Solicitation 1706-168

Inner Loop Improvements

Bid Designation: Public

Williamson County, Texas

Bid 1706-168
Inner Loop Improvements

Bid Number	1706-168
Bid Title	Inner Loop Improvements
Expected Expenditure	**$5,600,000.00** (This price is expected - not guaranteed)
Bid Start Date	In Held
Bid End Date	Aug 9, 2017 3:00:00 PM CDT
Question & Answer End Date	Aug 4, 2017 5:00:00 PM CDT
Bid Contact	Will Hutchinson Purchasing Specialist III 512-**943**-1553 will.hutchinson@wilco.org
Contract Duration	**300 days**
Contract Renewal	Not Applicable
Prices Good for	**90 days**
Pre-Bid Conference	**Jul 26, 2017 3:00:00 PM CDT** **Attendance is optional** **Location: 901 S. Austin Avenue, Georgetown, TX 78626**

Bid Comments

BID COMMENTS

Williamson County is seeking qualified contractors to construct turn lanes on existing Inner Loop at Wilco Way, Rockride, and the County's Central Maintenance Facility. Construction activities consist of excavation, embankment, grading, flexible base, asphalt pavement, culvert extensions, and pavement markings.

Estimated time of completion is 300 calendar days to substantial completion, and 330 calendar days to final completion, with an estimated cost of $5,600,000.

If entering an electronic bid in BidSync (PREFERRED), the following documents MUST be completed and attached to the First Line Item.
Completed Bid Form – Enter Total Price in area provided, then download/print/complete bid form and upload to first line item.
Bid Affidavit - This is a Fill-able form - Complete and Accept.
Bid Bond - See Details Below.

The following documents are fillable forms on BidSync - Fill in blanks and accept to apply to the bid.
Conflict of Interest Form
References
Bid Bond - See Details Below.

If delivering a paper bid instead of electronic, you must provide (2) originals, (1) copy, and (1) USB or CD of all the required documents. All documents must be delivered in a sealed envelope to:

Williamson County Purchasing
Attn: Bid #1706-168 Inner Loop Improvements
901 South Austin Ave
Georgetown, TX 78626

BID BOND REQUIRED: Bidders are not required to use Surety 2000 for your Bid Bond supplier, however; when bidding electronically in BidSync and using Surety 2000, you may import your bid bond directly from the Surety 2000 website.
IF A COPY OF THE BID BOND IS SUBMITTED ELECTRONICALLY THROUGH WWW.BIDSYNC.COM **, AN ORIGINAL MUST BE SUBMITTED TO PURCHASING BEFORE BEING RECOMMENDED FOR COMMISSIONERS COURT AWARD.** The original Bid Bond may be provided with the 1295 form, after being notified of probable award.

To use a different bond provider, you MUST: Scan the completed Bond; download the completed bond to the first line item of this bid with your other required documents or your bid will be disqualified.

All Bids shall be accompanied by either;
A certified cashier's check: payable without recourse to Williamson County and drawn upon a National or State Bank in the amount not less than five percent (5%) of the total maximum bid price;
OR
A bid bond not less than five percent (5%) of the total maximum bid price, from a surety company authorized to do business in the State of Texas.

For unit price contracts, the total maximum bid price shall be estimated and calculated by multiplying the estimated quantities to the unit bid price.

Bid bonds must be attached to the line item of the electronic bid OR submitted in the same sealed envelope with a paper Bid.

Bids requiring a bid bond and submitted without a cashier's check or a bid bond will not be considered.

If you are awarded the bid, please see reference to new State Requirement for Certificate of Interest in Section 3 Bid Instructions/Requirements: #36: Certificate of Interested Parties.

Bonds
Payment and Performance Bond documents are provided in the Bid documents for completion upon award.
Maintenance Bond documents are provided in the Bid documents for completion upon final completion of the work.

LIQUIDATED DAMAGES for failure to substantially complete the work within the allotted time will be applied. The road-user cost Liquidated Damages will be in accordance with Special Provision 000-001, and are estimated to be $970 per calendar day.

PLAN HOLDERS LISTS
Please note that a bidder adding their name to the Plan-Holders list is voluntary.
The plan-holders on construction bids allows Prime and Subcontractors to add their names and information to a list of users that are participating in this bid. To add a company to the Plan holder's list, the user will choose either the Subcontractor or the Prime contractor tabs and then click Add my company to this Plan holder's list. This will add the company's contact information to the Plan holder's list for other suppliers on the list to see.

If the user would like to view the suppliers that have been added to the list, they will need to click on the Subscribe button. This will allow the user to view other suppliers that have added their names to the Plan holder's list. Both of these actions will require that the vendor agree to the terms for the action.

Contract Administrator for this project is Bob Daigh, Senior Director of Infrastructure or designee, and shall be the Contract Administrator with designated responsibility to ensure compliance with contract requirements, such as but not limited to acceptance, inspection, and delivery. The contract administrator will serve as liaison between Williamson County Commissioners Court and the successful bidder or the Construction Inspector.

Item Response Form

Item **1706-168--01-01 -** ATTACH COMPLETED BID FORM AND REQUIRED DOCUMENTS HERE

Quantity **1 each**

Prices are not requested for this item.

Delivery Location **Williamson County, Texas**

Purchasing Department
901 S. Austin Avenue
Georgetown TX 78626
Qty 1

Description

ATTACH COMPLETED BID FORM AND REQUIRED DOCUMENTS HERE
(except fill-able forms when submitting via Bidsync)
Enter the total price in Bidsync, then download the Bid form, complete it and upload it to this first line item.
Unit prices must be good from the date of the bid opening through completion of the project.

PUBLIC ANNOUNCEMENT AND GENERAL INFORMATION

WILLIAMSON COUNTY PURCHASING DEPARTMENT
SOLICITATION 1706-168
Inner Loop Improvements

BIDS MUST BE RECEIVED ON OR BEFORE:
Aug 9, 2017 3:00:00 PM CDT

BIDS WILL BE PUBLICLY OPENED:
Aug 9, 2017 3:00:00 PM CDT

Notice is hereby given that sealed Bids for the above-mentioned goods and/or services will be accepted by the Williamson County Purchasing Department. Williamson County uses BidSync to distribute and receive bids. Specifications for this IFB may be obtained by registering at www.bidsync.com.

Williamson County prefers and requests electronic submittal of this Bid.

All electronic bids must be submitted via: www.bidsync.com

Electronic bids are requested, however paper bids will currently still be received, until further notice and may be mailed or delivered to the address listed below.

Bidders are strongly encouraged to carefully read this entire IFB.

All interested Bidders are invited to submit a Bid in accordance with the Instructions and General Requirements, Bid Format, Bid Specifications, and Definitions, Terms and Conditions stated in this IFB.

Please note that a complete package must be submitted choosing one of the above two methods. Split packages submitted will be considered "unresponsive" and will not be accepted or evaluated.

Williamson County will not accept any Bids received after the submittal deadline, and shall return such Bids unopened to the Bidder.

General Information:

- If mailed or delivered in person, Bids and Bid addenda are to be delivered in sealed envelope on or before the submittal deadline, as noted in the Public Announcement and General Information listed above for this IFB, to:

  Williamson County Purchasing Department
  Attn: **BID NAME AND NUMBER**
  901 South Austin Avenue
  Georgetown, Texas 78626

  - Bidders should list the Bid Number, Bid Name, Name and Address of Bidder, and the Date of the Bid opening on the outside of the box or envelope and note "Sealed Bid Enclosed."
  - Bidder should submit one (1) original.
  - Williamson County will NOT be responsible for unmarked or improperly marked envelopes.
  - Williamson County will not accept any responsibility for Bids being delivered by third party carriers.
  - Facsimile transmittals will NOT be accepted.

- Bids will be opened publicly in a manner; however, to avoid public disclosure of contents only the names and of Bidders and prices will be read aloud.

- All submitted questions with their answers will be posted and updated on www.bidsync.com.

- It is the Bidder's responsibility to review all documents in BidSync, including any Addenda that may have been added after the document packet was originally released and posted.

  - Any Addenda and/or other information relevant to the IFB will be posted on www.bidsync.com.

  - The Williamson County Purchasing Department takes no responsibility to ensure any interested Bidder has obtained any outstanding addenda or additional information.

WILLIAMSON COUNTY

PROJECT CONSTRUCTION MANUAL

FOR

INNER LOOP IMPROVEMENTS

SOLICITATION 1706-168

WILLIAMSON COUNTY, TEXAS
PURCHASING DEPARTMENT
901 SOUTH AUSTIN AVENUE
GEORGETOWN, TEXAS 78626

JULY 2017

The enclosed Specifications, Special Specifications, Special Provisions, General Notes, and Specification Data in this document have been selected by me, or under my responsible supervision as being applicable to this project. Alteration of a sealed document without proper notification to the responsible engineer is an offense under the Texas Engineering Practice Act.

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SECTION 1
ADDENDA

ADDENDUM NO. __

Date:

Owner: **Williamson County, Texas**

Project Name:

Project No:

This Addendum forms a part of the Contract and clarifies, corrects or modifies the original Construction Documents, dated _____. Acknowledge receipt of this addendum in space provided on Bid Form. Failure to do so may subject bidder to disqualification.

DESCRIPTION OF ADDITION OR CHANGE:

This addendum consists of __ page(s).

_____
Approved by ENGINEER

END

EXAMPLE

SECTION 2
INVITATION FOR BIDS

PUBLIC NOTICE WILLIAMSON COUNTY
INVITATION FOR BIDS

Williamson County Commissioner's Court invites the submission of sealed bids for:

INNER LOOP IMPROVEMENTS

Williamson County is seeking qualified contractors to construct turn lanes on existing Inner Loop at Wilco Way, Rockride, and the County's Central Maintenance Facility. Construction activities consist of excavation, embankment, grading, flexible base, asphalt pavement, culvert extensions, and pavement markings. Estimated time of completion is 300 calendar days to substantial completion, and 30 calendar days to final completion, with an estimated cost of $5,600,000.00.

Sealed bids will be publicly opened and read aloud in the Williamson County Purchasing Department, 901 South Austin Avenue, Georgetown, Texas on WEDNESDAY, AUGUST 9TH AT 3:00 PM.

Bids must be received on or before WEDNESDAY, AUGUST 9TH AT 3:00 PM. Bid documents and plans may be viewed and responded to by registering with BIDSYNC at www.bidsync.com.

No fee is required to register with Bidsync as a Williamson County Supplier, or to participate in the County's solicitation process. The receipt of electronic bids will be registered in Bidsync.

The Time-Date Stamp Clock located at the Williamson County Purchasing Department will serve as the official clock for the purpose of verifying the date and time of receipt of Paper Bids.

There will be a Non-Mandatory Pre-Bid Conference on THURSDAY, JULY 26TH AT 3:00 PM at Williamson County Purchasing Department, 901 South Austin Avenue, Georgetown, Texas.

BID BOND REQUIRED
A Cashier's Check, Certified Check, or acceptable Bidder's Bond in the amount of five percent (5%) of the Bid must accompany each Bid. Performance, Payment and Warranty Bonds will be required as designated in the bidding documents.

The Williamson County Commissioners' Court reserves the right to accept the lowest and best Bid as deemed by the Court, or reject any and/or all bids.

Bidder shall use per unit pricing. Payments will be made by check.

The designated Purchasing Agent for this Bid is Kerstin Hancock, Senior Purchasing Specialist, under the direction of Randy Barker, Purchasing Agent for Williamson County, 512-943-3553.

This notice is issued by order of the Williamson County Commissioners' Court on Tuesday, July 18th; Dan A. Gattis, County Judge.

SECTION 3
BID INSTRUCTIONS/REQUIREMENTS

BID INSTRUCTIONS/REQUIREMENTS

All Bids must be received in the Williamson County Purchasing Department either hardcopy or electronically through BidSync.

Williamson County prefers and requests electronic submittal of this bid.

All electronic bids must be submitted via: www.bidsync.com

All interested Respondents are invited to submit a Bid in accordance with the Instructions and General Requirements, Bid Format, Bid Specifications, and Definitions, Terms and Conditions stated in this BID.

Electronic bids are requested, however paper bids will currently still be received, until further notice and may be mailed or delivered to the address listed below.

Please note that a complete package must be submitted choosing one of the above two methods.

Split packages submitted will be considered "unresponsive" and will not be accepted or evaluated.

If mailed or delivered in person, Bids are to be delivered in sealed envelope on or before the submittal deadline to:

Williamson County Purchasing Department
Attn: **BID NAME AND NUMBER**
901 South Austin Avenue
Georgetown, Texas 78626

Respondents should list the Bid Number, Bid Name, Name and Address of Respondent, and the Date of the Bid opening on the outside of the box or envelope.

Respondent should submit one (1) original; **AND** (2) two copies and (1) CD **OR** (1) USB copy of the Bid.

Williamson County will not accept any Bids received after the submittal deadline.
Williamson County will not accept any responsibility for Bids being delivered by third party carriers. Facsimile transmittals will NOT be accepted.

All questions should be submitted on the Bidsync site. Questions with their answers will be posted and updated on www.bidsync.com.

Any addenda and/or other information relevant to the Bid will be posted on: www.bidsync.com.

ALL BIDS MUST BE SUBMITTED ON THE FORMS PROVIDED IN THIS BID DOCUMENT. (May be replaced with a computer generated printout, if submitted in an identical format to the proposal).

FACSIMILE AND ELECTRONIC MAIL TRANSMITTALS SHALL NOT BE ACCEPTED.

1. All of the items listed are to be on a "per unit" basis, stating a firm price per unit or unit quantity of each item. **This price must be good from the date of Bid opening through the completion of the project. Bids which do not state a fixed price will not be considered.** The Court may award a contract for the period implied or expressly stated in the lowest and best Bid.

2. All of the items listed are to be Free On Board to final destination **(FOB DESTINATION)** with all transportation charges if applicable to be included in the price, unless otherwise specified in the Invitation for Bids. The title and risk of loss of the goods shall not pass to the County until receipt and acceptance takes place at the FOB point.

3. It is understood that the Commissioners Court of Williamson County, Texas, reserves the right to accept or reject any and/or all Bids for any or all materials and/or services covered in this Bid request, and to waive informalities or defects in the Bid or to accept such Bid it shall deem to be in the best interest of Williamson County.

4. Funding: Funds for payment have been provided through the Williamson County budget approved by Commissioners Court for the 2013 Road Bond Program.

5. Late Bid: Bids received after submission deadline will be considered VOID AND UNACCEPTABLE and will be returned to the bidder unopened. Williamson County is

not responsible for lateness or non-delivery of mail, carrier, etc. The date and time stamp of the Williamson County Purchasing Department shall be the official date and time of receipt.

6. Altering Bid: Bidders **cannot alter or amend bid** after submission deadline.

7. Sales Tax: Williamson County is by statute, exempt from the State Sales Tax and Federal Excise Tax.

8. Contract: This Bid, when properly accepted by Williamson County, shall constitute a contract equally binding between the successful bidder and Williamson County. No different or additional terms will become part of this contract.

9. Changes: No oral statement of any person shall modify or otherwise change, or affect the terms, conditions, plans and/or specifications stated in the Bid Package and or Bid Instructions/Requirements.

10. Delivery Times and Locations: The commodity and/or service covered by this Bid shall be as stated in the Bid Package.

11. Payments: The Construction Inspector will manage the Contractor payments. Invoices for the work specified in the Contract Documents will be submitted to the Construction Inspector. Upon satisfactory completion and acceptance of these invoices, the Construction Inspector will forward the invoices to the County via the GEC. County's payment for goods and services shall be governed by Chapter 2251 of the Texas Government Code. An invoice shall be deemed overdue the 31st day after the later of (1) the date County receives the goods under the Contract; (2) the date the performance of the service under the Contract is completed; or (3) the date the Williamson County Auditor receives an invoice for the goods or services. Interest charges for any overdue payments shall be paid by County in accordance with Texas Government Code Section 2251.025. More specifically, the rate of interest that shall accrue on a late payment is the rate in effect on September 1 of County's fiscal year in which the payment becomes due. The said rate in effect on September 1 shall be equal to the sum of one percent (1%); and (2) the prime rate published in the Wall Street Journal on the first day of July of the preceding fiscal year that does not fall on a Saturday or Sunday.

In the event that an error appears in an invoice submitted by Successful Bidder, County shall notify Successful Bidder of the error not later than the twenty first (21st) day after the date County receives the invoice. If the error is resolved in favor of Successful Bidder, Successful Bidder shall be entitled to receive interest on the unpaid balance of the invoice submitted by Successful Bidder beginning on the date that the payment for the invoice became overdue. If the error is resolved in favor of the County, Successful Bidder shall submit a corrected invoice that must be paid in accordance within the time set forth above. The unpaid balance accrues interest as provided by Chapter 2251 of the Texas Government Code if the corrected invoice is not paid by the appropriate date. As a minimum, invoices shall include:

(1) Name, address, and telephone number of Contractor and similar information in the event the payment is to be made to a different address

(2) County contract, Purchase Order, and/or delivery order number

(3) Identification of items or service as outlined in the contract

(4) Quantity or quantities, applicable unit prices, total prices, and total amount

(5) Any additional payment information which may be called for by the Contract

Payment inquiries should be directed to the Williamson County Auditor's Office, Accounts Payable Department:
512-943-1573
accountspayable@wilco.org

12. Conflict of Interest: No public official shall have interest in a contract, in accordance with Vernon's Texas Codes Annotated, Local Government Code Title 5, Subtitle C, Chapter 171. As of January 1, 2006 Vendors are responsible for complying with

Local Government Code Title 5, Subtitle C, Chapter 176. Additional information may be obtained from the County website at the following link: http://www.wilco.org/CountyDepartments/Purchasing/ConflictofInterestDisclosure/tabid/689/language/en-US/Default.aspx. The Williamson County Conflict of Interest Questionnaire is attached as a fillable form. This form must be completed, signed, and submitted with your bid (attached to the first Line Item of this bid) or completed electronically and signed electronically when entering your password in Bidsync.

13. Ethics: The bidder shall not accept or offer gifts or anything of value nor enter into any business arrangement with any employee, official or agent of Williamson County.

14. Minimum Standards for Responsible Bidders: A prospective bidder must affirmatively demonstrate bidder's responsibility. A prospective bidder must meet the following requirements:

    a. have adequate financial resources, or the ability to obtain such resources as required;

    b. be able to comply with the required or proposed delivery schedule;

    c. have a satisfactory record of performance;

    d. be otherwise qualified and eligible to receive an award.

    Williamson County may request representation and other information sufficient to determine bidder's ability to meet these minimum standards listed above.

15. References: Williamson County **REQUIRES** bidder to supply with this Bid, a list of at least **three (3) references** where like services have been supplied by their firm. The Bidder References Form is attached as a fillable form in this bid document. This form must be completed and attached to the first line item on your bid or included with an all paper bid.

16. Bidder shall provide with this Bid response, all documentation required by this Bid. Failure to provide this information may result in rejection of the Bid.

17. Termination for Default: Williamson County reserves the right to enforce the performance of this contract in any manner prescribed by law or deemed to be in the best interest of the County in the event of breach or default of this contract. Non-Performance of the bidder in terms of specifications shall be a basis for the termination of the contract by the County. The County shall not pay for commodities/services which are unsatisfactory. Contractors will be given a reasonable opportunity before termination to correct the deficiencies. This, however, shall in no way be construed as negating the basis for termination for non-performance.

18. Contract Administration: Under this contract, Robert Daigh, Williamson County Sr. Director of Infrastructure or designee, shall be the contract administrator with designated responsibility to ensure compliance with contract requirements, such as but not limited to, acceptance, inspection and delivery. The contract administrator will serve as liaison between Williamson County Commissioners Court and the successful bidder or the Construction Inspector.

19. Purchase Order: Williamson County may generate a purchase order(s) to the successful bidder as products and/or services are required. The purchase order number must appear on all itemized invoices and/or request for payment.

20. Silence of Specifications: The apparent silence of these specifications as to any detail or to the apparent omission from it of a detailed description concerning any point, shall be regarded as meaning that only the best practices are to prevail. All interpretations of these specifications shall be made on the basis of this statement.

21. Contract Times and Liquidated Damages - Bidders must agree to commence work on or before a date to be specified in a written “Notice to Proceed” of the County, and to fully complete the project within the specified time stated in the proposal. Bidders must agree to pay liquidated damages in accordance with Special Provision 000-001 per day to County for

every day past the specified completion date stated in the proposal.

22. BIDS MUST BE: legible and of a quality that can be reproduced.

23. Bid forms that are included in the Bid package shall be used. **CHANGES to Bid forms made by bidders shall DISQUALIFY THE BID.** Exceptions to the Bid forms and or specifications shall be made on an **attachment** to the Bid package.

24. Workers Compensation Coverage Requirements: The Texas Labor Code, §406.096, requires workers' compensation insurance coverage for all persons providing services on a building or construction project for a governmental entity. The rule requires a governmental entity to timely obtain certificates of coverage and retain them for the duration of the project. The rule also sets out the language to be included in bid specifications and in contracts awarded by a governmental entity and the information required to be in the posted notice to employees. The rule is adopted under the Texas Labor Code, §402.061. The information provided below is a result of this rule. By submitting your bid to the county, you are acknowledging that this rule is a part of these bid specifications, and that you will observe and abide by all of the requirements outlined in the rule. You are further agreeing that should your bid or proposal be accepted by the Williamson County Commissioners' Court, the necessary certificates of coverage showing workers' compensation coverage, will be provided to the following name and address, prior to beginning work:

Williamson County Purchasing Department
901 South Austin Avenue
Georgetown, Texas 78626

If you have any questions related to this ruling and/or requirement, you are encouraged to contact either the Williamson County Purchasing Department at (512) 943-1553, or you may call the Texas Workers' Compensation Commission at (512) 804-4000.

A. Definitions: The following words and terms, when used in this provision, shall have the following meanings. Terms not defined in this rule shall have the meaning defined in the Texas Labor Code, if so defined.

(1) Certificate of coverage ("certificate")-A copy of a certificate of insurance, a certificate of authority to self-insure issued by the commission, or a coverage agreement (TWCC-81, TWCC-82, TWCC-83, or TWCC-84), showing statutory workers' compensation insurance coverage for the person's or entity's employees (including those subject to a coverage agreement) providing services on a project, for the duration of the project.

(2) Building or construction – Has the meaning defined in the Texas Labor Code, §406.096(e)(1).

(3) Contractor--A person bidding for or awarded a building or construction project by Williamson County.

(4) Coverage--Workers' compensation insurance meeting the statutory requirements of the Texas Labor Code, §401.011(44).

(5) Coverage agreement--A written agreement on form TWCC-81, form TWCC-82, form TWCC-83, or form TWCC-84, filed with the Texas Workers' Compensation Commission which establishes a relationship between the parties for purposes of the Texas Workers' Compensation Act, pursuant to the Texas Labor Code, Chapter 406, Subchapters F and G, as one of employer/employee and establishes who will be responsible for providing workers' compensation coverage for persons providing services on the project.

(5) Duration of the project - includes the time from the beginning of the work on the project until the contractor's/person's work on the project has been completed and accepted by the governmental entity.

(6) Persons providing services on the project ("subcontractor" in §406.096) - includes all persons or entities performing all or part of the services the contractor has undertaken to perform on the project, regardless of whether that person

contracted directly with the contractor and regardless of whether that person has employees. This includes, without limitation, independent contractors, subcontractors, leasing companies, motor carriers, owner-operators, employees of any such entity, or employees of any entity which furnishes persons to provide services on the project. "Services" include, without limitation, providing, hauling, or delivering equipment or materials, or providing labor, transportation, or other service related to a project. "Services" does not include activities unrelated to the project, such as food/beverage vendors, office supply deliveries, and delivery of portable toilets.

(8) Project--Includes the provision of all services related to a building or construction contract for Williamson County.

B. The contractor shall provide coverage, based on proper reporting of classification codes and payroll amounts and filing of any coverage agreements, which meets the statutory requirements of Texas Labor Code, Section 401.011(44) for all employees of the contractor providing services on the project, for the duration of the project.

C. The Contractor must provide a certificate of coverage to the governmental entity prior to being awarded the contract.

D. If the coverage period shown on the contractor's current certificate of coverage ends during the duration of the project, the contractor must, prior to the end of the coverage period, file a new certificate of coverage with the governmental entity showing that coverage has been extended.

E. The contractor shall obtain from each person providing services on a project, and provide to the governmental entity:

(1) a certificate of coverage, prior to that person beginning work on the project, so the governmental entity will have on file certificates of coverage showing coverage for all persons providing services on the project;

(2) no later than seven (7) days after receipt by the contractor, a new certificate of coverage showing extension of coverage, if the coverage period shown on the current certificate of coverage ends during the duration of the project.

F. The contractor shall retain all required certificates of coverage for the duration of the project and for one year thereafter.

G. The contractor shall notify Williamson County in writing by certified mail or personal delivery, within ten (10) days after the contractor knew or should have known, of any change that materially affects the provision of coverage of any person providing services on the project.

H. The contractor shall post on each project site a notice, in the text, form and manner prescribed by the Texas Workers' Compensation Commission, informing all persons providing services on the project that they are required to be covered, and stating how a person may verify coverage and report lack of coverage.

I. The contractor shall contractually require each person with whom it contracts to provide services on a project, to:

(1) provide coverage, based on proper reporting of classification codes and payroll amounts and filing of any coverage agreements, which meets the statutory requirements of Texas Labor Code, Section 401.011(44) for all of its employees providing services on the project, for the duration of the project;

(2) provide to the contractor, prior to that person beginning work on the project, a certificate of coverage showing that coverage is being provided for all employees of the person providing services on the project, for the duration of the project;

(3) provide the contractor, prior to the end of the coverage period, a new

certificate of coverage showing extension of coverage, if the coverage period shown on the current certificate of coverage ends during the duration of the project;

(4) obtain from each other person with whom it contracts, and provide to the contractor:

(a) a certificate of coverage, prior to the other person beginning work on the project; &

(b) a new certificate of coverage showing extension of coverage, prior to the end of the coverage period, if the coverage period shown on the current certificate of coverage ends during the duration of the project;

(5) retain all required certificates of coverage on file for the duration of the project and for one year thereafter;

(6) notify the governmental entity in writing by certified mail or personal delivery, within ten(10) days after the person knew or should have known, of any change that materially affects the provision of coverage of any person providing services on the project; and

(7) contractually require each person with whom it contracts, to perform as required by paragraphs (1) - (7), with the certificates of coverage to be provided to the person for whom they are providing services.

J. By signing this contract or providing or causing to be provided a certificate of coverage, the contractor is representing to the governmental entity that all employees of the contractor who will provide services on the project will be covered by workers' compensation coverage for the duration of the project, that the coverage will be based on proper reporting of classification codes and payroll amounts, and that all coverage agreements will be filed with the appropriate insurance carrier or, in the case of a self-insured, with the commission's Division of Self-Insurance Regulation. Providing false or misleading information may subject the contractor to administrative penalties, criminal penalties, civil penalties, or other civil actions.

K. The contractor's failure to comply with any of these provisions is a breach of contract by the contractor which entitles the governmental entity to declare the contract void if the contractor does not remedy the breach within ten (10) days after receipt of notice of breach from Williamson County.

25. **PERFORMANCE AND PAYMENT BONDS:** Chapter 262.032 and Chapter 2253.021 of the Texas Government Code governs the requirements for performance bonds and payment bonds for government entities making public work contracts. A performance bond is required if the contract is in excess of $50,000 and is to be made for the full amount of the contract. A payment bond is required if the contract is in excess of $25,000 and is to be made for the full amount of the contract. The bonds are to be executed within ten (10) days after receipt of written notification of award of contract prior to beginning work on the project and must be executed by a corporate surety or sureties in accordance with the Texas Insurance Code. In the event the bond exceeds $100,000.00, the surety must also (1) hold a certificate of authority from the United States secretary of the treasury to qualify as a surety on obligations permitted or required under federal law; or (2) have obtained reinsurance for any liability in excess of $100,000.00 from a reinsurer that is authorized and admitted as are insurer in this state and is the holder of a certificate of authority from the United States secretary of the treasury to qualify as a surety or reinsurer on obligations permitted or required under federal law.

In determining whether the surety or reinsurer holds a valid certificate of authority the County may rely on the list of companies holding certificates of authority as published in the Federal Register covering the date on which the bond is to be executed. If the public works contract is less than $50,000 the performance bond will not be required

as long as the contract provides that payment is not due until the work is completed and accepted by the county. The purpose of a performance bond is for the protection of the government entity and is conditioned on the faithful performance of the work being done in accordance with the plans, specifications and contract documents. The payment bond is for the protection of persons supplying labor and materials to the contractor to ensure payment.

26. **BIDDERS BOND:** All bids shall be accompanied by a certified cashier's check upon a National or State bank in an amount not less than five percent (5%) of the total maximum bid price, payable without recourse to Williamson County, or a bid bond in the same amount from a reliable surety company, as a guarantee that the bidder will enter into a contract and execute performance and payment bonds, as stipulated by item 25 above, within ten (10) days after notice of award of contract to him. Bid guarantees must be submitted in the same sealed envelope with the bid. Bids submitted without check or bid bonds will not be considered.
Bidders are not required to use Surety 2000 for your Bid Bond supplier, however; when bidding electronically in Bidsync and using Surety 2000, you may import your bid bond directly from the Surety 2000 web site. To use a different bond provider you MUST:

    1. Scan the completed bond
    2. Download the completed bond to the line item of this bid with your other required documents.

    Bid bonds must be attached to the line item of the electronic bid OR submitted in the same sealed envelope with a paper Bid.

27. All bid securities will be returned to the respective bidders within twenty-five (25) days after bids are opened, except those which the County elects to hold until the successful bidder has executed the contract. Thereafter, all remaining securities, including security of the successful bidder, will be returned within sixty (60) days.

28. Prior to submitting any bid, bidders are required to read the plans, specifications, bid, contract and bond forms carefully; to inform themselves by their independent research, test and investigation of the difficulties to be encountered and judge for themselves of the accessibility of the work and all attending circumstances affecting the cost of doing the work and the time required for its completion and obtain all information required to make an intelligent bid.

29. Should the bidder find discrepancies in, or omissions from the plans, specifications, or other documents, or should he/she be in doubt as to their meaning, he/she should notify at once the Project Engineer and may obtain clarification or addendum prior to submitting any bid.

30. In case of ambiguity or lack of clarity in the statement of prices in the bids, the county reserves the right to consider the most favorable analysis thereof, or to reject the bid. Unreasonable (or unbalanced) prices submitted in a bid may result in rejection of such bid or other bids.

31. Award of the contract, if awarded, will be made within sixty (60) days after opening of the bids and no bidder may withdraw his bid within said sixty (60) day period of time unless a prior award is made.

32. Within ten (10) days of written notification of award of the contract, the bidder shall execute and furnish to the County the performance bond, or letter of credit if applicable, and payment bond as required by item 25 above; and the Certificate of Insurance showing coverages in accordance with contract documents. Failure to execute contract, Bonds and Certificate of Insurance shall be just cause for the annulment of the award. In case of the annulment of the award, the bid guarantee shall become the property of Williamson County, not as a penalty, but as a liquidated damage.

33. Any quantities given in any portion of the contract documents, including the plans, are estimates only, and the actual amount of work required may differ somewhat from the estimates. The basis for the payment shall be the actual amount of work done and/or material furnished.

34. **THE TEXAS HAZARD COMMUNICATION ACT**, Chapter 502 of the Health and Safety Code, Sec. 502.006, states that a chemical manufacturer or distributor shall provide appropriate Material Safety Data Sheets (MSDS) to employers who acquire hazardous chemicals in this state with each initial shipment and with the first shipment after a MSDS is updated. The MSDS must conform to the most current requirements of the OSHA standard in 29 CFR 1910.1200. By submitting your bid to the County you are acknowledging that this regulation is a part of this bid and that you will provide appropriate MSDS with each initial shipment and with the first shipment after a MSDS is updated.

35. **THE WILLIAMSON COUNTY HAZARD COMMUNICATION PROGRAM POLICY** Under Revised Texas Hazard Communication Act (THCA) of 1993 states that it is the responsibility of all contractor/sub-contractors who bring hazardous chemicals onto county property to provide appropriate MSDS to the county at the work site. When exposure to a hazardous chemical is expected each contractor/sub-contractor shall be responsible for the appropriate training of their employees. For a copy of the Williamson County Hazard Communication Program Policy contact the Williamson County Unified Road & Bridge System Safety/Training Coordinator at 512/930-3330. By submitting your bid to the County you are acknowledging that this policy is a part of this bid and that you will provide appropriate MSDS to the county work site and provide for appropriate training as applicable.

36. **CERTIFICATE OF INTERESTED PARTIES TEXAS ETHICS COMMISSION (FORM 1295)** As of January 1, 2016, Bidders are responsible for complying with the Texas Government Code Section 2252.908. The law states that the County may not enter into certain contracts with a Bidder unless the Bidder submits a disclosure of interested parties to the County at the time the Bidder submits the signed contract to Williamson County.
    On January 1, 2016, the Texas Ethics Commission made available on its website a new filing application that must be used to file Form 1295. Information regarding how to use the filing application is available on the Texas Ethics Commission website at the following link:
    https://www.ethics.state.tx.us/whatsnew/elf_info_form1295.htm
    The Low Bidder must:
    1. Use the online application to process the required information on Form 1295
    2. Print a copy of the form which will contain a unique certification number
    3. An authorized agent of the Bidder must sign the printed copy of the form
    4. and have the form notarized
    5. the completed Form 1295 and certification of filing must be filed (scanning and emailing form is sufficient) with Williamson County prior to award of the contract by Commissioners Court.

37. Ambiguity, Conflict, or other Errors in the IFB If Bidder discovers any ambiguity, conflict, discrepancy, omission or other error in this IFB, Bidder shall immediately notify Williamson County Purchasing Department of such error in writing and request modification or clarification of the document. Modifications will be made by issuing Addenda. If the Bidder fails to notify Williamson County prior to the date and time fixed for submission of Bids of an error or ambiguity in the IFB known to Bidder, or an error or ambiguity that reasonably should have been known to Bidder, then Bidder shall be deemed to have waived the error or ambiguity or its later resolution. Williamson County may also modify the IFB, no later than 48 hours prior to the date and time fixed for submission of Bids, by issuance of an Addendum. All addenda will be numbered consecutively, beginning with 1.

SECTION 4
BID FORM, BID AFFIDAVIT, BIDDER REFERENCES, & CONFLICT OF INTEREST QUESTIONNAIRE

ALL REQUIRED DOCUMENTS MUST BE FILLED OUT AND SUBMITTED WITH BID

www.bidsync.com

FOLLOWING CONTRACT AWARD REQUIRED DOCUMENTS WILL BE INSERTED IN THIS SECTION

SECTION 5
STANDARD FORM OF AGREEMENT

STANDARD FORM OF AGREEMENT

STATE OF TEXAS

WILLIAMSON COUNTY

THIS STANDARD FORM OF AGREEMENT (the "Agreement") is by and between WILLIAMSON COUNTY, TEXAS, a political subdivision of the State of Texas (hereinafter called "County") and _____ (hereinafter called "Contractor").

The County and Contractor, in consideration of the mutual covenants hereinafter set forth, agree as follows:

Article 1. Work

Contractor shall complete all Work as specified or indicated in the Contract Documents. The "Project" is generally described as follows:

Project No. **1706-168 – INNER LOOP IMPROVMENTS**

Article 2. Engineer of Record

The Project has been designed by **Rodriguez Transportation Group, Bridgefarmers & Associates, and Cobb Fendley & Associates**, who is hereinafter called the "Engineer of Record" and who is to act as the County's design professional.

Article 3. Contract Time

The Work shall be Substantially Completed in **300** calendar days (the "Contract Time"). Following Substantial Completion, the Contractor shall proceed expeditiously with adequate forces and shall achieve Final Completion within the time specified in the Special Conditions.

Article 4. Contract Price

County shall pay Contractor for completion of the Work in accordance with the Contract Documents an amount in current funds equal to the sum of the amounts determined pursuant to paragraph 4.1 below (the "Contract Price"):

4.1 For all Unit Price Work, an amount equal to the sum of the established unit price for each separately identified item of Unit Price Work times the estimated quantity of that item as indicated in the Bid Form, and as totaled below:

TOTAL OF ALL UNIT PRICES_____ $_____(dollars)
(insert words)

As provided in the General Conditions, estimated quantities are not guaranteed, and determinations of actual quantities and classification are to be made by the Engineer of Record.

Article 5. Contractor's Representations

In order to induce County to enter into this Agreement, Contractor makes the following representations:

5.1 Contractor has examined and carefully studied the Contract Documents and the other related data identified in the Bidding Documents including the "technical data".

5.2 Contractor has visited the site and become familiar with and is satisfied as to the general, local and site conditions that may affect cost, progress, performance or furnishing of the Work.

5.3 Contractor is familiar with and is satisfied as to all federal, state and local Laws and Regulations that may affect cost, progress, performance and furnishing of the Work.

5.4 Contractor has carefully studied all reports of explorations and tests of subsurface conditions at or contiguous to the site and all drawings of physical conditions in or relating to existing surface or subsurface structures at or contiguous to the site which have been identified. Contractor acknowledges that such reports and drawings are not Contract Documents and may not be complete for Contractor's purposes. Contractor acknowledges that the County and Engineer of Record do not assume responsibility for the accuracy or completeness of information and data shown or indicated in the Contract Documents with respect to Underground Facilities at or contiguous to the site.

5.5 Contractor has correlated the information known to Contractor, information and observations obtained from visits to the site, reports and drawings identified in the Contract Documents and all additional examinations, investigations, explorations, tests, studies and data with the Contract Documents.

5.6 Contractor has given Engineer of Record written notice of all conflicts, errors, ambiguities or discrepancies that Contractor has discovered in the Contract Documents and the written resolution thereof by Engineer of Record is acceptable to Contractor, and the Contract Documents are generally sufficient to indicate and

convey understanding of all terms and conditions for performance and furnishing of the Work.

5.7 Contractor represents and agrees that there are no obligations, commitments, or impediments of any kind that will limit or prevent performance of its obligations under the Contract Documents.

5.8 Contractor warrants, represents, and agrees that if (i) it is a corporation or limited liability company, then it is a corporation duly organized, validly existing and in good standing under the laws of the State of Texas, or a foreign corporation or limited liability company duly authorized and in good standing to conduct business in the State of Texas, that it has all necessary corporate power and has received all necessary corporate approvals to execute and deliver this Agreement, and the individual executing the Agreement on behalf of Contractor has been duly authorized to act for and bind Contractor; or (ii) if it is a partnership, limited partnership, or limited liability partnership, then it has all necessary partnership power and has secured all necessary approvals to execute and deliver this Agreement and perform all its obligations under the Contract Documents; and the individual executing this Agreement on behalf of Contractor has been duly authorized to act for and bind Contractor.

5.9 Neither the execution and delivery of this Agreement by Contractor nor the performance of its obligations under the Contract Documents will result in the violation of any provision, if a corporation, of its articles of incorporation or by-laws, if a limited liability company, of its articles of organization or regulations, or if a partnership, by any partnership agreement by which Contractor is bound, or any agreement by which Contractor is bound or to the best of the Contractor's knowledge and belief, will conflict with any order or decree of any court or governmental instrumentality relating to Contractor.

5.10 Except for the obligation of the County to pay Contractor the Contract Price pursuant to the terms of the Contract Documents, and to perform certain other obligations pursuant to the terms and conditions explicitly set forth in the Contract Documents, County shall have no liability to Contractor or to anyone claiming through or under Contractor by reason of the execution or performance of this Agreement. Notwithstanding any obligation or liability of County to Contractor, no present or future partner or affiliate of County or any agent, officer, director, or employee of County, or of the various departments comprising Williamson County, or anyone claiming under County has or shall have any personal liability to Contractor or to anyone claming through or under Contractor by reason of the execution or performance of this Agreement.

Article 6. Contract Documents

The "Contract Documents," which comprise the entire agreement between the County and Contractor concerning the Work, consist of the following:

6.1 This Standard Form of Agreement

6.2 Performance Bond

6.3 Payment Bond

6.4 Maintenance Bond

6.5 Certificate of Insurance

6.6 Wage Rates

6.7 General Conditions

6.8 Special Conditions

6.9 Technical Specifications

6.10 Plan Drawings

6.11 Addenda numbers _____ to _____, inclusive

6.12 Contractor's Bid Affidavit and Bid Form

6.13 Documentation submitted by Contractor prior to Notice of Award.

6.14 The following which may be delivered or issued after the Effective Date of the Agreement and are not attached hereto: All Written Amendments and other documents amending, modifying or supplementing the Contract Documents pursuant to applicable sections in the General Conditions.

The documents listed in paragraphs 6.2 et seq. above are attached to this Agreement (except as expressly noted otherwise above).

There are no Contract Documents other than those listed above in this Article 6. The Contract Documents may only be amended, modified or supplemented as provided in the General Conditions.

Article 7. Miscellaneous

7.1 Terms used in this Agreement, which are defined in the General Conditions, will have the meanings indicated in the General Conditions.

7.2 No assignment by a party hereto of any rights under or interests in the Contract Documents will be binding on another party hereto without the written consent of the party sought to be bound; and, specifically but without limitation, moneys that may become due and moneys that are due may not be assigned without such consent (except to the extent that the effect of this restriction may be limited by law), and unless specifically stated to the contrary in any written consent to an assignment no assignment will release or discharge the assignor from any duty or responsibility under the Contract Documents.

7.3 The County and Contractor each binds itself, its partners, successors, assigns and legal representatives to the other party hereto, its partners, successors, assigns and legal representatives in respect to all covenants, agreements and obligations contained in the Contract Documents.

7.4 Any provision or part of the Contract Documents held to be void or unenforceable under any Law or Regulation shall be deemed stricken, and all remaining provisions shall continue to be valid and binding upon the County and Contractor, who agree that the Contract Documents shall be reformed to replace such stricken provision or part thereof with a valid and enforceable provision that comes as close as possible to expressing the intention of the stricken position.

7.5 Each party to this Agreement hereby agrees and acknowledges that venue and jurisdiction of any suit, right, or cause of action arising out of or in connection with this Agreement shall lie exclusively in Williamson County, Texas. Furthermore, this Agreement shall be governed by and construed in accordance with the laws of the State of Texas, excluding, however, its choice of law rules.

7.6 The parties to this Agreement agree that during the performance of the services under this Agreement they will not discriminate against any employee or applicant for employment because of race, color, religion, sex, or national origin. The parties to this Agreement will take affirmative action to ensure that applicants are employed, and that employees are treated during employment, without regard to their race, color, religion, sex or national origin. Such action shall include, but not be limited to the following: employment, upgrading, demotion, or transfer; termination; rates of pay or other forms of compensation, and selection for training, including apprenticeship.

7.7 This Agreement is for the sole and exclusive benefit of the parties hereto, and nothing in this Agreement, express or implied, is intended to confer or shall be construed as conferring upon any other person any rights, remedies or any other type or types of benefits.

7.8 Each party to this Agreement acknowledges that it and its counsel have reviewed this Agreement and that the normal rules of construction are not applicable and there will be no presumption that any ambiguities will be resolved against the drafting party in the interpretation of this Agreement.

7.9 Each party to this Agreement, in the performance of this Agreement, shall act in an individual capacity and not as agents, employees, partners, joint ventures or associates of one another. The employees or agents of one party shall not be deemed or construed to be the employees or agents of the other party for any purposes whatsoever.

7.10 Nothing in this Agreement shall be deemed to waive, modify or amend any legal defense available at law or in equity to County, its past or present officers, employees, or agents or employees, nor to create any legal rights or claim on behalf of any third party. County does not waive, modify, or alter to any extent whatsoever the availability of the defense of governmental immunity under the laws of the State of Texas and of the United States.

7.11 To the extent, if any, that any provision in this Agreement is in conflict with Tex. Gov't Code 552.001 et seq., as amended (the "Public Information Act"), the same shall be of no force or effect. Furthermore, it is expressly understood and agreed that County, its officers and employees may request advice, decisions and opinions of the Attorney General of the State of Texas in regard to the application of the Public Information Act to any items or data furnished to County as to whether or not the same are available to the public. It is further understood that County's officers and employees shall have the right to rely on the advice, decisions and opinions of the Attorney General, and that County, its officers and employees shall have no liability or obligation to any party hereto for the disclosure to the public, or to any person or persons, of any items or data furnished to County by a party hereto, in reliance of any advice, decision or opinion of the Attorney General of the State of Texas.

7.12 County and Contractor have signed this Agreement in triplicate. One counterpart each has been delivered to the County, Contractor and Engineer of Record. All portions of the Contract Documents have been signed, initialed or identified by County and Contractor or identified by Engineer of Record on their behalf.

7.13 This Agreement and the Contract Documents represent the entire and integrated agreement between the parties hereto and supersedes all prior negotiations, representations, or agreements, either oral or written. This Agreement may be amended only by written instrument signed by each party to this Agreement. NO OFFICIAL, EMPLOYEE, AGENT, OR REPRESENTATIVE OF THE COUNTY HAS ANY AUTHORITY, EITHER EXPRESS OR IMPLIED, TO AMEND THIS CONTRACT, EXCEPT PURSUANT TO SUCH EXPRESS AUTHORITY AS MAY BE GRANTED BY THE WILLIAMSON COUNTY COMMISSIONERS COURT.

This Agreement will be effective on _____, 20_____ (which is the "Effective Date" of the Agreement).

COUNTY_____	CONTRACTOR_____
By:_____	By: _____
Dan A. Gattis, Williamson County Judge	Title: _____
	[CORPORATE SEAL]
Attest_____	Attest_____

SECTION 6
WAGE RATES

WAGE RATES

Contractor must pay all workers not less than the prevailing wage rate for Williamson County, Texas.

General Decision Number: TX170016 01/06/2017 TX16

Superseded General Decision Number: TX20160016

State: Texas

Construction Types: Heavy and Highway

Counties: Atascosa, Bandera, Bastrop, Bell, Bexar, Brazos, Burleson, Caldwell, Comal, Coryell, Guadalupe, Hays, Kendall, Lampasas, McLennan, Medina, Robertson, Travis, Williamson and Wilson Counties in Texas.

HEAVY (excluding tunnels and dams, not to be used for work on Sewage or Water Treatment Plants or Lift / Pump Stations in Bell, Coryell, McClennon and Williamson Counties) and HIGHWAY Construction Projects

Note: Under Executive Order (EO) 13658, an hourly minimum wage of $10.20 for calendar year 2017 applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2015. If this contract is covered by the EO, the contractor must pay all workers in any classification listed on this wage determination at least $10.20 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract in calendar year 2017. The EO minimum wage rate will be adjusted annually. Additional information on contractor requirements and worker protections under the EO is available at www.dol.gov/whd/govcontracts.

Modification Number	Publication Date
0	01/06/2017

* SUTX2011-006 08/03/2011

	Rates	Fringes
CEMENT MASON/CONCRETE FINISHER (Paving and Structures)	$ 12.56	
ELECTRICIAN	$ 26.35	
FORM BUILDER/FORM SETTER		
Paving & Curb	$ 12.94	
Structures	$ 12.87	
LABORER		
Asphalt Raker	$ 12.12	
Flagger	$ 9.45	
Laborer, Common	$ 10.50	
Laborer, Utility	$ 12.27	
Pipelayer	$ 12.79	

Work Zone Barricade Servicer.....$ 11.85

PAINTER (Structures).....$ 18.34

POWER EQUIPMENT OPERATOR:
- Agricultural Tractor.....$ 12.69
- Asphalt Distributor.....$ 15.55
- Asphalt Paving Machine.....$ 14.36
- Boom Truck.....$ 18.36
- Broom or Sweeper.....$ 11.04
- Concrete Pavement Finishing Machine.....$ 15.48
- Crane, Hydraulic 80 tons or less.....$ 18.36
- Crane, Lattice Boom 80 tons or less.....$ 15.87
- Crane, Lattice Boom over 80 tons.....$ 19.38
- Crawler Tractor.....$ 15.67
- Directional Drilling Locator.....$ 11.67
- Directional Drilling Operator.....$ 17.24
- Excavator 50,000 lbs or Less.....$ 12.88
- Excavator over 50,000 lbs...$ 17.71
- Foundation Drill, Truck Mounted.....$ 16.93
- Front End Loader, 3 CY or Less.....$ 13.04
- Front End Loader, Over 3 CY.$ 13.21
- Loader/Backhoe.....$ 14.12
- Mechanic.....$ 17.10
- Milling Machine.....$ 14.18
- Motor Grader, Fine Grade....$ 18.51
- Motor Grader, Rough.....$ 14.63
- Pavement Marking Machine....$ 19.17
- Reclaimer/Pulverizer.....$ 12.88
- Roller, Asphalt.....$ 12.78
- Roller, Other.....$ 10.50
- Scraper.....$ 12.27
- Spreader Box.....$ 14.04
- Trenching Machine, Heavy....$ 18.48

Servicer.....$ 14.51

Steel Worker
- Reinforcing.....$ 14.00
- Structural.....$ 19.29

TRAFFIC SIGNAL INSTALLER
- Traffic Signal/Light Pole Worker.....$ 16.00

TRUCK DRIVER
- Lowboy-Float.....$ 15.66

Off Road Hauler.....$ 11.88
Single Axle.....$ 11.79
Single or Tandem Axle Dump Truck.....$ 11.68
Tandem Axle Tractor w/Semi Trailer.....$ 12.81

WELDER.....$ 15.97

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

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Note: Executive Order (EO) 13706, Establishing Paid Sick Leave for Federal Contractors applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2017. If this contract is covered by the EO, the contractor must provide employees with 1 hour of paid sick leave for every 30 hours they work, up to 56 hours of paid sick leave each year. Employees must be permitted to use paid sick leave for their own illness, injury or other health-related needs, including preventive care; to assist a family member (or person who is like family to the employee) who is ill, injured, or has other health-related needs, including preventive care; or for reasons resulting from, or to assist a family member (or person who is like family to the employee) who is a victim of, domestic violence, sexual assault, or stalking. Additional information on contractor requirements and worker protections under the EO is available at www.dol.gov/whd/govcontracts.

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (ii)).

The body of each wage determination lists the classification and wage rates that have been found to be prevailing for the cited type(s) of construction in the area covered by the wage determination. The classifications are listed in alphabetical order of "identifiers" that indicate whether the particular rate is a union rate (current union negotiated rate for local), a survey rate (weighted average rate) or a union average rate (weighted union average rate).

Union Rate Identifiers

A four letter classification abbreviation identifier enclosed in dotted lines beginning with characters other than "SU" or "UAVG" denotes that the union classification and rate were prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2014. PLUM is an abbreviation identifier of the union which prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. 07/01/2014 is the effective date of the most current negotiated rate, which in this example is July 1, 2014.

Union prevailing wage rates are updated to reflect all rate changes in the collective bargaining agreement (CBA) governing this classification and rate.

Survey Rate Identifiers

Classifications listed under the "SU" identifier indicate that no one rate prevailed for this classification in the survey and the published rate is derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As this weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SULA2012-007 5/13/2014. SU indicates the rates are survey rates based on a weighted average calculation of rates and are not majority rates. LA indicates the State of Louisiana. 2012 is the year of survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. 5/13/2014 indicates the survey completion date for the classifications and rates under that identifier.

Survey wage rates are not updated and remain in effect until a new survey is conducted.

Union Average Rate Identifiers

Classification(s) listed under the UAVG identifier indicate that no single majority rate prevailed for those classifications; however, 100% of the data reported for the classifications was union data. EXAMPLE: UAVG-OH-0010 08/29/2014. UAVG indicates that the rate is a weighted union average rate. OH indicates the state. The next number, 0010 in the example, is an internal number used in producing the wage determination. 08/29/2014 indicates the survey completion date for the classifications and rates under that identifier.

A UAVG rate will be updated once a year, usually in January of each year, to reflect a weighted average of the current negotiated/CBA rate of the union locals from which the rate is based.

WAGE DETERMINATION APPEALS PROCESS

1.) Has there been an initial decision in the matter? This can be:

* an existing published wage determination
* a survey underlying a wage determination
* a Wage and Hour Division letter setting forth a position on a wage determination matter
* a conformance (additional classification and rate) ruling

On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour Regional Office for the area in which the survey was conducted because those Regional Offices have responsibility for the Davis-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of Construction Wage Determinations. Write to:

Branch of Construction Wage Determinations
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

2.) If the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

Wage and Hour Administrator
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and by any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3.) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

4.) All decisions by the Administrative Review Board are final.

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END OF GENERAL DECISION

SECTION 7
PERFORMANCE BOND

PERFORMANCE BOND

STATE OF TEXAS
COUNTY OF _____

KNOW ALL MEN BY THESE PRESENTS: That _____

_____of the City of _____

County of _____, and State of _____, as principal, and

_____

authorized under the laws of the State of Texas to act as surety on bonds for principals, are held and firmly bound unto Williamson County (County), in the penal sum of

_____Dollars

($_____) for the payment whereof, the said Principal and Surety bind themselves, their heirs, administrators, executors, successors, jointly and severally, by these presents:

WHEREAS, the Principal has entered into a certain written Agreement with the County, dated the _____day of _____, 20_____(the "Agreement"), to which the said Agreement, along with the Contract Documents referenced therein are hereby referred to and made a part hereof as fully and to the same extent as if copied at length herein.

NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION IS SUCH, that if the said Principal shall faithfully perform said Agreement and shall in all respects duly and faithfully observe and perform all and singular the covenants, conditions and agreements in and by the Agreement agreed and covenanted by the Principal to be observed and performed, and according to the true intent and meaning of said Agreement and the Contract Documents hereto annexed, then this obligation shall be void; otherwise to remain in full force and effect.

PROVIDED, HOWEVER, that this bond is executed pursuant to the provisions of Chapter 2253 of the Texas Government Code, as amended and all liabilities on this bond shall be determined in accordance with the provisions of said Chapter to the same extent as if it were copied at length herein.

SURETY, for value received, stipulates and agrees that no change, extension of time, alteration or addition to the terms of the Agreement or to the work performed thereunder, or to the Contract Documents referenced therein, shall in anyway affect the obligations on this bond, and it does hereby waive notice of such change, extension of time, alteration or addition to the terms on the Agreement, or to the work to be performed thereunder.

IN WITNESS WHEREOF, the said Principal and Surety have signed and sealed this instrument this _____ day of _____, 20___.

_____	_____
PRINCIPAL	SURETY
_____	_____
SIGNATURE	SIGNATURE
_____	_____
NAME & TITLE	NAME & TITLE
_____	_____
ADDRESS	ADDRESS
_____	_____
(_____) _____	(_____) _____
PHONE NUMBER	PHONE NUMBER

The name and address of the Resident Agency of Surety is:

_____

_____

(_____) _____	_____
PHONE NUMBER	SIGNATURE OF LICENSED LOCAL RECORDING AGENT appointed to countersign on behalf of Surety (Required by Art. 21.09 of the Insurance Code)

****

I,_____, having executed Bonds
SIGNATURE

for _____ do hereby affirm I have
NAME OF SURETY

verified that said Surety is now certified with Authority from either: (a) the Secretary of the Treasury of the United States if the project funding includes Federal monies; or (b) the State of Texas if none of the project funding is from Federal sources; and further, said Surety is in no way limited or restricted from furnishing Bond in the State of Texas for the amount and under conditions stated herein.

SECTION 8
PAYMENT BOND

PAYMENT BOND

STATE OF TEXAS
COUNTY OF _____

KNOW ALL MEN BY THESE PRESENTS: That _____

_____of the City of _____

County of _____, and State of _____, as Principal (hereinafter referred to as the "Principal"), and

_____
authorized under the laws of the State of Texas to act as Surety on bonds for principals (hereinafter referred to as the "Surety"), are held and firmly bound unto Williamson County, (hereinafter referred to as the "County"), in the penal sum of

_____Dollars

($_____) for the payment whereof, the said Principal and Surety bind themselves, their heirs, administrators, executors, successors and assigns, jointly and severally, by these presents:

WHEREAS, the Principal has entered into a certain written agreement with the County, dated the _____ day of _____, 20_____, to _____

_____ (hereinafter referred to as the "Agreement"), which said Agreement and the Contract Documents incorporated therein are hereby referred to and made a part hereof as fully and to the same extent as if copied at length herein.

NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION IS SUCH, that if the said Principal shall pay all claimants supplying labor and material to him or a subcontractor in the prosecution of the Work provided for in said Agreement, then, this obligation shall be void; otherwise to remain in full force and effect.

PROVIDED, HOWEVER, that this bond is executed pursuant to the provisions of Chapter 2253 of the Texas Government Code, as amended and all liabilities on this bond shall be determined in accordance with the provisions of said Chapter to the same extent as if it were copied at length herein.

SURETY, for value received, stipulates and agrees that no change, extension of time, alteration or addition to the terms of the Agreement or to the Work performed thereunder, or to the other Contract Documents accompanying the same, shall in anyway affect its obligation on this bond, and it does hereby waive notice of such change, extension of time, alteration or addition to the terms of the Agreement, or to the work to be performed thereunder or to the other Contract Documents accompanying the same.

IN WITNESS WHEREOF, the said Principal and Surety have signed and sealed this instrument this _____ day of _____, 20___.

_____	_____
PRINCIPAL	SURETY
_____	_____
SIGNATURE	SIGNATURE
_____	_____
NAME & TITLE	NAME & TITLE
_____	_____
ADDRESS	ADDRESS
_____	_____
(_____) _____	(_____) _____
PHONE NUMBER	PHONE NUMBER

The name and address of the Resident Agency of Surety is:

_____

_____

(_____) _____	_____
PHONE NUMBER	SIGNATURE OF LICENSED LOCAL RECORDING AGENT appointed to countersign on behalf of Surety (Required by Art. 21.09 of the Insurance Code)

SECTION 9
MAINTENANCE BOND

MAINTENANCE BOND

KNOW ALL MEN BY THESE PRESENTS: That _____
(NAME OF CONTRACTOR)

_____

as principal, hereinafter called "CONTRACTOR" and _____

_____
(NAME OF SURETY)

a corporation organized under the laws of _____
as Surety, hereinafter called "SURETY", do hereby expressly acknowledge themselves to be held and bound to pay unto WILLIAMSON COUNTY as Obligee, a political subdivision of the State of Texas, hereinafter called "COUNTY", the sum of (20% of total construction contract amount)

_____
(INSERT WORDS)
_____ Dollars ($_____) for the payment of which sum well and truly to be made unto said COUNTY and its successors, said principal and sureties do hereby bind themselves, their assigns, and successors jointly and severally.

This obligation is conditioned, however, that whereas said CONTRACTOR has by written Agreement dated _____ , 20 _____ , entered into an agreement with said COUNTY to build and construct _____

_____
which said Agreement and the Contract Documents therein mentioned and adopted by the COUNTY are hereby expressly made a part thereof as though the same were written and embodied herein.

WHEREAS, under the terms and conditions of the Agreement, specifications and other Contract Documents, it is provided that the CONTRACTOR shall maintain and keep in good repair the Work constructed and/or equipment furnished by it as contemplated by the plan drawings, specifications, and other Contract Documents, and perform for a period of 2 years from the date of acceptance as shown on the "Certificate of Completion" issued by the ENGINEER, or the date of Final Payment by the COUNTY if a separate Certificate of Completion is not issued, all necessary repairs, reconstruction and renewal of any part of said construction, and to furnish the labor and materials to make good and to repair any defective condition growing out of or on account of the breakage or failure of any substance or the improper function of any part of the construction work. The CONTRACTOR shall reimburse the COUNTY for the costs of all engineering and special services required to be furnished by the COUNTY which are directly attributable to the restoration of the constructed work. Said maintenance contemplates the complete restoration of the constructed work to a functional use during the said period as set forth above. It is the intended purpose of this section to require the correction of all defective conditions resulting from materials furnished or work and labor performed by the CONTRACTOR under the conditions prescribed by the Agreement, plans and specifications and other Contract Documents; and in case the CONTRACTOR shall fail or refuse to commence and actively pursue such corrections within ten (10) days after proper written notifications have been furnished to it by the COUNTY, it is agreed that the COUNTY may do said work and supply such materials and the said CONTRACTOR and SURETY herein shall be liable for the payment of all costs thereby incurred.

NOW THEREFORE, if the said CONTRACTOR shall keep and perform its said agreement to maintain said work and keep the same in good repair for the said maintenance period as provided above, then these presents shall be null and void and have no further effect, but if default shall be made by the

CONTRACTOR in the performance of its Agreement to maintain and repair said work, then these presents shall have full force and effect and the COUNTY shall have and recover from the said CONTRACTOR and its sureties damages in the premises, as provided, and it is further understood and agreed that this obligation shall be a continuing one against the principal and sureties hereon, and that successive recoveries may be had hereon for successive breaches until the full amount shall have been exhausted; and it is further understood that the obligation herein to maintain said work shall continue throughout said maintenance period, and the same shall not be changed, diminished, or in any manner affected from any cause during said time.

IN WITNESS WHEREOF, this instrument is executed this _____ day of _____, 20 ____

_____ _____

PRINCIPAL PHONE NO.

_____

SIGNATURE (SEAL)

_____ _____

NAME & TITLE WITNESS OR ATTEST TO SEAL

_____ _____

SURETY PHONE NO.

_____

SIGNATURE (SEAL)

_____ _____

NAME & TITLE WITNESS OR ATTEST TO SEAL

_____

SIGNATURE OF LICENSED LOCAL RECORDING AGENT
appointed to countersign on behalf of Surety

SECTION 10
CERTIFICATE OF INSURANCE

CERTIFICATE OF INSURANCE

TO: DATE:_____

_____ Project No.:_____
(COUNTY)

_____ Type of _____

_____ Project:_____
(ADDRESS)

THIS IS TO CERTIFY THAT _____
(Name and address of insured)

is, at the date of this certificate, insured by this Company with respect to the business operations hereinafter described for the types of Insurance and in accordance with the provisions of the standard policies used by this Company, and further hereinafter described. Exceptions to the standard policy noted on reverse side hereof.

TYPE OF INSURANCE	POLICY NO.	EFFECTIVE	EXPIRES	LIMITS OF LIABILITY
Workmen's Compensation				1 Person $
Public Liability				1 Accident $
Contingent Liability				1 Person $
				1 Accident $
Property Damage				
Builder's Risk				
Automobile				
Other				

The foregoing Policies (do) (do not) cover all sub-contractors.

Locations Covered:_____

Descriptions of Operations Covered:_____

The above policies either in the body thereof or by appropriate endorsement provide that they may not be changed or canceled by the insurer in less than five days after the insured has received written notice of such change or cancellation.

Where applicable local laws or regulations require more than five days actual notice of change or cancellation to the assured, the above policies contain such special requirements, either in the body thereof or by appropriate endorsement thereto attached.

_____
(Name of Insurer)

By:_____

Phone No. (___) _____ Title:_____

SECTION 11
GENERAL CONDITIONS OF AGREEMENT

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General Conditions of Agreement

1. Definition of Terms

For purposes of the Contract Documents, the following terms shall have the meanings set forth herein:

1.01 The Agreement

The term the "Agreement" shall mean Standard Form of Agreement by and between County and Contractor relating to the Work and the construction of the Project.

1.02 County

Williamson County, Texas, being a political subdivision of the State of Texas, is the entity identified in the Agreement and hereinafter referred to as the "County." Nothing contained in the Contract Documents shall create any contractual or agency relationship between any parties other than the County and the Contractor.

1.03 Department

The "Department" shall mean the Texas Department of Transportation (TxDOT).

1.04 Contractor

The term the "Contractor" shall mean the successful bidder that enters into the Agreement with the County for the construction of the Work and the Project defined by the Contract Documents.

1.05 Engineer

The term the "Engineer" shall mean the County Engineer or the authorized representative of the County Engineer.

1.06 General Engineering Consultant (GEC)

The term the "General Engineering Consultant" or "GEC" shall mean the consulting engineering firm representing and assisting the County in the design, review, and coordination of the design and construction phases of the Project. The GEC shall be responsible for the construction oversight of the Project.

1.07 Construction Observer

The "Construction Observer" or the "Observer" shall mean the County's employee or a contracted consultant who performs construction engineering and inspection services for the Project.

1.08 Construction Representative

The "Construction Representative" shall mean the GEC's designated field representative

during construction of the Project which shall provide for coordination and assistance of the construction observation effort.

1.09 Engineer of Record

The term "Engineer of Record" shall mean the County's design professional, who shall provide professional engineering design services for the Project.

1.10 Contract Documents

The "Contract Documents" shall consist of the Special Conditions, Notice for Bidders, Proposal, the fully executed Agreement, Performance and Payment Bonds, Maintenance Bond, Special Bonds (when required), General Conditions, Technical Specifications or Specifications, Plans and all modifications thereof incorporated in any such documents before the execution of the Agreement and all modifications that are made, in accordance with the Contract Documents, following the execution of the Agreement.

The Contract Documents are complementary, and what is called for by any one shall be as binding as if called for by all. In case of conflict between any of the Contract Documents, priority of interpretation shall be in the following order: Fully Executed Agreement, Performance and Payment Bonds, Maintenance Bond, Special Bonds (if any), Proposal, General Conditions, Special Conditions, Technical Specifications or Specifications, and Plans.

1.11 Subcontractor

The term "Subcontractor", as employed herein, includes only those having a direct contract with the Contractor. It includes one who furnishes material worked to special design according to the plans or specifications of this work, but does not include one who merely furnishes material not so worked.

1.12 Sub-Subcontractor

The term "Sub-Subcontractor" means one who has a direct or indirect contract with a Subcontractor to perform any of the Work at the site. It includes one who furnishes material worked to a special design according to the plans or specifications of this work, but does not include one who merely furnishes material not so worked.

1.13 Written Notice

Written notice shall be deemed to have been duly served if delivered in person to the individual or to an officer of the entity for whom it is intended, or if delivered to or sent by registered mail to the last business address known to it who gives the notice.

1.14 Work

The Contractor shall provide and pay for all materials, machinery, equipment, tools, superintendence, labor, services, insurance, and all water, light, power, fuel, transportation and other facilities necessary for the execution and completion of the work covered by the Contract Documents (collectively known as the "Work"). Unless otherwise specified, all materials shall be new and both workmanship and materials shall be of a good quality. The

Contractor shall, if required, furnish satisfactory evidence as to the kind and quality of materials. Materials or work described in words which, when so applied, have a well-known technical or trade meaning shall be held to refer to such recognized standards.

1.15 Extra Work

The term "Extra Work" as used in the Contract Documents shall be understood to mean and include all work that may be required by the County to be done by the Contractor to accomplish any change, alteration or addition to the Work shown upon the plans, or reasonably implied by the specifications, and not covered by the Contractor's Proposal, except as provided under Section 2.13 "Changes and Alterations" herein.

1.16 Working Day

The term "Working Day" is defined as any day not including Saturdays, Sundays or any legal holidays, in which weather or other conditions, not under the control of the Contractor, will permit construction of the principal units of the Work for a period of not less than seven (7) hours between 7:00 a.m. and 6:00 p.m.

1.17 Calendar Day

The term "Calendar Day" is defined as any day of the week or month, no days being excepted.

1.18 Substantially Completed

The term "Substantially Completed" or "Substantial Completion" shall be understood to mean that all Project Work (or the work for a specified phase of the Project) requiring lane or shoulder closures or obstructions is completed, and traffic is following the lane arrangement as shown on the plans for the finished roadway (or the specified phase of work). Additionally, all pavement construction, resurfacing, traffic control devices, and pavement markings shall be in their final position (or as called for on the plans for the specified phase of work) at such time; provided, however, the Engineer may make an exception as to the permanent pavement markings being in their final position provided that, in the Engineer's sole discretion, the lack of markings does not cause a disruption to traffic flow or an unsafe condition for the traveling public, and work zone pavement markings are in place.

1.19 Notice of Substantial Completion

Notice issued to the Contractor by the Observer or County's Representative acknowledging Substantial Completion of the Project, signifying the end of time charges.

1.20 Certificate of Completion

Certificate issued to the Contractor by the Observer acknowledging "Final Completion" of the Project, as determined by completion of the Punch List, from which time the warranty period for the Project shall begin. The issuance of the Certificate of Completion shall serve as evidence of "Final Completion" and such certificate shall relieve the Contractor of ownership responsibilities for the Project, except for repair of damage caused by the Contractor or by the Contractor's operations to existing facilities or completed and substantially accepted work.

1.21 Certificate of Acceptance

Certificate issued to the Contractor by the County acknowledging final acceptance and purchase of the Project.

1.22 Project

The "Project" shall mean and include the Project defined, described and set forth in the Agreement.

1.23 Contract Time

The "Contract Time" shall mean the amount of time in which the Work shall be Substantially Completed. The number of days allotted for the Contract Time shall be specifically set forth in the Agreement.

1.24 Contract Price

The "Contract Price" shall mean the amount that the County shall pay the Contractor for completion of the Work in accordance with the Contract Documents. The specific amount of the Contract Price shall be determined pursuant to the terms of the Contract Documents.

2. Responsibilities of the Engineer and the Contractor

2.01 County-Observer Relationship

The Observer will be the County's contracted consultant during construction. The duties, responsibilities and limitations of authority of the Observer as the County's representative during construction are as set forth in the Contract Documents and/or the Agreement for Construction Engineering and Inspection Services and shall not be extended or limited without written consent of the County or the Observer. The Observer will advise and consult with the County and the GEC, and all of the County's instructions to the Contractor shall be issued through the Observer.

2.02 Professional Observation by the Construction Observer

The Observer shall be on the jobsite when work is being performed to provide construction engineering inspections of the Work performed by the Contractor. In addition to performing material testing on behalf of the County, the Observer shall review the progress of the executed Work and to determine if such Work meets the essential performance and design features and the technical and functional engineering requirements of the Contract Documents; provided and except, however, that the Observer shall not be responsible, directly or indirectly, for the Contractor's construction means, methods, techniques, sequences, quality, procedures, programs, safety precautions or lack of same incident thereto or in connection therewith. Notwithstanding any other provision of the Contract Documents, the Engineer and the Observer shall not be responsible or liable for any acts, errors, omissions or negligence of the Contractor, any Subcontractor or any of the Contractor's or Subcontractor's agents, servants or employees or any other person, firm or corporation performing or attempting to perform any of the Work.

2.03 Payments for Work

The Observer shall review the Contractor's applications for payment and supporting data, determine the amount owed to the Contractor and recommend, in writing to the GEC for review, payment to the Contractor in such amounts; such recommendation of payment to the Contractor constitutes a representation to the County of the Observer's professional judgment that the Work has progressed to the point indicated to the best of its knowledge, information and belief, but such recommendation of an application for payment to the Contractor shall not be deemed as a representation by the Observer that the Observer has made any examination to determine how or for what purpose the Contractor has used the monies paid on account of the Contract Price.

2.04 Initial Determinations

The Observer initially shall determine all claims, disputes and other matters in question between the Contractor and the County relating to execution or progress of the Work or interpretation of the Contract Documents. The Observer's decision shall be rendered in writing to the GEC for review within a reasonable time, which shall not be construed to be less than ten (10) days.

2.05 Objections

In the event the Observer renders any decision which, in the opinion of either party hereto, is not in accordance with the meaning and intent of the Contract Documents, either party may file with the Observer its written objection to the decision within thirty (30) days of such decision by the Observer, and by such action may reserve the right to submit the question so raised to litigation as hereinafter provided.

2.06 Lines and Grades

Unless otherwise specified, all lines and grades shall be furnished by the Contractor at its own expense. Whenever necessary, construction work shall be suspended to permit performance of this work, but such suspension will be as brief as practicable and the Contractor shall be allowed no extra compensation therefore.

2.07 Contractor's Duty and Superintendence

The Contractor shall give adequate attention to the faithful prosecution and completion of the Work subject of the Contract Documents and shall keep on the Project site, at all times during its progress, a competent Superintendent and any necessary assistants to supervise and direct the Work. The Superintendent shall represent the Contractor in its absence and all directions given to the Superintendent shall be as binding as if given to the Contractor.

The Contractor is and at all times shall remain an independent contractor, solely responsible for the manner and method of completing its work under the Contract Documents, with full power and authority to select the means, method and manner of performing such work, so long as such methods do not adversely affect the completed improvements, the County and the Observer being interested only in the result obtained and conformity of such completed improvements with the Contract Documents.

Likewise, the Contractor shall be solely responsible for the safety of itself, its employees and other persons, as well as for the protection and safety of the improvements being erected and its property or any other person's property, as a result of its operations under the Contract Documents. Engineering construction drawings and specifications, as well as any additional information concerning the Work to be performed passing from or through the Observer, shall not be interpreted as requiring or allowing the Contractor to deviate from the Contract documents, the plans and specifications; the intent of such drawings, specifications and any other such information being to define with specificity the agreement of the parties as to the Work the Contractor is to perform.

Any review of work in process, or any visit or observation and inspection during construction, or any clarification of plans and specifications, by the Observer or the County, or any agent, employee, or representative of either of them, whether through personal observation or inspection on the Project site or by means of approval of shop drawings for temporary construction or construction processes, or by other means or methods, is agreed by the Contractor to be for the purpose of observing the extent and nature of work completed or being performed, as measured against the drawings and specifications constituting the Contract Documents, or for the purpose of enabling the Contractor to more fully understand the plans and specifications so that the completed construction work will conform thereto, and shall in no way relieve the Contractor from full and complete responsibility for the proper performance of its work on the Project, including but not limited to the propriety of means and methods of the Contractor in performing in accordance with the Contract Documents, and the adequacy of any designs, plans or other facilities for accomplishing such performance. Deviation by the Contractor from plans and specifications that may have been in evidence during any such visitation or observation by the Observer, the Engineer, or any of their representatives, whether called to the Contractor's attention or not, shall in no way relieve the Contractor from its responsibility to complete all work in accordance with the Contract Documents.

2.08 Contractor's Understanding

It is understood and agreed that the Contractor has, by careful examination, satisfied itself as to the nature and location of the Work, the conformation of the ground, the character, quality and quantity of the materials to be encountered, the character of equipment and facilities needed preliminary to and during the prosecution of the Work, the general and local conditions, and all other matters which can in any way affect the Work under the Contract Documents.

2.09 Character of Workers

The Contractor agrees to employ only orderly and competent workers, skillful in the performance of the type of work required under the Contract Documents, to do the Work; and agrees that whenever the Observer shall inform it in writing that any workers on the Work are, in its opinion, incompetent, unfaithful or disorderly, or refuse instructions from the Observer in the absence of the Superintendent, such worker shall be discharged from the Work and shall not again be employed on the Work without the Observer's written consent. No illegal alien may be employed by any Contractor for work on this Project, and a penalty

of $500.00 per day will be assessed for each day and for each illegal alien who works for the Contractor at this Project.

2.10 Shop Drawings

The Contractor shall submit to the Observer, with such promptness as to cause no delay in its own work or in that of any other contractor, a minimum of four (4) stamped/reviewed copies, unless otherwise specified, of all shop and/or setting drawings and schedules required for the work of the various trades, and the Engineer of Record shall pass upon them with reasonable promptness, making desired corrections. Note: A single copy of the reviewed drawings shall be retained by the reviewer, the County, and the County's Representative for their records. The Contractor may not submit more than four different shop drawing plans for review in any one week. The Engineer of Record shall return the shop drawings to the Contractor, via the GEC, within three (3) weeks of its having received them, with appropriate comments. The Contractor shall make any corrections required by the Engineer of Record, file with it two (2) corrected copies and furnish such other copies as may be needed. The Engineer of Record's approval of such drawings or schedules shall not relieve the Contractor from responsibility for deviations from drawings or specifications, unless the Contractor has in writing called the Engineer of Record's attention to such deviations at the time of submission, nor shall it relieve Contractor from responsibility for errors of any sort in shop drawings or schedules. It shall be the Contractor's responsibility to fully and completely review all shop drawings to ascertain their effect on its ability to perform the required work in accordance with the Contract Documents and within the time for completion thereof. Any shop drawings which are required for temporary supports must be signed and sealed by an Engineer registered in the State of Texas.

Such review by the Engineer of Record shall be for the sole purpose of determining the sufficiency of said shop drawings or schedules to result in finished improvements in conformity with the plans and specifications, and shall not relieve the Contractor of its duties and obligations, as an independent contractor, set forth in the Contract Documents. It is hereby expressly understood and agreed that the Engineer of Record does not assume any duty to pass upon the propriety or adequacy of such drawings or schedules, or any means or methods reflected thereby, in relation to the safety of either person or property during the Contractor's performance hereunder.

2.11 Preliminary Approval

The Observer shall not have the power to waive the obligations of the Contract Documents for the furnishing by the Contractor of good material, and of its performing good work as herein described, and in full accordance with the Contract Documents. No failure or omission of the Observer to discover, object to or condemn any defective work or material shall release the Contractor from the obligations to fully and properly perform in full accordance with the Contract Documents, including without limitation, the obligation to at once tear out, remove and properly replace any defective work or material at any time prior to final acceptance upon the discovery of said defective work or material; provided, however, that the Observer shall, upon request of the Contractor, inspect and accept or reject any material furnished, and in the event the material has been once accepted by the Observer,

such acceptance shall be binding on the County unless it can be clearly shown that such material furnished does not meet the specifications for this work.

Any questioned work may be ordered to be taken up or removed for re-examination by the Observer, prior to final acceptance, and if found not in accordance with the plans and/or specifications for said work, all expenses relating to the removing, re-examination and replacement shall be solely borne by the Contractor. Otherwise, if the questioned work is found to be in accordance with the plans and/or specifications for said work, the expense thus incurred shall be allowed as Extra Work and shall be paid for by the County; provided, however, where inspection or approval is specifically required by the specifications prior to performance of certain work, should the Contractor proceed with such work without requesting prior inspection or approval, the Contractor shall bear all expense of taking up, removing, and replacing this work if so directed by the Observer.

2.12 Defects and Their Remedies

It is further agreed that if the Work or any part thereof, or any material brought on the site of the Work for use in the Work or selected for the same, shall be deemed by the Observer as unsuitable or not in conformity with the Contract Documents, or the intent thereof, the Contractor shall, after receipt of notice thereof from the Observer, forthwith remove such material and rebuild or otherwise remedy such work so that it shall be in full accordance with the Contract Documents.

2.13 Changes and Alterations

The Contractor further agrees that the County may make such changes and alterations as the County may see fit in the line, grade, form, dimensions, plans or materials for the Work herein contemplated, or any part thereof, either before or after the beginning of the construction, without affecting the validity of the Contract Documents.

If such changes or alterations diminish the quantity of the Work to be done, they shall not constitute the basis for a claim for damages or anticipated profits on the Work that may be dispensed with, except as provided for unit price items under Section 5 “Measurement and Payment”. If the amount of work is increased, and the Work can fairly be classified under the specifications, such increase shall be paid for according to the quantity actually done and at the unit price, if any, established for such work under the Contract Documents, except as provided for unit price items under Section 5 “Measurement and Payment”. Otherwise, such additional work shall be paid for as provided under Extra Work. In the event the County makes such changes or alterations as shall make useless any work already done or material already furnished or used in said work, then the County shall compensate the Contractor for any material or labor so used, and for any actual loss occasioned by such change, due to actual expense incurred in preparation for the Work as originally planned.

3. General Obligations and Responsibilities

3.01 Keeping of Plans and Specifications Accessible and Keeping a Superintendent on the Project Site

The Contractor shall keep one (1) copy of the plans and specifications constantly accessible on the Work, with the latest revisions noted thereon. The Contractor shall give the Work its constant attention to facilitate the progress thereof and shall cooperate with the Construction Observer in every way possible. The Contractor shall designate, to the Construction Observer in writing, the name of a Superintendent, employed by the firm, regardless of how much of the Work may be sublet. The Superintendent will be available at all time. In the event a competent superintendent is not available, the Construction Observer may suspend work until one is available.

3.02 Ownership of Documents

All drawings, specifications and copies thereof furnished by the Engineer of Record shall not be reused on other work, and, with the exception of the signed contract sets, are to be returned to the Engineer of Record on request, at the completion of the work. All models, drawings, specifications and copies thereof are the property of the County.

3.03 Adequacy of Design

It is understood that the County believes it has employed competent engineers and designers. It is therefore agreed that the County and Engineer shall be responsible for the adequacy of the design, sufficiency of the Contract Documents, the safety of the structure and the practicability of the operations of the completed project provided that the Contractor has complied with the requirements of the said Contract Documents, all approved modifications thereof, and additions and alterations thereto approved in writing by the County. The burden of proof of such compliance shall be upon the Contractor to show that it has complied with the said requirements of the Contract Documents, approved modifications thereof, and all approved additions and alterations thereto.

The paper copies of the Contract Documents are considered to be the official contract documents. Any request by the Contractor and use thereof of electronic or digital information, including engineering design and survey files, shall be at the sole risk and legal responsibility of the Contractor. Neither the County nor the Engineer of Record makes any warranty or representation as to the compatibility of the files provided with other software programs, nor shall they be held responsible for subsequent uses of the data by the Contractor or anyone who may obtain the data from the Contractor. **THE CONTRACTOR SHALL, TO THE FULLEST EXTENT PERMITTED BY LAW, INDEMNIFY AND HOLD THE COUNTY ITS AGENTS, EMPLOYEES, OR REPRESENTATIVES AND THE ENGINEER OF RECORD HARMLESS FROM ANY AND ALL CLAIMS, SUITS, LIABILITY, DEMANDS OR COSTS ARISING OUT OF OR RESULTING FROM SUCH USE.** Because data stored on electronic media can deteriorate undetected or be modified undetected, neither the County nor the Engineer of Record can be held liable for the completeness or correctness of the electronic data once in possession of the Contractor.

3.04 Contractor's Responsibility for Work

Until the issuance of the Certificate of Completion for the Project, the Contractor shall have the charge and care thereof and shall take every precaution against injury or damage to any part thereof by the action of the elements or from any other cause, whether arising from the execution or from the non execution of the Work.

In case of suspension of work for any cause, the Contractor shall be responsible for the preservation of all materials. The Contractor shall provide suitable drainage of the roadway in good and passable condition until Final Completion, except as outlined below for opening the roadway to traffic.

Whenever, in the opinion of the Observer, any roadway or portion thereof is in suitable condition for travel, it shall be opened to traffic; provided, however, such opening shall not be held to be, in any way, the final acceptance of the roadway or any part thereof or be held as a waiver of any of the provisions of the Contract Documents. Where it is considered by the Observer to be in the public interest and so ordered in writing by the Observer, any Substantially Completed roadway or portion thereof may be opened to traffic as follows:

(1) When both required by plans, job sequence or the approved traffic control plan, and when the County accepts responsibility for maintaining such portion of the roadway opened to traffic.
(2) When work is suspended for a period of time at the convenience of the County, the County will assume the responsibility for maintaining the entire roadway during the period of suspension; or
(3) When the roadway or portion thereof is opened to traffic during construction operations at the convenience of the County, the County will assume responsibility for the maintenance of the traveled way and shoulders during the period in which it is opened to traffic.

The County, in assuming responsibility for maintenance under this provision, may require the Work to be done in accordance with Section 6, "Extra Work and Claims".

Except for damage by the Contractor or damage caused by the Contractor's operations, the Contractor will not be responsible for repair of damage to existing facilities or damage to completed and accepted work such as guard fence, bridge wings, railing, illumination assemblies, underpass structure, traffic barriers, delineator assemblies, signs, sign bridges, changeable message signs, vehicle impact attenuators (crash cushions and guardrail end treatments) and traffic signals, where such damage is caused by (a) motor-vehicle, seacraft or aircraft that are not being operated by Contractor; (b) railroad-train collision (c) vandalism: (d) Acts of God, such as earthquake, tidal wave, tornado, hurricane, or other cataclysmic phenomena of natures: or (e) Acts of Governmental Authorities.

Upon completion of all work provided for in the Contract Documents for any individual limits, control or project, the Observer may make an inspection, and if the Work is found to be satisfactory, the Contractor will be released from further maintenance on that portion of

the Work, except for damage caused by the Contractor or its operations. Such partial acceptance must be made in writing and shall in no way void or alter any terms of the Contract Documents. Other specific units of the Project will be accepted on an individual basis when shown on the plans or as approved, in writing, by the Observer.

3.05 Protection Against Accident to Employees and the Public

The Contractor shall at all times exercise reasonable precautions for the safety of employees and others on or near the Work and shall comply with all applicable provisions of federal, state, and municipal safety laws and building and construction codes. All machinery and equipment and other physical hazards shall, except where incompatible with federal, state, or municipal laws or regulations, be guarded in accordance with the "Manual of Accident Prevention in Construction" of the Associated General Contractors of America. The Contractor shall provide such machinery guards, safe walkways, ladders, bridges, gangplanks, and other safety devices. The safety precautions actually taken and their adequacy shall be the sole responsibility of the Contractor, acting at its discretion as an independent contractor.

Within 24 hours after Contractor becomes aware of the occurrence of any accident or other event which results in, or might result in, injury to the person or property of anyone, whether or not it results from or involves any action or failure to act by the Contractor or any employee or agent of the Contractor and which arises in any manner from the performance of the Work, the Contractor shall send a written report of such accident or other event to the County and the Observer, setting forth a full and concise statement of the facts pertaining thereto. Such statement shall include a written recordation of the location of the event and the circumstances surrounding the event through photographs, interviewing witnesses, obtaining of medical reports and other documentation that defines the event. The Contractor shall also provide to the County a copy of any and all accident reports received from safety officials or agencies. Copies of such documentation shall be provided to the County and the Observer for their records. The Contractor shall also immediately send the County and the Observer a copy of any summons, subpoena, notice, or other documents served upon the Contractor, its agents, employees, or representatives, or received by it or them, in connection with any matter before any court arising in any manner from the Contractor's performance of the Work.

3.06 Performance and Payment Bonds

Unless otherwise specified, it is further agreed by the parties to the Contract Documents that the Contractor will execute separate performance and payment bonds, each in the sum of one hundred (100%) percent of the total Contract Price, on forms acceptable to County, guaranteeing faithful performance of the Work and the fulfillment of any guarantee required, and further guaranteeing payment to all persons supplying labor and materials or furnishing Contractor with any equipment in the execution of the Work subject of the Contract Documents. It is agreed that the Contractor shall have no rights under the Contract Documents until such performance and payment bonds are furnished to and approved by the County.

Unless otherwise specified, the cost of the premium for the performance and payment bonds shall be included in the price bid by the Contractor for the Work subject of the Contract Documents, and no extra payment for such bonds will be made by the County.

Each bond shall be executed by a corporate surety or corporate sureties, with an A.M. Best rating of "B" or better, duly authorized to do business and to issue surety bonds in the State of Texas. If any surety upon any bond furnished in connection herewith becomes insolvent, or otherwise not authorized to do business in this state, the Contractor shall promptly furnish equivalent security to protect the interests of the County and of persons supplying labor, materials and equipment in the prosecution of the Work subject of the Contract Documents. Furthermore, the surety company underwriting the bonds must be acceptable to the County.

Each bond shall be accompanied by a valid Power of Attorney (issued by the surety company and attached, signed and sealed, with the corporate embossed seal, to the bond) authorizing the agent who signs the bond to commit the company to the terms of the bond, and stating on the face of the Power of Attorney the limit, if any, in the total amount for which such agent is empowered to issue a single bond.

3.07 Protection of Adjoining Property

The Contractor shall take proper means to protect the adjacent or adjoining property or properties, in any way encountered, which might be injured or seriously affected by any process of construction to be undertaken pursuant to the Contract Documents, from any damage or injury by reason of said process of construction; and the Contractor shall be liable for any and all claims for such damage on account of its failure to fully protect all adjoining property. **THE CONTRACTOR AGREES TO INDEMNIFY, SAVE AND HOLD HARMLESS THE COUNTY, THE OBSERVER THE GEC AND THE ENGINEER OF RECORD, AS WELL AS ANY OF THEIR AGENTS, REPRESENTATIVES, OFFICERS OR EMPLOYEES AGAINST ANY CLAIM OR CLAIMS FOR DAMAGES DUE TO ANY INJURY TO ANY ADJACENT OR ADJOINING PROPERTY, ARISING OR GROWING OUT OF THE PERFORMANCE OF THE WORK, BUT ANY SUCH INDEMNITY SHALL NOT APPLY TO ANY CLAIM OF ANY KIND ARISING SOLELY OUT OF THE EXISTENCE OR CHARACTER OF THE WORK.**

3.08 Protection Against Claims of Subcontractors, Laborers, Materialmen and Furnishers of Machinery, Equipment and Supplies

THE CONTRACTOR AGREES THAT IT WILL INDEMNIFY, DEFEND AND SAVE HARMLESS THE COUNTY, THE OBSERVER, THE GEC AND THE ENGINEER OF RECORD, AS WELL AS ANY OF THEIR AGENTS, REPRESENTATIVES, OFFICERS OR EMPLOYEES FROM ALL CLAIMS GROWING OUT THE LAWFUL DEMANDS OF SUBCONTRACTORS, LABORERS, WORKERS, MECHANICS, MATERIALMEN AND FURNISHERS OF MACHINERY, MACHINERY PARTS, EQUIPMENT, POWER TOOLS, AND ALL SUPPLIES, INCLUDING COMMISSARY, INCURRED IN THE FURTHERANCE OF THE PERFORMANCE OF THE WORK SUBJECT OF THE CONTRACT DOCUMENTS. When so desired by the County, the Contractor shall furnish satisfactory evidence that all obligations of the nature hereinabove designated have been paid, discharged or waived. If the Contractor fails to furnish such evidence to County's complete satisfaction, then the County may either pay directly any unpaid bills of which the County has written notice of, or may withhold from

the Contractor's unpaid compensation a sum of money deemed reasonably sufficient to liquidate any and all such lawful claims. When satisfactory evidence is furnished that all liabilities have been fully discharged, payments to the Contractor shall be resumed in full in accordance with the terms of the Contract Documents, but in no event shall the provisions of this sentence be construed to impose any obligation upon the County by either the Contractor or its surety.

3.09 Protection Against Royalties or Patented Invention

The Contractor shall pay all royalties and license fees, and shall provide for the use of any design, device, material or process covered by letter patent or copyright by suitable legal agreement with the patentee or owner. **THE CONTRACTOR SHALL DEFEND ALL SUITS OR CLAIMS FOR INFRINGEMENT OF ANY PATENT OR COPYRIGHT RIGHTS AND SHALL INDEMNIFY AND SAVE HARMLESS THE COUNTY, THE OBSERVER THE GEC AND THE ENGINEER OF RECORD, AS WELL AS ANY OF THEIR AGENTS, REPRESENTATIVES, OFFICERS OR EMPLOYEES FROM ANY LOSS ON ACCOUNT THEREOF, EXCEPT THAT THE COUNTY SHALL DEFEND ALL SUCH SUITS AND CLAIMS AND SHALL BE RESPONSIBLE FOR ALL SUCH LOSS WHEN A PARTICULAR DESIGN, DEVICE, MATERIAL OR PROCESS OR THE PRODUCT OF A PARTICULAR MANUFACTURER OR MANUFACTURERS IS SPECIFIED OR REQUIRED BY THE COUNTY; PROVIDED, HOWEVER, IF CHOICE OF ALTERNATE DESIGN, DEVICE, MATERIAL OR PROCESS IS ALLOWED TO THE CONTRACTOR, THEN THE CONTRACTOR SHALL INDEMNIFY AND SAVE THE COUNTY HARMLESS FORM ANY LOSS ON ACCOUNT THEREOF.** If the material or process specified or required by the County is known by the Contractor to be an infringement, the Contractor shall be responsible for such loss unless it promptly gives such information to the County.

3.10 Laws and Ordinances

The Contractor shall at all times observe and comply with all federal, state and local laws, ordinance and regulations, which in any manner affect the Contract Documents or the Work, and **SHALL INDEMNIFY AND SAVE HARMLESS THE COUNTY, THE OBSERVER THE GEC AND THE ENGINEER OF RECORD, AS WELL AS ANY OF THEIR AGENTS, REPRESENTATIVES, OFFICERS OR EMPLOYEES AGAINST ANY CLAIM ARISING FROM THE VIOLATION OF ANY SUCH LAWS, ORDINANCES, AND REGULATIONS WHETHER BY THE CONTRACTOR OR ITS EMPLOYEES, EXCEPT WHERE SUCH VIOLATIONS ARE CALLED FOR BY THE PROVISIONS OF THE CONTRACT DOCUMENTS.** If the Contractor observes that the plans and specifications are at variance therewith, it shall promptly notify the Observer, in writing, and any necessary changes shall be prepared as provided in the Contract Documents for changes in the Work. If the Contractor performs any work knowing it to be contrary to such laws, ordinances, rules and regulations, and without such notice to the Observer, the Contractor shall bear all costs arising therefrom.

In case the County is a body politic and corporate, the law from which it derives its powers, insofar as the same regulates the objects for which, or the manner in which, or the conditions under which the County may enter into contract, shall be controlling and shall be considered as part of the Contract Documents to the same effect as though embodied herein.

3.11 Assignment and Subletting

The Contractor further agrees that it will retain personal control and will give its personal attention to the fulfillment of the Work strictly in accordance with the Contract Documents and that Contractor will not assign, by Power of Attorney or otherwise, or sublet any right or interest it may have under the Contract Documents without the written consent of the Observer, and that no part or feature of the Work will be sublet to anyone objectionable to the Observer or the County. The Contractor further agrees that the subletting of any portion or feature of the Work, or materials required in the performance of the Work, shall not relieve the Contractor from its full obligations to the County as provided in the Contract Documents.

3.12 Indemnification

THE CONTRACTOR SHALL DEFEND, INDEMNIFY AND HOLD HARMLESS THE COUNTY, THE OBSERVER, THE GEC AND THE ENGINEER OF RECORD AND THEIR RESPECTIVE OFFICERS, AGENTS AND EMPLOYEES, FROM AND AGAINST ALL DAMAGES, CLAIMS, LOSSES, DEMANDS, SUITS, JUDGMENTS AND COSTS, INCLUDING REASONABLE ATTORNEYS' FEES AND EXPENSES, ARISING OUT OF OR RESULTING FROM THE PERFORMANCE OF THE WORK, PROVIDED THAT ANY SUCH DAMAGE, CLAIM, LOSS, DEMAND, SUIT, JUDGMENT, COST OR EXPENSE:

(1) IS ATTRIBUTABLE TO BODILY INJURY, SICKNESS, DISEASE OR DEATH OF ANY PERSON INCLUDING CONTRACTOR'S EMPLOYEES AND ANY SUBCONTRACTOR'S EMPLOYEES AND ANY SUB-SUBCONTRACTOR'S EMPLOYEES, OR TO INJURY TO OR DESTRUCTION OF TANGIBLE PROPERTY INCLUDING CONTRACTOR'S PROPERTY (OTHER THAN THE WORK ITSELF) AND THE PROPERTY OF ANY SUBCONTRACTOR OF SUB-SUBCONTRACTOR INCLUDING THE LOSS OF USE RESULTING THEREFROM; AND,

(2) IS CAUSED IN WHOLE OR IN PART BY ANY INTENTIONAL OR NEGLIGENT ACT OR OMISSION OF THE CONTRACTOR, ANY SUBCONTRACTOR, ANY SUB-SUBCONTRACTOR OR ANYONE DIRECTLY OR INDIRECTLY EMPLOYED BY ANY ONE OF THEM OR ANYONE FOR WHOSE ACTS ANY OF THEM MAY BE LIABLE.

THE OBLIGATION OF THE CONTRACTOR UNDER THIS PARAGRAPH SHALL NOT EXTEND TO THE LIABILITY OF THE OBSERVER, THE ENGINEER, THE GEC, THE ENGINEER OF RECORD THEIR AGENTS OR EMPLOYEES ARISING OUT OF THE PREPARATION OF MAPS, PLANS, REPORTS, SURVEYS, CHANGE ORDERS, DESIGNS OR SPECIFICATIONS, OR THE APPROVAL OF MAPS, PLANS, REPORTS, SURVEYS, CHANGE ORDERS, DESIGNS OR SPECIFICATIONS OR THE ISSUANCE OF OR THE FAILURE TO GIVE DIRECTIONS OR INSTRUCTIONS BY THE OBSERVER, ITS AGENTS OR EMPLOYEES, PROVIDED SUCH IS THE SOLE CAUSE OF THE INJURY OR DAMAGE.

IN ANY AND ALL CLAIMS AGAINST THE COUNTY, THE OBSERVER THE GEC OR THE ENGINEER OF RECORD OR ANY OF THEIR AGENTS OR EMPLOYEES BY ANY EMPLOYEE OF THE CONTRACTOR, ANY SUBCONTRACTOR, ANY SUB-SUBCONTRACTOR, ANYONE DIRECTLY OR INDIRECTLY EMPLOYED BY ANY OF THEM, OR ANYONE FOR WHOSE ACTS ANY OF THEM MAY BE LIABLE, THE INDEMNIFICATION OBLIGATION UNDER SECTION 3.12 SHALL NOT BE

LIMITED IN ANY WAY BY ANY LIMITATION ON THE AMOUNT OR TYPE OF DAMAGES, COMPENSATION OR BENEFITS PAYABLE BY OR FOR THE CONTRACTOR OR ANY SUBCONTRACTOR OR SUB-SUBCONTRACTOR UNDER WORKERS' COMPENSATION ACTS, DISABILITY BENEFIT ACTS OR OTHER EMPLOYEE BENEFIT ACTS.

3.13 Insurance

The Contractor at its own expense shall purchase, maintain and keep in force such insurance as will protect Contractor from claims set forth below which may arise out of or result from the Contractor's operations under the Contract Documents, whether such operations be by itself or by any Subcontractor or by anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable.

(1) Workman's compensation claims, disability benefits and other similar employee benefit acts;

(2) Claims for damages because of body injury, occupational sickness or disease, or death of its employees, and claims insured by usual bodily injury liability coverages;

(3) Claims for damages because of bodily injury, sickness or disease, or death of any person other than its employees, and claims insured by usual bodily injury liability coverages; and

(4) Claims for damages because of injury to or destruction of tangible property, including loss of use resulting therefrom.

CERTIFICATE OF INSURANCE. Before commencing any of the Work, Contractor shall file with the County valid Certificates of Insurance acceptable to the County and the Observer. Such Certificates shall contain a provision that coverages afforded under the policies will not be canceled until at least thirty (30) days prior written notice has been given to the County.

The Contractor shall also file with the County valid Certificates of Insurance covering all Sub-contractors of the Contractor.

3.14 Final Clean-up

Upon the completion of the Work and before acceptance and Final Payment will be made, the Contractor shall clean and remove from the site of the Work all surplus and discarded materials, temporary structures and debris of every kind. The Contractor shall leave the site of the Work in a neat and orderly condition at least equal to that which originally existed. Surplus and waste materials removed from the site of the Work shall be disposed of at locations that are both satisfactory to the Observer and in accordance with the laws pertaining to the disposal of such surplus, debris and waste materials.

In the event the Contractor fails or refuses to clean and remove surplus materials and debris as provided above, the County or the Observer may do so, or cause same to be done, at the

Contractor's expense, and the reasonable cost thereof shall be deducted from any amounts that are owing to the Contractor.

4. Prosecution and Progress

4.01 Time and Order of Completion

It is the meaning and intent of the Contractor Documents, unless otherwise specifically provided, that the Contractor shall be allowed to prosecute its work at such times and seasons, in such order of precedence, and in such manner as shall be most conducive to the economy of construction; provided, however, that the order and the time of prosecution shall be such that the Work shall be substantially completed, as a whole and in part, in accordance with the Contract Documents and within the time of completion designated in the Contractor's bid or proposal; provided, however, when the County is having other work done on the same Project or an adjoining project, either by contract or by its own force, the Observer may direct the time and manner of constructing the Work done under the Contract Documents, so that conflict will be avoided and the construction of the various works and projects being performed for the County shall be harmonized.

Unless otherwise specified, the Contractor shall plan to begin work 10 calendar days from the authorization date to begin work as designated by the Notice to Proceed.

The Contractor shall submit, at such times as may reasonably be requested by the Observer, schedules which shall show the order in which the Contractor proposes to carry on the Work, the dates at which the Contractor will start the several parts of the Work, and estimated dates of completion of the several parts.

Nighttime work is allowed only when shown on the plans or directed or allowed by the Engineer. Nighttime work is defined as work performed from 30 min. after sunset to 30 min. before sunrise.

4.02 Extension of Time

Should the Contractor be delayed in the completion of the Work by any act or neglect of the County, the Observer or the Engineer of Record, or of any employee of either, or by other contractors employed by the County, or by changes ordered in the Work, or by strikes, lockouts, fires, and unusual delays by common carriers, or unavoidable cause or causes beyond the Contractor's control, or by any cause which the Observer shall decide justifies the delay, then an extension of time shall be allowed for completing the Work, sufficient to compensate for the delay, the amount of the extension to be determined by the Observer; provided, however, before the Observer may decide whether or not to allow such an extension of time, the Contractor must tender a prompt written request for an extension of time wherein the Contractor shall give the Observer a written description of the cause of such delay. Adverse weather conditions will not be justification for extension of time on "Calendar Days" contracts.

4.03 Hindrances and Delays

No claims shall be made by the Contractor for damages resulting from hindrances or delays from any cause (except where the Work is stopped by order of and for the convenience of the County) during the progress of any portion of the Work embraced in the Contract Documents. In case said work shall be stopped by the act of the County, then such expense, as in the sole judgment of the Observer is caused by such stoppage of said work, shall be paid by the County to the Contractor.

5. Measurement and Payment

5.01 Quantities and Measurements

No extra or customary measurements of any kind will be allowed. Rather the actual measured and/or computed length, area, solid contents, number and weight only shall be considered, unless otherwise specifically provided otherwise in the Contract Documents.

5.02 Estimated Quantities

The Contract Documents are intended to show clearly all work to be done and material to be furnished hereunder. Where the estimated quantities are shown for the various classes of work to be done and material to be furnished under the Contract Documents, they are approximate and are to be used only as a basis for estimating the probable cost of the Work and for comparing the proposals offered for the Work. It is understood and agreed that the actual amount of work to be done and material to be furnished under the Contract Documents may differ somewhat from these estimates.

Plans quantities may or may not represent the exact quantity of work performed or material moved, handled, or placed during the execution of the Work. For plans quantity measurement items, the estimated bid quantities are designated as final payment quantities, unless revised by the governing specifications. If the actual quantity measured as outlined under “Measurement” varies by more than 5% (or as stipulated under “Measurement” for specific Items) from the total estimated quantity for an individual Item originally shown in the Contract Documents, an adjustment may be made to the quantity of authorized work done for payment purposes. The party requesting the adjustment will provide field measurements and calculations showing the revised quantity. When approved, this revised quantity will constitute the final quantity for which payment will be made. Payment for revised quantity will be made at the unit price bid for that Item, except as provided for in the Contract Documents. When quantities are revised by a change in design approved by the County, by change order, or to correct an error on the plans, the plans quantity will be increased or decreased by the amount involved in the change, and the 5% variance will apply to the new plans quantity.

Where payment is based on the unit price method, the Contractor agrees that it will make no claim for damages, anticipated profits or otherwise on account of any differences which may be found between the quantities of work actually done, the material actually furnished under the Contract Documents and the estimated quantities contemplated and contained in the proposal; provided, however, that in case the actual quantity of any major item should

become as much as twenty-five percent (25%) more than or twenty-five percent (25%) less than the estimated or contemplated quantity for such items, then either party to the Agreement, upon demand, shall be entitled to revised consideration upon the portion of the Work above or below twenty-five percent (25%) of the estimated quantity.

A "Major Item" shall be construed to be any individual bid item incurred in the proposal that has a total cost equal to or greater that five percent (5%) of the total contract cost, computed on the basis of the proposal quantities and the contract unit prices.

Any revised consideration is to be determined by agreement between the parties, otherwise by the terms of the Contract Documents, as provided under Section 6.03 "Extra Work".

5.03 Price of Work

In consideration of the furnishing of all the necessary labor, equipment and material, and the completion of all of the Work by the Contractor, and on the completion of all of the Work and on the delivery of all material in full conformity with the specifications and stipulations contained in the Contract Documents, the County agrees to pay the Contractor the Contract Price that is set forth in the Agreement. The Contractor hereby agrees to receive such Contract Price in full for furnishing all material and all labor required for the Work, also for all expense incurred by Contractor, and for well and truly performing the same and the whole thereof in the manner with and in accordance to the Contract Documents.

5.04 Partial Payments

On or before the first Wednesday of each month, the Contractor shall submit to the Observer a statement showing the total value of the Work performed up to and including the last day of the preceding month. The statement shall also include the value of all sound materials delivered on the job site and to be included in the Work and all partially completed work whether bid as a lump sum or a unit item which, in the opinion of the Observer, is acceptable. The Observer shall either examine and approve by signature or modify and approve such modified statement.

The County shall then pay the Contractor, within 30 days of the statement submittal, the total amount of the approved statement, less ten percent (10%) of the amount thereof, which ten percent (10%) shall be retained until Final Payment, and further less all previous payments and all further sums that may by retained by the County under the terms of the Contract Documents and/or under state or federal law. It is understood, however, that in case the whole work be near to completion and some unexpected and unusual delay occurs due to no fault or neglect on the part of the Contractor, then the County may, upon written recommendation of the Observer, pay a reasonable and equitable portion of the retained percentage to the Contractor; or the Contractor, at the County's option, may be relieved of the obligation to fully complete the Work and, thereupon, the Contractor shall receive payment of the balance due Contractor under the contract subject to the terms and conditions stated in the Contract Documents.

(1) When work progress is fifty percent (50%) complete, as determined by the value of the work completed to date against the original or revised contract amount, whichever is greater, the County may reduce the amount retained to five percent (5%) of the value of all work satisfactorily complete to date, including the value paid for materials on hand, provided, in the sole opinion of the Observer, the Contractor is making satisfactory progress toward completion of the project in a timely manner and there is no other cause to retain a greater percentage.
(2) Upon issuance of the NOTICE OF SUBSTANTIAL COMPLETION and agreement to final project quantities, the percent retained may be further reduced, at the discretion of the Engineer and the Observer, to two percent (2%) of the total value of all work completed to date. This amount shall be retained until Final Payment and close out of the project.

5.05 Punch List

The Contractor shall notify the Observer in writing when, in the Contractor's opinion, the Work has been "Substantially Completed" and when so notifying the Observer, the Contractor shall furnish to the Observer, in writing, a detailed list of unfinished work, also known as the Punch List. The Observer will review the Punch List and will add any items that the Contractor failed to include on said list. The fact that a structure or facility has been "Substantially Completed" shall not excuse the Contractor from performing all of the Work undertaken, whether such work is of a minor or major nature. Furthermore, the Contractor shall remain obligated to fully complete the Work and perform its obligations under the Contract Documents after the Work has been Substantially Completed.

5.06 Final Completion and Acceptance

The Contractor shall have a specified time period for completion of the Punch List items, as set forth in Section XI of the Special Conditions, "Completion of Work on Time." Within ten (10) days after the Contractor has given the Observer written notice that the Punch List has been completed, the Observer shall inspect the Work and within said time, if the Work is found to be completed in accordance with the Contact Documents, the Observer shall issue to the Contractor its Certificate of Completion. In the event the Punch List has not been completed, the Observer shall advise the Contractor, in writing, of the Observer's basis for deeming the Punch List incomplete. Following the Contractor's receipt of the Observer's notice that the Punch List is incomplete, the Contractor shall complete the remaining items prior to the expiration of the above referenced specified time period for completion of the Punch List items. Upon satisfactory completion of the Punch List and the issuance of the Certificate of Completion, it shall be the Contractor's responsibility to submit the contract close-out documents, which shall include the record drawings, maintenance bond and Affidavit of All Bills Paid, and thereupon it shall be the duty of the County to issue a Certificate of Acceptance (Final Acceptance) to the Contractor.

5.07 Final Payment

Upon the issuance of the Notice of Substantial Completion, the Observer shall proceed to make final measurements and prepare final statement for the value of all work performed and materials furnished under the terms of the Contract Documents and shall certify same to the

County, and, then, Final Payment shall be made to the Contractor. At the County's sole discretion, this payment may include payment for work remaining to be performed in association with the removal of temporary erosion controls or the establishment of permanent stabilization measures. On or after the 30th day, and before the 35th day after the date of the Certificate of Acceptance, the balance due the Contractor under the terms of the Contract Documents shall be paid. Neither the Certificate of Acceptance nor the Final Payment, nor any provision in the Contract Documents, shall relieve the Contractor of the obligation for fulfillment of any warranty which may be required.

5.08 Payments Withheld

The County may, on account of subsequently discovered evidence, withhold or nullify the whole or part of any certificate to such extent as may be necessary to protect itself from loss on account of:

(a) Defective work not remedied or other obligations hereunder not completed.
(b) Claims filed or reasonable evidence indicating the probable or potential filing of claims.
(c) Failure of the Contractor to make payments properly to Subcontractors or for material or labor.
(d) Damage to the County or another contractor's work, material or equipment.
(e) Reasonable doubt that the Work can be completed for the unpaid balance of the contract amount or Contract Price.
(f) Reasonable indication that the Work will not be completed within the contract time.
(g) Other causes affecting the performance of the Work subject of the Contract Documents.

When the above grounds are removed or the Contractor provides a surety bond satisfactory to the County, which will protect the County in the amount withheld, payment shall be made for amounts withheld because of them.

5.09 Delayed Payments

Should the County fail to make payment to the Contractor of the sum named in any partial or final statement, when such payment is due, then the County shall pay to the Contractor, in addition to the sum shown as due by such statement, interest thereon in accordance with Texas Government Code Section 2251.025. More specifically, the rate of interest that shall accrue on a late payment is the rate in effect on September 1 of County's fiscal year in which the payment becomes due. The said rate in effect on September 1 shall be equal to the sum of one percent (1%); and (2) the prime rate published in the Wall Street Journal on the first day of July of the preceding fiscal year that does not fall on a Saturday or Sunday. County's payment of the amount due plus said interest shall fully liquidate any injury to the Contractor growing out of such delay in payment. It is expressly agreed that delay by the County in making payment to the Contractor of the sum named in any partial or final statement shall not constitute, on the part of the County, a breach under the Contract Documents, nor shall it serve as an abandonment by the County. Furthermore, any delay by the County in making payment to the Contractor of the sum named in any partial or final statement shall not, to any

extent or for any time, relieve the Contractor of its obligations to fully and completely perform pursuant to the terms of the Contract Documents.

6. Extra Work and Claims

6.01 Change Orders

Without invalidating the Agreement or any terms of the Contract Documents, the County may, at any time or from time to time, order additions, deletions or revisions to the Work. Any such additions, deletions or revisions to the Work may only be effectuated and authorized by written Change Order. The said written Change Order shall be prepared by the GEC for execution by the County and the Contractor. The Change Order shall set forth the basis for any change in Contract Price, as hereinafter set forth in Section 6.03, Extra Work, and for any change in contract time which may result from the change.

In the event the Contractor shall refuse to execute a Change Order which has been prepared by the GEC and executed by the County, the GEC may, in writing, instruct the Contractor to proceed with the Work as set forth in the Change Order and the Contractor shall thereafter proceed with such work. The Contractor may make claim against the County for Extra Work involved under the Change Order, as hereinafter provided.

6.02 Minor Changes

The Observer may authorize minor changes in the Work which are not inconsistent with the overall intent of the Contract Documents and which do not involve an increase in Contract Price. If the Contractor believes that any minor change or alteration authorized by the Observer involves Extra Work which entitles it to an increase in the Contract Price, the Contractor shall make written request to the Observer for a written Field Order. For purposes of this section, a "Field Order" shall mean the Contractor's cost proposal for the Extra Work that the Contractor believes would increase the Contract Price.

In such case, the Contractor, by copy of its communication to the Observer or by separate writing, shall advise the County of its request to the Observer for a written Field Order. The Contractor's notice to the County shall inform the County that the work subject of the written Field Order may result in an increase in the Contract Price.

Any request by the Contractor for a change in Contract Price shall be made prior to commencing the work covered by the proposed change.

6.03 Extra Work

It is agreed that the basis of compensation to the Contractor for work either added or deleted by a change order or for which a claim for Extra Work is made shall be determined by the unit prices upon which the Work and Project was bid to the extent such work can be fairly classified within the various work item descriptions. For work that cannot be fairly classified within the said various work item descriptions, the basis of compensation to the Contractor

for work either added or deleted by a change order or for which a claim for Extra Work is made shall be determined by one or more of the following methods:

Method (A)
By agreed unit prices; or

Method (B)
By agreed lump sum; or

Method (C)
If neither Method (A) nor Method (B) is agreed upon before the Extra Work is commenced, then the Contractor shall be paid the "actual field cost" of the Work, plus fifteen percent (15%).

In the event said Extra Work is performed and paid for under Method (C), then the provisions of this paragraph shall apply and the "actual field cost" is hereby defined to include the cost to the Contractor of all workmen, such as foremen, timekeepers, mechanics and laborers, and materials, supplies, trucks, rentals on machinery and equipment, for the time actually employed or used on such Extra Work, plus actual equipment, for the time actually employed or used on such Extra Work, plus actual transportation charges necessarily incurred, together with all power, fuel, lubricants, water and similar operating expenses, also all necessary incidental expenses incurred directly on account of such Extra Work, including Social Security, Old Age Benefits and other payroll taxes, and a rateable proportion of premiums on performance and payment bonds and maintenance bonds, public liability and property damage and workers' compensation, and all other insurance as may be required by any law or ordinance, or directed or agreed to by the County. The Observer may direct the form in which accounts of the "actual field cost" shall be kept and the records of these accounts shall be made available to the Observer. The Observer or the County may also specify, in writing before the Extra Work commences, the method of doing the Extra Work and the type and kind of machinery and equipment to be used; otherwise these matters shall be determined by the Contractor. Unless otherwise agreed upon, the prices for the use of machinery and equipment shall be determined by using one hundred percent (100%), unless otherwise specified, of the latest schedule of Equipment ownership Expense adopted by the Associated General Contractors of America. Where practicable the terms and prices for the use of machinery and equipment shall be incorporated in the written Extra Work order. The fifteen percent (15%) of the "actual field cost" to be paid the Contractor shall cover and compensate Contractor for its profit, overhead, general superintendence and field office expense, and all other elements of cost and expense not embraced within the "actual field cost" as herein defined, save that where the Contractor's camp or field office must be maintained primarily on account of such Extra Work; then the cost to maintain and operate the same shall be included in the "actual field cost."

No claim for Extra Work of any kind will be allowed unless ordered, in writing, by the Observer. In case any orders or instructions, either oral or written, appear to the Contractor to involve Extra Work for which Contractor should receive compensation or an adjustment in

the construction time, Contractor shall make written request to the Observer for written order authorizing such Extra Work. Should a difference of opinion arise as to what does or does not constitute Extra Work, or as to the payment therefor, and the Observer insists upon its performance, the Contractor shall proceed with the Work after making written request for written order and shall keep an accurate account of the "actual field cost" thereof, as provided under Method (C).

6.04 Time of Filing Claims

The County and Contractor hereby agree and acknowledge that all questions of dispute or adjustment presented by the Contractor shall be in writing and filed with the Observer within thirty (30) days after the Observer has given any directions, order or instruction to which the Contractor desires to take exception. The Observer shall reply within thirty (30) days to such written exceptions by the Contractor and render the Observer's final decision in writing. In case the Contractor should appeal from the Observer's decision, the Contractor may file with the County its objection. It is further agreed that the acceptance by the Contractor of the Final Payment shall serve as a bar to any claims that the Contractor may have for matters arising prior to or after the Contractor's acceptance of the Final Payment.

6.05 Continuing Performance

The Contractor shall continue performance of the Work during all disputes or disagreements with the County. The production or delivery of goods, the furnishing of services and the construction of projects or facilities shall not be delayed, prejudiced or postponed pending resolution of any disputes or disagreements, except as the County may otherwise agree in writing.

7. Abandonment of Contract

7.01 Abandonment by Contractor

In case the Contractor should abandon and fail or refuse to resume work within ten (10) days after written notification from either the County or the Observer, or if the Contractor fails to comply with the orders of the Observer when such orders are consistent with the Contract Documents, then and in such case where performance bonds exist, the appropriate sureties on these bonds shall be provided with a notice of abandonment and notice for completion whereby (i) the sureties are notified of the Contractor's abandonment or Contractor's failure or refusal to resume work; and (ii) the sureties are directed to complete the Work. A copy of the notice of abandonment and notice for completion shall be delivered to the Contractor.

After receiving a copy of the above described notice of abandonment and notice for completion, the Contractor shall not remove from the Project any machinery, equipment, tools, materials or supplies that then currently exist on the Project site, but the same, together with any materials and equipment under contract for the Work, may be held for use on the Project by the County or the surety on the performance bond, or another contractor in completion of the Work; and the Contractor shall not receive any rental or credit therefor (except when used in connection with Extra Work, where credit shall be allowed as provided for under Section 6, Extra Work and Claims, herein), it being understood that the use of such

equipment and materials will ultimately reduce the cost to complete the Work and be reflected in the final settlement.

Where there is no performance bond provided or in case the surety should fail to commence compliance within ten (10) days after service of the herein above provided notice of abandonment and notice for completion, then the County may provide for completion of the Work in either of the following elective manners:

(1) The County may thereupon employ such force of men and use such machinery, equipment, tools, materials and supplies as the County may deem necessary to complete the Work and charge the expense of such labor, machinery, equipment, tools, materials and supplies to the Contractor, and expense so charged shall be deducted and paid by the County out of such monies as may be due, or that may thereafter at any time become due to the Contractor under and by virtue of the Contract Documents. In case such expense is less than the sum which would have been payable under the Contract Documents if the same had been completed by the Contractor, then the Contractor shall receive the difference. In case such expense is greater than the sum which would have been payable under the Contract Documents if the same had been completed by the Contractor, then the Contractor and/or its surety shall pay the amount of such excess to the County, or
(2) The County, under sealed bids, after five (5) days notice published one or more times in a newspaper having general circulation in the area of the location of the Project, may let a contract for the completion of the Work under substantially the same terms and conditions which are provided in the Contract Documents. In case there is any increase in cost to the County under the new contract as compared to what would have been the cost under the Contract Documents, such increase shall be charged to the Contractor and the surety shall be and remain bound therefor. However, should the cost to complete any such contract prove to be less than what would have been the cost to complete under the Contract Documents, the Contractor and/or its surety shall be credited therewith.

When the Work shall have reached Final Completion, the Contractor and its surety shall be so notified and Certificates of Completion and Acceptance, as provided in Section 5.06 herein above, shall be issued. A complete itemized statement of the contract accounts, certified by the Observer as being correct, shall then be prepared and delivered to the Contractor and its surety, whereupon the Contractor and/or its surety, or the County as the case may be, shall pay the balance due as reflected by said statement within fifteen (15) days after the date of such Certificate of Completion.

In the event the statement of accounts shows that the cost to complete the Work is less than that which would have been the cost to the County had the Work been completed by the Contractor under the terms of the Contract Documents, or when the Contractor and/or its surety shall pay the balance shown to be due by them to the County, then all machinery, equipment, tools, materials or supplies left on the site of the Project shall be turned over to the Contractor and/or its surety.

Should the cost to complete the Work exceed the exceed the amount the County would have been obligated to pay the Contractor had the Work been completed by the Contractor under the terms of the Contract Documents, and should the Contractor and/or its surety fail to pay the amount due the County within the time designated hereinabove, and should there remain any machinery, equipment, tools, materials or supplies on the site of the Project, notice thereof, together with an itemized list of such equipment and materials, shall be mailed to the Contractor and its surety at the respective addresses designated in the Contract Documents. After properly tendering such notice, such property shall be held at the risk of the Contractor and its surety subject only to the duty of the County to exercise ordinary care to protect such property. After fifteen (15) days from the date of said notice, the County may sell such machinery, equipment, tools, materials or supplies and apply the net sum derived from such sale to the credit of the Contractor and its surety. Such sale may be made at either public or private sale, with or without notice, as the County may elect. The County shall release, to their proper owners, any machinery, equipment, tools, materials, or supplies, which remain on the Project and which belong to persons other than the Contractor or its surety. The books on all operations provided herein shall be opened to the Contractor and its surety.

7.02 Abandonment by the County

In the event that the County should fail, within ten (10) days after receiving written notification from the Contractor, to comply with the terms of the Contract Documents, then the Contractor may suspend or wholly abandon the Work, and may remove therefrom all machinery, tools and equipment, and all materials on the Project site that have not been included in payments to the Contractor and have not been wrought into the Work. Thereupon, the Observer shall make an estimate of the total amount earned by the Contractor, which estimate shall include the value of all work actually completed by said Contractor (at the prices stated in the Contract Documents), the value of all partially completed work at a fair and equitable price, and the amount of all Extra Work performed at the prices agreed upon, or provided for by the terms of the Contract Documents. The Observer shall then make a final statement of the balance due the Contractor by deducting from the above estimate all previous payments by the County and all other sums that may be retained by the County under the terms of the Agreement and the Contract Documents and the Observer shall certify same to the County who shall pay to the Contractor on or before thirty (30) days after the date of the Observer's certification.

8. Subcontractors

8.01 Award of Subcontracts for Portions of the Work

Unless otherwise specified in the Contract Documents or in the Instructions to Bidders, the Contractor, as soon as practicable after the award of the contract, shall furnish to the Observer, in writing for acceptance by the County, a list of the names of the Subcontractors proposed for the principal portions of the Work. The Observer shall promptly notify the Contractor, in writing, if the County, after due investigation, has objection to any Subcontractor on such list and does not accept such Subcontractor.

The Contractor shall not contract with any Subcontractor or any person or organization (including those who are to furnish materials or equipment fabricated to a special design) proposed for portions of the Work designated in the Contract Documents or in the Instructions to Bidders or, if none is so designated, with any Subcontractor proposed for the principal portions of the Work who has been rejected by the County. The Contractor will not be required to contract with any Subcontractor or person or organization against whom the Contractor has a reasonable objection.

If the County refuses to accept any Subcontractor or person or organization on a list submitted by the Contractor in response to the requirements of the Contract Documents or the Instructions to Bidders, the Contractor shall submit an acceptable substitute and the Contract Price shall be increased or decreased by the difference in cost occasioned by such substitution and an appropriate change order shall be issued; however, no increase in the Contract Price shall be allowed for any such substitution unless the Contractor has acted promptly and responsively in submitting for acceptance any list or lists of names as required by the Contract Documents or the Instructions to Bidders.

If the County requires a change of any proposed Subcontractor or person or organization previously accepted by them, the Contract Price shall be increased or decreased by the difference in cost occasioned by such change and an appropriate change order shall be issued.

The Contractor shall not make any substitution for any Subcontractor or person or organization that has been accepted by the County, unless the substitution is acceptable to the County.

8.02 Subcontractual Relations

All work performed for the Contractor by a Subcontractor shall be pursuant to an appropriate written agreement between the Contractor and the Subcontractor (and where appropriate between Subcontractors and Sub-subcontractors) which shall contain provisions that:

(1) preserve and protect the rights of the County, the Observer, the GEC and the Engineer of Record under the contract with respect to the Work to be performed under the subcontract so that the subcontracting thereof will not prejudice such rights;
(2) require that such work be performed in accordance with the requirements of the Contract Documents;
(3) require submission to the Contractor of the applications for payment under each subcontract to which the Contractor is a party, in reasonable time to enable the Contractor to apply for payment in accordance with the Contract Documents;
(4) require that all claims for additional costs, extensions of time, damages for delays or otherwise with respect to subcontracted portions of the Work shall be submitted to the Contractor (via any Subcontractor or Sub-subcontractor where appropriate) in sufficient time so that the Contractor may comply in the manner provided in the Contract Documents for like claims by the Contractor upon the County;
(5) obligate each subcontractor specifically to consent to the provisions of this section.

A copy of all such signed subcontract agreements shall be filed by the Contractor with the Observer before the Subcontractor shall be allowed to commence work.

8.03 Payments to Subcontractors

The Contractor shall pay each Subcontractor, upon receipt of payment from the County, an amount directly based upon the value of the Work performed and allowed to the Contractor on account of such Subcontractor's work, less the percentage retained from payments to the Contractor. The Contractor shall also require each Subcontractor to make similar payments to its subcontractors.

If the Observer fails to approve a payment for any cause which is the fault of the Contractor and not the fault of a particular Subcontractor, the Contractor shall pay the Subcontractor, on demand made at any time after the Certificate for Payment should otherwise have been issued, for its work to the extent completed, less the retained percentage, if any.

The Observer may, on request and at its discretion, furnish to any Subcontractor, if practicable, information regarding percentages of completion certified to the Contractor on account of work done by such Subcontractors.

Neither the County, the Observer nor the Engineer shall have any obligation to pay or to see to the payment of any monies to such Subcontractor except as may otherwise be required.

9. Protection of Persons and Property

9.01 Safety Precautions and Programs

The Contractor shall be responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the Work.

9.02 Safety of Persons and Property

The Contractor shall take all reasonable precautions for the safety of, and shall provide all reasonable protection to prevent damage, injury, or loss to:

(1) all employees on the Work and all other persons who may be affected thereby:
(2) all the Work and all materials and equipment to be incorporated therein, whether in storage or off the site, under the care, custody or control of the Contractor or any of its Subcontractors or Sub-subcontractors; and
(3) other property at the site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, fences, roadways, structures and utilities not designated for removal, relocation or replacement in the course of construction.

The Contractor shall comply with all applicable laws, ordinances, rules, regulations and lawful orders of any public authority having jurisdiction for the safety of persons or property or to protect them from damage, injury or loss. Contractor shall erect and maintain, as required by existing conditions and progress of the Work, all reasonable safeguards for safety

and protection, including posting danger signs and other warnings against hazards, promulgating safety regulations and notifying owners and users of adjacent utilities.

When the use or storage of explosives or other hazardous materials or equipment is necessary for the execution of the Work, the Contractor shall exercise the utmost care and shall carry on such activities under the supervision of properly qualified personnel.

All blasting, including methods of storing and handling explosives and highly inflammable materials, shall conform to federal, state, local laws and ordinances.

The following is a list of requirements in addition to federal, state, and local laws and ordinances:

(1) The Contractor shall furnish the County with a Certificate of Blasting Insurance in the amount of $300,000.00 for each contract, at least twenty-four (24) hours prior to using explosives. A blasting permit must be obtained from the appropriate jurisdictions at least five (5) days prior to use of explosives. If blasting is covered under the Contractor's General Insurance Certificate for each contract, a separate blasting certificate will not be required.
(2) The following public utility companies and departments will be notified by the Contractor, on every occasion, at least twenty-four (24) hours prior to the use of explosives: Water and Wastewater, Electric, Gas, Telephone and the County Engineering Department.
(3) Explosive materials to be used shall be limited to blasting agents and dynamite, unless prior approval of other materials is obtained in writing from the Engineering Department.
(4) During blasting, all reasonable precautions shall be taken to protect pedestrians, passing vehicles, and public or private property. Blasting mats or protective cover shall be used when required by the Observer, the permit, or by safe blasting practices.
(5) All explosives shall be stored in accordance with all applicable laws and codes.
(6) The Engineer or its representative shall have the right to limit the use of explosives and/or blasting methods which in its opinion are dangerous to the public or nearby property of any kind.
(7) The Contractor, at its expense, shall promptly repair or replace all items known to be damaged as a result of blasting. All claims of damage shall be investigated by the County or by consulting firms approved by the County.
(8) The Contractor shall maintain accurate records throughout the blasting operations showing the type explosive used, number of holes, pounds per hole, depth of hole, total pounds per shot, delays used, date and time of blast and initials of the Observer. The Contractor is fully responsible for all claims resulting from its blasting operation.

All damage or loss to any property referred to in this article caused, in whole or in part, by the Contractor, any Subcontractor, any Sub-subcontractor, or anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable, shall be

remedied by the Contractor, except damage or loss attributable solely to faulty drawings or specifications or solely to the acts or omissions of the County its agents, employees, or representatives or anyone employed by either of them, and not attributable in any degree to the fault or negligence of the Contractor.

The Contractor shall designate a responsible member of its organization at the site whose duty shall be the prevention of accidents. This person shall be the Contractor's superintendent unless otherwise designated in writing by the Contractor to the County.

9.03 Location and Protection of Utilities

Notwithstanding any other provision of the Contract Documents, the Contractor shall be solely responsible for the location and protection of any and all public utility lines and utility customer service lines in the Project area. The Contractor shall exercise due care to locate and to mark, uncover or otherwise protect all such lines in the construction zone and any of the Contractor's work or storage areas. Upon request, the County shall provide such information as it has about the location and grade of water, sewer, gas, and telephone and electric lines and other utilities in the Work area but such information shall not relieve or be deemed to be in satisfaction of the Contractor's obligation hereunder, which shall be primary and nondelegable. Any such lines damaged by the Contractor's operations shall be immediately repaired by the Contractor or it shall cause such damage to be repaired at its expense.

10. Termination

10.01 Termination by the County for Cause

Conditions for termination are as follows:

(A) Without prejudice to any other legal or equitable right or remedy which it would otherwise possess hereunder or as a matter of law, the County shall be entitled, by giving Contractor five (5) days prior written notice, to terminate the Agreement in its entirety at any time:

(1) If the Contractor becomes insolvent, voluntarily files for bankruptcy, is the subject of an involuntary petition for bankruptcy commenced by its creditors, makes a general assignment for the benefit of creditors or becomes the subject of any other proceeding commenced under any statute or law for the relief of debtors; or

(2) If a receiver trustee or liquidator of any of the property or income of Contractor shall be appointed; or

(3) If Contractor:

(a) Shall fail to prosecute the Work or any part thereof with diligence necessary to insure its progress and completion as prescribed by the time schedules; and shall fail to take such steps to remedy such default within ten (10) days after written notice thereof from the County; or

(4) If Contractor:

(a) Shall commit a default under any of the terms, provisions, conditions, or covenants contained in the Contract Documents; and

(b) Shall fail to take such steps to remedy such default within ten (10) days after written notice thereof from the County.

(B) In the event of County's termination for cause, Contractor shall only be paid its reimbursable costs incurred prior to the effective date of the termination notice and shall not be entitled to receive any further fixed fee payments hereunder and shall be further subject to any claim the County may have against Contractor under other provisions of the Contract Documents or as a matter of law, including the refund of any overpayment of reimbursable costs and/or fixed fee.

(C) If the Agreement is terminated for cause, the County shall have the right, but shall not be obligated, to complete the Work itself or by others; and to this end, the County shall be entitled to take possession of and use such equipment and materials as may be on the Project site, and to exercise all rights, options, and privileges of Contractor under its subcontracts, purchase orders, or otherwise; and Contractor shall promptly assign such rights, options and privileges to the County. If the County elects to complete the Work itself or by others, pursuant to the foregoing, the Contractor will reimburse the County for all costs incurred by the County (including, without limitation, applicable, general, and administrative expenses, and field overhead, and the cost of necessary equipment, materials, and field labor) in correcting work by Contractor which fails to meet contract requirements.

Nothing contained in the preceding sections shall require the County to pay for any of the Work which is unsatisfactory, as determined by the Observer or which is not submitted in compliance with the terms of the Contract Documents. The County shall not be required to make any payments to Contractor when Contractor is in default under the Contract Documents.

This Article shall not constitute a waiver of any right, at law or at equity, which the County may have if Contractor is in default, including the right to bring legal action for damages or to force specific performance of the terms and conditions of the Contract Documents.

10.02 Termination for Convenience

In connection with the Work outlined in the Contract Documents, it is agreed and fully understood by Contractor, that the County may cancel or indefinitely suspend further work hereunder or terminate the Agreement for the convenience of the County, upon fifteen (15) days written notice to Contractor. In the event the County terminates the Agreement for convenience, it is hereby understood and acknowledged by the Contractor that immediately upon receipt of the County's notice of termination, all work and labor being performed under the Contract Documents shall cease. Contractor shall invoice the County for all work satisfactorily completed and shall be compensated in accordance with the terms of the Contractor Documents for work accomplished prior to the receipt of said notice. No amount shall be due for lost or anticipated profits. However, no cost incurred after the effective date of the notice of termination shall be treated as reimbursable costs unless it relates to carrying out the un-terminated portion or taking closeout measures.

10.03 Obligations of Contractor Following Termination

After receipt of a notice of termination, whether such termination be for cause or convenience, Contractor shall, in good faith and to the best of its ability, do all things necessary to assure the efficient proper closeout of the terminated work (including the protection of County property). Among other things, the Contractor shall, except as otherwise directed or approved by the County:

(1) Stop the Work on the date and to the extent specified in the notice of termination.
(2) Place no further orders for subcontracts for services, equipment or materials, except as may be necessary for completion of such portion of the Work as is not terminated.
(3) Terminate all orders and subcontracts to the extent that they relate to the performance of the Work terminated by the notice of termination.
(4) Assign to the County, in the manner and to the extent directed by it, all right title, and interest of Contractor under the orders or subcontracts so terminated; in which case, the County shall have the right to settle or pay any or all claims arising out of such termination of such orders and/or subcontracts.
(5) With the approval of the County, settle all outstanding liabilities and all claims arising out of such termination or orders and subcontracts.
(6) Deliver to the County, all documents, property, plans, field surveys, maps, cross sections and other data, designs and work related to the Project, which shall become the property of the County upon termination. The delivery of such items shall be made in a reasonably organized form, without restriction on future use. Should the County subsequently contract with a new contractor for continuation of services on the Project subject of the Contract Documents, Contractor shall cooperate in providing information to the County and the new contractor.

11. Inspection and Audit

Contractor's records shall be subject to audit and such records shall include, but not be limited to accounting records, written policies and procedures; subcontract files (including proposals of successful and unsuccessful bidders, bid recaps, etc.); original estimates; estimating work sheets; correspondence; change order files (including documentation covering negotiated settlements); back charge logs and supporting documentation; general ledger entries detailing cash and trade discounts earned, insurance rebates and dividends; and any other Contractor records which may have a bearing on matters of interest to the County in connection with the contractor's work for the County. All of the foregoing, hereinafter referred to as "records," shall be open to inspection and subject to audit and/or reproduction by County or its authorized representative to the extent necessary to adequately permit evaluation and verification of:

(a) Contractor compliance with the Contract Documents,
(b) compliance with County's business ethics policies,
(c) compliance by other contractors or subcontractors with contracts with County or Contractor, and
(d) compliance with provisions for pricing change orders, invoices or claims submitted by the Contractor or any of its payees.

Other specific records subject to audit include all information, materials and data of every kind and character such as documents, subscriptions, recordings, computerized information, agreements, purchase orders, leases, contracts, commitments, arrangements, notes, daily diaries, superintendent reports, drawings, receipts, vouchers and memoranda, and any and all other agreements, sources of information that may, in County's judgment, have any bearing on or pertain to any matters, rights, duties or obligations under or covered by the Contract Documents. Such records subject to audit shall also include those records necessary to evaluate and verify direct and indirect costs, (including overhead allocations) as they may apply to costs associated with this Project. In those situations where Contractor's records have been generated from computerized data (whether mainframe, mini-computer, or PC based computer systems), Contractor agrees to provide County's representatives with extracts of data files in computer readable format on data disks or suitable alternative computer data exchange formats.

The County or its designee shall be entitled to audit all of the Contractor's records for a period of three (3) years after final payment or a longer period if required by law.

Contractor shall require all payees (including those entering into lump sum subcontracts and lump sum major material purchase orders), to comply with the provisions of this article by insertion of the requirements hereof in a written contract agreement between Contractor and payee. Requirements to include flow-down audit provisions in contracts with payees will apply to Subcontractors, Sub-Subcontractors, material suppliers, etc. when working under any type of contract including lump sum agreement, unit price agreements, time and material agreements, cost plus agreements, or other agreements. Contractor will cooperate fully and will cause all payees to cooperate fully in furnishing or in making available to County from time to time whenever requested in an expeditious manner any and all such information, materials and data required by this section.

County's agent or its authorized representative shall have access to the Contractor's facilities, shall be allowed to interview all current or former employees to discuss matters pertinent to the performance of the Work, shall have access to all necessary records, and shall be provided adequate and appropriate work space, in order to conduct audits in compliance with this section.

SECTION 12
SPECIAL CONDITIONS OF AGREEMENT

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SPECIAL CONDITIONS

I. County

Williamson County, a political subdivision of the State of Texas, acting through its County Judge, or his designee, agents or employees, whom Contractor has entered into the Agreement and for whom the Work is to be performed, is referred to as "County". The County shall be contacted through its Purchasing Department for contract related subjects and through the County Engineer's office for design and construction related subjects:

Purchasing Department	County Engineer
Williamson County	Williamson County
901 South Austin Avenue	3151 SE Inner Loop
Georgetown, TX 78626	Georgetown, TX 78626

II. Program Manager

Prime Strategies, Inc. is the County's Program Manager for the Project. The Program Manager represents the County and oversees the planning, design, review, and coordination of the design and construction phases of the Project.

III. General Engineering Consultant (GEC)

HNTB Corporation is the consulting engineering firm representing and assisting the County in the design, review, and coordination of the design and construction phases of the project, including oversight of the construction engineering and inspection services performed on the Project.

IV. The Construction Observer

Williamson County or Representative is the "Construction Observer" referred to herein and in the Contract Documents. The Construction Observer will be responsible for performing construction observation services on the Project.

V. Engineer of Record

Rodriguez Transportation Group, Bridgefarmers & Associates, and Cobb Fendley & Associates is the County's design professional, who shall provide professional engineering services as defined in the Texas Government Code Chapter 2254, Subchapter A, and referred to as the " Engineer of Record" in the "General Conditions of Agreement" contained in the Contract Documents. Nothing contained in the Contract Documents shall create any contractual or agency relationship between the Engineer of Record and the Contractor.

VI. Insurance

The Contractor will carry Workmen's Compensation Insurance, Public Liability and Property Damage Insurance, and Automobile Insurance sufficient to provide adequate protection against damage claims which may arise from operations under the Contract Documents, in compliance with the following:

Contractors Insurance: Without limiting any of the other obligations or liabilities of the Contractor, during the term of the Agreement and prior to Final Completion, the Contractor and each subcontractor, at their own expense, shall purchase and maintain the herein stipulated minimum insurance with companies duly approved to do business in the State of Texas and satisfactory to the County. Certificates of each policy shall be delivered to the County before any work is started, along with a written statement from the issuing company stating that said policy shall not be canceled, non-renewed or materially changed without 30 days advance written notice being given to the County. Prior to the effective date of cancellation, Contractor must deliver to the County a replacement certificate of insurance or proof of reinstatement. A model Certificate of Insurance is illustrated herein. Coverage shall be of the following types and not less than the specified amounts:

(a) workers' compensation as required by Texas law, with the policy endorsed to provide a waiver of subrogation as to the County; employer's liability insurance of not less than $500,000 for each accident, $500,000 disease--each employee, $500,000 disease-policy limit.

(b) commercial general liability insurance, including independent contractor's liability, completed operations and contractual liability covering, but not limited to, the liability assumed under the indemnification provisions of the Contract Documents, fully insuring Contractor's (or subcontractor's) liability for injury to or death of County's employees and third parties, extended to include personal injury liability coverage with damage to property of third parties, with minimum limits as set forth below:

General Aggregate	$1,000,000
Operations Aggregate	$1,000,000
Personal and Advertising Injury	$600,000
Each Occurrence	$600,000
Fire Damage (any one fire)	$50,000
Medical Expense (any one person)	$5,000

The policy shall include coverage extended to apply to completed operations, asbestos hazards (if this project involves work with asbestos) and XCU (explosion, collapse and underground) hazards. The completed operations coverage must be maintained for a minimum of one year after Final Completion and acceptance of the Work, with evidence of same filed with County.

(c) comprehensive automobile and truck liability insurance, covering owned, hired and non-owned vehicles, with a combined bodily injury and property damage minimum limit of $600,000 per occurrence; or separate limits of $250,000 for bodily injury (per person), $500,000 bodily injury (per accident) and $100,000 for property damage. Such insurance shall include coverage for loading and unloading hazards.

"Umbrella" Liability Insurance: The Contractor shall obtain, pay for and maintain umbrella liability insurance during the contract term, insuring Contractor for an amount of not less than $1,000,000 per occurrence combined limit for bodily injury and property damage that

follows form and applies in excess of the primary liability coverages required herein above. The policy shall provide "drop down" coverage where underlying primary insurance coverage limits are insufficient or exhausted. County and Project Engineer shall be named as additional insured.

Policy Endorsements and Special Conditions

(a) Each insurance policy to be furnished by Contractor shall include the following conditions by endorsement to the policy:

(1) name the County, the Program Manager, the County's Representatives, the GEC, the Construction Observer and the Engineer of Record as an additional insured as to all applicable coverage;
(2) each policy shall require that 30 days prior to the cancellation, non-renewal or any material change in coverage, a notice thereof shall be given to County by certified mail.
(3) the term "County" shall include all authorities, boards, bureaus, commissions, divisions, departments and offices of the County and individual members, employees and agents thereof in their official capacities, and/or while acting on behalf of the County;
(4) the "Program Manager" represents and assists the County in the planning, design, review, and coordination of the design and construction phases of the project.
(5) the policy phrase "other insurance" shall not apply to the County where the County is an additional insured on the policy; and
(6) all provisions of the Contract Documents concerning liability, duty and standard of care together with the indemnification provision, shall be underwritten by contractual liability coverage sufficient to include such obligations within applicable policies.

(b) Insurance furnished by the Contractor shall also be in accordance with the following requirements:
(1) any policy submitted shall not be subject to limitations, conditions or restrictions deemed inconsistent with the intent of the insurance requirements to be fulfilled by Contractor. The County's decision thereon shall be final;
(2) all policies are to be written through companies duly licensed to transact that class of insurance in the State of Texas; and
(3) all liability policies required herein shall be written with an "occurrence" basis coverage trigger.

(c) Contractor agrees to the following:
(1) Contractor hereby waives subrogation rights for loss or damage to the extent same are covered by insurance. Insurers shall have no right of recovery or subrogation against the County, it being the intention that the insurance policies shall protect all parties to the Agreement and be primary coverage for all losses covered by the policies;
(2) companies issuing the insurance policies and Contractor shall have no recourse against the County for payment of any premiums or assessments for any

deductibles, as all such premiums and deductibles are the sole responsibility and risk of the Contractor;

(3) approval, disapproval or failure to act by the County regarding any insurance supplied by the Contractor (or any subcontractors) shall not relieve the Contractor of full responsibility or liability for damages and accidents as set forth in the contract documents. Neither shall the bankruptcy, insolvency or denial of liability by the insurance company exonerate the Contractor from liability; and

(4) no special payments shall be made for any insurance that the Contractor and subcontractors are required to carry; all are included in the contract price and the contract unit prices.

Any of such insurance policies required under the Contract Documents may be written in combination with any of the others, where legally permitted, but none of the specified limits may be lowered thereby.

The Contractor shall furnish the County with satisfactory proof that it has provided adequate insurance coverage in amounts and by approved carriers as required by the Contract Documents.

VII. Record ("As-Built") Drawings

The Contractor shall mark all changes and revisions on all of its copies of the working drawings during the course of the Project as they occur. Upon completion of the Project and prior to Final Acceptance and Payment, the Contractor shall submit to the Construction Observer one set of its working drawings, dated and signed by the Contractor and its project superintendent and labeled as "As-Built", that shows all changes and revisions outlined above and that shows field locations of all above ground appurtenances including, but not limited to valves, fire hydrants and manholes. These as-built drawings shall be forwarded to the GEC and then to the County and become the property of the County. Each appurtenance shall be located by at least two (2) horizontal distances measured from existing, easily identifiable, immovable appurtenances such as fire hydrants or valves. Property pins can be used for as-builts tie-ins provided no existing utilities as previously described are available. Costs for delivering as-built drawings shall be subsidiary to other bid items.

VIII. Limit of Financial Resources

The County has a limited amount of financial resources committed to this Project; therefore, it shall be understood by Contractor that the County may be required to change and/or delete any items which it may feel is necessary to accomplish all or part of the scope of work within its limit of financial resources. Contractor shall be entitled to no claim for damages or anticipated profits on any portion of work that may be omitted. At any time during the duration of the Project, the County reserves the right to omit any work from the Contract Documents. Unit prices for all items previously approved in the Contract Documents shall be used to delete or add work per change order.

IX. Limits of Work and Payment

It shall be the obligation of the Contractor to complete all work included in the Contract Documents, so authorized by the County, as described in the Contract Documents and Technical Specifications. Any question arising as to the limits of work shall be left up to the interpretation of the Engineer and/or Observer.

X. State Sales Tax

On a contract awarded by a governmental entity for the construction of a publicly-owned improvement in a street right-of-way or other easement which has been dedicated to the public and to the an Organization which qualifies for exemption pursuant to the provisions of Article 20.04 (F) of the Texas Limited Sales, Excise and Use Tax Act, the Contractor can probably be exempted in the following manner:

> The Contractor may buy tax-free any materials incorporated into the project by issuing a resale certificate in lieu of paying the sales tax at the time of purchase. The Contractor may then accept an exemption certificate from the City for the materials.

Even with a separated contract, the rental of equipment and the purchase of items which do not ultimately become part of the physical structure will still be subject to state and local sales taxes.

XI. Completion of Work on Time

The Contractor agrees that time is of the essence and that the definite value of damages which would result from delay would be incapable of ascertainment and uncertain, so that for each day of delay beyond the number of days herein agreed upon for the Substantial Completion of the Work specified in the Contract Documents and contracted for, after due allowance for such extension of time as is provided for under the provisions of Section 4.02 of the General Conditions, the County may withhold permanently from the Contractor's total compensation, not as penalty but as liquidated damages, the sum as specified in Special Specification 000-001 per calendar day.

Furthermore, it is agreed by the Contractor that the time period between Substantial Completion and Final Completion shall be no longer than **30** calendar days. This separate time period shall be for completion of the Punch List, as set forth in Section 5.06 of the General Conditions, Final Completion and Acceptance. In the event that Contractor fails to attain Final Completion on or before the expiration of the above said time period, the Contractor shall be subject to the remedies set forth in the Contract Documents. More specifically, the Contractor shall be subject to the terms set forth under Section 7.01 of the General Conditions, Abandonment by the Contractor. In addition to exercising its rights and remedies under the Contract Documents, the County may also exercise any remedy that may be available to it under the law or in equity.

XII. Layout and Construction Stakes

All construction staking shall be performed by the Contractor at the Contractor’s expense.

XIII. Safety

The Contractor must use methods of construction that meet or exceed Occupational Safety and Health Administration Standards and any other local, state or federal regulations for safety that are in effect. The Contractor will have a trench safety plan prepared and sealed by Contractor's registered professional engineer.

XIV. Maintenance Bond Term & Amount

The required Maintenance Bond amount for this Project shall be twenty percent (20%) of the total amount bid and the bond period shall be two years from date of acceptance of completion, as noted on the Certificate of Completion.

XV. Safety Restrictions - Work Near High Voltage Lines

The following procedures shall be followed for work near high voltage lines on the Project.

(a) A warning sign not less than five (5) inches by seven (7) inches, painted yellow with black letters that are legible at twelve (12) feet shall be placed inside and outside vehicles such as cranes, derricks, power shovels, drilling rigs, pile drivers, hoisting equipment or similar apparatus. The warning sign shall read as follows: "Warning-Unlawful to Operate This Equipment Within Six Feet of High Voltage Lines".

(b) Equipment that may be operated with ten (10) feet of high voltage lines shall have an insulating cage guard around the boom or arm (except backhoes or dippers), and insulator links on the lift hook connections.

(c) When necessary to work within six (6) feet of high voltage electrical lines, notify the power company. The electric company will erect temporary mechanical barriers, de-energize the line, or raise or lower the line. All such work done by the power company shall be at the expense of the contractor. The contractor shall maintain an accurate log of all such calls to the electric company.

(d) No person shall work within six (6) feet of high voltage lines without protection measures having been taken as outlined in Paragraph C.

XVI. Erosion Control

Contractor shall comply with all laws prohibiting the pollution of any lake, stream, river, or wetland by the dumping of any refuse, rubbish, dredge material, or debris therein.

The Contractor will file the Notice of Intent (NOI) and the Notice of Termination (NOT) as the Project's operator. All required Permits and Notices shall be posted by the Contractor at the Project site.

Contractor shall apply temporary and/or permanent erosion and sedimentation controls, as specified in the plans or directed to disturbed roadside areas, fifteen feet and beyond from road pavement, prior to initiating road base operations. Following asphalt paving of road pavement, apply temporary and/or permanent erosion and sedimentation controls to remaining disturbed areas, as specified in the plans or as directed.

Contractor shall be responsible for the maintenance of all temporary and permanent water quality and erosion control measures proposed under the Storm Water Pollution Prevention Plan (SWPPP) or the Water Pollution Abatement Plan (WPAP) for the duration of the Project construction. Upon completion of construction and before the Construction Observer issues the Certificate of Completion, Contractor shall be responsible for the removal of all temporary measures and the cleaning and resetting of all permanent measures. All costs associated with this work shall be considered subsidiary to other bid items and no additional compensation shall be allowed.

Contractor shall take special precautions during all periods of heavy rainfall and at all locations where storm water, groundwater and/or mud and debris may enter the sewer systems. All mud, stones, and debris that enter the sewer systems due to Contractor's operations, or Contractor's neglect, shall be cleaned from the system by Contractor. It shall be Contractor's responsibility to see that such storm water, groundwater and debris do not enter the sewer system. All costs for such work shall be merged in the unit prices bid and no additional compensation shall be allowed.

If it is necessary in the prosecution of the Work to interrupt existing surface drainage, sewers, or under drainage, temporary drainage shall be provided until permanent drainage work is completed. The construction of all temporary drainage installations shall be considered as incidental to the construction of the Work. Drainage ways shall be kept clear or other satisfactory provisions made for drainage.

Contractor shall be responsible for and shall take all reasonable and necessary precautions to preserve and protect all existing tile drains, sewers, and other subsurface drains, or parts thereof, which may be continued in service without

change. Contractor shall repair, at its own expense, any and all damage to such facilities resulting from negligence or carelessness on the part of its operations.

The Construction Observer shall be responsible for the monitoring and inspection of the erosion control measures by completion of the Construction Pollution Prevention Plan Inspection and Maintenance Report, as required for coverage under the Texas Pollutant Discharge Elimination System (TPDES) General Construction Permit (TXR150000).

XVII. Discovery of Hazardous Materials

If, during the course of the Work, the existence of hazardous material, including asbestos containing material, is observed in the work area, the Contractor shall immediately notify the County in writing. The Contractor shall not perform any work pertinent to the hazardous material prior to receipt of special instructions from the County. Asbestos containing material includes transit pipe.

XVIII. Submittals – Certificate of Compliance

The Contractor shall submit to the Construction Observer a Certificate of Compliance from the manufacturer and/or supplier of each and every specified material or manufactured equipment item. The said certificate shall state that the material or the item of equipment to be furnished has been manufactured with materials in accordance with the applicable sections of all required codes, specifications, and standards as required by the specifications.

XIX. Unavailability of Materials

If the Contractor is unable to furnish or use any of the materials or equipment specified because of any order by a governmental agency limiting the manufacture or use, or because of the supply situation in the general market for such material or equipment, the Contractor shall offer substitutes therefor. The substitutes shall be suitable for the purpose, considering the factors of quality, serviceability, appearance, and maintenance. No substitute shall be used until the Engineer has approved it.

No consideration will be given to the use of substitutes on account of market conditions unless the Contractor demonstrates that, for the item in question, the Contractor placed its order without delay, that it has shown due diligence in attempting to locate the item as specified, and that the unavailability is due to market conditions in general throughout the particular industry.

If substitutes are used in the Work, the compensation to be paid to the Contractor shall be subject to review and adjustment. As a general principle, if the Engineer shall determine that the substitute will be less satisfactory, the Contractor shall allow a credit to the County; only under unusual circumstances shall there be an increase in compensation to the Contractor on account of substitution. The basis upon which the amount of price and adjustments will be founded shall be the cost of the appropriate items at the time the bids for the Project were opened.

XX. Traffic Control

Access shall be provided for residents and emergency vehicles at all times. When it becomes necessary to restrict access, the Contractor shall notify all applicable agencies (i.e. Fire Department, E.M.S., Public Works, etc.) a minimum of five (5) working days in advance of the proposed restrictions. At the end of each day, two lanes of traffic shall be opened to the public, unless otherwise stated in the Contract Documents.

XXI. Temporary Traffic Handling Devices

The Contractor shall furnish, erect and maintain all necessary barricades, lights, warning signs and temporary pavement markings as shown on the Plans and/or in accordance with the Texas Manual on Uniform Traffic Control Devices and with the Specifications in the Contract Documents. In addition, the Contractor shall provide flag-persons and take necessary precautionary measures for the protection of persons, property and the Work, when deemed necessary by the County or the Construction Observer.

The Construction Observer shall be responsible for the monitoring and inspection of the traffic control measures by completion of the Traffic Control Devices Inspection Report (TCDIR), and the Contractor shall be responsible for compliance with the terms of the TCDIR procedures.

XXII. Roadway Signs

All permanent and temporary roadway signage designated in the Contract Documents shall be in accordance with the Texas Manual on Uniform Traffic Control Devices.

XXIII. Project Signs

The Contractor shall erect at the site of construction, and maintain during construction, signs satisfactory to the County identifying the Project and indicating that the government is participating in the development of the Project. The project signs must be temporary signs, mounted in such a way that they can be moved and do not pose a safety issue. Two project signs will be required for the Project. The two said signs shall be 8' X 4' and made out of white 10 mm corrugated plastic with pressure sensitive vinyl lettering or approved equivalent to include: Road Bond Program, Your County Tax Dollars at Work!, with the Williamson County Seal, the Project’s name, and a brief description relating to the estimated date of completion, website address and the appropriate Williamson County Commissioner's name and precinct number. Furnishing, installing and maintaining these signs shall be considered subsidiary to Item 502, “Barricades, Signs and Traffic Handling”. The Contractor may use any manufacturer; however, the manufacturer must meet Williamson County standards.

XXIV. Permits

The Contractor shall be responsible for obtaining any and all required construction permits. Contractor agrees to comply with all conditions of the permits and to

maintain copies of the permits at the site at all times while the Work is in progress. The County shall be responsible for obtaining Section 404 permits from the U.S. Army Corps of Engineers as part of the Project design. When Contractor-initiated changes in the construction method changes the impacts to waters of the U.S., Contractor shall be responsible for obtaining new or revised Section 404 permits.

XXV. Landscape Restoration

If not designated as a specific pay item in bid package, the Contractor shall take the means necessary to protect all trees, shrubbery and sod. Protection, removal and replacement of existing landscaping will be in accordance with the Contract Documents.

XXVI. Existing Fencing

All fences encountered during construction within the right-of-way (ROW) shall be removed by the Contractor under "Preparing Right-of-Way." Permanent fencing, designating the ROW, will be provided by others, unless otherwise shown in the Contract Documents. The Contractor will be required to coordinate preparing ROW operations and fence removal and installations with the landowners as needed.

XXVII. Easements

Any easements, both temporary and permanent, required for the Project will be provided by the County as shown in the Contract Documents. Other easements required or desirable by the Contractor shall be arranged by the Contractor at its sole expense. The easements shall be cleaned after use and restored to their original conditions, or better by the Contractor. In the event additional work is required by the Contractor, it shall be the Contractor's responsibility to obtain written permission from the property owners involved for the use of additional property required. No additional payment will be allowed for this item.

XXVIII. Limits of Contractor's Operation

The Contractor shall limit construction operations to within the ROW or the easement unless otherwise directed by the County or its authorized representative.

XXIX. Maintenance of Pedestrian Walkways

The Contractor will be required to maintain clear walkways for pedestrians during construction in a manner to provide access in the most convenient and safest manner consistent with essential construction operations. Specifically, the following will be enforced.

Pedestrian traffic may be blocked at a location where work is actually in progress. Signs, barricades, and warning devices must be placed at nearest crosswalks approaching the construction site from every direction advising pedestrians of the blockage and advising them to use alternate routes.

Access to doorways and pedestrian entrances must be maintained at all times during hours that access is needed by business. Paving by sections or providing temporary access may be required.

No more than one corner of any intersection may be under construction at any one time. Work must be completed and opened for use by pedestrians before starting work on any other corner of an intersection.

The Contractor will be expected to diligently pursue construction from start to completion at every location to avoid prolonged and unnecessary disruptions to pedestrian traffic.

This work shall be considered incidental and not a separate pay item, unless provided otherwise in the Contract Documents.

XXX. Spoil

All excavated material unfit for backfill, waste material accumulated on the job, and any material surplus to that needed in the prosecution of the Work shall be removed from the site by the Contractor and properly and legally disposed of at its expense, unless otherwise directed by the Observer. **THE CONTRACTOR SHALL INDEMNIFY AND SAVE HARMLESS THE COUNTY, ALL OF ITS OFFICERS, AGENTS, AND EMPLOYEES FROM ALL SUITS, ACTIONS, OR CLAIMS OF ANY CHARACTER RESULTING FROM ITS ARRANGEMENTS FOR THE DISPOSAL OF SPOIL.** This shall be incidental and not a separate pay item.

XXXI. Materials Testing

Quality Control testing of all materials, construction items or products incorporated in the work shall be performed by the Contractor at the Contractor's expense, and shall be performed in accordance with the Quality Control (QC) / Quality Assurance (QA) program outlined in Appendix A.

Quality Assurance sampling and testing for acceptance may be required for quality assurance of used materials as directed by the Construction Observer or the County. The cost of such tests will be incurred by the County and coordinated by the Construction Observer through funds made available to the Construction Observer under his/her agreement with the County for the professional services related to construction engineering and inspection on the Project.

The Contractor shall furnish for review by the Construction Observer, not later than 10 days after receipt of notice to proceed, a Quality Control Plan consisting of plans, procedures, and organization necessary to produce an end product which complies with the contract documents. The Contractor will be allowed the latitude to develop standards of control subject to approval by the County. As a minimum, the plan shall include description of the type and frequency of inspection staffing,

materials handling and control, and testing deemed necessary to measure and control quality as specified by the contract documents.

XXXII. Pre-Construction Conference

Before the Project work order is issued, a pre-construction conference shall be held with representatives of the County and the Contractor. The Contractor shall plan to submit a schedule of operations at the pre-construction conference, unless otherwise notified. See Section XXXVI-Prosecution and Progress for additional construction schedule requirements.

XXXIII. Weight Tickets

The Contractor will be responsible for providing asphalt and aggregate tickets for quantity verifications on all asphaltic concrete used for the Project.

XXXIV. Confined Space Entry Program

It shall be the responsibility of the Contractor to implement and maintain a variable "Confined Space Entry Program" which must meet OSHA requirements for all its employees and subcontractors at all times during construction. OSHA defines all active sewer manholes, regardless of depth, as "permit required confined spaces". Contractors shall submit an acceptable "Confined Space Entry Program" for all applicable manholes and maintain an active file for these manholes. The cost of complying with this program shall be subsidiary to the pay items involving work in confined spaces.

XXXV. Tree and Plant Protection

Scope: Provide complete protection and maintenance of existing trees, shrubs, and grass areas designated to remain within construction limits and/or right-of-way.

Coordination: Coordinate protection of existing trees, shrubs and grass areas with other trades so as to prevent damage to these items.

Payment for Damages: If existing trees, shrubs or grass areas are destroyed, killed or badly damaged as a result of construction observations, Contract sum will be reduced by the amount of assessed damages. Damages will be evaluated by the Construction Observer, using the following:

Trees: International Shade Tree Conference Standards and following formula – measurement of a cross section of tree trunk will be made at a point 2 feet above existing grade level to determine cross section area in square inches. Assessment for damage will be $27.00 per square inch.

Shrubs and Grass Areas: An initial fine of $1,000 shall be imposed for any unauthorized disturbance within the boundaries of the shrub and grass areas to remain within the right-of-way and outside the limits of disturbance. This disturbance includes but is not limited to: parking or intrusion of equipment or

vehicles; storage of any materials, and any unauthorized damage and/or removal of vegetation. In addition to the initial fine, a base fine of $8.00 for every square foot of area of damaged vegetation within any areas designated to remain on the plans shall be imposed. The areas covered under this section include but are not limited to: areas designated to remain or no-work areas. In determining the amount of fine, the Construction Observer shall consider the degree and extent of harm caused by the violation, the cost of rectifying the damage, and whether the violation was committed willfully.

Materials: Tree Protection lumber dimensions shall be 4X4 and 2X4 sizes.

Protection: The Contractor shall protect existing trees, shrubs, and grass areas within construction limits from the following damage:

(1) Compaction of root area by equipment, vehicles or material storage;
(2) Trunk damage by moving equipment material storage, nailing or bolting;
(3) Strangling by tying ropes or guy wires to trunks or large branches;
(4) Poisoning by pouring solvents, gas, paint or other chemicals on or around trees and roots;
(5) Cutting of roots by excavating or ditching;
(6) Damage of branches by improper pruning;
(7) Drought from failure to water or by cutting or changing normal drainage pattern past roots;
(8) Changes of soil pH factor by disposal of lime base materials such as concrete or plaster;
(9) Do not cut roots 1-1/2" in diameter or over. Excavation and earthwork within drip line of trees shall be done by hand.

Install barricade protection around trees and shrubs, constructed of 4X4 posts and 2X4 stringers top and bottom. Install protection prior to demolition or excavation operations. Leave protection until construction operations are essentially complete.

Maintenance:

(1) Water trees and shrubs within construction limits as required to maintain their health during course of construction operations.
(2) Pruning will be performed by County.

XXXVI. Prosecution and Progress

At the pre-construction meeting, the Contractor shall submit for acceptance a schedule of all planned work activities and sequences that is intended to be followed in order to both substantially and fully complete the Work within the allotted time periods (the "Project Schedule"). The purpose of the County requiring the Project Schedule shall be to:

(1) Ensure adequate planning during the prosecution and progress of the work in accordance with the allowable number of working/ calendar days and all milestones;
(2) Assure coordination of the efforts of the Contractor, County, Program Manager, Construction Observer, utilities and others that may be involved in the Project;
(3) Assist the Contractor, County, Program Manager and Construction Observer in monitoring the progress of the Work and evaluating proposed changes to the Contract Documents; and
(4) Assist the County, Program Manager and Construction Observer in administering the time requirements set forth in the Contract Documents.

A Type B Schedule will be required on all projects. Following is the schedule requirements:

Type B Schedule:

The Contractor shall create and maintain a Critical Path Method (CPM) Project Schedule showing the manner of prosecution of work that it intends to follow in order to both substantially and fully complete the Work within the allotted time periods. The Project Schedule shall employ computerized CPM for the planning, scheduling and reporting of the work as described in this specification. The CPM Project Schedule shall be prepared using the Precedence Diagram Method (PDM). No direct compensation will be allowed for fulfilling these requirements, as such work is considered subsidiary to the various bid items of the Project.

(1) Personnel. The Contractor shall provide an individual, referred to hereinafter as the Scheduler, to create and maintain the CPM schedule. He or she shall be proficient in CPM analysis and shall be able to perform required tasks on the software. The Scheduler shall be made available for discussion or meetings when requested by the County, Construction Observer or Program Manager.

(2) Schedule. The Project Schedule shall show the sequence and interdependence of activities required for complete performance of the work. The Contractor shall be responsible for assuring all work sequences are logical and show a coordinated plan of the Work.

Each activity on the schedule shall be described by: An activity number utilizing an alphanumeric designation system tied to the traffic control plans, and that is agreeable to the County, Program Manager, or Construction Observer; concise description of the Work represented by the activity; and activity durations in whole working days with a maximum of

twenty (20) working days. Durations greater than twenty (20) working days may be used for non-construction activities (mobilization, submittal preparation, curing, etc.), and other activities mutually agreeable between the Contractor and County, Program Manager or Construction Observer. The Contractor shall provide a legend for all abbreviations. The activities shall be coded so that organized plots of the schedule may be produced. Typical activity coding includes: Traffic control phase, location and work type.

The activity durations shall be based on the quantity for the individual work activity divided by a production rate. An estimated production rate for each activity shall also be shown.

The Contractor shall plan and incorporate major resources into the schedule. Major resources are defined as crews and equipment that constrain the Contractor from pursuing available work. The resources shall accurately represent the Contractor's planned equipment and manpower to achieve the productivity rates specified above.

Seasonal weather conditions shall be considered and included in the CPM schedule for all work influenced by temperature and/or precipitation. Seasonal weather conditions shall be determined by an assessment of average historical climatic conditions. Average historical weather data is available through the National Oceanic and Atmospheric Administration (NOAA). These effects will be simulated through the use of work calendars for each major work type (i.e., earthwork, concrete paving, structures, asphalt, drainage, etc.) Project and work calendars should be updated each month to show days actually able to work on the various work activities.

“Total float” is defined as the amount of time between the early start date and the late start date, or the early finish date and the late finish date, for each and every activity in the schedule. Float time in the schedule is a shared commodity between the County and the Contractor.

Only responsible delays in activities that affect milestone dates or the Project’s completion date, as determined by CPM analysis, will be considered for a time extension.

The schedule shall show the sequence and interdependence of activities required for complete performance of the work. The schedule shall be prepared and maintained in accordance with the scheduling requirements stated in this Section and shall include two (2) organized plots with the activities logically grouped using the activity coding. The Contractor shall also provide an electronic copy of the schedule via e-mail.

The schedule shall encompass the time from the start of the Contract Time to the Project's Final Completion. The longest path through the schedule shall be readily discernable on the plot of the schedule.

(3) Joint Review, Revision and Acceptance. Within twenty (20) calendar days of receipt of the Contractor's proposed schedule, the County or its authorized agents shall evaluate the schedule for compliance with this specification, and notify the Contractor of the findings. If the County or its authorized personnel request a revision or justification, the Contractor shall provide a satisfactory revision or adequate justification to the satisfaction of the Construction Observer or County authorized personnel within seven (7) calendar days.

If the Contractor submits a CPM schedule for acceptance which is based on a sequence of work not in the Contract Documents, then the Contractor shall notify the County or its authorized entities in writing, separate from the schedule submittal.

The County's review and acceptance of the Contractor's Project Schedule is for conformance to the requirements of the Contract Documents only. Review and acceptance by the County or other authorized personnel of the Contractor's Project Schedule does not relieve the Contractor of any of its responsibility for the Project Schedule, or of the Contractor's ability to meet interim milestone dates (if specified) and the Final Completion date, nor does such review and acceptance expressly or by implication warrant, acknowledge or admit the reasonableness of the logic, durations, manpower or equipment loading of the Contractor's Project Schedule. In the event the Contractor fails to define any element of work, activity or logic and the County's review does not detect this omission or error, such omission or error, when discovered by the Contractor or County and its authorized personnel, shall be corrected by the Contractor at the next monthly schedule update and shall not affect the project completion date.

(4) Updates. The Project Schedule shall be updated on a monthly basis and shall be required as a basis for the pay application approval. The Project Schedule update shall be submitted with the pay application. The Contractor shall meet with the Construction Observer or County authorized personnel each month at a scheduled update meeting to review actual progress made through the data date of the schedule update. The review of progress will include dates activities actually started and/or completed, and the percentage of work completed or remaining duration on each activity started and/or completed. The percentage of work complete shall be calculated by utilizing the quantity and productivity rate information. The Project Schedule update shall include one (1) copy of the following information:

a) Electronic copy of the updated schedule including revisions and changes via e-mail.
b) One (1) logically organized plot of the schedule update if requested by the County or its authorized personnel.

(5) Project Schedule Revisions. If the Contractor desires to make major changes in the Project Schedule, the Contractor shall notify the County or Construction Observer in writing. The written notification shall include the reason for the proposed revision, what the revision is comprised of, and how the revision was incorporated into the schedule. In addition to the written notification of the revision, the Contractor shall provide an electronic copy and one logically organized plot of the schedule including the revision if requested by the County or Construction Observer.

Major changes are hereby defined as those that may affect compliance with the requirements of the Contract Documents or those that change the critical path. All other changes may be accomplished through the monthly updating process.

(6) Time Impact Analysis. The Contractor shall notify the County or Construction Observer when an impact may justify an extension of Contract Time or adjustment of milestone dates. This notice shall be made in writing as soon as possible, but no later than the end of the next estimate period after the commencement of an impact or the notice for a change is given to the Contractor. Not providing notice to the County or Construction Observer by the end of the next estimate period will indicate the Contractor's approval of the time charges as shown on that time statement. Future consideration of that statement will not be permitted and the Contractor forfeits its right to subsequently request a time extension or time suspension unless the circumstances are such that the Contractor could not reasonably have knowledge of the impact by the end of the next estimate period.

When changes are initiated or impacts are experienced, the Contractor shall submit to the County or Construction Observer a written time impact analysis describing the influence of each change or impact.

A time impact analysis is an evaluation of the effects of changes in the construction sequence, contract, plans, or site conditions on the Contractor's plan for constructing the Project, as represented by the Project Schedule. The purpose of the time impact analysis is to determine if the overall Project has been delayed, and if necessary, to provide the Contractor and the County a basis for making adjustments to the time allotted for Substantial Completion and Final Completion.

A time impact analysis shall consist of one or all of the steps listed below.

Step 1. Establish the status of the Project before the impact using the most recent Project Schedule update prior to the impact occurrence.

Step 2. Predict the effect of the impact on the most recent Project Schedule update prior to the impact occurrence. This requires estimating the duration of the impact and inserting the impact into the schedule update. The Contractor shall demonstrate how the impact was inserted into the schedule showing the added or modified activities and the added or modified relationships. Any other changes made to the schedule including modifications to the calendars or constraints shall be noted.

Step 3. Track the effects of the impact on the schedule during its occurrence. Note any changes in sequencing, and mitigation efforts.

Step 4. Compare the status of the Work prior to the impact (Step 1) to the prediction of the effect of the impact (Step 2), and to the status of the work during and after the effects of the impact are over (Step 3). Note that if an impact causes a lack of access to a portion of the Project, the effects of the impact may extend to include a reasonable period for remobilization.

The time impact analysis shall include an electronic copy of the complete schedule prepared in Step 2. If the Project Schedule is revised after the submittal of a time impact analysis but prior to its approval, the Contractor shall promptly indicate in writing to the County or Construction Observer the need for any modification to its time impact analysis.

Only one (1) copy of each time impact analysis shall be submitted within fourteen (14) calendar days after the completion of an impact. The County or Construction Observer may require Step 1 and Step 2 of the time impact analysis be submitted at the commencement of the impact, if needed to make a decision regarding the suspension of Contract Time.

Approval or rejection of each time impact analysis by the County, Construction Observer or Program Manager shall be made within fourteen (14) calendar days after receipt unless subsequent meetings and negotiations are necessary.

The time impact analysis shall be incorporated into and attached to any relevant change order(s) and/or supplemental agreement(s).

XXXVII. Sanitary Provisions

Provide and maintain adequate, neat, and sanitary toilet accommodations for employees, including County employees and representatives, in compliance with the requirements and regulations of the Texas Department of Health or other authorities having jurisdiction.

XXXVIII. Work Near Railroads

(A) General.

If the work crosses or is in close proximity to a railroad, do not interfere with the use or operation of the railroad company's trains or other property. Assign responsible supervisory personnel to ensure that tracks and adjacent areas are clear of debris, road materials, and equipment. It is the Contractor's responsibility to contact the railroad to determine the railroad's requirements for work within the railroad right of way and to comply with the requirements. The County will not reimburse the Contractor for any cost associated with these requirements. If the work requires construction within 25 ft. horizontally of the near rail or if the tracks may be subject to obstruction due to construction operations, notify the Engineer and the Railroad Company at least 3 days before performing work. The railroad company will provide flaggers during this work. If railroad flaggers will be needed longer than 2 consecutive days, request them at least 30 days before performing work within the railroad right of way. Flaggers provided by the railroad company will be paid for by the County. Do not store material or equipment in the Railroad's right of way within 15 ft. of the centerline of any track. Do not place any forms or temporary falsework within 8.5 ft. horizontally from the centerline or 22 ft. vertically above the top of rails of any track, unless otherwise shown in the Contract Documents.

(B) Temporary Crossings.

If a temporary crossing is needed, obtain permission from the railroad company before crossing the tracks. Execute the "Agreement for Contractor's Temporary Crossing" if required by the Railroad Company. The Contractor shall ensure that the tracks are left clear of equipment and debris that would endanger the safe operation of railroad traffic. Provide a crossing guard on each side of the crossing to direct equipment when hauling across the tracks. The Contractor shall stop construction traffic a safe distance away from the crossing upon the approach of railroad traffic. Work for temporary crossings will not be paid for directly, but shall be subsidiary to items of the Work subject of the Contract Documents. Work performed by the Railroad Company for the temporary crossing, except flaggers, will be at the Contractor's expense.

SECTION 13
TECHNICAL SPECIFICATIONS

Williamson County
Project: Inner Loop at Wilco Way

GENERAL NOTES: April 21, 2017 Version

Basis of Estimate

Item	Description	**Rate	Basis	Quantity
160	**Furnishing and Placing Topsoil (4")**	1 CY/9 SY	24,389 SY	2,710 CY
160	**Furnishing and Placing Topsoil (6")**	1 CY/6 SY	9,569 SY	1,594 CY
161	**Erosion Control Compost (3")**	1 CY/12 SY	6,097 SY	508 CY
162	**Mulch Topdressing (5")**	1 CY/7 SY	6,097 SY	871 CY
164	**Seed for Erosion Control** (Item 164) (Temp) (Cool) (TY 4) (Item 164) (Perm) (Warm) (TY 5) (Item 164) (Temp) (Warm) (TY 10)	 4840 SY/AC 4840 SY/AC 4840 SY/AC	 16,979 SY 33,958 SY 16,979 SY	 3.51 AC 7.02 AC 3.51 AC
166	**Fertilizer (13-13-13)**	1/8 LB/SY	33,958 SY	2.2 TON
168	**Vegetative Watering** (Item 164) (Temp) (Item 164) (Perm)	 10 GAL/SY 20 GAL/SY	 33,958 SY 33.958 SY	 339.6 MG 679.2 MG
**204	**Sprinkling** (Item 132) (Item 247)	 30 GAL/CY 30 GAL/CY	 13,247 CY 2,144 CY	 397,410 GAL 64,320 GAL
**210	**Roll (Flat Wheel)** (Item 247) (Item 316)	 1 HR/200 TON 1 HR/6000 SY	 3,821 TON 16,448 SY	 20 HR 3 HR
**210	**Roll (Tamping)** (Item 132)	 1 HR/200 CY	 13,247 CY	 67 HR
**210	**Roll (Heavy Tamp)** (Item 132)	 1 HR/200 CY	 13,247 CY	 HR
**210	**Roll (Lt Pneu Tire)** (Item 132) (Item 247) (Item 316) (Seal Coat)	 1 HR/500 CY 1 HR/200 TON 1 HR/6000 SY	 13,247 CY 3,821 TON 16,448 SY	 27 HR 20 HR 3 HR
247	**FL BS (CMP IN PLC)** (TY A GR 4) (TY A GR 4) (TY A GR 4)	 132 LB/CF 3564 LB/CY 27 CF/CY	 57,888 CF 2,144 CY 57,888 CF	 3,821 TON 3,821 TON 2,144 CY
310	**Prime Coat (Multi Option)**	0.20 GAL/SY	7,600 SY	1,520 GAL
316	**Surface Treatments** **Seal Coat:** Asphalt Aggregate (Ty D or L,GR 5)	 <u>Total</u> 0.38 GAL/SY 1 CY/115 SY	 16,448 SY 16,448 SY	 6,250 GAL 143 CY

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Item	Description	**Rate	Basis	Quantity
341	**Dense-Graded Hot-Mix Asphalt** TY-B PG64-22 TY-C SAC-B PG70-22	 115 LB/SY/IN 115 LB/SY/IN	 7,490 SY 16,304 SY	 1,292 TON 1,875 TON

** For Informational Purposes Only

GENERAL

References to manufacturer's trade name or catalog numbers are for the purpose of identification only. Similar materials from other manufacturers are permitted if they are of equal quality, comply with the specifications for this project, and are approved.

If work is performed at Contractor's option, when inclement weather is impending, and the work is damaged by subsequent precipitation, the Contractor is responsible for all costs associated with replacing the work, if required.

The roadbed shall be free of organic material prior to placing any section of the pavement structure.

Equip all construction equipment used in roadway work with highly visible omnidirectional flashing warning lights.

Provide a smooth, clean saw-cut along the existing asphalt pavement structure, as directed. Consider subsidiary to the pertinent Items.

Supply litter barrels in enough numbers at locations as directed to control litter within the project. Consider subsidiary to pertinent Items.

Use a self-contained vacuum broom to sweep the roadway and keep it free of sediment as directed. The contractor will be responsible for any sweeping above and beyond the normal maintenance required to keep fugitive sediment off the roadway as directed by the Construction Observer.

Protect all areas of the right of way, which are not included in the actual limits of the proposed construction areas, from disturbance. Restore any area disturbed because of the Contractor's operations to a condition as good as, or better than, before the beginning of work at no cost to the state.

Damage to existing pipes and SETs due to Contractor operations shall be repaired at Contractor's expense.

All locations used for storing construction equipment, materials, and stockpiles of any type, within the right of way, will be as directed. Use of right of way for these purposes will be restricted to those locations where driver sight distance to businesses and side street intersections is not obstructed and at other locations where an unsightly appearance will not exist. The Contractor will not have exclusive use of right of way but will cooperate in the use of the right of way with the city/county and various public utility companies as required.

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The Project Superintendent will be capable of speaking English and will be available on the project at all times when work is being performed, including subcontractor work. The Superintendent will be available and on-call 24 hours a day.

Use materials from prequalified material producers list as shown on the Texas Department of Transportation (TxDOT) – Construction Division's (CST) materials producers list. Refer to TxDOT's website for list of pre-qualified manufacturers. No substitutions will be allowed for materials found on the list. Submit list of approved suppliers/materials from TxDOT website to show items are TxDOT approved. Submit this list with request for material approval.

When any abandoned well is encountered, cease construction operations in this area and notify the Engineer who will coordinate the proper plugging procedures. A water well driller licensed in the State of Texas must be used to plug a well.

Erosion control and stabilization measures must be initiated immediately in portions of the site where construction activities have temporarily ceased and will not resume for a period exceeding 14 calendar days. Track all exposed soil, stockpiles, and slopes. Tracking consists of operating a tracked vehicle or equipment up and down the slope, leaving track marks perpendicular to the direction of the slope. Re-track slopes and stockpiles after each rain event or every 14 days, whichever occurs first. This work is subsidiary.

Perform maintenance of vehicles or equipment at designated maintenance sites. Keep a spill kit on-site during fueling and maintenance. This work is subsidiary.

Maintain positive drainage for permanent and temporary work for the duration of the project. Be responsible for any items associated with the temporary or interim drainage and all related maintenance. This work is subsidiary.

Suspend all activities near any significant recharge features, such as sinkholes, caves, or any other subterranean openings that are discovered during construction or core sampling. Do not proceed until the designated Geologist or TCEQ representative is present to evaluate and approve remedial action.

Locate aboveground storage tanks kept on-site for construction purposes in a contained area as to not allow any exposure to soils. The containment will be sized to capture 150% of the total capacity of the storage tanks.

Project Specific Location (PSL) in USACE Jurisdictional Area.
Do not initiate activities in a PSL associated with a U.S. Army Corps of Engineers (USACE) jurisdictional area that have not been previously evaluated by the USACE as part of the permit review of this project. Such activities include, but are not limited to, haul roads, equipment staging areas, borrow and disposal sites. Associated defined here means materials are delivered to or from the PSL. The jurisdictional area includes all waters of the U.S. including wetlands or associated wetlands affected by activities associated with this project. Special restrictions may be required for such work. Consult with the USACE regarding activities, including PSLs that have not been previously evaluated by the USACE. Provide the Department with a copy of all USACE coordination and approvals before initiating activities.

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Proceed with activities in PSLs that do not affect a USACE jurisdictional area if self-determination has been made that the PSL is non-jurisdictional or proper clearances have been obtained in USACE jurisdictional areas or have been previously evaluated by the USACE as part of the permit review of this project. Document any determinations that PSL activities do not affect a USACE jurisdictional area. Maintain copies of PSL determinations for review by the Department or any regulatory agency. The Contractor must document and coordinate with the USACE, if required, before any excavation material hauled from or embankment material hauled into a USACE jurisdictional area by either (1) or (2) below.

1. Restricted Use of Materials for the Previously Evaluated Permit Areas. When an area within the project limits has been evaluated by the USACE as part of the permit process for this project:
    a. suitable excavation of required material in the areas shown on the plans and cross sections as specified in Standard Specification Item 110, Excavation is used for permanent or temporary fill within a USACE jurisdictional area;
    b. suitable embankment from within the USACE jurisdictional area is used as fill within a USACE evaluated area;
    c. Unsuitable excavation or excess excavation that is disposed of at an approved location within a USACE evaluated area.
2. Contractor Materials from Areas Other than Previously Evaluated Areas. Provide the Department with a copy of all USACE coordination and approvals before initiating any activities in a jurisdictional area within the project limits that has not been evaluated by the USACE or for any off right of way locations used for the following, but not limited to, haul roads, equipment staging areas, borrow and disposal sites:
    a. Standard Specification Item 132, Embankment is used for temporary or permanent fill within a USACE jurisdictional area;
    b. Unsuitable excavation or excess excavation that is disposed of outside a USACE evaluated area.

Work over or near Bodies of Water (Lakes, Rivers, Ponds, Creeks, etc.).
Keep on site a universal spill kit adequate for the body of water and the work being performed. No debris is allowed to fall into a body of water. Debris that falls into the water must be removed at the end of each work day. Debris that falls into the floodway must be removed at the end of each work week or prior to a rain event. This work is subsidiary.

Migratory Birds and Bats.
Migratory birds may be nesting within the project limits and concentrated on roadway structures such as bridges and culverts. Remove all old and unoccupied migratory bird nests from any structures, trees, etc. between September 1st and January 31st. Prevent migratory birds from re-nesting between February 1st and August 31st.

All methods used for the removal of unoccupied bird nests and the prevention of re-nesting must be approved by the Construction Observer well in advance of the planned use.

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In the event that any active nests are encountered on-site during construction, all construction activity within the immediate vicinity of the nest must cease immediately. Contact the Construction Observer to determine how to proceed.

Bats may roost within the project limits under bridges, in culverts, in large hollow trees, in dead standing trees, and in trees with shaggy bark. Maternity colonies may occur from April 1st through August 31st. If bats are present, ensure bats are not harmed. Exclusion protocols for known colonies should be followed well in advance of commencement of construction activities. Exclusion measures by qualified individuals are used to relocate existing colonies, except from April 1st through August 31st when such measures may separate mothers and pups. Exclusion measures are also the means of preventing establishment of new colonies and re-establishment of relocated colonies.

No extension of time or compensation payment will be granted for a delay or suspension of work caused by migratory birds or bats. This work is subsidiary.

ITEM 100 – PREPARING RIGHT OF WAY
Do not burn brush, unless otherwise approved.

Trim vegetation around signs and other obstructions. Consider subsidiary to pertinent Items.

Use hand methods or other means to remove objectionable material and obstructions, if doing work by mechanical methods is impractical. Consider subsidiary to the pertinent Items.

ITEM 110 & 132 – EXCAVATION & EMBANKMENT
Obtain approval of all compaction equipment prior to all backfilling and embankment operations.

ITEM 132 – EMBANKMENT
The underlying layer or existing subgrade must be prepared and inspected prior to placement of the embankment. Proof roll the pavement area according to Item 216 prior to placement of embankment or subsequent layers. Payment for proof rolling will be subsidiary to the various bid Items of the contract.

Correct unstable material (e.g. dry, wet, loose, etc.) to a depth of six (6) inches below existing grade. This work will be considered subsidiary to pertinent bid Items. Drying required deeper than six (6) inches below existing grade will be paid for in accordance with Item 6.03, “Extra Work.” However, there will be no payment to correct failures in the subgrade areas that were constructed under this contract.

ITEM 132 – EMBANKMENT TY B
Embankment shall be ordinary compaction Type B.

Pond embankment shall be free of pockets, voids, or rocks larger than 4”.

The Construction Observer must approve the embankment material before use on the project.

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If delivery from offsite source is necessary, furnish embankment with a PI of less than 25 that does not contain sulfate contents greater than 3000 ppm.

Correct unstable material (e.g. dry, wet, loose, etc.) to a depth of six (6) inches below existing grade. This work will be considered subsidiary to pertinent bid Items. Drying required deeper than six (6) inches below existing grade will be paid for in accordance with Item 6.03, "Extra Work." However, there will be no payment to correct failures in the subgrade areas that were constructed under this contract.

Track ALL embankment slopes left idle for more than 14 days, within or at the end of the 14-day idle period, to prevent erosion. Tracking consists of operating a tracked vehicle or equipment up and down the slope, leaving track marks perpendicular to the direction of the slope. Re-track slopes after rain events, as directed. Consider tracking of slopes to prevent erosion as subsidiary to the pertinent Items.

Correct subgrade (e.g. unstable areas, soft spots, etc.) prior to dumping of Flex Base or HMACP. Consider subsidiary to the pertinent Items.

When subgrade materials contain sulfates, as determined by Tex-145-E, use the following table for treatment of material placed under the pavement structure.

Sulfate Content (SC, ppm)	Action
SC < 3000 ppm	Apply calcium-based additive as specified by the pertinent item.
3000 ppm ≤ SC < 7000 ppm	Perform a minimum of 7 days of mellowing and continuous water curing, in accordance to Department guidelines for soil treatment of sulfate-laden soils.
SC ≥ 7000 ppm	Do not treat with calcium-based additives. Undercut to the specified depth and fill with select material or implement fly ash treatment as specified in the general notes for Item 265.

ITEM 160 – TOPSOIL
No sandy loam allowed. Obtain approval of the actual depth of the topsoil sources for both on-site and off-site sources.

ITEM 204 – SPRINKLING
Apply water for dust control as directed. When dust control is not being maintained, cease operations until dust control is maintained. Consider subsidiary to the pertinent Items.

ITEM 216 – PROOF ROLLING
Correct and perform "Proof Rolling" retest at the Contractor's expense, to the satisfaction of the Construction Observer, when initial "Proof Rolling" yields a failing result.

Initial proof rolling will be considered subsidiary to the pertinent Items.

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ITEM 247 – FLEXIBLE BASE
Furnish Type A material.

Furnish flexible base meeting Grade 4 requirements.

The following table will govern the acceptance of compaction on base courses, when compacted in multiple courses. Compaction requirements are in percent of maximum dry density as determined by (Tex-113-E). When compacting in a single course, compact to at least 100% of maximum dry density as determined by Tex-113-E.

Item	Material	All Roadways	
		Lift	Min. Density
247	FL BS (CMP IN PLC)	1st of 3 lifts 2nd of 3 lifts (final lift)	95% 98% 100%

Table 1
Flexible Base Material Requirements

Property	Test Method	Grade 4
Master gradation sieve size	Tex-110-E	**% Retained**
2½ in.		0
1¾ in.		0
7/8 in.		10-35
3/8 in.		30-50
No. 4		45-65
No. 40		70-90
No. 200		87-95
Liquid Limit, % Max.[1]	Tex-104-E	35
Plasticity Index, Max.[1]	Tex-106-E	10
Wet ball mill, % Max.	Tex-116-E	40
Wet ball mill, % Max. increase passing the No. 40 sieve		20
Min. compressive strength, psi	Tex-117-E	
Lateral pressure 0 psi		–
Lateral pressure 3 psi		90
Lateral pressure 15 psi		175

1. Determine plastic index in accordance with Tex-107-E (linear shrinkage) when liquid limit is unattainable as defined in Tex-104-E.

Correct subgrade (e.g. unstable areas, soft spots, etc.) prior to placing Flex Base. Consider subsidiary to the pertinent Items.

Complete all subgrade, ditches, slopes, and place all drainage structures to conform to required lines, grades, and cross-sections, as shown and directed, prior to the placement of Flex Base.

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For Flex Base placed over the box culverts, do not use a Vibratory Roller to compact the material.

ITEM 300 – ASPHALTS, OILS, AND EMULSIONS
Asphalt season starts May 1st and ends September 15th.

PPA and REOBs are not allowed.

ITEM 300 – ASPHALTS, OILS, AND EMULSIONS (NON-TRACKING TACK COAT)
Apply non-tracking tack coat at 0.04 to 0.08 GAL/SY (residual) or as directed by the Construction Observer.

Spray a test strip of tack coat at a location on or near the project as directed. Consult the manufacturer for the recommended application rate. Allow the strip to cure for the maximum time specified. Drive over the test strip with equipment to simulate the effect of paving equipment. There should be no evidence tracking or picking up of the tack coat on the wheels of the equipment.

The Construction Observer shall verify the bond strength as directed.

ITEM 302 – AGGREGATES FOR SURFACE TREATMENTS
Previously tested aggregates delivered to the project, which are found to contain excessive quantities of dust (more than 0.5% passing the No. 40 sieve) during pre-coating, stockpiling or hauling operations, will be rejected, unless otherwise directed. Use test method Tex-200-F, Part II, for testing.

Table 3 Los Angeles Abrasion, % Max., is lowered from 35 to 30 and is applicable to all aggregates.

ITEMS 310, 316, & 341
Perform work during good weather, unless otherwise directed. If work is performed at Contractor's option, when inclement weather is impending, and the work is damaged by subsequent precipitation, the Contractor is responsible for all costs associated with replacing the work, if required.

ITEM 310 – PRIME COAT
Apply blotter material to all driveways and intersections.

Provide Construction Observer with current Distributer Certification confirming calibration of asphalt measurement equipment.

Apply Prime to finished flex base surface at the rate shown in the plans. Hot mix can be applied to the primed surface of flex base after the prime has penetrated and cured for a minimum of 36 hours depending on weather conditions or as approved by the Construction Observer. Provide the Construction Observer with a copy of the asphalt deliver ticket prior to application.

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Apply blotter material to all driveways and intersections. This work is subsidiary. When Multi Option is allowed, provide MC 30, EC 30, or AE-P. MC 30 is not allowed in Travis County.

ITEM 316 – SEAL COAT
Use ionically compatible asphalt to precoated aggregate, which is compatible with the asphalt specified for each specific Surface Treatment.

Do not apply asphalt within 1½ hours of sunset, or later, unless otherwise directed.

Ensure that all underseal surface treatment operations are covered by HMACP before exposing to traffic, including construction traffic.

Use paper or other approved material at the beginning and end of each shot so that the transverse joint is straight and prevents overlap of asphalt shots.

Any areas with excessive asphalt or aggregate will be removed.

The Contractor is required to provide recommendations to the Construction Observer on adjusting aggregate and asphalt rates, when the road conditions, material properties or construction methods change.

Furnish medium pneumatic-tire rollers in accordance with Item 210, "Rolling." Roll before opening to traffic.

Surface all transitions, tapers, climbing lanes and intersections to the limits as directed.

Keep all traffic, including construction traffic, off freshly placed surface treatment, as directed.

Provide Construction Observer with current Distributer Certification confirming calibration of asphalt measurement equipment.

Provide Construction Observer with a copy of the shipping ticket for the asphalt prior to application. Contractor must sample asphalt, in accordance to the applicable item. Label the sample can with date and project numbers. Samples must be stored where they are readily available to the County representative at the plant. The Contractor will be responsible for supplying storage for all samples until the project achieves substantial completion or otherwise directed.

Removal and proper disposal off the ROW of audible/profile markings, reflectorized markings, and raised markers is subsidiary.

ITEM 320 – EQUIPMENT FOR ASPHALT CONCRETE PAVEMENT
Use of motor grader is allowed with approval of the Construction Observer.

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ITEMS 341 (HMACP Testing)
The Contractor must sample asphalt binder, in accordance to the applicable item. Label the sample can with the corresponding CSJ, lot, and sub-lot numbers.

Samples must be stored in a common area where they are readily available to the County's representative at the plant. The Contractor will be responsible for supplying storage for all samples. Retain all asphalt samples until hot mix production is complete or directed otherwise.

When directed, the Contractor is responsible for disposal of all asphalt binder samples, in accordance to Local, State, and Federal regulations.

[Hot Mix Asphaltic Concrete (HMAC) Core Holes]
Refill and compact all HMAC core holes to the same elevation as the adjacent roadway. Use hot mix of the type being used in the project to fill core holes. As an alternative a high performance cold patching mix such as Rapid Cure Patching Mix meeting the requirements of DMS-9203 or Medium Cure Patching mix made with SCM meeting requirements of DMS-9202. Consider this work subsidiary to the pertinent Items.

Mill a transverse butt joint to transition from the new ACP to the existing surface tie-in. Make the transition a minimum of 50 feet H: 1 inch V slope ratio of newly placed ACP. Make the temporary joint, at the tie-in, a minimum of a 10 feet longitudinally and covering the entire width. Saw-cut existing pavement as directed. Prior to milling, core the existing pavement to determine its thickness. Do not proceed with milling until directed. Consider this work subsidiary to the pertinent Items.

ITEMS 340 & 341 – DENSE-GRADED HOT-MIX ASPHALT
Contractor to submit for approval a current mix design (less than 6 months old) to the Construction Observer that meets the following requirements prior to use on the project.

PPA and REOBS are not allowed.

Lime or an approved anti-stripping agent must be used when crushed gravel is utilized to meet a SAC "A" requirement.

Aggregates used on shoulders and ramps are required to meet SAC requirements.

Target laboratory molded density is 97% for all mixtures for Texas Gyratory Compactor (TGC) mixture designs.

When using Superpave Gyratory Compactor (SGC) to design mixtures, submit the SGC mix design to the Construction Observer for approval.

When using substitute binders, mold specimens for mix design and production at the temperature required for the substitute binder used to produce the HMA.

All mixtures must meet the Hamburg requirement as stated in the table below.

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High-Temperature Binder Grade	Test Method	Hamburg Wheel Test Requirements [1]		
		Minimum # of Passes	Maximum Rut Depth (mm)[2]	Minimum Rut Depth (mm)[2,3]
PG 64 or lower	Tex-242-F	7,000	12.5	3
PG 70	Tex-242-F	15,000	12.5	3
PG 76 or higher	Tex-242-F	20,000	12.5	3

1. The Construction Observer may accept Hamburg Wheel test results for production and placement if no more than 1 of the 5 most recent tests is below the specified number of passes and the failing test is no more than 2,000 passes below the specified number of passes.
2. Rut depth tested @ 122°F
3. Unless approved otherwise.

When using RAP and/or RAS:
Use of RAS is not allowed. When using RAP, include the management methods of processing, stockpiling, and testing of RAP in the QCP submitted for the project. Blending of RAP in one feeder bin or in a stockpile is not permitted.

Asphalt content and binder properties of RAP stockpiles must be documented when recycled asphalt content greater than 20% is utilized.

RAP is not allowed for any surface mix applications.

No more than 20% RAP by weight of aggregate is allowed in any mix application.

Complete all roadways before final surface course placement, unless directed otherwise.

Ensure placement sequence to avoid excess distance of longitudinal joint lapback not to exceed one day's production rates.

The Contractor shall utilize a material transfer device per item 320 and a grade reference (such as a ski) for overlay operations. Consider subsidiary to the pertinent items.

Use a device to create a maximum 3H: 1V notched wedge joint on all hot mix joints of two (2) inches or greater. Consider subsidiary to the pertinent Items.

Taper transverse faces at ends of passes as directed.

Make transverse tapers on each end of pass using a minimum slope rate of 60H:1V. Tapers shall be removed directly before placement of final lift. Consider subsidiary to the pertinent Items.

Provide a minimum transition for all side streets of at least 12 ft. and driveways of at least six (6) feet, unless otherwise shown on the plans or otherwise approved/directed.

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Submit any proposed adjustments or changes to a job mix formula to the Construction Observer before production of the new job mix formula.

For Mixture Design Verification, provide the Construction Observer with two 5-gallon buckets of each aggregate stockpile to be used on the project with three gallons of each PG binder from the plant to be used on the project. Sufficient quantities of any other additives that will be used in the HMA mixture shall also be provided.

Prior to allowing production of the trial batch, the Construction Observer will use the materials provided by the Contractor to perform the following tests to verify the HMA mixture .

1. Indirect Tensile Test in accordance with Tex-266-F
2. HAMBURG Wheel Test in accordance with Tex-242-F
3. Overlay Test in accordance with Tex-248-F
4. Cantabro Test in accordance with Tex-245-F

For mixtures designed with a Texas Gyratory Compactor (TGC), the Construction Observer may require that the target laboratory molded density be raised to no more than 97.5% or may lower the design number of gyrations to no less than 35 for mixtures designed with an SGC if any of the following conditions exist:

1. The Indirect Tensile Test results in a value greater than 200 PSI
2. The Hamburg Wheel Test results in a value less than 3.0 mm
3. The Overlay Test results in a value less than 100 cycles
4. The Cantabro Test results in a value of more than 20% loss

In lieu of or in addition to evaluating the mixture design prior to allowing a trial batch to be produced, the Construction Observer may also evaluate the mixture produced during the trial batch for compliance with the four tests listed above.

Submit thermal and segregation profiles as well as longitudinal joint densities on electronic forms provided by County to the Construction Observer.

When surface irregularities, as defined in Article 341.4.9.3.3.5, “Irregularities,” are detected or measured, the Contractor must take immediate corrective action defined as the removal and replacement of a full lane width of the defective area using a paver to place new mix, unless otherwise directed. If there are multiple defective areas within a sub-lot, making up to 30% of the sub-lot by area, the Construction Observer will require the entire sub-lot be removed, unless directed otherwise.

ITEM 351 – FLEXIBLE PAVEMENT STRUCTURE REPAIR
All repairs shall be made using HMA Type B PG 64-22 unless specified in the plans.

When performing repair work under this Item in conjunction with an overlay or seal coat project, perform all repair work, established by the Construction Observer, within one paving season. If

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repair work is not complete within this timeframe, any additional damage beyond what was originally established and identified for repair work occurs and requires repair work will be performed at the Contractor's expense, unless approved otherwise.

ITEM 400 – EXCAVATION AND BACKFILL FOR STRUCTURES
Cut pavements with the use of a saw as directed. Consider subsidiary to pertinent Items.

Obtain approval of all compaction equipment prior to all backfilling and embankment operations.

Use Class "B" sand bedding for pipe and box culvert installation unless otherwise directed.

ITEM 420 – CONCRETE SUBSTRUCTURES
Remove all loose Formwork and other Materials from the Floodplain or drainage areas, daily, which could float off in a Storm Water Event, as directed.

ITEM 432 – RIPRAP
Fibers for Concrete as defined in DMS-4550 will not be allowed.

Make five (5) inches thick unless otherwise noted or directed.

Where any proposed riprap joins existing riprap, saw cut the existing riprap and dowel/epoxy the joint as directed. Consider subsidiary to the pertinent Items.

Additional riprap may be required, as determined by the Construction Observer, near the end of project completion, due to unanticipated erosion locations. Any additional, approved riprap will be paid under this Item.

Consider saw cutting of riprap as subsidiary.

Provide Class B Concrete for riprap.

Remove all loose Formwork and other Materials from the Floodplain or drainage areas, daily, which could float off in a Storm Water Event, as directed.

ITEMS 462, 464, 465, 466, & 467
Concrete collars shall be used to connect RCP to existing CMP. Concrete collars will not be paid for directly but will be considered subsidiary to these items.

ITEM 466 – HEADWALLS AND WINGWALLS
Use Class C concrete for headwalls or wingwalls.

Remove all loose Formwork and other Materials from the Floodplain or drainage areas, daily, which could float off in a Storm Water Event, as directed.

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ITEM 467 – SAFETY END TREATMENT
Cut pipe ends, in the field, to match roadway side slopes, or as directed. Apply asphalt base aluminum paint to the cut ends.

All Type II SETs shall have mitered pipe ends and cast-in-place riprap aprons.

Use Class C concrete.

Concrete collars shall be used to connect RCP SETs to existing CMP. Concrete collars will not be paid for directly but will be considered subsidiary to these items.

Remove all loose Formwork and other Materials from the Floodplain or drainage areas, daily, which could float off in a Storm Water Event, as directed.

ITEM 481 – PIPE FOR DRAINS
All polyvinyl chloride (PVC) pipe for ponds shall be Scheduled 80 unless otherwise noted in the plans.

ITEM 496 – REMOVING STRUCTURES
The Contractor's attention is directed to the fact that migratory birds tend to concentrate nesting on transportation structures. If migratory bird nests are present within the project limits, remove all old migratory bird nests only between September 1st and January 31st from any structure where work will be done. In addition, be prepared to prevent migratory birds from building nests between February 1st and August 31st.

All methods used for the removal of old bird nests and the prevention of re-nesting must be approved by the Construction Observer, well in advance of the planned use.

In the event that any active nest of migratory birds is encountered on-site during project construction, all construction activity, within the immediate vicinity of the nest, will cease immediately. Contact the Construction Observer to determine how to proceed.

ITEM 502 – BARRICADES, SIGNS, AND TRAFFIC HANDLING
Unless otherwise approved, one (1) lane in each direction shall remain open at all times.

Nighttime lane closures will be allowed from 8:00 PM to 5:00 AM, unless otherwise shown on the plans.

No Daytime Lane Closures will be allowed, unless otherwise shown on the plans or as directed by the GEC.

The GEC is the authority to approve additional lane closures, prior to any work.

Maintain a written record of documentation of "The Additional Approved Lane Closures."

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Submit and secure concurrence, prior to the publication of any notices or placement of any traffic control devices for implementation of the traffic control plan, hereinafter called a Lane Closure Notice (LCN).

Present to GEC, an LCN for traffic control, which is proposed for implementation, a minimum of four (4) full working days preceding any proposed implementation date. Indicate the estimated date, time, duration, and location for the proposed work. As a part of the LCN submit a written description of the lane closure(s) depicting the proposed traffic control devices used, based on the appropriate plan sheet, TxDOT or Texas Manual on Uniform Traffic Control Devices (TMUTCD) standards, and an operational description of the work to be performed.

Present to GEC, LCN's proposed to detour traffic, a minimum of ***seven (7)*** full calendar days preceding any proposed implementation date.

Present to GEC, LCN's proposed for night work, a minimum of ***seven (7)*** full calendar days preceding any proposed implementation date.

Receive concurrence prior to LCN implementation.

Meet with the Construction Observer prior to roadway and lane closures to ensure that sufficient equipment, materials, devices, and workers will be used. Discuss contingency plans at that time. Consider inclement weather prior to implementing the lane closures.

Submit a cancellation of any lane closures, no later than noon on the day preceding the proposed work.

Coordinate lane closures with adjacent projects.

Take immediate action to modify Closures / Traffic Control, if at any time backup (roadway queuing) becomes unreasonable (greater than 20 minutes). Have in place, a contingency plan of how this will occur.

Utilize Shadow Vehicle with Truck Mounted Attenuator for setup and removal of each lane closure.

Do not set up any Lane Closure / TCP when the pavement is wet prior to the "setup," unless otherwise directed. Revise Traffic Control, when inclement weather is imminent, as directed.

Incorporate and maintain a 3H: 1V safety wedge into the proposed construction for any roadway edge of 2 inches or greater adjacent to a roadway under traffic.

Within the limits of the project, provide standard barricades, warning signs, delineators, lights, 28-inch cones, and flaggers in enough numbers and combinations, as directed.

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ITEM 530 – INTERSECTIONS, DRIVEWAYS, AND TURNOUTS
Notify property owners a minimum of 48 hours in advance of beginning work on their driveways. Provide, to GEC, a list of each notification and contact prior to each closure.

Provide access, at all times, to adjacent property. Construct driveways one-half sections, to allow access.

Do not completely close driveways for reconstruction purposes, unless a reasonable alternate access exists to the property, as approved.

Place the Flex Base for the Driveways using Ordinary Compaction.

ITEM 585 - RIDE QUALITY FOR PAVEMENT SURFACES
Ride quality requirements are waived.

ITEM 618 – CONDUIT
Use materials from prequalified material producers list as shown on the Texas Department of Transportation (TxDOT) – Construction Division's (CST) materials producers list. Category is "Roadway Illumination and Electrical Supplies."

Refer to plans and specifications for type of conduit. Waterproof and tighten all couplings and connections. Bring all proposed and existing conduit into a ground box and 'elbow' it unless otherwise shown on the plans. Provide a bushing to protect the wire from abrasion when a conduit run terminates.

Saw cut and replace any riprap, which must be removed to install the conduit. Replace riprap with material and texture as directed.

The locations of conduit and ground boxes are diagrammatic and so shift, as directed, to accommodate field conditions.

Install conduit in an area not exceeding two (2) feet in any direction from a straight line with the depth of the conduit at least two (2) feet, unless otherwise shown on the plans.

Install conduit on a 2-inch sand cushion and backfill with at least six (6) inches of sand. Backfill the remainder of the trench with flexible base, soil or two-sack concrete as required by the location of the conduit or as directed.

Consider all conduit elbows and rigid metal extensions required to be installed on PVC conduit systems subsidiary.

Install a high tension, non-metallic pull rope in all conduit runs. The pull ropes are for future use. Cap all empty conduit runs using standard weather tight conduit caps as directed. Consider this work subsidiary to the pertinent Item.

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Seal all conduit ends with a permanently soft, non-toxic duct seal. The dust seal must not adversely affect plastic materials or corrode metals.

Consider all fittings, brackets, and junction boxes necessary to complete the installations subsidiary to the pertinent Items.

ITEM 620 – ELECTRICAL CONDUCTORS
Bond grounding conductors, which share the same conduit, junction box or structures, together at every accessible point, in accordance with the Electrical Detail Standard Sheets and the latest edition of the National Electrical Code (NEC).

All wiring will be in accordance with the National Electrical Code (NEC) and the appropriate Department standard sheets.

ITEM 628 – ELECTRICAL SERVICES
The service enclosure provided in this contract will have provisions for pad locking the enclosure shut.

ITEM 644 – SMALL ROADSIDE SIGN ASSEMBLIES
Fabricate all small signs not detailed on the plans in conformance with the latest edition of the "Standard Highway Sign Designs for Texas," refer to TxDOT's website.

ITEM 662 – WORK ZONE PAVEMENT MARKINGS
Notify the Construction Observer at least 24 hours in advance of removing existing striping and placing pavement markings & markers.

Apply markings during good weather unless otherwise directed. If markings are placed at Contractor's option, when inclement weather is impending, and the markings are damaged by subsequent precipitation, the Contractor is responsible for all costs associated with replacing the markings if required.

Remove work zone pavement markings within 48 hours after permanent striping has been completed.

Foil backed pavement markings will not be allowed.

ITEM 672 – RAISED PAVEMENT MARKERS
Place the bituminous adhesive at a temperature range of 380°F to 390°F. Place the pavement marker on the bituminous adhesive within approximately 20 seconds after the adhesive is placed on the pavement. Ensure the pavement marker rests solely on the adhesive and not the pavement surface. Ensure that a minimum of ⅛ inch layer of bituminous adhesive remains between the pavement marker and the pavement surface.

ITEM 6001 – PORTABLE CHANGEABLE MESSAGE SIGN
Provide 2 "Electronic" Portable Changeable Message Sign(s) (EPCMS) as part of the traffic control operations and provide another one that is available to utilize when a backup is needed.

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Consider the one designated for backup as subsidiary to the various Items of the project. All EPCMS will be exclusive to this project, unless otherwise approved. Placement location and message as directed.

Place appropriate number of "Electronic" Portable Changeable Message Signs (EPCMS) at locations requiring lane closures for one (1) week prior to the closures, or as directed. Obtain approval for the actual message that will appear on the boards. If more than two phases of a message are required per board, provide additional EPCMS's to meet the two-phases-per-board requirement.

Williamson County Sheet A
Project: Inner Loop at Rockride & Inner Loop at Central Maintenance Facility

GENERAL NOTES

Basis of Estimate

Item	Description	**Rate	Basis	Quantity
160	**Topsoil**	1 CY/9 SY	17,347 SY	1,927 CY
161	**Erosion Control Compost (3")**	1 CY/12 SY	4,337 SY	361 CY
162	**Mulch Topdressing (5")**	1 CY/7 SY	4,337 SY	620 CY
164	**Seed for Erosion Control**			
	(Item 164)(Temp)	4840 SY/AC	8,674 SY	1.79 AC
	(Item 164)(Perm)	4840 SY/AC	17,347 SY	3.58 AC
166	**Fertilizer (13-13-13)**	1/8 LB/SY	17,347 SY	1.1 TON
168	**Vegetative Watering**			
	(Item 164)(Temp)	10 GAL/SY	17,348 SY	173 MG
	(Item 164)(Perm)	20 GAL/SY	19,114 SY	382 MG
	Sprinkling			
**204	(Item 132)	30 GAL/CY	2,493 CY	74,790 GAL
	(Item 247)	30 GAL/CY	2,963 CY	88,890 GAL
**210	**Roll (Flat Wheel)**			
	(Item 316)	1 HR/6000 SY	7,394 SY	2 HR
**210	**Roll (Tamping)**			
	(Item 132)	1 HR/200 CY	2,493 CY	13 HR
**210	**Roll (Heavy Tamp)**			
	(Item 132)	1 HR/200 CY	2,493 CY	13 HR
	Roll (Lt Pneu Tire)			
**210	(Item 132)	1 HR/500 CY	2,493 CY	5 HR
	(Item 316) (Seal Coat)	1 HR/6000 SY	7,394 SY	2 HR
247	**FL BS (CMP IN PLC)**			
	(TY A GR 4 – 4 Lifts)	27 CF/CY	79,272 CF	2,963 CY
310	**Prime Coat** (MULTI OPTION)	0.20 GAL/SY	7,940 SY	1,588 GAL
316	**Surface Treatments**			
	Seal Coat: (TIER II)			
	Asphalt	0.25 GAL/SY	7,394 SY	1,849 GAL
	Aggregate (Ty-D GR 5 SAC-B)	1 CY/165 SY	7,394 SY	45 CY
341	**Dense-Graded Hot-Mix Asphalt**			
	TY B PG 64-22	115 LB/SY/IN	7,667 SY	1,984 TON
	TY C SAC-B PG70-22	115 LB/SY/IN	17,656 SY	2,030 TON

** For Informational Purposes Only

MODIFIED STANDARDS
The following standard detail sheet or sheets have been modified:

Williamson County Sheet B
Project: Inner Loop at Rockride & Inner Loop at Central Maintenance Facility

N/A

GENERAL

References to manufacturer's trade name or catalog numbers are for the purpose of identification only. Similar materials from other manufacturers are permitted if they are of equal quality, comply with the specifications for this project, and are approved.

If work is performed at Contractor's option, when inclement weather is impending, and the work is damaged by subsequent precipitation, the Contractor is responsible for all costs associated with replacing the work, if required.

The roadbed shall be free of organic material prior to placing any section of the pavement structure.

Equip all construction equipment used in roadway work with highly visible omnidirectional flashing warning lights.

Provide a smooth, clean saw-cut along the existing asphalt pavement structure, as directed. Consider subsidiary to the pertinent Items.

Supply litter barrels in enough numbers at locations as directed to control litter within the project. Consider subsidiary to pertinent Items.

Use a self-contained vacuum broom to sweep the roadway and keep it free of sediment as directed. The contractor will be responsible for any sweeping above and beyond the normal maintenance required to keep fugitive sediment off the roadway as directed by the Construction Observer.

Protect all areas of the right of way, which are not included in the actual limits of the proposed construction areas, from disturbance. Restore any area disturbed because of the Contractor's operations to a condition as good as, or better than, before the beginning of work at no cost to the county.

Damage to existing pipes and SET's due to Contractor operations shall be repaired at Contractor's expense.

All locations used for storing construction equipment, materials, and stockpiles of any type, within the right of way, will be as directed. Use of right of way for these purposes will be restricted to those locations where driver sight distance to businesses and side street intersections is not obstructed and at other locations where an unsightly appearance will not exist. The Contractor will not have exclusive use of right of way but will cooperate in the use of the right of way with the city/county and various public utility companies as required.

The Project Superintendent will be capable of speaking English and will be available on the project at all times when work is being performed, including subcontractor work. The Superintendent will be available and on-call 24 hours a day.

Coordinate and obtain approval from the Construction Observer for all bridgework over existing roadways.

Measure all minimum vertical clearances for all structures (including, but not limited to, signal mast arms, span wires, and overhead sign bridge structures) within the limits of the project for all roadway alignments in all directions of travel. Coordinate with the Construction Observer to take these measurements and obtain prior to opening roadways to traffic unless otherwise approved.

All traffic control shall be coordinated with adjacent construction projects.

Use materials from prequalified material producers list as shown on the Texas Department of Transportation (TxDOT) – Construction Division's (CST) materials producers list. Refer to TxDOT's website for list of pre-qualified manufacturers. No substitutions will be allowed for materials found on the list. Submit list of approved suppliers/materials from TxDOT website to show items are TxDOT approved. Submit this list with request for material approval.

When any abandoned well is encountered, cease construction operations in this area and notify the Engineer who will coordinate the proper plugging procedures. A water well driller licensed in the State of Texas must be used to plug a well.

Erosion control and stabilization measures must be initiated immediately in portions of the site where construction activities have temporarily ceased and will not resume for a period exceeding 14 calendar days. Track all exposed soil, stockpiles, and slopes. Tracking consists of operating a tracked vehicle or equipment up and down the slope, leaving track marks perpendicular to the direction of the slope. Re-track slopes and stockpiles after each rain event or every 14 days, whichever occurs first. This work is subsidiary.

Perform maintenance of vehicles or equipment at designated maintenance sites. Keep a spill kit on-site during fueling and maintenance. This work is subsidiary.

Maintain positive drainage for permanent and temporary work for the duration of the project. Be responsible for any items associated with the temporary or interim drainage and all related maintenance. This work is subsidiary.

Suspend all activities near any significant recharge features, such as sinkholes, caves, or any other subterranean openings that are discovered during construction or core sampling. Do not proceed until the designated Geologist or TCEQ representative is present to evaluate and approve remedial action.

Locate aboveground storage tanks kept on-site for construction purposes in a contained area as to not allow any exposure to soils. The containment will be sized to capture 150% of the total capacity of the storage tanks.

Migratory Birds and Bats.

Migratory birds may be nesting within the project limits and concentrated on roadway structures such as bridges and culverts. Remove all old and unoccupied migratory bird nests from any structures, trees, etc. between September 1st and January 31st. Prevent migratory birds from re-nesting between February 1st and August 31st.

All methods used for the removal of unoccupied bird nests and the prevention of re-nesting must be approved by the Construction Observer well in advance of the planned use.

In the event that any active nests are encountered on-site during construction, all construction activity within the immediate vicinity of the nest must cease immediately. Contact the Construction Observer to determine how to proceed.

Bats may roost within the project limits under bridges, in culverts, in large hollow trees, in dead standing trees, and in trees with shaggy bark. Maternity colonies may occur from April 1st through August 31st. If bats are present, ensure bats are not harmed. Exclusion protocols for known colonies should be followed well in advance of commencement of construction activities. Exclusion measures by qualified individuals are used to relocate existing colonies, except from April 1st through August 31st when such measures may separate mothers and pups. Exclusion measures are also the means of preventing establishment of new colonies and re-establishment of relocated colonies.

No extension of time or compensation payment will be granted for a delay or suspension of work caused by migratory birds or bats. This work is subsidiary.

ITEM 100 - PREPARING RIGHT OF WAY
Do not burn brush, unless otherwise approved.

Trim vegetation around signs and other obstructions. Consider subsidiary to pertinent Items.

Use hand methods or other means to remove objectionable material and obstructions, if doing work by mechanical methods is impractical. Consider subsidiary to the pertinent Items.

ITEM 110 & 132 – EXCAVATION & EMBANKMENT
At no time will the retaining wall backfill material exceed the adjacent embankment operation by more than one embankment lift. At no time will the embankment adjacent to the retaining wall backfill exceed the wall backfill by any elevation.

Unsuitable material encountered in a cut or fill section will be considered waste. The Construction Observer will define unsuitable material. Material, which the Contractor might deem to be unsatisfactory or unsuitable, due to moisture content, will not be considered unsuitable material, unless otherwise approved.

Obtain approval of all compaction equipment prior to all backfilling and embankment operations.

ITEM 132 – EMBANKMENT

The underlying layer or existing subgrade must be prepared and inspected prior to placement of the embankment. Proof roll the pavement area according to Item 216 prior to placement of embankment or subsequent layers. Payment for proof rolling will be subsidiary to the various bid Items of the contract.

Correct unstable material (e.g. dry, wet, loose, etc.) to a depth of six (6) inches below existing grade. This work will be considered subsidiary to pertinent bid Items. Drying required deeper than six (6) inches below existing grade will be paid for in accordance with Item 6.03, "Extra Work." However, there will be no payment to correct failures in the subgrade areas that were constructed under this contract.

ITEM 132 – EMBANKMENT TY B
Embankment shall be ordinary compaction Type B.

The Construction Observer must approve the embankment material before use on the project.

If delivery from offsite source is necessary, furnish embankment with a PI of less than 25 that does not contain sulfate contents greater than 3000 ppm.

Correct unstable material (e.g. dry, wet, loose, etc.) to a depth of six (6) inches below existing grade. This work will be considered subsidiary to pertinent bid Items. Drying required deeper than six (6) inches below existing grade will be paid for in accordance with Item 6.03, "Extra Work." However, there will be no payment to correct failures in the subgrade areas that were constructed under this contract.

Track ALL embankment slopes left idle for more than 14 days, within or at the end of the 14-day idle period, to prevent erosion. Tracking consists of operating a tracked vehicle or equipment up and down the slope, leaving track marks perpendicular to the direction of the slope. Re-track slopes after rain events, as directed. Consider tracking of slopes to prevent erosion as subsidiary to the pertinent Items.

Correct subgrade (e.g. unstable areas, soft spots, etc.) prior to dumping of Flex Base or HMACP. Consider subsidiary to the pertinent Items.

Scarify and re-compact existing asphaltic/base sections, which are not called out to be removed in fill sections, where bottom of the proposed pavement structure is higher than and over the top of the existing asphalt surface, in order to reduce the possibility of a slip plane.

When subgrade materials contain sulfates, as determined by Tex-145-E, use the following table for treatment of material placed under the pavement structure.

Sulfate Content (SC, ppm)	Action
SC < 3000 ppm	Apply calcium-based additive as specified by the pertinent item.

Sulfate Content (SC, ppm)	Action
3000 ppm ≤ SC < 7000 ppm	Perform a minimum of 7 days of mellowing and continuous water curing, in accordance to Department guidelines for soil treatment of sulfate-laden soils.
SC ≥ 7000 ppm	Do not treat with calcium-based additives. Undercut to the specified depth and fill with select material or implement fly ash treatment as specified in the general notes for Item 265.

ITEM 160, 161, 162, 164 & 168
Use Wilco Special Provisions for all 160 Items (attached).

ITEM 160 – TOPSOIL
No sandy loam allowed. Obtain approval of the actual depth of the topsoil sources for both on-site and off-site sources.

ITEM 169 – SOIL RETENTION BLANKETS
Use materials from prequalified material producers list as shown on the Texas Department of Transportation (TxDOT) – Construction Divisions (CST) materials producers list. Refer to TxDOT's website for list of pre-qualified manufacturers. Direct all questions to the Maintenance Division, Vegetation Management Section, 125 E. 11th Street, Austin, TX 78701-2483.

ITEM 204 – SPRINKLING
Apply water for dust control as directed. When dust control is not being maintained, cease operations until dust control is maintained. Consider subsidiary to the pertinent Items.

ITEM 216 - PROOF ROLLING
Correct and perform "Proof Rolling" retest at the Contractor's expense, to the satisfaction of the Construction Observer, when initial "Proof Rolling" yields a failing result.

ITEM 247 - FLEXIBLE BASE
Furnish Type A material.

Furnish flexible base meeting Grade 4 requirements.

The following table will govern the acceptance of compaction on base courses, when compacted in multiple courses. Compaction requirements are in percent of maximum dry density as determined by (Tex-113-E). When compacting in a single course, compact to at least 100% of maximum dry density as determined by Tex-113-E.

Item	Material	All Roadways	
		Lift	Min. Density
247	FL BS (CMP IN PLC)	1st of 3 lifts 2nd of 3 lifts (final lift)	95% 98% 100%

Table 1
Flexible Base Material Requirements

Property	Test Method	Grade 4
Master gradation sieve size	Tex-110-E	**% Retained**
2½ in.		0
1¾ in.		0
7/8 in.		10-35
3/8 in.		30-50
No. 4		45-65
No. 40		70-90
No. 200		87-95
Liquid Limit, % Max.[1]	Tex-104-E	35
Plasticity Index, Max.[1]	Tex-106-E	10
Wet ball mill, % Max.	Tex-116-E	40
Wet ball mill, % Max. increase passing the No. 40 sieve		20
Min. compressive strength, psi	Tex-117-E	
Lateral pressure 0 psi		–
Lateral pressure 3 psi		90
Lateral pressure 15 psi		175

1. Determine plastic index in accordance with Tex-107-E (linear shrinkage) when liquid limit is unattainable as defined in Tex-104-E.

Correct subgrade (e.g. unstable areas, soft spots, etc.) prior to placing Flex Base. Consider subsidiary to the pertinent Items.

Complete all subgrade, ditches, slopes, and place all drainage structures to conform to required lines, grades, and cross-sections, as shown and directed, prior to the placement of Flex Base.

For Flex Base placed over the box culverts, do not use a Vibratory Roller to compact the material.

ITEM 300 – ASPHALTS, OILS, AND EMULSIONS
Asphalt season starts May 1 and ends September 15.

PPA and REOBS are not allowed.

ITEM 310, 316, and 341
Perform work during good weather, unless otherwise directed. If work is performed at Contractor's option, when inclement weather is impending, and the work is damaged by subsequent precipitation, the Contractor is responsible for all costs associated with replacing the work, if required.

ITEM 310 – PRIME COAT
Apply blotter material to all driveways and intersections.

Use bituminous material of the type multi-option.

Provide Construction Observer with current Distributer Certification confirming calibration of asphalt measurement equipment.

Distribute prime coat smoothly and evenly at the rate of 0.20 gallons per square yard.

Apply Prime to finished flex base surface at the rate shown in the plans. Hot mix can be applied to the primed surface of flex base after the prime has penetrated and cured for a minimum of 36 hours depending on weather conditions or as approved by the Construction Observer. Provide the Construction Observer with a copy of the asphalt deliver ticket prior to application.

Apply blotter material to all driveways and intersections. This work is subsidiary. When Multi Option is allowed, provide MC 30, EC 30, or AE-P.

ITEM 316 – SEAL COAT

Use ionically compatible asphalt to precoated aggregate, which is compatible with the asphalt specified for each specific Surface Treatment.

Do not apply asphalt within 1½ hours of sunset, or later, unless otherwise directed.

Grade 4 and 5 Type D or Type E is allowed as AGGR (MULTI OPTION) for an underseal.

Ensure that all underseal surface treatment operations are covered by HMACP before exposing to traffic, including construction traffic.

Apply both the first and second course of the two course surface treatment on the same day.

Use paper or other approved material at the beginning and end of each shot so that the transverse joint is straight and prevents overlap of asphalt shots.

Any areas with excessive asphalt or aggregate will be removed.

The Contractor is required to provide recommendations to the Construction Observer on adjusting aggregate and asphalt rates, when the road conditions, material properties or construction methods change.

Furnish medium pneumatic-tire rollers in accordance with Item 210, “Rolling.” Roll before opening to traffic.

Surface all transitions, tapers, climbing lanes and intersections to the limits as directed.

Keep all traffic, including construction traffic, off freshly placed surface treatment, as directed.

Provide Construction Observer with current Distributer Certification confirming calibration of asphalt measurement equipment.

Provide Construction Observer with a copy of the shipping ticket for the asphalt prior to application. Contractor must sample asphalt, in accordance to the applicable item. Label the sample can with date and project numbers. Samples must be stored where they are readily available to the County representative at the plant. The Contractor will be responsible for supplying storage for all samples until the project achieves substantial completion or otherwise directed.

Removal and proper disposal off the ROW of audible/profile markings, reflectorized markings, and raised markers is subsidiary.

ITEM 320 - EQUIPMENT FOR ASPHALT CONCRETE PAVEMENT
Use of motor grader is allowed with approval of the Construction Observer.

ITEM 341 (HMACP Testing)
The Contractor must sample asphalt binder, in accordance to the applicable item. Label the sample can with the corresponding lot, and sub-lot numbers.

Samples must be stored in a common area where they are readily available to the County's representative at the plant. The Contractor will be responsible for supplying storage for all samples. Retain all asphalt samples until hot mix production is complete or directed otherwise.

When directed, the Contractor is responsible for disposal of all asphalt binder samples, in accordance to Local, State, and Federal regulations.

Refill and compact all HMAC core holes to the same elevation as the adjacent roadway. Use hot mix of the type being used in the project to fill core holes. As an alternative a high performance cold patching mix such as Rapid Cure Patching Mix meeting the requirements of DMS-9203 or Medium Cure Patching mix made with SCM meeting requirements of DMS-9202. Consider this work subsidiary to the pertinent Items.

Mill a transverse butt joint to transition from the new ACP to the existing surface tie-in. Make the transition a minimum of 50 feet H: 1 inch V slope ratio of newly placed ACP. Make the temporary joint, at the tie-in, a minimum of a 10 feet longitudinally and covering the entire width. Sawcut existing pavement as directed. Prior to milling, core the existing pavement to determine its thickness. Do not proceed with milling until directed. Consider this work subsidiary to the pertinent Items.

ITEM 341 - DENSE-GRADED HOT-MIX ASPHALT
Contractor to submit for approval a current mix design (less than 6 months old) to the Construction Observer that meets the following requirements prior to use on the project.

PPA and REOBS are not allowed.

Lime or an approved anti-stripping agent must be used when crushed gravel is utilized to meet a SAC "A" requirement.

Aggregates used on shoulders and ramps are required to meet SAC requirements.

Target laboratory molded density is 97% for all mixtures for TGC mixture designs.

When using Superpave Gyratory Compactor (SGC) to design mixtures, submit the SGC mix design to the Construction Observer for approval.

When using substitute binders, mold specimens for mix design and production at the temperature required for the substitute binder used to produce the HMA.

All mixtures must meet the Hamburg requirement as stated in the table below.

High-Temperature Binder Grade	**Test Method**	**Hamburg Wheel Test Requirements [1]**		
		Minimum # of Passes	**Maximum Rut Depth (mm) [2]**	**Minimum Rut Depth (mm)[2,3]**
PG 64 or lower	Tex-242-F	7,000	12.5	3
PG 70	Tex-242-F	15,000	12.5	3
PG 76 or higher	Tex-242-F	20,000	12.5	3

1. The Construction Observer may accept Hamburg Wheel test results for production and placement if no more than 1 of the 5 most recent tests is below the specified number of passes and the failing test is no more than 2,000 passes below the specified number of passes.
2. Rut depth tested @122°F
3. Unless approved otherwise.

When using RAP and/or RAS:
Use of RAS is not allowed. When using RAP, include the management methods of processing, stockpiling, and testing of RAP in the QCP submitted for the project. Blending of RAP in one feeder bin or in a stockpile is not permitted.

Asphalt content and binder properties of RAP stockpiles must be documented when recycled asphalt content greater than 20% is utilized.

RAP is not allowed for any surface mix applications.

No more than 20% RAP by weight of aggregate is allowed in any mix application.

Complete all roadways before final surface course placement, unless directed otherwise.

Ensure placement sequence to avoid excess distance of longitudinal joint lapback not to exceed one day's production rates.

The Contractor shall utilize a material transfer device per item 320 and a grade reference (such as a ski) for overlay operations. Consider subsidiary to the pertinent items.

Use a device to create a maximum 3H: 1V notched wedge joint on all hot mix joints of 2 in. or greater. Consider subsidiary to the pertinent Items.

Taper transverse faces at ends of passes as directed.

Make transverse tapers on each end of pass using a minimum slope rate of 60H:1V. Tapers shall be removed directly before placement of final lift. Consider subsidiary to the pertinent Items.

Tack every intermediate layer, unless otherwise directed. Do not dilute tack coat. Apply it through a distributor spray bar in accordance with Article 316.3.1 Distributor.

Submit any proposed adjustments or changes to a job mix formula to the Construction Observer before production of the new job mix formula.

For Mixture Design Verification, provide the Construction Observer with two 5-gallon buckets of each aggregate stockpile to be used on the project with three gallons of each PG binder from the plant to be used on the project. Sufficient quantities of any other additives that will be used in the HMA mixture shall also be provided.

Prior to allowing production of the trial batch, the Construction Observer will use the materials provided by the Contractor to perform the following tests to verify the HMA mixture .

1. Indirect Tensile Test in accordance with Tex-266-F
2. HAMBURG Wheel Test in accordance with Tex-242-F
3. Overlay Test in accordance with Tex-248-F
4. Cantabro Test in accordance with Tex-245-F

For mixtures designed with a Texas Gyratory Compactor (TGC), the Construction Observer may require that the target laboratory molded density be raised to no more than 97.5% or may lower the design number of gyrations to no less than 35 for mixtures designed with an SGC if any of the following conditions exist:

1. The Indirect Tensile Test results in a value greater than 200 PSI
2. The Hamburg Wheel Test results in a value less than 3.0 mm
3. The Overlay Test results in a value less than 100 cycles
4. The Cantabro Test results in a value of more than 20% loss

In lieu of or in addition to evaluating the mixture design prior to allowing a trial batch to be produced, the Construction Observer may also evaluate the mixture produced during the trial batch for compliance with the four tests listed above.

Submit thermal and segregation profiles as well as longitudinal joint densities on electronic forms provided by County to the Construction Observer.

When surface irregularities, as defined in Article 341.4.9.3.3.5, "Irregularities", are detected or measured, the Contractor must take immediate corrective action defined as the removal and replacement of a full lane width of the defective area using a paver to place new mix, unless otherwise directed. If there are multiple defective areas within a sub-lot, making up to 30% of the sub-lot by area, the Construction Observer will require the entire sub-lot be removed, unless directed otherwise.

Provide a minimum transition for all side streets of at least 12 feet and driveways of at least six (6) feet, unless otherwise shown on the plans or otherwise approved/directed.

ITEM 400 - EXCAVATION AND BACKFILL FOR STRUCTURES
Cut pavements with the use of a saw as directed. Consider subsidiary to pertinent Items.

Obtain approval of all compaction equipment prior to all backfilling and embankment operations.

Use Class "B" sand bedding for pipe and box culvert installation unless otherwise directed.

ITEM 416 – DRILLED SHAFT FOUNDATIONS
Stake all Illumination Assembly Foundations, for approval, before beginning drilling operations, as directed.

Field cut holes for anchor bolts only as directed.

ITEM 432 – RIPRAP
Fibers for Concrete as defined in DMS-4550 will not be allowed.

Make 5-inches thick unless otherwise noted or directed.

Make all mow strip riprap four (4) inches, unless otherwise directed.

Where any proposed riprap joins existing riprap, saw cut the existing riprap and dowel/epoxy the joint as directed. Consider subsidiary to the pertinent Items.

Additional riprap may be required, as determined by the Construction Observer, near the end of project completion, due to unanticipated erosion locations. Any additional, approved riprap will be paid under this Item.

Consider saw cutting of riprap as subsidiary.

Provide Class B Concrete for riprap.

Remove all loose Formwork and other Materials from the Floodplain or drainage areas, daily, which could float off in a Storm water Event, as directed.

ITEMS 460, 462, 464, 466 & 467

Place FLOWABLE FILL in areas, underneath the Roadway, where there will be less than three (3) feet of depth from top of pipe or structure to the subgrade elevation. Payment made under Item 401.

ITEM 460 – CORRUGATED METAL PIPE
Cut pipe ends, in the field, to match roadway side slopes, or as directed. Apply asphalt base aluminum paint to the cut ends.

Verify all side-road pipe lengths in the field to conform to a side slope ratio of 6H: 1V from the pipe flowline to the base crown of the side road or street.

Cut ditches to grade before laying pipe.

ITEM 462 - CONCRETE BOX CULVERTS AND DRAINS
Provide Shop Drawings, signed and sealed by a Licensed Professional Engineer, for all precast box culverts. Indicate the appropriate design load as shown on the plans LRFD and the maximum design depth of fill.

Use cohesionless backfill material of aggregate size range of ⅜-inch to 1½-inch, for bedding material.

Remove all loose Formwork and other Materials from the Floodplain or drainage areas, daily, which could float off in a Storm water Event, as directed.

ITEM 466 - HEADWALLS AND WINGWALLS
Use Class C concrete for headwalls or wingwalls.

Remove all loose Formwork and other Materials from the Floodplain or drainage areas, daily, which could float off in a Storm Water Event, as directed.

ITEM 467 - SAFETY END TREATMENT
Cut pipe ends, in the field, to match roadway side slopes, or as directed. Apply asphalt base aluminum paint to the cut ends.

All Type II SET's shall have mitered pipe ends and cast-in-place riprap aprons.

Use Class C concrete.

Remove all loose Formwork and other Materials from the Floodplain or drainage areas, daily, which could float off in a Storm water Event, as directed.

ITEM 496 - REMOVING STRUCTURES
The Contractor's attention is directed to the fact that migratory birds tend to concentrate nesting on transportation structures. If migratory bird nests are present within the project limits, remove all old migratory bird nests only between September 1st and January 31st from any structure where

work will be done. In addition, be prepared to prevent migratory birds from building nests between February 1st and August 31st.

All methods used for the removal of old bird nests and the prevention of re-nesting must be approved by the Construction Observer, well in advance of the planned use.

In the event that any active nest of migratory birds is encountered on-site during project construction, all construction activity, within the immediate vicinity of the nest, will cease immediately. Contact the Construction Observer to determine how to proceed.

Provide a detailed plan for the removal of the existing structure(s) to include the schedule of removal and list of all equipment to be used.

Include a Traffic Control Plan (TCP) for any Structure(s) Removal, as directed.

The structure or structures to be removed may have surface coatings, which may contain hazardous materials. Provide for the safety and health of employees and abide by all OSHA Standards and Regulations as well as those set by Texas Department of State Health Services (DSHS).

Store the following Items to be salvaged at an approved location(s).

ITEM 502 - BARRICADES, SIGNS, AND TRAFFIC HANDLING

Use Wilco Special Provision 502-WC001 (attached).

Unless otherwise approved, 1 lane in each direction shall remain open at all times.

Nighttime lane closures will be allowed from 8:00 PM to 5:00 AM, unless otherwise shown on the plans.

No Daytime Lane Closures will be allowed, unless otherwise shown on the plans or as directed by the GEC.

The GEC is the authority to approve additional lane closures, prior to any work.

Maintain a written record of documentation of “The Additional Approved Lane Closures.”

Submit and secure concurrence, prior to the publication of any notices or placement of any traffic control devices for implementation of the traffic control plan, hereinafter called a Lane Closure Notice (LCN).

Present to GEC, an LCN for traffic control, which is proposed for implementation, a minimum of four (4) full working days preceding any proposed implementation date. Indicate the estimated date, time, duration, and location for the proposed work. As a part of the LCN submit a written description of the lane closure(s) depicting the proposed traffic control devices used, based on the

appropriate plan sheet, TxDOT or Texas Manual on Uniform Traffic Control Devices (TMUTCD) standards, and an operational description of the work to be performed.

Present to GEC, LCN's proposed to detour traffic, a minimum of seven (7) full calendar days preceding any proposed implementation date.

Present to GEC, LCN's proposed for night work, a minimum of seven (7) full calendar days preceding any proposed implementation date.

Receive concurrence prior to LCN implementation.

Meet with the Construction Observer prior to roadway and lane closures to ensure that sufficient equipment, materials, devices, and workers will be used. Discuss contingency plans at that time. Consider inclement weather prior to implementing the lane closures.

Submit a cancellation of any lane closures, no later than noon on the day preceding the proposed work.

Coordinate Main Lane closures with adjacent projects.

Obtain prior approval for any Lane Closures of the mainlanes, which occur during peak hours. Maintain a minimum of one (1) lane open, in each direction, at all times. This includes 'full' closures of the Roadway, unless otherwise directed.

Take immediate action to modify Closures / Traffic Control, if at any time backup (roadway queuing) becomes unreasonable (greater than 20 minutes). Have in place, a contingency plan of how this will occur.

Utilize Shadow Vehicle with Truck Mounted Attenuator for setup and removal of each lane closure.

Do not set up any Lane Closure / TCP when the pavement is wet prior to the "setup," unless otherwise directed. Revise Traffic Control, when inclement weather is imminent, as directed.

Incorporate and maintain a 3H: 1V safety wedge into the proposed construction for any roadway edge of 2 inches or greater adjacent to a roadway under traffic.

Within the limits of the project, provide standard barricades, warning signs, delineators, lights, 28-inch cones, and flaggers in enough numbers and combinations, as directed.

For Mainlanes use night-work and same-night remove-and-replace operations.

No closures will be allowed on the weekends, which include the following holidays: January 1st, the last Monday in May, July 4th, the first Monday in September, the fourth Thursday in November, December 25th, Easter weekend, and the working day prior to or immediately after any of the aforementioned holidays. Unless otherwise approved, no closures will be allowed on

the weekends of special events that could be impacted by the construction. Ensure all equipment, vehicles, workers, etc., associated with these closures are off the roadways and all lanes re-opened, at least, by noon of the Friday before these holidays and special events.

Maintain a minimum of one (1) through lane in each direction, during the daylight hours, as directed.

ITEM 529 – CONCRETE CURB, GUTTER AND COMBINED CURB AND GUTTER
Fibers for concrete as defined in DMS-4550 will not be allowed.

ITEM 530 – INTERSECTIONS, DRIVEWAYS, AND TURNOUTS
Notify property owners a minimum of 48 hours in advance of beginning work on their driveways. Provide, to GEC, a list of each notification and contact prior to each closure.

Provide access, at all times, to adjacent property. Construct driveways one-half sections, to allow access.

Do not completely close driveways for reconstruction purposes, unless a reasonable alternate access exists to the property, as approved.

Place the Flex Base for the Driveways using Ordinary Compaction.

ITEM 585 – RIDE QUALITY FOR PAVEMENT SURFACES
Use Surface Test Type B Pay Adjustment Schedule 3 to evaluate ride quality of the travel lanes in accordance with Item 585, “Ride Quality for Pavement Surfaces.”

ITEM 610 – ROADWAY ILLUMINATION ASSEMBLIES
Alternate designs to RIP-11 or the use of aluminum to fabricate poles will require the submission of shop drawings.

Maintain all new and existing illumination for the duration of the contract.

All existing illumination, within the project limits, will remain operational until the last possible moment, as directed.

Place the illumination system in operation after satisfactory completion of the circuit tests. Final acceptance will not be made until the system has operated satisfactorily for a period of at least 14 consecutive days. Consider all repairs and adjustments subsidiary to pertinent Items. Pay for electrical energy during the trial period.

Inspection of all completed work provided in the Contract will be performed. The Contractor will be released from further maintenance on that project if the work is found to be satisfactory. Partial acceptance will be made and will be in no way void or alter any Items of the contract.

Removal of illumination assemblies and foundations shall be coordinated with the GEC prior to beginning removal.

Salvaged illumination assembles shall be stored in a location approved by the GEC.

ITEM 618 - CONDUIT

Use materials from prequalified material producers list as shown on the Texas Department of Transportation (TxDOT) - Construction Division's (CST) materials producers list. Category is "Roadway Illumination and Electrical Supplies."

Refer to plans and specifications for type of conduit. Waterproof and tighten all couplings and connections. Bring all proposed and existing conduit into a ground box and 'elbow' it unless otherwise shown on the plans. Provide a bushing to protect the wire from abrasion when a conduit run terminates.

Replace sections of conduit with the size and type shown on the plans in the event the existing conduit proves unusable due to location or damage.

Secure permission from the proper authority, as directed, before cutting into or removing any sidewalks or curbs for installation of this Item.

Saw cut and replace any riprap, which must be removed to install the conduit. Replace riprap with material and texture as directed.

The locations of conduit and ground boxes are diagrammatic and so shift, as directed, to accommodate field conditions.

Install conduit in an area not exceeding two (2) feet in any direction from a straight line with the depth of the conduit at least two (2) feet, unless otherwise shown on the plans. Installation of the conduit by jacking or boring method will be at a depth of at least one (1) foot below the bottom of the base material of the roadway. Evidence of damage to the roadway during the jacking or boring operation will be enough grounds to stop the method being used.

Install conduit on a 2-inch sand cushion and backfill with at least six (6) inches of sand. Backfill the remainder of the trench with flexible base, soil or two-sack concrete as required by the location of the conduit or as directed.

Consider all conduit elbows and rigid metal extensions required to be installed on PVC conduit systems subsidiary.

Install a high tension, non-metallic pull rope in all conduit runs. The pull ropes are for future use. Cap all empty conduit runs using standard weather tight conduit caps as directed. Consider this work subsidiary to the pertinent Item.

Install a continuous bare or green insulated copper wire No. 8 AWG or larger in every conduit throughout the electrical system including installed loop detectors and traffic signal cables which are in conformance with the Electrical Detail Standard Sheets and the latest edition of the National Electrical Code (NEC).

Placement of conduit under the existing pavement using the open trench method will not be allowed without prior approval.

Seal all conduit ends with a permanently soft, non-toxic duct seal. The dust seal must not adversely affect plastic materials or corrode metals.

Use a coring device when drilling holes through concrete structures. Do not use masonry or concrete drills, unless otherwise approved.

Structurally mounted junction boxes shall be as shown on the plans. When used for traffic signal installations, these boxes shall be 12" x 12" x 8", and shall be approved. Consider these boxes subsidiary to this Item.

Place conduit a minimum depth of 42 inches below the bottom of ties.

Existing conduit may be proposed for reuse in this project. If the existing conduit cannot be used to place or add new electrical conductors, repair or replace this conduit, as directed. Repair of the conduit will be paid as "Extra Work" on a "Force Account" basis. Probe the existing conduit when locating drill shafts so that the existing conduit's location will be known before it is needed.

When using existing conduit, ensure that all conduits have bushings and are cleaned of dirt, mud, grease, and other debris. Restrap conduit that is being relocated to new timber poles as if it were a new installation. Consider this work subsidiary to this Item.

Consider all fittings, brackets, and junction boxes necessary to complete the installations subsidiary to the pertinent Items.

ITEM 620 – ELECTRICAL CONDUCTORS

Clearly and permanently, mark "Illumination" on the Illumination Conductors installed in a Signal Mast-Arm Pole or Strain Pole. Make the marks easily visible from the hand hole.

Identify the conductors as shown on the Electrical Details Standard Sheets when two or more conductors are present in one conduit or enclosure. Use identification tag with two plastic straps. Each tag will indicate circuit number, letter, or other identification as shown on the plans.

Bond grounding conductors, which share the same conduit, junction box or structures, together at every accessible point, in accordance with the Electrical Detail Standard Sheets and the latest edition of the National Electrical Code (NEC).

All wiring will be in accordance with the National Electrical Code (NEC) and the appropriate Department standard sheets.

ITEM 644 - SMALL ROADSIDE SIGN ASSEMBLIES

Fabricate all small signs not detailed on the plans in conformance with the latest edition of the "Standard Highway Sign Designs for Texas," refer to TxDOT's website.

ITEM 662 - WORK ZONE PAVEMENT MARKINGS
Notify the Construction Observer at least 24 hours in advance of removing existing striping and placing pavement markings & markers.

Apply markings during good weather unless otherwise directed. If markings are placed at Contractor's option, when inclement weather is impending, and the markings are damaged by subsequent precipitation, the Contractor is responsible for all costs associated with replacing the markings if required.

Remove work zone pavement markings within 48 hours after permanent striping has been completed.

Foil backed pavement markings will not be allowed.

ITEM 666 - RETROREFLECTORIZED PAVEMENT MARKINGS
Reference existing channel islands, gores, and lane striping before commencing work. Provide referencing that will include a sketch of the layout to the Construction Observer. Obtain approval for placement of guidemarks from the Construction Observer before installing any permanent pavement markings. Consider subsidiary to the pertinent Items.

ITEM 672 - RAISED PAVEMENT MARKERS
Place the bituminous adhesive at a temperature range of 380°F to 390°F. Place the pavement marker on the bituminous adhesive within approximately 20 seconds after the adhesive is placed on the pavement. Ensure the pavement marker rests solely on the adhesive and not the pavement surface. Ensure that a minimum of ⅛ inch layer of bituminous adhesive remains between the pavement marker and the pavement surface.

ITEM 677 - ELIMINATING EXISTING PAVEMENT MARKINGS AND MARKERS
Remove and dispose of, off the right of way, any existing raised pavement markings before beginning surfacing operations. Remove the existing traffic buttons and pavement markers, daily, as work progresses and as directed. Consider subsidiary to the pertinent Items.

Grinding is not an acceptable method of stripe removal on final pavement surface.

Blast cleaning is required for the removal of existing pavement markings.

Black paint will not be allowed, unless otherwise directed. Acceptable methods will be sand blasting (Blasting Method) or strip sealing (Surface Treatment Method).

ITEM 730 – ROADSIDE MOWING
Perform roadside mowing along the Roadway for the length of the project, as directed. A minimum of three (3) mowing cycles will be required.

Complete spot mowing, as directed.

ITEM 734 - LITTER REMOVAL
Litter Removal, as defined below, is subsidiary to Roadside Mowing.

Complete Litter Removal Cycles along the Roadway for the length of the project, as directed.

Complete Litter Removal cycles prior to any mowing cycles.

Remove all litter on the right of way, within project limits.

ITEM 738 – CLEANING AND SWEEPING HIGHWAYS
Complete cleaning and sweeping cycles at the intervals, as directed. Complete one cycle at the end of construction and prior to final acceptance by the county.

ITEM 6001 – PORTABLE CHANGEABLE MESSAGE SIGN
Provide two (2) "Electronic" Portable Changeable Message Signs (EPCMS) as part of the traffic control operations and provide another one that is available to utilize when a backup is needed. Consider the one designated for backup as subsidiary to the various Items of the project. All EPCMS will be exclusive to this project, unless otherwise approved. Placement location and message as directed.

Place appropriate number of "Electronic" Portable Changeable Message Signs (EPCMS) at locations requiring lane closures for one (1) week prior to the closures, or as directed. Obtain approval for the actual message that will appear on the boards. If more than two phases of a message are required per board, provide additional EPCMS's to meet the two-phases-per-board requirement.

INNER LOOP IMPROVEMENTS

WILLIAMSON COUNTY
GOVERNING SPECIFICATIONS
(STANDARD SPECIFICATIONS, SPECIAL PROVISIONS, AND SPECIAL SPECIFICATIONS)

WHERE DISCREPENCIES OCCUR BETWEEN THE VARIOUS GOVERNING SPECIFICATIONS, THE SPECIAL PROVISIONS SHALL GOVERN OVER BOTH STANDARD SPECIFICATIONS AND SPECIAL SPECIFICATIONS.

ALL SPECIFICATIONS AND SPECIAL PROVISIONS APPLICABLE TO THIS PROJECT ARE IDENTIFIED AS FOLLOWS:

STANDARD SPECIFICATIONS: ADOPTED BY THE TEXAS DEPARTMENT OF TRANSPORTATION NOVEMBER 1, 2014. STANDARD SPECIFICATIONS ARE INCORPORATED INTO THE CONTRACT BY REFERENCE.

< > REFERNCE ITEMS NOT USED ON THIS CONTRACT
( ) REFERENCE ITEMS USED ON THIS CONTRACT

ITEMS 1 - 9 ARE SUPERSEDED BY THE CONTRACT GENERAL AND SPECIAL CONDITIONS, WHERE APPLICABLE. WHEREVER, IN THE TXDOT STANDARD SPECIFICATIONS, REFERENCE IS MADE TO THE STATE OF TEXAS, THE DEPARTMENT AND ITS REPRESENTATIVES, SUCH REFERENCE SHALL BE TAKEN TO MEAN WILLIAMSON COUNTY AND ITS REPRESENTATIVES.

ITEM 100 PREPARING RIGHT OF WAY (103)
ITEM 104 REMOVING CONCRETE
ITEM 105 REMOVING TREATED AND UNTREATED BASE AND ASPHALT PAVEMENT
ITEM 110 EXCAVATION (132)
ITEM 132 EMBANKMENT (100)(160)(204)(210)(216)(400)
ITEM 160 TOPSOIL (168)
ITEM 161 COMPOST (160)
ITEM 162 SODDING FOR EROSION CONTROL (166)(168)
ITEM 164 SEEDING FOR EROSION CONTROL (166)(168)(169)
ITEM 166 FERTILIZER (520)
ITEM 168 VEGETATIVE WATERING
ITEM 169 SOIL RETENTION BLANKETS
ITEM 247 FLEXIBLE BASE (105)(204)(210)(216)(520)
ITEM 310 PRIME COAT (300)(316)
ITEM 316 SEAL COAT (210)(300)(302)<340>(520)
ITEM 341 DENSE-GRADED HOT-MIX ASPHALT (300)(301)(320)(520)(585)
ITEM 351 FLEXIBLE PAVEMENT STRUCTURE REPAIR (132)<204>(247)<260><263><275> <276><292>(310)(316)<330><334>(340)
ITEM 354 PLANING AND TEXTURING PAVEMENT
ITEM 400 EXCAVATION AND BACKFILL FOR STRUCTURES (110)(132)(401)(402)(403) (416)(420)<421><423>
ITEM 401 FLOWABLE BACKFILL<421>
ITEM 402 TRENCH EXCAVATION PROTECTION
ITEM 403 TEMPORARY SPECIAL SHORING <410><411>(423)
ITEM 416 DRILLED SHAFT FOUNDATIONS <405>(420)<421><423><440><448>
ITEM 420 CONCRETE SUBSTRUCTURES (400)<404>(421)<422><426>(427)(440)<441><448>
ITEM 432 RIPRAP <247>(420)(421)<431>(440)
ITEM 450 RAILING (420)<421><422><424><440><441><442><445><446><448><540>
ITEM 460 CORRUGATED METAL PIPE (400)(402(403)<445>(467)<476>

ITEM 462	CONCRETE BOX CULVERTS AND DRAINS (400)(402)(403)(420)<421><422><424>(440)(464)<476>
ITEM 464	REINFORCED CONCRETE PIPE (400)(402)(403)(467)<476>
ITEM 465	JUNCTION BOXES, MANHOLES AND INLETS (400)(420)(421)(424)(440)(471)
ITEM 466	HEADWALLS AND WINGWALLS (400)(420)(421)(432)(440)(464)
ITEM 467	SAFETY END TREATMENT (400)(420)(421)(432)(440)<442>(445)(460)(464)
ITEM 480	CLEANING EXISTING CULVERTS
ITEM 481	PIPE FOR DRAINS (400)
ITEM 496	REMOVING STRUCTURES
ITEM 500	MOBILIZATION
ITEM 502	BARRICADES, SIGNS AND TRAFFIC HANDLING
ITEM 506	TEMPORARY EROSION, SEDIMENTATION, AND ENVIRONMENTAL CONTROLS (161)(432)<556>
ITEM 508	CONSTRUCTING DETOURS
ITEM 512	PORTABLE CONCRETE TRAFFIC BARRIER (420)(421)(424)(440)(442)
ITEM 529	CONCRETE CURB, GUTTER AND COMBINED CURB AND GUTTER (360)<420><421><440>
ITEM 530	INTERSECTIONS, DRIVEWAYS AND TURNOUTS (247)(260)<263><275><276><292>(316)<330><334><340>(360)(421)(440)
ITEM 531	SIDEWALKS (104)(360)(420)(421)(440)(530)
ITEM 610	ROADWAY ILLUMINATION ASSEMBLIES (416)(421)(432)(441)(442)(445)(449)(618)
ITEM 618	CONDUIT (400)(476)
ITEM 620	ELECTRICAL CONDUCTORS (610)(628)
ITEM 624	GROUND BOXES <420><421>(432)(440)(618)(620)
ITEM 628	ELECTRICAL SERVICES (441)(445)(449)(618)(620)(627)(656)
ITEM 636	SIGNS (643)
ITEM 644	SMALL ROADSIDE SIGN ASSEMBLIES (421)(440)<441><442><445>(636)(643)(656)
ITEM 658	DELINEATOR AND OBJECT MARKER ASSEMBLIES (445)
ITEM 662	WORK ZONE PAVEMENT MARKINGS (666)(668)(672)(677)
ITEM 666	REFLECTORIZED PAVEMENT MARKINGS (316)(502)(662)(677)(678)
ITEM 672	RAISED PAVEMENT MARKERS (677)(678)
ITEM 677	ELIMINATING EXISTING PAVEMENT MARKINGS AND MARKERS (300)(302)(316)

SPECIAL PROVISIONS: THE CONTENT OF THE SPECIAL PROVISIONS ARE INCLUDED ON THE FOLLOWING PAGES.

SPECIAL PROVISION	000-001 LIQUIDATED DAMAGES
SPECIAL PROVISION	002-WC1 RIGHT OF WAY NOTICE
SPECIAL PROVISION	002-WC2 UTILITY NOTICE
SPECIAL PROVISION	002-WC3 ENVIRONMENTAL PERMITTING NOTICE
SPECIAL PROVISION TO ITEM 160	(160-WC001) TOPSOIL
SPECIAL PROVISION TO ITEM 161	(161-WC001) COMPOST
SPECIAL PROVISION TO ITEM 164	(164-WC001) SEEDING FOR EROSION CONTROL
SPECIAL PROVISION TO ITEM 168	(168-WC001) VEGETATIVE WATERING
SPECIAL PROVISION TO ITEM 300	(300-007) ASPHALT, OILS AND EMULSIONS
SPECIAL PROVISION TO ITEM 300	(300-009) ASPHALT, OILS, AND EMULSIONS
SPECIAL PROVISION TO ITEM 421	(421-002) HYDRAULIC CEMENT CONCRETE
SPECIAL PROVISION TO ITEM 500	(500-WC01) MOBILIZATION
SPECIAL PROVISION TO ITEM 502	(502-WC01) BARRICADES, SIGNS, AND TRAFFIC HANDLING
SPECIAL PROVISION TO ITEM 506	(506-WC001) TEMPORARY EROSION, SEDIMENTATION, AND ENVIRONMENTAL CONTROLS

SPECIAL SPECIFICATIONS: THE CONTENT OF THE SPECIAL SPECIFICATIONS ARE INCLUDED ON THE FOLLOWING PAGES.

ITEM 6001	PORTABLE CHANGEABLE MESSAGE SIGN
ITEM 9001	IMPERMEABLE LINER
ITEM 9002-9901	DETENTION POND CONTROL SYSTEM (416)(421)(440)(442)(445)(449)(465)(618)(620) (624)(687)
ITEM 9003	POND ACCESS GATE (420)(445)
ITEM GT101	GEORGETOWN WATER RELOCATION PLANS (CIP11)(G4)(G5)(W1)(W2)(W3)(W4)(C1)(C2)(C7)(C9)
ITEM WC9030	LED DECORATIVE ILLUMINATION ASSEMBLIES (442)(449)(616)(620)

GENERAL: THE ABOVE-LISTED SPECIFICATION ITEMS ARE THOSE UNDER WHICH PAYMENT IS TO BE MADE. THESE, TOGETHER WITH SUCH OTHER PERTINENT ITEMS, IF ANY, AS MAY BE REFERRED TO IN THE ABOVE-LISTED SPECIFICATION ITEMS, AND INCLUDING THE SPECIAL PROVISIONS AND SPECIAL SPECIFICATIONS LISTED ABOVE, CONSTITUTE THE COMPLETE SPECIFICATIONS FOR THIS PROJECT.

Special Provision to Item 000
Schedule of Liquidated Damages

Table1
Schedule of Liquidated Damages

For Dollar Amount of Original Contract		Dollar Amount of Daily Contract Administration Liquidated Damages per Working Day
From More Than	To and Including	
0	100,000	**570**
100,000	500,000	**590**
500,000	1,000,000	**610**
1,000,000	1,500,000	**685**
1,500,000	3,000,000	**785**
3,000,000	5,000,000	**970**
5,000,000	10,000,000	**1125**
10,000,000	20,000,000	**1285**
20,000,000	Over 20,000,000	**2590**

Special Provision 002—WC1
Right Of Way Important Notice to Contractors

The Contractor's attention is directed to the fact that there may be some outstanding right of way acquisitions as of July 2017 required for the construction of this project. The County anticipates that these acquisitions will be completed as shown.

For the Contractor's information, the following is a list of all tracts of right of way required for the construction of the project. The Contractor is invited to review the outstanding acquisitions with the Engineer assigned to this project and listed in the "Notice to Contractors." An extension of work time may be granted, as necessary, for delays caused by interference with acquisitions beyond the estimated dates of clearance.

The following right of way tracts are to be acquired as shown. The approximate location is based on the project centerline/baseline stationing.

PARCEL	OWNER	RT/LT OF CL	APPROX. LOCATION	ESTIMATED DATE OF ACQUISITION
Inner Loop at Wilco Way				
1	Williamson County	LT.	From Sta. 92+41 to Sta. 100+68	9/30/2017
2	Williamson County	LT.	From Sta. 100+68 to Sta. 126+32	9/30/2017
2E–Pt 1	Williamson County	LT.	From Sta. 100+68 to Sta. 110+35	9/30/2017
2E–Pt 2	Williamson County	LT.	From Sta. 100+68 to Sta. 110+35	9/30/2017
Inner Loop at Central Maintenance Facility				
E1	Williamson County	RT.	From Sta. 172+70 to Sta. 173+30	9/30/2017
E2	Williamson County	RT.	From Sta. 157+80 to Sta. 158+30	9/30/2017
E3	Williamson County	LT.	From Sta. 155+60 to Sta. 159+50	9/30/2017
E4	Williamson County	LT.	From Sta. 162+50 to Sta. 163+60	9/30/2017

Special Provision 002—WC2
Utilities Important Notice to Contractors

The Contractor's attention is directed to the fact that there may be some outstanding utility adjustments as of June 2017 required for the construction of this project. The County anticipates that these utility adjustments will be completed as shown.

The Contractor is invited to review the outstanding utility adjustments with the Engineer assigned to this project and listed in the "Notice to Contractors." An extension of work time may be granted, as necessary, for delays caused by utility interference with this work.

The following utilities are to be adjusted by their owners and are to be completed as shown. The approximate location is based on the project centerline/baseline stationing.

OWNER	APPROX. LOCATION	ESTIMATED DATE OF RELOCATION
Inner Loop at Wilco Way		
City of Georgetown Electric	Sta. 110+26 – Sta. 111+95	August 18, 2017
Frontier	Sta. 91+00 – Sta. 92+00, Sta. 97+21, Sta. 100+72, Sta. 106+78, Sta. 109+19, Sta. 110+00 – Sta. 110+39	October 31, 2017
Williamson County Fiber Optic	Sta. 101+50 – Sta. 105+00, Sta. 110+00 – Sta. 110+70	In the PS&E
AT&T Metro	Sta. 91+30 – Sta. 92+17, Sta. 109+28 – Sta.110+58	September 15, 2017
Atmos Distribution	Sta. 110+27 – Sta.112+21	August 31, 2017
City of Georgetown Water	Sta. 91+91 – Sta. 92+27, Sta. 106+08 Crossing, Sta. 106+08 – Sta. 106+33, Sta. 108+14, Sta. 109+60, Sta. 110 +93 – Sta. 111+37, Sta. 111+26 – Sta. 111+37	In the PS&E

OWNER	APPROX. LOCATION	ESTIMATED DATE OF RELOCATION
Inner Loop at Central Maintenance Facility		
City of Georgetown Water	Sta. 163+72 Crossing Sta.171+50 to Sta.177+08	In the PS&E

Special Provision 002—WC3
Environmental Permitting
Important Notice to Contractors

The Contractor's attention is directed to the fact that there may be some outstanding environmental permits as of July 2017 required for the construction of this project. The County anticipates that these permits will be acquired as shown.

The Contractor is invited to review the outstanding permitting requirements with the Engineer assigned to this project and listed in the "Notice to Contractors." An extension of work time may be granted, as necessary, for delays caused by environmental permitting interference with this work.

The following environmental reports and/or permits are to be completed or secured as shown.

PERMIT/REPORT	REQUIRED	NOT REQUIRED	ESTIMATED DATE OF APPROVAL
Inner Loop at Wilco Way			
Environmental Impact Statement		X	
Environmental Assessment		X	
Categorical Exclusion		X	
Phase 1 Environmental Assessment		X	
Jurisdictional Waters Survey	X		8/31/2017
Archaeological Investigations	X		Completed 6/2015
Cultural Resources Survey	X		8/31/2017
Karst Survey	X		Completed 6/2017
Habitat Assessment	X		10/1/2017
Geological Survey	X		Completed 6/2017
Contributing Zone Plan		X	
Water Pollution Abatement Plan	X		12/31/2017
Air Quality Analysis		X	
Noise Quality Analysis		X	
Regional Habitat Conservation Plan	X		8/31/2017

PERMIT/REPORT	REQUIRED	NOT REQUIRED	ESTIMATED DATE OF APPROVAL
Inner Loop at Rockride			
Environmental Impact Statement		X	
Environmental Assessment		X	
Categorical Exclusion		X	
Phase 1 Environmental Assessment		X	
Jurisdictional Waters Survey	X		8/31/2017
Archaeological Investigations	X		Completed 6/2015
Cultural Resources Survey	X		8/31/2017
Karst Survey	X		Completed 6/2017
Habitat Assessment	X		10/1/2017
Geological Survey	X		Completed 6/2017
Contributing Zone Plan		X	
Water Pollution Abatement Plan		X	
Air Quality Analysis		X	
Noise Quality Analysis		X	
Regional Habitat Conservation Plan		X	
Inner Loop at Central Maintenance Facility			
Environmental Impact Statement		X	
Environmental Assessment		X	
Categorical Exclusion		X	
Phase 1 Environmental Assessment	X		Completed 6/2015
Jurisdictional Waters Survey	X		Completed 6/2015
Archaeological Investigations	X		Completed 4/2015
Cultural Resources Survey	X		Completed 4/2015
Karst Survey		X	
Habitat Assessment	X		Completed 6/2015
Geological Survey		X	
Contributing Zone Plan		X	
Water Pollution Abatement Plan		X	
Air Quality Analysis		X	
Noise Quality Analysis		X	
Regional Habitat Conservation Plan		X	

Special Provision 160-WC001
Topsoil

For this project, Item 160, "Topsoil," of the Standard Specifications, is hereby voided and replaced in its entirety with the clauses and requirements below.

PART 1 – GENERAL

1.1 DESCRIPTION

Furnish and apply topsoil as shown in the plans or as directed.

1.2 RELATED ITEMS

A. Item 161–WC001, "Compost"

B. Item WC101, "Soil Ripping"

1.3 MEASUREMENT

This item will be measured by the 100-ft. station along the baseline of each roadbed, by the square yard complete in place, or by the cubic yard in vehicles at the point of delivery.

1.4 PAYMENT

Unless topsoil is specified as a pay item, the work performed and materials furnished in accordance with this item will not be paid for directly, but will be subsidiary to pertinent Items.

When topsoil is specified on the plans as a pay item, the work performed and topsoil furnished will be paid for at the unit price bid for "Furnishing and Placing Topsoil" of the depth specified on the plans (except for measurement by the cubic yard). This price is full compensation for securing necessary sources and royalties, furnishing topsoil, excavation, loading, hauling, stockpiling and placing, watering, rolling and equipment, labor, materials, tools, and incidentals. Limits of excavation and embankment for payment are shown in Figure 1.

1.5 QUALITY CONTROL SUBMITTALS

A. Submit one (1) pound sample of on-site stockpiled topsoil for approval.

B. Submit imported topsoil and supplier information, including product composition, as well as a one (1) pound sample for approval.

C. A statement that the on-site stockpiled topsoil has met the decomposition process.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Use easily cultivated, fertile topsoil, through fresh mining, that is free from objectionable material such as weed seeds, roots, rhizomes, or stolons, has a high resistance to erosion, and is able to support plant growth.

1. Obtain topsoil from the right-of-way at sites of proposed excavation or embankment when specified on the plans or as directed.

2. Secure additional topsoil, if necessary, from approved sources outside the right-of-way in accordance with all applicable environmental laws, rules, regulations, and requirements. Ensure that the topsoil obtained from sites outside the right-of-way has a pH of 5.5 to 8.5.

3. Topsoil is subject to testing by the Engineer.

4. Use water that is clean and free of industrial wastes and other substances harmful to the growth of vegetation.

PART 3 – EXECUTION

3.1 SEQUENCING

A. Following removal of the existing vegetation from the site (if specified), excavate in specified areas and place in a stockpile on-site. Complete the decomposition process in stockpile prior to installation or use of topsoil at depths specified on plans. Install topsoil prior to installation of erosion control compost (ECC). Reference Item 161–WC001, “Compost” for installation specifications.

3.2 CONSTRUCTION

A. Installation

1. Remove and dispose of objectionable material from the topsoil source before beginning the work.

2. Place excavated topsoil in stockpiles no less than three (3) feet by three (3) feet by three (3) feet in size at designated locations along the right-of-way line or as directed.

3. Keep source and stockpile areas drained during the period of topsoil removal and leave them in a neat condition when removal is complete.

4. From June 1 to October 15, completely turn the stockpiled mulch once per month. Internal temperature of the material should be 120°F – 140°F. Stockpile should continue to be turned and remain at this internal temperature for no less than one (1) month before use.

5. From October 16 to May 31, if the average outdoor temperature is below 75°F, remove and discard the top six (6) inches of the stockpile. It is not necessary to turn the stockpile during this time period.

6. Stockpiles should be surrounded by biodegradable erosion control logs to prevent run-off of material.

7. Uniformly blend topsoil per “Compost” if specified as Compost Modified Topsoil (CMT). Reference “Compost” for installation specifications.

8. For subsoils that are not compacted, scarify or break the surface of the soil with a flexible tine harrow one (1) to two (2) inches in depth. Spread the topsoil to a uniform loose cover at the thickness specified. Place and shape the topsoil to no greater than 70% – 75% Proctor density. Soils compacted above the specified Proctor density must be ripped until they are within the desired percentages according to Item WC101, “Soil Ripping.” Apply the topsoil to the ripped soil and work into the lower soil horizons with a harrow.

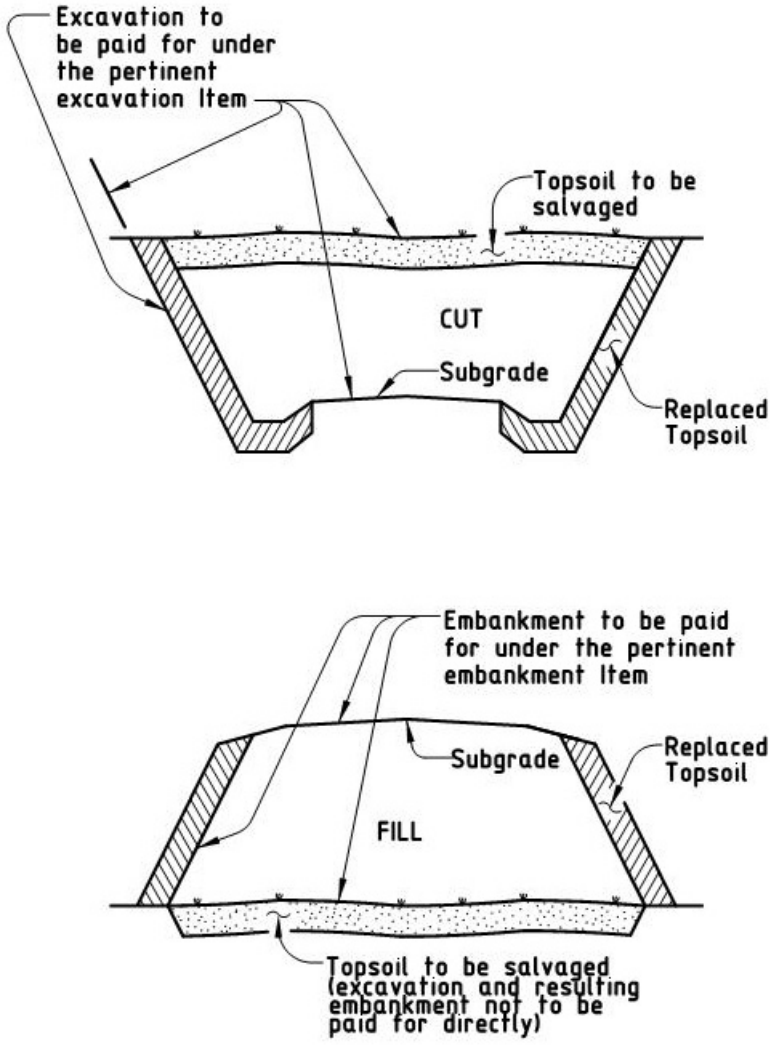

Figure 1
Roadway cross sections showing payment for excavation and embankment.

END OF SECTION

Special Provision 161-WC001
Compost

For this project, Item 161, "Compost," of the Standard Specifications, is hereby voided and replaced in its entirety with the clauses and requirements below.

PART 1 – GENERAL

1.1 DESCRIPTION

Furnish and apply compost as shown in the plans or as directed.

1.2 RELATED ITEMS

A. Item WC102, "Mulch"

B. Item WC101, "Soil Ripping"

C. Item 164–WC001, "Seeding for Erosion Control"

D. Item 160–WC001, "Topsoil"

E. United States Code of Federal Regulations (CFR), Title 40, Part 503 standards for Class A biosolids

F. Texas Commission on Environmental Quality (TCEQ) health and safety regulations as defined in the Texas Administrative Code (TAC), Chapter 332, including the time and temperature standards in Subchapter B, Part 23

G. USCC Seal of Testing Assurance (STA) program

1.3 MEASUREMENT

This item will be measured by the square yard or cubic yard.

1.4 PAYMENT

Unless compost is specified as a pay item, the work performed and the materials furnished in accordance with this Item will not be paid for directly, but will be subsidiary to pertinent items.

When compost is specified on the plans as a pay item, the work performed and the compost furnished will be paid for at the unit price bid for "Compost Manufactured Topsoil" or "Erosion Control Compost" of the depth specified. This price is full compensation for furnishing materials, labor, equipment, maintenance, tools, supplies, and incidentals.

1.5 QUALITY CONTROL SUBMITTALS

A. Prior to the delivery of the compost to the site, the following submittals are to be provided to the Owner's representative for approval:

1. A statement that the compost meets federal and state health and safety regulations.

2. A statement that the composting process has met time and temperature requirements.

3. A copy of the producer's STA certification.

4. A copy of the lab analysis, performed by an STA-certified lab, verifying the compost meets the materials requirements, for every 1000 CY of material. Test data should not be older than one (1) month old.

5. The compost installation method.

6. A copy of purchase receipt from approved vendor.

7. A copy of the current TCEQ compliance statement signed by the facility manager when furnishing biosolids compost.

8. A copy of the compost analysis from the compost supplier that lists NO_3, NH_4, and P levels (parts per million).

PART 2 – PRODUCTS

2.1 MATERIALS

A. Compost

1. Furnish compost that has been produced by aerobic (biological) decomposition of organic matter and meets the requirements set forth by the United States Department of Agriculture and the United States Composting Council (USCC), "Test Methods for Examination of Composting and Compost" (TMECC), shown in 2.1.A.2.

2. Physical Requirements for Compost:

   a. Particle Size: 95% passing 5/8 inch, 70% passing 3/8 inch in accordance with TMECC 02.02-B, "Sample Sieving for Aggregate Size Classification"

   b. Heavy Metals: Pass in accordance with TMECC 04.06, "Heavy Metals and Hazardous Elements"

      i. 04.06-As, Arsenic

      ii. 04.06-Cd, Cadmium

      iii. 04.06-Cu, Copper

      iv. 04.06-Pb, Lead

      v. 04.06-Hg, Mercury

      vi. 04.06-Mo, Molybdenum

      vii. 04.06-Ni, Nickel

      viii. 04.06-Se, Selenium

      ix. 04.06-Zn, Zinc

   c. Soluble Salts: 5.0 max.* dS/m in accordance with TMECC 04.10-A, "1:5 Slurry Method, Mass Basis" (*A soluble salt content up to 10.0 dS/m for compost used in CMT will be acceptable)

d. pH: 5.5 – 8.5** in accordance with TMECC 04.11-A, "1:5 Slurry pH" (**A maximum pH of 9.5 will be acceptable for manure compost)

e. Maturity: greater than 80% in accordance with TMECC 05.05-A, "Germination and Root Elongation"

f. Organic Matter Content: 25% – 65%*** (dry mass) in accordance with TMECC 05.07-A, "Loss-On-Ignition Organic Matter Method" (***A minimum organic matter content of 10% will be acceptable for manure compost)

g. Stability: less than 0.5 mg CO_2 carbon/g compost carbon/day

h. Fecal Coliform: Pass in accordance with TMECC 07.01-B, "Fecal Coliforms"

3. Compost feedstock may include, but is not limited to, leaves and yard trimmings, biosolids, food scraps, food-processing residuals, manure or other agricultural residuals, forest residues, bark, and paper.

4. Compost shall be reasonably free (less than 1% by dry weight) of manmade foreign matter. The organic matter shall not possess objectionable odor and shall not resemble the raw material from which it was derived. Particle size shall meet the following additional specifications: maximum particle length 0.5 inches

5. Ensure compost does not contain any visible refuse, other physical contaminants, or any substance considered to be harmful to plant growth, as approved by the engineer. Do not use materials that have been treated with chemical preservatives as a compost feedstock or as wood chips.

6. Provide compost meeting all applicable CFR, Title 40, Part 503 standards for Class A biosolids and TCEQ health and safety regulations as defined in the TAC, Chapter 332, including the time and temperature standards in Subchapter B, Part 23. Meet the requirements of the USCC STA program. (TxDOT, 2014)

7. Compost shall be obtained from any of the following approved vendors (vendors that utilize static compost piling are preferred):

a. Organics by Gosh, Austin, TX

(512) 276-1211

b. Garden-Ville, Austin, TX

(888) 655-6115

c. Geo Growers, Austin, TX

(512) 892-2722

d. Soil Express, Prosper, TX

(972) 347-2994

B. Compost Manufactured Topsoil (CMT)

CMT consists of blended compost, as specified in 2.1.A, and mineral soil. The Contractor shall determine the blend based on the compost supplier's nutrient analysis and the corresponding ratios in Table 1. The mineral soil should have a soil texture of less than 75% sand and organic matter less than 2%. Measures must be taken to avoid weed contamination, through fresh mining, or complete cover or non-use of top six (6) inches of stockpiled material. Reference Item 160-WC001, "Topsoil" for stockpiling specifications of on-site excavated topsoil. Material sources

must be approved by the Owner's Representative. Dilution of compost must not be achieved with organic matter (mulch).

Table 1: Compost to Mineral Soil Amendment Ratios for Compost Manufactured Topsoil (CMT)

Compost Condition NO_3, NH_4, or P (available):	**Ratio (volume) Compost: Soil**
exceed 2000 ppm (0.2%)	1:25
are less than 2000 ppm (0.2%), but greater than 1000 ppm (0.1%)	1:20
are less than 1000 ppm (0.1%), but greater than 500 ppm (0.05%)	1:10
are less than 500 ppm (0.05%), but greater than 250 ppm (0.025%)	1:4
are less than 250 ppm (0.1%), but greater than 100 ppm (0.05%)	2:3

Source: Lady Bird Johnson Wildflower Center, 2010

C. Erosion Control Compost (ECC)

ECC consists of compost, as specified in 2.1.A, blended with mulch in a ratio of three (3) parts compost to one (1) part mulch (3:1). Mulch to be in accordance with Item WC102, "Mulch."

PART 3 – EXECUTION

3.1 SEQUENCING

A. CMT

Initiate site preparation, CMT and fine grading prior to any native grass and wildflower seeding as specified in the plans or as directed to disturbed roadside areas and channels. If road base operations have not been completed, exclude site preparation and CMT installation fifteen (15) ft. from the road pavement.

B. ECC

Initiate site preparation, topsoil installation, fine grading, and ECC topdressing installation prior to any grass and wildflower seeding as specified in the plans or as directed to disturbed roadside areas and channels. If road base operations have not been completed, exclude site preparation and ECC topdressing installation fifteen (15) ft. from the road pavement.

C. Following road pavement, initiate specified CMT or ECC installation prior to grass and wildflower seeding to remaining disturbed areas, as specified in the plans or as directed.

3.2 CONSTRUCTION

A. Site Preparation

1. Remove debris, unsatisfactory soil materials, and obstructions from surface prior to CMT or ECC installation.

2. Remove top growth of vegetation to remain by mowing to a six (6) inch height to ensure that the CMT or ECC contacts the surface material.

3. CMT and ECC should not be installed onto compacted soil. Scarify or break the surface of the soil with a flexible tine harrow one (1) to two (2) inches in depth.

B. Installation

1. Apply CMT or ECC evenly at depths and locations as indicated in the drawings or as directed.

2. Installation method of the CMT or ECC is to be determined by the Contractor and submitted for approval. Any of the following are acceptable methods of installation:

   a. By hand raking

   b. By mechanized spreader

   c. By a pneumatic blower – Seed can be mixed with CMT or ECC during this application. Reference Item 164-WC001, "Seeding for Erosion Control."

3. Depending on slope, accessibility of location, and rockiness of the terrain, the Contractor is to select an approved installation method that is the least invasive to the adjacent areas.

4. Spread the CMT or ECC to a uniform loose cover at the thickness specified.

5. Till the CMT to a depth no less than four (4) inches to integrate into the subsoil.

6. Lightly rake the ECC compost to ensure good seed to compost contact.

7. Apply ECC at least three (3) ft. over the shoulder of a slope to prevent rill formation and erosion of compost.

8. Do not apply ECC on surfaces with a slope greater than 4:1.

9. Do not apply on surfaces that are muddy, frozen, or contain frost or ice.

10. Do not roll or tamp CMT or ECC.

11. Do not compact the CMT or ECC after application with heavy equipment or foot traffic.

3.3 MAINTENANCE

A. Requirements

1. Maintain CMT or ECC in a functional condition at all times and correct deficiencies immediately until acceptance of project.

2. Install additional CMT or ECC as directed by the Owner's Representative after inspection.

3. Protect areas from traffic and repair or re-establish if damaged or compacted.

4. Restore appearance, quality, and condition to match adjacent work if damaged.

B. Schedule

1. The CMT or ECC should be inspected weekly until native grass is established, in accordance with the Stormwater Pollution Prevention Plan (SW3P), and within 24 hours of every one-half (½) inch or greater rain event until project completion.

END OF SECTION

Special Provision 164-WC001
Seeding for Erosion Control

For this project, Item 164, "Seeding for Erosion Control," of the Standard Specifications, is hereby voided and replaced in its entirety with the clauses and requirements below.

PART 1 – GENERAL

1.1 DESCRIPTION

Provide and install native grass seeding as shown in the plans or as directed.

1.2 RELATED ITEMS

A. Item 161-WC001, "Compost"

B. Item 168-WC001, "Vegetative Watering"

C. Item 160-WC001, "Topsoil"

D. Item 636, "Aluminum Signs"

E. Item 644, "Small Roadside Sign Supports and Assemblies"

1.3 REFERENCES

A. Federal Seed Act

B. Texas Seed Law

C. Texas Fertilizer Law

1.4 MEASUREMENT

This item will be measured by the square yard.

1.5 PAYMENT

A. The work performed and the materials furnished in accordance with the seeding Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Seeding for Erosion Control." This price is full compensation for furnishing materials, including seed, fertilizer, mowing, labor, equipment, maintenance, tools, supplies, and incidentals.

B. When humic acid or MycoApply Endo are specified on the plans as a pay item, the work performed and the material furnished will be paid for at the unit price bid for "Humic Acid" or "MycoApply Endo" at the application rates specified. This price is full compensation for furnishing materials, labor, equipment, water, tools, supplies, and incidentals.

1.6 QUALITY CONTROL SUBMITTALS

A. Submit seeding product data, including plant tags and seed certification for native grass seed mix for approval.

B. Submit seed planting equipment method, manufacturer, and data for approval.

C. Submit product data and sample for sign in accordance with Tex-726-I.

D. Submit humic acid and MycoApply Endo product data and supplier's information for approval.

E. Submit fertilizer analysis, manufacturer, and product data for approval.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Native Grass Seed

Provide seed as shown in the plans or as directed, using Tables 1 – 11 to determine the appropriate seed mix and rates, and meeting the requirements of the Federal Seed Act and Texas Seed Law, including the testing and labeling for pure live seed (PLS = Purity and Germination). Minimum purity shall be 50%. The seed test to be conducted by the State Seed Laboratory, and a seed test report shall be submitted in accordance with 1.6, "Quality Control Submittals." Each type (mix) of seed must be mixed by the supplier and delivered in labeled and unopened bags or containers, unless otherwise approved by the Owner's representative. Do not blend the seed mixes on site. Use within twelve (12) months from that date of analysis. When Buffalograss is specified, use seed treated with KNO_3 (potassium nitrate) to overcome dormancy.

Parts A and B of the seed mix tables are the primary seed mixes for application. Part A is not required unless shown in the plans. In the event that a species in Part A or B of the mixes is not seasonally available, coordinate with the seed supplier to designate substitute species and quantities in the mix using Part C of the tables. Substitutions will only be allowed at the discretion of the County.

Seeds must be stored in a dry, well-ventilated location away from contaminants. Seed storage humidity level should be lower than 75%. Store any unused seed in a water resistant container. If seed will be stored longer than one (1) year, the optimal temperature range would be 40°F – 60°F.

During transit (from storage to sowing), seed should be protected from dramatic temperature fluctuations day after day; temperature cannot exceed 100°F at any time. Seed must remain dry and protected from sun exposure. The transit period may not exceed ten (10) days.

Obtain native grass seed from any three of the approved providers:

1. Native American Seed, Junction TX
   (800) 728-4043

2. Wildseed Farms, Fredericksburg, TX
   (800) 848-0078

3. Douglass King Company, San Antonio, TX
   (888) 357-3337

Table 1: Type 1 – Tall Native Grass Seed Mix with Wildflowers for Edward's Plateau and Blackland Prairie Eco-Regions

Part A: Wildflowers		
Species	**Common Name**	**lbs. per acre**
Cassia (Chamaecrista) fasiculata	Partridge Pea	5.00
Centaurea americana	American Basketflower	5.00
Coreopsis tinctoria	Plains Coreopsis	2.00
Desmanthus illinoensis	Illinois Bundleflower	3.75
Engelmannia pinnatifida (Engelmannia peristenia)	Engelmann Daisy (Cutleaf Daisy)	9.00
Gaillardia pulchella	Indian Blanket	7.50
Helianthus maximiliani	Maximilian Sunflower	2.00
Ipomopsis rubra	Standing Cypress	3.00
Monarda citriodora	Lemon Mint	1.50
Oenothera speciosa	Pink Evening Primrose	0.50
Rudbeckia hirta	Black-eyed Susan	0.50
Thelesperma filifolium	Greenthread	2.00
		41.75
Part B: Grasses		
Species	**Common Name**	**lbs. per acre**
Bouteloua curtipendula	Sideoats Grama	14.00
Bouteloua gracilis	Blue Grama	15.00
Buchloe dactyloides	Buffalograss	6.00
Elymus canadensis	Canada (Prairie) Wildrye	10.00
Leptochloa dubia	Green Sprangletop	4.00
Panicum virgatum	Switchgrass (Upland)	2.00
Schizachyrium scoparium	Little Bluestem	4.00
Sorghastrum nutans	Indian Grass	3.00
		58.00
Part C: Replacement Species and/or Species Added for Increased Diversity		
Species	**Common Name**	**lbs. per acre**
Andropogon gerardii	Big Bluestem	4.00
Argemone albiflora	White Prickly Poppy	3.00
Bothriochloa laguroides	Silver Bluestem	
Bouteloua rigidiseta	Texas Grama Grass	2.70
Callirhoe leiocarpa	Annual Winecup	1.20
Castilleja indivisa	Indian Paintbrush	0.15
Dalea candida (Petalostemon candidus)	White Prairie Clover	1.00
Eragrostis trichoides	Sand Lovegrass	0.50
liatris mucronata	Gayfeather	2.50
Lindheimera texana	Texas Yellow Star	3.00
Oenothera missouriensis	Missouri Primrose	0.50
Oenothera speciosa	Pink Evening Primrose	0.50
Salvia azurea	Pitcher Sage	0.25
Salvia farinacea	Mealy Blue Sage	1.50
Simsia calva	Bush Sunflower	1.75
Solidago nemoralis	Grey Goldenrod	1.75
"Midway Mix" (Native American Seed)	Grasses 1 ft. – 2 ft. tall	2.50

Source: Lady Bird Johnson Wildflower Center, 2010

Table 2: Type 2 – Tall Native Grass Seed Mix with Wildflowers for Post Oak Savanna Eco-Region

Part A: Wildflowers		
Species	**Common Name**	**lbs. per acre**
Cassia (Chamaecrista) fasiculata	Partridge Pea	5.00
Centaurea americana	American Basketflower	5.00
Coreopsis tinctoria	Plains Coreopsis	1.00
Desmanthus illinoensis	Illinois Bundleflower	3.75
Engelmannia pinnatifida (Engelmannia peristenia)	Engelmann Daisy (Cutleaf Daisy)	9.00
Ipomopsis rubra	Standing Cypress	3.00
Monarda citriodora	Lemon Mint	1.50
Oenothera speciosa	Pink Evening Primrose	0.25
Rudbeckia hirta	Black-eyed Susan	0.50
Thelesperma filifolium	Greenthread	2.00
		31.00
Part B: Grasses		
Species	**Common Name**	**lbs. per acre**
Bouteloua curtipendula	Sideoats Grama	14.00
Bouteloua gracilis	Blue Grama	15.00
Buchloe dactyloides	Buffalograss	6.00
Elymus canadensis	Canada Wildrye	10.00
Eragrostis trichoides	Sand Lovegrass	0.50
Panicum virgatum	Switchgrass (Upland)	10.00
Schizachyrium scoparium	Little bluestem (Native)	4.00
Sporobolus cryptandrus	Sand Dropseed	1.00
Sorghastrum nutans	Indian Grass	3.00
		63.5
Part C: Replacement Species and/or Species added for Increased Diversity		
Species	**Common Name**	**lbs. per acre**
Andropogon gerardii	Big Bluestem Grass	2.00
Argemone albiflora	White Prickly Poppy	2.00
Asclepias tuberosa	Butterfly Weed	2.50
Bouteloua rigidiseta	Texas Grama Grass	2.25
Callirhoe leiocarpa	Annual Winecup	1.00
Castilleja indivisa	Indian Paintbrush	0.15
Corydalis curvisiliqua	Scrambled Eggs	0.50
liatris mucronata	Gayfeather	2.25
Lindheimera texana	Texas Yellow Star	3.00
Salvia azurea	Pitcher Sage	1.50
Salvia farinacea	Mealy Blue Sage	1.50
Simsia calva	Bush Sunflower	1.25
Tridens flavus	Purpletop (Grass)	2.25
"Midway Mix" (Native American Seed)	Grasses 1 ft. – 2 ft. tall	2.00

Source: Lady Bird Johnson Wildflower Center, 2010

Table 3: Type 3 – Riparian Native Grass Seed Mix for Edward's Plateau, Blackland Prairie, and Post Oak Savannah Eco-Regions

Part A: Wildflowers		
Species	**Common Name**	**lbs. per acre**
Centaurea Americana	American Basketflower	5.00
Coreopsis tinctoria	Plains Coreopsis	4.00
Desmanthus illinoensis	Illinois Bundleflower	7.50
Engelmannia pinnatifida (Engelmannia peristenia)	Engelmann Daisy (Cutleaf Daisy)	9.00
Helianthus maximiliani	Maximilian Sunflower	2.00
Oenothera speciosa	Pink Evening Primrose	0.50
Rudbeckia (Dracopis) amplexicaulis	Clasping Coneflower	3.00
		31.00
Part B: Grasses		
Species	**Common Name**	**lbs. per acre**
Bouteloua curtipendula	Sideoats Grama	14.00
Bouteloua gracilis	Blue Grama	15.00
Buchloe dactyloides	Buffalograss	6.00
Elymus canadensis	Canada (Prairie) Wildrye	10.00
Leptochloa dubia	Green Sprangletop	4.00
Panicum virgatum	Switchgrass (Upland)	2.00
Schizachyrium scoparium	Little Bluestem	4.00
Sorghastrum nutans	Indian Grass	3.00
Tripsacum dactyloides	Eastern Gamagrass	10.00
		68.00
Part C: Replacement Species and/or Species Added for Increased Diversity		
Species	**Common Name**	**lbs. per acre**
Andropogon gerardii	Big Bluestem	1.00
Andropogon glomeratus	Bushy Bluestem Grass (for moist areas)	0.50
Chasmanthium latifolium	Inland Sea Oats	1.50
Physostegia intermedia	Obedient Plant	0.50
Solidago altissima (S. canadensis)	Tall Goldenrod	0.75
Solidago gigantea	Giant Goldenrod	0.75
Salvia azurea	Pitcher Sage	0.75
"Midway Mix" (Native American Seed)	Grasses 1 ft. – 2 ft. tall	2.50

Source: Lady Bird Johnson Wildflower Center, 2009

Table 4: Type 4 – Cool Season Native Grass Seed Mix for Edward's Plateau, Blackland Prairie, and Post Oak Savannah Eco-Regions

Species	Common Name	lbs. per acre
Elymus canadensis	Prairie Wildrye	10.00
Pascopyrum smithii	Western Wheatgrass	9.00
Dalea candida (var. candida)	White Prairie Clover	3.00
		22.00

Source: Lady Bird Johnson Wildflower Center, 2009

Table 5: Type 5 – Standard Native Grass Seed Mix for Edward's Plateau and Blackland Prairie Eco-Regions

Species	Common Name	lbs. per acre
Bouteloua curtipendula	Sideoats grama	14.00
Bouteloua gracilis	Blue grama	15.00
Buchloe dactyloides	Buffalograss	6.00
Elymus canadensis	Canada wildrye	10.00
Leptochloa dubia	Green sprangletop	4.00
Panicum virgatum	Switchgrass (upland variety)	2.00
Schizachyrium scoparium	Little bluestem (native)	4.00
Sorghastrum nutans	Indian grass	3.00
		58.00

Source: Lady Bird Johnson Wildflower Center, 2009

Table 6: Type 6 – Standard Native Grass Seed Mix for Post Oak Savannah Eco-Region

Species	Common Name	lbs. per acre
Bouteloua curtipendula	Sideoats grama	14.00
Bouteloua gracilis	Blue grama	15.00
Buchloe dactyloides	Buffalograss	6.00
Elymus canadensis	Canada wildrye	10.00
Eragrostis trichoides	Sand lovegrass	0.50
Panicum virgatum	Switchgrass (upland variety)	10.00
Schizachyrium scoparium	Little bluestem (native)	4.00
Sporobolus cryptandrus	Sand dropseed	1.00
Sorghastrum nutans	Indian grass	3.00
		63.50

Source: Lady Bird Johnson Wildflower Center, 2009

Table 7: Type 7 – Standard Short Native Grass Seed Mix for Edward's Plateau and Blackland Prairie Eco-Regions

Part A: Wildflowers		
Species	**Common Name**	**lbs. per acre**
Cassia (Chamaecrista) fasiculata	Partridge Pea	5.00
Coreopsis tinctoria	Plains Coreopsis	1.00
Lupinus texensis	Bluebonnet	15.00
Gaillardia pulchella	Indian Blanket	10.00
Mondarda citriodora	Lemon Mint	3.00
Oenothera speciosa	Pink Evening Primrose	0.50
Rudbecia hirta	Black-eyed Susan	2.00
Thelesperma filifolium	Greenthread	1.50
		38.00
Part B: Grasses		
Species	**Common Name**	**lbs. per acre**
Bouteloua curtipendula	Sideoats Grama	21.00
Bouteloua gracilis	Blue Grama	35.00
Buchloe dactyloides	Buffalograss	50.00
Elymus Canadensis	Prairie Wildrye	10.00
Eragrostis trichoides	Sand Lovegrass	0.50
		116.5

Part C: Replacement Species and/or Species added for Increased Diversity		
Species	**Common Name**	**lbs. per acre**
Bouteloua rigidiseta	Texas Gama Grass	2.25
Callirhoe leiocarpa	Annual Winecup	1.00
Castilleja indivisa	Indian Paintbrush	0.15
Corydalis curvisiliqua	Scrambled Eggs	0.50
liatris mucronata	Gayfeather	2.25
Oenothera missouriensis	Missouri Primrose	1.75
Dalea candida (Petalostemon candidus)	White Prairie Clover	0.75
Salvia farinacea	Mealy Blue Sage	1.50
Simsia calva	Bush Sunflower	1.75
"Midway Mix" (Native American Seeds)	Grasses 1 ft. – 2 ft. tall	2.50

Source: Lady Bird Johnson Wildflower Center, 2010

Table 8: Type 8 – Standard Short Native Grass Seed Mix For Post Oak Savannah Eco-Region

Part A: Wildflowers		
Species	**Common Name**	**lbs. per acre**
Cassia (Chamaecrista) fasiculata	Partridge Pea	5.00
Centaurea americana	American Basketflower	5.00
Coreopsis tinctoria	Plains Coreopsis	2.00
Desmanthus illinoensis	Illinois Bundleflower	3.75
Engelmannia pinnatifida	Engelmann Daisy (Cutleaf Daisy)	9.00
Gaillardia pulchella	Indian Blanket	7.50
Ipomopsis rubra	Standying Cypress	3.00
Mondardo citriodora	Lemon Mint	1.50
Oenothera speciosa	Pink Evening Primrose	0.25
Rudbecia herta	Black-eyed Susan	0.50
Thelesperma filifolium	Greenthread	2.00
		39.50
Part B: Grasses		
Grasses	**Species**	**lbs. per acre**
Bouteloua curtipendula	Sideoats Grama	14.00
Bouteloua gracilis	Blue Grama	15.00
Buchloe dactyloides	Buffalograss	6.00
Elymus canadensis	Canada Wildrye	10.00
Schizachyrium scoparium	Little Bluestem (Native)	8.00
		53.00
Part C: Replacement Species and/or Species added for Increased Diversity		
Grasses	**Species**	**lbs. per acre**
Argemone albiflora	White Prickly Poppy	2.50
Bouteloua rigidiseta	Texas Grama Grass	2.75
Callirhoe leiocarpa	Annual Winecup	1.00
Castilleja indivisa	Indian Paintbrush	0.15
Eragrostis trichoides	Sand Lovegrass	0.50
liatris mucronata	Gayfeather	2.50

Lindheimera texana	Texas Yellow Star	3.00
Oenothera missouriensis	Missouri Primrose	0.50
Oenothera speciosa	Pink Evening Primrose	0.25
Salvia azurea	Pitcher Sage	0.75
Salvia farinacea	Mealy Blue Sage	1.50
Simsia calva	Bush Sunflower	1.25
"Midway Mix" (Native American Seeds)	Grasses 1 ft. – 2 ft. tall	2.50

Source: Lady Bird Johnson Wildflower Center, 2010

Table 9: Type 9 – Bare Patch Repair Mix for Edward's Plateau, Blackland Prairie, and Post Oak Savannah Eco-Regions

Species	Common Name	lbs. per acre
Bouteloua curtipendula	Sideoats grama	25.00
Bouteloua gracilis	Blue grama	10.00
Leptochloa dubia	Green sprangletop	10.00
		45.00

Source: Lady Bird Johnson Wildflower Center, 2009

Table 10: Type 10 – Warm Season Mix for Edward's Plateau, Blackland Prairie, and Post Oak Savannah Eco-Regions

Species	Common Name	lbs. per acre
Seleria italica	Foxtail Millet	34
		34

Table 11: Type 11 – Substitute Standard Mix for Blackland Prairie Eco-Regions

Species	Common Name	lbs. per acre
Cynodon dactylon	Bermuda	10
		10

B. Cool Season Temporary Cover Seed

If native grass seed is to be installed during the winter period of November 8th to February 14th, then Table 4 (temporary cool season mix) must be incorporated into the native grass seed mix, as specified on the plans, or as directed.

C. Warm Season Temporary Cover Seed

Between the dates of May 1st to August 31st, use Temporary Warm Season Seeding (Type 10) as specified on the plans, or as directed.

D. Warm Season Permanent Cover Seed Substitute

For installation in areas with curb and gutter, substitute applicable Type 7 or Type 8 Standard Short Native Grass Seed in lieu of Tall Native selections.

E. Substitute Standard Mix for Blackland Prairie Eco-Regions

Table 11 (Type 11) may be substituted in areas where adjacent private property employs the use of herbicides which limits the plant establishment of specified seasonal seeding.

F. Compost Manufactured Topsoil (CMT) and Erosion Control Compost (ECC)

As specified in Item 161–WC001, “Compost.”

G. Topsoil

As specified in Item 160–WC001, “Topsoil.”

H. Humic Acid

Humic Acid can be obtained from the following supplier or approved equal:

1. Medina Agriculture Products
   (830) 426-3011

I. Fertilizer

Use a complete fertilizer containing nitrogen (N), phosphoric acid (P), and potash (K) nutrients. Ensure at least 50% of the nitrogen component is a slow-release sulfur-coated urea. Ensure that fertilizer is in an acceptable condition for distribution in containers labeled with product analysis. Fertilizer is subject to testing in accordance with Texas Fertilizer Law. Deliver and apply the complete fertilizer uniformly, as a dry material, at a rate equal to 60 lbs. of nitrogen per acre or at the analysis and rate specified on the plans.

J. Mycorrhizal Fungi

MycoApply Endo, produced by Mycorrhizal Applications, Inc., can be obtained from the following supplier or approved equal:

1. Horizon Distributors, Inc.
   (512) 282-2331

This product will require de-chlorinated, clean, fresh water for application.

K. Vegetative Watering

Clean, fresh, and free of substances or matter that could inhibit vigorous growth of plants. As specified in Item 168–WC001, “Vegetative Watering.”

L. No Mowing Notice Sign

As specified in Item 636, “Aluminum Signs.”

M. Sign Support

As specified in Item 644, “Small Roadside Sign Supports and Assemblies.”

PART 3 – EXECUTION

3.1 SEQUENCING

A. Following fine grading and topsoil or compost/fertilizer installation, initiate seed installation as specified in the plans or as directed to disturbed roadside areas and channels. If road base operations have not been completed, exclude seeding install fifteen (15) ft. from the road pavement.

B. Following road pavement, initiate seed installation following grading and topsoil or compost/fertilizer installation to remaining disturbed areas, as specified in the plans or as directed.

C. Install no mowing notice signs in accordance with the plans or as directed at time of Final Acceptance.

3.2 CONSTRUCTION

A. Installation

1. Remove and dispose of objectionable material from the topsoil source before beginning the work.

B. Site Preparation

1. Remove all invasive species.

   a. Invasive weeds, either living plants or weed seed, shall be minimized at the site using appropriate herbicide application and/or weed-free soil amendments. Mow, burn, or apply herbicides as needed to control unwanted vegetation as directed.

2. Seed should not be installed onto compacted soil. Scarify or break the surface of the soil with a flexible tine one (1) to two (2) inches in depth in the area to be seeded.

3. Apply specified compost/fertilizer and/or topsoil to the seeding surface (refer to plans for required depth).

4. Humic Acid concentrate shall be mixed with clean, fresh water prior to application. Apply humic acid and water mixture to all areas to receive any type of native grass seeding at the rate of one (1) gallon of humic acid concentrate per acre (or 0.16 teaspoons per square yard).

5. MycoApply Endo shall be mixed with de-chlorinated, clean, fresh water prior to application. The water MUST be de-chlorinated or the fungi in the MycoApply Endo will die. Apply MycoApply Endo mixture to all areas to receive any type of native grass seeding at the rate of 10 lbs. per acre (or 0.0336 ounces per square yard).

6. The humic acid and the MycoApply Endo can be mixed together with de-chlorinated water and applied to areas to receive any native grass seeding at the same time. The water MUST be de-chlorinated or the fungi in the MycoApply Endo will die.

7. Seed area in accordance with the plans or as directed, with regard to installation specification below.

C. Installation

Apply the entire specified amount of seed to the area to be seeded. Application rates should be set to allow at least two complete passes over seeding area so the area is completely and evenly covered. Lightly rake compost and/or topsoil to ensure good seed contact. Seeds should not be buried at a depth over ¼ inches.

1. Broadcast Seeding

   All areas shown to be seeded in the plans must be broadcast unless otherwise directed by the Engineer. Broadcast seed using hand or mechanical distribution in a uniform manner. Coordinate the application rate setting with the Owner's Representative prior to application. Apply seed on the surface of compost or topsoil. The seedbed should be culti-packed or rolled before and after seeding to ensure seed contact with the soil. Roll the seeding areas along slope contours. Wind speed should be fifteen (15) mph or less during seeding. Up to one-third ($^1/_3$) of the seed may remain on top of the soil surface.

2. No-Till Drill Seeding

   No-till drill seeding should only be used when directed by the Engineer. Use a no-till drill to reduce the risk of erosion and loss of seed. Ensure the drill opening size is adequate to allow free movement of full range of seed sizes being planted. Coordinate the application rate setting with the Owner's Representative prior to application. Plant seed parallel to the contour of the slopes.

3. Pre-mixing Seed with Compost (CMT and ECC)

   Apply uniform dry mixture of seed and compost pneumatically only as directed by the Engineer in areas shown in the plans to a depth not to exceed two (2) inches. Pre-mixing the seed with compost will aid in a uniform application of seed.

D. Seeding Schedule

1. The preferred time to seed is from September 21st to November 7th to take advantage of winter rains.

2. Native Grass Seeding Schedule:

Table 12: Seeding Schedule

	OPTIMUM PLANTING TIME			
	Fall Seeding	Winter Seeding	Spring Seeding	Summer Seeding
Seeding Dates	**Sept. 21st – Nov. 7th**	Nov. 8th – Feb. 14th	Feb. 15th – June 15th	June 16th – Sept. 20th
Grass Type	**Type 1** **Type 2** **Type 5** **Type 7** **Type 8** **Type 9** **Type 11**	Type 1 Type 2 Type 5 Type 6 Type 7 Type 9 Type 11	Type 5 or 6	Type 10
		PLUS	PLUS (Only if Directed)	PLUS
Supplemental Grass		Apply the Table 4: Type 4 Cool Season Non-Native Grass Seed Mix	Apply the Table 2: Type 2 Wildflower Seed Mix in the next Fall Seeding Time Period	Apply the Permanent Type 1,Type 3, or Type 5 Grass Mix in the Fall Seeding Time Period

E. Vegetative Watering

Provide vegetative watering to seeded areas shown on the plan immediately after seed installation for healthy vegetative establishment, in accordance with Item 168-WC001, "Vegetative Watering" or as directed.

F. No Mow Signs

At final acceptance, post signs at locations indicated on the plans or as directed to prevent mowing of established native grass stands.

3.3 MAINTENANCE

A. Requirements

1. Maintain the native grass areas during and after construction until the certificate of completion is issued.

2. Maintain the ECC if the seeding time falls in the summer period. Seed the specified grass mix when the fall seeding period begins.

3. Maintain native grass areas to establish vigorous growth and plant establishment of native grass mix. Establish an overall vegetative cover of 70% – 80% minimum with no single bare area larger than 100 SF. Areas should have at least 30% of species diversity and be four (4) to six (6) inches in height.

4. Watering of the native grass seed shall be in accordance with Item 168-WC001, "Vegetative Watering."

5. Posted signs should be repaired or replaced immediately if found to be damaged or missing.

B. Schedule

1. Inspect the grass areas weekly and within 24 hours after each rain event of one-half (½) inch or more. Restore eroded areas to finished grade and reseed.

2. Reseed areas that have not established if grass cover is less than 80% of coverage (TCEQ, 2005).

3. Inspect seeded areas every two weeks during establishment phase to check for invasive species, refer to Invasive Species Control.

END OF SECTION

Special Provision 168-WC001
Vegetative Watering

For this project, Item 168, "Vegetative Watering," of the Standard Specifications, is hereby voided and replaced in its entirety with the clauses and requirements below.

PART 1 – GENERAL

1.1 DESCRIPTION

Provide and distribute water to promote growth of vegetation as specified or as directed.

1.2 RELATED ITEMS

A. Item 164-WC001, "Seeding for Erosion Control"

B. Item WC104, "Wildflower Seeding"

C. Item 170, "Irrigation System"

1.3 MEASUREMENT

This item will be measured by the 1000 gallons as applied.

1.4 PAYMENT

The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Vegetative Watering." This price is full compensation for furnishing and operating watering equipment and measuring devices for furnishing and applying water, including hauling, equipment, labor, and incidentals.

1.5 QUALITY CONTROL SUBMITTALS

A. Submit water source and technique of application for approval.

B. Submit a layout drawing and shop drawings of the temporary irrigation system (drip or rotor/spray irrigation) for approval.

C. Submit a report of pH and soluble salt levels of the irrigation water for approval prior to installation.

D. Submit a weekly report for each delivery of water per water truck, if source of water is off-site.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Water

Use water that is clean and free of industrial wastes and other substances harmful to the growth of vegetation. Do not incorporate fertilizer into the water for irrigation. The pH should be between 6.5 and 8.4 to be acceptable for use as irrigation water (MSUES, 2009). Soluble salt levels between 0 and 1,500 mmhos/cm are acceptable for use (CTIP, 2008).

B. Temporary Irrigation

For materials, refer to Item 170, “Irrigation System.”

PART 3 – EXECUTION

3.1 SEQUENCING

A. Vegetative watering shall commence following installation of seeding and plants.

3.2 CONSTRUCTION

A. Schedule

1. Apply vegetative watering in the appropriate quantities and frequencies shown in Table 2 for native grass and wildflower seeded areas and Table 3 for planted trees and shrubs or to replace moisture loss per evapotranspiration (ET) rate, whichever is greater. Significant on-site rainfall of one-half (½) inch or greater allows the postponement of watering until the next scheduled irrigation.

2. Daily ET rates for the County may be found at this AgriLife Extension website: http://texaset.tamu.edu/

   See an example as shown in Table 1.

   How to use this table: Look at the first column, ETo, for the inches of water lost per day in evapotranspiration. Add the inches for the last 7 or 14 days (depending on your watering phase shown in Tables 2 and 3) of ETo to get the total number of inches lost by evapotranspiration. This is the amount of watering that needs to be applied to the vegetation at the frequency given in Tables 2 and 3.

Table 1: ET and Weather Data – 14 Day Table (for example only)

Georgetown II Weather Station
Station Sponsored by : Williamson County Extension

Date	ETo PET (in)	Tmax (F)	Tmin (F)	RHmin (%)	Solar (MJm2)	Rain (in)	Wind 4am (mph)	Wind 4pm (mph)
2010-08-26	0.20	90	76	35	15.47	0.00	4.91	4.15
2010-08-27	0.25	93	67	21	26.20	0.00	0.33	7.51
2010-08-28	0.24	95	62	23	26.05	0.00	0.10	4.28
2010-08-29	0.29	95	70	32	22.64	0.00	8.42	8.55
2010-08-30	0.30	96	78	38	20.19	0.00	8.73	8.46
2010-08-31	0.27	95	75	41	21.45	0.00	5.91	6.64
2010-09-01	0.28	95	77	38	21.56	0.00	5.55	6.35
2010-09-02	0.22	91	77	49	17.02	0.00	8.52	6.62
2010-09-03	0.16	84	71	49	11.92	0.18	1.34	9.83
2010-09-04	0.25	88	69	37	23.25	0.00	4.65	6.88
2010-09-05	0.24	91	67	32	23.00	0.00	0.49	6.55
2010-09-06	0.20	89	69	54	18.45	0.05	2.96	11.46
2010-09-07	0.06	77	72	84	2.64	4.74	4.73	14.46
2010-09-08	0.11	83	74	73	7.36	4.69	12.68	4.04
14 Day Summary	3.07	90	72	43	18.37	9.66	4.95	7.56

Note: Reported are the average hourly values, not the absolute highs and lows.
Source: AgriLIFE EXTENSION - Texas A&M System

Table 2: Vegetative Watering Schedule for Native Grass, Wildflower Seeding, and Live Root Plantings

Time Period	Irrigation Application Amount*	Frequency**
Day of Installation	Min. 1 inch	Min. 2 times per day
Phase 1 – Next 10 days	Min. 1 inch	Min. 1 time per day (no rain)
Phase 2 – Next 14 days	Min. 1 inch or replace weekly ET	Min. 2 times per week (no rain or dew)
Phase 3 – Until Plant Establishment	Min. 1.5 inches or replace weekly ET	Min. 1 time per every other week, or as necessary***

Source: Adapted from COA, 2009 & TCEQ, 2005.

Note 1: *5.6 gallons per square yard = 1 inch of applied water

Note 2: **Reduce irrigation frequency if during period of seasonal rains, since the watering frequency will greatly depend on the time of year. Deviations from the above watering schedule should be approved.

Note 3: ***Irrigation in Phase 3 should pause during the dormant season, beginning on December 15th, and should be reinstated beginning February 15th.

Note 4: Reference Item 164-WC001, "Seeding for Erosion Control" 3.3 Maintenance Requirements for plant establishment specifications.

Note 5: Stop irrigation if there is puddling.

Table 3: Vegetative Watering Schedule for Planted Trees and Shrubs

Time Period	Irrigation Application Amount*	Frequency**
Day of Installation	Saturate Root Depth	Min. 1 times per day
Phase 1 – Next 14 days	Saturate Root Depth	Min. 1 time per every other day, or as necessary
Phase 2 – Until Plant Establishment	Saturate Root Depth	Min. 1 time per week, or as necessary***

Source: Adapted from COA, 2009 & TCEQ, 2005.

Note 1: *5.6 gallons per square yard = 1 inch of applied water

Note 2: **Reduce irrigation frequency if during period of seasonal rains, since the watering frequency will greatly depend on the time of year. Deviations from the above watering schedule should be approved.

Note 3: ***Irrigation in Phase 2 should pause during the dormant season, beginning on December 15th, and should be reinstated beginning February 15th.

Note 4: Stop irrigation if there is puddling.

B. General Guidelines:

1. Contractor should determine the vegetative watering technique (temporary drip irrigation, temporary rotor or spray irrigation, or water truck) most appropriate for the project if not specified in the plans.

2. After approval of drip or rotor/spray irrigation technique (if selected as the appropriate technique), produce shop drawings for these systems for approval by the Engineer.

3. Apply water to all newly vegetated areas as shown on the plans or as directed.

4. Irrigation water should not cause excessive run-off.

5. Water should ensure 100% coverage on all seeded and planted areas.

6. Overspray onto pavement is not allowed.

C. Temporary drip irrigation guidelines:

1. Install temporary drip irrigation lines per approved shop drawings.

2. Irrigation system should provide coverage to 100% of plant establishment areas.

3. Drip irrigation water should come from one of the following sources, submit water source for approval.

   a. Tie into existing water source or well.

   b. Pump water from nearby creek or river with the use of a generator. Obtain approval from Construction Observer prior to pumping.

   c. Tie temporary irrigation line to a water truck.

   d. Store water in a storage tank and locate at the highest elevation on the site to effectively move water to each emitter through pressure.

4. Pressure compensating emitters should be used on hilly sites.

5. Two emitters should be placed at each plant to ensure adequate watering in case one emitter becomes clogged.

6. Drip system components may consist of barbed emitters in polyethylene tubing or in-line emitter tubing. Spaghetti tubing from multi-nozzle emitter heads should not be used due to ease of damage and numerous parts involved.

7. Irrigation piping and all related equipment should be removed from site at acceptance at the conclusion of the establishment period.

D. Temporary rotor or spray irrigation guidelines:

1. Install temporary rotor or spray irrigation lines per approved shop drawings.

2. Irrigation system should provide coverage to 100% of plant establishment areas.

3. Rotor or spray water should come from one of the following sources, submit water source to Owner's representative for approval.

a. Tie into existing water source or well.

b. Pump water from nearby creek or river with the use of a generator. Obtain approval from Construction Observer prior to pumping.

c. Tie temporary irrigation line to a water truck.

d. Store water in a storage tank and locate at the highest elevation on the site to effectively move water to each emitter through pressure.

4. Pressure compensating emitters shall be used on hilly sites.

5. Collect water lines and all irrigation equipment at the conclusion of the establishment period.

E. Water truck distribution:

1. Furnish and operate water truck equipment to apply water at a uniform and controllable rate that does not scour or erode the soil or seeding bed or wash away seeds or plantings. Applying water in multiple passes may be necessary to avoid scouring or erosion.

2. The water truck operator should not drive within designated seeding or planting areas.

3. The water spray should be directed upwards to distribute the water force and reduce potential erosion.

3.3 MAINTENANCE

A. The contractor should maintain the irrigation system and inspect designated seeding or planting areas after each watering to ensure adequate water distribution. If erosion or seed washout occurs, soil and compost shall be restored to finished grade and the area shall be reseeded (refer to Item 164-WC001, "Seeding for Erosion Control").

B. Irrigation water lines should remain intact and functioning during the establishment period. The contractor should inspect equipment, including drip lines, connectors, and main lines on a regular basis to ensure that they are operable and do not leak. Broken water lines should be repaired immediately.

C. The site should be inspected after irrigation applications to ensure watering trucks have not eroded soil or compost or washed out seeds or plants. Soils compacted by water trucks are to be ripped. Refer to Item WC101, “Soil Ripping.” Damaged areas should be regraded and reseeded immediately.

END OF SECTION

Special Provision to Item 300
Asphalts, Oils and Emulsions

Item 300, “Asphalts, Oils and Emulsions” of the Standard Specifications is amended with respect to the clauses cited below. No other clauses or requirements of this Item are waived or changed.

Section 300.2.4., “Emulsified Asphalt”, is supplemented by the following:

Emulsified Asphalt. Provide emulsified asphalt that is homogeneous, does not separate after thorough mixing, and meets the requirements for the specified type and grade in Tables 7, 8, 9, and 10.

Table 10B
Non-Tracking Tack Coat Emulsion

Property	Test Procedure	Quick Setting QS-1HH	
		Min	Max
Viscosity, Saybolt Furol, 77º F,sec	T 72	15	--
Storage stability, 1 Day, %	T 59	--	1
Settlement, 5-day, %	T 59	2	5
Sieve test, %	T 59	--	0.30
Distillation test:[1]	T 59		
Residue by distillation, % by wt.		50	--
Oil distillate, by volume of emulsion		--	1.0
Test on residue from distillation:			
Penetration, 77ºF, 100 g, 5 sec.	T 49	--	20
Solubility in trichloroethylene, %	T 44	97.5	--
Softening point, ºF	T 53	150	
Dynamic shear, G*/sin(δ), 82°C, 10 rad/s, kPa	T 315	1.0	--

1. Exception to AASHTO T-59: Bring the temperature on the lower thermometer slowly to 350ºF ± 10ºF. Maintain at this temperature for 20 min. Complete total distillation in 60 ± 5 min. from first application of heat.

Special Provision to Item 300
Asphalts, Oils, and Emulsions

Item 300, “Asphalts, Oils, and Emulsions,” of the Standard Specifications is amended with respect to the clauses cited below. No other clauses or requirements of this Item are waived or changed.

Article 300.2., “Materials.” The first paragraph is voided and replaced by the following.

Provide asphalt materials that meet the stated requirements when tested in accordance with the referenced Department, AASHTO, and ASTM test methods. Use asphalt containing recycled materials only if the recycled components meet the requirements of Article 6.9, “Recycled Materials.” Provide asphalt materials that the Department has preapproved for use in accordance with Tex-545-C, “Asphalt Binder Quality Program.”

Inform the Department of all additives or modifiers included in the asphalt binder as part of the facility quality plan, as required by Tex-545-C, “Asphalt Binder Quality Program,” and provide that information to Department personnel. The Department reserves the right to prohibit the use of any asphalt additive or modifier.

Section 300.2.10. “Performance-Graded Binders,” is supplemented by the following:

Limit the use of polyphosphoric acid to no more than 0.5% by weight of the asphalt binder.

Limit the use of re-refined engine oil bottoms to no more than 5.0% by weight of the asphalt binder.

Special Provision to Item 421
Hydraulic Cement Concrete

Item 421, "Hydraulic Cement Concrete" of the Standard Specifications is amended with respect to the clauses cited below. No other clauses or requirements of this Item are waived or changed.

Article 421.4.2, "Mix Design Proportioning," Table 8 is voided and replaced by the following.

Table 8
Concrete Classes

Class of Concrete	Design Strength,[1] Min f'_c (psi)	Max w/cm Ratio	Coarse Aggregate Grades[2,3,4]	Cement Types	Mix Design Options	Exceptions to Mix Design Options	General Usage[5]
A	3,000	0.60	1–4, 8	I, II, I/II, IL, IP, IS, IT, V	1, 2, 4, & 7	When the cementitious material content does not exceed 520 lb./cu. yd., Class C fly ash may be used instead of Class F fly ash.	Curb, gutter, curb & gutter, conc. retards, sidewalks, driveways, back-up walls, anchors, non-reinforced drilled shafts
B	2,000	0.60	2–7				Riprap, traffic signal controller foundations, small roadside signs, and anchors
C[6]	3,600	0.45	1–6	I, II, I/II, IP, IS, IT[7], V	1–8		Drilled shafts, bridge substructure, bridge railing, culverts except top slab of direct traffic culverts, headwalls, wing walls, inlets, manholes, concrete traffic barrier
E	3,000	0.50	2–5	I, II, I/II, IL, IP, IS, IT[7], V	1–8	When the cementitious material content does not exceed 520 lb./cu. yd., Class C fly ash may be used instead of Class F fly ash.	Seal concrete
F[6]	Note[8]	0.45	2–5	I, II, I/II, IP, IS, IT[7], V			Railroad structures; occasionally for bridge piers, columns, or bents
H[6]	Note[8]	0.45	3–6	I, II, I/II, III, IP, IS, IT[7], V	1–5	Do not use Type III cement in mass placement concrete. Up to 20% of blended cement may be replaced with listed SCMs when Option 4 is used for precast concrete.	Precast concrete, post-tension members
S[6]	4,000	0.45	2–5	I, II, I/II, IP, IS, IT[7], V	1–8		Bridge slabs, top slabs of direct traffic culverts, approach slabs
P	See Item 360, "Concrete Pavement."	0.50	2–3	I, II, I/II, IL, IP, IS, IT, V	1–8	When the cementitious material content does not exceed 520 lb./cu. yd., Class C fly ash may be used instead of Class F fly ash.	Concrete pavement
CO[6]	4,600	0.40	6	I, II, I/II, IP, IS, IT[7], V	1–8		Bridge deck concrete overlay
LMC[6]	4,000	0.40	6–8				Latex-modified concrete overlay
SS[6]	3,600	0.45	4–6		1-8	Use a minimum cementitious material content of 658 lb./cu. yd. of concrete. Limit the alkali loading to 4.0 lbs./cu. yd. or less when using option 7.	Slurry displacement shafts, underwater drilled shafts

Class of Concrete	Design Strength,[1] Min f'c (psi)	Max w/cm Ratio	Coarse Aggregate Grades[2,3,4]	Cement Types	Mix Design Options	Exceptions to Mix Design Options	General Usage[5]
K[6]	Note[8]	0.40	Note[8]	I, II, I/II, III IP, IS, IT[7], V	1-8		Note[8]
HES	Note[8]	0.45	Note[8]	I, IL, II, I/II, III		Mix design options do not apply. 700 lb. of cementitious material per cubic yard limit does not apply.	Concrete pavement, concrete pavement repair
"X" (HPC) [6,9,10]	Note[11]	0.45	Note[11]	I, II, I/II, III IP, IS, IT[7], V	1–5, & 8	Maximum fly ash replacement for Options 1 and 3 may be increased to 45%. Up to 20% of a blended cement may be replaced with listed SCMs for Option 4. Do not use Option 8 for precast concrete.	
"X" (SRC) [6,9,10]	Note[11]	0.45	Note[11]	I/II, II, IP, IS, IT[7], V	1–4 , & 7	Do not use Class C Fly Ash. Type III-MS may be used where allowed. Type I and Type III cements may be used with Options 1–3, with a maximum w/cm of 0.40. Up to 20% of blended cement may be replaced with listed SCMs when Option 4 is used for precast concrete. Do not use Option 7 for precast concrete[12].	

1. Design strength must be attained within 56 days.
2. Do not use Grade 1 coarse aggregate except in massive foundations with 4 in. minimum clear spacing between reinforcing steel bars, unless otherwise permitted. Do not use Grade 1 aggregate in drilled shafts.
3. Use Grade 8 aggregate in extruded curbs unless otherwise approved.
4. Other grades of coarse aggregate maybe used in non-structural concrete classes when allowed by the Engineer.
5. For information only.
6. Structural concrete classes.
7. Do not use Type IT cements containing > 5% limestone.
8. As shown on the plans or specified.
9. "X" denotes class of concrete shown on the plans or specified.
10. (HPC): High Performance Concrete, (SRC): Sulfate Resistant Concrete.
11. Same as class of concrete shown on the plans.
12. Option 7 will be allowed for precast concrete products included in Items 462, 464, and 465.

Article 421.4.2.2, "Aggregates," is supplemented by the following.

Use the following equation to determine if the aggregate combination meets the sand equivalency requirement when blending fine aggregate or using an intermediate aggregate:

$$\frac{(SE_1 \times P_1) + (SE_2 \times P_2) + (SE_{ia} \times P_{ia})}{100} \geq 80\%$$

where:
SE_1 = sand equivalency (%) of fine aggregate 1
SE_2 = sand equivalency (%) of fine aggregate 2
SE_{ia} = sand equivalency (%) of intermediate aggregate passing the 3/8 in. sieve
P_1 = percent by weight of fine aggregate 1 of the fine aggregate blend
P_2 = percent by weight of fine aggregate 2 of the fine aggregate blend
P_{ia} = percent by weight of intermediate aggregate passing the 3/8 in. sieve

Article 421.4.2.5, "Slump," the second paragraph is voided and not replaced.

Article 421.4.2.7, "Optimized Aggregate Gradation (OAG) Concrete," the first sentence of the first paragraph is voided and replaced by the following.

The gradations requirements in Table 4 and Table 6 do not apply when OAG concrete is specified or used by the Contractor unless otherwise shown on the plans.

Article 421.4.6.2, "Delivering Concrete," the fifth paragraph is voided and replaced with the following:

Begin the discharge of concrete delivered in truck mixers within the times listed in Table 14. Concrete delivered after these times, and concrete that has not begun to discharge within these times will be rejected.

Article 421.4.8.3, "Testing of Fresh Concrete," is voided and replaced with the following:

Testing Concrete. The Engineer, unless specified in other Items or shown on the plans, will test the fresh and hardened concrete in accordance with the following methods:

- Slump. Tex-415-A
- Air Content. Tex 414-A or Tex-416-A
- Temperature. Tex-422-A
- Making and Curing Strength Specimens. Tex-447-A
- Compressive Strength. Tex-418-A
- Flexural Strength. Tex-448-A
- Maturity. Tex-426-A

Flexural strength and maturity specimens will not be made unless specified in other items or shown on the plans. Concrete not meeting fresh concrete testing requirements will be rejected. Fresh concrete exhibiting segregation and excessive bleeding will be rejected.

Article 421.4.8.3.1. "Job-Control Testing," is voided and not replaced.

Special Provision to Item 502
Barricades, Signs, and Traffic Handling

For this project, Item 502, "Barricades, Signs, and Traffic Handling," of the Standard Specifications is amended with respect to the clauses cited below. No other clauses or requirements of this Item are waived or changed.

Article 502.4.1.3., "Maximum Total Payment Prior to Acceptance" is voided and replaced by the following:

> **Maximum Total Payment Prior to Completion.** The total payment for this Item will not exceed 10% of the total Contract amount before final completion in accordance with General Conditions of Agreement, Section 5.06, "Final Completion and Acceptance." The remaining balance will be paid in accordance with Section 502.4.1.5, "Balance Due."

Article 502.4.1.5., "Balance Due" is voided and replaced by the following:

> **Balance Due.** If all work is complete in accordance with General Conditions of Agreement, Section 5.06, "Final Completion and Acceptance," before payment of the amount allowed by this Article, the balance due will be paid with the Final Payment.

Special Provision 506-WC001

Temporary Erosion, Sedimentation, and Environmental Controls

For this project, Item 506, "Temporary Erosion, Sedimentation, and Environmental Controls," of the Standard Specifications, is hereby voided and replaced with the following.

PART 1 – GENERAL

1.1 DESCRIPTION

Install, maintain, and remove erosion, sedimentation, and environmental control measures to prevent or reduce the discharge of pollutants in accordance with the Storm Water Pollution Prevention Plan (SW3P) in the plans and the Texas Pollutant Discharge Elimination System (TPDES) General Permit TXR150000.

1.2 MEASUREMENT

A. Rock Filter Dams

Installation or removal of rock filter dams will be measured by the foot or by the cubic yard. The measured volume will include sandbags when used.

1. Linear Measurement

When rock filter dams are measured by the foot, measurement will be along the centerline of the top of the dam.

2. Volume Measurement

When rock filter dams are measured by the cubic yard, measurement will be based on the volume of rock computed by the method of average end areas.

a. Installation: Measurement will be made in final position.

b. Removal: Measurement will be made at the point of removal.

B. Temporary Pipe Slope Drains

Temporary pipe slope drains will be measured by the foot.

C. Temporary Paved Flumes

Temporary paved flumes will be measured by the square yard of surface area. The measured area will include the energy dissipater at the flume outlet.

D. Construction Exits

Construction exits will be measured by the square yard of surface area.

E. Earthwork for Erosion and Sediment Control

1. Equipment and Labor Measurement

   Equipment and labor used will be measured by the actual number of hours the equipment is operated and the labor is engaged in the work.

2. Volume Measurement

   a. In Place

      i. Excavation

         Excavation will be measured by the cubic yard in its original position and the volume computed by the method of average end areas.

      ii. Embankment

         Embankment will be measured by the cubic yard in its final position by the method of average end areas. The volume of embankment will be determined between:

         - the original ground surfaces or the surface upon that the embankment is to be constructed for the feature and
         - the lines, grades, and slopes of the accepted embankment for the feature.

   b. In Vehicles

      Excavation and embankment quantities will be combined and paid for under "Earthwork (Erosion and Sediment Control, In Vehicle)." Excavation will be measured by the cubic yard in vehicles at the point of removal. Embankment will be measured by the cubic yard in vehicles measured at the point of delivery. Shrinkage or swelling factors will not be considered in determining the calculated quantities.

F. Construction Perimeter Fence

   Construction perimeter fence will be measured by the foot.

G. Sandbags for Erosion Control

   Sandbags will be measured as each sandbag or by the foot along the top of sandbag berms or dams.

H. Temporary Sediment-Control Fence

   Installation or removal of temporary sediment-control fence will be measured by the foot.

I. Biodegradable Erosion Control Logs

   Installation or removal of biodegradable erosion control logs will be measured by the foot along the centerline of the top of the control logs.

J. Vertical Tracking

   Vertical tracking will not be measured or paid for directly, but is considered subsidiary to this Item.

1.3 PAYMENT

The following will not be paid for directly, but are subsidiary to pertinent Items:

- erosion-control measures for Contractor project-specific locations (PSLs) inside and outside the right-of-way (such as construction and haul roads, field offices, equipment and supply areas, plants, and material sources);

- removal of litter, unless a separate pay item is shown on the plans;
- repair to devices and features damaged by Contractor operations;
- added measures and maintenance needed due to negligence, carelessness, lack of maintenance, and failure to install permanent controls;
- removal and reinstallation of devices and features needed for the convenience of the Contractor;
- finish grading and dressing upon removal of the device; and
- minor adjustments including, but not limited to plumbing posts, reattaching fabric, minor grading to maintain slopes on an erosion embankment feature, or moving small numbers of sandbags.

Stabilization of disturbed areas will be paid for under pertinent Items.

Furnishing and installing pipe for outfalls associated with sediment traps and ponds will not be paid for directly, but is subsidiary to the excavation and embankment under this Item.

A. Rock Filter Dams

The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid as follows:

1. Installation

Installation will be paid for as "Rock Filter Dams (Install)" of the type specified. This price is full compensation for furnishing and operating equipment, finish backfill and grading, lacing, proper disposal, labor, materials, tools, and incidentals.

2. Removal

Removal will be paid for as "Rock Filter Dams (Remove)." This price is full compensation for furnishing and operating equipment, proper disposal, labor, materials, tools, and incidentals.

When the Owner directs that the rock filter dam installation or portions thereof be replaced, payment will be made at the unit price bid for "Rock Filter Dams (Remove)" and for "Rock Filter Dams (Install)" of the type specified. This price is full compensation for furnishing and operating equipment, finish backfill and grading, lacing, proper disposal, labor, materials, tools, and incidentals.

B. Temporary Pipe Slope Drains

The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Temporary Pipe Slope Drains" of the size specified. This price is full compensation for furnishing materials, removal and disposal, furnishing and operating equipment, labor, tools, and incidentals.

Removal of temporary pipe slope drains will not be paid for directly, but is subsidiary to the installation Item. When the Owner directs that the pipe slope drain installation or portions thereof be replaced, payment will be made at the unit price bid for "Temporary Pipe Slope Drains" of the size specified, which is full compensation for the removal and reinstallation of the pipe drain.

Earthwork required for the pipe slope drain installation, including construction of the sediment trap, will be measured and paid for under "Earthwork for Erosion and Sediment Control."

Riprap concrete or stone, when used as an energy dissipater or as a stabilized sediment trap, will be measured and paid for in accordance with Item 432, "Riprap."

C. Temporary Paved Flumes

The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Temporary Paved Flume (Install)" or "Temporary Paved Flume (Remove)." This price is full compensation for furnishing and placing materials, removal and disposal, equipment, labor, tools, and incidentals.

When the Owner directs that the paved flume installation or portions thereof be replaced, payment will be made at the unit prices bid for "Temporary Paved Flume (Remove)" and "Temporary Paved Flume (Install)." These prices are full compensation for the removal and replacement of the paved flume and for equipment, labor, tools, and incidentals.

Earthwork required for the paved flume installation, including construction of a sediment trap, will be measured and paid for under "Earthwork for Erosion and Sediment Control."

D. Construction Exits

Contractor-required construction exits from off right-of-way locations or on right-of-way PSLs will not be paid for directly, but are subsidiary to pertinent Items.

The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" for construction exits needed on right-of-way access to work areas required by the Owner will be paid for at the unit price bid for "Construction Exits (Install)" of the type specified or "Construction Exits (Remove)." This price is full compensation for furnishing and placing materials, excavating, removal and disposal, cleaning vehicles, labor, tools, and incidentals.

When the Owner directs that a construction exit or portion thereof be removed and replaced, payment will be made at the unit prices bid for "Construction Exit (Remove)" and "Construction Exit (Install)" of the type specified. These prices are full compensation for the removal and replacement of the construction exit and for equipment, labor, tools, and incidentals.

Construction of sediment traps used in conjunction with the construction exit will be measured and paid for under "Earthwork for Erosion and Sediment Control."

E. Earthwork for Erosion and Sediment Control

1. Initial Earthwork for Erosion and Sediment Control

The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Excavation (Erosion and Sediment Control, In Place)," "Embankment (Erosion and Sediment Control, In Place)," "Excavation (Erosion and Sediment Control, In Vehicle)," "Embankment (Erosion and Sediment Control, (In Vehicle)," or "Earthwork (Erosion and Sediment Control, In Vehicle)."

This price is full compensation for excavation and embankment, including hauling, disposal of material not used elsewhere on the project; embankments, including furnishing material from approved sources and construction of erosion-control features; and equipment, labor, tools, and incidentals.

Sprinkling and rolling required by this Item will not be paid for directly, but will be subsidiary to this Item.

2. Maintenance Earthwork for Erosion and Sediment Control for Cleaning and Restoring Control Measures

The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid under a Contractor Force Account Item from invoice provided to the Owner.

This price is full compensation for excavation, embankment, and re-grading, including removal of accumulated sediment in various erosion control installations as directed, hauling, and disposal of material not used elsewhere on the project, excavation for construction of erosion-control features, embankments, including furnishing material from approved sources and construction of erosion-control features, and equipment, labor, tools, and incidentals.

Earthwork needed to remove and obliterate erosion-control features will not be paid for directly, but is subsidiary to pertinent Items unless otherwise shown on the plans.

Sprinkling and rolling required by this Item will not be paid for directly, but will be subsidiary to this Item.

F. Construction Perimeter Fence

The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Construction Perimeter Fence." This price is full compensation for furnishing and placing the fence, digging, fence posts, wire, and flagging, removal and disposal, and materials, equipment, labor, tools, and incidentals.

Removal of construction perimeter fence will be not paid for directly, but is subsidiary to the installation Item. When the Owner directs that the perimeter fence installation or portions thereof be removed and replaced, payment will be made at the unit price bid for "Construction Perimeter Fence," which is full compensation for the removal and reinstallation of the construction perimeter fence.

G. Sandbags for Erosion Control

Sandbags will be paid for at the unit price bid for "Sandbags for Erosion Control" (of the height specified when measurement is by the foot). This price is full compensation for materials, placing sandbags, removal and disposal, equipment, labor, tools, and incidentals.

Removal of sandbags will not be paid for directly but is subsidiary to the installation Item. When the Owner directs that the sandbag installation or portions thereof be replaced, payment will be made at the unit price bid for "Sandbags for Erosion Control," which is full compensation for the reinstallation of the sandbags.

H. Temporary Sediment-Control Fence

The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid as follows:

1. Installation

Installation will be paid for as "Temporary Sediment-Control Fence (Install)." This price is full compensation for furnishing and operating equipment, finish backfill and grading, lacing, proper disposal, labor, materials, tools, and incidentals.

2. Removal

Removal will be paid for as "Temporary Sediment-Control Fence (Remove)." This price is full compensation for furnishing and operating equipment, proper disposal, labor, materials, tools, and incidentals.

I. Biodegradable Erosion Control Logs

The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid as follows:

1. Installation

   Installation will be paid for as "Biodegradable Erosion Control Logs (Install)" of the size specified. This price is full compensation for furnishing and operating equipment, finish backfill and grading, staking, proper disposal, labor, materials, tools, and incidentals.

2. Removal

   Removal will be paid for as "Biodegradable Erosion Control Logs (Remove)." This price is full compensation for furnishing and operating equipment, proper disposal, labor, materials, tools, and incidentals.

J. Vertical Tracking

Vertical tracking will not be measured or paid for directly, but is considered subsidiary to this Item.

PART 2 – PRODUCTS

2.1 MATERIALS

Furnish materials in accordance with the following:

- Item 161, "Compost"
- Item 432, "Riprap"
- Item 556, "Pipe Underdrains"

A. Rock Filter Dams

1. Aggregate

   Furnish aggregate with hardness, durability, cleanliness, and resistance to crumbling, flaking, and eroding acceptable to the Owner. Provide the following:

   a. Type 1, Type 2, and Type 4 rock filter dams: Use three (3) inches to six (6) inches aggregate.

   b. Type 3 rock filter dams: Use four (4) inches to eight (8) inches aggregate.

2. Wire

   Provide minimum twenty (20) gauge galvanized wire for the steel wire mesh and tie wires for Types 2 and Type 3 rock filter dams. Type 4 dams require:

   a. a double-twisted, hexagonal weave with a nominal mesh opening of 2½ inches by 3¼ inches;

   b. minimum 0.0866 inches steel wire for netting;

   c. minimum 0.1063 inches steel wire for selvages and corners; and

   d. minimum 0.0866 inches for binding or tie wire.

3. Sandbag Material

   Furnish sandbags meeting Section 506.2.8., "Sandbags," except that any gradation of aggregate may be used to fill the sandbags.

B. Temporary Pipe Slope Drains

Provide corrugated metal pipe, polyvinyl chloride (PVC) pipe, flexible tubing, watertight connection bands, grommet materials, prefabricated fittings, and flared entrance sections that conform to the plans. Recycled and other materials meeting these requirements are allowed if approved.

Furnish concrete in accordance with Item 432, "Riprap."

C. Temporary Paved Flumes

Furnish asphalt concrete, hydraulic cement concrete, or other comparable non-erodible material that conforms to the plans. Provide rock or rubble with a minimum diameter of six (6) inches and a maximum volume of one-half (½) $ft.^3$ for the construction of energy dissipaters.

D. Construction Exits

Provide materials that meet the details shown on the plans and this Section.

1. Rock Construction Exit

Provide crushed aggregate for long-term and short-term construction exits. Furnish aggregates that are clean, hard, durable, and free from adherent coatings such as salt, alkali, dirt, clay, loam, shale, soft or flaky materials, and organic and injurious matter. Use four (4) inch to eight (8) inch aggregate for Type 1. Use two (2) inch to four (4) inch aggregate for Type 3.

2. Timber Construction Exit

Furnish No. 2 quality or better railroad ties and timbers for long-term construction exits, free of large and loose knots, and treated to control rot. Fasten timbers with nuts and bolts or lag bolts, of at least one-half (½) inch diameter, unless otherwise shown on the plans or allowed. Provide plywood or pressed wafer board at least one-half (½) inch thick for short-term exits.

3. Foundation Course

Provide a foundation course consisting of flexible base, bituminous concrete, hydraulic cement concrete, or other materials as shown on the plans or directed.

E. Embankment for Erosion Control

Provide rock, loam, clay, topsoil, or other earth materials that will form a stable embankment to meet the intended use.

F. Pipe

Provide pipe outlet material in accordance with Item 556, "Pipe Underdrains," and details shown on the plans.

G. Construction Perimeter Fence

1. Posts

Provide essentially straight wood or steel posts that are at least sixty (60) inches long. Furnish soft wood posts with a minimum diameter of three (3) inches or use nominal two (2) inch by four (4) inch boards. Furnish hardwood posts with a minimum cross-section of 1½ inches by $1^1/_5$ inches. Furnish T-shaped or L-shaped steel posts with a minimum weight of 0.5 lbs. per foot.

2. Fence

   Provide orange construction fencing as approved.

3. Fence Wire

   Provide eleven (11) gauge or larger galvanized smooth or twisted wire. Provide sixteen (16) gauge or larger tie wire.

4. Flagging

   Provide brightly-colored flagging that is fade-resistant and at least ¾ inches wide to provide maximum visibility both day and night.

5. Staples

   Provide staples with a crown at least one-half (½) inch wide and legs at least one-half (½) inch long.

6. Used Materials

   Previously used materials meeting the applicable requirements may be used if approved.

H. Sandbags

Provide sandbag material of polypropylene, polyethylene, or polyamide woven fabric with a minimum unit weight of four (4) oz. per square yard, a Mullen burst-strength exceeding 300 psi, and an ultraviolet stability exceeding 70%.

Use natural coarse sand or manufactured sand meeting the gradation given in Table 1 to fill sandbags. Filled sandbags must be twenty-four (24) inches to thirty (30) inches long, sixteen (16) inches to eighteen (18) inches wide, and six (6) inches to eight (8) inches thick.

Table 1: Sand Gradation

Sieve #	Retained (% by Weight)
4	Maximum 3%
100	Minimum 80%
200	Minimum 95%

Aggregate may be used instead of sand for situations where sandbags are not adjacent to traffic. The aggregate size shall not exceed $^{3}/_{8}$ inch.

I. Temporary Sediment Control Fence

Provide a net-reinforced fence using woven geo-textile fabric. Logos visible to the traveling public will not be allowed.

1. Fabric

   Provide fabric materials in accordance with DMS-6230, “Temporary Sediment Control Fence Fabric.”

2. Posts

   Provide essentially straight wood or steel posts with a minimum length of 48 inches, unless otherwise shown on the plans. Furnish soft wood posts at least three (3) inches in diameter or use nominal two (2) inch by four (4) inch boards. Furnish hardwood posts with a minimum cross-section of 1½ inches by 1½ inches. Furnish T-shaped or L-shaped steel posts with a minimum weight of 1.3 lbs. per foot.

3. Net Reinforcement

   Provide net reinforcement of at least 12½ gauge galvanized welded wire mesh, with a maximum opening size of two (2) inches by four (4) inches, at least twenty-four (24) inches wide, unless otherwise shown on the plans.

4. Staples

   Provide staples with a crown at least ¾ inch wide and legs one-half (½) inch long.

5. Used Materials

   Use recycled material meeting the applicable requirements if approved.

J. Biodegradable Erosion Control Logs

1. Core Material

   Furnish core material that is biodegradable or recyclable. Use compost, mulch, aspen excelsior wood fibers, chipped site vegetation, agricultural rice or wheat straw, coconut fiber, 100% recyclable fibers, or any other acceptable material unless specifically called out on the plans. Permit no more than 5% of the material to escape from the containment mesh. Furnish compost meeting the requirements of Item 161, "Compost."

2. Containment Mesh

   Furnish containment mesh that is 100% biodegradable, photodegradable, or recyclable such as burlap, twine, UV photodegradable plastic, polyester, or any other acceptable material.

   Furnish biodegradable or photodegradable containment mesh when log will remain in place as part of a vegetative system.

   Furnish recyclable containment mesh for temporary installations.

3. Size

   Furnish biodegradable erosion control logs with diameters shown on the plans or as directed. Stuff containment mesh densely so logs do not deform.

PART 3 – EXECUTION

3.1 Construction

A. Contractor Responsibilities

Implement the Owner's SW3P for the project in accordance with the plans and specifications, TPDES General Permit TXR150000, and as directed by the Owner. Develop and implement an SW3P for project-specific material supply plants within and outside of the Owner's right-of-way in accordance with the specific or general storm water permit requirements. Prevent water pollution from storm water associated with construction activity from entering any surface water or private property on or adjacent to the project site.

B. General

1. Phasing

Implement control measures in the area to be disturbed before beginning construction or as directed. Limit the disturbance to the area shown on the plans or as directed. If, in the opinion of the Owner, the Contractor cannot control soil erosion and sedimentation resulting from construction operations, the Owner will limit the disturbed area to that which the Contractor is able to control. Minimize disturbance to vegetation.

2. Maintenance

Immediately correct ineffective control measures. Implement additional controls as directed. Remove excavated material within the time requirements specified in the applicable storm water permit.

3. Stabilization

Stabilize disturbed areas where construction activities will be temporarily stopped in accordance with the applicable storm water permit. Establish a uniform vegetative cover. The project will not be accepted until a 70% density of existing adjacent undisturbed areas is obtained, unless otherwise shown on the plans. When shown on the plans, the Owner may accept the project when adequate controls are in place that will control erosion, sedimentation, and water pollution until sufficient vegetative cover can be established.

4. Finished Work

Upon acceptance of vegetative cover, remove and dispose of all temporary control measures, temporary embankments, bridges, matting, falsework, piling, debris, or other obstructions placed during construction that are not a part of the finished work or as directed.

5. Restricted Activities and Required Precautions

Do not discharge onto the ground or surface waters any pollutants such as chemicals, raw sewage, fuels, lubricants, coolants, hydraulic fluids, bitumens, or any other petroleum product. Operate and maintain equipment on-site to prevent actual or potential water pollution. Manage, control, and dispose of litter on-site such that no adverse impacts to water quality occur. Prevent dust from creating a potential or actual unsafe condition, public nuisance, or condition endangering the value, utility, or appearance of any property. Wash out concrete trucks only as described in the TPDES General Permit TXR150000. Utilize appropriate controls to minimize the off-site transport of suspended sediments and other pollutants if it is necessary to pump or channel standing water (i.e. dewatering). Prevent discharges that would contribute to a violation of Edwards Aquifer Rules, water quality standards, the impairment of a listed water body, or other state or federal law.

C. Installation, Maintenance, and Removal Work

Perform work in accordance with the SW3P, according to manufacturers' guidelines, and in accordance with the TPDES General Permit TXR150000. Install and maintain the integrity of temporary erosion and sedimentation control devices to accumulate silt and debris until soil disturbing activities are completed and permanent erosion control features are in place or the disturbed area has been adequately stabilized as determined by the Owner. If a device ceases to function as intended, repair or replace the device or portions thereof as necessary. Remove sediment, debris, and litter. When approved, sediments may be disposed of within embankments, or in the right-of-way in areas where the material will not contribute to further siltation. Dispose of removed material in accordance with federal, state, and local regulations.

Remove devices upon approval or as directed. Finish-grade and dress the area upon removal. Stabilize disturbed areas in accordance with the permit and as shown on the plans or as directed. Materials removed are considered consumed by the project. Retain ownership of stockpiled material and remove it from the project when new installations or replacements are no longer required.

1. Rock Filter Dams for Erosion Control

   Remove trees, brush, stumps, and other objectionable material that may interfere with the construction of rock filter dams. Place sandbags as a foundation when required or at the Contractor's option.

   Place the aggregate to the lines, height, and slopes specified, without undue voids for Types 1, 2, 3, and 5. Place the aggregate on the mesh and then fold the mesh at the upstream side over the aggregate and secure it to itself on the downstream side with wire ties or hog rings for Types 2 and Type 3, or as directed. Place rock filter dams perpendicular to the flow of the stream or channel unless otherwise directed. Construct filter dams according to the following criteria unless otherwise shown on the plans:

   a. Type 1: Non-reinforced

      i. Height: At least eighteen (18) inches measured vertically from existing ground to top of filter dam

      ii. Top Width: At least two (2) ft.

      iii. Slopes: No steeper than 2:1

   b. Type 2: Reinforced

      i. Height: At least eighteen (18) inches measured vertically from existing ground to top of filter dam

      ii. Top Width: At least two (2) ft.

      iii. Slopes: No steeper than 2:1

   c. Type 3: Reinforced

      i. Height: At least thirty-six (36) inches measured vertically from existing ground to top of filter dam

      ii. Top Width: At least two (2) ft.

      iii. Slopes: No steeper than 2:1

   d. Type 4: Sack Gabions

      Unfold sack gabions and smooth out kinks and bends. Connect the sides by lacing in a single loop–double loop pattern on four (4) inch to 5 inch spacing for vertical filling. Pull the end lacing rod at one end until tight, wrap around the end, and twist four (4) times. Fill with stone at the filling end, pull the rod tight, cut the wire with approximately six (6) inches remaining, and twist wires four (4) times.

      Place the sack flat in a filling trough, fill with stone, connect sides, and secure ends as described above for horizontal filling.

      Lift and place without damaging the gabion. Shape sack gabions to existing contours.

   e. Type 5: Provide rock filter dams as shown on the plans.

2. Temporary Pipe Slope Drains

   Install pipe with a slope as shown on the plans or as directed. Construct embankment for the drainage system in eight (8) inch lifts to the required elevations. Hand-tamp the soil around and under the entrance section to the top of the embankment as shown on the plans or as directed. Form the top of the embankment or earth dike over the pipe slope drain at least one (1) ft. higher than the top of the inlet pipe at all points. Secure the pipe with hold-downs or hold-down grommets spaced a maximum of ten (10) ft. on

center. Construct the energy dissipaters or sediment traps as shown on the plans or as directed. Construct the sediment trap using concrete or rubble riprap in accordance with Item 432, "Riprap," when designated on the plans.

3. Temporary Paved Flumes

Construct paved flumes as shown on the plans or as directed. Provide excavation and embankment (including compaction of the subgrade) of material to the dimensions shown on the plans unless otherwise indicated. Install a rock or rubble riprap energy dissipater, constructed from the materials specified above, to a minimum depth of nine (9) inches at the flume outlet to the limits shown on the plans or as directed.

4. Construction Exits

Prevent traffic from crossing or exiting the construction site or moving directly onto a public roadway, alley, sidewalk, parking area, or other right-of-way areas other than at the location of construction exits when tracking conditions exist. Construct exits for either long-term or short-term use.

a. Long-Term

Place the exit over a foundation course as required. Grade the foundation course or compacted subgrade to direct runoff from the construction exits to a sediment trap as shown on the plans or as directed. Construct exits with a width of at least fourteen (14) ft. for one-way and twenty (20) ft. for two-way traffic for the full width of the exit or as directed.

i. Type 1: Construct to a depth of at least eight (8) inches using crushed aggregate as shown on the plans or as directed.

ii. Type 2: Construct using railroad ties and timbers as shown on the plans or as directed.

b. Short-Term

i. Type 3: Construct using crushed aggregate, plywood, or wafer board. This type of exit may be used for daily operations where long-term exits are not practical.

ii. Type 4: Construct as shown on the plans or as directed.

5. Earthwork for Erosion Control

Perform excavation and embankment operations to minimize erosion and to remove collected sediments from other erosion control devices.

a. Excavation and Embankment for Erosion Control Features

Place earth dikes, swales, or combinations of both along the low crown of daily lift placement, or as directed, to prevent runoff spillover. Place swales and dikes at other locations as shown on the plans or as directed to prevent runoff spillover or to divert runoff. Construct cuts with the low end blocked with undisturbed earth to prevent erosion of hillsides. Construct sediment traps at drainage structures in conjunction with other erosion control measures as shown on the plans or as directed.

Create a sediment basin, where required, providing 3,600 cu. ft. of storage per acre drained, or equivalent control measures for drainage locations that serve an area with ten (10) or more disturbed acres at one time, not including off-site areas.

b. Excavation of Sediment and Debris

Remove sediment and debris when accumulation affects the performance of the devices, after a rain, and when directed.

6. Construction Perimeter Fence

Construct, align, and locate fencing as shown on the plans or as directed.

a. Installation of Posts

Embed posts eighteen (18) inches deep or adequately anchor in rock, with a spacing of eight (8) ft. to ten (10) ft.

b. Wire Attachment

Attach the top wire to the posts at least three (3) ft. from the ground. Attach the lower wire midway between the ground and the top wire.

c. Flag Attachment

Attach flagging to both wire strands midway between each post. Use flagging at least eighteen (18) inches long. Tie flagging to the wire using a square knot.

7. Sandbags for Erosion Control

Construct a berm or dam of sandbags that will intercept sediment-laden storm water runoff from disturbed areas, create a retention pond, detain sediment, and release water in sheet flow. Fill each bag with sand so that at least the top six (6) inches of the bag is unfilled to allow for proper tying of the open end. Place the sandbags with their tied ends in the same direction. Offset subsequent rows of sandbags one-half (½) the length of the preceding row. Place a single layer of sandbags downstream as a secondary debris trap. Place additional sandbags as necessary or as directed for supplementary support to berms or dams of sandbags or earth.

8. Temporary Sediment-Control Fence

Provide temporary sediment-control fence near the downstream perimeter of a disturbed area to intercept sediment from sheet flow. Incorporate the fence into erosion-control measures used to control sediment in areas of higher flow. Install the fence as shown on the plans, as specified in this Section, or as directed.

a. Installation of Posts

Embed posts at least eighteen (18) inches deep, or adequately anchor if in rock, with a spacing of six (6) ft. to eight (8) ft. and install on a slight angle toward the runoff source.

b. Fabric Anchoring

Dig trenches along the uphill side of the fence to anchor six (6) inches to eight (8) inches of fabric. Provide a minimum trench cross-section of six (6) inches by six (6) inches. Place the fabric against the side of the trench and align approximately two (2) inches of fabric along the bottom in the upstream direction. Backfill the trench, then hand-tamp.

c. Fabric and Net Reinforcement Attachment

Attach the reinforcement to wooden posts with staples, or to steel posts with T-clips, in at least four (4) places equally spaced unless otherwise shown on the plans. Sewn vertical pockets may be used to attach reinforcement to end posts. Fasten the fabric to the top strand of reinforcement by hog rings or cord every fifteen (15) inches or less.

d. Fabric and Net Splices

Locate splices at a fence post with a minimum lap of six (6) inches attached in at least six (6) places equally spaced unless otherwise shown on the plans. Do not locate splices in concentrated flow areas.

Requirements for installation of used temporary sediment-control fence include the following:

i. fabric with minimal or no visible signs of biodegradation (weak fibers);

ii. fabric without excessive patching (more than one (1) patch every fifteen (15) ft. to twenty (20) ft.);

iii. posts without bends; and

iv. backing without holes.

9. Biodegradable Erosion Control Logs

Install biodegradable erosion control logs near the downstream perimeter of a disturbed area to intercept sediment from sheet flow. Incorporate the biodegradable erosion control logs into the erosion measures used to control sediment in areas of higher flow. Install, align, and locate the biodegradable erosion control logs as specified below, as shown in plans or as directed.

Secure biodegradable erosion control logs in a method adequate to prevent displacement as a result of normal rain events, prevent damage to the logs, and to the satisfaction of the Owner such that flow is not allowed under the logs. Temporarily removing and replacing biodegradable erosion logs as to facilitate daily work is allowed at the Contractor's expense.

10. Vertical Tracking

Perform vertical tracking on slopes to temporarily stabilize soil. Provide equipment with a track undercarriage capable of producing a linear soil impression measuring a minimum of twelve (12) inches long by two (2) inches to four (4) inches wide by one-half (½) inch to two (2) inches deep. Do not exceed twelve (12) inches between track impressions. Install continuous linear track impressions where the twelve (12) inches length impressions are perpendicular to the slope. Vertical tracking is required on projects where soil disturbing activities have occurred unless otherwise approved.

END OF SECTION

Special Specification 6001
Portable Changeable Message Sign

1. DESCRIPTION

Furnish, operate, and maintain portable trailer mounted changeable message sign (PCMS) units.

2. MATERIALS

Furnish new or used material in accordance with the requirements of this Item and the details shown on the plans. Provide a self-contained PCMS unit with the following:

- Sign controller
- Changeable Message Sign
- Trailer
- Power source

Paint the exterior surfaces of the power supply housing, supports, trailer, and sign with Federal Orange No. 22246 or Federal Yellow No. 13538 of Federal Standard 595C, except paint the sign face assembly flat black.

2.1. **Sign Controller**. Provide a controller with permanent storage of a minimum of 75 pre-programmed messages. Provide an external input device for random programming and storage of a minimum of 75 additional messages. Provide a controller capable of displaying up to 3 messages sequentially. Provide a controller with adjustable display rates. Enclose sign controller equipment in a lockable enclosure.

2.2. **Changeable Message Sign**. Provide a sign capable of being elevated to at least 7 ft. above the roadway surface from the bottom of the sign. Provide a sign capable of being rotated 360° and secured against movement in any position.

Provide a sign with 3 separate lines of text and 8 characters per line minimum. Provide a minimum 18 in. character height. Provide a 5 × 7 character pixel matrix. Provide a message legibility distance of 600 ft. for nighttime conditions and 800 ft. for normal daylight conditions. Provide for manual and automatic dimming light sources.

The following are descriptions for 3 screen types of PCMS:

- **Character Modular Matrix**. This screen type comprises of character blocks.
- **Continuous Line Matrix**. This screen type uses proportionally spaced fonts for each line of text.
- **Full Matrix**. This screen type uses proportionally spaced fonts, varies the height of characters, and displays simple graphics on the entire sign.

2.3. **Trailer**. Provide a 2 wheel trailer with square top fenders, 4 leveling jacks, and trailer lights. Do not exceed an overall trailer width of 96 in. Shock mount the electronics and sign assembly.

2.4. **Power Source**. Provide a diesel generator, solar powered power source, or both. Provide a backup power source as necessary.

2.5. **Cellular Telephone**. When shown on the plans, provide a cellular telephone connection to communicate with the PCMS unit remotely.

3. CONSTRUCTION

Place or relocate PCMS units as shown on the plans or as directed. The plans will show the number of PCMS units needed, for how many days, and for which construction phases.

Maintain the PCMS units in good working condition. Repair damaged or malfunctioning PCMS units as soon as possible. PCMS units will remain the property of the Contractor.

4. MEASUREMENT

This Item will be measured by each PCMS or by the day used. All PCMS units must be set up on a work area and operational before a calendar day can be considered measurable. When measurement by the day is specified, a day will be measured for each PCMS set up and operational on the worksite.

5. PAYMENT

The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Portable Changeable Message Sign." This price is full compensation for PCMS units; set up; relocating; removing; replacement parts; batteries (when required); fuel, oil, and oil filters (when required); cellular telephone charges (when required); software; and equipment, materials, tools, labor, and incidentals.

2014 Specifications

SPECIAL SPECIFICATION

9001

IMPERMEABLE LINER

1. Description.

This Item shall govern for the furnishing and installation of the impermeable geomembrane liner shown on the plans. The geomembrane shall be high-density polyethylene (HDPE) membrane. HDPE membrane shall be used as a detention pond liner to prevent stormwater from penetrating the soil in unwanted locations.

2. Materials.

(1) Geomembrane.

(a) The geomembrane liner shall be new and comprised of HDPE material manufactured of first-quality products designed and manufactured specifically for the purpose of liquid containment in hydraulic structures. The nominal thickness of the HDPE membrane shall be 30 mils and be ultraviolet resistant.

(b) The contractor shall, at the time of award, submit to the Engineer, a certification from the manufacturer of the sheeting, stating that the sheeting meets physical property requirements for the intended application.

(c) The geomembrane shall be textured on both sides. The surface of the geomembrane shall not have striation, pinholes or bubbles and shall be so produced to be free of holes, blisters, undispersed raw materials, or any contamination of foreign matter. Any defects shall be reported to the Engineer immediately after discovery and replaced or repaired under the direction of the Engineer at the Contractor’s expense. If repair is required, extrusion fusion welding technique shall be performed in accordance with the manufacturer’s recommendations.

(d) The geomembrane shall be manufactured in a minimum of 22-feet seamless widths. Labels on the roll shall identify the thickness, length, width and manufacturer’s batch and roll number. There shall be no factory seams.

(e) The geomembrane rolls shall meet the minimum values as shown in the following chart:

Geomembrane Specifications*

Property	Value	Test Method
Nominal Thk	30 mils	
Density (Min)	0.033 oz/cc	ASTM D1505
Melt Flow Index (Max)	0.014 oz/10 min	ASTM D1238
		Condition E(374 F, 4.76 lb)
Tensile Properties (Typical)		ASTM D 638 Type IV Dumb-bell at 2.0 in/min
Tensile Strength at Break	240 lb/in width	
Tensile Strength at Yield	140 lb/in width	
Elongation at Break	700%	
Elongation at Yield	13%	
Tear Resistance Initiation (Typ)	45.0 lbs	ASTM D1004 Die C
Low Temperature Brittleness (Typ)	-112 F	ASTM D746 Procedure B
Dimensional Stability Change Each Direction (Max)	+/- 2%	ASTM D1204 212 F, 1 hr
Environmental Stress Crack. (Min)	2,000 hours	ASTM D1693 (10% Igepal, 60 C)
Puncture Resistance (Typical)	80 lbs	FTMS 101 Method 2065
Coefficient of Linear Thermal Expansion (Typical)	0.00008 in/in F	ASTM D696
Thermal Stability Oxidative Induction	2,000 mins Time (OIT)	ASTM D3895 266 F 800.03 PSI Oxygen (Min)
Carbon Black	2-3%	

* Note: Minimum values, unless otherwise specified, are average roll values as reported by the specific test methods.

(f) Manufactured Roll Goods. Samples of the production run shall be taken and tested according to ASTM D638 to ensure the tensile strength at yield and break, and elongation at yield and break meet the minimum specifications. A quality control certificate shall be issued with the material.

(g) All welding material shall be of a type recommended by the manufacturer.

(2) Liner System. The liner method system shall consist of a layer of 30 mil HDPE geomembrane. A nonwoven geotextile fabric shall be placed on the top and bottom of the geomembrane for puncture protection. The liner shall be covered with a minimum of 6” of compacted top soil.

(a) The geotextile fabric shall meet the specifications in the table below.

Property	Value	Test Method
Unit weight	8 oz/sy	
Filtration Rate	0.08 in/sec	
Puncture Strength	125 lb	ASTM D-751
Mullen Burst Strength	4000 psi	ASTM D-751
Tensile Strength	200 lb	ASTM D-1682
Equiv. Opening Size	No. 80	US Standard Sieve

(b) The contractor shall, at the time of award, submit to the Engineer, a certification from the manufacturer of the sheeting, stating that the sheeting meets physical property requirements for the intended application.

(3) Material Compliance. Engineer reserves the right to inspect the manufacturer’s or the fabricator’s facilities to ensure compliance with these specifications.

3. Construction Methods.

(1) Area Subgrade Preparation. Surfaces to be lined shall be smooth and free of all rocks, stones, sticks, roots, sharp objects, or debris of any kind and shall be approved by the Engineer prior to liner installation. A 2" layer of flowable backfill shall be placed on the subgrade prior to installing the HDPE geomembrane. The surface shall provide a firm, unyielding foundation for the geomembrane with no sudden, sharp or abrupt changes or break in grade, except as shown on the plans. Bends indicated on the plans shall be field fabricated using Manufacturer's recommendation and approved by the Engineer. No standing water or excessive moisture shall be allowed. The Contractor shall certify in writing that the surface on which the geomembrane is to be installed is acceptable before commencing work.

(2) Weather Conditions. Geomembrane deployment shall proceed between ambient temperatures of 32℉ and 105℉. Placement can proceed below 32℉ only after it has been verified by the Engineer that the material can be seamed according to the specification. Geomembrane placement shall not be done during any precipitation, in the presence of excessive moisture (e.g., fog, rain, dew) or in the presence of excessive winds, as determined by the Engineer.

(3) Methods of Placement. The liner shall not be installed with any equipment or tools that can damage the liner materials by handling, trafficking, or other means. The method used to unroll the liner panels shall not cause scratches or crimps in the geomembrane and shall not damage the supporting soil or flowable backfill. Panels of geomembrane shall be placed using a method that shall minimize wrinkles.

(4) Field Seams. Individual panels of geomembrane shall be laid out and overlapped by a maximum of 4-inches for an extrusion weld prior to welding or 5-inches for a hot wedge weld prior to welding. Extreme care shall be taken in the preparation of the areas to be welded. The area to be welded shall be cleaned and prepared according to the procedures of the material manufacturer. All sheeting shall be welded together using the hot wedge welding system.

The welding equipment used shall be capable of continuously monitoring and controlling the temperatures in the zone of contact where the machine is actually fusing the lining material to ensure that changes in environmental conditions will not affect the integrity of the weld.

No "fish mouths" shall be allowed within the seam area. Where "fish mouths" occur, the material shall be cut, overlapped, and an overlap extrusion weld shall be applied.

(5) Field Seam Testing/Quality Control. The Contractor shall employ on-site physical non-destructive testing on 100 percent of all welds.

A quality-control technician furnished by the Contractor shall inspect each seam. The ECM shall be notified of all tests in order to be present to observe the testing. Any area showing a defect shall be marked and repaired in accordance with HDPE repair procedures.

A test weld one 3-feet long from each welding machine shall be run each day prior to liner welding and under the same conditions as exist for the liner welding. The test weld shall be marked with the date, ambient temperature, and welding machine number. Samples of weld ½-inch to ¾-inch wide shall be cut from the test weld and pulled by hand peel. The weld shall not peel. Seams shall exhibit a film tear bond. The weld sample shall be kept for subsequent testing on laboratory tensometer

equipment in accordance with the applicable ASTM standards. Random weld samples may be removed from the installed welded sheeting at a frequency to be approved by the Engineer.

4. **Measurement.** The impermeable liner will be paid for by the square yard. This includes all materials, welding materials, excavation for toe and top anchor trenching, equipment, and labor requires for a complete installation.

5. **Payment.** The work performed and materials furnished in accordance with this Item and measured as provided under “Measurement” will be paid for at the unit price bid for “Impermeable Liner” of the type shown. This price is full compensation for furnishing all labor, materials, freight, tools, equipment, testing, and incidentals, and for doing all the work involved in placement of the liner, complete in place.

9002-9901

Special Specification 9002-9901
Detention Pond Control System
(Basic)

1. Description

Furnish, install, test, and make fully operational a Detention Pond Control System at designated locations as shown on the plans. Ensure the equipment, design, and construction use the latest available techniques with a minimum number of different parts, subassemblies, circuits, cards, and modules to maximize standardization and commonality.

2. Materials

Provide all materials necessary for the installation of a Detention Pond Control System. Provide materials that comply with the details shown on the plans, the requirements of this Item, and the pertinent requirements of the following items:

- Item 416, “Drilled Shaft Foundation"
- Item 420, “Concrete Substructures”
- Item 421, "Hydraulic Cement Concrete"
- Item 440, “Reinforcement for Concrete“
- Item 442, "Metal for Structures“
- Item 445, "Galvanizing“
- Item 449, “Anchor Bolts“
- Item 465, “Junction Boxes, Manholes, and Inlets”
- Item 618 “Conduit“
- Item 620, "Electrical Conductors“
- Item 624, “Ground Boxes“
- Item 687, “Pedestal Pole Assemblies“

2.1. **Block Valve Control Panel.** This panel shall contain the equipment, batteries, inverter, and block valve controls within the same enclosure. The enclosure shall be pole-mounted and a NEMA 3R powder coated aluminum enclosure.

The Block Valve Controls shall include the controls for the block valve and the capacitance proximity sensor to detect water in the pipe. These controls shall contain, but not necessarily limited to, the PLC, Interposing relays, terminal blocks, LED indicating lights, and voltage monitor relay.

The internal wiring of this Control Panel shall be as indicated. The control panel shall also be equipped with a 120 VAC single-phase surge suppressor for the incoming service as indicated.

2.2. **Programmable Logic Controller.** The Programmable Logic Controller (PLC) shall include timing and logic functions to control the pond plug valve based on sensing the presence of water in a pipe with a level capacitance switch. The PLC shall operate from 24 VDC and shall include the required number of 24 VDC digital inputs and outputs as indicated. The PLC shall include a build-in 10/100 Mbps EtherNet/IP port for peer-to-peer messaging. The PLC shall also include an RS-232 port for connection for a programming laptop computer. The PLC shall be capable of operation in temperatures ranging from - 20^0C to 65^0C. The PLC shall be model MicroLogix 1100 by Rockwell Automation or a similar model by GE, Square D or approved equal.

2.3. **End User Interface.** To allow for offsite access and control of the PLC, at a minimum it shall be capable of remote access for online editing, interface utilizing a web browser, email messaging via SMTP for statuses and alarms, remote monitoring and programming, and read/write data table access.

2.4. **Batch Detention Outlet Structure.** An outlet structure with a duel hatch entry hatch for access shall be furnished and installed. The structure shall contain, but not necessarily limited to, 6" actuated eccentric plug valve, 6" manual eccentric plug valve, connectors, pipe supports, capacitance level sensor, piping, conduit, and a NEMA 4X junction box.

3. Construction

3.1. **Installation.** Provide equipment that utilizes the latest available techniques for design and construction with a minimum number of parts, subassemblies, and modules to maximize standardization and commonality.

3.2. **System Configuration.** Configure and fully integrate the equipment to provide a fully operational system providing one-way communications as designated in the plans.

3.3. **Testing.** Perform testing in accordance with, Special Specification 6005, "Testing, Training, Documentation, Final Acceptance, and Warranty.

4. Measurement

This Item will be measured as each Detention Pond Control System installed, fully integrated and tested.

5. Payment

The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Detention Pond Control System (Basic)". This price shall be full compensation for all equipment described under this item, all conduit, cables and connectors, all documentation and testing and furnishing all labor, and equipment necessary to complete the work.

SPECIAL SPECIFICATION

9003

POND ACCESS GATE

1. Description.

This item shall govern furnishing and installation of gates at locations shown on the plans or directed by the Engineer or designated representative, including all posts, bracing and accessories as specified in this Item and as indicated on the plans.

This specification is applicable for projects or work involving either inch-pound or SI units. Within the text inch-pound units are given preference followed by SI units shown within parentheses.

2. Materials.

(1) **Metal Posts and Gates.** Steel pipe used for posts and gate frames shall conform to the specifications of ASTM A 53. Steel sections used for posts and frames shall be a good commercial quality weldable steel. All material shall be new and not used, re-rolled or open seam material will be acceptable. All posts shall meet the weight and length requirements indicated. All fittings required for posts shall be pressed or rolled steel, forge steel, malleable iron or wrought iron of good commercial quality and spaced as indicated on the plans.

(a) **Gate Posts.** Gate posts shall be round. All gateposts shall be furnished with watertight malleable iron caps.

(b) **Gates.** Double swing gates shall be furnished and installed as indicated on the plans. The gates shall be hinged to swing 180 degrees from closed to open. The gates shall be complete with frames, latches, stops, keepers, hinges, braces, and padlocks. Gates shall have intermediate members and diagonal truss rods as required for rigid construction and shall be free from sag and twist.

Hinges shall be pinned type, heavy pattern with large bearing surface and shall not twist or turn under the action of gate. Latches for double swing gates shall be plunger bar type, full gate height, and arranged to engage the gate stop. Stops shall consist of a roadway plate with anchor set in Portland Cement concrete and arranged to engage the plunger. Keepers shall consist of mechanical devices for securing and supporting the free end when in the full open position. Latches shall be arranged for padlocking with padlock accessible from sides of the gate. Gates shall be installed so that they cannot be removed without disassembly of the hardware. Hardware attachment bolt shall be penned to prevent easy removal.

(c) **Fittings, Bolts and Other Miscellaneous Hardware.** All fittings, bolts and miscellaneous hardware shall be hot dip galvanized in conformance with Item No. 445, "Galvanizing."

(d) **Galvanizing.** Thin-wall, high-strength pipe posts shall be externally hot-dip galvanized with a minimum weight of coating of 0.9 ounce per square foot (0.3 kilogram per square meter). After galvanizing, thin-wall, high-strength pipe posts shall be externally chromated by total immersion followed by application of clear polyurethane finish.

Interior surfaces shall have a hot-dip galvanized coating, a zinc base coating with thickness 0.5 mil ± 0.2 mil (13 micrometer ± 5 micrometer). The coating shall be 94 percent zinc powder by weight (mass).

All tubular posts, rails and braces shall comply with the following salt spray performance requirements when tested in accordance with ASTM B117.

Exterior - 1250 hours to maximum 5 % red rust

Interior - 650 hours to maximum 5 % red rust

The uniformity of the zinc coating shall be determined by visual inspection. If, in the opinion of the Engineer or designated representative, visual examination is not conclusive, he may use the Preece Test as described in ASTM A239. When so tested, all items shall withstand a minimum of 6 one-minute dips except for those items designated in ASTM A153 as Class B-2, B-3, C and D, which shall withstand a minimum of 4 one-minute dips.

Careful visual inspection shall be made to determine the quality of the zinc coating. Excessive roughness, blisters, salammoniac spots, bruises and flaking if present to any considerable extent, shall provide a basis for rejection. Where practicable, all inspection and tests shall be made at the place of manufacturer prior to shipment and shall be so conducted as not to interfere unnecessarily with the progress of the work.

Damaged spelter coating shall be repaired by thoroughly wire brushing the damaged area and removing all loose, cracked or weld-burner spelter coating. The cleaned area shall be painted with 2 coats of zinc oxide-zinc dust paint conforming to the requirements of Federal Specification TT-P-641B. The paint shall be furnished at the Contractor's expense.

(e) The contractor shall, at the time of award, submit to the Engineer, a certification from the manufacturer of the posts and gate, stating that the material meets physical property requirements for the intended application.

(2) Concrete Post Anchorages.

(a) Concrete for post footings, catch blocks, anchors and other such items related to the gate construction, shall be Class B Concrete conforming to Item No. 420, "Concrete for Substructures" or as indicated on the plans. Maximum size of aggregate shall be ¾ inch (19 mm). Hand mixing of concrete will be permitted on batches under ½ cubic yard (0.38 cubic meter). All batches exceeding this volume will be machine mixed.

(b) Concrete shall be placed promptly and without segregation after mixing. The Contractor shall consolidate the concrete satisfactorily by tamping or vibrating. Excess excavation from footings shall be satisfactorily disposed of.

(c) The tops of post footings shall extend slightly above ground and shall be steel troweled to a smooth finish sloped to drain away from posts. Posts, braces and other units shall be centered in footings.

3. Construction Methods.

The gate shall be erected to lines and grades established by the Engineer in accordance with the details indicated on the plans. The fence shall be true to line, and shall comply with the best practice for gate construction of this type.

(1) **Clearing and Grading**. The Contractor shall perform all clearing of brush, rocks and debris necessary for the installation of this fencing.

(2) **Erection of Posts.** Posts shall be set plumb and permanently positioned and anchorages firmly set. Posts shall be set in concrete, unless otherwise indicated on the plans.

Concrete footings shall be carried to the depth and dimensions indicated on the plans. Where rock is encountered within the required depth to which the post is to be erected, a hole of a diameter slightly larger than the largest dimension of the post may be drilled into the rock and the post grouted in. The regular dimensioned concrete footing as indicated on the plans shall then be placed between the top of the rock and required grade indicated on the plans. Posts shall be approximately centered in their footings. All concrete shall be placed promptly and compacted by tamping or other approved methods. Concrete shall be finished in a dome and shall be cured a minimum of 48 hours before further work is done on the posts.

4. Measurement.

Gates will be measured as each gate, complete in place.

5. Payment.

The work performed and material furnished as prescribed by this item, measured as provided under "Measurement" will be paid for at the unit bid price for "Pond Access Gate". The unit bid price shall include full compensation for furnishing all materials; fabricating, preparation, hauling, handling charges and erecting, including all miscellaneous fittings, braces, latches, gate hinges, stops and center anchorage; and for all manipulations, labor, tools, equipment and incidentals necessary for complete installation.

Special Specification 9030
LED Decorative Illumination Assemblies

1. DESCRIPTION

Furnish, fabricate, and install decorative illumination assemblies with light-emitting diode (LED) lamp modules, banner arms and pole.

2. MATERIALS

Use new materials conforming to the details shown in the plans and the pertinent requirements of the following Standard Specification Items:

A. Item 442, “Metal for Structures,”

B. Item 449, “Anchor Bolts,”

C. Item 616, “Performance Testing of Lighting Systems,”

D. Item 620, “Electrical Conductors.”

Submittals. Furnish 7 sets of submittals of the illumination assemblies with stanchion mount, luminaires, poles, bases, all mounting hardware and color sample to the Engineer at the project address. Do not purchase materials or begin work before these submittals are approved.

Pole Options. Furnish a non-tapered steel light pole with nominal height of 30 ft. Provide a decorative base with removable access door with a nominal height as shown on plans, A nominal width at the bottom of the base section as shown on plans. Provide a durable ABS plastic two-piece full base cover, finished to match the pole. The pole shaft will have a uniform dimension and wall thickness, and made of a weld-able grade, hot-rolled, commercial-quality steel tubing with a minimum yield of 55 KSI (11-gauge, .1196"), or 50 KSI (7-gauge, .1793"). Provide shaft that is 5” diameter and of one-piece with a full-length longitudinal high-frequency electric resistance weld that is uniformly square in cross-section with flat sides. Pole assembly shall meet the aesthetics and design criteria shown in the plans. Exposed hardware shall be aluminum or stainless steel. All electrical components shall be UL listed. Pole assembly finish color shall be dark bronze. Fabricate hardware, brackets, nuts, bolts, washers, and parts from stainless steel or aluminum of adequate thickness. Provide 2 3/8” O.D. top tenon. Pole shaft must support the luminaires, tenon, rectangular arms and all equipment as detailed for 80 mph wind load. Provide grounding provision with hardware.

LED Luminaire:

General Requirements. Provide an LED Shoe Box style luminaire. Single-piece die-cast, aluminum housing with contoured edges with a 0.12” nominal wall thickness. Luminaire shall have 60 LEDS, 4000K, with precision-molded refractive acrylic lenses, type 3 distribution and “dark sky” compliant shielding. All luminaires to be installed on tenon mount decorative arms as detailed in the plans.

Electronic Driver and LED Lamp Modules. Provide replaceable LED driver modules that will operate at multi- voltages, 700ma drive current, 137 watt rated assembly. Provide a two-position barrier-type terminal block secured to housing. Provide lugs with captive screws for wire sizes up to 6 AWG. Identify each terminal position. Provide LED lamp modules so that catastrophic loss or failure of an individual LED will not result in the loss of the entire lamp. Provide sufficient thermal management of the heat generated by the lamp to ensure a minimum operable life of 90,000 hr. with an average operating

time of 12 hr. per night. Provide a passive thermal management system if required. Fans or other mechanical cooling systems will not be allowed. Design lamp so that the maximum junction temperature of the LEDs at maximum ambient temperature will not be exceeded, and will not exceed 105°C.

Performance Requirements. Photometric data must be certified by manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program for Energy Efficient Lighting Products. Provide photometric data (in. ies format) for luminaires at specified color temperature and operating at 25°C ambient temperature. Ensure the fixture will be IESNA cutoff or better.

Warranty. The manufacturer will replace failed luminaires, when non-operable due to defect in material or workmanship, within 3 years of installation with a luminaire that meets all specifications, delivered to the project location. Photocells (if used) are subject to the warranties of their respective manufacturers.

3. CONSTRUCTION

Perform work in accordance with the details shown on the plans in accordance with the manufacturers' requirements and the requirements of this Item.

Use established industry and utility safety practices when installing poles or luminaires located near overhead or underground utilities. Consult with the appropriate utility company before beginning work.

Prevent scarring or marring of poles, luminaire arms, and luminaires. Replace damaged components. Repair damaged painted areas of roadway illumination assemblies according to manufacturer's recommendation.

Stake, install and align each illumination assembly as shown on the plans. The Department may shift a luminaire's location, if necessary, to secure a more desirable location or to avoid conflict with utilities.

Fabricate and install illumination assembly components in accordance with the details, dimensions, and requirements shown on the plans. Do not use screw-in type foundations. Install anchor bolts and coat anchor bolt threads electrically conductive lubricant. Erect structures after foundation concrete has attained its design strength as required. Tighten anchor bolts for poles with shoe bases. Do not place grout between base plate and foundation. Test installed illumination assemblies.

4. MEASUREMENT

This Item will be measured as each LED Decorative Illumination Assembly installed.

5. PAYMENT

The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "LED Decorative Illumination Assembly."

This price is full compensation for furnishing, installing, and testing LED luminaires; drivers, anchor bolts, anchor plates, internal transformer, internal conductors, lightning arrestors, poles, decorative bases, arms, banner brackets, and connections; system performance testing; and equipment, labor, tools, and incidentals.

New drilled shaft foundations will be paid for under Item 416, "Drilled Shaft Foundations." New conduit will be paid for under Item 618, "Conduit." New conductors, except the conductors internal to the pole, will be paid for under Item 620, "Electrical Conductors." New ground boxes will be paid for under Item 624, "Ground Boxes." New electrical services will be paid for under Item 628, "Electrical Services."

Special Specification GT101
Georgetown Water Relocation Plans

1. DESCRIPTION

This Item will govern for all materials and work necessary for the construction of the City of Georgetown Waterline as shown on the waterline plans. Wherever, in the City of Georgetown Special Specification reference is made to City of Georgetown and its representatives, such reference shall be taken to mean Williamson County and its representatives.

2. MATERIALS

Furnish materials of the type as shown on the plans and in accordance with Jonah Water Special Utility District Special Specifications as listed below and included herein:

A. Item Section CIP11 “Trench Safety Requirements”

B. Item Section G4 “Pipe Excavation, Trenching, Embedment, Encasement and Backfilling”

C. Item Section G5 “Granular Fill Materials”

D. Item Section W1 “Ductile Iron Pipe and Fittings”

E. Item Section W2 “Polyvinyl Chloride (PVC) Pipe – Water”

F. Item Section W3 “Valves, Hydrants and Appurtenances”

G. Item Section W4 “Encasement Pipe”

H. Item Section C1 “Concrete Structures”

I. Item Section C2 “Concrete for Structures”

J. Item Section C7 “Reinforcing Steel”

K. Item Section C9 “Flowable Backfill”

3. CONSTRUCTION

The water distribution will be constructed in accordance with the City of Georgetown Specifications included herein.

Pipe Delivery and Inspection. Each load of pipe delivered to the job site will be checked to assure that it meets specifications. When a load of pipe is found to have inadequate wall thickness or tolerances greater than specified, randomly selected samples of the pipe shall be immediately taken to an approved testing laboratory with instructions to check the pipe for compliance with applicable product standards, AWWA specifications, ASTM specifications, and other specifications for the specific Contract. When the testing laboratory reports concur that the pipe does not meet specifications, it is to be understood that all of the defective pipe delivered to the site will be immediately removed and replaced by the Contractor at no additional cost to the County.

Coordination of Work. This contract involves the modifications and/or improvements to existing facilities; therefore, all waterline work schedules must be submitted to the Construction Observer for approval prior to beginning work so as to maintain water service to the area.

Preservation of Property Corners. If the corners of the land owner's property have been marked with an iron pin in the ground, then these corners must be protected from the construction process. If any property corner is disturbed, then the Contractor shall arrange for the corner or corners to be replaced by a Registered Professional Land Surveyor (R.P.L.S.).

Applicable Specifications. All references to the following standard specifications contained in this specification shall mean the most current revision or addition of these specifications for the specific item, material, or work described, in effect at the time of the receipt of the bids:

- **American Society for Testing Materials**
- **American Water Works Association**
- **Texas Department of Transportation Standard Specifications**

4. MEASUREMENT

The water distribution will be measured in accordance with the City of Georgetown Specifications included herein.

5. PAYMENT

The water distribution will be paid in accordance with the City of Georgetown Specifications included herein.

For this project, City of Georgetown Item Section W1, "Ductile Iron Pipe and Fittings", of the Standard Specifications is amended with respect to clauses cited below. No other clauses or requirements of this item are waived or changed.

W1.17 PAYMENT

Fittings is added:

C. Ductile iron fittings, furnished in accordance with these specifications, will be paid for at the unit price bid per ton, complete in place, according to the schedule of weights in the City of Austin Standard Products List WW-27C. Bolts, glands, and gaskets will not be paid for separately and shall be included in the contract unit price for fittings.

Wet Connections to Potable Water Mains is added:

D. When called for in the bid, wet connections will be paid at the unit price bid per each, complete in place, according to the size of the main that is in service and shall be full compensation for all Work, including labor and materials, required to make the connection and place the pipe in service.

Pressure Connections to Potable Water Mains is added:

E. When called for in the bid, pressure connections will be paid at the unit price bid per each, complete in place, according to the size of the main that is in service and shall be full compensation for all Work, including labor and materials, required to make the connection and place the pipe in service.

Abandonment of Pipes, Valves, and Appurtenances is added:

F. The installation of proposed pipeline shall include the abandonment of existing pipe, valves, and appurtenances affected. The existing pipe under roadways are to be cut, capped, and filled with flowable fill. Existing pipes to be abandoned in place and are not under a roadway or driveway, will be capped. Payment is subsidiary to the cost of the installation of the proposed pipeline.

For this project, City of Georgetown Item Section W2, "Polyvinyl Chloride (PVC) Pipe – Water", of the Standard Specifications is amended with respect to clauses cited below. No other clauses or requirements of this item are waived or changed.

W2.10 PAYMENT

Fittings is added:

C. Ductile iron fittings, furnished in accordance with these specifications, will be paid for at the unit price bid per ton, complete in place, according to the schedule of weights in the City of Austin Standard Products List WW-27C. Bolts, glands, and gaskets will not be paid for separately and shall be included in the contract unit price for fittings.

Wet Connections to Potable Water Mains is added:

D. When called for in the bid, wet connections will be paid at the unit price bid per each, complete in place, according to the size of the main that is in service and shall be full compensation for all Work required, including labor and materials, to make the connection and place the pipe in service.

Pressure Connections to Potable Water Mains is added:

E. When called for in the bid, pressure connections will be paid at the unit price bid per each, complete in place, according to the size of the main that is in service and shall be full compensation for all Work required, including labor and materials, to make the connection and place the pipe in service.

Abandonment of Pipes, Valves, and Appurtenances is added:

F. The installation of proposed pipeline shall include the abandonment of existing pipe, valves, and appurtenances affected. The existing pipe under roadways are to be cut, capped, and filled with flowable fill. Existing pipes to be abandoned in place and are not under a roadway or driveway, will be capped. Payment is subsidiary to the cost of the installation of the proposed pipeline.

For this project, City of Georgetown Item Section W3, "Valves, Hydrants, and Appurtenances", of the Standard Specifications is amended with respect to clauses cited below. No other clauses or requirements of this item are waived or changed.

W3.21 PAYMENT

Fire Hydrant Adjustments is added:

E. Fire hydrant adjustments shall consist of the raising or lowering to final grade of the existing fire hydrant as shown on the Plans. Fire hydrant adjustments will be paid for at the unit contract price per each as provided in the Proposal and Bid Schedule. The unit price per each adjustment shall be the total compensation for furnishing all labor, materials, tools, equipment and incidentals necessary to complete the work including excavation, base blocking, disposal of surplus materials and backfill in conformance with the Plans and these specifications. The six (6) inch connection pipe, test station, concrete collar, thrust block, drain pit, concrete pad, rods, bolts, paint, protective coatings, and fittings for fire hydrants shall not be paid for separately and included in the price for the fire hydrant relocation per each. Barrel extensions will not be measured and paid for separately.

Valve Adjustments is added:

F. Valve adjustments shall consist of the raising or lowering to final grade of the water valve riser box as shown on the Plans. Water valve riser box adjustments will be paid for at the unit contract price per each as provided in the Proposal and Bid Schedule. The unit price per each adjustment shall be the total compensation for furnishing all labor, materials, tools, equipment and incidentals necessary to complete the work including excavation, base blocking, disposal of surplus materials and backfill in conformance with the Plans and these specifications.

TECHNICAL SPECIFICATIONS

SECTION CIP11 – TRENCH SAFETY REQUIREMENTS

CIP11.01 SCOPE OF WORK

A. This specification covers the requirements to plan, design, construct, install, maintain, monitor, modify as necessary, and remove upon completion, a Trench Safety System as specified herein.

B. The requirements of this Section apply to all trenches which equal or exceed a depth of five (5) feet, measured from the ground surface at the highest side of the trench to the trench bottom.

C. All applicable and non-conflicting portions of Section G4- TRENCHING, BACKFILLING AND COMPACTION apply as appropriate.

CIP11.02 SUBMITTALS

A. Within 30 days after the Notice to Proceed, but not less than 10 calendar days prior to execution of any trench excavation operations, the Contractor shall submit a site specific Trench Safety System Conformance Affidavit stating that operations will be conducted in full conformance with the OSHA Standards.

1. The Conformance Letter shall also describe the Trench Safety System techniques proposed to be used on the Project.

2. Specific references to the applicable OSHA Standards sections shall be included for each technique to be used.

B. The Trench Safety System Plan shall be in writing, site specific and sufficiently detailed and clear to be understandable and usable by all personnel who will be executing, supervising and witnessing the trenching operations. A copy of the Trench Safety System Plan shall be available at the site of trenching operations at all times.

C. If borings and/or detailed geotechnical analyses are required to develop the Trench Safety System Plan, they shall be executed by the Contractor at his cost.

D. For trenches having depths greater than the various limits given in the OSHA Standards (8, 12 or 20 feet, depending on the techniques used), a site specific protective system shall be designed by a Registered Professional Engineer, registered in the State of Texas experienced in soil mechanics and structural design. The design shall be signed, sealed and dated by the Professional Engineer, and it shall identify those specific locations where the design is applicable.

CIP11.03 GENERAL

A. All materials and products incorporated into the Trench Safety System shall be suitable for their intended uses; shall meet all design criteria and parameters used by the Trench Safety System designer; and shall meet all applicable requirements of OSHA Standards.

CIP11.04 METHODS OF PROVIDING FOR TRENCH SAFETY

A. Protective systems referenced in this Section shall be as defined and described in 29 CFR 1962.652, "Requirements for Protective Systems."

B. It is the duty, responsibility and prerogative of the Contractor to determine the specific applicability of a proposed Trench Safety System for each field condition encountered on the Project. Contractor specifically holds the City, Engineer, and any of their designated representatives harmless in any actions resulting from the failure or inadequacy of the Trench Safety System used to complete the Project.

C. Unless otherwise noted on the drawings or excluded below, Sloping/Benching, Trench Shielding with trench boxes, and/or Sheeting/Shoring/Bracing protective systems may be used on this Project.

D. Restrictions on the use of the various protective systems for this Project are as follows:

1. Sloping or Benching. Allowed with prior approval from the City.

2. Trench Shields/Boxes. No restrictions.

3. Sheeting/Shoring/Bracing. No restrictions.

CIP11.05 INSPECTION DUTIES OF CONTRACTOR

A. Provide a Competent Person, as defined in the OSHA Standards, to make frequent inspections of the trenching operations and the Trench Safety System in full conformance with the OSHA Standards.

B. If evidence of a possible cave-in or landslide is apparent, all work in the trench shall immediately cease and not be resumed until all necessary precautions have been taken to safeguard personnel entering the trench.

C. In an emergency situation, which may threaten or affect the safety or welfare of any persons or properties, the Contractor shall act at his discretion to prevent possible damage, injury or loss. Any additional compensation or time extension claimed for such actions shall be considered in view of the cause of the emergency and in accordance with the General Conditions.

CIP11.06 MEASUREMENT AND PAYMENT

A. Payment for the Trench Safety Plan shall be on a Lump Sum price basis, the Lump Sum price being as given in the Bid Proposal.

B. Payment for the Trench Safety Plan Implementation shall be on a unit price basis, the unit price being as given in the Bid Proposal, and the unit of measure being linear feet of trench and/or square foot of bore pit or structure, without regard to whether specific trench safety precautions are required or used for the trench reach being measured.

END OF SECTION

TECHNICAL SPECIFICATIONS

SECTION CIP12 – TESTING OF PIPELINES AND MANHOLES

CIP12.01 SCOPE OF WORK

A. This specification covers the requirements to perform ex-filtration testing and deflection testing of gravity pipelines and to perform pressure and leakage testing of pressure pipelines.

CIP12.02 SUBMITTALS

A. Within 30 days after the Notice to Proceed, the Contractor shall submit to the Engineer or the City for approval, technical product literature including a description of the deflection test procedure for flexible pipe greater than 27-inches in diameter, video inspection of gravity wastewater lines, and all other pertinent data to illustrate conformance to the specification found within.

CIP12.03 GENERAL

A. The entire length of the installed gravity line and the force main shall be field tested for water tightness. Gravity wastewater lines shall be video taped by camera.

B. Hydrostatic pressure and leakage tests shall be made on all pressure pipelines carrying wastewater or water.

C. All labor and equipment, including, but not limited to test pump with regulated by-pass meters and gauges required for conducting pipeline tests, shall be furnished by the Contractor. The Contractor shall furnish equipment and necessary piping as required to transport water used in testing from source to test location.

D. Time and sequence of testing shall be scheduled by the Contractor, subject to observation and approval by the City. The Contractor shall provide adequate labor, tools and equipment to operate valves and to locate and repair any leaks discovered during the initial filling of the pipeline prior to actual testing or during the course of the tests.

CIP12.04 CLEANING

A. At the conclusion of the work, thoroughly clean all pipelines by flushing with water or other means to remove all dirt, stones, pieces of wood, or other material which may have entered the pipes during the construction period. Debris cleaned from the lines shall be removed from the low end of the pipeline. If after this cleaning, obstructions remain, they shall be removed. After the pipelines are cleaned and if the groundwater level is above the pipe or following a heavy rain, the Engineer will examine the pipes for leaks. If any defective pipes or joints are discovered, they shall be repaired, and/or replaced by the Contractor at his expense.

CIP12.05 TEST PROCEDURES FOR GRAVITY PIPELINES, FORCE MAINS AND MANHOLES

A. Scope: After sewers and manholes have been installed and backfilled, subject newly laid gravity lines and manholes to a leakage test. Contractor to furnish all labor, materials, tools and equipment to test lines. Take such precautions as required to prevent damage to lines and appurtenances being tested. Repair any damage resulting from test at Contractor's expense. Conduct test in presence of Engineer or designated City Representative.

B. Test Procedures for Leakage Test of Gravity Sewer: Contractor, at his option, may test lines by hydrostatic or low pressure air test as specified below. However, the Engineer may direct a specific test be performed in specified areas of the Project.

C. Infiltration or Exfiltration Test (for Gravity Sewer)

1. Preparation: Seal ends of line section being tested with water tight plugs, equipped with pipe riser inserted and braced in the inlet of the manholes. Fill section with water 24-hours prior to start of test. Fill slowly from downstream manhole in test section so that no air is trapped in the line. Leave outlets of stacks and service lines exposed and unplugged until after exfiltration test has been made. Outlets terminating below level of test water surface to be temporarily extended upward by installing additional lengths of pipe. After completion of satisfactory test, remove lengths of pipe added for test.

2. Duration of Test: Test for 24-hours. Minimum head of either two (2) feet measured above the crown, inside pipe at upper end of section or four (4) feet measured above trench water table, whichever is higher, so that a net positive of two (2) feet TCEQ is used for testing.

3. Allowable Leakage: Allowable leakage or exfiltration in any individual section under construction shall not exceed 10 gallons per inch of inside diameter per mile of pipe per 24 hours.

D. Low Pressure Air Test

1. Preparation: Clean pipe to be tested by propelling snug fitting inflated rubber ball through the pipe with water or by use of water jet cleaning equipment. After manhole to manhole reach of pipe has been backfilled and cleaned, pneumatic plugs shall be placed in the line at each manhole and inflated to 25 psig. Add air slowly to the section under test until the internal pressure of 4.0 psig is obtained. Allow at least two (2) minutes for air temperature to stabilize, adding only the amount of air required to maintain pressure.

2. Duration of Test and Allowable Leakage

Decrease pressure to 3.5 psig and start stopwatch. Determine the time in seconds that is required for the internal air pressure to reach 2.5 psig. Minimum permissible pressure holding times are indicated in seconds and shall be computed by the following equation:

$T = (0.085 \times D \times K)/Q$

T = time for pressure to drop 1.0 pound per square inch gauge in seconds
K = 0.000419xDxL, but not less than 1.0
D = average inside diameter in inches
L = length of line of same pipe size being tested, in feet
Q = rate of loss assume 0.0015 cubic feet per minute per square foot internal surface shall be used

Since K value of less than 1.0 shall not be used, there are minimum times for each pipe diameter as outlined below:

Pipe Diameter	Minimum Time	Length for Minimum Time	Time for Longer Length
(inches)	(seconds)	(feet)	(seconds)
6	340	398	0.855(L)
8	454	298	1.520(L)
10	567	239	2.374(L)
12	680	199	3.419(L)
15	850	159	5.342(L)
18	1020	133	7.693(L)
21	1190	114	10.471(L)
24	1360	100	13.676(L)

Pipe Diameter	Minimum Time	Length for Minimum Time	Time for Longer Length
27	1530	88	17.309(L)
30	1700	80	21.369(L)
33	1870	72	25.856(L)
36	2040	66	30.771(L)

The test may be stopped if no pressure loss has occurred during the first 25% of the calculated testing time. If any pressure loss or leakage has occurred during the first 25% of the testing period, then the test shall continue for the entire test duration as outlined above or until failure. Lines with a 27-inch average inside diameter and larger may be air tested at each joint. If the joint test is used, a visual inspection of the joint shall be performed immediately after testing. The pipe is to be pressurized to 3.5 psi greater than the pressure exerted by groundwater above the pipe. Once the pressure has stabilized, the minimum time allowable for the pressure to drop from 3.5 psi gauge to 2.5 psi gauge shall be 10 seconds.

E. Test Procedures for Hydrostatic Test for Manholes

1. Manholes shall be tested for leakage separately and independently of the wastewater lines by hydrostatic exfiltration testing, or other methods acceptable to the City. If a manhole fails a leakage test, the manhole must be made water tight and retested. The maximum leakage for hydrostatic testing shall be 0.025 gallon per vertical foot per hour. Alternative test methods must ensure compliance with the above allowable leakage. Hydrostatic exfiltration testing shall be performed as follows: all wastewater lines coming into the manhole shall be sealed with an internal pipe plug, then the manhole shall be filled with water and maintained full for at least one (1) hour. For concrete manholes a wetting period of 24-hours may be used prior to testing in order to allow saturation of the concrete.

F. Test Procedures for Vacuum Testing Manholes

1 In lieu of the hydrostatic exfiltration test, manholes may be tested by vacuum. Manholes tested by vacuum shall be performed by the Contractor in compliance with these specifications.

2. Manholes shall be tested after installation of all connections (existing and/or proposed) in place. All lift holes shall be plugged with an approved non-shrink grout and all drop connections and gas sealing connections shall be installed prior to testing. The lines entering the manhole shall be temporarily plugged with the plugs braced to prevent them from being drawn into the manhole. The plugs shall be installed in the lines beyond the drop-connections, gas sealing connections, etc. The test head shall be placed inside the frame at the top of the manhole and inflated in accordance with the manufacturer□s recommendations. A vacuum of 10-inches of mercury shall be drawn, and the vacuum pump shall be turned off. With the valve closed, the level of vacuum shall be read after the required test time as shown in the following table. If the drop in the level is less than one (1) inch of mercury (final vacuum of nine (9) inches of mercury), the manhole will have passed the vacuum test. The required test time shall be 120- seconds.

3. Manholes which have a final vacuum of nine (9) inches of mercury after the time indicated will be accepted. Any manhole which fails the vacuum test as described above shall be repaired with an approved non-shrink grout or other material acceptable to the Engineer and the City based on the material from which the manhole is constructed. The manhole shall be retested as described above until a successful test is made.

G. Exfiltration Test

1. Preparation: Seal ends of manhole being tested with watertight plugs. Fill manhole 24-hours prior to start of test. Manholes to be filled to top of manhole cone section.

2. Duration of Test: The test shall be performed for a 24-hour duration.

3. Allowable Leakage: No leakage is allowed. The water elevation shall be the same at beginning and end of test period.

H. Deflection Testing

1. Deflection tests shall be performed on all flexible pipes. For pipes with inside diameters less than 27-inches, a rigid mandrel shall be used to measure deflection. For pipelines with an inside diameter of 27-inches and greater, the Contractor shall submit to the Engineer the proposed method, with which shall provide a precision of ± two tenths of one percent (0.2%) deflection, for review and approval by the Texas Commission on Environmental Quality. The test shall be conducted after final backfill has been in place at least 30 days in the presence of a representative of the City's Utilities Department. No pipe shall exceed a deflection of five percent (5%). If a pipe should fail to pass the deflection test, the problem shall be corrected and a second test shall be conducted after the final backfill has been in place an additional 30 days. Test shall be performed without mechanical pulling devices.

2. Mandrel Sizing: The rigid mandrel shall have an outside diameter (O.D.) equal to 95% of the inside diameter (I.D.) of the pipe. The inside diameter of the pipe, for the purpose of determining the outside diameter of the mandrel, shall be the average outside diameter of the pipe minus two minimum wall thickness for O.D. controlled pipe and the average inside diameter for the I.D. Controlled pipe, all dimensions shall be per appropriate standard. Statistical or other "tolerance packages" shall not be considered in mandrel sizing.

3. Mandrel Design: The rigid mandrel shall be constructed of a metal or rigid plastic material that can withstand 200 psi without being deformed. The mandrel shall have nine or more "runners" or "legs" as long as the total number of legs is an odd number. The barrel section of the mandrel shall have a length of at least 75% of the inside diameter of the pipe. A proving ring shall be provided and used for each size mandrel in use.

4. Method Options: Adjustable or flexible mandrels are prohibited. A television inspection is not a substitute for the deflection test. A deflectometer may be approved provided the Contractor notifies the Engineer in a timely manner and submits adequate information for the Engineer to submit to the Texas Commission on Environmental Quality for review and approval. Mandrels with removable legs or runners may also be approved provided the Contractor notifies the Engineer in a timely manner and submits adequate information for the Engineer to submit to the Texas Commission on Environmental Quality for review and approval.

I. Repairs of Lines: Remove and replace or make approved corrective repairs to any section of line or manhole which has leakage that exceeds above amounts. Repair any individual leaks that may appear whether or not overall section meets leakage requirements. Individual leaks will ordinarily be revealed by looking through sewer with a light while groundwater level is over sewer, during water tamping operations or immediately after water leakage is emptied from sewer.

J. Retest: Sewers and/or manholes failing to meet requirements of leakage test will, after repair by Contractor, be tested again for leakage. No sewer or manhole will be accepted until leakage is less than allowable amount.

K. Video Inspection

1. The use of a television camera for inspection prior to placing the sewer in service will be required. Video inspection is at the cost of the Contractor, and copies of the DVD will be presented to the City prior to final acceptance. One (1) copy of the DVD shall be submitted to the City.

2. Post construction video of the gravity wastewater lines will be evaluated on a case-by-case basis for acceptance. Preparation for video taping of wastewater line shall be as follows:

   a. Flush and clean the gravity wastewater line prior to video taping.

   b. The videotape shall display the station, in accordance with the Plans and Standards, and counter on the screen. Manhole numbers and stations shall correspond to the contract documents.

   c. If debris is evident in the line during the video, the line will be flushed and cleaned to allow a clean video.

   d. All manholes will be identified at the beginning and end of the video corresponding to contract documents with upstream and downstream ends identified.

   e. Additional video inspections shall be performed prior to completion of one-year warranty period and submitted on DVD.

L. Force Main

1. Force Main shall be pressure tested one and one-half (1 1/2) times the maximum output of the pumps. The allowable hydrostaic leakage rate shall be based on CIP 12.06 Table 6A.

CIP12.06 TEST PROCEDURES FOR PRESSURE PIPELINES

A. General

1. After the pipe has been laid and backfilled and the backfill has been otherwise consolidated, all newly laid pipe, or any valved section thereof, shall be subjected to the hydrostatic pressure specified below for that particular type of pipe. The duration of the hydrostatic test shall be at least two (2) hours. Unless otherwise specified or noted on the Plans. All meters, fixtures, devices or appliances which are connected to the pipeline system and which might be damaged if subjected to the specified test pressure shall be disconnected and the ends of the branch lines plugged or capped during the testing procedures.

2. Each valved (capped or plugged) section of pipe shall be filled slowly with water and all air shall be expelled. If permanent air vents are not located at all high points, the Contractor shall install, at his own expense, corporation or blow-off cocks at such points so that air can be expelled as filling takes place. After verification that all air has been expelled, the cocks shall be closed and the pipe kept filled until tested. All exposed pipe, fittings, valves, hydrants and joints shall be examined while under test pressure and all visible leaks shall be stopped. Any cracked or defective pipe, fittings, valves or hydrants discovered during testing shall be removed and replaced by the Contractor. Replacement shall be with sound material and the test shall be repeated until satisfactory to the City.

B. Special Requirements: Where any section of pipeline is provided with concrete reaction blocking, the hydrostatic pressure shall not be made until at least five (5) days have elapsed after installation of the blocking. However, if high-early-strength cement is used in the concrete, two (2) days shall have elapsed prior to testing.

C. Leakage Test: A Leakage Test will be conducted on each valved section over the entire Project. The leakage test shall be at 150 psi for at least four (4) hours. Fire lines shall be tested at 200 psi for two (2)

hours with 0 loss.

D. Allowable Leakage

1. The allowable hydrostatic leakage rate shall be based on the following formula:

Fire lines 0 loss
L= SD √P133,200
L = testing allowance in gallons per hour
S = length of pipe tested in feet
D = nominal diameter of the pipe in inches
P = average test pressure during the hydrostatic test in pounds per square inch (gauge)

Table 6A
Hydrostatic testing allowance per 1,000 ft of pipeline* - *gph*

Avg. Test Pressure *psi*	Nominal Pipe Diameter in.																	
	3	4	6	8	10	12	14	16	18	20	24	30	36	42	48	54	60	64
450	.48	.64	.95	1.27	1.59	1.91	2.23	2.55	2.87	3.18	3.82	4.78	5.73	6.69	7.64	8.60	9.56	10.19
400	.45	.60	.90	1.20	1.50	1.80	2.10	2.40	2.70	3.00	3.60	4.50	5.41	6.31	7.21	8.11	9.01	9.61
350	.42	.56	.84	1.12	1.40	1.69	1.97	2.25	2.53	2.81	3.37	4.21	5.06	5.90	6.74	7.58	8.43	8.99
300	.39	.52	.78	1.04	1.30	1.56	1.82	2.08	2.34	2.60	3.12	3.90	4.68	5.46	6.24	7.02	7.80	8.32
275	.37	.50	.75	1.00	1.24	1.49	1.74	1.99	2.24	2.49	2.99	3.73	4.48	5.23	5.98	6.72	7.47	7.97
250	.36	.47	.71	.95	1.19	1.42	1.66	1.90	2.14	2.37	2.85	3.56	4.27	4.99	5.70	6.41	7.12	7.60
225	.34	.45	.68	.90	1.13	1.35	1.58	1.80	2.03	2.25	2.70	3.38	4.05	4.73	5.41	6.03	6.76	7.21
200	.32	.43	.64	.85	1.06	1.28	1.48	1.70	1.91	2.12	2.55	3.19	3.82	4.46	5.09	5.73	6.37	6.80
175	.30	.40	.59	.80	.99	1.19	1.39	1.59	1.79	1.98	2.38	2.98	3.58	4.17	4.77	5.36	5.96	6.36
150	.28	.37	.55	.74	.92	1.10	1.29	1.47	1.66	1.84	2.21	2.76	3.31	3.86	4.41	4.97	5.52	5.88
125	.25	.34	.50	.67	.84	1.01	1.18	1.34	1.51	1.68	2.01	2.52	3.02	3.53	4.03	4.53	5.04	5.37
100	.23	.30	.45	.60	.75	.90	1.05	1.20	1.35	1.50	1.80	2.25	2.70	3.15	3.60	4.05	4.50	4.80

* If the pipeline under test contains sections of various diameters, the testing allowance will be the sum of the testing allowance for each size.
Calculated on the basis of Eq. 1.

a. These formulas are based on a testing allowance of 11.65 gpd/mi/in. (1.079 L/d/km/mm) of nominal diameter at a pressure of 150 psi (1,034 kPa).

b. 5.2.1.6.1 Testing allowance at various pressures is shown in Tables 6A and 6B.

c. 5.2.1.6.2 When testing against closed metal-seated valves, an additional testing allowance per closed valve of 0.0078 gal/h/in. (1.2 mL/h/mm) of nominal valve size shall be allowed.

d. 5.2.1.6.3 When hydrants are in the test section, the test shall be made against the main valve in the hydrant.

e. 5.2.1.7 Acceptance of installation. Acceptance shall be determined on the basis of testing allowance. If any test of laid pipe discloses a testing allowance grater than that specified in Sec. 5.2.1.6, repairs or replacements shall be accomplished inaccordance with the specifications.

f. 5.2.1.7.1 All visible leaks are to be repaired regardless of the allowance used for

testing.

2. If such testing discloses leakage in excess of this specified allowable, the Contractor, at his expense, shall locate and correct all defects in the pipeline until the leakage is within the specified allowance. All known leaks, irregardless of this test, shall be repaired.

E. Pressure Test: After satisfactorily completing the leakage test, each valved section over the entire project, shall be tested at 200 psi for a sufficient period (approximately 10 min) to discover all leaking or defective materials and/or workmanship.

F. Disinfecting Water Mains: The Contractor shall disinfect all water mains before the new facilities are placed into service. Disinfection must be performed in accordance with AWWA C651, latest revision and water samples must be submitted to a laboratory approved by the Texas Department of Health. Sample must be collected by the Contractor or his representative in the presence of the City or his representative. The Contractor shall be responsible for delivering the samples to an approved laboratory for testing. Sample results must indicate the facility is free of microbiological contamination before it is placed into service. It shall be the Contractor's responsibility to obtain a current copy of AWWA C651 to determine the correct forms of chlorine for disinfection, the basic disinfection procedure, preventive and corrective measures during construction, methods of chlorination, final flushing procedures, procedures for bacteriological tests, procedures for redisinfection and disinfection procedures when cutting into existing mains. The Contractor, at its expense, will supply the concentrated chlorine disinfecting material, the City□s personnel will supervise and direct the overall sterilization procedure. The Contractor, at his own expense, shall provide all other equipment, supplies and necessary labor to perform the sterilization under general supervision by the City.

G. General

1. All valves shall be arranged to prevent the strong disinfecting dosage from flowing back into the existing water supply piping. The new pipeline shall then be completely filled with disinfecting solution by feeding the concentrated chlorine and approved water from the existing system uniformly into the new piping in such proportions that every part of the line has a minimum concentration of chlorine as prescribed in AWWA C651.

2. Unless otherwise identified, all quantities called for herein refer to measurements by the testing procedures in the current edition of □Standard Methods of Examination of Water and Wastewater□. The chlorine concentration of each step in the sterilization procedure shall be verified by chlorine residual determinations. This disinfecting solution shall be retained in the piping for at least twenty-four (24) hours, and all valves, hydrants, etc., shall be operated to disinfect all their parts. After this retention period, the water shall contain no less than the chlorine residual prescribed in AWWA C651 throughout the treated section of the pipeline.

3. This heavily chlorinated water shall then be carefully flushed from the line until the chlorine concentration is not higher than the residual generally prevailing in the existing distribution system, or approximately 1.0 parts per million. Proper planning and appropriate preparations to handle, dilute and dispose of this strong chlorine solution without causing injury or damage to the public, the water system, the environment must be approved by the City before flushing of the line may begin, and the flushing shall be witnessed by an authorized representative of the City.

H. Bacteriological Testing

1. After final flushing of the strong disinfecting solution, water samples from the line shall be tested for bacteriological quality, at the Contractor's expense, and must be found free of coliform organisms before the pipeline may be placed in service. One (1) test sample shall be drawn from the end of the main and additional samples collected at intervals of not more than one-thousand (1,000) feet along the pipeline. A minimum of three (3) samples must be collected.

2. The Contractor, at his own expense, shall install sufficient sampling taps at proper locations along the pipeline. Each sampling tap shall consist of a standard corporation cock installed in

the line and extended with a copper tubing gooseneck assembly. After samples have been collected, the gooseneck assembly shall be removed and retained for future use.

3. Samples for bacteriological analysis shall be collected only from suitable taps, in sterile bottles. Collection of the test samples shall be made in the presence of City personnel. If the initial disinfection fails to produce acceptable sample tests, the disinfection procedure shall be repeated (without extra compensation) until satisfactory test results have been obtained, before the piping may be placed in service.

CIP12.07 FINAL ACCEPTANCE

A. No pipe installation will be accepted until all known leaks have been repaired whether or not leakage is within allowable limits. Locating and repairing of leaks shall be performed by the Contractor at no additional cost to the City.

B. The City will certify that all required pressure and leakage tests have been successfully completed before the pipeline is accepted.

CIP12.08 PAYMENT

A. No separate payment will be made for work completed in accordance with this specification, and the cost thereof will be included in the appropriate items of the Proposal and Bid Schedule.

END OF SECTION

TECHNICAL SPECIFICATIONS

SECTION CIP13 - SUMMARY OF TESTING (MISCELLANEOUS)

CIP13.01 SCOPE OF WORK

A. This specification covers the requirements to perform testing of various work items for this Project.

CIP13.02 SUBMITTALS

A. Within 30 days after the Notice to Proceed, the Contractor shall submit to the Engineer or the City for approval, technical product literature and all other pertinent data to illustrate conformance to the specification found within.

CIP13.03 TESTING FOR ROADS

Testing for roads shall be in accordance with Table 13-1.

Table 13-1

Item	Test Method	Passing Criteria	Comments
Hot Mix Asphaltic Concrete (HMAC)	Tex-200-F	See SD1.06 A	Sieve Analysis of Fine and Coarse Aggregate
	Tex-207-F	94.5%-97.5%Lab Density; 91.0%-96.0%In-PlaceField Density	Determining Density of Compacted Bituminous Mixtures
	Tex-210-F	See SD 1.06 B	Determining Asphalt Content of Bituminous Mixtures by Extraction
	Tex-227-F		Max. Specific Gravity of Bituminous Mixtures
	Tex-208-F	Max 35	Stability
Trench Backfill	Applicable Tex Testing Method	See Section G4.05	Minimum of one test every 250 linear feet of trench length for each lift.
Embankment	Tex-114-E		Test every 2,000 SY of roadbed surface
Flexible Base	Tex-107-E, Part II Tex-411-A Tex-110-E	2% shrinkage	Bar Linear Shrinkage Magnesium Soundness Sieve Analysis
	Tex-113-E	100% Density	Moisture Density
	Tex-115-E		Roadway Density
	Tex-116-E	40 Max.	Wet Ball Mill
	Tex-117-E	45 psi @ 0 psi lateral & 175 psi @ 15 psi lateral Max. increase ≤ 20	Triaxial Test (Part I or II)
	Tex-460-A	Plasticity Index ≤ 10	Particle Count (Part I)
	Tex-106-E	Liquid Limit ≤35	Plasticity Index
	Tex-104-E	±2% Optimum	Liquid Limit
	Tex-103-E		Moisture Content

Table 13-1, cont.

Item	Test Method	Passing Criteria	Comments
Striping	Tex-828-B Tex-854-B	10 or more stripes visible (day) 6 or more stripes visible (night) 0.060-inches minimum thickness for edgeline markings 0.090-inches minimum thickness for stop bars, legends, symbols, gore and centerline/no passing barrier line markings 0.180-inches maximum thickness for all markings	Glass Beads: If criteria is not met, check Tex-828-B for scheduling replacement of striping. The average of the readings across each sample must be equal to or above the specified minimum thickness. No reading should be more than 10-mils below the specified minimum thickness.

CIP13.04 TESTING FOR WATER/WASTEWATER

Testing for water/wastewater shall be in accordance with Table 13-2.

Table 13-2

Item	Test Method	Passing Criteria	Comments
Valves, Hydrants and Appurtenances	Manufacturer's Recommendations	Manufacturer's Recommendations	Functional field test of each valve, including actuators and valve control equipment.
Water and Wastewater Lines			As described in Section CIP 12: Testing of Pipelines

CIP13.05 TESTING FOR CONCRETE

Testing for concrete shall be in accordance with Table 13-3.

Table 13-3

Item	Test Method	Passing Criteria	Comments
Asphalt Board	Tex-524-C	Deflection from horizontal <1:3 1/2	
Concrete Slump			See Table 13-4 for Slump
Coarse Aggregate	Tex-413-A Tex-410-A Tex-411-A	0.25% by weight clay lumps 1.00% by weight shale 5.00% by weight laminated and/or friable particles 40% wear 12% loss Sodium Sulfate 18% loss Magnesium Sulfate	See Table 13-5 for Gradation Soundness Test

Table 13-3, cont.

Fine Aggregate	Tex-612-J Tex-408-A	60% by weight acid insoluble residue subject to direct traffic. Color shall not be darker than Organic Color No. 3 (Gardner No. 11)	 Color Test

	Tex-401-F Tex-203-F Tex-402-A	 Not less than 80 Between 2.3 & 3.1 for Non-Class K Between 2.6 & 2.8 for Class K	See Table 13-6 for Gradation Sand Equivalent Fineness Modulus
Membrane Curing	Tex-219-F	2% loss for 24-hour test 4% loss for 72-hour test	Water Retention Test

Table 13-4

Concrete Designation	Slump	Maximum Slump
1. All drill shaft	6	7
2. Uncased drill shafts, thin walled sections (<9□) and pre-stressed concrete members	4	5
3. Slabs, caps, columns, piers, wall sections over 9□, etc.	3	4
4. Underwater or seal concrete	6	7
5. Riprap, curb, gutter and other miscellaneous concrete.	As specified by City.	

Table 13-5

Aggregate Grade No.	Nominal Size (in)	Amount Retained (%)								
		2 1/2 in	2 in	1 1/2 in	1 in	¾ in	½ in	3/8 in	No 4	No 8
1	2	0	0-20	15-50		60-80			95-100	
2 (467)*	1 1/2			0-5		30-65		70-90	95-100	
3	1 1/2			0-5		10-40	40-75		95-100	
4 (57)*	1				0-5		40-75		90-100	95-100
5 (67)*	¼					0-10		45-80	90-100	95-100
6 (7)*	½							30-60	85-100	95-100
7	3/8							5-30	75-100	
8	3/8							0-5	35-80	90-100

Table 13-6

Aggregate Grade No.	Amount Retained (%)							
	3/8 in	No 4	No 8	No 16	No 30	No 50	No 100	No 200
1	0	0-5	0-20	15-50	35-75	65-90	90-100	97-100

CIP13.06 PAYMENT

A. No separate payment will be made for work completed in accordance with this specification, and the cost thereof will be included in the appropriate items of the Proposal and Bid Schedule.

END OF SECTION

TECHNICAL SPECIFICATIONS

SECTION G4 - PIPE EXCAVATION, TRENCHING, EMBEDMENT, ENCASEMENT AND BACKFILLING

G4.01 SCOPE OF WORK

A. This specification covers the requirements for furnishing all labor, equipment and material and performing all work necessary, in connection with excavation, trenching, embedment, encasement, and backfilling, for the installation of water lines, storm sewer lines, wastewater lines, etc. in this Project.

G4.02 SUBMITTALS

A. Within 30 days after the Notice to Proceed, the Contractor shall submit to the Engineer or the City for approval, technical product literature including a Trench Safety Plan (which shall be sealed by a Professional Engineer registered in the State of Texas, if required) embedment material (source, gradation and type), backfill material (source, gradation and type), encasement material (if required), equipment and all other pertinent data to illustrate conformance to the specification found within.

G4.03 EXCAVATION

A. General

1. Excavation shall include the removal of any trees, stumps, brush, debris, or other obstacles that may obstruct the line of work, and the excavation and removal of all earth, rock or other materials to the extent necessary to install the pipe and appurtenances in conformance with the line and grades shown in the Plans, or as specified.

B. Maximum and Minimum Width of Trenches

1. The sides of all trenches shall be cut as nearly vertical as possible. Unless otherwise specified on the Plans, the minimum width of trench in which the pipe may be installed shall not be less than 12-inches plus the outside diameter of the pipe, and the maximum width shall not be more than 24-inches plus the outside diameter of the pipe, measured at an elevation in the trench which is 12-inches above the top of the pipe when it is laid to grade.

2. Wherever the prescribed maximum trench width is exceeded, the Contractor shall use the class embedment or encasement required by the Engineer to provide the load carrying capacity for the trench width as actually cut, and the additional cost incurred will be borne by the Contractor.

C. Sheeting and Shoring

1. Where required in the Contractor's Trench Safety System, or where required for other reasons in caving ground, or in wet, saturated or flowing materials, the sides of all trenches and excavations shall be adequately sheeted and braced so as to maintain the excavation free from slides or cave-ins.

2. Sheeting and shoring shall not be left in place unless its removal is impractical.

D. Dewatering Excavations

1. There shall be sufficient pumping equipment, in good working order, available at all times to remove any water that accumulates in excavations. Where the pipeline crosses natural drainage channels, the work shall be conducted in such a manner that unnecessary damage or delays in the prosecution of the work will be prevented. Provisions shall be made for the

satisfactory disposal of surface water pumped so as to prevent damage to public or private property. The Contractor shall be responsible for maintaining safe working conditions and suitable construction techniques.

E. Disposal of Excavated Materials

1. Suitable excavated materials may be piled adjacent to the work to be used for backfilling. Excavated materials unsuitable for backfilling, or in excess of that required for backfilling, shall be disposed of by the Contractor. Desirable topsoil, sod, etc. shall be carefully removed and piled separately adjacent to the work when required. Excavated materials shall be handled at all times in such a manner as to cause a minimum of inconvenience to public travel. Suitable selected bedding or backfill material shall be provided at no additional cost to the City.

F. Trench Depth

1. Excavation for the pipeline shall be removed to a depth below the pipe barrel and pipe bell as shown in the Plans for the type of embedment specified, and the bottom of the trench brought to true subgrade with the embedment or encasement shown in the Plans.

G. Soft Subgrade

1. Where soft or spongy material is encountered in the excavation at subgrade level, it shall be removed to such a depth that a stable foundation is achieved by replacing the unsuitable material with tamped gravel, brought to the level of the bottom of bedding.

2. Gravel used shall be washed gravel or crushed stone and may fit any gradation of size up to three (3) inches. The particular gradation shall take into consideration the actual field conditions.

H. Excavated Materials

1. Excavated materials shall be piled adjacent to the work to be used for backfilling as required. After the trench has been refilled, topsoil shall be replaced to the extent that rock excavated from the trench will be completely covered and the area is returned to its original condition.

2. Where required on the Plans or when otherwise specified, desirable topsoil shall be piled separately in a careful manner and replaced in its original position.

3. Where a trench is required to cross a paved area, the asphalt or concrete shall be saw cut and removed for a total width that is two (2) feet greater than the trench width. The Contractor shall dispose of all excavated concrete, asphalt and subgrade material that is unsuitable for backfilling or in excess of that required for backfilling.

I. Damage to Existing Utilities

1. Where existing utilities are damaged, they shall be replaced immediately with material equal to or better than the existing material. Such work shall be at the entire expense of the Contractor.

G4.04 EMBEDMENT AND ENCASEMENT

A. General

1. Embedment shall be as required in the Plans or Standards. All embedment materials shall be free of grass, roots, vegetation, and other deleterious materials. Embedment Standards are shown on the Plans or Standards.

2. When the pipe has been checked for line and grade, the trench shall be backfilled with enough granular material or concrete on both sides to hold the pipe firmly in position. When placing granular material or concrete around the pipe, care shall be taken to fill all voids around the pipe. The pipe shall not be floated. The embedment or encasement material shall be carefully tamped to assure uniform pipe support and density.

B. Embedment Materials

1. Material for embedment shall conform to the following sieve analysis:

Sieve Size	3/8" F % Retained	½" D % Retained
½"	0	0
3/8"	0-2	5-25
4m	40-85	80-100
10m	95-100	96-100

C. Concrete Embedment and Encasement

1. Concrete embedment and encasement and cap shall have a minimum compressive strength of 2,000 pounds per square inch at 28 days.

2. Dry mix will not be permitted. The concrete cushion portion of the embedment or encasement will be mixed moist or damp to give a slump of not more than one (1) inch. Concrete for the sides and top, if specified, shall be mixed to obtain a slump of not less than one (1) inch or more than three (3) inches.

3. After pipe joints are completed, the voids at the joints in the embedment section shall be filled with concrete, and the embedment shall be brought up to proper grade. Where concrete is placed over or along the pipe, it shall be placed in such a manner as not to damage or injure the joints or displace the pipe. Care shall be taken in the placement of concrete to assure that a uniform pad, free of voids and of specified thickness, is constructed under the entire pipe section.

4. A cleavage line between the base concrete and the side embedment concrete will not be allowed. Backfilling shall be done in a careful manner and at such time, after concrete embedment or encasement has been placed, as not to damage the concrete in any way.

G4.05 BACKFILLING

A. General

1. Backfilling shall include the refilling and consolidating of the fill in trenches and excavations up to the surrounding ground surface or road grade at crossings. No backfill shall be placed until the Engineer, the City or his authorized Inspector has inspected the trench and pipe in place and has authorized the placing of backfill.

2. Backfilling shall be done with select material or concrete backfill as described hereafter and shown on the Plans. No material of a perishable, spongy or otherwise unsuitable nature shall be used in backfilling.

B. Select Backfill Material

1. Unless otherwise shown on the Plans, or approved by the Engineer, the select material backfill shall be Specification Section SD4 Flexible Base, Type A Grade 1.

2. If approved by the Engineer, good, sound earth may be used as select material for backfill over the pipe. Good, sound earth as defined as gravel, sandy loam or loam, free from excessive clay. Select material shall not have rocks with an average dimension larger than one (1) inch, and no dimension greater than two (2) inches.

3. An alternative to the flexible base as select backfill will be on-site or imported select material so long as it is properly moisture-conditioned, placed and compacted.

4. It shall be the full responsibility of the Contractor to explore the project and subsurface materials to determine if the trench excavation will be suitable for use as select materials and to follow as closely as possible this Specification to insure a good, sound pipeline when completed.

C. Concrete Trench Cap

1. Where 36-inch minimum cover cannot be obtained or due to potential surface loading, the City may require a cap to be installed.

D. Concrete Backfill

1. Where shown on the Plans, concrete backfill shall consist of selected rock material or granular sand material mixed with a minimum of three sacks of cement per cubic yard. All material shall be mixed in a concrete mixer or transit mixed unless otherwise approved by the City.

E. Backfilling Operation

1. Backfilling operation outside of pavement shall be compacted to the required density without damaging the pipe or bedding. Backfill under non paved areas, two feet outside of any structure or utilities and excluding lines within a floodplain, streams and watercourses shall be compacted to 90% of the maximum dry density in accordance Tex-114-E. Areas within two feet of structures or existing utilities and areas within a floodplain, streams and water courses shall be compacted to 95% in accordance with Tex-114-E. Prior to any compaction, moisture shall be within $\pm$3% of the optimum moisture content.

2. All trenches under proposed or existing concrete roadways, driveways and sidewalks, paved waterways, brick roadways, asphaltic roadways with concrete base, gravel roadways, and roadways with gravel base and asphalt surface, shall be backfilled to the required density in six (6) inch maximum lifts without damaging the pipe or bedding except the first lift over the pipe bedding will be twelve (12) inches in depth. Swelling soils (soils with a plasticity index of 20 or more) shall be sprinkled as required to provide not less than optimum moisture nor more than 3% over the optimum moisture content to the extent necessary to provide not less than 95% nor more than 102% of the maximum dry density as determined in accordance with Tex-114-E. Non-swelling soils (soils with a plasticity index less than 20) shall be sprinkled as required and compacted to the extent necessary to provide not less than 95% of the optimum dry density with the moisture within $\pm$3% of the optimum moisture content in accordance with Tex-114-E. Jetting with water will not be permitted. Flexible base used as select backfill shall be compacted to 95% of Tex-113E at $\pm$3% of the optimum moisture content.

3. After the trench has been refilled, topsoil shall be replaced to the extent that rock excavated from the trench will be completely covered or removed and the area is returned to its original condition, except that in cultivated areas a minimum of six (6) inches of topsoil shall be replaced.

G4.06 PAYMENT

A. No separate payment will be made for work performed under this Specification for excavating, trenching, embedment, and backfilling. All costs incurred shall be included in the contract price for the appropriate items in the Proposal and Bid Schedule.

B. No separate payment will be made for the bedding used in embedment. All costs incurred shall be included in the contract price for the appropriate bid item.

C. Separate payment, if authorized by the City, will be made for crushed stone or washed gravel as described in these specifications under Section G4.02(G), SOFT SUBGRADE, at the contract unit price per cubic yard as provided in the Proposal and Bid Schedule under "Extra Gravel for Embedment."

D. Separate payment will be made for 2,000 psi Concrete Encasement or Backfill at the contract unit price per cubic yard or linear foot as provided in the Proposal and Bid Schedule under 2,000 psi Concrete Encasement. Concrete and three (3) sack granular sand or rock material mix backfill will be measured in cubic yards or linear feet actually placed based on actual trench width not to exceed the specified maximum trench width and will be paid for at the contract price per cubic yard or linear foot as provided in the Proposal and Bid Schedule.

E. Where authorized by the Engineer, gravel used to replace unsuitable material will be paid for at the unit bid price for Extra Gravel for embedment.

END OF SECTION

TECHNICAL SPECIFICATIONS

SECTION G5 – GRANULAR FILL MATERIALS

G5.01 SCOPE OF WORK

A. This specification covers the requirements for the use of granular fill materials for this Project.

G5.02 SUBMITTALS

A. Within 30 days after the Notice to Proceed, the Contractor shall submit to Engineer or the City for approval, technical product literature including the source of the material, gradation, type of material, and all other pertinent data to illustrate conformance to the specification found within.

G5.03 GENERAL

A. Granular fill materials are specified in this Section, but their use for bedding pipe, pavement base, are specified in detail in sections G4 TRENCHING, BACKFILLING AND COMPACTION and SD4 FLEXIBLE BASE. The Engineer may respectively order the use of fill materials for purposes other than those specified in other Sections if, in his/her opinion, such use is advisable.

G5.04 MATERIALS

A. Common fill shall consist of mineral soil, substantially free of clay, organic material, loam, wood, trash, and other objectionable material which may be compressible, or which cannot be compacted properly. Common fill shall not contain stones larger than six (6) inches in any dimension, broken concrete, masonry, rubble, asphalt pavement, or other similar materials. It shall have physical properties, as approved by the Engineer, such that it can be readily spread and compacted.

B. Select common fill shall be as specified above for common fill except that the material shall contain no stones larger than two (2) inches in its largest dimension.

C. Crushed Stone Backfill shall consist of hard, durable, particles of proper size and gradation, free from sand, loam, clay, excess fines and deleterious materials. The size of the particles shall be uniformly graded such that the following bedding specifications are met:

Sieve Size	3/8" F % Retained	½" D % Retained	Washed Gravel % Retained
½"	0	0	0
3/8"	0-2	5-25	---
4m	40-85	80-100	---
10m	95-100	96-100	---
¾"	---	---	100

D. Crushed Stone Base shall consist of sound, durable stone, free of any foreign material, angular in shape, free from structural defects and comparatively free of chemical decay. This material shall comply with Texas Department of Transportation Item 248, Type "A", Grade 1 unless otherwise shown on the Plans or Standards. The stone shall have a maximum size of 7/8 inch.

E. Cement Stabilization Sand Backfill shall consist of a mixture of ASTM C33 fine aggregate and Type I cement. The mix shall be proportioned of two (2) sacks of cement per cubic yard.

G5.05 PAYMENT

A. No separate payment will be made for work performed in accordance with this specification, and the cost thereof shall be included in the proper items of the Proposal and Bid Schedule.

END OF SECTION

TECHNICAL SPECIFICATIONS

SECTION W1 – DUCTILE IRON PIPE AND FITTINGS

W1.01 SCOPE OF WORK

A. This specification covers the requirements to furnish and install ductile iron pipe and ductile iron pipe fittings including bracing, pipe laying, jointing, testing, blocking, and any other work that is required or necessary to complete the installation as shown on the Plans and as specified herein.

W1.02 SUBMITTALS

A. Within 30 days of the Notice to Proceed, the Contractor shall submit to the Engineer for approval, technical product literature including the name of the pipe and fitting suppliers and a list of materials to be furnished, completely detailed working drawings and schedules of all ductile-iron pipe and fittings required, prior to each shipment of pipe, submit certified test reports that the pipe for this Contract was manufactured and tested in accordance with the ASTM and ANSI/AWWA Standards specified herein.

W1.03 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM)

1. ASTM A307 - Standard Specification for Carbon Steel Bolts and Studs 60,000 PSI Tensile Strength.

B. American Water Works Association (AWWA)

1. AWWA C104 - Cement-Mortar Lining for Ductile-Iron Pressure Pipe and Fittings.

2. AWWA C105 - Polyethylene Encasement for Ductile-Iron Piping for Water and Other Liquids.

3. AWWA C110 - Ductile-Iron and Gray-Iron Fittings, 3-inch Through 48-in for Water and Other Liquids.

4. AWWA C111 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.

5. AWWA C115 - Standard for Flanged Ductile-Iron Pipe with Threaded Flanges.

6. AWWA C151 - Ductile-Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined Molds for Water or Other Liquids.

7. AWWA C153 - Ductile-Iron Compact Fittings, 3-inch Through 16-inch for Water and Other Liquids.

8. AWWA C600 - Standard for Installation of Ductile-Iron Water Mains and Their Appurtenances.

9. AWWA C651 - Disinfection Water Mains

C. American National Standards Institute (ANSI)

1. ANSI B16.1 - Cast Iron Pipe Flanges and Flanged Fittings.

D. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

W1.04 QUALITY ASSURANCE

A. All ductile-iron pipe and fittings shall be from a single Manufacturer. All ductile-iron pipe to be installed under this Contract may be inspected at the foundry for compliance with these Specifications by an independent testing laboratory provided by the City. The Contractor shall require the Manufacturer's cooperation in these inspections. The cost of foundry inspection of all pipe approved for this Contract, plus the cost of inspection of disapproved pipe will be borne by the Contractor.

B. Inspection of the pipe will be made by the Engineer or other representatives of the City after delivery. The pipe shall be subject to rejection at any time on account of failure to meet any of the Specification requirements, even though pipes may have been accepted as satisfactory at the place of manufacture. Pipe rejected after delivery shall be marked for identification and shall immediately be removed from the job.

W1.05 MATERIALS

A. Ductile iron pipe shall conform to AWWA C151, be manufactured from metal having a minimum tensile strength of 60,000 psi, a minimum yield strength of 42,000 psi, and a minimum elongation of 10 percent (60–42–10), and be provided in the following minimum pressure classes:

1. 12-inch and smaller, Class 350.
2. 14-inch through 20-inch, Class 250.
3. 24-inch, Class 200.
4. 30-inch and larger, Class 150.

B. Ductile iron fittings shall conform to AWWA C110 or C153.

C. All pipe and fittings shall have a bituminous outside coating in accordance with AWWA C151 and C110, respectively. All pipe and fittings shall be cement-mortar lined and seal coated in accordance with AWWA C104. Cement mortar lining shall be double thickness.

D. Ductile iron pipe with push-on or mechanical joints shall be centrifugally cast pipe in accordance with AWWA C150 and C151.

E. Restrained joints shall be restrained push-on joints, TR Flex by U.S. Pipe and Foundry; Lok-Fast by American Cast Iron Pipe Company, or equal. Joints shall be suitable for 250 psi working pressure and be fabricated of heavy section ductile iron casting. Bolts and nuts shall be low carbon steel conforming to ASTM A307, Grade B.

F. Sleeve type couplings shall be of steel and shall be Style 38 by Dresser Manufacturing Division, Smith-Blair or equal. Couplings shall be furnished with black steel bolts and nuts and with pipe stop removed. Gaskets shall be of a material suitable for exposure to liquid within the pipe.

W1.06 POLYETHYLENE ENCASEMENT

A. All buried ductile iron pipe and metallic fittings shall be encased with 8 mil, Type I, Grade E-1, polyethylene film conforming to AWWA C105. Class usage shall be:

1. Class A - Natural Color where exposure to weather (including sunlight) is less than 48 hours total before burial.
2. Class C - Black where exposure to weather (including sunlight) may be more than 48 hours.

B. Exposure to weather shall be kept to a minimum, and in no case shall it exceed 10 days. The Class of polyethylene used shall be approved by the Engineer.

C. Polyethylene encasement shall not be paid for separately, but the cost there of shall be included in he appropriate item of the Proposal and Bid Schedule.

W1.07 LAYING DUCTILE IRON PIPE AND FITTINGS

A. Care shall be taken in loading, transporting and unloading to prevent injury to the pipe, lining or coatings. Pipe or fittings shall not be dropped. All pipe or fittings shall be examined before laying and no piece shall be installed which is found to be defective. Any damage to the pipe linings or coatings shall be repaired as directed by the Engineer. Handling and laying of pipe and fittings shall be in accordance with the Manufacturer's instruction and as specified herein.

B. All pipe and fittings shall be thoroughly cleaned before laying, shall be kept clean until they are used in the work, and when laid, shall conform to the lines and grades required. Pipe shall not be laid unless the subgrade is free of water and in a satisfactory condition. Ductile iron pipe and fittings shall be installed in accordance with the requirements of AWWA C600 except as otherwise provided herein. All piping on this project regardless of size or class shall be placed in the embedment as shown on the detail sheets in the Plans. If any defective pipe is discovered after it has been laid, it shall be removed and replaced with a sound pipe in a satisfactory manner by the Contractor, at his own expense.

C. All pipe shall be sound and clean before laying. When laying is not in progress, including lunchtime, the open ends of the pipe shall be closed by watertight plugs or other approved means. Good alignment shall be preserved in laying. The deflection at joints shall not exceed that recommended by the Manufacturer. Fittings, in addition to those shown on the Plans, shall be provided, if required, for crossing utilities which may be encountered upon opening the trench. Solid sleeves shall be used only where approved by the Engineer and the City.

D. When cutting pipe is required, the cutting shall be done by machine, leaving a smooth cut at right angles to the axis of the pipe. Cut ends of pipe to be joined with a bell shall be beveled to conform to the manufactured spigot end. Cement lining shall be undamaged.

E. Joints shall be protected by eight (8) mil. Polyethylene film prior to placing concrete. Concrete shall be placed against undisturbed material, and shall not cover joints, bolts or nuts, or interfere with the removal of any joint.

W1.08 PUSH-ON JOINTS

A. Push-on joints shall be made in accordance with AWWA C111 and the Manufacturer’s instructions. Pipe shall be laid with bell ends in the direction of trenching. A rubber gasket shall be inserted in the groove of the bell end of the pipe, and the joint surfaces cleaned and lubricated. The plain end of the pipe to be laid shall then be aligned and inserted in the bell of the pipe to which it is to be joined and pushed home with a jack or by other means. After joining the pipe, a metal feeler shall be used to make certain that the rubber gasket is correctly located.

W1.09 MECHANICAL JOINTS

A. Mechanical joints shall be made in accordance with Appendix “A” of AWWA C111 and the Manufacturer's instructions. Thoroughly clean and lubricate the joint surfaces and rubber gasket with soapy water before assembly. Bolts shall be tightened to the specified torque. Under no conditions shall extension wrenches or pipe over the handle of ordinary ratchet wrench be used to secure greater leverage.

W1.10 RESTRAINED JOINTS

A. Restrained joints shall be installed where shown on the Plans. The joint assemblies shall be made in accordance with the Manufacturer's recommendations.

W1.11 SLEEVE TYPE COUPLINGS

A. Couplings shall be installed where shown on the Plans. Couplings shall not be assembled until adjoining push-on joints have been assembled. After installation, apply a heavy bituminastic coating to bolts and nuts.

W1.12 POLYETHYLENE ENCASEMENT

A. The polyethylene encasement shall be installed in accordance with either method specified in AWWA C105.

W1.13 CONCRETE AND BLOCKING

A. 2,500 psi concrete shall be placed for blocking at each change in direction in the pipeline, in such manner as will substantially brace the pipe against undisturbed trench walls. Concrete blocking, made from Type I cement, shall have been in place four (4) days prior to testing the pipeline as hereinafter specified. Test may be made in two (2) days after completion of blocking if Type III cement is used.

B. At all points where wet connections are made to existing lines, the existing lines shall be adequately blocked and the tapping connection fittings shall be supported by blocking up to the spring line with 2,500 psi concrete.

C. Concrete blocking will not be measured or paid for as a separate item but the cost thereof shall be included in the proper items listed in the Proposal and Bid Schedule.

W1.14 CLEANING

A. At the conclusion of the work thoroughly clean all of the new pipelines by flushing with water or other means to remove all dirt, stones, pieces of wood or other material which may have entered during the construction period. If obstructions remain after this cleaning, the obstructions shall be removed.

W1.15 CONNECTIONS AND APPURTENANCES

A. The Contractor shall make the alterations and the necessary connections to existing water mains as shown on the Plans. Such connection shall be made at such time and in a manner approved by the City; in each case, when the work is started, it shall be prosecuted expeditiously and continuously until completed.

B. Fittings, bends, plugs and valves and shall be of standard manufacture and mechanical joint type to fit AWWA pipe specifications in Classes A, B, C and D, unless otherwise shown on the Plans.

C. Payment for fittings and gate valves shall be restrained and shall be made separately under the appropriate bid items listed in the Proposal and Bid Schedule.

W1.16 LEAKAGE TESTING AND STERILIZATION

A. All Ductile Iron Pipe shall be leak tested and sterilized according to Section CIP12 – TESTING OF PIPELINES.

W1.17 PAYMENT

A. The pipeline, complete in place, including cleanup, will be measured for payment in linear feet along the centerline of the pipe actually installed. Measurement shall be through all fittings, specials, valves, etc., and no deduction in length shall be made for such appurtenances. Installation of the pipeline will be paid for at the unit contract price per linear foot as provided in the Proposal and Bid Schedule.

B. Payment of the unit contract price for the items of work performed shall be the total compensation for furnishing all labor, materials, tools, equipment and incidentals and performing all work that is necessary for the installation, testing, and sterilization of the pipe, fittings, connections, blocking, embedment or placing in encasement pipe and all other appurtenances in accordance with the Plans and the provisions of the Specifications.

END OF SECTION

TECHNICAL SPECIFICATIONS

SECTION W2 – POLYVINYL CHLORIDE (PVC) PIPE-WATER

W2.01 SCOPE OF WORK

A. This specification covers the requirements to install polyvinyl chloride (PVC) water pipe and ductile iron fittings for the water line, including excavation, sheeting, shoring, dewatering, pipe laying, jointing, testing, backfilling and any other work that is required or necessary to complete the installation as shown on the Plans and as specified herein.

W2.02 SUBMITTALS

A. Within 30 days of the Notice to Proceed, the Contractor shall submit to the Engineer or the City for approval, technical product literature including the name of the pipe and fittings suppliers, a list of materials to be furnished, shop drawings and schedules of all PVC pipe and fittings required, prior to each shipment of pipe, submit certified test reports that the pipe for this Contract was Manufactured and tested in accordance with the ASTM Standards specified herein.

W2.03 QUALITY ASSURANCE

A. All PVC pipe and fittings shall be from a single Manufacturer. The supplier shall be responsible for the provisions of all test requirements specified in ASTM D3034 or ASTM F789 and/or ASTM F758 as applicable. In addition, all PVC pipe to be installed under this Contract may be inspected at the plant for compliance with these specifications by an independent testing laboratory provided by the City. The Contractor shall require the Manufacturer's cooperation in these inspections. The cost of plant inspection of all pipe approved for this Contract, plus the cost of inspection of disapproved pipe, will be borne by the Contractor.

B. Inspections of the pipe may also be made by the Engineer or other representatives of the City after delivery. The pipe shall be subject to rejection at any time on account of failure to meet any of the Specification requirements, even though sample pipes may have been accepted as satisfactory at the place of manufacture. Pipe rejected after delivery shall be marked for identification and shall be removed from the job at once.

W2.04 POLYVINYL CHLORIDE (PVC) PIPE AND FITTINGS

A. Polyvinyl chloride pipe for water lines, unless otherwise specifically shown on the Plans, or approved in writing, shall be AWWA C900, C905, or C909 Class 150 psi with a dimension ratio of 18 (DR-18), for water lines and shall be extruded, be of rubber gasket type, and be furnished in 20-foot nominal laying lengths. All such pipe shall bear a mark denoting approval by the Underwriters' Laboratories of Chicago, Illinois, so that it will be acceptable to the Texas State Fire Insurance Commission for use in fire protection lines without penalty. All joints shall be of the type which provides a recession in the bell for the employment of a single rubber gasket to be placed before the insertion of the succeeding spigot. Each size of polyvinyl chloride pipe shall have the same outside diameter as the corresponding size of cast iron pipe.

B. Fittings shall be ductile iron, mechanical joint or flanged type and shall be Class 250 in accordance with AWWA Specifications C110-77, C-111-80, and C115-75. Flanges shall be faced and drilled in accordance with ASA Standard B16.1, Class 125 unless otherwise shown on the Plans or in the Special Conditions. All fittings shall be tar coated on the outside surface and shall have an interior cement lining with seal coat per AWWA Specifications C104-80 unless otherwise shown or specified.

C. The Contractor shall obtain installation instructions, including support spacing and solvent welding, from the supplying Manufacturer, shall comply with the instructions, and shall meet the requirements of ASTM D-2855, Standard Recommended Practice for making Solvent Cemented Joints with PVC Pipe and Fittings. The PVC solvent cement shall comply with ASTM D-2564 and shall be furnished by the pipe and fitting Manufacturer for the class and type of pipe supplied to the project.

W2.05 HANDLING AND CUTTING PIPE

A. Pipe and fittings are slightly brittle. Care shall be taken in shipping, handling and laying to avoid damaging the pipe and fittings. Extra care will be necessary during cold weather construction.

B. Any pipe or fitting showing a crack or which has received a blow that may have caused an incipient fracture, even though no such fracture can be seen, shall be marked as rejected and removed at once from the work.

C. All pipe ends shall be square after cutting.

D. While stored, pipe shall be adequately supported from below at not more than three (3) foot intervals to prevent deformation. Pipe shall not be stacked higher than six (6) feet. Pipe and fittings shall be stored in a manner which will keep them at ambient outdoor temperatures and out of direct sunlight. Temporary shading as required to meet this requirement shall be provided. Simple covering of the pipe and fittings which allows temperature buildup when exposed to direct sunlight will not be permitted.

W2.06 JOINTING POLYVINYL CHLORIDE (PVC) PIPE AND FITTINGS

A. PVC pipe and fittings shall be jointed in accordance with the recommendations of the latest ASTM Standards and detailed instructions of the Manufacturer.

W2.07 INSTALLING POLYVINYL CHLORIDE (PVC) PIPE AND FITTINGS

A. Unless otherwise specified on the Plans, polyvinyl chloride pipe shall be installed to clear all utility lines and shall have three (3) feet minimum cover. For water lines to be constructed under a future roadway, the cover may be increased to allow for future paving grades. The depth of cover, where shown on the Plans, is that distance from the top of the pipe to the approximate proposed grade line.

B. No single piece of pipe shall be laid unless it is generally straight. The centerline of the pipe shall not deviate from a straight line drawn between the centers of the openings at the ends of the pipe by more than $^{1}/_{16}$-inch per foot of length. If a piece of pipe fails to meet this requirement check for straightness, it shall be rejected and removed from the site. Laying instructions of the Manufacturer shall be explicitly followed.

C. Any pipe or fittings discovered to be defective after laying shall be removed and replaced with a sound piece.

D. The Engineer or the City may examine each bell and spigot end to determine whether any preformed joint has been damaged prior to installation. Any pipe having defective joint surfaces shall be rejected, marked as such, and immediately removed from the job site.

E. All pipe shall be sound and clean before laying. When laying is not in progress, including lunch time, the open ends of the pipe shall be closed by watertight plugs or other approved means. Good alignment shall be preserved in laying.

F. Pipe and fittings shall be installed in accordance with the instructions of the Manufacturer, ASTM D2321 and as specified herein. As soon as the excavation is complete to normal grade of the bottom of the trench, embedment material shall be placed, compacted and graded to provide firm, uniform and continuous support for the pipe. Bell holes shall be excavated so that only the barrel of the pipe bears upon the bedding. The pipe shall be laid accurately to the lines and grades indicated on the Plans. The specified embedment shall be accurately shaped and trimmed to receive the pipe barrel and each pipe section, when in place, shall have a uniform bearing on the subgrade for the full length of the pipe barrel. Pipe shall not be laid unless the subgrade is free of water and in a satisfactory condition. Embedment material shall be placed evenly on each side of the pipe to mid-diameter and hand tools shall be used to force the embedment material under the haunches of the pipe and into the bell holes to give firm continuous support for the pipe. Embedment material shall then be placed to 12-inches above the top of the pipe. Next, the varying depths of select material backfill above the embedment material backfill shall be placed according to the Plan Details and carefully compacted. Generally, the compaction shall be done evenly on each side of the pipe and compaction equipment shall not be operated directly over the

pipe until sufficient select material backfill has been placed to ensure that such compaction equipment will not have a damaging effect on the pipe. Equipment used in compacting the varying depths of select material backfill shall be approved by the pipe Manufacturer's representative prior to use. Adjustments of the pipe to line and grade shall be made by scraping away or filling in with granular material, and not by wedging or blocking up the bell.

G. Perforated PVC Pipe and fittings shall be installed in accordance with the instructions of the Manufacturer, ASTM F758 and as specified herein. As soon as the excavation for the trench is complete to normal grade of the bottom of the trench, geotextile fabric shall be laid and then the pea gravel bedding shall be carefully placed (so not to damage the geotextile fabric) and graded to provide uniform and continuous support for the pipe. Bell holes shall be excavated so that only the barrel of the pipe bears upon the bedding. Before the perforated pipe is laid on the trench, the perforated pipe shall be wrapped around and closed according to the Manufacturer's closure recommendations with the geotextile fabric. The pipe shall be laid accurately to the lines and grades indicated on the Plans. Blocking under the perforated PVC pipe will not be permitted. Pea gravel shall be placed evenly on each side of the pipe to mid-diameter and hand tools shall be used to gently place the pea gravel under the haunches of the pipe and into the bell holes to give firm continuous support for the pipe. Making sure not to damage the geotextile fabric, pea gravel shall then be carefully placed above the top of the perforated pipe varying from two to three (2-3) feet depending on the Plans. Once the remaining pea gravel has been placed, overlap or close the geotextile fabric according to the Manufacturer's recommendations or six (6) inches minimum overlap. Then one (1) foot of topsoil shall be placed over the pea gravel to the ground level with proper grass sodding on top.

H. Joints shall not be "pulled" or "cramped". Each joint of pipe shall be completed in compliance with Manufacturer's recommendations.

I. Before any joint is made, the pipe shall be checked to assure that a close joint with the next adjoining pipe has been maintained and that the inverts are matched and conform to the required grade. The pipe shall not be driven down to grade by striking it.

J. Precautions shall be taken to prevent flotation of the pipe in the trench.

K. When moveable trench bracing such as trench boxes, moveable sheeting, shoring or plates are used to support the sides of the trench, care shall be taken in placing and moving the boxes or supporting bracing to prevent movement of the pipe, or disturbance of the pipe bedding and backfill or embedment material. Trench boxes, moveable sheeting, shoring or plates shall not be allowed to extend below mid-diameter of the pipe. As trench boxes, moveable sheeting, shoring or plates are moved, embedment material shall be placed to fill any voids created and the embedment material and backfill shall be recompacted to provide uniform side support for the pipe.

W2.08 CONCRETE AND BLOCKING

A. 2,500 psi concrete shall be placed for blocking at each change in direction in the pipeline, as shown in the Standard Details and in such manner as will substantially brace the pipe against undisturbed trench walls. In no event shall this quantity of concrete blocking be less than those shown in the Plans. Concrete blocking, made from Type I cement, shall have been in place four (4) days prior to testing the pipeline as hereinafter specified. Tests may be made in two (2) days after completion of blocking if Type III cement is used.

B. At all points where wet connections are made to existing lines, the existing lines shall be adequately blocked and the tapping connection fittings shall be supported by blocking up to the spring line with 2,500 psi concrete.

C. Concrete blocking will not be measured or paid for as a separate item but the cost thereof shall be included in the various items listed in the Proposal and Bid Schedule.

W2.09 TESTING AND ALLOWABLE LEAKAGE

A. All PVC pipe and fittings shall be leak tested and sterilized according to Section CIP12.05- TEST PROCEDURES FOR PRESSURE PIPELINES.

W2.10 PAYMENT

A. The pipeline, complete in place, including cleanup, will be measured for payment in linear feet along the centerline of the pipe actually installed. Measurement shall be through all fittings, specials, valves, etc., and no deduction in length shall be made for such appurtenances. Installation of the pipeline will be paid for at the unit contract price per linear foot as provided in the Proposal and Bid Schedule.

B. Payment of the unit contract price for the items of work performed shall be the total compensation for furnishing all labor, materials, tools, equipment and incidentals and performing all work that is necessary for the installation, testing, and sterilization of the pipe, fittings, connections, blocking, embedment or placing in encasement pipe and all other appurtenances in accordance with the Plans and the provisions of the Specifications.

END OF SECTION

TECHNICAL SPECIFICATIONS

SECTION W3 – VALVES, HYDRANTS AND APPURTENANCES

W3.01 SCOPE OF WORK

A. This specification covers the requirements to provide all buried valves, valves in manholes and underground vaults, hydrants and appurtenances complete with actuators and all accessories as shown on the Plans and as specified herein.

W3.02 SUBMITTALS

A. Within 30 days of the Notice to Proceed, the Contractor shall submit to the Engineer or the City for approval, technical product literature including Manufacturer's literature, illustrations, specifications and engineering data which includes dimensions, size, materials of construction, weight, protection coating, and all other pertinent data to illustrate conformance to the specification found within. The Contractor shall also submit four (4) copies of all certified shop test results specified herein, complete operation and maintenance manuals including all copies of all approved shop drawings, and certificates of compliance where required by referenced standards: For each valve specified to be manufactured and/or installed in accordance with AWWA and other standards, submit an affidavit of compliance with the appropriate standards, including certified results of required tests, and certification of proper installation.

W3.03 REFERENCE STANDARDS

A. Comply with applicable provisions and recommendations of the following, except as otherwise shown or specified.

B. American Water Works Association (AWWA)

1. AWWA C515 - Gate Valves, three (3)-inch through 48-inch NPS, for Water and Sewage Systems.

2. AWWA C502 - Dry-Barrel Fire Hydrants.

3. AWWA C509 - Resilient-Seated Gate Valves, three (3) inch through 12-inch NPS, for Water and Sewage Systems.

C. American National Standards Institute (ANSI)

1. ANSI B16.1 - Cast-Iron Pipe Flanges and Flanged Fittings.

2. ANSI C111 - Rubber-Gasket Joints for Ductile-Iron and Gray-Iron Pressure Pipe and Fittings.

D. American Society for Testing and Materials (ASTM)

1. ASTM A48 - Gray Iron Castings.

2. ASTM A126 - Gray Iron Castings for Valves, Flanges and Pipe Fittings

3. ASTM A153 - Zinc Coating (Hot-Dip) on Iron and Steel Hardware

4. ASTM A276 - Standard Specification for Stainless and Heat Resisting Steel Bars and Shapes.

5. ASTM A536 - Ductile Iron Castings.

E. Steel Structures Painting Council (SSPC)

1. SSPC SP-6 - Commercial Blast Cleaning

F. Where reference is made to one (1) of the above standards, the revision in effect at the time of bid opening shall apply.

W3.04 DELIVERY, STORAGE AND HANDLING

A. Deliver materials to the site to ensure uninterrupted progress of the work.

B. Protect threads and seats from corrosion and damage. Rising stems and exposed stem valves shall be coated with a protective oil film which shall be maintained until time of use.

C. Provide covers for all openings.

1. All valves three (3) inches and larger shall be shipped and stored on site until time of use with wood or plywood covers on each valve end.

2. All valves smaller than three (3) inches shall be shipped and stored as above except that heavy card board covers may be furnished instead of wood.

D. Store equipment to permit easy access for inspection and identification. Any corrosion in evidence at the time of City acceptance shall be removed, or the valve shall be removed from the job.

E. Store all equipment in covered storage off the ground.

W3.05 COORDINATION

A. Review installation procedures under other Sections and coordinate with the work which is related to this Section including buried piping installation and site utilities.

B. Contractor shall coordinate the location and placement of concrete thrust blocks when required.

W3.06 GENERAL

A. All valves shall open counter-clockwise.

B. The use of a Manufacturer's name and/or model or catalog number is for the purpose of establishing the standard of quality and general configuration desired.

C. Valves shall be of the size shown on the Plans or as noted, and as far as possible equipment of the same type shall be identical and from one Manufacturer.

D. Valves shall have the name of the maker, nominal size, flow directional arrows, working pressure for which they are designed and standard to which they are manufactured cast in raised letters on some appropriate part of the body.

E. Unless otherwise noted, valves shall have a minimum working pressure of 200 psi or be of the same working pressure as the pipe they connect to, whichever is higher, and suitable for the pressures noted where they are installed.

F. Valves shall be of the same nominal diameter as the pipe or fittings they are connected to. Except as otherwise noted, joints shall be mechanical joints, with joint restraint where the adjacent piping is required to be restrained.

G. Valves shall be constructed for buried service.

W3.07 VALVE BOXES

A. All gate valves shall be provided with extension shafts (where the operating nut is greater than five (5) feet below grade), operating nuts and valve boxes as follows:

1. Extension shafts shall be steel and the operating nut shall be two (2) inches square. Shafts shall be designed to provide a factor of safety of not less than four (4). Operating nuts shall be pinned to the shafts.

2. Valve boxes shall be a heavy-pattern cast iron, three (3) piece, telescoping type box with dome base suitable for installation on the buried valves. Inside diameter shall be at least 5¼-inches. Barrel length shall be adapted to the depth of cover, with a lap of at least six (6) inches when in the most extended position. Covers shall be cast iron with integrally-cast direction-to-open arrow and "WATER" shall be cast in the cover when used on a water line or "SEWER" when used on a wastewater force main. Aluminum or plastic are not acceptable. A means of lateral support for the valve extension shafts shall be provided in the top portion of the valve box. The valve box lid shall be furnished with a pentagon-head bolt for locking.

3. The upper section of each box shall have a bottom flange of sufficient bearing area to prevent settling. The bottom of the lower section shall enclose the stuffing box and operating nut of the valve and shall be oval.

4. An approved operating key or wrench shall be provided.

5. All fasteners shall be Type 304 stainless steel.

W3.08 RESILIENT SEATED GATE VALVES

A. Valves shall be manufactured in accordance with AWWA C509.

Acceptable Gate Valves are:

1. American Flow Control – Series 2500
2. Mueller – 2360 Series
3. Clow

B. Valves shall be provided with a minimum of two (2) O-ring stem seals.

C. Bonnet and gland bolts and nuts shall be either fabricated from a low alloy-steel for corrosion resistance or electroplated with zinc or cadmium. The hot-dip process in accordance with ASTM A153 is not acceptable.

D. Wedges shall be totally encapsulated with rubber.

E. Units shall be, in addition, UL and FM approved.

F. Resilient wedge gate valves shall be furnished and installed in sizes and shall be manufactured in accordance with the latest AWWA C-509 and cast iron shall conform to the latest ASTM A-126 standards. Gate valves furnished under these specifications shall be of the solid wedge, resilient seat type with cast iron/ductile iron body and bronze stem designed for 250 pounds per square inch working pressure. All gate valves shall be tested hydrostatically to 400 pounds per square inch. Gate valves shall meet the latest AWWA standard specifications (C-509).

G. The seat shall be made of Styrene Butadiene rubber and provide a positive water tight seal. The seat shall be permanently bonded or mechanically attached to the wedge with stainless steel screws. If bonded, ASTM P-429 requirements shall be followed. Non-rising stem gate valves shall be equipped with "O" ring type packing gland consisting of at least two (2) "O" rings. The thrust collar shall work in an "O" ring seal lubricant reservoir or against bearings or washers, above and below constructed of Delrin or approved equal material. Gate valve stems, shall be fabricated from solid bronze rod having a tensile strength of not less than 60,000 pounds per square inch, and a minimum yield strength of 30,000 pounds per square inch.

H. Cast iron body shall be of iron with an even grain and shall possess a tensile strength of not less than 32,000 pounds per square inch. All bronze castings, except the stem, shall have a tensile strength of not less than 30,000 pounds per square inch. The entire internal valve body surfaces shall be coated with a factory applied two (2) component epoxy system or approved equal. The seating surface shall be machined or otherwise constructed to provide a smooth, even surface for the resilient seat. All valves shall open left (counter clockwise) and have a two (2) inch square wrench nut unless specified otherwise.

W3.09 TAPPING SLEEVES AND TAPPING VALVES

A. Tapping sleeves shall be of cast iron epoxy coated, designated for working pressure not less than 200 psi. Armored end gaskets shall be provided for the full area of the sleeve flanges. Sleeves shall be as manufactured by A.P. Smith Division of U.S. Pipe, Mueller, Clow, or equal. Nuts and bolts shall be Type 304 stainless steel.

B. Size-on-Size tapping sleeve shall be ductile iron or cast iron.

C. Tapping valves shall conform to the requirements specified above for gate valves except that one (1) end shall be flanged and one (1) mechanical. Tapping valves shall be provided with an oversized opening to permit the use of full size cutters. Tapping valves shall be Ford B81-777 or equal.

W3.10 CHECK VALVES

A. Controlled Closing Swing Check Valves (lever & weight)

1. Check valves shall be of the controlled closing swing type. The controlled closing swing check valves shall be guaranteed to operate under severe conditions as check valves. The valve shall be designed to open smoothly, provide full pipe line flow, permit minimum head loss and close at a controlled rate of speed for the final predetermined portion of its stroke. All bolts and nuts used in the assembly shall be steel, commercial.

2. The valve body shall be Cast Iron ASTM A126-B/ductile iron ASTM A536. The disc arm and chamber level shall be of heavy steel construction and keyed to the hinge shaft. The hinge shaft shall be of 18-8 stainless steel and of adequate diameter to withstand a complete hydraulic unbalance pressure of 125 psi on the valve disc. A single cushioning device mounted on the external side of the valve shall control the valve closure by way of the interchange of oil to and from an oil reservoir. The use of air or gas pressurized oil reservoir shall not be permitted. The oil plunger assembly shall be rigidly attached to the valve body by shoulder bolts or dowel pins to prevent fretting.

3. The Manufacturer, if required by the Engineer or the City, shall submit design calculations of principle component stresses to substantiate the integrity of the valve for the working pressure involved.

4. The valve when closed shall be tight seating by way of a resilient replaceable seat against a bronze seat ring in the body.

5. Valves shall be as manufactured by GA Industries or Series 6000 as manufactured by APCO. The City reserves the right to inspect all valves before shipment is made. Any failure of valves to operate satisfactorily during the first year of installation due to faulty workmanship or defective material shall be replaced and made good by the Manufacturer. Under these specifications, any valve stuffing box that leaks for any reason or because of excessive wear or deterioration of packing, shall be reason for classification as defective material.

B. Slanted / Tilted Check Valves

1. Slanted or tilted check valves shall be furnished and installed where shown on the Plans.

2. The body of the valve shall be ductile iron or cast iron with access ports to the disc. The disc shall be cast iron. The seat and disc rings shall be bronze. Pivot pins and bushings shall be bronze or stainless steel. The valve shall include a localized indicator of the position of the valve.

3. The valves shall include a top mounted oil dash pot to prevent slamming of the disc. The dash pot shall control the last 10% of closure of the disc. The speed of closure within this 10% shall be adjustable.

4. Valves shall be APCO Slanting Disc, Valmatic or Golden Anderson Tilted Disc or approved equal.

W3.11 FLANGES

A. Flanges shall be cast solid and faced accurately at right angles to the axis of the casting. Dimensions and drilling of flanges shall be in accordance with the American Standard Association for a workingpressure of 125 pounds per square inch. Special drilling shall be provided where necessary.

W3.12 FIRE HYDRANTS

A. Fire hydrants shall be dry-barrel type conforming to the requirements of the latest revision of AWWA C502. Hydrants shall be designed such that the hydrant valve closes with line pressure preventing loss of water and consequent flooding in the event of traffic damage.

B. Hydrants shall have six (6)-inch mechanical joint inlet connections, two 2½-inch hose connections and one $4^{1}/_{2}$-inch pumper connection. Threads for the hose and pumper connections shall be in accordance with National Standard Thread. Hydrants shall be according to Manufacturer's standard pattern. Hydrants shall be equipped with "O" ring packing. Each nozzle cap shall be provided with a Buna-N rubber washer.

C. Hydrants shall be so arranged that the direction of outlets may be turned 90 degrees without interference with the drip mechanism or obstructing the discharge from any outlet. The body of the hydrant shall be equipped with a breakable flange, or breakable cast iron flange bolts, just above the grade line.

D. A bronze or rustproof steel nut and check nut shall be provided to hold the main hydrant valve on its stem.

E. Hydrant valve opening shall have an area at least equal to that area of a $4^{1}/_{2}$-inch minimum diameter circle and be obstructed only by the valve rod. Each hydrant shall be able to deliver 500 gallons minimum through its two 2½-inch hose nozzles when opened together with a loss of not more than two (2) psi in the hydrant.

F. Hydrants shall be designed for installation in a trench that will provide minimum cover as noted on Plans and for the flange to be $3\ ^{1}/_{2}$-inches above ground surface. Hydrant extensions shall be as manufactured by the company furnishing the hydrants and of a style appropriate for the hydrants as furnished.

G. Hydrants shall be provided with an automatic and positively operating, non-corrodible drain or drip valve so as to drain the hydrant completely when the main valve is shut. A drain valve operating by

springs or gravity is not acceptable.

H. Operating stems whose threads are located in the barrel or waterway shall be of manganese bronze, everdur, or other high-quality non-corrodible metal, and all working parts in the waterway shall be bronze to bronze.

I. Hydrants shall open by turning operating nut to left (counter-clockwise) and shall be marked with a raised arrow and the word "open" to indicate the direction to turn stem to open hydrant.

J. Hydrants shall be furnished with caps, double galvanized steel hose cap chain, galvanized steel pumper hose cap chain, a galvanized steel chain holder and any other hooks and/or appurtenances required for proper use.

K. Hydrant operating nut shall be AWWA Standard pentagonal type measuring 1½-inch point to flat.

L. Hydrants shall be hydrostatically tested as specified in AWWA C502.

M. Hydrants shall be of the following:

1. Kennedy – K81

3. American Darling – B84B

2. Clow Medallion

N. All iron work to be set below ground, after being thoroughly cleaned, shall be painted with two (2) coats of asphalt varnish specified in AWWA C502. Iron work to be left above ground shall be factory primed and painted silver using a high grade enamel paint of quality and color to correspond to the present standard of the City.

O. Fire hydrants shall be installed on the same side of the street or roadway as the water main and shall be installed plumb and true.

P. Heel and thrust blocks shall be placed in undisturbed soil as shown in the details of the Plans.

Q. Double blue reflector “HYE – LITES” brand as manufactured by pavement markers ink shall be installed at the centerline of the street or roadway perpendicular to the hydrant.

W3.13 CORPORATION STOPS

A. Corporation stops shall be brass, not less than 1-inch in diameter and shall be installed where shown, specified or required.

B. Provide corporation stops as manufactured by the following:

1. Ford Company

W3.14 COMBINATION AIR-VACUUM RELIEF VALVES

A. The air-vacuum release valves shall be installed as shown on the Plans. The valve body shall be of cast iron ASTM A126-B; the floats, float guide, and stem shall be of Type 316 stainless steel. The resilient seat shall be of Buna N. The valve shall be suitable for 150 psig working pressure. Valve shall have standard NPT inlets and outlet ports with diameters as indicated on the Plans. Valve shall be Model 200A Series by APCO Valve and Primer Corporation, Schaumburg, IL, or approved equal.

W3.15 SURFACE PREPARATION AND SHOP COATINGS

A. The interior ferrous metal surfaces, except finished or bearing surfaces, shall be blast cleaned in accordance with SSPC SP-6 and painted with two (2) coats of an approved two (2) component coal tar

epoxy coating specifically formulated for potable water use. The coating used must appear on the current edition of the United States Environmental Protection Agency's list entitled "Accepted Categories and Subcategories of Coatings, Liners and Paints for Potable Water Usage."

B. Exterior ferrous metal surfaces of all buried valves and hydrants shall be blast cleaned in accordance with SSPC SP-6 and given two (2) shop coats of a heavy coat tar enamel or an approved two (2) component coat tar epoxy paint.

W3.16 INSPECTION AND PREPARATION

A. During installation of all valves and appurtenances, the Contractor shall verify that all items are clean, free of defects in material and workmanship and function properly.

B. All valves shall be closed and kept closed until otherwise directed by the Engineer or the City.

W3.17 INSTALLATION OF BURIED VALVES AND VALVE BOXES

A. Buried valves shall be cleaned and manually operated before installation. Buried valves and valve boxes shall be set with the stem vertically aligned in the center of the valve box. Valves shall be set on a firm foundation and supported by tamping pipe bedding material under the sides of the valve. The valve box shall be supported during backfilling and maintained in vertical alignment with the top flush with finish grade. The valve box shall be set so as not to transmit traffic loads to the valve.

B. Before backfilling, all exposed portions of any bolts shall be coated with two (2) coats of bituminous paint.

W3.18 INSTALLATION OF TAPPING SLEEVES AND VALVES

A. The City of Georgetown shall be contacted and their permission granted prior to tapping a line. The required procedures and time table shall be followed exactly.

B. Installation shall be made under pressure and flow shall be maintained. The diameters of the tap shall be a minimum of $^{1}/_{4}$-inch less than the inside diameter of the branch line.

C. The entire operation shall be conducted by workers experienced in the installation of tapping sleeves and valves. The tapping machine shall be furnished by the Contractor.

D. Determine the location of the line to be tapped to confirm that the proposed location will be satisfactory and that no interference will be encountered such as joints or fittings. No tap or sleeve will be made closer than three (3) feet from a pipe joint.

E. A tapping sleeve and valve with boxes shall be set squarely centered on the line to be tapped. Adequate support shall be provided under the sleeve and valve during the tapping operation. Thrust blocks or other permanent restraint acceptable to the Engineer and the City shall be provided behind all tapping sleeves. Proper tamping of supporting pipe bedding material around and under the valve and sleeve is mandatory for buried installations.

F. After completing the tap, the valve shall be flushed to ensure that the valve seat is clean. All proper regulatory procedures (including disinfection) shall be followed exactly.

W3.19 INSTALLATION OF FIRE HYDRANTS

A. Fire hydrants shall be set at the locations as shown on the Plans and bedded on a firm foundation. Hydrants and connecting pipe shall have at least the same depth of cover as the distributing pipe. A drainage pit as detailed on the Plans shall be filled with ¾-inch washed rock gravel and compacted. The hydrants shall be set upon a slab of concrete not less than four (4)-inches thick and 15-inches square. During backfilling, additional screened gravel shall be brought up around and six (6) inches over the drain port. Each hydrant shall be set in true vertical alignment and properly braced.

B. 2,500 psi concrete thrust blocks shall be placed between the back of the hydrant inlet and undisturbed soil at the end of the trench. Minimum bearing area shall be as shown on the Plans. Eight (8) mil. Poyethlene film shall be placed around the hydrant elbow before placing concrete. CARE SHALL BE TAKEN TO ENSURE THAT CONCRETE DOES NOT PLUG THE DRAIN PORTS.

C. All connections from the main to the fire hydrants shall be anchoring mechanical joints designed to prevent movement due to thrust or pressure.

D. The hydrant shall be tied to the pipe with suitable rods or clamps, and shall be coated with Koppers 300 or approved equal at a minimum of 8 mil. thick. Bolts shall have a zinc bolt cover per AWWA. Hydrant paint shall be touched up as required after installation.

E. Fire hydrants shall be factory primed and painted silver using a high grade enamel.

F. Fire sprinkler lines shall be protected by a reduced pressure zone (RPZ). All fire lines shall be ductile iron pipe. All private fire lines shall be separated by double detecta check.

W3.20 FIELD TESTS AND ADJUSTMENTS

A. Conduct a functional field test of each valve, including actuators and valve control equipment, in presence of Engineer or the Representative of the City to demonstrate that each part and all components together function correctly. All testing equipment required shall be provided by the Contractor at his/her sole expense.

W3.21 PAYMENT

A. Gate valves, tapping sleeves and tapping valves, fire hydrants, and air and vacuum relief valves complete in place as shown on the Plans and as specified, will be paid for at the unit contract price per each as provided in the Proposal and Bid Schedule.

B. The unit price per each installation shall be the total compensation for furnishing all labor, materials, tools, equipment and incidentals necessary to complete the work including excavation, base blocking, disposal of surplus materials and backfill in conformance with the Plans and these specifications. The six (6) inch connection pipe, six (6) inch gate valve, test station, concrete collar, thrust block, drain pit, concrete pad, rods, bolts, paint, protective coatings, and fittings for fire hydrants shall not be paid for separately.

C. Fire hydrants shall be furnished with the proper length of barrel to comply with these specifications. Barrel extensions will not be measured and paid for separately.

D. No separate payment shall be made for work performed in accordance with this specification, other than that listed in Parts A-C of this subsection, and the cost thereof shall be included in the proper items of the Proposal and Bid Schedule.

END OF SECTION

TECHNICAL SPECIFICATIONS

SECTION C1 – CONCRETE STRUCTURES

C1.01 SCOPE OF WORK

A. This specification covers the requirements for the construction of all types of structures involving the use of structural concrete, except where the requirements are waived or revised by other governing specifications.

B. All concrete structures shall be constructed in accordance with the design requirements and details shown on the Plans; in conformity with the pertinent provisions of the items contracted for; the incidental items referred to; and in conformity with the requirements herein.

C1.02 SUBMITTALS

A. Within 30 days after the Notice to Proceed, the Contractor shall submit to the Engineer or the City for approval, technical product literature including the type of concrete, concrete mix design, concrete type and Manufacturer of precast structures, a description of curing methods used, and all other pertinent data to illustrate conformance to the specification found within.

C1.03 MATERIALS

A. Concrete

1. All concrete shall conform to the provisions of Section C2, CONCRETE FOR STRUCTURES. The class of concrete for each type of structure or unit shall be as specified on the Plans, or by pertinent governing specifications.

B. Expansion Joint Material

1. Preformed Fiber Material - Preformed fiber expansion joint material shall be one-half (½) inch or as shown on the Plans. At the Contractor's option, the material shall be one of the following types, unless otherwise noted on the Plans:

a. "Preformed Bituminous Fiber Material" shall meet the requirements of the Standard Specifications for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction, ASTM Designation: D1751.

b. "Preformed Non-Bituminous Fiber Material": shall meet the requirements of the Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction ASTM Designation: D1751, except that the requirements pertaining to bitumen content, density and water absorption shall be voided.

2. Joint Sealing Material - Unless otherwise noted on the Plans, the sealer shall be synthetic polymer Sikaflex – ICSL or equivalent.

3. Asphalt Board - Asphalt Board shall consist of two liners of 0.016 inches asphalt impregnated paper, filler with a mastic mixture of asphalt and vegetable fiber and/or mineral filler. Boards shall be smooth, flat and sufficiently rigid to permit installation. When tested in accordance with Test Method Tex-524-C, the asphalt board shall not deflect from the horizontal more than one (1) inch in three and one half (3 ½) inches.

4. Rebonded Neoprene Filler - Rebonded neoprene filler shall consist of ground closed-cell neoprene particles, rebonded and molded into sheets of uniform thickness of the dimensions shown on Plans.

Filler material shall meet the requirements of ASTM Designations: D1752 Type 1 where applicable.

C. Expansion Joints - Joints and devices to provide for expansion and contraction shall be constructed as indicated herein or on the Plans.

D. Placing Reinforcements - Reinforcement in concrete structures shall be placed carefully and accurately and rigidly supported as provided in the Section C7 – REINFORCING STEEL.

E. Placing Concrete-General - The minimum temperature of all concrete at the time of placement shall not be less than 50°F.

F. The consistency of the concrete as placed should allow the completion of all finishing operations without the addition of water to the surface. When conditions are such that additional moisture is needed for finishing, the required water shall be applied to the surface by Fog Spray Only, and shall be held to a minimum amount. Fog spray for this purpose may be applied with hand operated fogging equipment.

G. The maximum time interval between the addition of cement to the batch, and the placing of concrete in the forms shall not exceed the following:

Air or Concrete Temperature	Maximum Time (Without Retarding Agent)	Maximum Time (With Retarding Agent)
Non-Agitated Concrete		
Up to 80° F	30 Minutes	45 Minutes
Over 80° F	15 Minutes	30 Minutes
Agitated Concrete		
90° F or above	45 Minutes	75 Minutes
Above 75° F to 89° F	60 Minutes	90 Minutes
75° F and below	90 Minutes	120 Minutes

H. Upon completion of the final finish, interim curing will be required for slab concrete in bridge decks and top slabs of direct traffic culverts as follows:

1. Unless otherwise shown on the Plans, Type 1 membrane curing compound (Resin Base Only) shall be applied to the slab surface.

I. Required water curing shall begin as soon as it can be done without damaging the concrete finish.

J. The Contractor shall notify the City two (2) days in advance before placing concrete in any unit of the structure to permit the inspection of forms, reinforcing steel placement, and other preparations. Concrete shall not be placed in any unit prior to the completion of form work and placement of reinforcement therein.

K. Concrete mixing, placing and finishing shall be done in daylight, hours, unless adequate provisions are made to light the entire site of all operations.

L. Concrete placement will not be permitted when impending weather conditions will impair the quality of the finished work. If rainfall should occur after placing operations are started, the Contractor shall provide ample coverage to protect the work. In case of drop in temperature, the provisions set forth in Section C1.04- PLACING CONCRETE IN COLD WEATHER shall apply.

M. The sequence of placing concrete shall be as provided on the Plans or as required herein. The placing shall be regulated so the pressures caused by the plastic concrete shall not exceed the loads used in the form design. Form design shall be the sole responsibly of the Contractor.

N. The method of handling, placing, and consolidation of concrete shall minimize segregation and displacement of the reinforcement, and produce a uniformly dense and compact mass. Concrete shall not have a free fall of more than 5 feet, except in the case of thin walls such as in culverts. Any hardened concrete splatter ahead of the plastic concrete shall be removed.

O. The method and equipment used to transport concrete to the forms shall be capable of maintaining the rate of placement approved by the City. Concrete may be transported by bucket, chutes, buggies, belt conveyors, pumps or other acceptable methods.

P. Each part of the forms shall be filled by depositing concrete as near its final position as possible. The coarse aggregate shall be worked back from the face and the concrete forced under and around the reinforcement bars without displacing them. Depositing large quantities at one point and running or working it along the forms will not be allowed.

Q. Concrete shall be deposited in the forms in layers of suitable depth but not more than 36-inches in thickness, unless otherwise directed by the City.

R. The sequence of successive layers or adjacent portions of concrete shall be such that they can be vibrated into a homogeneous mass with the previously placed concrete without a cold joint. Not more than one hour shall elapse between adjacent or successive placements of concrete. Unauthorized construction joints shall be avoided by placing all concrete between the authorized joints in one continuous operation.

S. An approved retarding agent shall be used to control stress cracks, and/or unauthorized cold joints in mass placements where differential settlement and/or setting time may induce stress cracking, such as on false work, in deep girder stems, etc.

T. Openings in forms shall be provided, if needed, for the removal of laitance or foreign matter of any kind.

U. All forms shall be wetted thoroughly before the concrete is placed therein.

V. All concrete shall be well consolidated and the mortar flushed to the form surfaces by continuous working with immersion type vibrators. Vibrators which operate by attachment to forms or reinforcement will not be permitted, except on steel forms.

W. The concrete shall be vibrated immediately after deposit. Prior to the beginning of work, a systematic spacing of the points of vibrations shall be established to insure complete consolidation and thorough working of the concrete around the reinforcement, embedded fixtures, and into the corners and angles of the forms. Immersion type vibrators shall be inserted vertically, at points 18 to 30-inches apart, and slowly withdrawn. The vibrator may be inserted in a sloping or horizontal position in shallow slabs. The entire depth of each lift shall be vibrated, allowing the vibrator to penetrate several inches into the preceding lift. Concrete along construction joints shall be thoroughly consolidated by operating the vibrator along and close to but not against the joint surface. The vibration shall continue until thorough consolidation, and complete embedment of reinforcement and fixtures is produced, but not long enough to cause segregation. Vibration may be supplemented by hand spading or rodding, if necessary, to insure the flushing of mortar to the surface of all forms.

C1.04 PLACING CONCRETE IN COLD WEATHER

A. Cast-in-Place Concrete - Concrete may be placed when the atmospheric temperature is not less than 35° F. Concrete shall not be placed in contact with any material coated with frost or having a temperature less than 32° F.

B. Aggregates shall be free from ice, frost and frozen lumps. When required, in order to produce the minimum specified concrete temperature, the aggregate and/or the water shall be heated uniformly, in accordance with the following:

The water temperature shall not exceed 180° F nor shall the aggregate temperature exceed 150° F. The heating apparatus shall heat the mass of aggregate uniformly. The temperature of the mixture of aggregates and water shall be between 50° F and 85° F before introduction of the cement.

C. All concrete shall be effectively protected as follows:

1. The temperature of slab concrete of all unformed surfaces shall be maintained at 50° F or above for a period of 72 hours from time of placement and above 40° F for an additional 72 hours.

2. The temperature at the surface of all concrete in bents, piers, culvert walls, retaining walls, parapets, wingwalls, bottom of slabs, and other similar formed concrete shall be maintained at 40° F or above for a period of 72 hours from time of placement.

3. The temperature of all concrete, including the bottom slabs of culverts placed on or in the ground, shall be maintained above 32° F for a period of 72 hours from time of placement.

D. Protection shall consist of providing additional covering, insulated forms or other means, and if necessary, supplementing such covering with artificial heating. Curing as specified under Section C1.10-CURING CONCRETE, shall be provided during this period until all requirements for curing have been satisfied.

E. When impending weather conditions indicate the possibility of the need for such temperature protection, all necessary heating and covering material shall be on hand ready for use before permission is granted to begin placement.

C1.05 PLACING CONCRETE IN HOT WEATHER

A. When the temperature of the air is above 85° F, an approved retarding agent will be required in all concrete used in superstructures, top slabs of direct traffic culverts, and will be required in all cased drilled shafts regardless of temperature. No concrete will be placed any time the temperature of the concrete at placement, exceeds 90° F. Ice will be used to decrease the temperature of concrete. The general formula will be, five (5) pounds of ice per yard of concrete per degree of temperature drop.

C1.06 PLACING CONCRETE IN WATER

A. Concrete shall be deposited in water only when specified on the Plans or with written permission of the City. The forms, cofferdams or caissons shall be sufficiently tight to prevent any water current passing through the space in which the concrete is being deposited. Pumping will not be permitted during concrete placing, nor until it has set for at least 36 hours.

B. The concrete shall be placed with a tremie, closed bottom-dump bucket, or other approved method, and shall not be permitted to fall freely through the water nor shall it be disturbed after it has been placed. Its surface shall be kept approximately level during placement

C. The tremie shall consist of a water-tight tube 14-inches or less in diameter. It shall be constructed so that the bottom can be sealed and opened after it is in place and fully charged with concrete. It shall be supported so that it can be easily moved horizontally to cover all the work area and vertically to control the concrete flow.

D. The placing operations shall be continuous until the work is complete.

C1.07 PLACING CONCRETE IN BOX CULVERTS

A. In general, construction joints will be permitted only where shown on the Plans.

B. Where the top slab and walls are placed monolithically in culverts more than four (4) feet in clear height, an interval of not less than one (1) nor more than two (2) hours shall elapse before placing the top slab to allow for shrinkage in the wall concrete.

C. The base slab shall be finished accurately at the proper time to provide a smooth uniform surface. Top slabs which carry direct traffic shall be finished as specified under Item 360 “Concrete Pavement” of the Standard Specifications for the Construction of Highways Streets and Bridges of Texas Department of Transportation, latest addition. Top slab of fill type culverts shall be given a reasonable smooth float finish.

C1.08 PLACING CONCRETE IN FOUNDATIONS AND SUBSTRUCTURE

A. Concrete shall not be placed in footings until the depth and character of the foundation has been inspected by the City and permission has been given to proceed.

B. Placing of concrete footings upon seal courses will be permitted after the caissons of cofferdams are free from water and the seal course cleaned. Any necessary pumping or bailing during the concrete operation shall be done from a suitable pump located outside the forms.

C. All temporary walls or braces inside cofferdams or caissons shall be constructed or adjusted as the work proceeds to prevent unauthorized construction joints in footings or shafts.

D. When footings can be placed in a dry excavation without the use of cofferdams or caissons, forms maybe omitted, if desired by the Contractor and approved by the City, and the entire excavation filled with concrete to the elevation of the top of footing.

C1.09 TREATMENT AND FINISHING OF HORIZONTAL SURFACES

A. All unformed upper surfaces shall be struck off to grade and finished. The use of mortar topping for surfaces under this classification will not be permitted.

C1.10 CURING CONCRETE

A. The Contractor shall inform the City fully of the methods and procedures proposed for curing; shall provide the proper equipment and material in adequate amounts, and shall have the proposed method, equipment and material approved prior to placing concrete.

B. Inadequate curing and/or facilities therefore shall be cause for the City to stop all construction on the job until remedial action is taken.

C. All concrete shall be cured for a period of four (4) curing days except as noted herein.

C1.11 EXCEPTIONS TO 4-DAY CURING

A. When the air temperature is expected to drop below 35° F, the water curing mats shall be covered with polyethylene sheeting, burlap-polyethylene blankets or other material to provide the protection required by Section C1.04- PLACING CONCRETE IN COLD WEATHER.

B. A curing day is defined as a calendar day when the temperature, taken in the shade away from artificial heat, is above 50° F for at least 19 hours, (or colder days are satisfactory if provisions are made to maintain the temperature at all surfaces of the concrete above 40° F for the entire 24 hours). The required curing period shall begin when all concrete therein has attained its initial set.

C. The following methods are permitted for curing concrete subject to the restrictions and the following requirements for each method of curing.

1. Form Curing - When forms are left in contact with the concrete, other curing methods will not be required except for cold weather protection.

a. Wet Mat - Cotton mats shall be used for this curing method. They shall be placed as soon as possible after the surface has sufficiently hardened to prevent damage to the concrete. Damp burlap blankets made from nine (9) ounce stock may be placed on the damp concrete surface for temporary protection prior to the application of the cotton mats which may be placed dry and wetted down after placement.

The mats shall be weighted down adequately to provide continuous contact with all concrete surfaces where possible. The surfaces of the concrete shall be kept wet for the required curing time. Surfaces which cannot be cured by contact shall be enclosed with mats, anchored positively to the forms, or to the ground, so that outside air cannot enter the enclosure. Sufficient moisture shall be provided inside the enclosure to keep all surfaces of the concrete wet.

b. Water Spray - This method shall consist of overlapping sprays or sprinklers that keep all unformed surfaces continuously wet.

c. Ponding - This method required the covering of the surfaces with a minimum of two (2) inches of clean granular material, kept wet at all times, or a minimum of one (1) inch depth of water. Satisfactory provisions shall be made to provide a dam to retain the water or saturated sand.

2. Membrane Curing - Unless otherwise provided herein or shown on the Plans, either Type 1 or Type 2 membrane curing compound may be used where permitted.

a. For substructure concrete, only one (1) type of curing compound will be permitted on any one (1) structure. (Material requirements and construction methods shall be as required by Section C6 – MEMBRANE CURING except as changed herein.) Membrane shall be applied in a single, uniform coating at the rate of coverage recommended by the Manufacturer and as approved by the City, but not less than one (1) gallon per 180 square feet of area. Tests for acceptance shall be at this specified rate.

b. Membrane curing shall not be applied to dry surfaces, but shall be applied just after free moisture has disappeared. Formed surfaces and surfaces which have been given a first rub shall be dampened and shall be moist at the time of applications of the membrane.

c. When membrane is used for complete curing, the film shall remain unbroken for the minimum curing period specified. Membrane which is damaged shall be corrected immediately by reapplication of membrane. Unless otherwise noted herein or on the Plans, the choice of membrane type shall be at the option of the Contractor, except that the City may require the same curing method for like portions of a single structure.

C1.12 REMOVAL OF FORMS AND FALSEWORK

A. Except as herein provided, forms for vertical surfaces may be removed when the concrete has aged not less than one (1) day when Type I or Type II cement is used, and not less than one-half ($^{1}/_{2}$) day when Type III cement is used, provided it can be done without damage to the concrete.

C1.13 DEFECTIVE WORK

A. Any defective work discovered after the forms have been removed shall be repaired as soon as possible in accordance with Section C1.14- FINISHING EXPOSED SURFACES.

B. If the surface of the concrete is bulged, uneven or shows excess honeycombing or form marks, which in the opinion of the City, cannot be repaired satisfactorily, the entire section shall be removed and replaced at the expense of the Contractor.

C1.14 FINISHING EXPOSED SURFACES

A. Ordinary Surface Finish - An Ordinary Surface Finish shall be applied to all concrete surfaces either as a final finish or preparatory to a higher grade or class of finish. Higher grades and classes of finish shall be in accordance with the Plans, Standards or Special Conditions. Where neither a grade nor class of finish is specified, and Ordinary Surface Finish, only, will be required.

B. Ordinary Surface Finish shall be provided as follows:

1. After form removal, all porous or honeycombed areas and spalled areas shall be corrected by chipping away all loose or broken material to sound concrete.

2. Featheredges shall be eliminated by cutting a face perpendicular to the surface. Shallow cavities shall be repaired using adhesive grout or epoxy grout. If judged repairable by the Engineer or the City, large defective areas shall be corrected using concrete or other material approved by the City.

3. Holes and spalls caused by removal of metal ties, etc., shall be cleaned and filled with adhesive grout or epoxy grout. Exposed parts of metal chairs on surfaces to be finished by rubbing, shall be chipped out to a depth of one-half ($^1/_2$) inch and the surface repaired.

4. All fins, runs, dips or mortar shall be removed from surfaces which remain exposed. Form marks and chamfer edges shall be smoothed by grinding and/or dry rubbing.

C1.15 PAYMENT

A. No separate payment shall be made for work performed in accordance with this section of the specifications, and the cost thereof shall be included in the proper items of the Bid Schedule.

END OF SECTION

TECHNICAL SPECIFICATIONS

SECTION C2 – CONCRETE FOR STRUCTURES

C2.01 SCOPE OF WORK

A. This specification covers the requirements for concrete related materials used for the storing and handling of concrete related materials; and for the proportioning and mixing of concrete for bridges, culverts, pre-stressed concrete, and incidental concrete construction.

C2.02 SUBMITTALS

A. Within 30 days after the Notice to Proceed, the Contractor shall submit to the Engineer or the City for approval, technical product literature including the type of concrete, concrete mix design, concrete type and Manufacturer of precast structures, a description of curing methods used, and all other pertinent data to illustrate conformance to the specification found within.

C2.03 GENERAL

A. The concrete shall be composed of Portland cement, aggregates (fine and coarse), admixtures if desired or required, and water, proportioned and mixed as hereinafter provided.

1. Cement - The cement shall be either Type, I, II, or III Portland Cement conforming to ASTM Designation : C150

2. Mortar (Grout) - Mortar for repair of concrete, shall consist of 1 part cement, two (2) parts finely graded sand, and enough water to make the mixture plastic. When required to prevent color difference, white cement shall be added to produce the color required. When required by the City, latex adhesive shall be added to the mortar.

3. Admixtures - Calcium Chloride will not be permitted. Unless otherwise noted, Air-entraining, retarding and water reducing admixtures may be used in all concrete and shall conform to the requirements of the Standard Specification for Construction of Highways, Streets, and Bridges of the Texas Department of Transportation, latest edition.

C2.04 CLASSIFICATION AND MIX DESIGN

A. It shall be the responsibility of the Contractor to furnish the mix design, using a Coarse Aggregate Factor acceptable to the City, for the class (es) of concrete specified. The mix shall be designed by a qualified concrete technician to conform with the requirements contained herein and in accordance with current Texas Department of Transportation standards. The Contractor shall perform, at his own expense, the work required to substantiate the design. Complete concrete design data shall be submitted to the City for approval.

B. It shall also be the responsibility of the Contractor to determine and measure the batch quantity of each ingredient, including all water, so that the mix conforms to these specifications and any other requirements shown on the Plans.

C. In lieu of the above mix design responsibility, the Contractor may accept a design furnished by the City, however, this will not relieve him of providing concrete meeting the requirements of these specifications.

C2.05 QUALITY OF CONCRETE, GENERAL

A. The concrete shall be uniform and workable. The cement content, maximum allowable water cement ratio, the desired and maximum slump and the strength requirements of the various classes of concrete shall conform to the requirements of Tables 1 - 4 and as required herein.

Table 1

Concrete Designation	Desired Slump	Max. Slump
Structural Concrete		
(1) All Drill Shaft	6	7
(2) Uncased Drilled Shafts, Thin-Walled Sections (9” or less), and Prestressed Concrete Members	4	5
(3) Slabs, Caps, Columns, Piers, Wall Sections Over 9”, etc.	3	4
Underwater or Seal Concrete	6	7
Riprap, Curb, Gutter and Other Miscellaneous Concrete	As specified by City	

NOTE: NO CONCRETE WILL BE PERMITTED WITH SLUMP IN EXCESS OF THE MAXIMUMS SHOWN.

B. Coarse Aggregate

Coarse aggregate shall be washed and shall consist of durable particles of gravel, crushed blast furnace slag, crushed stone, or combinations thereof and shall be free from frozen material or injurious amounts of salt, alkali, vegetable matter, or other objectionable material either free or as an adherent coating. When white portland cement is specified, the coarse aggregates used in the concrete shall be light colored. Quality shall be reasonably uniform throughout. Coarse aggregate shall not contain more than 0.25 percent by weight of clay lumps, or more than one (1) percent by weight of shale, or more than five (5) percent by weight of laminated and/or friable particles when tested in accordance with Test Method Tex-413-A. Coarse aggregate from each source shall have a wear of not more than 40 percent when tested in accordance with Test Method Tex-410-A.

Unless otherwise shown on the Plans, coarse aggregate from each source will be subjected to five (5) cycles of both the sodium sulfate and the magnesium sulfate soundness test in accordance with Test Method
Tex-411-A. When the loss is greater than 12-percent with sodium sulfate and/or 18 percent with magnesium sulfate, further testing will be required prior to acceptance or rejection of the material. A satisfactory record under similar conditions of service and exposure will be considered in the evaluation of material failing to meet these requirements.

When tested in accordance with Test Method Tex-401-A, the coarse aggregate, including combinations of aggregates when used, shall conform to the gradation requirements shown in Table 2.

Table 2
COARSE AGGREGATE GRADATION CHART

Percent Retained on Each Sieve										
Aggregate Grade No.	Nominal Size in.	2- ½ in.	2 in.	1- ½ in.	1 in.	¾ in.	½ in.	3/8in	No. 4	No. 8
1	2	0	0-20	15-50		60-80			95-100	
2 (467)*	1-1/2		0	0-5		30-65		70-90	95-100	
3	1-1/2		0	0-5		10-40	40-75		95-100	
4 (57)*	1			0	0-5		40-75		90-100	95-100
5 (67)*	1/4				0	0-10		45-80	90-100	95-100
6 (7)*	1/2					0	0-10	30-60	85-100	95-100
7	3/8						0	5-30	75-100	
8	3/8						0	0-5	35-80	90-100

* Numbers in parenthesis indicate that these gradations conform to corresponding ASTM gradation in ASTM C33.

C. Fine Aggregate

Fine Aggregate shall be washed and consist of clean, hard, durable and uncoated particles of natural or Manufactured sand or a combination thereof, with or without a mineral filler. When white Portland cement is specified the fine aggregate used in the concrete shall be light colored. It shall be free from frozen material or injurious amounts of salt, alkali, vegetable matter or other objectionable material and it shall not contain more than 0.5-percent by weight of clay lumps. When the aggregate is subjected to the color test for organic impurities in accordance with Test Method Tex-408-A, the test result shall not show a color darker than standard.

Unless otherwise shown on the Plans, the acid insoluble residue of fine aggregate used in concrete subject to direct traffic shall be not less than 60 percent by weight when tested in accordance with Test Method Tex-612-J.

When tested in accordance with Test Method Tex-401-A, the fine aggregate or combinations of aggregates, including mineral filler shall conform to the gradation requirements shown in Table 3.

Table 3
FINE AGGREGATE GRADATION CHART

Percent Retained on Each Sieve								
Aggregate Grade No.	3/8 in.	No. 4	No. 8	No. 16	No. 30	No.50	No. 100	No. 200
1	0	0-5	0-20	15-50	35-75	65-90	90-100	97-100

1. Where manufactured sand is used in lieu of natural sand, the percent retained on the No. 200 sieve shall be 94 to 100.

2. Where the sand equivalent value is greater than 85, the retainage on the No. 50 sieve may be 65 to 94 percent.

3. Fine aggregate will be subjected to the Sand Equivalent Test (Test Method Tex-203-F). The sand equivalent shall not be less than 80 unless otherwise shown on the Plans.

4. For all classes of concrete, except class K, the fineness modulus shall be between 2.30 and 3.10 as determined by Test Method Tex-402-A. The fineness modulus for class K shall be 2.6 to 2.8 unless otherwise shown on the Plans.

Table 4

SLUMP REQUIREMENTS

Class of Conc.	Sacks of Cement per C.Y.	Min. Comp Strength 28 (f'c) 28 Day psi	Min Beam Strength 7 Day	Max. Water Cement Ratio gal/sack	Coarse Aggr. No.
A	5.0	3000	425 390 (3)	6.5	1-2-3-4-8 (1) (4)
B	4.5	2500	300	8.0	2-3-4-5-6-7
C	6.0	3600	510	6.0	1-2-3-4-5-
D	3.0	1500	215	11.0	2-3-4-5-6-7
E	6.0	3000	425	6.0	2-3-4-5
S	6.5	4000	570 525 (3)	5.0	2-3-4-5
P	5.0	NA	555 (2)	6.25	2-3
DC	8.75	5500	720	3.6	6
CO	7.0	4600	640	4.5	6
SS	7.0	3600	510	5.5	3-4-5

1. Grade 8 aggregate for use in extended course, unless a larger size is approved by the Engineer or City.

2. Minimum running average of concrete pavement.

3. When Type II or Type I / II is cement is used.

4. Unless otherwise permitted by the Engineer, Grade I coarse aggregate may only be used in massive foundations with four (4) inch minimum clear spacing between reinforcing steel bars. Grade I aggregate may not be used in Drill Shafts.

CLASS OF CONCRETE	TYPICAL USAGE
A	Drill Shafts, Culverts, (except top of slab of Direct Traffic Culverts), Inlets, Manholes, Headwalls, Approach Slabs, Curb, Gutter, Curb and Gutter, Concrete Retards, Sidewalks, Driveways, Concrete Pavement, Back-up Walls and Anchors.
B	Rip Rap, Small Roadside Signs, and Anchors
C	Drilled Shafts, Bridge Substructures, Bridge Railing, Culverts (except top of slab of Direct Traffic Culverts), Wing Walls, Approach Slabs, Concrete Traffic Barriers
D	Rip Rap
E	Seal Concrete
S	Bridge Slab, Top Slab of Direct Traffic Culvert, Bridge Sub-structure
P	Concrete Pavement
DC	Dense Concrete Overlay
CO	Concrete Overlay
SS	Slurry Displacement Shafts, Underwater Drill Shafts

C2.06 MIXING CONDITIONS

A. The concrete shall be mixed in quantities required for immediate use. Retempering of concrete will not be permitted.

B. In threatening weather, which may result in conditions that will adversely affect quality of the concrete to be placed, the City may order postponement of the work. Where work has been started and changes in weather conditions require protective measures, the Contractor shall furnish adequate shelter to protect the concrete against damage from rainfall, or freezing temperatures. If necessary to continue operations during rainfall, the Contractor shall also provide protective coverings for the material stock piles. Aggregate stock piles need to be covered only to the extent necessary to control the moisture conditions in the aggregates to adequately control the consistency of the concrete.

C2.07 PLACING, CURING AND FINISHING

A. The placing of concrete, including construction of forms and falsework, curing and finishing, shall be in accordance with Section C1- CONCRETE STRUCTURES, and Section C1.14- FINISHING EXPOSED SURFACES.

C2.08 PAYMENT

A. No separate payment shall be made for work performed in accordance with this section of the specifications, and the cost thereof shall be included in the proper items of the Proposal and Bid Schedule.

END OF SECTION

TECHNICAL SPECIFICATIONS

SECTION C7 – REINFORCING STEEL

C7.01 SCOPE OF WORK

A. This specification covers the requirements for the furnishing and placing of reinforcing steel, deformed and smooth, of the size and quantity designated on the Plans and in accordance with these specifications.

C7.02 SUBMITTALS

A. Within 30 days after the Notice to Proceed, the Contractor shall submit to the Engineer or the City for approval, technical product literature including the type of steel, mill test results, cut list as required by Contract, Plans or Details, type and Manufacturer of spacers and/or chairs, and all other pertinent data to illustrate conformance to the specification found within.

C7.03 MATERIALS

A. Unless otherwise designated on the Plans, all bar reinforcement shall be deformed, and shall conform to one of the following:

1. ASTM A 615, Grades 40 or 60 open hearth, basic oxygen, or electric furnace new billet steel.

2. ASTM A617, Grades 40 or 60, axle steel.

3. ASTM A616, Grade 60, rail steel will be permitted in concrete pavement only. ASTM A616 bars shall be furnished as straight bars only and bending is prohibited. Bend tests will not be required.

4. ASTM A706, Grade 60, weldable reinforcing steel.

5. Smooth Bars for concrete pavement shall have a minimum yield strength of 60 ksi.

   All other smooth bars, larger than No. 4, may be steel conforming to the above or may be furnished in any steel that meets the physical requirements of ASTM A36.

6. Spiral reinforcement shall be in accordance with TxDOT Item 440 of the Standards Specifications for Construction of Highways, Streets and Bridges and be either smooth or deformed bars, or wire, of the minimum size or gage shown on the plans, or as specified herein.

   Bars for spiral reinforcement shall comply with ASTM A675, Grade 80 (reference to ASTM A29 is voided) A615 or A617, Grade 40, unless otherwise shown on the plans. Smooth wire shall comply with ASTM A82 and deformed wire shall comply with ASTM A496.

7. Wire for fabric reinforcement shall be in accordance with TxDOT Item 440 of the Standard Specifications for Construction of Highways, Streets and Bridges and conform to ASTM A82 or A496. Wire fabric shall conform to ASTM A185 or A497.

8. Epoxy coating material and the material used for the repair of the coating shall be in accordance with TxDOT Item 440 of the Standard Specifications for Construction of Highways, Streets and Bridges.

C7.04 BENDING

A. The reinforcement shall be bent cold, true to the shapes shown on the plans. Fabrication shall preferably be done in the shop. Field fabrication, if permitted, shall be done with equipment approved by the Engineer. Misfabricated, damaged or broken bars shall be rejected and replaced at the Contractor's expense. Damaged or broken bars imbedded in a previous concrete placement may be repaired with the approval of the Engineer. The inside diameter, unless otherwise shown on the plans, shall be in accordance with TxDOT Item 440 of the Standard Specifications for Construction of Highways, Streets and Bridges.

C7.05 TOLERANCES

A. Fabricating tolerances for bars, from plan dimensions, shall not be greater than shown in Figure 1 of TxDOT Item 440 of the Standard Specifications for Construction of Highways, Streets and Bridges.

C7.06 STORING

A. Steel reinforcement shall be stored above the surface of the ground upon platforms, skids, or other supports and shall be protected as far as practical from mechanical injury and surface deterioration caused by exposure to conditions producing rust. When placed in the work, reinforcement shall be free from dirt, paint, grease, oil, or other foreign materials. Reinforcement shall be free from injurious defects such as cracks and laminations. Rust, surface seams, surface irregularities or mill scale will not be cause for rejection, provided the minimum dimensions, cross-sectional area and tensile properties of a hand wire brushed specimen meets the physical requirements for the size and grade of steel specified.

C7.07 SPLICES

A. The splicing of bars, except when provided on the Plans, or specified herein, will not be permitted without written approval of the City.

B. Splices not provided for on the plans will be permitted in slabs 15 inches or less in thickness, columns, walls and parapets, but will not be included for measurement, and subject to the following:

C. Unless otherwise approved by the City, splices will not be permitted in bars 30 feet or less in plan length. For bars exceeding 30 feet in plans length, the distance center to center of splices shall not be less than 30 feet minus one splice length, with no more than one individual bar length less than 10 feet. Lap splices no shown on the plans, but permitted herein, shall be made in accordance with TABLE C7-1. The specified concrete cover and proper spacing shall be maintained at such splices and the lap spliced bars placed in contact and securely tied together.

TABLE C7-1 – Minimum Lap Requirements for Bar Sizes Through No. 11

	LAP LENGTH	
SIZE	UNCOATED	COATED
No. 3	1'-0''	1'-6''
No. 4	1'-6''	2'-3''
No. 5	1'-10''	2'-9''
No. 6	2'-3''	3'-4''
No. 7	3'-0''	4'-6''
No. 8	3'-9''	5'-7''
No. 9	4'-8''	7'-0''
No. 10	5'-7''	8'-4''
No. 11	6'-7''	9'-10''

Spiral steel shall be lapped a minimum of one turn. Bar sizes No. 14 and No. 18 may not be lapped.

D. Welded splices shall conform to the requirements of the plans and TxDOT Item 448, "Structural Field Welding", of the Standard Specifications for Construction of Highways, Streets and Bridges. End preparation for butt welding reinforcing bars shall be done in the field. Delivered bars shall be of

sufficient length to permit weld preparation.

E. Welded wire fabric shall be spliced using a lap length that will include the overlap of a minimum of two (2) cross wires plus two (2) inches on each sheet or roll. Splices using bars which develop equivalent strength and lapped in accordance with TABLE 7-1 will be permitted.

F. For box culvert extensions with less than one (1) foot of fill, the existing longitudinal bars shall have a lap with the new bars as shown in Table 1. For extensions with more than one (1) foot of fill, a minimum of six (6) inch lap will be required.

C7.08 MECHANICAL COUPLERS

A. When shown on the plans, or approved by the City, mechanical splices may be made in the reinforcing steel bars in accordance with TxDOT Item 440 of the Standard Specifications for Construction of Highways, Streets and Bridges.

C7.09 PLACING

A. Reinforcement shall be placed as near as possible in the position shown on the Plans. Unless otherwise shown on the Plans, dimensions shown for reinforcement are to the centers of the bars. In the plane of the steel parallel to the nearest surface of concrete, bars shall not vary from plan placement by more than one-twelfth ($^{1}/_{12}$) of the spacing between bars. In the plane of the steel perpendicular to the nearest surface of concrete, bars shall not vary from plan placement by more than one-quarter inch. Cover of concrete to the nearest surface of steel shall meet the above requirements but shall never be less than one and a half(1½) inches.

B. Vertical stirrups shall always pass around the main tension members and be attached securely thereto. The reinforcing steel shall be spaced its required distance from the form surface by means of approved galvanized metal spacers, metal spacers with plastic coated tips, stainless steel spacers, plastic spacers, or approved pre-cast mortar or concrete blocks. For approval of plastic spacers on a project, representative samples of the plastic shall show no visible indications of deterioration after immersion in a five (5) percent solution of sodium hydroxide for 120 hours.

C. All reinforcing steel shall be tied at all intersections, except that where spacing is less than one (1) foot in each direction in which case reinforcing site shall be tied at alternate intersections. For reinforcing steel cages for other structural members, the steel shall be tied at a sufficient number of intersections to provide a rigid cage of steel.

D. Before any concrete is placed, all mortar, mud, dirt, etc. shall be cleaned from the reinforcement. Precast mortar or concrete blocks to be used for holding steel in position adjacent to formed surfaces shall be cast in molds meeting the approval of the City and shall be cured by covering with wet burlap or cotton mats for a period of 72 hours. Mortar for blocks shall contain approximately one (1) part portland cement to three (3) parts sand. Concrete for blocks shall contain nine (9) sacks of portland cement per cubic yard of concrete.

E. The blocks shall be cast in the form of a frustum of a cone or pyramid with the smaller face placed against the forms.

F. A suitable tie wire shall be provided in each block, to be used for anchoring to the steel. Except in unusual cases, and when specifically otherwise authorized by the City, the size of the surface to be placed adjacent to the forms shall not exceed two and one-half (2½) inches square or the equivalent thereof in cases where circular or rectangular areas are provided. Blocks shall be cast accurately to the thickness required, and the surface to be placed adjacent to the forms shall be a true plane free of surface imperfections.

G. Reinforcement shall be supported and tied in such manner that a sufficiently rigid cage of steel is provided. If the cage is not adequately supported to resist settlement or floating upward of the steel, overturning of truss bars, or movement in any direction during concrete placement, permission to continue concrete placement will be withheld until corrective measures are taken. Sufficient measurements shall be made during concrete placement to insure compliance with the first paragraph of the Article.

H. Mats of wire fabric shall overlap each other sufficiently to maintain a uniform strength and shall be fastened securely at the ends and edges.

I. No concrete shall be deposited until the City has inspected the placement of the reinforcing steel and given permission to proceed. If the reinforcement is not adequately supported or tied to resist settlement, floating upward, overturning of truss bars, or movement in any direction during concrete placement, concrete placement will be halted until corrective measures are taken.

C7.10 EPOXY COATING OF REINFORCING STEEL

A. When shown on the plans, coating with epoxy of reinforcing bars, plain wire, deformed wire or welded wire fabric to be used as reinforcement of concrete shall conform to the requirements of TxDOT Item440 of the Standard Specifications for Construction of Highways, Streets and Bridges.

C7.11 PAYMENT

A. No separate payment shall be made for work performed in accordance with this section of the specifications, and the cost thereof shall be included in the proper items of the Proposal and Bid Schedule.

END OF SECTION

TECHNICAL SPECIFICATIONS

SECTION C9 – FLOWABLE BACKFILL

C9.01 SCOPE OF WORK

A. This specification covers the requirements for the furnishing and placing of flowable backfill as indicated on the Plans.

C9.02 SUBMITTALS

A. Within 30 days after the Notice to Proceed, the Contractor shall submit to the Engineer or the City for approval, technical product literature including flowable backfill mix design, curing method, and all other pertinent data to illustrate conformance to the specification found within.

C9.03 CONSTRUCTION METHODS

A. All trenches to be backfilled shall be properly prepared according to the Plans and Specifications prior to placement of flowable backfill.

C9.04 FLOWABLE BACKFILL

A. Flowable backfill shall be placed in accordance with the details and to the dimensions shown on the Plans or as established by the City.

B. The mixture shall consist of 188 pounds of Type III Portland cement, 94 pounds of fly ash and 3,000 pounds of sand per cubic yard of flowable backfill.

C. The minimum allowable slump for flowable backfill is 6-inches.

D. Immediately following the placement of flowable backfill, it shall be cured in accordance with Section C1- CONCRETE STRUCTURES.

C9.05 PAYMENT

A. Payment for flowable backfill shall be subsidiary to the appropriate bid items of the Proposal and Bid Schedule.

END OF SECTION

APPENDIX A

QUALITY CONTROL / QUALITY ASSURANCE PROGRAM

Approved December 2007

Appendix A

Quality Control / Quality Assurance Program

Section 1. Overview

Introduction

Williamson County has established the following Quality Control (QC) / Quality Assurance (QA) Program to assure that the materials and workmanship incorporated into any roadway or highway construction project are in reasonable conformity with the requirements of the approved plans and specifications, including any approved changes. It consists of an "Acceptance Program" and a “QA Program" based on test results obtained by qualified persons and equipment.

This QC/QA Program allows for the use of validated contractor-performed QC test results as part of an acceptance decision. It also allows for the use of test results obtained by commercial laboratories in the QA Program in acceptance decisions, as well. The effectiveness of the “Acceptance Program” shall be the responsibility of the Construction Observer.

Definitions

Acceptance Program - All factors that comprise the Williamson County's determination of the quality of the product as specified in the contract requirements. These factors include QC and QA verification sampling and testing, and inspection.

Quality Control Program - The contractor’s systematic program detailing the control measures and reporting requirements necessary to achieve reasonable conformance with the requirements of the approved plans and specifications.

Quality Assurance Program - Activities that are an unbiased and independent evaluation of all the inspection, sampling and testing procedures used in the acceptance program.

Proficiency Samples - Homogenous samples that are distributed and tested by two or more laboratories and/or personnel. The test results are compared to assure that the laboratories and/or personnel are obtaining the same results.

Qualified Laboratories - Laboratories that are capable as defined by appropriate programs established by Williamson County and as indicated in the "Laboratory Qualification Program". As a minimum, the qualification program shall include provisions for checking testing equipment and the laboratory shall keep records of calibration checks.

Qualified Sampling and Testing Personnel - Personnel who are capable as defined by appropriate programs established as stated in Section 6 of this Appendix.

Quality Assurance – All those planned and systematic actions necessary to provide confidence that a product or service will satisfy given requirements for quality.

Quality Control - All contractor/vendor operational techniques and activities that are performed or conducted to fulfill the contract requirements.

Vendor – A supplier of project-produced material that is not the contractor.

Verification Sampling and Testing - Sampling and testing performed to validate the quality of the product, which consists of the QC and QA sampling and testing.

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Section 2. Acceptance Program

Materials incorporated into any roadway or highway construction project shall be subject to verification sampling and testing, and inspection as part of the QC program outlined below:

- Quality Control Inspection

  - Contractor-performed QC Inspection will be required as part of the acceptance decision. Inspection check lists for the following structural items shall be completed and submitted as part of the acceptance program:

    Item 400 – Excavation & Backfill
    Item 416 – Drilled Shaft Foundations
    Item 420 – Concrete Structures
    Item 421 – Hydraulic Cement Concrete
    Item 422 – Bridge Deck
    Item 423 – Retaining Wall
    Item 425 – Precast Pre-stressed Concrete Structural Members
    Item 440 – Reinforcing Steel
    Item 442 – Metal for Structures
    Item 462 – Concrete Box Culverts
    Item 464 – Reinforced Concrete Pipe

    Sample Inspection check lists are included at the end of this Appendix.

  - The contractor shall designate individual(s) responsible for the QC Inspection for the project or each work element thereof. The designated QC individual(s) will maintain responsibility for providing reports detailing the compliance of each work element to the requirements of the approved project plans and specifications.

  - The QC report will detail requirements of the approved project plans and specifications and measures initiated to ensure reasonable conformity.

  - The contactor shall submit the QC Plan for acceptance detailing the individuals & methods(s) intended to be used to obtain reasonable conformance to the approved project plans and specifications.

- Quality Control Sampling, Testing and frequency

  - Contractor-performed QC sampling and testing will be used as part of an acceptance decision.

  - The frequency and location will be according to the “Project Test” frequency as shown in Appendix B. This project has been designed utilizing TxDOT Specifications; therefore, the 2005 TxDOT Guide Schedule for Sampling and Testing has been adopted for the testing program. As a County-developed project, all references to TxDOT in the testing program shall be understood to mean Williamson County, and all references to the Engineer shall be understood to mean the County Engineer or his designated representative(s).

  - These QC sampling and testing personnel, laboratories, and equipment shall be qualified according to the "Sampling and Testing Personnel Qualification Program" and the "Laboratory Qualification Program" and shall be evaluated under the "Quality Assurance Program" contained herein.

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- Any equipment used to perform QC sampling and testing shall be subject to an evaluation by QA sampling and testing personnel. This evaluation shall include calibration checks and split or proficiency sample tests. The requirements for, and frequency of, equipment calibration are shown in Appendix B. Acceptable tolerance limits for the comparison of test results from split or proficiency samples are shown in “Acceptable Tolerance Limits for Independent Assurance.”

- Any individual who performs verification or QC sampling and testing shall be evaluated by QA sampling and testing personnel. This evaluation shall include observations and split or proficiency sample testing. Acceptable tolerance limits for the comparison of test results for split or proficiency samples are shown in "Acceptable Tolerance Limits for Quality Assurance."

- Furthermore, these QC test results may be validated by verification test results obtained from independently taken samples at the direction of the Construction Observer or the County.

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Section 3. Quality Assurance Program

This Quality Assurance Program; as deemed necessary by the County or the Construction Observer; shall evaluate all QC inspection, sampling and testing procedures, personnel, and equipment used as part of the acceptance program.

- QA Inspection
    - The Construction Observer will be responsible for QA inspection. The inspection will be performed at periodic intervals to assure compliance with the accepted QC program, as well as to assure reasonable close conformity to the approved project plans and specifications.
- Sampling and Testing Frequency and Location
    - Quality Assurance sampling and testing shall be performed at the same location and frequency established for the Project Tests in the "Guide Schedule of Sampling and Testing" found in Appendix B.
    - The frequency for the “Independent Assurance Tests” shall be as directed by the Construction Observer.
- Testing Equipment
    - Laboratory testing equipment used for QA sampling and testing shall be qualified according to the "Laboratory Qualification Program."
    - All laboratories used for QA sampling and testing must be AASHTO accredited and listed as an accepted Lab by the County.
    - The frequency for qualifying QA sampling and testing equipment shall not exceed one (1) year or as directed by the Construction Observer.
    - Calibration/verification is required whenever the laboratory or equipment is moved.
    - The QA equipment shall be other than that used for performing verification or QC testing.
- Testing Personnel
    - Laboratory personnel who perform QA sampling and testing shall be in accordance with the "Sampling and Testing Personnel Qualification Program" Included herein.
    - The individuals performing QA sampling and testing shall be other than those who perform other verification or QC testing.
- Comparison of QC and QA Test Results
    - Acceptable tolerance limits for the comparison of test results from split and proficiency samples are shown in "Acceptable Tolerance Limits for Independence Assurance."
    - If the comparison of the test results do not comply with the tolerances, an engineering review of the test procedures and equipment shall be performed immediately to determine the source of the discrepancy.
    - Corrective actions must be identified and incorporated as appropriate.

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Test results from all samples involved in the Quality Assurance Program shall be documented and reported in the project files.

- Dispute Resolution System
    - Testing disputes arising between the Construction Observer, or his/her designated agents, and the Contractor shall be resolved in a reliable, unbiased manner. The decision of the County, the Construction Observer, or their authorized representatives will be final.

Approved December 2007

Section 4. Materials Certification

The Independent Assurance agency shall submit a "Certificate of Materials" to the Construction Observer indicating the conformity of tested materials to the approved plans and specifications including any exceptions, if applicable.

Approved December 2007

Section 5. Conflict of Interest

To avoid an appearance of a conflict of interest, sampling and testing of materials under the QA program shall be performed at a qualified laboratory other than the laboratory used for project testing by the Contractor.

Approved December 2007

Section 6. Sampling and Testing Personnel Qualification Program

Purpose

This program provides uniform Countywide procedures for sampling and testing personnel qualification to ensure that tests required by the specifications are performed according to the prescribed sampling and testing methods.

Sampling and Testing Personnel Qualification

Sampling and testing personnel will be qualified to perform tests for the acceptance of materials in the areas of Portland cement concrete, soils and aggregates and bituminous materials. The test methods for which individuals can be qualified include, but are not limited to, the following.
(* Denotes tests on which split or proficiency sample evaluations are required.)

Soils & Aggregates (100-E Series & 400-A Series)
Tex-101-E, Preparing Soil and Flexible Base Materials for Testing

Tex-102-E, Determining Slaking Time

Tex-103-E, Determining Moisture Content in Soil Materials

Tex-104-E, Determining Liquid Limit of Soils*

Tex-105-E, Determining Plastic Limit of Soils*

Tex-106-E, Calculating the Plasticity Index of Soils*

Tex-107-E, Determining the Bar Linear Shrinkage of Soils*

Tex-108-E, Determining the Specific Gravity of Soils

Tex-110-E, Particle Size Analysis of Soils*

Tex-111-E, Determining the Amount of Material in Soils Finer than 75 □m (No.200) Sieve

Tex-113-E, Laboratory Compaction Characteristics and Moisture-Density Relationship of Base Materials

Tex-114-E, Laboratory Compaction Characteristics and Moisture-Density Relationship of Subgrade and Embankment Soils

Tex-115-E, Field Method for Determining In-Place Density of Soils and Base Materials

Tex-116-E, Ball Mill Method for Determining the Disintegration of Flexible Base Material

Tex-117-E, Triaxial Compression Tests for Disturbed Soils and Base Materials

Tex-120-E, Soil-Cement Testing

Tex-121-E, Soil-Lime Testing

Tex-126-E, Molding, Testing, and Evaluating Bituminous Black Base Materials*

Tex-127-E, Lime Fly-Ash Compressive Strength Test Methods
Tex-128-E, Determining Soil pH

Tex-129-E, Measuring the Resistivity of Soil Materials

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Tex-140-E, Measuring Thickness of Pavement Layer

Tex-400-A, Sampling Stone, Gravel, Sand, and Mineral Aggregates

Tex-401-A, Sieve Analysis of Fine and Coarse Aggregate*

Tex-402-A, Fineness Modulus of Fine Aggregate

Tex-403-A, Saturated Surface Dry Specific Gravity and Absorption of Aggregates

Tex-404-A, Determining Unit Mass (Weight) of Aggregates

Tex-405-A, Determining Percent Solids and Voids in Concrete Aggregates

Tex-406-A, Material Finer Than 75 □m (No. 200) Sieve in Mineral Aggregates (Decantation Test for Concrete Aggregates)

Tex-408-A, Organic Impurities in Fine Aggregate for Concrete

Tex-409-A, Free Moisture and Water Absorption in Aggregate for Concrete

Tex-409-A, Free Moisture and Water Absorption in Aggregate for Concrete

Tex-411-A, Soundness of Aggregate by Using Sodium Sulfate or Magnesium Sulfate

Tex-413-A, Determining Deleterious Materials in Mineral Aggregates

Tex-425-A, Determining Moisture Content in Fine Aggregate by the "Speedy" Moisture Method

Tex-460-A, Determining Crushed Face Particle Count

Bituminous (200-F Series)

Tex-200-F, Sieve Analysis of Fine and Coarse Aggregate*

Tex-201-F, Bulk Specific Gravity and Water Absorption of Aggregate

Tex-202-F, Apparent Specific Gravity of Material Finer than 180 □m (No. 80) Sieve

Tex-203-F, Sand Equivalent Test*

Tex-204-F, Design of Bituminous Mixtures

Tex-205-F, Laboratory Method of Mixing Bituminous Mixtures

Tex-206-F, Compacting Test Specimens of Bituminous Mixtures*

Tex-207-F, Determining Density of Compacted Bituminous Mixtures*

Tex-208-F, Test for Stabilometer Value of Bituminous Mixtures*

Tex-210-F, Determining Asphalt Content of Bituminous Mixtures by Extraction*

Tex-211-F, Recovery of Asphalt from Bituminous Mixtures by the Abson Process

Tex-212-F, Determining Moisture Content of Bituminous Mixtures

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Tex-213-F, Determining Hydrocarbon-Volatile Content of Bituminous Mixtures

Tex-217-F, Determining Deleterious Material and Decantation Test for Coarse Aggregates

Tex-221-F, Sampling Aggregate for Bituminous Mixtures, Surface Treatments and Limestone Rock Asphalt

Tex-222-F, Sampling Bituminous Mixtures

Tex-224-F, Determining Flakiness Index

Tex-226-F, Indirect Tensile Strength Test

Tex-227-F, Theoretical Maximum Specific Gravity of Bituminous Mixtures*

Tex-228-F, Determining Asphalt Content of Bituminous Mixtures by the Nuclear Method*

Tex-229-F, Combined HMAC Cold-Belt Sampling and Testing Procedure

Tex-236-F, Determining Asphalt Content from Asphalt Paving Mixtures by the Ignition Method*

Concrete (400-A Series)

Tex-407-A, Sampling Freshly-Mixed Concrete

Tex-414-A, Air Content of Freshly Mixed Concrete by the Volumetric Method*

Tex-415-A, Slump of Portland Cement Concrete*

Tex-416-A, Air Content of Freshly Mixed Concrete by the Pressure Method*

Tex-417-A, Unit Weight, Yield, and Air Content (Gravimetric) of Concrete

Tex-418-A, Compressive Strength of Cylindrical Concrete Specimens*

Tex-419-A, Compressive Strength of Concrete Using Portions of Beams Broken in Flexure

Tex-424-A, Obtaining and Testing Drilled Cores of Concrete

Tex-436-A, Measuring Texture Depth by the Sand Patch Method

Tex-437-A, Test for Flow of Grout Mixtures (Flow Cone Method)

Tex-447-A, Making and Curing Concrete Test Specimens

Tex-448-A, Flexural Strength of Concrete Using Simple Beam Third-Point Loading*

Tex-450-A, Capping Cylindrical Concrete Specimens

Tex-460-A, Determining Crushed Face Particle Count

Asphalt (500-C Series)

Tex-502-C, Penetration of Bituminous Materials (refer to AASHTO T 49)

Tex-530-C, Effect of Water on Bituminous Paving Mixtures

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Tex-531-C, Prediction of Moisture-Induced Damage to Bituminous Paving Materials Using Molded Specimens

Tex-1000-S, Operating Pavement Profilograph and Evaluating Profiles

Who Must Be Qualified?

Any individual who performs tests on materials for acceptance must be qualified.

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Qualification of Sampling and Testing Personnel

All sampling and testing personnel for approved laboratories shall be qualified to do the work in accordance with "Laboratory Qualification Program".

Each laboratory shall maintain a minimum of one (1) qualified individual for each test procedure performed.

Section 7. Laboratory Qualification Program

Purpose

This program provides uniform countywide procedures to ensure that laboratory facilities and equipment are adequate for the performance of required sampling and testing methods.

Laboratories

All laboratories that perform testing for Williamson County must be accredited under the AASHTO Laboratory Accreditation Program. These include, but are not limited to the following:

- Area/project laboratories (includes field laboratories)
- Commercial laboratories
- Contractor laboratories
- Vendor laboratories (material suppliers).

The most current AASHTO accredited laboratories in the State of Texas can be obtained at http://patapsco.nist.gov/aashto/amrl/services/aap_intro.htm. In addition, Appendix C includes a list of AASHTO accredited laboratories obtained at the time this document was prepared.

Laboratory Qualification Responsibility

The Construction Observer or his/her authorized representatives will be responsible to ensure all QA laboratories used for project and QA testing and sampling are qualified.

Qualification Process

The laboratory qualifying authority will:

- identify the scope of testing to be performed
- verify that manuals and/or test methods used to perform tests are available and up-to-date
- document that the laboratory has the required equipment to perform the tests
- check the calibration/verification records for each piece of equipment, to include:
    - description of equipment
    - identification of any traceable standard used
    - frequency of calibration
    - date of last calibration
    - date of next calibration
    - procedure used to calibrate equipment
    - procedure used to identify equipment not in compliance.

In addition, all equipment may be subjected to calibration verification or other inspection by the qualifying authority.

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Calibration Standards and Frequencies for Laboratory Equipment

The standards for calibration and the frequencies for laboratory equipment calibrations shall be in accordance with appropriate testing equipment measures as indicated in the Texas Department of Transportation Manual of Testing Procedures. 100-E (Soils), 200-F (Bituminous), and 400-A (Concrete) series of TxDOT's *Manual of Testing Procedures*.

Frequency for Laboratory Qualification

Laboratories shall be qualified at an interval not to exceed six (6) months, or as directed by the Construction Observer. Calibration/verification is required whenever the laboratory or equipment is moved.

Non-Compliance

A laboratory that does not meet the above requirements is subject to disqualification. Any equipment in a qualified laboratory failing to meet specified equipment requirements for a specific test method shall not be used for that test method.

Documentation

The Construction Observer will be responsible for verifying that laboratories are qualified to perform material testing. Documentation will be required to be kept by the qualified laboratory. Calibration records will be maintained for three (3) years, unless directed otherwise by the Construction Observer.

Dispute Resolution

The County will have the final decision regarding all disputes of the laboratory qualification and calibration of testing equipment.

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Section 8. Acceptable Tolerance Limits for Quality Assurance

The following tables indicate the acceptable tolerance limits for the specified material.

Embankment

Embankment		
Procedure	**Texas Test Method**	**Tolerance**
In-place Density	"Tex-115-E, Field Method for Determining In-Place Density of Soils and Base Materials"	± 2.5% Field Density

Untreated & Treated Sub-base and Base Courses

Untreated & Treated Sub-base and Base Courses		
Procedure	**Texas Test Method**	**Tolerance**
In-place Density	"Tex-115-E, Field Method for Determining In-Place Density of Soils and Base Materials"	± 2.5% Field Density
Gradation:	"Tex-110-E, Particle Size Analysis of Soils"	-
> No. 4 ≤ No. 4	-	± 5% ± 3%
Liquid Limit	"Tex-104-E, Determining Liquid Limit of Soils"	15% of the mean*
Plasticity Index	"Tex-106-E, Calculating the Plasticity Index of Soils"	20% of the mean*

Asphalt Stabilized Base

Asphalt Stabilized Base		
Procedure	**Texas Test Method**	**Tolerance**
Gradation:	"Tex-200-F, Sieve Analysis of Fine and Coarse Aggregates"	-
> No. 4 ≤ No. 4	-	± 5% ± 3%
Liquid Limit	"Tex-104-E, Determining Liquid Limit of Soils"	15% of the mean*
Plasticity Index	"Tex-106-E, Calculating the Plasticity Index of Soils"	20% of the mean*
Percent Asphalt	"Tex-210-F, Determining Asphalt Content of Bituminous Mixtures by Extraction"	± 0.3%
-	"Tex-228-F, Determining Asphalt Content of Bituminous Mixtures by the Nuclear Method"	± 0.3%

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-	"Tex-126-E, Molding, Testing, and Evaluating Bituminous Black Base Materials"	± 0.3%
-	"Tex-229-F, Combined HMAC Cold-belt Sampling and Testing Procedure"	± 0.3%
-	"Tex-236-F, Determining Asphalt Content from Asphalt Paving Mixtures by the Ignition Method"	± 0.3%
In-place Density (Cores)	"Tex-207-F, Determining Density of Compacted Bituminous Mixtures"	± 1% Field Density

Surface Treatment Aggregates

Surface Treatment Aggregates		
Procedure	**Texas Test Method**	**Tolerance**
Gradation:	"Tex-200-F, Sieve Analysis of Fine and Coarse Aggregates"	-
> No. 4 ≤ No. 4	-	± 5% ± 3%

Portland Cement Concrete Coarse Aggregate

Portland Cement Concrete Coarse Aggregate		
Procedure	**Texas Test Method**	**Tolerance**
Gradation:	"Tex-401-A, Sieve Analysis of Fine and Coarse Aggregate"	-
> No. 4 ≤ No. 4	-	± 5% ± 3%

Portland Cement Concrete Fine Aggregate

Portland Cement Concrete Fine Aggregate		
Procedure	**Texas Test Method**	**Tolerance**
Gradation (3/8" through No. 200)	"Tex-401-A, Sieve Analysis of Fine and Coarse Aggregate"	± 3%
Sand Equivalent	"Tex-203-F, Sand Equivalent Test"	± 10

Portland Cement Concrete Complete Mixture

Portland Cement Concrete Complete Mixture		
Procedure	**Texas Test Method**	**Tolerance**
Flexural Strength Compressive	1. "Tex-448-A, Flexural Strength of Concrete Using Simple Beam Third-Point Loading" 2. "Tex-418-A, Compressive Strength of Cylindrical Concrete Specimens"	20% of the mean*

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Slump	"Tex-415-A, Slump of Portland Cement Concrete"	± 1.0"
Entrained Air	3. "Tex-414-A, Air Content of Freshly Mixed Concrete by the Volumetric Method" 4. "Tex-416-A, Air Content of Freshly Mixed Concrete by the Pressure Method"	± 1%

Asphaltic Concrete Coarse Aggregate

Asphaltic Concrete Coarse Aggregate		
Procedure	**Texas Test Method**	**Tolerance**
Gradation:	"Tex-200-F, Sieve Analysis of Fine and Coarse Aggregates"	-
> No. 10 ≤ No. 10	-	± 5% ± 3%
Deleterious Material	"Tex-217-F, Determining Deleterious Material and Decantation Test for Coarse Aggregates"	± 0.3 %
Decantation	"Tex-217-F, Determining Deleterious Material and Decantation Test for Coarse Aggregates"	20% of the mean*

Asphaltic Concrete Fine Aggregate

Asphaltic Concrete Fine Aggregate		
Procedure	**Texas Test Method**	**Tolerance**
Gradation (No. 10 through No. 200)	"Tex-200-F, Sieve Analysis of Fine and Coarse Aggregates"	± 3%
Bar Linear Shrinkage	"Tex-107-E, Determining the Bar Linear Shrinkage of Materials"	± 2

Asphaltic Concrete Combined Aggregate

Asphaltic Concrete Combined Aggregate		
Procedure	**Texas Test Method**	**Tolerance**
Gradation:	"Tex-200-F, Sieve Analysis of Fine and Coarse Aggregates"	-
> 5/8" 5/8" through No. 200 Passing No. 200	-	± 5% ± 3% ± 1.5%
Sand Equivalent	"Tex-203-F, Sand Equivalent Test"	± 10

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Asphaltic Concrete Complete Mixture

Asphaltic Concrete Complete Mixture		
Procedure	**Texas Test Method**	**Tolerance**
Asphalt Content	"Tex-210-F, Determining Asphalt Content of Bituminous Mixtures by Extraction"	± 0.3%
-	"Tex-228-F, Determining Asphalt Content of Bituminous Mixtures by the Nuclear Method"	± 0.3%
-	"Tex-229-F, Combined HMAC Cold-belt Sampling and Testing Procedure"	± 0.3%
-	"Tex-236-F, Determining Asphalt Content from Asphalt Paving Mixtures by the Ignition Method"	± 0.3%
Maximum Theoretical Specific Gravity	"Tex-227-F, Theoretical Maximum Specific Gravity of Bituminous Mixtures"	± 0.020
Laboratory Molded Density	"Tex-207-F, Determining Density of Compacted Bituminous Mixtures"	± 1.0%
Laboratory Molded Bulk Specific Gravity	"Tex-207-F, Determining Density of Compacted Bituminous Mixtures"	± 0.020
Stability	"Tex-208-F, Test for Stabilometer Value of Bituminous Mixtures"	5 points
Moisture	"Tex-212-F, Determining Moisture Content of Bituminous Mixtures"	± 0.2 mL
In-place Air Voids (Core)	"Tex-207-F, Determining Density of Compacted Bituminous Mixtures"	± 1.0%

NOTE: The above tolerances are to be used when comparison of test results is by split samples. A tolerance of plus or minus two (2) standard deviations shall be used when comparison of test results is by proficiency samples.

*The difference between compared test results shall not exceed the indicated percentage of the mean of the compared test results - the mean being the average of the two test results.

EXAMPLE: Plasticity Index	
Job Control test value	18
IA Test value	22
Mean	20
20% difference	4

Both values are within 20% of the mean.

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Williamson County Road Bond Program
Construction Quality Control & Quality Assurance Program

Inspection Check Lists

Williamson County
Road Bond Program
Inspection Check Lists

Spec Item: 400 – Excavation & Backfill for Structures
Description:
Location:
Report No.:
Date:
Time:

QC Reviewer:

Results: ☐ Accepted ☐ Not Accepted

Remarks:

QC Reviewer Signature:

Excavation and Backfill for Structures	**Yes**	**No**	**NA**
I. Excavation (400.3)			
1. Whenever excavating for installing structures across private property beyond the limits of the embankment, is the top soil removed prior excavation and kept separate and later replaced, as nearly as feasible, in its original position?	☐	☐	☐
2. If trench excavation deeper than five (5) feet, is trench protection required?	☐	☐	☐

Williamson County
Road Bond Program
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		Yes	No	NA
3.	When old or abandoned structures or foundations are encountered in the excavation, are they removed for the full width of the excavation and to a depth of one (1) foot below the bottom of the excavation?	☐	☐	☐
4.	During construction, did the contractor receive approval from the Engineer of Record before laying any structures in the presence of water?	☐	☐	☐
5.	If the excavation cannot be dewatered to the point where the subgrade is free of mud, was a concrete mixture with not less than three (3) sacks of cement per cubic yard (or other material approved by the Engineer of Record) placed a minimum of three (3) inches in depth in the bottom of the excavation?	☐	☐	☐
6.	For all culverts where the soil encountered at established footing grade is an unstable or incompressible material is the procedure shown in Item 400.3.A.4 followed unless other methods are called for in the plans?	☐	☐	☐
7.	Unless otherwise shown on the plans, are all sewer pipe structures constructed in an open cut with vertical sides to a point one (1) foot above the pipe?	☐	☐	☐
8.	Are all vertical sides sheeted and braced when necessary to maintain the required vertical excavation throughout the construction?	☐	☐	☐
9.	For pipe to be installed in a fill section was the embankment constructed to one (1) foot above the top of the pipe and then excavated for the pipe?	☐	☐	☐

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	Yes	No	NA
10. Is the trench excavated to the width and elevations as shown in the plans?	☐	☐	☐
11. Is the pipe, culvert, etc., properly centered in the trench?	☐	☐	☐

II. Shaping and Bedding (400.3.B)

1. For precast box sections and pipe, is the bedding in accordance with Item 400.3.B unless otherwise shown on the plans?	☐	☐	☐
2. For precast pipe and box sections where cement stabilized backfill is indicated on the plans, is the excavation undercut a minimum 4 inches and backfilled with stabilized material to support the pipe at the required grade?	☐	☐	☐

III. Backfill – General (400.3.C)

1. Is backfill material free from stones of such size as to interfere with compaction, large or frozen lumps which will not break down readily under compaction; and wood or other extraneous material?	☐	☐	☐
2. a. Is backfill in areas not supporting any portion of the completed roadbed, retaining wall or embankment, placed in layers not more than ten (10) inches in depth (loose measurement)?	☐	☐	☐
b. Is backfill which will support any portion of the roadbed, retaining wall or embankment, placed in uniform layers not to exceed eight (8) inches in depth (loose measurement)?	☐	☐	☐

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	Yes	No	NA
3. Is each layer of backfill material to the moisture content needed to obtain the required density?	☐	☐	☐
4. If a cohesionless material, such as sand, is used, is it compacted with vibratory equipment, water ponding or a combination of both?	☐	☐	☐

IV. Backfill – Bridge Foundations, Retaining Walls and Culverts (400.3.C.2)

1. Is the material used for backfilling free of any appreciable amount of gravel or stone particles more than four (4) inches in greatest dimension and of a gradation that permits thorough compaction?	☐	☐	☐
2. Are mechanical tamps or rammers required when the structure being backfilled could sustain damage from other compacting operations?	☐	☐	☐
3. Are any special density requirements for backfill under or adjacent to structures met?	☐	☐	☐

V. Backfill – Pipe (400.3.C.3)

1. After the bedding and pipes have been installed as required, is the selected backfill materials brought to proper moisture condition, placed along both sides of the pipe equally, in uniform layers not exceeding eight (8) inches in depth (loose measurement), and thoroughly compacted mechanically?	☐	☐	☐

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	Yes	No	NA
2. Is the method of backfill in question 1 above continued in this manner to the top of pipe elevation and compacted in accordance with Item 400.3.C.1?	☐	☐	☐

VI. Cement Stabilized Backfill (400.3.C.4)

1. When required by plans, is cement stabilized backfill or flowable backfill placed equally along all sides of the structure, so as to prevent strain on or displacement of the structure; and are all voids filled?	☐	☐	☐

Williamson County
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Inspection Check Lists

Spec Item: 416 – Drilled Shaft Foundations
Description:
Location:
Report No.:
Date:
Time:

QC Reviewer:

Results: ☐ Accepted ☐ Not Accepted

Remarks:

QC Reviewer Signature:

416 – Drilled Shaft Foundations	**Yes**	**No**	**NA**
I. Materials (416.2)			
1. Did the Contractor incorporate materials into this project that meet the requirements of referenced items in Section 416.2?	☐	☐	☐
2. Does concrete for Drilled Shafts meet the requirements of Table 1 and Table 2 for concrete class and slump?	☐	☐	☐
3. If drilling slurry is used, does it meet the requirements of Table 3, as determined by Tex-130 E?	☐	☐	☐

Williamson County
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Drilled Shaft Foundations – Item 416

	Yes	No	NA
4. Do Chemical Admixtures meet the requirements of DMS-4620?	☐	☐	☐

II. Construction (416.3)

A. Excavation

1. When excavating, was satisfactory founding material encountered at plan elevation?	☐	☐	☐
If not, was the bottom of the shaft adjusted, or the foundation altered, as determined by the Engineer of Record, to satisfactorily comply with the design requirements?			
2. Is the shaft vertical alignment measured and found to be within a tolerance of 1 inch per 10 feet of depth? **(Hold Point)**	☐	☐	☐
3. Is the center of shaft location measured and found to be not more than 1 inch from the horizontal position shown on the plans? **(Hold Point)**	☐	☐	☐
If not, was a structural review performed?			
4. Did the Contractor provide suitable access and lighting for proper inspection of the completed excavation?	☐	☐	☐

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Drilled Shaft Foundations – Item 416

	Yes	No	NA
5. For abutment drill shafts, is the embankment at the bridge ends completed to grade and thoroughly compacted prior to drilling?	☐	☐	☐

B. Requirements for Slurry Displacement Method

1. If the slurry method is used to construct drilled shaft, is slurry mixed at the project site or is it premixed in a reservoir adjacent to the excavation (not in the shaft excavation or other hole)?	☐	☐	☐
2. During and after drilling was a head of slurry maintained in the shaft excavation at or near ground level or higher as necessary to counteract ground water pressure?	☐	☐	☐
3. Just prior to placement of reinforcing steel, was an airlift or proper size cleanout bucket used to remove accumulated material on the bottom after the completion of drilling? **(Hold Point)**	☐	☐	☐
4. Was concrete placement started within 4 hours of shaft excavation? If not, was shaft reprocessed?	☐	☐	☐
5. Is the slurry agitated if the placement of concrete is delayed to keep it liquefied?			

Williamson County
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Drilled Shaft Foundations – Item 416

C. Reinforcing Steel	Yes	No	NA
1. Is the cage of reinforcing steel completely assembled according to plans and placed in the drill shaft as a unit immediately prior to concrete placement? **(Hold Point)**	☐	☐	☐
2. Where spiral reinforcement is used, is it tied to longitudinal bars (not welded) at a spacing not to exceed 24 inches?	☐	☐	☐
3. In uncased shafts, are concrete spacer blocks or steel chairs placed at sufficient intervals to insure concentric spacing for the entire length of the cage?	☐	☐	☐
4. In cased shafts, are steel chair spacers or bent pieces of steel bars placed at sufficient intervals to insure concentric spacing inside the casing?	☐	☐	☐
5. Is the cage adequately supported to control vertical displacement and racking and distortion of the steel during concrete placement and/or extraction of the casing?	☐	☐	☐
6. a. Is the elevation of the steel cage checked before and after concrete placement or after casing extraction when casing is used?	☐	☐	☐
b. Did the downward movement of the steel not exceed 6 inches per 20 feet of shaft length?	☐	☐	☐

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Drilled Shaft Foundations – Item 416

	Yes	No	NA
c. Did the upward movement of the steel not exceed 6 inches?	☐	☐	☐
d. Were the dowel bars checked for proper lap length between the shaft and column?	☐	☐	☐

D. Concrete (Perform all work in accordance with the requirements of Item 420, "Concrete Structures".)

1. For dry shafts 24" in diameter or smaller, is concrete placed continuously through the entire length of the shaft through a suitable tube or tremie (limit freefall to 25 feet) to prevent segregation of materials?	☐	☐	☐
2. Does the elapsed time from the beginning of concrete placement into the cased portion of the shaft until the completion of extraction of the casing exceed one hour?	☐	☐	☐
3. At the time the concrete is placed, is the excavated drill shaft free from accumulated seep water?	☐	☐	☐
4. Has all loose material been removed from the bottom of the excavation prior to placing concrete?	☐	☐	☐

(Note: For dry shafts over 24" diameter concrete freefall is unlimited; use 3 foot drop tube.)

Williamson County
Road Bond Program
Inspection Check Lists

Drilled Shaft Foundations – Item 416

	Yes	No	NA
E. Additional Requirements for Slurry Displacement or Underwater Concrete Placement Methods			
1. Is the concrete placed through a closed tremie or pumped to the bottom of the excavation?	☐	☐	☐
2. If a tremie is used, is it kept full of concrete and well submerged in the previously placed concrete at all times?	☐	☐	☐

How is this determined?

3. During the placement of concrete was the tremie raised, as necessary, to maintain the free flow of concrete and the stability of any casing used?

4. Was additional concrete placed to ensure the removal of any contaminated concrete at the top of the shaft?

5. For pours over water, was a collar used to capture the slurry and the top portion of concrete flushed from the shaft?

6. If the tremie seal (separating layer between the concrete and contaminated bottom hole material) is lost, was the tremie removed, the bottom resealed and the tremie re-inserted at least 5 feet below the new seal before continuing concrete placement?

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Inspection Check Lists

Drilled Shaft Foundations – Item 416

	Yes	No	NA
F. Load Testing			
1. If required, were the poured drill shafts load tested after curing in accordance with Item 405, "Foundation Test Load"?	☐	☐	☐

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Williamson County
Road Bond Program
Inspection Check Lists

Drilled Shaft Foundations – Item 416

Drilled Shaft Record
Form No. 416

DRILLED SHAFT				BELL FTG.		Date Drilled	Casing Used	Drilling Mud	Slurry Plmt.	Remarks
No.	Dia. (in)	Top of Shaft Elev.	Length (ft)	Dia. (CY)	Vol. (CY)					
Bent No.	Design Load		Tons per shaft							
Bent No.	Design Load		Tons per shaft							
Bent No.	Design Load		Tons per shaft							
Bent No.	Design Load		Tons per shaft							
Bent No.	Design Load		Tons per shaft							

Summary for Payment				Comments
Total this sheet		Total this structure		
size of shaft	Length (ft.)	size of shaft	Length (ft.)	
Total Vol of Bells		Total Vol of Bells		

Williamson County
Road Bond Program
Inspection Check Lists

Drilled Shaft Foundations – Item 416

Signature/Date:_____

Williamson County
Road Bond Program
Inspection Check Lists

Spec Item: 420 – Concrete Structures
Description: _____
Location: _____
Report No.: _____
Date: _____
Time: _____

QC Reviewer: _____

Results: ☐ Accepted ☐ Not Accepted

Remarks: _____

QC Reviewer Signature: _____

Concrete Structures	**Yes**	**No**	**NA**
I. Materials (420.2)	☐	☐	☐
1. Were concrete structures constructed from materials conforming to TxDOT's Department Material Specifications in accordance with Section 420.2?			

II. Construction (420.4)

A. Schedule Restrictions

Williamson County
Road Bond Program
Inspection Check Lists

Concrete Structures – Item 420

	Yes	No	NA
1. Did the Contractor comply with the schedule restrictions of Section 420.4.A, prior to erecting forms, removing forms, placement of materials, equipment and bridge rail, opening to construction or full traffic, post-tensioning or backfilling, ensure the previously placed concrete attained the minimum compressive strength or curing time?	☐	☐	☐

B. Falsework and Forms

1. Are the working drawings for forms and falsework signed and sealed by a Registered Professional Engineer, licensed in the state of Texas?	☐	☐	☐
2. Were the falsework and forms placed braced and alignments checked to ensure placement in accordance with the plans signed/sealed working drawings?	☐	☐	☐

C. Reinforcement (provided under Item 440)

1. Was reinforcing steel supports welded to I-beams or girders or to reinforcing steel as shown in the plans?	☐	☐	☐
2. Is the installation of dowels and anchor bolts in accordance with Section 420.4.G.10?	☐	☐	☐

D. Placing Concrete - General

1. Is the temperature of structural concrete at the time of placement between 50°and 95° F?	☐	☐	☐

Williamson County
Road Bond Program
Inspection Check Lists

Concrete Structures – Item 420

	Yes	No	NA
2. Is the temperature of each truck load of concrete for bridge slabs and top slabs of direct traffic culverts being checked and is it between 50° and 85°F?	☐	☐	☐
3. Does the transporting time from the Batching Plant to the placing of concrete in the forms conform to the specification or requirements?	☐	☐	☐
4. If a pump is used to deliver concrete from the truck to the structure, is sampling for testing done at the discharge or was correlation testing performed and documented to ensure that specifications are met at the discharge end?	☐	☐	☐
5. Are all forms, pre-stressed concrete panels, T-beams and concrete box beams wetted thoroughly and remaining puddles of excess water removed prior to concrete placement?	☐	☐	☐
6. Does the method of handling, placing and consolidation of concrete minimize segregation of the concrete and displacement of the reinforcement?	☐	☐	☐
7. Does the concrete have a free fall of five (5) feet or less except in the case of thin walls or as specified otherwise?	☐	☐	☐

Williamson County
Road Bond Program
Inspection Check Lists

Concrete Structures – Item 420

	Yes	No	NA
8. Is the concrete deposited in the forms in uniform layers not more than thirty-six (36) inches in thickness unless otherwise directed by the Engineer?	☐	☐	☐
9. Is the sequence of successive layers or adjacent portions of concrete such that they can be vibrated into a homogenous mass with the previously placed concrete before it sets?	☐	☐	☐
10. Is the construction sequence arranged so that cold joints in a monolithic placement is avoided?	☐	☐	☐
11. Is the concrete vibrated immediately after placement to consolidate the concrete and have the mortar flushed to the form surfaces?	☐	☐	☐
12. Is at least one stand-by vibrator provided for emergency use in addition to those required for placement?	☐	☐	☐
13. Is the rate of placement and finish satisfactory?	☐	☐	☐
14. Unless otherwise shown on the plans, for monolithic mass placements having a least dimension greater than five (5) feet, did the contractor submit a detailed plan to minimize temperature differential and meet the requirements of the Specification?	☐	☐	☐

Williamson County
Road Bond Program
Inspection Check Lists

Concrete Structures – Item 420

	Yes	No	NA
E. Construction Joints			
1. Are all construction joints in bridge slabs of the type and at the locations shown on the plans?	☐	☐	☐
2. Are there additional bridge slab construction joints placed that are not shown on the plans?	☐	☐	☐
3. Was written authorization from the Engineer given for additional joints in these members?	☐	☐	☐
F. Placing Concrete in Cold Weather			
1. Is concrete placed only when the ambient temperature in the shade is 35°F and rising or above 40°F?	☐	☐	☐
2. Is the temperature maintained after placement in accordance with Section 420.4.G.11?	☐	☐	☐
G. Placing Concrete in Hot Weather			
1. Unless otherwise directed by the Engineer, is an approved retarding agent used in all concrete pours for superstructures and top slabs of direct traffic culverts when the air temperature is above 85°F?	☐	☐	☐

Williamson County
Road Bond Program
Inspection Check Lists

Concrete Structures – Item 420

	Yes	No	NA
H. Placing Concrete in Water			
1. Are all classes of concrete placed under water, except Class E and Class SS, redesigned to contain an additional sack of cement per cubic yard?	☐	☐	☐
2. Is the concrete placed with a tremie meeting the requirements of Section 420.4.G.13, and is it not permitted to fall freely through the water nor disturbed after being placed?	☐	☐	☐
I. Placing Concrete in Superstructure			
1. For simple span bridge slabs, what type of finishing machine was used?	☐	☐	☐
2. If other than a mechanical longitudinal screed or a self-propelled transverse finishing machine was used, was approval given by the Engineer for small placements or unusual conditions?	☐	☐	☐
J. Finish of Bridge Slabs			
1. Did QC Reviewer witness the dry-run with the Contractor to ensure dead load deflection, screed profile, steel elevation, tying of rebar, armor joint elevation, depth of cover, etc. was checked?	☐	☐	☐
2. Was the concrete worked with a float to ensure a smooth finish?	☐	☐	☐

Williamson County
Road Bond Program
Inspection Check Lists

Concrete Structures – Item 420

	Yes	No	NA
3. Did QC Reviewer perform sufficient checks with a 16-ft. straight edge on the plastic concrete to ensure final surface is within specified tolerances?	☐	☐	☐
4. Did QC Reviewer continue checking and floating until the deck surface was true to grade, free of depressions, high spots, voids and rough spots?	☐	☐	☐
5. Was the surface finish achieved by using a carpet drag, burlap drag or broom?	☐	☐	☐
6. Was the finished concrete surface coated within 10 minutes with a single application of evaporation retardant at the rate recommended by the manufacturer?	☐	☐	☐
7. Is the final bridge deck surface given a grooved steel tine finish approximately 1/8 to 3/16 inches deep approximately 1/8 inches wide, randomly spaced approximately ¾ to 1 inch apart?	☐	☐	☐
8. Did the bridge deck finish meet the ride quality tolerance of 1/8 inch in ten (10) feet (10 feet straight edge test)?	☐	☐	☐
9. Was the bridge deck grooved by saw-cutting in accordance with Section 420.4.I?	☐	☐	☐

Williamson County Road Bond Program Inspection Check Lists

Concrete Structures – Item 420

	Yes	No	NA
K. Curing Concrete			
1. Were the curing requirements of Item 420.4.J met? (Note: See Table 1 – Please note "Exceptions to 4-Day Curing?")	☐	☐	☐
L. Removal of Forms and Falsework			
1. Did the Contractor remove the forms and falsework in accordance with Section 420.4.K?	☐	☐	☐
M. Ordinary Surface Finish			
1. Unless noted otherwise in the plans, did the exposed surfaces for the following items receive an ordinary finish in accordance with Section 420.4.M?			
a. Inside and top of inlets?	☐	☐	☐
b. Inside and top of manholes?	☐	☐	☐
c. Inside of sewer appurtenances?	☐	☐	☐
d. Inside of culvert barrels?	☐	☐	☐
e. Bottom of bridge slab between girders or beams?	☐	☐	☐
f. Vertical and bottom surfaces of interior concrete beams or girders?	☐	☐	☐

Note: Form marks and chamfer edges do not need to be smoothed for inside of culvert barrels and bottom of bridge slabs between girders or beams.

N. Surface Finishes for Concrete (Item 427)			
1. Was the surface cleaned and patched in preparation to receive the finish coating as shown in the plans: was this work performed in accordance with the requirements of Item 427?	☐	☐	☐

Williamson County
Road Bond Program
Inspection Check Lists

Concrete Structures – Item 420

Williamson County
Road Bond Program
Inspection Check Lists

Spec Item: 421 – Hydraulic Cement Concrete
Description:
Location:
Report No.:
Date:
Time:

QC Reviewer:

Results: ☐ Accepted ☐ Not Accepted

Remarks:

QC Reviewer Signature:

Portland Cement Concrete	**Yes**	**No**	**NA**
I. Materials (421.2)			
1. Do the materials used in all mixed concrete placed on the job conform to TxDOT's Department Material Specifications and other requirements of Section 421.2?	☐	☐	☐
2. Is the concrete mix visually checked for uniformity from the beginning to the end of each load?	☐	☐	☐

Williamson County
Road Bond Program
Inspection Check Lists

Hydraulic Cement Concrete – Item 421

	Yes	No	NA
II. Construction (421.4)			
A. Classification and Mix Design			
1. Are the requirements for entrained air met as outlined in Section 421.4.A.4 (Table 7)?	☐	☐	☐
2. Are the requirements of Table 8 – "Slump Requirements" being met?	☐	☐	☐
3. Is the maximum water-cement ratio exceeded?	☐	☐	☐
4. If question 3 is "yes", is the ratio regularly exceeded; was a new design performed?	☐	☐	☐
5. Is no water added to the concrete once discharge has begun to ensure that the maximum water-cement ratio is not exceeded?	☐	☐	☐
B. Job Testing and Documentation			
1. Was the concrete checked at the beginning of the load for slump or entrained air to prohibit placement of non-conforming material?	☐	☐	☐
2. Is the required job site testing (strength, clump, entrained air, concrete temperature, etc.) being performed at the required frequency using proper TxDOT testing methods?	☐	☐	☐

Williamson County
Road Bond Program
Inspection Check Lists

Hydraulic Cement Concrete – Item 421

	Yes	No	NA
3. Are the concrete tickets properly completed?	☐	☐	☐
4. Is the amount of water withheld (based on the design water-cement ratio) at the plant shown on the concrete ticket?	☐	☐	☐
5. If concrete is pumped, where is sampling and testing being performed?	☐	☐	☐
6. Were comparison tests recorded between the haul unit and the point of unit discharge after pump?	☐	☐	☐

C. Truck Mounted Paving Mixers and Transit Mix Trucks

1. Is each truck delivered concrete batch mixed not less than 70 nor more than 100 revolutions of the drum at the mixing speed designated by the manufacturer to produce a uniform concrete mix?	☐	☐	☐
2. When water is added at the job site, is the batch mixed a minimum of 25 revolutions at mixing speed?	☐	☐	☐

Concrete Batch Ticket

Ticket No: _____

Date: _____

Material Information

MAT'L	Identification*	Am't Batched
AEA		oz.
RA		oz.
WRA		oz.
		oz.
CA_1		lbs.
CA_2		lbs.
FA_1		lbs.
Cement		lbs.
Fly Ash		lbs.
		lbs.
		lbs.
		lbs.

AT PLANT

Plant | Des. No. | Truck No.

CY | County | Project | CCSJ

Class | Air Temp ℉ | Mixer Chg'd. ☐ AM ☐ PM | MAX TIME

*%Moist | CA_1 | CA_2 | CA_3 | CA_4 | FA_1 | FA_2

Water: Added (gal). | Ice. (lbs) | Max. (gal)

Rev. Const.: Beg. | End | Mix Rev.

Remarks

Plant Inspector Signature

AT JOBSITE

Structure | Location in Str.

Water Added (gal). | Ice (lbs).

Rev. Constr. Beg. | End. | Mix Rev.

*Slump | *%Air | *Conc. Temp ℉ | *Unit Weight Lbs/ft^3

*Bm. Or Cyl. Nos | Target Value psi | Mixer Unloaded ☐ AM ☐ PM

Remarks

Plant Inspector Signature

Williamson County
Road Bond Program
Inspection Check Lists

Spec Item: 422 – Reinforced Concrete Slab
Description: _____
Location: _____
Report No.: _____
Date: _____
Time: _____

QC Reviewer: _____

Results: ☐ Accepted ☐ Not Accepted

Remarks: _____

QC Reviewer Signature: _____

Reinforced Concrete Slab	**Yes**	**No**	**NA**
I. Materials (422.2)			
1. Are the materials furnished by the Contractor in accordance with the referenced Items of work and meet the requirements of Section 422.2?	☐	☐	☐
II. Construction (422.3)			
A. Pre-placement			
1. Is all placing, finishing and curing equipment in place and operational?	☐	☐	☐

Williamson County
Road Bond Program
Inspection Check Lists

Reinforced Concrete Slab – Item 422

	Yes	No	NA
2. Has a dry runoff the equipment been done?	☐	☐	☐
3. Has the proper clear cover for the rebar been checked?	☐	☐	☐
4. Does screed clear at the armor joints?	☐	☐	☐
5. Are drains and grates at plan location and elevation?	☐	☐	☐
6. Is sufficient plastic and curing blankets available in case of inclement weather after the pour begins?	☐	☐	☐
7. Are forms, deck panels, beams and every element that the fresh concrete will come in contact with properly wetted?	☐	☐	☐

B. During Placement

1. Has placement begun at the low end on spans with a profile grade of 1.5% or more?	☐	☐	☐
2. Are proper clear cover depths being checked at the frequency shown in the Test Guide Schedule?	☐	☐	☐

Williamson County
Road Bond Program
Inspection Check Lists

Reinforced Concrete Slab – Item 422

	Yes	No	NA
3. Is concrete being placed between exterior and adjacent beams prior to placing concrete on overhangs?	☐	☐	☐
4. Is the application of evaporation retardant and curing compound being applies at the times required by specification and at the rates identified by the manufacturer?	☐	☐	☐

C. Post Placement

1. Is the final surface within specification tolerances when checked with a 16-ft straightedge?	☐	☐	☐
2. Has concrete attained a compressive strength in accordance with Section 420.4.A and Table 5 of Section 421.4 prior to removing forms or introducing loads?	☐	☐	☐
3. If deck grooves are saw cut, were they installed in accordance with Section 420.4.I?	☐	☐	☐

Williamson County
Road Bond Program
Inspection Check Lists

Spec Item: 423 – Retaining Wall
Description:
Location:
Report No.:
Date:
Time:

QC Reviewer:

Results: ☐ Accepted ☐ Not Accepted

Remarks:

QC Reviewer Signature:

Retaining Wall	**Yes**	**No**	**NA**
I. Materials (432.2)			
1. Do the materials furnished by the Contractor meet the requirements of the referenced Items of work and other requirements of Section 432.2?			
2. For non-reinforced cast-in-place, was “Class A” concrete used?	☐	☐	☐
3. For reinforced cast-in-place, was “Class C” concrete used?	☐	☐	☐

Williamson County
Road Bond Program
Inspection Check Lists

Retaining Wall – Item 423

	Yes	No	NA
4. Are precast panels fabricated with "Class H" concrete with compressive strength breaks of 4,000 psi or greater?	☐	☐	☐
5. If machine-made concrete block units are used, were they cast in accordance with ASTM C-90, Class 1, Type II and meet the 28-day compressive strength of 4,000 psi with maximum moisture absorption of 7%?	☐	☐	☐
6. If machine-made concrete block units are used, were they sampled and tested in accordance with ASTM C-140 and are the molded dimensions within 1/8" tolerance, except where height must be within 1/16"?	☐	☐	☐
7. For filter fabric used in the Retaining Wall System, is it UV-resistant and does the material meet the requirements of DMS-6200?	☐	☐	☐
8. Are approved joint fillers, pads, waterstops, etc. used as shown in the plans?	☐	☐	☐
9. Does the retaining wall design service life meet the requirements of Section 423.3B?	☐	☐	☐
10. Does the backfill material conform to the gradation and other requirements stated in the plans and/or Item 423.C.2: Table 2 and Item 423.3.C.3: Table 3?	☐	☐	☐

Williamson County
Road Bond Program
Inspection Check Lists

Retaining Wall – Item 423

II. Construction (423.2)	Yes	No	NA
1. Is the foundation for the structure graded level and compacted with a roller approved prior to wall construction? (Hold Point)	☐	☐	☐
2. Are any foundation soils found to be unsuitable removed and replaced?	☐	☐	☐
3. Is filter fabric placed behind all wall joints, and at the intersection of retaining walls with other structures, including riprap?	☐	☐	☐
4. Does the filter fabric cover joints a minimum of 6 inches on each side and is it positively held in place?	☐	☐	☐
5. As select fill material is placed behind the wall panels, are the panel alignments maintained by acceptable bracing methods?	☐	☐	☐
6. Do vertical tolerances and horizontal alignment tolerance not exceed ¾" when measured along the wall with a 10-foot straight edge?	☐	☐	☐
7. Is the overall vertical tolerance of the wall (plumbness from top to bottom) within ½" per 10-feet of wall height?	☐	☐	☐
8. Does the backfill placement closely follow the erection of each lift of panels, and is it placed in 8" lifts and compacted to 95% of density?	☐	☐	☐

Williamson County
Road Bond Program
Inspection Check Lists

Retaining Wall – Item 423

	Yes	No	NA
9. At each reinforcement level, is the backfill leveled and compacted before placing the reinforcement?	☐	☐	☐
10. Is adjacent embankment placed to approximately the same level as the backfill material? Note: Do not create a continuous, distinct, vertical joint between the select and embankment backfill.	☐	☐	☐
11. Is compaction in the 3-foot strip adjacent to the backside of the wall accomplished with hand operated or walk-behind compacter?	☐	☐	☐
12. If rock backfill is used as select material, was a filter fabric layer placed before placing the last 2 feet of backfill immediately below the pavement structure or top of wall? Note: Overlap splices by at least 18".	☐	☐	☐
13. Does the upper 2 feet of rock backfill contain no stones larger than 3" in their greatest dimension and is it composed of material with sufficient fines to fill the voids in a compacted state?	☐	☐	☐
14. Is the wall being constructed in accordance with the details shown on the plan sheets and/or construction drawings?	☐	☐	☐
15. If construction drawings are used to show the construction details, does the Reviewer have (or have access to) a copy of these drawings?	☐	☐	☐

Williamson County
Road Bond Program
Inspection Check Lists

Retaining Wall – Item 423

	Yes	No	NA
16. Are proper spacers provided between panels?	☐	☐	☐
17. Is grading and drainage maintained adjacent to the wall during construction?	☐	☐	☐
18. If temporary MSE walls are used, were the walls constructed in accordance with Section 423.3.F requirements?	☐	☐	☐
19. If Concrete Block Retaining Walls are used, were the walls constructed in accordance with Section 423.3.G?	☐	☐	☐

Williamson County
Road Bond Program
Inspection Check Lists

Spec Item:	425 – Precast Pre-stressed Concrete Structural Members	Report No.:	
Description:		Date:	
Location:		Time:	

QC Reviewer: _____

Results: ☐ Accepted ☐ Not Accepted

Remarks: _____

QC Reviewer Signature: _____

Precast/Pre-stressed Concrete Structural Members	**Yes**	**No**	**NA**
I. Materials (425.2)			
1. Do the materials incorporated in the Precast Pre-stressed Concrete Structural Members conform to the reference items of work, TxDOT's Department Material Specifications and other requirements of Section 425.2?	☐	☐	☐
2. Did the Contractor provide manufacturer's certifications for bedding strips and use adhesives or bonding agents as recommended by the polystyrene manufacturer?	☐	☐	☐

Williamson County
Road Bond Program
Inspection Check Lists

Precast Pre-stressed Concrete Structural Members – Item 425

	Yes	No	NA
II. Construction (425.3)			
1. Are beams, bridge deck panels and bearing pads approved by TxDOT and is the TxDOT stamp on them?	☐	☐	☐
2. Do beams have any signs of damage such as cracks, spalling and/or "honeycombs"?	☐	☐	☐
3. Are dimensions correct?	☐	☐	☐
4. During erection of beams, did the Contractor securely tie or brace all beams in accordance with minimum erection and bracing standards?	☐	☐	☐
5. Are any safety hazards apparent (power lines, traffic hazards or other construction activities)?	☐	☐	☐
6. Have beams been erected to proper alignment as shown on the plans?	☐	☐	☐
7. Are beams positioned with the proper clearance from the abutment back-wall and adjacent beam?	☐	☐	☐

Williamson County
Road Bond Program
Inspection Check Lists

Spec Item: 440 – Reinforcing Steel
Description:
Location:
Report No.:
Date:
Time:

QC Reviewer:

Results: ☐ Accepted ☐ Not Accepted

Remarks:

QC Reviewer Signature:

Reinforcing Steel	**Yes**	**No**	**NA**
I. Materials (440.2)			
1. Does the reinforcing steel to be welded comply with ASTM A706 or have a carbon equivalency of not more than 0.55%?	☐	☐	☐
2. Do the electrodes used for welding conform to the requirements of Item 448.2 for the type of reinforcing steel used?	☐	☐	☐

Williamson County
Road Bond Program
Inspection Check Lists

Reinforcing Steel – Item 440

		Yes	No	NA
3.	Does the person performing the welding operation have welder certification paper issued by TxDOT that covers the type of work he/she is performing? (448.4)	☐	☐	☐
4.	Is an oven used to dry and store electrodes with low hydrogen coverings for the times and at the temperatures required? (448.4.C)	☐	☐	☐
5.	Is the rebar used on the job from an approved Mill as required by Section 440.2.A?	☐	☐	☐
6.	Unless otherwise shown on the plans, is the deformed rebar Grade 60 as required by Section 440.2.B?	☐	☐	☐
7.	For Epoxy Coated Rebar, is the coated reinforcing steel in accordance with Table 3 (440.2.F)?	☐	☐	☐
8.	Are mechanical couplers used when reinforcing steel is spliced?	☐	☐	☐
9.	Are all couplers furnished by the Contractor produced by a pre-qualified manufacturer? (DMS-4510)	☐	☐	☐
10.	Before being used, are the couplers sampled and tested as required in Item 440.2.G and do they meet all requirements? (DMS-4510)	☐	☐	☐

Williamson County
Road Bond Program
Inspection Check Lists

Reinforcing Steel – Item 440

	Yes	No	NA
II. Construction (440.3.C)			
1. Is steel reinforcement adequately stored above the surface of the ground upon platforms, skids or other supports and protected from damage and deterioration?	☐	☐	☐
2. In final placement, is the reinforcement free from dirt, paint, grease, oil or other foreign materials and from defects such as cracks and delaminations?	☐	☐	☐
3. Are lap-splice, wield-splice, or mechanically spliced bars placed as shown on the plans and meet the requirements of Section 440.3.D and Table 5 "Minimum Lap Requirements by Bar Size"?	☐	☐	☐
If not, was written approval given by the Engineer for additional splices?			
4. In the plane of the steel parallel to the nearest surface of concrete, do the bars vary from plan placement by not more than 1/12 of the spacing between bars?	☐	☐	☐
5. In the plane of the steel perpendicular to the nearest surface of concrete, do the bars vary from plan placement by not more than 1/4"?	☐	☐	☐
6. Is the depth of cover (concrete) to the nearest surface of steel at least 1" unless otherwise shown on the plans?	☐	☐	☐

Williamson County
Road Bond Program
Inspection Check Lists

Reinforcing Steel – Item 440

		Yes	No	NA
7.	For bridge slabs, is the clear cover tolerance for the top mat of reinforcement 0" to ½"?	☐	☐	☐
8.	Are bars of the proper size, location and quantity as shown on the plans?	☐	☐	☐
9.	a. What type of bar supports are used?	☐	☐	☐
	b. Are the bar supports adequate in strength and number to hold the reinforcement in place, before and during concrete placement?	☐	☐	☐
	If not, is concrete placement halted until corrective measures are taken?			
	c. If individual bar supports are used, are they placed in rows at 4 ft. maximum spacing?	☐	☐	☐
	d. If continuous type bar supports are used, are they placed in rows at 4 ft. maximum spacing?	☐	☐	☐
	e. Are continuous type bar supports used when permanent metal deck forms are used?	☐	☐	☐

Williamson County
Road Bond Program
Inspection Check Lists

Reinforcing Steel – Item 440

	Yes	No	NA
10. Are all accessories used with epoxy coated reinforcement such as tie wires, bar chairs, supports or clips made of steel, fully coated with epoxy or plastic?	☐	☐	☐
11. Has all visible damage to the coating been repaired in accordance with Section 440.3.F.3 before the reinforcement is used?	☐	☐	☐
12. Is any cutting of coated reinforcement done only by sawing or shear cutting with permission of the Engineer?	☐	☐	☐
13. Have all cut ends been coated before the reinforcement is used?	☐	☐	☐

Williamson County
Road Bond Program
Inspection Check Lists

Spec Item: 442 – Metal for Structures
Description: _____
Location: _____

Report No.: _____
Date: _____
Time: _____

QC Reviewer: _____

Results: ☐ Accepted ☐ Not Accepted

Remarks: _____

QC Reviewer Signature: _____

Metal for Structures	**Yes**	**No**	**NA**
I. Materials (442.2)			
A. Non-Bridge Structures:			
1. Was the structural steel delivered and used within the project tested in accordance with ASTM A370?	☐	☐	☐
2. Does the type and grades of steel used by the Contractor in accordance with the listing in Section 442.2.2.A or as shown on the plans?	☐	☐	☐

Williamson County
Road Bond Program
Inspection Check Lists

Metal for Structures – Item 442

	Yes	No	NA
3. Have tension members and other components listed in Section 442.2.2.B been impact tested and do the test results conform with the Charpy V-notch (CVN) requirements of Table 1 within the above stated section?	☐	☐	☐

B. Other Components such as Shear Connectors, Anchors, Fasteners, Slip-resistant Deck Plates and Rail Posts:

1. Do the materials supplied to the project under this section have a certification of material properties from the manufacturer?	☐	☐	☐
2. Do the materials meet the ASTM requirements as shown in Section 442.2.3 per category description and tested in accordance with section requirements?	☐	☐	☐

C. Forgings, Castings and Extrusions (442.2.B, C, D, E, F, G):

1. Do the components under this category meet the ASTM, class, grade and/or alloy-temper as required in accordance by Section 442.2.B, C, D, E, F, G?	☐	☐	☐

II. Construction Methods (442.3)

1. Was the structural metal fabricated, welded and erected in accordance with Item 441, “Steel Structures”; Item 447, “Structural Bolting; Item 448, “Structural Field Welding”; and applicable AWS welding codes?	☐	☐	☐
2. Were the fabricated and erected structural metal members painted in accordance with Item 446, “Cleaning and Painting Steel”?	☐	☐	☐

Williamson County
Road Bond Program
Inspection Check Lists

Metal for Structures – Item 442

		Yes	No	NA
3.	When specified in the plans, was the fabricated steel items galvanized in accordance with Item 445, "Galvanizing"?	☐	☐	☐
4.	Were field repairs to the painting or galvanizing of fabricated and erected steel items performed in accordance with Item 446, "Cleaning and Painting" or Item 445, "Galvanizing"?	☐	☐	☐

Williamson County
Road Bond Program
Inspection Check Lists

Spec Item: 462 – Concrete Box Culverts & Storm Drains
464 – Reinforced Concrete Pipe

Report No.: _____

Description: _____

Date: _____

Location: _____

Time: _____

QC Reviewer: _____

Results: ☐ Accepted ☐ Not Accepted

Remarks: _____

QC Reviewer Signature: _____ :

Concrete Box Culverts & Storm Drains/Reinforced Concrete Pipe	**Yes**	**No**	**NA**
I. Materials (462.2 and 464.2)			
A. Reinforced Concrete Pipe, Concrete Box Culverts and Strom Drains	☐	☐	☐
1. Were the individual sections of pipe or pre-cast boxes inspected and rejected if they do not have the Division of Materials and Tests monogram on them?	☐	☐	☐
2. For cast-in-place or pre-cast box culverts and storm drains, do the materials and method of fabrication comply with the requirements of Section 462.2.A, B?			

Williamson County
Road Bond Program
Inspection Check Lists

Concrete Box Culverts & Storm Drains – Item 462
Reinforced Concrete Pipe – Item 464

	Yes	No	NA
3. For cast-in-place box culverts and storm drains, during fabrication, did test specimens meet the requirements of Item 421, "Hydraulic Cement Concrete"; Item 440, "Reinforcing Steel" and conform to the requirements of Item 420, "Concrete Structures"?	☐	☐	☐
4. Were the individual sections of pipe or pre-cast boxes inspected at the project site and repaired or rejected if any of the defects are found?	☐	☐	☐
5. Were pre-cast sections inspected to ensure they meet the tolerance in accordance with Section 462.2.F?	☐	☐	☐
6. Are cracks which extend into the plane of the reinforcing steel repaired in an approved manner?	☐	☐	☐
7. Are small damaged or honeycombed areas which are purely surface in nature repaired to the satisfaction of the Engineer?	☐	☐	☐
8. Are precast sections stored on level blocking in a manner acceptable to the Engineer?	☐	☐	☐
9. Are lifting holes larger than 3" diameter?	☐	☐	☐

Williamson County
Road Bond Program
Inspection Check Lists

Concrete Box Culverts & Storm Drains – Item 462
Reinforced Concrete Pipe – Item 464

	Yes	No	NA
B. Jointing Materials			
1. For all jointing materials except mortar, has the Contractor furnished the Engineer the Manufacturer's Certificate of Compliance that complies with the requirements in Section 464.2.I?	☐	☐	☐

II. Construction (462.3 and 464.3)

A. Laying Pipe and Pre-cast Boxes

1. Unless otherwise authorized by the Engineer, did the Contractor start the laying of pipe or present boxes on the bedding at the outlet end with the spigot or tongue pointing downstream and proceed toward the inlet end with the abutting sections properly matched, true to the established lines and grade?	☐	☐	☐
2. Is proper equipment provided for hoisting and lowering the sections of pipe or pre-cast boxes into the trench without disturbing the bedding and the sides of the trench?	☐	☐	☐
3. Are the ends of the pipe or precast boxes carefully cleaned, if necessary?	☐	☐	☐
4. Is the pipe or pre-cast boxes fitted and matched so that when laid in the bed, it forms a smooth uniform conduit?	☐	☐	☐
5. Are multiple installations of reinforced concrete pipe (RCP) laid with the center lines of individual barrels parallel?	☐	☐	☐

Williamson County
Road Bond Program
Inspection Check Lists

Concrete Box Culverts & Storm Drains – Item 462
Reinforced Concrete Pipe – Item 464

	Yes	No	NA
6. Unless otherwise shown on the plans for multiple installations for RCP, are the clear distances between outer surfaces of adjacent pipes as shown in Item 464.3.B (Table 5)?	☐	☐	☐
7. Is the area for placement of structures excavated, shaped and the structures bedded and backfilled in accordance with Item 400, "Excavation and Backfill Structures"?	☐	☐	☐
8. Unless otherwise shown on the plans or permitted in writing by the Engineer, did heavy earth moving equipment haul over the structure before a minimum of 4-feet of compacted fill was placed over the top of the structure?	☐	☐	☐
9. Is pipe or pre-cast boxes damaged by the Contractor's equipment removed and replaced or repaired by an approved method by the Engineer?	☐	☐	☐

B. Jointing for Pipes, Concrete Box Culverts and Storm Drains

1. Does the mortar consist of one part cement, two parts sand, and sufficient water to make a plastic mix?	☐	☐	☐
2. Are the structure ends cleaned and wetted before making the joint?	☐	☐	☐
3. After the structures are tightly jointed, is the mortar packed into the joint from both inside and outside the structure, and then the inside finished smooth and flush with adjacent joints of structure?	☐	☐	☐

Williamson County
Road Bond Program
Inspection Check Lists

Concrete Box Culverts & Storm Drains – Item 462
Reinforced Concrete Pipe – Item 464

	Yes	No	NA
4. Are mortar joints cured by keeping the joints wet for at least 48 hours or until the backfill operation begins after the mortar joint has cured for at least 6 hours?	☐	☐	☐
5. Is no mortar jointing done when the atmospheric temperature is at or below 40°F?	☐	☐	☐
6. Are mortared joints protected against freezing by backfilling or other approved methods for at least 24 hours?	☐	☐	☐

C. Joints using Cold-Applied, Plastic Asphalt Sewer Joint Compound

1. Are both ends of the structure clean and dry at the time the joint is made?	☐	☐	☐
2. Was a ½" thick layer of the compound troweled or otherwise placed in the groove end of the structure covering not less than two-thirds of the joint face around the entire circumference before the tongue end of the next structure is shoved home with sufficient pressure to make a tight joint?	☐	☐	☐
3. After the joint is made, is any excess mastic projecting into the structure removed?	☐	☐	☐

D. Joints Using Rubber Gasket

1. Where rubber gasket joints are required by the plans, is the joint assembly made according to the recommendations of the gasket manufacturer?	☐	☐	☐

Williamson County
Road Bond Program
Inspection Check Lists

Concrete Box Culverts & Storm Drains – Item 462
Reinforced Concrete Pipe – Item 464

	Yes	No	NA
2. When using rubber gaskets, are the joints water tight?	☐	☐	☐

E. Joints Using Pre-formed Flexible Joint Sealants

1. Are the joints placed according to the procedure shown in Article 464.3.C.4 and the manufacturer's recommendations?	☐	☐	☐
2. Is the joint sealer placed in such manner that no dirt or other deleterious materials will come in contact with the joint sealing material?	☐	☐	☐
3. When the atmospheric temperature is below 60°F, are plastic joint seal gaskets either stored in an area warmed to above 70°F or artificially warmed to this temperature in a manner satisfactory to the Engineer?	☐	☐	☐

F. Connections and Stub Ends for Pipes, Concrete Box Culverts and Storm Drains

1. Is the bottom of existing structures mortared or concreted if necessary to eliminate any drainage pockets created by the connections?	☐	☐	☐
2. Is any damage to the existing structure resulting form making the connection satisfactorily repaired by the Contractor?	☐	☐	☐
3. Unless otherwise shown on the plans, are the connections between concrete pipe and corrugated metal pipe made with a suitable concrete collar having a minimum thickness of 4"?	☐	☐	☐

Williamson County
Road Bond Program
Inspection Check Lists

Concrete Box Culverts & Storm Drains – Item 462
Reinforced Concrete Pipe – Item 464

	Yes	No	NA
4. Are stub ends, for connections to future work not shown on the plans, finished by installing watertight plugs into the free end of the pipe?	☐	☐	☐
5. For precast boxes, fill lifting holes with mortar or concrete and cure or precast concrete mortar plugs may be used. Have the holes been filled accordingly prior to backfill?	☐	☐	☐

APPENDIX B

GUIDE SCHEDULE OF SAMPLING AND TESTING

GUIDE SCHEDULE OF SAMPLING & TESTING

MARCH 2015

Using the Guide Schedule

Research of sampling and testing rates listed for project tests in the following Guide Schedule show that the Department's and the Contractor's risk of either rejecting "good" material or accepting "bad" material range from 20% to 40%.

To reduce this risk, we recommend that the sampling rate be increased during initial production. A four-fold increase in testing frequency will generally reduce risk to approximately 5%. The intent of increasing testing at the start of production is to insure that the Contractor's processes are in control and to establish acceptability requirements early.

There is a need to increase the frequency of testing for high-variability materials and when testing results do not meet specifications. The Engineer may require the Contractor to reimburse the Department for costs resulting from failing test results, in accordance with the specifications.

Materials incorporated in TxDOT projects are subjected to various quality assurance procedures such as testing (as outlined in this document), certification, quality monitoring, approved lists, etc. The Engineer and testing staff should familiarize themselves with materials to be used before work begins by reviewing the specifications and this document. Discuss material testing requirements with the Contractor.

Other testing required by the specifications, but not shown in the Guide Schedule, should be performed at a frequency necessary to provide adequate confidence that materials meet specifications.

NOTE: For projects subject to FHWA construction oversight activities, use the "Letter of Certification of Materials Used" to document reasons for material acceptance when a test fails. For all other projects, document the justification and explanation for acceptance of materials that fail project tests in the project file.

Assuring the quality of the product and proper incorporation of materials into the project begins with proper sampling practices. Sampling, testing, and construction inspection must be performed collaboratively to assure the specific attributes of the finished product reflect quality workmanship. Sampling guidance for hot-mixed asphalt is contained in Tex-225-F, Random Selection of Bituminous Mixture Samples, and the respective specification for that material. All remaining materials are covered by method and materials specifications, to which the following applies.

For acceptance testing, especially that which directly determines payment for the Contractor, sampling personnel should provide randomness in sampling by avoiding patterned sampling routines. Examples of such sampling practices are as follows:

- Soils/flexible base: Vary sampling between stockpiling operations, completed stockpile, windrow, and project site. Vary the time of day sampling is performed.
- Aggregates: Sample aggregates nearest the point of incorporation into the work. Vary sampling between stockpiling operations, completed stockpile, belt sampling, and if deemed necessary, railroad cars/trucks. Vary the time of day sampling is performed.
- Concrete (structural and miscellaneous: Always sample as near as practicable to the point of placement. For strength testing, vary the time of day or the number of truck from which the concrete is sampled. Tests for slump, air, and temperature should be done often to ensure the consistent control of the concrete production (not applicable to miscellaneous concrete).

This Guide Schedule is applicable to all contracts associated with the 2014 Standard Specifications.

This is a guide for minimum sampling and testing.
Testing frequency may need to be increased for high material variability or when test results approach specification limits.

TABLE I – EMBANKMENTS, SUBGRADES, BACKFILL, AND BASE COURSES

			PROJECT TESTS		
MATERIAL OR PRODUCT	TEST FOR	TEST NUMBER	LOCATION OR TIME OF SAMPLING (D)	FREQUENCY OF SAMPLING (F)	REMARKS
EMBANKMENT (CUTS & FILLS)	Liquid Limit **(A)**	Tex-104-E	During stockpiling operations, from completed stockpile, or project site **(B)**	Materials with PI ≤ 15: 10,000 CY	For type A embankment or when required by the plans. This test may be waived for embankment cuts as directed by the Engineer. Determine a new liquid limit and plasticity index for each different material or notable change in material. Sample in accordance with Tex-100-E.
	Plasticity Index **(A)**	Tex-106-E		Materials with PI > 15: 5,000 CY	
	Gradation	Tex-110-E		Each 10,000 CY	When shown on plans. This test may be waived for embankment cuts, as directed by the Engineer. Sample in accordance with Tex-100-E.
	Moisture/Density	Tex-114-E		As directed by the Engineer	Not required for ordinary compaction. Determine a new optimum moisture and maximum density for each different material or notable change in material. Sample in accordance with Tex-100-E.
	In-place Density **(A)**	Tex-115-E	As designated by the Engineer	Fill: each 5,000 CY min. 1 per lift.	Not required for ordinary compaction. Determine a new optimum moisture and maximum density according to Tex-114-E for each different material or notable change in material. Correct the moisture contents measured by nuclear density gauge in Tex-115-E with the moisture contents determined in accordance with Tex-103-E, as necessary for control, for each different material or notable change in material and adjust the density accordingly. Materials such as RAP, gypsum, lime, cement, and iron ore tend to bias the counts for nuclear density gauges.
				Cut: each 6,000 LF	
RETAINING WALL (NON-SELECT BACKFILL)	As shown above for Embankment (Cuts and Fills)		As shown above for Embankment (Cuts and Fills)	As shown above for Embankment (Cuts and Fills)	Sample in accordance with Tex-100-E.
RETAINING WALL (SELECT BACKFILL)	Gradation	Tex-110-E	During stockpiling operations, from completed stockpile, or project site **(B)**	Each 5,000 CY	Sample in accordance with Tex-400-A.
	Resistivity **(A)**	Tex-129-E	During stockpiling operations, from completed stockpile, or project site **(B)**	Each 5,000 CY	For material with resistivity between 1,500 and 3,000 ohm-cm, determine chloride and sulfate content, as specified in Item 423. Sample in accordance with Tex-400-A.
	pH **(A)**	Tex-128-E	During stockpiling operations, from completed stockpile, or project site **(B)**	Each 5,000 CY	Sample in accordance with Tex-400-A.

This is a guide for minimum sampling and testing.
Testing frequency may need to be increased for high material variability or when test results approach specification limits.

TABLE I – EMBANKMENTS, SUBGRADES, BACKFILL, AND BASE COURSES

			PROJECT TESTS		
MATERIAL OR PRODUCT	TEST FOR	TEST NUMBER	LOCATION OR TIME OF SAMPLING (D)	FREQUENCY OF SAMPLING (F)	REMARKS
RETAINING WALL (SELECT BACKFILL) (continued)	Soundness	Tex-411-A	During stockpiling operations, or from completed stockpile	1 per source, per project	Test when backfill sources appear to contain particles such as shale, caliche, or other soft, poor-durability particles. Sample in accordance with Tex-400-A.
	In-place Density **(A)**	Tex-115-E	As designated by the Engineer.	1 per backfill lift, per wall	Not required for rock backfill. For walls greater than 500 ft. in length, perform one test per lift for every 500 ft. in length. **(F)** Correct the moisture contents measured by nuclear density gauge in Tex-115-E with the moisture contents determined in accordance with Tex-103-E for each different material or notable change in material and adjust the density accordingly.
UNTREATED BASE COURSES	Liquid Limit **(A)**	Tex-104-E	During stockpiling operations, from completed stockpile, or windrow **(B)**	Each 5,000 CY	Sample in accordance with Tex-400-A.
	Plasticity Index **(A)**	Tex-106-E	During stockpiling operations, from completed stockpile, or windrow **(B)**	Each 5,000 CY	
	Gradation **(A)**	Tex-110-E	During stockpiling operations, from completed stockpile, or windrow **(B)**	Each 5,000 CY	Sample in accordance with Tex-400-A.
	Moisture/Density	Tex-113-E	From completed stockpile at the source **(E)**	Each 20,000 CY	Not required for ordinary compaction. Sample in accordance with Tex-400-A.
	Wet Ball Mill **(A)**	Tex-116-E	From completed stockpile at the source **(E)**	Each 20,000 CY	As required by the plans. Sample in accordance with Tex-400-A.
	Strength **(A)**	Tex-117-E	From completed stockpile at the source **(E)**	Each 20,000 CY	As required by the plans. When base material is from a source where the District has a record of satisfactory triaxial results, the frequency of testing may be reduced to one per 30,000 CY. If any one test falls below the minimum value required, the frequency of testing will return to the original frequency of 20,000 CY. Sample in accordance with Tex-400-A.

This is a guide for minimum sampling and testing.
Testing frequency may need to be increased for high material variability or when test results approach specification limits.

TABLE I – EMBANKMENTS, SUBGRADES, BACKFILL, AND BASE COURSES

				PROJECT TESTS		
MATERIAL OR PRODUCT		**TEST FOR**	**TEST NUMBER**	**LOCATION OR TIME OF SAMPLING (D)**	**FREQUENCY OF SAMPLING (F)**	**REMARKS**
UNTREATED BASE COURSES		In-place Density **(A)**	Tex-115-E	As designated by the Engineer	Each 3,000 CY, min. 1 per lift	Correct the moisture contents measured by nuclear density gauge in Tex-115-E with the moisture contents determined in accordance with Tex-103-E, as necessary for control, for each different material or notable change in material and adjust the density accordingly. Materials such as RAP, gypsum, lime, cement, and iron ore tend to bias the counts for nuclear density gauges.
		Thickness **(A)**	Tex-140-E	As designated by the Engineer	Each 3,000 CY	Not required where survey grade control documents compliance.
TREATED SUBGRADE AND BASE COURSES	SUBGRADE BEFORE TREATMENT	Organic Content	Tex-148-E	As designated by the Engineer	1 per 500 linear feet or 5,000 CY	Required for existing subgrade material and material imported from a borrow source. Soil survey and geologic maps may be used to determine sampling locations. Sample in accordance with Tex-100-E.
		Sulfate Content	Tex-145-E	As designated by the Engineer	1 per 500 linear feet or 5,000 CY	Required for existing subgrade material and material imported from a borrow source. Soil survey and geologic maps may be used to determine sampling locations. Sample in accordance with Tex-100-E.
	NEW BASE MATERIAL	Liquid Limit **(A)**	Tex-104-E	During stockpiling operations, from completed stockpile, or windrow **(B)**	Each 5,000 CY	When central mix site or plant is used, windrow sampling may be waived. Sample in accordance with Tex-400-A.
		Plasticity Index **(A)**	Tex-106-E	During stockpiling operations, from completed stockpile, or windrow **(B)**	Each 5,000 CY	
		Gradation **(A)**	Tex-110-E	During stockpiling operations, from completed stockpile, or windrow **(B)**	Each 5,000 CY	Sample in accordance with Tex-400-A.
		Wet Ball Mill **(A)**	Tex-116-E	From completed stockpile at the source **(E)**	Each 20,000 CY	As required by the plans. Sample in accordance with Tex-400-A.

This is a guide for minimum sampling and testing.
Testing frequency may need to be increased for high material variability or when test results approach specification limits.

TABLE I – EMBANKMENTS, SUBGRADES, BACKFILL, AND BASE COURSES

				PROJECT TESTS		
MATERIAL OR PRODUCT		TEST FOR	TEST NUMBER	LOCATION OR TIME OF SAMPLING (D)	FREQUENCY OF SAMPLING (F)	REMARKS
TREATED SUBGRADE AND BASE COURSES	NEW BASE MATERIAL	Strength **(A)**	Tex-117-E	From completed stockpile at the source **(E)**	Each 20,000 CY	As required by the plans. When base material is from a source where the District has a record of satisfactory triaxial results, the frequency of testing may be reduced to one per 30,000 CY. If any one test falls below the minimum value required, the frequency of testing will return to the original frequency of 20,000 CY.
	LIME	Compliance with DMS-6350	Tex-600-J	During delivery to project	Commercial Lime Slurry: each 200 tons of lime Carbide Lime Slurry: each 100 tons of lime	Sample in accordance with Tex-400-A.Verify the source is listed in the current Material Producer List for Lime. Only materials listed in the Material Producer List will be accepted. Sample frequency for Carbide Lime Slurry may be increased as directed by the Engineer. For Hydrated Lime and Quick Lime project testing is not required but it is encouraged to sample and test the material at a rate of 1 per project as a best practice.
	CEMENT	Compliance with DMS-4600		Railroad car, truck, or cement bins		Verify the source is listed in the current Material Producer List for Cement. If not, sample and test in accordance with DMS-4600. **(C)**
	FLY ASH MATERIAL	Compliance with DMS-4615		Project samples at location designated by the Engineer		Verify the source is listed in the current Material Producer List for Fly Ash. Only materials from CSTM&P approved sources listed in the Material Producer List for Fly Ash will be accepted. Project testing is not required but it is encouraged to sample and test the material at a rate of 1 per project as a best practice. **(C)**
	COMPLETE MIXTURE	Pulverization Gradation	Tex-101-E Part III	Roadway, after pulverization and mixing	As necessary for control	At the beginning of the project, one test must be made for each 4,500 CY or 6,000 tons until the Engineer is satisfied that acceptable pulverization results are being obtained. Sample in accordance with Tex-100-E.
		Soil-Cement Testing Soil-Lime Testing	Tex-120-E (Part II), or Tex-121-E (Part II)	From roadway windrow after treatment **(E)**	Each 20,000 CY	Not required for ordinary compaction. Determine a new moisture/density curve for each different or notable change in material. Perform a Tex-120-E Part II for Cement Treated Material and Tex-121-E Part II for Lime, Lime-Fly Ash or Fly Ash Treated Material. If Tex-120-E Part I, Tex-121-E Part I or Tex-127-E is performed prior to the project, this test may be waived. Sample in accordance with Tex-100-E.

This is a guide for minimum sampling and testing.
Testing frequency may need to be increased for high material variability or when test results approach specification limits.

TABLE I – EMBANKMENTS, SUBGRADES, BACKFILL, AND BASE COURSES

				PROJECT TESTS		
MATERIAL OR PRODUCT		TEST FOR	TEST NUMBER	LOCATION OR TIME OF SAMPLING (D)	FREQUENCY OF SAMPLING (F)	REMARKS
TREATED SUBGRADE AND BASE COURSES	COMPLETE MIXTURE	Soil-Cement Testing Soil-Lime Testing	Tex-120-E (Part I) Tex-121-E (Part I) or Tex-127-E	From roadway windrow after treatment	As necessary for control	Perform Tex-120-E Part I on cement treated material, Tex-121-E Part I for lime-fly ash or fly ash treated material. Verifies the field strength by comparing results from the mix design. Performed at the discretion of Engineer. Sample in accordance with Tex-100-E.
		In-place Density **(A)**	Tex-115-E	As designated by the Engineer	Each 3,000 CY, min 1 per lift	Determine the appropriate moisture/density curve for each different material or notable change in material. Correct the moisture contents measured by nuclear density gauge in Tex-115-E with the moisture contents determined in accordance with Tex-103-E, as necessary for control, for each different material or notable change in material and adjust the density accordingly. Stabilizers and materials such as RAP, gypsum and iron ore tend to bias the counts for nuclear density gauges.
		Thickness **(A)**	Tex-140-E	As designated by the Engineer	Each 3,000 CY	Not required where survey grade control documents are used for compliance
RECLAIMED ASPHALT PAVEMENT (RAP), CRUSHED CONCRETE, and RECYCLED MATERIALS		Sulfate Content	Tex-145-E	During stockpiling operations, from completed stockpile, or windrow	Each 5,000 CY	Required only for contractor furnished recycled material, including crushed concrete. Not required for RAP. Sample in accordance with Tex-400-A.
		Deleterious Material	Tex-413-A		Each 5,000 CY	Required only for contractor furnished recycled material, including crushed concrete. Sample in accordance with Tex-400-A.
		Decantation	Tex-406-A	During stockpiling operations, from completed stockpile, or windrow	Each 5,000 CY	Required only for contractor furnished RAP. Sample in accordance with Tex-400-A.

This is a guide for minimum sampling and testing.

Testing frequency may need to be increased for high material variability or when test results approach specification limits.

TABLE I – FOOTNOTES	
A	When this project acceptance test fails but the product is accepted, document the reasons for acceptance on the Letter of Certification of Materials Used or in the SiteManager Remarks field.
B	Engineer will select any of these locations or any combinations thereof with the provision that the initial sample will be obtained from the completed stockpile at the source and at least one out of ten consecutive samples will be taken at the project site (from the windrow for treated and untreated bases and embankments when possible).
C	Attach the corresponding QM test report for SiteManager projects to satisfy project sampling and testing requirements.
D	For acceptance testing, especially that which directly determines payment for the Contractor, sampling personnel should provide randomness in sampling by avoiding patterned sampling routines. Examples of such sampling practices are as follows: • Soils/Flexible Base: For gradation, liquid limit, and plastic limit, vary sampling between stockpiling operations, completed stockpile, windrow, and project site. Vary the time of day sampling is performed. • Aggregates: Sample aggregates nearest the point of incorporation into the work. Vary sampling between stockpiling operations, completed stockpile, belt sampling, and if deemed necessary, railroad cars/trucks. Vary the time of day sampling is performed.
E	The Engineer will sample from the completed stockpile at the source and test prior to placement.
F	Each test performed that is based on a quantity of material is considered “or fraction thereof” for calculating number of tests.

This is a guide for minimum sampling and testing.
Testing frequency may need to be increased for high material variability or when test results approach specification limits.

TABLE IA – ASPHALT STABILIZED BASE (Plant Mix)

			PROJECT TESTS		
MATERIAL OR PRODUCT	TEST FOR	TEST NUMBER	LOCATION OR TIME OF SAMPLING (C)	FREQUENCY OF SAMPLING (D)	REMARKS
AGGREGATE	Gradation **(A)**	Tex-200-F Part I	During stockpiling operations, from completed stockpile, or prior to mixing	Each 5,000 CY	Sample in accordance with Tex-400-A.
	Liquid Limit **(A)**	Tex-104-E	During stockpiling operations, from completed stockpile, or prior to mixing	Each 5,000 CY	Sample in accordance with Tex-400-A.
	Plasticity Index **(A)**	Tex-106-E	During stockpiling operations, from completed stockpile, or prior to mixing	Each 5,000 CY	
	Wet Ball Mill or L. A. Abrasion **(A)**	Tex-116-E or Tex-410-A	During stockpiling operations, from completed stockpile, or prior to mixing	Each 20,000 CY	When L. A. Abrasion is specified, tests are not required when the published value of the source, as listed in the current Material Producer list for BRSQC, meets the project specifications. Sample in accordance with Tex-400-A. **(B)**
	Coarse Aggregate Angularity **(A)**	Tex-460-A Part I	During stockpiling operations, from completed stockpile, or prior to mixing	1 per project, per source	Not required for crushed stone sources. Sample in accordance with Tex-400-A.
	Sand Equivalent	Tex-203-F	Hot aggregate bins, feeder belt, or stockpile	1 per project, per source	When designated by the Engineer, test may be run on combined aggregates when multiple sources are used. Sample in accordance with Tex-400-A.
LIME	Compliance with DMS-6350		During delivery to the project	Hydrated Lime: 1 Per Project. Commercial Lime Slurry: each 200 tons of lime **(D)** Carbide Lime Slurry: each 100 tons of lime **(D)** Quick Lime: 1 Per Project	On projects requiring less than 50 tons, material from CSTM&P approved sources may be accepted on the basis of Producer's Certification without sampling.
RECLAIMED ASPHALT PAVEMENT (RAP), and RECYCLED AGGREGATE	Decantation	Tex-217-F Part II	During stockpiling operations, from completed stockpile, or prior to mixing	Each 10,000 CY	Sample in accordance with Tex-400-A.

This is a guide for minimum sampling and testing.
Testing frequency may need to be increased for high material variability or when test results approach specification limits.

TABLE IA – ASPHALT STABILIZED BASE (Plant Mix)

			PROJECT TESTS		
MATERIAL OR PRODUCT	TEST FOR	TEST NUMBER	LOCATION OR TIME OF SAMPLING (C)	FREQUENCY OF SAMPLING (D)	REMARKS
RECYCLED ASPHALT SHINGLES (RAS)	Decantation	Tex-217-F Part III	During stockpiling operations, from completed stockpile, or prior to mixing	Each 10,000 CY	Sample in accordance with Tex-400-A.
ASPHALT BINDER	Compliance with Item 300 – Binder and Tack Coat		Sampled, tested and preapproved by CSTM&P. Take project samples when designated by the Engineer.	1 each for binder and tack coat per project, per grade, per source	Test at least one sample taken from the project. Sample tack coat at the distributor on the roadway in accordance with Tex-500-C, Part III. Sample binder at hot mix plant in accordance with Tex-500-C, Part II. Binder should arrive on the project pre-approved. If not pre-approved, sample binder before use.
COMPLETE MIXTURE	Laboratory Density **(A)**	Tex-126-E	Plant Mix **(C)**	20,000 CY (25,000 tons)	Sample in accordance with Tex-222-F.
	Percent Asphalt **(A)**	Tex-236-F	Plant Mix **(C)**	Each 1,500 CY (2,000 tons) or days production	Determine asphalt content correlation factors for ignition oven at a minimum of one per project. Sample in accordance with Tex-222-F.
	Indirect Tensile Strength – Dry	Tex-226-F	Plant Mix	1 per project, per design	Sample in accordance with Tex-222-F.
	Moisture Susceptibility	Tex-530-C	As designated by the Engineer	1 per project, per design	This test may be waived, when shown on the plans. Sample in accordance with Tex-222-F.
ROADWAY	In-Place Air Voids **(A)**	Tex-207-F	Roadway cores, as designated by the Engineer **(C, D)**	Each 2,500 CY (3,000 tons) or days production	Not required for ordinary compaction or when air void requirements are waived. Sample in accordance with Tex-222-F.

TABLE IA – FOOTNOTES

A	When this project acceptance test fails but the product is accepted, document the reasons for acceptance on the Letter of Certification of Materials Used or in the SiteManager Remarks field.
B	Engineer will select any of these locations or any combinations thereof with the provision that at least one out of ten consecutive samples will be taken at the project site (from the windrow for treated and untreated bases and embankments when possible).
C	For acceptance testing, especially that which directly determines payment for the Contractor, sampling personnel should provide randomness in sampling by avoiding patterned sampling routines. Examples of such sampling practices are as follows: • Soils/flexible base: Vary sampling between stockpiling operations, completed stockpile, windrow, and project site. Vary the time of day sampling is performed. • Aggregates: Sample aggregates nearest the point of incorporation into the work. Vary sampling between stockpiling operations, completed stockpile, belt sampling, and if deemed necessary, railroad cars/trucks. Vary the time of day sampling is performed.
D	Each test performed that is based on a quantity of material is considered “or fraction thereof” for calculating number of tests.

This is a guide for minimum sampling and testing.
Testing frequency may need to be increased for high material variability or when test results approach specification limits.

TABLE II – SEAL COAT					
			PROJECT TESTS		
MATERIAL OR PRODUCT	TEST FOR	TEST NUMBER	LOCATION OR TIME OF SAMPLING (C)	FREQUENCY OF SAMPLING (D)	REMARKS
AGGREGATE	Gradation (A)	Tex-200-F, Part I	Stockpile (At source or at point of delivery)	One each 1,000 CY	Rate may be reduced to one each 2,000 CY if the Engineer approves a contractor quality control plan. Sample in accordance with Tex-221-F.
	L. A. Abrasion (A)	Tex-410-A	Stockpile	1 per 20,000 CY	Verify the published value of the source, as listed in the current Material Producer list for BRSQC, meets the project specifications. If not, sample and test at 1 per 20,000 CY prior to use. Sample in accordance with Tex-221-F. (B)
	Magnesium Soundness (A)	Tex-411-A	Stockpile	1 per 20,000 CY	Verify the published value of the source, as listed in the current Material Producer list for BRSQC, meets the project specifications. If not, sample and test at 1 per 20,000 CY prior to use. Sample in accordance with Tex-221-F. (B)
	Surface Aggregate Classification (A)	Tex-612-J Tex-411-A	Stockpile	1 per 20,000 CY	Verify the published value of the source, as listed in the current Material Producer list for BRSQC, meets the project specifications. If not, sample and test at 1 per 20,000 CY prior to use. Sample in accordance with Tex-221-F. (B)
	Pressure Slake (A)	Tex-431-A	Stockpile	1 per 20,000 CY	Same as above. Required only for lightweight aggregate. Sample in accordance with Tex-221-F.
	Freeze Thaw (A)	Tex-432-A	Stockpile	1 per 20,000 CY	Same as above. Required only for lightweight aggregate. Sample in accordance with Tex-221-F.
	Unit Weight	Tex-404-A	Stockpile	1 per 20,000 CY	Same as above. Required only for lightweight aggregate. Sample in accordance with Tex-221-F.
	24 hr Water Absorption (A)	Tex-433-A	Stockpile	1 per 20,000 CY	Same as above. Required only for lightweight aggregate. Sample in accordance with Tex-221-F.
	Coarse Aggregate Angularity	Tex-460-A	Stockpile	1 per 20,000 CY	Only required for crushed gravel. Sample in accordance with Tex-221-F.
	Deleterious Material (A)	Tex-217-F Part I	Stockpile	1 per 10,000 CY	Not required for lightweight aggregate. Sample in accordance with Tex-221-F.
	Decantation (A)	Tex-406-A	Stockpile	1 per 10,000 CY	Sample in accordance with Tex-221-F.
	Flakiness Index	Tex-224-F	Stockpile	Frequency as directed by the Engineer	Sample in accordance with Tex-221-F.

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Testing frequency may need to be increased for high material variability or when test results approach specification limits.

TABLE II – SEAL COAT

			PROJECT TESTS		
MATERIAL OR PRODUCT	TEST FOR	TEST NUMBER	LOCATION OR TIME OF SAMPLING (C)	FREQUENCY OF SAMPLING (D)	REMARKS
	Micro Deval	Tex-461-A	Stockpile	1 per project or as necessary for control	Compare result to published value listed in the current Material Producer List for BRSQC. Submit sample to CSTM&P for Soundness and LA Abrasion testing when results differ by more than 3% points, unless otherwise directed by the Engineer. Sample in accordance with Tex-221-F.
	White Rock Count	Tex-220-F	Stockpile		Required only for Limestone Rock Asphalt. Not required when CSTM&P provides inspection at the plant. Sample in accordance with Tex-221-F.
	Naturally Impregnated Bitumen Content	Tex-236-F	Stockpile		Required only for Limestone Rock Asphalt. Not required when CSTM&P provides inspection at the plant. Sample in accordance with Tex-221-F.
PRECOATED AGGREGATE	Asphalt Content	Tex-236-F	Stockpile	Frequency as directed by the Engineer when a target value is specified	Sample in accordance with Tex-221-F.
ASPHALT	Compliance with Item 300		Sampled, tested and preapproved by CSTM&P. Take project samples when designated by the Engineer from the distributor or transport.	1 per project, per grade, per source	Sample in accordance with Tex-500-C. Binder should arrive on the project pre-approved. If not pre-approved, sample binder before use.

TABLE II – FOOTNOTES

A	When this project acceptance test fails but the product is accepted, document the reasons for acceptance on the Letter of Certification of Materials Used or in the SiteManager Remarks field.
B	Attach the corresponding QM test report for SiteManager projects to satisfy project sampling and testing requirements.
C	For acceptance testing, especially that which directly determines payment for the Contractor, sampling personnel should provide randomness in sampling by avoiding patterned sampling routines. Examples of such sampling practices are as follows: • Aggregates: Sample aggregates nearest the point of incorporation into the work. Vary sampling between stockpiling operations, completed stockpile, belt sampling, and if deemed necessary, railroad cars/trucks. Vary the time of day sampling is performed.
D	Each test performed that is based on a quantity of material is considered “or fraction thereof” for calculating number of tests.

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Testing frequency may need to be increased for high material variability or when test results approach specification limits.

TABLE III – HYDRAULIC CEMENT CONCRETE – STRUCTURAL (Classes: C, F, H, S, CO, K, LMC, or SS)						
				PROJECT TESTS		
MATERIAL OR PRODUCT		TEST FOR	TEST NUMBER	LOCATION OR TIME OF SAMPLING (D)	FREQUENCY OF SAMPLING (E)	REMARKS
MINERAL AGGREGATE	COARSE AGGREGATE	Decantation **(B)**	Tex-406-A	From stockpile at concrete plant	Each 20,000 CY of concrete (each source)	Sample in accordance with Tex-400-A.
		Sieve Analysis **(A) (B)**	Tex-401-A		Each 1,000 CY of concrete (each source)	Sample in accordance with Tex-400-A. Test combined aggregate when used.
		Deleterious Materials **(B)**	Tex-413-A		1 per project or as necessary for control	Sample in accordance with Tex-400-A.
		Los Angeles Abrasion **(A) (B)**	Tex-410-A		Two, each source	Verify the value of the source, as listed in the current Material Producer list for CRSQC, meets the project specifications. If not, sample and submit to CSTM&P for testing prior to use in accordance with Tex-499-A. Sample in accordance with Tex-400-A. **(C)**
		5-cycle Magnesium Sulfate Soundness **(A) (B)**	Tex-411-A		Two, each source	Verify the value of the source, as listed in the current CRSQC, meets the project specifications. **(C)**
	FINE AGGREGATE	Sand Equivalent **(B)**	Tex-203-F	From stockpile at concrete plant	1 per project or as necessary for control	Sample in accordance with Tex-400-A. Test combined aggregate when used.
		Organic Impurities **(B)**	Tex-408-A		1 per project, per source	Sample in accordance with Tex-400-A.
		Sieve Analysis **(A) (B)**	Tex-401-A		Each 1,000 CY of concrete (each source)	Sample in accordance with Tex-400-A.
		Fineness Modulus **(B)**	Tex-402-A		1 per project or as necessary for control	Sample in accordance with Tex-400-A. Test combined aggregate when used. Test to confirm material variability when strength values are in question.
		Deleterious Material **(B)**	Tex-413-A		1 per project or as necessary for control	Sample in accordance with Tex-400-A. Test to confirm material variability when strength values are in question.
		Acid Insoluble Residue **(A) (B)**	Tex-612-J		Two, each source	Only for concrete subject to direct traffic. Verify the value of the source, as listed in the current CRSQC, meets the project specifications. If not, sample and submit to CSTM&P for testing prior to use in accordance with Tex-499-A. Sample in accordance with Tex-400-A. **(C)**
SILICA FUME		Compliance with DMS-4630 **(A)**		Railroad car, truck, bags or silos	1 per project, per class of concrete (For each type and brand)	Sample in accordance with Tex-320-D.

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TABLE III – HYDRAULIC CEMENT CONCRETE – STRUCTURAL (Classes: C, F, H, S, CO, K, LMC, or SS)					
			PROJECT TESTS		
MATERIAL OR PRODUCT	TEST FOR	TEST NUMBER	LOCATION OR TIME OF SAMPLING (D)	FREQUENCY OF SAMPLING (E)	REMARKS
METAKAOLIN	Compliance with DMS-4635 (A)		Railroad car, truck or silos	1 per project, per class of concrete (For each type and brand)	
MIX DESIGN	Compliance with Standard Specification Item 421.4.A		At source (if not approved)	Min. 1 design per class, per source	Verify if cement, fly ash, slag cement, and chemical admixture sources are listed in the Material Producer Lists. If not, sample and submit to CSTM&P for testing. Water testing is contracted by the concrete supplier (commercial lab report to be reviewed by TxDOT). Sample in accordance with Tex-300-D for cement and in accordance with Tex-733-I for fly ash.
JOINT MATERIAL	Compliance with DMS-6300				Sample in accordance with Tex-500-C. Verify the source is listed in the Material Producer List for Joint Sealers. If not, sample and test prior to use in accordance with DMS-6310. (C)
CURING COMPOUND	Compliance with DMS-4650		Sampled at jobsite; tested by CSTM&P. See remarks.	When requested by CST	Only products listed in the Material Producer List for Concrete Curing Compounds will be allowed. When sample is requested by CST, sample in accordance with Tex-718-I. Ensure container has been agitated and mixed prior to sampling. (C)
EVAPORATION RETARDANTS	Compliance with DMS-4650				Only products listed in the Material Producer list for Evaporation Retardants will be allowed. (C)
REINFORCING STEEL	Compliance with the Std. Specifications & Spec. Provisions	As Specified			Only materials from CSTM&P approved sources listed in the Material Producer List for Reinforcing Steel Mills and Seven Wire Steel Strand will be allowed. (C)
MECHANICAL COUPLERS	Compliance with DMS-4510	Tex-743-I	Sampled at jobsite; Tested by CSTM&P	3 couplers per lot (500 couplers) for each type, model, bar size and grade	Only materials from CSTM&P approved sources listed in the Material Producer List for Mechanical Couplers will be allowed. (C)
LATEX	Compliance with DMS-4640 for concrete chemical admixtures		Sampled at jobsite.	Min. of 1 test per project	Sample in accordance with Tex-321-E.
EPOXY	Compliance with DMS-6100, unless otherwise specified		Sampled at jobsite if not pre-approved by CSTM&P.	1 per batch or shipment	Verify the source is listed in the Material Producer List for Epoxies and Adhesives. If not, sample and test prior to use in accordance with DMS-6100. Sample in accordance with Tex-734-I. (C)

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TABLE III – HYDRAULIC CEMENT CONCRETE – STRUCTURAL (Classes: C, F, H, S, CO, K, LMC, or SS)					
			PROJECT TESTS		
MATERIAL OR PRODUCT	TEST FOR	TEST NUMBER	LOCATION OR TIME OF SAMPLING (D)	FREQUENCY OF SAMPLING (E)	REMARKS
CONCRETE	Compressive Strength (A)	Tex-418-A	At point of concrete placement	4 cylinders for each 60 CY per class, per day (For bridge railing and traffic railing, testing may be reduced to 4 cylinders per 180 CY per class regardless of days)	Sampling must be in accordance with Tex-407-A. Two cylinders shall be tested at 7 days and if the average value is below the design strength as defined in Item 421 Table 8, the remaining 2 cylinders shall be tested at 28 days. If the average value of the 2 cylinders tested at 7 days meets the minimum design strength listed in Item 421 Table 8, the two remaining cylinders are not required to be tested.
CONCRETE	Slump	Tex-415-A		See Remarks	When the contract requires the project testing to be by the Engineer, the frequency and job control testing will be in accordance with the item of work. • Sample in accordance with Tex-407-A. • Perform slump and temperature tests on the same load from which strength test specimens are made. • Perform entrained air test only when entrained air concrete is specified in the plans. Check temperature of every load for bridge slabs and mass concrete placements. Contractor's required testing will be in accordance with specification requirements for the appropriate specification Item #.
	Entrained Air (A)	Tex-416-A or Tex-414-A		1 test for every 10 contractor job control tests	
	Temperature of Concrete (A)	Tex-422-A			
	Slab Thickness and Depth of Reinforcement	Tex-423-A Part II	During dry run and during concrete placement (Bridge decks and direct traffic culverts)	1 per span	Min. 6 – Max. 18 locations per span.

TABLE III – FOOTNOTES	
A	When this project acceptance test fails but the product is accepted, document the reasons for acceptance on the Letter of Certification of Materials Used or in the SiteManager Remarks field.
B	These Project Tests may be used for one or more projects being furnished concrete from the same plant during the same period.
C	Attach the corresponding QM test report for SiteManager projects to satisfy project sampling and testing requirements.
D	For acceptance testing, especially that which directly determines payment for the Contractor, sampling personnel should provide randomness in sampling by avoiding patterned sampling routines. Examples of such sampling practices are as follows: • Aggregates: Sample aggregates nearest the point of incorporation into the work. Vary sampling between stockpiling operations, completed stockpile, and if deemed necessary, railroad cars/trucks. Vary the time of day sampling is performed. • Concrete (structural): Always sample as near as practicable to the point of placement. For strength testing, vary the time of day or the number of truck from which the concrete is sampled. Tests for slump, air, and temperature should be done often to ensure the consistent control of the concrete production.
E	Each test performed that is based on a quantity of material is considered "or fraction thereof" for calculating number of tests.

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TABLE IV – HYDRAULIC CEMENT CONCRETE – NON-STRUCTURAL CONCRETE (Classes: A, B, or E)					
			PROJECT TESTS		
MATERIAL OR PRODUCT	TEST FOR	TEST NUMBER	LOCATION OR TIME OF SAMPLING (B)	FREQUENCY OF SAMPLING (C)	REMARKS
CONCRETE	Compressive Strength (A)	Tex-418-A	At point of concrete placement	2 cylinders per 180 CY, per class	Sampling must be in accordance with Tex-407-A. Strength will be determined by 7-day specimens.
MIX DESIGN	Compliance with the Standard Specification		At source if not approved.	Min. 1 design per class, per source	Verify if cement, fly ash, slag cement, and chemical admixture sources are listed in the Material Producer Lists. If not, sample and submit to CSTM&P for testing. Sample in accordance with Tex-300-D for cement and in accordance with Tex-733-I for fly ash. Water testing is contracted by the concrete supplier (commercial lab report to be reviewed by TxDOT).
SILICA FUME	Compliance with DMS-4630		Railroad car, truck, bags or silos	1 test per project, per class (for each type and brand)	Sample in accordance with Tex-320-D.
METAKAOLIN	Compliance with DMS-4635		Railroad car, truck or silos	1 test per project, per class (for each type and brand)	

TABLE IV – FOOTNOTES	
A	When this project acceptance test fails but the product is accepted, document the reasons for acceptance on the Letter of Certification of Materials Used or in the SiteManager Remarks field.
B	For acceptance testing, especially that which directly determines payment for the Contractor, sampling personnel should provide randomness in sampling by avoiding patterned sampling routines. Examples of such sampling practices are as follows: • Concrete (miscellaneous): Always sample as near as practicable to the point of placement. For strength testing, vary the time of day or the number of truck from which the concrete is sampled.
C	Each test performed that is based on a quantity of material is considered “or fraction thereof” for calculating number of tests.

This is a guide for minimum sampling and testing.
Testing frequency may need to be increased for high material variability or when test results approach specification limits.

TABLE V – HYDRAULIC CEMENT CONCRETE PAVEMENT (Classes: P, or HES)						
				PROJECT TESTS		
MATERIAL OR PRODUCT		TEST FOR	TEST NUMBER	LOCATION OR TIME OF SAMPLING	FREQUENCY OF SAMPLING (D)	REMARKS
MINERAL AGGREGATE	COARSE AGGREGATE	Decantation	Tex-406-A	From stockpile at concrete plant	Each 20,000 CY of concrete (each source)	Sample in accordance with Tex-400-A.
		Sieve Analysis **(A)**	Tex-401-A		As necessary for control	Sample in accordance with Tex-400-A. Test combined aggregate when used.
		Deleterious Materials	Tex-413-A		Each 20,000 CY of concrete (each source)	Sample in accordance with Tex-400-A.
		L.A Abrasion **(A)**	Tex-410-A		Two, each source	Verify the value of the source, as listed in the current CRSQC, meets the project specifications. If not, sample and submit to CSTM&P for testing prior to use in accordance with Tex-499-A. Sample in accordance with Tex-400-A. **(C)**
		5-Cycle Magnesium Sulfate Soundness **(A)**	Tex-411-A			
	FINE AGGREGATE	Sand Equivalent	Tex-203-F	From stockpile at concrete plant	Each 3,000 CY of concrete (Each source or combination of sources)	Sample in accordance with Tex-400-A. Test combined aggregate when used. No less than one per week's production
		Organic Impurities	Tex-408-A		1 per project, per source	Sample in accordance with Tex-400-A.
		Sieve Analysis **(A)**	Tex-401-A		As necessary for control	Sample in accordance with Tex-400-A. Test combined aggregate when used.
		Fineness Modulus **(B)**	Tex-402-A			
		Deleterious Material **(B)**	Tex-413-A		Each 20,000 CY of concrete (each source)	Sample in accordance with Tex-400-A.
		Acid Insoluble **(A)**	Tex-612-J		1 per project, per source	Verify the value of the source, as listed in the current CRSQC, meets the project specifications. If not, sample and submit to CSTM&P for testing prior to use in accordance with Tex-499-A. Sample in accordance with Tex-400-A. **(C)**
MIX DESIGN		Compliance with the Standard Specifications Item 421.4.A		At source, if not approved	Min. 1 design, per class, per source	Verify if cement, fly ash, ground granulated blast furnace slag, and admixture sources are listed in the Material Producer List. If not, sample and submit to CSTM&P for testing. Sample in accordance with Tex-300-D for cement and in accordance with Tex-733-I for fly ash. Water testing is contracted by the concrete supplier (commercial lab report to be reviewed by TxDOT).

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TABLE V – HYDRAULIC CEMENT CONCRETE PAVEMENT (Classes: P, or HES)					
			PROJECT TESTS		
MATERIAL OR PRODUCT	TEST FOR	TEST NUMBER	LOCATION OR TIME OF SAMPLING	FREQUENCY OF SAMPLING (D)	REMARKS
SILICA FUME	Compliance with DMS-4630		Railroad car, truck, bags or silos	1 per project per class of concrete (For each type and brand)	Sample in accordance with Tex-320-D.
METAKAOLIN	Compliance with DMS-4635		Railroad car, truck or silos	1 per project per class of concrete (For each type and brand)	Sample in accordance with Tex-320-D.
JOINT MATERIAL	Compliance with DMS-6310		Sampled at jobsite if not sampled at source by CSTM&P; tested by CSTM&P. See remarks.	1 per batch or shipment	Sample in accordance with Tex-500-C. Sampling may be waived when the source is listed in the Material Producer List for Joint Sealers. **(C)**
CURING COMPOUND	Compliance with DMS-4650		Sampled at jobsite; tested by CSTM&P. See remarks.	When requested by CST	Only products listed in the Material Producer List for Concrete Curing Compounds will be allowed. When sample is requested by CST, sample in accordance with Tex-718-I. Ensure container has been agitated and mixed prior to sampling. **(C)**
EVAPORATION RETARDANTS	Compliance with DMS-4650				Only products listed in the Material Producer List for Evaporation Retardants will be allowed. **(C)**
REINFORCING STEEL	Compliance with the Std. Specifications & Spec. Provisions	As Specified			Only materials from CSTM&P approved sources listed in the Material Producer List for Reinforcing Steel Mills and Seven Wire Steel Strand will be accepted. **(C)**
MULTIPLE PIECE TIE BARS	Compliance with DMS-4515	Tex-712-I	Sampled at jobsite if not sampled at source by CSTM&P; tested by CSTM&P. See remarks.	Refer to Tex-711-I for sampling rates	Only materials from CSTM&P approved sources listed in the Material Producer List for Multiple Piece Tie-bars for Concrete Pavements will be allowed. Sample in accordance with Tex-734-I.
EPOXY	Compliance with DMS-6100		Sampled at jobsite if not pre-approved by CSTM&P. See remarks.	1 batch per shipment	Verify the source is listed in the Material Producer List for Epoxies and Adhesives. If not, sample and test prior to use in accordance with DMS-6100. Sample in accordance with Tex-734-I. **(C)**

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TABLE V – HYDRAULIC CEMENT CONCRETE PAVEMENT (Classes: P, or HES)					
			PROJECT TESTS		
MATERIAL OR PRODUCT	TEST FOR	TEST NUMBER	LOCATION OR TIME OF SAMPLING	FREQUENCY OF SAMPLING (D)	REMARKS
CONCRETE	Strength **(A) (B)**	Tex-448-A or Tex-418-A	At point of concrete placement	2 cylinders for every 10 contractor job control tests	Sampling shall be in accordance with Tex-407-A. When the contract requires the project testing to be by the Engineer, the frequency and job control testing will be in accordance with the item of work. Split sample verification testing used when contractor performs job control testing. When job control testing by the contractor is waived by the plans, the frequency of sampling shall be one test (2 specimens) for each 3,000 SY of concrete or fraction thereof or per day and split sample verification testing shall be waived. Contractor's required testing will be in accordance with specification requirements for the appropriate specification Item #.
	Slump	Tex-415-A	At time and location strength specimens are made	See Remarks	Slump is not required for slip-formed pavement. When the contract requires the project testing to be by the Engineer, the frequency and job control testing will be in accordance with the item of work. • Sample in accordance with Tex-407-A. • Perform slump and temperature tests on the same load from which the strength specimens are made. • Perform entrained air test only when entrained air concrete is specified in the plans. Contractor's required testing will be in accordance with specification requirements for the appropriate specification Item #.
	Entrained Air **(A)**	Tex-416-A or Tex-414-A		1 test for every 10 contractor job control tests.	
	Temperature	Tex-422-A			
	Thickness	Tex-423-A	Center of paving machine	Every 500 feet	Methods other than Tex-423-A may be shown on the plans.
	Ride Quality Surface Test Type B. **(A)**	Tex-1001-S	Final riding surface of travel lanes		Engineer may verify contractor's results for surface test Type B. For traditional design-bid-build TxDOT projects, CST has contracted with TTI to perform random ride verification at 10% frequency. Results from surface test Type A are not required to be reported.

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TABLE V – FOOTNOTES	
A	When this project acceptance test fails but the product is accepted, document the reasons for acceptance on the Letter of Certification of Materials Used or in the SiteManager Remarks field.
B	When a project test does not meet the specified strength requirements and a reduced pay factor is assigned, the analysis shall be documented on the Letter of Certification of Materials Used.
C	Attach the corresponding QM test report for SiteManager projects to satisfy project sampling and testing requirements.
D	Each test performed that is based on a quantity of material is considered “or fraction thereof” for calculating number of tests.

This is a guide for minimum sampling and testing.
Testing frequency may need to be increased for high material variability or when test results approach specification limits.

TABLE VI – ASPHALT CONCRETE PAVEMENT (Items 341, 342, 344, 346, 347 and 348) (All testing as noted in Table VI may be waived for exempt production as defined by specification.)					
			PROJECT TESTS		
MATERIAL OR PRODUCT	**TEST FOR**	**TEST NUMBER**	**LOCATION (Per Design)**	**FREQUENCY OF SAMPLING (E)**	**REMARKS**
COARSE AGGREGATE	L. A. Abrasion **(A)**	Tex-410-A	Stockpile **(B)**	1 per project, per source	Verify the published value of the source, as listed in the current Material Producer list for BRSQC, meets the project specifications. If not, sample in accordance with Tex-221-F and submit to CSTM&P for testing prior to use in accordance with Tex-499-A. **(C)**
	Magnesium Sulfate Soundness **(A)**	Tex-411-A			
	Surface Aggregate Classification **(A)**	Tex-499-A		1 per project, per source	
	Micro Deval	Tex-461-A		1 per project, per aggregate source	Not required when the Rated Source Soundness Magnesium loss is 15 or less as listed in the current published BRSQC. If testing is required, sample in accordance with Tex-221-F.
COMBINED AGGREGATE	Sand Equivalent	Tex-203-F	Stockpiles, hot bins or feeder belts	1 per project, per source, per design	Does not apply to Item 342. Sample in accordance with Tex-221-F. The timing of when the test is performed is at the discretion of the Engineer.
ASPHALT BINDER	Compliance with Item 300 Binder & Tack Coat **(A)**		Sampled, tested and pre-approved by CSTM&P. Project test sampled at the Plant for Binder & Road for Tack Coat	1 each for binder and tack coat per project, per grade, per source	Test a minimum of one sample taken from the project. Sample tack coat at the distributor on the roadway in accordance with Tex-500C, Part III. Sample binder at hot mix plant in accordance with Tex-500-C, Part II. Binder should arrive on the project pre-approved. If not pre-approved, sample binder before use.
MIX DESIGN	Compliance with applicable specification	Tex-204-F	At source (if not approved)	Min 1 design per Mix Type and Asphalt Grade	Verify that aggregates, recycled asphalt pavement, recycled asphalt shingles, mineral filler, asphalt binder, anti-stripping additives, and warm mix systems are on the Material Producer List where applicable and that they meet project specification requirements. Project sampling and testing may be conducted on individual materials as necessary for control.

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TABLE VI – ASPHALT CONCRETE PAVEMENT (Items 341, 342, 344, 346, 347 and 348) (All testing as noted in Table VI may be waived for exempt production as defined by specification.)							
			PROJECT TESTS		PROJECT INDEPENDENT ASSURANCE TESTS		
MATERIAL OR PRODUCT	TEST FOR	TEST NUMBER	LOCATION	FREQUENCY (Per Design)	LOCATION	FREQUENCY	REMARKS
COMPLETE MIXTURE	Asphalt Content (%) (A)	Tex-236-F	Engineer Truck Sample (D)	Minimum 1 per Lot			Sample in accordance with Tex-222-F. Determine correlation factors for ignition oven using Tex-236-F at a minimum of one per project.
	Voids in Mineral Aggregates (VMA)	Tex-207-F	Truck Sample Plant Produced (D)	1 per Sublot	Truck	1 per 10 Lots only if compactor is shared by Contractor and State	Sample in accordance with Tex-222-F. Does not apply to Item 342, Permeable Friction Course. Contractor's required testing will be in accordance with specification requirements for the appropriate specification Item #.
	Gradation (A)	Tex-236-F	Engineer Truck Sample (D)	Minimum 1 per 12 Sublots (E)			Sample in accordance with Tex-222-F. Determine correlation factors for ignition oven using Tex-236-F at a minimum of one per project.
	Boil Test	Tex-530-C	Truck Sample	1 per project			Sample in accordance with Tex-222-F. Unless waived by the Engineer.
	Indirect Tensile Strength – Dry	Tex-226-F					Sample in accordance with Tex-222-F. Unless waived by the Engineer. Does not apply to Items 342, 346, and 348.
	Moisture Content	Tex-212-F Part II	Engineer Truck Sample				Sample in accordance with Tex-222-F.
	Lab Molded Density (A)	Tex-207-F	Truck Sample (D)	1 per Sublot 1 per Lot for Item 347	Truck	1 per 10 Lots only if compactor is shared by Contractor and State	Sample in accordance with Tex-222-F. Contractor's required testing will be in accordance with specification requirements for the appropriate specification Item #.
	Drain Down Test (A)	Tex-235-F	Engineer Truck Sample	1 per project 1 per Lot for Item 342			Sample in accordance with Tex-222-F. Not required for Item 341 and Item 344.
	Hamburg Wheel Test (A)	Tex-242-F	Engineer Truck Sample	1 per project			Sample in accordance with Tex-222-F. Sample during production. Does not apply to Item 348.
	Overlay Test	Tex-248-F	Engineer Truck Sample	1 per project			Sample in accordance with Tex-222-F. Does not apply to Items 341, 344, and 348.

This is a guide for minimum sampling and testing.
Testing frequency may need to be increased for high material variability or when test results approach specification limits.

TABLE VI – ASPHALT CONCRETE PAVEMENT (Items 341, 342, 344, 346, 347, and 348) (All testing as noted in Table VI may be waived for exempt production as defined by specification.)					
			PROJECT TESTS		
MATERIAL OR PRODUCT	TEST FOR	TEST NUMBER	LOCATION	FREQUENCY (Per Design)	REMARKS
ROADWAY	In-Place Air Voids (A)	Tex-207-F	Roadway (D)	2 cores per Sublot	Two cores taken per Sublot and averaged. Sample in accordance with Tex-222-F. Does not apply to Items 342, 347, and 348.
ROADWAY	Segregation Profile (A)	Tex-207-F Part V	Roadway	1 per project	Not required when Contractor uses thermal imaging system. Does not apply to Items 342, 347, and 348.
	Joint Density (A)	Tex-207-F Part VII	Roadway	1 per project	
	Thermal Profile	Tex-244-F	Immediately behind paver	1 per project	Not required when Contractor uses thermal imaging system.
	Ride Quality Test Type B (A)	Tex-1001-S	Final riding surface of travel lanes	1 per project	Engineer may verify Contractor's results for surface test Type B. For traditional design-bid-build TxDOT projects, CST has contracted with TTI to perform random ride verification at 10% frequency. Results for surface test Type A are not required to be reported.
	Permeability	Tex-246-F	Roadway	1 per project	Only applies to Items 342, 347, and 348.
FABRIC UNDERSEAL	Compliance with DMS-6220		Sampled, tested, and approved by CSTM&P		Sampling must be in accordance with Tex-735-I. Verify the source is listed in the current Material Producer List for Silt Fence, Filter Fabric and Fabric Underseals. If not sample and test prior to use in accordance with DMS-6220.

TABLE VI – FOOTNOTES	
A	When this project acceptance test fails but the product is accepted, document the reasons for acceptance on the Letter of Certification of Materials Used or in the SiteManager Remarks field. This letter is required only for Asphalt Content and/or Gradation when production of complete mixture is suspended as required by QC/QA specifications.
B	Sampling may be performed at the plant, quarry, or both. Aggregate properties may be re-tested at any time during the project. These project tests may be used for one or more projects furnishing hot mix with the same aggregate source.
C	Attach the corresponding QM test report for SiteManager projects to satisfy project sampling and testing requirements.
D	Perform random sampling as specified in Tex-225-F, Random Selection of Bituminous Mixture Samples.
E	Each test performed that is based on a quantity of material is considered "or fraction thereof" for calculating number of tests.

This is a guide for minimum sampling and testing.
Testing frequency may need to be increased for high material variability or when test results approach specification limits.

TABLE VII – ASPHALT CONCRETE PAVEMENT (Items 334) (Refer to DMS-9210, Limestone Rock Asphalt (LRA) for testing requirements for Item 330.)					
			PROJECT TESTS		
MATERIAL OR PRODUCT	TEST FOR	TEST NUMBER	LOCATION	FREQUENCY (Per Design) (F)	REMARKS
COARSE AGGREGATE	L. A. Abrasion **(A)**	Tex-410-A	Stockpile **(B)**	1 per project, per source	Verify the published value of the source, as listed in the current Material Producer list for BRSQC, meets the project specifications. If not, sample in accordance with Tex-221-F and submit to CSTM&P for testing prior to use in accordance with Tex-499-A. **(D)**
	Magnesium Sulfate Soundness **(A)**	Tex-411-A			
	Micro Deval	Tex-461-A			Sample in accordance with Tex-221-F. Testing frequency may be reduced or eliminated based on a satisfactory test history.
	Surface Aggregate Classification **(A)**	Tex-499-A	Stockpile **(B)**	1 per project, per source	Verify the published value of the source, as listed in the current Material Producer list for BRSQC, meets the project specifications. If not, sample in accordance with Tex-221-F and submit to CSTM&P for testing prior to use in accordance with Tex-499-A. SiteManager Quality Monitoring test documentation is accomplished by attaching an approved mix design.
COMBINED AGGREGATE	Sand Equivalent	Tex-203-F	Stockpiles, hot bins or feeder belts	1 per project, per source	Sample in accordance with Tex-221-F. The timing of when the test is performed is at the discretion of the Engineer.
ASPHALT BINDER	Compliance with Item 300 Binder & Tack Coat **(A) (C)**		Sampled, tested and pre-approved by CSTM&P. Project test sampled at the Plant for Binder & Road for Tack Coat	1 each for binder and tack coat per project, per grade, per source	Test a minimum of one sample from production. Sample tack coat at the distributor on the roadway in accordance with Tex-500-C, Part III. Sample binder at hot mix plant in accordance with Tex-500-C, Part II. Binder should arrive on the project pre-approved. If not pre-approved, sample binder before use.
MIX DESIGN	Compliance with applicable specification	Tex-204-F	At source (if not approved)	Min 1 design per Mix Type and Asphalt Grade	Verify that aggregates, recycled asphalt pavement, recycled asphalt shingles, mineral filler, asphalt binder, anti-stripping additives, and warm mix systems are on the Material Producer List where applicable and that they meet project specification requirements. Project sampling and testing may be conducted in individual materials as necessary for control.
COMPLETE MIXTURE	Asphalt Content (%) **(A)**	Tex-236-F	Engineer Truck Sample **(E)**	Minimum of 1 per 5,000 tons	Sample in accordance with Tex-222-F. Determine correlation factors for ignition oven using Tex-236-F at a minimum of one per project.
	Voids in Mineral Aggregates (VMA)	Tex-207-F	Truck Sample Plant Produced **(E)**	1 per 5,000 tons	Sample in accordance with Tex-222-F.
	Gradation **(A)**	Tex-236-F	Truck Sample	Minimum 1 per 5,000 tons	Sample in accordance with Tex-222-F. Determine correlation factors for ignition oven using Tex-236-F at a minimum of one per project.
	Boil Test	Tex-530-C		1 per project	Sample in accordance with Tex-222-F. The timing of when the test is performed is at the discretion of the Engineer.

This is a guide for minimum sampling and testing.
Testing frequency may need to be increased for high material variability or when test results approach specification limits.

TABLE VII – ASPHALT CONCRETE PAVEMENT (Items 334) (Refer to DMS-9210, Limestone Rock Asphalt (LRA) for testing requirements for Item 330.)					
			PROJECT TESTS		
MATERIAL OR PRODUCT	TEST FOR	TEST NUMBER	LOCATION	FREQUENCY (Per Design) (F)	REMARKS
COMPLETE MIXTURE	Moisture Content	Tex-212-F Part II	Truck Sample	1 per 5,000 tons	Sample in accordance with Tex-222-F. Performed by CSTM&P at the point of production for payment calculations.
	Hydrocarbon-Volatile Content	Tex-213-F		1 per 5,000 tons	Sample in accordance with Tex-222-F. The timing of when the test is performed is at the discretion of the Engineer.
	Lab Molded Density (A)	Tex-207-F		1 per 5,000 tons	Sample in accordance with Tex-222-F.
	Hveem Stability (A)	Tex-208-F		1 per 5,000 tons	Sample in accordance with Tex-222-F. The timing of when the test is performed is at the discretion of the Engineer.
ROADWAY	Ride Quality Test Type B (A)	Tex-1001-S	Final riding surface of travel lanes		Engineer may verify Contractor's results for surface test Type B. For traditional design-bid-build TxDOT projects, CST has contracted with TTI to perform random ride verification at 10% frequency. Results from surface test Type A are not required to be reported.

TABLE VII – FOOTNOTES	
A	When this project acceptance test fails but the product is accepted, document the reasons for acceptance on the Letter of Certification of Materials Used or in the SiteManager Remarks field.
B	Sampling may be performed at the plant, quarry, or both. Aggregate properties may be re-tested at any time during the project.
C	Or as called for in the Specifications.
D	Attach the corresponding QM test report for SiteManager projects to satisfy project sampling and testing requirements.
E	Perform random sampling as specified in Tex-225-F, Random Selection of Bituminous Mixture Samples.
F	Each test performed that is based on a quantity of material is considered "or fraction thereof" for calculating number of tests.

This is a guide for minimum sampling and testing.
Testing frequency may need to be increased for high material variability or when test results approach specification limits.

TABLE VIII – ASPHALT CONCRETE PAVEMENT (Item 340)

			PROJECT TESTS		
MATERIAL OR PRODUCT	TEST FOR	TEST NUMBER	LOCATION	FREQUENCY	REMARKS
COARSE AGGREGATE	L. A. Abrasion (A)	Tex-410-A	Stockpile (B)	1 per project, per source	Verify the published value of the source, as listed in the current Material Producer list for BRSQC, meets the project specifications. If not, sample in accordance with Tex-221-F and submit to CSTM&P for testing prior to use in accordance with Tex-499-A. (C)
	Magnesium Sulfate Soundness (A)	Tex-411-A			
	Micro Deval	Tex-461-A	Stockpile (B)	1 per project, per source	Sample in accordance with Tex-221-F. Testing frequency may be reduced or eliminated based on a satisfactory test history.
	Surface Aggregate Classification (A)	Tex-499-A	Stockpile (B)	1 per project, per source	Verify the published value of the source, as listed in the current Material Producer list for BRSQC, meets the project specifications. If not, sample in accordance with Tex-221-F and submit to CSTM&P for testing prior to use in accordance with Tex-499-A. (C)
COMBINED AGGREGATE	Sand Equivalent	Tex-203-F	Stockpiles, hot bins or feeder belts	1 per project, per design	Sample in accordance with Tex-221-F.
ASPHALT BINDER	Compliance with Item 300 Binder & Tack Coat (A)		Sampled, tested and pre-approved by CSTM&P. Plant for Binder & Road for Tack Coat	1 each for binder and tack coat per project, per grade, per source	Test a minimum of 1 sample taken from the project. Sample tack coat at the distributor on the roadway in accordance with Tex-500-C, Part III. Sample binder at hot mix plant in accordance with Tex-500-C, Part II. Binder should arrive on the project pre-approved. If not pre-approved, sample binder before use.
MIX DESIGN	Compliance with applicable specification	Tex-204-F	At source (if not approved)	Min. 1 design per Mix Type and Asphalt Grade	Verify that aggregates, recycled asphalt pavement, recycled asphalt shingles, mineral filler, asphalt binder, anti-stripping additives, and warm mix systems are on the Material Producer List where applicable and that they meet project specification requirements. Project sampling and testing may be conducted in individual materials as necessary for control.
COMPLETE MIXTURE	Asphalt Content (%)	Tex-236-F	Truck Sample (D)	Minimum of 1 per day	Sample in accordance with Tex-222-F. Determine correlation factors for ignition oven using Tex-236-F at a minimum of one per project.
	Voids in Mineral Aggregates (VMA)	Tex-207-F	Truck Sample Plant Produced (D)	1 per day	Sample in accordance with Tex-222-F.
	Gradation (A)	Tex-236-F	Truck Sample	Minimum 1 per day	Sample in accordance with Tex-222-F. Determine correlation factors for ignition oven using Tex-236-F at a minimum of one per project.
	Boil Test	Tex-530-C		1 per project	Sample in accordance with Tex-222-F. Unless waived by the Engineer.
	Indirect Tensile Strength – Dry	Tex-226-F		1 per project, per design	Sample in accordance with Tex-222-F. Unless waived by the Engineer.

This is a guide for minimum sampling and testing.
Testing frequency may need to be increased for high material variability or when test results approach specification limits.

TABLE VIII – ASPHALT CONCRETE PAVEMENT (Item 340)

			PROJECT TESTS		
MATERIAL OR PRODUCT	**TEST FOR**	**TEST NUMBER**	**LOCATION**	**FREQUENCY**	**REMARKS**
COMPLETE MIXTURE	Lab Molded Density **(A)**	Tex-207-F	Truck Sample	1 per day	Sample in accordance with Tex-222-F.
	Hamburg Wheel Tracker **(A)**	Tex-242-F		1 per project	Sample in accordance with Tex-222-F. Sample during production.
ROADWAY	Air Voids **(A)**	Tex-207-F	Selected by the Engineer **(D)**	1 per day (2 Cores)	Sample in accordance with Tex-222-F.
	Ride Quality Test Type B **(A)**	Tex-1001-S	Final riding surface of travel lanes		Engineer may verify Contractor's results for surface test Type B. For traditional design-bid-build TxDOT projects, CST has contracted with TTI to perform random ride verification at 10% frequency. Results from surface test Type A are not required to be reported.
FABRIC UNDERSEAL	Compliance with DMS-6220		Sampled, tested, and approved by CSTM&P		Sample in accordance with Tex-735-I. Verify the source is listed in the current Material Producer List for Silt Fence, Filter Fabric and Fabric Underseals. If not sample and submit to CSTM&P for testing prior to use in accordance with DMS-6220.

TABLE VIII – FOOTNOTES

A	When this project acceptance test fails but the product is accepted, document the reasons for acceptance on the Letter of Certification of Materials Used or in the SiteManager Remarks field. This letter is required only for Asphalt Content and/or Gradation when production of complete mixture is suspended as required by QC/QA specifications.
B	Sampling may be performed at the plant, quarry, or both. Aggregate properties may be re-tested at any time during the project. These project tests may be used for one or more projects furnishing hot mix with the same aggregate source.
C	Attach the corresponding QM test report for SiteManager projects to satisfy project sampling and testing requirements.
D	Perform random sampling as specified in Tex-225-F, Random Selection of Bituminous Mixture Samples.

This is a guide for minimum sampling and testing.
Testing frequency may need to be increased for high material variability or when test results approach specification limits.

TABLE IX – MICROSURFACING (Item 350)

			PROJECT TESTS		
MATERIAL OR PRODUCT	**TEST FOR**	**TEST NUMBER**	**LOCATION OF SAMPLING**	**FREQUENCY (Per Design)**	**REMARKS**
AGGREGATE	5-Cycle Magnesium Sulfate Soundness **(A)**	Tex-411-A	Stockpile **(B)**	1 per project, per source	Verify the published value of the source, as listed in the current Material Producer list for BRSQC meets the project specifications. If not, sample in accordance with Tex-221-F and submit to CSTM&P for testing at 1 per project, per source. **(C)**
	Gradation	Tex-200-F Part II		1 per project, per source	Sample in accordance with Tex-221-F.
	Crushed Face Count	Tex-460-A		1 per project, per source	Sample in accordance with Tex-221-F.
	Acid Insoluble **(A)**	Tex-612-J		1 per project, per source	Verify the value of the source, as listed in the current BRSQC, meets the project specifications. If not, sample and submit to CSTM&P for testing prior to use in accordance with Tex-499-A. Sample in accordance with Tex-221-F. **(C)**
	Surface Aggregate Classification	Tex-499-A	Stockpile, or BRSQC **(B)**	1 per project, per source	Verify the published value of the source, as listed in the current Material Producer list for BRSQC meets the project specifications. If not, sample in accordance with Tex-221-F and submit to CSTM&P for testing at 1 per project, per source. **(C)**
COMBINED BLEND	Sand Equivalent	Tex-203-F	Stockpile **(B)**	1 per project, per source	Sample in accordance with Tex-221-F.
ASPHALT BINDER	Compliance with Item 300 Binder & Tack Coat **(A)**		Sampled, tested, and pre-approved by CSTM&P. Project test sampled at the Plant for Binder & Road for Tack Coat	1 each for binder and tack coat per project, per grade, per source	Test a minimum of one sample during production. Sample tack coat at the distributor on the roadway in accordance with Tex-500-C, Part III. Sample binder at microsurfacing machine in accordance with Tex-500-C, Part III. Binder should arrive on the project pre-approved. If not pre-approved, sample binder before use.
CEMENT	Compliance with DMS-4600				Verify the source is listed in the current Material Producer List for Cement. If not, sample and submit to CSTM&P for testing prior to use in accordance with DMS-4600.
COMPLETE MIX	Asphalt Content	Tex-236-F	During production	1 per day	Sample in accordance with Tex-222-F. Determine correlation factors for ignition oven using Tex-236-F at a minimum of one per project.
	Gradation	Tex-200-F Part II Tex-236-F			Sample in accordance with Tex-222-F. Determine correlation factors for ignition oven use at a minimum of one per project.

This is a guide for minimum sampling and testing.

Testing frequency may need to be increased for high material variability or when test results approach specification limits.

TABLE IX – FOOTNOTES	
A	When this project acceptance test fails but the product is accepted, document the reasons for acceptance on the Letter of Certification of Materials Used or in the SiteManager Remarks field. This letter is required only for Asphalt Content and/or Gradation when production of complete mixture is suspended as required by QC/QA specifications.
B	Sampling may be performed at the plant, quarry, or both. Aggregate properties may be re-tested at any time during the project. These project tests may be used for one or more projects furnishing hot mix with the same aggregate source.
C	Attach the corresponding QM test report for SiteManager projects to satisfy project sampling and testing requirements.
D	Each test performed that is based on a quantity of material is considered “or fraction thereof” for calculating number of tests.

APPENDIX C

AASHTO ACCREDITED LABORATORIES

AASHTO Accredited CMT Laboratories in Texas

* Directory of accredited laboratories and scope of testing is maintained on the AASHTO Materials Reference Laboratory website at: http://www.amrl.net. Laboratory must be accredited for each specific test performed.

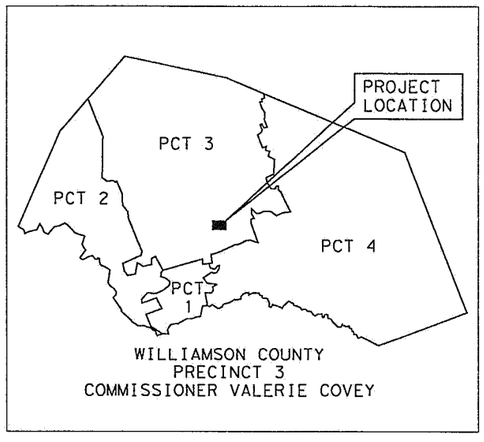
cwm 6/26/2017 10:21:29 AM

SHEET INDEX

SHEET NO.	DESCRIPTION
1	TITLE SHEET
2	SHEET INDEX

REGISTERED ACCESSIBILITY SPECIALIST (RAS) INSPECTION REQUIRED

REQUIRED SIGNS SHALL BE PLACED IN ACCORDANCE WITH STANDARD SHEETS BC(1)-14 THRU BC(12)-14 AND THE "TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES."



TxDOT STANDARD SPECIFICATIONS FOR CONSTRUCTION OF HIGHWAYS, STREETS AND BRIDGES ADOPTED NOVEMBER 1, 2014 AND ALL APPLICABLE SPECIAL PROVISIONS AND SPECIAL SPECIFICATIONS AS INDICATED IN THE BID DOCUMENTS SHALL GOVERN ON THIS PROJECT.

WILLIAMSON COUNTY

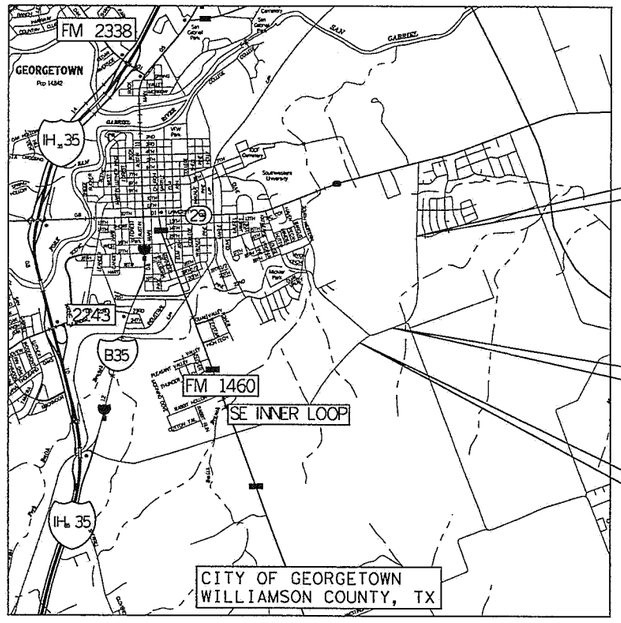
GEORGETOWN INNER LOOP AT CENTRAL MAINTENANCE FACILITY

PRECINCT NUMBER 3

NET LENGTH OF ROADWAY = 4,514.66 FT (0.855 MILES)
NET LENGTH OF BRIDGES = 0.00 FT (0.000 MILES)
NET LENGTH OF PROJECT = 4,514.66 FT (0.855 MILES)

LIMITS: FROM 600' SOUTH OF ROCKRIDE LANE
TO 600' NORTH OF BELMONT DRIVE

FOR THE RECONSTRUCTION OF AN ARTERIAL STREET
CONSISTING OF ASPHALT CONCRETE PAVING, GRADING, DRAINAGE
CULVERTS, SIGNING AND PAVEMENT MARKINGS



VICINITY MAP
NOT TO SCALE

EXCEPTIONS: NONE
EQUATIONS: NONE
RAILROAD CROSSINGS: NONE
WATERSHED: SAN GABRIEL
AREA OF DISTURBANCE: 11.86 ACRE

BRIDGEFARMER & ASSOCIATES, INC.
CONSULTING ENGINEERS
TBPE REGISTRATION NO. 264

ROADWAY CLASSIFICATION: URBAN ARTERIAL
DESIGN SPEED: 55 MPH

ADT		DIR DIST	DHV		
2015	2035	%	2015	2035	% TRUCKS
11,000	27,400	50-50	1,100	2,740	5.7%

EST. 1848 GEORGETOWN TEXAS

WILLIAMSON COUNTY 1848

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PREPARED BY:
BRIDGEFARMER & ASSOCIATES
DESIGN FIRM

Wayne A. Dennis, PE 6/26/2017

WAYNE A. DENNIS — DATE
PROJECT MANAGER

APPROVED BY:
WILLIAMSON COUNTY

_____ _____
JUDGE DAN A GATTIS — DATE
WILLIAMSON COUNTY JUDGE

APPROVED BY:
WILLIAMSON COUNTY

_____ _____
COMMISSIONER VALERIE COVEY — DATE
WILLIAMSON COUNTY COMMISSIONER, PRECINCT 3

APPROVED BY:
HNTB CORPORATION

_____ _____
RICHARD L RIDINGS, PE — DATE
ROAD BOND MANAGEMENT TEAM

APPROVED BY:
CITY OF GEORGETOWN

_____ _____
WESLEY WRIGHT, PE — DATE

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THE STANDARD DRAWINGS SHOWN IN THE SHEET INDEX ABOVE AND IDENTIFIED HERIN BY THE SYMBOL * HAVE BEEN SELECTED BY ME OR UNDER MY DIRECT SUPERVISION AS BEING APPLICABLE TO THIS PROJECT.

STATE OF TEXAS
CHASE W. MYERS
94895
LICENSED
PROFESSIONAL ENGINEER
6/26/17

BRIDGEFARMER & ASSOCIATES, INC.
CONSULTING ENGINEERS
TBPE REGISTRATION NO. 264

GEORGETOWN INNER LOOP @ CENTRAL MAINTENANCE FACILITY

SHEET INDEX

SHEET 1 OF 1

DESIGN	GRAPHICS	CHECK	CHECK	SHEET NO.
KA	AKH	CWM	WD	2

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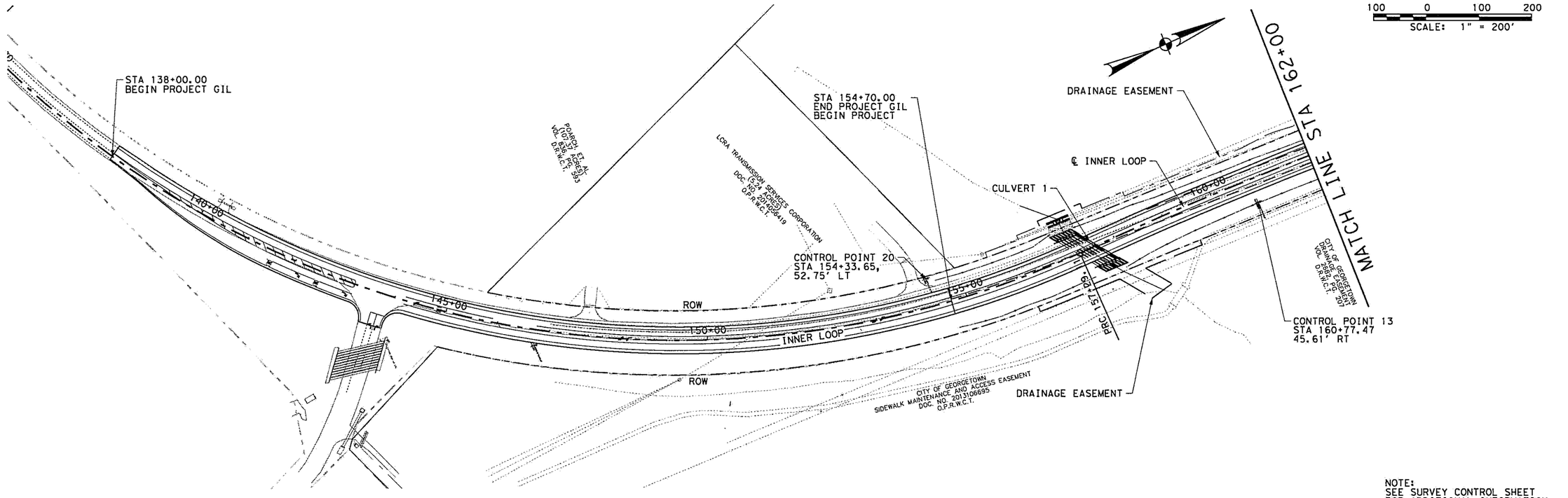
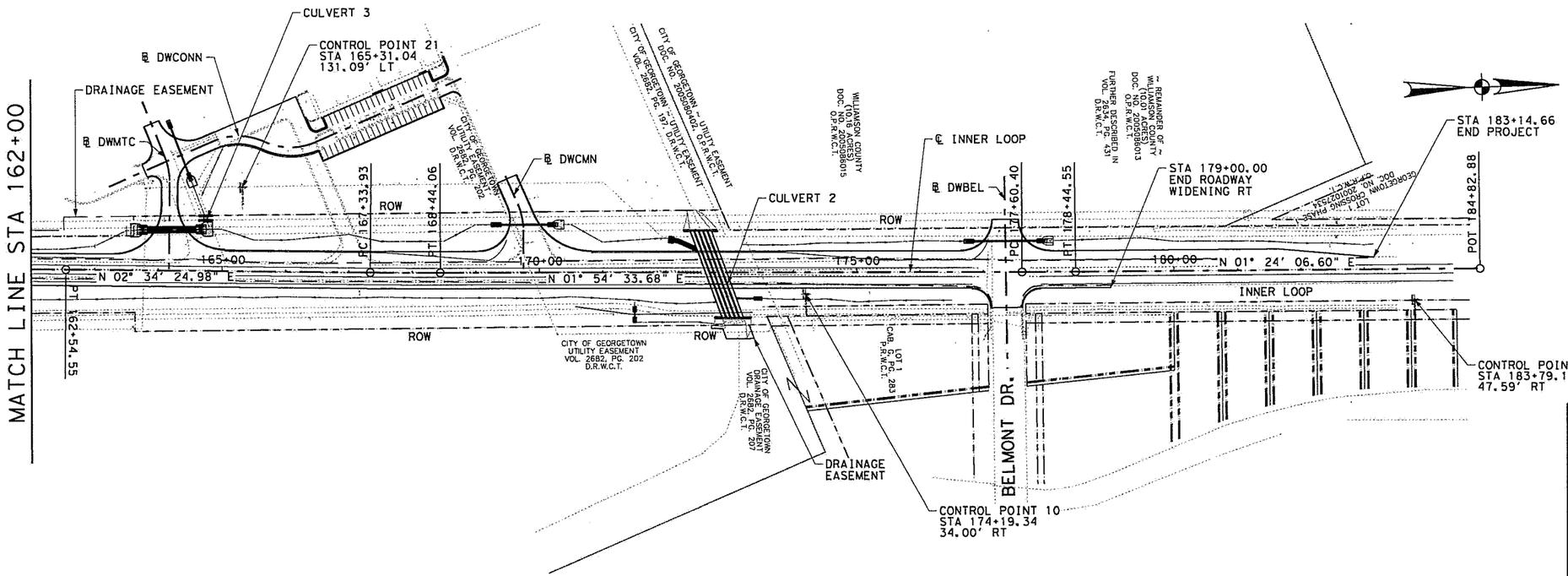
cwm





NOTE:
SEE SURVEY CONTROL SHEET
FOR ADDITIONAL INFORMATION
ON PROJECT CONTROL POINTS

STATE OF TEXAS
CHASE W. MYERS
94895
LICENSED
PROFESSIONAL ENGINEER
6/26/17

BRIDGEFARMER & ASSOCIATES, INC.
CONSULTING ENGINEERS
TBPE REGISTRATION NO. 264

GEORGETOWN INNER LOOP @ CENTRAL MAINTENANCE FACILITY

PROJECT LAYOUT

SCALE: 1" = 200' SHEET 1 OF 1

DESIGN	GRAPHICS	CHECK	CHECK	SHEET NO.
KA	AKH	CWM	WD	3 p374

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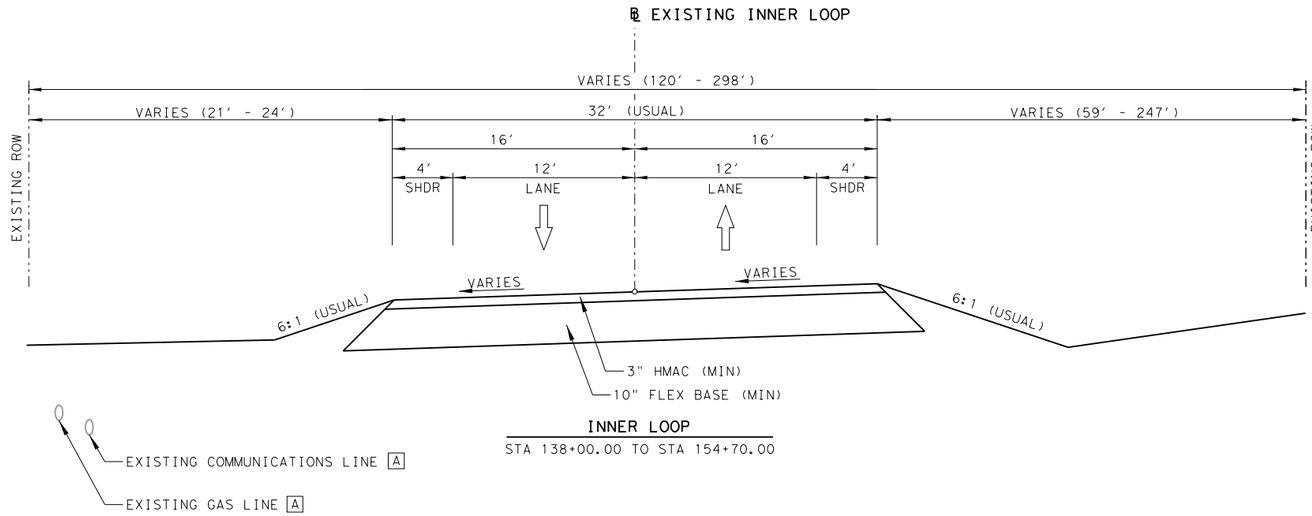
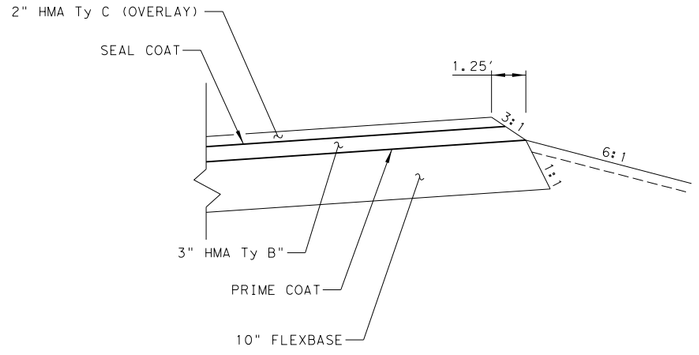


INNER LOOP
STA 138+00.00 TO STA 154+70.00

A APPROXIMATE UTILITY LOCATION SHOWN, DEPTH UNDETERMINED



DETAIL A
PROPOSED EDGE OF PAVEMENT

STATE OF TEXAS
ROBERT CARRILLO
80169
REGISTERED PROFESSIONAL ENGINEER
6/22/2017
Robert Carrillo, P.E.

NO.	REVISION	BY	DATE

WILLIAMSON COUNTY
1848

RTG RODRIGUEZ TRANSPORTATION GROUP
FIRM #587

GEORGETOWN INNER LOOP

EXISTING TYPICAL SECTIONS

6/22/2017 SHEET 1 OF 2

DESIGNED:	PROJECT NUMBER		ROADWAY	
CHECKED:			SE INNER LOOP	
DRAWN:	STATE	COUNTY	CITY	SHEET No.
CHECKED:	TEXAS	WILLIAMSON	GEORGETOWN	4

jbrooks
6/22/2017 6:08
c:\rtg-pw.bentley.com:rtg-pw\Documents\8760101\dlv\planShts\general\GIL*TYP*EX*01-C.dgn

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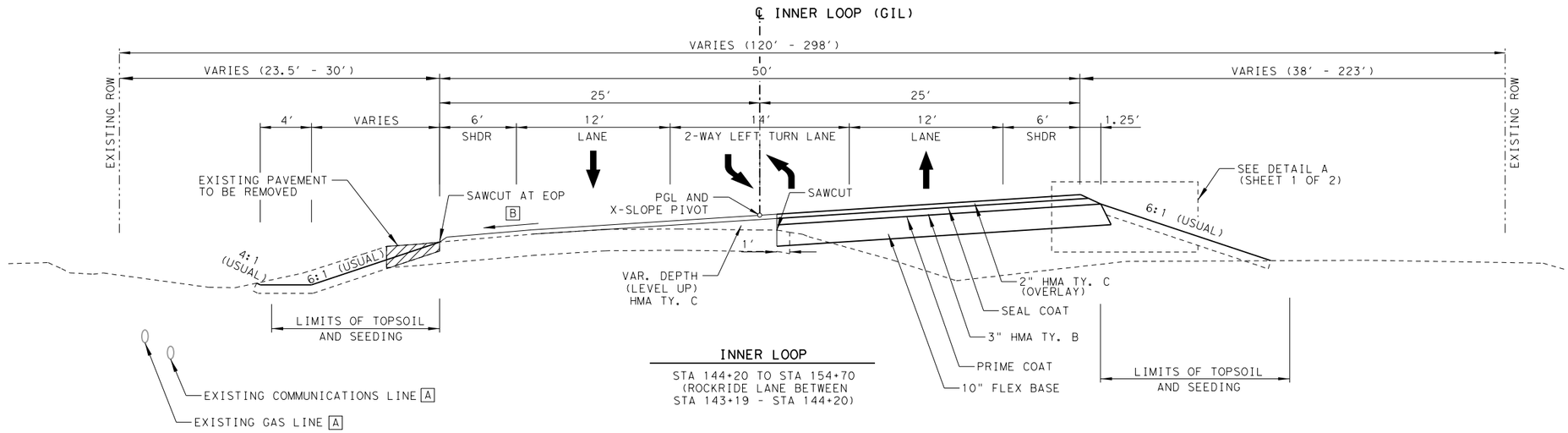
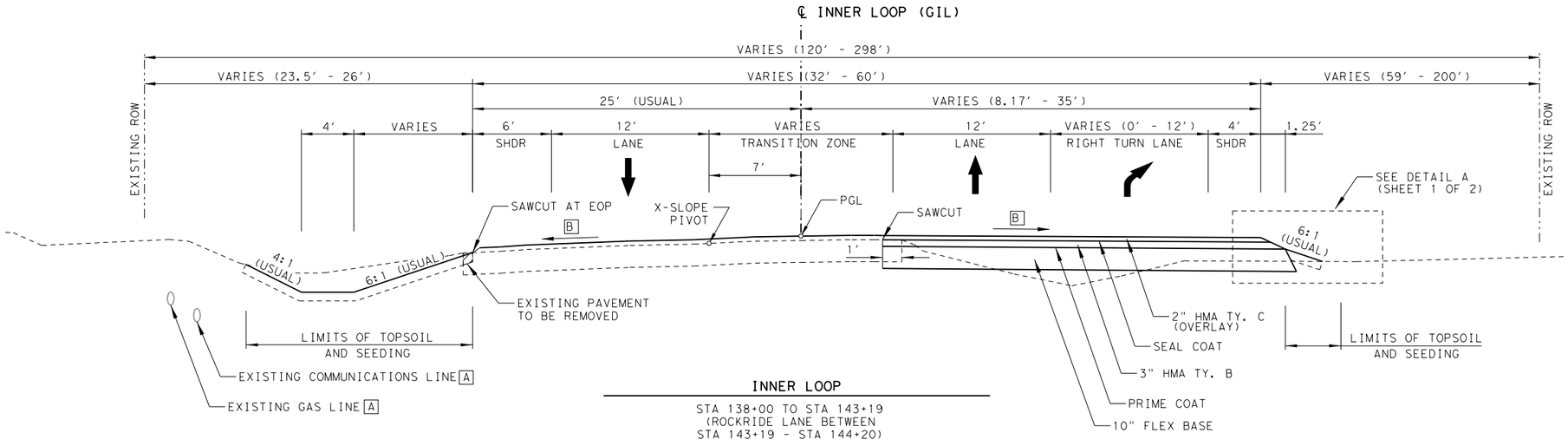


A APPROXIMATE UTILITY LOCATIONS SHOWN, DEPTH UNDETERMINED

B REFER TO TABLE OF CROSS SLOPES ON ROADWAY PLAN AND PROFILE SHEETS

NOTES:

1. REFER TO ROADWAY PLAN AND PROFILE SHEETS FOR TRANSITION TO EXISTING PAVEMENT WIDTH AT BEGIN PROJECT LOCATION.
2. LOCATE SAWCUT AT A 1′ (MIN.) OFFSET FROM EXISTING EDGE OF PAVEMENT. WILL NOT BE PAID FOR DIRECTLY BY CONSIDERED SUBSIDIARY TO THE VARIOUS PAY ITEMS.



STATE OF TEXAS
ROBERT CARRILLO
80169
REGISTERED PROFESSIONAL ENGINEER
6/22/2017
Robert Carrillo, P.E.

NO.	REVISION	BY	DATE

WILLIAMSON COUNTY
1848

RTG RODRIGUEZ TRANSPORTATION GROUP
FIRM #587

GEORGETOWN INNER LOOP

PROPOSED TYPICAL SECTIONS

6/22/2017 SHEET 2 OF 2

DESIGNED:	PROJECT NUMBER		ROADWAY	
CHECKED:			SE INNER LOOP	
DRAWN:	STATE	COUNTY	CITY	SHEET No.
CHECKED:	TEXAS	WILLIAMSON	GEORGETOWN	5

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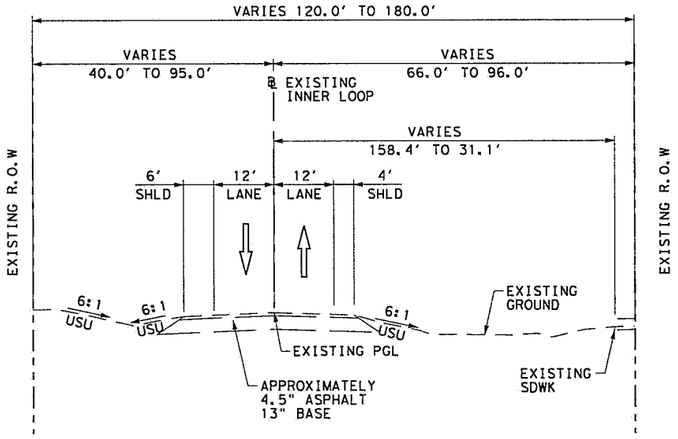
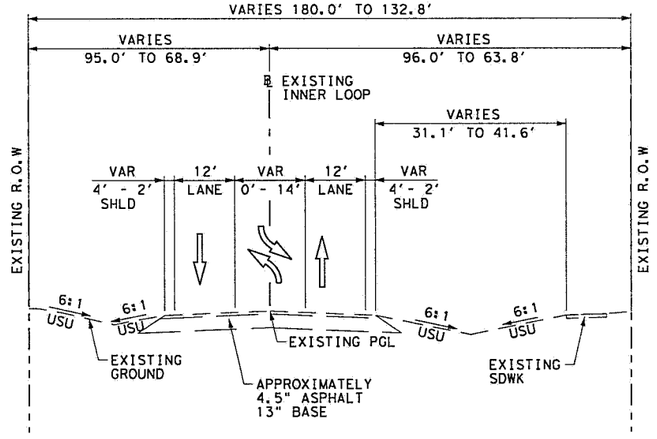


EXISTING INNER LOOP TYPICAL SECTION

STA 154+70.00 TO STA 171+00.00



EXISTING INNER LOOP TYPICAL SECTION

STA 171+00.00 TO STA 183+14.66

PROPOSED TYPICAL SECTION LEGEND

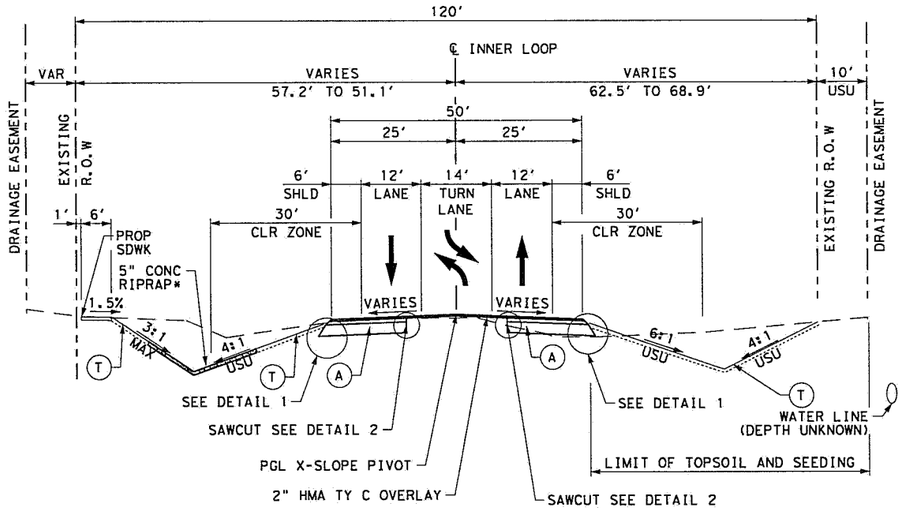
(A) 2" HMA TY C OVERLAY
SEAL COAT
4.5" HMA TY B
PRIME COAT
13" FLEX BASE

(B) 2" HMA TY C
SEAL COAT
4" HMA TY B
PRIME COAT
6" FLEX BASE

(C) 2" HMA TY C
11" HMA TY B

(D) 9" CONCRETE
8" LIME STABILIZED SUBGRADE (6% LIME)

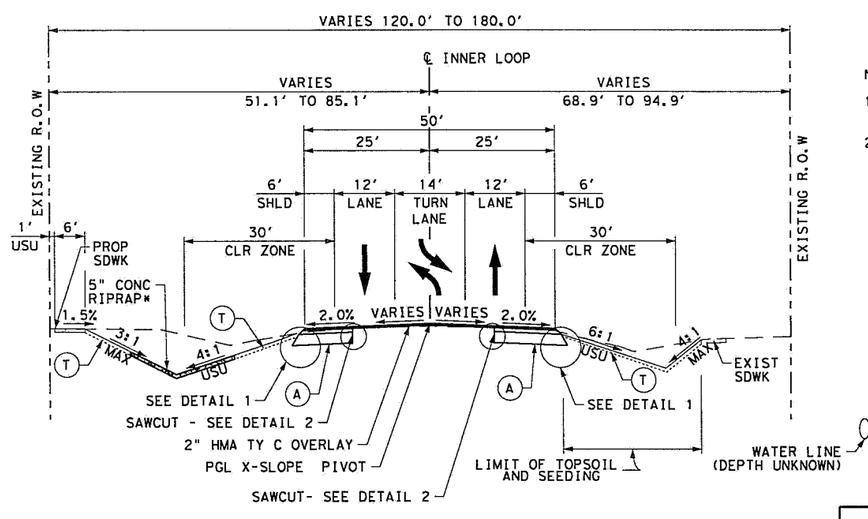
(T) 4" TOPSOIL & SEED



* SEE ROADWAY PLANS FOR CONCRETE RIPRAP LOCATION
SEE DRAINAGE DETAILS FOR ADDITIONAL INFORMATION

PROPOSED INNER LOOP TYPICAL SECTION

STA 154+70.00 TO STA 159+50.00



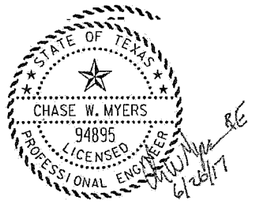
* SEE ROADWAY PLANS FOR CONCRETE RIPRAP LOCATION
SEE DRAINAGE DETAILS FOR ADDITIONAL INFORMATION

PROPOSED INNER LOOP TYPICAL SECTION

STA 159+50.00 TO STA 164+00.00

NOTES:

1. CROSS SLOPE SHOWN ARE TYPICAL, SEE ROADWAY SHEETS FOR PAVEMENT SUPERELEVATION SLOPES.
2. FOR PAVEMENT MARKING LOCATIONS, SEE SIGNING & PAVEMENT MARKING



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CONSULTING ENGINEERS
TBPE REGISTRATION NO. 264

GEORGETOWN INNER LOOP @ CENTRAL MAINTENANCE FACILITY

TYPICAL SECTIONS

SHEET 1 OF 3

DESIGN	GRAPHICS	CHECK	CHECK	SHEET NO.
KA	AKH	CWM	WD	6

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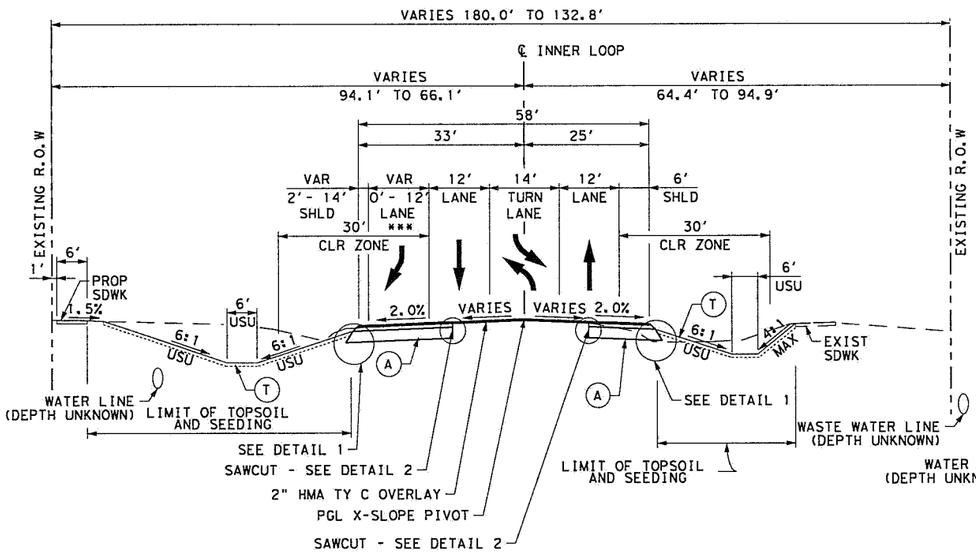
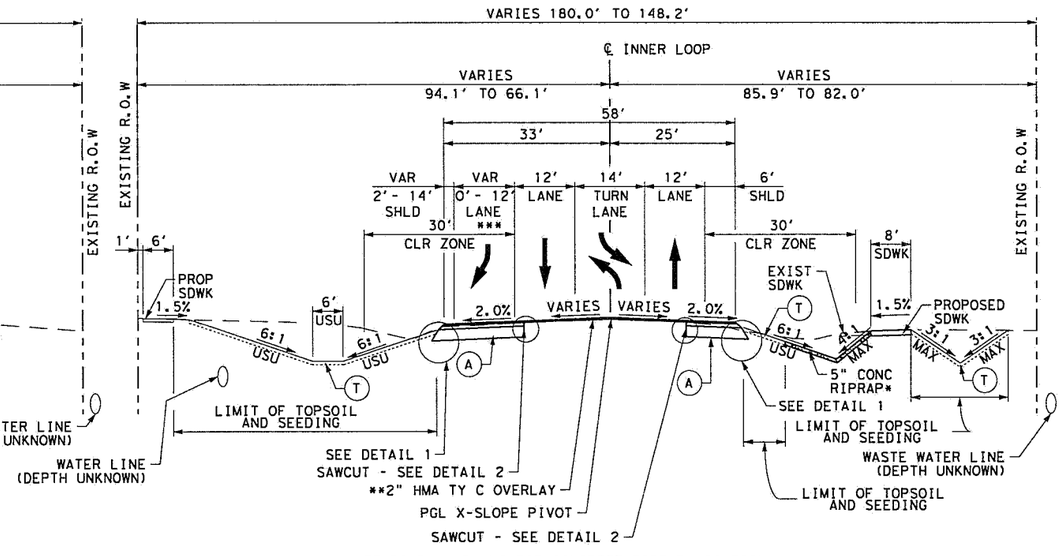


PROPOSED INNER LOOP TYPICAL SECTION

STA 164+00.00 TO STA 169+00.00
STA 173+33.95 TO STA 179+00.00

*** SB RIGHT TURN BAY
STA 165+04.13 TO STA 169+20.87
STA 170+81.80 TO STA 175+38.55



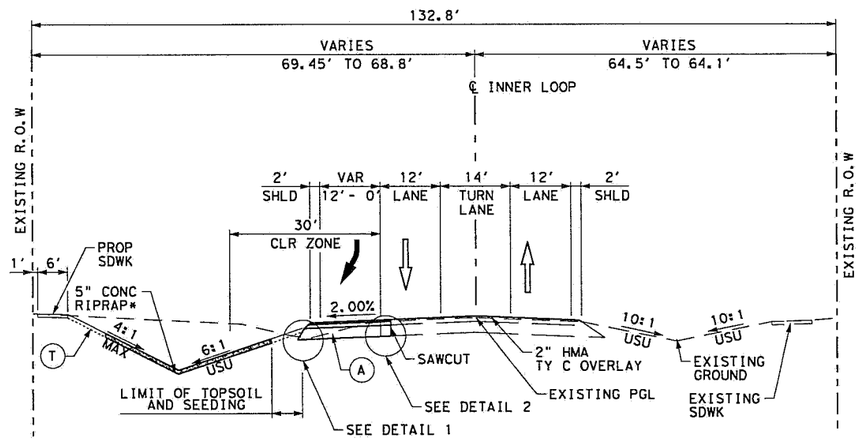
* SEE ROADWAY PLANS FOR CONCRETE RIPRAP LOCATION
SEE DRAINAGE DETAILS FOR ADDITIONAL INFORMATION
** OVERLAY VARIES BETWEEN 2"-9"

PROPOSED INNER LOOP TYPICAL SECTION

STA 169+00.00 TO STA 173+33.95

PROPOSED TYPICAL SECTION LEGEND

- (A) 2" HMA TY C OVERLAY
  SEAL COAT
  4.5" HMA TY B
  PRIME COAT
  13" FLEX BASE
- (B) 2" HMA TY C
  SEAL COAT
  4" HMA TY B
  PRIME COAT
  6" FLEX BASE
- (C) 2" HMA TY C
  11" HMA TY B
- (D) 9" CONCRETE
  8" LIME STABILIZED SUBGRADE
  (6% LIME)
- (T) 4" TOPSOIL & SEED



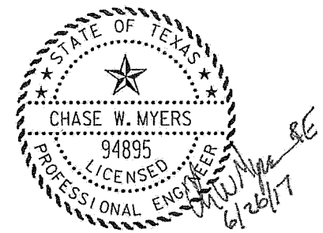
* SEE ROADWAY PLANS FOR CONCRETE RIPRAP LOCATION
SEE DRAINAGE DETAILS FOR ADDITIONAL INFORMATION

PROPOSED INNER LOOP TYPICAL SECTION

STA 179+00.00 TO STA 183+14.66

NOTES:

1. CROSS SLOPE SHOWN ARE TYPICAL, SEE ROADWAY SHEETS FOR PAVEMENT SUPERELEVATION SLOPES.
2. FOR PAVEMENT MARKING LOCATIONS, SEE SIGNING & PAVEMENT MARKING



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CONSULTING ENGINEERS
TBPE REGISTRATION NO. 264

GEORGETOWN INNER LOOP @ CENTRAL MAINTENANCE FACILITY

TYPICAL SECTIONS

SHEET 2 OF 3

DESIGN	GRAPHICS	CHECK	CHECK	SHEET NO.
KA	AKH	CWM	WD	7 p.378

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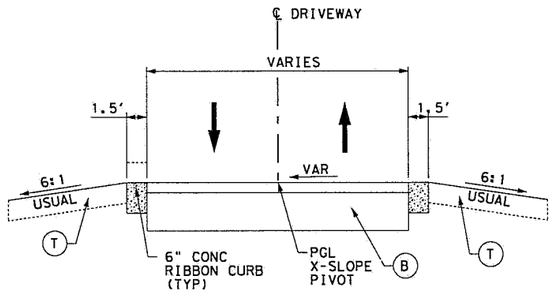
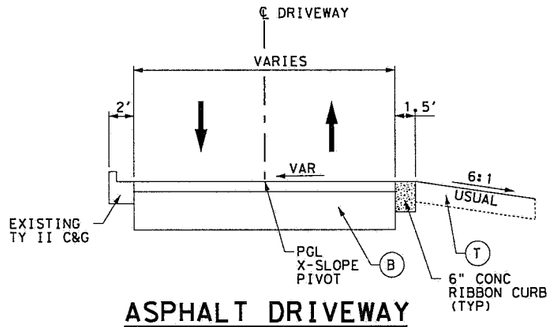


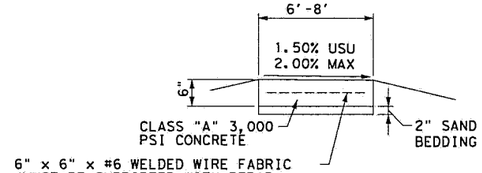
ASPHALT DRIVEWAY

DWMTC
STA 9+57.39 TO STA 10+83.69
DWCONN
STA 10+61.44 TO STA 11+98.49



ASPHALT DRIVEWAY

DWCONN
STA 13+44.19 TO STA 15+82.94



SIDEWALK DETAIL

SIDEWALK ON EAST SIDE IS 8'
SIDEWALK ON WEST SIDE IS 6'

PROPOSED TYPICAL SECTION LEGEND

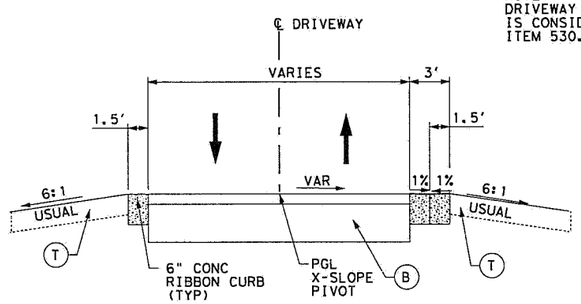
(A) 2" HMA TY C OVERLAY
SEAL COAT
4.5" HMA TY B
PRIME COAT
13" FLEX BASE

(B) 2" HMA TY C
SEAL COAT
4" HMA TY B
PRIME COAT
6" FLEX BASE

(C) 2" HMA TY C
11" HMA TY B

(D) 9" CONCRETE
8" LIME STABILIZED SUBGRADE
(6% LIME)

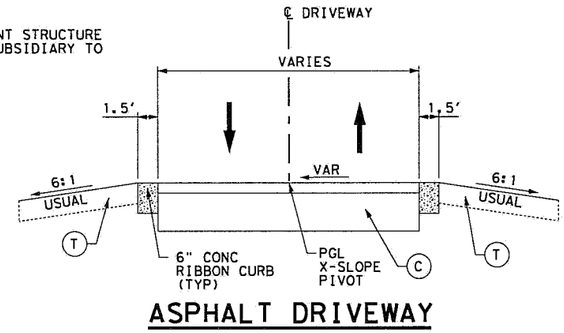
(T) 4" TOPSOIL & SEED



ASPHALT DRIVEWAY

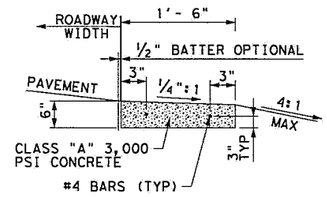
DWCONN
STA 11+98.49 TO STA 13+49.19

NOTE:
DRIVEWAY PAVEMENT STRUCTURE IS CONSIDERED SUBSIDIARY TO ITEM 530.



ASPHALT DRIVEWAY

DWBEL (BELMONT DR)
STA 11+47.00 TO STA 12+05.20

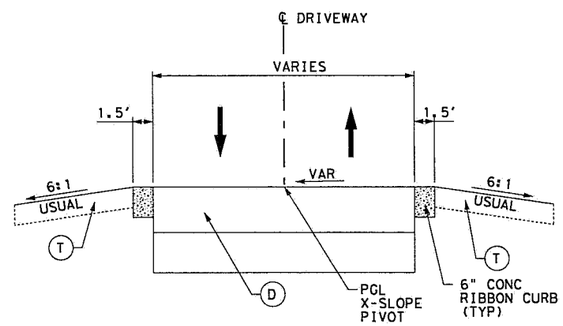


RIBBON CURB DETAIL

PAID AS VALLEY GUTTER

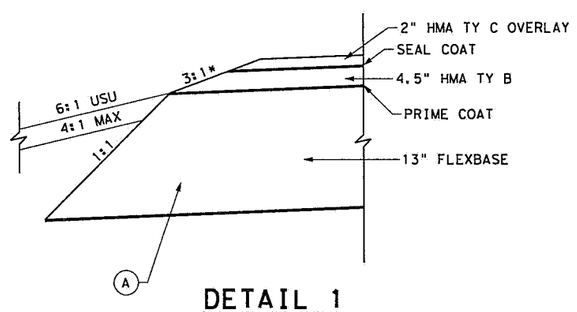
NOTES:

1. CROSS SLOPE SHOWN ARE TYPICAL, SEE ROADWAY SHEETS FOR PAVEMENT SUPERELEVATION SLOPES.
2. FOR PAVEMENT MARKING LOCATIONS, SEE SIGNING & PAVEMENT MARKING



CONCRETE DRIVEWAY

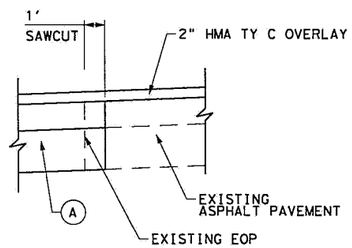
DWMTC
STA 10+83.69 TO STA 11+60.69
DWCMN
STA 9+45.00 TO STA 10+65.00
DWBEL
STA 10+67.00 TO STA 11+18.40



DETAIL 1

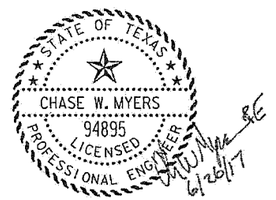
TAPERED EDGE DETAIL

* THE HMAC TAPERED EDGE SHALL BE PRODUCED BY USE OF A SCREED ATTACHMENT CAPABLE OF PRODUCING A SMOOTH COMPACTED SURFACE. ADDITIONAL COMPACTING EFFORT BEHIND THE SCREED IS NOT REQUIRED.



DETAIL 2

PAVEMENT WIDENING



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GEORGETOWN INNER LOOP @ CENTRAL MAINTENANCE FACILITY

TYPICAL SECTIONS

SHEET 3 OF 3

DESIGN	GRAPHICS	CHECK	CHECK	SHEET NO.
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GENERAL NOTES

Basis of Estimate

Item	Description	**Rate	Basis	Quantity
160	Topsoil	1 CY/9 SY	27,127 SY	3,014 CY
161	Erosion Control Compost (3")	1 CY/12 SY	6,781 SY	565 CY
162	Mulch Topdressing (5")	1 CY/7 SY	6,781 SY	969 CY
164	Seed for Erosion Control (Item 164) (Temp) (Item 164) (Perm)	4840 SY/AC 4840 SY/AC	13,564 SY 20,582 SY	2.80 AC 4.25 AC
166	Fertilizer (13-13-13)	1/8 LB/SY	27,127 SY	1.15 TON
168	Vegetative Watering (Item 164) (Temp) (Item 164) (Perm)	10 GAL/SY 20 GAL/SY	27,364 SY 47,533 SY	273 MG 951 MG
** 204	Sprinkling (Item 132) (Item 247)	30 GAL/CY 30 GAL/CY	4,830 CY 4,049 CY	144,900 GAL 121,470 GAL
** 210	Roll (Flat Wheel) (Item 316)	1 HR/6000 SY	16,834 SY	3 HR
** 210	Roll (Tamping) (Item 132)	1 HR/200 CY	4,830 CY	25 HR
** 210	Roll (Heavy Tamp) (Item 132)	1 HR/200 CY	4,830 CY	25 HR
** 210	Roll (Lt Pneu Tire) (Item 132) (Item 316) (Seal Coat)	1 HR/500 CY 1 HR/6000 SY	4,830 CY 16,834 SY	10 HR 3 HR
247	FL BS (CMP IN PLC) (TY A GR 4 - 4 Lifts)	27 CF/CY	109,323 CF	4,049 CY
310	Prime Coat (MULTI OPTION)	0.20 GAL/SY	11,935 SY	2,387 GAL
316	Surface Treatments Seal Coat: Asphalt Aggregate (Ty-D GR 5 SAC-B)	0.25 GAL/SY 1 CY/165 SY	16,834 SY 16,834 SY	4,209 GAL 103 CY
341	Dense-Graded Hot-Mix Asphalt TY B PG 64-22 TY C SAC-B PG70-22	115 LB/SY/IN 115 LB/SY/IN	11,867 SY 27,539 SY	2,615 TON 3,167 TON

** For Informational Purposes Only

MODIFIED STANDARDS
The following standard detail sheet or sheets have been modified:

RID (FND)-11 (MOD)

GENERAL
References to manufacturer's trade name or catalog numbers are for the purpose of identification only. Similar materials from other manufacturers are permitted if they are of equal quality, comply with the specifications for this project, and are approved.

If work is performed at Contractor's option, when inclement weather is impending, and the work is damaged by subsequent precipitation, the Contractor is responsible for all costs associated with replacing the work, if required.

Priority of construction is to complete reconstruction of Rock Ride turn lanes by 12/31/2017 from station 138+00 to station 154+00. Contractor must finish this portion of the roadway by this date. This includes the construction of culvert 1 at station 157+44.25.

The roadbed shall be free of organic material prior to placing any section of the pavement structure.

Equip all construction equipment used in roadway work with highly visible omnidirectional flashing warning lights.

Provide a smooth, clean saw-cut along the existing asphalt pavement structure, as directed. Consider subsidiary to the pertinent Items.

Supply litter barrels in enough numbers at locations as directed to control litter within the project. Consider subsidiary to pertinent Items.

Use a self-contained vacuum broom to sweep the roadway and keep it free of sediment as directed. The contractor will be responsible for any sweeping above and beyond the normal maintenance required to keep fugitive sediment off the roadway as directed by the Construction Observer.

Protect all areas of the right of way, which are not included in the actual limits of the proposed construction areas, from disturbance. Restore any area disturbed because of the Contractor's operations to a condition as good as, or better than, before the beginning of work at no cost to the county.

Damage to existing pipes and SET's due to Contractor operations shall be repaired at Contractor's expense.

All locations used for storing construction equipment, materials, and stockpiles of any type, within the right of way, will be as directed. Use of right of way for these purposes will be restricted to those locations where driver sight distance to businesses and side street intersections is not obstructed and at other locations where an unsightly appearance will not exist. The Contractor will not have exclusive use of right of way but will cooperate in the use of the right of way with the city/county and various public utility companies as required.

The Project Superintendent will be capable of speaking English and will be available on the project at all times when work is being performed, including subcontractor work. The Superintendent will be available and on-call 24 hours a day.

Coordinate and obtain approval from the Construction Observer for all bridgework over existing roadways.

Measure all minimum vertical clearances for all structures (including, but not limited to, signal mast arms, span wires, and overhead sign bridge structures) within the limits of the project for all roadway alignments in all directions of travel. Coordinate with the Construction Observer to take these measurements and obtain prior to opening roadways to traffic unless otherwise approved.

All traffic control shall be coordinated with adjacent construction projects.

Use materials from prequalified material producers list as shown on the Texas Department of Transportation (TxDOT) - Construction Division's (CST) materials producers list. Refer to TxDOT's website for list of pre-qualified manufacturers. No substitutions will be allowed for materials found on the list. Submit list of approved suppliers/materials from TxDOT website to show items are TxDOT approved. Submit this list with request for material approval.

When any abandoned well is encountered, cease construction operations in this area and notify the Engineer who will coordinate the proper plugging procedures. A water well driller licensed in the State of Texas must be used to plug a well.

Erosion control and stabilization measures must be initiated immediately in portions of the site where construction activities have temporarily ceased and will not resume for a period exceeding 14 calendar days. Track all exposed soil, stockpiles, and slopes. Tracking consists of operating a tracked vehicle or equipment up and down the slope, leaving track marks perpendicular to the direction of the slope. Re-track slopes and stockpiles after each rain event or every 14 days, whichever occurs first. This work is subsidiary.

Perform maintenance of vehicles or equipment at designated maintenance sites. Keep a spill kit on-site during fueling and maintenance. This work is subsidiary.

Maintain positive drainage for permanent and temporary work for the duration of the project. Be responsible for any items associated with the temporary or interim drainage and all related maintenance. This work is subsidiary.

Suspend all activities near any significant recharge features, such as sinkholes, caves, or any other subterranean openings that are discovered during construction or core sampling. Do not proceed until the designated Geologist or TCEQ representative is present to evaluate and approve remedial action.

Locate aboveground storage tanks kept on-site for construction purposes in a contained area as to not allow any exposure to soils. The containment will be sized to capture 150% of the total capacity of the storage tanks.

Migratory Birds and Bats.
Migratory birds may be nesting within the project limits and concentrated on roadway structures such as bridges and culverts. Remove all old and unoccupied migratory bird nests from any structures, trees, etc. between September 1st and January 31st. Prevent migratory birds from re-nesting between February 1st and August 31st.

All methods used for the removal of unoccupied bird nests and the prevention of re-nesting must be approved by the Construction Observer well in advance of the planned use.

In the event that any active nests are encountered on-site during construction, all construction activity within the immediate vicinity of the nest must cease immediately. Contact the Construction Observer to determine how to proceed.

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TBPE REGISTRATION NO. 264

GEORGETOWN INNER LOOP @ CENTRAL MAINTENANCE FACILITY

GENERAL NOTES

SHEET 1 OF 6

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Bats may roost within the project limits under bridges, in culverts, in large hollow trees, in dead standing trees, and in trees with shaggy bark. Maternity colonies may occur from April 1st through August 31st. If bats are present, ensure bats are not harmed. Exclusion protocols for known colonies should be followed well in advance of commencement of construction activities. Exclusion measures by qualified individuals are used to relocate existing colonies, except from April 1st through August 31st when such measures may separate mothers and pups. Exclusion measures are also the means of preventing establishment of new colonies and re-establishment of relocated colonies.

No extension of time or compensation payment will be granted for a delay or suspension of work caused by migratory birds or bats. This work is subsidiary.

ITEM 100 - PREPARING RIGHT OF WAY
Do not burn brush, unless otherwise approved.

Trim vegetation around signs and other obstructions. Consider subsidiary to pertinent Items.

Use hand methods or other means to remove objectionable material and obstructions, if doing work by mechanical methods is impractical. Consider subsidiary to the pertinent Items.

ITEM 110 & 132 - EXCAVATION & EMBANKMENT
At no time will the retaining wall backfill material exceed the adjacent embankment operation by more than one embankment lift. At no time will the embankment adjacent to the retaining wall backfill exceed the wall backfill by any elevation.

Unsuitable material encountered in a cut or fill section will be considered waste. The Construction Observer will define unsuitable material. Material, which the Contractor might deem to be unsatisfactory or unsuitable, due to moisture content, will not be considered unsuitable material, unless otherwise approved.

Obtain approval of all compaction equipment prior to all backfilling and embankment operations.

ITEM 132 - EMBANKMENT
The underlying layer or existing subgrade must be prepared and inspected prior to placement of the embankment. Proof roll the pavement area according to Item 216 prior to placement of embankment or subsequent layers. Payment for proof rolling will be subsidiary to the various bid Items of the contract.

Correct unstable material (e.g. dry, wet, loose, etc.) to a depth of six (6) inches below existing grade. This work will be considered subsidiary to pertinent bid Items. Drying required deeper than six (6) inches below existing grade will be paid for in accordance with Item 6.03, "Extra Work." However, there will be no payment to correct failures in the subgrade areas that were constructed under this contract.

ITEM 132 - EMBANKMENT TY B
Embankment shall be ordinary compaction Type B.

The Construction Observer must approve the embankment material before use on the project.

If delivery from offsite source is necessary, furnish embankment with a PI of less than 25 that does not contain sulfate contents greater than 3000 ppm.

Correct unstable material (e.g. dry, wet, loose, etc.) to a depth of six (6) inches below existing grade. This work will be considered subsidiary to pertinent bid Items. Drying required deeper than six (6) inches below existing grade will be paid for in accordance with Item 6.03, "Extra Work." However, there will be no payment to correct failures in the subgrade areas that were constructed under this contract.

Track ALL embankment slopes left idle for more than 14 days, within or at the end of the 14-day idle period, to prevent erosion. Tracking consists of operating a tracked vehicle or equipment up and down the slope, leaving track marks perpendicular to the direction of the slope. Re-track slopes after rain events, as directed. Consider tracking of slopes to prevent erosion as subsidiary to the pertinent Items.

Correct subgrade (e.g. unstable areas, soft spots, etc.) prior to dumping of Flex Base or HMACP. Consider subsidiary to the pertinent Items.

Scarify and re-compact existing asphaltic/base sections, which are not called out to be removed in fill sections, where bottom of the proposed pavement structure is higher than and over the top of the existing asphalt surface, in order to reduce the possibility of a slip plane.

When subgrade materials contain sulfates, as determined by Tex-145-E, use the following table for treatment of material placed under the pavement structure.

Sulfate Content (SC, ppm)	Action
SC < 3000 ppm	Apply calcium-based additive as specified by the pertinent item.
3000 ppm * SC < 7000 ppm	Perform a minimum of 7 days of mellowing and continuous water curing, in accordance to Department guidelines for soil treatment of sulfate-laden soils.
SC * 7000 ppm	Do not treat with calcium-based additives. Undercut to the specified depth and fill with select material or implement fly ash treatment as specified in the general notes for Item 265.

ITEM 160, 161, 162, 164 & 168
Use Wilco Special Provisions for all 160 Items (attached).

ITEM 160 - TOPSOIL
No sandy loam allowed. Obtain approval of the actual depth of the topsoil sources for both on-site and off-site sources.

ITEM 169 - SOIL RETENTION BLANKETS
Use materials from prequalified material producers list as shown on the Texas Department of Transportation (TxDOT) - Construction Divisions (CST) materials producers list. Refer to TxDOT's website for list of pre-qualified manufacturers. Direct all questions to the Maintenance Division, Vegetation Management Section, 125 E. 11th Street, Austin, TX 78701-2483.

ITEM 204 - SPRINKLING
Apply water for dust control as directed. When dust control is not being maintained, cease operations until dust control is maintained. Consider subsidiary to the pertinent Items.

ITEM 216 - PROOF ROLLING
Correct and perform "Proof Rolling" retest at the Contractor's expense, to the satisfaction of the Construction Observer, when initial "Proof Rolling" yields a failing result.

ITEM 247 - FLEXIBLE BASE
Furnish Type A material.

Furnish flexible base meeting Grade 4 requirements.

The following table will govern the acceptance of compaction on base courses, when compacted in multiple courses. Compaction requirements are in percent of maximum dry density as determined by (Tex-113-E). When compacting in a single course, compact to at least 100% of maximum dry density as determined by Tex-113-E.

Item	Material	All Roadways	
		Lift	Min. Density
247	FL BS (CMP IN PLC)	1st of 3 lifts	95%
		2nd of 3 lifts	98%
		(final lift)	100%

Table 1
Flexible Base Material Requirements

Property	Test Method	Grade 4
Master gradation sieve size	Tex-110-E	% Retained
2-1/2 in.		0
1-3/4 in.		0
7/8 in.		10-35
3/8 in.		30-50
No. 4		45-65
No. 40		70-90
No. 200		87-95
Liquid Limit, % Max.[1]	Tex-104-E	35
Plasticity Index, Max.[1]	Tex-106-E	10
Wet ball mill, % Max.	Tex-116-E	40
Wet ball mill, % Max. increase passing the No. 40 sieve		20
Min. compressive strength, psi	Tex-117-E	
Lateral pressure 0 psi		-
Lateral pressure 3 psi		90
Lateral pressure 15 psi		175

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GENERAL NOTES

SHEET 2 OF 6

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Correct subgrade (e.g. unstable areas, soft spots, etc.) prior to placing Flex Base. Consider subsidiary to the pertinent Items.

Complete all subgrade, ditches, slopes, and place all drainage structures to conform to required lines, grades, and cross-sections, as shown and directed, prior to the placement of Flex Base.

For Flex Base placed over the box culverts, do not use a Vibratory Roller to compact the material.

ITEM 300 - ASPHALTS, OILS, AND EMULSIONS
Asphalt season starts May 1 and ends September 15.

PPA and REOBS are not allowed.

ITEM 310, 316, and 341
Perform work during good weather, unless otherwise directed. If work is performed at Contractor's option, when inclement weather is impending, and the work is damaged by subsequent precipitation, the Contractor is responsible for all costs associated with replacing the work, if required.

ITEM 310 - PRIME COAT
Apply blotter material to all driveways and intersections.

Use bituminous material of the type multi-option.

Provide Construction Observer with current Distributer Certification confirming calibration of asphalt measurement equipment.

Distribute prime coat smoothly and evenly at the rate of 0.20 gallons per square yard.

Apply Prime to finished flex base surface at the rate shown in the plans. Hot mix can be applied to the primed surface of flex base after the prime has penetrated and cured for a minimum of 36 hours depending on weather conditions or as approved by the Construction Observer. Provide the Construction Observer with a copy of the asphalt deliver ticket prior to application.

Apply blotter material to all driveways and intersections. This work is subsidiary. When Multi Option is allowed, provide MC 30, EC 30, or AE-P.

ITEM 316 - SEAL COAT
Use ionically compatible asphalt to precoat ed aggregate, which is compatible with the asphalt specified for each specific Surface Treatment.

Do not apply asphalt within 1-1/2 hours of sunset, or later, unless otherwise directed.

Grade 4 and 5 Type D or Type E is allowed as AGGR (MULTI OPTION) for an underseal.

Ensure that all underseal surface treatment operations are covered by HMACP before exposing to traffic, including construction traffic.

Apply both the first and second course of the two course surface treatment on the same day.

Use paper or other approved material at the beginning and end of each shot so that the transverse joint is straight and prevents overlap of asphalt shots.

Any areas with excessive asphalt or aggregate will be removed.

The Contractor is required to provide recommendations to the Construction Observer on adjusting aggregate and asphalt rates, when the road conditions, material properties or construction methods change.

Furnish medium pneumatic-tire rollers in accordance with Item 210, "Rolling." Roll before opening to traffic.

Surface all transitions, tapers, climbing lanes and intersections to the limits as directed.

Keep all traffic, including construction traffic, off freshly placed surface treatment, as directed.

Provide Construction Observer with current Distributer Certification confirming calibration of asphalt measurement equipment.

Provide Construction Observer with a copy of the shipping ticket for the asphalt prior to application. Contractor must sample asphalt, in accordance to the applicable item. Label the sample can with date and project numbers. Samples must be stored where they are readily available to the County representative at the plant. The Contractor will be responsible for supplying storage for all samples until the project achieves substantial completion or otherwise directed.

Removal and proper disposal off the ROW of audible/profile markings, reflectorized markings, and raised markers is subsidiary.

ITEM 320 - EQUIPMENT FOR ASPHALT CONCRETE PAVEMENT
Use of motor grader is allowed with approval of the Construction Observer.

ITEM 341 (HMACP Testing)
The Contractor must sample asphalt binder, in accordance to the applicable item. Label the sample can with the corresponding lot, and sub-lot numbers.

Samples must be stored in a common area where they are readily available to the County's representative at the plant. The Contractor will be responsible for supplying storage for all samples. Retain all asphalt samples until hot mix production is complete or directed otherwise.

When directed, the Contractor is responsible for disposal of all asphalt binder samples, in accordance to Local, State, and Federal regulations.

Refill and compact all HMAC core holes to the same elevation as the adjacent roadway. Use hot mix of the type being used in the project to fill core holes. As an alternative a high performance cold patching mix such as Rapid Cure Patching Mix meeting the requirements of DMS-9203 or Medium Cure Patching mix made with SCM meeting requirements of DMS-9202. Consider this work subsidiary to the pertinent Items.

Mill a transverse butt joint to transition from the new ACP to the existing surface tie-in. Make the transition a minimum of 50 feet H: 1 inch V slope ratio of newly placed ACP. Make the temporary joint, at the tie-in, a minimum of a 10 feet longitudinally and covering the entire width. Sawcut existing pavement as directed. Prior to milling, core the existing pavement to determine its thickness. Do not proceed with milling until directed. Consider this work subsidiary to the pertinent Items.

ITEM 341 - DENSE-GRADED HOT-MIX ASPHALT
Contractor to submit for approval a current mix design (less than 6 months old) to the Construction Observer that meets the following requirements prior to use on the project.

PPA and REOBS are not allowed.

Lime or an approved anti-stripping agent must be used when crushed gravel is utilized to meet a SAC "A" requirement.

Aggregates used on shoulders and ramps are required to meet SAC requirements.

Target laboratory molded density is 97% for all mixtures for Texas Gyratory Compactor (TGC) mixture designs.

When using Superpave Gyratory Compactor (SGC) to design mixtures, submit the SGC mix design to the Construction Observer for approval.

When using substitute binders, mold specimens for mix design and production at the temperature required for the substitute binder used to produce the HMA.

All mixtures must meet the Hamburg requirement as stated in the table below.

High-Temperature Binder Grade	Test Method	Hamburg Wheel Test Requirements [1]		
		Minimum # of Passes	Maximum Rut Depth (mm) [2]	Minimum Rut Depth (mm) [2,3]
PG 64 or lower	Tex-242-F	7,000	12.5	3
PG 70	Tex-242-F	15,000	12.5	3
PG 76 or higher	Tex-242-F	20,000	12.5	3

1. The Construction Observer may accept Hamburg Wheel test results for production and placement if no more than 1 of the 5 most recent tests is below the specified number of passes and the failing test is no more than 2,000 passes below the specified number of passes.
2. Rut depth tested @122° F
3. Unless approved otherwise.

When using RAP and/or RAS:
Use of RAS is not allowed. When using RAP, include the management methods of processing, stockpiling, and testing of RAP in the QCP submitted for the project. Blending of RAP in one feeder bin or in a stockpile is not permitted.

Asphalt content and binder properties of RAP stockpiles must be documented when recycled asphalt content greater than 20% is utilized.

RAP is not allowed for any surface mix applications.

No more than 20% RAP by weight of aggregate is allowed in any mix application.

Complete all roadways before final surface course placement, unless directed otherwise.

Ensure placement sequence to avoid excess distance of longitudinal joint lapback not to exceed one day's production rates.

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GENERAL NOTES

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The Contractor shall utilize a material transfer device per item 320 and a grade reference (such as a ski) for overlay operations. Consider subsidiary to the pertinent items.

Use a device to create a maximum 3H: 1V notched wedge joint on all hot mix joints of 2 in. or greater. Consider subsidiary to the pertinent Items.

Taper transverse faces at ends of passes as directed.

Make transverse tapers on each end of pass using a minimum slope rate of 60H:1V. Tapers shall be removed directly before placement of final lift. Consider subsidiary to the pertinent Items.

Provide a minimum transition for all side streets of at least 12 ft. and driveways of at least six (6) feet, unless otherwise shown on the plans or otherwise approved/directed.

Tack every intermediate layer, unless otherwise directed. Do not dilute tack coat. Apply it through a distributor spray bar in accordance with Article 316.3.1 Distributor.

Submit any proposed adjustments or changes to a job mix formula to the Construction Observer before production of the new job mix formula.

For Mixture Design Verification, provide the Construction Observer with two 5-gallon buckets of each aggregate stockpile to be used on the project with three gallons of each PG binder from the plant to be used on the project. Sufficient quantities of any other additives that will be used in the HMA mixture shall also be provided.

Prior to allowing production of the trial batch, the Construction Observer will use the materials provided by the Contractor to perform the following tests to verify the HMA mixture .

1. Indirect Tensile
Test in accordance with Tex-266-F
2. HAMBURG Wheel Test
in accordance with Tex-242-F
3. Overlay Test in
accordance with Tex-248-F
4. Cantabro Test in
accordance with Tex-245-F

For mixtures designed with a Texas Gyratory Compactor (TGC), the Construction Observer may require that the target laboratory molded density be raised to no more than 97.5% or may lower the design number of gyrations to no less than 35 for mixtures designed with an SGC if any of the following conditions exist:
1. The Indirect Tensile
Test results in a value greater than 200 PSI
2. The Hamburg Wheel
Test results in a value less than 3.0 mm
3. The Overlay Test
results in a value less than 100 cycles
4. The Cantabro Test
results in a value of more than 20% loss

In lieu of or in addition to evaluating the mixture design prior to allowing a trial batch to be produced, the Construction Observer may also evaluate the mixture produced during the trial batch for compliance with the four tests listed above.

Submit thermal and segregation profiles as well as longitudinal joint densities on electronic forms provided by County to the Construction Observer.

When surface irregularities, as defined in Article 341.4.9.3.3.5, "Irregularities", are detected or measured, the Contractor must take immediate corrective action defined as the removal and replacement of a full lane width of the defective area using a paver to place new mix, unless otherwise directed. If there are multiple defective areas within a sub-lot, making up to 30% of the sub-lot by area, the Construction Observer will require the entire sub-lot be removed, unless directed otherwise.

ITEM 400 - EXCAVATION AND BACKFILL FOR STRUCTURES
Cut pavements with the use of a saw as directed. Consider subsidiary to pertinent Items.

Obtain approval of all compaction equipment prior to all backfilling and embankment operations.

Use Class "B" sand bedding for pipe and box culvert installation unless otherwise directed.

ITEM 416 - DRILLED SHAFT FOUNDATIONS
Stake all Illumination Assembly Foundations, for approval, before beginning drilling operations, as directed.

Field cut holes for anchor bolts only as directed.

ITEM 432 - RIPRAP
Fibers for Concrete as defined in DMS-4550 will not be allowed.

Make 5-inches thick unless otherwise noted or directed.

Where any proposed riprap joins existing riprap, saw cut the existing riprap and dowel/epoxy the joint as directed. Consider subsidiary to the pertinent Items.

Additional riprap may be required, as determined by the Construction Observer, near the end of project completion, due to unanticipated erosion locations. Any additional, approved riprap will be paid under this Item.

Consider saw cutting of riprap as subsidiary.

Provide Class B Concrete for riprap.

Remove all loose Formwork and other Materials from the Floodplain or drainage areas, daily, which could float off in a Storm water Event, as directed.

ITEMS 460, 462, 464, 466 & 467
Place FLOWABLE FILL in areas, underneath the Roadway, where there will be less than three (3) feet of depth from top of pipe or structure to the subgrade elevation. Payment made under Item 401.

ITEM 460 - CORRUGATED METAL PIPE
Cut pipe ends, in the field, to match roadway side slopes, or as directed. Apply asphalt base aluminum paint to the cut ends.

Verify all side-road pipe lengths in the field to conform to a side slope ratio of 6H: 1V from the pipe flowline to the base crown of the side road or street.

Cut ditches to grade before laying pipe.

ITEM 462 - CONCRETE BOX CULVERTS AND DRAINS
Provide Shop Drawings, signed and sealed by a Licensed Professional Engineer, for all precast box culverts. Indicate the appropriate design load as shown on the plans LRFD and the maximum design depth of fill.

Use cohesionless backfill material of aggregate size range of 3/8 inch to 1-1/2 inch, for bedding material.

Remove all loose Formwork and other Materials from the Floodplain or drainage areas, daily, which could float off in a Storm water Event, as directed.

ITEM 466 - HEADWALLS AND WINGWALLS
Use Class C concrete for headwalls or wingwalls.

Remove all loose Formwork and other Materials from the Floodplain or drainage areas, daily, which could float off in a Storm Water Event, as directed.

ITEM 467 - SAFETY END TREATMENT
Cut pipe ends, in the field, to match roadway side slopes, or as directed. Apply asphalt base aluminum paint to the cut ends.

All Type II SET's shall have mitered pipe ends and cast-in-place riprap aprons.

Use Class C concrete.

Remove all loose Formwork and other Materials from the Floodplain or drainage areas, daily, which could float off in a Storm water Event, as directed.

ITEM 496 - REMOVING STRUCTURES
The Contractor's attention is directed to the fact that migratory birds tend to concentrate nesting on transportation structures. If migratory bird nests are present within the project limits, remove all old migratory bird nests only between September 1st and January 31st from any structure where work will be done. In addition, be prepared to prevent migratory birds from building nests between February 1 st and August 31st.

All methods used for the removal of old bird nests and the prevention of re-nesting must be approved by the Construction Observer, well in advance of the planned use.

In the event that any active nest of migratory birds is encountered on-site during project construction, all construction activity, within the immediate vicinity of the nest, will cease immediately. Contact the Construction Observer to determine how to proceed.

Provide a detailed plan for the removal of the existing structure(s) to include the schedule of removal and list of all equipment to be used.

Include a Traffic Control Plan (TCP) for any Structure(s) Removal, as directed.

The structure or structures to be removed may have surface coatings, which may contain hazardous materials. Provide for the safety and health of employees and abide by all OSHA Standards and Regulations as well as those set by Texas Department of State Health Services (DSHS).

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GENERAL NOTES

SHEET 4 OF 6

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ITEM 502 - BARRICADES, SIGNS, AND TRAFFIC HANDLING
Use Wilco Special Provision 502-WC001 (attached).

Unless otherwise approved, 1 lane in each direction shall remain open at all times.

Nighttime lane closures will be allowed from 8:00 PM to 5:00 AM, unless otherwise shown on the plans.

No Daytime Lane Closures will be allowed, unless otherwise shown on the plans or as directed by the GEC.

The GEC is the authority to approve additional lane closures, prior to any work.

Maintain a written record of documentation of "The Additional Approved Lane Closures."

Submit and secure concurrence, prior to the publication of any notices or placement of any traffic control devices for implementation of the traffic control plan, hereinafter called a Lane Closure Notice (LCN).

Present to GEC, an LCN for traffic control, which is proposed for implementation, a minimum of four (4) full working days preceding any proposed implementation date. Indicate the estimated date, time, duration, and location for the proposed work. As a part of the LCN submit a written description of the lane closure(s) depicting the proposed traffic control devices used, based on the appropriate plan sheet, TxDOT or Texas Manual on Uniform Traffic Control Devices (TMUTCD) standards, and an operational description of the work to be performed.

Present to GEC, LCN's proposed to detour traffic, a minimum of seven (7) full calendar days preceding any proposed implementation date.

Present to GEC, LCN's proposed for night work, a minimum of seven (7) full calendar days preceding any proposed implementation date.

Receive concurrence prior to LCN implementation.

Meet with the Construction Observer prior to roadway and lane closures to ensure that sufficient equipment, materials, devices, and workers will be used. Discuss contingency plans at that time. Consider inclement weather prior to implementing the lane closures.

Submit a cancellation of any lane closures, no later than noon on the day preceding the proposed work.

Coordinate Main Lane closures with adjacent projects.

Obtain prior approval for any Lane Closures of the mainlanes, which occur during peak hours. Maintain a minimum of one (1) lane open, in each direction, at all times. This includes 'full' closures of the Roadway, unless otherwise directed.

Take immediate action to modify Closures / Traffic Control, if at any time backup (roadway queuing) becomes unreasonable (greater than 20 minutes). Have in place, a contingency plan of how this will occur.

Utilize Shadow Vehicle with Truck Mounted Attenuator for setup and removal of each lane closure.

Do not set up any Lane Closure / TCP when the pavement is wet prior to the "setup," unless otherwise directed. Revise Traffic Control, when inclement weather is imminent, as directed.

Incorporate and maintain a 3H: 1V safety wedge into the proposed construction for any roadway edge of 2 inches or greater adjacent to a roadway under traffic.

Within the limits of the project, provide standard barricades, warning signs, delineators, lights, 28-inch cones, and flaggers in enough numbers and combinations, as directed.

For Mainlanes use night-work and same-night remove-and-replace operations.

No closures will be allowed on the weekends, which include the following holidays: January 1st, the last Monday in May, July 4th, the first Monday in September, the fourth Thursday in November, December 25th, Easter weekend, and the working day prior to or immediately after any of the aforementioned holidays. Unless otherwise approved, no closures will be allowed on the weekends of special events that could be impacted by the construction. Ensure all equipment, vehicles, workers, etc., associated with these closures are off the roadways and all lanes re-opened, at least, by noon of the Friday before these holidays and special events.

ITEM 529 - CONCRETE CURB, GUTTER AND COMBINED CURB AND GUTTER
Fibers for concrete as defined in DMS-4550 will not be allowed.

ITEM 530 - INTERSECTIONS, DRIVEWAYS, AND TURNOUTS
Notify property owners a minimum of 48 hours in advance of beginning work on their driveways. Provide, to GEC, a list of each notification and contact prior to each closure.

Provide access, at all times, to adjacent property. Construct driveways one-half sections, to allow access.

Do not completely close driveways for reconstruction purposes, unless a reasonable alternate access exists to the property, as approved.

Place the Flex Base for the Driveways using Ordinary Compaction.

ITEM 585 - RIDE QUALITY FOR PAVEMENT SURFACES
Use Surface Test Type B Pay Schedule 1 to evaluate ride quality of travel lanes, including service roads.

ITEM 610 - ROADWAY ILLUMINATION ASSEMBLIES
Alternate designs to RIP-11 or the use of aluminum to fabricate poles will require the submission of shop drawings.

Maintain all new and existing illumination for the duration of the contract.

All existing illumination, within the project limits, will remain operational until the last possible moment, as directed.

Place the illumination system in operation after satisfactory completion of the circuit tests. Final acceptance will not be made until the system has operated satisfactorily for a period of at least 14 consecutive days. Consider all repairs and adjustments subsidiary to pertinent Items. Pay for electrical energy during the trial period.

Inspection of all completed work provided in the Contract will be performed. The Contractor will be released from further maintenance on that project if the work is found to be satisfactory. Partial acceptance will be made and will be in no way void or alter any Items of the contract.

Removal of illumination assemblies and foundations shall be coordinated with the GEC prior to beginning removal.

Salvaged illumination assembles shall be stored in a location approved by the GEC.

ITEM 618 - CONDUIT
Use materials from prequalified material producers list as shown on the Texas Department of Transportation (TxDOT) - Construction Division's (CST) materials producers list. Category is "Roadway Illumination and Electrical Supplies."

Refer to plans and specifications for type of conduit. Waterproof and tighten all couplings and connections. Bring all proposed and existing conduit into a ground box and 'elbow' it unless otherwise shown on the plans. Provide a bushing to protect the wire from abrasion when a conduit run terminates.

Replace sections of conduit with the size and type shown on the plans in the event the existing conduit proves unusable due to location or damage.

Secure permission from the proper authority, as directed, before cutting into or removing any sidewalks or curbs for installation of this Item.

Saw cut and replace any riprap, which must be removed to install the conduit. Replace riprap with material and texture as directed.

The locations of conduit and ground boxes are diagrammatic and so shift, as directed, to accommodate field conditions.

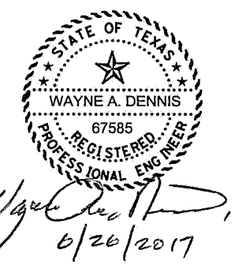
Install conduit in an area not exceeding two (2) feet in any direction from a straight line with the depth of the conduit at least two (2) feet, unless otherwise shown on the plans. Installation of the conduit by jacking or boring method will be at a depth of at least one (1) foot below the bottom of the base material of the roadway. Evidence of damage to the roadway during the jacking or boring operation will be enough grounds to stop the method being used.

Install conduit on a 2-inch sand cushion and backfill with at least six (6) inches of sand. Backfill the remainder of the trench with flexible base, soil or two-sack concrete as required by the location of the conduit or as directed.

Consider all conduit elbows and rigid metal extensions required to be installed on PVC conduit systems subsidiary.

Install a high tension, non-metallic pull rope in all conduit runs. The pull ropes are for future use. Cap all empty conduit runs using standard weather tight conduit caps as directed. Consider this work subsidiary to the pertinent Item.

Install a continuous bare or green insulated copper wire No. 8 AWG or larger in every conduit throughout the electrical system including installed loop detectors and traffic signal cables which are in conformance with the Electrical Detail Standard Sheets and the latest edition of the National Electrical Code (NEC).



BRIDGEFARMER & ASSOCIATES, INC.
CONSULTING ENGINEERS
TBPE REGISTRATION NO. 264

GEORGETOWN INNER LOOP @ CENTRAL MAINTENANCE FACILITY

GENERAL NOTES

SHEET 5 OF 6

DESIGN	GRAPHICS	CHECK	CHECK	SHEET NO.
KA	AKH	CWM	WD	13

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cwm

Placement of conduit under the existing pavement using the open trench method will not be allowed without prior approval.

Seal all conduit ends with a permanently soft, non-toxic duct seal. The dust seal must not adversely affect plastic materials or corrode metals.

Use a coring device when drilling holes through concrete structures. Do not use masonry or concrete drills, unless otherwise approved.

Structurally mounted junction boxes shall be as shown on the plans. When used for traffic signal installations, these boxes shall be 12" x 12" x 8", and shall be approved. Consider these boxes subsidiary to this Item.

Place conduit a minimum depth of 42 inches below the bottom of ties.

Existing conduit may be proposed for reuse in this project. If the existing conduit cannot be used to place or add new electrical conductors, repair or replace this conduit, as directed. Repair of the conduit will be paid as "Extra Work" on a "Force Account" basis. Probe the existing conduit when locating drill shafts so that the existing conduit's location will be known before it is needed.

When using existing conduit, ensure that all conduits have bushings and are cleaned of dirt, mud, grease, and other debris. Restrap conduit that is being relocated to new timber poles as if it were a new installation. Consider this work subsidiary to this Item.

Consider all fittings, brackets, and junction boxes necessary to complete the installations subsidiary to the pertinent Items.

ITEM 620 - ELECTRICAL CONDUCTORS
Clearly and permanently, mark "Illumination" on the Illumination Conductors installed in a Signal Mast-Arm Pole or Strain Pole. Make the marks easily visible from the hand hole.

Identify the conductors as shown on the Electrical Details Standard Sheets when two or more conductors are present in one conduit or enclosure. Use identification tag with two plastic straps. Each tag will indicate circuit number, letter, or other identification as shown on the plans.

Bond grounding conductors, which share the same conduit, junction box or structures, together at every accessible point, in accordance with the Electrical Detail Standard Sheets and the latest edition of the National Electrical Code (NEC).

All wiring will be in accordance with the National Electrical Code (NEC) and the appropriate Department standard sheets.

ITEM 644 - SMALL ROADSIDE SIGN ASSEMBLIES
Fabricate all small signs not detailed on the plans in conformance with the latest edition of the "Standard Highway Sign Designs for Texas," refer to TxDOT's website.

ITEM 662 - WORK ZONE PAVEMENT MARKINGS
Notify the Construction Observer at least 24 hours in advance of removing existing striping and placing pavement markings & markers.

Apply markings during good weather unless otherwise directed. If markings are placed at Contractor's option, when inclement weather is impending, and the markings are damaged by subsequent precipitation, the Contractor is responsible for all costs associated with replacing the markings if required.

Remove work zone pavement markings within 48 hours after permanent striping has been completed.

Foil backed pavement markings will not be allowed.

ITEM 666 - RETROREFLECTORIZED PAVEMENT MARKINGS
Reference existing channel islands, gores, and lane striping before commencing work. Provide referencing that will include a sketch of the layout to the Construction Observer. Obtain approval for placement of guidemarks from the Construction Observer before installing any permanent pavement markings. Consider subsidiary to the pertinent Items.

ITEM 672 - RAISED PAVEMENT MARKERS
Place the bituminous adhesive at a temperature range of 380°F to 390°F. Place the pavement marker on the bituminous adhesive within approximately 20 seconds after the adhesive is placed on the pavement. Ensure the pavement marker rests solely on the adhesive and not the pavement surface. Ensure that a minimum of * inch layer of bituminous adhesive remains between the pavement marker and the pavement surface.

ITEM 677 - ELIMINATING EXISTING PAVEMENT MARKINGS AND MARKERS
Remove and dispose of, off the right of way, any existing raised pavement markings before beginning surfacing operations. Remove the existing traffic buttons and pavement markers, daily, as work progresses and as directed. Consider subsidiary to the pertinent Items.

Grinding is not an acceptable method of stripe removal on final pavement surface.

Blast cleaning is required for the removal of existing pavement markings.

Black paint will not be allowed, unless otherwise directed. Acceptable methods will be sand blasting (Blasting Method) or strip sealing (Surface Treatment Method).

ITEM 730 - ROADSIDE MOWING
Perform roadside mowing along the Roadway for the length of the project, as directed. A minimum of three (3) mowing cycles will be required.

Complete spot mowing, as directed.

ITEM 734 - LITTER REMOVAL
Litter Removal, as defined below, is subsidiary to Roadside Mowing.

Complete Litter Removal Cycles along the Roadway for the length of the project, as directed.

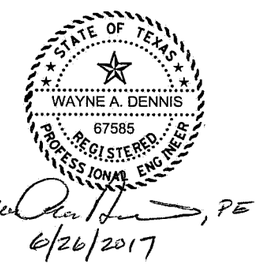
Complete Litter Removal cycles prior to any mowing cycles.

Remove all litter on the right of way, within project limits.

ITEM 738 - CLEANING AND SWEEPING HIGHWAYS
Complete cleaning and sweeping cycles at the intervals, as directed. Complete one cycle at the end of construction and prior to final acceptance by the county.

ITEM 6001 - PORTABLE CHANGEABLE MESSAGE SIGN
Provide two (2) "Electronic" Portable Changeable Message Signs (EPCMS) as part of the traffic control operations and provide another one that is available to utilize when a backup is needed. Consider the one designated for backup as subsidiary to the various Items of the project. All EPCMS will be exclusive to this project, unless otherwise approved. Placement location and message as directed.

Place appropriate number of "Electronic" Portable Changeable Message Signs (EPCMS) at locations requiring lane closures for one (1) week prior to the closures, or as directed. Obtain approval for the actual message that will appear on the boards. If more than two phases of a message are required per board, provide additional EPCMS's to meet the two-phases-per-board requirement.



BRIDGEFARMER & ASSOCIATES, INC.
CONSULTING ENGINEERS
TBPE REGISTRATION NO. 264

GEORGETOWN INNER LOOP @
CENTRAL MAINTENANCE FACILITY

GENERAL NOTES

SHEET 6 OF 6

DESIGN	GRAPHICS	CHECK	CHECK	SHEET NO.
KA	AKH	CWM	WD	1p3385

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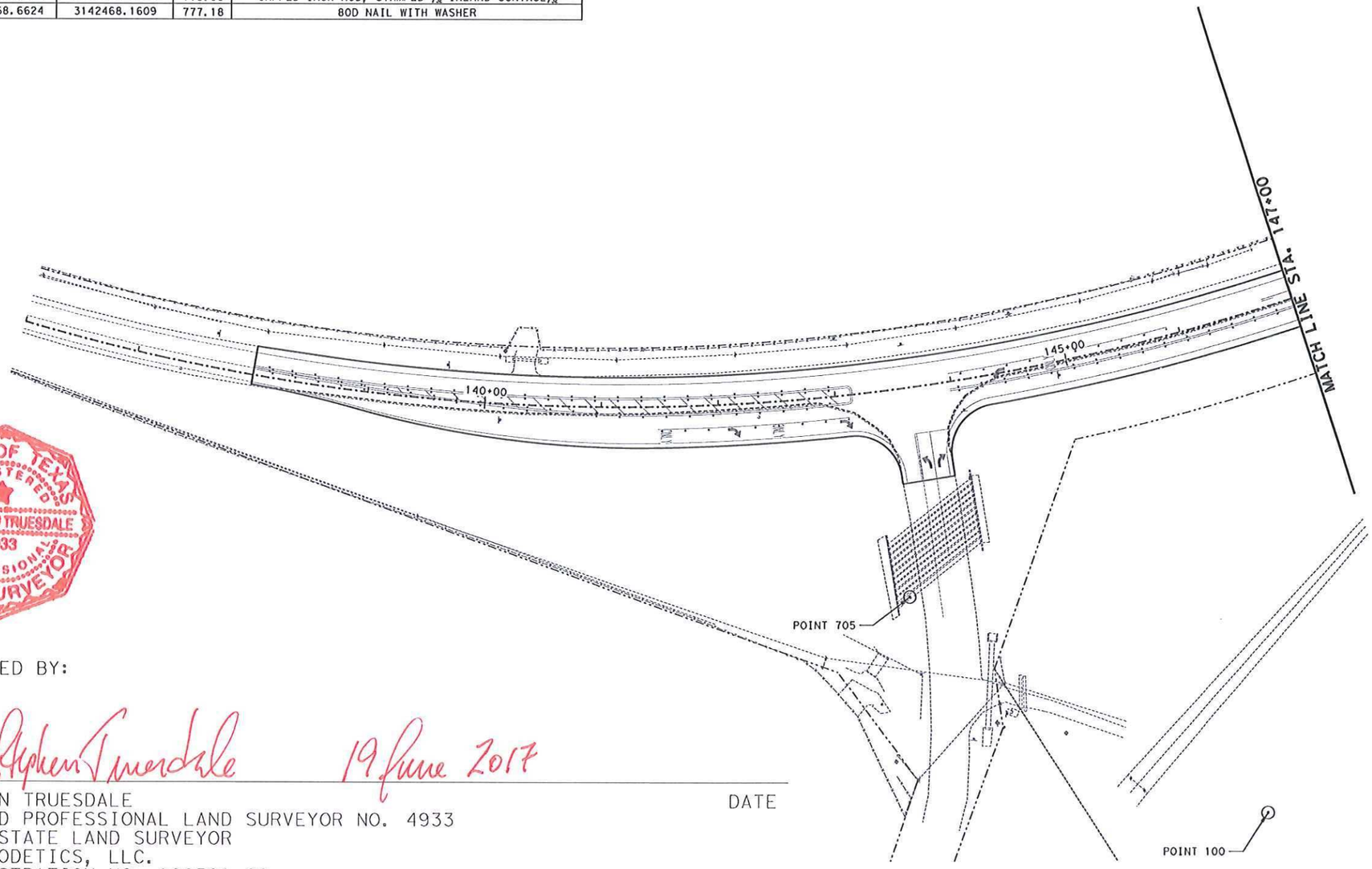
NOTES:
COORDINATES ARE SURFACE VALUES BASED ON THE TEXAS STATE PLANE COORDINATE SYSTEM, NAD 83, CENTRAL ZONE. DISTANCES ARE SURFACE DISTANCES. TO OBTAIN GRID COORDINATES AND DISTANCES, DIVIDE SURFACE VALUES BY THE COMBINED SURFACE ADJUSTMENT FACTOR OF 1.00012. ELEVATIONS REPORTED ARE ORTHOMETRIC HEIGHTS BASED ON GEOID 03.

FIELD WORK WAS PERFORMED BETWEEN 09/12/14 AND 11/18/14.

PROJECT CONTROL - HORIZONTAL AND VERTICAL VALUES				
PNT#	NORTHING	EASTING	ELEV.	DESCRIPTION
20	10202264.8889	3142749.9357	768.64	CAPPED IRON ROD, STAMPED 1/32 INLAND CONTROL1/32
100	10201227.3264	3142820.6416	778.89	CAPPED IRON ROD, STAMPED 1/32 INLAND CONTROL1/32
705	10201168.6624	3142468.1609	777.18	80D NAIL WITH WASHER

0 50 100
SCALE IN FEET



STATE OF TEXAS
REGISTERED
M. STEPHEN TRUESDALE
4933
PROFESSIONAL
LAND SURVEYOR

AS PREPARED BY:

M. Stephen Truesdale 19 June 2017

M. STEPHEN TRUESDALE DATE
REGISTERED PROFESSIONAL LAND SURVEYOR NO. 4933
LICENSED STATE LAND SURVEYOR
INLAND GEODETICS, LLC.
FIRM REGISTRATION NO: 100591-00
1504 CHISHOLM TRAIL ROAD, STE. 103
ROUND ROCK, TX 78681

NO.	REVISION	BY	DATE

WILLIAMSON COUNTY
1848

RTG RODRIGUEZ TRANSPORTATION GROUP FIRM #597

GEORGETOWN INNER LOOP
SURVEY
CONTROL

BEGIN PROJECT - STA. 147+00

6/19/2017 SHEET 1 OF 2

DESIGNED:	PROJECT NUMBER		ROADWAY	
CHECKED:			SE INNER LOOP	
DRAWN:	STATE	COUNTY	CITY	SHEET No.
CHECKED:	TEXAS	WILLIAMSON	GEORGETOWN	14

brooks
6/19/2017 2:41
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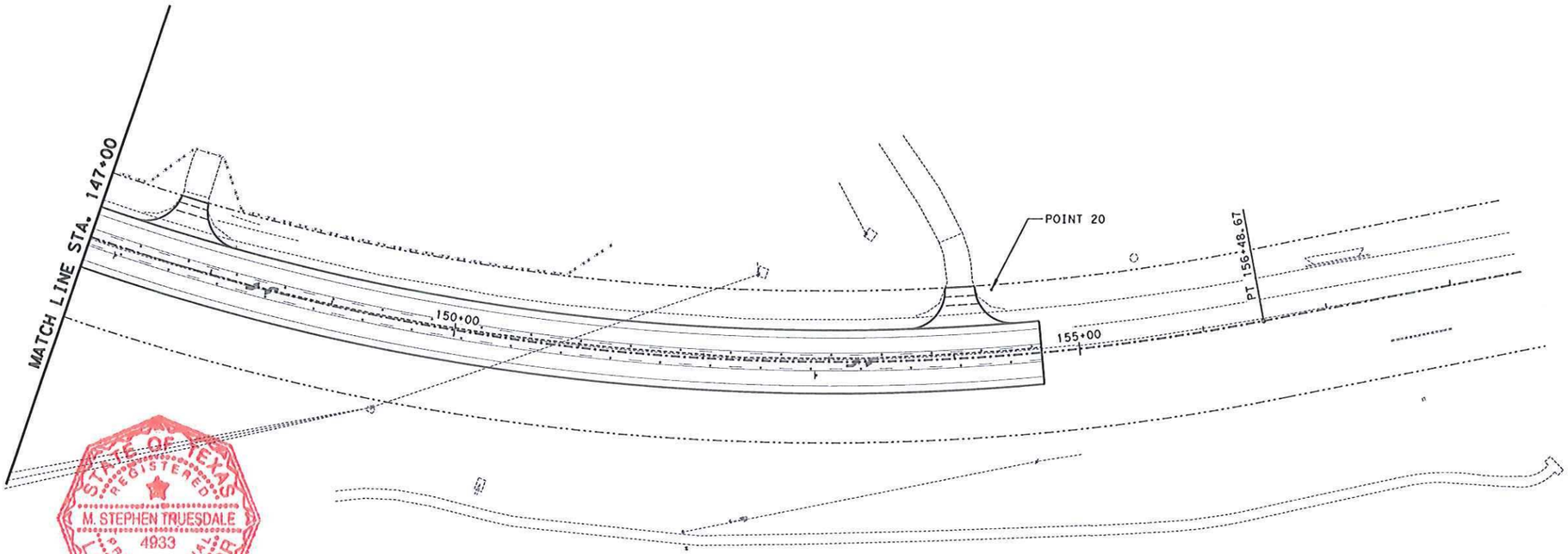
0 50 100
SCALE IN FEET

NOTES:
COORDINATES ARE SURFACE VALUES BASED ON THE TEXAS STATE PLANE COORDINATE SYSTEM, NAD 83, CENTRAL ZONE. DISTANCES ARE SURFACE DISTANCES. TO OBTAIN GRID COORDINATES AND DISTANCES, DIVIDE SURFACE VALUES BY THE COMBINED SURFACE ADJUSTMENT FACTOR OF 1.00012. ELEVATIONS REPORTED ARE ORTHOMETRIC HEIGHTS BASED ON GEOID 03.

FIELD WORK WAS PERFORMED BETWEEN 09/12/14 AND 11/18/14.

PROJECT CONTROL - HORIZONTAL AND VERTICAL VALUES				
PNT#	NORTHING	EASTING	ELEV.	DESCRIPTION
20	10202264.8889	3142749.9357	768.64	CAPPED IRON ROD, STAMPED 7/32 INLAND CONTROL 5/32
100	10201227.3264	3142820.6416	778.89	CAPPED IRON ROD, STAMPED 7/32 INLAND CONTROL 5/32
705	10201168.6624	3142468.1609	777.18	80D NAIL WITH WASHER



STATE OF TEXAS
REGISTERED
M. STEPHEN TRUESDALE
4933
PROFESSIONAL
LAND SURVEYOR

AS PREPARED BY:

M. Stephen Truesdale 19 June 2017

M. STEPHEN TRUESDALE DATE
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INLAND GEODETICS, LLC.
FIRM REGISTRATION NO: 100591-00
1504 CHISHOLM TRAIL ROAD, STE. 103
ROUND ROCK, TX 78681

NO.	REVISION	BY	DATE

WILLIAMSON COUNTY
1848

RTG RODRIGUEZ TRANSPORTATION GROUP FIRM #597

GEORGETOWN INNER LOOP
SURVEY
CONTROL
STA. 147+00 - STA. 154+70

6/19/2017 SHEET 2 OF 2

DESIGNED:	PROJECT NUMBER		ROADWAY	
CHECKED:			SE INNER LOOP	
DRAWN:	STATE	COUNTY	CITY	SHEET No.
CHECKED:	TEXAS	WILLIAMSON	GEORGETOWN	15

jbrooks
6/19/2017 2:42
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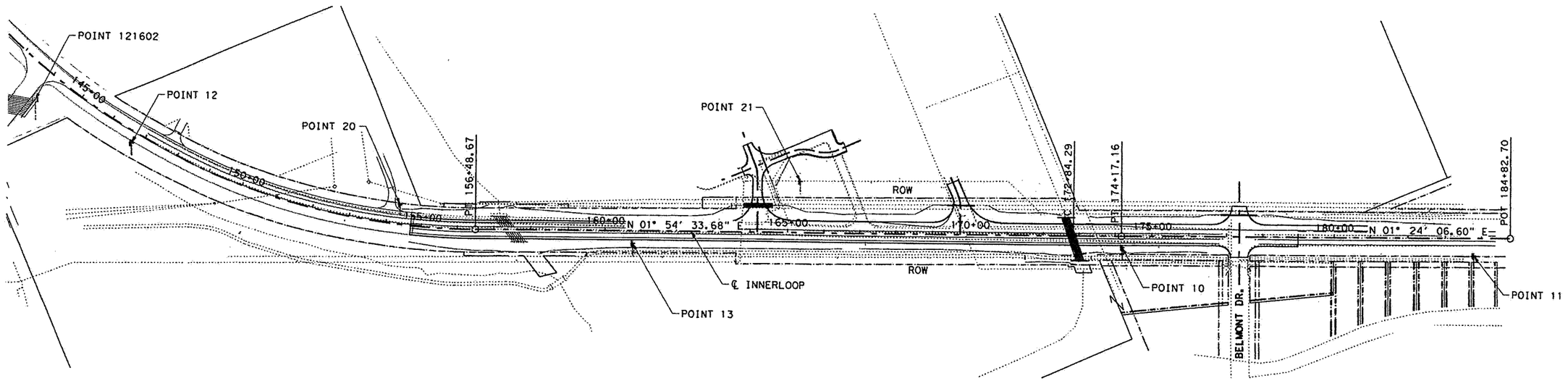
SCALE: 1" = 300'



NOTES:

1. ALL PROJECT COORDINATES ARE BASED ON THE TEXAS STATE PLANE COORDINATE SYSTEM, CENTRAL ZONE, NAD 83 HARN(93)/NAVD 88. ALL COORDINATES SHOWN HEREON ARE ADJUSTED TO SURFACE BY MULTIPLYING BY A COMBINED ADJUSTMENT FACTOR OF 1.00012. UNITS: U.S. SURVEY FEET.

2. FIELD COLLECTION WAS PERFORMED 11-17-2014 THRU 12-03-14

3. THIS BASE MAP IS FOR ENGINEERING DESIGN PURPOSES ONLY AND IS NOT INTENDED TO BE A BOUNDARY SURVEY. BOUNDARY LINES, ROW AND EASEMENTS ARE APPROXIMATE ONLY. NO REASERCH WAS PERFORMED.

4. THE UNDERGROUND WATER AND UNDERGROUND SANITARY SEWER LINES SHOWN HERON ARE TAKEN FROM .SHP FILES PROVIDED TO SAM BY THE CITY OF GEORGETOWN AND WERE NOT LOCATED IN THE FIELD.

5. ONE CALL TICKETS WERE SUBMITED ON 11-17-2014 BEFORE THE FIELD SURVEY WAS PERFORMED. ONLY UNDERGROUND UTILITIES THAT WERE MARKED AT THE TIME OF SURVEY WERE LOCATED (TICKET NO. 1482190932).

6. PERFORMING A SITE CALIBRATION/LOCALIZATION SHOULD ALWAYS BE DONE WHEN UTILIZING THE CONTROL SHOWN HEREON

SURVEY PROVIDED BY
SAM, LLC

SAM
SURVEYING · AERIAL MAPPING · ENGINEERING

4801 Southwest Parkway
Building Two, Suite 100
Austin, Texas 78735
(512) 447-0575
Fax.: (512) 326-3029

Texas Firm Registration No. 10064300

PROJECT CONTROL- HORIZONTAL AND VERTICAL VALUES

CENTRAL ZONE GRID VALUES

PNT#	NORTHING	EASTING	ELEV.	DESCRIPTION
10	10203015.116	3142533.656	767.183'	CP-5/8"IRS-W/PCAP
11	10203974.426	3142574.123	760.840'	CP-5/8"IRS-W/PCAP
12	10200311.506	3142187.769	772.676'	CP-5/8"IRS-W/PCAP
13	10201674.354	3142493.968	767.821'	CP-5/8"IRS-W/PCAP
* 20	10201040.764	3142372.851	768.580'	CP-IRFC-IG-LVL
* 21	10202134.551	3142336.160	772.060'	CP-IRFC-IG-LVL
* 121602	10200054.913	3142065.041	776.340'	WILCO-MON-2001-06-LVL

PROJECT CONTROL- HORIZONTAL AND VERTICAL VALUES

CENTRAL ZONE SURFACE VALUES

PNT#	NORTHING	EASTING	ELEV.	DESCRIPTION
10	10204239.48	3142910.76	767.18'	CP-5/8"IRS-W/PCAP
11	10205198.90	3142951.23	760.84'	CP-5/8"IRS-W/PCAP
12	10201535.54	3142564.83	772.68'	CP-5/8"IRS-W/PCAP
13	10202898.55	3142871.07	767.82'	CP-5/8"IRS-W/PCAP
* 20	10202264.89	3142749.94	768.58'	CP-IRFC-IC-LVL
* 21	10203358.81	3142713.24	772.06'	CP-IRFC-IG-LVL
* 121602	10201278.92	3142442.09	776.34'	WILCO-MON-2001-06-LVL

* NOTE POINT VALUES WERE TAKEN FROM PREVIOUSLY ESTABLISHED CONTROL SET BY INLAND RTG. POINTS 20-21 AND 121602 WERE HELD TO DERIVE THE COORDINATES OF POINTS 20-21 AND 121602.

STATE OF TEXAS
REGISTERED
JOE D. WEBBER JR.
4552
PROFESSIONAL
LAND SURVEYOR
1-14-16

BRIDGEFARMER & ASSOCIATES, INC.
CONSULTING ENGINEERS
TBPE REGISTRATION NO. 264

GEORGETOWN INNER LOOP
CENTRAL MAINTENANCE FACILITY

SURVEY CONTROL

SCALE: 1" = 300' SHEET 1 OF 1

DESIGN	GRAPHICS	CHECK	CHECK	SHEET NO.
CWM	AKH	CWM	WD	16

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REMOVAL SUMMARY

LOCATION	104 6017 REMOVING CONC (DRIVEWAYS)	105 6036✳ REMOVING STAB BASE & ASPH PAV(15" -20")	354 6021 PLANE ASPH CONC PAV(0" TO 2")	644 6076 REMOVE SM RD SN SUP&AM
	SY	SY	SY	EA
SHEET 1 OF 4	0	61	180	1
SHEET 2 OF 4	5	342	240	3
SHEET 3 OF 4	99	632	0	1
SHEET 4 OF 4	93	141	0	0
PROJECT TOTAL	**197**	**1176**	**420**	**5**

✳ FOR CONTRACTORS INFORMATION ONLY

DRAINAGE SUMMARY

PLAN SHEET	464 6025 RC PIPE (CL V)(18 IN)	467 6363 SET (TY II) (18 IN) (RCP) (6: 1) (P)
	LF	EA
DRIVEWAY DETAILS 1 OF 1	273	12
PROJECT TOTAL	**273**	**12**

EARTHWORK SUMMARY

STATION	110 6001 EXCAVATION (ROADWAY)	132 6003 EMBANKMENT (FINAL)(ORD COMP)(TY B)
	CY	CY
138+00.00	0	0
138+50.00	17	7
139+00.00	19	12
139+50.00	28	17
140+00.00	30	18
140+50.00	32	16
141+00.00	33	13
141+50.00	41	7
142+00.00	55	3
142+50.00	59	3
143+00.00	39	13
143+50.00	18	12
144+00.00	19	1
144+50.00	27	16
145+00.00	30	46
145+50.00	27	68
146+00.00	28	86
146+50.00	30	99
147+00.00	32	97
147+50.00	49	93
148+00.00	61	90
148+50.00	54	84
149+00.00	49	85
149+50.00	47	94
150+00.00	45	101
150+50.00	44	105
151+00.00	46	101
151+50.00	45	102
152+00.00	40	122
152+50.00	38	134
153+00.00	38	133
153+50.00	39	130
154+00.00	54	136
154+50.00	70	156
154+70.00	27	66
PROJECT TOTAL	**1310**	**2266**

ROADWAY SUMMARY

PLAN SHEET	100 6002 PREPARING ROW	247 6044 FL BS (CMP IN PLC)(TY A GR 4)(FNAL POS)	310 6001 PRIME COAT (MULTI OPTION)	316 6193 AGGR(TY-D GR -5 SAC-B)	316 6413 ASPH(AC-15P, HFRS-2P OR CRS-2P)	341 6008 D-GR HMA TY -B PG64-22	341 6027 D-GR HMA TY -C SAC-B PG70-22	341 6066 D-GR HMA TY -C PG70-22 (LEVEL-UP)	530 6004 DRIVEWAYS (CONC)
	STA	CY	GAL	CY	GAL	TON	TON	TON	SY
SHEET 1 OF 2	9.0	606	428	49	2135	363	640	50	
SHEET 2 OF 2	7.7	676	479	38	1658	408	497	412	241
PROJECT TOTAL	**16.7**	**1282**	**907**	**87**	**3793**	**771**	**1137**	**462**	**241**

SMALL SIGNS, DELINEATORS AND PAVEMENT MARKINGS SUMMARY

PLAN SHEET	0644 6056 IN SM RD SN SUP&AM TYTWT (1)UA(P)	644 6071 RELOCATE SM RD SN SUP&AM TY TWT	658 6047 INSTL OM ASSM (OM-2Y) (WC)GND	666 6036 REFL PAV MRK TY I (W)8" (SLD) (100MIL)	666 6048 REFL PAV MRK TY I (W)24" (SLD) (100MIL)	666 6054 REFL PAV MRK TY I (W) (ARROW) (100MIL)	666 6078 REFL PAV MRK TY I (W) (WORD) (100MIL)	666 6141 REFL PAV MRK TY I (Y)12" (SLD) (100MIL)	666 6170 REFL PAV MRK TY II (W) 4" (SLD)	666 6178 REFL PAV MRK TY II (W) 8" (SLD)
	EA	EA	EA	LF	LF	EA	EA	LF	LF	LF
SHEET 1 OF 2	4	2	2	395	31	5	3	308	1841	395
SHEET 2 OF 2	2		4			4	0		1540	
PROJECT TOTAL	**6**	**2**	**6**	**395**	**31**	**9**	**3**	**308**	**3381**	**395**

SMALL SIGNS, DELINEATORS AND PAVEMENT MARKINGS SUMMARY

PLAN SHEET	666 6182 REFL PAV MRK TY II (W) 24" (SLD)	666 6184 REFL PAV MRK TY II (W) (ARROW)	666 6192 REFL PAV MRK TY II (W) (WORD)	666 6205 REFL PAV MRK TY II (Y) 4" (BRK)	666 6207 REFL PAV MRK TY II (Y) 4" (SLD)	666 6212 REFL PAV MRK TY II (Y) 12" (SLD)	666 6303 RE PM W/RET REQ TY I (W)4"(SLD) (100MIL)	666 6312 RE PM W/RET REQ TY I (Y)4"(BRK) (100MIL)	666 6315 RE PM W/RET REQ TY I (Y)4"(SLD) (100MIL)	672 6007 REFL PAV MRKR TY I-C	672 6009 REFL PAV MRKR TY II-A-A
	LF	EA	EA	LF	LF	LF	LF	LF	LF	EA	EA
SHEET 1 OF 2	31	5	3	10	2761	308	1841	10	2761	19	132
SHEET 2 OF 2		4		390	1540		1540	390	1540		40
PROJECT TOTAL	**31**	**9**	**3**	**400**	**4301**	**308**	**3381**	**400**	**4301**	**19**	**172**

EROSION CONTROL SUMMARY

PLAN SHEET	160 WC02 FURNISHING AND PLACING TOPSOIL (4")	161 WC001 EROSION CONTROL COMPOST (3")	162 WC103 MULCH TOPDRESSING (5")	164 WC04 SEEDING FOR EROSION CONTROL (TY 4)	164 WC05 SEEDING FOR EROSION CONTROL (TY 5)	164 WC10 SEEDING FOR EROSION CONTROL (TY 10)	168 WC01 VEGETATIVE WATERING	506 6002 ROCK FILTER DAMS (INSTALL) (TY 2)	506 6011 ROCK FILTER DAMS (REMOVE)	506 6020 CONSTRUCTION EXITS (INSTALL) (TY 1)	506 6024 CONSTRUCTION EXITS (REMOVE)	506 6038 TEMP SEDMT CONT FENCE (INSTALL)	506 6039 TEMP SEDMT CONT FENCE (REMOVE)
	SY	SY	SY	SY	SY	SY	MG	LF	LF	SY	SY	LF	LF
SHEET 1 OF 2	3885	971	971	971	971	1943	58	50	50	78	78	990	990
SHEET 2 OF 2	4841	1210	1210	1210	1210	2421	73	20	20	78	78	1559	1559
PROJECT TOTAL	**8726**	**2181**	**2181**	**2181**	**2181**	**4364**	**131**	**70**	**70**	**156**	**156**	**2549**	**2549**

NO.	REVISION	BY	DATE

WILLIAMSON COUNTY 1848

RTG RODRIGUEZ TRANSPORTATION GROUP FIRM #587

GEORGETOWN INNER LOOP

SUMMARY OF QUANTITIES

6/27/2017 SHEET 1 OF 1

DESIGNED:	PROJECT NUMBER		ROADWAY	
CHECKED:			SE INNER LOOP	
DRAWN:	STATE	COUNTY	CITY	SHEET No.
CHECKED:	TEXAS	WILLIAMSON	GEORGETOWN	17

brooks 6/27/2017 2:31 p:\rtg-pw.bentley.com:rtg-pw\Documents\8760101\dlv\planShts\general\GIL*SUMMARY*01-C.dgn

SUMMARY OF WKZONE ITEMS

LOCATION	400 6006	403 6001	502 6001	508 6001	512 6009	512 6010	512 6033	512 6034	512 6057	512 6058	662 6004	662 6012	662 6014	662 6034	662 6063	662 6095	677 6001	6001 6001
	CUT & RESTORING PAV	TEMPORARY SPL SHORING	BARRICADES, SIGNS AND TRAFFIC HANDLING	CONSTRUCTING DETOURS	PORT CTB (FUR & INST) (LOW PROF) (TY 1)	PORT CTB (FUR & INST) (LOW PROF) (TY 2)	PORT CTB (MOVE) (LOW PROF) (TY 1)	PORT CTB (MOVE) (LOW PROF) (TY 2)	PORT CTB (REMOVE) (LOW PROF) (TY 1)	PORT CTB (REMOVE) (LOW PROF) (TY 2)	WK ZN PAV MRK NON-REMOV (W)4" (SLD)	WK ZN PAV MRK NON-REMOV (W)8" (SLD)	WK ZN PAV MRK NON-REMOV (W)12" (SLD)	WK ZN PAV MRK NON-REMOV (Y)4" (SLD)	WK ZN PAV MRK REMOV (W)4" (SLD)	WK ZN PAV MRK REMOV (Y)4" (SLD)	ELIM EXT PAV MRK & MRKS (4")	PORTABLE CHANGEABLE MESSAGE SIGN
	SY	SF	MO	SY	LF	LF	LF	LF	LF	LF	LF	LF	LF	LF	LF	LF	LF	DAY
			6															30
PHASE 1 STAGE 1 - SHEET 1 OF 3				305														
PHASE 1 STAGE 1 - SHEET 2 OF 3				176														
PHASE 1 STAGE 1 - SHEET 3 OF 3															774	909	1652	
PHASE 1 STAGE 2 - SHEET 1 OF 5															2289	2042	4333	
PHASE 1 STAGE 2 - SHEET 2 OF 5															2388	2388	3950	
PHASE 1 STAGE 2 - SHEET 3 OF 5	45														2003	2003	2277	
PHASE 1 STAGE 2 - SHEET 4 OF 5		300			390	20			280						866	1335	4276	
PHASE 1 STAGE 2 - SHEET 5 OF 5		65			70	20												
PHASE 2 STAGE 1 - SHEET 1 OF 4											2688	168		3583				
PHASE 2 STAGE 1 - SHEET 2 OF 4											2390			2949				
PHASE 2 STAGE 1 - SHEET 3 OF 4		300					85	20	85	20	2000			2000				
PHASE 2 STAGE 1 - SHEET 4 OF 4		65					95	20	95	20	1200			1200	724	980		
PHASE 2 STAGE 2 - SHEET 1 OF 3																		
PHASE 2 STAGE 2 - SHEET 2 OF 3											217	217	20					
PHASE 2 STAGE 2 - SHEET 3 OF 3											280	202						
PROJECT TOTALS	45	730	6	481	460	40	180	40	460	40	8775	587	20	9732	9044	9657	16488	30

BRIDGEFARMER & ASSOCIATES, INC.
CONSULTING ENGINEERS
TBPE REGISTRATION NO. 264

GEORGETOWN INNER LOOP @
CENTRAL MAINTENANCE FACILITY

SUMMARY OF WORK ZONE

SHEET 1 OF 1

DESIGN	GRAPHICS	CHECK	CHECK	SHEET NO.
KA	AKH	CWM	WD	18

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SUMMARY OF REMOVAL ITEMS

LOCATION	104 6009	104 6015	104 6017	104 6022	* 105 6036	* 496 6004	* 496 6005	* 496 6006	496 6007	496 6008	496 6045	610 6007	644 6076
	REMOVING CONC (RIPRAP)	REMOVING CONC (SIDEWALKS)	REMOVING CONC (DRIVEWAYS)	REMOVING CONC (CURB AND GUTTER)	REMOVING STAB BASE & ASPH PAV (15"-20")	REMOV STR (SET)	REMOV STR (WINGWALL)	REMOV STR (HEADWALL)	REMOV STR (PIPE)	REMOV STR (BOX CULVERT)	REMOV STR (FLAG POLE)	REMOVE RD IL ASM (SHOE-BASE)	REMOVE SM RD SN SUP&AM
	SY	SY	SY	LF	SY	EA	EA	EA	LF	LF	EA	EA	EA
SHEET 1 OF 3					464			2					
SHEET 2 OF 3	492	271	195	116	3361	2	2		457	18	1	2	5
SHEET 3 OF 3	19	30			179		2	2					3
PROJECT TOTALS	511	301	195	116	4004	2	4	4	457	18	1	2	8

* FOR CONTRACTORS INFORMATION ONLY, SUBSIDIARY TO OTHER ITEMS

BRIDGEFARMER & ASSOCIATES, INC.
CONSULTING ENGINEERS
TBPE REGISTRATION NO. 264

GEORGETOWN INNER LOOP @
CENTRAL MAINTENANCE FACILITY

SUMMARY OF REMOVALS

SHEET 1 OF 1

DESIGN	GRAPHICS	CHECK	CHECK	SHEET NO.
KA	AKH	CWM	WD	19

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SUMMARY OF ROADWAY ITEMS

LOCATION	100 6002	110 6001	132 6003	247 6044	310 6001	316 6193	316 6413	341 6008	341 6027	351 6011	432 6002	450 6048	529 6008	529 6030	530 6004	530 6005	531 6003	531 6005	618 6033	624 6010
	PREPARING ROW	EXCAVATION (ROADWAY)	EMBANKMENT (FINAL) (ORD COMP) (TY B)	FL BS (CMP IN PLC) (TY A GR 4) (FNAL POS)	PRIME COAT (MULTI OPTION)	AGGR (TY-D GR-5 SAC-B)	ASPH (AC-15P, HFRS-2P OR CRS-2P)	D-GR HMA TY-B PG64-22	D-GR HMA TY-C SAC-B PG70-22	FLEXIBLE PAVEMENT STRUCTURE REPAIR(18")	RIPRAP (CONC) (5 IN)	RAIL (HANDRAIL) (TY B)	CONC CURB & GUTTER (TY II)	CONC CURB & GUTTER (VALLEY GUTTER)	DRIVEWAYS (CONC)	DRIVEWAYS (ACP)	CONC SIDEWALKS (6")	CURB RAMPS (TY 2)	CONDT (PVC) (SCH 40) (4")	GROUND BOX TY D (162922) W/APRON
	STA	CY	CY	CY	GAL	CY	GAL	TON	TON	SY	CY	LF	LF	LF	SY	SY	SY	EA	LF	EA
MAINLANE SHEET 1 OF 3	9	2152	1173	861	461	13	538	577	536	594	177	80					539			
MAINLANE SHEET 2 OF 3	10	3451	935	1148	616	17	718	770	730	750	178	144	162	1498	1190	3122	857	1	78	2
MAINLANE SHEET 3 OF 3	10	1256	457	758	402	11	457	497	764	842	191	31		254	370		442			
PROJECT TOTALS	29	6859	2564	2767	1480	42	1713	1844	2030	2186	546	255	162	1752	1560	3122	1838	1	78	2

NOTE: QUALITY SPOIL MATERIAL CAN BE STOCKPILED FOR FUTURE USE AT A COUNTY SITE WITHIN 5 MILES OF PROJECT LOCATION. COORDINATE WITH CONSTRUCTION OBSERVER.

BRIDGEFARMER & ASSOCIATES, INC.
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GEORGETOWN INNER LOOP @ CENTRAL MAINTENANCE FACILITY

SUMMARY OF ROADWAY

SHEET 1 OF 1

DESIGN	GRAPHICS	CHECK	CHECK	SHEET NO.
KA	AKH	CWM	WD	20

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cwm

EARTHWORK SHOWN ON THIS SHEET
IS FOR CONTRACTORS INFORMATION ONLY

INNERLOOP EARTHWORK		
	Excavation	Embankment
STA	CY	CY
154+70.00		
155+00.00	58	79
155+50.00	96	148
156+00.00	98	150
156+50.00	100	156
157+00.00	78	181
157+20.00	23	61
157+38.42	26	59
157+50.00	19	47
157+80.00	48	92
158+00.00	32	38
158+50.00	103	48
159+00.00	115	15
159+50.00	103	19
160+00.00	113	25
160+50.00	138	19
161+00.00	168	10
161+50.00	196	7
162+00.00	211	6
162+50.00	208	5
163+00.00	220	6
163+50.00	278	6
164+00.00	235	31
164+17.00	50	18
164+50.00	96	18
165+00.00	209	5
165+50.00	251	5
166+00.00	230	2
166+50.00	202	2
167+00.00	184	3
167+50.00	196	2
168+00.00	202	0
168+50.00	202	0
169+00.00	197	1
169+50.00	139	103
169+75.00	46	107
170+00.00	47	98
170+50.00	122	109
171+00.00	139	32
171+50.00	131	33
172+00.00	128	54

INNERLOOP EARTHWORK		
	Excavation	Embankment
STA	CY	CY
172+50.00	91	133
172+77.93	38	102
172+87.00	17	26
173+00.00	22	42
173+20.00	36	61
173+50.00	54	38
174+00.00	71	8
174+50.00	89	4
175+00.00	97	2
175+50.00	106	1
176+00.00	116	0
176+50.00	110	2
177+00.00	68	33
177+35.14	23	55
177+50.00	10	29
178+00.00	52	58
178+50.00	64	18
179+00.00	62	19
179+50.00	57	23
180+00.00	44	24
180+50.00	38	24
181+00.00	37	22
181+50.00	36	15
182+00.00	32	11
182+50.00	27	9
183+00.00	22	4
183+14.84	5	0
TOTAL	6859	2564

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BRIDGEFARMER & ASSOCIATES, INC.
CONSULTING ENGINEERS
TBPE REGISTRATION NO. 264

GEORGETOWN INNER LOOP @
CENTRAL MAINTENANCE FACILITY

SUMMARY OF EARTHWORK

SHEET 1 OF 1

DESIGN	GRAPHICS	CHECK	CHECK	SHEET NO.
KA	AKH	CWM	WD	21

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SUMMARY OF DRAINAGE ITEMS

LOCATION	401 6001	432 6002	460 6012	462 6006	462 6007	464 6003	464 6005	464 6025	464 6026	466 6178	466 6179	467 6358	467 6359	467 6363	467 6391	467 6395	467 6559
	FLOWABLE BACKFILL	RIPRAP (CONC) (5 IN)	CMP AR (GAL STL DES 5)	CONC BOX CULV (5 FT X 2 FT)	CONC BOX CULV (5 FT X 3 FT)	RC PIPE (CL III) (18 IN)	RC PIPE (CL III) (24 IN)	RC PIPE (CL V) (18 IN)	RC PIPE (CL V) (24 IN)	WINGWALL (PW - 1) (HW=3 FT)	WINGWALL (PW - 1) (HW=4 FT)	SET (TY II) (18 IN) (RCP) (4: 1) (C)	SET (TY II) (18 IN) (RCP) (4: 1) (P)	SET (TY II) (18 IN) (RCP) (6: 1) (P)	SET (TY II) (24 IN) (RCP) (4: 1) (P)	SET (TY II) (24 IN) (RCP) (6: 1) (P)	SET (TY II) (DES 5) (CMP) (6: 1) (C)
	CY	CY	LF	LF	LF	LF	LF	LF	LF	EA	EA	EA	EA	EA	EA	EA	EA
CULVERT 1	40.8	12	93														14
CULVERT 2		10.5		731							2						
CULVERT 3				8						2							
SDWK CULVERT 1					24						2						
DRAINAGE SHEET 1 OF 3																	
DRAINAGE SHEET 2 OF 3	94.3	19.6				128	74	76	234			2	3	2	3	5	
DRAINAGE SHEET 3 OF 3	19	4.3				129							1	2			
PROJECT TOTALS	154.1	46.4	93	739	24	257	74	76	234	2	4	2	4	4	3	5	14

BRIDGEFARMER & ASSOCIATES, INC.
CONSULTING ENGINEERS
TBPE REGISTRATION NO. 264

GEORGETOWN INNER LOOP @
CENTRAL MAINTENANCE FACILITY

SUMMARY OF DRAINAGE

SHEET 1 OF 1

DESIGN	GRAPHICS	CHECK	CHECK	SHEET NO.
KA	AKH	CWM	WD	22

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SUMMARY OF PVMRK ITEMS

LOCATION	618 6033	618 6034	624 6010	658 6047	666 6036	666 6042	666 6048	666 6054	666 6078	666 6170	666 6174	666 6178	666 6180	666 6182	666 6184	666 6192	666 6205	666 6207	666 6303	666 6309	666 6312
	CONDT (PVC) (SCH 40) (4")	CONDT (PVC) (SCH 40) (4") (BORE)	GROUND BOX TY D (162922) W/APRON	INSTL OM ASSM (OM-2Y) (WC) GND	REFL PAV MRK TY I (W) 8" (SLD) (100MIL)	REFL PAV MRK TY I (W) 12" (SLD) (100MIL)	REFL PAV MRK TY I (W) 24" (SLD) (100MIL)	REFL PAV MRK TY I (W) (ARROW) (100MIL)	REFL PAV MRK TY I (W) (WORD) (100MIL)	REFL PAV MRK TY II (W) 4" (SLD)	REFL PAV MRK TY II (W) 6" (SLD)	REFL PAV MRK TY II (W) 8" (SLD)	REFL PAV MRK TY II (W) 12" (SLD)	REFL PAV MRK TY II (W) 24" (SLD)	REFL PAV MRK TY II (W) (ARROW)	REFL PAV MRK TY II (W) (WORD)	REFL PAV MRK TY II (Y) 4" (BRK)	REFL PAV MRK TY II (Y) 4" (SLD)	RE PM W/RET REQ TY I (W) 4" (SLD) (100MIL)	RE PM W/RET REQ TY I (W) 6" (SLD) (100MIL)	RE PM W/RET REQ TY I (Y) 4" (BRK) (100MIL)
	LF	LF	EA	EA	LF	LF	LF	EA	EA	LF	LF	LF	LF	LF	EA	EA	LF	LF	LF	LF	LF
SHEET 1 OF 3				4				2		1660					2		415	1660	1660		415
SHEET 2 OF 3				11	471	295	67	7	3	2452	46	471	295	67	7	3	614	2489	2452	46	614
SHEET 3 OF 3	291	104	4	4	339	362	23	7	3	2178		339	362	23	7	3	437	2133	2178		437
PROJECT TOTALS	291	104	4	19	810	657	90	16	6	6290	46	810	657	90	16	6	1466	6282	6290	46	1466

SUMMARY OF PVMRK ITEMS

LOCATION	666 6315	668 6055	672 6007	672 6009
	RE PM W/RET REQ TY I (Y) 4" (SLD) (100MIL)	PRE PM TY B (ACC PRK) (BL& WH) (W/BOR DR) LG	REFL PAV MRKR TY I-C	REFL PAV MRKR TY II-A-A
	LF	EA	EA	EA
SHEET 1 OF 3	1660			43
SHEET 2 OF 3	2489	2	39	62
SHEET 3 OF 3	2133		46	80
PROJECT TOTALS	6282	2	85	185

SUMMARY OF SIGNING ITEMS

LOCATION	636 6001	644 6060	644 6070
	ALUMINUM SIGNS (TY A)	IN SM RD SN SUP&AM TYTWT (1) WS (P)	RELOCATE SM RD SN SUP&AM TY S80
	SF	EA	EA
SHEET 1 OF 3	13.5	2	
SHEET 2 OF 3	55.3	8	1
SHEET 3 OF 3	19.5	3	1
PROJECT TOTALS	88.3	13	2

BRIDGEFARMER & ASSOCIATES, INC.
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TBPE REGISTRATION NO. 264

GEORGETOWN INNER LOOP @ CENTRAL MAINTENANCE FACILITY

SUMMARY OF SIGNING AND PAVEMENT MARKINGS

SHEET 1 OF 1

DESIGN	GRAPHICS	CHECK	CHECK	SHEET NO.
KA	AKH	CWM	WD	23

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InnerLoop: SIGNS INVENTORY

SUMMARY OF SMALL SIGNS

SM RD SGN ASSM TY XXXXX (X) XX (X - XXXX)

PLAN SHEET NO.	SIGN NO.	SIGN NOMENCLATURE	SIGN TEXT	SIGN DIMENSION (IN. X IN.)			ALUMINUM TYPE A	ALUMINUM TYPE G	Post Type (FRP = Fiberglass, TWT = Thin-Wall, 10BWG = 10BWG, S80 = Sch 80)	Posts (1 or 2)	Anchor Type (UA = Univer-Conc, UB = Univer-Bolt, SA = Slip-Conc, SB = Slip-Bolt, WS = Wedge Steel, WP = Wedge Plastic)	Mounting Designation: P = Prefab. "Plain", T = Prefab. "T", U = Prefab. "U"	Mounting Designation: 1EXT or 2EXT = # of Ext. BM = Extruded Wind Beam EXAL = Extruded Alum. Signs WC = 1.12 #/ft Wing Chan.
1 OF 3	1	R3-9b	Two-Way Left Turn Only	24	X	36	X		TWT	1	WS	P	
	2	R2-1	SPEED LIMIT	30	X	36	X		TWT	1	WS	P	
2 OF 3	2	R1-1	STOP	36	X	36	X		TWT	1	WS	P	
	3	R1-1	STOP	36	X	36	X		TWT	1	WS	P	
	4	R1-1	STOP	36	X	36	X		TWT	1	WS	P	
	5	D1-3	Sheriff's Dept. Impound Yard	48	X	24	X		TWT	1	WS	P	
	6	D1-3	Sheriff's Dept. Impound Yard	48	X	24	X		TWT	1	WS	P	
	7	D1-3	Impound Yard	30	X	42	X		TWT	1	WS	P	
	8	R7-8T	RESERVED PARKING	12	X	18	X		TWT	1	WS	P	
		R7-8P	VAN ACCESSIBLE	12	X	6	X		TWT				
	9	R7-8T	RESERVED PARKING	12	X	18	X		TWT	1	WS	P	
		R7-8P	VAN ACCESSIBLE	12	X	6	X		TWT				
3 OF 3	1	R2-1	SPEED LIMIT	30	X	36	X		TWT	1	WS	P	
	2	R3-9b	Two-Way Left Turn Only	24	X	36	X		TWT	1	WS	P	
	3	R3-9b	Two-Way Left Turn Only	24	X	36	X		TWT	1	WS	P	

ALUMINUM SIGN BLANKS (TYPE A)

Square Ft.	Min. Thickness
Less than 7.5	0.080"
7.5 to 15	0.100"
Greater than 15	0.125"

Sign supports shall be located as shown on the plans, except that the Engineer may shift the sign supports, within design guidelines, where necessary to secure a more desirable location or to avoid conflict with utilities. Unless otherwise shown on the plans, the Contractor shall stake and the Engineer will verify all sign support locations.

STATE OF TEXAS
CHASE W. MYERS
94895
LICENSED
PROFESSIONAL ENGINEER
6/26/17
RE

BRIDGEFARMER & ASSOCIATES, INC.
CONSULTING ENGINEERS
TBPE REGISTRATION NO. 264

GEORGETOWN INNER LOOP @ CENTRAL MAINTENANCE FACILITY

SUMMARY OF SMALL SIGNS

SCALE: N.T.S. SHEET 1 OF 1

DESIGN	GRAPHICS	CHECK	CHECK	SHEET NO.
KA	AKH	CWM	WD	24

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SUMMARY OF EROSION ITEMS

LOCATION	160 WC002	161 WC001	162 WC103	164 WC004	164 WC005	164 WC007	164 WC010	166 6002	168 WC001	169 6001	506 6002	506 6003	506 6011	506 6020	506 6024	506 6041	506 6043	730 6107 *
	FURNISHING AND PLACING TOPSOIL (4")	EROSION CONTROL COMPOST (3")	MULCH TOPDRESSING (5")	SEEDING FOR EROSION CONTROL (TEMP) (COOL) (TY 4)	SEEDING FOR EROSION CONTROL (PERM) (WARM) (TY 5)	SEEDING FOR EROSION CONTROL (TEMP & PERM) (TY 7)	SEEDING FOR EROSION CONTROL (TEMP) (WARM) (TY 10)	FERTILIZER	VEGETATIVE WATERING	SOIL RETENTION BLANKETS (CL 1) (TY A)	ROCK FILTER DAMS (INSTALL) (TY 2)	ROCK FILTER DAMS (INSTALL) (TY 3)	ROCK FILTER DAMS (REMOVE)	CONSTRUCTION EXITS (INSTALL) (TY 1)	CONSTRUCTION EXITS (REMOVE)	BIODEG EROSN CONT LOGS (INSTL) (12")	BIODEG EROSN CONT LOGS (REMOVE)	FULL - WIDTH MOWING
	SY	SY	SY	SY	SY	SY	SY	TON	MG	SY	LF	LF	LF	SY	SY	LF	LF	CYC
PHASE 1 STAGE 1 - SHEET 1 OF 3											32		32					
PHASE 1 STAGE 1 - SHEET 2 OF 3											32		32			32	32	
PHASE 1 STAGE 1 - SHEET 3 OF 3											16		16			16	16	
PHASE 1 STAGE 2 - SHEET 1 OF 3	3645	911	911	1823	3645		1823	0.2	210			54	54	140		32	32	
PHASE 1 STAGE 2 - SHEET 2 OF 3	2567	642	642	1284	2567		1284	0.2	148	79		36	36			380	380	
PHASE 1 STAGE 2 - SHEET 3 OF 3	956	239	239	478	956	100	478	0.1	57							32	32	
PHASE 2 STAGE 1 - SHEET 1 OF 3	1519	380	380	760	1519		760	0.1	87									
PHASE 2 STAGE 1 - SHEET 2 OF 3	3043	761	761	1522	3043	389	1522	0.2	183	225						49	49	
PHASE 2 STAGE 1 - SHEET 3 OF 3	2158	540	540	1079	2158	167	1079	0.1	127	59						16	16	
PHASE 2 STAGE 2 - SHEET 1 OF 3							0	0.0										
PHASE 2 STAGE 2 - SHEET 2 OF 3	4513	1128	1128	2257	4513	1111	2257	0.3	282			16	16			100	100	
PHASE 2 STAGE 2 - SHEET 3 OF 3															140			
																		3
PROJECT TOTALS	18401	4600	4600	9201	18401	1767	9201	1.2	1093	363	80	106	186	140	140	657	657	3

* FOR CONTRACTORS INFORMATION ONLY, SUBSIDIARY TO OTHER ITEMS

BRIDGEFARMER & ASSOCIATES, INC.
CONSULTING ENGINEERS
TBPE REGISTRATION NO. 264

GEORGETOWN INNER LOOP @
CENTRAL MAINTENANCE FACILITY

SUMMARY OF SWPPP

SHEET 1 OF 1

DESIGN	GRAPHICS	CHECK	CHECK	SHEET NO.
KA	AKH	CWM	WD	25

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GENERAL TCP NOTES:

1. PLACE APPLICABLE ADVANCED WARNING SIGNS PRIOR TO ANY CONSTRUCTION ACTIVITIES. PLACE ADVANCED WARNING SIGNS PER TMUTCD AND TXDOT BC 1-12(14) STANDARDS.
2. INSTALL ALL ENVIRONMENTAL BMP'S AS SHOWN IN THE PLANS PRIOR TO ANY CONSTRUCTION ACTIVITIES.
3. CONSTRUCT ASPHALT PAVEMENT TO BELOW FINAL GRADE DURING CONSTRUCTION UNTIL FINAL PLACEMENT OF TRAFFIC AND THEN PLACE FINAL LIFT (TOP 2" HMA OVERLAY). FINAL 2" LIFT OF HMA SHALL NOT BE PLACED UNTIL TRAFFIC IS LOCATED IN FINAL POSITION.
4. FOLLOW BC AND TCP STANDARDS. CONTRACTOR TO MAINTAIN 3:1 SAFETY SLOPE AT THE END OF EACH WORK DAY IN RELATION TO TXDOT'S EDGE CONDITION TREATMENT STANDARD. PAYMENT IS SUBSIDIARY TO TCP ITEMS.
5. REMOVE EXISTING PAVEMENT MARKINGS AND PLACE CURRENT PHASE / STAGE PAVEMENT MARKINGS PRIOR TO SHIFTING TRAFFIC.
6. SEE REMOVAL PLANS FOR REMOVAL OF PERTINENT ITEMS PRIOR TO CONSTRUCTION FOR EACH PHASE.
7. MAINTAIN POSITIVE DRAINAGE FLOW AT ALL TIMES. DRIVEWAY PIPES TO BE LENGTHENED OR MOVED AS NEEDED TO MAINTAIN FLOW ARE SUBSIDIARY TO OTHER TCP ITEMS.
8. TEMPORARY PAVEMENT PAID AS ITEM 508 - CONSTRUCTING DETOURS.
9. PRIORITY OF CONSTRUCTION IS TO COMPLETE RECONSTRUCTION OF ROCK RIDE TURN LANES BY 12/31/2017 FROM STATION 138+00 TO STATION 154+00. CONTRACTOR MUST FINISH THIS PORTION OF ROADWAY BY THIS DATE. THIS INCLUDES THE CONSTRUCTION OF CULVERT 1 AT STATION 157+44.25.

PHASE 1 - STAGE 1:

MAINTAIN TRAFFIC ON THE EXISTING INNER LOOP

IMPROVEMENTS TO INNER LOOP

1. CONSTRUCT ALL TEMPORARY PAVEMENT ON THE WEST SIDE OF INNER LOOP AS SHOWN IN THE PLANS. EARTHWORK IS CONSIDERED SUBSIDIARY TO CONSTRUCTING DETOURS.
2. MAINTAIN DRIVEWAY ACCESS AT ALL TIMES.

PHASE 1 - STAGE 2:

THIS PHASE CONSTRUCTS THE NB DIRECTION OF INNER LOOP.
MAINTAIN TRAFFIC ON THE EXISTING AND THE TEMPORARY PAVEMENT CONSTRUCTED IN PHASE 1 STAGE 1.

1. SHIFT THE 2-WAY TRAFFIC TO SB (WEST) SIDE OF THE EXISTING INNER LOOP.
2. CONSTRUCT THE NEW PAVEMENT FOR NORTHBOUND DIRECTION AS SHOWN IN THE PLANS.
3. CONSTRUCT CULVERT 1 USING CUT & RESTORE PAVEMENT WITH 1 LANE CLOSURES AT NIGHT. COORDINATE WITH CONSTRUCTION OBSERVER.
4. CONSTRUCT THE EAST HALF OF CULVERT 2 AS SHOWN IN THE PLANS.
5. CONSTRUCT BELMONT DRIVE IN ONE EVENING BETWEEN 9:00 PM AND 5:00 AM OR AS DIRECTED BY THE CONSTRUCTION OBSERVER USING FULL DEPTH ACP. DETOUR LOCAL TRAFFIC TO CHURCHILL FARMS DR VIA INNERLOOP AND KEENLAND DR. SEE DETOUR SHEET FOR ADDITIONAL INFORMATION. USE PORTABLE CHANGEABLE MESSAGE SIGNS TO ANNOUNCE DETOUR FOR AT LEAST 1 WEEK PRIOR TO DETOUR.

PHASE 2 - STAGE 1

SHIFT INNER LOOP TRAFFIC FROM EXISTING / TEMPORARY PAVEMENT ONTO THE NEW NB PAVEMENT. SOUTH OF STATION 154+70 SHIFT TRAFFIC TO FINAL CONFIGURATION. USE TEMPORARY PAVEMENT MARKINGS UNTIL FINAL OVERLAY.

1. CONSTRUCT SB INNER LOOP AS SHOWN IN THE PLANS.
2. CONSTRUCT THE REMAINING PORTION OF CULVERT 2 AS SHOWN IN THE PLANS.
3. MAINTAIN ACCESS TO THE WILLIAMSON COUNTY OFFICES BY LEAVING THE MAINTENANCE (DWMTC) AND SOUTHERN EXISTING DRIVEWAYS OPEN TO TRAFFIC.
4. CONSTRUCT THE CONNECTING ACCESS ROAD (DWCONN) BETWEEN THE MAINTENANCE FACILITY AND COUNTY OFFICES.

PHASE 2 - STAGE 2:

MAINTAIN TRAFFIC ON THE PROPOSED NB PAVEMENT

1. MAINTAIN TRAFFIC ON THE NB AND PORTIONS OF THE SB PAVEMENT AS SHOWN IN THE PLANS.
2. CONSTRUCT THE MISSING PORTION OF THE SB LANES FROM THE MAINTENANCE FACILITY DRIVEWAY (DWMTC) TO THE COUNTY OFFICES DRIVEWAY (DWCMN).
3. CONSTRUCT THE MISSING PORTIONS OF THE MAINTENANCE FACILITY DRIVEWAY (DWMTC) AND ACCESS ROAD (DWCONN).
4. DIVERT TRAFFIC THAT NEEDS TO ACCESS THE MAINTENANCE FACILITY THROUGH THE NORTHERN DRIVEWAY (DWCMN) OF THE COUNTY OFFICES.

FINAL PHASE:

1. CONTRACTOR SHALL SHIFT TRAFFIC IN COMPLIANCE WITH TCP STANDARDS, TMUTCD, AND AS DIRECTED BY THE CONSTRUCTION OBSERVER FOR THE FINAL SURFACE COURSE OPERATIONS (2" HMA OVERLAY). SHIFT TRAFFIC AS DIRECTED BY CONSTRUCTION OBSERVER. REFER TO MOBILE OPERATIONS STANDARD TCP (3-1)-13 FOR ADDITIONAL DETAILS.
   ANY TEMPORARY PAVEMENT MARKINGS REQUIRED ARE SUBSIDIARY TO OTHER TCP ITEMS.
2. PLACE FINAL PAVEMENT MARKINGS AND REMOVE ALL TRAFFIC CONTROL DEVICES.

STATE OF TEXAS
CHASE W. MYERS
94895
LICENSED
PROFESSIONAL ENGINEER
6/26/17

BRIDGEFARMER & ASSOCIATES, INC.
CONSULTING ENGINEERS
TBPE REGISTRATION NO. 264

GEORGETOWN INNER LOOP & CENTRAL MAINTENANCE FACILITY

TCP NARRATIVE

SHEET 1 OF 1

DESIGN	GRAPHICS	CHECK	CHECK	SHEET NO.
KA	AKH	CWM	WD	26

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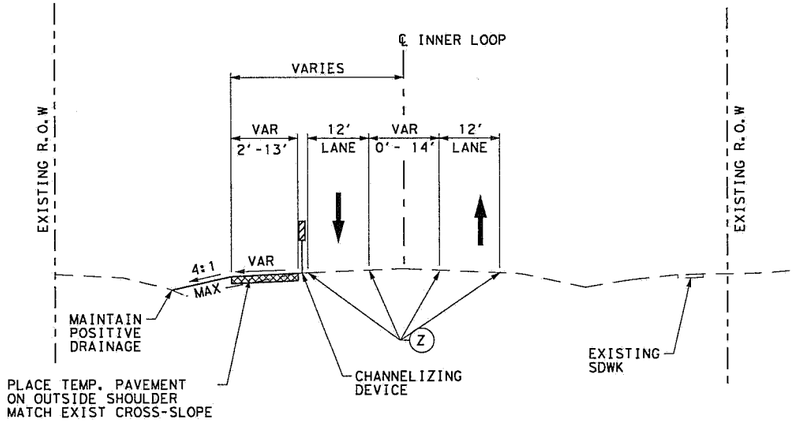
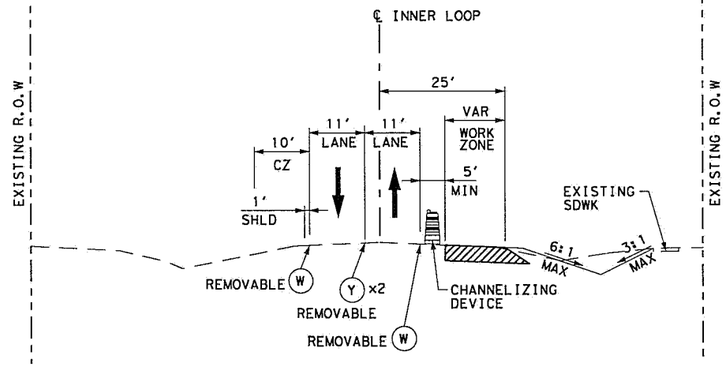


PHASE 1 STAGE 1

STA 169+90 TO STA 175+10



PHASE 1 STAGE 2

BEGIN TO END

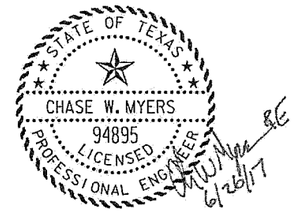
TEMPORARY PAVEMENT DESIGN

4" HMA (TY D)
5" HMA (TY B)

TEMPORARY PAVEMENT
PAID AS ITEM 508

TCP LEGEND

- TEMP PAVEMENT UNDER CONSTRUCTION
- TEMP PAVEMENT ALREADY CONSTRUCTED
- PERM PAVEMENT UNDER CONSTRUCTION
- PERM PAVEMENT ALREADY CONSTRUCTED
- (T) 8" WHITE SOLID (NON-REMOVABLE)
- (U) 12" WHITE SOLID (NON-REMOVABLE)
- (W) 4" WHITE SOLID (NON-REMOVABLE)
- (Y) 4" YELLOW SOLID (NON-REMOVABLE)
- (Z) EXISTING PAVEMENT MARKING
- TRAVEL LANE



BRIDGEFARMER & ASSOCIATES, INC.
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TBPE REGISTRATION NO. 264

GEORGETOWN INNER LOOP @ CENTRAL MAINTENANCE FACILITY

TCP TYPICAL SECTION

SHEET 1 OF 2

DESIGN	GRAPHICS	CHECK	CHECK	SHEET NO.
KA	AKH	CWM	WD	27

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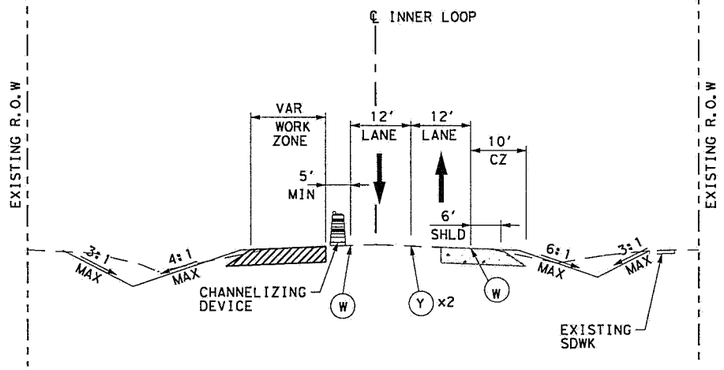
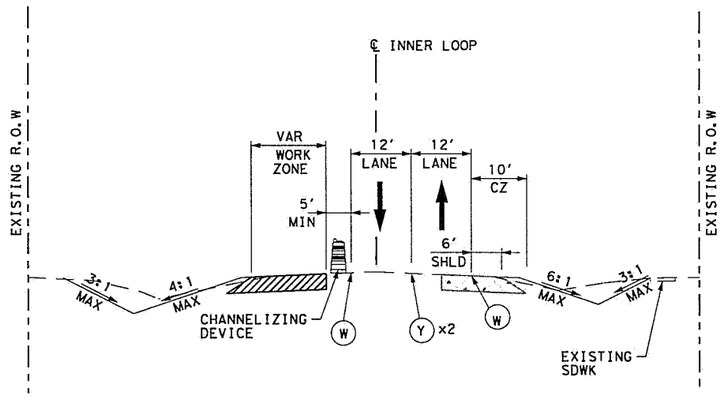
7/18/2017 9:58 AM

cwm 6/26/2017 10:21:52 AM



PHASE 2 STAGE 1

STA 154+70.00 TO STA 163+30.13
STA 168+06.00 TO STA 183+14.66

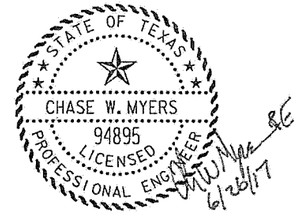


PHASE 2 STAGE 2

STA 163+30.13 TO STA 168+06.00

TCP LEGEND

- TEMP PAVEMENT UNDER CONSTRUCTION
- TEMP PAVEMENT ALREADY CONSTRUCTED
- PERM PAVEMENT UNDER CONSTRUCTION
- PERM PAVEMENT ALREADY CONSTRUCTED
- (T) 8" WHITE SOLID (NON-REMOVABLE)
- (U) 12" WHITE SOLID (NON-REMOVABLE)
- (W) 4" WHITE SOLID (NON-REMOVABLE)
- (Y) 4" YELLOW SOLID (NON-REMOVABLE)
- (Z) EXISTING PAVEMENT MARKING
- TRAVEL LANE



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GEORGETOWN INNER LOOP @ CENTRAL MAINTENANCE FACILITY

TCP TYPICAL SECTION

SHEET 2 OF 2

DESIGN	GRAPHICS	CHECK	CHECK	SHEET NO.
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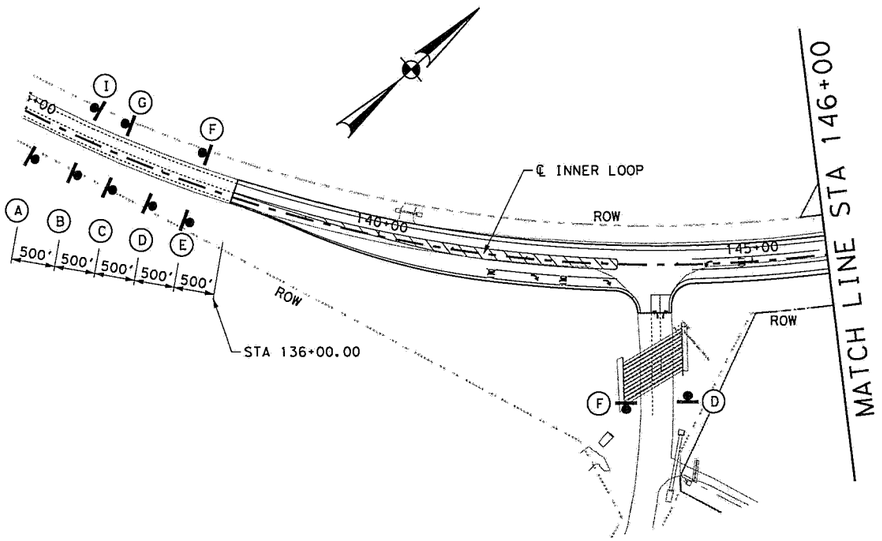

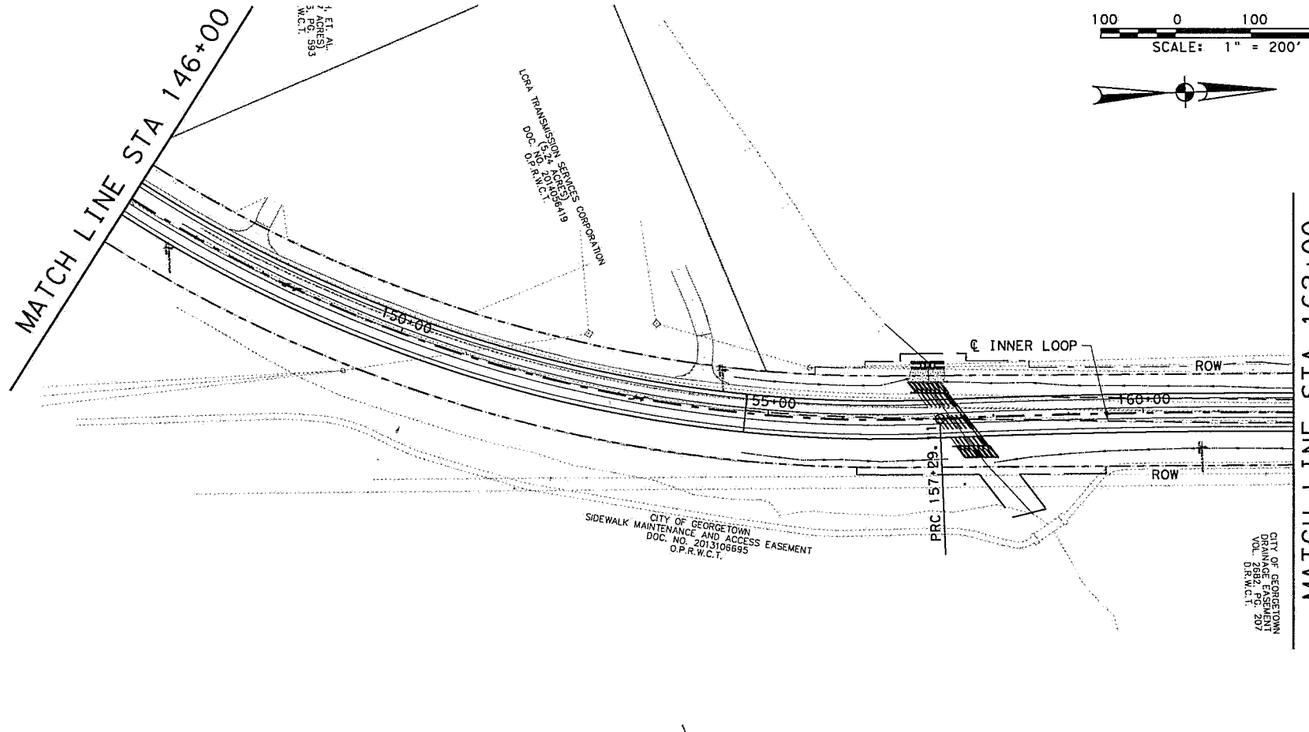

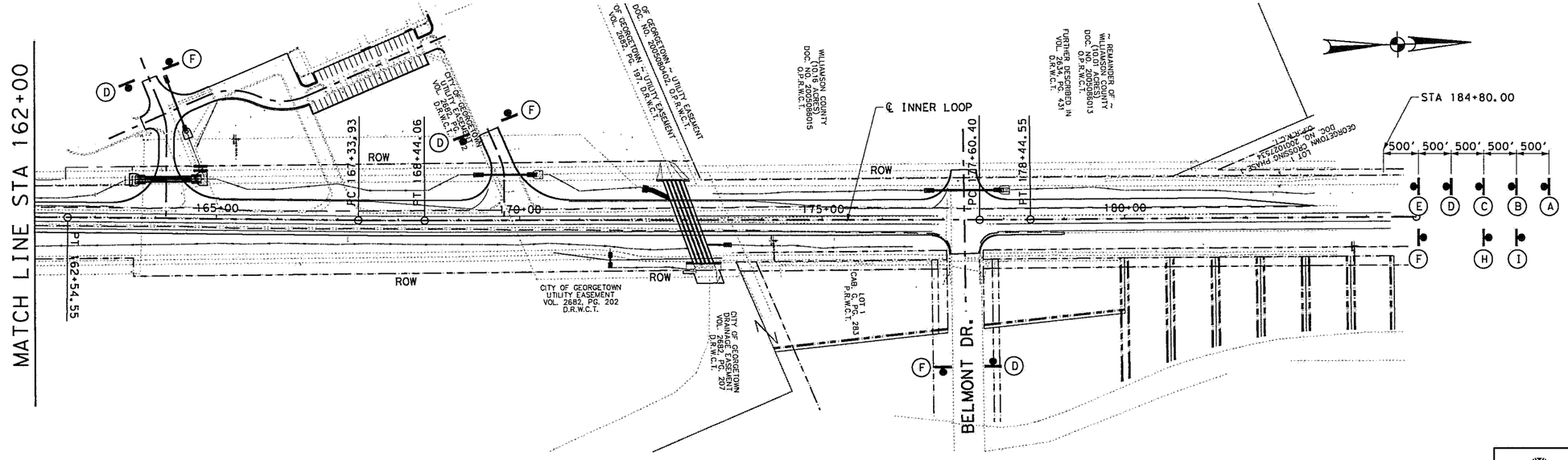

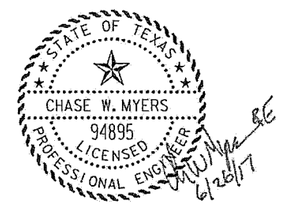

A — OBEY WARNING SIGNS / STATE LAW — R20-3

B — BEGIN WORK ZONE — G20-9T
TRAFFIC FINES DOUBLE — R20-5
WHEN WORKERS ARE PRESENT — R20-5 PLAQUE

C — WORK ZONE / SPEED LIMIT 45 — G20-9 — R2-1

D — ROAD WORK AHEAD — CW20-1D

E — BEGIN ROAD WORK NEXT 2 MILES / NAME ADDRESS CITY STATE / CONTRACTOR — G20-5T — G20-6

F — END ROAD WORK — G20-2

G — SPEED LIMIT 55 — R2-1

H — SPEED LIMIT 45 — R2-1

I — END WORK ZONE — G20-2bT

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GEORGETOWN INNER LOOP @ CENTRAL MAINTENANCE FACILITY

TCP ADVANCE SIGNING LAYOUT

SCALE: 1" = 200' SHEET OF

DESIGN	GRAPHICS	CHECK	CHECK	SHEET NO.
KA	AKH	CWM	WD	29

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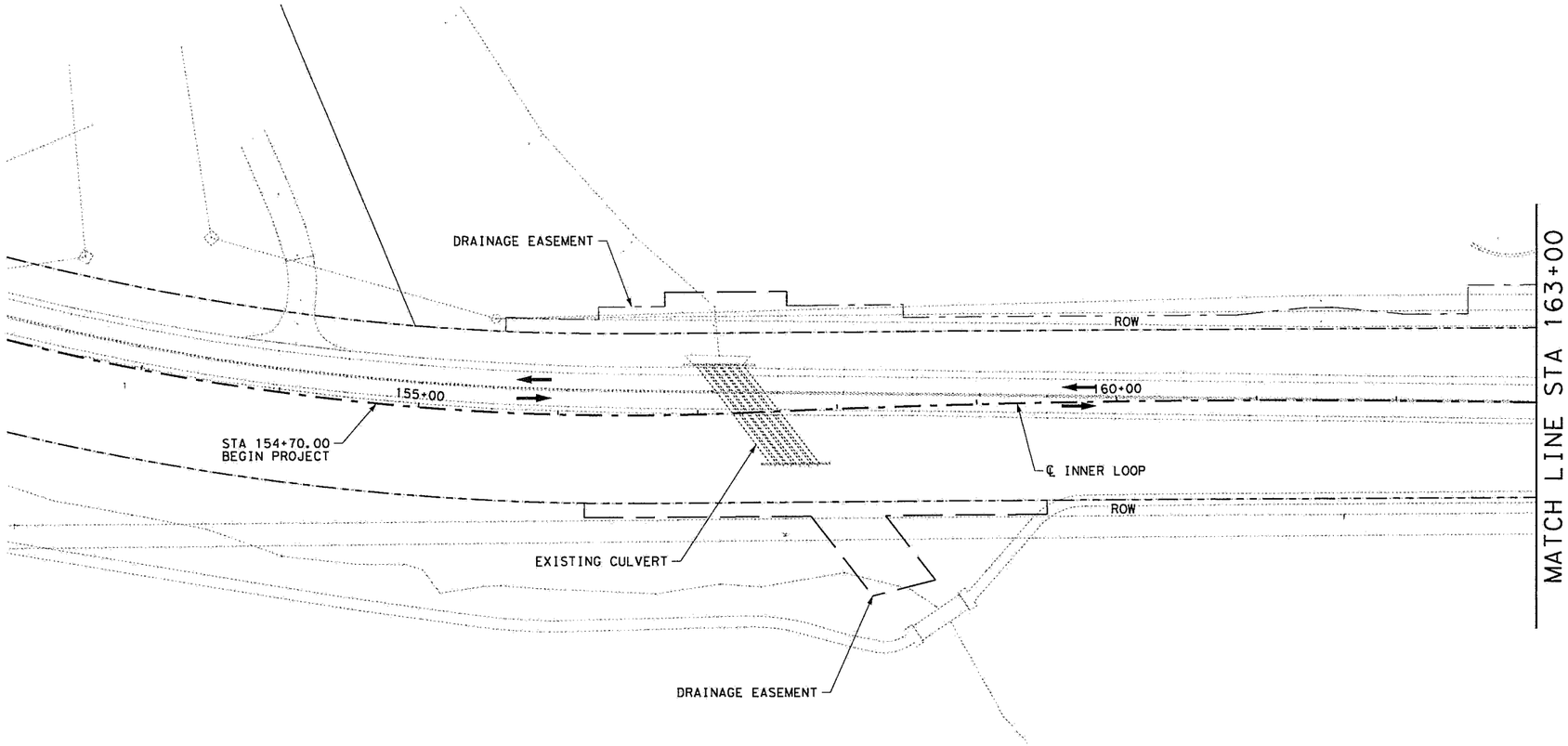

50 0 50 100
SCALE: 1" = 100'

TCP PLAN LEGEND

- TEMP PAVEMENT UNDER CONSTRUCTION
- TEMP PAVEMENT ALREADY CONSTRUCTED
- PERM PAVEMENT UNDER CONSTRUCTION
- PERM PAVEMENT ALREADY CONSTRUCTED
- (T) 8" WHITE SOLID (NON-REMOVABLE)
- (U) 12" WHITE SOLID (NON-REMOVABLE)
- (W) 4" WHITE SOLID (NON-REMOVABLE)
- (Y) 4" YELLOW SOLID (NON-REMOVABLE)
- LPCB TY 1 (W/ TY 2 AT EACH END)
- TRAVEL LANE
- CONSTRUCTION SIGN
- CHANNELIZING DEVICE
- TEMPORARY SHORING
- IMPACT ATTENUATOR
- CHANGEABLE MESSAGE BOARD
- FLASHING ARROW PANEL
- TYPE III BARRICADE

NOTES:

1. LPCB CALLOUTS ARE TO INSIDE EDGE OF LPCB ON TRAVEL LANE SIDE. LENGTHS OF LPCB ARE FOR TY I WHICH INCLUDES ONE TY 2 LPCB AT EACH END.

2. CHANNELIZING DEVICES ARE SPACED AT 50', UNLESS NOTED OTHERWISE.

3. ALL PAVEMENT MARKINGS ARE NON-REMOVABLE UNLESS NOTED OTHERWISE.

STATE OF TEXAS
CHASE W. MYERS
94895
LICENSED
PROFESSIONAL ENGINEER
6/26/17

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GEORGETOWN INNER LOOP @ CENTRAL MAINTENANCE FACILITY

TRAFFIC CONTROL PHASE 1 STAGE 1

SCALE: 1" = 100' SHEET 1 OF 3

DESIGN	GRAPHICS	CHECK	CHECK	SHEET NO.
KA	AKH	CWM	WD	30

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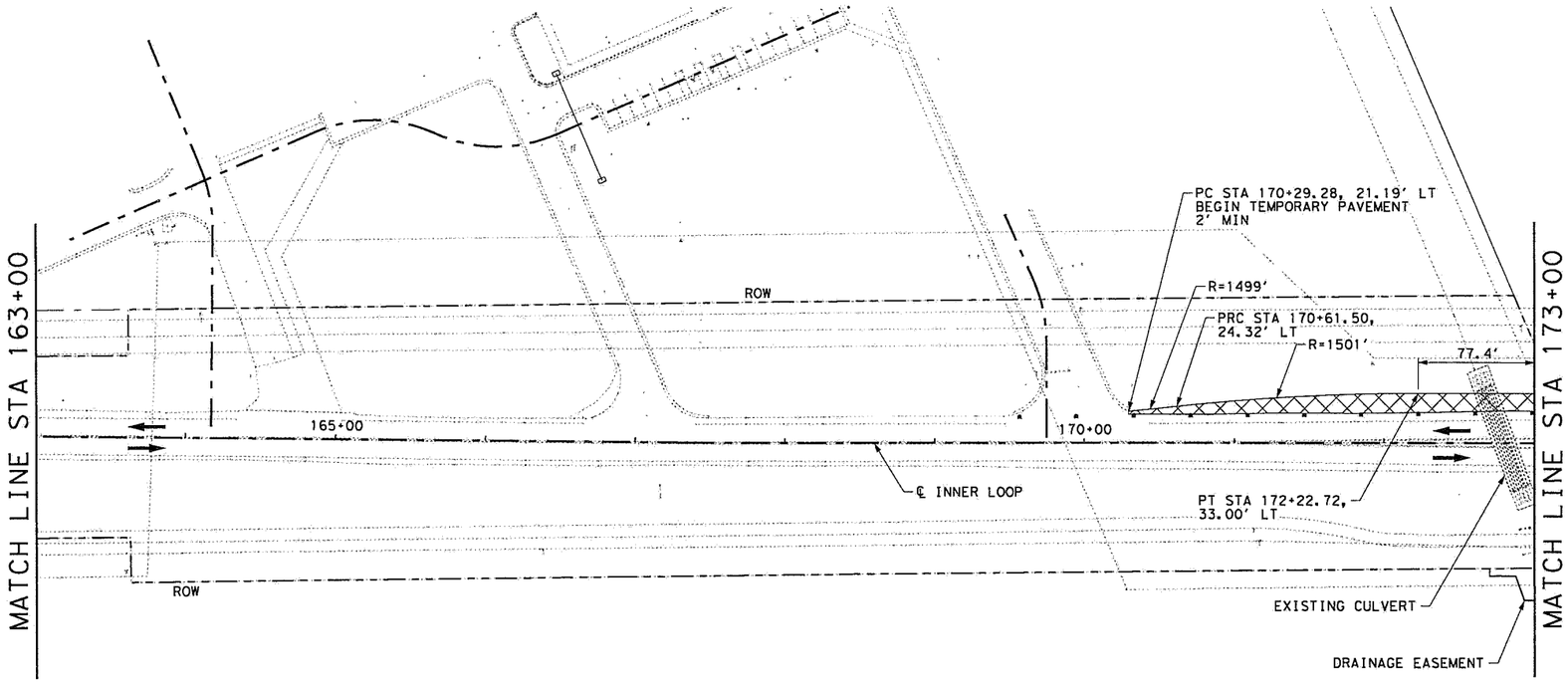

50 0 50 100
SCALE: 1" = 100'

TCP PLAN LEGEND

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- TEMP PAVEMENT ALREADY CONSTRUCTED
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GEORGETOWN INNER LOOP @ CENTRAL MAINTENANCE FACILITY

TRAFFIC CONTROL PHASE 1 STAGE 1

SCALE: 1" = 100' SHEET 2 OF 3

DESIGN	GRAPHICS	CHECK	CHECK	SHEET NO.
KA	AKH	CWM	WD	31

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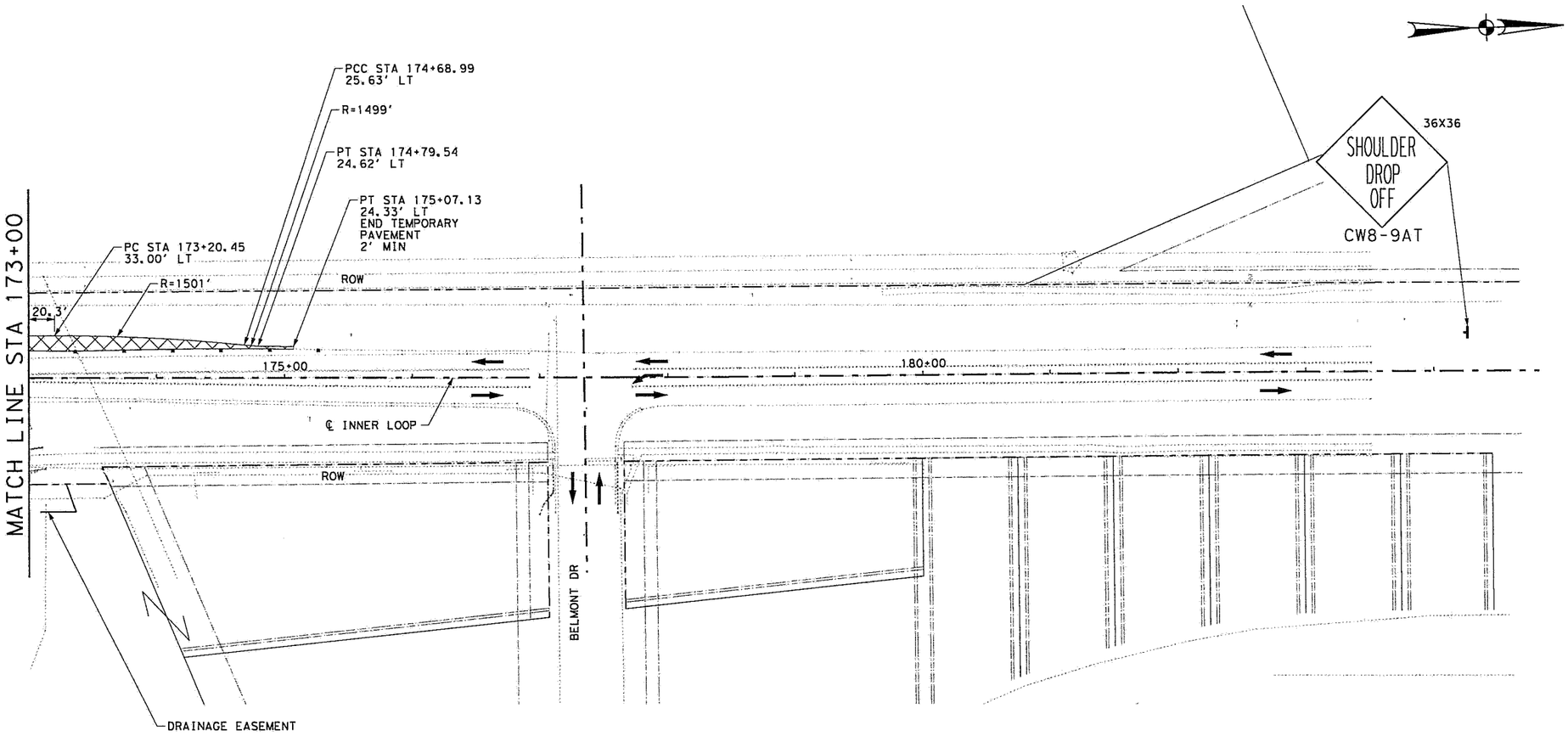
SCALE: 1" = 100'



TCP PLAN LEGEND

- TEMP PAVEMENT UNDER CONSTRUCTION
- TEMP PAVEMENT ALREADY CONSTRUCTED
- PERM PAVEMENT UNDER CONSTRUCTION
- PERM PAVEMENT ALREADY CONSTRUCTED
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- (W) 4" WHITE SOLID (NON-REMOVABLE)
- (Y) 4" YELLOW SOLID (NON-REMOVABLE)
- LPCB TY 1 (W/ TY 2 AT EACH END)
- TRAVEL LANE
- CONSTRUCTION SIGN
- CHANNELIZING DEVICE
- TEMPORARY SHORING
- IMPACT ATTENUATOR
- CHANGEABLE MESSAGE BOARD
- FLASHING ARROW PANEL
- TYPE III BARRICADE

NOTES:

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2. CHANNELIZING DEVICES ARE SPACED AT 50', UNLESS NOTED OTHERWISE.

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STATE OF TEXAS
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GEORGETOWN INNER LOOP @ CENTRAL MAINTENANCE FACILITY

TRAFFIC CONTROL PHASE 1 STAGE 1

SCALE: 1" = 100' SHEET 3 OF 3

DESIGN	GRAPHICS	CHECK	CHECK	SHEET NO.
KA	AKH	CWM	WD	32

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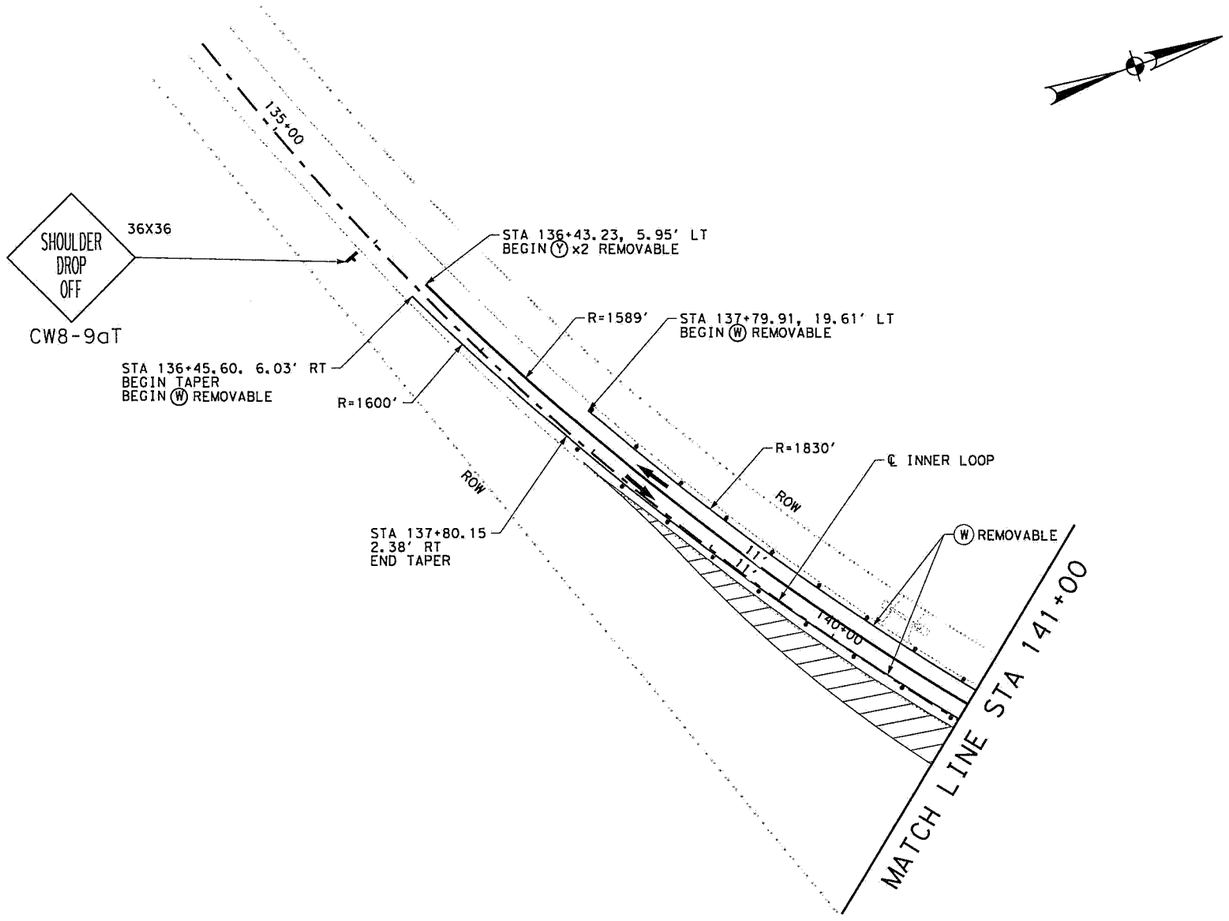

50 0 50 100
SCALE: 1" = 100'

TCP PLAN LEGEND

- TEMP PAVEMENT UNDER CONSTRUCTION
- TEMP PAVEMENT ALREADY CONSTRUCTED
- PERM PAVEMENT UNDER CONSTRUCTION
- PERM PAVEMENT ALREADY CONSTRUCTED
- (T) 8" WHITE SOLID (NON-REMOVABLE)
- (U) 12" WHITE SOLID (NON-REMOVABLE)
- (W) 4" WHITE SOLID (NON-REMOVABLE)
- (Y) 4" YELLOW SOLID (NON-REMOVABLE)
- LPCB TY 1 (W/ TY 2 AT EACH END)
- TRAVEL LANE
- CONSTRUCTION SIGN
- CHANNELIZING DEVICE
- TEMPORARY SHORING
- IMPACT ATTENUATOR
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- FLASHING ARROW PANEL
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NOTES:

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2. CHANNELIZING DEVICES ARE SPACED AT 50', UNLESS NOTED OTHERWISE.

3. ALL PAVEMENT MARKINGS ARE NON-REMOVABLE UNLESS NOTED OTHERWISE.

STATE OF TEXAS
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GEORGETOWN INNER LOOP @ CENTRAL MAINTENANCE FACILITY

TRAFFIC CONTROL PHASE 1 STAGE 2

SCALE: 1" = 100' SHEET 1 OF 5

DESIGN	GRAPHICS	CHECK	CHECK	SHEET NO.
KA	AKH	CWM	WD	33

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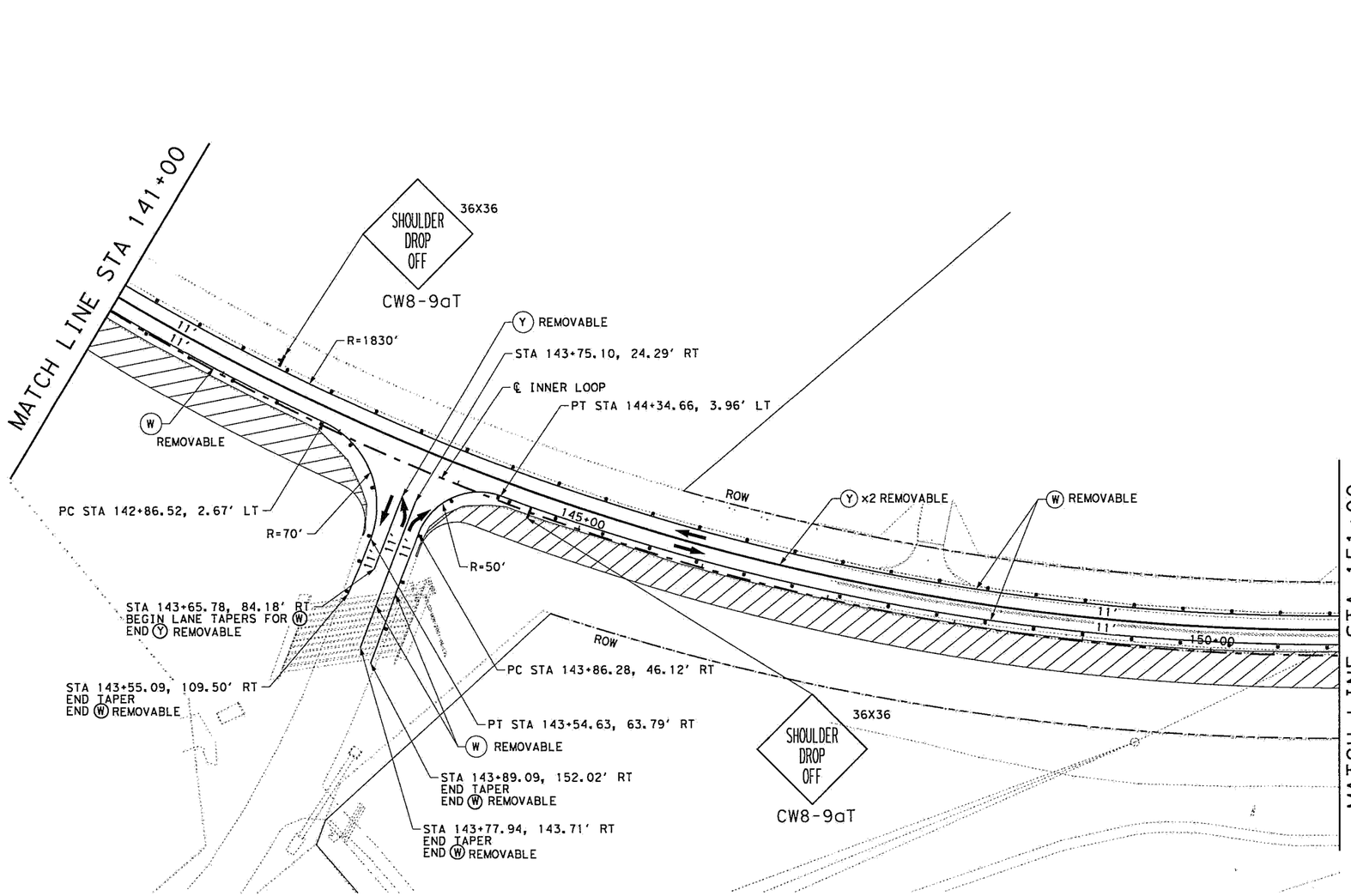

50 0 50 100
SCALE: 1" = 100'

TCP PLAN LEGEND

- TEMP PAVEMENT UNDER CONSTRUCTION
- TEMP PAVEMENT ALREADY CONSTRUCTED
- PERM PAVEMENT UNDER CONSTRUCTION
- PERM PAVEMENT ALREADY CONSTRUCTED
- (T) 8" WHITE SOLID (NON-REMOVABLE)
- (U) 12" WHITE SOLID (NON-REMOVABLE)
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- (Y) 4" YELLOW SOLID (NON-REMOVABLE)
- LPCB TY 1 (W/ TY 2 AT EACH END)
- TRAVEL LANE
- CONSTRUCTION SIGN
- CHANNELIZING DEVICE
- TEMPORARY SHORING
- IMPACT ATTENUATOR
- CHANGEABLE MESSAGE BOARD
- FLASHING ARROW PANEL
- TYPE III BARRICADE

NOTES:

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GEORGETOWN INNER LOOP @ CENTRAL MAINTENANCE FACILITY

TRAFFIC CONTROL PHASE 1 STAGE 2

SCALE: 1" = 100' SHEET 2 OF 5

DESIGN	GRAPHICS	CHECK	CHECK	SHEET NO.
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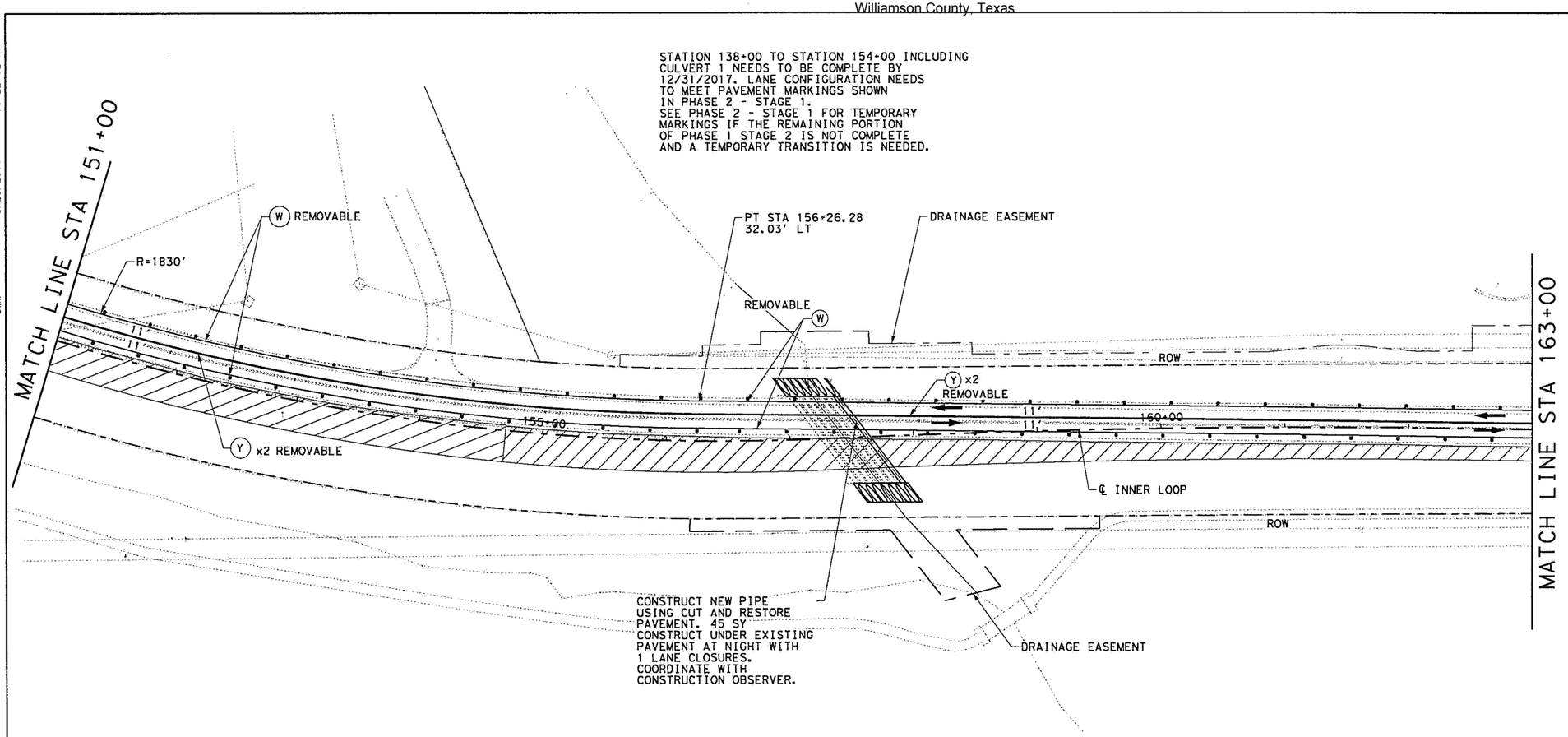

50 0 50 100
SCALE: 1" = 100'

TCP PLAN LEGEND

- TEMP PAVEMENT UNDER CONSTRUCTION
- TEMP PAVEMENT ALREADY CONSTRUCTED
- PERM PAVEMENT UNDER CONSTRUCTION
- PERM PAVEMENT ALREADY CONSTRUCTED
- (T) 8" WHITE SOLID (NON-REMOVABLE)
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- LPCB TY 1 (W/ TY 2 AT EACH END)
- TRAVEL LANE
- CONSTRUCTION SIGN
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NOTES:

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GEORGETOWN INNER LOOP @ CENTRAL MAINTENANCE FACILITY

TRAFFIC CONTROL PHASE 1 STAGE 2

SCALE: 1" = 100' SHEET 3 OF 5

DESIGN	GRAPHICS	CHECK	CHECK	SHEET NO.
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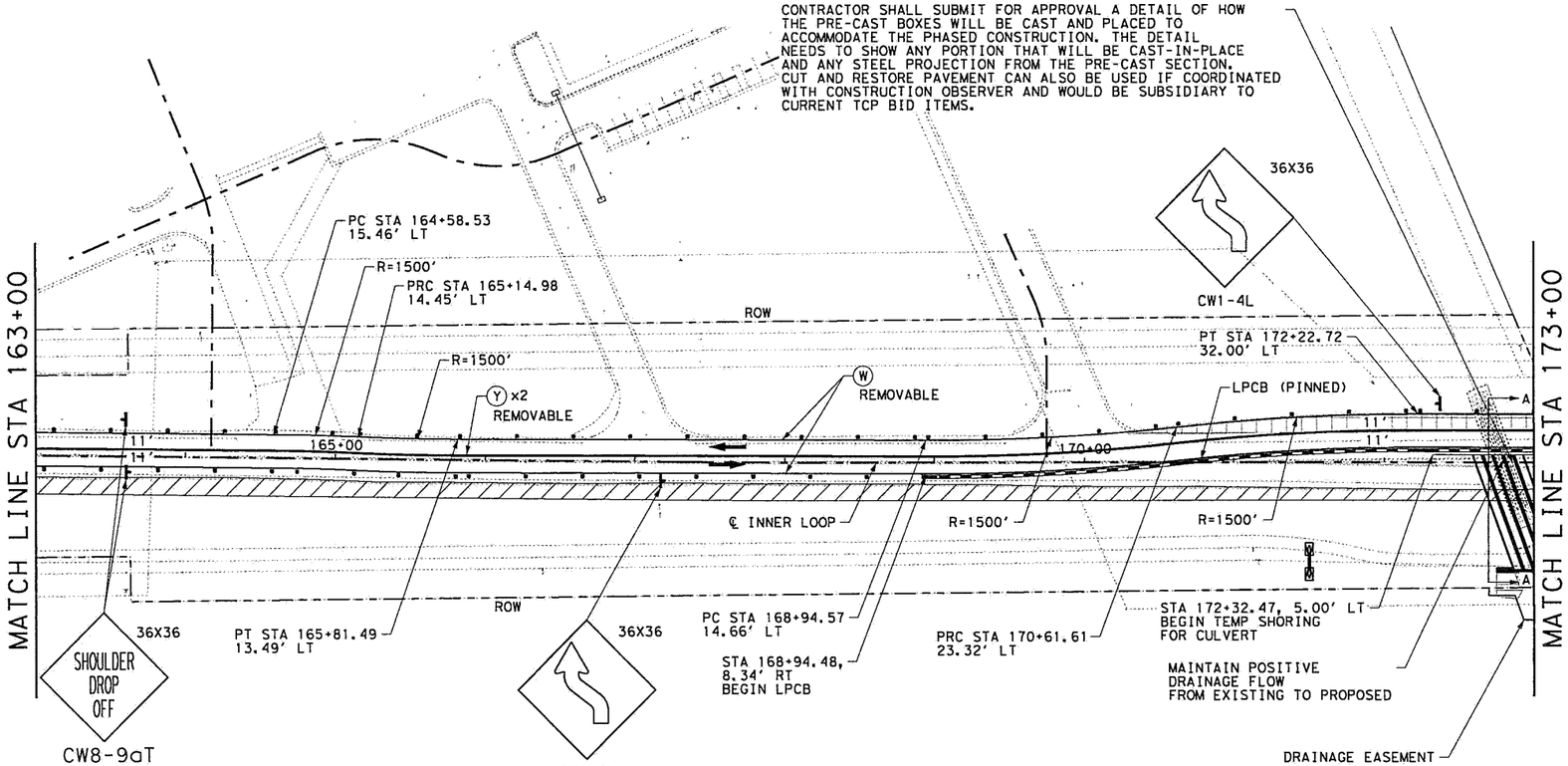
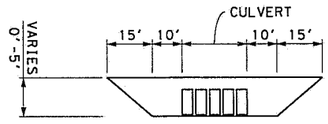
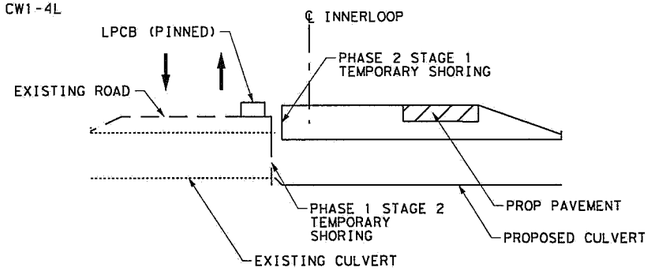




TEMP SHORING PROFILE FOR CULVERT



SECTION A-A

SEE PHASE 2 STAGE 1 FOR ADDITIONAL INFORMATION

50 0 50 100
SCALE: 1" = 100'

TCP PLAN LEGEND

- TEMP PAVEMENT UNDER CONSTRUCTION
- TEMP PAVEMENT ALREADY CONSTRUCTED
- PERM PAVEMENT UNDER CONSTRUCTION
- PERM PAVEMENT ALREADY CONSTRUCTED
- (T) 8" WHITE SOLID (NON-REMOVABLE)
- (U) 12" WHITE SOLID (NON-REMOVABLE)
- (W) 4" WHITE SOLID (NON-REMOVABLE)
- (Y) 4" YELLOW SOLID (NON-REMOVABLE)
- LPCB TY 1 (W/ TY 2 AT EACH END)
- TRAVEL LANE
- CONSTRUCTION SIGN
- CHANNELIZING DEVICE
- TEMPORARY SHORING
- IMPACT ATTENUATOR
- CHANGEABLE MESSAGE BOARD
- FLASHING ARROW PANEL
- TYPE III BARRICADE

NOTES:

1. LPCB CALLOUTS ARE TO INSIDE EDGE OF LPCB ON TRAVEL LANE SIDE. LENGTHS OF LPCB ARE FOR TY 1 WHICH INCLUDES ONE TY 2 LPCB AT EACH END.
2. CHANNELIZING DEVICES ARE SPACED AT 50', UNLESS NOTED OTHERWISE.
3. ALL PAVEMENT MARKINGS ARE NON-REMOVABLE UNLESS NOTED OTHERWISE.

STATE OF TEXAS
CHASE W. MYERS
94895
LICENSED
PROFESSIONAL ENGINEER
6/26/17

BRIDGEFARMER & ASSOCIATES, INC.
CONSULTING ENGINEERS
TBPE REGISTRATION NO. 264

GEORGETOWN INNER LOOP @ CENTRAL MAINTENANCE FACILITY

TRAFFIC CONTROL PHASE 1 STAGE 2

SCALE: 1" = 100' SHEET 4 OF 5

DESIGN	GRAPHICS	CHECK	CHECK	SHEET NO.
KA	AKH	CWM	WD	36

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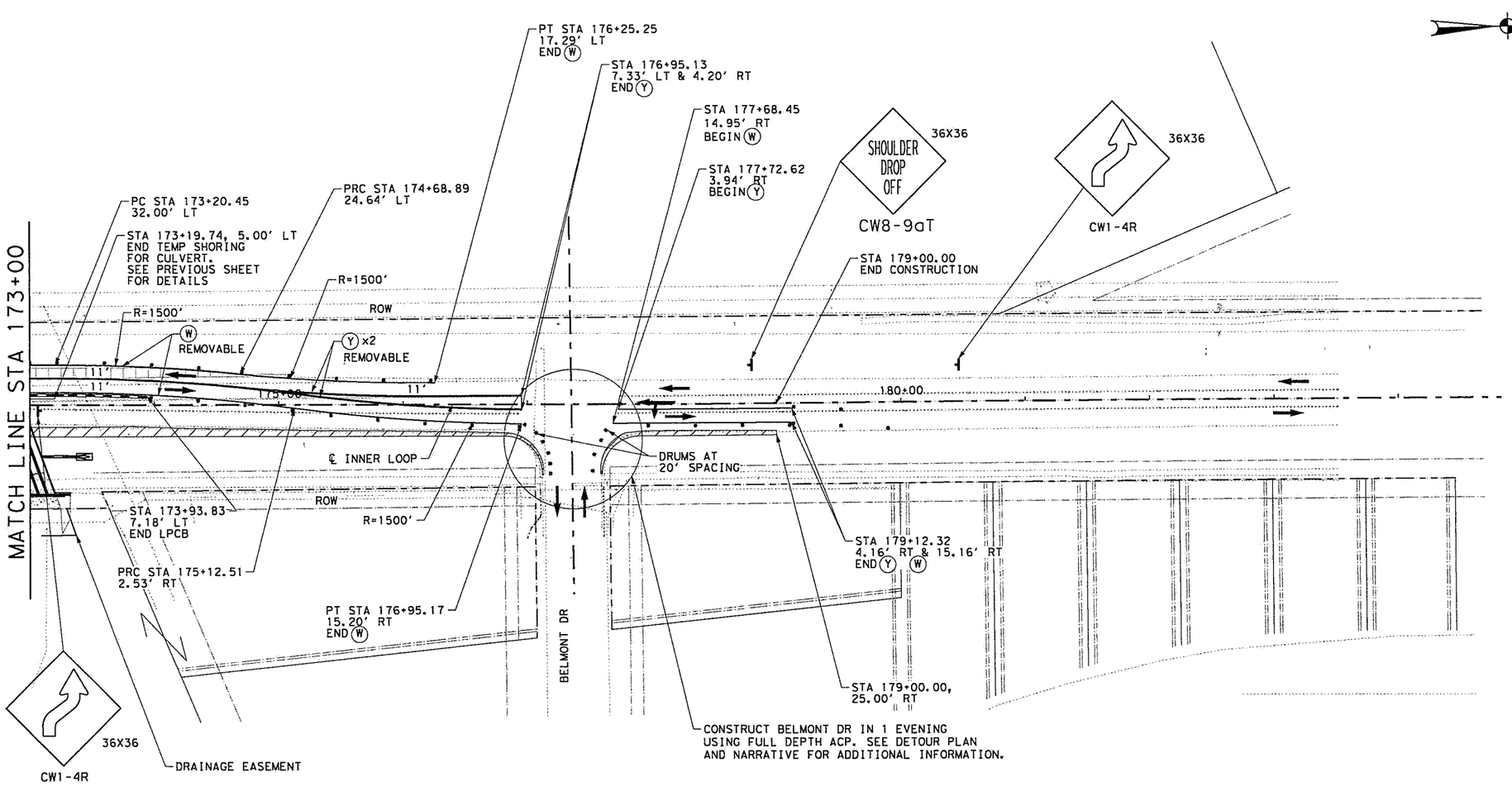

50 0 50 100
SCALE: 1" = 100'

TCP PLAN LEGEND

- TEMP PAVEMENT UNDER CONSTRUCTION
- TEMP PAVEMENT ALREADY CONSTRUCTED
- PERM PAVEMENT UNDER CONSTRUCTION
- PERM PAVEMENT ALREADY CONSTRUCTED
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GEORGETOWN INNER LOOP @ CENTRAL MAINTENANCE FACILITY

TRAFFIC CONTROL PHASE 1 STAGE 2

SCALE: 1" = 100' SHEET 5 OF 5

DESIGN	GRAPHICS	CHECK	CHECK	SHEET NO.
KA	AKH	CWM	WD	37

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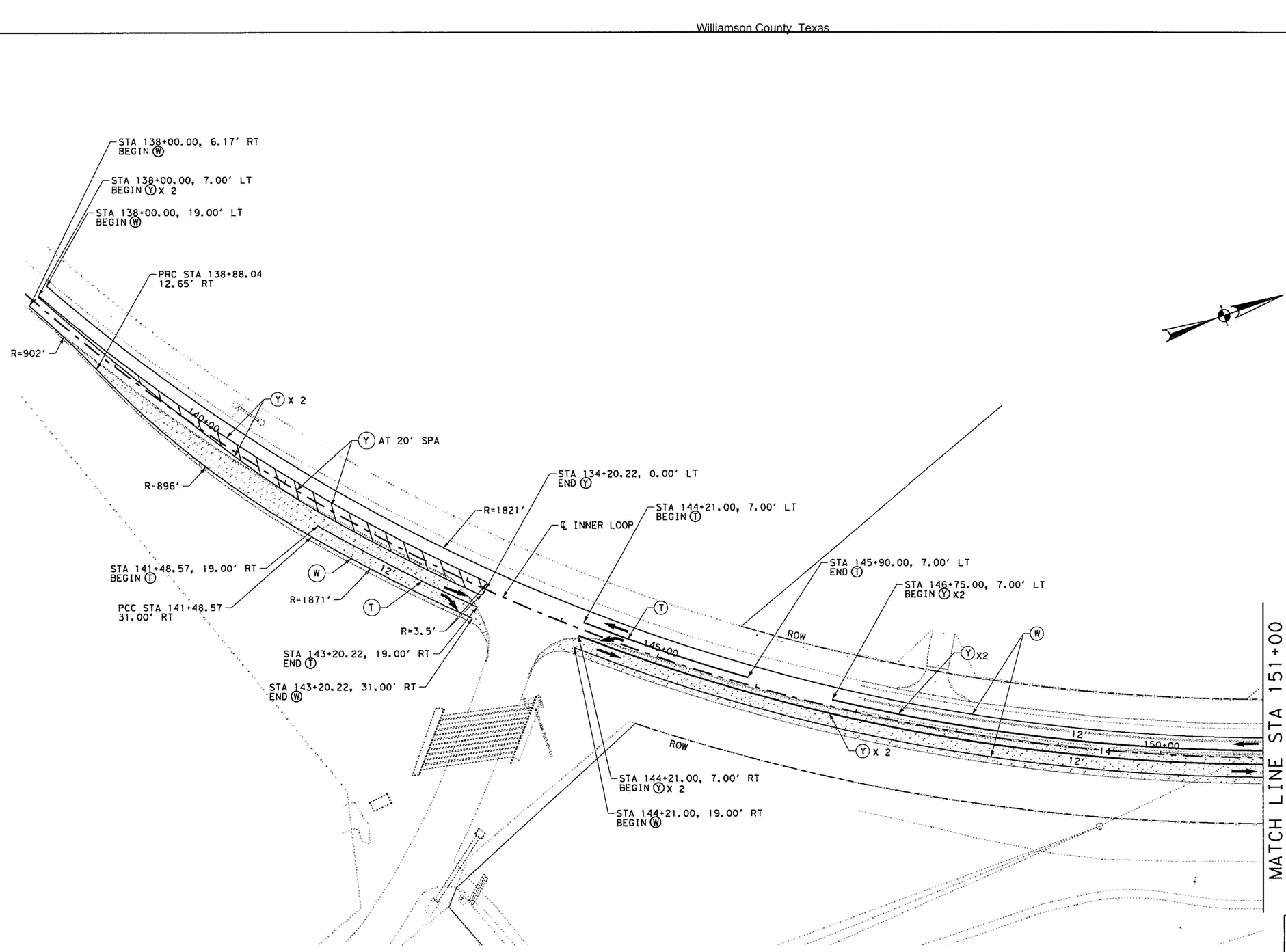
cwm



50 0 50 100
SCALE: 1" = 100'

TCP PLAN LEGEND

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- TEMP PAVEMENT ALREADY CONSTRUCTED
- PERM PAVEMENT UNDER CONSTRUCTION
- PERM PAVEMENT ALREADY CONSTRUCTED
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GEORGETOWN INNER LOOP @ CENTRAL MAINTENANCE FACILITY

TRAFFIC CONTROL PHASE 2 STAGE 1

SCALE: 1" = 100' SHEET 1 OF 4

DESIGN	GRAPHICS	CHECK	CHECK	SHEET NO.
KA	AKH	CWM	WD	38

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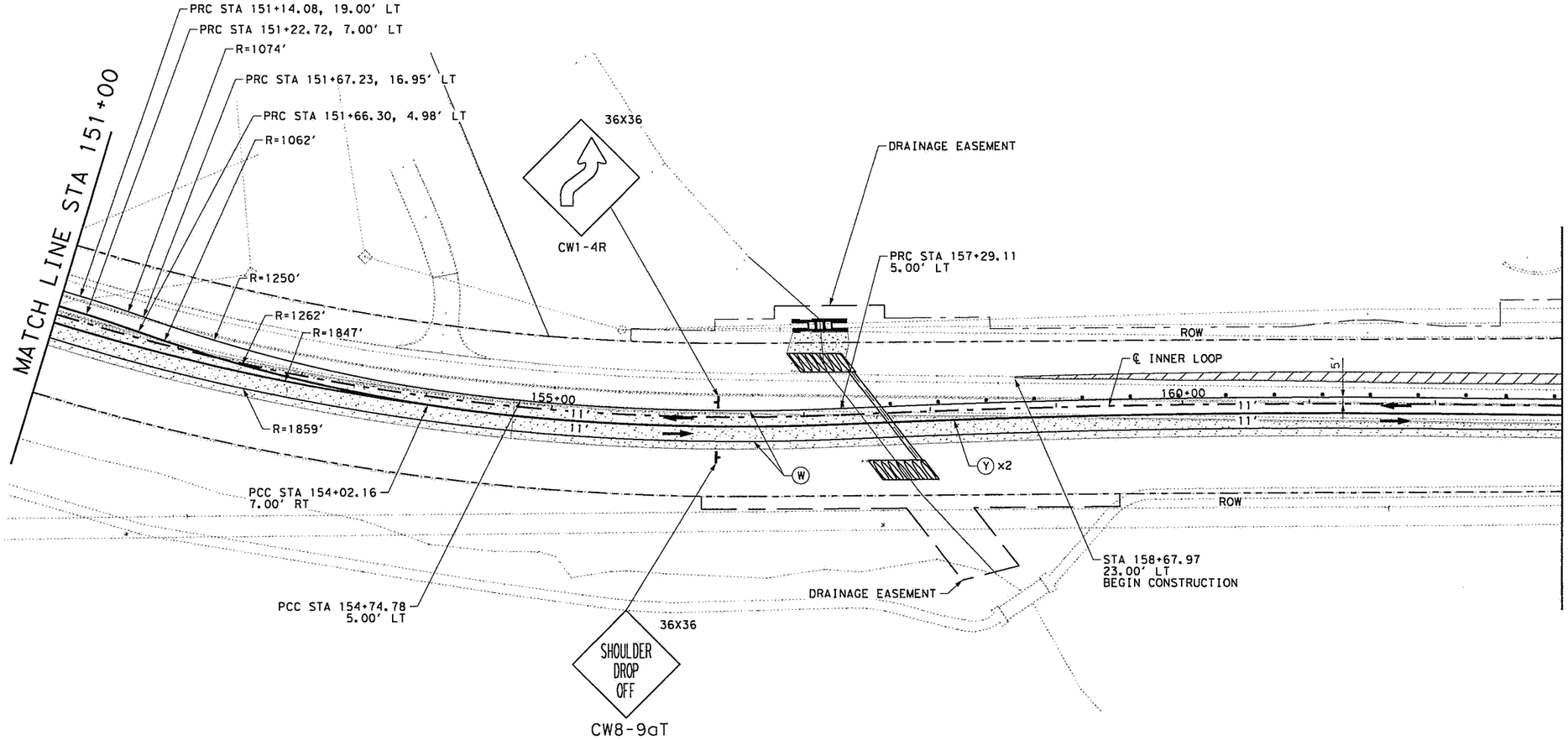

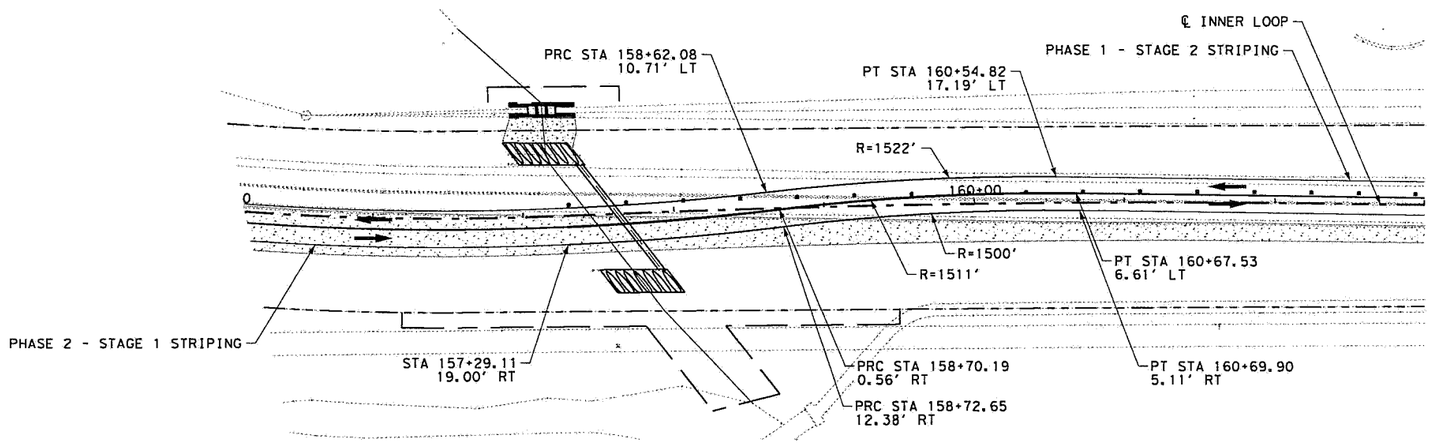

TEMPORARY STRIPING IF NEEDED TO MAINTAIN TRAFFIC BETWEEN PHASE 1 - STAGE 2 AND PHASE 2 - STAGE 1. IF USED TO MEET CONSTRUCTION SCHEDULE OF 138+00 TO 154+00 FINISH DATE OF 12/31/17, PAVEMENT MARKINGS AND TRAFFIC SHIFTS ARE SUBSIDIARY TO OTHER TCP ITEMS

50 0 50 100
SCALE: 1" = 100'

TCP PLAN LEGEND

- TEMP PAVEMENT UNDER CONSTRUCTION
- TEMP PAVEMENT ALREADY CONSTRUCTED
- PERM PAVEMENT UNDER CONSTRUCTION
- PERM PAVEMENT ALREADY CONSTRUCTED
- (T) 8" WHITE SOLID (NON-REMOVABLE)
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- TRAVEL LANE
- CONSTRUCTION SIGN
- CHANNELIZING DEVICE
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GEORGETOWN INNER LOOP @ CENTRAL MAINTENANCE FACILITY

TRAFFIC CONTROL PHASE 2 STAGE 1

SCALE: 1" = 100' SHEET 2 OF 4

DESIGN	GRAPHICS	CHECK	CHECK	SHEET NO.
KA	AKH	CWM	WD	39

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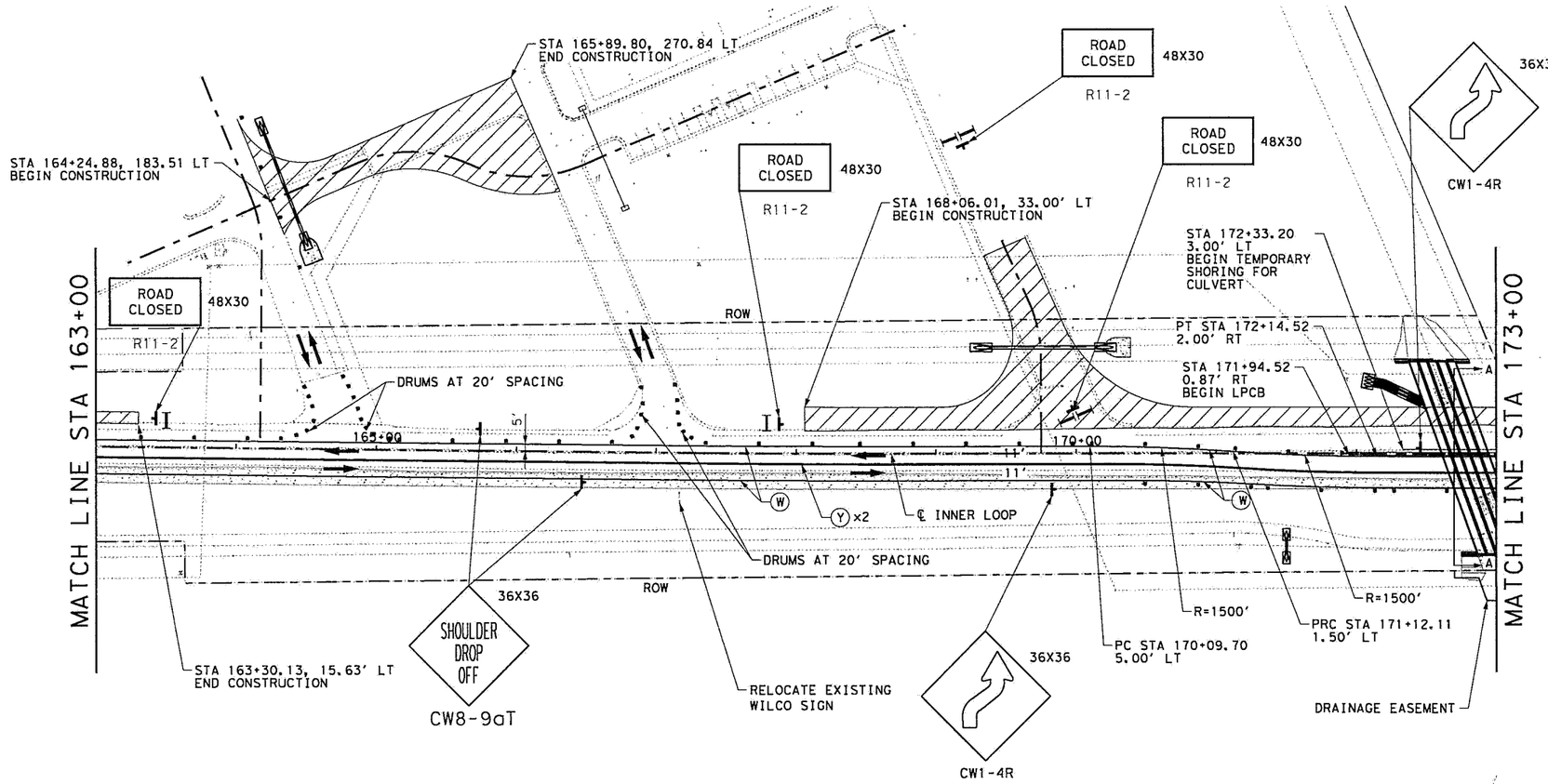
6/26/2017
cwm



50 0 50 100
SCALE: 1" = 100'

TCP PLAN LEGEND

- TEMP PAVEMENT UNDER CONSTRUCTION
- TEMP PAVEMENT ALREADY CONSTRUCTED
- PERM PAVEMENT UNDER CONSTRUCTION
- PERM PAVEMENT ALREADY CONSTRUCTED
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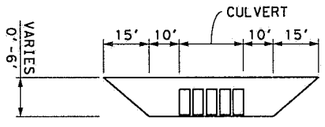
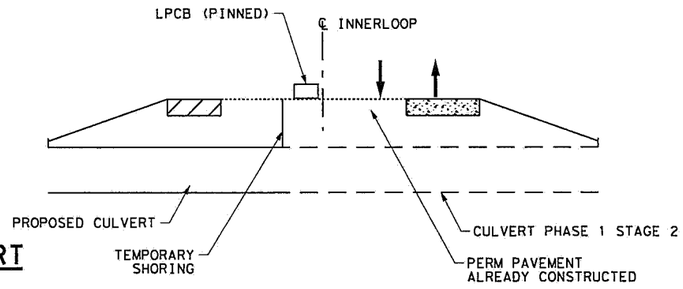


TEMP SHORING PROFILE FOR CULVERT



SECTION A-A

SEE PHASE 1 STAGE 2 FOR ADDITIONAL INFORMATION

STATE OF TEXAS
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GEORGETOWN INNER LOOP @ CENTRAL MAINTENANCE FACILITY

TRAFFIC CONTROL PHASE 2 STAGE 1

SCALE: 1" = 100' SHEET 3 OF 4

DESIGN	GRAPHICS	CHECK	CHECK	SHEET NO.
KA	AKH	CWM	WD	40

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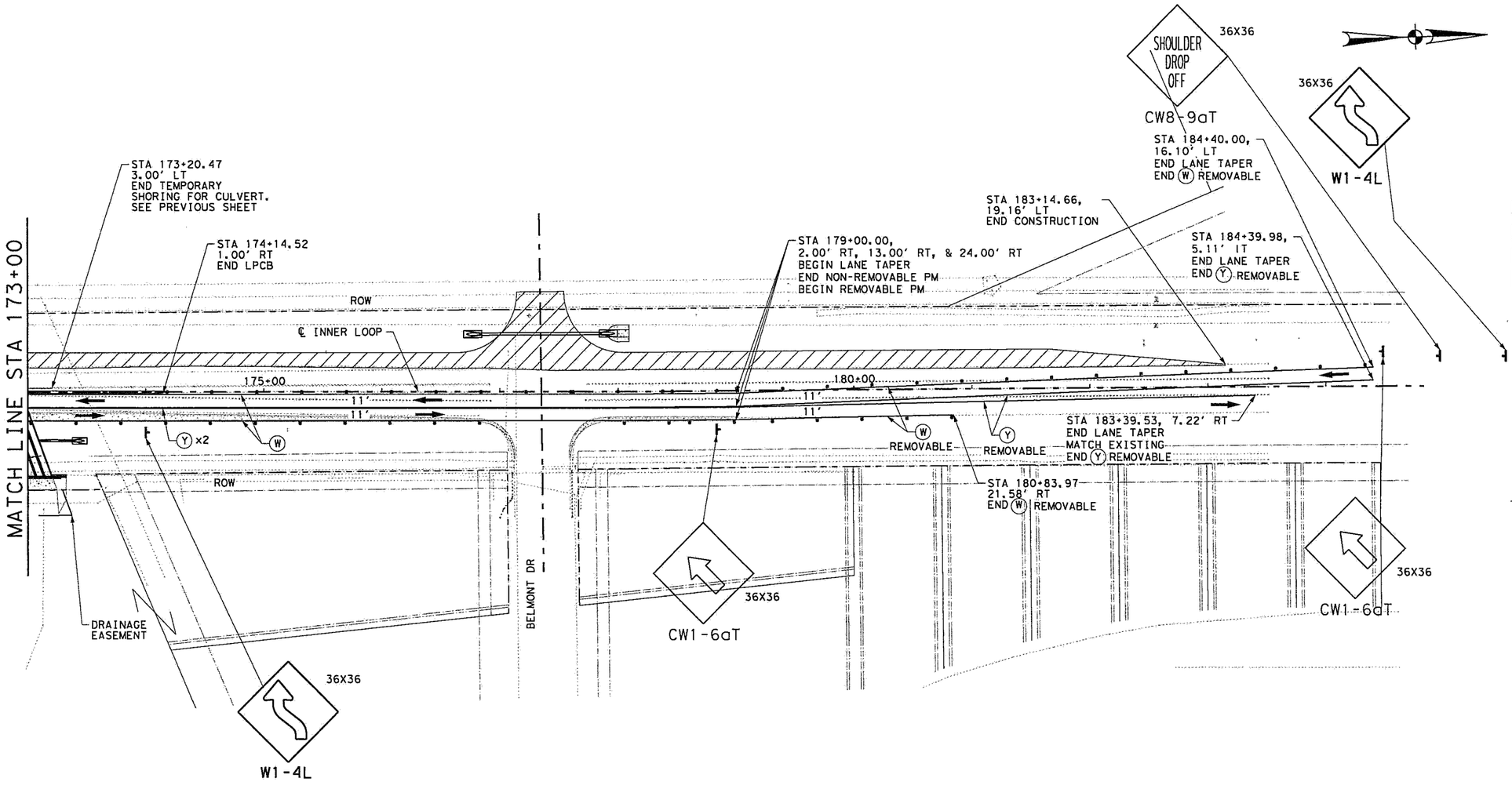

50 0 50 100
SCALE: 1" = 100'

TCP PLAN LEGEND

- TEMP PAVEMENT UNDER CONSTRUCTION
- TEMP PAVEMENT ALREADY CONSTRUCTED
- PERM PAVEMENT UNDER CONSTRUCTION
- PERM PAVEMENT ALREADY CONSTRUCTED
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- CONSTRUCTION SIGN
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GEORGETOWN INNER LOOP @ CENTRAL MAINTENANCE FACILITY

TRAFFIC CONTROL PHASE 2 STAGE 1

SCALE: 1" = 100' SHEET 4 OF 4

DESIGN	GRAPHICS	CHECK	CHECK	SHEET NO.
KA	AKH	CWM	WD	41

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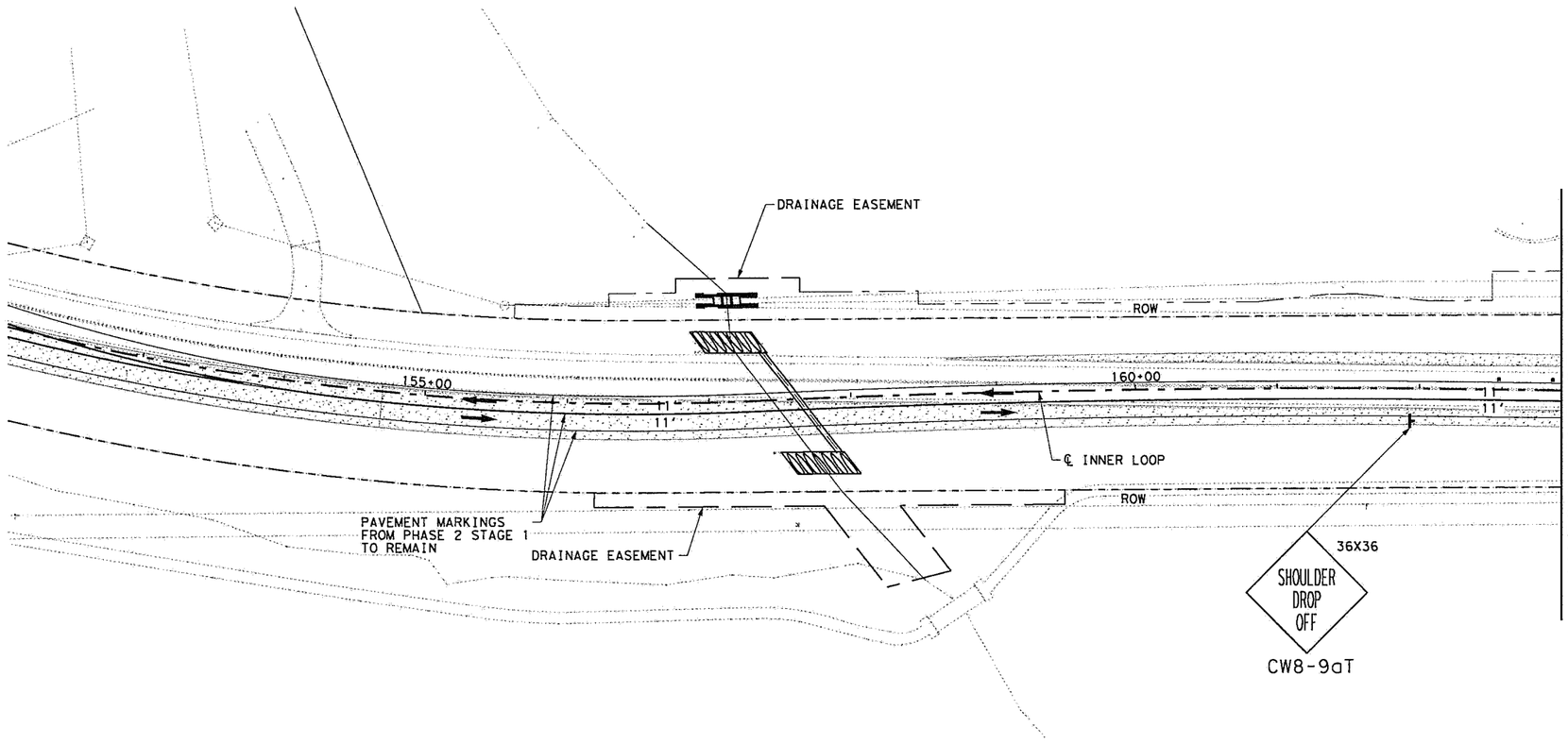
SCALE: 1" = 100'



TCP PLAN LEGEND

- TEMP PAVEMENT UNDER CONSTRUCTION
- TEMP PAVEMENT ALREADY CONSTRUCTED
- PERM PAVEMENT UNDER CONSTRUCTION
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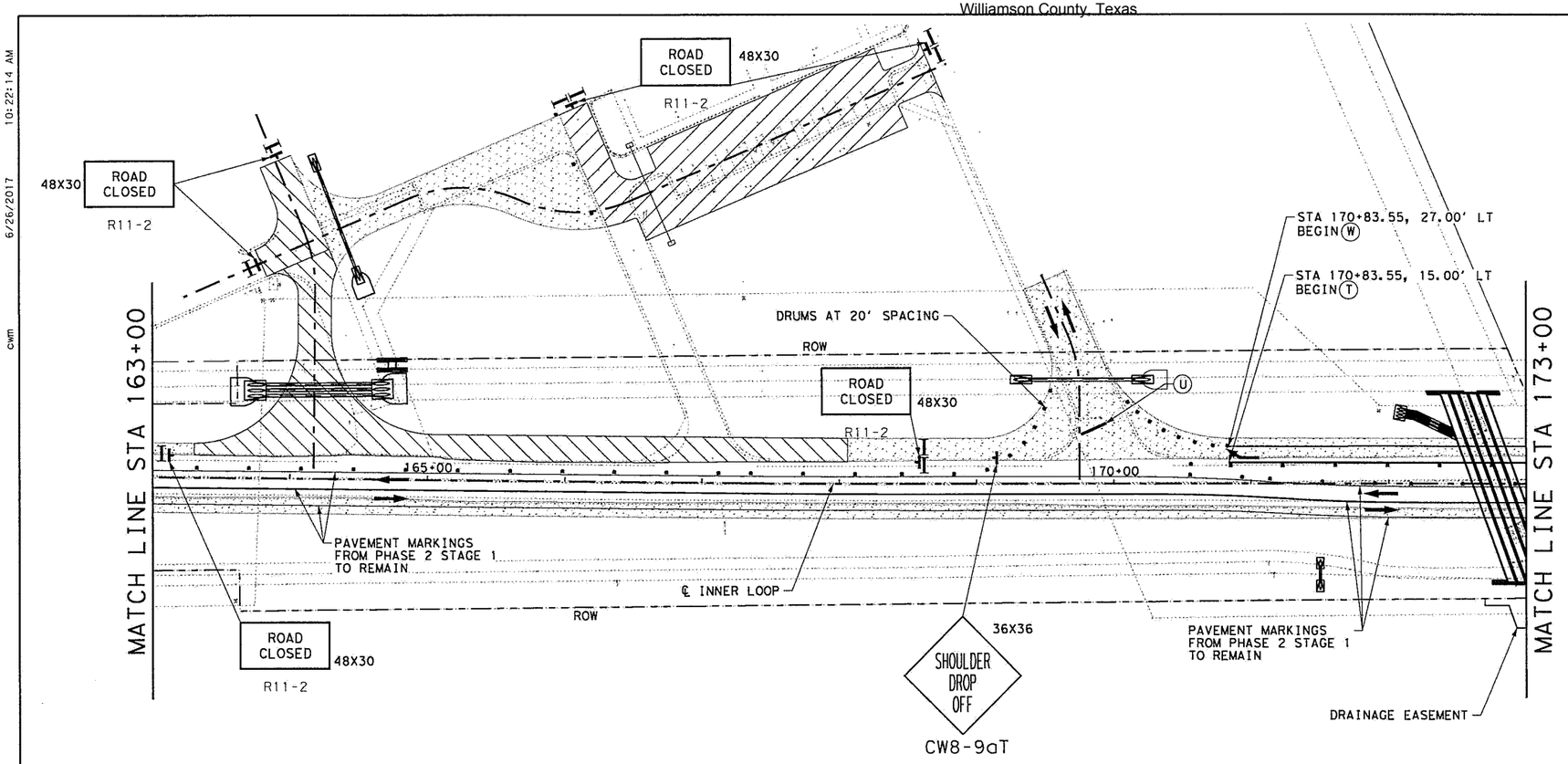
GEORGETOWN INNER LOOP @ CENTRAL MAINTENANCE FACILITY

TRAFFIC CONTROL PHASE 2 STAGE 2

SCALE: 1" = 100' SHEET 1 OF 3

DESIGN	GRAPHICS	CHECK	CHECK	SHEET NO.
KA	AKH	CWM	WD	42



50 0 50 100
SCALE: 1" = 100'

TCP PLAN LEGEND

- TEMP PAVEMENT UNDER CONSTRUCTION
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TRAFFIC CONTROL PHASE 2 STAGE 2

SCALE: 1" = 100' SHEET 2 OF 3

DESIGN	GRAPHICS	CHECK	CHECK	SHEET NO.
KA	AKH	CWM	WD	43 of 415

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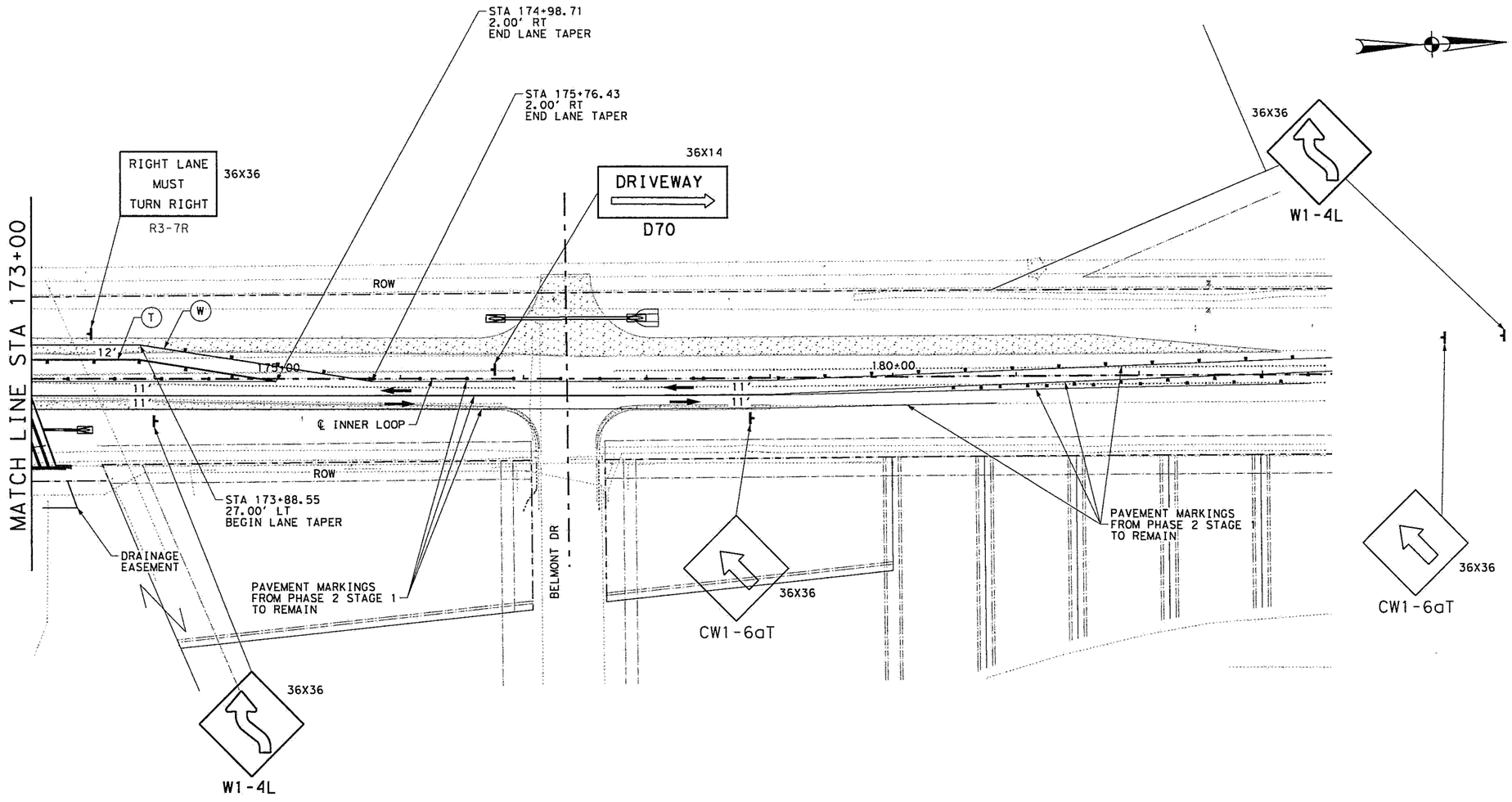

TCP PLAN LEGEND

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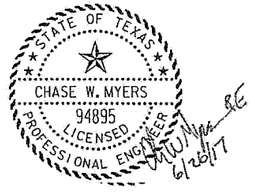

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GEORGETOWN INNER LOOP @ CENTRAL MAINTENANCE FACILITY

TRAFFIC CONTROL PHASE 2 STAGE 2

SCALE: 1" = 100' SHEET 3 OF 3

DESIGN	GRAPHICS	CHECK	CHECK	SHEET NO.
KA	AKH	CWM	WD	44

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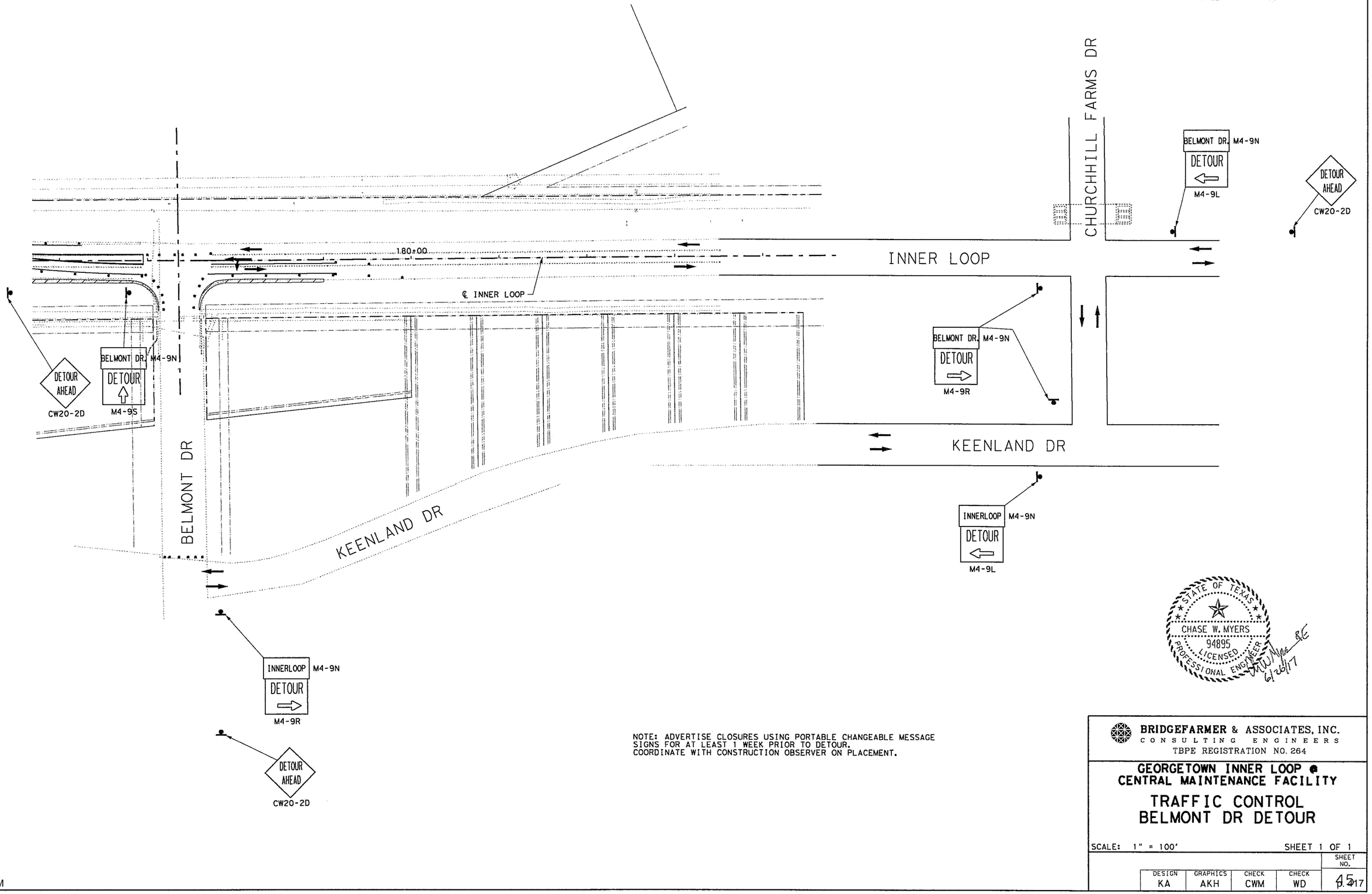
SCALE: 1" = 100'



NOTE: ADVERTISE CLOSURES USING PORTABLE CHANGEABLE MESSAGE SIGNS FOR AT LEAST 1 WEEK PRIOR TO DETOUR. COORDINATE WITH CONSTRUCTION OBSERVER ON PLACEMENT.

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GEORGETOWN INNER LOOP @ CENTRAL MAINTENANCE FACILITY

TRAFFIC CONTROL BELMONT DR DETOUR

SCALE: 1" = 100' SHEET 1 OF 1

DESIGN	GRAPHICS	CHECK	CHECK	SHEET NO.
KA	AKH	CWM	WD	45

6/26/2017

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BARRICADE AND CONSTRUCTION (BC) STANDARD SHEETS GENERAL NOTES:

1. The Barricade and Construction Standard Sheets (BC sheets) are intended to show typical examples for placement of temporary traffic control devices, construction pavement markings, and typical work zone signs. The information contained in these sheets meet or exceed the requirements shown in the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD).

2. The development and design of the Traffic Control Plan (TCP) is the responsibility of the Engineer.

3. The Contractor may propose changes to the TCP that are signed and sealed by a licensed professional engineer for approval. The Engineer may develop, sign and seal Contractor proposed changes.

4. The Contractor is responsible for installing and maintaining the traffic control devices as shown in the plans. The Contractor may not move or change the approximate location of any device without the approval of the Engineer.

5. Geometric design of lane shifts and detours should, when possible, meet the applicable design criteria contained in manuals such as the American Association of State Highway and Transportation Officials (AASHTO), "A Policy on Geometric Design of Highways and Streets," the TxDOT "Roadway Design Manual" or engineering judgment.

6. When projects abut, the Engineer(s) may omit the END ROAD WORK, TRAFFIC FINES DOUBLE, and other advance warning signs if the signing would be redundant and the work areas appear continuous to the motorists. If the adjacent project is completed first, the Contractor shall erect the necessary warning signs as shown on these sheets, the TCP sheets or as directed by the Engineer. The BEGIN ROAD WORK NEXT X MILES sign shall be revised to show appropriate work zone distance.

7. The Engineer may require duplicate warning signs on the median side of divided highways where median width will permit and traffic volumes justify the signing.

8. All signs shall be constructed in accordance with the details found in the "Standard Highway Sign Designs for Texas," latest edition. Sign details not shown in this manual shall be shown in the plans or the Engineer shall provide a detail to the Contractor before the sign is manufactured.

9. The temporary traffic control devices shown in the illustrations of the BC sheets are examples. As necessary, the Engineer will determine the most appropriate traffic control devices to be used.

10. As shown on BC(2), the OBEY WARNING SIGNS STATE LAW sign, STAY ALERT TALK OR TEXT LATER (see Sign Detail G20-10T) and the WORK ZONE TRAFFIC FINES DOUBLE sign with plaque shall be erected in advance of the CSJ limits. However, the TRAFFIC FINES DOUBLE sign will not be required on projects consisting solely of mobile operation work, such as striping or milling edgeline rumble strips. The BEGIN ROAD WORK NEXT X MILES, CONTRACTOR and END ROAD WORK signs shall be erected at or near the CSJ limits.

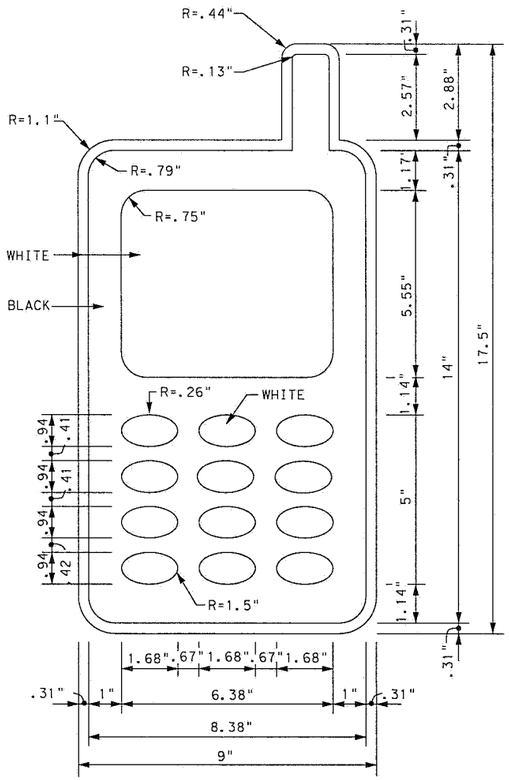
11. Except for devices required by Note 10, traffic control devices should be in place only while work is actually in progress or a definite need exists.

12. The Engineer has the final decision on the location of all traffic control devices.

13. Inactive equipment and work vehicles, including workers' private vehicles must be parked away from travel lanes. They should be as close to the right-of-way line as possible, or located behind a barrier or guardrail, or as approved by the Engineer.

WORKER SAFETY APPAREL NOTES:

1. Workers on foot who are exposed to traffic or to construction equipment within the right-of-way shall wear high-visibility safety apparel meeting the requirements of ISEA "American National Standard for High-Visibility Apparel," or equivalent revisions, and labeled as ANSI 107-2004 standard performance for Class 2 or 3 risk exposure. Class 3 garments should be considered for high traffic volume work areas or night time work.



3.0" Radius, 1.25" Border, 0.75" Indent, Black on Yellow; [STAY ALERT] Font: D
3.0" Radius, 1.25" Border, 0.75" Indent, Black on Orange; [TALK OR TEXT LATER] Font: C specified length;

SIGN DETAIL (G20-10T)

Only pre-qualified products shall be used. The "Compliant Work Zone Traffic Control Devices List" (CWZTCD) describes pre-qualified products and their sources and may be found on-line at the web address given below or by contacting:

Texas Department of Transportation
Traffic Operations Division - TE
Phone (512) 416-3118

THE DOCUMENTS BELOW CAN BE FOUND ON-LINE AT http://www.txdot.gov
COMPLIANT WORK ZONE TRAFFIC CONTROL DEVICES LIST (CWZTCD)
DEPARTMENTAL MATERIAL SPECIFICATIONS (DMS)
MATERIAL PRODUCER LIST (MPL)
ROADWAY DESIGN MANUAL - SEE "MANUALS (ONLINE MANUALS)"
STANDARD HIGHWAY SIGN DESIGNS FOR TEXAS (SHSD)
TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (TMUTCD)
TRAFFIC ENGINEERING STANDARD SHEETS

Texas Department of Transportation — Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION GENERAL NOTES AND REQUIREMENTS

BC(1)-14

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REVISIONS 4-03 5-10 8-14 9-07 7-13	DIST	COUNTY		SHEET NO. 4 of 18

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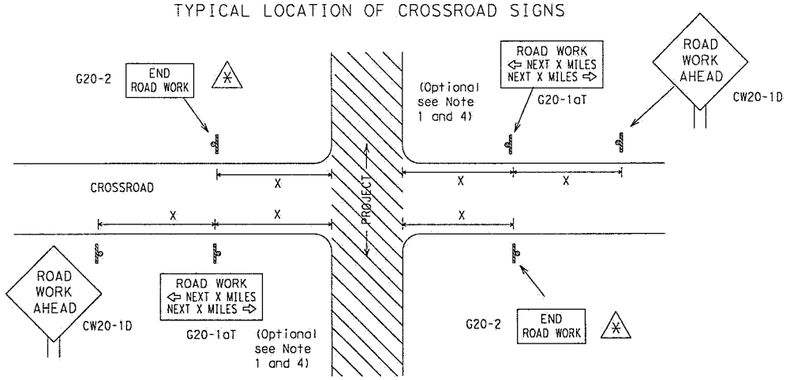
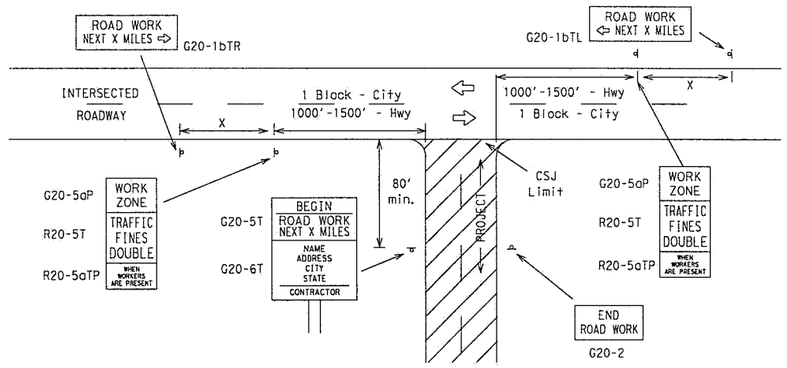
TYPICAL LOCATION OF CROSSROAD SIGNS



⁂ May be mounted on back of "ROAD WORK AHEAD"(CW20-1D) sign with approval of Engineer. (See note 2 below)

1. The typical minimum signing on a crossroad approach should be a "ROAD WORK AHEAD" (CW20-1D)sign and a (G20-2) "END ROAD WORK" sign, unless noted otherwise in plans.
2. The Engineer may use the reduced size 36" x 36" ROAD WORK AHEAD (CW20-1D) sign mounted back to back with the reduced size 36" x 18" "END ROAD WORK"(G20-2) sign on low volume crossroads (see Note 4 under "Typical Construction Warning Sign Size and Spacing"). See the "Standard Highway Sign Designs for Texas" manual for sign details. The Engineer may omit the advance warning signs on low volume crossroads. The Engineer will determine whether a road is low volume. This information shall be shown in the plans.
3. Based on existing field conditions, the Engineer/Inspector may require additional signs such as FLAGGER AHEAD, LOOSE GRAVEL, or other appropriate signs. When additional signs are required, these signs will be considered part of the minimum requirements. The Engineer/Inspector will determine the proper location and spacing of any sign not shown on the BC sheets, Traffic Control Plan sheets or the Work Zone Standard Sheets.
4. The "ROAD WORK NEXT X MILES"(G20-1aT)sign shall be required at high volume crossroads to advise motorists of the length of construction in either direction from the intersection. The Engineer will determine whether a roadway is considered high volume.
5. Additional traffic control devices may be shown elsewhere in the plans for higher volume crossroads.
6. When work occurs in the intersection area, appropriate traffic control devices, as shown elsewhere in the plans or as determined by the Engineer/Inspector, shall be in place.

T-INTERSECTION



CSJ LIMITS AT T-INTERSECTION

1. The Engineer will determine the types and location of any additional traffic control devices, such as a flagger and accompanying signs, or other signs, that should be used when work is being performed at or near an intersection.
2. If construction closes the road at a T-intersection the Contractor shall place the "CONTRACTOR NAME"(G20-6T) sign behind the Type 3 Barricades for the road closure (see BC(10) also). The "ROAD WORK NEXT X MILES" left arrow(G20-1bTL) and "ROAD WORK NEXT X MILES" right arrow (G20-1bTR)" signs shall be replaced by the detour signing called for in the plans.

TYPICAL CONSTRUCTION WARNING SIGN SIZE AND SPACING[1,5,6]

SIZE		
Sign Number or Series	Conventional Road	Expressway/ Freeway
CW20[4], CW21, CW22, CW23, CW25	48" x 48"	48" x 48"
CW1, CW2, CW7, CW8, CW9, CW11, CW14	36" x 36"	48" x 48"
CW3, CW4, CW5, CW6, CW8-3, CW10, CW12	48" x 48"	48" x 48"

SPACING	
Posted Speed	Sign Spacing "X" Δ
MPH	Feet (Apprx.)
30	120
35	160
40	240
45	320
50	400
55	500[2]
60	600[2]
65	700[2]
70	800[2]
75	900[2]
80	1000[2]
*	*[3]

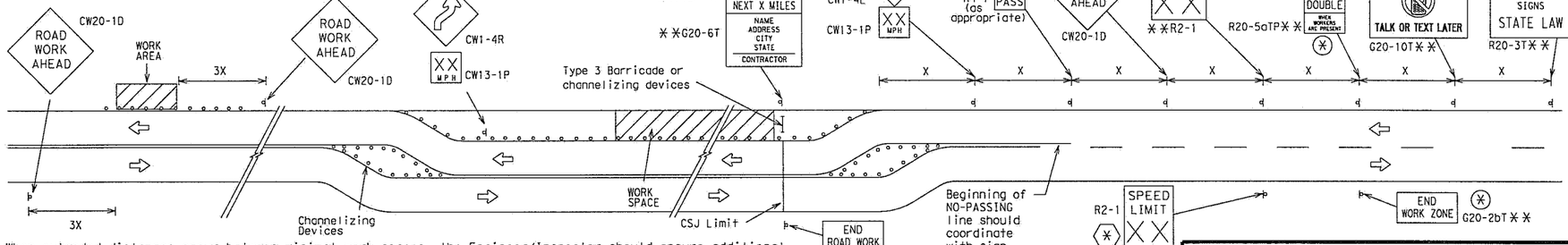
* For typical sign spacings on divided highways, expressways and freeways, see Part 6 of the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD) typical application diagrams or TCP Standard Sheets.

Δ Minimum distance from work area to first Advance Warning sign nearest the work area and/or distance between each additional sign.

GENERAL NOTES

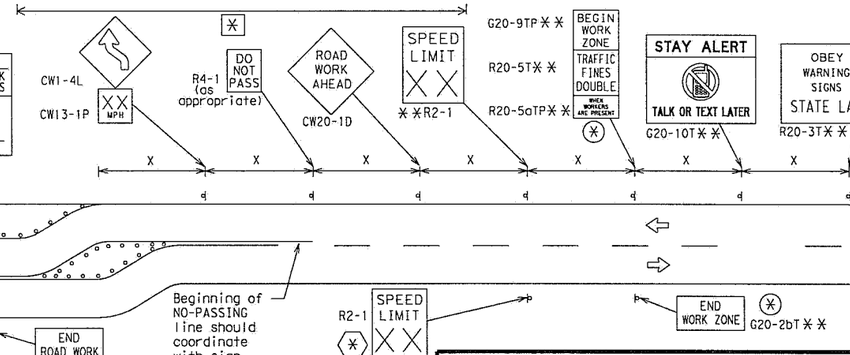
1. Special or larger size signs may be used as necessary.
2. Distance between signs should be increased as required to have 1500 feet advance warning.
3. Distance between signs should be increased as required to have 1/2 mile or more advance warning.
4. 36" x 36" "ROAD WORK AHEAD" (CW20-1D)signs may be used on low volume crossroads at the discretion of the Engineer. See Note 2 under "Typical Location of Crossroad Signs".
5. Only diamond shaped warning sign sizes are indicated.
6. See sign size listing in "TMUTCD", Sign Appendix or the "Standard Highway Sign Designs for Texas" manual for complete list of available sign design sizes.

WORK AREAS IN MULTIPLE LOCATIONS WITHIN CSJ LIMITS

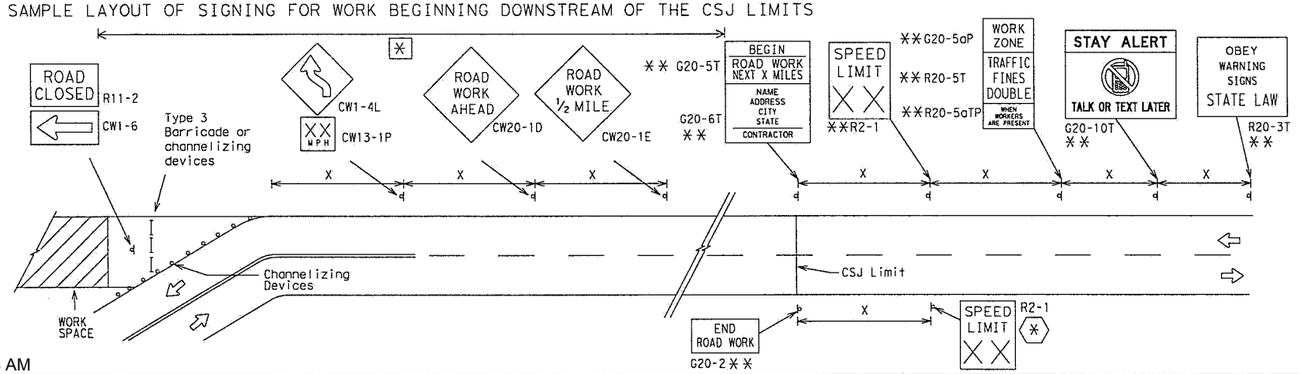


When extended distances occur between minimal work spaces, the Engineer/Inspector should ensure additional "ROAD WORK AHEAD"(CW20-1D)signs are placed in advance of these work areas to remind drivers they are still within the project limits. See the applicable TCP sheets for exact location and spacing of signs and channelizing devices.

SAMPLE LAYOUT OF SIGNING FOR WORK BEGINNING AT THE CSJ LIMITS



SAMPLE LAYOUT OF SIGNING FOR WORK BEGINNING DOWNSTREAM OF THE CSJ LIMITS



NOTES

The Contractor shall determine the appropriate distance to be placed on the G20-1 series signs and "BEGIN ROAD WORK NEXT X MILES"(G20-5T)sign for each specific project. This distance shall replace the "X" and shall be rounded to the nearest whole mile with the approval of the Engineer. No decimals shall be used.

⁂ The "BEGIN WORK ZONE"(G20-9TP) and "END WORK ZONE" (G20-2bT) shall be used as shown on the sample layout when advance signs are required outside the CSJ Limits. They inform the motorist of entering or leaving a part of the work zone lying outside the CSJ Limits where traffic fines may double if workers are present.

⁂⁂ Required CSJ Limit signing. See Note 10 on BC(1). TRAFFIC FINES DOUBLE signs will not be required on projects consisting solely of mobile operations work.

⁂ Area for placement of "ROAD WORK AHEAD" (CW20-1D)sign and other signs or devices as called for on the Traffic Control Plan.

⁂ Contractor will install a regulatory speed limit sign at the end of the work zone.

LEGEND	
⊢⊣	Type 3 Barricade
○○○	Channelizing Devices
▬	Sign
X	See Typical Construction Warning Sign Size and Spacing chart or the TMUTCD for sign spacing requirements.

Texas Department of Transportation — Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION PROJECT LIMIT

BC(2)-14

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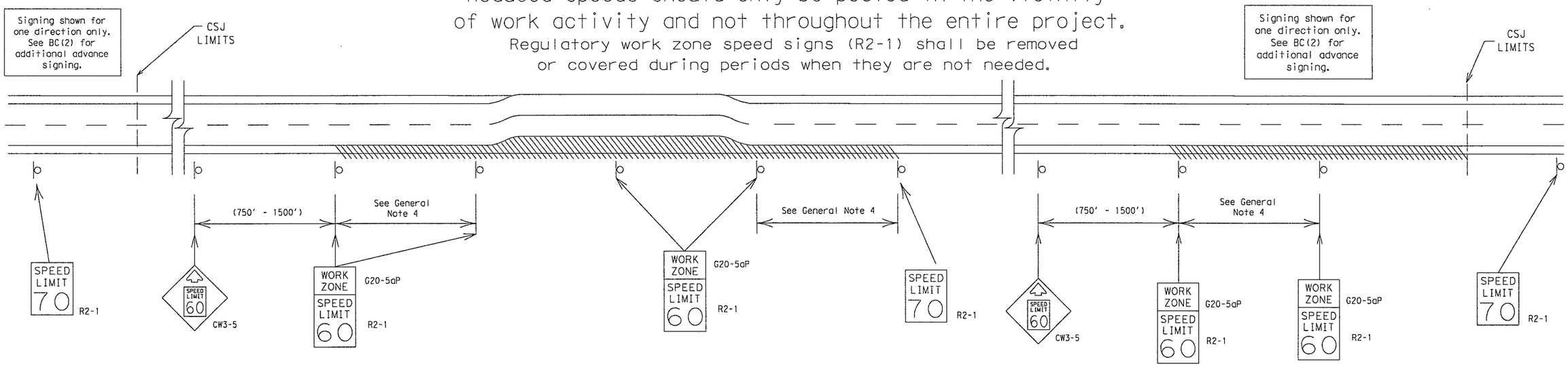
TYPICAL APPLICATION OF WORK ZONE SPEED LIMIT SIGNS

Work zone speed limits shall be regulatory, established in accordance with the "Procedures for Establishing Speed Zones," and approved by the Texas Transportation Commission, or by City Ordinance when within Incorporated City Limits.

Reduced speeds should only be posted in the vicinity of work activity and not throughout the entire project.

Regulatory work zone speed signs (R2-1) shall be removed or covered during periods when they are not needed.



GUIDANCE FOR USE:

LONG/INTERMEDIATE TERM WORK ZONE SPEED LIMITS

This type of work zone speed limit should be included on the design of the traffic control plans when restricted geometrics with a lower design speed are present in the work zone and modification of the geometrics to a higher design speed is not feasible.

Long/Intermediate Term Work Zone Speed Limit signs, when approved as described above, should be posted and visible to the motorist when work activity is present. Work activity may also be defined as a change in the roadway that requires a reduced speed for motorists to safely negotiate the work area, including:

a) rough road or damaged pavement surface
b) substantial alteration of roadway geometrics (diversions)
c) construction detours
d) grade
e) width
f) other conditions readily apparent to the driver

As long as any of these conditions exist, the work zone speed limit signs should remain in place.

SHORT TERM WORK ZONE SPEED LIMITS

This type of work zone speed limit may be included on the design of the traffic control plans when workers or equipment are not behind concrete barrier, when work activity is within 10 feet of the traveled way or actually in the travelled way.

Short Term Work Zone Speed Limit signs should be posted and visible to the motorists only when work activity is present. When work activity is not present, signs shall be removed or covered.
(See Removing or Covering on BC(4)).

GENERAL NOTES

1. Regulatory work zone speed limits should be used only for sections of construction projects where speed control is of major importance.
2. Regulatory work zone speed limit signs shall be placed on supports at a 7 foot minimum mounting height.
3. Speed zone signs are illustrated for one direction of travel and are normally posted for each direction of travel.
4. Frequency of work zone speed limit signs should be:
   40 mph and greater 0.2 to 2 miles
   35 mph and less 0.2 to 1 mile
5. Regulatory speed limit signs shall have black legend and border on a white reflective background (See "Reflective Sheeting" on BC(4)).
6. Fabrication, erection and maintenance of the"ADVANCE SPEED LIMIT"(CW3-5)sign, "WORK ZONE"(G20-5aP) plaque and the "SPEED LIMIT"(R2-1)signs shall not be paid for directly, but shall be considered subsidiary to Item 502.
7. Turning signs from view, laying signs over or down will not be allowed, unless as otherwise noted under "REMOVING OR COVERING" on BC(4).
8. Techniques that may help reduce traffic speeds include but are not limited to:
   A. Law enforcement.
   B. Flagger stationed next to sign.
   C. Portable changeable message sign (PCMS).
   D. Low-power (drone) radar transmitter.
   E. Speed monitor trailers or signs.
9. Speeds shown on details above are for illustration only. Work Zone Speed Limits should only be posted as approved for each project.
10. For more specific guidance concerning the type of work, work zone conditions and factors impacting allowable regulatory construction speed zone reduction see TxDOT form #1204 in the TxDOT e-form system.

Texas Department of Transportation | Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION WORK ZONE SPEED LIMIT

BC(3)-14

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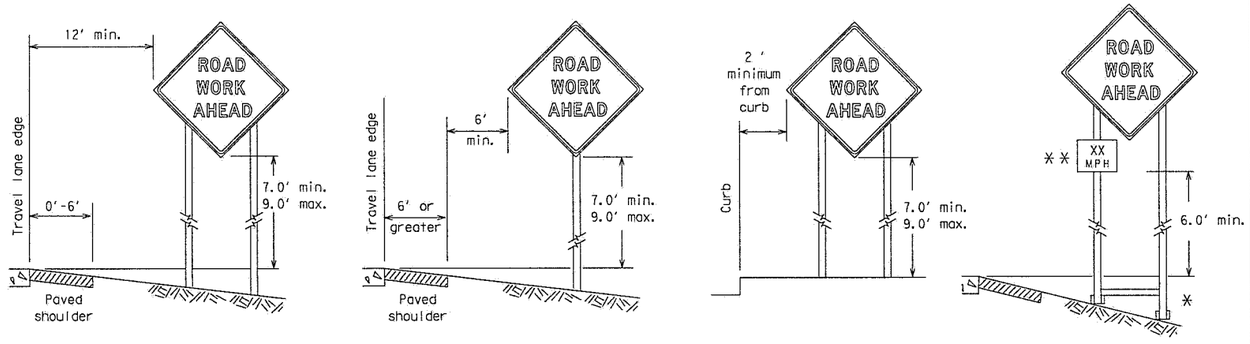
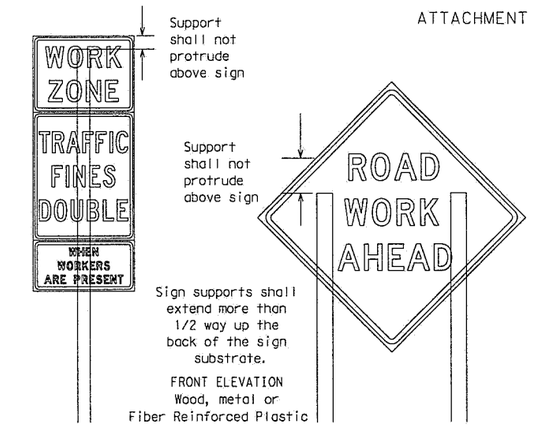
TYPICAL MINIMUM CLEARANCES FOR LONG TERM AND INTERMEDIATE TERM SIGNS

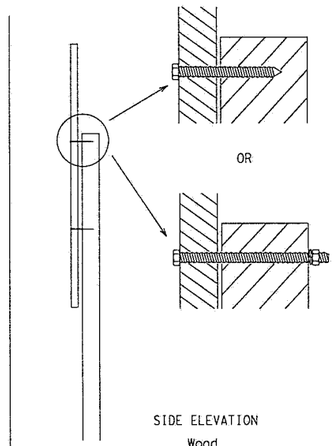


⁎ When placing skid supports on unlevel ground, the leg post lengths must be adjusted so the sign appears straight and plumb. Objects shall NOT be placed under skids as a means of leveling.

⁎⁎ When plaques are placed on dual-leg supports, they should be attached to the upright nearest the travel lane. Supplemental plaques (advisory or distance) should not cover the surface of the parent sign.

ATTACHMENT FOR SIGN SUPPORTS





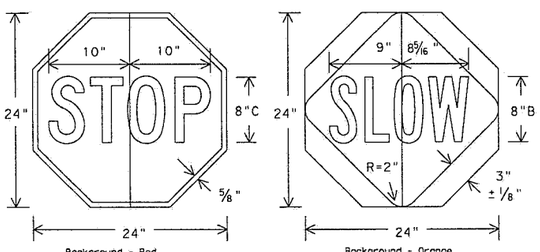
Attachment to wooden supports will be by bolts and nuts or screws. Use TxDOT's or manufacturer's recommended procedures for attaching sign substrates to other types of sign supports

Nails shall NOT be allowed. Each sign shall be attached directly to the sign support. Multiple signs shall not be joined or spliced by any means. Wood supports shall not be extended or repaired by splicing or other means.

Splicing embedded perforated square metal tubing in order to extend post height will only be allowed when the splice is made using four bolts, two above and two below the spice point. Splice must be located entirely behind the sign substrate, not near the base of the support. Splice insert lengths should be at least 5 times nominal post size, centered on the splice and of at least the same gauge material.

STOP/SLOW PADDLES

1. STOP/SLOW paddles are the primary method to control traffic by flaggers. The STOP/SLOW paddle size should be 24" x 24" as detailed below.
2. When used at night, the STOP/SLOW paddle shall be retroreflectorized.
3. STOP/SLOW paddles may be attached to a staff with a minimum length of 6' to the bottom of the sign.
4. Any lights incorporated into the STOP or SLOW paddle faces shall only be as specifically described in Section 6E.03 Hand Signaling Devices in the TMUTCD.



CONTRACTOR REQUIREMENTS FOR MAINTAINING PERMANENT SIGNS WITHIN THE PROJECT LIMITS

1. Permanent signs are used to give notice of traffic laws or regulations, call attention to conditions that are potentially hazardous to traffic operations, show route designations, destinations, directions, distances, services, points of interest, and other geographical, recreational, or cultural information. Drivers proceeding through a work zone need the same, if not better route guidance as normally installed on a roadway without construction.
2. When permanent regulatory or warning signs conflict with work zone conditions, remove or cover the permanent signs until the permanent sign message matches the roadway condition.
3. When existing permanent signs are moved and relocated due to construction purposes, they shall be visible to motorists at all times.
4. If existing signs are to be relocated on their original supports, they shall be installed on crashworthy bases as shown on the SMD Standard sheets. The signs shall meet the required mounting heights shown on the BC Sheets or the SMD Standards. This work should be paid for under the appropriate pay item for relocating existing signs.
5. If permanent signs are to be removed and relocated using temporary supports, the Contractor shall use crashworthy supports as shown on the BC sheets or the CWZTCD. The signs shall meet the required mounting heights shown on the BC Sheets or the SMD Standards during construction. This work should be paid for under the appropriate pay item for relocating existing signs.
6. Any sign or traffic control device that is struck or damaged by the Contractor or his/her construction equipment shall be replaced as soon as possible by the Contractor to ensure proper guidance for the motorists. This will be subsidiary to Item 502.

GENERAL NOTES FOR WORK ZONE SIGNS

1. Contractor shall install and maintain signs in a straight and plumb condition and/or as directed by the Engineer.
2. Wooden sign posts shall be painted white.
3. Barricades shall NOT be used as sign supports.
4. All signs shall be installed in accordance with the plans or as directed by the Engineer. Signs shall be used to regulate, warn, and guide the traveling public safely through the work zone.
5. The Contractor may furnish either the sign design shown in the plans or in the "Standard Highway Sign Designs for Texas" (SHSD). The Engineer/Inspector may require the Contractor to furnish other work zone signs that are shown in the TMUTCD but may have been omitted from the plans. Any variation in the plans shall be documented by written agreement between the Engineer and the Contractor's Responsible Person. All changes must be documented in writing before being implemented. This can include documenting the changes in the Inspector's TxDOT diary and having both the Inspector and Contractor initial and date the agreed upon changes.
6. The Contractor shall furnish sign supports listed in the "Compliant Work Zone Traffic Control Device List" (CWZTCD). The Contractor shall install the sign support in accordance with the manufacturer's recommendations. If there is a question regarding installation procedures, the Contractor shall furnish the Engineer a copy of the manufacturer's installation recommendations so the Engineer can verify the correct procedures are being followed.
7. The Contractor is responsible for installing signs on approved supports and replacing signs with damaged or cracked substrates and/or damaged or marred reflective sheeting as directed by the Engineer/Inspector.
8. Identification markings may be shown only on the back of the sign substrate. The maximum height of letters and/or company logos used for identification shall be 1 inch.
9. The Contractor shall replace damaged wood posts. New or damaged wood sign posts shall not be spliced.

DURATION OF WORK (as defined by the "Texas Manual on Uniform Traffic Control Devices" Part 6)

1. The types of sign supports, sign mounting height, the size of signs, and the type of sign substrates can vary based on the type of work being performed. The Engineer is responsible for selecting the appropriate size sign for the type of work being performed. The Contractor is responsible for ensuring the sign support, sign mounting height and substrate meets manufacturer's recommendations in regard to crashworthiness and duration of work requirements.
   a. Long-term stationary - work that occupies a location more than 3 days.
   b. Intermediate-term stationary - work that occupies a location more than one daylight period up to 3 days, or nighttime work lasting more than one hour.
   c. Short-term stationary - daytime work that occupies a location for more than 1 hour in a single daylight period.
   d. Short, duration - work that occupies a location up to 1 hour.
   e. Mobile - work that moves continuously or intermittently (stopping for up to approximately 15 minutes.)

SIGN MOUNTING HEIGHT

1. The bottom of Long-term/Intermediate-term signs shall be at least 7 feet, but not more than 9 feet, above the paved surface, except as shown for supplemental plaques mounted below other signs.
2. The bottom of Short-term/Short Duration signs shall be a minimum of 1 foot above the pavement surface but no more than 2 feet above the ground.
3. Long-term/Intermediate-term Signs may be used in lieu of Short-term/Short Duration signing.
4. Short-term/Short Duration signs shall be used only during daylight and shall be removed at the end of the workday or raised to appropriate Long-term/Intermediate sign height.
5. Regulatory signs shall be mounted at least 7 feet, but not more than 9 feet, above the paved surface regardless of work duration.

SIZE OF SIGNS

1. The Contractor shall furnish the sign sizes shown on BC (2) unless otherwise shown in the plans or as directed by the Engineer.

SIGN SUBSTRATES

1. The Contractor shall ensure the sign substrate is installed in accordance with the manufacturer's recommendations for the type of sign support that is being used. The CWZTCD lists each substrate that can be used on the different types and models of sign supports.
2. "Mesh" type materials are NOT an approved sign substrate, regardless of the tightness of the weave.
3. All wooden individual sign panels fabricated from 2 or more pieces shall have one or more plywood cleat, 1/2" thick by 6" wide, fastened to the back of the sign and extending fully across the sign. The cleat shall be attached to the back of the sign using wood screws that do not penetrate the face of the sign panel. The screws shall be placed on both sides of the splice and spaced at 6" centers. The Engineer may approve other methods of splicing the sign face.

REFLECTIVE SHEETING

1. All signs shall be retroreflective and constructed of sheeting meeting the color and retro-reflectivity requirements of DMS-8300 for rigid signs or DMS-8310 for roll-up signs. The web address for DMS specifications is shown on BC(1).
2. White sheeting, meeting the requirements of DMS-8300 Type A, shall be used for signs with a white background.
3. Orange sheeting, meeting the requirements of DMS-8300 Type B_{FL} or Type C_{FL}, shall be used for rigid signs with orange backgrounds.

SIGN LETTERS

1. All sign letters and numbers shall be clear, and open rounded type uppercase alphabet letters as approved by the Federal Highway Administration (FHWA) and as published in the "Standard Highway Sign Design for Texas" manual. Signs, letters and numbers shall be of first class workmanship in accordance with Department Standards and Specifications.

REMOVING OR COVERING

1. When sign messages may be confusing or do not apply, the signs shall be removed or completely covered.
2. Long-term stationary or intermediate stationary signs installed on square metal tubing may be turned away from traffic 90 degrees when the sign message is not applicable. This technique may not be used for signs installed in the median of divided highways or near any intersections where the sign may be seen from approaching traffic.
3. Signs installed on wooden skids shall not be turned at 90 degree angles to the roadway. These signs should be removed or completely covered when not required.
4. When signs are covered, the material used shall be opaque, such as heavy mil black plastic, or other materials which will cover the entire sign face and maintain their opaque properties under automobile headlights at night, without damaging the sign sheeting.
5. Burlap shall NOT be used to cover signs.
6. Duct tape or other adhesive material shall NOT be affixed to a sign face.
7. Signs and anchor stubs shall be removed and holes backfilled upon completion of work.

SIGN SUPPORT WEIGHTS

1. Where sign supports require the use of weights to keep from turning over, the use of sandbags with dry, cohesionless sand should be used.
2. The sandbags will be tied shut to keep the sand from spilling and to maintain a constant weight.
3. Rock, concrete, iron, steel or other solid objects shall not be permitted for use as sign support weights.
4. Sandbags should weigh a minimum of 35 lbs and a maximum of 50 lbs.
5. Sandbags shall be made of a durable material that tears upon vehicular impact. Rubber (such as tire inner tubes) shall NOT be used.
6. Rubber ballasts designed for channelizing devices should not be used for ballast on portable sign supports. Sign supports designed and manufactured with rubber bases may be used when shown on the CWZTCD list.
7. Sandbags shall only be placed along or laid over the base supports of the traffic control device and shall not be suspended above ground level or hung with rope, wire, chains or other fasteners. Sandbags shall be placed along the length of the skids to weigh down the sign support.
8. Sandbags shall NOT be placed under the skid and shall not be used to level sign supports placed on slopes.

FLAGS ON SIGNS

1. Flags may be used to drow attention to warning signs. When used the flag shall be 16 inches square or larger and shall be orange or fluorescent red-orange in color. Flags shall not be allowed to cover any portion of the sign face.

SHEET 4 OF 12

Texas Department of Transportation | Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION TEMPORARY SIGN NOTES

BC(4)-14

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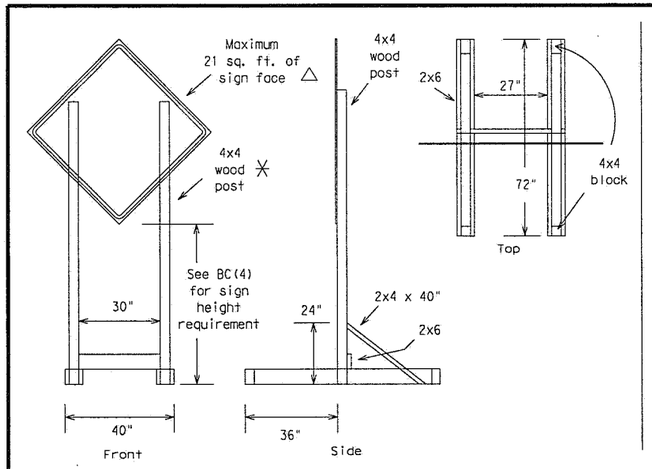
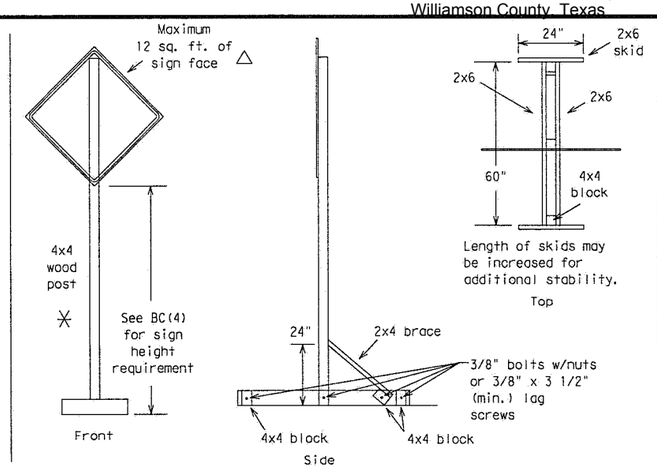
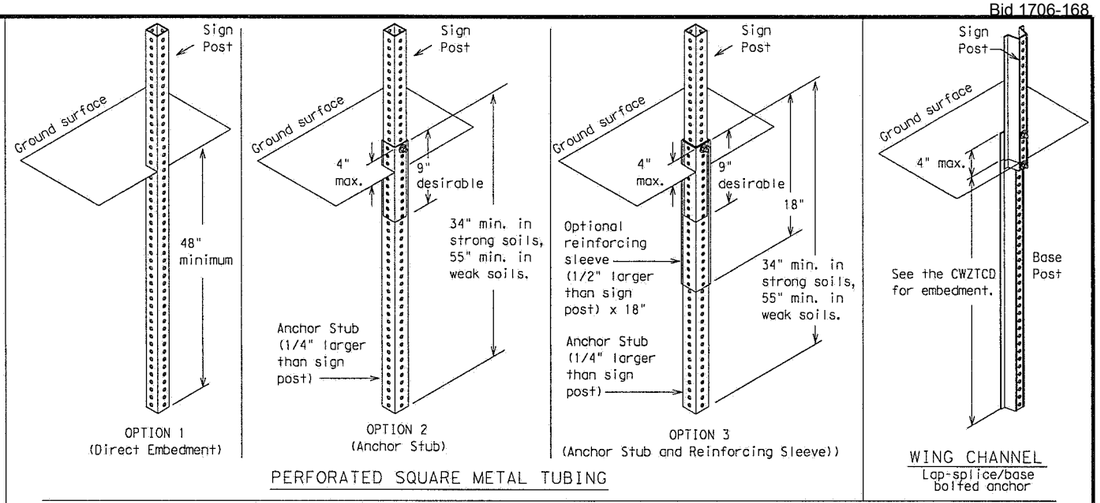




SKID MOUNTED WOOD SIGN SUPPORTS

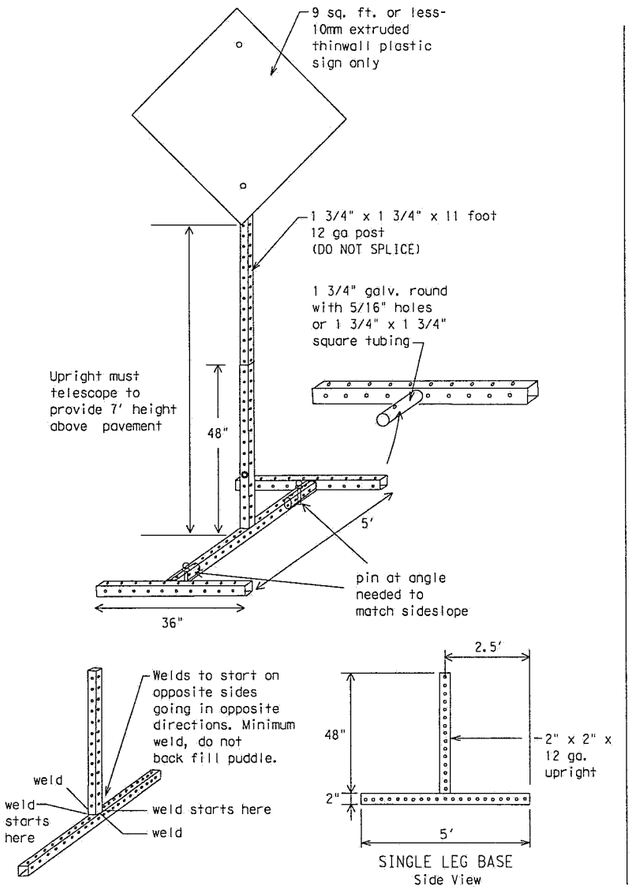
LONG/INTERMEDIATE TERM STATIONARY - PORTABLE SKID MOUNTED SIGN SUPPORTS □

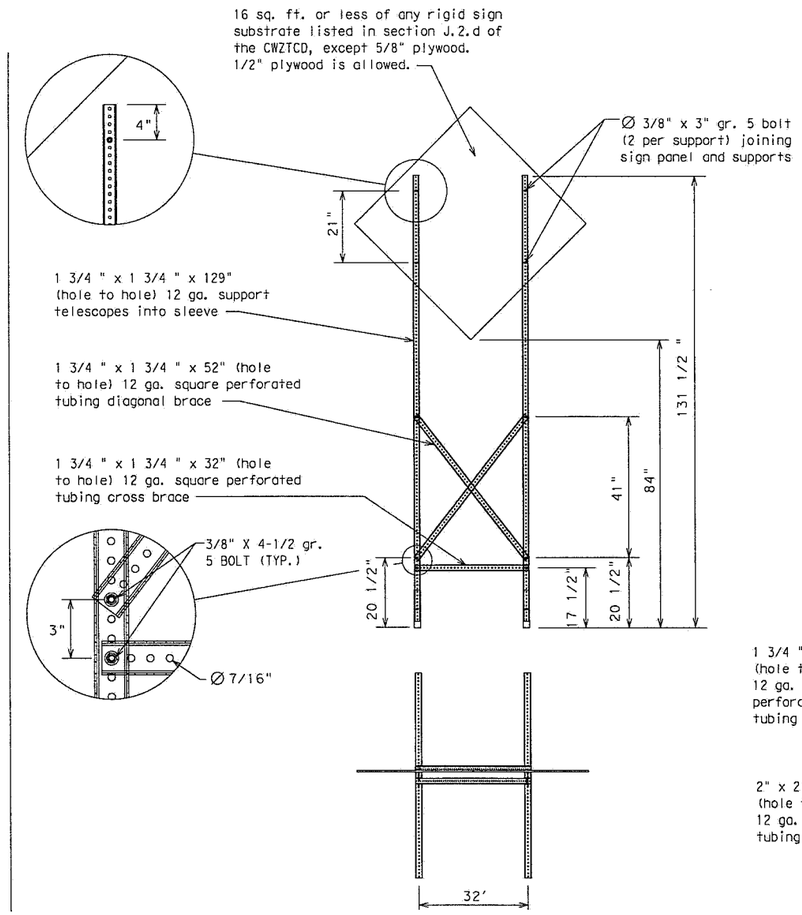


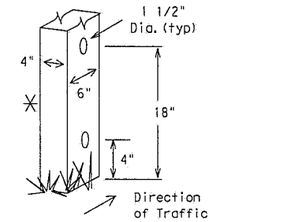
PERFORATED SQUARE METAL TUBING

GROUND MOUNTED SIGN SUPPORTS

Refer to the CWZTCD and the manufacturer's installation procedure for each type sign support.
The maximum sign square footage shall adhere to the manufacturer's recommendation.
Two post installations can be used for larger signs.

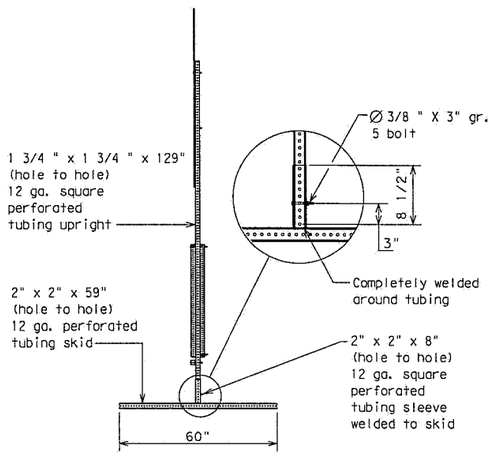






Nominal Post Size	Number of Posts	Maximum Sq. feet of Sign Face	Minimum Soil Embedment	Drilled Hole(s) Required
4 x 4	1	12	36"	NO
4 x 4	2	21	36"	NO
4 x 6	1	21	36"	YES
4 x 6	2	36	36"	YES

WOOD POST SYSTEM FOR GROUND MOUNTED SIGN SUPPORTS



WEDGE ANCHORS

Both steel and plastic Wedge Anchor Systems as shown on the SMD Standard Sheets may be used as temporary sign supports for signs up to 10 square feet of sign face. They may be set in concrete or in sturdy soils if approved by the Engineer. (See web address for "Traffic Engineering Standard Sheets" on BC(1)).

OTHER DESIGNS

MORE DETAILS OF APPROVED LONG/INTERMEDIATE AND SHORT TERM SUPPORTS CAN BE FOUND ON THE CWZTCD LIST. SEE BC(1) FOR WEBSITE LOCATION.

GENERAL NOTES

1. Nails may be used in the assembly of wooden sign supports, but 3/8" bolts with nuts or 3/8" x 3 1/2" lag screws must be used on every joint for final connection.
2. No more than 2 sign posts shall be placed within a 7 ft. circle, except for specific materials noted on the CWZTCD List.
3. When project is completed, all sign supports and foundations shall be removed from the project site. This will be considered subsidiary to Item 502.

□ See BC(4) for definition of "Work Duration."

✳ Wood sign posts MUST be one piece. Splicing will NOT be allowed. Posts shall be painted white.

△ See the CWZTCD for the type of sign substrate that can be used for each approved sign support.

SKID MOUNTED PERFORATED SQUARE STEEL TUBING SIGN SUPPORTS

Texas Department of Transportation — Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION TYPICAL SIGN SUPPORT

BC(5)-14

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WHEN NOT IN USE, REMOVE THE PCMS FROM THE RIGHT-OF-WAY OR PLACE THE PCMS BEHIND BARRIER OR GUARDRAIL WITH SIGN PANEL TURNED PARALLEL TO TRAFFIC

PORTABLE CHANGEABLE MESSAGE SIGNS

1. The Engineer/Inspector shall approve all messages used on portable changeable message signs (PCMS).
2. Messages on PCMS should contain no more than 8 words (about four to eight characters per word), not including simple words such as "TO," "FOR," "AT," etc.
3. Messages should consist of a single phase, or two phases that alternate. Three-phase messages are not allowed. Each phase of the message should convey a single thought, and must be understood by itself.
4. Use the word "EXIT" to refer to an exit ramp on a freeway; i.e., "EXIT CLOSED." Do not use the term "RAMP."
5. Always use the route or interstate designation (IH, US, SH, FM) along with the number when referring to a roadway.
6. When in use the bottom of a stationary PCMS message panel should be a minimum 7 feet above the roadway, where possible.
7. The message term "WEEKEND" should be used only if the work is to start on Saturday morning and end by Sunday evening at midnight. Actual days and hours of work should be displayed on the PCMS if work is to begin on Friday evening and/or continue into Monday morning.
8. The Engineer/Inspector may select one of two options which are available for displaying a two-phase message on a PCMS. Each phase may be displayed for either four seconds each or for three seconds each.
9. Do not "flash" messages or words included in a message. The message should be steady burn or continuous while displayed.
10. Do not present redundant information on a two-phase message; i.e., keeping two lines of the message the same and changing the third line.
11. Do not use the word "Danger" in message.
12. Do not display the message "LANES SHIFT LEFT" or "LANES SHIFT RIGHT" on a PCMS. Drivers do not understand the message.
13. Do not display messages that scroll horizontally or vertically across the face of the sign.
14. The following table lists abbreviated words and two-word phrases that are acceptable for use on a PCMS. Both words in a phrase must be displayed together. Words or phrases not on this list should not be abbreviated, unless shown in the TMUTCD.
15. PCMS character height should be at least 18 inches for trailer mounted units. They should be visible from at least 1/2 (.5) mile and the text should be legible from at least 600 feet at night and 800 feet in daylight. Truck mounted units must have a character height of 10 inches and must be legible from at least 400 feet.
16. Each line of text should be centered on the message board rather than left or right justified.
17. If disabled, the PCMS should default to an illegible display that will not alarm motorists and will only be used to alert workers that the PCMS has malfunctioned. A pattern such as a series of horizontal solid bars is appropriate.

WORD OR PHRASE	ABBREVIATION
Access Road	ACCS RD
Alternate	ALT
Avenue	AVE
Best Route	BEST RTE
Boulevard	BLVD
Bridge	BRDG
Cannot	CANT
Center	CTR
Construction Ahead	CONST AHD
CROSSING	XING
Detour Route	DETOUR RTE
Do Not	DONT
East	E
Eastbound	(route) E
Emergency	EMER
Emergency Vehicle	EMER VEH
Entrance, Enter	ENT
Express Lane	EXP LN
Expressway	EXPWY
XXXX Feet	XXXX FT
Fog Ahead	FOG AHD
Freeway	FRWY, FWY
Freeway Blocked	FWY BLKD
Friday	FRI
Hazardous Driving	HAZ DRIVING
Hazardous Material	HAZMAT
High-Occupancy	HOV
Vehicle Highway	HWY
Hour(s)	HR, HRS
Information	INFO
It Is	ITS
Junction	JCT
Left	LFT
Left Lane	LFT LN
Lane Closed	LN CLOSED
Lower Level	LWR LEVEL
Maintenance	MAINT

WORD OR PHRASE	ABBREVIATION
Major	MAJ
Miles	MI
Miles Per Hour	MPH
Minor	MNR
Monday	MON
Normal	NORM
North	N
Northbound	(route) N
Parking	PKING
Road	RD
Right Lane	RT LN
Saturday	SAT
Service Road	SERV RD
Shoulder	SHLDR
Slippery	SLIP
South	S
Southbound	(route) S
Speed	SPD
Street	ST
Sunday	SUN
Telephone	PHONE
Temporary	TEMP
Thursday	THURS
To Downtown	TO DWNTN
Traffic	TRAF
Travelers	TRVLRS
Tuesday	TUES
Time Minutes	TIME MIN
Upper Level	UPR LEVEL
Vehicles (s)	VEH, VEHS
Warning	WARN
Wednesday	WED
Weight Limit	WT LIMIT
West	W
Westbound	(route) W
Wet Pavement	WET PVMT
Will Not	WONT

Roadway designation # IH-number, US-number, SH-number, FM-number

RECOMMENDED PHASES AND FORMATS FOR PCMS MESSAGES DURING ROADWORK ACTIVITIES

(The Engineer may approve other messages not specifically covered here.)

Phase 1: Condition Lists

Road/Lane/Ramp Closure List

FREEWAY CLOSED X MILE	FRONTAGE ROAD CLOSED
ROAD CLOSED AT SH XXX	SHOULDER CLOSED XXX FT
ROAD CLSD AT FM XXXX	RIGHT LN CLOSED XXX FT
RIGHT X LANES CLOSED	RIGHT X LANES OPEN
CENTER LANE CLOSED	DAYTIME LANE CLOSURES
NIGHT LANE CLOSURES	I-XX SOUTH EXIT CLOSED
VARIOUS LANES CLOSED	EXIT XXX CLOSED X MILE
EXIT CLOSED	RIGHT LN TO BE CLOSED
MALL DRIVEWAY CLOSED	X LANES CLOSED TUE - FRI
XXXXXXXX BLVD CLOSED	

Other Condition List

ROADWORK XXX FT	ROAD REPAIRS XXXX FT
FLAGGER XXXX FT	LANE NARROWS XXXX FT
RIGHT LN NARROWS XXXX FT	TWO-WAY TRAFFIC XX MILE
MERGING TRAFFIC XXXX FT	CONST TRAFFIC XXX FT
LOOSE GRAVEL XXXX FT	UNEVEN LANES XXXX FT
DETOUR X MILE	ROUGH ROAD XXXX FT
ROADWORK PAST SH XXXX	ROADWORK NEXT FRI-SUN
BUMP XXXX FT	US XXX EXIT X MILES
TRAFFIC SIGNAL XXXX FT	LANES SHIFT *

* LANES SHIFT in Phase 1 must be used with STAY IN LANE in Phase 2.

Phase 2: Possible Component Lists

Action to Take/Effect on Travel List

MERGE RIGHT	FORM X LINES RIGHT
DETOUR NEXT X EXITS	USE XXXXX RD EXIT
USE EXIT XXX	USE EXIT I-XX NORTH
STAY ON US XXX SOUTH	USE I-XX E TO I-XX N
TRUCKS USE US XXX N	WATCH FOR TRUCKS
WATCH FOR TRUCKS	EXPECT DELAYS
EXPECT DELAYS	PREPARE TO STOP
REDUCE SPEED XXX FT	END SHOULDER USE
USE OTHER ROUTES	WATCH FOR WORKERS
STAY IN LANE *	

Location List

AT FM XXXX
BEFORE RAILROAD CROSSING
NEXT X MILES
PAST US XXX EXIT
XXXXXXX TO XXXXXXX
US XXX TO FM XXXX

Warning List

SPEED LIMIT XX MPH
MAXIMUM SPEED XX MPH
MINIMUM SPEED XX MPH
ADVISORY SPEED XX MPH
RIGHT LANE EXIT
USE CAUTION
DRIVE SAFELY
DRIVE WITH CARE

** Advance Notice List

TUE-FRI XX AM- X PM
APR XX-XX X PM-X AM
BEGINS MONDAY
BEGINS MAY XX
MAY X-X XX PM - XX AM
NEXT FRI-SUN
XX AM TO XX PM
NEXT TUE AUG XX
TONIGHT XX PM- XX AM

* LANES SHIFT in Phase 1 must be used with STAY IN LANE in Phase 2.

** See Application Guidelines Note 6.

APPLICATION GUIDELINES

1. Only 1 or 2 phases are to be used on a PCMS.
2. The 1st phase (or both) should be selected from the "Road/Lane/Ramp Closure List" and the "Other Condition List".
3. A 2nd phase can be selected from the "Action to Take/Effect on Travel, Location, General Warning, or Advance Notice Phase Lists".
4. A Location Phase is necessary only if a distance or location is not included in the first phase selected.
5. If two PCMS are used in sequence, they must be separated by a minimum of 1000 ft. Each PCMS shall be limited to two phases, and should be understandable by themselves.
6. For advance notice, when the current date is within seven days of the actual work date, calendar days should be replaced with days of the week. Advance notification should typically be for no more than one week prior to the work.

WORDING ALTERNATIVES

1. The words RIGHT, LEFT and ALL can be interchanged as appropriate.
2. Roadway designations IH, US, SH, FM and LP can be interchanged as appropriate.
3. EAST, WEST, NORTH and SOUTH (or abbreviations E, W, N and S) can be interchanged as appropriate.
4. Highway names and numbers replaced as appropriate.
5. ROAD, HIGHWAY and FREEWAY can be interchanged as needed.
6. AHEAD may be used instead of distances if necessary.
7. FT and MI, MILE and MILES interchanged as appropriate.
8. AT, BEFORE and PAST interchanged as needed.
9. Distances or AHEAD can be eliminated from the message if a location phase is used.

PCMS SIGNS WITHIN THE R.O.W. SHALL BE BEHIND GUARDRAIL OR CONCRETE BARRIER OR SHALL HAVE A MINIMUM OF FOUR (4) PLASTIC DRUMS PLACED PERPENDICULAR TO TRAFFIC ON THE UPSTREAM SIDE OF THE PCMS, WHEN EXPOSED TO ONE DIRECTION OF TRAFFIC. WHEN EXPOSED TO TWO WAY TRAFFIC, THE FOUR DRUMS SHOULD BE PLACED WITH ONE DRUM AT EACH OF THE FOUR CORNERS OF THE UNIT.

FULL MATRIX PCMS SIGNS

1. When Full Matrix PCMS signs are used, the character height and legibility/visibility requirements shall be maintained as listed in Note 15 under "PORTABLE CHANGEABLE MESSAGE SIGNS" above.
2. When symbol signs, such as the "Flagger Symbol"(CW20-7) are represented graphically on the Full Matrix PCMS sign and, with the approval of the Engineer, it shall maintain the legibility/visibility requirement listed above.
3. When symbol signs are represented graphically on the Full Matrix PCMS, they shall only supplement the use of the static sign represented, and shall not substitute for, or replace that sign.
4. A full matrix PCMS may be used to simulate a flashing arrow board provided it meets the visibility, flash rate and dimming requirements on BC(7), for the same size arrow.

Texas Department of Transportation

Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)

BC(6)-14

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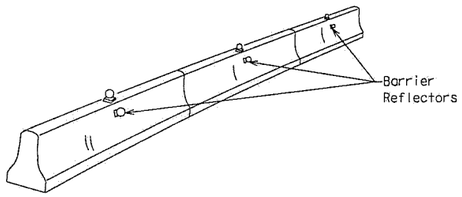
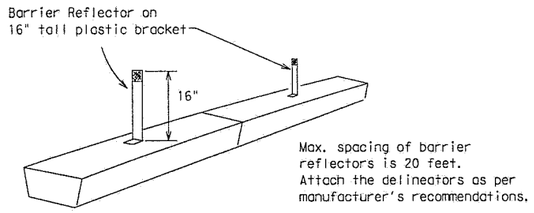
1. Barrier Reflectors shall be pre-qualified, and conform to the color and reflectivity requirements of DMS-8600. A list of prequalified Barrier Reflectors can be found at the Material Producer List web address shown on BC(1).
2. Color of Barrier Reflectors shall be as specified in the TMUTCD. The cost of the reflectors shall be considered subsidiary to Item 512.

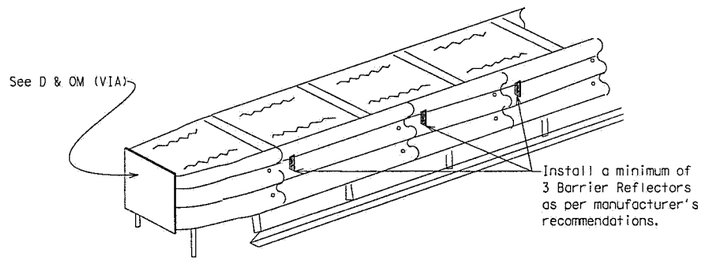


CONCRETE TRAFFIC BARRIER (CTB)

3. Where traffic is on one side of the CTB, two (2) Barrier Reflectors shall be mounted in approximately the midsection of each section of CTB. An alternate mounting location is uniformly spaced at one end of each CTB. This will allow for attachment of a barrier grapple without damaging the reflector. The Barrier Reflector mounted on the side of the CTB shall be located directly below the reflector mounted on top of the barrier, as shown in the detail above.
4. Where CTB separates two-way traffic, three barrier reflectors shall be mounted on each section of CTB. The reflector unit on top shall have two yellow reflective faces (Bi-Directional)while the reflectors on each side of the barrier shall have one yellow reflective face, as shown in the detail above.
5. When CTB separates traffic traveling in the same direction, no barrier reflectors will be required on top of the CTB.
6. Barrier Reflector units shall be yellow or white in color to match the edgeline being supplemented.
7. Maximum spacing of Barrier Reflectors is forty (40) feet.
8. Pavement markers or temporary flexible-reflective roadway marker tabs shall NOT be used as CTB delineation.
9. Attachment of Barrier Reflectors to CTB shall be per manufacturer's recommendations.
10. Missing or damaged Barrier Reflectors shall be replaced as directed by the Engineer.
11. Single slope barriers shall be delineated as shown on the above detail.



LOW PROFILE CONCRETE BARRIER (LPCB)

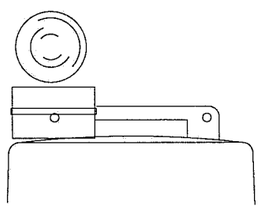


DELINEATION OF END TREATMENTS

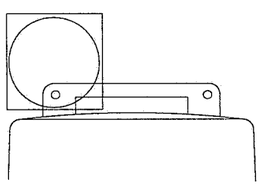
END TREATMENTS FOR CTB'S USED IN WORK ZONES

End treatments used on CTB's in work zones shall meet crashworthy standards as defined in the National Cooperative Highway Research Report 350. Refer to the CWZTCD List for approved end treatments and manufacturers.

BARRIER REFLECTORS FOR CONCRETE TRAFFIC BARRIER AND ATTENUATORS



Type C Warning Light or approved substitute mounted on a drum adjacent to the travel way.



Warning reflector may be round or square. Must have a yellow reflective surface area of at least 30 square inches

WARNING LIGHTS

1. Warning lights shall meet the requirements of the TMUTCD.
2. Warning lights shall NOT be installed on barricades.
3. Type A-Low Intensity Flashing Warning Lights are commonly used with drums. They are intended to warn of or mark a potentially hazardous area. Their use shall be as indicated on this sheet and/or other sheets of the plans by the designation "FL". The Type A Warning Lights shall not be used with signs manufactured with Type B_{FL} or C_{FL} Sheeting meeting the requirements of Departmental Material Specification DMS-8300.
4. Type-C and Type D 360 degree Steady Burn Lights are intended to be used in a series for delineation to supplement other traffic control devices. Their use shall be as indicated on this sheet and/or other sheets of the plans by the designation "SB".
5. The Engineer/Inspector or the plans shall specify the location and type of warning lights to be installed on the traffic control devices.
6. When required by the Engineer, the Contractor shall furnish a copy of the warning lights certification. The warning light manufacturer will certify the warning lights meet the requirements of the latest ITE Purchase Specifications for Flashing and Steady-Burn Warning Lights.
7. When used to delineate curves, Type-C and Type D Steady Burn Lights should only be placed on the outside of the curve, not the inside.
8. The location of warning lights and warning reflectors on drums shall be as shown elsewhere in the plans.

WARNING LIGHTS MOUNTED ON PLASTIC DRUMS

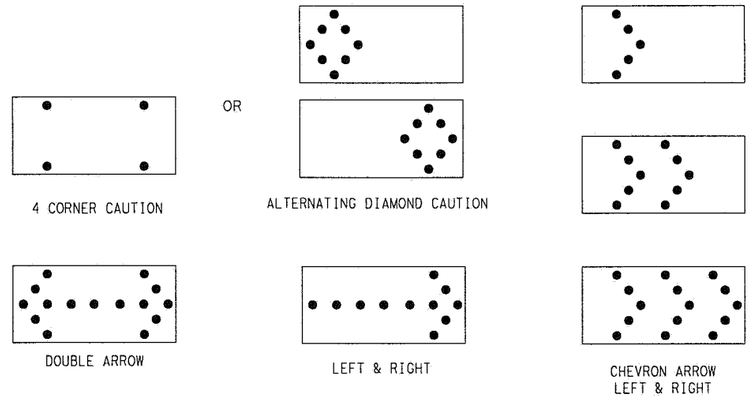
1. Type A flashing warning lights are intended to warn drivers that they are approaching or are in a potentially hazardous area.
2. Type A random flashing warning lights are not intended for delineation and shall not be used in a series.
3. A series of sequential flashing warning lights placed on channelizing devices to form a merging taper may be used for delineation. If used, the successive flashing of the sequential warning lights should occur from the beginning of the taper to the end of the merging taper in order to identify the desired vehicle path. The rate of flashing for each light shall be 65 flashes per minute, plus or minus 10 flashes.
4. Type C and D steady-burn warning lights are intended to be used in a series to delineate the edge of the travel lane on detours, on lane changes, on lane closures, and on other similar conditions.
5. Type A, Type C and Type D warning lights shall be installed at locations as detailed on other sheets in the plans.
6. Warning lights shall not be installed on a drum that has a sign, chevron or vertical panel.
7. The maximum spacing for warning lights on drums should be identical to the channelizing device spacing.

WARNING REFLECTORS MOUNTED ON PLASTIC DRUMS AS A SUBSTITUTE FOR TYPE C (STEADY BURN) WARNING LIGHTS

1. A warning reflector or approved substitute may be mounted on a plastic drum as a substitute for a Type C, steady burn warning light at the discretion of the Contractor unless otherwise noted in the plans.
2. The warning reflector shall be yellow in color and shall be manufactured using a sign substrate approved for use with plastic drums listed on the CWZTCD.
3. The warning reflector shall have a minimum retroreflective surface area (one-side) of 30 square inches.
4. Round reflectors shall be fully reflectorized, including the area where attached to the drum.
5. Square substrates must have a minimum of 30 square inches of reflectorized sheeting. They do not have to be reflectorized where it attaches to the drum.
6. The side of the warning reflector facing approaching traffic shall have sheeting meeting the color and retroreflectivity requirements for DMS 8300-Type B or Type C.
7. When used near two-way traffic, both sides of the warning reflector shall be reflectorized.
8. The warning reflector should be mounted on the side of the handle nearest approaching traffic.
9. The maximum spacing for warning reflectors should be identical to the channelizing device spacing requirements.

Arrow Boards may be located behind channelizing devices in place for a shoulder taper or merging taper, otherwise they shall be delineated with four (4) channelizing devices placed perpendicular to traffic on the upstream side of traffic.

1. The Flashing Arrow Board should be used for all lane closures on multi-lane roadways, or slow moving maintenance or construction activities on the travel lanes.
2. Flashing Arrow Boards should not be used on two-lane, two-way roadways, detours, diversions or work on shoulders unless the "CAUTION" display (see detail below) is used.
3. The Engineer/Inspector shall choose all appropriate signs, barricades and/or other traffic control devices that should be used in conjunction with the Flashing Arrow Board.
4. The Flashing Arrow Board should be able to display the following symbols:



5. The "CAUTION" display consists of four corner lamps flashing simultaneously, or the Alternating Diamond Caution mode as shown.
6. The straight line caution display is NOT ALLOWED.
7. The Flashing Arrow Board shall be capable of minimum 50 percent dimming from rated lamp voltage. The flashing rate of the lamps shall not be less than 25 nor more than 40 flashes per minute.
8. Minimum lamp "on time" shall be approximately 50 percent for the flashing arrow and equal intervals of 25 percent for each sequential phase of the flashing chevron.
9. The sequential arrow display is NOT ALLOWED.
10. The flashing arrow display is the TxDOT standard; however, the sequential Chevron display may be used during daylight operations.
11. The Flashing Arrow Board shall be mounted on a vehicle, trailer or other suitable support.
12. A Flashing Arrow Board SHALL NOT BE USED to laterally shift traffic.
13. A full matrix PCMS may be used to simulate a Flashing Arrow Board provided it meets visibility, flash rate and dimming requirements on this sheet for the same size arrow.
14. Minimum mounting height of trailer mounted Arrow Boards should be 7 feet from roadway to bottom of panel.

REQUIREMENTS			
TYPE	MINIMUM SIZE	MINIMUM NUMBER OF PANEL LAMPS	MINIMUM VISIBILITY DISTANCE
B	30 x 60	13	3/4 mile
C	48 x 96	15	1 mile

ATTENTION
Flashing Arrow Boards shall be equipped with automatic dimming devices.

WHEN NOT IN USE, REMOVE THE ARROW BOARD FROM THE RIGHT-OF-WAY OR PLACE THE ARROW BOARD BEHIND CONCRETE TRAFFIC BARRIER OR GUARDRAIL.

FLASHING ARROW BOARDS

TRUCK-MOUNTED ATTENUATORS

1. Truck-mounted attenuators (TMA) used on TxDOT facilities must meet the requirements outlined in the National Cooperative Highway Research Report No. 350 (NCHRP 350) or the Manual for Assessing Safety Hardware (MASH).
2. Refer to the CWZTCD for the requirements of Level 2 or Level 3 TMAs.
3. Refer to the CWZTCD for a list of approved TMAs.
4. TMAs are required on freeways unless otherwise noted in the plans.
5. A TMA should be used anytime that it can be positioned 30 to 100 feet in advance of the area of crew exposure without adversely affecting the work performance.
6. The only reason a TMA should not be required is when a work area is spread down the roadway and the work crew is an extended distance from the TMA.

SHEET 7 OF 12

Texas Department of Transportation — Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION ARROW PANEL, REFLECTORS, WARNING LIGHTS & ATTENUATOR

BC(7)-14

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GENERAL NOTES

1. For long term stationary work zones on freeways, drums shall be used as the primary channelizing device.
2. For intermediate term stationary work zones on freeways, drums should be used as the primary channelizing device but may be replaced in tangent sections by vertical panels, or 42" two-piece cones. In tangent sections one-piece cones may be used with the approval of the Engineer but only if personnel are present on the project at all times to maintain the cones in proper position and location.
3. For short term stationary work zones on freeways, drums are the preferred channelizing device but may be replaced in tapers, transitions and tangent sections by vertical panels, two-piece cones or one-piece cones as approved by the Engineer.
4. Drums and all related items shall comply with the requirements of the current version of the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD) and the "Compliant Work Zone Traffic Control Devices List" (CWZTCD).
5. Drums, bases, and related materials shall exhibit good workmanship and shall be free from objectionable marks or defects that would adversely affect their appearance or serviceability.
6. The Contractor shall have a maximum of 24 hours to replace any plastic drums identified for replacement by the Engineer/Inspector. The replacement device must be an approved device.

GENERAL DESIGN REQUIREMENTS

Pre-qualified plastic drums shall meet the following requirements:

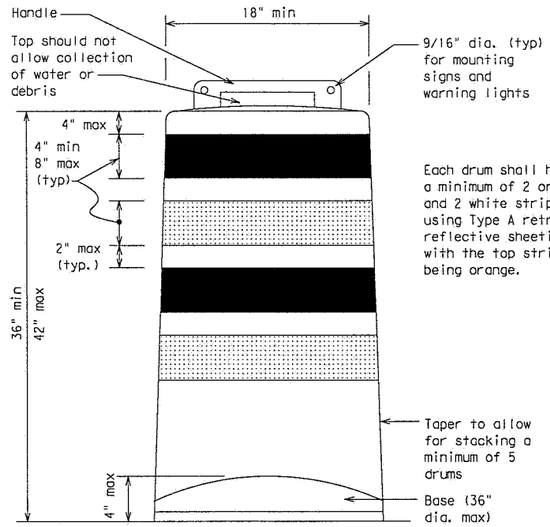
1. Plastic drums shall be a two-piece design; the "body" of the drum shall be the top portion and the "base" shall be the bottom.
2. The body and base shall lock together in such a manner that the body separates from the base when impacted by a vehicle traveling at a speed of 20 MPH or greater but prevents accidental separation due to normal handling and/or air turbulence created by passing vehicles.
3. Plastic drums shall be constructed of lightweight flexible, and deformable materials. The Contractor shall NOT use metal drums or single piece plastic drums as channelization devices or sign supports.
4. Drums shall present a profile that is a minimum of 18 inches in width at the 36 inch height when viewed from any direction. The height of drum unit (body installed on base) shall be a minimum of 36 inches and a maximum of 42 inches.
5. The top of the drum shall have a built-in handle for easy pickup and shall be designed to drain water and not collect debris. The handle shall have a minimum of two widely spaced 9/16 inch diameter holes to allow attachment of a warning light, warning reflector unit or approved compliant sign.
6. The exterior of the drum body shall have a minimum of four alternating orange and white retroreflective circumferential stripes not less than 4 inches nor greater than 8 inches in width. Any non-reflectorized space between any two adjacent stripes shall not exceed 2 inches in width.
7. Bases shall have a maximum width of 36 inches, a maximum height of 4 inches, and a minimum of two footholds of sufficient size to allow base to be held down while separating the drum body from the base.
8. Plastic drums shall be constructed of ultra-violet stabilized, orange, high-density polyethylene (HDPE) or other approved material.
9. Drum body shall have a maximum unballasted weight of 11 lbs.
10. Drum and base shall be marked with manufacturer's name and model number.

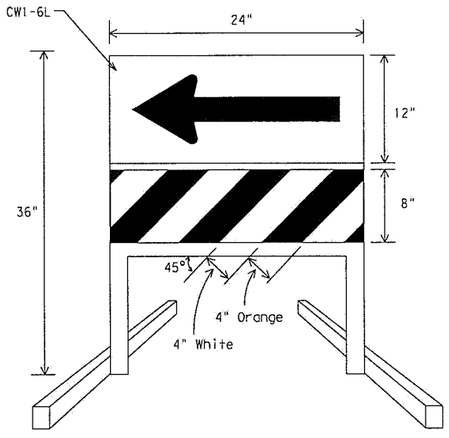
RETROREFLECTIVE SHEETING

1. The stripes used on drums shall be constructed of sheeting meeting the color and retroreflectivity requirements of Departmental Materials Specification DMS-8300, "Sign Face Materials." Type A reflective sheeting shall be supplied unless otherwise specified in the plans.
2. The sheeting shall be suitable for use on and shall adhere to the drum surface such that, upon vehicular impact, the sheeting shall remain adhered in-place and exhibit no delaminating, cracking, or loss of retroreflectivity other than that loss due to abrasion of the sheeting surface.

BALLAST

1. Unballasted bases shall be large enough to hold up to 50 lbs. of sand. This base, when filled with the ballast material, should weigh between 35 lbs (minimum) and 50 lbs (maximum). The ballast may be sand in one to three sandbags separate from the base, sand in a sand-filled plastic base, or other ballasting devices as approved by the Engineer. Stacking of sandbags will be allowed, however height of sandbags above pavement surface may not exceed 12 inches.
2. Bases with built-in ballast shall weigh between 40 lbs. and 50 lbs. Built-in ballast can be constructed of an integral crumb rubber base or a solid rubber base.
3. Recycled truck tire sidewalls may be used for ballast on drums approved for this type of ballast on the CWZTCD list.
4. The ballast shall not be heavy objects, water, or any material that would become hazardous to motorists, pedestrians, or workers when the drum is struck by a vehicle.
5. When used in regions susceptible to freezing, drums shall have drainage holes in the bottoms so that water will not collect and freeze becoming a hazard when struck by a vehicle.
6. Ballast shall not be placed on top of drums.
7. Adhesives may be used to secure base of drums to pavement.

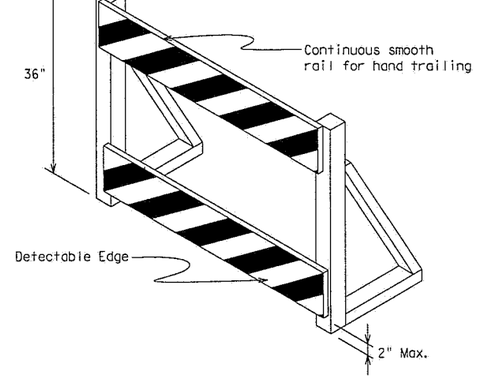




DIRECTION INDICATOR BARRICADE

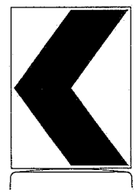
1. The Direction Indicator Barricade may be used in tapers, transitions, and other areas where specific directional guidance to drivers is necessary.
2. If used, the Direction Indicator Barricade should be used in series to direct the driver through the transition and into the intended travel lane.
3. The Direction Indicator Barricade shall consist of One-Direction Large Arrow (CW1-6) sign in the size shown with a black arrow on a background of Type B_{FL} or Type C_{FL} Orange retroreflective sheeting above a rail with Type A retroreflective sheeting in alternating 4" white and orange stripes sloping downward at an angle of 45 degrees in the direction road users are to pass. Sheeting types shall be as per DMS 8300.
4. Double arrows on the Direction Indicator Barricade will not be allowed.
5. Approved manufacturers are shown on the CWZTCD List. Ballast shall be as approved by the manufacturers instructions.

This detail is not intended for fabrication. See note 3 and the CWZTCD list for providers of approved Detectable Pedestrian Barricades

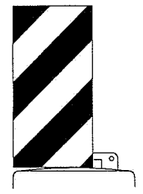


DETECTABLE PEDESTRIAN BARRICADES

1. When existing pedestrian facilities are disrupted, closed, or relocated in a TTC zone, the temporary facilities shall be detectable and include accessibility features consistent with the features present in the existing pedestrian facility.
2. Where pedestrians with visual disabilities normally use the closed sidewalk, a device that is detectable by a person with a visual disability traveling with the aid of a long cane shall be placed across the full width of the closed sidewalk.
3. Detectable pedestrian barricades similar to the one pictured above, longitudinal channelizing devices, some concrete barriers, and wood or chain link fencing with a continuous detectable edging can satisfactorily delineate a pedestrian path.
4. Tape, rope, or plastic chain strung between devices are not detectable, do not comply with the design standards in the "Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities (ADAAG)" and should not be used as a control for pedestrian movements.
5. Warning lights shall not be attached to detectable pedestrian barricades.
6. Detectable pedestrian barricades may use 8" nominal barricade rails as shown on BC(10) provided that the top rail provides a smooth continuous rail suitable for hand trailing with no splinters, burrs, or sharp edges.



18" x 24" Sign
(Maximum Sign Dimension)
Chevron CW1-8, Opposing Traffic Lane Divider, Driveway sign D70a, Keep Right R4 series or other signs as approved by Engineer



12" x 24"
Vertical Panel
mount with diagonals sloping down towards travel way

Plywood, Aluminum or Metal sign substrates shall NOT be used on plastic drums

SIGNS, CHEVRONS, AND VERTICAL PANELS MOUNTED ON PLASTIC DRUMS

1. Signs used on plastic drums shall be manufactured using substrates listed on the CWZTCD.
2. Chevrons and other work zone signs with an orange background shall be manufactured with Type B_{FL} or Type C_{FL} Orange sheeting meeting the color and retroreflectivity requirements of DMS-8300, "Sign Face Material," unless otherwise specified in the plans.
3. Vertical Panels shall be manufactured with orange and white sheeting meeting the requirements of DMS-8300 Type A Diagonal stripes on Vertical Panels shall slope down toward the intended traveled lane.
4. Other sign messages (text or symbolic) may be used as approved by the Engineer. Sign dimensions shall not exceed 18 inches in width or 24 inches in height, except for the R9 series signs discussed in note 8 below.
5. Signs shall be installed using a 1/2 inch bolt (nominal) and nut, two washers, and one locking washer for each connection.
6. Mounting bolts and nuts shall be fully engaged and adequately torqued. Bolts should not extend more than 1/2 inch beyond nuts.
7. Chevrons may be placed on drums on the outside of curves, on merging tapers or on shifting tapers. When used in these locations they may be placed on every drum or spaced not more than on every third drum. A minimum of three (3) should be used at each location called for in the plans.
8. R9-9, R9-10, R9-11 and R9-11a Sidewalk Closed signs which are 24 inches wide may be mounted on plastic drums, with approval of the Engineer.

Texas Department of Transportation | Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(8)-14

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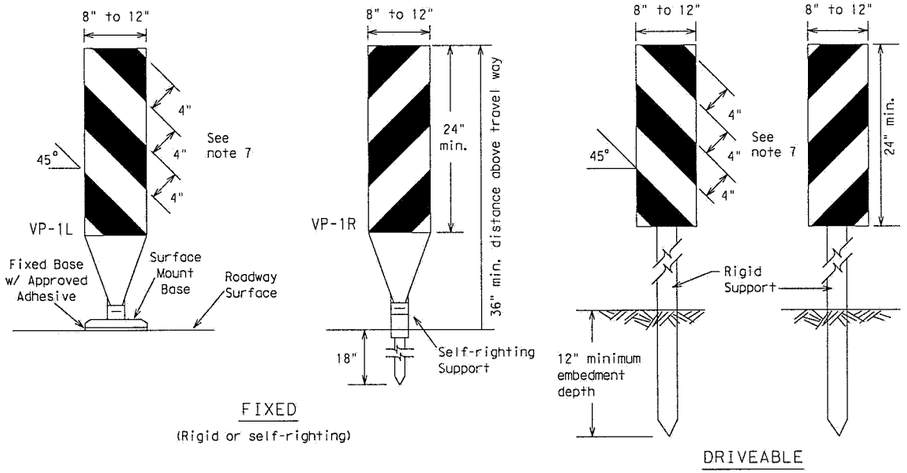
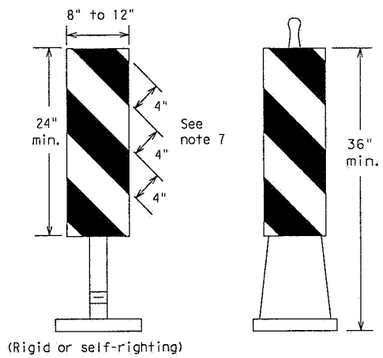


FIXED
(Rigid or self-righting)

DRIVEABLE

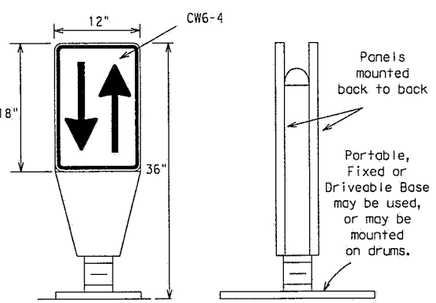


(Rigid or self-righting)

PORTABLE

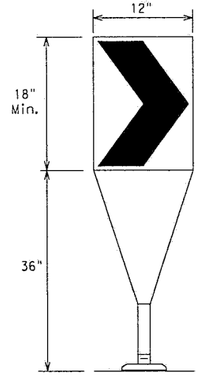
1. Vertical Panels (VP's) are normally used to channelize traffic or divide opposing lanes of traffic.
2. VP's may be used in daytime or nighttime situations. They may be used at the edge of shoulder drop-offs and other areas such as lane transitions where positive daytime and nighttime delineation is required. The Engineer/Inspector shall refer to the Roadway Design Manual Appendix B "Treatment of Pavement Drop-offs in Work Zones" for additional guidelines on the use of VP's for drop-offs.
3. VP's should be mounted back to back if used at the edge of cuts adjacent to two-way two lane roadways. Stripes are to be reflective orange and reflective white and should always slope downward toward the travel lane.
4. VP's used on expressways and freeways or other high speed roadways, may have more than 270 square inches of retroreflective area facing traffic.
5. Self-righting supports are available with portable base. See "Compliant Work Zone Traffic Control Devices List" (CWZTCD).
6. Sheeting for the VP's shall be retroreflective Type A conforming to Departmental Material Specification DMS-8300, unless noted otherwise.
7. Where the height of reflective material on the vertical panel is 36 inches or greater, a panel stripe of 6 inches shall be used.

VERTICAL PANELS (VPs)



1. Opposing Traffic Lane Dividers (OTLD) are delineation devices designed to convert a normal one-way roadway section to two-way operation. OTLD's are used on temporary centerlines. The upward and downward arrows on the sign's face indicate the direction of traffic on either side of the divider. The base is secured to the pavement with an adhesive or rubber weight to minimize movement caused by a vehicle impact or wind gust.
2. The OTLD may be used in combination with 42" cones or VPs.
3. Spacing between the OTLD shall not exceed 500 feet. 42" cones or VPs placed between the OTLD's should not exceed 100 foot spacing.
4. The OTLD shall be orange with a black non-reflective legend. Sheeting for the OTLD shall be retroreflective Type B_{FL} or Type C_{FL} conforming to Departmental Material Specification DMS-8300, unless noted otherwise. The legend shall meet the requirements of DMS-8300.

OPPOSING TRAFFIC LANE DIVIDERS (OTLD)



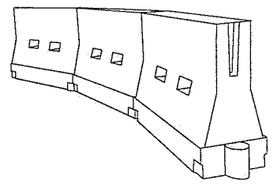
Fixed Base w/ Approved Adhesive (Driveable Base, or Flexible Support can be used)

1. The chevron shall be a vertical rectangle with a minimum size of 12 by 18 inches.
2. Chevrons are intended to give notice of a sharp change of alignment with the direction of travel and provide additional emphasis and guidance for vehicle operators with regard to changes in horizontal alignment of the roadway.
3. Chevrons, when used, shall be erected on the outside of a sharp curve or turn, or on the far side of an intersection. They shall be in line with and at right angles to approaching traffic. Spacing should be such that the motorist always has three in view, until the change in alignment eliminates its need.
4. To be effective, the chevron should be visible for at least 500 feet.
5. Chevrons shall be orange with a black nonreflective legend. Sheeting for the chevron shall be retroreflective Type B_{FL} or Type C_{FL} conforming to Departmental Material Specification DMS-8300, unless noted otherwise. The legend shall meet the requirements of DMS-8300.
6. For Long Term Stationary use on tapers or transitions on freeways and divided highways self-righting chevrons may be used to supplement plastic drums but not to replace plastic drums.

CHEVRONS

GENERAL NOTES

1. Work Zone channelizing devices illustrated on this sheet may be installed in close proximity to traffic and are suitable for use on high or low speed roadways. The Engineer/Inspector shall ensure that spacing and placement is uniform and in accordance with the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD).
2. Channelizing devices shown on this sheet may have a driveable, fixed or portable base. The requirement for self-righting channelizing devices must be specified in the General Notes or other plan sheets.
3. Channelizing devices on self-righting supports should be used in work zone areas where channelizing devices are frequently impacted by errant vehicles or vehicle related wind gusts making alignment of the channelizing devices difficult to maintain. Locations of these devices shall be detailed elsewhere in the plans. These devices shall conform to the TMUTCD and the "Compliant Work Zone Traffic Control Devices List" (CWZTCD).
4. The Contractor shall maintain devices in a clean condition and replace damaged, nonreflective, faded, or broken devices and bases as required by the Engineer/Inspector. The Contractor shall be required to maintain proper device spacing and alignment.
5. Portable bases shall be fabricated from virgin and/or recycled rubber. The portable bases shall weigh a minimum of 30 lbs.
6. Pavement surfaces shall be prepared in a manner that ensures proper bonding between the adhesives, the fixed mount bases and the pavement surface. Adhesives shall be prepared and applied according to the manufacturer's recommendations.
7. The installation and removal of channelizing devices shall not cause detrimental effects to the final pavement surfaces, including pavement surface discoloration or surface integrity. Driveable bases shall not be permitted on final pavement surfaces. The Engineer/Inspector shall approve all application and removal procedures of fixed bases.



LONGITUDINAL CHANNELIZING DEVICES (LCD)

1. LCDs are crashworthy, lightweight, deformable devices that are highly visible, have good target value and can be connected together. They are not designed to contain or redirect a vehicle on impact.
2. LCDs may be used instead of a line of cones or drums.
3. LCDs shall be placed in accordance to application and installation requirements specific to the device, and used only when shown on the CWZTCD list.
4. LCDs should not be used to provide positive protection for obstacles, pedestrians or workers.
5. LCDs shall be supplemented with retroreflective delineation as required for temporary barriers on BC(7) when placed roughly parallel to the travel lanes.
6. LCDs used as barricades placed perpendicular to traffic should have at least one row of reflective sheeting meeting the requirements for barricade rails as shown on BC(10) placed near the top of the LCD along the full length of the device.

WATER BALLASTED SYSTEMS USED AS BARRIERS

1. Water ballasted systems used as barriers shall not be used solely to channelize road users, but also to protect the work space per the appropriate NCHRP 350 crashworthiness requirements based on roadway speed and barrier application.
2. Water ballasted systems used to channelize vehicular traffic shall be supplemented with retroreflective delineation or channelizing devices to improve daytime/nighttime visibility. They may also be supplemented with pavement markings.
3. Water ballasted systems used as barriers shall be placed in accordance to application and installation requirements specific to the device, and used only when shown on the CWZTCD list.
4. Water ballasted systems used as barriers should not be used for a merging taper except in low speed (less than 45 MPH) urban areas. When used on a taper in a low speed urban area, the taper shall be delineated and the taper length should be designed to optimize road user operations considering the available geometric conditions.
5. When water ballasted systems used as barriers have blunt ends exposed to traffic, they should be attenuated as per manufacturer recommendations or flared to a point outside the clear zone.

If used to channelize pedestrians, longitudinal channelizing devices or water ballasted systems must have a continuous detectable bottom for users of long canes and the top of the unit shall not be less than 32 inches in height.

HOLLOW OR WATER BALLASTED SYSTEMS USED AS LONGITUDINAL CHANNELIZING DEVICES OR BARRIERS

Posted Speed *	Formula	Minimum Desirable Taper Lengths ** 10' Offset	11' Offset	12' Offset	Suggested Maximum Spacing of Channelizing Devices On a Taper	On a Tangent
30	$L=\frac{WS^2}{60}$	150'	165'	180'	30'	60'
35		205'	225'	245'	35'	70'
40		265'	295'	320'	40'	80'
45	L=WS	450'	495'	540'	45'	90'
50		500'	550'	600'	50'	100'
55		550'	605'	660'	55'	110'
60		600'	660'	720'	60'	120'
65		650'	715'	780'	65'	130'
70		700'	770'	840'	70'	140'
75		750'	825'	900'	75'	150'
80		800'	880'	960'	80'	160'

** Taper lengths have been rounded off.
L=Length of Taper (FT.) W=Width of Offset (FT.)
S=Posted Speed (MPH)

SUGGESTED MAXIMUM SPACING OF CHANNELIZING DEVICES AND MINIMUM DESIRABLE TAPER LENGTHS

SHEET 9 OF 12

Texas Department of Transportation — Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(9)-14

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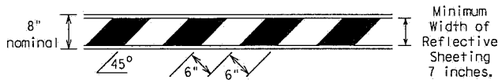
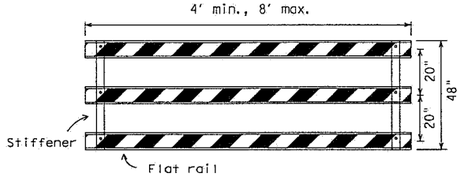
TYPE 3 BARRICADES

1. Refer to the Compliant Work Zone Traffic Control Devices List (CWZTCD) for details of the Type 3 Barricades and a list of all materials used in the construction of Type 3 Barricades.
2. Type 3 Barricades shall be used at each end of construction projects closed to all traffic.
3. Barricades extending across a roadway should have stripes that slope downward in the direction toward which traffic must turn in detouring. When both right and left turns are provided, the chevron striping may slope downward in both directions from the center of the barricade. Where no turns are provided at a closed road striping should slope downward in both directions toward the center of roadway.
4. Striping of rails, for the right side of the roadway, should slope downward to the left. For the left side of the roadway, striping should slope downward to the right.
5. Identification markings may be shown only on the back of the barricade rails. The maximum height of letters and/or company logos used for identification shall be 1".
6. Barricades shall not be placed parallel to traffic unless an adequate clear zone is provided.
7. Warning lights shall NOT be installed on barricades.
8. Where barricades require the use of weights to keep from turning over, the use of sandbags with dry, cohesionless sand is recommended. The sandbags will be tied shut to keep the sand from spilling and to maintain a constant weight. Sand bags shall not be stacked in a manner that covers any portion of a barricade rails reflective sheeting. Rock, concrete, iron, steel or other solid objects will NOT be permitted. Sandbags should weigh a minimum of 35 lbs and a maximum of 50 lbs. Sandbags shall be made of a durable material that tears upon vehicular impact. Rubber (such as tire inner tubes) shall not be used for sandbags. Sandbags shall only be placed along or upon the base supports of the device and shall not be suspended above ground level or hung with rope, wire, chains or other fasteners.
9. Sheeting for barricades shall be retroreflective Type A conforming to Departmental Material Specification DMS-8300 unless otherwise noted.

Barricades shall NOT be used as a sign support.



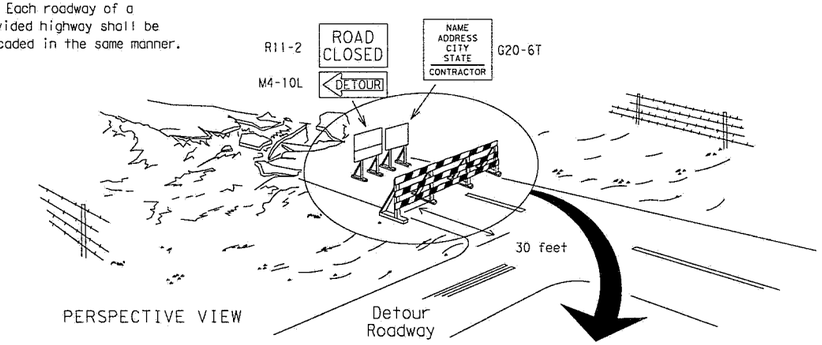
TYPICAL STRIPING DETAIL FOR BARRICADE RAIL



Stiffener may be inside or outside of support, but no more than 2 stiffeners shall be allowed on one barricade.

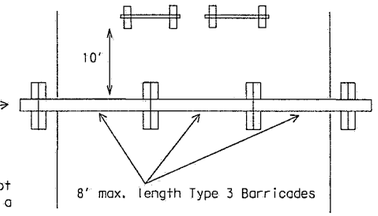
TYPICAL PANEL DETAIL
FOR SKID OR POST TYPE BARRICADES

Each roadway of a divided highway shall be barricaded in the same manner.



PERSPECTIVE VIEW

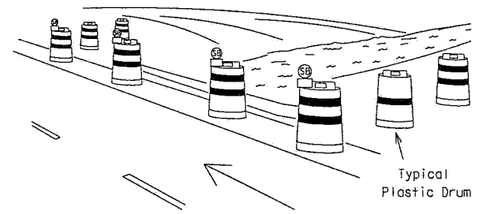
The three rails on Type 3 barricades shall be reflectorized orange and reflective white stripes on one side facing one-way traffic and both sides for two-way traffic.
Barricade striping should slant downward in the direction of detour.



PLAN VIEW

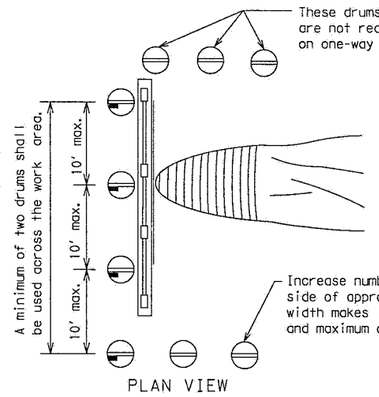
1. Signs should be mounted on independent supports at a 7 foot mounting height in center of roadway. The signs should be a minimum of 10 feet behind Type 3 Barricades.
2. Advance signing shall be as specified elsewhere in the plans.

TYPE 3 BARRICADE (POST AND SKID) TYPICAL APPLICATION



PERSPECTIVE VIEW

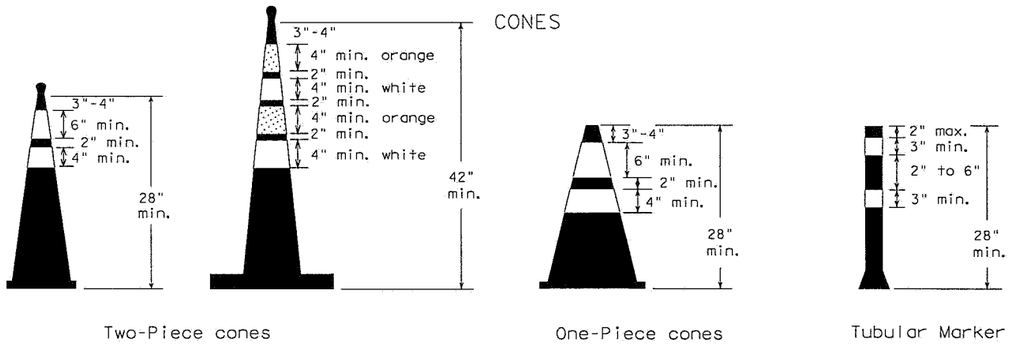
1. Where positive redirectional capability is provided, drums may be omitted.
2. Plastic construction fencing may be used with drums for safety as required in the plans.
3. Vertical Panels on flexible support may be substituted for drums when the shoulder width is less than 4 feet.
4. When the shoulder width is greater than 12 feet, steady-burn lights may be omitted if drums are used.
5. Drums must extend the length of the culvert widening.



LEGEND	
	Plastic drum
	Plastic drum with steady burn light or yellow warning reflector
SB	Steady burn warning light or yellow warning reflector

PLAN VIEW

CULVERT WIDENING OR OTHER ISOLATED WORK WITHIN THE PROJECT LIMITS



Two-Piece cones

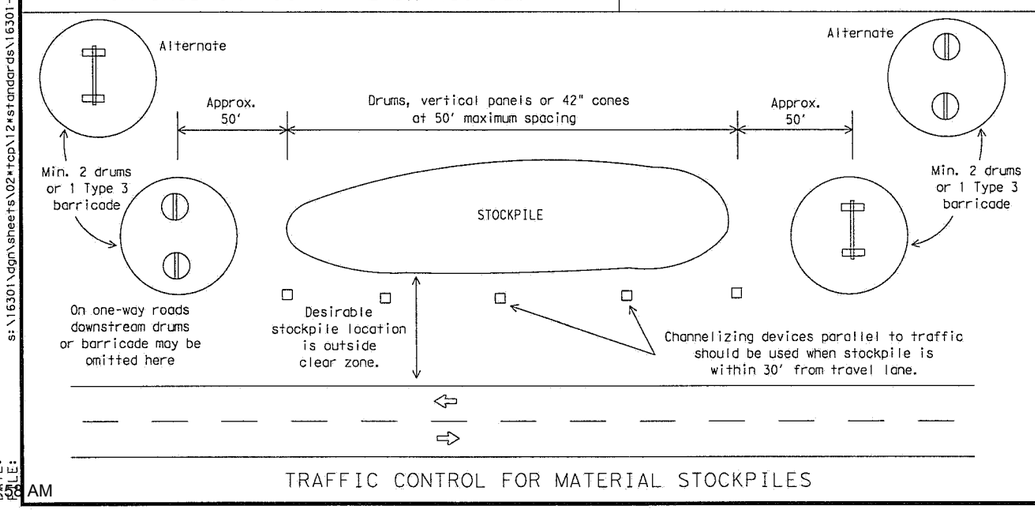
One-Piece cones

Tubular Marker

28" Cones shall have a minimum weight of 9 1/2 lbs.

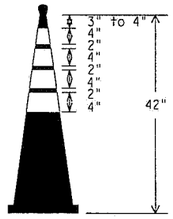
42" 2-piece cones shall have a minimum weight of 30 lbs. including base.

1. Traffic cones and tubular markers shall be predominantly orange, and meet the height and weight requirements shown above.
2. One-piece cones have the body and base of the cone molded in one consolidated unit. Two-piece cones have a cone shaped body and a separate rubber base, or ballast, that is added to keep the device upright and in place.
3. Two-piece cones may have a handle or loop extending up to 8" above the minimum height shown, in order to aid in retrieving the device.
4. Cones or tubular markers used at night shall have white or white and orange reflective bands as shown above. The reflective bands shall have a smooth, sealed outer surface and meet the requirements of Departmental Material Specification DMS-8300 Type A.
5. 28" cones and tubular markers are generally suitable for short duration and short-term stationary work as defined on BC(4). These should not be used for intermediate-term or long-term stationary work unless personnel is on-site to maintain them in their proper upright position.
6. 42" two-piece cones, vertical panels or drums are suitable for all work zone durations.
7. Cones or tubular markers used on each project should be of the same size and shape.



TRAFFIC CONTROL FOR MATERIAL STOCKPILES

THIS DEVICE SHALL NOT BE USED ON PROJECTS LET AFTER MARCH 2014.



EDGELINE CHANNELIZER

1. This device is intended only for use in place of a vertical panel to channelize traffic by indicating the edge of the travel lane. It is not intended to be used in transitions or tapers.
2. This device shall not be used to separate lanes of traffic (opposing or otherwise) or warn of objects.
3. This device is based on a 42 inch, two-piece cone with an alternate striping pattern: four 4 inch retroreflective bands, with an approximate 2 inch gap between bands. The color of the band should correspond to the color of the edgeline (yellow for left edgeline, white for right edgeline) for which the device is substituted or for which it supplements. The reflectorized bands shall be retroreflective Type A conforming to Departmental Material Specification DMS-8300, unless otherwise noted.
4. The base must weigh a minimum of 30 lbs.

Texas Department of Transportation

Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(10)-14

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WORK ZONE PAVEMENT MARKINGS

GENERAL

1. The Contractor shall be responsible for maintaining work zone and existing pavement markings, in accordance with the standard specifications and special provisions, on all roadways open to traffic within the CSJ limits unless otherwise stated in the plans.
2. Color, patterns and dimensions shall be in conformance with the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD).
3. Additional supplemental pavement marking details may be found in the plans or specifications.
4. Pavement markings shall be installed in accordance with the TMUTCD and as shown on the plans.
5. When short term markings are required on the plans, short term markings shall conform with the TMUTCD, the plans and details as shown on the Standard Plan Sheet WZ(STPM).
6. When standard pavement markings are not in place and the roadway is opened to traffic, DO NOT PASS signs shall be erected to mark the beginning of the sections where passing is prohibited and PASS WITH CARE signs at the beginning of sections where passing is permitted.
7. All work zone pavement markings shall be installed in accordance with Item 662, "Work Zone Pavement Markings."

RAISED PAVEMENT MARKERS

1. Raised pavement markers are to be placed according to the patterns on BC(12).
2. All raised pavement markers used for work zone markings shall meet the requirements of Item 672, "RAISED PAVEMENT MARKERS" and Departmental Material Specification DMS-4200 or DMS-4300.

PREFABRICATED PAVEMENT MARKINGS

1. Removable prefabricated pavement markings shall meet the requirements of DMS-8241.
2. Non-removable prefabricated pavement markings (foil back) shall meet the requirements of DMS-8240.

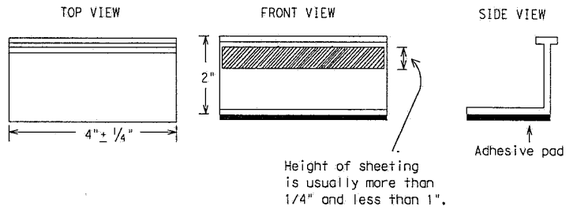
MAINTAINING WORK ZONE PAVEMENT MARKINGS

1. The Contractor will be responsible for maintaining work zone pavement markings within the work limits.
2. Work zone pavement markings shall be inspected in accordance with the frequency and reporting requirements of work zone traffic control device inspections as required by Form 599.
3. The markings should provide a visible reference for a minimum distance of 300 feet during normal daylight hours and 160 feet when illuminated by automobile low-beam headlights at night, unless sight distance is restricted by roadway geometrics.
4. Markings failing to meet this criteria within the first 30 days after placement shall be replaced at the expense of the Contractor as per Specification Item 662.

REMOVAL OF PAVEMENT MARKINGS

1. Pavement markings that are no longer applicable, could create confusion or direct a motorist toward or into the closed portion of the roadway shall be removed or obliterated before the roadway is opened to traffic.
2. The above shall not apply to detours in place for less than three days, where flaggers and/or sufficient channelizing devices are used in lieu of markings to outline the detour route.
3. Pavement markings shall be removed to the fullest extent possible, so as not to leave a discernable marking. This shall be by any method approved by TxDOT Specification Item 677 for "Eliminating Existing Pavement Markings and Markers".
4. The removal of pavement markings may require resurfacing or seal coating portions of the roadway as described in Item 677.
5. Subject to the approval of the Engineer, any method that proves to be successful on a particular type pavement may be used.
6. Blast cleaning may be used but will not be required unless specifically shown in the plans.
7. Over-painting of the markings SHALL NOT BE permitted.
8. Removal of raised pavement markers shall be as directed by the Engineer.
9. Removal of existing pavement markings and markers will be paid for directly in accordance with Item 677, "ELIMINATING EXISTING PAVEMENT MARKINGS AND MARKERS," unless otherwise stated in the plans.
10. Black-out marking tape may be used to cover conflicting existing markings for periods less than two weeks when approved by the Engineer.

Temporary Flexible-Reflective Roadway Marker Tabs



STAPLES OR NAILS SHALL NOT BE USED TO SECURE TEMPORARY FLEXIBLE-REFLECTIVE ROADWAY MARKER TABS TO THE PAVEMENT SURFACE

1. Temporary flexible-reflective roadway marker tabs used as guidemarks shall meet the requirements of DMS-8242.
2. Tabs detailed on this sheet are to be inspected and accepted by the Engineer or designated representative. Sampling and testing is not normally required, however at the option of the Engineer, either "A" or "B" below may be imposed to assure quality before placement on the roadway.
   A. Select five (5) or more tabs at random from each lot or shipment and submit to the Construction Division, Materials and Pavement Section to determine specification compliance.
   B. Select five (5) tabs and perform the following test. Affix five (5) tabs at 24 inch intervals on an asphaltic pavement in a straight line. Using a medium size passenger vehicle or pickup, run over the markers with the front and rear tires at a speed of 35 to 40 miles per hour, four (4) times in each direction. No more than one (1) out of the five (5) reflective surfaces shall be lost or displaced as a result of this test.
3. Small design variances may be noted between tab manufacturers.
4. See Standard Sheet WZ(STPM) for tab placement on new pavements. See Standard Sheet TCP(7-1) for tab placement on seal coat work.

RAISED PAVEMENT MARKERS USED AS GUIDEMARKS

1. Raised pavement markers used as guidemarks shall be from the approved product list, and meet the requirements of DMS-4200.
2. All temporary construction raised pavement markers provided on a project shall be of the same manufacturer.
3. Adhesive for guidemarks shall be bituminous material hot applied or butyl rubber pad for all surfaces, or thermoplastic for concrete surfaces.

Guidemarks shall be designated as:
YELLOW - (two amber reflective surfaces with yellow body).
WHITE - (one silver reflective surface with white body).

DEPARTMENTAL MATERIAL SPECIFICATIONS	
PAVEMENT MARKERS (REFLECTORIZED)	DMS-4200
TRAFFIC BUTTONS	DMS-4300
EPOXY AND ADHESIVES	DMS-6100
BITUMINOUS ADHESIVE FOR PAVEMENT MARKERS	DMS-6130
PERMANENT PREFABRICATED PAVEMENT MARKINGS	DMS-8240
TEMPORARY REMOVABLE, PREFABRICATED PAVEMENT MARKINGS	DMS-8241
TEMPORARY FLEXIBLE, REFLECTIVE ROADWAY MARKER TABS	DMS-8242

A list of prequalified reflective raised pavement markers, non-reflective traffic buttons, roadway marker tabs and other pavement markings can be found at the Material Producer List web address shown on BC(1).

Texas Department of Transportation — Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION PAVEMENT MARKINGS

BC(11)-14

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11-02 8-14				

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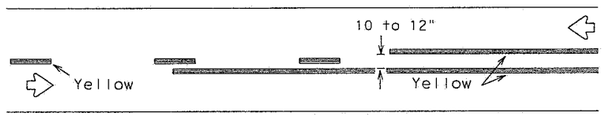
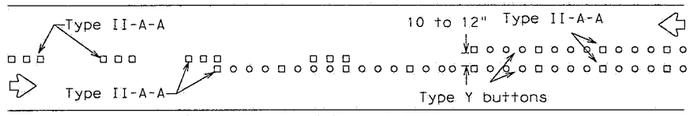
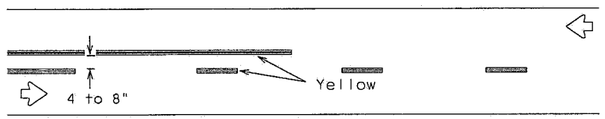
PAVEMENT MARKING PATTERNS



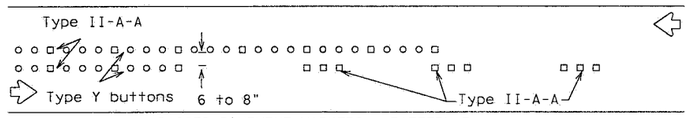
REFLECTORIZED PAVEMENT MARKINGS - PATTERN A



RAISED PAVEMENT MARKERS - PATTERN A



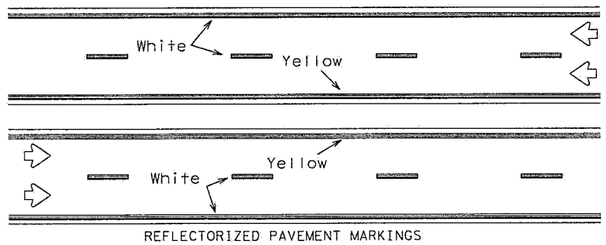
REFLECTORIZED PAVEMENT MARKINGS - PATTERN B



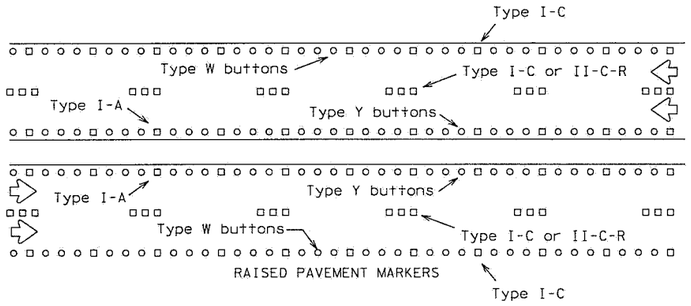
RAISED PAVEMENT MARKERS - PATTERN B

Pattern A is the TXDOT Standard, however Pattern B may be used if approved by the Engineer.
Prefabricated markings may be substituted for reflectorized pavement markings.

CENTER LINE & NO-PASSING ZONE BARRIER LINES FOR TWO-LANE, TWO-WAY HIGHWAYS



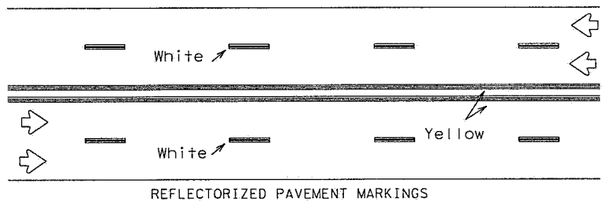
REFLECTORIZED PAVEMENT MARKINGS



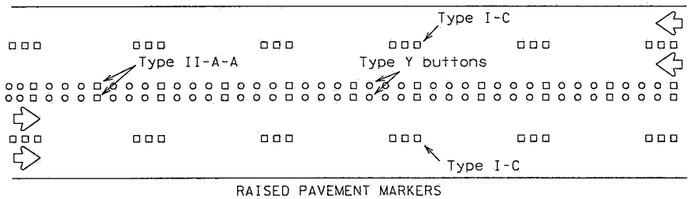
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

EDGE & LANE LINES FOR DIVIDED HIGHWAY



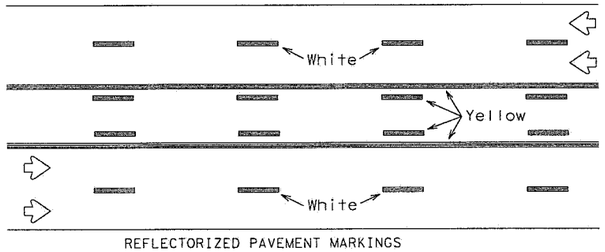
REFLECTORIZED PAVEMENT MARKINGS



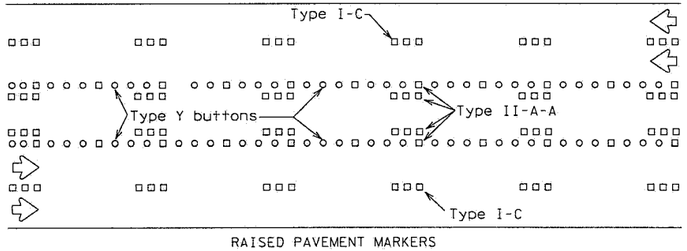
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS



REFLECTORIZED PAVEMENT MARKINGS

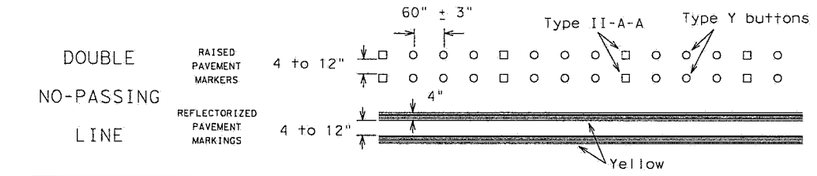


RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

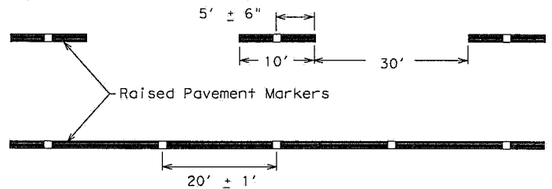
TWO-WAY LEFT TURN LANE

STANDARD WORK ZONE PAVEMENT MARKINGS DETAILS



REMOVABLE MARKINGS WITH RAISED PAVEMENT MARKERS

If raised pavement markers are used to supplement REMOVABLE markings, the markers shall be applied to the top of the tape at the approximate mid length of tape used for broken lines or at 20 foot spacing for solid lines. This allows an easier removal of raised pavement markers and tape.



Centerline only - not to be used on edge lines

Raised pavement markers used as standard pavement markings shall be from the approved products list and meet the requirements of Item 672 "RAISED PAVEMENT MARKERS."

Texas Department of Transportation

Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION PAVEMENT MARKING PATTERNS

BC(12)-14

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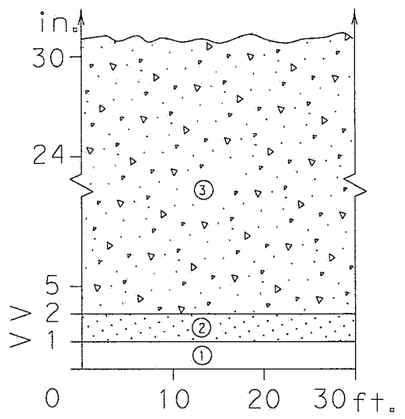
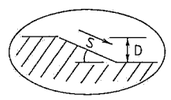
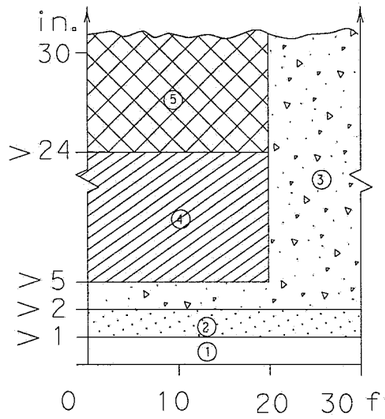
DEFINITION OF TREATMENT ZONES FOR VARIOUS EDGE CONDITIONS

Edge Height (D) in Inches versus Lateral Clearance (Y) in Feet

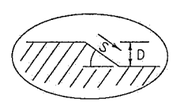


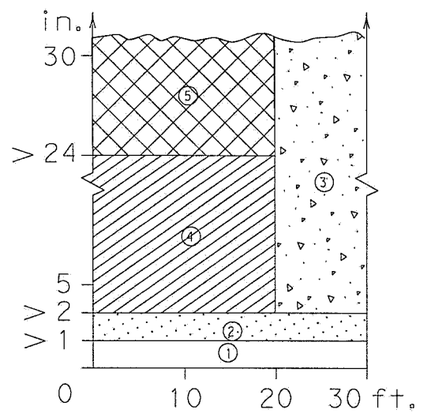
Edge Condition I
S = (3:1) (or flatter)



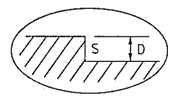


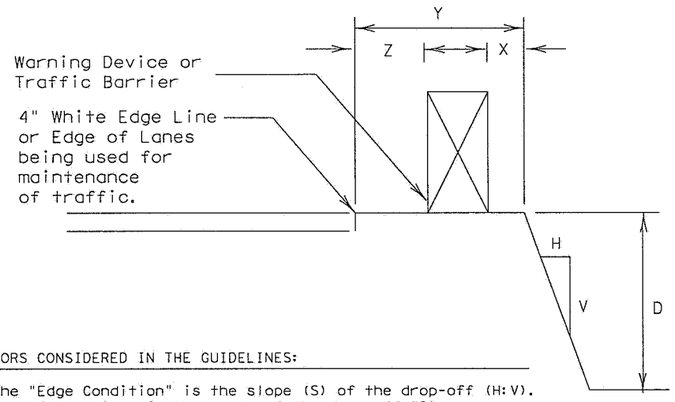
Edge Condition II
S = ((2.99):1) to (1:1)





Edge Condition III
S is steeper than (1:1)





FACTORS CONSIDERED IN THE GUIDELINES:

1. The "Edge Condition" is the slope (S) of the drop-off (H:V). The "Edge Height is the depth of the drop-off "D".

2. Distance "X" is to be the maximum practical under job conditions. Two feet minimum for high speed conditions. Distance "Y" is the lateral clearance from edge of travel lane to edge of dropoff. Distance "Z" does not have a minimum.

3. In addition to the factors considered in the guidelines, each construction zone drop-off situation should be analyzed individually, taking into account other variables, such as: traffic mix, posted speed in the construction zone, horizontal curvature, and the practicality of the treatment options.

4. The conditions for indicating the use of positive or protective barriers are given by Zone-5 and Figure-1. Traffic barriers are primarily applicable for high speed conditions. Urban areas with speeds of 30 mph or less may have a lesser need for signing, delineation, and barriers. Right-angled edges, however, with "D" greater than 2 inches and located within a lateral offset of 6 feet, may indicate a higher level of treatment.

5. If the distance "Y" must be less than 3 feet, the use of a positive barrier may not be feasible. In such a case, consider either: 1) narrowing the lanes to a desired 11 to 12 feet or 10 foot minimum (see CW20-8 sign), or 2) provide an edge slope such as Edge Condition I.

Zone	Treatment Types Guidelines:
①	No treatment.
②	CW 8-11 "Uneven Lanes" signs.
③	CW 8-9a "Shoulder Drop-Off" or CW 8-11 signs plus vertical panels.
④	CW 8-9a or CW 8-11, signs plus drums. Where restricted space precludes the use of drums, use vertical panels. An edge fill may be provided to change the edge slope to that of the preferable Edge Condition I.
⑤	Check indications (Figure-1) for positive barrier. Where positive barrier is not indicated, the treatment shown above for Zone- 4 may be used after consideration of other applicable factors.

Edge Condition Notes:

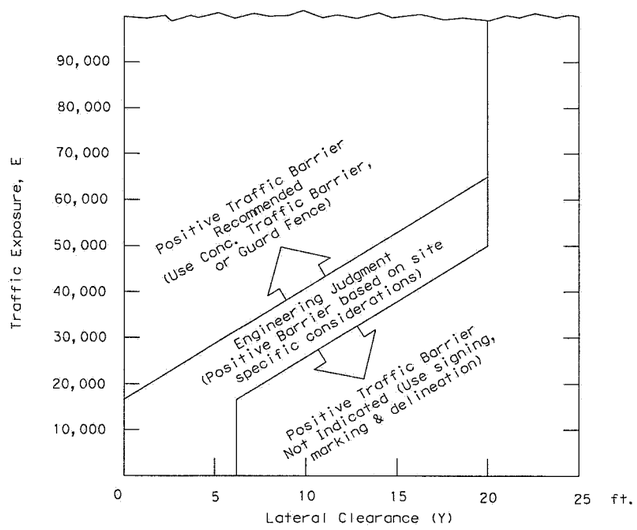
1. Edge Condition I: Most vehicles are able to traverse an edge condition with a slope rate of (3 to 1) or flatter. The slope must be constructed with a compacted material capable of supporting vehicles.

2. Edge Condition II: Most vehicles are able to traverse an edge condition with a slope between (2.99 to 1) and (1to 1) so long as "D" does not exceed 5 inches. Under-carriage drag on most automobiles will occur when "D" exceeds 6 inches. As "D" exeeds 24 inches, the possibility for rollover is greater in most vehicles.

3. Edge Condition III: When slopes are greater than (1 to 1) and where "D" is greater than 2 inches, a more difficult control factor may exist for some vehicles, if not properly treated. For example, where "D" is greater than 2 inches and up to 24 inches different types of vehicles may experience different steering control at different edge heights. Automobiles might experience more steering control differential when "D" is greater than 2 inches and up to 5 inches. Trucks, particularly those with high loads, have more steering control differential when "D" is greater than 5 inches and up to 24 inches. When "D" exceeds 24 inches, the possibility of rollover is greater for most vehicles.

4. Milling or overlay operations that result in Edge Condition III should not be in place without appropriate warning treatments, and these conditions should not be left in place for extended periods of time.

FIGURE-1: CONDITIONS INDICATING USE OF POSITIVE BARRIER FOR ZONE 5 (▨)



1 E = ADT x T
Where ADT is that portion of the average daily traffic volume traveling within 20 feet (generally two adjacent lanes) of the edge dropoff condition; and, T is the duration time in years of the dropoff condition.

2 Figure-1 provides a practical approach to the use of positive barriers for the protection of vehicles from pavement drop-offs. Other factors, such as the presence of heavy machinery, construction workers, or the mix and volume of traffic may make the use of positive barriers appropriate, even when the edge condition alone may not justify the use of a barrier.

3 An approved end treatment should be provided for any positive barrier end located within a lateral offset of 20 feet from the edge of the travel lane.

These guidelines apply to temporary traffic control areas or work zones where continuous pavement edges or drop-offs exists parallel and adjacent to a lane used by traffic. The edge conditions may be present between shoulders and travel lanes, between adjacent or opposing travel lanes, or at intermediate points across the width of the paved surface. Due to the variability in construction operations, tolerances in the variables may be allowed by the engineer. These guidelines do not apply to short term operations. These guidelines do not constitute a rigid standard or policy; rather, they are guidance to be used in conjunction with engineering judgement. These guidelines may be updated on the Design Division's on-line manuals.

Engineer's Seal

STATE OF TEXAS
CHASE W. MYERS
94895
LICENSED
PROFESSIONAL ENGINEER
6/26/17

Date _____

Texas Department of Transportation
Traffic Operations Division

TREATMENT FOR VARIOUS EDGE CONDITIONS

© TxDOT August 2000

DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT

REVISIONS	CONT	SECT	JOB	HIGHWAY
03-01				
08-01 correct typos	DIST	COUNTY		SHEET NO.
				430

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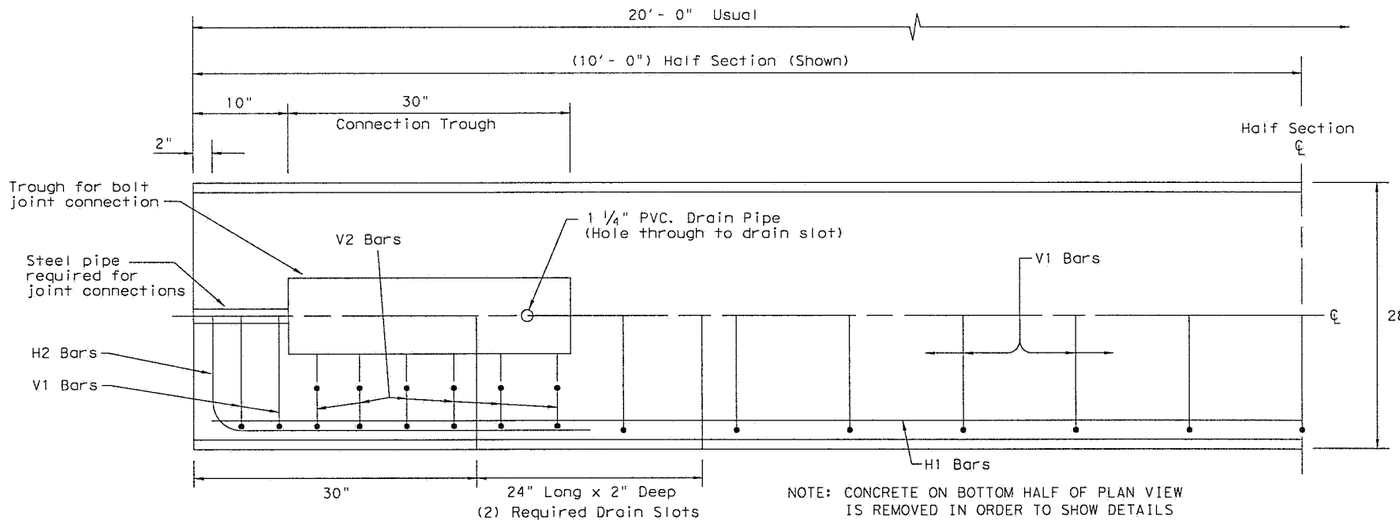
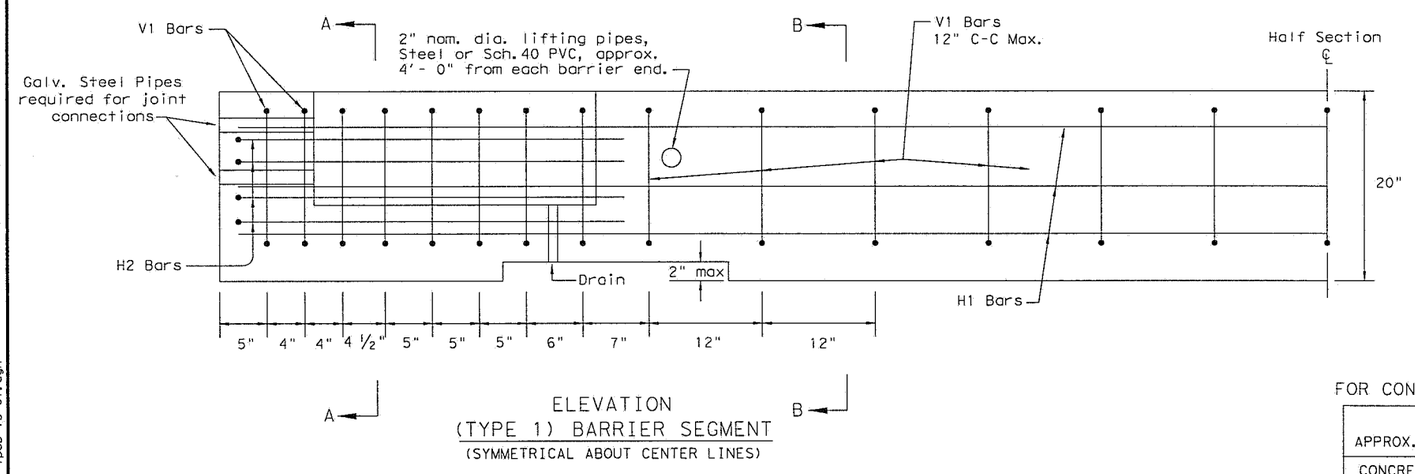
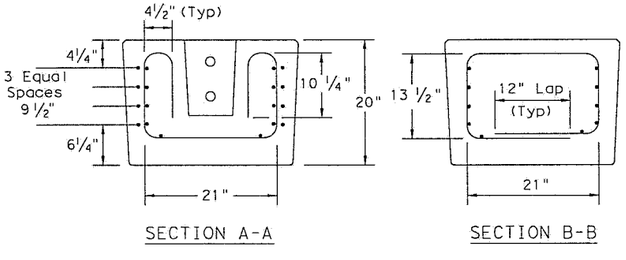


PLAN
(TYPE 1) BARRIER SEGMENT
(SYMMETRICAL ABOUT CENTER LINES)



ELEVATION
(TYPE 1) BARRIER SEGMENT
(SYMMETRICAL ABOUT CENTER LINES)



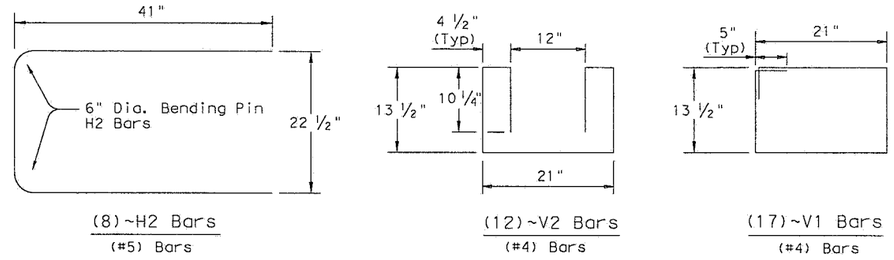
(WWR) GENERAL NOTES

1. Deformed Welded Wire Reinforcement shall conform to ASTM A497.
2. Welded wire cage may be cut or bent, if necessary, but must be approved by the Engineer.
3. Combinations of reinforcing steel and WWR are permitted, as directed by the Engineer. The dimensions from the end of the barrier section to the first wire shall not exceed 3".

REQUIRED (WWR) WIRE DESIGN

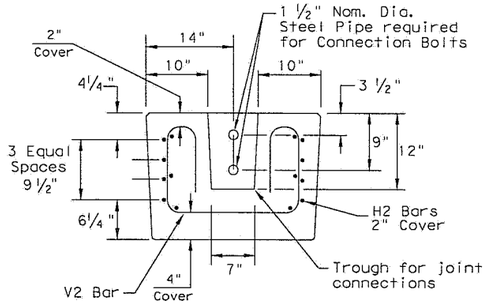
8 ~ (D31) Horizontal Wires (Equally spaced)
10 ~ (D20) Horizontal Wires (Equally spaced)
29 ~ (D20) Vertical Wires (Spaced as shown in Elevation View)

WELDED WIRE REINFORCEMENT (WWR)- OPTIONAL REINFORCING

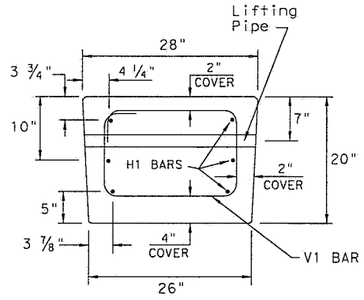


REINFORCING STEEL DETAILS
TYPE 1 - BARRIER SEGMENT

Note: Use 2" Dia. Bending Pin, unless otherwise shown



SECTION A-A



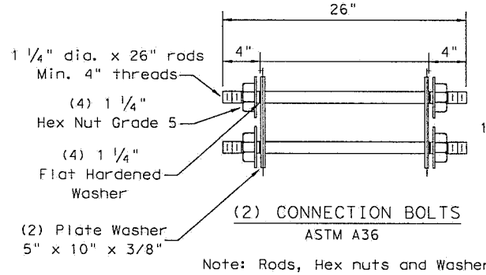
SECTION B-B

GENERAL NOTES

1. Low Profile Concrete Barrier (LPCB), is approved for use in temporary work zone locations, where the posted speed is 45 mph, or less.
2. Concrete shall be Class H for precast barrier with a minimum compressive strength of 3,600 psi.
3. Where used, rebar reinforcement shall be Grade 60 and conform to ASTM A615.
4. Precast LPCB barrier length shall be 20 ft.
5. All barrier edges shall have ¾" chamfer or a tooled radius.
6. Joint connection hardware shall be in accordance with Item 449, "Anchor Bolts." and is considered subsidiary.
7. Steel pipe required for joint connection bolts shall be galvanized in accordance with Item 445,"Galvanizing."
8. Welded wire reinforcement (WWR) may be used in lieu of conventional reinforcement for Type 1 barrier, and shall meet the requirements shown.

FOR CONTRACTORS INFORMATION ONLY

(TYPE 1) APPROX. QUANTITIES 20 FT. SECTION		
CONCRETE	CY	2.6
REINFORCING STEEL	LBS	330
TOTAL BARRIER WT.	LBS	11000



(2) CONNECTION BOLTS
ASTM A36

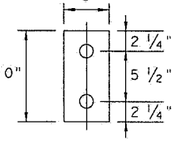


PLATE WASHER
5" x 10" x ⅜"

Note: Rods, Hex nuts and Washers shall be Galvanized.

SHEET 1 OF 2

Texas Department of Transportation — Design Division Standard

LOW PROFILE CONCRETE BARRIER PRECAST BARRIER (TYPE 1) LPCB-13

FILE: lpcb13.dgn	DN: TxDOT	CK: AM	DW: VP	CK:
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REVISIONS				
	DIST	COUNTY		SHEET NO.

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cwm

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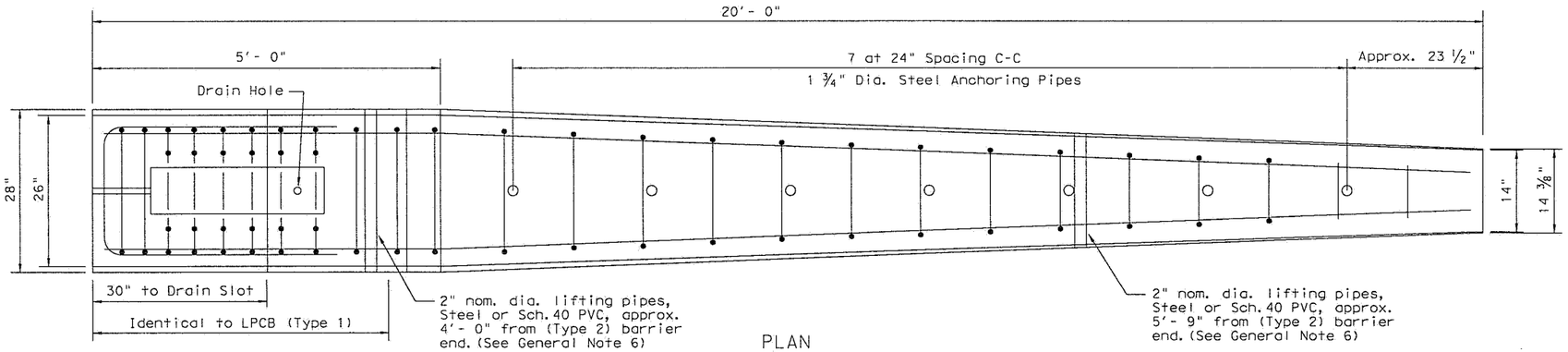
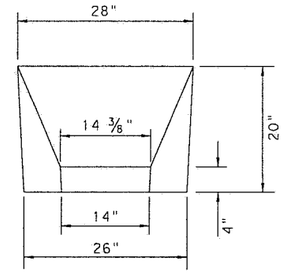
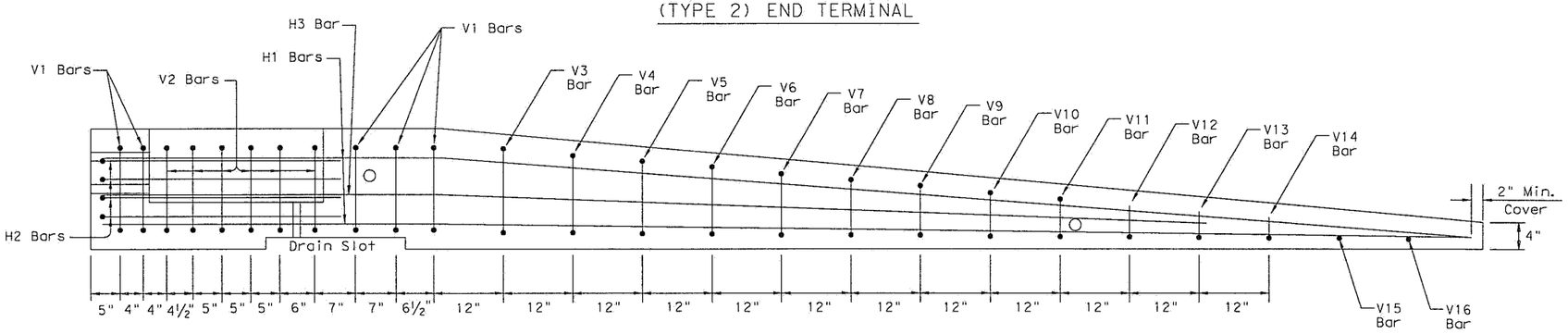


PLAN
(TYPE 2) END TERMINAL

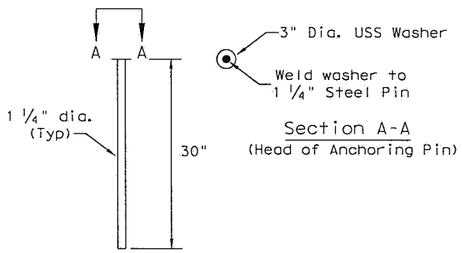


APPROACH VIEW



ELEVATION
(TYPE 2) END TERMINAL

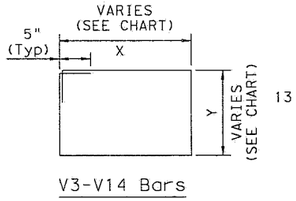
Note:
Anchoring pipes not shown in Elevation View



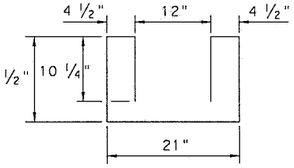
(7) Anchor Pins
ASTM A36 Steel
(See Note 3)

TYPE 2 - NOTES

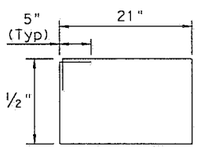
1. Welded wire reinforcment (WWR) is "not" an option for Type 2 Barrier.
2. Type 2 Barrier shall be used as an end treatment for the Type 1 barrier segments, when applicable.
3. The end treatment can be used without the anchor pins in locations that can accommodate approximately 4 ft. of lateral displacement of the end treatment. The use of non-pinned end treatment does not affect the performance or the deflection of the Low-Profile barrier system.
4. The anchor pins are all the same length and are to be driven flush with the top of the (Type 2) barrier surface.
5. The bends in the H3 and H1 bars are slight, no formal bend is necessary.
6. The Type 2 barrier segment must be lifted from the rear first, to prevent cracking of sloped section.
7. See LPCB sheet 1 for additional information.



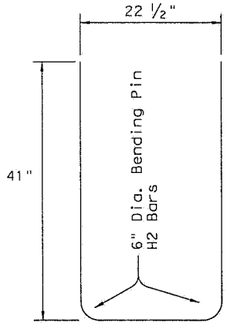
V3-V14 Bars



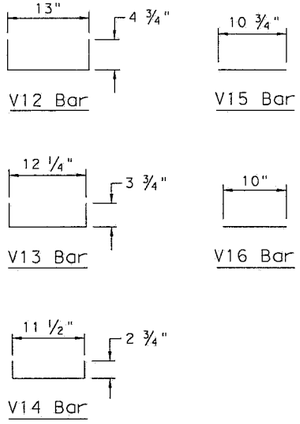
(6)~V2 Bars



(5)~V1 Bars



(4)~H2 Bars
(#5) Bars

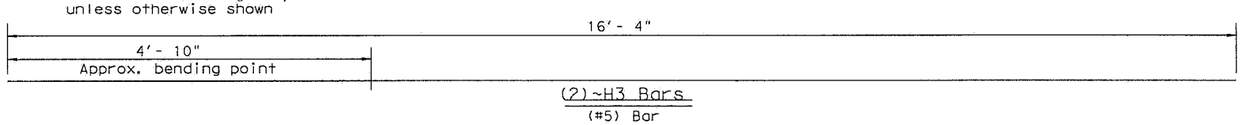


Note: All V Bars are (#4)

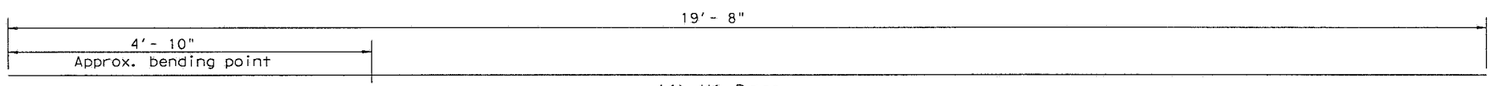
BAR (#4)	X (IN.)	Y (IN.)
V3 BAR	20 ¼	14 ½
V4 BAR	19 ½	13 ½
V5 BAR	18 ½	12 ¼
V6 BAR	17 ½	11 ¼
V7 BAR	17	10 ¼
V8 BAR	16 ¼	9
V9 BAR	15 ½	8
V10 BAR	14 ½	7
V11 BAR	13 ¾	6

REINFORCING STEEL DETAILS
TYPE 2 - END TERMINAL

Note: Use 2" Dia. Bending Pin, unless otherwise shown

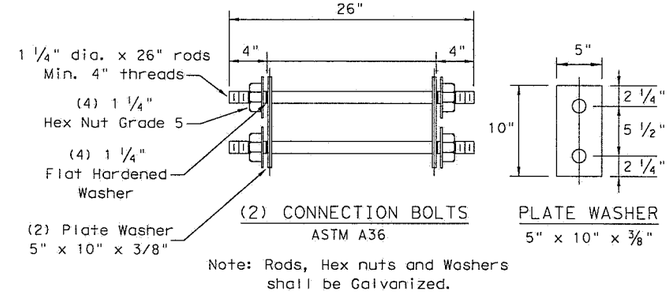


(2)~H3 Bars
(#5) Bar



Note: Bends on H1 and H3 bars are slight and do not require formal bends.

(4)~H1 Bars
(#5) Bar



(2) CONNECTION BOLTS
ASTM A36

PLATE WASHER
5" x 10" x ⅜"

Note: Rods, Hex nuts and Washers shall be Galvanized.

FOR CONTRACTORS INFORMATION ONLY

(TYPE 2) APPROX. QUANTITIES 20 FT. SECTION		
CONCRETE	CY	1.65
REINFORCING STEEL	LBS	240
TOTAL BARRIER WT.	LBS	7000

SHEET 2 OF 2

Texas Department of Transportation

Design Division Standard

LOW PROFILE CONCRETE BARRIER
PRECAST BARRIER (TYPE 2)
LPCB-13

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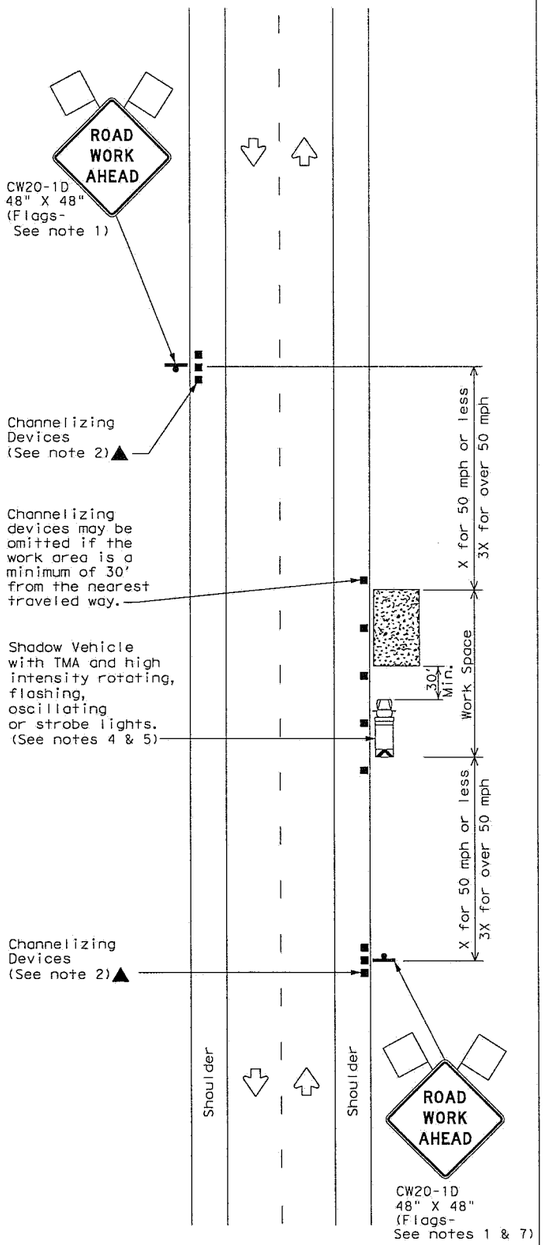
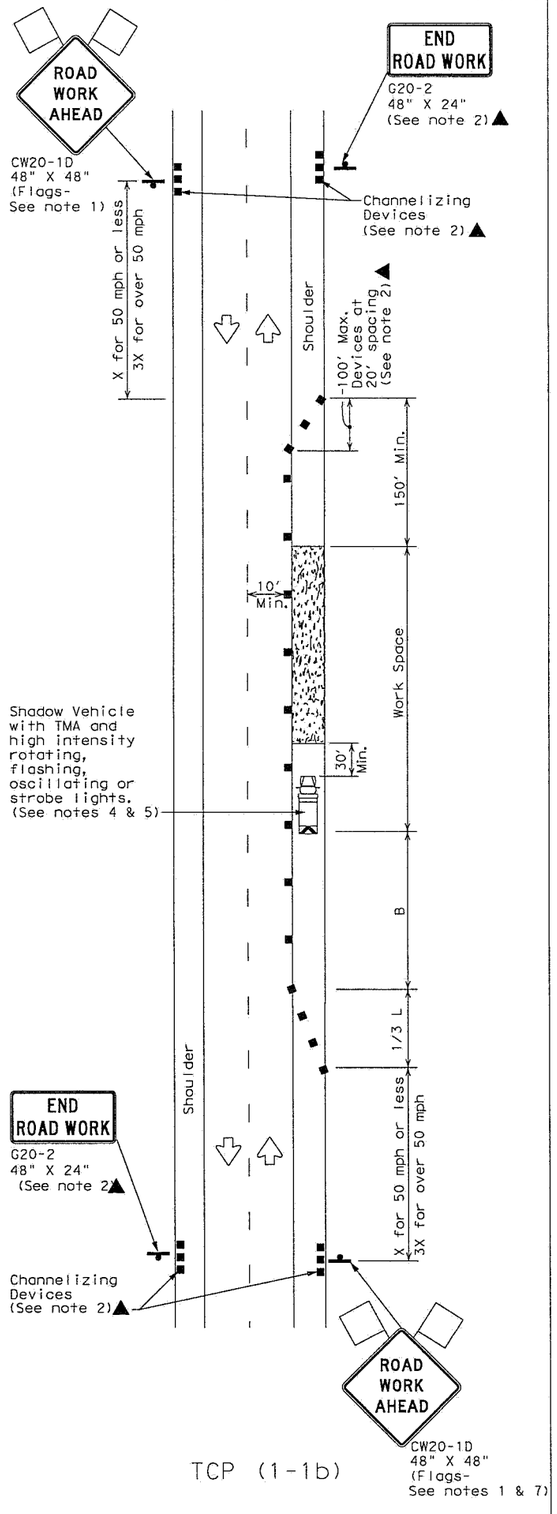


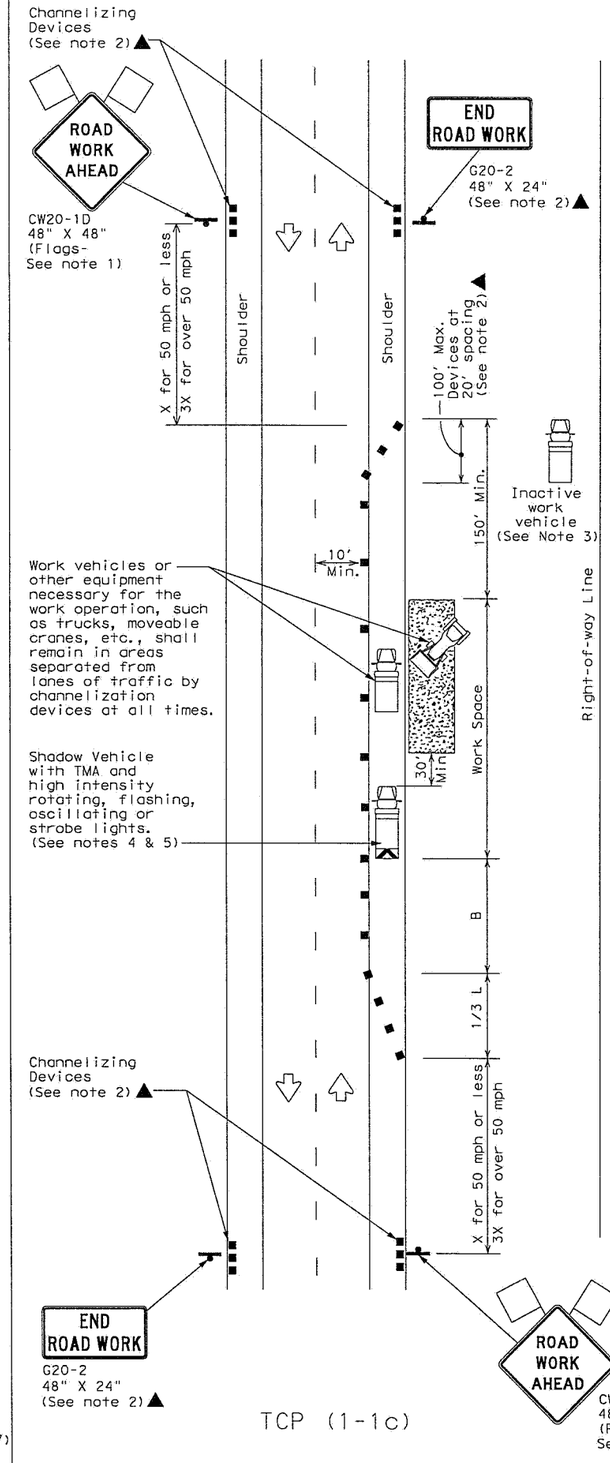
TCP (1-1a)

WORK SPACE NEAR SHOULDER
Conventional Roads



TCP (1-1b)

WORK SPACE ON SHOULDER
Conventional Roads



TCP (1-1c)

WORK VEHICLES ON SHOULDER
Conventional Roads

LEGEND			
	Type 3 Barricade		Channelizing Devices
	Heavy Work Vehicle		Truck Mounted Attenuator (TMA)
	Trailer Mounted Flashing Arrow Board	M	Portable Changeable Message Sign (PCMS)
	Sign		Traffic Flow
	Flag		Flagger

Posted Speed *	Formula	Minimum Desirable Taper Lengths ** 10' Offset	11' Offset	12' Offset	Suggested Maximum Spacing of Channelizing Devices: On a Taper	On a Tangent	Minimum Sign Spacing "X" Distance	Suggested Longitudinal Buffer Space "B"
30	$L=\frac{WS^2}{60}$	150'	165'	180'	30'	60'	120'	90'
35		205'	225'	245'	35'	70'	160'	120'
40		265'	295'	320'	40'	80'	240'	155'
45	L=WS	450'	495'	540'	45'	90'	320'	195'
50		500'	550'	600'	50'	100'	400'	240'
55		550'	605'	660'	55'	110'	500'	295'
60		600'	660'	720'	60'	120'	600'	350'
65		650'	715'	780'	65'	130'	700'	410'
70		700'	770'	840'	70'	140'	800'	475'
75		750'	825'	900'	75'	150'	900'	540'

* Conventional Roads Only

** Taper lengths have been rounded off.
L=Length of Taper(FT) W=Width of Offset(FT) S=Posted Speed(MPH)

TYPICAL USAGE				
MOBILE	SHORT DURATION	SHORT TERM STATIONARY	INTERMEDIATE TERM STATIONARY	LONG TERM STATIONARY
	✓	✓		

GENERAL NOTES

1. Flags attached to signs where shown are REQUIRED.
2. All traffic control devices illustrated are REQUIRED, except those denoted with the triangle symbol may be omitted when stated elsewhere in the plans, or for routine maintenance work, when approved by the Engineer.
3. Inactive work vehicles or other equipment should be parked near the right-of-way line and not parked on the paved shoulder.
4. A Shadow Vehicle with a TMA should be used anytime it can be positioned 30 to 100 feet in advance of the area of crew exposure without adversely affecting the performance or quality of the work. If workers are no longer present but road or work conditions require the traffic control to remain in place, Type 3 Barricades or other channelizing devices may be substituted for the Shadow Vehicle and TMA.
5. Additional Shadow Vehicles with TMAs may be positioned off the paved surface, next to those shown in order to protect wider work spaces.
6. See TCP(5-1)for shoulder work on divided highways, expressways and freeways.
7. CW21-5 "SHOULDER WORK" signs may be used in place of CW20-1D "ROAD WORK AHEAD" signs for shoulder work on conventional roadways.

For construction or maintenance contract work, specific project requirements for shadow vehicles can be found in the project GENERAL NOTES for Item 502, Barricades, Signs and Traffic Handling.

Texas Department of Transportation
Traffic Operations Division

TRAFFIC CONTROL PLAN CONVENTIONAL ROAD SHOULDER WORK

TCP(1-1)-12

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CONT	SECT	JOB	HIGHWAY
DIST	COUNTY		SHEET NO.

REVISIONS
2-94 2-12
8-95
1-97
4-98

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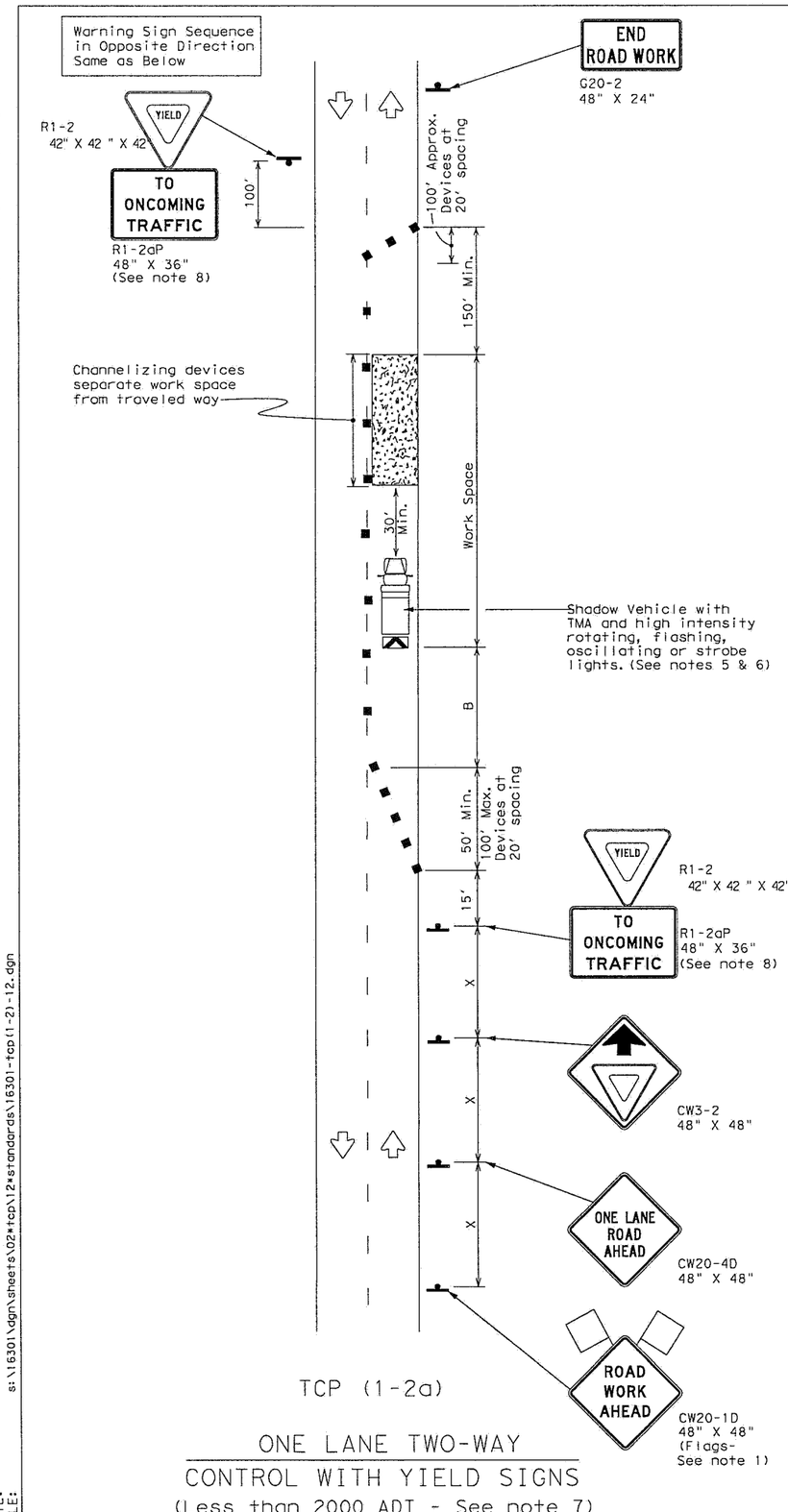
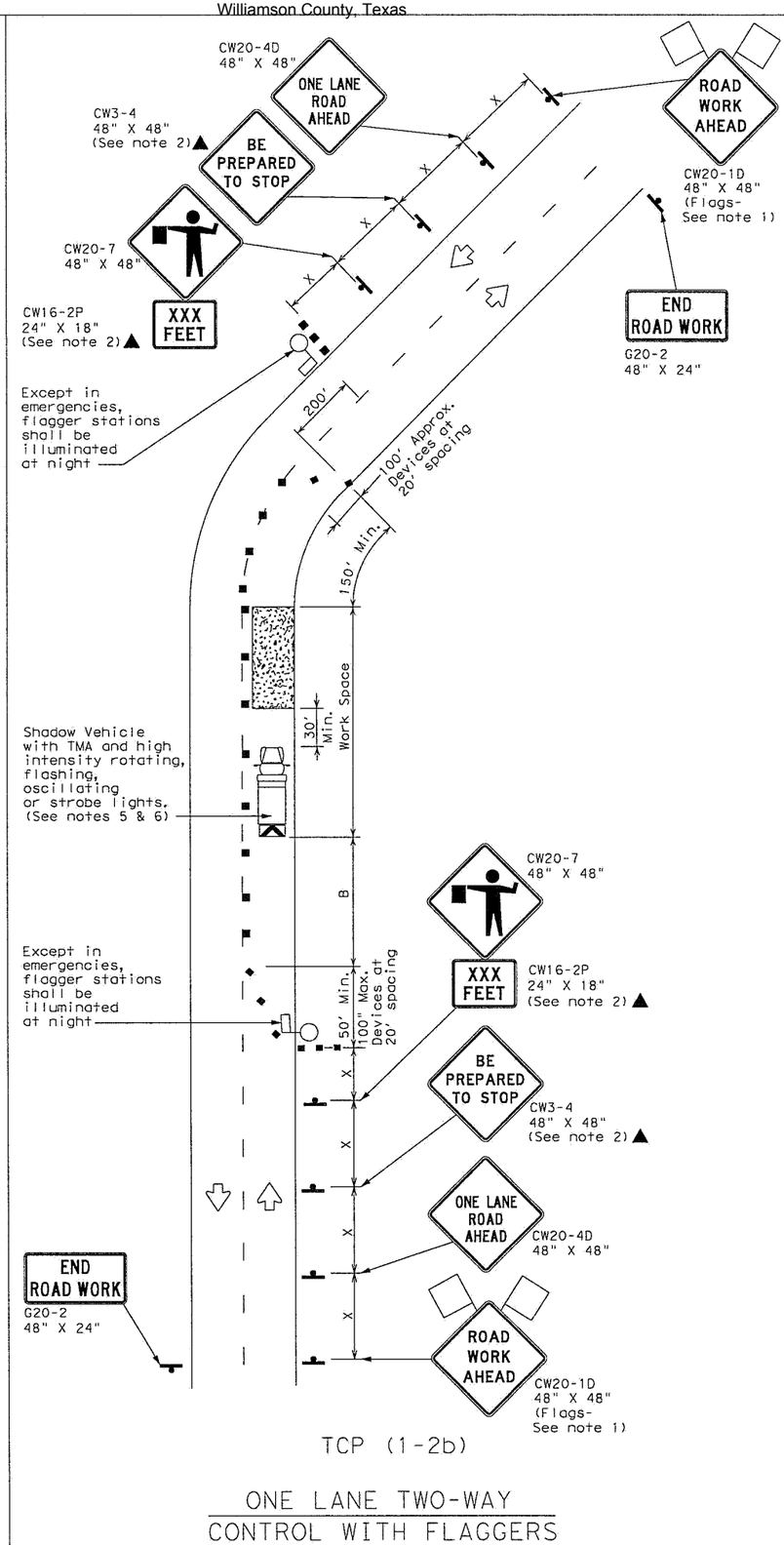


TCP (1-2a)

ONE LANE TWO-WAY CONTROL WITH YIELD SIGNS

(Less than 2000 ADT - See note 7)



TCP (1-2b)

ONE LANE TWO-WAY CONTROL WITH FLAGGERS

LEGEND			
	Type 3 Barricade		Channelizing Devices
	Heavy Work Vehicle		Truck Mounted Attenuator (TMA)
	Trailer Mounted Flashing Arrow Board		Portable Changeable Message Sign (PCMS)
	Sign		Traffic Flow
	Flag		Flagger

Posted Speed *	Formula	Minimum Desirable Taper Lengths ** 10' Offset	11' Offset	12' Offset	Suggested Maximum Spacing of Channelizing Devices: On a Taper	On a Tangent	Minimum Sign Spacing "X" Distance	Suggested Longitudinal Buffer Space "B"	Stopping Sight Distance
30	$L=\frac{WS^2}{60}$	150'	165'	180'	30'	60'	120'	90'	200'
35		205'	225'	245'	35'	70'	160'	120'	250'
40		265'	295'	320'	40'	80'	240'	155'	305'
45	L=WS	450'	495'	540'	45'	90'	320'	195'	360'
50		500'	550'	600'	50'	100'	400'	240'	425'
55		550'	605'	660'	55'	110'	500'	295'	495'
60		600'	660'	720'	60'	120'	600'	350'	570'
65		650'	715'	780'	65'	130'	700'	410'	645'
70		700'	770'	840'	70'	140'	800'	475'	730'
75		750'	825'	900'	75'	150'	900'	540'	820'

* Conventional Roads Only
** Taper lengths have been rounded off.
L=Length of Taper(FT) W=Width of Offset(FT) S=Posted Speed(MPH)

TYPICAL USAGE				
MOBILE	SHORT DURATION	SHORT TERM STATIONARY	INTERMEDIATE TERM STATIONARY	LONG TERM STATIONARY
	✓	✓		

GENERAL NOTES

1. Flags attached to signs where shown are REQUIRED.
2. All traffic control devices illustrated are REQUIRED, except those denoted with the triangle symbol may be omitted when stated elsewhere in the plans, or for routine maintenance work, when approved by the Engineer.
3. The CW3-4 "BE PREPARED TO STOP" sign may be installed after the CW20-4D "ONE LANE ROAD AHEAD" sign, but proper sign spacing shall be maintained.
4. Sign spacing may be increased or an additional CW20-1D "ROAD WORK AHEAD" sign may be used if advance warning ahead of the flagger or R1-2 "YIELD" sign is less than 1500 feet.
5. A Shadow Vehicle with a TMA should be used anytime it can be positioned 30 to 100 feet in advance of the area of crew exposure without adversely affecting the performance or quality of the work. If workers are no longer present but road or work conditions require the traffic control to remain in place, Type 3 Barricades or other channelizing devices may be substituted for the Shadow Vehicle and TMA.
6. Additional Shadow Vehicles with TMAs may be positioned off the paved surface, next to those shown in order to protect wider work spaces.

TCP (1-2a)

7. R1-2 "YIELD" sign traffic control may be used on projects with approaches that have adequate sight distance. For projects in urban areas, work spaces should be no longer than one half city block. In rural areas on roadways with less than 2000 ADT, work spaces should be no longer than 400 feet.
8. R1-2 "YIELD" sign with R1-2aP "TO ONCOMING TRAFFIC" plaque shall be placed on a support at a 7 foot minimum mounting height.

TCP (1-2b)

9. Flaggers should use two-way radios or other methods of communication to control traffic.
10. Length of work space should be based on the ability of flaggers to communicate.
11. If the work space is located near a horizontal or vertical curve, the buffer distances should be increased in order to maintain adequate stopping sight distance to the flagger and a queue of stopped vehicles (see table above).
12. Channelizing devices on the center-line may be omitted when a pilot car is leading traffic and approved by the Engineer.
13. Flaggers should use 24" STOP/SLOW paddles to control traffic. Flags should be limited to emergency situations.

For construction or maintenance contract work, specific project requirements for shadow vehicles can be found in the project GENERAL NOTES for Item 502, Barricades, Signs and Traffic Handling.

Texas Department of Transportation
Traffic Operations Division

TRAFFIC CONTROL PLAN ONE-LANE TWO-WAY TRAFFIC CONTROL

TCP(1-2)-12

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DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT

REVISIONS	CONT	SECT	JOB	HIGHWAY
4-90 2-12				
2-94				
1-97	DIST	COUNTY		SHEET NO.
4-98				634

7/18/2017 9:58 AM

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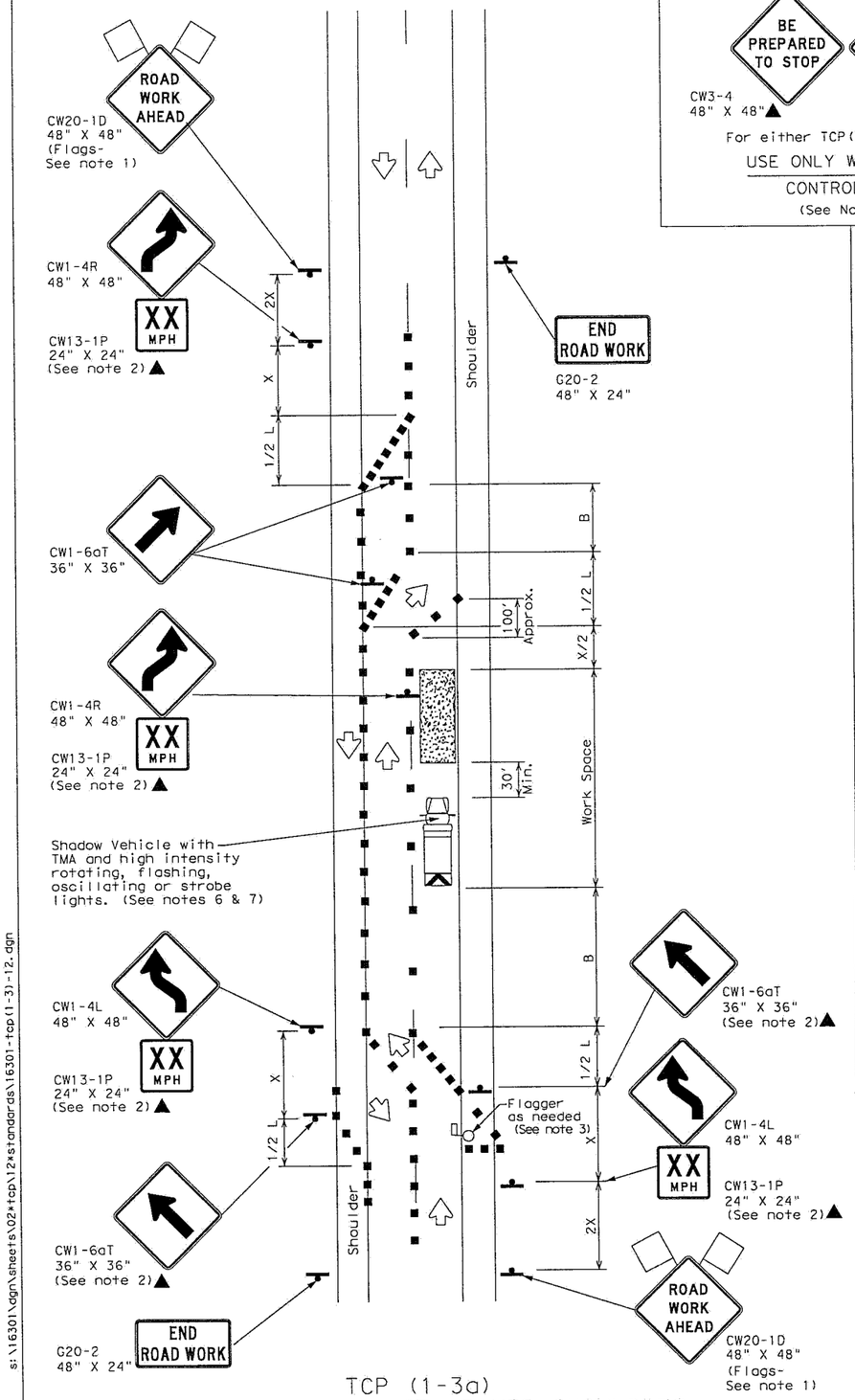
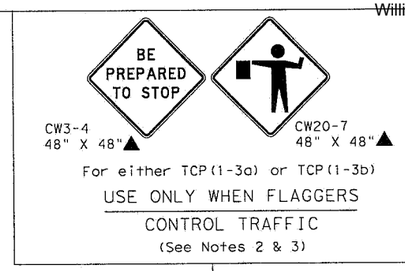
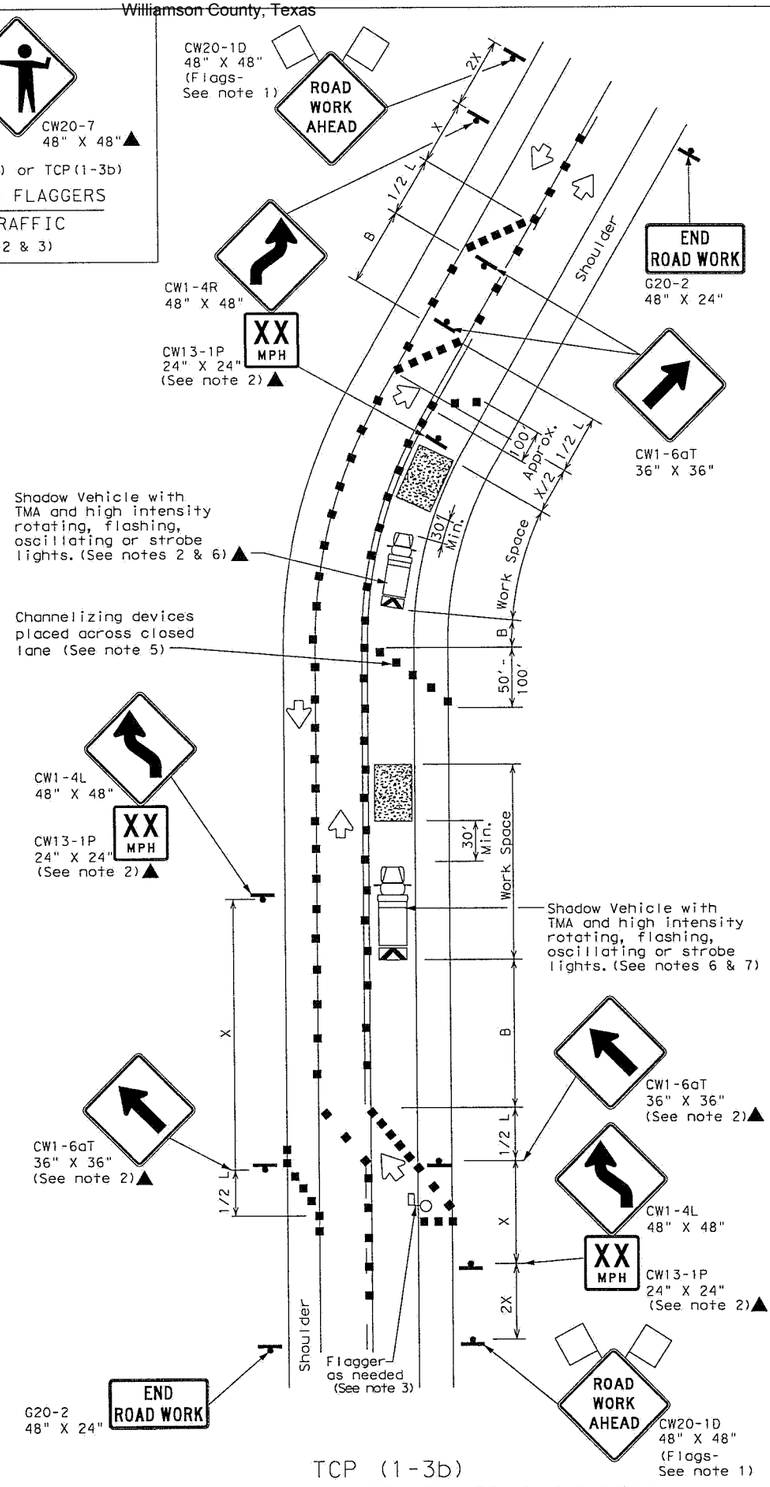


TCP (1-3a)
2-LANE ROADWAY WITH PAVED SHOULDERS

ONE LANE CLOSED
ADEQUATE FIELD OF VIEW





TCP (1-3b)
2-LANE ROADWAY WITH PAVED SHOULDERS

ONE LANE CLOSED
INADEQUATE FIELD OF VIEW

LEGEND			
	Type 3 Barricade		Channelizing Devices
	Heavy Work Vehicle		Truck Mounted Attenuator (TMA)
	Trailer Mounted Flashing Arrow Board	M	Portable Changeable Message Sign (PCMS)
	Sign		Traffic Flow
	Flag		Flagger

Posted Speed *	Formula	Minimum Desirable Taper Lengths ** 10' Offset	11' Offset	12' Offset	Suggested Maximum Spacing of Channelizing Devices: On a Taper	On a Tangent	Minimum Sign Spacing "X" Distance	Suggested Longitudinal Buffer Space "B"
30	$L=\frac{WS^2}{60}$	150'	165'	180'	30'	60'	120'	90'
35		205'	225'	245'	35'	70'	160'	120'
40		265'	295'	320'	40'	80'	240'	155'
45	L=WS	450'	495'	540'	45'	90'	320'	195'
50		500'	550'	600'	50'	100'	400'	240'
55		550'	605'	660'	55'	110'	500'	295'
60		600'	660'	720'	60'	120'	600'	350'
65		650'	715'	780'	65'	130'	700'	410'
70		700'	770'	840'	70'	140'	800'	475'
75		750'	825'	900'	75'	150'	900'	540'

* Conventional Roads Only

** Taper lengths have been rounded off.
L=Length of Taper(FT) W=Width of Offset(FT) S=Posted Speed(MPH)

TYPICAL USAGE				
MOBILE	SHORT DURATION	SHORT TERM STATIONARY	INTERMEDIATE TERM STATIONARY	LONG TERM STATIONARY
	✓	✓		

GENERAL NOTES

1. Flags attached to signs where shown are REQUIRED.
2. All traffic control devices illustrated are REQUIRED, except those denoted with the triangle symbol may be omitted when stated elsewhere in the plans, or for routine maintenance work, when approved by the Engineer.
3. Flagger control should NOT be used unless roadway conditions or heavy traffic volume require additional emphasis to safely control traffic. Additional flaggers may be positioned in advance of traffic queues to alert traffic to reduce speed.
4. DO NOT PASS, PASS WITH CARE and construction regulatory speed zone signs may be installed downstream of the ROAD WORK AHEAD signs.
5. When the work zone is made up of several work spaces, channelizing devices should be placed laterally across the closed lane to re-emphasize closure. Laterally placed channelizing devices should be repeated every 500 to 1000 feet in urban areas and every 1/4 to 1/2 mile in rural areas.
6. A Shadow Vehicle with a TMA should be used anytime it can be positioned 30 to 100 feet in advance of the area of crew exposure without adversely affecting the performance or quality of the work. If workers are no longer present but road or work conditions require the traffic control to remain in place, Type 3 Barricades or other channelizing devices may be substituted for the Shadow Vehicle and TMA.
7. Additional Shadow Vehicles with TMAs may be positioned off the paved surface, next to those shown in order to protect wider work spaces.
8. Where traffic is directed over a yellow centerline, channelizing devices which separate two-way traffic should be spaced on tapers at 20', or 15' if posted speed are 35 mph or slower, and for tangent sections, at 1/2S where S is the speed in mph. This tighter device spacing is intended for the area of conflicting markings not the entire work zone.

For construction or maintenance contract work, specific project requirements for shadow vehicles can be found in the project GENERAL NOTES for Item 502, Barricades, Signs and Traffic Handling.

Texas Department of Transportation
Traffic Operations Division

TRAFFIC CONTROL PLAN TRAFFIC SHIFTS ON TWO LANE ROADS

TCP(1-3)-12

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DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT

REVISIONS	CONT	SECT	JOB	HIGHWAY
2-94 2-12				
8-95				
1-97				
4-98				

DIST	COUNTY	SHEET NO.
		64

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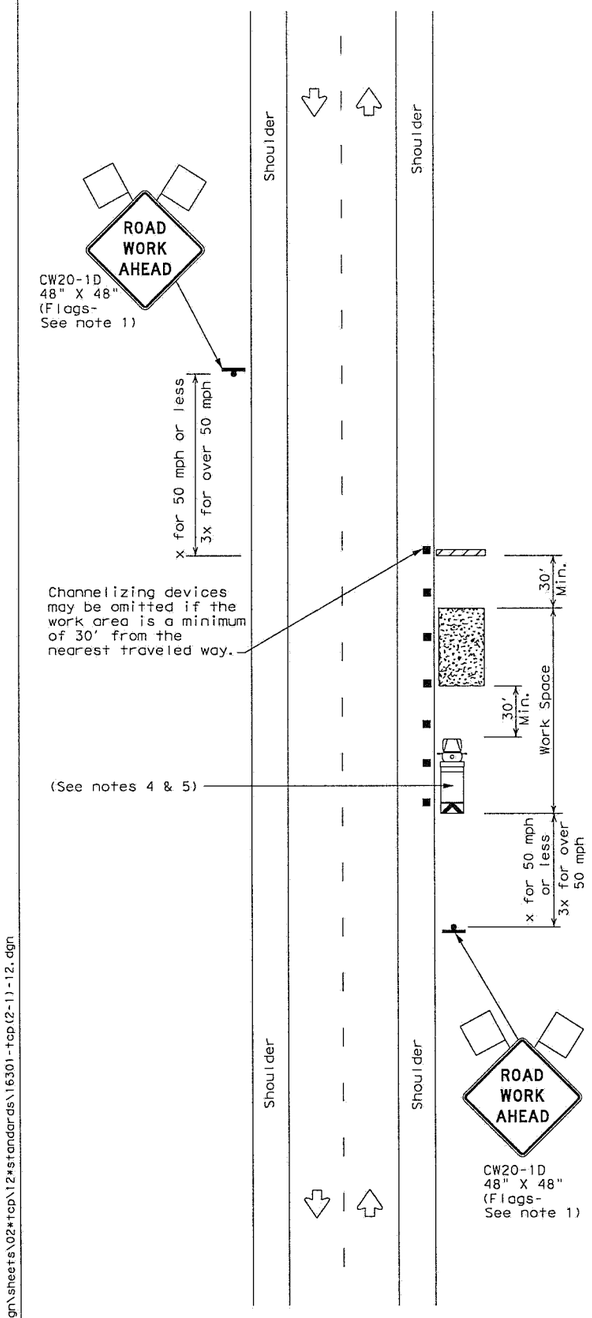
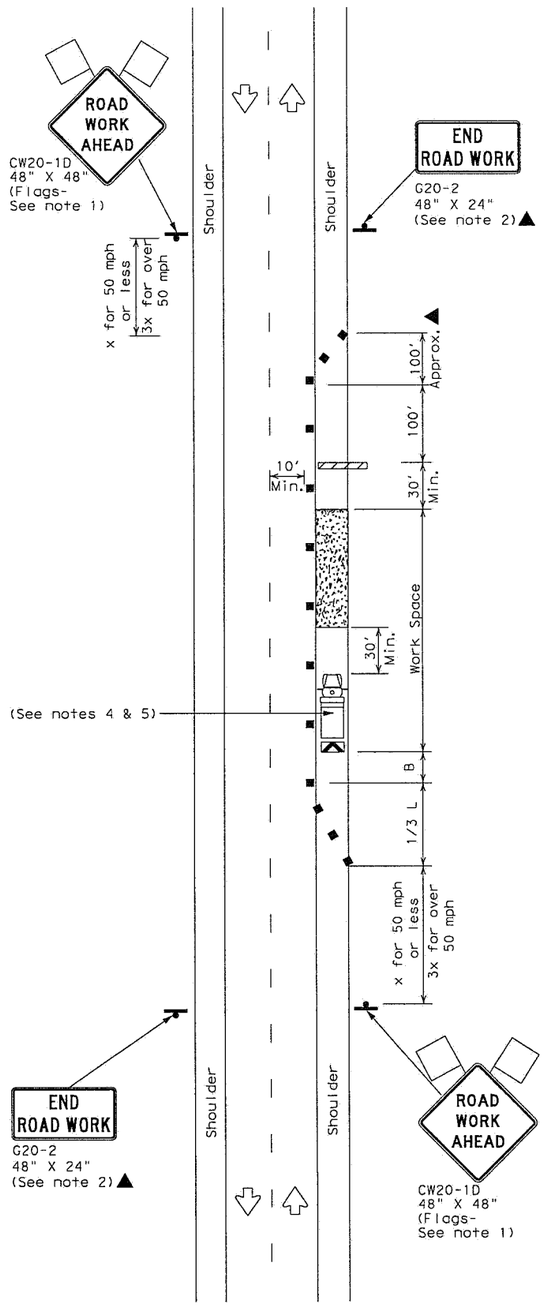


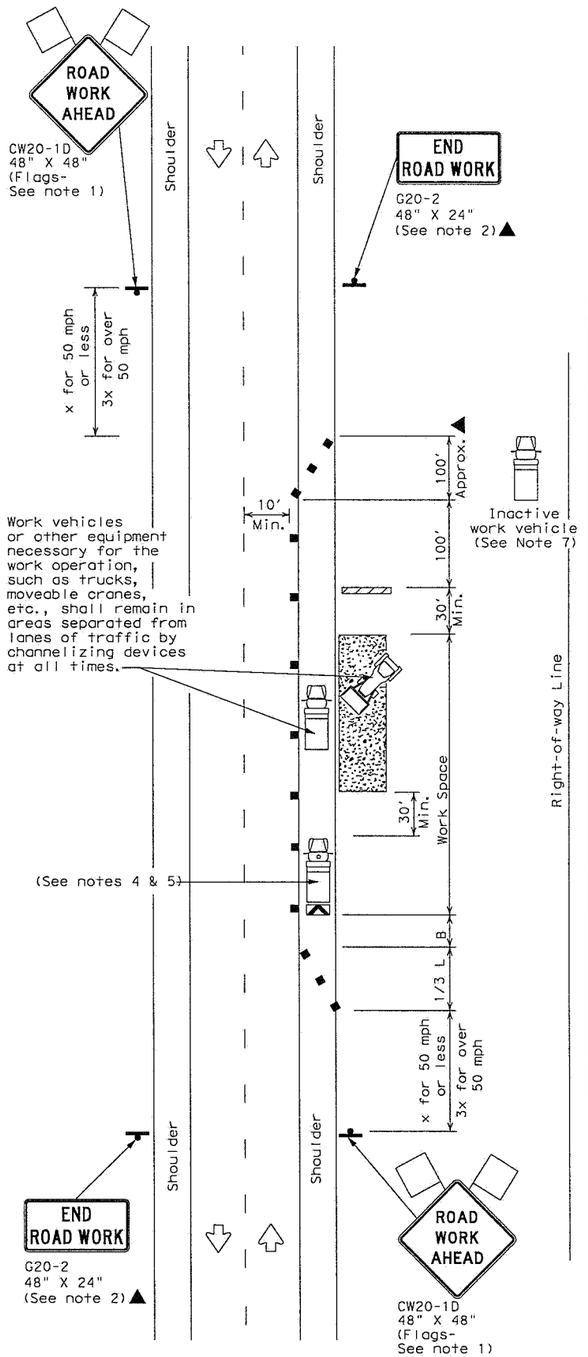
TCP (2-1a)

WORK SPACE NEAR SHOULDER
Conventional Roads



TCP (2-1b)

WORK SPACE ON SHOULDER
Conventional Roads



TCP (2-1c)

WORK VEHICLES ON SHOULDER
Conventional Roads

LEGEND			
	Type 3 Barricade		Channelizing Devices
	Heavy Work Vehicle		Truck Mounted Attenuator (TMA)
	Trailer Mounted Flashing Arrow Board		Portable Changeable Message Sign (PCMS)
	Sign		Traffic Flow
	Flag		Flagger

Posted Speed *	Formula	Minimum Desirable Taper Lengths ** 10' Offset	11' Offset	12' Offset	Suggested Maximum Spacing of Channelizing Devices On a Taper	On a Tangent	Minimum Sign Spacing "X" Distance	Suggested Longitudinal Buffer Space "B"
30	$L=\frac{WS^2}{60}$	150'	165'	180'	30'	60'	120'	90'
35		205'	225'	245'	35'	70'	160'	120'
40		265'	295'	320'	40'	80'	240'	155'
45	L=WS	450'	495'	540'	45'	90'	320'	195'
50		500'	550'	600'	50'	100'	400'	240'
55		550'	605'	660'	55'	110'	500'	295'
60		600'	660'	720'	60'	120'	600'	350'
65		650'	715'	780'	65'	130'	700'	410'
70		700'	770'	840'	70'	140'	800'	475'
75		750'	825'	900'	75'	150'	900'	540'

* Conventional Roads Only

** Taper lengths have been rounded off.
L=Length of Taper(FT) W=Width of Offset(FT) S=Posted Speed(MPH)

TYPICAL USAGE				
MOBILE	SHORT DURATION	SHORT TERM STATIONARY	INTERMEDIATE TERM STATIONARY	LONG TERM STATIONARY
	✓	✓	✓	✓

GENERAL NOTES

1. Flags attached to signs where shown, are REQUIRED.
2. All traffic control devices illustrated are REQUIRED, except those denoted with the triangle symbol may be omitted when stated in the plans, or for routine maintenance work, when approved by the Engineer.
3. Stockpiled material should be placed a minimum of 30 feet from nearest traveled way.
4. Shadow Vehicle with TMA and high intensity rotating, flashing, oscillating or strobe lights. A Shadow Vehicle with a TMA should be used anytime it can be positioned 30 to 100 feet in advance of the area of crew exposure without adversely affecting the performance or quality of the work. If workers are no longer present but road or work conditions require the traffic control to remain in place, Type 3 Barricades or other channelizing devices may be substituted for the Shadow Vehicle and TMA.
5. Additional Shadow Vehicles with TMAs may be positioned off the paved surface, next to those shown in order to protect a wider work space.
6. See TCP(5-1) for shoulder work on divided highways, expressways and freeways.
7. Inactive work vehicles or other equipment should be parked near the right-of-way line and not parked on the paved shoulder.
8. CW21-5 "SHOULDER WORK" signs may be used in place of CW21-1D "ROAD WORK AHEAD" signs for shoulder work on conventional roadways.

For construction or maintenance contract work, specific project requirements for shadow vehicles can be found in the project GENERAL NOTES for Item 502, Barricades, Signs and Traffic Handling.

Texas Department of Transportation
Traffic Operations Division

TRAFFIC CONTROL PLAN CONVENTIONAL ROAD SHOULDER WORK

TCP(2-1)-12

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REVISIONS	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
2-94 2-12	CONT	SECT	JOB	HIGHWAY
8-95				
1-97	DIST	COUNTY		SHEET NO.
4-98				65436

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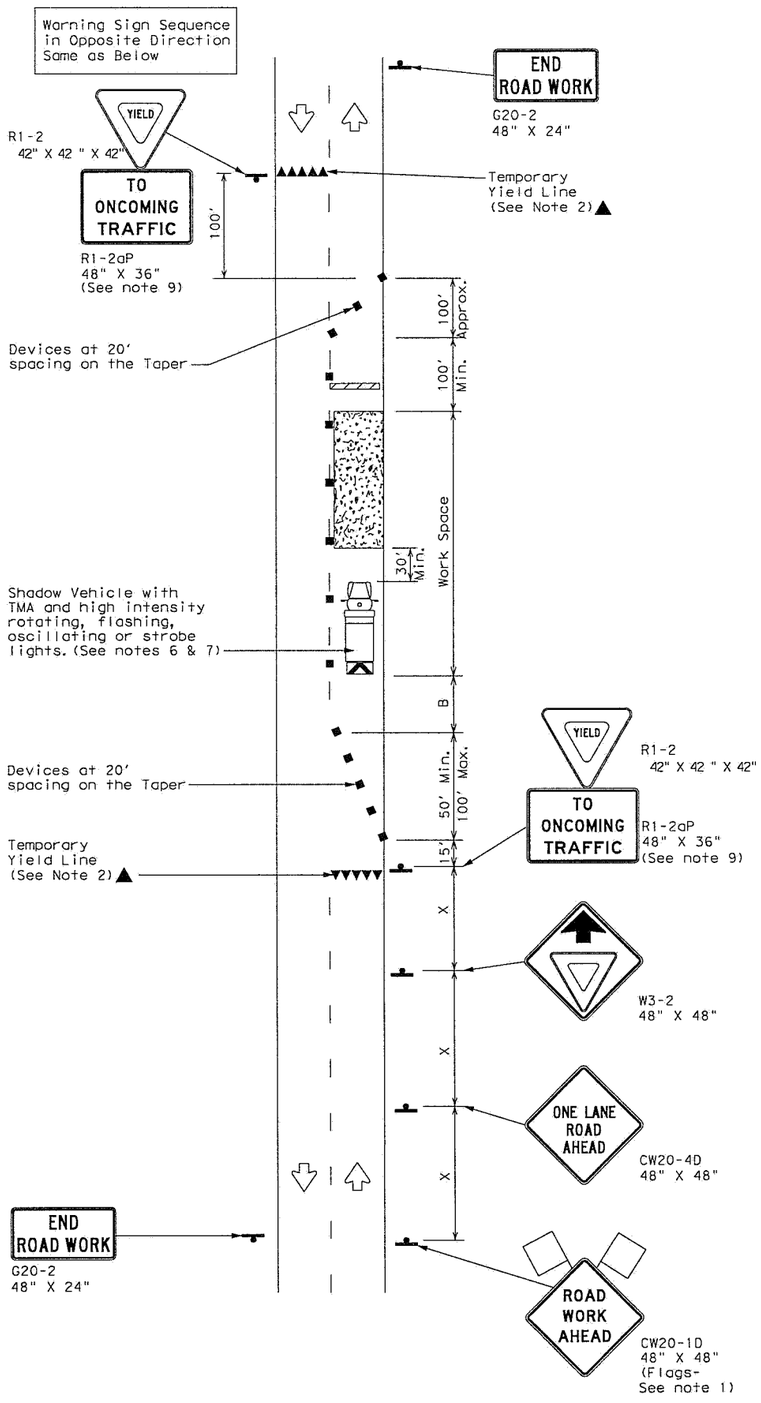
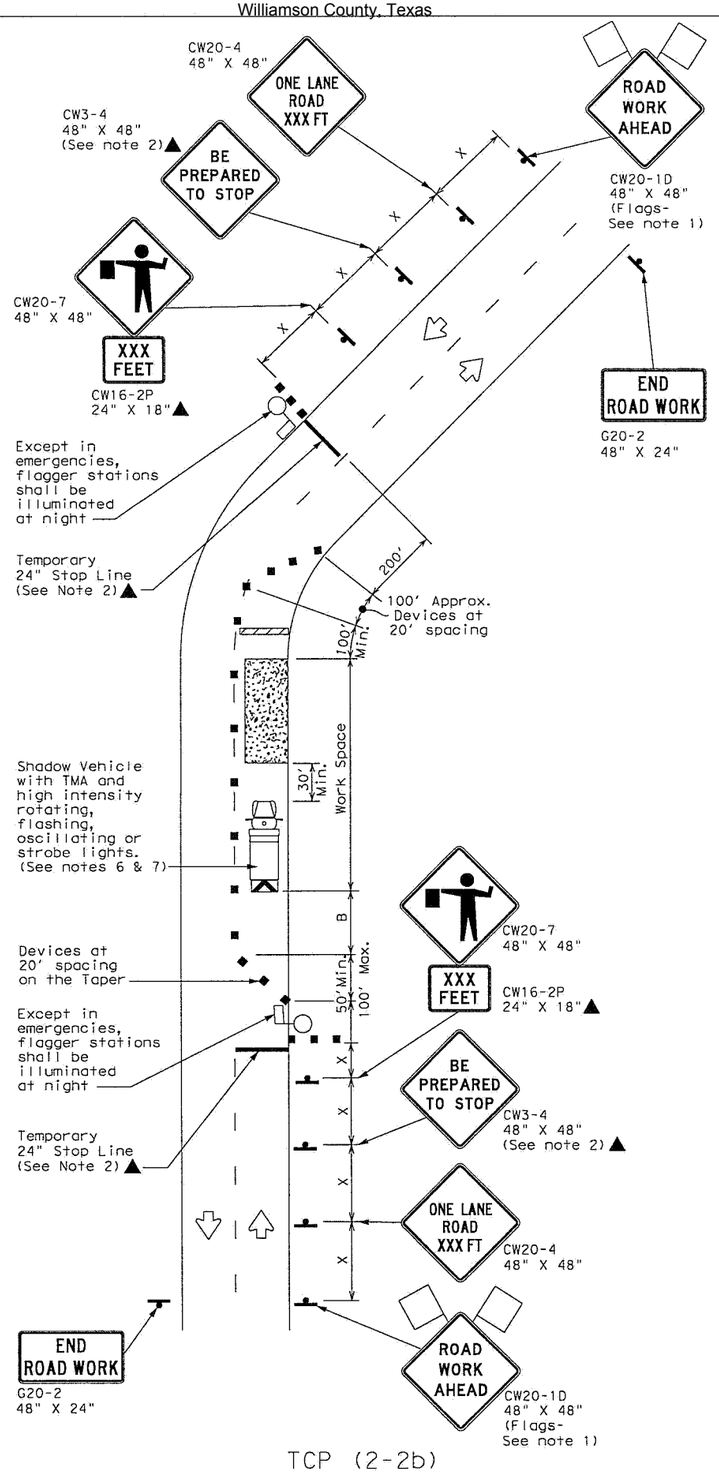


TCP (2-2a)
2-LANE ROADWAY WITHOUT PAVED SHOULDERS
ONE LANE TWO-WAY
CONTROL WITH YIELD SIGNS
(Less than 2000 ADT - See Note 9)



TCP (2-2b)
2-LANE ROADWAY WITHOUT PAVED SHOULDERS
ONE LANE TWO-WAY
CONTROL WITH FLAGGERS

LEGEND			
	Type 3 Barricade		Channelizing Devices
	Heavy Work Vehicle		Truck Mounted Attenuator (TMA)
	Trailer Mounted Flashing Arrow Board	M	Portable Changeable Message Sign (PCMS)
	Sign		Traffic Flow
	Flag		Flagger

Posted Speed ✳	Formula	Minimum Desirable Taper Lengths ✳✳ 10' Offset	11' Offset	12' Offset	Suggested Maximum Spacing of Channelizing Devices On a Taper	On a Tangent	Minimum Sign Spacing "X" Distance	Suggested Longitudinal Buffer Space "B"	Stopping Sight Distance
30	$L=\frac{WS^2}{60}$	150'	165'	180'	30'	60'	120'	90'	200'
35		205'	225'	245'	35'	70'	160'	120'	250'
40		265'	295'	320'	40'	80'	240'	155'	305'
45	L=WS	450'	495'	540'	45'	90'	320'	195'	360'
50		500'	550'	600'	50'	100'	400'	240'	425'
55		550'	605'	660'	55'	110'	500'	295'	495'
60		600'	660'	720'	60'	120'	600'	350'	570'
65		650'	715'	780'	65'	130'	700'	410'	645'
70		700'	770'	840'	70'	140'	800'	475'	730'
75		750'	825'	900'	75'	150'	900'	540'	820'

✳ Conventional Roads Only
✳✳ Taper lengths have been rounded off.
L=Length of Taper(FT) W=Width of Offset(FT) S=Posted Speed(MPH)

TYPICAL USAGE				
MOBILE	SHORT DURATION	SHORT TERM STATIONARY	INTERMEDIATE TERM STATIONARY	LONG TERM STATIONARY
	✓	✓	✓	

GENERAL NOTES

1. Flags attached to signs where shown, are REQUIRED.
2. All traffic control devices illustrated are REQUIRED, except those denoted with the triangle symbol may be omitted when stated elsewhere in the plans, or for routine maintenance work, when approved by the Engineer.
3. The CW3-4 "BE PREPARED TO STOP" sign may be installed after the CW20-4 "ONE LANE ROAD XXX FT" sign, but proper sign spacing shall be maintained.
4. Flaggers should use two-way radios or other methods of communication to control traffic.
5. Length of work space should be based on the ability of flaggers to communicate.
6. A Shadow Vehicle with a TMA should be used anytime it can be positioned 30 to 100 feet in advance of the area of crew exposure without adversely affecting the performance or quality of the work. If workers are no longer present but road or work conditions require the traffic control to remain in place, Type 3 Barricades or other channelizing devices may be substituted for the Shadow Vehicle and TMA.
7. Additional Shadow Vehicles with TMAs may be positioned off the paved surface, next to those shown in order to protect a wider work space.

TCP (2-2a)

8. The R1-2 "YIELD" sign traffic control may be used on projects with approaches that have adequate sight distance. For projects in urban areas, work space should be no longer than one half city block. In rural areas, roadways with less than 2000 ADT, work space should be no longer than 400 feet.
9. The R1-2aP "YIELD TO ONCOMING TRAFFIC" sign shall be placed on a support at a 7 foot minimum mounting height.

TCP (2-2b)

10. Channelizing devices on the center line may be omitted when a pilot car is leading traffic and approved by the Engineer.
11. If the work space is located near a horizontal or vertical curve, the buffer distances should be increased in order to maintain stopping sight distance to the flagger and a queue of stopped vehicles. (See table above).
12. Flaggers should use 24" STOP/SLOW paddles to control traffic. Flags should be limited to emergency situtations.

For construction or maintenance contract work, specific project requirements for shadow vehicles can be found in the project GENERAL NOTES for Item 502, Barricades, Signs and Traffic Handling.

Texas Department of Transportation
Traffic Operations Division

TRAFFIC CONTROL PLAN ONE-LANE TWO-WAY TRAFFIC CONTROL

TCP(2-2)-12

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DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT

REVISIONS	CONT	SECT	JOB	HIGHWAY
8-95 2-12				
1-97				
4-98	DIST	COUNTY		SHEET NO.
3-03				66

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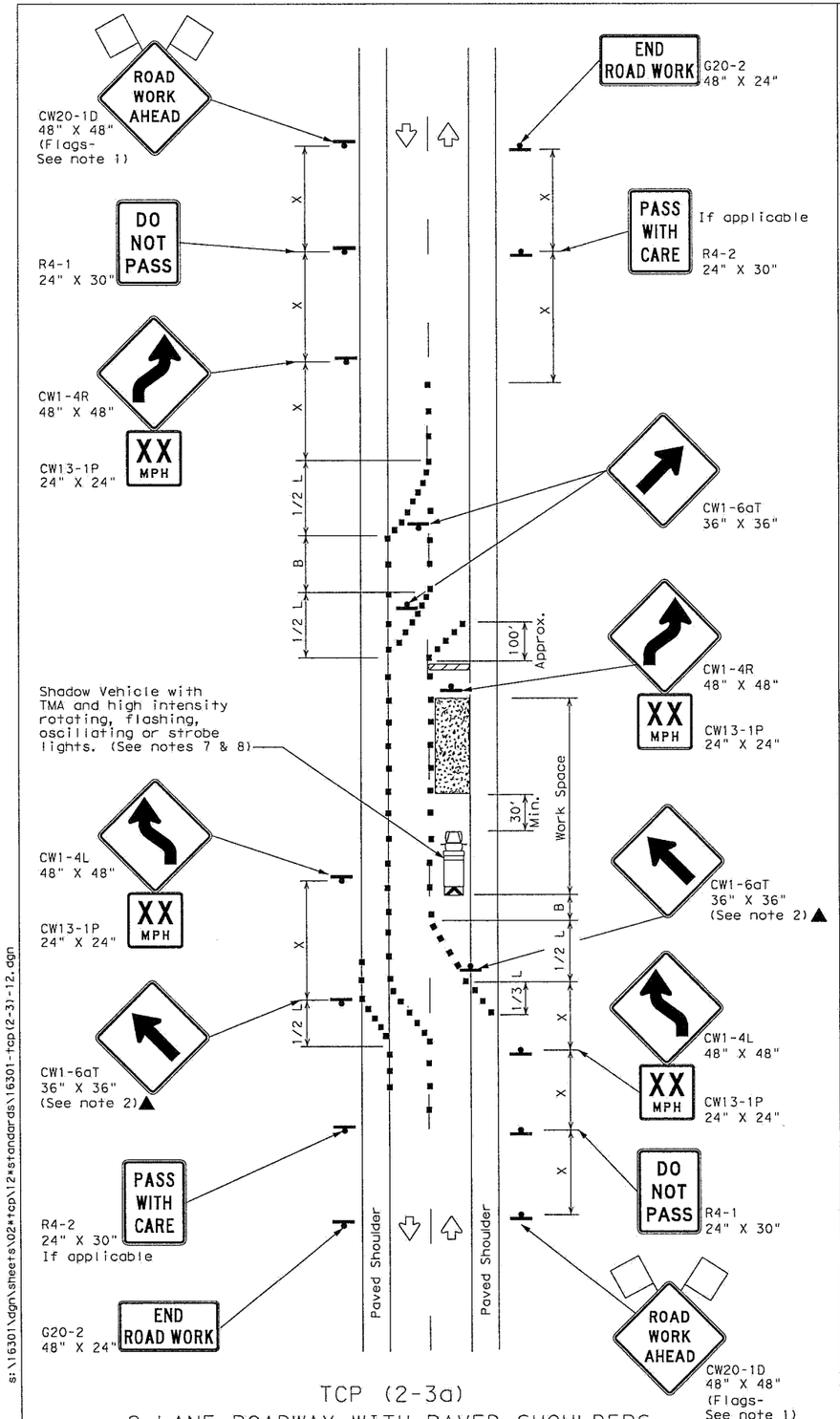
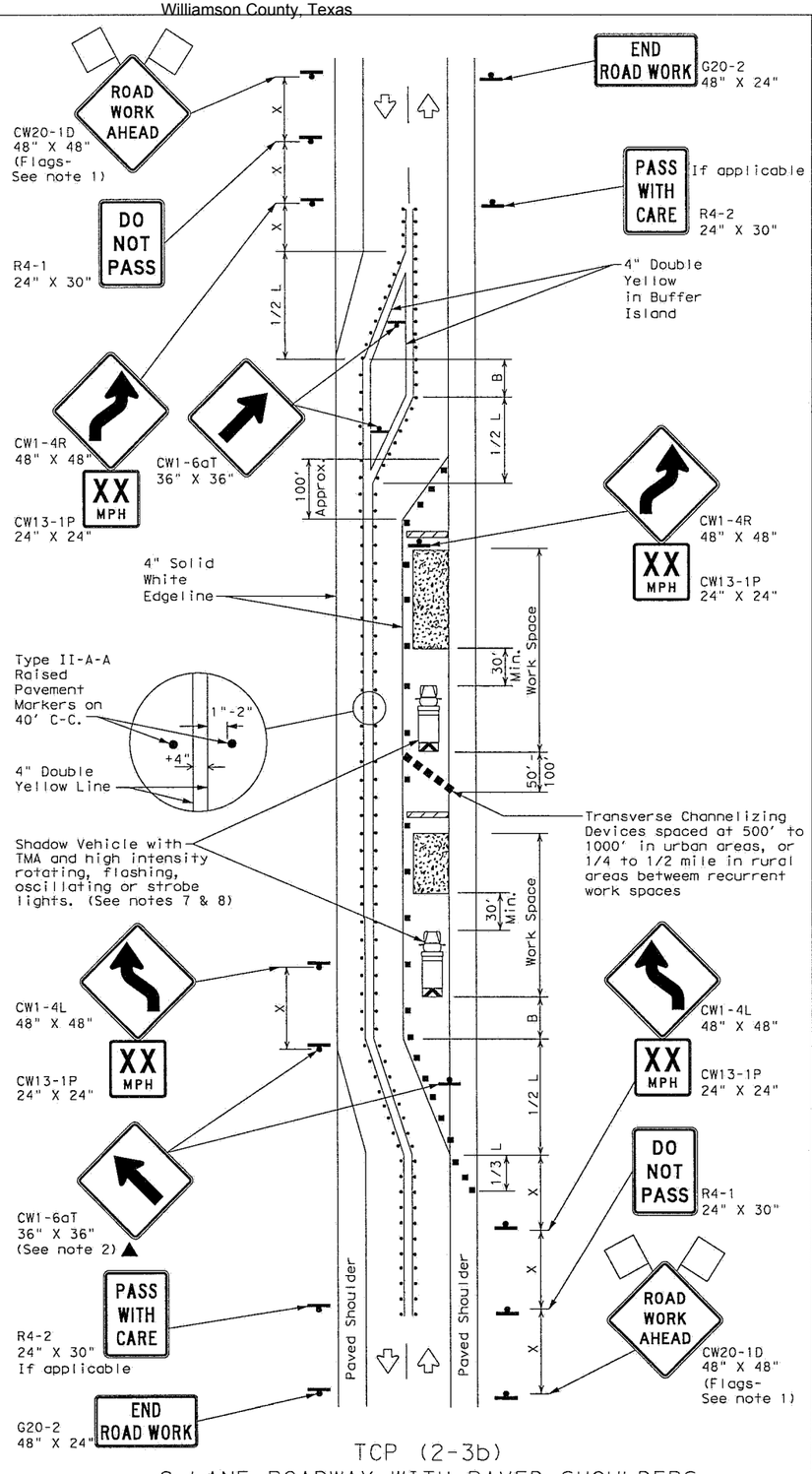


TCP (2-3a)

2-LANE ROADWAY WITH PAVED SHOULDERS

ONE LANE CLOSED

ADEQUATE FIELD OF VIEW



TCP (2-3b)

2-LANE ROADWAY WITH PAVED SHOULDERS

ONE LANE CLOSED

INADEQUATE FIELD OF VIEW

LEGEND			
	Type 3 Barricade		Channelizing Devices
	Heavy Work Vehicle		Truck Mounted Attenuator (TMA)
	Trailer Mounted Flashing Arrow Board		Raised Pavement Markers Ty II-AA
	Sign		Traffic Flow
	Flag		Flagger

Posted Speed *	Formula	Minimum Desirable Taper Lengths ** 10' Offset	11' Offset	12' Offset	Suggested Maximum Spacing of Channelizing Devices: On a Taper	On a Tangent	Minimum Sign Spacing "X" Distance	Suggested Longitudinal Buffer Space "B"
30	$L=\frac{WS^2}{60}$	150'	165'	180'	30'	60'	120'	90'
35		205'	225'	245'	35'	70'	160'	120'
40		265'	295'	320'	40'	80'	240'	155'
45	L=WS	450'	495'	540'	45'	90'	320'	195'
50		500'	550'	600'	50'	100'	400'	240'
55		550'	605'	660'	55'	110'	500'	295'
60		600'	660'	720'	60'	120'	600'	350'
65		650'	715'	780'	65'	130'	700'	410'
70		700'	770'	840'	70'	140'	800'	475'
75		750'	825'	900'	75'	150'	900'	540'

* Conventional Roads Only

** Taper lengths have been rounded off.

L=Length of Taper(FT) W=Width of Offset(FT) S=Posted Speed(MPH)

TYPICAL USAGE				
MOBILE	SHORT DURATION	SHORT TERM STATIONARY	INTERMEDIATE TERM STATIONARY	LONG TERM STATIONARY
				TCP(2-3b)ONLY
			✓	✓

GENERAL NOTES

1. Flags attached to signs where shown, are REQUIRED.
2. All traffic control devices illustrated are REQUIRED, except those denoted with the triangle symbol may be omitted when stated elsewhere in the plans, or for routine maintenance work, when approved by the Engineer.
3. When work space will be in place less than three days existing pavement markings may remain in place. Channelizing devices shall be used to separate traffic.
4. Flagger control should NOT be used unless roadway conditions or heavy traffic volume require additional emphasis to safely control traffic. Flagger should be positioned at end of traffic queue.
5. The R4-1 "DO NOT PASS," R4-2 " PASS WITH CARE" and construction regulatory speed zone signs may be installed within CW20-1D "ROAD WORK AHEAD" signs. Proper spacing of signs shall be maintained.
6. Conflicting pavement marking shall be removed for long term projects.
7. A Shadow Vehicle with a TMA should be used anytime it can be positioned 30 to 100 feet in advance of the area of crew exposure without adversely affecting the performance or quality of the work. If workers are no longer present but road or work conditions require the traffic control to remain in place, Type 3 Barricades or other channelizing devices may be substituted.
8. Additional Shadow Vehicles with TMAs may be positioned off the paved surface, next to those shown in order to protect a wider work space.

TCP (2-3a)

9. Conflicting pavement markings shall be removed for long-term projects. For shorter durations where traffic is directed over a yellow centerline, channelizing devices which separate two-way traffic should be spaced on tapers at 20' or 15' if posted speeds are 35 mph or slower, and for tangent sections, at 1/2(S) where S is the speed in mph. This tighter device spacing is intended for the area of the conflicting markings, not the entire work zone.

For construction or maintenance contract work, specific project requirements for shadow vehicles can be found in the project GENERAL NOTES for Item 502, Barricades, Signs and Traffic Handling.

Texas Department of Transportation
Traffic Operations Division

TRAFFIC CONTROL PLAN TRAFFIC SHIFTS ON TWO-LANE ROADS

TCP(2-3)-12

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DN: TXDOT	CK: TXDOT	DN: TXDOT	CK: TXDOT
CONT	SECT	JOB	HIGHWAY
DIST	COUNTY		SHEET NO.

REVISIONS
8-95 2-12
1-97
4-98
3-03

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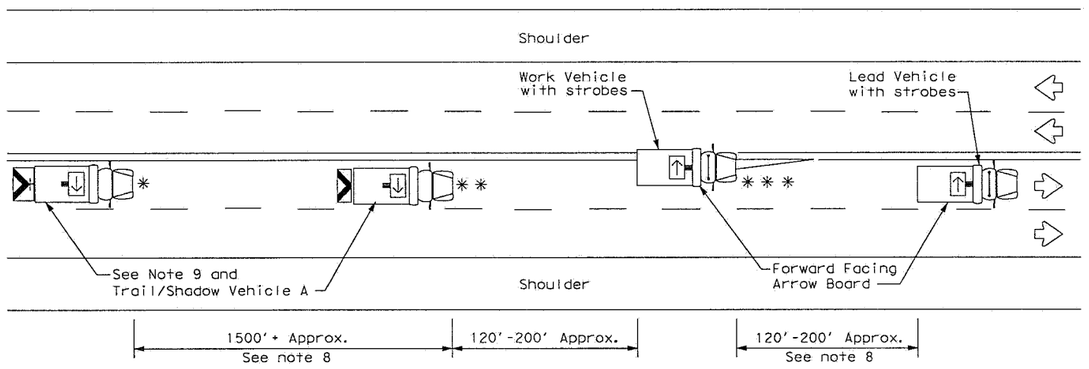
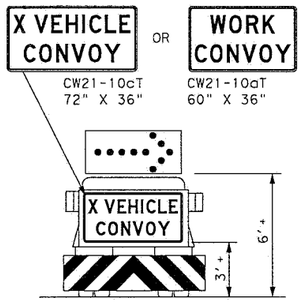


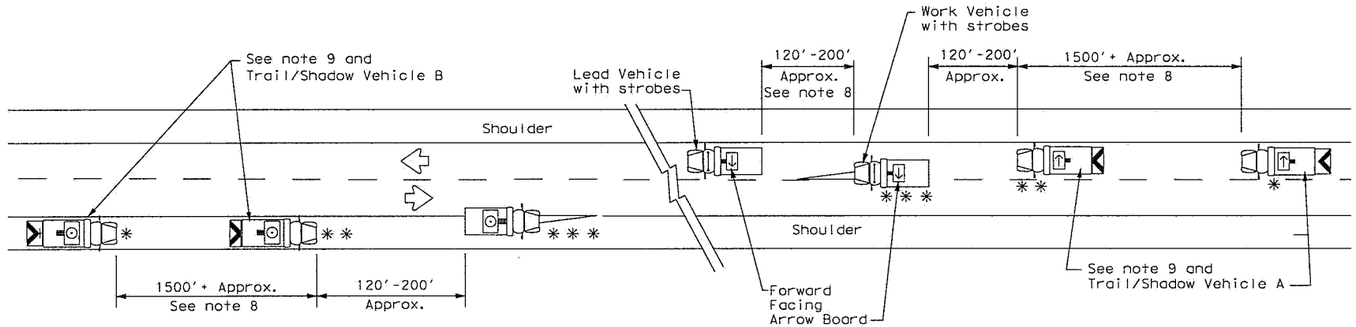
TCP (3-1a)

UNDIVIDED MULTILANE ROADWAY



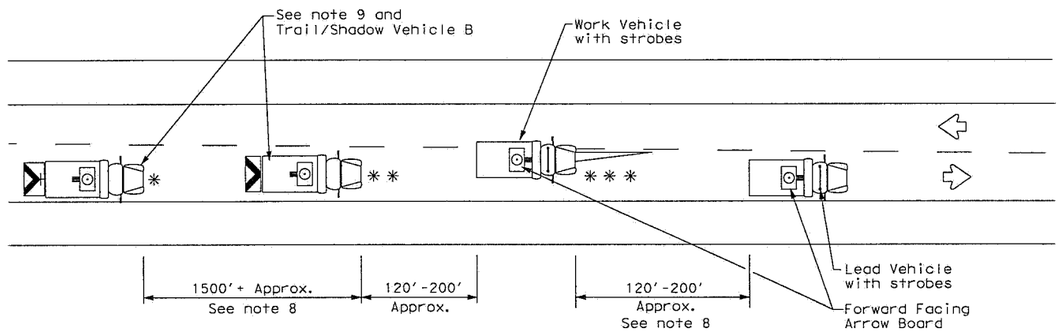
TRAIL/SHADOW VEHICLE A

with RIGHT Directional display Flashing Arrow Board



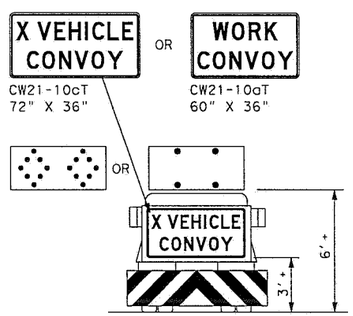
TCP (3-1b)

TWO-WAY ROADWAY WITH PAVED SHOULDERS



TCP (3-1c)

TWO-WAY ROADWAY WITHOUT PAVED SHOULDERS



TRAIL/SHADOW VEHICLE B

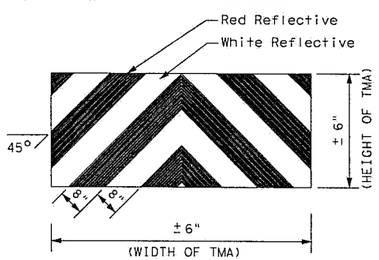
with Flashing Arrow Board in CAUTION display

LEGEND			
*	Trail Vehicle	ARROW BOARD DISPLAY	
**	Shadow Vehicle		
***	Work Vehicle		RIGHT Directional
	Heavy Work Vehicle		LEFT Directional
	Truck Mounted Attenuator (TMA)		Double Arrow
	Traffic Flow		CAUTION (Alternating Diamond or 4 Corner Flash)

TYPICAL USAGE				
MOBILE	SHORT DURATION	SHORT TERM STATIONARY	INTERMEDIATE TERM STATIONARY	LONG TERM STATIONARY
✓				

GENERAL NOTES

1. TRAIL, SHADOW, and LEAD vehicles shall be equipped with arrow boards as illustrated. When a LEAD vehicle is not used the WORK vehicle must be equipped with an arrow board. The Engineer will determine if the LEAD VEHICLE and/or TRAIL VEHICLE are required based on prevailing roadway conditions, traffic volume, and sight distance restrictions.
2. The use of amber high intensity rotating, flashing, oscillating, or strobe lights on vehicles are required. Blue high intensity rotating, flashing, oscillating or strobe lights when mounted on the driver's side of the vehicle may be operated simultaneously with the amber beacons or strobe lights.
3. The use of truck mounted attenuators (TMA) on the SHADOW VEHICLE and TRAIL VEHICLE are required.
4. Reflective sheeting on the rear of the TMA shall meet or exceed the reflectivity and color requirements of DEPARTMENTAL MATERIAL SPECIFICATION DMS 8300, Type A.
5. Flashing arrow boards shall be Type B or Type C as per the Barricade and Construction (BC) standards. The board shall be controlled from inside the vehicle.
6. Each vehicle shall have two-way radio communication capability.
7. When work convoys must change lanes, the TRAIL VEHICLE should change lanes first to shadow the other convoy vehicles.
8. Vehicle spacing between the TRAIL VEHICLE and the SHADOW VEHICLE will vary depending on sight distance restrictions. Motorists approaching the work convoy should be able to see the TRAIL VEHICLE in time to slow down and/or change lanes as they approach the TRAIL VEHICLE. Vehicle spacing between the WORK VEHICLE and SHADOW VEHICLE and vehicle spacing between WORK VEHICLE and LEAD VEHICLE may vary according to terrain, work activity and other factors.
9. "X VEHICLE CONVOY" (CW21-10cT) or "WORK CONVOY" (CW21-10aT) signs shall be used on TRAIL VEHICLES and SHADOW VEHICLES as shown. As an option 48" X 48" diamond shaped "WORK CONVOY"(CW21-10T) or "X VEHICLE CONVOY" (CW21-10bT) signs may be used where adequate mounting space exists. When used, the X VEHICLE CONVOY sign shall have the number of the convoy vehicles displayed on the sign in the number designation "X" location. The "X VEHICLE CONVOY" sign shall not be used on the SHADOW VEHICLE if a TRAIL VEHICLE is used.
10. On two-lane two-way roadways, the work and protection vehicles should pull over periodically to allow motor vehicle traffic to pass. If motorists are not allowed to pass the work convoy, a "DO NOT PASS" (R4-1) sign should be placed on the back of the rearmost protection vehicle.



STRIPING FOR TMA

Texas Department of Transportation — Traffic Operations Division Standard

TRAFFIC CONTROL PLAN MOBILE OPERATIONS UNDIVIDED HIGHWAYS

TCP(3-1)-13

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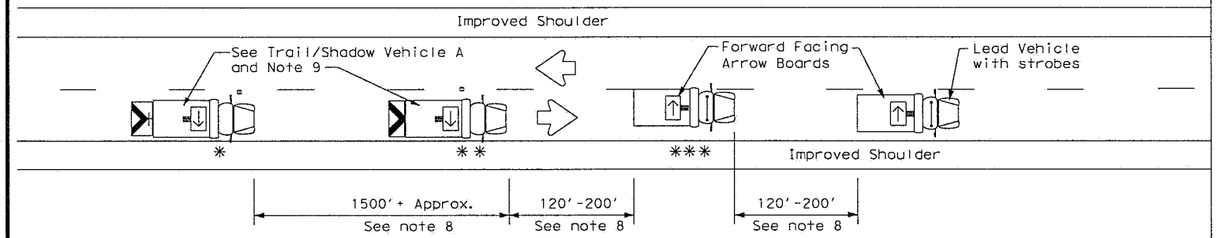
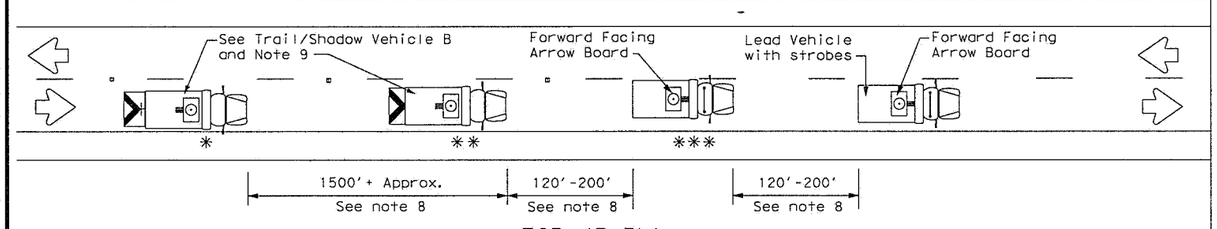


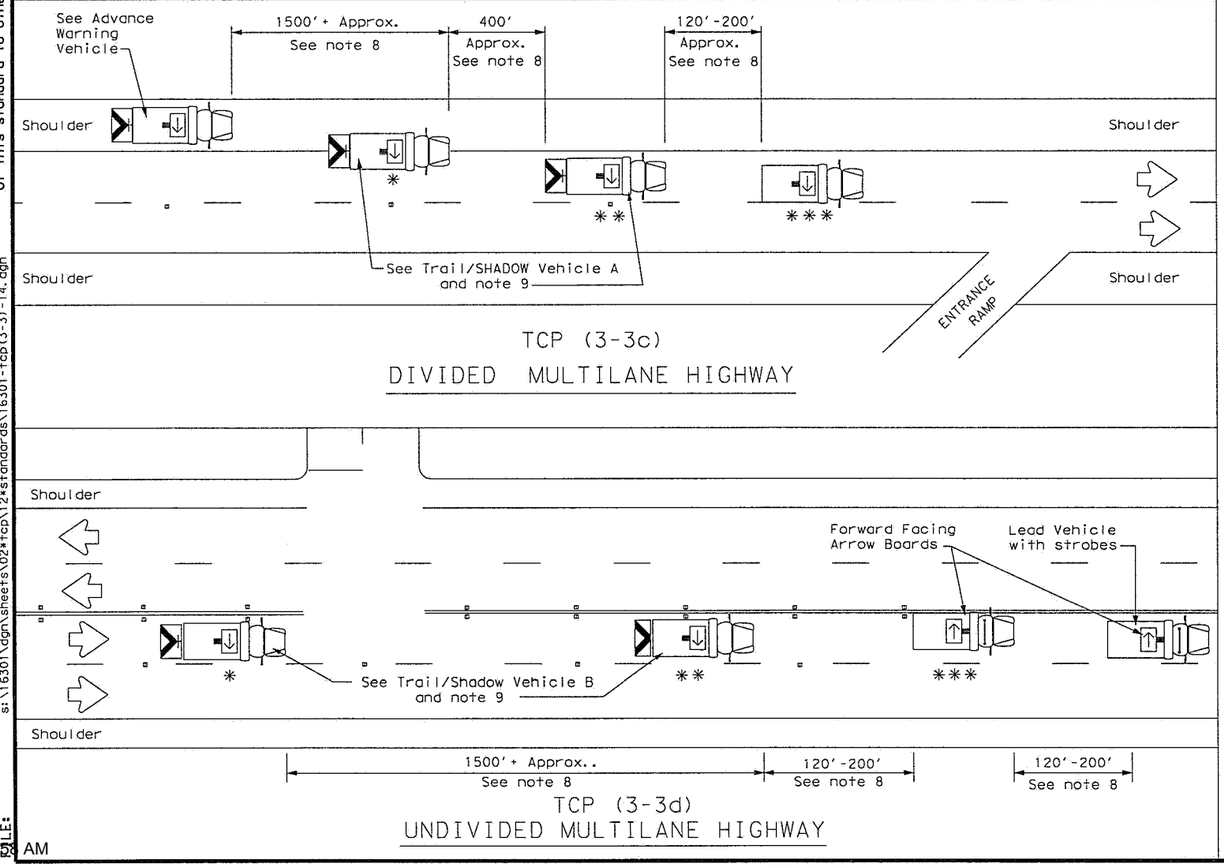
TCP (3-3a)

TWO LANE HIGHWAY WITH PAVED SHOULDERS
(WORK ON TRAVEL LANE)



TCP (3-3b)

TWO LANE HIGHWAY WITHOUT PAVED SHOULDERS
(WORK ON TRAVEL LANE)

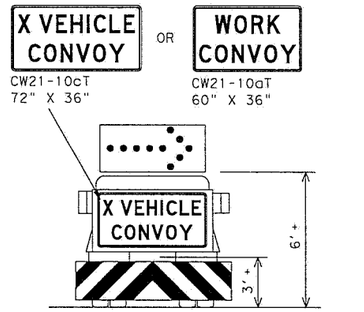


TCP (3-3c)

DIVIDED MULTILANE HIGHWAY

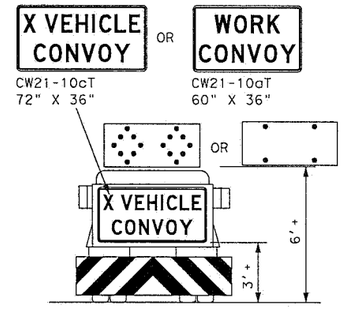
TCP (3-3d)

UNDIVIDED MULTILANE HIGHWAY



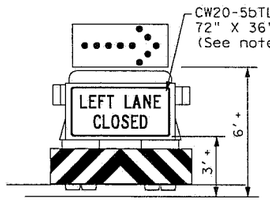
TRAIL/SHADOW VEHICLE A

with RIGHT Directional display
Flashing Arrow Board

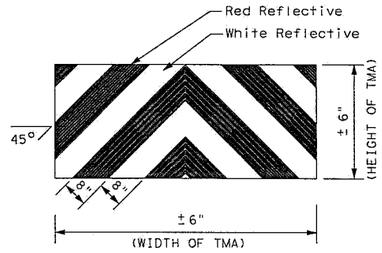


TRAIL/SHADOW VEHICLE B

with Flashing Arrow Board
in Caution Mode



ADVANCE WARNING
VEHICLE



STRIPING FOR TMA

LEGEND			
*	Trail Vehicle	ARROW BOARD DISPLAY	
**	Shadow Vehicle		
***	Work Vehicle		RIGHT Directional
	Heavy Work Vehicle		LEFT Directional
	Truck Mounted Attenuator (TMA)		Double Arrow
	Traffic Flow		CAUTION (Alternating Diamond or 4 Corner Flash)

TYPICAL USAGE				
MOBILE	SHORT DURATION	SHORT TERM STATIONARY	INTERMEDIATE TERM STATIONARY	LONG TERM STATIONARY
✓				

GENERAL NOTES

1. TRAIL, SHADOW, and LEAD vehicles shall be equipped with arrow boards as illustrated. When a LEAD vehicle is not used on two way roads the WORK vehicle must have an arrow board. For divided roadways, the arrow board on the WORK vehicle is optional based on the type of work being performed. The Engineer will determine if the LEAD vehicle and/or TRAIL vehicle are required based on prevailing roadway conditions, traffic volume, and sight distance restrictions.
2. The use of amber high intensity rotating, flashing, oscillating, or strobe lights on vehicles are required. Blue high intensity rotating, flashing, oscillating, or strobe lights when mounted on the driver's side of the vehicle may be operated simultaneously with the amber beacons or strobe lights.
3. The use of truck mounted attenuators (TMA) on the SHADOW VEHICLE, ADVANCE WARNING and TRAIL VEHICLE are required.
4. Reflective sheeting on the rear of the TMA shall meet or exceed the reflectivity and color requirements of DEPARTMENTAL MATERIAL SPECIFICATION DMS 8300, Type A.
5. Flashing arrow boards shall be Type B or Type C as per the Barricade and Construction (BC) standards. The board shall be controlled from inside the vehicle.
6. Each vehicle shall have two-way radio communication capability.
7. When work convoys must change lanes, the TRAIL VEHICLE should change lanes first to shadow the other convoy vehicles.
8. Vehicle spacing between the TRAIL VEHICLE and the SHADOW VEHICLE will vary depending on sight distance restrictions. Motorists approaching the convoy should be able to see the TRAIL VEHICLE in time to slow down and/or change lanes as they approach the TRAIL VEHICLE. Vehicle spacing between the WORK VEHICLE and SHADOW VEHICLE and vehicle spacing between WORK VEHICLE and LEAD VEHICLE may vary according to terrain, work activity and other factors.
9. X VEHICLE CONVOY (CW21-10cT) or WORK CONVOY (CW21-10aT) signs shall be used on TRAIL VEHICLES and SHADOW VEHICLES as shown. As an option 48" x 48" diamond shaped WORK CONVOY (CW21-10T) or X VEHICLE CONVOY (CW21-10bT) signs may be used where adequate mounting space exists. When used, the X VEHICLE CONVOY sign shall have the number of the convoy vehicles displayed on the sign in the number designation "X" location. The X VEHICLE CONVOY sign shall not be used on the SHADOW VEHICLE if a TRAIL VEHICLE is used.
10. For divided highways with two or three lanes in one direction, the appropriate LEFT LANE CLOSED (CW20-5bTL), RIGHT LANE CLOSED (CW20-5bTR), or CENTER LANE CLOSED (CW20-5dT) sign should be used on the Advance Warning Vehicle. As an option, a portable changeable message sign (PCMS) or truck mounted changeable message sign (TMCMS) with a minimum character height of 12", and displaying the same legend may be substituted for these signs. An appropriate directional arrow display, simulating the size and legibility of the flashing arrow board may be used in the second phase of the PCMS/TMCMS message. When this is done, the arrow board will not be required on the Advance Warning Vehicle.
11. A double arrow shall not be displayed on the arrow board on the Advance Warning Vehicle.
12. For divided highways with three or four lanes in each direction, use TCP(3-2).
13. Standard diamond shape versions of the CW20-5 series signs may be used as an option if the rectangular signs shown are not available.
14. The Advance Warning Vehicle may straddle the edgeline when Shoulder width makes it necessary.
15. On two-lane two-way roadways, the work and protection vehicles should pull over periodically to allow motor vehicle traffic to pass. If motorists are not allowed to pass the work convoy, a DO NOT PASS (R4-1) sign should be placed on the back of the rearmost protection vehicle.

Texas Department of Transportation — Traffic Operations Division Standard

TRAFFIC CONTROL PLAN MOBILE OPERATIONS RAISED PAVEMENT MARKER INSTALLATION/ REMOVAL
TCP(3-3)-14

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1-97 7-14				

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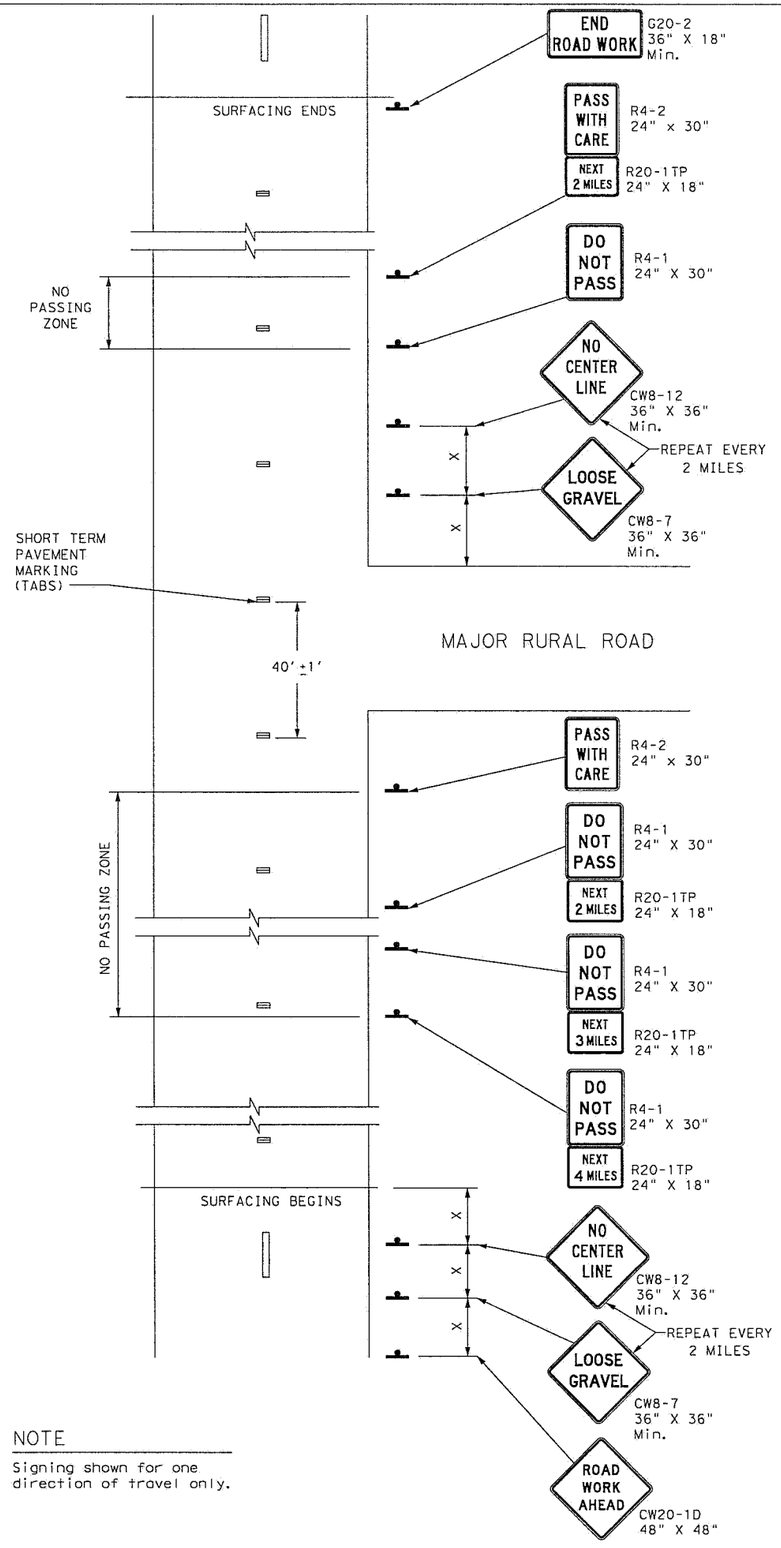
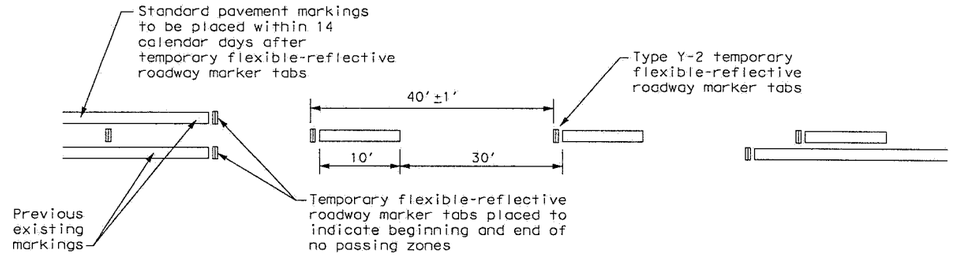


NOTE

Signing shown for one direction of travel only.

NO PASSING ZONES ON TWO-LANE TWO-WAY ROADS



TABS ON CENTERLINES OF TWO-LANE TWO-WAY ROADS

For seal coat, micro-surface or similar operations

"DO NOT PASS" SIGN (R4-1) and NO-PASSING ZONES

A. Prior to the beginning of construction, all currently striped no-passing zones shall be signed with the DO NOT PASS (R4-1) signs and PASS WITH CARE (R4-2) signs placed at the beginning and end of each zone for each direction of travel except as otherwise provided herein. Signs marking these individual no-passing zones need not be covered prior to construction if the signs supplement the existing pavement markings.

B. At the discretion of the Engineer, in areas of numerous no-passing zones, several zones may be combined as a single zone. If passing is to be prohibited over one or more lengthy sections, a DO NOT PASS sign and a NEXT XX MILES (R20-1TP) plaque may be used at the beginning of such zones. The DO NOT PASS sign and the NEXT XX MILES plaque should be repeated every mile to the end of the no-passing zone. In areas where there is considerable distance between no-passing zones, the end of the no-passing zone may be signed with a PASS WITH CARE sign and a NEXT XX MILES plaque.

C. Depending on traffic volumes and length of sections, it may be desirable to prohibit passing throughout the project to prevent damage to windshield and lights. The DO NOT PASS sign and NEXT XX MILES plaque should be used and repeated as often as necessary for this purpose. Where several existing zones are to be combined into one individual no-passing zone, the sign at the beginning of the zone should be covered until the surfacing operation has passed this location so as not to have the DO NOT PASS sign conflict with the existing pavement markings. Also, unless one days operation completes the entire length of such combined zones, appropriate DO NOT PASS and PASS WITH CARE signs should be placed at the beginning and end of the no-passing zones where the surfacing operation has stopped for the day.

D. R4-1 and R4-2 are to remain in place until standard pavement markings are installed.

"NO CENTER LINE" SIGN (CW8-12)

A. Center line markings are yellow pavement markings that delineate the separation of travel lanes that have opposite directions of travel on a roadway. Divided highways do not typically have center line markings.

B. At the time construction activity obliterates the existing center line markings(low volume roads may not have an existing centerline), a NO CENTER LINE (CW8-12) sign should be erected at the beginning of the work area, at approximately 2 mile intervals within the work area, beyond major intersections and other locations deemed necessary by the Engineer.

C. The NO CENTER LINE signs are to remain in place until standard pavement markings are installed.

"LOOSE GRAVEL" SIGN (CW8-7)

A. When construction begins, a LOOSE GRAVEL (CW8-7) sign should be erected at each end of the work area and repeated at intervals of approximately 2 miles in rural areas and closer in urban areas.

B. The LOOSE GRAVEL signs are to remain in place until the condition no longer exists.

PAVEMENT MARKINGS

A. Temporary markings for surfacing projects shall be Temporary Flexible-reflective Roadway Marker Tabs unless otherwise approved by the Engineer. Tabs are to be installed to provide true alignment for striping crews or as directed by the Engineer. Tabs will be placed at the spacing indicated. Tabs should be applied to the pavement no more than two (2) days before the surfacing is applied. After the surfacing is rolled and swept, the cover over the reflective strip shall be removed.

B. Tabs shall not be used to simulate edge lines.

C. Tab placement for overlay/inlay operations shall be as shown on the WZ(STPM) standard sheet.

COORDINATION OF SIGN LOCATIONS

A. The location of warning signs at the beginning and end of a work area are to be coordinated with other signing typically shown on the Barricade and Construction Standards for project limits to ensure adequate sign spacing.

B. Where possible the ROAD WORK AHEAD (CW20-1D), LOOSE GRAVEL (CW8-7), and NO CENTER LINE (CW8-12) signs should be placed in the sequence shown following the OBEY WARNING SIGNS STATE LAW (R20-3T) and the TRAFFIC FINES DOUBLE (R20-5T) sign, and one "X" sign spacing prior to the CONTRACTOR (G20-6T)sign typically located at or near the limits of surfacing. LOOSE GRAVEL and NO CENTER LINE signs will then be repeated as described above.

Posted Speed *	Minimum Sign Spacing "X" Distance
30	120'
35	160'
40	240'
45	320'
50	400'
55	500'
60	600'
65	700'
70	800'
75	900'

* Conventional Roads Only

TYPICAL USAGE				
MOBILE	SHORT DURATION	SHORT TERM STATIONARY	INTERMEDIATE TERM STATIONARY	LONG TERM STATIONARY
			✓	✓

GENERAL NOTES

1. The traffic control devices detailed on this sheet will be furnished and erected as directed by the Engineer on sections of roadway where tabs must be placed prior to the surfacing operation which will cover or obliterate the existing pavement markings.
2. The devices shown on this sheet are to be used to supplement those required by the BC Standards or others required elsewhere in the plans.
3. Signs shall be erected as detailed on the BC Standards or the Compliant Work Zone Traffic Control Devices List (CWZTCD) on supports approved for Long-Term / Intermediate-Term Work Zone Sign Supports.
4. When surfacing operations take place on divided highways, freeways or expressways, the size of diamond shaped construction warning signs shall be 48" x 48".
5. Signs on divided highways, freeways and expressways will be placed on both right and left sides of the roadway based on roadway conditions as directed by the Engineer.

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL DETAILS FOR SURFACING OPERATIONS

TCP(7-1)-13

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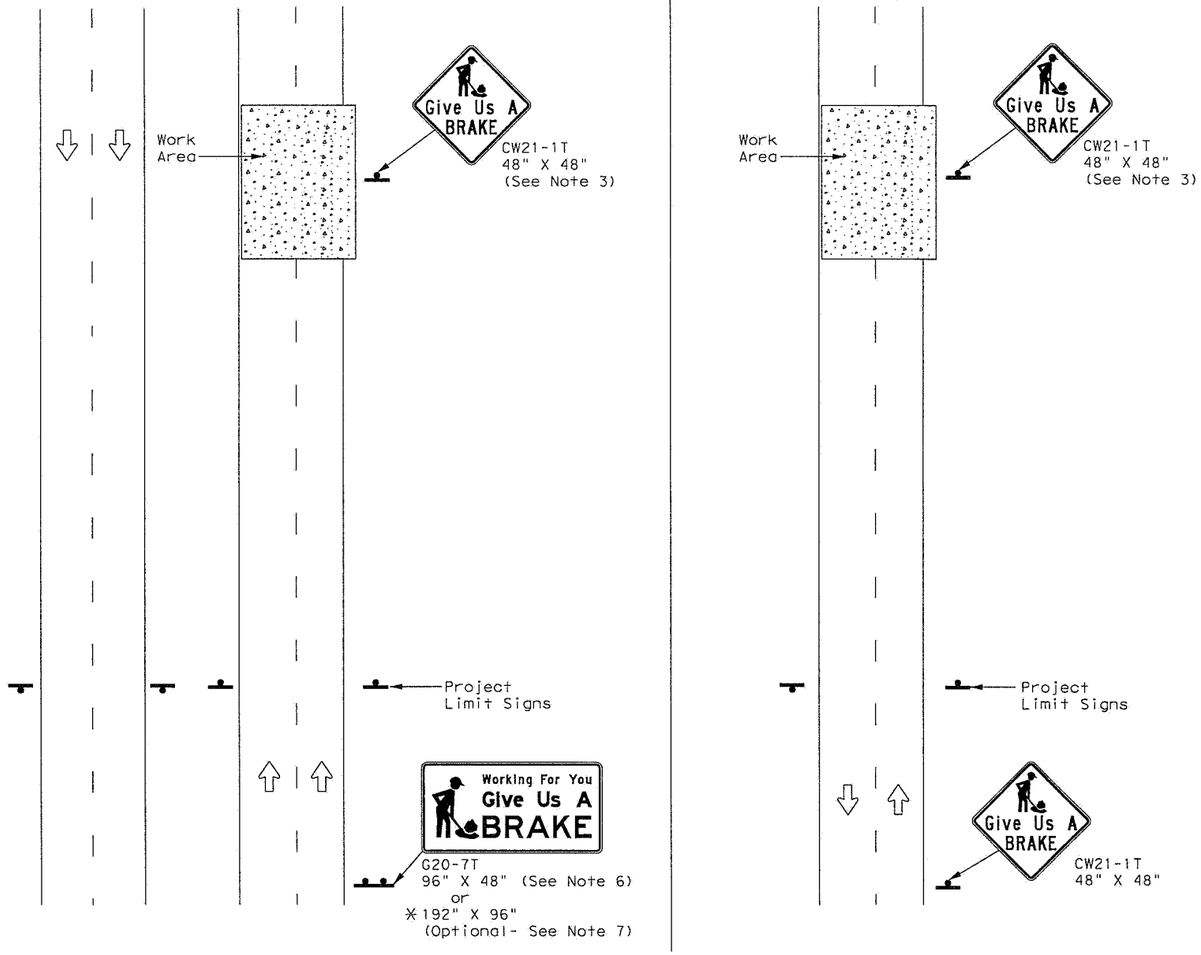

DIVIDED HIGHWAY

UNDIVIDED HIGHWAY

SIGNS ARE SHOWN FOR ONE DIRECTION OF TRAVEL

* When the optional larger WORKING FOR YOU GIVE US A BRAKE (G20-7T) 192" x 96" sign is required, the locations shall be noted elsewhere in the plans.

SUMMARY OF LARGE SIGNS

BACKGROUND COLOR	SIGN DESIGNATION	SIGN	SIGN DIMENSIONS	REFLECTIVE SHEETING	SQ FT	GALVANIZED STRUCTURAL STEEL			DRILLED SHAFT 24" DIA. (LF)
						Size	(LF) ①	(LF) ②	
Orange	G20-7T	Working For You Give Us A BRAKE	96" X 48"	Type B_{FL} or C_{FL}	32	▲	▲	▲	▲
Orange	G20-7T	Working For You Give Us A BRAKE	192" X 96"	Type B_{FL} or C_{FL}	128	W8x18	16	17	12

▲ See Note 6 Below

LEGEND	
	Sign
	Large Sign
	Traffic Flow

DEPARTMENTAL MATERIAL SPECIFICATIONS

PLYWOOD SIGN BLANKS	DMS-7100
ALUMINUM SIGN BLANKS	DMS-7110
SIGN FACE MATERIALS	DMS-8300

COLOR	USAGE	SHEETING MATERIAL
ORANGE	BACKGROUND	TYPE B_{FL} OR TYPE C_{FL}
BLACK	LEGEND & BORDERS	NON-REFLECTIVE ACRYLIC FILM

GENERAL NOTES

1. See BC and SMD sheets for additional sign support details.
2. Sign locations shall be approved by the Engineer.
3. For projects more than two miles in length, Give Us a BRAKE signs should be repeated halfway through the project. The Give Us a Brake (CW21-1T) may be used for this purpose.
4. Work zone speed limits are sometimes used in conjunction with GIVE US A BRAKE signing. See BC(3) for location and spacing of construction speed zone signing when required.
5. Give Us a Brake (CW21-1T) signs and supports shall be considered subsidiary to Item 502, "Barricades, Signs and Traffic Handling."
6. The 96" X 48" Working For You Give Us A BRAKE (G20-7T) may use a 1/2" or 5/8" plywood substrate or 0.125" aluminum sheeting substrate and may be supported by two 4" x 6" wood posts with drilled holes for breakaway as per BC(5) and will be subsidiary to Item 502.
7. The Working For You Give Us A BRAKE (G20-7T) 192" X 96" sign shall be paid for under the following specification items:
   Item 636 - Aluminum Signs
   Item 647 - Large Roadside Sign Supports and Assemblies.
   Item 416 - Drilled Shaft Foundations
8. All signs shall be constructed in accordance with the details found in the "Standard Highway Sign Designs for Texas," latest edition. Sign details not shown in this manual shall be shown in the plans or the Engineer shall provide a detail to the Contractor before the sign is manufactured.

Texas Department of Transportation

Traffic Operations Division Standard

WORK ZONE "GIVE US A BRAKE" SIGNS

WZ(BRK)-13

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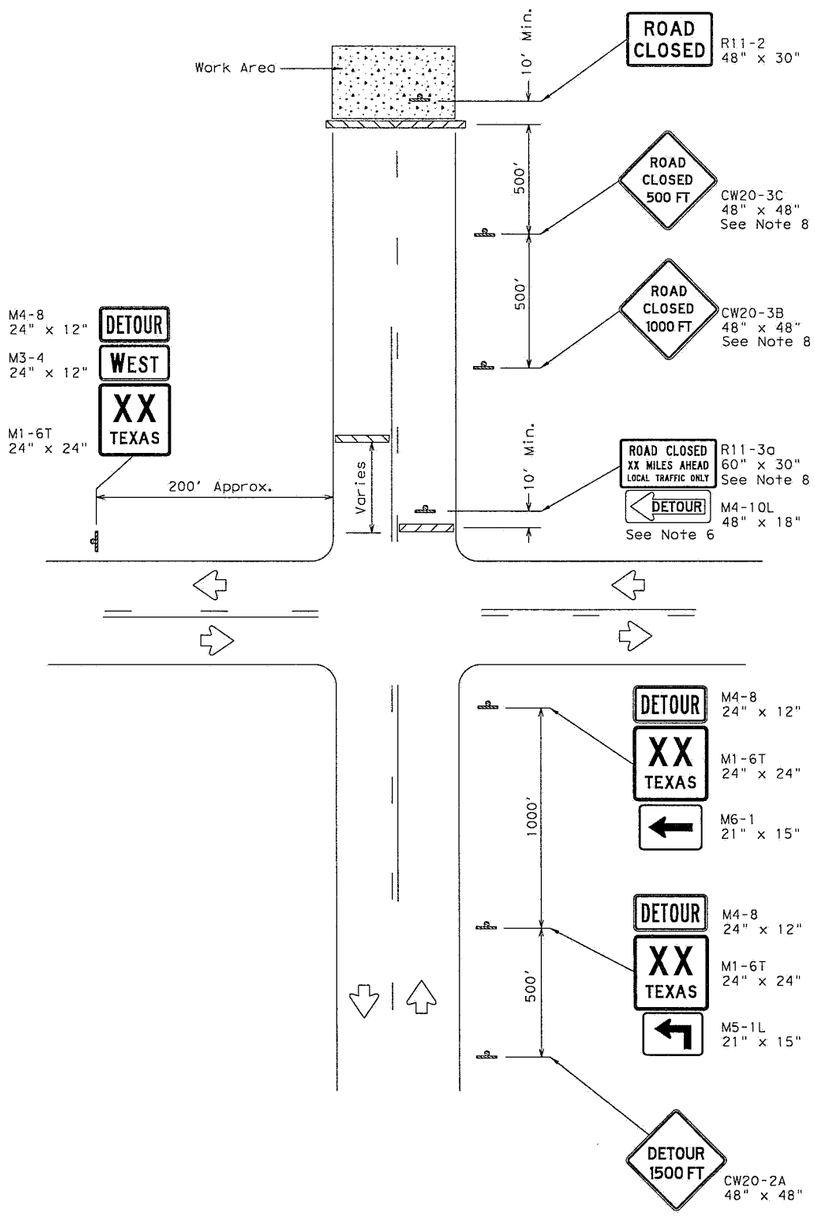
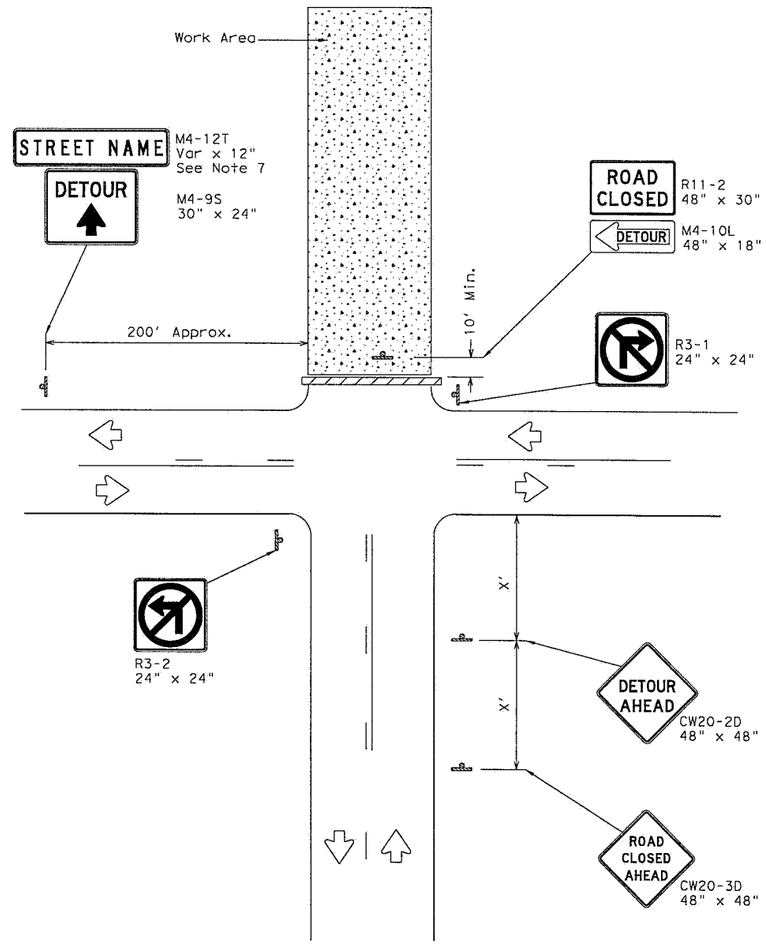


ROAD CLOSURE BEYOND THE INTERSECTION

Signing for a Numbered Route with an Off-Site Detour



ROAD CLOSURE AT THE INTERSECTION

Signing for an Un-numbered Route with an Off-Site Detour

LEGEND	
	Type 3 Barricade
	Sign

Posted Speed *	Minimum Sign Spacing "X" Distance
30	120'
35	160'
40	240'
45	320'
50	400'
55	500'
60	600'
65	700'
70	800'
75	900'

* Conventional Roads Only

GENERAL NOTES

1. This sheet is intended to provide details for temporary work zone road closures. For permanent road closure details see the D&OM standards.
2. Barricades used shall meet the requirements shown on Barricade and Construction Standard BC(10) and listed on the Compliant Work Zone Traffic Control Devices list (CWZTCD).
3. Stockpiled materials shall not be placed on the traffic side of barricades.
4. Barricades at the road closure should extend from pavement edge to pavement edge.
5. Detour signing shown is intended to illustrate the type of signing that is appropriate for numbered routes or un-numbered routes as labeled. It does not indicate the full extent of detour signing required. Detour routes should be signed as shown elsewhere in the plans.
6. If the road is open for a significant distance beyond the intersection or there are significant origin/destination points beyond the intersection, the signs and barricades at this location should be located at the edge of the traveled way.
7. The Street Name (M4-12T) sign is to be placed above the DETOUR (M4-9S) sign.
8. For urban areas where there is a shorter distance between the intersection and the actual closure location, the ROAD CLOSED XX MILES AHEAD (R11-3a) sign may be replaced with a ROAD CLOSED TO THRU TRAFFIC (R11-4) sign. If adequate space does not exist between the intersection and the closure a single ROAD CLOSED AHEAD (CW20-3D) sign spaced as per the table above may replace the ROAD CLOSED 1000 FT (CW20-3B) and ROAD CLOSED 500 FT (CW20-3C) signs.
9. Signs and barricades shown shall be subsidiary to Item 502. Locations where these details will be required shall be as shown elsewhere in the plans.

Texas Department of Transportation

Traffic Operations Division Standard

WORK ZONE ROAD CLOSURE DETAILS

WZ(RCD)-13

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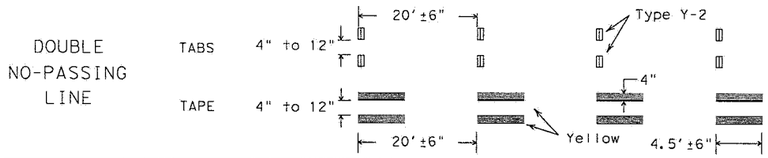
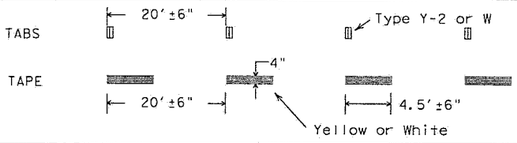
WORK ZONE SHORT TERM PAVEMENT MARKINGS DETAILS

SOLID LINES

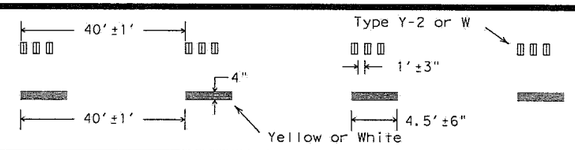
DOUBLE NO-PASSING LINE



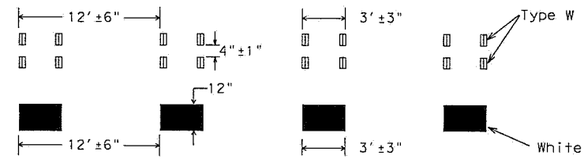
SINGLE NO-PASSING LINE or CHANNELIZATION LINE



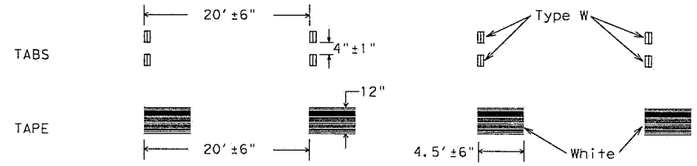
BROKEN LINES (FOR CENTER LINE OR LANE LINE)



WIDE DOTTED LINES (FOR LANE DROP LINES)



WIDE GORE MARKINGS



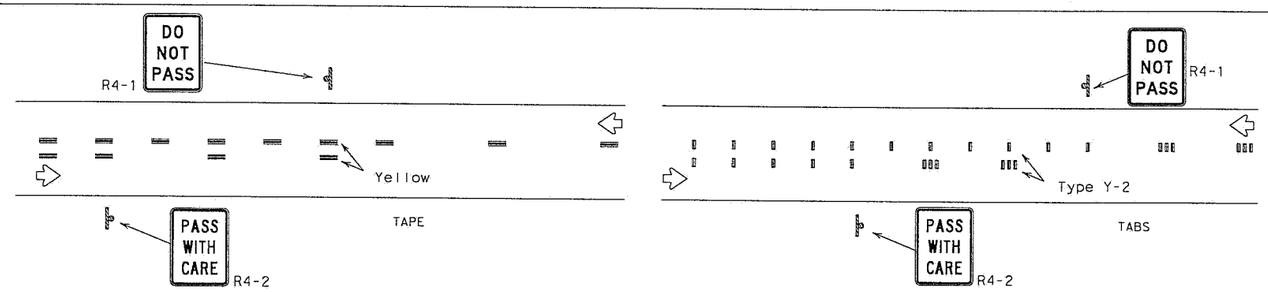
NOTES:

1. Short term pavement markings may be prefabricated markings (stick down tape) or temporary flexible-reflective roadway marker tabs unless otherwise specified elsewhere in plans.
2. Short term pavement markings shall NOT be used to simulate edge lines.
3. Dimensions indicated on this sheet are typical and approximate. Variations in size and height may occur between markers or devices made by manufacturers, by as much as 1/4 inch, unless otherwise noted.
4. Temporary flexible-reflective roadway marker tabs will require normal maintenance replacement when used on roadways with an ADT per lane of up to 7500 vehicles with no more than 10% truck mix. When roadways exceed these values, additional maintenance replacement of devices should be planned.
5. No segment of roadway open to traffic shall remain without permanent pavement markings for a period greater than 14 calendar days. The Contractor will be responsible for maintaining short term pavement markings until permanent pavement markings are in place. When the Contractor is responsible for placement of permanent pavement markings, no segment of roadway shall remain without permanent pavement markings for a period greater than 14 calendar days unless weather conditions prohibit placement. Permanent pavement markings shall be placed as soon as weather permits.
6. For two lane, two-way roadways, DO NOT PASS signs shall be erected to mark the beginning of sections where passing is prohibited and PASS WITH CARE signs shall be erected to mark the beginning of sections where passing is permitted. Signs shall be in accordance with the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD) and may be used to indicate the limits of no-passing zones for up to 14 calendar days. Permanent pavement markings should then be placed.
7. For low volume two lane, two-way roadways of 4000 ADT or less, no-passing lines may be omitted when approved by the Engineer. DO NOT PASS and PASS WITH CARE signs shall be erected (see note 6).
8. For exit gores where a lane is being dropped place wide gore markings or retroreflective channelizing devices to guide motorist through the exit. If channelizing devices are to be used it should be noted elsewhere in the plans. One piece cones are not allowed for this purpose.

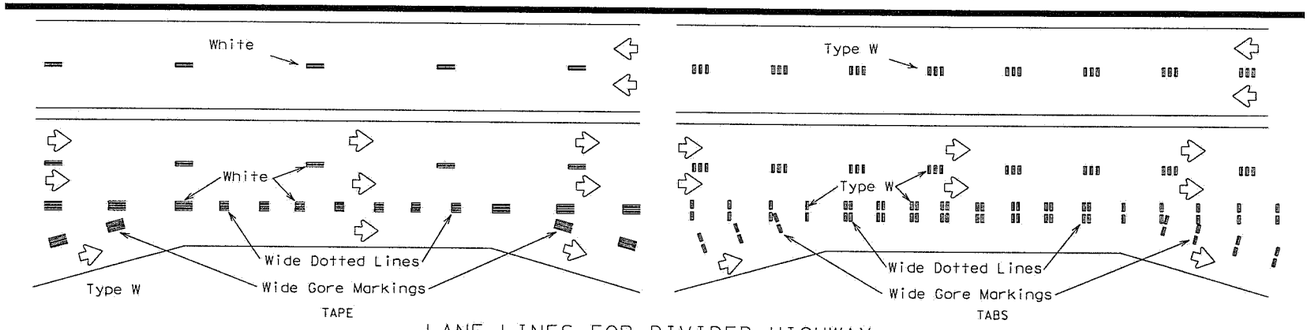
TEMPORARY FLEXIBLE, REFLECTIVE ROADWAY MARKER TABS (TABS)

1. Temporary flexible-reflective roadway marker tabs detailed on this sheet will be designated Type Y-2 (two amber reflective surfaces with yellow body); Type Y (one amber reflective surface with yellow body); and Type W (one white or silver reflective surface with white body). Additional details may be found on BC(11).
2. Tabs shall meet requirements of Departmental Material Specification DMS-8242.
3. When dry, tabs shall be visible for a minimum distance of 200 feet during normal daylight hours and when illuminated by automobile low-beam head light at night, unless sight distance is restricted by roadway geometrics.
4. No two consecutive tabs nor four tabs per 1000 feet of line shall be missing or fail to meet the visual performance requirements of Note 3.

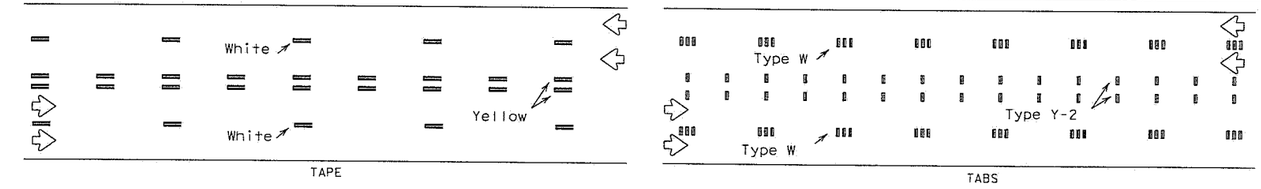
WORK ZONE SHORT TERM PAVEMENT MARKINGS PATTERNS



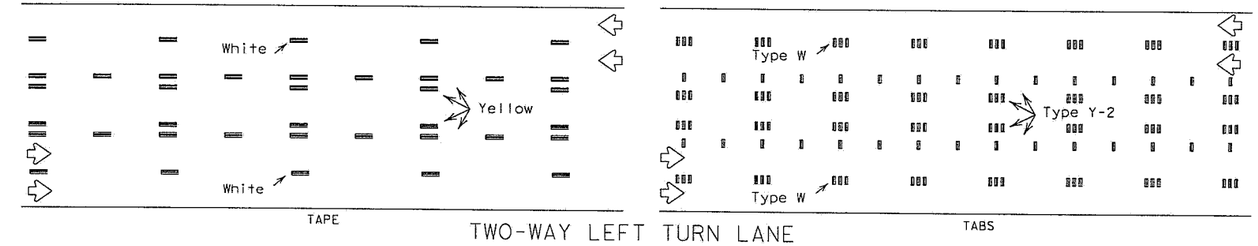
CENTER LINE & NO-PASSING ZONE BARRIER LINES FOR TWO LANE TWO-WAY HIGHWAYS



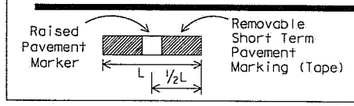
LANE LINES FOR DIVIDED HIGHWAY



LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS



TWO-WAY LEFT TURN LANE



If raised pavement markers are used to supplement REMOVABLE short term markings, the markers shall be applied to the top of the tape at the approximate mid length of the tape. This allows an easier removal of raised markers and tape.

PREFABRICATED PAVEMENT MARKINGS

1. Temporary Removable Prefabricated Pavement Markings shall meet the requirements of DMS-8241.
2. Non-removable Prefabricated Pavement Markings shall meet the requirements of either DMS-8240 "Permanent Prefabricated Pavement Markings" or DMS-8243 "Temporary Costruction-Grade Prefabricated Pavement Markings."

RAISED PAVEMENT MARKERS

1. All raised pavement markers used for work zone markings shall meet the requirements of Item 672, "RAISED PAVEMENT MARKERS" and DMS-4200.

DEPARTMENTAL MATERIAL SPECIFICATIONS (DMS) & MATERIAL PRODUCER LISTS (MPL)

1. DMSs referenced above can be found along with embedded links to their respective MPLs at the following website:
   http://www.txdot.gov/business/contractors_consultants/material_specifications/default.htm

Texas Department of Transportation

Traffic Operations Division Standard

WORK ZONE SHORT TERM PAVEMENT MARKINGS

WZ(STPM)-13

FILE: wzstpm-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT April 1992	CONT	SECT	JOB	HIGHWAY
REVISIONS				
1-97	DIST	COUNTY		SHEET NO.
3-03				74
7-13				

DISCLAIMER:
The use of this standard is governed by the "Texas Engineering Practice Act". No warranty of any kind is made by TxDOT for any purpose whatsoever. TxDOT assumes no responsibility for the conversion of this standard to other formats or for incorrect results or damages resulting from its use.

DATE: 7/18/2017 8:18 AM
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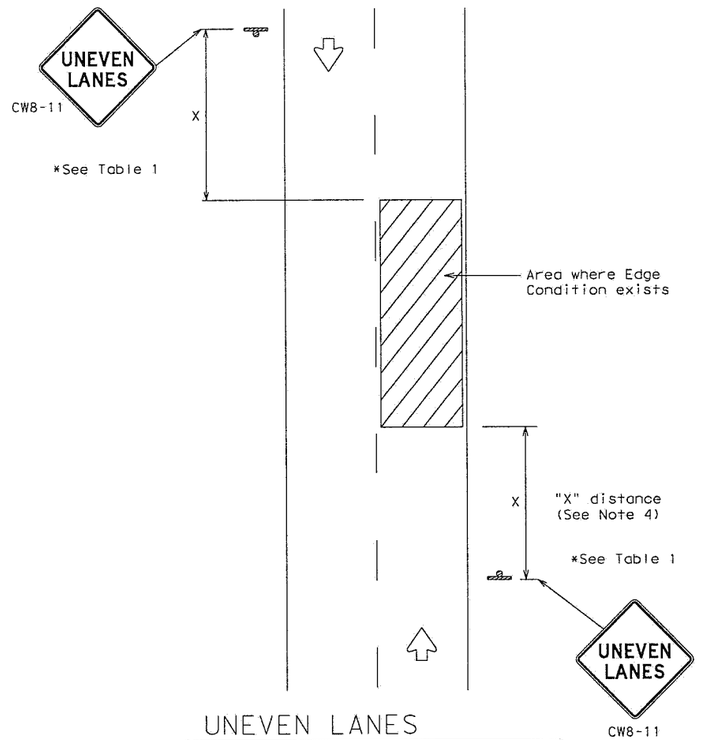
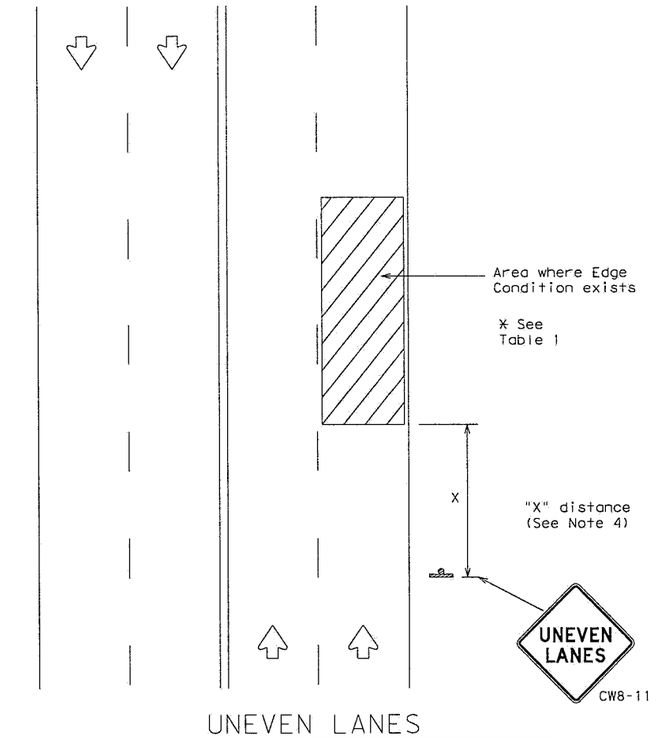
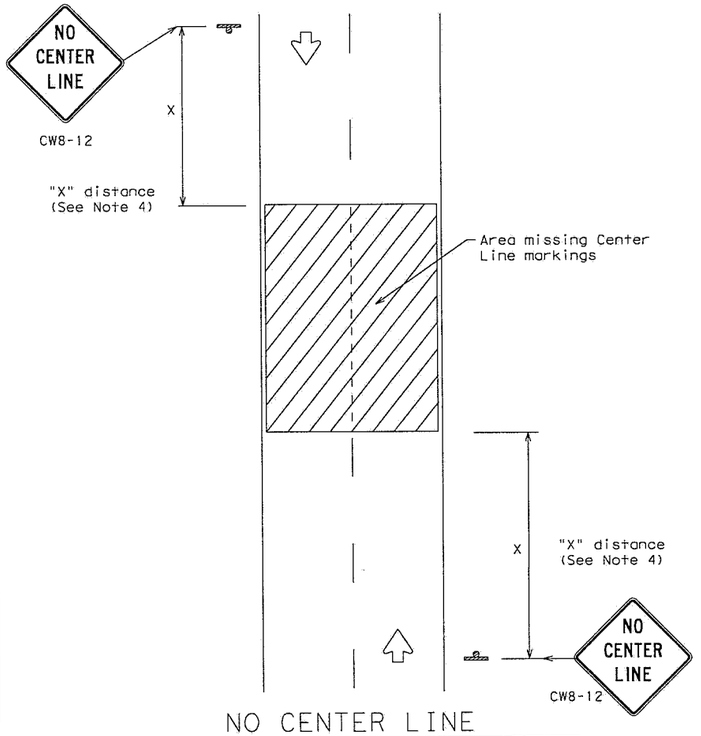


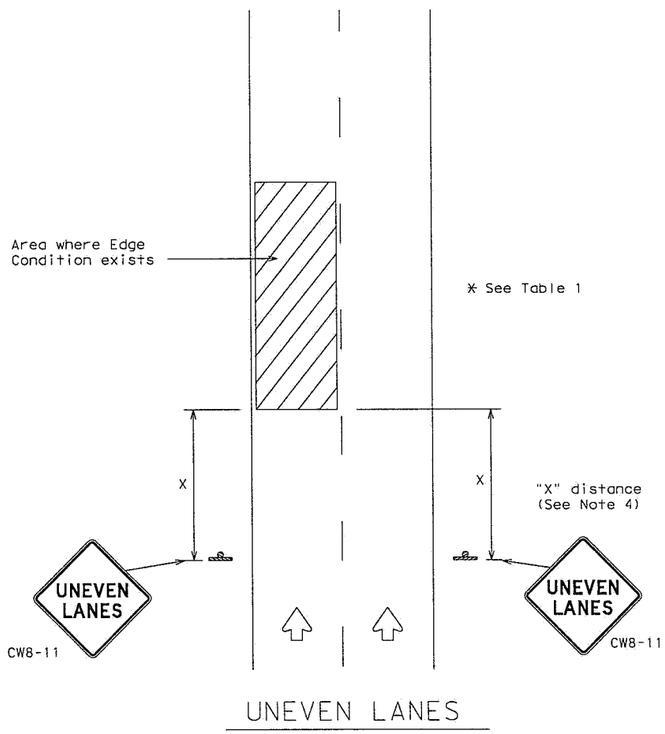
UNEVEN LANES
TWO LANE CONVENTIONAL ROAD



UNEVEN LANES
FOUR LANE CONVENTIONAL ROAD



NO CENTER LINE
TWO LANE CONVENTIONAL ROAD



UNEVEN LANES
DIVIDED ROADWAY

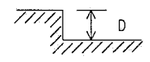
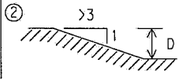
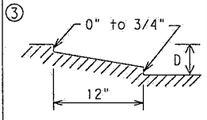
DEPARTMENTAL MATERIAL SPECIFICATIONS	
PERMANENT PREFABRICATED PAVEMENT MARKINGS	DMS-8240
TEMPORARY (REMOVABLE) PREFABRICATED PAVEMENT MARKINGS	DMS-8241
SIGN FACE MATERIALS	DMS-8300

COLOR	USAGE	SHEETING MATERIAL
ORANGE	BACKGROUND	TYPE B_{FL} OR TYPE C_{FL} SHEETING
BLACK	LEGEND & BORDERS	ACRYLIC NON-REFLECTIVE SHEETING

GENERAL NOTES

1. If spalling or holes occur, ROUGH ROAD (CW8-8) signs should be placed in advance of the condition and be repeated every two miles where the condition persists.
2. UNEVEN LANES (CW8-11) signs shall be installed in advance of the condition and repeated every mile. Signs installed along the uneven lane condition may be supplemented with the NEXT XX MILES (CW7-3aP) plaque or Advisory Speed (CW13-1P) plaque.
3. NO CENTER LINE (CW8-12) signs and temporary pavement markings as per the WZ(STPM) standard shall be installed if yellow centerlines separating two way traffic are obscured or obliterated. Repeat NO CENTER LINE signs every two miles where the center line markings are not in place. The signs and markings shall remain in place until permanent pavement markings are installed.
4. Signs shall be spaced at the distances recommended as per BC standards.
5. Additional signs may be required as directed by the Engineer. Signs shall remain in place until final surface is applied. Signs shall be considered subsidiary to Item 502 "BARRICADES, SIGNS AND TRAFFIC HANDLING."
6. Signs shall be fabricated and mounted on supports as shown on the BC standards and/or listed on the "Compliant Work Zone Traffic Control Devices" list.
7. Short term markings shall not be used to simulate edge lines.
8. All signs shall be constructed in accordance with the details found in the "Standard Highway Sign Designs for Texas," latest edition.

TABLE 1

Edge Condition	Edge Height (D)	* Warning Devices
① 	Less than or equal to: 1¼" (maximum-planing) 1½" (typical-overlay)	Sign: CW8-11
	Distance "D" may be a maximum of 1 1/4 " for planing operations and 2" for overlay operations if uneven lanes with edge condition 1 are open to traffic after work operations cease.	
② 	Less than or equal to 3"	Sign: CW8-11
③  Notched Wedge Joint	Distance "D" may be a maximum of 3" if uneven lanes with edge condition 2 or 3 are open to traffic after work operations cease. Uneven lanes should not be open to traffic when "D" is greater than 3".	

TRAFFIC CONTROL DURING PLANING, OVERLAY AND LEVELING OPERATIONS ARE SHOWN ELSEWHERE IN THE PLANS.

MINIMUM WARNING SIGN SIZE	
Conventional roads	36" x 36"
Freeways/expressways, divided roadways	48" x 48"

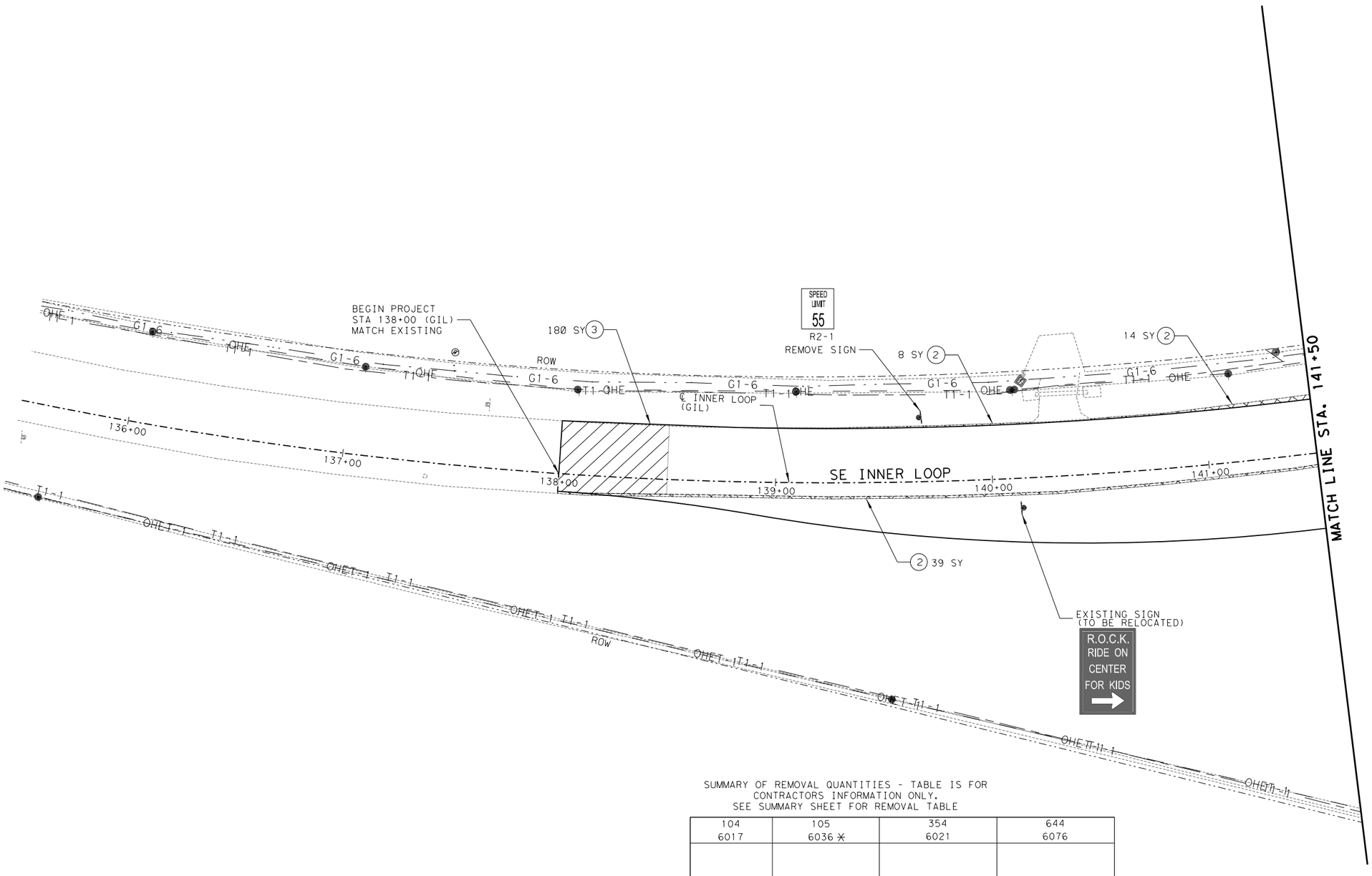
Texas Department of Transportation — Traffic Operations Division Standard

SIGNING FOR UNEVEN LANES

WZ(UL)-13

FILE: wzul-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT April 1992	CONT	SECT	JOB	HIGHWAY
REVISIONS				
8-95 2-98 7-13	DIST	COUNTY		SHEET NO.
1-97 3-03				16

0 25 50
SCALE IN FEET



SUMMARY OF REMOVAL QUANTITIES - TABLE IS FOR CONTRACTORS INFORMATION ONLY.
SEE SUMMARY SHEET FOR REMOVAL TABLE

104 6017	105 6036	354 6021	644 6076
REMOVING CONC. (DRIVEWAYS)	REMOVING STAB BASE AND ASPH PAV (15"-20")	PLANE ASPH CONC PAV(0" TO 2")	REMOVE SM RD SN SUP & AM
SY	SY	SY	EA
	61	180	1

LEGEND

(1)	REMOVE CONCRETE (PAV)
(2)	REMOVE ASPH. PAV
(3)	PLANE ASPH. CONC PAV
	REMOVE SMALL RDSD SGN ASSEM.

NOTES:

1. EXISTING SIGNS CONSIDERED ESSENTIAL, BUT ARE SHOWN TO BE REMOVED SHALL BE PLACED ON TEMPORARY SUPPORTS UNTIL NEW SIGNS ARE INSTALLED. SUBSIDIARY TO OTHER REMOVAL ITEMS.
2. REMOVAL OF EXISTING BASE AND ASPHALT PAVEMENT STRUCTURE IS SUBSIDIARY TO ITEM 100 - PREP. ROW.

STATE OF TEXAS
ROBERT CARRILLO
80169
REGISTERED PROFESSIONAL ENGINEER
6/22/2017
Robert Carrillo, P.E.

NO.	REVISION	BY	DATE

WILLIAMSON COUNTY
1848

RTG RODRIGUEZ TRANSPORTATION GROUP
FIRM #587

GEORGETOWN INNER LOOP

REMOVAL PLAN

BEGIN PROJECT - STA. 141+50.00

6/22/2017 SHEET 1 OF 4

DESIGNED:	PROJECT NUMBER		ROADWAY	
CHECKED:			SE INNER LOOP	
DRAWN:	STATE	COUNTY	CITY	SHEET No.
CHECKED:	TEXAS	WILLIAMSON	GEORGETOWN	77

6:09
brooks
6/22/2017
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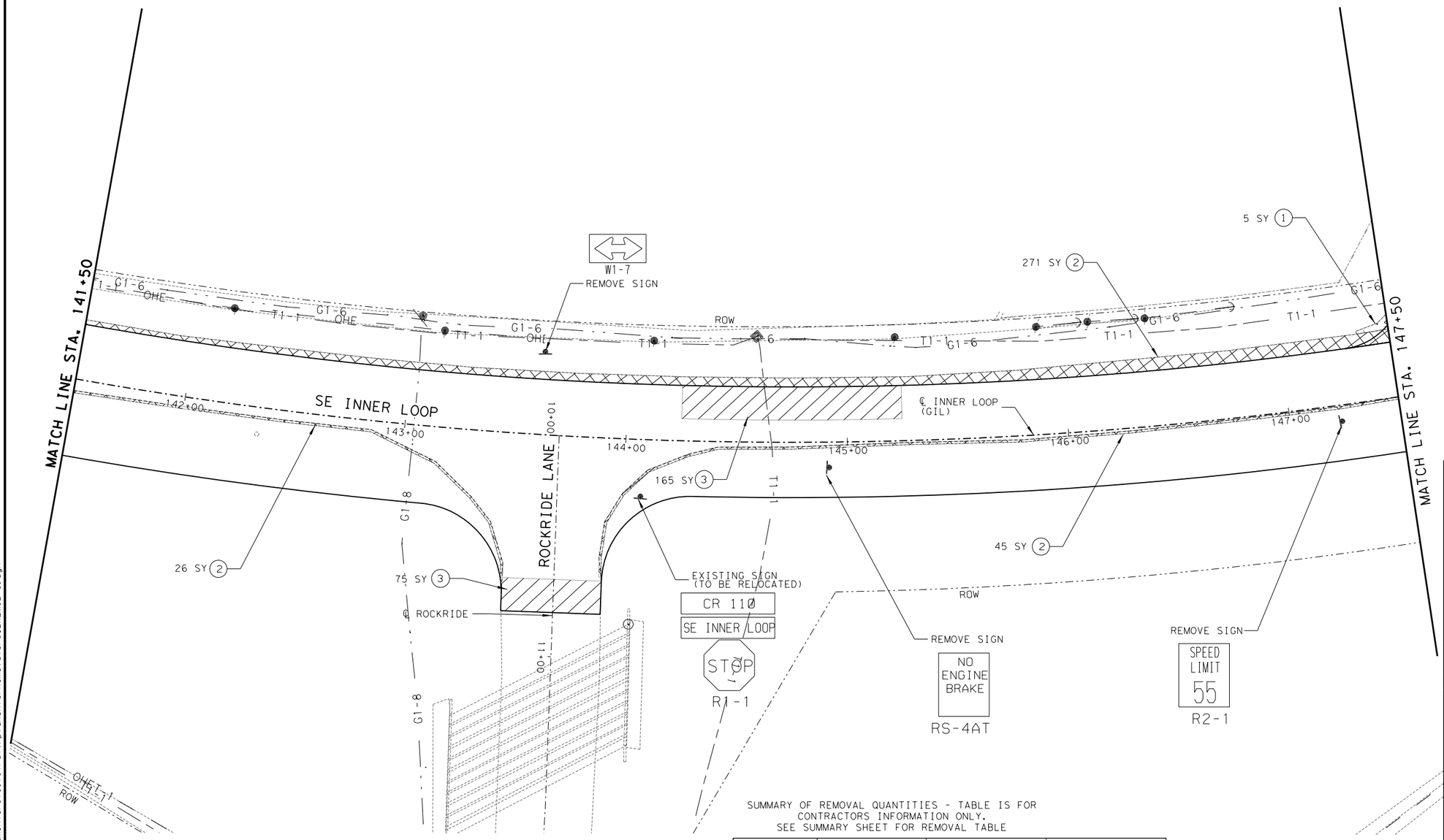

LEGEND

(1)	REMOVE CONCRETE (PAV)
(2)	REMOVE ASPH. PAV
(3)	PLANE ASPH. CONC PAV
	REMOVE SMALL RDSD SGN ASSEM.

NOTES:

1. EXISTING SIGNS CONSIDERED ESSENTIAL, BUT ARE SHOWN TO BE REMOVED SHALL BE PLACED ON TEMPORARY SUPPORTS UNTIL NEW SIGNS ARE INSTALLED. SUBSIDIARY TO OTHER REMOVAL ITEMS.
2. REMOVAL OF EXISTING BASE AND ASPHALT PAVEMENT STRUCTURE IS SUBSIDIARY TO ITEM 100 - PREP. ROW.

SUMMARY OF REMOVAL QUANTITIES - TABLE IS FOR CONTRACTORS INFORMATION ONLY.
SEE SUMMARY SHEET FOR REMOVAL TABLE

104 6017	105 6036 ✱	354 6021	644 6076
REMOVING CONC. (DRIVEWAYS)	REMOVING STAB BASE AND ASPH PAV (15"-20")	PLANE ASPH CONC PAV(0" TO 2")	REMOVE SM RD SN SUP & AM
SY	SY	SY	EA
5	342	240	3

STATE OF TEXAS
ROBERT CARRILLO
80169
REGISTERED PROFESSIONAL ENGINEER
6/22/2017
Robert Carrillo, PE

NO.	REVISION	BY	DATE

WILLIAMSON COUNTY
1848

RTG RODRIGUEZ TRANSPORTATION GROUP FIRM #587

GEORGETOWN INNER LOOP

REMOVAL PLAN

STA. 141+50.00 - STA. 147+50.00

6/22/2017 SHEET 2 OF 4

DESIGNED:	PROJECT NUMBER		ROADWAY	
CHECKED:			SE INNER LOOP	
DRAWN:	STATE	COUNTY	CITY	SHEET No.
CHECKED:	TEXAS	WILLIAMSON	GEORGETOWN	78

brooks
7/22/2017
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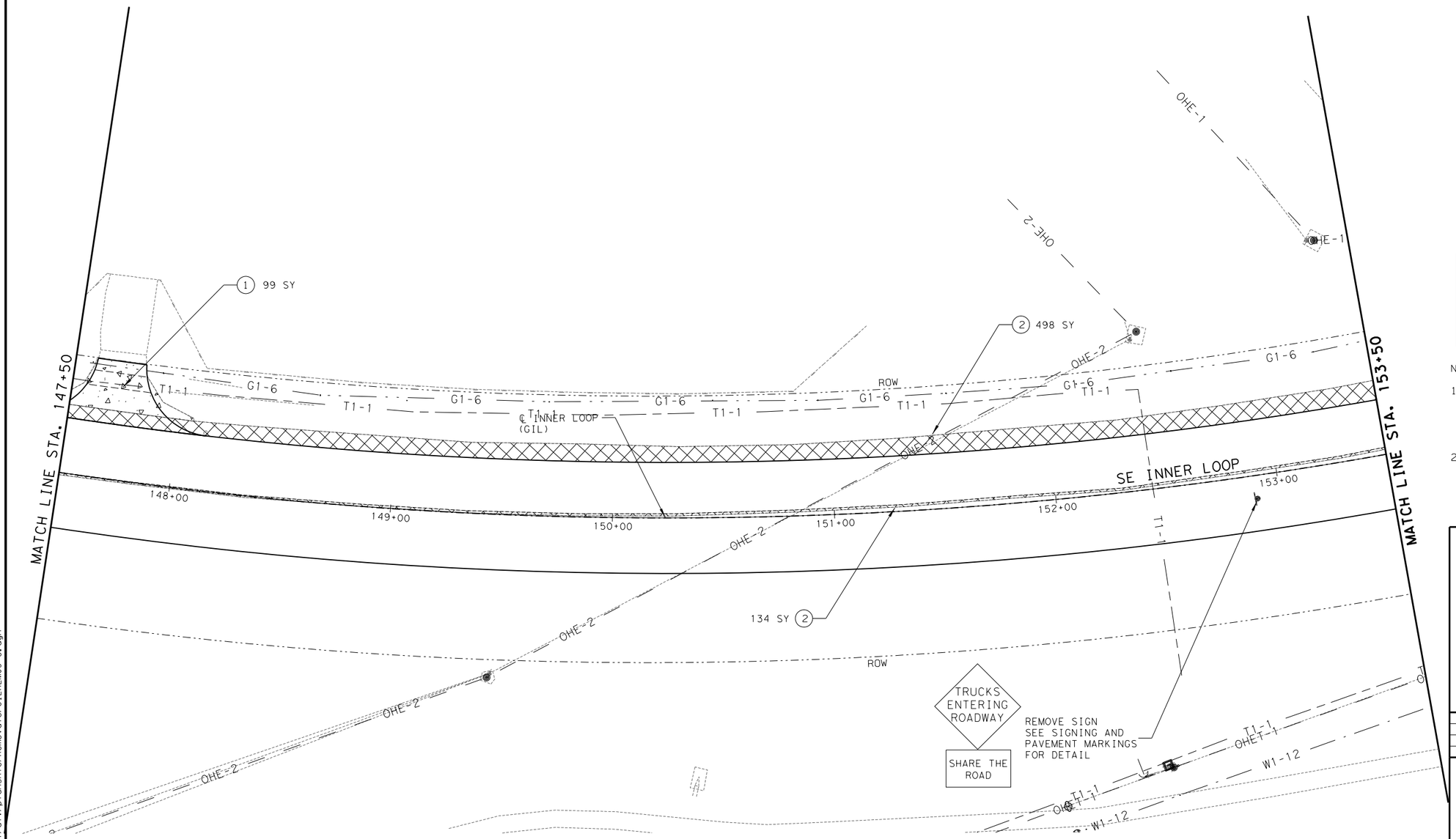

SUMMARY OF REMOVAL QUANTITIES - TABLE IS FOR CONTRACTORS INFORMATION ONLY.
SEE SUMMARY SHEET FOR REMOVAL TABLE

104 6017	105 6036 ~~X~~	354 6021	644 6076
REMOVING CONC. (DRIVEWAYS)	REMOVING STAB BASE AND ASPH PAV (15"-20")	PLANE ASPH CONC PAV(0" TO 2")	REMOVE SM RD SN SUP & AM
SY	SY	SY	EA
99	632		1

LEGEND

1	REMOVE CONCRETE (PAV)
2	REMOVE ASPH. PAV
3	PLANE ASPH. CONC PAV
	REMOVE SMALL RDSD SGN ASSEM.

NOTES:

1. EXISTING SIGNS CONSIDERED ESSENTIAL, BUT ARE SHOWN TO BE REMOVED SHALL BE PLACED ON TEMPORARY SUPPORTS UNTIL NEW SIGNS ARE INSTALLED. SUBSIDIARY TO OTHER REMOVAL ITEMS.
2. REMOVAL OF EXISTING BASE AND ASPHALT PAVEMENT STRUCTURE IS SUBSIDIARY TO ITEM 100 - PREP. ROW.

STATE OF TEXAS
ROBERT CARRILLO
80169
REGISTERED PROFESSIONAL ENGINEER
6/22/2017
Robert Carrillo, PE

NO.	REVISION	BY	DATE

WILLIAMSON COUNTY
1848

RTG RODRIGUEZ TRANSPORTATION GROUP
FIRM #587

GEORGETOWN INNER LOOP

REMOVAL PLAN

STA. 147+50.00 - STA. 153+50.00

6/22/2017 SHEET 3 OF 4

DESIGNED:	PROJECT NUMBER		ROADWAY	
CHECKED:			SE INNER LOOP	
DRAWN:	STATE	COUNTY	CITY	SHEET No.
CHECKED:	TEXAS	WILLIAMSON	GEORGETOWN	79

6:10
brooks
6/22/2017
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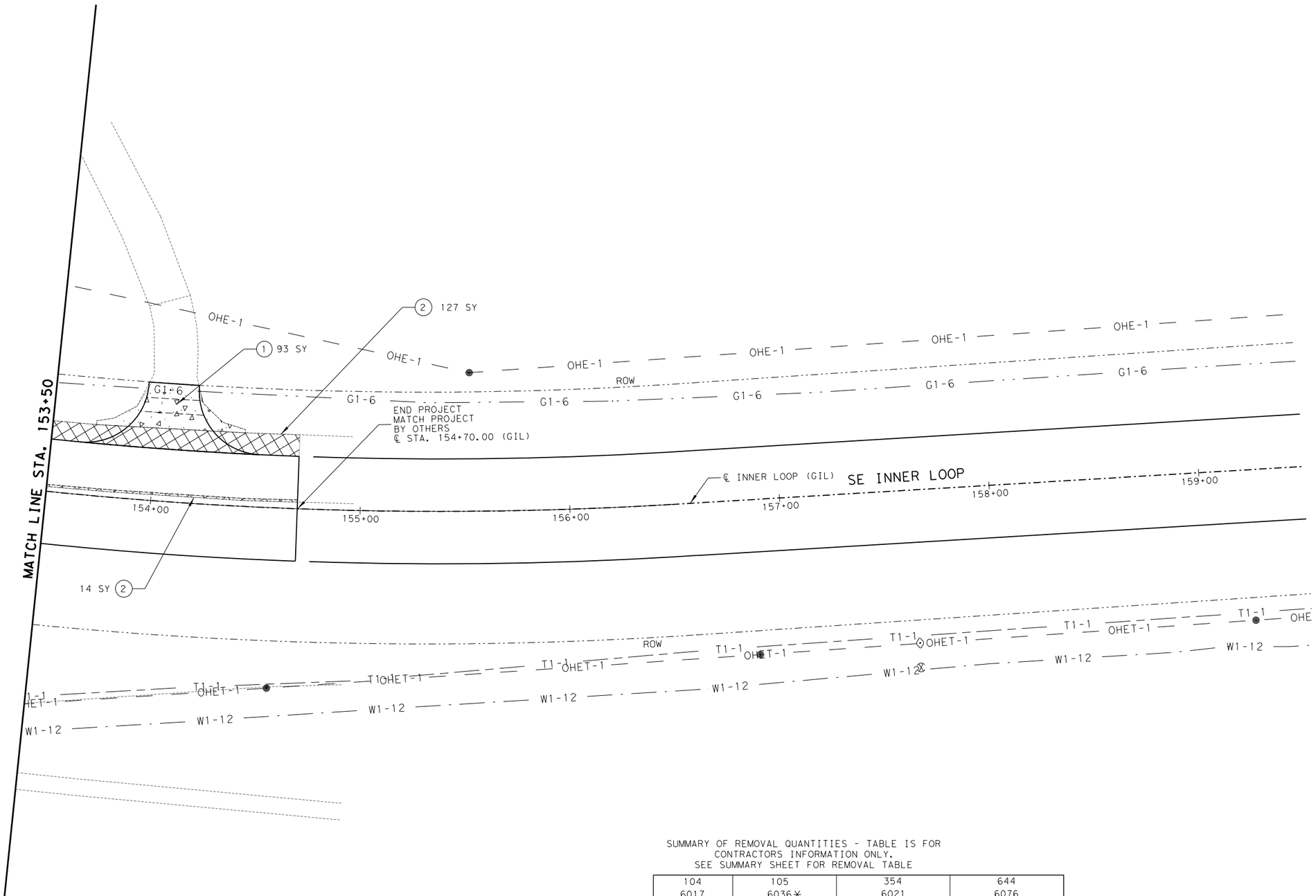
SCALE IN FEET



LEGEND

1	REMOVE CONCRETE (PAV)
2	REMOVE ASPH. PAV
3	PLANE ASPH. CONC PAV
	REMOVE SMALL RDSD SGN ASSEM.

NOTES:

1. EXISTING SIGNS CONSIDERED ESSENTIAL, BUT ARE SHOWN TO BE REMOVED SHALL BE PLACED ON TEMPORARY SUPPORTS UNTIL NEW SIGNS ARE INSTALLED. SUBSIDIARY TO OTHER REMOVAL ITEMS.
2. REMOVAL OF EXISTING BASE AND ASPHALT PAVEMENT STRUCTURE IS SUBSIDIARY TO ITEM 100 - PREP. ROW.

SUMMARY OF REMOVAL QUANTITIES - TABLE IS FOR CONTRACTORS INFORMATION ONLY.
SEE SUMMARY SHEET FOR REMOVAL TABLE

104 6017	105 6036 ~~X~~	354 6021	644 6076
REMOVING CONC. (DRIVEWAYS)	REMOVING STAB BASE AND ASPH PAV (15"-20")	PLANE ASPH CONC PAV(0" TO 2")	REMOVE SM RD SN SUP & AM
SY	SY	SY	EA
93	141		

STATE OF TEXAS
ROBERT CARRILLO
80169
REGISTERED PROFESSIONAL ENGINEER
6/22/2017
Robert Carrillo, PE

NO.	REVISION	BY	DATE

WILLIAMSON COUNTY
1848

RTG RODRIGUEZ TRANSPORTATION GROUP FIRM #587

GEORGETOWN INNER LOOP
REMOVAL PLAN
STA. 153+50.00 - STA. 154+70

6/22/2017 SHEET 4 OF 4

DESIGNED:	PROJECT NUMBER		ROADWAY	
CHECKED:			SE INNER LOOP	
DRAWN:	STATE	COUNTY	CITY	SHEET No.
CHECKED:	TEXAS	WILLIAMSON	GEORGETOWN	80

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brooks
6/22/2017
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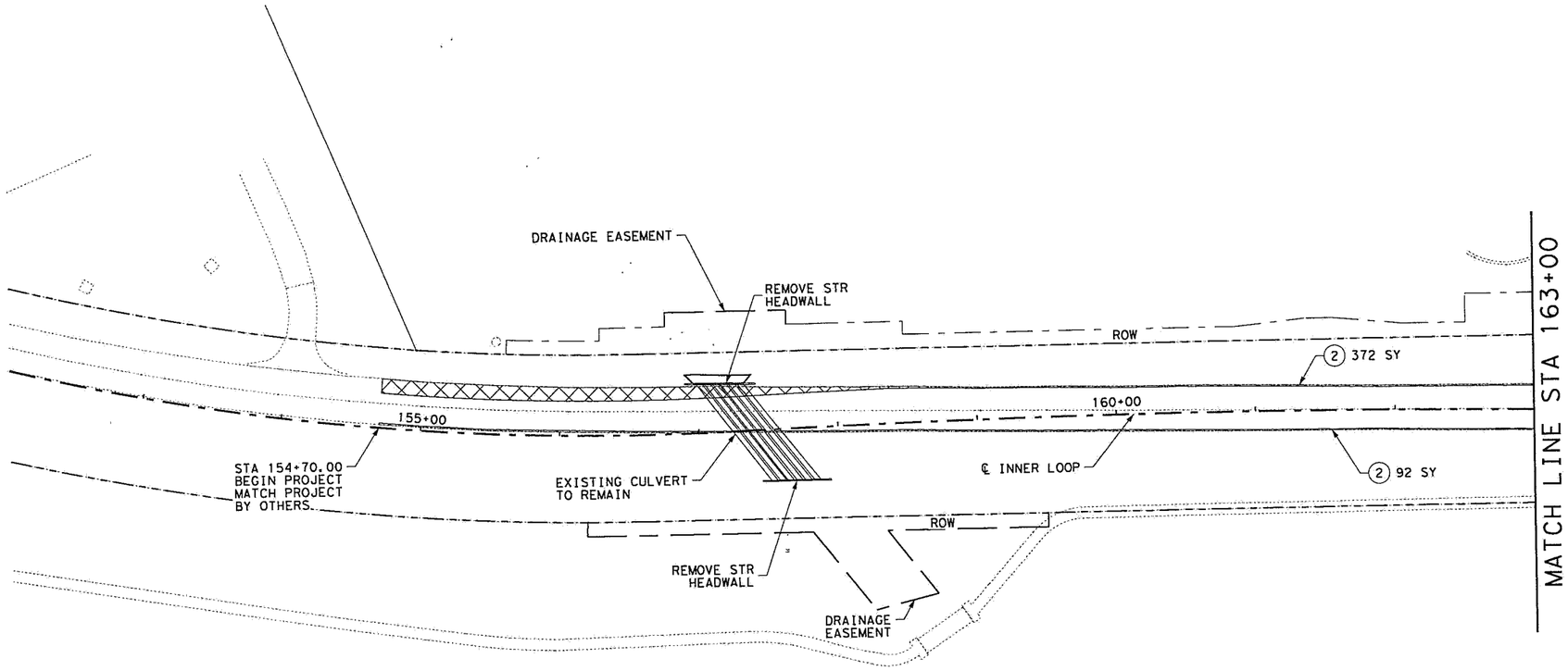
50 0 50 100
SCALE: 1" = 100'

6/26/2017 10:22:46 AM
cwm

LEGEND

(1) REMOVE CONC (PVMT)

(2) REMOVE ASPH PAV



NOTES:

1. EXISTING SIGNS CONSIDERED ESSENTIAL, BUT ARE SHOWN TO BE REMOVED SHALL BE PLACED ON TEMPORARY SUPPORTS UNTIL NEW SIGNS ARE INSTALLED. SUBSIDIARY TO OTHER REMOVAL ITEMS.
2. REMOVAL OF STR (WINGWALL), (HEADWALL) AND (SET) ARE CONSIDERED SUBSIDIARY TO REMOVAL OF STR (PIPE) AND/OR REMOVAL OF STR (BOX CULVERT).
3. REMOVAL OF EXISTING BASE AND ASPHALT PAVEMENT STRUCTURE IS SUBSIDIARY TO ITEM 100 - PREPARING ROW.

STATE OF TEXAS
CHASE W. MYERS
94895
LICENSED
PROFESSIONAL ENGINEER
6/26/17

SUMMARY OF REMOVAL QUANTITES - TABLE IS FOR CONTRACTORS INFORMATION ONLY. SEE SUMMARY SHEET FOR REMOVAL TABLE

105 * 6036	496 * 6006
REMOVING STAB BASE & ASPH PAV(15"-20")	REMOV STR (HEADWALL)
SY	EA
*464	*2

* FOR CONTRACTORS INFORMATION ONLY

BRIDGEFARMER & ASSOCIATES, INC.
CONSULTING ENGINEERS
TBPE REGISTRATION NO. 264

GEORGETOWN INNER LOOP @ CENTRAL MAINTENANCE FACILITY

REMOVAL PLAN

SCALE: 1" = 100' SHEET 1 OF 3

DESIGN	GRAPHICS	CHECK	CHECK	SHEET NO.
KA	AKH	CWM	WD	81

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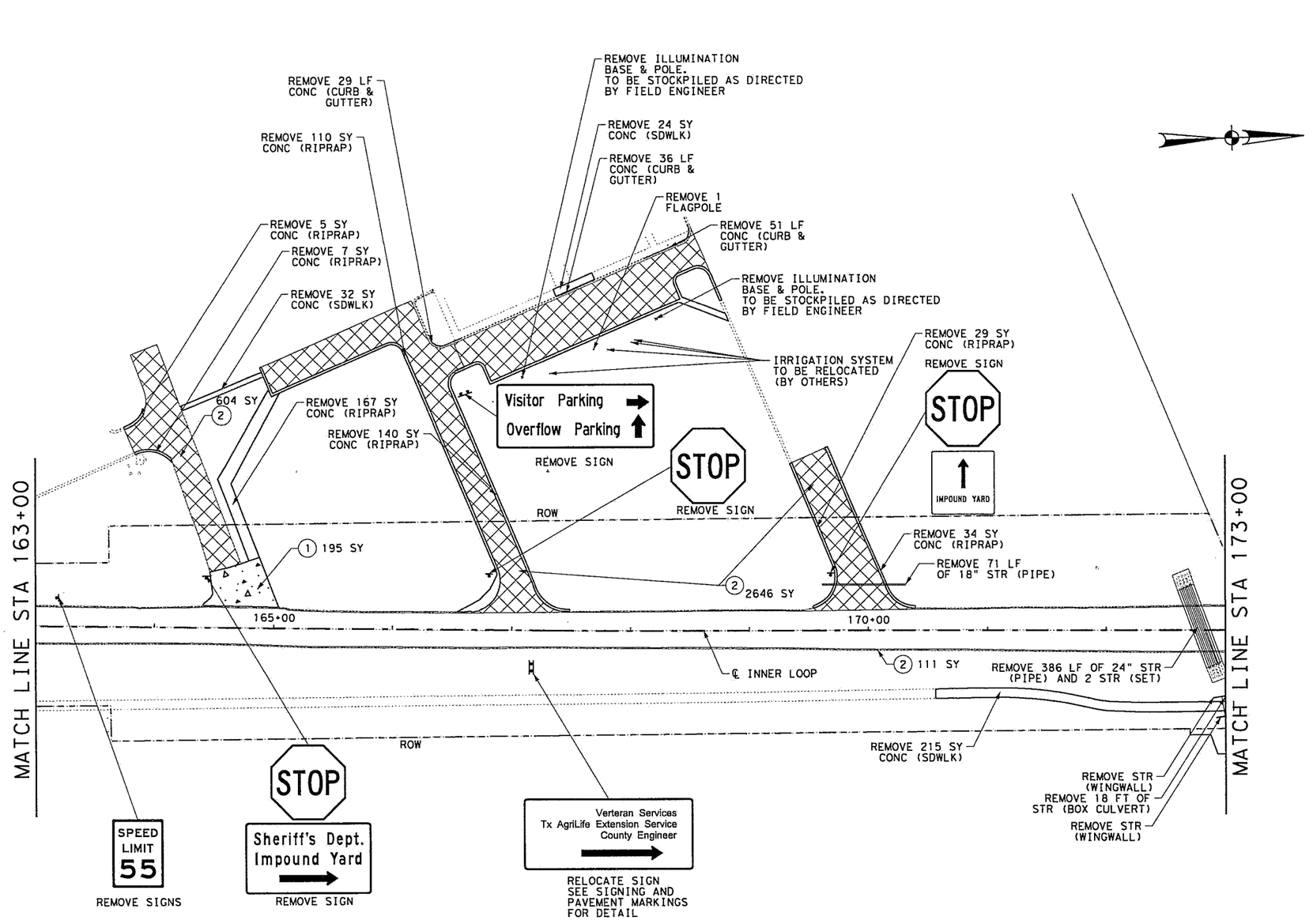

50 0 50 100
SCALE: 1" = 100'

LEGEND

(1) REMOVE CONC (PVMT)

(2) REMOVE ASPH PAV

NOTES:

1. EXISTING SIGNS CONSIDERED ESSENTIAL, BUT ARE SHOWN TO BE REMOVED SHALL BE PLACED ON TEMPORARY SUPPORTS UNTIL NEW SIGNS ARE INSTALLED. SUBSIDIARY TO OTHER REMOVAL ITEMS.
2. REMOVAL OF STR (WINGWALL), (HEADWALL) AND (SET) ARE CONSIDERED SUBSIDIARY TO REMOVAL OF STR (PIPE) AND/OR REMOVAL OF STR (BOX CULVERT).
3. REMOVAL OF EXISTING BASE AND ASPHALT PAVEMENT STRUCTURE IS SUBSIDIARY TO ITEM 100 - PREPARING ROW.

STATE OF TEXAS
CHASE W. MYERS
94895
LICENSED
PROFESSIONAL ENGINEER
6/26/17

SUMMARY OF REMOVAL QUANTITES - TABLE IS FOR CONTRACTORS INFORMATION ONLY. SEE SUMMARY SHEET FOR REMOVAL TABLE

104 6009	104 6015	104 6017	104 6022	105 6036	496 6004	496 6005	496 6007	496 6008	644 6076	496 6045	610 6007
REMOVING CONC (RIPRAP)	REMOVING CONC (SIDEWALKS)	REMOVING CONC (DRIVEWAYS)	REMOVING CONC (CURB AND GUTTER)	* REMOVING STAB BASE & ASPH PAV(15"-20")	* REMOV STR (SET)	* REMOV STR (WINGWALL)	REMOV STR (PIPE)	REMOV STR (BOX CULVERT)	REMOVE SM RD SN SUP&AM	REMOV STR (FLAG POLE)	REMOVE RD IL ASM (SHOE-BASE)
SY	SY	SY	LF	SY	EA	EA	LF	LF	LF	EA	EA
492	271	195	116	*3361	2 *	2 *	457	18	5	1	2

* FOR CONTRACTORS INFORMATION ONLY

BRIDGEFARMER & ASSOCIATES, INC.
CONSULTING ENGINEERS
TBPE REGISTRATION NO. 264

GEORGETOWN INNER LOOP @ CENTRAL MAINTENANCE FACILITY

REMOVAL PLAN

SCALE: 1" = 100' SHEET 2 OF 3

DESIGN	GRAPHICS	CHECK	CHECK	SHEET NO.
KA	AKH	CWM	WD	82

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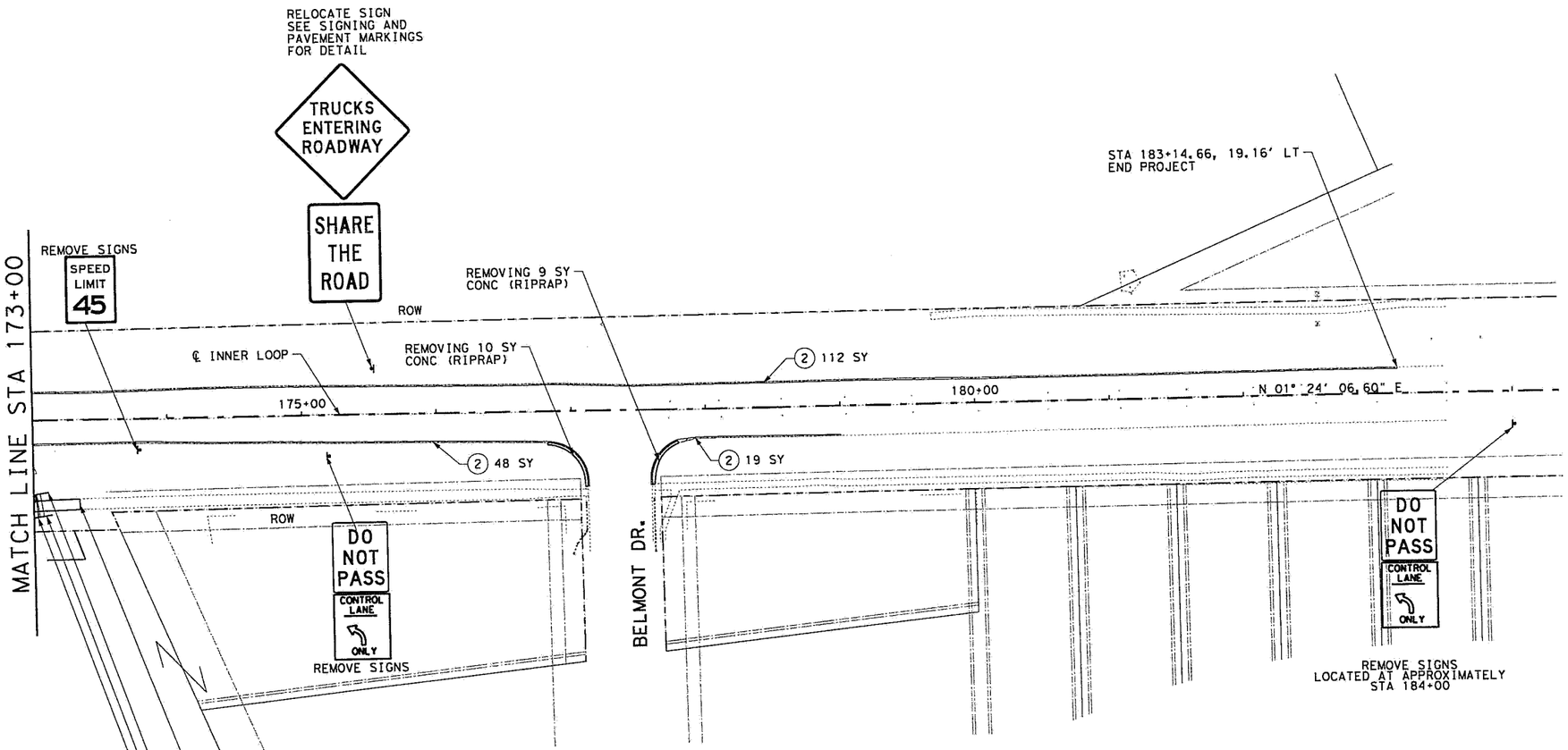
50 0 50 100
SCALE: 1" = 100'

LEGEND

(1) REMOVE CONC (PVMT)

(2) REMOVE ASPH PAV



NOTES:

1. EXISTING SIGNS CONSIDERED ESSENTIAL, BUT ARE SHOWN TO BE REMOVED SHALL BE PLACED ON TEMPORARY SUPPORTS UNTIL NEW SIGNS ARE INSTALLED. SUBSIDIARY TO OTHER REMOVAL ITEMS.
2. REMOVAL OF STR (WINGWALL), (HEADWALL) AND (SET) ARE CONSIDERED SUBSIDIARY TO REMOVAL OF STR (PIPE) AND/OR REMOVAL OF STR (BOX CULVERT).
3. REMOVAL OF EXISTING BASE AND ASPHALT PAVEMENT STRUCTURE IS SUBSIDIARY TO ITEM 100 - PREPARING ROW.

STATE OF TEXAS
CHASE W. MYERS
94895
LICENSED
PROFESSIONAL ENGINEER
6/26/17

SUMMARY OF REMOVAL QUANTITES - TABLE IS FOR CONTRACTORS INFORMATION ONLY. SEE SUMMARY SHEET FOR REMOVAL TABLE

104 6009	104 6015	105 6036	496 6005	496 6006	644 6076
REMOVING CONC (RIPRAP)	REMOVING CONC (SIDEWALKS)	* REMOVING STAB BASE & ASPH PAV(15"-20")	* REMOV STR (WINGWALL)	* REMOV STR (HEADWALL)	REMOVE SM RD SN SUP&AM
SY	SY	SY	EA	EA	EA
19	30	* 179	* 2	* 2	3

* FOR CONTRACTORS INFORMATION ONLY

BRIDGEFARMER & ASSOCIATES, INC.
CONSULTING ENGINEERS
TBPE REGISTRATION NO. 264

GEORGETOWN INNER LOOP @ CENTRAL MAINTENANCE FACILITY

REMOVAL PLAN

SCALE: 1" = 100' SHEET 3 OF 3

DESIGN	GRAPHICS	CHECK	CHECK	SHEET NO.
KA	AKH	CWM	WD	83

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GEORGETOWN INNER LOOP ALIGNMENT DATA (℄ GIL)

Chain GIL contains:
CUR GIL-1 CUR GIL-2 CUR GIL-3 CUR GIL-4 CUR GIL-5 CUR GIL-6 CUR GIL-7 GIL02

Beginning chain GIL description

				Curve Data				
Curve GIL-1								
P.I. Station			86+59.29	X	3,138,221.56	Y	10,197,611.57	
Delta	=	32° 44′ 06.88"	(LT)					
Degree	=	3° 22′ 13.22"						
Tangent	=	499.29						
Length	=	971.27						
Radius	=	1,700.00						
External	=	71.81						
Long Chord	=	958.12						
Mid. Ord.	=	68.90						
P.C. Station			81+60.00	X	3,137,764.90	Y	10,197,409.68	
P.T. Station			91+31.27	X	3,138,496.51	Y	10,198,028.34	
C.C.				X	3,137,077.48	Y	10,198,964.49	
Back	= N	66° 08′ 55.13" E						
Ahead	= N	33° 24′ 48.25" E						
Chord Bear	= N	49° 46′ 51.69" E						

				Curve Data				
Curve GIL-2								
P.I. Station			92+19.96	X	3,138,545.34	Y	10,198,102.37	
Delta	=	5° 58′ 20.34"	(LT)					
Degree	=	3° 22′ 13.22"						
Tangent	=	88.68						
Length	=	177.20						
Radius	=	1,700.00						
External	=	2.31						
Long Chord	=	177.12						
Mid. Ord.	=	2.31						
P.C. Station			91+31.27	X	3,138,496.51	Y	10,198,028.34	
P.T. Station			93+08.48	X	3,138,586.21	Y	10,198,181.07	
C.C.				X	3,137,077.48	Y	10,198,964.49	
Back	= N	33° 24′ 48.25" E						
Ahead	= N	27° 26′ 27.91" E						
Chord Bear	= N	30° 25′ 38.08" E						

				Curve Data				
Curve GIL-3								
P.I. Station			96+11.70	X	3,138,725.95	Y	10,198,450.18	
Delta	=	5° 51′ 16.04"	(RT)					
Degree	=	0° 57′ 58.33"						
Tangent	=	303.23						
Length	=	605.92						
Radius	=	5,930.00						
External	=	7.75						
Long Chord	=	605.66						
Mid. Ord.	=	7.74						
P.C. Station			93+08.48	X	3,138,586.21	Y	10,198,181.07	
P.T. Station			99+14.40	X	3,138,892.40	Y	10,198,703.63	
C.C.				X	3,143,848.99	Y	10,195,448.31	
Back	= N	27° 26′ 27.91" E						
Ahead	= N	33° 17′ 43.95" E						
Chord Bear	= N	30° 22′ 05.93" E						

Course from PT GIL-3 to PC GIL-4 N 33° 17′ 43.95" E Dist 59.47

				Curve Data				
Curve GIL-4								
P.I. Station			103+30.40	X	3,139,120.77	Y	10,199,051.35	
Delta	=	6° 16′ 45.00"	(RT)					
Degree	=	0° 52′ 53.30"						
Tangent	=	356.53						
Length	=	712.35						
Radius	=	6,500.00						
External	=	9.77						
Long Chord	=	711.99						
Mid. Ord.	=	9.76						
P.C. Station			99+73.87	X	3,138,925.05	Y	10,198,753.34	
P.T. Station			106+86.22	X	3,139,347.91	Y	10,199,326.16	
C.C.				X	3,144,358.08	Y	10,195,185.11	
Back	= N	17° 43.95" E						
Ahead	= N	39° 34′ 28.96" E						
Chord Bear	= N	36° 26′ 06.46" E						

Course from PT GIL-4 to PC GIL-5 N 39° 34′ 28.96" E Dist 709.02

				Curve Data				
Curve GIL-5								
P.I. Station			118+94.53	X	3,140,117.71	Y	10,200,257.52	
Delta	=	30° 21′ 49.31"	(RT)					
Degree	=	3° 06′ 50.04"						
Tangent	=	499.29						
Length	=	975.10						
Radius	=	1,840.00						
External	=	66.54						
Long Chord	=	963.73						
Mid. Ord.	=	64.22						
P.C. Station			113+95.24	X	3,139,799.62	Y	10,199,872.67	
P.T. Station			123+70.34	X	3,140,586.70	Y	10,200,428.79	
C.C.				X	3,141,217.88	Y	10,198,700.43	
Back	= N	39° 34′ 28.96" E						
Ahead	= N	69° 56′ 18.27" E						
Chord Bear	= N	54° 45′ 23.61" E						

GEORGETOWN INNER LOOP ALIGNMENT DATA (℄ GIL) CONT.

Course from PT GIL-5 to PC GIL-6 N 69° 56′ 18.27" E Dist 1,093.64

				Curve Data				
Curve GIL-6								
P.I. Station			147+05.76	X	3,142,780.42	Y	10,201,229.91	
Delta	=	68° 01′ 44.59"	(LT)					
Degree	=	3° 06′ 50.04"						
Tangent	=	1,241.77						
Length	=	2,184.69						
Radius	=	1,840.00						
External	=	379.82						
Long Chord	=	2,058.60						
Mid. Ord.	=	314.83						
P.C. Station			134+63.98	X	3,141,613.99	Y	10,200,803.94	
P.T. Station			156+48.67	X	3,142,821.79	Y	10,202,470.99	
C.C.				X	3,140,982.81	Y	10,202,532.30	
Back	= N	69° 56′ 18.27" E						
Ahead	= N	1° 54′ 33.68" E						
Chord Bear	= N	35° 55′ 25.97" E						

Course from PT GIL-6 to PC GIL-7 N 1° 54′ 33.68" E Dist 1,635.62

				Curve Data				
Curve GIL-7								
P.I. Station			173+50.72	X	3,142,878.50	Y	10,204,172.10	
Delta	=	0° 30′ 27.08"	(LT)					
Degree	=	0° 22′ 55.10"						
Tangent	=	66.43						
Length	=	132.87						
Radius	=	15,000.00						
External	=	0.15						
Long Chord	=	132.87						
Mid. Ord.	=	0.15						
P.C. Station			172+84.29	X	3,142,876.29	Y	10,204,105.70	
P.T. Station			174+17.16	X	3,142,880.12	Y	10,204,238.51	
C.C.				X	3,127,884.61	Y	10,204,605.48	
Back	= N	1° 54′ 33.68" E						
Ahead	= N	1° 24′ 06.60" E						
Chord Bear	= N	1° 39′ 20.14" E						

Course from PT GIL-7 to GIL02 N 1° 24′ 06.60" E Dist 933.89

Point GIL02 X 3,142,902.97 Y 10,205,172.13 Sta 183+51.05

Ending chain GIL description

ROCKRIDE ALIGNMENT DATA (℄ ROCKRIDE)

Chain ROCKRIDE contains:
RR01 CUR ROCKRIDE-1

Beginning chain ROCKRIDE description

Point RR01 X 3,142,355.95 Y 10,201,307.51 Sta 10+00.00

Course from RR01 to PC ROCKRIDE-1 S 49° 24′ 17.90" E Dist 162.74

				Curve Data				
Curve ROCKRIDE-1								
P.I. Station			12+93.96	X	3,142,579.16	Y	10,201,116.23	
Delta	=	25° 29′ 43.68"	(RT)					
Degree	=	9° 52′ 42.90"						
Tangent	=	131.22						
Length	=	258.09						
Radius	=	580.00						
External	=	14.66						
Long Chord	=	255.96						
Mid. Ord.	=	14.30						
P.C. Station			11+62.74	X	3,142,479.52	Y	10,201,201.62	
P.T. Station			14+20.83	X	3,142,632.34	Y	10,200,996.28	
C.C.				X	3,142,102.11	Y	10,200,761.21	
Back	= S	49° 24′ 17.90" E						
Ahead	= S	23° 54′ 34.22" E						
Chord Bear	= S	36° 39′ 26.06" E						

Ending chain ROCKRIDE description

STATE OF TEXAS
ROBERT CARRILLO
80169
REGISTERED PROFESSIONAL ENGINEER
6/22/2017

NO.	REVISION	BY	DATE

WILLIAMSON COUNTY
1848

RTG RODRIGUEZ TRANSPORTATION GROUP FIRM #587

GEORGETOWN INNER LOOP

HORIZONTAL ALIGNMENT DATA

6/22/2017 SHEET 1 OF 1

DESIGNED:	PROJECT NUMBER		ROADWAY	
CHECKED:			SE INNER LOOP	
DRAWN:	STATE	COUNTY	CITY	SHEET No.
CHECKED:	TEXAS	WILLIAMSON	GEORGETOWN	84

brooks
6/22/2017
6:10
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Beginning chain INNERLOOP description

Point INNERLOOP1 N 10,200,781.9928 E 3,141,553.8862 Sta 134+00.00

Course from INNERLOOP1 to PC INNERLOOP-1 N 69° 56' 18.27" E Dist 63.9828

Curve Data

Curve INNERLOOP-1						
P.I. Station	147+65.18	N	10,201,250.2907	E	3,142,836.2335	
Delta =	70° 32' 01.72"	(LT)				
Degree =	3° 06' 50.04"					
Tangent =	1,301.1977					
Length =	2,265.1269					
Radius =	1,840.0000					
External =	413.6005					
Long Chord =	2,124.7809					
Mid. Ord. =	337.6929					
P.C. Station	134+63.98	N	10,200,803.9408	E	3,141,613.9868	
P.T. Station	157+29.11	N	10,202,551.4181	E	3,142,822.7120	
C.C.		N	10,202,532.2977	E	3,140,982.8114	
Back = N	69° 56' 18.27" E					
Ahead = N	0° 35' 43.45" W					
Chord Bear = N	34° 40' 17.41" E					

Curve Data

Curve INNERLOOP-2						
P.I. Station	159+91.90	N	10,202,814.1917	E	3,142,819.9813	
Delta =	3° 10' 08.43"	(RT)				
Degree =	0° 36' 11.21"					
Tangent =	262.7877					
Length =	525.4415					
Radius =	9,500.0000					
External =	3.6339					
Long Chord =	525.3745					
Mid. Ord. =	3.6325					
P.C. Station	157+29.11	N	10,202,551.4181	E	3,142,822.7120	
P.T. Station	162+54.55	N	10,203,076.7143	E	3,142,831.7812	
C.C.		N	10,202,650.1379	E	3,152,322.1991	
Back = N	0° 35' 43.45" W					
Ahead = N	2° 34' 24.98" E					
Chord Bear = N	0° 59' 20.77" E					

Course from PT INNERLOOP-2 to PC INNERLOOP-3 N 2° 34' 24.98" E Dist 479.3748

Curve Data

Curve INNERLOOP-3						
P.I. Station	167+89.00	N	10,203,610.6192	E	3,142,855.7792	
Delta =	0° 39' 51.30"	(LT)				
Degree =	0° 36' 11.21"					
Tangent =	55.0691					
Length =	110.1369					
Radius =	9,500.0000					
External =	0.1596					
Long Chord =	110.1363					
Mid. Ord. =	0.1596					
P.C. Station	167+33.93	N	10,203,555.6056	E	3,142,853.3064	
P.T. Station	168+44.06	N	10,203,665.6577	E	3,142,857.6140	
C.C.		N	10,203,982.1821	E	3,133,362.8885	
Back = N	2° 34' 24.98" E					
Ahead = N	1° 54' 33.68" E					
Chord Bear = N	2° 14' 29.33" E					

Course from PT INNERLOOP-3 to PC INNERLOOP-4 N 1° 54' 33.68" E Dist 916.3405

Curve Data

Curve INNERLOOP-4						
P.I. Station	178+02.48	N	10,204,623.5415	E	3,142,889.5469	
Delta =	0° 30' 27.08"	(LT)				
Degree =	0° 36' 11.21"					
Tangent =	42.0755					
Length =	84.1504					
Radius =	9,500.0000					
External =	0.0932					
Long Chord =	84.1502					
Mid. Ord. =	0.0932					
P.C. Station	177+60.40	N	10,204,581.4894	E	3,142,888.1450	
P.T. Station	178+44.55	N	10,204,665.6044	E	3,142,890.5762	
C.C.		N	10,204,898.0139	E	3,133,393.4195	
Back = N	1° 54' 33.68" E					
Ahead = N	1° 24' 06.60" E					
Chord Bear = N	1° 39' 20.14" E					

Course from PT INNERLOOP-4 to INNERLOOP2 N 1° 24' 06.60" E Dist 638.3221

Point INNERLOOP2 N 10,205,303.7355 E 3,142,906.1922 Sta 184+82.88

Ending chain INNERLOOP description

Beginning chain DWBEL description

Point DWBEL1 N 10,204,559.3401 E 3,142,737.9329 Sta 10+00.00

Course from DWBEL1 to DWBEL2 S 88° 48' 38.79" E Dist 300.0000

Point DWBEL2 N 10,204,553.1138 E 3,143,037.8683 Sta 13+00.00

Ending chain DWBEL description

Beginning chain DWMTC description

Point DWMTC1 N 10,203,206.9419 E 3,142,574.0124 Sta 9+20.00

Course from DWMTC1 to PC DWMTC-1 N 69° 49' 16.66" E Dist 93.8066

Curve Data

Curve DWMTC-1						
P.I. Station	10+33.93	N	10,203,246.2409	E	3,142,680.9465	
Delta =	22° 45' 08.32"	(RT)				
Degree =	57° 17' 44.81"					
Tangent =	20.1202					
Length =	39.7103					
Radius =	100.0000					
External =	2.0040					
Long Chord =	39.4499					
Mid. Ord. =	1.9647					
P.C. Station	10+13.81	N	10,203,239.3004	E	3,142,662.0612	
P.T. Station	10+53.52	N	10,203,245.3374	E	3,142,701.0464	
C.C.		N	10,203,145.4383	E	3,142,696.5562	
Back = N	69° 49' 16.66" E					
Ahead = S	87° 25' 35.02" E					
Chord Bear = N	81° 11' 50.82" E					

Course from PT DWMTC-1 to DWMTC2 S 87° 25' 35.02" E Dist 138.1745

Point DWMTC2 N 10,203,239.1330 E 3,142,839.0816 Sta 11+91.69

Ending chain DWMTC description

Beginning chain DWCONN description

Point DWCONN1 N 10,203,149.5988 E 3,142,704.9029 Sta 10+00.00

Course from DWCONN1 to PC DWCONN-1 N 21° 29' 08.04" W Dist 177.6929

Curve Data

Curve DWCONN-1						
P.I. Station	12+22.00	N	10,203,356.1735	E	3,142,623.5911	
Delta =	47° 47' 41.92"	(RT)				
Degree =	57° 17' 44.81"					
Tangent =	44.3087					
Length =	83.4180					
Radius =	100.0000					
External =	9.3767					
Long Chord =	81.0203					
Mid. Ord. =	8.5728					
P.C. Station	11+77.69	N	10,203,314.9439	E	3,142,639.8199	
P.T. Station	12+61.11	N	10,203,395.8924	E	3,142,643.2295	
C.C.		N	10,203,351.5706	E	3,142,732.8708	
Back = N	21° 29' 08.04" W					
Ahead = N	26° 18' 33.88" E					
Chord Bear = N	2° 24' 42.92" E					

Curve Data

Curve DWCONN-2						
P.I. Station	13+05.22	N	10,203,435.4293	E	3,142,662.7779	
Delta =	47° 36' 01.13"	(LT)				
Degree =	57° 17' 44.81"					
Tangent =	44.1056					
Length =	83.0782					
Radius =	100.0000					
External =	9.2946					
Long Chord =	80.7096					
Mid. Ord. =	8.5041					
P.C. Station	12+61.11	N	10,203,395.8924	E	3,142,643.2295	
P.T. Station	13+44.19	N	10,203,476.5246	E	3,142,646.7630	
C.C.		N	10,203,440.2142	E	3,142,553.5881	
Back = N	26° 18' 33.88" E					
Ahead = N	21° 17' 27.25" W					
Chord Bear = N	2° 30' 33.31" E					

Course from PT DWCONN-2 to DWCONN2 N 21° 17' 27.25" W Dist 250.9950

Point DWCONN2 N 10,203,710.3889 E 3,142,555.6259 Sta 15+95.18

Ending chain DWCONN description

Beginning chain DWCMN description

Point DWCMN1 N 10,203,773.9422 E 3,142,710.3308 Sta 9+40.00

Course from DWCMN1 to PC DWCMN-1 N 68° 16' 11.05" E Dist 48.0188

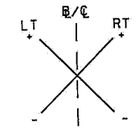
Curve Data

Curve DWCMN-1						
P.I. Station	10+08.95	N	10,203,799.4686	E	3,142,774.3772	
Delta =	23° 38' 22.62"	(RT)				
Degree =	57° 17' 44.81"					
Tangent =	20.9272					
Length =	41.2589					
Radius =	100.0000					
External =	2.1663					
Long Chord =	40.9669					
Mid. Ord. =	2.1203					
P.C. Station	9+88.02	N	10,203,791.7206	E	3,142,754.9372	
P.T. Station	10+29.28	N	10,203,798.7714	E	3,142,795.2928	
C.C.		N	10,203,698.8269	E	3,142,791.9609	
Back = N	68° 16' 11.06" E					
Ahead = S	88° 05' 26.32" E					
Chord Bear = N	80° 05' 22.37" E					

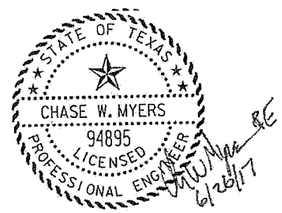
Course from PT DWCMN-1 to DWCMN2 S 88° 05' 26.32" E Dist 66.7218

Point DWCMN2 N 10,203,796.5483 E 3,142,861.9775 Sta 10+96.00

Ending chain DWCMN description



SUPERELEVATION TABLE - 4.0% MAXIMUM SUPERELEVATION RATE		
℄ INNERLOOP		
STATION	CROSS SLOPE (LT)	CROSS SLOPE (RT)
154+70.00	-3.80% MATCH SUPER BY OTHERS	+3.80% MATCH SUPER BY OTHERS
156+70.00	-3.80% BEGIN TRANSITION OUT	+3.80% BEGIN TRANSITION OUT
159+10.00	-2.00% END TRANSITION	-2.00% END TRANSITION
179+00.00		-2.00% END CONSTRUCTION
183+14.66	-2.00% END CONSTRUCTION LT / END PROJECT	



BRIDGEFARMER & ASSOCIATES, INC.
CONSULTING ENGINEERS
TBPE REGISTRATION NO. 264

GEORGETOWN INNER LOOP ●
CENTRAL MAINTENANCE FACILITY

HORIZONTAL
ALIGNMENT DATA

SHEET 1 OF 1

DESIGN	GRAPHICS	CHECK	CHECK	SHEET NO.
KA	AKH	CWM	WD	85

10:22:49 AM
6/26/2017
cwm
s:\16301\dgn\sheets\01*general\04*horizontal*control\16301-hc-01.dgn

CURVE C1
Delta = 5° 51′ 15.75" (RT)
Degree = 6° 21′ 58.31"
Tangent = 46.02
Length = 91.96′
Radius = 900′
External = 1.1758′
Back = N59°28′30.59"E
Ahead = N65°19′46.34"E
Chord Bearing = N62°24′08.47"E

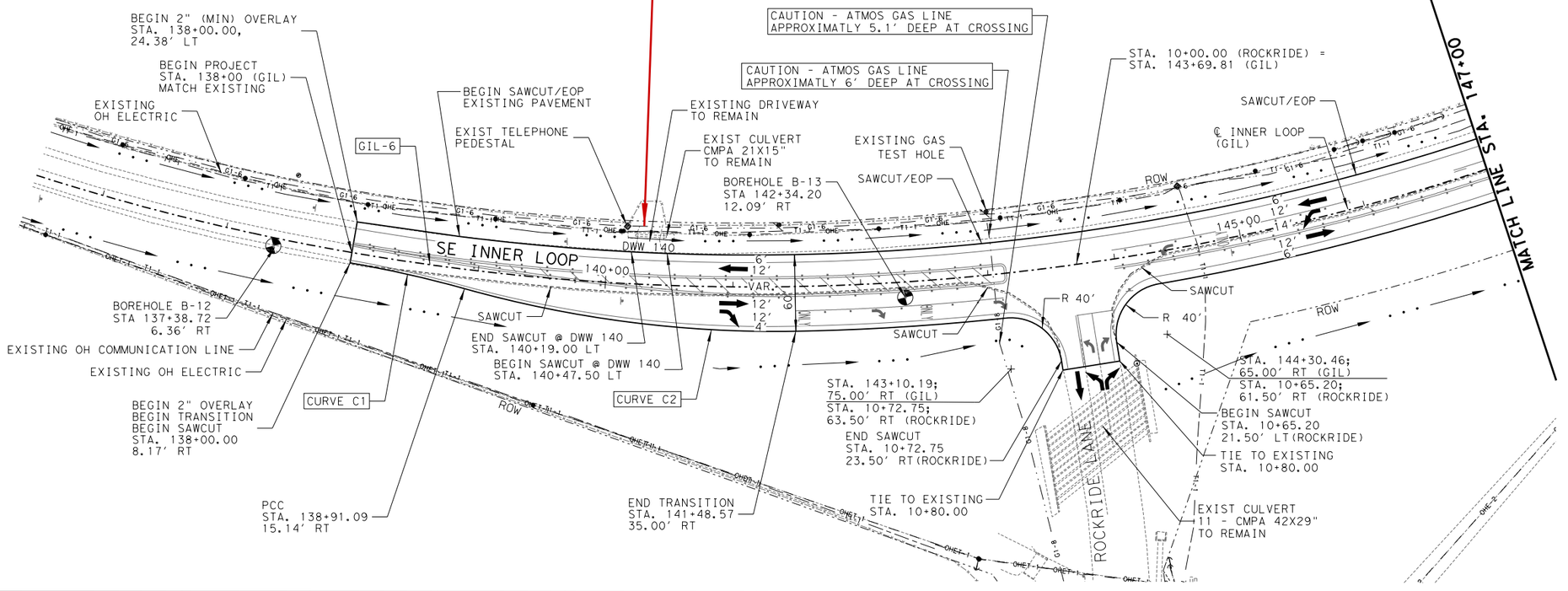
CURVE C2
Delta = 16°42′30.46" (LT)
Degree = 6° 21′ 58.31"
Tangent = 132.17
Length = 262.46′
Radius = 900′
External = 9.6526′
Back = N65°19′46.34"E
Ahead = N48°37′15.88"E
Chord Bearing = N56°58′31.11"E

NOTE TO CONTRACTOR! USE EXTREME CAUTION IN THIS AREA. PROTECT UG FRONTIER FIBER LINE IN PLACE. CONTRACTOR MUST CONTACT WILLIAMSON COUNTY TELECOM MANAGER PRIOR TO ANY DITCH CONSTRUCTION SHOWN HERE:

Bill Bingham
bbingham@wilco.org
P 512-943-1463
F 512-943-3825

TABLE OF SUPERELEVATION CROSS SLOPES

Left Cross Slope	Pivot Point from HAL(FT)	Station to Station		Right Cross Slope
-2.50%	-7	138+00	141+50	1.00%
-3.00%	-7	142+00		1.00%
-3.25%	-7	142+50		1.00%
-3.50%	-7	143+00	144+00	1.00%
-3.50%	-3.5	144+50		1.50%
-3.50%	0	145+00		2.00%
-3.50%	0	145+50		2.50%
-3.50%	0	146+00		3.00%
-3.50%	0	146+50		3.50%



HORZ. 0 50 100
VERT. 0 5 10
SCALE IN FEET

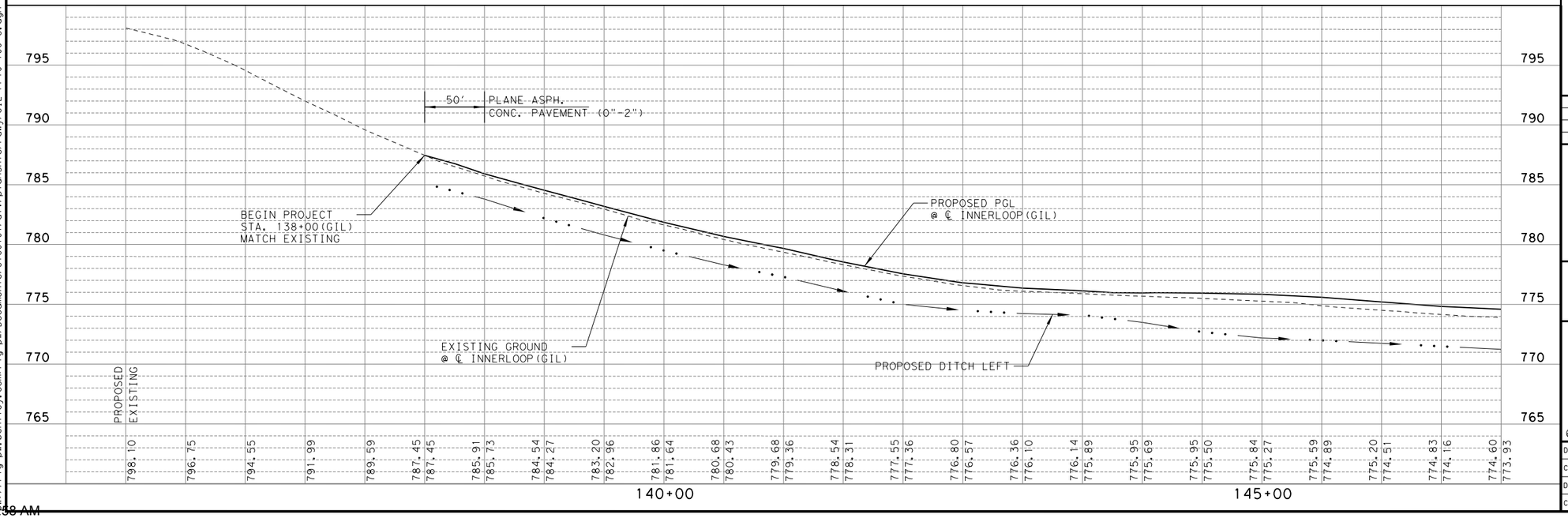
LEGEND

DIRECTION ARROWS

RIGHT OF WAY (ROW)

NOTES:

1. ALL DIMENSIONS ARE TO LANE LINE OR EOP, UNLESS NOTED OTHERWISE.
2. REFER TO "HORIZONTAL ALIGNMENT DATA" SHEET FOR HORIZONTAL ALIGNMENT INFORMATION.
3. THE CONTRACTOR SHALL BE RESPONSIBLE FOR LOCATING EXISTING UTILITIES PRIOR TO CONSTRUCTION.
4. REFER TO "DRIVEWAY DETAILS" AND "INTERSECTION DETAILS" SHEETS FOR DRIVEWAY AND MINOR SIDE STREET DESIGN INFORMATION.



ROBERT CARRILLO
80169
REGISTERED PROFESSIONAL ENGINEER
STATE OF TEXAS
6/27/2017
Robert Carrillo, PE

NO.	REVISION	BY	DATE

WILLIAMSON COUNTY
1848

RTG RODRIGUEZ TRANSPORTATION GROUP FIRM #587

GEORGETOWN INNER LOOP
ROADWAY
PLAN & PROFILE
BEGIN PROJECT - STA. 147+00

6/27/2017 SHEET 1 OF 2

DESIGNED:	PROJECT NUMBER		ROADWAY
CHECKED:			SE INNER LOOP
DRAWN:	STATE	COUNTY	CITY / SHEET No.
CHECKED:	TEXAS	WILLIAMSON	GEORGETOWN / 86

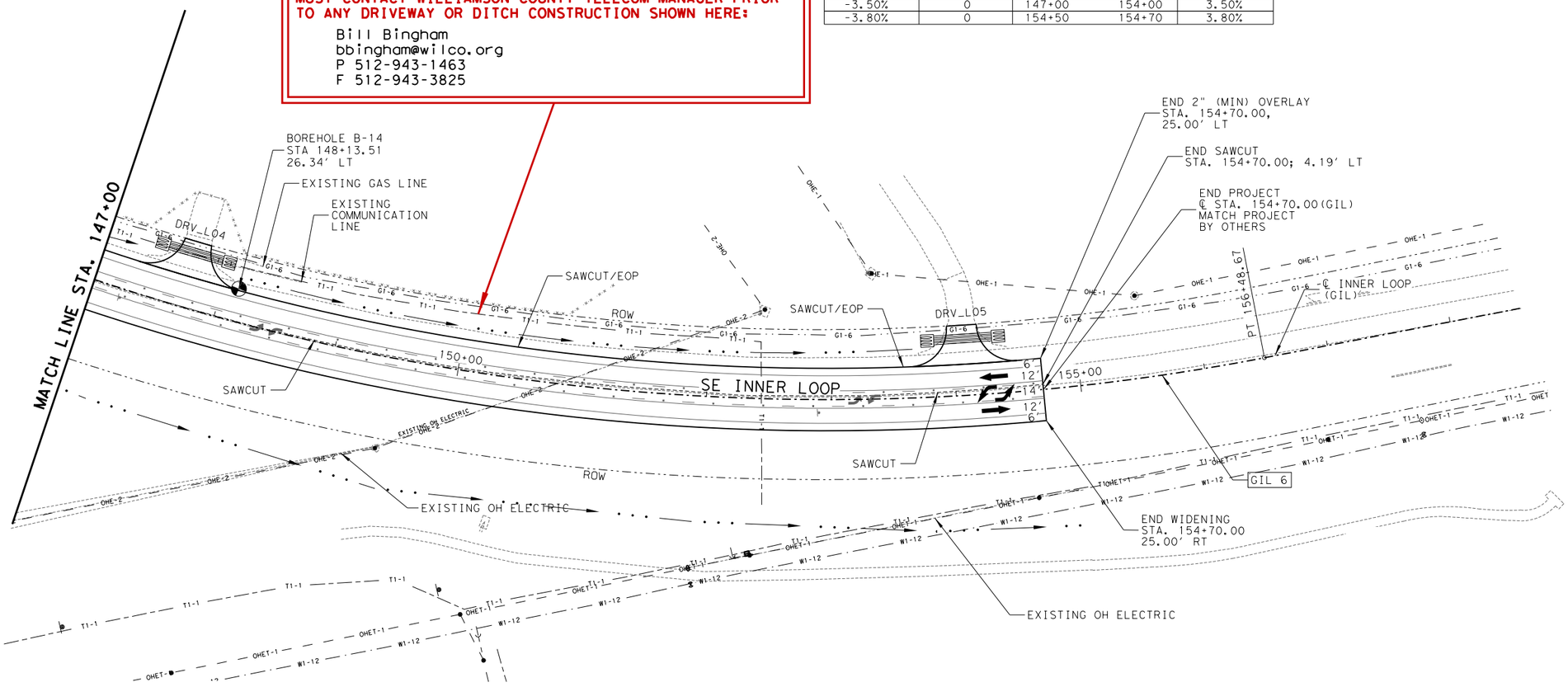
jbrooks
6/27/2017 2:58
e:/rtg-pw.bentley.com:rtg-pw/Documents/8760101/dlv/planShts/rdwy/GIL*PP10-100-C.dgn

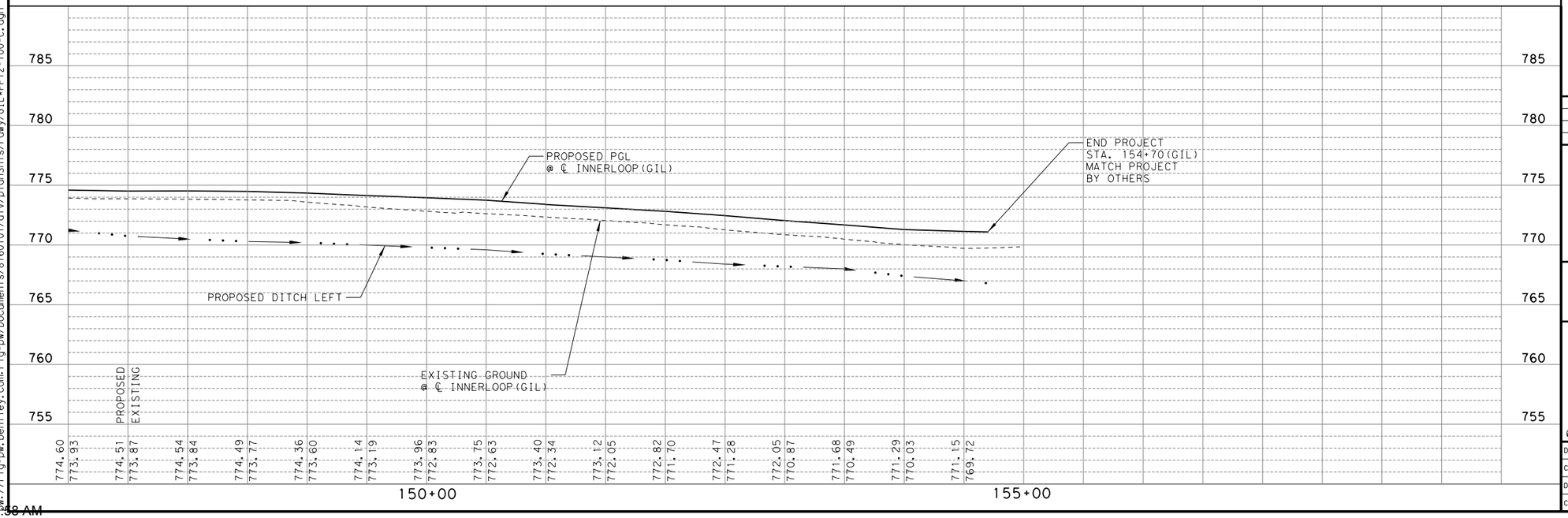
NOTE TO CONTRACTOR! USE EXTREME CAUTION IN THIS AREA. PROTECT UG FRONTIER FIBER LINE IN PLACE. CONTRACTOR MUST CONTACT WILLIAMSON COUNTY TELECOM MANAGER PRIOR TO ANY DRIVEWAY OR DITCH CONSTRUCTION SHOWN HERE:

Bill Bingham
bbingham@wilco.org
P 512-943-1463
F 512-943-3825

TABLE OF SUPERELEVATION CROSS SLOPES

Left Cross Slope	Pivot Point from HAL	Station to Station		Right Cross Slope
-3.50%	0	147+00	154+00	3.50%
-3.80%	0	154+50	154+70	3.80%





HORZ. 0 50 100
VERT. 0 5 10
SCALE IN FEET

LEGEND

DIRECTION ARROWS

RIGHT OF WAY (ROW)

NOTES:

1. ALL DIMENSIONS ARE TO LANE LINE OR EOP, UNLESS NOTED OTHERWISE.
2. REFER TO "HORIZONTAL ALIGNMENT DATA" SHEET FOR HORIZONTAL ALIGNMENT INFORMATION.
3. THE CONTRACTOR SHALL BE RESPONSIBLE FOR LOCATING EXISTING UTILITIES PRIOR TO CONSTRUCTION.
4. REFER TO "DRIVEWAY DETAILS" AND "INTERSECTION DETAILS" SHEETS FOR DRIVEWAY AND MINOR SIDE STREET DESIGN INFORMATION.

STATE OF TEXAS
ROBERT CARRILLO
80169
PROFESSIONAL ENGINEER
REGISTERED

6/27/2017

Robert Carrillo, P.E.

NO.	REVISION	BY	DATE

WILLIAMSON COUNTY
1848

RTG RODRIGUEZ TRANSPORTATION GROUP FIRM #587

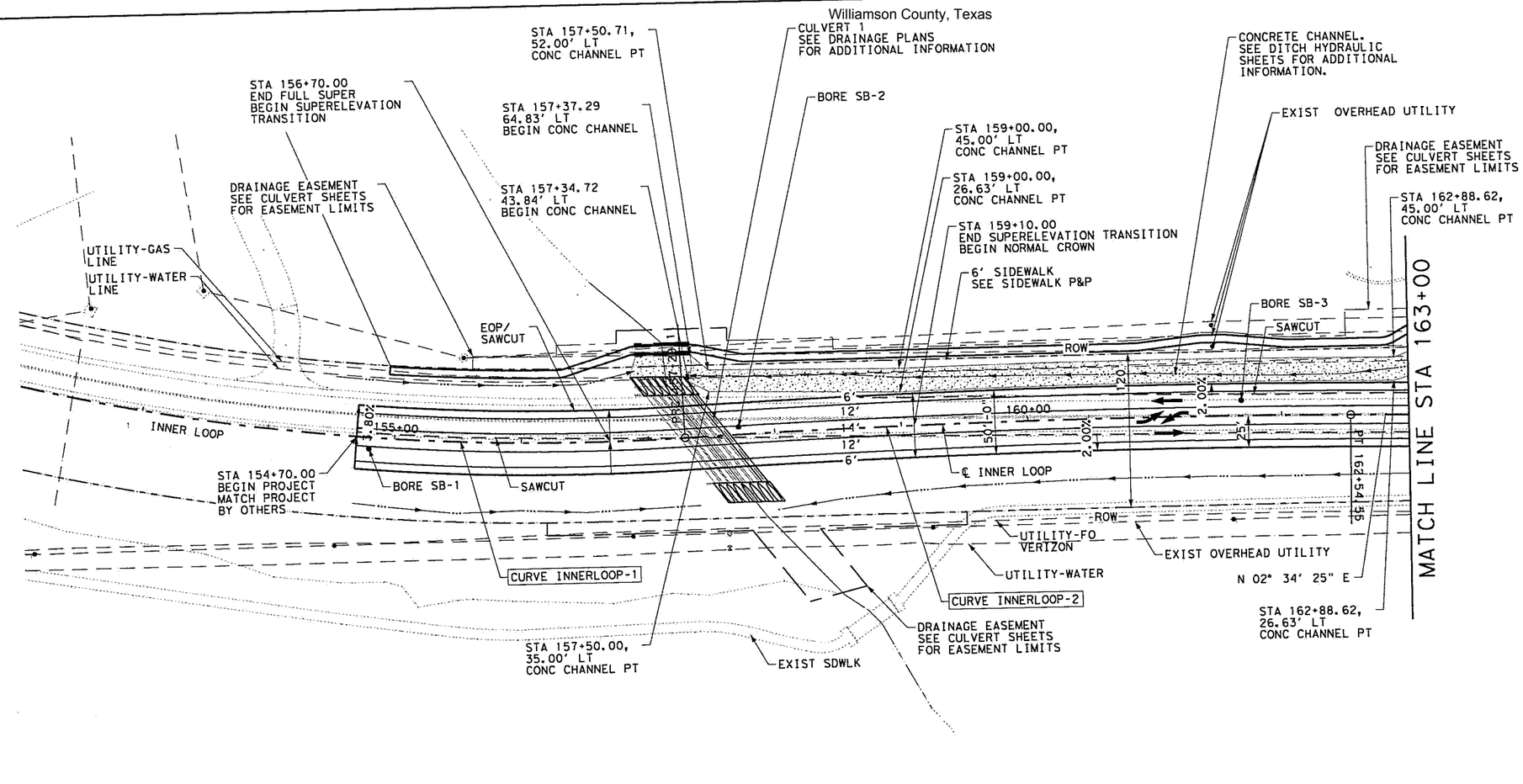
GEORGETOWN INNER LOOP
ROADWAY
PLAN & PROFILE
STA. 147+00 - STA. 154+70

6/27/2017 SHEET 2 OF 2

DESIGNED:	PROJECT NUMBER		ROADWAY	
CHECKED:			SE INNER LOOP	
DRAWN:	STATE	COUNTY	CITY	SHEET No.
CHECKED:	TEXAS	WILLIAMSON	GEORGETOWN	87

brooks
6/27/2017 2:58
c:/rtg-pw.bentley.com:rtg-pw/Documents/8760101/dlv/planShts/rdwy/GIL*PP12-100-C.dgn

SCALE: 1" = 100' HORIZONTAL
1" = 10' VERTICAL

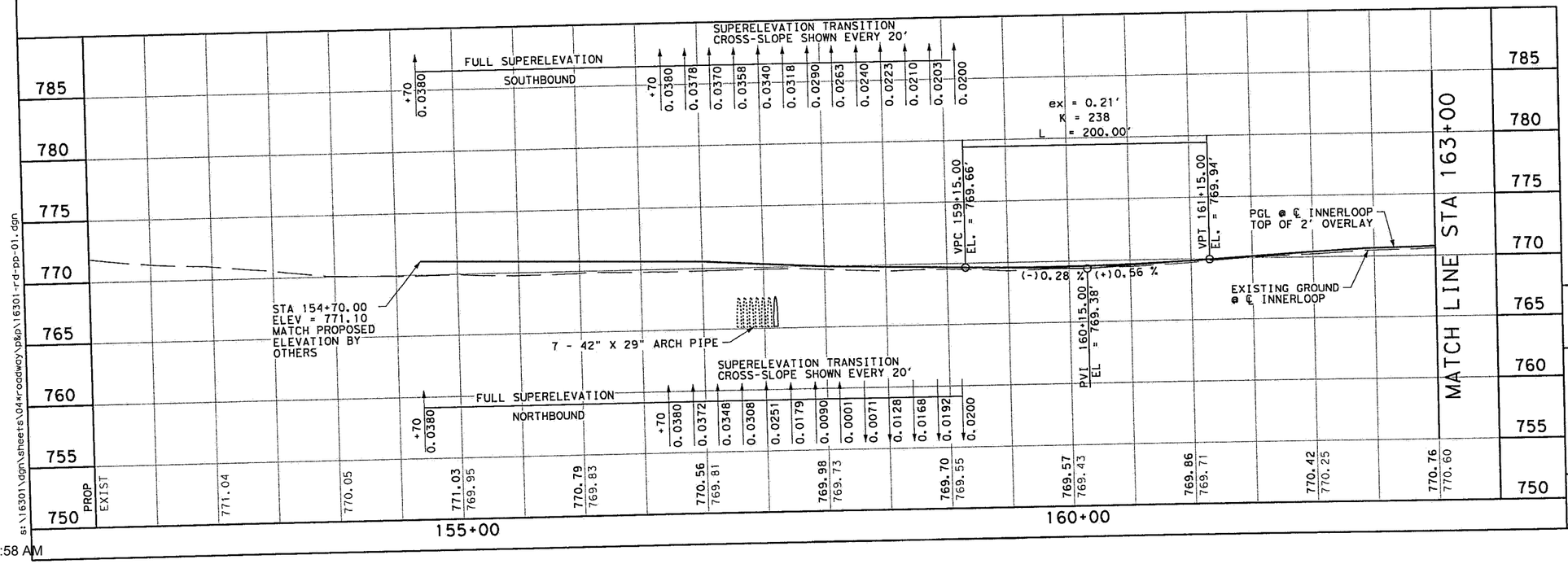


LEGEND

- DIRECTION ARROWS
- RIGHT OF WAY (ROW)
- CONCRETE

NOTES:

1. ALL DIMENSIONS ARE TO LANE LINE OR EOP, UNLESS NOTED OTHERWISE.
2. REFER TO PROFILE FOR SUPER ELEVATION INFORMATION. ALL SUPER ELEVATION TRANSITIONS ARE PARABOLIC. SUPER ELEVATION IS BASED ON 4.0% MAX.
3. REFER TO "HORIZONTAL ALIGNMENT DATA" SHEET FOR HORIZONTAL ALIGNMENT INFORMATION.
4. REFER TO "DRIVEWAY LAYOUT" SHEETS FOR DRIVEWAY AND MINOR SIDE STREET DESIGN INFORMATION.
5. REFER TO "DRAINAGE" SHEETS FOR CULVERT AND DRAINAGE INFORMATION.
6. REFER TO "SIDEWALK P&P" SHEETS FOR SIDEWALK DESIGN INFORMATION.



STATE OF TEXAS
CHASE W. MYERS
94895
LICENSED
PROFESSIONAL ENGINEER
6/26/17

BRIDGEFARMER & ASSOCIATES, INC.
CONSULTING ENGINEERS
TBPE REGISTRATION NO. 264

GEORGETOWN INNER LOOP @ CENTRAL MAINTENANCE FACILITY

ROADWAY PLAN & PROFILE

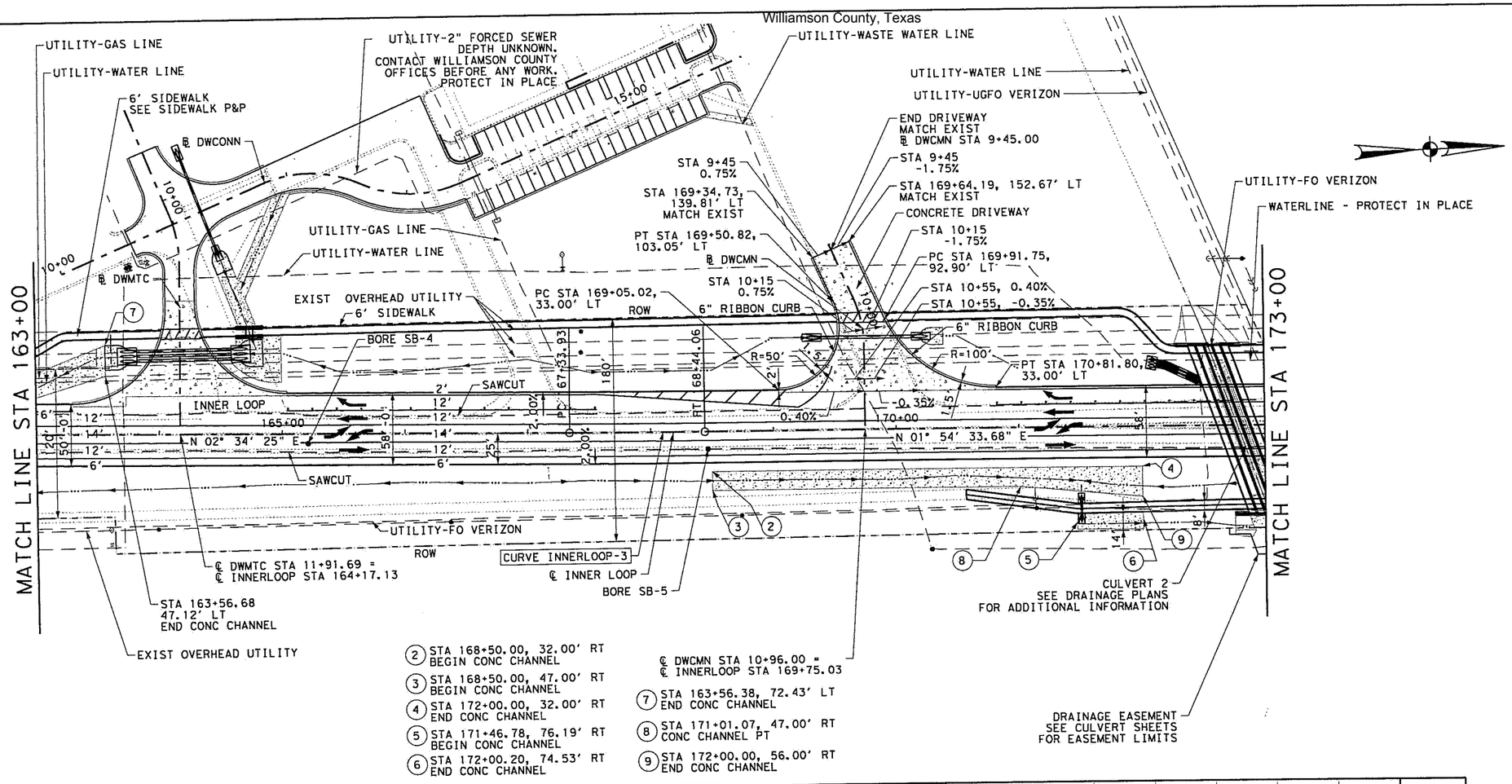
SCALE: 1" = 100' HORIZONTAL, 1" = 10' VERTICAL

SHEET 1 OF 3

DESIGN	GRAPHICS	CHECK	CHECK	SHEET NO.
KA	AKH	CWM	WD	88

s:\16301\dgn\sheets\04roadway\pp&p\16301-rd-pp-01.dgn 6/26/2017 10:22:51 AM CWM

cwm 6/26/2017 10:22:53 AM



② STA 168+50.00, 32.00' RT BEGIN CONC CHANNEL
③ STA 168+50.00, 47.00' RT BEGIN CONC CHANNEL
④ STA 172+00.00, 32.00' RT END CONC CHANNEL
⑤ STA 171+46.78, 76.19' RT BEGIN CONC CHANNEL
⑥ STA 172+00.20, 74.53' RT END CONC CHANNEL
⑦ STA 163+56.38, 72.43' LT END CONC CHANNEL
⑧ STA 171+01.07, 47.00' RT CONC CHANNEL PT
⑨ STA 172+00.00, 56.00' RT END CONC CHANNEL

℄ DWCMN STA 10+96.00 = ℄ INNERLOOP STA 169+75.03

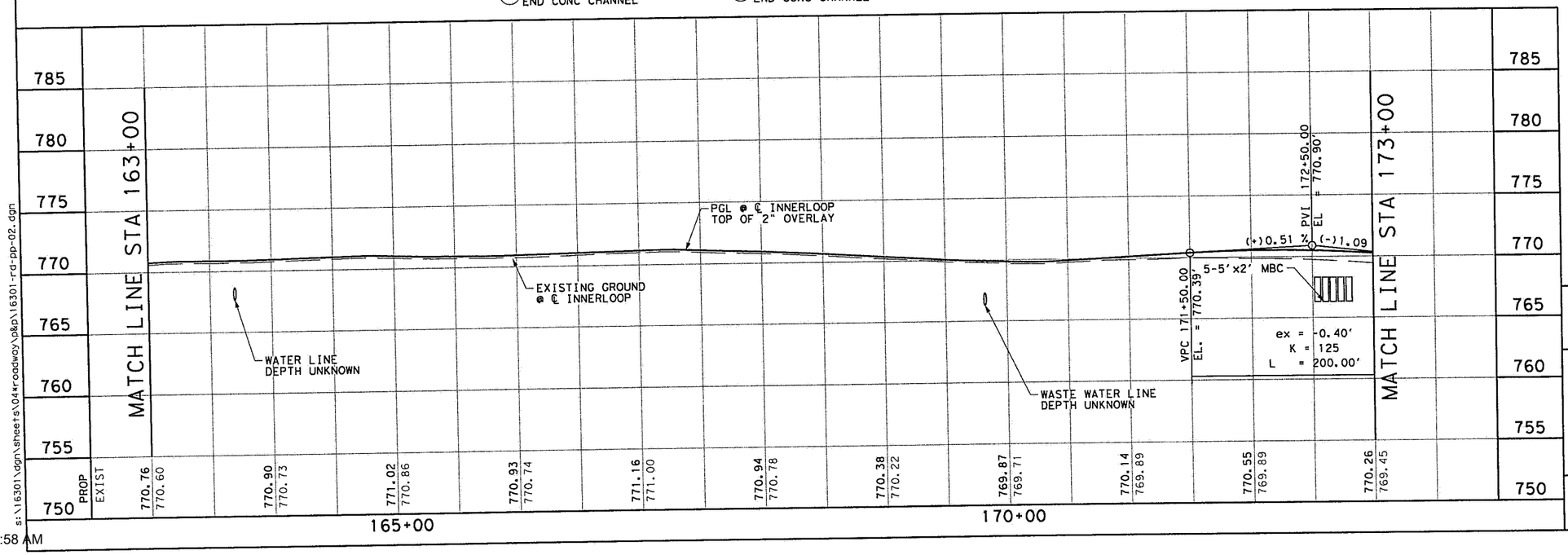
SCALE: 1" = 100' HORIZONTAL
1" = 10' VERTICAL

LEGEND

- DIRECTION ARROWS
- RIGHT OF WAY (ROW)
- CONCRETE

NOTES:

1. ALL DIMENSIONS ARE TO LANE LINE OR EOP, UNLESS NOTED OTHERWISE.
2. REFER TO PROFILE FOR SUPER ELEVATION INFORMATION. ALL SUPER ELEVATION TRANSITIONS ARE PARABOLIC. SUPER ELEVATION IS BASED ON 4.0% MAX.
3. REFER TO "HORIZONTAL ALIGNMENT DATA" SHEET FOR HORIZONTAL ALIGNMENT INFORMATION.
4. REFER TO "DRIVEWAY LAYOUT" SHEETS FOR DRIVEWAY AND MINOR SIDE STREET DESIGN INFORMATION.
5. REFER TO "DRAINAGE" SHEETS FOR CULVERT AND DRAINAGE INFORMATION.
6. REFER TO "SIDEWALK P&P" SHEETS FOR SIDEWALK DESIGN INFORMATION.



STATE OF TEXAS
CHASE W. MYERS
94895
LICENSED
PROFESSIONAL ENGINEER
6/26/17

BRIDGEFARMER & ASSOCIATES, INC.
CONSULTING ENGINEERS
TBPE REGISTRATION NO. 264

GEORGETOWN INNER LOOP @ CENTRAL MAINTENANCE FACILITY

ROADWAY PLAN & PROFILE

SCALE: 1" = 100' HORIZONTAL
1" = 10' VERTICAL

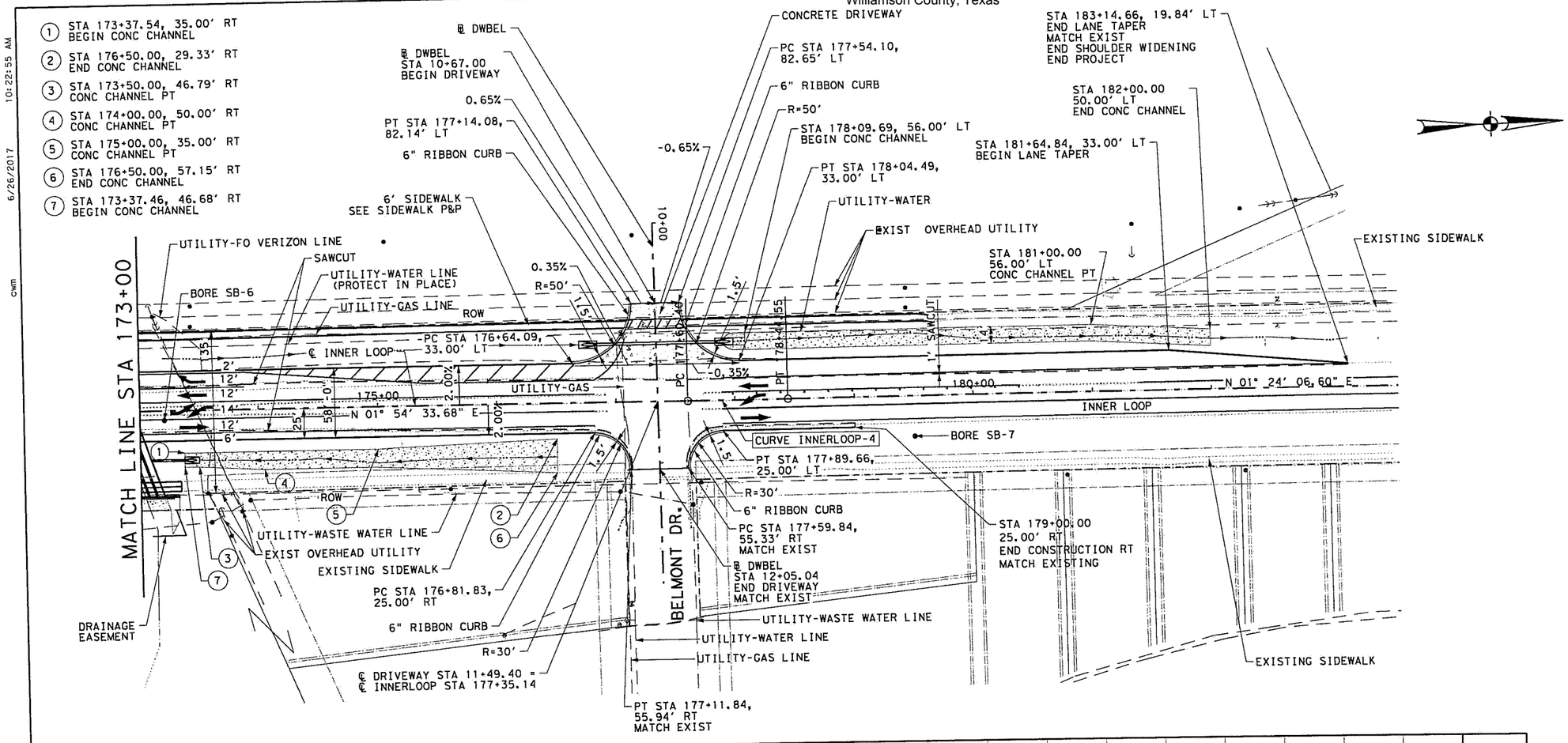
SHEET 2 OF 3

DESIGN	GRAPHICS	CHECK	CHECK	SHEET NO.
KA	AKH	CWM	WD	89

s:\16301\dgn\sheets\04roadway\pp\16301-rd-pp-02.dgn

SCALE: 1" = 100' HORIZONTAL
1" = 10' VERTICAL

1. STA 173+37.54, 35.00' RT BEGIN CONC CHANNEL
2. STA 176+50.00, 29.33' RT END CONC CHANNEL
3. STA 173+50.00, 46.79' RT CONC CHANNEL PT
4. STA 174+00.00, 50.00' RT CONC CHANNEL PT
5. STA 175+00.00, 35.00' RT CONC CHANNEL PT
6. STA 176+50.00, 57.15' RT END CONC CHANNEL
7. STA 173+37.46, 46.68' RT BEGIN CONC CHANNEL

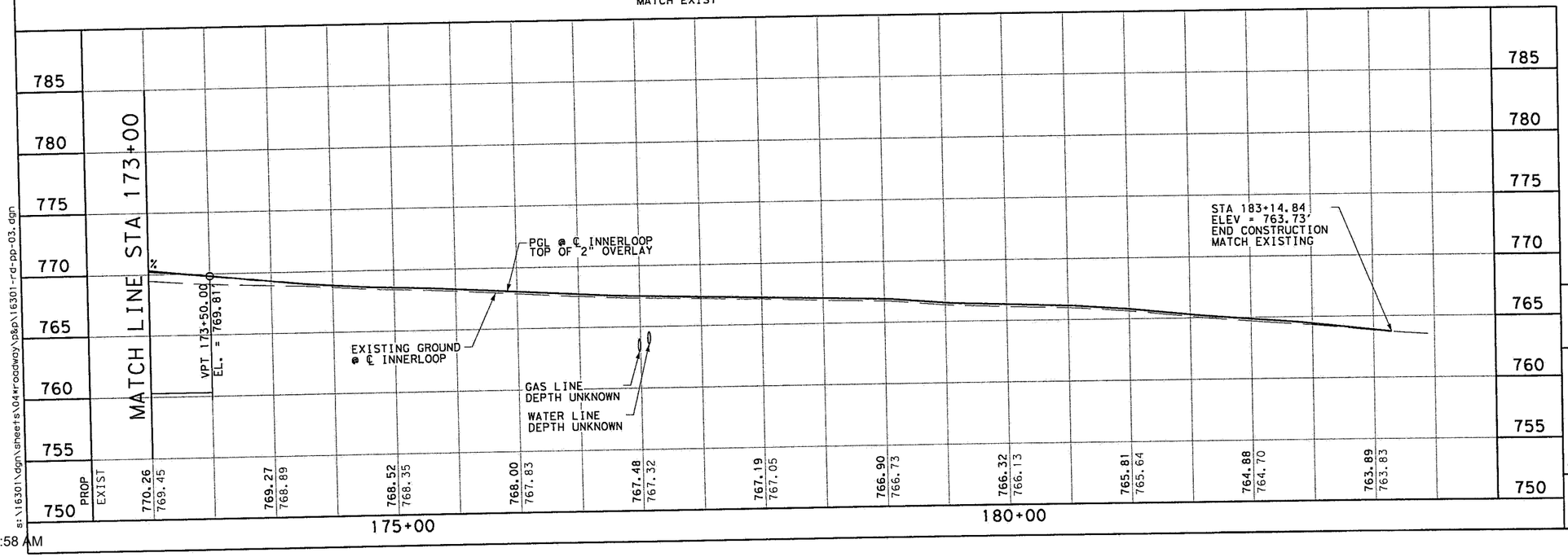


LEGEND

- DIRECTION ARROWS
- RIGHT OF WAY (ROW)
- CONCRETE

NOTES:

1. ALL DIMENSIONS ARE TO LANE LINE OR EOP, UNLESS NOTED OTHERWISE.
2. REFER TO PROFILE FOR SUPER ELEVATION INFORMATION. ALL SUPER ELEVATION TRANSITIONS ARE PARABOLIC. SUPER ELEVATION IS BASED ON 4.0% MAX.
3. REFER TO "HORIZONTAL ALIGNMENT DATA" SHEET FOR HORIZONTAL ALIGNMENT INFORMATION.
4. REFER TO "DRIVEWAY LAYOUT" SHEETS FOR DRIVEWAY AND MINOR SIDE STREET DESIGN INFORMATION.
5. REFER TO "DRAINAGE" SHEETS FOR CULVERT AND DRAINAGE INFORMATION.
6. REFER TO "SIDEWALK P&P" SHEETS FOR SIDEWALK DESIGN INFORMATION.



STATE OF TEXAS
CHASE W. MYERS
94895
LICENSED
PROFESSIONAL ENGINEER
6/26/17

BRIDGEFARMER & ASSOCIATES, INC.
CONSULTING ENGINEERS
TBPE REGISTRATION NO. 264

GEORGETOWN INNER LOOP @ CENTRAL MAINTENANCE FACILITY

ROADWAY PLAN & PROFILE

SCALE: 1" = 100' HORIZONTAL
1" = 10' VERTICAL

SHEET 3 OF 3

DESIGN	GRAPHICS	CHECK	CHECK	SHEET NO.
KA	AKH	CWM	WD	90

s:\16301\dgn\sheets\04*roadway\p&p\16301-rd-pp-03.dgn
6/26/2017 10:22:55 AM CWM

PLANE ASPH. CONC. PAVEMENT (0"-2") WILL BE REQUIRED FROM STA. 10+65.00 TO STA. 10+80.00

0 10 20
SCALE IN FEET

T1-1

STA. 10+65.20; 61.50' LT (ROCKRIDE)
STA. 144+30.46; 65.00' RT (GIL)

PC STA. 10+25.20
60.98' LT (ROCKRIDE)
ELEV. = 776.28'

STA. 10+30.35
41.86' LT (ROCKRIDE)
ELEV. = 776.27'

PT STA. 10+65.20
21.50' LT (ROCKRIDE)
ELEV. = 776.25'

BEGIN SAWCUT
STA. 10+65.20
21.50' LT (ROCKRIDE)

TIE TO EXISTING
STA. 10+80.00
21.50' LT (ROCKRIDE)
ELEV. = 776.15'

END CONSTRUCTION
STA. 10+80.00(ROCKRIDE)

ROW

℄ INNER LOOP (GIL)

144+00

SAWCUT

STA. 10+44.03
27.56' LT (ROCKRIDE)
ELEV. = 776.26'

4.0' SH

12' LANE

12' LEFT

12' LANE

4.0' SH

10+00

ROCKRIDE LANE

11+00

℄ ROCKRIDE

PC 11+62.74

44'

44'

POT 10+00.00

STA. 10+00.00 (ROCKRIDE) =
STA. 143+69.81 (GIL)

EXIST CULVERT
TO REMAIN
11' - CMPA 42X29"

STA. 10+52.92
28.76' RT (ROCKRIDE)
ELEV. = 776.45'

SAWCUT

END 2" OVERLAY
STA. 10+80.00 (ROCKRIDE)

TIE TO EXISTING
STA. 10+80.00
23.50' RT (ROCKRIDE)
ELEV. = 776.50'

END SAWCUT
STA. 10+72.75
23.50' RT (ROCKRIDE)

SE INNER LOOP

STA. 10+38.70
42.52' RT (ROCKRIDE)
ELEV. = 776.41'

PT STA. 10+72.75
2350' RT (ROCKRIDE)
ELEV. = 776.49'

G1-8

143+00

PC STA. 10+32.80
61.41' RT (ROCKRIDE)
ELEV. = 776.37'

STA. 10+72.75; 63.50' RT (ROCKRIDE)
STA. 143+10.19; 75.00' RT (GIL)

CAUTION - ATMOS GAS LINE
APPROXIMATLY 6' DEEP AT CROSSING

G1-6 OHE

T1-1

775

776

777

6:1

STATE OF TEXAS
ROBERT CARRILLO
80169
REGISTERED PROFESSIONAL ENGINEER
6/22/2017
Robert Carrillo, PE

NO.	REVISION	BY	DATE

WILLIAMSON COUNTY
1848

RTG RODRIGUEZ TRANSPORTATION GROUP FIRM #587

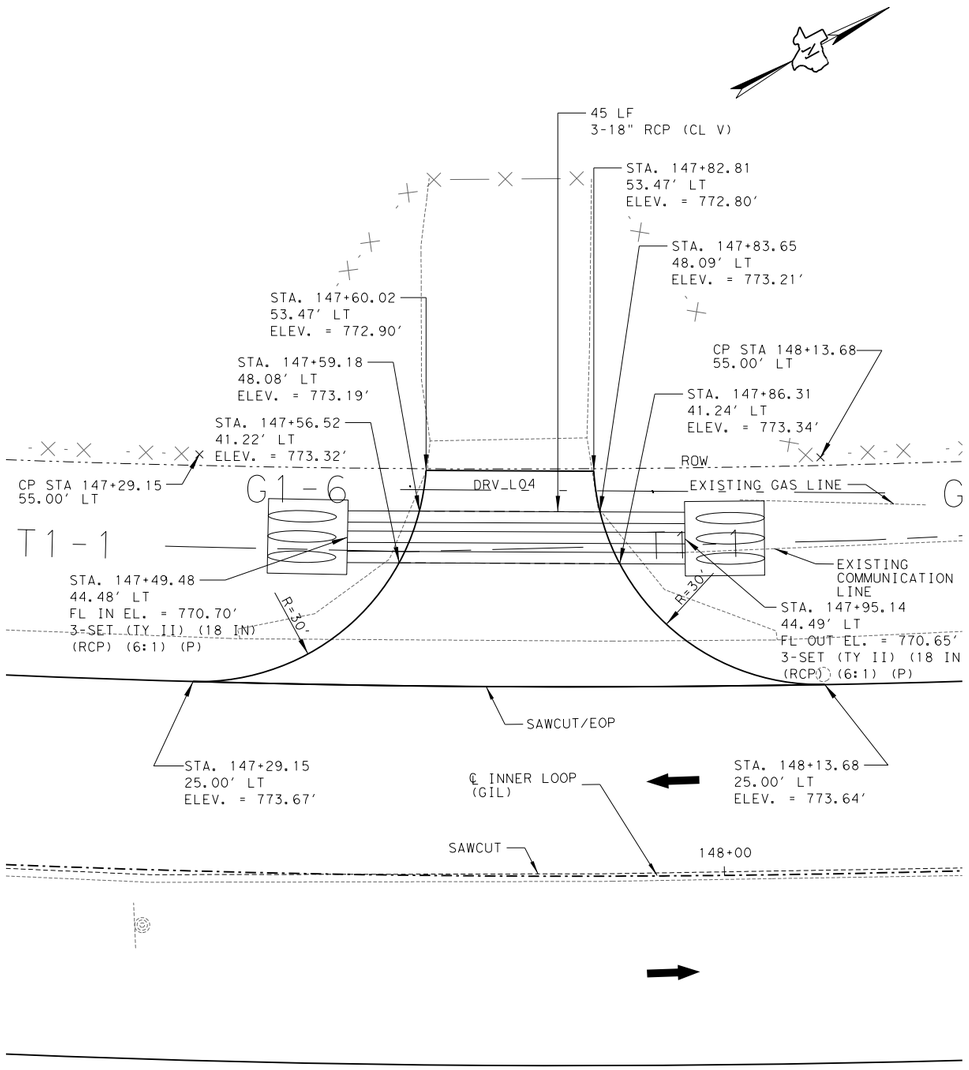
GEORGETOWN INNER LOOP

INTERSECTION DETAILS
ROCKRIDE LANE

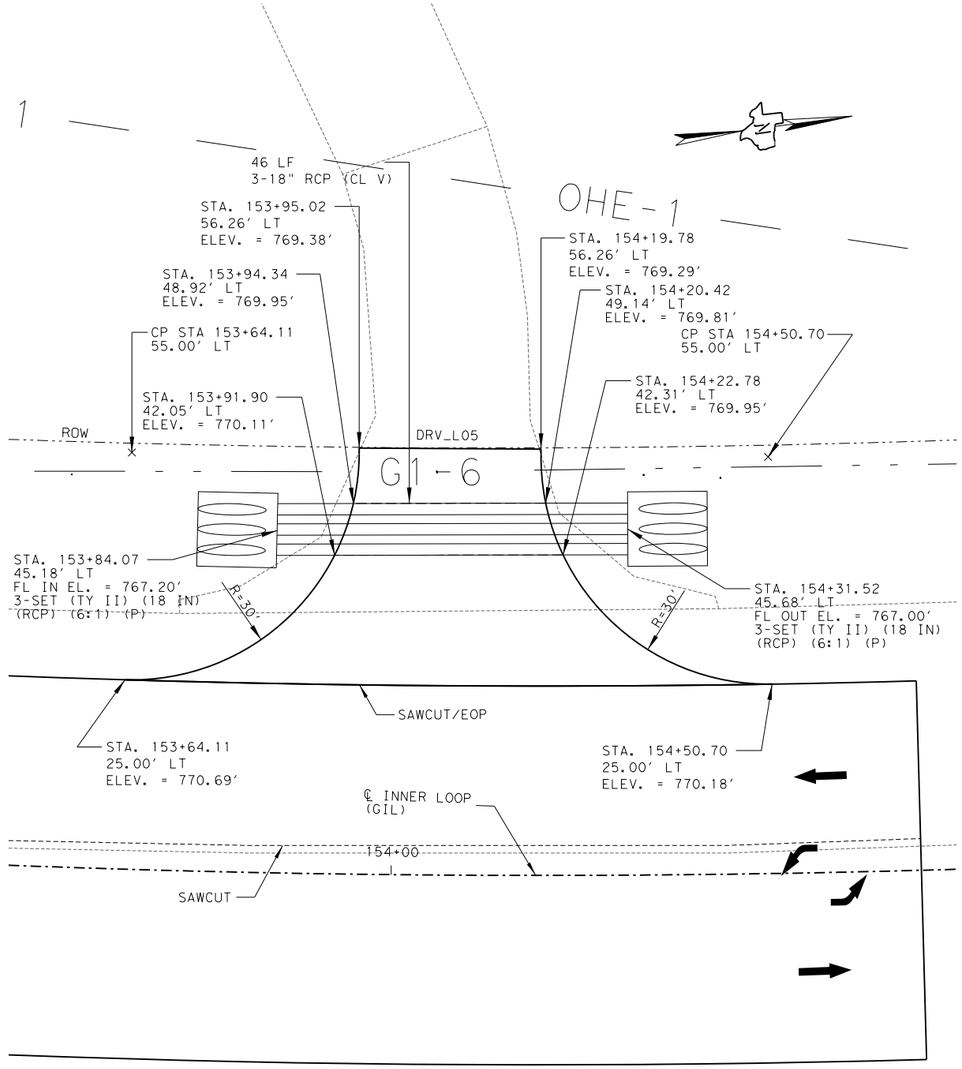
6/22/2017 SHEET 1 OF 1

DESIGNED:	PROJECT NUMBER		ROADWAY	
CHECKED:			SE INNER LOOP	
DRAWN:	STATE	COUNTY	CITY	SHEET No.
CHECKED:	TEXAS	WILLIAMSON	GEORGETOWN	91

brooks
6/22/2017
w://rtg-pw.bentley.com:rtg-pw/Documents/8760101/div/planShts/rdwy/GIL*PLN102-C.dgn



ESTIMATED QUANTITIES			
ITEM-DESC	DESCRIPTION	UNITS	QUANTITY
464 6025	RC PIPE (CL V)(18 IN)	LF	135
467 6363	SET (TY II) (18 IN) (RCP) (6:1) (P)	EA	6



ESTIMATED QUANTITIES			
ITEM-DESC	DESCRIPTION	UNITS	QUANTITY
464 6025	RC PIPE (CL V)(18 IN)	LF	138
467 6363	SET (TY II) (18 IN) (RCP) (6:1) (P)	EA	6

0 10 20
SCALE IN FEET

NOTES:

1. DRIVEWAY PAVEMENT STRUCTURE SHALL CONSIST OF 6" CONCRETE AND 6" FLEX BASE.

STATE OF TEXAS
ROBERT CARRILLO
80169
REGISTERED
PROFESSIONAL ENGINEER
6/22/2017
Robert Carrillo, PE

NO.	REVISION	BY	DATE

WILLIAMSON COUNTY
1848

RTG RODRIGUEZ TRANSPORTATION GROUP FIRM #587

GEORGETOWN INNER LOOP

DRIVEWAY DETAILS

6/22/2017 SHEET 1 OF 1

DESIGNED:	PROJECT NUMBER		ROADWAY	
CHECKED:			SE INNER LOOP	
DRAWN:	STATE	COUNTY	CITY	SHEET No.
CHECKED:	TEXAS	WILLIAMSON	GEORGETOWN	92

brooks
6/22/2017 6:11
w://rtg-pw.bentley.com:rtg-pw/Documents/8760101/div/plansShts/rdwy/GIL*DWY001-C.dgn

6/26/2017 10:22:56 AM cwm

SCALE: 1" = 40' HORIZONTAL
1" = 4' VERTICAL

UTILITY-2" FORCED SEWER
DEPTH UNKOWN.
CONTRACTOR TO COORDINATE
WITH WILLIAMSON COUNTY
OFFICES PRIOR TO ANY WORK.
PROTECT IN PLACE

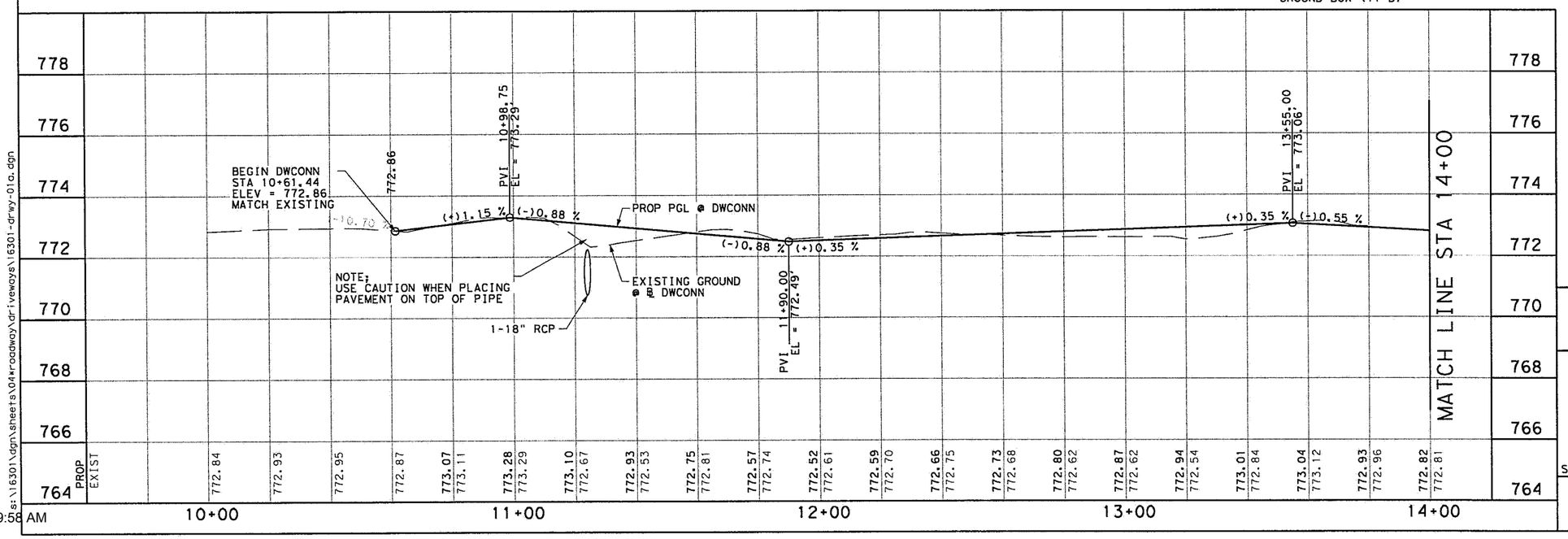
6" RIBBON CURB
℄ DWMTC
℄ DWCONN
PT ℄ DWCONN
STA 11+62.43,
12.00' LT
PC ℄ DWCONN
STA 10+62.80,
10.50' LT
0.92%
+61.44
R=25'
1.5'
10+00
6" RIBBON CURB
R=50'
1.5'
℄ DWCONN
STA 11+84.74,
13.78' LT
END RIBBON CURB
CURVE DWCONN-1
℄ DWCONN
STA 10+61.44
BEGIN CONSTRUCTION
MATCH EXISTING
10+00
11+00
12+00
1.75%
+85
1.83%
+85
1.58%
+15
1.42%
+15
1.00%
+30
1.00%
+30
21'
24'
-1.08%
+61.44
PROPOSED
SIDEWALK
PT ℄ DWCONN
STA 10+61.44,
10.50' RT
R=15'
1.5'
R=50'
PT ℄ DWCONN
STA 11+44.77,
12.00' RT
℄ DWCONN
STA 11+98.49,
15.00' RT
BEGIN DUAL
RIBBON CURB
12'
1.5'
6" RIBBON CURB
℄ DWMTC
℄ DWCONN STA 10+98.75 =
℄ DWMTC STA 10+20.83
13+00
3.0'
6" RIBBON CURB
PC ℄ DWCONN
STA 12+61.64
12.00' RT
CURVE DWCONN-2
6" RIBBON CURB
PROPOSED
CONCRETE
FLUME
UTILITY-WATER LINE
PT ℄ DWCONN
STA 13+42.45, 14.98' RT
CENTER OF 2' RADIUS
END DUAL RIBBON CURB
BEGIN SINGLE RIBBON CURB
℄ DWCONN
STA 13+44.19
31.00' RT
℄ DWCONN
STA 13+60.17, 40.13' RT
GROUND BOX (TY D)
UTILITY-GAS LINE
PI ℄ DWCONN
STA 13+35.60,
57.64' LT
℄ DWCONN
STA 13+45.61
42.46' LT (BOC)
BEGIN TY II C&G
MATCH EXISTING
℄ DWCONN
STA 13+60.17, 37.22' LT
GROUND BOX (TY D)
℄ DWCONN
STA 13+55.64
25.00' LT (LOG)
CENTER OF
12' RADIUS
SCHD 40 - 4" CONDUIT
MIN 1' BELOW SUBGRADE
END EACH END OF CONDUIT
IN A GROUND BOX (TY D)
℄ DWCONN
STA 13+69.19
31.00' LT
END TY II C&G
℄ DWCONN
STA 13+69.19
15.00' LT (LOG)
CENTER OF
2' RADIUS
0.67%
1.00%
+00
14
1.00%
+44.19
1.00%
MATCH LINE STA 14+00

LEGEND

- DIRECTION ARROWS
- RIGHT OF WAY (ROW)

NOTES:

1. ALL DIMENSIONS ARE TO LANE LINE OR EOP, UNLESS NOTED OTHERWISE.
2. ALL SUPER ELEVATION TRANSITIONS ARE PARABOLIC.
3. REFER TO "HORIZONTAL ALIGNMENT DATA" SHEET FOR HORIZONTAL ALIGNMENT INFORMATION.
4. REFER TO "DRAINAGE" SHEETS FOR CULVERT AND DRAINAGE INFORMATION.
5. REFER TO "SIDEWALK P&P" SHEETS FOR SIDEWALK DESIGN INFORMATION.



STATE OF TEXAS
CHASE W. MYERS
94895
LICENSED
PROFESSIONAL ENGINEER
6/26/17

BRIDGEFARMER & ASSOCIATES, INC.
CONSULTING ENGINEERS
TBPE REGISTRATION NO. 264

GEORGETOWN INNER LOOP @
CENTRAL MAINTENANCE FACILITY

DRIVEWAY LAYOUT
DWCONN

SCALE: 1" = 40' HORIZONTAL
1" = 4' VERTICAL

SHEET 1 OF 4

DESIGN	GRAPHICS	CHECK	CHECK
KA	AKH	CWM	WD

SHEET NO. 07

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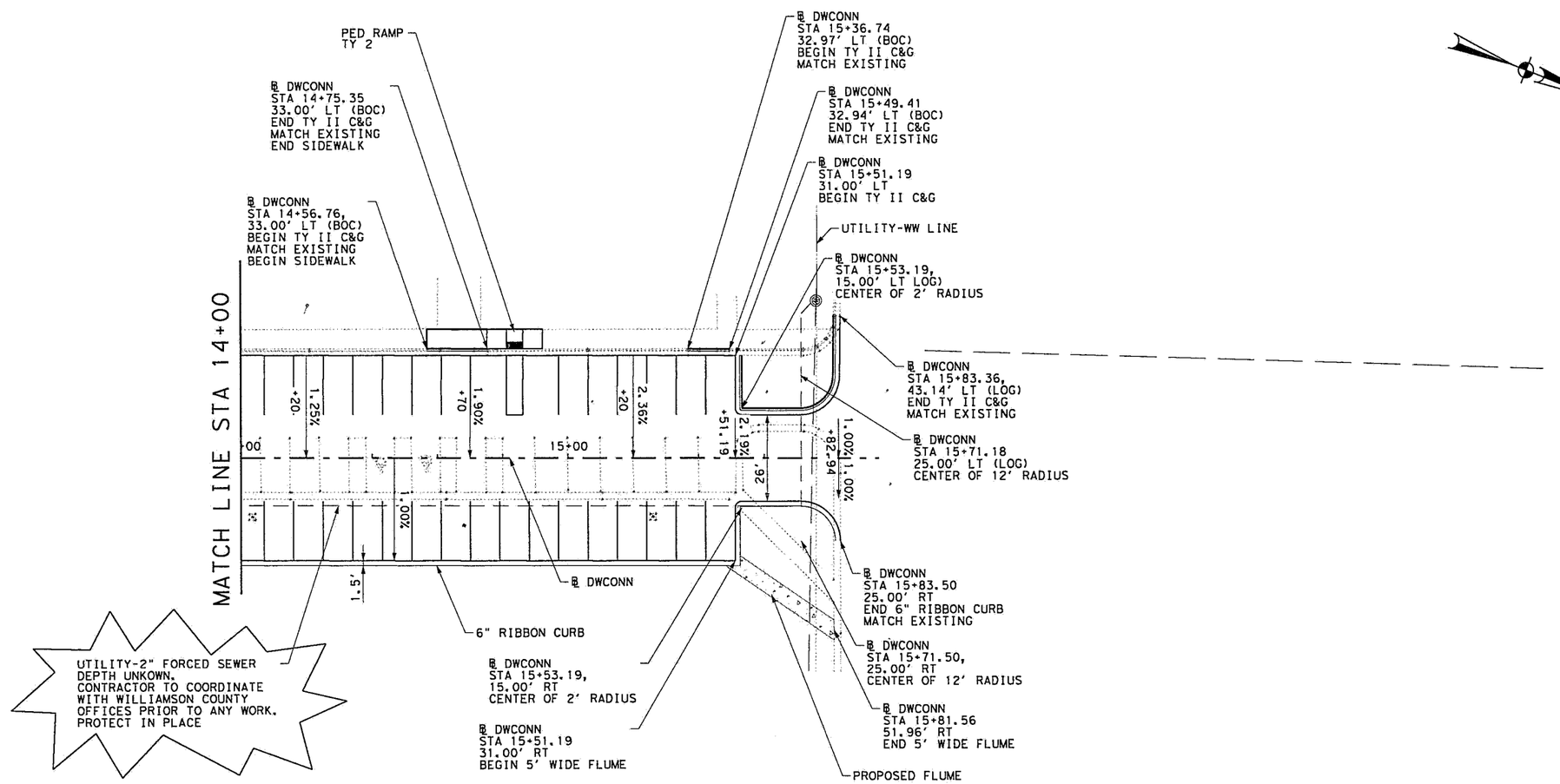

20 0 20 40
SCALE: 1" = 40' HORIZONTAL
1" = 4' VERTICAL

LEGEND

- DIRECTION ARROWS
- RIGHT OF WAY (ROW)

NOTES:

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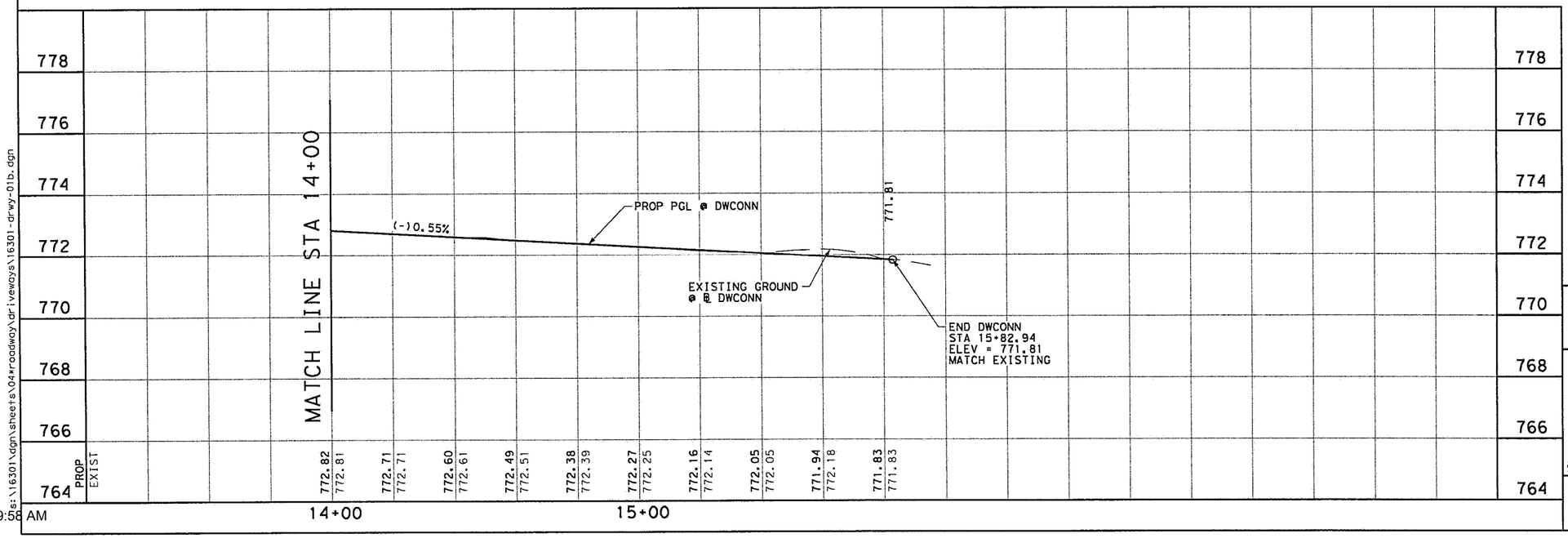

STATE OF TEXAS
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BRIDGEFARMER & ASSOCIATES, INC.
CONSULTING ENGINEERS
TBPE REGISTRATION NO. 264

GEORGETOWN INNER LOOP @ CENTRAL MAINTENANCE FACILITY

DRIVEWAY LAYOUT DWCONN

SCALE: 1" = 40' HORIZONTAL
1" = 4' VERTICAL

SHEET 2 OF 4

DESIGN	GRAPHICS	CHECK	CHECK	SHEET NO.
KA	AKH	CWM	WD	9463

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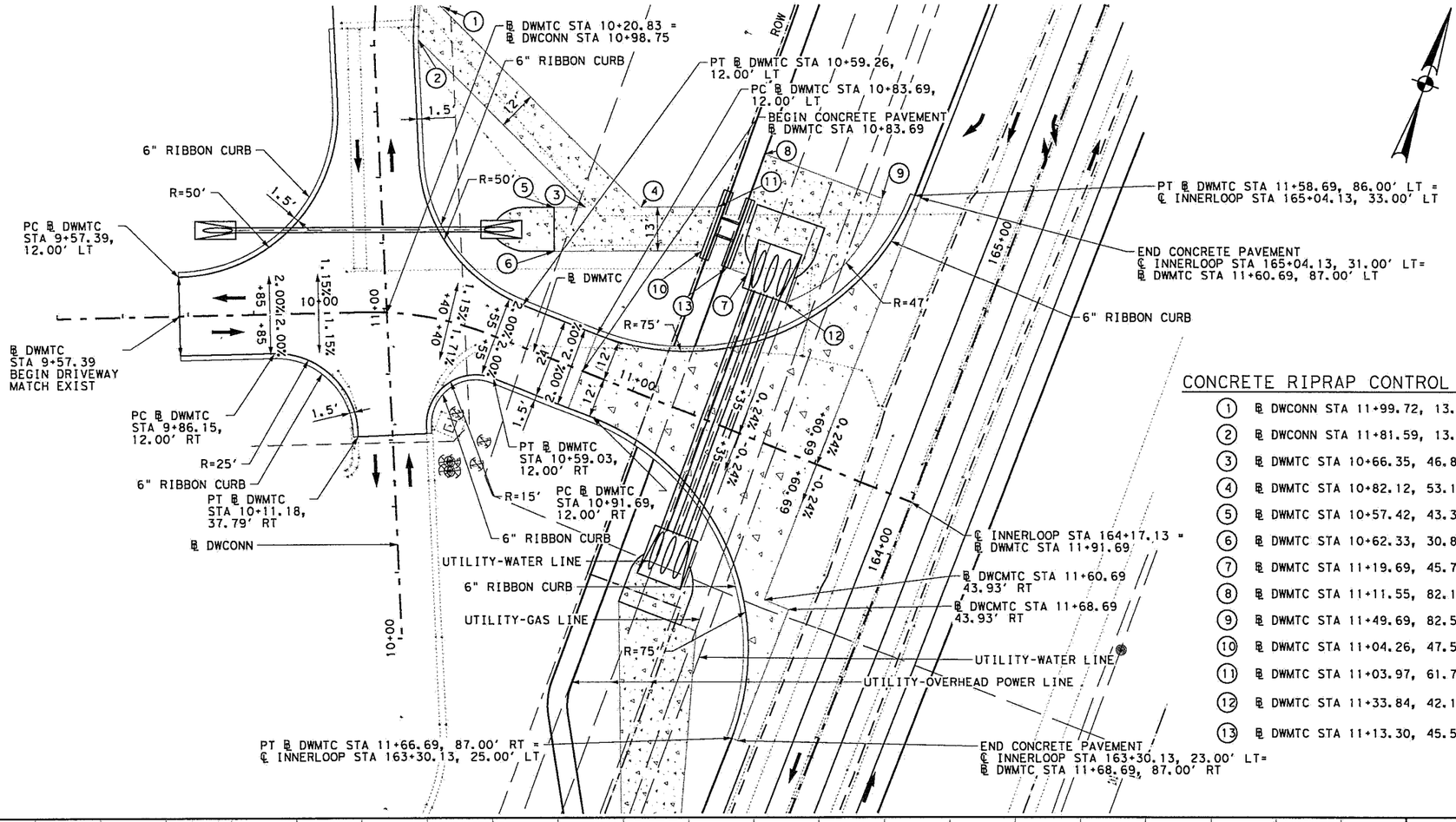

20 0 20 40
SCALE: 1" = 40' HORIZONTAL
1" = 4' VERTICAL

LEGEND

- DIRECTION ARROWS
- RIGHT OF WAY (ROW)
- CONCRETE PAVEMENT
- CONCRETE RIPRAP

CONCRETE RIPRAP CONTROL POINTS

1. ℄ DWCONN STA 11+99.72, 13.50' RT
2. ℄ DWCONN STA 11+81.59, 13.50' RT
3. ℄ DWMTC STA 10+66.35, 46.84' LT
4. ℄ DWMTC STA 10+82.12, 53.10' LT
5. ℄ DWMTC STA 10+57.42, 43.30' LT
6. ℄ DWMTC STA 10+62.33, 30.89' LT
7. ℄ DWMTC STA 11+19.69, 45.79' LT
8. ℄ DWMTC STA 11+11.55, 82.11' LT
9. ℄ DWMTC STA 11+49.69, 82.56' LT
10. ℄ DWMTC STA 11+04.26, 47.53' LT
11. ℄ DWMTC STA 11+03.97, 61.77' LT
12. ℄ DWMTC STA 11+33.84, 42.11' LT
13. ℄ DWMTC STA 11+13.30, 45.55' LT

NOTES:

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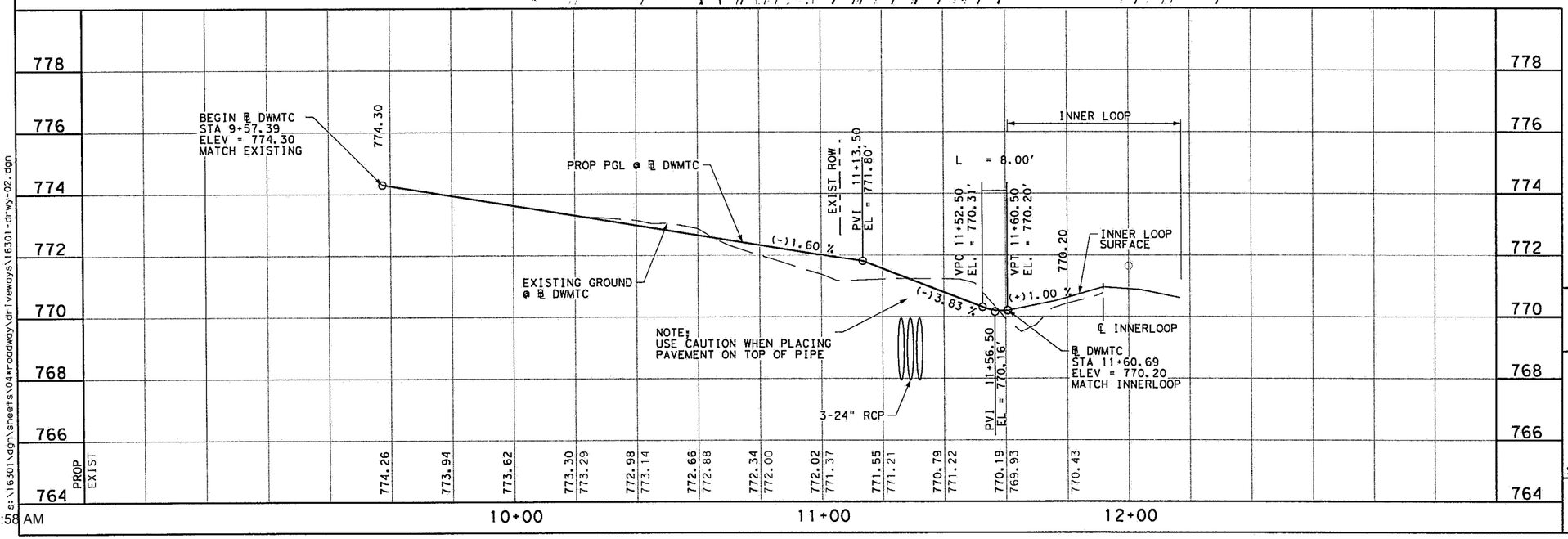
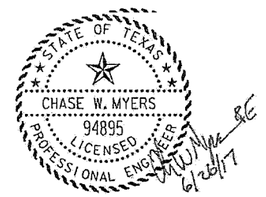
4. REFER TO "DRAINAGE" SHEETS FOR CULVERT AND DRAINAGE INFORMATION.
5. REFER TO "SIDEWALK P&P" SHEETS FOR SIDEWALK DESIGN INFORMATION.





BRIDGEFARMER & ASSOCIATES, INC.
CONSULTING ENGINEERS
TBPE REGISTRATION NO. 264

GEORGETOWN INNER LOOP @ CENTRAL MAINTENANCE FACILITY

DRIVEWAY LAYOUT DWMTC

1" = 40' HORIZONTAL
SCALE: 1" = 4' VERTICAL

SHEET 3 OF 4

DESIGN	GRAPHICS	CHECK	CHECK	SHEET NO.
KA	AKH	CWM	WD	95464

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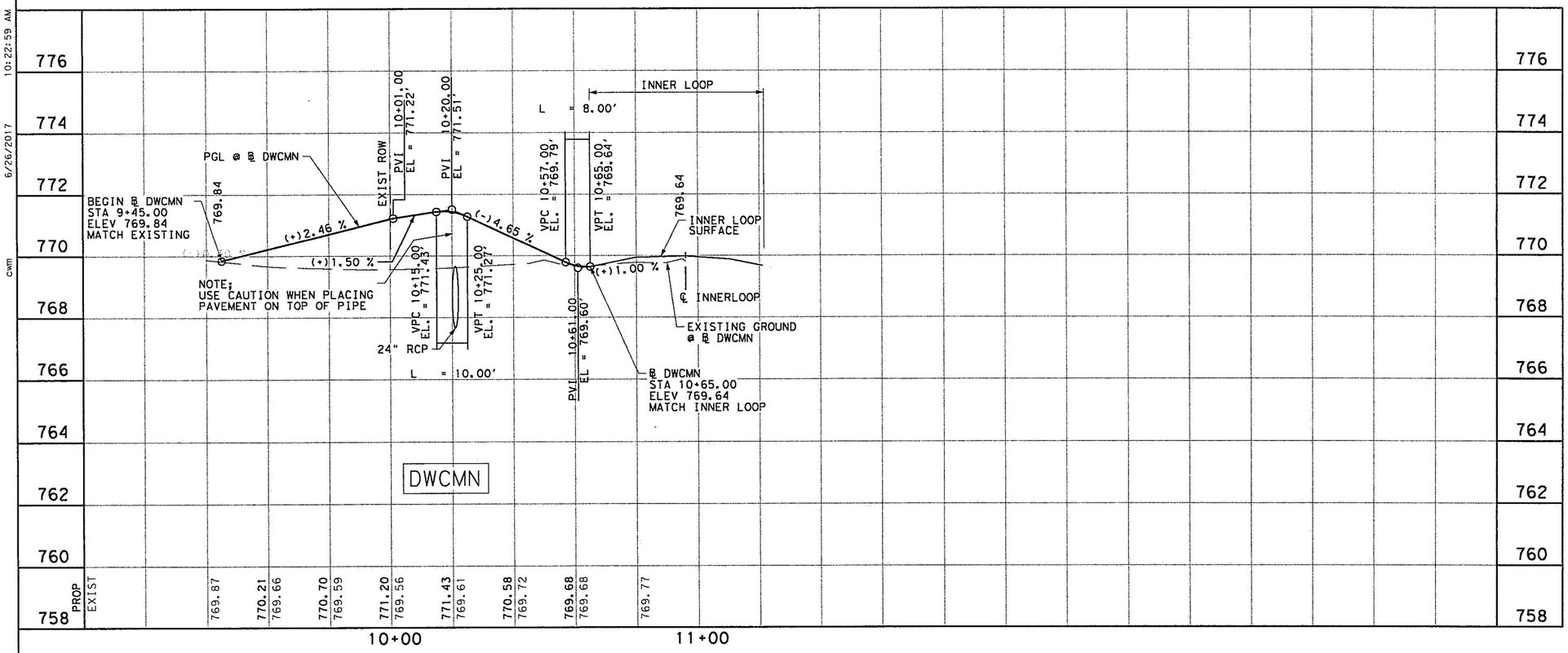

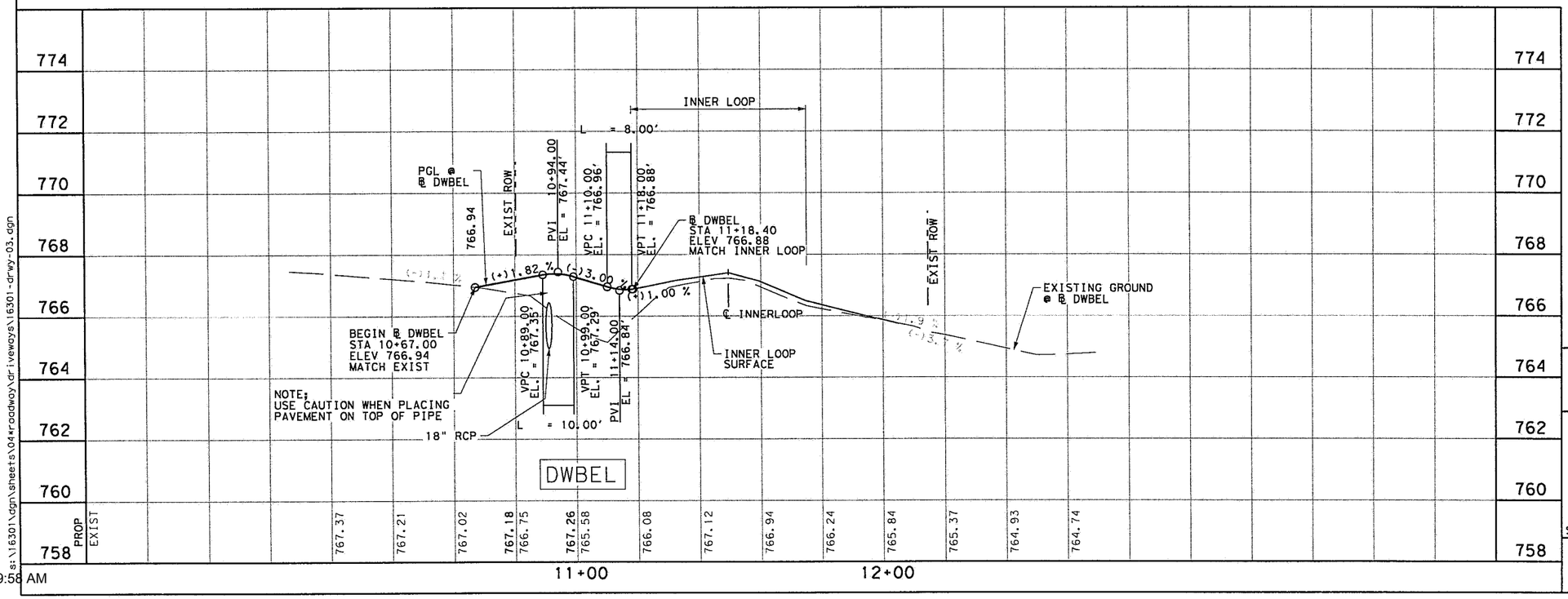

20 0 20 40
SCALE: 1" = 40' HORIZONTAL
1" = 4' VERTICAL

NOTE:
SEE ROADWAY P&P
FOR DRIVEWAY PLAN

STATE OF TEXAS
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TBPE REGISTRATION NO. 264

GEORGETOWN INNER LOOP @
CENTRAL MAINTENANCE FACILITY

DRIVEWAY PROFILES
DWCMN & DWBEL

1" = 40' HORIZONTAL
SCALE: 1" = 4' VERTICAL

SHEET 4 OF 4

DESIGN	GRAPHICS	CHECK	CHECK	SHEET NO.
KA	AKH	CWM	WD	96

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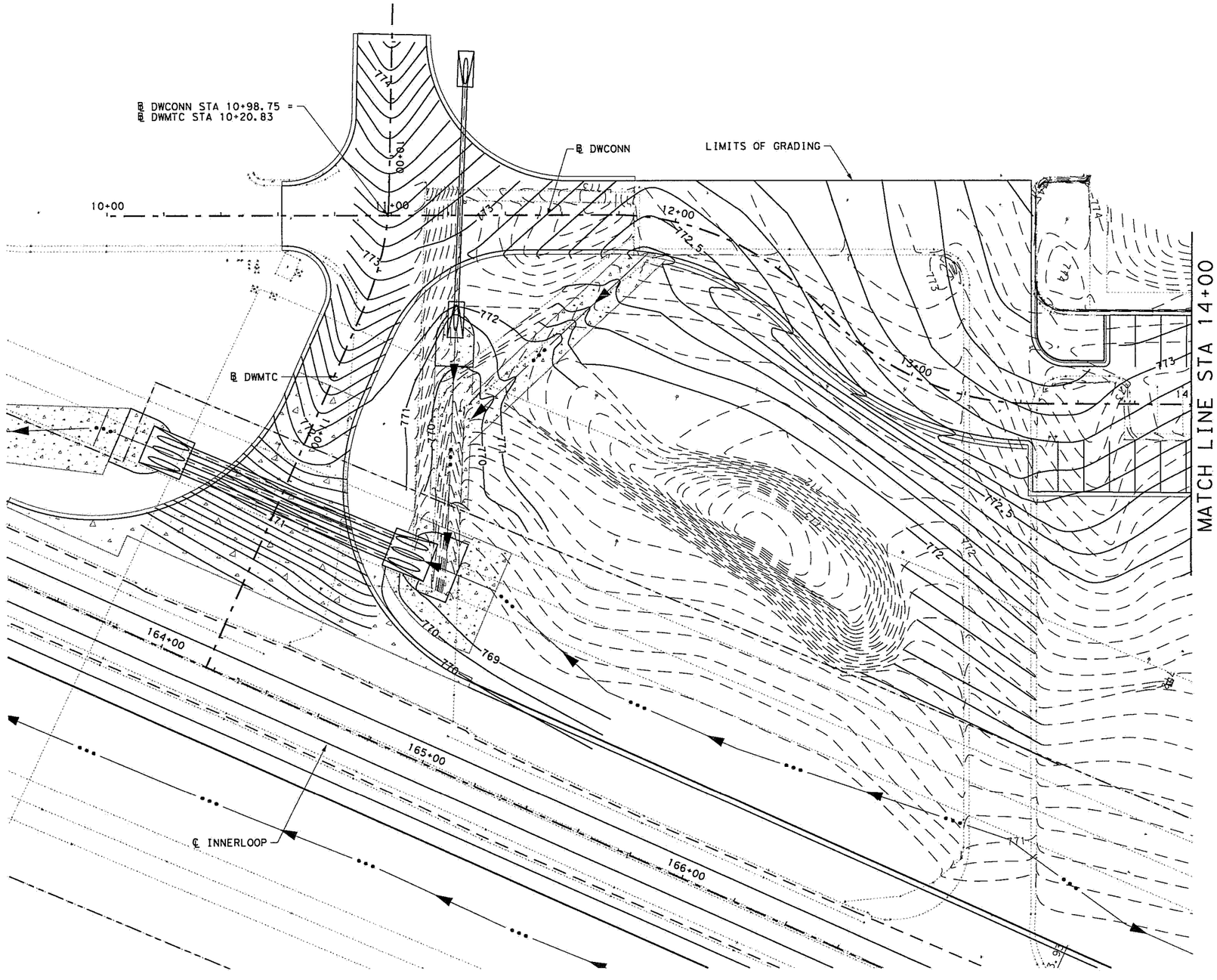

20 0 20 40
SCALE: 1" = 40'

LEGEND

430 EXISTING CONTOUR

430 PROPOSED CONTOUR

NOTES:

1) REFER TO ROADWAY AND DRAINAGE P&P SHEETS FOR ADDITIONAL INFORMATION.
2) ALL DISTURBED AREAS SHALL RECIEVE 4" TOPSOIL AND SEED

STATE OF TEXAS
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GEORGETOWN INNER LOOP @ CENTRAL MAINTENANCE FACILITY

DRIVEWAY GRADING

SCALE: 1" = 40' SHEET 1 OF 2

DESIGN	GRAPHICS	CHECK	CHECK	SHEET NO.
KA	AKH	CWM	WD	97

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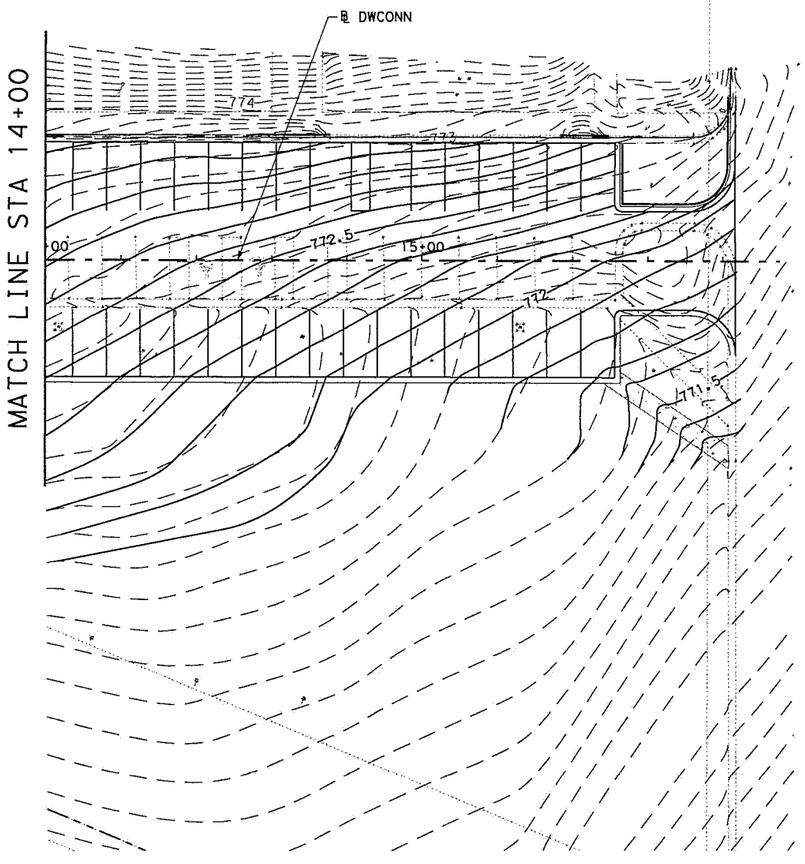

20 0 20 40
SCALE: 1" = 40'

LEGEND

— — 430— — EXISTING CONTOUR

——— 430——— PROPOSED CONTOUR

NOTES:

1) REFER TO ROADWAY AND DRAINAGE P&P SHEETS FOR ADDITIONAL INFORMATION.
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GEORGETOWN INNER LOOP @ CENTRAL MAINTENANCE FACILITY

DRIVEWAY GRADING

SCALE: 1" = 40' SHEET 2 OF 2

DESIGN	GRAPHICS	CHECK	CHECK	SHEET NO.
KA	AKH	CWM	WD	28

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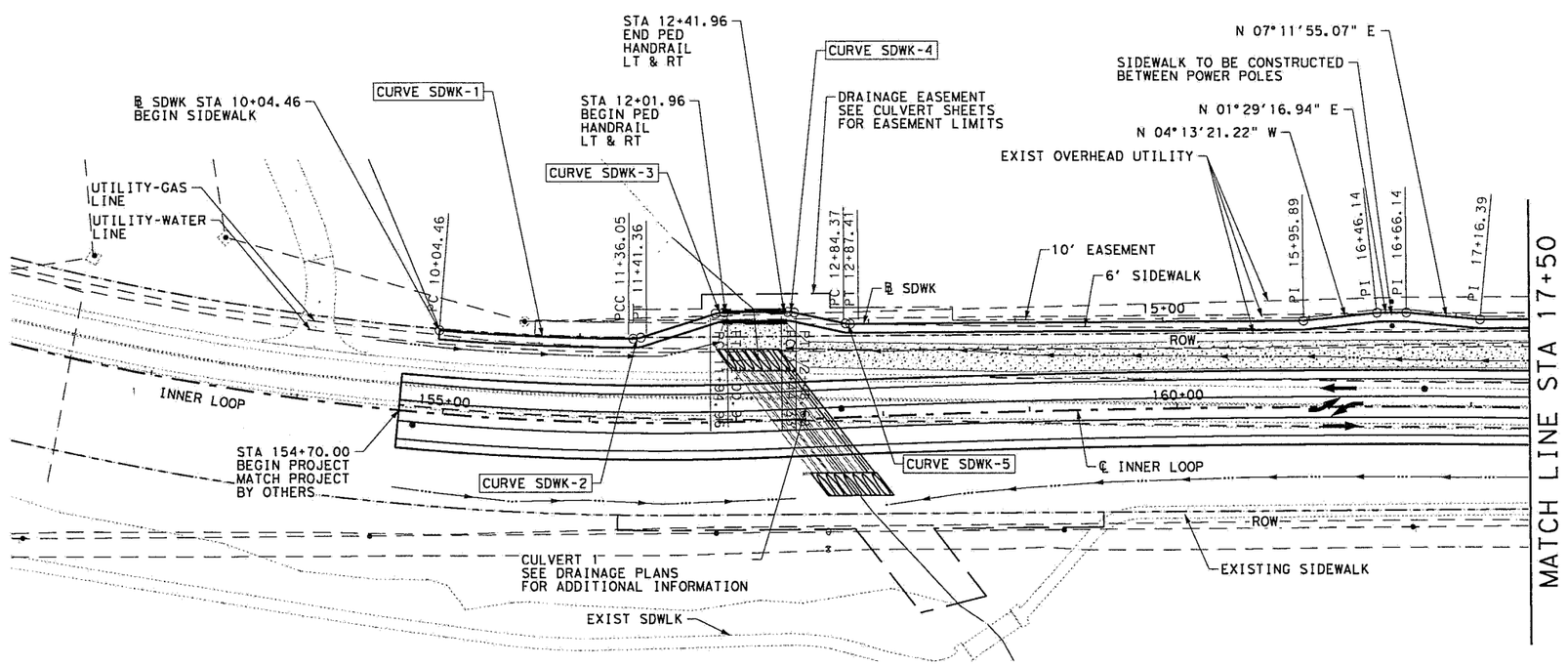

50 0 50 100
SCALE: 1" = 100' HORIZONTAL
1" = 10' VERTICAL

LEGEND

- DIRECTION ARROWS
- RIGHT OF WAY (ROW)
- CONCRETE

NOTES:

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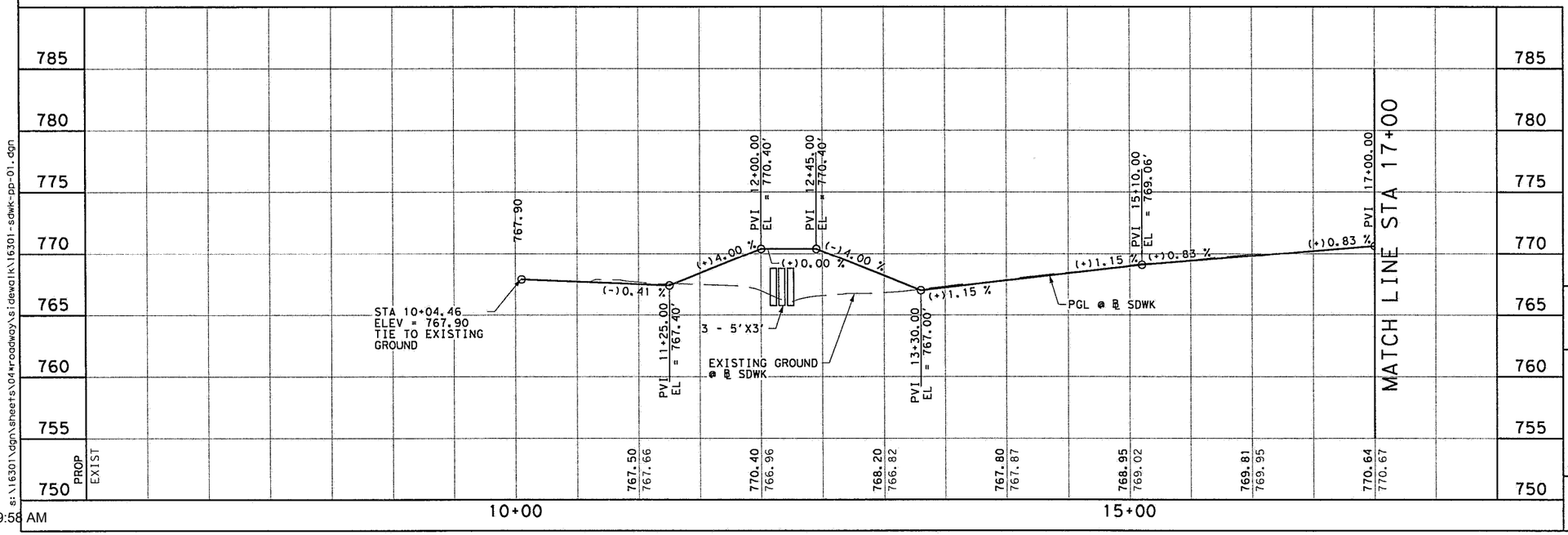
5. REFER TO "DRAINAGE" SHEETS FOR CULVERT AND DRAINAGE INFORMATION.
6. REFER TO "SIDEWALK P&P" SHEETS FOR SIDEWALK DESIGN INFORMATION.

HORIZ CURVE DATA

CURVE SDWK-1		CURVE SDWK-2		CURVE SDWK-3		CURVE SDWK-4		CURVE SDWK-5	
P.I. STA	10+70.28	P.I. STA	11+38.73	P.I. STA	11+97.96	P.I. STA	12+46.52	P.I. STA	12+85.90
DELTA	04°12'21.17" (LT)	DELTA	17°51'59.63" (LT)	DELTA	17°02'45.69" (RT)	DELTA	12°28'15.08" (RT)	DELTA	12°28'38.55" (LT)
DEGREE	03°11'45.52"	DEGREE	337°02'02.22"	DEGREE	286°28'44.03"	DEGREE	286°28'44.03"	DEGREE	409°15'20.04"
TANGENT	65.83	TANGENT	2.67	TANGENT	3.00	TANGENT	2.19	TANGENT	1.53
LENGTH	131.60	LENGTH	5.30	LENGTH	5.95	LENGTH	4.35	LENGTH	3.05
RADIUS	1,792.75	RADIUS	17.00	RADIUS	20.00	RADIUS	20.00	RADIUS	14.00
PC	10+04.46	PC	11+36.05	PC	11+94.96	PC	12+44.33	PC	12+84.37
PT	11+36.05	PT	11+41.36	PT	12+00.91	PT	12+48.68	PT	12+87.41
BACK	N 06°31'15.52" E	BACK	N 02°18'54.35" E	BACK	N 15°33'05.29" W	BACK	N 01°29'40.40" E	BACK	N 13°57'55.48" E
AHEAD	N 02°18'54.35" E	AHEAD	N 15°33'05.29" W	AHEAD	N 01°29'40.40" E	AHEAD	N 13°57'55.48" E	AHEAD	N 01°29'16.94" E



CHASE W. MYERS
94895
LICENSED
PROFESSIONAL ENGINEER
STATE OF TEXAS
6/26/17

BRIDGEFARMER & ASSOCIATES, INC.
CONSULTING ENGINEERS
TBPE REGISTRATION NO. 264

GEORGETOWN INNER LOOP @ CENTRAL MAINTENANCE FACILITY

SIDEWALK PLAN & PROFILE

1" = 100' HORIZONTAL
SCALE: 1" = 10' VERTICAL
SHEET 1 OF 3

DESIGN	GRAPHICS	CHECK	CHECK	SHEET NO.
KA	AKH	CWM	WD	p.99

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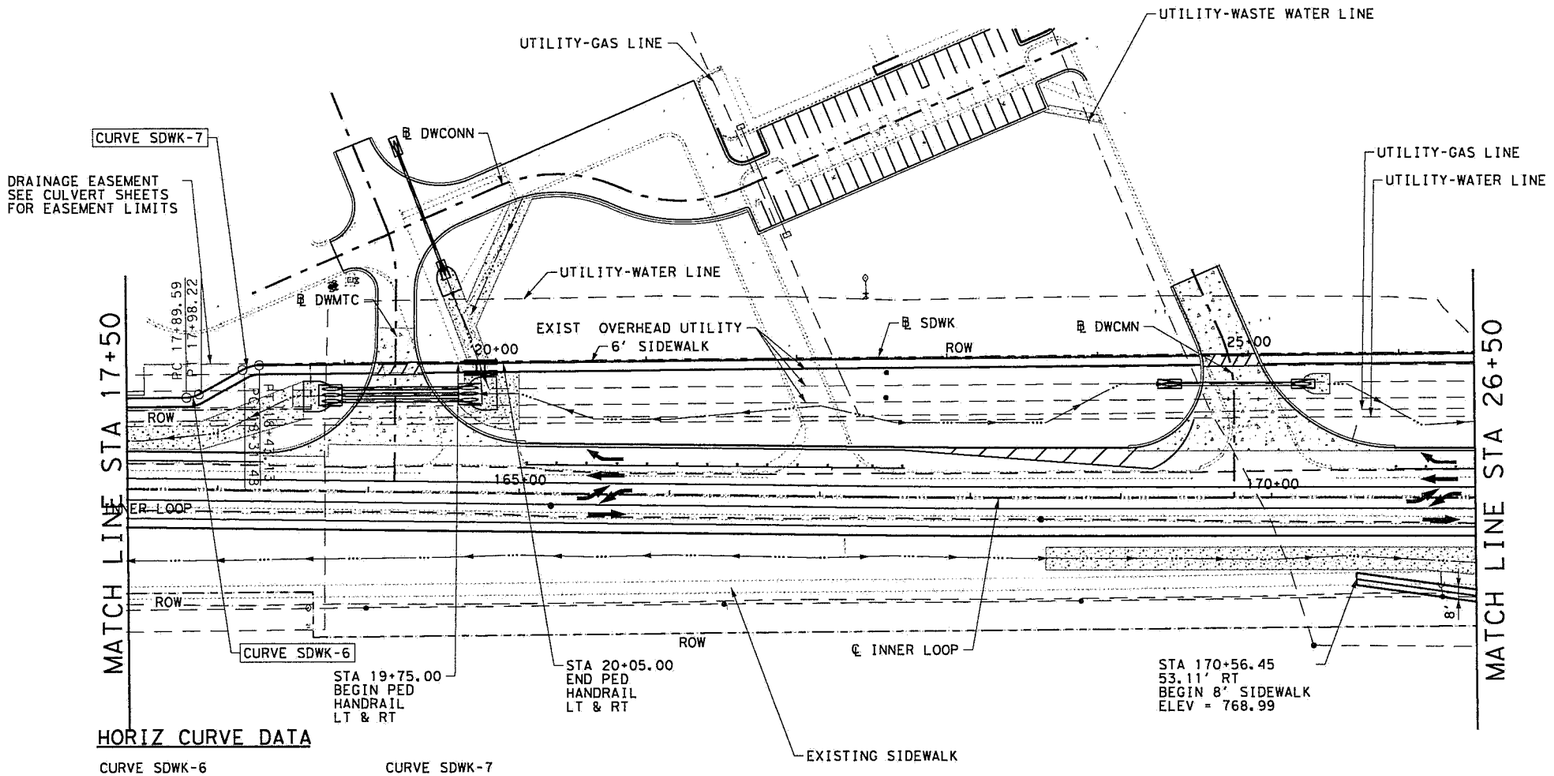

50 0 50 100
SCALE: 1" = 100' HORIZONTAL
1" = 10' VERTICAL

LEGEND

- DIRECTION ARROWS
- RIGHT OF WAY (ROW)
- CONCRETE

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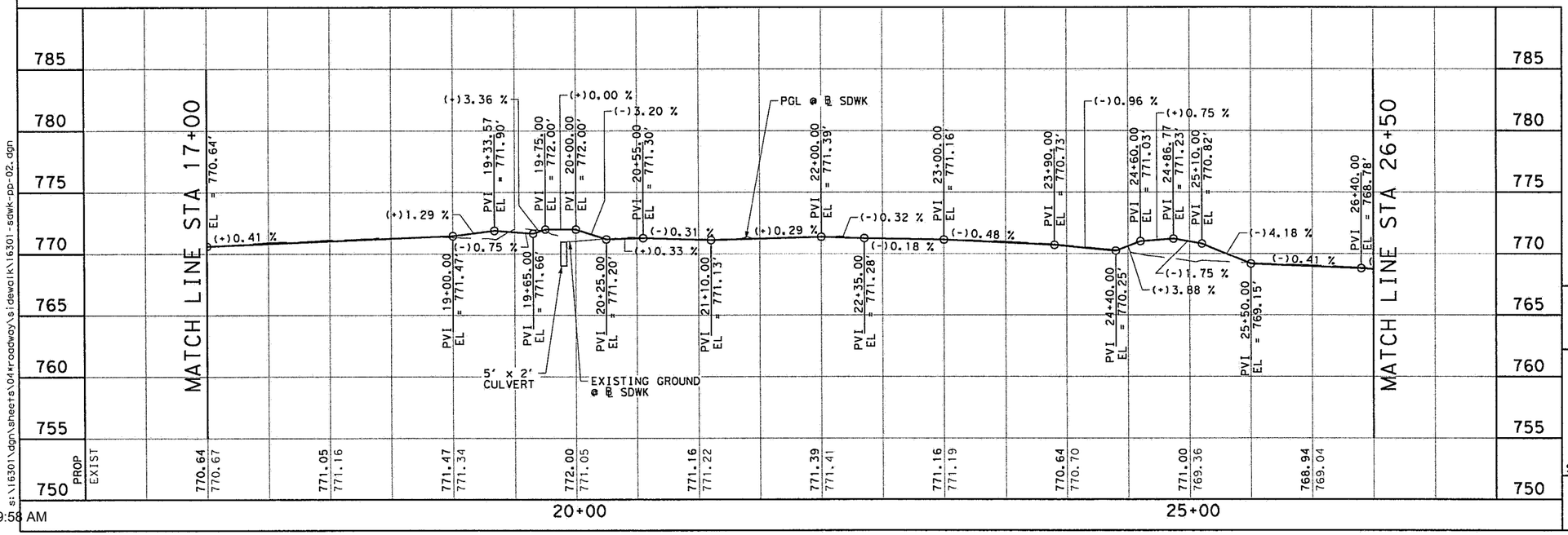
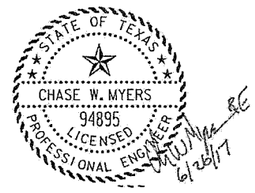
HORIZ CURVE DATA

CURVE SDWK-6		CURVE SDWK-7	
P.I. STA	= 17+94.00	P.I. STA	= 18+37.43
DELTA	= 29°05'30.20" (LT)	DELTA	= 28°59'57.38" (RT)
DEGREE	= 337°02'02.39"	DEGREE	= 249°06'43.51"
TANGENT	= 4.41	TANGENT	= 5.95
LENGTH	= 8.63	LENGTH	= 11.64
RADIUS	= 17.00	RADIUS	= 23.00
PC	= 17+89.59	PC	= 18+31.48
PT	= 17+98.22	PT	= 18+43.13
BACK	= N 01°29'16.94" E	BACK	= N 27°36'13.27" W
AHEAD	= N 27°36'13.27" W	AHEAD	= N 01°23'44.12" E





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CONSULTING ENGINEERS
TBPE REGISTRATION NO. 264

GEORGETOWN INNER LOOP @ CENTRAL MAINTENANCE FACILITY

SIDEWALK PLAN & PROFILE

SCALE: 1" = 100' HORIZONTAL
1" = 10' VERTICAL

SHEET 2 OF 3

DESIGN	GRAPHICS	CHECK	CHECK	SHEET NO.
KA	AKH	CWM	WD	10469

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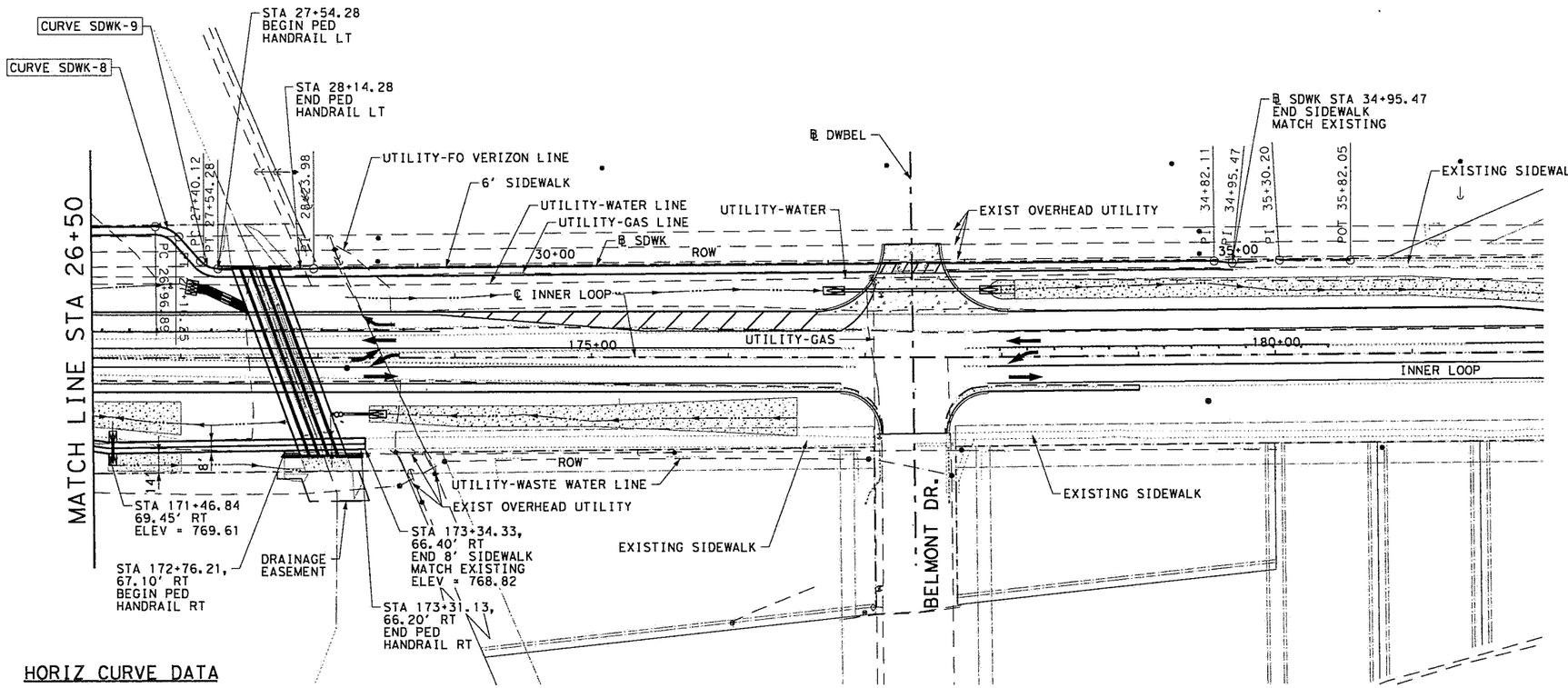

50 0 50 100
SCALE: 1" = 100' HORIZONTAL
1" = 10' VERTICAL

LEGEND

- DIRECTION ARROWS
- RIGHT OF WAY (ROW)
- CONCRETE

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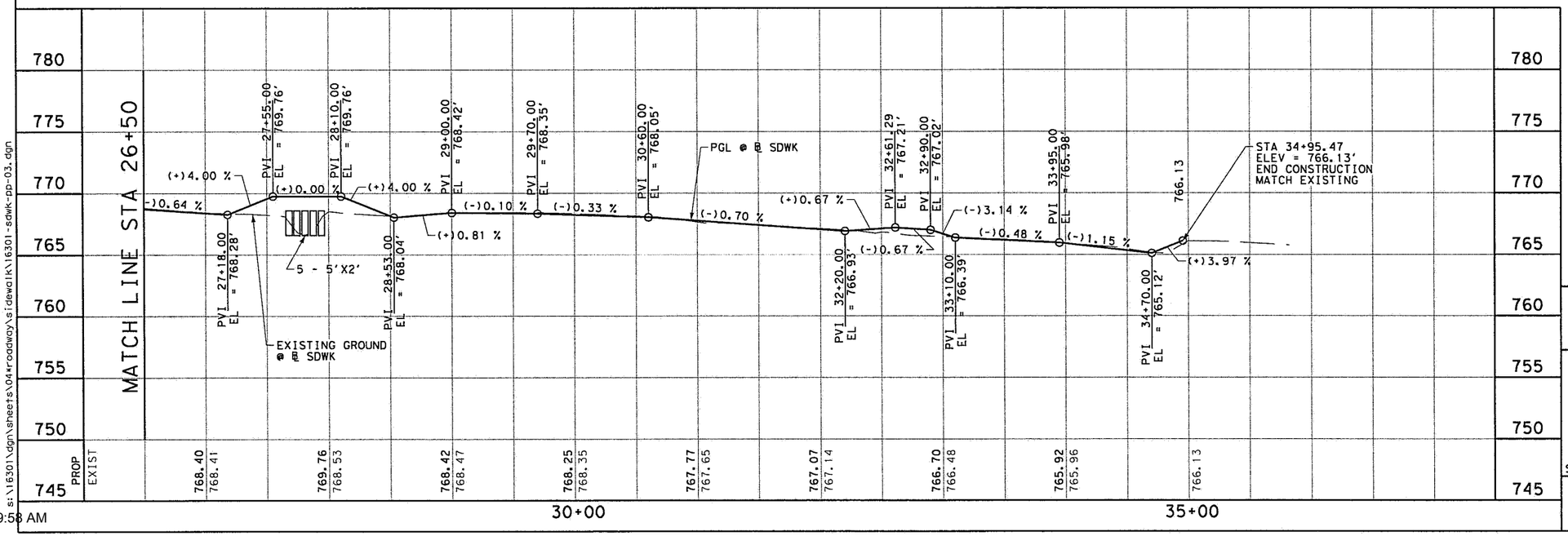
6. REFER TO "SIDEWALK P&P" SHEETS FOR SIDEWALK DESIGN INFORMATION.

HORIZ CURVE DATA

CURVE SDWK-8		CURVE SDWK-9	
PI STA	= 27+07.18	PI STA	= 27+47.64
DELTA	= 48°13'45.91" (RT)	DELTA	= 47°42'56.35" (LT)
DEGREE	= 249°06'43.51"	DEGREE	= 337°02'02.39"
TANGENT	= 10.30	TANGENT	= 7.52
LENGTH	= 19.36	LENGTH	= 14.16
RADIUS	= 23.00	RADIUS	= 17.00
PC	= 26+96.89	PC	= 27+40.12
PT	= 27+16.25	PT	= 27+54.28
BACK	= N 01°23'44.12" E	BACK	= N 49°37'30.03" E
AHEAD	= N 49°37'30.03" E	AHEAD	= N 01°54'33.68" E



STATE OF TEXAS
CHASE W. MYERS
94895
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CONSULTING ENGINEERS
TBPE REGISTRATION NO. 264

GEORGETOWN INNER LOOP @ CENTRAL MAINTENANCE FACILITY

SIDEWALK PLAN & PROFILE

SCALE: 1" = 100' HORIZONTAL
1" = 10' VERTICAL

SHEET 3 OF 3

DESIGN	GRAPHICS	CHECK	CHECK	SHEET NO.
KA	AKH	CWM	WD	10470

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7/18/2017 9:58 AM

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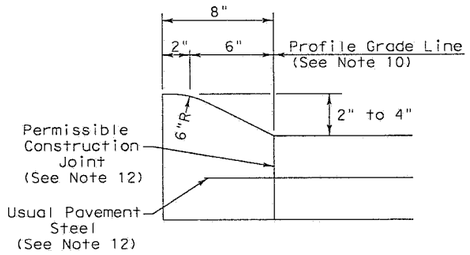
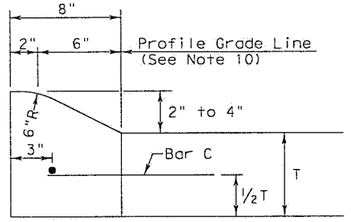
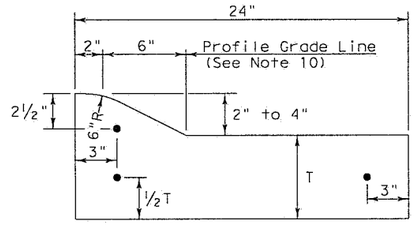


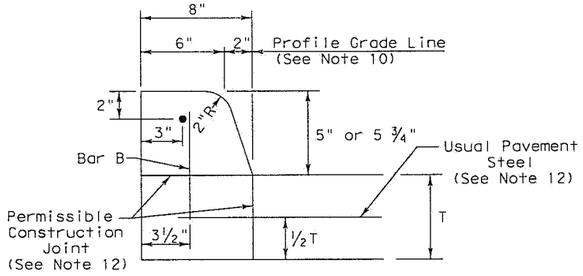
TYPE I CURB (MONOLITHIC)
2" - 4" HEIGHT



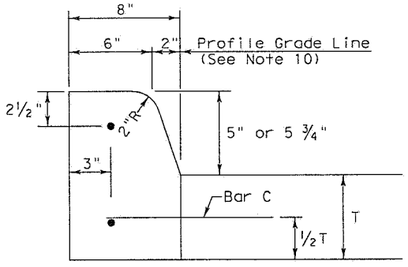
TYPE I CURB
2" - 4" HEIGHT



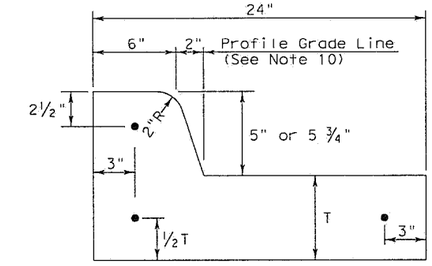
TYPE I CURB AND GUTTER
2" - 4" HEIGHT



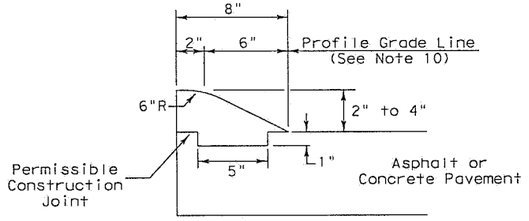
TYPE II CURB (MONOLITHIC)
5" - 5 ¾" HEIGHT



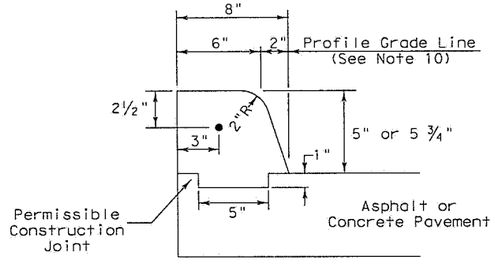
TYPE II CURB
5" - 5 ¾" HEIGHT



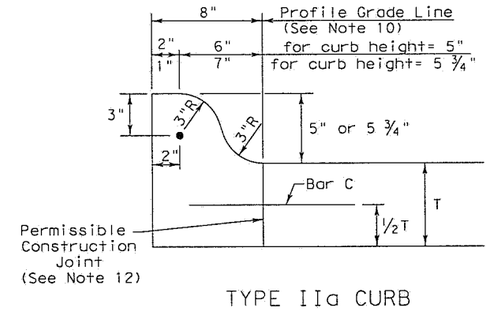
TYPE II CURB AND GUTTER
5" - 5 ¾" HEIGHT



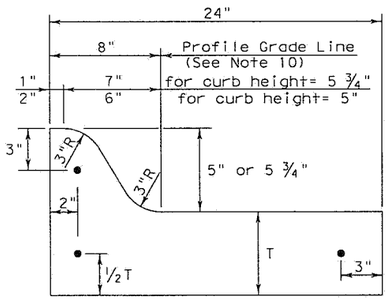
TYPE III CURB (KEYED)
2" - 4" HEIGHT



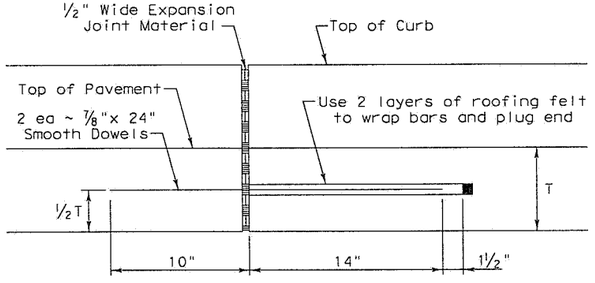
TYPE IV CURB (KEYED)
5" - 5 ¾" HEIGHT



TYPE IIa CURB
5" - 5 ¾" HEIGHT

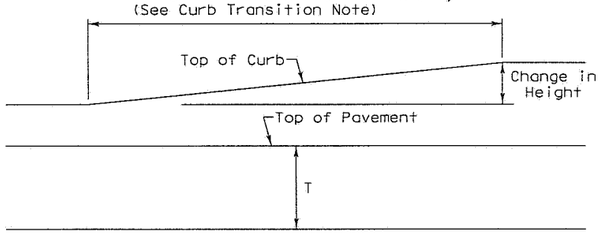


TYPE IIa CURB AND GUTTER
5" - 5 ¾" HEIGHT



EXPANSION JOINT DETAIL

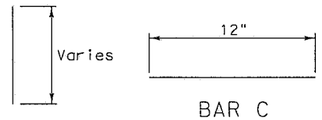
Curb Transition Note:
Field conditions may require a longer or shorter transition, and shall be shown elsewhere in the plans, or as directed by the Engineer.



CURB TRANSITION
Note: To be paid for as Highest Curb

General Notes

1. All materials and construction shall be in accordance with Item 529, "Concrete Curb, Gutter, and Combined Curb and Gutter."
2. Concrete shall be Class A.
3. When reinforcing bars are used, they shall be No.4 unless otherwise shown. The use of synthetic fiber in lieu of steel reinforcing is acceptable, provided the fiber producer is on the Department Producer List (MPL), maintained by TxDOT, Construction Division.
4. Round exposed sharp edges with a rounding tool, to a minimum radius of ¼ inch.
5. All existing curbs and driveways to be removed shall be sawed or removed at existing joints.
6. Where concrete curb is placed on existing concrete pavement, the pavement shall be drilled and the reinforcing bars grouted in place.
7. Expansion and contraction joints shall be constructed to match pavement joints in all curbs and curb and gutter adjacent to jointed concrete pavement. Where placement of curb or curb and gutter is not adjacent to concrete pavement, expansion joints shall be provided at structures, curb returns at streets, and at locations directed by The Engineer.
8. Vertical and horizontal dowel bars and transverse reinforcing bars shall be placed at four feet C-C.
9. Dimension 'T' shown is the thickness of concrete pavement. When curb is installed adjacent to flexible pavement dimension 'T' is 8" maximum.
10. Usual profile grade line. Refer to typical sections and plan-profile sheets for exact locations.
11. One-half inch expansion joint material shall be provided where curb or curb and gutter is adjacent to sidewalk or riprap.
12. When vertical permissible construction joints are used, resulting in a longitudinal construction joint in the pavement, the longitudinal pavement steel shall be placed in accordance with pavement details shown elsewhere in the plans for longitudinal construction joints. Reinforcing steel for curb section shall then conform to that required for concrete curb.



BAR B BAR C

Texas Department of Transportation — Design Division Standard

CONCRETE CURB AND CURB AND GUTTER

CCCG-12

FILE: cccg12.dgn	DN: TxDOT	CK: AM	DW: VP	CK:
©TxDOT: 1995	CONT	SECT	JOB	HIGHWAY
REVISIONS UPDATED 2012 - VP	DIST	COUNTY		SHEET NO. 271

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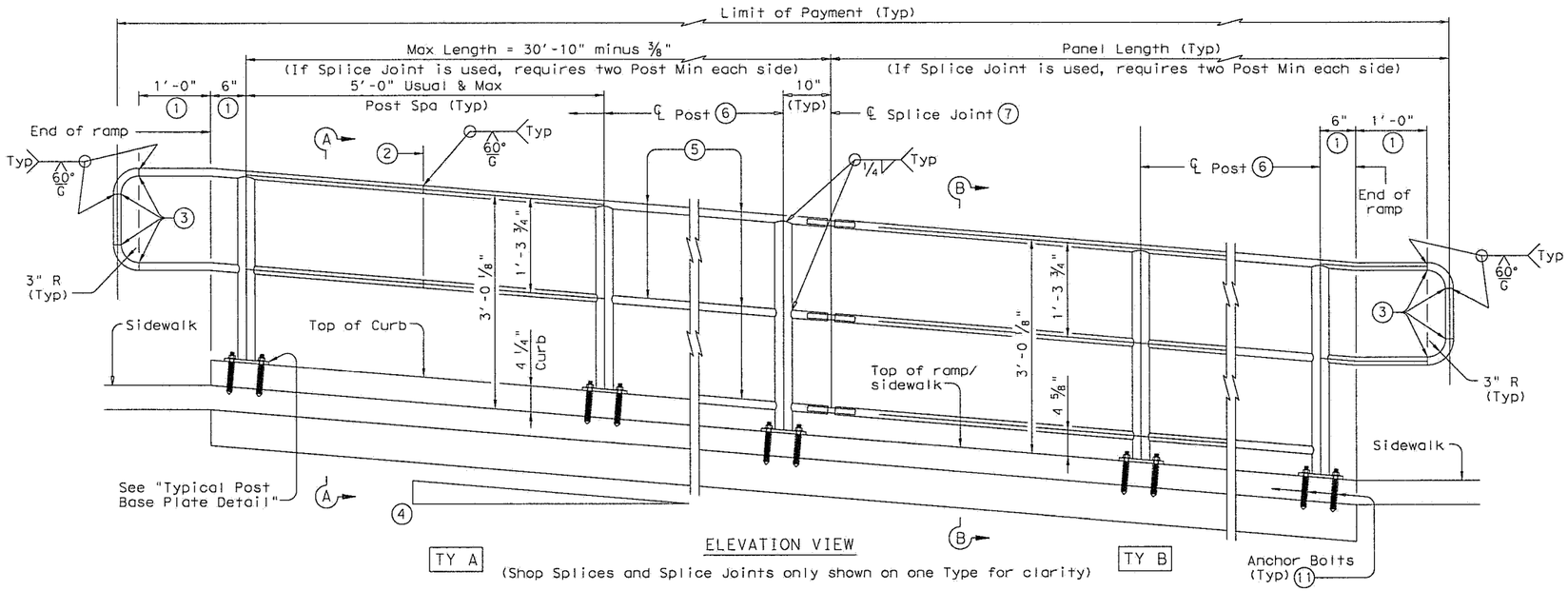
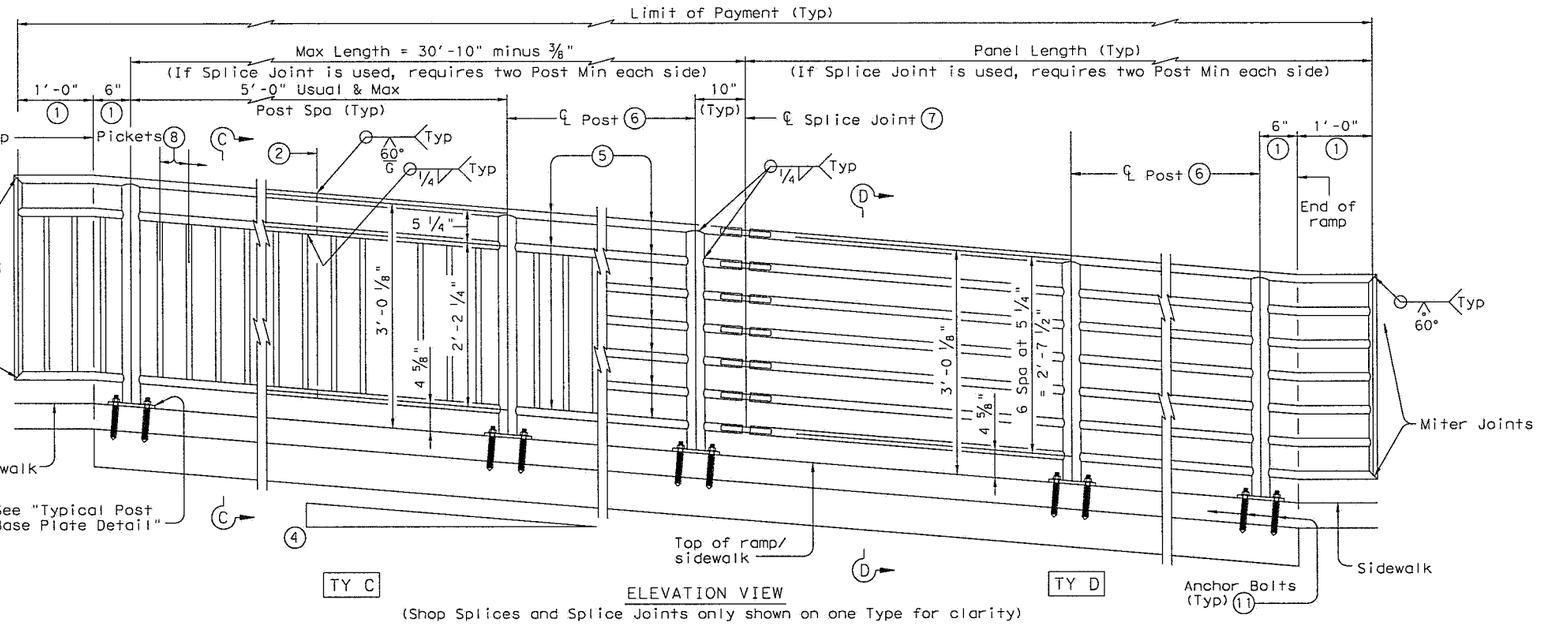
cwm

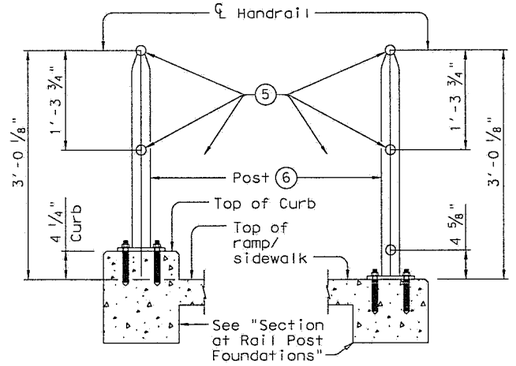


ELEVATION VIEW
(Shop Splices and Splice Joints only shown on one Type for clarity)



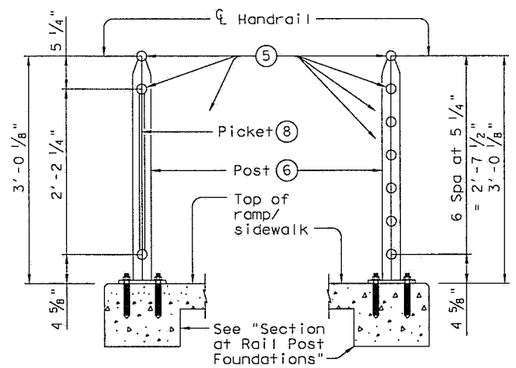
ELEVATION VIEW
(Shop Splices and Splice Joints only shown on one Type for clarity)

RECOMMENDED USAGE ⑨⑩	
Dropoff Height/ Condition	Recommended Rail Options
< 30" dropoff	TY A, TY B, TY C, or TY D
≥ 30" dropoff, or along Bike Path	TY E or TY F



SECTION A-A
(Showing Handrail TY A)

SECTION B-B
(Showing Handrail TY B)



SECTION C-C
(Showing Handrail TY C)

SECTION D-D
(Showing Handrail TY D)

① Parallel to ground.

② One shop splice per panel is permitted with minimum 85 percent penetration. The weld may be square groove or single vee groove. Grind smooth.

③ Shop splice is permitted with minimum 85 percent penetration. The weld may be square groove or single vee groove. Grind smooth.

④ See Ramp Details located elsewhere in plans for ramp slope and dimensions. Maximum ramp slope will not exceed 8.3 percent. Level landing required for each 30" rise if grade exceeds 5 percent.

⑤ 1 ½" Dia. Standard Pipe (1.900" O.D., 0.145" wall thickness). Parallel to ramp / sidewalk. Provide holes as needed in 1 ½" Dia. pipe for galvanizing drainage and venting.

⑥ 2 ½" Dia. Standard Pipe (2.875" O.D., 0.203" wall thickness). See "Post Mount Detail" for crimping and trimming post to fit Dia. of top rail. Provide holes as needed in post for galvanizing drainage and venting. Plumb all posts.

⑦ See "Handrail Fabrication Details" for Splice Joints.

⑧ ℄ ⅝" Dia. Round Bar equal spacing at 4 ½" Max. Plumb all pickets.

⑨ When needed for accessibility (grade > 5 percent) or as needed for pedestrian safety.

⑩ Not to be used on bridges.

⑪ See "General Notes" for anchor bolt information.

SHEET 1 OF 3

Texas Department of Transportation | Design Division Standard

PEDESTRIAN HANDRAIL DETAILS

PRD-13

FILE: prd13.dgn	DN: TxDOT	CK: AM	DW: JTR	CK: CGL
©TxDOT Decmeber 2006	CONT	SECT	JOB	HIGHWAY
REVISIONS REVISED MAY, 2013 (VP)				
	DIST	COUNTY		SHEET NO. 472

7/18/2017 7:56 AM

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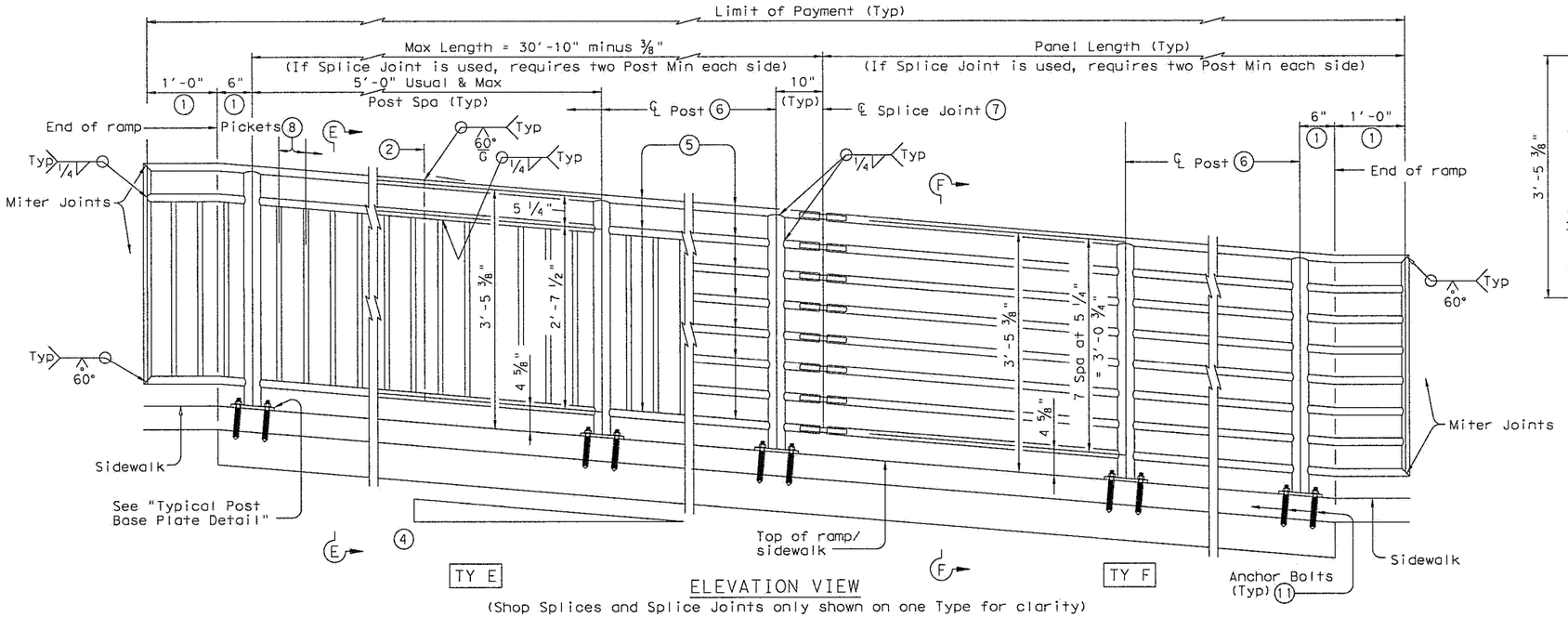
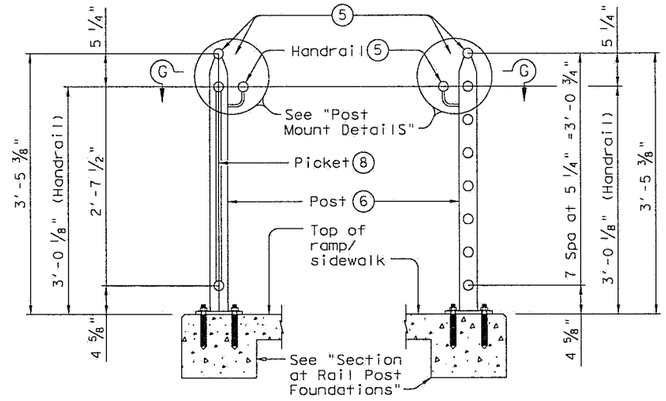
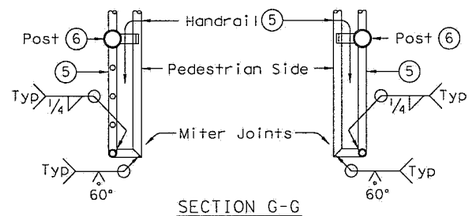


ELEVATION VIEW
(Shop Splices and Splice Joints only shown on one Type for clarity)

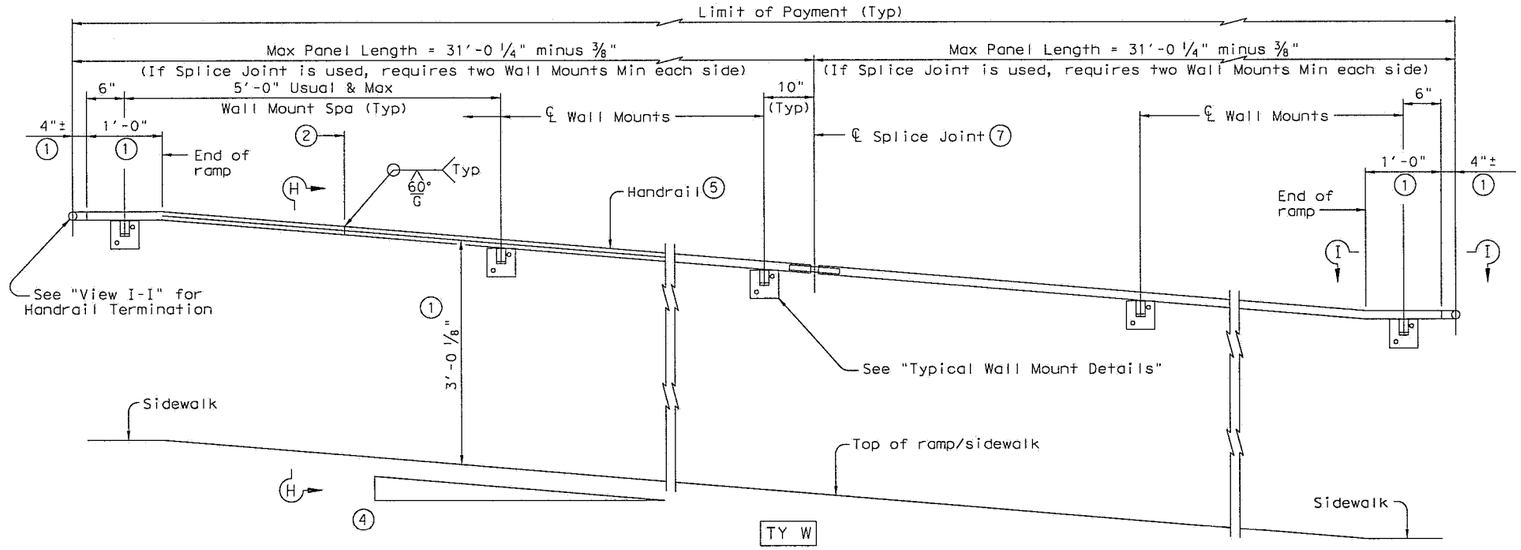


SECTION E-E
(Showing Handrail TY E)

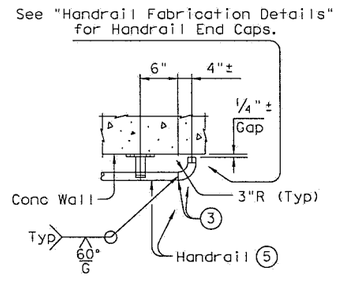
SECTION F-F
(Showing Handrail TY F)



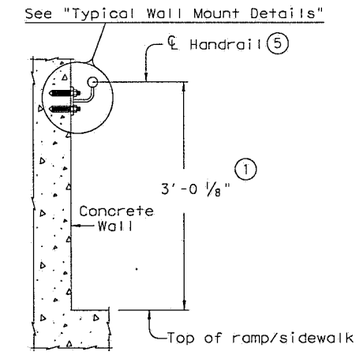
SECTION G-G
(Showing Handrail Termination)



ELEVATION VIEW



VIEW I-I
(Showing Handrail Termination)



SECTION H-H
(Showing Handrail TY W)

1. Parallel to ground.
2. One shop splice per panel is permitted with minimum 85 percent penetration. The weld may be square groove or single vee groove. Grind smooth.
3. Shop splice is permitted with minimum 85 percent penetration. The weld may be square groove or single vee groove. Grind smooth.
4. See Ramp Details located elsewhere in plans for ramp slope and dimensions. Maximum ramp slope will not exceed 8.3 percent. Level landing required for each 30" rise if grade exceeds 5 percent.
5. 1 ½" Dia. Standard Pipe (1.900" O.D., 0.145" wall thickness). Parallel to ramp / sidewalk. Provide holes as needed in 1 ½" Dia. pipe for galvanizing drainage and venting.
6. 2 ½" Dia. Standard Pipe (2.875" O.D., 0.203" wall thickness). See "Post Mount Detail" for crimping and trimming post to fit Dia. of top rail. Provide holes as needed in post for galvanizing drainage and venting. Plumb all posts.
7. See "Handrail Fabrication Details" for Splice Joints.
8. ℄ 5/8" Dia. Round Bar equal spacing at 4 ½" Max. Plumb all pickets.
11. See "General Notes" for anchor bolt information.

SHEET 2 OF 3

Texas Department of Transportation | Design Division Standard

PEDESTRIAN HANDRAIL DETAILS

PRD-13

FILE: prd13.dgn	DN: TxDOT	CK: AM	DW: JTR	CK: CGL
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REVISIONS REVISED MAY, 2013 (VP)	DIST	COUNTY		SHEET NO.

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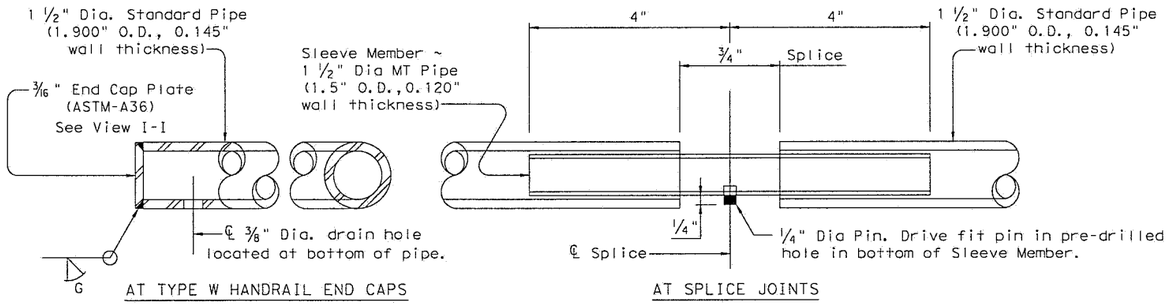
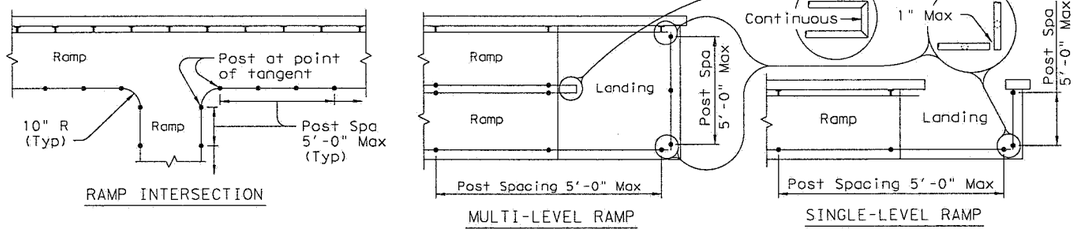
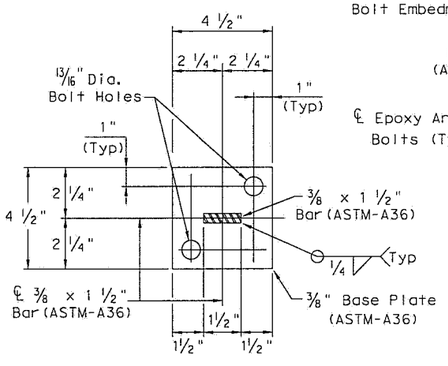
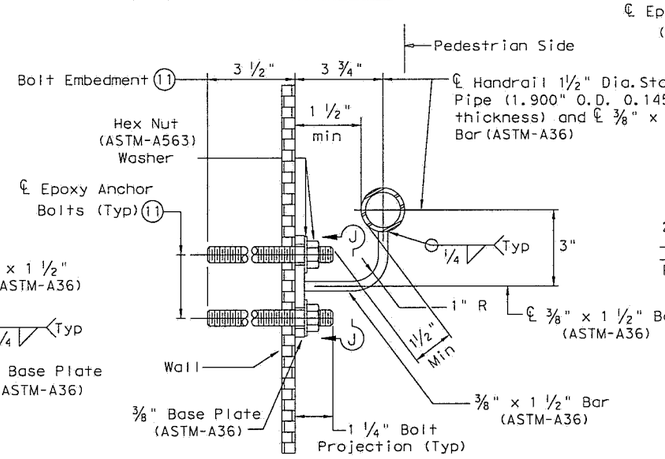


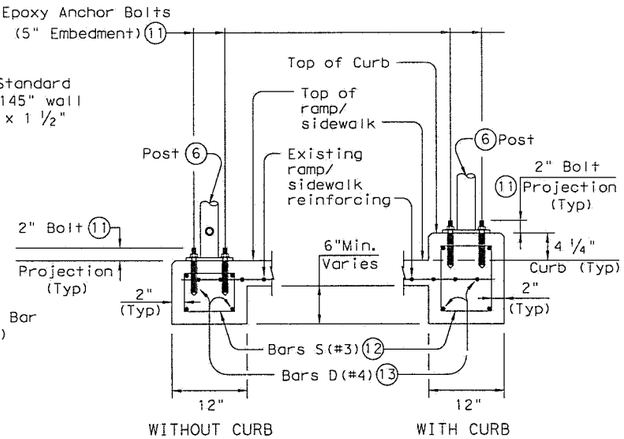
HANDRAIL FABRICATION DETAILS



PLAN SHOWING RAIL AT RAMP CONDITIONS







TYPICAL WALL MOUNT DETAILS

GENERAL NOTES

Designed according to ADAAG, Texas Accessibility Standards, Uniform Building Code, and AASHTO LRFD Specifications.

Handrail anchorage details shown on this standard may require modification for select structure types. See appropriate details elsewhere in plans for these modifications.

Pipe will conform to ASTM-A53 Grade B or A500 Grade B. Steel plates and steel bars will conform to ASTM-A36. Mechanical tubing (MT) will conform to ASTM A513 Grade 1015 or higher. Galvanize all steel components except reinforcing steel unless noted otherwise.

Concrete for foundations will be in accordance with Item 531 "Sidewalks". All reinforcing steel must be Grade 60. Bar laps, where required, will be as follows: Uncoated ~ #4 = 1'-5" Epoxy coated ~ #4 = 2'-1"

When the plans require painted steel, follow the requirements for painting galvanized steel in Item 446, "Cleaning and Painting Steel". Sleeve Members will receive galvanization and only get field painted after installation unless directed otherwise by Engineer.

Epoxy Anchor bolts for wall mount and post base plate will be ⅝" Dia. ASTM A36 threaded rods with one hex nut and one hardened steel washer at each bolt. ⅝" Dia. threaded rod embedment depth for wall mounts is 3 ½" and embedment depth for post base plate is 5".

Embed threaded rods into concrete with a Type III (Class C) epoxy meeting the requirements of DMS-6100, "Epoxies and Adhesives". Mix and dispense adhesive with the manufacturer's static mixing nozzle/dual cartridge system. Core drill holes (percussion drilling not permitted).

At the contractor's option the post base plate anchor bolts may be cast with the Ramp/Sidewalk (See Cast-in-Place Anchor Bolt Options).

Optional cast-in-place anchor bolts will be ⅝" Dia ASTM A307 Grade A bolts (or A36 threaded rods with one tack welded hex nut each) with one hex nut and one hardened steel washer at each bolt. Embedment depth of cast-in-place bolt will be 8" for post base plate.

Handrails and any wall or other surface adjacent to them will be free of any sharp or abrasive elements.

Submit shop drawings to the Engineer unless otherwise noted. For curved handrail applications, fabricate the handrail to the curve if radius is less than 600 ft. Shop drawings are required when rail is fabricated to the curve.

For all handrails, erection drawings will be submitted to the Engineer for approval to ensure proper installation.

Drawings will show handrail mount locations with bolts setting, spacing, ramp slope, and/or splice joint locations, and handrail lengths with identification showing where each handrail goes on the layout.

Payment for concrete sidewalks or curb ramps will be paid for in accordance with Item 531 "Sidewalks".

Payment for all items shown is to be included in unit price bid in accordance with Item 450 "Railing" of the type specified.

All exposed edges will be rounded or chamfered to approximately ⅛" by grinding.

(5) 1 ½" Dia. Standard Pipe (1.900" O.D., 0.145" wall thickness). Parallel to ramp/sidewalk. Provide holes as needed in 1 ½" Dia. pipe for galvanizing drainage and venting.

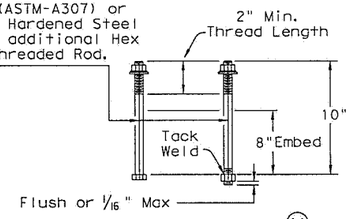
(6) 2 ½" Dia. Standard Pipe (2.875" O.D., 0.203" wall thickness). Plumb all posts. See "Post Mount Detail" for crimping and trimming post to fit the diamenter of top rail. Provide holes as needed in post for galvanizing drainage and venting.

(11) See "General Notes" for anchor bolt information.

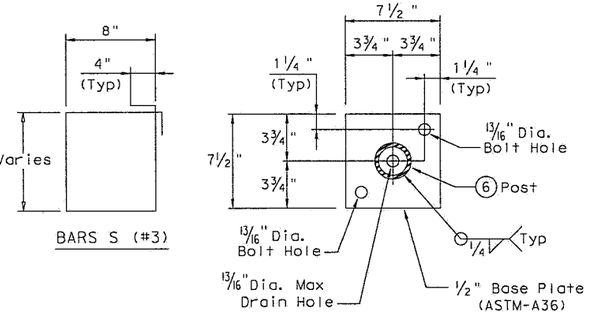
(12) Bars S(#3) spaced at 12" Max (Spaced 3" from outside edge of overall length of Ramp/Sidewalk).

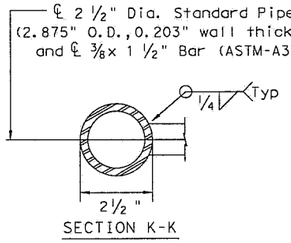
(13) Provide 1 ½" end cover to Bars D(#4) from outside edge of overall length of Ramp/Sidewalk.

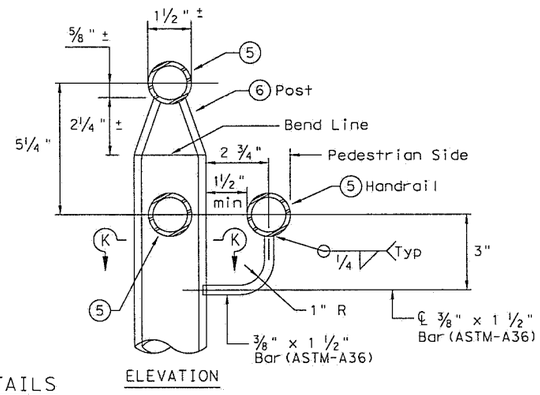
℄ ⅝" Dia. Hex Head Anchor Bolt (ASTM-A307) or Threaded Rod (ASTM-A36) with one Hardened Steel Washer placed under Hex Nut. One additional Hex Nut will be furnished for each Threaded Rod.



CAST-IN-PLACE ANCHOR BOLT OPTIONS
(Used for Post Base Plate only)







POST MOUNT DETAILS

SHEET 3 OF 3

Texas Department of Transportation | Design Division Standard

PEDESTRIAN HANDRAIL DETAILS

PRD-13

FILE: prd13.dgn	DN: TxDOT	CK: AM	DW: JTR	CK: CGL
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REVISIONS REVISED MAY, 2013 (VP)	DIST	COUNTY		SHEET NO.

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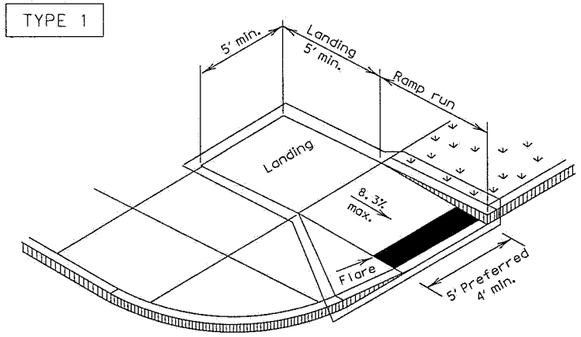
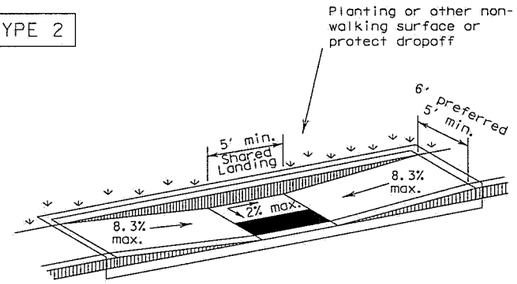


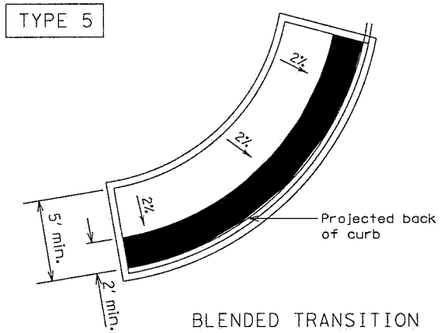
PERPENDICULAR CURB RAMP

TYPE 2



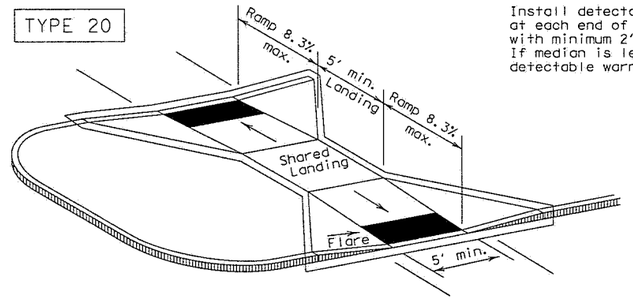
PARALLEL CURB RAMP
(Use only where water will not pond in the landing.)

TYPE 5



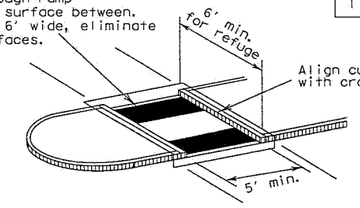
BLENDED TRANSITION

TYPE 20



Install detectable warning surface at each end of cut-through ramp with minimum 2' smooth surface between. If median is less than 6' wide, eliminate detectable warning surfaces.

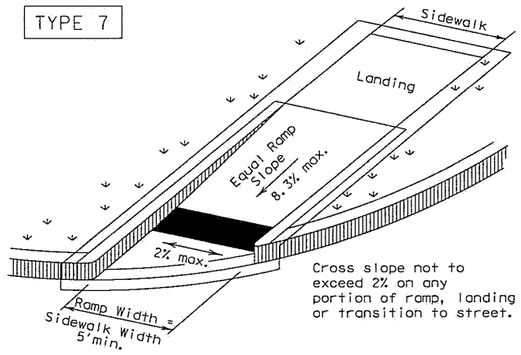
TYPE 21



Curb details are shown elsewhere in the plans.

CURB RAMPS AT MEDIAN ISLANDS

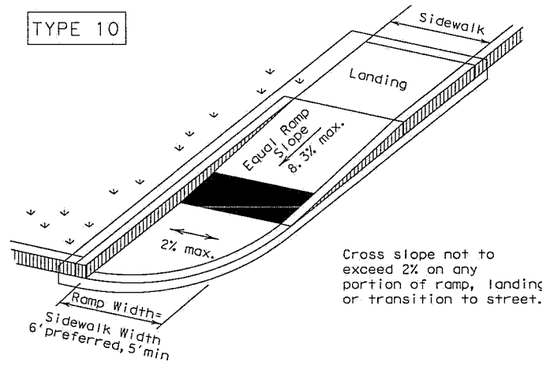
TYPE 7



Cross slope not to exceed 2% on any portion of ramp, landing or transition to street.

(Sidewalk set back from curb)

TYPE 10

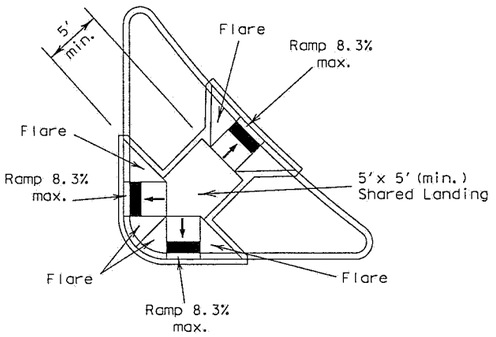


Cross slope not to exceed 2% on any portion of ramp, landing or transition to street.

(Sidewalk adjacent to curb)

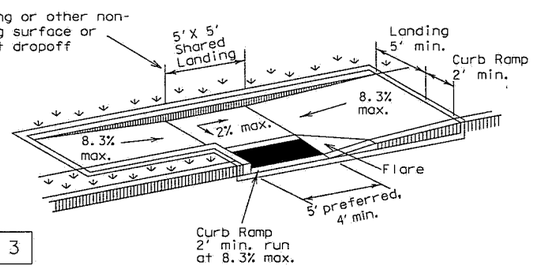
DIRECTIONAL RAMPS WITHIN RADIUS

TYPE 22

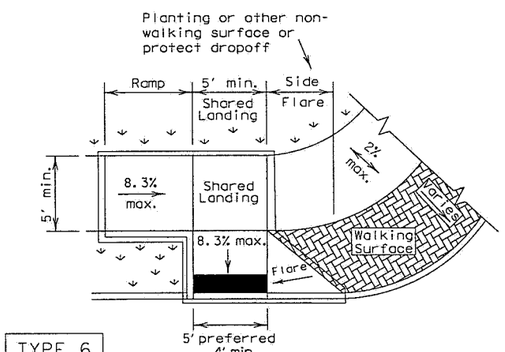


COMBINATION ISLAND RAMPS

TYPE 3

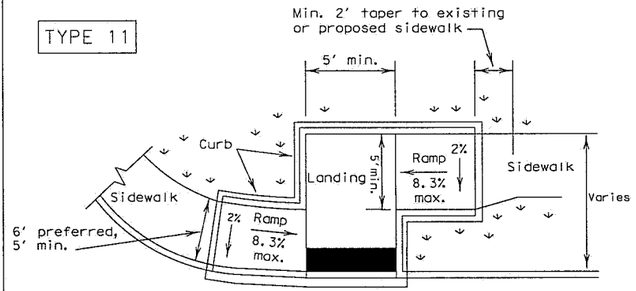


TYPE 6



COMBINATION CURB RAMPS

TYPE 11



OFFSET PARALLEL CURB RAMP

NOTES / LEGEND:

See General Notes on sheet 2 of 4 for more information.

Denotes planting or non-walking surface not part of pedestrian circulation path.

Ramp Limits of Payment

Detectable Warning Surface

SHEET 1 OF 4

Texas Department of Transportation

Design Division Standard

PEDESTRIAN FACILITIES CURB RAMPS

PED-12A

FILE: ped12a.dgn	DN: TxDOT	CK: RM	DW: TxDOT	CK: VP
©TxDOT March 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS VP June 13, 2012	DIST	COUNTY		SHEET NO. 9675

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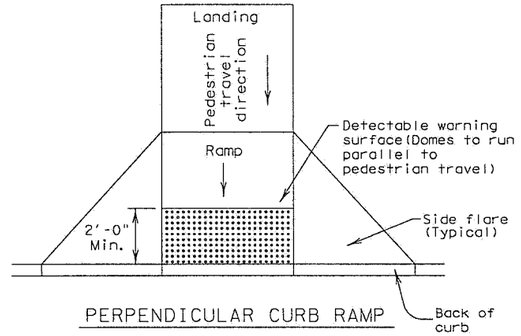
General Notes

Curb Ramps

1. Install a curb ramp or blended transition at each pedestrian street crossing.
2. All slopes shown are maximum allowable. Lesser slopes that will still drain properly should be used. Adjust curb ramp length or grade of approach sidewalks as directed.
3. The minimum sidewalk width is 5'. Where the sidewalk is adjacent to the back of curb, a 6' sidewalk width is desirable. Where a 5' sidewalk cannot be provided due to site constraints, sidewalk width may be reduced to 4' for short distances. 5'x 5' passing areas at intervals not to exceed 200' are required.
4. Landings shall be 5'x 5' minimum with a maximum 2% slope in any direction.
5. Maneuvering space at the bottom of curb ramps shall be a minimum of 4'x 4' wholly contained within the crosswalk and wholly outside the parallel vehicular travel path.
6. Maximum allowable cross slope on sidewalk and curb ramp surfaces is 2%.
7. Provide flared sides where the pedestrian circulation path crosses the curb ramp. Flared sides shall be sloped at 10% maximum, measured parallel to the curb. Returned curbs may be used only where pedestrians would not normally walk across the ramp, either because the adjacent surface is planted, substantially obstructed, or otherwise protected.
8. Additional information on curb ramp location, design, light reflective value and texture may be found in the current edition of the Texas Accessibility Standards (TAS) and 16 TAC 68.102.
9. To serve as a pedestrian refuge area, the median should be a minimum of 6' wide, measured from back of curbs. Medians should be designed to provide accessible passage over or through them.
10. Small channelization islands, which do not provide a minimum 5'x 5' landing at the top of curb ramps, shall be cut through level with the surface of the street.
11. Crosswalk dimensions, crosswalk markings and stop bar locations shall be as shown elsewhere in the plans. At intersections where crosswalk markings are not required, curb ramps shall align with theoretical crosswalks unless otherwise directed.
12. Handrails are not required on curb ramps. Provide curb ramps wherever on accessible route crosses (penetrates) a curb.
13. Curb ramps and landings shall be constructed and paid for in accordance with Item 531 "Sidewalks".
14. Place concrete at a minimum depth of 5" for ramps, flares and landings, unless otherwise directed.
15. Provide a smooth transition where the curb ramps connect to the street.
16. Curbs shown on sheet 1 within the limits of payment are considered part of the curb ramp for payment, whether it is concrete curb, gutter, or combined curb and gutter.
17. Existing features that comply with TAS may remain in place unless otherwise shown on the plans.

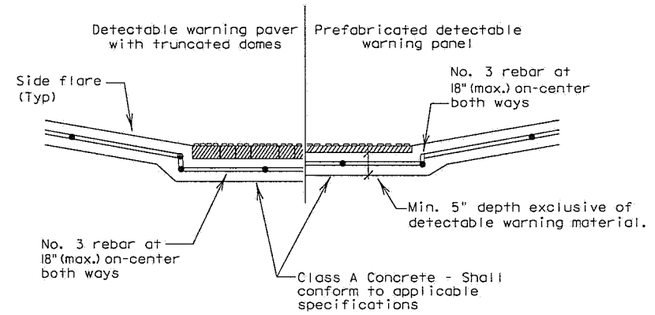
Detectable Warning Material

18. Curb ramps must contain a detectable warning surface that consists of raised truncated domes complying with Section 705 of the TAS. The surface must contrast visually with adjoining surfaces, including side flares. Furnish and install an approved cast-in-place dark brown or dark red detectable warning surface material adjacent to uncolored concrete, unless specified elsewhere in the plans.
19. Detectable Warning Materials must meet TxDOT Departmental Materials Specification DMS 4350 and be listed on the Material Producer List. Install products in accordance with manufacturer's specifications.
20. Detectable warning surfaces must be slip resistant and not allow water to accumulate.
21. Detectable warning surfaces shall be a minimum of 24" in depth in the direction of pedestrian travel, and extend the full width of the curb ramp or landing where the pedestrian access route enters the street.
22. Detectable warning surfaces shall be located so that the edge nearest the curb line is at the back of curb. Align the rows of domes to be perpendicular to the grade break between the ramp run and the street. Detectable warning surfaces may be curved along the corner radius.
23. Shaded areas on Sheet 1 of 4 indicate the approximate location for the detectable warning surface for each curb ramp type.

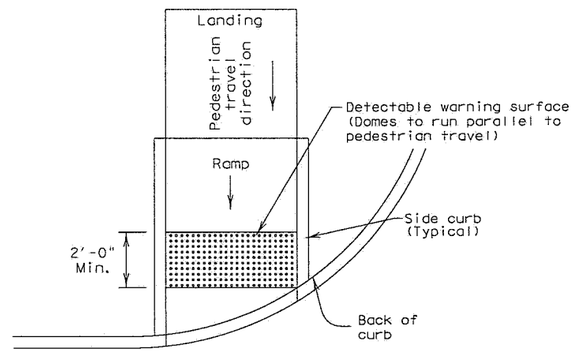


PERPENDICULAR CURB RAMP

Typical placement of detectable warning surface on sloping ramp run.

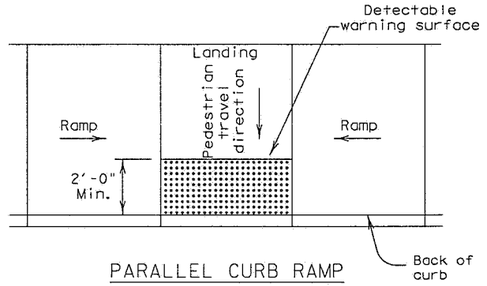


SECTION: CURB RAMP AT DETECTABLE WARNING



DIRECTIONAL CURB RAMP

Typical placement of detectable warning surface on sloping ramp run.



PARALLEL CURB RAMP

Typical placement of detectable warning surface on landing at street edge.

DETECTABLE WARNINGS

Detectable Warning Pavers

24. Furnish detectable warning paver units meeting all requirements of ASTM C-936, C-33. Lay in a two by two unit basket weave pattern or as directed.
25. Lay full-size units first followed by closure units consisting of at least 25 percent of a full unit. Cut detectable warning paver units using a power saw.

Sidewalks

26. Provide clear ground space at operable parts, including pedestrian push buttons. Operable parts shall be placed within one or more reach ranges specified in TAS 308.
27. Place traffic signal or illumination poles, ground boxes, controller boxes, signs, drainage facilities and other items so as not to obstruct the pedestrian access route or clear ground space.
28. Street grades and cross slopes shall be as shown elsewhere in the plans.
29. Changes in level greater than 1/4 inch are not permitted.
30. The least possible grade should be used to maximize accessibility. The running slope of sidewalks and crosswalks within the public right of way may follow the grade of the parallel roadway. Where a continuous grade greater than 5% must be provided, handrails may be desirable to improve accessibility. Handrails may also be needed to protect pedestrians from potentially hazardous conditions. If provided, handrails shall comply with TAS 505.
31. Handrail extensions shall not protrude into the usable landing area or into intersecting pedestrian routes.
32. Driveways and turnouts shall be constructed and paid for in accordance with Item "Intersections, Driveways and Turnouts". Sidewalks shall be constructed and paid for in accordance with Item, "Sidewalks".
33. Sidewalk details are shown elsewhere in the plans.

SHEET 2 OF 4

Texas Department of Transportation | Design Division Standard

PEDESTRIAN FACILITIES CURB RAMPS

PED-12A

FILE: ped12a.dgn	DN: TxDOT	CK: RM	DN: TxDOT	CK: VP
©TxDOT March 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS				
VP June 13, 2012	DIST	COUNTY		SHEET NO.
				0.476

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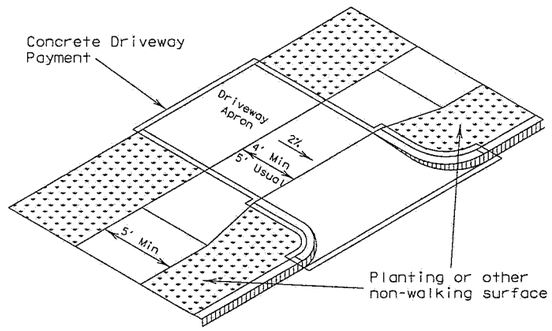
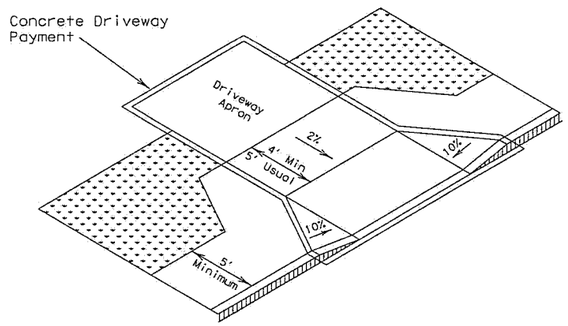
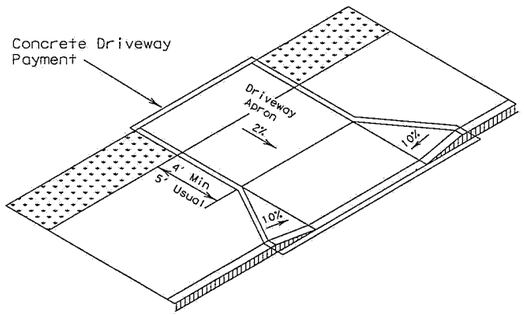


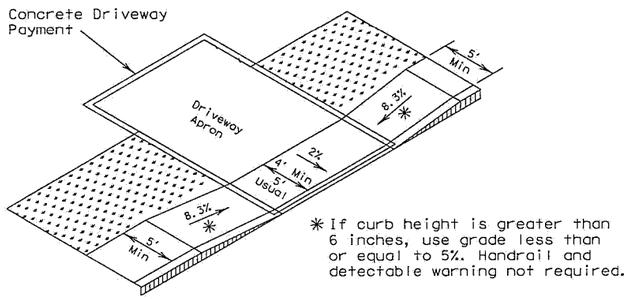
Setback sidewalk



Apron offset sidewalk



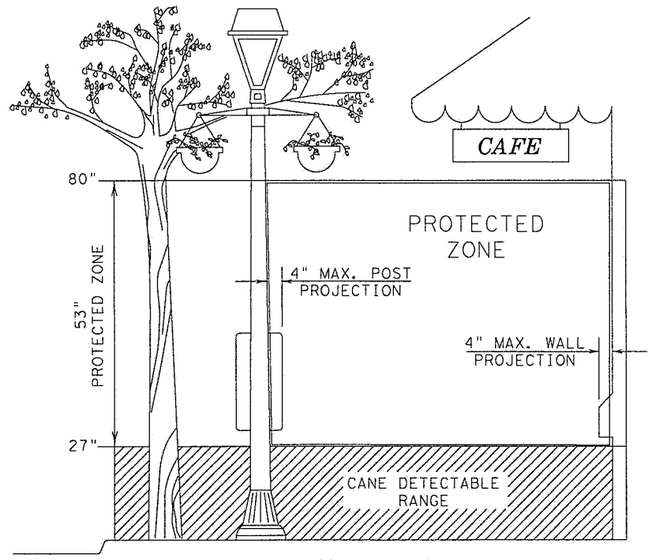
Wide sidewalk



* If curb height is greater than 6 inches, use grade less than or equal to 5%. Handrail and detectable warning not required.

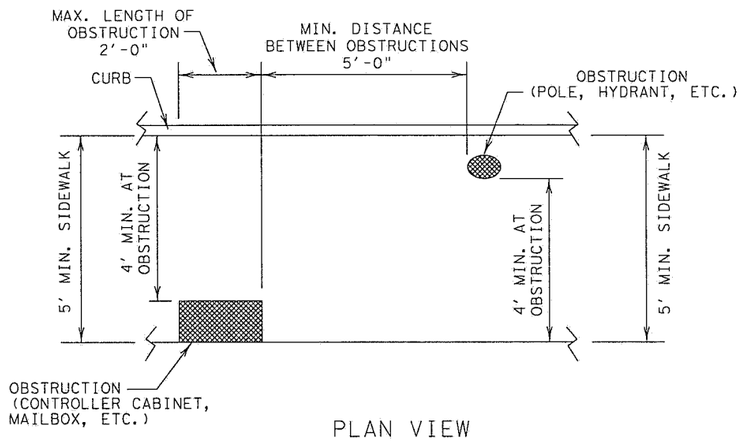
Ramp sidewalk

SIDEWALK TREATMENT AT DRIVEWAYS



PROTECTED ZONE

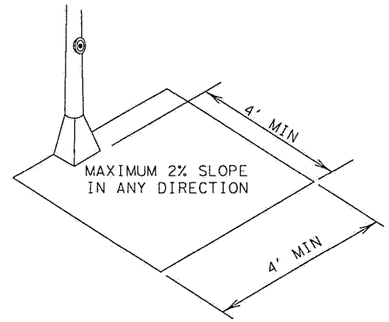
In pedestrian circulation area, maximum 4" projection for post or wall mounted objects between 27"and 80" above the surface.



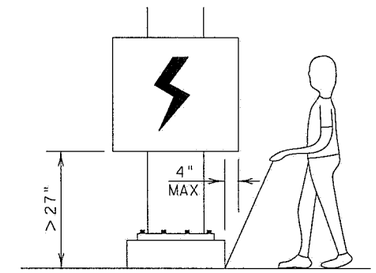
PLAN VIEW

PLACEMENT OF STREET FIXTURES

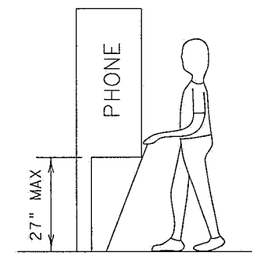
(ITEMS NOT INTENDED FOR PUBLIC USE. MINIMUM 4' x 4' CLEAR GROUND SPACE REQUIRED AT PUBLIC USE FIXTURES.)



CLEAR GROUND SPACE ADJACENT TO PEDESTRIAN PUSH BUTTON



When an obstruction of a height greater than 27" from the surface would create a protrusion of more than 4" into the pedestrian circulation area, construct additional curb or foundation at the bottom to provide a maximum 4" overhang.



Protruding objects of a height ≤ 27" are detectable by cane and do not require additional treatment.

DETECTION BARRIER FOR VERTICAL CLEARANCE < 80"

Texas Department of Transportation

Design Division Standard

PEDESTRIAN FACILITIES CURB RAMPS

PED-12A

FILE: ped12a.dgn	DN: TxDOT	CK: RM	DW: TxDOT	CK: VP
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REVISIONS VP June 13, 2012	DIST	COUNTY		SHEET NO. 077

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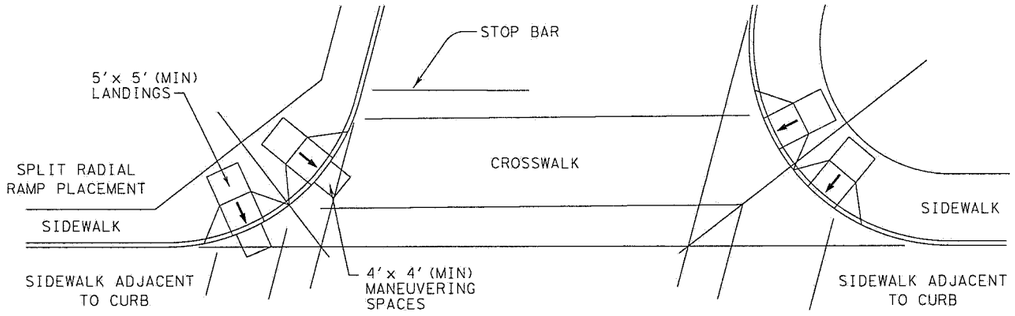
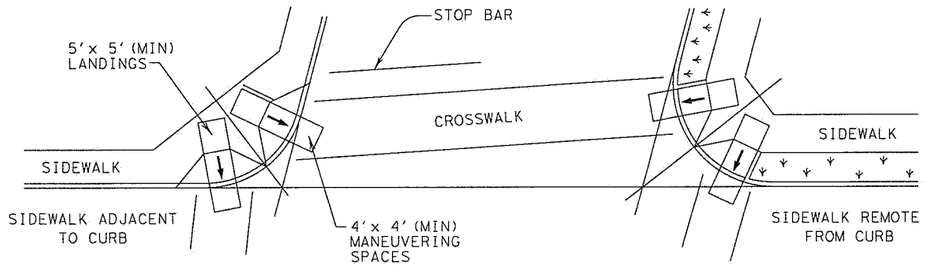
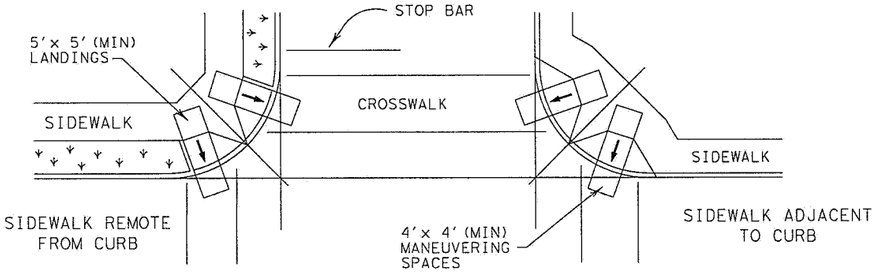


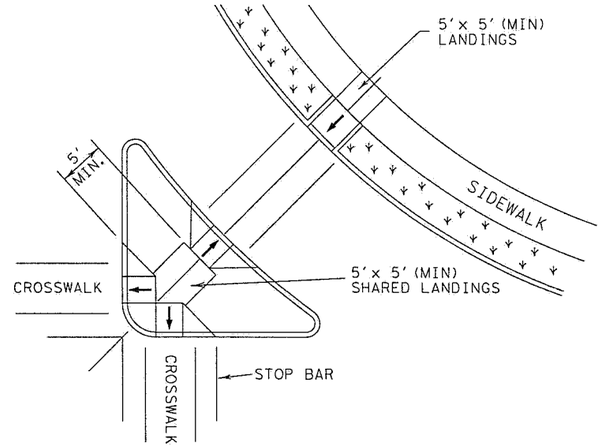
SKEWED INTERSECTION WITH "LARGE" RADIUS



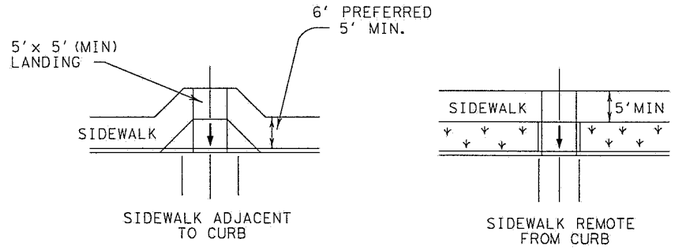
SKEWED INTERSECTION WITH "SMALL" RADIUS



NORMAL INTERSECTION WITH "SMALL" RADIUS



AT INTERSECTION
W/FREE RIGHT TURN & ISLAND



MID-BLOCK PLACEMENT
PERPENDICULAR RAMPS

TYPICAL CROSSING LAYOUTS

SHEET 4 OF 4

Texas Department of Transportation | Design Division Standard

PEDESTRIAN FACILITIES CURB RAMPS

PED-12A

FILE: ped12a.dgn	DN: TxDOT	CK: RM	DW: TxDOT	CK: VP
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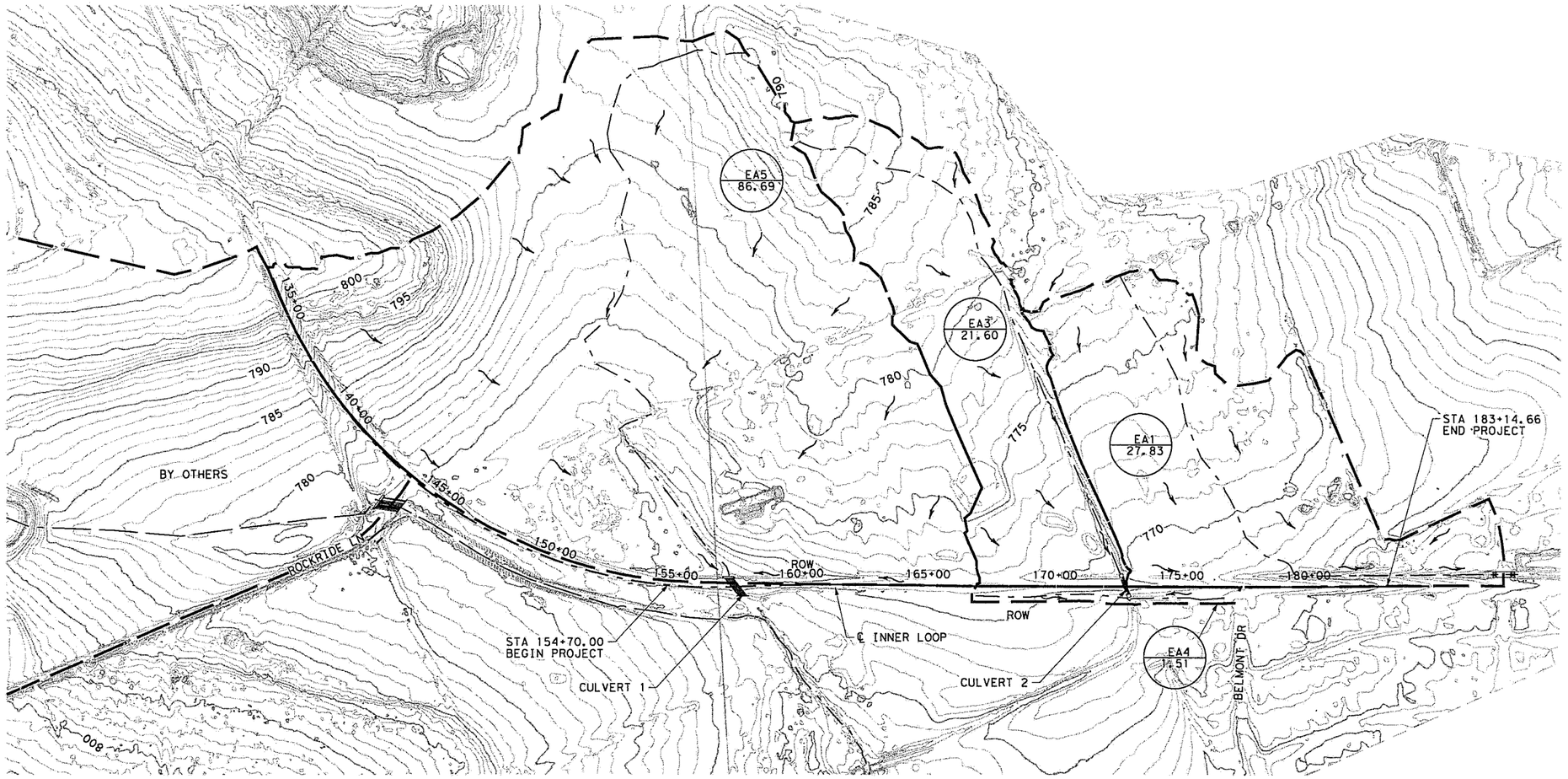

LEGEND

- BASIN FLOW PATH
- DRAINAGE AREA BOUNDARY
- DRAINAGE FLOW ARROW
- BASIN ID / XX-X / XX.X / ACRES

NOTE:

1. ALL DRAINAGE AREA DISCHARGES WERE CALCULATED USING RATIONAL METHOD.
2. RUNOFF COEFFICIENTS (C) USED FOR DISCHARGE CALCULATION WERE BASED ON SECTION 3.4.2 OF THE CITY OF GEORGETOWN DRAINAGE CRITERIA MANUAL, FIRST EDITION -VERSION TWO.
3. TIME OF CONCENTRATION WAS DETERMINED BASED ON METHODOLOGY OUTLINED IN SECTION 3.4.3 (RATIONAL METHOD TIME OF CONCENTRATION) OF THE CITY OF GEORGETOWN DRAINAGE CRITERIA MANUAL, FIRST EDITION -VERSION TWO.
4. INTENSITY BASED ON (INTESITY-DURATION -FREQUENCY COEFFICIENTS FOR THE CITY OF GEORGETOWN) SECTION 3.4.4 OF THE CITY OF GEORGETOWN DRAINAGE CRITERIA MANUAL, FIRST EDITION-VERSION TWO.
5. EXISTING DRAINAGE AREA EA1 FLOWS AWAY FROM PROJECT, AND IT IS SHOWN FOR INFORMATION ONLY.
6. EXISTING DRAINAGE AREA EA4 DISCHARGES DOWNSTREAM OF CULVERT 2 AND IS SHOWN FOR INFORMATION ONLY.
7. DRAINAGE AREAS WERE DELINEATED BASED ON 2' WILCO LIDAR CONTOURS USING MICROSTATION.

STATE OF TEXAS
AARON DEMARAY TAINTER
105733
LICENSED
PROFESSIONAL ENGINEER
Aaron Demaray Tainter 6/26/2017

EXISTING CONDITION DRAINAGE BASIN CALCULATIONS

BASINS INFORMATION									TIME OF CONC.	INTENSITIES AND FLOWS											
Basin ID	Basins to Following Inlet	Area	Composite C Value	Composite C Value	Composite C Value	Composite C Value	Composite C Value	Composite C Value	Tc	INTENSITY 2 YR	DISCHARGE 2 YR	INTENSITY 5 YR	DISCHARGE 5 YR	INTENSITY 10 YR	DISCHARGE 10 YR	INTENSITY 25 YR	DISCHARGE 25 YR	INTENSITY 50 YR	DISCHARGE 50 YR	INTENSITY 100 YR	DISCHARGE 100 YR
		(Ac)	2 YR	5 YR	10 YR	25 YR	50 YR	100 YR	(MIN)	(IN/HR)	(CFS)	(IN/HR)	(CFS)	(IN/HR)	(CFS)	(IN/HR)	(CFS)	(IN/HR)	(CFS)	(IN/HR)	(CFS)
EA3	CULVERT 2	21.60	0.48	0.49	0.50	0.52	0.54	0.56	23.76	3.69	37.93	4.57	48.41	5.19	56.47	6.10	69.09	6.82	79.89	7.52	91.39
EA5	CULVERT 1	86.69	0.36	0.37	0.39	0.42	0.44	0.47	51.50	2.30	70.85	2.96	95.86	3.40	115.71	4.07	147.82	4.59	176.47	5.09	208.22

PROPOSED CONDITION DRAINAGE BASIN CALCULATIONS

BASINS INFORMATION									TIME OF CONC.	INTENSITIES AND FLOWS											
Basin ID	Basins to Following Inlet	Area	Composite C Value	Composite C Value	Composite C Value	Composite C Value	Composite C Value	Composite C Value	Tc	INTENSITY 2 YR	DISCHARGE 2 YR	INTENSITY 5 YR	DISCHARGE 5 YR	INTENSITY 10 YR	DISCHARGE 10 YR	INTENSITY 25 YR	DISCHARGE 25 YR	INTENSITY 50 YR	DISCHARGE 50 YR	INTENSITY 100 YR	DISCHARGE 100 YR
		(Ac)	2 YR	5 YR	10 YR	25 YR	50 YR	100 YR	(MIN)	(IN/HR)	(CFS)	(IN/HR)	(CFS)	(IN/HR)	(CFS)	(IN/HR)	(CFS)	(IN/HR)	(CFS)	(IN/HR)	(CFS)
A3+A4-1	CULVERT 2	49.99	0.73	0.74	0.74	0.75	0.76	0.77	23.76	3.69	135.13	4.57	168.96	5.19	193.26	6.10	229.83	6.82	259.22	7.52	288.99
A5	CULVERT 1	88.80	0.57	0.58	0.59	0.61	0.62	0.64	51.50	2.30	116.33	2.96	152.87	3.40	179.34	4.07	220.60	4.59	253.41	5.09	289.49

BRIDGEFARMER & ASSOCIATES, INC.
CONSULTING ENGINEERS
TBPE REGISTRATION NO. 264

GEORGETOWN INNER LOOP @ CENTRAL MAINTENANCE FACILITY

DRAINAGE AREA MAP EXISTING CONDITIONS

SCALE: 1" = 500' SHEET 1 OF 1

DESIGN	GRAPHICS	CHECK	CHECK	SHEET NO.
KA	AKH	AT	WD	1 of 1

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7/18/2017 9:58 AM

cwm 6/26/2017 10:23:38 AM

250 0 250 500
SCALE: 1" = 500'

LEGEND

- BASIN FLOW PATH
- DRAINAGE AREA BOUNDARY
- DRAINAGE FLOW ARROW
- BASIN ID
- XX-X / XX.X — ACRES

NOTES:

1. ALL DRAINAGE AREA DISCHARGES WERE CALCULATED USING RATIONAL METHOD.
2. DRAINAGE AREA A3 INCLUDES A3-1.
3. DRAINAGE AREA A5 INCLUDES A5-1, A5-2 AND A5-3.
4. DRAINAGE AREA A4 INCLUDES A4-1 AND A4-2.
5. AREA A4-2 DISCHARGES DOWNSTREAM OF CULVERT 2 AND IS NOT INCLUDED IN CULVERT 2 DESIGN BASIN AREA.
6. SEE D.A.M. EXISTING CONDITIONS SHEET FOR DISCHARGE CALCULATIONS.
7. DRAINAGE AREAS WERE DELINEATED BASED ON 2' WILCO LIDAR CONTOURS USING MICROSTATION, WITH THE EXCEPTION OF PROPOSED BASIN A3, WHERE ADDITIONAL AREA WAS ADDED BASED ON FUTURE DEVELOPMENT PLAN CONCEPT RECEIVED 02/11/2015 FROM WILLIAMSON COUNTY.

STATE OF TEXAS
AARON DEMARAY TAINTER
105733
LICENSED
PROFESSIONAL ENGINEER
Aaron Demaray Tainter 6/26/2017

BRIDGEFARMER & ASSOCIATES, INC.
CONSULTING ENGINEERS
TBPE REGISTRATION NO. 264

GEORGETOWN INNER LOOP @ CENTRAL MAINTENANCE FACILITY

DRAINAGE AREA MAP MAJOR BASIN

SCALE: 1" = 500' SHEET 1 OF 1

DESIGN	GRAPHICS	CHECK	CHECK	SHEET NO.
KA	AKH	AT	WD	1p.1480

s:\16301\dgn\sheets\05xdrainage\01xdrainagexareaxmaps\16301-dr-cul-am-02.dgn
7/18/2017 9:58 AM

cwm 6/26/2017 10:23:45 AM

100 0 100 200
SCALE: 1" = 200'

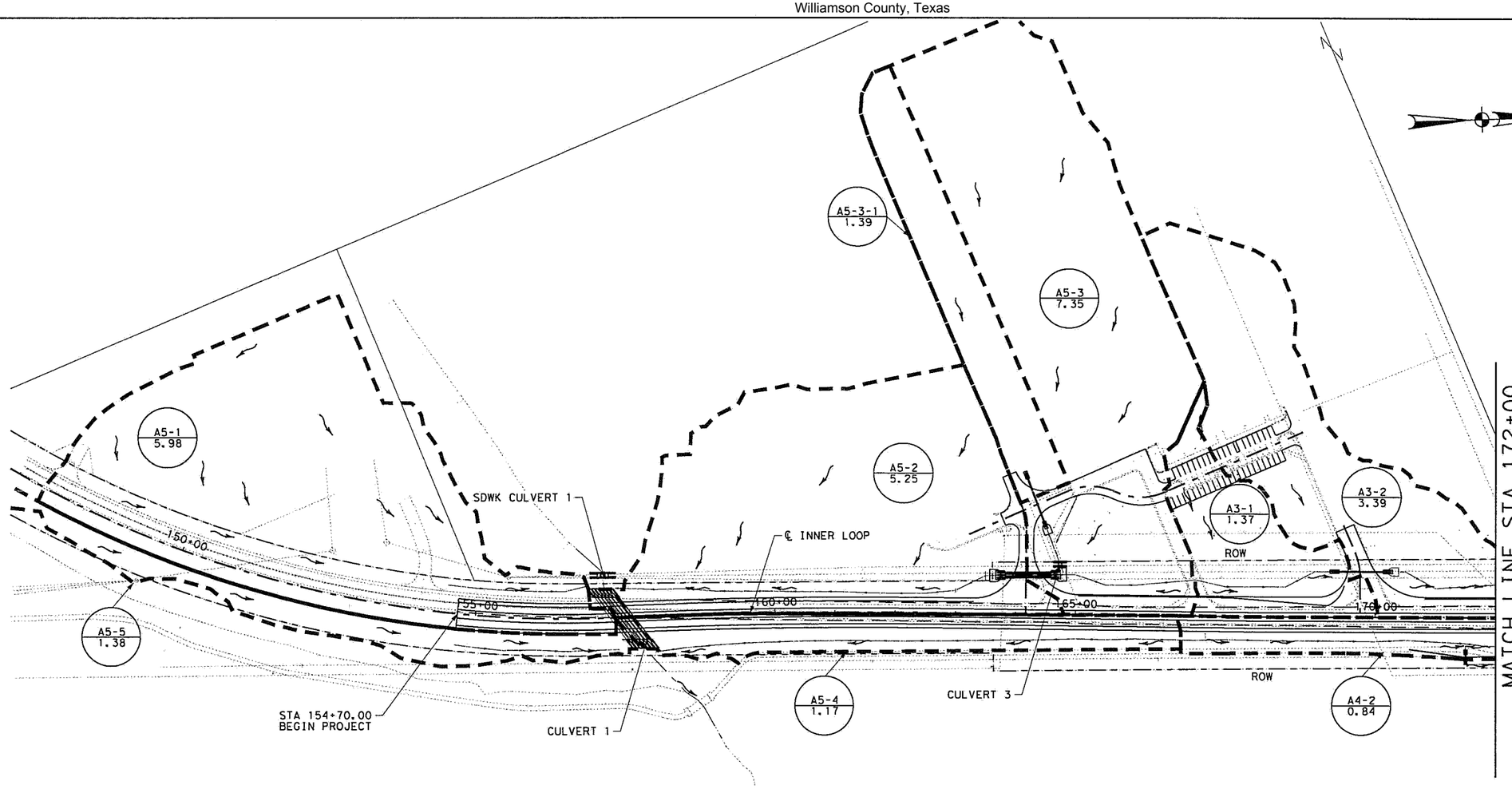
MINOR BASIN BOUNDARY

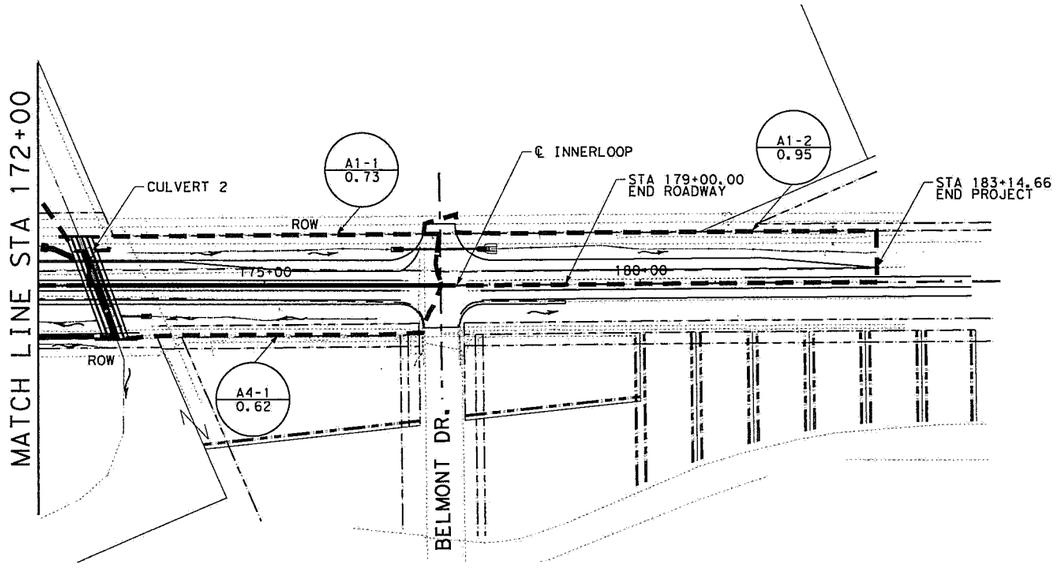
FLOW DIRECTION

BASIN ID

XX-X / X.XX

ACRES





NOTE:

1. ALL DRAINAGE AREA DISCHARGES WERE CALCULATED USING RATIONAL METHOD.

STATE OF TEXAS
AARON DEMARAY TAINTER
105733
LICENSED
PROFESSIONAL ENGINEER
Aaron Demaray Tainter 6/26/2017

BRIDGEFARMER & ASSOCIATES, INC.
CONSULTING ENGINEERS
TBPE REGISTRATION NO. 264

GEORGETOWN INNER LOOP @ CENTRAL MAINTENANCE FACILITY

DRAINAGE AREA MAP MINOR BASINS

SCALE: 1" = 200' SHEET 1 OF 1

DESIGN	GRAPHICS	CHECK	CHECK	SHEET NO.
KA	AKH	AT	WD	1p1421

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7/18/2017 9:58 AM

DRAINAGE REPORT

GEOPAK (STORM DRAIN DESIGN)
PROJECT DESCRIPTION: **Inner Loop - Segment C**
DESIGN FREQUENCY: **25**
MEASUREMENT UNITS: ENGLISH
SYSTEM:

VERSION: 2006-01-01
DATE: 2016-11-01
COUNTY: **Williamson**

DRAINAGE OUTPUT FOR DESIGN FREQUENCY

Runoff Computation for Design Frequency.

ID	Area (acre)	Grass C Value	Grass Area (acre)	*Pvmt Pvmt C Value	*Pvmt Area (acre)	Composite C Value	Tc (min)	Tc Used (min)	Intensity (in/hr)	Total Q (cfs)
3A1	2.35	0.30	0.79	0.90	1.56	0.70	8.22	8.22	10.09	16.55
3A3	1.28	0.30	0.44	0.90	0.85	0.70	3.79	5.00	11.89	10.65
3B1	1.78	0.30	1.78	0.00	0.00	0.30	8.66	8.66	9.89	5.28

* "Pvmt" represents an accumulation of all sub areas with impervious areas. (Residential, Commercial, Industrial, etc.)

Cumulative Junction Discharge Computations

Node I.D.	Node Type	Weighted C-Value (ft)	Cumulative Drainage Area (acre)	Cumulative Tc (min)	Intensity (in/hr)	User Supply Q (cfs)	Total Discharge (cfs)
3A1	Junction	0.70	2.35	8.22	10.09	0.00	16.55
3A3	Junction	0.70	3.64	13.04	8.30	0.00	21.06

DRAINAGE REPORT

GEOPAK (STORM DRAIN DESIGN)
PROJECT DESCRIPTION: **Inner Loop - Segment C**
DESIGN FREQUENCY: **100**
MEASUREMENT UNITS: ENGLISH
SYSTEM:

VERSION: 2006-01-01
DATE: 2016-11-01
COUNTY: **Williamson**

DRAINAGE OUTPUT FOR DESIGN FREQUENCY

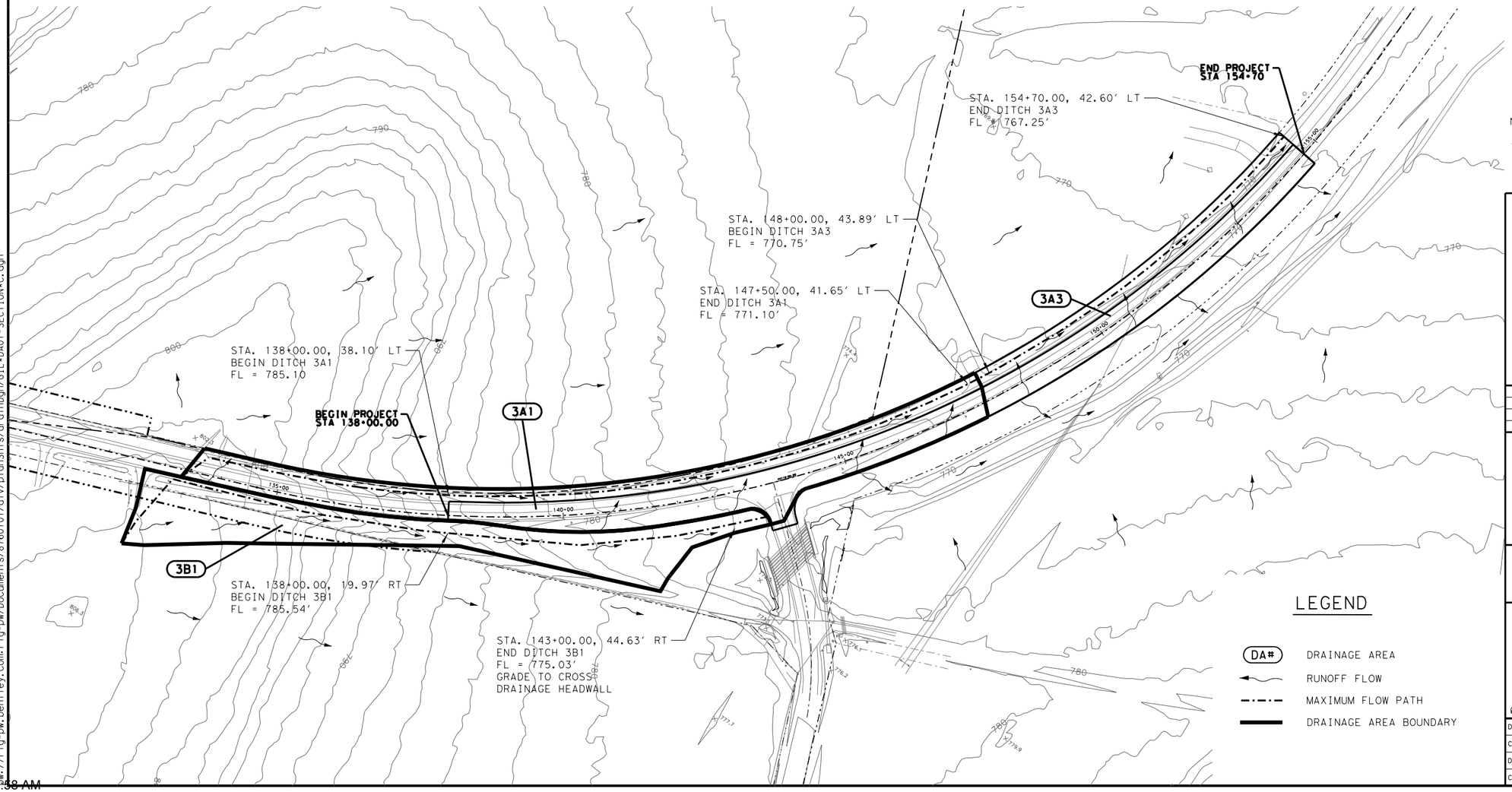
Runoff Computation for Design Frequency.

ID	Area (acre)	Grass C Value	Grass Area (acre)	*Pvmt Pvmt C Value	*Pvmt Area (acre)	Composite C Value	Tc (min)	Tc Used (min)	Intensity (in/hr)	Total Q (cfs)
3A1	2.35	0.30	0.79	0.90	1.56	0.70	8.22	8.22	12.71	26.07
3A3	1.28	0.30	0.44	0.90	0.85	0.70	3.79	5.00	15.01	16.80
3B1	1.78	0.30	1.78	0.00	0.00	0.30	8.66	8.66	12.46	8.32

* "Pvmt" represents an accumulation of all sub areas with impervious areas. (Residential, Commercial, Industrial, etc.)

Cumulative Junction Discharge Computations

Node I.D.	Node Type	Weighted C-Value (ft)	Cumulative Drainage Area (acre)	Cumulative Tc (min)	Intensity (in/hr)	User Supply Q (cfs)	Total Discharge (cfs)
3A1	Junction	0.70	2.35	8.22	12.71	0.00	26.07
3A3	Junction	0.70	3.64	12.48	10.66	0.00	33.82



NOTES:

1. DRAINAGE AREAS WERE DELINEATED BASED ON 2' WILCO LIDAR CONTOURS USING MICROSTATION.

STATE OF TEXAS
ANDRES M. CARDENAS
88453
LICENSED PROFESSIONAL ENGINEER
6/22/2017

NO.	REVISION	BY	DATE

WILLIAMSON COUNTY
1848

RTG RODRIGUEZ TRANSPORTATION GROUP FIRM #587

GEORGETOWN INNER LOOP

DRAINAGE AREA MAP

6/22/2017 SHEET 1 OF 1

DESIGNED:	PROJECT NUMBER		ROADWAY	
CHECKED:			SE INNER LOOP	
DRAWN:	STATE	COUNTY	CITY	SHEET No.
CHECKED:	TEXAS	WILLIAMSON	GEORGETOWN	113

brooks
6:11
7/22/2017
w://rtg-pw.bentley.com:rtg-pw/Documents/8760101/div/planShts/drainDgn/GL*DA01-SECTION*C.dgn

		Q25 (cfs)
Drainage Basins	3A1	16.55
	3A1+3A3	21.06
	3B1	5.28

RUNOFF SOURCE	DITCH I.D.	BEGIN STA.	US ELEV.	END STA.	DS ELEV.	LEFT SIDE SLOPE (H:1)	RIGHT SIDE SLOPE (H:1)	BOTTOM WIDTH (ft)	n	DITCH SLOPE (ft/ft)	BASIN FLOW (cfs)	% OF BASIN (%)	DITCH FLOW (cfs)	WATER SURFACE ELEVATION (ft)	ADJACENT ROW ELEVATION (ft)	FREEBOARD (FROM ROW) (ft)	ADJACENT ROADWAY ELEVATION (ft)	A (sqft)	P (ft)	R (ft)	NORMAL DEPTH (ft)	VELOCITY (ft/s)	SHEAR (lbs /sqft)
3A1	3A1 LT	138+00	785.10	138+50	783.80	4	6	4	0.04	0.026	16.6	4.8%	0.8	783.92	786.95	3.03	785.45	0.58	5.27	0.11	**0.12**	1.37	0.18
		138+50	783.80	139+00	782.20	4	6	4	0.04	0.032	16.6	9.5%	1.6	782.37	785.56	3.19	783.98	0.85	5.78	0.15	**0.17**	1.85	0.29
		139+00	782.20	139+50	780.80	4	6	4	0.04	0.028	16.6	14.3%	2.4	781.03	782.91	1.88	782.66	1.17	6.32	0.19	**0.23**	2.02	0.32
		139+50	780.80	140+00	779.50	4	6	4	0.04	0.026	16.6	19.0%	3.2	779.77	781.65	1.88	781.33	1.46	6.78	0.22	**0.27**	2.15	0.35
		140+00	779.50	140+50	778.30	4	6	4	0.04	0.024	16.6	23.8%	3.9	778.61	780.53	1.92	780.15	1.76	7.21	0.24	**0.31**	2.24	0.36
		140+50	778.30	141+00	777.30	4	6	4	0.04	0.020	16.6	28.6%	4.7	777.67	779.51	1.84	779.15	2.13	7.73	0.28	**0.37**	2.22	0.34
		141+00	777.30	141+50	776.10	4	6	4	0.04	0.024	16.6	33.3%	5.5	776.48	778.46	1.98	778.00	2.22	7.85	0.28	**0.38**	2.48	0.42
		141+50	776.10	142+00	775.00	4	6	4	0.04	0.022	16.6	38.1%	6.3	775.41	777.30	1.89	776.92	2.52	8.23	0.31	**0.41**	2.50	0.42
		142+00	775.00	142+50	774.50	4	6	4	0.04	0.010	16.6	42.8%	7.1	775.04	776.53	1.49	776.13	3.63	9.52	0.38	**0.54**	1.95	0.24
		142+50	774.50	143+00	774.23	4	6	4	0.04	0.005	16.6	47.6%	7.9	774.90	775.94	1.04	775.64	4.89	10.81	0.45	**0.67**	1.61	0.15
		143+00	774.23	143+50	774.10	4	6	4	0.04	0.003	16.6	52.4%	8.7	774.94	774.96	0.02	775.43	6.85	12.54	0.55	**0.84**	1.27	0.09
		143+50	774.10	144+00	773.50	4	6	4	0.04	0.012	16.6	57.1%	9.5	774.10	774.16	0.06	775.23	4.18	10.11	0.41	**0.60**	2.26	0.31
		144+00	773.50	144+50	772.70	4	6	4	0.04	0.016	16.6	61.9%	10.2	773.28	773.68	0.40	775.12	3.99	9.91	0.40	**0.58**	2.56	0.40
		144+50	772.70	145+00	772.20	4	6	4	0.04	0.010	16.6	66.6%	11.0	772.88	773.56	0.68	774.94	5.00	10.91	0.46	**0.68**	2.21	0.29
		145+00	772.20	145+50	772.00	4	6	4	0.04	0.004	16.6	71.4%	11.8	772.88	773.59	0.71	774.69	7.34	12.94	0.57	**0.88**	1.61	0.14
		145+50	772.00	146+00	771.75	4	6	4	0.04	0.005	16.6	76.2%	12.6	772.61	773.55	0.94	774.31	7.09	12.74	0.56	**0.86**	1.78	0.17
		146+00	771.75	146+50	771.50	4	6	4	0.04	0.005	16.6	80.9%	13.4	772.38	773.30	0.92	773.94	7.41	13.00	0.57	**0.88**	1.81	0.18
		146+50	771.50	147+00	771.25	4	6	4	0.04	0.005	16.6	85.7%	14.2	772.16	772.90	0.74	773.71	7.73	13.25	0.58	**0.91**	1.83	0.18
		147+00	771.25	147+50	770.75	4	6	4	0.04	0.010	16.6	90.4%	15.0	771.54	773.02	1.48	773.63	6.24	12.03	0.52	**0.79**	2.40	0.32
Approx. Driveway Location		147+50	770.75	148+00	770.65	4	6	4	0.04	0.002	16.6	95.2%	15.8	771.83	772.66	0.83	773.65	11.71	16.06	0.73	**1.18**	1.35	0.09
		148+00	770.65	148+50	770.40	4	6	4	0.04	0.005	16.6	100.0%	16.6	771.38	772.12	0.74	773.60	8.66	13.96	0.62	**0.98**	1.91	0.19
3A1+3A3	3A3 LT	148+50	770.40	149+00	770.20	4	6	4	0.04	0.004	21.1	7.7%	16.9	771.24	771.73	0.49	773.47	9.55	14.60	0.65	**1.04**	1.77	0.16
		149+00	770.20	149+50	770.00	4	6	4	0.04	0.004	21.1	15.4%	17.2	771.05	771.54	0.49	773.25	9.69	14.70	0.66	**1.05**	1.78	0.16
		149+50	770.00	150+00	769.80	4	6	4	0.04	0.004	21.1	23.1%	17.6	770.86	771.40	0.54	773.07	9.83	14.80	0.66	**1.06**	1.79	0.17
		150+00	769.80	150+50	769.60	4	6	4	0.04	0.004	21.1	30.8%	17.9	770.67	771.16	0.49	772.87	9.98	14.90	0.67	**1.07**	1.80	0.17
		150+50	769.60	151+00	769.25	4	6	4	0.04	0.007	21.1	38.5%	18.3	770.19	770.75	0.56	772.51	8.23	13.64	0.60	**0.94**	2.22	0.26
		151+00	769.25	151+50	769.00	4	6	4	0.04	0.005	21.1	46.2%	18.6	770.03	770.14	0.11	772.23	9.45	14.53	0.65	**1.03**	1.97	0.20
		151+50	769.00	152+00	768.75	4	6	4	0.04	0.005	21.1	53.8%	19.0	769.79	769.84	0.05	771.94	9.58	14.62	0.66	**1.04**	1.98	0.20
		152+00	768.75	152+50	768.40	4	6	4	0.04	0.007	21.1	61.5%	19.3	769.37	769.54	0.17	771.58	8.58	13.89	0.62	**0.97**	2.25	0.27
		152+50	768.40	153+00	768.20	4	6	4	0.04	0.004	21.1	69.2%	19.7	769.32	769.41	0.09	771.16	10.68	15.38	0.69	**1.12**	1.84	0.17
		153+00	768.20	153+50	768.00	4	6	4	0.04	0.004	21.1	76.9%	20.0	769.12	769.12	0.00	770.79	10.82	15.47	0.70	**1.12**	1.85	0.17
		153+50	768.00	153+92	767.85	4	6	4	0.04	0.004	21.1	84.0%	20.3	769.01	769.12	0.11	770.38	11.41	15.87	0.72	**1.16**	1.78	0.16
Approx. Driveway Location		153+92	767.85	154+00	767.40	4	6	4	0.04	0.056	21.1	84.6%	20.4	768.00	769.36	1.36	770.40	4.17	10.09	0.41	**0.60**	4.89	1.45
		154+00	767.40	154+22	767.20	4	6	4	0.04	0.009	21.1	88.0%	20.5	768.14	769.10	0.96	770.29	8.14	13.57	0.60	**0.94**	2.52	0.34
		154+22	767.20	154+50	767.00	4	6	4	0.04	0.007	21.1	92.3%	20.7	768.00	768.83	0.83	770.18	8.96	14.18	0.63	**1.00**	2.31	0.28
		154+50	767.00	154+70	766.80	4	6	4	0.04	0.010	21.1	100.0%	21.1	767.73	768.44	0.71	770.14	8.01	13.47	0.60	**0.93**	2.63	0.37
3B1	3B1 RT	138+00	785.54	138+50	783.74	6	4	0	0.04	0.036	5.28	10.0%	0.5	783.99	N/A	N/A	786.01	0.31	2.52	0.12	**0.25**	1.73	0.27
		138+50	783.74	139+00	782.90	6	4	0	0.04	0.017	5.28	20.0%	1.1	783.27	N/A	N/A	784.68	0.68	3.78	0.18	**0.37**	1.54	0.19
		139+00	782.90	139+50	781.90	6	4	0	0.04	0.020	5.28	30.0%	1.6	782.32	N/A	N/A	783.43	0.87	4.26	0.20	**0.42**	1.82	0.25
		139+50	781.90	140+00	780.60	6	4	0	0.04	0.026	5.28	40.0%	2.1	781.04	N/A	N/A	782.15	0.98	4.51	0.22	**0.44**	2.16	0.35
		140+00	780.60	140+50	779.40	6	4	0	0.04	0.024	5.28	50.0%	2.6	779.89	N/A	N/A	781.01	1.19	4.98	0.24	**0.49**	2.22	0.36
		140+50	779.40	141+00	778.30	6	4	0	0.04	0.022	5.28	60.0%	3.2	778.83	N/A	N/A	780.03	1.41	5.42	0.26	**0.53**	2.25	0.36
		141+00	778.30	141+50	777.25	6	4	0	0.04	0.021	5.28	70.0%	3.7	777.82	N/A	N/A	778.89	1.61	5.79	0.28	**0.57**	2.29	0.36
		141+50	777.25	142+00	776.20	6	4	0	0.04	0.021	5.28	80.0%	4.2	776.80	N/A	N/A	777.90	1.78	6.09	0.29	**0.60**	2.37	0.38
		142+00	776.20	142+50	775.40	6	4	0	0.04	0.016	5.28	90.0%	4.8	776.06	N/A	N/A	777.15	2.15	6.70	0.32	**0.66**	2.21	0.32
		142+50	775.40	143+00	774.90	6	4	0	0.04	0.010	5.28	100.0%	5.3	775.65	N/A	N/A	776.71	2.78	7.61	0.37	**0.75**	1.90	0.23

STATE OF TEXAS
ANDRES M. CARDENAS
88453
LICENSED PROFESSIONAL ENGINEER
6/22/2017

NO.	REVISION	BY	DATE

WILLIAMSON COUNTY
1848

RTG RODRIGUEZ TRANSPORTATION GROUP
FIRM #587

GEORGETOWN INNER LOOP

HYDRAULIC DATA SHEET

DITCH CALCULATIONS

6/22/2017 SHEET 1 OF 2

DESIGNED:	PROJECT NUMBER		ROADWAY	
CHECKED:			SE INNER LOOP	
DRAWN:	STATE	COUNTY	CITY	SHEET No.
CHECKED:	TEXAS	WILLIAMSON	GEORGETOWN	114

sbrooks
6/22/2017
6:11
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HY-8 Culvert Analysis Report

Crossing Discharge Data

Discharge Selection Method: Recurrence

Table 1 - Summary of Culvert Flows at Crossing: Driveway 147+50

Headwater Elevation (ft)	Discharge Names	Total Discharge (cfs)	3-18 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
771.99	5 year	12.44	12.44	0.00	1
772.09	10 year	14.16	14.16	0.00	1
772.23	25 year	16.55	16.55	0.00	1
772.76	100 year	26.07	24.81	1.19	10
772.70	Overtopping	24.01	24.01	0.00	Overtopping

Table 2 - Culvert Summary Table: 3-18" RCP

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
5 year	12.44	12.44	771.99	1.161	1.286	3-M2t	1.500	0.779	0.784	0.784	4.438	2.004
10 year	14.16	14.16	772.09	1.258	1.391	3-M2t	1.500	0.832	0.835	0.835	4.671	2.075
25 year	16.55	16.55	772.23	1.399	1.533	7-M2c	1.500	0.903	0.903	0.900	4.966	2.163
100 year	26.07	24.81	772.76	2.018	2.057	3-M2t	1.500	1.110	1.116	1.116	5.866	2.439

****

Straight Culvert

Inlet Elevation (invert): 770.70 ft, Outlet Elevation (invert): 770.65 ft

Culvert Length: 45.00 ft, Culvert Slope: 0.0011

****

Site Data - 3-18" RCP

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 770.70 ft

Outlet Station: 45.00 ft

Outlet Elevation: 770.65 ft

Number of Barrels: 3

Culvert Data Summary - 3-18" RCP

Barrel Shape: Circular

Barrel Diameter: 1.50 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Mitered to Conform to Slope

Inlet Depression: None

Table 3 - Downstream Channel Rating Curve (Crossing: Driveway 147+50)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
12.44	771.43	0.78	2.00	0.34	0.49
14.16	771.48	0.83	2.07	0.36	0.49
16.55	771.55	0.90	2.16	0.39	0.50
26.07	771.77	1.12	2.44	0.49	0.51

Tailwater Channel Data - Driveway 147+50

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 4.00 ft

Side Slope (H:V): 5.00 (_:1)

Channel Slope: 0.0070

Channel Manning's n: 0.0400

Channel Invert Elevation: 770.65 ft

Roadway Data for Crossing: Driveway 147+50

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 30.00 ft

Crest Elevation: 772.70 ft

Roadway Surface: Paved

Roadway Top Width: 33.00 ft

HY-8 Culvert Analysis Report

Crossing Discharge Data

Discharge Selection Method: Recurrence

Table 1 - Summary of Culvert Flows at Crossing: Driveway 154+00

Headwater Elevation (ft)	Discharge Names	Total Discharge (cfs)	3-18" RCP Discharge (cfs)	Roadway Discharge (cfs)	Iterations
768.70	5 year	15.58	15.58	0.00	1
768.81	10 year	17.86	17.86	0.00	1
768.97	25 year	21.06	21.06	0.00	1
769.62	100 year	33.82	28.83	4.94	8
769.47	Overtopping	27.42	27.42	0.00	Overtopping

Table 2 - Culvert Summary Table: 3-18" RCP

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
5 year	15.58	15.58	768.70	1.344	1.500	3-M1t	0.893	0.872	0.907	0.907	4.646	2.011
10 year	17.86	17.86	768.81	1.486	1.605	3-M2t	0.982	0.938	0.968	0.968	4.934	2.086
25 year	21.06	21.06	768.97	1.711	1.770	3-M2t	1.119	1.023	1.047	1.047	5.330	2.178
100 year	33.82	28.83	769.62	2.415	2.256	3-M2t	1.500	1.196	1.304	1.304	5.893	2.466

****

Straight Culvert

Inlet Elevation (invert): 767.20 ft, Outlet Elevation (invert): 767.00 ft

Culvert Length: 46.00 ft, Culvert Slope: 0.0043

****

Site Data - 3-18" RCP

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 767.20 ft

Outlet Station: 46.00 ft

Outlet Elevation: 767.00 ft

Number of Barrels: 3

Culvert Data Summary - 3-18" RCP

Barrel Shape: Circular

Barrel Diameter: 1.50 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Mitered to Conform to Slope

Inlet Depression: None

Table 3 - Downstream Channel Rating Curve (Crossing: Driveway 154+00)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
15.58	767.91	0.91	2.01	0.34	0.46
17.86	767.97	0.97	2.09	0.36	0.46
21.06	768.05	1.05	2.18	0.39	0.47
33.82	768.30	1.30	2.47	0.49	0.48

Tailwater Channel Data - Driveway 154+00

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 4.00 ft

Side Slope (H:V): 5.00 (_:1)

Channel Slope: 0.0060

Channel Manning's n: 0.0400

Channel Invert Elevation: 767.00 ft

Roadway Data for Crossing: Driveway 154+00

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 30.00 ft

Crest Elevation: 769.47 ft

Roadway Surface: Paved

Roadway Top Width: 33.00 ft

STATE OF TEXAS
ANDRES M. CARDENAS
88453
LICENSED PROFESSIONAL ENGINEER
6/22/2017

NO.	REVISION	BY	DATE

WILLIAMSON COUNTY 1848

RTG RODRIGUEZ TRANSPORTATION GROUP FIRM #587

GEORGETOWN INNER LOOP

HYDRAULIC DATA SHEET

DRIVEWAY CULVERT CALCULATIONS

6/22/2017 SHEET 2 OF 2

DESIGNED:	PROJECT NUMBER		ROADWAY	
CHECKED:			SE INNER LOOP	
DRAWN:	STATE	COUNTY	CITY	SHEET No.
CHECKED:	TEXAS	WILLIAMSON	GEORGETOWN	15

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PROPOSED CONDITION DRAINAGE BASIN CALCULATIONS

BASINS INFORMATION

Basin ID	Area (Ac)	Asphalt ALL 0.95	Concrete /Roof ALL 0.97	Grass, 75%+ cover, 0-2% slope 2 YR 0.24	Grass, 75%+ cover, 0-2% slope 5 YR 0.26	Grass, 75%+ cover, 0-2% slope 10 YR 0.28	Grass, 75%+ cover, 0-2% slope 25 YR 0.31	Grass, 75%+ cover, 0-2% slope 50 YR 0.33	Grass, 75%+ cover, 0-2% slope 100 YR 0.36	Grass, 0-50%+ cover, 0-2% slope 2 YR 0.32	Grass, 0-50%+ cover, 0-2% slope 5 YR 0.34	Grass, 0-50%+ cover, 0-2% slope 10 YR 0.37	Grass, 0-50%+ cover, 0-2% slope 25 YR 0.4	Grass, 0-50%+ cover, 0-2% slope 50 YR 0.43	Grass, 0-50%+ cover, 0-2% slope 100 YR 0.47	Composite C Value 2 YR	Composite C Value 5 YR	Composite C Value 10 YR
A1-1	0.73	0.37		0.36	0.36	0.36	0.36	0.36	0.36							0.60	0.61	0.62
A3-1	1.37	0.41	0.05	0.91	0.91	0.91	0.91	0.91	0.91							0.48	0.49	0.50
A3-2	3.39	1.32	0.45	1.62	1.62	1.62	1.62	1.62	1.62							0.61	0.62	0.63
A4-1	0.62	0.27	0.07	0.28	0.28	0.28	0.28	0.28	0.28							0.63	0.64	0.65
A4-2	0.84	0.35	0.12	0.38	0.38	0.38	0.38	0.38	0.38							0.64	0.64	0.65
A5-1	5.98	1.45	1.79	2.74	2.74	2.74	2.74	2.74	2.74							0.63	0.64	0.65
A5-2	5.25	1.02	0.20	3.01	3.01	3.01	3.01	3.01	3.01	1.01	1.01	1.01	1.01	1.01	1.01	0.42	0.44	0.45
A5-3	7.35	4.03	0.58	2.75	2.75	2.75	2.75	2.75	2.75							0.69	0.69	0.70
A5-3-1	1.39	0.38		1.01	1.01	1.01	1.01	1.01	1.01							0.44	0.45	0.46
A5-4	1.17	0.55		0.62	0.62	0.62	0.62	0.62	0.62							0.57	0.58	0.59
A5-5	1.38			1.38	1.38	1.38	1.38	1.38	1.38							0.24	0.26	0.28
A1-2	0.95	0.47		0.47	0.47	0.47	0.47	0.47	0.47							0.59	0.60	0.61

PROPOSED CONDITION DRAINAGE BASIN CALCULATIONS

Basin ID	BASINS INFORMATION: Composite C Value 25 YR	Composite C Value 50 YR	Composite C Value 100 YR	TIME OF CONCENTRATION: Tc Actual (MIN)	Tc Used (MIN)	INTENSITIES AND FLOWS: INTENSITY 2 YR (IN/HR)	DISCHARGE 2 YR (CFS)	INTENSITY 5 YR (IN/HR)	DISCHARGE 5 YR (CFS)	INTENSITY 10 YR (IN/HR)	DISCHARGE 10 YR (CFS)	INTENSITY 25 YR (IN/HR)	* DISCHARGE 25 YR (CFS)	INTENSITY 50 YR (IN/HR)	DISCHARGE 50 YR (CFS)	INTENSITY 100 YR (IN/HR)	** DISCHARGE 100 YR (CFS)
A1-1	0.64	0.65	0.66	1.97	5.00	6.48	2.84	7.68	3.43	8.64	3.92	9.84	4.56	10.92	5.14	11.88	5.72
A3-1	0.52	0.54	0.56	11.79	11.79	5.07	3.32	6.12	4.12	6.91	4.77	7.99	5.74	8.90	6.56	9.74	7.44
A3-2	0.65	0.66	0.67	21.23	21.23	3.91	8.14	4.83	10.20	5.47	11.74	6.41	14.06	7.17	15.96	7.89	17.94
A4-1	0.66	0.67	0.68	10.18	10.18	5.34	2.08	6.43	2.54	7.25	2.91	8.35	3.42	9.30	3.86	10.17	4.31
A4-2	0.67	0.68	0.69	9.00	9.00	5.56	2.98	6.67	3.62	7.52	4.14	8.65	4.86	9.62	5.47	10.50	6.10
A5-1	0.66	0.67	0.69	19.08	19.08	4.12	15.55	5.07	19.40	5.74	22.27	6.71	26.58	7.49	30.11	8.24	33.78
A5-2	0.48	0.49	0.52	17.24	17.24	4.32	9.55	5.29	12.13	5.99	14.26	6.98	17.47	7.80	20.21	8.56	23.32
A5-3	0.71	0.72	0.73	9.82	9.82	5.41	27.28	6.50	33.17	7.33	37.78	8.44	44.22	9.39	49.73	10.27	55.20
A5-3-1	0.49	0.50	0.52	10.79	10.79	5.23	3.16	6.31	3.94	7.11	4.58	8.21	5.53	9.14	6.35	10.00	7.24
A5-4	0.61	0.62	0.64	12.49	12.49	4.96	3.32	6.00	4.10	6.77	4.71	7.84	5.59	8.74	6.34	9.57	7.12
A5-5	0.31	0.33	0.36	3.09	5.00	6.48	2.14	7.68	2.75	8.64	3.33	9.84	4.19	10.92	4.96	11.88	5.88
A1-2	0.63	0.64	0.65	4.18	5.00	6.48	3.65	7.68	4.40	8.64	5.03	9.84	5.87	10.92	6.62	11.88	7.37

NOTE: ALL DRAINAGE AREA DISCHARGES WERE CALCULATED USING RATIONAL METHOD.

* 4% AEP DESIGN STORM FREQUENCY
** 1% AEP STORM FREQUENCY

STATE OF TEXAS
AARON DEMARAY TAINTER
105733
LICENSED
PROFESSIONAL ENGINEER

Aaron Demaray Tainter 6/26/2017

BRIDGEFARMER & ASSOCIATES, INC.
CONSULTING ENGINEERS
TBPE REGISTRATION NO. 264

GEORGETOWN INNER LOOP @ CENTRAL MAINTENANCE FACILITY

HYDRAULIC DATA
MINOR DRAINAGE AREAS

SHEET 1 OF 1

DESIGN	GRAPHICS	CHECK	CHECK	SHEET NO.
KA	AKH	AT	WD	16

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Ditch Number	Offsets	Downstream Station SE INNER LOOP (STA)	Downstream Elevation (ft)	Downstream lowest adjacent rdwy elev. (ft)	Downstream Bottom of Flexbase (ft)	Upstream Station (STA)	Upstream Elevation (ft)	Ditch Slope 'S' (%)	Roughness Coefficient 'n'	Ditch Lining Material	Left Slope (X:1)	Bottom Width (ft)	Right Slope (X:1)	Design Storm (Yr)	Concrete Lined Ditch Detail *	Design Discharge 'Q' (cfs)	Design Velocity 'V' (fps)	Ditch Flow Depth 'd' (ft)	Downstream Water Surface (ft)	Upstream Water Surface (ft)	Max. Water Surface Elev. (ft)	Downstream Shear Stress 'Td' (psf)
DTCH-IL-A5-1	-45.6	154+50.00	767.00	770.18	768.56																	
	-44.7	155+00.00	766.86	770.08	768.46	154+50.00	767.00	0.27%	0.040	GRASS	4	4.0	6	25	-	24.41	1.7	1.34	768.21		768.46	0.14
	-44.6	155+50.00	766.73	769.96	768.34	155+00.00	766.86	0.27%	0.040	GRASS	4	4.4	5.5	25	-	24.97	1.7	1.34	768.07	768.21	768.34	0.14
	-44.7	156+00.00	766.59	769.84	768.22	155+50.00	766.73	0.27%	0.040	GRASS	4	4.4	5.5	25	-	25.50	1.7	1.36	767.94	768.07	768.22	0.14
	-44.6	156+50.00	766.45	769.73	768.11	156+00.00	766.59	0.27%	0.040	GRASS	4	4.0	5.5	25	-	26.01	1.7	1.40	767.85	767.94	768.11	0.15
	-43.9	156+91.38	766.34	769.72	768.10	156+50.00	766.45	0.27%	0.040	GRASS	4	10.5	4	25	-	26.58	1.7	1.06	767.40	767.85	768.10	0.14
DTCH-IL-A5-3	-59.5	167+00.00	769.85	770.72	769.10																	
	-43.5	166+50.00	769.08	770.61	768.99	167+00.00	769.85	1.53%	0.040	GRASS	6	6.0	6	25	-	0.97	1.1	0.13	769.21		770.61	0.11
	-47.2	166+00.00	768.83	770.46	768.84	166+50.00	769.08	0.50%	0.040	GRASS	6	12.0	6	25	-	6.37	1.2	0.37	769.20	769.08	770.46	0.10
	-58.4	165+00.00	768.33	770.32	768.70	166+00.00	768.83	0.50%	0.015	CONCRETE	6	20.0	4	25	Detail B	44.22	4.0	0.49	768.82	768.83	770.32	0.14
	-59.2	163+50.00	767.58	770.00	768.38	165+00.00	768.33	0.50%	0.015	CONCRETE	3	14.0	6	25	Detail B	44.92	4.5	0.60	768.18	768.33	768.38	0.16
	-41.6	163+00.00	767.42	769.96	768.34	163+50.00	767.58	0.33%	0.015	CONCRETE	6	6.0	4	25	Detail B	47.50	4.4	0.99	768.41	767.58	769.96	0.14
	-36.6	162+00.00	767.09	769.61	767.99	163+00.00	767.42	0.33%	0.015	CONCRETE	4	4.0	4	25	Detail B	50.63	4.8	1.21	768.29	767.42	769.61	0.16
	-35.9	161+00.00	766.76	769.12	767.50	162+00.00	767.09	0.33%	0.015	CONCRETE	4	4.0	4	25	Detail B	53.62	4.8	1.24	768.00	767.09	769.12	0.16
	-36.4	160+00.00	766.43	768.91	767.29	161+00.00	766.76	0.33%	0.015	CONCRETE	4	4.0	4	25	Detail B	56.55	4.9	1.27	767.70	766.76	768.91	0.16
	-37.9	159+00.00	766.10	768.96	767.34	160+00.00	766.43	0.33%	0.015	CONCRETE	4	4.0	4	25	Detail B	59.35	5.0	1.30	767.40	766.43	768.96	0.17
	-40.9	158+00.00	765.77	769.29	767.67	159+00.00	766.10	0.33%	0.015	CONCRETE	4	4.0	4	25	Detail B	61.52	5.0	1.32	767.09	766.10	767.67	0.17
	-50.5	157+38.42	765.54	769.65	768.03	158+00.00	765.77	0.37%	0.015	CONCRETE	5	4.0	4	25	Detail B	62.14	5.2	1.28	766.82	765.77	768.03	0.18
DTCH-IL-A3-1	-59.5	167+00.00	769.85	770.72	769.10																	
	-45.6	167+50.00	769.12	770.67	769.05	167+00.00	769.85	1.46%	0.040	GRASS	8	6.0	8	25	-	2.21	1.4	0.21	769.33	769.85		0.16
	-47.1	168+00.00	768.87	770.59	768.97	167+50.00	769.12	0.50%	0.040	GRASS	8	6.0	8	25	-	3.32	1.1	0.35	769.22	769.12	770.59	0.08
	-47.4	168+50.00	768.62	770.39	768.77	168+00.00	768.87	0.50%	0.040	GRASS	8	6.0	8	25	-	4.22	1.2	0.40	769.02	768.87	770.39	0.09
	-47.6	169+00.00	768.37	770.16	768.54	168+50.00	768.62	0.50%	0.040	GRASS	8	6.0	8	25	-	4.81	1.2	0.42	768.79	768.62	770.16	0.10
	-75.0	170+50.00	767.62	769.58	767.96	170+25.56	767.74	0.50%	0.015	CONCRETE	8	6.0	8	25	Detail B	15.76	3.4	0.47	768.09	767.74	769.58	0.11
	-47.8	171+00.00	767.32	769.48	767.86	170+50.00	767.62	0.60%	0.040	GRASS	6	6.0	6	25	-	16.73	1.9	0.80	768.12	767.62	769.48	0.21
	-51.2	171+50.00	767.12	769.73	768.11	171+00.00	767.32	0.40%	0.040	GRASS	6	6.0	6	25	-	17.59	1.7	0.91	768.03	767.32	768.11	0.15
	-53.9	172+00.00	766.97	769.89	768.27	171+50.00	767.12	0.30%	0.040	GRASS	6	6.0	6	25	-	18.67	1.5	1.00	767.97	767.12	768.27	0.12
DTCH-IL-A1-1	-43.8	173+20.00	767.92	769.44	767.82																	
	-43.0	173+50.00	767.89	769.15	767.53	173+20.00	767.92	0.10%	0.040	GRASS	60	0.0	10	25	-	1.03	0.3	0.27	768.16		769.15	0.01
	-43.2	174+00.00	767.47	768.61	766.99	173+50.00	767.89	0.84%	0.040	GRASS	6	6.0	8	25	-	2.04	1.1	0.23	767.70	768.16	768.61	0.10
	-46.3	174+50.00	767.08	768.71	767.09	174+00.00	767.47	0.78%	0.040	GRASS	6	6.0	8	25	-	2.54	1.2	0.27	767.35	767.70	768.71	0.11
	-46.3	175+00.00	766.69	768.31	766.69	174+50.00	767.08	0.78%	0.040	GRASS	6	6.0	8	25	-	3.04	1.3	0.30	766.99	767.35	768.31	0.12
	-47.0	175+50.00	766.30	768.01	766.39	175+00.00	766.69	0.78%	0.040	GRASS	6	6.0	8	25	-	3.54	1.3	0.33	766.63	766.99	768.01	0.12
	-49.3	176+00.00	765.91	767.90	766.28	175+50.00	766.30	0.78%	0.040	GRASS	6	6.0	8	25	-	4.04	1.4	0.35	766.26	766.63	766.28	0.13
	-45.9	176+50.00	765.48	767.40	765.78	176+00.00	765.91	0.86%	0.040	GRASS	4	6.0	6	25	-	4.31	1.5	0.36	765.84	766.26	767.40	0.16
	-48.3	176+69.43	764.90	767.10	765.48	176+50.00	765.48	2.99%	0.040	GRASS	4	6.0	4	25	-	4.56	2.4	0.27	765.17	765.84	765.48	0.43

* SEE DRAINAGE DETAILS SHEET

STATE OF TEXAS
AARON DEMARAY TAINTER
105733
LICENSED
PROFESSIONAL ENGINEER

Aaron Demaray Tainter 6/26/2017

BRIDGEFARMER & ASSOCIATES, INC.
CONSULTING ENGINEERS
TBPE REGISTRATION NO. 264

GEORGETOWN INNER LOOP @
CENTRAL MAINTENANCE FACILITY

DITCH HYDRAULICS

SHEET 1 OF 3

DESIGN	GRAPHICS	CHECK	CHECK	SHEET NO.
KA	AKH	AT	WD	1p1486

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Ditch Number	Offsets	Downstream				Upstream		Ditch Slope	Roughness Coefficient	Ditch Lining Material	Left Slope	Bottom Width	Right Slope	Design Storm	Concrete Lined Ditch Detail *	Design Discharge	Design Velocity	Ditch Flow Depth	Downstream Water Surface	Upstream Water Surface	Max. Water Surface Elev.	Downstream Shear Stress
		Station SE INNER LOOP	Elevation	lowest adjacent rdwy elev.	Bottom of Flexbase	Station	Elevation	'S'	'n'							'Q'	'V'	'd'				'Td'
		(STA)	(ft)	(ft)	(ft)	(STA)	(ft)	(%)			(X:1)	(ft)	(X:1)	(Yr)		(cfs)	(fps)	(ft)	(ft)	(ft)	(ft)	(psf)
DTCH-IL-A5-4	39.5	166+50.00	769.00	770.52	768.90																	
	39.2	166+00.00	768.74	770.47	768.85	166+50.00	769.00	0.52%	0.040	GRASS	8	6.0	8.0	25	-	0.41	0.6	0.11	768.85		770.47	0.03
	41.0	165+50.00	768.48	770.43	768.81	166+00.00	768.74	0.52%	0.040	GRASS	8	6.0	8.0	25	-	0.69	0.7	0.14	768.63	768.85	768.81	0.04
	40.1	165+00.00	768.23	770.52	768.90	165+50.00	768.48	0.52%	0.040	GRASS	6	6.0	6.0	25	-	0.97	0.8	0.18	768.41	768.63	768.90	0.05
	42.3	164+50.00	767.97	770.62	769.00	165+00.00	768.23	0.52%	0.040	GRASS	6	6.0	6.0	25	-	1.25	0.8	0.21	768.18	768.41	769.00	0.06
	43.5	164+00.00	767.71	770.55	768.93	164+50.00	767.97	0.52%	0.040	GRASS	6	6.0	6.0	25	-	1.53	0.9	0.23	767.94	768.18	768.93	0.06
	44.4	163+50.00	767.45	770.45	768.83	164+00.00	767.71	0.52%	0.040	GRASS	6	6.0	6.0	25	-	1.82	0.9	0.26	767.71	767.94	768.83	0.07
	45.9	163+00.00	767.20	770.46	768.84	163+50.00	767.45	0.52%	0.040	GRASS	6	6.0	6.0	25	-	2.11	1.0	0.28	767.47	767.71	768.84	0.07
	46.7	162+50.00	766.94	770.32	768.70	163+00.00	767.20	0.52%	0.040	GRASS	6	6.0	6.0	25	-	2.40	1.0	0.30	767.24	767.47	768.70	0.08
	47.5	162+00.00	766.68	770.19	768.57	162+50.00	766.94	0.52%	0.040	GRASS	6	6.0	6.0	25	-	2.70	1.1	0.32	767.00	767.24	768.57	0.08
	47.1	161+50.00	766.42	769.88	768.26	162+00.00	766.68	0.52%	0.040	GRASS	6	6.0	6.0	25	-	2.99	1.1	0.34	766.76	767.00	768.26	0.09
	47.1	161+00.00	766.17	769.62	768.00	161+50.00	766.42	0.52%	0.040	GRASS	6	6.0	6.0	25	-	3.29	1.1	0.36	766.52	766.76	768.00	0.09
	47.1	160+50.00	765.91	769.36	767.74	161+00.00	766.17	0.52%	0.040	GRASS	6	6.0	6.0	25	-	3.60	1.2	0.37	766.28	766.52	767.74	0.09
	48.1	160+00.00	765.65	769.27	767.65	160+50.00	765.91	0.52%	0.040	GRASS	6	6.0	6.0	25	-	3.90	1.2	0.39	766.04	766.28	767.65	0.10
	48.9	159+50.00	765.39	769.15	767.53	160+00.00	765.65	0.52%	0.040	GRASS	6	6.0	6.0	25	-	4.22	1.2	0.41	765.80	766.04	767.53	0.10
	51.2	159+00.00	765.14	769.29	767.67	159+50.00	765.39	0.52%	0.040	GRASS	6	6.0	6.0	25	-	4.58	1.3	0.42	765.56	765.80	767.67	0.10
	54.2	158+50.00	764.88	769.52	767.90	159+00.00	765.14	0.52%	0.040	GRASS	6	6.0	6.0	25	-	4.93	1.3	0.44	765.32	765.56	767.90	0.11
	59.2	158+00.00	764.62	770.09	768.47	158+50.00	764.88	0.52%	0.040	GRASS	5	6.0	6.0	25	-	5.59	1.4	0.48	765.10	765.32	768.47	0.12
DTCH-IL-A4-2	40.0	167+00.00	769.00	770.61	768.99																	
	38.2	167+50.00	768.74	770.36	768.74	167+00.00	769.00	0.52%	0.040	GRASS	8.0	6.0	8.0	25	-	0.57	0.6	0.13	768.87		770.36	0.04
	38.9	168+00.00	768.48	770.19	768.57	167+50.00	768.74	0.52%	0.040	GRASS	8.0	6.0	8.0	25	-	0.94	0.7	0.17	768.65	768.87	770.19	0.05
	39.3	168+50.00	768.25	770.00	768.38	168+00.00	768.48	0.46%	0.015	CONCRETE	8.0	6.0	7.8	25	Detail B	1.32	1.5	0.12	768.37	768.65	768.38	0.03
	39.4	169+00.00	768.09	769.85	768.23	168+50.00	768.25	0.32%	0.015	CONCRETE	8.0	6.0	6.0	25	Detail B	1.69	1.5	0.16	768.25	768.37	769.85	0.03
	39.6	169+50.00	767.92	769.71	768.09	169+00.00	768.09	0.35%	0.015	CONCRETE	8.0	6.0	6.0	25	Detail B	2.06	1.6	0.17	768.09	768.25	769.71	0.03
	40.1	169+75.00	767.82	769.67	768.05	169+50.00	767.92	0.38%	0.015	CONCRETE	8.0	6.0	6.0	25	Detail B	2.24	1.7	0.18	768.00	768.09	768.05	0.04
	40.4	170+00.00	767.74	769.62	768.00	169+75.00	767.82	0.32%	0.015	CONCRETE	8.0	6.0	4.5	25	Detail B	2.43	1.7	0.20	767.94	768.00	768.00	0.03
	37.8	170+50.00	767.57	769.47	767.85	170+00.00	767.74	0.35%	0.015	CONCRETE	6.0	6.0	6.0	25	Detail B	2.81	1.9	0.21	767.77	767.94	767.85	0.04
	40.4	171+00.00	767.39	769.64	768.02	170+50.00	767.57	0.35%	0.015	CONCRETE	6.0	6.0	4.0	25	Detail B	3.21	2.0	0.23	767.62	767.77	768.02	0.04
	42.9	171+50.00	767.22	769.89	768.27	171+00.00	767.39	0.35%	0.015	CONCRETE	6.0	6.0	4.0	25	Detail B	3.63	2.1	0.24	767.46	767.62	768.27	0.05
	76.6	171+50.00	767.08	769.89	768.27	171+50.00	767.22	0.50%	0.015	CONCRETE	4.0	6.0	4.0	25	Detail B	3.63	2.4	0.22	767.30	767.46	768.27	0.06
	76.0	172+00.00	766.88	770.05	768.43	171+50.00	767.08	0.40%	0.015	CONCRETE	4.0	6.0	4.0	25	Detail B	4.06	2.3	0.25	767.13	767.30	768.43	0.05
	77.7	172+50.00	766.14	770.00	768.38	172+00.00	766.88	1.48%	0.040	GRASS	3.0	4.8	3.0	25	-	4.49	2.1	0.37	766.51	767.13	768.38	0.28
	81.4	172+77.93	765.93	769.89	768.27	172+50.00	766.14	0.75%	0.040	GRASS	2.0	6.0	2.0	25	-	4.69	1.6	0.42	766.35	766.51	768.27	0.17
	75.5	172+87.00	765.54	769.84	768.22	172+77.93	765.93	4.30%	0.040	GRASS	1.0	8.0	3.0	25	-	4.86	2.7	0.22	765.76	766.35	768.22	0.54

* SEE DRAINAGE DETAILS SHEET

STATE OF TEXAS
AARON DEMARAY TAINTER
105733
LICENSED
PROFESSIONAL ENGINEER

Aaron Demaray Tainter 6/26/2017

BRIDGEFARMER & ASSOCIATES, INC.
CONSULTING ENGINEERS
TBPE REGISTRATION NO. 264

GEORGETOWN INNER LOOP @
CENTRAL MAINTENANCE FACILITY

DITCH HYDRAULICS

SHEET 2 OF 3

DESIGN	GRAPHICS	CHECK	CHECK	SHEET NO.
KA	AKH	AT	WD	18

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Ditch Number	Offsets	Downstream Station SE INNER LOOP (STA)	Downstream Elevation (ft)	Downstream lowest adjacent rdwy elev. (ft)	Downstream Bottom of Flexbase (ft)	Upstream Station (STA)	Upstream Elevation (ft)	Ditch Slope 'S' (%)	Roughness Coefficient 'n'	Ditch Lining Material	Left Slope (X:1)	Bottom Width (ft)	Right Slope (X:1)	Design Storm (Yr)	Concrete Lined Ditch Detail *	Design Discharge 'Q' (cfs)	Design Velocity 'V' (fps)	Ditch Flow Depth 'd' (ft)	Downstream Water Surface (ft)	Upstream Water Surface (ft)	Max. Water Surface Elev. (ft)	Downstream Shear Stress 'Td' (psf)
DTCH-IL-A4-1	44.0	176+50.00	766.92	767.13	765.51																	
	42.0	176+00.00	766.82	767.57	765.95	176+50.00	766.92	0.20%	0.015	CONCRETE	50	10.0	50.0	25	Detail B	0.96	0.7	0.09	766.91		767.57	0.01
	44.2	175+50.00	766.72	767.65	766.03	176+00.00	766.82	0.20%	0.015	CONCRETE	36	6.5	22.6	25	Detail B	1.36	0.9	0.14	766.86	766.91	767.65	0.01
	46.5	175+00.00	766.51	767.82	766.20	175+50.00	766.72	0.42%	0.015	CONCRETE	12	6.0	21.8	25	Detail B	1.75	1.5	0.14	766.65	766.86	767.82	0.03
	41.4	174+50.00	766.36	768.04	766.42	175+00.00	766.51	0.30%	0.015	CONCRETE	10	6.7	10.0	25	Detail B	2.14	1.5	0.17	766.53	766.65	768.04	0.03
	42.2	174+00.00	766.22	768.77	767.15	174+50.00	766.36	0.28%	0.015	CONCRETE	8	6.0	6.0	25	Detail B	2.53	1.6	0.21	766.43	766.53	767.15	0.03
	40.9	173+50.00	766.15	769.31	767.69	174+00.00	766.22	0.14%	0.015	CONCRETE	4	6.0	4.0	25	Detail B	3.42	1.5	0.31	766.46	766.43	767.69	0.02
DTCH-IL-A5-5	51.9	154+70.00	767.30	772.05	770.43																	
	53.2	155+00.00	767.00	771.98	770.36	154+70.00	767.30	1.00%	0.040	GRASS	6	0.0	6	25	-	3.19	1.6	0.58	767.58		770.36	0.18
	55.5	155+50.00	766.50	771.86	770.24	155+00.00	767.00	1.00%	0.040	GRASS	6	0.0	6	25	-	3.32	1.6	0.58	767.09	767.58	770.24	0.18
	52.6	156+00.00	766.00	771.74	770.12	155+50.00	766.50	1.00%	0.040	GRASS	5	0.0	5	25	-	3.51	1.7	0.64	766.64	767.09	770.12	0.20
	54.6	156+50.00	765.50	771.63	770.01	156+00.00	766.00	1.00%	0.040	GRASS	5	0.0	5	25	-	3.67	1.7	0.65	766.15	766.64	770.01	0.20
	53.3	157+00.00	765.00	771.46	769.84	156+50.00	765.50	1.00%	0.040	GRASS	4.5	0.0	4.5	25	-	3.83	1.8	0.69	765.69	766.15	769.84	0.21
	53.3	157+20.00	764.80	771.27	769.65	157+00.00	765.00	1.00%	0.040	GRASS	4.5	0.0	4.5	25	-	4.16	1.8	0.71	765.51	765.69	769.65	0.22
	53.1	157+38.42	764.62	771.05	769.43	157+20.00	764.80	1.00%	0.040	GRASS	4.5	0.0	4.5	25	-	4.19	1.8	0.71	765.33	765.51	769.43	0.22
DTCH-IL-A4-2-2	44.2	172+87.00	768.81	769.84	769.51																	
	44.2	172+77.93	768.86	769.89	769.56	172+87.00	768.81	0.55%	0.040	GRASS	20.0	10.2	20.0	25	-	0.41	0.5	0.08	768.94		769.56	0.02
	48.4	172+50.00	768.08	770.00	769.67	172+77.93	768.86	2.79%	0.040	GRASS	10.0	13.7	10.0	25	-	0.90	1.0	0.06	768.14	768.94	769.67	0.11
	47.4	172+00.00	767.39	770.05	769.72	172+50.00	768.08	1.38%	0.040	GRASS	8.0	6.0	8.0	25	-	1.39	1.2	0.16	767.55	768.14	769.72	0.12
	42.9	171+50.00	767.22	769.89	769.56	172+00.00	767.39	0.34%	0.015	CONCRETE	4.0	6.0	6.0	25	Detail B	1.87	1.6	0.17	767.39	767.55	769.56	0.03
DTCH-IL-A1-2	-48.9	178+00.00	764.24	766.57	764.95																	
	-42.8	178+50.00	763.99	766.47	764.85	178+00.00	764.24	0.50%	0.015	CONCRETE	6	0.0	8	25	Detail A	5.86	2.9	0.54	764.53		764.85	0.08
	-51.1	179+00.00	763.56	766.16	764.54	178+50.00	763.99	0.86%	0.015	CONCRETE	6	0.0	8	25	Detail A	6.35	3.6	0.50	764.06	764.53	764.54	0.13
	-52.3	179+50.00	763.23	765.99	764.37	179+00.00	763.56	0.66%	0.015	CONCRETE	6	0.0	8	25	Detail A	6.85	3.4	0.55	763.78	764.06	764.37	0.11
	-46.7	180+00.00	762.88	765.77	764.15	179+50.00	763.23	0.70%	0.015	CONCRETE	6	0.0	5	25	Detail A	7.34	3.7	0.60	763.48	763.78	764.15	0.13
	-49.2	180+50.00	762.69	765.48	763.86	180+00.00	762.88	0.38%	0.015	CONCRETE	6	0.0	5	25	Detail A	7.83	3.0	0.69	763.38	763.48	763.86	0.08
	-46.2	181+00.00	762.34	765.13	763.51	180+50.00	762.69	0.70%	0.015	CONCRETE	6	0.0	5	25	Detail A	8.32	3.8	0.63	762.97	763.38	763.51	0.14
	-42.0	182+00.00	761.81	764.41	762.79	181+00.00	762.34	0.53%	0.015	CONCRETE	10	0.0	5	25	Detail A	9.31	3.3	0.62	762.43	762.97	762.79	0.10
	-40.0	183+14.84	761.30	763.25	761.63	182+00.00	761.81	0.44%	0.015	CONCRETE	17	11.9	6	25	Detail B	10.43	2.5	0.28	761.58	762.43	761.63	0.06

* SEE DRAINAGE DETAILS SHEET

STATE OF TEXAS
AARON DEMARAY TAINTER
105733
LICENSED
PROFESSIONAL ENGINEER

Aaron Demaray Tainter 6/26/2017

BRIDGEFARMER & ASSOCIATES, INC.
CONSULTING ENGINEERS
TBPE REGISTRATION NO. 264

GEORGETOWN INNER LOOP @
CENTRAL MAINTENANCE FACILITY

DITCH HYDRAULICS

SHEET 3 OF 3

DESIGN	GRAPHICS	CHECK	CHECK	SHEET NO.
KA	AKH	AT	WD	19

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INNERLOOP LINK CONFIGURATION (25-YEAR FREQUENCY)

LINK/RUN ID	FROM NODE	TO NODE	DRAINAGE AREA NO.	TOTAL DA (AC)	WEIGHTED C-VALUE	CUMULATIVE Tc (MIN)	INTENSITY (IN/HR)	DESIGN Q 25 Yr (CFS)	CONDUIT SIZE	NUMBER OF BARRELS	FLOWLINE U.S. (FT)	FLOWLINE D.S. (FT)	HYDRAULIC LENGTH (FT)	SLOPE (%)	MANNING'S N-VALUE
A3-2 LINK	A3-2	A3-2-JNT	A3-2	4.76	0.62	21.23	6.41	18.67	18" CL III RCP	3	766.92	766.88	7.52	0.53	0.013
A3-2-JNT LINK	A3-2-JNT	A3-2-OUT	A3-2-JNT	7.76	0.62	21.23	6.41	18.67	18" CL III RCP	3	766.88	766.67	32.06	0.66	0.013
A4-1-LINK	A4-1	A4-1-OUT	A4-1	0.62	0.66	10.18	8.35	3.43	18" CL III RCP	1	766.11	766.01	29.28	0.34	0.013

INNERLOOP LINK HYDRAULICS (25-YEAR FREQUENCY)

LINK/RUN ID	FROM NODE	TO NODE	CRITICAL ELEVATION (FT)	HGL U.S. (FT)	HGL D.S. (FT)	FRICTION SLOPE (FT/FT)	UNIFORM DEPTH (FT)	ACTUAL DEPTH (FT)	UNIFORM VELOCITY (FT/S)	ACTUAL VELOCITY (FT/S)	Q 25 Yr (CFS)	CAPACITY (CFS)	JUNCTION LOSS (FT)	REMARKS
A3-2 LINK	A3-2	A3-2-JNT	768.80	768.49	767.91	0.005	1.08	1.03	4.85	5.09	18.67	24.73	0.39	
A3-2-JNT LINK	A3-2-JNT	A3-2-OUT	768.90	767.91	767.66	0.007	0.99	0.99	5.33	5.33	18.67	27.43	0.04	
A4-1-LINK	A4-1	A4-1-OUT	767.11	767.14	766.72	0.003	0.80	0.71	3.56	4.19	3.43	6.58	0.21	

NOTE: ALL DISCHARGES WERE CALCULATED USING RATIONAL METHOD.

STATE OF TEXAS
AARON DEMARAY TAINTER
105733
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Aaron Demaray Tainter 6/26/2017

BRIDGEFARMER & ASSOCIATES, INC.
CONSULTING ENGINEERS
TBPE REGISTRATION NO. 264

GEORGETOWN INNER LOOP @
CENTRAL MAINTENANCE FACILITY

LINK HYDRAULICS
LINK CONFIGURATION

SHEET 1 OF 1

DESIGN	GRAPHICS	CHECK	CHECK	SHEET NO.
KA	AKH	AT	WD	120

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Culvert Station and/or Creek Name	Description of Box Culert No. Spans ~ Span X Height	Max Fill Height (ft)	Applicable Box Culvert Standard	Applicable Wingwall or End Treatment Standard	Skew Angle (0o, 15o, 30o or 45o)	Side Slope or Channel Slope (SL:1)	T Culvert Top Slab Thick's (in)	U Culvert Wall Thick's (in)	C Estimated Curb Height (ft)	Hw ① Height of Wing (ft)	A Curb to End of Wingwall (ft)	B Offset of End of Wingwall (ft)	Lw Length of Longest Wingwall (ft)	Ltw Culvert Toewall Length (ft)	Atw Anchor Toewall Length (ft)	Riprap Apron (C.Y.)	Class ② "C" Conc. (Curb) (CY)	Class ③ "C" Conc. (Wing.) (CY)	Total Wingwall Area (SF)
CULVERT 2 (US) (Lt)	5 ~ 5' X 2'	2'	SCP-5	PW-1	15	3:1	6"	6"	0.833	3.333	N/A	N/A	10.353	33.129	N/A	0.0	1.0	7.3	69
CULVERT 2 (DS) (Rt)	5 ~ 5' X 2'	2'	SCP-5	PW-1	15	3:1	6"	6"	1.333	3.833	N/A	N/A	11.906	33.129	N/A	0.0	1.6	8.7	91
SDWK CULVERT 1 (Both)	3 ~ 5' X 3'	2'	SCP-5	PW-1	0	3:1	6"	6"	0.500	4.000	N/A	N/A	12.000	19.000	N/A	0.0	0.8	15.4	192
SDWK CULVERT 3 (Both)	1 ~ 5' X 2'	2'	SCP-5	PW-1	0	4:1	6"	6"	0.500	3.000	N/A	N/A	12.000	6.000	N/A	0.0	0.2	11.6	144

NOTES:
Skew Angle = 0° for SW-0, FW-0, SETB-CD, SETB-SW-0, and SETB-FW-0 standards.
30° Maximum for Safety End Treatment

SL:1 = Horizontal:1 Vertical
Side Slope at culvert for Flared or Straight Wingwalls. Channel Slope for Parallel Wingwalls.
Slope shall be 3:1 or flatter for Safety End Treatments.

T = Box Culvert Top Slab Thickness. Dimension can be found on the applicable Box Culvert Standard.

U = Box Culvert Wall Thickness. Dimension can be found on the applicable Box Culvert Standard.

C = Curb Height.

Hw = Height of Wingwall.
A = Distance from Face of Curb to End of Wingwall (Not applicable to Parallel or Straight Wingwalls).
B = Offset of End of Wingwall (Not applicable to Parallel or Straight Wingwalls).
Lw = Length of Longest Wingwall.
Atw = Length of Anchor Toewall (Applicable to Safety End Treatment only).
Total Wingwall Area = Wingwall area in S.F. for two wingwalls (one structure end) if Lt or Rt.
Area for four wingwalls (two structure ends) if Both.

① The wall heights shown will be rounded to the nearest Foot for bidding purposes.

② Concrete volume shown is for box culvert curb only. For curbs using the RAC standard, quantities shown must be increased by a factor of 2. If Class "S" concrete is required for the top slab of the culvert, the curb concrete shall also be Class "S". Curb concrete is considered part of the Box Culvert for payment.

③ Concrete volume shown is total of wing, footing, culvert toewall (if any), anchor toewall (if any) and wingwall toewall. Riprap apron, culvert and curb quantities are not included.

④ Regardless of the type of culvert shown on this sheet, the Contractor shall have the option of furnishing cast-in-place or precast culverts unless otherwise shown elsewhere on the plans. If the Contractor elects to provide culverts of a different type than those shown on this sheet, it shall be the Contractor's responsibility to make the necessary adjustments to the dimensions and quantities shown.

SPECIAL NOTE:
This sheet is a supplement to the Box Culvert standards. It is to be filled out by the culvert specifier and provides dimensions for the construction of the Box Culvert Wingwalls and Safety End Treatments.

An Excel 97 spreadsheet to assist in completing this table can be downloaded from the Bridge Standards (English) web page on the TxDOT web site. The completed sheet shall be signed, sealed, and dated by a licensed Professional Engineer.

STATE OF TEXAS
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TBPE REGISTRATION NO. 264

GEORGETOWN INNER LOOP @
CENTRAL MAINTENANCE FACILITY

BCS SHEET

SHEET 1 OF 1

DESIGN	GRAPHICS	CHECK	CHECK	SHEET NO.
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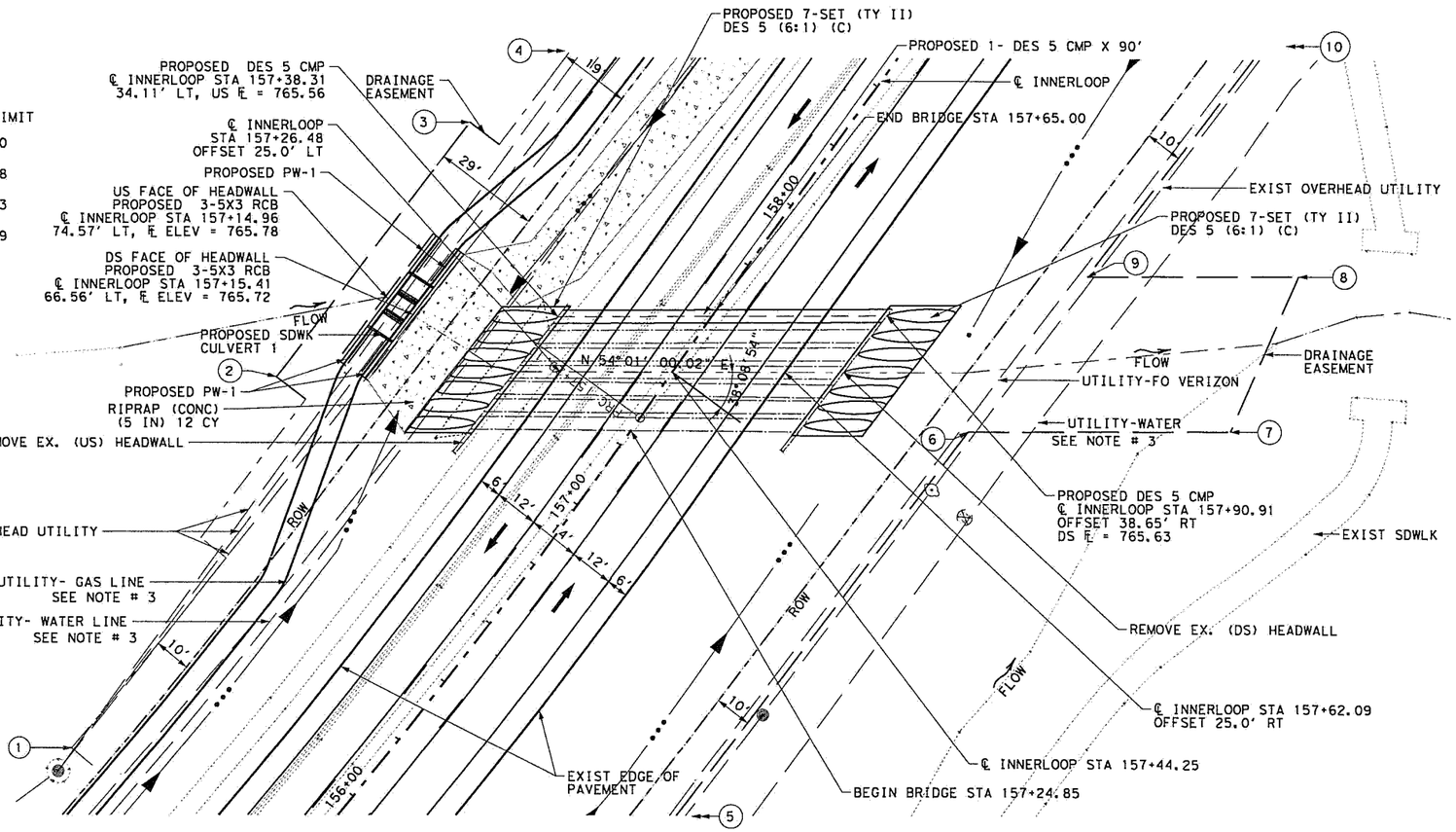
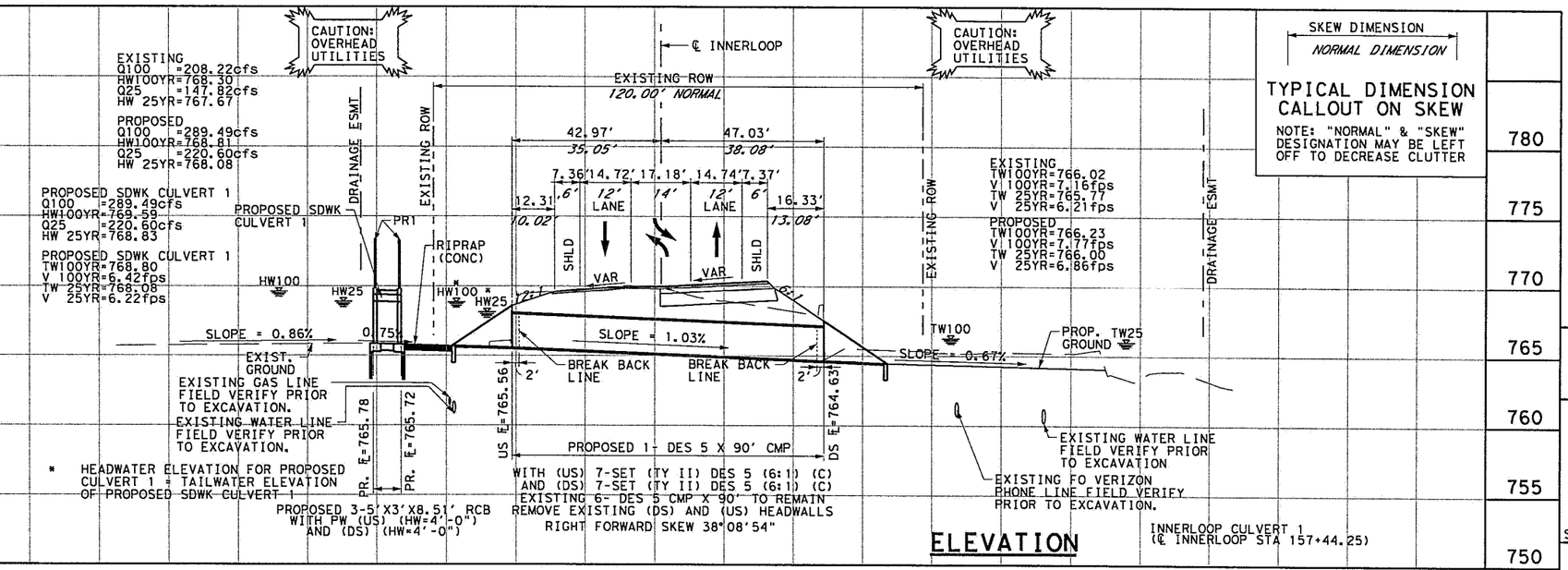
PLAN



NOTES:

1. SEE HY8 ANALYSIS SHEET FOR TAILWATER ELEVATION NOTES
2. SEE GRADING SHEET FOR GRADING DETAILS
3. LOCATE AND PROTECT GAS AND WATER LINE PRIOR TO CULVERT CONSTRUCTION
4. FOR CONCRETE RIPRAP SEE STANDARD CRR (TYPE RR8) FOR REINFORCEMENT DETAILS AND OTHER DETAILS NOT SHOWN

ELEVATION



SKEW DIMENSION
NORMAL DIMENSION

TYPICAL DIMENSION CALLOUT ON SKEW

NOTE: "NORMAL" & "SKEW" DESIGNATION MAY BE LEFT OFF TO DECREASE CLUTTER

STATE OF TEXAS
AARON DEMARAY TAINTER
105733
LICENSED
PROFESSIONAL ENGINEER
Aaron Demaray Tainter 6/26/2017

BRIDGEFARMER & ASSOCIATES, INC.
CONSULTING ENGINEERS
TBPE REGISTRATION NO. 264

GEORGETOWN INNER LOOP @ CENTRAL MAINTENANCE FACILITY

CULVERT 1 LAYOUT

SCALE: 1" = 40' SHEET 1 OF 1

DESIGN	GRAPHICS	CHECK	CHECK	SHEET NO.
KA	AKH	AT	WD	1221

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HY-8 Analysis Results

Culvert Summary Table - Existing 6-42"X29" ARCH CMP Culvert 1

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)	Tailwater Elevation (ft/s)
115.71	115.71	767.38	1.75	1.82	2-M2c	1.20	1.11	1.11	0.99	5.62	2.84	765.62
124.96	124.96	767.47	1.84	1.91	2-M2c	1.27	1.16	1.16	1.04	5.79	2.92	765.67
134.21	134.21	767.56	1.92	2.00	2-M2c	1.34	1.20	1.20	1.08	5.96	2.99	765.71
143.46	143.46	767.65	2.01	2.09	2-M2c	1.41	1.25	1.25	1.12	6.13	3.06	765.75
* 147.82	147.82	767.69	2.05	2.13	2-M2c	1.44	1.27	1.27	1.14	6.21	3.09	765.77
161.97	161.97	767.82	2.18	2.26	2-M2c	1.55	1.33	1.33	1.21	6.44	3.18	765.84
171.22	171.22	767.91	2.27	2.35	2-M2c	1.63	1.38	1.38	1.24	6.59	3.24	765.87
180.47	180.47	768.01	2.36	2.45	7-M2c	1.71	1.42	1.42	1.28	6.72	3.30	765.91
189.72	189.72	768.10	2.45	2.54	7-M2c	1.81	1.46	1.46	1.32	6.87	3.35	765.95
198.97	198.97	768.21	2.54	2.65	7-M2c	2.42	1.50	1.50	1.35	7.02	3.41	765.98
** 208.22	208.22	768.31	2.64	2.75	7-M2c	2.42	1.54	1.54	1.39	7.16	3.46	766.02

Note: HY8.7.30 WAS USED FOR THE CULVERT ANALYSIS
* 4% AEP DESIGN STORM FREQ
** 1% AEP STORM FREQ

****
Straight Culvert
Inlet Elevation (invert): 765.56 ft, Outlet Elevation (invert): 764.63 ft
Culvert Length: 90.00 ft, Culvert Slope: 0.0103
****

Site Data - Culvert 1
Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 765.56 ft
Outlet Station: 90.00 ft
Outlet Elevation: 764.63 ft
Number of Barrels: 6
Culvert Data Summary - Culvert 1
Barrel Shape: Pipe Arch
Barrel Span: 42.00 in
Barrel Rise: 29.00 in
Barrel Material: Steel or Aluminum
Embedment: 0.00 in
Barrel Manning's n: 0.0240
Culvert Type: Straight
Inlet Configuration: Headwall
Inlet Depression: None

Tailwater Channel Data -roposed_Culvert 1 6-42"x29"
Tailwater Channel Option: Trapezoidal Channel
Bottom Width: 41.00 ft
Side Slope (H:V): 4.00 (_:1)
Channel Slope: 0.0067
Channel Manning's n: 0.0400
Channel Invert Elevation: 764.63 ft

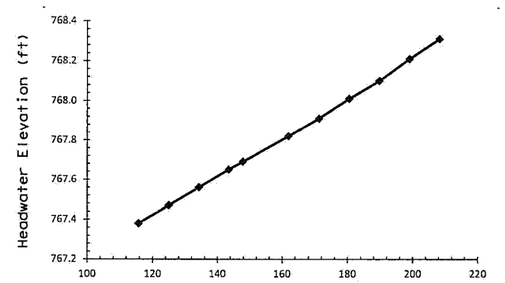
Roadway Data for Crossing: Proposed_Culvert 1 6-42"x29"
Roadway Profile Shape: Irregular Roadway Shape (coordinates)
Irregular Roadway Cross-Section:

Coord No.	Station (ft)	Elevation (ft)
0	15652.90	769.39
1	15704.38	769.42
2	15727.71	769.34
3	15751.24	769.25
4	15798.35	768.94

Roadway Surface: Paved
Roadway Top Width: 50.00 ft

Total Rating Curve

Crossing: Existing_Culvert 1 6-42"x29" Arch CMP



EXIST CULVERT 1
PROPOSED CULVERT 1

THE ALLOWABLE HEADWATER ELEVATION = 769.00
℄ INNERLOOP STA = 159+50.00, 16.50' LT.

Site Data - Culvert 1
Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 765.56 ft
Outlet Station: 90.00 ft
Outlet Elevation: 764.63 ft
Number of Barrels: 7
Culvert Data Summary - Culvert 1
Barrel Shape: Pipe Arch
Barrel Span: 42.00 in
Barrel Rise: 29.00 in
Barrel Material: Steel or Aluminum
Embedment: 0.00 in
Barrel Manning's n: 0.0240
Culvert Type: Straight
Inlet Configuration: Mitered
Inlet Depression: None

Tailwater Channel Data - Proposed_Culvert 1 7-42"x29"
Tailwater Channel Option: Trapezoidal Channel
Bottom Width: 41.00 ft
Side Slope (H:V): 4.00 (_:1)
Channel Slope: 0.0067
Channel Manning's n: 0.0400
Channel Invert Elevation: 764.63 ft

****
Straight Culvert
Inlet Elevation (invert): 765.56 ft,
Outlet Elevation (invert): 764.63 ft
Culvert Length: 90.00 ft, Culvert Slope: 0.0103
****

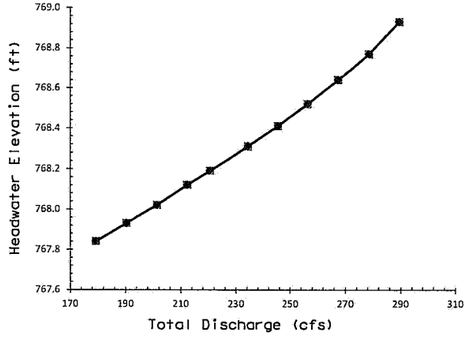
Roadway Data for Crossing: Proposed_Culvert 1 7-42"x29"
Roadway Profile Shape: Irregular Roadway Shape (coordinates)
Irregular Roadway Cross-Section:

Coord No.	Station (ft)	Elevation (ft)
0	15652.90	769.39
1	15704.38	769.42
2	15727.71	769.34
3	15751.24	769.25
4	15798.35	768.94

Roadway Surface: Paved
Roadway Top Width: 50.00 ft

Total Rating Curve

Crossing: Prop_Culvert 1 7-42"X29" Arch CMP



Culvert Summary Table - Proposed 7-42"X29" ARCH CMP Culvert 1

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)	Tailwater Elevation (ft/s) ***
179.34	179.34	767.84	2.14	2.28	2-M2c	1.44	1.29	1.29	1.21	6.32	3.22	765.84
190.36	190.36	767.93	2.23	2.37	2-M2c	1.51	1.34	1.34	1.26	6.46	3.29	765.89
201.37	201.37	768.02	2.34	2.46	7-M2c	1.58	1.38	1.38	1.30	6.62	3.36	765.93
212.38	212.38	768.12	2.45	2.56	7-M2c	1.66	1.43	1.43	1.34	6.75	3.42	765.97
* 220.6	220.60	768.19	2.53	2.63	7-M2c	1.72	1.46	1.46	1.37	6.86	3.47	766.00
234.42	234.42	768.31	2.68	2.75	7-M2c	1.84	1.51	1.51	1.42	7.05	3.54	766.05
245.43	245.43	768.41	2.80	2.85	7-M2c	2.42	1.55	1.55	1.46	7.20	3.60	766.09
256.44	256.44	768.52	2.93	2.96	7-M2c	2.42	1.59	1.59	1.49	7.33	3.65	766.12
267.46	267.46	768.64	3.07	3.08	7-M2c	2.42	1.63	1.63	1.53	7.47	3.71	766.16
278.48	278.48	768.77	3.21	3.21	7-M2c	2.42	1.66	1.66	1.57	7.62	3.76	766.20
** 289.49	289.49	768.93	3.36	3.37	7-M2c	2.42	1.70	1.70	1.60	7.77	3.81	766.23

Note: HY8.7.30 WAS USED FOR THE CULVERT ANALYSIS
* 4% AEP DESIGN STORM FREQ
** 1% AEP STORM FREQ

STATE OF TEXAS
AARON DEMARAY TAINTER
105733
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PROFESSIONAL ENGINEER
Aaron Demaray Tainter 6/26/2017

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CONSULTING ENGINEERS
TBPE REGISTRATION NO. 264

GEORGETOWN INNER LOOP @
CENTRAL MAINTENANCE FACILITY

HY 8 ANALYSIS
CULVERT 1

SHEET 1 OF 1

DESIGN	GRAPHICS	CHECK	CHECK	SHEET NO.
KA	AKH	AT	WD	123

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HY-8 Analysis Results

Culvert Summary Table - Proposed 3-5'X3' RCB SDWK Culvert 1

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)	Tailwater Elevation (ft/s) ***
179.34	179.34	768.45	2.58	2.68	1-S1t	1.22	1.64	2.12	2.12	5.63	0.00	767.84
190.36	190.36	768.57	2.69	2.79	1-S1t	1.27	1.71	2.21	2.21	5.73	0.00	767.93
201.37	201.37	768.68	2.80	2.90	1-S1t	1.33	1.78	2.30	2.30	5.83	0.00	768.02
212.38	212.38	768.79	2.90	3.01	1-S1t	1.38	1.84	2.40	2.40	5.89	0.00	768.12
* 220.6	220.60	768.87	2.98	3.10	1-S1t	1.41	1.89	2.47	2.47	5.95	0.00	768.19
234.42	234.42	769.01	3.12	3.23	1-S1t	1.48	1.96	2.59	2.59	6.03	0.00	768.31
245.43	245.43	769.12	3.22	3.34	1-S1t	1.52	2.03	2.69	2.69	6.08	0.00	768.41
256.44	256.44	769.23	3.33	3.46	1-S1t	1.57	2.09	2.80	2.80	6.10	0.00	768.52
267.46	267.46	769.35	3.44	3.58	1-S1t	1.62	2.15	2.92	2.92	6.10	0.00	768.64
278.48	278.48	769.51	3.55	3.73	4-FFf	1.67	2.20	3.00	3.05	6.19	0.00	768.77
** 289.49	288.93	769.64	3.62	3.92	4-FFf	1.70	2.24	3.00	3.21	6.33	0.00	768.93

Note: HY8.7.30 WAS USED FOR THE CULVERT ANALYSIS
* 4% AEP DESIGN STORM FREQ
** 1% AEP STORM FREQ

*** THE TAILWATER ELEVATION WAS SET EQUAL TO THE ADJACENT CULVERT 1 HEADWATER ELEVATION TO SIMULATE THE WATER SURFACE ELEVATION RISE AS THE DOWNSTREAM FLOW THROUGH THE PROPOSED DOWNSTREAM CULVERT.

Site Data - Culvert 1
Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 765.78 ft
Outlet Station: 8.02 ft
Outlet Elevation: 765.72 ft
Number of Barrels: 3
Culvert Data Summary - Culvert 1
Barrel Shape: Concrete Box
Barrel Span: 5.00 ft
Barrel Rise: 3.00 ft
Barrel Material: Concrete
Embedment: 0.00 in
Barrel Manning's n: 0.0120
Culvert Type: Straight
Inlet Configuration: 1:1 Bevel Headwall
Inlet Depression: None

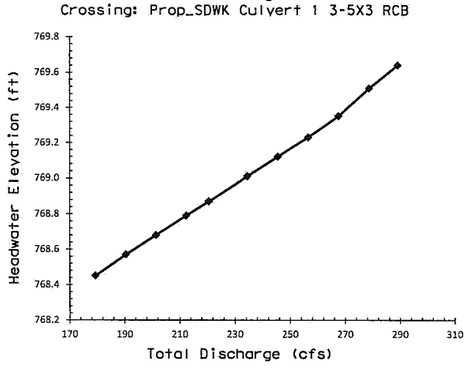
Tailwater Channel Data - Proposed_3-5x3 SDWK CULVERT 1
Tailwater Channel Option: Enter Rating Curve
Channel Invert Elevation: 765.72 ft

Roadway Data for Crossing: Proposed_3-5x3 SDWK CULVERT 1
Roadway Profile Shape: Constant Roadway Elevation
Crest Lenght: 100 ft
Crest Elevation: 769.60 ft

Roadway Surface: Paved
Roadway Top Width: 8.02 ft

****
Straight Culvert
Inlet Elevation (invert):765.78 ft,
Outlet Elevation (invert): 765.72 ft
Culvert Length: 8.02 ft, Culvert Slope: 0.0075
****

Total Rating Curve
Crossing: Prop_SDWK Culvert 1 3-5X3 RCB



STATE OF TEXAS
AARON DEMARAY TAINTER
105733
LICENSED
PROFESSIONAL ENGINEER
Aaron Demaray Tainter 6/26/2017

BRIDGEFARMER & ASSOCIATES, INC.
CONSULTING ENGINEERS
TBPE REGISTRATION NO. 264

GEORGETOWN INNER LOOP @
CENTRAL MAINTENANCE FACILITY

HY 8 ANALYSIS
SDWK CULVERT 1

SHEET 1 OF 1

DESIGN	GRAPHICS	CHECK	CHECK	SHEET NO.
KA	AKH	AT	WD	124

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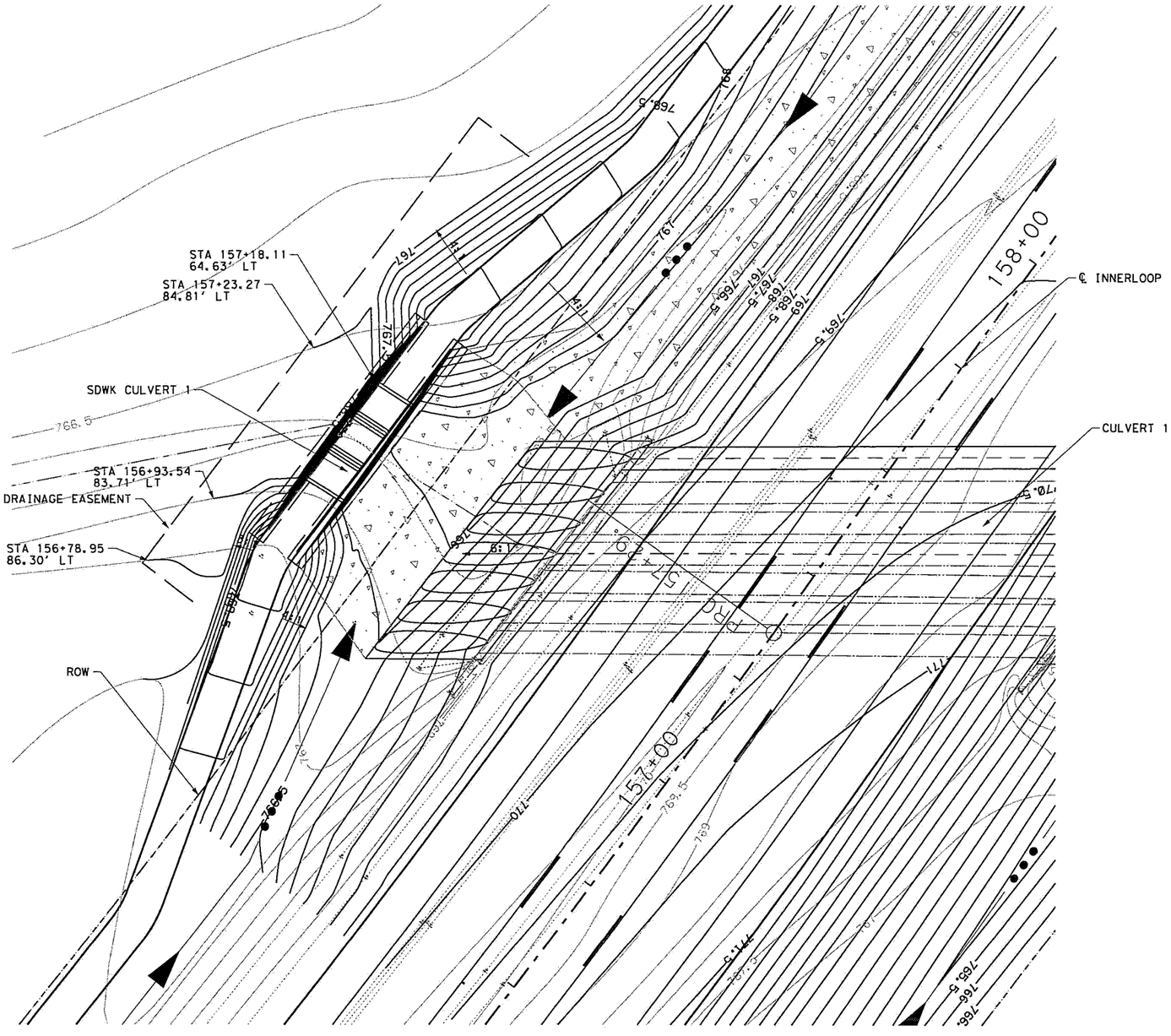
SCALE: 1" = 20'



LEGEND

430 EXISTING CONTOUR

430 PROPOSED CONTOUR

STATE OF TEXAS
AARON DEMARAY TAINTER
105733
LICENSED
PROFESSIONAL ENGINEER
Aaron Demaray Tainter 6/26/2017

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TBPE REGISTRATION NO. 264

GEORGETOWN INNER LOOP @ CENTRAL MAINTENANCE FACILITY

CULVERT 1 UPSTREAM GRADING

SCALE: 1" = 20' SHEET 1 OF 1

DESIGN	GRAPHICS	CHECK	CHECK	SHEET NO.
KA	AKH	AT	WD	125

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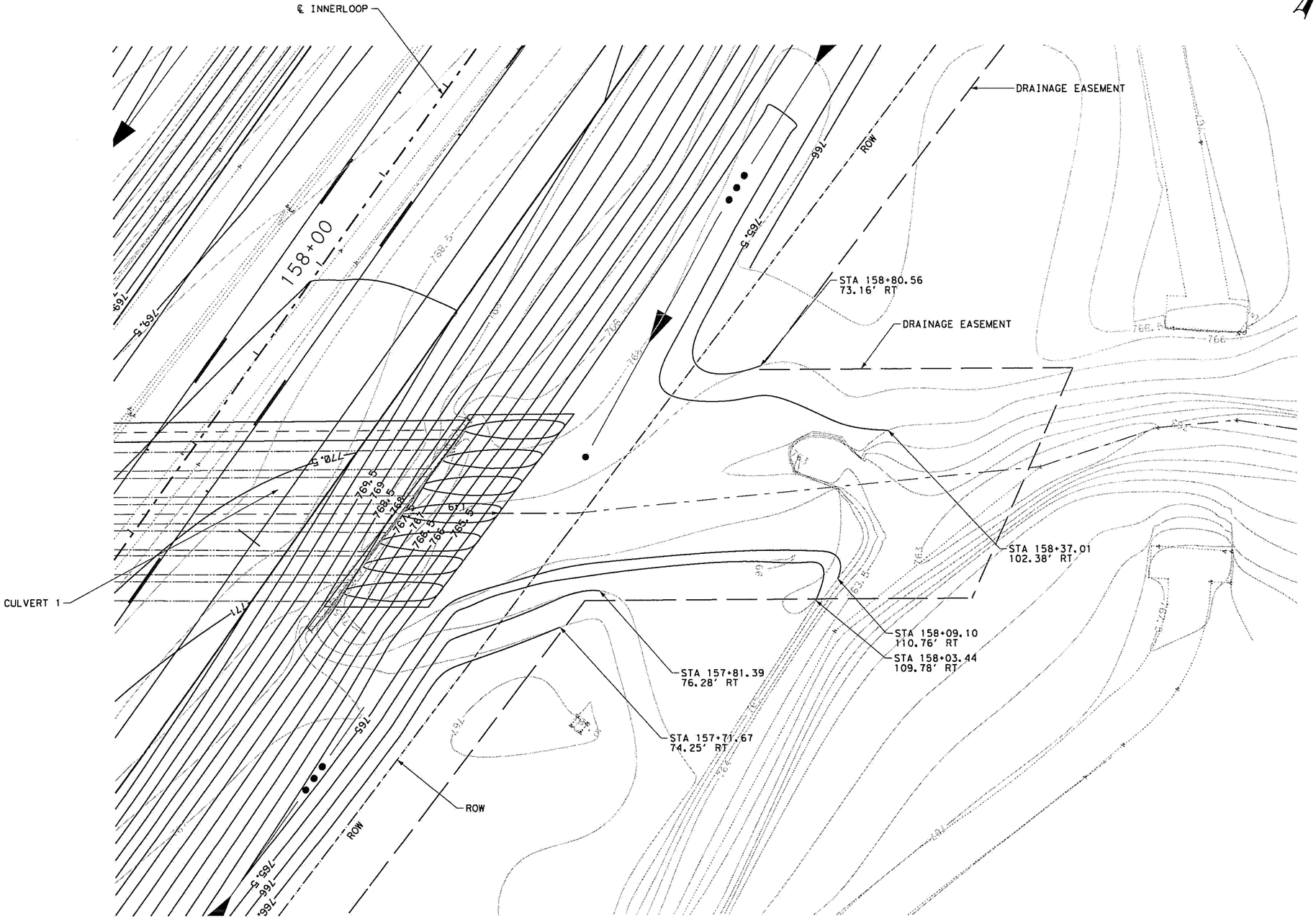

10 0 10 20
SCALE: 1" = 20'

LEGEND

430 EXISTING CONTOUR

430 PROPOSED CONTOUR

STATE OF TEXAS
AARON DEMARAY TAINTER
105733
LICENSED
PROFESSIONAL ENGINEER
Aaron Demaray Tainter 6/26/2017

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CONSULTING ENGINEERS
TBPE REGISTRATION NO. 264

GEORGETOWN INNER LOOP @ CENTRAL MAINTENANCE FACILITY

CULVERT 1 DOWNSTREAM GRADING

SCALE: 1" = 20' SHEET 1 OF 1

DESIGN	GRAPHICS	CHECK	CHECK	SHEET NO.
KA	AKH	AT	WD	126

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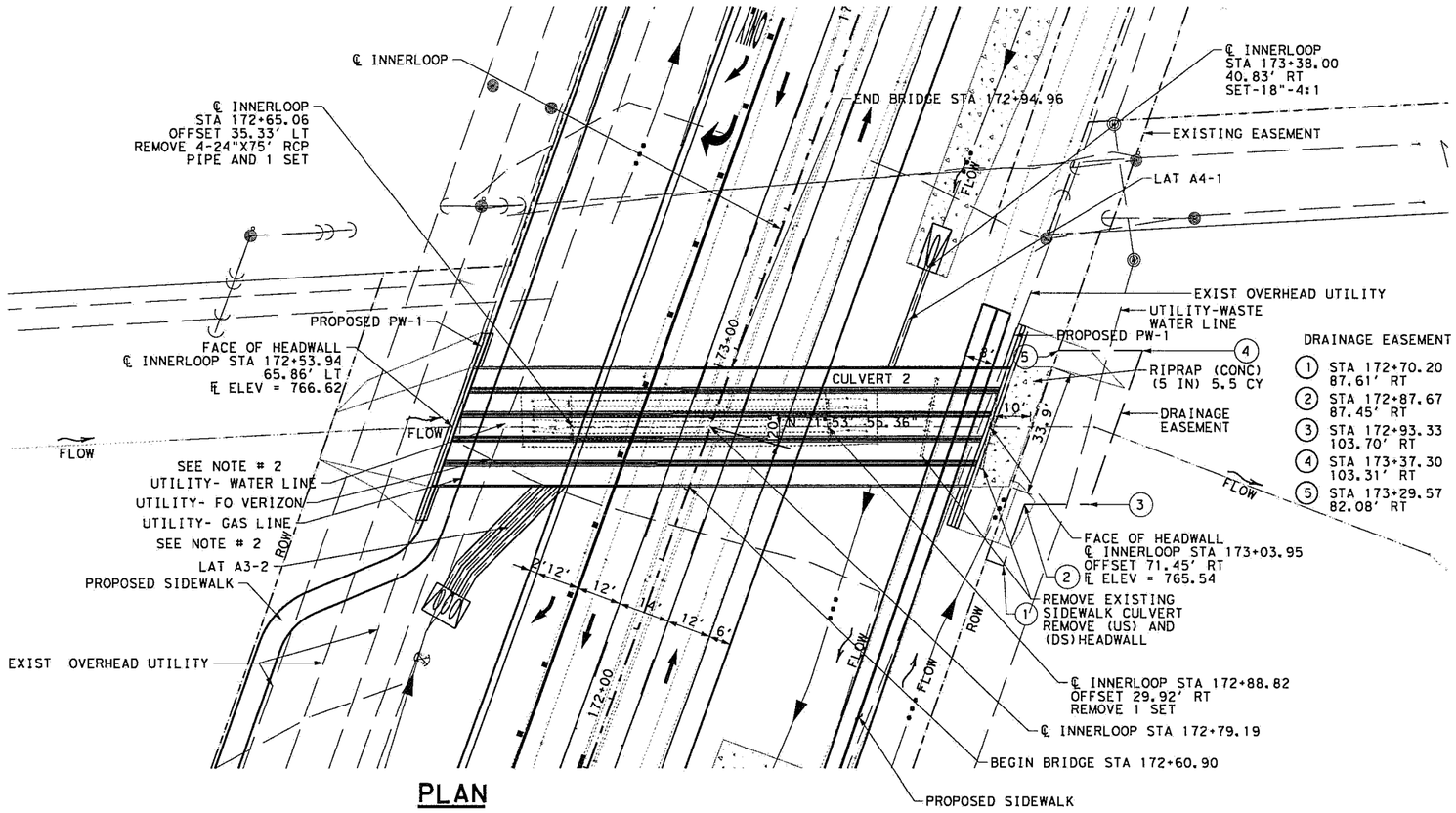
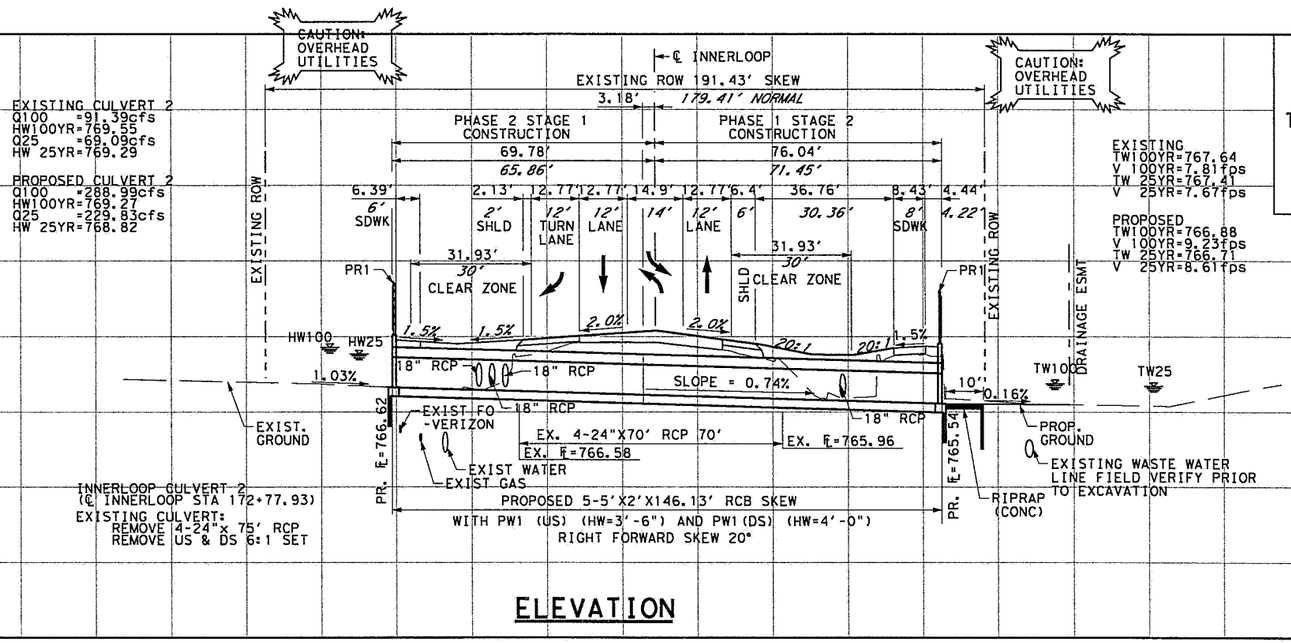


PLAN

20 0 20 40
SCALE: 1" = 40'

NOTES:

1. SEE GRADING SHEET FOR GRADING DETAILS
2. LOCATE AND PROTECT GAS AND WATER LINE PRIOR TO CULVERT CONSTRUCTION
3. FOR CONCRETE RIPRAP SEE STANDARD CRR (TYPE RR8) FOR REINFORCEMENT DETAILS AND OTHER DETAILS NOT SHOWN
4. SEE DRAINAGE PLAN & PROFILE SHEET FOR RCP CONNECTION LOCATIONS AND ELEVATIONS



ELEVATION

SKEW DIMENSION
NORMAL DIMENSION

TYPICAL DIMENSION CALLOUT ON SKEW

NOTE: "NORMAL" & "SKEW" DESIGNATION MAY BE LEFT OFF TO DECREASE CLUTTER

NEW NBI NO:14-246-AA04-95-001

STATE OF TEXAS
AARON DEMARAY TAINTER
105733
LICENSED
PROFESSIONAL ENGINEER
6/26/2017

BRIDGEFARMER & ASSOCIATES, INC.
CONSULTING ENGINEERS
TBPE REGISTRATION NO. 264

GEORGETOWN INNER LOOP @ CENTRAL MAINTENANCE FACILITY

CULVERT 2 LAYOUT

SCALE: 1" = 40' SHEET 1 OF 1

DESIGN	GRAPHICS	CHECK	CHECK	SHEET NO.
KA	AKH	AT	WD	127

P-496

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HY-8 Analysis Results

Culvert Summary Table - Existing 4-24" RCP Culvert 2

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)	Tailwater Elevation (ft/s)
56.47	56.47	768.82	2.24	1.50	5-S2n	1.10	1.35	1.15	1.30	7.32	3.20	767.26
59.96	59.96	768.95	2.37	1.64	5-S2n	1.15	1.39	1.19	1.34	7.43	3.26	767.30
63.45	63.45	769.09	2.51	1.78	5-S2n	1.19	1.43	1.24	1.38	7.54	3.33	767.34
66.95	66.72	769.23	2.65	1.92	5-S2n	1.23	1.47	1.28	1.43	7.62	3.39	767.39
* 69.09	68.16	769.29	2.71	1.98	5-S2n	1.25	1.49	1.30	1.45	7.67	3.42	767.41
73.93	70.15	769.38	2.80	2.32	5-S2n	1.27	1.51	1.32	1.50	7.72	3.51	767.46
77.42	71.16	769.43	2.85	2.14	5-S2n	1.29	1.52	1.34	1.54	7.75	3.56	767.50
80.91	71.97	769.47	2.89	2.20	5-S2n	1.30	1.53	1.35	1.58	7.77	3.62	767.54
84.41	72.63	769.50	2.92	2.26	5-S2n	1.31	1.53	1.36	1.61	7.78	3.68	767.57
87.90	73.24	769.53	2.95	2.32	5-S2n	1.31	1.54	1.36	1.65	7.80	3.73	767.61
** 91.39	73.81	769.55	2.97	2.37	5-S2n	1.32	1.54	1.37	1.68	7.81	3.78	767.64

Note: HY8.7.30 WAS USED FOR THE CULVERT ANALYSIS
* 4% AEP DESIGN STORM FREQ
** 1% AEP STORM FREQ

****
Straight Culvert
Inlet Elevation (invert): 766.58 ft, Outlet Elevation (invert): 765.96 ft
Culvert Length: 70.75 ft, Culvert Slope: 0.0088
****

Site Data - Culvert 2
Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 766.58 ft
Outlet Station: 70.75 ft
Outlet Elevation: 765.96 ft
Number of Barrels: 4
Culvert Data Summary - Culvert 2
Barrel Shape: Circular
Barrel Diameter: 2.00 ft
Barrel Material: Concrete
Embedment: 0.00 in
Barrel Manning's n: 0.0130
Culvert Type: Straight
Inlet Configuration: Mitered to Conform to Slope
Inlet Depression: NONE
Tailwater Channel Data - Existing_Culvert 2 4-24"Rcp
Tailwater Channel Option: Irregular Channel
Channel Slope: 0.0071
User Defined Channel Cross-Section:

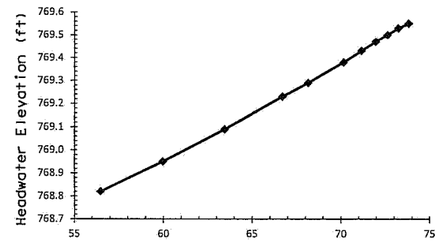
Coord No.	Sta (ft)	Elev (ft)	Manning's n
1	3.59	767.40	0.0400
2	3.88	767.40	0.0400
3	7.59	765.96	0.0400
4	11.33	765.96	0.0400
5	13.25	765.96	0.0400
6	15.91	765.96	0.0400
7	18.37	766.06	0.0400
8	18.54	766.07	0.0400
9	21.69	766.08	0.0000

Roadway Data for Crossing: Existing_Culvert 2 4-24"Rcp
Roadway Profile Shape: Irregular Roadway Shape (coordinates)
Irregular Roadway Cross-Section:

Coord No.	Station (ft)	Elevation (ft)
0	17024.72	769.37
1	17075.52	769.59
2	17125.72	769.69
3	17174.04	769.59
4	17228.65	769.46
5	17265.37	769.27
6	17273.14	769.23
7	17280.85	769.18

Roadway Surface: Paved
Roadway Top Width: 42.50 ft

Total Rating Curve
Crossing: Existing_Culvert 2 4-24"RCP W/Existing PGL



EXIST CULVERT 2
PROPOSED CULVERT 2

THE ALLOWABLE HEADWATER ELEVATION = 769.27
℄ INNERLOOP STA = 170+82.31, 32.99' LT.

Site Data - Culvert 2
Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 766.62 ft
Outlet Station: 146.13 ft
Outlet Elevation: 765.54 ft
Number of Barrels: 5
Culvert Data Summary - Culvert 2
Barrel Shape: Concrete Box
Barrel Span: 5.00 ft
Barrel Rise: 2.00 ft
Barrel Material: Concrete
Embedment: 0.00 in
Barrel Manning's n: 0.0120
Culvert Type: Straight
Inlet Configuration: 1:1 Bevel Headwall
Inlet Depression: NONE

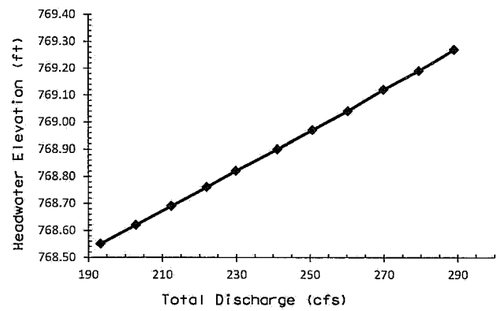
Tailwater Channel Data - Prop_Culvert 2 5-5x2 RCB
Tailwater Channel Option: Trapezoidal Channel
Bottom Width: 34.06 ft
Side Slope (H:V): 4.00 (_:1)
Channel Slope: 0.0016
Channel Manning's n: 0.0120
Channel Invert Elevation: 765.54 ft

****
Straight Culvert
Inlet Elevation (invert): 766.62 ft, Outlet Elevation (invert): 765.54 ft
Culvert Length: 146.13 ft, Culvert Slope: 0.0074
****

Roadway Data for Crossing: Prop_Culvert2 5-5x2
Roadway Profile Shape: Constant Roadway Elevation
Crest Lenght: 200 ft
Crest Elevation: 769.63 ft

Roadway Surface: Paved
Roadway Top Width: 87.27 ft

Total Rating Curve
Crossing: Prop_Culvert 2 4-24"RCB W/Prop PGL



Culvert Summary Table - Proposed 5-5'X2' RCB Culvert 2

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)	Tailwater Elevation (ft/s)
193.26	193.26	768.55	1.94	0.65	1-S2n	0.91	1.23	0.95	1.06	8.16	4.77	766.60
202.83	202.83	768.62	2.01	0.75	5-S2n	0.94	1.27	0.98	1.09	8.28	4.86	766.63
212.41	212.41	768.69	2.08	0.84	5-S2n	0.97	1.31	1.01	1.12	8.40	4.94	766.66
221.98	221.98	768.76	2.15	0.93	5-S2n	1.00	1.35	1.04	1.15	8.51	5.01	766.69
* 229.83	229.83	768.82	2.20	1.01	5-S2n	1.03	1.38	1.07	1.17	8.61	5.07	766.71
241.13	241.13	768.90	2.28	1.13	5-S2n	1.06	1.42	1.10	1.20	8.73	5.16	766.74
250.70	250.70	768.97	2.36	1.23	5-S2n	1.09	1.46	1.13	1.23	8.84	5.23	766.77
260.27	260.27	769.04	2.43	1.33	5-S2n	1.12	1.50	1.16	1.26	8.95	5.30	766.80
269.84	269.84	769.12	2.50	1.67	5-S2n	1.15	1.54	1.20	1.28	9.03	5.36	766.82
279.42	279.42	769.19	2.57	1.76	5-S2n	1.17	1.57	1.22	1.31	9.14	5.43	766.85
** 288.99	288.99	769.27	2.65	1.85	5-S2n	1.20	1.61	1.25	1.34	9.23	5.49	766.88

Note: HY8.7.30 WAS USED FOR THE CULVERT ANALYSIS
* 4% AEP DESIGN STORM FREQ
** 1% AEP STORM FREQ

STATE OF TEXAS
AARON DEMARAY TAINTER
105733
LICENSED
PROFESSIONAL ENGINEER
Aaron Demaray Tainter 6/26/2017

BRIDGEFARMER & ASSOCIATES, INC.
CONSULTING ENGINEERS
TBPE REGISTRATION NO. 264

GEORGETOWN INNER LOOP @ CENTRAL MAINTENANCE FACILITY

HY 8 ANALYSIS CULVERT 2

SHEET 1 OF 1

DESIGN	GRAPHICS	CHECK	CHECK	SHEET NO.
KA	AKH	AT	WD	128

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HY-8 Analysis Results

Culvert Summary Table - A1-1 LINK

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)	Tailwater Elevation (ft/s)
3.92	3.92	765.95	1.13	0.0*	1-S2n	0.72	0.76	0.72	0.23	4.53	2.38	764.55
4.1	4.1	765.98	1.16	0.55	1-S2n	0.74	0.77	0.74	0.24	4.58	2.41	764.56
4.28	4.28	766.01	1.19	0.59	1-S2n	0.76	0.79	0.76	0.24	4.63	2.45	764.56
4.46	4.46	766.04	1.22	0.63	1-S2n	0.78	0.81	0.78	0.25	4.68	2.48	764.57
* 4.56	4.56	766.05	1.23	0.65	1-S2n	0.79	0.82	0.79	0.25	4.7	2.5	764.57
4.82	4.82	766.1	1.28	0.72	1-S2n	0.81	0.84	0.81	0.26	4.76	2.55	764.58
5	5	766.13	1.31	0.76	1-S2n	0.83	0.86	0.83	0.26	4.8	2.58	764.58
5.18	5.18	766.16	1.34	0.8	1-S2n	0.85	0.87	0.85	0.27	4.84	2.61	764.59
5.36	5.36	766.19	1.37	0.85	1-S2n	0.87	0.89	0.87	0.28	4.88	2.64	764.6
5.54	5.54	766.23	1.41	0.9	1-S2n	0.89	0.9	0.89	0.28	4.91	2.66	764.6
** 5.72	5.72	766.26	1.44	0.95	1-S2n	0.91	0.92	0.91	0.29	4.95	2.69	764.61

Culvert Summary Table - A3-1 LINK

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)	Tailwater Elevation (ft/s)
4.77	4.77	769.3	1.12	0.04	1-S2n	0.69	0.76	0.69	0.42	4.77	1.2	768.22
5.04	5.04	769.33	1.15	0.51	1-S2n	0.71	0.79	0.71	0.44	4.84	1.22	768.24
5.3	5.3	769.37	1.19	0.54	1-S2n	0.73	0.81	0.73	0.45	4.91	1.24	768.25
5.57	5.57	769.4	1.22	0.57	1-S2n	0.75	0.83	0.75	0.46	4.97	1.26	768.26
* 5.74	5.74	769.42	1.24	0.09	1-S2n	0.77	0.84	0.77	0.47	5.02	1.27	768.27
6.11	6.11	769.46	1.28	0.64	1-S2n	0.79	0.87	0.79	0.48	5.1	1.29	768.28
6.37	6.37	769.5	1.32	0.67	1-S2n	0.81	0.89	0.81	0.49	5.16	1.31	768.29
6.64	6.64	769.53	1.35	0.71	1-S2n	0.83	0.91	0.83	0.5	5.21	1.32	768.3
6.91	6.91	769.56	1.38	0.74	1-S2n	0.85	0.93	0.85	0.51	5.27	1.34	768.31
7.17	7.17	769.59	1.41	0.77	1-S2n	0.87	0.95	0.89	0.52	5.13	1.35	768.32
** 7.44	7.44	769.62	1.44	0.81	1-S2n	0.88	0.97	0.91	0.53	5.17	1.36	768.33

Culvert Summary Table - A4-2 LINK

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)	Tailwater Elevation (ft/s)
4.14	4.14	768.36	1.16	0.22	1-S2n	0.75	0.78	0.77	0.26	4.4	2.3	767.42
4.34	4.34	768.4	1.2	0.92	1-S2n	0.77	0.8	0.79	0.26	4.46	2.33	767.42
4.53	4.53	768.43	1.23	0.96	1-S2n	0.79	0.81	0.79	0.27	4.66	2.37	767.43
4.73	4.73	768.46	1.26	0.99	1-S2n	0.81	0.83	0.81	0.28	4.71	2.4	767.44
* 4.86	4.86	768.49	1.29	0.24	1-S2n	0.82	0.84	0.82	0.28	4.74	2.43	767.44
5.12	5.12	768.53	1.33	1.06	1-S2n	0.85	0.87	0.85	0.29	4.79	2.47	767.45
5.32	5.32	768.57	1.37	1.1	1-S2n	0.87	0.89	0.87	0.3	4.84	2.5	767.46
5.51	5.51	768.6	1.4	1.14	1-S2n	0.89	0.9	0.89	0.3	4.87	2.53	767.46
5.71	5.71	768.64	1.44	1.17	1-S2n	0.91	0.92	0.91	0.31	4.91	2.56	767.47
5.9	5.9	768.82	1.48	1.62	7-M2c	0.94	0.93	0.93	0.31	5.1	2.59	767.47
** 6.1	6.1	768.84	1.52	1.64	7-M2c	0.96	0.95	0.95	0.32	5.17	2.62	767.48

Site Data - A4-2 LINK
Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 767.20 ft
Outlet Station: 8.97 ft
Outlet Elevation: 767.16 ft
Number of Barrels: 1
Culvert Data Summary - A4-2 LINK
Barrel Shape: Circular
Barrel Diameter: 1.50 ft
Barrel Material: Concrete
Embedment: 0.00 in
Barrel Manning's n: 0.0120
Culvert Type: Straight
Inlet Configuration: Mitered to Conform to Slope
Inlet Depression: None

Tailwater Channel Data -A4-2 LINK Tailwater Channel
Option: Trapezoidal Channel
Bottom Width: 6.00 ft
Side Slope (H:V): 4.00 (_:1)
Channel Slope: 0.0040
Channel Manning's n: 0.0150
Channel Invert Elevation: 767.16 ft

Roadway Data for Crossing: A4-2 LINK
Roadway Profile Shape: Constant Roadway Elevation
Crest Lenght: 30 ft
Crest Elevation: 767.67 ft
Roadway Surface: Paved
Roadway Top Width: 8.00 ft

****
Straight Culvert
Inlet Elevation (invert): 767.20 ft,
Outlet Elevation (invert): 767.16 ft
Culvert Length: 8.97 ft
Culvert Slope: 0.0049
****

Site Data - A1-1 LINK
Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 764.82 ft
Outlet Station: 100.00 ft
Outlet Elevation: 764.32 ft
Number of Barrels: 1
Culvert Data Summary - A1-1 LINK
Barrel Shape: Circular
Barrel Diameter: 1.50 ft
Barrel Material: Concrete
Embedment: 0.00 in
Barrel Manning's n: 0.0120
Culvert Type: Straight
Inlet Configuration: Mitered to Conform to Slope
Inlet Depression: None

Tailwater Channel Data -A1-1 LINK Tailwater Channel
Option: Trapezoidal Channel
Bottom Width: 6.00 ft
Side Slope (H:V): 5.00 (_:1)
Channel Slope: 0.0050
Channel Manning's n: 0.0150
Channel Invert Elevation: 764.32 ft

Roadway Data for Crossing: A1-1 LINK
Roadway Profile Shape: Constant Roadway Elevation
Crest Lenght: 30 ft
Crest Elevation: 767.10 ft
Roadway Surface: Paved
Roadway Top Width: 72.00 ft

****
Straight Culvert
Inlet Elevation (invert): 764.82 ft,
Outlet Elevation (invert): 764.32 ft
Culvert Length: 100.00 ft
Culvert Slope: 0.0050
****

Site Data - A3-1 LINK
Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 768.18 ft
Outlet Station: 74.00 ft
Outlet Elevation: 767.80 ft
Number of Barrels: 1
Culvert Data Summary - A3-1 LINK
Barrel Shape: Circular
Barrel Diameter: 2.00 ft
Barrel Material: Concrete
Embedment: 0.00 in
Barrel Manning's n: 0.0120
Culvert Type: Straight
Inlet Configuration: Mitered to Conform to Slope
Inlet Depression: None

Tailwater Channel Data -A3-1 LINK Tailwater Channel
Option: Trapezoidal Channel
Bottom Width: 6.00 ft
Side Slope (H:V): 8.00 (_:1)
Channel Slope: 0.0050
Channel Manning's n: 0.0400
Channel Invert Elevation: 767.80 ft

Roadway Data for Crossing: A3-1 LINK
Roadway Profile Shape: Constant Roadway Elevation
Crest Lenght: 30 ft
Crest Elevation: 770.99 ft
Roadway Surface: Paved
Roadway Top Width: 49.34 ft

****
Straight Culvert
Inlet Elevation (invert): 768.18 ft,
Outlet Elevation (invert): 767.80 ft
Culvert Length: 74.00 ft
Culvert Slope: 0.0051
****

* 4% AEP DESIGN STORM FREQ
** 1% AEP STORM FREQ

STATE OF TEXAS
AARON DEMARAY TAINTER
105733
LICENSED
PROFESSIONAL ENGINEER
Aaron Demaray Tainter 6/26/2017

BRIDGEFARMER & ASSOCIATES, INC.
CONSULTING ENGINEERS
TBPE REGISTRATION NO. 264

GEORGETOWN INNER LOOP @ CENTRAL MAINTENANCE FACILITY

HY 8 ANALYSIS
DRIVEWAY CULVERTS

SHEET 1 OF 2

DESIGN	GRAPHICS	CHECK	CHECK	SHEET NO.
KA	AKH	AT	WD	129

p. 498

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Culvert Summary Table - A5-3-1 LINK

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)	Tailwater Elevation (ft/s)
4.58	4.58	772.25	1.24	0.36	1-S2n	0.64	0.82	0.64	0.18	6.1	3.86	770.43
4.85	4.85	772.3	1.29	0.42	1-S2n	0.67	0.84	0.67	0.18	6.2	3.94	770.43
5.11	5.11	772.35	1.34	0.48	1-S2n	0.69	0.86	0.69	0.19	6.28	4.01	770.44
5.38	5.38	772.39	1.38	0.54	1-S2n	0.71	0.89	0.71	0.19	6.36	4.08	770.44
* 5.53	5.53	772.42	1.41	0.58	1-S2n	0.72	0.9	0.72	0.2	6.4	4.12	770.45
5.91	5.91	772.49	1.48	0.67	1-S2n	0.75	0.93	0.77	0.21	6.26	4.22	770.46
6.18	6.18	772.55	1.54	0.74	5-S2n	0.77	0.96	0.79	0.21	6.32	4.29	770.46
6.44	6.44	772.6	1.59	0.81	5-S2n	0.79	0.98	0.81	0.22	6.38	4.35	770.47
6.71	6.71	772.66	1.65	0.88	5-S2n	0.81	1	0.83	0.22	6.44	4.41	770.47
6.97	6.97	772.72	1.71	0.95	5-S2n	0.83	1.02	0.85	0.23	6.5	4.47	770.48
** 7.24	7.24	772.78	1.77	1.03	5-S2n	0.85	1.04	0.87	0.23	6.56	4.53	770.48

Site Data - A5-3-1 LINK
Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 771.01 ft
Outlet Station: 76.00 ft
Outlet Elevation: 770.25 ft
Number of Barrels: 1
Culvert Data Summary - A5-3-1 LINK
Barrel Shape: Circular
Barrel Diameter: 1.50 ft
Barrel Material: Concrete
Embedment: 0.00 in
Barrel Manning's n: 0.0120
Culvert Type: Straight
Inlet Configuration: Mitered to Conform to Slope
Inlet Depression: None

Tailwater Channel Data -A5-3-1 LINK Tailwater
Channel Option: Trapezoidal Channel
Bottom Width: 6.00 ft
Side Slope (H:V): 4.00 (_:1)
Channel Slope: 0.0176
Channel Manning's n: 0.0150
Channel Invert Elevation: 770.25 ft

Roadway Data for Crossing: A5-3-1 LINK
Roadway Profile Shape: Constant Roadway Elevation
Crest Lenght: 30 ft
Crest Elevation: 773.51 ft
Roadway Surface: Paved
Roadway Top Width: 49.34 ft

****
Straight Culvert
Inlet Elevation (invert): 771.01 ft,
Outlet Elevation (invert): 770.25 ft
Culvert Length: 76.00 ft
Culvert Slope: 0.0100
****

Culvert Summary Table - A5-3 LINK

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)	Tailwater Elevation (ft/s)
37.78	37.78	770.16	2.03	0.16	5-S2n	1.23	1.27	1.23	0.55	6.02	4.38	768.29
39.52	39.52	770.24	2.11	1.6	5-S2n	1.27	1.3	1.27	0.57	6.08	4.45	768.31
41.26	41.26	770.32	2.19	1.69	5-S2n	1.31	1.33	1.31	0.58	6.13	4.51	768.32
43.01	43.01	770.4	2.27	1.79	5-S2n	1.35	1.36	1.35	0.59	6.17	4.58	768.33
* 44.22	44.22	770.46	2.33	0.21	5-S2n	1.38	1.38	1.38	0.6	6.2	4.62	768.34
46.49	46.49	770.65	2.45	2.52	7-M2c	1.44	1.41	1.41	0.62	6.52	4.71	768.36
48.23	48.23	770.71	2.54	2.58	7-M2c	1.48	1.44	1.44	0.64	6.64	4.77	768.38
49.97	49.97	770.77	2.64~	2.63	7-M2c	1.53	1.47	1.47	0.65	6.73	4.83	768.39
51.72	50.78	770.82	2.69~	2.66	7-M2c	1.56	1.48	1.48	0.66	6.79	4.88	768.4
53.46	51.14	770.84	2.71~	2.67	7-M2c	1.57	1.49	1.49	0.68	6.81	4.94	768.42
** 55.2	51.44	770.86	2.73~	2.68	7-M2c	1.58	1.49	1.49	0.69	6.83	4.99	768.43

* 4% AEP DESIGN STORM FREQ
** 1% AEP STORM FREQ

Site Data - A5-3 LINK
Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 768.13 ft
Outlet Station: 78.00 ft
Outlet Elevation: 767.74 ft
Number of Barrels: 3
Culvert Data Summary - A5-3 LINK
Barrel Shape: Circular
Barrel Diameter: 2.00 ft
Barrel Material: Concrete
Embedment: 0.00 in
Barrel Manning's n: 0.0120
Culvert Type: Straight
Inlet Configuration: Mitered to Conform to Slope
Inlet Depression: None

Tailwater Channel Data -A5-3-1 LINK Tailwater
Channel Option: Trapezoidal Channel
Bottom Width: 14.00 ft
Side Slope (H:V): 3.00 (_:1)
Channel Slope: 0.0050
Channel Manning's n: 0.0150
Channel Invert Elevation: 767.74 ft

Roadway Data for Crossing: A5-3 LINK
Roadway Profile Shape: Constant Roadway Elevation
Crest Lenght: 30 ft
Crest Elevation: 770.79 ft
Roadway Surface: Paved
Roadway Top Width: 50.78 ft

****
Straight Culvert
Inlet Elevation (invert): 768.13 ft,
Outlet Elevation (invert): 767.74 ft
Culvert Length: 78.00 ft
Culvert Slope: 0.0050
****

STATE OF TEXAS
AARON DEMARAY TAINTER
105733
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GEORGETOWN INNER LOOP @
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HY 8 ANALYSIS
DRIVEWAY CULVERTS

SHEET 2 OF 2

DESIGN	GRAPHICS	CHECK	CHECK	SHEET NO.
KA	AKH	AT	WD	129A

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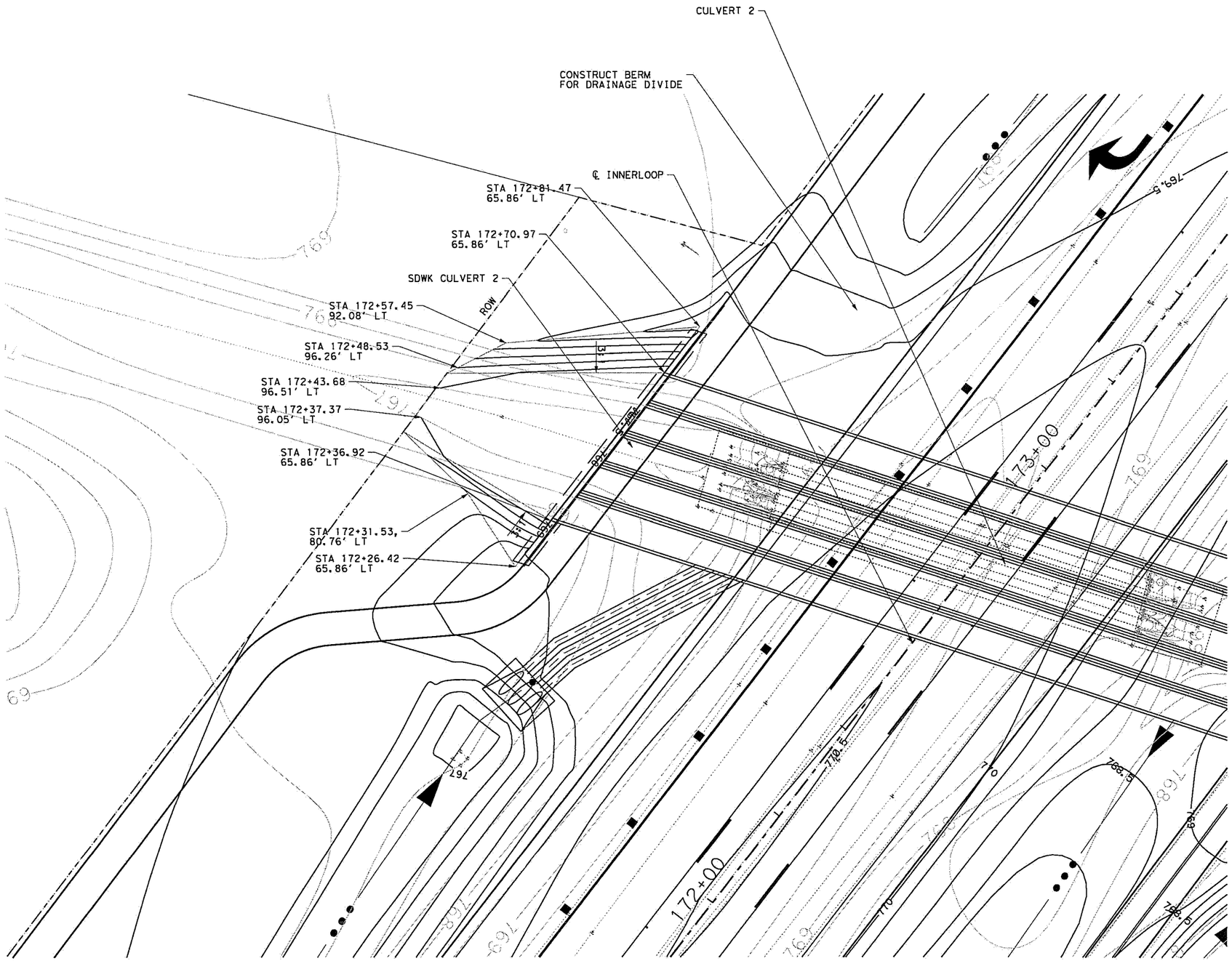
10 0 10 20
SCALE: 1" = 20'



LEGEND

430 EXISTING CONTOUR

430 PROPOSED CONTOUR

STATE OF TEXAS
AARON DEMARAY TAINTER
105733
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PROFESSIONAL ENGINEER
Aaron Demaray Tainter 6/26/2017

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GEORGETOWN INNER LOOP @ CENTRAL MAINTENANCE FACILITY

CULVERT 2 UPSTREAM GRADING

SCALE: 1" = 20' SHEET 1 OF 1

DESIGN	GRAPHICS	CHECK	CHECK	SHEET NO.
KA	AKH	AT	WD	130

6/26/2017 10:24:09 AM cwm

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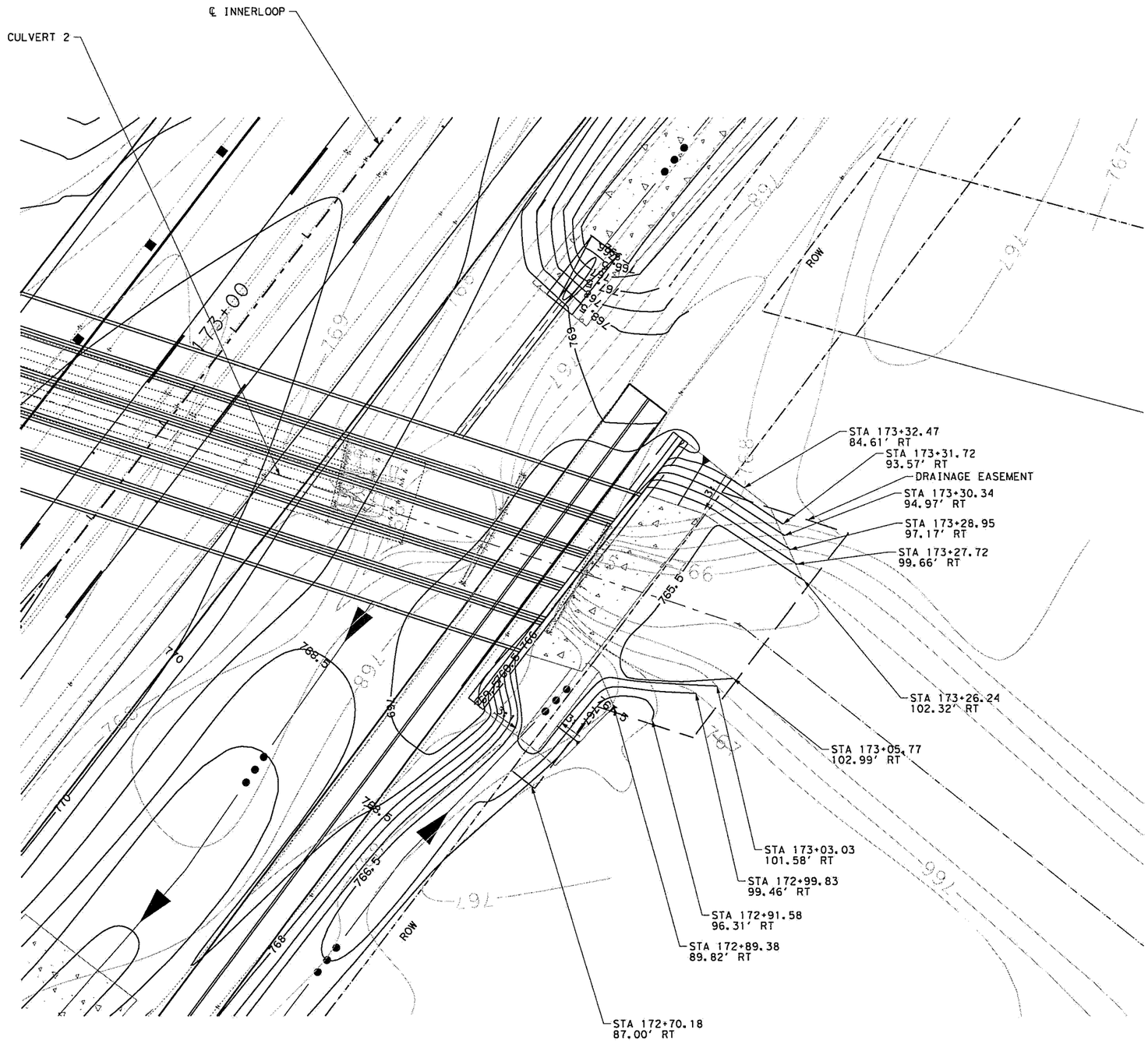

10 0 10 20
SCALE: 1" = 20'

LEGEND

430 EXISTING CONTOUR

430 PROPOSED CONTOUR

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**GEORGETOWN INNER LOOP ●
CENTRAL MAINTENANCE FACILITY**

CULVERT 2
DOWNSTREAM GRADING

SCALE: 1" = 20' SHEET 1 OF 1

DESIGN	GRAPHICS	CHECK	CHECK	SHEET NO.
KA	AKH	AT	WD	131

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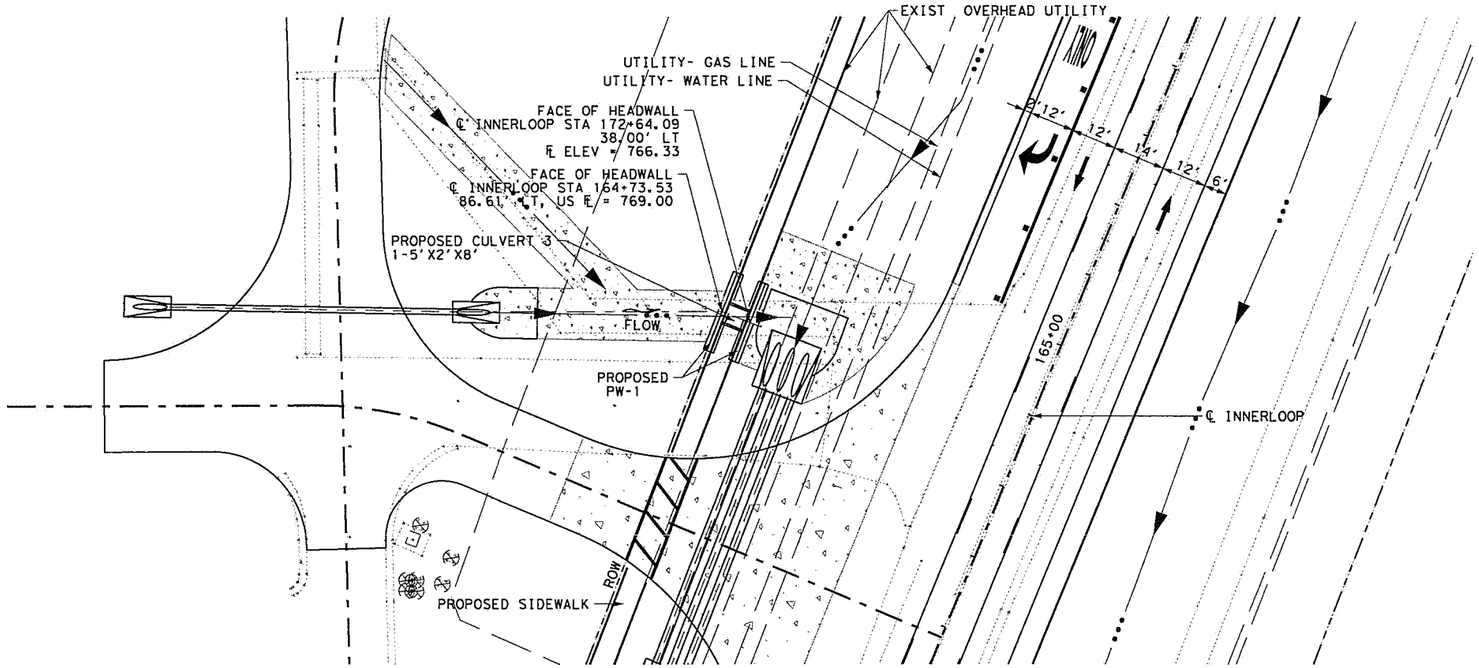
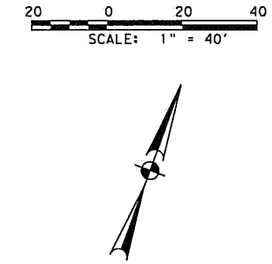
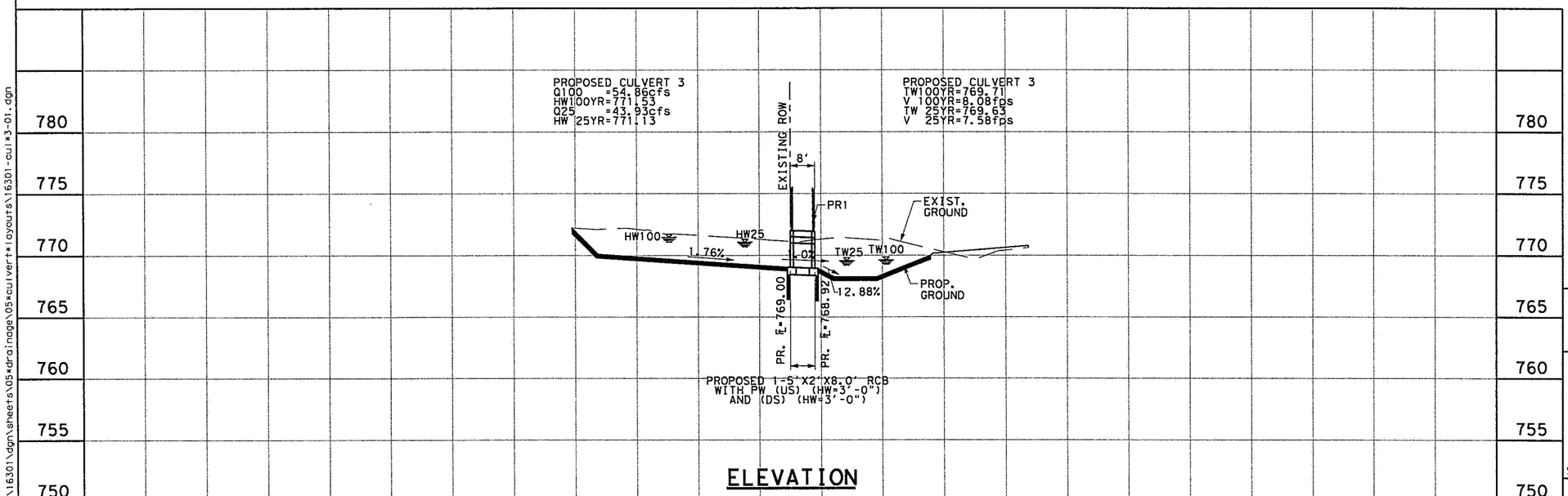




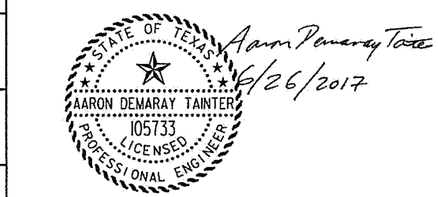
NOTES:

1. SEE GRADING SHEET FOR GRADING DETAILS.
2. LOCATE AND PROTECT GAS AND WATER LINE PRIOR TO CULVERT CONSTRUCTION
3. FOR CONCRETE RIPRAP SEE STANDARD CRR (TYPE RR8) FOR REINFORCEMENT DETAILS AND OTHER DETAILS NOT SHOWN

PLAN



ELEVATION



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GEORGETOWN INNER LOOP @ CENTRAL MAINTENANCE FACILITY

CULVERT 3 LAYOUT

SCALE: 1" = 40' SHEET 1 OF 1

DESIGN	GRAPHICS	CHECK	CHECK	SHEET NO.
KA	AKH	AT	WD	132 p.502

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6/26/2017
cwm

HY-8 Analysis Results

Culvert Summary Table - Proposed 1-5'X2' RCB Culvert 3

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)	Tailwater Elevation (ft/s) ***
37.51	37.51	770.90	1.90	1.40	1-S2n	0.81	1.20	1.04	0.65	7.24	7.57	769.57
39.24	39.24	770.96	1.96	1.46	1-S2n	0.83	1.24	1.07	0.67	7.34	7.67	769.59
40.98	40.98	771.02	2.02	1.52	5-S2n	0.86	1.28	1.10	0.68	7.43	7.76	769.60
42.71	42.71	771.08	2.08	1.59	5-S2n	0.88	1.31	1.14	0.70	7.52	7.86	769.62
* 43.93	43.93	771.13	2.13	1.63	5-S2n	0.90	1.34	1.16	0.71	7.58	7.92	769.63
46.19	46.19	771.21	2.21	1.72	5-S2n	0.93	1.38	1.20	0.73	7.69	8.04	769.65
47.92	47.92	771.27	2.27	1.78	5-S2n	0.95	1.42	1.23	0.74	7.77	8.12	769.66
49.66	49.66	771.33	2.33	1.85	5-S2n	0.98	1.45	1.26	0.75	7.85	8.20	769.67
51.39	51.39	771.40	2.40	1.92	5-S2n	1.00	1.49	1.30	0.77	7.93	8.28	769.69
53.13	53.13	771.47	2.47	2.23	5-S2n	1.02	1.52	1.33	0.78	8.01	8.36	769.70
** 54.86	54.86	771.53	2.53	2.28	5-S2n	1.04	1.55	1.36	0.79	8.08	8.44	769.71

Note: HY8.7.30 WAS USED FOR THE CULVERT ANALYSIS
* 4% AEP DESIGN STORM FREQ
** 1% AEP STORM FREQ

THE ALLOWABLE HEADWATER ELEVATION = 771.75
@ DWMTC STA = 11+06.88, 17.25' LT.

Site Data - Culvert 3
Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 769.00 ft
Outlet Station: 8.00 ft
Outlet Elevation: 768.92 ft
Number of Barrels: 1

Culvert Data Summary - Culvert 3
Barrel Shape: Concrete Box
Barrel Span: 5.00 ft
Barrel Rise: 2.00 ft
Barrel Material: Concrete
Embedment: 0.00 in
Barrel Manning's n: 0.0120
Culvert Type: Straight
Inlet Configuration: 1:1 Bevel Headwall
Inlet Depression: None

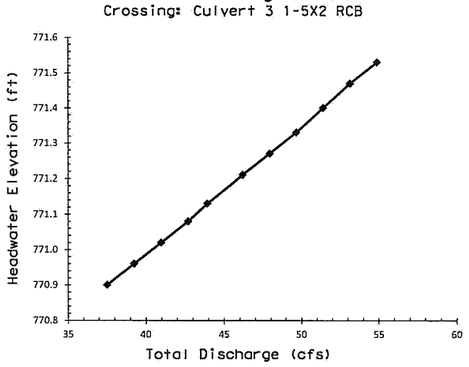
Tailwater Channel Data - Culvert 3
Tailwater Channel Option: Trapezoidal Channel
Bottom Width: 5.00 ft
Side Slope (H:V): 4.00 (_:1)
Channel Slope: 0.0010
Channel Manning's n: 0.0120
Channel Invert Elevation: 768.92 ft

Roadway Data for Crossing: CULVERT 3
Roadway Profile Shape: Constant Roadway Elevation
Crest Lenght: 100 ft
Crest Elevation: 771.54 ft

Roadway Surface: Paved
Roadway Top Width: 8.00 ft

****
Straight Culvert
Inlet Elevation (invert): 769.00 ft,
Outlet Elevation (invert): 768.92 ft
Culvert Length: 8.00 ft, Culvert Slope: 0.0100
****

Total Rating Curve
Crossing: Culvert 3 1-5X2 RCB



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TBPE REGISTRATION NO. 264

GEORGETOWN INNER LOOP @
CENTRAL MAINTENANCE FACILITY

HY 8 ANALYSIS
CULVERT 3

SHEET 1 OF 1

DESIGN	GRAPHICS	CHECK	CHECK	SHEET NO.
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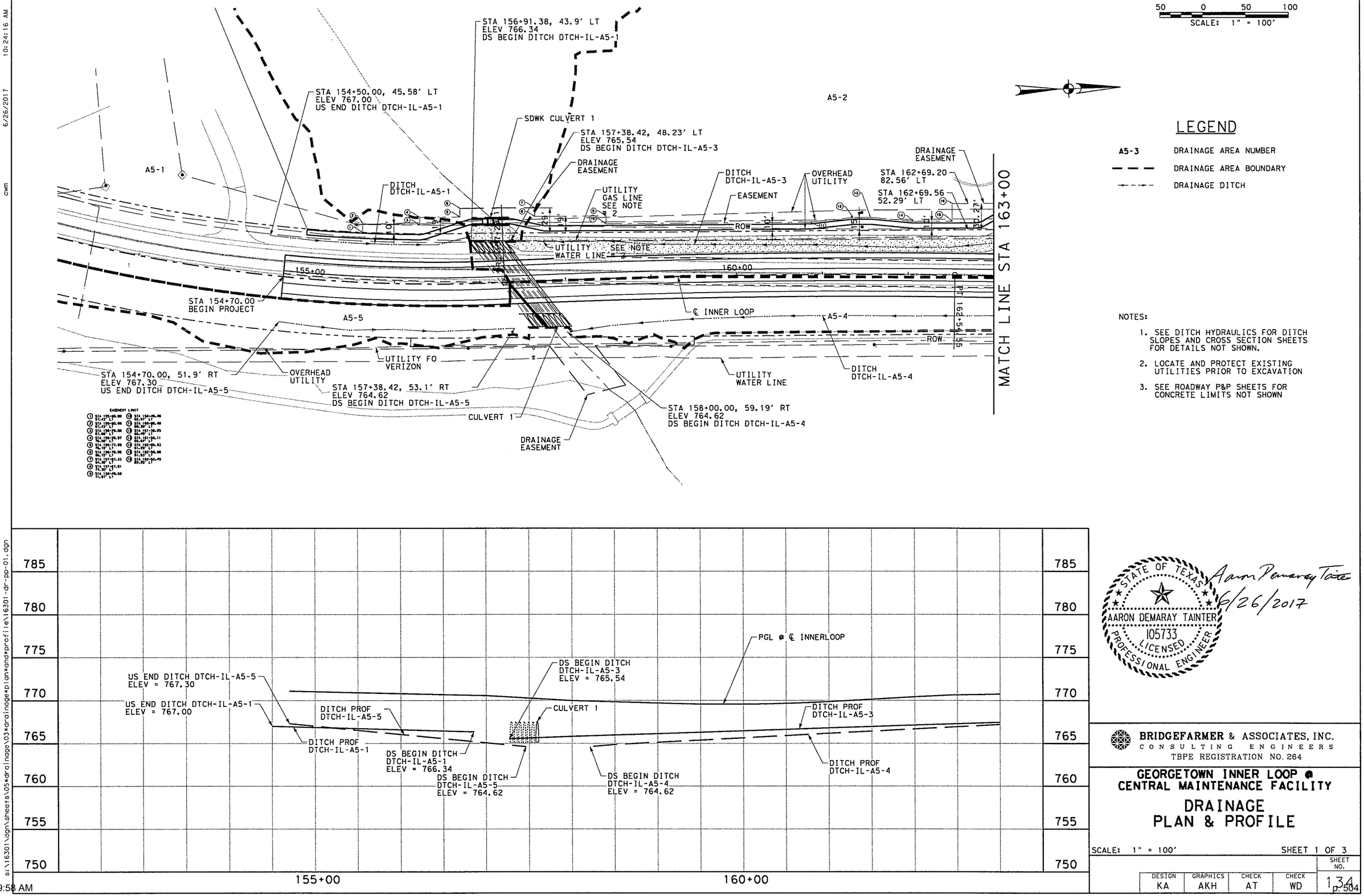

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GEORGETOWN INNER LOOP @ CENTRAL MAINTENANCE FACILITY

DRAINAGE PLAN & PROFILE

SCALE: 1" = 100' SHEET 1 OF 3

DESIGN	GRAPHICS	CHECK	CHECK	SHEET NO.
KA	AKH	AT	WD	134

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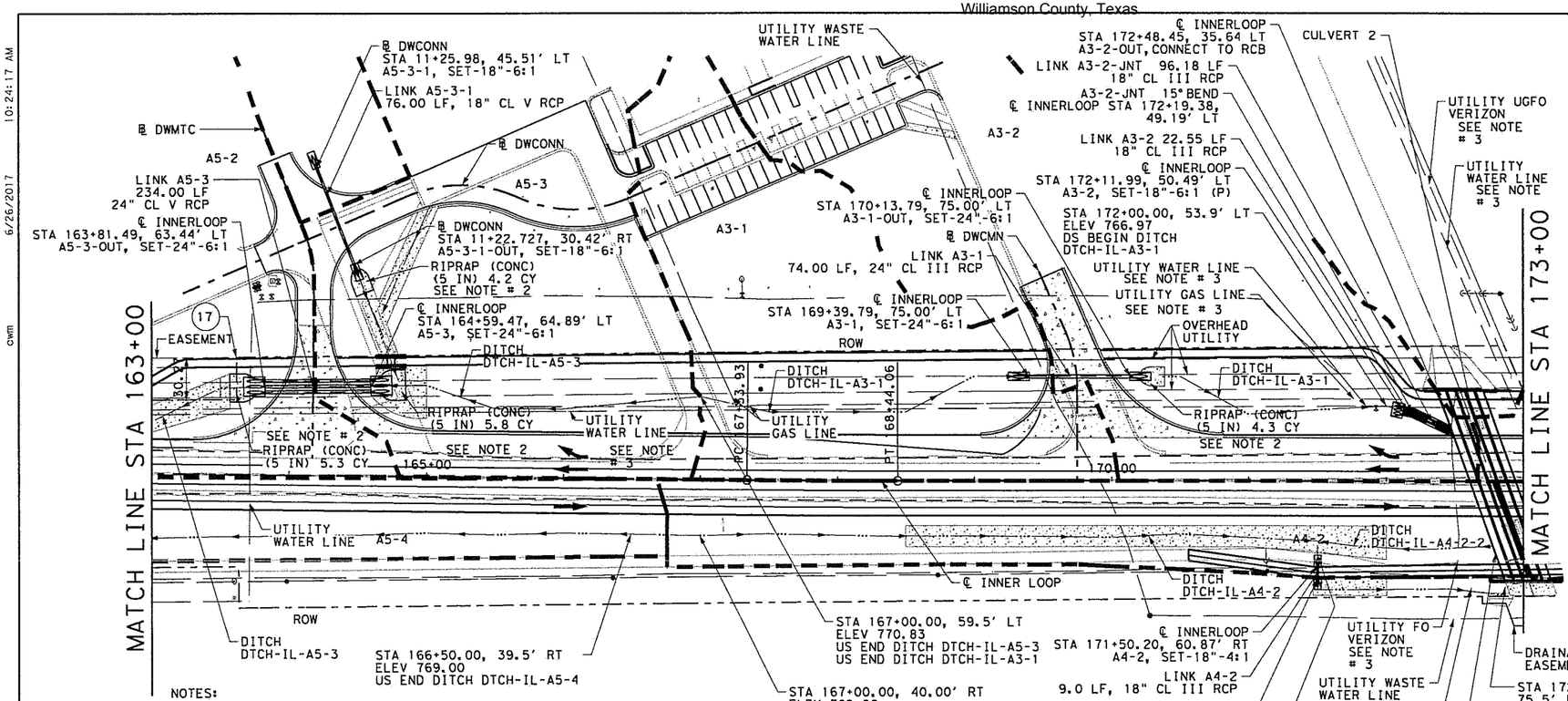


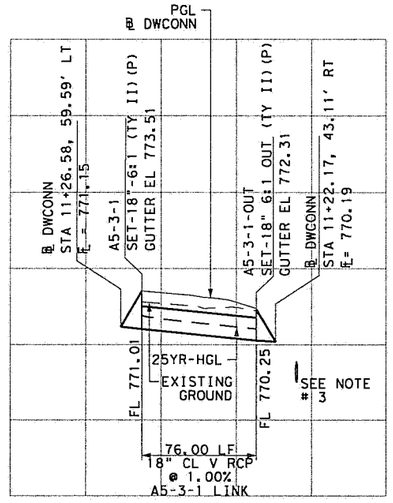
NOTES:

1. SEE DITCH HYDRAULICS FOR DITCH SLOPES AND CROSS SECTION SHEETS FOR DETAILS NOT SHOWN.
2. SEE DRAINAGE DETAILS SHEET FOR RIPRAP PROTECTION DETAILS NOT SHOWN.
3. LOCATE AND PROTECT EXISTING UTILITIES PRIOR TO EXCAVATION
4. SEE ROADWAY P&P SHEETS FOR CONCRETE LIMITS NOT SHOWN

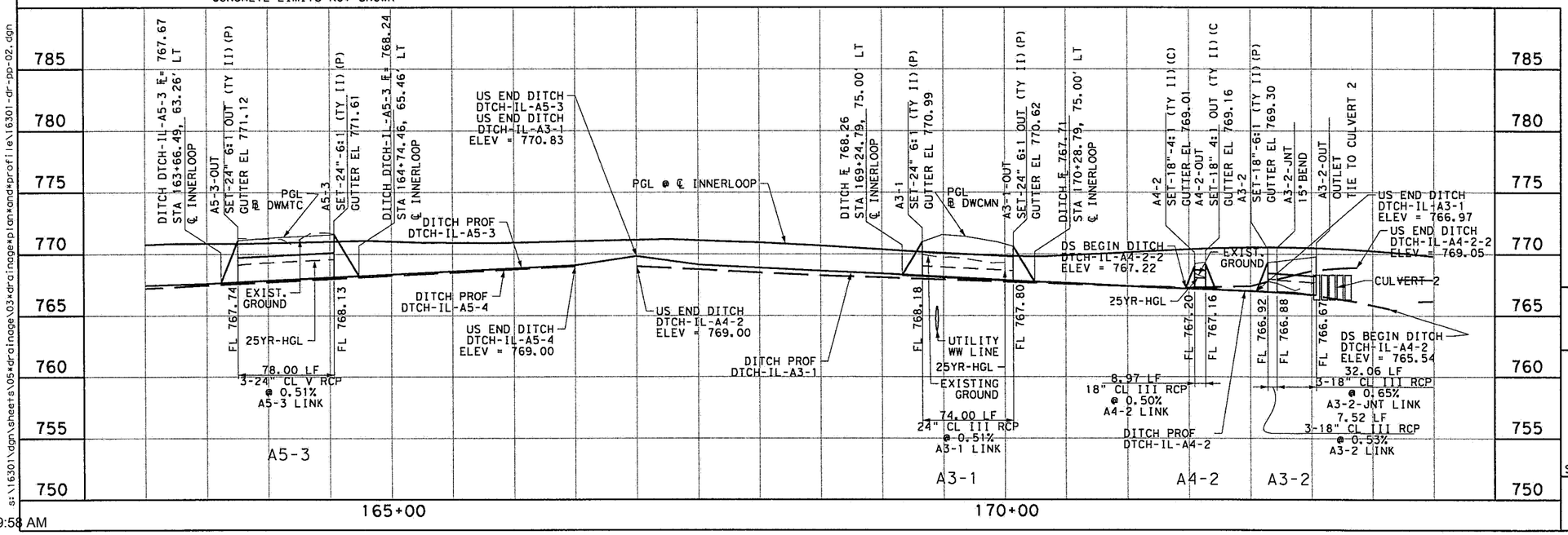
EASEMENT LIMIT
(17) STA 163+60.82 84.29' LT

LEGEND

A5-3	DRAINAGE AREA NUMBER
— — —	DRAINAGE AREA BOUNDARY
—·—·—	DRAINAGE DITCH



A5-3-1



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GEORGETOWN INNER LOOP @ CENTRAL MAINTENANCE FACILITY

DRAINAGE PLAN & PROFILE

SCALE: 1" = 100' SHEET 2 OF 3

DESIGN	GRAPHICS	CHECK	CHECK	SHEET NO.
KA	AKH	AT	WD	135

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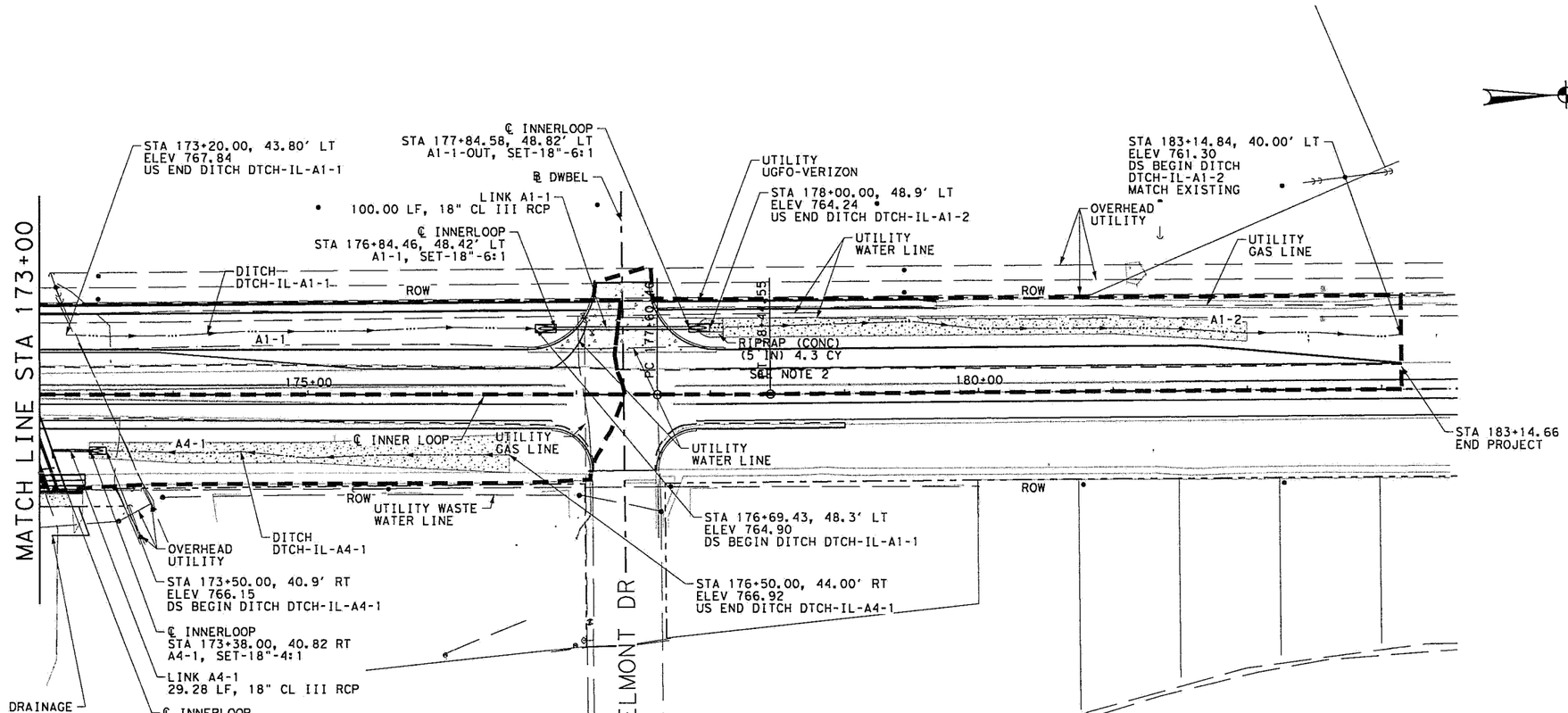
7/18/2017 9:58 AM

6/26/2017 10:24:19 AM cwm

50 0 50 100
SCALE: 1" = 100'

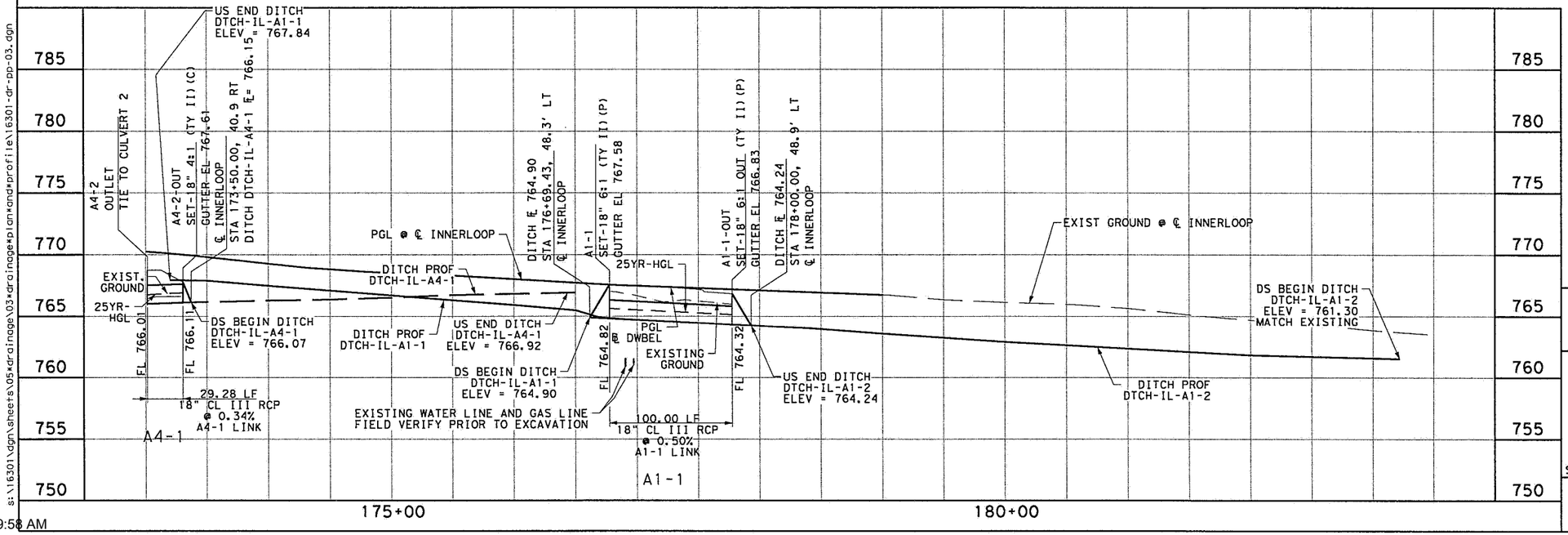


LEGEND

A5-3	DRAINAGE AREA NUMBER
— — —	DRAINAGE AREA BOUNDARY
→→→	DRAINAGE DITCH

NOTES:

1. SEE DITCH HYDRAULICS AND CROSS SECTION SHEETS FOR DETAILS NOT SHOWN.
2. SEE DRAINAGE DETAILS SHEET FOR RIPRAP PROTECTION DETAILS NOT SHOWN.
3. SEE ROADWAY P&P SHEETS FOR CONCRETE LIMITS NOT SHOWN



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GEORGETOWN INNER LOOP @ CENTRAL MAINTENANCE FACILITY

DRAINAGE PLAN & PROFILE

SCALE: 1" = 100' SHEET 3 OF 3

DESIGN	GRAPHICS	CHECK	CHECK	SHEET NO.
KA	AKH	AT	WD	136

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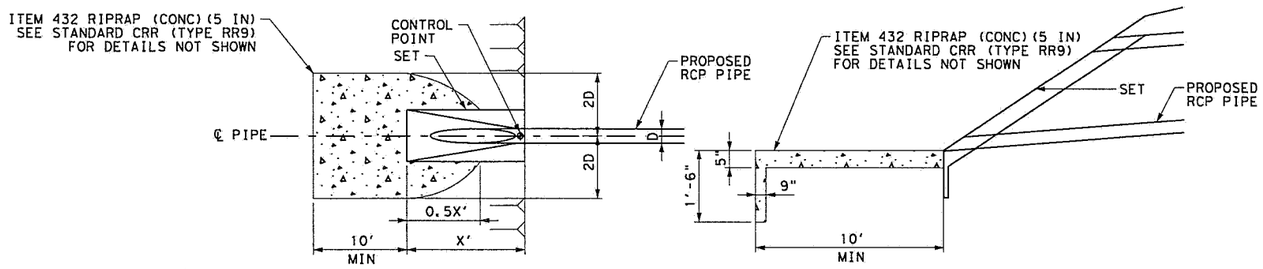
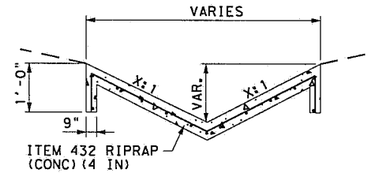
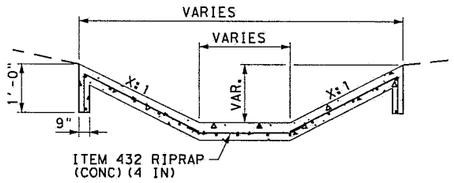


OUTFALL RIPRAP PROTECTION DETAIL



CONCRETE LINED TRIANGULAR DITCH DETAIL A



CONCRETE LINED TRAPEZOIDAL DITCH DETAIL B

NOTES:

1- SEE STANDARD CRR (TYPE RR9) FOR DETAILS NOT SHOWN

2- SEE DITCH HYDRAULICS AND CROSS SECTION SHEETS FOR DITCH SIDE SLOPE AND DETAILS NOT SHOWN

3- SEE ROADWAY PLAN & PROFILE SHEETS FOR CONCRETE RIPRAP LIMITS NOT SHOWN

CONCRETE LINED DITCH DETAILS

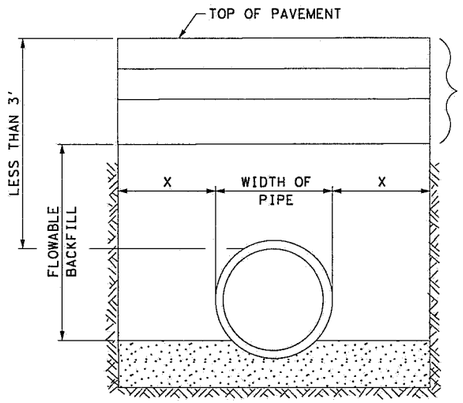
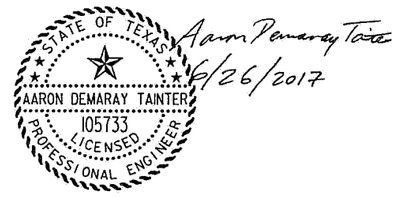


TABLE OF STANDARD FLOWABLE FILL WIDTHS FOR RC PIPE			
PIPE		X	WIDTH OF FLOWABLE BACKFILL
ID	OD		
18"	22 ½"	1'	3.88'
24"	29 ½"	1'	4.46'

FLOWABLE BACK FILL DETAIL

USE FLOWABLE BACKFILL WHEN COVER FROM TOP OF PIPE TO TOP OF PAVEMENT IS LESS THAN 3' UNDER PROPOSED PAVEMENT.



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GEORGETOWN INNER LOOP @ CENTRAL MAINTENANCE FACILITY

DRAINAGE DETAILS

SHEET 1 OF 1

DESIGN	GRAPHICS	CHECK	CHECK	SHEET NO.
KA	AKH	AT	WD	137

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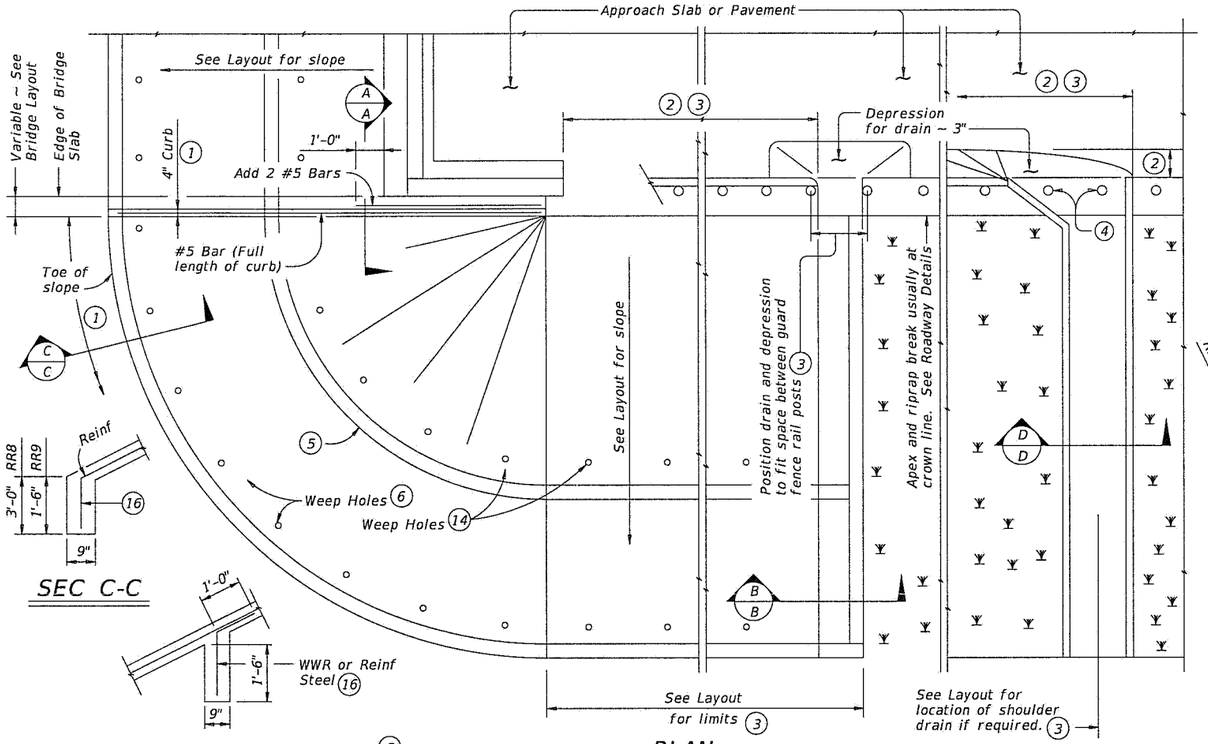
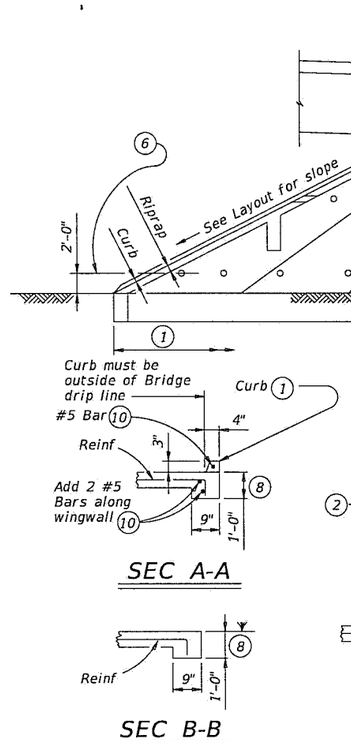
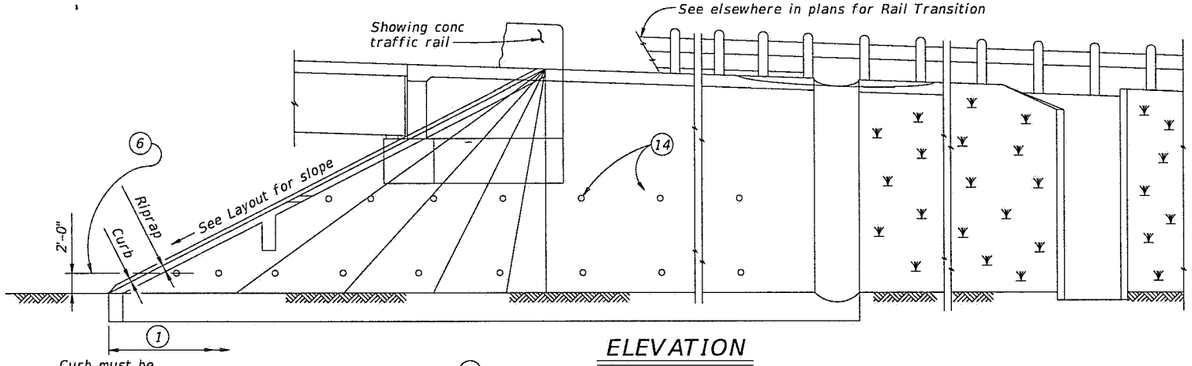
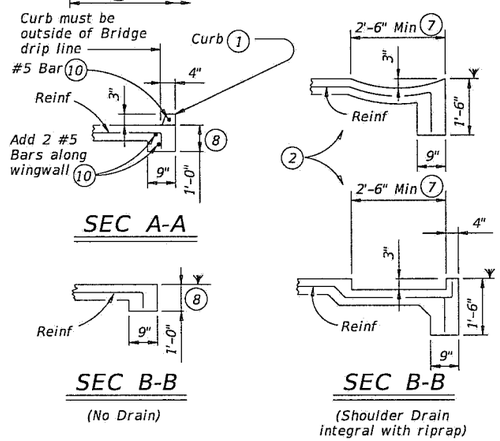
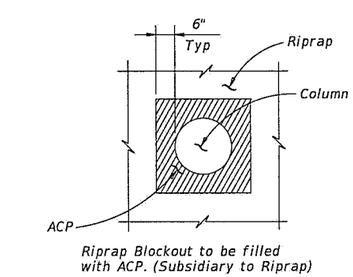
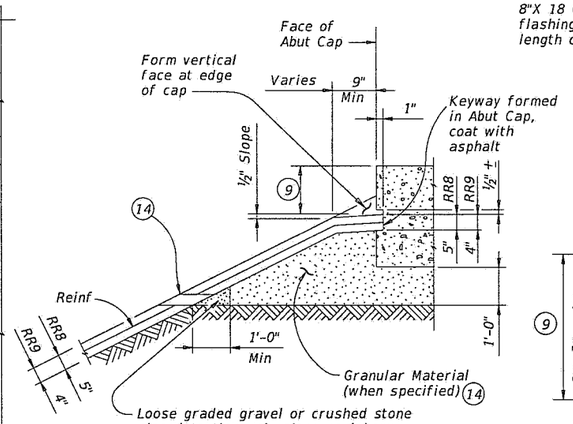


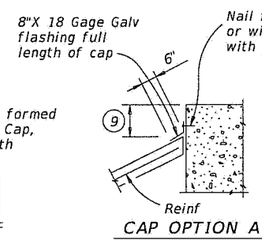


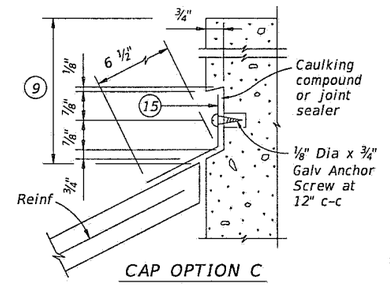


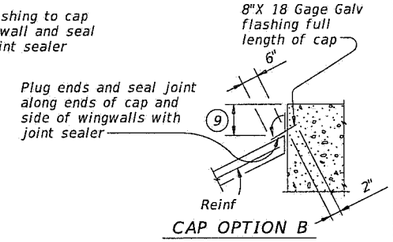


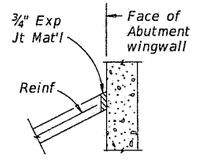




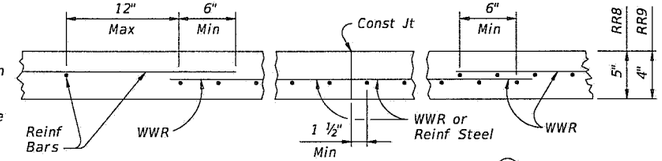








SECTIONS THRU RIPRAP AT CAP 11



REINFORCEMENT DETAILS 13

See General Notes for optional sythetic fiber reinforcement.

1. When riprap is shown extended around header on layout, extend slab and toewall as shown and eliminate 4" curb.
2. Limits and configuration of drains and depressions are as shown elsewhere in plans or as directed by the Engineer.
3. Location of shoulder drain must consider limitations imposed by rail transition. Do not locate shoulder drains at expansion joints between approach slab and concrete pavement.
4. See details elsewhere in plans for installation of guard fence posts through concrete riprap.
5. Provide intermediate toewall only when designated elsewhere in the plans or included in the specifications.
6. Provide lower level of 2" Dia weep holes at 10' c-c backed by 1 CF packet of gravel and galvanized hardware cloth at all locations unless directed by the Engineer to eliminate.
7. Use wider or other drain configurations if shown elsewhere in plans or if directed by the Engineer.
8. Wall extension may be reduced or modified if approved by the Engineer. Increase wall extension to 1'-6" whenever the optional intermediate toewall is called for in the plans.
9. Top of cap to top of riprap dimension varies as directed by the Engineer. Should be 9" Min for beam/slab type bridges and 1'-6" for slab span, box beam, or slab beam bridges.
10. #5 bars shown are required even when synthetic fiber reinforcing option is selected.
11. Provide sealing option for joint between the face of cap and riprap as designated by the Engineer or as shown elsewhere on plans.
12. Flashing (shown in Cap Option A) may be used at wingwall in addition to Exp Jt Mat'l if shown on plans or directed by the Engineer.
13. Provide #3 reinforcing bars at 18" Spa c-c. Provide Welded Wire Reinforcement (WWR) as 6x6-D3xD3. Combinations of WWR and reinforcing bars may be used if both are permitted. Use lap splices of a minimum 6 inches, measured from the transverse wire of WWR, and the ends of reinforcing bars.
14. If granular material is specified, provide upper level of 2" Dia weep holes at 10' c-c backed by galvanized hardware cloth.
15. 8" x 18 Gage Galv Sheet Metal
16. Provide WWR or #3 bars, with 1'-0" extension into slope.

FOR CONTRACTOR'S INFORMATION ONLY:
5" of RR8 = 0.015 CY/SF
4" of RR9 = 0.012 CY/SF
#3 Reinf at 18" c-c = 0.501 Lbs/SF
6x6-D3xD3 = 0.408 Lbs/SF

GENERAL NOTES:

Provide Class "B" concrete with a minimum compressive strength of 2,000 psi unless noted elsewhere in plans.

Provide Grade 60 reinforcing steel.

Provide synthetic fibers listed on the "Fibers for Concrete" Material Producer List (MPL) in lieu of steel reinforcing in riprap concrete unless noted otherwise.

Install construction joints or grooved joints extending the full slant slope height at intervals of approximately 20 feet unless otherwise directed by the Engineer.

Hardware cloth, loose grade stone behind weep holes, flashing, or other sealing material are subsidiary to the bid item "Riprap".

Use reinforcing bars, deformed Welded Wire Reinforcing (WWR), or any suitable combination of both types for riprap reinforcing, unless specified elsewhere in the plans.

See Layout for limits of riprap.

RR8 is to be used on stream crossings.

RR9 is to be used on other embankments.

Texas Department of Transportation

Bridge Division Standard

CONCRETE RIPRAP AND SHOULDER DRAINS
EMBANKMENTS AT BRIDGE ENDS (TYPES RR8 & RR9)

CRR

FILE: crrstde1.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT January 2015	CONT	SECT	JOB	HIGHWAY
REVISIONS	DIST	COUNTY		SHEET NO.

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FILE: s:\16301\dgn\sheets\05*drainage\07*standards\16301-pw.dgn
cwm

TABLE OF DIMENSIONS & REINFORCING STEEL
(Wings for One Structure End)

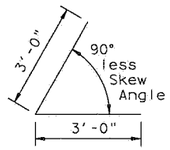
Dimensions					Variable Reinforcing				Estimated ④ Quantities per ft of wing (2~Wings)		Estimated Quantities per ft of Toewall (1~Toewall)	
					Bars J1		Bars J2					
Maximum Wingwall Height Hw	W	X	Y	Z	Size	Spa	Size	Spa	Reinf (Lb/Ft)	Conc (CY/Ft)	Reinf (Lb/Ft)	Conc (CY/Ft)
2'-6"	2'-10"	10"	1'- 0"	7"	#4	1'-0"	#4	1'-0"	48.64	0.406	6.85	0.071
2'-9"	2'-10"	10"	1'- 0"	7"	#4	1'-0"	#4	1'-0"	49.31	0.424	6.85	0.071
3'-0"	2'-10"	10"	1'- 0"	7"	#4	1'-0"	#4	1'-0"	49.98	0.444	6.85	0.071
3'-3"	2'-10"	10"	1'- 0"	7"	#4	1'-0"	#4	1'-0"	53.32	0.462	6.85	0.071
3'-6"	2'-10"	10"	1'- 0"	7"	#4	1'-0"	#4	1'-0"	53.98	0.480	6.85	0.071
4'-0"	3'- 2"	1'- 2"	1'- 0"	7"	#4	1'-0"	#4	1'-0"	55.77	0.532	6.85	0.071
4'-6"	3'- 2"	1'- 2"	1'- 0"	7"	#4	1'-0"	#4	1'-0"	59.77	0.568	6.85	0.071
5'-0"	3'- 9"	1'- 7"	1'- 2"	7"	#4	1'-0"	#4	1'-0"	63.45	0.632	6.96	0.075
5'-6"	3'- 9"	1'- 7"	1'- 2"	7"	#4	1'-0"	#4	1'-0"	67.46	0.668	6.96	0.075
6'-0"	4'- 4"	2'- 0"	1'- 4"	7"	#5	1'-0"	#5	1'-0"	80.67	0.730	7.07	0.078
6'-6"	4'- 4"	2'- 0"	1'- 4"	7"	#5	1'-0"	#5	1'-0"	85.05	0.768	7.07	0.078
7'-0"	5'- 0"	2'- 3"	1'- 9"	8"	#5	1'-0"	#5	1'-0"	92.15	0.864	8.07	0.093
7'-6"	5'- 0"	2'- 3"	1'- 9"	8"	#5	1'-0"	#5	1'-0"	96.54	0.902	8.07	0.093
8'-0"	5'- 6"	2'- 8"	1'-10"	8"	#5	6"	#5	6"	139.04	0.962	8.13	0.095
8'-6"	5'- 6"	2'- 8"	1'-10"	8"	#5	6"	#5	6"	144.47	1.000	8.13	0.095
9'-6"	6'- 0"	2'-10"	2'- 2"	9"	#5	6"	#5	6"	156.93	1.136	8.41	0.110
10'-6"	6'- 5"	3'- 0"	2'- 5"	9"	#6	6"	#5	6"	196.27	1.234	8.57	0.117
11'-6"	7'- 2"	3'- 6"	2'- 8"	11"	#6	6"	#6	6"	230.13	1.438	9.52	0.140
12'-6"	7'- 8"	3'- 9"	2'-11"	1'- 0"	#7	6"	#6	6"	283.41	1.592	9.74	0.157
13'-6"	8'- 2"	4'- 0"	3'- 2"	1'- 2"	#8	6"	#6	6"	348.72	1.804	10.02	0.186
14'-6"	8'-10"	4'- 5"	3'- 5"	1'- 4"	#9	6"	#6	6"	432.94	2.046	10.30	0.218
15'-6"	9'- 6"	4'-10"	3'- 8"	1'- 6"	#9	6"	#7	6"	489.52	2.302	11.24	0.253
16'-0"	9'-11"	5'- 0"	3'-11"	1'- 7"	#9	6"	#7	6"	505.72	2.448	11.47	0.279

TABLE OF WINGWALL REINFORCING (2~Wings)

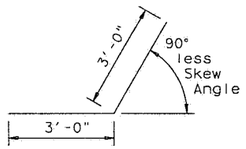
Bar	Size	No.	Spa
D1	#6	~	1'-0"
D2	#6	~	1'-0"
E1	#4	~	1'-0"
F	#4	~	1'-0"
G	#6	~	8"
M1	#4	4	~
P	#4	~	1'-0"
V	#4	~	1'-0"

TABLE OF TOEWALL REINFORCING

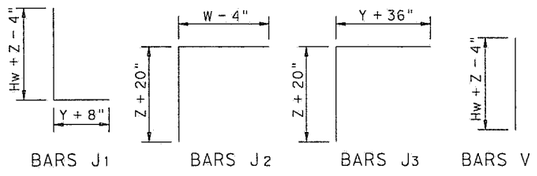
Bar	Size	No	Spa
J3	#4	~	1'-0"
M2	#4	2	~
E2	#4	~	1'-0"



BARS D1



BARS D2



BARS J1 BARS J2 BARS J3 BARS V

WING DIMENSION CALCULATIONS:

Formulas: (All values are in Feet)

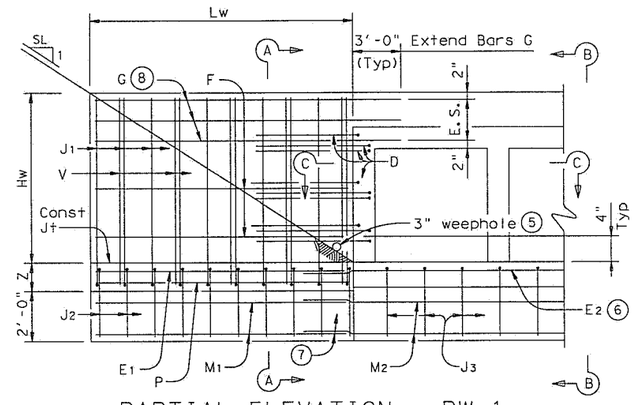
Hw = H + T + C
Lw = (Hw) (SL) ÷ Cosine θ for Ty PW-1
= (Hw - 1') (SL) ÷ Cosine θ for Ty PW-2 and Hw ≥ 4'
= (Hw - 0.5') (SL) ÷ Cosine θ for Ty PW-2 and Hw < 4'

For Cast-in-place culverts:
Ltw = [(N) (S) + (N + 1) (U)] ÷ Cosine θ

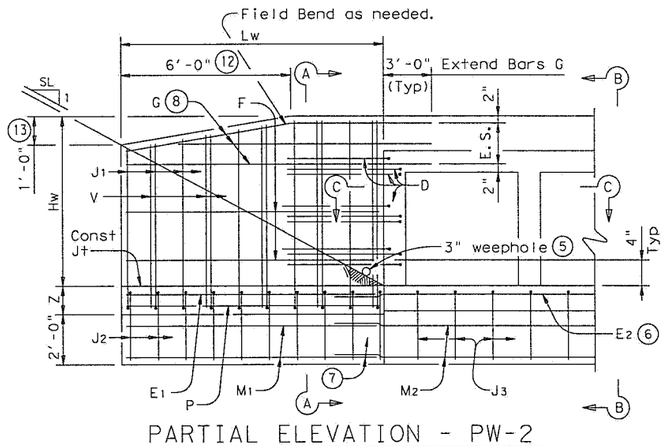
For Precast culverts:
Ltw = [(N) (2 U + S) + (N - 1) (0.5')] ÷ Cosine θ
Total Wingwall Area (Two Wings ~ SF)
= (2)(Hw)(Lw) for Ty PW-1
= (2)(Hw)(Lw) - 6 SF for Ty PW-2 and Hw ≥ 4'
= (2)(Hw)(Lw) - 1.5 SF for Ty PW-2 and Hw < 4'

Hw = Height of Wingwall
Lw = Length of Wingwall
Ltw = Culvert Toewall Length
N = Number of Culvert Spans
SL:1 = Channel Slope ratio. (Horizontal: 1 Vertical, Usual value is 2:1)
θ = Culvert Skew

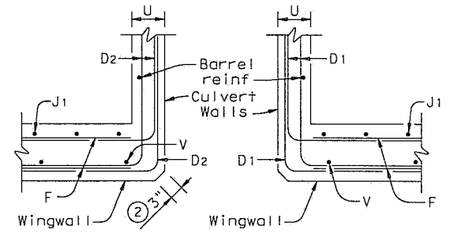
See applicable box culvert standard for S, H, T and U values.



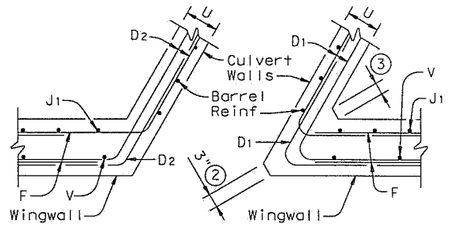
PARTIAL ELEVATION - PW-1



PARTIAL ELEVATION - PW-2



SECTION C-C



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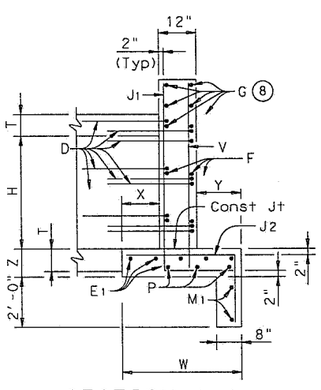
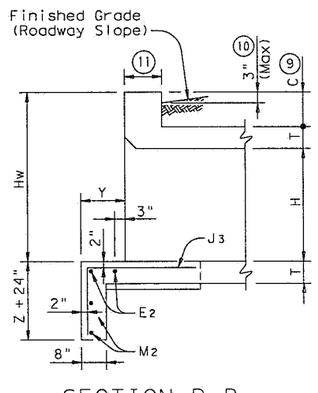
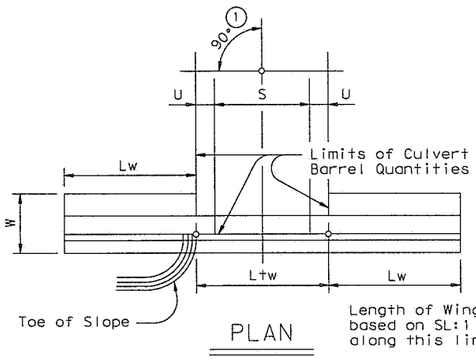


SECTION A-A
(Showing Wing Reinf)

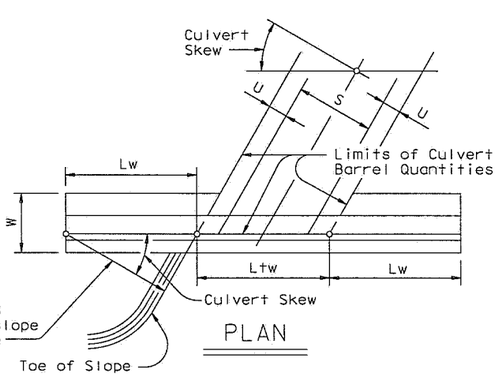


SECTION B-B
(Showing Wing Reinf)



PLAN

DETAILS FOR NON-SKEWED BOX CULVERTS



PLAN

DETAILS FOR SKEWED BOX CULVERTS
(Showing 30° Skew)

① Skew Angle = 0°

② At discharge end, chamfer may be ¾".

③ For 15° Skew ~ 1"
For 30° Skew ~ 2"
For 45° Skew ~ 3"

④ Quantities shown are for two Type PW-1 wings. Adjust concrete volume for Type PW-2 wings. To determine estimated quantities for two wings, multiply the tabulated values by Lw. Quantities shown do not include weight of Bars D.

⑤ Provide weepholes for Hw = 5'-0" and greater. Fill around weepholes with coarse gravel.

⑥ Extend Bars E2 1'-6" minimum into the wingwall footing.

⑦ Lap Bars M1 1'-6" minimum with Bars M2.

⑧ Bars G equally spaced at 8" maximum, place as shown. Provide at least two pair Bars G per wing.

⑨ 0" min to 5'-0" max. Estimated curb heights are shown elsewhere in the plans. For structures with pedestrian rail, bicycle rail or curbs taller than 1'-0", refer to ECD standard. For structures with T6 bridge rail, refer to T6-CM standard. For structures with traffic rail, other than T6, refer to RAC standard.

⑩ For vehicle safety, the following requirements must be met:
- For structures without bridge rail, curbs cannot project more than 3" above finished grade.
- For structures with bridge rail, build curbs flush with finished grade.
Reduce curb heights, if necessary, to meet the above requirements. No changes will be made in quantities and no additional compensation will be allowed for this work.

⑪ 1'-0" typical. 2'-0" typical when RAC standard is referenced elsewhere in the plans.

⑫ 3'-0" for Hw < 4'.

⑬ 6" for Hw < 4'.

GENERAL NOTES:
Designed in accordance with AASHTO LRFD Bridge Design Specifications.
Provide Class "C" Concrete (f'c = 3,600 psi Min) and Grade 60 reinforcing steel.
Provide 1 ¼" Min clear cover to reinforcing steel.
Depth of toewalls for wingwalls and culverts may be reduced or eliminated when founded on solid rock, when directed by the Engineer.
See BCS sheet for wingwall type and additional dimensions and information.
The quantities for concrete and reinforcing steel resulting from the formulas given on this sheet are for the Contractor's information only.

DESIGNER NOTES:
Type PW-1 can be used for all applications and must be used if railing is to be mounted to the wingwall.
Type PW-2 can only be used for applications without a railing mounted to the wingwall.

Texas Department of Transportation — Bridge Division Standard

CONCRETE WINGWALLS
WITH PARALLEL WINGS FOR BOX CULVERTS TYPES PW-1 AND PW-2

PW

FILE: pwstde01.dgn	DN: GAF	CK: CAT	DW: TxDOT	CK: GAF
©TxDOT February 2010	CONT	SECT	JOB	HIGHWAY
REVISIONS				
11-10: Reinforcing Quantities. 01-12: PW-1 & PW-2.	DIST	COUNTY		SHEET NO.
				13909

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TABLE OF DIMENSIONS & REINFORCING STEEL
(Wings for One Structure End)

Dimensions					Variable Reinforcing				Estimated Quantities (3) per ft of wing length (2~Wings)	
					Bars J1		Bars J2			
Maximum Wingwall Height Hw	W	X	Y	Z	Size	Spa	Size	Spa	Reinf (Lb/Ft)	Conc (CY/Ft)
2'-6"	2'- 5"	1'- 0"	9"	7"	#4	1'-0"	#4	1'-0"	33.73	0.248
3'-0"	2'- 5"	1'- 0"	9"	7"	#4	1'-0"	#4	1'-0"	37.07	0.261
3'-6"	2'- 5"	1'- 0"	9"	7"	#4	1'-0"	#4	1'-0"	37.74	0.273
4'-0"	2'- 5"	1'- 0"	9"	7"	#4	1'-0"	#4	1'-0"	38.41	0.285
4'-6"	3'- 2"	1'- 6"	1'- 0"	7"	#4	1'-0"	#4	1'-0"	41.75	0.330
5'-0"	3'- 2"	1'- 6"	1'- 0"	7"	#4	1'-0"	#4	1'-0"	45.09	0.343
5'-6"	3'- 2"	1'- 6"	1'- 0"	7"	#4	1'-0"	#4	1'-0"	45.75	0.355
6'-0"	3'- 2"	1'- 6"	1'- 0"	7"	#4	1'-0"	#4	1'-0"	46.42	0.367
7'-0"	3'- 8"	1'- 9"	1'- 3"	7"	#4	1'-0"	#4	1'-0"	52.77	0.414
8'-0"	4'- 2"	2'- 0"	1'- 6"	8"	#5	1'-0"	#4	1'-0"	60.19	0.486
9'-0"	4'- 8"	2'- 3"	1'- 9"	8"	#4	6"	#4	6"	81.49	0.535
10'-0"	5'- 2"	2'- 6"	2'- 0"	8"	#5	6"	#4	6"	97.25	0.584
11'-0"	5'- 8"	2'- 9"	2'- 3"	8"	#6	6"	#5	6"	133.65	0.634
12'-0"	6'- 2"	3'- 0"	2'- 6"	9"	#7	6"	#5	6"	162.29	0.721
13'-0"	6'- 8"	3'- 3"	2'- 9"	11"	#7	6"	#5	6"	178.80	0.856
14'-0"	7'- 2"	3'- 6"	3'- 0"	1'- 0"	#8	6"	#5	6"	216.78	0.959
15'-0"	7'- 8"	4'- 0"	3'- 0"	1'- 1"	#9	6"	#6	6"	283.06	1.068
16'-0"	8'- 2"	4'- 6"	3'- 0"	1'- 3"	#9	6"	#6	6"	297.02	1.234

TABLE OF WINGWALL REINFORCING (2~Wings)

Bar	Size	No.	Spa
DL	#5	~	1'-0"
DS	#5	~	1'-0"
E	#4	~	1'-0"
F	#4	~	1'-0"
G	#6	4	~
M	#4	4	~
P	#4	~	1'-0"
RS	#5	3	~
RL	#5	3	~
V	#4	~	1'-0"

TABLE OF ESTIMATED CULVERT TOEWALL QUANTITIES

Bar	Size	No.	Spa
L	#4	~	1'-6"
Q	#4	1	~
Reinf (Lb/Ft)			2.45
Conc (CY/Ft)			0.037

WING DIMENSION CALCULATIONS:

Formulas: (All values are in Feet)

Hw = H + T + C - 0.250'
A = (Hw - 0.333') (SL)
B = (A) [Tangent (Θ + 15°)]
Lw = (A) ÷ [Cosine (Θ + 15°)]

For Cast-in-place culverts:

Ltw = [(N) (S) + (N+1) (U)] ÷ (Cosine Θ)

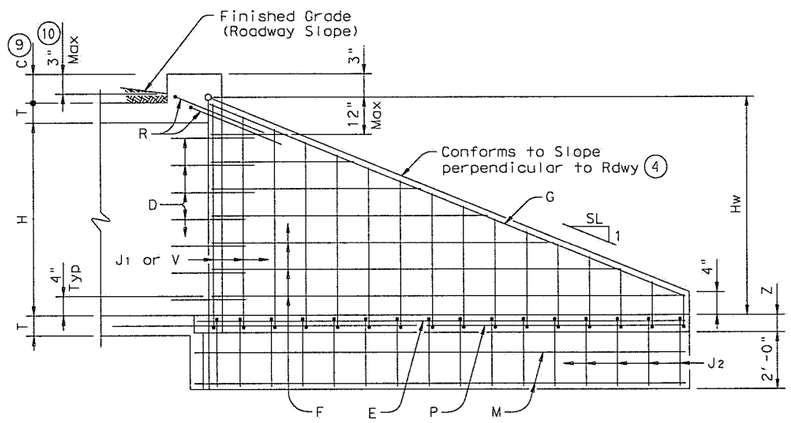
For Precast culverts:

Ltw = [(N) (2U+S) + (N-1) (0.500')] ÷ (Cosine Θ)

Total Wingwall Area (Two Wings ~ S.F.) = (0.5) (Hw + 0.333') (Lw + A)

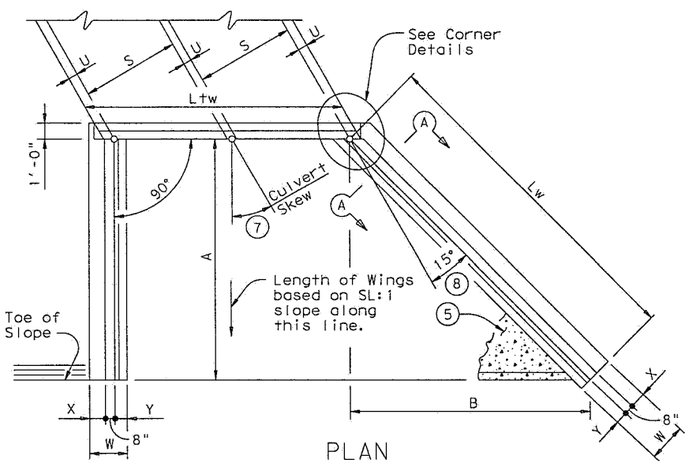
Hw = Height of Wingwall
SL:1 = Side Slope Ratio (Horizontal:1 Vertical)
A = Length of Short Wingwall
Lw = Length of Long Wingwall
Ltw = Culvert Toewall Length
N = Number of Culvert Spans
Θ = Culvert Skew

See applicable box culvert standard for H, S, T, and U values.



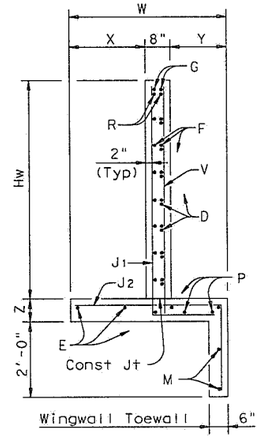
INSIDE ELEVATION

(Showing reinforcing. Culvert and Culvert Toewall reinforcing not shown for clarity.)

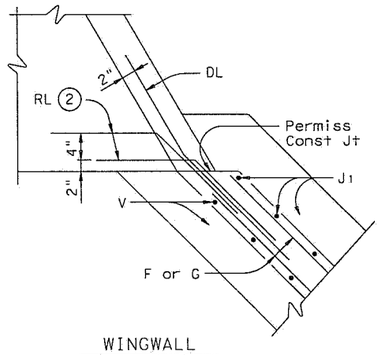


PLAN

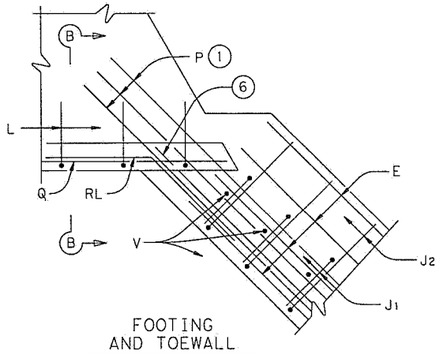
(Showing dimensions and 30° Skew.)



SECTION A-A



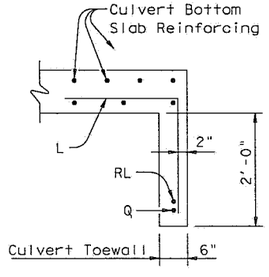
WINGWALL



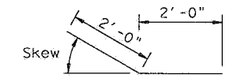
FOOTING AND TOEWALL

CORNER DETAILS

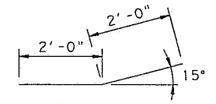
(Culvert and Culvert Toewall reinforcing not shown for clarity.)



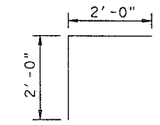
SECTION B-B (5)



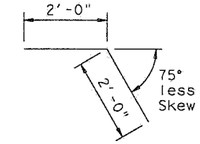
BARS DS
(Short Wing)



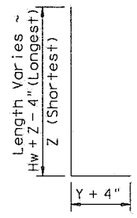
BARS DL
(Long Wing)



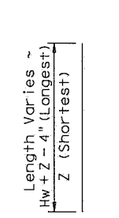
BARS RS
(Short Wing)



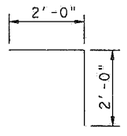
BARS RL
(Long Wing)



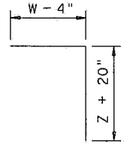
BARS J1



BARS V



BARS L



BARS J2

1. Extend Bars P 3'-0" minimum into bottom slab of Box Culvert.
2. Adjust to fit as necessary to maintain 1 ¼" clear cover and 4" minimum between bars.
3. Quantities shown are based on an average wing height for two wings (one structure end). To determine total quantities for two wings multiply the tabulated values by 0.5 x (A+Lw).
4. Recommended values of Slope are: 2:1, 3:1, 4:1, & 6:1.
5. When shown elsewhere on the plans, a 5" deep concrete riprap shall be constructed. Payment for riprap shall be as required by Item 432, "Riprap". Unless otherwise shown on the plans or directed by the Engineer, the riprap shall have a 6" wide by 1'-6" deep reinforced concrete toewall along all edges adjacent to natural ground; the toewall shall be reinforced by extending typical riprap reinforcing into the toewall; construction joints or grooved joints, oriented in the direction of flow, shall extend across the full distance of the riprap, at intervals of approximately 20'. When such riprap is provided, the culvert toewall shown in SECTION B-B will not be required.
6. At Contractor's option, Culvert Toewall may be ended flush with Wingwall Toewall. Adjust reinforcing from that shown as necessary.
7. Applicable values of of Skew are: 15°, 30°, and 45°.
8. Typical wingwall angle for all skews.
9. 0" min to 5'-0" max. Estimated curb heights are shown elsewhere in the plans. For structures with pedestrian rail, bicycle rail or curbs taller than 1'-0", refer to ECD standard. For structures with T6 bridge rail, refer to T6-CM standard. For structures with traffic rail, other than T6, refer to RAC standard.
10. For vehicle safety, curb heights and wall heights shall be reduced, if necessary, to provide a maximum 3" projection above finished grade. No changes will be made in quantities and no additional compensation will be allowed for this work.

GENERAL NOTES:

Designed according to AASHTO LRFD Specifications.
All reinforcing steel shall be Grade 60.
Synthetic fibers listed on the "Fibers for Concrete" Material Producer List (MPL) may be used in lieu of steel reinforcing in riprap concrete unless noted otherwise.
All concrete shall be Class "C" and shall have a minimum compressive strength of 3600 psi.
All reinforcing bars shall be adjusted to provide a minimum of 1 ¼" clear cover.
When structure is founded on solid rock, depth of toewalls for culverts and wingwalls may be reduced or eliminated as directed by the Engineer.
See BCS sheet for additional dimensions and information.
The quantities for concrete and reinforcing steel resulting from the formulas given on this sheet are for Contractor's information only.

Texas Department of Transportation — Bridge Division Standard

CONCRETE WINGWALLS WITH FLARED WINGS FOR SKEWED BOX CULVERTS

FW-S

FILE: fw-sstde.dgn	DN: GAF	CK: CAT	DW: TxDOT	CK: GAF
©TxDOT February 2010	CONT	SECT	JOB	HIGHWAY
REVISIONS				
11-10: Add note for synthetic fibers.	DIST	COUNTY		SHEET NO.
				14910

BOX DATA

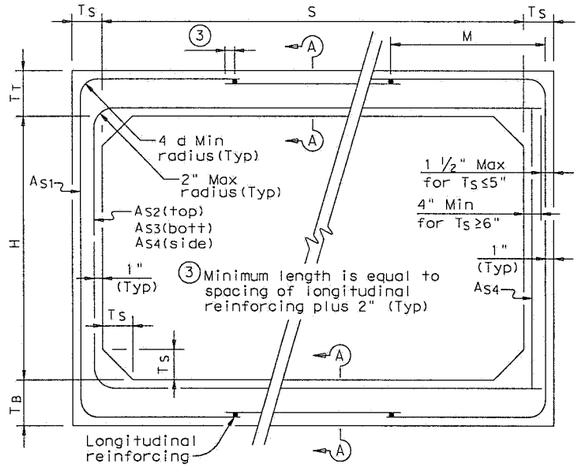
SECTION DIMENSIONS					Fill Height	M (Min)	REINFORCING (in²/ft) ②								① Lift Weight
S (ft)	H (ft)	T_T (in)	T_B (in)	T_S (in)	(ft)	(in)	A_{S1}	A_{S2}	A_{S3}	A_{S4}	A_{S5}	A_{S6}	A_{S7}	A_{S8}	(Tons)
5	3	8	7	6	<2	-	0.19	0.31	0.21	0.14	0.19	0.19	0.19	0.17	6.6
5	3	6	6	6	2<3	45	0.18	0.24	0.19	0.14	-	-	-	-	5.7
5	3	6	6	6	3-5	36	0.14	0.17	0.16	0.14	-	-	-	-	5.7
5	3	6	6	6	10	36	0.14	0.16	0.17	0.14	-	-	-	-	5.7
5	3	6	6	6	15	35	0.16	0.21	0.22	0.14	-	-	-	-	5.7
5	3	6	6	6	20	35	0.21	0.27	0.28	0.14	-	-	-	-	5.7
5	3	6	6	6	25	35	0.26	0.34	0.34	0.14	-	-	-	-	5.7
5	3	6	6	6	30	35	0.31	0.41	0.41	0.14	-	-	-	-	5.7
5	4	8	7	6	<2	-	0.19	0.33	0.24	0.14	0.19	0.19	0.19	0.17	7.2
5	4	6	6	6	2<3	45	0.16	0.27	0.22	0.14	-	-	-	-	6.3
5	4	6	6	6	3-5	45	0.14	0.19	0.18	0.14	-	-	-	-	6.3
5	4	6	6	6	10	36	0.14	0.18	0.18	0.14	-	-	-	-	6.3
5	4	6	6	6	15	35	0.14	0.23	0.24	0.14	-	-	-	-	6.3
5	4	6	6	6	20	35	0.17	0.30	0.31	0.14	-	-	-	-	6.3
5	4	6	6	6	25	35	0.21	0.37	0.38	0.14	-	-	-	-	6.3
5	4	6	6	6	30	35	0.25	0.44	0.45	0.14	-	-	-	-	6.3
5	5	8	7	6	<2	-	0.19	0.35	0.26	0.14	0.19	0.19	0.19	0.17	7.8
5	5	6	6	6	2<3	45	0.14	0.29	0.24	0.14	-	-	-	-	6.9
5	5	6	6	6	3-5	45	0.14	0.21	0.20	0.14	-	-	-	-	6.9
5	5	6	6	6	10	45	0.14	0.19	0.20	0.14	-	-	-	-	6.9
5	5	6	6	6	15	36	0.14	0.24	0.25	0.14	-	-	-	-	6.9
5	5	6	6	6	20	35	0.15	0.31	0.32	0.14	-	-	-	-	6.9
5	5	6	6	6	25	35	0.18	0.38	0.39	0.14	-	-	-	-	6.9
5	5	6	6	6	30	35	0.21	0.46	0.47	0.14	-	-	-	-	6.9
5	2	8	7	6	<2	-	0.20	0.31	0.20	0.14	0.22	0.19	0.19	0.17	6.0
5	2	6	6	6	30	44	0.39	0.33	0.34	0.14	-	-	-	-	5.1

⑤

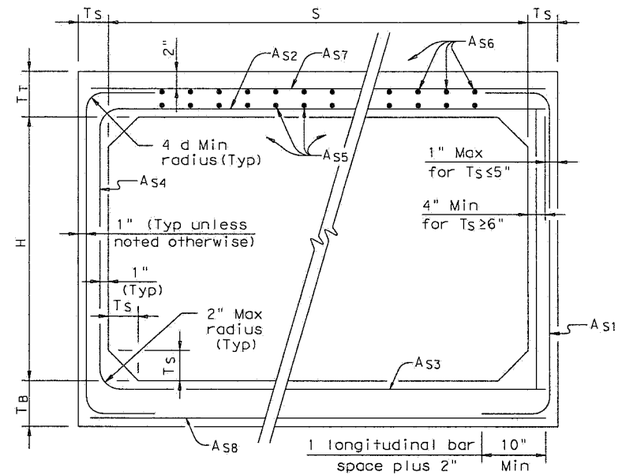
① For Box Length = 8'-0"

② A_{S1} thru A_{S4}, A_{S7} and A_{S8} are minimum required areas of reinforcement per linear foot of box length. A_{S6} and A_{S5} are minimum required areas of reinforcement per linear foot of box width.

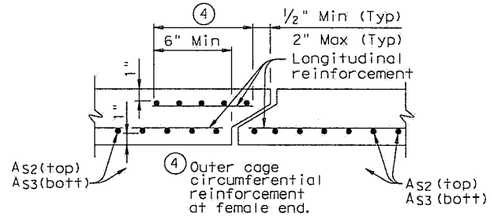
⑤ These designs were created by TxDOT and are not shown in the ASTM Specifications.



FILL HEIGHT 2 FT AND GREATER



FILL HEIGHT LESS THAN 2 FT



SECTION A-A

(TOP AND BOTTOM SLAB JOINT REINFORCEMENT)

GENERAL NOTES:

Designs shown conform to ASTM C1577. Refer to ASTM C1577 for information or details not shown.

All concrete shall be Class "H" Concrete with a minimum compressive strength of 5,000 psi.

See SCP-MD standard sheet for miscellaneous details and notes not shown.

In lieu of furnishing the designs shown on this sheet, the contractor may furnish an alternate design that is equal to or exceeds the box design for the design fill height in the table. Shop plans for alternate designs shall be submitted in accordance with Item "Precast Concrete Structural Members (Fabrication)".

HL93 LOADING

Texas Department of Transportation | Bridge Division Standard

SINGLE BOX CULVERTS PRECAST 5'-0" SPAN

SCP-5

FILE: scp05sts.dgn	DN: GAF	CK: LMW	DW: BWH/TxDOT	CK: GAF
©TxDOT February 2010	CONT	SECT	JOB	HIGHWAY
REVISIONS	DIST	COUNTY		SHEET NO.
				0.411

DISCLAIMER:
The use of this standard is governed by the "Texas Engineering Practice Act". No warranty of any kind is made by TxDOT for any purpose whatsoever. TxDOT assumes no responsibility for the conversion of this standard to other formats or for incorrect results or damages resulting from its use.

DATE: 6/26/2017 10:24:24 AM
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cwm

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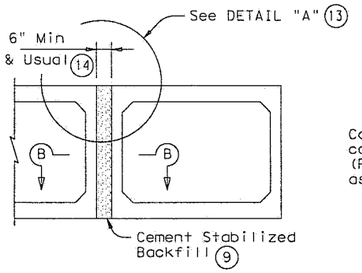
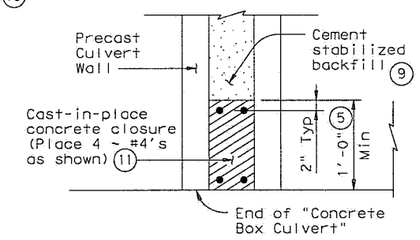
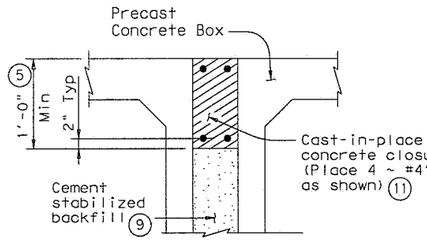


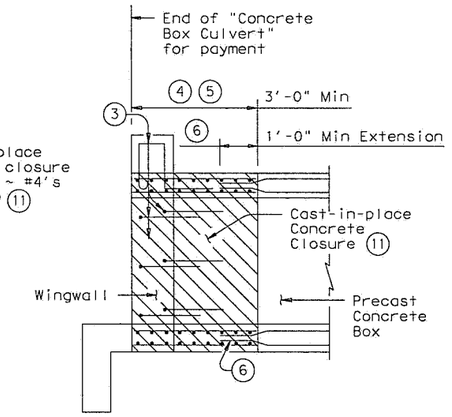
MULTIPLE UNIT PLACEMENT



SECTION B-B

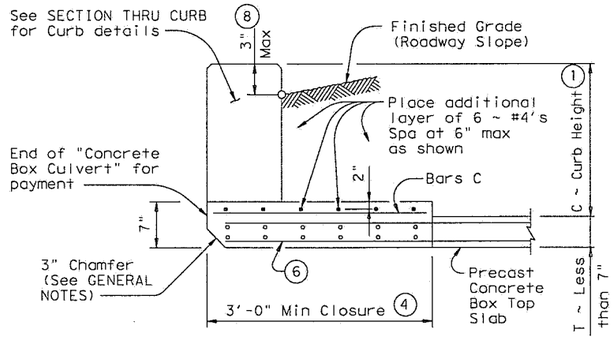


DETAIL "A" (13)

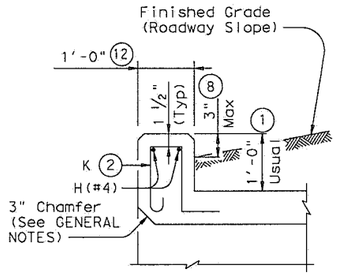


WINGWALL CONNECTION

(Also applies to Safety End Treatment)

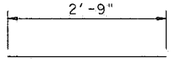


SECTION THRU TOP SLABS LESS THAN 7"

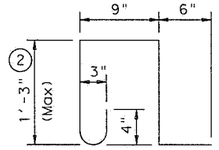


SECTION THRU CURB

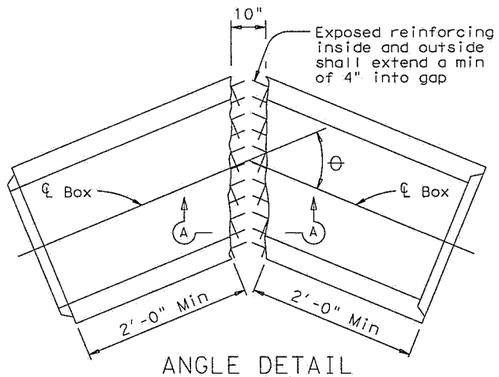
(10) QUANTITIES PER FOOT OF CURB	
Reinforcing Steel	4.18 Lb
Concrete	0.037 CY



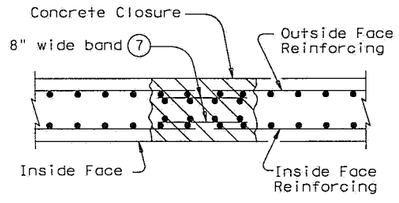
BARS C ~ #4
(Spa = 1'-0" Max)



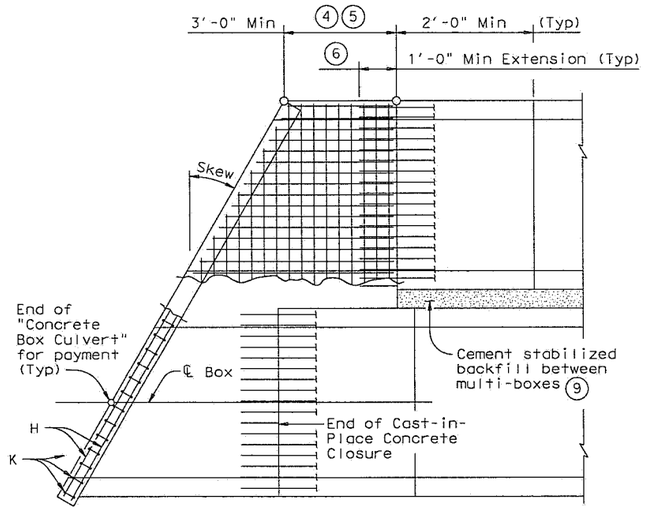
BARS K ~ #4
(Spa = 1'-0" Max)
(Length = 4'-3")



ANGLE DETAIL



SECTION A-A



PLAN OF SKEWED ENDS

(Showing multi-box placement)

(1) 0" min to 5'-0" max. Estimated curb heights are shown elsewhere in the plans. For structures with pedestrian rail, bicycle rail or curbs taller than 1'-0", refer to ECD standard. For structures with T6 traffic rail, refer to T6-CM standard. For structures with traffic rail, other than T6, refer to RAC standard.

(2) For curbs less than 1'-0" high, tilt Bars K or reduce bar height as necessary to maintain cover. For curbs less than 3" high, Bars K may be omitted.

(3) Curb, Wingwall or Safety End Treatment reinforcing shall extend into concrete closure. Any reinforcing that does not fit into the closure shall be bent or trimmed as necessary.

(4) Cast-in-place concrete closure shall be 3'-0" min. Boxes shall be cast short or broken back in the field. All reinforcing in the closure shall be the same size and spacing as in the precast box section. Except where shown otherwise, the cast-in-place closure shall be flush with the inside and outside faces of the precast box section.

(5) For multiple unit placements the length of the closure for the interior walls may be adjusted as necessary. The length of the top slab, bottom slab, and exterior wall closure shall not be less than 3'-0". See Section B-B detail when interior walls are cast full length.

(6) Precast box reinforcing shall extend a minimum of 1'-0" into concrete closure (Typ).

(7) Bands of reinforcing matching the inside and outside face reinforcing shall be placed in the gaps of the top and bottom slabs. A band matching the outside face reinforcing of the wall shall be placed in the gaps of the walls (placed in the outside face only). The bands shall be tack welded to the exposed reinforcing at each point of contact.

(8) For vehicle safety, the following requirements must be met:
- For structures without bridge rail, curbs shall project no more than 3" above finished grade.
- For structures with bridge rail, curbs shall be flush with finished grade.

Curb heights shall be reduced, if necessary, to meet the above requirements. No changes will be made in quantities and no additional compensation will be allowed for this work.

(9) Cement Stabilized Backfill between boxes is considered part of the Box Culvert for payment.

(10) All curb concrete and reinforcing is considered part of the Box Culvert for payment.

(11) Any additional concrete and reinforcing required for the closures shall be considered as subsidiary to the Concrete Box Culvert.

(12) 1'-0" typical. 2'-0" when RAC standard is referred to elsewhere in the plans.

(13) For multiple unit placement with overlay, with 1 to 2 course surface treatment, or with the top slab as the final riding surface, provide wall closure as shown in DETAIL "A".

(14) This dimension may be increased with approval of the Engineer to allow the precast boxes to be tunneled or jacked in accordance with Item 476, "Jacking, Boring, or Tunneling Pipe or Box". No payment will be made for any additional material in the gap between adjacent boxes.

GENERAL NOTES:

Designed according to AASHTO LRFD Specifications.

All closure concrete shall be Class "C" with a minimum compressive strength of 3600 psi and shall be placed according to the Item, "Concrete Substructures".

Any additional concrete required for the closures shall be considered as subsidiary to the Concrete Box Culvert.

Refer to the Single Box Culverts Precast standard for details not shown.

The bottom edge of the top slab closure shall be chamfered 3 inches at the entrance.

HL93 LOADING

Texas Department of Transportation

Bridge Division Standard

BOX CULVERTS PRECAST MISCELLANEOUS DETAILS

SCP-MD

FILE: scpmdsts.dgn	DN: GAF	CK: LMW	DW: BWH/TxDOT	CK: GAF
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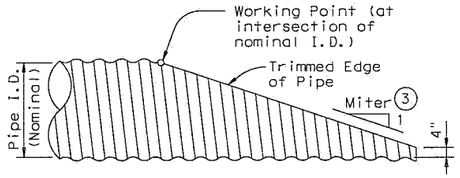
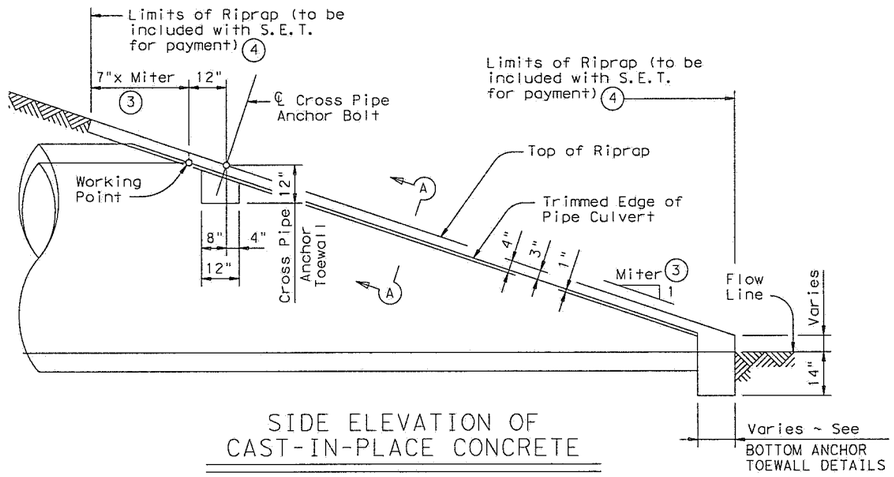


NOTE: All Pipe Runners, calculations, and dimensions are based on the pipe culverts mitered as shown in this detail. Alternate styles of mitered ends will require that appropriate adjustments be made to the values presented on this standard.

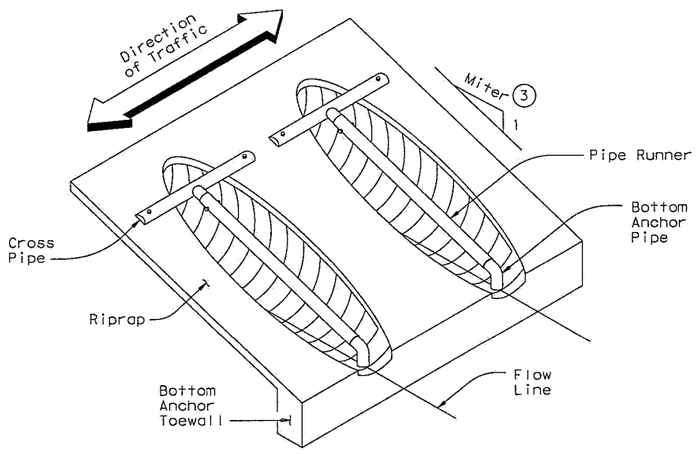
SIDE ELEVATION OF TYPICAL PIPE CULVERT MITER

(Showing Corrugated Metal Pipe Culvert. Details of Concrete Pipe Culvert are similar.)



SIDE ELEVATION OF CAST-IN-PLACE CONCRETE

(Showing Concrete Pipe Culvert. Details of Corrugated Metal Pipe Culvert are similar. Pipe Runners not shown for clarity)



ISOMETRIC VIEW OF TYPICAL INSTALLATION

(Showing installation with no skew.)

CROSS PIPE LENGTHS & PIPE RUNNER LENGTHS (1)(2)

Nominal Culvert I.D.	Pipe Culvert Spa ~ G	Cross Pipe Length	Pipe Runner Length											
			3:1 Side Slope				4:1 Side Slope				6:1 Side Slope			
			0° Skew	15° Skew	30° Skew	45° Skew	0° Skew	15° Skew	30° Skew	45° Skew	0° Skew	15° Skew	30° Skew	45° Skew
24"	1'- 7"	3'- 5"	N/A	N/A	N/A	5'-10"	N/A	N/A	N/A	8'- 1"	N/A	N/A	N/A	12'- 9"
27"	1'- 8"	3'- 8"	N/A	N/A	5'- 5"	6'-11"	N/A	N/A	7'- 7"	9'- 7"	N/A	N/A	11'-11"	14'-11"
30"	1'-10"	3'-11"	N/A	N/A	6'- 4"	8'- 0"	N/A	N/A	8'- 9"	11'- 0"	N/A	N/A	13'- 8"	17'- 0"
33"	1'-11"	4'- 2"	6'- 2"	6'- 5"	7'- 3"	9'- 1"	8'- 6"	8'-10"	10'- 0"	12'- 5"	13'- 3"	13'- 9"	15'- 5"	19'- 2"
36"	2'- 1"	4'- 5"	6'-11"	7'- 3"	8'- 2"	10'- 2"	9'- 6"	9'-11"	11'- 2"	13'-10"	14'- 9"	15'- 3"	17'- 2"	21'- 3"
42"	2'- 4"	4'-11"	8'- 6"	8'-10"	9'-11"	12'- 4"	11'- 7"	12'- 0"	13'- 6"	16'- 8"	17'- 9"	18'- 5"	20'- 8"	25'- 7"
48"	2'- 7"	5'- 5"	10'- 1"	10'- 5"	11'- 9"	N/A	13'- 7"	14'- 2"	15'-10"	N/A	20'- 9"	21'- 6"	24'- 2"	N/A
54"	3'- 0"	5'-11"	11'- 8"	12'- 1"	N/A	N/A	15'- 8"	16'- 3"	N/A	N/A	23'-10"	24'- 8"	N/A	N/A
60"	3'- 3"	6'- 5"	13'- 3"	N/A	N/A	N/A	17'- 9"	N/A	N/A	N/A	26'-10"	N/A	N/A	N/A

TYPICAL PIPE CULVERT MITERS (3)

Side Slope	0° Skew	15° Skew	30° Skew	45° Skew
3:1	3:1	3.106:1	3.464:1	4.243:1
4:1	4:1	4.141:1	4.619:1	5.657:1
6:1	6:1	6.212:1	6.928:1	8.485:1

CONDITIONS WHERE PIPE RUNNERS ARE NOT REQUIRED (2)

Nominal Culvert I.D.	Single Pipe Culvert	Multiple Pipe Culverts
12" thru 21"	Skews thru 45°	Skews thru 45°
24"	Skews thru 45°	Skews thru 30°
27"	Skews thru 30°	Skews thru 15°
30"	Skews thru 15°	Skews thru 15°
33"	Skews thru 15°	Always required
36"	Normal (No Skew)	Always required
42" to 60"	Always required	Always required

STANDARD PIPE SIZES & MAX PIPE RUNNER LENGTHS (1)

Pipe Size	Pipe O.D.	Pipe I.D.	Max Pipe Runner Length
2" STD	2.375"	2.067"	N/A
3" STD	3.500"	3.068"	10'- 0"
4" STD	4.500"	4.026"	19'- 8"
5" STD	5.563"	5.047"	34'- 2"

ESTIMATED CONCRETE RIPRAP QUANTITIES (CY) (5)

Nominal Culvert I.D.	3:1 Side Slope				4:1 Side Slope				6:1 Side Slope			
	0° Skew	15° Skew	30° Skew	45° Skew	0° Skew	15° Skew	30° Skew	45° Skew	0° Skew	15° Skew	30° Skew	45° Skew
12"	0.4	0.4	0.5	0.5	0.5	0.5	0.5	0.6	0.7	0.7	0.7	0.8
15"	0.5	0.5	0.5	0.6	0.6	0.6	0.6	0.7	0.7	0.7	0.8	0.9
18"	0.5	0.5	0.6	0.6	0.6	0.7	0.7	0.8	0.8	0.8	0.9	1.0
21"	0.6	0.6	0.6	0.7	0.7	0.7	0.8	0.9	0.9	0.9	1.0	1.2
24"	0.6	0.7	0.7	0.8	0.8	0.8	0.8	1.0	1.0	1.0	1.1	1.3
27"	0.7	0.7	0.8	0.9	0.8	0.9	0.9	1.1	1.1	1.1	1.2	1.4
30"	0.8	0.8	0.8	0.9	0.9	0.9	1.0	1.2	1.2	1.2	1.3	1.6
33"	0.8	0.8	0.9	1.0	1.0	1.0	1.1	1.3	1.3	1.4	1.5	1.7
36"	0.9	0.9	0.9	1.1	1.1	1.1	1.2	1.4	1.4	1.5	1.6	1.8
42"	1.0	1.0	1.1	1.3	1.2	1.3	1.3	1.6	1.6	1.7	1.8	2.1
48"	1.1	1.1	1.2	N/A	1.4	1.4	1.5	N/A	1.9	1.9	2.1	N/A
54"	1.3	1.3	N/A	N/A	1.6	1.6	N/A	N/A	2.1	2.1	N/A	N/A
60"	1.4	N/A	N/A	N/A	1.7	N/A	N/A	N/A	2.3	N/A	N/A	N/A

(1) Size of Pipe Runner shall be as shown in the tables. Cross Pipe shall be the same size as the Pipe Runner. Cross Pipe Stub Out and Bottom Anchor Pipe shall be the next smaller size pipe as shown in the STANDARD PIPE SIZES table.

(2) This standard allows for the placement of only one pipe runner across each culvert pipe opening. In order to limit the clear opening to be traversed by an errant vehicle, the following conditions must be met:

For 60" culvert pipes, the skew must not exceed 0°.
For 54" culvert pipes, the skew must not exceed 15°.
For 48" culvert pipes, the skew must not exceed 30°.
For all culvert pipe sizes 42" and less, the skew must not exceed 45°.

If the above conditions cannot be met, the designer should consider using a safety end treatment with flared wings. For further information, refer to the TxDOT "Roadway Design Manual".

(3) Miter = Slope of Mitered Pipe Culvert End

(4) Riprap placed beyond the limits shown will be paid as Concrete Riprap in accordance with Item 432, "Riprap".

(5) Quantities shown are for one end of one reinforced Concrete Pipe Culvert. For multiple Pipe Culverts or for Corrugated Metal Pipe Culverts, quantities will need to be adjusted. Riprap quantities are for Contractor's information only.

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SHEET 1 OF 2

Texas Department of Transportation | Bridge Division Standard

SAFETY END TREATMENT

FOR 12" DIA TO 60" DIA PIPE CULVERTS
TYPE II ~ CROSS DRAINAGE

SETP-CD

FILE: setpcdse.dgn	DN: GAF	CK: CAT	DW: JRP	CK: GAF
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REVISIONS				
11-10: Add note for synthetic fibers.	DIST	COUNTY		SHEET NO.

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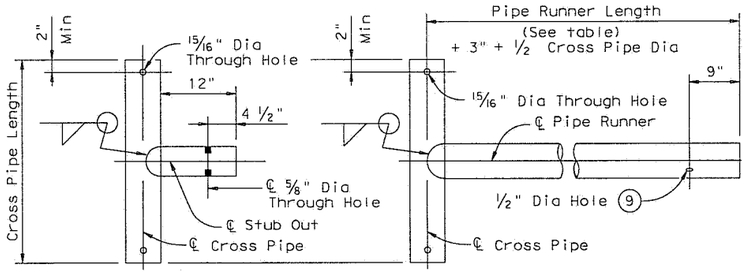
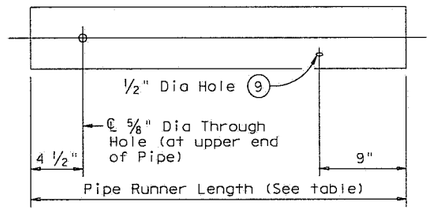


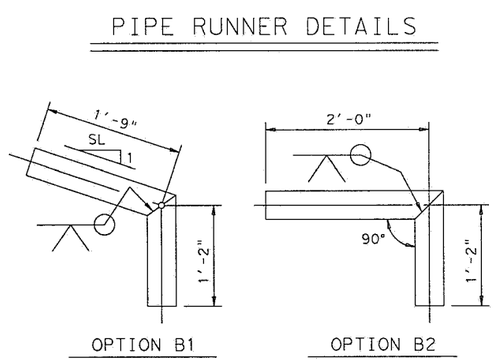
OPTION A1 OPTION A2

CROSS PIPE AND CONNECTIONS DETAILS



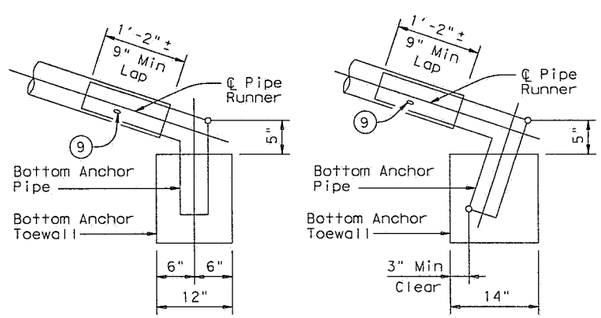
NOTE: The separate Pipe Runner shown is required when Cross Pipe Connection Option A1 is used.

PIPE RUNNER DETAILS



OPTION B1 OPTION B2

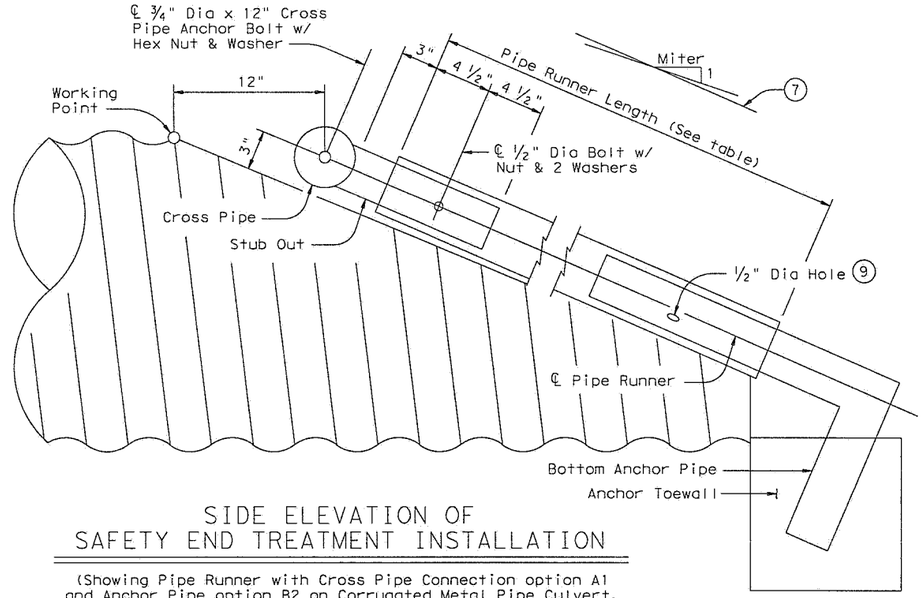
BOTTOM ANCHOR PIPE DETAILS (10)



OPTION B1 OPTION B2

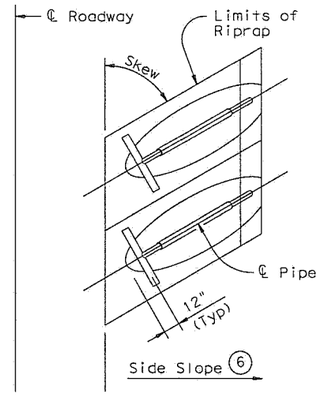
BOTTOM ANCHOR TOEWALL DETAILS

(Culvert & Riprap not shown for clarity)

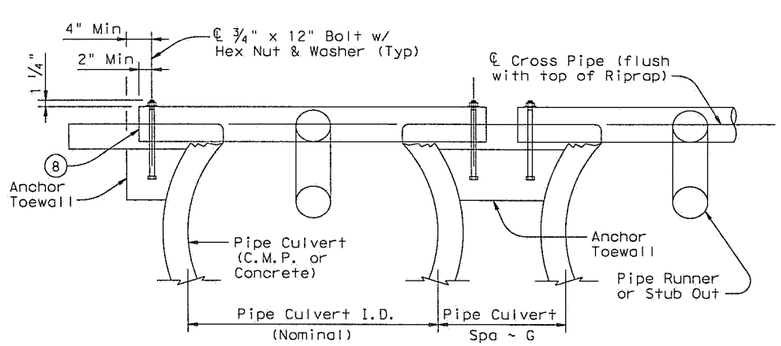


SIDE ELEVATION OF SAFETY END TREATMENT INSTALLATION

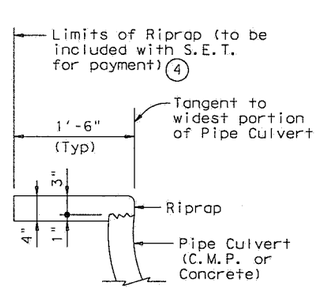
(Showing Pipe Runner with Cross Pipe Connection option A1 and Anchor Pipe option B2 on Corrugated Metal Pipe Culvert. Concrete Pipe Culvert details are similar. Riprap not shown for clarity)



PLAN OF SKEWED INSTALLATION



SHOWING CROSS PIPE & ANCHOR TOEWALL



SHOWING TYPICAL PIPE CULVERT & RIPRAP

SECTION A-A

(4) Riprap placed beyond the limits shown will be paid as Concrete Riprap in accordance with Item 432, "Riprap".

(6) Recommended values of side slope are 3:1, 4:1, & 6:1. All quantities, calculations, and dimensions shown herein are based on these recommended values. Slope of 3:1 or flatter is required for vehicle safety.

(7) Note that actual slope of Pipe Runner may vary slightly from Side Slope of Riprap and trimmed Culvert Pipe edge.

(8) Care shall be taken to ensure that Riprap concrete does not flow into the Cross Pipe so as to permit disassembly of the bolted connection to allow cleanout access.

(9) After installation, the 1/2" hole shall be inspected to ensure that the lap of the Pipe Runner with the Bottom Anchor Pipe is adequate.

(10) At fabricator's option, a heat bend to a smooth 5" radius or a manufactured elbow (of the same material as the Runner) may be substituted for the mitered and welded joint in the Bottom Anchor Pipe.

GENERAL NOTES:

Pipe Runners are designed for a traversing load of 1,800 pounds at yield as recommended by Research Report 280-1, "Safety Treatment of Roadside Cross-Drainage Structures", Texas Transportation Institute, March 1981.

The Safety End Treatments shown herein are intended for use in those installations where out of control vehicles are likely to traverse the openings approximately perpendicular to the Pipe Runners.

Riprap and all necessary inverts shall be Concrete Riprap conforming to the requirements of Item 432, "Riprap".

Synthetic fibers listed on the "Fibers for Concrete" Material Producer List (MPL) may be used in lieu of steel reinforcing in riprap concrete unless noted otherwise.

Payment for riprap and toewall is included in the Price Bid for each Safety End Treatment.

Pipe Runners, Cross Pipes, and Anchor Pipes shall conform to the requirements of ASTM A53 (Type E or S, Grade B), ASTM A500 (Grade B), or API 5LX52.

Bolts and nuts shall conform to ASTM A307.

All steel components, except concrete reinforcing, shall be galvanized after fabrication. Galvanizing damaged during transport or construction shall be repaired in accordance with the specifications.

Texas Department of Transportation

Bridge Division Standard

SAFETY END TREATMENT

FOR 12" DIA TO 60" DIA PIPE CULVERTS TYPE II ~ CROSS DRAINAGE

SETP-CD

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REVISIONS				
11-10: Add note for synthetic fibers.	DIST	COUNTY		SHEET NO.
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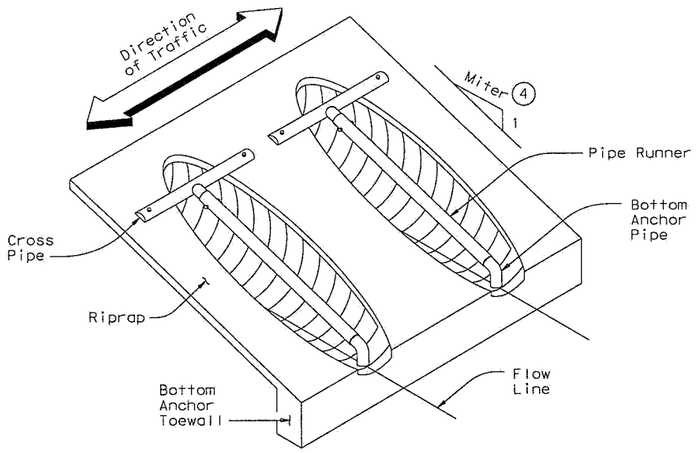
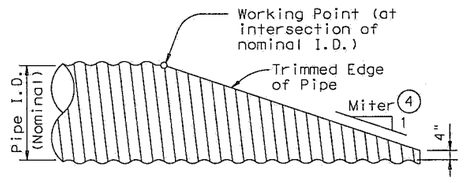


ISOMETRIC VIEW OF TYPICAL INSTALLATION

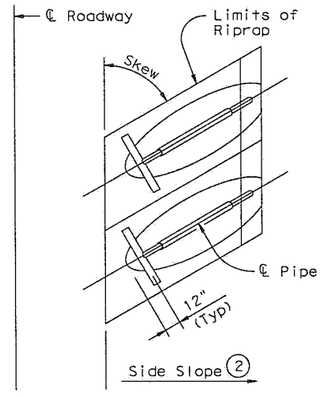
(Showing installation with no skew.)



NOTE: All Pipe Runners, calculations, and dimensions are based on the pipe culverts mitered as shown in this detail. Alternate styles of mitered ends will require that appropriate adjustments be made to the values presented on this standard.

SIDE ELEVATION OF TYPICAL PIPE CULVERT MITER

(Showing Corrugated Metal Pipe Culvert. Details of Concrete Pipe Culvert are similar.)



PLAN OF SKEWED INSTALLATION

CROSS PIPE LENGTHS, PIPE RUNNER LENGTHS, & REQUIRED PIPE SIZES (1) (3)

CORRUGATED METAL PIPE CULVERTS

Design	Pipe Culvert Span	Pipe Culvert Rise	Pipe Culvert Spa ~ G	Cross Pipe Length	Pipe Runner Length											
					3:1 Side Slope				4:1 Side Slope				6:1 Side Slope			
					0° Skew	15° Skew	30° Skew	45° Skew	0° Skew	15° Skew	30° Skew	45° Skew	0° Skew	15° Skew	30° Skew	45° Skew
1	17"	13"	1'- 0"	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2	21"	15"	1'- 2"	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
3	28"	20"	1'- 5"	3'- 9"	N/A	N/A	3'- 5"	4'- 7"	N/A	N/A	4'-11"	6'- 5"	N/A	N/A	7'-11"	10'- 2"
4	35"	24"	1'- 8"	4'- 4"	3'-10"	4'- 0"	4'- 7"	6'- 0"	5'- 5"	5'- 8"	6'- 6"	8'- 4"	8'- 8"	9'- 1"	10'- 3"	12'-11"
5	42"	29"	1'-11"	4'-11"	5'- 1"	5'- 4"	6'- 1"	7'-10"	7'- 2"	7'- 5"	8'- 6"	10'- 9"	11'- 2"	11'- 8"	13'- 2"	16'- 6"
6	49"	33"	2'- 2"	5'- 6"	6'- 2"	6'- 5"	7'- 4"	N/A	8'- 6"	8'-10"	10'- 0"	N/A	13'- 3"	13'- 9"	15'- 6"	N/A
7	57"	38"	2'- 5"	6'- 2"	7'- 6"	7'- 9"	N/A	N/A	10'- 2"	10'- 7"	N/A	N/A	15'- 9"	16'- 4"	N/A	N/A

CONCRETE PIPE CULVERTS

Design	Pipe Culvert Span	Pipe Culvert Rise	Pipe Culvert Spa ~ G	Cross Pipe Length	Pipe Runner Length											
					3:1 Side Slope				4:1 Side Slope				6:1 Side Slope			
					0° Skew	15° Skew	30° Skew	45° Skew	0° Skew	15° Skew	30° Skew	45° Skew	0° Skew	15° Skew	30° Skew	45° Skew
1	22"	13 ½"	1'- 0"	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2	26"	15 ½"	1'- 2"	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
3	28 ½"	18"	1'- 5"	3'-9 ½"	N/A	N/A	2'-10"	3'-10"	N/A	N/A	4'- 2"	5'- 5"	N/A	N/A	6'- 9"	8'- 9"
4	36 ¼"	22 ½"	1'- 8"	4'-5 ¼"	3'- 5"	3'- 7"	4'- 2"	5'- 6"	4'-11"	5'- 1"	5'-11"	7'- 7"	7'-11"	8'- 3"	9'- 5"	11'-11"
5	43 ¾"	26 ⅝"	1'-11"	5'-0 ¾"	4'- 6"	4'- 8"	5'- 5"	6'-11"	6'- 4"	6'- 7"	7'- 6"	9'- 7"	10'- 0"	10'- 5"	11'- 9"	14'-10"
6	51 ⅛"	31 5/16"	2'- 2"	5'- 8"	5'- 9"	6'- 0"	6'-10"	N/A	7'-11"	8'- 3"	9'- 4"	N/A	12'- 4"	12'-10"	14'- 6"	N/A
7	58 ½"	36"	2'- 5"	6'-3 ½"	6'-11"	7'- 3"	N/A	N/A	9'- 6"	9'-11"	N/A	N/A	14'- 9"	15'- 4"	N/A	N/A

TYPICAL PIPE CULVERT MITERS (4)

Side Slope	0° Skew	15° Skew	30° Skew	45° Skew
3:1	3:1	3.106:1	3.464:1	4.243:1
4:1	4:1	4.141:1	4.619:1	5.657:1
6:1	6:1	6.212:1	6.928:1	8.485:1

STANDARD PIPE SIZES & MAX PIPE RUNNER LENGTHS (1)

Pipe Size	Pipe O.D.	Pipe I.D.	Max Pipe Runner Length
2" STD	2.375"	2.067"	N/A
3" STD	3.500"	3.068"	10'- 0"
4" STD	4.500"	4.026"	19'- 8"
5" STD	5.563"	5.047"	34'- 2"

CONDITIONS WHERE PIPE RUNNERS ARE NOT REQUIRED (3)

Design	Single Pipe Culvert	Multiple Pipe Culverts
1 & 2	Skews thru 45°	Skews thru 45°
3	Skews thru 30°	Skews thru 15°
4	Normal (No Skew)	Always required
5 thru 7	Always required	Always required

(1) Size of Pipe Runner shall be as shown in the tables. Cross Pipe shall be the same size as the Pipe Runner. Cross Pipe Stub Out and Bottom Anchor Pipe shall be the next smaller size pipe as shown in the STANDARD PIPE SIZES table.

(2) Recommended values of slope are 3:1, 4:1, & 6:1. All quantities, calculations, and dimensions shown herein are based on these recommended values. Slope of 3:1 or flatter is required for vehicle safety.

(3) This standard allows for the placement of only one pipe runner across each culvert pipe opening. In order to limit the clear opening to be traversed by an errant vehicle, the following conditions must be met:

For Design 1 through 5 culvert pipe sizes, the skew must not exceed 45°.
For Design 6 culvert pipes, the skew must not exceed 30°.
For Design 7 culvert pipes, the skew must not exceed 15°.

If the above conditions cannot be met, the designer should consider using a safety end treatment with flared wings. For further information, refer to the TxDOT "Roadway Design Manual".

(4) Miter = Slope of Mitered Pipe Culvert End

GENERAL NOTES:

Pipe Runners are designed for a traversing load of 1,800 pounds at yield as recommended by Research Report 280-1, "Safety Treatment of Roadside Cross-Drainage Structures", Texas Transportation Institute, March 1981.

The Safety End Treatments shown herein are intended for use in those installations where out of control vehicles are likely to traverse the openings approximately perpendicular to the Pipe Runners.

Riprap and all necessary inverts shall be Concrete Riprap conforming to the requirements of Item 432, "Riprap".

Synthetic fibers listed on the "Fibers for Concrete" Material Producer List (MPL) may be used in lieu of steel reinforcing in riprap concrete unless noted otherwise.

Payment for riprap and toewall is included in the Price Bid for each Safety End Treatment.

Pipe Runners, Cross Pipes, and Anchor Pipes shall conform to the requirements of ASTM A53 (Type E or S, Grade B), ASTM A500 (Grade B), or API 5LX52.

Bolts and nuts shall conform to ASTM A307.

All steel components, except concrete reinforcing, shall be galvanized after fabrication. Galvanizing damaged during transport or construction shall be repaired in accordance with the specifications.

Texas Department of Transportation — Bridge Division Standard

SAFETY END TREATMENT

FOR DESIGN 1 TO 7 ARCH PIPE CULVERTS TYPE II ~ CROSS DRAINAGE

SETP-CD-A

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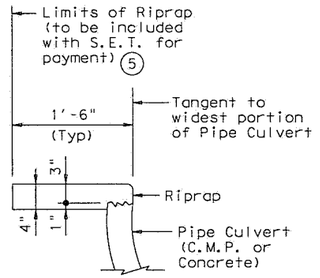


SHOWING TYPICAL PIPE CULVERT & RIPRAP

SECTION A-A

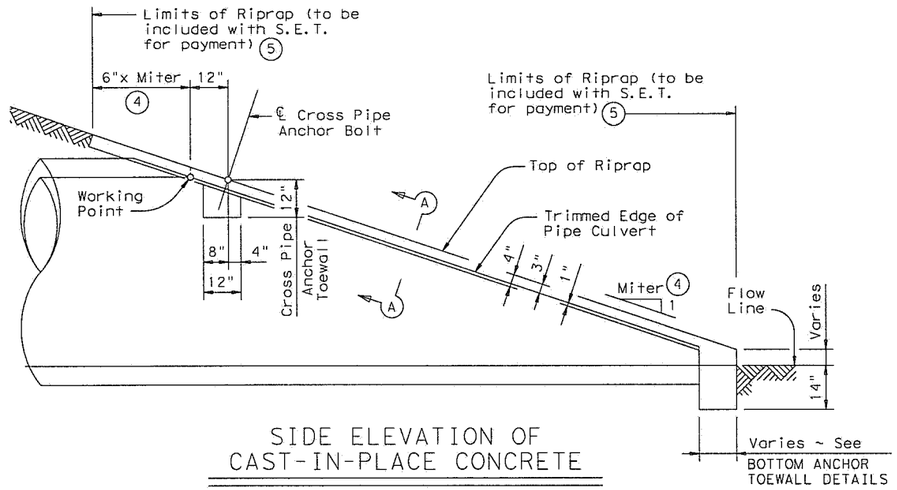
ESTIMATED CONCRETE RIPRAP QUANTITIES (CY) (6)
BOTH CORRUGATED METAL PIPE CULVERTS AND CONCRETE PIPE CULVERTS

Design	3:1 Side Slope				4:1 Side Slope				6:1 Side Slope			
	0° Skew	15° Skew	30° Skew	45° Skew	0° Skew	15° Skew	30° Skew	45° Skew	0° Skew	15° Skew	30° Skew	45° Skew
1	0.5	0.5	0.5	0.6	0.6	0.6	0.6	0.7	0.7	0.7	0.8	0.9
2	0.5	0.5	0.6	0.6	0.6	0.6	0.6	0.7	0.7	0.8	0.8	1.0
3	0.6	0.6	0.7	0.8	0.7	0.7	0.8	0.9	0.9	1.0	1.0	1.2
4	0.7	0.7	0.8	0.9	0.8	0.9	0.9	1.0	1.1	1.1	1.2	1.4
5	0.8	0.8	0.9	1.0	1.0	1.0	1.1	1.2	1.3	1.3	1.4	1.7
6	0.9	1.0	1.0	N/A	1.1	1.1	1.2	N/A	1.4	1.5	1.6	N/A
7	1.0	1.1	N/A	N/A	1.3	1.3	N/A	N/A	1.7	1.7	N/A	N/A

(4) Miter = Slope of Mitered Pipe Culvert End

(5) Riprap placed beyond the limits shown will be paid as Concrete Riprap in accordance with Item 432, "Riprap".

(6) Quantities shown are for one end of one Pipe Culvert. For multiple Pipe Culverts, quantities will need to be adjusted. Riprap quantities are for Contractor's information only.



SIDE ELEVATION OF CAST-IN-PLACE CONCRETE

(Showing Concrete Pipe Culvert.
Details of Corrugated Metal Pipe Culvert are similar.
Pipe Runners not shown for clarity)

Texas Department of Transportation

Bridge Division Standard

SAFETY END TREATMENT

FOR DESIGN 1 TO 7
ARCH PIPE CULVERTS
TYPE II ~ CROSS DRAINAGE

SETP-CD-A

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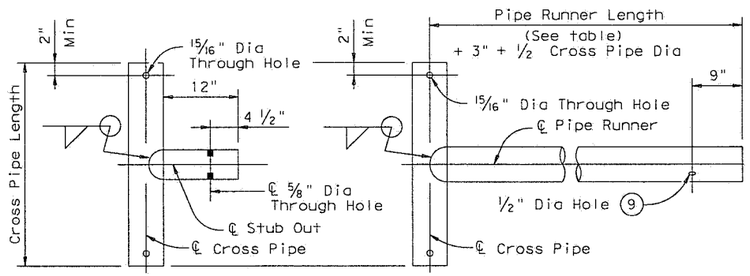
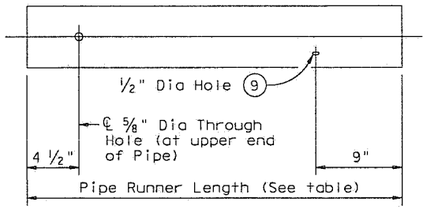


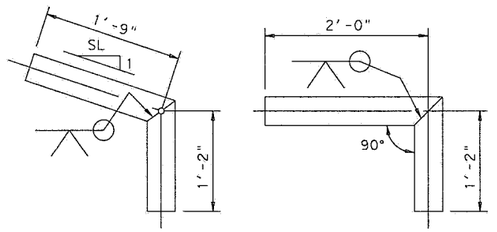
OPTION A1 OPTION A2

CROSS PIPE AND CONNECTIONS DETAILS



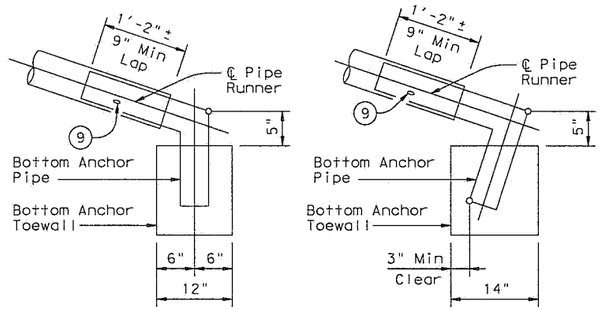
NOTE: The separate Pipe Runner shown is required when Cross Pipe Connection Option A1 is used.

PIPE RUNNER DETAILS



OPTION B1 OPTION B2

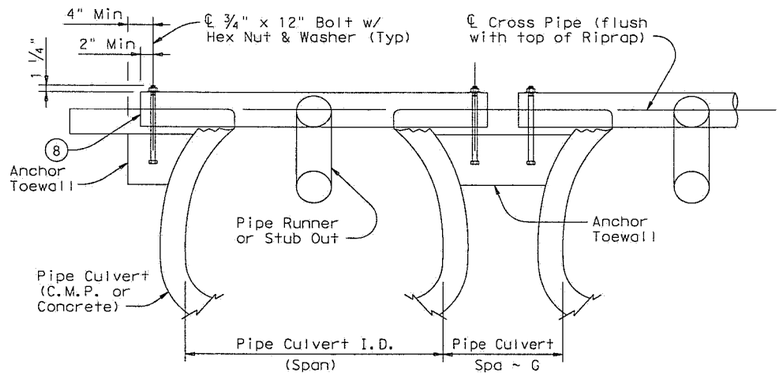
BOTTOM ANCHOR PIPE DETAILS (10)



OPTION B1 OPTION B2

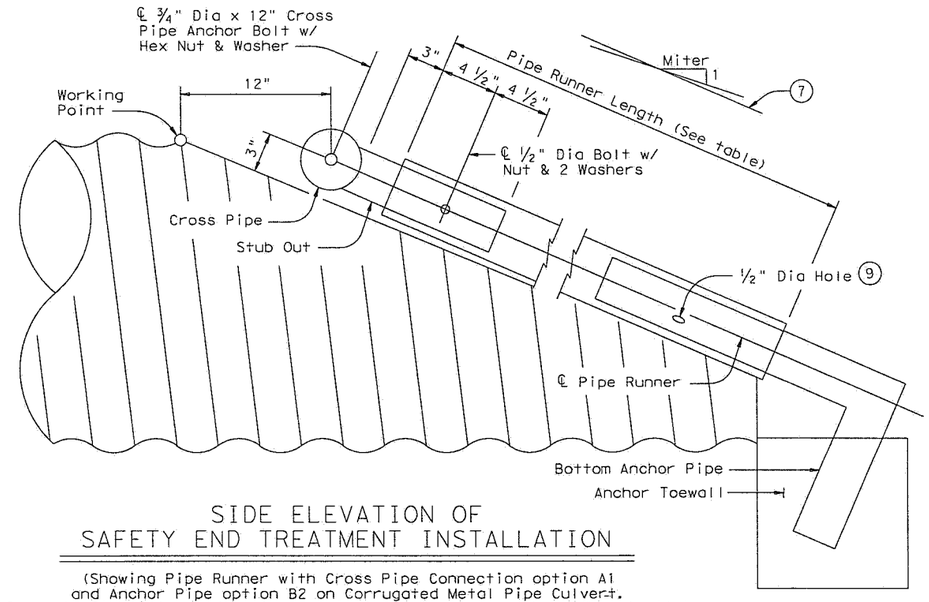
BOTTOM ANCHOR TOEWALL DETAILS

(Culvert & Riprap not shown for clarity)



SHOWING CROSS PIPE & ANCHOR TOEWALL

SECTION A-A



SIDE ELEVATION OF SAFETY END TREATMENT INSTALLATION

(Showing Pipe Runner with Cross Pipe Connection option A1 and Anchor Pipe option B2 on Corrugated Metal Pipe Culvert. Concrete Pipe Culvert details are similar. Riprap not shown for clarity)

(7) Note that actual slope of Pipe Runner may vary slightly from Side Slope of Riprap and trimmed Culvert Pipe edge.

(8) Care shall be taken to ensure that Riprap concrete does not flow into the Cross Pipe so as to permit disassembly of the bolted connection to allow cleanout access.

(9) After installation, the 1/2" hole shall be inspected to ensure that the lap of the Pipe Runner with the Bottom Anchor Pipe is adequate.

(10) At fabricator's option, a heat bend to a smooth 5" radius or a manufactured elbow (of the same material as the Runner) may be substituted for the mitered and welded joint in the Bottom Anchor Pipe.

Texas Department of Transportation — Bridge Division Standard

SAFETY END TREATMENT

FOR DESIGN 1 TO 7
ARCH PIPE CULVERTS
TYPE II ~ CROSS DRAINAGE

SETP-CD-A

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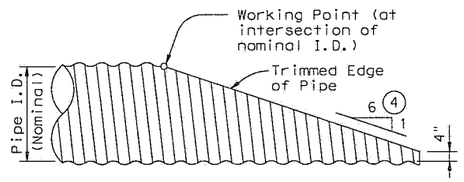
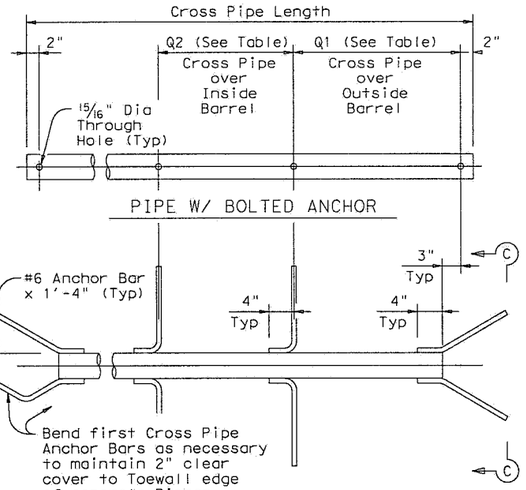
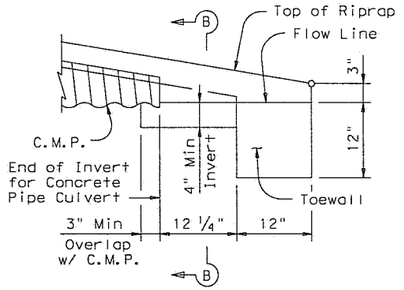


NOTE: All Cross Pipes, calculations, and dimensions are based on the pipe culverts mitered as shown in this detail. Alternate styles of mitered ends will require that appropriate adjustments be made to the values presented on this standard.

SIDE ELEVATION OF TYPICAL PIPE CULVERT MITER

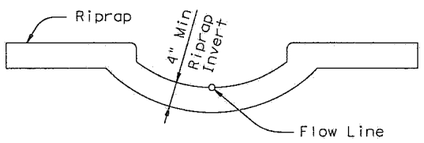
(Showing Corrugated Metal Pipe Culvert.)
(Details at Concrete Pipe Culvert are similar.)





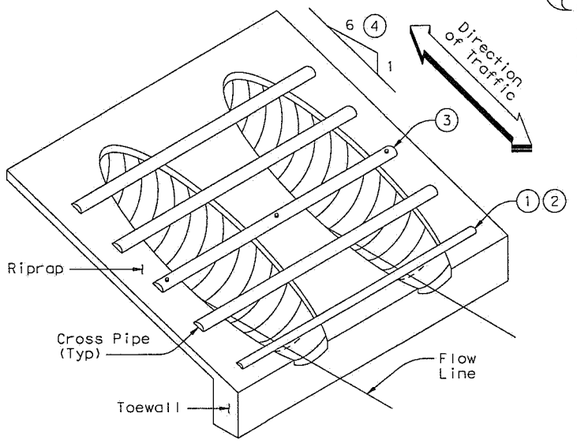
DETAIL "A"

(Showing Invert with Corrugated Metal Pipe Culvert. Concrete Pipe Culvert details are similar. Cross Pipes not shown for clarity.)

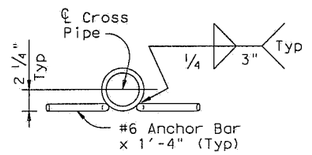


SECTION B-B

(Cross Pipes not shown for clarity.)



ISOMETRIC VIEW OF TYPICAL INSTALLATION



SECTION C-C

CROSS PIPE DETAILS

CROSS PIPE LENGTHS, REQUIRED PIPE SIZES, & RIPRAP QUANTITIES (2)							
Nominal Culvert I.D.	Conc Riprap (CY) (6)	Pipe Culvert Spa ~ G	Single Barrel ~ Q1	Multi-Barrel ~ Q1	Q2	Conditions for use of Cross Pipes	Cross Pipe Size
12"	0.6	9"	N/A	2'- 1"	1'- 9"	3 or more Pipe Culverts	3" Std (3.500" O.D.)
15"	0.7	11"	N/A	2'- 5"	2'- 2"		
18"	0.8	1'- 2"	N/A	2'-10"	2'- 8"		
21"	0.9	1'- 4"	N/A	3'- 2"	3'- 1"		
24"	0.9	1'- 7"	N/A	3'- 6"	3'- 7"		
27"	1.0	1'- 8"	N/A	3'-10"	3'-11"	3 or more Pipe Culverts	3 1/2" Std (4.000" O.D.)
30"	1.1	1'-10"	N/A	4'- 2"	4'- 4"	2 or more Pipe Culverts	
33"	1.2	1'-11"	4'- 2"	4'- 5"	4'- 8"	All Pipe Culverts	
36"	1.3	2'- 1"	4'- 5"	4'- 9"	5'- 1"	All Pipe Culverts	4" Std (4.500" O.D.)
42"	1.5	2'- 4"	4'-11"	5'- 5"	5'-10"		
48"	1.7	2'- 7"	5'- 5"	6'- 0"	6'- 7"	All Pipe Culverts	5" Std (5.563" O.D.)
54"	2.0	3'- 0"	5'-11"	6'- 9"	7'- 6"		
60"	2.2	3'- 3"	6'- 5"	7'- 4"	8'- 3"		
66"	2.4	3'- 3"	6'-11"	7'-10"	8'- 9"		
72"	2.7	3'- 4"	7'- 5"	8'- 5"	9'- 4"		

(1) The proper installation of the first Cross Pipe is critical for vehicle safety. The top of the first Cross Pipe must be placed at no more than 6" above the flow line.

(2) Size of Cross Pipes, except the first bottom pipe, shall be as shown in the PIPE SIZE table. The first bottom pipe shall be 3 1/2" Standard Pipe (4" O.D.).

(3) The third Cross Pipe from the bottom of the Culvert shall always be installed using a bolted connection. Care shall be taken to ensure that Riprap concrete does not flow into the Cross Pipe so as to permit disassembly of the bolted connection to allow cleanout access. At the Contractor's option, all other Cross Pipes may also be installed using the bolted connection details.

(4) Match Cross Slope as shown elsewhere in the plans. Cross Slope of 6:1 or flatter is required for vehicle safety.

(5) Riprap placed beyond the limits shown will be paid as Concrete Riprap in accordance with Item 432, "Riprap".

(6) Quantities shown are for one end of one reinforced Concrete Pipe Culvert. For multiple pipe culverts or for Corrugated Metal Pipe Culverts, quantities will need to be adjusted. Riprap quantities are for Contractor's information only.

GENERAL NOTES:

Cross Pipes are designed for a traversing load of 10,000 pounds at yield as recommended by Research Report 280-2F, "Safety Treatment of Roadside Parallel-Drainage Structures", Texas Transportation Institute, March 1981.

Safety End Treatments shown herein are intended for use in those installations where out of control vehicles are likely to traverse the openings approximately perpendicular to the Cross Pipes.

Riprap and all necessary inverts shall be Concrete Riprap conforming to the requirements of Item 432, "Riprap".

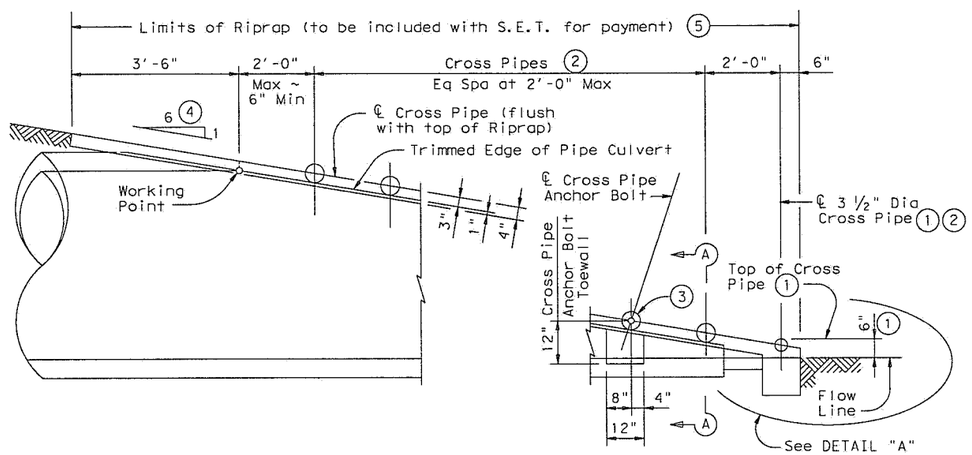
Synthetic fibers listed on the "Fibers for Concrete" Material Producer List (MPL) may be used in lieu of steel reinforcing in riprap concrete unless noted otherwise.

Payment for riprap and toewall is included in the Price Bid for each Safety End Treatment.

Cross Pipes shall conform to the requirements of ASTM A53 (Type E or S, Grade B), ASTM A500 (Grade B), or API 5LX52.

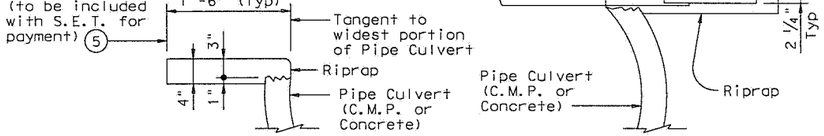
Bolts and nuts shall conform to ASTM A307.

All steel components, except concrete reinforcing, shall be galvanized after fabrication. Galvanizing damaged during transport or construction shall be repaired in accordance with the specifications.



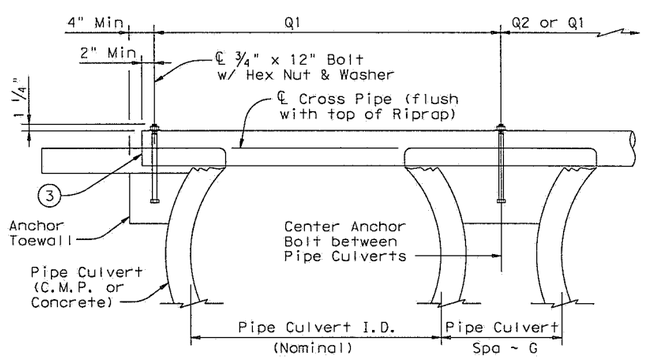
SIDE ELEVATION OF CAST-IN-PLACE CONCRETE

(Showing Concrete Pipe Culvert.)
(Details at Corrugated Metal Pipe Culvert are similar.)



SHOWING TYPICAL PIPE CULVERT & RIPRAP

SHOWING CROSS PIPE WITH ANCHOR BAR



SHOWING CROSS PIPE WITH BOLTED ANCHOR

SECTION A-A

Texas Department of Transportation

Bridge Division Standard

SAFETY END TREATMENT

FOR 12" DIA TO 72" DIA
PIPE CULVERTS
TYPE II ~ PARALLEL DRAINAGE

SETP-PD

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TABLE OF DIMENSIONS & REINFORCING STEEL
(Wings for One Structure End)

Maximum Wingwall Height (10) Hw	W	X	Y	Z	Variable Reinforcing Bars J1 Size	Bars J1 Spa	Bars J2 Size	Bars J2 Spa	Estimated (3) Quantities per ft of wing length (2~Wings) Reinf (Lb/Ft)	Conc (CY/Ft)
2'-6"	2'- 5"	1'- 0"	9"	7"	#4	1'-0"	#4	1'-0"	33.73	0.248
3'-0"	2'- 5"	1'- 0"	9"	7"	#4	1'-0"	#4	1'-0"	37.07	0.261
3'-6"	2'- 5"	1'- 0"	9"	7"	#4	1'-0"	#4	1'-0"	37.74	0.273
4'-0"	2'- 5"	1'- 0"	9"	7"	#4	1'-0"	#4	1'-0"	38.41	0.285
4'-6"	3'- 2"	1'- 6"	1'- 0"	7"	#4	1'-0"	#4	1'-0"	41.75	0.330
5'-0"	3'- 2"	1'- 6"	1'- 0"	7"	#4	1'-0"	#4	1'-0"	45.09	0.343
5'-6"	3'- 2"	1'- 6"	1'- 0"	7"	#4	1'-0"	#4	1'-0"	45.75	0.355
6'-0"	3'- 2"	1'- 6"	1'- 0"	7"	#4	1'-0"	#4	1'-0"	46.42	0.367
7'-0"	3'- 8"	1'- 9"	1'- 3"	7"	#4	1'-0"	#4	1'-0"	52.77	0.414
8'-0"	4'- 2"	2'- 0"	1'- 6"	8"	#5	1'-0"	#4	1'-0"	60.19	0.486
9'-0"	4'- 8"	2'- 3"	1'- 9"	8"	#4	6"	#4	6"	81.49	0.535
10'-0"	5'- 2"	2'- 6"	2'- 0"	8"	#5	6"	#4	6"	97.25	0.584
11'-0"	5'- 8"	2'- 9"	2'- 3"	8"	#6	6"	#5	6"	133.65	0.634
12'-0"	6'- 2"	3'- 0"	2'- 6"	9"	#7	6"	#5	6"	162.29	0.721

TABLE OF WINGWALL REINFORCING (2~Wings)

Bar	Size	No.	Spa
DL & DS	#5	~	1'-0"
E	#4	~	1'-0"
F	#4	~	1'-0"
G	#6	4	~
M	#4	4	~
P	#4	~	1'-0"
RL	#5	3	~
RS	#5	3	~
V	#4	~	1'-0"

TABLE OF ESTIMATED CULVERT TOEWALL QUANTITIES

Bar	Size	No.	Spa
L	#4	~	1'-6"
Q	#4	1	~
Reinf (Lb/Ft)			2.45
Conc (CY/Ft)			0.037

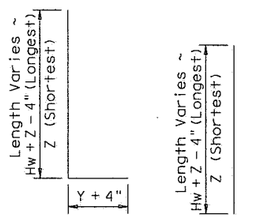
TABLE OF ESTIMATED ANCHOR TOEWALL QUANTITIES

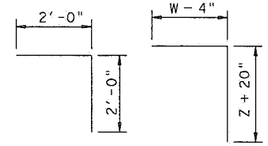
Bar	Size	No.	Spa
K	#4	~	1'-0"
N	#5	6	~
OL	#4	3	~
OS	#4	3	~
Reinf (Lb/Ft)			9.82
Conc (CY/Ft)			0.074

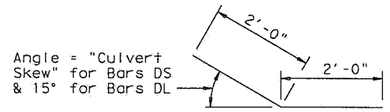
(1) Extend Bars P 3'-0" minimum into bottom slab of Box Culvert.
(2) Adjust to fit as necessary to maintain 1 1/4" clear cover and 4" minimum between bars.
(3) Quantities shown are based on an average wing height for two wings (one structure end). To determine total quantities for two wings multiply the tabulated values by 0.5(A+Lw).
(4) Recommended values of Slope are: 3:1, 4:1, & 6:1. Slope shall be 3:1 or flatter.
(5) When shown elsewhere on the plans, a 5" deep concrete riprap shall be constructed. Payment for riprap shall be as required by Item 432, "Riprap". Unless otherwise shown on the plans or directed by the Engineer, construction joints or grooved joints, oriented in the direction of flow, and shall extend across the full distance of the riprap, at intervals of approximately 20'. When such riprap is provided, the culvert toewall shown in SECTION B-B will not be required.
(6) At Contractor's option, Culvert Toewall may be ended flush with Wingwall Toewall. Adjust reinforcing from that shown as necessary.
(7) 3" min to 5'-0" max. Estimated curb heights are shown elsewhere in the plans. For structures without railing and curbs taller than 1'-0", refer to ECD standard.
(8) For vehicle safety, curbs shall project no more than 3" above finished grade. Curb heights shall be reduced, if necessary, to meet these requirements. No changes will be made in quantities and no additional compensation will be allowed for this work.
(9) Culvert Skew (limited to 15° or 30°)
(10) See "Table Of Maximum Wing Heights" for various slopes. Height is limited based on a 33'-6" maximum safety pipe runner length.
(11) Typical Wingwall angle for all skews.

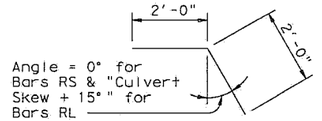
TABLE OF MAXIMUM (10) WING HEIGHTS (Hw max)

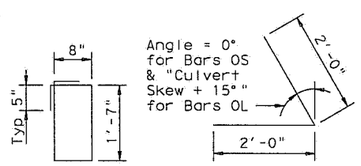
Side Slope	Hw max
3:1	11'- 5"
4:1	8'-10"
6:1	6'- 1"











WING DIMENSION CALCULATIONS:

Formulas: (All values are in Feet)
Hw = H + T + C - 0.250' (10)
A = (Hw - 0.333') (SL)
B = (A) [Tangent (Θ + 15°)]
Lw = (A) ÷ [Cosine (Θ + 15°)]

For Cast-in-place culverts:
Ltw = [(N) (S) + (N+1) (U)] ÷ (Cosine Θ)
For Precast culverts:
Ltw = [(N) (2U+S) + (N-1) (0.500')] ÷ (Cosine Θ)

Lc = (Ltw) - (2U) ÷ (Cosine Θ)
Atw = (Lc) + (B)
Total Wingwall Area (Two Wings ~ S.F.)
= (0.5) (Hw + 0.333') (Lw + A)

Hw = Height of Wingwall
SL:1 = Side Slope Ratio (Horizontal : 1 Vertical)
Lw = Length of Wingwall
Ltw = Culvert Toewall Length
Lc = Culvert Curb between Wings
Atw = Anchor Toewall Length
N = Number of Culvert Spans
Θ = Culvert Skew

See applicable box culvert standard for H, S, T, and U values. See Table of Maximum Wall Heights for limits on Hw.

GENERAL NOTES:

Designed according to AASHTO LRFD Specifications.

The Safety End Treatments shown herein are intended for use in those installations where out of control vehicles are likely to traverse the openings approximately perpendicular to the Pipe Runners.

Pipe Runners are designed for a traversing load of 1,800 pounds at yield as recommended by Research Report 280-1, "Safety Treatment of Roadside Cross-Drainage Structures", Texas Transportation Institute, March 1981.

All reinforcing steel shall be Grade 60.

Synthetic fibers listed on the "Fibers for Concrete" Material Producer List (MPL) may be used in lieu of steel reinforcing in riprap concrete unless noted otherwise.

All concrete shall be Class "C" and shall have a minimum compressive strength of 3600 psi.

All reinforcing bars shall be adjusted to provide a minimum of 1 1/4" clear cover.

When structure is founded on solid rock, depth of toewalls for culverts and wingwalls may be reduced or eliminated as directed by the Engineer.

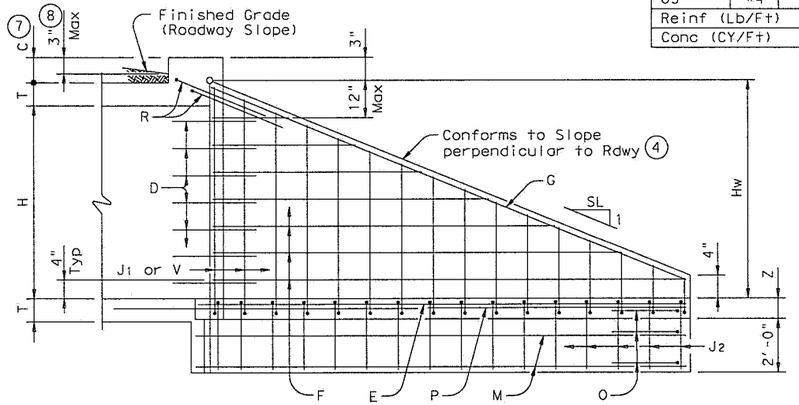
See BCS sheet for additional dimensions and information.

All bolts, nuts, washers, brackets, angles, and pipe runners are considered parts of the Safety End Treatment for payment.

Pipe Runners shall conform to the requirements of ASTM A53 (Type E or S, Grade B), ASTM A500 (Grade B), or API 5LX52.

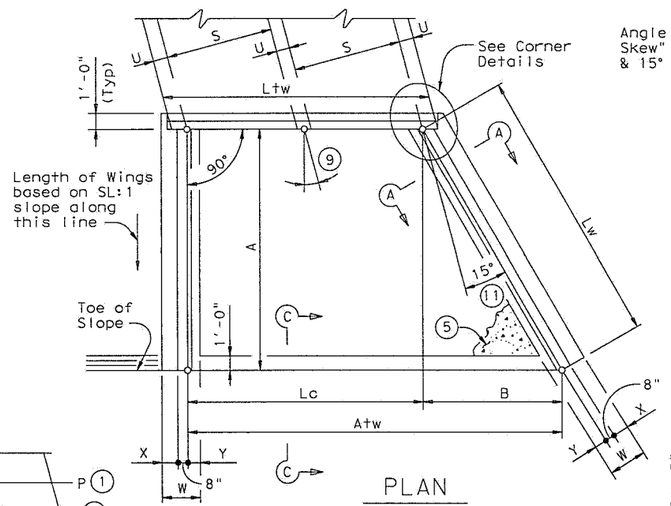
Bolts and nuts shall conform to ASTM A307. Steel plates shall conform to ASTM A36. All steel components, except reinforcing, shall be galvanized. Galvanizing damaged during transport or construction shall be repaired in accordance with the specifications.

The quantities for concrete and reinforcing steel resulting from the formulas given on this sheet are for Contractor's information only.



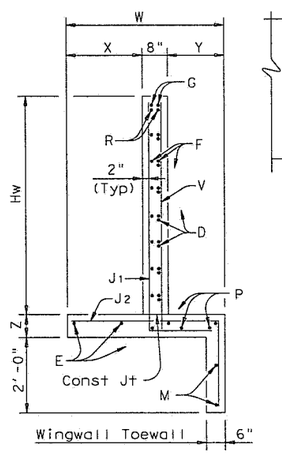
INSIDE ELEVATION OF WINGWALL

(Showing reinforcing. Culvert and Culvert Toewall reinforcing not shown for clarity.)

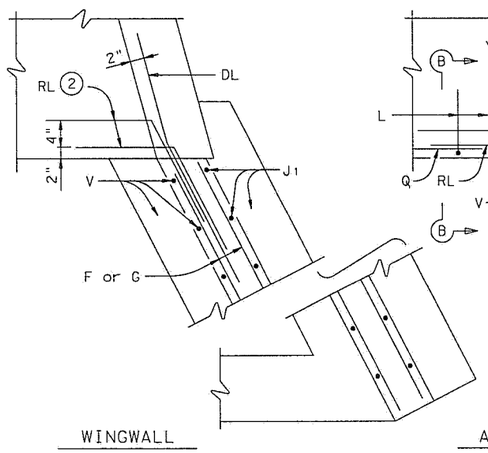


PLAN

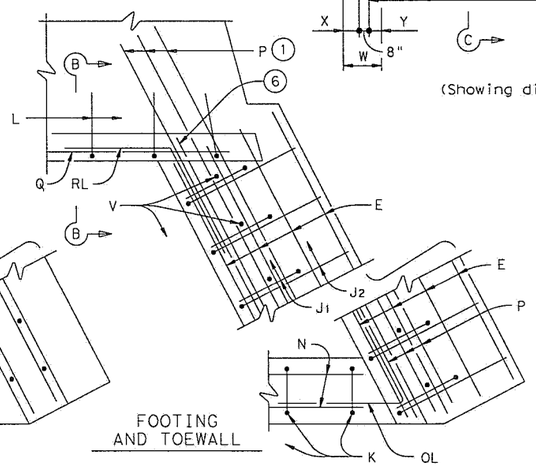
(Showing dimensions and 15° Skew.)



SECTION A-A



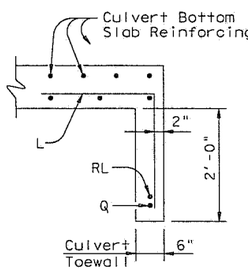
WINGWALL



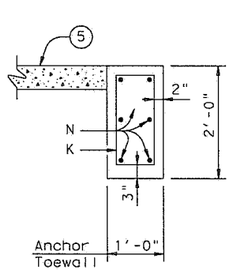
FOOTING AND TOEWALL

CORNER DETAILS

(Culvert and Culvert Toewall reinforcing not shown for clarity.)



SECTION B-B (5)



SECTION C-C

SHEET 1 OF 3

Texas Department of Transportation | Bridge Division Standard

SAFETY END TREATMENT WITH FLARED WINGS

FOR 15° & 30° SKEW BOX CULVERTS
TYPE I ~ CROSS DRAINAGE

SETB-FW-S

FILE: setbfsse.dgn	DN: GAF	CK: CAT	DW: TxDOT	CK: GAF
©TxDOT February 2010	CONT	SECT	JOB	HIGHWAY
REVISIONS				
11-10: Add note for synthetic fibers.	DIST	COUNTY		SHEET NO.
				04519

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DATE: 6/26/2017 10:24:32 AM
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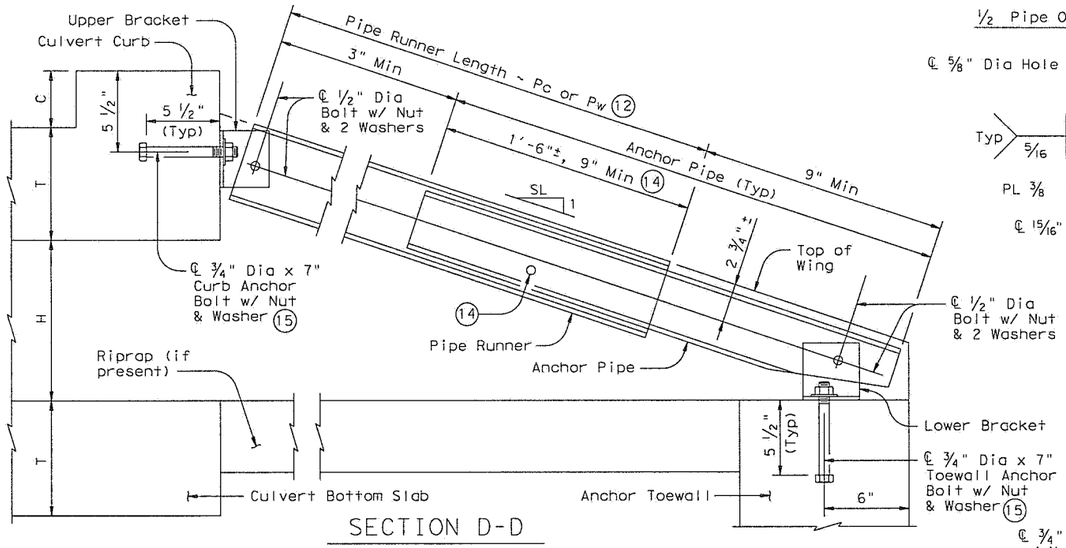
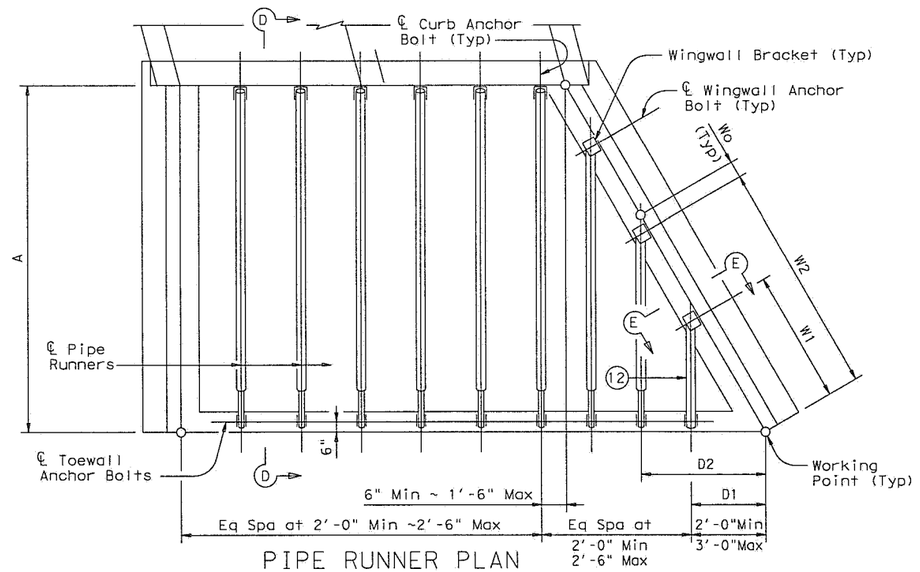
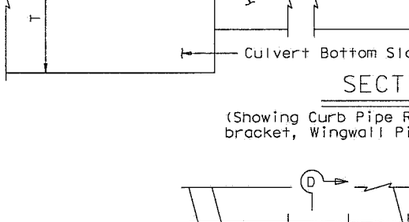


SECTION D-D

(Showing Curb Pipe Runner. Except for upper bracket, Wingwall Pipe Runners are similar.)

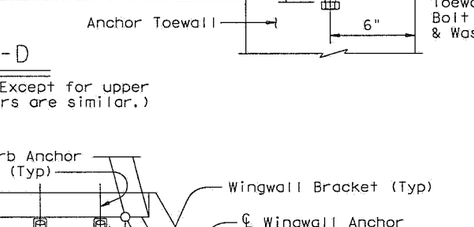


PIPE RUNNER PLAN

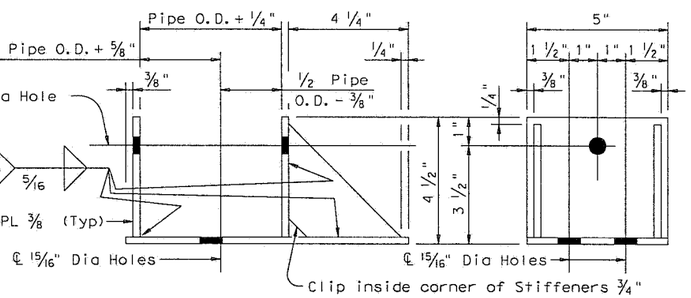


Note: Pipe diameter required for curb pipe runner shall also be used for wingwall pipe runner.

PIPE RUNNER DETAILS

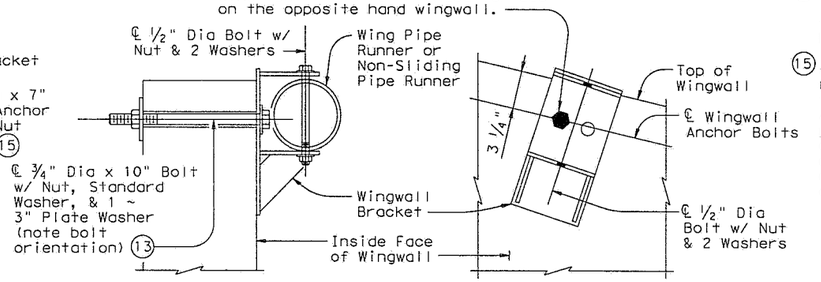


ANCHOR PIPE DETAILS



ELEVATION SIDE VIEW

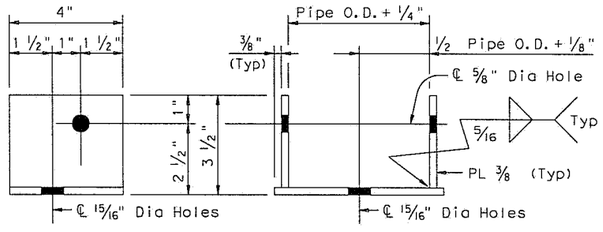
¾" Anchor Bolt shall be installed in hole nearest to the culvert curb. Other bolt hole is intended for use on the opposite hand wingwall.



SECTION E-E (Showing installed bracket.) ELEVATION (Showing installed bracket normal to Wall. Pipe not shown for clarity.)

Note: Wingwall Bracket shall match the Upper Curb Bracket size.

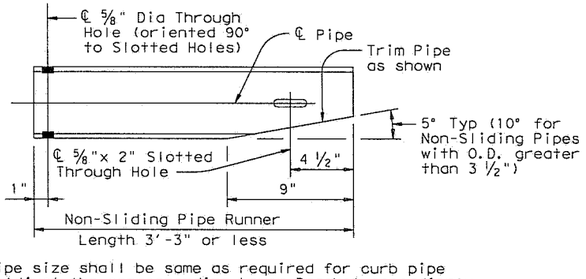
WINGWALL BRACKET DETAILS



SIDE VIEW ELEVATION

Note: Upper and Lower Brackets shall, except for the brackets used with Non-Sliding Pipe Runners, match the required pipe diameters as shown in the table.

UPPER & LOWER BRACKET DETAILS



Note: Pipe size shall be same as required for curb pipe runner. Adjust the corresponding Lower Bracket accordingly.

NON-SLIDING PIPE RUNNER DETAILS

MAXIMUM PIPE RUNNER LENGTHS & REQUIRED PIPE RUNNER AND ANCHOR PIPE SIZES

Maximum Pipe Runner Length (Pc or Pw)	Required Pipe Runner Size			Required Anchor Pipe Size		
	Pipe Size	Pipe O.D.	Pipe I.D.	Pipe Size	Pipe O.D.	Pipe I.D.
9'-4"	3" STD	3.500"	3.068"	2" STD	2.375"	2.067"
19'-0"	4" STD	4.500"	4.026"	3" STD	3.500"	3.068"
33'-6"	5" STD	5.563"	5.047"	4" STD	4.500"	4.026"

(12) If Pipe Runner Length Pw is 1'-9" or less, a single Non-Sliding Pipe Runner shall replace the normal Pipe Runner and Anchor Pipe. See NON-SLIDING PIPE RUNNER DETAILS for additional information.

(13) At Contractor's option, ⅞" diameter hole may be formed or cored drilled. Percussion drilling is not permitted. Adjust placement of reinforcing steel as necessary to avoid bolt holes.

(14) After installation of Pipe Runner, the ½" inspection hole shall be utilized to ensure that the lap of the Anchor Pipe with the Pipe Runner is adequate.

(15) At Contractor's option, an epoxy anchorage system may be used. Anchorage system chosen must be able to achieve an ultimate tensile resistance of 20 kips. Anchor diameter shall be ¾". The Contractor must provide evidence to the Engineer that this can be achieved. Evidence of adequate tensile resistance can be based on the manufacturer's published values of ultimate tensile strength (anchor spacing and edge distance must be accounted for). Anchor installation, including hole size, drilling, and clean-out, must be in accordance with the manufacturer's recommendations.

PIPE RUNNER DIMENSION CALCULATIONS:

Formulas:
W"n" = (K3) (D"n") - (Wo)
Pw"n" = (D"n") (K2) - (2.063)
Pw1 Non-Sliding Pipe Runner (If required)
= (D1) (K2) - (0.563)
Pc = (A) (K1) - (1.688)

W"n" = Distance from Working Point to centerline Anchor Bolt measured along bottom inside face of Wing
D"n" = Distance from Working Point to centerline Pipe Runner measured along outside face of Anchor Toewall
Pw = Wingwall Pipe Runner Length
Pc = Curb Pipe Runner Length
K = Constant Values for use in formulas

Slope SL:1	Ki	K2~15° Skew	K2~30° Skew
3:1	~ 1.054	~ 1.826	~ 1.054
4:1	~ 1.031	~ 1.785	~ 1.031
6:1	~ 1.014	~ 1.756	~ 1.014

K3 = 15° Skew ~ 2.000
30° Skew ~ 1.414
"n" = Wing Pipe Runner Number
Wo = 15° Skew ~ 5"
30° Skew ~ 2 ½"

Texas Department of Transportation — Bridge Division Standard

SAFETY END TREATMENT WITH FLARED WINGS

FOR 15° & 30° SKEW BOX CULVERTS
TYPE I ~ CROSS DRAINAGE

SETB-FW-S

FILE: setbfsse.dgn	DN: GAF	CK: CAT	DW: TxDOT	CK: GAF
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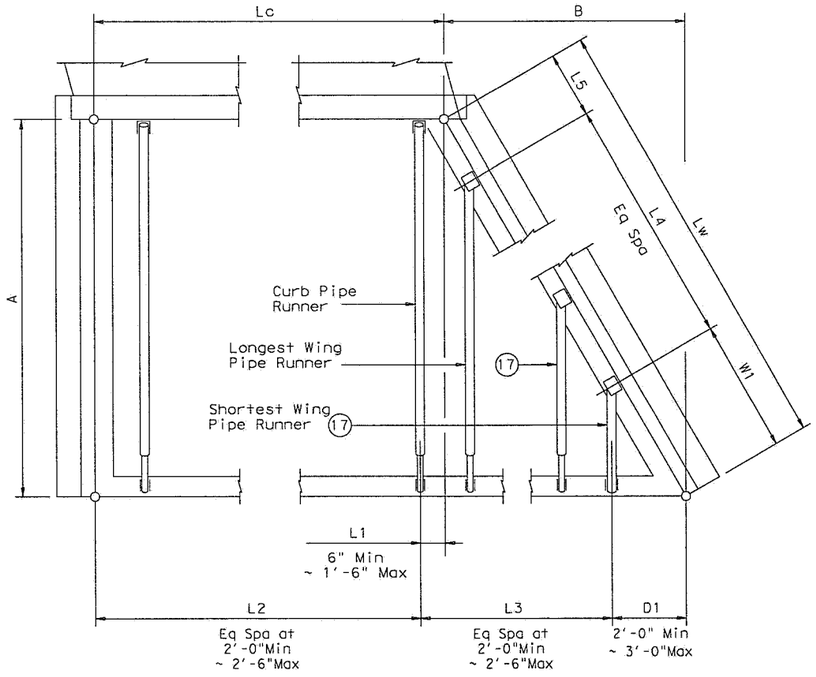
REVISIONS				
11-10: Add note for synthetic fibers.	DIST	COUNTY		SHEET NO.

Culvert Station and/or Creek name followed by applicable end (Lt, Rt or Both) (16)	Lc (Ft)	L1 (Ft)	L2 No. Spa	L2 Spa at (Ft)	L2 Overall Length (Ft)	D1 (Ft)	L3 No. Spa	L3 Spa at (Ft)	L3 Overall Length (Ft)	W1 (Ft)	L4 No. Spa	L4 Spa at (Ft)	L4 Overall Length (Ft)	L5 (Ft)	Curb Pipe Runner (Pc) No.	Curb Pipe Runner (Pc) Length (Ft)	Longest Wing Pipe Runner (Pw) (Ft)	Shortest Wing Pipe Runner (Pw) (Ft)	Non-Sliding Wing Pipe Runner (if applicable) (Ft)	Curb, Wing, and/or Non-Sliding Pipe Runners Size (3", 4" or 5")	Curb, Wing, and/or Non-Sliding Pipe Runners Total Length (16) (Ft)	3'-0" Anchor Pipe Size (2", 3" or 4")	3'-0" Anchor Pipe Total Length (16) (Ft)
CULVERT 2 (US) (Lt)																							



PIPE RUNNER LAYOUT

Note: Right forward culvert skew shown, actual culvert skew may be opposite hand.

(16) Quantities shown are for one structure end if Lt or Rt. Quantities shown are for two structure ends if Both.

(17) If the outermost Wing Pipe Runner is a Non-Sliding Pipe Runner, the next outermost Wing Pipe Runner shall be considered the Shortest.

SPECIAL NOTE:

This tabular sheet is to be filled out by the culvert specifier and provides information for the construction details and quantities of Pipe Runners.

An Excel 97 spreadsheet to assist in completing this table can be downloaded from the Bridge Standards (English) web page on the TxDOT web site. The completed sheet shall be signed, sealed, and dated by a licensed Professional Engineer.

Note that the tabular quantities are given for estimating purposes only. It is likely that these quantities will change due to field conditions. Therefore, all dimensions shall be verified by the Contractor in the field prior to fabrication of the Safety End Treatment components.

DISCLAIMER:
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cwm

SHEET 3 OF 3

Texas Department of Transportation — Bridge Division Standard

SAFETY END TREATMENT WITH FLARED WINGS

FOR 15° & 30° SKEW BOX CULVERTS
TYPE I ~ CROSS DRAINAGE

SETB-FW-S

FILE: setbfsse.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: GAF
©TxDOT February 2010	CONT	SECT	JOB	HIGHWAY
REVISIONS				
11-10: Add note for synthetic fibers.	DIST	COUNTY		SHEET NO.
				05521

6/26/2017 10:24:35 AM cwm

NOTES:

1. THE UNDERGROUND WATER AND UNDERGROUND SANITARY SEWER LINES SHOWN HEREON ARE TAKEN FROM .SHP FILES PROVIDED TO SAM BY THE CITY OF GEORGETOWN AND WERE NOT LOCATED IN THE FIELD.

2. ONE CALL TICKETS WERE SUBMITTED ON 11-17-2014 BEFORE THE FIELD SURVEY WAS PERFORMED. ONLY UNDERGROUND UTILITIES THAT WERE MARKED AT THE TIME OF SURVEY WERE LOCATED (TICKET NO. 1482190932).

3. EXISTING UTILITIES WERE PROVIDED FROM SURVEY PERFORMED BY SAM, LLC. AS WELL AS ROAD BOND PROGRAM UTILITY COORDINATORS, COBB, FENDLEY & ASSOCIATES, INC.

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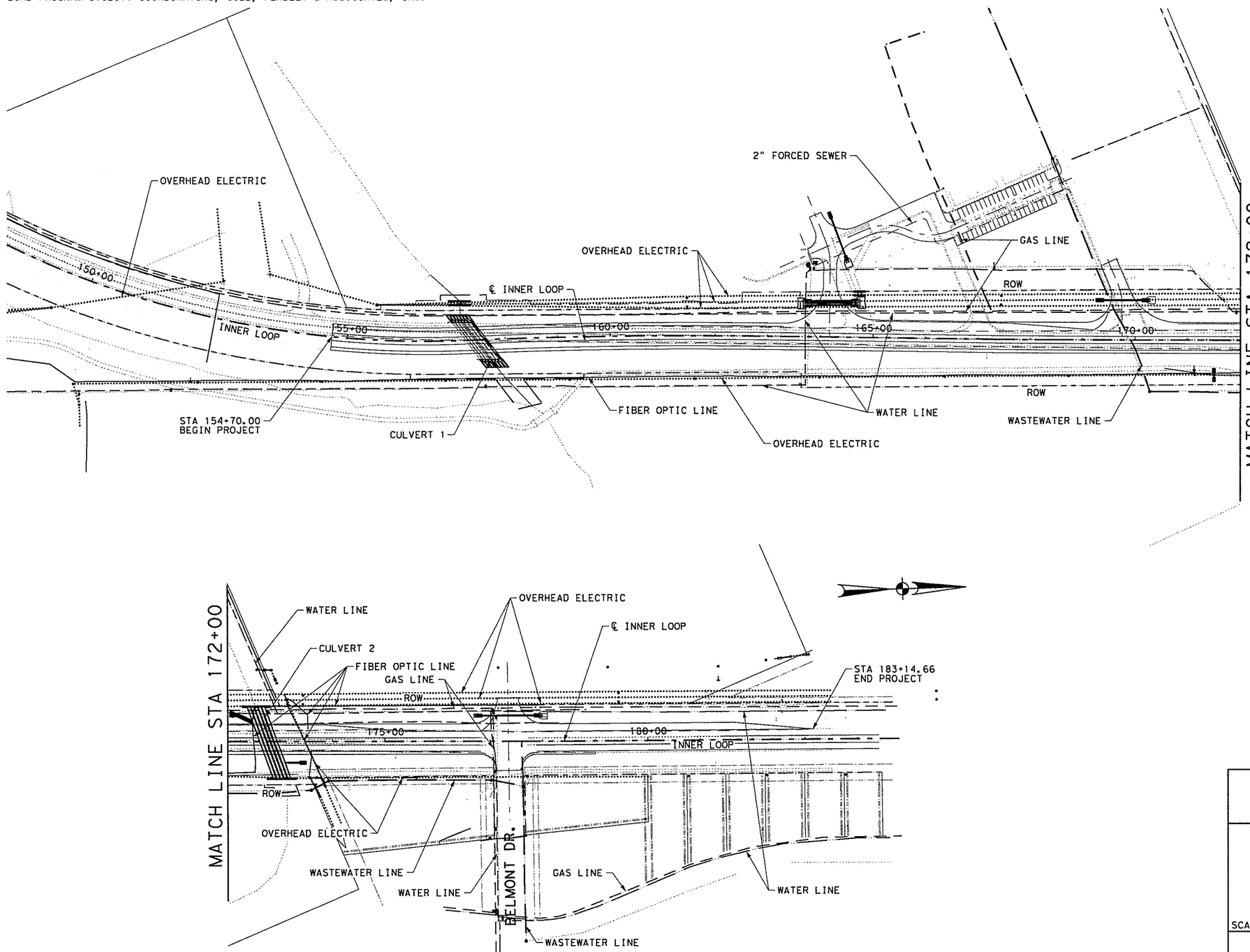
SCALE: 1" = 200'



LEGEND

UTILITY	
WATER	— — — —
WASTE WATER	— — — —
OVERHEAD ELECTRIC	.....
GAS LINE	— — — —
FIBER OPTIC	———

STATE OF TEXAS
CHASE W. MYERS
94895
LICENSED
PROFESSIONAL ENGINEER
6/26/17

BRIDGEFARMER & ASSOCIATES, INC.
CONSULTING ENGINEERS
TBPE REGISTRATION NO. 264

GEORGETOWN INNER LOOP @ CENTRAL MAINTENANCE FACILITY

EXISTING UTILITIES

SCALE: 1" = 200' SHEET 1 OF 1

DESIGN	GRAPHICS	CHECK	CHECK	SHEET NO.
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SHEET QUANTITIES

SYMBOL	ITEM CODE	DESCRIPTION	UNIT	QUANTITY
	644 6056	IN SM RD SN SUP&AM TYTWT(1)UA(P)	EA	4
	644 6071	RELOCATE SM RD SN SUP&AM TY TWT	EA	2
	658 6047	INSTL OM ASSM (OM-2Y) (WC) GND	EA	2
Ⓐ	666 6036	REFL PAV MRK TY I (W)8"(SLD)(100MIL)	LF	395
Ⓑ	666 6042	REFL PAV MRK TY I (W)12"(SLD)(100MIL)	LF	
Ⓒ	666 6048	REFL PAV MRK TY I (W)24"(SLD)(100MIL)	LF	31
Ⓓ	666 6054	REFL PAV MRK TY I (W)(ARROW)(100MIL)	EA	5
Ⓔ	666 6078	REFL PAV MRK TY I (W)(WORD)(100MIL)	EA	3
Ⓕ	666 6141	REFL PAV MRK TY I (Y)12"(SLD)(100MIL)	LF	308
Ⓖ	666 6170	REFL PAV MRK TY II (W) 4" (SLD)	LF	1841
Ⓗ	666 6178	REFL PAV MRK TY II (W) 8" (SLD)	LF	395
Ⓘ	666 6182	REFL PAV MRK TY II (W) 24" (SLD)	LF	31
Ⓙ	666 6184	REFL PAV MRK TY II (W) (ARROW)	EA	5
Ⓚ	666 6192	REFL PAV MRK TY II (W) (WORD)	EA	3
Ⓛ	666 6205	REFL PAV MRK TY II (Y) 4" (BRK)	LF	10
Ⓜ	666 6207	REFL PAV MRK TY II (Y) 4" (SLD)	LF	2761
Ⓝ	666 6212	REFL PAV MRK TY II (Y) 12" (SLD)	LF	308
Ⓞ	666 6303	RE PM W/RET REQ TY I (W)4"(SLD)(100MIL)	LF	1841
Ⓟ	666 6312	RE PM W/RET REQ TY I (Y)4"(BRK)(100MIL)	LF	10
Ⓠ	666 6315	RE PM W/RET REQ TY I (Y)4"(SLD)(100MIL)	LF	2761
Ⓡ	672 6007	REFL PAV MRKR TY I-C	EA	19
Ⓢ	672 6009	REFL PAV MRKR TY II-A-A	EA	132

NOTE: REFLECTORIZED PAVEMENT MARKINGS TYPE II SHALL BE PLACED AS A SEALER FOR REFLECTORIZED PAVEMENT MARKINGS TYPE I AND SHALL BE PLACED IN IDENTICAL LOCATION AND QUANTITY AS REFLECTIVE PAVEMENT MARKINGS TYPE I AS SHOWN.

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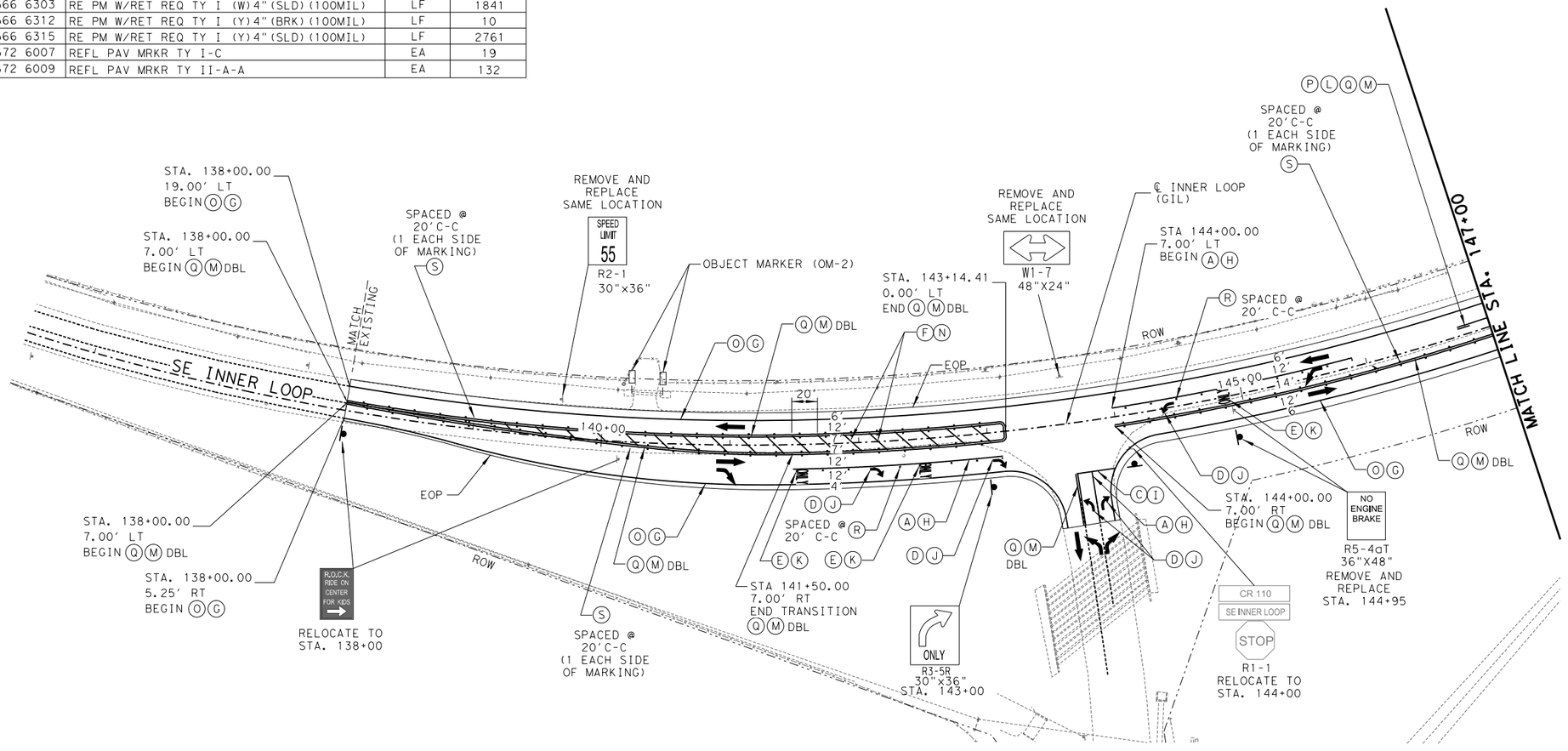

NOTES:
1. ENGINEER WILL DETERMINE SPEED LIMIT.
2. DELINEATORS & OBJECT MARKER SHOULD BE PLACED PER TxDOT STANDARDS.
3. REFER TO ROADWAY SHEETS FOR ADDITIONAL GEOMETRIC INFORMATION.

STATE OF TEXAS
ROBERT CARRILLO
80169
REGISTERED
PROFESSIONAL ENGINEER
6/22/2017

NO.	REVISION	BY	DATE

WILLIAMSON COUNTY
1848

RTG RODRIGUEZ TRANSPORTATION GROUP
FIRM #587

GEORGETOWN INNER LOOP
SIGNING AND PAVEMENT MARKINGS
BEGIN PROJECT - STA. 147+00

6/22/2017 SHEET 1 OF 2

DESIGNED:	PROJECT NUMBER		ROADWAY	
CHECKED:			SE INNER LOOP	
DRAWN:	STATE	COUNTY	CITY	SHEET No.
CHECKED:	TEXAS	WILLIAMSON	GEORGETOWN	153

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6/22/2017 6:13
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SHEET QUANTITIES

SYMBOL	ITEM CODE	DESCRIPTION	UNIT	QUANTITY
	644 6056	IN SM RD SN SUP&AM TYTWT(1)UA(P)	EA	2
	644 6071	RELOCATE SM RD SN SUP&AM TY TWT	EA	
	658 6047	INSTL OM ASSM (OM-2Y) (WC) GND	EA	4
Ⓐ	666 6036	REFL PAV MRK TY I (W)8"(SLD)(100MIL)	LF	
Ⓑ	666 6042	REFL PAV MRK TY I (W)12"(SLD)(100MIL)	LF	
Ⓒ	666 6048	REFL PAV MRK TY I (W)24"(SLD)(100MIL)	LF	
Ⓓ	666 6054	REFL PAV MRK TY I (W)(ARROW)(100MIL)	EA	4
Ⓔ	666 6078	REFL PAV MRK TY I (W)(WORD)(100MIL)	EA	
Ⓕ	666 6141	REFL PAV MRK TY I (Y)12"(SLD)(100MIL)	LF	
Ⓖ	666 6170	REFL PAV MRK TY II (W) 4" (SLD)	LF	1540
Ⓗ	666 6178	REFL PAV MRK TY II (W) 8" (SLD)	LF	
Ⓘ	666 6182	REFL PAV MRK TY II (W) 24" (SLD)	LF	
Ⓙ	666 6184	REFL PAV MRK TY II (W) (ARROW)	EA	4
Ⓚ	666 6192	REFL PAV MRK TY II (W) (WORD)	EA	
Ⓛ	666 6205	REFL PAV MRK TY II (Y) 4" (BRK)	LF	390
Ⓜ	666 6207	REFL PAV MRK TY II (Y) 4" (SLD)	LF	1540
Ⓝ	666 6212	REFL PAV MRK TY II (Y) 12" (SLD)	LF	
Ⓞ	666 6303	RE PM W/RET REQ TY I (W)4"(SLD)(100MIL)	LF	1540
Ⓟ	666 6312	RE PM W/RET REQ TY I (Y)4"(BRK)(100MIL)	LF	390
Ⓠ	666 6315	RE PM W/RET REQ TY I (Y)4"(SLD)(100MIL)	LF	1540
Ⓡ	672 6007	REFL PAV MRKR TY I-C	EA	
Ⓢ	672 6009	REFL PAV MRKR TY II-A-A	EA	40

NOTE: REFLECTORIZED PAVEMENT MARKINGS TYPE II SHALL BE PLACED AS A SEALER FOR REFLECTORIZED PAVEMENT MARKINGS TYPE I AND SHALL BE PLACED IN IDENTICAL LOCATION AND QUANTITY AS REFLECTIVE PAVEMENT MARKINGS TYPE I AS SHOWN.

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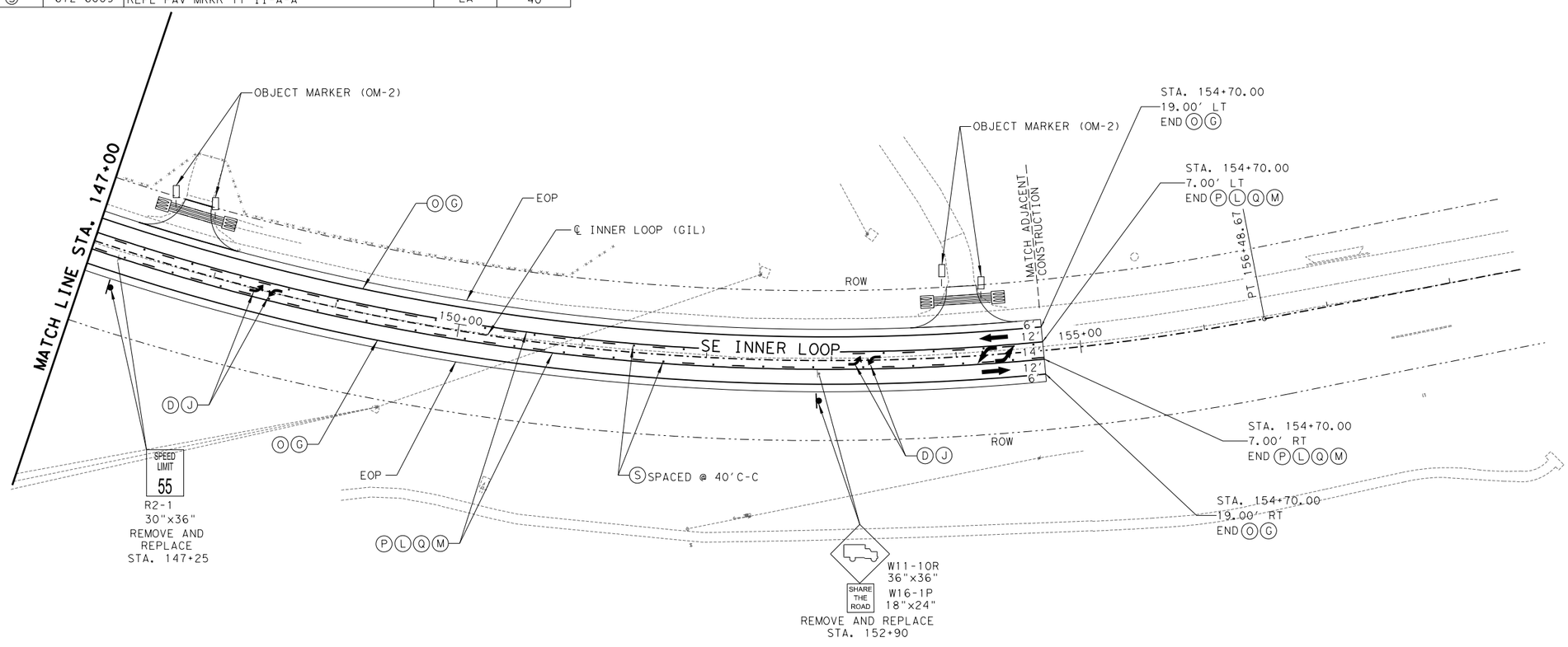

NOTES:
1. ENGINEER WILL DETERMINE SPEED LIMIT.
2. DELINEATORS & OBJECT MARKER SHOULD BE PLACED PER TxDOT STANDARDS.
3. REFER TO ROADWAY SHEETS FOR ADDITIONAL GEOMETRIC INFORMATION.

STATE OF TEXAS
ROBERT CARRILLO
80169
REGISTERED PROFESSIONAL ENGINEER
6/22/2017
Robert Carrillo, P.E.

NO.	REVISION	BY	DATE

WILLIAMSON COUNTY
1848

RTG RODRIGUEZ TRANSPORTATION GROUP
FIRM #587

GEORGETOWN INNER LOOP
SIGNING AND PAVEMENT MARKINGS
STA. 147+00 - STA. 154+70

6/22/2017 SHEET 2 OF 2

DESIGNED:	PROJECT NUMBER		ROADWAY	
CHECKED:			SE INNER LOOP	
DRAWN:	STATE	COUNTY	CITY	SHEET No.
CHECKED:	TEXAS	WILLIAMSON	GEORGETOWN	154

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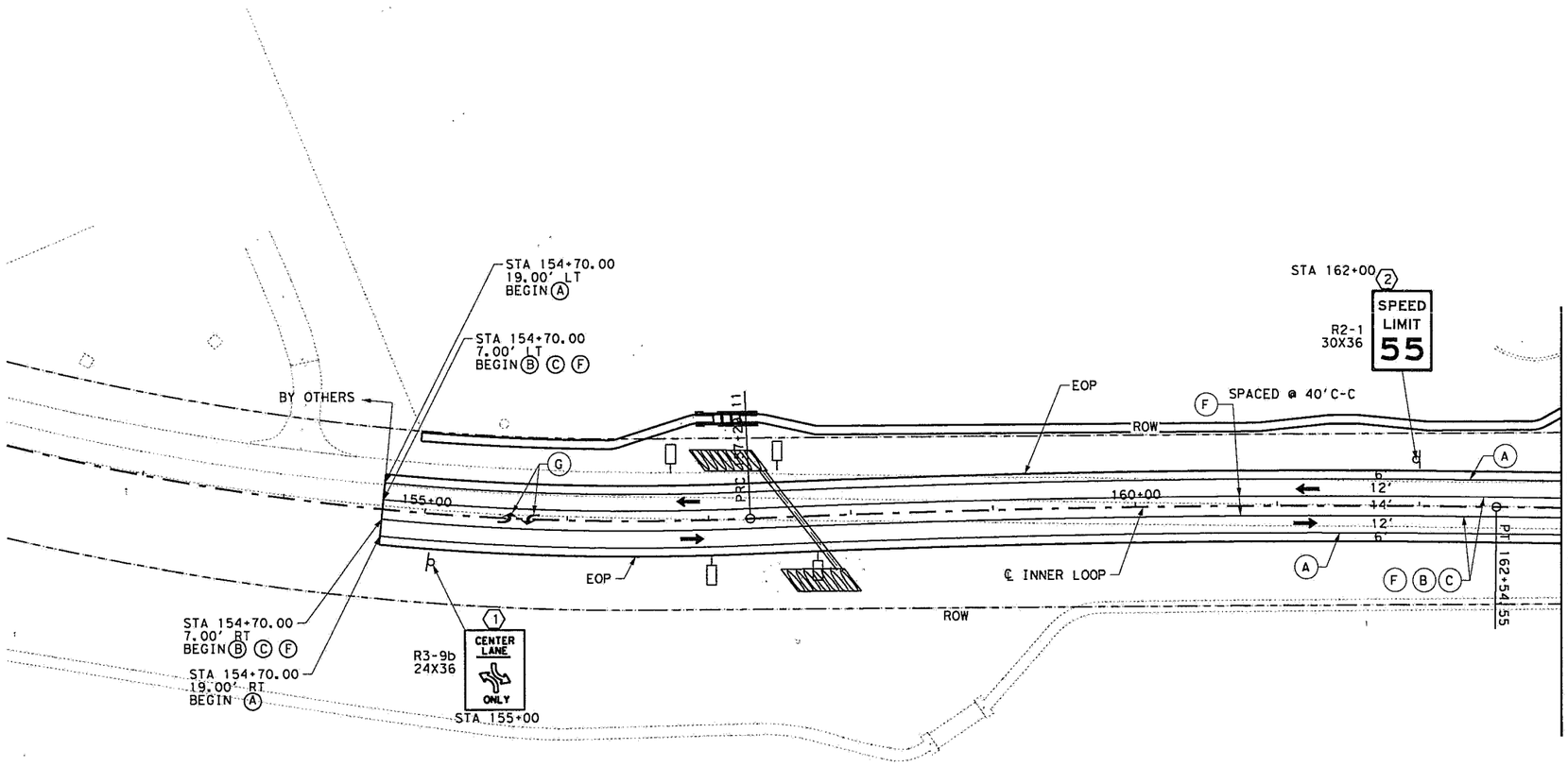


LEGEND

- (A) REFL PAV MRK TY I & TY II (W)(4")(SLD)
- (B) REFL PAV MRK TY I & TY II (Y)(4")(SLD)
- (C) REFL PAV MRK TY I & TY II (Y)(4")(BRK)
- (D) REFL PAV MRK TY I & TY II (W)(8")(SLD)
- (E) REFL PAV MRK TY I & TY II (W)(12")(SLD)
- (F) REFL PAV MRK TY II-A-A
- (G) REFL PAV MRK TY I & TY II (W)(ARROW)
- (H) REFL PAV MRK TY I & TY II (W)(WORD)
- (I) REFL PAV MRK TY I-C
- (J) REFL PAV MRK TY I & TY II (W)(24")(SLD)
- OBJECT MARKER (OM-2)
- (XX) PROPOSED SMALL SIGN AND NUMBER
- POST MOUNTED SIGN
- DIRECTION OF TRAVEL

NOTES:
1. DELINEATORS & OBJECT MARKERS SHOULD BE PLACED PER TxDOT STANDARDS.
2. REFER TO ROADWAY SHEETS FOR ADDITIONAL GEOMETRIC INFORMATION.

STATE OF TEXAS
CHASE W. MYERS
94895
LICENSED
PROFESSIONAL ENGINEER
6/26/17

BRIDGEFARMER & ASSOCIATES, INC.
CONSULTING ENGINEERS
TBPE REGISTRATION NO. 264

GEORGETOWN INNER LOOP @ CENTRAL MAINTENANCE FACILITY

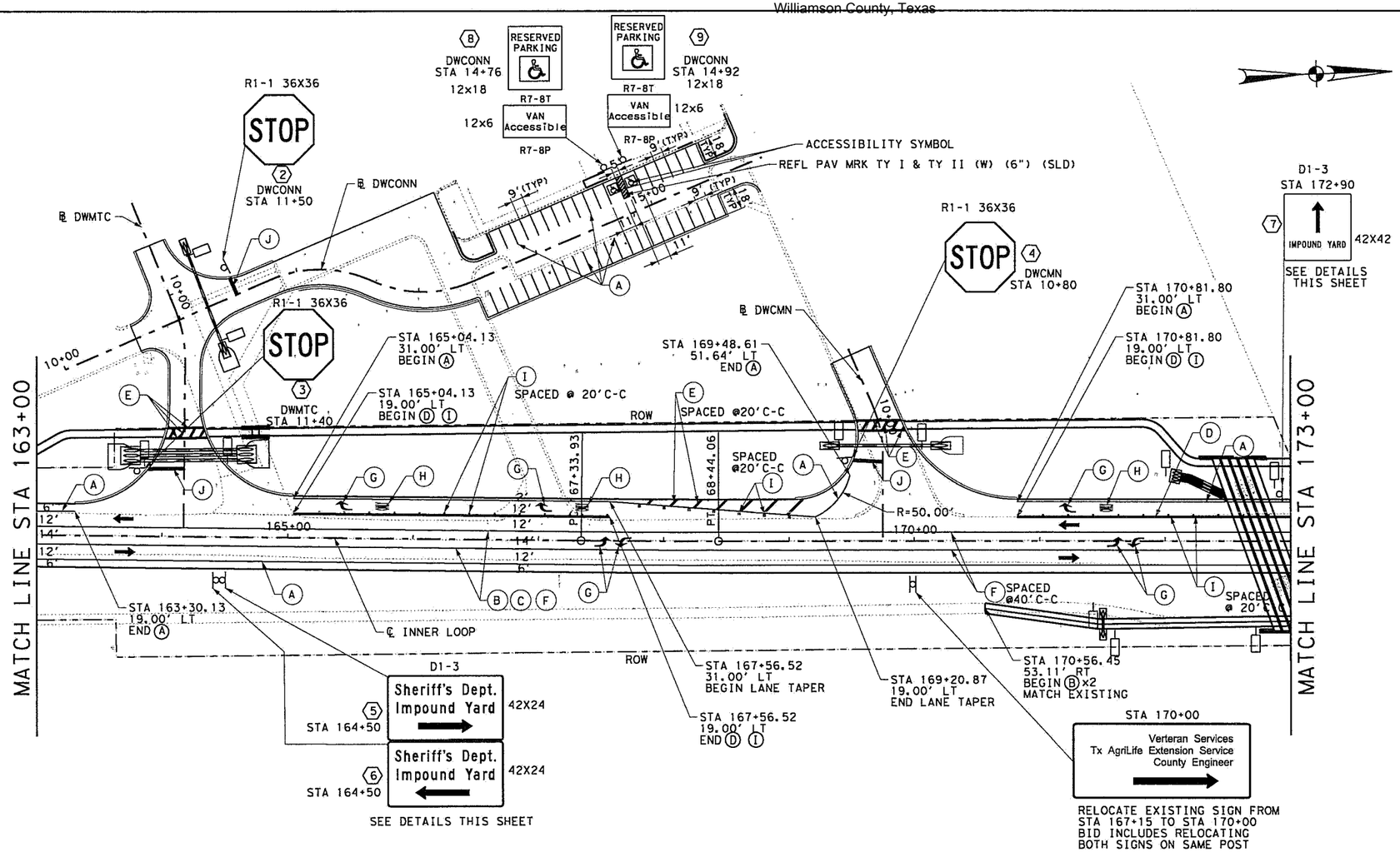
SIGNING AND PAVEMENT MARKINGS

SCALE: 1" = 100' SHEET 1 OF 3

DESIGN	GRAPHICS	CHECK	CHECK	SHEET NO.
KA	AKH	CWM	WD	155

s:\16301\dgn\sheets\06*traffic*items\01-pavement*markings\16301-pmrk-01.dgn
7/18/2017 9:58 AM

6/26/2017 10:24:38 AM cwm



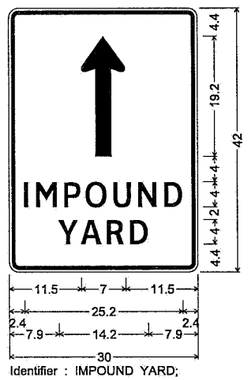
50 0 50 100
SCALE: 1" = 100'

LEGEND

- (A) REFL PAV MRK TY I & TY II (W) (4") (SLD)
- (B) REFL PAV MRK TY I & TY II (Y) (4") (SLD)
- (C) REFL PAV MRK TY I & TY II (Y) (4") (BRK)
- (D) REFL PAV MRK TY I & TY II (W) (8") (SLD)
- (E) REFL PAV MRK TY I & TY II (W) (12") (SLD)
- (F) REFL PAV MRK TY II-A-A
- (G) REFL PAV MRK TY I & TY II (W) (ARROW)
- (H) REFL PAV MRK TY I & TY II (W) (WORD)
- (I) REFL PAV MRK TY I-C
- (J) REFL PAV MRK TY I & TY II (W) (24") (SLD)
- OBJECT MARKER (OM-2)
- (XX) PROPOSED SMALL SIGN AND NUMBER
- POST MOUNTED SIGN
- DIRECTION OF TRAVEL

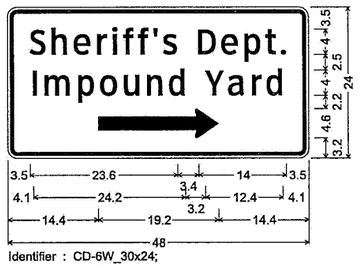
NOTES:
1. DELINEATORS & OBJECT MARKERS SHOULD BE PLACED PER TxDOT STANDARDS.
2. REFER TO ROADWAY SHEETS FOR ADDITIONAL GEOMETRIC INFORMATION.

(7)



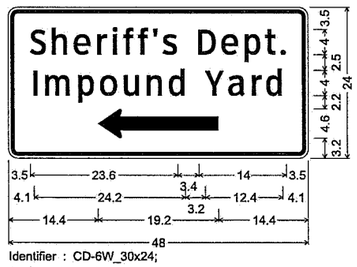
Identifier : IMPOUND YARD;
1.5" Radius, 0.6" Border, 0.4" Indent, White on Green;
C h=19.125, s=2.5;
[IMPOUND] ClearviewHwy-3-W;
[YARD] ClearviewHwy-3-W;

(5)

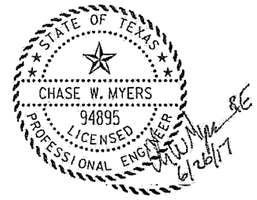


Identifier : CD-6W_30x24;
1.5" Radius, 0.6" Border, 0.4" Indent, White on Green;
[Sheriff's Dept.] ClearviewHwy-3-W;
[Impound Yard] ClearviewHwy-3-W;
Standard Arrow Custom 19.3" X 4.6" 0";

(6)



Identifier : CD-6W_30x24;
1.5" Radius, 0.6" Border, 0.4" Indent, White on Green;
[Sheriff's Dept.] ClearviewHwy-3-W;
[Impound Yard] ClearviewHwy-3-W;
Standard Arrow Custom 19.3" X 4.6" 0";



BRIDGEFARMER & ASSOCIATES, INC.
CONSULTING ENGINEERS
TBPE REGISTRATION NO. 264

GEORGETOWN INNER LOOP & CENTRAL MAINTENANCE FACILITY

SIGNING AND PAVEMENT MARKINGS

SCALE: 1" = 100' SHEET 2 OF 3

DESIGN	GRAPHICS	CHECK	CHECK	SHEET NO.
KA	AKH	CWM	WD	156

s:\16301\dgn\sheets\06*traffic*items\01-pavement*markings\16301-pmrk-02.dgn

6/26/2017 10:24:39 AM cwm

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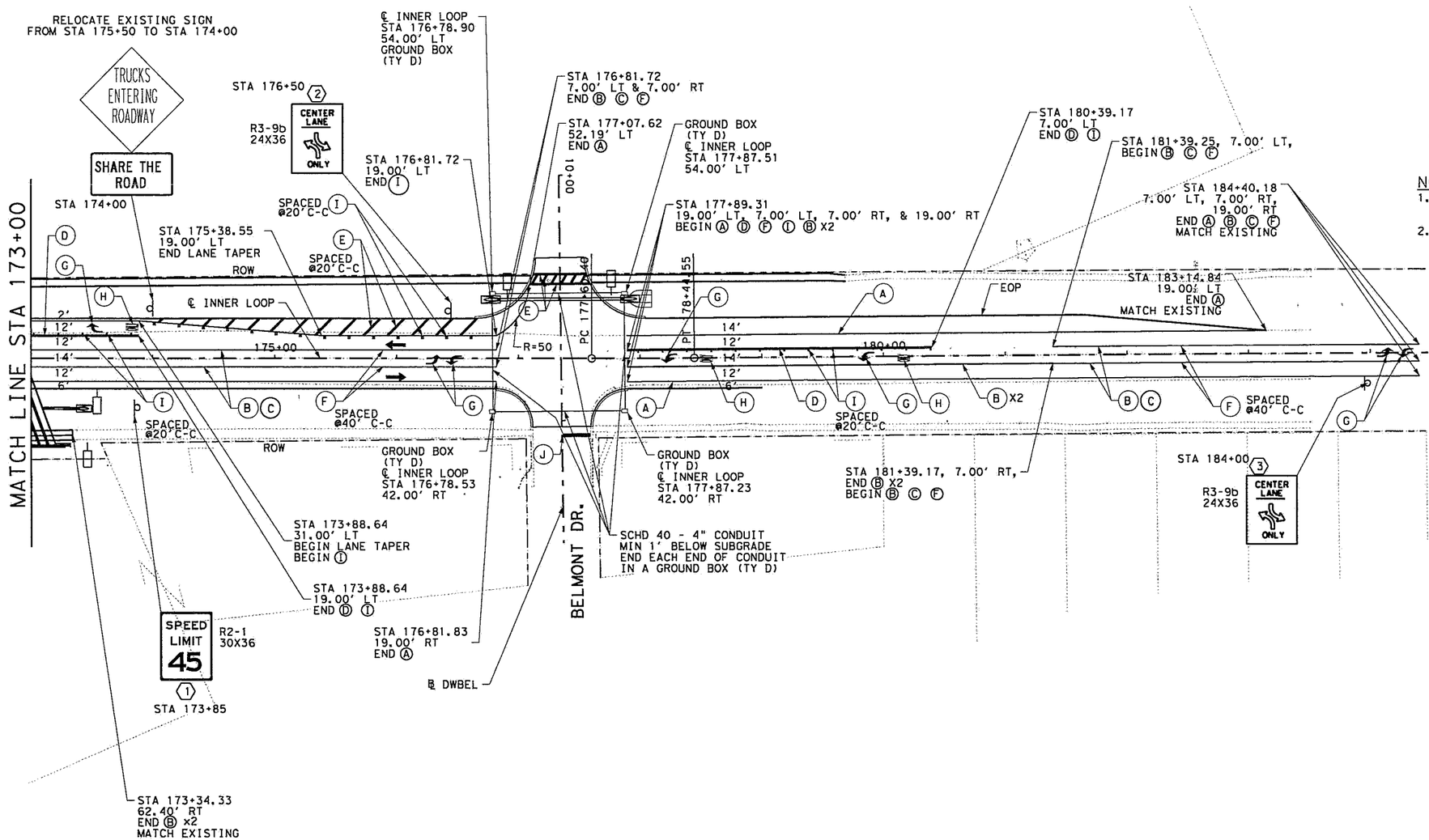
SCALE: 1" = 100'



LEGEND

- (A) REFL PAV MRK TY I & TY II (W)(4")(SLD)
- (B) REFL PAV MRK TY I & TY II (Y)(4")(SLD)
- (C) REFL PAV MRK TY I & TY II (Y)(4")(BRK)
- (D) REFL PAV MRK TY I & TY II (W)(8")(SLD)
- (E) REFL PAV MRK TY I & TY II (W)(12")(SLD)
- (F) REFL PAV MRK TY II-A-A
- (G) REFL PAV MRK TY I & TY II (W)(ARROW)
- (H) REFL PAV MRK TY I & TY II (W)(WORD)
- (I) REFL PAV MRK TY I-C
- (J) REFL PAV MRK TY I & TY II (W)(24")(SLD)
- OBJECT MARKER (OM-2)
- (XX) PROPOSED SMALL SIGN AND NUMBER
- POST MOUNTED SIGN
- DIRECTION OF TRAVEL

NOTES:
1. DELINEATORS & OBJECT MARKERS SHOULD BE PLACED PER TxDOT STANDARDS.
2. REFER TO ROADWAY SHEETS FOR ADDITIONAL GEOMETRIC INFORMATION.

STATE OF TEXAS
CHASE W. MYERS
94895
LICENSED
PROFESSIONAL ENGINEER
6/26/17

BRIDGEFARMER & ASSOCIATES, INC.
CONSULTING ENGINEERS
TBPE REGISTRATION NO. 264

GEORGETOWN INNER LOOP @ CENTRAL MAINTENANCE FACILITY

SIGNING AND PAVEMENT MARKINGS

SCALE: 1" = 100' SHEET 3 OF 3

DESIGN	GRAPHICS	CHECK	CHECK	SHEET NO.
KA	AKH	CWM	WD	157 p. 527

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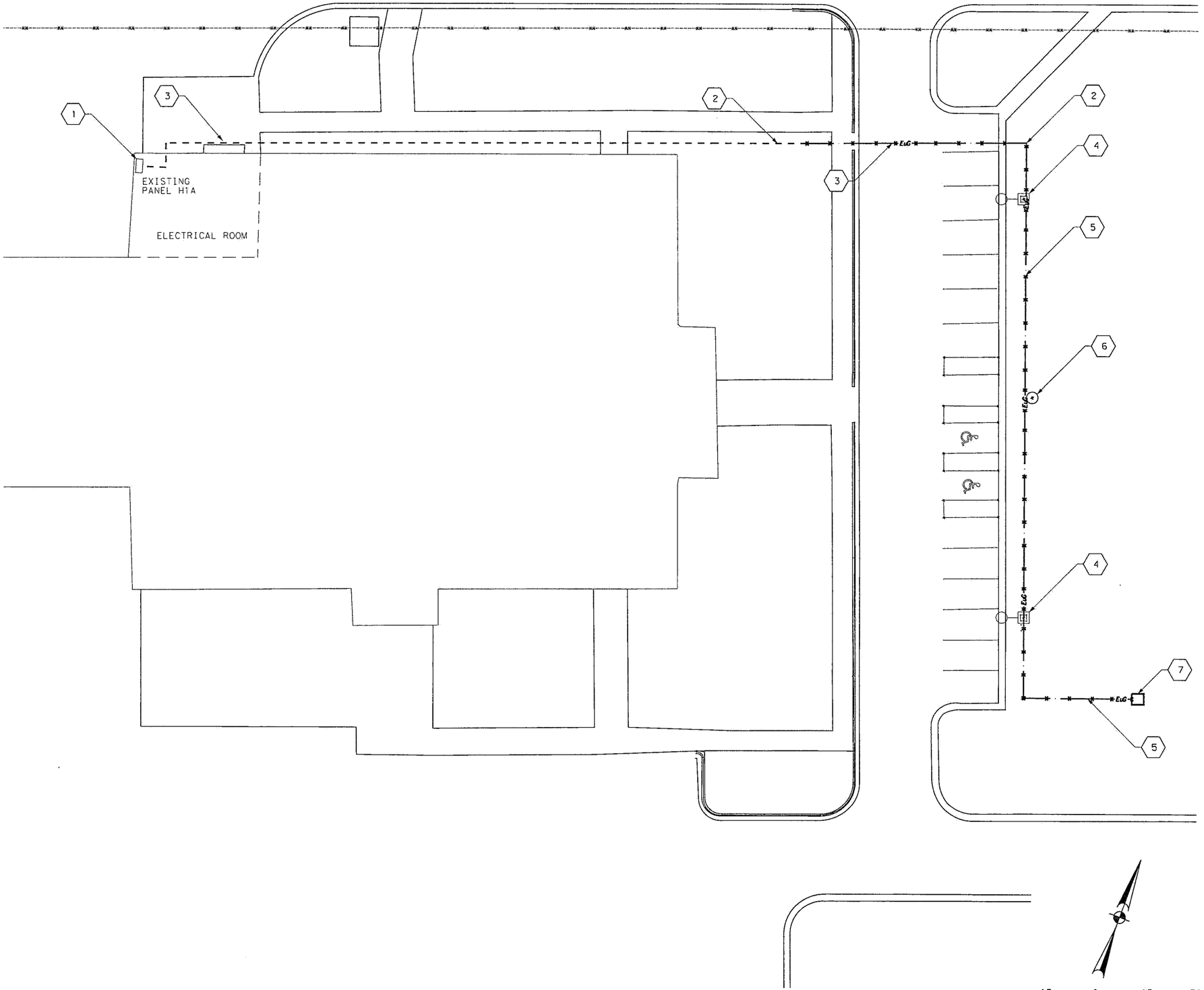

1. LOCATE EXISTNG PANEL H1A IN BUILDING. TURN OFF CIRCUIT #7 AND PROVIDE LOCK-OUT/TAG-OUT DEVICE PRIOR TO WORKING ON EXISTING PARKING LOT LIGHTS.
2. LOCATE EXISTNG UNDERGROUND CONDUIT. INTERCEPT AT APPROXIMATE LOCATION SHOWN. REMOVE CONDUCTORS BACK TO PANEL H1A. EXISTING CONDUIT TO BE REUSED FOR NEW LIGHT POLE LAYOUT. REFER TO PROPOSED ELECTRICAL SHEET 159 FOR CONTINUATION OF CONDUIT.
3. EXISTNG CONDUIT ON YARD AND UNDER EXISTING PARKING LOT TO REMAIN. REMOVE CONDUCTORS AND PREPARE CONDUIT ENDS FOR CONTINUATION OF CIRCUIT TO NEW GROUND BOX.
4. REMOVE EXISTING LIGHT POLE ASSEMBLY AND REMOVE FND TO 1' BELOW GRADE. DELIVER EXISTING LIGHT POLE ASSEMBLY TO OWNER. CLEAN AREA AND DISCARD ALL DEBRIS.
5. REMOVE EXISTING CONDUCTORS AND ABANDON CONDUIT IN PLACE. CLEAN AND DISCARD ALL DEBRIS ASSOCIATED WITH REMOVAL OF CONDUCTORS AND PARTS.
6. EXISTING FLAG POLE TO BE REMOVED BY OTHERS.
7. EXISTING J-BOX TO BE ABANDONED

LEGEND

- (X) KEY NOTE CALLOUT
- [X-X] LUMINAIRE POLE LABEL
- EXISTING CONDUIT TO REMAIN
- EXG EXISTING CONDUIT TO BE ABANDONED
- PROPOSED CONDUIT
- EXISTING FLAG POLE TO BE REMOVED
- EXISTING GROUND BOX TO BE ABANDONED
- PROPOSED GROUND BOX
- EXISTING LUMINAIRE TO BE REMOVED
- PROPOSED LUMINAIRE

STATE OF TEXAS
K BURKETT
68910
LICENSED
PROFESSIONAL ENGINEER
6/26/17

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TBPE REG. # F-10258

BRIDGEFARMER & ASSOCIATES, INC.
CONSULTING ENGINEERS
TBPE REGISTRATION NO. 264

WILLIAMSON COUNTY EXISTING PARKING LOT ILLUMINATION

SCALE: 1" = 30'

SHEET 1 OF 3

15 0 15 30
SCALE: 1" = 30'

DESIGN	GRAPHICS	CHECK	CHECK	SHEET NO.
AH	PDA	BRK	KAB	158

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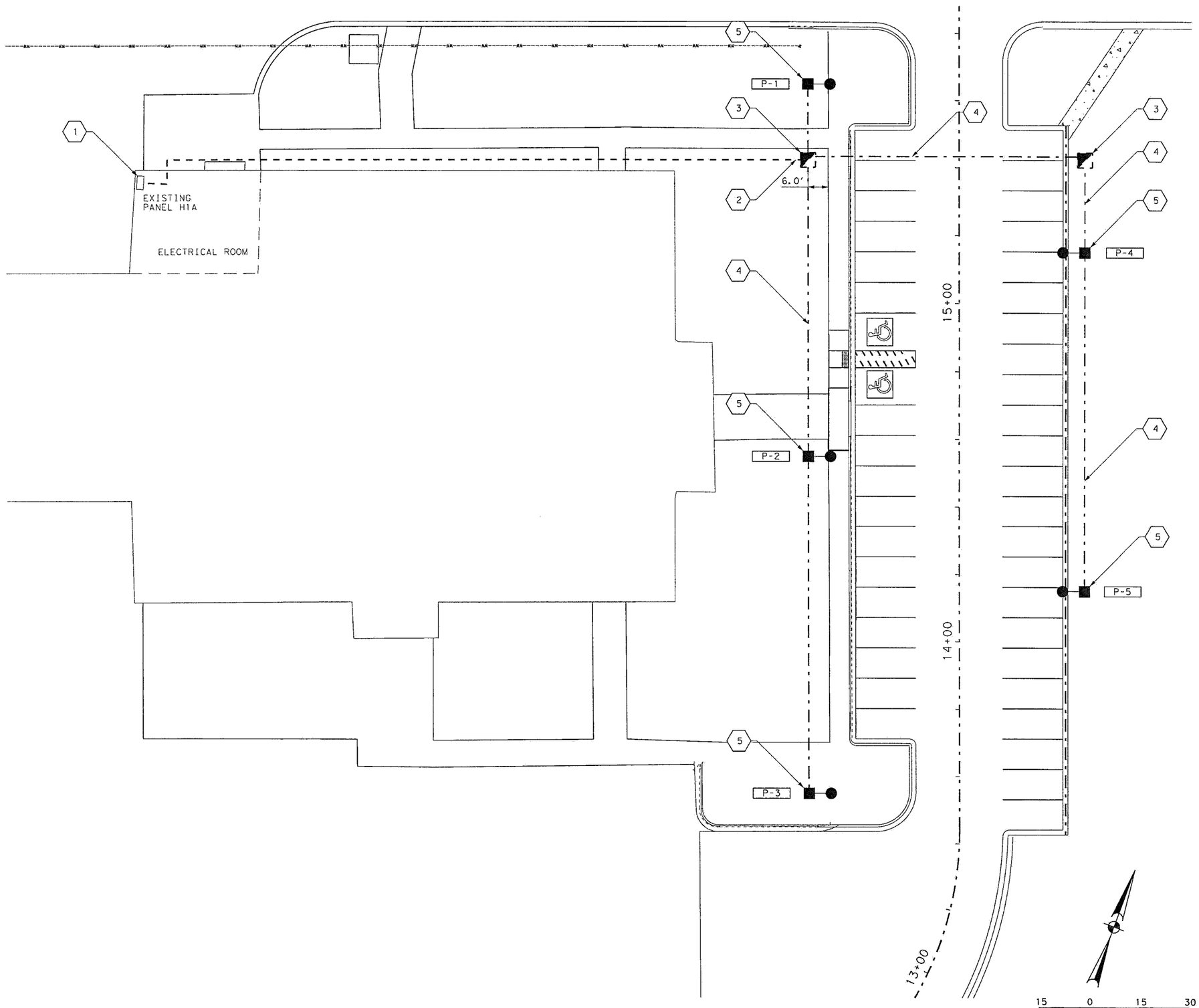

NOTES:

1. LOCATE EXISTNG PANEL H1A IN BUILDING. REUSE CIRCUIT #7 AND PROVIDE NEW CONDUCTORS FOR NEW PARKING LOT LIGHTING CIRCUIT.
2. LOCATE EXISTNG CONDUIT ADJACENT TO BUILDING. INTERCEPT CONDUIT AT APPROXIMETE LOCATION OF NEW GROUND BOX AS SHOWN ON THE PLANS. CLEAN AND PREPARE EXISTING CONDUIT FOR NEW CIRCUIT CONDUCTORS FROM EXISTING PANEL H1A TO NEW GROUND BOX. EXTEND AND/OR REPLACE ANY DAMAGED CONDUIT WITH SAME TO NEW GROUND BOX. REFER TO ED(1) THRU (4)-14 FOR INSTALLATION METHODS.
3. PROVIDE AND INSTALL NEW TYPE A GROUND BOX AS SHOWN ON ED(4)-14 STANDARD SHEETS. ENSURE GROUND BOX IS STRATEGICALLY PLACED TO ALLOW FOR CONDUIT ROUTING TO NEW LIGHT POLES AS SHOWN AND IS FLUSH FOR MOWERS. DO NOT PLACE GROUND BOX WHERE IT INTERFERS WITH SIDE WALKS OR OTHER STRUCTURES.
4. EXTEND NEW CONDUIT UNDER AND ACROSS PARKING LOT AND SIDE WALKS FROM JUNCTION BOXES UTILIZING TRENCHING OR BORING METHODS AS SHOWN ON STANDARD SHEETS ED (1 THRU(4)-14. MATCH CONDUIT SIZE TO EXISTING LIGHTING CONDUIT.
5. PROVIDE NEW PARKING LOT LIGHTING ASSEMBLY AS PER SPECIAL SPECIFICATION WC9030. UTILIZE STANDARD SHEET RID(FND)-11 FOR NEW FOUNDATION. REFER TO POLE DETAIL SHEET FOR POLE BASE BOLT PATTERN. PLACE LIGHTING ASSEMBLIES ON LOCATIONS AS SHOWN ON PLANS.

GENERAL NOTES:

1. EXISTING CONDUTI SHOWN IS BASED ON CURRENT ELECTRICAL AS-BUILT LAYOUTS.
2. FIELD VERIFICATION OF EXISTING CONDUIT IS REQUIRED FOR LOCATING POINT OF INTERCEPT FOR PROPOSED CONDUIT.

LEGEND

- (X) KEY NOTE CALLOUT
- [X-X] LUMINAIRE POLE LABEL
- EXISTING CONDUIT TO REMAIN
- EXISTING CONDUIT TO BE ABANDONED
- PROPOSED CONDUIT
- EXISTING FLAG POLE TO BE REMOVED
- EXISTING GROUND BOX TO BE ABANDONED
- PROPOSED GROUND BOX
- EXISTING LUMINAIRE TO BE REMOVED
- PROPOSED LUMINAIRE

STATE OF TEXAS
K BURKETT
68910
LICENSED
PROFESSIONAL ENGINEER
6/26/17

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TBPE REG. # F-10258

BRIDGEFARMER & ASSOCIATES, INC.
CONSULTING ENGINEERS
TBPE REGISTRATION NO. 264

WILLIAMSON COUNTY PROPOSED PARKING LOT ILLUMINATION

SCALE: 1" = 30'

SHEET 2 OF 3

DESIGN	GRAPHICS	CHECK	CHECK	SHEET NO.
AH	PDA	BRK	KAB	159

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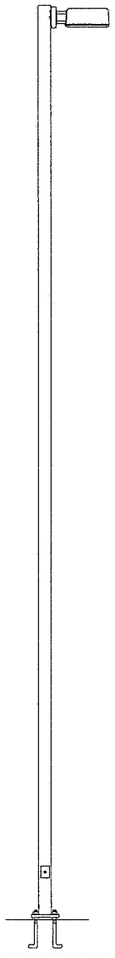
SCHEDULE OF LED ILLUMINATION ASSEMBLIES							
DESCRIPTION	POLE NUMBER	ALIGNMENT (FEET)	OFFSET (FEET)	MOUNTING HEIGHT (FEET)	DRILL SHAFT DIAMETER/ LENGTH	LUMINAIRE DISTRIBUTION TYPE	NOTES
LED ILLUMINATION ASSEMBLY (TY3)	P-1	15+65.00	45.00 LT	30	30"/8'	3	
LED ILLUMINATION ASSEMBLY (TY3)	P-2	15+15.00	37.50 RT	30	30"/8'	3	
LED ILLUMINATION ASSEMBLY (TY3)	P-3	14+55.00	45.00 LT	30	30"/8'	3	
LED ILLUMINATION ASSEMBLY (TY3)	P-4	14+15.00	37.50 RT	30	30"/8'	3	
LED ILLUMINATION ASSEMBLY (TY3)	P-5	13+55.00	45.00 LT	30	30"/8'	3	

SUMMARY OF QUANTITIES					
ITEM CODE	416 6088	618 6016	*620 6006	624 6001	WC9030
DESCRIPTION	DRILL SHAFT (RDWY ILL POLE) (24 IN)	CONDT (PVC) (SCH 40) (1 IN)	ELEC CONDR (NO. 10) INSULATED	GROUND BOX TYPE A (122311)	LED ILLUMINATION ASSEMBLY (TY3)
UNIT	LF	LF	LF	EA	EA
QTY	40	422	2079	2	5

* SERVE LUMINAIRE FROM EXISTING 1P/30A BREAKER AT 277VAC. QUANTITY REPRESENTS HOT, NEUTRAL, AND INSULATED EQUIPMENT GROUNDING CONDUCTOR.

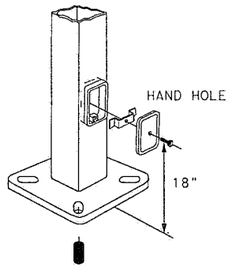
GENERAL NOTES:

1. ALL PERTINENT REQUIREMENTS OF RID(FND)-11 STANDARD SHEETS APPLY TO POLE BASE DETAIL AND BOLT PATTERNS.
2. TEST LIGHTING SYSTEM PER ITEM 616.

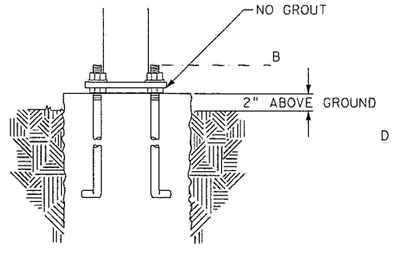


DECORATIVE POLE
30', NON-TAPERED STEEL

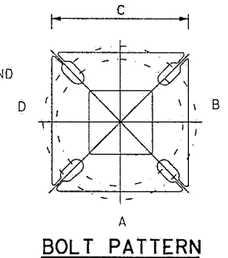
POLE DATA							
SHAFT BASE SIZE	BOLT CIRCLE A	BOLT PROJ B	BASE DIA C	BASE THICKNESS	TEMPLATE DESCRIPTION	ANCHOR BOLT DESCRIPTION	ANCHOR BOLT AND TEMPLATE NUMBER
5"	10" ± 2"	3.5 - 4"	11"	1"	ABTEMPLATE PJ50010	AB36-0	ABSSS-5



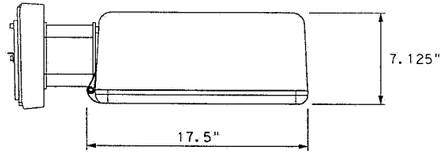
BASE DETAIL



BOLT PATTERN
SEE RID(FND)-11



BOLT PATTERN



LED AREA LUMINAIRE

STATE OF TEXAS
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68910
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6/26/17

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TBPE REG. # F-10256

BRIDGEFARMER & ASSOCIATES, INC.
CONSULTING ENGINEERS
TBPE REGISTRATION NO. 264

WILLIAMSON COUNTY PARKING LOT DETAILS & QUANTITIES

SHEET 3 OF 3

DESIGN	GRAPHICS	CHECK	CHECK	SHEET NO.
AH	PDA	BRK	KAB	160

DISCLAIMER:
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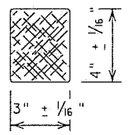
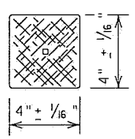
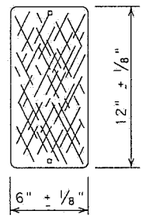
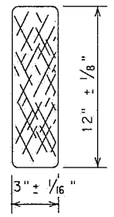
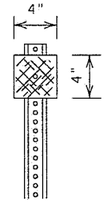
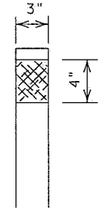
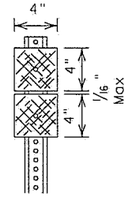
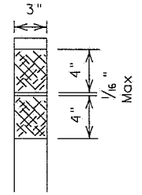
cwm

REFLECTOR UNIT SIZES FOR DELINEATORS AND OBJECT MARKERS

	SIZE 1	SIZE 2	SIZE 3	SIZE 4
DEVICE				
SHEETING	Yellow, White or Red Type B or C reflective sheeting			

NOTE
1. Size 1 and 4 - Direct applied reflective sheeting for use on flexible post (flx).
2. Size 2 and 3 - For use on wing channel (wc) post only. Use approved metal, plastic or fiberglass backplate with 17/64" mounting holes.

DELINEATORS

	SINGLE		DOUBLE	
DEVICE				
	1-Size 2 reflector unit	1-Size 1 reflector unit	2-Size 2 reflector units	2-Size 1 reflector units
SHEETING	Yellow, White or Red Type B or C Reflective Sheeting			
POST TYPE	WC	FLX	WC	FLX
MOUNT TYPE	GND	GND, SRF	GND	GND, SRF

D & OM DESCRIPTIVE CODES

INSTL DEL ASSM (D-XX)SZ X (XXX)XXX(XX)

NUMBER OF REFLECTORS
- S = Single
- D = Double

COLOR OF REFLECTORS
- W = White
- Y = Yellow
- R = Red

REFLECTOR UNIT SIZE
- 1 or 2

TYPE OF POST OR DELINEATOR
- WC = Wing Channel Post
- FLX = Flexible Post
- BRF = Barrier Reflector

TYPE OF MOUNT
- GND = Embedded (drivable or set in concrete)
- CTB = Concrete Barrier Mount
- GF1 or GF2 = Guard Fence Attachment
- SRF = Surface Mount

DIRECTION
- If Required
- BI = Bi-Directional
- BR = Bi-Directional with red on back

INSTL OM ASSM (OM-XX) (XXX)XXX(XX)

TYPE OF OBJECT MARKER
- 1, 2, 3, or 4

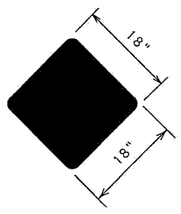
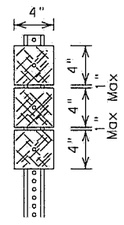
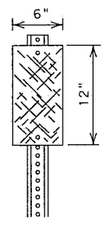
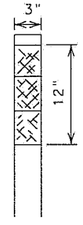
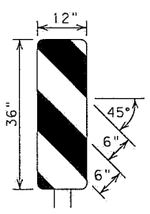
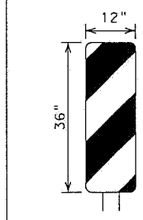
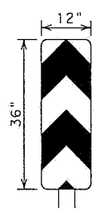
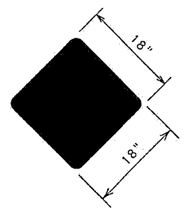
NUMBER OF REFLECTORS OR DIRECTION
- X = 3-Size 2 reflector units (Type 2 only)
- Y = 1-Size 3 reflector unit (Type 2 only)
- Z = 3-Size 1 or 1-Size 4 reflector unit(s) (Type 2 only)
- L = Left Side (Type 3 Object Marker only)
- R = Right Side (Type 3 Object Marker only)
- C = Center (Type 3 Object Marker only)

TYPE OF POST
- WC = Wing Channel Post
- FLX = Flexible Post
- TWT = Thin Walled Tubing

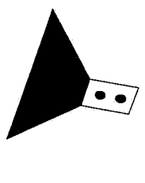
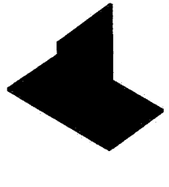
TYPE OF MOUNT
- GND = Embedded (drivable)
- SRF = Surface Mount
- WAS = Wedge Anchor Steel
- WAP = Wedge Anchor Plastic

DIRECTION
- If Required
- BI = Bi-Directional

OBJECT MARKERS

	Type 1 (OM-1)	Type 2 (OM-2)			Type 3 (OM-3)			Type 4 (OM-4)
	OM-1	OM-2X	OM-2Y	OM-2Z	OM-3L	OM-3R	OM-3C	OM-4
DEVICE								
		3-Size 2 reflector units	1-Size 3 reflector unit	3-Size 1 reflector units or 1-Size 4 reflector unit				
SHEETING	Yellow-Type B_{FL} or C_{FL} Sheeting	Yellow - Type B or C Sheeting			Alternating acrylic black and retroflective yellow - Type B_{FL} or C_{FL} Sheeting			Red -Type B_{FL} or C_{FL} Sheeting
POST TYPE	TWT	WC	WC	FLX	TWT			TWT
MOUNT TYPE	WAS, WAP	GND	GND	GND, SRF	WAS, WAP			WAS, WAP

BARRIER REFLECTORS (BRF)

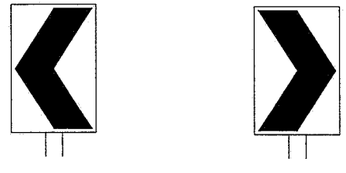
	GF1	GF2	CTB
DEVICE			

1. Barrier reflectors shall meet the requirements of DMS 8600.
2. Approved Barrier Reflectors are listed on the "Barrier Reflectors" Material Producer List at: www.txdot.gov.

SHEETING: Yellow, White, Red

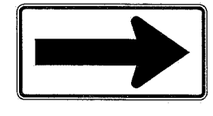
NOTE
1. Minimum 9 square inches of reflective sheeting surface area.

CHEVRONS

DEVICE:  W1-8

SIZE (W x L)	18"x 24" (Conventional)	24"x 30" (Conventional Oversize)	30"x 36" (Expressway)	36" x 48" (Freeway)
MOUNTING HEIGHT	4'-0" or 7'-0"		7'-0" Only	

ONE DIRECTION LARGE ARROW

DEVICE:  W1-6

SIZE (W x L)	48" x 24" (Conventional)	60" x 30" (Expressway & Freeway)
MOUNTING HEIGHT	7'-0"	

NOTE
1. CHEVRON (W1-8) signs and ONE DIRECTION LARGE ARROW (W1-6) Signs shall be installed per Sign Mounting Details (SMD) Standard Sheets and paid under Item 644 (Small Roadside Sign Assemblies).
2. The Texas version of the ONE DIRECTION LARGE ARROW sign (W1-9T) may be used instead of the ONE DIRECTIONAL LARGE ARROW (W1-6).

DEPARTMENTAL MATERIAL SPECIFICATIONS

FLEXIBLE DELINEATOR & OBJECT MARKER POSTS (EMBEDDED & SURFACE MOUNT TYPES)	DMS-4400
SIGN FACE MATERIALS	DMS-8300
DELINEATORS, OBJECT MARKERS AND BARRIER REFLECTORS	DMS-8600

NOTE:
Delineator and object marker backplates and sign substrates shall be 0.080" Aluminum sign blank to conform to ASTM B-209 Alloy 6061-T6 or approved alternative.

Texas Department of Transportation — Traffic Operations Division Standard

DELINEATOR & OBJECT MARKER MATERIAL DESCRIPTION
D & OM(1)-15

FILE:	dom1-15.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
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REVISIONS					
10-09 3-15		DIST	COUNTY		SHEET NO.
4-10					204

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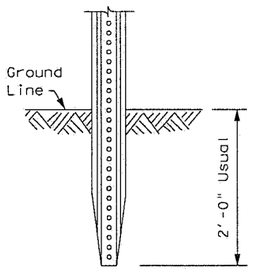
POST TYPE AND SUPPORT FOUNDATION DETAILS

WING CHANNEL (WC)

GND

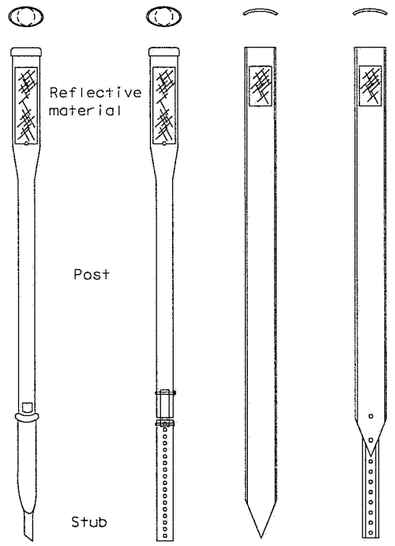


NOTES

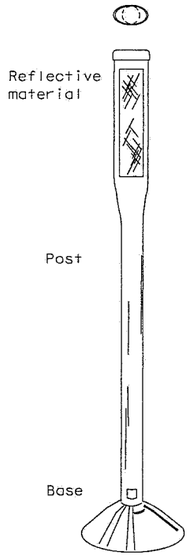
1. Embedded Wing Channel (WC) post option may be used for Type 2 Object Markers and Delineators only.
2. 1.12 lbs/ft steel per ASTM A 1011 SS Gr. 50, or ASTM A499.

FLEXIBLE POSTS (FLX)

GND



SRF



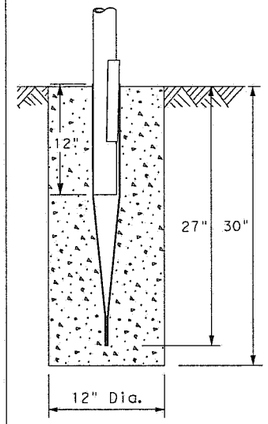
EMBEDDED | SURFACE MOUNT

NOTES

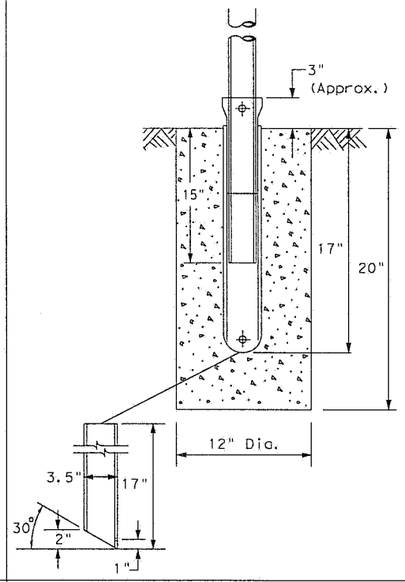
1. See "Flexible Delineator and Object Marker Posts" Material Producer List for approved devices.
2. Install per manufacturer's recommendations.
3. Post length may vary to meet field conditions.

WEDGE ANCHOR SYSTEMS

WAS



WAP



STEEL | PLASTIC

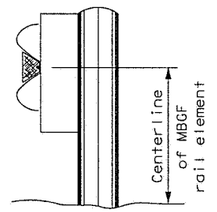
NOTE

1. Install per manufacturer's recommendations.

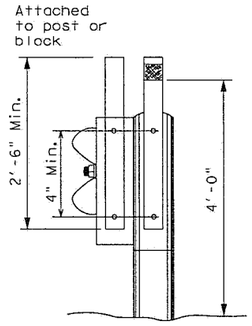
TYPE OF BARRIER MOUNTS

GUARD FENCE ATTACHMENT

GF1

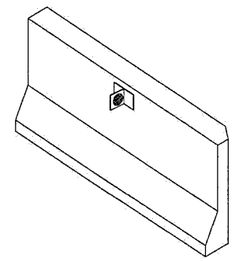


GF2



CONCRETE BARRIER / BRIDGE RAIL

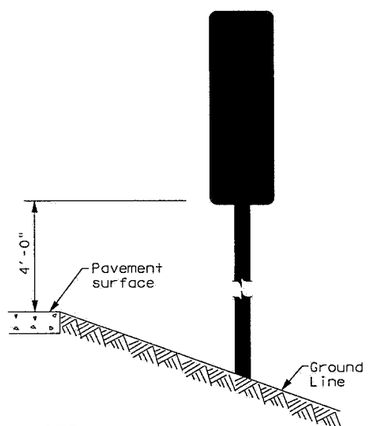
CTB



GENERAL NOTES

1. Place delineators on a section of roadway at a consistent distance from the edge of pavement.
2. Where a restriction prevents consistent placement from the pavement edge, place the affected object markers in line with the innermost edge of the obstruction.
3. When Type 2 object markers and delineators are more than 8'-0" from the edge of the pavement, it may not be possible to maintain a height of approximately 4'-0". If this is the case, place the object marker or delineator as close to the desired height as possible.
4. Install all delineators, object markers and barrier reflectors in accordance with the manufacturer's recommendation.
5. Barrier reflectors should be installed a minimum of 18 inches above the edge of the pavement surface.

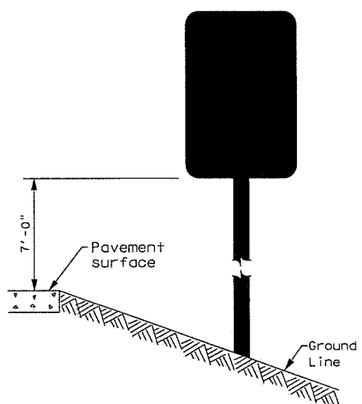
TYPES 1, 3, AND 4 OBJECT MARKERS AND CHEVRONS



NOTE

Mounting at 4 feet to the bottom of the chevron is permitted for chevrons that will not exceed a height of 6'-6" to the top of the chevron (sizes 24" x 30" and smaller)

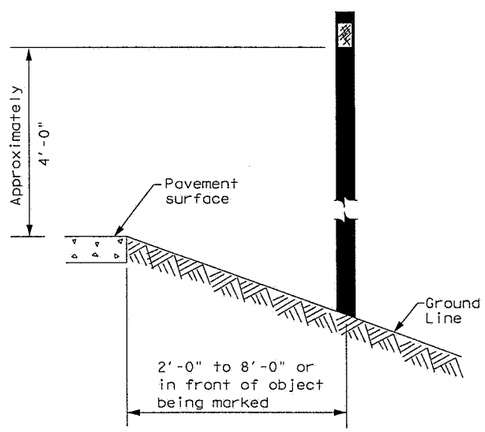
CHEVRONS AND ONE DIRECTION LARGE ARROW SIGN



NOTE

Chevrons 30" x 36" and larger shall be mounted at a height of 7' to the bottom of the chevron. Chevron sign and ONE DIRECTIONAL LARGE ARROW sign (W1-9T) shall be installed per SMD standard sheets and paid under item 644.

DELINEATORS AND TYPE 2 OBJECT MARKERS



See general notes 1, 2 and 3.

Texas Department of Transportation — Traffic Operations Division Standard

DELINEATOR & OBJECT MARKER INSTALLATION

D & OM(2)-15

FILE: dom2-15.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
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REVISIONS				
10-09 3-15	DIST	COUNTY		SHEET NO.
4-10				16832

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cwm

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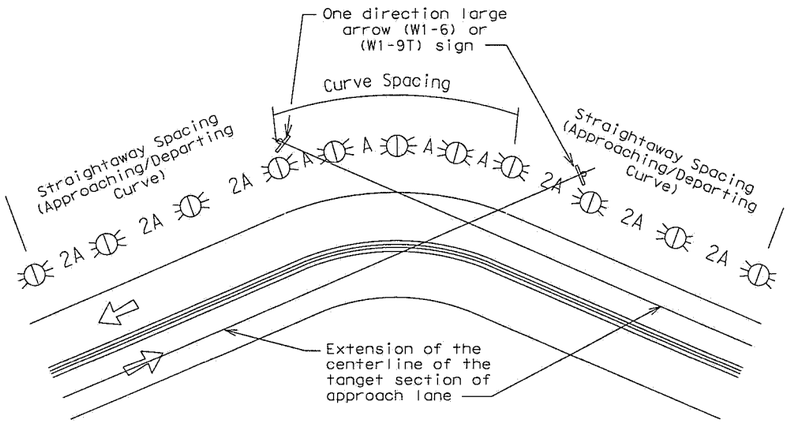
cwm

USE OF WARNING DEVICES AT CURVES WITH ADVISORY SPEED LIMITS

Amount by which Advisory Speed Is less than Posted Speed	Warning Devices Needed
5 MPH & 10 MPH	RPMs
15 MPH & 20 MPH	RPMs, and Delineators or RPMs and ONE DIRECTION LARGE ARROW (W1-6) or (W1-9T) sign
25 MPH & Greater	RPMs and Chevrons

SUGGESTED SPACING FOR DELINEATORS ON HORIZONTAL CURVES

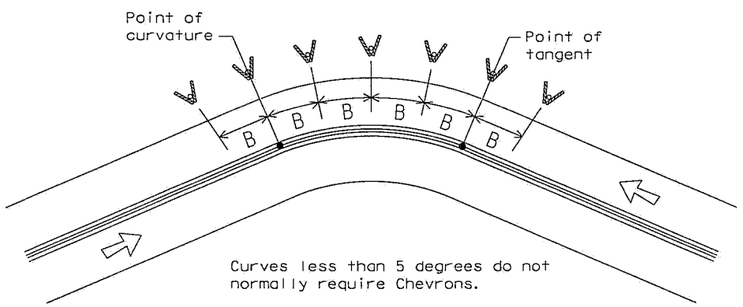


Curves less than 1 degree do not normally require delineators.

NOTE

ONE DIRECTIONAL LARGE ARROW (W1-6) or(W1-9T) sign should be located at approximately and perpendicular to the extension of the centerline of the tangent section of approach lane.

SUGGESTED SPACING FOR CHEVRONS ON HORIZONTAL CURVES



Curves less than 5 degrees do not normally require Chevrons.

DELINEATOR AND CHEVRON SPACING

WHEN DEGREE OF CURVE OR RADIUS IS KNOWN

Degree of Curve	FEET			
	Radius of Curve	Spacing in Curve	Spacing in Straightaway	Chevron Spacing in Curve
		A	2A	B
1	5730	225	450	——
2	2865	160	320	——
3	1910	130	260	200
4	1433	110	220	160
5	1146	100	200	160
6	955	90	180	160
7	819	85	170	160
8	716	75	150	160
9	637	75	150	120
10	573	70	140	120
11	521	65	130	120
12	478	60	120	120
13	441	60	120	120
14	409	55	110	80
15	382	55	110	80
16	358	55	110	80
19	302	50	100	80
23	249	40	80	80
29	198	35	70	40
38	151	30	60	40
57	101	20	40	40

Curve delineator approach and departure spacing should include 3 delineators spaced at 2A. This spacing should be used during design preparation or when the degree of curve is known.

DELINEATOR AND CHEVRON SPACING

WHEN DEGREE OF CURVE OR RADIUS IS NOT KNOWN

Advisory Speed (MPH)	Spacing in Curve	Spacing in Straightaway	Chevron Spacing in Curve
	A	2xA	B
65	130	260	200
60	110	220	160
55	100	200	160
50	85	170	160
45	75	150	120
40	70	140	120
35	60	120	120
30	55	110	80
25	50	100	80
20	40	80	80
15	35	70	40

If the degree of curve is not known, delineator spacing may be determined based on the Advisory Speed of the curve. Use the delineator curve spacing for each Advisory Speed (MPH).

DELINEATOR AND OBJECT MARKER APPLICATION AND SPACING

CONDITION	REQUIRED TREATMENT	MINIMUM SPACING
Frwy./Exp. Tangent	RPMs	See PM-series and FPM-series standard sheets
Frwy./Exp. Curve[1]	Single delineators on right side	See delineator spacing table
FRWY/EXP. Ramp	Single delineators on at least one side of ramp (should be on outside of curves) (see Detail 4 on D&OM(4))	100 feet on ramp tangents. Use delineator spacing table for ramp curves ("straightway spacing" does not apply to ramp curves).
Acceleration/Deceleration Lane	Double delineators (see Detail 4 on D&OM(4))	100 feet (See Detail 4 on D & OM (4))
Truck Escape Ramp	Single red delineators on both sides	50 feet
Bridge Rail (steel or concrete)and Metal Beam Guard Fence or CTB	Bi-Directional Delineators when undivided with one lane each direction Single Delineators when multiple lanes each direction	Equal spacing (100'max) but not less than 3 delineators
Guard Rail Terminus/Impact Head	Divided highway - Object marker on approach end. Undivided 2-lane highways - Object marker on approach and departure end.	Requires Type 3 Object Marker or reflective sheeting provided by manufacturer per D & OM(VIA).
Bridges with no Approach Rail	Type 3 Object Marker at end of rail and 3 single delineators approaching rail.	See Detail 2 on D & OM(4)
Reduced Width Approaches to Bridge Rail	Type 2 Object Markers and 3 single delineators approaching bridge.	See Detail 1 on D & OM(4)
Culverts without MBGF	Type 2 Object Markers	See Detail 3 on D & OM(4)
Crossovers	Double yellow delineators or RPM's	See Detail 5 on D & OM (4)
Pavement Narrowing (lane merge) on Freeways/Expressway	Single delineators adjacent to affected lane for full length of transition	100 feet

NOTES

1. Delineators not required in urban areas with continuous illumination.
2. Unless indicated otherwise, the delineator or barrier reflector color shall conform to the color of the pavement edge line on the side of the road where the delineators or barrier reflectors are placed.
3. Barrier reflectors may be used to replace required delineators.
4. Single red delineators may be mounted on the back side of delineator posts for wrong way driver applications

LEGEND	
	Bi-directional Delineator
	Delineator
	Sign

Texas Department of Transportation — Traffic Operations Division Standard

DELINEATOR & OBJECT MARKER PLACEMENT DETAILS

D & OM(3)-15B

FILE: dom3-15b.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
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3-15	DIST	COUNTY		SHEET NO.
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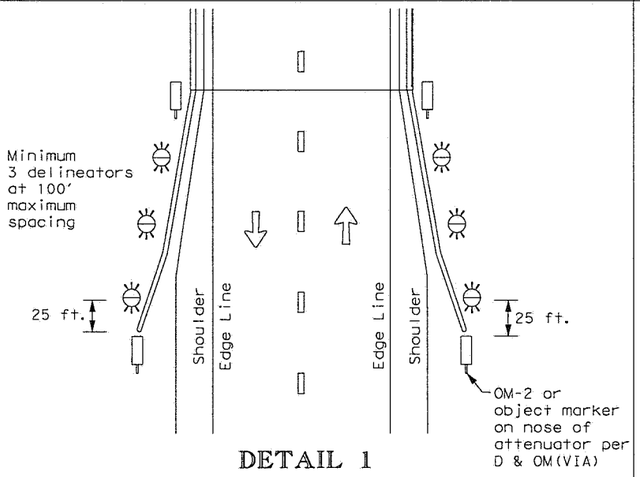
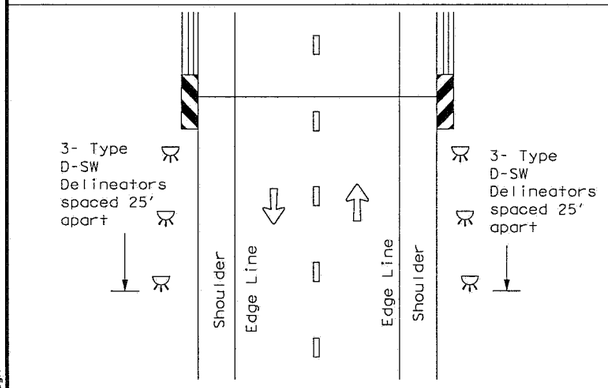
TWO-WAY, TWO LANE ROADWAY WITH REDUCED WIDTH APPROACH



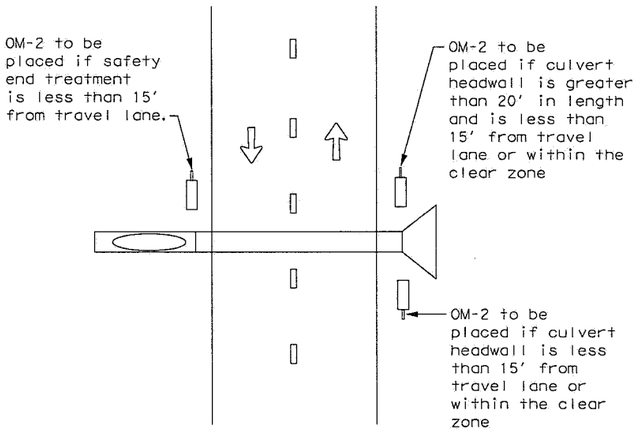
DETAIL 1

TWO-WAY, TWO LANE ROADWAY BRIDGE WITH NO APPROACH RAIL



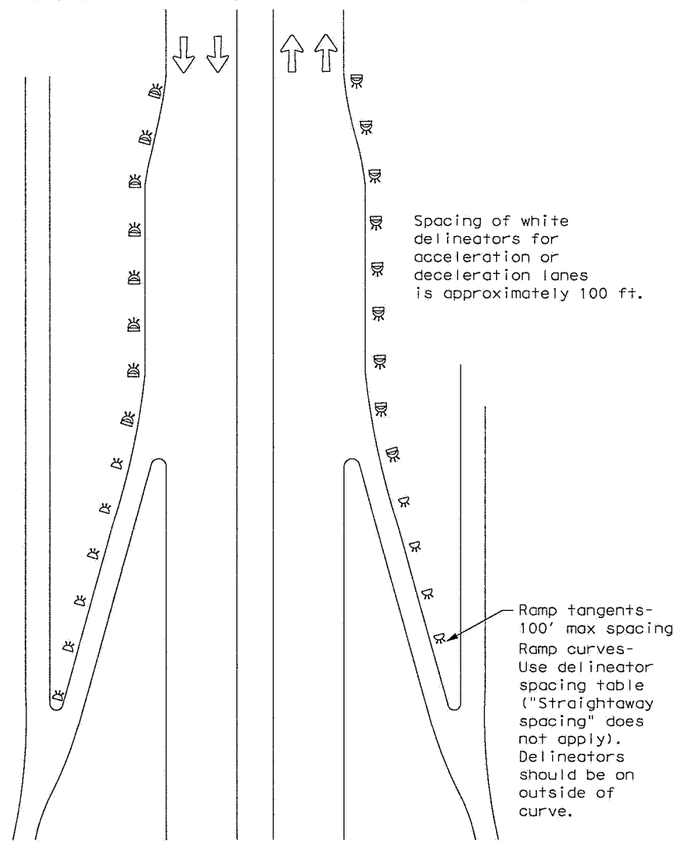
DETAIL 2

FOR CULVERTS WITHOUT MBGF



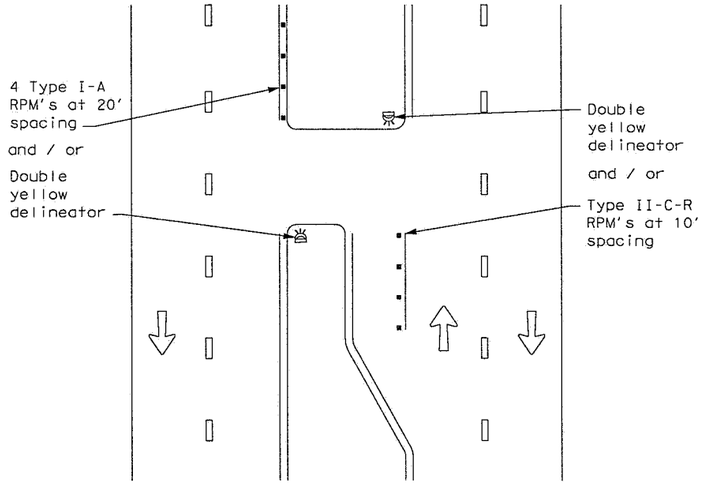
DETAIL 3

FREEWAY DELINEATION FOR RAMPS AND ACCELERATION/DECELERATION LANES



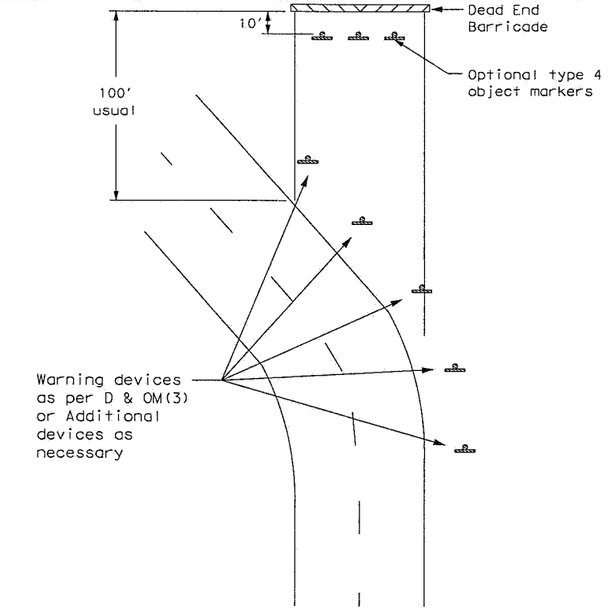
DETAIL 4

CROSSOVERS



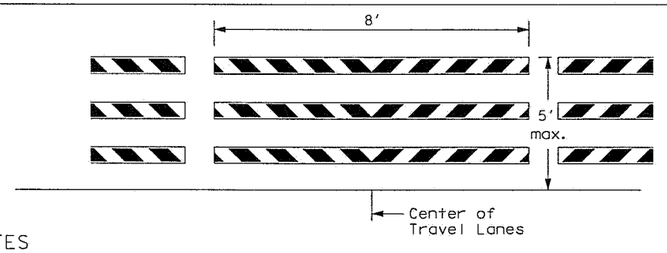
DETAIL 5

TYPICAL APPLICATION OF DEAD END BARRICADE



DETAIL 6

TYPICAL DEAD END BARRICADE INSTALLATION



NOTES

1. Barricade striping shall be red and white reflective sheeting for all permanent road closures.
2. Barricade striping is red and white sloping toward the center of the roadway.
3. Type 3 Barricade Supports should be anchored to soil or pavement as described in compliant Work Zone Traffic Control Devices List, section D.2.f and D.2.g.

DETAIL 7

LEGEND	
	Bidirectional Delineator
	Delineator
	OM-3
	Barricade
	Sign
	OM-2
	Double Delineator

Texas Department of Transportation

Traffic Operations Division Standard

DELINEATOR & OBJECT MARKER PLACEMENT DETAILS

D & OM(4)-15

FILE: dom4-15.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
©TxDOT August 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS 3-15	DIST	COUNTY		SHEET NO.

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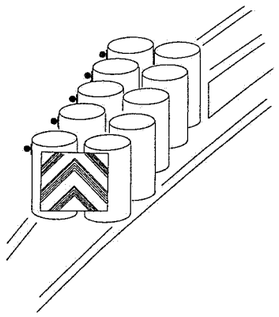
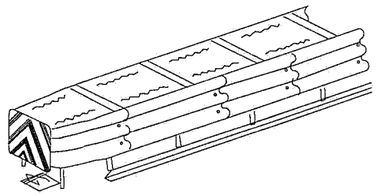
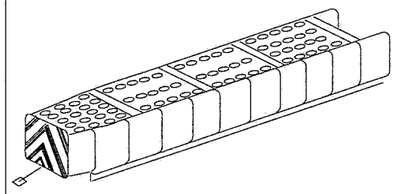
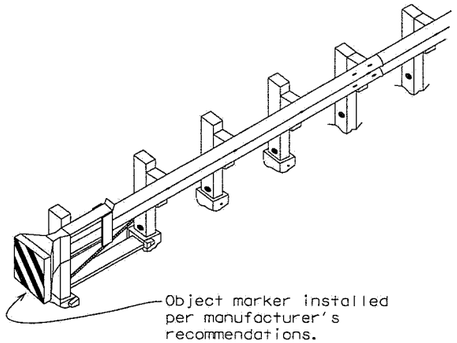
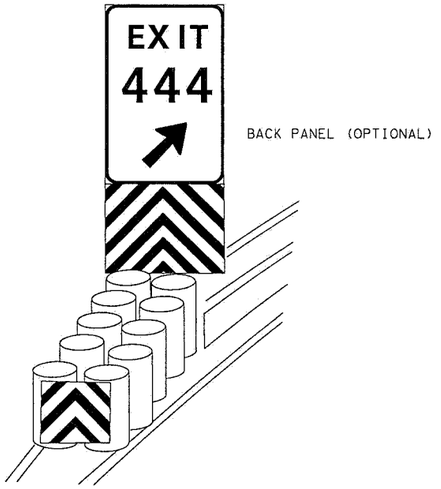
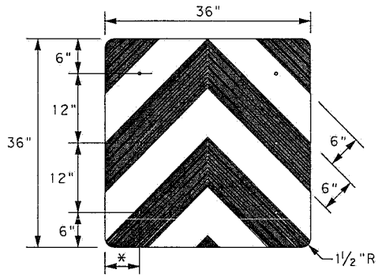


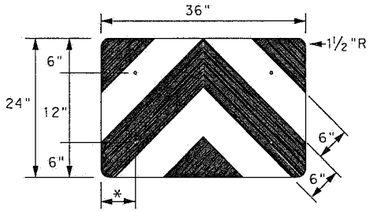




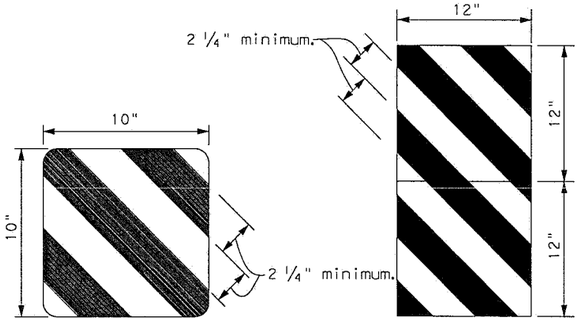




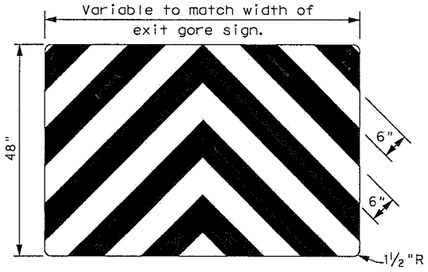


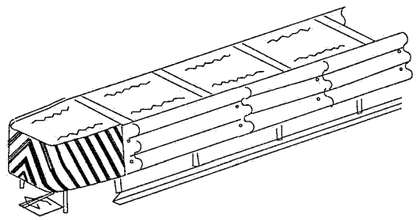


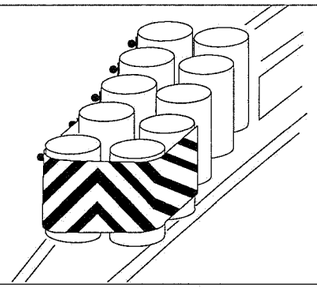
* Adjust to fit attenuator per manufacturer's recommendation, or as directed by the Engineer

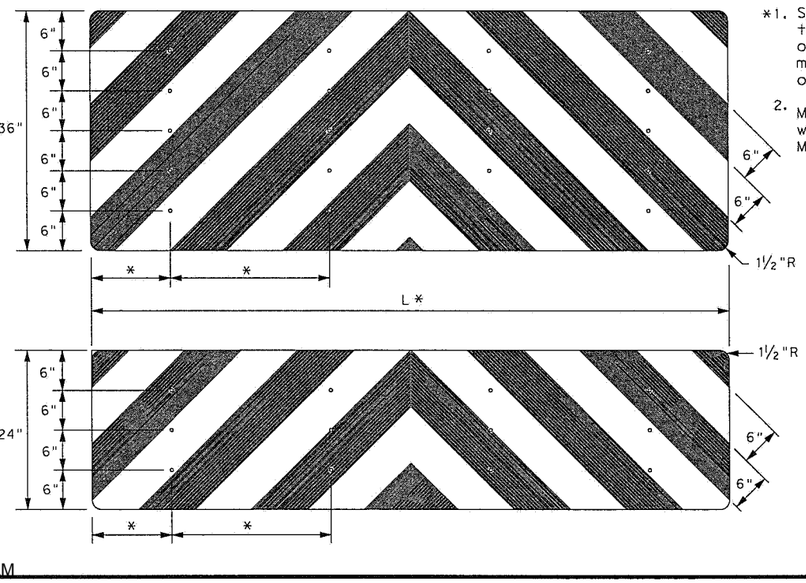


OBJECT MARKERS SMALLER THAN 3 FT^2









NOTES

*1. Spacing should be adjusted to attach through centerline of drum, per attenuator manufacturers recommendation, or as directed by the Engineer.

2. Mounting should be flush with top of attenuator. Minimum size 96" x 24".

NOTES

1. Object Markers shall conform to the Texas MUTCD and meet the color and reflectivity requirement of Department Material Specification DMS 8300. Background shall be yellow reflective sheeting (Type B or C) and Chevron shall be black.

2. Object Markers may be fabricated from adhesive backed reflective sheeting applied directly to guardrail end treatment, or applied directly to an "end cap" as per the manufacturer's recommendation. Direct applied sheeting shall provide a smooth surface and have no wrinkles, air bubbles, cuts or tears. A radius at the corners is not required for direct applied sheeting.

3. Object Marker size may be reduced to fit smaller devices. Width of alternating black and yellow stripes are typically 6". Object Markers smaller than 3ft may have reduced width stripes of a minimum of 2 ¼".

4. Pop rivets, screws, or nuts and bolts may be used to attach object markers and reflectors. Holes, slots or other openings may be cut or drilled through object markers to allow cable or other attachments.

5. Object Marker at nose of attenuator is subsidiary to the attenuator.

6. See D & OM (1-4) for required barrier reflectors.

Texas Department of Transportation

Traffic Operations Division Standard

DELINEATOR & OBJECT MARKER FOR VEHICLE IMPACT ATTENUATORS

D & OM(VIA)-15

FILE: domvia15.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
© TxDOT December 1989	CONT	SECT	JOB	HIGHWAY
REVISIONS				
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8-95 3-15				
4-98				06535
20G				

DATE: 6/26/2017 10:24:44 AM
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cwm

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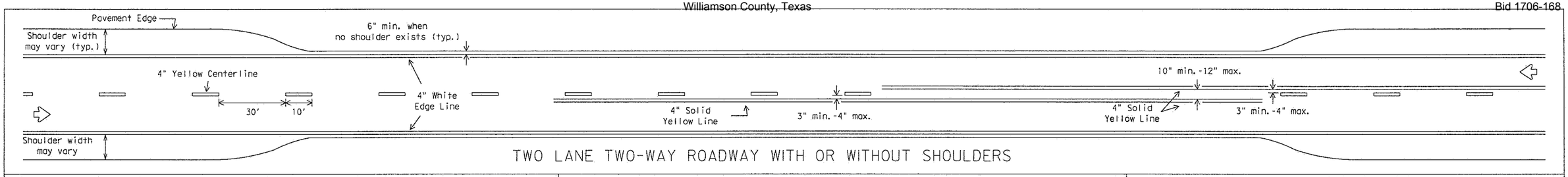
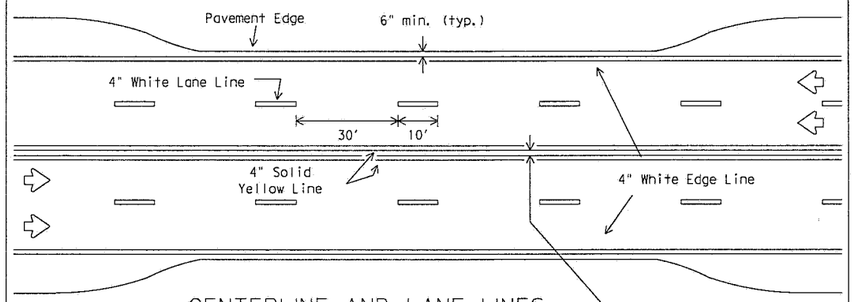
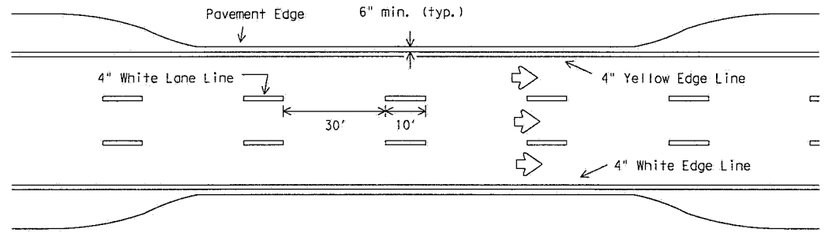


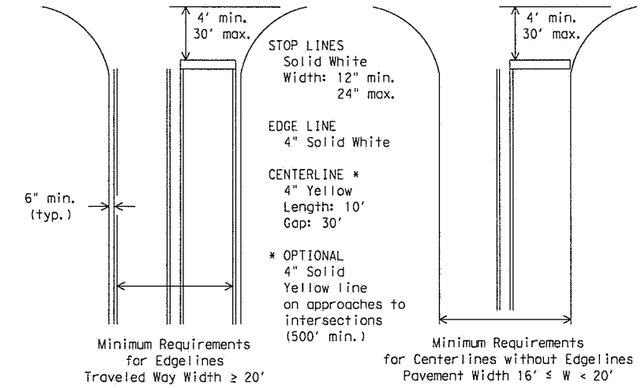
TWO LANE TWO-WAY ROADWAY WITH OR WITHOUT SHOULDERS



CENTERLINE AND LANE LINES FOUR LANE TWO-WAY ROADWAY WITH OR WITHOUT SHOULDERS

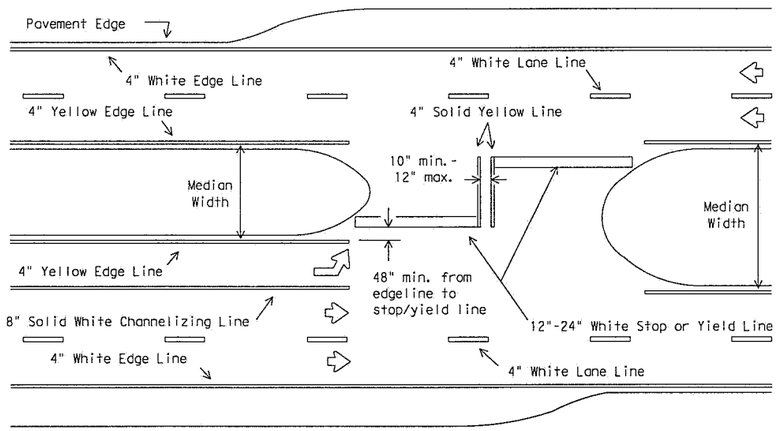


EDGE LINE AND LANE LINES ONE-WAY ROADWAY WITH OR WITHOUT SHOULDERS



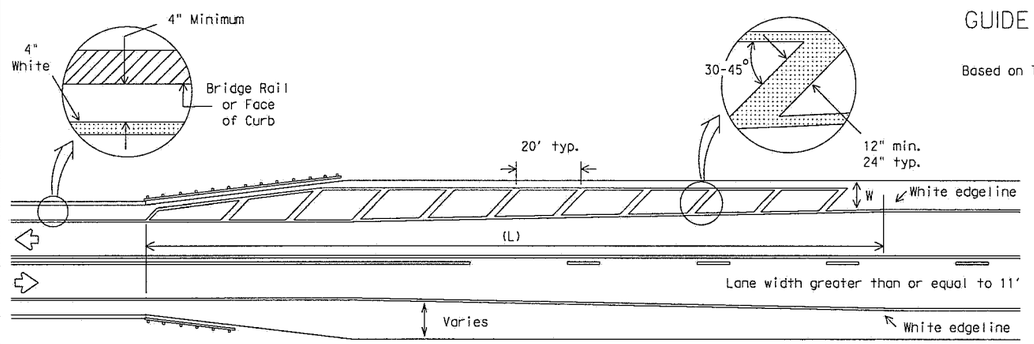
GUIDE FOR PLACEMENT OF STOP LINES, EDGE LINE & CENTERLINE

Based on Traveled Way and Pavement Widths for Undivided Highways



All medians shall be field measured to determine the location of necessary striping. Stop/Yield bars and centerlines shall be placed when the median width is greater than 30 ft. The median width is defined as the area between two roadways of a divided highway measured from edge of traveled way to edge of traveled way. The median excludes turn lanes. The median width might be different between intersections, interchanges and of opposite approaches of the same intersection. The narrow median width will be the controlling width to determine if markings are required.

FOUR LANE DIVIDED ROADWAY INTERSECTIONS



NOTES:

1. No-passing zone on bridge approach is optional but if used, it shall be a minimum 500 feet long.
2. For crosshatching length (L) see Table 1.
3. The width of the offset (W) and the required crosshatching width is the full shoulder width in advance of the bridge.
4. The crosshatching is not required if delineators or barrier reflectors are used along the structure.
5. For guard fence details, refer elsewhere in the plans.

ROADWAYS WITH REDUCED SHOULDER WIDTHS ACROSS BRIDGE OR CULVERT

TABLE 1 - TYPICAL LENGTH (L)

Posted Speed ✕	Formula
≤ 40	$L = \frac{WS^2}{60}$
≥ 45	L=WS

✕ 85th Percentile Speed may be used on roads where traffic speeds normally exceed the posted speed limit. Crosshatching length should be rounded up to nearest 5 foot increment.

L=Length of Crosshatching (FT.) W=Width of Offset (FT.)
S=Posted Speed (MPH)

EXAMPLES:

An 8 foot shoulder in advance of a bridge reduces to 4 feet on a 70 MPH roadway. The length of the crosshatching should be:

$L = 8 \times 70 = 560$ ft.

A 4 foot shoulder in advance of a bridge reduces to 2 feet on a 40 MPH roadway. The length of the crosshatching should be:

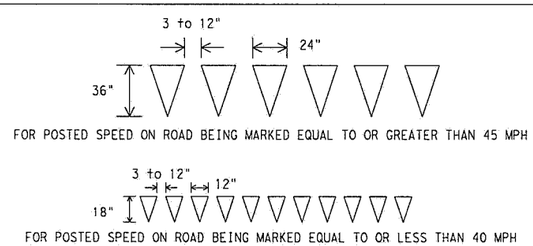
$L = 4(40)^2 / 60 = 106.67$ ft. rounded to 110 ft.

GENERAL NOTES

1. Edgeline striping shall be as shown in the plans or as directed by the Engineer. The edgeline should typically be placed a minimum of 6 inches from the edge of pavement. This distance may vary due to pavement raveling or other conditions. Edgelines are not required in curb and gutter sections of roadways.
2. The traveled way includes only that portion of the roadway used for vehicular travel and not the parking lanes, sidewalks, berms and shoulders. The traveled ways shall be measured from the inside of edgeline to inside of edgeline of a two lane roadway.

MATERIAL SPECIFICATIONS	
PAVEMENT MARKERS (REFLECTORIZED)	DMS-4200
EPOXY AND ADHESIVES	DMS-6100
BITUMINOUS ADHESIVE FOR PAVEMENT MARKERS	DMS-6130
TRAFFIC PAINT	DMS-8200
HOT APPLIED THERMOPLASTIC	DMS-8220
PERMANENT PREFABRICATED PAVEMENT MARKINGS	DMS-8240

All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.



YIELD LINES

Texas Department of Transportation
Traffic Operations Division

TYPICAL STANDARD PAVEMENT MARKINGS

PM(1)-12

©TxDOT November 1978	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
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5-00				
8-00	DIST	COUNTY		SHEET NO.
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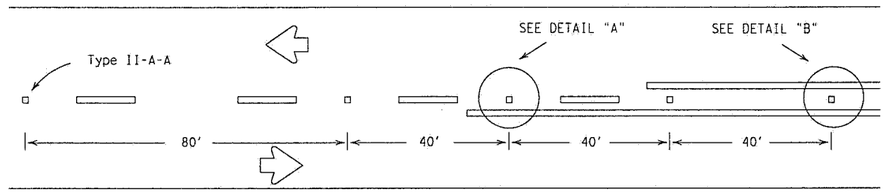
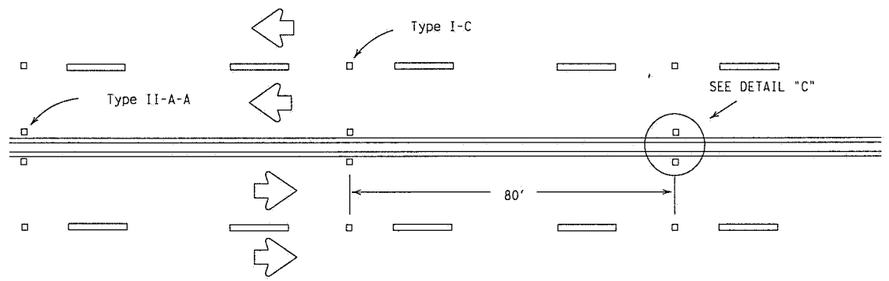
REFLECTIVE RAISED PAVEMENT MARKERS FOR VEHICLE POSITIONING GUIDANCE

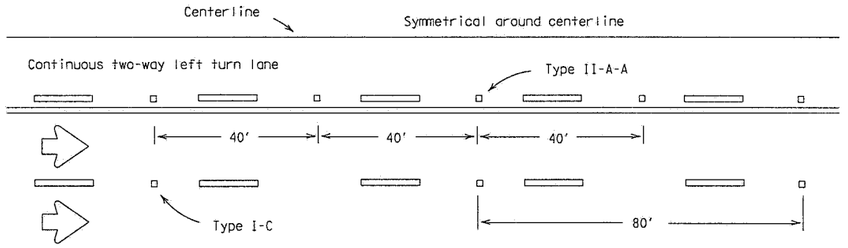


CENTERLINE FOR ALL TWO LANE ROADWAYS

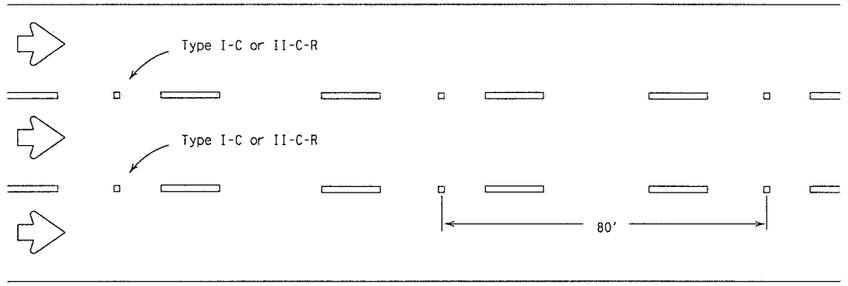


CENTERLINE & LANE LINES FOR FOUR LANE TWO-WAY HIGHWAYS

Raised pavement marker Type I-C, clear face toward normal traffic, shall be placed on 80-foot centers.

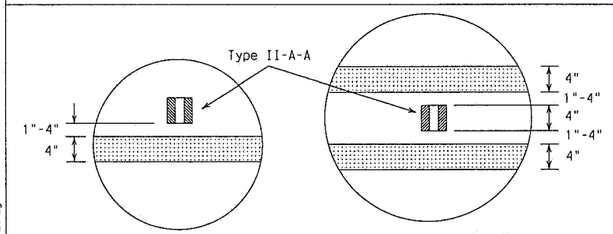


CENTERLINE AND LANE LINES FOR TWO-WAY LEFT TURN LANE

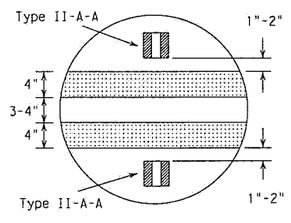


LANE LINES FOR ONE-WAY ROADWAY (NON-FREEWAY FACILITIES)

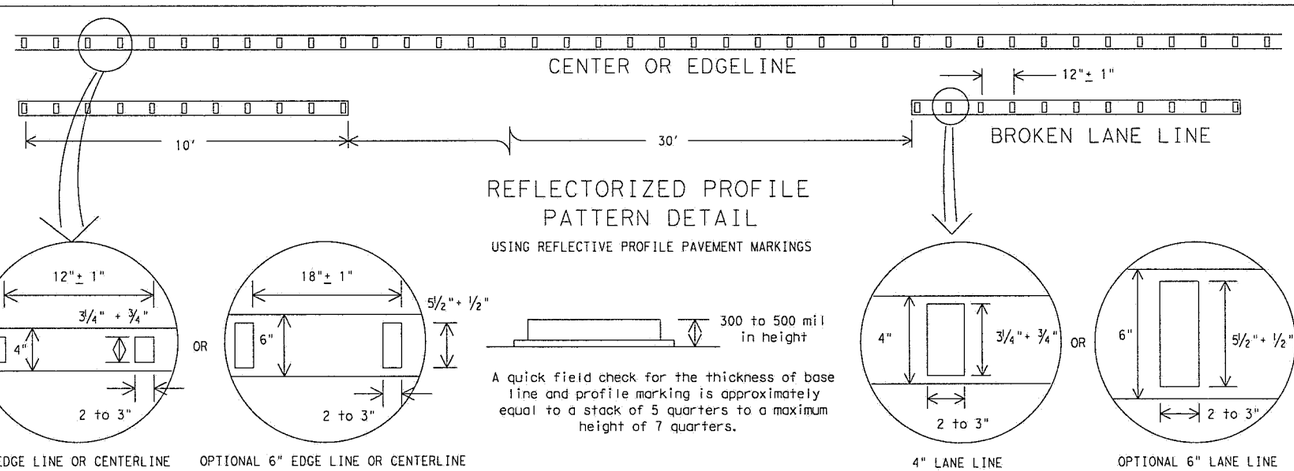
Raised pavement markers Type II-C-R shall have clear face toward normal traffic and red face toward wrong-way traffic.



DETAIL "A" DETAIL "B"



DETAIL "C"



4" EDGE LINE OR CENTERLINE | OPTIONAL 6" EDGE LINE OR CENTERLINE | 4" LANE LINE | OPTIONAL 6" LANE LINE

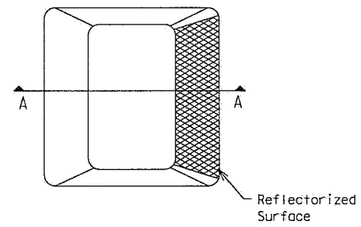
NOTE:
Profile markings shall not be placed on roadways with a posted speed limit of 45 MPH or less.

GENERAL NOTES

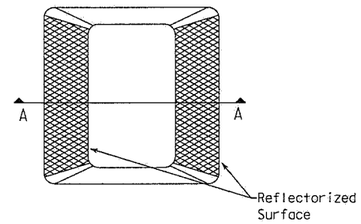
1. All raised pavement markers placed in broken lines shall be placed in line with and midway between the stripes.
2. On concrete pavements the raised pavement markers should be placed to one side of the longitudinal joints.

MATERIAL SPECIFICATIONS	
PAVEMENT MARKERS (REFLECTORIZED)	DMS-4200
EPOXY AND ADHESIVES	DMS-6100
BITUMINOUS ADHESIVE FOR PAVEMENT MARKERS	DMS-6130
TRAFFIC PAINT	DMS-8200
HOT APPLIED THERMOPLASTIC	DMS-8220
PERMANENT PREFABRICATED PAVEMENT MARKINGS	DMS-8240

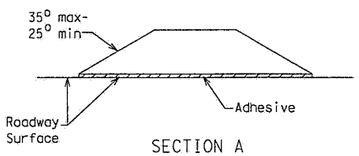
All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.



Type I (Top View)



Type II (Top View)



SECTION A

RAISED PAVEMENT MARKERS

Texas Department of Transportation
Traffic Operations Division

POSITION GUIDANCE USING RAISED MARKERS
REFLECTORIZED PROFILE MARKINGS

PM(2)-12

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CONT	SECT	JOB	HIGHWAY
DIST	COUNTY		SHEET NO.

REVISIONS
4-92 2-10
5-00 2-12
8-00
2-08

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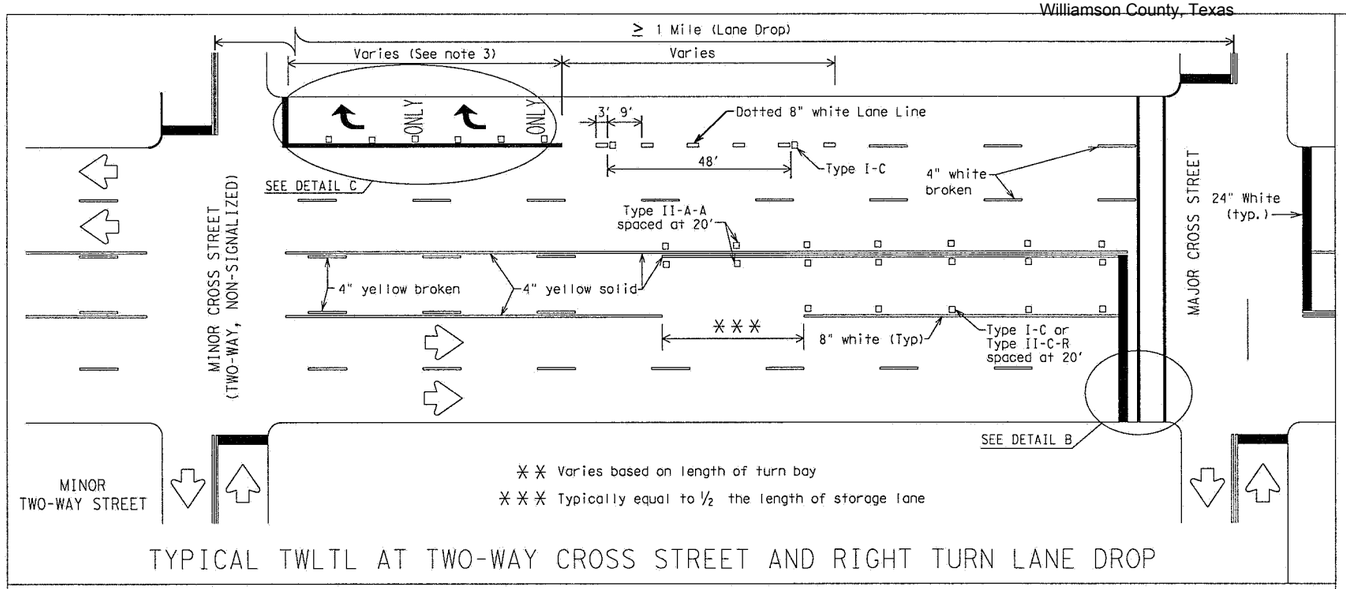
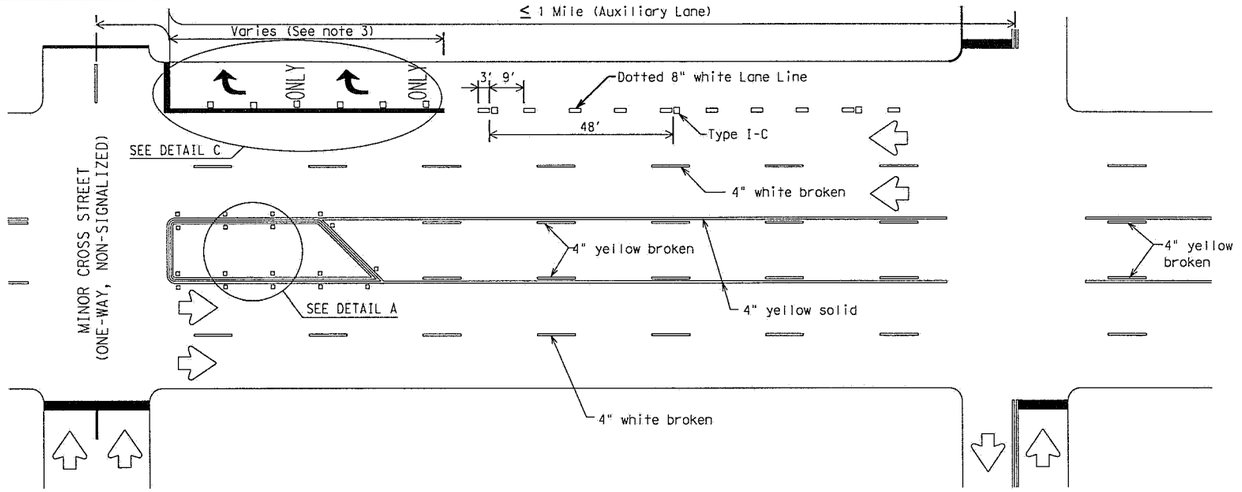
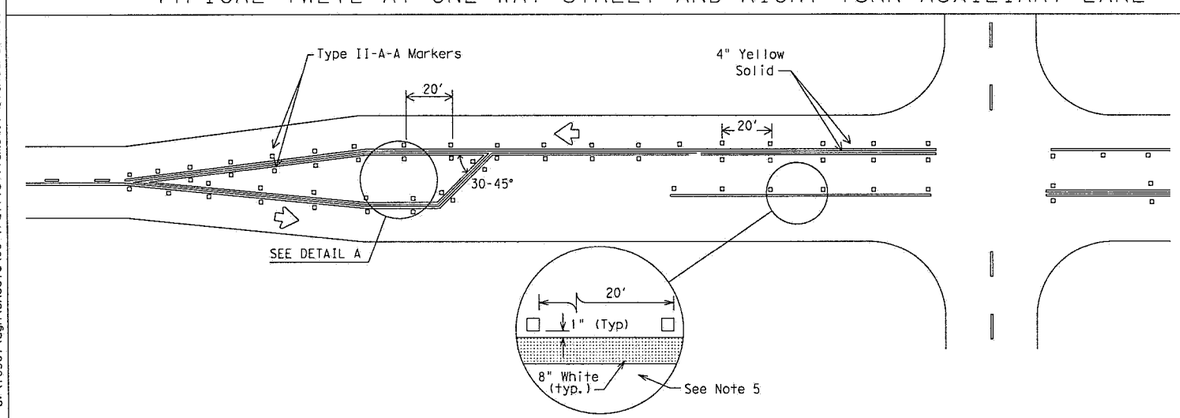


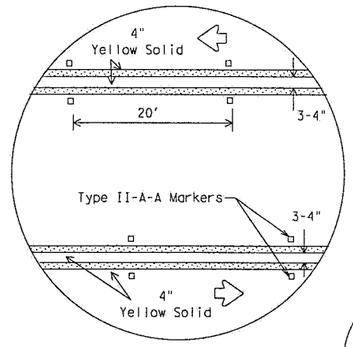
TYPICAL TWLTL AT TWO-WAY CROSS STREET AND RIGHT TURN LANE DROP



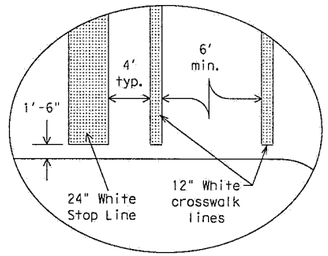
TYPICAL TWLTL AT ONE-WAY STREET AND RIGHT TURN AUXILIARY LANE



TYPICAL TWO-LANE HIGHWAY INTERSECTION WITH LEFT TURN BAYS

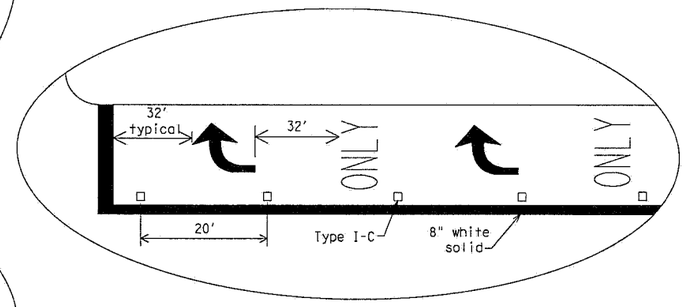


DETAIL A



Final placement of Stop Bar and Crosswalk shall be approved by the Engineer in the field.

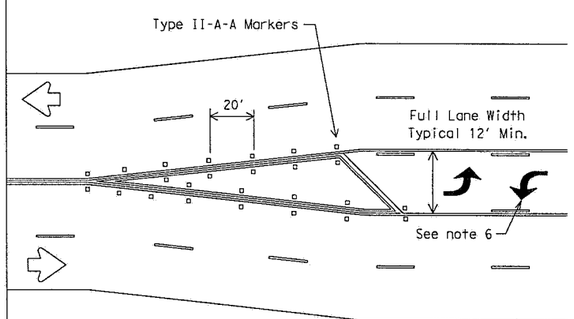
DETAIL B



DETAIL C

MATERIAL SPECIFICATIONS	
PAVEMENT MARKERS (REFLECTORIZED)	DMS-4200
EPOXY AND ADHESIVES	DMS-6100
BITUMINOUS ADHESIVE FOR PAVEMENT MARKERS	DMS-6130
TRAFFIC PAINT	DMS-8200
HOT APPLIED THERMOPLASTIC	DMS-8220
PERMANENT PREFABRICATED PAVEMENT MARKINGS	DMS-8240

All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.



TYPICAL TRANSITION FOR TWLTL AND DIVIDED HIGHWAY

GENERAL NOTES

1. Refer elsewhere in plans for additional RPM placement and details.
2. Lane use word and arrow markings shall be used where through lanes approaching an intersection become mandatory turn lanes. Lane use word and arrow markings should be used in auxiliary lanes of substantial length. Lane use arrow markings or word and arrow markings may be used in other lanes and turn bays for emphasis. Details for words and arrows as shown in the Standard Highway Sign Designs for Texas.
3. When lane used word and arrow markings are used, two sets of arrows should be used if the length of the bay is greater than 180 feet. When a single lane use arrow or word and arrow marking is used for a short turn lane, it should be located at or near the upstream end of the full-width turn lane.
4. Other crosswalk paterns as shown in the "Texas Manual on Uniform Traffic Control Devices" may be used.
5. Raised pavement marker Type I-C with undivided highways, flush medians and two way left turn lanes. Raised pavement marker Type II-C-R with divided highways and raised medians.
6. A two-way left-turn (TWLT) lane-use arrow pavement marking should be used at or just downstream from the beginning of a two-way left-turn lane within a corridor. Repeating the marking after each intersection or dedicated turn bay is not required unless stated elsewhere in the plans.

Texas Department of Transportation
Traffic Operations Division

PAVEMENT MARKINGS FOR TWO-WAY LEFT TURN LANES DIVIDED HIGHWAYS AND RURAL LEFT TURN BAYS

PM(3)-12

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DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
REVISIONS	CONT	SECT	JOB	HIGHWAY
5-00 2-12				
8-00				
3-03	DIST	COUNTY		SHEET NO.
2-10				65538

22C

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SIGN SUPPORT DESCRIPTIVE CODES

(Descriptive Codes correspond to project estimate and quantities sheets)

SM RD SGN ASSM TY XXXXX(X)XX(X-XXXX)

Post Type
- FRP = Fiberglass Reinforced Plastic Pipe (see SMD(FRP))
- TWT = Thin-Walled Tubing (see SMD(TWT))
- 10BWG = 10 BWG Tubing (see SMD(SLIP-1) to (SLIP-3))
- S80 = Schedule 80 Pipe (see SMD(SLIP-1) to (SLIP-3))

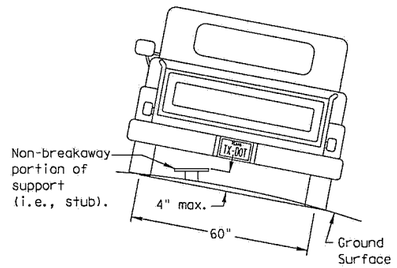
Number of Posts (1 or 2)

Anchor Type
- UA = Universal Anchor - Concreted (see SMD(FRP) and (TWT))
- UB = Universal Anchor - Bolted down (see SMD(FRP) and (TWT))
- WS = Wedge Anchor Steel - (see SMD(TWT))
- WP = Wedge Anchor Plastic (see SMD(TWT))
- SA = Slipbase - Concreted (see SMD(SLIP-1) to (SLIP-3))
- SB = Slipbase - Bolted Down (see SMD(SLIP-1) to (SLIP-3))

Sign Mounting Designation
- P = Prefab. "Plain" (see SMD(SLIP-1) to (SLIP-3), (TWT), (FRP))
- T = Prefab. "T" (see SMD(SLIP-1) to (SLIP-3), (TWT))
- U = Prefab. "U" (see SMD(SLIP-1) to (SLIP-3))

IF REQUIRED
- 1EXT or 2EXT = Number of Extensions (see SMD(SLIP-1) to (SLIP-3), (TWT))
- BM = Extruded Wind Beam (see SMD(SLIP-1) to (SLIP-3))
- WC = 1.12 #/ft Wing Channel (see SMD(SLIP-1) to (SLIP-3))
- EXAL = Extruded Aluminum Sign Panels (see SMD(SLIP-3))

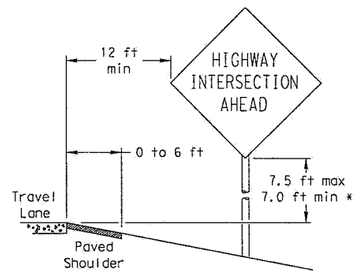
REQUIRED CLEARANCE FOR BREAKAWAY SUPPORT



To avoid vehicle undercarriage snagging, any substantial remains of a breakaway support, when it is broken away, should not project more than 4 inches above a 60-inch chord (i.e., typical space between wheel paths).

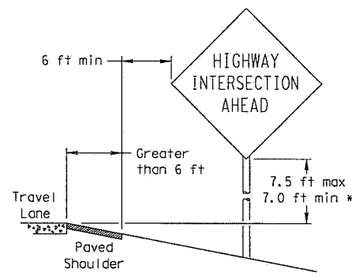
SIGN LOCATION

PAVED SHOULDERS



LESS THAN 6 FT. WIDE

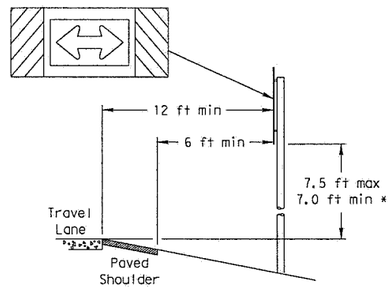
When the shoulder is 6 ft. or less in width, the sign must be placed at least 12 ft. from the edge of the travel lane.



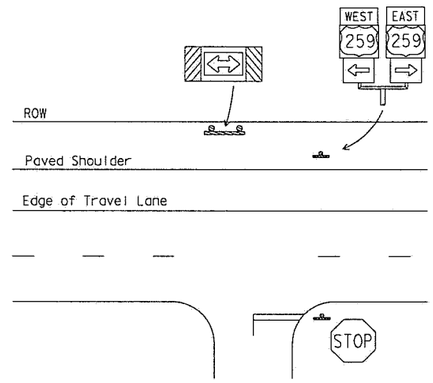
GREATER THAN 6 FT. WIDE

When the shoulder is greater than 6 ft in width, the sign must be placed at least 6 ft. from the edge of the shoulder.

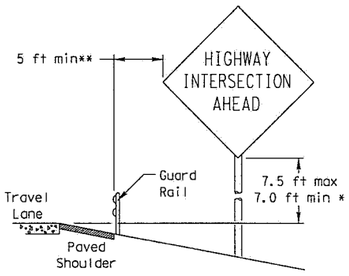
T-INTERSECTION



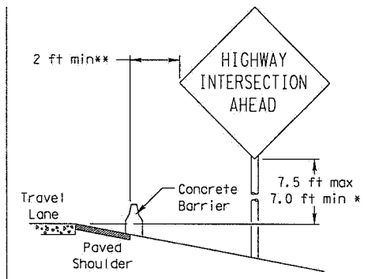
When this sign is needed at the end of a two-lane, two way roadway, the right edge of the sign should be in line with the centerline of the roadway. Place as close to ROW as practical.



BEHIND BARRIER



BEHIND GUARDRAIL



BEHIND CONCRETE BARRIER

**Sign clearance based on distance required for proper guard rail or concrete barrier performance.

* Signs shall be mounted using the following condition that results in the greatest sign elevation:

(1) a minimum of 7 to a maximum of 7.5 feet above the edge of the travel lane or

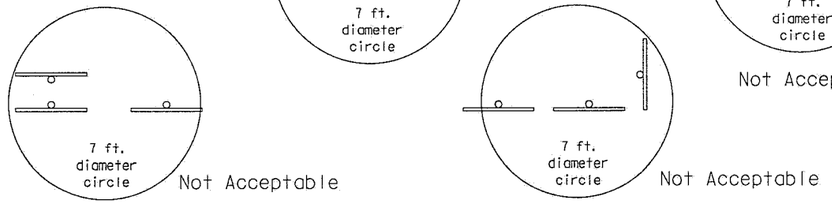
(2) a minimum of 7 to a maximum of 7.5 feet above the grade at the base of the support when sign is installed on the backslope.

The maximum values may be increased when directed by the Engineer.

See the Traffic Operations Division website for detailed drawings of sign clamps, Triangular Slipbase System components and Wedge Anchor System components.

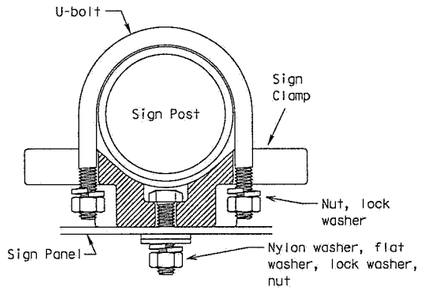
The website address is:
http://www.txdot.gov/publications/traffic.htm

No more than 2 sign posts should be located within a 7 ft. circle.



TYPICAL SIGN ATTACHMENT DETAIL

Single Signs

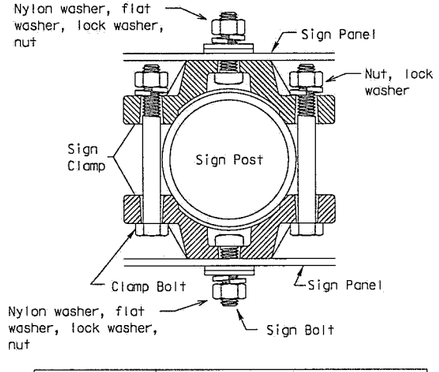


Bolts used to mount sign panels to the clamp are 5/16-18 UNC galvanized square head with nut, nylon washer, flat washer and lock washer. The bolt length is 1 inch for aluminum.

When two sign clamps are used to mount signs back-to-back, use a 5/16-18 UNC galvanized hex head per ASTM A307 with nut and helical-spring lock washer. The approximate bolt lengths for various post sizes and sign clamp types are given in the table at right. The bolt length may need to be adjusted depending upon field conditions.

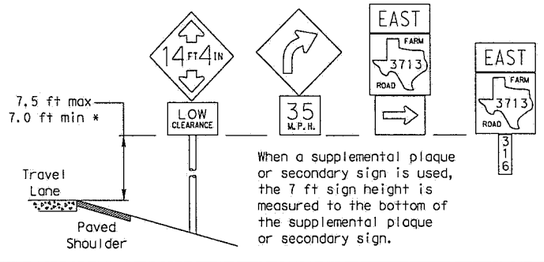
Sign clamps may be either the specific size clamp or the universal clamp.

Back-to-Back Signs



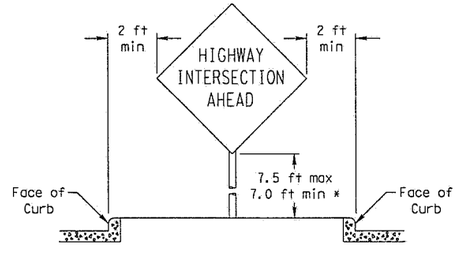
Pipe Diameter	Approximate Bolt Length	
	Specific Clamp	Universal Clamp
2" nominal	3"	3 or 3 1/2"
2 1/2" nominal	3 or 3 1/2"	3 1/2 or 4"
3" nominal	3 1/2 or 4"	4 1/2"

SIGNS WITH PLAQUES



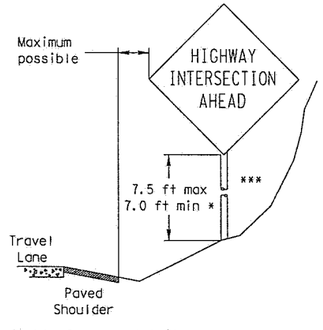
When a supplemental plaque or secondary sign is used, the 7 ft sign height is measured to the bottom of the supplemental plaque or secondary sign.

CURB & GUTTER OR RAISED ISLAND



RESTRICTED RIGHT-OF-WAY

(When 6 ft min. is not possible.)



Right-of-way restrictions may be created by rocks, water, vegetation, forest, buildings, a narrow island, or other factors.

In situations where a lateral restriction prevents the minimum horizontal clearance from the edge of the travel lane, signs should be placed as far from the travel lane as practical.

*** Post may be shorter if protected by guardrail or if Engineer determines the post could not be hit due to extreme slope.

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS GENERAL NOTES & DETAILS

SMD(GEN)-08

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9-08 REVISIONS	CONT	SECT	JOB	HIGHWAY
	DIST	COUNTY		SHEET NO.
264				p.539

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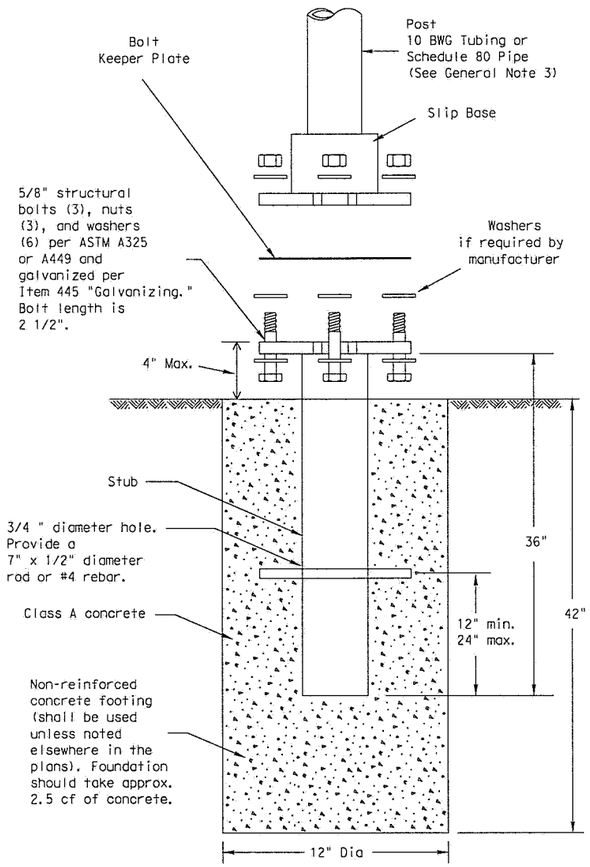
TRIANGULAR SLIPBASE INSTALLATION GENERAL REQUIREMENTS



SM RD SGN ASSM TY XXXXX(X)SA(X-XXXX)

NOTE

There are various devices approved for the Triangular Slipbase System. Please reference the Material Producer List for approved slip base systems. http://www.txdot.gov/business/producer_list.htm The devices shall be installed per manufacturers' recommendations. Installation procedures shall be provided to the Engineer by Contractor.

GENERAL NOTES:

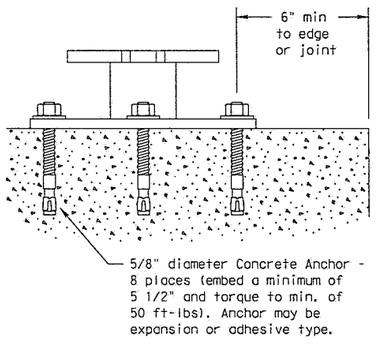
1. Slip base shall be permanently marked to indicate manufacturer. Method, design, and location of marking are subject to approval of the TxDOT Traffic Standards Engineer.
2. Material used as post with this system shall conform to the following specifications:
   10 BWG Tubing (2.875" outside diameter)
   0.134" nominal wall thickness
   Seamless or electric-resistance welded steel tubing or pipe
   Steel shall be HSLAS Gr 55 per ASTM A1011 or ASTM A1008
   Other steels may be used if they meet the following:
   55,000 PSI minimum yield strength
   70,000 PSI minimum tensile strength
   20% minimum elongation in 2"
   Wall thickness (uncoated) shall be within the range of 0.122" to 0.138"
   Outside diameter (uncoated) shall be within the range of 2.867" to 2.883"
   Galvanization per ASTM A123 or ASTM A653 G210. For precoated steel tubing (ASTM A653), recoat tube outside diameter weld seam by metallizing with zinc wire per ASTM B833.
   Schedule 80 Pipe (2.875" outside diameter)
   0.276" nominal wall thickness
   Steel tubing per ASTM A500 Gr C
   Other seamless or electric-resistance welded steel tubing or pipe with equivalent outside diameter and wall thickness may be used if they meet the following:
   46,000 PSI minimum yield strength
   62,000 PSI minimum tensile strength
   21% minimum elongation in 2"
   Wall thickness (uncoated) shall be within the range of 0.248" to 0.304"
   Outside diameter (uncoated) shall be within the range of 2.855" to 2.895"
   Galvanization per ASTM A123
3. See the Traffic Operations Division website for detailed drawings of sign clamps and Texas Universal Triangular Slipbase System components. The website address is: http://www.txdot.gov/publications/traffic.htm
4. Sign supports shall not be spliced except where shown. Sign support posts shall not be spliced.

ASSEMBLY PROCEDURE

Foundation
1. Prepare 12-inch diameter by 42-inch deep hole. If solid rock is encountered, the depth of the foundation may be reduced such that it is embedded a minimum of 18 inches into the solid rock.
2. The Engineer may permit batches of concrete less than 2 cubic yards to be mixed with a portable, motor-driven concrete mixer. For small placements less than 0.5 cubic yards, hand mixing in a suitable container may be allowed by Engineer. Concrete shall be Class A.
3. Push the pipe end of the slip base stub into the center of the concrete. Rotate the stub back and forth while pushing it down into the concrete to assure good contact between the concrete and stub. Continue to work the stub into the concrete until it is between 2 to 4 inches above the ground.
4. Plumb the stub. Allow a minimum of 4 days to set, unless otherwise directed by the Engineer.
5. The triangular slipbase system is multidirectional and is designed to release when struck from any direction.

Support
1. Cut support so that the bottom of the sign will be 7 to 7.5 feet above the edge of the travelway (i.e., edge of the closest lane) when slip plate is below the edge of pavement or 7 to 7.5 feet above slip plate when the slip plate is above the edge of the travelway. The cut shall be plumb and straight.
2. Attach sign to support using connections shown. When multiple signs are installed on the same support, ensure the minimum clearance between each sign is maintained. See SMD(SLIP-2) for clearances based on sign types.

CONCRETE ANCHOR



SM RD SGN ASSM TY XXXXX(X)SB(X-XXXX)

Concrete anchor consists of 5/8" diameter stud bolt with UNC series bolt threads on the upper end. Heavy hex nut per ASTM A563, and hardened washer per ASTM F436. The stud bolt shall have a minimum yield and ultimate tensile strength of 50 and 75 KSI, respectively. Nuts, bolts and washers shall be galvanized per Item 445, "Galvanizing." Adhesive type anchors shall have stud bolts installed with Type III epoxy per DMS-6100, "Epoxies and Adhesives." Adhesive anchors may be loaded after adequate epoxy cure time per the manufacturer's recommendations. Top of bolt shall extend at least flush with top of the nut when installed. The anchor, when installed in 4000 psi normal-weight concrete with a 5 1/2" minimum embedment, shall have a minimum allowable tension and shear of 3900 and 3100 psi, respectively.

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS TRIANGULAR SLIPBASE SYSTEM

SMD(SLIP-1)-08

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REVISIONS	CONT	SECT	JOB	HIGHWAY
9-08				
	DIST	COUNTY		SHEET NO.
				p.7540

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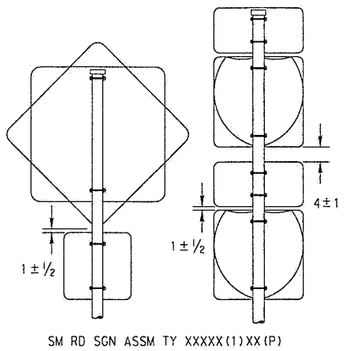

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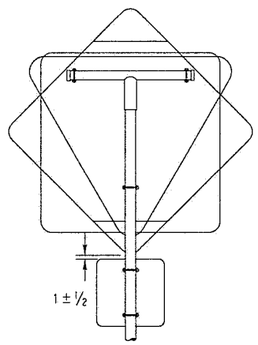

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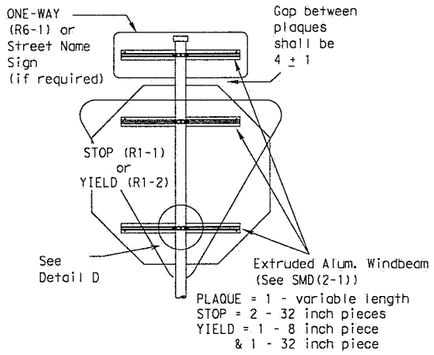
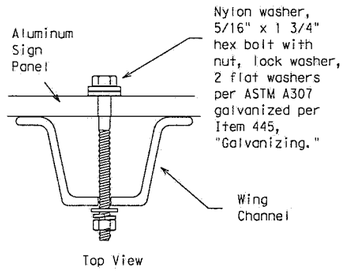
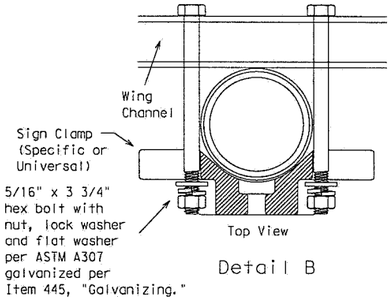


Detail A



Detail B



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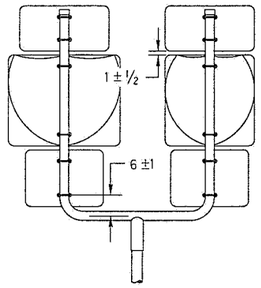

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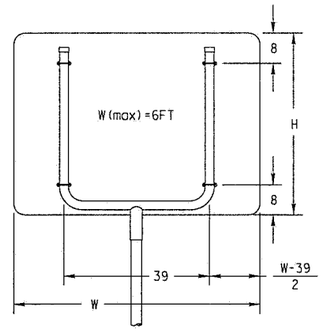
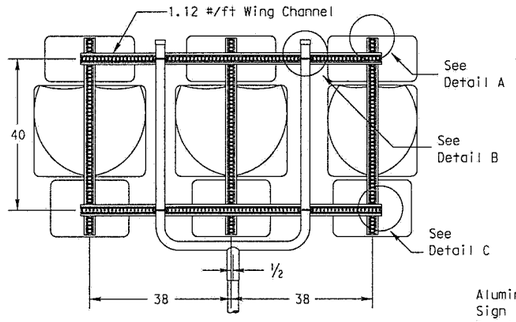


SM RD SGN ASSM TY XXXXX(1)XX(U-WC)
(See Note 11)



Drill 7/16" hole (through) after assembly and install bolt, nut, 2 flat washers and lock washer.
3/8" x 3 1/2" heavy hex bolt with nut, lock washer and 2 flat washers per ASTM A307 galvanized per Item 445 "Galvanizing."
1 1/2"
Extender
U-Bracket

Detail F

Splices shall only be allowed behind the sign substrate.

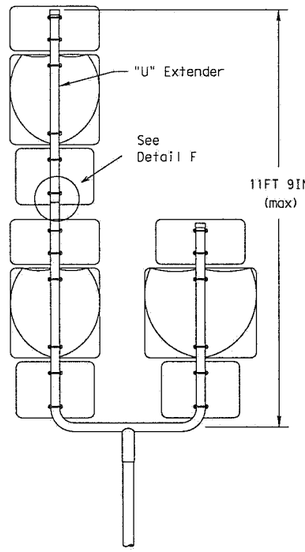
GENERAL NOTES:

1.

SIGN SUPPORT	# OF POSTS	MAX. SIGN AREA
10 BWG	1	16 SF
10 BWG	2	32 SF
Sch 80	1	32 SF
Sch 80	2	64 SF

2. The Engineer may require that a Schedule 80 post be used in place of a 10 BWG where a sign height is abnormally high due to a fill slope.
3. Sign supports shall not be spliced except where shown. Sign support posts shall not be spliced.
4. Aluminum sign blanks shall conform to Departmental Material Specifications DMS-7110 and shall have the following minimum thicknesses: 0.080 for signs less than 7.5 sq. ft., 0.100 for signs 7.5 to 15 sq. ft., and 0.125 for signs greater than 15 sq. ft.
5. Signs that require specific supports due to reasons in addition to windloading are indicated on the "REQUIRED SUPPORT" table on this sheet.
6. For horizontal rectangular signs fabricated from flat aluminum, T-brackets are used for signs 24 inches or less in height. U-brackets are used for signs of greater height.
7. When two triangular slipbase supports are used to support a single sign, they shall not be "rigidly" connected to each other except through the sign panel. This will allow each support to act independently when impacted by an errant vehicle.
8. Wing channel shall meet ASTM A 1011 SS Gr 50 and be galvanized per ASTM A 123.
9. Excess pipe, wing channel, or windbeam shall be cut off so that it does not extend beyond the sign panel (i.e., excess support shall not be visible when the sign is viewed from the front.) Repair galvanized coating at cut support ends per Item 445, "Galvanizing."
10. Additional route markers may be added vertically, provided the total sign area does not exceed the maximum allowable amount per Note 1.
11. Additional sign clamp required on the "T-bracket" post for 24 inch height signs. Place the clamp 3 inches above bottom of sign when possible.
12. Post open ends shall be fitted with Friction Caps.
13. Sign blanks shall be the sizes and shapes shown on the plans.

SM RD SGN ASSM TY S80(1)XX(U-1EXT)



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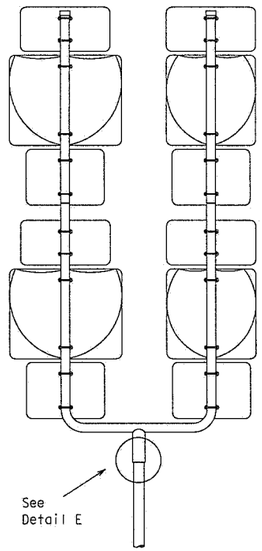

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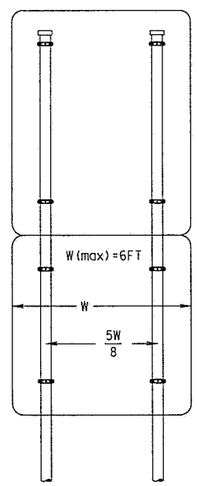
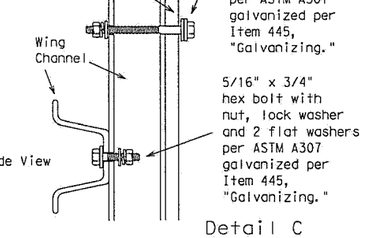


SIDE VIEW



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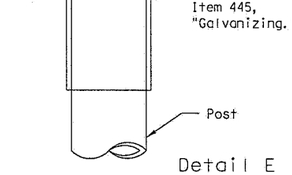

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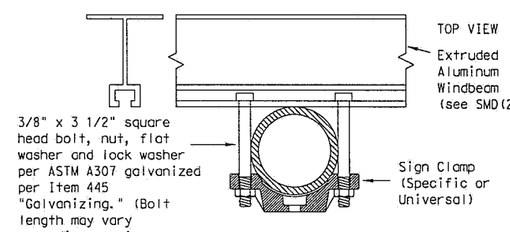

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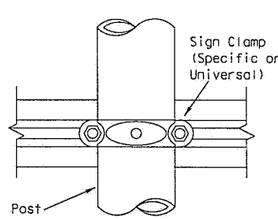
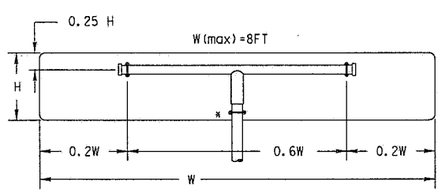


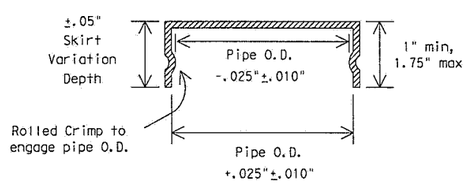
REQUIRED SUPPORT		
	SIGN DESCRIPTION	SUPPORT
Regulatory	48-inch STOP sign (R1-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	60-inch YIELD sign (R1-2)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	48x16-inch ONE-WAY sign (R6-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	36x48, 48x36, and 48x48-inch signs	TY 10BWG(1)XX(T)
	48x60-inch signs	TY S80(1)XX(T)
Warning	48x48-inch signs (diamond or square)	TY 10BWG(1)XX(T)
	48x60-inch signs	TY S80(1)XX(T)
	48-inch Advance School X-ing sign (S1-1)	TY 10BWG(1)XX(T)
	48-inch School X-ing sign (S2-1)	TY 10BWG(1)XX(T)
	Large Arrow sign (W1-6 & W1-7)	TY 10BWG(1)XX(T)

SM RD SGN ASSM TY XXXXX(1)XX(T)
(* - See Note 12)



All dimensions are in english unless detailed otherwise.

FRICTION CAP DETAIL



Friction caps may be manufactured from hot rolled or cold rolled steel sheets. The minimum sheet metal thickness shall be 24 gauge for all cap sizes.

The rim edges shall be reasonably straight and smooth. Caps shall be sized and formed in such a manner as to produce a drive-on friction fit and have no tendency to rock when seated on the pipe. The depth shall be sufficient to give positive protection against entrance of rainwater. They shall be free of sharp creases or indentations and show no evidence of metal fracture.

Caps shall have an electrodeposited coating of zinc in accordance with the requirements of ASTM B633 Class FE/ZN 8.

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS TRIANGULAR SLIPBASE SYSTEM

SMD(SLIP-2)-08

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9-08 REVISIONS	CONT	SECT	JOB	HIGHWAY
	DIST	COUNTY		SHEET NO.
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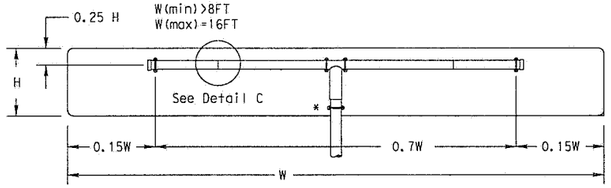
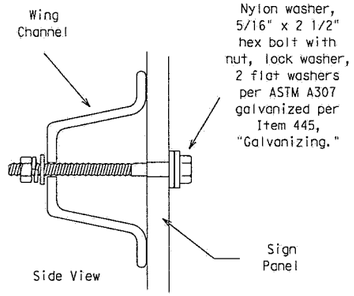
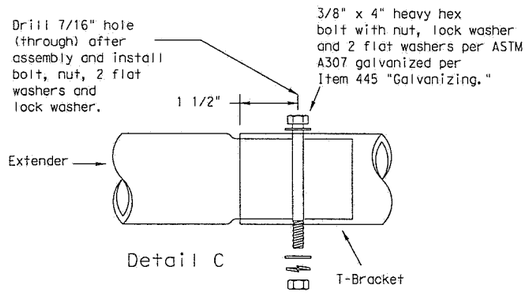


SM RD SGN ASSM TY XXXXX(1)XX(T-2EXT)
(* - See Note 12)



Detail B



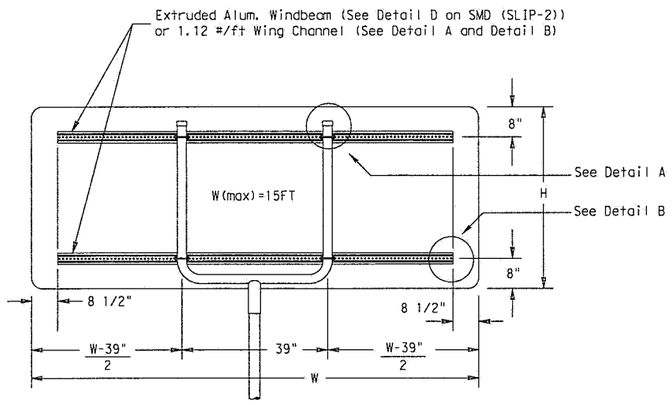
Detail C

Splices shall only be allowed behind the sign substrate.

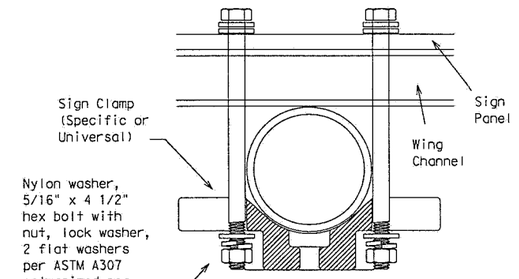
GENERAL NOTES:

SIGN SUPPORT	# OF POSTS	MAX. SIGN AREA
10 BWG	1	16 SF
10 BWG	2	32 SF
Sch 80	1	32 SF
Sch 80	2	64 SF

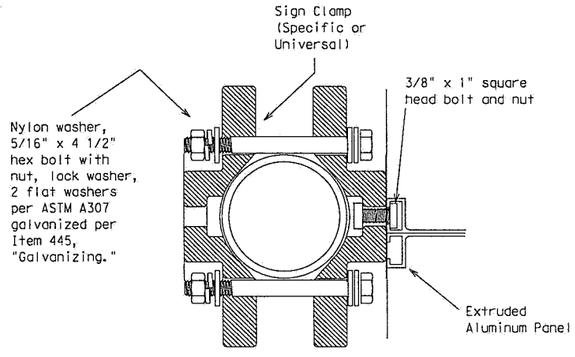
1. See table above.
2. The Engineer may require that a Schedule 80 post be used in place of a 10 BWG where a sign height is abnormally high due to a fill slope.
3. Sign supports shall not be spliced except where shown. Sign support posts shall not be spliced.
4. Aluminum sign blanks shall conform to Departmental Material Specifications DMS-7110 and shall have the following minimum thicknesses: 0.080 for signs less than 7.5 sq. ft., 0.100 for signs 7.5 to 15 sq. ft., and 0.125 for signs greater than 15 sq. ft.
5. Signs that require specific supports due to reasons in addition to windloading are indicated on the "REQUIRED SUPPORT" table on this sheet.
6. For horizontal rectangular signs fabricated from flat aluminum, T-brackets are used for signs 24 inches or less in height. U-brackets are used for signs of greater height.
7. When two triangular slipbase supports are used to support a single sign, they shall not be "rigidly" connected to each other except through the sign panel. This will allow each support to act independently when impacted by an errant vehicle.
8. Wing channel shall meet ASTM A 1011 SS Gr 50 and be galvanized per ASTM A 123.
9. Excess pipe, wing channel, or windbeam shall be cut off so that it does not extend beyond the sign panel (i.e., excess support shall not be visible when the sign is viewed from the front.) Repair galvanized coating at cut support ends per Item 445, "Galvanizing."
10. Sign blanks shall be the sizes and shapes shown on the plans.
11. Additional sign clamp required on the "T-bracket" post for 24 inch high signs. Place the clamp 3 inches above bottom of sign when possible.
12. Post open ends shall be fitted with Friction Caps.



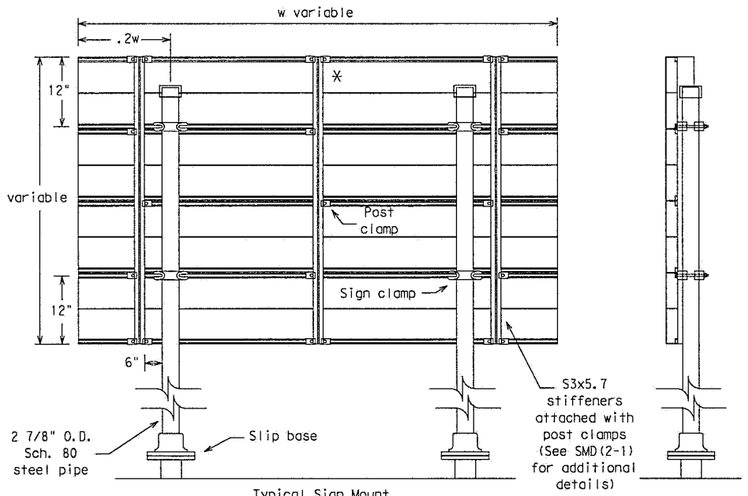
SM RD SGN ASSM TY XXXXX(1)XX(U-XX)



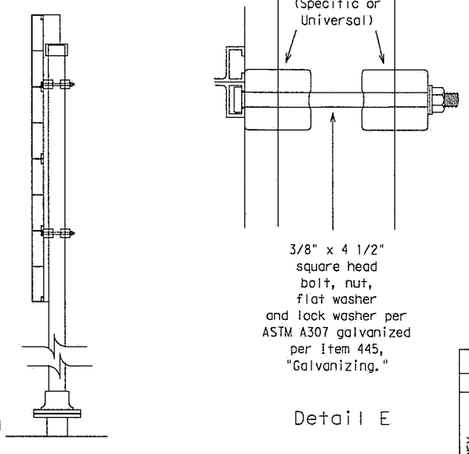
Detail A

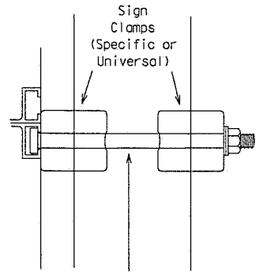


Detail D
EXTRUDED ALUMINUM SIGN WITH T BRACKET

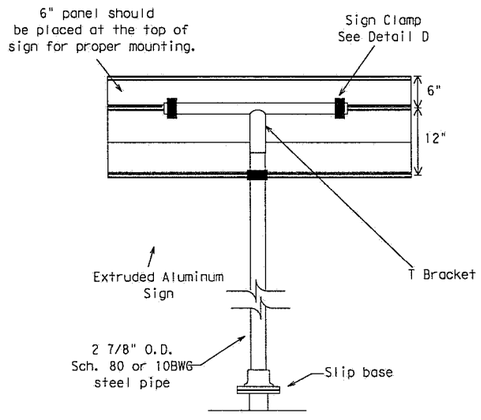


Typical Sign Mount
SM RD SGN ASSM TY S80(2)XX(P-EXAL)
* Additional stiffener placed at approximate center of signs when sign width is greater than 10'.

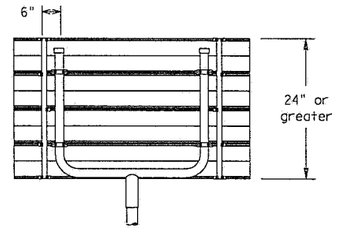




Detail E



Extruded Aluminum Sign
With T Bracket



Use Extruded Alum. Windbeam as stiffeners
See SMD (2-1) for additional details

See Detail E
for clamp installation

REQUIRED SUPPORT		
	SIGN DESCRIPTION	SUPPORT
Regulatory	48-inch STOP sign (R1-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	60-inch YIELD sign (R1-2)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	48x16-inch ONE-WAY sign (R6-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	36x48, 48x36, and 48x48-inch signs	TY 10BWG(1)XX(T)
	48x60-inch signs	TY S80(1)XX(T)
Warning	48x48-inch signs (diamond or square)	TY 10BWG(1)XX(T)
	48x60-inch signs	TY S80(1)XX(T)
	48-inch Advance School X-ing sign (S1-1)	TY 10BWG(1)XX(T)
	48-inch School X-ing sign (S2-1)	TY 10BWG(1)XX(T)
	Large Arrow sign (W1-6 & W1-7)	TY 10BWG(1)XX(T)

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS TRIANGULAR SLIPBASE SYSTEM

SMD(SLIP-3)-08

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DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
CONT	SECT	JOB	HIGHWAY
DIST	COUNTY		SHEET NO.

9-08 REVISIONS

26D

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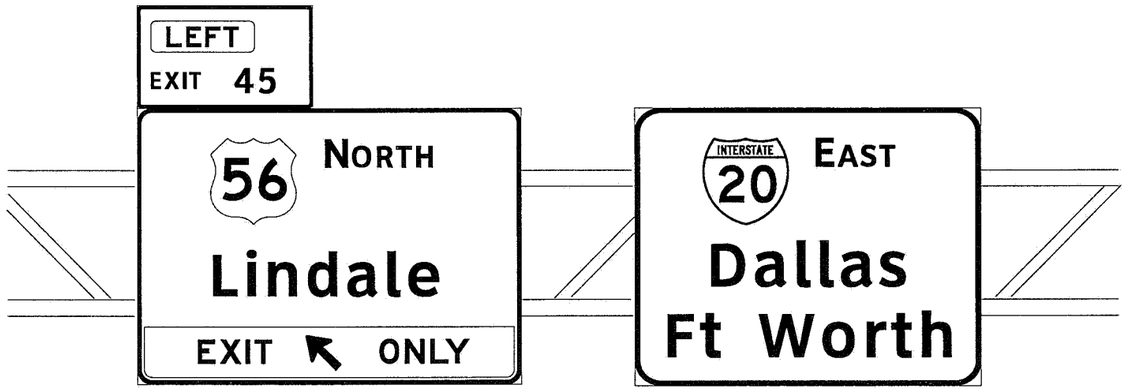
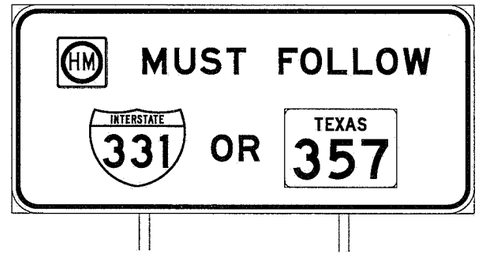
REQUIREMENTS FOR OVERHEAD AND LARGE GROUND-MOUNTED SIGNS

TYPICAL EXAMPLES





GENERAL NOTES

1. Signs to be furnished shall be as detailed elsewhere in the plans and/or as shown on sign summary sheet. Standard sign designs and arrow dimensions can be found in the "Standard Highway Sign Designs for Texas" (SHSD).
2. Black legend shall use the Federal Highway Administration (FHWA) Standard Highway Alphabets (B, C, D, E, Emod, or F).
   White legend shall use the Clearview Alphabet.
   The following Clearview fonts shall be used to replace the existing white FHWA lettering, when not specified in the SHSD or in the plans.

B	CV-1W
C	CV-2W
D	CV-3W
E	CV-4W
Emod	CV-5WR
F	CV-6W

3. Lateral spacing between letters and numerals shall conform with the SHSD, and any approved changes thereto. Lateral spacing of legend shall provide a balanced appearance when spacing is not shown.
4. Black legend shall be applied by screening process or cut-out acrylic non-reflective black film to background sheeting, or combination thereof.
5. White legend and borders shall be cut-out white sheeting applied to colored background sheeting.
6. Information regarding borders and radii for signs is found in the "Standard Highway Sign Designs for Texas". Dimensions shown and described for borders and corner radii on parent sign are nominal. Borders may vary in width as much as 1/2 inch. Corner radii above 3 inches may vary in width as much as 1 inch. Borders and corner radii within a parent sign must be of matching widths. The sign area outside the corner radius need not be trimmed or rounded if fabricated from an extruded material.
7. Sign substrate for ground-mounted signs shall be any material that meets the Departmental Material Specification requirements of DMS-7110 or approved alternative. Sign substrate for overhead signs shall be any material that meets DMS-7110. Exit Number Panels attached above the parent sign shall be made with the same substrate and sheeting as the parent sign.
8. Mounting details of attachments to parent sign face are shown on Standard Plan Sheet TSR(5). Mounting details of exit number panels above parent sign are shown in the "SMD series" Standard Plan Sheets.
9. Background sheeting shall be applied to the substrate per sheeting manufacturer's recommendations. Sheeting will not be allowed to bridge the horizontal gap between panels.
10. Cut all legend, symbols, borders, and direct applied sign attachments at panel joints.

DEPARTMENTAL MATERIAL SPECIFICATIONS	
ALUMINUM SIGN BLANKS	DMS-7110
SIGN FACE MATERIALS	DMS-8300

The Standard Highway Sign Designs for Texas (SHSD) can be found at the following website.

http://www.txdot.gov/

SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	WHITE	TYPE B OR C SHEETING
BACKGROUND	ALL OTHERS	TYPE B OR C SHEETING
LEGEND & BORDERS	WHITE	TYPE D SHEETING
LEGEND & BORDERS	BLACK	ACRYLIC NON-REFLECTIVE FILM

Texas Department of Transportation

Traffic Operations Division Standard

TYPICAL SIGN REQUIREMENTS

TSR(1)-13

FILE: tsr1-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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REVISIONS 12-03 7-13 9-08	DIST	COUNTY		SHEET NO. 7543

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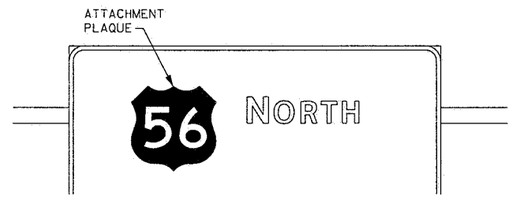
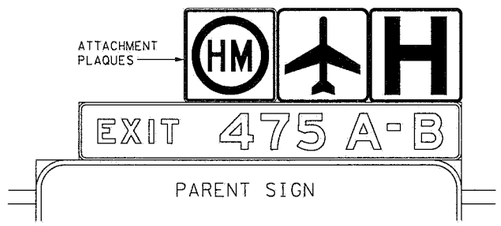
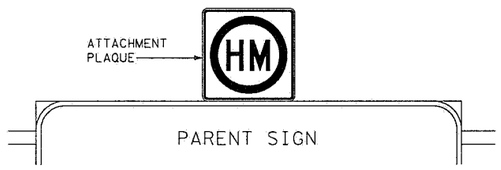
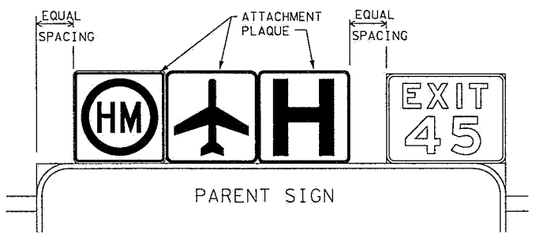
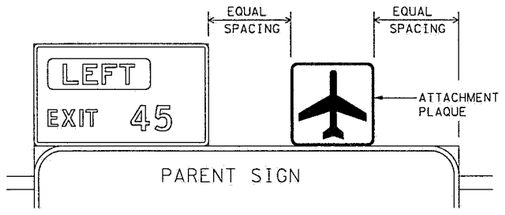
REQUIREMENTS FOR ATTACHMENTS TO OVERHEAD AND LARGE GROUND MOUNTED SIGNS









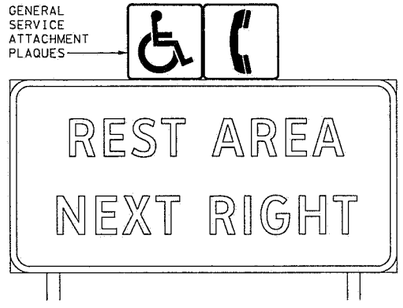


DEPARTMENTAL MATERIAL SPECIFICATIONS	
ALUMINUM SIGN BLANKS	DMS-7110
SIGN FACE MATERIALS	DMS-8300

SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	ALL	TYPE B OR C SHEETING
LEGEND & BORDERS	BLACK	ACRYLIC NON-REFLECTIVE FILM
LEGEND & BORDERS	ALL OTHERS	TYPE B OR C SHEETING

GENERAL NOTES

1. Signs to be furnished shall be as detailed elsewhere in the plans and/or as shown on sign tabulation sheet. Standard sign designs and arrow dimensions can be found in the "Standard Highway Sign Designs for Texas" (SHSD).
2. Route Marker legends (ie. IH, US, SH and FM shields) shall use the Federal Highway Administration (FHWA) Standard Highway Alphabets (B, C, D, E, Emod, or F).
3. Lateral spacing between letters and numerals shall conform with the SHSD, and any approved changes thereto. Lateral spacing of legend shall provide a balanced appearance when spacing is not shown.
4. Black legend and borders shall be applied by screening process or cut-out acrylic non-reflective black film to background sheeting, or combination thereof.
5. White legend and borders shall be applied by screening process with transparent colored ink, transparent colored overlay film to white background sheeting or cut-out white sheeting to colored background sheeting, or combination thereof.
6. Colored legend and borders shall be applied by screening process with transparent colored ink, transparent colored overlay film or colored sheeting to white background sheeting, or combination thereof.
7. Route markers and other attachments within the parent sign face shall be direct applied unless otherwise specified in the plans. Attachments not direct applied shall use 0.063 inch thick one piece sheet aluminum signs (Type A).
8. General Service Plaques shall be 0.080 inch thick and Routing Plaques shall be 0.100 inch thick.
9. The priority for Routing Plaques shall be (left to right) Hazardous Material, Airport then Hospital. See examples for mounting location.
10. Mounting details of attachments to parent signs face are shown on Standard Plan Sheet TSR(5). Mounting details of sign plaque attachments above and below parent sign are shown in the "SMD series" Standard Plan Sheets.
11. Plaques shall be horizontally centered at the top of the parent sign. If an exit number panel exists, the plaque shall be centered between the edge of the parent sign and the edge of the exit number panel. The plaque may be placed above the exit number panel when there is insufficient space.

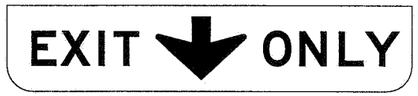


TYPICAL EXAMPLES

REQUIREMENTS FOR EXIT ONLY AND LEFT EXIT PANELS

DEPARTMENTAL MATERIAL SPECIFICATIONS	
ALUMINUM SIGN BLANKS	DMS-7110
SIGN FACE MATERIALS	DMS-8300

SHEETING REQUIREMENTS FOR OVERHEAD EXIT PANELS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	FLUORESCENT YELLOW	TYPE B_{FL} OR C_{FL} SHEETING
LEGEND	BLACK	ACRYLIC NON-REFLECTIVE FILM



TYPICAL EXAMPLES

GENERAL NOTES

1. Signs to be furnished shall be as detailed elsewhere in the plans and/or as shown on sign tabulation sheet. Standard sign designs and arrow dimensions can be found in the "Standard Highway Sign Designs for Texas" (SHSD). Individual panel sizes shown in the plans may be adjusted to fit actual parent sign sizes if necessary.
2. Exit Panel legend shall use the Federal Highway Administration (FHWA)Standard Highway Alphabets E Series.
3. Lateral spacing between letters and numerals shall conform with the SHSD, and any approved changes thereto. Lateral spacing of legend shall provide a balanced appearance when spacing is not shown.
4. Black legend shall be applied by screening process or cut-out acrylic non-reflective black film to yellow background sheeting, or combination thereof.
5. Exit Only and Left Exit panels within the parent sign face shall be direct applied unless otherwise specified in the plans. Panels not direct applied shall use 0.063 inch thick one piece sheet aluminum signs (Type A).
6. Mounting details of Exit Only and Left Exit panel attachments to parent signs face are shown on Standard Plan Sheet TSR(5).

The Standard Highway Sign Designs for Texas (SHSD) can be found at the following website.

http://www.txdot.gov/

Texas Department of Transportation | Traffic Operations Division Standard

TYPICAL SIGN REQUIREMENTS

TSR(2)-13

FILE: tsr2-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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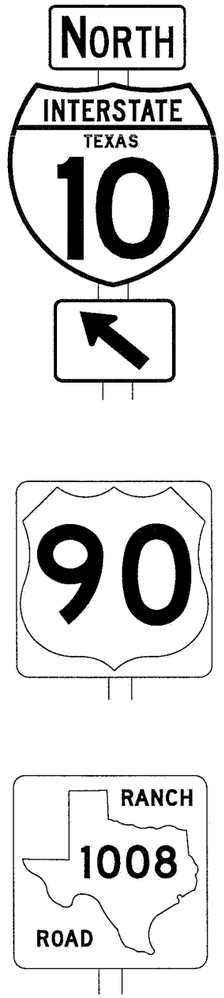
cwm

REQUIREMENTS FOR INDEPENDENT MOUNTED ROUTE SIGNS

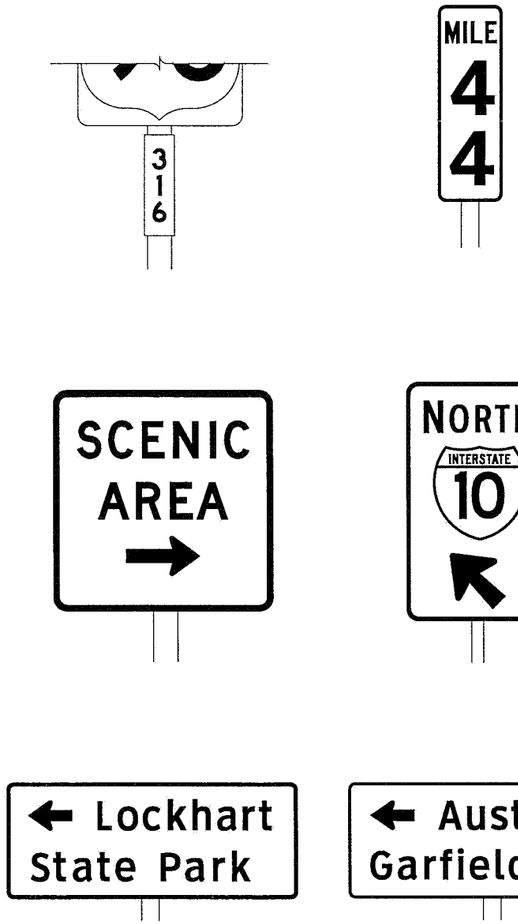
SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	WHITE	TYPE A SHEETING
BACKGROUND	ALL OTHERS	TYPE B OR C SHEETING
LEGEND & BORDERS	WHITE	TYPE A SHEETING
LEGEND & BORDERS	BLACK	ACRYLIC NON-REFLECTIVE FILM
LEGEND & BORDERS	ALL OTHERS	TYPE B or C SHEETING



TYPICAL EXAMPLES

REQUIREMENTS FOR BLUE, BROWN & GREEN D AND I SERIES GUIDE SIGNS

SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	ALL	TYPE B OR C SHEETING
LEGEND & BORDERS	WHITE	TYPE D SHEETING
LEGEND, SYMBOLS & BORDERS	ALL OTHERS	TYPE B OR C SHEETING



TYPICAL EXAMPLES

GENERAL NOTES

1. Signs to be furnished shall be as detailed elsewhere in the plans and/or as shown on sign tabulation sheet. Standard sign designs and arrow dimensions can be found in the "Standard Highway Sign Designs for Texas" (SHSD).

2. White legend shall use the Clearview Alphabet. The following Clearview fonts shall be used to replace the existing white Federal Highway Administration (FHWA) Standard Highway Alphabets, when not specified in the SHSD, or in the plans.

B	CV-1W
C	CV-2W
D	CV-3W
E	CV-4W
Emod	CV-5WR
F	CV-6W

3. Route sign legend (ie. IH, US, SH and FM shields) shall use the Federal Highway Administration (FHWA) Standard Highway Alphabets B, C, D, E, Emod or F).

4. Lateral spacing between letters and numerals shall conform with the SHSD, and any approved changes thereto. Lateral spacing of legend shall provide a balanced appearance when spacing is not shown.

5. Independent mounted route sign with white or colored legend and borders shall be applied by screening process with transparent color ink, transparent colored overlay film to white background sheeting or cut-out white sheeting to colored background sheeting, or combination thereof. White legend, symbols and borders on all other signs shall be cut-out white sheeting applied to colored background sheeting.

6. Information regarding borders and radii for signs is found in the "Standard Highway Sign Designs for Texas". Dimensions shown and described for borders and corner radii on parent sign are nominal. Borders may vary in width as much as 1/2 inch. Corner radii above 3 inches may vary in width as much as 1 inch. Borders and corner radii within a parent sign must be of matching widths. The sign area outside the corner radius should be trimmed or rounded.

7. Sign substrate shall be any material that meets the Departmental Material Specification requirements of DMS-7110 or approved alternative.

8. Mounting details of roadside signs are shown in the "SMD series" Standard Plan Sheets.

DEPARTMENTAL MATERIAL SPECIFICATIONS	
ALUMINUM SIGN BLANKS	DMS-7110
SIGN FACE MATERIALS	DMS-8300

ALUMINUM SIGN BLANKS THICKNESS	
Square Feet	Minimum Thickness
Less than 7.5	0.080
7.5 to 15	0.100
Greater than 15	0.125

The Standard Highway Sign Designs for Texas (SHSD) can be found at the following website.

http://www.txdot.gov/

Texas Department of Transportation | Traffic Operations Division Standard

TYPICAL SIGN REQUIREMENTS

TSR(3)-13

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REVISIONS				
12-03 7-13	DIST	COUNTY		SHEET NO.
9-08				07545

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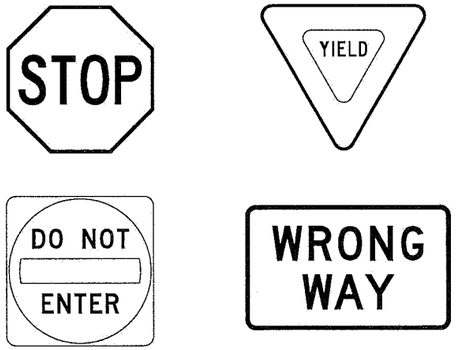
cwm

REQUIREMENTS FOR RED BACKGROUND REGULATORY SIGNS
(STOP, YIELD, DO NOT ENTER AND WRONG WAY SIGNS)



REQUIREMENTS FOR FOUR SPECIFIC SIGNS ONLY

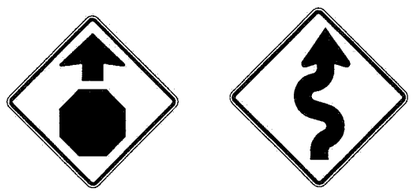
SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	RED	TYPE B OR C SHEETING
BACKGROUND	WHITE	TYPE B OR C SHEETING
LEGEND & BORDERS	WHITE	TYPE B OR C SHEETING
LEGEND	RED	TYPE B OR C SHEETING

REQUIREMENTS FOR WHITE BACKGROUND REGULATORY SIGNS
(EXCLUDING STOP, YIELD, DO NOT ENTER AND WRONG WAY SIGNS)

TYPICAL EXAMPLES

SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	WHITE	TYPE A SHEETING
BACKGROUND	ALL OTHERS	TYPE B OR C SHEETING
LEGEND, BORDERS AND SYMBOLS	BLACK	ACRYLIC NON-REFLECTIVE FILM
LEGEND, BORDERS AND SYMBOLS	ALL OTHER	TYPE B OR C SHEETING

REQUIREMENTS FOR WARNING SIGNS



TYPICAL EXAMPLES

SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	FLOURESCENT YELLOW	TYPE B_{FL} OR C_{FL} SHEETING
LEGEND & BORDERS	BLACK	ACRYLIC NON-REFLECTIVE FILM
LEGEND & SYMBOLS	ALL OTHER	TYPE B OR C SHEETING

REQUIREMENTS FOR SCHOOL SIGNS

TYPICAL EXAMPLES

SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	WHITE	TYPE A SHEETING
BACKGROUND	FLOURESCENT YELLOW GREEN	TYPE B_{FL} OR C_{FL} SHEETING
LEGEND, BORDERS AND SYMBOLS	BLACK	ACRYLIC NON-REFLECTIVE FILM
SYMBOLS	RED	TYPE B OR C SHEETING

GENERAL NOTES

1. Signs to be furnished shall be as detailed elsewhere in the plans and/or as shown on sign tabulation sheet. Standard sign designs and arrow dimensions can be found in the "Standard Highway Sign Designs for Texas" (SHSD).
2. Sign legend shall use the Federal Highway Administration (FHWA) Standard Highway Alphabets (B, C, D, E, Emod or F).
3. Lateral spacing between letters and numerals shall conform with the SHSD, and any approved changes thereto. Lateral spacing of legend shall provide a balanced appearance when spacing is not shown.
4. Black legend and borders shall be applied by screening process or cut-out acrylic non-reflective black film to background sheeting, or combination thereof.
5. White legend and borders shall be applied by screening process with transparent colored ink, transparent colored overlay film to white background sheeting or cut-out white sheeting to colored background sheeting, or combination thereof.
6. Colored legend shall be applied by screening process with transparent colored ink, transparent colored overlay film or colored sheeting to background sheeting, or combination thereof.
7. Sign substrate shall be any material that meets the Departmental Material Specification requirements of DMS-7110 or approved alternative.
8. Mounting details for roadside mounted signs are shown in the "SMD series" Standard Plan Sheets.

ALUMINUM SIGN BLANKS THICKNESS	
Square Feet	Minimum Thickness
Less than 7.5	0.080
7.5 to 15	0.100
Greater than 15	0.125

DEPARTMENTAL MATERIAL SPECIFICATIONS	
ALUMINUM SIGN BLANKS	DMS-7110
SIGN FACE MATERIALS	DMS-8300

The Standard Highway Sign Designs for Texas (SHSD) can be found at the following website.
http://www.txdot.gov/

Texas Department of Transportation — Traffic Operations Division Standard

TYPICAL SIGN REQUIREMENTS

TSR(4)-13

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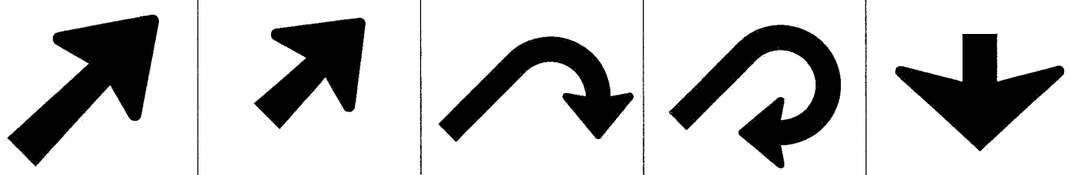
ARROW DETAILS

for Large Ground-Mounted and Overhead Guide Signs



TYPE	LETTER SIZE	USE
A-1	10.67" U/L and 10" Caps	Single Lane Exits
A-2	13.33" U/L and 12" Caps	
A-3	16" & 20" U/L	
B-1	10.67" U/L and 10" Caps	Multiple Lane Exits
B-2	13.33" U/L and 12" Caps	
B-3	16" & 20" U/L	

CODE	USED ON SIGN NO.
E-3	E5-1aT
E-4	E5-1bT

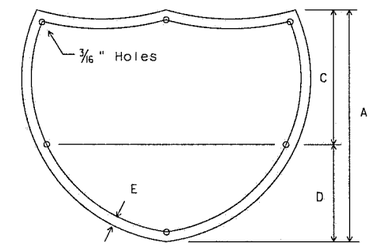
NOTE

Arrow dimensions are shown in the "Standard Highway Sign Designs for Texas" manual.

The Standard Highway Sign Designs for Texas (SHSD) can be found at the following website.

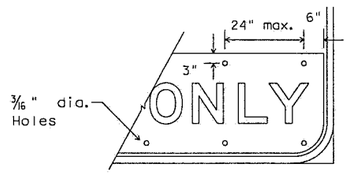
http://www.txdot.gov/

SIGN BLANK PUNCHING DETAILS FOR ATTACHMENTS WHEN SPECIFIED TO BE TYPE A ALUMINUM SIGNS (FOR MOUNTING TO GUIDE SIGN FACE)

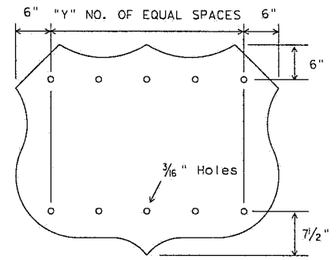


INTERSTATE ROUTE MARKERS

A	C	D	E
36	21	15	1 1/2
48	28	20	1 3/4

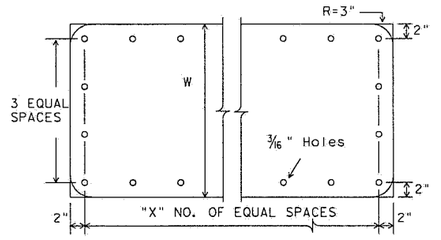


EXIT ONLY PANEL



U.S. ROUTE MARKERS

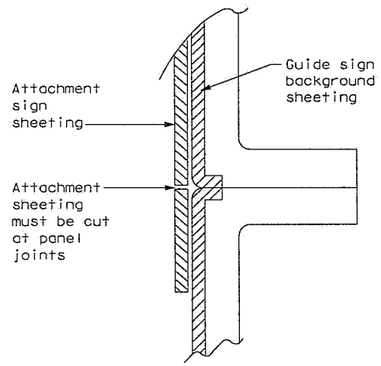
Sign Size	"Y"
24x24	2
30x24	3
36x36	3
45x36	4
48x48	4
60x48	5



STATE ROUTE MARKERS

No. of Digits	W	X
4	24	4
4	36	5
4	48	6
3	24	3
3	36	4
3	48	5

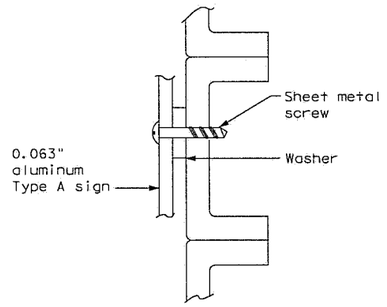
MOUNTING DETAILS OF ATTACHMENTS TO GUIDE SIGN FACE ("EXIT ONLY" AND "LEFT EXIT" PANELS, ROUTE MARKERS AND OTHER ATTACHMENTS)



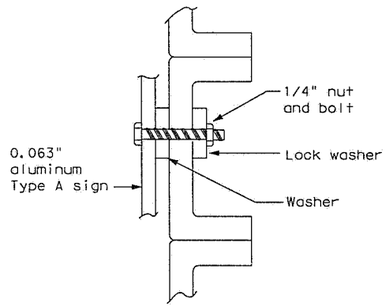
DIRECT APPLIED ATTACHMENT

NOTE:

1. Sheeting for legend, symbols, and borders must be cut at panel joints.
2. Direct applied attachment signs will be subsidiary to "Aluminum Signs" or "Fiberglass Signs".



SCREW ATTACHMENT



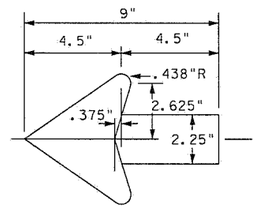
NUT/BOLT ATTACHMENT

NOTE:

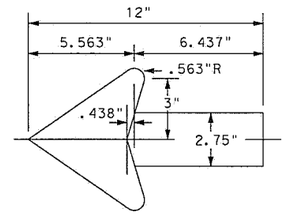
Furnish Type A aluminum sign attachments only when specified in the plans. These signs will be paid for under "Aluminum Signs".

ARROW DETAILS

for Destination Signs (Type D)



Standard arrow to be used with 6 inch letters.



Standard arrow to be used with 8 inch letters.

Texas Department of Transportation

Traffic Operations Division Standard

TYPICAL SIGN REQUIREMENTS

TSR(5)-13

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GENERAL NOTES FOR ALL ELECTRICAL WORK

1. The location of all conduits, junction boxes, ground boxes, and electrical services is diagrammatic and may be shifted to accommodate field conditions.

2. Provide new and unused materials. Ensure that all materials and installations comply with the applicable articles of the National Electrical Code (NEC), TxDOT standards and specifications, National Electrical Manufacturers Association (NEMA), and are listed by Underwriters Laboratories (UL) or a Nationally Recognized Testing Lab (NRTL). NRTLs such as Canadian Standard Association (CSA), Intertek Testing Services NA Inc., or FM Approvals LLC can be considered equivalent to UL. Where reference is made to NEMA listed devices, International Electrotechnical Commission (IEC) listed devices will not be considered an acceptable equal to a NEMA listed device. Acceptable devices may have both a NEMA and IEC listing. Faulty fabrication or poor workmanship in any material, equipment, or installation is justification for rejection. Replace or reinstall rejected material or equipment at no additional cost to the Department.

3. Miscellaneous nuts, bolts and hardware, except for high strength bolts, may be stainless steel when plans specify galvanized, provided the bolt size is ½ in. or less in diameter.

4. Provide the following test equipment as required by the Engineer to confirm compliance with the contract and the NEC: voltmeter, ammeter, megohm meter (1000 volt DC), ground resistance tester, torque wrenches, and torque screwdrivers. Ensure all equipment has been properly calibrated within the last year. Provide calibration certification to the Engineer upon request. Operate test equipment during inspection as requested by the Engineer.

5. Install grounding as shown on the plans and in accordance with the NEC. Ensure all metallic conduits; metal poles; luminaires; and metal enclosures are bonded to the equipment grounding conductor. Provide stranded bare copper or green insulated grounding conductors. Ground rods, connectors, and bonding jumpers are subsidiary to the various bid items.

6. When required by the Engineer, notify the Department in writing of materials from the Material Producers List (MPL) intended for use on each project. Prequalified materials are listed on the MPL on TxDOT's website under "Roadway Illumination and Electrical Supplies." No substitutions will be allowed for materials on this list.

CONDUIT

A. MATERIALS

1. Provide conduit, junction boxes, fittings, and hardware as per TxDOT Departmental Material Specification (DMS) 11030 "Conduit" and Item 618 "Conduit" of TxDOT's "Standard Specifications For Construction And Maintenance Of Highways, Streets, And Bridges," latest edition. Provide conduits listed under Item 618 on the MPL under "Roadway Illumination and Electrical Supplies." Provide conduit types according to the descriptive code or as shown on the plans. Do not substitute other types of conduits for those shown. Provide liquidtight flexible metal conduit (LFMC) when flexible conduit is called for on galvanized steel rigid metallic conduit (RMC) systems. Provide liquidtight flexible nonmetallic conduit (LFNC) when flexible conduit is called for on polyvinyl chloride (PVC) systems.

2. Provide galvanized steel RMC for all exposed conduits, unless otherwise shown on the plans. Properly bond all metal conduits.

3. Unless otherwise shown on the plans, provide junction boxes with a minimum size as shown in the following table, which applies to the greatest number of conductors entering the box through one conduit with no more than four conduits per box. When a mixture of conductor sizes is present, count the conductors as if all are of the larger size. For situations not applicable to the table, size junction boxes in accordance with NEC.

AWG	3 CONDUCTORS	5 CONDUCTORS	7 CONDUCTORS
#1	10" x 10" x 4"	12" x 12" x 4"	16" x 16" x 4"
#2	8" x 8" x 4"	10" x 10" x 4"	12" x 12" x 4"
#4	8" x 8" x 4"	10" x 10" x 4"	10" x 10" x 4"
#6	8" x 8" x 4"	8" x 8" x 4"	10" x 10" x 4"
#8	8" x 8" x 4"	8" x 8" x 4"	8" x 8" x 4"

4. Junction boxes with an internal volume of less than 100 cu. in. and supported by entering raceways must have threaded entries or hubs identified for the intended purpose and supported by connection of two or more rigid metal conduits. Secure conduit within 3 ft. of the enclosure or within 18 in. of the enclosure if all conduit entries are on the same side. Mechanically secure all junction boxes with an internal volume greater than 100 cu. inches.

5. Provide hot dipped galvanized cast iron or sand cast aluminum outlet boxes for junction boxes containing only 10 AWG or 12 AWG conductors. Do not use die cast aluminum boxes. Size outlet boxes according to the NEC.

6. Do not use intermediate metal conduit (IMC) or electrical metallic tubing (EMT) unless specifically required by the plan sheets. When EMT is called for, provide junction boxes made from galvanized steel sheeting, listed and approved for outdoor use, unless otherwise noted on the plans. Size all galvanized steel junction boxes in accordance with the NEC. Provide junction boxes for IMC conduit systems that meet the same requirements for junction boxes used with RMC systems.

7. Provide PVC junction boxes intended for outdoor use on PVC conduit systems, unless otherwise noted on the plans.

8. Provide PVC elbows in PVC conduit systems, unless otherwise shown on the plans. Use only a flat, high tensile strength polyester fiber pull tape for pulling conductors through the PVC conduit system. When galvanized steel RMC elbows are specifically called for in the plans and any portion of the RMC elbow is buried less than 18 in., ground the RMC elbow by means of a grounding bushing on a rigid metal extension. Grounding of the rigid metal elbow is not required if the entire RMC elbow is encased in a minimum of 2 in. of concrete. PVC extensions are allowed on these concrete encased rigid metal elbows. RMC or PVC elbows are subsidiary to various bid items.

9. When required, provide High-Density Polyethylene (HDPE) conduit with factory installed internal conductors according to Item 622 "Duct Cable." At the Contractor's request and with approval by the Engineer, substitute HDPE conduit with no conductors for bored schedule 40 or schedule 80 PVC conduit bid under Item 618. Ensure bored HDPE substituted for PVC is schedule 40 and of the same size PVC called for in the plans. Ensure the substituted HDPE meets the requirements of Item 622, except that the conduit is supplied without factory-installed conductors. Make the transition of the HDPE conduit to PVC (or RMC elbow when required) at the bore pit. Provide conduit of the size and schedule as shown on the plans. Do not extend substituted conduit into ground boxes or foundations. Provide PVC or galvanized steel RMC elbows as called for at all ground boxes and foundations.

10. Use two-hole straps when supporting 2 in. and larger conduits. On electrical service poles, properly sized stainless steel or hot dipped galvanized one-hole standoff straps are allowed on the service riser conduit.

B. CONSTRUCTION METHODS

1. Provide and install expansion joint conduit fittings on all structure-mounted conduits at the structure's expansion joints to allow for movement of the conduit. In addition, provide and install expansion joint fittings on all continuous runs of galvanized steel RMC conduit externally exposed on structures such as bridges at maximum intervals of 150 ft. When requested by the project Engineer, supply manufacturer's specification sheet for expansion joint conduit fittings. Repair or replace expansion joint fittings that do not allow for movement at no additional cost to the Department. Provide the method of determining the amount of expansion to the Engineer upon request. Do not use LFMC or LFNC as a substitute for the required expansion conduit fittings.

2. Space all conduit supports at maximum intervals of 5 ft. Install conduit spacers when attaching metal conduit to surface of concrete structures. See "Conduit Mounting Options" on ED(2). Install conduit support within 3 ft. of all enclosures and conduit terminations.

3. Do not attach conduit supports directly to pre-stressed concrete beams except as shown specifically in the plans or as approved by the Engineer.

4. Unless otherwise shown on the plans, jack or bore conduit placed beneath existing roadways, driveways, sidewalks, or after the base or surfacing operation has begun. Backfill and compact the bore pits below the conduit per Item 476 "Jacking, Boring, or Tunneling Pipe or Box" prior to installing conduit or duct cable to prevent bending of the connections.

5. When placing conduit in the sub-grade of new roadways, backfill all trenches with excavated material unless otherwise noted on the plans. When placing conduit in the sub-base of new roadways, backfill all trenches with cement-stabilized base as per requirements of Items 110 "Excavation", 400 "Excavation and Backfill for Structures", 401 "Flowable Backfill", 402 "Trench Excavation Protection", and 403 "Temporary Special Shoring."

6. Provide and place warning tape approximately 10 in. above all trenched conduit as per Item 618.

7. During construction, temporarily cap or plug open ends of all conduit and raceways immediately after installation to prevent entry of dirt, debris and animals. Temporary caps constructed of durable duct tape are allowed. Tightly fix the tape to the conduit opening. Clean out the conduit and prove it clear in accordance with Item 618 prior to installing any conductors.

8. Ensure conduit entry into the top of any enclosure is waterproof by installing conduit sealing hubs or using boxes with threaded bosses. This includes surface mounted safety switches, meter cans, service enclosures, auxiliary enclosures and junction boxes. Grounding bushings on water tight sealing hubs are not required.

9. Fit the ends of all PVC conduit terminations with bushings or bell end fittings. Provide and install a grounding type bushing on all metal conduit terminations.

10. Install a bonding jumper from each grounding bushing to the nearest ground rod, grounding lug, or equipment grounding conductor. Ensure all bonding jumpers are the same size as the equipment grounding conductor. Bonding of conduit used as a casing under roadways for duct cable is not required, if the duct extends the full length through the casing.

11. At all electrical services, install a 6 AWG solid copper grounding electrode conductor.

12. Place conduits entering ground boxes so that the conduit openings are between 3 in. and 6 in. from the bottom of the box. See the ground box detail on sheet ED(4).

13. Seal ends of all conduits with duct seal, expandable foam, or by other methods approved by the Engineer. Seal conduit immediately after completion of conductor installation and pull tests. Do not use duct tape as a permanent conduit sealant. Do not use silicone caulk as a conduit sealant.

14. File smooth the cut ends of all mounting strut and conduit. Before installing, paint the field cut ends of all mounting strut and RMC (threaded or non-threaded) with zinc rich paint (94% or more zinc content) to alleviate overspray. Use zinc rich paint to touch up galvanized material as allowed under Item 445 "Galvanizing." Do not paint non-galvanized material with a zinc rich paint as an alternative for materials required to be galvanized.

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ELECTRICAL DETAILS CONDUITS & NOTES

ED(1)-14

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		DST	CTY		178

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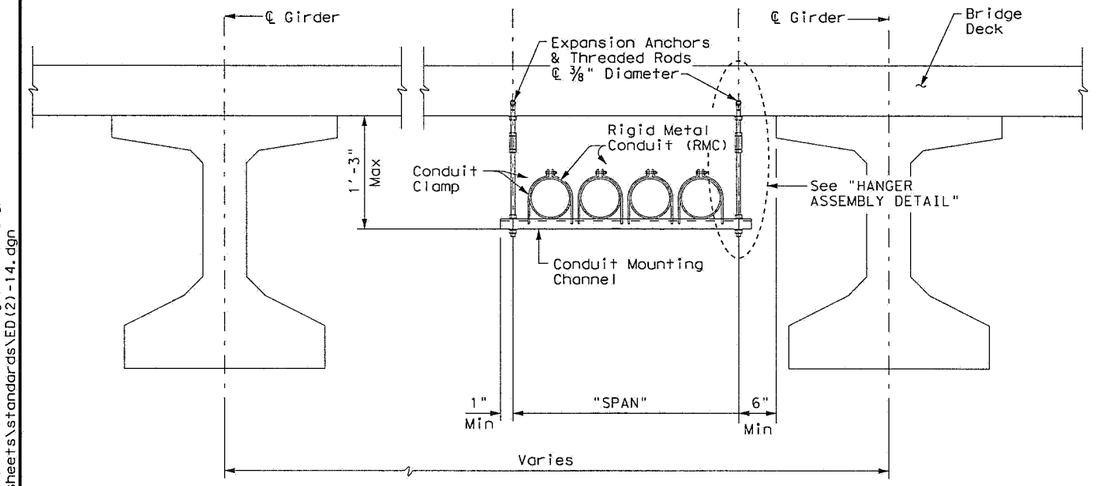
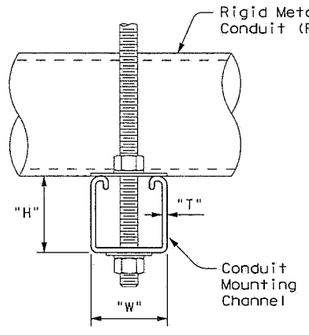
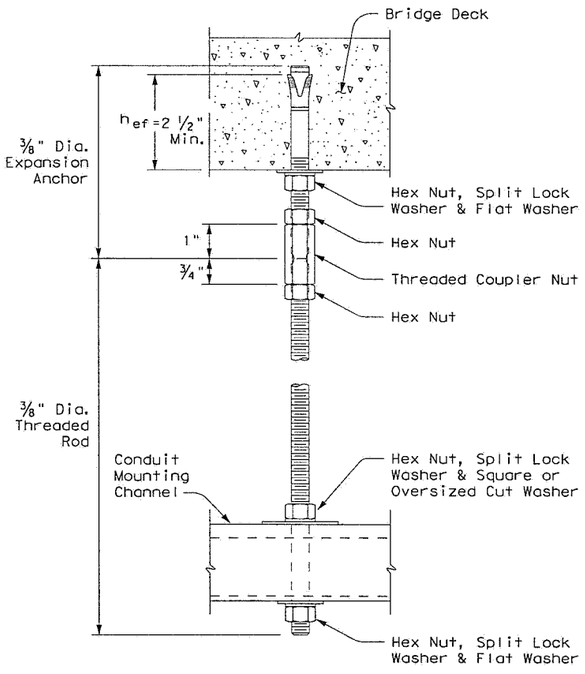


CONDUIT HANGING DETAIL

CONDUIT MOUNTING CHANNEL		
"SPAN"	"W" x "H"	"T"
less than 2'	1 5/8" x 1 3/8"	12 Ga.
2'-0" to 2'-6"	1 5/8" x 1 5/8"	12 Ga.
>2'-6" to 3'-0"	1 5/8" x 2 7/16"	12 Ga.

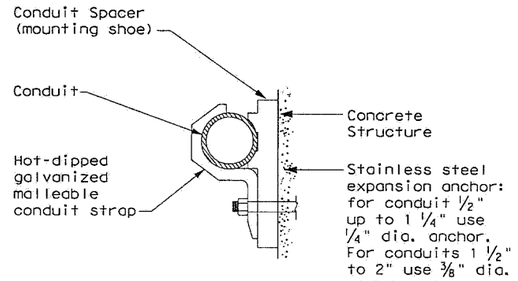
Channels with round or short slotted hole patterns are allowed, if the load carrying capacity is not reduced by more than 15%.

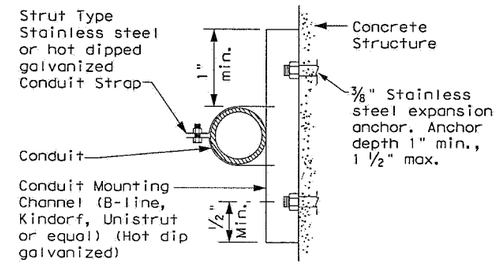




HANGER ASSEMBLY DETAIL

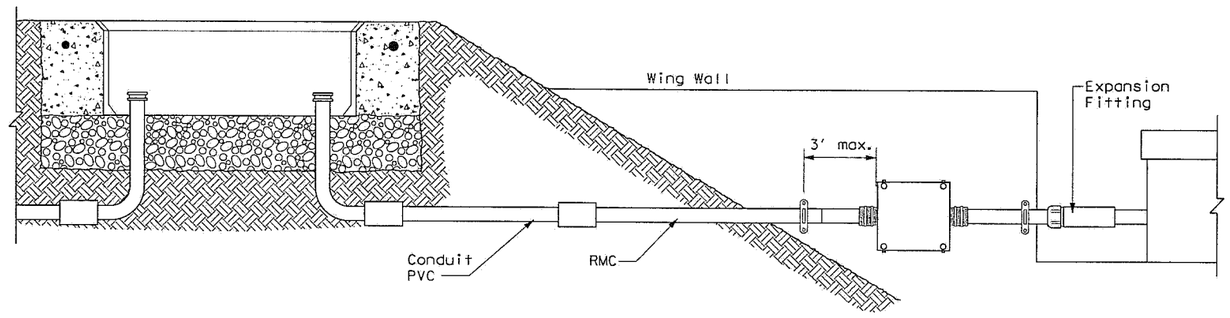
ELECTRIC CONDUIT TO BRIDGE DECK ATTACHMENT





CONDUIT MOUNTING OPTIONS

Attachment to concrete surfaces
See ED(1)B.2



TYPICAL CONDUIT ENTRY TO BRIDGE STRUCTURE DETAIL

EXPANSION ANCHOR NOTES FOR BRIDGE DECK ATTACHMENT

1. Use torque controlled mechanical expansion anchors that are approved for use in cracked concrete by the International Code Council, Evaluation Service (ICC-ES). The chosen anchor product shall have a designated ICC-ES Evaluation Report number, and its approval status shall be maintained on the ICC-ES website under Division 031600 for Concrete Anchors.
2. Unless otherwise approved by the Engineer: do not use adhesive anchors; do not use expansion anchors that are not included in the ICC-ES approval list; and do not use expansion anchors that are only approved for use in uncracked concrete.
3. Use anchors manufactured with stainless steel expansion wedges. Anchors manufactured with carbon steel expansion wedges are not allowed. Anchor bodies can be either zinc-plated carbon steel or stainless steel. For application in marine environment, both the anchor body and expansion wedge shall be stainless steel.
4. Install anchors as shown on the plans and in accordance with the anchor manufacturer's published installation instructions. Arrange a field demonstration test to evaluate the procedures and tools. The test shall be witnessed and approved by the Engineer prior to furnishing anchors on the structure.
5. Prior to hole drilling, use rebar locator to ensure clearing of existing deck strands or reinforcement. Install anchors to ensure a minimum effective embedment depth, (h_{ef}), as shown. Increase (h_{ef}) as needed to ensure sufficient thread length for proper torqueing and tightening of anchors.
6. Use anchors of minimum 1600 Lbs tensile capacity (minimum of steel, concrete breakout, and concrete pullout strengths as determined by ACI 318 Appendix D) at the required minimum embedment depth (h_{ef}). No lateral loads shall be introduced after conduit installation.

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ELECTRICAL DETAILS CONDUIT SUPPORTS

ED(2)-14

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	DIST	COUNTY		SHEET NO.
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ELECTRICAL CONDUCTORS

A. MATERIAL INFORMATION

1. Provide Type XHHW insulated conductors in accordance with Departmental Material Specification (DMS)11040 "Conductors" and Item 620 "Electrical Conductors." Provide conductors as listed on the Material Producers List (MPL) on the Department web site under "Roadway Illumination and Electrical Supplies" Item 620. Color code insulated conductors in conformance with the NEC. Identify grounded (neutral) conductors with white insulation. Identify grounding conductors (ground wires) with green insulation or bare conductors. Identify ungrounded (hot) conductors with any color insulation except green, white, or gray. Keep color scheme consistent throughout the wiring system. Identify conductors 6 American Wire Gauge (AWG) and smaller by continuous color jacket. Identify electrical conductors 4 AWG and larger by continuous color jacket or by colored tape. When identifying conductors with colored tape, mark at least 6 in. of the conductor's insulation with half laps of tape.

2. Provide a solid copper 6 AWG grounding electrode conductor to bond the electrical service equipment to the concrete encased grounding electrode or the ground rod at the service location. Connect the grounding electrode conductor to the ground rod with a UL listed connector in accordance with DMS 11040. Connect the grounding electrode conductor to the concrete encased grounding electrode as shown in the plans.

3. Where two or more circuits are present in one conduit or enclosure, permanently identify the conductors of each branch circuit by attaching a non-metallic tag around both circuit conductors at each accessible location. Provide tags with two straps, large enough to indicate circuit number, letter, or other identification as shown in the plans. Print circuit identification on the tag with a permanent marker.

4. Use listed compression or screw type pressure connectors, terminal blocks, or split bolt connectors for splicing as specified in DMS 11040. Use hot melt adhesive tape to fill the gap and seal the ends of heat shrink tubing. Provide UL listed gel-filled insulating splice covers. Splicing materials, insulating materials, breakaway disconnects, splice covers, and fuse holders are subsidiary to various bid items.

B. CONSTRUCTION METHODS

1. Use only a flat, high tensile strength polyester fiber pull tape for pulling conductors through the conduit system. After installing conductors in conduit, perform conductor pull test. If a conductor cannot be freely pulled, make any needed alterations or repairs at no additional cost to the department. Perform insulation resistance tests in accordance with Item 620. Coordinate with the Engineer to witness the tests.

2. Leave 2 ft. minimum, 3 ft. maximum length for each conductor up to the splice in ground boxes. Leave 3 ft. minimum, 4 ft. maximum length of conductor in ground boxes when pulled through with no splice. Leave 1 ft. minimum, 1.5 ft. maximum length of conductor at enclosures, weatherheads and pole bases.

3. Make splices only in junction boxes, ground boxes, pole bases, or electrical enclosures and use only listed compression or screw type pressure connectors, terminal blocks, or split bolt connectors. Insulate splices with heavy wall heat shrink tubing or gel-filled insulating splice covers to provide a watertight splice. Overlap conductor insulation with heat shrink tubing a minimum of 2 in. past both sides of the splice. Where heat shrink tubing may not shrink sufficiently to provide a watertight seal around the individual conductors, prior to heating the tubing, increase the diameter of the conductor insulation using hot melt adhesive tape to provide a watertight seal between the individual conductors and the heat shrink tubing. Ensure the tape extends past the heat shrink tubing. Use hot melt adhesive tape to fill the gap and seal the ends of heat shrink tubing. Heat shrink tubing that appears to have been burned, or overheated, is considered defective and must be replaced.

4. Size and install gel-filled insulating splice covers according to manufacturer's specifications when used in place of heat shrink tubing.

5. Wire nuts with factory applied waterproof sealant may be used for 8 AWG or smaller conductors in above ground junction boxes, but not in pole bases or ground boxes. Install wire nuts in an upright position to prevent the accumulation of water.

6. Support conductors in illumination poles with a J-hook at the top of the pole.

7. When terminating conductors, remove the insulation and jacketing material without nicking the individual strands of the conductor. Conductors with nicked individual conductor strands or removed strands will be considered damaged.

8. Replace conductors and cables that are damaged beyond repair or that fail an insulation resistance test at no additional cost to the department.

9. Do not repair damaged conductors with duct tape, electrical tape, or wire nuts. Use only approved splicing methods.

10. Do not terminate more than one conductor under a single connector, unless the connector is rated for multiple conductors. Do not exceed the pressure connector's listing for maximum number and size of conductors allowed.

11. Install breakaway connectors on conductors bid under Item 620 whenever those conductors pass through a breakaway support device. Follow manufacturer's instructions when terminating conductors to breakaway connectors. Properly torque threaded connections. Proper terminations are critical to the safe operation of breakaway devices. Trim waterproofing boots on breakaway connectors to fit snugly around the conductor to ensure waterproof connection. Only one conductor may enter a single opening in a boot. Provide waterproof boots with the correct number of openings. Leave unused openings factory sealed. Use prequalified breakaway connectors as shown on the MPL.

12. Provide and install a separate stranded equipment grounding conductor (EGC) in all conduits that contain circuit wiring of 50 volts or more. Unless shown elsewhere, size the EGC to be the same size as the largest current carrying conductor contained in the conduit. Ensure all EGCs are bonded together at every accessible location. For traffic signal installations, provide a minimum size 8 AWG EGC. The EGC is paid for under Item 620.

C. TEMPORARY WIRING

1. Install temporary conductors and electrical equipment in accordance with the NEC article "Temporary Installations" and Department standard sheets.

2. Provide a ground fault circuit interrupter (GFCI) for power outlets for portable electrical equipment, power tools, ice machines, ice storage bins and refrigerators located outdoors at grade. GFCI may be any one of the following: molded cord and plug set, receptacle, or circuit breaker type.

3. Use listed wire nuts with factory applied sealant for temporary wiring where approved.

4. Enclose conductor splices within a listed enclosure or ground box, or ensure the splices are more than 10 ft. above grade vertically and more than 5 ft. horizontally from any metal structure. Where installing temporary conductors in areas subject to vehicle traffic or mobile construction equipment, ensure the vertical clearance to ground is at least 18 ft. when measured at the lowest point. Ground messenger wires that support power conductors in conformance with the NEC.

5. Protect and when necessary repair any existing electrical conduits uncovered during the construction process in a timely manner and in conformance with the NEC.

GROUND RODS & GROUNDING ELECTRODES

A. MATERIAL INFORMATION

1. Provide and install a grounding electrode at electrical services. Provide ground rods according to DMS 11040 and the plans. Larger diameter or longer length rods may be called for in some specific locations, see the individual plans sheets. Concrete encased grounding electrodes may be called for in specific locations including electrical service, see individual plan sheets.

B. CONSTRUCTION METHODS

1. Furnish auxiliary ground rods for lightning protection and install in soil, concrete, or both, as called for in the plans. For ground rods installed in concrete, ensure the connection of the conductor to the ground rod is readily accessible for inspection or repairs. For ground rods installed in soil, ensure that the upper end is between 2 to 4 in. below finished grade.

2. Do not place ground rods in the same drilled hole as a timber pole.

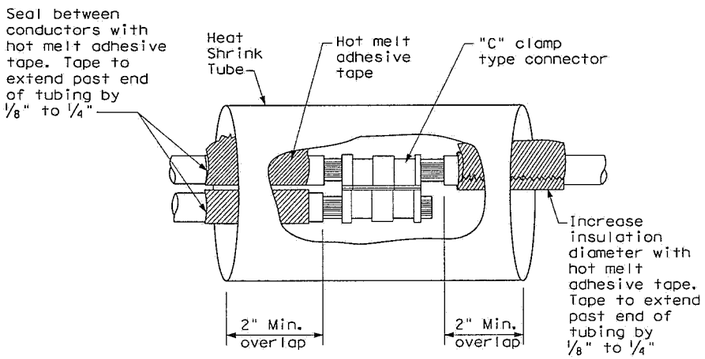
3. Install ground rods so the imprinted part number is at the upper end of the rod.

4. Remove all non-conductive coatings such as concrete splatter from the rod at the clamp location.

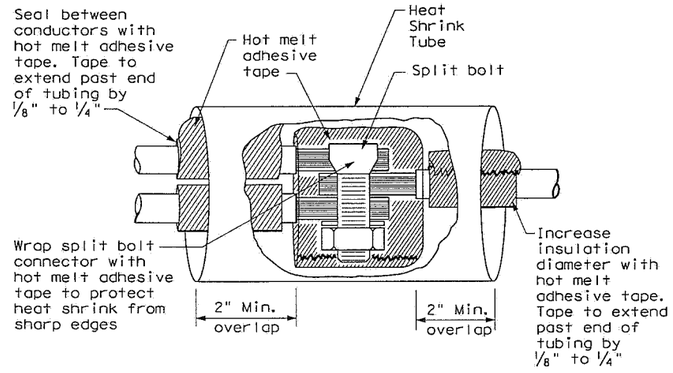
5. Route all conductors as short and straight as possible for connection to lightning protection ground rods. When a bend is required, ensure a minimum radius bend of four inches for these conductors.

6. Unless otherwise called for in the plans, protect grounding electrode conductors with non-metallic conduit. When protecting grounding electrode conductors with metal conduit, provide and install a grounding type bushing and properly sized bonding jumper on each end of the metal conduit.

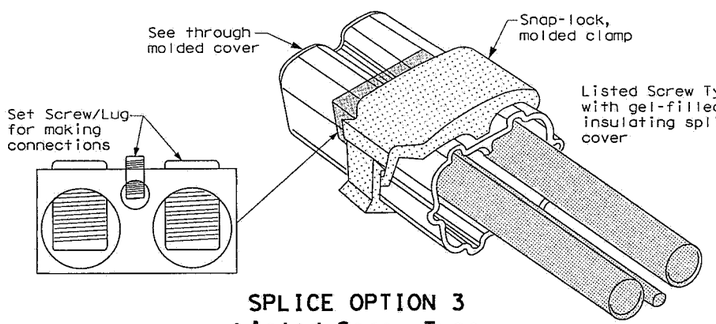
7. Written authorization is required before installing a ground rod in a horizontal trench for rocky soil or a solid rock bottom.



SPLICE OPTION 1
Compression Type



SPLICE OPTION 2
Split Bolt Type



SPLICE OPTION 3
Listed Screw Type

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ELECTRICAL DETAILS CONDUCTORS

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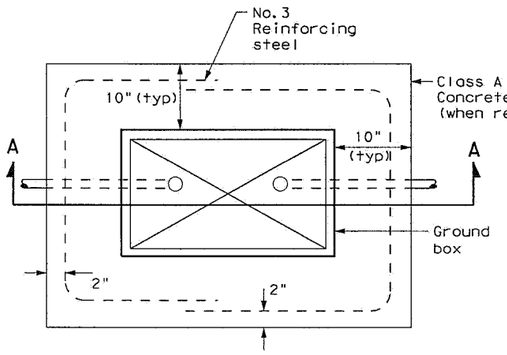
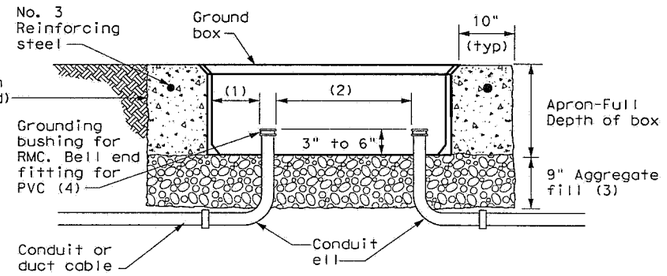


PLAN VIEW



SECTION A - A

APRON FOR GROUND BOX

(1) Uniformly space ends of conduits within the ground box. Position ends of conduits so that ground box walls do not interfere with the installation of grounding bushings or bell end fittings.

(2) Maintain sufficient space between conduits to allow for proper installation of bushing.

(3) Place aggregate under the box, not in the box. Aggregate should not encroach on the interior volume of the box.

(4) Install a grounding bushing on the upper end of all RMC terminating in a ground box. Ground RMC elbows when any part of the elbow is less than 18 in. below the bottom of the ground box. Install a PVC bushing or bell end fitting on the upper end of all PVC conduits terminating in a ground box.

GROUND BOXES

A. MATERIALS

1. Provide polymer concrete ground boxes measuring 16x30x24 in. (WxLxD) or smaller in accordance with Departmental Material Specification (DMS) 11070 "Ground Boxes" and Item 624 "Ground Boxes."

2. Provide Type A, B, C, D, and E ground boxes as shown in the plans, and as listed on the Material Producers List (MPL) on the Department web site under "Roadway Illumination and Electrical Supplies," Item 624.

3. Ensure ground box cover is correctly labeled in accordance with DMS 11070.

4. Provide larger ground boxes in accordance with Item 624 and as shown in the plans.

B. CONSTRUCTION METHODS

1. Remove all gravel and dirt from conduit. Cap all conduits prior to placing aggregate and setting ground box. Provide Grade 3 or 4 coarse aggregate as shown on Table 2 of Item 302 "Aggregates for Surface Treatments." Ensure aggregate bed is in place and at least 9 inches deep, prior to setting the ground box. Install ground box on top of aggregate.

2. Cast ground box aprons in place. Reinforcing steel may be field bent. Ensure the depth of concrete for the apron extends from finished grade to the top of the aggregate bed under the box. Ground box aprons, including concrete and reinforcing steel, are subsidiary to ground boxes when called for by descriptive code.

3. Keep bolt holes in the box clear of dirt. Bolt covers down when not working in ground boxes.

4. Install all conduits and ells in a neat and workmanlike manner. Uniformly space conduits so grounding bushings and bell end fittings can easily be installed.

5. Temporarily seal all conduits in the ground box until conductors are installed.

6. Permanently seal conduits immediately after the completion of conductor installation and pull tests. Permanently seal the ends of all conduits with duct seal, expandable foam, or other method as approved. Do not use duct tape as a permanent conduit sealant. Do not use silicone caulk as a sealant.

7. When a ground rod is present in a ground box, bond all equipment grounding conductors together and to the ground rod with listed connectors.

8. When a type B or D ground box is stacked to meet volume requirements, it is allowable to cut an appropriately sized hole for conduit entry in the side wall at least 18 inches below grade.

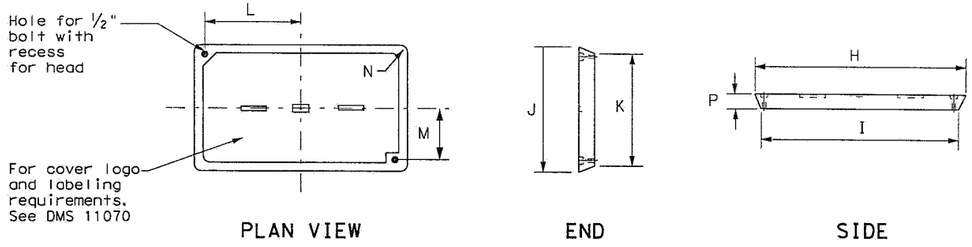
9. If an existing ground box in the contract has a metal cover, bond the cover to the equipment grounding conductor with a 3 ft. long stranded bonding jumper the same size as the grounding conductor. The bonding jumper is subsidiary to various bid items. Verify existing ground boxes with metal covers are shown on the plans, with notes fully describing the work required.

10. If other ground boxes with metal covers are within the project limits but are not part of the contract, the Engineer may direct the Contractor to bond the metal covers, identifying the specific boxes in writing. This work will be paid for separately.

11. Bond metal ground box covers to the grounding conductor with a tank ground type lug.

GROUND BOX DIMENSIONS	
TYPE	OUTSIDE DIMENSIONS (INCHES) (Width x Length X Depth)
A	12 X 23 X 11
B	12 X 23 X 22
C	16 X 29 X 11
D	16 X 29 X 22
E	12 X 23 X 17

GROUND BOX COVER DIMENSIONS								
TYPE	DIMENSIONS (INCHES)							
	H	I	J	K	L	M	N	P
A, B & E	23 1/4	23	13 3/4	13 1/2	9 7/8	5 1/8	1 3/8	2
C & D	30 1/2	30 1/4	17 1/2	17 1/4	13 1/4	6 3/4	1 3/8	2



PLAN VIEW END SIDE

GROUND BOX COVER

Texas Department of Transportation

Traffic Operations Division Standard

ELECTRICAL DETAILS GROUND BOXES

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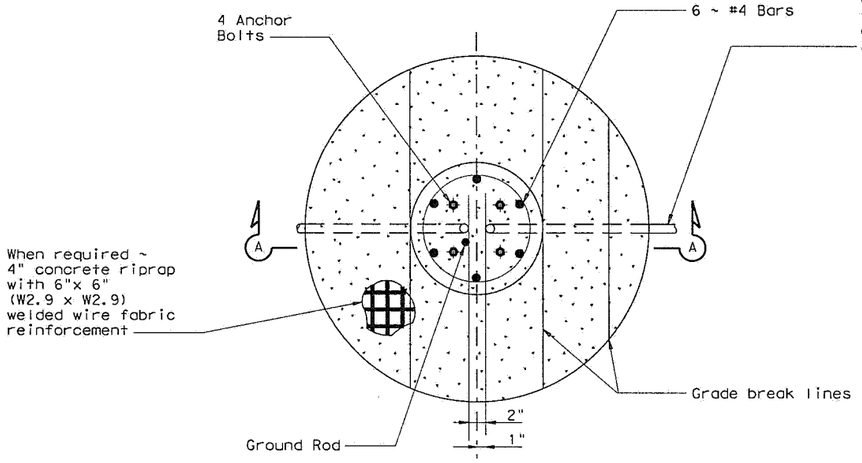
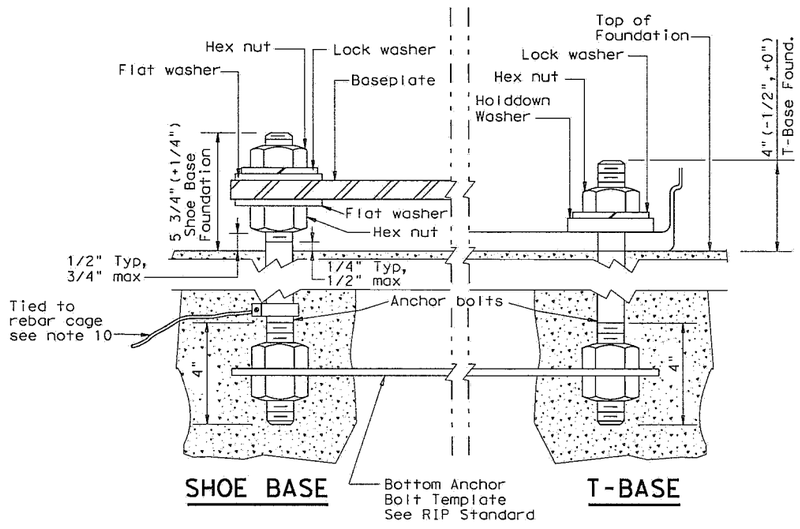


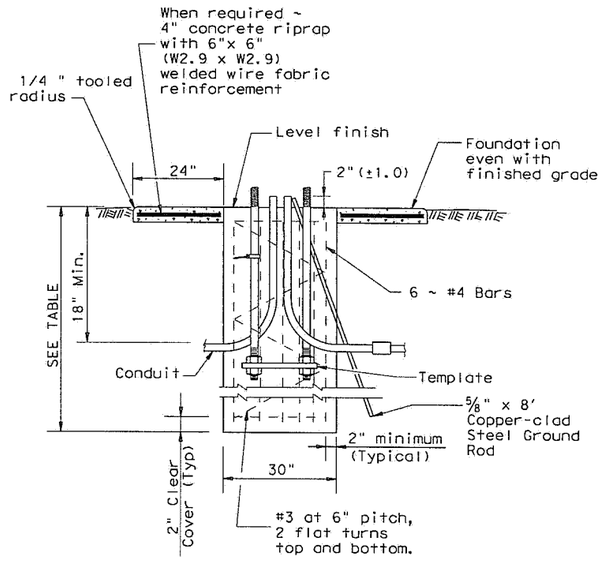
FOUNDATION DETAIL



SHOE BASE T-BASE

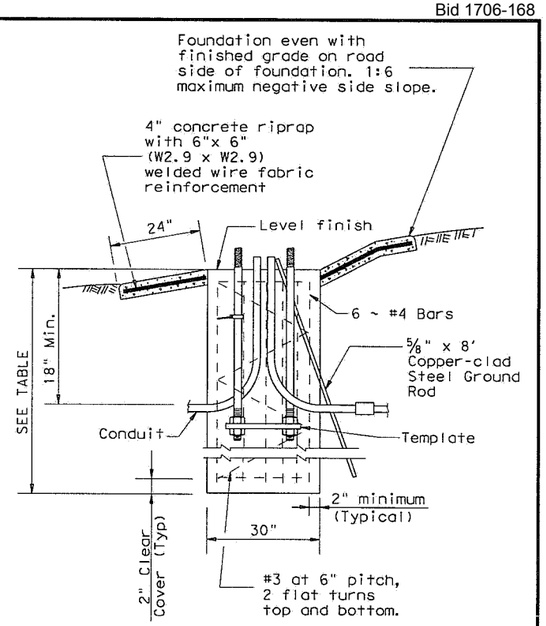
ANCHOR BOLT DETAIL

1. "Recommended Foundation Lengths" table is for information purposes only. Foundation lengths shall be as shown on the plans, or as directed by the Engineer. Foundations will be paid for under Item 416, "Drilled Shaft Foundations," unless otherwise shown on the plans.
2. Erect roadway illumination assembly poles plumb and true. Form and level the top 6" of the foundation so the pole will be plumb. Use leveling nuts to plumb shoe base poles. Do not use shims or leveling nuts under transformer bases. Do not grout between baseplate and the foundation.
3. Ensure Class 2A and 2B fit for anchor bolts and nuts. Tap and chase nuts after galvanizing. Anchor bolt body with rolled threads need not be full size.
4. Use appropriate class of concrete as specified in Items 416 and 432.
5. Place riprap around the foundation when called for elsewhere in the plans. Riprap will be paid for under Item 432.
6. Locate breakaway roadway illumination assemblies as shown in the placement table, unless otherwise dimensioned on the plans. Protect non-breakaway illumination assemblies from vehicular impact (i.e. 2 ft. behind guard rail or mounted on traffic barrier), or located outside the clear zone, except that 2.5 ft. from curb face is minimum desired for light poles on city streets, 45 mph or less, see design guidelines for further information.
7. Use 8 hold down washers on transformer base poles as recommended by the manufacturer and supplied with base.
8. Install a minimum of 2 conduits in each foundation. See lighting layout sheets for locations of foundations with more than 2 conduits. Cap unused conduits in foundations on both ends.
9. Conduit location in foundations is critical for breakaway devices. Place conduits 2 in. apart on centerline as shown.
10. Bond anchor bolt to rebar cage with #6 bare stranded copper conductor. Use listed mechanical connectors rated for embedment in concrete.
11. Use rip rap on T-base foundations that are located on a sloped grades.



SECTION A-A

SHOWING CONSTANT GRADE



SECTION A-A

SHOWING SLOPED GRADE

PAY QUANTITY OF RIPRAP PER FOUNDATION (Install only when shown on the plans)		
Foundation Diameter	RIPRAP DIAMETER	RIPRAP (CONC) (CL B)
30 in.	78 in.	0.35 CY

ANCHOR BOLTS			
POLE MOUNTING HEIGHT	BOLT CIRCLE		ANCHOR BOLT SIZE
	Shoe Base	T-Base	
<40 ft.	13 in.	14 in.	1in.x 30in.
40-50 ft.	15 in.	17 1/4in.	1 1/4in. x 30in.

RECOMMENDED FOUNDATION LENGTHS (See note 1)			
MOUNTING HEIGHT	TEXAS CONE PENETROMETER N Blows/ft		
	10	15	40
≤20 ft.	6'	6'	6'
>20 ft. to 30 ft.	8'	6'	6'
>30 ft. to 40 ft.	8'	8'	6'
>40 ft. to 50 ft.	10'	8'	6'

BREAKAWAY POLE PLACEMENT (See note 6)	
Roadway Functional Classification	** Pole offset (distance to transformer base, tolerance + 6in.-0in.)
Freeway Mainlanes (roadway with full control of access)	15 ft. (minimum and typical) from lane edge
All curbed, 45 mph or less design speed	2.5 ft. minimum (15 ft. desirable) from curb face
All others	10 ft. minimum*(15 ft. desirable) from lane edge

* or as close to ROW line as is practical

** provide 2/5 of the luminaire mounting height behind the pole for "falling area" to prevent encroachment on the other travel lanes. See design guidelines.

Texas Department of Transportation
Traffic Operations Division

ROADWAY ILLUMINATION DETAILS

(RDWY ILLUM FOUNDATIONS)

RID(FND)-11

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C	S	J	HWY
DIST	COUNTY		SHEET NO.
DST	CTY		182

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A. GENERAL SITE DATA

1. PROJECT LIMITS: *FROM 600' SOUTH OF ROCKRIDE LANE TO 600' NORTH OF BELMONT DRIVE*

Begin Project Coordinates : Latitude (N): 30.6207833 Longitude (W): -97.64683056
End Project Coordinates : Latitude (N): 30.6323056 Longitude (W): -97.64326667

2. PROJECT SITE MAPS:

- *Project Location Map: The Title Sheet*
- *Drainage Patterns: Drainage Area Maps (Sheets 111 - 113)*
- *Slopes Anticipated After Major Gradings or Areas of Soil Disturbance: Typical Sections (Sheets 4 - 7)*
- *Location of Erosion and Sediment Controls: SW3P Site Maps (Sheets 184 - 197)*
- *Surface Waters and Discharge Locations: Drainage and Culvert Layouts (Sheets 122 - 136)*
- *Project Specific Location(s) (PSL): To be determined by the project Construction Personnel. Location(s) shown on SW3P Site Map (if PSL location(s) is within one mile of project) and information located in project SW3P Binder (Reference item #10 below).*

3. PROJECT DESCRIPTION:

FOR THE CONSTRUCTION OF AN ARTERIAL STREET CONSISTING OF ASPHALT CONCRETE PAVING, GRADING, DRAINAGE CULVERTS, SIGNING AND PAVEMENT MARKINGS

4. MAJOR SOIL DISTURBING ACTIVITIES:

INCLUDES PREPARATION OF RIGHT-OF-WAY, CLEARING/GRUBBING, GRADING, EXCAVATION, AND EMBANKMENT, FOR ROADWAY, TOPSOIL WORK FOR FINAL PLANTING AND SEEDING.

5. EXISTING CONDITION OF SOIL & VEGETATIVE COVER AND % OF EXISTING VEGETATIVE COVER:

THE EXISTING SOILS (7.49 ACRES) ARE ACIDIC SANDY LAMS AND CLAYS WITH GENTLY ROLLING TO HILLY TOPOGRAPHY. THIS PROJECT IS LOCATED IN THE BLACKLAND PRAIRIE ECOREGION AND IS CHARACTERIZED BY DECIDUOUS TREES INCLUDING HONEY MESQUITE (PROSOPIS GLANDULOSA), SCATTERED AMONGST GRASSES. DOMINANT GRASSES INCLUDE LITTLE BLUESTEM (SCHIZACHYRIUM SCOPARIUM), SWITCHGRASS (PANICUM VIRGATUM), BIG BLUESTEM (ANDROPOGON GERARDII) AND EASTER GAMAGRASS (TRIPSAOU DACTYLOIDES).

THE REMAINDER (2.50 ACRES) IS PAVEMENT.

6. TOTAL PROJECT AREA: *13.88* Acres

7. TOTAL AREA TO BE DISTURBED: *11.86* Acres (*80* %)

8. WEIGHTED RUNOFF COEFFICIENT

BEFORE CONSTRUCTION: *0.50*
AFTER CONSTRUCTION: *0.58*

9. NAME OF RECEIVING WATERS:

ALL RUNOFF FROM THE PROJECT WILL FLOW INTO TRIBUTARIES OF MANKINS BRANCH WHICH EVENTUALLY FLOWS INTO THE BRAZOS RIVER DRAINAGE BASIN.

10. PROJECT SW3P Binder:

A. For projects disturbing one to five acres, The Contractor will maintain a SW3P Binder at the project field office (if there is not a project field office, should be kept on the Job Site at all times) which contains the following: Index Sheet, TCEQ Signature Authority, TCEQ Small Construction Site Notice, Contractor Certification of Compliance, SW3P Inspector Qualification Statements, Inspection and Maintenance Reports (Form 2118), SW3P Sheet, Site Location Maps, Stored Material Lists specifying associated control measures and the Appendix which contains the TPDES Construction General Permit, MS4 Operator Notification(s) and the Construction PSL Permits per all applicable requirements.

B. For projects disturbing 5 acres or more, the Contractor will follow the actions listed in (10.A.) above with the addition of the following: Notice Of Intent (N.O.I.) and Fee Payment Form, TCEQ Large Construction Site Notice (to be used instead of Small Site Notice), and TPDES Permit Coverage Notice.

C. For projects disturbing less than one acre, actions described in (10.A.) and (10.B.) above are not required. Acreage is calculated by adding Total Area To Be Disturbed Acres on project (See #7 above) and the PSL(s) acreage located within one mile of project.

B. EROSION AND SEDIMENT CONTROLS

1. SOIL STABILIZATION PRACTICES: (Select T = Temporary or P = Permanent, as applicable)

- T TEMPORARY SEEDING
- ___ MULCHING (Hay or Straw)
- ___ BUFFER ZONES
- P PLANTING
- P SEEDING
- ___ SODDING
- ___ PRESERVATION OF NATURAL RESOURCES
- ___ FLEXIBLE CHANNEL LINER
- P RIGID CHANNEL LINER
- T SOIL RETENTION BLANKET
- ___ COMPOST MANUFACTURED TOPSOIL
- T VERTICAL TRACKING
- ___ OTHER: *Disturbed areas on which construction activity has ceased, either temporarily or permanently, shall be stabilized within 14 days unless activities are scheduled to resume and do so within 21 days.*

2. STRUCTURAL PRACTICES:
(T = Temporary or P = Permanent)

- T SILT FENCES
- T EROSION CONTROL LOGS
- ___ EROSION CONTROL COMPOST BERMS (Low Velocity)
- T ROCK FILTER DAMS
- ___ DIVERSION, INTERCEPTOR, OR PERIMETER DIKES
- ___ DIVERSION, INTERCEPTOR, OR PERIMETER SWALES
- ___ DIVERSION DIKE AND SWALE COMBINATIONS
- ___ PIPE SLOPE DRAINS
- ___ PAVED FLUMES
- T ROCK BEDDING AT CONSTRUCTION EXIT
- ___ TIMBER MATTING AT CONSTRUCTION EXIT
- P CHANNEL LINERS
- ___ SEDIMENT TRAPS
- ___ SEDIMENT BASINS
- ___ STORM INLET SEDIMENT TRAP
- ___ STONE OUTLET STRUCTURES
- P CURBS AND GUTTERS
- ___ STORM SEWERS
- P VELOCITY CONTROL DEVICES
- P OTHER: RIPRAP

NOTE: TOP OF BMP'S SHOULD NOT BE HIGHER THAN ROADWAY ELEVATION AS NOT TO FLOOD ROADWAY UNLESS PRIOR APPROVAL FROM ENGINEER IS OBTAINED.

3. STORM WATER MANAGEMENT: *(Example Below - May be used as applicable, or revised)*

A. Storm water drainage will be provided by ditches, inlets, and storm water systems which carry drainage within the R.O.W. to the lows within the roadway and project site which drains to natural facilities.

B. Non paved areas and ditches shall be stabilized with a permanent vegetative cover.

C. Other permanent erosion controls include hydraulic design to limit structure outlet velocities and grading design generally consisting of 4 :1 or flatter slopes with permanent vegetative cover.

4. STORM WATER MANAGEMENT ACTIVITIES: (Sequence of Construction)

1. INSTALL PERIMETER CONTROLS, PREP R.O.W., BEGIN EXCAVATION AND EMBANKMENT. INSTALL SILT FENCES AND ROCK BERMS AS SOON AS PRACTICAL. COMPLETE TOPSOIL AND SEEDING AS SOON AS PRACTICAL FOLLOWING EXCAVATION AND EMBANKMENT.

2. REPLACE DRAINAGE STRUCTURES, FLEX BASE AND PAVEMENT.

3. WHEN ALL CONSTRUCTION ACTIVITY IS COMPLETE AND THE SITE IS STABLE AND APPROVED BY THE CONSTRUCTION ENGINEER, REMOVE ALL TEMPORARY CONTROLS AND RESEED ANY AREA DISTURBED BY THEIR REMOVAL.

5. NON-STORM WATER DISCHARGES:

Filter non-storm water discharges, or hold in retention basins, before being allowed to mix with storm water. These discharges consist of, but not limited to, non-polluted ground water, spring water, foundation or footing drain water, water used for dust control or pavement washing and vehicle washwater containing no detergents.

C. OTHER REQUIREMENTS & PRACTICES

1. MAINTENANCE:

Maintain all erosion and sediment controls in good working order. Perform any necessary cleaning/repairs/replacements at the earliest possible date prior to next rain event, but no later than 7 calendar days. Ensure the surrounding ground has dried sufficiently to prevent damage from equipment. "Too Wet" is the only reason for not adhering to time frames described. When construction activities permanently or temporarily cease and are not expected to resume for 14 or more days on a disturbed portion of the site, stabilization measures must be initiated immediately.

2. INSPECTION:

A Construction Observer will perform a regularly scheduled SW3P inspection every 7 calendar days. An inspection and Maintenance Report, signed by the Construction Observer and the Contractor, will be filed for each inspection. Revise/clean/repair/replace each BMP control device in accordance with the current Field Inspection and Maintenance Report (Form 2118) and item 1 (Maintenance) above.

3. WASTE MATERIALS:

On a daily basis, or as may be directed, collect all waste materials, trash and debris from the construction site and deposit into a metal dumpster having a secure cover and which meets all state and local city solid waste management requirements. Empty the dumpster as required by regulation, or as may be directed, at a local approved landfill site. Do not bury construction waste on the construction project site.

4. HAZARDOUS WASTE & SPILL REPORTING:

As a minimum, any products in the following categories are considered to be hazardous: Paints, Acids, Solvents, Fuels, Asphalt Products, Chemical Additives for Soil Stabilization, and Concrete Curing Compounds or Additives. When storing hazardous material on the project site, or at a Project Specific Location, take all practicable precaution to prevent and/or contain any spillage of these materials. In the event of a spill, contact the spill coordinator immediately.

5. SANITARY WASTE:

Use a licensed sanitary waste management contractor to collect all sanitary waste from portable units as may be required by local regulation, or as directed.

6. CONSTRUCTION VEHICLE TRACKING:

On a regular basis, or as may be directed, dampen haul roads for dust control and stabilize construction entrances/exits. Provide for a motorized broom or vacuum type sweeper to be available on a daily basis, or as may be directed, to remove sediment from paved roadways abutting or traversing the project site.

7. MANAGEMENT PRACTICES:

A. Construct disposal areas, stockpiles, haul roads and PSL's in a manner that will minimize and control the amount of sediment that may enter receiving waters. Do not locate disposal areas in any wetland, waterbody or streambed.
B. Locate construction staging areas, vehicle maintenance and PSL's areas in a manner to minimize the runoff of pollutants.
C. When working in or near a wetland, install and maintain operating soil erosion and sediment controls at all times during construction and isolate the work from the wetland.
D. Clear all waterways as soon as practicable of temporary embankment, temporary bridges, matting, falsework, piling, debris or other obstructions placed during construction operations that are not a part of the finished work.
E. Procedures and/or practices should be taken to control dust.
F. Sediment to be removed from roadways daily or when work begins after weather events if construction activities have ceased due to weather event.
G. The Contractor will be required to contain wash water from concrete trucks in a manner that will prevent same from entering any waterway.
H. The Contractor is responsible for insuring that all Subcontractors are aware and comply with all components of the Temporary Erosion Control Plans.

STATE OF TEXAS
CHASE W. MYERS
94895
LICENSED
PROFESSIONAL ENGINEER
6/26/17

, P.E.
Signature of Registrant & Date

BRIDGEFARMER & ASSOCIATES, INC.
CONSULTING ENGINEERS
TBPE REGISTRATION NO. 264

WILLIAMSON COUNTY

STORM WATER POLLUTION PREVENTION PLAN (SW3P)

TEMPLATE REVISION DATE: 06/12/2015

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
GRAPHICS	6			
	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK	TEXAS		WILLIAMSON	
CHECK	CONTROL	SECTION	JOB	183

DESIGNER DATE FILE NAME
6/26/2017
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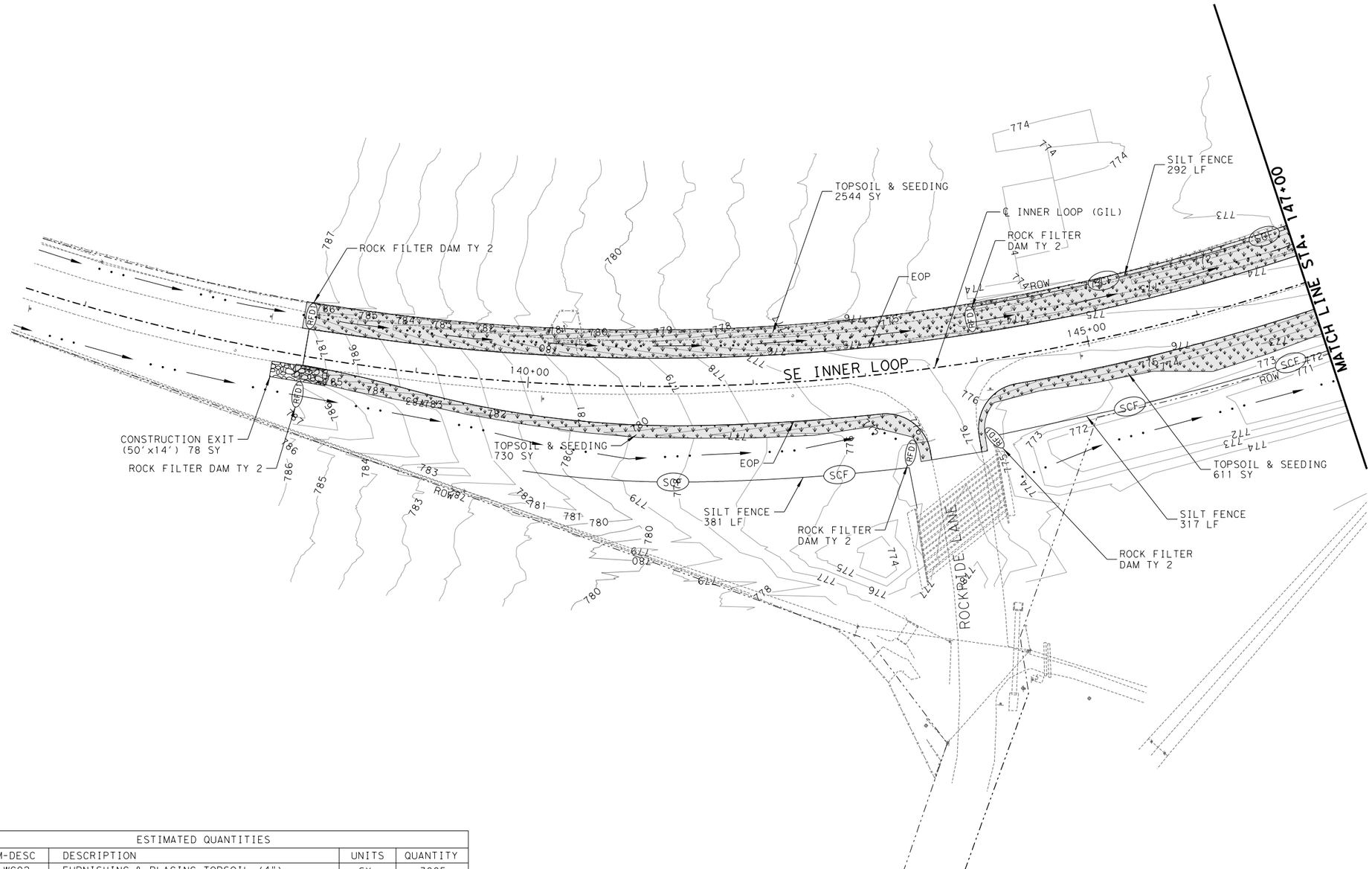

NOTES:

1. PERIMETER CONTROLS SHALL BE IN PLACE PRIOR TO COMMENCING ANY SOIL DISTURBING ACTIVITIES.
2. THE QUANTITIES SHOWN ARE APPROXIMATE AND MAY BE ADJUSTED TO MEET FIELD CONDITIONS.
3. CONSTRUCTION EXITS SHALL BE FIELD LOCATED AS NEEDED OR AS DIRECTED BY THE ENGINEER.
4. LENGTH OF ROCK FILTER DAMS ARE TO BE 10LF OR AS DIRECTED BY THE ENGINEER.

LEGEND

SCF	SEDIMENT CONTROL FENCE (SCF)
RFD2	ROCK FILTER DAM TYPE 2
	BIO EROSION CONTROL LOG
	FURNISHING & PLACING TOPSOIL & SEEDING FOR EROSION CONTROL

ESTIMATED QUANTITIES			
ITEM-DESC	DESCRIPTION	UNITS	QUANTITY
160 WC02	FURNISHING & PLACING TOPSOIL (4")	SY	3885
161 WC001	EROSION CONTROL COMPOST (3")	SY	971 *
162 WC103	MULCH TOPDRESSING (5")	SY	971 *
164 WC04	SEEDING FOR EROSION CONTROL (TY 4)	SY	971
164 WC05	SEEDING FOR EROSION CONTROL (TY 5)	SY	971
164 WC10	SEEDING FOR EROSION CONTROL (TY10)	SY	1943
168 WC01	VEGETATIVE WATERING	MG	58
506 6002	ROCK FILTER DAMS (INSTL)(TY2)	LF	50
506 6011	ROCK FILTER DAMS (REMOVE)	LF	50
506 6020	CONSTRUCTION EXITS (INSTL)(TY1)	SY	78
506 6024	CONSTRUCTION EXITS (REMOVE)	SY	78
506 6038	TEMP SEDMT CONT FENCE (INSTL)	LF	990
506 6039	TEMP SEDMT CONT FENCE (REMOVE)	LF	990

* TO BE PLACED AS DIRECTED BY THE CONSTRUCTION OBSERVER

STATE OF TEXAS
ROBERT CARRILLO
80169
REGISTERED PROFESSIONAL ENGINEER
6/22/2017
Robert Carrillo, PE

NO.	REVISION	BY	DATE

WILLIAMSON COUNTY
1848

RTG RODRIGUEZ TRANSPORTATION GROUP FIRM #587

GEORGETOWN INNER LOOP

EROSION CONTROL PLAN

BEGIN PROJECT - STA. 147+00

6/22/2017 SHEET 1 OF 2

DESIGNED:	PROJECT NUMBER		ROADWAY	
CHECKED:			SE INNER LOOP	
DRAWN:	STATE	COUNTY	CITY	SHEET No.
CHECKED:	TEXAS	WILLIAMSON	GEORGETOWN	184

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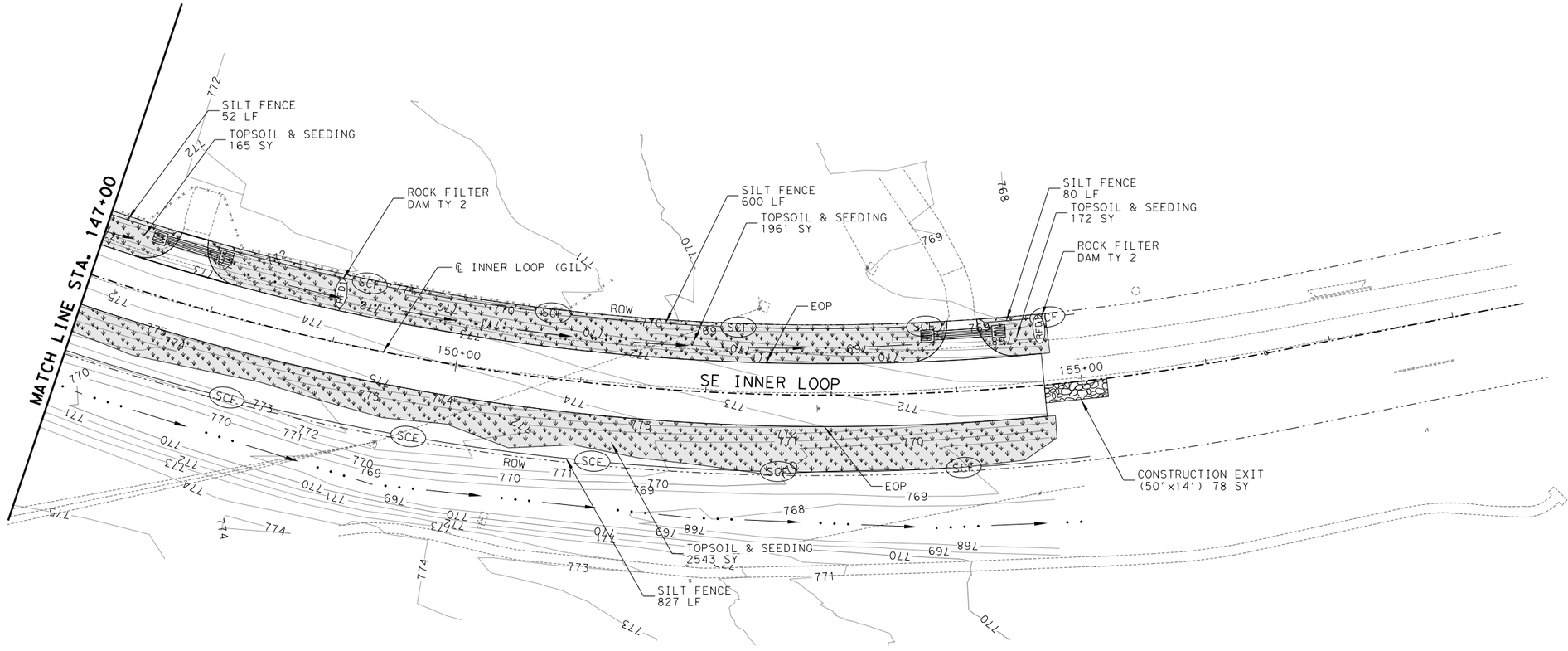

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4. LENGTH OF ROCK FILTER DAMS ARE TO BE 10LF OR AS DIRECTED BY THE ENGINEER.

LEGEND

- SCF — SEDIMENT CONTROL FENCE (SCF)
- RFD2 — ROCK FILTER DAM TYPE 2
- BIO EROSION CONTROL LOG
- FURNISHING & PLACING TOPSOIL & SEEDING FOR EROSION CONTROL

ESTIMATED QUANTITIES			
ITEM-DESC	DESCRIPTION	UNITS	QUANTITY
160 WC02	FURNISHING & PLACING TOPSOIL (4")	SY	4841
161 WC001	EROSION CONTROL COMPOST (3")	SY	1210 *
162 WC103	MULCH TOPDRESSING (5")	SY	1210 *
164 WC04	SEEDING FOR EROSION CONTROL (TY 4)	SY	1210
164 WC05	SEEDING FOR EROSION CONTROL (TY 5)	SY	1210
164 WC10	SEEDING FOR EROSION CONTROL (TY10)	SY	2421
168 WC01	VEGETATIVE WATERING	MG	73
506 6002	ROCK FILTER DAMS (INSTL)(TY2)	LF	20
506 6011	ROCK FILTER DAMS (REMOVE)	LF	20
506 6020	CONSTRUCTION EXITS (INSTL)(TY1)	SY	78
506 6024	CONSTRUCTION EXITS (REMOVE)	SY	78
506 6038	TEMP SEDMT CONT FENCE (INSTL)	LF	1559
506 6039	TEMP SEDMT CONT FENCE (REMOVE)	LF	1559

* TO BE PLACED AS DIRECTED BY THE CONSTRUCTION OBSERVER

STATE OF TEXAS
ROBERT CARRILLO
80169
REGISTERED PROFESSIONAL ENGINEER
6/22/2017
Robert Carrillo, P.E.

NO.	REVISION	BY	DATE

WILLIAMSON COUNTY
1848

RTG RODRIGUEZ TRANSPORTATION GROUP
FIRM #587

GEORGETOWN INNER LOOP

EROSION CONTROL PLAN

STA. 147+00 - STA. 154+70

6/22/2017 SHEET 2 OF 2

DESIGNED:	PROJECT NUMBER		ROADWAY	
CHECKED:			SE INNER LOOP	
DRAWN:	STATE	COUNTY	CITY	SHEET No.
CHECKED:	TEXAS	WILLIAMSON	GEORGETOWN	185

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RFD2 # 1
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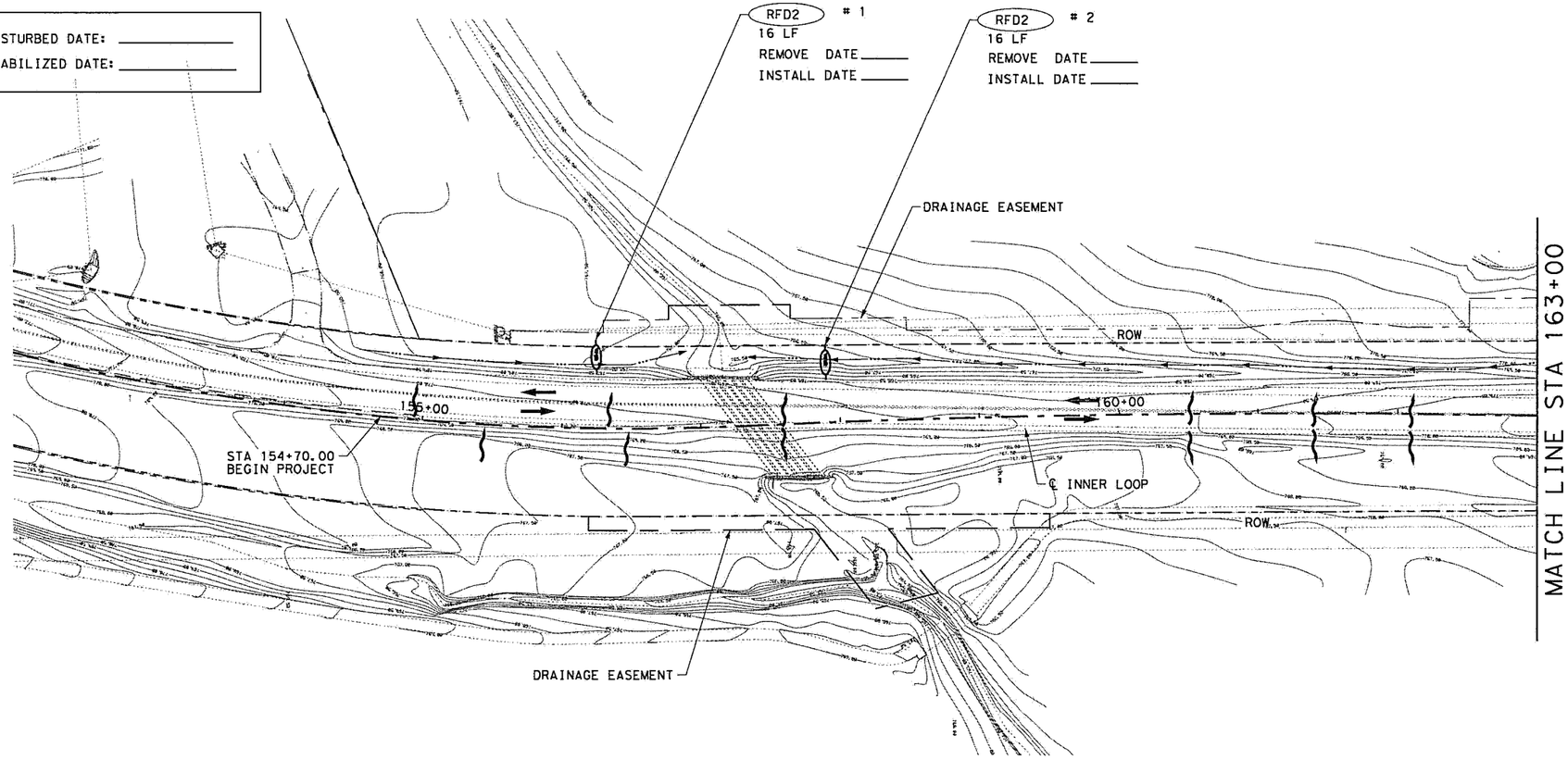
REMOVE DATE _____
INSTALL DATE _____

RFD2 # 2
16 LF
REMOVE DATE _____
INSTALL DATE _____



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SW3P PLAN LEGEND

- PERMANENT PAVEMENT UNDER CONSTRUCTION
- TEMPORARY PAVEMENT UNDER CONSTRUCTION
- PREVIOUSLY CONSTRUCTED PAVEMENT
- FURNISHING AND PLACING TOPSOIL (4") & SEEDING
- SOIL RETENTION BLANKET, TYPE E
- SURFACE FLOW
- EXISTING DITCH FLOW LINE
- DITCH FLOW LINE
- ECL — EROSION CONTROL LOG, TYPE 1
- RFD3 — ROCK FILTER DAM, TYPE 3
- RFD2 — ROCK FILTER DAM, TYPE 2
- PREVIOUS PHASE/STAGE BMP

NOTES:
1. INSTALL EROSION CONTROL DEVICES PRIOR TO THE START OF ANY CONSTRUCTION AND KEEP IN PLACE UNTIL CONSTRUCTION IS COMPLETE.
2. INSTALLATION, MAINTENANCE AND REMOVAL OF EROSION CONTROL DEVICES WILL BE IN ACCORDANCE WITH TXDOT STANDARDS FOR EROSION CONTROL AND WILLIAMSON COUNTY PROTOCOL FOR SUSTAINABLE ROADSIDES.
3. LOCATIONS OF CONSTRUCTION EXITS TO BE DETERMINED IN THE FIELD.
4. EROSION CONTROL LOGS CAN BE LEFT IN PLACE AT PROJECT COMPLETION IF DETERMINED BY CONSTRUCTION OBSERVER.

STATE OF TEXAS
CHASE W. MYERS
94895
LICENSED
PROFESSIONAL ENGINEER
6/26/17

BRIDGEFARMER & ASSOCIATES, INC.
CONSULTING ENGINEERS
TBPE REGISTRATION NO. 264

GEORGETOWN INNER LOOP @ CENTRAL MAINTENANCE FACILITY

SWPPP
PHASE 1 STAGE 1

SCALE: 1" = 100' SHEET 1 OF 3

DESIGN	GRAPHICS	CHECK	CHECK	SHEET NO.
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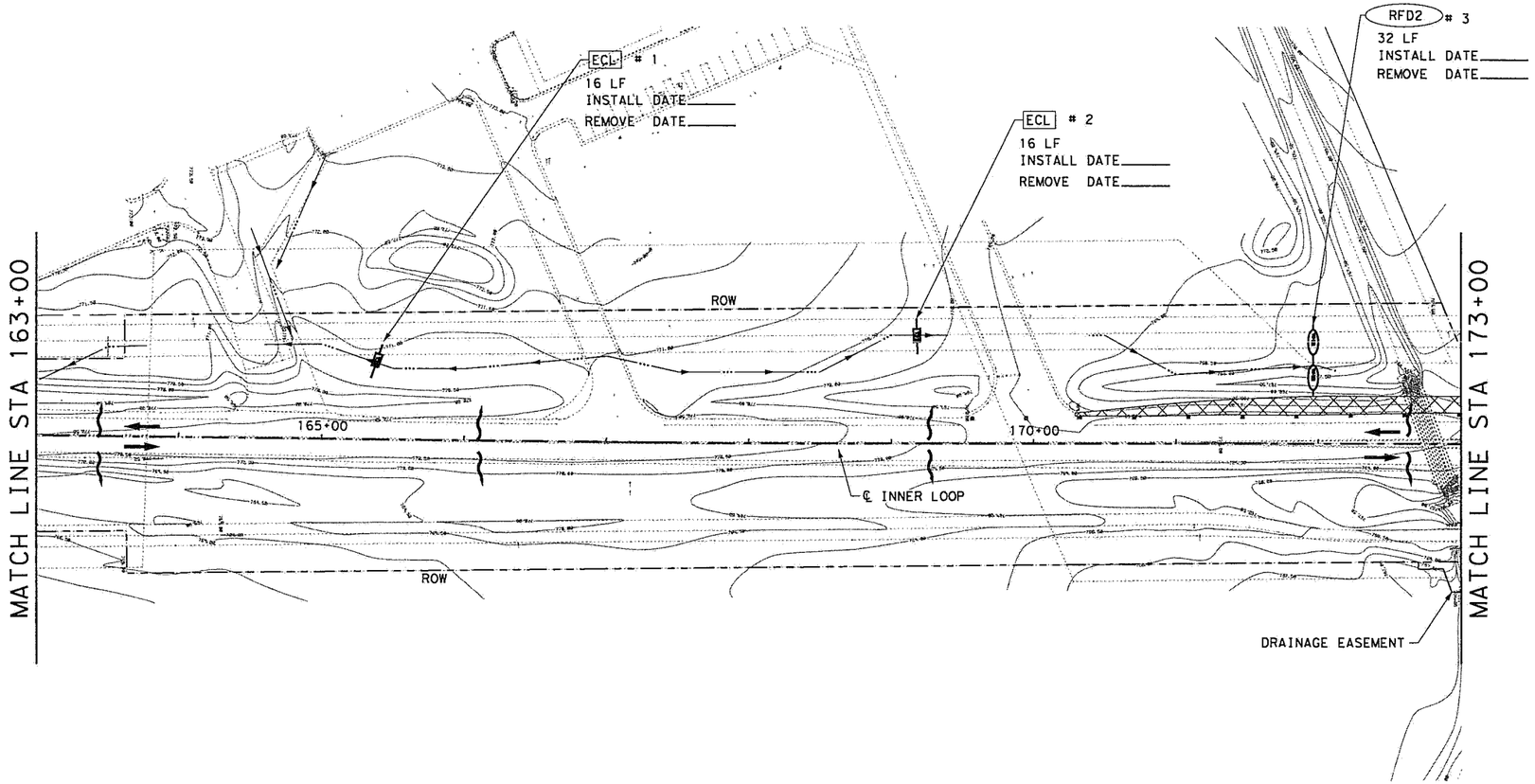

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SW3P PLAN LEGEND

- PERMANENT PAVEMENT UNDER CONSTRUCTION
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STATE OF TEXAS
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GEORGETOWN INNER LOOP @ CENTRAL MAINTENANCE FACILITY

SWPPP
PHASE 1 STAGE 1

SCALE: 1" = 100' SHEET 2 OF 3

DESIGN	GRAPHICS	CHECK	CHECK	SHEET NO.
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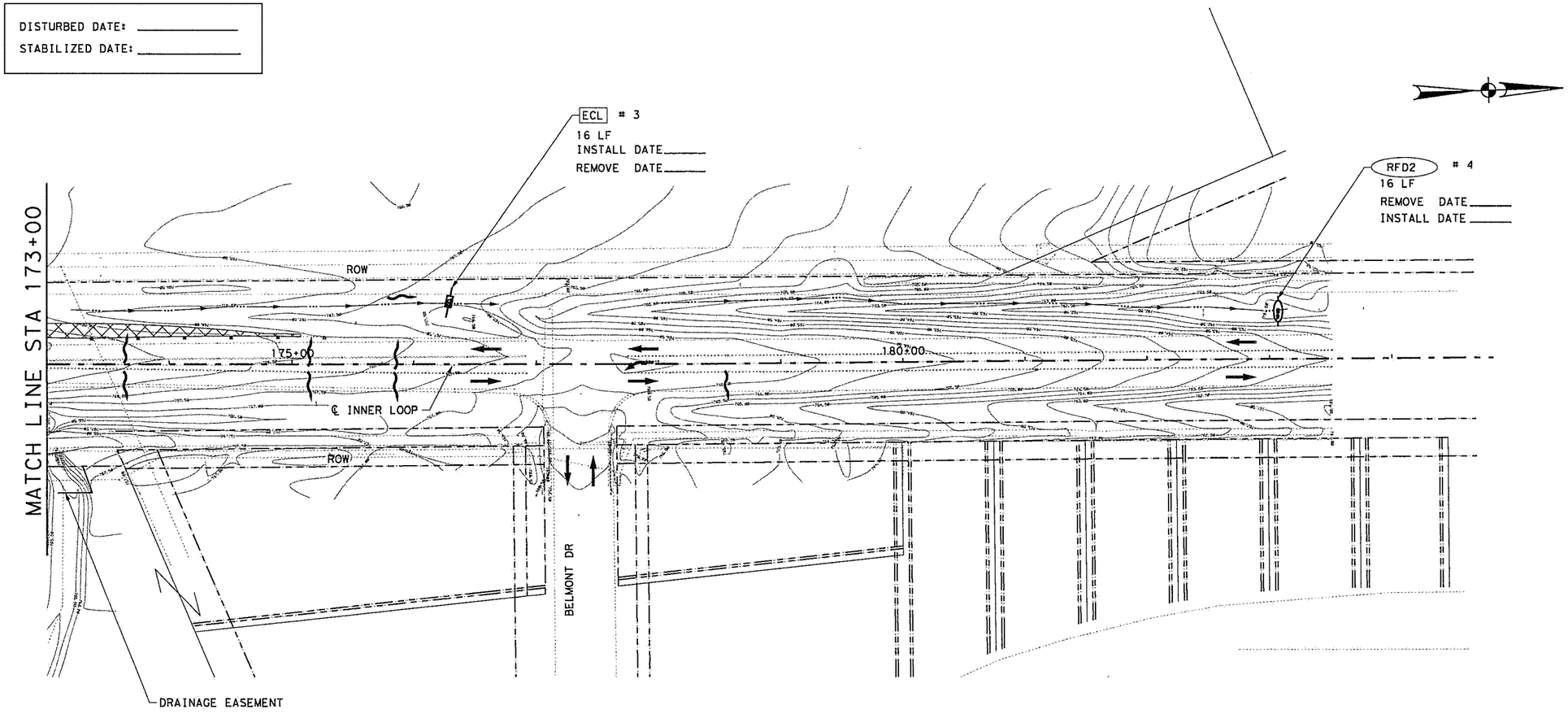

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BRIDGEFARMER & ASSOCIATES, INC.
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TBPE REGISTRATION NO. 264

GEORGETOWN INNER LOOP @ CENTRAL MAINTENANCE FACILITY

SWPPP
PHASE 1 STAGE 1

SCALE: 1" = 100' SHEET 3 OF 3

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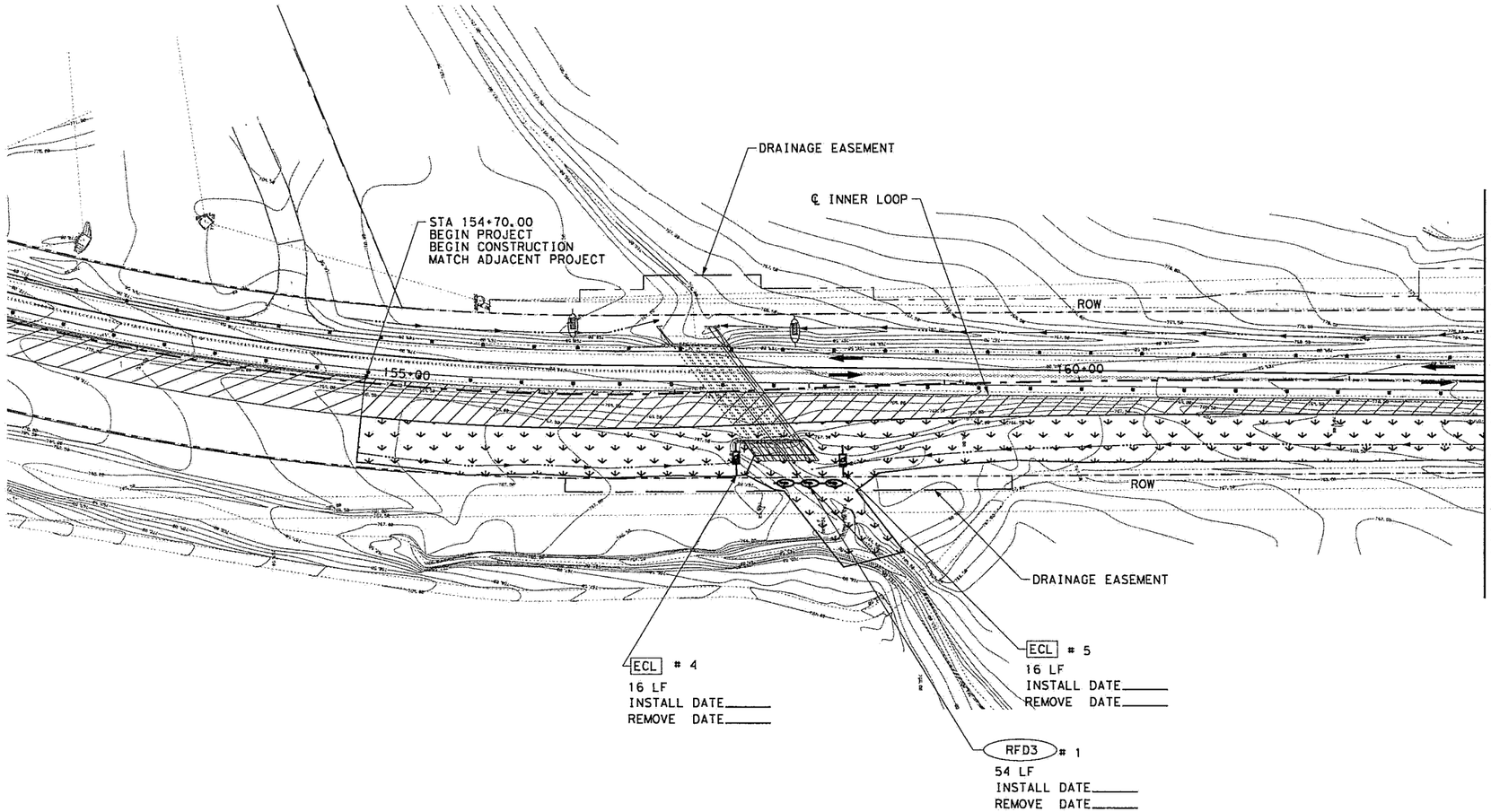

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STATE OF TEXAS
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CONSULTING ENGINEERS
TBPE REGISTRATION NO. 264

GEORGETOWN INNER LOOP @ CENTRAL MAINTENANCE FACILITY

SWPPP
PHASE 1 STAGE 2

SCALE: 1" = 100' SHEET 1 OF 3

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DISTURBED DATE: _____
STABILIZED DATE: _____

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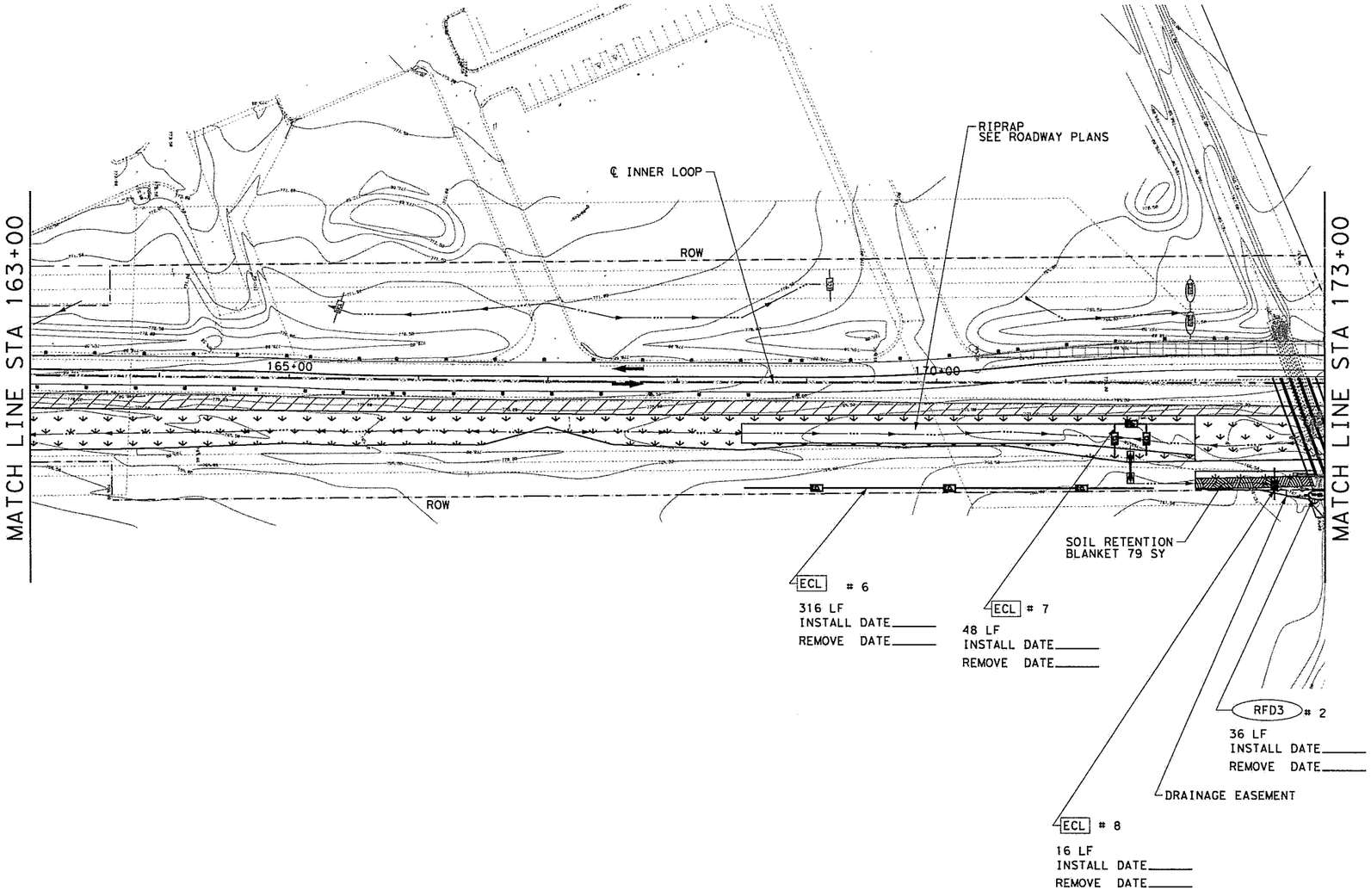
SCALE: 1" = 100'



SW3P PLAN LEGEND

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- DITCH FLOW LINE
- ECL — EROSION CONTROL LOG, TYPE 1
- RFD3 — ROCK FILTER DAM, TYPE 3
- RFD2 — ROCK FILTER DAM, TYPE 2
- PREVIOUS PHASE/STAGE BMP

STATE OF TEXAS
CHASE W. MYERS
94895
LICENSED
PROFESSIONAL ENGINEER
6/26/17

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BRIDGEFARMER & ASSOCIATES, INC.
CONSULTING ENGINEERS
TBPE REGISTRATION NO. 264

GEORGETOWN INNER LOOP @ CENTRAL MAINTENANCE FACILITY

SWPPP
PHASE 1 STAGE 2

SCALE: 1" = 100' SHEET 2 OF 3

DESIGN	GRAPHICS	CHECK	CHECK	SHEET NO.
KA	AKH	CWM	WD	190 p. 580

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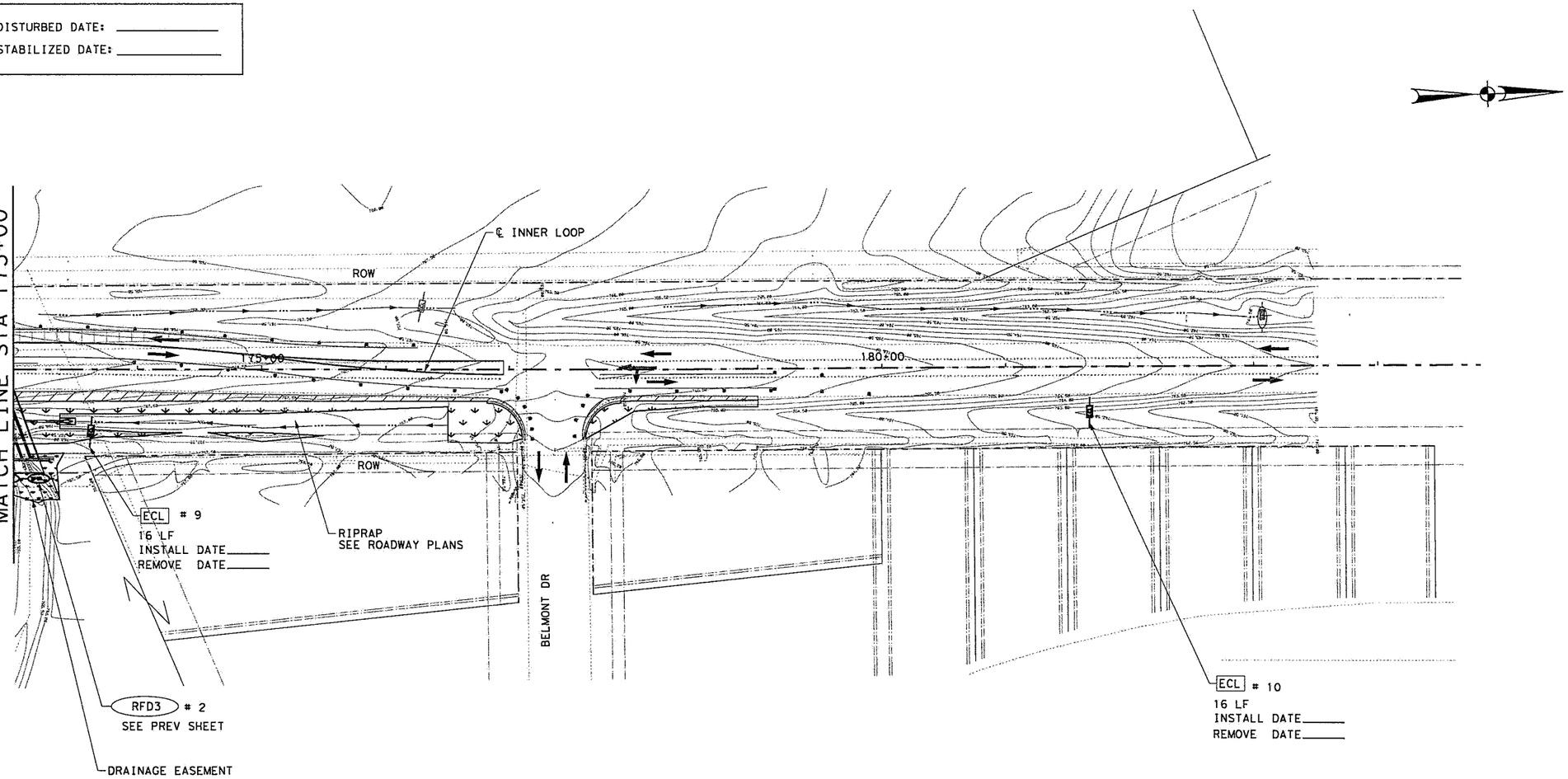

50 0 50 100
SCALE: 1" = 100'

SW3P PLAN LEGEND

- PERMANENT PAVEMENT UNDER CONSTRUCTION
- TEMPORARY PAVEMENT UNDER CONSTRUCTION
- PREVIOUSLY CONSTRUCTED PAVEMENT
- FURNISHING AND PLACING TOPSOIL (4") & SEEDING
- SOIL RETENTION BLANKET, TYPE E
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GEORGETOWN INNER LOOP @ CENTRAL MAINTENANCE FACILITY

SWPPP
PHASE 1 STAGE 2

SCALE: 1" = 100' SHEET 3 OF 3

DESIGN	GRAPHICS	CHECK	CHECK	SHEET NO.
KA	AKH	CWM	WD	1p261

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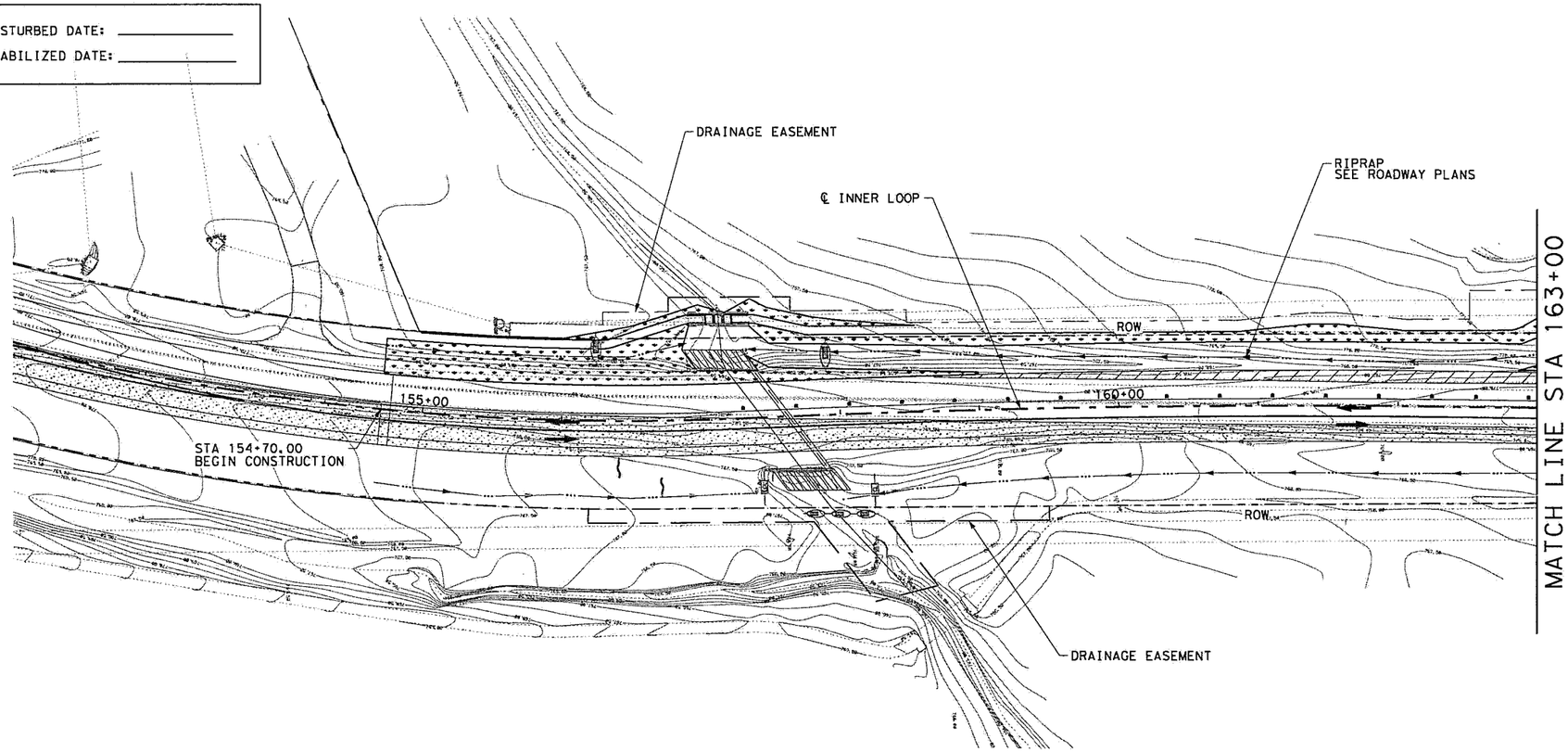
STABILIZED DATE: _____



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SCALE: 1" = 100'

SW3P PLAN LEGEND

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GEORGETOWN INNER LOOP @ CENTRAL MAINTENANCE FACILITY

SWPPP
PHASE 2 STAGE 1

SCALE: 1" = 100' SHEET 1 OF 3

DESIGN	GRAPHICS	CHECK	CHECK	SHEET NO.
KA	AKH	CWM	WD	192

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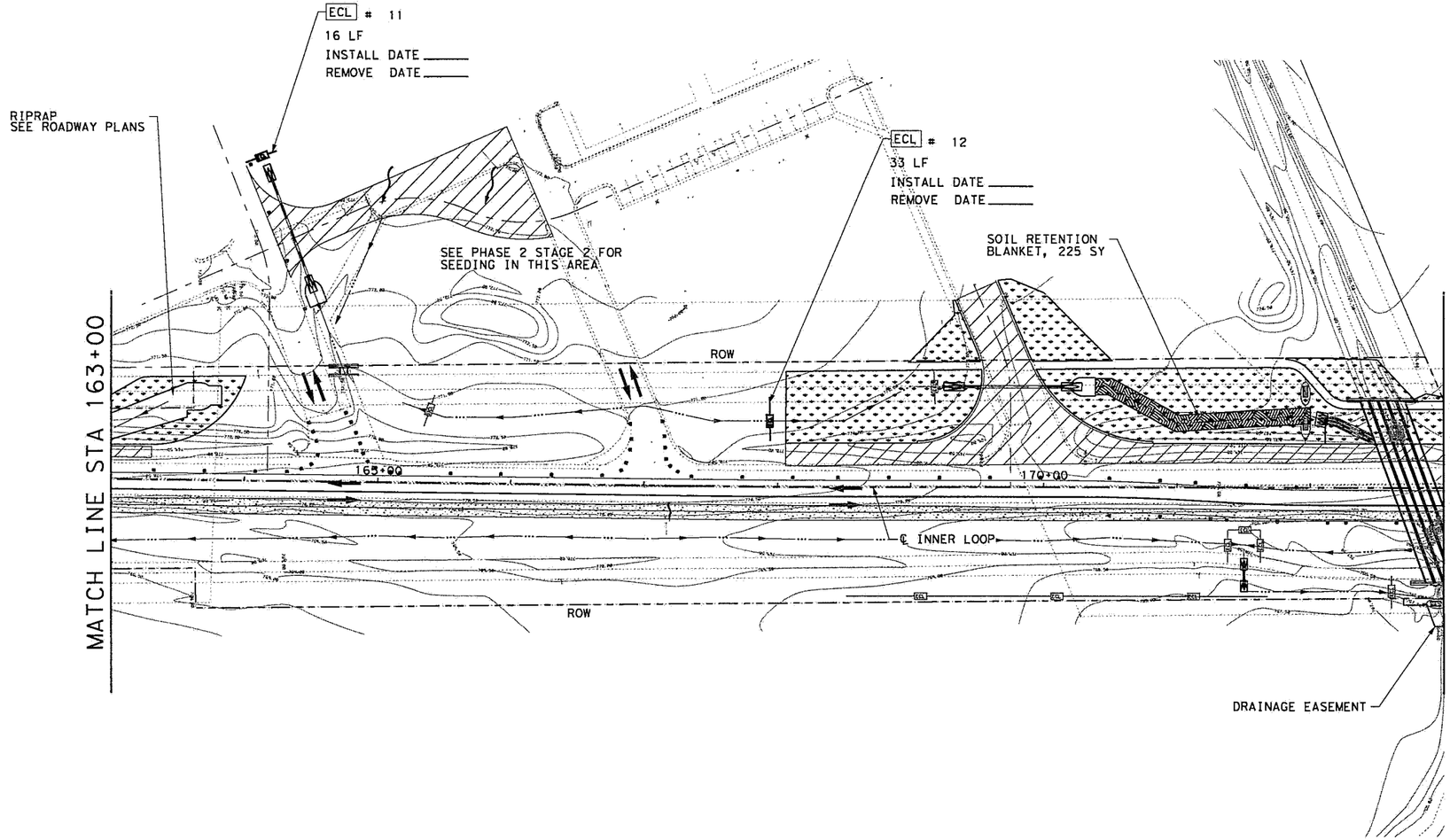

50 0 50 100
SCALE: 1" = 100'

SW3P PLAN LEGEND

- PERMANENT PAVEMENT UNDER CONSTRUCTION
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GEORGETOWN INNER LOOP @ CENTRAL MAINTENANCE FACILITY

SWPPP
PHASE 2 STAGE 1

SCALE: 1" = 100' SHEET 2 OF 3

DESIGN	GRAPHICS	CHECK	CHECK	SHEET NO.
KA	AKH	CWM	WD	193

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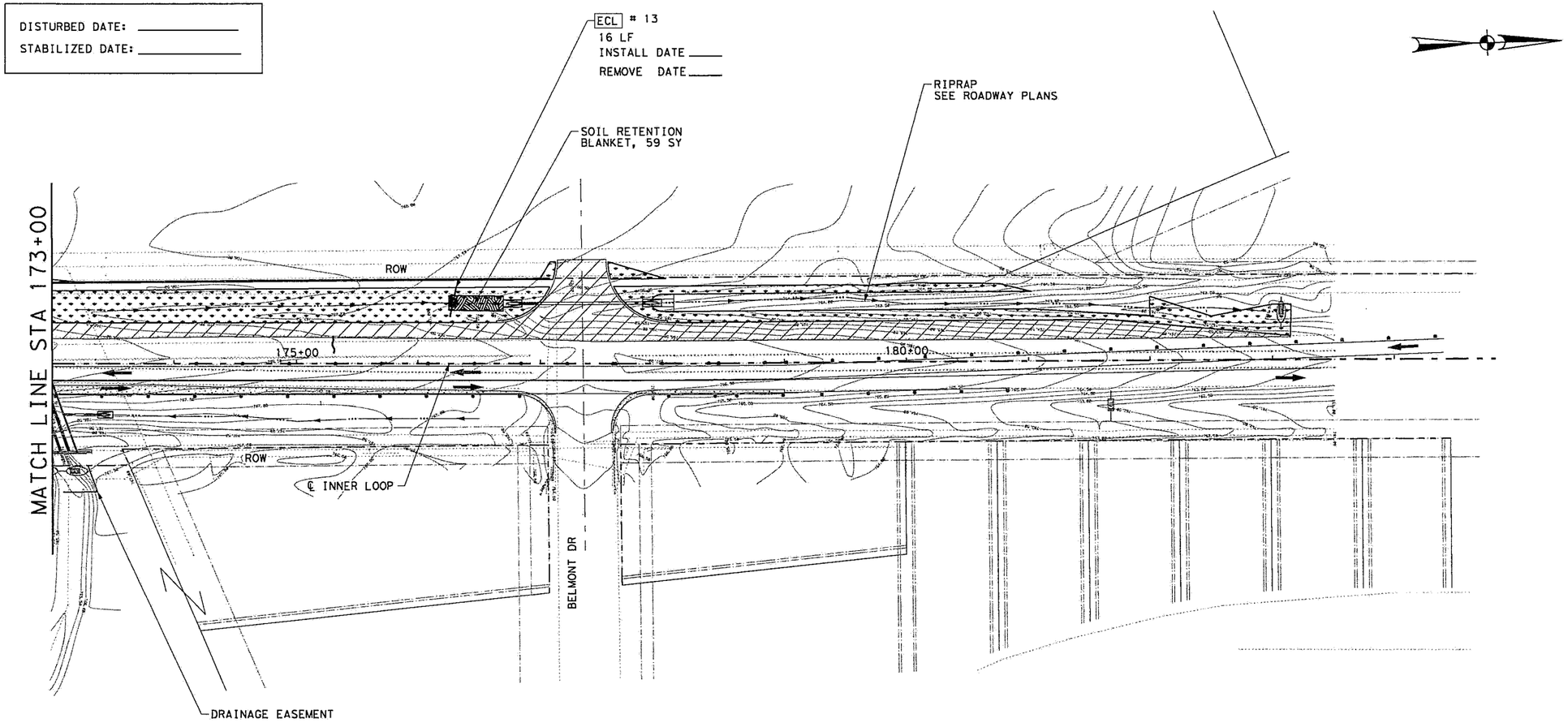

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SCALE: 1" = 100'

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GEORGETOWN INNER LOOP @ CENTRAL MAINTENANCE FACILITY

SWPPP
PHASE 2 STAGE 1

SCALE: 1" = 100' SHEET 3 OF 3

DESIGN	GRAPHICS	CHECK	CHECK	SHEET NO.
KA	AKH	CWM	WD	194

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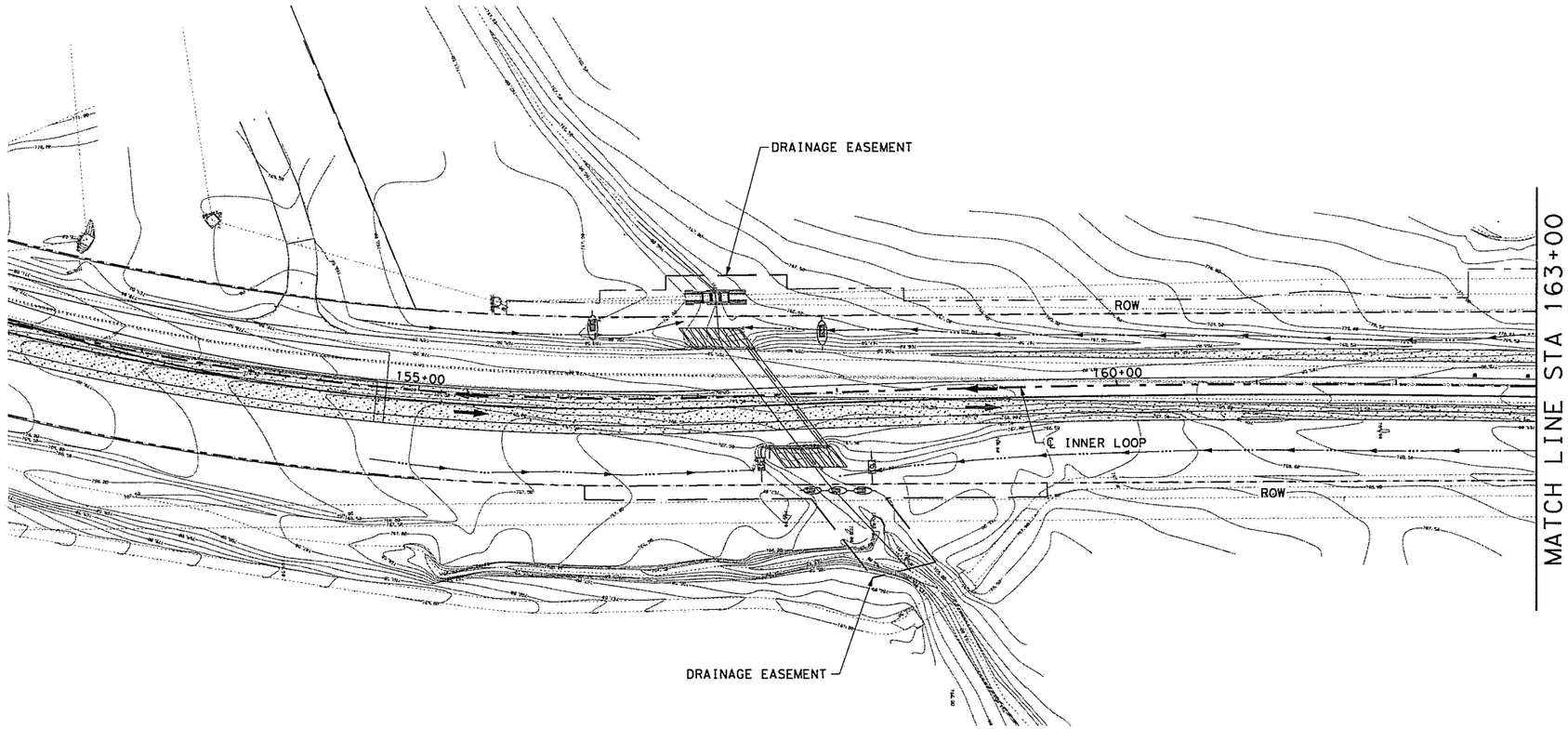
STABILIZED DATE: _____



50 0 50 100
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SWPPP
PHASE 2 STAGE 2

SCALE: 1" = 100' SHEET 1 OF 3

DESIGN	GRAPHICS	CHECK	CHECK	SHEET NO.
KA	AKH	CWM	WD	195

p-585

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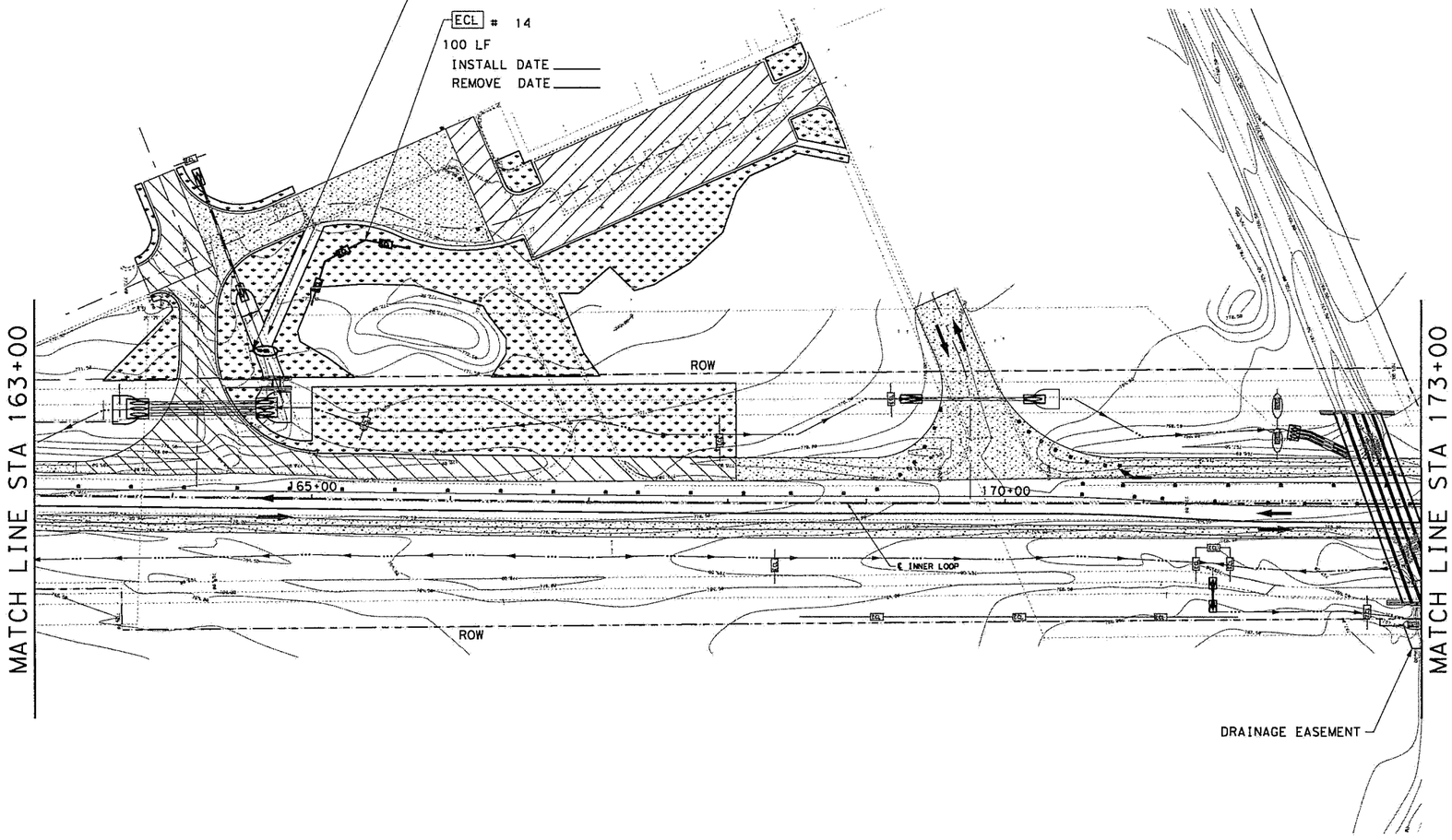
6/26/2017
cwm

DISTURBED DATE: _____
STABILIZED DATE: _____

RFD3 # 3
16 LF
REMOVE DATE_____
INSTALL DATE_____

ECL # 14
100 LF
INSTALL DATE_____
REMOVE DATE_____



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SWPPP
PHASE 2 STAGE 2

SCALE: 1" = 100' SHEET 2 OF 3

DESIGN	GRAPHICS	CHECK	CHECK	SHEET NO.
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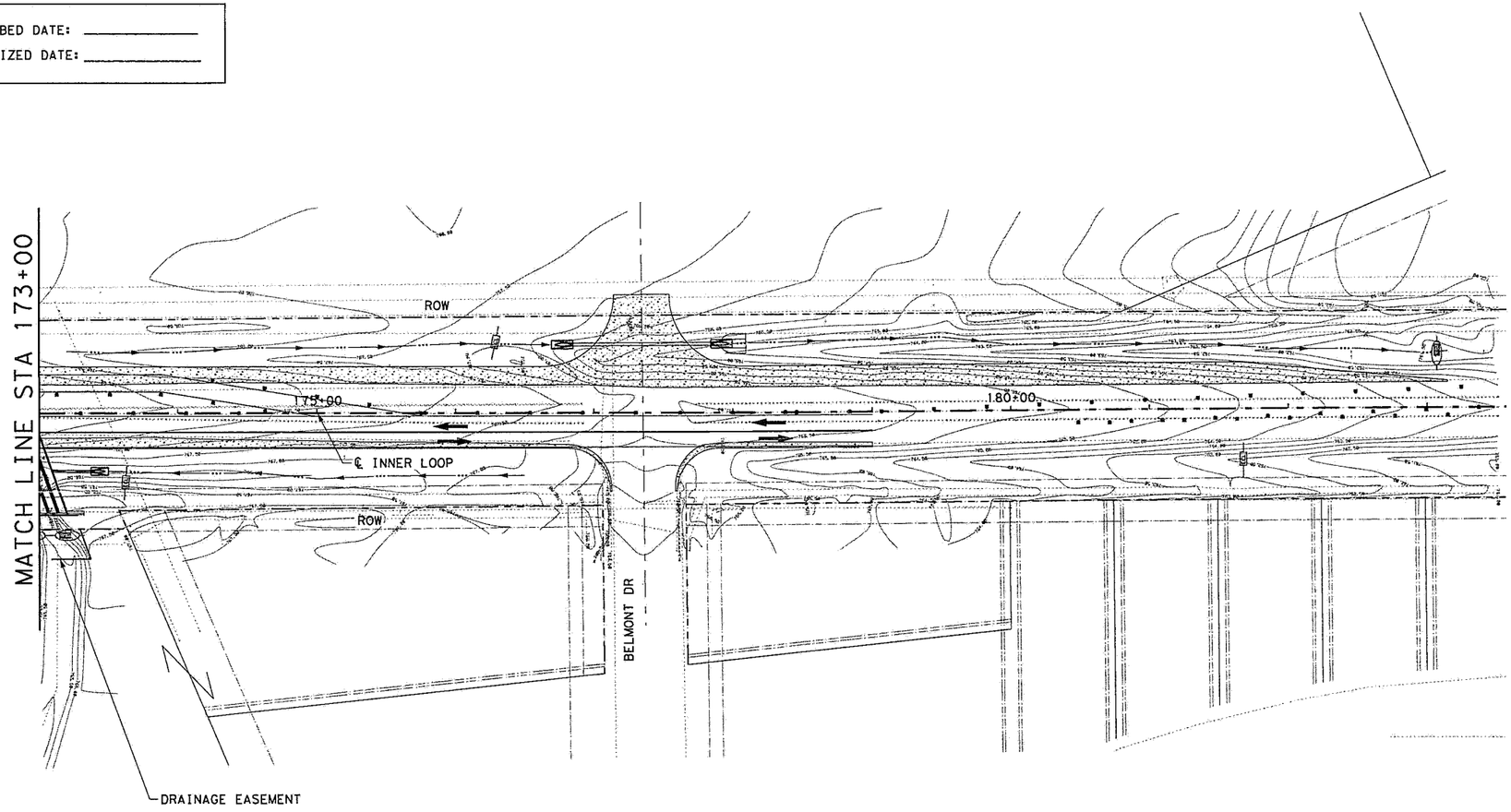

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SWPPP
PHASE 2 STAGE 2

SCALE: 1" = 100' SHEET 3 OF 3

DESIGN	GRAPHICS	CHECK	CHECK	SHEET NO.
KA	AKH	CWM	WD	197

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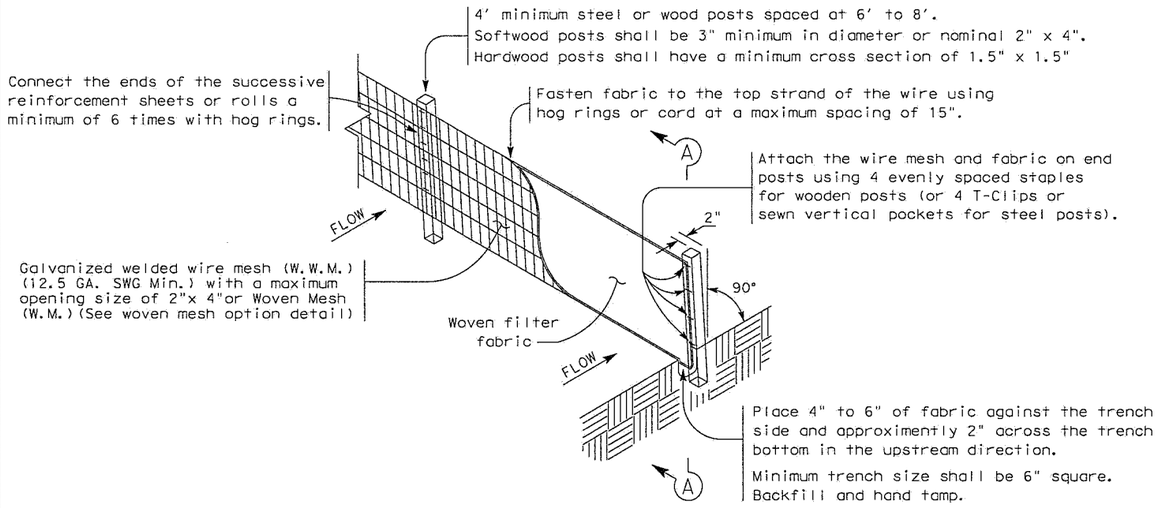
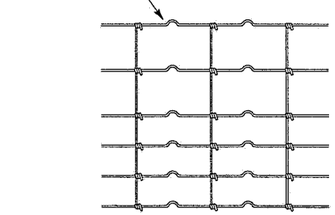
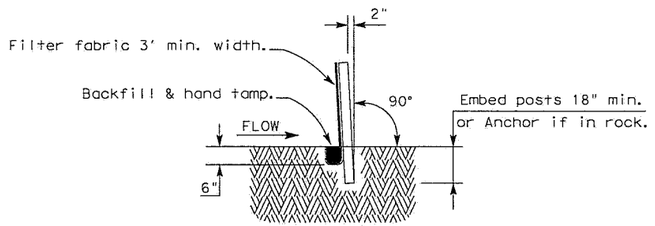


TEMPORARY SEDIMENT CONTROL FENCE

SCF





SECTION A-A

HINGE JOINT KNOT WOVEN MESH (OPTION) DETAIL

Galvanized hinge joint knot woven mesh (12.5 GA.SWG Min.) requires a minimum of five horizontal wires spaced at a maximum of 12 inches apart and all vertical wires spaced at a maximum of 12 inches apart.

SEDIMENT CONTROL FENCE USAGE GUIDELINES

A sediment control fence may be constructed near the downstream perimeter of a disturbed area along a contour to intercept sediment from overland runoff. A 2 year storm frequency may be used to calculate the flow rate to be filtered.

Sediment control fence should be sized to filter a maximum flow through rate of 100 GPM/FT^2. Sediment control fence is not recommended to control erosion from a drainage area larger than 2 acres.

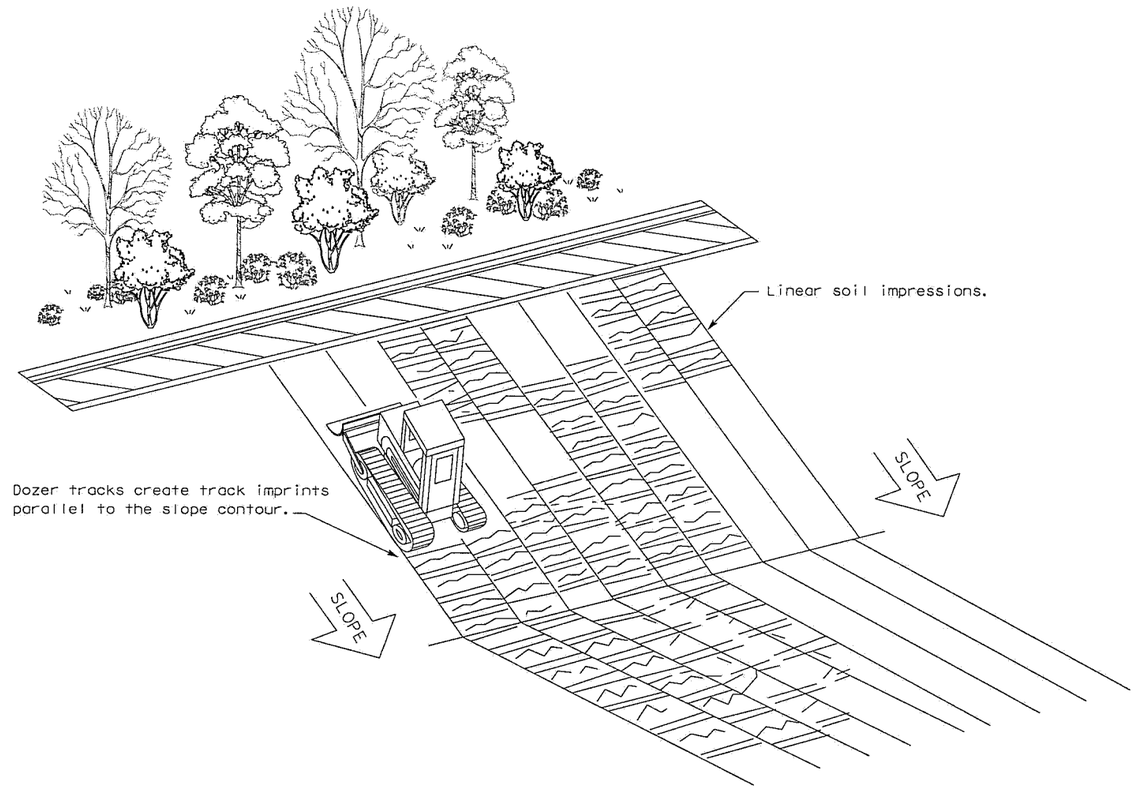
LEGEND

Sediment Control Fence

SCF

GENERAL NOTES

1. Vertical tracking is required on projects where soil distributing activities have occurred unless otherwise approved.
2. Perform vertical tracking on slopes to temporarily stabilize soil.
3. Provide equipment with a track undercarriage capable of producing linear soil impressions measuring a minimum of 12" in length by 2" to 4" in width by 1/2" to 2" in depth.
4. Do not exceed 12" between track impressions.
5. Install continous linear track impressions where the minimum 12" length impressions are perpendicular to the slope or direction of water flow.



VERTICAL TRACKING

Texas Department of Transportation

Design Division Standard

TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

FENCE & VERTICAL TRACKING

EC(1)-16

FILE: ec116	DN: TxDOT	CK: KM	DW: VP	DW/CK: LS
© TxDOT: JULY 2016	CONT	SECT	JOB	HIGHWAY
REVISIONS				
	DIST	COUNTY		SHEET NO.
				568

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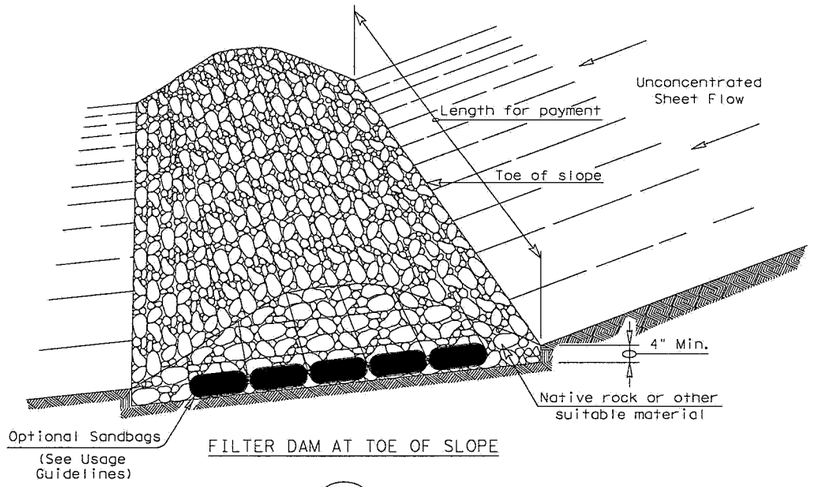
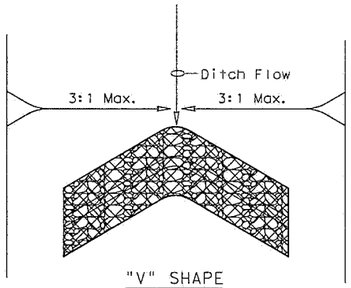
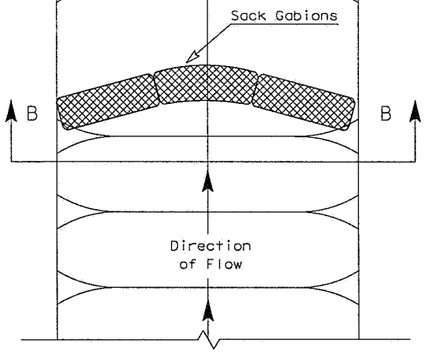


FILTER DAM AT TOE OF SLOPE

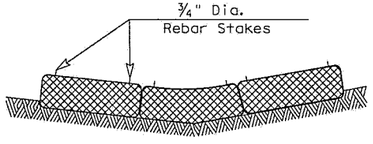
RFD1



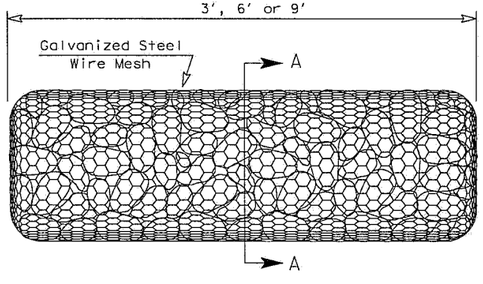
"V" SHAPE
PLAN VIEW



PLAN VIEW

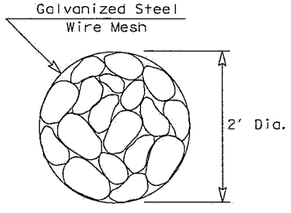


SECTION B-B

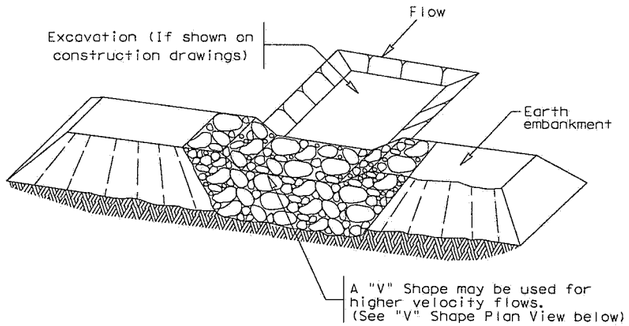


TYPE 4 (SACK GABIONS)

RFD4

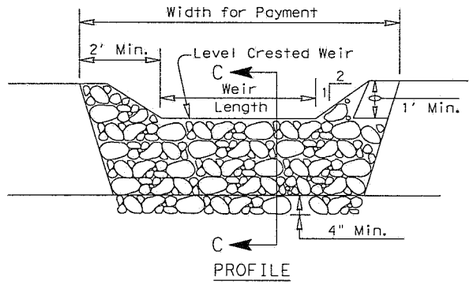


SECTION A-A



FILTER DAM AT SEDIMENT TRAP

RFD1 OR RFD2



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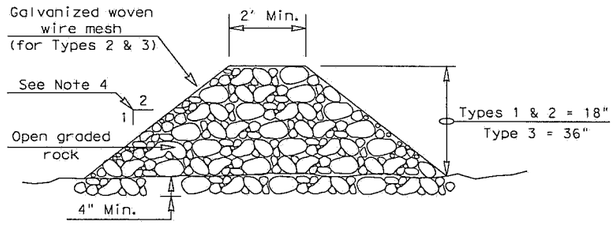
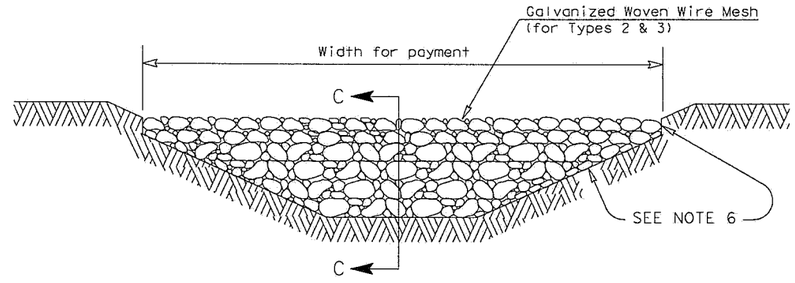


SECTION C-C



FILTER DAM AT CHANNEL SECTIONS

RFD1 OR RFD2 OR RFD3

ROCK FILTER DAM USAGE GUIDELINES

Rock Filter Dams should be constructed downstream from disturbed areas to intercept sediment from overland runoff and/or concentrated flow. The dams should be sized to filter a maximum flow through rate of 60 GPM/FT^2 of cross sectional area. A 2 year storm frequency may be used to calculate the flow rate.

Type 1 (18" high with no wire mesh) (3" to 6" aggregate): Type 1 may be used at the toe of slopes, around inlets, in small ditches, and at dike or swale outlets. This type of dam is recommended to control erosion from a drainage area of 5 acres or less. Type 1 may not be used in concentrated high velocity flows (approximently 8 Ft/Sec or more) in which aggregate wash out may occur. Sandbags may be used at the embedded foundation (4" deep min.) for better filtering efficiency of low flows if called for on the plans or directed by the Engineer.

Type 2 (18" high with wire mesh) (3" to 6" aggregate): Type 2 may be used in ditches and at dike or swale outlets.

Type 3 (36" high with wire mesh) (4" to 8" aggregate): Type 3 may be used in stream flow and should be secured to the stream bed.

Type 4 (Sack gabions) (3" to 6" aggregate): Type 4 May be used in ditches and smaller channels to form an erosion control dam.

Type 5: Provide rock filter dams as shown on plans.

GENERAL NOTES

1. If shown on the plans or directed by the Engineer, filter dams should be placed near the toe of slopes where erosion is anticipated, upstream and/or downstream at drainage structures, and in roadway ditches and channels to collect sediment.
2. Materials (aggregate, wire mesh, sandbags, etc.) shall be as indicated by the specification for "Rock Filter Dams for Erosion and Sedimentation Control".
3. The rock filter dam dimensions shall be as indicated on the SW3P plans.
4. Side slopes should be 2:1 or flatter. Dams within the safety zone shall have sidesiopes of 6:1 or flatter.
5. Maintain a minimum of 1' between top of rock filter dam weir and top of embankment for filter dams at sediment traps.
6. Filter dams should be embedded a minimum of 4" into existing ground.
7. The sediment trap for ponding of sediment laden runoff shall be of the dimensions shown on the plans.
8. Rock filter dam types 2 & 3 shall be secured with 20 gauge galvanized woven wire mesh with 1" diameter hexagonal openings. The aggregate shall be placed on the mesh to the height & slopes specified. The mesh shall be folded at the upstream side over the aggregate and tightly secured to itself on the downstream side using wire ties or hog rings. For in stream use, the mesh should be secured or staked to the stream bed prior to aggregate placement.
9. Sack Gabions should be staked down with ¾" dia. rebar stakes, and have a double-twisted hexagonal weave with a nominal mesh opening of 2 ½" x 3 ¼"
10. Flow outlet should be onto a stabilized area (vegetation, rock, etc.).
11. The guidelines shown hereon are suggestions only and may be modified by the Engineer.

PLAN SHEET LEGEND

Type 1 Rock Filter Dam — RFD1
Type 2 Rock Filter Dam — RFD2
Type 3 Rock Filter Dam — RFD3
Type 4 Rock Filter Dam — RFD4

Texas Department of Transportation | Design Division Standard

TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

ROCK FILTER DAMS

EC(2)-16

FILE: ec216	DN: TxDOT	CK: KM	DW: VP	DN/CK: LS
© TxDOT: JULY 2016	CONT	SECT	JOB	HIGHWAY
REVISIONS				
	DIST	COUNTY		SHEET NO.

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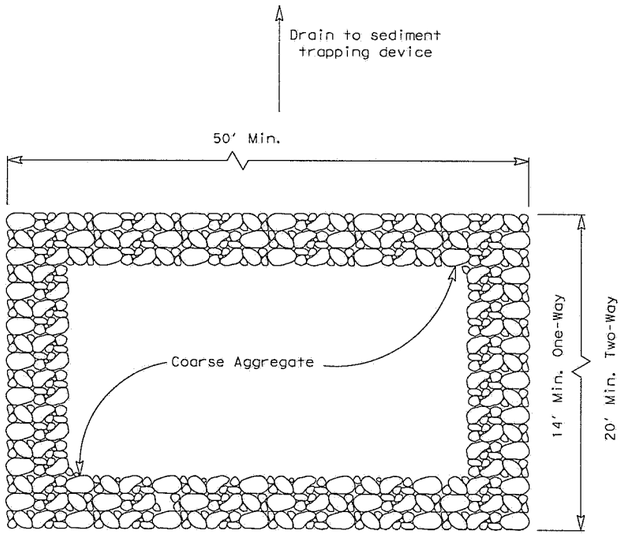
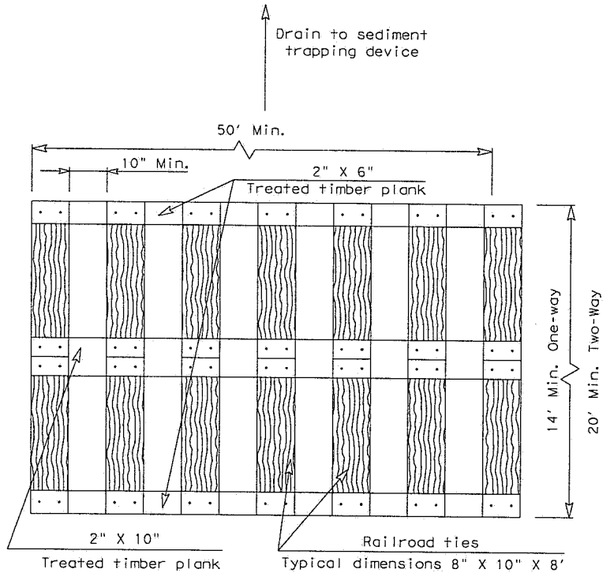
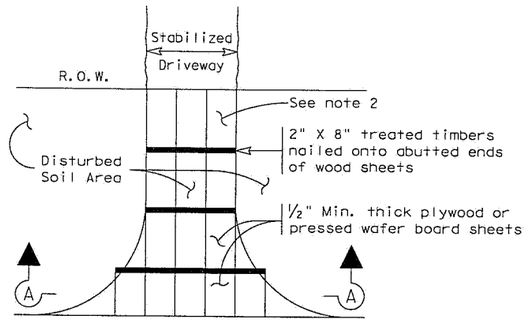


PLAN VIEW

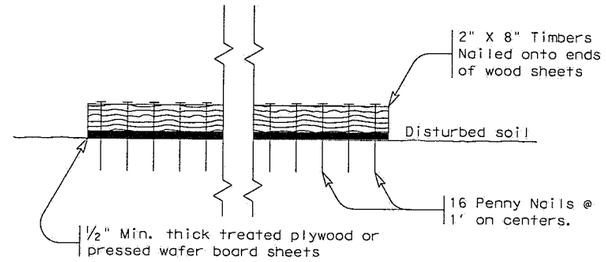


PLAN VIEW



Paved Roadway

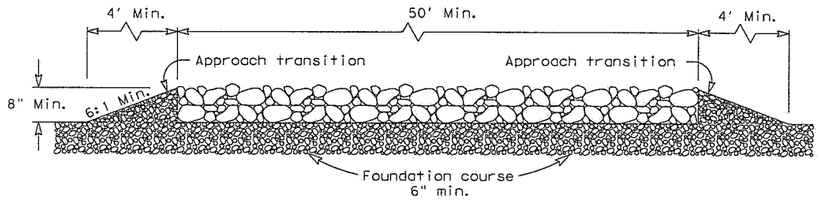
PLAN VIEW



SECTION A-A

CONSTRUCTION EXIT (TYPE 3)

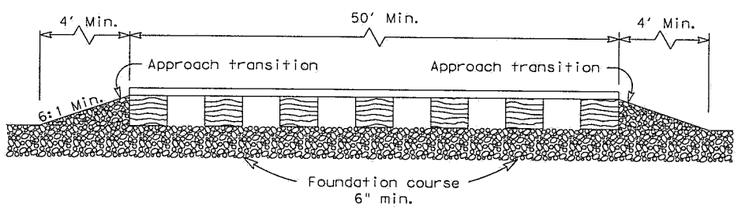
SHORT TERM



ELEVATION VIEW

CONSTRUCTION EXIT (TYPE 1)

ROCK CONSTRUCTION (LONG TERM)



ELEVATION VIEW

CONSTRUCTION EXIT (TYPE 2)

TIMBER CONSTRUCTION (LONG TERM)

GENERAL NOTES (TYPE 1)

1. The length of the type 1 construction exit shall be as indicated on the plans, but not less than 50'.
2. The coarse aggregate should be open graded with a size of 4" to 8".
3. The approach transitions should be no steeper than 6:1 and constructed as directed by the Engineer.
4. The construction exit foundation course shall be flexible base, bituminous concrete, portland cement concrete or other materialas approved by the Engineer.
5. The construction exit shall be graded to allow drainage to a sediment trapping device.
6. The guidelines shown hereon are suggestions only and may be modified by the Engineer.
7. Construct exits with a width of at least 14 ft. for one-way and 20 ft. for two-way traffic for the full width of the exit, or as directed by the engineer.

GENERAL NOTES (TYPE 2)

1. The length of the type 2 construction exit shall be as indicated on the plans, but not less than 50'.
2. The treated timber planks shall be attached to the railroad ties with ½"x 6" min. lag bolts. Other fasteners may be used as approved by the Engineer.
3. The treated timber planks shall be #2 grade min., and should be free from large and loose knots.
4. The approach transitions shall be no steeper than 6:1 and constructed as directed by the Engineer.
5. The construction exit foundation course shall be flexible base, bituminous concrete, portland cement concrete or other material as approved by the Engineer.
6. The construction exit should be graded to allow drainage to a sediment trapping device.
7. The guidelines shown hereon are suggestions only and may be modified by the Engineer.
8. Construct exits with a width of at least 14 ft. for one-way and 20 ft. for two-way traffic for the full width of the exit, or as directed by the engineer.

GENERAL NOTES (TYPE 3)

1. The length of the type 3 construction exit shall be as shown on the plans, or as directed by the Engineer.
2. The type 3 construction exit may be constructed from open graded crushed stone with a size of two to four inches spread a min. of 4" thick to the limits shown on the plans.
3. The treated timber planks shall be #2 grade min., and should be free from large and loose knots.
4. The guidelines shown hereon are suggestions only and may be modified by the Engineer.

Texas Department of Transportation — Design Division Standard

TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

CONSTRUCTION EXITS

EC(3)-16

FILE: ec316	DN: TxDOT	CK: KM	DW: VP	DW/CK: LS
©TxDOT: JULY 2016	CONT	SECT	JOB	HIGHWAY
REVISIONS				
	DIST	COUNTY		SHEET NO.
				200

110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120

795 790 785 780 775

GIL
STA 139+00.00

48.7 89.9

EXIST ROW

45.42 LT
783.76

37.17 LT
782.20

25.00 LT
783.98

16.49 RT
784.68

25.92 RT
782.90

26.92 RT
783.15

4:1 6:1 2.5% 1.0% 6:1 4:1

G T T

EXIST ROW

GIL
STA 138+50.00

48.4 78.5

EXIST ROW

41.92 LT
784.68

36.40 LT
783.80

25.19 LT
785.42

10.26 RT
786.01

22.64 RT
783.74

24.08 RT
784.10

6:1 6:1 2.2% 1.0% 6:1 6:1

G T T

EXIST ROW

795 790 785 780 800

GIL
STA 138+00.00

48.1 68.7

EXIST ROW

46.24 LT
786.78

38.10 LT
785.10

24.38 LT
784.14

8.17 RT
787.72

19.97 RT
785.54

25.36 RT
785.64

4:1 6:1 2.4% 1.0% 6:1 4:1

G T T

EXIST ROW

795 790 785 780

110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120

Note : Utilities are displayed at an assumed depth. The contractor shall be responsible for locating existing utilities prior to construction.

STATE OF TEXAS
ROBERT CARRILLO
80169
REGISTERED PROFESSIONAL ENGINEER
7/11/2017
Robert Carrillo, PE

NO.	REVISION	BY	DATE

RODRIGUEZ TRANSPORTATION GROUP
CONSULTING ENGINEERS
FIRM #587

GEORGETOWN INNER LOOP

DESIGN CROSS SECTIONS
STATION 138+00 TO 154+70

DESIGNED:	PROJECT NUMBER		ROADWAY	
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DRAWN:	STATE	COUNTY	CITY	SHEET No.
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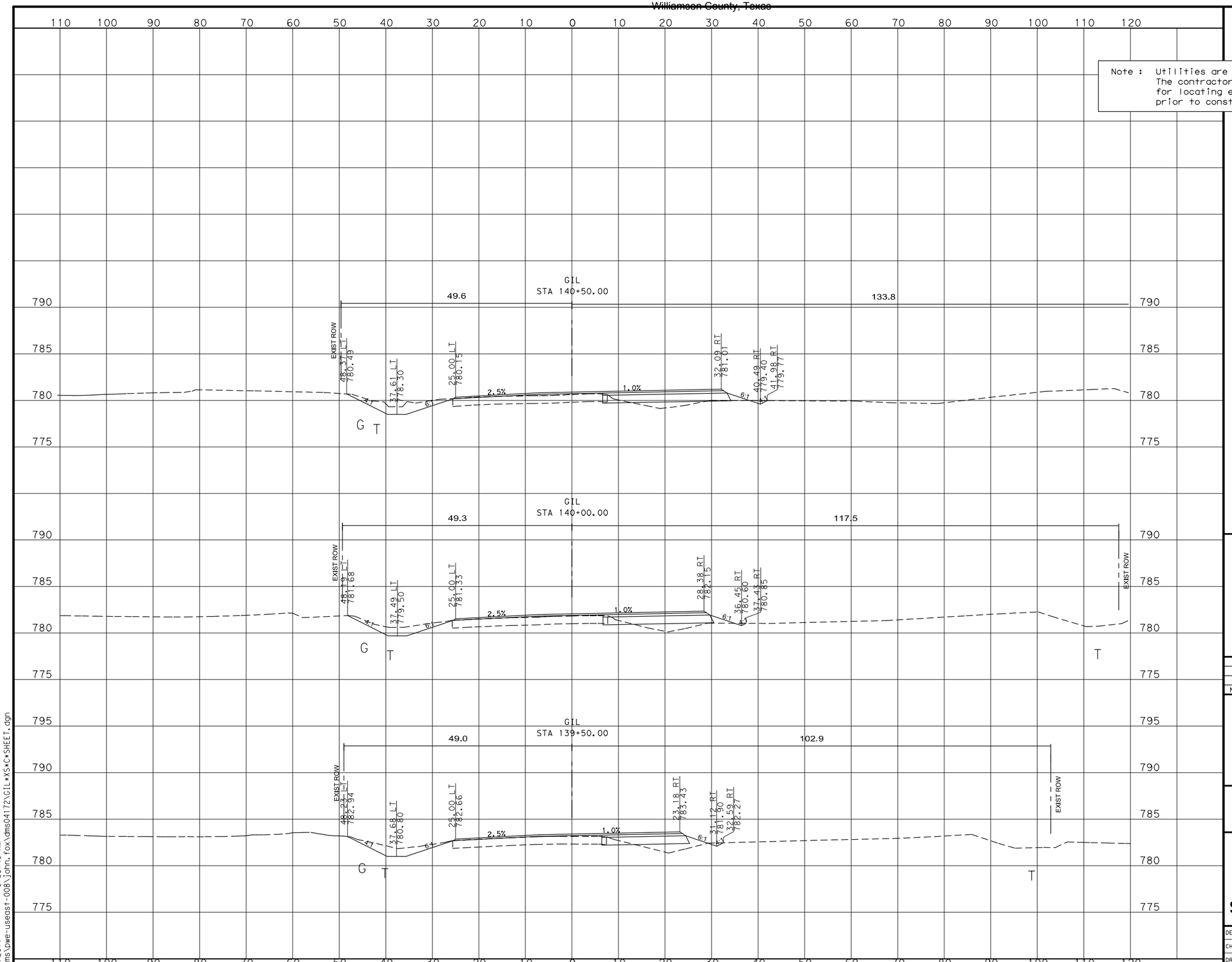

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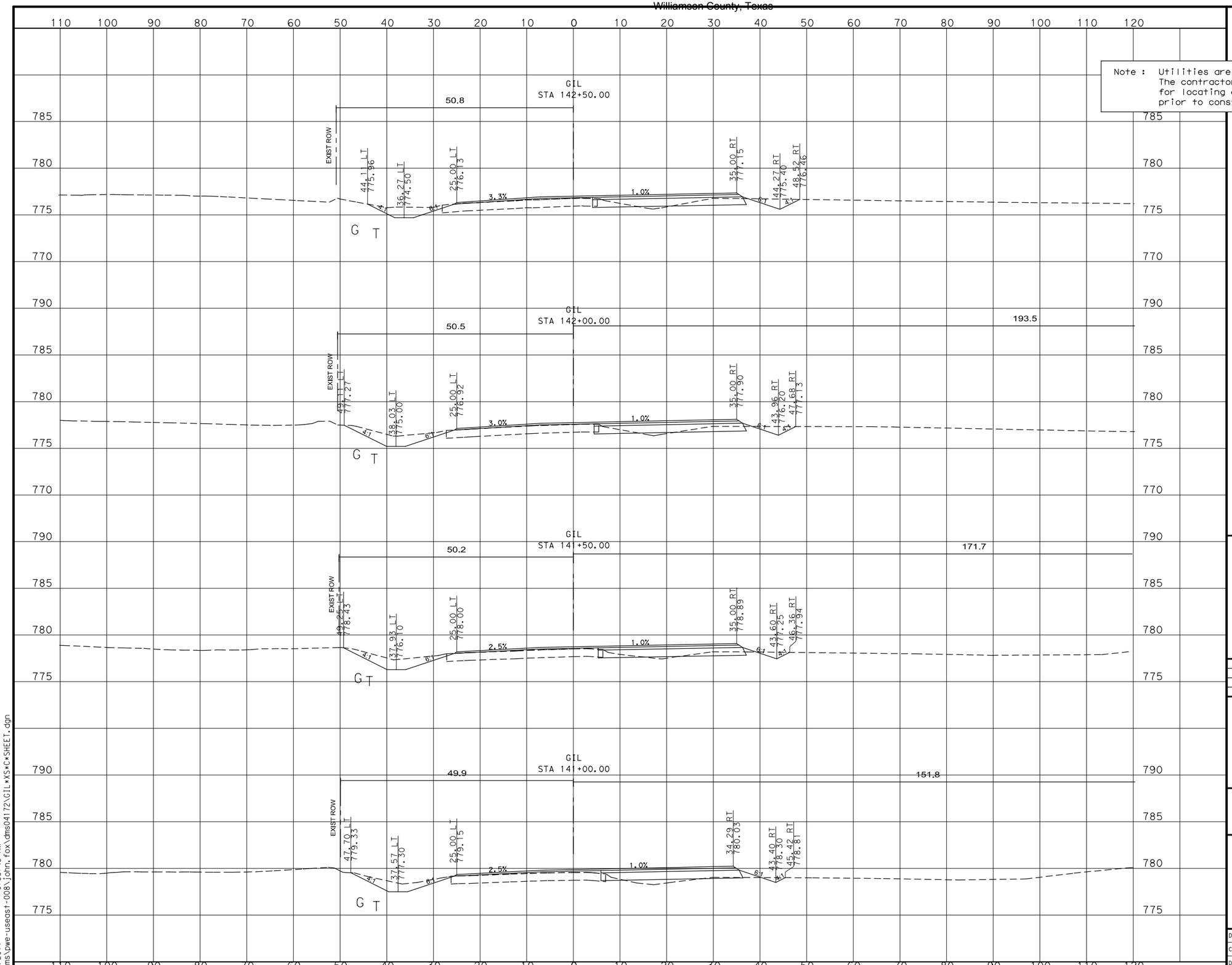

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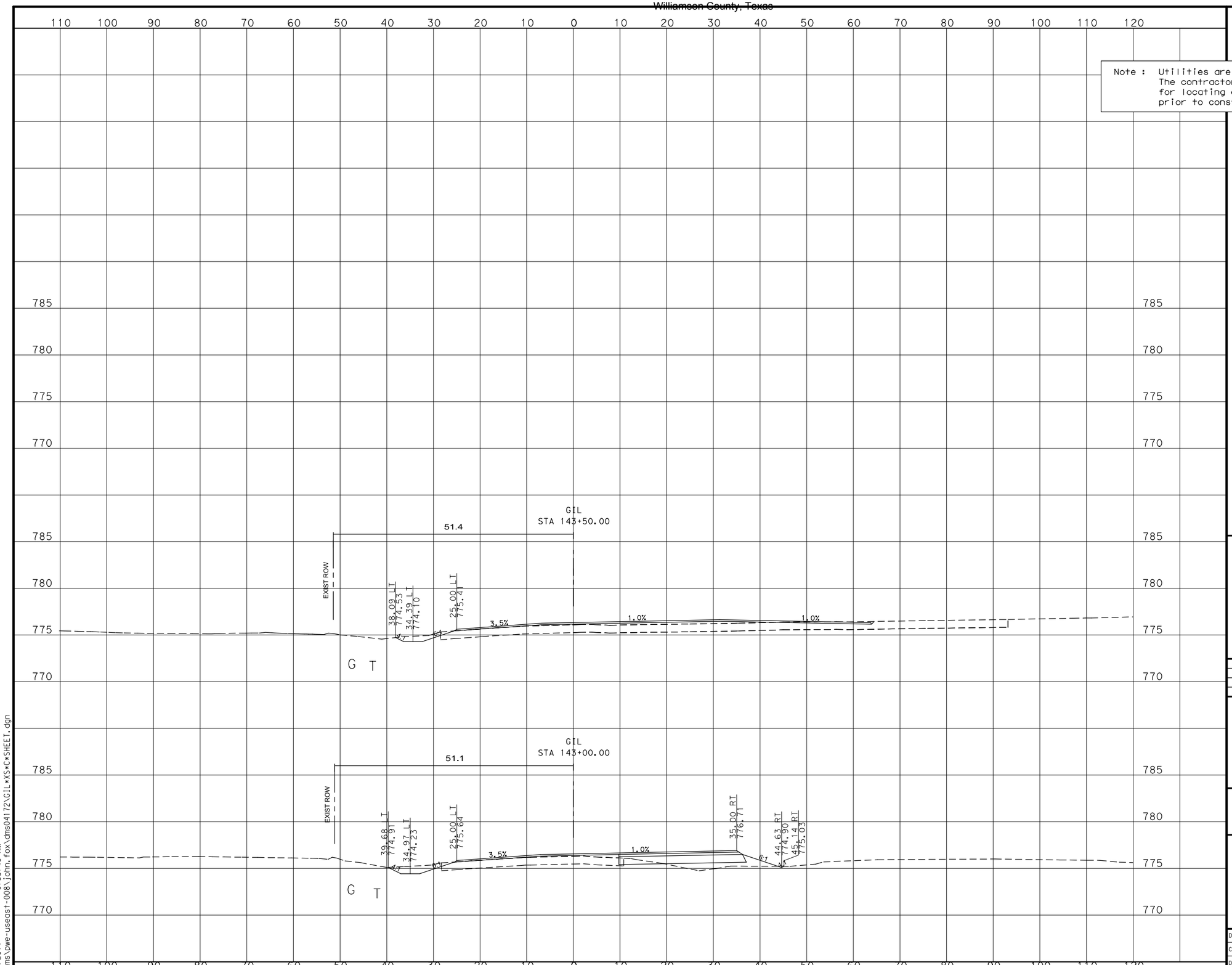

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DESIGN CROSS SECTIONS STATION 138+00 TO 154+70

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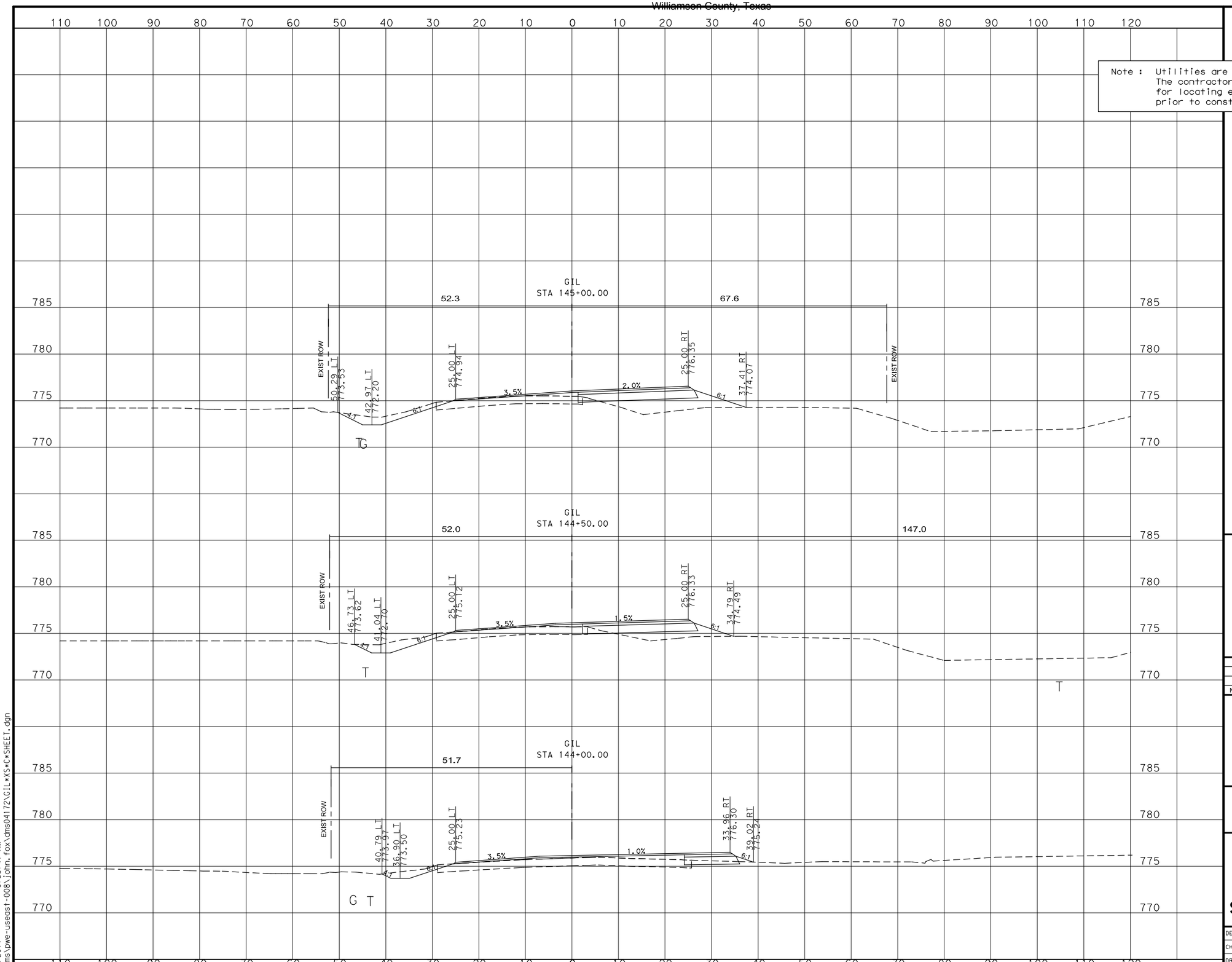

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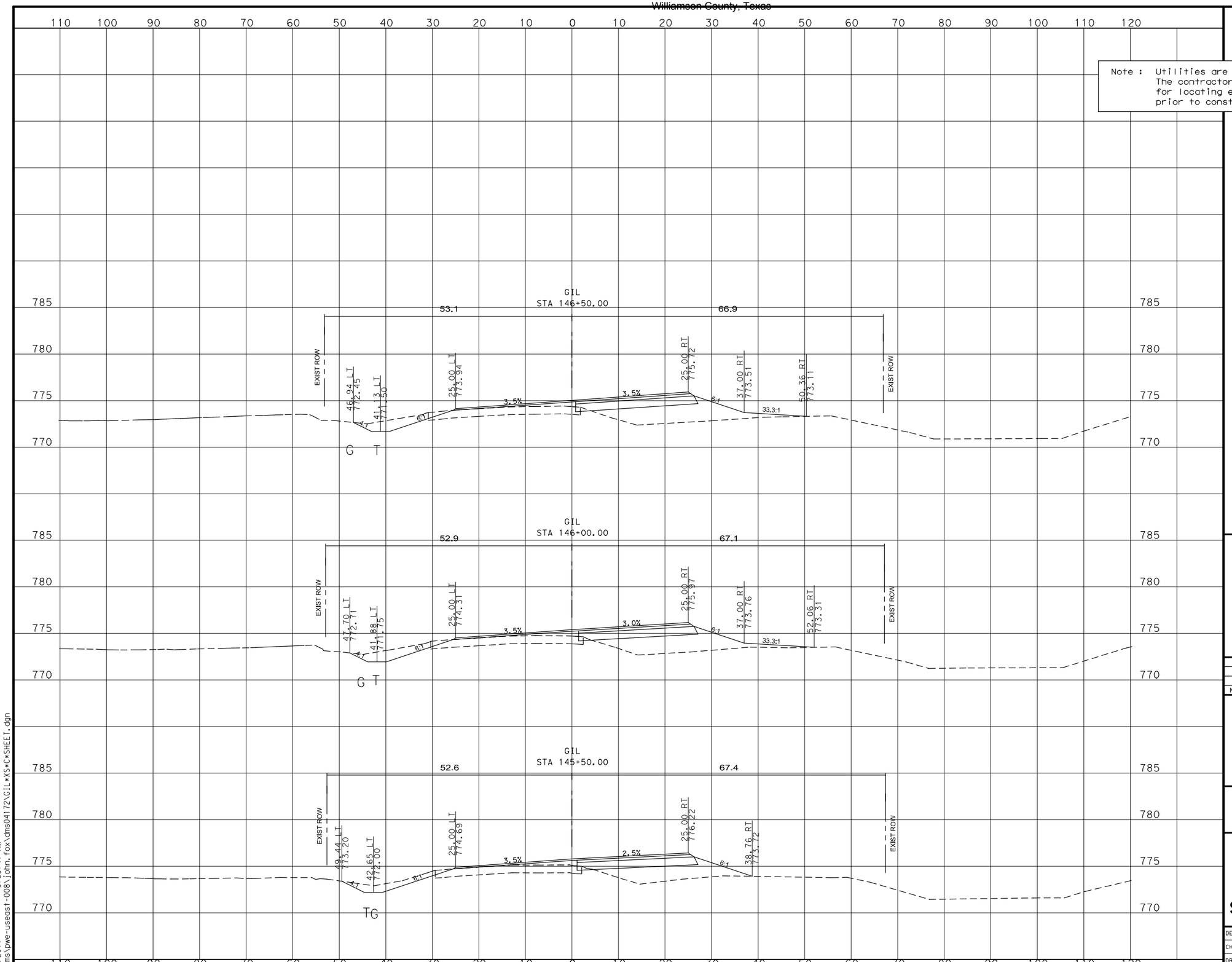

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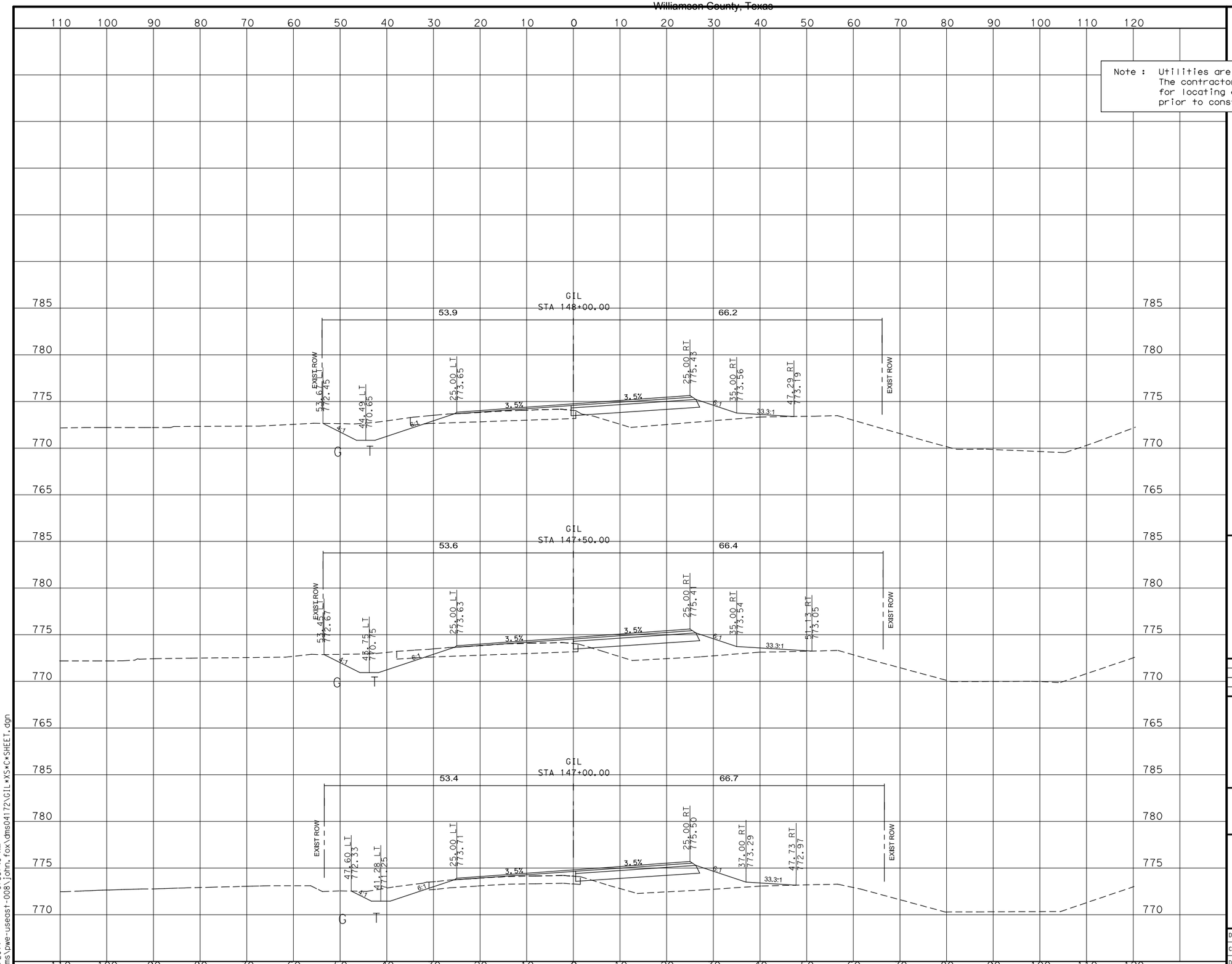

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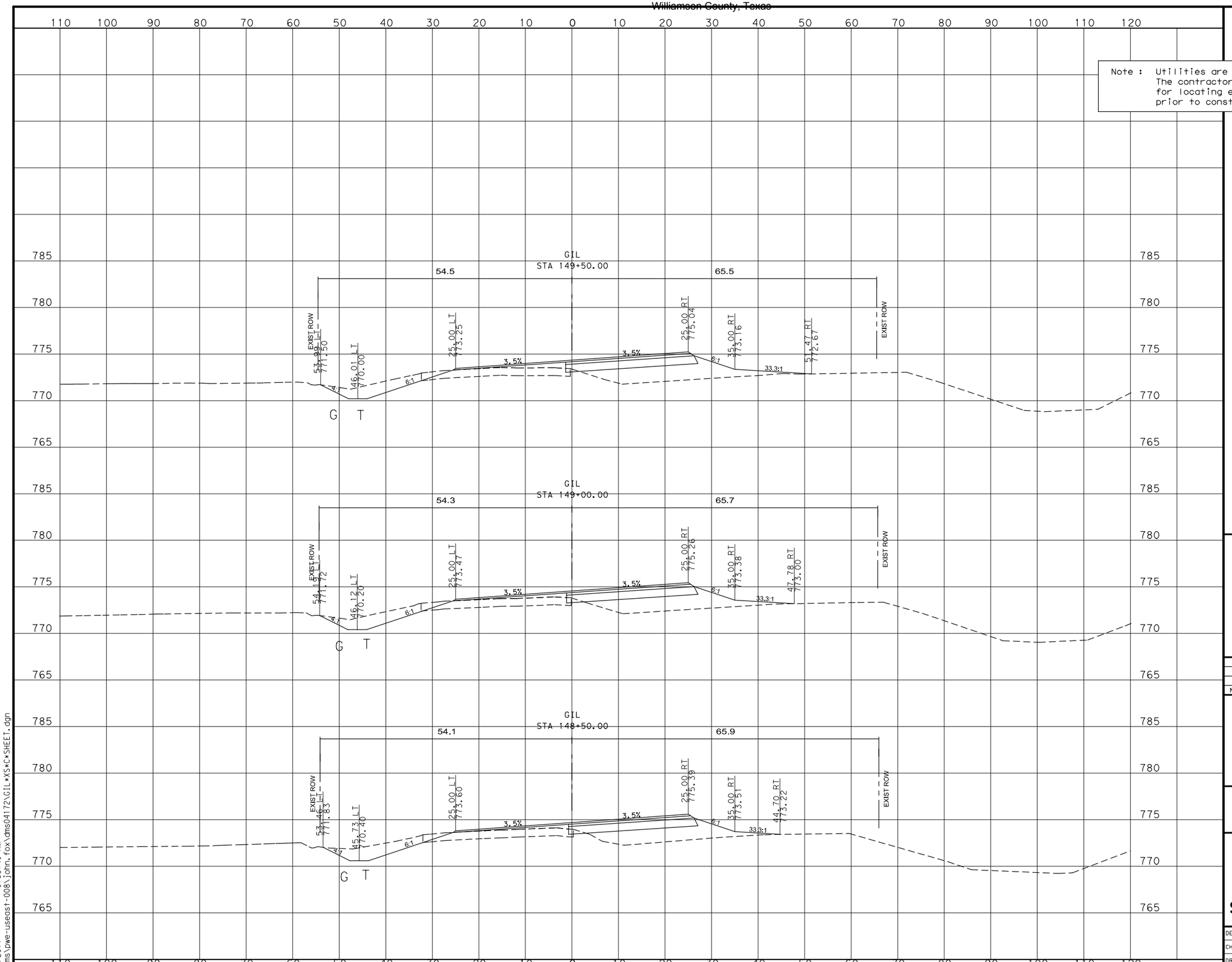

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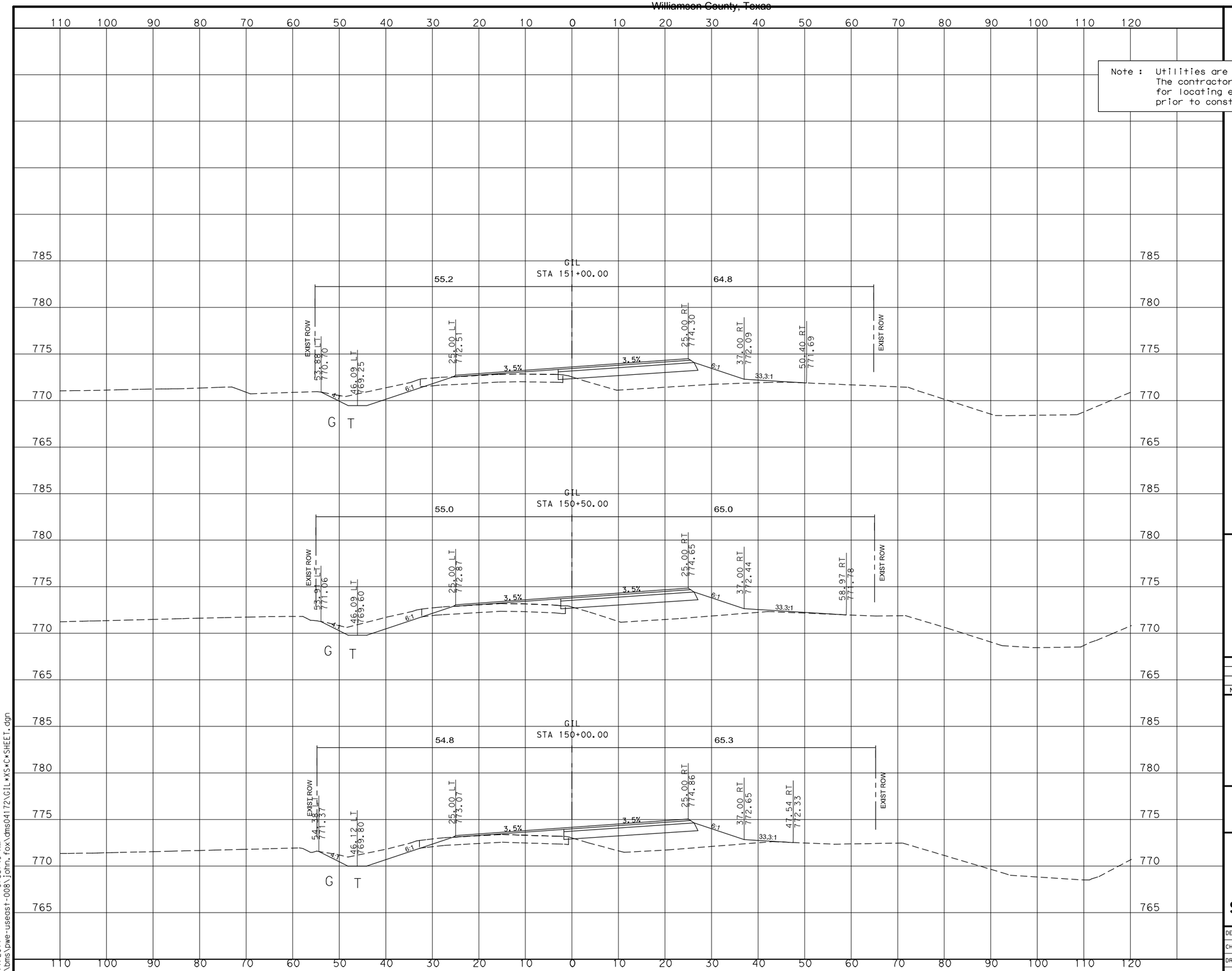

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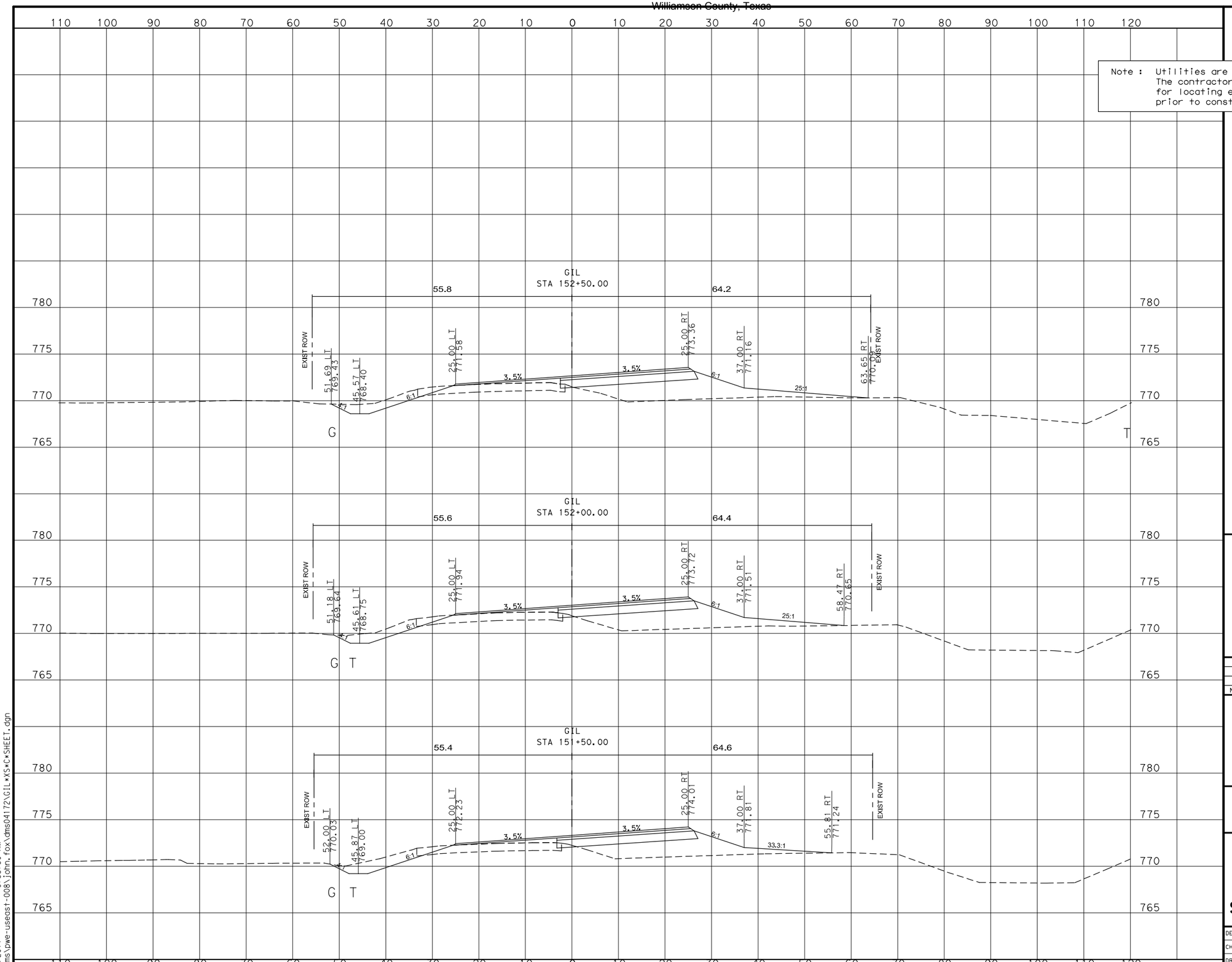

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GEORGETOWN INNER LOOP

DESIGN CROSS SECTIONS
STATION 138+00 TO 154+70

DESIGNED:	PROJECT NUMBER		ROADWAY	
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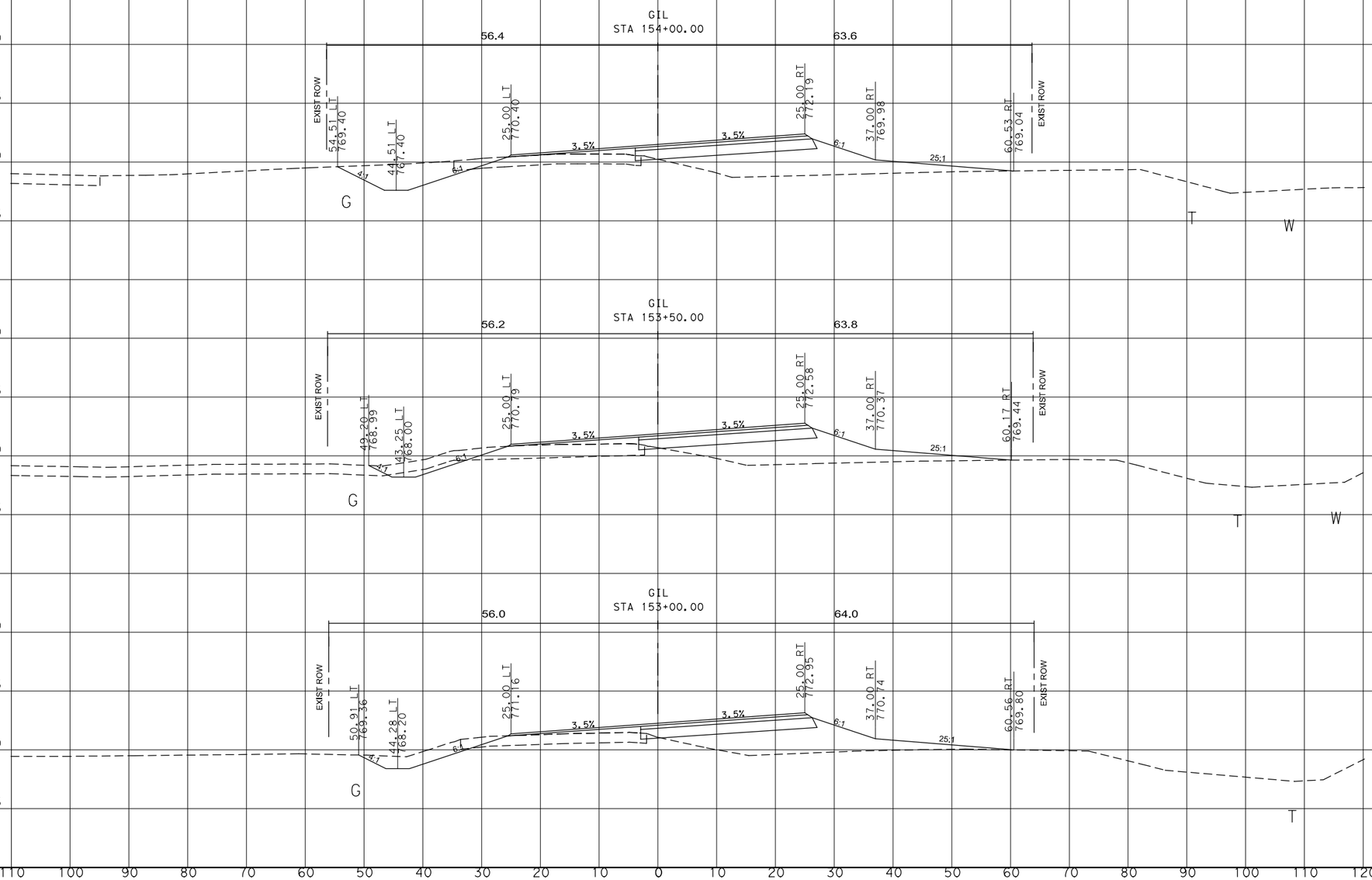

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STATE OF TEXAS
7/11/2017

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STATION 138+00 TO 154+70

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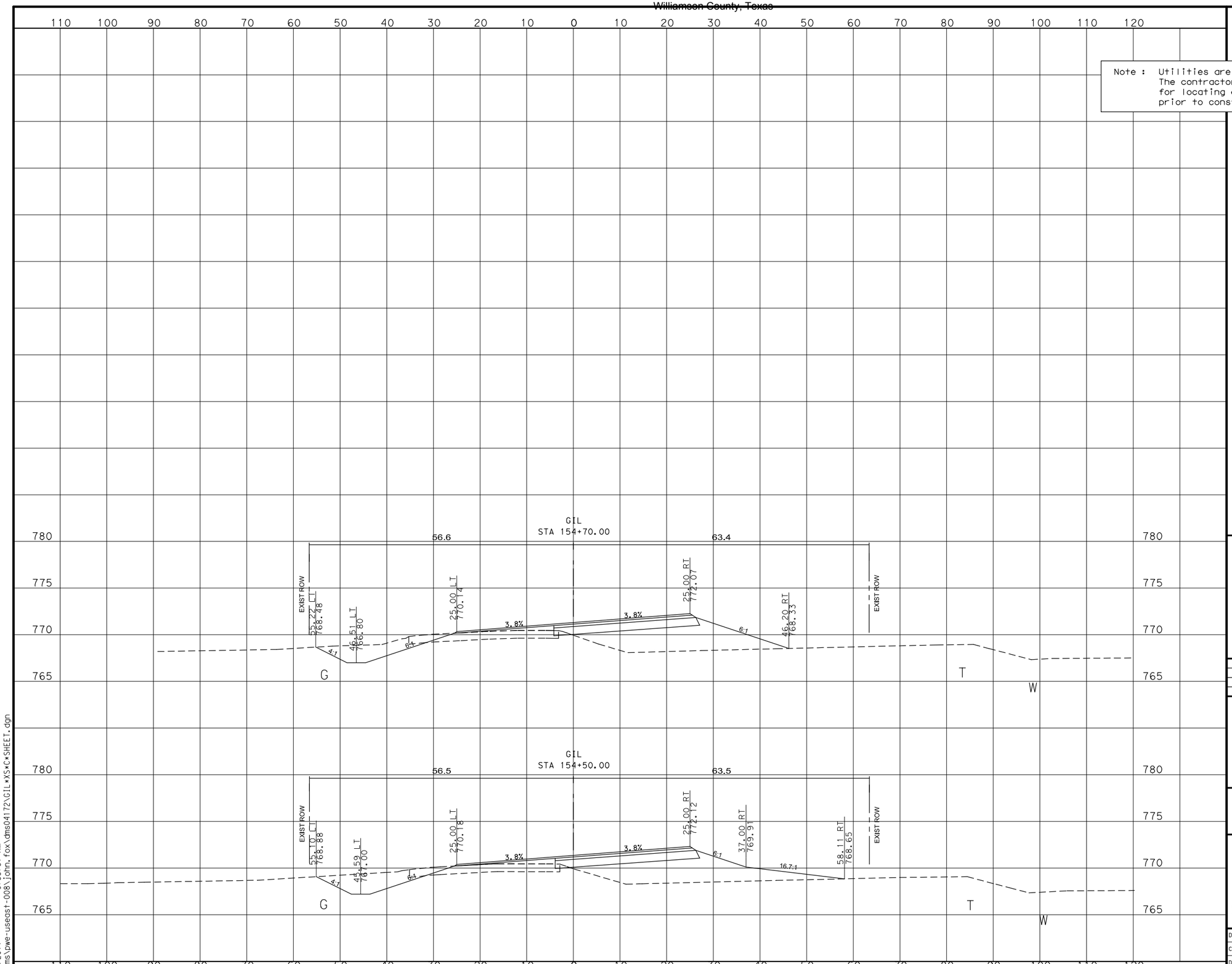
Note : Utilities are displayed at an assumed depth. The contractor shall be responsible for locating existing utilities prior to construction.



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CONSULTING ENGINEERS
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GEORGETOWN INNER LOOP

DESIGN CROSS SECTIONS
STATION 138+00 TO 154+70

DESIGNED:	PROJECT NUMBER		ROADWAY	
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CHECKED:	TEXAS	WILLIAMSON	GEORGETOWN	12

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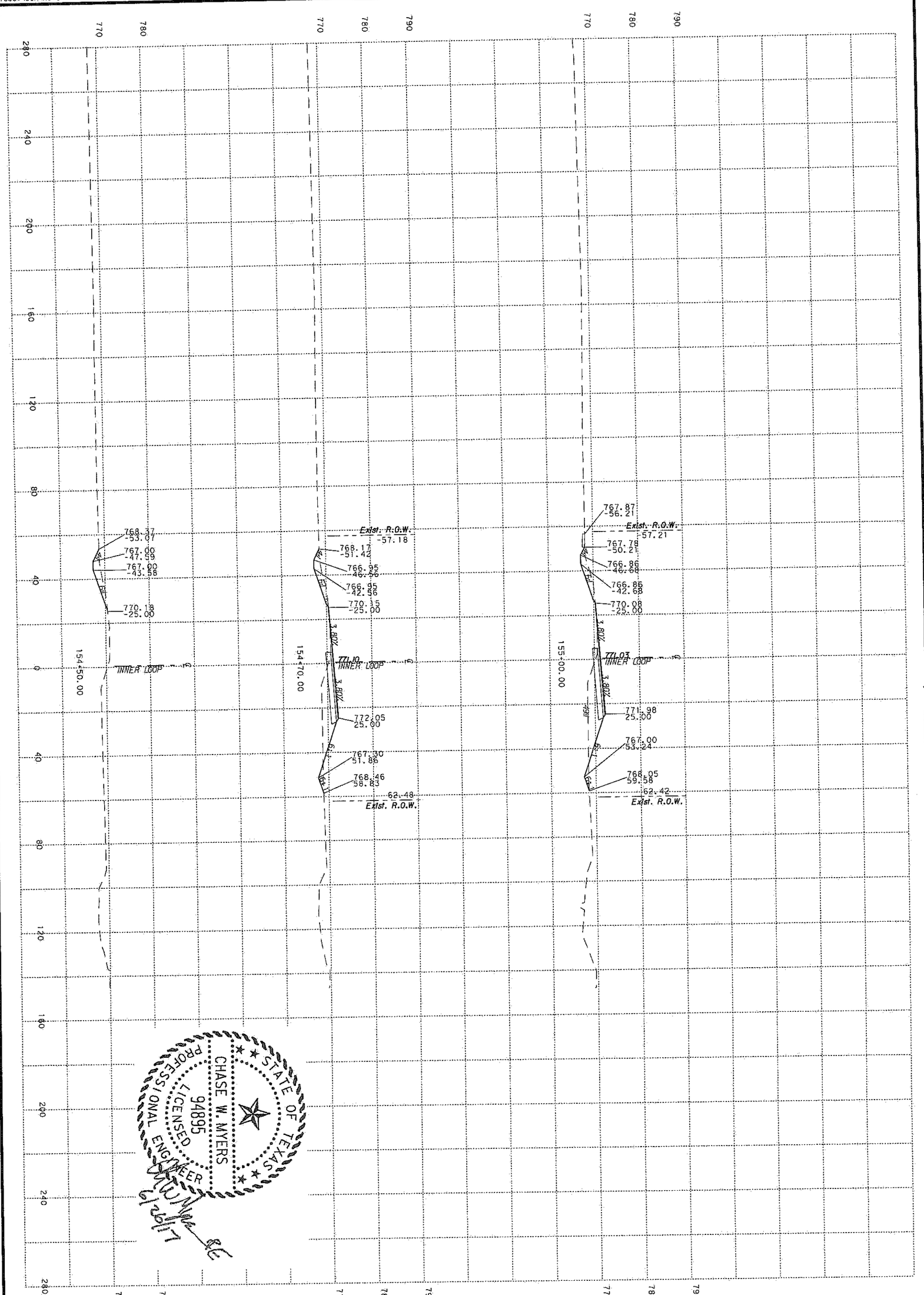


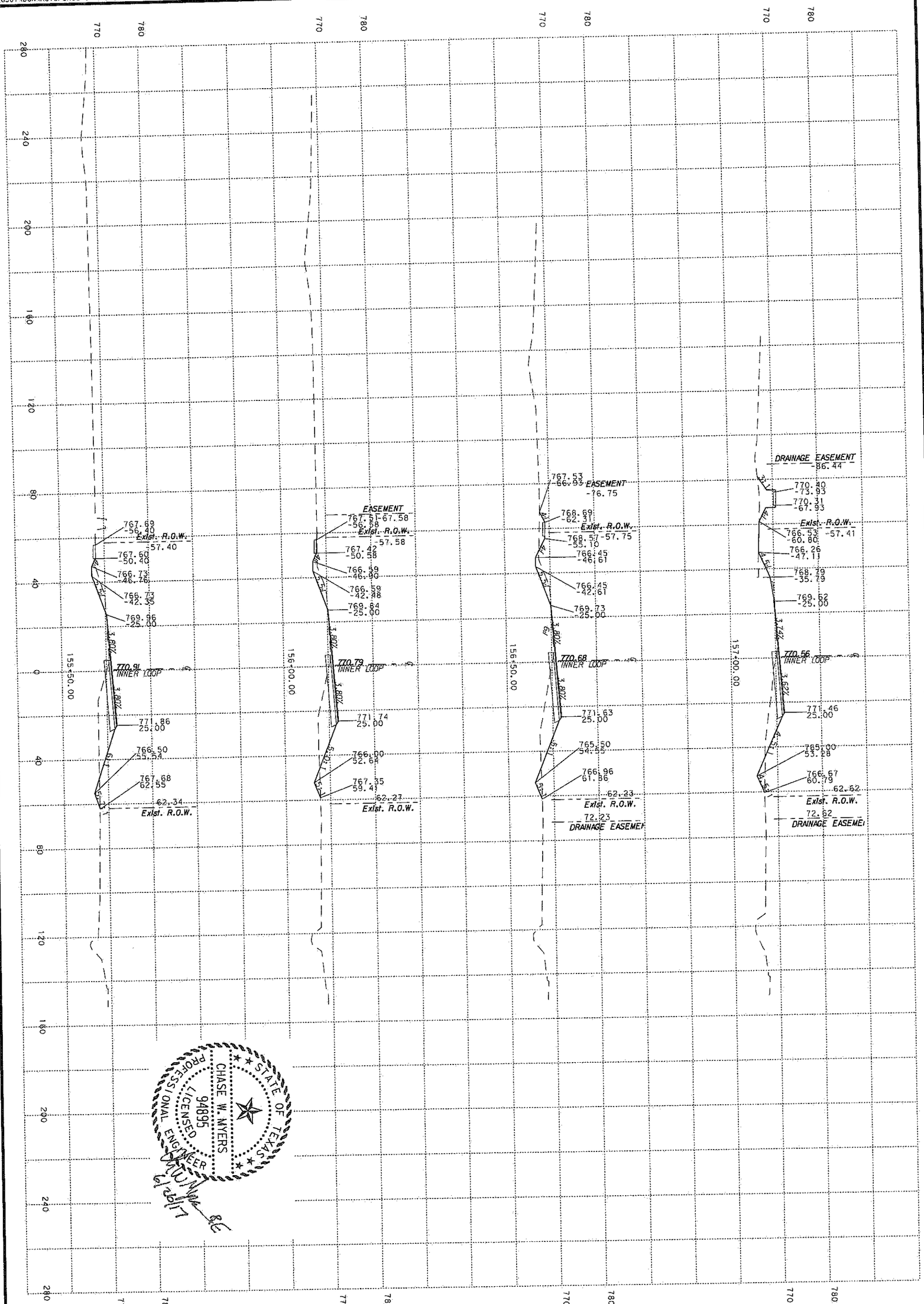
STATE OF TEXAS
CHASE W. MYERS
94895
LICENSED
PROFESSIONAL ENGINEER

WILLIAMSON COUNTY

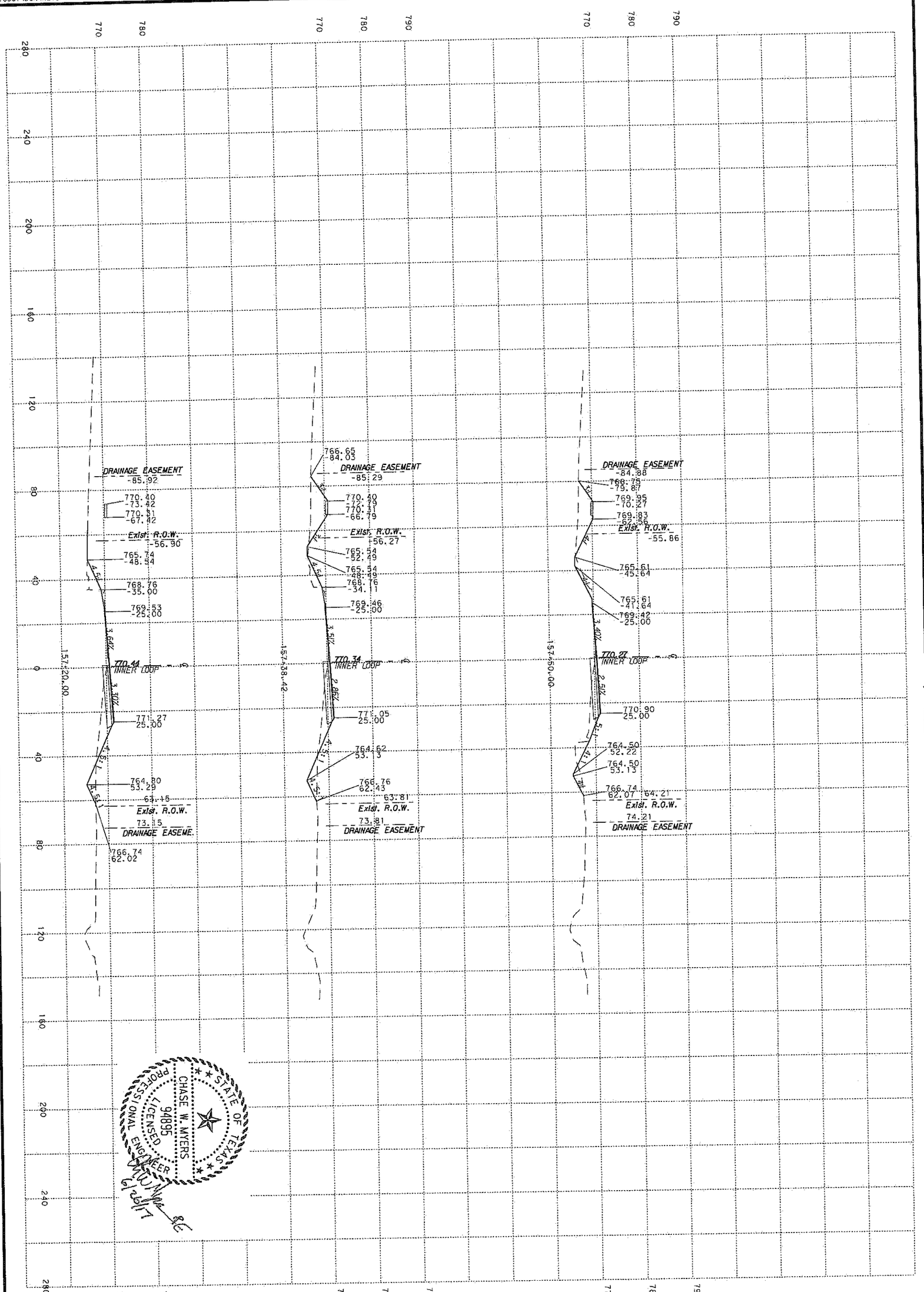
BRIDGEFARMER & ASSOCIATES, INC.
CONSULTING ENGINEERS
TBPE REGISTRATION NO. 264

GEORGETOWN INNER LOOP @ CENTRAL MAINTENANCE FACILITY

STATE: TEXAS	SCALE : 1"=40' HOR. 1"=20" VERT.
DIST:	
COUNTY: WILLIAMSON	SHEET NO. 1 OF 22 SHEETS
CSJ:	

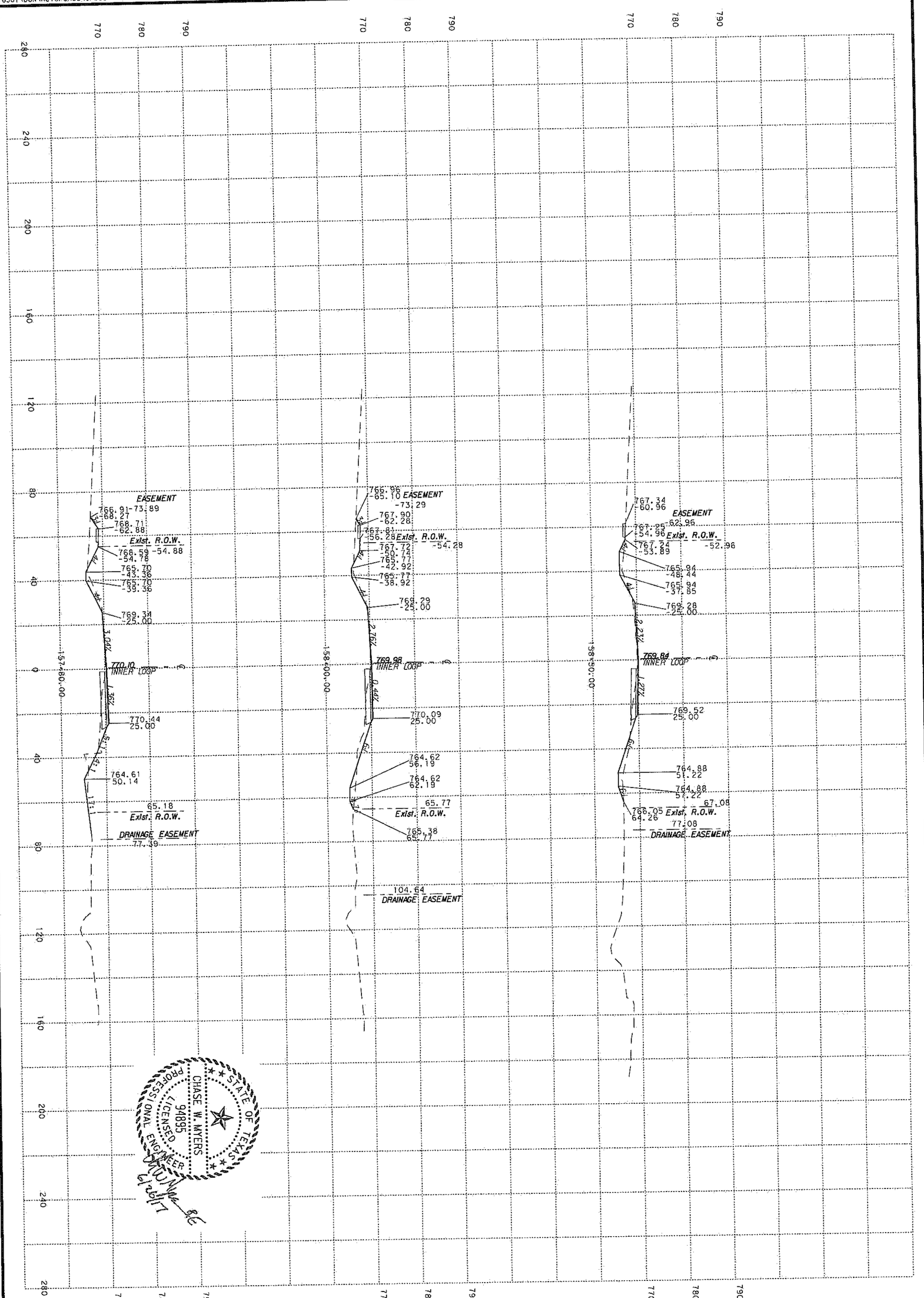


WILLIAMSON COUNTY	GEORGETOWN INNER LOOP @ CENTRAL MAINTENANCE FACILITY	STATE: TEXAS	SCALE : 1"=40' HOR. 1"=20" VERT.
BRIDGEFARMER & ASSOCIATES, INC. CONSULTING ENGINEERS TBPE REGISTRATION NO. 264		DIST:	
		COUNTY: WILLIAMSON	SHEET NO. 2 OF 22 SHEETS
		CSJ:	



PROFESSIONAL ENGINEER
CHASE W. MYERS
94895
LICENSED
STATE OF TEXAS
6/26/17

WILLIAMSON COUNTY	GEORGETOWN INNER LOOP @ CENTRAL MAINTENANCE FACILITY	STATE: TEXAS	SCALE : 1"=40' HOR. 1"=20" VERT.
BRIDGEFARMER & ASSOCIATES, INC. CONSULTING ENGINEERS TBPE REGISTRATION NO. 264		DIST:	
		COUNTY: WILLIAMSON	SHEET NO. 3 OF 22 SHEETS
		CSJ:	



STATE OF TEXAS
CHASE W. MYERS
94885
LICENSED
PROFESSIONAL ENGINEER
6/26/17

WILLIAMSON COUNTY

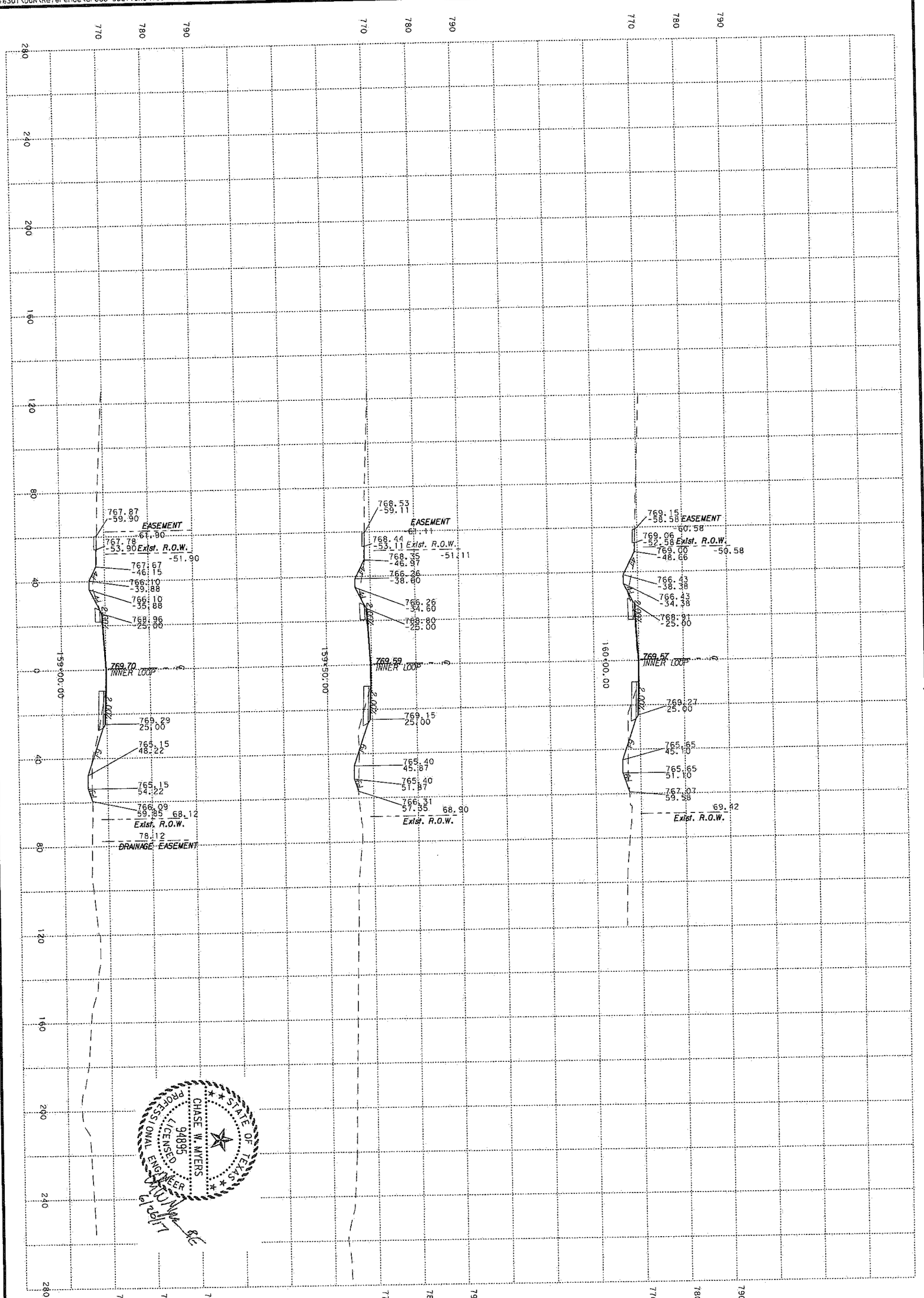
BRIDGEFARMER & ASSOCIATES, INC.
CONSULTING ENGINEERS
TBPE REGISTRATION NO. 264

GEORGETOWN INNER LOOP @ CENTRAL MAINTENANCE FACILITY

STATE: TEXAS	SCALE: 1"=40' HOR. 1"=20" VERT.
DIST:	
COUNTY: WILLIAMSON	SHEET NO. 4 OF 22 SHEETS
CSJ:	

Williamson County, Texas

Bid 170618



WILLIAMSON COUNTY

BRIDGEFARMER & ASSOCIATES, INC.
CONSULTING ENGINEERS
TBPE REGISTRATION NO. 264

GEORGETOWN INNER LOOP @ CENTRAL MAINTENANCE FACILITY

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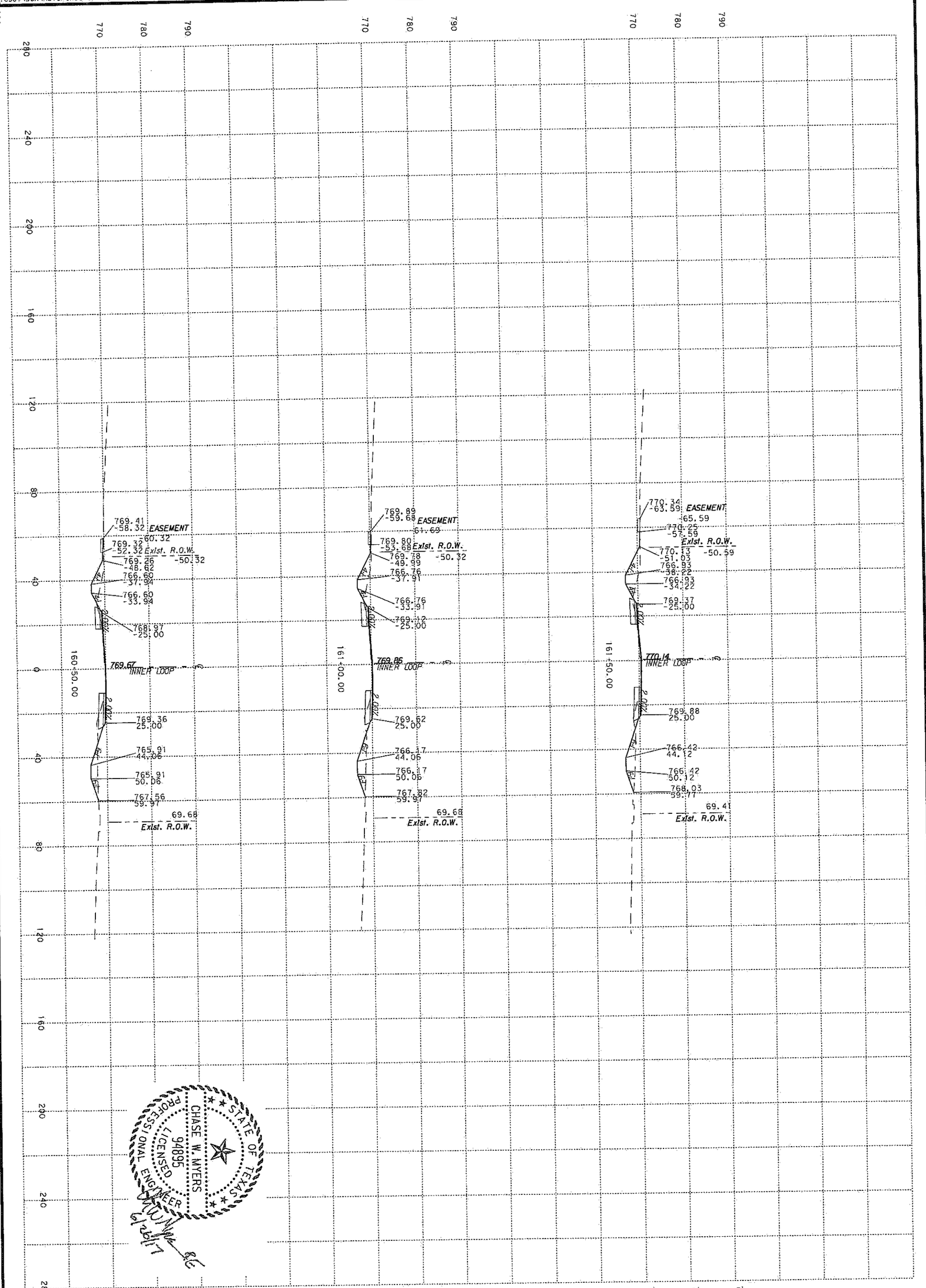
COUNTY: WILLIAMSON	SHEET NO. 5 OF 22 SHEETS
CSJ:	



WILLIAMSON COUNTY

BRIDGEFARMER & ASSOCIATES, INC.
CONSULTING ENGINEERS
TBPE REGISTRATION NO. 264

GEORGETOWN INNER LOOP @ CENTRAL MAINTENANCE FACILITY

STATE: TEXAS	SCALE : 1"=40' HOR. 1"=20" VERT.
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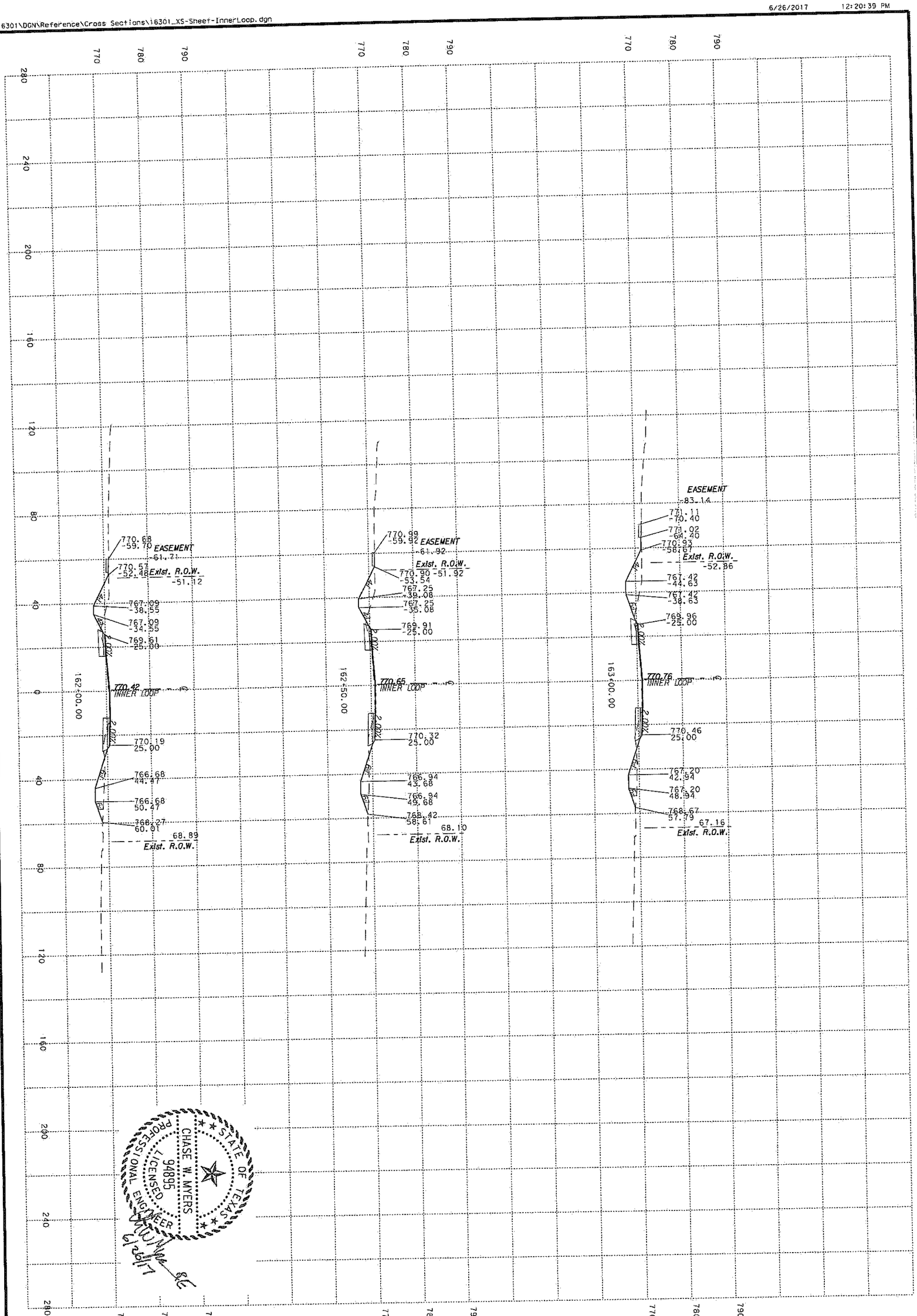
COUNTY: WILLIAMSON	SHEET NO. 6 OF 22 SHEETS
CSJ:	



STATE OF TEXAS
CHASE W. MYERS
94895
LICENSED
PROFESSIONAL ENGINEER
6/26/17

WILLIAMSON COUNTY

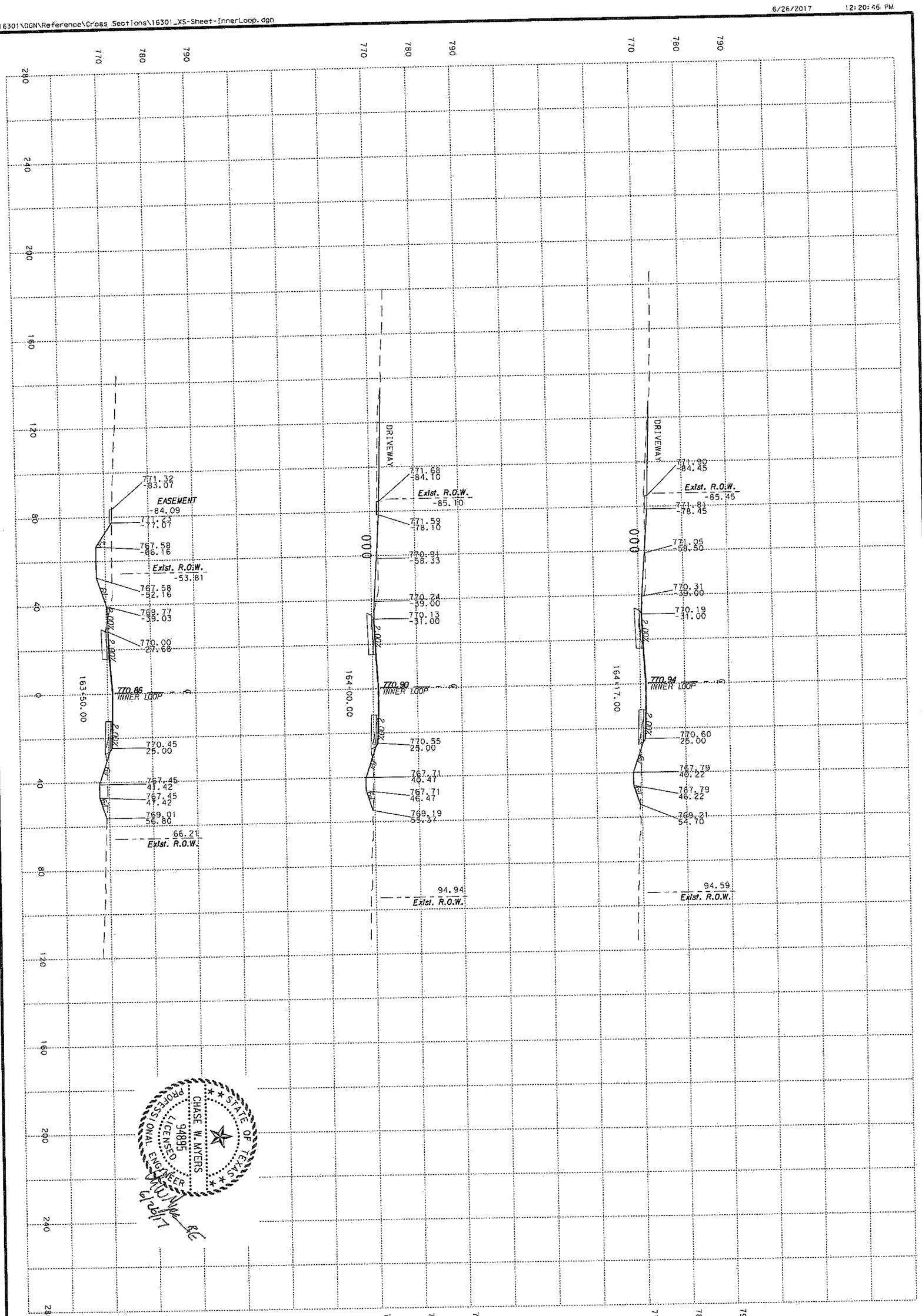
BRIDGEFARMER & ASSOCIATES, INC.
CONSULTING ENGINEERS
TBPE REGISTRATION NO. 264

GEORGETOWN INNER LOOP @ CENTRAL MAINTENANCE FACILITY

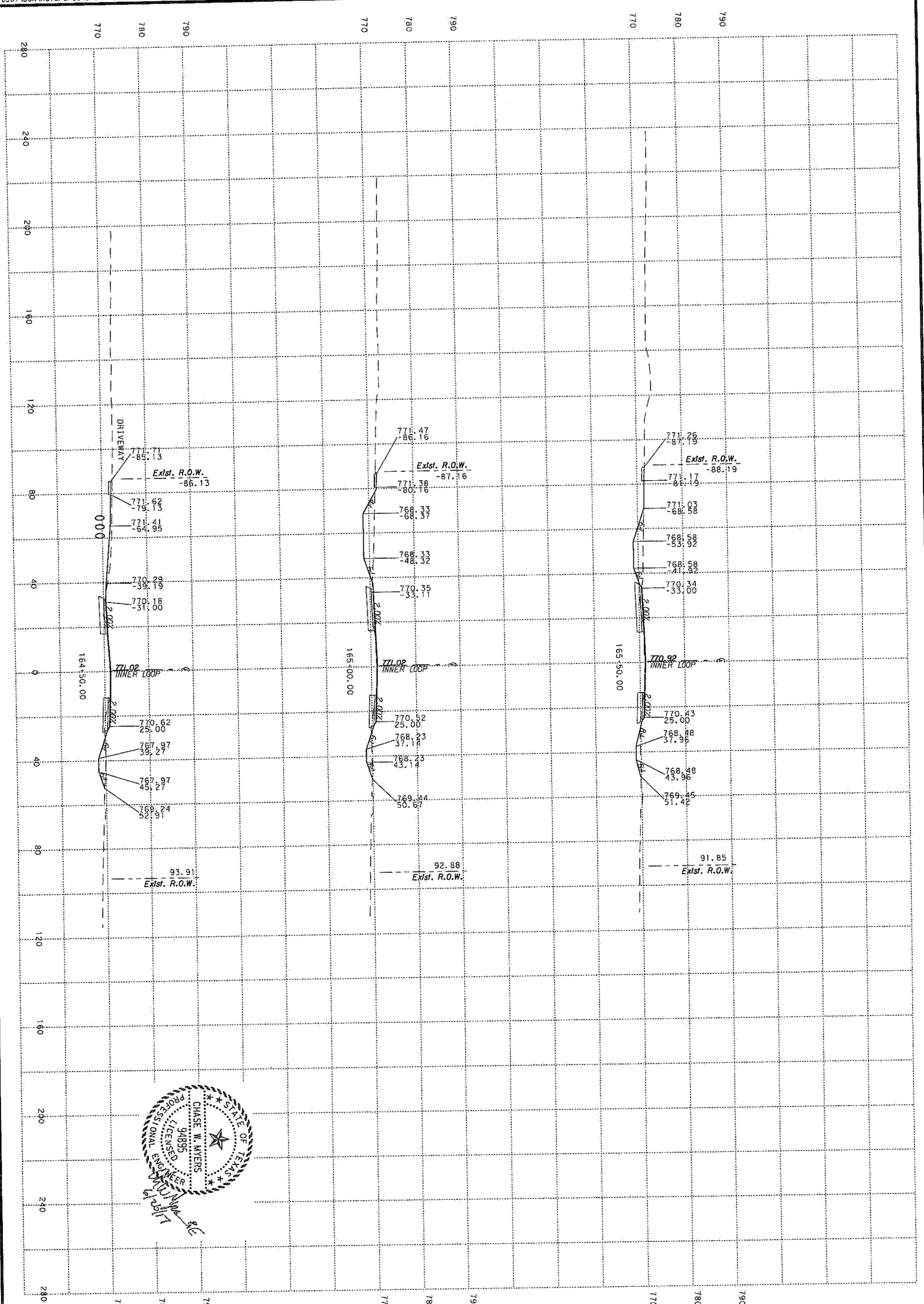
STATE: TEXAS	SCALE : 1"=40' HOR. 1"=20" VERT.
DIST:	
COUNTY: WILLIAMSON	SHEET NO. 7 OF 22 SHEETS
CSJ:	

Bid 170118

Williamson County, Texas



WILLIAMSON COUNTY	GEORGETOWN INNER LOOP @ CENTRAL MAINTENANCE FACILITY	STATE: TEXAS	SCALE : 1"=40' HOR. 1"=20" VERT.
BRIDGEFARMER & ASSOCIATES, INC. CONSULTING ENGINEERS TBPE REGISTRATION NO. 264		DIST:	
		COUNTY: WILLIAMSON	SHEET NO. 8 OF 22 SHEETS
		CSJ:	



WILLIAMSON COUNTY	GEORGETOWN INNER LOOP @ CENTRAL MAINTENANCE FACILITY	STATE: TEXAS	SCALE: 1"=40' HOR. 1"=20" VERT.
BRIDGEFARMER & ASSOCIATES, INC. CONSULTING ENGINEERS TBPE REGISTRATION NO. 264		DIST:	
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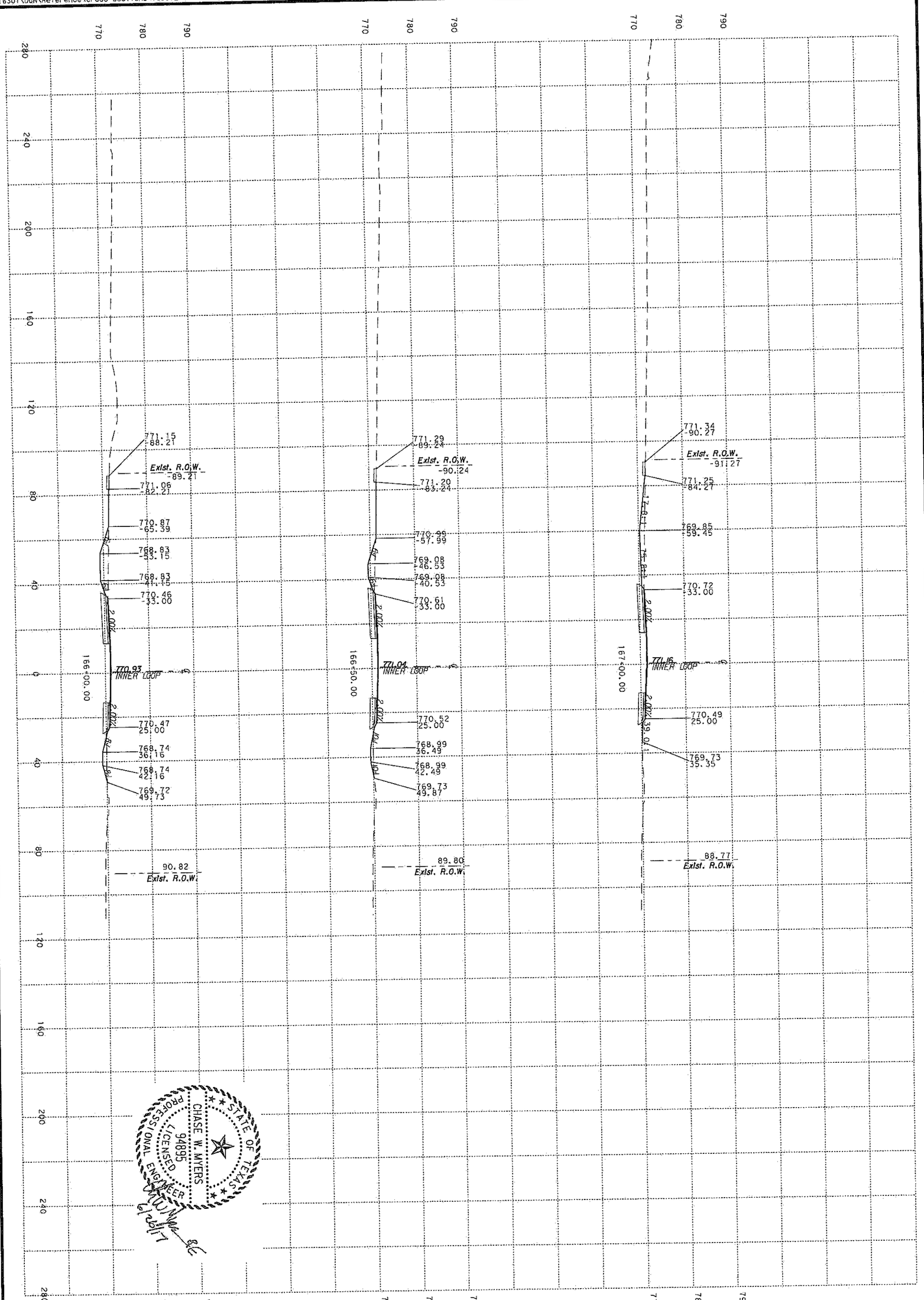

CHASE W. MYERS
94895
LICENSED
PROFESSIONAL ENGINEER
STATE OF TEXAS
6/26/17

WILLIAMSON COUNTY

BRIDGEFARMER & ASSOCIATES, INC.
CONSULTING ENGINEERS
TBPE REGISTRATION NO. 264

GEORGETOWN INNER LOOP @ CENTRAL MAINTENANCE FACILITY

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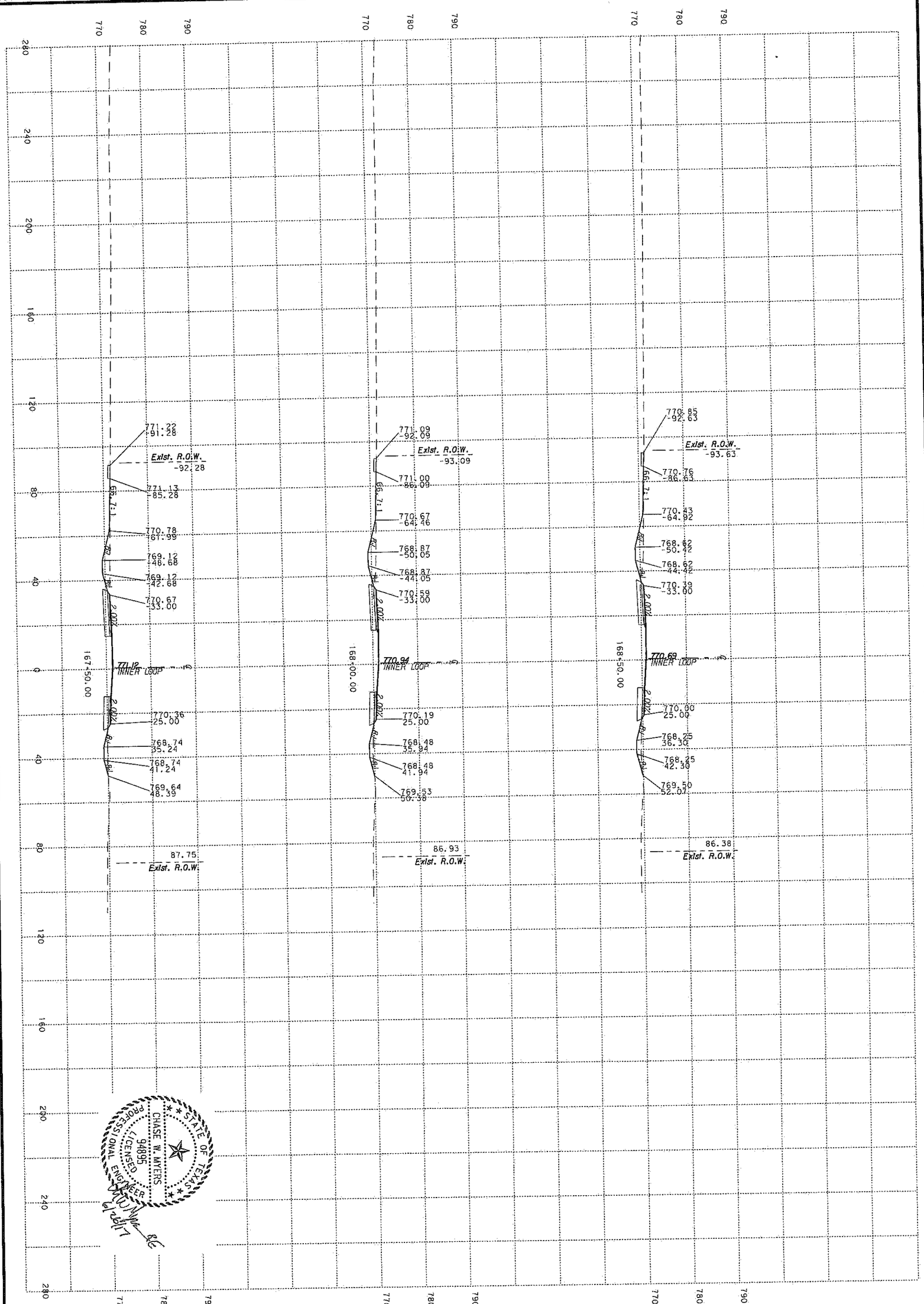
DIST:	
COUNTY: WILLIAMSON	SHEET NO. 10 OF 22 SHEETS
CSJ:	



WILLIAMSON COUNTY	GEORGETOWN INNER LOOP @ CENTRAL MAINTENANCE FACILITY	STATE: TEXAS	SCALE : 1"=40' HOR. 1"=20" VERT.
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BRIDGEFARMER & ASSOCIATES, INC. CONSULTING ENGINEERS TBPE REGISTRATION NO. 264		COUNTY: WILLIAMSON	SHEET NO. 11 OF 22 SHEETS
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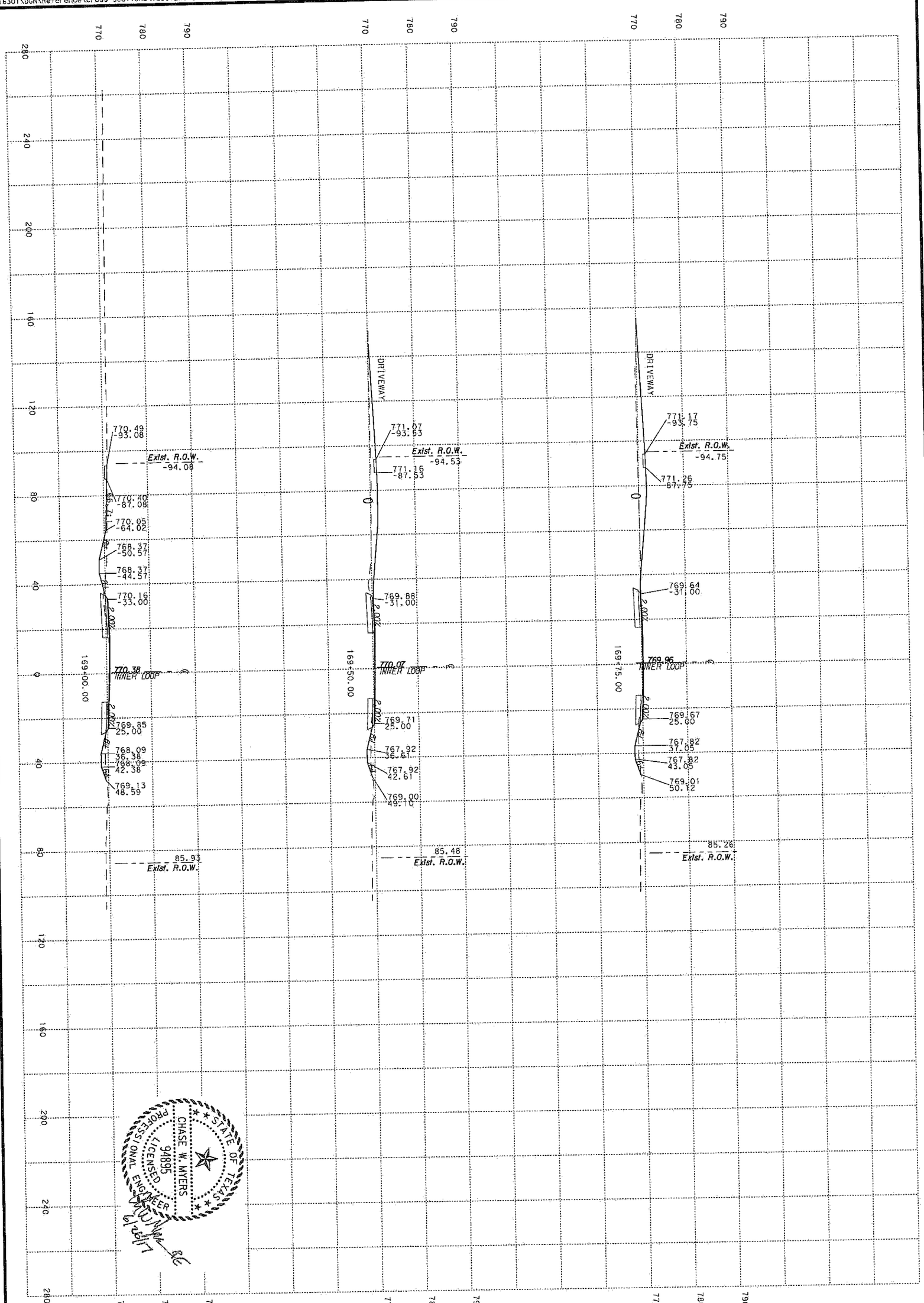

STATE OF TEXAS
CHASE W. MYERS
94895
LICENSED
PROFESSIONAL ENGINEER
6/26/17

WILLIAMSON COUNTY

BRIDGEFARMER & ASSOCIATES, INC.
CONSULTING ENGINEERS
TBPE REGISTRATION NO. 264

GEORGETOWN INNER LOOP @ CENTRAL MAINTENANCE FACILITY

STATE: TEXAS	SCALE : 1"=40' HOR. 1"=20" VERT.
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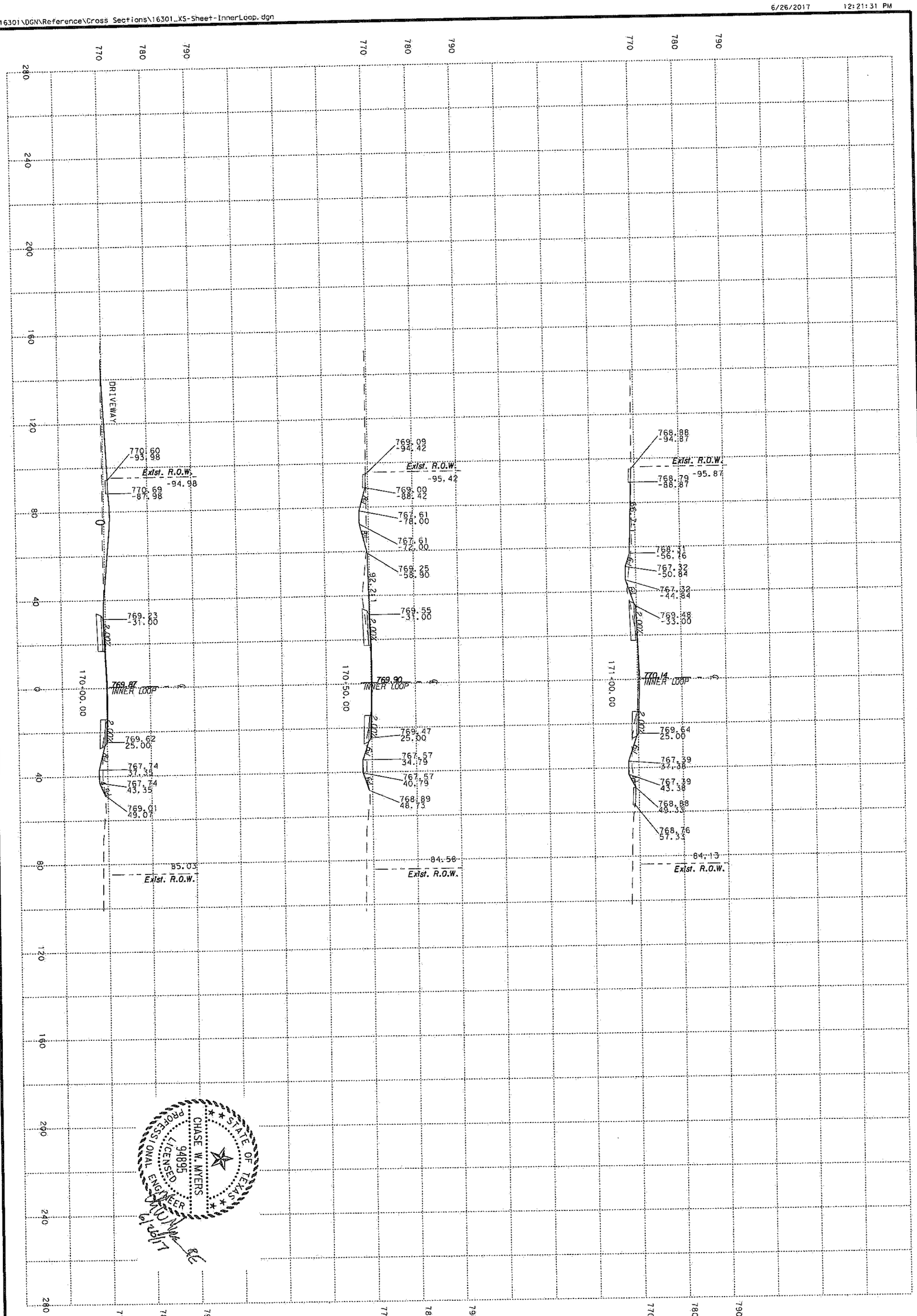


CHASE W. MYERS
94895
LICENSED
PROFESSIONAL ENGINEER
STATE OF TEXAS
6/26/17

WILLIAMSON COUNTY

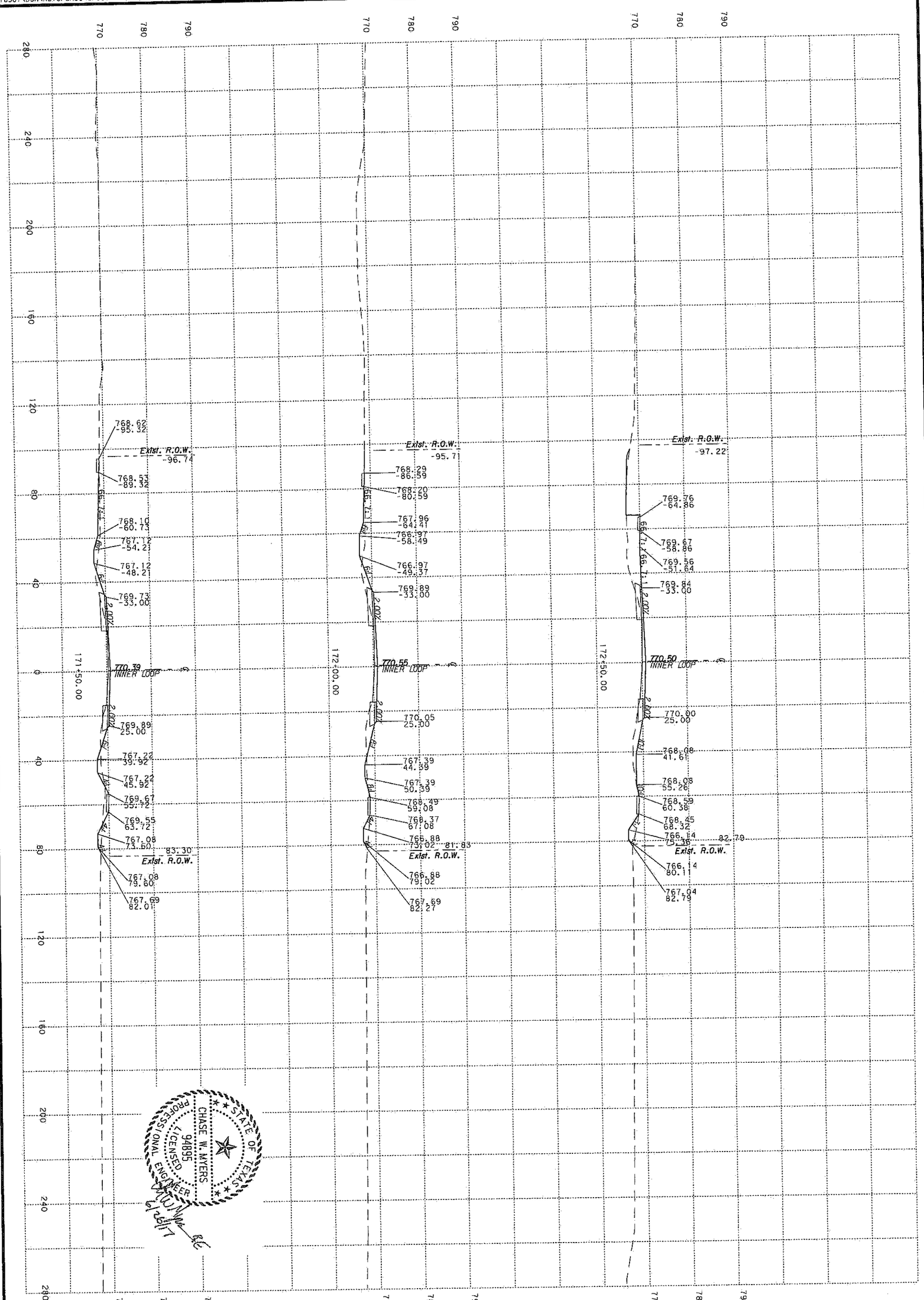
BRIDGEFARMER & ASSOCIATES, INC.
CONSULTING ENGINEERS
TBPE REGISTRATION NO. 264

GEORGETOWN INNER LOOP @ CENTRAL MAINTENANCE FACILITY

STATE: TEXAS	SCALE : 1"=40' HOR. 1"=20" VERT.
DIST:	
COUNTY: WILLIAMSON	SHEET NO. 13 OF 22 SHEETS
CSJ:	

Bid 170188

Williamson County, Texas



WILLIAMSON COUNTY	GEORGETOWN INNER LOOP @ CENTRAL MAINTENANCE FACILITY	STATE: TEXAS	SCALE : 1"=40' HOR. 1"=20" VERT.
BRIDGEFARMER & ASSOCIATES, INC. CONSULTING ENGINEERS TBPE REGISTRATION NO. 264		DIST:	
		COUNTY: WILLIAMSON	SHEET NO. 14 OF 22 SHEETS
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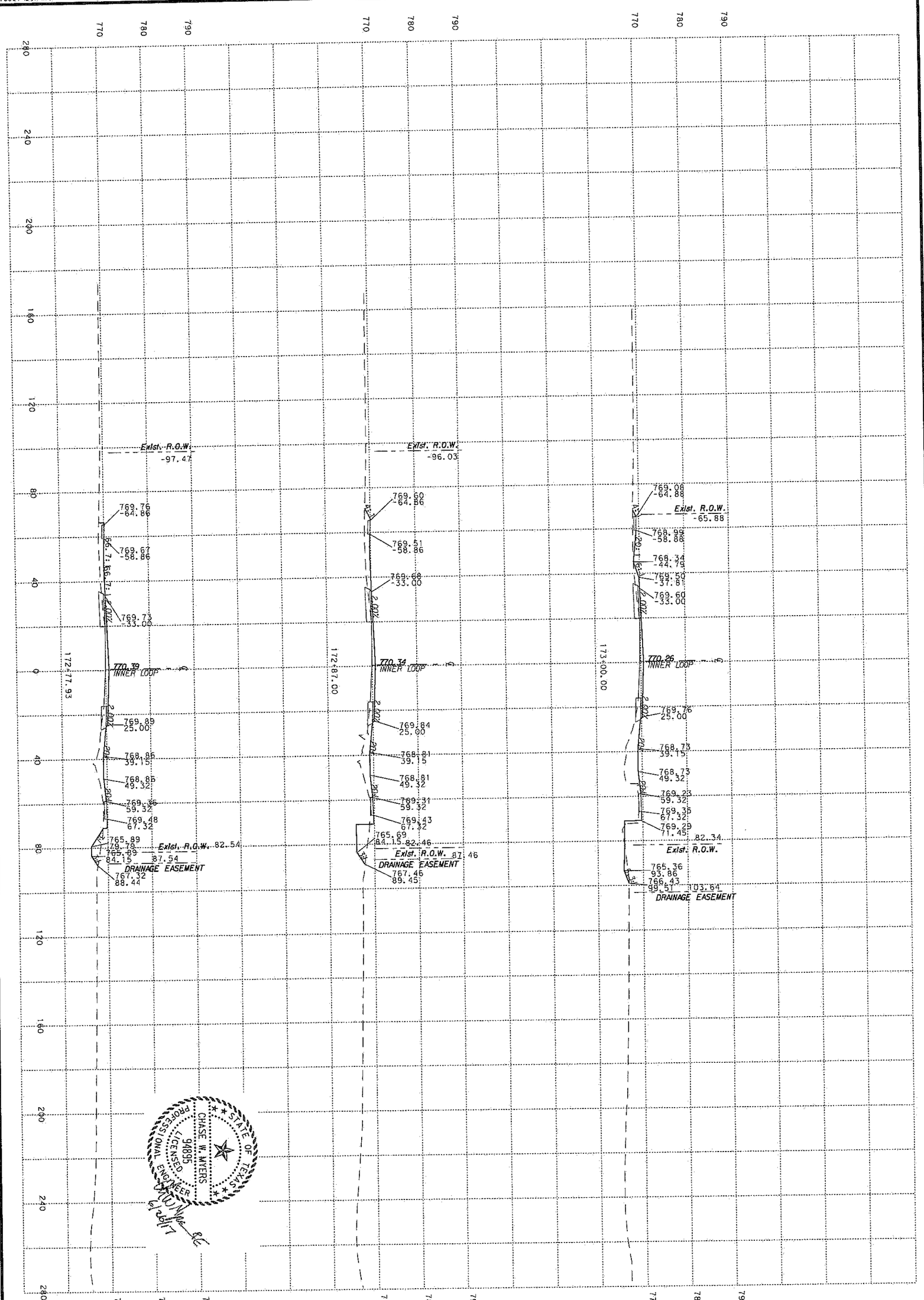

WILLIAMSON COUNTY	GEORGETOWN INNER LOOP @ CENTRAL MAINTENANCE FACILITY	STATE: TEXAS	SCALE : 1"=40' HOR. 1"=20" VERT.
BRIDGEFARMER & ASSOCIATES, INC. CONSULTING ENGINEERS TBPE REGISTRATION NO. 264		DIST:	
		COUNTY: WILLIAMSON	SHEET NO. 15 OF 22 SHEETS
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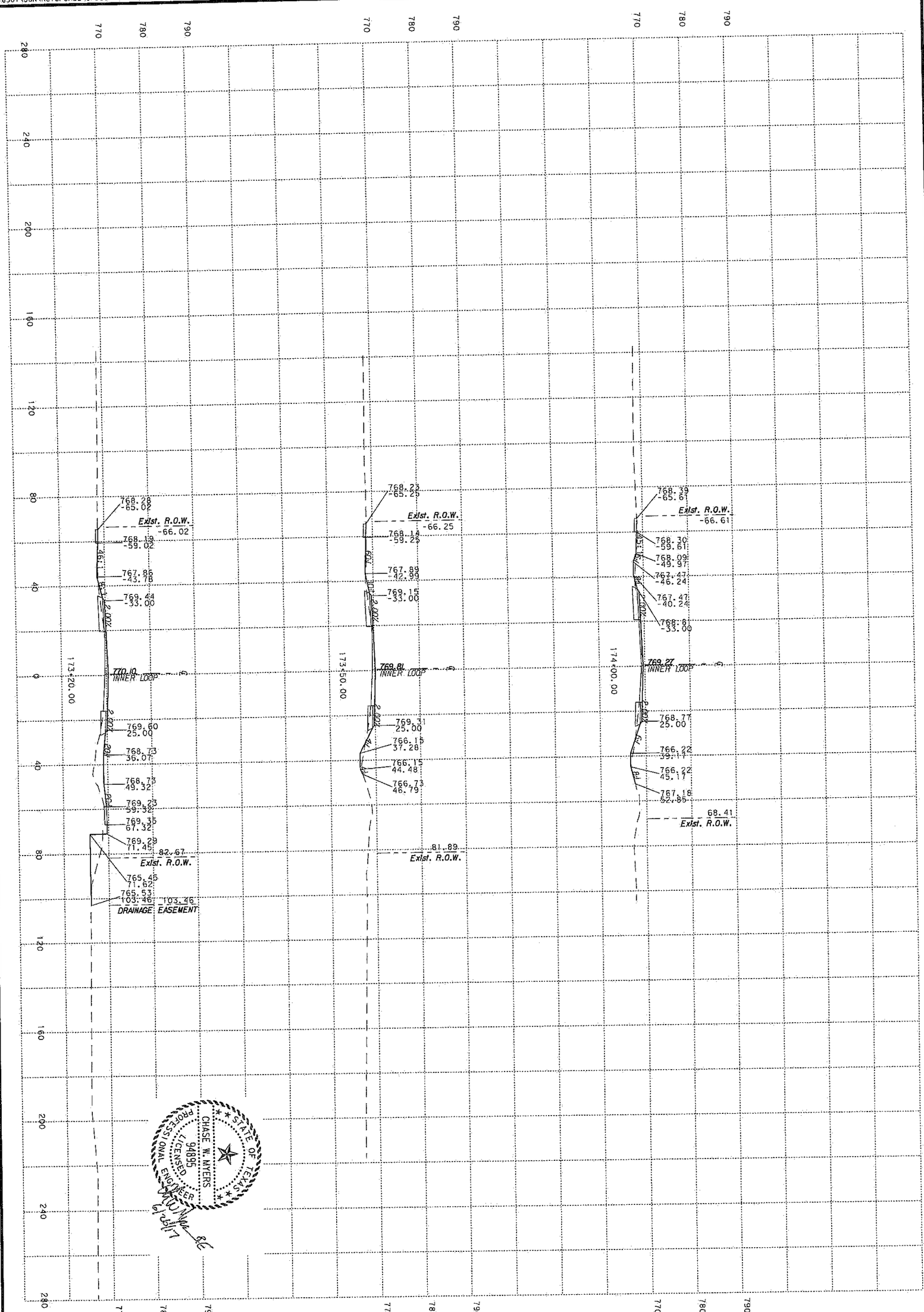


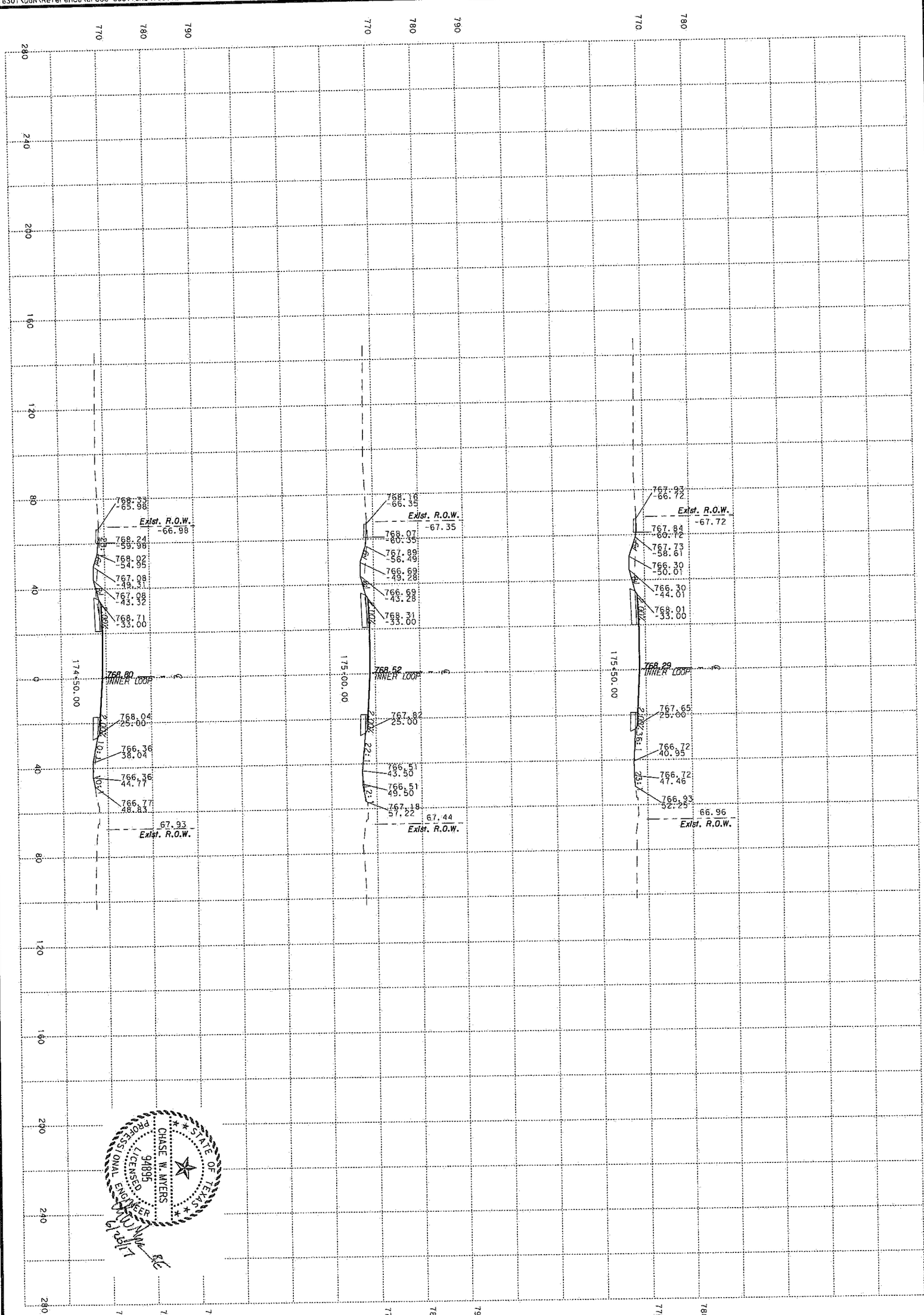
WILLIAMSON COUNTY

BRIDGEFARMER & ASSOCIATES, INC.
CONSULTING ENGINEERS
TBPE REGISTRATION NO. 264

GEORGETOWN INNER LOOP @ CENTRAL MAINTENANCE FACILITY

STATE: TEXAS	SCALE : 1"=40' HOR. 1"=20" VERT.
DIST:	
COUNTY: WILLIAMSON	SHEET NO. 16 OF 22 SHEETS
CSJ:	

Bid 170118



WILLIAMSON COUNTY

BRIDGEFARMER & ASSOCIATES, INC.
CONSULTING ENGINEERS
TBPE REGISTRATION NO. 264

GEORGETOWN INNER LOOP @ CENTRAL MAINTENANCE FACILITY

STATE: TEXAS	SCALE : 1"=40' HOR. 1"=20" VERT.
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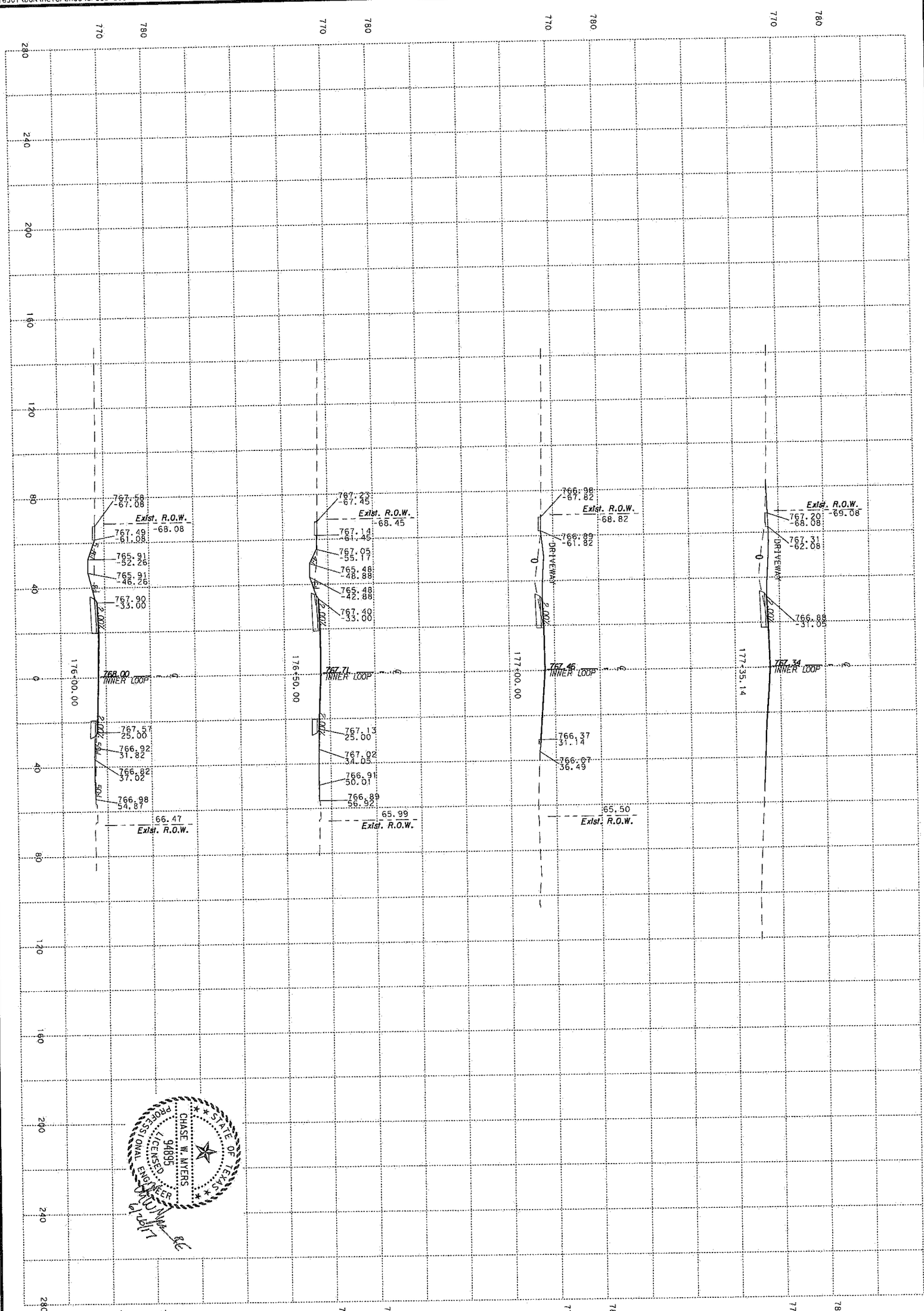
COUNTY: WILLIAMSON	SHEET NO. 17 OF 22 SHEETS
CSJ:	

Bid 170108

Williamson County, Texas



WILLIAMSON COUNTY

BRIDGEFARMER & ASSOCIATES, INC.
CONSULTING ENGINEERS
TBPE REGISTRATION NO. 264

GEORGETOWN INNER LOOP @ CENTRAL MAINTENANCE FACILITY

STATE: TEXAS	SCALE : 1"=40' HOR. 1"=20" VERT.
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COUNTY: WILLIAMSON	SHEET NO. 18 OF 22 SHEETS
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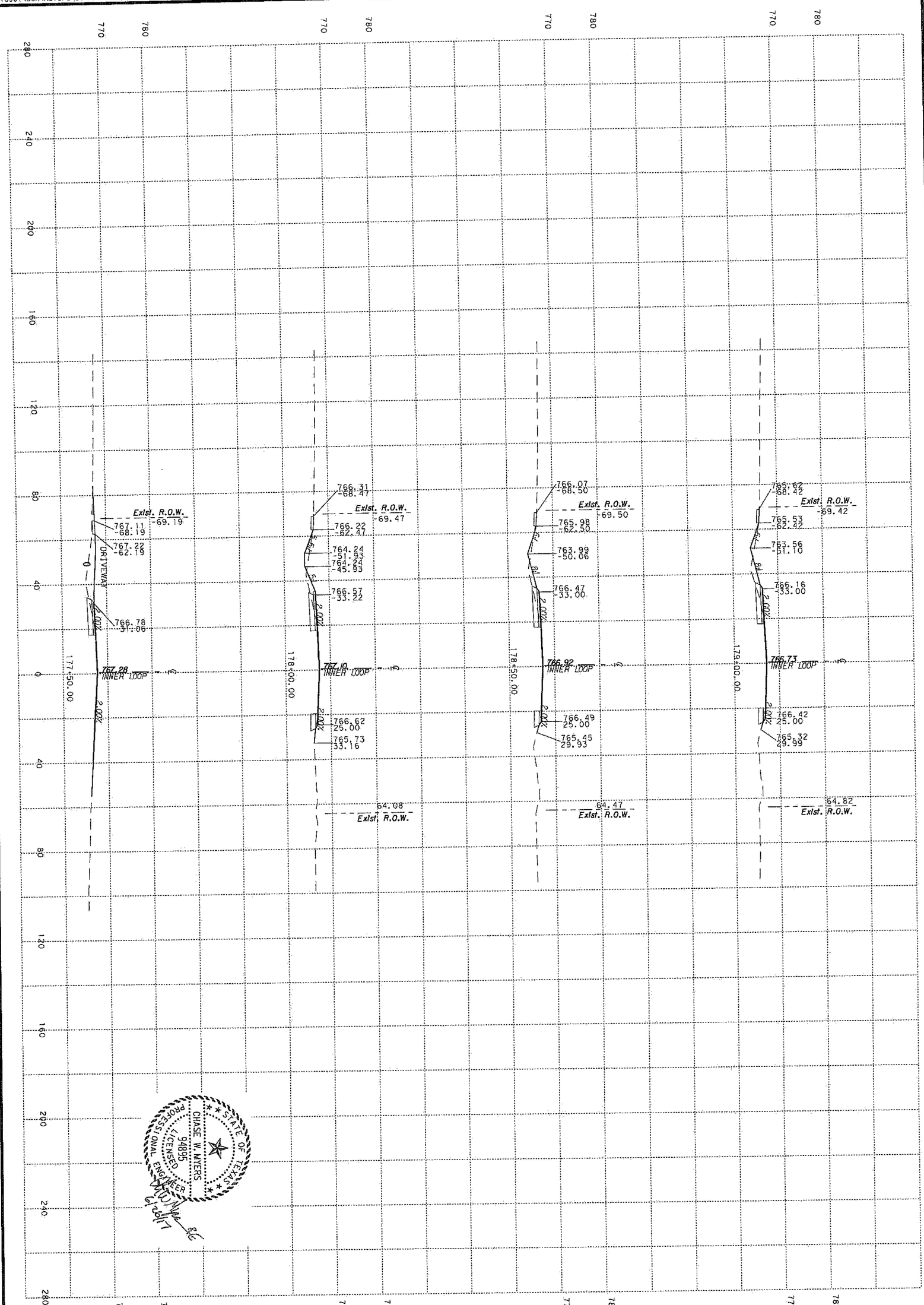
Bid 170118

Williamson County, Texas



WILLIAMSON COUNTY

BRIDGEFARMER & ASSOCIATES, INC.
CONSULTING ENGINEERS
TBPE REGISTRATION NO. 264

GEORGETOWN INNER LOOP @ CENTRAL MAINTENANCE FACILITY

STATE: TEXAS	SCALE : 1"=40' HOR. 1"=20" VERT.
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COUNTY: WILLIAMSON	SHEET NO. 19 OF 22 SHEETS
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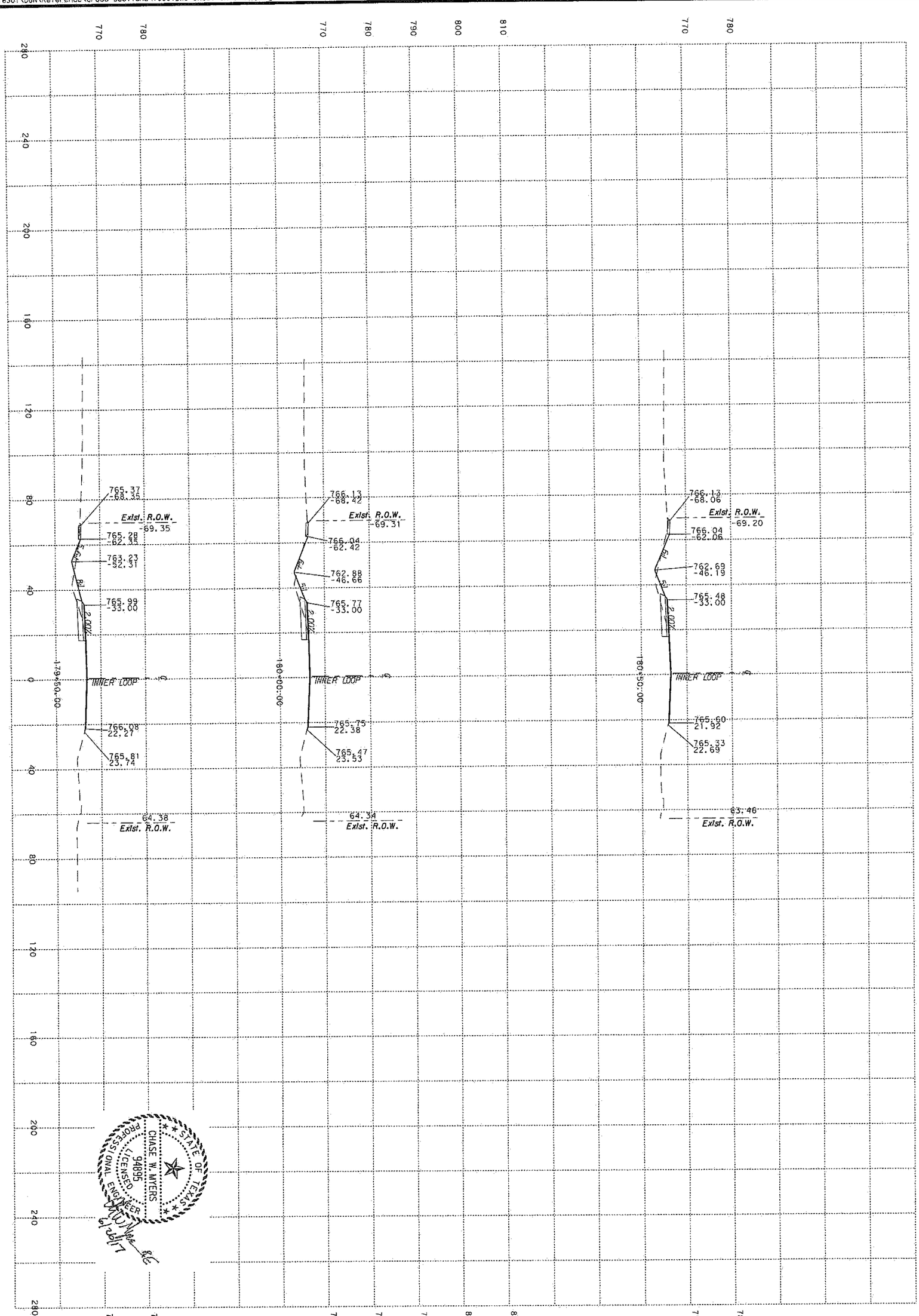
Bid 170118

Williamson County, Texas



CHASE W. MYERS
94895
LICENSED
PROFESSIONAL ENGINEER
STATE OF TEXAS
6/26/17

WILLIAMSON COUNTY	GEORGETOWN INNER LOOP @ CENTRAL MAINTENANCE FACILITY	STATE: TEXAS	SCALE : 1"=40' HOR. 1"=20" VERT.
BRIDGEFARMER & ASSOCIATES, INC. CONSULTING ENGINEERS TBPE REGISTRATION NO. 264		DIST:	
		COUNTY: WILLIAMSON	SHEET NO. 20 OF 22 SHEETS
		CSJ:	

Williamson County, Texas
Bid 4706-468

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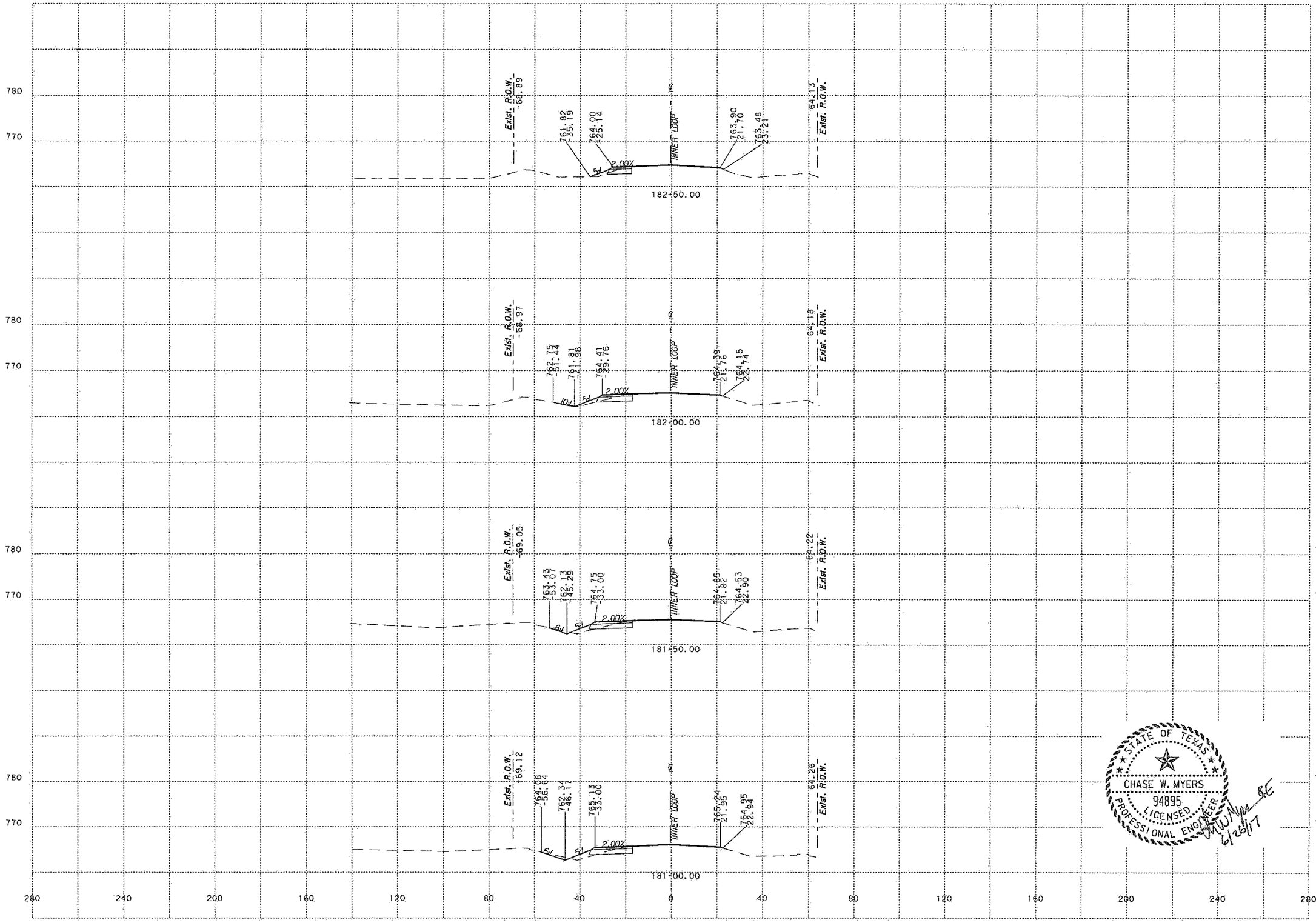

STATE OF TEXAS
CHASE W. MYERS
94895
LICENSED
PROFESSIONAL ENGINEER
6/26/17

STATE: TEXAS
DIST:
COUNTY: WILLIAMSON
CSJ:
SCALE : 1"=40' HOR. 1"=20" VERT.
SHEET NO. 21 OF 22 SHEETS

GEORGETOWN INNER LOOP @ CENTRAL MAINTENANCE FACILITY

WILLIAMSON COUNTY

BRIDGEFARMER & ASSOCIATES, INC.
CONSULTING ENGINEERS
TBPE REGISTRATION NO. 264

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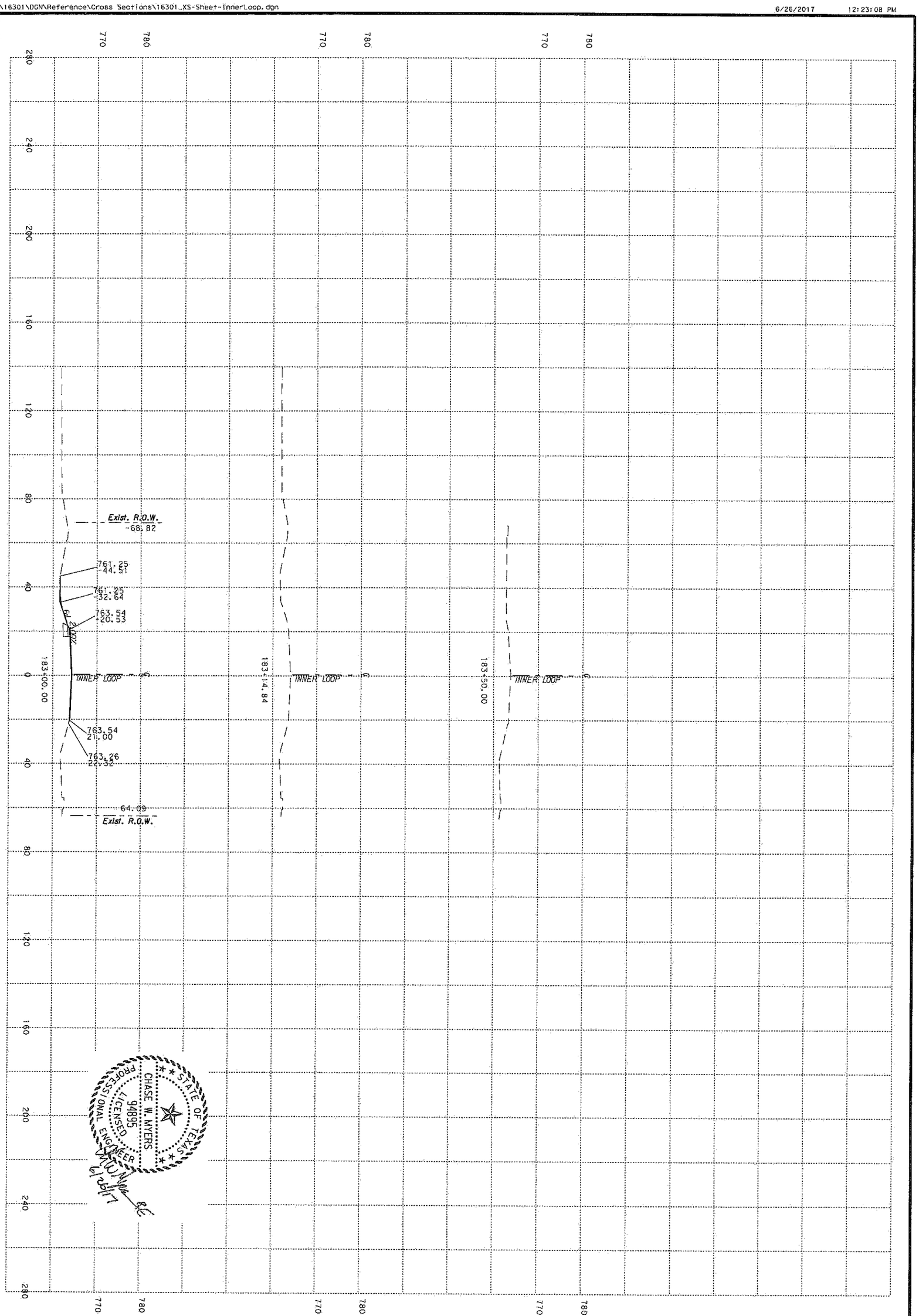


WILLIAMSON COUNTY	GEORGETOWN INNER LOOP @ CENTRAL MAINTENANCE FACILITY	STATE: TEXAS	SCALE : 1"=40' HOR. 1"=20" VERT.
BRIDGEFARMER & ASSOCIATES, INC. CONSULTING ENGINEERS TBPE REGISTRATION NO. 264		DIST:	
		COUNTY: WILLIAMSON	SHEET NO. 22
		CSJ:	OF 22 SHEETS

Bid 1706-168

Williamson County, Texas

Dwg Info: G:\CFA\2014\0308801_Williamson_County_2013_Road_Bond\MUN\18 Inner Loop - Central Maintenance\DESIGN\C-001-COVR.dwg - Tab: C001 COVER - Plotted: 6/27/2017 3:54 PM By: HARSHA SHETTY

p. 605

INDEX OF SHEETS

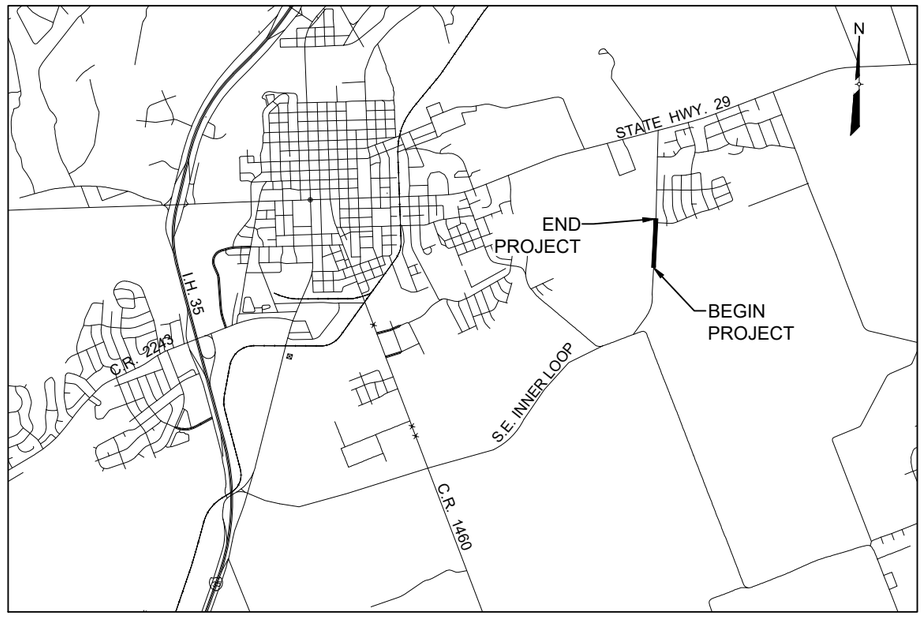
C-001	TITLE SHEET
C-002	GENERAL NOTES
C-003	LEGEND, SYMBOLS AND ABBREVIATIONS
C-100	KEY MAP
C-101	16" WATERLINE 'A' PLAN AND PROFILE
C-102	VALVE ADJUSTMENTS TO GRADE
C-501	STANDARD UTILITY DETAILS

WILLIAMSON COUNTY
RECONSTRUCTION OF INNER LOOP AT CENTRAL MAINTENANCE
16" WATER LINE RELOCATION

TOTAL LENGTH OF PROJECT: 91 LF

PROJECT LIMITS: FROM THE CENTRAL MAINTENANCE FACILITY TO BOLTON ROAD

RELOCATION OF 16" WATER LINE, WITH VALVES, APPURTENANCES, INCLUDING RECONNECTION TO EXISTING MAINS AND SERVICES



VICINITY MAP
(NOT TO SCALE)

REV. NO.	REVISION DESCRIPTION	(C)ORRECT, (A)DD, (V)OID SHEET NUMBERS	APPR'D BY:	DATE

OWNER INFORMATION

OWNER:
CITY OF GEORGETOWN, TEXAS
300 INDUSTRIAL AVENUE
GEORGETOWN, TEXAS 78626

CONTACT:
MICHAEL HALLMARK
512-930-3569

DESIGNER:
COBB FENDLEY
505 E. HUNTLAND DR. SUITE 100
AUSTIN, TEXAS 78752

CONTACT:
LANCE PARISHER, P.E.
512-834-9798

SUBMITTED FOR APPROVAL:

STATE OF TEXAS
JAMES LANCE PARISHER
106221
LICENSED
PROFESSIONAL ENGINEER

06/28/17

LANCE PARISHER P.E. — DATE
COBB FENDLEY, INC.

APPROVALS:

DATE

CITY OF GEORGETOWN, TEXAS

CobbFendley
TBPE NO. 274 / TBPLS NO. 10046701
505 EAST HUNTLAND DRIVE, SUITE 100
AUSTIN, TEXAS 78752
512.834.9798 | FAX 512.834.7277
WWW.COBBFENDLEY.COM

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Bid 1706-168

GENERAL NOTES

1. ALL CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE CITY OF GEORGETOWN STANDARD SPECIFICATIONS.
2. ALL RESPONSIBILITY FOR THE ADEQUACY OF THESE PLANS REMAINS WITH THE ENGINEER WHO PREPARED THEM. IN REVIEWING THESE PLANS, THE CITY OF GEORGETOWN MUST RELY ON THE ADEQUACY OF THE WORK OF THE DESIGN ENGINEER.
3. DESIGN PROCEDURES SHALL BE IN COMPLIANCE WITH THE CITY OF GEORGETOWN ENGINEERING DESIGN GUIDELINES AND UNIFIED DEVELOPMENT CODE. ALL WAIVERS OR VARIANCES ARE LISTED BELOW:
4. AFTER THE CONSTRUCTION PERMIT HAS BEEN ISSUED AND PRIOR TO THE BEGINNING CONSTRUCTION, THE OWNER OR HIS REPRESENTATIVE SHALL CONVENE A PRE-CONSTRUCTION CONFERENCE BETWEEN THE CITY OF GEORGETOWN, DESIGN ENGINEER, CONTRACTOR(S), WILLIAMSON COUNTY (IF IN THE ETJ), OTHER UTILITY COMPANIES, AND ANY OTHER AFFECTED PARTIES. THE CITY OF GEORGETOWN SHALL BE NOTIFIED AT LEAST 48 HOURS PRIOR TO THE PROPOSED MEETING TIME (512-930-3569).
5. THE CONTRACTOR SHALL GIVE THE CITY OF GEORGETOWN CONSTRUCTION INSPECTOR AT LEAST 48 HOURS NOTICE BEFORE BEGINNING EACH PHASE OF CONSTRUCTION.
6. ANY CHANGES OR REVISIONS TO THESE APPROVED PLANS MUST BE SUBMITTED BY THE DESIGN ENGINEER AND APPROVED BY THE CITY OF GEORGETOWN PRIOR TO CONSTRUCTION OF THE REVISION.
7. ANY EXISTING UTILITIES, PAVEMENT, CURBS, SIDEWALKS, STRUCTURES, TREES, ETC., NOT PLANNED FOR DESTRUCTION OR REMOVAL OR OTHER PUBLIC INFRASTRUCTURE DAMAGED OR REMOVED WILL BE BY THE CONTRACTOR AT HIS EXPENSE BEFORE ACCEPTANCE OF THE PROJECT.
8. BENCHMARKS:
   SEE "SURVEY CONTROL DATA" PLANS IN "RECONSTRUCTION OF COUNTY ROAD 258, ROADWAY AND DRAINAGE IMPROVEMENTS" PLAN SET FOR BENCHMARK INFORMATION, PREPARED BY:
   CIVIL ENGINEERING CONSULTANTS
   11550 IH-10 WEST, SUITE 395
   SAN ANTONIO, TEXAS 78230
   (210) 641-9999
9. BLASTING OR BURNING SHALL NOT BE PERMITTED ON THIS PROJECT.
10. THE CONTRACTOR SHALL VERIFY ALL DEPTHS AND LOCATIONS OF EXISTING UTILITIES PRIOR TO BEGINNING CONSTRUCTION. ANY DISCREPANCIES WITH THE CONSTRUCTION PLANS FOUND IN THE FIELD SHALL BE BROUGHT TO THE ATTENTION OF THE DESIGN ENGINEER IMMEDIATELY. THE DESIGN ENGINEER SHALL BE RESPONSIBLE FOR REVISING THE PLANS AS APPROPRIATE AND SUBMITTING A REVISION TO THE CITY. USE ONE CALL UTILITY SYSTEM: DIAL 1-800-344-8377, 48 HOURS BEFORE YOU DIG.
11. EXCESS SOIL SHALL BE REMOVED AT THE CONTRACTOR'S EXPENSE. NOTIFY THE CITY OF GEORGETOWN IF THE DISPOSAL SITE IS INSIDE THE CITY'S JURISDICTIONAL BOUNDARIES.
12. ALL AREAS DISTURBED OR EXPOSED DURING CONSTRUCTION SHALL BE REVEGETATED IN ACCORDANCE WITH THE PLANS AND SPECIFICATIONS. REVEGETATION OF ALL DISTURBED AREAS OR EXPOSED AREAS SHALL CONSIST OF SODDING OR SEEDING; AT THE CONTRACTOR'S OPTION.
13. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO INSPECT TEMPORARY EROSION CONTROLS ON A DAILY BASIS. ADJUST THE CONTROLS AND/OR REMOVE ANY SEDIMENT BUILDUP AS NECESSARY.
14. CONTRACTOR WILL BE RESPONSIBLE FOR KEEPING ROADS AND DRIVES ADJACENT TO AND NEAR THE SITE FREE FROM SOIL, SEDIMENT AND DEBRIS. CONTRACTOR WILL NOT REMOVE SOIL, SEDIMENT OR DEBRIS FROM ANY AREA OR VEHICLE BY MEANS OF WATER, ONLY SHOVELING AND SWEEPING WILL BE ALLOWED. CONTRACTOR WILL BE RESPONSIBLE FOR DUST CONTROL FROM THE SITE.
15. PRIOR TO ANY CONSTRUCTION, THE CONTRACTOR SHALL APPLY FOR AND SECURE ALL PROPER PERMITS FROM THE APPROPRIATE AUTHORITIES.
16. ALL WET UTILITIES SHALL BE INSTALLED AND ALL DENSITIES MUST HAVE PASSED INSPECTIONS(S) PRIOR TO THE INSTALLATION OF DRY UTILITIES.
17. A TRAFFIC CONTROL PLAN, IN ACCORDANCE WITH THE TEXAS MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES, SHALL BE SUBMITTED TO THE CITY FOR REVIEW AND APPROVAL PRIOR TO ANY PARTIAL OR COMPLETE ROADWAY CLOSURES. TRAFFIC CONTROL PLANS SHALL BE SITE SPECIFIC AND BE SEALED BY A REGISTERED TEXAS PROFESSIONAL ENGINEER.

EROSION AND SEDIMENTATION CONTROL NOTES

1. EROSION CONTROL MEASURES, SITE WORK, AND RESTORATION WORK SHALL BE IN ACCORDANCE WITH THE CITY OF GEORGETOWN'S SUBDIVISION CODE AND CONSTRUCTION STANDARDS MANUAL, EXCEPT AS NOTED BELOW AND APPROVED BY CITY COUNCIL:
2. SLOPES SHALL BE SODDED OR SEEDED WITH THE APPROPRIATE GRASS, GRASS MIXTURES, OR GROUND COVER SUITABLE TO THE AREA AND SEASON TO WHICH THEY ARE APPLIED.
3. SILT FENCES, ROCK BERMS AND SIMILARLY RECOGNIZED TECHNIQUES AND MATERIALS SHALL BE EMPLOYED DURING CONSTRUCTION TO PREVENT POINT SOURCE SEDIMENTATION LOADING OF DOWNSTREAM FACILITIES. SUCH INSTALLATION SHALL BE REGULARLY INSPECTED BY THE CITY OF GEORGETOWN FOR EFFECTIVENESS. ADDITIONAL MEASURES MAY BE REQUIRED IF, IN THE OPINION OF THE CITY ENGINEER, THEY ARE WARRANTED.
4. ALL TEMPORARY EROSION CONTROL MEASURES SHALL NOT BE REMOVED UNTIL FINAL INSPECTION AND APPROVAL OF THE PROJECT BY THE ENGINEER.
5. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO MAINTAIN ALL TEMPORARY EROSION CONTROL STRUCTURES AND TO REMOVE EACH STRUCTURE AS APPROVED BY THE ENGINEER.

WATER NOTES

1. PIPE MATERIAL FOR WATER MAINS SHALL BE PVC (AWWA C-900, MIN CLASS 150), OR DUCTILE IRON (AWWA C-100, MIN 150). WATER SERVICES (2" OR LESS) SHALL BE POLYETHYLENE TUBING (200 PSI, DR9).
2. UNLESS OTHERWISE ACCEPTED BY THE CITY ENGINEER, DEPTH OF COVER FOR ALL LINES OUT OF THE PAVEMENT SHALL BE 36" MIN. AND DEPTH OF COVER FOR ALL LINES UNDER PAVEMENT SHALL BE A MIN. OF 36" BELOW SUBGRADE.
3. WHERE A WATER OR WASTEWATER LINE CROSSES BELOW A STORM SEWER STRUCTURE AND THE TOP OF THE PIPE IS WITHIN 18" OF THE BOTTOM OF THE UTILITY STRUCTURE, THE PIPE SHALL BE ENCASED WITH CONCRETE FOR A DISTANCE OF AT LEAST 1' ON EITHER SIDE OF THE DITCH LINE OF THE UTILITY STRUCTURE OR THE STORM SEWER. CONCRETE ENCASEMENT WILL NOT BE REQUIRED FOR DUCTILE IRON PIPE WITH SIZES LARGER THAN 12". CONCRETE ENCASEMENT SHALL CONFORM TO THE CITY OF GEORGETOWN STANDARD DETAIL.
4. ALL PIPE BEDDING MATERIAL SHALL CONFORM TO THE CITY OF GEORGETOWN STANDARD DETAIL.
5. ALL FIRE HYDRANT LEADS SHALL BE DUCTILE IRON PIPE (AWWA C-100, MIN. CLASS 150).
6. ALL IRON PIPE AND FITTINGS SHALL BE WRAPPED WITH A MINIMUM 8-MIL POLYETHYLENE FILM PRIOR TO PLACING CONCRETE.
7. THE CONTRACTOR SHALL CONTACT THE CITY INSPECTOR TO COORDINATE UTILITY TIE-INS AND NOTIFY HIM AT LEAST 48 HOURS PRIOR TO CONNECTION TO EXISTING LINES.
8. THE CONTRACTOR, AT HIS EXPENSE, SHALL PERFORM QUALITY TESTING FOR ALL WATER PIPE INSTALLED AND PRESSURE PIPE HYDROSTATIC TESTING OF ALL WATER LINES CONSTRUCTED AND SHALL PROVIDE EQUIPMENT INCLUDING PUMPS, GAUGES, SUPPLIES, AND LABOR NECESSARY TO PERFORM THE TESTS. QUALITY AND PRESSURE TESTING SHALL BE MONITORED BY CITY OF GEORGETOWN PERSONNEL. WATER SAMPLES WILL BE COLLECTED BY THE CITY OF GEORGETOWN TO VERIFY EACH TREATED LINE HAS ATTAINED AN INITIAL CHLORINE CONCENTRATION OF 50 PPM.
9. THE CONTRACTOR SHALL COORDINATE TESTING WITH THE CITY OF GEORGETOWN AND PROVIDE NO LESS THAN 24 HOURS NOTICE PRIOR TO PERFORMING STERILIZATION, QUALITY TESTING OR PRESSURE TESTING.
10. THE CONTRACTOR SHALL NOT OPEN OR CLOSE ANY VALVES UNLESS AUTHORIZED BY THE CITY OF GEORGETOWN.
11. ALL VALVE BOXES AND COVERS SHALL BE CAST IRON.
12. A DOUBLE CHECK BACKFLOW DEVICE IN A VAULT SHALL BE INSTALLED ADJACENT THE RIGHT OF WAY OR PUBLIC EASEMENT ON PRIVATE PROPERTY ON ALL PRIVATE FIRE LINES.
13. ALL WATER SERVICE AND VALVE LOCATIONS SHALL BE APPROPRIATELY MARKED AS FOLLOWS:

    WATER SERVICE "W" ON TOP OF CURB
    VALVE "V" ON FACE OF CURB
14. THE CONTRACTOR IS HEREBY NOTIFIED THAT CONNECTING TO, SHUTTING DOWN, OR TERMINATING EXISTING UTILITY LINES MAY HAVE TO OCCUR AT OFF-PEAK HOURS. SUCH HOURS ARE USUALLY OUTSIDE NORMAL WORKING HOURS AND POSSIBLY BETWEEN 12 A.M. AND 6 A.M.
15. ALL FIRE HYDRANTS SHALL BE NATIONAL STANDARD HOSE THREAD.
16. LIBERTY HILL FIRE DEPARTMENT:
    FIRE HYDRANTS MUST BE INSTALLED WITH THE CENTER OF THE FIVE (5) INCH STEAMER OPENING AT LEAST 18 INCHES ABOVE FINISHED GRADE. THE FIVE (5) INCH OPENING MUST FACE THE DRIVEWAY OR STREET AND MUST BE TOTALLY UNOBSTRUCTED TO THE STREET. FIRE HYDRANT DESIGN SHALL BE 2- 2.5" NST OUTLETS, 1 - 5.0" STORZ CONNECTION WITH A CAP TO INCLUDE A HEX NUT TO FIT A HYDRANT WRENCH ALONG WITH A REFLECTIVE BAND. THE FIRE HYDRANT SHALL BE PAINTED SILVER IN COLOR AND DESIGNATED BY A BLUE REFLECTOR IN THE CENTER OF THE STREET.
17. ALL MATERIAL TESTS, INCLUDING SOIL DENSITY TESTS AND RELATED SOIL ANALYSIS, SHALL BE ACCOMPLISHED BY AN INDEPENDENT LABORATORY FUNDED BY THE DEVELOPER IN ACCORDANCE WITH THE SPECIFICATIONS.
18. FULL-BODIED DRESSER TAPPING SADDLE REQUIRED FOR SIZE-ON-SIZE TAPS.
19. PRESSURE TESTING AND THREE BACTERIOLOGICAL SAMPLES SHALL BE TAKEN ON EACH NEW WATER LINE PRIOR TO TIE-IN TO EXISTING LINES.
20. TRACER WIRE TEST STATIONS ARE REQUIRED AT EACH TAPPING VALVE WHERE TIE-INS ARE CONSTRUCTED.

REV. NO.	REVISION DESCRIPTION	APPROVED BY:	DATE

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TBPE NO. 274 / TBPLS NO. 10046701
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AUSTIN, TEXAS 78752
512.834.9798 | FAX 512.834.7727
WWW.COBBFENDLEY.COM

GENERAL NOTES

INNER LOOP @ CENTRAL MAINTENANCE
16" WATERLINE RELOCATION
WILLIAMSON COUNTY, TEXAS

WILLIAMSON COUNTY 1848

PROJ. NO. 1403-088-02-09F
DESIGN: G. LITTLEFIELD
DRAWN: G. LITTLEFIELD
CHECK: J. HASTINGS
APPR: L. PARISHER
DATE: JULY 23, 2017

STATE OF TEXAS
JAMES LANCE PARISHER
106221
LICENSED
PROFESSIONAL ENGINEER
06/23/2017

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2 of 7

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Williamson County, Texas
Dwg Info: G:\CFA\2014\0308801_Williamson_County_2013_Road_Bond\MUN\18 Inner Loop - Central Maintenance\DESIGN\C-002-GNOT.dwg - Tab: C002 GENERAL NOTES - Plotted: 6/27/2017 3:54 PM By: HARSHA SHETTY

Bid 1706-168

Williamson County, Texas

Dwg Info: G:\CFA\2014\0308801_Williamson_County_2013_Road_Bond\MUN\18 Inner Loop - Central Maintenance\DESIGN\C-002-GNOT.dwg - Tab: C003 C003 LEGEND SYMBOLS AND ABBREVIATIONS - Plotted: 6/27/2017 3:54 PM By: HARSHA SHETTY

SURVEY LEGEND

BENCHMARK	POWER POLE
BOLLARD	POWER POLE WITH LIGHT
BORE HOLE	POWER POLE WITH RISER
CABLE TV JUNCTION BOX	PULL BOX
CABLE TV PEDESTAL	RISER
CLEANOUT	ROOF DRAIN
COMMUNICATIONS MANHOLE	SEPTIC LID
CONC. HWY. MONUMENT FOUND TYPE II	SIGN
CONCRETE MONUMENT FOUND	SPRINKLER HEAD
CONCRETE MONUMENT SET	STORM MANHOLE
COTTON SPINDLE FOUND	TELECOM JUNCTION BOX
COTTON SPINDLE SET	TELECOM MANHOLE
ELECTRIC JUNCTION BOX	TELECOM PEDESTAL
ELECTRIC MANHOLE	TEST HOLE
ELECTRIC METER	TRAFFIC SIGNAL BOX
ELECTRIC PEDESTAL	TRAFFIC SIGNAL POLE
ELECTRIC TRANSFORMER PAD	TREE
FIRE HYDRANT	TREE TO BE REMOVED
GAS MANHOLE	UNDERGROUND CABLE TV MARKER
GAS METER	UNDERGROUND ELECTRIC MARKER
GAS TEST LEAD	UNDERGROUND FIBER OPTIC MARKER
GAS VALVE	UNDERGROUND GAS PIPELINE MARKER
GROUND LIGHT	UNDERGROUND PIPELINE MARKER
GUARD POST	UNDERGROUND TELECOM MARKER
GUY WIRE	UNDERGROUND WATER MARKER
IRON PIPE FOUND	VALVE, MISCELLANEOUS
IRON ROD FOUND	VENT
IRON ROD SET	WASTEWATER MANHOLE
IRRIGATION CONTROL VALVE	WATER FAUCET
LIGHT, STANDARD	WATER MANHOLE
MAILBOX	WATER METER
MANHOLE	WATER VALVE
MONITORING WELL	WELL
NAIL FOUND	
NAIL SET	

EXISTING UTILITIES AND FEATURES

RIGHT OF WAY	
EASEMENT	
W W	WATER LINE
RW RW	REUSE WATER
W W W	WATER, ABANDONED
WW WW	WASTEWATER LINE
FM FM	FORCE MAIN
WW WW	WASTEWATER, ABANDONED
SD SD	STORM DRAIN
	STORM CULVERT
G G	GAS LINE
OE OE	OVERHEAD ELECTRIC
UT UT	U.G. TELECOM
FO FO	FIBER OPTIC
UE UE	U.G. ELECTRIC
TV	CABLE TV
O O	CHAINLINK FENCE
□ □	IRON FENCE
	ROCK FENCE
X X	WIRE FENCE
// //	WOOD FENCE
	GUARD RAIL
	APPROXIMATE TREE LINE

ABBREVIATIONS

ASPH	ASPHALT
B-B	BACK TO BACK
BKFL	BACKFILL
℄	BASELINE
BE	BEVELED END
BM	BENCHMARK
BTM	BOTTOM
℄	CENTERLINE
CI	CAST IRON
CONC	CONCRETE
CONSTR	CONSTRUCTION
CMP	CORRUGATED METAL PIPE
DE	DRAINAGE EASEMENT
DI	DUCTILE IRON
ESMT	EASEMENT
ELEC	ELECTRIC
EL	ELEVATION
ELL	ELBOW
EXIST	EXISTING
FB	FIELDBOOK
FH	FIRE HYDRANT
F/C	FRAME AND COVER
FUT	FUTURE
HP	HIGH PRESURE (>60 PSIG)
LP	LOW PRESSURE (<60 PSIG)
LT	LEFT
MH	MANHOLE
NFIF	NOT FOUND IN FIELD
O/S	OFFSET
OHWM	ORDINARY HIGH WATER MARK
PE	POLYETHYLENE
PVC	POLYVINYL CHLORIDE
PVMT	PAVEMENT
℄	PROPERTY LINE
PROP	PROPOSED
REF	REFERENCE
RCB	REINFORCED CONCRETE BOX
RCP	REINFORCED CONCRETE PIPE
RT	RIGHT
ROW	RIGHT OF WAY
SHT	SHEET
SW	SIDEWALK
STA	STATION
STL	STEEL
SD	STORM DRAIN
TELE	TELEPHONE / TELECOM
TBM	TEMPORARY BENCH MARK
TXDOT	TEXAS DEPARTMENT OF TRANSPORTATION
TGS	TEXAS GAS SERVICE CO.
UE	UTILITY EASEMENT
WE	WATER EASEMENT
WL	WATERLINE
WM	WATER METER
WV	WATER VALVE
WW	WASTEWATER
WWE	WASTEWATER EASEMENT

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CobbFendley
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AUSTIN, TEXAS 78752
512.834.9788 | FAX 512.834.7727
WWW.COBBFENDLEY.COM

LEGEND, SYMBOLS AND ABBREVIATIONS

INNER LOOP @ CENTRAL MAINTENANCE
16" WATERLINE RELOCATION
WILLIAMSON COUNTY, TEXAS

WILLIAMSON COUNTY 1848

PROJ. NO. 1403-088-02-09F
DESIGN: G. LITTLEFIELD
DRAWN: G. LITTLEFIELD
CHECK: J. HASTINGS
APPR: L. PARISHER
DATE: JULY 23, 2017

STATE OF TEXAS
JAMES LANCE PARISHER
106221
LICENSED
PROFESSIONAL ENGINEER
06/23/2017

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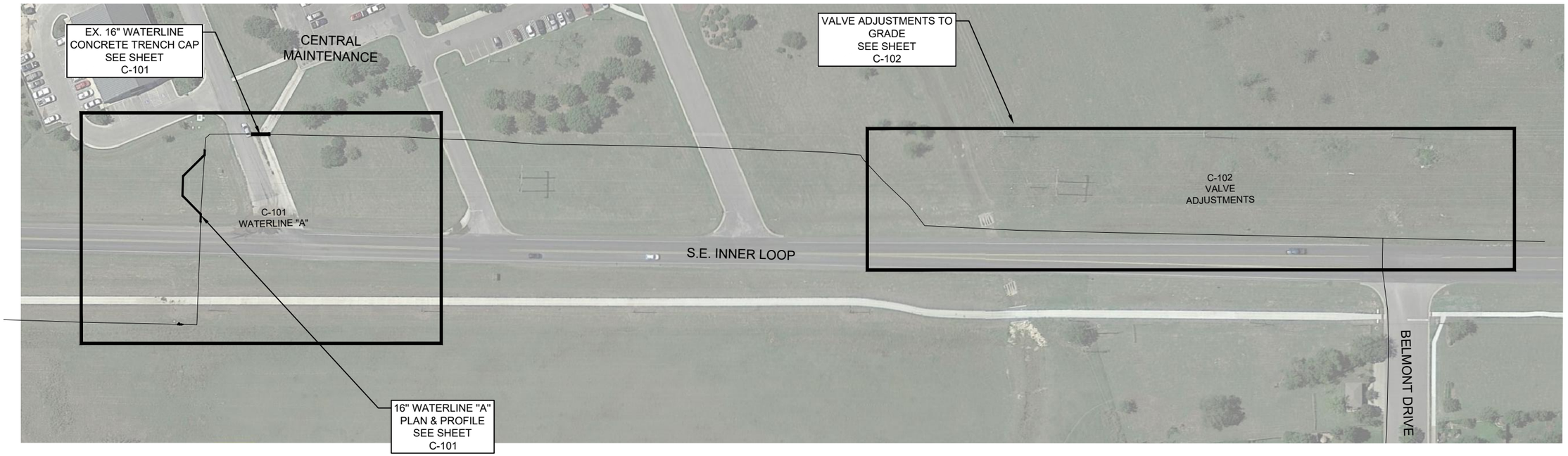
Williamson County, Texas



N

0 60' 120'
SCALE: 1" = 60'

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KEY-MAP

INNER LOOP @ CENTRAL MAINTENANCE
16" WATERLINE RELOCATION
WILLIAMSON COUNTY, TEXAS

WILLIAMSON COUNTY 1848

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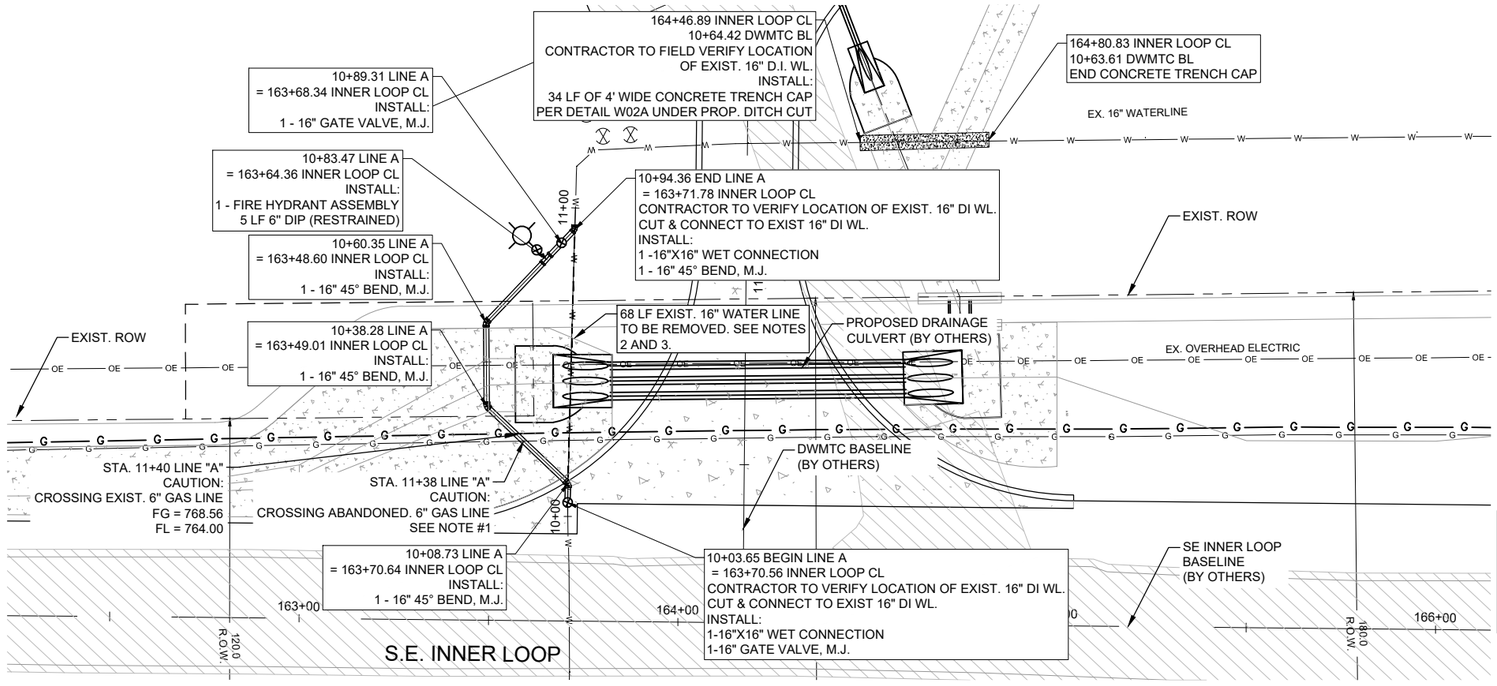

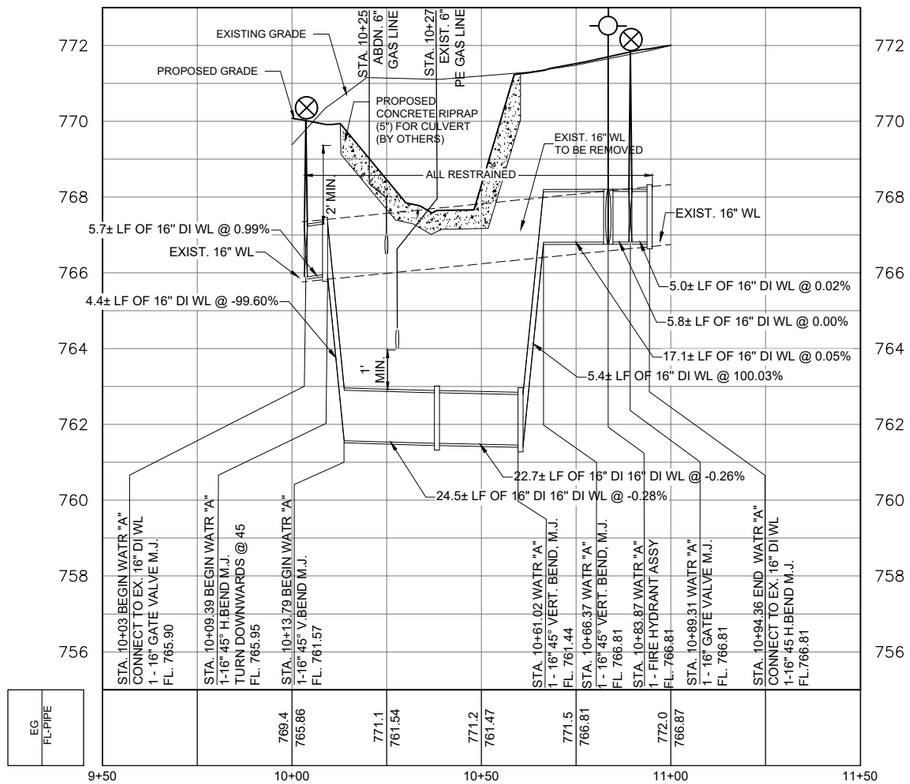

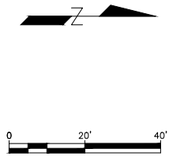

LEGEND

- PROP. WATER LINE
- RIGHT OF WAY
- EASEMENT
- ATT — PROPOSED AT&T
- W — WATER LINE
- WW — WASTEWATER LINE
- SD — STORM DRAIN
- G — EXIST. GAS LINE
- TEL — U.G. TELECOM
- FO — FIBER OPTIC
- OE — OVERHEAD ELECTRIC
- E — U.G. ELECTRIC
- O — CHAINLINK FENCE
- ROCK FENCE
- X — WIRE FENCE
- // — WOOD FENCE
- ESC — EROSION AND SEDIMENTATION CONTROL DEVICES
- PROPOSED ROADWAY
- EXISTING ROADWAY
- FLUSH VALVE
- FIRE HYDRANT

GENERAL NOTES:

1. THE LOCATIONS OF EXISTING UNDERGROUND UTILITIES ARE SHOWN IN AN APPROXIMATE WAY ONLY. THE CONTRACTOR SHALL DETERMINE THE EXACT LOCATION OF ALL EXISTING UTILITIES BEFORE COMMENCING WORK AND AGREES TO BE FULLY RESPONSIBLE FOR ANY AND ALL DAMAGES THAT MIGHT BE OCCASIONED BY THE FAILURE TO EXACTLY LOCATE AND PRESERVE ANY AND ALL UNDERGROUND UTILITIES. WHEN THE CONTRACTOR IS USING TRENCHLESS INSTALLATION METHODS, THE CONTRACTOR SHALL LOCATE ALL UTILITIES FOR THE ENTIRE LENGTH OF THE INSTALLATION PRIOR TO ANY ACTIVITIES.
2. EXISTING 16" AND 12" PVC WATER MAIN(S) IS TO BE PROTECTED AND REMAIN IN SERVICE UNTIL THE NEW 16" AND 12" MAIN(S) IS CONSTRUCTED, TESTED, APPROVED AND SERVICE LINES RECONNECTED AND THE NEW MAIN IS PLACED IN SERVICE.
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5. IF THERE ARE TREES WITHIN THE PROJECT LIMITS, THE CONTRACTOR IS TO PROTECT THE TREE ROOT ZONES DURING CONSTRUCTION.
6. ANY DISCREPANCIES FROM WHAT IS SHOWN SHALL BE IMMEDIATELY BROUGHT TO THE ATTENTION OF THE ENGINEER.

PROFILE SCALE
1"=20' HORIZ.
1"=2' VERT.

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WWW.COBBFENDLEY.COM

16" WATERLINE "A" - PLAN AND PROFILE

INNER LOOP @ CENTRAL MAINTENANCE
16" WATERLINE RELOCATION
WILLIAMSON COUNTY, TEXAS

WILLIAMSON COUNTY 1848

PROJ. NO.	1403-088-02-09F
DESIGN:	G. LITTLEFIELD
DRAWN:	G. LITTLEFIELD
CHECK:	J. HASTINGS
APPR:	L. PARISHER
DATE:	JULY 23, 2017

STATE OF TEXAS
JAMES LANCE PARISHER
106221
LICENSED PROFESSIONAL ENGINEER
06/23/2017

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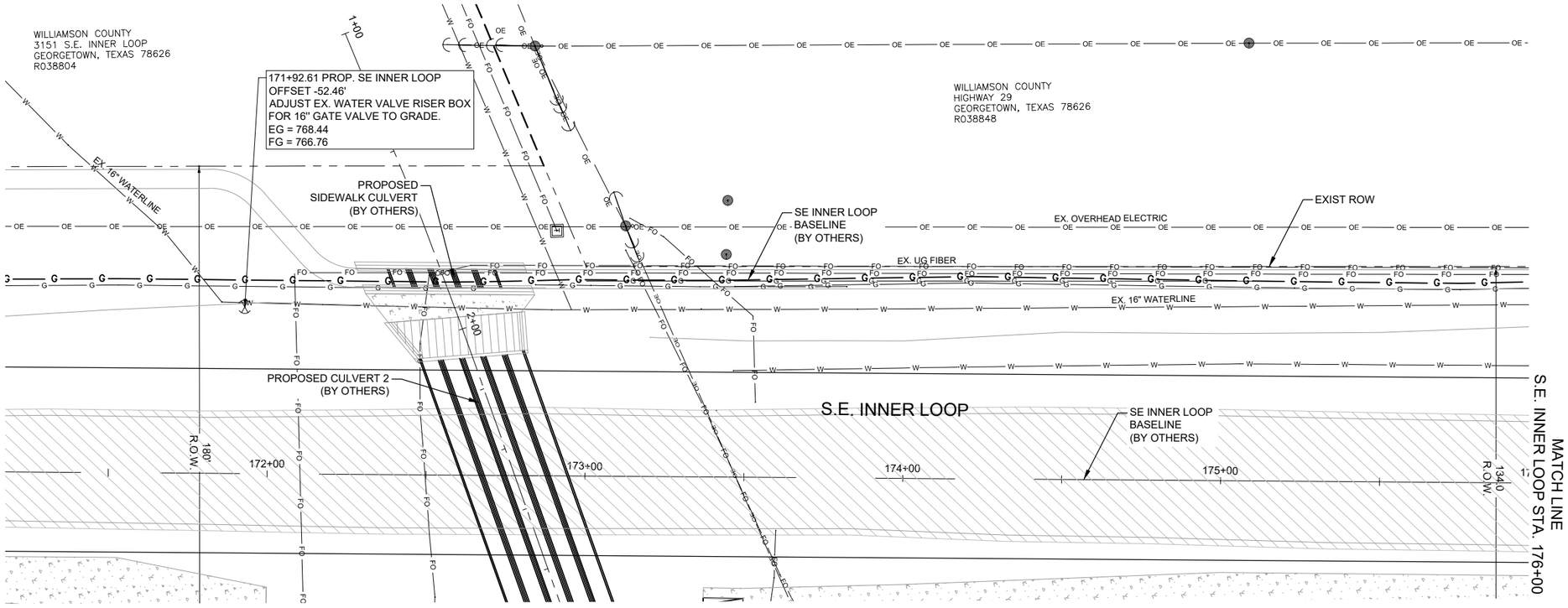
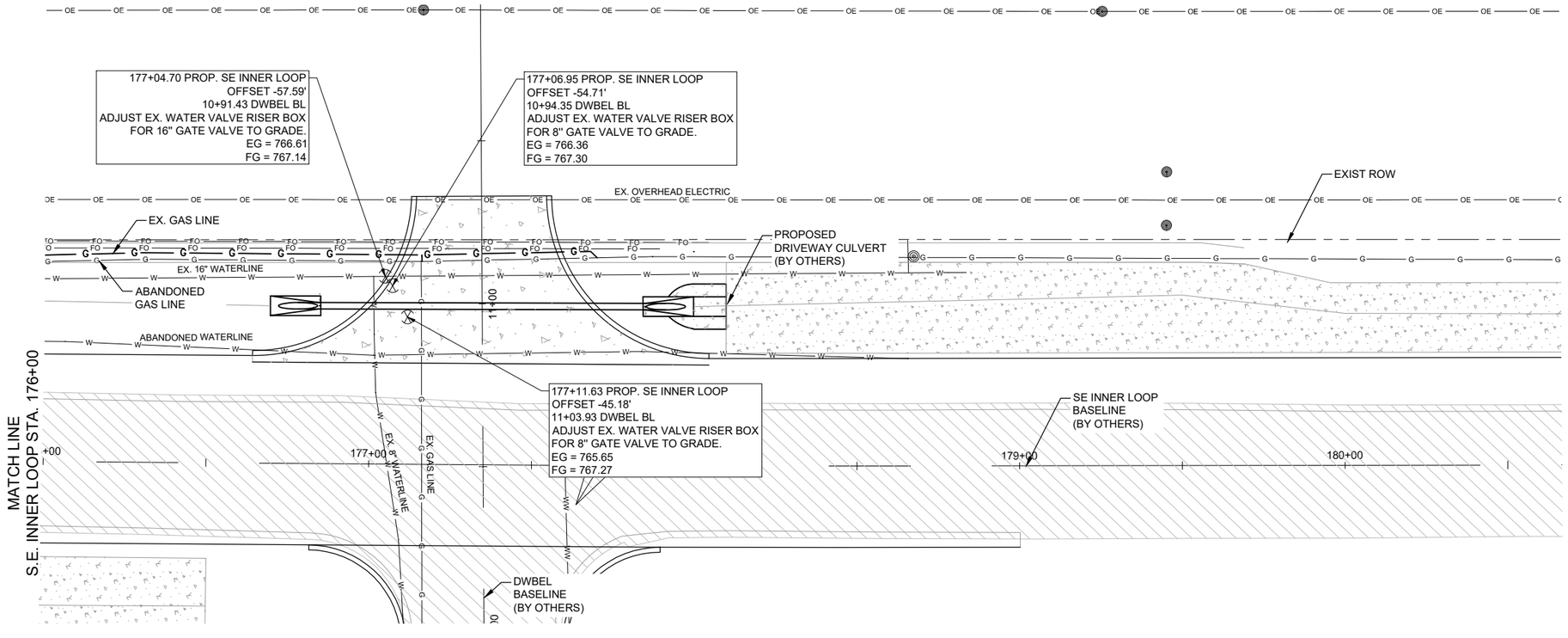
Williamson County, Texas





0 20' 40'

LEGEND

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- RIGHT OF WAY
- EASEMENT
- ATT — ATT — PROPOSED AT&T
- W — W — WATER LINE
- WW — WW — WASTEWATER LINE
- SD — SD — STORM DRAIN
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AUSTIN, TEXAS 78752
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Bid 1706-168

VALVE ADJUSTMENTS TO GRADE

INNER LOOP @ CENTRAL MAINTENANCE
16" WATERLINE RELOCATION
WILLIAMSON COUNTY, TEXAS

WILLIAMSON COUNTY 1848

PROJ. NO.	1403-088-02-09F
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STATE OF TEXAS
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06/23/2017

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Williamson County, Texas

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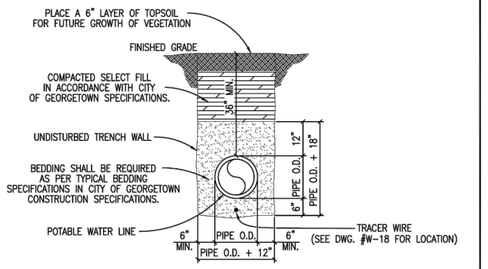
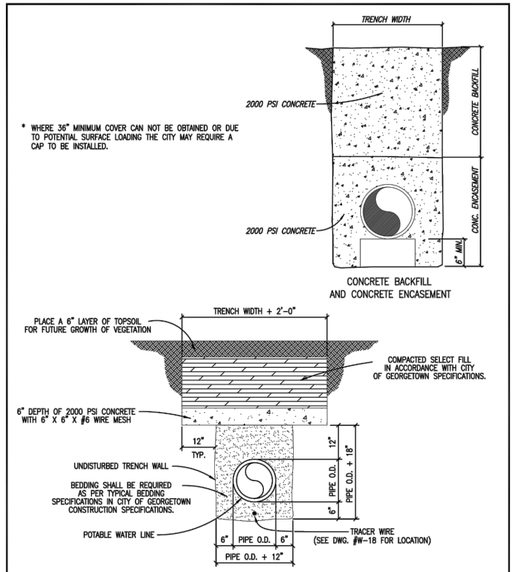


TRENCH WIDTHS
*PIPE LESS THAN 20" DIAMETER
1'-0" + PIPE O.D.
*20" DIAMETER PIPE AND LARGER
2'-0" + PIPE O.D.

The Architect/Engineer assumes responsibility for appropriate use of this standard.

CITY OF GEORGETOWN
CONSTRUCTION STANDARDS AND DETAILS
TRENCH AND EMBEDMENT DETAIL UNDER NON-PAVED AREAS

ADOPTED 6/21/2006
W02
SCALE: NTS | DATE: 1/2003
DRAWN BY: MRS | APPROVED BY: TRB

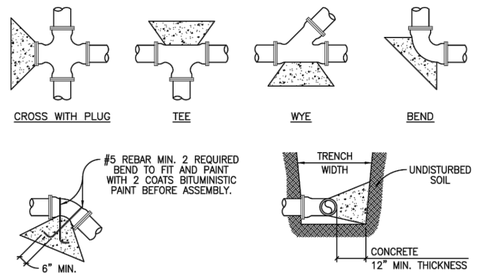


TRENCH WIDTHS
*PIPE LESS THAN 20" DIAMETER
1'-0" + PIPE O.D.
*20" DIAMETER PIPE AND LARGER
2'-0" + PIPE O.D.

The Architect/Engineer assumes responsibility for appropriate use of this standard.

CITY OF GEORGETOWN
CONSTRUCTION STANDARDS AND DETAILS
CONCRETE TRENCH CAP DETAIL

ADOPTED 6/21/2006
W02A
SCALE: NTS | DATE: 1/2003
DRAWN BY: MRS | APPROVED BY: TRB



ALL THRUST BLOCKS SHALL BE FORMED. LAID FORMS SHALL BE INSPECTED BY THE CITY OF GEORGETOWN PRIOR TO THE POURING OF CONCRETE AND SHALL ALSO BE INSPECTED BY THE CITY OF GEORGETOWN PRIOR TO COVERING. TYPICAL LOCATIONS WHICH REQUIRE CONCRETE REACTION (THRUST) BLOCKS, FOR PRESSURE MAINS FOUR INCHES (4") AND GREATER. CONCRETE SHALL HAVE 2,500 P.S.I. MINIMUM STRENGTH AT TWENTY EIGHT (28) DAYS AND BEAR AGAINST UNDISTURBED STABLE SOILS, AREA OF CONTACT SHALL BE GOVERNED BY PIPE SIZE, MAXIMUM PRESSURE IN PIPE, AND BEARING CAPACITY OF SOIL. PROTECT FITTINGS, BOLTS, ETC. BY COVERING WITH VISQUEEN OR OTHER ACCEPTABLE MATERIAL. CONCRETE SHALL BE A MINIMUM OF TWELVE INCHES (12") THICK.

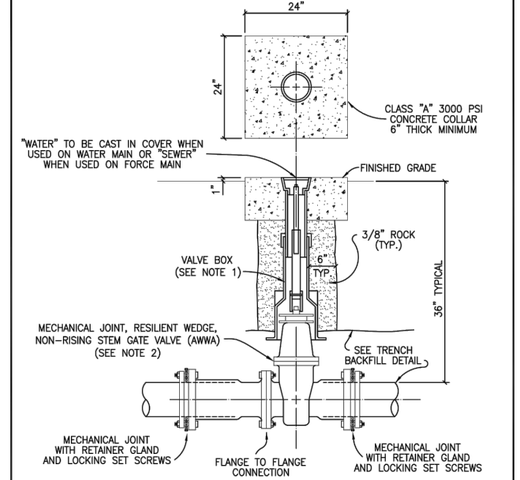
PIPE SIZE	THRUST BLOCK AREA REQUIRED	PIPE SIZE	THRUST BLOCK AREA REQUIRED	REMARKS
4"	2.0 SQ. FT.	18"	30.0 SQ. FT.	VALUES ARE FOR 90° BENDS, BASED ON 2000 P.S.F. SAFE BEARING LOAD AND PIPE PRESSURE OF 150 P.S.I. PLUS 33% SAFETY FACTOR FOR OTHER SOILS AND PRESSURES, THE AREA REQUIRED IS IN DIRECT PROPORTION.
6"	4.0 SQ. FT.	20"	37.0 SQ. FT.	
8"	6.6 SQ. FT.	24"	53.0 SQ. FT.	
10"	10.0 SQ. FT.	27"	80.0 SQ. FT.	
12"	14.0 SQ. FT.	30"	98.0 SQ. FT.	
14"	18.0 SQ. FT.	36"	127.0 SQ. FT.	
16"	24.0 SQ. FT.			

* THE ENGINEER OF RECORD SHALL CALCULATE THE SIZE OF THE DEADMAN REQUIRED AS WELL AS ANY INSTALLATION WHICH IS NOT COVERED BY THE ABOVE.

The Architect/Engineer assumes responsibility for appropriate use of this standard.

CITY OF GEORGETOWN
CONSTRUCTION STANDARDS AND DETAILS
TYPICAL THRUST BLOCKS FOR WATER AND FORCE MAIN

ADOPTED 6/21/2006
W11
SCALE: NTS | DATE: 1/2003
DRAWN BY: MRS | APPROVED BY: TRB



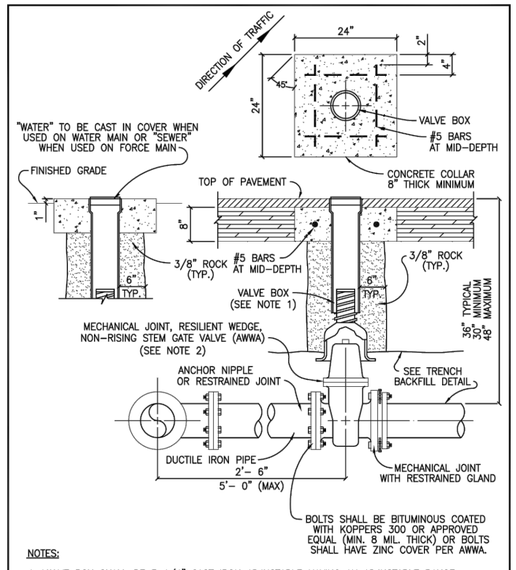
NOTES:

1. SEE VALVE SETTING DETAIL, DWG. #W-07.
2. ACCEPTABLE GATE VALVES ARE:
   A. MUELLER – 2360 SERIES
   B. CLOW

The Architect/Engineer assumes responsibility for appropriate use of this standard.

CITY OF GEORGETOWN
CONSTRUCTION STANDARDS AND DETAILS
INLINE VALVE INSTALLATION

ADOPTED 6/21/2006
W21
SCALE: NTS | DATE: 1/2003
DRAWN BY: MRS | APPROVED BY: TRB



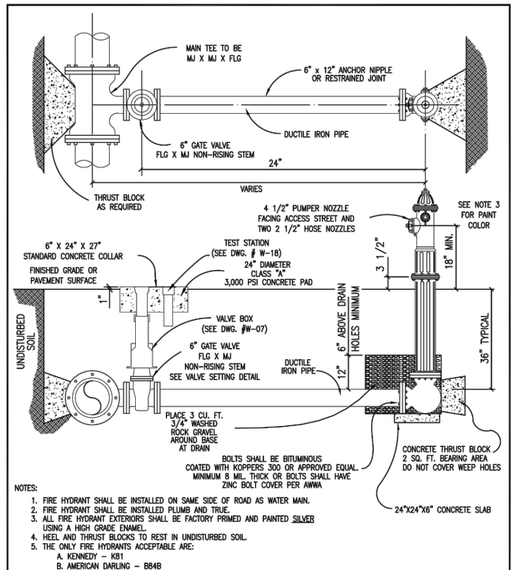
NOTES:

1. VALVE BOX SHALL BE 5 1/4" CAST IRON ADJUSTABLE HAVING AN ADJUSTABLE RANGE OF + OR – 6 INCHES FROM INSTALLED FINISH GRADE.
2. ACCEPTABLE GATE VALVES ARE:
   A. AMERICAN FLOW CONTROL – SERIES 2500
   B. MUELLER – 2360 SERIES
   C. CLOW

The Architect/Engineer assumes responsibility for appropriate use of this standard.

CITY OF GEORGETOWN
CONSTRUCTION STANDARDS AND DETAILS
TYPICAL VALVE SETTING

ADOPTED 6/21/2006
W07
SCALE: NTS | DATE: 1/2003
DRAWN BY: MRS | APPROVED BY: TRB



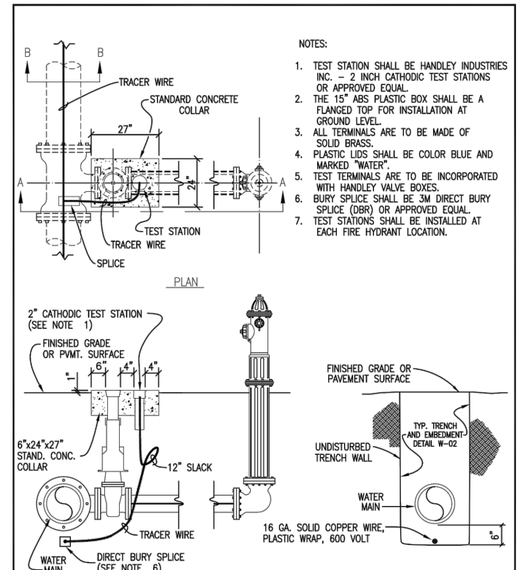
NOTES:

1. FIRE HYDRANT SHALL BE INSTALLED ON SAME SIDE OF ROAD AS WATER MAIN.
2. FIRE HYDRANT SHALL BE INSTALLED PLUMB AND TRUE.
3. ALL FIRE HYDRANT EXTERIORS SHALL BE FACTORY PRIMED AND PAINTED SILVER USING A HIGH GRADE ENAMEL.
4. HEEL AND THRUST BLOCKS TO REST IN UNDISTURBED SOIL.
5. THE ONLY FIRE HYDRANTS ACCEPTABLE ARE:
   A. KENNEDY – K81
   B. AMERICAN DARLING – B84B
   C. CLOW MEDALLION
6. DOUBLE BLUE REFLECTOR "HYE-LITES" BRAND, MANUFACTURED BY PAVEMENT MARKERS INC. TO BE INSTALLED AT CENTERLINE OF STREET PERPENDICULAR TO HYDRANT.
7. ALL METALLIC PIPES AND FITTINGS SHALL BE WRAPPED WITH 8 MILL. POLYETHELENE FILM.

The Architect/Engineer assumes responsibility for appropriate use of this standard.

CITY OF GEORGETOWN
CONSTRUCTION STANDARDS AND DETAILS
TYPICAL FIRE HYDRANT INSTALLATION

ADOPTED 6/21/2006
W10
SCALE: NTS | DATE: 1/2003
DRAWN BY: MRS | APPROVED BY: TRB



NOTES:

1. TEST STATION SHALL BE HANDLEY INDUSTRIES INC. – 2 INCH CATHODIC TEST STATIONS OR APPROVED EQUAL.
2. THE 15" ABS PLASTIC BOX SHALL BE A FLANGED TOP FOR INSTALLATION AT GROUND LEVEL.
3. ALL TERMINALS ARE TO BE MADE OF SOLID BRASS.
4. PLASTIC LIDS SHALL BE COLOR BLUE AND MARKED "WATER".
5. TEST TERMINALS ARE TO BE INCORPORATED WITH HANDLEY VALVE BOXES.
6. BURY SPLICE SHALL BE 3M DIRECT BURY SPLICE (DBR) OR APPROVED EQUAL.
7. TEST STATIONS SHALL BE INSTALLED AT EACH FIRE HYDRANT LOCATION.

The Architect/Engineer assumes responsibility for appropriate use of this standard.

CITY OF GEORGETOWN
CONSTRUCTION STANDARDS AND DETAILS
TRACER WIRE INSTALLATION AND TEST STATION LOCATION

ADOPTED 6/21/2006
W18
SCALE: NTS | DATE: 1/2003
DRAWN BY: MRS | APPROVED BY: TRB

REV. NO.	REVISION DESCRIPTION	APPROVED BY:	DATE

CobbFendley
TBPE NO. 274 / TBPLS NO. 10046701
505 EAST HUNTLAND DRIVE, SUITE 100
AUSTIN, TEXAS 78752
512.834.9788 | FAX 512.834.7727
WWW.COBBFENDLEY.COM

STANDARD WATER UTILITY DETAILS - SHEET 1

INNER LOOP @ CENTRAL MAINTENANCE
16" WATERLINE RELOCATION
WILLIAMSON COUNTY, TEXAS

WILLIAMSON COUNTY 1848

PROJ. NO. 1403-088-02-09F
DESIGN: G. LITTLEFIELD
DRAWN: G. LITTLEFIELD
CHECK: J. HASTINGS
APPR: L. PARISHER
DATE: JULY 23, 2017

STATE OF TEXAS
JAMES LANCE PARISHER
106221
LICENSED
PROFESSIONAL ENGINEER
06/23/2017

THESE DESIGN DOCUMENTS ARE NOT TO BE USED FOR CONSTRUCTION PRIOR TO REGULATORY SIGNATURE AND PERMIT

SHEET
C-501
7 of 7

7/28/2017 7:58 AM

p. 611

WILLIAMSON COUNTY

GEORGETOWN INNER LOOP AT WILCO WAY
PRECINCT NUMBER 3

ROADWAY CLASSIFICATION: URBAN ARTERIAL
DESIGN SPEED: 50 MPH

ADT		DIRECTIONAL DISTRIBUTION	DHV		
2015	2035	%	2015	2035	% TRUCKS
11,000	27,400	50 - 50	1,100	2,740	5.7

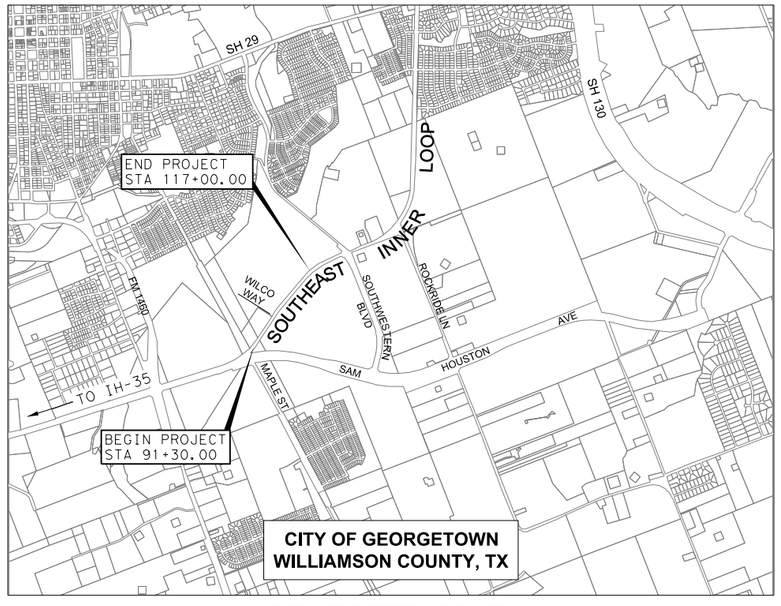
INDEX OF SHEETS

SHEET NO.	DESCRIPTION
1	TITLE SHEET
2	INDEX OF SHEETS

NET LENGTH OF ROADWAY = 2532.89 FT (0.480 MILES)
NET LENGTH OF BRIDGE CLASS CULVERT = 37.11 FT (0.007 MILES)
NET LENGTH OF PROJECT = 2570.00 FT (0.487 MILES)

LIMITS: FROM MAPLE STREET TO APPROX. 1100' WEST OF SOUTHWESTERN BLVD.

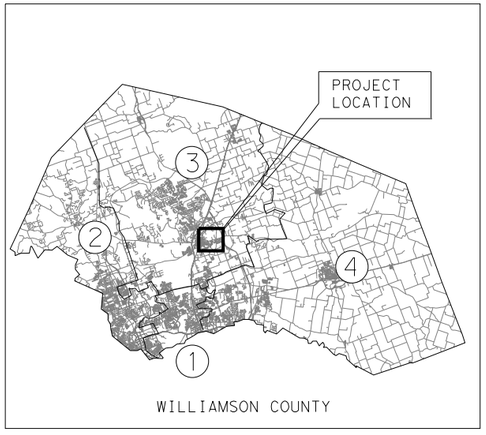
FOR THE WIDENING AND OVERLAY OF SE INNER LOOP CONSISTING OF GRADING, FLEX BASE, ASPHALT PAVEMENT, DRAINAGE, WATER QUALITY PONDS, AND SIGNING AND PAVEMENT MARKINGS.



VICINITY MAP
NOT TO SCALE

REGISTERED ACCESSIBILITY SPECIALIST (RAS) INSPECTION REQUIRED
TDLR NO. EABPRJ_____

REQUIRED SIGNS SHALL BE PLACED IN ACCORDANCE WITH STANDARD SHEETS BC(1)-14 THRU BC(12)-14 AND THE "TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES.



TxDOT STANDARD SPECIFICATIONS FOR CONSTRUCTION OF HIGHWAYS, STREETS AND BRIDGES ADOPTED ON NOVEMBER 1, 2014 AND ALL APPLICABLE SPECIAL PROVISIONS AND SPECIAL SPECIFICATIONS AS INDICATED IN THE BID DOCUMENTS SHALL GOVERN ON THIS PROJECT.

WAIVERS: SUPERELEVATION
EQUATIONS: NONE
RAILROAD CROSSINGS: NONE
WATERSHEAD: SAN GABRIEL RIVER (SEGMENT 1248)
AREA OF DISTURBANCE: 8.05 AC

PREPARED BY:
RODRIGUEZ TRANSPORTATION GROUP

RTG RODRIGUEZ TRANSPORTATION GROUP FIRM #587

ROBERT CARRILLO
PROJECT MANAGER _____ DATE

STATE OF TEXAS
ROBERT CARRILLO
80169
REGISTERED PROFESSIONAL ENGINEER

Robert Carrillo, P.E.
6/26/2017

EST. 1848 GEORGETOWN TEXAS

WILLIAMSON COUNTY 1848

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RECOMMENDED BY:
WILLIAMSON COUNTY

_____ _____
DAN A GATTIS DATE
WILLIAMSON COUNTY JUDGE

RECOMMENDED BY:
WILLIAMSON COUNTY

_____ _____
VALERIE COVEY DATE
WILLIAMSON COUNTY COMMISSIONER, PRECINCT 3

RECOMMENDED BY:
HNTB CORPORATION

_____ _____
RICHARD L RIDINGS, PE DATE
ROAD BOND MANAGER

RECOMMENDED BY:
CITY OF GEORGETOWN

_____ _____
WESLEY WRIGHT DATE
SYSTEMS ENGINEERING MANAGER

SHEET NUMBER	DESCRIPTION
	GENERAL
1	TITLE SHEET
2	INDEX OF SHEETS
3	PROJECT LAYOUT
4 - 5	TYPICAL SECTIONS
5A - 5__	GENERAL NOTES
6	TRAFFIC CONTROL SUMMARY
7	ROADWAY SUMMARY
8	DRIVEWAY SUMMARY AND DETAILS
9	DRAINAGE SUMMARY
10	WATER QUALITY SUMMARY
11	SIGNING AND PAVEMENT MARKING SUMMARY
12	EROSION CONTROL SUMMARY
	TRAFFIC CONTROL
13	CONSTRUCTION SEQUENCE NARRATIVE
14	ADVANCE WARNING SIGN LAYOUT
15 - 16	PHASE 1 DETOUR LAYOUTS
17	PHASE 1 CULVERT ADJUSTMENT DETAILS
18 - 20	PHASE 2 TRAFFIC CONTROL PLAN
	TRAFFIC CONTROL STANDARDS **
21 - 32	BC(1)-14 THRU BC(12)-14
33 - 34	LPCB
35	WZ(STPM)-13
36	WZ(RCD)-13
37	TCP(3-1)-13
	ROADWAY
38 - 39A	HORIZONTAL ALIGNMENT DATA
40 - 44	REMOVAL PLAN
45 - 47	PLAN & PROFILE
48	INTERSECTION LAYOUT
49 - 50	DRIVEWAY LAYOUTS
51	MISCELLANEOUS ROADWAY DETAILS
	ROADWAY STANDARDS **
52 - 55	PED-12A
	DRAINAGE
56 - 56A	DRAINAGE AREA MAP
57 - 59	DRAINAGE PLAN
60	CULVERT NO. 1 LAYOUT
61	CULVERT NO. 2 LAYOUT
62	DRAINAGE PROFILES
63	DRAINAGE COMPUTATIONS
64 - 67	HYDRAULIC DATA SHEETS
68	DRAINAGE DETAILS
	DRAINAGE STANDARDS **
69 - 70	SETP-CD
71	SETP-PD
72	PSET-SC
73	PSET-SP
74	PSET-RC
75	PSET-RP
76	PSET-RR
77 - 78	SRR
79	PB
80	PDD
81 - 82	PSL
	WATER QUALITY
83	WATER QUALITY POND LAYOUT - POND A
84	WATER QUALITY POND DETAILS - POND A
85	WATER QUALITY POND LAYOUT - POND B
86	WATER QUALITY POND DETAILS - POND B
87	WATER QUALITY MISCELLANEOUS DETAILS

SHEET NUMBER	DESCRIPTION
	WATER QUALITY (CONTINUED)
88	BATCH DETENTION POND LAYOUT - POND A
89	BATCH DETENTION POND LAYOUT - POND B
90	POND CONTROL LOGIC DIAGRAM
91	POND LEVEL CONTROL ELEMENTARY DIAGRAM
92	POND CONDUIT AND WIRING RISER DIAGRAM
93	POND CONTROLLER RISER ASSEMBLY DETAIL
94	BATCH DETENTION OUTLET STRUCTURE
	WATER QUALITY STANDARDS **
95	PRM
96	PAZD
97	PJB
	SIGNING AND PAVEMENT MARKINGS
98 - 100	SIGNING AND PAVEMENT MARKINGS
	SIGNING AND PAVEMENT MARKING STANDARDS **
101	TSR(4)-13
102	D & OM(1)-15
103	D & OM(2)-15
104	PM(1)-12
105	PM(2)-12
106	PM(3)-12
107	SMD(GEN)-08
108	SMD(TWT)-08
	EROSION CONTROL
109	TCEQ REQUIREMENT FOR THE EDWARDS AQUIFER
110	SW3P
111 - 113	EROSION CONTROL PLAN
	EROSION CONTROL STANDARDS **
114	EC(1)-16
115	EC(2)-16
116	EC(3)-16
	MISCELLANEOUS
117	MONUMENT SIGN DETAILS
118	ELECTRICAL DETAIL (MISC)
119	ELECTRICAL SERVICE DATA SHEET
	ELECTRICAL STANDARDS **
120	ED(1)-14
121	ED(3)-15
122	ED(5)-16
123	ED(6)-17
124	ED(7)-18
125	ED(10)-19

** THE STANDARD SHEETS SPECIFICALLY IDENTIFIED HAVE BEEN SELECTED BY ME OR UNDER MY RESPONSIBLE SUPERVISION AS BEING APPLICABLE TO THIS PROJECT.

STATE OF TEXAS
JAMES BROOKS
101002
LICENSED PROFESSIONAL ENGINEER
6/24/2017

NO.	REVISION	BY	DATE

WILLIAMSON COUNTY
1848

RTG RODRIGUEZ TRANSPORTATION GROUP FIRM #587

GEORGETOWN INNER LOOP

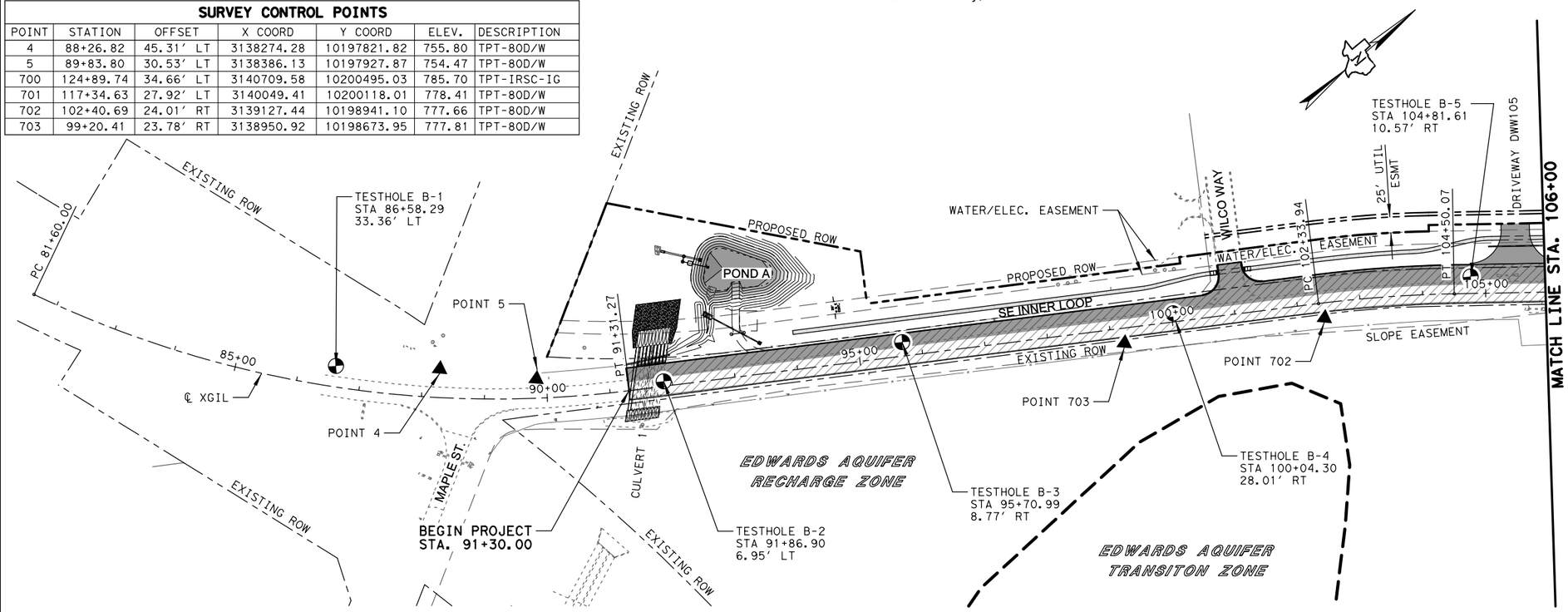
INDEX OF SHEETS

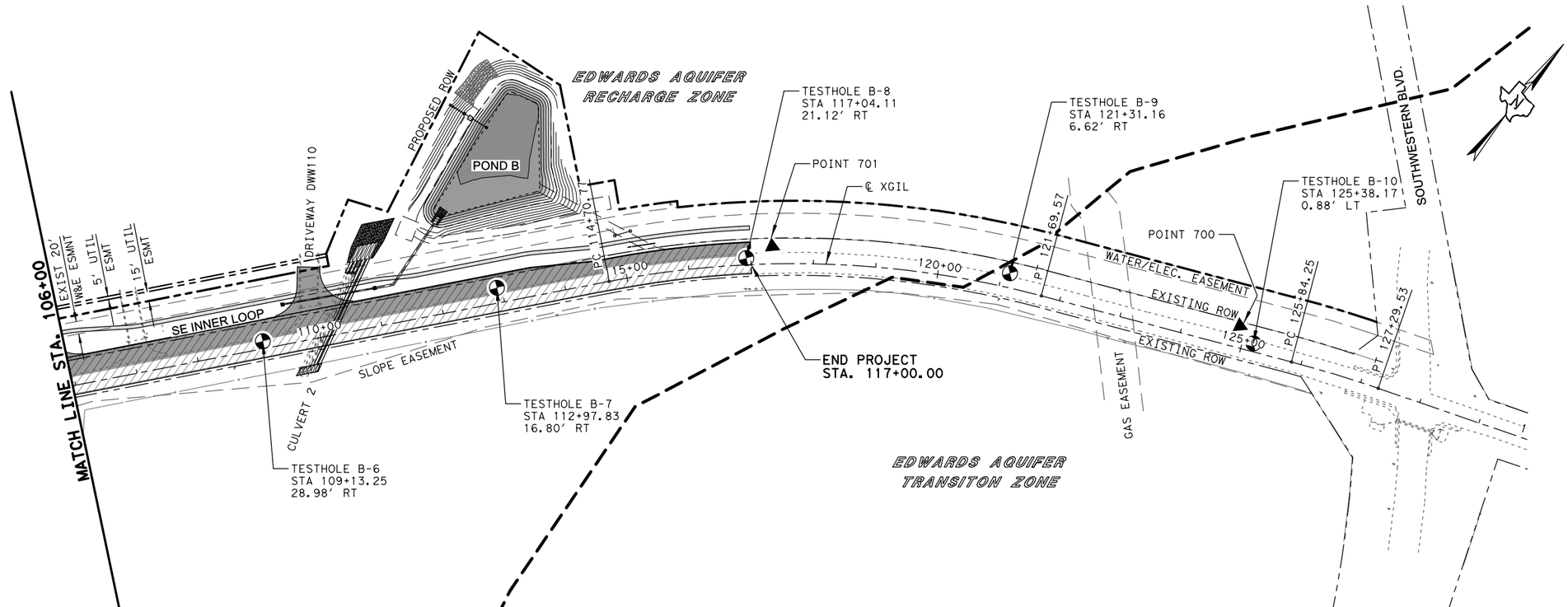
6/24/2017 SHEET 1 OF 1

DESIGNED:	PROJECT NUMBER		ROADWAY	
CHECKED:			SE INNER LOOP	
DRAWN:	STATE	COUNTY	CITY	SHEET No.
CHECKED:	TEXAS	WILLIAMSON	GEORGETOWN	2

jbrooks
6/24/2017
11:00
P:\rtg-pw.bentley.com:rtg-pw\Documents\8760101\div\planShts\general\GIL_INDEX-A.dgn

SURVEY CONTROL POINTS						
POINT	STATION	OFFSET	X COORD	Y COORD	ELEV.	DESCRIPTION
4	88+26.82	45.31' LT	3138274.28	10197821.82	755.80	TPT-80D/W
5	89+83.80	30.53' LT	3138386.13	10197927.87	754.47	TPT-80D/W
700	124+89.74	34.66' LT	3140709.58	10200495.03	785.70	TPT-IRSC-IG
701	117+34.63	27.92' LT	3140049.41	10200118.01	778.41	TPT-80D/W
702	102+40.69	24.01' RT	3139127.44	10198941.10	777.66	TPT-80D/W
703	99+20.41	23.78' RT	3138950.92	10198673.95	777.81	TPT-80D/W





0 100 200
SCALE IN FEET

LEGEND

- PAVEMENT OVERLAY
- NOTCH AND WIDEN
- SIDEWALK

NOTES:

1. COORDINATES ARE SURFACE VALUES BASED ON THE TEXAS STATE PLANE COORDINATE SYSTEM, NAD 83, CENTRAL ZONE. DISTANCES ARE SURFACE DISTANCES. TO OBTAIN GRID COORDINATES AND DISTANCES, DIVIDE SURFACE VALUES BY THE COMBINED SURFACE ADJUSTMENT FACTOR OF 1.00012. ELEVATIONS REPORTED ARE ORTHOMETRIC HEIGHTS BASED ON GEOID 03.
2. SEE HORIZONTAL ALIGNMENT DATA SHEETS FOR ALIGNMENT DETAILS.

STATE OF TEXAS
JAMES BROOKS
101002
LICENSED PROFESSIONAL ENGINEER
6/26/2017

NO.	REVISION	BY	DATE

WILLIAMSON COUNTY
1848

RTG RODRIGUEZ TRANSPORTATION GROUP
FIRM #587

GEORGETOWN INNER LOOP
PROJECT LAYOUT

BEGIN PROJECT - END PROJECT

6/26/2017 SHEET 1 OF 1

DESIGNED:	PROJECT NUMBER		ROADWAY	
CHECKED:			SE INNER LOOP	
DRAWN:	STATE	COUNTY	CITY	SHEET No.
CHECKED:	TEXAS	WILLIAMSON	GEORGETOWN	3

gbldroyd
6/26/2017 5:40:47 PM
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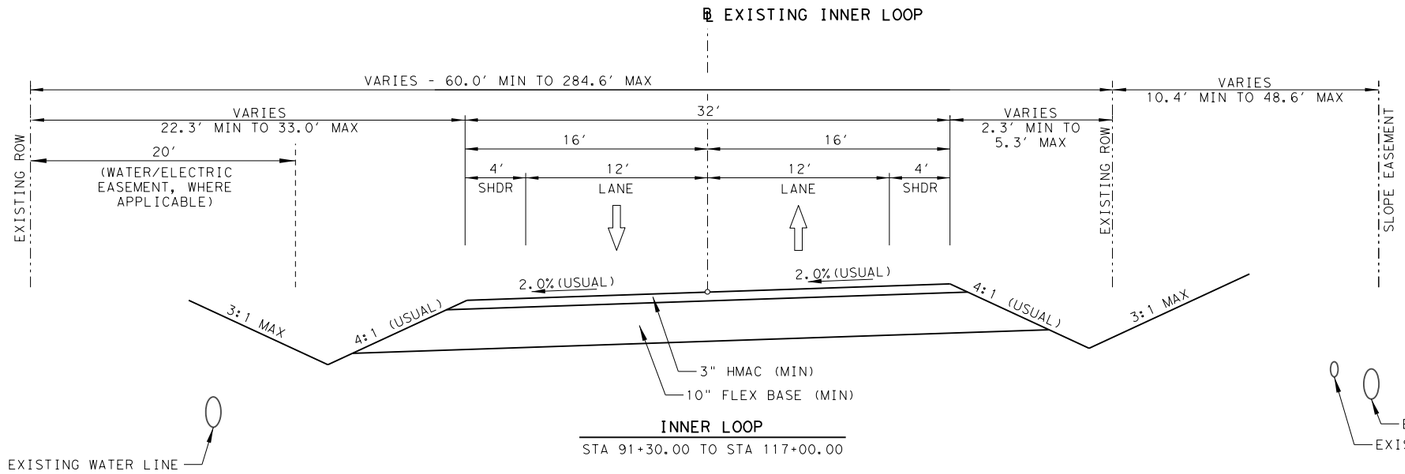
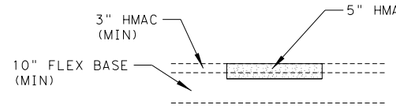
0 5 10
0 2.5 5
SCALE IN FEET



INNER LOOP
STA 91+30.00 TO STA 117+00.00



FULL DEPTH PAVEMENT
REPAIR DETAIL
NOT TO SCALE
(PAVEMENT REPAIR LOCATIONS
WILL BE DETERMINED BY THE
COUNTY'S CONSTRUCTION OBSERVER)

NOTES:

1. APPROXIMATE UTILITY LOCATIONS SHOWN, DEPTH UNDETERMINED.

STATE OF TEXAS
JAMES BROOKS
101002
LICENSED
PROFESSIONAL ENGINEER
6/24/2017

NO.	REVISION	BY	DATE

WILLIAMSON COUNTY
1848

RTG RODRIGUEZ TRANSPORTATION GROUP
FIRM #587

GEORGETOWN INNER LOOP

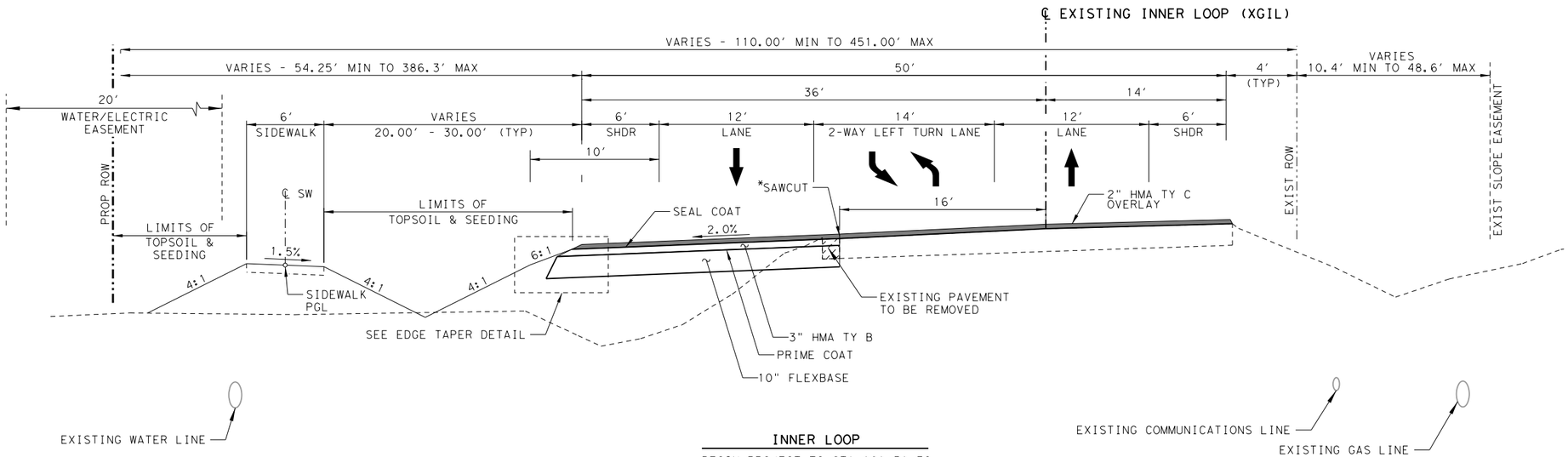
EXISTING TYPICAL SECTIONS

6/24/2017 SHEET 1 OF 2

DESIGNED:	PROJECT NUMBER		ROADWAY
CHECKED:			SE INNER LOOP
DRAWN:	STATE	COUNTY	CITY / SHEET No.
CHECKED:	TEXAS	WILLIAMSON	GEORGETOWN / 4

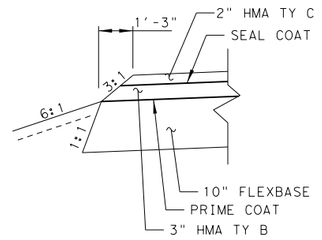
brooks
7/24/2017
6:26
c:\rtg-pw.bentley.com:rtg-pw\Documents\8760101\div\planShts\general\GIL_TYP_EX_01-A.dgn

0 5 10
0 2.5 5
SCALE IN FEET



INNER LOOP

BEGIN PROJECT TO STA 101+51.39
STA 114+50 TO END PROJECT
(SEAL COAT EXTENDS ACROSS
ENTIRE LIMITS OF ROADWAY)

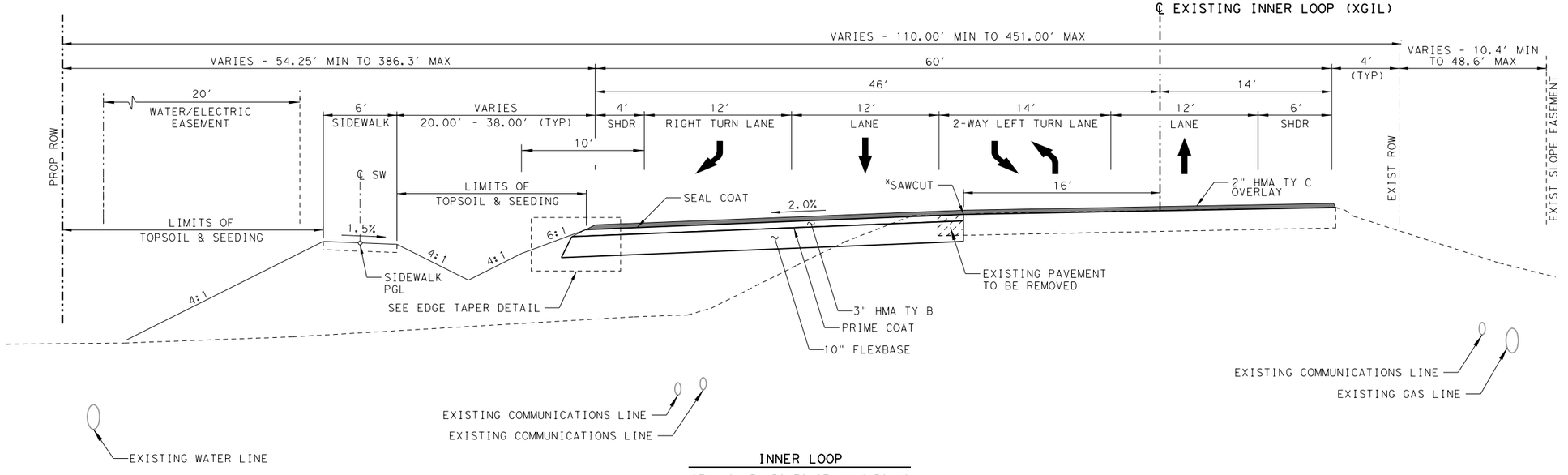


EDGE TAPER DETAIL
NOT TO SCALE

NOTES:

1. APPROXIMATE UTILITIES LOCATION SHOWN, DEPTH UNDETERMINED.
2. WIDENING CROSS SLOPE IS A CONSTANT 2% FROM THE SAWCUT LINE.

* 3. SAWCUT WILL NOT BE PAID FOR DIRECTLY, BUT WILL BE CONSIDERED SUBSIDIARY TO ITEM 105, REMOVING STABILIZED BASE AND ASPHALT PAVEMENT.



INNER LOOP

STA 101+51.39 TO STA 114+50.00
(SEAL COAT EXTENDS ACROSS
ENTIRE LIMITS OF ROADWAY)

STATE OF TEXAS
JAMES BROOKS
101002
LICENSED PROFESSIONAL ENGINEER
6/24/2017

NO.	REVISION	BY	DATE

WILLIAMSON COUNTY
1848

RTG RODRIGUEZ TRANSPORTATION GROUP
FIRM #587

GEORGETOWN INNER LOOP

PROPOSED TYPICAL SECTIONS

6/24/2017 SHEET 2 OF 2

DESIGNED:	PROJECT NUMBER		ROADWAY
CHECKED:			SE INNER LOOP
DRAWN:	STATE	COUNTY	CITY / SHEET No.
CHECKED:	TEXAS	WILLIAMSON	GEORGETOWN / 5

jbrooks
6/24/2017
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BASIS OF ESTIMATE

Item	Description	Rate **	Basis	Quantity
160	Furnishing and Placing Topsoil (4")	1 CY/9	24,389 SY	2,710 CY
160	Furnishing and Placing Topsoil (6")	1 CY/6	9,569 SY	1,594 SY
161	Erosion Control Compost (3")	1 CY/12	6,097 SY	508 CY
162	Mulch Topdressing (5")	1 CY/7	6,097 SY	871 CY
164	Seed for Erosion Control			
	(Item 164) (Temp) (Cool) (TY 4)	4840 SY/AC	16,979 SY	3.51 AC
	(Item 164) (Perm) (Warm) (TY 5)	4840 SY/AC	33,958 SY	7.02 AC
	(Item 164) (Temp) (Warm) (TY 10)	4840 SY/AC	16,979 SY	3.51 AC
166	Fertilizer (13-13-13)	1/8 LB/SY	33,958 SY	2.2 TON
168	Vegetative Watering			
	(Item 164) (Temp)	10 GAL/SY	33,958 SY	339.6 MG
	(Item 164) (Perm)	20 GAL/SY	33,958 SY	679.2 MG
**204	Sprinkling			
	(Item 132)	30 GAL/CY	13,958 SY	397,410 GAL
	(Item 247)	30 GAL/CY	2,144 CY	64,320 GAL
**210	Roll (Flat Wheel)			
	(Item 247)	1 HR/200 TON	3,821 TON	20 HR
	(Item 316)	1 HR/6000 SY	16,448 SY	3 HR
**210	Roll (Tamping)			
	(Item 132)	1 HR/200 CY	13,247 CY	67 HR
**210	Roll (Heavy Tamp)			
	(Item 132)	1 HR/200 CY	13,247 CY	HR
**210	Roll (Lt Pneu Tire)			
	(Item 132)	1 HR/500 CY	13,247 CY	27 HR
	(Item 247)	1 HR/200 TON	3,821 TON	20 HR
	(Item 316) (Seal Coat)	1 HR/6000 SY	16,448 SY	3 HR
247	FL BS (CMP IN PLC)			
	(TY A GR 4)	132 LB/CF	57,888 CF	3,821 TON
	(TY A GR 4)	3564 LB/CY	2,144 CY	3,821 TON
	(TY A GR 4)	27 CF/CY	57,888 CF	2,144 CY
310	Prime Coat (Multi Option)	0.20 GAL/SY	7,600 SY	1,520 GAL
		TOTAL:		
316	Surface Treatments	0.38 GAL/SY	16,448 SY	6,250 GAL
	Seal Coat:	1 CY/115 SY	16,448 SY	143 CY
	Asphalt			
	Aggregate (Ty D or L,GR 5)			
341	Dense-Graded Hot-Mix Asphalt			
	TY-B PG64-22	115 LB/SY/IN	7,490 SY	1,292 TON
	TY-C SAC-B PG70-22	115 LB/SY/IN	16,304 SY	1,875 TON

** For Informational Purposes Only

GENERAL NOTES

References to manufacturer's trade name or catalog numbers are for the purpose of identification only. Similar materials from other manufacturers are permitted if they are of equal quality, comply with the specifications for this project, and are approved.

If work is performed at Contractor's option, when inclement weather is impending, and the work is damaged by subsequent precipitation, the Contractor is responsible for all costs associated with replacing the work, if required.

The roadbed shall be free of organic material prior to placing any section of the pavement structure.

Equip all construction equipment used in roadway work with highly visible omnidirectional flashing warning lights.

Provide a smooth, clean saw-cut along the existing asphalt pavement structure, as directed. Consider subsidiary to the pertinent Items.

Supply litter barrels in enough numbers at locations as directed to control litter within the project. Consider subsidiary to pertinent Items.

Use a self-contained vacuum broom to sweep the roadway and keep it free of sediment as directed. The contractor will be responsible for any sweeping above and beyond the normal maintenance required to keep fugitive sediment off the roadway as directed by the Construction Observer.

Protect all areas of the right of way, which are not included in the actual limits of the proposed construction areas, from disturbance. Restore any area disturbed because of the Contractor's operations to a condition as good as, or better than, before the beginning of work at no cost to the state.

Damage to existing pipes and SETs due to Contractor operations shall be repaired at Contractor's expense.

All locations used for storing construction equipment, materials, and stockpiles of any type, within the right of way, will be as directed. Use of right of way for these purposes will be restricted to those locations where driver sight distance to businesses and side street intersections is not obstructed and at other locations where an unsightly appearance will not exist. The Contractor will not have exclusive use of right of way but will cooperate in the use of the right of way with the city/county and various public utility companies as required.

The Project Superintendent will be capable of speaking English and will be available on the project at all times when work is being performed, including subcontractor work. The Superintendent will be available and on-call 24 hours a day.

Use materials from prequalified material producers list as shown on the Texas Department of Transportation (TxDOT) Construction Division's (CST) materials producers list. Refer to TxDOT's website for list of pre-qualified manufacturers. No substitutions will be allowed for materials found on the list. Submit list of approved suppliers/materials from TxDOT website to show items are TxDOT approved. Submit this list with request for material approval.

When any abandoned well is encountered, cease construction operations in this area and notify the Engineer who will coordinate the proper plugging procedures. A water well driller licensed in the State of Texas must be used to plug a well.

Erosion control and stabilization measures must be initiated immediately in portions of the site where construction activities have temporarily ceased and will not resume for a period exceeding 14 calendar days. Track all exposed soil, stockpiles, and slopes. Tracking consists of operating a tracked vehicle or equipment up and down the slope, leaving track marks perpendicular to the direction of the slope. Re-track slopes and stockpiles after each rain event or every 14 days, whichever occurs first. This work is subsidiary.

Perform maintenance of vehicles or equipment at designated maintenance sites. Keep a spill kit on-site during fueling and maintenance. This work is subsidiary.

Maintain positive drainage for permanent and temporary work for the duration of the project. Be responsible for any items associated with the temporary or interim drainage and all related maintenance. This work is subsidiary.

Suspend all activities near any significant recharge features, such as sinkholes, caves, or any other subterranean openings that are discovered during construction or core sampling. Do not proceed until the designated Geologist or TCEQ representative is present to evaluate and approve remedial action.

Locate aboveground storage tanks kept on-site for construction purposes in a contained area as to not allow any exposure to soils. The containment will be sized to capture 150% of the total capacity of the storage tanks.

Project Specific Location (PSL) in USACE Jurisdictional Area.
Do not initiate activities in a PSL associated with a U.S. Army Corps of Engineers (USACE) jurisdictional area that have not been previously evaluated by the USACE as part of the permit review of this project. Such activities include, but are not limited to, haul roads, equipment staging areas, borrow and disposal sites. Associated defined here means materials are delivered to or from the PSL. The jurisdictional area includes all waters of the U.S. including wetlands or associated wetlands affected by activities associated with this project. Special restrictions may be required for such work. Consult with the USACE regarding activities, including PSLs that have not been previously evaluated by the USACE. Provide the Department with a copy of all USACE coordination and approvals before initiating activities.

Proceed with activities in PSLs that do not affect a USACE jurisdictional area if self-determination has been made that the PSL is nonjurisdictional or proper clearances have been obtained in USACE jurisdictional areas or have been previously evaluated by the USACE as part of the permit review of this project. Document any determinations that PSL activities do not affect a USACE jurisdictional area. Maintain copies of PSL determinations for review by the Department or any regulatory agency. The Contractor must document and coordinate with the USACE, if required, before any excavation material hauled from or embankment material hauled into a USACE jurisdictional area by either (1) or (2) below.

1. Restricted Use of Materials for the Previously Evaluated Permit Areas. When an area within the project limits has been evaluated by the USACE as part of the permit process for this project:
   a. suitable excavation of required material in the areas shown on the plans and cross sections as specified in Standard Specification Item 110, Excavation is used for permanent or temporary fill within a USACE jurisdictional area;
   b. suitable embankment from within the USACE jurisdictional area is used as fill within a USACE evaluated area;
   c. Unsuitable excavation or excess excavation that is disposed of at an approved location within a USACE evaluated area.
2. Contractor Materials from Areas Other than Previously Evaluated Areas. Provide the Department with a copy of all USACE coordination and approvals before initiating any activities in a jurisdictional area within the project limits that has not been evaluated by the USACE or for any off right of way locations used for the following, but not limited to, haul roads, equipment staging areas, borrow and disposal sites:
   a. Standard Specification Item 132, Embankment is used for temporary or permanent fill within a USACE jurisdictional area;
   b. Unsuitable excavation or excess excavation that is disposed of outside a USACE evaluated area.

Work over or near Bodies of Water (Lakes, Rivers, Ponds, Creeks, etc.).
Keep on site a universal spill kit adequate for the body of water and the work being performed. No debris is allowed to fall into a body of water. Debris that falls into the water must be removed at the end of each work day. Debris that falls into the floodway must be removed at the end of each work week or prior to a rain event. This work is subsidiary.

Migratory Birds and Bats.
Migratory birds may be nesting within the project limits and concentrated on roadway structures such as bridges and culverts. Remove all old and unoccupied migratory bird nests from any structures, trees, etc. between September 1st and January 31st. Prevent migratory birds from re-nesting between February 1st and August 31st.

All methods used for the removal of unoccupied bird nests and the prevention of re-nesting must be approved by the Construction Observer well in advance of the planned use.

In the event that any active nests are encountered on-site during construction, all construction activity within the immediate vicinity of the nest must cease immediately. Contact the Construction Observer to determine how to proceed.

Bats may roost within the project limits under bridges, in culverts, in large hollow trees, in dead standing trees, and in trees with shaggy bark. Maternity colonies may occur from April 1st through August 31st. If bats are present, ensure bats are not harmed. Exclusion protocols for known colonies should be followed well in advance of commencement of construction activities. Exclusion measures by qualified individuals are used to relocate existing colonies, except from April 1st through August 31st when such measures may separate mothers and pups. Exclusion measures are also the means of preventing establishment of new colonies and re-establishment of relocated colonies.

No extension of time or compensation payment will be granted for a delay or suspension of work caused by migratory birds or bats. This work is subsidiary.

STATE OF TEXAS
ROBERT CARRILLO
80169
REGISTERED PROFESSIONAL ENGINEER
6/26/2017
Robert Carrillo, PE

NO.	REVISION	BY	DATE

WILLIAMSON COUNTY
1848

RTG RODRIGUEZ TRANSPORTATION GROUP
FIRM #587

GEORGETOWN INNER LOOP

GENERAL NOTES

6/26/2017 SHEET 1 OF 4

DESIGNED:	PROJECT NUMBER		ROADWAY	
CHECKED:			SE INNER LOOP	
DRAWN:	STATE	COUNTY	CITY	SHEET No.
CHECKED:	TEXAS	WILLIAMSON	GEORGETOWN	5A

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ITEM 100 PREPARING RIGHT OF WAY
Do not burn brush, unless otherwise approved.

Trim vegetation around signs and other obstructions. Consider subsidiary to pertinent Items.

Use hand methods or other means to remove objectionable material and obstructions, if doing work by mechanical methods is impractical. Consider subsidiary to the pertinent Items.

ITEM 110 & 132 EXCAVATION & EMBANKMENT
Obtain approval of all compaction equipment prior to all backfilling and embankment operations.

ITEM 132 EMBANKMENT
The underlying layer or existing subgrade must be prepared and inspected prior to placement of the embankment. Proof roll the pavement area according to Item 216 prior to placement of embankment or subsequent layers. Payment for proof rolling will be subsidiary to the various bid Items of the contract.

Correct unstable material (e.g. dry, wet, loose, etc.) to a depth of six (6) inches below existing grade. This work will be considered subsidiary to pertinent bid Items. Drying required deeper than six (6) inches below existing grade will be paid for in accordance with Item 6.03, "Extra Work." However, there will be no payment to correct failures in the subgrade areas that were constructed under this contract.

ITEM 132 EMBANKMENT TY B
Embankment shall be ordinary compaction Type B.

Pond embankment shall be free of pockets, voids, or rocks larger than 4".

The Construction Observer must approve the embankment material before use on the project.

If delivery from offsite source is necessary, furnish embankment with a PI of less than 25 that does not contain sulfate contents greater than 3000 ppm.

Correct unstable material (e.g. dry, wet, loose, etc.) to a depth of six (6) inches below existing grade. This work will be considered subsidiary to pertinent bid Items. Drying required deeper than six (6) inches below existing grade will be paid for in accordance with Item 6.03, "Extra Work." However, there will be no payment to correct failures in the subgrade areas that were constructed under this contract.

Track ALL embankment slopes left idle for more than 14 days, within or at the end of the 14-day idle period, to prevent erosion. Tracking consists of operating a tracked vehicle or equipment up and down the slope, leaving track marks perpendicular to the direction of the slope. Re-track slopes after rain events, as directed. Consider tracking of slopes to prevent erosion as subsidiary to the pertinent Items.

Correct subgrade (e.g. unstable areas, soft spots, etc.) prior to dumping of Flex Base or HMACP. Consider subsidiary to the pertinent Items.

When subgrade materials contain sulfates, as determined by Tex-145-E, use the following table for treatment of material placed under the pavement structure.

Sulfate Content Action(SC, ppm)	
SC < 3000 ppm	Apply calcium-based additive as Specified by the pertinent item.
3000 ppm ≤=SC < 7000 ppm	Perform a minimum of 7 days of mellowing and continuous water curing, in accordance to Department guidelines for soil treatment of sulfate-laden soils.
SC ≥=7000 ppm	Do not treat with calcium-based additives. Undercut to the specified depth and fill with select material or implement fly ash treatment as specified in the general notes for Item 265.

ITEM 160 TOPSOIL
No sandy loam allowed. Obtain approval of the actual depth of the topsoil sources for both on-site and off-site sources.

ITEM 204 SPRINKLING
Apply water for dust control as directed. When dust control is not being maintained, cease operations until dust control is maintained. Consider subsidiary to the pertinent Items.

ITEM 216 PROOF ROLLING
Correct and perform "Proof Rolling"retest at the Contractor's expense, to the satisfaction of the Construction Observer, when initial "Proof Rolling"yields a failing result.

Initial proof rolling will be considered subsidiary to the pertinent Items.

ITEM 247 FLEXIBLE BASE
Furnish Type A material.

Furnish flexible base meeting Grade 4 requirements.

The following table will govern the acceptance of compaction on base courses, when compacted in multiple courses. Compaction requirements are in percent of maximum dry density as determined by (Tex-113-E). When compacting in a single course, compact to at least 100% of maximum dry density as determined by Tex-113-E.

		All Roadways	
Item	Material	Lift	Min. Density
247	FLBS(CMP IN PLC)	1st of 3 lifts 2nd of 3 lifts (final lift)	95% 98% 100%

Complete all subgrade, ditches, slopes, and place all drainage structures to conform to required lines, grades, and cross-sections, as shown and directed, prior to the placement of Flex Base.

For Flex Base placed over the box culverts, do not use a Vibratory Roller to compact the material.

Table 1
Flexible Base Material Requirements

Property Master gradation sieve size	Test Method	Grade 4 % Retained
1½in.	Tex-110-E	
¾in.		
7/8 in.		10-35
3/8 in.		
No. 4		
No. 40		
No. 200		
Liquid Limit, % Max.1	Tex-104-E	35
Plasticity Index, Max.1	Tex-106-E	10
Wet ball mill, % Max.	Tex-116-E	40
Wet ball mill, % Max. increase passing the No. 40 sieve		20
Min. compressive strength, psi	Tex-117-E	
Lateral pressure 0 psi		
Lateral pressure 3 psi		
Lateral pressure 15 psi		

1. Determine plastic index in accordance with Tex-107-E (linear shrinkage) when liquid limit is unattainable as defined in Tex-104-E.

Correct subgrade (e.g. unstable areas, soft spots, etc.) prior to placing Flex Base. Consider subsidiary to the pertinent Items.

ITEM 300 ASPHALTS, OILS, AND EMULSIONS
Asphalt season starts May 1st and ends September 15th.

PPA and REOBs are not allowed.

ITEM 300 ASPHALTS, OILS, AND EMULSIONS (NON-TRACKING TACK COAT)
Apply non-tracking tack coat at 0.04 to 0.08 GAL/SY (residual) or as directed by the Construction Observer.

Spray a test strip of tack coat at a location on or near the project as directed. Consult the manufacturer for the recommended application rate. Allow the strip to cure for the maximum time specified. Drive over the test strip with equipment to simulate the effect of paving equipment. There should be no evidence tracking or picking up of the tack coat on the wheels of the equipment.

The Construction Observer shall verify the bond strength as directed.

ITEM 302 AGGREGATES FOR SURFACE TREATMENTS
Previously tested aggregates delivered to the project, which are found to contain excessive quantities of dust (more than 0.5% passing the No. 40 sieve) during pre-coating, stockpiling or hauling operations, will be rejected, unless otherwise directed. Use test method Tex-200-F, Part II, for testing.

Table 3 Los Angeles Abrasion, % Max., is lowered from 35 to 30 and is applicable to all aggregates.

ITEMS 310, 316, & 341
Perform work during good weather, unless otherwise directed. If work is performed at Contractor's option, when inclement weather is impending, and the work is damaged by subsequent precipitation, the Contractor is responsible for all costs associated with replacing the work, if required.

ITEM 310 PRIME COAT
Apply blotter material to all driveways and intersections.

Provide Construction Observer with current Distributer Certification confirming calibration of asphalt measurement equipment.

Apply Prime to finished flex base surface at the rate shown in the plans. Hot mix can be applied to the primed surface of flex base after the prime has penetrated and cured for a minimum of 36 hours depending on weather conditions or as approved by the Construction Observer. Provide the Construction Observer with a copy of the asphalt deliver ticket prior to application.

Apply blotter material to all driveways and intersections. This work is subsidiary. When Multi Option is allowed, provide MC 30, EC 30, or AE-P. MC 30 is not allowed in Travis County.

ITEM 316 SEAL COAT
Use ionically compatible asphalt to precoated aggregate, which is compatible with the asphalt specified for each specific Surface Treatment.

Do not apply asphalt within 1½ hours of sunset, or later, unless otherwise directed.

Ensure that all underseal surface treatment operations are covered by HMACP before exposing to traffic, including construction traffic.

Use paper or other approved material at the beginning and end of each shot so that the transverse joint is straight and prevents overlap of asphalt shots.

Any areas with excessive asphalt or aggregate will be removed.

The Contractor is required to provide recommendations to the Construction Observer on adjusting aggregate and asphalt rates, when the road conditions, material properties or construction methods change.

Furnish medium pneumatic-tire rollers in accordance with Item 210, "Rolling." Roll before opening to traffic.

Surface all transitions, tapers, climbing lanes and intersections to the limits as directed.

Keep all traffic, including construction traffic, off freshly placed surface treatment, as directed.

Provide Construction Observer with current Distributer Certification confirming calibration of asphalt measurement equipment.

Provide Construction Observer with a copy of the shipping ticket for the asphalt prior to application. Contractor must sample asphalt, in accordance to the applicable item. Label the sample can with date and project numbers. Samples must be stored where they are readily available to the County representative at the plant. The Contractor will be responsible for supplying storage for all samples until the project achieves substantial completion or otherwise directed.

Removal and proper disposal off the ROW of audible/profile markings, reflectorized markings, and raised markers is subsidiary.

ITEM 320 EQUIPMENT FOR ASPHALT CONCRETE PAVEMENT
Use of motor grader is allowed with approval of the Construction Observer.

STATE OF TEXAS
ROBERT CARRILLO
80169
REGISTERED PROFESSIONAL ENGINEER
6/26/2017
Robert Carrillo, PE

NO.	REVISION	BY	DATE

WILLIAMSON COUNTY
1848

RTG RODRIGUEZ TRANSPORTATION GROUP FIRM #587

GEORGETOWN INNER LOOP

GENERAL NOTES

6/26/2017 SHEET 2 OF 4

DESIGNED:	PROJECT NUMBER		ROADWAY	
CHECKED:			SE INNER LOOP	
DRAWN:	STATE	COUNTY	CITY	SHEET No.
CHECKED:	TEXAS	WILLIAMSON	GEORGETOWN	5B

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ITEMS 341 (HMACP Testing)
The Contractor must sample asphalt binder, in accordance to the applicable item. Label the sample can with the corresponding CSJ, lot, and sub-lot numbers.

Samples must be stored in a common area where they are readily available to the County's representative at the plant. The Contractor will be responsible for supplying storage for all samples. Retain all asphalt samples until hot mix production is complete or directed otherwise.

When directed, the Contractor is responsible for disposal of all asphalt binder samples, in accordance to Local, State, and Federal regulations.

[Hot Mix Asphaltic Concrete (HMAC) Core Holes]
Refill and compact all HMAC core holes to the same elevation as the adjacent roadway. Use hot mix of the type being used in the project to fill core holes. As an alternative a high performance cold patching mix such as Rapid Cure Patching Mix meeting the requirements of DMS-9203 or Medium Cure Patching mix made with SCM meeting requirements of DMS-9202. Consider this work subsidiary to the pertinent Items.

Mill a transverse butt joint to transition from the new ACP to the existing surface tie-in. Make the transition a minimum of 50 feet H: 1 inch V slope ratio of newly placed ACP. Make the temporary joint, at the tie-in, a minimum of a 10 feet longitudinally and covering the entire width. Saw-cut existing pavement as directed. Prior to milling, core the existing pavement to determine its thickness. Do not proceed with milling until directed. Consider this work subsidiary to the pertinent Items.

ITEMS 340 & 341 DENSE-GRADED HOT-MIX ASPHALT
Contractor to submit for approval a current mix design (less than 6 months old) to the Construction Observer that meets the following requirements prior to use on the project.

PPA and REOBS are not allowed.

Lime or an approved anti-stripping agent must be used when crushed gravel is utilized to meet a SAC "A"requirement.

Aggregates used on shoulders and ramps are required to meet SAC requirements.

Target laboratory molded density is 97% for all mixtures for Texas Gyratory Compactor (TGC) mixture designs.

When using Superpave Gyratory Compactor (SGC) to design mixtures, submit the SGC mix design to the Construction Observer for approval.

When using substitute binders, mold specimens for mix design and production at the temperature required for the substitute binder used to produce the HMA.
All mixtures must meet the Hamburg requirement as stated in the table below.

High-Temperature Binder Grade	Test Method	Hamburg Wheel Test Requirements [1]		
		Minimum # of Passes	Maximum Rut Depth (mm) [1]	Minimum Rut Depth (mm) [2,3]
PG 64 or lower	Tex-242-F	7,000	12.5	3
PG 70	Tex-242-F	15,000	12.5	3
PG 76 or higher	Tex-242-F	20,000	12.5	3

1.The Construction Observer may accept Hamburg Wheel test results for production and placement if no more than 1 of the 5 most recent tests is below the specified number of passes and the failing test is no more than 2,000 passes below the specified number of passes.

2.Rut depth tested @ 122°F
3.Unless approved otherwise.

When using RAP and/or RAS:
Use of RAS is not allowed. When using RAP, include the management methods of processing, stockpiling, and testing of RAP in the QCP submitted for the project. Blending of RAP in one feeder bin or in a stockpile is not permitted.

Asphalt content and binder properties of RAP stockpiles must be documented when recycled asphalt content greater than 20% is utilized.

RAP is not allowed for any surface mix applications.

No more than 20% RAP by weight of aggregate is allowed in any mix application.

Complete all roadways before final surface course placement, unless directed otherwise.

Ensure placement sequence to avoid excess distance of longitudinal joint lapback not to exceed one day's production rates.

The Contractor shall utilize a material transfer device per item 320 and a grade reference (such as a ski) for overlay operations. Consider subsidiary to the pertinent items.

Use a device to create a maximum 3H: 1V notched wedge joint on all hot mix joints of two (2) inches or greater. Consider subsidiary to the pertinent Items.

Taper transverse faces at ends of passes as directed.

Make transverse tapers on each end of pass using a minimum slope rate of 60H:1V. Tapers shall be removed directly before placement of final lift. Consider subsidiary to the pertinent Items.

Provide a minimum transition for all side streets of at least 12 ft. and driveways of at least six (6) feet, unless otherwise shown on the plans or otherwise approved/directed.

Submit any proposed adjustments or changes to a job mix formula to the Construction Observer before production of the new job mix formula.

For Mixture Design Verification, provide the Construction Observer with two 5-gallon buckets of each aggregate stockpile to be used on the project with three gallons of each PG binder from the plant to be used on the project. Sufficient quantities of any other additives that will be used in the HMA mixture shall also be provided.

Prior to allowing production of the trial batch, the Construction Observer will use the materials provided by the Contractor to perform the following tests to verify the HMA mixture .

1. Indirect Tensile Test in accordance with Tex-266-F
2. HAMBURG Wheel Test in accordance with Tex-242-F
3. Overlay Test in accordance with Tex-248-F
4. Cantabro Test in accordance with Tex-245-F

For mixtures designed with a Texas Gyratory Compactor (TGC), the Construction Observer may require that the target laboratory molded density be raised to no more than 97.5% or may lower the design number of gyrations to no less than 35 for mixtures designed with an SGC if any of the following conditions exist:

1. The Indirect Tensile Test results in a value greater than 200 PSI
2. The Hamburg Wheel Test results in a value less than 3.0 mm
3. The Overlay Test results in a value less than 100 cycles
4. The Cantabro Test results in a value of more than 20% loss

In lieu of or in addition to evaluating the mixture design prior to allowing a trial batch to be produced, the Construction Observer may also evaluate the mixture produced during the trial batch for compliance with the four tests listed above.

Submit thermal and segregation profiles as well as longitudinal joint densities on electronic forms provided by County to the Construction Observer.

When surface irregularities, as defined in Article 341.4.9.3.3.5, "Irregularities," are detected or measured, the Contractor must take immediate corrective action defined as the removal and replacement of a full lane width of the defective area using a paver to place new mix, unless otherwise directed. If there are multiple defective areas within a sub-lot, making up to 30% of the sub-lot by area, the Construction Observer will require the entire sub-lot be removed, unless directed otherwise.

ITEM 351 FLEXIBLE PAVEMENT STRUCTURE REPAIR
All repairs shall be made using HMA Type B PG 64-22 unless specified in the plans.

When performing repair work under this Item in conjunction with an overlay or seal coat project, perform all repair work, established by the Construction Observer, within one paving season. If repair work is not complete within this timeframe, any additional damage beyond what was originally established and identified for repair work occurs and requires repair work will be performed at the Contractor's expense, unless approved otherwise.

ITEM 400 EXCAVATION AND BACKFILL FOR STRUCTURES
Cut pavements with the use of a saw as directed. Consider subsidiary to pertinent Items.

Obtain approval of all compaction equipment prior to all backfilling and embankment operations.

Use Class "B"sand bedding for pipe and box culvert installation unless otherwise directed.

ITEM 420 CONCRETE SUBSTRUCTURES
Remove all loose Formwork and other Materials from the Floodplain or drainage areas, daily, which could float off in a Storm Water Event, as directed.

ITEM 432 RIPRAP
Fibers for Concrete as defined in DMS-4550 will not be allowed.

Make five (5) inches thick unless otherwise noted or directed.

Where any proposed riprap joins existing riprap, saw cut the existing riprap and dowel/epoxy the joint as directed. Consider subsidiary to the pertinent Items.

Additional riprap may be required, as determined by the Construction Observer, near the end of project completion, due to unanticipated erosion locations. Any additional, approved riprap will be paid under this Item.

Consider saw cutting of riprap as subsidiary.

Provide Class B Concrete for riprap.

Remove all loose Formwork and other Materials from the Floodplain or drainage areas, daily, which could float off in a Storm Water Event, as directed.

ITEMS 462, 464, 465, 466, & 467
Concrete collars shall be used to connect RCP to existing CMP. Concrete collars will not be paid for directly but will be considered subsidiary to these items.

ITEM 466 HEADWALLS AND WINGWALLS
Use Class C concrete for headwalls or wingwalls.

Remove all loose Formwork and other Materials from the Floodplain or drainage areas, daily, which could float off in a Storm Water Event, as directed.

ITEM 467 SAFETY END TREATMENT
Cut pipe ends, in the field, to match roadway side slopes, or as directed. Apply asphalt base aluminum paint to the cut ends.

All Type II SETs shall have mitered pipe ends and cast-in-place riprap aprons.

Use Class C concrete.

Concrete collars shall be used to connect RCP SETs to existing CMP. Concrete collars will not be paid for directly but will be considered subsidiary to these items.

Remove all loose Formwork and other Materials from the Floodplain or drainage areas, daily, which could float off in a Storm Water Event, as directed.

ITEM 481 PIPE FOR DRAINS
All polyvinyl chloride (PVC) pipe for ponds shall be Scheduled 80 unless otherwise noted in the plans.

ITEM 496 REMOVING STRUCTURES
The Contractor's attention is directed to the fact that migratory birds tend to concentrate nesting on transportation structures. If migratory bird nests are present within the project limits, remove all old migratory bird nests only between September 1st and January 31st from any structure where work will be done. In addition, be prepared to prevent migratory birds from building nests between February 1st and August 31st.

All methods used for the removal of old bird nests and the prevention of re-nesting must be approved by the Construction Observer, well in advance of the planned use.

In the event that any active nest of migratory birds is encountered on-site during project construction, all construction activity, within the immediate vicinity of the nest, will cease immediately. Contact the Construction Observer to determine how to proceed.

STATE OF TEXAS
ROBERT CARRILLO
80169
REGISTERED PROFESSIONAL ENGINEER
6/26/2017
Robert Carrillo, PE

NO.	REVISION	BY	DATE

WILLIAMSON COUNTY
1848

RTG RODRIGUEZ TRANSPORTATION GROUP FIRM #587

GEORGETOWN INNER LOOP

GENERAL NOTES

6/26/2017 SHEET 3 OF 4

DESIGNED:	PROJECT NUMBER		ROADWAY	
CHECKED:			SE INNER LOOP	
DRAWN:	STATE	COUNTY	CITY	SHEET No.
CHECKED:	TEXAS	WILLIAMSON	GEORGETOWN	5C

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7/26/2017

ITEM 502 BARRICADES, SIGNS, AND TRAFFIC HANDLING
Unless otherwise approved, one (1) lane in each direction shall remain open at all times.

Nighttime lane closures will be allowed from 8:00 PM to 5:00 AM, unless otherwise shown on the plans.

No Daytime Lane Closures will be allowed, unless otherwise shown on the plans or as directed by the GEC.

The GEC is the authority to approve additional lane closures, prior to any work.

Maintain a written record of documentation of "The Additional Approved Lane Closures."

Submit and secure concurrence, prior to the publication of any notices or placement of any traffic control devices for implementation of the traffic control plan, hereinafter called a Lane Closure Notice (LCN).

Present to GEC, an LCN for traffic control, which is proposed for implementation, a minimum of four (4) full working days preceding any proposed implementation date. Indicate the estimated date, time, duration, and location for the proposed work. As a part of the LCN submit a written description of the lane closure(s) depicting the proposed traffic control devices used, based on the appropriate plan sheet, TxDOT or Texas Manual on Uniform Traffic Control Devices (TMUTCD) standards, and an operational description of the work to be performed.

Present to GEC, LCN's proposed to detour traffic, a minimum of seven (7) full calendar days preceding any proposed implementation date.

Present to GEC, LCN's proposed for night work, a minimum of seven (7) full calendar days preceding any proposed implementation date.

Receive concurrence prior to LCN implementation.

Meet with the Construction Observer prior to roadway and lane closures to ensure that sufficient equipment, materials, devices, and workers will be used. Discuss contingency plans at that time. Consider inclement weather prior to implementing the lane closures.

Submit a cancellation of any lane closures, no later than noon on the day preceding the proposed work.

Coordinate lane closures with adjacent projects.

Take immediate action to modify Closures / Traffic Control, if at any time backup (roadway queuing) becomes unreasonable (greater than 20 minutes). Have in place, a contingency plan of how this will occur.

Utilize Shadow Vehicle with Truck Mounted Attenuator for setup and removal of each lane closure.

Do not set up any Lane Closure / TCP when the pavement is wet prior to the "setup,"unless otherwise directed. Revise Traffic Control, when inclement weather is imminent, as directed.

Incorporate and maintain a 3H: 1V safety wedge into the proposed construction for any roadway edge of 2 inches or greater adjacent to a roadway under traffic.

Within the limits of the project, provide standard barricades, warning signs, delineators, lights, 28-inch cones, and flaggers in enough numbers and combinations, as directed.

ITEM 530 INTERSECTIONS, DRIVEWAYS, AND TURNOUTS
Notify property owners a minimum of 48 hours in advance of beginning work on their driveways. Provide, to GEC, a list of each notification and contact prior to each closure.

Provide access, at all times, to adjacent property. Construct driveways one-half sections, to allow access.

Do not completely close driveways for reconstruction purposes, unless a reasonable alternate access exists to the property, as approved.

Place the Flex Base for the Driveways using Ordinary Compaction.

ITEM 585 - RIDE QUALITY FOR PAVEMENT SURFACES
Ride quality requirements are waived.

ITEM 618 CONDUIT
Use materials from prequalified material producers list as shown on the Texas Department of Transportation (TxDOT) Construction Division's (CST) materials producers list. Category is "Roadway Illumination and Electrical Supplies."

Refer to plans and specifications for type of conduit. Waterproof and tighten all couplings and connections. Bring all proposed and existing conduit into a ground box and 'elbow' it unless otherwise shown on the plans. Provide a bushing to protect the wire from abrasion when a conduit run terminates.

Saw cut and replace any riprap, which must be removed to install the conduit. Replace riprap with material and texture as directed.

The locations of conduit and ground boxes are diagrammatic and so shift, as directed, to accommodate field conditions.

Install conduit in an area not exceeding two (2) feet in any direction from a straight line with the depth of the conduit at least two (2) feet, unless otherwise shown on the plans.

Install conduit on a 2-inch sand cushion and backfill with at least six (6) inches of sand. Backfill the remainder of the trench with flexible base, soil or two-sack concrete as required by the location of the conduit or as directed.

Consider all conduit elbows and rigid metal extensions required to be installed on PVC conduit systems subsidiary.

Install a high tension, non-metallic pull rope in all conduit runs. The pull ropes are for future use. Cap all empty conduit runs using standard weather tight conduit caps as directed. Consider this work subsidiary to the pertinent Item.

Seal all conduit ends with a permanently soft, non-toxic duct seal. The dust seal must not adversely affect plastic materials or corrode metals.

Consider all fittings, brackets, and junction boxes necessary to complete the installations subsidiary to the pertinent Items.

ITEM 620 ELECTRICAL CONDUCTORS
Bond grounding conductors, which share the same conduit, junction box or structures, together at every accessible point, in accordance with the Electrical Detail Standard Sheets and the latest edition of the National Electrical Code (NEC).

All wiring will be in accordance with the National Electrical Code (NEC) and the appropriate Department standard sheets.

ITEM 628 ELECTRICAL SERVICES
The service enclosure provided in this contract will have provisions for pad locking the enclosure shut.

ITEM 644 SMALL ROADSIDE SIGN ASSEMBLIES
Fabricate all small signs not detailed on the plans in conformance with the latest edition of the "Standard Highway Sign Designs for Texas," refer to TxDOT's website.

ITEM 662 WORK ZONE PAVEMENT MARKINGS
Notify the Construction Observer at least 24 hours in advance of removing existing striping and placing pavement markings & markers.

Apply markings during good weather unless otherwise directed. If markings are placed at Contractor's option, when inclement weather is impending, and the markings are damaged by subsequent precipitation, the Contractor is responsible for all costs associated with replacing the markings if required.

Remove work zone pavement markings within 48 hours after permanent striping has been completed.

Foil backed pavement markings will not be allowed.

ITEM 672 RAISED PAVEMENT MARKERS
Place the bituminous adhesive at a temperature range of 380°F to 390°F. Place the pavement marker on the bituminous adhesive within approximately 20 seconds after the adhesive is placed on the pavement. Ensure the pavement marker rests solely on the adhesive and not the pavement surface. Ensure that a minimum of ⅛ inch layer of bituminous adhesive remains between the pavement marker and the pavement surface.

ITEM 6001 PORTABLE CHANGEABLE MESSAGE SIGN
Provide 2 "Electronic" Portable Changeable Message Sign(s) (EPCMS) as part of the traffic control operations and provide another one that is available to utilize when a backup is needed. Consider the one designated for backup as subsidiary to the various Items of the project. All EPCMS will be exclusive to this project, unless otherwise approved. Placement location and message as directed.

Place appropriate number of "Electronic"Portable Changeable Message Signs (EPCMS) at locations requiring lane closures for one (1) week prior to the closures, or as directed. Obtain approval for the actual message that will appear on the boards. If more than two phases of a message are required per board, provide additional EPCMS's to meet the two-phases-per-board requirement.

STATE OF TEXAS
ROBERT CARRILLO
80169
REGISTERED PROFESSIONAL ENGINEER
6/26/2017
Robert Carrillo, PE

NO.	REVISION	BY	DATE

WILLIAMSON COUNTY
1848

RTG RODRIGUEZ TRANSPORTATION GROUP FIRM #587

GEORGETOWN INNER LOOP

GENERAL NOTES

6/26/2017 SHEET 4 OF 4

DESIGNED:	PROJECT NUMBER		ROADWAY	
CHECKED:			SE INNER LOOP	
DRAWN:	STATE	COUNTY	CITY	SHEET No.
CHECKED:	TEXAS	WILLIAMSON	GEORGETOWN	5D

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TRAFFIC CONTROL SUMMARY

PHASE	0400 6005 CEM STABIL BKFL	0400 6008 CUT & RESTORE ASPH PAVING	0403 6001 TEMPORARY SPL SHORING	0512 6009 PORT CTB (FUR & INST)(LOW PROF)(TY 1)	0512 6010 PORT CTB (FUR & INST)(LOW PROF)(TY 2)	0512 6057 PORT CTB (REMOVE)(LOW PROF)(TY 1)	0512 6058 PORT CTB (REMOVE)(LOW PROF)(TY 2)	0662 6004 WK ZN PAV MRK NON-REMOV (W)4"(SLD)	662 6109 WK ZN PAV MRK SHT TERM (TAB)TY W	662 6111 WK ZN PAV MRK SHT TERM (TAB)TY Y-2	6001 6001 PORTABLE CHANGEABLE MESSAGE SIGN
	CY	SY	SF	LF	LF	LF	LF	LF	EA	EA	DAY
1	715	110	2200	2400	120			2620			50
2						2400	120		349	883	
PROJECT TOTAL	**715**	**110**	**2200**	**2400**	**120**	**2400**	**120**	**2620**	**349**	**883**	**50**

SHORT TERM MARKINGS TO BE USED AFTER OVERLAY IS PLACED AND BEFORE PERMANENT STRIPING IS PLACED. MATCH PERMANENT STRIPING CONFIGURATION AS DIRECTED BY THE CONSTRUCTION OBSERVER.

NO.	REVISION	BY	DATE

WILLIAMSON COUNTY 1848

RTG RODRIGUEZ TRANSPORTATION GROUP FIRM #587

GEORGETOWN INNER LOOP

TRAFFIC CONTROL SUMMARY

6/26/2017 SHEET 1 OF 1

DESIGNED:	PROJECT NUMBER		ROADWAY	
CHECKED:			SE INNER LOOP	
DRAWN:	STATE	COUNTY	CITY	SHEET No.
CHECKED:	TEXAS	WILLIAMSON	GEORGETOWN	6

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EARTHWORK SUMMARY

STATION	110 6001 EXCAVATION (ROADWAY)	132 6003 EMBANKMENT (FINAL) (ORD COMP) (TY B)
	CY	CY
91+30	0	0
91+50	3	65
92+00	7	221
92+50	8	162
93+00	9	83
93+50	10	80
94+00	10	88
94+50	9	99
95+00	8	108
95+50	8	123
96+00	7	136
96+50	8	138
97+00	8	123
97+50	9	113
98+00	10	109
98+50	13	93
99+00	17	71
99+50	21	52
100+00	30	37
100+50	46	28
101+00	97	23
101+50	118	19
102+00	106	17
102+50	128	18
103+00	167	20
103+50	182	20
104+00	143	22
104+50	95	28
105+00	74	41
105+50	39	104
106+00	32	129
106+50	42	130
107+00	63	112
107+50	81	67
108+00	40	219
108+50	13	411
109+00	15	444
109+50	28	294
110+00	47	96
110+50	36	166
111+00	14	548
111+50	11	782
112+00	9	720
112+50	9	655
113+00	9	628
113+50	9	637
114+00	9	641
114+50	8	628
115+00	8	626
115+50	7	569
116+00	8	411
116+50	9	240
117+00	10	99
PROJECT TOTAL	**1907**	**11493**

REMOVAL SUMMARY

LOCATION	100 6002 PREPARING ROW	104 6017 REMOVING CONC (DRIVEWAYS)	104 6029 REMOVING CONC (CURB OR CURB & GUTTER)	105 6036 REMOVING STAB BASE & ASPH PAV(15" -20")
	STA	SY	LF	SY
REMOVAL PLAN SHEET 1 OF 5	2.7			27
SHEET 2 OF 5	6.0			131
SHEET 3 OF 5	6.0		144	463
SHEET 4 OF 5	6.0	370	236	463
SHEET 5 OF 5	5.0			73
PROJECT TOTAL	**25.7**	**370**	**380**	**1157**

ROADWAY SUMMARY

PLAN SHEET	247 6044 FL BS (CMP IN PLC) (TY A GR 4) (FNAL POS)	310 6001 PRIME COAT (MULTI OPTION)	316 6193 AGGR (TY-D GR-5 SAC -B)	316 6413 ASPH (AC-15P, HFRS-2P OR CRS-2P)	341 6008 D-GR HMA TY-B PG64 -22	341 6027 D-GR HMA TY-C SAC-B PG70-22	351 6001 FLEXIBLE PAVEMENT STRUCTURE REPAIR (5")	0420 6141 CL C CONC (CURB)	0531 6002 CONC SIDEWALKS (5")	0531 6010 CURB RAMPS (TY 7)
	CY	GAL	CY	GAL	TON	TON	SY	CY	SY	EA
PLAN & PROFILE SHEET 1 OF 3	176	124	13	594	105	178				
SHEET 2 OF 3	999	708	67	2914	602	874			716	2
SHEET 3 OF 3	969	688	63	2742	585	823			689	
INTERSECTION LAYOUT								2.7		
**							1830			
PROJECT TOTAL	**2144**	**1520**	**143**	**6250**	**1292**	**1875**	**1830**	**2.7**	**1405**	**2**

** EXISTING ASPHALT PAVEMENT TO BE REPAIRED AS DIRECTED BY THE CONSTRUCTION OBSERVER

NO.	REVISION	BY	DATE

WILLIAMSON COUNTY
1848

RTG RODRIGUEZ TRANSPORTATION GROUP FIRM #587

GEORGETOWN INNER LOOP

ROADWAY SUMMARY

6/26/2017 SHEET 1 OF 1

DESIGNED:	PROJECT NUMBER		ROADWAY	
CHECKED:			SE INNER LOOP	
DRAWN:	STATE	COUNTY	CITY	SHEET No.
CHECKED:	TEXAS	WILLIAMSON	GEORGETOWN	7

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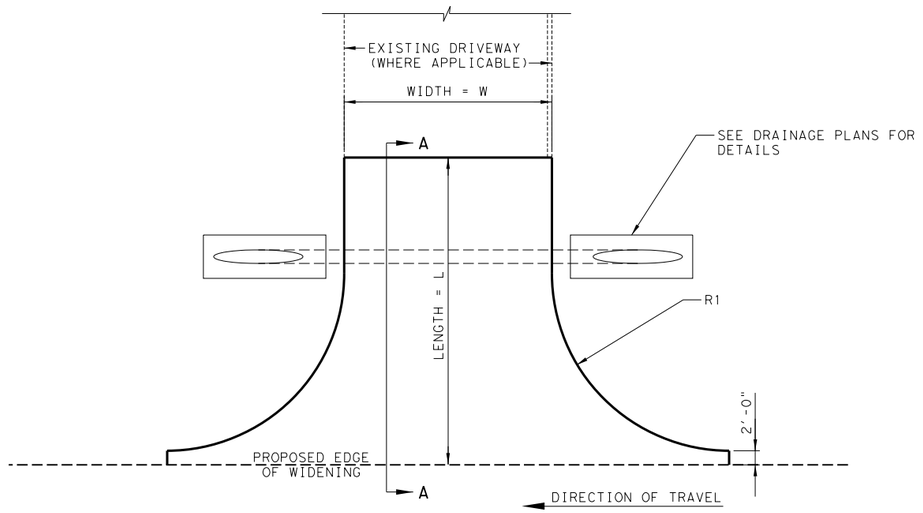
DRIVEWAY SUMMARY							
DRIVEWAY	APPROX STATION	WIDTH (W)	LENGTH (L)	RADIUS (R1)	RADIUS (R2)	PIPE ID	530 6004 DRIVEWAYS (CONC)
		FT	FT	FT	FT		SY
DWW105	105+50	45	64	50	50	2A-1A	461
DWW110	110+00	36	69	50	50	2A	430
						QUANTITY TOTALS	891

NOTES:

1. REFER TO DRIVEWAY LAYOUTS FOR GEOMETRY INFORMATION.
2. SEE DRAINAGE PLANS FOR PIPE DETAILS.
3. GRADE ALL DRIVEWAYS TO DRAIN.
4. PAYMENT FOR DRIVEWAYS WILL BE IN ACCORDANCE WITH ITEM 530, "DRIVEWAYS".
5. DRIVEWAY REINFORCEMENT SHALL BE WWF 6X6-W2.9XW2.9 (OR EQUIVALENT).
6. PROVIDE EXPANSION JOINT(S) FOR ANY WIDTH/LENGTH OVER 22.5'. PROVIDE 1/2" EXPANSION JOINT MATERIAL AND 1/4" TOOLED RADIUS AT JOINT.



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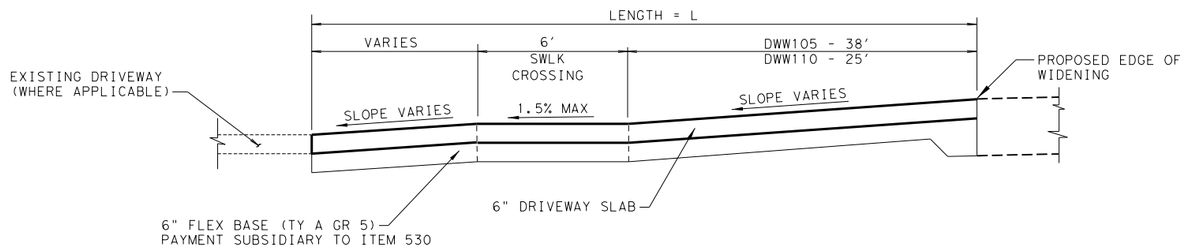

SECTION A-A
N.T.S.

STATE OF TEXAS
JAMES BROOKS
101002
LICENSED PROFESSIONAL ENGINEER
6/24/2017

NO.	REVISION	BY	DATE

WILLIAMSON COUNTY
1848

RTG RODRIGUEZ TRANSPORTATION GROUP FIRM #587

GEORGETOWN INNER LOOP

DRIVEWAY SUMMARY AND DETAILS

6/24/2017 SHEET 1 OF 1

DESIGNED:	PROJECT NUMBER		ROADWAY	
CHECKED:			SE INNER LOOP	
DRAWN:	STATE	COUNTY	CITY	SHEET No.
CHECKED:	TEXAS	WILLIAMSON	GEORGETOWN	8

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BRIDGE CLASS CULVERT SUMMARY											
CULVERT ID/LOCATION	110-6002	432-6027	464-6009	464-6010	467-6461	467-6465	467-6477	467-6479	496-6004	496-6006	480-6001
	EXCAVATION (CHANNEL)	RIPRAP (STONE COMMON) (DRY) (24 IN)	RC PIPE (CL III) (42 IN)	RC PIPE (CL III) (48 IN)	SET (TY II) (42 IN) (RCP) (3:1) (C)	SET (TY II) (42 IN) (RCP) (6:1) (C)	SET (TY II) (48 IN) (RCP) (4:1) (C)	SET (TY II) (48 IN) (RCP) (6:1) (C)	REMOV STR (SET)	REMOV STR (HEADWALL)	CLEAN EXIST CULVERTS
	(CY)	(CY)	(LF)	(LF)	(EA)	(EA)	(EA)	(EA)	(EA)	(EA)	(EA)
NO. 1/GIL STA 91+60	505	245		350			9	9	16		1
NO. 2/GIL STA 105+50	280	149	434		5	5			3	1	1
TOTALS	785	394	434	350	5	5	9	9	19	1	2

CULVERT SUMMARY						
CULVERT ID/LOCATION	464-6024	464-6003	467-6326	467-6363	496-6004	496-6007
	RC PIPE (CL V) (12 IN)	RC PIPE (CL III) (18 IN)	SET (TY II) (12 IN) (RCP) (6:1) (P)	SET (TY II) (18 IN) (RCP) (6:1) (P)	REMOV STR (SET)	REMOV STR (PIPE)
	(LF)	(LF)	(EA)	(EA)	(EA)	(LF)
DRIVEWAY STA. 105+50		87		2	2	23
ACCESS RD STA. 115+50	37		2			
TOTALS	37	87	2	2	2	23

DRAINAGE STRUCTURES SUMMARY									
CULVERT ID/LOCATION	402-6001	432-6024	465-6126	465-6128	464-6003	464-6005	464-6008	467-6358	467-6450
	TRENCH EXCAVATION PROTECTION	RIPRAP (STONE COMMON) (DRY) (12 IN)	(PSL) (FG) (3 FT X 3 FT- 3 FT X 3 FT)	(PSL) (FG) (4 FT X 4 FT- 4 FT X 4 FT)	RC PIPE (CL III) (18 IN)	RC PIPE (CL III) (24 IN)	RC PIPE (CL III) (36 IN)	SET (TY II) (18 IN) (RCP) (4:1) (C)	SET (TY II) (36 IN) (RCP) (4:1) (C)
	(LF)	(CY)	(EA)	(EA)	(LF)	(LF)	(LF)	(EA)	(EA)
BEGIN PROJECT - STA 94+00		4							
STA 106+00 - END PROJECT	97	11	1	2	84	146	146	1	1
TOTALS	97	11	1	2	84	146	146	1	1

NO.	REVISION	BY	DATE

WILLIAMSON COUNTY
1848

RTG RODRIGUEZ TRANSPORTATION GROUP
FIRM #587

GEORGETOWN INNER LOOP

DRAINAGE SUMMARIES

6/23/2017 SHEET 1 OF 1

DESIGNED:	PROJECT NUMBER		ROADWAY	
CHECKED:			SE INNER LOOP	
DRAWN:	STATE	COUNTY	CITY	SHEET No.
CHECKED:	TEXAS	WILLIAMSON	GEORGETOWN	9

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ITEM NAME	110 6003 EXCAVATION (SPECIAL)	132 6003 EMBANKMENT (FINAL)(ORD COMP)(TY B)	160 6004 FURNISHING AND PLACING TOPSOIL (6")	432 6002 RIPRAP (CONC)(5 IN)	432 6032 RIPRAP (STONE PROTECTION) (15 IN)	464 6003 RC PIPE (CL III) (18 IN)	464 6005 RC PIPE (CL III) (24 IN)	465 6002 MANH (COMPL)(PRM) (48IN)	465 6153 INLET (COMPL)(PAZD) (RC)(4FTX4FT)	465 9901 WQ RISER STRUCTURE	467 6388 SET (TY II) (24 IN) (RCP) (3: 1) (C)	467 6358 SET (TY II) (18 IN) (RCP) (4: 1) (C)	481 6023 PIPE (PVC) (SCH 80) (6 IN)	618 6042 CONDT (PVC) (SCH 80) (1 1/4")	620 6007 ELEC CONDR (NO.8) BARE	620 6008 ELEC CONDR (NO.8) INSULATED	628 6011 ELC SRV TY A 120/240 060(NS)SS(E)TP(O)
	CY	CY	SY	CY	CY	LF	LF	EA	EA	EA	EA	EA	LF	LF	LF	LF	EA
POND A	3286	68	3004	4	9	5	53	2	1	1	1		34	20	20	40	1
POND B	6082	1686	6565	19	119	19		1		1		1	35	20	20	40	1
PROJECT TOTALS:	**9368**	**1754**	**9569**	**23**	**128**	**24**	**53**	**3**	**1**	**2**	**1**	**1**	**69**	**40**	**40**	**80**	**2**

ITEM NAME	9001 9901 IMPERMEABLE LINER	9002 9901 DETENTION POND CONTROL SYSTEM	9003 9901 POND ACCESS GATE
	SY	EA	EA
POND A	2861	1	1
POND B	6252	1	1
PROJECT TOTALS:	**9113**	**2**	**2**

NO.	REVISION	BY	DATE

WILLIAMSON COUNTY
1848

K·FRIESE + ASSOCIATES
PUBLIC PROJECT ENGINEERING
FIRM #6535

GEORGETOWN INNER LOOP

WATER QUALITY SUMMARY

6/26/2017 SHEET 1 OF 1

DESIGNED:	PROJECT NUMBER		ROADWAY	
CHECKED:			SE INNER LOOP	
DRAWN:	STATE	COUNTY	CITY	SHEET No.
CHECKED:	TEXAS	WILLIAMSON	GEORGETOWN	10

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SIGN INSTALL, REMOVAL & RELOCATION SUMMARY

	0636-6007	0644-6060	0644-6061	0644-6071	0658-6047
SHEET OF SHEET	REPLACE EXISTING ALUMINUM SIGNS (TY A)	IN SM RD SN SUP&AM TYTWT(1)WS(P)	IN SM RD SN SUP&AM TYTWT(1)WS(T)	RELOCATE SM RD SN SUP & AM TY TWT	INSTL OM ASSM (OM -2Y) (WC) GND
	SF	EA	EA	EA	EA
1 OF 3	13.75	3			4
2 OF 3		5	1	5	
3 OF 3		3	1		
TOTAL	13.75	11	2	5	4

PAVEMENT MARKING SUMMARY

	0666-6029	0666-6035	0666-6047	0666-6053	0666-6077	0666-6302	0666-6311	0666-6314	0672-6007	0672-6009
SHEET OF SHEET	REFL PAV MRK TY I (W) 8" (DOT)(090MIL)	REFL PAV MRK TY I (W) 8" (SLD)(090MIL)	REFL PAV MRK TY I (W) 24" (SLD)(090MIL)	REFL PAV MRK TY I (W) (ARROW) (090MIL)	REFL PAV MRK TY I (W) (WORD) (090MIL)	RE PM W/RET REQ TY I (W) 4" (SLD) (90MIL)	RE PM W/RET REQ TY I (Y) 4" (BRK) (90MIL)	RE PM W/RET REQ TY I (Y) 4" (SLD) (90MIL)	REFL PAV MRKR TY I-C	REFL PAV MRKR TY II-A-A
	LF	LF	LF	EA	EA	LF	LF	LF	EA	EA
1 OF 3				2		1640	172	2403		101
2 OF 3		732	24	5	5	2157	547	2305	37	54
3 OF 3	44	200		3	1	1101	109	1703	10	73
TOTAL	44	932	24	10	6	4,898	828	6,411	47	228

PAVEMENT MARKING SUMMARY

	0666-6170	0666-6176	0666-6178	0666-6182	0666-6184	0666-6192	0666-6205	0666-6207
SHEET OF SHEET	REF PAV MRK TY II (W) 4" (SLD)	REF PAV MRK TY II (W) 8" (DOT)	REF PAV MRK TY II (W) 8" (SLD)	REF PAV MRK TY II (W) 24" (SLD)	REF PAV MRK TY II (W) (ARROW)	REF PAV MRK TY II (W) (WORD)	REF PAV MRK TY II (Y) 4" (BRK)	REF PAV MRK TY II (Y) 4" (SLD)
	LF	LF	LF	LF	EA	EA	LF	LF
1 OF 3	1640	0	0	0	2	0	172	2403
2 OF 3	2157	0	732	24	5	5	547	2305
3 OF 3	1101	44	200	0	3	1	109	1703
TOTAL	4,898	44	932	24	10	6	828	6,411

NO.	REVISION	BY	DATE

WILLIAMSON COUNTY 1848

RTG RODRIGUEZ TRANSPORTATION GROUP FIRM #587

GEORGETOWN INNER LOOP

SIGNING AND PAVEMENT MARKING SUMMARY

6/26/2017 SHEET 1 OF 1

DESIGNED:	PROJECT NUMBER		ROADWAY	
CHECKED:			SE INNER LOOP	
DRAWN:	STATE	COUNTY	CITY	SHEET No.
CHECKED:	TEXAS	WILLIAMSON	GEORGETOWN	11

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EROSION CONTROL SUMMARY

	160-WC02	161-WC001	162-WC103	164-WC04	164-WC05	164-WC10	166-6002	168-WC01	169-6001	506-6002	506-6011	506-6020	506-6024	506-6041	506-6043
SHEET OF SHEET	FURNISHING AND PLACING TOPSOIL (4")	EROSION CONTROL COMPOST (3")	MULCH TOPDRESSING (5")	SEEDING FOR EROSION CONTROL (TEMP) (COOL) (TY 4)	SEEDING FOR EROSION CONTROL (PERM) (WARM) (TY 5)	SEEDING FOR EROSION CONTROL (TEMP) (WARM) (TY 10)	FERTILIZER	VEGETATIVE WATERING	SOIL RETENTION BLANKETS (CL 1) (TY A)	ROCK FILTER DAMS (INSTALL) (TY2)	ROCK FILTER DAMS (REMOVE)	CONSTRUCTION EXITS (INSTALL) (TY 1)	CONSTUCTION EXITS (REMOVE)	BIODEG EROSN CONT LOGS (INSTL) (12")	BIODEG EROSN CONT LOGS (REMOVE)
	SY	SY	SY	SY	SY	SY	TON	MG	SY	LF	LF	SY	SY	LF	LF
1 OF 3	9010	2253	2253	4505	9010	4505	0.6	270.3	1427	80	80	78	78	1171	1171
2 OF 3	7565	1891	1891	3783	7565	3783	0.5	227.0	4354	85	85			1716	1716
3 OF 3	7814	1954	1954	3907	7814	3907	0.5	234.4	3092	5	5	78	78	1208	1208
** Pond A				1502	3004	1502	0.2	90.1							
** Pond B				3283	6565	3283	0.4	197.0							
TOTAL	24,389	6,097	6,097	16,979	33,958	16,979	2.2	1,018.8	8,873	170	170	156	156	4,095	4,095

** REFER TO WATER QUALITY POND SUMMARY FOR ADDITIONAL TOPSOIL QUANTITIES

NO.	REVISION	BY	DATE

WILLIAMSON COUNTY
1848

RTG RODRIGUEZ TRANSPORTATION GROUP FIRM #587

GEORGETOWN INNER LOOP

EROSION CONTROL SUMMARY

6/26/2017 SHEET 1 OF 1

DESIGNED:	PROJECT NUMBER		ROADWAY	
CHECKED:			SE INNER LOOP	
DRAWN:	STATE	COUNTY	CITY	SHEET No.
CHECKED:	TEXAS	WILLIAMSON	GEORGETOWN	12

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TRAFFIC CONTROL GENERAL NOTES

1. ALL TRAFFIC CONTROL DEVICES SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR AND SHALL BE IN ACCORDANCE WITH THE TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (TMUTCD), LATEST EDITION AND AMENDMENTS. ALL TRAFFIC CONTROL DEVICES SHALL ALSO COMPLY WITH THE CRASHWORTHINESS REQUIREMENTS OF THE AASHTO MANUAL FOR ASSESSING SAFETY HARDWARE (MASH).

2. A MEETING BETWEEN THE CONTRACTOR AND THE CONSTRUCTION OBSERVER TO DISCUSS UPCOMING CHANGES IN CONSTRUCTION PHASING AND TRAFFIC SWITCHES IS REQUIRED AT LEAST 14 DAYS PRIOR TO THE PHASE CHANGE. ITEMS TO BE DISCUSSED AT THIS MEETING INCLUDE TEMPORARY SIGNING, TRAFFIC CONTROL, PAVEMENT MARKINGS, THE PROCESSES NECESSARY FOR THE PHASE CHANGE AND SUBCONTRACTOR SCHEDULING.

3. ALL SIGNS, DELINEATORS, OBJECT MARKERS, AND ROUTE MARKERS SHALL BE IN PLACE PRIOR TO OPENING EACH PHASE OF CONSTRUCTION TO TRAFFIC. EXISTING SIGNS MAY BE USED AND RELOCATED TO TEMPORARY MOUNTS IN THIS SITUATION WHEN PERMANENT SIGNS CANNOT BE PLACED AND PRIOR APPROVAL OF THE CONSTRUCTION OBSERVER IS GIVEN.

4. PLACE ADVISORY SPEED PLATES (CW13-1) IN ACCORDANCE WITH THE TMUTCD AND AS DIRECTED BY THE CONSTRUCTION OBSERVER. SIGNS (CW13-1) SHALL NOT BE USED WITH ANY SIGNS OTHER THAN A WARNING SIGN, NOR SHALL IT BE USED ALONE. SIGN MOUNTING HEIGHT SHALL BE SEVEN (7) FEET MINIMUM TO THE BOTTOM OF THE SPEED PLATE.

5. UNLESS OTHERWISE SHOWN ON PLANS, WHERE THERE IS EXCAVATION ADJACENT TO THE PAVEMENT EDGE, PROVIDE ADEQUATE WARNING SIGNS, VERTICAL PANELS, DRUMS, AND REFLECTORS AT THE PAVEMENT EDGE, AS DIRECTED BY THE CONSTRUCTION OBSERVER. TREAT PAVEMENT DROP-OFFS CREATED BY ACP OPERATIONS IN A SIMILAR MANNER AND IN ACCORDANCE WITH THE DETAILS SHOWN IN THE PLANS.

6. WHEN EXCAVATION IS REQUIRED NEXT TO A TRAVEL LANE CARRYING TRAFFIC AND WIDENING IS NOT COMPLETED BY THE END OF THE DAY'S OPERATION, AND UNLESS OTHERWISE PERMITTED IN THE PLANS, PLACE SUFFICIENT BACKFILL AGAINST THE EDGE OF THE TRAVEL LANE IN ORDER TO PROVIDE A 3:1 SLOPE. THE BACKFILL USED SHALL BE DURABLE CRUSHED STONE TYPE OF FLEXIBLE BASE OR OTHER MATERIALS APPROVED BY THE CONSTRUCTION OBSERVER. WHEN WORK IS RESUMED ON THIS EXCAVATED AREA THIS BACKFILL MATERIAL SHALL BE INCORPORATED INTO THE ROAD WORK OR DISPOSED AS APPROVED BY THE CONSTRUCTION OBSERVER. MATERIALS AND LABOR FOR THIS WORK WILL NOT BE PAID DIRECTLY, BUT WILL BE SUBSIDIARY TO THE VARIOUS BID ITEMS.

7. EQUIP ALL CONSTRUCTION EQUIPMENT INVOLVED IN ROADWAY WORK WITH A PERMANENTLY-MOUNTED WARNING LIGHT WITH AMBER LENS AS APPROVED BY THE CONSTRUCTION OBSERVER.

8. TRAFFIC MUST BE HANDLED APPROPRIATELY THROUGHOUT THE PROJECT DURING CONSTRUCTION, AND IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO PROVIDE FOR THE SAFETY OF THE TRAVELING PUBLIC AT ALL TIMES.

9. AT POINTS WHERE IT IS NECESSARY FOR TRUCKS TO STOP AND UNLOAD, WARNING SIGNS AND FLAGGERS SHALL BE PROVIDED AS NECESSARY TO ADEQUATELY PROTECT THE TRAVELING PUBLIC.

10. ADEQUATE SIGNS, BARRICADES, AND OTHER TRAFFIC CONTROL DEVICES SHALL BE APPROVED BY THE CONSTRUCTION OBSERVER AND THEN INSTALLED BY THE CONTRACTOR PRIOR TO BEGINNING OF CONSTRUCTION.

11. THE CONTRACTOR MAINTAINS THE RESPONSIBILITY TO PROTECT THE UTILITIES DURING CONSTRUCTION.

12. TRAFFIC SHALL BE CONTROLLED OR DETOURED AS SHOWN ON THE PHASING PLAN SHEETS OR AS DIRECTED BY THE CONSTRUCTION OBSERVER. CONTRACTOR MAY PROPOSE AN OPTIONAL CONSTRUCTION SEQUENCING AND TRAFFIC CONTROL PLAN, TO BE APPROVED BY THE CONSTRUCTION OBSERVER.

13. CONSTRUCTION IN ANY AREA THAT IS ADVERSELY AFFECTING TRAFFIC FLOW MUST BE PURSUED DILIGENTLY BY THE CONTRACTOR. IF, IN THE OPINION OF THE CONSTRUCTION OBSERVER, CONSTRUCTION IS NOT PROCEEDING TOWARDS COMPLETION IN THESE AREAS, THE CONSTRUCTION OBSERVER MAY REQUIRE THE CONTRACTOR TO ALTER THE WORK SCHEDULE TO EXPEDITE COMPLETION IN THE AREAS OF CONCERN.

14. THE USE OF ADVANCE WARNING FLASHING ARROW PANELS ARE REQUIRED FOR THE CLOSING OF TRAFFIC LANES. THE CONTRACTOR SHALL BE REQUIRED TO FURNISH ONE STAND-BY UNIT, IN GOOD WORKING CONDITION AT THE JOB SITE, READY FOR IMMEDIATE USE.

15. ALL TEMPORARY TRAFFIC CONTROL DEVICES SHALL BE REMOVED AS SOON AS PRACTICAL WHEN THEY ARE NO LONGER NEEDED. WHEN WORK IS SUSPENDED FOR SHORT PERIODS OF TIME, TEMPORARY TRAFFIC CONTROL DEVICES THAT ARE NO LONGER APPROPRIATE SHALL BE REMOVED OR COVERED.

16. CHANNELIZING DEVICE LOCATIONS SHOWN ON THE TRAFFIC CONTROL PLAN SHEETS ARE APPROXIMATE. ACTUAL LOCATIONS SHALL BE DETERMINED IN THE FIELD USING SUGGESTED SPACING SHOWN ON THE TCP STANDARDS.

17. ADDITIONAL SIGNS, BARRICADES AND/OR OTHER CHANNELIZING DEVICES MAY BE NEEDED, REQUIRED AND/OR ADJUSTED TO MATCH FIELD CONDITIONS AS DIRECTED BY THE CONSTRUCTION OBSERVER.

18. ACCESS TO ALL SIDE STREETS AND DRIVEWAYS SHALL BE MAINTAINED AT ALL TIMES AT THE SOLE EXPENSE OF THE CONTRACTOR. THE CONTRACTOR WILL CONTACT THE BUSINESS OR PROPERTY OWNER AT LEAST 5 DAYS IN ADVANCE OF DRIVEWAY CONSTRUCTION. IF THE PROPERTY OWNER HAS MORE THAN ONE DRIVEWAY, CONSTRUCTION WILL ONLY BE PERMITTED ON ONE DRIVEWAY AT A TIME. IT IS THE CONTRACTORS RESPONSIBILITY TO PROVIDE ADEQUATE TEMPORARY SURFACING FOR TRANSITIONS BETWEEN PAVEMENT ELEVATIONS.

19. REFER TO STANDARD BC(2)-14 FOR ADDITIONAL INFORMATION ON THE TYPICAL LOCATION OF CROSSROAD SIGNS. ALL SIDE STREETS WITHIN THE PROJECT LIMITS SHALL HAVE CROSSROAD SIGNS IN ACCORDANCE WITH THIS STANDARD. ALL PROJECT LIMIT WARNING SIGNS SHALL BE PLACED PRIOR TO CONSTRUCTION BEGINNING AT THE RELEVANT LOCATION AND ARE TO REMAIN IN PLACE THROUGHOUT THE DURATION OF THE PROJECT UNLESS OTHERWISE DIRECTED BY THE CONSTRUCTION OBSERVER.

20. EXISTING SMALL SIGNS ARE TO REMAIN IN PLACE DURING CONSTRUCTION UNLESS REMOVAL OR RELOCATION IS REQUIRED BY PROPOSED CONSTRUCTION. EXISTING SIGNS THAT WILL REMAIN IN PLACE BUT ARE NOT APPROPRIATE FOR CONSTRUCTION CONDITIONS SHALL BE COVERED.

21. NO EQUIPMENT OR MATERIALS SHALL BE STORED WITHIN THE CLEAR ZONE UNLESS OTHERWISE APPROVED BY THE CONSTRUCTION OBSERVER.

22. CONTRACTOR SHALL BE RESPONSIBLE FOR TEMPORARY DRAINAGE BY MAINTAINING FLOW TO EXISTING INLETS, SO THAT DURING CONSTRUCTION ACTIVITIES THE PERFORMANCE OF EXISTING DRAINAGE STRUCTURES OR FEATURES IS NOT DECREASED.

23. CULVERTS THAT ARE DEPICTED IN THE PLANS SHOULD BE CONSTRUCTED DURING THE ASSOCIATED PHASE. REFER TO DRAINAGE PLANS FOR ADDITIONAL INFORMATION.

24. CONSTRUCTION TRAFFIC CROSSING, ENTERING OR EXITING A ROADWAY WITHOUT THE USE OF FLAGGERS WILL REQUIRE TRUCK CROSSING SIGNS.

CONSTRUCTION SEQUENCE NARRATIVE

PLACE ADVANCE WARNING SIGNS PRIOR TO ANY CONSTRUCTION ACTIVITY. CONSTRUCT ASPHALT PAVEMENT TO BELOW FINAL GRADE DURING CONSTRUCTION. PLACE 2" HMAC OVERLAY IN PHASE 2.

PHASE 1

CLOSE SE INNER LOOP AT VARIOUS LOCATIONS AND DETOUR TRAFFIC ONTO EXISTING ROADS. CONSTRUCT CROSS CULVERTS, WILCO WAY INTERSECTION, AND DRIVEWAYS. PLACE TEMPORARY STRIPING & BARRIER TO BE USED IN PHASE 2. CLOSURE DATES AND TIMES MUST BE APPROVED BY THE CONSTRUCTION OBSERVER.

STEP A: (CULVERT 1 CONSTRUCTION)
1. CLOSE SE INNER LOOP FROM MAPLE ST TO STA 100+25 AND DETOUR TRAFFIC AS DETAILED IN PHASE 1A DETOUR LAYOUT.
2. CONSTRUCT CULVERT 1. WILCO WAY INTERSECTION TO REMAIN OPEN DURING STEP A.

STEP B: (WILCO WAY TIE-IN)
1. CLOSE SE INNER LOOP FROM MAPLE ST TO STA 101+75, INCLUDING WILCO WAY INTERSECTION. DETOUR TRAFFIC AS DETAILED IN PHASE 1B DETOUR LAYOUT.
2. CONSTRUCT PROPOSED WIDENING FROM STA 100+25 TO STA 101+75 AND WILCO WAY INTERSECTION. IF DIRECTED BY THE CONSTRUCTION OBSERVER, USE FULL DEPTH ASPHALT FOR THE WILCO WAY INTERSECTION. NO ADDITIONAL PAYMENT WILL BE MADE FOR THIS OPTION.
3. PLACE TEMPORARY LOW PROFILE CONCRETE BARRIER (LPCB) AND STRIPING ALONG OUTSIDE OF WB TRAFFIC LANE FROM MAPLE ST TO WILCO WAY.
4. OPEN WILCO WAY INTERSECTION TO TRAFFIC.

STEP C: (CULVERT 2 CONSTRUCTION AND DWW110 CONSTRUCTION)
1. CLOSE SE INNER LOOP FROM STA 108+00 TO SOUTHWESTERN BLVD, INCLUDING DRIVEWAY DWW110. DETOUR TRAFFIC AS DETAILED IN PHASE 1C DETOUR LAYOUT.
2. CONSTRUCT CULVERT 2, PROPOSED WIDENING FROM STA 109+00 TO STA 111+00 AND DRIVEWAY DWW110.
3. PLACE TEMPORARY LPCB AND STRIPING ALONG OUTSIDE OF WB TRAFFIC LANE FROM DRIVEWAY DWW110 TO END PROJECT.
4. OPEN DWW110 TO TRAFFIC.

STEP D: (COMPLETE PLACEMENT OF TEMPORARY BARRIER)
1. CLOSE SE INNER LOOP FROM WILCO WAY TO DWW110 AND DETOUR TRAFFIC AS DETAILED IN PHASE 1D DETOUR LAYOUT.
2. PLACE TEMPORARY LPCB AND STRIPING ALONG OUTSIDE OF WB TRAFFIC LANE FROM WILCO WAY TO DWW110.
3. REMOVE DETOUR SIGNAGE AND OPEN

PHASE 2

1. CONSTRUCT REMAINDER OF WIDENING PAVEMENT AND DRIVEWAY DWW105 BEHIND LPCB PLACED IN PHASE 1.
2. REMOVE LPCB AND REPLACE WITH CHANNELIZERS AT 90' SPACING.
3. PLACE 2" OVERLAY ON ASPHALT PAVEMENT AND INSTALL FINAL PROPOSED PAVEMENT MARKINGS. SHIFT TRAFFIC AS DIRECTED BY CONSTRUCTION OBSERVER. REFER TO MOBILE OPERATIONS STANDARD TCP (3-1)-13 FOR ADDITIONAL DETAILS.
4. SHIFT TRAFFIC TO FINAL CONFIGURATION.
5. CONSTRUCT SIDEWALK AND WATER QUALITY PONDS.
6. REMOVE ALL REMAINING TRAFFIC CONTROL DEVICES.

STATE OF TEXAS
JAMES BROOKS
101002
LICENSED PROFESSIONAL ENGINEER
6/26/2017

NO.	REVISION	BY	DATE

WILLIAMSON COUNTY
1848

RTG RODRIGUEZ TRANSPORTATION GROUP
FIRM #587

GEORGETOWN INNER LOOP

TRAFFIC CONTROL PLAN

CONSTRUCTION SEQUENCE NARRATIVE

6/26/2017 SHEET 1 OF 1

DESIGNED:	PROJECT NUMBER		ROADWAY	
CHECKED:			SE INNER LOOP	
DRAWN:	STATE	COUNTY	CITY	SHEET No.
CHECKED:	TEXAS	WILLIAMSON	GEORGETOWN	13

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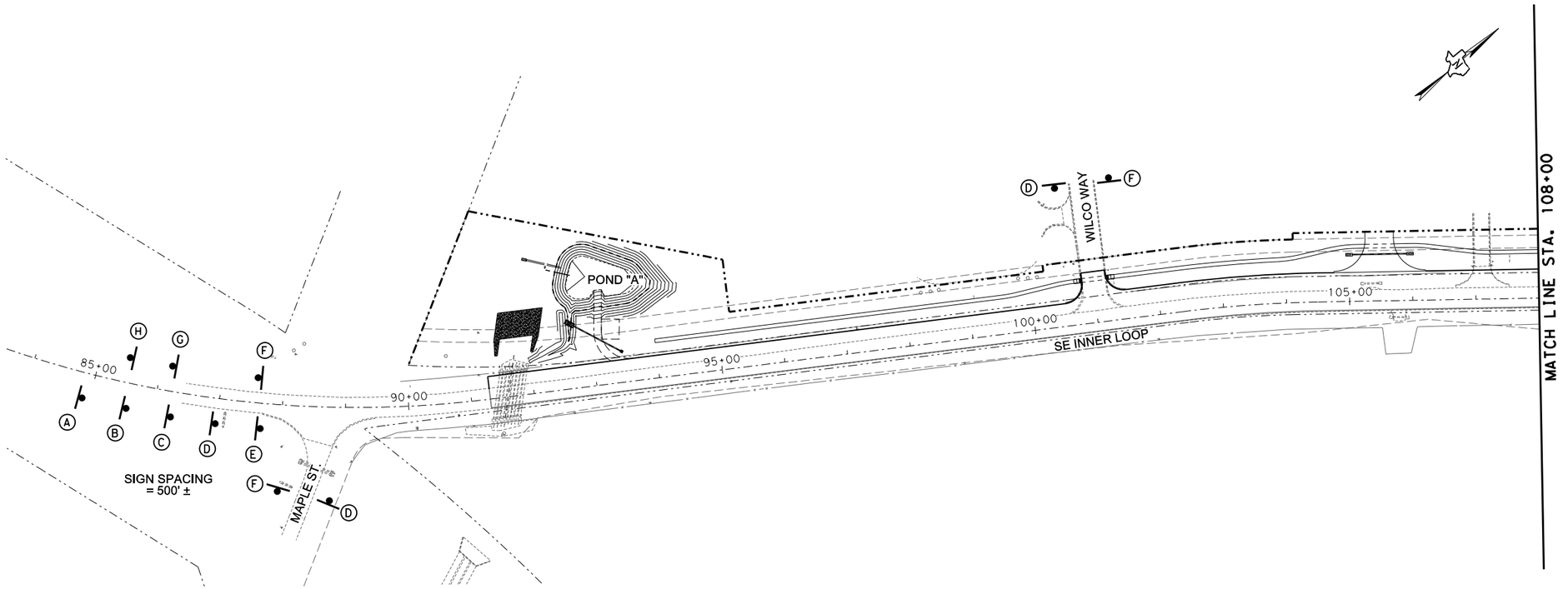

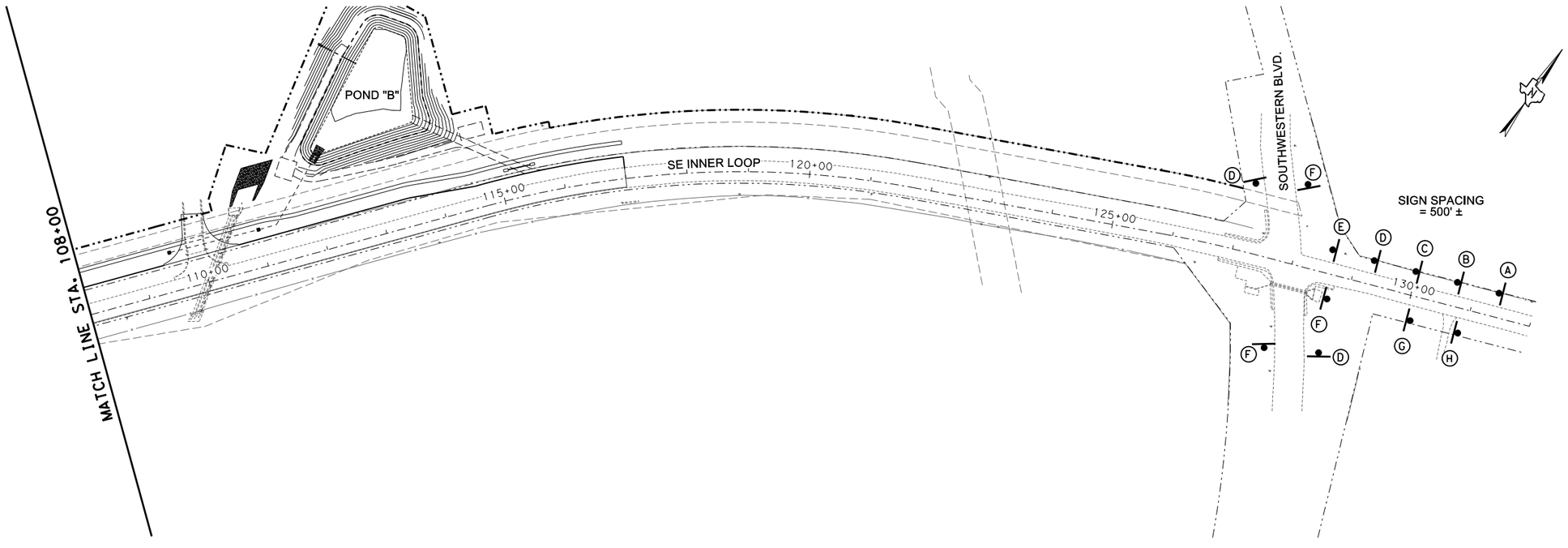

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SCALE IN FEET

Ⓐ OBEY WARNING SIGNS STATE LAW — R20-3

Ⓑ BEGIN WORK ZONE — G20-9T
TRAFFIC FINES DOUBLE — R20-5
WHEN WORKERS ARE PRESENT PLAQUE — R20-5

Ⓒ WORK ZONE — G20-9
SPEED LIMIT 45 — R2-1

Ⓓ ROAD WORK AHEAD — CW20-1D

Ⓔ BEGIN ROAD WORK NEXT 1 MILE — R20-3
NAME ADDRESS CITY STATE CONTRACTOR — G20-6

Ⓕ END ROAD WORK — G20-2

Ⓖ SPEED LIMIT 55 — R2-1

Ⓗ END WORK ZONE — G20-2bT

STATE OF TEXAS
JAMES BROOKS
101002
LICENSED PROFESSIONAL ENGINEER
6/24/2017

NO.	REVISION	BY	DATE

WILLIAMSON COUNTY 1848

RTG RODRIGUEZ TRANSPORTATION GROUP FIRM #587

GEORGETOWN INNER LOOP

TRAFFIC CONTROL PLAN

ADVANCE WARNING SIGN LAYOUT

6/24/2017 SHEET 1 OF 1

DESIGNED:	PROJECT NUMBER		ROADWAY	
CHECKED:			SE INNER LOOP	
DRAWN:	STATE	COUNTY	CITY	SHEET No.
CHECKED:	TEXAS	WILLIAMSON	GEORGETOWN	14

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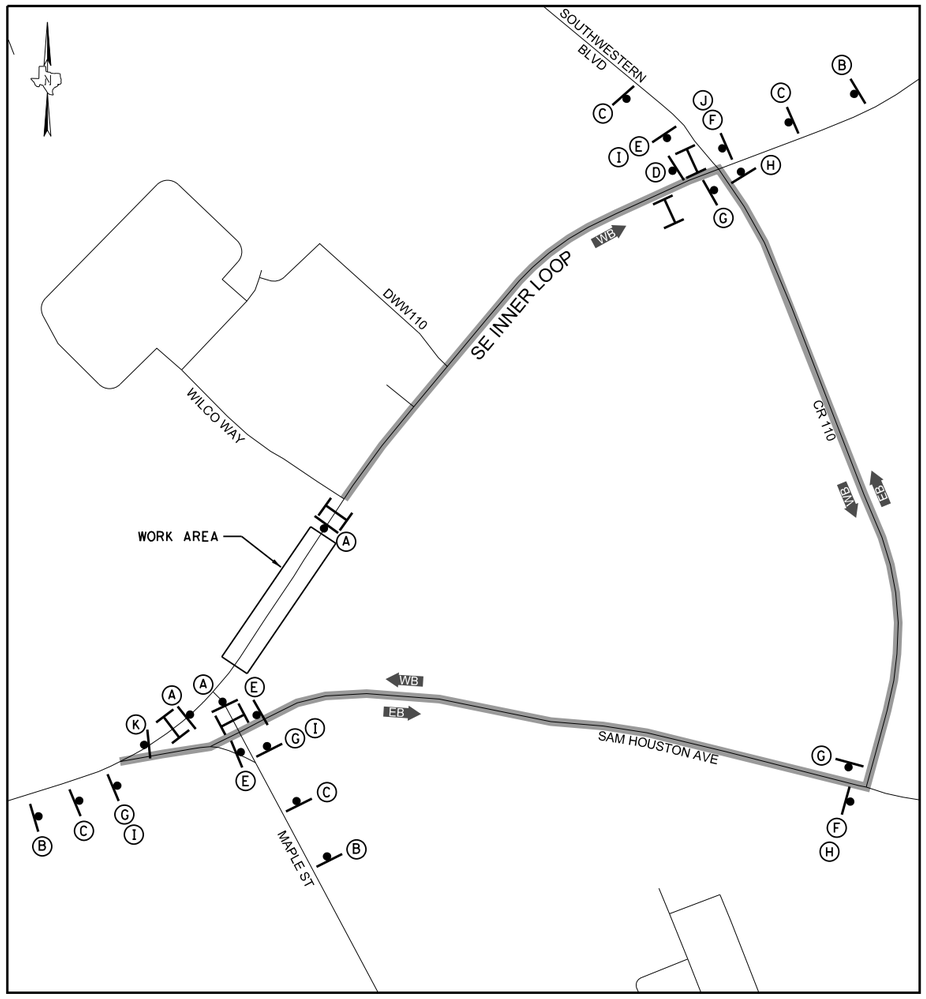
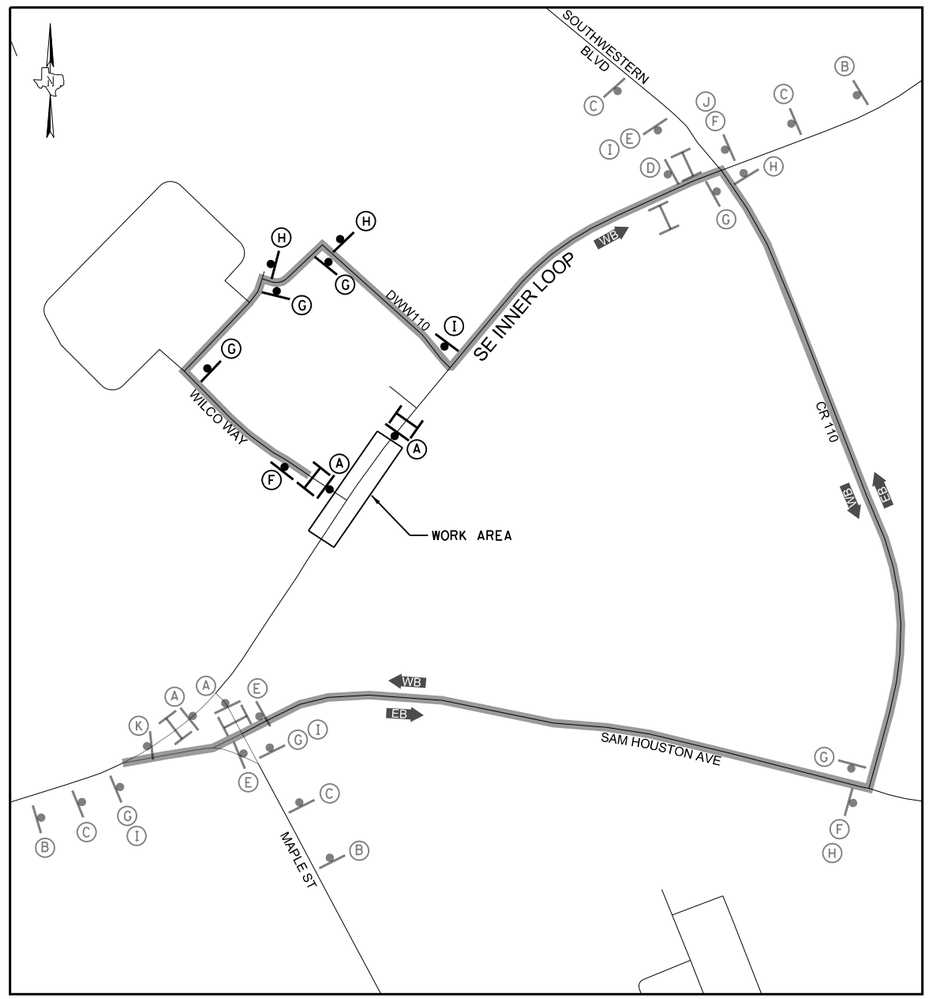


PHASE 1A



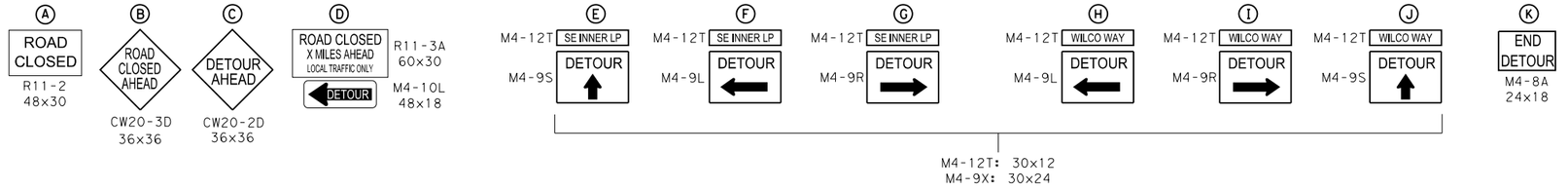
PHASE 1B

LEGEND

- EB — EASTBOUND TRAFFIC FLOW
- WB — WESTBOUND TRAFFIC FLOW
- TY 3 BARRICADE(S)
- TEMPORARY SIGN

NOTES:

1. DETOUR APPROACH SIGNS SHOULD BE SPACED APPROXIMATELY 500' APART.
2. CHANGES TO THE SUGGESTED TRAFFIC CONTROL PLAN MUST BE APPROVED BY THE ENGINEER.
3. DYNAMIC MESSAGE SIGNS SHOULD BE IN PLACE AT LEAST 1 WEEK BEFORE TRAFFIC IS DETOURED.



STATE OF TEXAS
JAMES BROOKS
101002
LICENSED PROFESSIONAL ENGINEER
6/24/2017

NO.	REVISION	BY	DATE

WILLIAMSON COUNTY
1848

RTG RODRIGUEZ TRANSPORTATION GROUP
FIRM #587

GEORGETOWN INNER LOOP

TRAFFIC CONTROL PLAN

PHASE 1 DETOUR LAYOUT

6/24/2017 SHEET 1 OF 2

DESIGNED:	PROJECT NUMBER		ROADWAY	
CHECKED:			SE INNER LOOP	
DRAWN:	STATE	COUNTY	CITY	SHEET No.
CHECKED:	TEXAS	WILLIAMSON	GEORGETOWN	15

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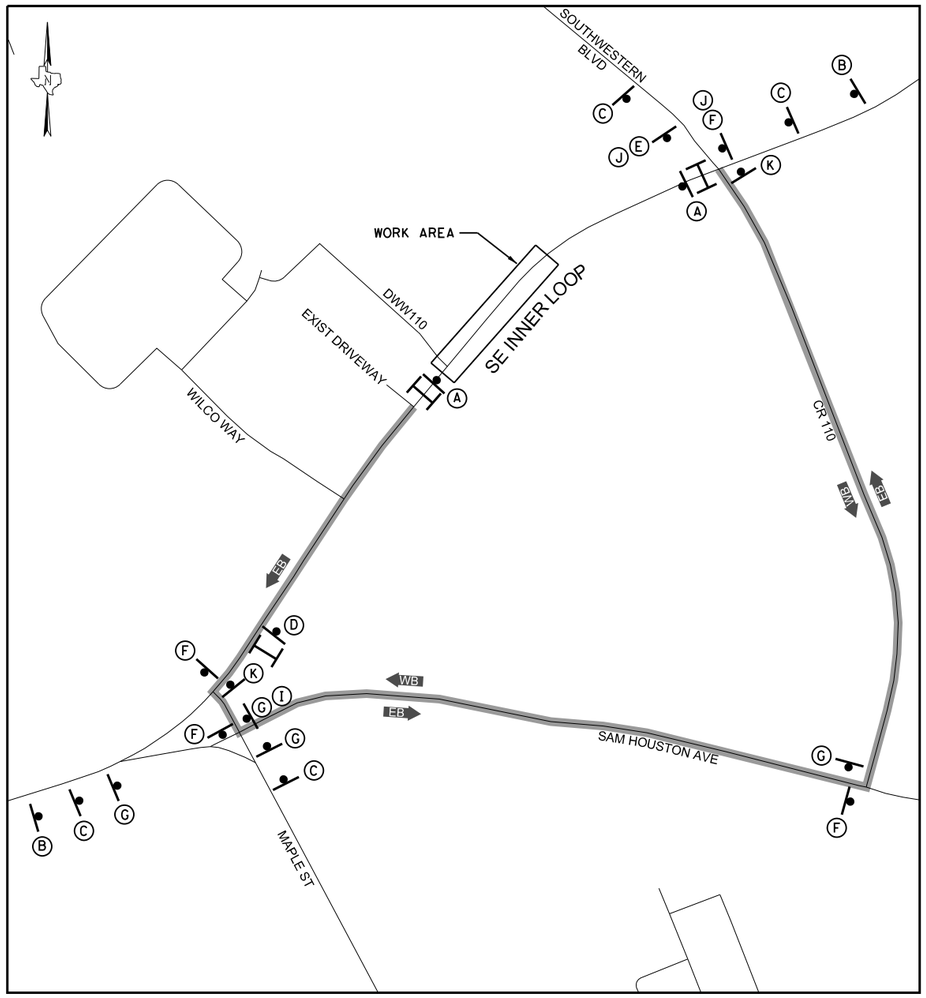

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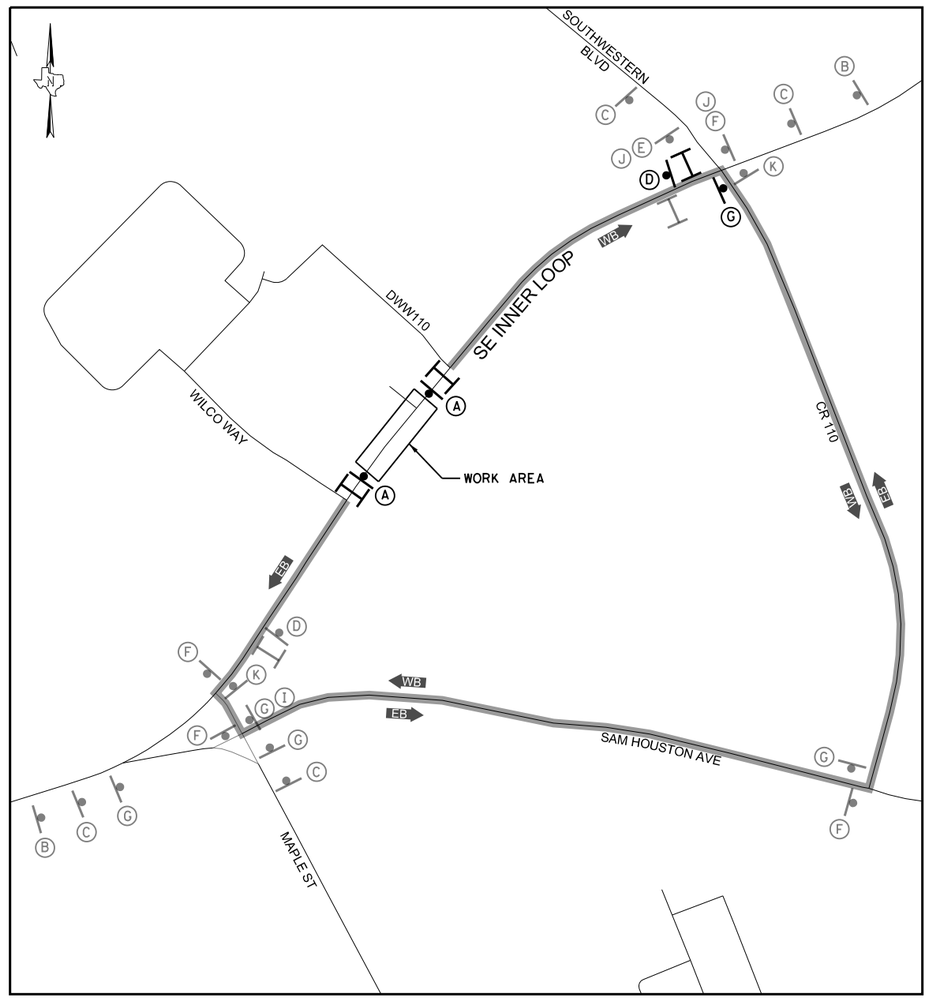


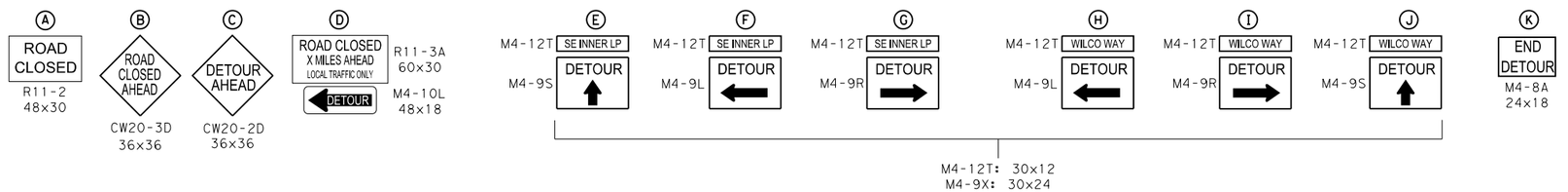
PHASE 1D

LEGEND

- EB — EASTBOUND TRAFFIC FLOW
- WB — WESTBOUND TRAFFIC FLOW
- TY 3 BARRICADE(S)
- TEMPORARY SIGN

NOTES:

1. DETOUR APPROACH SIGNS SHOULD BE SPACED APPROXIMATELY 500' APART.
2. CHANGES TO THE SUGGESTED TRAFFIC CONTROL PLAN MUST BE APPROVED BY THE ENGINEER.



STATE OF TEXAS
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6/24/2017

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WILLIAMSON COUNTY
1848

RTG RODRIGUEZ TRANSPORTATION GROUP FIRM #587

GEORGETOWN INNER LOOP

TRAFFIC CONTROL PLAN

PHASE 1 DETOUR LAYOUT

6/24/2017 SHEET 2 OF 2

DESIGNED:	PROJECT NUMBER		ROADWAY	
CHECKED:			SE INNER LOOP	
DRAWN:	STATE	COUNTY	CITY	SHEET No.
CHECKED:	TEXAS	WILLIAMSON	GEORGETOWN	16

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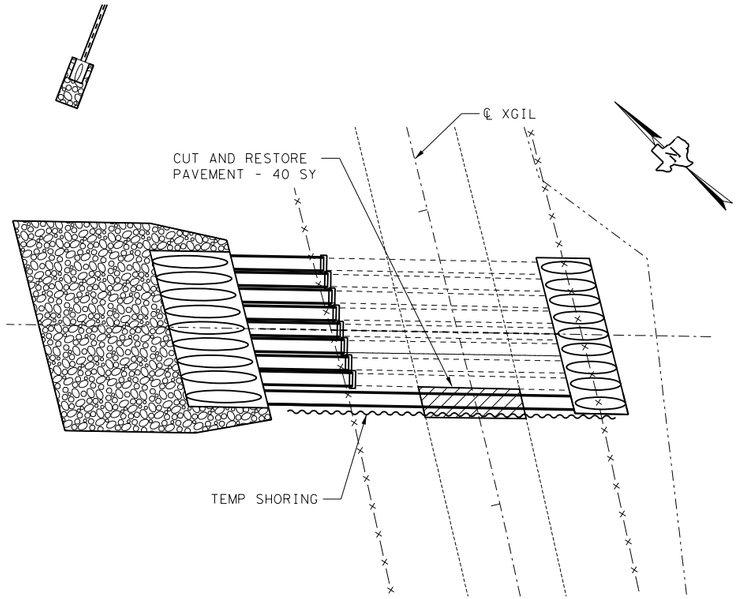

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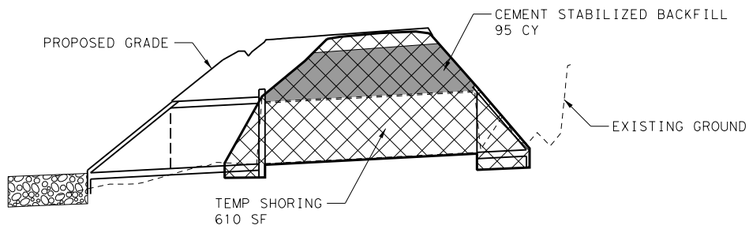
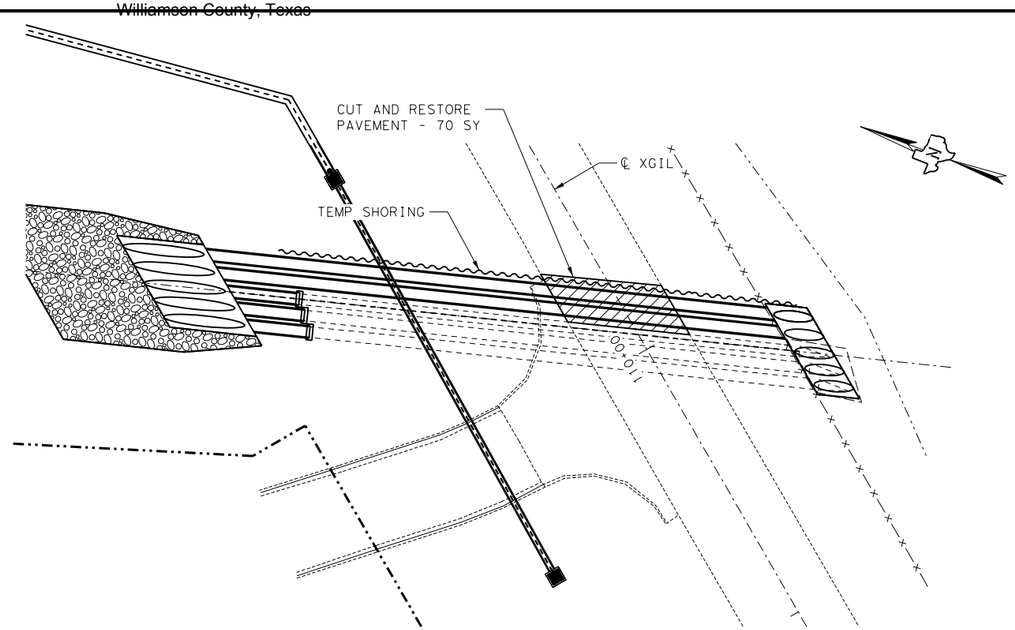


ELEVATION

CULVERT 1



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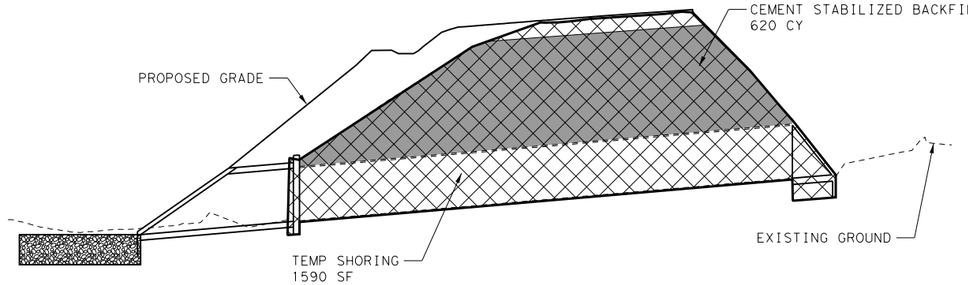
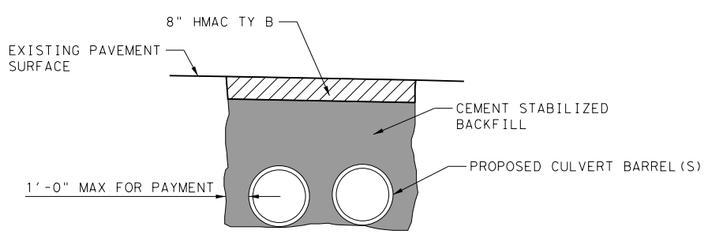


ELEVATION

CULVERT 2



BACKFILL DETAIL

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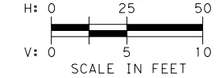

LEGEND

- CUT & RESTORE PAVEMENT
- TEMPORARY SPECIAL SHORING
- CEMENT STABILIZED BACKFILL

NOTES:

1. EXISTING UTILITIES NOT SHOWN FOR CLARITY.
2. IT IS CONTRACTOR'S RESPONSIBILITY TO MAINTAIN FLOW AT ALL TIMES DURING CONSTRUCTION.
3. REFER TO DRAINAGE PLANS FOR CULVERT INFORMATION.

STATE OF TEXAS
JAMES BROOKS
101002
LICENSED
PROFESSIONAL ENGINEER
6/26/2017

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RTG RODRIGUEZ TRANSPORTATION GROUP FIRM #587

GEORGETOWN INNER LOOP

TRAFFIC CONTROL PLAN

PHASE 1 CULVERT ADJUSTMENT DETAILS

6/26/2017 SHEET 1 OF 1

DESIGNED:	PROJECT NUMBER		ROADWAY	
CHECKED:			SE INNER LOOP	
DRAWN:	STATE	COUNTY	CITY	SHEET No.
CHECKED:	TEXAS	WILLIAMSON	GEORGETOWN	17

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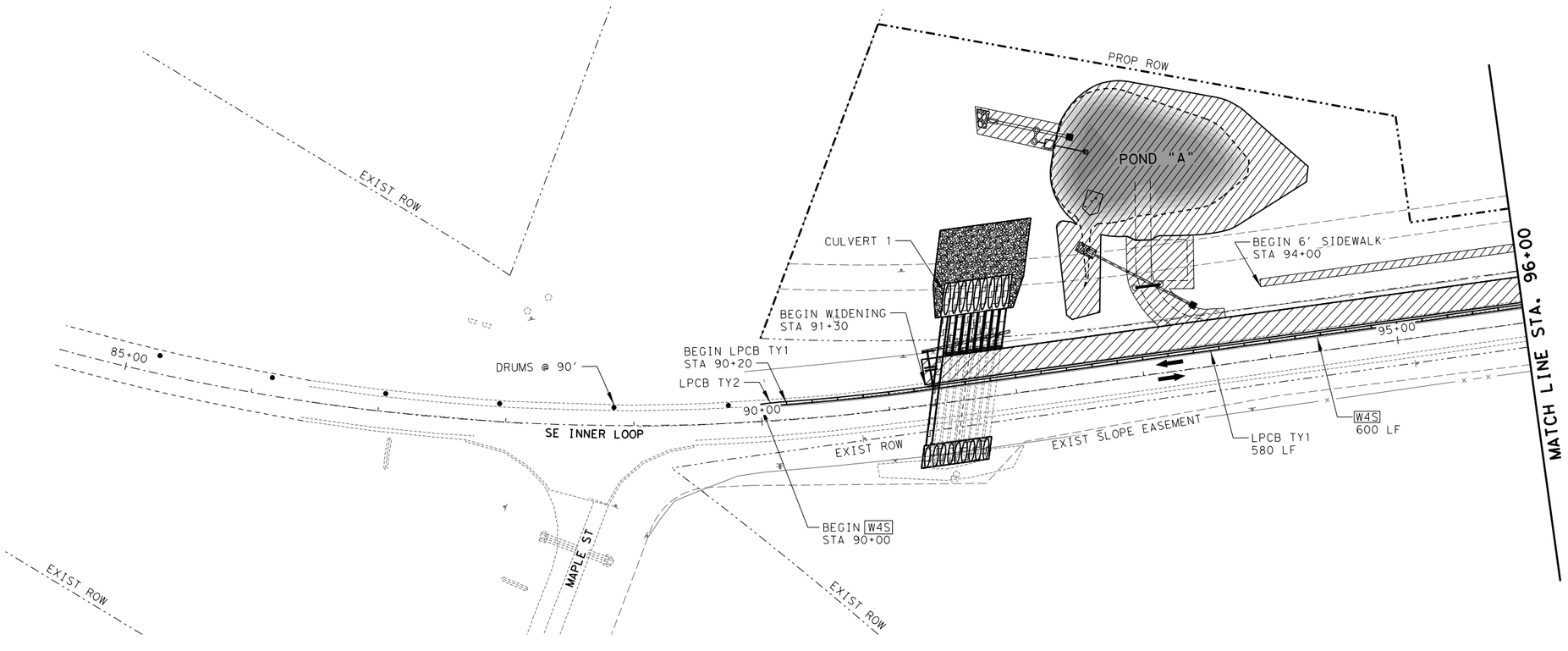

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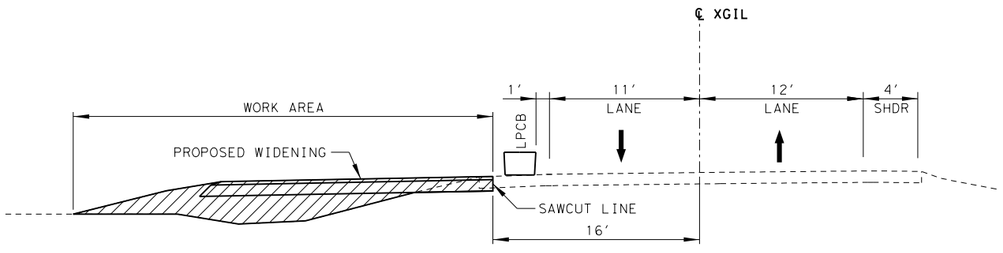
SCALE IN FEET

LEGEND

- PHASE 2 CONSTRUCTION
- PHASE 1 CONSTRUCTION
- LPCB (PLACED IN PHASE 1)
- CHANNELIZER
- TRAVEL DIRECTION
- W4S WK ZN PAV MRK NON-REMOV (W)4"(SLD) (PLACED IN PHASE 1)



PHASE 2 TYPICAL SECTION

NOT TO SCALE

STATE OF TEXAS
ROBERT CARRILLO
80169
REGISTERED PROFESSIONAL ENGINEER

6/24/2017

Robert Carrillo, PE

NO.	REVISION	BY	DATE

WILLIAMSON COUNTY 1848

RTG RODRIGUEZ TRANSPORTATION GROUP FIRM #587

GEORGETOWN INNER LOOP

TRAFFIC CONTROL PLAN

PHASE 2
BEGIN PROJECT - STA. 96+00

6/24/2017 SHEET 1 OF 3

DESIGNED:	PROJECT NUMBER		ROADWAY	
CHECKED:			SE INNER LOOP	
DRAWN:	STATE	COUNTY	CITY	SHEET No.
CHECKED:	TEXAS	WILLIAMSON	GEORGETOWN	18

sbrooks
6/24/2017 7:21
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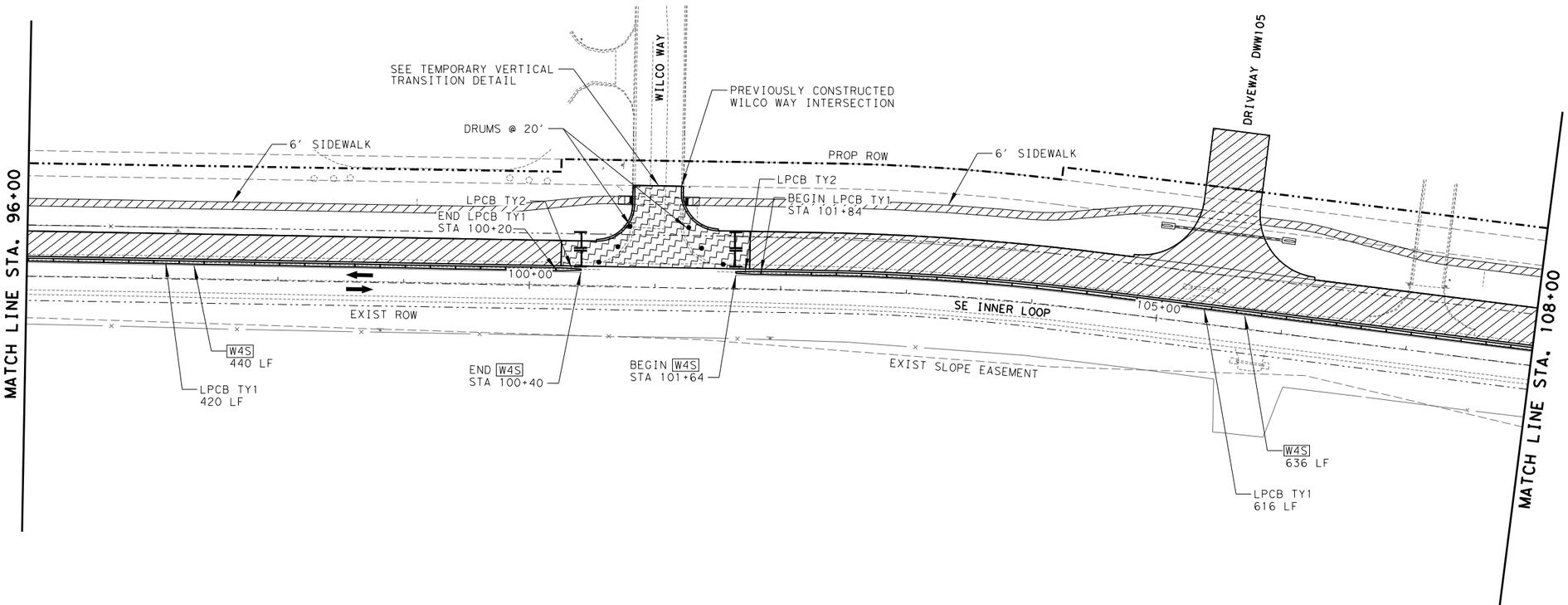
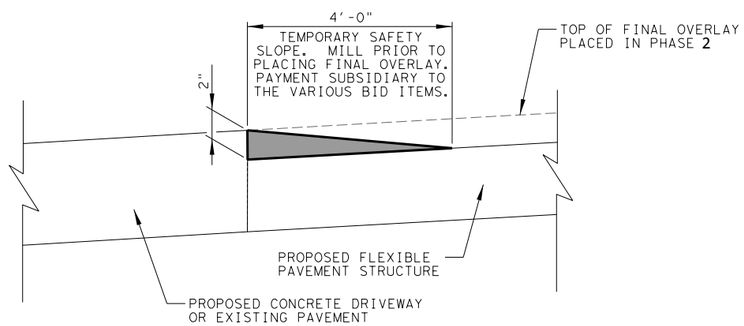


0 50 100

SCALE IN FEET

LEGEND

- PHASE 2 CONSTRUCTION
- PHASE 1 CONSTRUCTION
- LPCB (PLACED IN PHASE 1)
- CHANNELIZER
- TRAVEL DIRECTION
- W4S WK ZN PAV MRK NON-REMOV (W)4"(SLD) (PLACED IN PHASE 1)



TEMPORARY VERTICAL TRANSITION DETAIL

NOT TO SCALE

STATE OF TEXAS
JAMES BROOKS
101002
LICENSED PROFESSIONAL ENGINEER

6/24/2017

NO.	REVISION	BY	DATE

WILLIAMSON COUNTY 1848

RTG RODRIGUEZ TRANSPORTATION GROUP FIRM #587

GEORGETOWN INNER LOOP

TRAFFIC CONTROL PLAN

PHASE 2
STA. 96+00 - STA. 108+00

6/24/2017 SHEET 2 OF 3

DESIGNED:	PROJECT NUMBER		ROADWAY	
CHECKED:			SE INNER LOOP	
DRAWN:	STATE	COUNTY	CITY	SHEET No.
CHECKED:	TEXAS	WILLIAMSON	GEORGETOWN	19

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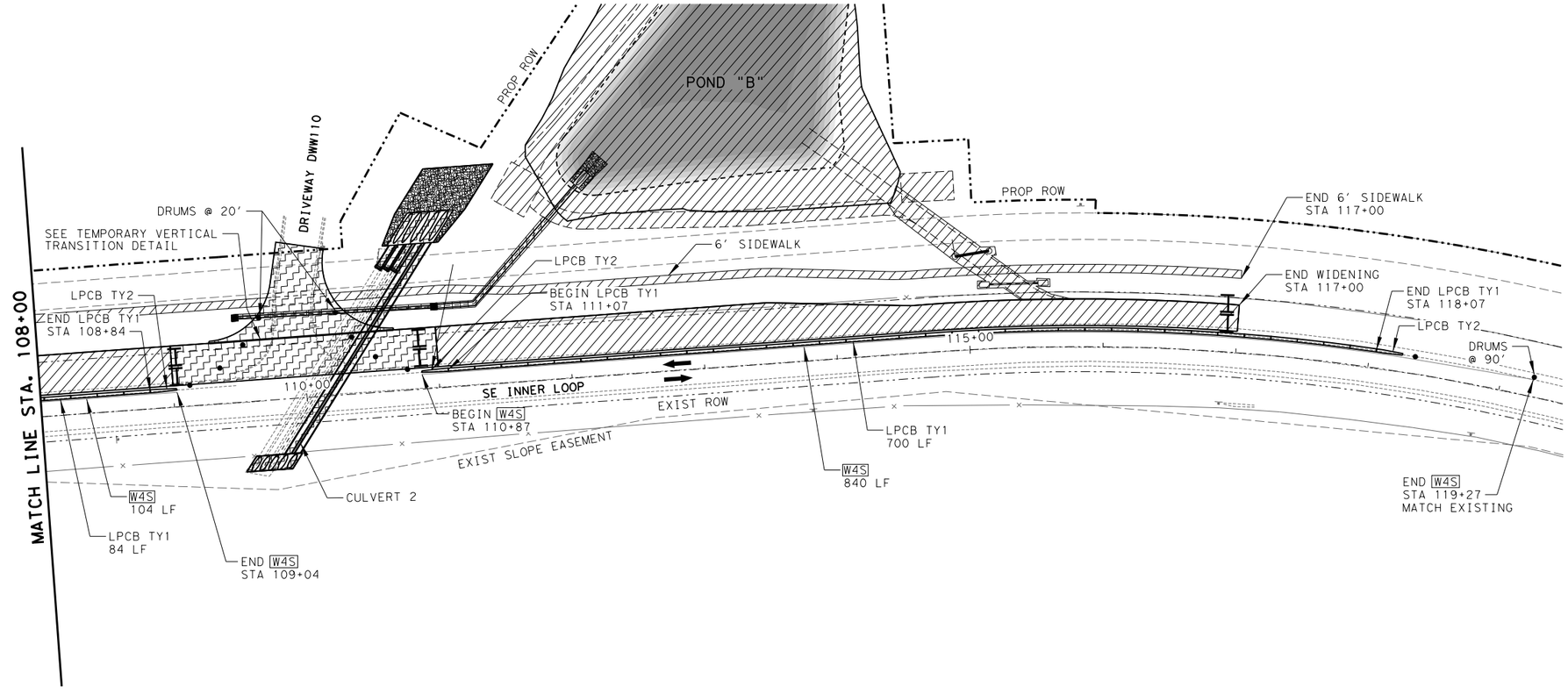

0 50 100

SCALE IN FEET

LEGEND

- PHASE 2 CONSTRUCTION
- PHASE 1 CONSTRUCTION
- LPCB (PLACED IN PHASE 1)
- CHANNELIZER
- TRAVEL DIRECTION
- W4S WK ZN PAV MRK NON-REMOV (W)4"(SLD) (PLACED IN PHASE 1)

STATE OF TEXAS
JAMES BROOKS
101002
LICENSED PROFESSIONAL ENGINEER

6/24/2017

NO.	REVISION	BY	DATE

WILLIAMSON COUNTY 1848

RTG RODRIGUEZ TRANSPORTATION GROUP FIRM #587

GEORGETOWN INNER LOOP

TRAFFIC CONTROL PLAN

PHASE 2
STA. 108+00 - END PROJECT

6/24/2017 SHEET 3 OF 3

DESIGNED:	PROJECT NUMBER		ROADWAY	
CHECKED:			SE INNER LOOP	
DRAWN:	STATE	COUNTY	CITY	SHEET No.
CHECKED:	TEXAS	WILLIAMSON	GEORGETOWN	20

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BARRICADE AND CONSTRUCTION (BC) STANDARD SHEETS GENERAL NOTES:

1. The Barricade and Construction Standard Sheets (BC sheets) are intended to show typical examples for placement of temporary traffic control devices, construction pavement markings, and typical work zone signs. The information contained in these sheets meet or exceed the requirements shown in the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD).

2. The development and design of the Traffic Control Plan (TCP)is the responsibility of the Engineer.

3. The Contractor may propose changes to the TCP that are signed and sealed by a licensed professional engineer for approval. The Engineer may develop, sign and seal Contractor proposed changes.

4. The Contractor is responsible for installing and maintaining the traffic control devices as shown in the plans. The Contractor may not move or change the approximate location of any device without the approval of the Engineer.

5. Geometric design of lane shifts and detours should, when possible, meet the applicable design criteria contained in manuals such as the American Association of State Highway and Transportation Officials (AASHTO), "A Policy on Geometric Design of Highways and Streets," the TxDOT "Roadway Design Manual" or engineering judgment.

6. When projects abut, the Engineer(s) may omit the END ROAD WORK, TRAFFIC FINES DOUBLE, and other advance warning signs if the signing would be redundant and the work areas appear continuous to the motorists. If the adjacent project is completed first, the Contractor shall erect the necessary warning signs as shown on these sheets, the TCP sheets or as directed by the Engineer. The BEGIN ROAD WORK NEXT X MILES sign shall be revised to show appropriate work zone distance.

7. The Engineer may require duplicate warning signs on the median side of divided highways where median width will permit and traffic volumes justify the signing.

8. All signs shall be constructed in accordance with the details found in the "Standard Highway Sign Designs for Texas," latest edition. Sign details not shown in this manual shall be shown in the plans or the Engineer shall provide a detail to the Contractor before the sign is manufactured.

9. The temporary traffic control devices shown in the illustrations of the BC sheets are examples. As necessary, the Engineer will determine the most appropriate traffic control devices to be used.

10. As shown on BC(2), the OBEY WARNING SIGNS STATE LAW sign, STAY ALERT TALK OR TEXT LATER (see Sign Detail G20-10T) and the WORK ZONE TRAFFIC FINES DOUBLE sign with plaque shall be erected in advance of the CSJ limits. However, the TRAFFIC FINES DOUBLE sign will not be required on projects consisting solely of mobile operation work, such as striping or milling edgeline rumble strips. The BEGIN ROAD WORK NEXT X MILES, CONTRACTOR and END ROAD WORK signs shall be erected at or near the CSJ limits.

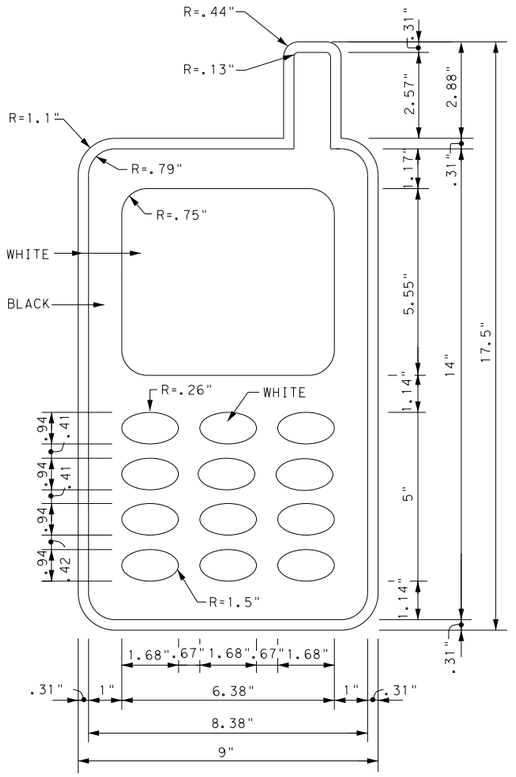
11. Except for devices required by Note 10, traffic control devices should be in place only while work is actually in progress or a definite need exists.

12. The Engineer has the final decision on the location of all traffic control devices.

13. Inactive equipment and work vehicles, including workers' private vehicles must be parked away from travel lanes. They should be as close to the right-of-way line as possible, or located behind a barrier or guardrail, or as approved by the Engineer.

WORKER SAFETY APPAREL NOTES:

1. Workers on foot who are exposed to traffic or to construction equipment within the right-of-way shall wear high-visibility safety apparel meeting the requirements of ISEA "American National Standard for High-Visibility Apparel," or equivalent revisions, and labeled as ANSI 107-2004 standard performance for Class 2 or 3 risk exposure. Class 3 garments should be considered for high traffic volume work areas or night time work.



3.0" Radius, 1.25" Border, 0.75" Indent, Black on Yellow;
[STAY ALERT] Font: D
3.0" Radius, 1.25" Border, 0.75" Indent, Black on Orange;
[TALK OR TEXT LATER] Font: C specified length;

SIGN DETAIL (G20-10T)

Only pre-qualified products shall be used. The "Compliant Work Zone Traffic Control Devices List" (CWZTCD) describes pre-qualified products and their sources and may be found on-line at the web address given below or by contacting:

Texas Department of Transportation
Traffic Operations Division - TE
Phone (512) 416-3118

THE DOCUMENTS BELOW CAN BE FOUND ON-LINE AT http://www.txdot.gov
COMPLIANT WORK ZONE TRAFFIC CONTROL DEVICES LIST (CWZTCD)
DEPARTMENTAL MATERIAL SPECIFICATIONS (DMS)
MATERIAL PRODUCER LIST (MPL)
ROADWAY DESIGN MANUAL - SEE "MANUALS (ONLINE MANUALS)"
STANDARD HIGHWAY SIGN DESIGNS FOR TEXAS (SHSD)
TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (TMUTCD)
TRAFFIC ENGINEERING STANDARD SHEETS

Texas Department of Transportation | Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION GENERAL NOTES AND REQUIREMENTS

BC(1)-14

FILE: bc-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS				SE INNER LP
4-03 5-10 8-14	DIST	COUNTY		SHEET NO.
9-07 7-13		WILLIAMSON		21

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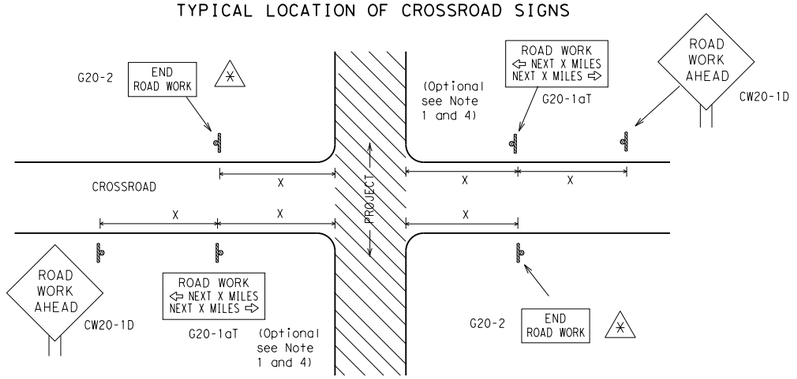
FILE: pw://rtg-pw.bentley.com:rtg-pw/Documents/8760101/dlv/standards/tcp/BC-14.dgn

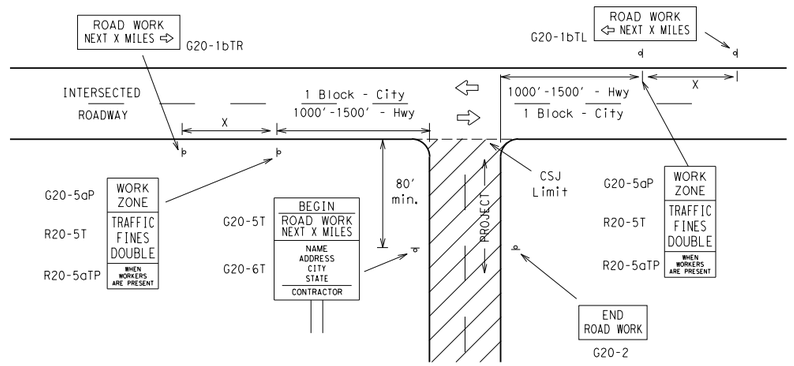
TYPICAL LOCATION OF CROSSROAD SIGNS



✳ May be mounted on back of "ROAD WORK AHEAD"(CW20-1D) sign with approval of Engineer. (See note 2 below)

1. The typical minimum signing on a crossroad approach should be a "ROAD WORK AHEAD" (CW20-1D)sign and a (G20-2) "END ROAD WORK" sign, unless noted otherwise in plans.
2. The Engineer may use the reduced size 36" x 36" ROAD WORK AHEAD (CW20-1D) sign mounted back to back with the reduced size 36" x 18" "END ROAD WORK"(G20-2) sign on low volume crossroads (see Note 4 under "Typical Construction Warning Sign Size and Spacing"). See the "Standard Highway Sign Designs for Texas" manual for sign details. The Engineer may omit the advance warning signs on low volume crossroads. The Engineer will determine whether a road is low volume. This information shall be shown in the plans.
3. Based on existing field conditions, the Engineer/Inspector may require additional signs such as FLAGGER AHEAD, LOOSE GRAVEL, or other appropriate signs. When additional signs are required, these signs will be considered part of the minimum requirements. The Engineer/Inspector will determine the proper location and spacing of any sign not shown on the BC sheets, Traffic Control Plan sheets or the Work Zone Standard Sheets.
4. The "ROAD WORK NEXT X MILES"(G20-1aT)sign shall be required at high volume crossroads to advise motorists of the length of construction in either direction from the intersection. The Engineer will determine whether a roadway is considered high volume.
5. Additional traffic control devices may be shown elsewhere in the plans for higher volume crossroads.
6. When work occurs in the intersection area, appropriate traffic control devices, as shown elsewhere in the plans or as determined by the Engineer/Inspector, shall be in place.

T-INTERSECTION



CSJ LIMITS AT T-INTERSECTION

1. The Engineer will determine the types and location of any additional traffic control devices, such as a flagger and accompanying signs, or other signs, that should be used when work is being performed at or near an intersection.
2. If construction closes the road at a T-intersection the Contractor shall place the "CONTRACTOR NAME"(G20-6T) sign behind the Type 3 Barricades for the road closure (see BC(10) also). The "ROAD WORK NEXT X MILES" left arrow(G20-1bTL) and "ROAD WORK NEXT X MILES" right arrow (G20-1bTR)" signs shall be replaced by the detour signing called for in the plans.

TYPICAL CONSTRUCTION WARNING SIGN SIZE AND SPACING

SIZE

Sign Number or Series	Conventional Road	Expressway/ Freeway
CW20[4] CW21 CW22 CW23 CW25	48" x 48"	48" x 48"
CW1, CW2, CW7, CW8, CW9, CW11, CW14	36" x 36"	48" x 48"
CW3, CW4, CW5, CW6, CW8-3, CW10, CW12	48" x 48"	48" x 48"

SPACING

Posted Speed	Sign Spacing "X" △
MPH	Feet (Apprx.)
30	120
35	160
40	240
45	320
50	400
55	500[2]
60	600[2]
65	700[2]
70	800[2]
75	900[2]
80	1000[2]
✳	✳[3]

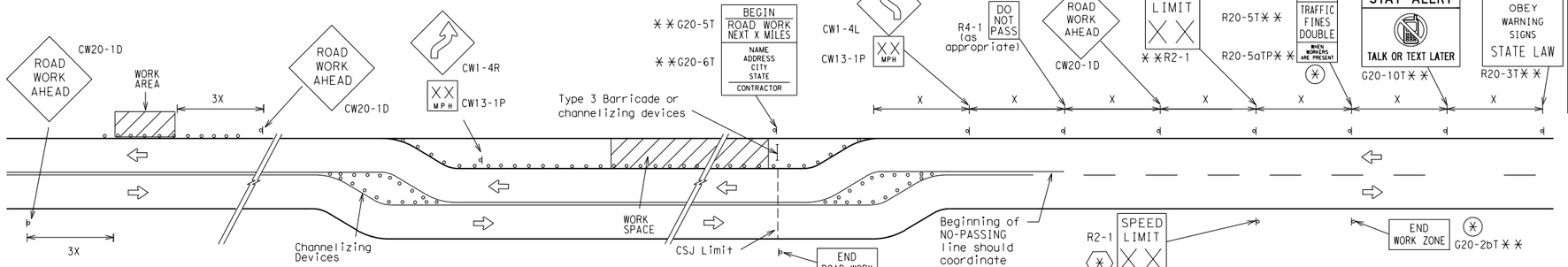
✳ For typical sign spacings on divided highways, expressways and freeways, see Part 6 of the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD) typical application diagrams or TCP Standard Sheets.

△ Minimum distance from work area to first Advance Warning sign nearest the work area and/or distance between each additional sign.

GENERAL NOTES

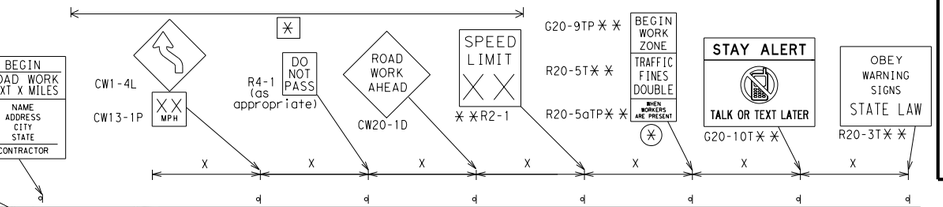
1. Special or larger size signs may be used as necessary.
2. Distance between signs should be increased as required to have 1500 feet advance warning.
3. Distance between signs should be increased as required to have 1/2 mile or more advance warning.
4. 36" x 36" "ROAD WORK AHEAD" (CW20-1D)signs may be used on low volume crossroads at the discretion of the Engineer. See Note 2 under "Typical Location of Crossroad Signs".
5. Only diamond shaped warning sign sizes are indicated.
6. See sign size listing in "TMUTCD", Sign Appendix or the "Standard Highway Sign Designs for Texas" manual for complete list of available sign design sizes.

WORK AREAS IN MULTIPLE LOCATIONS WITHIN CSJ LIMITS

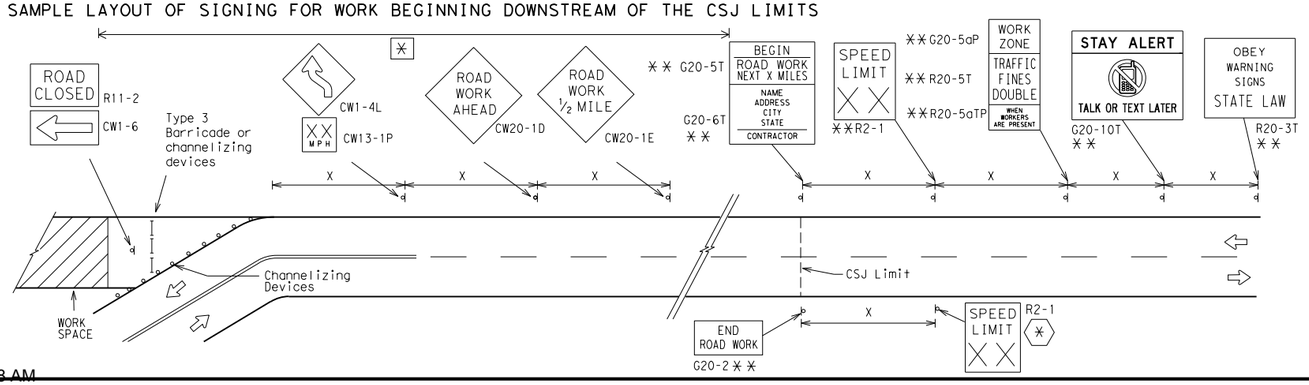


When extended distances occur between minimal work spaces, the Engineer/Inspector should ensure additional "ROAD WORK AHEAD"(CW20-1D)signs are placed in advance of these work areas to remind drivers they are still within the project limits. See the applicable TCP sheets for exact location and spacing of signs and channelizing devices.

SAMPLE LAYOUT OF SIGNING FOR WORK BEGINNING AT THE CSJ LIMITS



SAMPLE LAYOUT OF SIGNING FOR WORK BEGINNING DOWNSTREAM OF THE CSJ LIMITS



NOTES

The Contractor shall determine the appropriate distance to be placed on the G20-1 series signs and "BEGIN ROAD WORK NEXT X MILES"(G20-5T)sign for each specific project. This distance shall replace the "X" and shall be rounded to the nearest whole mile with the approval of the Engineer. No decimals shall be used.

✳ The "BEGIN WORK ZONE"(G20-9TP) and "END WORK ZONE" (G20-2bT) shall be used as shown on the sample layout when advance signs are required outside the CSJ Limits. They inform the motorist of entering or leaving a part of the work zone lying outside the CSJ Limits where traffic fines may double if workers are present.

✳✳ Required CSJ Limit signing. See Note 10 on BC(1). TRAFFIC FINES DOUBLE signs will not be required on projects consisting solely of mobile operations work.

✳ Area for placement of "ROAD WORK AHEAD" (CW20-1D)sign and other signs or devices as called for on the Traffic Control Plan.

✳ Contractor will install a regulatory speed limit sign at the end of the work zone.

LEGEND	
⊢⊣	Type 3 Barricade
○ ○ ○	Channelizing Devices
▬	Sign
X	See Typical Construction Warning Sign Size and Spacing chart or the TMUTCD for sign spacing requirements.

Texas Department of Transportation

Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION PROJECT LIMIT

BC(2)-14

FILE: bc-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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REVISIONS				SE INNER LP
9-07 8-14 7-13	DIST	COUNTY		SHEET NO.
		WILLIAMSON		22

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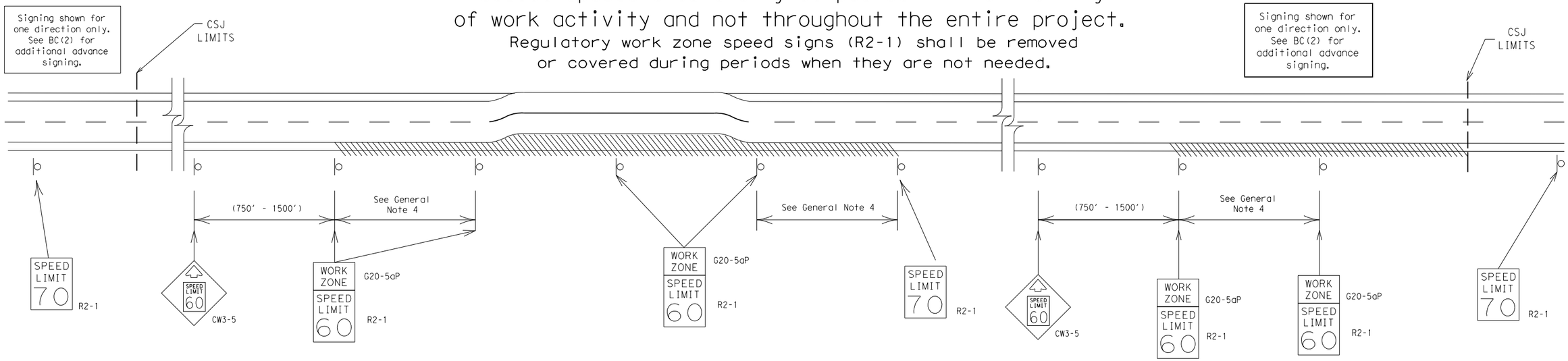
TYPICAL APPLICATION OF WORK ZONE SPEED LIMIT SIGNS

Work zone speed limits shall be regulatory, established in accordance with the "Procedures for Establishing Speed Zones," and approved by the Texas Transportation Commission, or by City Ordinance when within Incorporated City Limits.

Reduced speeds should only be posted in the vicinity of work activity and not throughout the entire project.

Regulatory work zone speed signs (R2-1) shall be removed or covered during periods when they are not needed.



GUIDANCE FOR USE:

LONG/INTERMEDIATE TERM WORK ZONE SPEED LIMITS

This type of work zone speed limit should be included on the design of the traffic control plans when restricted geometrics with a lower design speed are present in the work zone and modification of the geometrics to a higher design speed is not feasible.

Long/Intermediate Term Work Zone Speed Limit signs, when approved as described above, should be posted and visible to the motorist when work activity is present. Work activity may also be defined as a change in the roadway that requires a reduced speed for motorists to safely negotiate the work area, including:

a) rough road or damaged pavement surface
b) substantial alteration of roadway geometrics (diversions)
c) construction detours
d) grade
e) width
f) other conditions readily apparent to the driver

As long as any of these conditions exist, the work zone speed limit signs should remain in place.

SHORT TERM WORK ZONE SPEED LIMITS

This type of work zone speed limit may be included on the design of the traffic control plans when workers or equipment are not behind concrete barrier, when work activity is within 10 feet of the traveled way or actually in the travelled way.

Short Term Work Zone Speed Limit signs should be posted and visible to the motorists only when work activity is present. When work activity is not present, signs shall be removed or covered.
(See Removing or Covering on BC(4)).

GENERAL NOTES

1. Regulatory work zone speed limits should be used only for sections of construction projects where speed control is of major importance.
2. Regulatory work zone speed limit signs shall be placed on supports at a 7 foot minimum mounting height.
3. Speed zone signs are illustrated for one direction of travel and are normally posted for each direction of travel.
4. Frequency of work zone speed limit signs should be:
   40 mph and greater 0.2 to 2 miles
   35 mph and less 0.2 to 1 mile
5. Regulatory speed limit signs shall have black legend and border on a white reflective background (See "Reflective Sheeting" on BC(4)).
6. Fabrication, erection and maintenance of the"ADVANCE SPEED LIMIT"(CW3-5)sign, "WORK ZONE"(G20-5aP) plaque and the "SPEED LIMIT"(R2-1)signs shall not be paid for directly, but shall be considered subsidiary to Item 502.
7. Turning signs from view, laying signs over or down will not be allowed, unless as otherwise noted under "REMOVING OR COVERING" on BC(4).
8. Techniques that may help reduce traffic speeds include but are not limited to:
   A. Law enforcement.
   B. Flagger stationed next to sign.
   C. Portable changeable message sign (PCMS).
   D. Low-power (drone) radar transmitter.
   E. Speed monitor trailers or signs.
9. Speeds shown on details above are for illustration only. Work Zone Speed Limits should only be posted as approved for each project.
10. For more specific guidance concerning the type of work, work zone conditions and factors impacting allowable regulatory construction speed zone reduction see TxDOT form #1204 in the TxDOT e-form system.

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SHEET 3 OF 12

Texas Department of Transportation | Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION WORK ZONE SPEED LIMIT

BC(3)-14

FILE: bc-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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REVISIONS 9-07 8-14 7-13				SE INNER LP
	DIST	COUNTY		SHEET NO.
		WILLIAMSON		23

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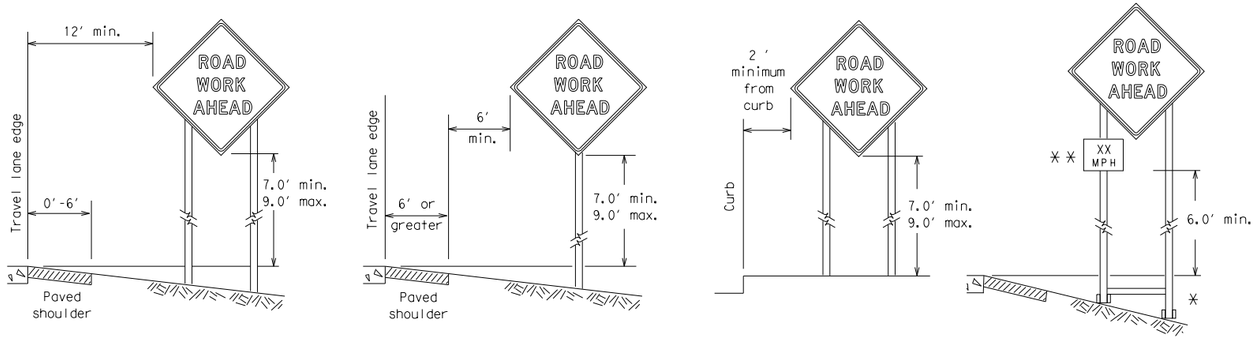
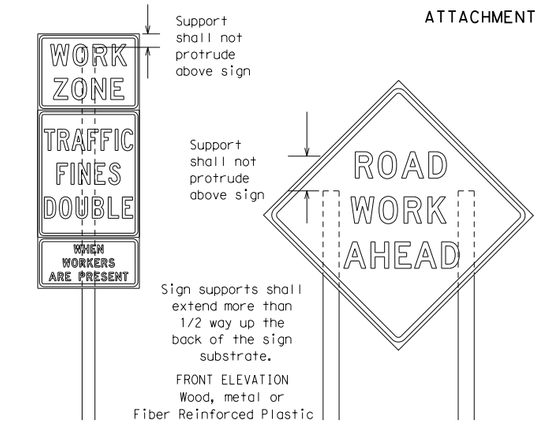
TYPICAL MINIMUM CLEARANCES FOR LONG TERM AND INTERMEDIATE TERM SIGNS

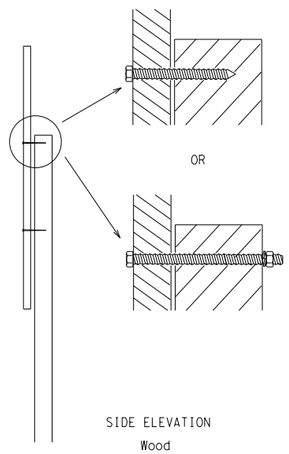


⁎ When placing skid supports on unlevel ground, the leg post lengths must be adjusted so the sign appears straight and plumb. Objects shall NOT be placed under skids as a means of leveling.

⁎⁎ When plaques are placed on dual-leg supports, they should be attached to the upright nearest the travel lane. Supplemental plaques (advisory or distance) should not cover the surface of the parent sign.

ATTACHMENT FOR SIGN SUPPORTS





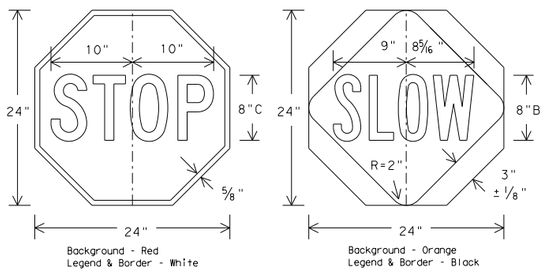
Attachment to wooden supports will be by bolts and nuts or screws. Use TxDOT's or manufacturer's recommended procedures for attaching sign substrates to other types of sign supports

Nails shall NOT be allowed. Each sign shall be attached directly to the sign support. Multiple signs shall not be joined or spliced by any means. Wood supports shall not be extended or repaired by splicing or other means.

Splicing embedded perforated square metal tubing in order to extend post height will only be allowed when the splice is made using four bolts, two above and two below the spice point. Splice must be located entirely behind the sign substrate, not near the base of the support. Splice insert lengths should be at least 5 times nominal post size, centered on the splice and of at least the same gauge material.

STOP/SLOW PADDLES

1. STOP/SLOW paddles are the primary method to control traffic by flaggers. The STOP/SLOW paddle size should be 24" x 24" as detailed below.
2. When used at night, the STOP/SLOW paddle shall be retroreflectorized.
3. STOP/SLOW paddles may be attached to a staff with a minimum length of 6′ to the bottom of the sign.
4. Any lights incorporated into the STOP or SLOW paddle faces shall only be as specifically described in Section 6E.03 Hand Signaling Devices in the TMUTCD.



CONTRACTOR REQUIREMENTS FOR MAINTAINING PERMANENT SIGNS WITHIN THE PROJECT LIMITS

1. Permanent signs are used to give notice of traffic laws or regulations, call attention to conditions that are potentially hazardous to traffic operations, show route designations, destinations, directions, distances, services, points of interest, and other geographical, recreational, or cultural information. Drivers proceeding through a work zone need the same, if not better route guidance as normally installed on a roadway without construction.
2. When permanent regulatory or warning signs conflict with work zone conditions, remove or cover the permanent signs until the permanent sign message matches the roadway condition.
3. When existing permanent signs are moved and relocated due to construction purposes, they shall be visible to motorists at all times.
4. If existing signs are to be relocated on their original supports, they shall be installed on crashworthy bases as shown on the SMD Standard sheets. The signs shall meet the required mounting heights shown on the BC Sheets or the SMD Standards. This work should be paid for under the appropriate pay item for relocating existing signs.
5. If permanent signs are to be removed and relocated using temporary supports, the Contractor shall use crashworthy supports as shown on the BC sheets or the CWZTCD. The signs shall meet the required mounting heights shown on the BC Sheets or the SMD Standards during construction. This work should be paid for under the appropriate pay item for relocating existing signs.
6. Any sign or traffic control device that is struck or damaged by the Contractor or his/her construction equipment shall be replaced as soon as possible by the Contractor to ensure proper guidance for the motorists. This will be subsidiary to Item 502.

GENERAL NOTES FOR WORK ZONE SIGNS

1. Contractor shall install and maintain signs in a straight and plumb condition and/or as directed by the Engineer.
2. Wooden sign posts shall be painted white.
3. Barricades shall NOT be used as sign supports.
4. All signs shall be installed in accordance with the plans or as directed by the Engineer. Signs shall be used to regulate, warn, and guide the traveling public safely through the work zone.
5. The Contractor may furnish either the sign design shown in the plans or in the "Standard Highway Sign Designs for Texas" (SHSD). The Engineer/Inspector may require the Contractor to furnish other work zone signs that are shown in the TMUTCD but may have been omitted from the plans. Any variation in the plans shall be documented by written agreement between the Engineer and the Contractor's Responsible Person. All changes must be documented in writing before being implemented. This can include documenting the changes in the Inspector's TxDOT diary and having both the Inspector and Contractor initial and date the agreed upon changes.
6. The Contractor shall furnish sign supports listed in the "Compliant Work Zone Traffic Control Device List" (CWZTCD). The Contractor shall install the sign support in accordance with the manufacturer's recommendations. If there is a question regarding installation procedures, the Contractor shall furnish the Engineer a copy of the manufacturer's installation recommendations so the Engineer can verify the correct procedures are being followed.
7. The Contractor is responsible for installing signs on approved supports and replacing signs with damaged or cracked substrates and/or damaged or marred reflective sheeting as directed by the Engineer/Inspector.
8. Identification markings may be shown only on the back of the sign substrate. The maximum height of letters and/or company logos used for identification shall be 1 inch.
9. The Contractor shall replace damaged wood posts. New or damaged wood sign posts shall not be spliced.

DURATION OF WORK (as defined by the "Texas Manual on Uniform Traffic Control Devices" Part 6)

1. The types of sign supports, sign mounting height, the size of signs, and the type of sign substrates can vary based on the type of work being performed. The Engineer is responsible for selecting the appropriate size sign for the type of work being performed. The Contractor is responsible for ensuring the sign support, sign mounting height and substrate meets manufacturer's recommendations in regard to crashworthiness and duration of work requirements.
   a. Long-term stationary - work that occupies a location more than 3 days.
   b. Intermediate-term stationary - work that occupies a location more than one daylight period up to 3 days, or nighttime work lasting more than one hour.
   c. Short-term stationary - daytime work that occupies a location for more than 1 hour in a single daylight period.
   d. Short, duration - work that occupies a location up to 1 hour.
   e. Mobile - work that moves continuously or intermittently (stopping for up to approximately 15 minutes.)

SIGN MOUNTING HEIGHT

1. The bottom of Long-term/Intermediate-term signs shall be at least 7 feet, but not more than 9 feet, above the paved surface, except as shown for supplemental plaques mounted below other signs.
2. The bottom of Short-term/Short Duration signs shall be a minimum of 1 foot above the pavement surface but no more than 2 feet above the ground.
3. Long-term/Intermediate-term Signs may be used in lieu of Short-term/Short Duration signing.
4. Short-term/Short Duration signs shall be used only during daylight and shall be removed at the end of the workday or raised to appropriate Long-term/Intermediate sign height.
5. Regulatory signs shall be mounted at least 7 feet, but not more than 9 feet, above the paved surface regardless of work duration.

SIZE OF SIGNS

1. The Contractor shall furnish the sign sizes shown on BC (2) unless otherwise shown in the plans or as directed by the Engineer.

SIGN SUBSTRATES

1. The Contractor shall ensure the sign substrate is installed in accordance with the manufacturer's recommendations for the type of sign support that is being used. The CWZTCD lists each substrate that can be used on the different types and models of sign supports.
2. "Mesh" type materials are NOT an approved sign substrate, regardless of the tightness of the weave.
3. All wooden individual sign panels fabricated from 2 or more pieces shall have one or more plywood cleat, 1/2" thick by 6" wide, fastened to the back of the sign and extending fully across the sign. The cleat shall be attached to the back of the sign using wood screws that do not penetrate the face of the sign panel. The screws shall be placed on both sides of the splice and spaced at 6" centers. The Engineer may approve other methods of splicing the sign face.

REFLECTIVE SHEETING

1. All signs shall be retroreflective and constructed of sheeting meeting the color and retro-reflectivity requirements of DMS-8300 for rigid signs or DMS-8310 for roll-up signs. The web address for DMS specifications is shown on BC(1).
2. White sheeting, meeting the requirements of DMS-8300 Type A, shall be used for signs with a white background.
3. Orange sheeting, meeting the requirements of DMS-8300 Type B_{FL} or Type C_{FL}, shall be used for rigid signs with orange backgrounds.

SIGN LETTERS

1. All sign letters and numbers shall be clear, and open rounded type uppercase alphabet letters as approved by the Federal Highway Administration (FHWA) and as published in the "Standard Highway Sign Design for Texas" manual. Signs, letters and numbers shall be of first class workmanship in accordance with Department Standards and Specifications.

REMOVING OR COVERING

1. When sign messages may be confusing or do not apply, the signs shall be removed or completely covered.
2. Long-term stationary or intermediate stationary signs installed on square metal tubing may be turned away from traffic 90 degrees when the sign message is not applicable. This technique may not be used for signs installed in the median of divided highways or near any intersections where the sign may be seen from approaching traffic.
3. Signs installed on wooden skids shall not be turned at 90 degree angles to the roadway. These signs should be removed or completely covered when not required.
4. When signs are covered, the material used shall be opaque, such as heavy mil black plastic, or other materials which will cover the entire sign face and maintain their opaque properties under automobile headlights at night, without damaging the sign sheeting.
5. Burlap shall NOT be used to cover signs.
6. Duct tape or other adhesive material shall NOT be affixed to a sign face.
7. Signs and anchor stubs shall be removed and holes backfilled upon completion of work.

SIGN SUPPORT WEIGHTS

1. Where sign supports require the use of weights to keep from turning over, the use of sandbags with dry, cohesionless sand should be used.
2. The sandbags will be tied shut to keep the sand from spilling and to maintain a constant weight.
3. Rock, concrete, iron, steel or other solid objects shall not be permitted for use as sign support weights.
4. Sandbags should weigh a minimum of 35 lbs and a maximum of 50 lbs.
5. Sandbags shall be made of a durable material that tears upon vehicular impact. Rubber (such as tire inner tubes) shall NOT be used.
6. Rubber ballasts designed for channelizing devices should not be used for ballast on portable sign supports. Sign supports designed and manufactured with rubber bases may be used when shown on the CWZTCD list.
7. Sandbags shall only be placed along or laid over the base supports of the traffic control device and shall not be suspended above ground level or hung with rope, wire, chains or other fasteners. Sandbags shall be placed along the length of the skids to weigh down the sign support.
8. Sandbags shall NOT be placed under the skid and shall not be used to level sign supports placed on slopes.

FLAGS ON SIGNS

1. Flags may be used to draw attention to warning signs. When used the flag shall be 16 inches square or larger and shall be orange or fluorescent red-orange in color. Flags shall not be allowed to cover any portion of the sign face.

Texas Department of Transportation | Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION TEMPORARY SIGN NOTES

BC(4)-14

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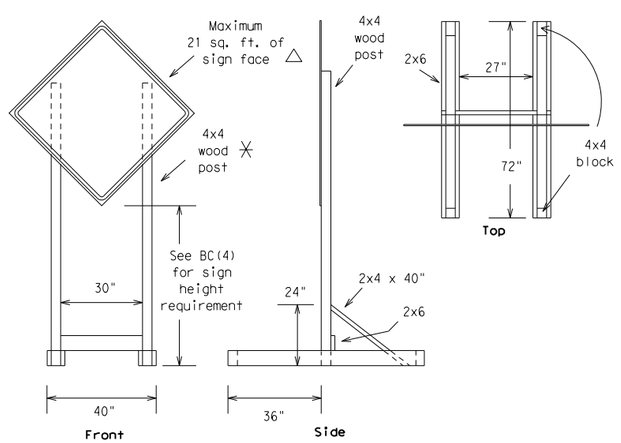
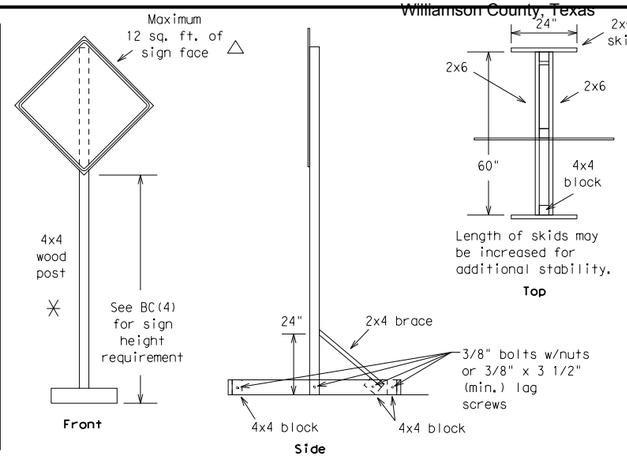
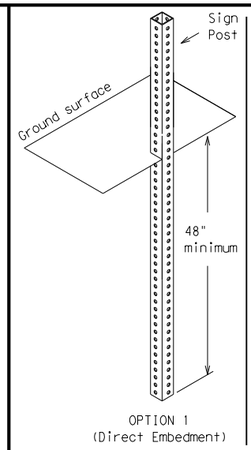
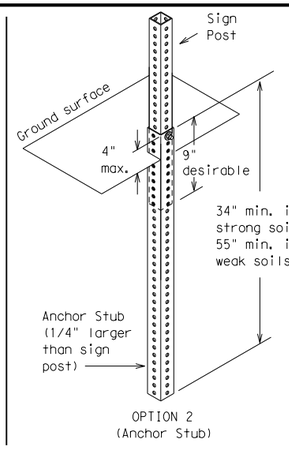


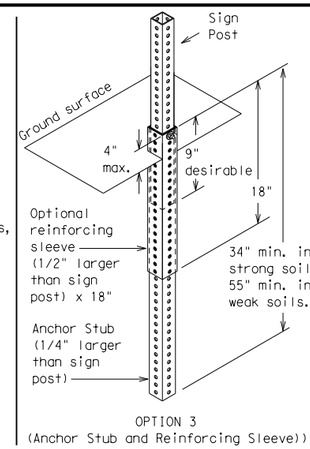


SKID MOUNTED WOOD SIGN SUPPORTS

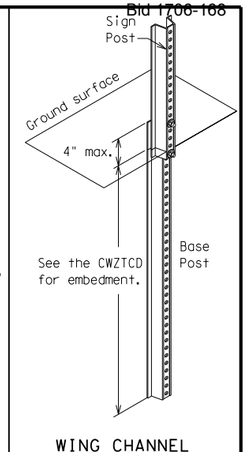
LONG/INTERMEDIATE TERM STATIONARY - PORTABLE SKID MOUNTED SIGN SUPPORTS □







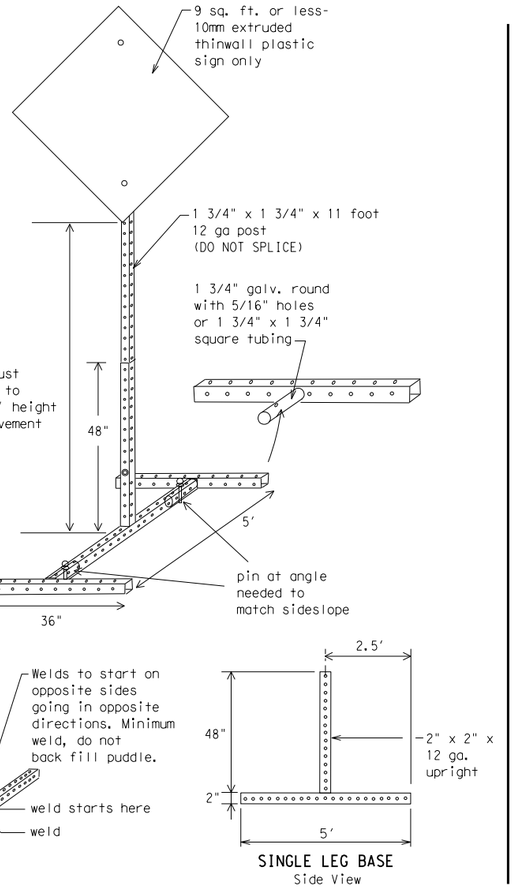
PERFORATED SQUARE METAL TUBING

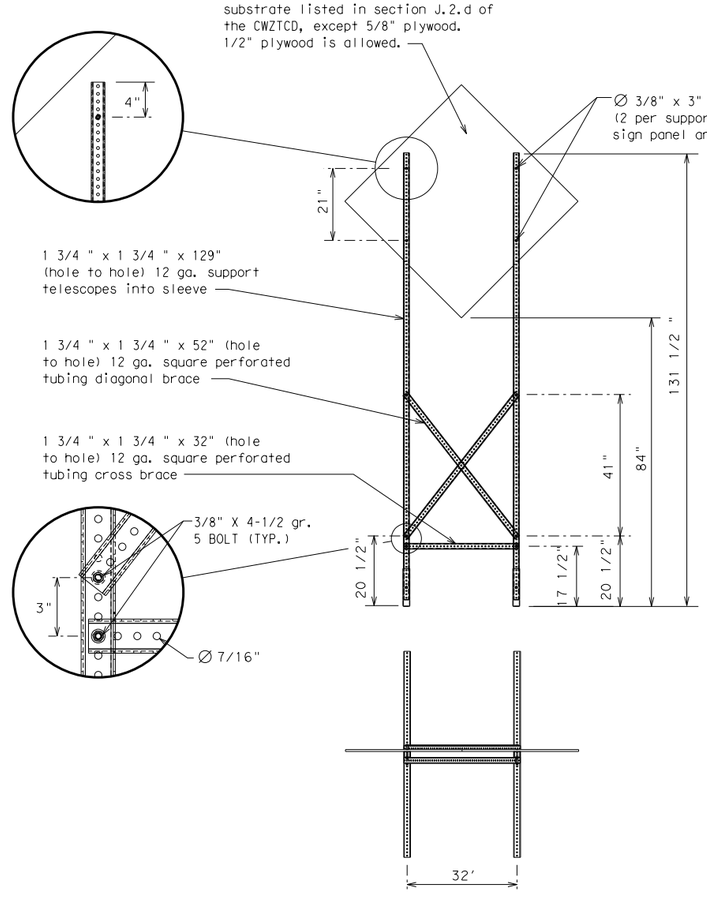


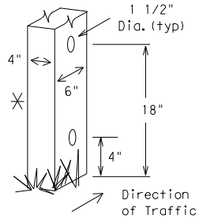
WING CHANNEL
Lap-splice/base bolted anchor

GROUND MOUNTED SIGN SUPPORTS

Refer to the CWZTCD and the manufacturer's installation procedure for each type sign support.
The maximum sign square footage shall adhere to the manufacturer's recommendation.
Two post installations can be used for larger signs.

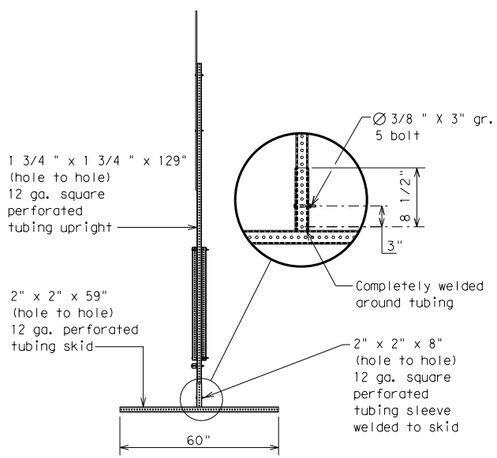






Nominal Post Size	Number of Posts	Maximum Sq. feet of Sign Face	Minimum Soil Embedment	Drilled Hole(s) Required
4 x 4	1	12	36"	NO
4 x 4	2	21	36"	NO
4 x 6	1	21	36"	YES
4 x 6	2	36	36"	YES

WOOD POST SYSTEM FOR GROUND MOUNTED SIGN SUPPORTS



WEDGE ANCHORS

Both steel and plastic Wedge Anchor Systems as shown on the SMD Standard Sheets may be used as temporary sign supports for signs up to 10 square feet of sign face. They may be set in concrete or in sturdy soils if approved by the Engineer. (See web address for "Traffic Engineering Standard Sheets" on BC(1)).

OTHER DESIGNS

MORE DETAILS OF APPROVED LONG/INTERMEDIATE AND SHORT TERM SUPPORTS CAN BE FOUND ON THE CWZTCD LIST. SEE BC(1) FOR WEBSITE LOCATION.

GENERAL NOTES

1. Nails may be used in the assembly of wooden sign supports, but 3/8" bolts with nuts or 3/8" x 3 1/2" lag screws must be used on every joint for final connection.
2. No more than 2 sign posts shall be placed within a 7 ft. circle, except for specific materials noted on the CWZTCD List.
3. When project is completed, all sign supports and foundations shall be removed from the project site. This will be considered subsidiary to Item 502.

□ See BC(4) for definition of "Work Duration."

✳ Wood sign posts MUST be one piece. Splicing will NOT be allowed. Posts shall be painted white.

△ See the CWZTCD for the type of sign substrate that can be used for each approved sign support.

SHEET 5 OF 12

Texas Department of Transportation | Traffic Operations Division Standard

SKID MOUNTED PERFORATED SQUARE STEEL TUBING SIGN SUPPORTS

BARRICADE AND CONSTRUCTION TYPICAL SIGN SUPPORT

BC(5)-14

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WHEN NOT IN USE, REMOVE THE PCMS FROM THE RIGHT-OF-WAY OR PLACE THE PCMS BEHIND BARRIER OR GUARDRAIL WITH SIGN PANEL TURNED PARALLEL TO TRAFFIC

PORTABLE CHANGEABLE MESSAGE SIGNS

1. The Engineer/Inspector shall approve all messages used on portable changeable message signs (PCMS).
2. Messages on PCMS should contain no more than 8 words (about four to eight characters per word), not including simple words such as "TO," "FOR," "AT," etc.
3. Messages should consist of a single phase, or two phases that alternate. Three-phase messages are not allowed. Each phase of the message should convey a single thought, and must be understood by itself.
4. Use the word "EXIT" to refer to an exit ramp on a freeway; i.e., "EXIT CLOSED." Do not use the term "RAMP."
5. Always use the route or interstate designation (IH, US, SH, FM) along with the number when referring to a roadway.
6. When in use the bottom of a stationary PCMS message panel should be a minimum 7 feet above the roadway, where possible.
7. The message term "WEEKEND" should be used only if the work is to start on Saturday morning and end by Sunday evening at midnight. Actual days and hours of work should be displayed on the PCMS if work is to begin on Friday evening and/or continue into Monday morning.
8. The Engineer/Inspector may select one of two options which are available for displaying a two-phase message on a PCMS. Each phase may be displayed for either four seconds each or for three seconds each.
9. Do not "flash" messages or words included in a message. The message should be steady burn or continuous while displayed.
10. Do not present redundant information on a two-phase message; i.e., keeping two lines of the message the same and changing the third line.
11. Do not use the word "Danger" in message.
12. Do not display the message "LANES SHIFT LEFT" or "LANES SHIFT RIGHT" on a PCMS. Drivers do not understand the message.
13. Do not display messages that scroll horizontally or vertically across the face of the sign.
14. The following table lists abbreviated words and two-word phrases that are acceptable for use on a PCMS. Both words in a phrase must be displayed together. Words or phrases not on this list should not be abbreviated, unless shown in the TMUTCD.
15. PCMS character height should be at least 18 inches for trailer mounted units. They should be visible from at least 1/2 (.5) mile and the text should be legible from at least 600 feet at night and 800 feet in daylight. Truck mounted units must have a character height of 10 inches and must be legible from at least 400 feet.
16. Each line of text should be centered on the message board rather than left or right justified.
17. If disabled, the PCMS should default to an illegible display that will not alarm motorists and will only be used to alert workers that the PCMS has malfunctioned. A pattern such as a series of horizontal solid bars is appropriate.

WORD OR PHRASE	ABBREVIATION
Access Road	ACCS RD
Alternate	ALT
Avenue	AVE
Best Route	BEST RTE
Boulevard	BLVD
Bridge	BRDG
Cannot	CANT
Center	CTR
Construction Ahead	CONST AHD
CROSSING	XING
Detour Route	DETOUR RTE
Do Not	DONT
East	E
Eastbound	(route) E
Emergency	EMER
Emergency Vehicle	EMER VEH
Entrance, Enter	ENT
Express Lane	EXP LN
Expressway	EXPWY
XXXX Feet	XXXX FT
Fog Ahead	FOG AHD
Freeway	FRWY, FWY
Freeway Blocked	FWY BLKD
Friday	FRI
Hazardous Driving	HAZ DRIVING
Hazardous Material	HAZMAT
High-Occupancy	HOV
Vehicle Highway	HWY
Hour(s)	HR, HRS
Information	INFO
It Is	ITS
Junction	JCT
Left	LFT
Left Lane	LFT LN
Lane Closed	LN CLOSED
Lower Level	LWR LEVEL
Maintenance	MAINT

WORD OR PHRASE	ABBREVIATION
Major	MAJ
Miles	MI
Miles Per Hour	MPH
Minor	MNR
Monday	MON
Normal	NORM
North	N
Northbound	(route) N
Parking	PKING
Road	RD
Right Lane	RT LN
Saturday	SAT
Service Road	SERV RD
Shoulder	SHLDR
Slippery	SLIP
South	S
Southbound	(route) S
Speed	SPD
Street	ST
Sunday	SUN
Telephone	PHONE
Temporary	TEMP
Thursday	THURS
To Downtown	TO DWNTN
Traffic	TRAF
Travelers	TRVLRS
Tuesday	TUES
Time Minutes	TIME MIN
Upper Level	UPR LEVEL
Vehicles (s)	VEH, VEHS
Warning	WARN
Wednesday	WED
Weight Limit	WT LIMIT
West	W
Westbound	(route) W
Wet Pavement	WET PVMT
Will Not	WONT

Roadway designation # IH-number, US-number, SH-number, FM-number

RECOMMENDED PHASES AND FORMATS FOR PCMS MESSAGES DURING ROADWORK ACTIVITIES

(The Engineer may approve other messages not specifically covered here.)

Phase 1: Condition Lists

Road/Lane/Ramp Closure List		Other Condition List	
FREEWAY CLOSED X MILE	FRONTAGE ROAD CLOSED	ROADWORK XXX FT	ROAD REPAIRS XXXX FT
ROAD CLOSED AT SH XXX	SHOULDER CLOSED XXX FT	FLAGGER XXXX FT	LANE NARROWS XXXX FT
ROAD CLSD AT FM XXXX	RIGHT LN CLOSED XXX FT	RIGHT LN NARROWS XXXX FT	TWO-WAY TRAFFIC XX MILE
RIGHT X LANES CLOSED	RIGHT X LANES OPEN	MERGING TRAFFIC XXXX FT	CONST TRAFFIC XXX FT
CENTER LANE CLOSED	DAYTIME LANE CLOSURES	LOOSE GRAVEL XXXX FT	UNEVEN LANES XXXX FT
NIGHT LANE CLOSURES	I-XX SOUTH EXIT CLOSED	DETOUR X MILE	ROUGH ROAD XXXX FT
VARIOUS LANES CLOSED	EXIT XXX CLOSED X MILE	ROADWORK PAST SH XXXX	ROADWORK NEXT FRI-SUN
EXIT CLOSED	RIGHT LN TO BE CLOSED	BUMP XXXX FT	US XXX EXIT X MILES
MALL DRIVEWAY CLOSED	X LANES CLOSED TUE - FRI	TRAFFIC SIGNAL XXXX FT	LANES SHIFT *
XXXXXXXX BLVD CLOSED			

* LANES SHIFT in Phase 1 must be used with STAY IN LANE in Phase 2.

Phase 2: Possible Component Lists

Action to Take/Effect on Travel List		Location List	Warning List	** Advance Notice List
MERGE RIGHT	FORM X LINES RIGHT	AT FM XXXX	SPEED LIMIT XX MPH	TUE-FRI XX AM- X PM
DETOUR NEXT X EXITS	USE XXXXX RD EXIT	BEFORE RAILROAD CROSSING	MAXIMUM SPEED XX MPH	APR XX-XX X PM-X AM
USE EXIT XXX	USE EXIT I-XX NORTH	NEXT X MILES	MINIMUM SPEED XX MPH	BEGINS MONDAY
STAY ON US XXX SOUTH	USE I-XX E TO I-XX N	PAST US XXX EXIT	ADVISORY SPEED XX MPH	BEGINS MAY XX
TRUCKS USE US XXX N	WATCH FOR TRUCKS	XXXXXXX TO XXXXXXX	RIGHT LANE EXIT	MAY X-X XX PM - XX AM
WATCH FOR TRUCKS	EXPECT DELAYS	US XXX TO FM XXXX	USE CAUTION	NEXT FRI-SUN
EXPECT DELAYS	PREPARE TO STOP		DRIVE SAFELY	XX AM TO XX PM
REDUCE SPEED XXX FT	END SHOULDER USE		DRIVE WITH CARE	NEXT TUE AUG XX
USE OTHER ROUTES	WATCH FOR WORKERS			TONIGHT XX PM- XX AM
STAY IN LANE *				

* LANES SHIFT in Phase 1 must be used with STAY IN LANE in Phase 2.

** See Application Guidelines Note 6.

APPLICATION GUIDELINES

1. Only 1 or 2 phases are to be used on a PCMS.
2. The 1st phase (or both) should be selected from the "Road/Lane/Ramp Closure List" and the "Other Condition List".
3. A 2nd phase can be selected from the "Action to Take/Effect on Travel, Location, General Warning, or Advance Notice Phase Lists".
4. A Location Phase is necessary only if a distance or location is not included in the first phase selected.
5. If two PCMS are used in sequence, they must be separated by a minimum of 1000 ft. Each PCMS shall be limited to two phases, and should be understandable by themselves.
6. For advance notice, when the current date is within seven days of the actual work date, calendar days should be replaced with days of the week. Advance notification should typically be for no more than one week prior to the work.

WORDING ALTERNATIVES

1. The words RIGHT, LEFT and ALL can be interchanged as appropriate.
2. Roadway designations IH, US, SH, FM and LP can be interchanged as appropriate.
3. EAST, WEST, NORTH and SOUTH (or abbreviations E, W, N and S) can be interchanged as appropriate.
4. Highway names and numbers replaced as appropriate.
5. ROAD, HIGHWAY and FREEWAY can be interchanged as needed.
6. AHEAD may be used instead of distances if necessary.
7. FT and MI, MILE and MILES interchanged as appropriate.
8. AT, BEFORE and PAST interchanged as needed.
9. Distances or AHEAD can be eliminated from the message if a location phase is used.

PCMS SIGNS WITHIN THE R.O.W. SHALL BE BEHIND GUARDRAIL OR CONCRETE BARRIER OR SHALL HAVE A MINIMUM OF FOUR (4) PLASTIC DRUMS PLACED PERPENDICULAR TO TRAFFIC ON THE UPSTREAM SIDE OF THE PCMS, WHEN EXPOSED TO ONE DIRECTION OF TRAFFIC. WHEN EXPOSED TO TWO WAY TRAFFIC, THE FOUR DRUMS SHOULD BE PLACED WITH ONE DRUM AT EACH OF THE FOUR CORNERS OF THE UNIT.

FULL MATRIX PCMS SIGNS

1. When Full Matrix PCMS signs are used, the character height and legibility/visibility requirements shall be maintained as listed in Note 15 under "PORTABLE CHANGEABLE MESSAGE SIGNS" above.
2. When symbol signs, such as the "Flagger Symbol"(CW20-7) are represented graphically on the Full Matrix PCMS sign and, with the approval of the Engineer, it shall maintain the legibility/visibility requirement listed above.
3. When symbol signs are represented graphically on the Full Matrix PCMS, they shall only supplement the use of the static sign represented, and shall not substitute for, or replace that sign.
4. A full matrix PCMS may be used to simulate a flashing arrow board provided it meets the visibility, flash rate and dimming requirements on BC(7), for the same size arrow.

Texas Department of Transportation — Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)

BC(6)-14

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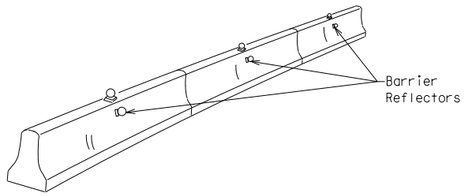
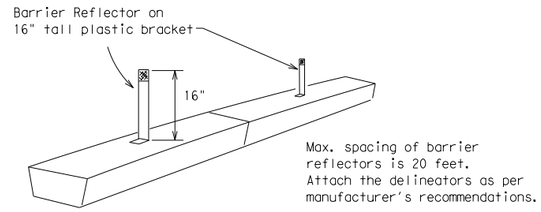
1. Barrier Reflectors shall be pre-qualified, and conform to the color and reflectivity requirements of DMS-8600. A list of prequalified Barrier Reflectors can be found at the Material Producer List web address shown on BC(1).
2. Color of Barrier Reflectors shall be as specified in the TMUTCD. The cost of the reflectors shall be considered subsidiary to Item 512.

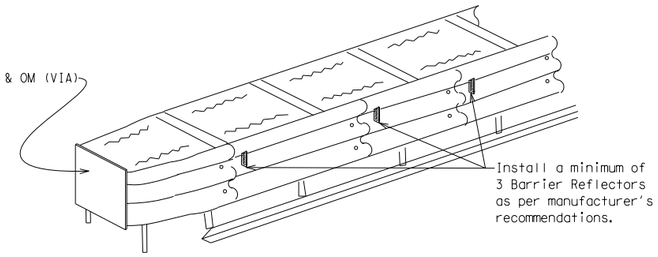


CONCRETE TRAFFIC BARRIER (CTB)

3. Where traffic is on one side of the CTB, two (2) Barrier Reflectors shall be mounted in approximately the midsection of each section of CTB. An alternate mounting location is uniformly spaced at one end of each CTB. This will allow for attachment of a barrier grapple without damaging the reflector. The Barrier Reflector mounted on the side of the CTB shall be located directly below the reflector mounted on top of the barrier, as shown in the detail above.
4. Where CTB separates two-way traffic, three barrier reflectors shall be mounted on each section of CTB. The reflector unit on top shall have two yellow reflective faces (Bi-Directional)while the reflectors on each side of the barrier shall have one yellow reflective face, as shown in the detail above.
5. When CTB separates traffic traveling in the same direction, no barrier reflectors will be required on top of the CTB.
6. Barrier Reflector units shall be yellow or white in color to match the edgeline being supplemented.
7. Maximum spacing of Barrier Reflectors is forty (40) feet.
8. Pavement markers or temporary flexible-reflective roadway marker tabs shall NOT be used as CTB delineation.
9. Attachment of Barrier Reflectors to CTB shall be per manufacturer's recommendations.
10. Missing or damaged Barrier Reflectors shall be replaced as directed by the Engineer.
11. Single slope barriers shall be delineated as shown on the above detail.



LOW PROFILE CONCRETE BARRIER (LPCB)

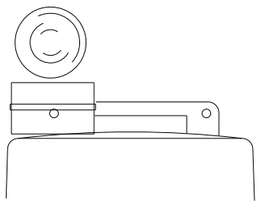


DELINEATION OF END TREATMENTS

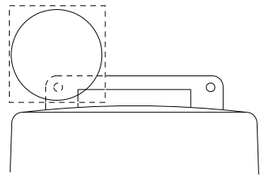
END TREATMENTS FOR CTB'S USED IN WORK ZONES

End treatments used on CTB's in work zones shall meet crashworthy standards as defined in the National Cooperative Highway Research Report 350. Refer to the CWZTCD List for approved end treatments and manufacturers.

BARRIER REFLECTORS FOR CONCRETE TRAFFIC BARRIER AND ATTENUATORS



Type C Warning Light or approved substitute mounted on a drum adjacent to the travel way.



Warning reflector may be round or square.Must have a yellow reflective surface area of at least 30 square inches

WARNING LIGHTS

1. Warning lights shall meet the requirements of the TMUTCD.
2. Warning lights shall NOT be installed on barricades.
3. Type A-Low Intensity Flashing Warning Lights are commonly used with drums. They are intended to warn of or mark a potentially hazardous area. Their use shall be as indicated on this sheet and/or other sheets of the plans by the designation "FL". The Type A Warning Lights shall not be used with signs manufactured with Type B_{FL} or C_{FL} Sheeting meeting the requirements of Departmental Material Specification DMS-8300.
4. Type-C and Type D 360 degree Steady Burn Lights are intended to be used in a series for delineation to supplement other traffic control devices. Their use shall be as indicated on this sheet and/or other sheets of the plans by the designation "SB".
5. The Engineer/Inspector or the plans shall specify the location and type of warning lights to be installed on the traffic control devices.
6. When required by the Engineer, the Contractor shall furnish a copy of the warning lights certification. The warning light manufacturer will certify the warning lights meet the requirements of the latest ITE Purchase Specifications for Flashing and Steady-Burn Warning Lights.
7. When used to delineate curves, Type-C and Type D Steady Burn Lights should only be placed on the outside of the curve, not the inside.
8. The location of warning lights and warning reflectors on drums shall be as shown elsewhere in the plans.

WARNING LIGHTS MOUNTED ON PLASTIC DRUMS

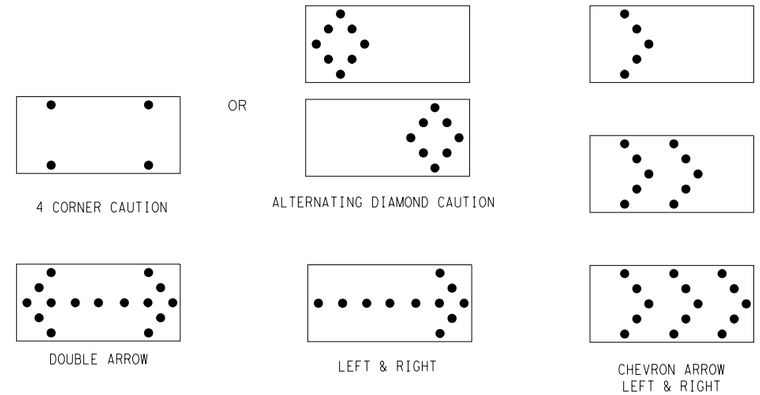
1. Type A flashing warning lights are intended to warn drivers that they are approaching or are in a potentially hazardous area.
2. Type A random flashing warning lights are not intended for delineation and shall not be used in a series.
3. A series of sequential flashing warning lights placed on channelizing devices to form a merging taper may be used for delineation. If used, the successive flashing of the sequential warning lights should occur from the beginning of the taper to the end of the merging taper in order to identify the desired vehicle path. The rate of flashing for each light shall be 65 flashes per minute, plus or minus 10 flashes.
4. Type C and D steady-burn warning lights are intended to be used in a series to delineate the edge of the travel lane on detours, on lane changes, on lane closures, and on other similar conditions.
5. Type A, Type C and Type D warning lights shall be installed at locations as detailed on other sheets in the plans.
6. Warning lights shall not be installed on a drum that has a sign, chevron or vertical panel.
7. The maximum spacing for warning lights on drums should be identical to the channelizing device spacing.

WARNING REFLECTORS MOUNTED ON PLASTIC DRUMS AS A SUBSTITUTE FOR TYPE C (STEADY BURN) WARNING LIGHTS

1. A warning reflector or approved substitute may be mounted on a plastic drum as a substitute for a Type C, steady burn warning light at the discretion of the Contractor unless otherwise noted in the plans.
2. The warning reflector shall be yellow in color and shall be manufactured using a sign substrate approved for use with plastic drums listed on the CWZTCD.
3. The warning reflector shall have a minimum retroreflective surface area (one-side) of 30 square inches.
4. Round reflectors shall be fully reflectorized, including the area where attached to the drum.
5. Square substrates must have a minimum of 30 square inches of reflectorized sheeting. They do not have to be reflectorized where it attaches to the drum.
6. The side of the warning reflector facing approaching traffic shall have sheeting meeting the color and retroreflectivity requirements for DMS 8300-Type B or Type C.
7. When used near two-way traffic, both sides of the warning reflector shall be reflectorized.
8. The warning reflector should be mounted on the side of the handle nearest approaching traffic.
9. The maximum spacing for warning reflectors should be identical to the channelizing device spacing requirements.

Arrow Boards may be located behind channelizing devices in place for a shoulder taper or merging taper, otherwise they shall be delineated with four (4) channelizing devices placed perpendicular to traffic on the upstream side of traffic.

1. The Flashing Arrow Board should be used for all lane closures on multi-lane roadways, or slow moving maintenance or construction activities on the travel lanes.
2. Flashing Arrow Boards should not be used on two-lane, two-way roadways, detours, diversions or work on shoulders unless the "CAUTION" display (see detail below) is used.
3. The Engineer/Inspector shall choose all appropriate signs, barricades and/or other traffic control devices that should be used in conjunction with the Flashing Arrow Board.
4. The Flashing Arrow Board should be able to display the following symbols:



5. The "CAUTION" display consists of four corner lamps flashing simultaneously, or the Alternating Diamond Caution mode as shown.
6. The straight line caution display is NOT ALLOWED.
7. The Flashing Arrow Board shall be capable of minimum 50 percent dimming from rated lamp voltage. The flashing rate of the lamps shall not be less than 25 nor more than 40 flashes per minute.
8. Minimum lamp "on time" shall be approximately 50 percent for the flashing arrow and equal intervals of 25 percent for each sequential phase of the flashing chevron.
9. The sequential arrow display is NOT ALLOWED.
10. The flashing arrow display is the TxDOT standard; however, the sequential Chevron display may be used during daylight operations.
11. The Flashing Arrow Board shall be mounted on a vehicle, trailer or other suitable support.
12. A Flashing Arrow Board SHALL NOT BE USED to laterally shift traffic.
13. A full matrix PCMS may be used to simulate a Flashing Arrow Board provided it meets visibility, flash rate and dimming requirements on this sheet for the same size arrow.
14. Minimum mounting height of trailer mounted Arrow Boards should be 7 feet from roadway to bottom of panel.

REQUIREMENTS			
TYPE	MINIMUM SIZE	MINIMUM NUMBER OF PANEL LAMPS	MINIMUM VISIBILITY DISTANCE
B	30 x 60	13	3/4 mile
C	48 x 96	15	1 mile

ATTENTION

Flashing Arrow Boards shall be equipped with automatic dimming devices.

WHEN NOT IN USE, REMOVE THE ARROW BOARD FROM THE RIGHT-OF-WAY OR PLACE THE ARROW BOARD BEHIND CONCRETE TRAFFIC BARRIER OR GUARDRAIL.

FLASHING ARROW BOARDS

TRUCK-MOUNTED ATTENUATORS

1. Truck-mounted attenuators (TMA) used on TxDOT facilities must meet the requirements outlined in the National Cooperative Highway Research Report No. 350 (NCHRP 350) or the Manual for Assessing Safety Hardware (MASH).
2. Refer to the CWZTCD for the requirements of Level 2 or Level 3 TMAs.
3. Refer to the CWZTCD for a list of approved TMAs.
4. TMAs are required on freeways unless otherwise noted in the plans.
5. A TMA should be used anytime that it can be positioned 30 to 100 feet in advance of the area of crew exposure without adversely affecting the work performance.
6. The only reason a TMA should not be required is when a work area is spread down the roadway and the work crew is an extended distance from the TMA.

Texas Department of Transportation | Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION ARROW PANEL, REFLECTORS, WARNING LIGHTS & ATTENUATOR

BC(7)-14

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GENERAL NOTES

1. For long term stationary work zones on freeways, drums shall be used as the primary channelizing device.
2. For intermediate term stationary work zones on freeways, drums should be used as the primary channelizing device but may be replaced in tangent sections by vertical panels, or 42" two-piece cones. In tangent sections one-piece cones may be used with the approval of the Engineer but only if personnel are present on the project at all times to maintain the cones in proper position and location.
3. For short term stationary work zones on freeways, drums are the preferred channelizing device but may be replaced in tapers, transitions and tangent sections by vertical panels, two-piece cones or one-piece cones as approved by the Engineer.
4. Drums and all related items shall comply with the requirements of the current version of the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD) and the "Compliant Work Zone Traffic Control Devices List" (CWZTCD).
5. Drums, bases, and related materials shall exhibit good workmanship and shall be free from objectionable marks or defects that would adversely affect their appearance or serviceability.
6. The Contractor shall have a maximum of 24 hours to replace any plastic drums identified for replacement by the Engineer/Inspector. The replacement device must be an approved device.

GENERAL DESIGN REQUIREMENTS

Pre-qualified plastic drums shall meet the following requirements:

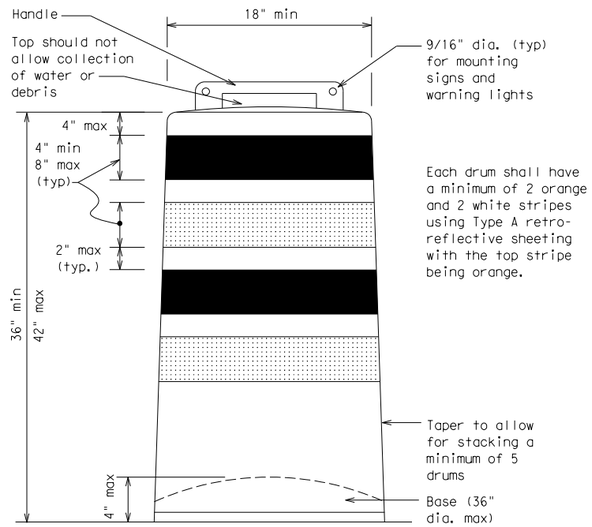
1. Plastic drums shall be a two-piece design; the "body" of the drum shall be the top portion and the "base" shall be the bottom.
2. The body and base shall lock together in such a manner that the body separates from the base when impacted by a vehicle traveling at a speed of 20 MPH or greater but prevents accidental separation due to normal handling and/or air turbulence created by passing vehicles.
3. Plastic drums shall be constructed of lightweight flexible, and deformable materials. The Contractor shall NOT use metal drums or single piece plastic drums as channelization devices or sign supports.
4. Drums shall present a profile that is a minimum of 18 inches in width at the 36 inch height when viewed from any direction. The height of drum unit (body installed on base) shall be a minimum of 36 inches and a maximum of 42 inches.
5. The top of the drum shall have a built-in handle for easy pickup and shall be designed to drain water and not collect debris. The handle shall have a minimum of two widely spaced 9/16 inch diameter holes to allow attachment of a warning light, warning reflector unit or approved compliant sign.
6. The exterior of the drum body shall have a minimum of four alternating orange and white retroreflective circumferential stripes not less than 4 inches nor greater than 8 inches in width. Any non-reflectorized space between any two adjacent stripes shall not exceed 2 inches in width.
7. Bases shall have a maximum width of 36 inches, a maximum height of 4 inches, and a minimum of two footholds of sufficient size to allow base to be held down while separating the drum body from the base.
8. Plastic drums shall be constructed of ultra-violet stabilized, orange, high-density polyethylene (HDPE) or other approved material.
9. Drum body shall have a maximum unballasted weight of 11 lbs.
10. Drum and base shall be marked with manufacturer's name and model number.

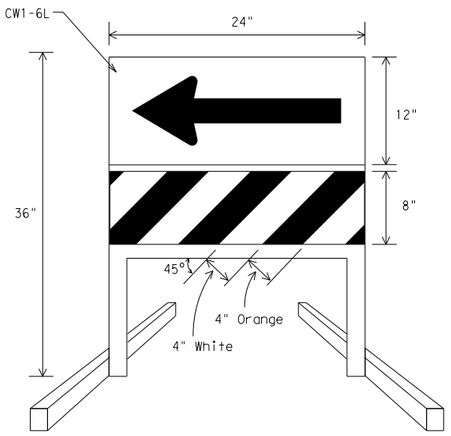
RETROREFLECTIVE SHEETING

1. The stripes used on drums shall be constructed of sheeting meeting the color and retroreflectivity requirements of Departmental Materials Specification DMS-8300, "Sign Face Materials." Type A reflective sheeting shall be supplied unless otherwise specified in the plans.
2. The sheeting shall be suitable for use on and shall adhere to the drum surface such that, upon vehicular impact, the sheeting shall remain adhered in-place and exhibit no delaminating, cracking, or loss of retroreflectivity other than that loss due to abrasion of the sheeting surface.

BALLAST

1. Unballasted bases shall be large enough to hold up to 50 lbs. of sand. This base, when filled with the ballast material, should weigh between 35 lbs (minimum) and 50 lbs (maximum). The ballast may be sand in one to three sandbags separate from the base, sand in a sand-filled plastic base, or other ballasting devices as approved by the Engineer. Stacking of sandbags will be allowed, however height of sandbags above pavement surface may not exceed 12 inches.
2. Bases with built-in ballast shall weigh between 40 lbs. and 50 lbs. Built-in ballast can be constructed of an integral crumb rubber base or a solid rubber base.
3. Recycled truck tire sidewalls may be used for ballast on drums approved for this type of ballast on the CWZTCD list.
4. The ballast shall not be heavy objects, water, or any material that would become hazardous to motorists, pedestrians, or workers when the drum is struck by a vehicle.
5. When used in regions susceptible to freezing, drums shall have drainage holes in the bottoms so that water will not collect and freeze becoming a hazard when struck by a vehicle.
6. Ballast shall not be placed on top of drums.
7. Adhesives may be used to secure base of drums to pavement.

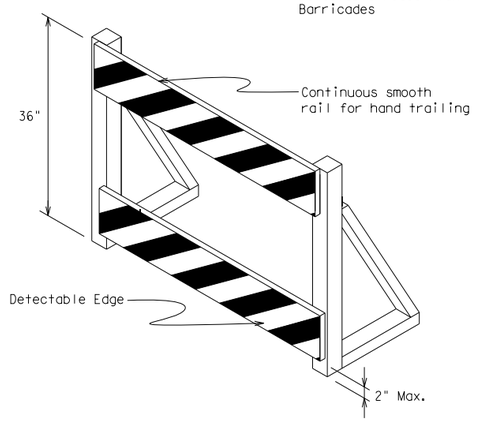




DIRECTION INDICATOR BARRICADE

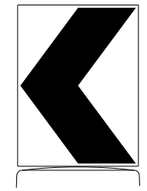
1. The Direction Indicator Barricade may be used in tapers, transitions, and other areas where specific directional guidance to drivers is necessary.
2. If used, the Direction Indicator Barricade should be used in series to direct the driver through the transition and into the intended travel lane.
3. The Direction Indicator Barricade shall consist of One-Direction Large Arrow (CW1-6) sign in the size shown with a black arrow on a background of Type B_{FL} or Type C_{FL} Orange retroreflective sheeting above a rail with Type A retroreflective sheeting in alternating 4" white and orange stripes sloping downward at an angle of 45 degrees in the direction road users are to pass. Sheeting types shall be as per DMS 8300.
4. Double arrows on the Direction Indicator Barricade will not be allowed.
5. Approved manufacturers are shown on the CWZTCD List. Ballast shall be as approved by the manufacturers instructions.

This detail is not intended for fabrication. See note 3 and the CWZTCD list for providers of approved Detectable Pedestrian Barricades

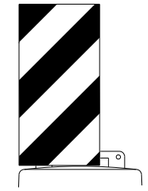


DETECTABLE PEDESTRIAN BARRICADES

1. When existing pedestrian facilities are disrupted, closed, or relocated in a TTC zone, the temporary facilities shall be detectable and include accessibility features consistent with the features present in the existing pedestrian facility.
2. Where pedestrians with visual disabilities normally use the closed sidewalk, a device that is detectable by a person with a visual disability traveling with the aid of a long cane shall be placed across the full width of the closed sidewalk.
3. Detectable pedestrian barricades similar to the one pictured above, longitudinal channelizing devices, some concrete barriers, and wood or chain link fencing with a continuous detectable edging can satisfactorily delineate a pedestrian path.
4. Tape, rope, or plastic chain strung between devices are not detectable, do not comply with the design standards in the "Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities (ADAAG)" and should not be used as a control for pedestrian movements.
5. Warning lights shall not be attached to detectable pedestrian barricades.
6. Detectable pedestrian barricades may use 8" nominal barricade rails as shown on BC(10) provided that the top rail provides a smooth continuous rail suitable for hand trailing with no splinters, burrs, or sharp edges.



18" x 24" Sign
(Maximum Sign Dimension)
Chevron CW1-8, Opposing Traffic Lane Divider, Driveway sign D70a, Keep Right R4 series or other signs as approved by Engineer



12" x 24"
Vertical Panel
mount with diagonals sloping down towards travel way

Plywood, Aluminum or Metal sign substrates shall NOT be used on plastic drums

SIGNS, CHEVRONS, AND VERTICAL PANELS MOUNTED ON PLASTIC DRUMS

1. Signs used on plastic drums shall be manufactured using substrates listed on the CWZTCD.
2. Chevrons and other work zone signs with an orange background shall be manufactured with Type B_{FL} or Type C_{FL} Orange sheeting meeting the color and retroreflectivity requirements of DMS-8300, "Sign Face Material," unless otherwise specified in the plans.
3. Vertical Panels shall be manufactured with orange and white sheeting meeting the requirements of DMS-8300 Type A Diagonal stripes on Vertical Panels shall slope down toward the intended traveled lane.
4. Other sign messages (text or symbolic) may be used as approved by the Engineer. Sign dimensions shall not exceed 18 inches in width or 24 inches in height, except for the R9 series signs discussed in note 8 below.
5. Signs shall be installed using a 1/2 inch bolt (nominal) and nut, two washers, and one locking washer for each connection.
6. Mounting bolts and nuts shall be fully engaged and adequately torqued. Bolts should not extend more than 1/2 inch beyond nuts.
7. Chevrons may be placed on drums on the outside of curves, on merging tapers or on shifting tapers. When used in these locations they may be placed on every drum or spaced not more than on every third drum. A minimum of three (3) should be used at each location called for in the plans.
8. R9-9, R9-10, R9-11 and R9-11a Sidewalk Closed signs which are 24 inches wide may be mounted on plastic drums, with approval of the Engineer.

Texas Department of Transportation | Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(8)-14

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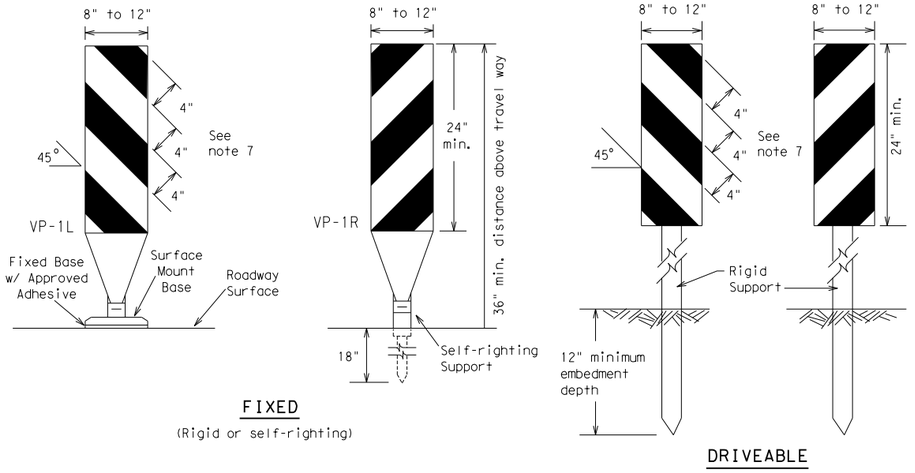
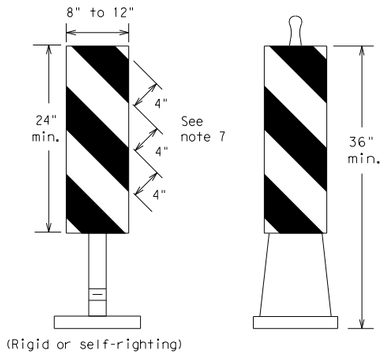


FIXED
(Rigid or self-righting)

DRIVEABLE

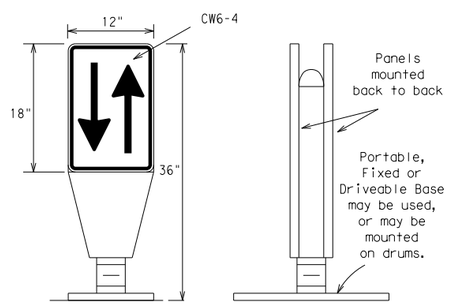


(Rigid or self-righting)

PORTABLE

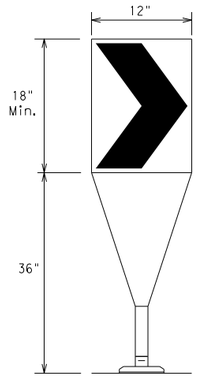
1. Vertical Panels (VP's) are normally used to channelize traffic or divide opposing lanes of traffic.
2. VP's may be used in daytime or nighttime situations. They may be used at the edge of shoulder drop-offs and other areas such as lane transitions where positive daytime and nighttime delineation is required. The Engineer/Inspector shall refer to the Roadway Design Manual Appendix B "Treatment of Pavement Drop-offs in Work Zones" for additional guidelines on the use of VP's for drop-offs.
3. VP's should be mounted back to back if used at the edge of cuts adjacent to two-way two lane roadways. Stripes are to be reflective orange and reflective white and should always slope downward toward the travel lane.
4. VP's used on expressways and freeways or other high speed roadways, may have more than 270 square inches of retroreflective area facing traffic.
5. Self-righting supports are available with portable base. See "Compliant Work Zone Traffic Control Devices List" (CWZTCD).
6. Sheeting for the VP's shall be retroreflective Type A conforming to Departmental Material Specification DMS-8300, unless noted otherwise.
7. Where the height of reflective material on the vertical panel is 36 inches or greater, a panel stripe of 6 inches shall be used.

VERTICAL PANELS (VPs)



1. Opposing Traffic Lane Dividers (OTLD) are delineation devices designed to convert a normal one-way roadway section to two-way operation. OTLD's are used on temporary centerlines. The upward and downward arrows on the sign's face indicate the direction of traffic on either side of the divider. The base is secured to the pavement with an adhesive or rubber weight to minimize movement caused by a vehicle impact or wind gust.
2. The OTLD may be used in combination with 42" cones or VPs.
3. Spacing between the OTLD shall not exceed 500 feet. 42" cones or VPs placed between the OTLD's should not exceed 100 foot spacing.
4. The OTLD shall be orange with a black non-reflective legend. Sheeting for the OTLD shall be retroreflective Type B_{FL} or Type C_{FL} conforming to Departmental Material Specification DMS-8300, unless noted otherwise. The legend shall meet the requirements of DMS-8300.

OPPOSING TRAFFIC LANE DIVIDERS (OTLD)



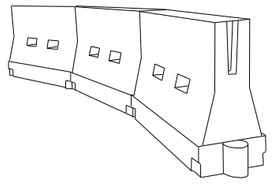
Fixed Base w/ Approved Adhesive (Driveable Base, or Flexible Support can be used)

1. The chevron shall be a vertical rectangle with a minimum size of 12 by 18 inches.
2. Chevrons are intended to give notice of a sharp change of alignment with the direction of travel and provide additional emphasis and guidance for vehicle operators with regard to changes in horizontal alignment of the roadway.
3. Chevrons, when used, shall be erected on the outside of a sharp curve or turn, or on the far side of an intersection. They shall be in line with and at right angles to approaching traffic. Spacing should be such that the motorist always has three in view, until the change in alignment eliminates its need.
4. To be effective, the chevron should be visible for at least 500 feet.
5. Chevrons shall be orange with a black nonreflective legend. Sheeting for the chevron shall be retroreflective Type B_{FL} or Type C_{FL} conforming to Departmental Material Specification DMS-8300, unless noted otherwise. The legend shall meet the requirements of DMS-8300.
6. For Long Term Stationary use on tapers or transitions on freeways and divided highways self-righting chevrons may be used to supplement plastic drums but not to replace plastic drums.

CHEVRONS

GENERAL NOTES

1. Work Zone channelizing devices illustrated on this sheet may be installed in close proximity to traffic and are suitable for use on high or low speed roadways. The Engineer/Inspector shall ensure that spacing and placement is uniform and in accordance with the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD).
2. Channelizing devices shown on this sheet may have a driveable, fixed or portable base. The requirement for self-righting channelizing devices must be specified in the General Notes or other plan sheets.
3. Channelizing devices on self-righting supports should be used in work zone areas where channelizing devices are frequently impacted by errant vehicles or vehicle related wind gusts making alignment of the channelizing devices difficult to maintain. Locations of these devices shall be detailed elsewhere in the plans. These devices shall conform to the TMUTCD and the "Compliant Work Zone Traffic Control Devices List" (CWZTCD).
4. The Contractor shall maintain devices in a clean condition and replace damaged, nonreflective, faded, or broken devices and bases as required by the Engineer/Inspector. The Contractor shall be required to maintain proper device spacing and alignment.
5. Portable bases shall be fabricated from virgin and/or recycled rubber. The portable bases shall weigh a minimum of 30 lbs.
6. Pavement surfaces shall be prepared in a manner that ensures proper bonding between the adhesives, the fixed mount bases and the pavement surface. Adhesives shall be prepared and applied according to the manufacturer's recommendations.
7. The installation and removal of channelizing devices shall not cause detrimental effects to the final pavement surfaces, including pavement surface discoloration or surface integrity. Driveable bases shall not be permitted on final pavement surfaces. The Engineer/Inspector shall approve all application and removal procedures of fixed bases.



LONGITUDINAL CHANNELIZING DEVICES (LCD)

1. LCDs are crashworthy, lightweight, deformable devices that are highly visible, have good target value and can be connected together. They are not designed to contain or redirect a vehicle on impact.
2. LCDs may be used instead of a line of cones or drums.
3. LCDs shall be placed in accordance to application and installation requirements specific to the device, and used only when shown on the CWZTCD list.
4. LCDs should not be used to provide positive protection for obstacles, pedestrians or workers.
5. LCDs shall be supplemented with retroreflective delineation as required for temporary barriers on BC(7) when placed roughly parallel to the travel lanes.
6. LCDs used as barricades placed perpendicular to traffic should have at least one row of reflective sheeting meeting the requirements for barricade rails as shown on BC(10) placed near the top of the LCD along the full length of the device.

WATER BALLASTED SYSTEMS USED AS BARRIERS

1. Water ballasted systems used as barriers shall not be used solely to channelize road users, but also to protect the work space per the appropriate NCHRP 350 crashworthiness requirements based on roadway speed and barrier application.
2. Water ballasted systems used to channelize vehicular traffic shall be supplemented with retroreflective delineation or channelizing devices to improve daytime/nighttime visibility. They may also be supplemented with pavement markings.
3. Water ballasted systems used as barriers shall be placed in accordance to application and installation requirements specific to the device, and used only when shown on the CWZTCD list.
4. Water ballasted systems used as barriers should not be used for a merging taper except in low speed (less than 45 MPH) urban areas. When used on a taper in a low speed urban area, the taper shall be delineated and the taper length should be designed to optimize road user operations considering the available geometric conditions.
5. When water ballasted systems used as barriers have blunt ends exposed to traffic, they should be attenuated as per manufacturer recommendations or flared to a point outside the clear zone.

If used to channelize pedestrians, longitudinal channelizing devices or water ballasted systems must have a continuous detectable bottom for users of long canes and the top of the unit shall not be less than 32 inches in height.

HOLLOW OR WATER BALLASTED SYSTEMS USED AS LONGITUDINAL CHANNELIZING DEVICES OR BARRIERS

Posted Speed *	Formula	Minimum Desirable Taper Lengths ** 10' Offset	11' Offset	12' Offset	Suggested Maximum Spacing of Channelizing Devices: On a Taper	On a Tangent
30	$L = \frac{WS^2}{60}$	150'	165'	180'	30'	60'
35		205'	225'	245'	35'	70'
40		265'	295'	320'	40'	80'
45	L = WS	450'	495'	540'	45'	90'
50		500'	550'	600'	50'	100'
55		550'	605'	660'	55'	110'
60		600'	660'	720'	60'	120'
65		650'	715'	780'	65'	130'
70		700'	770'	840'	70'	140'
75		750'	825'	900'	75'	150'
80		800'	880'	960'	80'	160'

** Taper lengths have been rounded off.
L=Length of Taper (FT.) W=Width of Offset (FT.)
S=Posted Speed (MPH)

SUGGESTED MAXIMUM SPACING OF CHANNELIZING DEVICES AND MINIMUM DESIRABLE TAPER LENGTHS

Texas Department of Transportation

Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(9)-14

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		WILLIAMSON		29

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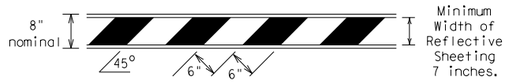
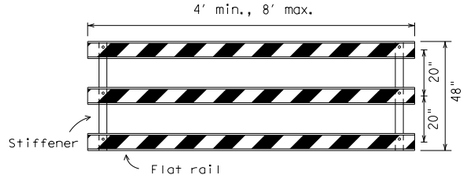
TYPE 3 BARRICADES

1. Refer to the Compliant Work Zone Traffic Control Devices List (CWZTCD) for details of the Type 3 Barricades and a list of all materials used in the construction of Type 3 Barricades.
2. Type 3 Barricades shall be used at each end of construction projects closed to all traffic.
3. Barricades extending across a roadway should have stripes that slope downward in the direction toward which traffic must turn in detouring. When both right and left turns are provided, the chevron striping may slope downward in both directions from the center of the barricade. Where no turns are provided at a closed road striping should slope downward in both directions toward the center of roadway.
4. Striping of rails, for the right side of the roadway, should slope downward to the left. For the left side of the roadway, striping should slope downward to the right.
5. Identification markings may be shown only on the back of the barricade rails. The maximum height of letters and/or company logos used for identification shall be 1".
6. Barricades shall not be placed parallel to traffic unless an adequate clear zone is provided.
7. Warning lights shall NOT be installed on barricades.
8. Where barricades require the use of weights to keep from turning over, the use of sandbags with dry, cohesionless sand is recommended. The sandbags will be tied shut to keep the sand from spilling and to maintain a constant weight. Sand bags shall not be stacked in a manner that covers any portion of a barricade rails reflective sheeting. Rock, concrete, iron, steel or other solid objects will NOT be permitted. Sandbags should weigh a minimum of 35 lbs and a maximum of 50 lbs. Sandbags shall be made of a durable material that tears upon vehicular impact. Rubber (such as tire inner tubes) shall not be used for sandbags. Sandbags shall only be placed along or upon the base supports of the device and shall not be suspended above ground level or hung with rope, wire, chains or other fasteners.
9. Sheeting for barricades shall be retroreflective Type A conforming to Departmental Material Specification DMS-8300 unless otherwise noted.

Barricades shall NOT be used as a sign support.



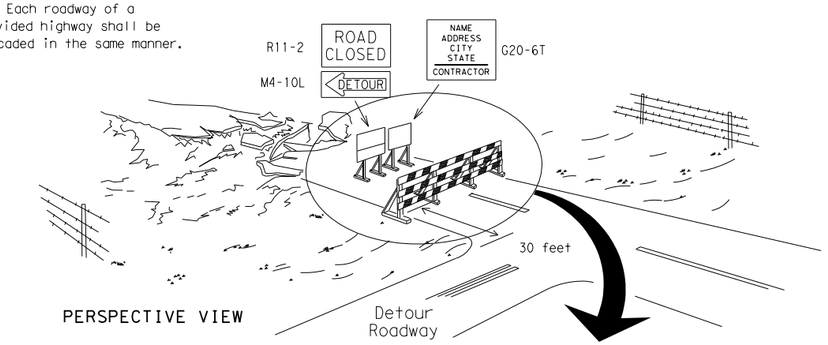
TYPICAL STRIPING DETAIL FOR BARRICADE RAIL



Stiffener may be inside or outside of support, but no more than 2 stiffeners shall be allowed on one barricade.

TYPICAL PANEL DETAIL FOR SKID OR POST TYPE BARRICADES

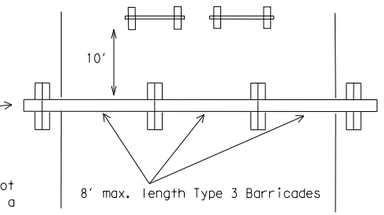
Each roadway of a divided highway shall be barricaded in the same manner.



PERSPECTIVE VIEW

The three rails on Type 3 barricades shall be reflectorized orange and reflective white stripes on one side facing one-way traffic and both sides for two-way traffic.

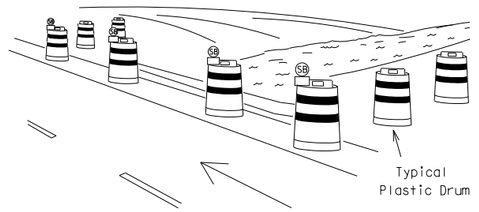
Barricade striping should slant downward in the direction of detour.



PLAN VIEW

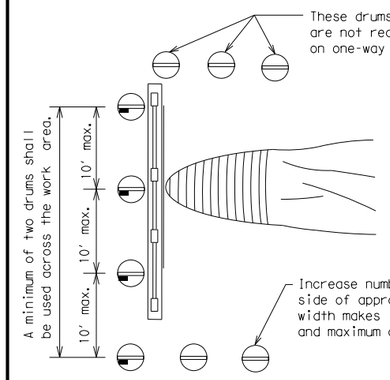
1. Signs should be mounted on independent supports at a 7 foot mounting height in center of roadway. The signs should be a minimum of 10 feet behind Type 3 Barricades.
2. Advance signing shall be as specified elsewhere in the plans.

TYPE 3 BARRICADE (POST AND SKID) TYPICAL APPLICATION



PERSPECTIVE VIEW

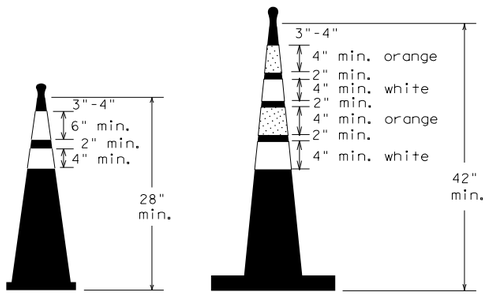
1. Where positive redirectional capability is provided, drums may be omitted.
2. Plastic construction fencing may be used with drums for safety as required in the plans.
3. Vertical Panels on flexible support may be substituted for drums when the shoulder width is less than 4 feet.
4. When the shoulder width is greater than 12 feet, steady-burn lights may be omitted if drums are used.
5. Drums must extend the length of the culvert widening.



PLAN VIEW

LEGEND	
	Plastic drum
	Plastic drum with steady burn light or yellow warning reflector
SB	Steady burn warning light or yellow warning reflector

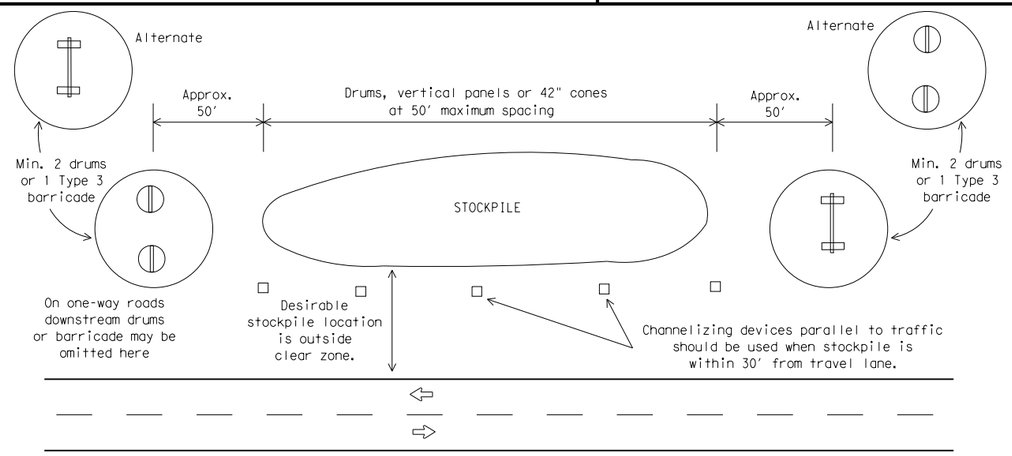
CULVERT WIDENING OR OTHER ISOLATED WORK WITHIN THE PROJECT LIMITS



28" Cones shall have a minimum weight of 9 1/2 lbs.

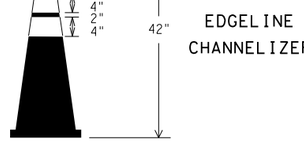
42" 2-piece cones shall have a minimum weight of 30 lbs. including base.

1. Traffic cones and tubular markers shall be predominantly orange, and meet the height and weight requirements shown above.
2. One-piece cones have the body and base of the cone molded in one consolidated unit. Two-piece cones have a cone shaped body and a separate rubber base, or ballast, that is added to keep the device upright and in place.
3. Two-piece cones may have a handle or loop extending up to 8" above the minimum height shown, in order to aid in retrieving the device.
4. Cones or tubular markers used at night shall have white or white and orange reflective bands as shown above. The reflective bands shall have a smooth, sealed outer surface and meet the requirements of Departmental Material Specification DMS-8300 Type A.
5. 28" cones and tubular markers are generally suitable for short duration and short-term stationary work as defined on BC(4). These should not be used for intermediate-term or long-term stationary work unless personnel is on-site to maintain them in their proper upright position.
6. 42" two-piece cones, vertical panels or drums are suitable for all work zone durations.
7. Cones or tubular markers used on each project should be of the same size and shape.



TRAFFIC CONTROL FOR MATERIAL STOCKPILES

THIS DEVICE SHALL NOT BE USED ON PROJECTS LET AFTER MARCH 2014.



1. This device is intended only for use in place of a vertical panel to channelize traffic by indicating the edge of the travel lane. It is not intended to be used in transitions or tapers.
2. This device shall not be used to separate lanes of traffic (opposing or otherwise) or warn of objects.
3. This device is based on a 42 inch, two-piece cone with an alternate striping pattern: four 4 inch retroreflective bands, with an approximate 2 inch gap between bands. The color of the band should correspond to the color of the edgeline (yellow for left edgeline, white for right edgeline) for which the device is substituted or for which it supplements. The reflectorized bands shall be retroreflective Type A conforming to Departmental Material Specification DMS-8300, unless otherwise noted.
4. The base must weigh a minimum of 30 lbs.

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BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(10)-14

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WORK ZONE PAVEMENT MARKINGS

GENERAL

1. The Contractor shall be responsible for maintaining work zone and existing pavement markings, in accordance with the standard specifications and special provisions, on all roadways open to traffic within the CSJ limits unless otherwise stated in the plans.
2. Color, patterns and dimensions shall be in conformance with the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD).
3. Additional supplemental pavement marking details may be found in the plans or specifications.
4. Pavement markings shall be installed in accordance with the TMUTCD and as shown on the plans.
5. When short term markings are required on the plans, short term markings shall conform with the TMUTCD, the plans and details as shown on the Standard Plan Sheet WZ(STPM).
6. When standard pavement markings are not in place and the roadway is opened to traffic, DO NOT PASS signs shall be erected to mark the beginning of the sections where passing is prohibited and PASS WITH CARE signs at the beginning of sections where passing is permitted.
7. All work zone pavement markings shall be installed in accordance with Item 662, "Work Zone Pavement Markings."

RAISED PAVEMENT MARKERS

1. Raised pavement markers are to be placed according to the patterns on BC(12).
2. All raised pavement markers used for work zone markings shall meet the requirements of Item 672, "RAISED PAVEMENT MARKERS" and Departmental Material Specification DMS-4200 or DMS-4300.

PREFABRICATED PAVEMENT MARKINGS

1. Removable prefabricated pavement markings shall meet the requirements of DMS-8241.
2. Non-removable prefabricated pavement markings (foil back) shall meet the requirements of DMS-8240.

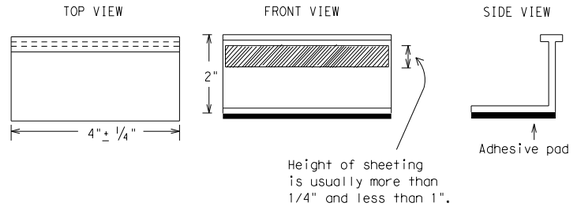
MAINTAINING WORK ZONE PAVEMENT MARKINGS

1. The Contractor will be responsible for maintaining work zone pavement markings within the work limits.
2. Work zone pavement markings shall be inspected in accordance with the frequency and reporting requirements of work zone traffic control device inspections as required by Form 599.
3. The markings should provide a visible reference for a minimum distance of 300 feet during normal daylight hours and 160 feet when illuminated by automobile low-beam headlights at night, unless sight distance is restricted by roadway geometrics.
4. Markings failing to meet this criteria within the first 30 days after placement shall be replaced at the expense of the Contractor as per Specification Item 662.

REMOVAL OF PAVEMENT MARKINGS

1. Pavement markings that are no longer applicable, could create confusion or direct a motorist toward or into the closed portion of the roadway shall be removed or obliterated before the roadway is opened to traffic.
2. The above shall not apply to detours in place for less than three days, where flaggers and/or sufficient channelizing devices are used in lieu of markings to outline the detour route.
3. Pavement markings shall be removed to the fullest extent possible, so as not to leave a discernable marking. This shall be by any method approved by TxDOT Specification Item 677 for "Eliminating Existing Pavement Markings and Markers".
4. The removal of pavement markings may require resurfacing or seal coating portions of the roadway as described in Item 677.
5. Subject to the approval of the Engineer, any method that proves to be successful on a particular type pavement may be used.
6. Blast cleaning may be used but will not be required unless specifically shown in the plans.
7. Over-painting of the markings SHALL NOT BE permitted.
8. Removal of raised pavement markers shall be as directed by the Engineer.
9. Removal of existing pavement markings and markers will be paid for directly in accordance with Item 677, "ELIMINATING EXISTING PAVEMENT MARKINGS AND MARKERS," unless otherwise stated in the plans.
10. Black-out marking tape may be used to cover conflicting existing markings for periods less than two weeks when approved by the Engineer.

Temporary Flexible-Reflective Roadway Marker Tabs



STAPLES OR NAILS SHALL NOT BE USED TO SECURE TEMPORARY FLEXIBLE-REFLECTIVE ROADWAY MARKER TABS TO THE PAVEMENT SURFACE

1. Temporary flexible-reflective roadway marker tabs used as guidemarks shall meet the requirements of DMS-8242.
2. Tabs detailed on this sheet are to be inspected and accepted by the Engineer or designated representative. Sampling and testing is not normally required, however at the option of the Engineer, either "A" or "B" below may be imposed to assure quality before placement on the roadway.
   A. Select five (5) or more tabs at random from each lot or shipment and submit to the Construction Division, Materials and Pavement Section to determine specification compliance.
   B. Select five (5) tabs and perform the following test. Affix five (5) tabs at 24 inch intervals on an asphaltic pavement in a straight line. Using a medium size passenger vehicle or pickup, run over the markers with the front and rear tires at a speed of 35 to 40 miles per hour, four (4) times in each direction. No more than one (1) out of the five (5) reflective surfaces shall be lost or displaced as a result of this test.
3. Small design variances may be noted between tab manufacturers.
4. See Standard Sheet WZ(STPM) for tab placement on new pavements. See Standard Sheet TCP(7-1) for tab placement on seal coat work.

RAISED PAVEMENT MARKERS USED AS GUIDEMARKS

1. Raised pavement markers used as guidemarks shall be from the approved product list, and meet the requirements of DMS-4200.
2. All temporary construction raised pavement markers provided on a project shall be of the same manufacturer.
3. Adhesive for guidemarks shall be bituminous material hot applied or butyl rubber pad for all surfaces, or thermoplastic for concrete surfaces.

Guidemarks shall be designated as:
YELLOW - (two amber reflective surfaces with yellow body).
WHITE - (one silver reflective surface with white body).

DEPARTMENTAL MATERIAL SPECIFICATIONS	
PAVEMENT MARKERS (REFLECTORIZED)	DMS-4200
TRAFFIC BUTTONS	DMS-4300
EPOXY AND ADHESIVES	DMS-6100
BITUMINOUS ADHESIVE FOR PAVEMENT MARKERS	DMS-6130
PERMANENT PREFABRICATED PAVEMENT MARKINGS	DMS-8240
TEMPORARY REMOVABLE, PREFABRICATED PAVEMENT MARKINGS	DMS-8241
TEMPORARY FLEXIBLE, REFLECTIVE ROADWAY MARKER TABS	DMS-8242

A list of prequalified reflective raised pavement markers, non-reflective traffic buttons, roadway marker tabs and other pavement markings can be found at the Material Producer List web address shown on BC(1).

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BARRICADE AND CONSTRUCTION PAVEMENT MARKINGS

BC(11)-14

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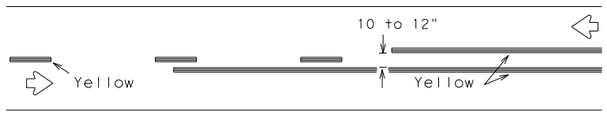
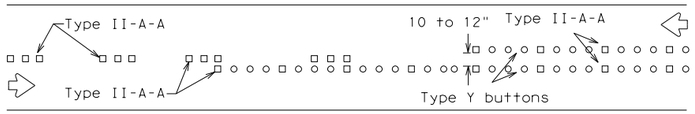
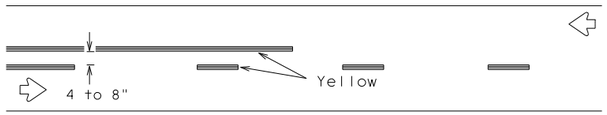
PAVEMENT MARKING PATTERNS



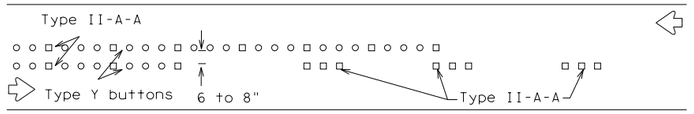
REFLECTORIZED PAVEMENT MARKINGS - PATTERN A



RAISED PAVEMENT MARKERS - PATTERN A



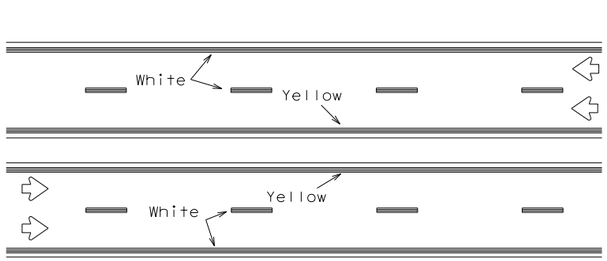
REFLECTORIZED PAVEMENT MARKINGS - PATTERN B



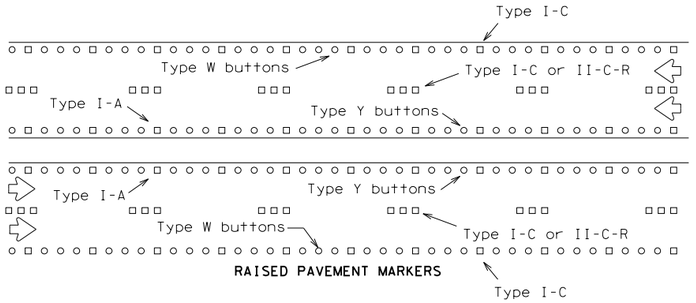
RAISED PAVEMENT MARKERS - PATTERN B

Pattern A is the TXDOT Standard, however Pattern B may be used if approved by the Engineer.
Prefabricated markings may be substituted for reflectorized pavement markings.

CENTER LINE & NO-PASSING ZONE BARRIER LINES FOR TWO-LANE, TWO-WAY HIGHWAYS



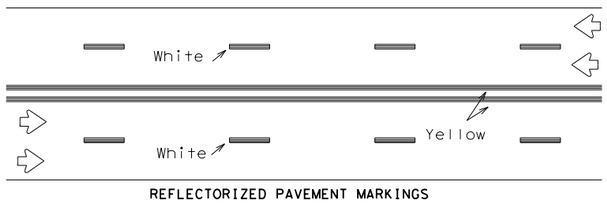
REFLECTORIZED PAVEMENT MARKINGS



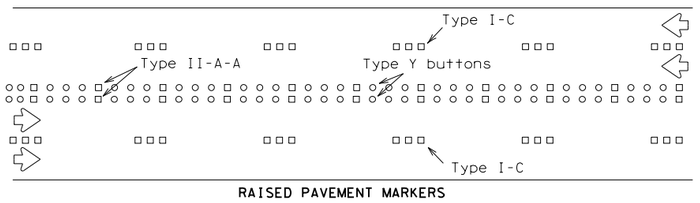
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

EDGE & LANE LINES FOR DIVIDED HIGHWAY



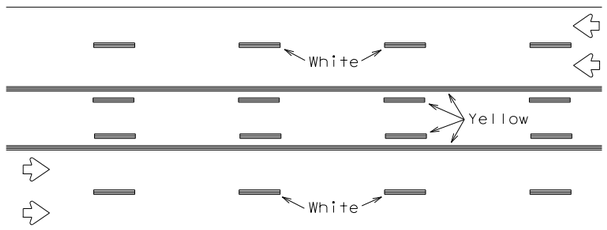
REFLECTORIZED PAVEMENT MARKINGS



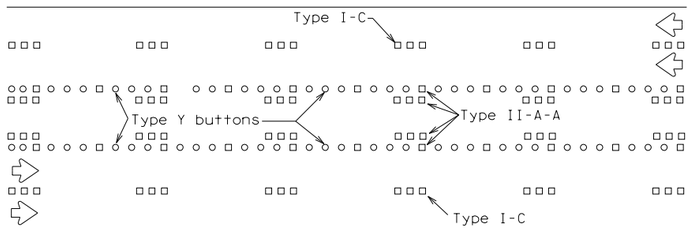
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS



REFLECTORIZED PAVEMENT MARKINGS



RAISED PAVEMENT MARKERS

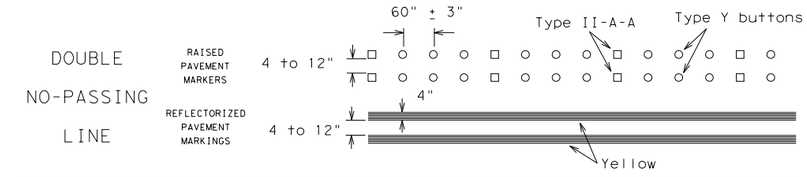
Prefabricated markings may be substituted for reflectorized pavement markings.

TWO-WAY LEFT TURN LANE

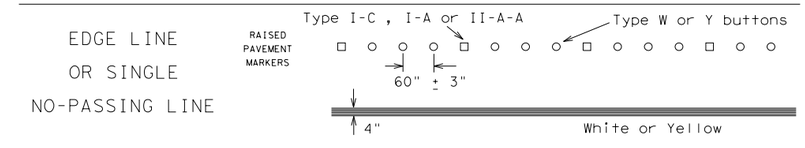
STANDARD WORK ZONE PAVEMENT MARKINGS DETAILS

SOLID LINES

DOUBLE NO-PASSING LINE

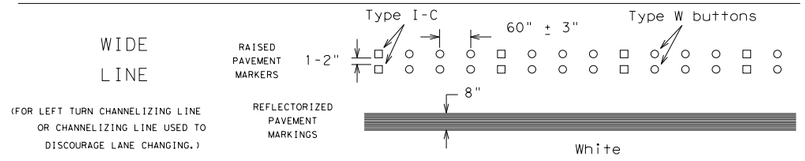


EDGE LINE OR SINGLE NO-PASSING LINE



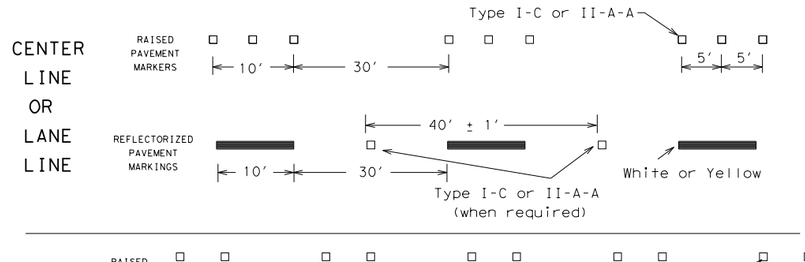
WIDE LINE

(FOR LEFT TURN CHANNELIZING LINE OR CHANNELIZING LINE USED TO DISCOURAGE LANE CHANGING.)

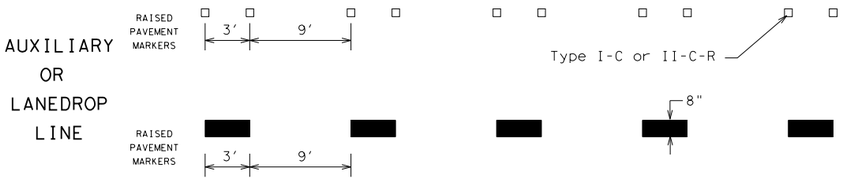


BROKEN LINES

CENTER LINE OR LANE LINE

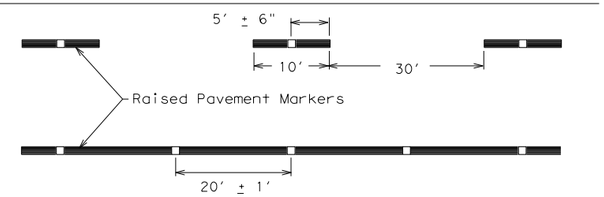


AUXILIARY OR LANEDROP LINE



REMOVABLE MARKINGS WITH RAISED PAVEMENT MARKERS

If raised pavement markers are used to supplement REMOVABLE markings, the markers shall be applied to the top of the tape at the approximate mid length of tape used for broken lines or at 20 foot spacing for solid lines. This allows an easier removal of raised pavement markers and tape.



Centerline only - not to be used on edge lines

Raised pavement markers used as standard pavement markings shall be from the approved products list and meet the requirements of Item 672 "RAISED PAVEMENT MARKERS."

Texas Department of Transportation

Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION PAVEMENT MARKING PATTERNS

BC(12)-14

FILE: bc-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT February 1998	CONT	SECT	JOB	HIGHWAY
REVISIONS				SE INNER LP
1-97 9-07				
2-98 7-13	DIST	COUNTY		SHEET NO.
11-02 8-14		WILLIAMSON		32

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DATE: 6/24/2017 7:54
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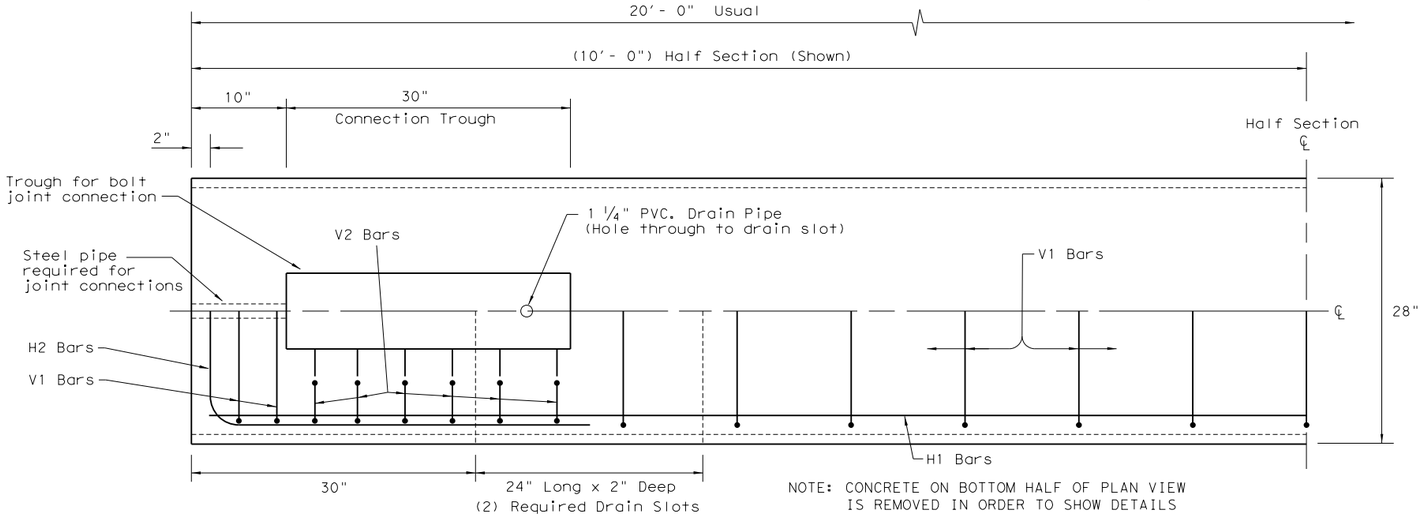
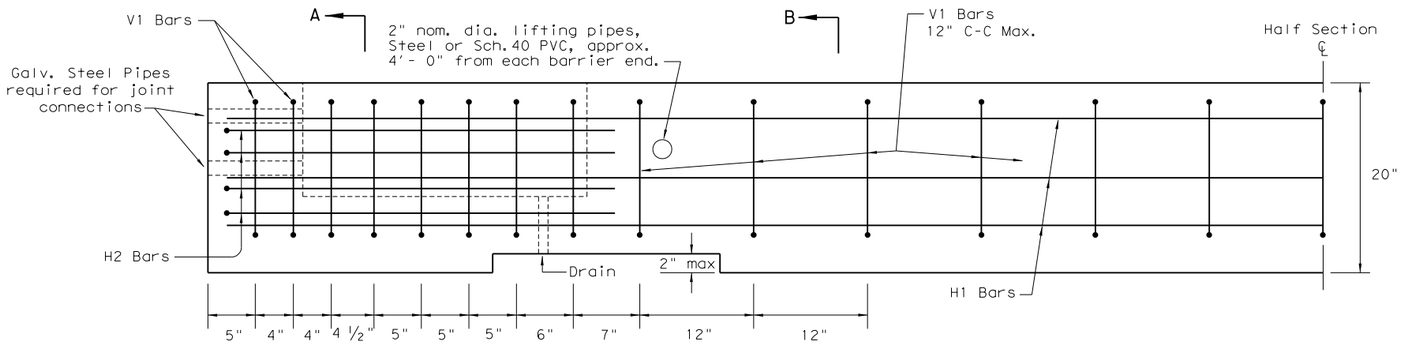
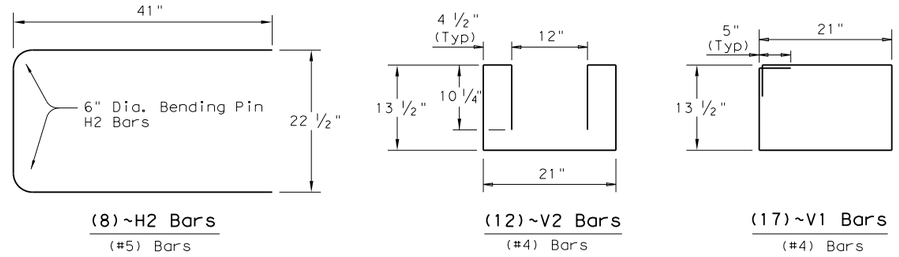


PLAN
(TYPE 1) BARRIER SEGMENT
(SYMMETRICAL ABOUT CENTER LINES)



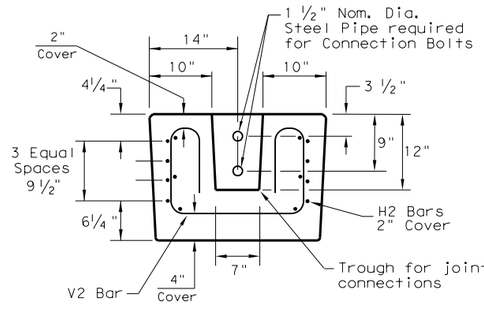
ELEVATION
(TYPE 1) BARRIER SEGMENT
(SYMMETRICAL ABOUT CENTER LINES)



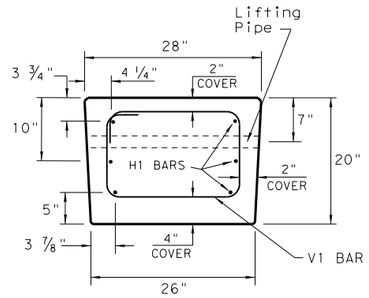
(8)~H2 Bars (#5) Bars
(12)~V2 Bars (#4) Bars
(17)~V1 Bars (#4) Bars

REINFORCING STEEL DETAILS
TYPE 1 - BARRIER SEGMENT

Note: Use 2" Dia. Bending Pin, unless otherwise shown



SECTION A-A



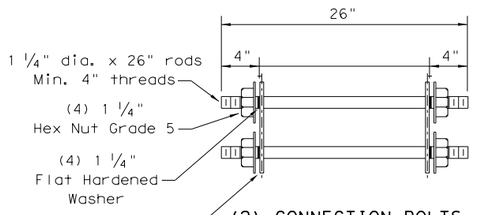
SECTION B-B

GENERAL NOTES

1. Low Profile Concrete Barrier (LPCB), is approved for use in temporary work zone locations, where the posted speed is 45 mph, or less.
2. Concrete shall be Class H for precast barrier with a minimum compressive strength of 3,600 psi.
3. Where used, rebar reinforcement shall be Grade 60 and conform to ASTM A615.
4. Precast LPCB barrier length shall be 20 ft.
5. All barrier edges shall have ¾" chamfer or a tooled radius.
6. Joint connection hardware shall be in accordance with Item 449, "Anchor Bolts." and is considered subsidiary.
7. Steel pipe required for joint connection bolts shall be galvanized in accordance with Item 445,"Galvanizing."
8. Welded wire reinforcement (WWR) may be used in lieu of conventional reinforcement for Type 1 barrier, and shall meet the requirements shown.

FOR CONTRACTORS INFORMATION ONLY

(TYPE 1) APPROX. QUANTITIES 20 FT. SECTION		
CONCRETE	CY	2.6
REINFORCING STEEL	LBS	330
TOTAL BARRIER WT.	LBS	11000



(2) CONNECTION BOLTS
ASTM A36

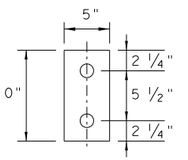
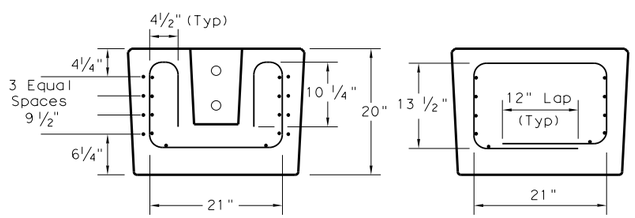


PLATE WASHER
5" x 10" x ⅜"

Note: Rods, Hex nuts and Washers shall be Galvanized.



SECTION A-A
SECTION B-B

(WWR) GENERAL NOTES

1. Deformed Welded Wire Reinforcement shall conform to ASTM A497.
2. Welded wire cage may be cut or bent, if necessary, but must be approved by the Engineer.
3. Combinations of reinforcing steel and WWR are permitted, as directed by the Engineer. The dimensions from the end of the barrier section to the first wire shall not exceed 3".

REQUIRED (WWR) WIRE DESIGN

8 ~ (D31) Horizontal Wires (Equally spaced)
10 ~ (D20) Horizontal Wires (Equally spaced)
29 ~ (D20) Vertical Wires (Spaced as shown in Elevation View)

WELDED WIRE REINFORCEMENT (WWR)- OPTIONAL REINFORCING

SHEET 1 OF 2

Texas Department of Transportation
Design Division Standard

LOW PROFILE CONCRETE BARRIER
PRECAST BARRIER (TYPE 1)
LPCB-13

FILE: lpcb13.dgn	DN: TxDOT	CK: AM	DW: VP	CK:
©TxDOT December 2010	CONT	SECT	JOB	HIGHWAY
REVISIONS				SE INNER LP
	DIST	COUNTY		SHEET NO.
		WILLIAMSON		33

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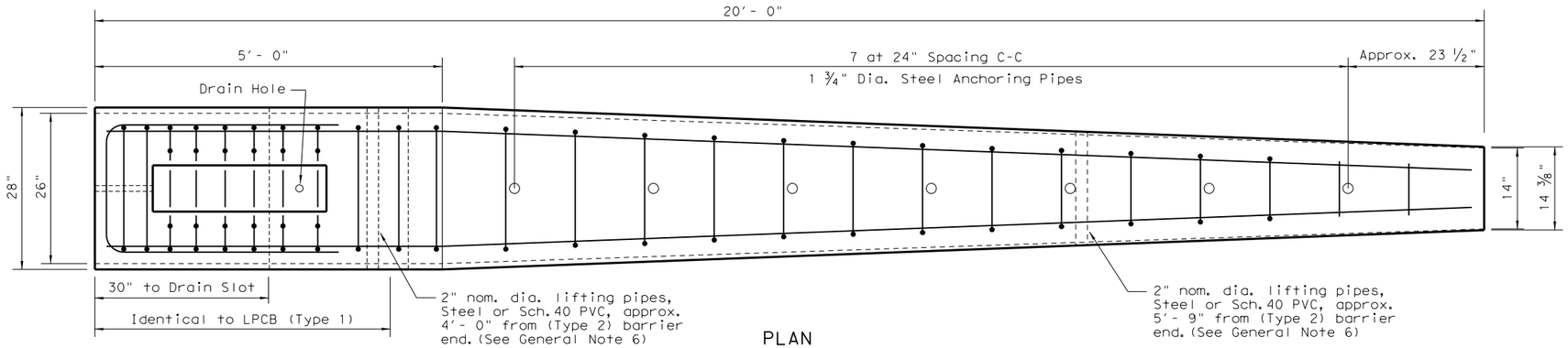
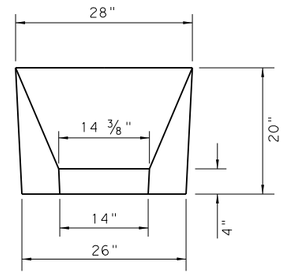
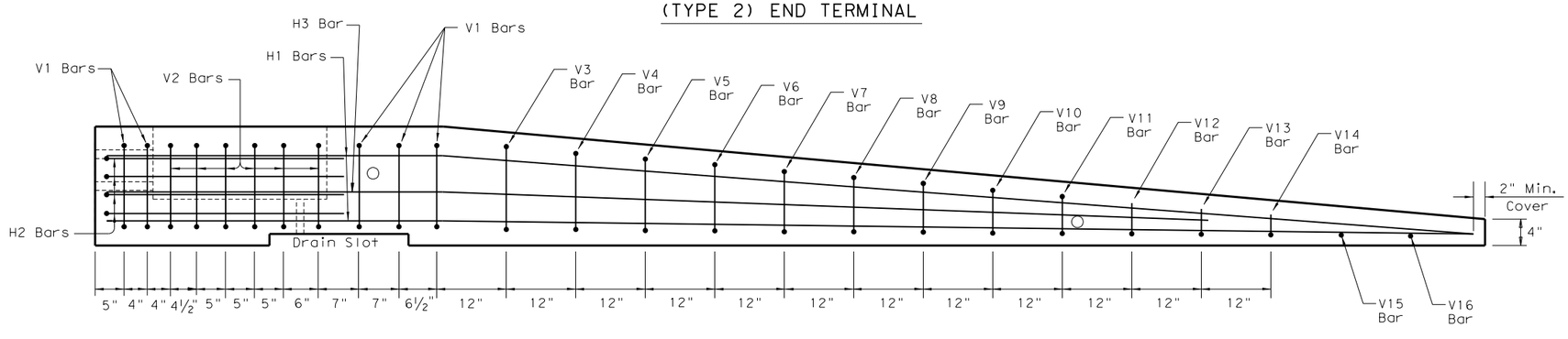


PLAN
(TYPE 2) END TERMINAL

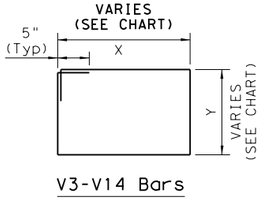


APPROACH VIEW



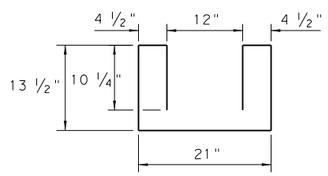
ELEVATION
(TYPE 2) END TERMINAL

Note:
Anchoring pipes not shown in Elevation View

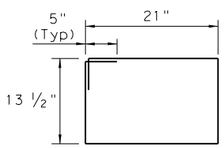


V3-V14 Bars

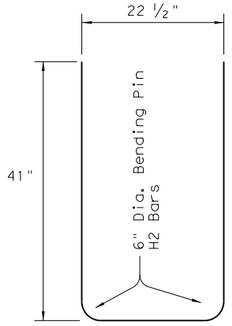
BAR(#4)	X (IN.)	Y (IN.)
V3 BAR	20 ¼	14 ½
V4 BAR	19 ½	13 ½
V5 BAR	18 ½	12 ¼
V6 BAR	17 ½	11 ¼
V7 BAR	17	10 ¼
V8 BAR	16 ¼	9
V9 BAR	15 ½	8
V10 BAR	14 ½	7
V11 BAR	13 ¾	6



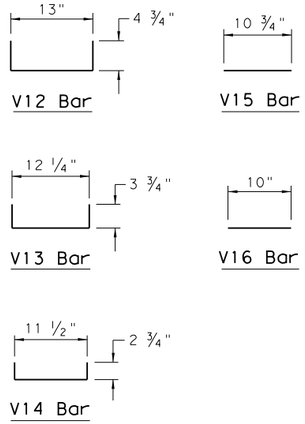
(6)~V2 Bars



(5)~V1 Bars

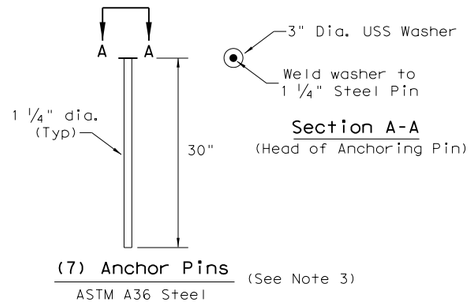


(4)~H2 Bars
(#5) Bars



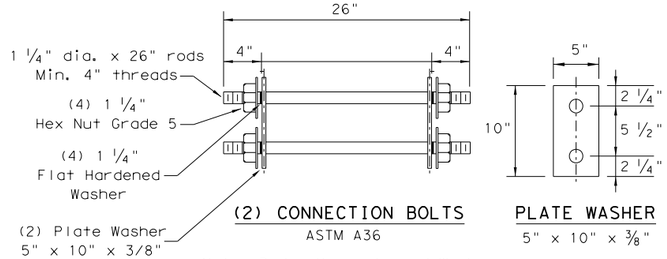
Note: All V Bars are (#4)

REINFORCING STEEL DETAILS
TYPE 2 - END TERMINAL



Section A-A
(Head of Anchoring Pin)

(7) Anchor Pins
ASTM A36 Steel
(See Note 3)



(2) CONNECTION BOLTS
ASTM A36

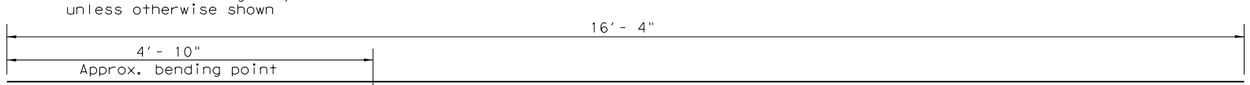
PLATE WASHER
5" x 10" x ⅜"

Note: Rods, Hex nuts and Washers shall be Galvanized.

TYPE 2 - NOTES

1. Welded wire reinforcment (WWR) is "not" an option for Type 2 Barrier.
2. Type 2 Barrier shall be used as an end treatment for the Type 1 barrier segments, when applicable.
3. The end treatment can be used without the anchor pins in locations that can accommodate approximately 4 ft. of lateral displacement of the end treatment. The use of non-pinned end treatment does not affect the performance or the deflection of the Low-Profile barrier system.
4. The anchor pins are all the same length and are to be driven flush with the top of the (Type 2) barrier surface.
5. The bends in the H3 and H1 bars are slight, no formal bend is necessary.
6. The Type 2 barrier segment must be lifted from the rear first, to prevent cracking of sloped section.
7. See LPCB sheet 1 for additional information.

Note: Use 2" Dia. Bending Pin, unless otherwise shown



(2)~H3 Bars
(#5) Bar

(4)~H1 Bars
(#5) Bar

Note: Bends on H1 and H3 bars are slight and do not require formal bends.

FOR CONTRACTORS INFORMATION ONLY

(TYPE 2) APPROX. QUANTITIES	20 FT. SECTION	
CONCRETE	CY	1.65
REINFORCING STEEL	LBS	240
TOTAL BARRIER WT.	LBS	7000

Texas Department of Transportation
Design Division Standard

LOW PROFILE CONCRETE BARRIER
PRECAST BARRIER (TYPE 2)
LPCB-13

FILE: lpcb13.dgn	DN: TxDOT	CK: AM	DW: VP	CK:
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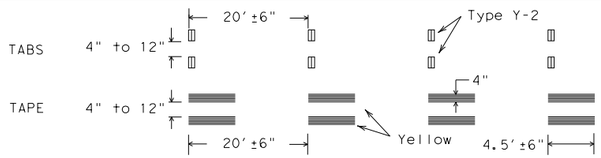
REVISIONS				SE INNER LP
	DIST	COUNTY		SHEET NO.
		WILLIAMSON		34

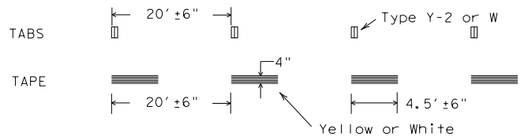
WORK ZONE SHORT TERM PAVEMENT MARKINGS DETAILS

SOLID LINES

DOUBLE NO-PASSING LINE

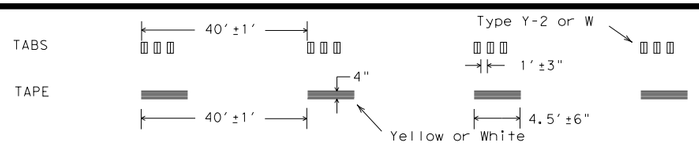


SINGLE NO-PASSING LINE or CHANNELIZATION LINE



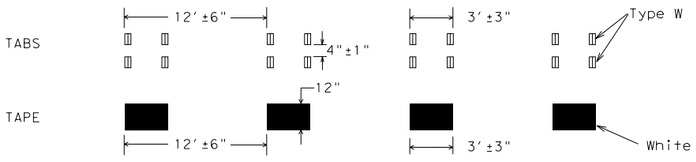
BROKEN LINES

(FOR CENTER LINE OR LANE LINE)

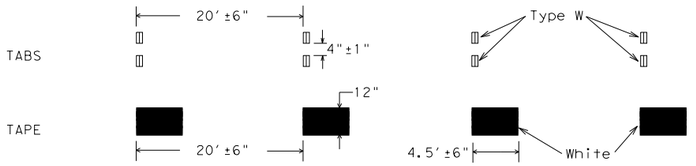


WIDE DOTTED LINES

(FOR LANE DROP LINES)



WIDE GORE MARKINGS



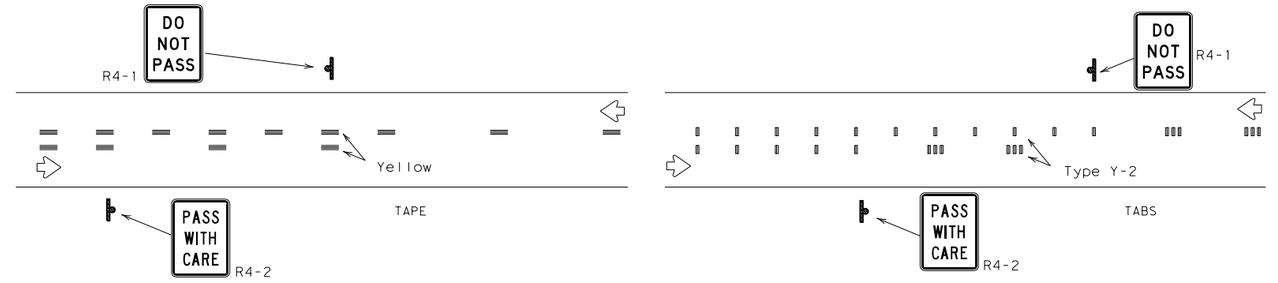
NOTES:

1. Short term pavement markings may be prefabricated markings (stick down tape) or temporary flexible-reflective roadway marker tabs unless otherwise specified elsewhere in plans.
2. Short term pavement markings shall NOT be used to simulate edge lines.
3. Dimensions indicated on this sheet are typical and approximate. Variations in size and height may occur between markers or devices made by manufacturers, by as much as 1/4 inch, unless otherwise noted.
4. Temporary flexible-reflective roadway marker tabs will require normal maintenance replacement when used on roadways with an ADT per lane of up to 7500 vehicles with no more than 10% truck mix. When roadways exceed these values, additional maintenance replacement of devices should be planned.
5. No segment of roadway open to traffic shall remain without permanent pavement markings for a period greater than 14 calendar days. The Contractor will be responsible for maintaining short term pavement markings until permanent pavement markings are in place. When the Contractor is responsible for placement of permanent pavement markings, no segment of roadway shall remain without permanent pavement markings for a period greater than 14 calendar days unless weather conditions prohibit placement. Permanent pavement markings shall be placed as soon as weather permits.
6. For two lane, two-way roadways, DO NOT PASS signs shall be erected to mark the beginning of sections where passing is prohibited and PASS WITH CARE signs shall be erected to mark the beginning of sections where passing is permitted. Signs shall be in accordance with the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD) and may be used to indicate the limits of no-passing zones for up to 14 calendar days. Permanent pavement markings should then be placed.
7. For low volume two lane, two-way roadways of 4000 ADT or less, no-passing lines may be omitted when approved by the Engineer. DO NOT PASS and PASS WITH CARE signs shall be erected (see note 6).
8. For exit gores where a lane is being dropped place wide gore markings or retroreflective channelizing devices to guide motorist through the exit. If channelizing devices are to be used it should be noted elsewhere in the plans. One piece cones are not allowed for this purpose.

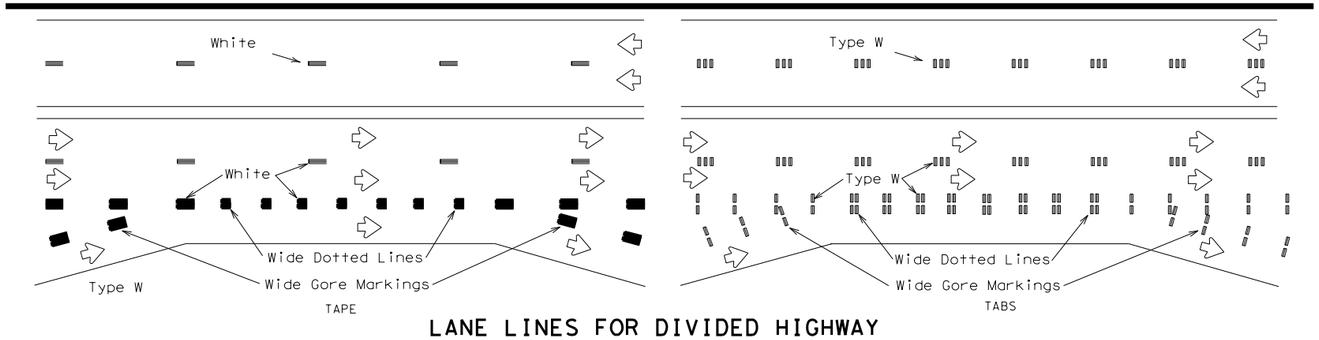
TEMPORARY FLEXIBLE, REFLECTIVE ROADWAY MARKER TABS (TABS)

1. Temporary flexible-reflective roadway marker tabs detailed on this sheet will be designated Type Y-2 (two amber reflective surfaces with yellow body); Type Y (one amber reflective surface with yellow body); and Type W (one white or silver reflective surface with white body). Additional details may be found on BC(11).
2. Tabs shall meet requirements of Departmental Material Specification DMS-8242.
3. When dry, tabs shall be visible for a minimum distance of 200 feet during normal daylight hours and when illuminated by automobile low-beam head light at night, unless sight distance is restricted by roadway geometrics.
4. No two consecutive tabs nor four tabs per 1000 feet of line shall be missing or fail to meet the visual performance requirements of Note 3.

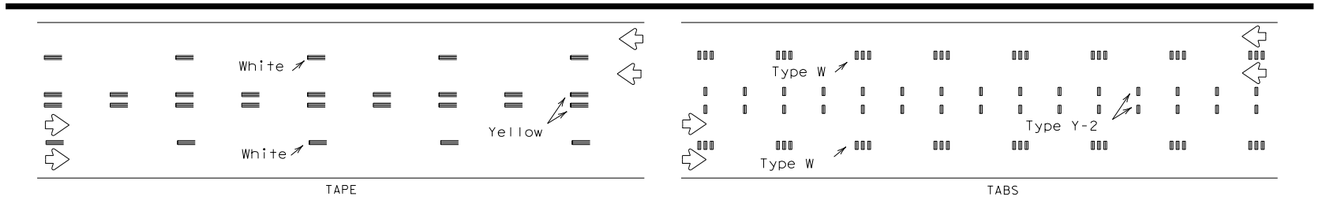
WORK ZONE SHORT TERM PAVEMENT MARKINGS PATTERNS



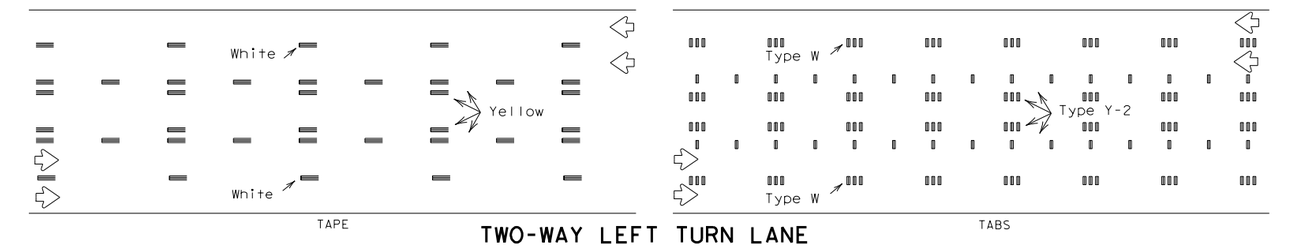
CENTER LINE & NO-PASSING ZONE BARRIER LINES FOR TWO LANE TWO-WAY HIGHWAYS



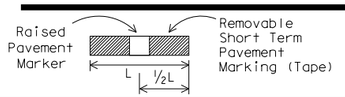
LANE LINES FOR DIVIDED HIGHWAY



LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS



TWO-WAY LEFT TURN LANE



If raised pavement markers are used to supplement REMOVABLE short term markings, the markers shall be applied to the top of the tape at the approximate mid length of the tape. This allows an easier removal of raised markers and tape.

PREFABRICATED PAVEMENT MARKINGS

1. Temporary Removable Prefabricated Pavement Markings shall meet the requirements of DMS-8241.
2. Non-removable Prefabricated Pavement Markings shall meet the requirements of either DMS-8240 "Permanent Prefabricated Pavement Markings" or DMS-8243 "Temporary Costruction-Grade Prefabricated Pavement Markings."

RAISED PAVEMENT MARKERS

1. All raised pavement markers used for work zone markings shall meet the requirements of Item 672, "RAISED PAVEMENT MARKERS" and DMS-4200.

DEPARTMENTAL MATERIAL SPECIFICATIONS (DMS) & MATERIAL PRODUCER LISTS (MPL)

1. DMSs referenced above can be found along with embedded links to their respective MPLs at the following website:
   http://www.txdot.gov/business/contractors_consultants/material_specifications/default.htm

Texas Department of Transportation

Traffic Operations Division Standard

WORK ZONE SHORT TERM PAVEMENT MARKINGS

WZ(STPM)-13

FILE:	wzstpm-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT	April 1992	CONT	SECT	JOB	HIGHWAY
REVISIONS					SE INNER LP
1-97		DIST	COUNTY		SHEET NO.
3-03			WILLIAMSON		35
7-13					

111

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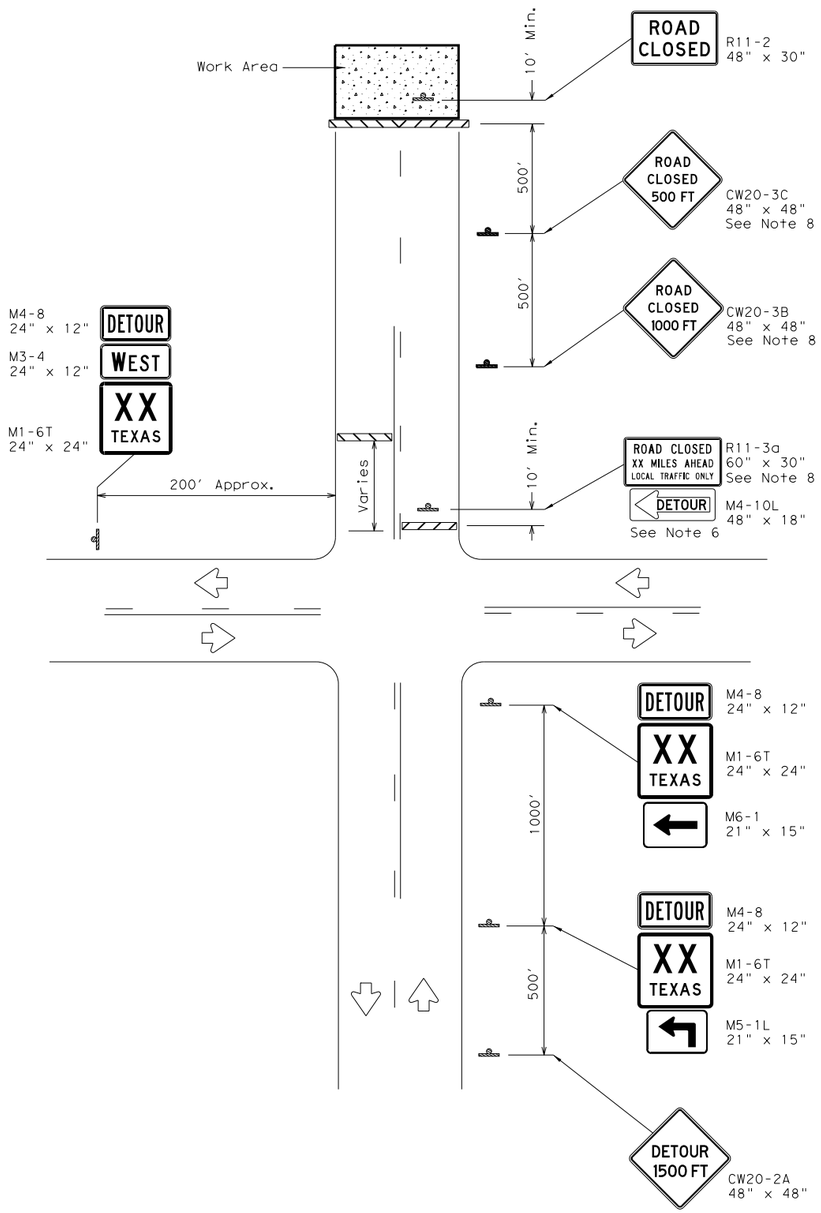
DATE: 6/24/2017 7:54
FILE: pw://rtg-pw.bentley.com:rtg-pw/Documents/8760101/dlv/standards/top/WZfSTPMs-stygard

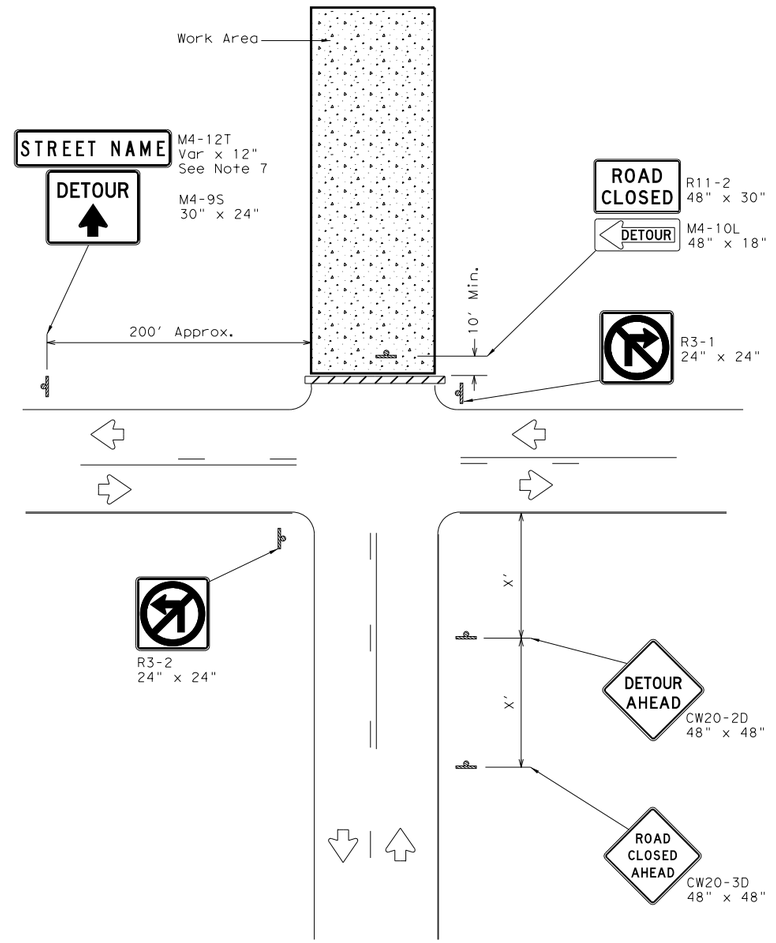
DISCLAIMER:
The use of this standard is governed by the "Texas Engineering Practice Act". No warranty of any kind is made by TxDOT for any purpose whatsoever. TxDOT assumes no responsibility for the conversion of this standard to other formats or for incorrect results or damages resulting from its use.

DATE: 6/24/2017 7:54
FILE: pw://rtg-pw.bentley.com:rtg-pw/Documents/8760101/dlv/standards/tcp/WZ(RCD)13.dgn



ROAD CLOSURE BEYOND THE INTERSECTION

Signing for a Numbered Route with an Off-Site Detour



ROAD CLOSURE AT THE INTERSECTION

Signing for an Un-numbered Route with an Off-Site Detour

LEGEND	
	Type 3 Barricade
	Sign

Posted Speed *	Minimum Sign Spacing "X" Distance
30	120'
35	160'
40	240'
45	320'
50	400'
55	500'
60	600'
65	700'
70	800'
75	900'

* Conventional Roads Only

GENERAL NOTES

1. This sheet is intended to provide details for temporary work zone road closures. For permanent road closure details see the D&OM standards.
2. Barricades used shall meet the requirements shown on Barricade and Construction Standard BC(10) and listed on the Compliant Work Zone Traffic Control Devices list (CWZTCD).
3. Stockpiled materials shall not be placed on the traffic side of barricades.
4. Barricades at the road closure should extend from pavement edge to pavement edge.
5. Detour signing shown is intended to illustrate the type of signing that is appropriate for numbered routes or un-numbered routes as labeled. It does not indicate the full extent of detour signing required. Detour routes should be signed as shown elsewhere in the plans.
6. If the road is open for a significant distance beyond the intersection or there are significant origin/destination points beyond the intersection, the signs and barricades at this location should be located at the edge of the traveled way.
7. The Street Name (M4-12T) sign is to be placed above the DETOUR (M4-9S) sign.
8. For urban areas where there is a shorter distance between the intersection and the actual closure location, the ROAD CLOSED XX MILES AHEAD (R11-3a) sign may be replaced with a ROAD CLOSED TO THRU TRAFFIC (R11-4) sign. If adequate space does not exist between the intersection and the closure a single ROAD CLOSED AHEAD (CW20-3D) sign spaced as per the table above may replace the ROAD CLOSED 1000 FT (CW20-3B) and ROAD CLOSED 500 FT (CW20-3C) signs.
9. Signs and barricades shown shall be subsidiary to Item 502. Locations where these details will be required shall be as shown elsewhere in the plans.

Texas Department of Transportation

Traffic Operations Division Standard

WORK ZONE ROAD CLOSURE DETAILS

WZ(RCD)-13

FILE: wzrcd-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT August 1995	CONT	SECT	JOB	HIGHWAY
REVISIONS				SE INNER LP
1-97 4-98 7-13	DIST	COUNTY		SHEET NO.
2-98 3-03		WILLIAMSON		36

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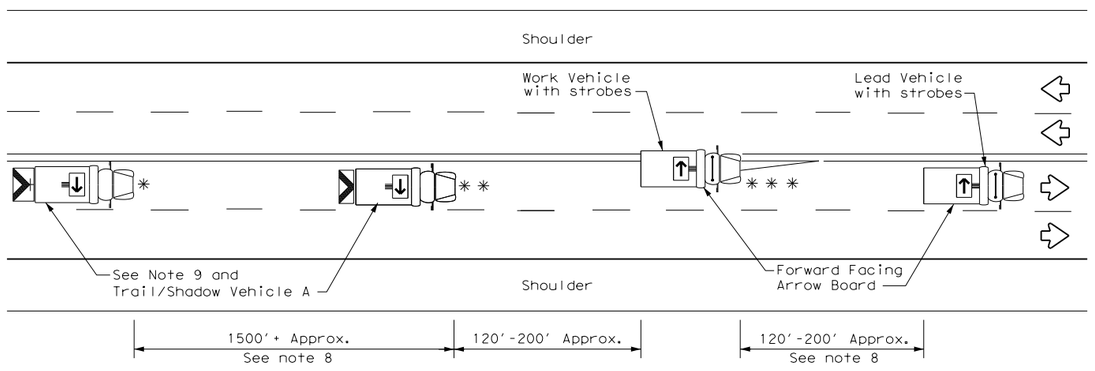
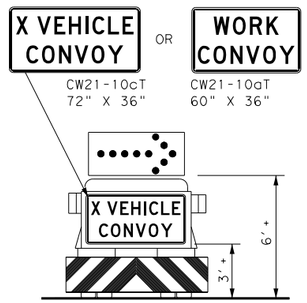
DATE: 6/24/2017 7:55
FILE: pw://rtg-pw.bentley.com:rtg_pw/Documents/8760101/dlv/standards/tcp/TCP(3b1-4)-13.dgn



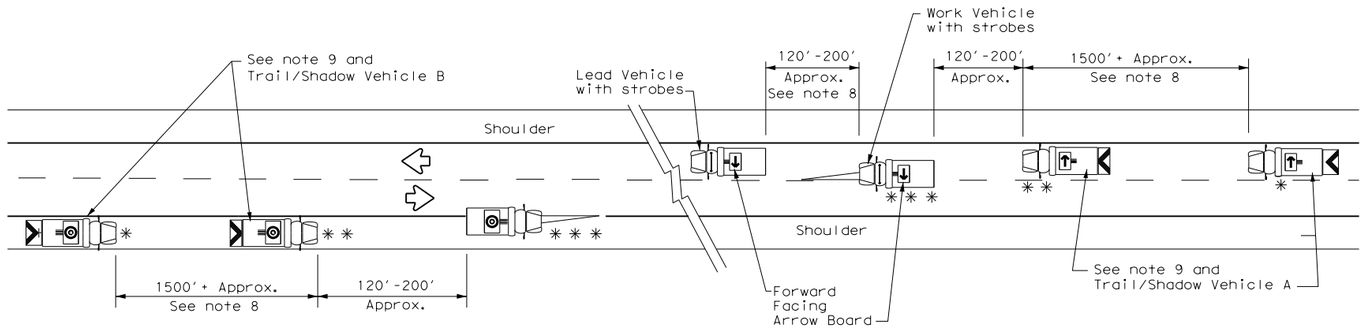
TCP (3-1a)

UNDIVIDED MULTILANE ROADWAY



TRAIL/SHADOW VEHICLE A

with RIGHT Directional display Flashing Arrow Board

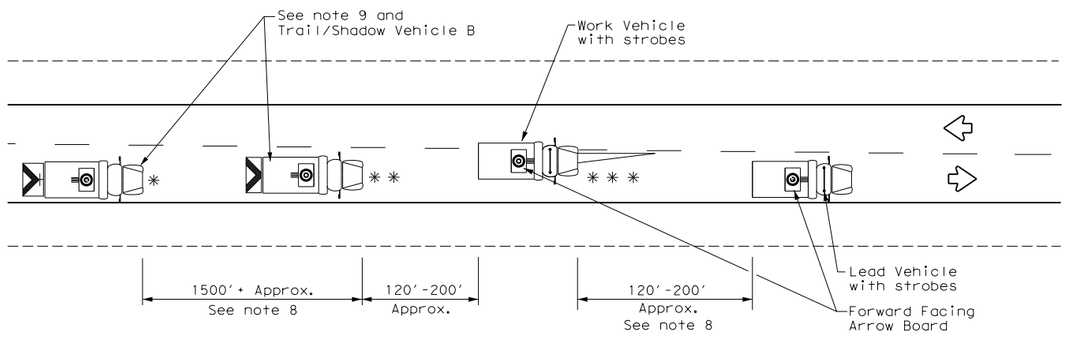


WORK ON SHOULDER

WORK ON TRAVEL LANE

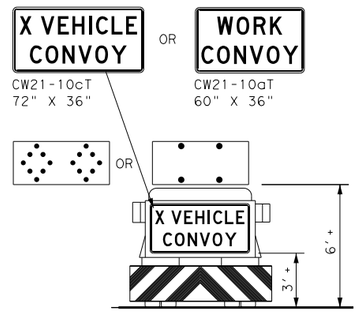
TCP (3-1b)

TWO-WAY ROADWAY WITH PAVED SHOULDERS



TCP (3-1c)

TWO-WAY ROADWAY WITHOUT PAVED SHOULDERS



TRAIL/SHADOW VEHICLE B

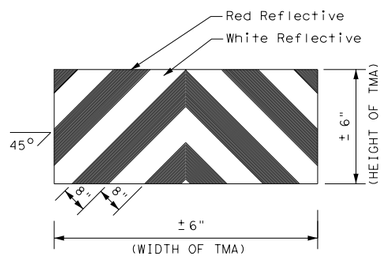
with Flashing Arrow Board in CAUTION display

LEGEND			
*	Trail Vehicle	ARROW BOARD DISPLAY	
* *	Shadow Vehicle		
* * *	Work Vehicle		RIGHT Directional
	Heavy Work Vehicle		LEFT Directional
	Truck Mounted Attenuator (TMA)		Double Arrow
	Traffic Flow		CAUTION (Alternating Diamond or 4 Corner Flash)

TYPICAL USAGE				
MOBILE	SHORT DURATION	SHORT TERM STATIONARY	INTERMEDIATE TERM STATIONARY	LONG TERM STATIONARY
✓				

GENERAL NOTES

1. TRAIL, SHADOW, and LEAD vehicles shall be equipped with arrow boards as illustrated. When a LEAD vehicle is not used the WORK vehicle must be equipped with an arrow board. The Engineer will determine if the LEAD VEHICLE and/or TRAIL VEHICLE are required based on prevailing roadway conditions, traffic volume, and sight distance restrictions.
2. The use of amber high intensity rotating, flashing, oscillating, or strobe lights on vehicles are required. Blue high intensity rotating, flashing, oscillating or strobe lights when mounted on the driver's side of the vehicle may be operated simultaneously with the amber beacons or strobe lights.
3. The use of truck mounted attenuators (TMA) on the SHADOW VEHICLE and TRAIL VEHICLE are required.
4. Reflective sheeting on the rear of the TMA shall meet or exceed the reflectivity and color requirements of DEPARTMENTAL MATERIAL SPECIFICATION DMS 8300, Type A.
5. Flashing arrow boards shall be Type B or Type C as per the Barricade and Construction (BC) standards. The board shall be controlled from inside the vehicle.
6. Each vehicle shall have two-way radio communication capability.
7. When work convoys must change lanes, the TRAIL VEHICLE should change lanes first to shadow the other convoy vehicles.
8. Vehicle spacing between the TRAIL VEHICLE and the SHADOW VEHICLE will vary depending on sight distance restrictions. Motorists approaching the work convoy should be able to see the TRAIL VEHICLE in time to slow down and/or change lanes as they approach the TRAIL VEHICLE. Vehicle spacing between the WORK VEHICLE and SHADOW VEHICLE and vehicle spacing between WORK VEHICLE and LEAD VEHICLE may vary according to terrain, work activity and other factors.
9. "X VEHICLE CONVOY" (CW21-10cT) or "WORK CONVOY" (CW21-10aT) signs shall be used on TRAIL VEHICLES and SHADOW VEHICLES as shown. As an option 48" X 48" diamond shaped "WORK CONVOY"(CW21-10T) or "X VEHICLE CONVOY" (CW21-10bT) signs may be used where adequate mounting space exists. When used, the X VEHICLE CONVOY sign shall have the number of the convoy vehicles displayed on the sign in the number designation "X" location. The "X VEHICLE CONVOY" sign shall not be used on the SHADOW VEHICLE if a TRAIL VEHICLE is used.
10. On two-lane two-way roadways, the work and protection vehicles should pull over periodically to allow motor vehicle traffic to pass. If motorists are not allowed to pass the work convoy, a "DO NOT PASS" (R4-1) sign should be placed on the back of the rearmost protection vehicle.



STRIPING FOR TMA

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN MOBILE OPERATIONS UNDIVIDED HIGHWAYS

TCP(3-1)-13

FILE: tcp3-1.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS 2-94 4-98 8-95 7-13 1-97				SE INNER LP
	DIST	COUNTY		SHEET NO.
		WILLIAMSON		37

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EXISTING ℄ SE INNER LOOP "XGIL"

Beginning chain XGIL description

			Curve Data			
Curve XGIL-1						
P.I. Station		86+59.29	X	3,138,221.56	Y	10,197,611.57
Delta	=	32° 44′ 06.88"	(LT)			
Degree	=	3° 22′ 13.22"				
Tangent	=	499.29				
Length	=	971.27				
Radius	=	1,700.00				
External	=	71.81				
Long Chord	=	958.12				
Mid. Ord.	=	68.90				
P.C. Station		81+60.00	X	3,137,764.90	Y	10,197,409.68
P.T. Station		91+31.27	X	3,138,496.51	Y	10,198,028.34
C.C.			X	3,137,077.48	Y	10,198,964.49
Back	= N	66° 08′ 55.13" E				
Ahead	= N	33° 24′ 48.25" E				
Chord Bear	= N	49° 46′ 51.69" E				

Course from PT XGIL-1 to PC XGIL-2 N 33° 24′ 48.25" E Dist 1,102.66

			Curve Data			
Curve XGIL-2						
P.I. Station		103+42.11	X	3,139,163.28	Y	10,199,039.05
Delta	=	6° 11′ 30.44"	(RT)			
Degree	=	2° 51′ 53.24"				
Tangent	=	108.17				
Length	=	216.13				
Radius	=	2,000.00				
External	=	2.92				
Long Chord	=	216.03				
Mid. Ord.	=	2.92				
P.C. Station		102+33.94	X	3,139,103.71	Y	10,198,948.76
P.T. Station		104+50.07	X	3,139,232.24	Y	10,199,122.39
C.C.			X	3,140,773.15	Y	10,197,847.40
Back	= N	33° 24′ 48.25" E				
Ahead	= N	39° 36′ 18.69" E				
Chord Bear	= N	36° 30′ 33.47" E				

Course from PT XGIL-2 to PC XGIL-3 N 39° 36′ 18.69" E Dist 1,020.70

			Curve Data			
Curve XGIL-3						
P.I. Station		118+26.21	X	3,140,109.52	Y	10,200,182.65
Delta	=	25° 49′ 52.56"	(RT)			
Degree	=	3° 41′ 47.41"				
Tangent	=	355.44				
Length	=	698.80				
Radius	=	1,550.00				
External	=	40.23				
Long Chord	=	692.90				
Mid. Ord.	=	39.21				
P.C. Station		114+70.77	X	3,139,882.93	Y	10,199,908.79
P.T. Station		121+69.57	X	3,140,432.80	Y	10,200,330.41
C.C.			X	3,141,077.14	Y	10,198,920.68
Back	= N	39° 36′ 18.69" E				
Ahead	= N	65° 26′ 11.25" E				
Chord Bear	= N	52° 31′ 14.97" E				

Course from PT XGIL-3 to PC XGIL-4 N 65° 26′ 11.25" E Dist 414.68

			Curve Data			
Curve XGIL-4						
P.I. Station		126+56.92	X	3,140,876.05	Y	10,200,533.00
Delta	=	4° 09′ 42.75"	(RT)			
Degree	=	2° 51′ 53.24"				
Tangent	=	72.67				
Length	=	145.28				
Radius	=	2,000.00				
External	=	1.32				
Long Chord	=	145.24				
Mid. Ord.	=	1.32				
P.C. Station		125+84.25	X	3,140,809.95	Y	10,200,502.79
P.T. Station		127+29.53	X	3,140,944.16	Y	10,200,558.33
C.C.			X	3,141,641.36	Y	10,198,683.79
Back	= N	65° 26′ 11.25" E				
Ahead	= N	69° 35′ 54.00" E				
Chord Bear	= N	67° 31′ 02.62" E				

Course from PT XGIL-4 to PC XGIL-5 N 69° 35′ 54.00" E Dist 708.77

			Curve Data			
Curve XGIL-5						
P.I. Station		149+41.27	X	3,143,017.16	Y	10,201,329.34
Delta	=	78° 38′ 19.50"	(LT)			
Degree	=	3° 07′ 20.59"				
Tangent	=	1,502.97				
Length	=	2,518.55				
Radius	=	1,835.00				
External	=	536.95				
Long Chord	=	2,325.47				
Mid. Ord.	=	415.40				
P.C. Station		134+38.31	X	3,141,608.47	Y	10,200,805.41
P.T. Station		159+56.85	X	3,142,781.00	Y	10,202,813.64
C.C.			X	3,140,968.79	Y	10,202,525.30
Back	= N	69° 35′ 54.00" E				
Ahead	= N	9° 02′ 25.50" W				
Chord Bear	= N	30° 16′ 44.25" E				

Ending chain XGIL description

EXISTING ℄ WILCO WAY "WILCO WAY"

Beginning chain WILCO WAY description

Point WW01			X	3,138,879.59	Y	10,198,937.54 Sta 10+00.00
Course from WW01 to WW02 S 56° 35′ 11.75" E Dist 180.91						
Point WW02			X	3,139,030.59	Y	10,198,837.92 Sta 11+80.91

Ending chain WILCO WAY description

℄ SIDEWALK "SW"

Beginning chain SW description

Point SW01			X	3,138,595.24	Y	10,198,285.14 Sta 194+00.00

Course from SW01 to PC SW1 N 33° 24′ 48.25" E Dist 556.17

			Curve Data			
Curve SW1						
P.I. Station		199+67.93	X	3,138,907.98	Y	10,198,759.20
Delta	=	6° 43′ 48.56"	(LT)			
Degree	=	28° 38′ 52.40"				
Tangent	=	11.76				
Length	=	23.49				
Radius	=	200.00				
External	=	0.35				
Long Chord	=	23.48				
Mid. Ord.	=	0.34				
P.C. Station		199+56.17	X	3,138,901.51	Y	10,198,749.39
P.T. Station		199+79.66	X	3,138,913.26	Y	10,198,769.71
C.C.			X	3,138,734.56	Y	10,198,859.52
Back	= N	33° 24′ 48.25" E				
Ahead	= N	26° 40′ 59.69" E				
Chord Bear	= N	30° 02′ 53.97" E				

Course from PT SW1 to PC SW2 N 26° 40′ 59.69" E Dist 61.81

			Curve Data			
Curve SW2						
P.I. Station		200+53.23	X	3,138,946.30	Y	10,198,835.44
Delta	=	6° 43′ 48.56"	(RT)			
Degree	=	28° 38′ 52.40"				
Tangent	=	11.76				
Length	=	23.49				
Radius	=	200.00				
External	=	0.35				
Long Chord	=	23.48				
Mid. Ord.	=	0.34				
P.C. Station		200+41.47	X	3,138,941.02	Y	10,198,824.94
P.T. Station		200+64.96	X	3,138,952.77	Y	10,198,845.26
C.C.			X	3,139,119.72	Y	10,198,735.12
Back	= N	26° 40′ 59.69" E				
Ahead	= N	33° 24′ 48.25" E				
Chord Bear	= N	30° 02′ 53.97" E				

Course from PT SW2 to PC SW3 N 33° 24′ 48.25" E Dist 169.51

			Curve Data			
Curve SW3						
P.I. Station		203+14.56	X	3,139,090.22	Y	10,199,053.60
Delta	=	4° 26′ 00.33"	(RT)			
Degree	=	2° 46′ 09.30"				
Tangent	=	80.09				
Length	=	160.09				
Radius	=	2,069.00				
External	=	1.55				
Long Chord	=	160.05				
Mid. Ord.	=	1.55				
P.C. Station		202+34.47	X	3,139,046.12	Y	10,198,986.75
P.T. Station		203+94.56	X	3,139,139.36	Y	10,199,116.84
C.C.			X	3,140,773.15	Y	10,197,847.40
Back	= N	33° 24′ 48.25" E				
Ahead	= N	37° 50′ 48.58" E				
Chord Bear	= N	35° 37′ 48.42" E				

			Curve Data			
Curve SW4						
P.I. Station		204+13.04	X	3,139,150.70	Y	10,199,131.44
Delta	=	10° 33′ 28.64"	(LT)			
Degree	=	28° 38′ 52.40"				
Tangent	=	18.48				
Length	=	36.85				
Radius	=	200.00				
External	=	0.85				
Long Chord	=	36.80				
Mid. Ord.	=	0.85				
P.C. Station		203+94.56	X	3,139,139.36	Y	10,199,116.84
P.T. Station		204+31.42	X	3,139,159.17	Y	10,199,147.86
C.C.			X	3,138,981.43	Y	10,199,239.55
Back	= N	37° 50′ 48.58" E				
Ahead	= N	27° 17′ 19.95" E				
Chord Bear	= N	32° 34′ 04.26" E				

Course from PT SW4 to PC SW5 N 27° 17′ 19.95" E Dist 46.24

℄ SIDEWALK "SW" (CONTINUED)

			Curve Data			
Curve SW5						
P.I. Station		204+99.23	X	3,139,190.26	Y	10,199,208.13
Delta	=	12° 18′ 58.75"	(RT)			
Degree	=	28° 38′ 52.40"				
Tangent	=	21.58				
Length	=	42.99				
Radius	=	200.00				
External	=	1.16				
Long Chord	=	42.91				
Mid. Ord.	=	1.15				
P.C. Station		204+77.65	X	3,139,180.37	Y	10,199,188.95
P.T. Station		205+20.65	X	3,139,204.02	Y	10,199,224.75
C.C.			X	3,139,358.11	Y	10,199,097.25
Back	= N	27° 17′ 19.95" E				
Ahead	= N	39° 36′ 18.69" E				
Chord Bear	= N	33° 26′ 49.32" E				

Course from PT SW5 to PC SW6 N 39° 36′ 18.69" E Dist 89.23

			Curve Data			
Curve SW6						
P.I. Station		206+23.26	X	3,139,269.43	Y	10,199,303.81
Delta	=	7° 39′ 21.80"	(RT)			
Degree	=	28° 38′ 52.40"				
Tangent	=	13.38				
Length	=	26.72				
Radius	=	200.00				
External	=	0.45				
Long Chord	=	26.70				
Mid. Ord.	=	0.45				
P.C. Station		206+09.88	X	3,139,260.90	Y	10,199,293.50
P.T. Station		206+36.61	X	3,139,279.26	Y	10,199,312.90
C.C.			X	3,139,414.99	Y	10,199,166.00
Back	= N	39° 36′ 18.69" E				
Ahead	= N	47° 15′ 40.50" E				
Chord Bear	= N	43° 25′ 59.59" E				

Course from PT SW6 to PC SW7 N 47° 15′ 40.49" E Dist 70.81

STATE OF TEXAS
JAMES BROOKS
101002
LICENSED PROFESSIONAL ENGINEER
6/24/2017

NO.	REVISION	BY	DATE

WILLIAMSON COUNTY
1848

RTG RODRIGUEZ TRANSPORTATION GROUP FIRM #587

GEORGETOWN INNER LOOP

HORIZONTAL ALIGNMENT DATA

6/24/2017 SHEET 1 OF 3

DESIGNED:	PROJECT NUMBER		ROADWAY	
CHECKED:			SE INNER LOOP	
DRAWN:	STATE	COUNTY	CITY	SHEET No.
CHECKED:	TEXAS	WILLIAMSON	GEORGETOWN	38

9:10
jbrooks
6/24/2017
C:\rtg-pw.bentley.com:rtg-pw\Documents\8760101\div\planSHts\rdwy\GIL_HAD_01-A.dgn
7/18/2017 9:38 AM

℄ SIDEWALK "SW" (CONTINUED)

			Curve Data			

Curve SW7						
P.I. Station		207+20.80	X	3,139,341.10	Y	10,199,370.04
Delta	=	7° 39′ 21.80"	(LT)			
Degree	=	28° 38′ 52.40"				
Tangent	=	13.38				
Length	=	26.72				
Radius	=	200.00				
External	=	0.45				
Long Chord	=	26.70				
Mid. Ord.	=	0.45				
P.C. Station		207+07.42	X	3,139,331.27	Y	10,199,360.95
P.T. Station		207+34.14	X	3,139,349.63	Y	10,199,380.35
C.C.			X	3,139,195.54	Y	10,199,507.84
Back	= N	47° 15′ 40.50" E				
Ahead	= N	39° 36′ 18.69" E				
Chord Bear	= N	43° 25′ 59.59" E				

Course from PT SW7 to PC SW8 N 39° 36′ 18.69" E Dist 376.53

			Curve Data			

Curve SW8						
P.I. Station		211+20.64	X	3,139,596.02	Y	10,199,678.13
Delta	=	5° 42′ 38.14"	(RT)			
Degree	=	28° 38′ 52.40"				
Tangent	=	9.98				
Length	=	19.93				
Radius	=	200.00				
External	=	0.25				
Long Chord	=	19.93				
Mid. Ord.	=	0.25				
P.C. Station		211+10.67	X	3,139,589.67	Y	10,199,670.44
P.T. Station		211+30.60	X	3,139,603.12	Y	10,199,685.14
C.C.			X	3,139,743.76	Y	10,199,542.94
Back	= N	39° 36′ 18.69" E				
Ahead	= N	45° 18′ 56.83" E				
Chord Bear	= N	42° 27′ 37.76" E				

Course from PT SW8 to PC SW9 N 45° 18′ 56.83" E Dist 30.30

			Curve Data			

Curve SW9						
P.I. Station		211+70.88	X	3,139,631.75	Y	10,199,713.46
Delta	=	5° 42′ 38.14"	(LT)			
Degree	=	28° 38′ 52.40"				
Tangent	=	9.98				
Length	=	19.93				
Radius	=	200.00				
External	=	0.25				
Long Chord	=	19.93				
Mid. Ord.	=	0.25				
P.C. Station		211+60.90	X	3,139,624.66	Y	10,199,706.45
P.T. Station		211+80.84	X	3,139,638.11	Y	10,199,721.15
C.C.			X	3,139,484.02	Y	10,199,848.65
Back	= N	45° 18′ 56.83" E				
Ahead	= N	39° 36′ 18.69" E				
Chord Bear	= N	42° 27′ 37.76" E				

Course from PT SW9 to PC SW10 N 39° 36′ 18.69" E Dist 171.05

			Curve Data			

Curve SW10						
P.I. Station		213+61.86	X	3,139,753.51	Y	10,199,860.62
Delta	=	5° 42′ 38.14"	(RT)			
Degree	=	28° 38′ 52.40"				
Tangent	=	9.98				
Length	=	19.93				
Radius	=	200.00				
External	=	0.25				
Long Chord	=	19.93				
Mid. Ord.	=	0.25				
P.C. Station		213+51.88	X	3,139,747.15	Y	10,199,852.93
P.T. Station		213+71.82	X	3,139,760.60	Y	10,199,867.63
C.C.			X	3,139,901.24	Y	10,199,725.43
Back	= N	39° 36′ 18.69" E				
Ahead	= N	45° 18′ 56.83" E				
Chord Bear	= N	42° 27′ 37.76" E				

Course from PT SW10 to PC SW11 N 45° 18′ 56.83" E Dist 80.79

			Curve Data			

Curve SW11						
P.I. Station		214+63.11	X	3,139,825.51	Y	10,199,931.83
Delta	=	6° 00′ 30.29"	(LT)			
Degree	=	28° 38′ 52.40"				
Tangent	=	10.50				
Length	=	20.97				
Radius	=	200.00				
External	=	0.28				
Long Chord	=	20.96				
Mid. Ord.	=	0.27				
P.C. Station		214+52.61	X	3,139,818.05	Y	10,199,924.45
P.T. Station		214+73.58	X	3,139,832.16	Y	10,199,939.95
C.C.			X	3,139,677.41	Y	10,200,066.65
Back	= N	45° 18′ 56.83" E				
Ahead	= N	39° 18′ 26.54" E				
Chord Bear	= N	42° 18′ 41.68" E				

℄ SIDEWALK "SW" (CONTINUED)

			Curve Data			

Curve SW12						
P.I. Station		215+96.98	X	3,139,910.33	Y	10,200,035.43
Delta	=	8° 46′ 16.76"	(RT)			
Degree	=	3° 33′ 39.44"				
Tangent	=	123.40				
Length	=	246.32				
Radius	=	1,609.00				
External	=	4.73				
Long Chord	=	246.08				
Mid. Ord.	=	4.71				
P.C. Station		214+73.58	X	3,139,832.16	Y	10,199,939.95
P.T. Station		217+19.90	X	3,140,002.15	Y	10,200,117.88
C.C.			X	3,141,077.14	Y	10,198,920.68
Back	= N	39° 18′ 26.54" E				
Ahead	= N	48° 04′ 43.30" E				
Chord Bear	= N	43° 41′ 34.92" E				

Ending chain SW description

DRIVEWAY (DWW105)

Beginning chain DWW105 description

Point DWW10501 X 3,139,171.24 Y 10,199,300.76 Sta 10+00.00

Course from DWW10501 to DWW10502 S 50 33/64 23′ 41.31" E Dist 160.71

Point DWW10502 X 3,139,295.06 Y 10,199,198.31 Sta 11+60.71

Ending chain DWW105 description

DRIVEWAY (DWW110)

Beginning chain DWW110 description

Point DWW11001 X 3,139,470.15 Y 10,199,654.00 Sta 10+00.00

Course from DWW11001 to PC DWW1101 S 38 33/64 19′ 56.52" E Dist 50.93

			Curve Data			

Curve DWW1101						
P.I. Station		10+57.27	X	3,139,505.67	Y	10,199,609.07
Delta	=	12 33/64	03′ 44.79"	(LT)		
Degree	=	95 33/64	29′ 34.68"			
Tangent	=	6.34				
Length	=	12.63				
Radius	=	60.00				
External	=	0.33				
Long Chord	=	12.61				
Mid. Ord.	=	0.33				
P.C. Station		10+50.93	X	3,139,501.74	Y	10,199,614.04
P.T. Station		10+63.57	X	3,139,510.56	Y	10,199,605.03
C.C.			X	3,139,548.81	Y	10,199,651.26
Back	= S	38 33/64	19′ 56.52" E			
Ahead	= S	50 33/64	23′ 41.31" E			
Chord Bear	= S	44 33/64	21′ 48.92" E			

Course from PT DWW1101 to DWW11002 S 50 33/64 23′ 41.31" E Dist 93.25

Point DWW11002 X 3,139,582.40 Y 10,199,545.58 Sta 11+56.82

Ending chain DWW110 description

STATE OF TEXAS
JAMES BROOKS
101002
LICENSED PROFESSIONAL ENGINEER
6/24/2017

NO.	REVISION	BY	DATE

WILLIAMSON COUNTY
1848

RTG RODRIGUEZ TRANSPORTATION GROUP FIRM #587

GEORGETOWN INNER LOOP

HORIZONTAL ALIGNMENT DATA

6/24/2017 SHEET 2 OF 3

DESIGNED:	PROJECT NUMBER		ROADWAY	
CHECKED:			SE INNER LOOP	
DRAWN:	STATE	COUNTY	CITY	SHEET No.
CHECKED:	TEXAS	WILLIAMSON	GEORGETOWN	39

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brooks
7/24/2017
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℄ WATER QUALITY POND ACCESS RD. A "WQ_ACCESS-A"

```
*        3   DESCRIBE CHAIN WQ ACCESS-A

Chain WQ ACCESS-A contains:
 WQAA1 CUR WQ ACCESS-A-1 WQAA2

Beginning chain WQ ACCESS-A description
================================================================================

Point WQAA1            X     3,138,474.47 Y    10,198,268.92 Sta      10+00.00

Course from WQAA1 to PC WQ ACCESS-A-1 S 49° 25' 21.05" E Dist 65.15

                                        Curve Data
                                       *----------*
Curve WQ ACCESS-A-1
P.I.  Station              11+21.82  X       3,138,567.00  Y       10,198,189.67
Delta       =      97° 09' 50.69" (LT)
Degree      =     114° 35' 29.61"
Tangent     =               56.68
Length      =               84.79
Radius      =               50.00
External    =               25.58
Long Chord  =               74.99
Mid. Ord.   =               16.92
P.C.  Station              10+65.15  X       3,138,523.95  Y       10,198,226.54
P.T.  Station              11+49.94  X       3,138,598.21  Y       10,198,236.99
C.C.                                 X       3,138,556.47  Y       10,198,264.52
Back        = S  49° 25' 21.05" E
Ahead       = N  33° 24' 48.25" E
Chord Bear  = N  81° 59' 43.60" E

Course from PT WQ ACCESS-A-1 to WQAA2 N 33° 24' 48.25" E Dist 54.35

Point WQAA2            X     3,138,628.14 Y    10,198,282.35 Sta      12+04.28

================================================================================
Ending chain WQ ACCESS-A description
```

℄ WATER QUALITY POND ACCESS RD. B1 "WQ_ACCESS-B1"

```
Beginning chain WQ_ACCESS-B1 description
================================================================================

Point WQ_AB11          X     3,139,542.72 Y    10,199,966.76 Sta      10+00.00

Course from WQ_AB11 to PC WQ ACCESS-B1-1 S 9° 35' 26.38" E Dist 174.80

                                        Curve Data
                                       *----------*
Curve WQ_ACCESS-B1-1
P.I.  Station              11+79.18  X       3,139,572.57  Y       10,199,790.08
Delta       =       9° 59' 45.05" (LT)
Degree      =     114° 35' 29.61"
Tangent     =               8.37
Length      =               8.72
Radius      =              50.00
External    =               0.19
Long Chord  =               8.71
Mid. Ord.   =               0.19
P.C.  Station              11+74.80  X       3,139,571.84  Y       10,199,794.40
P.T.  Station              11+83.53  X       3,139,574.04  Y       10,199,785.96
C.C.                                 X       3,139,621.14  Y       10,199,802.73
Back        = S   9° 35' 26.38" E
Ahead       = S  19° 35' 11.43" E
Chord Bear  = S  14° 35' 18.91" E

                                        Curve Data
                                       *----------*
Curve WQ_ACCESS-B1-2
P.I.  Station              11+96.75  X       3,139,578.47  Y       10,199,773.50
Delta       =      66° 57' 17.90" (LT)
Degree      =     286° 28' 45.03"
Tangent     =              13.23
Length      =              23.37
Radius      =              20.00
External    =               3.98
Long Chord  =              22.06
Mid. Ord.   =               3.32
P.C.  Station              11+83.53  X       3,139,574.04  Y       10,199,785.96
P.T.  Station              12+06.90  X       3,139,591.67  Y       10,199,772.71
C.C.                                 X       3,139,592.88  Y       10,199,792.67
Back        = S  19° 35' 11.43" E
Ahead       = S  86° 32' 29.33" E
Chord Bear  = S  53° 03' 50.38" E

                                        Curve Data
                                       *----------*
Curve WQ_ACCESS-B1-3
P.I.  Station              12+30.52  X       3,139,615.25  Y       10,199,771.28
Delta       =      50° 34' 01.32" (LT)
Degree      =     114° 35' 29.39"
Tangent     =              23.62
Length      =              44.13
Radius      =              50.00
External    =               5.30
Long Chord  =              42.71
Mid. Ord.   =               4.79
P.C.  Station              12+06.90  X       3,139,591.67  Y       10,199,772.71
P.T.  Station              12+51.03  X       3,139,631.32  Y       10,199,788.58
C.C.                                 X       3,139,594.69  Y       10,199,822.61
Back        = S  86° 32' 29.33" E
Ahead       = N  42° 53' 29.35" E
Chord Bear  = N  68° 10' 30.01" E

Course from PT WQ ACCESS-B1-3 to PC WQ ACCESS-B1-4 N 42° 53' 29.35" E Dist 96.26

                                        Curve Data
                                       *----------*
Curve WQ_ACCESS-B1-4
P.I.  Station              13+63.01  X       3,139,707.54  Y       10,199,870.63
Delta       =       3° 33' 36.25" (LT)
Degree      =      11° 19' 23.80"
Tangent     =              15.73
Length      =              31.44
Radius      =             506.00
External    =               0.24
Long Chord  =              31.44
Mid. Ord.   =               0.24
P.C.  Station              13+47.28  X       3,139,696.84  Y       10,199,859.11
P.T.  Station              13+78.72  X       3,139,717.51  Y       10,199,882.79
C.C.                                 X       3,139,326.12  Y       10,200,203.50
Back        = N  42° 53' 29.35" E
Ahead       = N  39° 19' 53.10" E
Chord Bear  = N  41° 06' 41.23" E

Course from PT WQ ACCESS-B1-4 to PC WQ ACCESS-B1-5 N 39° 19' 53.10" E Dist 95.12

                                        Curve Data
                                       *----------*
Curve WQ_ACCESS-B1-5
P.I.  Station              14+91.96  X       3,139,789.27  Y       10,199,970.38
Delta       =      39° 49' 08.44" (RT)
Degree      =     114° 35' 29.61"
Tangent     =              18.11
Length      =              34.75
Radius      =              50.00
External    =               3.18
Long Chord  =              34.05
Mid. Ord.   =               2.99
P.C.  Station              14+73.85  X       3,139,777.80  Y       10,199,956.37
P.T.  Station              15+08.60  X       3,139,807.06  Y       10,199,973.78
C.C.                                 X       3,139,816.47  Y       10,199,924.68
Back        = N  39° 19' 53.10" E
Ahead       = N  79° 09' 01.54" E
Chord Bear  = N  59° 14' 27.32" E

================================================================================
Ending chain WQ_ACCESS-B1 description
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℄ WATER QUALITY POND ACCESS RD. B2 "WQ_ACCESS-B2"

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Beginning chain WQ_ACCESS-B2 description
================================================================================

Point WQ_AB21          X     3,139,696.42 Y    10,199,952.58 Sta      10+00.00

Course from WQ_AB21 to PC WQ_ACCESS-B2-1 N 79° 09' 01.54" E Dist 210.15

                                        Curve Data
                                       *----------*
Curve WQ_ACCESS-B2-1
P.I.  Station              12+26.26  X       3,139,918.63  Y       10,199,995.17
Delta       =      35° 43' 15.34" (LT)
Degree      =     114° 35' 29.61"
Tangent     =              16.11
Length      =              31.17
Radius      =              50.00
External    =               2.53
Long Chord  =              30.67
Mid. Ord.   =               2.41
P.C.  Station              12+10.15  X       3,139,902.81  Y       10,199,992.14
P.T.  Station              12+41.32  X       3,139,929.71  Y       10,200,006.87
C.C.                                 X       3,139,893.40  Y       10,200,041.24
Back        = N  79° 09' 01.54" E
Ahead       = N  43° 25' 46.20" E
Chord Bear  = N  61° 17' 23.87" E

                                        Curve Data
                                       *----------*
Curve WQ_ACCESS-B2-2
P.I.  Station              12+45.71  X       3,139,932.72  Y       10,200,010.05
Delta       =       0° 19' 05.54" (RT)
Degree      =       3° 37' 34.73"
Tangent     =               4.39
Length      =               8.77
Radius      =           1,580.00
External    =               0.01
Long Chord  =               8.77
Mid. Ord.   =               0.01
P.C.  Station              12+41.32  X       3,139,929.71  Y       10,200,006.87
P.T.  Station              12+50.10  X       3,139,935.76  Y       10,200,013.22
C.C.                                 X       3,141,077.14  Y       10,198,920.68
Back        = N  43° 25' 46.20" E
Ahead       = N  43° 44' 51.74" E
Chord Bear  = N  43° 35' 18.97" E

================================================================================
Ending chain WQ_ACCESS-B2 description
```

STATE OF TEXAS
JAMES BROOKS
101002
LICENSED PROFESSIONAL ENGINEER

6/24/2017

NO.	REVISION	BY	DATE

WILLIAMSON COUNTY
1848

RTG RODRIGUEZ TRANSPORTATION GROUP FIRM #587

GEORGETOWN INNER LOOP

HORIZONTAL ALIGNMENT DATA

6/24/2017 SHEET 3 OF 3

DESIGNED:	PROJECT NUMBER		ROADWAY	
CHECKED:			SE INNER LOOP	
DRAWN:	STATE	COUNTY	CITY	SHEET No.
CHECKED:	TEXAS	WILLIAMSON	GEORGETOWN	39A

jbrooks
9:11
6/24/2017
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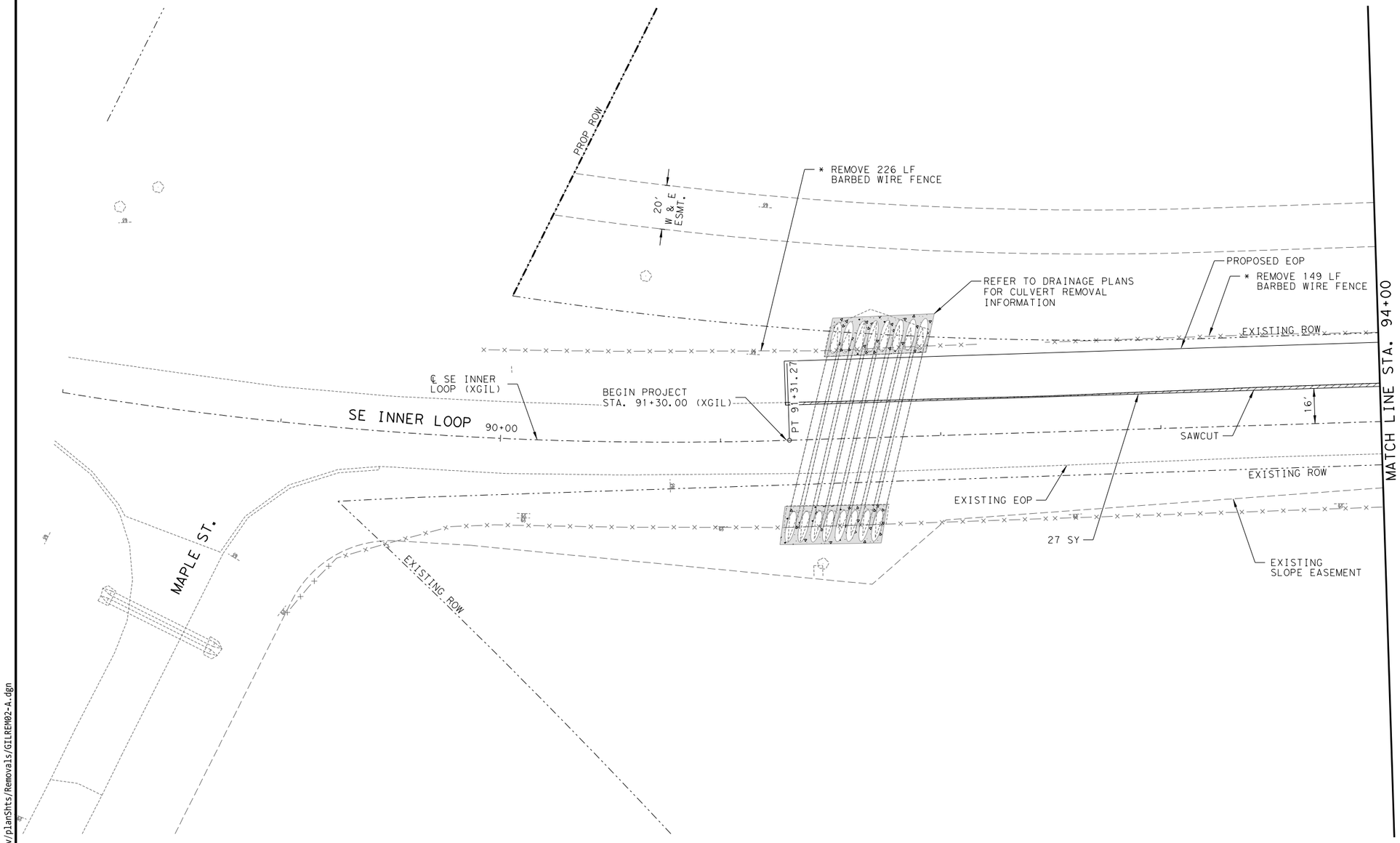

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SCALE IN FEET

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LEGEND	
	REMOVE CONCRETE (DRIVEWAY)
	REMOVE ASPH. PAV & STAB. BASE
C&G	REMOVE CONC. CURB & GUTTER

NOTES:

* 1. REMOVAL IS SUBSIDIARY TO ITEM 100 - PREP ROW

2. REFER TO SIGNING AND PAVEMENT MARKING PLAN SHEETS FOR SIGNS (TO BE RELOCATED)

SHEET QUANTITIES

104 6029	104 6017	105 6036	*
REMOVING CONC. CURB & GUTTER	REMOVING CONC. (DRIVEWAYS)	REMOVING STAB BASE AND ASPH PAV (15"-20")	REMOVE WIRE FENCE
LF	SY	SY	LF
		27	375

* FOR CONTRACTORS INFORMATION ONLY

STATE OF TEXAS
JAMES BROOKS
101002
LICENSED PROFESSIONAL ENGINEER
6/24/2017

NO.	REVISION	BY	DATE

WILLIAMSON COUNTY 1848

RTG RODRIGUEZ TRANSPORTATION GROUP FIRM #587

GEORGETOWN INNER LOOP

REMOVAL PLAN

BEGIN PROJECT - STA. 94+00.00

6/24/2017 SHEET 1 OF 5

DESIGNED:	PROJECT NUMBER		ROADWAY	
CHECKED:			SE INNER LOOP	
DRAWN:	STATE	COUNTY	CITY	SHEET No.
CHECKED:	TEXAS	WILLIAMSON	GEORGETOWN	40

jbrooks
6/24/2017
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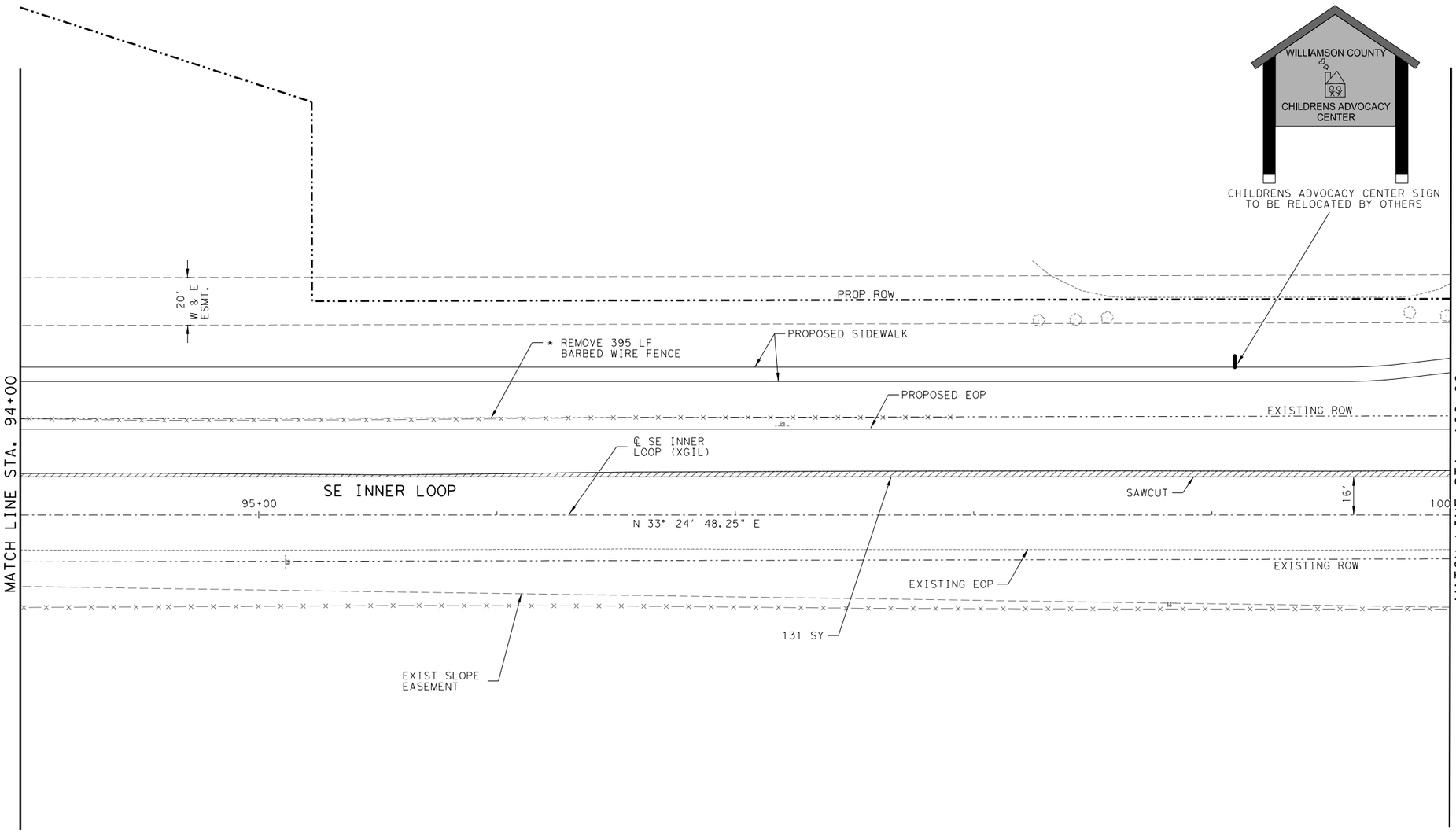

LEGEND

▨	REMOVE CONCRETE (DRIVEWAY)
▨	REMOVE ASPH. PAV & STAB. BASE
C&G	REMOVE CONC. CURB & GUTTER

NOTES:

* 1. REMOVAL IS SUBSIDIARY TO ITEM 100 - PREP ROW

2. REFER TO SIGNING AND PAVEMENT MARKING PLAN SHEETS FOR SIGNS (TO BE RELOCATED)

SHEET QUANTITIES

104 6029	104 6017	105 6036	*
REMOVING CONC. CURB & GUTTER	REMOVING CONC. (DRIVEWAYS)	REMOVING STAB BASE AND ASPH PAV (15"-20")	REMOVE WIRE FENCE
LF	SY	SY	LF
		131	395

* FOR CONTRACTORS INFORMATION ONLY

STATE OF TEXAS
JAMES BROOKS
101002
LICENSED PROFESSIONAL ENGINEER
6/24/2017

NO.	REVISION	BY	DATE

WILLIAMSON COUNTY 1848

RTG RODRIGUEZ TRANSPORTATION GROUP FIRM #587

GEORGETOWN INNER LOOP

REMOVAL PLAN

STA. 94+00.00 - STA. 100+00.00

6/24/2017 SHEET 2 OF 5

DESIGNED:	PROJECT NUMBER		ROADWAY	
CHECKED:			SE INNER LOOP	
DRAWN:	STATE	COUNTY	CITY	SHEET No.
CHECKED:	TEXAS	WILLIAMSON	GEORGETOWN	41

jbrooks
6/24/2017
9:03
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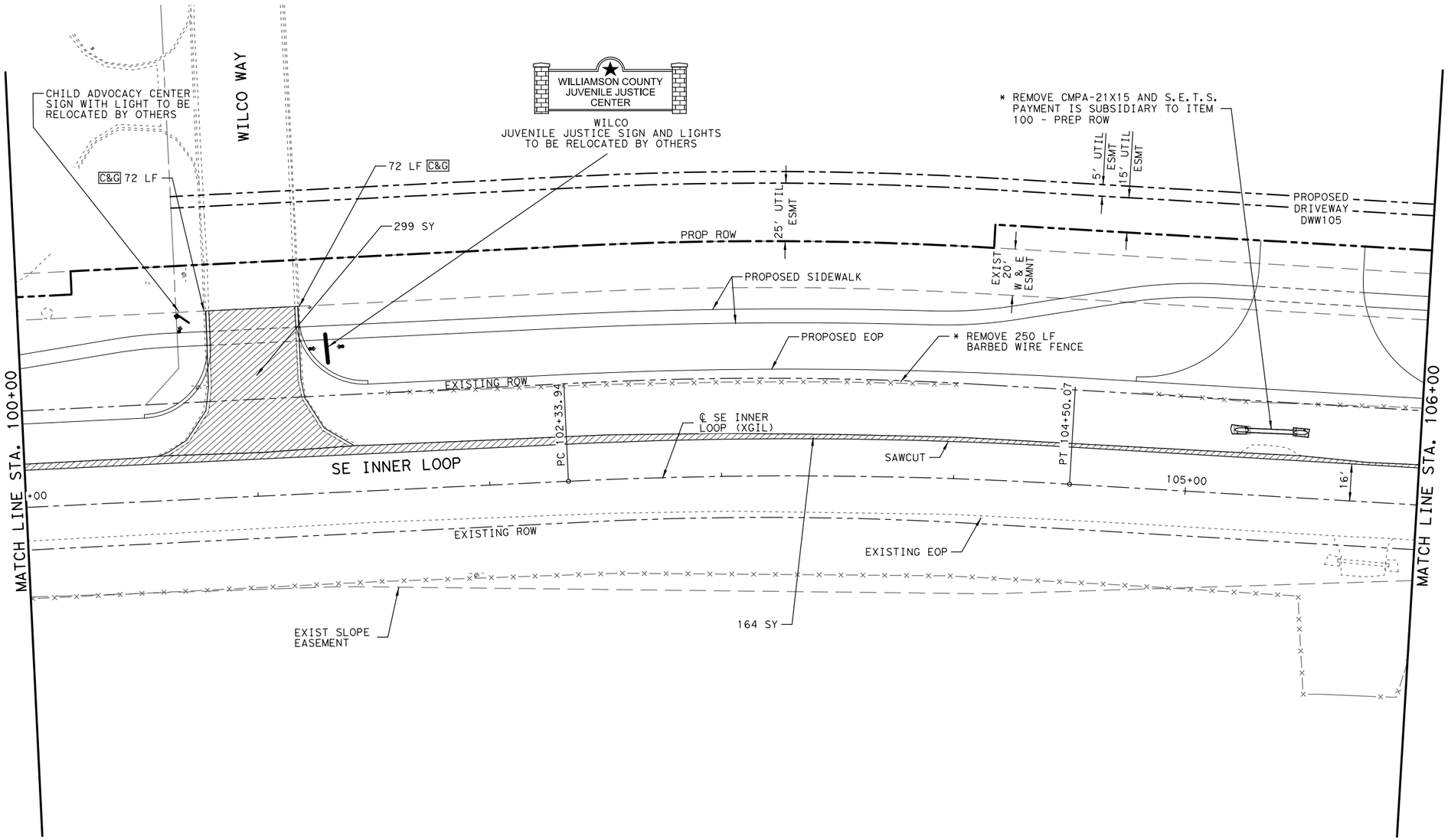

LEGEND	
	REMOVE CONCRETE (DRIVEWAY)
	REMOVE ASPH. PAV & STAB. BASE
C&G	REMOVE CONC. CURB & GUTTER

NOTES:

* 1. REMOVAL IS SUBSIDIARY TO ITEM 100 - PREP ROW

2. REFER TO SIGNING AND PAVEMENT MARKING PLAN SHEETS FOR SIGNS (TO BE RELOCATED)

SHEET QUANTITIES

104 6029	104 6017	105 6036	*	*
REMOVING CONC. CURB & GUTTER	REMOVING CONC. (DRIVEWAYS)	REMOVING STAB BASE AND ASPH PAV (15"-20")	REMOVE WIRE FENCE	REMOVE CMP AND SETS
LF	SY	SY	LF	LF
144		463	250	32

* FOR CONTRACTORS INFORMATION ONLY

STATE OF TEXAS
JAMES BROOKS
101002
LICENSED PROFESSIONAL ENGINEER
6/26/2017

NO.	REVISION	BY	DATE

WILLIAMSON COUNTY
1848

RTG RODRIGUEZ TRANSPORTATION GROUP FIRM #587

GEORGETOWN INNER LOOP

REMOVAL PLAN

STA. 100+00.00 - STA. 106+00.00

6/26/2017 SHEET 3 OF 5

DESIGNED:	PROJECT NUMBER		ROADWAY	
CHECKED:			SE INNER LOOP	
DRAWN:	STATE	COUNTY	CITY	SHEET No.
CHECKED:	TEXAS	WILLIAMSON	GEORGETOWN	42

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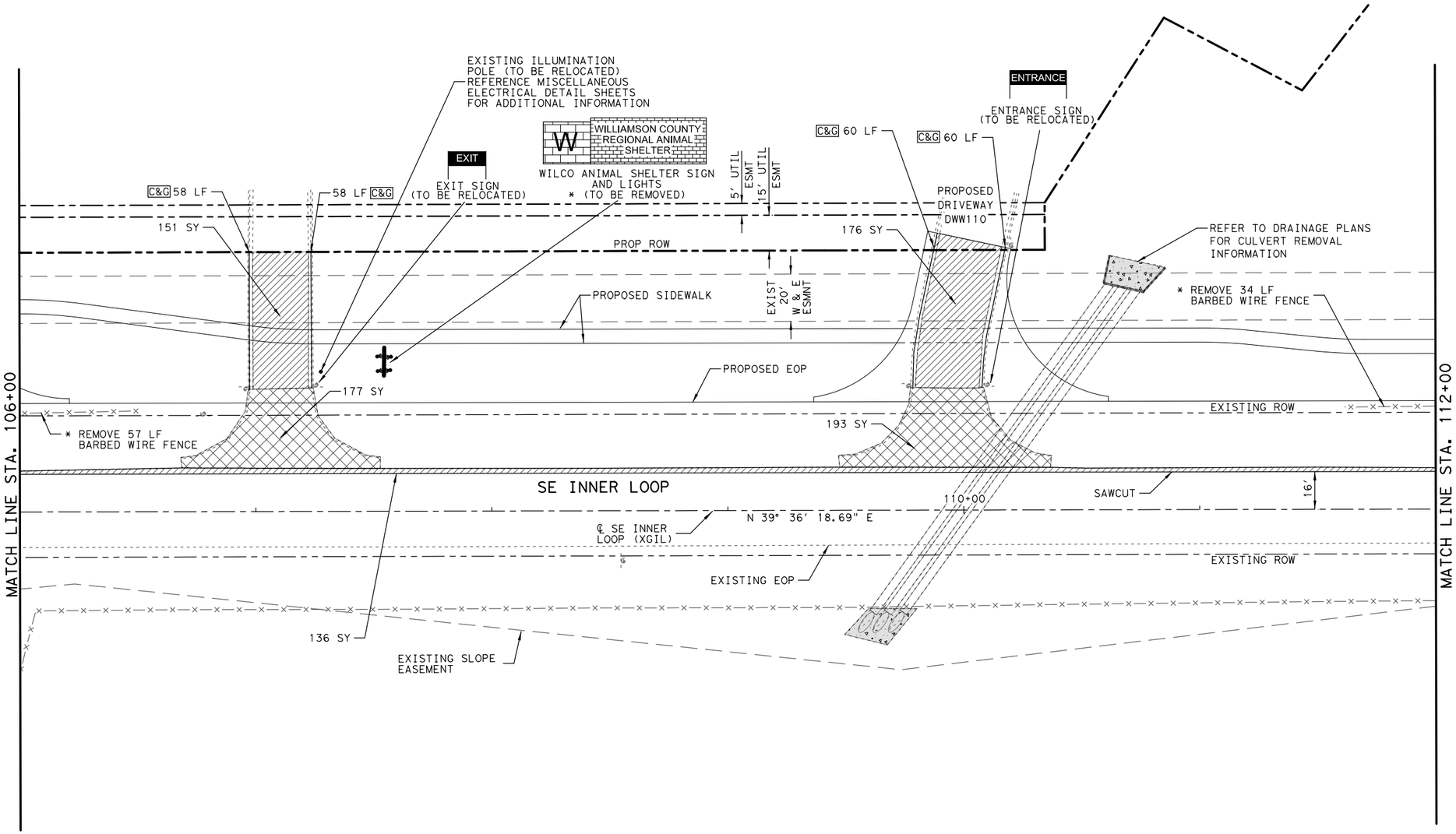

LEGEND	
▨	REMOVE CONCRETE (DRIVEWAY)
▨	REMOVE ASPH. PAV & STAB. BASE
C&G	REMOVE CONC. CURB & GUTTER

NOTES:

* 1. REMOVAL IS SUBSIDIARY TO ITEM 100 - PREP ROW

2. REFER TO SIGNING AND PAVEMENT MARKING PLAN SHEETS FOR SIGNS (TO BE RELOCATED)

SHEET QUANTITIES

104 6029	104 6017	105 6036	*	*
REMOVING CONC. CURB & GUTTER	REMOVING CONC. (DRIVEWAYS)	REMOVING STAB BASE AND ASPH PAV (15"-20")	REMOVE WIRE FENCE	REMOVE SIGN & LIGHTS
LF	SY	SY	LF	LF / EA
236	370	463	91	12' / 4

* FOR CONTRACTORS INFORMATION ONLY

STATE OF TEXAS
JAMES BROOKS
101002
LICENSED PROFESSIONAL ENGINEER
6/26/2017

NO.	REVISION	BY	DATE

WILLIAMSON COUNTY
1848

RTG RODRIGUEZ TRANSPORTATION GROUP FIRM #587

GEORGETOWN INNER LOOP

REMOVAL PLAN

STA. 106+00.00 - STA. 112+00.00

6/26/2017 SHEET 4 OF 5

DESIGNED:	PROJECT NUMBER		ROADWAY	
CHECKED:			SE INNER LOOP	
DRAWN:	STATE	COUNTY	CITY	SHEET No.
CHECKED:	TEXAS	WILLIAMSON	GEORGETOWN	43

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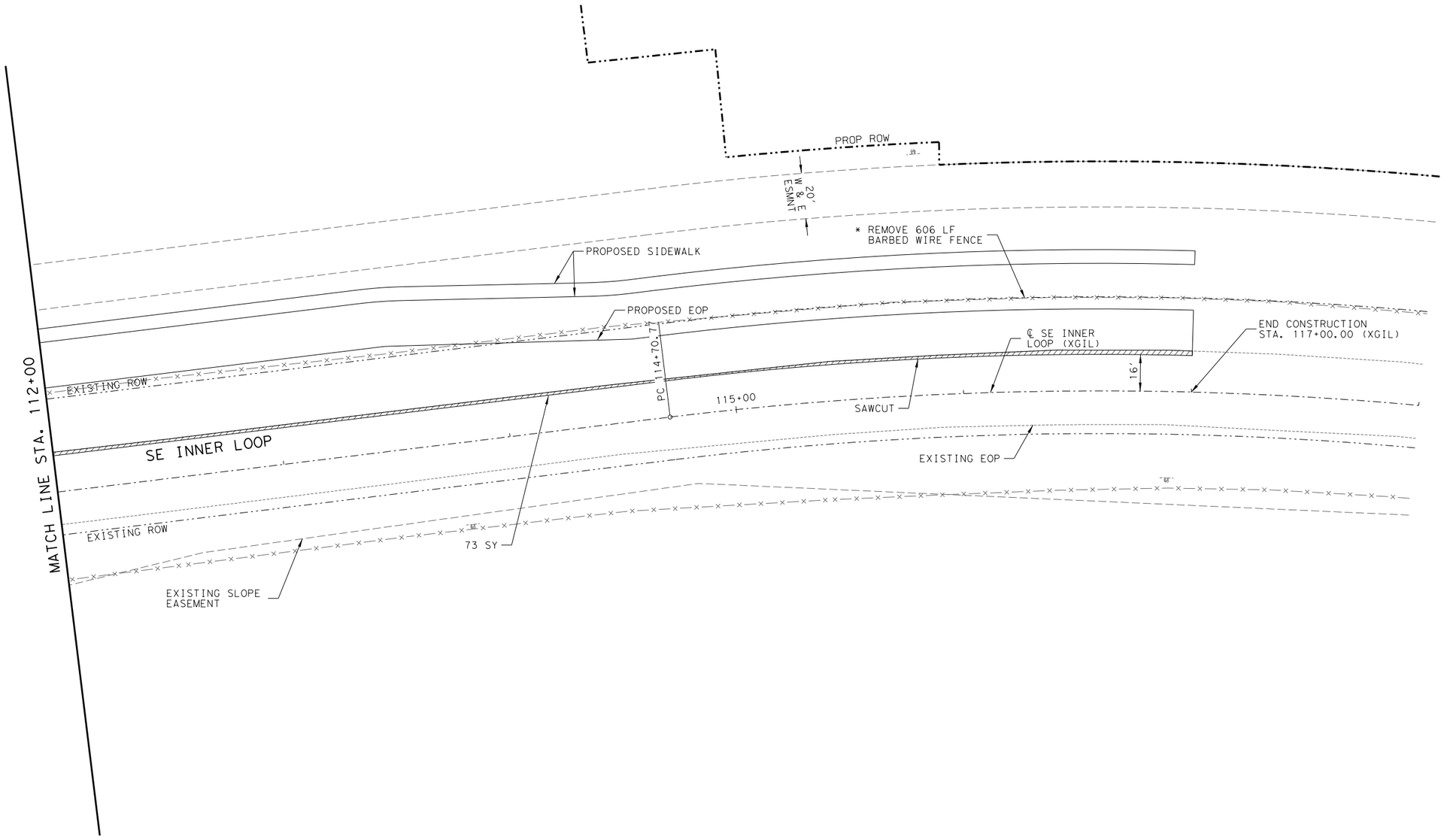

LEGEND

	REMOVE CONCRETE (DRIVEWAY)
	REMOVE ASPH. PAV & STAB. BASE
C&G	REMOVE CONC. CURB & GUTTER

NOTES:

* 1. REMOVAL IS SUBSIDIARY TO ITEM 100 - PREP ROW

2. REFER TO SIGNING AND PAVEMENT MARKING PLAN SHEETS FOR SIGNS (TO BE RELOCATED)

SHEET QUANTITIES

104 6029	104 6017	105 6036	⚹
REMOVING CONC. CURB & GUTTER	REMOVING CONC. (DRIVEWAYS)	REMOVING STAB BASE AND ASPH PAV (15"-20")	REMOVE WIRE FENCE
LF	SY	SY	LF
		73	606

⚹ FOR CONTRACTORS INFORMATION ONLY

STATE OF TEXAS
JAMES BROOKS
101002
LICENSED PROFESSIONAL ENGINEER
6/24/2017

NO.	REVISION	BY	DATE

WILLIAMSON COUNTY
1848

RTG RODRIGUEZ TRANSPORTATION GROUP FIRM #587

GEORGETOWN INNER LOOP

REMOVAL PLAN

STA. 112+00.00 - END PROJECT

6/24/2017 SHEET 5 OF 5

DESIGNED:	PROJECT NUMBER		ROADWAY	
CHECKED:			SE INNER LOOP	
DRAWN:	STATE	COUNTY	CITY	SHEET No.
CHECKED:	TEXAS	WILLIAMSON	GEORGETOWN	44

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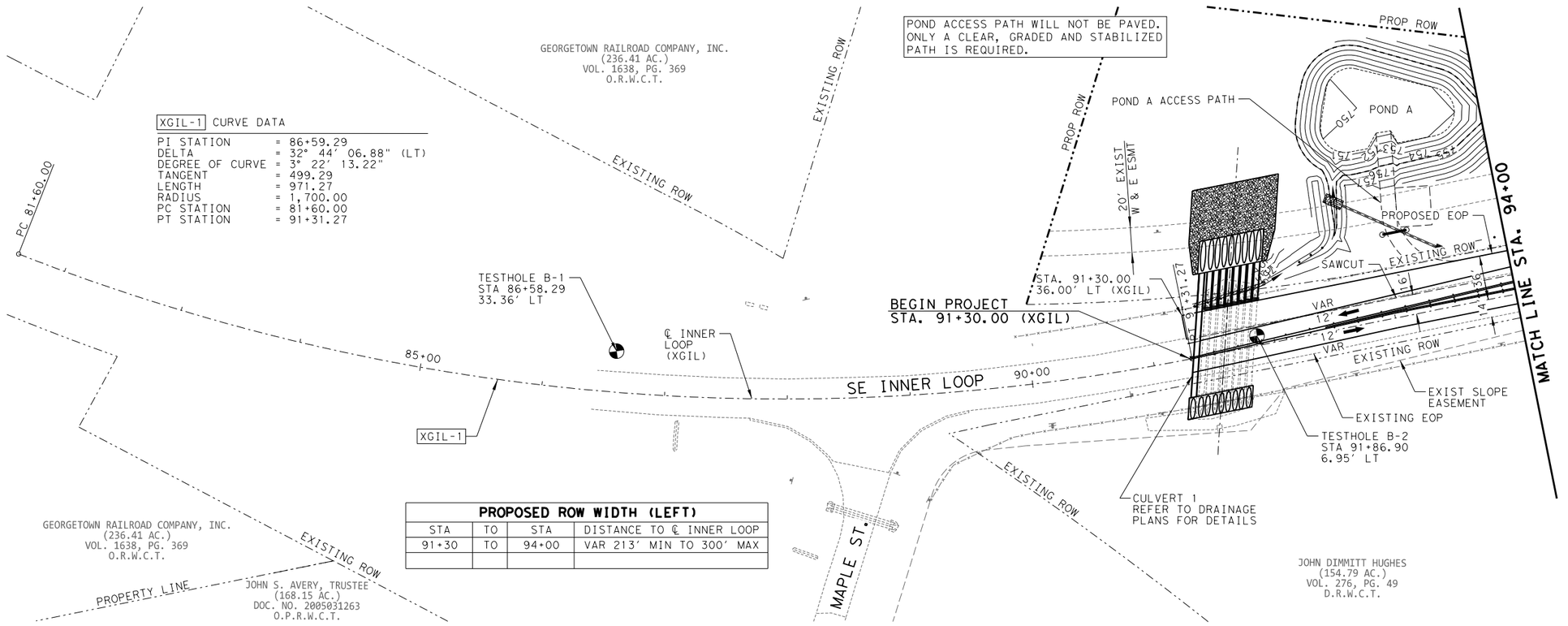
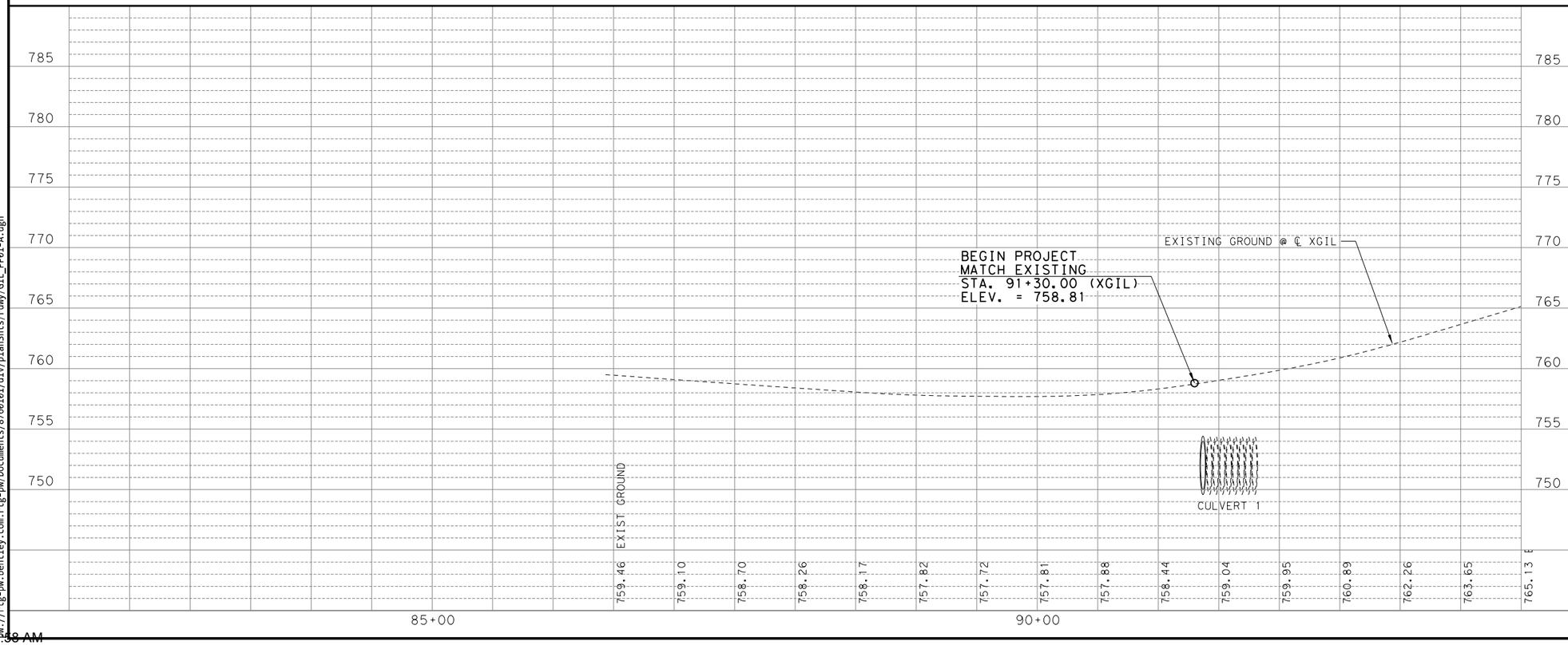


PROPOSED ROW WIDTH (LEFT)			
STA	TO	STA	DISTANCE TO ℄ INNER LOOP
91+30	TO	94+00	VAR 213' MIN TO 300' MAX

NOTES:

1. REFER TO "HORIZONTAL ALIGNMENT DATA" SHEET FOR HORIZONTAL ALIGNMENT INFORMATION.
2. THE CONTRACTOR SHALL BE RESPONSIBLE FOR LOCATING EXISTING UTILITIES PRIOR TO CONSTRUCTION.
3. REFER TO DRIVEWAY LAYOUTS AND INTERSECTION LAYOUT FOR DRIVEWAY AND WILCO WAY INTERSECTION DETAILS.



STATE OF TEXAS
JAMES BROOKS
101002
LICENSED PROFESSIONAL ENGINEER
6/25/2017

NO.	REVISION	BY	DATE

WILLIAMSON COUNTY
1848

RTG RODRIGUEZ TRANSPORTATION GROUP
FIRM #587

GEORGETOWN INNER LOOP
ROADWAY
PLAN & PROFILE
BEGIN PROJECT - STA. 94+00

6/25/2017 SHEET 1 OF 3

DESIGNED:	PROJECT NUMBER		ROADWAY	
CHECKED:			SE INNER LOOP	
DRAWN:	STATE	COUNTY	CITY	SHEET No.
CHECKED:	TEXAS	WILLIAMSON	GEORGETOWN	45

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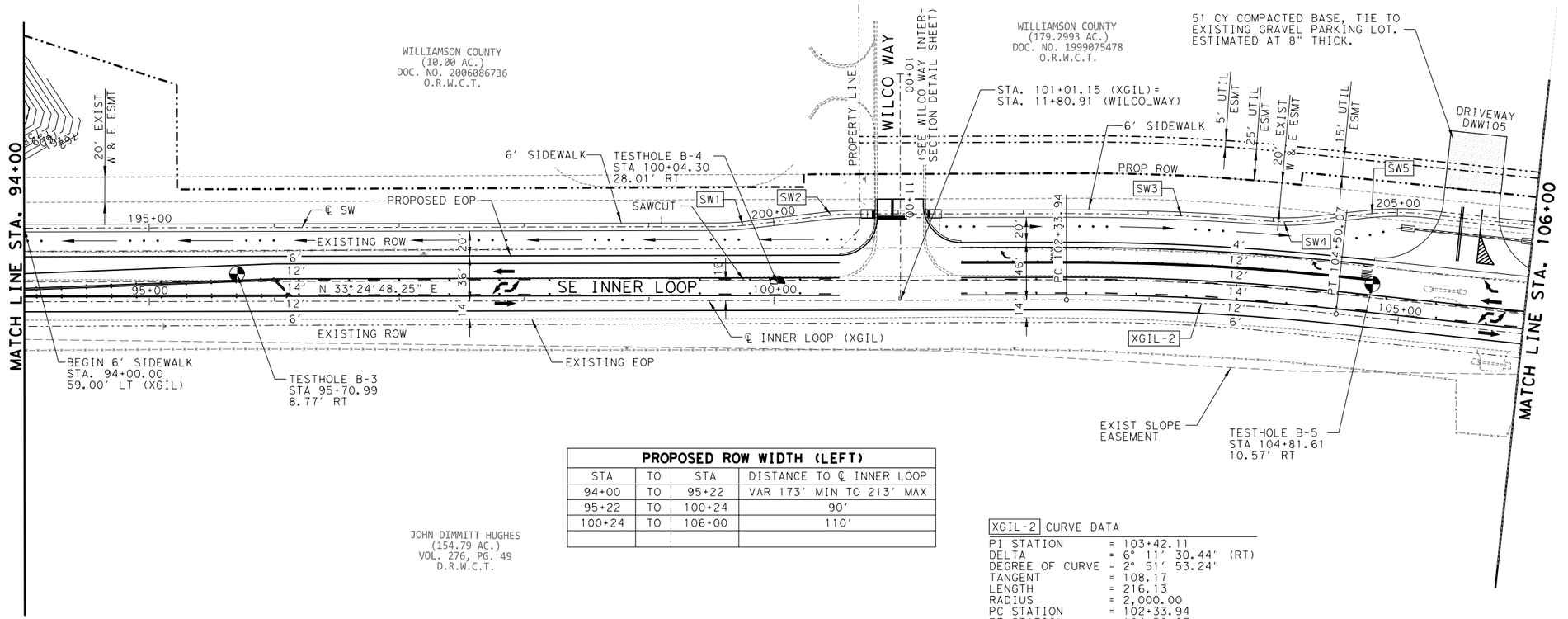


PROPOSED ROW WIDTH (LEFT)			
STA	TO	STA	DISTANCE TO ℄ INNER LOOP
94+00	TO	95+22	VAR 173' MIN TO 213' MAX
95+22	TO	100+24	90'
100+24	TO	106+00	110'

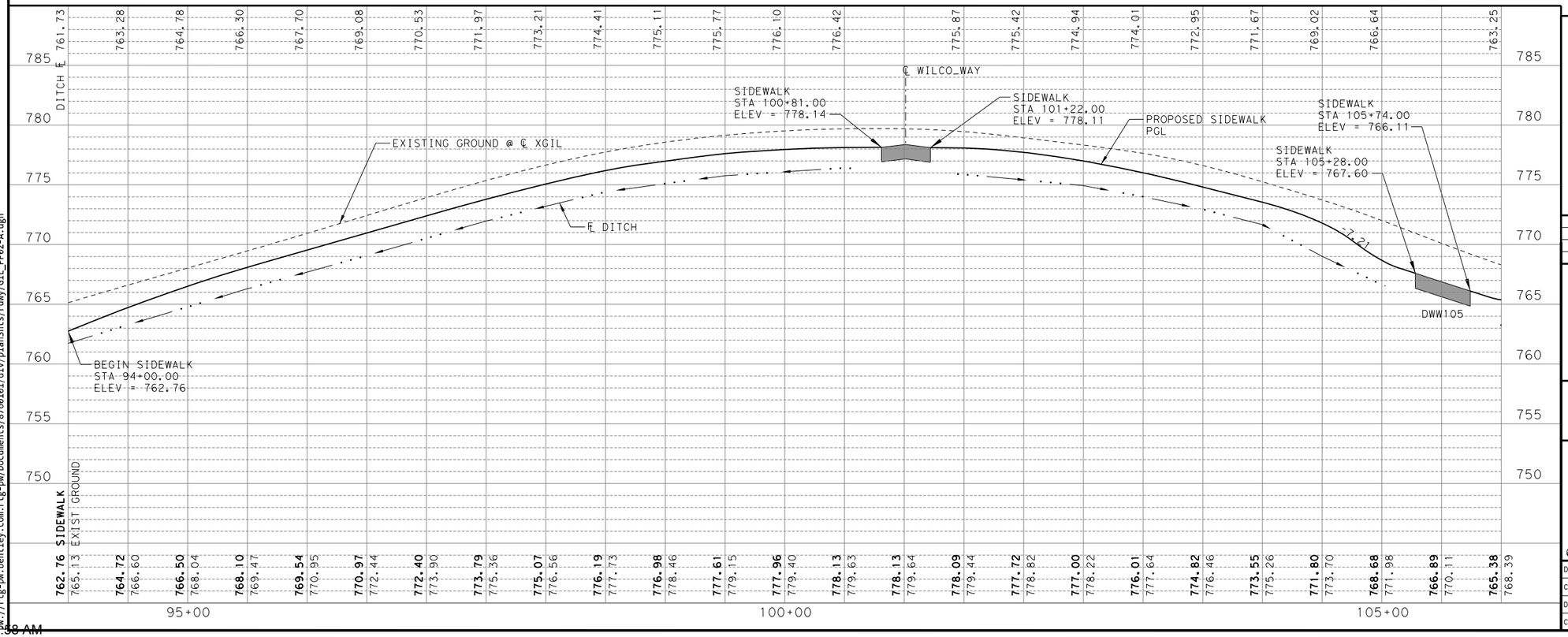
XGIL-2 CURVE DATA

PI STATION	= 103+42.11
DELTA	= 6° 11' 30.44" (RT)
DEGREE OF CURVE	= 2° 51' 53.24"
TANGENT	= 108.17
LENGTH	= 216.13
RADIUS	= 2,000.00
PC STATION	= 102+33.94
PT STATION	= 104+50.07

HORZ. 0 50 100
VERT. 0 5 10
SCALE IN FEET

NOTES:

1. REFER TO "HORIZONTAL ALIGNMENT DATA" SHEET FOR HORIZONTAL ALIGNMENT INFORMATION.
2. THE CONTRACTOR SHALL BE RESPONSIBLE FOR LOCATING EXISTING UTILITIES PRIOR TO CONSTRUCTION.
3. REFER TO DRIVEWAY LAYOUTS AND INTERSECTION LAYOUT FOR DRIVEWAY AND WILCO WAY INTERSECTION DETAILS.



STATE OF TEXAS
JAMES BROOKS
101002
LICENSED PROFESSIONAL ENGINEER
6/25/2017

NO.	REVISION	BY	DATE

WILLIAMSON COUNTY 1848

RTG RODRIGUEZ TRANSPORTATION GROUP FIRM #587

GEORGETOWN INNER LOOP
ROADWAY
PLAN & PROFILE
STA. 94+00 - STA. 106+00

6/25/2017 SHEET 2 OF 3

DESIGNED:	PROJECT NUMBER		ROADWAY
CHECKED:			SE INNER LOOP
DRAWN:	STATE	COUNTY	CITY / SHEET No.
CHECKED:	TEXAS	WILLIAMSON	GEORGETOWN / 46

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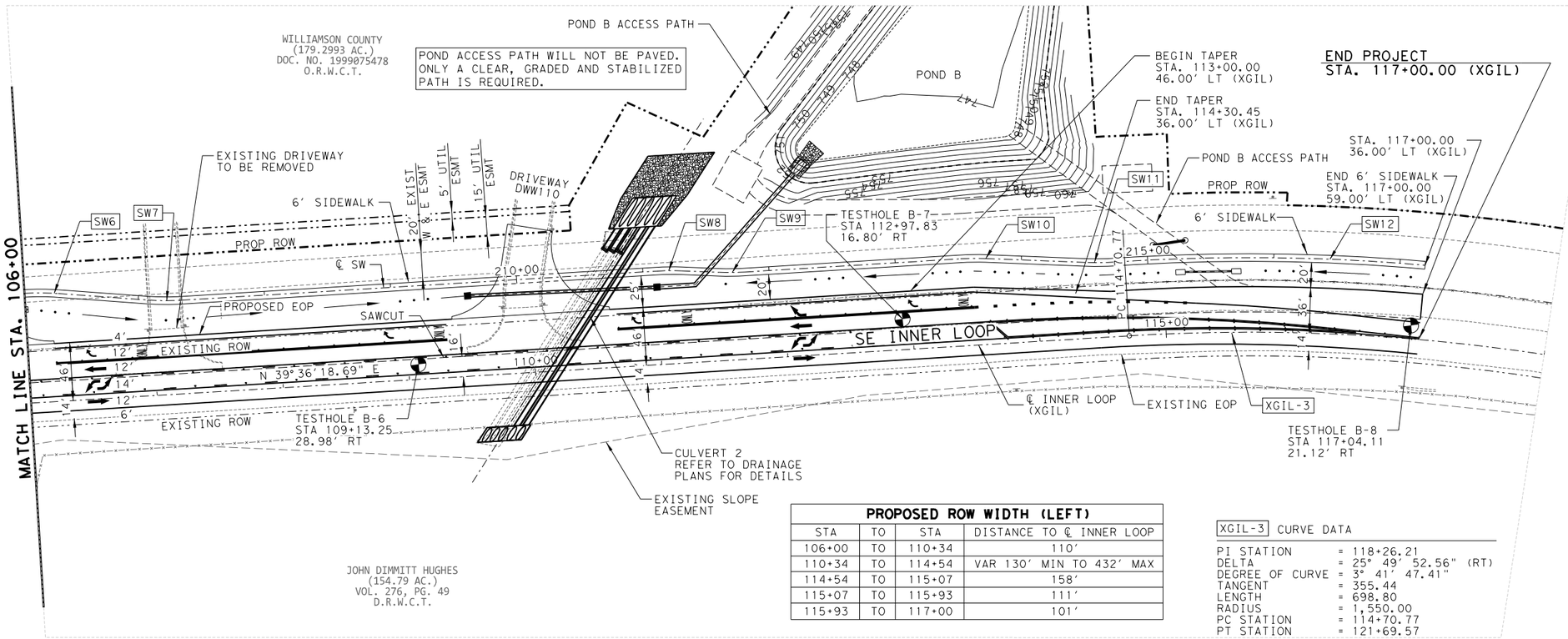


HORZ. 0 50 100
VERT. 0 5 10
SCALE IN FEET

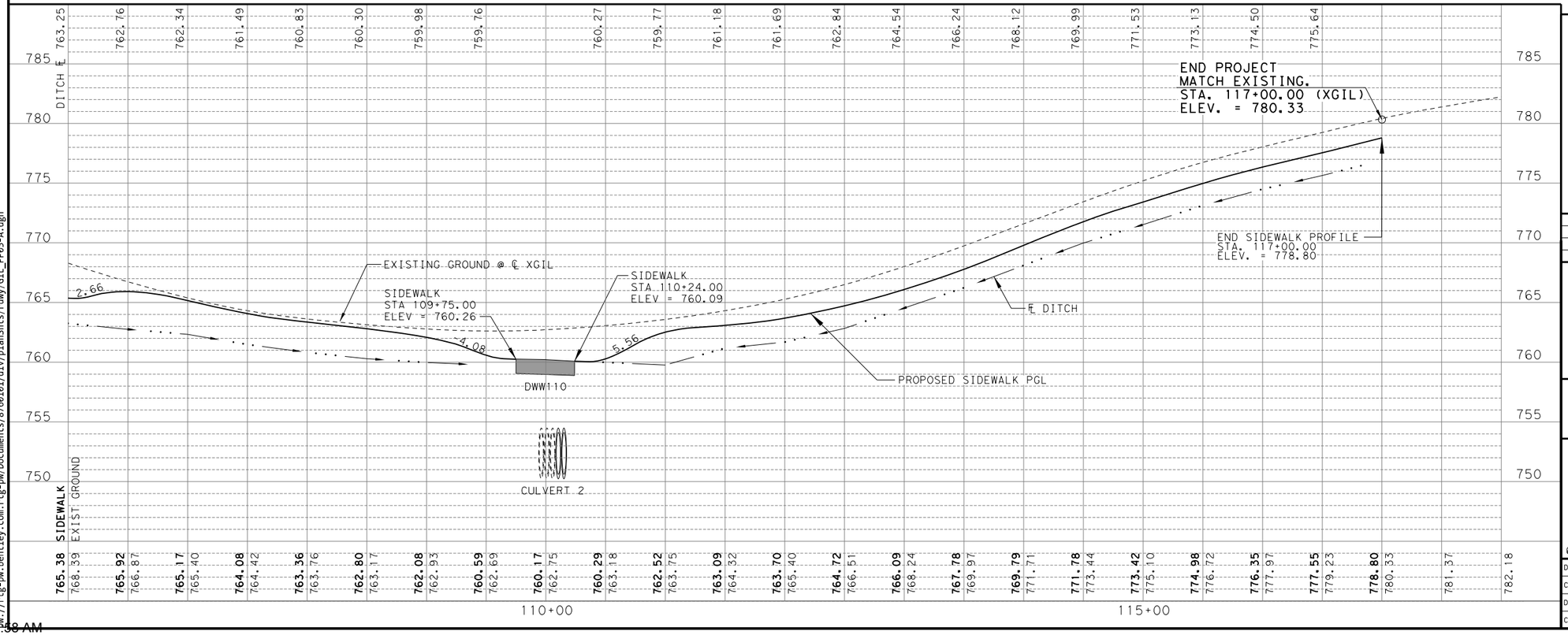
PROPOSED ROW WIDTH (LEFT)			
STA	TO	STA	DISTANCE TO ℄ INNER LOOP
106+00	TO	110+34	110'
110+34	TO	114+54	VAR 130' MIN TO 432' MAX
114+54	TO	115+07	158'
115+07	TO	115+93	111'
115+93	TO	117+00	101'

XGIL-3 CURVE DATA

PI STATION	= 118+26.21
DELTA	= 25° 49' 52.56" (RT)
DEGREE OF CURVE	= 3° 41' 47.41"
TANGENT	= 355.44
LENGTH	= 698.80
RADIUS	= 1,550.00
PC STATION	= 114+70.77
PT STATION	= 121+69.57

NOTES:

1. REFER TO "HORIZONTAL ALIGNMENT DATA" SHEET FOR HORIZONTAL ALIGNMENT INFORMATION.
2. THE CONTRACTOR SHALL BE RESPONSIBLE FOR LOCATING EXISTING UTILITIES PRIOR TO CONSTRUCTION.
3. REFER TO DRIVEWAY LAYOUTS AND INTERSECTION LAYOUT FOR DRIVEWAY AND WILCO WAY INTERSECTION DETAILS.



6/25/2017

NO.	REVISION	BY	DATE

WILLIAMSON COUNTY
1848

RTG RODRIGUEZ TRANSPORTATION GROUP FIRM #587

GEORGETOWN INNER LOOP
ROADWAY
PLAN & PROFILE
STA. 106+00 - END PROJECT

6/25/2017 SHEET 3 OF 3

DESIGNED:	PROJECT NUMBER		ROADWAY	
CHECKED:			SE INNER LOOP	
DRAWN:	STATE	COUNTY	CITY	SHEET No.
CHECKED:	TEXAS	WILLIAMSON	GEORGETOWN	47

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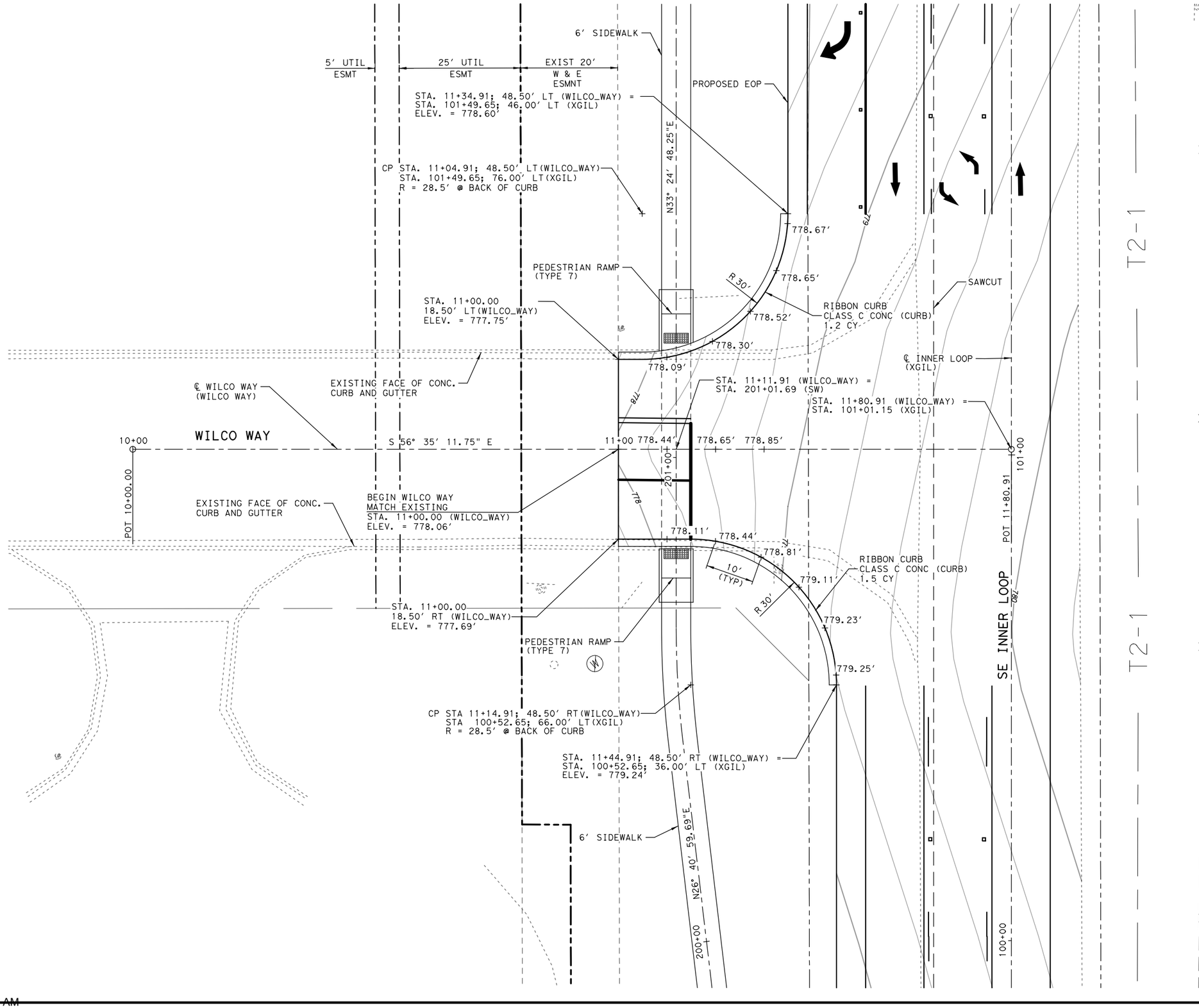

NOTES:

1. UTILITIES NOT SHOWN FOR CLARITY.

STATE OF TEXAS
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6/26/2017

NO.	REVISION	BY	DATE

WILLIAMSON COUNTY
1848

RTG RODRIGUEZ TRANSPORTATION GROUP
FIRM #587

GEORGETOWN INNER LOOP

INTERSECTION LAYOUT

WILCO WAY

6/26/2017 SHEET 1 OF 1

DESIGNED:	PROJECT NUMBER		ROADWAY	
CHECKED:			SE INNER LOOP	
DRAWN:	STATE	COUNTY	CITY	SHEET No.
CHECKED:	TEXAS	WILLIAMSON	GEORGETOWN	48

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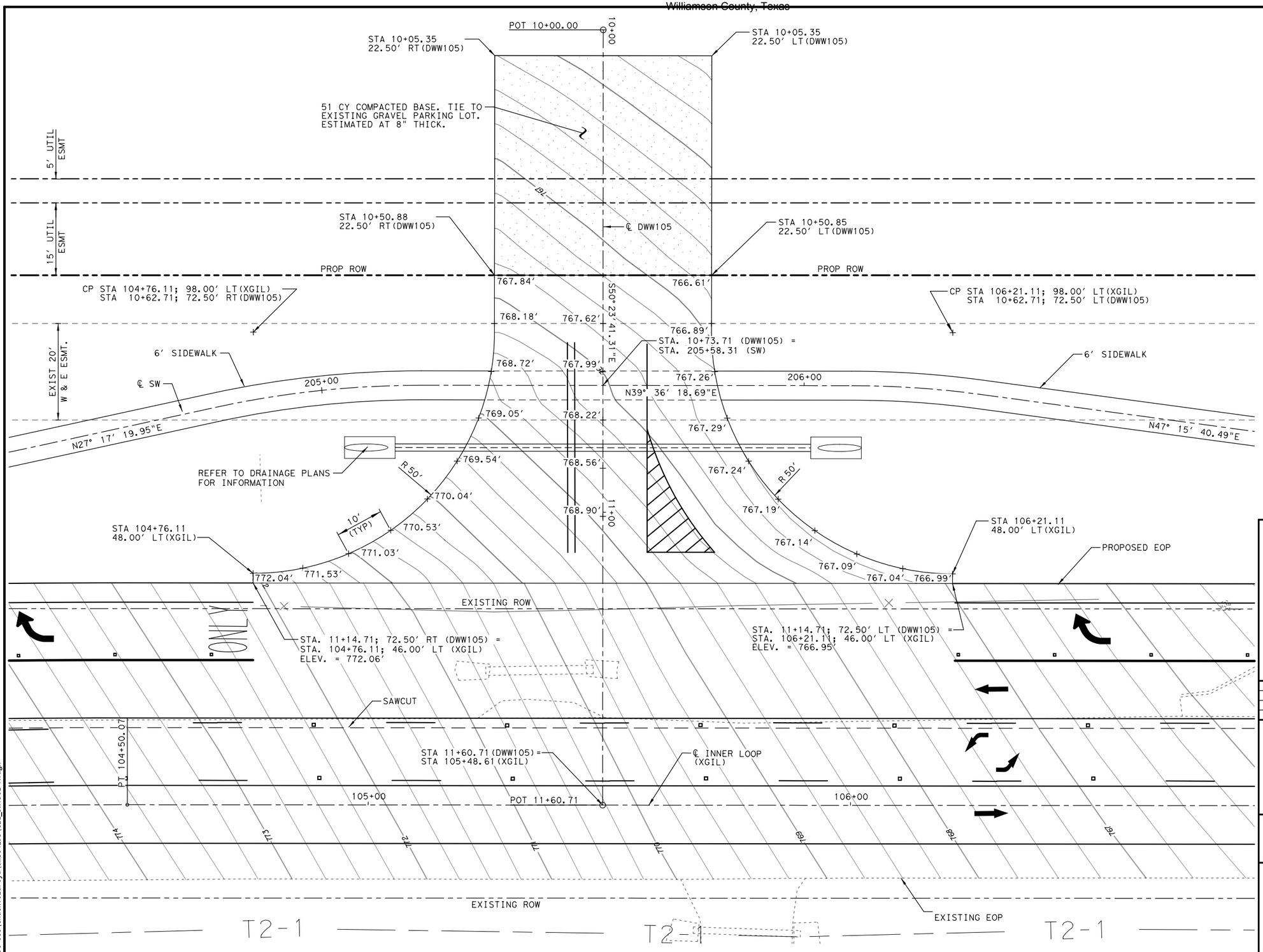

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SCALE IN FEET

NOTES:

1. UTILITIES NOT SHOWN FOR CLARITY.
2. REFERENCE DRIVEWAY SUMMARY AND DETAILS FOR ADDITIONAL INFORMATION

STATE OF TEXAS
JAMES BROOKS
101002
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6/26/2017

NO.	REVISION	BY	DATE

WILLIAMSON COUNTY
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RTG RODRIGUEZ TRANSPORTATION GROUP FIRM #587

GEORGETOWN INNER LOOP

DRIVEWAY LAYOUT

DWW105

6/26/2017 SHEET 1 OF 2

DESIGNED:	PROJECT NUMBER		ROADWAY	
CHECKED:			SE INNER LOOP	
DRAWN:	STATE	COUNTY	CITY	SHEET No.
CHECKED:	TEXAS	WILLIAMSON	GEORGETOWN	49

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0 10 20
SCALE IN FEET

NOTES:

1. UTILITIES NOT SHOWN FOR CLARITY.
2. REFERENCE DRIVEWAY SUMMARY AND DETAILS FOR ADDITIONAL INFORMATION

5' UTIL ESMT
15' UTIL ESMT
EXIST 20' W & E ESMT.
PROP ROW
EXISTING ROW
℄ SW
℄ DWW110
℄ INNER LOOP (XGIL)
6' SIDEWALK
PROPOSED EOP
SAWCUT
CULVERT 2
REFER TO DRAINAGE PLANS FOR INFORMATION
10' (TYP)
R 50'
209+00
210+00
211+00
109+00
110+00
111+00
N39° 36' 18.69"E
N 39° 36' 18.69" E
S38° 19' 36.52"E
S50° 23' 41.31"E
POT10+00.00
POT11+56.82
PC10+50.93
PT10+63.57
STA 10+42.00 18.00' RT(DWW110)
STA 10+42.00 18.00' LT(DWW110)
MATCH EXISTING
757.36'
757.26'
756.88'
CP STA 10+61.60; 70.05' RT(DWW110) = STA 109+29.36; 97.50' LT(XGIL)
CP STA 10+44.88; 68.00' LT(DWW110) = STA 110+68.43; 97.50' LT(XGIL)
758.14'
758.07'
757.86'
758.76'
758.90'
759.04'
759.45'
759.73'
759.86'
760.11'
760.30'
760.21'
760.24'
760.72'
760.53'
760.53'
761.26'
761.39'
761.17'
761.64'
761.70'
762.00'
762.06'
761.85'
761.81'
STA 109+36.48 48.00' LT(XGIL)
STA 110+61.33 48.00' LT(XGIL)
STA. 11+10.82; 62.86' RT (DWW110) = STA. 109+36.48; 46.00' LT (XGIL) ELEV. = 761.94'
STA. 11+10.82; 61.99' LT (DWW110) = STA. 110+61.33; 46.00' LT (XGIL) ELEV. = 762.15'
STA 11+56.82(DWW110) = STA 109+99.35(XGIL)
T2-1

STATE OF TEXAS
JAMES BROOKS
101002
LICENSED PROFESSIONAL ENGINEER
6/26/2017

NO.	REVISION	BY	DATE

WILLIAMSON COUNTY
1848

RTG RODRIGUEZ TRANSPORTATION GROUP FIRM #587

GEORGETOWN INNER LOOP

DRIVEWAY LAYOUT

DWW110

6/26/2017 SHEET 2 OF 2

DESIGNED:	PROJECT NUMBER		ROADWAY	
CHECKED:			SE INNER LOOP	
DRAWN:	STATE	COUNTY	CITY	SHEET No.
CHECKED:	TEXAS	WILLIAMSON	GEORGETOWN	50

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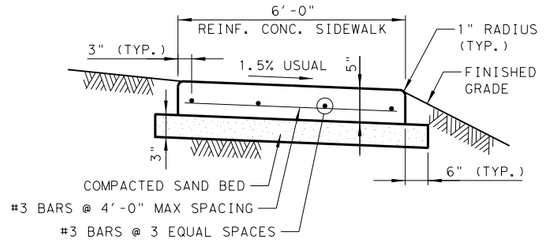
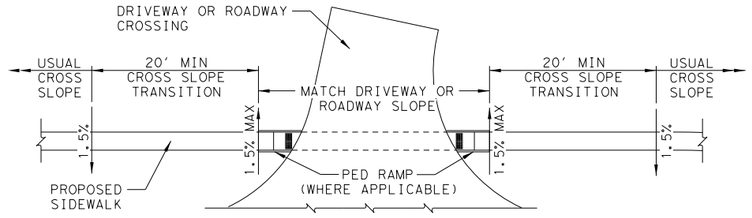


SIDEWALK SECTION

PAYMENT OF SAND BED SUBSIDIARY TO ITEM 531, SIDEWALKS.

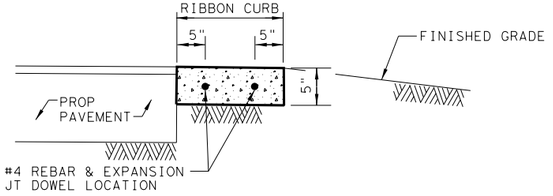
EQUIVALENT WWF MAY BE USED INSTEAD OF #3 BARS IF APPROVED BY THE CONSTRUCTION OBSERVER.



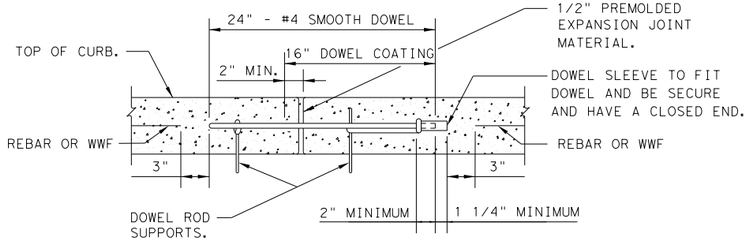
SIDEWALK AT CROSSING PLAN

NOTES:

1. REINFORCING STEEL SHALL BE GRADE 60.
2. SIDEWALK CONCRETE SHALL HAVE MIN STRENGTH OF 3,000 PSI. CURB CONCRETE SHALL BE CLASS "C".
3. SIDEWALK AND CURB CONTROL JOINT SPACING NOT TO EXCEED 10'.



RIBBON CURB SECTION



EXPANSION JOINT DETAIL (RIBBON CURB OR SIDEWALK)

EXPANSION JOINT SPACING NOT TO EXCEED 40'

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6/24/2017

NO.	REVISION	BY	DATE

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RTG RODRIGUEZ TRANSPORTATION GROUP FIRM #587

GEORGETOWN INNER LOOP

MISCELLANEOUS ROADWAY DETAILS

6/24/2017 SHEET 1 OF 1

DESIGNED:	PROJECT NUMBER		ROADWAY	
CHECKED:			SE INNER LOOP	
DRAWN:	STATE	COUNTY	CITY	SHEET No.
CHECKED:	TEXAS	WILLIAMSON	GEORGETOWN	51

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DISCLAIMER:
The use of this standard is governed by the "Texas Engineering Practice Act". No warranty of any kind is made by TxDOT for any purpose whatsoever. TxDOT assumes no responsibility for the conversion of this standard to other formats or for incorrect results or damages resulting from its use.
DATE: 6/24/2017
FILE: pw://rtg-pw.bentley.com:rtg-pw/Documents/8760101/dlv/standards/Roadway/PED-12A.dgn

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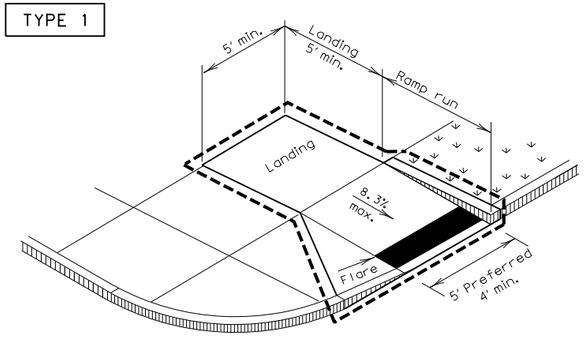
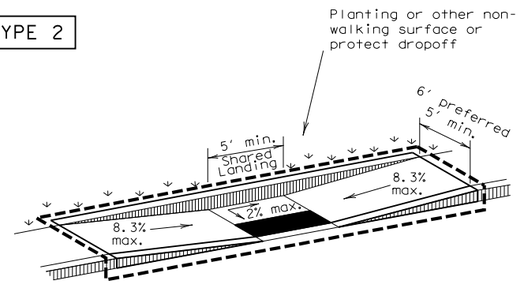


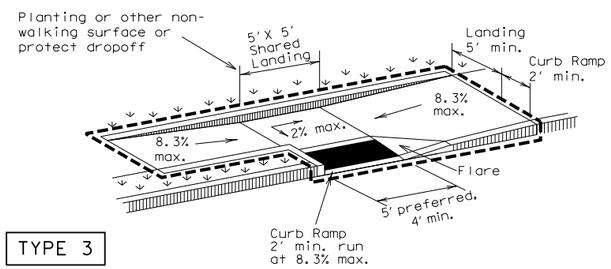
PERPENDICULAR CURB RAMP

TYPE 2



PARALLEL CURB RAMP
(Use only where water will not pond in the landing.)

TYPE 3



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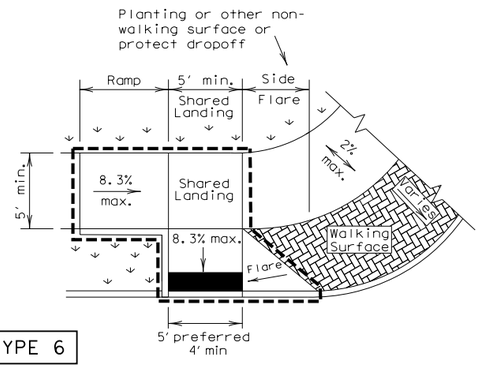
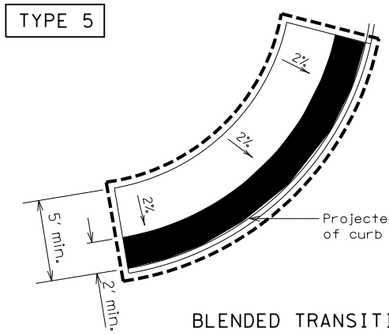


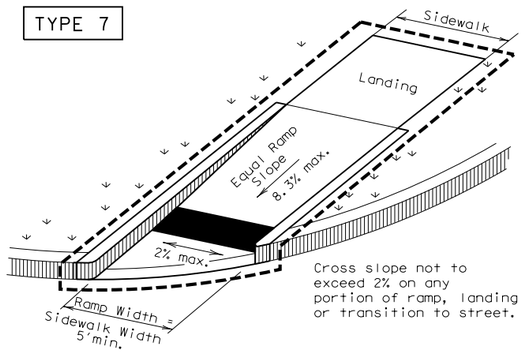
COMBINATION CURB RAMPS

TYPE 5



BLENDED TRANSITION

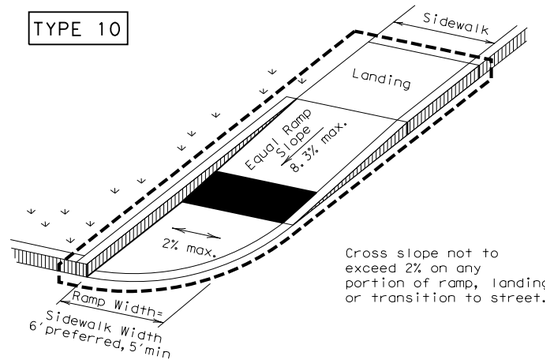
TYPE 7



Cross slope not to exceed 2% on any portion of ramp, landing or transition to street.

(Sidewalk set back from curb)

TYPE 10

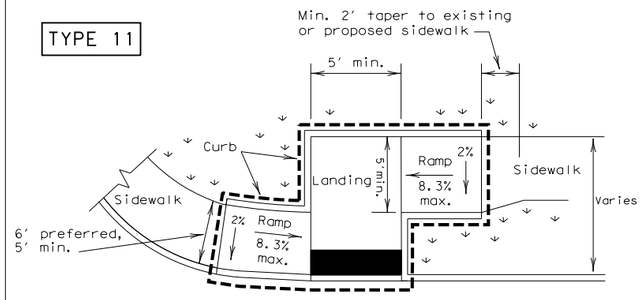


Cross slope not to exceed 2% on any portion of ramp, landing or transition to street.

(Sidewalk adjacent to curb)

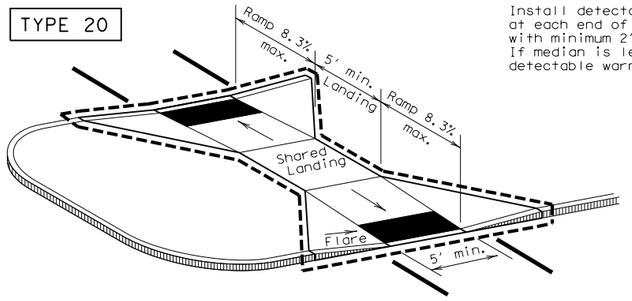
DIRECTIONAL RAMPS WITHIN RADIUS

TYPE 11



OFFSET PARALLEL CURB RAMP

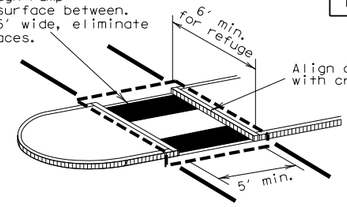
TYPE 20



Install detectable warning surface at each end of cut-through ramp with minimum 2' smooth surface between. If median is less than 6' wide, eliminate detectable warning surfaces.

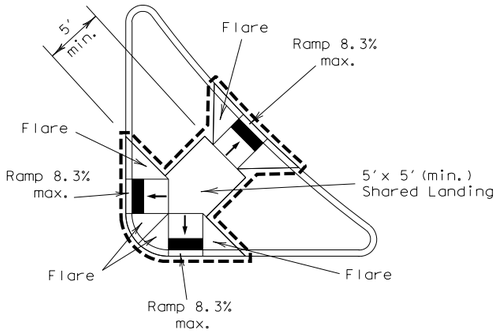
CURB RAMPS AT MEDIAN ISLANDS

TYPE 21



Curb details are shown elsewhere in the plans.

TYPE 22



COMBINATION ISLAND RAMPS

NOTES / LEGEND:

See General Notes on sheet 2 of 4 for more information.

Denotes planting or non-walking surface not part of pedestrian circulation path.

Ramp Limits of Payment

Detectable Warning Surface

SHEET 1 OF 4

Texas Department of Transportation

Design Division Standard

PEDESTRIAN FACILITIES CURB RAMPS

PED-12A

FILE: ped12a.dgn	DN: TxDOT	CK: PK	DW: TxDOT	CK: HD	
©TxDOT March 2002	CONT	SECT	JOB	HIGHWAY	
REVISIONS				SE INNER LP	
VP June 13, 2012	DIST	COUNTY		SHEET NO.	
		WILLIAMSON		52	

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DATE: 6/24/2017
FILE: pw://rtg-pw.bentley.com:rtg-pw/Documents/8760101/dlv/standards/Roadway/PED-12A.pdgnd

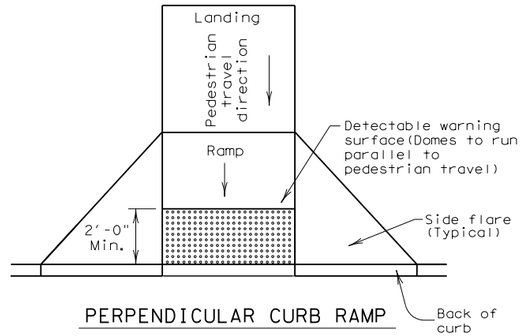
General Notes

Curb Ramps

1. Install a curb ramp or blended transition at each pedestrian street crossing.
2. All slopes shown are maximum allowable. Lesser slopes that will still drain properly should be used. Adjust curb ramp length or grade of approach sidewalks as directed.
3. The minimum sidewalk width is 5′. Where the sidewalk is adjacent to the back of curb, a 6′ sidewalk width is desirable. Where a 5′ sidewalk cannot be provided due to site constraints, sidewalk width may be reduced to 4′ for short distances. 5′x 5′ passing areas at intervals not to exceed 200′ are required.
4. Landings shall be 5′x 5′ minimum with a maximum 2% slope in any direction.
5. Maneuvering space at the bottom of curb ramps shall be a minimum of 4′x 4′ wholly contained within the crosswalk and wholly outside the parallel vehicular travel path.
6. Maximum allowable cross slope on sidewalk and curb ramp surfaces is 2%.
7. Provide flared sides where the pedestrian circulation path crosses the curb ramp. Flared sides shall be sloped at 10% maximum, measured parallel to the curb. Returned curbs may be used only where pedestrians would not normally walk across the ramp, either because the adjacent surface is planted, substantially obstructed, or otherwise protected.
8. Additional information on curb ramp location, design, light reflective value and texture may be found in the current edition of the Texas Accessibility Standards (TAS) and 16 TAC 68.102.
9. To serve as a pedestrian refuge area, the median should be a minimum of 6′ wide, measured from back of curbs. Medians should be designed to provide accessible passage over or through them.
10. Small channelization islands, which do not provide a minimum 5′x 5′ landing at the top of curb ramps, shall be cut through level with the surface of the street.
11. Crosswalk dimensions, crosswalk markings and stop bar locations shall be as shown elsewhere in the plans. At intersections where crosswalk markings are not required, curb ramps shall align with theoretical crosswalks unless otherwise directed.
12. Handrails are not required on curb ramps. Provide curb ramps wherever on accessible route crosses (penetrates) a curb.
13. Curb ramps and landings shall be constructed and paid for in accordance with Item 531 "Sidewalks".
14. Place concrete at a minimum depth of 5" for ramps, flares and landings, unless otherwise directed.
15. Provide a smooth transition where the curb ramps connect to the street.
16. Curbs shown on sheet 1 within the limits of payment are considered part of the curb ramp for payment, whether it is concrete curb, gutter, or combined curb and gutter.
17. Existing features that comply with TAS may remain in place unless otherwise shown on the plans.

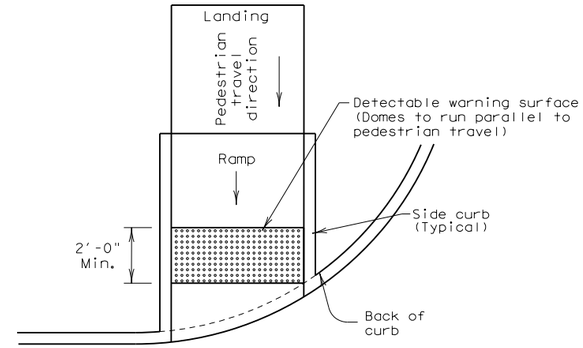
Detectable Warning Material

18. Curb ramps must contain a detectable warning surface that consists of raised truncated domes complying with Section 705 of the TAS. The surface must contrast visually with adjoining surfaces, including side flares. Furnish and install an approved cast-in-place dark brown or dark red detectable warning surface material adjacent to uncolored concrete, unless specified elsewhere in the plans.
19. Detectable Warning Materials must meet TxDOT Departmental Materials Specification DMS 4350 and be listed on the Material Producer List. Install products in accordance with manufacturer's specifications.
20. Detectable warning surfaces must be slip resistant and not allow water to accumulate.
21. Detectable warning surfaces shall be a minimum of 24" in depth in the direction of pedestrian travel, and extend the full width of the curb ramp or landing where the pedestrian access route enters the street.
22. Detectable warning surfaces shall be located so that the edge nearest the curb line is at the back of curb. Align the rows of domes to be perpendicular to the grade break between the ramp run and the street. Detectable warning surfaces may be curved along the corner radius.
23. Shaded areas on Sheet 1 of 4 indicate the approximate location for the detectable warning surface for each curb ramp type.



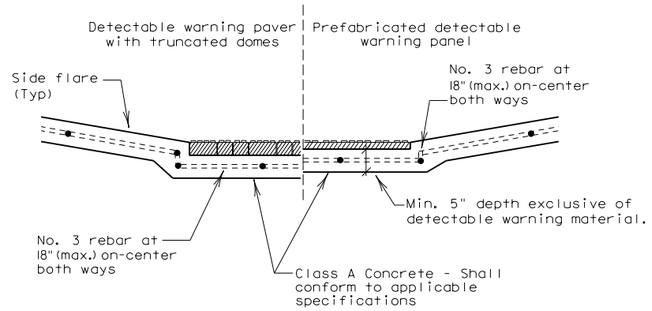
PERPENDICULAR CURB RAMP

Typical placement of detectable warning surface on sloping ramp run.

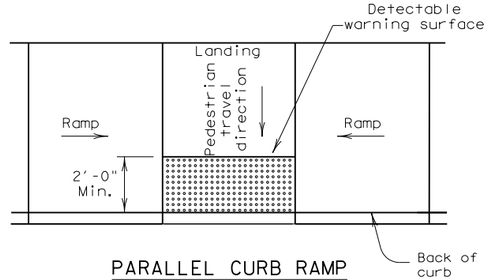


DIRECTIONAL CURB RAMP

Typical placement of detectable warning surface on sloping ramp run.



SECTION: CURB RAMP AT DETECTABLE WARNING



PARALLEL CURB RAMP

Typical placement of detectable warning surface on landing at street edge.

DETECTABLE WARNINGS

Detectable Warning Pavers

24. Furnish detectable warning paver units meeting all requirements of ASTM C-936, C-33. Lay in a two by two unit basket weave pattern or as directed.
25. Lay full-size units first followed by closure units consisting of at least 25 percent of a full unit. Cut detectable warning paver units using a power saw.

Sidewalks

26. Provide clear ground space at operable parts, including pedestrian push buttons. Operable parts shall be placed within one or more reach ranges specified in TAS 308.
27. Place traffic signal or illumination poles, ground boxes, controller boxes, signs, drainage facilities and other items so as not to obstruct the pedestrian access route or clear ground space.
28. Street grades and cross slopes shall be as shown elsewhere in the plans.
29. Changes in level greater than 1/4 inch are not permitted.
30. The least possible grade should be used to maximize accessibility. The running slope of sidewalks and crosswalks within the public right of way may follow the grade of the parallel roadway. Where a continuous grade greater than 5% must be provided, handrails may be desirable to improve accessibility. Handrails may also be needed to protect pedestrians from potentially hazardous conditions. If provided, handrails shall comply with TAS 505.
31. Handrail extensions shall not protrude into the usable landing area or into intersecting pedestrian routes.
32. Driveways and turnouts shall be constructed and paid for in accordance with Item "Intersections, Driveways and Turnouts". Sidewalks shall be constructed and paid for in accordance with Item, "Sidewalks".
33. Sidewalk details are shown elsewhere in the plans.

Texas Department of Transportation | Design Division Standard

PEDESTRIAN FACILITIES CURB RAMPS

PED-12A

FILE: ped12a.dgn	DN: TxDOT	CK: PK	DW: TxDOT	CK: HD
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REVISIONS				SE INNER LP
VP June 13, 2012	DIST	COUNTY		SHEET NO.
		WILLIAMSON		53

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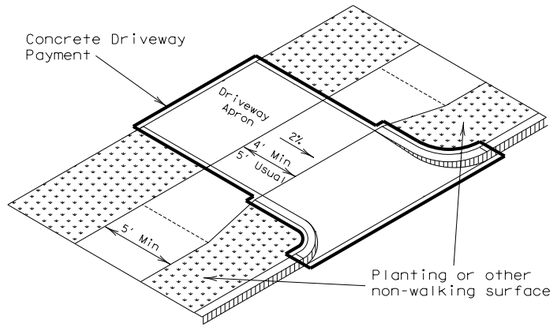
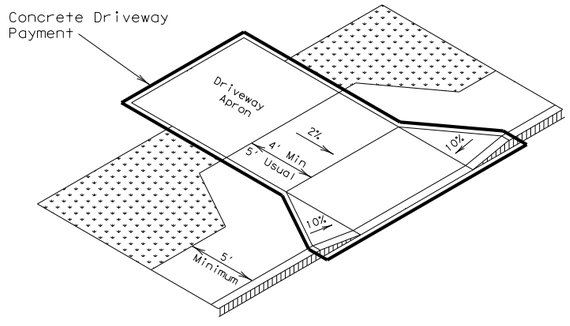
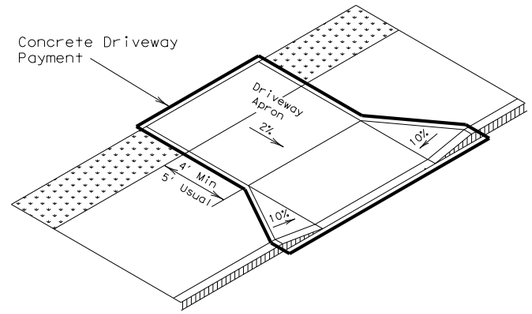


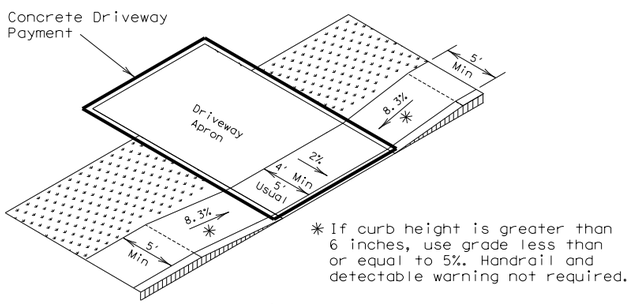
Setback sidewalk



Apron offset sidewalk



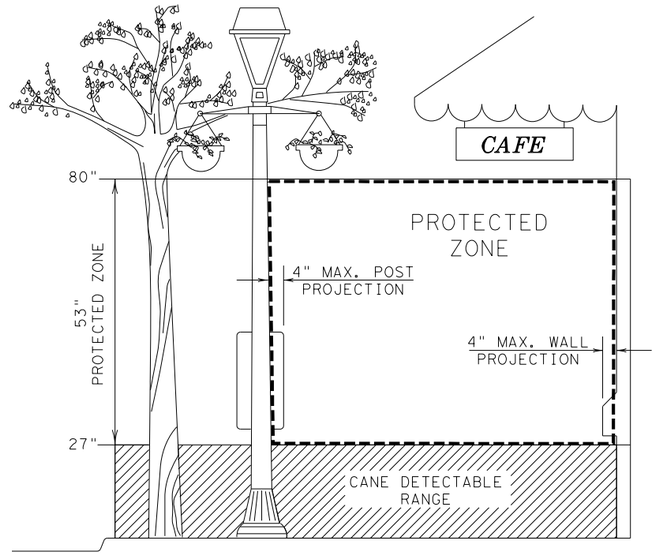
Wide sidewalk



* If curb height is greater than 6 inches, use grade less than or equal to 5%. Handrail and detectable warning not required.

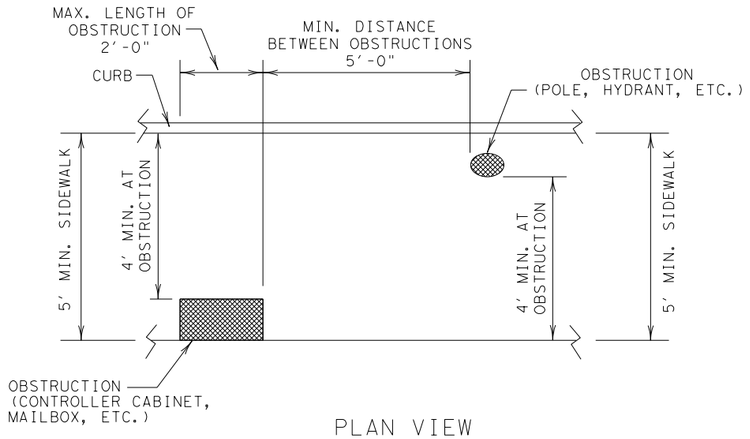
Ramp sidewalk

SIDEWALK TREATMENT AT DRIVEWAYS



PROTECTED ZONE

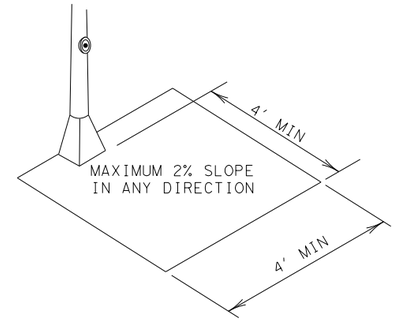
In pedestrian circulation area, maximum 4" projection for post or wall mounted objects between 27"and 80" above the surface.



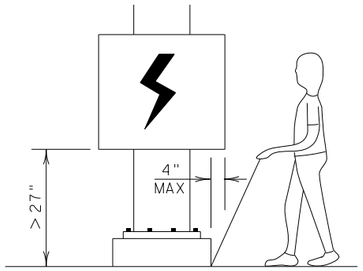
PLAN VIEW

PLACEMENT OF STREET FIXTURES

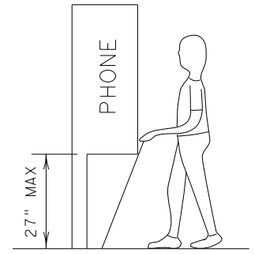
(ITEMS NOT INTENDED FOR PUBLIC USE. MINIMUM 4' x 4' CLEAR GROUND SPACE REQUIRED AT PUBLIC USE FIXTURES.)



CLEAR GROUND SPACE ADJACENT TO PEDESTRIAN PUSH BUTTON



When an obstruction of a height greater than 27" from the surface would create a protrusion of more than 4" into the pedestrian circulation area, construct additional curb or foundation at the bottom to provide a maximum 4" overhang.



Protruding objects of a height ≤ 27" are detectable by cane and do not require additional treatment.

DETECTION BARRIER FOR VERTICAL CLEARANCE < 80"

SHEET 3 OF 4

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	DIST	COUNTY		SHEET NO.
		WILLIAMSON		54

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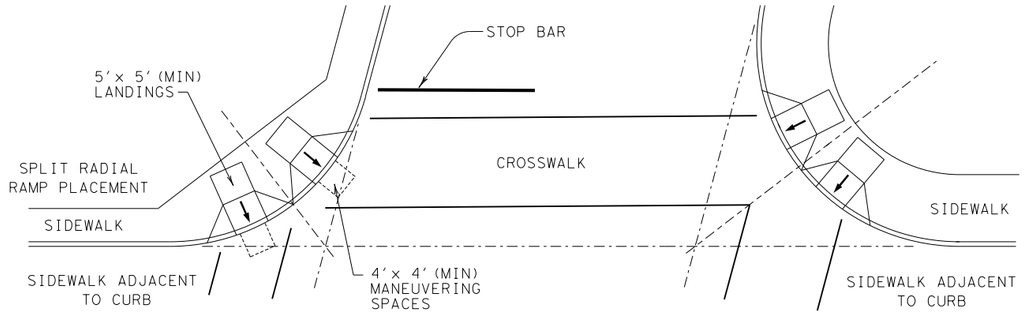
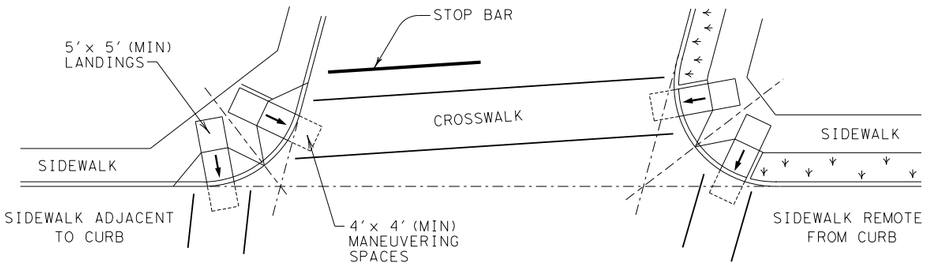
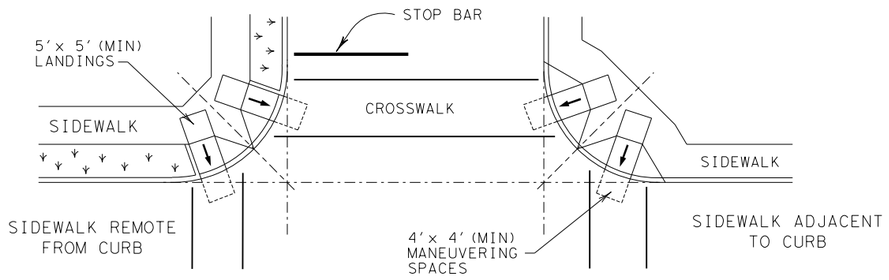


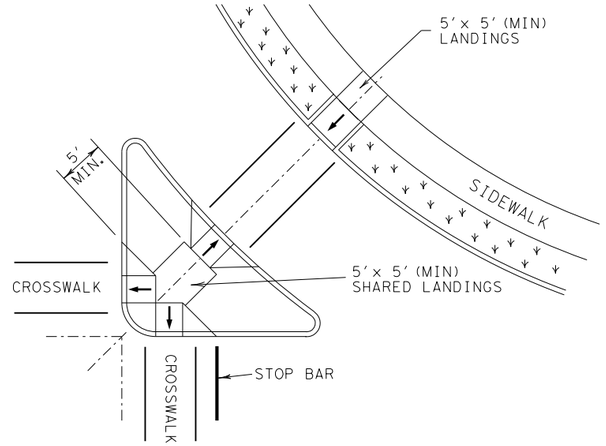
SKEWED INTERSECTION WITH "LARGE" RADIUS



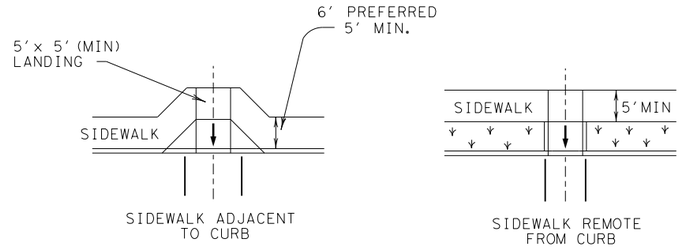
SKEWED INTERSECTION WITH "SMALL" RADIUS



NORMAL INTERSECTION WITH "SMALL" RADIUS



AT INTERSECTION
W/FREE RIGHT TURN & ISLAND



MID-BLOCK PLACEMENT
PERPENDICULAR RAMPS

TYPICAL CROSSING LAYOUTS

SHEET 4 OF 4

Texas Department of Transportation | Design Division Standard

PEDESTRIAN FACILITIES CURB RAMPS

PED-12A

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REVISIONS				SE INNER LP
VP June 13, 2012	DIST	COUNTY		SHEET NO.
		WILLIAMSON		55

DRAINAGE REPORT

GEOPAK (STORM DRAIN DESIGN)
PROJECT DESCRIPTION: Inner Loop - Segment A
DESIGN FREQUENCY: 25
MEASUREMENT UNITS: ENGLISH
SYSTEM:

VERSION: 2006-01-01
DATE: 2017-03-28
COUNTY: Williamson

DRAINAGE OUTPUT FOR DESIGN FREQUENCY

Runoff Computation for Design Frequency.

ID	Area (acre)	Grass C Value	Grass Area (acre)	*Pvmt Pvmt C Value	*Pvmt Area (acre)	Composite C Value	Tc (min)	Tc Used (min)	Intensity (in/hr)	Total Q (cfs)
1A	1.30	0.30	0.36	0.90	0.93	0.73	6.00	6.00	11.26	10.69
2A	2.05	0.30	0.79	0.90	1.26	0.67	6.00	6.00	11.26	15.44
3A	1.22	0.30	0.33	0.90	0.89	0.74	4.00	5.00	11.89	10.72
1AA	0.14	0.90	0.14	0.00	0.00	0.90	2.00	5.00	11.89	1.47

* "Pvmt" represents an accumulation of all sub areas with impervious areas. (Residential, Commercial, Industrial, etc.)

DRAINAGE REPORT

GEOPAK (STORM DRAIN DESIGN)
PROJECT DESCRIPTION: Inner Loop - Segment A
DESIGN FREQUENCY: 100
MEASUREMENT UNITS: ENGLISH
SYSTEM:

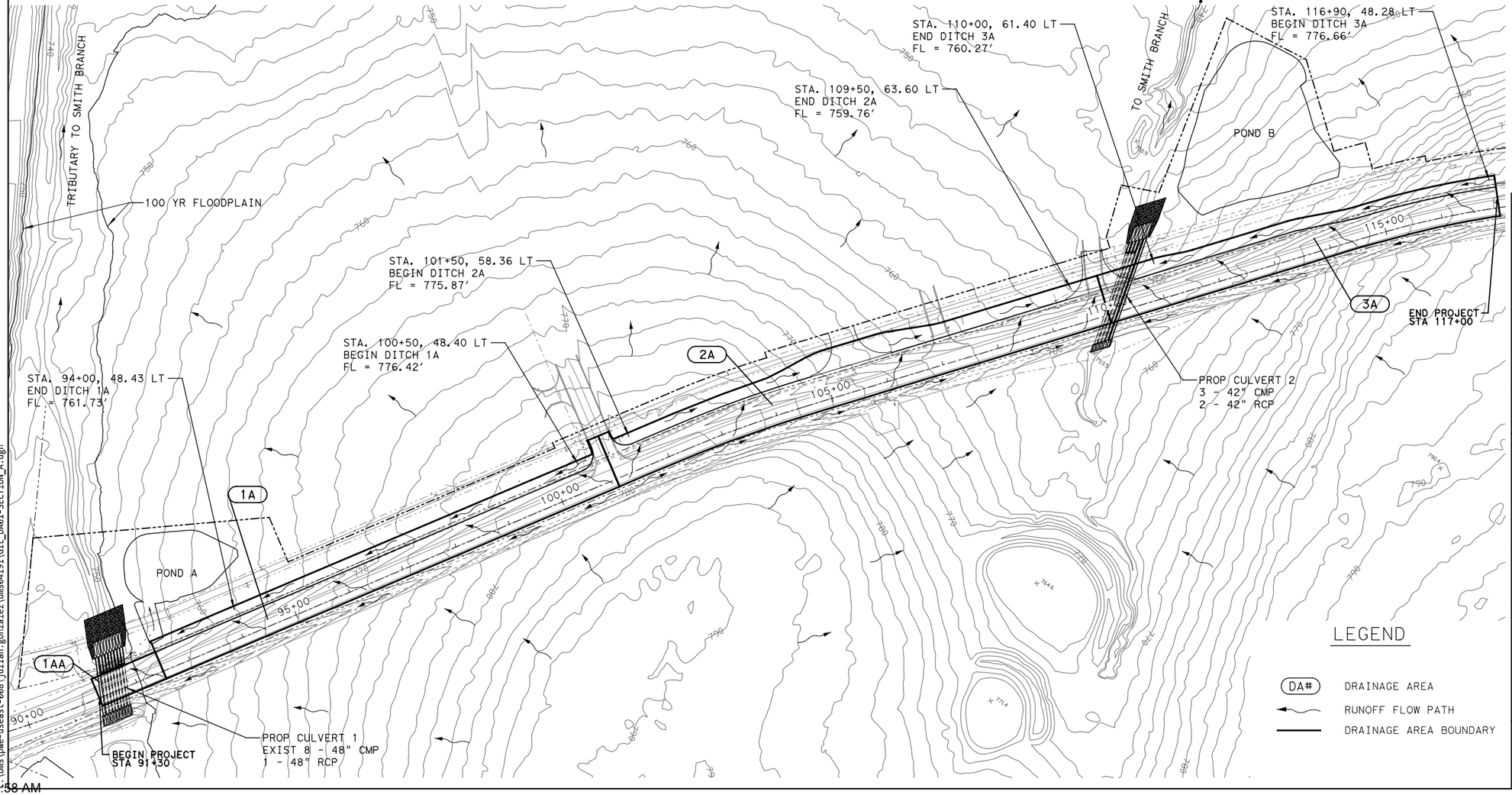
VERSION: 2006-01-01
DATE: 2017-03-28
COUNTY: Williamson

DRAINAGE OUTPUT FOR DESIGN FREQUENCY

Runoff Computation for Design Frequency.

ID	Area (acre)	Grass C Value	Grass Area (acre)	*Pvmt Pvmt C Value	*Pvmt Area (acre)	Composite C Value	Tc (min)	Tc Used (min)	Intensity (in/hr)	Total Q (cfs)
1A	1.30	0.30	0.36	0.90	0.93	0.73	6.00	6.00	14.19	13.48
2A	2.05	0.30	0.79	0.90	1.26	0.67	6.00	6.00	14.19	19.46
3A	1.22	0.30	0.33	0.90	0.89	0.74	4.00	5.00	15.01	13.53
1AA	0.14	0.90	0.14	0.00	0.00	0.90	2.00	5.00	15.01	1.86

* "Pvmt" represents an accumulation of all sub areas with impervious areas. (Residential, Commercial, Industrial, etc.)



NOTES:

1. DRAINAGE AREAS WERE DELINEATED BASED ON 2' WILCO LIDAR CONTOURS USING MICROSTATION.

STATE OF TEXAS
CLAY E. GANN
88491
LICENSED PROFESSIONAL ENGINEER
Clay E. Gann, P.E. 6/23/2017

NO.	REVISION	BY	DATE

WILLIAMSON COUNTY 1848

RTG RODRIGUEZ TRANSPORTATION GROUP FIRM #587

GEORGETOWN INNER LOOP

DRAINAGE AREA MAP

6/23/2017 SHEET 1 OF 2

DESIGNED:	PROJECT NUMBER		ROADWAY	
CHECKED:			SE INNER LOOP	
DRAWN:	STATE	COUNTY	CITY	SHEET No.
CHECKED:	TEXAS	WILLIAMSON	GEORGETOWN	56

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County: **WILLIAMSON** SCS Storm Distribution: **Type II**

RUNOFF SUMMARY FOR DRAINAGE AREAS LARGER THAN 200 ACRES USING NRCS TR-55 METHOD

DRAINAGE AREA NO.	DRAINAGE AREA ACRES	CURVE NUMBER (CN)	INITIAL ABSTRACT (Ia) (IN)	TIME OF CONCENTRATION Tc (MIN)	RAINFALL DEPTH P(2) (IN)	DISCHARGE 2 YEAR Q(2) (CFS)	RAINFALL DEPTH P(5) (IN)	DISCHARGE 5 YEAR Q(5) (CFS)	RAINFALL DEPTH P(10) (IN)	DISCHARGE 10 YEAR Q(10) (CFS)	RAINFALL DEPTH P(25) (IN)	DISCHARGE 25 YEAR Q(25) (CFS)	RAINFALL DEPTH P(50) (IN)	DISCHARGE 50 YEAR Q(50) (CFS)	RAINFALL DEPTH P(100) (IN)	DISCHARGE 100 YEAR Q(100) (CFS)	COMMENTS (COMBINED DRAINAGE AREAS, ETC.)
1C	332	92	0.17	39	3.87	440	5.53	516	6.30	828	7.66	1022	9.06	1147	9.93	1286	
2C	112	92	0.17	44	3.87	192	5.53	288	6.30	349	7.66	432	9.06	484	9.93	541	

NOTES:
1. ASSUMES ANTECEDENT MOISTURE CONDITION II.
2. CURVE NUMBER (CN) BASED ON NRCS WEB SOIL SURVEY AND RUNOFF CURVE NUMBERS FOR AGRICULTURAL LANDS. (USDA URBAN HYDROLOGY FOR SMALL WATERSHEDS, TABLE 2-2c).
3. TIME OF CONCENTRATION BASED ON SCS METHOD AND CHECKED WITH KERBY-KIRPICH METHOD.
4. ASSUME 400' OVERLAND FLOW FOR KERBY METHOD.

LEGEND

- DA# — DRAINAGE AREA
- RUNOFF FLOW
- MAXIMUM FLOW PATH
- DRAINAGE AREA BOUNDARY

0 500 1000
SCALE IN FEET

NOTES:

1. DRAINAGE AREAS WERE DELINEATED BASED ON 2' WILCO LIDAR CONTOURS USING MICROSTATION.

STATE OF TEXAS
CLAY E. GANN
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LICENSED PROFESSIONAL ENGINEER
Clay E. Gann P.E. 6/23/2017

NO.	REVISION	BY	DATE

WILLIAMSON COUNTY
1848

RTG RODRIGUEZ TRANSPORTATION GROUP FIRM #587

GEORGETOWN INNER LOOP

DRAINAGE AREA MAP
CROSS CULVERTS

6/23/2017 SHEET 2 OF 2

DESIGNED:	PROJECT NUMBER		ROADWAY	
CHECKED:			SE INNER LOOP	
DRAWN:	STATE	COUNTY	CITY	SHEET No.
CHECKED:	TEXAS	WILLIAMSON	GEORGETOWN	56A

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NODE CONTROL LOCATIONS

CONTROL= CENTER OF GRATE (LID)
ELEV= T/GRATE

DROP INLET
(TY PSL-FG)

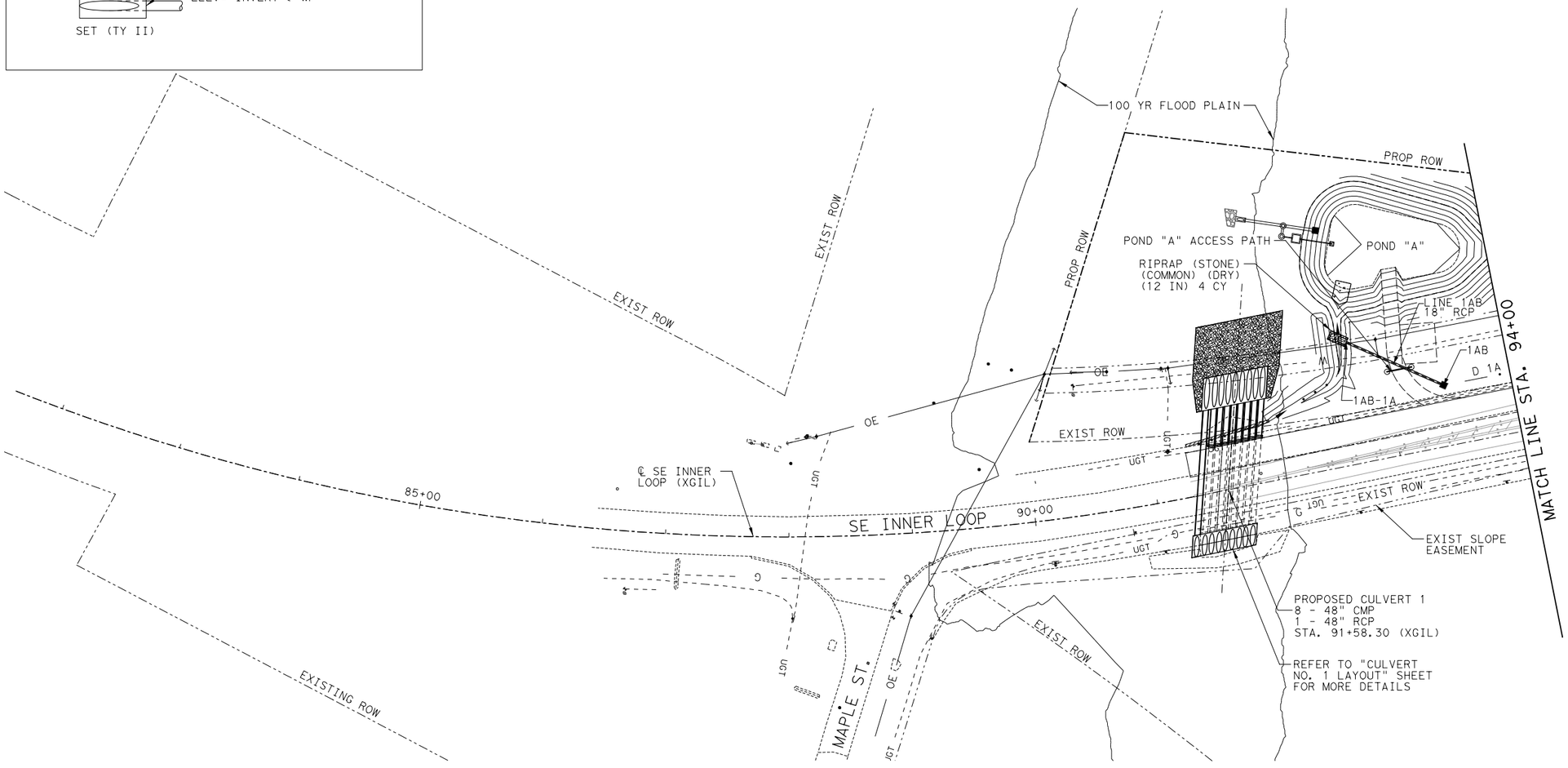
CONTROL= WORKING PT (WP)
ELEV= INVERT @ WP

SET (TY II)

HORZ. 0 50 100
VERT. 0 5 10
SCALE IN FEET

LEGEND

- D_XX_XX . . DITCH FLOWLINE & ID
- PROP STORM SEWER
- SAFETY END TREATMENT
- DROP INLET



NOTES:

1. SEE DRAINAGE PROFILES FOR DETAILED INFO.
2. BENDS TYPICALLY PLACED 4' OUTSIDE THE INSIDE FACE OF STRUCTURE UNLESS OTHERWISE NOTED. PROVIDE DEGREE OF BEND SPECIFIED UNLESS OTHERWISE APPROVED BY THE ENGINEER.
3. SEE FIRST DRAINAGE PLAN SHEET FOR NODE CONTROL PT INFORMATION.

NODE ID	LOCATION			NODE TOP	NODE BOTTOM	NODE BOTTOM X	NODE BOTTOM Y	NODE ELEV (FT)	DOWNSTREAM LINK	
	CHAIN	STA	OFF (FT)						ID	DESC
1AB	XGIL	93+45.53	-49.00	(TY PSL)(FG)(3X3)	(TY PB)(3X3)	3138573.589	10198234.169	759.94	LINE 1AB-1A	1-18" RCP
1AB-1A	XGIL	92+75.06	-98.35	SET (TY II)(18")(RCP)(4:1)(C)						

STATE OF TEXAS
CLAY E. GANN
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LICENSED PROFESSIONAL ENGINEER
Clay E. Gann, P.E. 6/23/2017

NO.	REVISION	BY	DATE

WILLIAMSON COUNTY 1848

RTG RODRIGUEZ TRANSPORTATION GROUP FIRM #587

GEORGETOWN INNER LOOP

DRAINAGE PLAN

BEGIN PROJECT - STA. 94+00

6/23/2017 SHEET 1 OF 3

DESIGNED:	PROJECT NUMBER		ROADWAY	
CHECKED:			SE INNER LOOP	
DRAWN:	STATE	COUNTY	CITY	SHEET No.
CHECKED:	TEXAS	WILLIAMSON	GEORGETOWN	57

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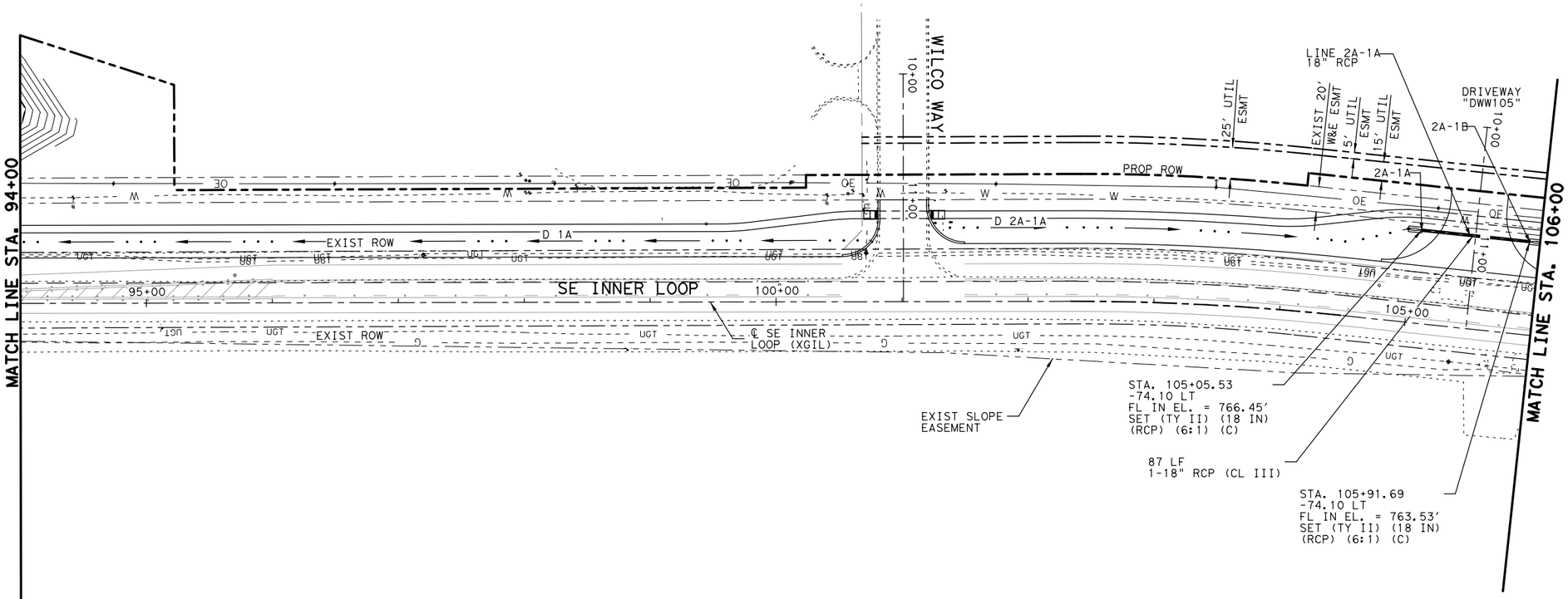
HORZ. 0 50 100
VERT. 0 5 10
SCALE IN FEET

LEGEND

- D_XX_XX . . DITCH FLOWLINE & ID
- PROP STORM SEWER
- SAFETY END TREATMENT
- DROP INLET



NOTES:

1. SEE DRAINAGE PROFILES FOR DETAILED INFO.
2. BENDS TYPICALLY PLACED 4' OUTSIDE THE INSIDE FACE OF STRUCTURE UNLESS OTHERWISE NOTED. PROVIDE DEGREE OF BEND SPECIFIED UNLESS OTHERWISE APPROVED BY THE ENGINEER.
3. SEE FIRST DRAINAGE PLAN SHEET FOR NODE CONTROL PT INFORMATION.

STATE OF TEXAS
CLAY E. GANN
88491
LICENSED PROFESSIONAL ENGINEER
Clay E. Gann, P.E. 6/26/2017

NO.	REVISION	BY	DATE

WILLIAMSON COUNTY 1848

RTG RODRIGUEZ TRANSPORTATION GROUP FIRM #587

GEORGETOWN INNER LOOP
DRAINAGE PLAN

STA. 94+00 - STA. 106+00

6/26/2017 SHEET 2 OF 3

DESIGNED:	PROJECT NUMBER		ROADWAY	
CHECKED:			SE INNER LOOP	
DRAWN:	STATE	COUNTY	CITY	SHEET No.
CHECKED:	TEXAS	WILLIAMSON	GEORGETOWN	58

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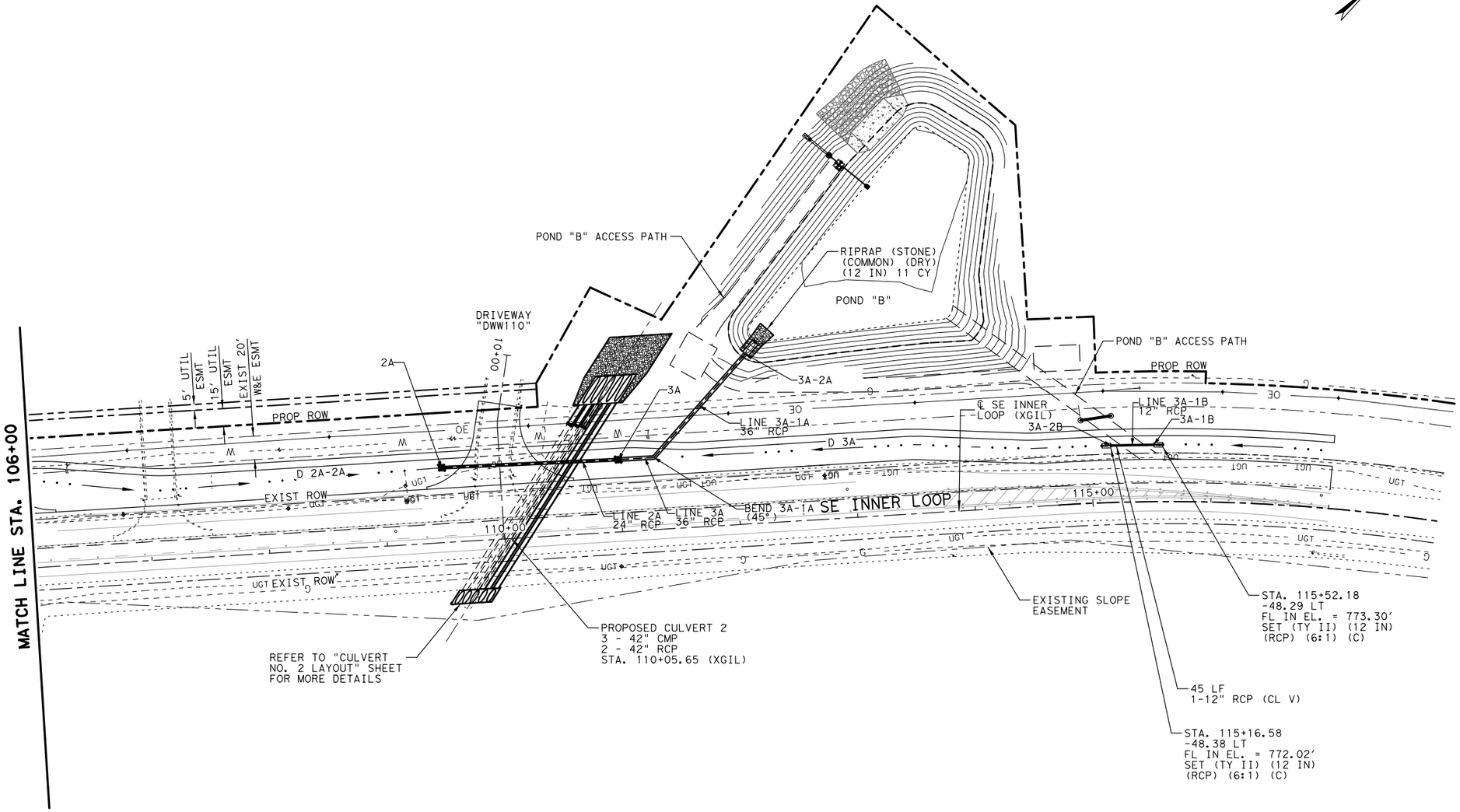
SCALE IN FEET

LEGEND

- D_XX_XX . . DITCH FLOWLINE & ID
- PROP STORM SEWER
- SAFETY END TREATMENT
- DROP INLET

NOTES:

1. SEE DRAINAGE PROFILES FOR DETAILED INFO.
2. BENDS TYPICALLY PLACED 4' OUTSIDE THE INSIDE FACE OF STRUCTURE UNLESS OTHERWISE NOTED. PROVIDE DEGREE OF BEND SPECIFIED UNLESS OTHERWISE APPROVED BY THE ENGINEER.
3. SEE FIRST DRAINAGE PLAN SHEET FOR NODE CONTROL PT INFORMATION.



NODE ID	LOCATION			NODE TOP	NODE BOTTOM	NODE BOTTOM X	NODE BOTTOM Y	NODE ELEV (FT)	DOWNSTREAM LINK	
	CHAIN	STA	OFF (FT)						ID	DESC
2A	XGIL	109+50.00	-63.60	(TY PSL)(FG)(4X4L)(4X4G)	(TY PB)(4X4)	3139501.943	10199548.109	759.76	LINE 2A	1-24" RCP
3A	XGIL	111+00.00	-61.30	(TY PSL)(FG)(4X4L)(4X4G)	(TY PB)(4X4)	3139599.339	10199662.211	759.77	LINE 3A	1-36" RCP
3A-1A	XGIL	111+30.37	-61.30	(BEND)					LINE 3A-1A	1-36" RCP
3A-2A	XGIL	112+13.09	-144.23	SET (TY II)(36")(RCP)(4:1)(C)						

CLAY E. GANN
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LICENSED PROFESSIONAL ENGINEER
STATE OF TEXAS
Clay E. Gann, P.E. 6/26/2017

NO.	REVISION	BY	DATE

WILLIAMSON COUNTY
1848

RTG RODRIGUEZ TRANSPORTATION GROUP FIRM #587

GEORGETOWN INNER LOOP
DRAINAGE PLAN

STA. 106+00 - END PROJECT

6/26/2017 SHEET 3 OF 3

DESIGNED:	PROJECT NUMBER		ROADWAY	
CHECKED:			SE INNER LOOP	
DRAWN:	STATE	COUNTY	CITY	SHEET No.
CHECKED:	TEXAS	WILLIAMSON	GEORGETOWN	59

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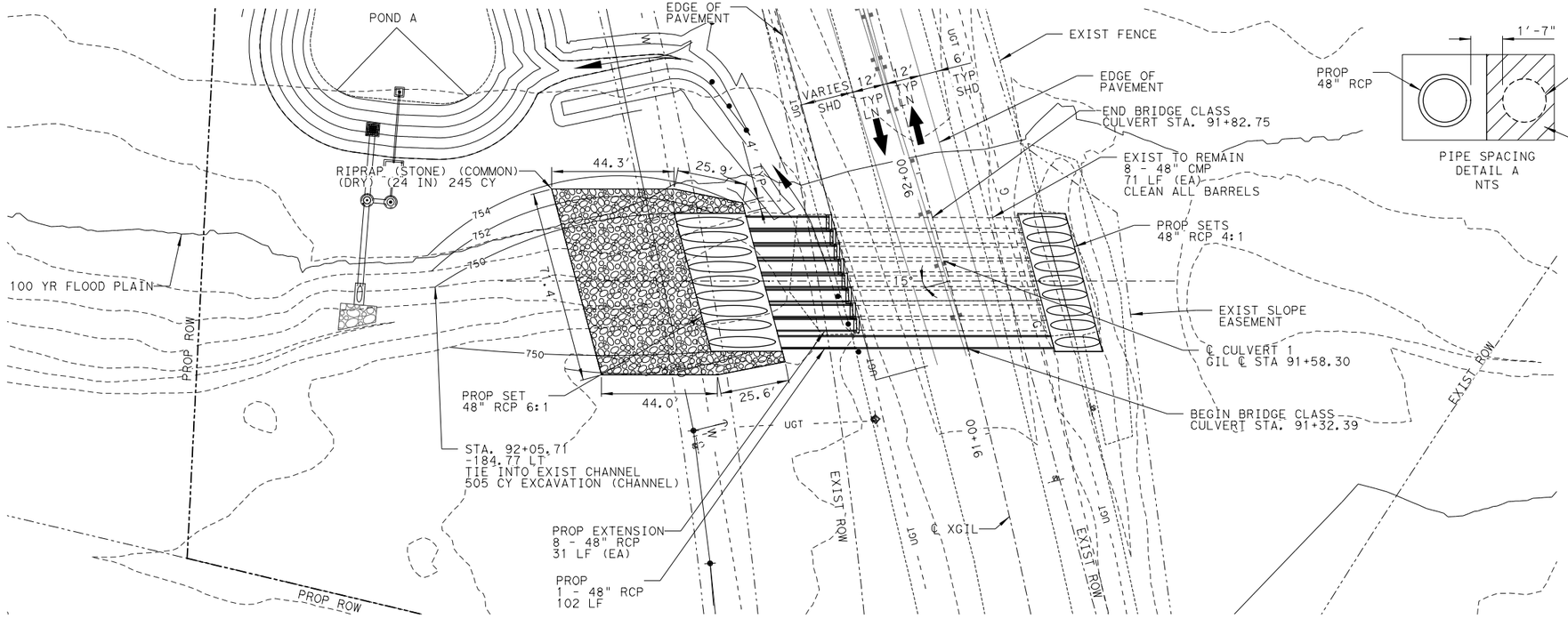
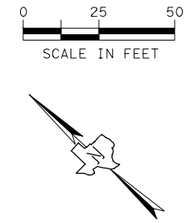




PIPE SPACING DETAIL A
NTS

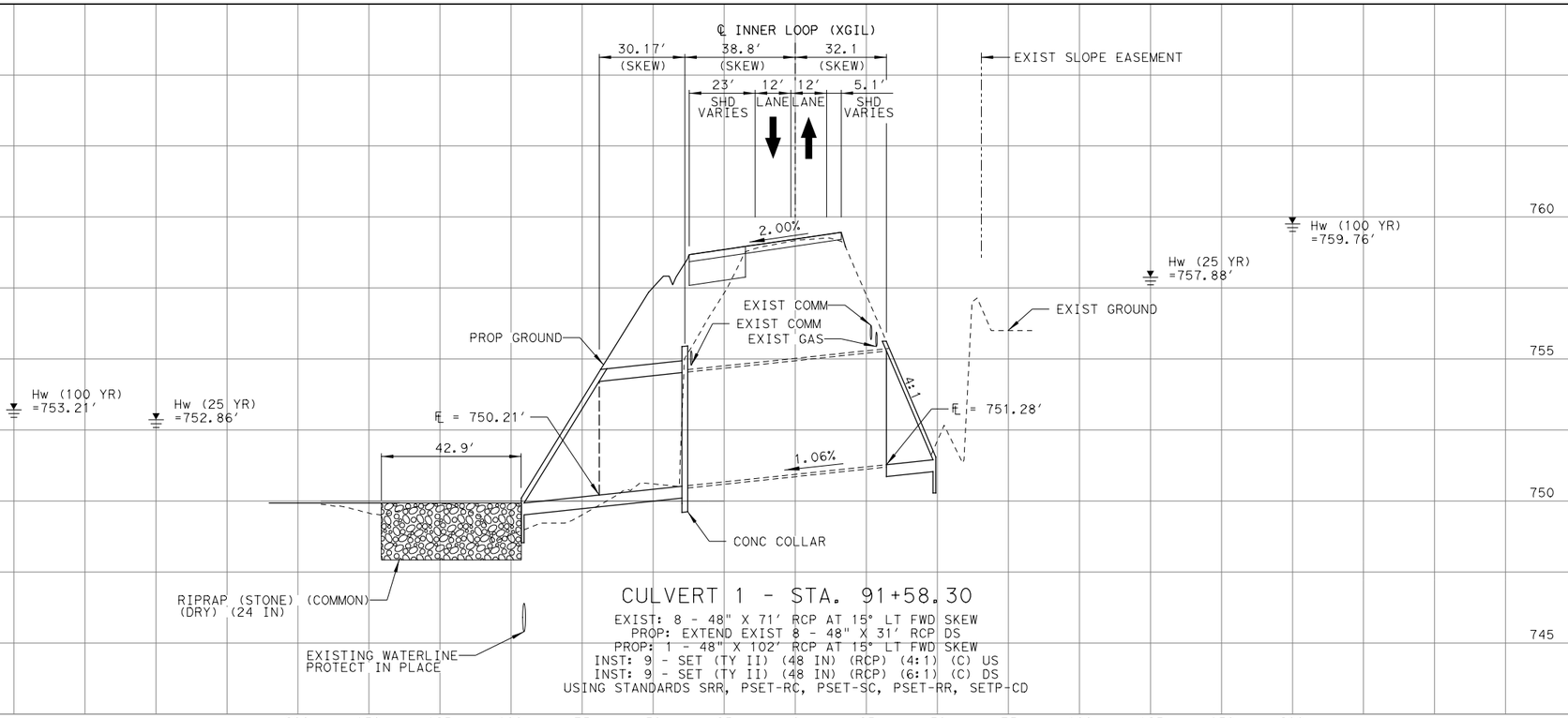
0 25 50
SCALE IN FEET

HYDRAULIC DATA

Q_{25} = 1022 CFS
V_{25} = 12.46 FPS
Q_{100} = 1286 CFS
V_{100} = 13.17 FPS

NOTES:

1. ALL DIMENSIONS ARE MEASURED NORMAL TO THE ℄ UNLESS OTHERWISE NOTED.
2. HY-8 WAS USED TO CALCULATE THE NORMAL DEPTH TAILWATER ELEVATION OF THE CULVERT.
3. APPROXIMATE UTILITY LOCATIONS SHOWN, DEPTH UNDETERMINED.



CULVERT 1 - STA. 91+58.30

EXIST: 8 - 48" X 71' RCP AT 15° LT FWD SKEW
PROP: EXTEND EXIST 8 - 48" X 31' RCP DS
PROP: 1 - 48" X 102' RCP AT 15° LT FWD SKEW
INST: 9 - SET (TY II) (48 IN) (RCP) (4:1) (C) US
INST: 9 - SET (TY II) (48 IN) (RCP) (6:1) (C) DS
USING STANDARDS SRR, PSET-RC, PSET-SC, PSET-RR, SETP-CD

CLAY E. GANN
88491
LICENSED PROFESSIONAL ENGINEER
STATE OF TEXAS

Clay E. Gann P.E. 6/23/2017

NO.	REVISION	BY	DATE

WILLIAMSON COUNTY 1848

RTG RODRIGUEZ TRANSPORTATION GROUP FIRM #587

GEORGETOWN INNER LOOP

CULVERT NO. 1 LAYOUT

6/23/2017 SHEET 1 OF 1

DESIGNED:	PROJECT NUMBER		ROADWAY
CHECKED:			SE INNER LOOP
DRAWN:	STATE	COUNTY	CITY / SHEET No.
CHECKED:	TEXAS	WILLIAMSON	GEORGETOWN / 60

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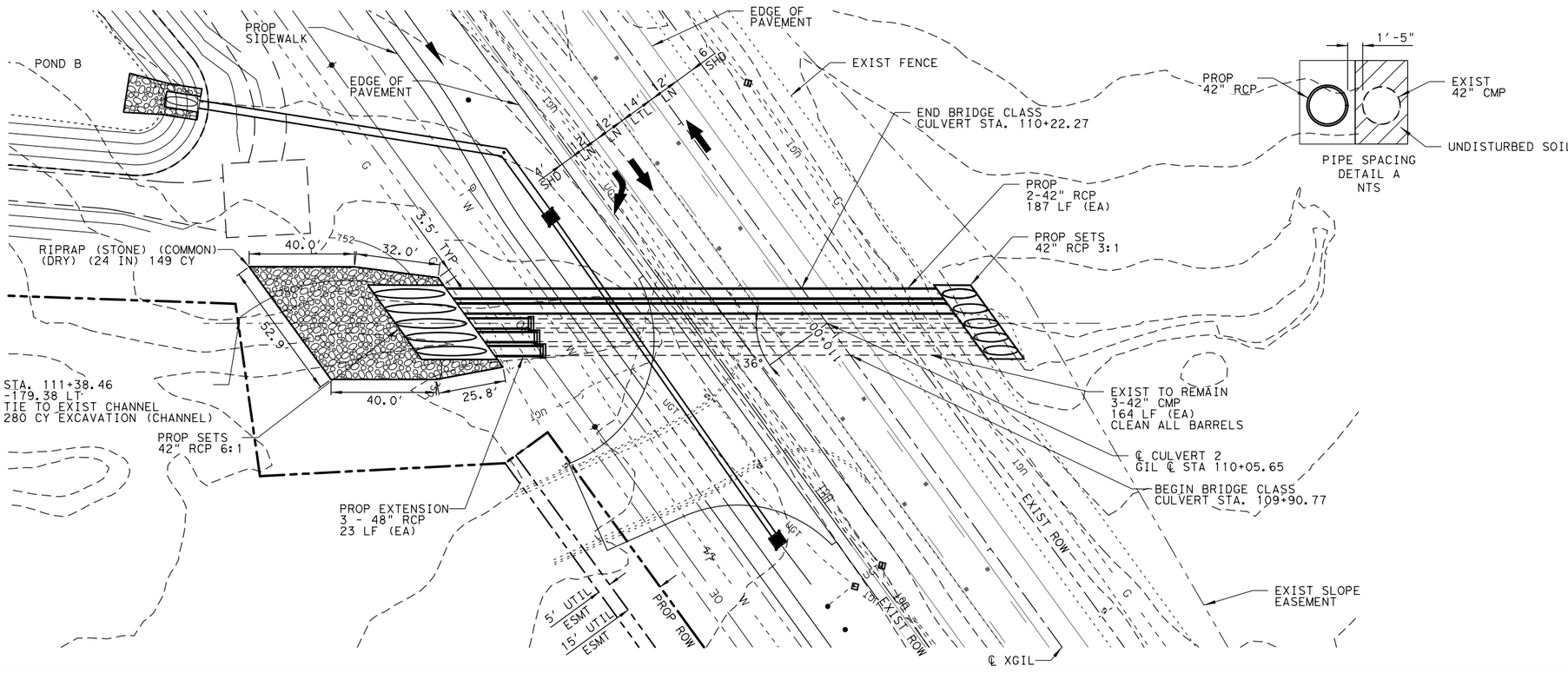
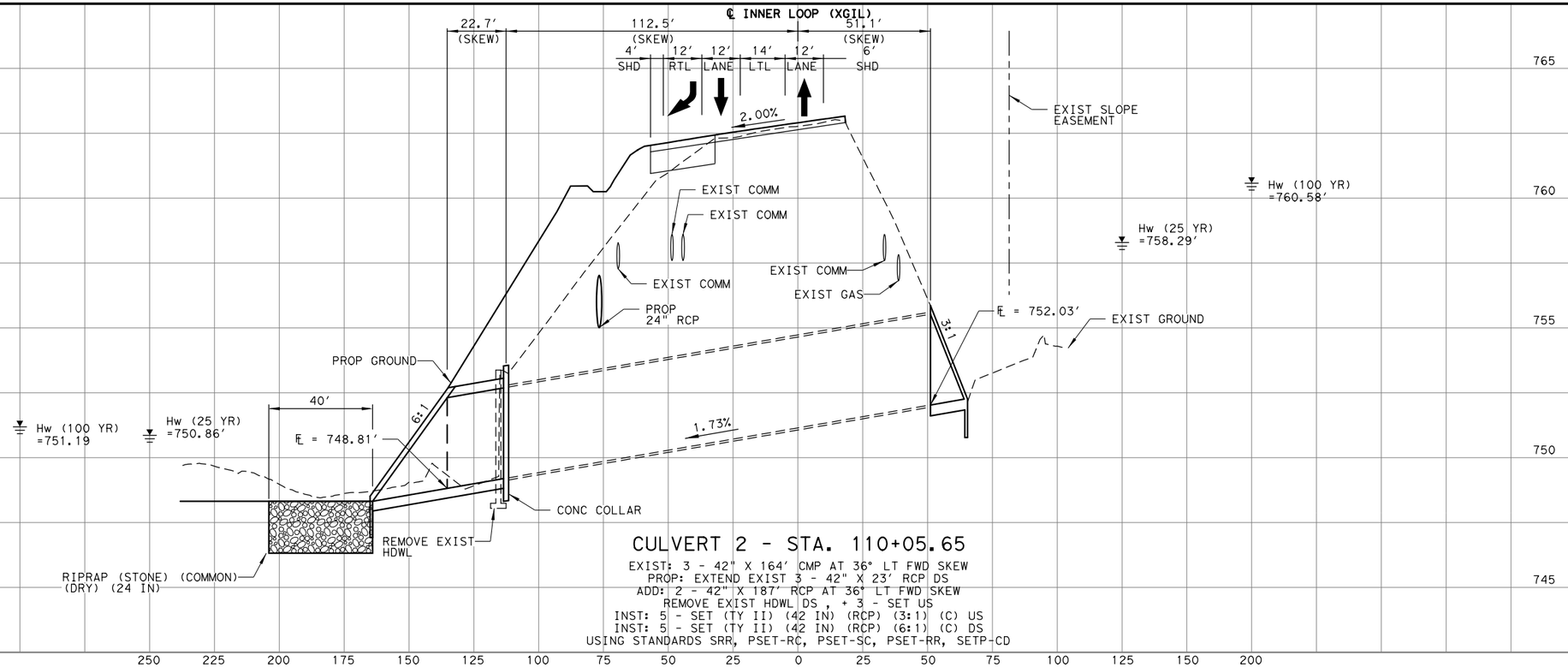


HYDRAULIC DATA

Q_{25} = 432 CFS
V_{25} = 14.32 FPS
Q_{100} = 541 CFS
V_{100} = 15.09 FPS

NOTES:

1. ALL DIMENSIONS ARE MEASURED NORMAL TO THE ℄ UNLESS OTHERWISE NOTED.
2. HY-8 WAS USED TO CALCULATE THE NORMAL DEPTH TAILWATER ELEVATION OF THE CULVERT.
3. APPROXIMATE UTILITY LOCATIONS SHOWN, DEPTH UNDETERMINED.



CULVERT 2 - STA. 110+05.65

EXIST: 3 - 42" X 164' CMP AT 36° LT FWD SKEW
PROP: EXTEND EXIST 3 - 42" X 23' RCP DS
ADD: 2 - 42" X 187' RCP AT 36° LT FWD SKEW
REMOVE EXIST HDWL DS , + 3 - SET US
INST: 5 - SET (TY II) (42 IN) (RCP) (3:1) (C) US
INST: 5 - SET (TY II) (42 IN) (RCP) (6:1) (C) DS
USING STANDARDS SRR, PSET-RC, PSET-SC, PSET-RR, SETP-CD

CLAY E. GANN
88491
LICENSED PROFESSIONAL ENGINEER
STATE OF TEXAS
Clay E. Gann P.E. 6/26/2017

NO.	REVISION	BY	DATE

WILLIAMSON COUNTY 1848

RTG RODRIGUEZ TRANSPORTATION GROUP FIRM #587

GEORGETOWN INNER LOOP

CULVERT NO. 2 LAYOUT

6/26/2017 SHEET 1 OF 1

DESIGNED:	PROJECT NUMBER		ROADWAY	
CHECKED:			SE INNER LOOP	
DRAWN:	STATE	COUNTY	CITY	SHEET No.
CHECKED:	TEXAS	WILLIAMSON	GEORGETOWN	61

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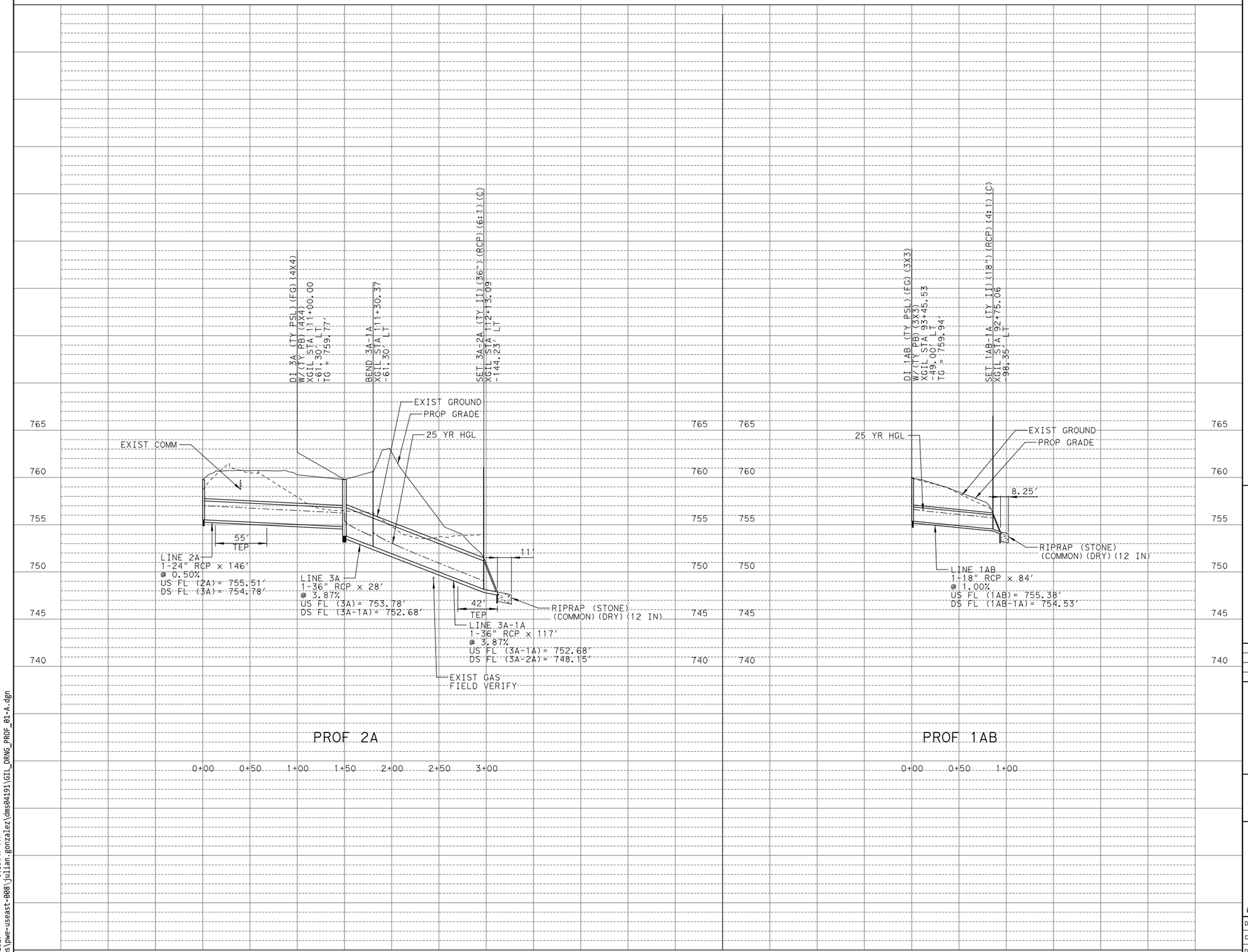

DRAINAGE PROFILE NOTES:

1. ANY UTILITIES SHOWN IN PROFILE ARE TO BE CONSIDERED APPROXIMATE AND FOR CONTRACTOR'S INFORMATION ONLY. THE ENGINEER MAKES NO GUARANTEE FOR THE TYPE, OWNER, LOCATION, DEPTH, SIZE, CONDITION OR NUMBER OF ANY EXISTING UTILITY.

2. THE CONTRACTOR SHALL CONTACT THE PROPER UTILITY OWNER AND A UTILITY LOCATE SERVICE AT LEAST 48 HOURS PRIOR TO BEGINNING CONSTRUCTION ON ANY STORM SEWER LINE OR STRUCTURE.

3. THE CONTRACTOR SHALL REFER TO TXDOT SPECIFICATIONS, ITEM 5.6, "COOPERATING WITH UTILITIES" REGARDING REQUIREMENTS FOR COOPERATING WITH UTILITIES BEFORE, DURING AND AFTER CONSTRUCTION.

4. ALL RCP SHALL BE CLASS III UNLESS SPECIFIED OTHERWISE.

5. SEE PLANS FOR INFO ON HORIZONTAL BENDS PLACED IMMEDIATELY OUTSIDE THE FACE OF STRUCTURE.

6. (-) MINUS SIGNS ON OFFSETS INDICATE LEFT OF ALIGNMENT. OFFSETS WITH NO MINUS (-) SIGN INDICATE RIGHT OF THE ALIGNMENT.

NODE TYPE LEGEND
CGI= CURB & GRATE INLET
CI = CURB INLET
BI = BARRIER INLET
GI = PAVEMENT GRATE INLET
DI = AREA DROP INLET
MH = MANHOLE
SET = SAFETY END TREATMENT
OUT = OUTFALL
DD = DECK DRAIN
WYE= WYE
BEND= BEND
TAP= TAP INTO PIPE OR BOX
JUNC= MISC. JUNCTION

STATE OF TEXAS
CLAY E. GANN
88491
LICENSED PROFESSIONAL ENGINEER
Clay E. Gann, P.E. 6/23/2017

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WILLIAMSON COUNTY 1848

RTG RODRIGUEZ TRANSPORTATION GROUP FIRM #587

GEORGETOWN INNER LOOP
DRAINAGE PROFILES

6/23/2017 SHEET 1 OF 1

DESIGNED:	PROJECT NUMBER		ROADWAY	
CHECKED:			SE INNER LOOP	
DRAWN:	STATE	COUNTY	CITY	SHEET No.
CHECKED:	TEXAS	WILLIAMSON	GEORGETOWN	62

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INLET CONFIGURATION — AEP(%) = **4**

Inlet I.D.	Inlet Type			Inlet Location: Cntrl Chain	Inlet Station	Offset	LT/RT	Roadway Gutter Data: Long (%)	Trans (%)	n	Grate: Length (ft)	Width (ft)	Type	Perimeter (ft)	Area (sf)	Curb: Length (ft)	Depr (ft)	Height (ft)	Depr Width (ft)
3A	(TY PSL)(FG)(4X4L)(4X4G)	Grate Inlet	In Sag	XGIL	111+00.00	61.30	LT	n/a	0.00	0.015	4.00	4.00	Reticuline	16.67	8.19				
2A	(TY PSL)(FG)(4X4L)(4X4G)	Grate Inlet	In Sag	XGIL	109+50.00	63.60	LT	n/a	0.00	0.015	4.00	4.00	Reticuline	16.67	8.19				

INLET HYDRAULICS

Inlet I.D.	Supply Q (cfs)	Total Q (cfs)	Intercept Capacity (cfs)	Q Bypass: Into (cfs)	Actual (cfs)	To Inlet I.D.	C.I. Length: Required (ft)	Actual (ft)	Ponded Width: Allowed (ft)	Actual (ft)	LT (Sag) (ft)	RT (Sag) (ft)	Ponded Depth: Allowed (ft)	Actual (ft)	Junct Loss (ft)	Inlet Elev (ft)	Crit Elev (ft)	Remarks
3A	0.00	11.07	22.02	0.00	0.00								1.00	0.57	0.07	759.77	759.27	RDWY RUN-OFF 3A
2A	0.00	15.38	22.02	0.00	0.00								1.00	0.71	0.59	759.76	759.26	RDWY RUN-OFF 2A

Note: Inlet capacity is calculated with a 50% clogging factor on all sag inlets.

CUMULATIVE JUNCTION DISCHARGE COMPUTATIONS

Node I.D.	Node Type	Weighted C-Value	Cumulative Drainage Area (acre)	Cumulative Tc (min)	Tc Used (min)	Cumulative Intensity (in/hr)	Supply Q (cfs)	Cumulative Discharge (cfs)
3A-2A	Outlet	0.75	3.06	6.56	0.00	0.00	0.00	25.32
3A-1A	Other	0.75	3.06	6.43	6.40	11.02	0.00	25.32
3A	Grate	0.75	3.06	6.40	6.40	11.02	0.00	25.32
2A	Grate	0.76	1.81	6.00	6.00	11.26	0.00	15.38

CONVEYANCE CONFIGURATION

Link I.D.	Node I.D.: US	DS	Invert Elev: US (ft)	DS (ft)	Soffit Elev: US (ft)	DS (ft)	Link Type	No. of Barrels	Span (ft)	Rise (ft)	Link Mtrl	Shape	Hydraulic Length (ft)	Slope (%)	Manning's "n"
LINE 3A-1A	3A-1A	3A-2A	752.68	748.15	755.68	751.15	Pipe	1		3	Concrete	Circular	117.13	3.87	0.012
LINE 3A	3A	3A-1A	753.78	752.68	756.78	755.68	Pipe	1		3	Concrete	Circular	30.37	3.87	0.012
2A	2A	3A	755.51	754.78	757.51	756.78	Pipe	1		2	Concrete	Circular	150.02	0.50	0.012

CONVEYANCE HYDRAULICS — Tailwater = **749.05**

Link I.D.	H.G.L.: US Elev (ft)	DS Elev (ft)	E.G.L.: US Elev (ft)	DS Elev (ft)	Unif Depth (ft)	Unif Vel (ft/s)	Crit Depth (ft)	Crit Vel (ft/s)	Crit Slope (%)	Frictn Slope (%)	Actual Depth (ft)	Actual Vel (ft/s)	Total Q (cfs)	Capacity (cfs)	Junctn Loss (ft)
LINE 3A-1A	755.17	749.05	755.82	752.26	0.86	15.19	1.62	6.48	0.38	3.87	0.89	14.35	25.32	152.83	0.86
LINE 3A	755.55	753.74	756.20	755.77	0.86	15.19	1.62	6.48	0.38	3.87	1.05	11.44	25.32	152.83	0.07
2A	757.81	756.19	758.19	756.20	1.47	6.23	1.41	6.48	0.55	0.50	1.41	6.48	15.38	18.64	0.59

SYSTEM 2A

INLET CONFIGURATION — AEP(%) = **4**

Inlet I.D.	Inlet Type			Inlet Location: Cntrl Chain	Inlet Station	Offset	LT/RT	Roadway Gutter Data: Long (%)	Trans (%)	n	Grate: Length (ft)	Width (ft)	Type	Perimeter (ft)	Area (sf)	Curb: Length (ft)	Depr (ft)	Height (ft)	Depr Width (ft)
1AB	(TY PSL)(FG)(3X3L)(3X3G)	Grate Inlet	Sag	XGIL	93+45.53	49.00	RT	n/a	0.00	0.015	3.00	3.00	Reticuline	12.67	4.53	n/a	0.00	0.00	0.00

INLET HYDRAULICS

Inlet I.D.	Supply Q (cfs)	Total Q (cfs)	Intercept Capacity (cfs)	Q Bypass: Into (cfs)	Actual (cfs)	To Inlet I.D.	C.I. Length: Required (ft)	Actual (ft)	Ponded Width: Allowed (ft)	Actual (ft)	LT (Sag) (ft)	RT (Sag) (ft)	Ponded Depth: Allowed (ft)	Actual (ft)	Junct Loss (ft)	Inlet Elev (ft)	Crit Elev (ft)	Remarks
1AB	6.82	10.94	12.18	0.00	0.00		0.00	0.00	0.00	0.00			1.00	0.81	0.71	759.94	759.44	

Note: Inlet capacity is calculated with a 50% clogging factor on all sag inlets.

CUMULATIVE JUNCTION DISCHARGE COMPUTATIONS

Node I.D.	Node Type	Weighted C-Value	Cumulative Drainage Area (acre)	Cumulative Tc (min)	Tc Used (min)	Cumulative Intensity (in/hr)	Supply Q (cfs)	Cumulative Discharge (cfs)
1AB-1A	Outlet	0.75	1.23	5.20	0.00	0.00	6.82	10.94
1AB	Grate	0.75	1.23	5.00	5.00	11.89	6.82	10.94

CONVEYANCE CONFIGURATION

Link I.D.	Node I.D.: US	DS	Invert Elev: US (ft)	DS (ft)	Soffit Elev: US (ft)	DS (ft)	Link Type	No. of Barrels	Span (ft)	Rise (ft)	Link Mtrl	Shape	Hydraulic Length (ft)	Slope (%)	Manning's "n"
LINE 1AB	1AB	1AB-1A	755.38	754.53	756.88	756.03	Pipe	1		1.5	Concrete	Circular	86.03	1.00	0.012

CONVEYANCE HYDRAULICS — Tailwater = **755.72**

Link I.D.	H.G.L.: US Elev (ft)	DS Elev (ft)	E.G.L.: US Elev (ft)	DS Elev (ft)	Unif Depth (ft)	Unif Vel (ft/s)	Crit Depth (ft)	Crit Vel (ft/s)	Crit Slope (%)	Frictn Slope (%)	Actual Depth (ft)	Actual Vel (ft/s)	Total Q (cfs)	Capacity (cfs)	Junctn Loss (ft)
LINE 1AB	757.89	755.72	758.11	756.55	1.18	7.36	1.27	6.87	0.88	1.01	1.18	7.33	10.94	12.24	0.71

SYSTEM 1AB

CLAY E. GANN 88491 LICENSED PROFESSIONAL ENGINEER STATE OF TEXAS
Clay E. Gann P.E. 6/23/2017

NO.	REVISION	BY	DATE

WILLIAMSON COUNTY 1848

RTG RODRIGUEZ TRANSPORTATION GROUP FIRM #587

GEORGETOWN INNER LOOP

DRAINAGE COMPUTATIONS

6/23/2017 SHEET 1 OF 1

DESIGNED:	PROJECT NUMBER		ROADWAY
CHECKED:			SE INNER LOOP
DRAWN:	STATE	COUNTY	CITY / SHEET No.
CHECKED:	TEXAS	WILLIAMSON	GEORGETOWN / 63

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DRAINAGE BASINS	Q25 (cfs)
1AA	1.5
1A	10.7
2A	15.4
3A	10.7

RUNOFF SOURCE	DITCH I.D.	BEGIN STA.	US ELEV.	END STA.	DS ELEV.	LEFT SIDE SLOPE (H:1)	RIGHT SIDE SLOPE (H:1)	BOTTOM WIDTH (ft)	n	DITCH SLOPE (ft/ft)	BASIN FLOW (cfs)	% OF BASIN (%)	DITCH FLOW (cfs)	WATER SURFACE ELEVATION (ft)	ADJACENT ROW ELEVATION (ft)	FREEBOARD (FROM ROW) (ft)	ADJACENT ROADWAY ELEVATION (ft)	A (sqft)	P (ft)	R (ft)	**NORMAL DEPTH (ft)**	VELOCITY (ft/s)	SHEAR (lbs /sqft)
1AA	1AA LT	91+30	757.30	91+50	757.05	4	6	0	0.04	0.013	1.5	50.0%	0.8	757.39	757.70	0.31	758.14	0.59	3.51	0.17	**0.34**	1.27	0.13
		91+50	757.05	92+00	756.80	4	6	0	0.04	0.005	1.5	100.0%	1.5	757.33	757.55	0.22	758.35	1.40	5.41	0.26	**0.53**	1.07	0.08
1A	1A LT	94+00	763.28	94+50	761.73	7.8	4	0	0.04	0.031	10.7	100.0%	10.7	762.5	762.8	0.3	764.6	3.21	8.84	0.36	**0.74**	3.33	0.70
		94+50	764.78	95+00	763.28	5.5	4	0	0.04	0.030	10.7	93.3%	10.0	764.07	764.72	0.65	766.09	2.93	7.63	0.38	**0.79**	3.40	0.72
		95+00	766.30	95+50	764.78	4.6	4	0	0.04	0.030	10.7	86.7%	9.3	765.57	766.50	0.93	767.58	2.70	7.00	0.39	**0.79**	3.43	0.73
		95+50	767.70	96+00	766.30	4.4	4	0	0.04	0.028	10.7	80.0%	8.6	767.09	768.10	1.01	769.09	2.61	6.80	0.38	**0.79**	3.28	0.67
		96+00	769.08	96+50	767.70	4.3	4	0	0.04	0.028	10.7	73.3%	7.8	768.47	769.54	1.07	770.48	2.45	6.56	0.37	**0.77**	3.20	0.64
		96+50	770.53	97+00	769.08	4.2	4	0	0.04	0.029	10.7	66.7%	7.1	769.82	770.97	1.15	771.86	2.23	6.23	0.36	**0.74**	3.19	0.65
		97+00	771.97	97+50	770.53	4.2	4	0	0.04	0.029	10.7	60.0%	6.4	771.24	772.40	1.16	773.53	2.07	5.99	0.35	**0.71**	3.10	0.62
		97+50	773.21	98+00	771.97	4.3	4	0	0.04	0.025	10.7	53.3%	5.7	772.67	773.79	1.12	774.80	2.01	5.94	0.34	**0.70**	2.84	0.52
		98+00	774.41	98+50	773.21	4.1	4	0	0.04	0.024	10.7	46.7%	5.0	773.88	775.07	1.19	776.06	1.83	5.61	0.33	**0.67**	2.73	0.49
		98+50	775.11	99+00	774.41	4.3	4	0	0.04	0.014	10.7	40.0%	4.3	775.11	776.19	1.08	777.26	2.01	5.93	0.34	**0.70**	2.13	0.30
		99+00	775.77	99+50	775.11	4.1	4	0	0.04	0.013	10.7	33.3%	3.6	775.77	776.98	1.21	777.96	1.78	5.53	0.32	**0.66**	2.00	0.26
		99+50	776.10	100+00	775.77	4.2	4	0	0.04	0.007	10.7	26.7%	2.9	776.46	777.61	1.15	778.62	1.96	5.83	0.34	**0.69**	1.46	0.14
		100+00	776.42	100+50	776.10	6.3	4	0	0.04	0.006	10.7	20.0%	2.1	776.67	777.96	1.29	778.91	1.68	6.00	0.28	**0.57**	1.27	0.11
		100+50	778.26	101+00	776.42	10.3	4	0	0.04	0.037	10.7	13.3%	1.4	776.73	778.13	1.40	779.23	0.70	4.51	0.15	**0.31**	2.05	0.35
Approx. Driveway Location		101+00	778.26	101+50	776.42	0	6	0	0.04	0.037	10.7	6.7%	0.7	776.77	777.58	0.81	778.26	0.36	2.45	0.15	**0.35**	1.98	0.34
2A	2A LT	101+50	775.87	102+00	775.42	3.5	4	0	0.04	0.009	15.4	5.9%	5.9%	775.58	778.09	2.51	778.67	0.09	1.22	0.08	**0.16**	0.63	0.04
		102+00	775.42	102+50	774.94	3.4	4	0	0.04	0.010	15.4	11.8%	1.8	775.51	777.72	2.21	778.23	1.19	4.34	0.27	**0.57**	1.53	0.16
		102+50	774.94	103+00	774.01	3.9	4	0	0.04	0.019	15.4	17.6%	2.7	774.58	777.00	2.42	777.72	1.27	4.62	0.27	**0.57**	2.14	0.32
		103+00	774.01	103+50	772.95	3.9	4	0	0.04	0.021	15.4	23.5%	3.6	773.57	776.01	2.44	776.81	1.50	5.03	0.30	**0.62**	2.42	0.40
		103+50	772.95	104+00	771.67	4.2	4	0	0.04	0.026	15.4	29.4%	4.5	772.31	774.82	2.51	775.77	1.67	5.38	0.31	**0.64**	2.72	0.49
		104+00	771.67	104+50	769.02	4.4	4	0	0.04	0.053	15.4	35.3%	5.4	769.61	773.55	3.94	774.49	1.46	5.10	0.29	**0.59**	3.72	0.95
		104+50	769.02	105+00	766.64	4.7	4	0	0.04	0.048	15.4	41.2%	6.4	767.27	771.80	4.53	772.90	1.72	5.62	0.31	**0.63**	3.69	0.91
		105+00	766.64	105+50	763.25	4.7	4	0	0.04	0.068	15.4	47.1%	7.3	763.87	768.68	4.81	772.90	1.67	5.53	0.30	**0.62**	4.35	1.28
Approx. Driveway Location		105+50	766.64	106+00	763.25	0	6	0	0.04	0.068	15.4	52.9%	8.2	764.02	766.23	2.21	769.31	1.78	5.46	0.33	**0.77**	4.59	1.38
		106+00	763.25	106+50	762.76	5.3	4	5	0.04	0.010	15.4	58.8%	9.1	763.33	765.38	2.05	767.50	4.40	10.46	0.42	**0.57**	2.06	0.26
		106+50	762.76	107+00	762.34	4.3	4	5	0.04	0.008	15.4	64.7%	10.0	762.98	765.92	2.94	766.15	4.87	10.44	0.47	**0.64**	2.05	0.24
Approx. Driveway Location		107+00	762.34	107+50	761.49	3.7	4	5	0.04	0.017	15.4	70.6%	10.9	762.05	765.17	3.12	764.87	3.99	9.44	0.42	**0.56**	2.73	0.45
		107+50	761.49	108+00	760.83	3.9	4	5	0.04	0.013	15.4	76.5%	11.8	761.45	764.08	2.63	763.70	4.64	10.07	0.46	**0.62**	2.55	0.38
		108+00	760.83	108+50	760.30	4	4	5	0.04	0.011	15.4	82.4%	12.7	760.98	763.36	2.38	763.05	5.29	10.64	0.50	**0.68**	2.40	0.33
		108+50	760.30	109+00	759.98	4.1	4	5	0.04	0.006	15.4	88.2%	13.6	760.79	762.80	2.01	762.51	6.67	11.73	0.57	**0.81**	2.04	0.23
		109+00	759.98	109+50	759.76	4.9	4	5	0.04	0.004	15.4	94.1%	14.5	760.66	762.08	1.42	762.17	8.15	13.24	0.62	**0.90**	1.78	0.17
		109+50	761.98	110+00	759.76	6.3	4	5	0.04	0.044	15.4	100.0%	15.4	760.26	760.59	0.33	761.76	3.82	10.28	0.37	**0.50**	4.04	1.03
3A	3A LT	110+50	760.27	111+00	759.77	175.9	4	4	0.04	0.010	10.7	100.0%	10.7	760.08	760.29	0.21	761.95	9.66	59.12	0.16	**0.31**	1.11	0.10
		111+00	761.18	111+50	759.77	3	4	5	0.04	0.028	10.7	92.3%	9.9	760.24	762.52	2.28	762.68	3.09	8.39	0.37	**0.47**	3.20	0.65
		111+50	761.69	112+00	761.18	3.3	4	5	0.04	0.010	10.7	84.6%	9.1	761.76	763.09	1.33	763.36	4.17	9.42	0.44	**0.58**	2.18	0.28
		112+00	762.84	112+50	761.69	3.9	4	0	0.04	0.023	10.7	76.9%	8.2	762.52	763.70	1.18	764.50	2.69	6.73	0.40	**0.83**	3.06	0.57
		112+50	764.54	113+00	762.84	4.1	4	0	0.04	0.034	10.7	69.2%	7.4	763.57	764.72	1.15	765.67	2.16	6.10	0.35	**0.73**	3.43	0.75
		113+00	766.24	113+50	764.54	5	4	0	0.04	0.034	10.7	61.5%	6.6	765.21	766.09	0.88	767.37	2.03	6.19	0.33	**0.67**	3.25	0.69
		113+50	768.12	114+00	766.24	7.3	4	0	0.04	0.038	10.7	53.8%	5.8	766.81	767.78	0.97	769.15	1.86	6.60	0.28	**0.57**	3.10	0.66
		114+00	769.99	114+50	768.12	6.3	4	0	0.04	0.037	10.7	46.2%	4.9	768.68	769.79	1.11	768.12	1.63	5.90	0.28	**0.56**	3.04	0.64
		114+50	771.53	115+00	769.99	4.5	4	0	0.04	0.031	10.7	38.5%	4.1	770.58	771.78	1.20	769.99	1.46	5.12	0.29	**0.59**	2.82	0.55
		115+00	773.13	115+50	771.53	4.2	4	0	0.04	0.032	10.7	30.8%	3.3	772.07	773.42	1.35	771.53	1.21	4.58	0.26	**0.54**	2.73	0.53
		115+50	774.50	116+00	773.13	4.3	4	0	0.04	0.027	10.7	23.1%	2.5	773.63	774.98	1.35	773.13	1.03	4.26	0.24	**0.50**	2.39	0.41
		116+00	775.64	116+50	774.50	4.3	4	0	0.04	0.023	10.7	15.4%	1.6	774.94	776.35	1.41	774.50	0.82	3.79	0.22	**0.44**	2.02	0.31
		116+50	776.66	117+00	775.64	4.2	4	0	0.04	0.020	10.7	7.7%	0.8	775.99	777.55	1.56	775.64	0.51	2.96	0.17	**0.35**	1.63	0.22

STATE OF TEXAS
CLAY E. GANN
88491
LICENSED PROFESSIONAL ENGINEER

Clay E. Gann, P.E. 6/23/2017

NO.	REVISION	BY	DATE

WILLIAMSON COUNTY
1848

RTG RODRIGUEZ TRANSPORTATION GROUP FIRM #587

GEORGETOWN INNER LOOP

HYDRAULIC DATA SHEET

DITCH CALCULATIONS

6/23/2017 SHEET 1 OF 4

DESIGNED:	PROJECT NUMBER		ROADWAY	
CHECKED:			SE INNER LOOP	
DRAWN:	STATE	COUNTY	CITY	SHEET No.
CHECKED:	TEXAS	WILLIAMSON	GEORGETOWN	64

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Table 1 - Summary of Culvert Flows at Crossing: Ex Culvert 1

Headwater Elevation (ft)	Total Discharge (cfs)	Ex Culvert 1 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
751.28	0.00	0.00	0.00	1
753.15	128.60	128.60	0.00	1
754.00	257.20	257.20	0.00	1
754.69	385.80	385.80	0.00	1
755.32	514.40	514.40	0.00	1
755.95	643.00	643.00	0.00	1
756.71	771.60	771.60	0.00	1
757.80	900.20	900.20	0.00	1
** 758.23	1022.00	945.25	76.48	6
758.47	1157.40	970.55	186.62	5
*** 758.67	1286.00	990.39	294.96	4
757.92	912.68	912.68	0.00	Overtopping

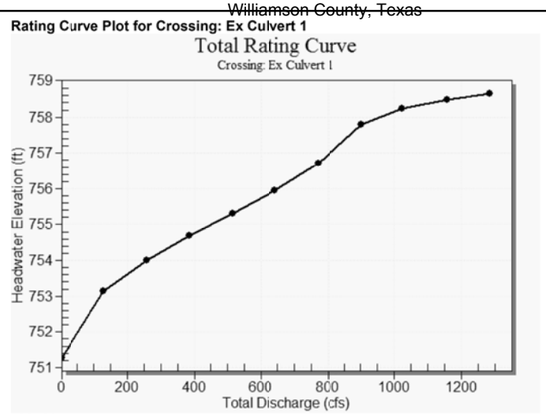


Table 2 - Culvert Summary Table: Ex Culvert 1

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.00	0.00	751.28	0.000	0.000	0-NF	0.000	0.000	0.000	0.000	0.000	0.000
128.60	128.60	753.15	1.693	1.871	2-M2c	1.214	1.173	1.173	0.618	5.232	2.527
257.20	257.20	754.00	2.481	2.717	2-M2c	1.774	1.680	1.680	0.916	6.418	3.180
385.80	385.80	754.69	3.123	3.407	2-M2c	2.257	2.080	2.080	1.147	7.305	3.618
514.40	514.40	755.32	3.768	4.039	7-M2c	2.745	2.416	2.416	1.343	8.101	3.954
643.00	643.00	755.95	4.520	4.671	7-M2c	3.366	2.713	2.713	1.515	8.858	4.230
771.60	771.60	756.71	5.434	5.382	7-M2c	4.000	2.973	2.973	1.671	9.630	4.466
900.20	900.20	757.80	6.525	6.466	7-M2c	4.000	3.201	3.201	1.813	10.439	4.674
** 1022.00	945.25	758.23	6.947	6.900	7-M2c	4.000	3.273	3.273	1.938	10.736	4.850
1157.40	970.55	758.47	7.193	7.149	7-M2c	4.000	3.311	3.311	2.068	10.907	5.027
*** 1286.00	990.39	758.67	7.389	7.355	7-M2c	4.000	3.340	3.340	2.184	11.043	5.181

Site Data - Ex Culvert 1

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 751.28 ft
Outlet Station: 74.88 ft
Outlet Elevation: 750.51 ft
Number of Barrels: 8

Culvert Data Summary - Ex Culvert 1

Barrel Shape: Circular
Barrel Diameter: 4.00 ft
Barrel Material: Corrugated Steel
Embedment: 0.00 in
Barrel Manning's n: 0.0240
Culvert Type: Straight
Inlet Ccnfiguration: Mitered to Conform to Slope
Inlet Depression: NONE

Tailwater Channel Data - Ex Culvert 1

Tailwater Channel Option: Trapezoidal Channel
Bottom Width: 70.00 ft
Side Slope (H:V): 20.00 (_:1)
Channel Slope: 0.0106
Channel Manning's n: 0.0400
Channel Invert Elevation: 750.51 ft

Roadway Data for Crossing: Ex Culvert 1

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 150.00 ft
Crest Elevation: 757.92 ft
Roadway Surface: Paved
Roadway Top Width: 32.

****

Straight Culvert

Inlet Elevation (invert): 751.28 ft, Outlet Elevation (invert): 750.51 ft

Culvert Length: 74.88 ft, Culvert Slope: 0.0103

****

EXIST CULVERT 1

PROP CULVERT 1

** 4% AEP DESIGN STORM FREQ
***1% AEP STORM FREQ

****

Straight Culvert

Inlet Elevation (invert): 751.28 ft, Outlet Elevation (invert): 750.21 ft

Culvert Length: 101.11 ft, Culvert Slope: 0.0106

****

Table 1 - Summary of Culvert Flows at Crossing: Prop Culvert 1

Headwater Elevation (ft)	Total Discharge (cfs)	Prop Culvert 1 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
751.28	0.00	0.00	0.00	1
752.87	128.60	128.60	0.00	1
753.60	257.20	257.20	0.00	1
754.20	385.80	385.80	0.00	1
754.75	514.40	514.40	0.00	1
755.37	643.00	643.00	0.00	1
756.09	771.60	771.60	0.00	1
756.94	900.20	900.20	0.00	1
** 757.88	1022.00	1022.00	0.00	1
759.06	1157.40	1157.40	0.00	1
*** 759.76	1286.00	1231.69	54.23	5
759.39	1192.77	1192.77	0.00	Overtopping

Table 2 - Culvert Summary Table: Prop Culvert 1

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.00	0.00	751.28	0.00	0.0	0-NF	0.00	0.00	0.00	0.00	0.00	0.00
128.60	128.60	752.87	1.59	0.34	1-S2n	0.78	1.10	0.82	2.88	7.43	2.19
257.20	257.20	753.60	2.32	0.83	1-S2n	1.11	1.58	1.18	3.24	8.85	2.60
385.80	385.80	754.20	2.92	1.31	1-S2n	1.38	1.96	1.49	3.51	9.73	2.87
514.40	514.40	754.75	3.47	1.88	1-S2n	1.61	2.27	1.75	3.71	10.44	3.09
643.00	643.00	755.37	4.09	2.55	5-S2n	1.82	2.55	1.99	3.94	11.04	3.09
771.60	771.60	756.09	4.81	3.27	5-S2n	2.03	2.80	2.23	4.07	11.55	3.31
900.20	900.20	756.94	5.66	4.53	5-S2n	2.23	3.03	2.45	4.18	12.03	3.51
** 1022.00	1022.00	757.88	6.60	5.23	5-S2n	2.42	3.21	2.65	4.28	12.46	3.69
1157.40	1157.40	759.06	7.78	6.08	5-S2n	2.64	3.39	2.88	4.39	12.92	3.87
*** 1286.00	1231.69	759.76	8.48	6.58	5-S2n	2.77	3.48	3.00	4.48	13.17	4.02

* Full Flow Headwater elevation is below inlet invert.

Site Data - Prop Culvert 1

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 751.28 ft
Outlet Station: 101.11 ft
Outlet Elevation: 750.21 ft
Number of Barrels: 9

Culvert Data Summary - Prop Culvert 1

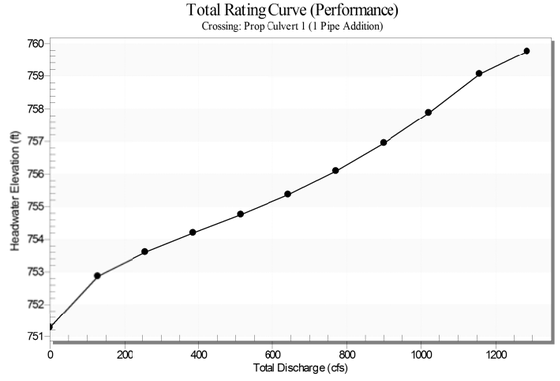
Barrel Shape: Circular
Barrel Span: 4.00 ft
Barrel Rise: 4.00 ft
Barrel Material: Concrete
Embedment: 0.00 in
Barrel Manning's n: 0.0120
Culvert Type: Straight
Inlet Ccnfiguration: Mitered to Conform to Slope
Inlet Depression: NONE

Tailwater Channel Data - Prop Culvert 1

Tailwater Channel Option: Trapezoidal Channel
Bottom Width: 70.00 ft
Side Slope (H:V): 20.00 (_:1)
Channel Slope: 0.0106
Channel Manning's n: 0.0400
Channel Invert Elevation: 750.21 ft

Roadway Data for Crossing: Prop Culvert 1

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 150.00 ft
Crest Elevation: 759.30 ft
Roadway Surface: Paved
Roadway Top Width: 56.00 ft



STATE OF TEXAS
CLAY E. GANN
88491
LICENSED PROFESSIONAL ENGINEER

Clay E. Gann P.E. 6/23/2017

NO.	REVISION	BY	DATE

WILLIAMSON COUNTY 1848

RTG RODRIGUEZ TRANSPORTATION GROUP FIRM #587

GEORGETOWN INNER LOOP

HYDRAULIC DATA SHEET

CULVERT 1

6/23/2017 SHEET 2 OF 4

DESIGNED:	PROJECT NUMBER		ROADWAY	
CHECKED:			SE INNER LOOP	
DRAWN:	STATE	COUNTY	CITY	SHEET No.
CHECKED:	TEXAS	WILLIAMSON	GEORGETOWN	65

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Table 1 - Summary of Culvert Flows at Crossing: Crossing 2

Headwater Elevation (ft)	Total Discharge (cfs)	Exist Culvert Discharge (cfs)	Roadway Discharge (cfs)	Iterations
752.03	0.00	0.00	0.00	1
753.94	54.10	54.10	0.00	1
754.85	108.20	108.20	0.00	1
755.79	162.30	162.30	0.00	1
757.04	216.40	216.40	0.00	1
759.25	270.50	270.50	0.00	1
760.31	324.60	289.09	35.30	7
760.50	378.70	292.43	85.96	5
** 760.66	432.00	295.21	136.64	5
760.80	486.90	296.74	189.80	4
*** 760.93	541.00	297.06	243.76	4
760.07	285.10	285.10	0.00	Overtopping

Rating Curve Plot for Crossing: Crossing 2

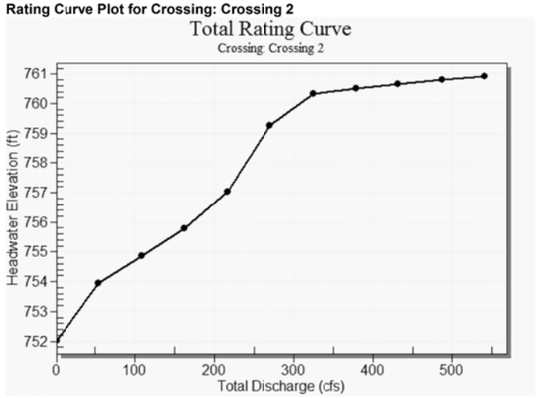


Table 2 - Culvert Summary Table: Exist Culvert

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.00	0.00	752.03	0.000	0.000	0-NF	0.000	0.000	0.000	0.000	0.000	0.000
54.10	54.10	753.94	1.910	0.0*	1-S2n	1.195	1.293	1.195	1.184	6.203	2.253
108.20	108.20	754.85	2.822	0.103	1-S2n	1.761	1.860	1.761	1.673	7.438	2.727
162.30	162.30	755.79	3.760	1.918	5-S2n	2.284	2.297	2.284	2.035	8.143	3.039
216.40	216.40	757.04	5.010	4.789	7-M2c	2.926	2.657	2.657	2.331	9.204	3.279
270.50	270.50	759.25	6.630	7.221	7-M2c	3.500	2.944	2.944	2.585	10.439	3.477
324.60	289.09	760.31	7.263	8.292	7-M2c	3.500	3.025	3.025	2.811	10.903	3.646
378.70	292.43	760.50	7.380	8.473	7-M2c	3.500	3.039	3.039	3.015	10.988	3.795
** 432.00	295.21	760.66	7.478	8.628	7-M2t	3.500	3.050	3.109	3.199	10.894	3.926
486.90	296.74	760.80	7.532	8.772	7-M2t	3.500	3.056	3.285	3.375	10.548	4.049
***541.00	297.06	760.93	7.544	8.905	7-M2t	3.500	3.057	3.448	3.538	10.324	4.160

* Full Flow Headwater elevation is below inlet invert.

Site Data - Exist Culvert

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 752.03 ft
Outlet Station: 168.01 ft
Outlet Elevation: 749.17 ft
Number of Barrels: 3

Culvert Data Summary - Exist Culvert

Barrel Shape: Circular
Barrel Diameter: 3.50 ft
Barrel Material: Corrugated Steel
Embedment: 0.00 in
Barrel Manning's n: 0.0240
Culvert Type: Straight
Inlet Configuration: Mitered to Conform to Slope
Inlet Depression: NONE

Tailwater Channel Data - Crossing 2

Tailwater Channel Option: Trapezoidal Channel
Bottom Width: 12.00 ft
Side Slope (H:V): 7.00 (_:1)
Channel Slope: 0.0073
Channel Manning's n: 0.0500
Channel Invert Elevation: 749.08 ft

Roadway Data for Crossing: Crossing 2

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 100.00 ft
Crest Elevation: 760.07 ft
Roadway Surface: Paved
Roadway Top Width: 60.00 ft

****

Straight Culvert

Inlet Elevation (invert): 752.03 ft, Outlet Elevation (invert): 749.17 ft

Culvert Length: 168.03 ft, Culvert Slope: 0.0170

****

EXIST CULVERT 2

** 4% AEP DESIGN STORM FREQ
***1% AEP STORM FREQ

PROP CULVERT 2

****

Straight Culvert

Inlet Elevation (invert): 752.03 ft, Outlet Elevation (invert): 748.81 ft

Culvert Length: 186.30 ft, Culvert Slope: 0.0173

****

Table 1 - Summary of Culvert Flows at Crossing: Prop Culvert 2

Headwater Elevation (ft)	Total Discharge (cfs)	Prop Culvert 2 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
752.03	0.00	0.00	0.00	1
753.48	54.10	54.10	0.00	1
754.14	108.20	108.20	0.00	1
754.68	162.30	162.30	0.00	1
755.20	216.40	216.40	0.00	1
755.79	270.50	270.50	0.00	1
756.50	324.60	324.60	0.00	1
757.34	378.70	378.70	0.00	1
** 758.29	432.00	432.00	0.00	1
759.40	486.90	486.90	0.00	1
*** 760.58	541.00	541.00	0.00	1
763.03	641.57	641.57	0.00	Overtopping

Table 2 - Culvert Summary Table: Prop Culvert 2

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.00	0.00	752.03	0.00	0.0	0-NF	0.00	0.00	0.19	0.00	0.00	0.00
54.10	54.10	753.48	1.45	0.0*	1-S2n	0.63	0.99	0.63	1.18	8.79	2.25
108.20	108.20	754.14	2.11	0.0*	1-S2n	0.89	1.42	0.92	1.67	10.31	2.73
162.30	162.30	754.68	2.65	0.0*	1-S2n	1.10	1.76	1.16	2.03	11.23	3.04
216.40	216.40	755.20	3.17	0.13	1-S2n	1.28	2.04	1.35	2.33	12.18	3.28
270.50	270.50	755.79	3.76	0.85	5-S2n	1.45	2.30	1.54	2.59	12.82	3.48
324.60	324.60	756.50	4.47	1.64	5-S2n	1.61	2.52	1.72	2.81	13.38	3.65
378.70	378.70	757.34	5.31	2.52	5-S2n	1.76	2.72	1.89	3.01	13.87	3.79
** 432.00	432.00	758.29	6.26	3.46	5-S2n	1.91	2.89	2.05	3.20	14.32	3.93
486.90	486.90	759.40	7.37	4.53	5-S2n	2.06	3.04	2.22	3.38	14.71	4.05
*** 541.00	541.00	760.58	8.55	5.67	5-S2n	2.21	3.15	2.38	3.54	15.09	4.16

Site Data - Prop Culvert 2

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 752.03 ft
Outlet Station: 186.30 ft
Outlet Elevation: 748.81 ft
Number of Barrels: 5

Culvert Data Summary - Prop Culvert 2

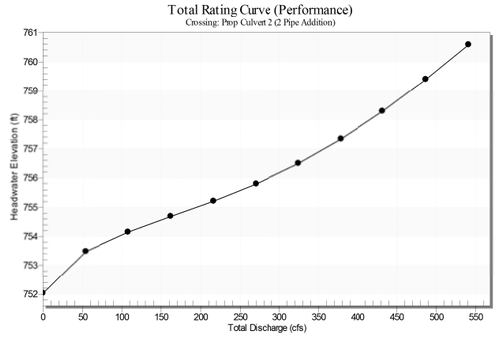
Barrel Shape: Circular
Barrel Span: 3.5 ft
Barrel Rise: 3.5 ft
Barrel Material: Concrete
Embedment: 0.00 in
Barrel Manning's n: 0.0120
Culvert Type: Straight
Inlet Configuration: Mitered to Conform to Slope
Inlet Depression: NONE

Tailwater Channel Data - Prop Culvert 2

Tailwater Channel Option: Trapezoidal Channel
Bottom Width: 12.00 ft
Side Slope (H:V): 7.00 (_:1)
Channel Slope: 0.0073
Channel Manning's n: 0.0500
Channel Invert Elevation: 748.81 ft

Roadway Data for Crossing: Prop Culvert 2

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 140.00 ft
Crest Elevation: 763.03 ft
Roadway Surface: Paved
Roadway Top Width: 60.00 ft



STATE OF TEXAS
CLAY E. GANN
88491
LICENSED PROFESSIONAL ENGINEER

Clay E. Gann, P.E. 6/23/2017

NO.	REVISION	BY	DATE

WILLIAMSON COUNTY 1848

RTG RODRIGUEZ TRANSPORTATION GROUP FIRM #587

GEORGETOWN INNER LOOP

HYDRAULIC DATA SHEET

CULVERT 2

6/23/2017 SHEET 3 OF 4

DESIGNED:	PROJECT NUMBER		ROADWAY
CHECKED:			SE INNER LOOP
DRAWN:	STATE	COUNTY	CITY / SHEET No.
CHECKED:	TEXAS	WILLIAMSON	GEORGETOWN / 66

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HY-8 Culvert Analysis Report

Crossing Discharge Data

Discharge Selection Method: Recurrence

Table 1 – Summary of Culvert Flows at Crossing: Driveway 105+50

Headwater Elevation (ft)	Discharge Names	Total Discharge (cfs)	18" RCP Discharge (cfs)	Roadway Discharge (cfs)	Iterations
767.94	5 year	5.82	5.82	0.00	1
768.11	10 year	6.63	6.63	0.00	1
768.36	25 year	7.73	7.73	0.00	1
768.94	100 year	9.76	9.76	0.00	1
769.38	Overtopping	11.77	0.00	1.00	Overtopping

Table 2 - Culvert Summary Table: 18" RCP

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
5.82	5.82	5.82	767.94	1.49	-1.48	1-S2n	0.53	0.93	0.55	0.33	2.84
6.63	6.63	6.63	768.11	1.66	-1.26	5-S2n	0.56	0.99	0.56	0.35	2.96
7.73	7.73	7.73	768.36	1.91	-0.94	5-S2n	0.61	1.07	0.55	0.38	3.11
9.76	9.76	9.76	768.94	2.49	-0.13	5-S2n	0.70	1.20	0.75	0.43	3.34

****
Straight Culvert

Inlet Elevation (invert): 766.45 ft, Outlet Elevation (invert): 763.53 ft
Culvert Length: 86.21 ft, Culvert Slope: 0.0339
****

Site Data – 18" RCP

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 766.45 ft
Outlet Station: 86.21 ft
Outlet Elevation: 763.53 ft
Number of Barrels: 1

Culvert Data Summary – 18" RCP

Barrel Shape: Circular
Barrel Diameter: 1.50 ft
Barrel Material: Concrete
Embedment: 0.00 in
Barrel Manning's n: 0.0120
Culvert Type: Straight
Inlet Configuration: Mitered to Conform to Slope
Inlet Depression: None

Table 3 - Downstream Channel Rating Curve (Crossing: Driveway 105+50)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
5.822	764.134	0.326	2.837	0.689	0.88
6.627	764.158	0.350	2.957	0.741	0.88
7.733	764.190	0.382	3.105	0.807	0.89
9.758	764.242	0.434	3.337	0.918	0.89

Tailwater Channel Data - Driveway 105+50

Tailwater Channel Option: Trapezoidal Channel
Bottom Width: 5 ft
Side Slope (H:V): 4 (_:1)
Channel Slope: 0.0339
Channel Manning's n: 0.0500
Channel Invert Elevation: 763.53 ft

Roadway Data for Crossing: Driveway 105+50

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 57.10 ft
Crest Elevation: 769.38 ft
Roadway Surface: Paved
Roadway Top Width: 31.00 ft

HY-8 Culvert Analysis Report

Crossing Discharge Data

Discharge Selection Method: Recurrence

Table 1 – Summary of Culvert Flows at Crossing: Driveway 115+35

Headwater Elevation (ft)	Discharge Names	Total Discharge (cfs)	18" RCP Discharge (cfs)	Roadway Discharge (cfs)	Iterations
774.16	5 year	1.70	1.70	0.00	1
774.24	10 year	1.94	1.94	0.00	1
774.35	25 year	2.26	2.26	0.00	1
774.60	100 year	2.85	2.85	0.00	1
775.09	Overtopping	3.75	0.00	1.00	Overtopping

Table 2 - Culvert Summary Table: 12" RCP

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
1.70	1.70	774.16	0.86	-0.53	1-S2n	0.32	0.55	0.34	0.16	7.04	1.88
1.94	1.94	774.24	0.94	-0.44	1-S2n	0.34	0.59	0.36	0.17	7.25	1.96
2.26	2.26	774.35	1.05	-0.29	5-S2n	0.37	0.64	0.40	0.19	7.52	2.07
2.85	2.85	774.60	1.30	-0.01	5-S2n	0.43	0.72	0.46	0.22	7.93	2.24

****
Straight Culvert

Inlet Elevation (invert): 773.30 ft, Outlet Elevation (invert): 772.02 ft
Culvert Length: 36.7 ft, Culvert Slope: 0.0348
****

Site Data – 12" RCP

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 773.30 ft
Outlet Station: 36.70 ft
Outlet Elevation: 772.02 ft
Number of Barrels: 1

Culvert Data Summary – 12" RCP

Barrel Shape: Circular
Barrel Diameter: 1.00 ft
Barrel Material: Concrete
Embedment: 0.00 in
Barrel Manning's n: 0.0120
Culvert Type: Straight
Inlet Configuration: Mitered to Conform to Slope
Inlet Depression: None

Table 3 - Downstream Channel Rating Curve (Crossing: Driveway 115+35)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
1.703	772.183	0.161	1.876	0.340	0.88
1.938	772.195	0.173	1.963	0.367	0.88
2.262	772.212	0.190	2.071	0.401	0.89
2.854	772.239	0.217	2.242	0.459	0.89

Tailwater Channel Data - Driveway 115+35

Tailwater Channel Option: Trapezoidal Channel
Bottom Width: 5 ft
Side Slope (H:V): 4 (_:1)
Channel Slope: 0.0119
Channel Manning's n: 0.0500
Channel Invert Elevation: 773.30 ft

Roadway Data for Crossing: Driveway 115+35

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 36.70 ft
Crest Elevation: 775.09 ft
Roadway Surface: Paved
Roadway Top Width: 20.00 ft

STATE OF TEXAS
CLAY E. GANN
88491
LICENSED PROFESSIONAL ENGINEER
Clay E. Gann, P.E. 6/23/2017

NO.	REVISION	BY	DATE

WILLIAMSON COUNTY 1848

RTG RODRIGUEZ TRANSPORTATION GROUP FIRM #587

GEORGETOWN INNER LOOP

HYDRAULIC DATA SHEET

DRIVEWAY CULVERT CALCULATIONS

6/23/2017 SHEET 4 OF 4

DESIGNED:	PROJECT NUMBER		ROADWAY	
CHECKED:			SE INNER LOOP	
DRAWN:	STATE	COUNTY	CITY	SHEET No.
CHECKED:	TEXAS	WILLIAMSON	GEORGETOWN	67

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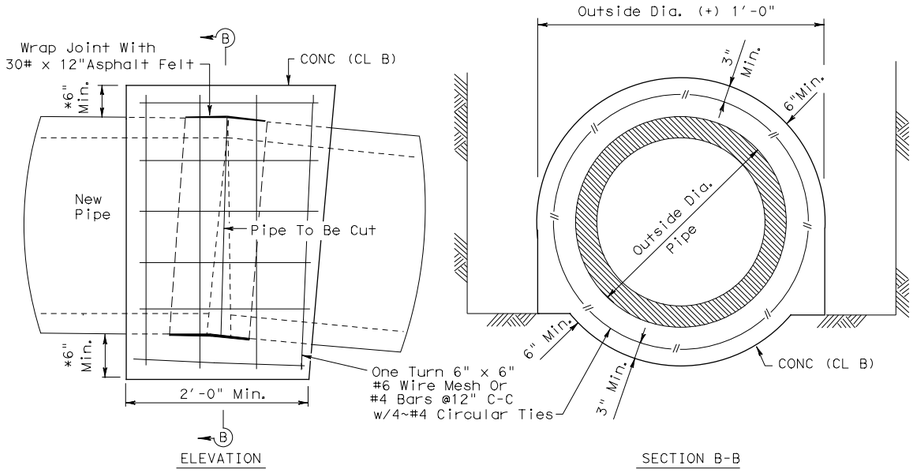
* THE 6" MIN DIMENSION MAY BE
REDUCED AS NEEDED TO FIT ACTUAL FIELD
CONDITIONS WHERE SPACING BETWEEN EXISTING CMPS IS LIMITED.



PIPE COLLAR DETAIL - END CONNECTION
For Horizontal Or Vertical Placement

d = Diameter
R = Radius

NOTES:

1. CONCRETE COLLARS WILL NOT BE PAID FOR DIRECTLY BUT WILL INSTEAD BE CONSIDERED SUBSIDIARY TO THE VARIOUS BID ITEMS.

STATE OF TEXAS
CLAY E. GANN
88491
LICENSED PROFESSIONAL ENGINEER
Clay E. Gann P.E. 6/23/2017

NO.	REVISION	BY	DATE

WILLIAMSON COUNTY 1848

RTG RODRIGUEZ TRANSPORTATION GROUP FIRM #587

GEORGETOWN INNER LOOP

DRAINAGE DETAILS

CONCRETE COLLAR

6/23/2017 SHEET 1 OF 1

DESIGNED:	PROJECT NUMBER		ROADWAY	
CHECKED:			SE INNER LOOP	
DRAWN:	STATE	COUNTY	CITY	SHEET No.
CHECKED:	TEXAS	WILLIAMSON	GEORGETOWN	68

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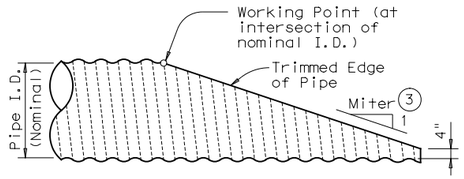
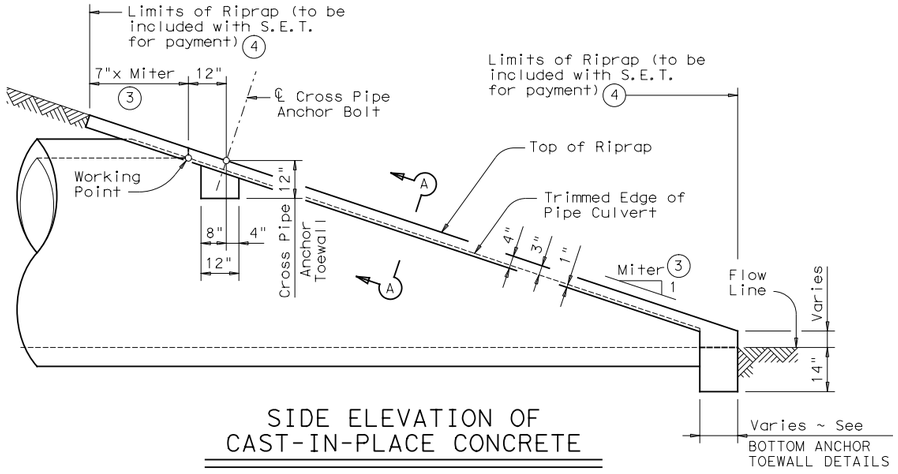


NOTE: All Pipe Runners, calculations, and dimensions are based on the pipe culverts mitered as shown in this detail. Alternate styles of mitered ends will require that appropriate adjustments be made to the values presented on this standard.

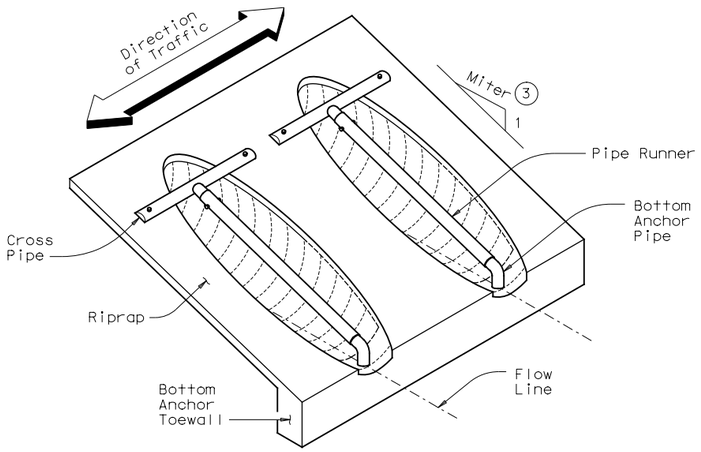
SIDE ELEVATION OF TYPICAL PIPE CULVERT MITER

(Showing Corrugated Metal Pipe Culvert.
Details of Concrete Pipe Culvert are similar.)



SIDE ELEVATION OF CAST-IN-PLACE CONCRETE

(Showing Concrete Pipe Culvert.
Details of Corrugated Metal Pipe Culvert are similar.
Pipe Runners not shown for clarity)



ISOMETRIC VIEW OF TYPICAL INSTALLATION

(Showing installation with no skew.)

CROSS PIPE LENGTHS & PIPE RUNNER LENGTHS (1)(2)

Nominal Culvert I.D.	Pipe Culvert Spa ~ G	Cross Pipe Length	Pipe Runner Length											
			3:1 Side Slope				4:1 Side Slope				6:1 Side Slope			
			0° Skew	15° Skew	30° Skew	45° Skew	0° Skew	15° Skew	30° Skew	45° Skew	0° Skew	15° Skew	30° Skew	45° Skew
24"	1'- 7"	3'- 5"	N/A	N/A	N/A	5'-10"	N/A	N/A	N/A	8'- 1"	N/A	N/A	N/A	12'- 9"
27"	1'- 8"	3'- 8"	N/A	N/A	5'- 5"	6'-11"	N/A	N/A	7'- 7"	9'- 7"	N/A	N/A	11'-11"	14'-11"
30"	1'-10"	3'-11"	N/A	N/A	6'- 4"	8'- 0"	N/A	N/A	8'- 9"	11'- 0"	N/A	N/A	13'- 8"	17'- 0"
33"	1'-11"	4'- 2"	6'- 2"	6'- 5"	7'- 3"	9'- 1"	8'- 6"	8'-10"	10'- 0"	12'- 5"	13'- 3"	13'- 9"	15'- 5"	19'- 2"
36"	2'- 1"	4'- 5"	6'-11"	7'- 3"	8'- 2"	10'- 2"	9'- 6"	9'-11"	11'- 2"	13'-10"	14'- 9"	15'- 3"	17'- 2"	21'- 3"
42"	2'- 4"	4'-11"	8'- 6"	8'-10"	9'-11"	12'- 4"	11'- 7"	12'- 0"	13'- 6"	16'- 8"	17'- 9"	18'- 5"	20'- 8"	25'- 7"
48"	2'- 7"	5'- 5"	10'- 1"	10'- 5"	11'- 9"	N/A	13'- 7"	14'- 2"	15'-10"	N/A	20'- 9"	21'- 6"	24'- 2"	N/A
54"	3'- 0"	5'-11"	11'- 8"	12'- 1"	N/A	N/A	15'- 8"	16'- 3"	N/A	N/A	23'-10"	24'- 8"	N/A	N/A
60"	3'- 3"	6'- 5"	13'- 3"	N/A	N/A	N/A	17'- 9"	N/A	N/A	N/A	26'-10"	N/A	N/A	N/A

TYPICAL PIPE CULVERT MITERS (3)

Side Slope	0° Skew	15° Skew	30° Skew	45° Skew
3:1	3:1	3.106:1	3.464:1	4.243:1
4:1	4:1	4.141:1	4.619:1	5.657:1
6:1	6:1	6.212:1	6.928:1	8.485:1

CONDITIONS WHERE PIPE RUNNERS ARE NOT REQUIRED (2)

Nominal Culvert I.D.	Single Pipe Culvert	Multiple Pipe Culverts
12" thru 21"	Skews thru 45°	Skews thru 45°
24"	Skews thru 45°	Skews thru 30°
27"	Skews thru 30°	Skews thru 15°
30"	Skews thru 15°	Skews thru 15°
33"	Skews thru 15°	Always required
36"	Normal (No Skew)	Always required
42" to 60"	Always required	Always required

STANDARD PIPE SIZES & MAX PIPE RUNNER LENGTHS (1)

Pipe Size	Pipe O.D.	Pipe I.D.	Max Pipe Runner Length
2" STD	2.375"	2.067"	N/A
3" STD	3.500"	3.068"	10'- 0"
4" STD	4.500"	4.026"	19'- 8"
5" STD	5.563"	5.047"	34'- 2"

ESTIMATED CONCRETE RIPRAP QUANTITIES (CY) (5)

Nominal Culvert I.D.	3:1 Side Slope				4:1 Side Slope				6:1 Side Slope			
	0° Skew	15° Skew	30° Skew	45° Skew	0° Skew	15° Skew	30° Skew	45° Skew	0° Skew	15° Skew	30° Skew	45° Skew
12"	0.4	0.4	0.5	0.5	0.5	0.5	0.5	0.6	0.7	0.7	0.7	0.8
15"	0.5	0.5	0.5	0.6	0.6	0.6	0.6	0.7	0.7	0.7	0.8	0.9
18"	0.5	0.5	0.6	0.6	0.6	0.7	0.7	0.8	0.8	0.8	0.9	1.0
21"	0.6	0.6	0.6	0.7	0.7	0.7	0.8	0.9	0.9	0.9	1.0	1.2
24"	0.6	0.7	0.7	0.8	0.8	0.8	0.8	1.0	1.0	1.0	1.1	1.3
27"	0.7	0.7	0.8	0.9	0.8	0.9	0.9	1.1	1.1	1.1	1.2	1.4
30"	0.8	0.8	0.8	0.9	0.9	0.9	1.0	1.2	1.2	1.2	1.3	1.6
33"	0.8	0.8	0.9	1.0	1.0	1.0	1.1	1.3	1.3	1.4	1.5	1.7
36"	0.9	0.9	0.9	1.1	1.1	1.1	1.2	1.4	1.4	1.5	1.6	1.8
42"	1.0	1.0	1.1	1.3	1.2	1.3	1.3	1.6	1.6	1.7	1.8	2.1
48"	1.1	1.1	1.2	N/A	1.4	1.4	1.5	N/A	1.9	1.9	2.1	N/A
54"	1.3	1.3	N/A	N/A	1.6	1.6	N/A	N/A	2.1	2.1	N/A	N/A
60"	1.4	N/A	N/A	N/A	1.7	N/A	N/A	N/A	2.3	N/A	N/A	N/A

(1) Size of Pipe Runner shall be as shown in the tables. Cross Pipe shall be the same size as the Pipe Runner. Cross Pipe Stub Out and Bottom Anchor Pipe shall be the next smaller size pipe as shown in the STANDARD PIPE SIZES table.

(2) This standard allows for the placement of only one pipe runner across each culvert pipe opening. In order to limit the clear opening to be traversed by an errant vehicle, the following conditions must be met:

For 60" culvert pipes, the skew must not exceed 0°.
For 54" culvert pipes, the skew must not exceed 15°.
For 48" culvert pipes, the skew must not exceed 30°.
For all culvert pipe sizes 42" and less, the skew must not exceed 45°.

If the above conditions cannot be met, the designer should consider using a safety end treatment with flared wings. For further information, refer to the TxDOT "Roadway Design Manual".

(3) Miter = Slope of Mitered Pipe Culvert End

(4) Riprap placed beyond the limits shown will be paid as Concrete Riprap in accordance with Item 432, "Riprap".

(5) Quantities shown are for one end of one reinforced Concrete Pipe Culvert. For multiple Pipe Culverts or for Corrugated Metal Pipe Culverts, quantities will need to be adjusted. Riprap quantities are for Contractor's information only.

DISCLAIMER:
The use of this standard is governed by the "Texas Engineering Practice Act". No warranty of any kind is made by TxDOT for any purpose whatsoever. TxDOT assumes no responsibility for the conversion of this standard to other formats or for incorrect results or damages resulting from its use.

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SHEET 1 OF 2

Texas Department of Transportation — Bridge Division Standard

SAFETY END TREATMENT

FOR 12" DIA TO 60" DIA
PIPE CULVERTS
TYPE II ~ CROSS DRAINAGE

SETP-CD

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©TxDOT February 2010	CONT	SECT	JOB	HIGHWAY
REVISIONS				SE INNER LP
11-10: Add note for synthetic fibers.	DIST	COUNTY		SHEET NO.
		WILLIAMSON		60

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DATE: 6/23/2017 7:00
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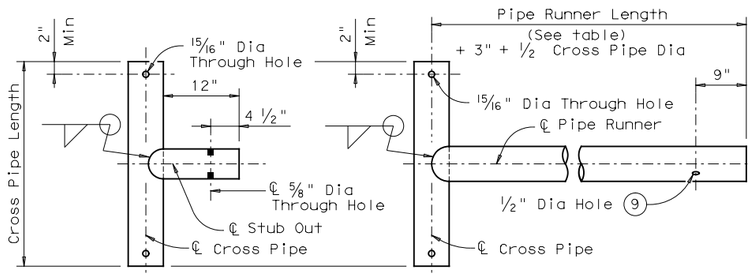
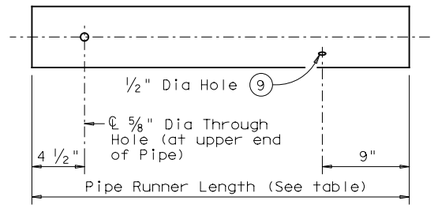


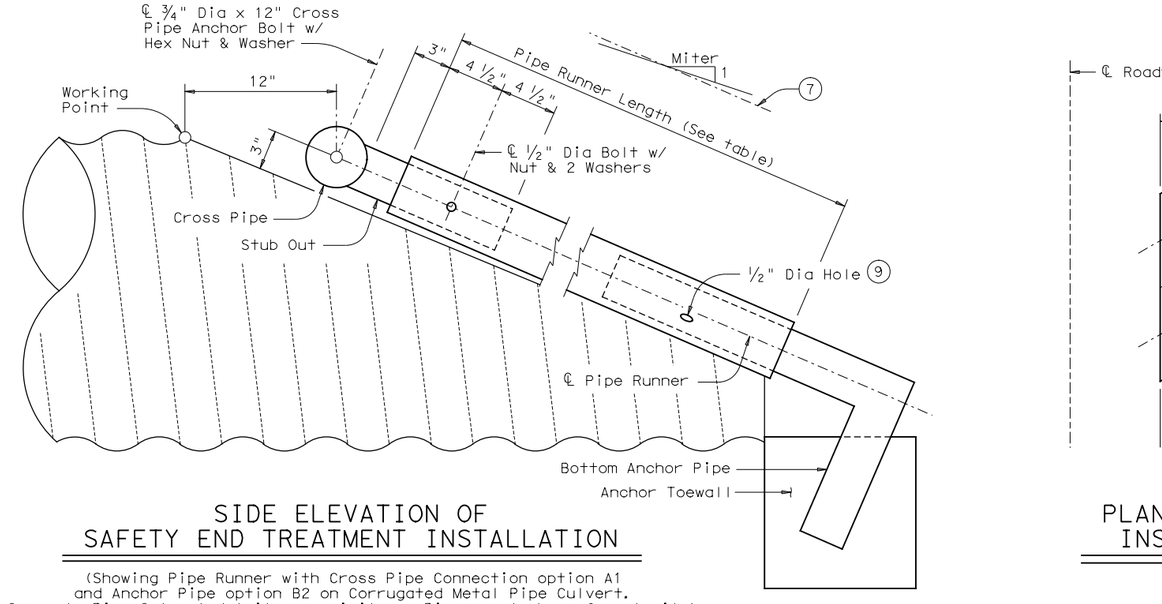
OPTION A1 OPTION A2

CROSS PIPE AND CONNECTIONS DETAILS



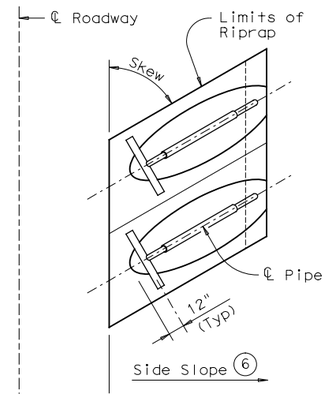
NOTE: The separate Pipe Runner shown is required when Cross Pipe Connection Option A1 is used.

PIPE RUNNER DETAILS

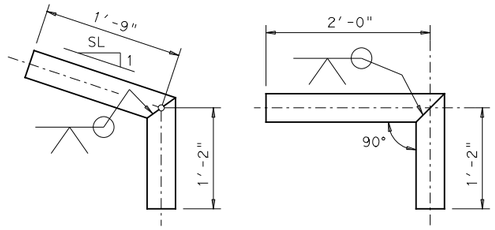


SIDE ELEVATION OF SAFETY END TREATMENT INSTALLATION

(Showing Pipe Runner with Cross Pipe Connection option A1 and Anchor Pipe option B2 on Corrugated Metal Pipe Culvert. Concrete Pipe Culvert details are similar. Riprap not shown for clarity)

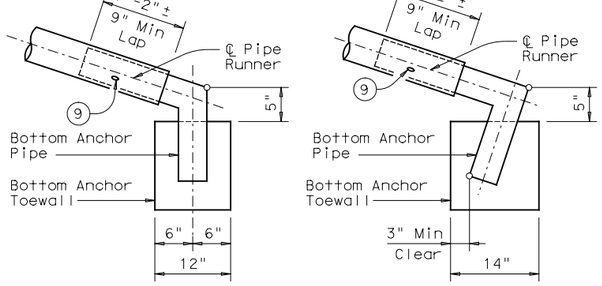


PLAN OF SKEWED INSTALLATION



OPTION B1 OPTION B2

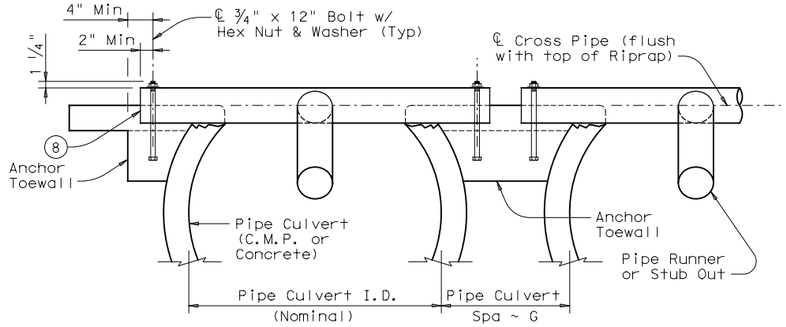
BOTTOM ANCHOR PIPE DETAILS (10)



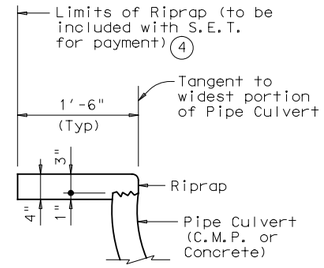
OPTION B1 OPTION B2

BOTTOM ANCHOR TOEWALL DETAILS

(Culvert & Riprap not shown for clarity)



SHOWING CROSS PIPE & ANCHOR TOEWALL



SHOWING TYPICAL PIPE CULVERT & RIPRAP

SECTION A-A

(4) Riprap placed beyond the limits shown will be paid as Concrete Riprap in accordance with Item 432, "Riprap".

(6) Recommended values of side slope are 3:1, 4:1, & 6:1. All quantities, calculations, and dimensions shown herein are based on these recommended values. Slope of 3:1 or flatter is required for vehicle safety.

(7) Note that actual slope of Pipe Runner may vary slightly from Side Slope of Riprap and trimmed Culvert Pipe edge.

(8) Care shall be taken to ensure that Riprap concrete does not flow into the Cross Pipe so as to permit disassembly of the bolted connection to allow cleanout access.

(9) After installation, the 1/2" hole shall be inspected to ensure that the lap of the Pipe Runner with the Bottom Anchor Pipe is adequate.

(10) At fabricator's option, a heat bend to a smooth 5" radius or a manufactured elbow (of the same material as the Runner) may be substituted for the mitered and welded joint in the Bottom Anchor Pipe.

GENERAL NOTES:

Pipe Runners are designed for a traversing load of 1,800 pounds at yield as recommended by Research Report 280-1, "Safety Treatment of Roadside Cross-Drainage Structures", Texas Transportation Institute, March 1981.

The Safety End Treatments shown herein are intended for use in those installations where out of control vehicles are likely to traverse the openings approximately perpendicular to the Pipe Runners.

Riprap and all necessary inverts shall be Concrete Riprap conforming to the requirements of Item 432, "Riprap".

Synthetic fibers listed on the "Fibers for Concrete" Material Producer List (MPL) may be used in lieu of steel reinforcing in riprap concrete unless noted otherwise.

Payment for riprap and toewall is included in the Price Bid for each Safety End Treatment.

Pipe Runners, Cross Pipes, and Anchor Pipes shall conform to the requirements of ASTM A53 (Type E or S, Grade B), ASTM A500 (Grade B), or API 5LX52.

Bolts and nuts shall conform to ASTM A307.

All steel components, except concrete reinforcing, shall be galvanized after fabrication. Galvanizing damaged during transport or construction shall be repaired in accordance with the specifications.

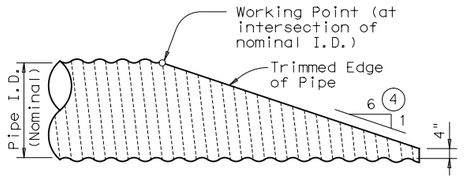
Texas Department of Transportation — Bridge Division Standard

SAFETY END TREATMENT

FOR 12" DIA TO 60" DIA
PIPE CULVERTS
TYPE II ~ CROSS DRAINAGE

SETP-CD

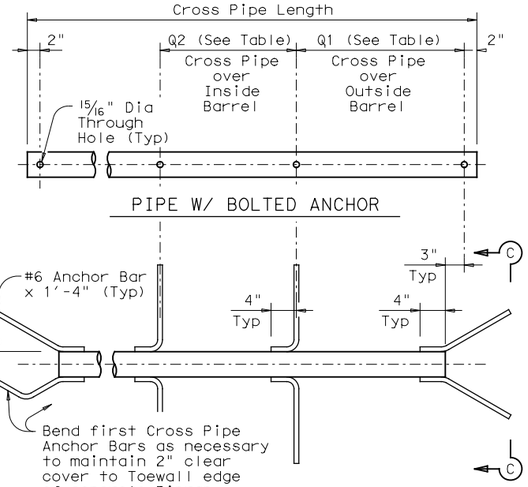
FILE: setpcdse.dgn	DN: GAF	CK: CAT	DW: JRP	CK: GAF
©TxDOT February 2010	CONT	SECT	JOB	HIGHWAY
REVISIONS				SE INNER LP
11-10: Add note for synthetic fibers.	DIST	COUNTY		SHEET NO.
		WILLIAMSON		70



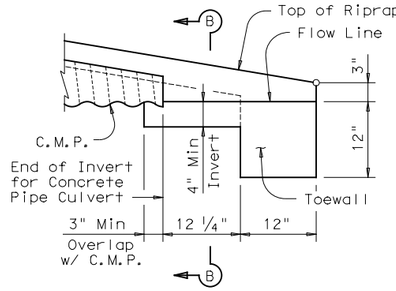
NOTE: All Cross Pipes, calculations, and dimensions are based on the pipe culverts mitered as shown in this detail. Alternate styles of mitered ends will require that appropriate adjustments be made to the values presented on this standard.

SIDE ELEVATION OF TYPICAL PIPE CULVERT MITER

(Showing Corrugated Metal Pipe Culvert.)
(Details at Concrete Pipe Culvert are similar.)

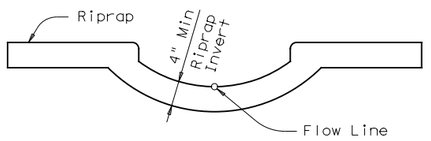


PIPE W/ BOLTED ANCHOR



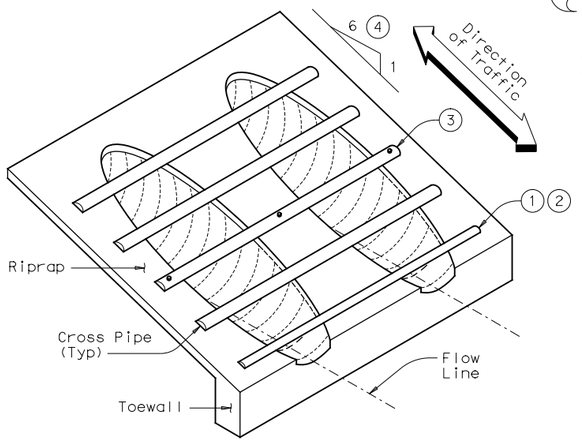
DETAIL "A"

(Showing Invert with Corrugated Metal Pipe Culvert. Concrete Pipe Culvert details are similar. Cross Pipes not shown for clarity.)

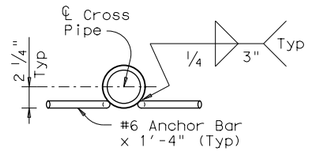


SECTION B-B

(Cross Pipes not shown for clarity.)



ISOMETRIC VIEW OF TYPICAL INSTALLATION



PIPE W/ ANCHOR BARS

SECTION C-C

CROSS PIPE DETAILS

CROSS PIPE LENGTHS, REQUIRED PIPE SIZES, & RIPRAP QUANTITIES (2)							
Nominal Culvert I.D.	Conc Riprap (CY) (6)	Pipe Culvert Spa ~ G	Single Barrel ~ Q1	Multi-Barrel ~ Q1	Q2	Conditions for use of Cross Pipes	Cross Pipe Size
12"	0.6	9"	N/A	2'- 1"	1'- 9"	3 or more Pipe Culverts	3" Std (3.500" O.D.)
15"	0.7	11"	N/A	2'- 5"	2'- 2"		
18"	0.8	1'- 2"	N/A	2'-10"	2'- 8"		
21"	0.9	1'- 4"	N/A	3'- 2"	3'- 1"		
24"	0.9	1'- 7"	N/A	3'- 6"	3'- 7"		
27"	1.0	1'- 8"	N/A	3'-10"	3'-11"	3 or more Pipe Culverts	3 1/2" Std (4.000" O.D.)
30"	1.1	1'-10"	N/A	4'- 2"	4'- 4"	2 or more Pipe Culverts	
33"	1.2	1'-11"	4'- 2"	4'- 5"	4'- 8"	All Pipe Culverts	
36"	1.3	2'- 1"	4'- 5"	4'- 9"	5'- 1"	All Pipe Culverts	4" Std (4.500" O.D.)
42"	1.5	2'- 4"	4'-11"	5'- 5"	5'-10"		
48"	1.7	2'- 7"	5'- 5"	6'- 0"	6'- 7"	All Pipe Culverts	5" Std (5.563" O.D.)
54"	2.0	3'- 0"	5'-11"	6'- 9"	7'- 6"		
60"	2.2	3'- 3"	6'- 5"	7'- 4"	8'- 3"		
66"	2.4	3'- 3"	6'-11"	7'-10"	8'- 9"		
72"	2.7	3'- 4"	7'- 5"	8'- 5"	9'- 4"		

1. The proper installation of the first Cross Pipe is critical for vehicle safety. The top of the first Cross Pipe must be placed at no more than 6" above the flow line.
2. Size of Cross Pipes, except the first bottom pipe, shall be as shown in the PIPE SIZE table. The first bottom pipe shall be 3 1/2" Standard Pipe (4" O.D.).
3. The third Cross Pipe from the bottom of the Culvert shall always be installed using a bolted connection. Care shall be taken to ensure that Riprap concrete does not flow into the Cross Pipe so as to permit disassembly of the bolted connection to allow cleanout access. At the Contractor's option, all other Cross Pipes may also be installed using the bolted connection details.
4. Match Cross Slope as shown elsewhere in the plans. Cross Slope of 6:1 or flatter is required for vehicle safety.
5. Riprap placed beyond the limits shown will be paid as Concrete Riprap in accordance with Item 432, "Riprap".
6. Quantities shown are for one end of one reinforced Concrete Pipe Culvert. For multiple pipe culverts or for Corrugated Metal Pipe Culverts, quantities will need to be adjusted. Riprap quantities are for Contractor's information only.

GENERAL NOTES:

Cross Pipes are designed for a traversing load of 10,000 pounds at yield as recommended by Research Report 280-2F, "Safety Treatment of Roadside Parallel-Drainage Structures", Texas Transportation Institute, March 1981.

Safety End Treatments shown herein are intended for use in those installations where out of control vehicles are likely to traverse the openings approximately perpendicular to the Cross Pipes.

Riprap and all necessary inverts shall be Concrete Riprap conforming to the requirements of Item 432, "Riprap".

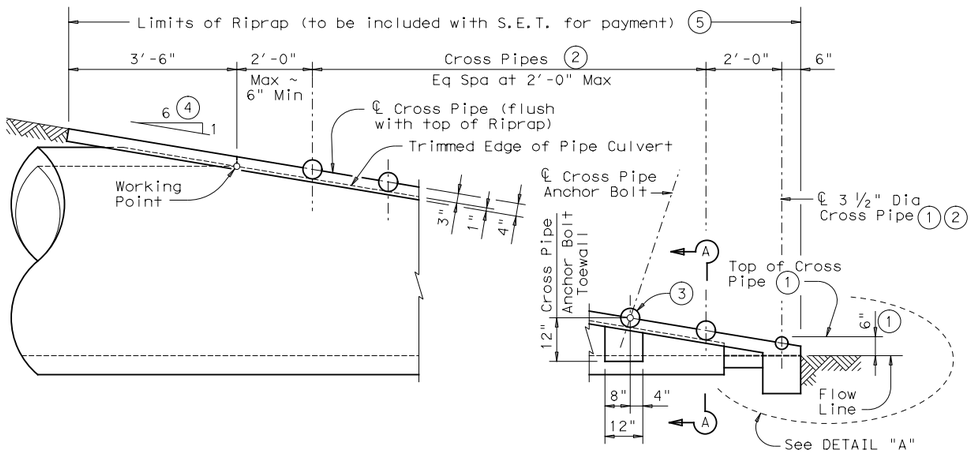
Synthetic fibers listed on the "Fibers for Concrete" Material Producer List (MPL) may be used in lieu of steel reinforcing in riprap concrete unless noted otherwise.

Payment for riprap and toewall is included in the Price Bid for each Safety End Treatment.

Cross Pipes shall conform to the requirements of ASTM A53 (Type E or S, Grade B), ASTM A500 (Grade B), or API 5LX52.

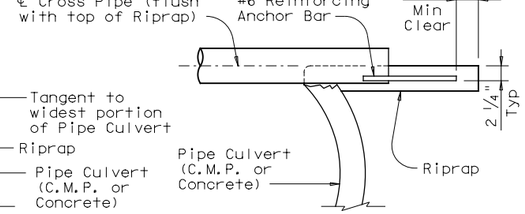
Bolts and nuts shall conform to ASTM A307.

All steel components, except concrete reinforcing, shall be galvanized after fabrication. Galvanizing damaged during transport or construction shall be repaired in accordance with the specifications.



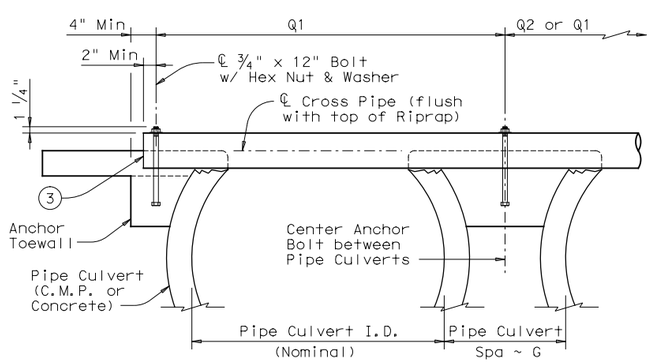
SIDE ELEVATION OF CAST-IN-PLACE CONCRETE

(Showing Concrete Pipe Culvert.)
(Details at Corrugated Metal Pipe Culvert are similar.)



SHOWING TYPICAL PIPE CULVERT & RIPRAP

SHOWING CROSS PIPE WITH ANCHOR BAR



SHOWING CROSS PIPE WITH BOLTED ANCHOR

SECTION A-A

Texas Department of Transportation — Bridge Division Standard

SAFETY END TREATMENT

FOR 12" DIA TO 72" DIA
PIPE CULVERTS
TYPE II ~ PARALLEL DRAINAGE

SETP-PD

FILE: setppdse.dgn	DN: GAF	CK: CAT	DW: JRP	CK: GAF
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REVISIONS				SE INNER LP
11-10: Add note for synthetic fibers.	DIST	COUNTY		SHEET NO.
		WILLIAMSON		71

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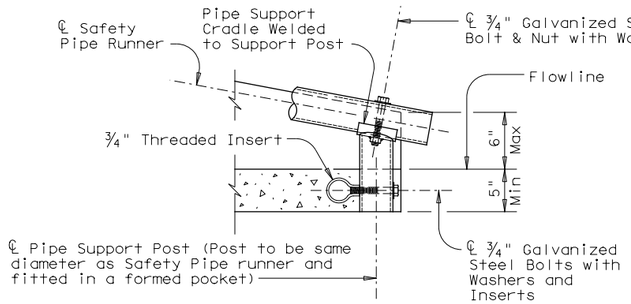
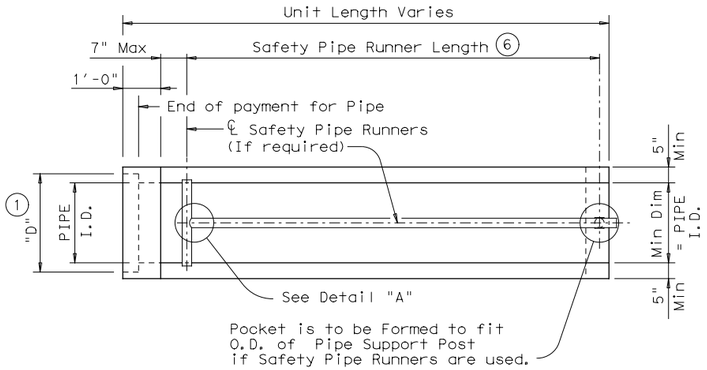
PIPE I.D.	PIPE WALL "B" THICKNESS	(1) "D"	SLOPE	MINIMUM LENGTH OF UNIT	SINGLE PIPE		MULTIPLE PIPE	
					SKEW	PIPE RUNNERS REQUIRED	SKEW	PIPE RUNNERS REQUIRED
12"	2"	17"	3:1	2'-11"	<=45 deg	No	<=45 deg	No
			4:1	3'-6"				
			6:1	4'-9"				
15"	2 1/4"	20 1/2"	3:1	3'-8"	<=45 deg	No	<=45 deg	No
			4:1	4'-7"				
			6:1	6'-5"				
18"	2 1/2"	24"	3:1	4'-6"	<=45 deg	No	<=45 deg	No
			4:1	5'-8"				
			6:1	8'-0"				
24"	3"	31"	3:1	6'-2"	<=45 deg	No	<=30 deg	No
			4:1	7'-10"			>30 deg	Yes
			6:1	11'-3"				
30"	3 1/2"	38 1/2"	3:1	7'-10"	<=15 deg	No	<=15 deg	No
			4:1	10'-1"				
			6:1	14'-8"	>15 deg	Yes	>15 deg	Yes
36"	4"	45 1/2"	3:1	9'-5"	=0 deg	No	=>0 deg	Yes
			4:1	12'-3"				
			6:1	17'-11"	>0 deg	Yes		
42"	4 1/2"	52 1/2"	3:1	11'-1"	=>0 deg	Yes	=>0 deg	Yes
			4:1	14'-5"				
			6:1	21'-2"				

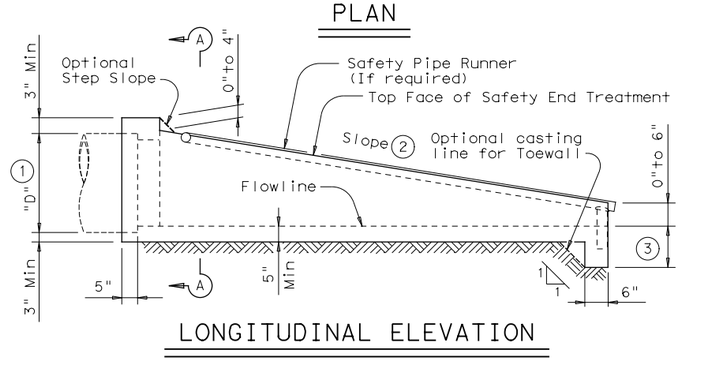


END DETAIL FOR INSTALLATION OF SAFETY PIPE RUNNERS

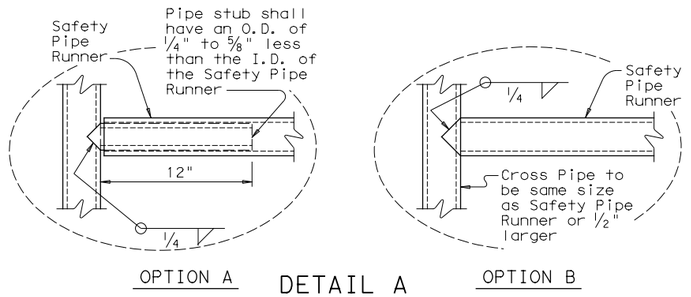
(If required)



PLAN

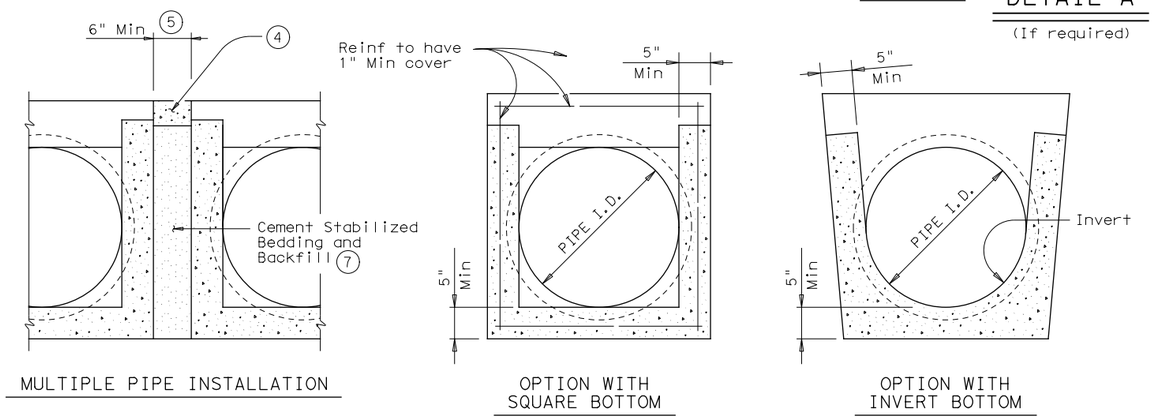


LONGITUDINAL ELEVATION



DETAIL A

(If required)

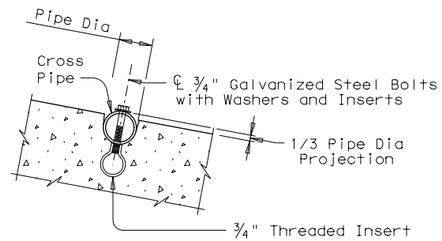


MULTIPLE PIPE INSTALLATION

OPTION WITH SQUARE BOTTOM

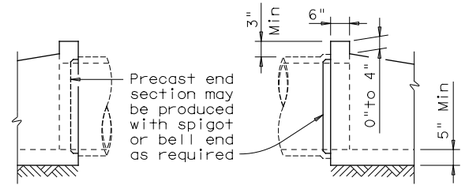
OPTION WITH INVERT BOTTOM

SECTION A-A



INSTALLATION DETAIL FOR SAFETY PIPE RUNNERS

(If required)



OPTIONAL JOINT

(Showing joint between RCP and Precast Safety End Treatment)

Maximum Safety Pipe Runner Length	Required Pipe Runner Size		
	Pipe Size	Pipe O.D.	Pipe I.D.
11'- 2"	3" STD	3.500"	3.068"
15'- 6"	3 1/2" STD	4.000"	3.548"
20'-10"	4" STD	4.500"	4.026"
35'- 4"	5" STD	5.563"	5.047"

(1) Dimension "D" is based on ASTM C-76, Class III, Wall thickness "B". If any other wall thickness is used, dimension "D" must be adjusted accordingly.

(2) Slope as shown elsewhere in plans. Slope of 3:1 or flatter is required for vehicle safety.

(3) Toewall to be used only when dimension is shown elsewhere in the plans.

(4) The top 4" of void between precast end treatments shall be filled with concrete riprap and shall be considered subsidiary to Safety End Treatment.

(5) Clear distance between pipes shall be adjusted to provide for the minimum distance between safety end treatments.

(6) Measured along Slope.

(7) Cement stabilized bedding and backfill shall be in accordance with the Item, "Excavation and Backfill for Structures". Bedding and backfill shall be considered subsidiary to the Item "Safety End Treatment". When concrete riprap is specified around the safety end treatment, backfill shall be as directed by Engineer.

GENERAL NOTES:

Precast safety end treatment for reinforced concrete pipe may be used for TYPE II end treatment as specified in Item "Safety End Treatment".

When Precast Safety End Treatment is used as a Contractor's alternate to mitered RCP, Riprap will not be required unless noted otherwise on the plans.

Synthetic fibers listed on the "Fibers for Concrete" Material Producer List (MPL) may be used in lieu of steel reinforcing in riprap concrete unless noted otherwise.

Manufacture of this product shall conform to requirements of Item "Safety End Treatment" except as noted below :

A. Minimum reinforcing shall be #4 at 6" (Grade 40) or #4 at 9" (Grade 60) each way or 6 x 6 - W12 x W12 or 5 x 5 - W10 x W10 welded wire fabric.

B. Concrete for precast (steel formed) sections shall be Class "C" with a minimum compressive strength of 3600 psi.

At the option and expense of the Contractor the next larger size of Safety End Treatment may be furnished; as long as the "D" dimension cast is that of the required size of pipe.

Pipe Runners are designed for a traversing load of 1,800 Lbs at yield as recommended by Research Report 280-1, "Safety Treatment of Roadside Cross-Drainage Structures", Texas Transportation Institute, March 1981.

Safety Pipe Runners, Cross Pipes, Pipe Support Posts, and Pipe Stubs shall conform to the requirements of ASTM A53 (Type E or S, Grade B), ASTM A500 (Grade B), or API 5LX52.

All steel components except reinforcing, shall be galvanized after fabrication. Galvanizing damaged during transport or construction shall be repaired in accordance with the specifications.

Texas Department of Transportation

Bridge Division Standard

PRECAST SAFETY END TREATMENT

TYPE II ~ CROSS DRAINAGE

PSET-SC

FILE: psetscse.dgn	DN: RLW	CK: KLR	DW: JTR	CK: GAF
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11-10: Add note for synthetic fibers.	DIST	COUNTY		SHEET NO.
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FILE: pw://rtg-pw.bentley.com:rtg-pw/Documents/8760101/dlv/standards/Drainage/psetscse.dgn

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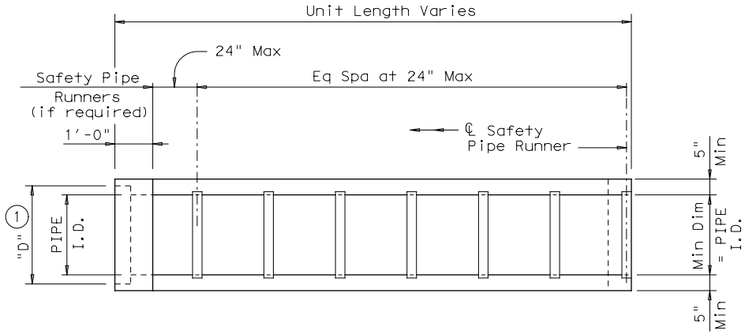
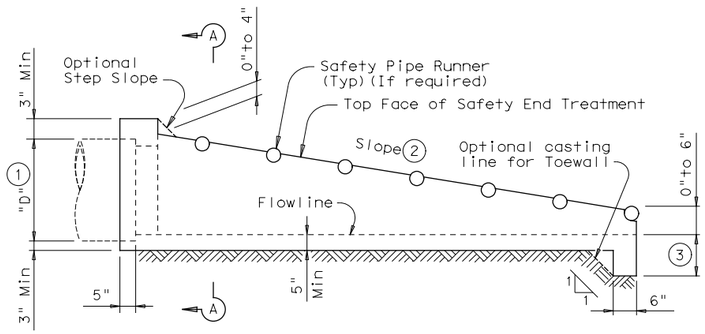
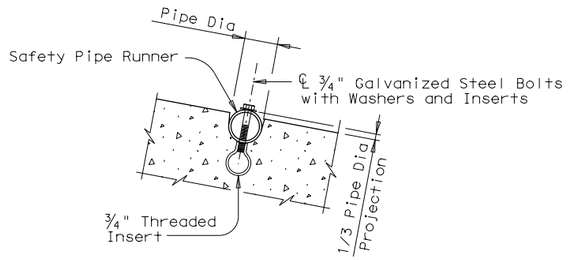


PLAN

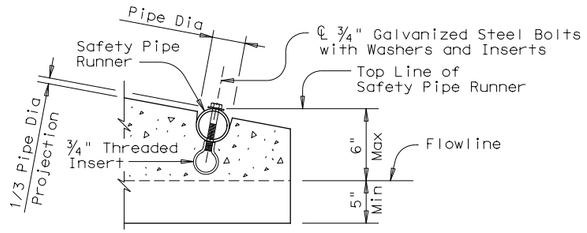


LONGITUDINAL ELEVATION

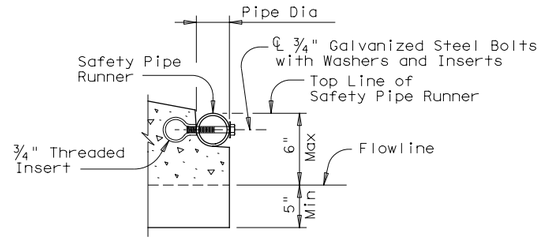


INSTALLATION DETAIL FOR SAFETY PIPE RUNNERS

(If required)



OPTION A



OPTION B

END DETAILS FOR INSTALLATION OF SAFETY PIPE RUNNERS

(If required)

PIPE I.D.	PIPE WALL "B" THICKNESS	"D" (1)	MAXIMUM SLOPE	MINIMUM LENGTH OF UNIT	PIPE RUNNERS REQUIRED		REQUIRED PIPE RUNNER SIZES		
					SINGLE PIPE	MULTIPLE PIPE	NOMINAL DIA.	O.D.	I.D.
12"	2"	17"	6:1	4'-9"	No	Yes, for >2 pipes	3" STD	3.500"	3.068"
15"	2 ¼"	20 ½"	6:1	6'-5"	No	Yes, for >2 pipes	3" STD	3.500"	3.068"
18"	2 ½"	24"	6:1	8'-0"	No	Yes, for >2 pipes	3" STD	3.500"	3.068"
24"	3"	31"	6:1	11'-3"	No	Yes, for >2 pipes	3" STD	3.500"	3.068"
30"	3 ½"	38 ½"	6:1	14'-8"	No	Yes	4" STD	4.500"	4.026"
36"	4"	45 ½"	6:1	17'-11"	Yes	Yes	4" STD	4.500"	4.026"
42"	4 ½"	52 ½"	6:1	21'-2"	Yes	Yes	4" STD	4.500"	4.026"

(1) Dimension "D" is based on ASTM C-76, Class III, Wall "B" thickness. If any other wall thickness is used, dimension "D" must be adjusted accordingly.

(2) Slope as shown elsewhere in the plans. Slope of 6:1 or flatter is required for vehicle safety.

(3) Toewall to be used only when dimension is shown elsewhere in the plans.

(4) The top 4" of void between Precast End Treatments shall be filled with concrete Riprap and shall be considered subsidiary to Safety End Treatment.

(5) Clear distance between pipes shall be adjusted to provide for the minimum distance between safety end treatments.

(6) Cement stabilized bedding and backfill shall be in accordance with the Item, "Excavation and Backfill for Structures". Bedding and backfill shall be considered subsidiary to the Item "Safety End Treatment". When concrete riprap is specified around the safety end treatment, backfill shall be as directed by Engineer.

GENERAL NOTES:

Precast safety end treatment for reinforced concrete pipe may be used for TYPE II end treatment as specified in Item "Safety End Treatment".

When Precast Safety End Treatment is used as a Contractor's alternate to mitered RCP, Riprap will not be required unless noted otherwise on the plans.

Synthetic fibers listed on the "Fibers for Concrete" Material Producer List (MPL) may be used in lieu of steel reinforcing in riprap concrete unless noted otherwise.

Manufacture of this product shall conform to requirements of Item "Safety End Treatment" except as noted below :

A. Minimum reinforcing shall be #4 at 6" (Grade 40) or #4 at 9" (Grade 60) each way or 6 x 6 - W12 x W12 or 5 x 5 - W10 x W10 welded wire fabric.

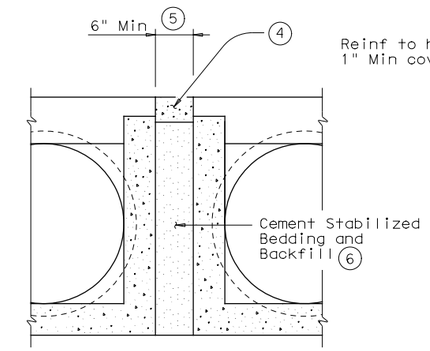
B. Concrete for precast (steel formed) sections shall be Class "C" with a minimum compressive strength of 3600 psi.

At the option and expense of the Contractor the next larger size of Safety End Treatment may be furnished; as long as the "D" dimension cast is that of the required size of pipe.

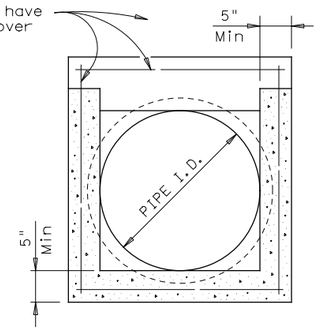
Pipe Runners are designed for a traversing load of 10,000 Lbs at yield as recommended by Research Report 280-2F, "Safety Treatment of Roadside Parallel-Drainage Structures", Texas Transportation Institute, March 1981.

Pipe Runners shall conform to the requirements of ASTM A53 (Type E or S, Grade B), ASTM A500 (Grade B), or API 5LX52.

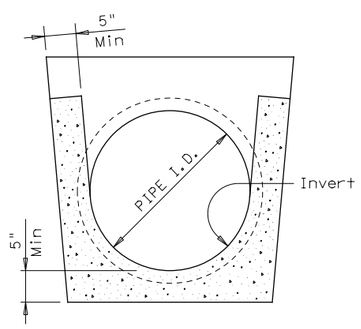
All steel components except reinforcing, shall be galvanized after fabrication. Galvanizing damaged during transport or construction shall be repaired in accordance with the specifications.



MULTIPLE PIPE INSTALLATION

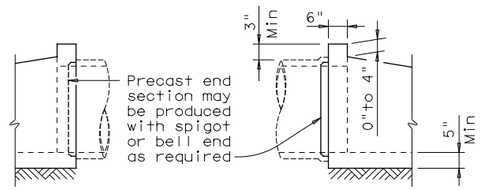


OPTION WITH SQUARE BOTTOM



OPTION WITH INVERT BOTTOM

SECTION A-A



OPTIONAL JOINT

(Showing joint between RCP and Precast Safety End Treatment)

Texas Department of Transportation

Bridge Division Standard

PRECAST SAFETY END TREATMENT

TYPE II ~ PARALLEL DRAINAGE

PSET-SP

FILE: psetspse.dgn	DN: RLW	CK: KLR	DW: JTR	CK: GAF
©TxDOT February 2010	CONT	SECT	JOB	HIGHWAY
REVISIONS				SE INNER LP
11-10: Add note for synthetic fibers.	DIST	COUNTY		SHEET NO.
		WILLIAMSON		73

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DATE: 6/23/2017 3:30
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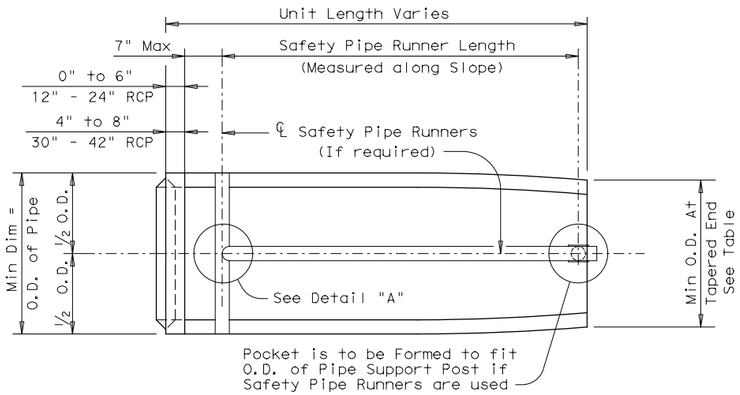
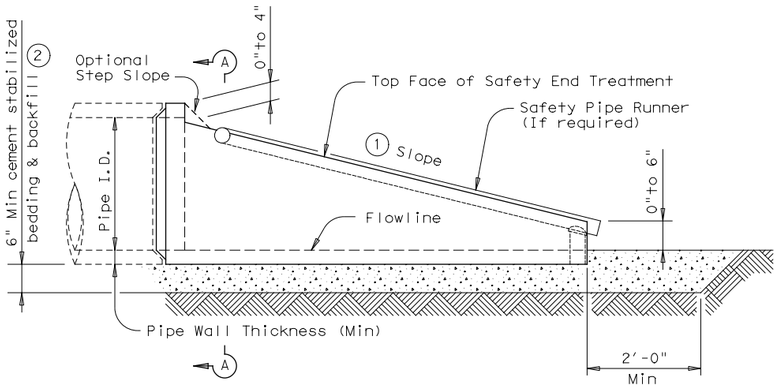


PLAN VIEW



LONGITUDINAL ELEVATION

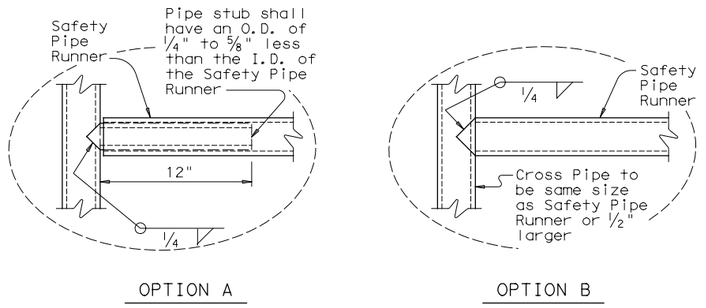
Maximum Safety Pipe Runner Lengths & Required Safety Pipe Runner Sizes			
Maximum Safety Pipe Runner Length	Required Pipe Runner Size		
	Pipe Size	Pipe O.D.	Pipe I.D.
11′- 2"	3" STD	3.500"	3.068"
15′- 6"	3 ½" STD	4.000"	3.548"
20′-10"	4" STD	4.500"	4.026"
35′- 4"	5" STD	5.563"	5.047"

① Slope as shown elsewhere in the plans. Slope of 3:1 or flatter is required for vehicle safety.

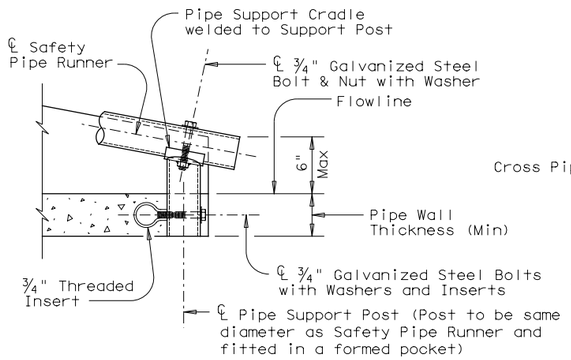
② Cement stabilized bedding and backfill shall be in accordance with the Item, "Excavation and Backfill for Structures". Bedding and backfill shall be considered subsidiary to the Item "Safety End Treatment". When concrete riprap is specified around the Safety End Treatment backfill shall be as directed by Engineer.

③ The top 4" of void between Precast End Treatments shall be filled with concrete Riprap and shall be considered subsidiary to Safety End Treatment.

④ Clear distance between pipes shall be adjusted to provide for the minimum distance between safety end treatments.

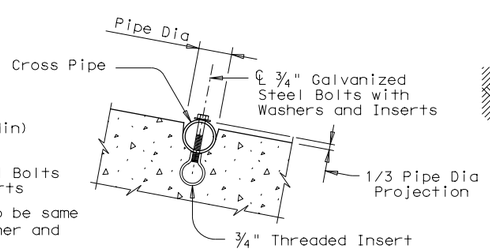


DETAIL A



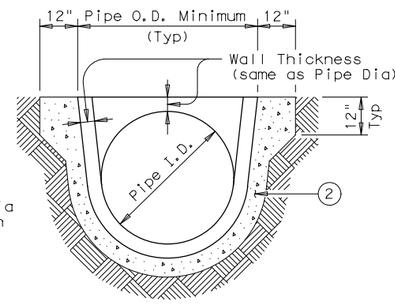
END DETAIL FOR INSTALLATION OF SAFETY PIPE RUNNERS

(If required)

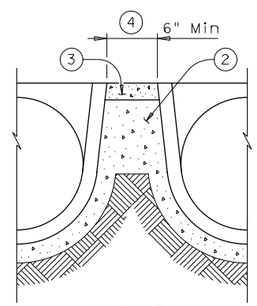


INSTALLATION DETAIL FOR SAFETY PIPE RUNNERS

(If required)



SECTION A-A



MULTIPLE PIPE INSTALLATION

PIPE I.D.	MINIMUM WALL THICKNESS	MINIMUM O.D.	MIN O.D. AT TAPERED END	MIN REINF REQUIREMENTS (Sq in/ft of pipe)	SLOPE	MINIMUM LENGTH OF UNIT	SINGLE PIPE		MULTIPLE PIPE	
							SKEW	PIPE RUNNERS REQUIRED	SKEW	PIPE RUNNERS REQUIRED
12"	2"	16"	16"	0.07 CIRC.	3:1	2′-0"	<=45 deg	No	<=45 deg	No
					4:1	2′-8"				
					6:1	4′-0"				
15"	2 ¼"	19 ½"	19"	0.07 CIRC.	3:1	2′-10"	<=45 deg	No	<=45 deg	No
					4:1	3′-9"				
					6:1	5′-8"				
18"	2 ½"	23"	21 ½"	0.07 CIRC.	3:1	3′-8"	<=45 deg	No	<=45 deg	No
					4:1	4′-10"				
					6:1	7′-3"				
24"	3"	30"	27"	0.07 CIRC.	3:1	5′-3"	<=45 deg	No	<=30 deg	No
					4:1	7′-0"			>30 deg	Yes
					6:1	10′-6"				
30"	3 ½"	37"	31"	0.18 CIRC.	3:1	6′-3"	<=15 deg	No	<=15 deg	No
					4:1	8′-2"	>15 deg	Yes	>15 deg	Yes
					6:1	12′-1"				
36"	4"	44"	36"	0.19 ELIP.	3:1	7′-10"	=0 deg	No	=>0 deg	Yes
					4:1	10′-4"	>0 deg	Yes		
					6:1	15′-4"				
42"	4 ½"	51"	41 ½"	0.23 ELIP.	3:1	9′-6"	=>0 deg	Yes	=>0 deg	Yes
					4:1	12′-6"				
					6:1	18′-7"				

GENERAL NOTES:

Precast safety end treatment for reinforced concrete pipe may be used for TYPE II end treatment as specified in Item "Safety End Treatment".

When Precast Safety End Treatment is used as a Contractor's alternate to mitered RCP, Riprap will not be required unless noted otherwise on the plans.

Synthetic fibers listed on the "Fibers for Concrete" Material Producer List (MPL) may be used in lieu of steel reinforcing in riprap concrete unless noted otherwise.

All precast concrete end sections shall be manufactured in accordance with Item "Reinforced Concrete Pipe Culverts" and in accordance with ASTM Specification C-76, Class III, Wall B for circular pipe.

Precast concrete end sections shall be provided with a spigot or bell end for compatibility to upstream or downstream end conditions with sufficient annular space to allow for mortar, cold applied asphalt joint compound or pre-formed plastic gasket material.

Methods of lifting shall be provided by the manufacturer for ease of loading, unloading and installation.

Pipe Runners are designed for a traversing load of 1,800 Lbs at yield as recommended by Research Report 280-1, "Safety Treatment of Roadside Cross-Drainage Structures", Texas Transportation Institute, March 1981.

Safety Pipe Runners, Cross Pipes, Pipe Support Posts, and Pipe Stubs shall conform to the requirements of ASTM A53 (Type E or S, Grade B), ASTM A500 (Grade B), or API 5LX52.

All steel components except reinforcing, shall be galvanized after fabrication. Galvanizing damaged during transport or construction shall be repaired in accordance with the specifications.

Texas Department of Transportation

Bridge Division Standard

PRECAST SAFETY END TREATMENT

TYPE II ~ CROSS DRAINAGE

PSET-RC

FILE: psetrcse.dgn	DN: RLW	CK: KLR	DW: JTR	CK: GAF
©TxDOT February 2010	CONT	SECT	JOB	HIGHWAY
REVISIONS				SE INNER LP
11-10: Add note for synthetic fibers.	DIST	COUNTY		SHEET NO.
		WILLIAMSON		74

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DATE: 6/23/2017 3:10
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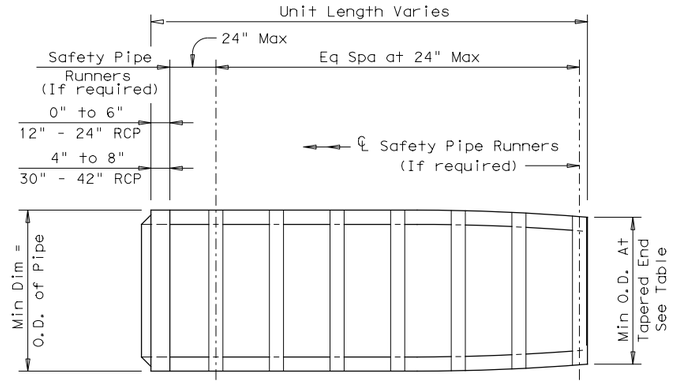
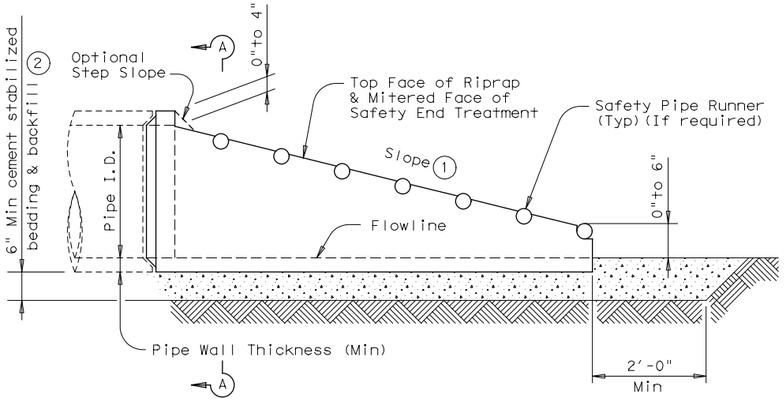


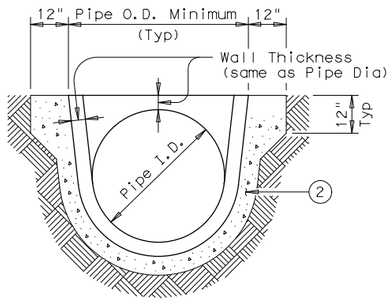
PLAN VIEW - 12" THRU 24"

1. Slope as shown elsewhere in the plans. Slope of 6:1 or flatter is required for vehicle safety.
2. Cement stabilized bedding and backfill shall be in accordance with the Item, "Excavation and Backfill for Structures". Bedding and backfill shall be considered subsidiary to the Item "Safety End Treatment". When concrete riprap is specified around the Safety End Treatment backfill shall be as directed by Engineer.
3. The top 4" of void between Precast End Treatments shall be filled with concrete Riprap and shall be considered subsidiary to Safety End Treatment.
4. Clear distance between pipes shall be adjusted to provide for the minimum distance between safety end treatments.

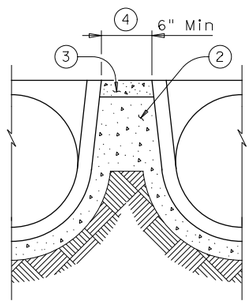
PIPE I.D.	MINIMUM WALL THICKNESS	MINIMUM O.D.	MIN O.D. AT TAPERED END	MIN REINF REQUIREMENTS (Sq in/ft of pipe)	MAXIMUM SLOPE	MINIMUM LENGTH OF UNIT	PIPE RUNNERS REQUIRED		REQUIRED PIPE RUNNER SIZES		
							SINGLE PIPE	MULTIPLE PIPE	NOMINAL DIA.	O.D.	I.D.
12"	2"	16"	16"	0.07 CIRC.	6:1	4'-0"	No	Yes, for >2 pipes	3" STD	3.500"	3.068"
15"	2 1/4"	19 1/2"	19"	0.07 CIRC.	6:1	5'-8"	No	Yes, for >2 pipes	3" STD	3.500"	3.068"
18"	2 1/2"	23"	21 1/2"	0.07 CIRC.	6:1	7'-3"	No	Yes, for >2 pipes	3" STD	3.500"	3.068"
24"	3"	30"	27"	0.07 CIRC.	6:1	10'-6"	No	Yes, for >2 pipes	3" STD	3.500"	3.068"
30"	3 1/2"	37"	31"	0.18 CIRC.	6:1	12'-1"	No	Yes	4" STD	4.500"	4.026"
36"	4"	44"	36"	0.19 ELIP.	6:1	15'-4"	Yes	Yes	4" STD	4.500"	4.026"
42"	4 1/2"	51"	41 1/2"	0.23 ELIP.	6:1	18'-7"	Yes	Yes	4" STD	4.500"	4.026"



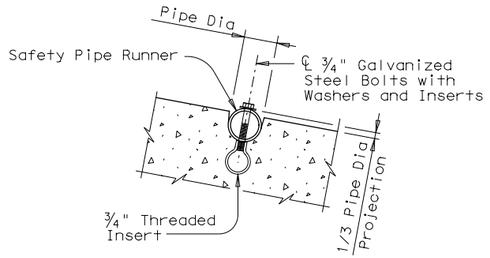
LONGITUDINAL ELEVATION - 12" THRU 24"



SECTION A-A

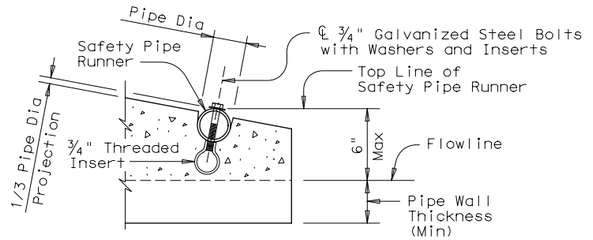


MULTIPLE PIPE INSTALLATION

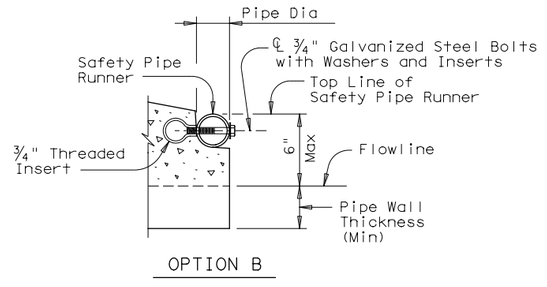


INSTALLATION DETAIL FOR SAFETY PIPE RUNNERS

(If required)



OPTION A



OPTION B

END DETAILS FOR INSTALLATION OF SAFETY PIPE RUNNERS

(If required)

GENERAL NOTES:

Precast safety end treatment for reinforced concrete pipe may be used for TYPE II end treatment as specified in Item "Safety End Treatment".

When Precast Safety End Treatment is used as a Contractor's alternate to mitered RCP, Riprap will not be required unless noted otherwise on the plans.

Synthetic fibers listed on the "Fibers for Concrete" Material Producer List (MPL) may be used in lieu of steel reinforcing in riprap concrete unless noted otherwise.

All precast concrete end sections shall be manufactured in accordance with Item "Reinforced Concrete Pipe Culverts" and in accordance with ASTM Specification C-76, Class III, Wall B for circular pipe.

Precast concrete end sections shall be provided with a spigot or bell end for compatibility to upstream or downstream end conditions with sufficient annular space to allow for mortar, cold applied asphalt joint compound or pre-formed plastic gasket material.

Methods of lifting shall be provided by the manufacturer for ease of loading, unloading and installation.

Pipe Runners are designed for a traversing load of 10,000 Lbs at yield as recommended by Research Report 280-2F, "Safety Treatment of Roadside Parallel-Drainage Structures", Texas Transportation Institute, March 1981.

Pipe Runners shall conform to the requirements of ASTM A53 (Type E or S, Grade B), ASTM A500 (Grade B), or API 5LX52.

All steel components except reinforcing, shall be galvanized after fabrication. Galvanizing damaged during transport or construction shall be repaired in accordance with the specifications.

Texas Department of Transportation

Bridge Division Standard

PRECAST SAFETY END TREATMENT

TYPE II ~ PARALLEL DRAINAGE

PSET-RP

FILE: psetrpse.dgn	DN: RLW	CK: KLR	DW: JTR	CK: GAF
©TxDOT February 2010	CONT	SECT	JOB	HIGHWAY
REVISIONS				SE INNER LP
11-10: Add note for synthetic fibers.	DIST	COUNTY		SHEET NO.
		WILLIAMSON		75

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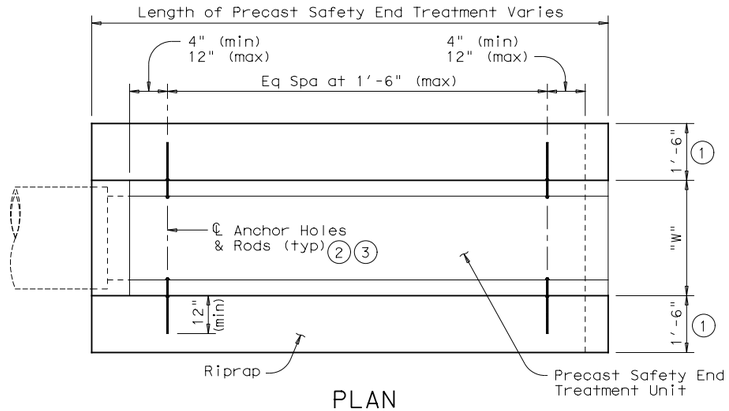
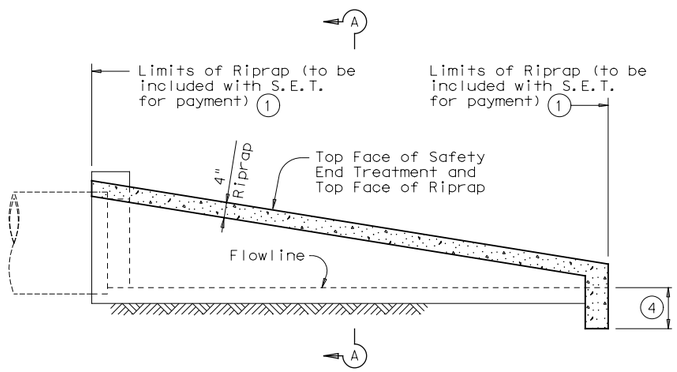
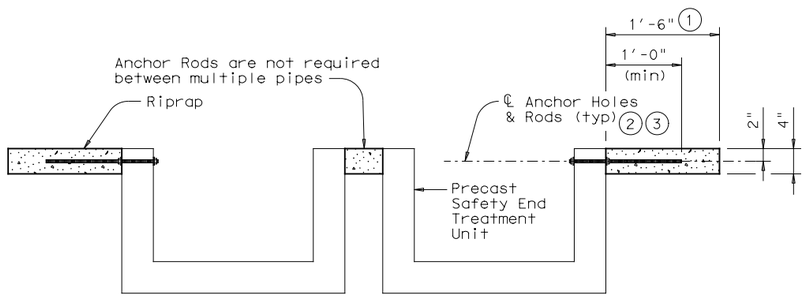


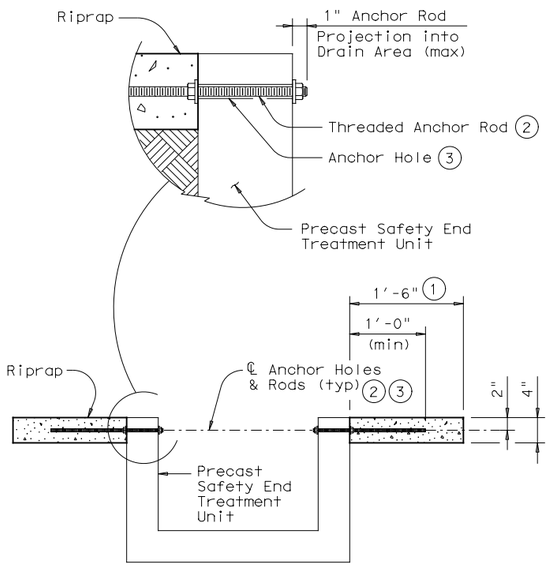
PLAN



LONGITUDINAL ELEVATION



MULTIPLE PIPE INSTALLATION



SINGLE PIPE INSTALLATION

SECTION A-A

ESTIMATED CONCRETE RIPRAP QUANTITIES (CY) 5

Nominal Culvert (Pipe) I.D.	PSET-SC & PSET-SP Standards				PSET-RC & PSET-RP Standards			
	Unit Width "W"	Side Slope			Unit Width "W"	Side Slope		
		3:1	4:1	6:1		3:1	4:1	6:1
12"	23.0"	0.1	0.2	0.2	16.0"	0.1	0.1	0.2
15"	26.5"	0.2	0.2	0.3	19.5"	0.1	0.2	0.2
18"	30.0"	0.2	0.2	0.3	23.0"	0.2	0.2	0.3
24"	37.0"	0.3	0.3	0.5	30.0"	0.2	0.3	0.4
30"	44.5"	0.3	0.4	0.6	37.0"	0.3	0.3	0.5
36"	51.5"	0.4	0.5	0.7	44.0"	0.3	0.4	0.6
42"	58.5"	0.5	0.6	0.8	51.0"	0.4	0.5	0.7

1 Riprap placed beyond the limits shown will be paid as Concrete Riprap in accordance with Item 432, "Riprap". When Riprap is cast integrally with the Precast Safety End Treatment, this dimension shall be 1'-0" minimum.

2 ½" Diam A307 Gr.A threaded Anchor Rod w/ 2 nuts & 2 washers. All components shall be galvanized in accordance with Item 445, "Galvanizing". Galvanizing that is damaged during transport or construction shall be repaired in accordance with the specifications.

3 ¾" through holes in walls of Safety End Treatment for Riprap Anchor Rods may be drilled with rotary (coring or masonry) type drilling equipment or may be formed. Percussive (star) type drilling equipment shall not be used. If holes are drilled, spalls in the inside face of the wall exceeding ½" from the holes shall be patched.

4 Provide Riprap Toe Wall when dimension is shown elsewhere in the plans or when field conditions require a Toe Wall.

5 Quantities shown are for one end of one reinforced concrete pipe culvert. For multiple pipe culverts, quantities will need to be adjusted. Riprap quantities are for Contractor's information only. Quantities are based on the minimum unit lengths shown on the Precast S.E.T. standards.

GENERAL NOTES:

Precast Safety End Treatment for reinforced concrete pipe may be used for TYPE II end treatment as specified in Item 467, "Safety End Treatment".

Riprap shall be Class "B" Riprap in accordance with Item 432, "Riprap".

Payment for Riprap and Toewalls is included in the Price Bid for each Safety End Treatment.

Synthetic fibers listed on the "Fibers for Concrete" Material Producer List (MPL) may be used in lieu of steel reinforcing in riprap concrete unless noted otherwise. The anchor rods shown are always required.

Refer to PSET-SC or PSET-SP standard sheets for details of square Safety End Treatments not shown. Refer to PSET-RC or PSET-RP standard sheets for details of round Safety End Treatments not shown.

For precast units with integrally cast Riprap, reinforcing steel in the amount on 0.26 sq in/ft minimum shall be substituted for the threaded anchor rods shown. When requested, sealed engineering drawings shall be submitted for approval prior to construction. Shop drawings will not be required. Note that a proprietary precast unit with integral Riprap is available from L&R Precast Concrete Works, Inc. (956) 583-6293 or www.lrprecast.com.

These Riprap details are only applicable when notes that require placement of Riprap with Precast Safety End Treatments are shown elsewhere in the plans.

Precast units with integrally cast Riprap shall be permitted unless noted otherwise on the plans.

Texas Department of Transportation — Bridge Division Standard

PRECAST SAFETY END TREATMENT
TYPE II
RIPRAP DETAILS
PSET-RR

FILE: psetrrse.dgn	DN: GAF	CK: TxDOT	DW: JRP	CK: GAF
©TxDOT February 2010	CONT	SECT	JOB	HIGHWAY
REVISIONS				SE INNER LP
11-10: Add note for synthetic fibers.	DIST	COUNTY		SHEET NO.
		WILLIAMSON		76

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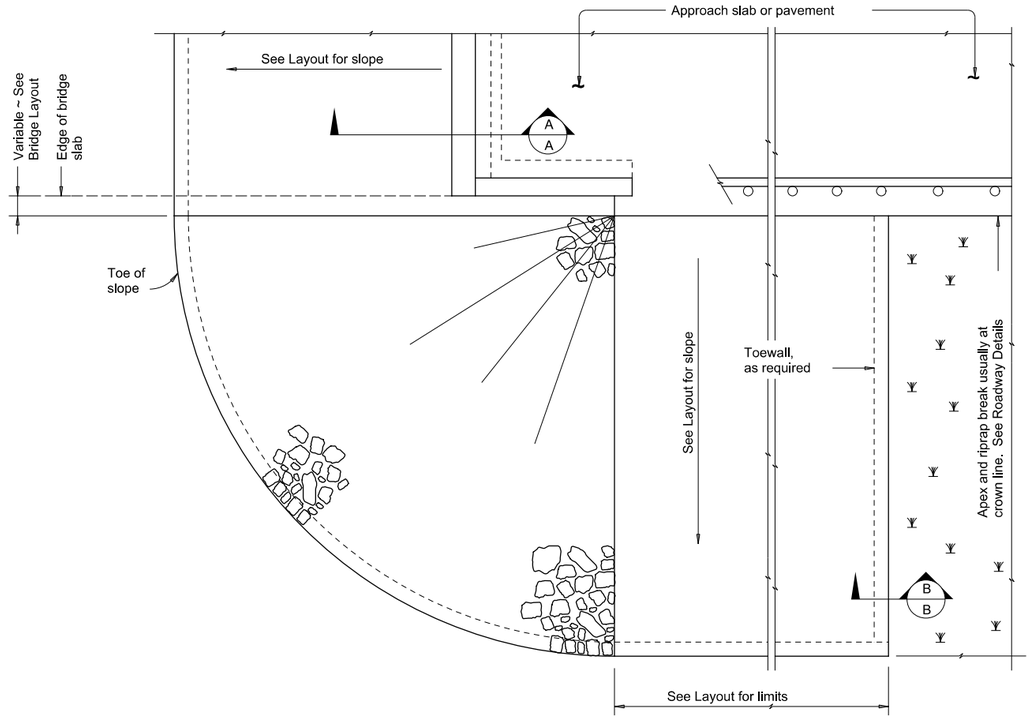
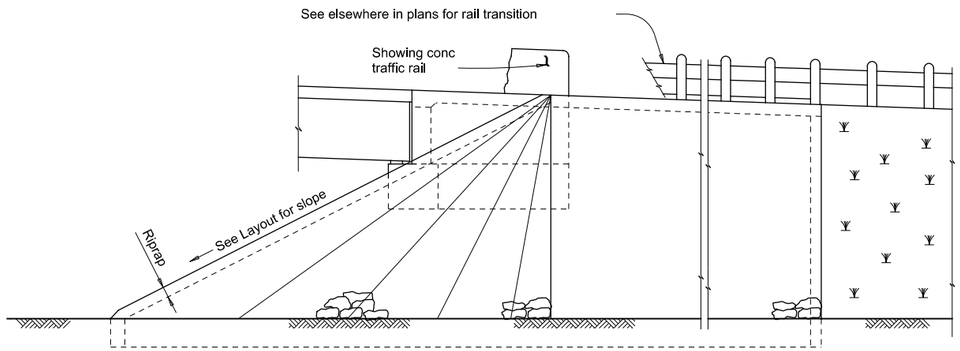
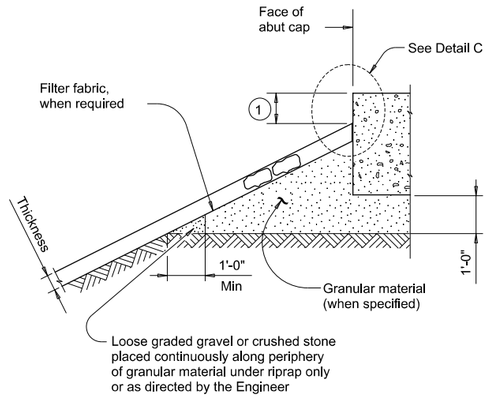


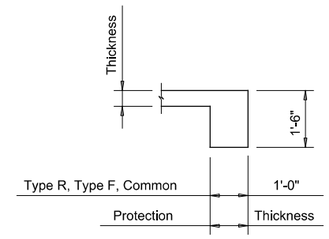
PLAN



ELEVATION

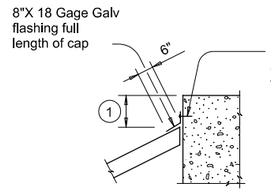


SECTION A-A AT CAP

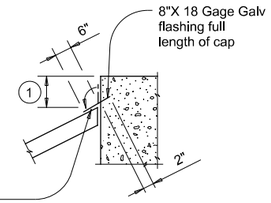


SECTION B-B

Provide toewall when shoulder drain is located adjacent to limits of stone riprap. Omit toewall when thickness of protection riprap is greater than 18".



CAP OPTION A



CAP OPTION B

DETAIL C

(1) Top of cap to top of riprap dimension varies as directed by the Engineer. Provide 9" Min for beam/slab type bridges and 1'-6" for slab span, box beam, or slab beam bridges.

GENERAL NOTES:
Refer to Item 432, "Riprap" for stone size and gradation, and construction details. See Layout for limits and thickness of riprap specified.
See elsewhere in plans for locations and details of shoulder drains.

SHEET 1 OF 2

Texas Department of Transportation | Bridge Division Standard

STONE RIPRAP

SRR

FILE: srrstde1.dgn	DN: AES	CK: JGD	DW: BWH	CK: AES
©TxDOT January 2015	CONT	SECT	JOB	HIGHWAY
REVISIONS				SE INNER LP
	DIST	COUNTY		SHEET NO.
		WILLIAMSON		77

DATE: 6/23/2017 3:11
FILE: pw://rtg-pw.bentley.com:rtg-pw/Documents/8760101/dlv/standards/Drainage/SRR.dgn

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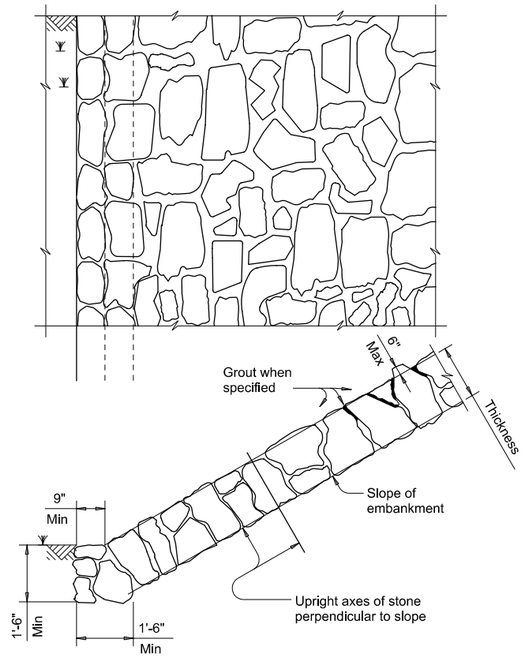

FIGURE 1 ~ TYPE R STONE RIPRAP

dry or grouted

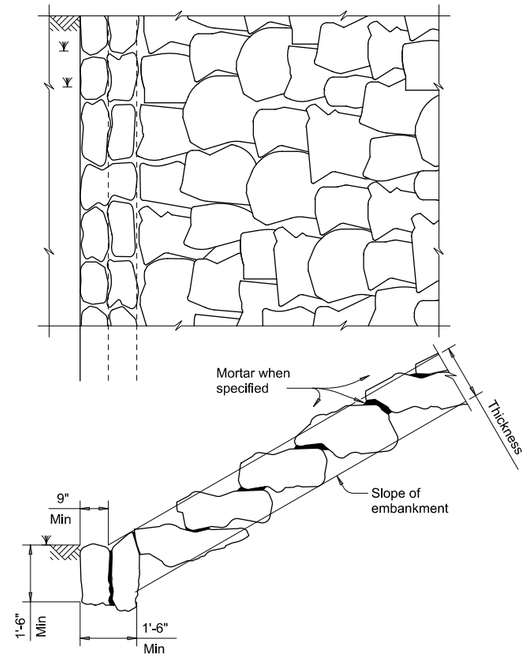

FIGURE 2 ~ TYPE F STONE RIPRAP

dry or mortared

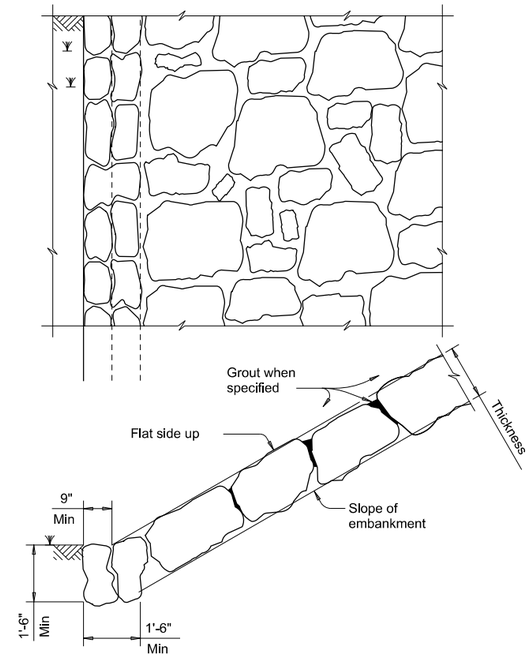

FIGURE 3 ~ TYPE F STONE RIPRAP

grouted

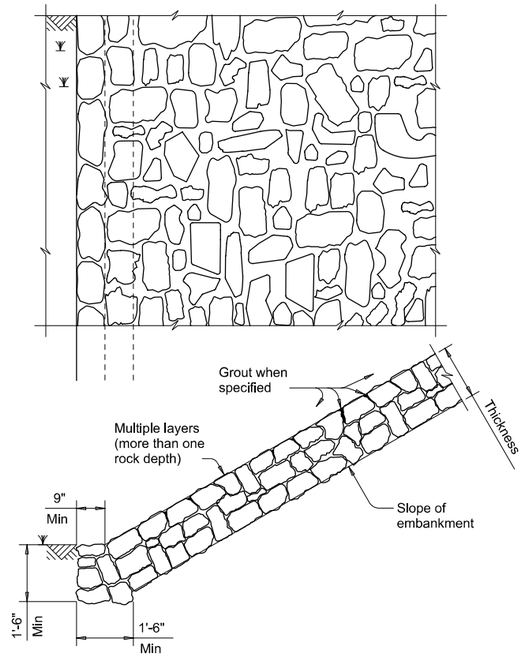

FIGURE 4 ~ COMMON STONE RIPRAP

dry or grouted

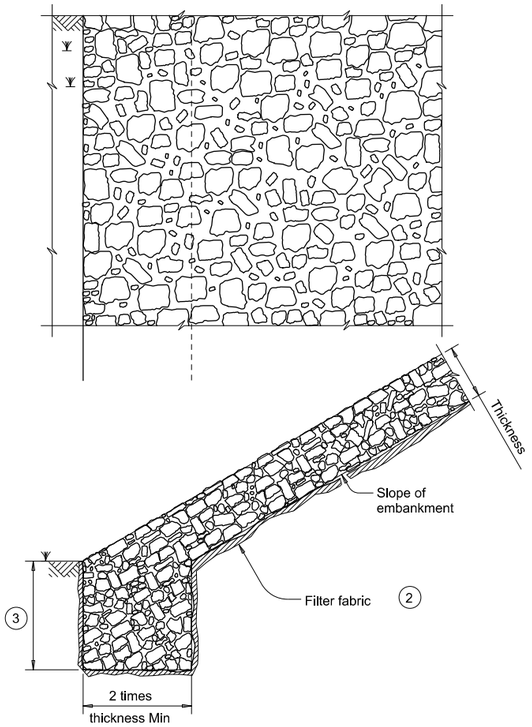

FIGURE 5 ~ PROTECTION STONE RIPRAP

(2) Provide bedding material instead of filter fabric if shown elsewhere in plans. See Layout for thickness of bedding material.

(3) Minimum toe depth is the larger of the maximum scour depth or 2 times the riprap thickness.

SHEET 2 OF 2

Texas Department of Transportation

Bridge Division Standard

STONE RIPRAP

SRR

FILE: srrstde1.dgn	DN: AES	CK: JGD	DW: BWH	CK: AES
©TxDOT January 2015	CONT	SECT	JOB	HIGHWAY
REVISIONS				SE INNER LP
	DIST	COUNTY		SHEET NO.
		WILLIAMSON		78

DATE: 6/23/2017 3:11
FILE: pw://rtg-pw.bentley.com:rtg-pw/Documents/8760101/dlv/standards/Drainage/SRR.dgn

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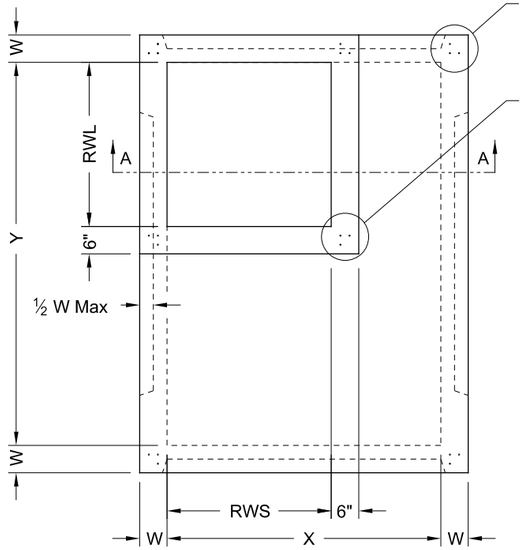
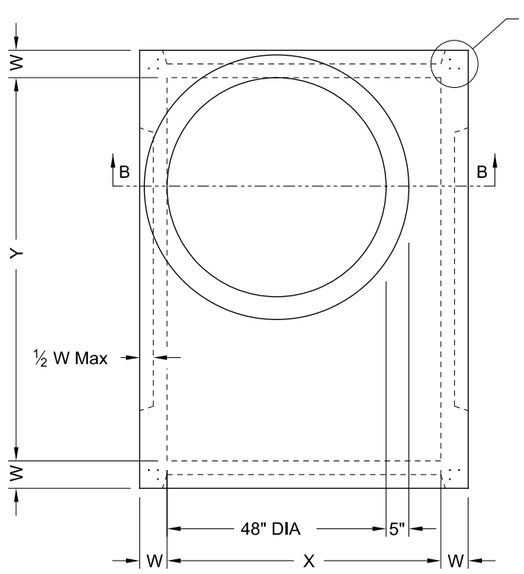


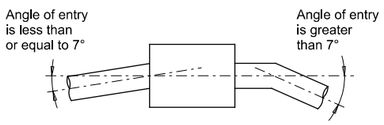
PLAN VIEW "A"

SQUARE REDUCED RISER OPTION



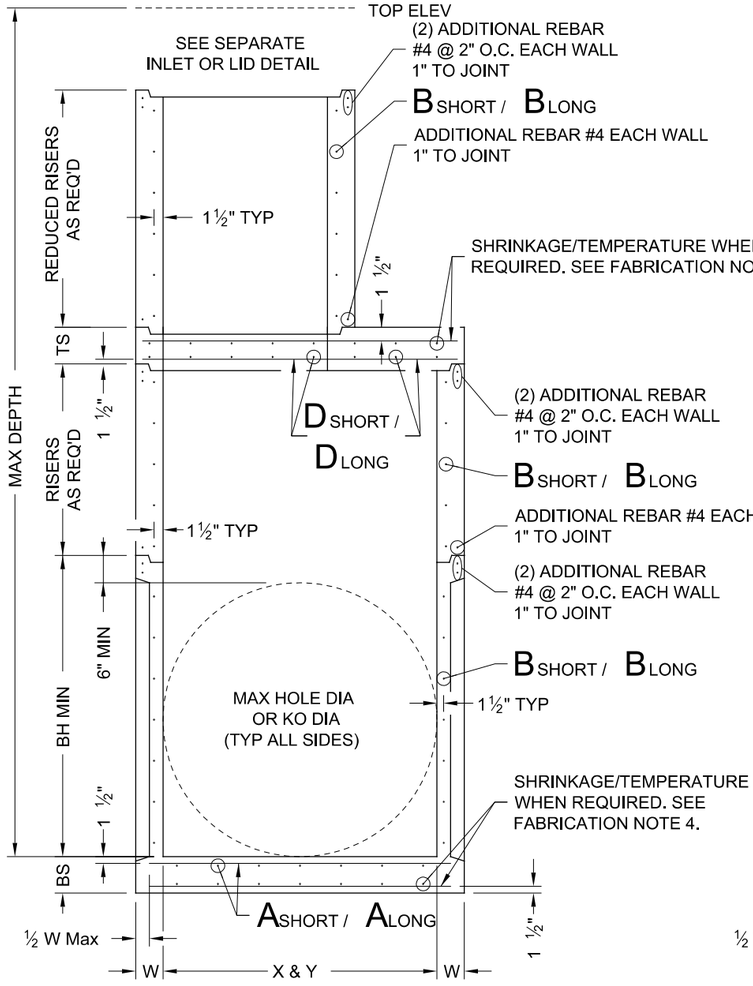
PLAN VIEW "B"

ROUND REDUCED RISER OPTION



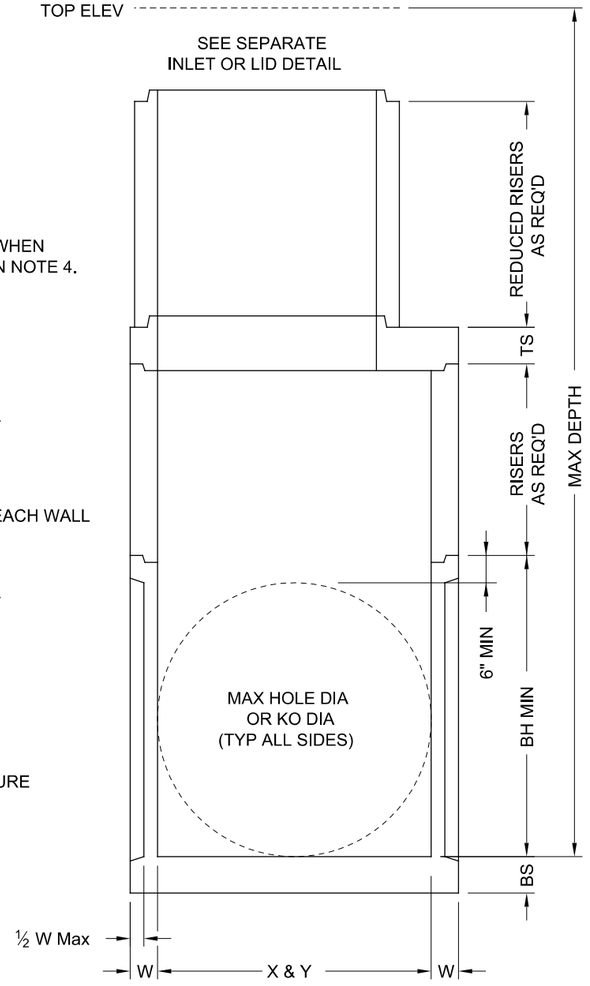
PIPE CONNECTION DETAIL

Connect pipes within 7° of normal to PB wall.
If necessary, use pipe elbow or curved approach alignment to stay within this limit.



SECTION A-A

SQUARE REDUCED RISER OPTION



SECTION B-B

ROUND REDUCED RISER OPTION

FABRICATION NOTES:

1. Provide Class "H" concrete in accordance with Item 421 and having a minimum compressive strength of 5,000 psi.
2. Provide Grade 60 reinforcing steel or equivalent area of WWR.
3. Provide typical clear cover of 1 ½" to reinforcing steel at interior or exterior walls.
4. Walls or slabs with a thickness of 8" or greater require shrinkage and temperature reinforcing steel. Provide steel area = 0.11 in²/ft each way.
5. No substitution is allowed for vertical and horizontal #4 bars in corners.
6. Manufacture base and risers to nearest 3" increment.
7. Design tongue and groove joints for full closure on both shoulders. Minimum spigot depth is ¾".
8. Provide lifting devices in conformance with Manufacturer's recommendations.
9. See sheet PDD for sizes, dimensions, and reinforcing steel not shown.

INSTALLATION NOTES:

1. Inverts (benching) to be provided by Contractor. Concrete or mortar used for invert is subsidiary to specified inlet or manhole.
2. Seal tongue and groove joints with preformed or bulk mastic in conformance with Manufacturer's recommendations. Tongue and groove joints may be grouted no more than 1" between each section, or ½ the joint depth, whichever is greater.
3. Do not grout rubber gasket joints without Manufacturer's recommendation.
4. For rigid pipe, cut hole in thin wall panel (KO) 4" Max, 2" Min larger than pipe OD.
5. For flexible pipe, consult boot/seal Manufacturer's specification for placement tolerance and hole size. Center pipe in hole and install boot/seal per Manufacturer's specification.

GENERAL NOTES:

1. Precast Base consists of base slab, base unit, risers (as required), reducing slab (as required), and reduced risers (as required). See sheet PDD for sizes.
2. Designed according to ASTM C913.
3. Payment for precast base is subsidiary to the specified inlet, per Item 465, "Junction Boxes, Manholes, and Inlets."

Cover dimensions are clear dimensions, unless noted otherwise.

HL93 LOADING

Texas Department of Transportation

Bridge Division Standard

PRECAST BASE

PB

FILE: prestd01.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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REVISIONS				SE INNER LP
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		WILLIAMSON		7/9

DATE: 6/23/2017 3:11
FILE: pw://rtg-pw.bentley.com:rtg-pw/Documents/8760101/dlv/standards/Drainage/PB.dgn

	Size	MAX DEPTH = 15 ft. to top of BASE SLAB										MAX DEPTH = 25 ft. to top of BASE SLAB										Min Height (See Gen Note 3)	Max HOLE DIA (See Fab Note 2)	Max KO DIA (See Fab Note 2)
		Base Slab			Base Unit or Riser Walls			Below Grade Slab (w/PJB) Reducing Slab (w/PB)				Base Slab			Base Unit or Riser Walls			Below Grade Slab (w/PJB) Reducing Slab (w/PB)						
		Short Span Reinf Steel Area	Long Span Reinf Steel Area	Thickness	Short Span Reinf Steel Area	Long Span Reinf Steel Area	Thickness	Reduced Riser Size	Short Span Reinf Steel Area	Long Span Reinf Steel Area	Thickness	Short Span Reinf Steel Area	Long Span Reinf Steel Area	Thickness	Short Span Reinf Steel Area	Long Span Reinf Steel Area	Thickness	Reduced Riser Size	Short Span Reinf Steel Area	Long Span Reinf Steel Area	Thickness			
	X x Y	Ashort	Along	BS	Bshort	Blong	W	RWSxRWL or ID	Dshort	Dlong	TS	Ashort	Along	BS	Bshort	Blong	W	RWSxRWL or ID	Dshort	Dlong	TS	BH MIN	HOLE DIA	KO DIA
	ft.	in^2/ft	in^2/ft	in.	in^2/ft	in^2/ft	in.	ft. **	in^2/ft	in^2/ft	in.	in^2/ft	in^2/ft	in.	in^2/ft	in^2/ft	in.	ft. **	in^2/ft	in^2/ft	in.	ft.	in.	in.
Precast Junction Box (PJB)	3x3	0.23	0.23	6	0.19	0.19	6	N/A	0.37	0.37	9	0.29	0.29	6	0.24	0.24	6	N/A	0.37	0.37	9	3.5	36	36
	4x4	0.29	0.29	6	0.24	0.24	6	N/A	0.41	0.41	9	0.47	0.47	6	0.38	0.38	6	N/A	0.41	0.41	9	4.5	48	48
	3x5	0.29	0.18	6	0.19	0.35	6	N/A	0.48	0.48	9	0.39	0.18	6	0.23	0.59	6	N/A	0.48	0.48	9	3.5	36/60	36/60
	4x5	0.36	0.18	6	0.22	0.34	6	N/A	0.42	0.42	9	0.53	0.26	6	0.39	0.59	6	N/A	0.42	0.42	9	4.5	48/60	48/60
	5x5	0.36	0.36	6	0.34	0.34	6	N/A	0.43	0.43	9	0.62	0.62	6	0.59	0.59	6	N/A	0.43	0.43	9	5.5	60	60
	5x6	0.27	0.27	9	0.34	0.45	6	N/A	0.48	0.48	9	0.47	0.45	9	0.38	0.54	8	N/A	0.48	0.48	9	5.5	60/72	60/72
	6x6	0.27	0.27	9	0.45	0.45	6	N/A	0.56	0.56	9	0.52	0.52	9	0.54	0.54	8	N/A	0.56	0.56	9	6.5	72	72
	8x8	0.46	0.46	9	0.51	0.51	8	N/A	0.45	0.45	12	0.87	0.87	9	0.59	0.59	10	N/A	0.45	0.45	12	8.5	96	72
Precast Base (PB)	3x3	0.23	0.23	6	0.19	0.19	6	N/A	N/A	N/A	N/A	0.29	0.29	6	0.24	0.24	6	N/A	N/A	N/A	N/A	3.5	36	36
	4x4	0.29	0.29	6	0.24	0.24	6	N/A	N/A	N/A	N/A	0.47	0.47	6	0.38	0.38	6	N/A	N/A	N/A	N/A	4.5	48	48
	3x5	0.29	0.18	6	0.19	0.35	6	3x3	0.30	0.34	9	0.39	0.18	6	0.23	0.59	6	3x3	0.40	0.40	9	3.5	36/60	36/60
	4x5	0.36	0.18	6	0.22	0.34	6	3x3	0.30	0.30	9	0.53	0.26	6	0.39	0.59	6	3x3	0.46	0.37	9	4.5	48/60	48/60
	4x5	0.36	0.18	6	0.22	0.34	6	4x4	0.30	0.30	9	0.53	0.26	6	0.39	0.59	6	4x4	0.39	0.39	9	4.5	48/60	48/60
	4x5	0.36	0.18	6	0.22	0.34	6	48"	0.39	0.39	9	0.53	0.26	6	0.39	0.59	6	48"	0.47	0.47	9	4.5	48/60	48/60
	4x5	0.36	0.18	6	0.22	0.34	6	3x5	0.33	0.40	9	0.53	0.26	6	0.39	0.59	6	3x5	0.48	0.48	9	4.5	48/60	48/60
	5x5	0.36	0.36	6	0.34	0.34	6	3x3	0.34	0.34	9	0.62	0.62	6	0.59	0.59	6	3x3	0.53	0.53	9	5.5	60	60
	5x5	0.36	0.36	6	0.34	0.34	6	4x4	0.36	0.36	9	0.62	0.62	6	0.59	0.59	6	4x4	0.64	0.64	9	5.5	60	60
	5x5	0.38	0.38	6	0.34	0.34	6	48"	0.36	0.36	9	0.62	0.62	6	0.59	0.59	6	48"	0.64	0.64	9	5.5	60	60
	5x5	0.36	0.36	6	0.34	0.34	6	3x5	0.34	0.40	9	0.62	0.62	6	0.59	0.59	6	3x5	0.53	0.53	9	5.5	60	60
	5x6	0.31	0.31	9	0.34	0.45	6	3x3	0.34	0.34	9	0.47	0.45	9	0.38	0.54	8	3x3	0.61	0.50	9	5.5	60/72	60/72
	5x6	0.27	0.27	9	0.34	0.45	6	4x4	0.36	0.45	9	0.47	0.45	9	0.38	0.54	8	4x4	0.74	0.57	9	5.5	60/72	60/72
	5x6	0.29	0.29	9	0.34	0.45	6	48"	0.36	0.45	9	0.47	0.45	9	0.38	0.54	8	48"	0.74	0.57	9	5.5	60/72	60/72
	5x6	0.29	0.29	9	0.34	0.45	6	3x5	0.45	0.45	9	0.47	0.45	9	0.38	0.54	8	3x5	0.61	0.61	9	5.5	60/72	60/72
	6x6	0.29	0.29	9	0.45	0.45	6	3x3	0.41	0.41	9	0.52	0.52	9	0.54	0.54	8	3x3	0.74	0.74	9	6.5	72	72
	6x6	0.27	0.27	9	0.45	0.45	6	4x4	0.45	0.45	9	0.52	0.52	9	0.54	0.54	8	4x4	0.87	0.87	9	6.5	72	72
	6x6	0.29	0.29	9	0.45	0.45	6	48"	0.45	0.45	9	0.52	0.52	9	0.54	0.54	8	48"	0.87	0.87	9	6.5	72	72
	6x6	0.29	0.29	9	0.45	0.45	6	3x5	0.45	0.45	9	0.52	0.52	9	0.54	0.54	8	3x5	0.87	0.87	9	6.5	72	72
	8x8	0.52	0.52	9	0.51	0.51	8	3x3	0.61	0.61	12	0.91	0.91	9	0.70	0.70	10	3x3	0.85	0.85	12	8.5	96	72
	8x8	0.52	0.52	9	0.51	0.51	8	4x4	0.70	0.70	12	0.87	0.87	9	0.70	0.70	10	4x4	1.01	1.01	12	8.5	96	72
	8x8	0.52	0.52	9	0.51	0.51	8	48"	0.70	0.70	12	0.87	0.87	9	0.70	0.70	10	48"	1.01	1.01	12	8.5	96	72
	8x8	0.52	0.52	9	0.51	0.51	8	3x5	0.70	0.85	12	0.87	0.87	9	0.70	0.70	10	3x5	1.01	1.01	12	8.5	96	72

** Unless otherwise indicated.

FABRICATION NOTES:
1. Maximum spacing of reinforcement is 8".
2. At manufacturer's option, provide cast or cored holes or thin wall panels (KO) to the maximum diameter shown for each. When no penetration is required, it is acceptable to provide a wall with no sectional reduction.

GENERAL NOTES:
1. Precast Junction Box consists of base slab, base unit, risers (as required), and below grade slab. See sheet PJB for details.
2. Precast Base consists of base slab, base unit, risers (as required), reducing slab (as required), and reduced risers (as required). See sheet PB for details.
3. Min Height shown is for stock base units. Use stock base units whenever practical. Smaller height base units can be used in special installation circumstances, when noted elsewhere in the plans. Absolute minimum height of base units is 2'-6".

HL93 LOADING

Texas Department of Transportation

Bridge Division Standard

DESIGN DATA FOR PRECAST BASE AND JUNCTION BOX

PDD

FILE: prestd10.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT January 2015	CONT	SECT	JOB	HIGHWAY
REVISIONS				SE INNER LP
	DIST	COUNTY		SHEET NO.
		WILLIAMSON		80

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DATE: 6/23/2017 3:11
FILE: pw://rtg-pw.bentley.com:rtg-pw/Documents/8760101/dlv/standards/Drainage/PDD.dgn

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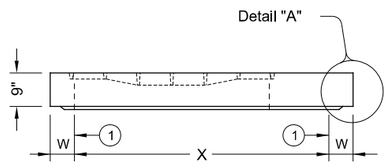
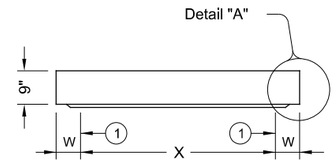
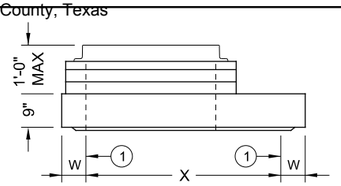


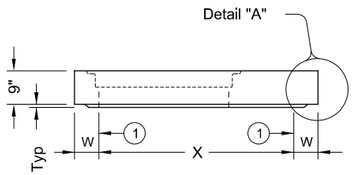
STYLE 'FG'



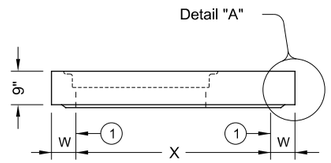
ELEVATION VIEW



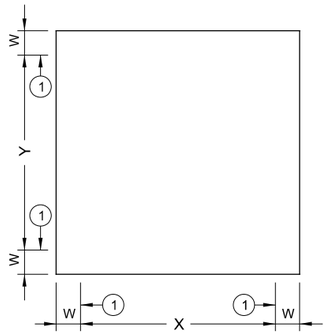
ELEVATION VIEW



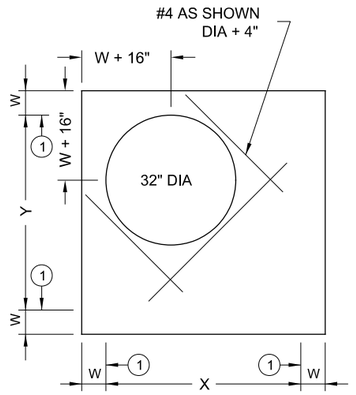
ELEVATION VIEW



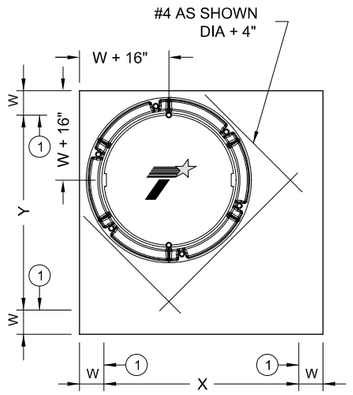
ELEVATION VIEW



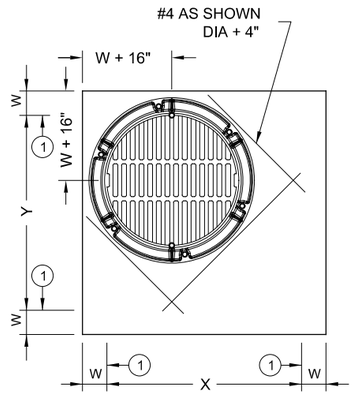
PLAN VIEW
NO OPENINGS
STYLE 'SL'



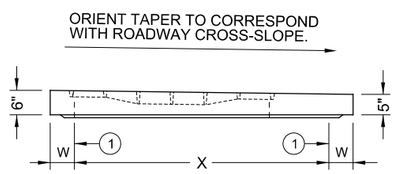
PLAN VIEW
SHIP LOOSE RING & COVER
STYLE 'RH'



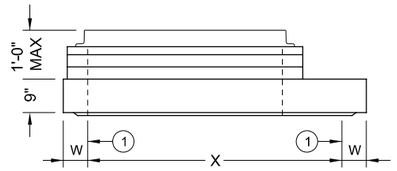
PLAN VIEW
32" DIA CAST-IN RING & COVER
STYLE 'RC'



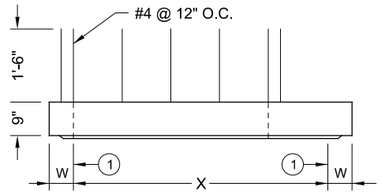
PLAN VIEW
32" DIA CAST-IN RING & GRATE
STYLE 'RG'



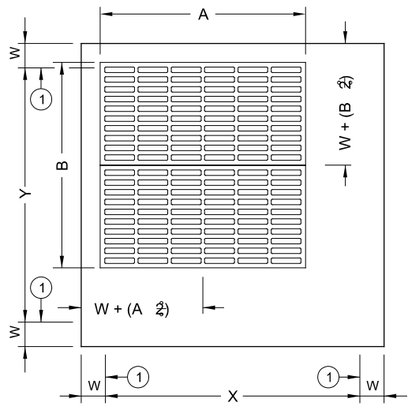
STYLE 'SFG'
ELEVATION VIEW



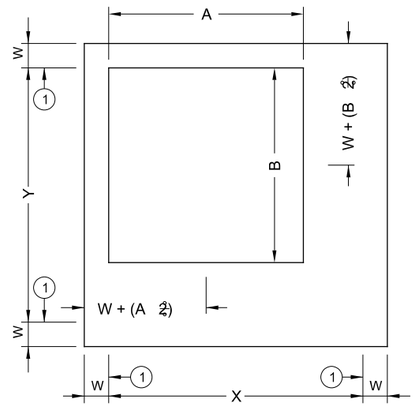
ELEVATION VIEW



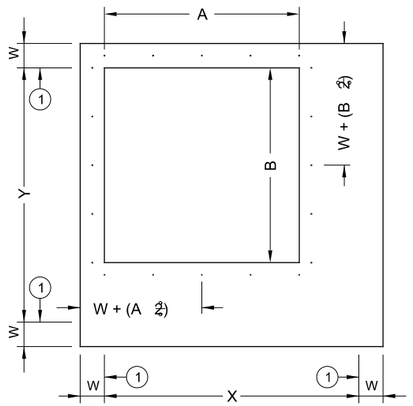
ELEVATION VIEW



PLAN VIEW
CAST-IN FRAME & GRATE
STYLES 'FG' & 'SFG'



PLAN VIEW
SHIP LOOSE FRAME & GRATE
STYLE 'SH'



PLAN VIEW
EXPOSED REBAR
STYLE 'S1'

(1) Matches inside face of wall of precast base or riser below inlet.

HL93 LOADING SHEET 1 OF 2

Texas Department of Transportation

Bridge Division Standard

PRECAST SLAB LID

PSL

FILE: prestd05.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT January 2015	CONT	SECT	JOB	HIGHWAY
REVISIONS				SE INNER LP
	DIST	COUNTY		SHEET NO.
		WILLIAMSON		21

DATE: 6/23/2017 3:11
FILE: pw://rtg-pw.bentley.com:rtg-pw/Documents/8760101/dlv/standards/Drainage/PSL.dgn

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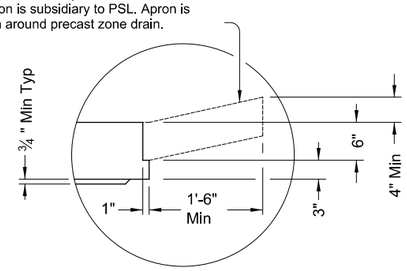
Style	Size (X x Y)	W (2)	A x B (nominal)	Short Span Reinf Steel Area	Long Span Reinf Steel Area
SL	3'x3'	6"	n/a	0.37 in□/ft	0.37 in□/ft
RH,RC,RG,SH,S1,FG	3'x3'	6"	3'x3' or 32" Dia	0.37 in□/ft	0.37 in□/ft
SFG	3'x3'	6"	3'x3'	0.32 in□/ft	0.32 in□/ft
SL	4'x4'	6"	n/a	0.34 in□/ft	0.34 in□/ft
RH,RC,RG,SH,S1,FG	4'x4'	6"	3'x3' or 32" Dia	0.41 in□/ft	0.41 in□/ft
SH,S1,FG	4'x4'	6"	4'x4'	0.41 in□/ft	0.41 in□/ft
SFG	4'x4'	6"	4'x4'	0.32 in□/ft	0.32 in□/ft
SL	3'x5'	6"	n/a	0.39 in□/ft	0.39 in□/ft
RH,RC,RG,SH,S1,FG	3'x5'	6"	3'x3' or 32" Dia	0.48 in□/ft	0.48 in□/ft
SH,S1,FG	3'x5'	6"	3'x5'	0.48 in□/ft	0.48 in□/ft
SFG	3'x5'	6"	3'x5'	0.32 in□/ft	0.32 in□/ft
SL	4'x5'	6"	n/a	0.42 in□/ft	0.42 in□/ft
RH,RC,RG,SH,S1,FG	4'x5'	6"	3'x3' or 32" Dia	0.42 in□/ft	0.42 in□/ft
SH,S1,FG	4'x5'	6"	4'x4'	0.63 in□/ft	0.63 in□/ft
SH,S1,FG	4'x5'	6"	3'x5'	0.66 in□/ft	0.66 in□/ft
SL	5'x5'	6"	n/a	0.36 in□/ft	0.36 in□/ft
RH,RC,RG,SH,S1,FG	5'x5'	6"	3'x3' or 32" Dia	0.43 in□/ft	0.43 in□/ft
SH,S1,FG	5'x5'	6"	4'x4'	0.63 in□/ft	0.63 in□/ft
SH,S1,FG	5'x5'	6"	3'x5'	0.63 in□/ft	0.63 in□/ft
SL	5'x6'	6"/8"	n/a	0.48 in□/ft	0.48 in□/ft
RH,RC,RG,SH,S1,FG	5'x6'	6"/8"	3'x3' or 32" Dia	0.48 in□/ft	0.48 in□/ft
SH,S1,FG	5'x6'	6"/8"	4'x4'	0.60 in□/ft	0.60 in□/ft
SH,S1,FG	5'x6'	6"/8"	3'x5'	0.60 in□/ft	0.60 in□/ft
SL	6'x6'	6"/8"	n/a	0.43 in□/ft	0.43 in□/ft
RH,RC,RG,SH,S1,FG	6'x6'	6"/8"	3'x3' or 32" Dia	0.56 in□/ft	0.56 in□/ft
SH,S1,FG	6'x6'	6"/8"	4'x4'	0.56 in□/ft	0.56 in□/ft
SH,S1,FG	6'x6'	6"/8"	3'x5'	0.59 in□/ft	0.59 in□/ft
SL	8'x8'	8"/10"	n/a	0.45 in□/ft	0.45 in□/ft
RH,RC,RG,SH,S1,FG	8'x8'	8"/10"	3'x3' or 32" Dia	0.45 in□/ft	0.45 in□/ft
SH,S1,FG	8'x8'	8"/10"	4'x4'	0.45 in□/ft	0.45 in□/ft
SH,S1,FG	8'x8'	8"/10"	3'x5'	0.45 in□/ft	0.45 in□/ft

(2) See sheet PDD for corresponding wall thickness (W) of base unit or riser.

Construct cast-in-place reinforced concrete apron, when shown elsewhere in plans. Use Class "A" concrete. Apron is subsidiary to PSL. Apron is 1'-6" Min width around precast zone drain.



DETAIL "A"

(Reinforcing not shown for clarity)

When an apron is to be cast around PSL, use detail above to create an apron ledge on all 4 sides.

FABRICATION NOTES:

1. Locate penetration (Style 'RH'), ring and cover (Style 'RC'), ring and grate (Style 'RG'), and frame and grate (Style 'FG') in a corner. Only one penetration is allowed per slab lid.
2. Provide Class "H" concrete in accordance with Item 421 and having a minimum compressive strength of 5,000 psi.
3. Provide Grade 60 reinforcing steel or equivalent area of WWR.
4. Provide clear cover of ¾" to reinforcing from lower outside shoulder of slab for structural reinforcement, and 2" from top of slab for shrinkage and temperature reinforcement. Place short span reinforcing closest to surface.
5. Slabs with a thickness of 8" or greater require shrinkage and temperature reinforcing. Provide steel area = 0.11 in²/ft each way.
6. No substitution is allowed for diagonal #4 bars around openings.
7. Design tongue and groove joints for full closure on both shoulders. Minimum spigot depth is ¾".
8. Provide lifting devices in conformance with Manufacturer's recommendations.

INSTALLATION NOTES:

1. Precast slab lids are intended for direct traffic and may be placed in roadway.
2. Seal tongue and groove joints with preformed or bulk mastic in conformance with Manufacturer's recommendations. Tongue and groove joints may be grouted no more than 1" between each section, or ½ the joint depth, whichever is greater.
3. Do not grout rubber gasket joints without Manufacturer's recommendation.
4. Initial installation of grade adjustment rings for Styles 'RH' and 'SH' is limited to 1'-0" Max as shown.
5. Grade adjustment rings for Styles 'RH' and 'SH' may be increased to 2'-0" Max when future construction affects final grade of structure. Make adjustments greater than 2'-0" with additional risers. Adjustments can be made up to Max depth shown on sheet PDD. Structure must be evaluated if Max depth will be exceeded.
6. Orient long dimension of grate slots perpendicular to traffic, unless noted otherwise on plans

GENERAL NOTES:

1. Designed according to ASTM C913.
2. Payment for lid is per Item 465, "Junction Boxes, Manholes, and Inlets" by type, style, size, and opening size (when applicable).

Cover dimensions are clear dimensions, unless noted otherwise.

HL93 LOADING SHEET 2 OF 2

Texas Department of Transportation | Bridge Division Standard

PRECAST SLAB LID

PSL

FILE: prestd05.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT January 2015	CONT	SECT	JOB	HIGHWAY
REVISIONS				SE INNER LP
	DIST	COUNTY		SHEET NO.
		WILLIAMSON		83

DATE: 6/23/2017 3:11
FILE: pw://rtg-pw.bentley.com:rtg-pw/Documents/8760101/div/standards/Drainage/PSL.dgn

A.2
BATCH DETENTION OUTLET STRUCTURE
SEE ELECTRICAL PLAN FOR VALVE LAYOUT
TY PJB(RC)(6'x6')
STA 92+51.30
OFF -187.62
TOP 756.04
6" ℄ 749.24

A.3
48" PRM
STA 92+40.41
OFF -192.57
6" ℄ 749.19

A.4
OVERFLOW WEIR
TY PAZD(RC)(4'x4')
STA 92+68.16
OFF -191.96

A.5
48" PRM
STA 92+43.35
OFF -200.81

A.OUT
24" 3:1 SET
STA 92+13.28
OFF -211.53

POINT NO	NORTHING	EASTING	ELEVATION	DESCRIPTION
A100	10198323.89	3138479.14	751.03	TOE
A101	10198295.76	3138506.32	751.05	TOE
A103	10198288.86	3138422.90	750.38	TOE
A104	10198259.93	3138417.43	749.86	TOE
A106	10198237.65	3138467.27	750.40	TOE
A107	10198236.85	3138434.64	749.82	TOE
A109	10198249.97	3138475.55	750.63	TOE
A110	10198263.67	3138471.37	750.45	TOE
A111	10198273.48	3138478.37	750.57	TOE
A112	10198270.64	3138489.43	750.80	TOE
A113	10198224.48	3138418.03	755.00	TOP
A114	10198211.30	3138461.89	755.00	TOP
A116	10198304.57	3138413.12	755.00	TOP
A117	10198247.65	3138400.95	755.00	TOP
A119	10198337.37	3138470.75	755.00	TOP
A120	10198342.25	3138490.12	755.00	TOP
A122	10198307.51	3138525.24	755.00	TOP
A123	10198286.95	3138519.43	755.00	TOP
A125	10198180.20	3138506.78	755.00	TOP
A126	10198189.78	3138500.62	755.00	TOP
A128	10198188.22	3138498.87	755.00	TOP
A130	10198205.59	3138475.15	755.00	TOP
A132	10198220.41	3138476.80	755.00	TOP
A133	10198229.24	3138483.70	755.00	TOP
A135	10198213.25	3138476.85	755.00	TOP
A136	10198209.31	3138480.19	755.00	TOP
A137	10198235.64	3138408.92	755.00	TOP
A138	10198341.56	3138517.64	755.00	TOP
A139	10198332.76	3138525.80	755.00	TOP
A140	10198238.91	3138489.69	755.00	TOP
A141	10198245.92	3138492.09	755.00	TOP
A142	10198256.19	3138498.56	755.00	TOP
A143	10198257.20	3138502.09	755.00	TOP
A144	10198259.66	3138502.53	755.00	TOP
A145	10198111.19	3138494.50	756.82	CHAN
A146	10198162.90	3138508.39	755.45	CHAN
A147	10198188.53	3138500.33	754.73	CHAN
A149	10198112.65	3138490.70	757.40	CHAN
A150	10198162.97	3138502.06	757.79	CHAN
A151	10198182.27	3138509.13	755.50	CHAN
A153	10198202.74	3138465.59	757.00	CHAN
A154	10198180.34	3138495.64	757.00	CHAN
A155	10198198.73	3138462.59	757.00	CHAN
A156	10198173.69	3138496.19	757.00	CHAN
A157	10198210.29	3138474.43	754.16	CHAN
A158	10198232.03	3138459.53	750.27	CHAN

0 20 40
SCALE IN FEET

LEGEND

- EXIST R.O.W.
- EXIST EASEMENT
- EXIST CONTOURS
- EXIST E.O.P.
- PROP R.O.W.
- PROP CONTOURS
- PROP E.O.P.
- PROP DITCH FLOWLINE
- TOE OF SLOPE
- POND TOP
- MAINTENANCE ACCESS
- FEMA ZONE A

NOTES:

1. REFERENCE DRAINAGE AREA MAPS FOR CONTRIBUTING AREA TO PONDS.
2. THE POND ACCESS PATH WILL NOT BE PAVED. ONLY A CLEAR GRADED AND STABILIZED PATH IS REQUIRED. SEE HORIZONTAL ALIGNMENT DATA SHEET FOR ADDITIONAL INFORMATION.
3. THE ELEVATION FOR POINT A137 IS FOR FINISHED GRADE.

STATE OF TEXAS
VICTORIA M. ORTEGA
113096
LICENSED PROFESSIONAL ENGINEER
Victoria M. Ortega 6/23/2017

NO.	REVISION	BY	DATE

WILLIAMSON COUNTY
1848

K·FRIESE + ASSOCIATES
PUBLIC PROJECT ENGINEERING
FIRM #6535

GEORGETOWN INNER LOOP

WATER QUALITY POND LAYOUT POND A

6/23/2017 SHEET 1 OF

DESIGNED:	PROJECT NUMBER		ROADWAY	
CHECKED:			SE INNER LOOP	
DRAWN:	STATE	COUNTY	CITY	SHEET No.
CHECKED:	TEXAS	WILLIAMSON	GEORGETOWN	83

Williamson County, Texas

$USER$
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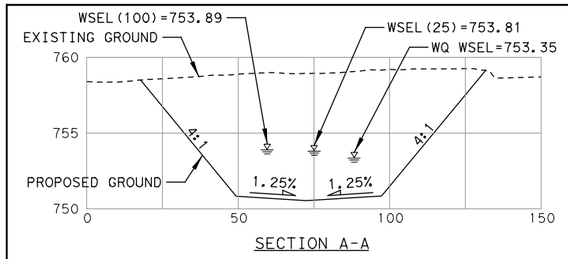
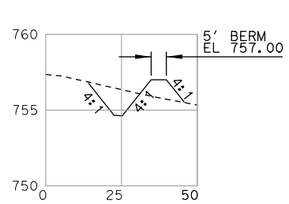
7/18/2017 9:58 AM



SECTION A-A



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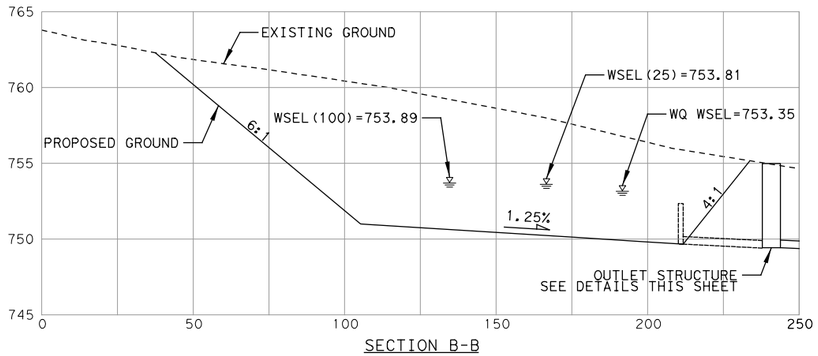

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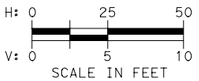


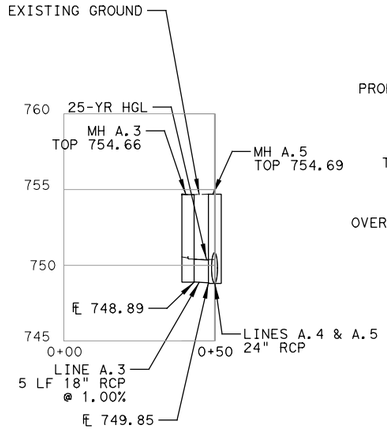
SCALE IN FEET

REQUIRED VOLUME = 15,234 CF
REQUIRED VOLUME(ULT) = 20,608 CF
PROVIDED VOLUME = 20,951 CF

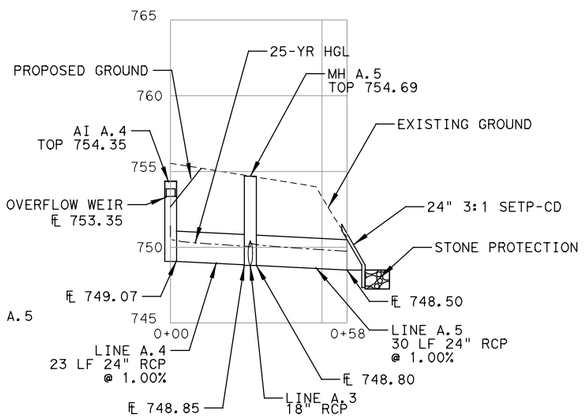
	ELEVATION FT	AREA SF	AREA AC	VOLUME CF	CUM. VOL. CF
	749.70	0	0.00	0	0
	750.00	744	0.02	112	112
	751.00	5,702	0.13	3,223	3,335
	752.00	7,256	0.17	6,479	9,814
WQ REQUIRED	752.68	8,249	-	-	15,234
	753.00	8,720	0.20	7,988	17,801
WQ REQUIRED (ULT)	753.30	9,187	-	-	20,608
WQ PROVIDED	753.35	9,274	0.21	3,149	20,951
	754.00	10,302	0.24	9,511	27,313
	755.00	11,978	0.27	11,140	38,453

POND A 25-YEAR WEIR	
TOTAL FLOW TO POND	
Q_{25} GEOPAK =	15.03 cfs
Q_{25} WEIR PASS =	15.03 cfs
FREEBOARD =	1.19 ft
TOP OF BERM/WALL =	755.00 ft
WEIR ELEVATION =	753.35 ft
WEIR DEPTH =	0.46 ft
WEIR LENGTH	16.00 ft
WEIR C =	3.00

POND A 100-YEAR WEIR	
Q_{100} GEOPAK =	18.96 cfs
Q_{100} WEIR PASS =	18.96 cfs
FREEBOARD =	1.11 ft
TOP OF BERM/WALL =	755.00 ft
WEIR ELEVATION =	753.35 ft
WEIR DEPTH =	0.54 ft
WEIR LENGTH	16.00 ft
WEIR C =	3.00



OUTLET STRUCTURE
LINE A.3



OUTLET STRUCTURE
LINES A.4 & A.5

NOTES:

1. ULTIMATE REQUIRED VOLUME IS APPROXIMATE AND BASED ON THE ASSUMPTION THAT THE ULTIMATE ROADWAY IS A FIVE LANE URBAN SECTION WITH CURB AND GUTTER AND A SIX FOOT SIDEWALK. ONE FOOT OF FREEBOARD DESIGNED FOR ULTIMATE CONDITION.
2. OVERFLOW WEIR CALCULATIONS SHOWN ARE FOR THE CURRENTLY PROPOSED PROJECT, NOT ULTIMATE CONDITIONS. THE POND OUTLET STRUCTURE AND/OR A SPLITTER BOX WILL NEED TO BE RE-EVALUATED UPON DESIGN OF THE ULTIMATE ROADWAY.
3. SEE "DRAINAGE COMPUTATIONS" SHEET FOR DESIGN FLOW COMPUTATIONS.

LINK HYDRAULIC DATA:

LINK ID	US NODE ID	DS NODE ID	US FL ELEV (FT)	25-YEAR US HGL (FT)	JUNCTION LOSS (FT)	DS FL ELEV (FT)	25-YEAR DS HGL (ft)	ACTUAL VELOCITY (FPS)	SIZE	NUMBER OF BARRELS	ACTUAL LENGTH (FT)	LINK SLOPE (%)	FRICTION SLOPE (%)	MANNINGS N	25-YEAR DISCHARGE (CFS)	CAPACITY (CFS)
A.3	A.3	A.5	748.89	750.48	0.10	748.85	750.38	0.6	18" RCP	1	5	1.00	0.99	0.012	1.0	12.2
A.4	A.4	A.5	749.07	751.33	0.60	748.85	750.05	7.6	24" RCP	1	23	1.00	1.01	0.012	15.0	26.4
A.5	A.5	A.OUT	748.80	750.38	0.12	748.50	749.74	7.8	24" RCP	1	30	1.00	1.00	0.012	16.0	26.4

STATE OF TEXAS
VICTORIA M. ORTEGA
113096
LICENSED
PROFESSIONAL ENGINEER
Victoria M. Ortega 6/23/2017

NO.	REVISION	BY	DATE

WILLIAMSON COUNTY
1848

K·FRIESE + ASSOCIATES
PUBLIC PROJECT ENGINEERING
FIRM #6535

GEORGETOWN INNER LOOP

WATER QUALITY
POND DETAILS
POND A

6/23/2017 SHEET 1 OF

DESIGNED:	PROJECT NUMBER		ROADWAY	
CHECKED:			SE INNER LOOP	
DRAWN:	STATE	COUNTY	CITY	SHEET No.
CHECKED:	TEXAS	WILLIAMSON	GEORGETOWN	84

Williamson County, Texas
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MATCHLINE A

B.2
BATCH DETENTION OUTLET STRUCTURE
SEE ELECTRICAL PLANS FOR VALVE LAYOUT
TY PJB(RC) (6'x6')
STA 113+02.95
OFF -299.46
TOP 753.00
6" ℄ 745.75

B.3
48" PRM
STA 112+94.31
OFF -308.22

B_OUT
18" 4:1 SET
STA 112+78.94
OFF -322.51

POINT NO	NORTHING	EASTING	ELEVATION	DESCRIPTION
B100	10200045.74	3139573.07	747.06	TOE
B101	10200054.80	3139608.92	746.86	TOE
B102	10200034.82	3139565.60	746.97	TOE
B104	10199824.37	3139591.60	747.75	TOE
B105	10199819.70	3139609.61	747.56	TOE
B107	10199944.19	3139700.34	747.29	TOE
B108	10199956.56	3139699.87	747.29	TOE
B110	10200051.59	3139618.98	746.93	TOE
B112	10199950.43	3139691.48	747.14	SWALE
B113	10200053.00	3139610.66	746.83	SWALE
B114	10199835.33	3139609.24	747.44	SWALE
B115	10200064.69	3139567.42	752.00	TOP
B116	10200047.47	3139547.79	752.00	TOP
B119	10200074.92	3139604.74	752.00	TOP
B120	10200065.38	3139633.85	752.00	TOP
B122	10199993.02	3139693.80	752.00	TOP
B123	10199988.33	3139548.27	751.99	TOP
B124	10199976.02	3139549.01	752.00	TOP
B125	10199971.59	3139549.51	752.00	TOP
B126	10199821.54	3139574.84	752.00	TOP
B127	10199808.62	3139623.48	752.00	TOP
B129	10199845.14	3139649.75	752.00	TOP
B130	10199880.19	3139675.40	752.00	TOP
B131	10199923.46	3139708.20	752.00	TOP
B132	10199969.00	3139725.50	752.00	TOP
B133	10199950.40	3139730.51	752.00	TOP
B136	10199967.20	3139740.82	754.36	PATH
B139	10199956.31	3139747.78	754.95	PATH
B141	10199986.64	3139902.78	775.68	PATH
B142	10199983.84	3139891.42	775.04	PATH
B144	10199979.69	3139869.78	773.84	PATH
B145	10200009.30	3139923.75	776.57	PATH
B146	10199995.63	3139889.17	774.75	PATH
B147	10199994.42	3139882.85	774.43	PATH
B148	10200059.70	3139506.30	744.78	STONE
B149	10200028.69	3139499.50	743.94	STONE
B150	10199985.49	3139499.91	743.52	STONE

0 20 40
SCALE IN FEET

LEGEND
- EXIST R.O.W.
- EXIST EASEMENT
- EXIST CONTOURS
- EXIST E.O.P.
- PROP R.O.W.
- PROP CONTOURS
- PROP E.O.P.
- PROP DITCH FLOWLINE
- TOE OF SLOPE
- POND TOP
- MAINTENANCE ACCESS
- FEMA ZONE A

NOTES:

1. REFERENCE DRAINAGE AREA MAPS FOR CONTRIBUTING AREA TO PONDS.
2. THE POND ACCESS PATH WILL NOT BE PAVED. ONLY A CLEAR GRADED AND STABILIZED PATH IS REQUIRED. SEE HORIZONTAL ALIGNMENT DATA SHEET FOR ADDITIONAL INFORMATION.
3. THE ELEVATION FOR POINT B125 IS FOR FINISHED GRADE.

STATE OF TEXAS
VICTORIA M. ORTEGA
113096
LICENSED
PROFESSIONAL ENGINEER
Victoria M. Ortega 6/23/2017

NO.	REVISION	BY	DATE

WILLIAMSON COUNTY
1848

K·FRIESE + ASSOCIATES
PUBLIC PROJECT ENGINEERING
FIRM #6535

GEORGETOWN INNER LOOP

WATER QUALITY POND LAYOUT POND B

6/23/2017 SHEET 1 OF

DESIGNED:	PROJECT NUMBER		ROADWAY	
CHECKED:			SE INNER LOOP	
DRAWN:	STATE	COUNTY	CITY	SHEET No.
CHECKED:	TEXAS	WILLIAMSON	GEORGETOWN	85

Williamson County, Texas

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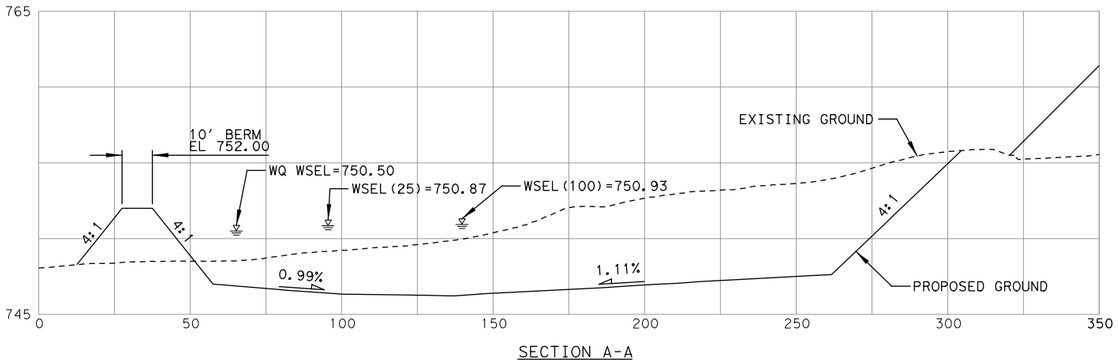
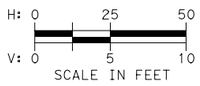
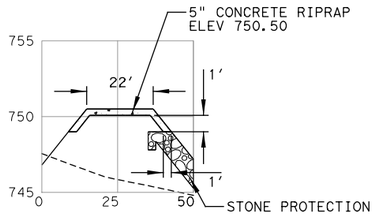
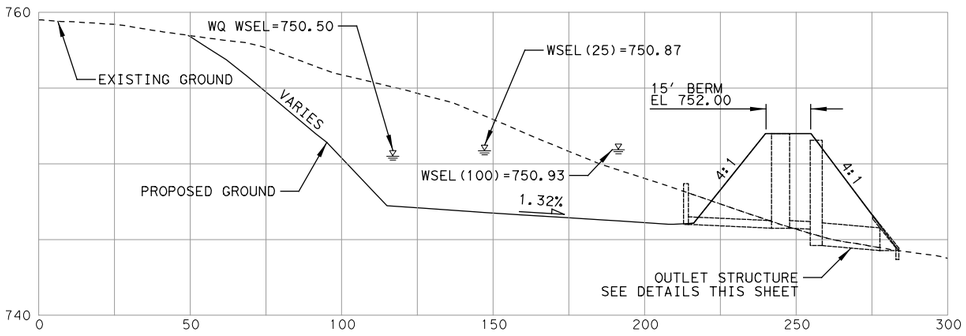


SECTION A-A

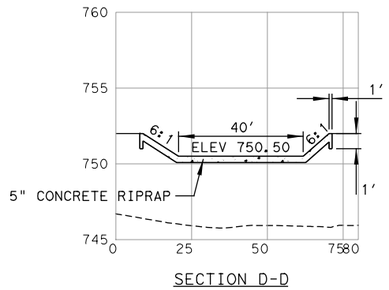




SECTION C-C



SECTION B-B



SECTION D-D

REQUIRED VOLUME = 33,127 CF
REQUIRED VOLUME (ULT) = 75,537 CF
PROVIDED VOLUME = 82,277 CF

POND AREA STORAGE SUMMARY

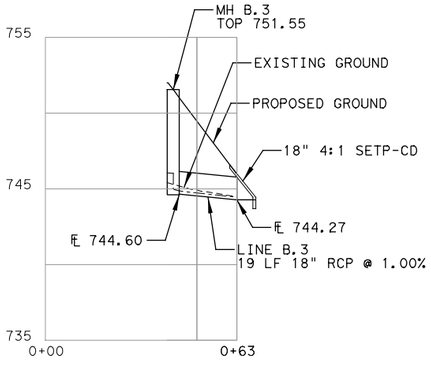
	ELEVATION FT	AREA SF	AREA AC	VOLUME CF	CUM. VOL. CF
	746.00	0	0.00	0	0
	747.00	11,642	0.27	5,821	5,821
	748.00	20,916	0.48	16,279	22,100
WQ REQUIRED	748.50	22,152	-	-	33,127
	749.00	23,400	0.54	22,158	44,286
	750.00	25,984	0.60	24,692	68,978
WQ REQUIRED (ULT)	750.25	26,647	-	-	75,537
WQ PROVIDED	750.50	27,326	0.63	13,327	82,277
	751.00	28,667	0.66	27,326	96,275
	752.00	31,452	0.72	30,060	126,335

POND B 25-YEAR WEIR

TOTAL FLOW TO POND	
Q_{25} GEOPAK =	26.58 cfs
Q_{25} WEIR PASS =	26.58 cfs
FREEBOARD =	1.13 ft
TOP OF BERM/WALL =	752.00 ft
WEIR ELEVATION =	750.50 ft
WEIR DEPTH =	0.37 ft
WEIR LENGTH	40.00 ft
WEIR C =	3.00

POND B 100-YEAR WEIR

Q_{100} GEOPAK =	33.47 cfs
Q_{100} WEIR PASS =	33.47 cfs
FREEBOARD =	1.07 ft
TOP OF BERM/WALL =	752.00 ft
WEIR ELEVATION =	750.50 ft
WEIR DEPTH =	0.43 ft
WEIR LENGTH	40.00 ft
WEIR C =	3.00



OUTLET STRUCTURE
LINE B.3

LINK HYDRAULIC DATA:

LINK ID	US NODE ID	DS NODE ID	US FL ELEV (FT)	25-YEAR US HGL (FT)	JUNCTION LOSS (FT)	DS FL ELEV (FT)	25-YEAR DS HGL (ft)	ACTUAL VELOCITY (FPS)	SIZE	NUMBER OF BARRELS	ACTUAL LENGTH (FT)	LINK SLOPE (%)	FRICTION SLOPE (%)	MANNING'S N	25-YEAR DISCHARGE (CFS)
B.3	B.3	B_OUT	744.65	744.96	0.01	744.27	744.45	4.1	18" RCP	1	19	2.00	1.99	0.012	0.5

NOTES:

1. ULTIMATE REQUIRED VOLUME IS APPROXIMATE AND BASED ON THE ASSUMPTION THAT THE ULTIMATE ROADWAY IS A FIVE LANE URBAN SECTION WITH CURB AND GUTTER AND A SIX FOOT SIDEWALK. ONE FOOT OF FREEBOARD DESIGNED FOR ULTIMATE CONDITION.
2. OVERFLOW WEIR CALCULATIONS SHOWN ARE FOR THE CURRENTLY PROPOSED PROJECT, NOT ULTIMATE CONDITIONS. THE POND OUTLET STRUCTURE AND/OR A SPLITTER BOX WILL NEED TO BE RE-EVALUATED UPON DESIGN OF THE ULTIMATE ROADWAY.
3. SEE "DRAINAGE COMPUTATIONS" SHEET FOR DESIGN FLOW COMPUTATIONS.

STATE OF TEXAS
VICTORIA M. ORTEGA
113096
LICENSED
PROFESSIONAL ENGINEER
Victoria M. Ortega
6/23/2017

NO.	REVISION	BY	DATE

WILLIAMSON COUNTY
1848

K·FRIESE + ASSOCIATES
PUBLIC PROJECT ENGINEERING
FIRM #6535

GEORGETOWN INNER LOOP

WATER QUALITY
POND DETAILS
POND B

6/23/2017 SHEET 1 OF

DESIGNED:	PROJECT NUMBER		ROADWAY	
CHECKED:			SE INNER LOOP	
DRAWN:	STATE	COUNTY	CITY	SHEET No.
CHECKED:	TEXAS	WILLIAMSON	GEORGETOWN	86

Williamson County, Texas

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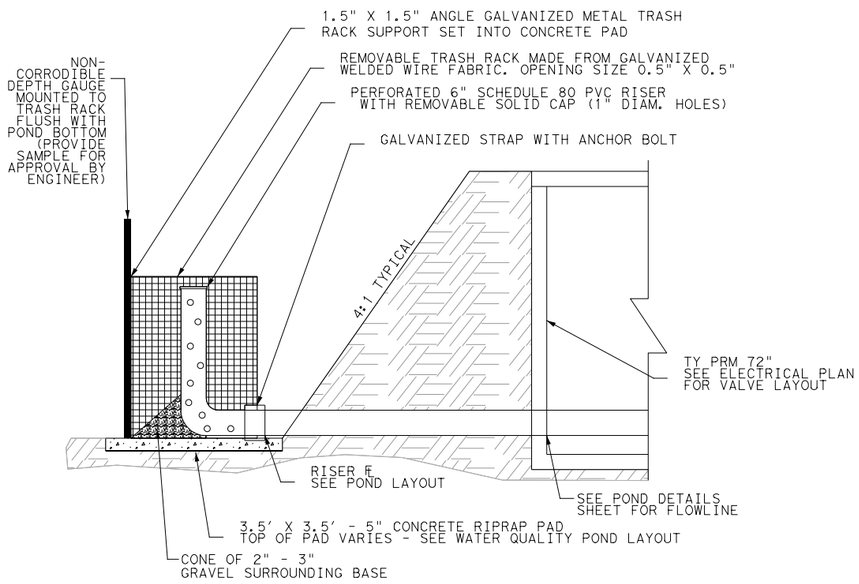
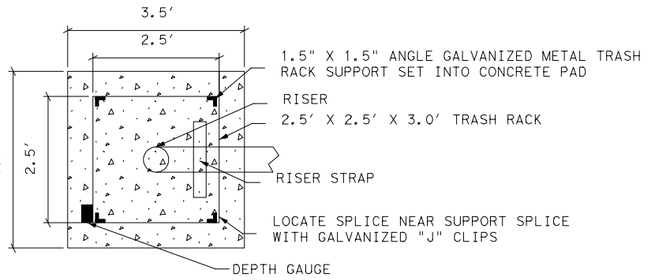
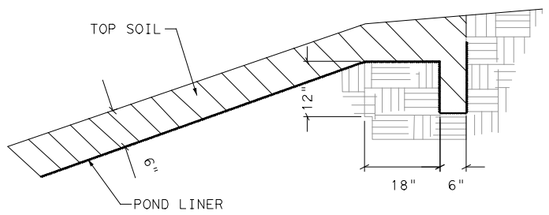


SIDE VIEW OUTLET RISER TO MANHOLE DETAIL



TOP VIEW OF RISER (SQUARE DESIGN)



POND LINER ON EARTHEN SLOPE

LINER NOTES:

1. IMPERMEABLE GEOMEMBRANE LINERS SHALL BE INSTALLED WITHIN ALL WATER QUALITY PONDS IN ACCORDANCE WITH SS9001. SEE THE TABLE BELOW FOR THE ELEVATIONS REQUIRED FOR EACH POND.

IMPERMEABLE LINER ELEVATIONS BY POND		
POND ID	REQUIRED LINER INSTALLATION ELEVATION	UNIT
A	754.35	FT
B	751.50	FT

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY WATER POLLUTION ABATEMENT PLAN GENERAL CONSTRUCTION NOTES (MODIFIED)

1. A WRITTEN NOTICE OF CONSTRUCTION MUST BE SUBMITTED TO THE TCEQ REGIONAL OFFICE AT LEAST 48 HOURS PRIOR TO THE START OF ANY REGULATED ACTIVITIES. THIS NOTICE MUST INCLUDE:
   -THE NAME OF THE APPROVED PROJECT
   -THE ACTIVITY START DATE; AND
   -THE CONTACT INFORMATION OF THE PRIME CONTRACTOR.

2. ALL CONTRACTORS CONDUCTING REGULATED ACTIVITIES ASSOCIATED WITH THIS PROJECT MUST BE PROVIDED WITH COMPLETE COPIES OF THE APPROVED WATER POLLUTION ABATEMENT PLAN (WPAP) AND THE TCEQ LETTER INDICATING THE SPECIFIC CONDITIONS OF ITS APPROVAL. DURING THE COURSE OF THESE REGULATED ACTIVITIES, THE CONTRACTORS ARE REQUIRED TO KEEP ON-SITE COPIES OF THE APPROVED PLAN AND APPROVAL LETTER.

3. IF ANY SENSITIVE FEATURE(S) (CAVES, SOLUTION CAVITY, SINK HOLE, ETC.) IS DISCOVERED DURING CONSTRUCTION, ALL REGULATED ACTIVITIES NEAR THE SENSITIVE FEATURE MUST BE SUSPENDED IMMEDIATELY. THE APPROPRIATE TCEQ REGIONAL OFFICE MUST BE IMMEDIATELY NOTIFIED OF ANY SENSITIVE FEATURES ENCOUNTERED DURING CONSTRUCTION. CONSTRUCTION ACTIVITIES MAY NOT BE RESUMED UNTIL THE TCEQ HAS REVIEWED AND APPROVED THE APPROPRIATE PROTECTIVE MEASURES IN ORDER TO PROTECT ANY SENSITIVE FEATURE AND THE EDWARDS AQUIFER FROM ANY POTENTIALLY ADVERSE IMPACTS TO WATER QUALITY.

4. NO TEMPORARY OR PERMANENT HAZARDOUS SUBSTANCE STORAGE TANK SHALL BE INSTALLED WITHIN 150 FEET OF A WATER SUPPLY SOURCE, DISTRIBUTION SYSTEM, WELL, OR SENSITIVE FEATURE.

5. PRIOR TO BEGINNING ANY CONSTRUCTION ACTIVITY, ALL TEMPORARY EROSION AND SEDIMENTATION (E&S) CONTROL MEASURES MUST BE PROPERLY INSTALLED AND MAINTAINED IN ACCORDANCE WITH THE APPROVED PLANS AND MANUFACTURERS SPECIFICATIONS. CONTROLS SPECIFIED IN THE TEMPORARY STORM WATER SECTION OF THE APPROVED EDWARDS AQUIFER PROTECTION PLAN ARE REQUIRED DURING CONSTRUCTION. IF INSPECTIONS INDICATE A CONTROL HAS BEEN USED INAPPROPRIATELY, OR INCORRECTLY, THE APPLICANT MUST REPLACE OR MODIFY THE CONTROL FOR SITE SITUATIONS. THESE CONTROLS MUST REMAIN IN PLACE UNTIL DISTURBED AREAS ARE REVEGETATED AND THE AREAS HAVE BECOME PERMANENTLY STABILIZED.

6. ANY SEDIMENT THAT ESCAPES THE CONSTRUCTION SITE MUST BE COLLECTED AND PROPERLY DISPOSED OF BEFORE THE NEXT RAIN EVENT TO ENSURE IT IS NOT WASHED INTO SURFACE STREAMS, SENSITIVE FEATURES, ETC.

7. SEDIMENT MUST BE REMOVED FROM SEDIMENT TRAPS OR SEDIMENTATION BASINS NOT LATER THAN WHEN IT OCCUPIES 50% OF THE BASIN'S DESIGN CAPACITY. A PERMANENT STAKE MUST BE PROVIDED THAT CAN INDICATE WHEN THE SEDIMENT OCCUPIES 50% OF THE BASIN VOLUME.

8. LITTER, CONSTRUCTION DEBRIS, AND CONSTRUCTION CHEMICALS EXPOSED TO STORMWATER SHALL BE PREVENTED FROM BEING DISCHARGED OFFSITE.

9. ALL SPOILS (EXCAVATED MATERIAL) GENERATED FROM THE PROJECT SITE MUST BE STORED ON-SITE WITH PROPER E&S CONTROLS. FOR STORAGE OR DISPOSAL OF SPOILS AT ANOTHER SITE ON THE EDWARDS AQUIFER RECHARGE ZONE, THE OWNER OF THE SITE MUST RECEIVE APPROVAL OF A WATER POLLUTION ABATEMENT PLAN FOR THE PLACEMENT OF FILL MATERIAL OR MASS GRADING PRIOR TO THE PLACEMENT OF SPOILS AT THE OTHER SITE.

10. IF PORTIONS OF THE SITE WILL HAVE A TEMPORARY OR PERMANENT CEASE IN CONSTRUCTION ACTIVITY LASTING LONGER THAN 14 DAYS, SOIL STABILIZATION IN THOSE AREAS SHALL BE INITIATED AS SOON AS POSSIBLE PRIOR TO THE 14TH DAY OF INACTIVITY. IF ACTIVITY WILL RESUME PRIOR TO THE 21ST DAY, STABILIZATION MEASURES ARE NOT REQUIRED. IF DROUGHT CONDITIONS OR INCLEMENT WEATHER PREVENT ACTION BY THE 14TH DAY, STABILIZATION MEASURES SHALL BE INITIATED AS SOON AS POSSIBLE.

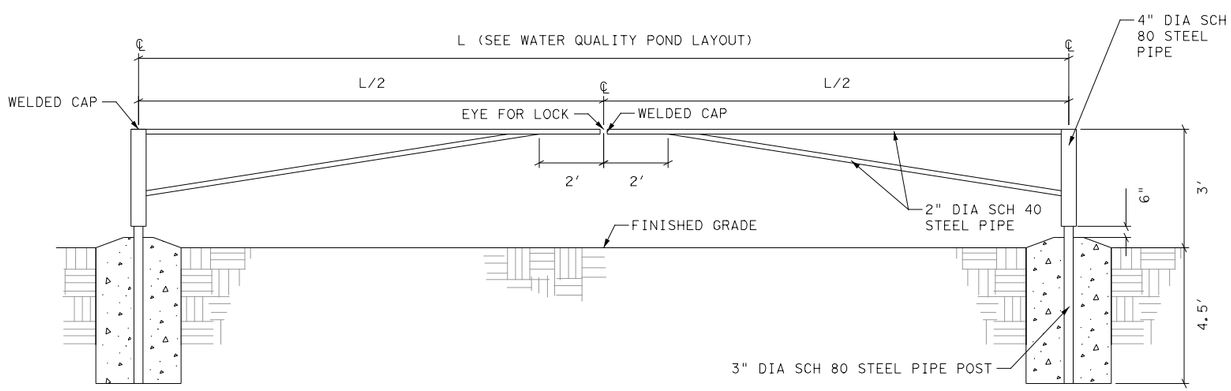
11. THE FOLLOWING RECORDS SHALL BE MAINTAINED AND MADE AVAILABLE TO THE TCEQ UPON REQUEST:
   -THE DATES WHEN MAJOR GRADING ACTIVITIES OCCUR;
   -THE DATES WHEN CONSTRUCTION ACTIVITIES TEMPORARILY OR PERMANENTLY CEASE ON A PORTION OF THE SITE; AND
   -THE DATES WHEN STABILIZATION MEASURES ARE INITIATED.

12. THE HOLDER OF ANY APPROVED EDWARD AQUIFER PROTECTION PLAN MUST NOTIFY THE APPROPRIATE REGIONAL OFFICE IN WRITING AND OBTAIN APPROVAL FROM THE EXECUTIVE DIRECTOR PRIOR TO INITIATING ANY OF THE FOLLOWING:

A. ANY PHYSICAL OR OPERATIONAL MODIFICATION OF ANY WATER POLLUTION ABATEMENT STRUCTURE(S), INCLUDING BUT NOT LIMITED TO PONDS, DAMS, BERMS, SEWAGE TREATMENT PLANTS, AND DIVERSIONARY STRUCTURES;

B. ANY CHANGE IN THE NATURE OR CHARACTER OF THE REGULATED ACTIVITY FROM THAT WHICH WAS ORIGINALLY APPROVED OR A CHANGE WHICH WOULD SIGNIFICANTLY IMPACT THE ABILITY OF THE PLAN TO PREVENT POLLUTION OF THE EDWARDS AQUIFER;

C. ANY DEVELOPMENT OF LAND PREVIOUSLY IDENTIFIED AS UNDEVELOPED IN THE ORIGINAL WATER POLLUTION ABATEMENT PLAN.



POND ACCESS GATE

NOTE: CONTRACTOR MAY SUBMIT GATE ALTERNATIVE FOR ENGINEER APPROVAL.

STATE OF TEXAS
VICTORIA M. ORTEGA
113096
LICENSED
PROFESSIONAL ENGINEER
Victoria M. Ortega 6/23/2017

NO.	REVISION	BY	DATE

WILLIAMSON COUNTY
1848

K·FRIESE + ASSOCIATES
PUBLIC PROJECT ENGINEERING
FIRM #6535

GEORGETOWN INNER LOOP
WATER QUALITY MISCELLANEOUS DETAILS

6/23/2017 SHEET 1 OF

DESIGNED:	PROJECT NUMBER		ROADWAY	
CHECKED:			SE INNER LOOP	
DRAWN:	STATE	COUNTY	CITY	SHEET No.
CHECKED:	TEXAS	WILLIAMSON	GEORGETOWN	87

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Williamson County, Texas

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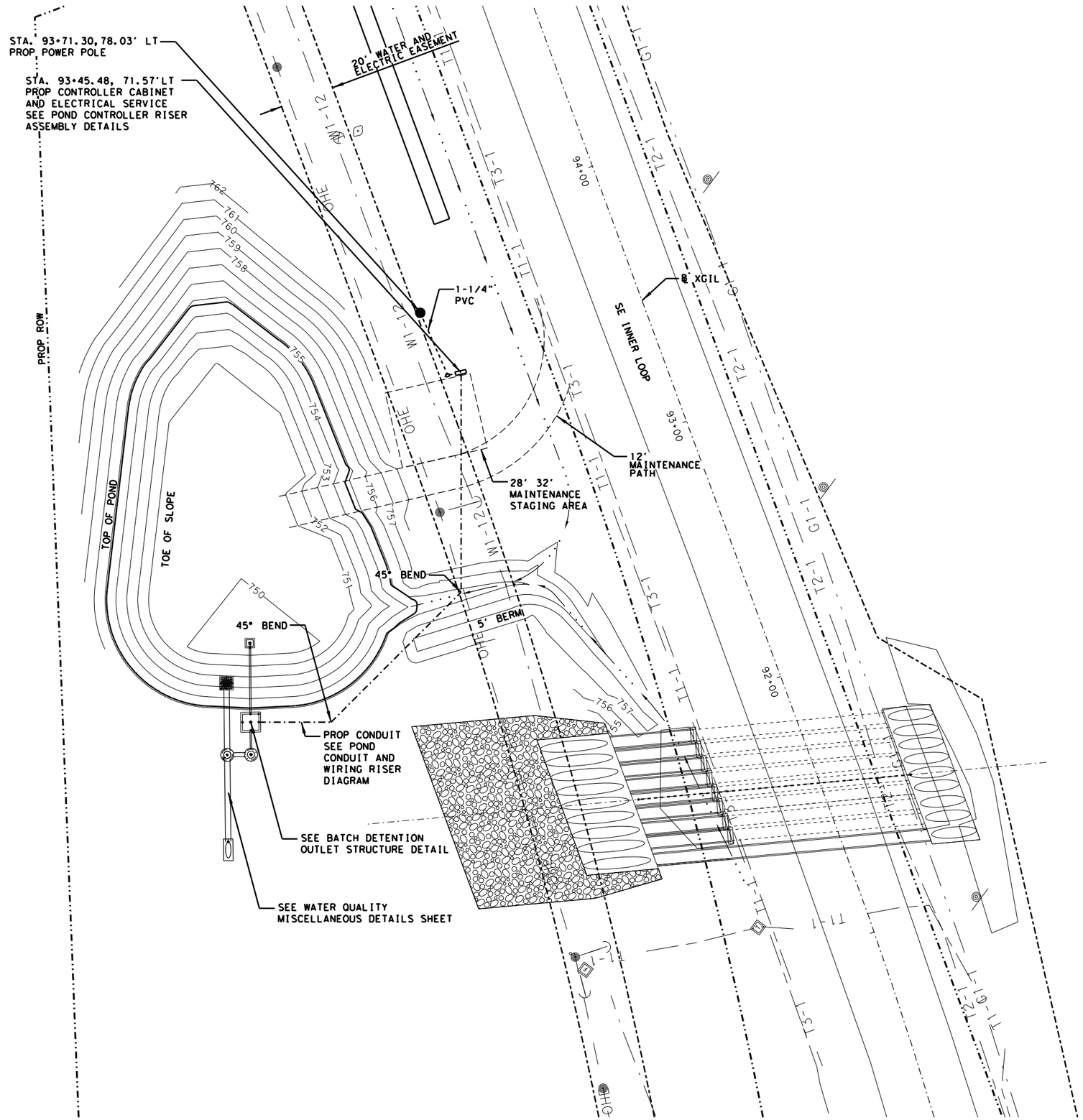

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SCALE IN FEET

STATE OF TEXAS
ERIK N. SCOTT
115070
PROFESSIONAL ENGINEER
LICENSED

June 23, 2017

NO.	REVISION	BY	DATE

WILLIAMSON COUNTY
1848

RTG RODRIGUEZ TRANSPORTATION GROUP
FIRM #587

RS&H®
RS&H, Inc.
8140 North Mo Pac Expy, Building 2,
Suite 100, Austin, Texas 78759
512-279-5427 FAX 512-459-2233
Texas Registration No. F-3401

GEORGETOWN INNER LOOP

BATCH DETENTION POND LAYOUT POND A

SHEET 1 OF 1

DESIGNED:	PROJECT NUMBER		ROADWAY	
CHECKED:			SE INNER LOOP	
DRAWN:	STATE	COUNTY	CITY	SHEET No.
CHECKED:	TEXAS	WILLIAMSON	GEORGETOWN	88

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0 20 40
SCALE IN FEET

28' X 32'
MAINTENANCE
STAGING AREA

12' ACCESS PATH

1:6

PROP ROW

TOP OF POND

TOE OF SLOPE

SE INNER LOOP

℄ XGIL

20' WATER AND ELECTRIC EASEMENT

6" CAST IRE

12" WATER LINE

28' X 32'
MAINTENANCE
STAGING AREA

12' MAINTENANCE PATH

PROP CONDUIT
SEE POND
CONDUIT AND
WIRING RISER
DIAGRAM

SEE BATCH DETENTION
OUTLET STRUCTURE DETAIL

SEE WATER QUALITY
MISCELLANEOUS DETAILS SHEET

STA. 111+57.13, 131.81' LT
PROP CONTROLLER CABINET
AND ELECTRICAL SERVICE
SEE POND CONTROLLER RISER
ASSEMBLY DETAILS

STA 111+68.65, 119.77' LT
PROP POWER POLE

1-1/4" PVC

ERIK N. SCOTT
115070
PROFESSIONAL ENGINEER
STATE OF TEXAS

June 23, 2017

NO.	REVISION	BY	DATE

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GEORGETOWN INNER LOOP

BATCH DETENTION POND LAYOUT POND B

SHEET 1 OF 1

DESIGNED:	PROJECT NUMBER		ROADWAY	
CHECKED:			SE INNER LOOP	
DRAWN:	STATE	COUNTY	CITY	SHEET No.
CHECKED:	TEXAS	WILLIAMSON	GEORGETOWN	89

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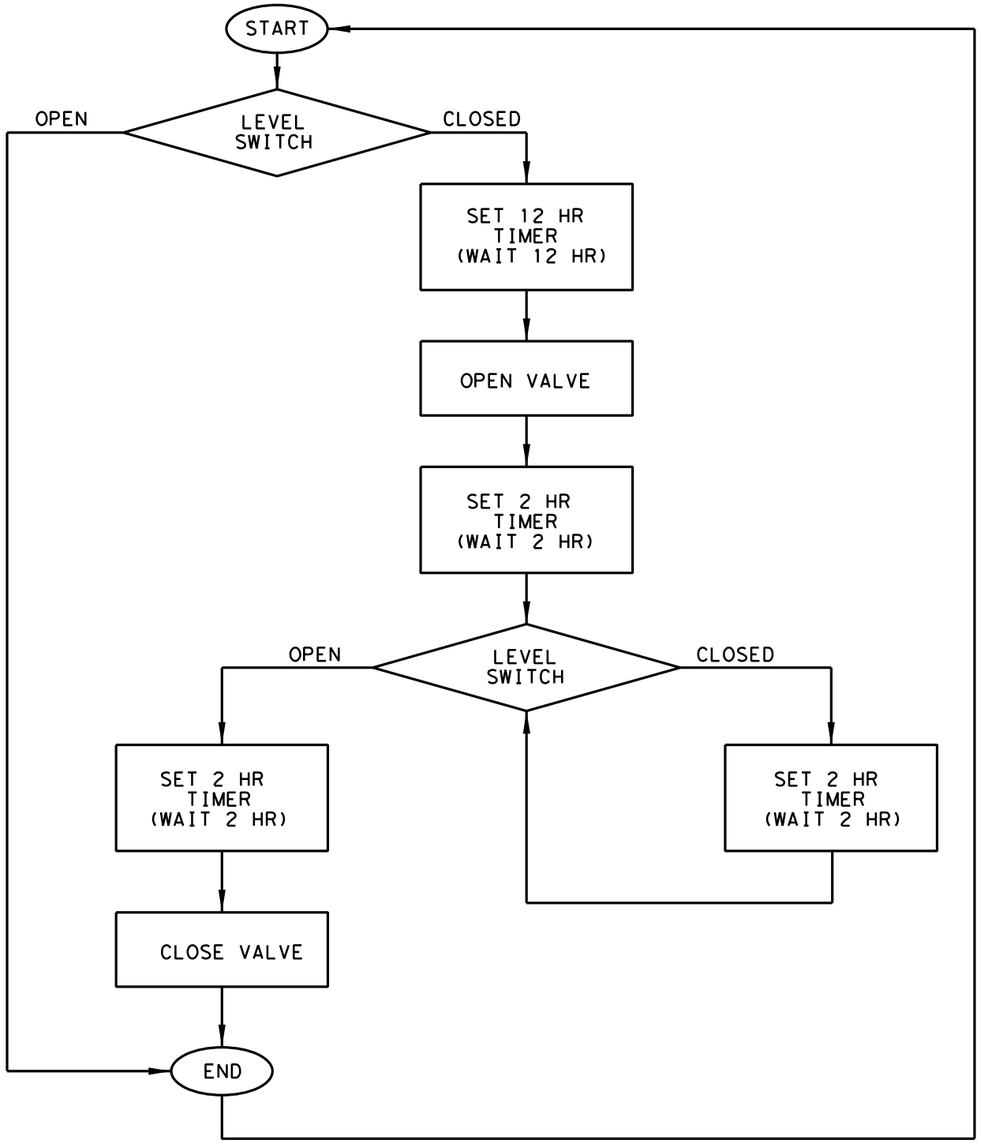
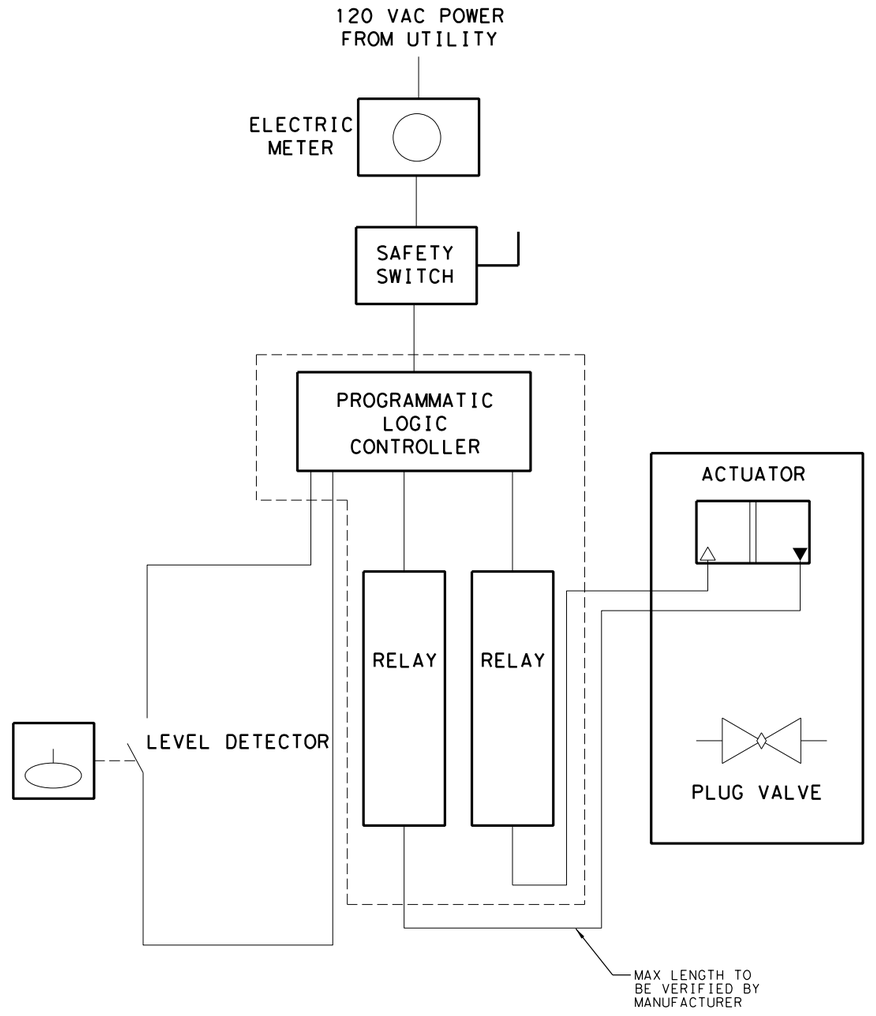
STARTING OPERATION:
-SWITCH = OPEN
-VALVE CLOSED



LOGIC DIAGRAM



BLOCK DIAGRAM

STATE OF TEXAS
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GEORGETOWN INNER LOOP

POND CONTROL LOGIC DIAGRAMS

SHEET 1 OF 1

DESIGNED:	PROJECT NUMBER		ROADWAY
CHECKED:			SE INNER LOOP
DRAWN:	STATE	COUNTY	CITY / SHEET No.
CHECKED:	TEXAS	WILLIAMSON	GEORGETOWN / 90

PLOTTED BY: JESSER$
ON: 7/18/2017
AT: 10:46:48 AM
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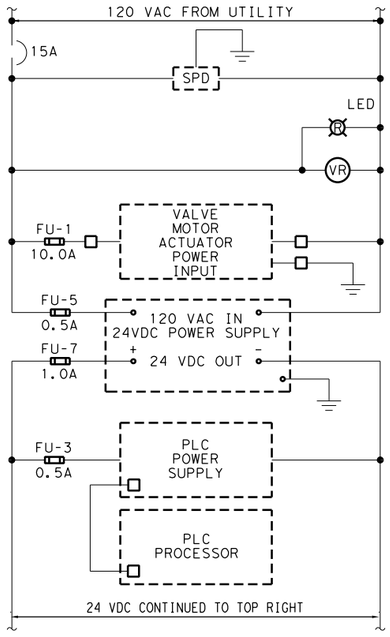
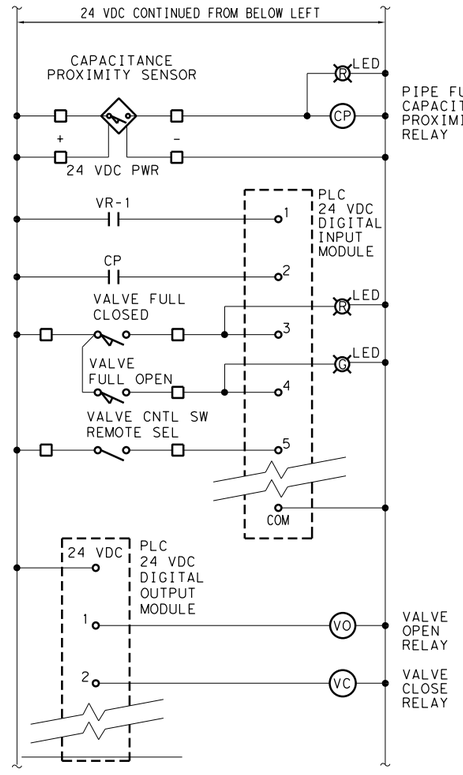
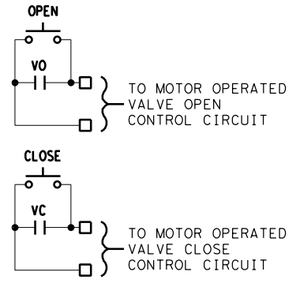
NOTES:
1. PROVIDE NEMA 3R CABINETS FOR ALL EQUIPMENT, UNLESS NOTED OTHERWISE
2. INSTALL ALL CABLES IN RIGID CONDUIT UNLESS OTHERWISE SPECIFICALLY IDENTIFIED BY THE MANUFACTURER AS DETRIMENTAL TO SIGNAL STRENGTH.
3. VALVE MOTOR ACTUATOR SHALL OPERATE ON 120 VAC.





LEGEND

- CX — RELAY CONTACT
- CX — RELAY COIL
- LED — LED INDICATING LIGHT
- POSITION LIMIT SWITCH
- SELECTOR SWITCH CONTACT
- FU-X 0.5A — FUSE
- 15A — AC CIRCUIT BREAKER
- SPD — SURGE PROTECTIVE DEVICE
- MOMENTARY PUSHBUTTON



NOTES:

1. CONNECT VALVE PER MANUFACTURER'S REQUIREMENTS. PROVIDE ADDITIONAL WIRING AT VALVE AS REQUIRED.

POND LEVEL CONTROL ELEMENTARY DIAGRAM

SCALE: N.T.S.

STATE OF TEXAS
ERIK N. SCOTT
115070
PROFESSIONAL ENGINEER
LICENSED

June 23, 2017

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Texas Registration No. F-3401

GEORGETOWN INNER LOOP

POND LEVEL CONTROL ELEMENTARY DIAGRAM

SHEET 1 OF 1

DESIGNED:	PROJECT NUMBER		ROADWAY	
CHECKED:			SE INNER LOOP	
DRAWN:	STATE	COUNTY	CITY	SHEET NO.
CHECKED:	TEXAS	WILLIAMSON	GEORGETOWN	97

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SUMMARY OF CONDUIT QUANTITIES *

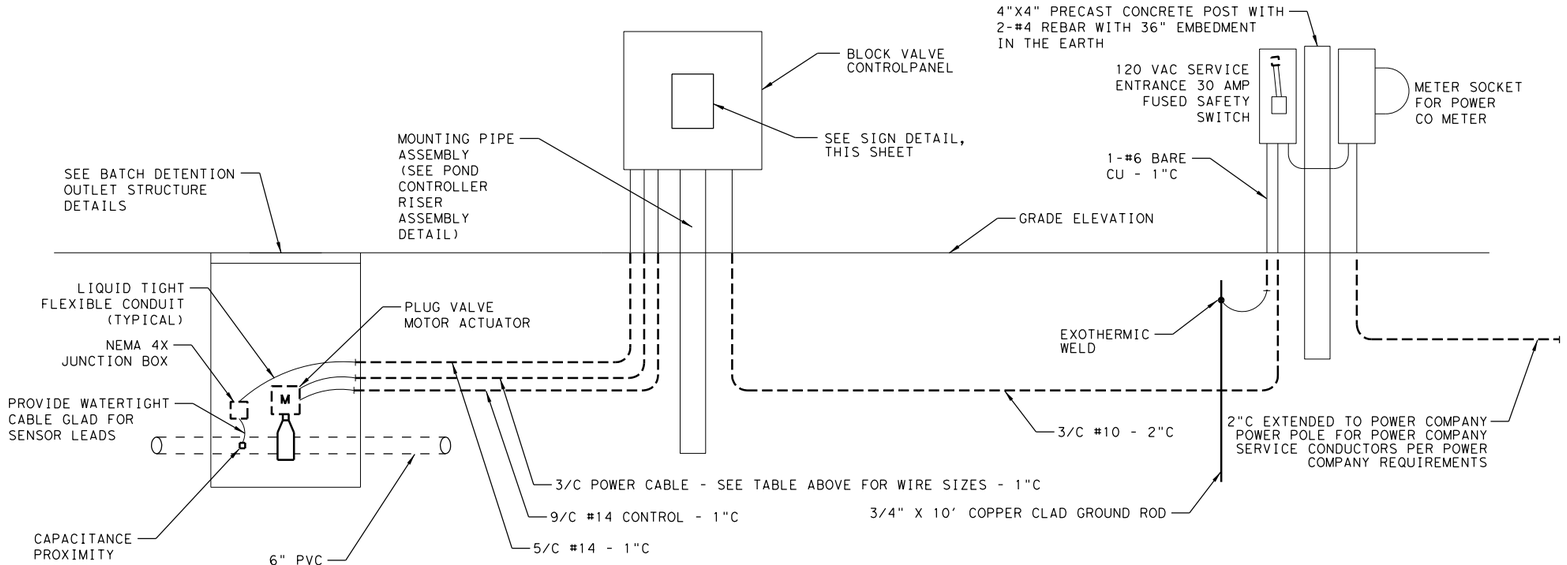
POND	3/C #8 (FT)	3/C #10 (FT)	3/C #12 (FT)	9/C #14 (FT)	5/C #14 (FT)	3/C #10 2"C (FT)	1" SCH 80 (FT)	2" SCH 80 (FT)
A			185	185	185	25	530	20
B		230		230	230	25	660	20

* FOR CONTRACTOR INFORMATION ONLY

DISTANCE FROM CONTROL PANEL TO VALVE (FT)	MINIMUM REQUIRED WIRE SIZE (AWG)
0 - 200	3/C #12
201 - 380	3/C #10
381 - 550	3/C #8

NOTE:
PROVIDE WIRE SPLICE ADAPTERS WHERE #8 AWG IS USED TO ALLOW CONNECTION TO THE VALVE TERMINALS

NOTES:
1. PROVIDE NEMA 3R CABINETS FOR ALL EQUIPMENT, UNLESS NOTED OTHERWISE.
2. INSTALL ALL CABLES IN RIGID CONDUIT ABOVE GRADE UNLESS OTHERWISE SPECIFICALLY IDENTIFIED BY THE MANUFACTURER AS DETRIMENTAL TO SIGNAL STRENGTH.
3. CONDUIT SHALL BE SCH 80 PVC BELOW GRADE, UNLESS NOTED OTHERWISE.



POND CONDUIT AND WIRING RISER DIAGRAM
SCALE: N.T.S.

GENERAL NOTES:

See special specification Detention Pond Control System, pay item 9002-9901.

BLOCK VALVE CONTROL PANEL

This panel shall contain the block valve controls and inverter within the same enclosure. The enclosure shall be pole-mounted and a NEMA 3R powder coated aluminum enclosure. A sign shall be secured on the outside of the door, see sign detail this sheet.

The Block Valve Controls shall include the controls for the block valve and the capacitance proximity sensor to detect water in the pipe. These controls shall contain, but not necessarily limited to, the PLC, Interposing relays, terminal blocks, LED indicating lights, and voltage monitor relay. The internal wiring of this Control Panel shall be as indicated. The control panel shall also be equipped with a 120 VAC single-phase surge suppressor for the incoming service as indicated.

PROGRAMMABLE LOGIC CONTROLLER

The Programmable Logic Controller (PLC) shall include timing and logic functions to control the pond plug valve based on sensing the presence of water in a pipe with a level capacitance switch. The PLC shall operate from 24 VDC and shall include the required number of 24 VDC digital inputs and outputs as indicated. The PLC shall include an RS-232 port for connection for a programming laptop computer. The PLC shall include a built-in 10/100 MBps ethernet/IP for future remote communication. The PLC shall be capable of operation in temperatures ranging from -20°C to 65°C. The PLC shall be model MicroLogix 1100 by Rockwell Automation or a similar model by GE or Square D.

SIZE OF SIGN = 8.5" X 11" (LETTER SIZE)

IN CASE OF MALFUNCTION, CALL:
SI NO FUNCIONA, LLAMA:

OWNER :
WILLIAMSON COUNTY:
(512) 943-1599

IN CASE OF ENVIRONMENTAL CONCERN CALL THE ENVIRONMENTAL REGULATORY AGENCY, TCEQ:
(512) 239-2507

TEXT COLOR = BLACK
TEXT HEIGHT = 1/2" ±
TEXT WIDTH = 1/2" ±
LINE SPACING = 7/8" ±
FONT = AERIAL BLACK

BACKGROUND COLOR = WHITE

NOTE:
MALFUNCTION SIGNS SHALL BE ATTACHED TO EACH WATER QUALITY POND LOGIC CONTROLLER PANEL. EACH SIGN SHALL BE PLACED OUTSIDE OF THE CONTROLLER PANEL AND CLEARLY VISIBLE TO PERSONNEL LOCATED IN FRONT OF THE PANEL. THE SIGNS SHALL BE WATER/WEATHER-PROOF. METHOD OF ATTACHMENT AT ALL CORNERS SHALL ENSURE THAT SIGNS REMAIN IN PLACE INDEFINTELY. SIGNS SHALL BE SUBSIDIARY TO 9002-9901 DETENTION POND CONTROL SYSTEM.

SIGN DETAIL
SCALE: N.T.S.

POND CONDUIT AND WIRING RISER DIAGRAM

STATE OF TEXAS
ERIK N. SCOTT
115070
PROFESSIONAL ENGINEER

June 23, 2017

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Texas Registration No. F-3401

GEORGETOWN INNER LOOP
POND CONDUIT AND WIRING RISER DIAGRAM

SHEET 1 OF 1

DESIGNED:	PROJECT NUMBER		ROADWAY	
CHECKED:			SE INNER LOOP	
DRAWN:	STATE	COUNTY	CITY	SHEET No.
CHECKED:	TEXAS	WILLIAMSON	GEORGETOWN	92

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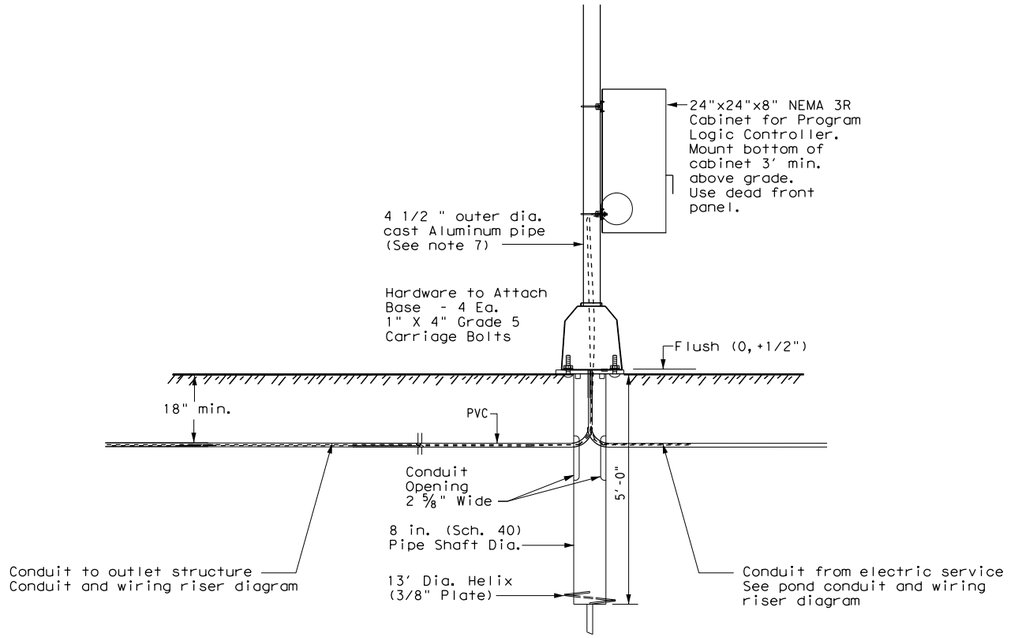
SUMMARY OF BATCH DETENTION POND QUANTITIES

POND	6X6 JUNCTION BOX (EA)	CAPACITIVE SWITCH (EA)	6" MANUAL PLUG VALVE (EA)	6" ELECTRICAL PLUG VALVE (EA)	NEMA 4X BOX (EA)	NEMA 3R CABINET (EA)	PLC (EA)	12V BATTERY 110 AH (EA)	DC TO AC INVERTOR (EA)	ELECTRIC METER AND SWITCH (EA)
A	1	1	1	1	1	1	1	1	1	1
B	1	1	1	1	1	1	1	1	1	1

* FOR CONTRACTOR INFORMATION ONLY

GENERAL NOTES:

1. Use either a Screw-In Type Anchor Foundation or a Drilled Shaft Foundation as shown elsewhere in the plans. When plans require a Drilled Shaft Foundation, see standard sheet TS-FD. Install the Screw-In Type Anchor Foundation as per manufacturer's recommendations. On a slope, install one edge at ground level. Screw-In/Drilled Shaft Foundation is subsidiary to Item 685.
2. When used, provide Screw-In Type Anchor Foundations as shown on TxDOT's Material Producer List (MPL) in the file "Highway Traffic Signals".
3. Use materials specifically designed for attaching cabinets,etc. to poles.
4. Per manufacturer's recommendations, engage all threads on the pedestal pole base and pipe unless the pipe is fully seated into base. In high winds, use a pole and base collar assembly to add strength and prevent loosening on connection.
5. See standard sheet Electrical Details (ED) for additional requirements regarding the installation of ground boxes, conduit, and cabinets.
6. Unless otherwise shown on the plans, pole shaft shall be one piece, Schedule 40 Aluminum pipe, ASTM B429 or B221 (Alloy 6061-T6 only). Aluminum conduit will not develop the necessary strength and will not be allowed.
7. Ensure height of conduit is below top of anchor bolts.



POND CONTROL RISER ASSEMBLY DETAIL

N.T.S.

STATE OF TEXAS
ERIK N. SCOTT
115070
PROFESSIONAL LICENSED ENGINEER

June 23, 2017

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512-279-5427 FAX 512-459-2233
Texas Registration No. F-3401

GEORGETOWN INNER LOOP

POND CONTROLLER RISER ASSEMBLY DETAIL

SHEET 1 OF 1

DESIGNED:	PROJECT NUMBER		ROADWAY	
CHECKED:			SE INNER LOOP	
DRAWN:	STATE	COUNTY	CITY	SHEET No.
CHECKED:	TEXAS	WILLIAMSON	GEORGETOWN	93

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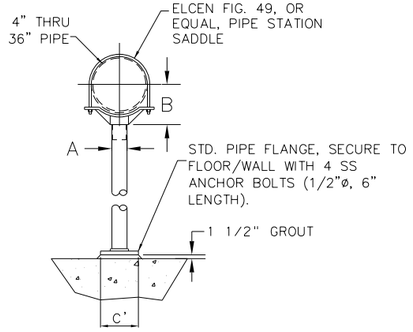
PIPE SIZE	DIMENSIONS (IN.) A	B	C
4"	3	4 3/16	9
5"	3	4 13/16	9
6"	3	5 7/16	9
8"	3	6 15/16	9
10"	3	8 7/16	9
12"	3	9 15/16	9
14"	4	8 1/8	11
16"	4	9 1/8	11
18"	4	10 3/8	11
20"	6	11 3/8	13 1/2
24"	6	13 3/4	13 1/2
30"	6	16 3/4	13 1/2
36"	8	24 1/2	16

NOTE:
SAME DETAIL APPLIES FOR HORIZONTAL BRACING. SUPPORT PIPE SHALL BE GALVANIZED STEEL.



1 PIPE SUPPORT DETAIL
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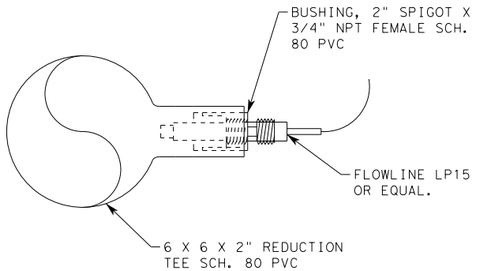

2 WET SWITCH DETAIL
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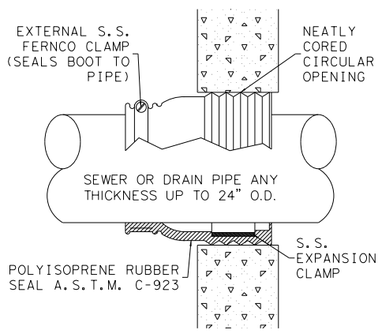

3 MANHOLE CONNECTION DETAIL
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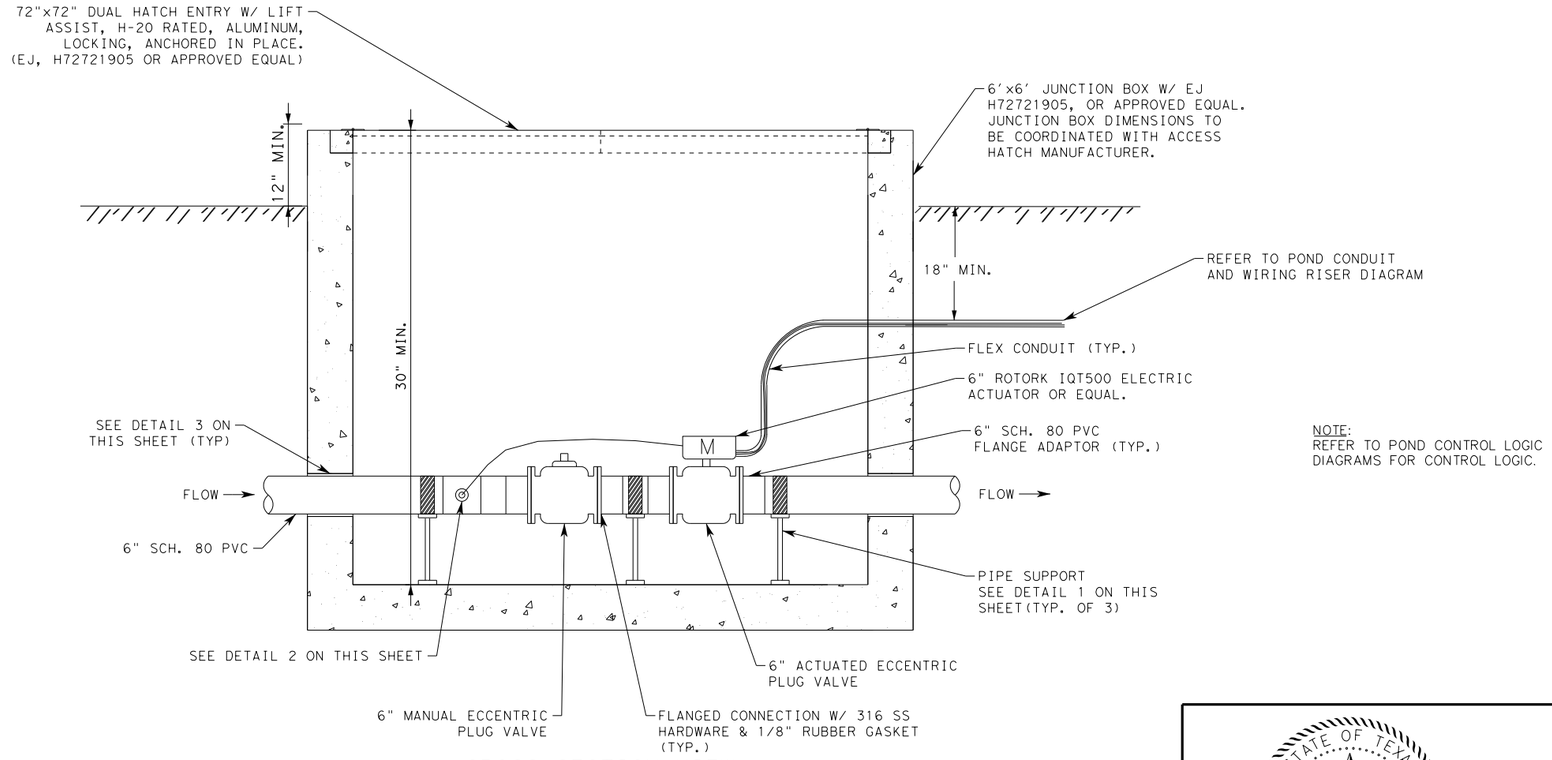

NOTE:
REFER TO POND CONTROL LOGIC DIAGRAMS FOR CONTROL LOGIC.

CROSS SECTION VIEW
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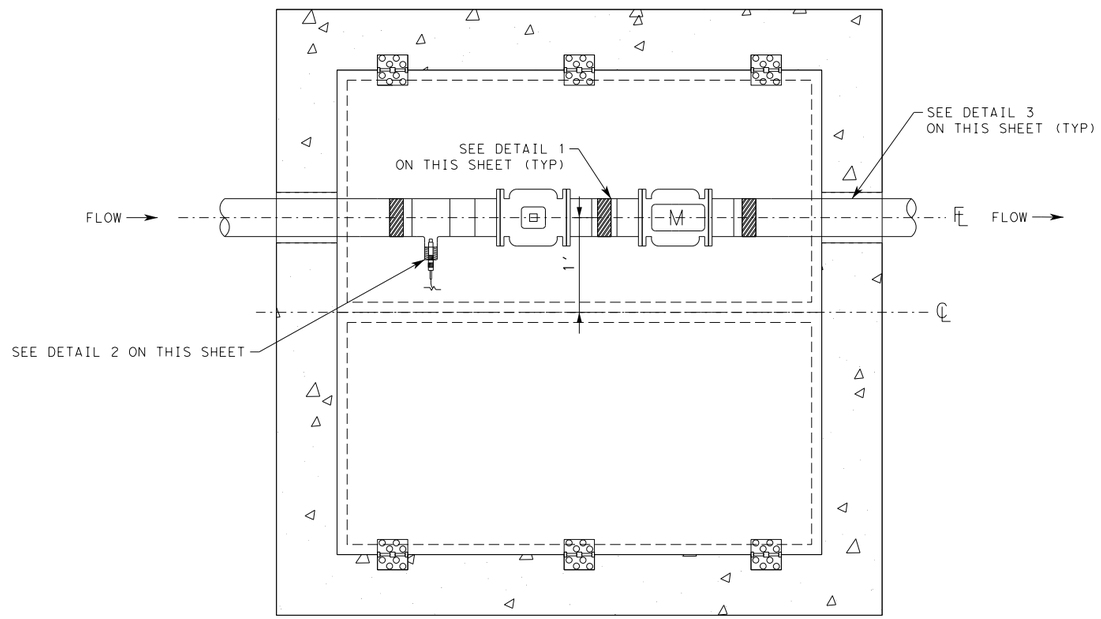
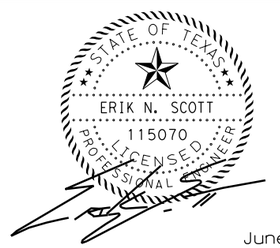


PLAN VIEW
SCALE: NOT TO SCALE



June 23, 2017

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GEORGETOWN INNER LOOP
BATCH DETENTION OUTLET STRUCTURE

SHEET 1 OF 1

DESIGNED:	PROJECT NUMBER		ROADWAY	
CHECKED:			SE INNER LOOP	
DRAWN:	STATE	COUNTY	CITY	SHEET No.
CHECKED:	TEXAS	WILLIAMSON	GEORGETOWN	94

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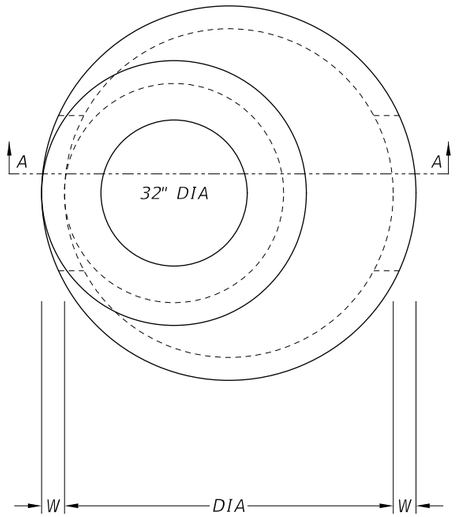
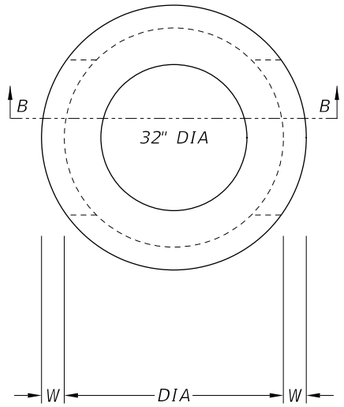
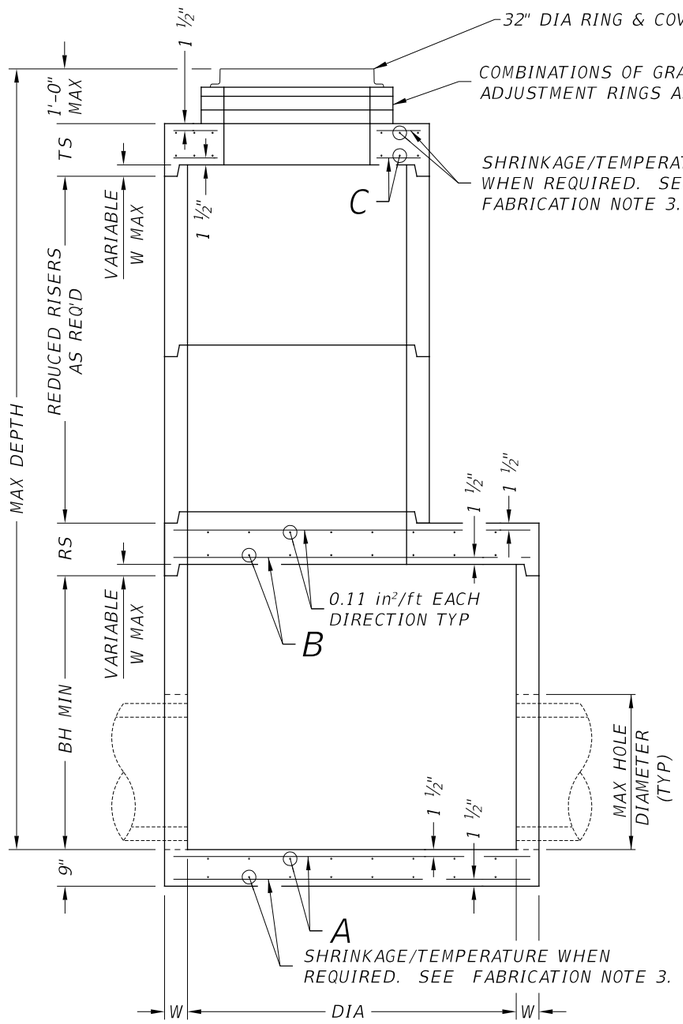
DATE:
FILE:



PLAN VIEW "A"

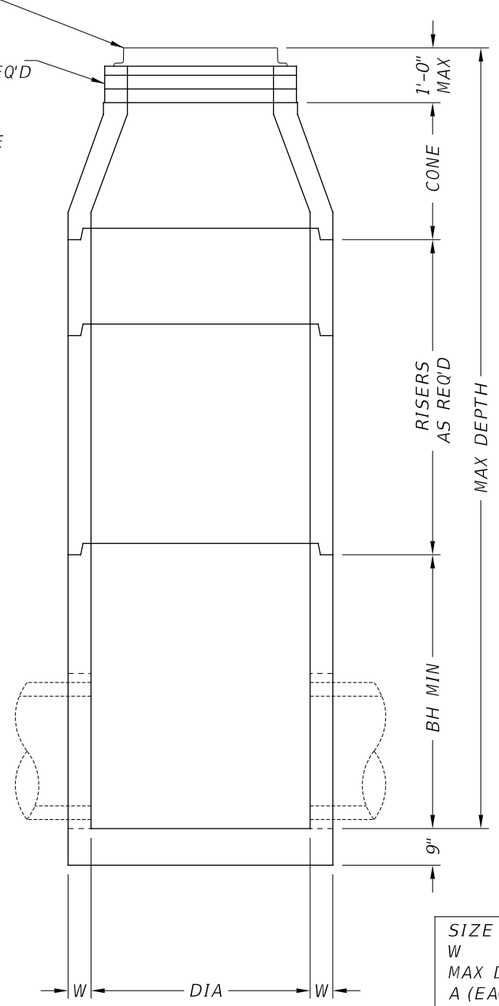


PLAN VIEW "B"



SECTION A-A

ROUND REDUCED RISER OPTION
SHOWING FLAT SLAB TOP



SECTION B-B

ROUND RISER OPTION
SHOWING CONE

FABRICATION NOTES:

1. Provide Class "H" concrete in accordance with Item 421 and having a minimum compressive strength of 5,000 psi.
2. Provide Grade 60 reinforcing steel or equivalent area of WWR. Provide circumferential reinforcing steel in vertical walls of base, riser and cone in accordance with ASTM C478.
3. Slabs with a thickness of 8" or greater require shrinkage and temperature reinforcing steel. Provide steel area = 0.11 in²/ft each way.
4. Manufacture base and risers to nearest 3" increment.
5. Design tongue and groove joints for full closure on both shoulders. Minimum spigot depth is ¾".
6. Provide lifting devices in conformance with Manufacturer's recommendations.
7. Provide cast iron solid cover, unless noted otherwise elsewhere in the plans.

INSTALLATION NOTES:

1. Cones may be concentric or eccentric. Reduction cones are acceptable. See Manufacturer for cone dimensions.
2. Inverts (benching) to be provided by Contractor. Concrete or mortar used for invert is subsidiary to this item.
3. Seal tongue and groove joints with preformed or bulk mastic in conformance with Manufacturer's recommendations. Tongue and groove joints may be grouted no more than 1" between each section, or ½ the joint depth, whichever is greater.
4. Do not grout rubber gasket joints without Manufacturer's recommendation.
5. Initial installation of grade adjustment rings is limited to 1'-0" Max as shown.
6. Grade adjustment rings may be increased to 2'-0" Max when future construction affects final grade of structure. Make adjustments greater than 2'-0" with additional risers. Adjustments may be made up to the Max depth shown. Structure must be evaluated if Max depth will be exceeded.

GENERAL NOTES:

1. Designed according to ASTM C478.
2. Payment for manhole is per Item 465, "Junction Boxes, Manholes, and Inlets" by type and size.
3. Pipe OD + placement tolerance must be equal or less than Max hole diameter. For rigid pipe, placement tolerance is 4" Max, 2" Min. For flexible pipe, consult boot/seal manufacturer's specification for placement tolerance.

Cover dimensions are clear dimensions, unless noted otherwise.

SIZE (DIA)	48 in	60 in	72 in
W	5 in	6 in	7 in
MAX DEPTH	25 ft	25 ft	25 ft
A (EACH WAY)	0.22 in²/ft	0.30 in²/ft	0.45 in²/ft
B (EACH WAY)	N/A	0.37 in²/ft	0.62 in²/ft
C (EACH WAY)	0.24 in²/ft	0.46 in²/ft	0.46 in²/ft
BH MIN	12 in	36 in	36 in
TS	9 in	9 in	9 in
RS	N/A	9 in	12 in
REDUCED RISER DIA	N/A	48 in	48/60 in
MAX HOLE DIA	32 in	40 in	54 in

HL93 LOADING

Texas Department of Transportation

Bridge Division Standard

PRECAST ROUND MANHOLE

PRM

FILE: prestd02.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT January 2015	CONT	SECT	JOB	HIGHWAY
REVISIONS				
	DIST	COUNTY		SHEET NO.

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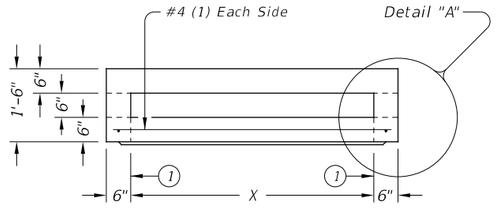
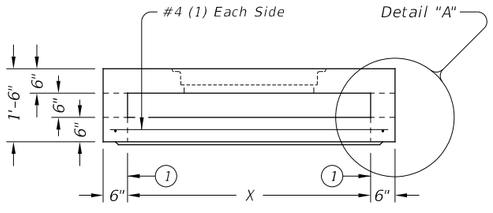


ELEVATION VIEW



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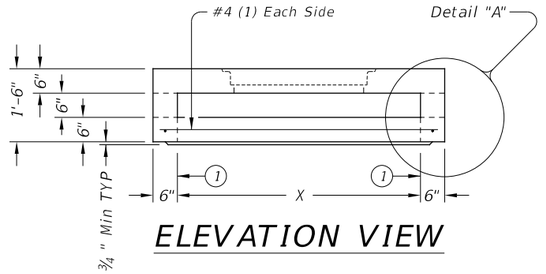
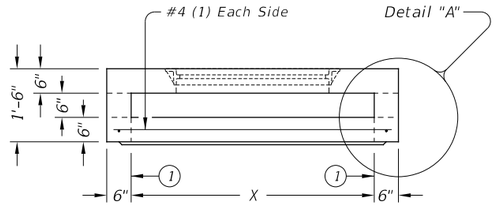
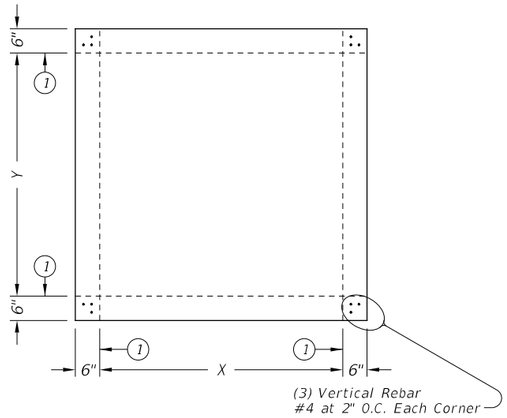


ELEVATION VIEW

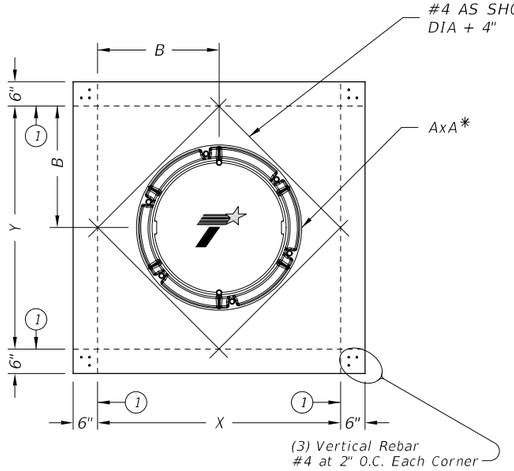


ELEVATION VIEW



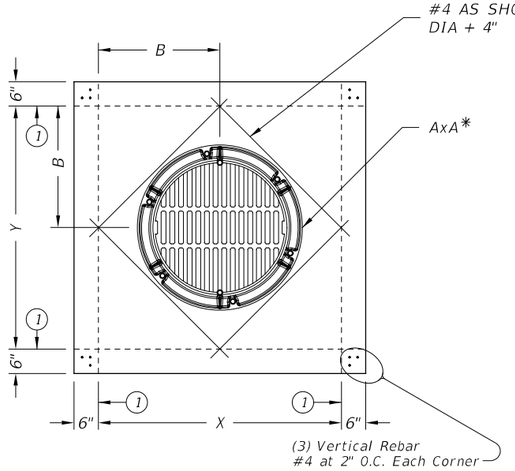
PLAN VIEW
NO OPENINGS

STYLE 'SL'



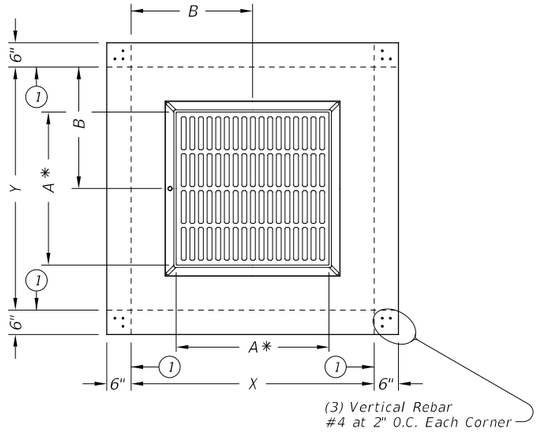
PLAN VIEW
32" DIA CAST-IN RING & COVER

STYLE 'RC'



PLAN VIEW
32" DIA CAST-IN RING & GRATE

STYLE 'RG'



PLAN VIEW
CAST-IN FRAME & GRATE

STYLE 'FG'

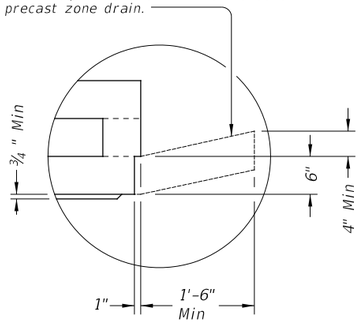
(1) Matches inside face of wall of precast base or riser below inlet.

FABRICATION NOTES:
1. Provide Class "H" concrete in accordance with Item 421 and having a minimum compressive strength of 5,000 psi.
2. Provide Grade 60 reinforcing steel or equivalent area of WWR.
3. Provide clear cover of ¾" to reinforcing from bottom of slab for structural reinforcement. Place short span reinforcing closest to surface.
4. No substitution is allowed for diagonal #4 bars around openings.
5. Design tongue and groove joints for full closure on both shoulders. Minimum spigot depth is ¾".
6. Provide lifting devices in conformance with Manufacturer's recommendations.

INSTALLATION NOTES:
1. PAZD is for use in ditches and medians outside of the horizontal clearance (clear zone). Precast Area Zone Drain is not intended for direct traffic and may not be placed in roadway.
2. Seal tongue and groove joints with preformed or bulk mastic in conformance with Manufacturer's recommendations. Tongue and groove joints may be grouted no more than 1" between each section, or ½ the joint depth, whichever is greater.
3. Do not grout rubber gasket joints without Manufacturer's recommendation.

GENERAL NOTES:
1. Designed according to ASTM C913.
2. Payment for inlet is per Item 465, "Junction Boxes, Manholes, and Inlets" by type, style, size, and opening size (when applicable).

Construct cast-in-place reinforced concrete apron when shown elsewhere in plans. Use Class "A" concrete. Apron is subsidiary to PAZD. Apron is 1'-6" Min width around precast zone drain.



DETAIL "A"

(Reinforcing not shown for clarity)

When an apron is to be cast around PAZD, use detail above to create an apron ledge on all 4 sides.

Style	Size (X x Y)	A x A *	B x B	Short Span Reinf Steel Area	Long Span Reinf Steel Area
SL	3'x3'	n/a	n/a	0.37 in²/ft	0.37 in²/ft
RC,RG	3'x3'	32" Dia	1.5'x1.5'	0.37 in²/ft	0.37 in²/ft
FG	3'x3'	3'x3'	1.5'x1.5'	0.37 in²/ft	0.37 in²/ft
SL	4'x4'	n/a	n/a	0.34 in²/ft	0.34 in²/ft
RC,RG	4'x4'	32" Dia	2'x2'	0.34 in²/ft	0.34 in²/ft
FG	4'x4'	3'x3'	2'x2'	0.34 in²/ft	0.34 in²/ft
FG	4'x4'	4'x4'	2'x2'	0.34 in²/ft	0.34 in²/ft
SL	5'x5'	n/a	n/a	0.43 in²/ft	0.43 in²/ft
RC,RG	5'x5'	32" Dia	2.5'x2.5'	0.68 in²/ft	0.68 in²/ft
FG	5'x5'	3'x3'	2.5'x2.5'	0.43 in²/ft	0.43 in²/ft
FG	5'x5'	4'x4'	2.5'x2.5'	0.43 in²/ft	0.43 in²/ft

* Nominal frame/grate or ring/cover size.

Texas Department of Transportation

Bridge Division Standard

PRECAST AREA ZONE DRAIN

PAZD

FILE: prestd08.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT January 2015	CONT	SECT	JOB	HIGHWAY
REVISIONS				
	DIST	COUNTY		SHEET NO.
				96

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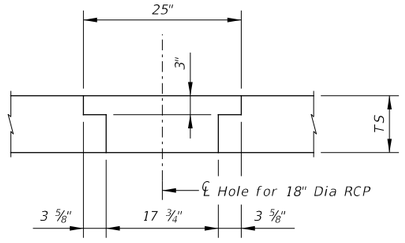
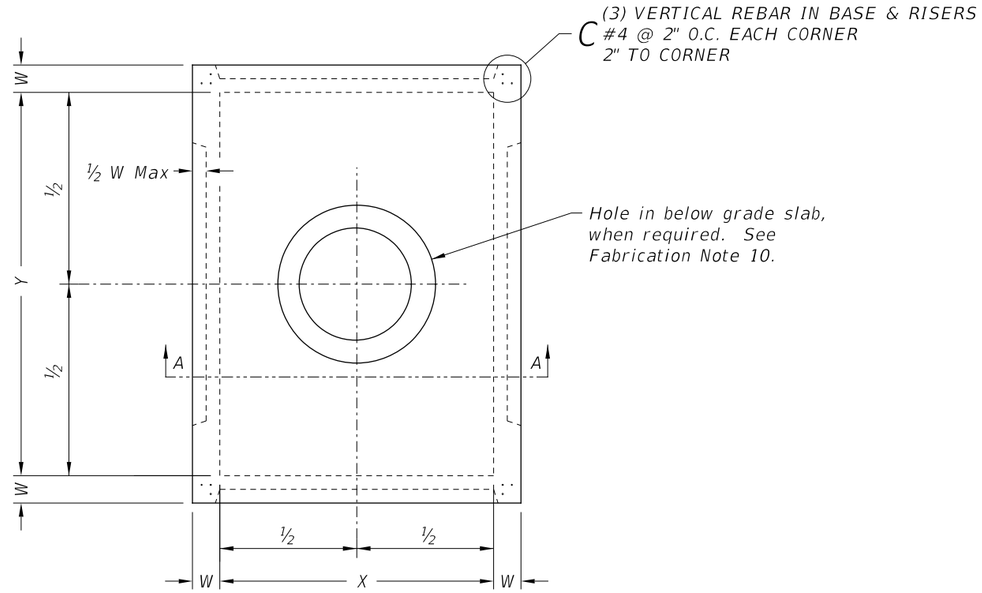
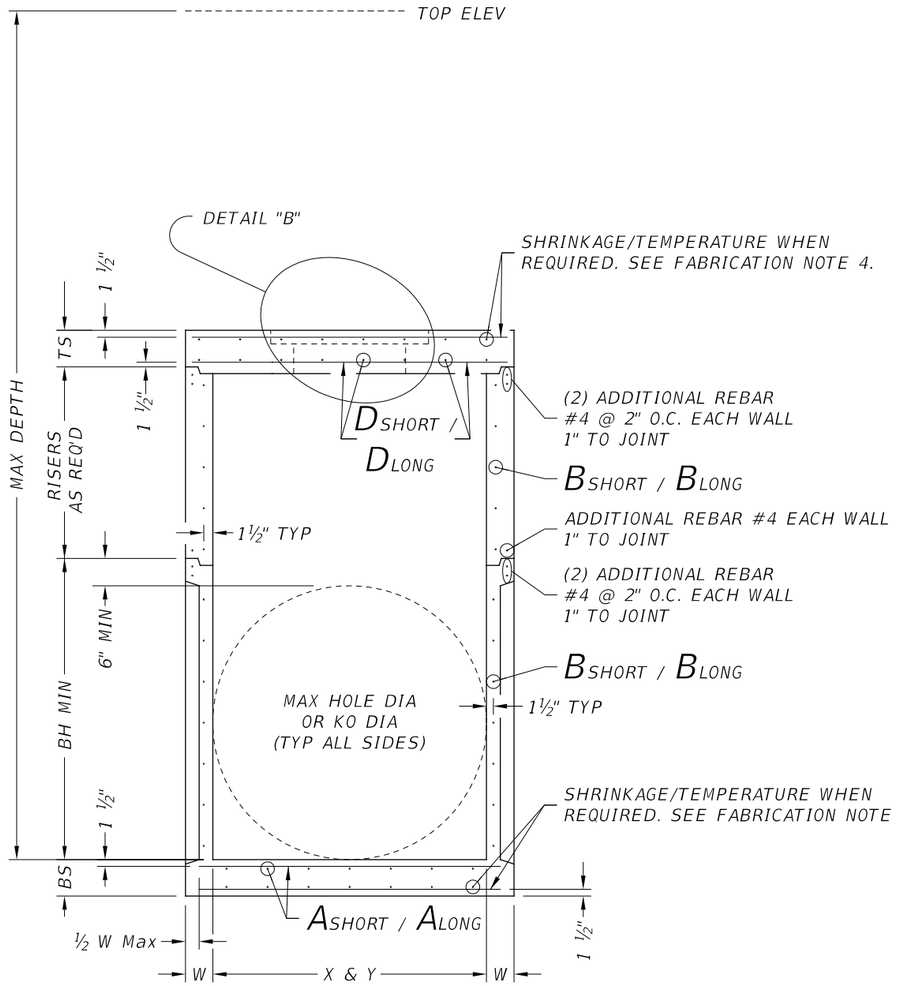
DATE:
FILE:



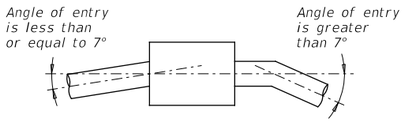
DETAIL "B"



PLAN VIEW



SECTION A-A



PIPE CONNECTION DETAIL

Connect pipes within 7° of normal to PJB wall.
If necessary, use pipe elbow or curved approach
alignment to stay within this limit.

FABRICATION NOTES:

1. Provide Class "H" concrete in accordance with Item 421 and having a minimum compressive strength of 5,000 psi.
2. Provide Grade 60 reinforcing steel or equivalent area of WWR.
3. Provide typical clear cover of 1 ½" to reinforcing steel at interior or exterior walls.
4. Walls or slabs with a thickness of 8" or greater require shrinkage and temperature reinforcing steel. Provide steel area = 0.11 in^2/ft each way.
5. No substitution is allowed for vertical and horizontal #4 bars in corners.
6. Manufacture base and risers to nearest 3" increment.
7. Design tongue and groove joints for full closure on both shoulders. Minimum spigot depth is ¾".
8. Provide lifting devices in conformance with Manufacturer's recommendations.
9. See sheet PDD for sizes, dimensions, and reinforcing steel not shown.
10. Provide hole in below grade slab only when PJB is installed with inlet type POD.

INSTALLATION NOTES:

1. Inverts (benching) to be provided by Contractor. Concrete or mortar used for invert is subsidiary to junction box.
2. Seal tongue and groove joints with preformed or bulk mastic in conformance with Manufacturer's recommendations. Tongue and groove joints may be grouted no more than 1" between each section, or ½ the joint depth, whichever is greater.
3. Do not grout rubber gasket joints without Manufacturer's recommendation.
4. For rigid pipe, cut hole in thin wall panel (KO) 4" Max, 2" Min larger than pipe OD.
5. For flexible pipe, consult boot/seal Manufacturer's specification for placement tolerance and hole size. Center pipe in hole and install boot/seal per Manufacturer's specification.

GENERAL NOTES:

1. Precast Junction Box consists of base slab, base unit, risers (as required), and below grade slab. See sheet PDD for sizes.
2. Designed according to ASTM C913.
3. Payment for junction box is per Item 465 "Junction Boxes, Manholes, and Inlets" by type and size.

Cover dimensions are clear dimensions, unless noted otherwise.

HL93 LOADING

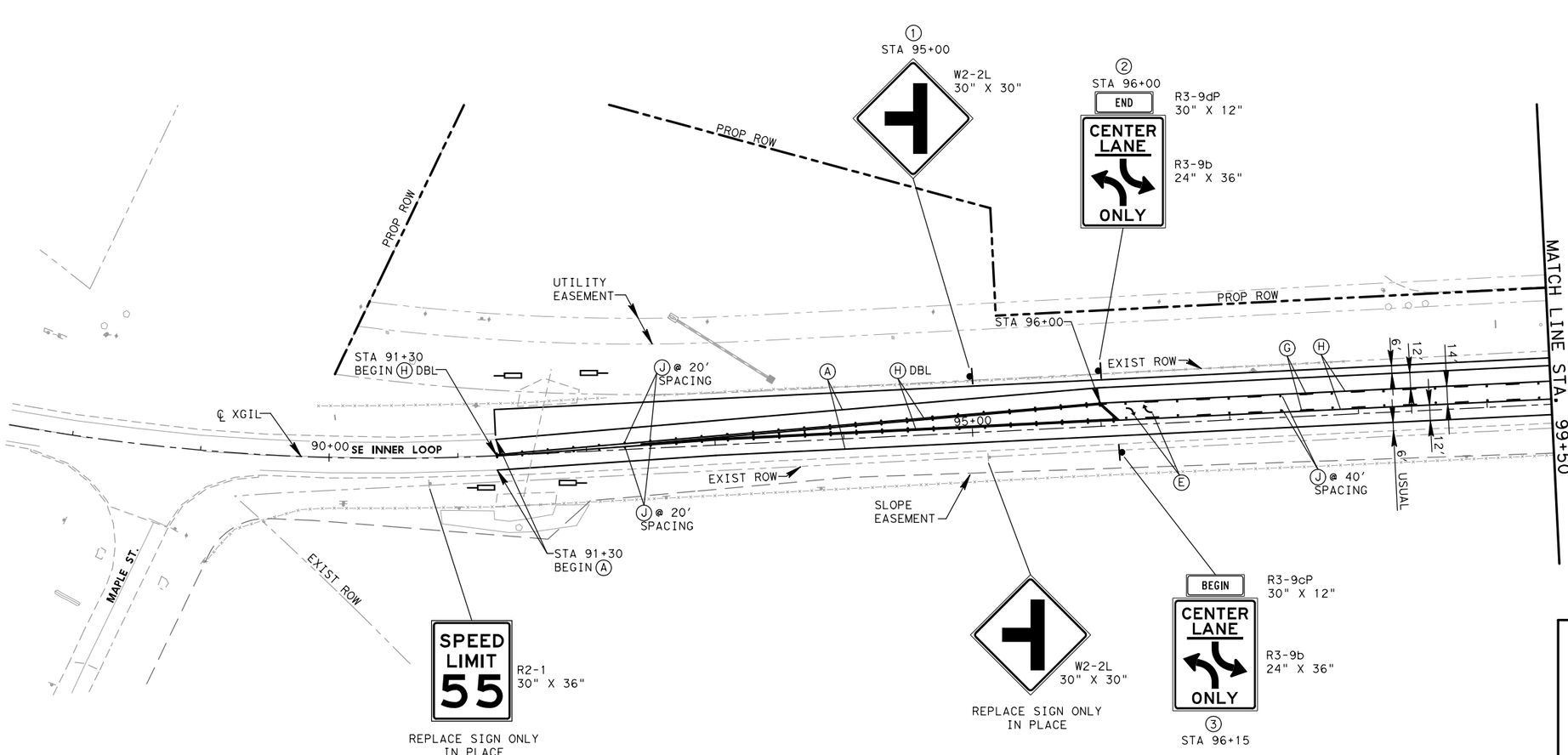
Texas Department of Transportation

Bridge Division Standard

PRECAST JUNCTION BOX

PJB

FILE: prestd09.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT January 2015	CONT	SECT	JOB	HIGHWAY
REVISIONS				
	DIST	COUNTY		SHEET NO.
				9-7



NOTE:
ADJUST PAVEMENT MARKINGS TO TIE TO EXISTING STRIPING AS APPLICABLE.

NOTE: REFLECTORIZED PAVEMENT MARKINGS TYPE II SHALL BE PLACED AS A SEALER FOR REFLECTORIZED PAVEMENT MARKINGS TYPE I AND SHALL BE PLACED IN IDENTICAL LOCATION AND QUANTITY AS REFLECTIVE PAVEMENT MARKINGS TYPE I AS SHOWN.

	ESTIMATED QUANTITIES			
LEGEND	ITEM-DESC	DESCRIPTION	UNITS	QUANTITY
	0636-6007	REPLACE EXISTING ALUMINUM SIGNS (TY A)	SF	13.75
	0644-6060	IN SM RD SN SUP & AM TYTWT(1)WS(P)	EA	3
	0644-6061	IN SM RD SN SUP & AM TYTWT(1)WS(T)	EA	
	0644-6071	RELOCATE SM RD SN SUP & AM TY TWT	EA	
	0644-6076	REMOVE SM RD SN SUP & AM	EA	
▭	0658-6047	INSTL OM ASSM (OM-2Y)(WC)GND	EA	4
(A)	0666-6302	RE PM W/RET REQ TY I (W) 4" (SLD) (90MIL)	LF	1640
(B)	0666-6029	REFL PAV MRK TY I (W) 8" (DOT) (90MIL)	LF	
(C)	0666-6035	REFL PAV MRK TY I (W) 8" (SLD) (90MIL)	LF	
(D)	0666-6047	REFL PAV MRK TY I (W) 24" (SLD) (90MIL)	LF	
(E)	0666-6053	REFL PAV MRK TY I (W) (ARROW) (90MIL)	EA	2
(F)	0666-6077	REFL PAV MRK TY I (W) (WORD) (90MIL)	EA	
(G)	0666-6311	RE PM W/RET REQ TY I (Y) 4" (BRK) (90MIL)	LF	172
(H)	0666-6314	RE PM W/RET REQ TY I (Y) 4" (SLD) (90MIL)	LF	2403
(I)	0672-6007	REFL PAV MRKR TY I-C	EA	
(J)	0672-6009	REFL PAV MRKR TY II-A-A	EA	101
⊗	0677-6012	ELIM EXT PAV MRK & MRKS (WORD)	EA	

STATE OF TEXAS
JEFFERY T. SEILER
77187
REGISTERED PROFESSIONAL ENGINEER
6/24/2017

NO.	REVISION	BY	DATE

WILLIAMSON COUNTY
1848

Seiler Lankes Group
TBPE License No. 12170
PLANNING • ENGINEERING • CONSTRUCTION

GEORGETOWN INNER LOOP
SIGNING & PAVEMENT MARKINGS
BEGIN TO STA. 99+50

SHEET 1 OF 3

DESIGNED:	PROJECT NUMBER		ROADWAY	
CHECKED:			SE INNER LOOP	
DRAWN:	STATE	COUNTY	CITY	SHEET No.
CHECKED:	TEXAS	WILLIAMSON	GEORGETOWN	98

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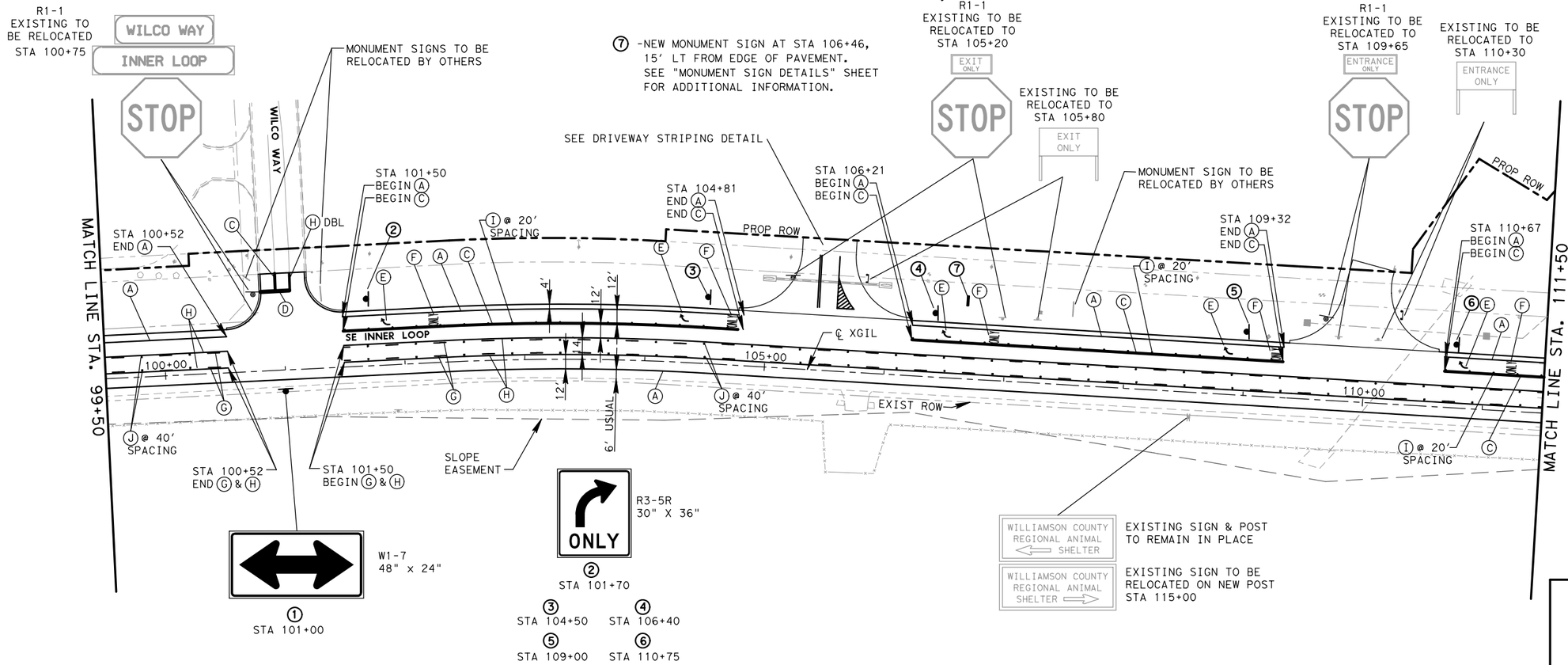

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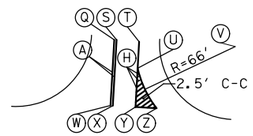
SCALE IN FEET

NOTE:
ADJUST PAVEMENT MARKINGS TO TIE
TO EXISTING STRIPING AS APPLICABLE.

NOTE: REFLECTORIZED PAVEMENT MARKINGS TYPE II SHALL BE PLACED AS A SEALER FOR REFLECTORIZED PAVEMENT MARKINGS TYPE I AND SHALL BE PLACED IN IDENTICAL LOCATION AND QUANTITY AS REFLECTIVE PAVEMENT MARKINGS TYPE I AS SHOWN.

	ESTIMATED QUANTITIES			
LEGEND	ITEM-DESC	DESCRIPTION	UNITS	QUANTITY
	0636-6007	REPLACE EXISTING ALUMINUM SIGNS (TY A)	SF	
	0644-6060	IN SM RD SN SUP & AM TYTWT(1)WS(P)	EA	5
	0644-6061	IN SM RD SN SUP & AM TYTWT(1)WS(T)	EA	1
	0644-6071	RELOCATE SM RD SN SUP & AM TY TWT	EA	5
	0644-6076	REMOVE SM RD SN SUP & AM	EA	
▭—	0658-6047	INSTL OM ASSM (OM-2Y)(WC)GND	EA	
Ⓐ	0666-6302	RE PM W/RET REQ TY I (W) 4" (SLD) (90MIL)	LF	2157
Ⓑ	0666-6029	REFL PAV MRK TY I (W) 8" (DOT) (90MIL)	LF	
Ⓒ	0666-6035	REFL PAV MRK TY I (W) 8" (SLD) (90MIL)	LF	732
Ⓓ	0666-6047	REFL PAV MRK TY I (W) 24" (SLD) (90MIL)	LF	24
Ⓔ	0666-6053	REFL PAV MRK TY I (W) (ARROW) (90MIL)	EA	5
Ⓕ	0666-6077	REFL PAV MRK TY I (W) (WORD) (90MIL)	EA	5
Ⓖ	0666-6311	RE PM W/RET REQ TY I (Y) 4" (BRK) (90MIL)	LF	547
Ⓗ	0666-6314	RE PM W/RET REQ TY I (Y) 4" (SLD) (90MIL)	LF	2305
Ⓘ	0672-6007	REFL PAV MRKR TY I-C	EA	37
Ⓙ	0672-6009	REFL PAV MRKR TY II-A-A	EA	54
⊗	0677-6012	ELIM EXT PAV MRK & MRKS (WORD)	EA	



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S	STA. 105+42.72, 95.87' LT
T	STA. 105+57.72, 95.57' LT
U	STA. 105+57.75, 78.04' LT
V	STA. 106+21.22, 96.15' LT
W	STA. 105+41.35, 52.37' LT
X	STA. 105+42.85, 52.37' LT
Y	STA. 105+57.80, 52.42' LT
Z	STA. 105+71.77, 52.44' LT

DRIVEWAY STRIPING
DETAIL

STATE OF TEXAS
JEFFERY T. SEILER
77187
REGISTERED
PROFESSIONAL ENGINEER
6/24/2017

NO.	REVISION	BY	DATE

WILLIAMSON COUNTY
1848

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GEORGETOWN INNER LOOP
SIGNING & PAVEMENT MARKINGS
STA. 99+50 - STA. 111+50

SHEET 2 OF 3

DESIGNED:	PROJECT NUMBER		ROADWAY	
CHECKED:			SE INNER LOOP	
DRAWN:	STATE	COUNTY	CITY	SHEET No.
CHECKED:	TEXAS	WILLIAMSON	GEORGETOWN	99

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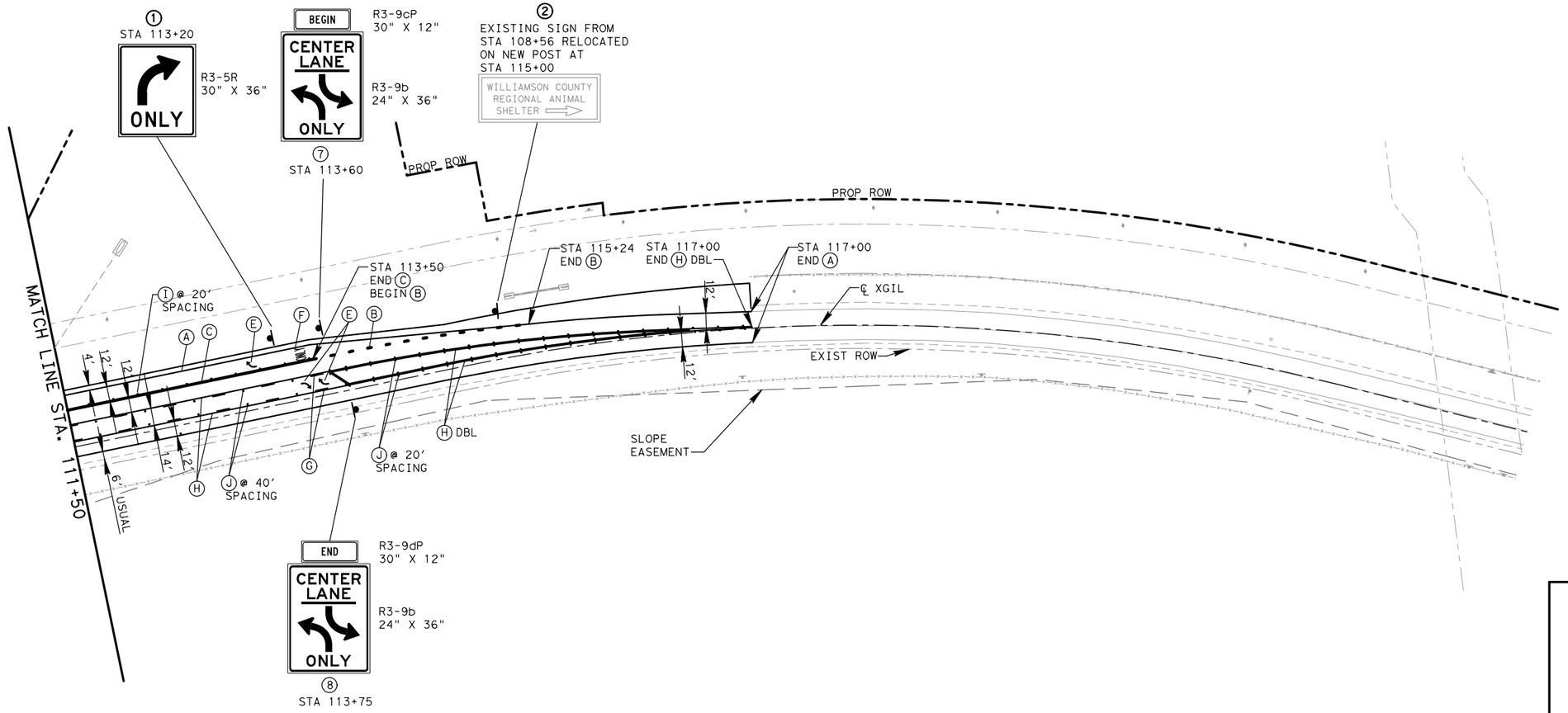

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SCALE IN FEET

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	ESTIMATED QUANTITIES			
LEGEND	ITEM-DESC	DESCRIPTION	UNITS	QUANTITY
	0636-6007	REPLACE EXISTING ALUMINUM SIGNS (TY A)	SF	
	0644-6060	IN SM RD SN SUP & AM TYTWT(1)WS(P)	EA	3
	0644-6061	IN SM RD SN SUP & AM TYTWT(1)WS(T)	EA	1
	0644-6071	RELOCATE SM RD SN SUP & AM TY TWT	EA	
	0644-6076	REMOVE SM RD SN SUP & AM	EA	
▭	0658-6047	INSTL OM ASSM (OM-2Y)(WC)GND	EA	
Ⓐ	0666-6302	RE PM W/RET REQ TY I (W) 4" (SLD) (90MIL)	LF	1101
Ⓑ	0666-6029	REFL PAV MRK TY I (W) 8" (DOT) (90MIL)	LF	44
Ⓒ	0666-6035	REFL PAV MRK TY I (W) 8" (SLD) (90MIL)	LF	200
Ⓓ	0666-6047	REFL PAV MRK TY I (W) 24" (SLD) (90MIL)	LF	
Ⓔ	0666-6053	REFL PAV MRK TY I (W) (ARROW) (90MIL)	EA	3
Ⓕ	0666-6077	REFL PAV MRK TY I (W) (WORD) (90MIL)	EA	1
Ⓖ	0666-6311	RE PM W/RET REQ TY I (Y) 4" (BRK) (90MIL)	LF	109
Ⓗ	0666-6314	RE PM W/RET REQ TY I (Y) 4" (SLD) (90MIL)	LF	1703
Ⓘ	0672-6007	REFL PAV MRKR TY I-C	EA	10
Ⓙ	0672-6009	REFL PAV MRKR TY II-A-A	EA	73
Ⓧ	0677-6012	ELIM EXT PAV MRK & MRKS (WORD)	EA	

STATE OF TEXAS
JEFFERY T. SEILER
77187
REGISTERED PROFESSIONAL ENGINEER
6/24/2017

NO.	REVISION	BY	DATE

WILLIAMSON COUNTY
1848

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GEORGETOWN INNER LOOP
SIGNING & PAVEMENT MARKINGS
STA. 111+50 TO END

SHEET 3 OF 3

DESIGNED:	PROJECT NUMBER		ROADWAY	
CHECKED:			SE INNER LOOP	
DRAWN:	STATE	COUNTY	CITY	SHEET No.
CHECKED:	TEXAS	WILLIAMSON	GEORGETOWN	100

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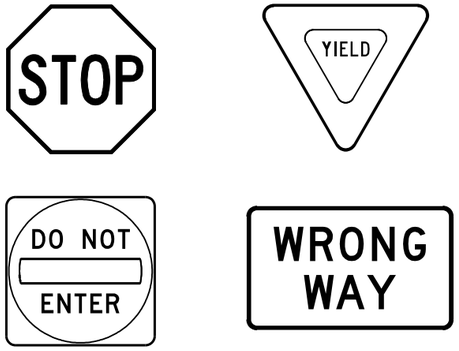
REQUIREMENTS FOR RED BACKGROUND REGULATORY SIGNS

(STOP, YIELD, DO NOT ENTER AND WRONG WAY SIGNS)



REQUIREMENTS FOR FOUR SPECIFIC SIGNS ONLY

SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	RED	TYPE B OR C SHEETING
BACKGROUND	WHITE	TYPE B OR C SHEETING
LEGEND & BORDERS	WHITE	TYPE B OR C SHEETING
LEGEND	RED	TYPE B OR C SHEETING

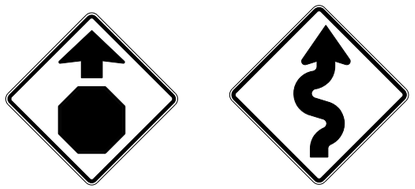
REQUIREMENTS FOR WHITE BACKGROUND REGULATORY SIGNS

(EXCLUDING STOP, YIELD, DO NOT ENTER AND WRONG WAY SIGNS)

TYPICAL EXAMPLES

SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	WHITE	TYPE A SHEETING
BACKGROUND	ALL OTHERS	TYPE B OR C SHEETING
LEGEND, BORDERS AND SYMBOLS	BLACK	ACRYLIC NON-REFLECTIVE FILM
LEGEND, BORDERS AND SYMBOLS	ALL OTHER	TYPE B OR C SHEETING

REQUIREMENTS FOR WARNING SIGNS



TYPICAL EXAMPLES

SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	FLOURESCENT YELLOW	TYPE B_{FL} OR C_{FL} SHEETING
LEGEND & BORDERS	BLACK	ACRYLIC NON-REFLECTIVE FILM
LEGEND & SYMBOLS	ALL OTHER	TYPE B OR C SHEETING

REQUIREMENTS FOR SCHOOL SIGNS

TYPICAL EXAMPLES

SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	WHITE	TYPE A SHEETING
BACKGROUND	FLOURESCENT YELLOW GREEN	TYPE B_{FL} OR C_{FL} SHEETING
LEGEND, BORDERS AND SYMBOLS	BLACK	ACRYLIC NON-REFLECTIVE FILM
SYMBOLS	RED	TYPE B OR C SHEETING

GENERAL NOTES

1. Signs to be furnished shall be as detailed elsewhere in the plans and/or as shown on sign tabulation sheet. Standard sign designs and arrow dimensions can be found in the "Standard Highway Sign Designs for Texas" (SHSD).
2. Sign legend shall use the Federal Highway Administration (FHWA) Standard Highway Alphabets (B, C, D, E, Emod or F).
3. Lateral spacing between letters and numerals shall conform with the SHSD, and any approved changes thereto. Lateral spacing of legend shall provide a balanced appearance when spacing is not shown.
4. Black legend and borders shall be applied by screening process or cut-out acrylic non-reflective black film to background sheeting, or combination thereof.
5. White legend and borders shall be applied by screening process with transparent colored ink, transparent colored overlay film to white background sheeting or cut-out white sheeting to colored background sheeting, or combination thereof.
6. Colored legend shall be applied by screening process with transparent colored ink, transparent colored overlay film or colored sheeting to background sheeting, or combination thereof.
7. Sign substrate shall be any material that meets the Departmental Material Specification requirements of DMS-7110 or approved alternative.
8. Mounting details for roadside mounted signs are shown in the "SMD series" Standard Plan Sheets.

ALUMINUM SIGN BLANKS THICKNESS	
Square Feet	Minimum Thickness
Less than 7.5	0.080
7.5 to 15	0.100
Greater than 15	0.125

DEPARTMENTAL MATERIAL SPECIFICATIONS	
ALUMINUM SIGN BLANKS	DMS-7110
SIGN FACE MATERIALS	DMS-8300

The Standard Highway Sign Designs for Texas (SHSD) can be found at the following website.

http://www.txdot.gov/

Texas Department of Transportation

Traffic Operations Division Standard

TYPICAL SIGN REQUIREMENTS

TSR(4)-13

FILE: tsr4-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT October 2003	CONT	SECT	JOB	HIGHWAY
REVISIONS				SE INNER LP
12-03 7-13	DIST	COUNTY		SHEET NO.
9-08		WILLIAMSON		101

4

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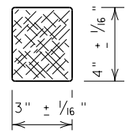
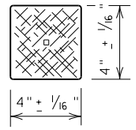
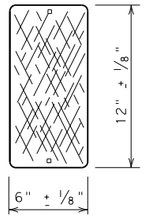
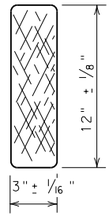
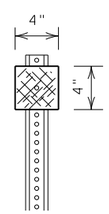
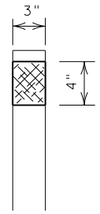
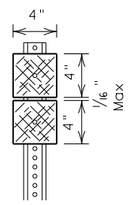
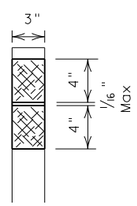
DATE: 6/24/2017 10:38
FILE: pw://rtg-pw.bentley.com:rtg-pw/Documents/8760101/dlv/standards/STRIP PNG/D&OM(1)-15.DGN

REFLECTOR UNIT SIZES FOR DELINEATORS AND OBJECT MARKERS

	SIZE 1	SIZE 2	SIZE 3	SIZE 4
DEVICE				
SHEETING	Yellow, White or Red Type B or C reflective sheeting			
NOTE	1. Size 1 and 4 - Direct applied reflective sheeting for use on flexible post (flx). 2. Size 2 and 3 - For use on wing channel (wc) post only. Use approved metal, plastic or fiberglass backplate with 17/64" mounting holes.			

DELINEATORS

	SINGLE		DOUBLE	
DEVICE				
	1-Size 2 reflector unit	1-Size 1 reflector unit	2-Size 2 reflector units	2-Size 1 reflector units
SHEETING	Yellow, White or Red Type B or C Reflective Sheeting			
POST TYPE	WC	FLX	WC	FLX
MOUNT TYPE	GND	GND, SRF	GND	GND, SRF

D & OM DESCRIPTIVE CODES

INSTL DEL ASSM (D-XX) SZ X (XXX) XXX (XX)

NUMBER OF REFLECTORS
S = Single
D = Double

COLOR OF REFLECTORS
W = White
Y = Yellow
R = Red

REFLECTOR UNIT SIZE
1 or 2

TYPE OF POST OR DELINEATOR
WC = Wing Channel Post
FLX = Flexible Post
BRF = Barrier Reflector

TYPE OF MOUNT
GND = Embedded (drivable or set in concrete)
CTB = Concrete Barrier Mount
GF1 or GF2 = Guard Fence Attachment
SRF = Surface Mount

DIRECTION
If Required
BI = Bi-Directional
BR = Bi-Directional with red on back

INSTL OM ASSM (OM-XX) (XXX) XXX (XX)

TYPE OF OBJECT MARKER
1, 2, 3, or 4

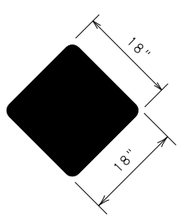
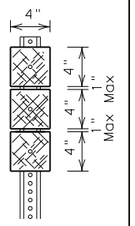
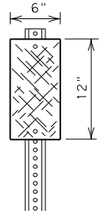
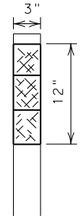
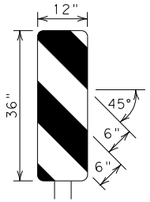
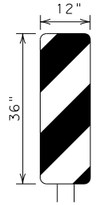
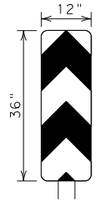
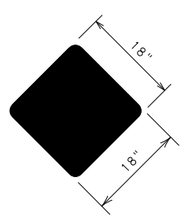
NUMBER OF REFLECTORS OR DIRECTION
X = 3-Size 2 reflector units (Type 2 only)
Y = 1-Size 3 reflector unit (Type 2 only)
Z = 3-Size 1 or 1-Size 4 reflector unit(s) (Type 2 only)
L = Left Side (Type 3 Object Marker only)
R = Right Side (Type 3 Object Marker only)
C = Center (Type 3 Object Marker only)

TYPE OF POST
WC = Wing Channel Post
FLX = Flexible Post
TWT = Thin Walled Tubing

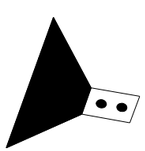
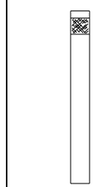
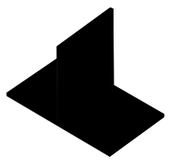
TYPE OF MOUNT
GND = Embedded (drivable)
SRF = Surface Mount
WAS = Wedge Anchor Steel
WAP = Wedge Anchor Plastic

DIRECTION
If Required
BI = Bi-Directional

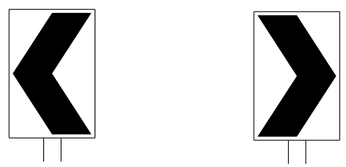
OBJECT MARKERS

	Type 1 (OM-1)	Type 2 (OM-2)			Type 3 (OM-3)			Type 4 (OM-4)
	OM-1	OM-2X	OM-2Y	OM-2Z	OM-3L	OM-3R	OM-3C	OM-4
DEVICE								
		3-Size 2 reflector units	1-Size 3 reflector unit	3-Size 1 reflector units or 1-Size 4 reflector unit				
SHEETING	Yellow-Type B_{FL} or C_{FL} Sheeting	Yellow - Type B or C Sheeting			Alternating acrylic black and retroflective yellow - Type B_{FL} or C_{FL} Sheeting			Red -Type B_{FL} or C_{FL} Sheeting
POST TYPE	TWT	WC	WC	FLX	TWT			TWT
MOUNT TYPE	WAS, WAP	GND	GND	GND, SRF	WAS, WAP			WAS, WAP

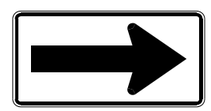
BARRIER REFLECTORS (BRF)

	GF1	GF2	CTB
DEVICE			
	1. Barrier reflectors shall meet the requirements of DMS 8600. 2. Approved Barrier Reflectors are listed on the "Barrier Reflectors" Material Producer List at: www.txdot.gov.		
SHEETING	Yellow, White, Red		
NOTE	1. Minimum 9 square inches of reflective sheeting surface area.		

CHEVRONS

DEVICE	 W1-8			
SIZE (W x L)	18"x 24" (Conventional)	24"x 30" (Conventional Oversize)	30"x 36" (Expressway)	36" x 48" (Freeway)
MOUNTING HEIGHT	4'-0" or 7'-0"		7'-0" Only	
NOTE	1. CHEVRON (W1-8) signs and ONE DIRECTION LARGE ARROW (W1-6) Signs shall be installed per Sign Mounting Details (SMD) Standard Sheets and paid under Item 644 (Small Roadside Sign Assemblies). 2. The Texas version of the ONE DIRECTION LARGE ARROW sign (W1-9T) may be used instead of the ONE DIRECTIONAL LARGE ARROW (W1-6).			

ONE DIRECTION LARGE ARROW

DEVICE	 W1-6	
SIZE (W x L)	48" x 24" (Conventional)	60" x 30" (Expressway & Freeway)
MOUNTING HEIGHT	7'-0"	

DEPARTMENTAL MATERIAL SPECIFICATIONS

FLEXIBLE DELINEATOR & OBJECT MARKER POSTS (EMBEDDED & SURFACE MOUNT TYPES)	DMS-4400
SIGN FACE MATERIALS	DMS-8300
DELINEATORS, OBJECT MARKERS AND BARRIER REFLECTORS	DMS-8600

NOTE:
Delineator and object marker backplates and sign substrates shall be 0.080" Aluminum sign blank to conform to ASTM B-209 Alloy 6061-T6 or approved alternative.

Texas Department of Transportation

Traffic Operations Division Standard

DELINEATOR & OBJECT MARKER MATERIAL DESCRIPTION

D & OM(1)-15

FILE: dom1-15.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
©TxDOT August 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS				SE INNER LP
10-09 3-15	DIST	COUNTY		SHEET NO.
4-10		WILLIAMSON		193
20A				

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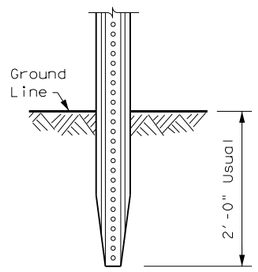
DATE: 6/24/2017 10:39
FILE: pw://rtg-pw.bentley.com:rtg-pw/Documents/8760101/dlv/standards/STRIP/D&OM(2)-15.dgn

POST TYPE AND SUPPORT FOUNDATION DETAILS

WING CHANNEL (WC)

GND

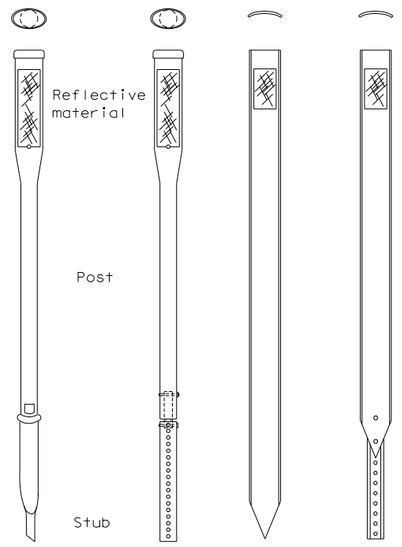


NOTES

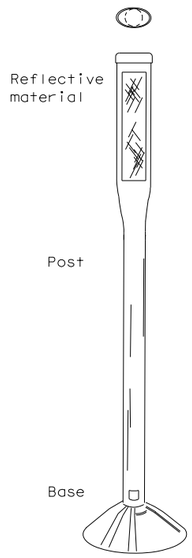
1. Embedded Wing Channel (WC) post option may be used for Type 2 Object Markers and Delineators only.
2. 1.12 lbs/ft steel per ASTM A 1011 SS Gr. 50, or ASTM A499.

FLEXIBLE POSTS (FLX)

GND



SRF



EMBEDDED

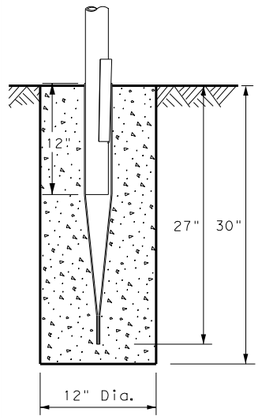
SURFACE MOUNT

NOTES

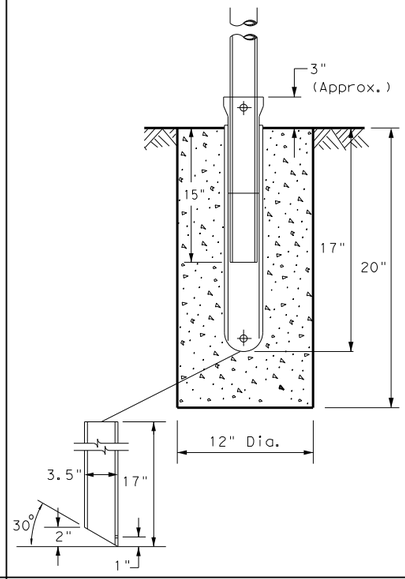
1. See "Flexible Delineator and Object Marker Posts" Material Producer List for approved devices.
2. Install per manufacturer's recommendations.
3. Post length may vary to meet field conditions.

WEDGE ANCHOR SYSTEMS

WAS



WAP



STEEL

PLASTIC

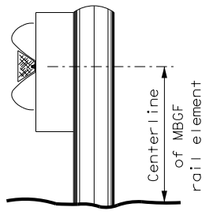
NOTE

1. Install per manufacturer's recommendations.

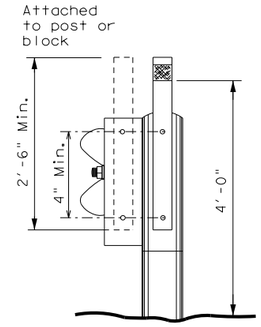
TYPE OF BARRIER MOUNTS

GUARD FENCE ATTACHMENT

GF1

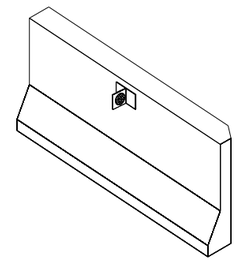


GF2



CONCRETE BARRIER / BRIDGE RAIL

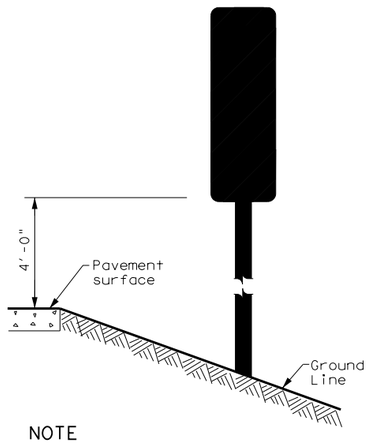
CTB



GENERAL NOTES

1. Place delineators on a section of roadway at a consistent distance from the edge of pavement.
2. Where a restriction prevents consistent placement from the pavement edge, place the affected object markers in line with the innermost edge of the obstruction.
3. When Type 2 object markers and delineators are more than 8'-0" from the edge of the pavement, it may not be possible to maintain a height of approximately 4'-0". If this is the case, place the object marker or delineator as close to the desired height as possible.
4. Install all delineators, object markers and barrier reflectors in accordance with the manufacturer's recommendation.
5. Barrier reflectors should be installed a minimum of 18 inches above the edge of the pavement surface.

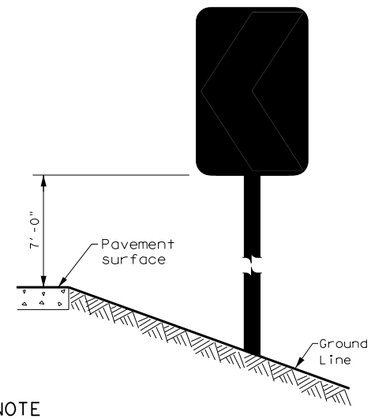
TYPES 1, 3, AND 4 OBJECT MARKERS AND CHEVRONS



NOTE

Mounting at 4 feet to the bottom of the chevron is permitted for chevrons that will not exceed a height of 6'-6" to the top of the chevron (sizes 24" x 30" and smaller)

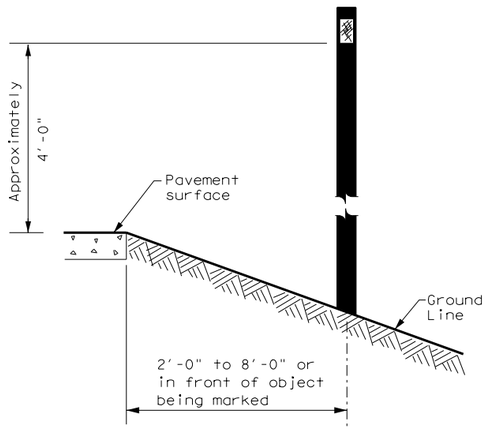
CHEVRONS AND ONE DIRECTION LARGE ARROW SIGN



NOTE

Chevrons 30" x 36" and larger shall be mounted at a height of 7' to the bottom of the chevron. Chevron sign and ONE DIRECTIONAL LARGE ARROW sign (W1-9T) shall be installed per SMD standard sheets and paid under item 644.

DELINEATORS AND TYPE 2 OBJECT MARKERS



See general notes 1, 2 and 3.

Texas Department of Transportation

Traffic Operations Division Standard

DELINEATOR & OBJECT MARKER INSTALLATION

D & OM(2)-15

FILE: dom2-15.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
© TxDOT August 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS				SE INNER LP
10-09 3-15	DIST	COUNTY		SHEET NO.
4-10		WILLIAMSON		103

20B

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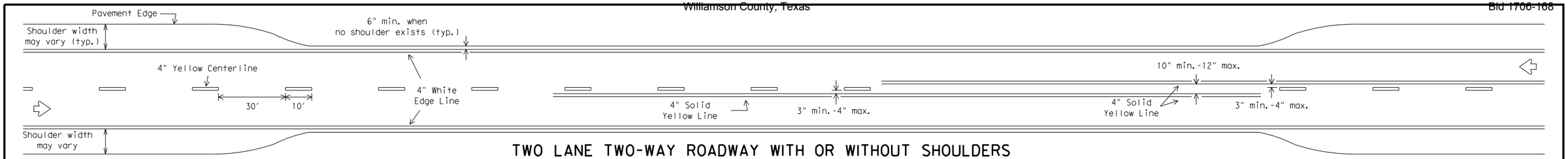
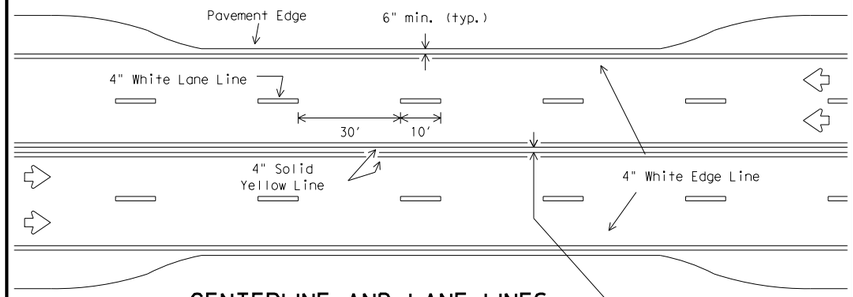
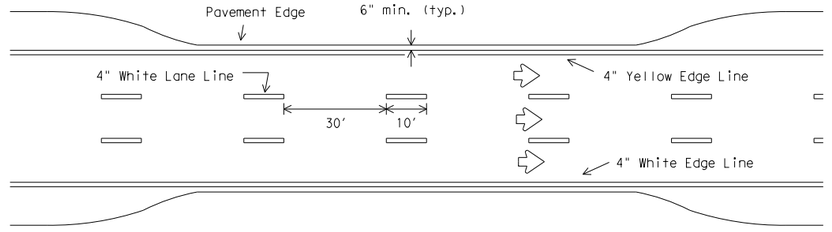
DATE: 6/24/2017
FILE: pw://rtg-pw.bentley.com:rtg-pw/Documents/8760101/dlv/standards/STRIPING/PM(1)-12.dgn



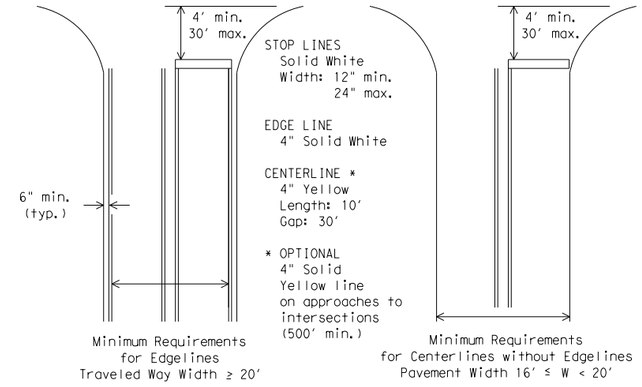
TWO LANE TWO-WAY ROADWAY WITH OR WITHOUT SHOULDERS



CENTERLINE AND LANE LINES FOUR LANE TWO-WAY ROADWAY WITH OR WITHOUT SHOULDERS

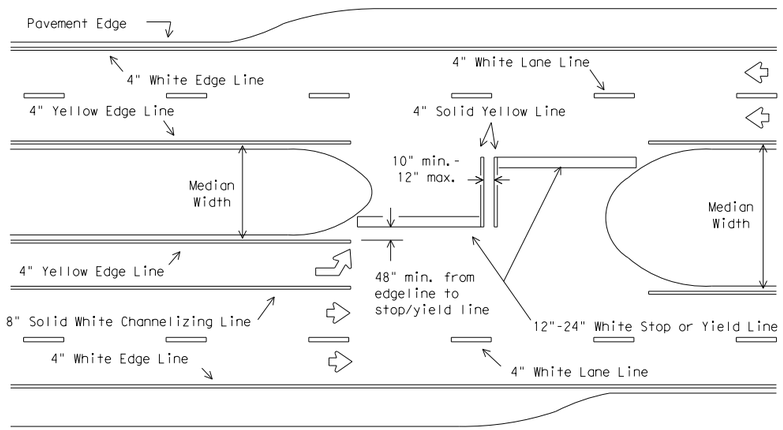


EDGE LINE AND LANE LINES ONE-WAY ROADWAY WITH OR WITHOUT SHOULDERS



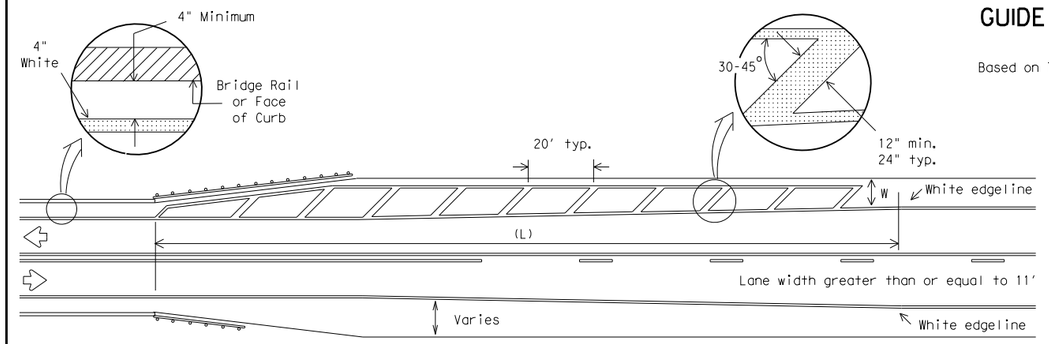
GUIDE FOR PLACEMENT OF STOP LINES, EDGE LINE & CENTERLINE

Based on Traveled Way and Pavement Widths for Undivided Highways



All medians shall be field measured to determine the location of necessary striping. Stop/Yield bars and centerlines shall be placed when the median width is greater than 30 ft. The median width is defined as the area between two roadways of a divided highway measured from edge of traveled way to edge of traveled way. The median excludes turn lanes. The median width might be different between intersections, interchanges and of opposite approaches of the same intersection. The narrow median width will be the controlling width to determine if markings are required.

FOUR LANE DIVIDED ROADWAY INTERSECTIONS



NOTES:

1. No-passing zone on bridge approach is optional but if used, it shall be a minimum 500 feet long.
2. For crosshatching length (L) see Table 1.
3. The width of the offset (W) and the required crosshatching width is the full shoulder width in advance of the bridge.
4. The crosshatching is not required if delineators or barrier reflectors are used along the structure.
5. For guard fence details, refer elsewhere in the plans.

ROADWAYS WITH REDUCED SHOULDER WIDTHS ACROSS BRIDGE OR CULVERT

TABLE 1 - TYPICAL LENGTH (L)

Posted Speed *	Formula
≤ 40	$L = \frac{WS^2}{60}$
≥ 45	L=WS

* 85th Percentile Speed may be used on roads where traffic speeds normally exceed the posted speed limit. Crosshatching length should be rounded up to nearest 5 foot increment.

L=Length of Crosshatching (FT.) W=Width of Offset (FT.)
S=Posted Speed (MPH)

EXAMPLES:

An 8 foot shoulder in advance of a bridge reduces to 4 feet on a 70 MPH roadway. The length of the cross-hatching should be:

$L = 8 \times 70 = 560$ ft.

A 4 foot shoulder in advance of a bridge reduces to 2 feet on a 40 MPH roadway. The length of the cross-hatching should be:

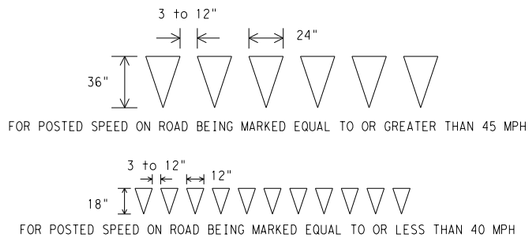
$L = 4(40)^2 / 60 = 106.67$ ft. rounded to 110 ft.

GENERAL NOTES

1. Edgeline striping shall be as shown in the plans or as directed by the Engineer. The edgeline should typically be placed a minimum of 6 inches from the edge of pavement. This distance may vary due to pavement raveling or other conditions. Edgelines are not required in curb and gutter sections of roadways.
2. The traveled way includes only that portion of the roadway used for vehicular travel and not the parking lanes, sidewalks, berms and shoulders. The traveled ways shall be measured from the inside of edgeline to inside of edgeline of a two lane roadway.

MATERIAL SPECIFICATIONS	
PAVEMENT MARKERS (REFLECTORIZED)	DMS-4200
EPOXY AND ADHESIVES	DMS-6100
BITUMINOUS ADHESIVE FOR PAVEMENT MARKERS	DMS-6130
TRAFFIC PAINT	DMS-8200
HOT APPLIED THERMOPLASTIC	DMS-8220
PERMANENT PREFABRICATED PAVEMENT MARKINGS	DMS-8240

All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.



YIELD LINES

Texas Department of Transportation
Traffic Operations Division

TYPICAL STANDARD PAVEMENT MARKINGS

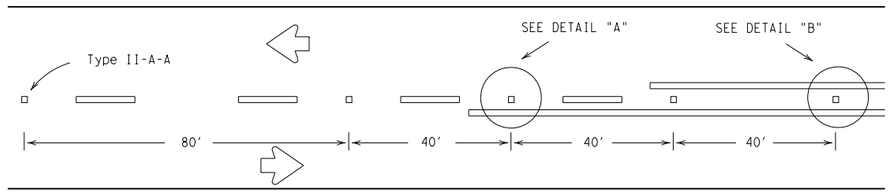
PM(1)-12

© TxDOT November 1978

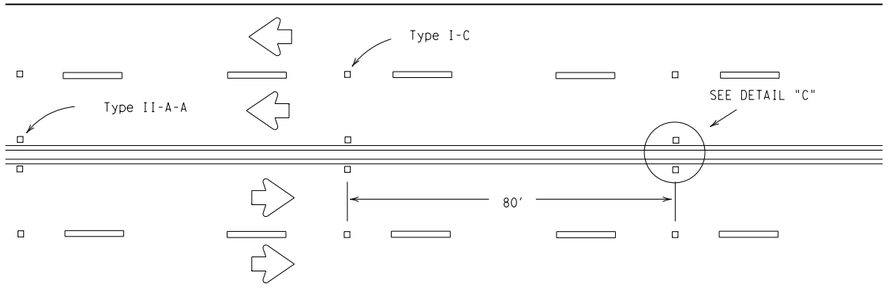
DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT

REVISIONS	CONT	SECT	JOB	HIGHWAY
8-95 2-12				SE INNER LP
5-00	DIST	COUNTY		SHEET NO.
8-00		WILLIAMSON		194
3-03				
22A				

REFLECTIVE RAISED PAVEMENT MARKERS FOR VEHICLE POSITIONING GUIDANCE

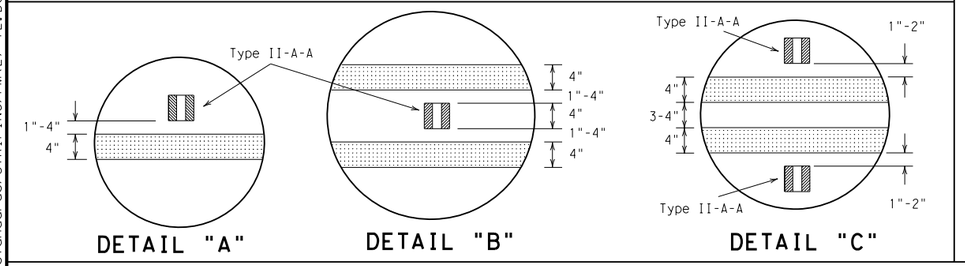


CENTERLINE FOR ALL TWO LANE ROADWAYS

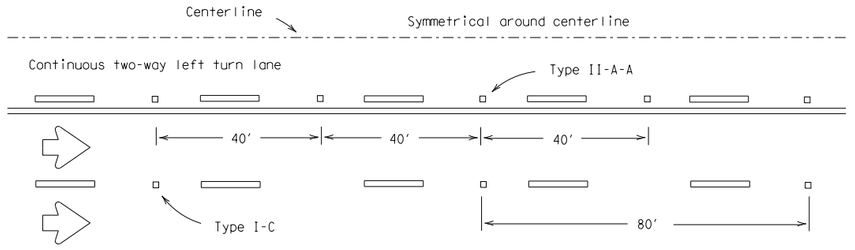


CENTERLINE & LANE LINES FOR FOUR LANE TWO-WAY HIGHWAYS

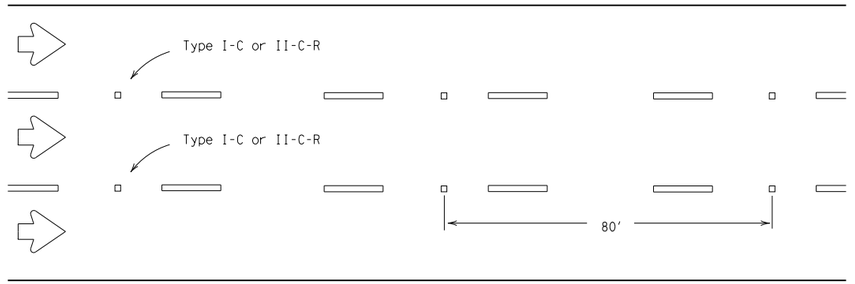
Raised pavement marker Type I-C, clear face toward normal traffic, shall be placed on 80-foot centers.



DETAIL "A" DETAIL "B" DETAIL "C"

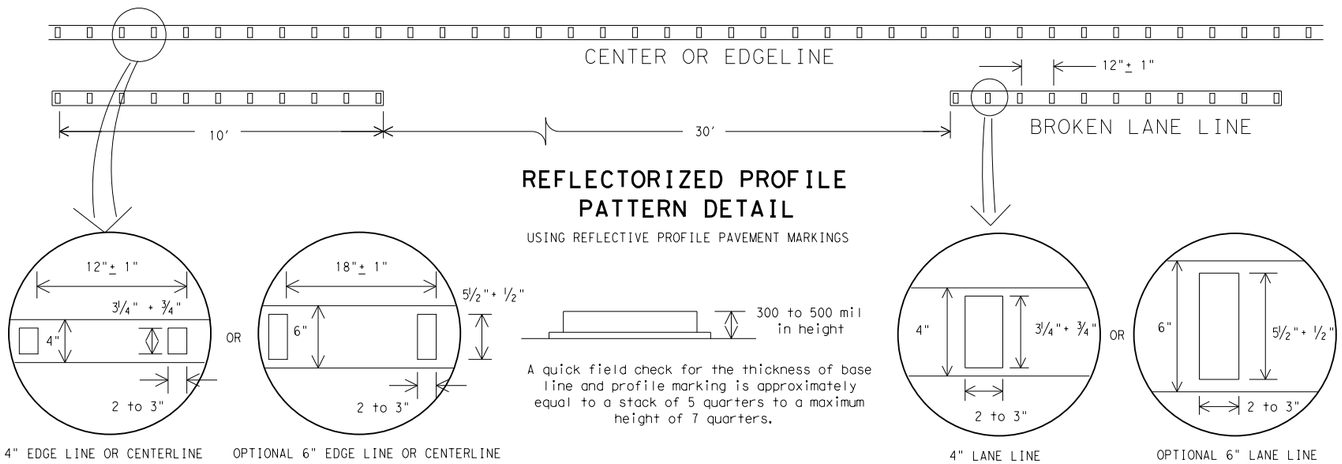


CENTERLINE AND LANE LINES FOR TWO-WAY LEFT TURN LANE



LANE LINES FOR ONE-WAY ROADWAY (NON-FREEWAY FACILITIES)

Raised pavement markers Type II-C-R shall have clear face toward normal traffic and red face toward wrong-way traffic.



REFLECTORIZED PROFILE PATTERN DETAIL

USING REFLECTIVE PROFILE PAVEMENT MARKINGS

A quick field check for the thickness of base line and profile marking is approximately equal to a stack of 5 quarters to a maximum height of 7 quarters.

4" EDGE LINE OR CENTERLINE — OPTIONAL 6" EDGE LINE OR CENTERLINE — 4" LANE LINE — OPTIONAL 6" LANE LINE

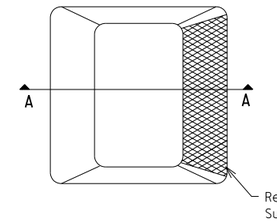
NOTE:
Profile markings shall not be placed on roadways with a posted speed limit of 45 MPH or less.

GENERAL NOTES

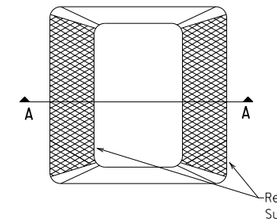
1. All raised pavement markers placed in broken lines shall be placed in line with and midway between the stripes.
2. On concrete pavements the raised pavement markers should be placed to one side of the longitudinal joints.

MATERIAL SPECIFICATIONS	
PAVEMENT MARKERS (REFLECTORIZED)	DMS-4200
EPOXY AND ADHESIVES	DMS-6100
BITUMINOUS ADHESIVE FOR PAVEMENT MARKERS	DMS-6130
TRAFFIC PAINT	DMS-8200
HOT APPLIED THERMOPLASTIC	DMS-8220
PERMANENT PREFABRICATED PAVEMENT MARKINGS	DMS-8240

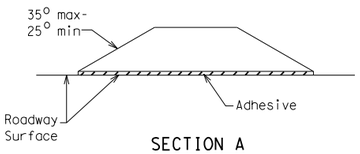
All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.



Type I (Top View)



Type II (Top View)



SECTION A

RAISED PAVEMENT MARKERS

Texas Department of Transportation
Traffic Operations Division

POSITION GUIDANCE USING RAISED MARKERS
REFLECTORIZED PROFILE MARKINGS
PM(2)-12

© TxDOT April 1977

REVISIONS	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
4-92 2-10	CONT	SECT	JOB	HIGHWAY
5-00 2-12				SE INNER LP
8-00	DIST	COUNTY		SHEET NO.
2-08		WILLIAMSON		195

22B

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DATE: 6/24/2017
FILE: pw://rtg-pw.bentley.com:rtg-pw/Documents/8760101/dlv/standards/STRIPING/PM(2)-12.DGN

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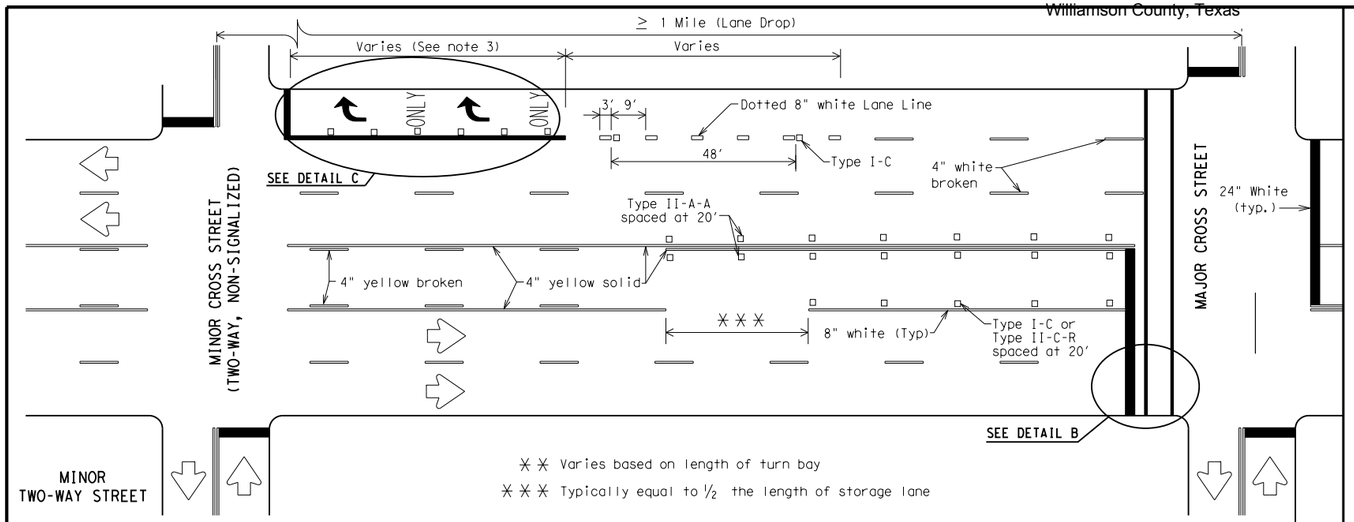
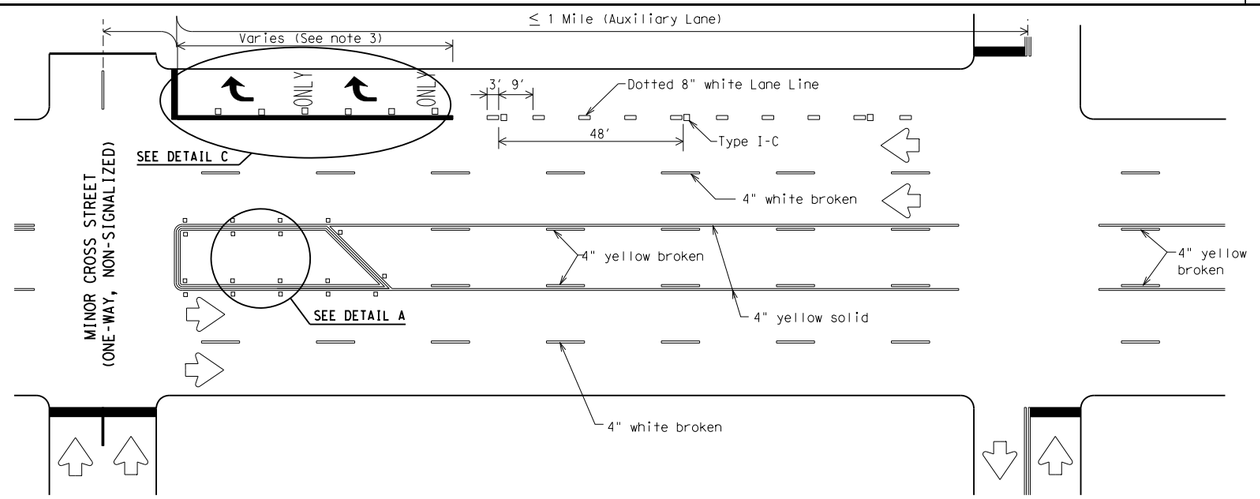
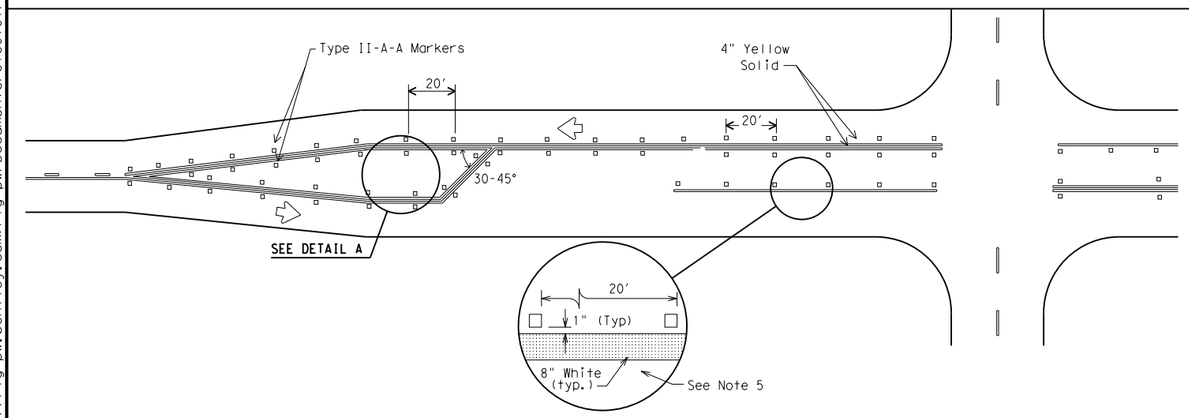


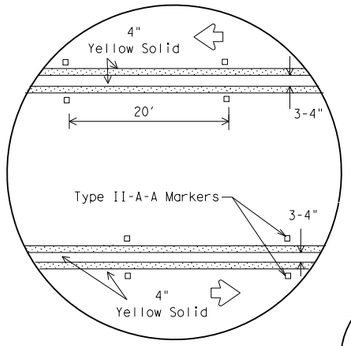
TYPICAL TWLTL AT TWO-WAY CROSS STREET AND RIGHT TURN LANE DROP



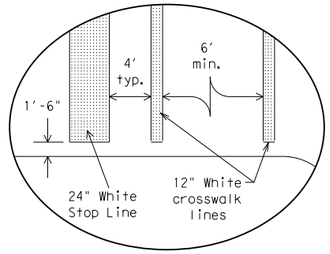
TYPICAL TWLTL AT ONE-WAY STREET AND RIGHT TURN AUXILIARY LANE



TYPICAL TWO-LANE HIGHWAY INTERSECTION WITH LEFT TURN BAYS

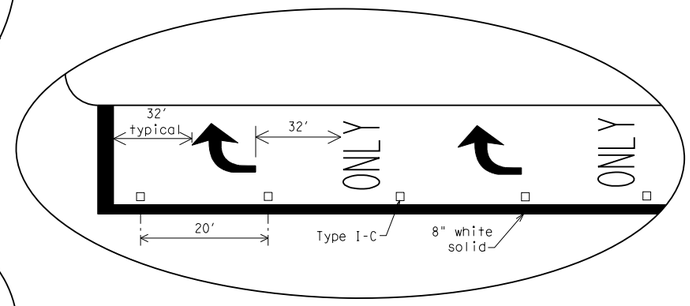


DETAIL A



Final placement of Stop Bar and Crosswalk shall be approved by the Engineer in the field.

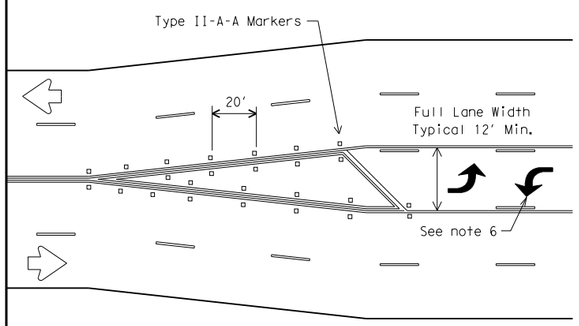
DETAIL B



DETAIL C

MATERIAL SPECIFICATIONS	
PAVEMENT MARKERS (REFLECTORIZED)	DMS-4200
EPOXY AND ADHESIVES	DMS-6100
BITUMINOUS ADHESIVE FOR PAVEMENT MARKERS	DMS-6130
TRAFFIC PAINT	DMS-8200
HOT APPLIED THERMOPLASTIC	DMS-8220
PERMANENT PREFABRICATED PAVEMENT MARKINGS	DMS-8240

All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.



TYPICAL TRANSITION FOR TWLTL AND DIVIDED HIGHWAY

GENERAL NOTES

1. Refer elsewhere in plans for additional RPM placement and details.
2. Lane use word and arrow markings shall be used where through lanes approaching an intersection become mandatory turn lanes. Lane use word and arrow markings should be used in auxiliary lanes of substantial length. Lane use arrow markings or word and arrow markings may be used in other lanes and turn bays for emphasis. Details for words and arrows as shown in the Standard Highway Sign Designs for Texas.
3. When lane used word and arrow markings are used, two sets of arrows should be used if the length of the bay is greater than 180 feet. When a single lane use arrow or word and arrow marking is used for a short turn lane, it should be located at or near the upstream end of the full-width turn lane.
4. Other crosswalk paterns as shown in the "Texas Manual on Uniform Traffic Control Devices" may be used.
5. Raised pavement marker Type I-C with undivided highways, flush medians and two way left turn lanes. Raised pavement marker Type II-C-R with divided highways and raised medians.
6. A two-way left-turn (TWLT) lane-use arrow pavement marking should be used at or just downstream from the beginning of a two-way left-turn lane within a corridor. Repeating the marking after each intersection or dedicated turn bay is not required unless stated elsewhere in the plans.

Texas Department of Transportation
Traffic Operations Division

PAVEMENT MARKINGS FOR TWO-WAY LEFT TURN LANES DIVIDED HIGHWAYS AND RURAL LEFT TURN BAYS

PM(3)-12

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REVISIONS		DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
5-00 2-12	CONT	SECT	JOB	HIGHWAY	
8-00				SE INNER LP	
3-03	DIST	COUNTY		SHEET NO.	
2-10		WILLIAMSON		196	

22C

DATE: 6/24/2017
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7/18/2017 9:58 AM

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SIGN SUPPORT DESCRIPTIVE CODES

(Descriptive Codes correspond to project estimate and quantities sheets)

SM RD SGN ASSM TY XXXXX(X)XX(X-XXXX)

Post Type

FRP = Fiberglass Reinforced Plastic Pipe (see SMD(FRP))
TWT = Thin-Walled Tubing (see SMD(TWT))
10BWG = 10 BWG Tubing (see SMD(SLIP-1) to (SLIP-3))
S80 = Schedule 80 Pipe (see SMD(SLIP-1) to (SLIP-3))

Number of Posts (1 or 2)

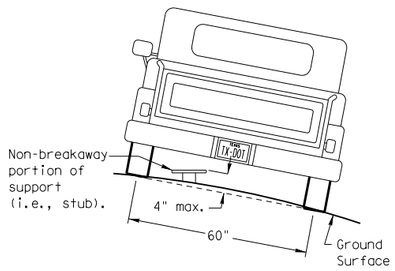
Anchor Type

UA = Universal Anchor - Concreted (see SMD(FRP) and (TWT))
UB = Universal Anchor - Bolted down (see SMD(FRP) and (TWT))
WS = Wedge Anchor Steel - (see SMD(TWT))
WP = Wedge Anchor Plastic (see SMD(TWT))
SA = Slipbase - Concreted (see SMD(SLIP-1) to (SLIP-3))
SB = Slipbase - Bolted Down (see SMD(SLIP-1) to (SLIP-3))

Sign Mounting Designation

P = Prefab. "Plain" (see SMD(SLIP-1) to (SLIP-3), (TWT), (FRP))
T = Prefab. "T" (see SMD(SLIP-1) to (SLIP-3), (TWT))
U = Prefab. "U" (see SMD(SLIP-1) to (SLIP-3))
IF REQUIRED
1EXT or 2EXT = Number of Extensions (see SMD(SLIP-1) to (SLIP-3), (TWT))
BM = Extruded Wind Beam (see SMD(SLIP-1) to (SLIP-3))
WC = 1.12 #/ft Wing Channel (see SMD(SLIP-1) to (SLIP-3))
EXAL = Extruded Aluminum Sign Panels (see SMD(SLIP-1))

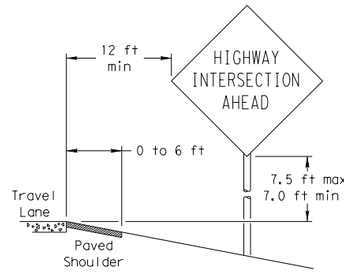
REQUIRED CLEARANCE FOR BREAKAWAY SUPPORT



To avoid vehicle undercarriage snagging, any substantial remains of a breakaway support, when it is broken away, should not project more than 4 inches above a 60-inch chord (i.e., typical space between wheel paths).

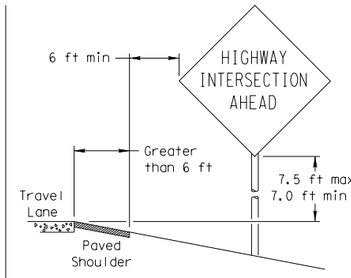
SIGN LOCATION

PAVED SHOULDERS



LESS THAN 6 FT. WIDE

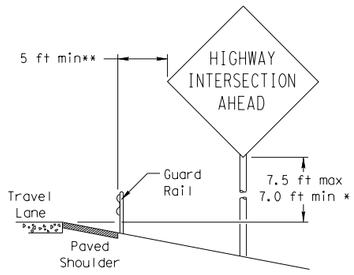
When the shoulder is 6 ft. or less in width, the sign must be placed at least 12 ft. from the edge of the travel lane.



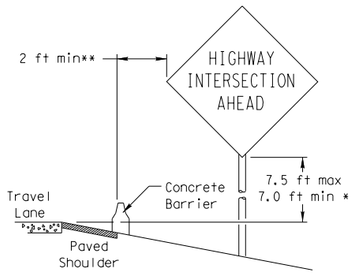
GREATER THAN 6 FT. WIDE

When the shoulder is greater than 6 ft in width, the sign must be placed at least 6 ft. from the edge of the shoulder.

BEHIND BARRIER



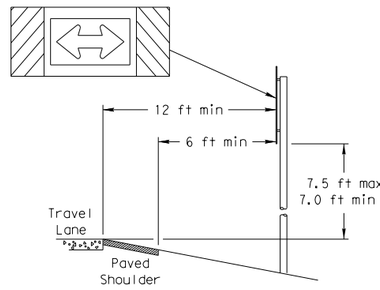
BEHIND GUARDRAIL



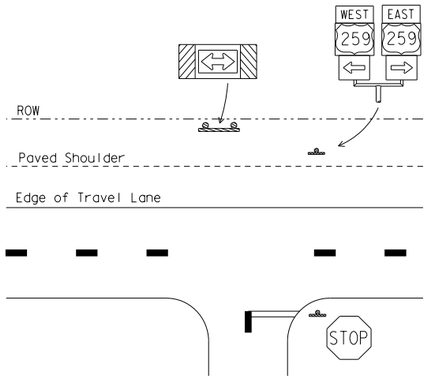
BEHIND CONCRETE BARRIER

**Sign clearance based on distance required for proper guard rail or concrete barrier performance.

T-INTERSECTION



When this sign is needed at the end of a two-lane, two way roadway, the right edge of the sign should be in line with the centerline of the roadway. Place as close to ROW as practical.



* Signs shall be mounted using the following condition that results in the greatest sign elevation:

(1) a minimum of 7 to a maximum of 7.5 feet above the edge of the travel lane or

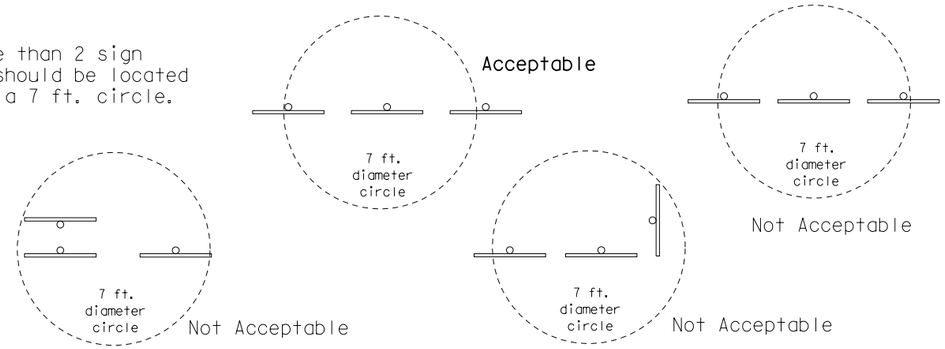
(2) a minimum of 7 to a maximum of 7.5 feet above the grade at the base of the support when sign is installed on the backslope.

The maximum values may be increased when directed by the Engineer.

See the Traffic Operations Division website for detailed drawings of sign clamps, Triangular Slipbase System components and Wedge Anchor System components.

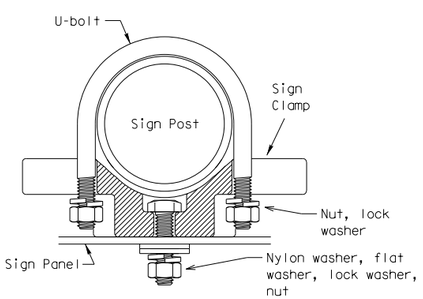
The website address is:
http://www.txdot.gov/publications/traffic.htm

No more than 2 sign posts should be located within a 7 ft. circle.



TYPICAL SIGN ATTACHMENT DETAIL

Single Signs

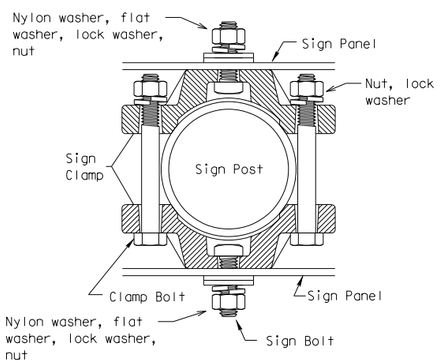


Bolts used to mount sign panels to the clamp are 5/16-18 UNC galvanized square head with nut, nylon washer, flat washer and lock washer. The bolt length is 1 inch for aluminum.

When two sign clamps are used to mount signs back-to-back, use a 5/16-18 UNC galvanized hex head per ASTM A307 with nut and helical-spring lock washer. The approximate bolt lengths for various post sizes and sign clamp types are given in the table at right. The bolt length may need to be adjusted depending upon field conditions.

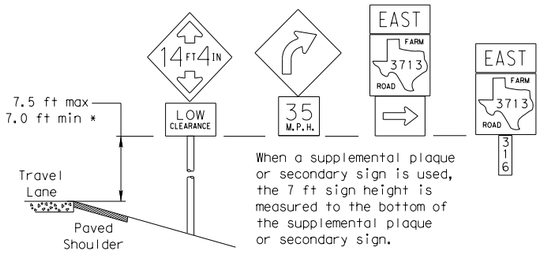
Sign clamps may be either the specific size clamp or the universal clamp.

Back-to-Back Signs



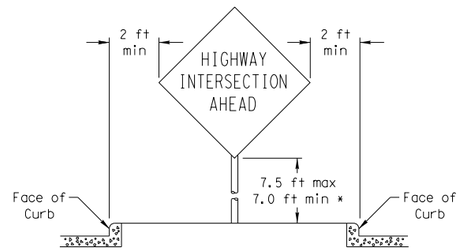
Pipe Diameter	Approximate Bolt Length	
	Specific Clamp	Universal Clamp
2" nominal	3"	3 or 3 1/2"
2 1/2" nominal	3 or 3 1/2"	3 1/2 or 4"
3" nominal	3 1/2 or 4"	4 1/2"

SIGNS WITH PLAQUES



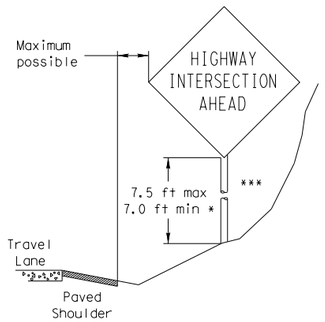
When a supplemental plaque or secondary sign is used, the 7 ft sign height is measured to the bottom of the supplemental plaque or secondary sign.

CURB & GUTTER OR RAISED ISLAND



RESTRICTED RIGHT-OF-WAY

(When 6 ft min. is not possible.)



Right-of-way restrictions may be created by rocks, water, vegetation, forest, buildings, a narrow island, or other factors.

In situations where a lateral restriction prevents the minimum horizontal clearance from the edge of the travel lane, signs should be placed as far from the travel lane as practical.

*** Post may be shorter if protected by guardrail or if Engineer determines the post could not be hit due to extreme slope.

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS GENERAL NOTES & DETAILS

SMD(GEN)-08

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9-08	CONT	SECT	JOB	HIGHWAY
				SE INNER LP
	DIST	COUNTY		SHEET NO.
		WILLIAMSON		197

26A

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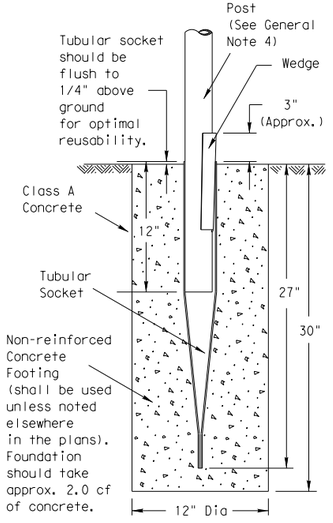
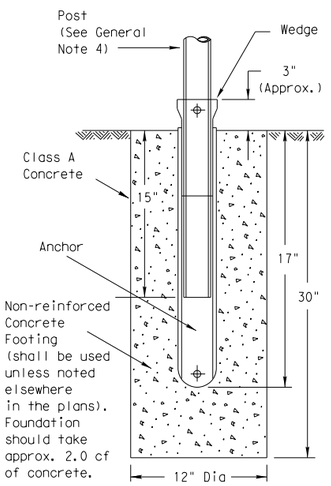
DATE: 6/24/2017
FILE: pw://rtg-pw.bentley.com:rtg-pw/Documents/8760101/div/standards/STRIPING/SMD(TWT)-08.dgn

Wedge Anchor Steel System



SM RD SGN ASSM TY TWT(X)WS(X)

Wedge Anchor High Density Polyethylene (HDPE) System



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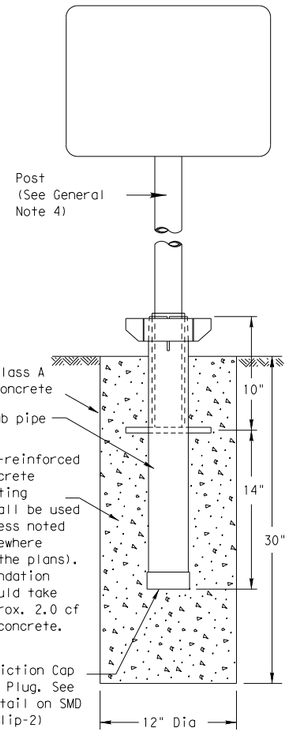
Universal Anchor System with Thin-Walled Tubing Post



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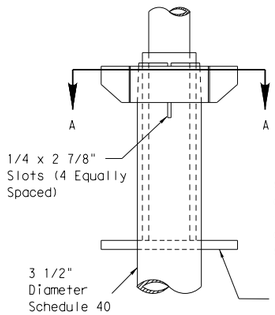
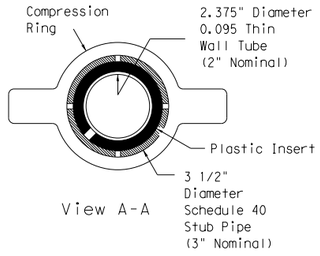
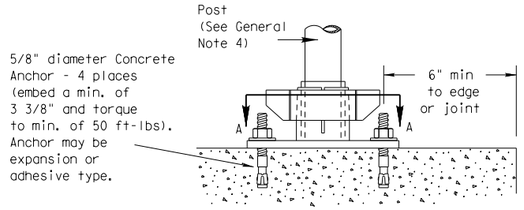


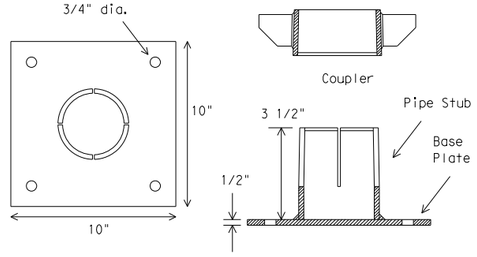


View A-A

Plastic insert must be used when using the TWT with either the Universal Anchor System or the Bolt Down Universal Anchor System. The insert should be approx. 10" long and cover the tubing from just above the top of the stub pipe to the bottom of the sign post when using the Universal Anchor System. The insert should be cut to approx. 4 1/2" when used with the Bolt Down Universal Anchor System.

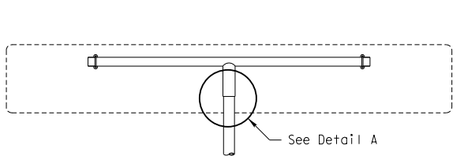


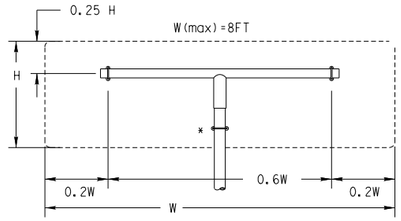
Concrete anchor consists of 5/8" diameter stud bolt with UNC series bolt threads on the upper end. A heavy hex nut per ASTM A563 and hardened washer per ASTM F436. The stud bolt shall have minimum yield and ultimate tensile strengths of 50 and 75 ksi, respectively. Nuts, bolts and washers shall be galvanized per Item 445, "Galvanizing." Top of bolt shall extend at least flush with top of nut when installed. The anchor, when installed in 4000 psi normal-weight concrete with a 3 3/8" minimum embedment, shall have a minimum allowable tension and shear of 2450 and 1525 psi, respectively. Adhesive type anchors shall have stud bolts installed with Type III epoxy per DMS-6100, "Epoxies and Adhesives." Adhesive anchors may be loaded after adequate epoxy cure time per the manufacturer's recommendations.



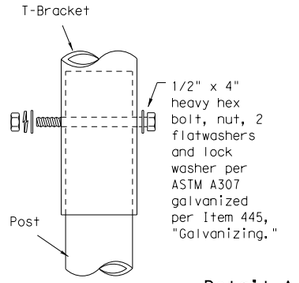
SM RD SGN ASSM TY TWT(X)UB(P)

Sign Installation Using a Prefabricated T-Bracket for Thin-Wall Tubing Post





SM RD SGN ASSM TY TWT(X)XX(T)
(* - See General Note 6)



Detail A

9/16" hole may need to be drilled through post to accommodate bolt.

NOTE

The devices shall be installed per manufacturer's recommendations. Installation procedures shall be provided to the Engineer by Contractor.

GENERAL NOTES:

1. The Wedge Anchor System and the Universal Anchor System with thin wall tubing post may be used to support up to 10 square feet of sign area.
2. The tubular socket, wedge and prefabricated T-bracket shall be permanently marked to indicate manufacturer. Method, design, and location of marking are subject to the approval of the TxDOT Traffic Standards Engineer.
3. Except for posts (13 BWG Tubing), clamps, nuts and bolts, all components shall be prequalified. A list of prequalified vendors may be obtained from the Material Producer List web page. The website address is: http://www.txdot.gov/business/producer list.htm
4. Material used as post with this system shall conform to the following specifications:
   13 BWG Tubing (2.375" outside diameter) (TWT)
   0.095" nominal wall thickness
   Seamless or electric-resistance welded steel tubing
   Steel shall be HSLAS Gr 55 per ASTM A1011 or ASTM A1008
   Other steels may be used if they meet the following:
   55,000 PSI minimum yield strength
   70,000 PSI minimum tensile strength
   18% minimum elongation in 2"
   Wall thickness (uncoated) shall be within the range of .083" to .099"
   Outside diameter (uncoated) shall be within the range of 2.369" to 2.381"
   Galvanization per ASTM 123 or ASTM A653 G210. For precoated steel tubing (ASTM A653), recoat tube outside diameter weld seam by metallizing with zinc wire per ASTM B833.
5. Sign blanks shall be the sizes and shapes shown on the plans.
6. Additional sign clamp required on the "T-bracket" post for 24" high signs. Place clamp at least 3" above bottom of sign when possible.
7. Sign supports shall not be spliced except where shown. Sign support posts shall not be spliced.
8. See the Traffic Operations Division website for detailed drawings of sign clamps and Wedge Anchor System components. The website address is: http://www.txdot.gov/publications/traffic.htm

WEDGE ANCHOR SYSTEM INSTALLATION PROCEDURE

1. Dig foundation hole. Where solid rock is encountered at ground level, the foundation shall be a minimum depth of 18". When solid rock is encountered below ground level, the foundation shall extend in the solid rock a minimum depth of 18" or provide a minimum foundation depth of 30". If solid rock is encountered, the socket/stub may be reduced in length as required to a minimum length of 18". Any material removed from the socket/stub shall be from the bottom and the clearance requirements given on SMD(GEN) must be followed. The inner surfaces of the socket/stub must remain free of concrete or other debris.
2. The Engineer may permit batches of concrete less than 2 cubic yards to be mixed with a portable, motor driven concrete mixer. For small placements less than 0.5 cubic yards, hand mixing in a suitable container may be allowed by Engineer. Place concrete into hole until it is approximately flush with the ground. Concrete shall be Class A.
3. Insert tubular socket into concrete until top of socket is approximaely 1/4 " above the concrete footing.
4. Plumb the socket. Allow a minimum 4 days for concrete to set, unless otherwise directed by Engineer..
5. Attach the sign to the sign post.
6. Insert the sign post into socket and align sign face with roadway.
7. Drive the wedge into the socket to secure post. This will leave approximately 3 inches of the wedge exposed.

UNIVERSAL ANCHOR SYSTEM INSTALLATION PROCEDURE

1. Dig foundation hole. Where solid rock is encountered at ground level, the foundation shall be a minimum depth of 18". When solid rock is encountered below ground level, the foundation shall extend in the solid rock a minimum depth of 18" or provide a minimum foundation depth of 30". If solid rock is encountered, the socket/stub may be reduced in length as required to a minimum length of 18". Any material removed from the socket/stub shall be from the bottom and the clearance requirements given on SMD(GEN) must be followed. The inner surfaces of the socket/stub must remain free of concrete or other debris.
2. Insert base post in hole to depths shown and backfill hole with concrete.
3. Level and plumb the base post using a torpedo level and allow concrete adequate time to set. The bottom of the slots provided in the stub pipe shall remain above the top of the concrete foundation.
4. Attach the sign to the sign post.
5. Install plastic insert around bottom of post.
6. Insert sign post into base post. Lower until the post comes to rest on steel rod.
7. Seat compression ring using a hammer. Typically, the top of compression ring will be approximately level with top of stub post when optimally installed.
8. Check sign post by hand to ensure it is unable to turn. If loose, increase the tightening of the compression ring.

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS WEDGE & UNIVERSAL ANCHOR WITH THIN WALL TUBING POST

SMD(TWT)-08

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DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT

CONT	SECT	JOB	HIGHWAY
			SE INNER LP

DIST	COUNTY	SHEET NO.
	WILLIAMSON	198

9-08 REVISIONS

26E

Texas Commission on Environmental Quality
Water Pollution Abatement Plan
General Construction Notes

1. Written construction notification must be given to the appropriate TCEQ regional office no later than 48 hours prior to commencement of the regulated activity. Information must include the date on which the regulated activity will commence, the name of the approved plan for the regulated activity, and the name of the prime contractor and the name and telephone number of the contact person.

2. All contractors conducting regulated activities associated with this project must be provided with complete copies of the approved Water Pollution Abatement Plan and the TCEQ letter indicating the specific conditions of its approval. During the course of these regulated activities, the contractors are required to keep on-site copies of the approved plan and approval letter.

3. If any sensitive feature is discovered during construction, all regulated activities near the sensitive feature must be suspended immediately. The appropriate TCEQ regional office must be immediately notified of any sensitive features encountered during construction. The regulated activities near the sensitive feature may not proceed until the TCEQ has reviewed and approved the methods proposed to protect the sensitive feature and the Edwards Aquifer from any potentially adverse impacts to water quality.

4. No temporary aboveground hydrocarbon and hazardous substance storage tank system is installed within 150 feet of a domestic, industrial, irrigation, or public water supply well, or other sensitive feature.

5. Prior to commencement of construction, all temporary erosion and sedimentation (E&S) control measures must be properly selected, installed, and maintained in accordance with the manufacturers specifications and good engineering practices. Controls specified in the temporary storm water section of the approved Edwards Aquifer Protection Plan are required during construction. If inspections indicate a control has been used inappropriately, or incorrectly, the applicant must replace or modify the control for site situations. The controls must remain in place until disturbed areas are revegetated and the areas have become permanently stabilized.

6. If sediment escapes the construction site, off-site accumulations of sediment must be removed at a frequency sufficient to minimize offsite impacts to water quality (e.g., fugitive sediment in street being washed into surface streams or sensitive features by the next rain).

7. Sediment must be removed from sediment traps or sedimentation ponds not later than when design capacity has been reduced by 50%. A permanent stake must be provided that can indicate when the sediment occupies 50% of the basin volume.

8. Litter, construction debris, and construction chemicals exposed to stormwater shall be prevented from becoming a pollutant source for stormwater discharges (e.g., screening outfalls, picked up daily).

9. All spoils (excavated material) generated from the project site must be stored on-site with proper E&S controls. For storage or disposal of spoils at another site on the Edwards Aquifer Recharge Zone, the owner of the site must receive approval of a water pollution abatement plan for the placement of fill material or mass grading prior to the placement of spoils at the other site.

10. Stabilization measures shall be initiated as soon as practicable in portions of the site where construction activities have temporarily or permanently ceased, but in no case more than 14 days after the construction activity in that portion of the site has temporarily or permanently ceased. Where the initiation of stabilization measures by the 14th day after construction activity temporary or permanently cease is precluded by weather conditions, stabilization measures shall be initiated as soon as practicable. Where construction activity on a portion of the site is temporarily ceased, and earth disturbing activities will be resumed within 21 days, temporary stabilization measures do not have to be initiated on that portion of site. In areas experiencing droughts where the initiation of stabilization measures by the 14th day after construction activity has temporarily or permanently ceased is precluded by seasonal arid conditions, stabilization measures shall be initiated as soon as practicable.

11. The following records shall be maintained and made available to the TCEQ upon request: the dates when major grading activities occur; the dates when construction activities temporarily or permanently cease on a portion of the site; and the dates when stabilization measures are initiated.

12. The holder of any approved Edward Aquifer protection plan must notify the appropriate regional office in writing and obtain approval from the executive director prior to initiating any of the following:

    A. any physical or operational modification of any water pollution abatement structure(s), including but not limited to ponds, dams, berms, sewage treatment plants, and diversionary structures;

    B. any change in the nature or character of the regulated activity from that which was originally approved or a change which would significantly impact the ability of the plan to prevent pollution of the Edwards Aquifer;

    C. any development of land previously identified as undeveloped in the original water pollution abatement plan.

Austin Regional Office 2800 S. IH 35, Suite 100 Austin, Texas 78704-5712 Phone (512) 339-2929 Fax (512) 339-3795	San Antonio Regional Office 14250 Judson Road San Antonio, Texas 78233-4480 Phone (210) 490-3096 Fax (210) 545-4329

STATE OF TEXAS
JAMES BROOKS
101002
LICENSED PROFESSIONAL ENGINEER
6/24/2017

NO.	REVISION	BY	DATE

WILLIAMSON COUNTY
1848

RTG RODRIGUEZ TRANSPORTATION GROUP
FIRM #587

GEORGETOWN INNER LOOP

TCEQ REQUIREMENTS FOR THE EDWARDS AQUIFER

6/24/2017 SHEET 1 OF 1

DESIGNED:	PROJECT NUMBER		ROADWAY	
CHECKED:			SE INNER LOOP	
DRAWN:	STATE	COUNTY	CITY	SHEET No.
CHECKED:	TEXAS	WILLIAMSON	GEORGETOWN	109

jbrooks
7/24/2017
10:51
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A. GENERAL SITE DATA

1. PROJECT LIMITS: *Maple Street to Approx. 1100 Ft West of Southwestern Blvd.*

Begin Project Coordinates : Latitude (N): 30.6130 Longitude (W): -97.6578
End Project Coordinates : Latitude (N): 30.6185 Longitude (W): -97.6528

2. PROJECT SITE MAPS:

- * *Project Location Map: The Title Sheet*
- * *Drainage Patterns: Drainage Area Maps*
- * *Slopes Anticipated After Major Gradings or Areas of Soil Disturbance: Typical Sections*
- * *Location of Erosion and Sediment Controls: SW3P Site Maps*
- * *Surface Waters and Discharge Locations: Drainage and Culvert Layouts*
- * *Project Specific Location(s) (PSL): To be determined by the project Construction Personnel. Location(s) shown on SW3P Site Map (if PSL location(s) is within one mile of project) and information located in project SW3P Binder (Reference Item *10 below).*

3. PROJECT DESCRIPTION:

For the widening and overlay of SE Inner Loop consisting of grading, flex base, asphalt pavement, drainage, signing and pavement markings and water quality ponds.

4. MAJOR SOIL DISTURBING ACTIVITIES:

Soil disturbing activities will include preparing the Right of Way, grading, excavation and embankment for the proposed roadway and water quality ponds, erosion controls and topsoil work for final seeding and/or sod.

5. EXISTING CONDITION OF SOIL & VEGETATIVE COVER AND % OF EXISTING VEGETATIVE COVER:

The existing soils contain Heiden clay, Houston Black clay and Castephen silty clay. Vegetation is various native grasses covering approximately 90% of the project area.

6. TOTAL PROJECT AREA: *10.40* Acres

7. TOTAL AREA TO BE DISTURBED: *8.05* Acres (*77* %)

8. WEIGHTED RUNOFF COEFFICIENT

BEFORE CONSTRUCTION: *0.54*
AFTER CONSTRUCTION: *0.67*

9. NAME OF RECEIVING WATERS:

All drainage flows to Smith Branch and into the San Gabriel River (Segment 1248)

10. PROJECT SW3P Binder:

A. For projects disturbing one to five acres, The Contractor will maintain a SW3P Binder at the project field office (if there is not a project field office, should be kept on the Job Site at all times) which contains the following: Index Sheet, TCEQ Signature Authority, TCEQ Small Construction Site Notice, Contractor Certification of Compliance, SW3P Inspector Qualification Statements, Inspection and Maintenance Reports (Form 2118), SW3P Sheet, Site Location Maps, Stored Material Lists specifying associated control measures and the Appendix which contains the TPDES Construction General Permit, MS4 Operator Notification(s) and the Construction PSL Permits per all applicable requirements.

B. For projects disturbing 5 acres or more, the Contractor will follow the actions listed in (10.A.) above with the addition of the following: Notice Of Intent (N.O.I.) and Fee Payment Form, TCEQ Large Construction Site Notice (to be used instead of Small Site Notice), and TPDES Permit Coverage Notice.

*C. For projects disturbing less than one acre, actions described in (10.A.) and (10.B.) above are not required. Acreage is calculated by adding Total Area To Be Disturbed Acres on project (See *7 above) and the PSL(s) acreage located within one mile of project.*

B. EROSION AND SEDIMENT CONTROLS

1. SOIL STABILIZATION PRACTICES: (Select T = Temporary or P = Permanent, as applicable)

- T TEMPORARY SEEDING
- ___ MULCHING (Hay or Straw)
- ___ BUFFER ZONES
- P PLANTING
- P SEEDING
- P SODDING
- ___ PRESERVATION OF NATURAL RESOURCES
- ___ FLEXIBLE CHANNEL LINER
- ___ RIGID CHANNEL LINER
- P SOIL RETENTION BLANKET
- P COMPOST MANUFACTURED TOPSOIL
- ___ VERTICAL TRACKING
- ___ OTHER: *Disturbed areas on which construction activity has ceased, either temporarily or permanently, shall be stabilized within 14 days unless activities are scheduled to resume and do so within 21 days.*

2. STRUCTURAL PRACTICES: (T = Temporary or P = Permanent)

- ___ SILT FENCES
- T EROSION CONTROL LOGS
- ___ EROSION CONTROL COMPOST BERMS (Low Velocity)
- T ROCK FILTER DAMS
- ___ DIVERSION, INTERCEPTOR, OR PERIMETER DIKES
- ___ DIVERSION, INTERCEPTOR, OR PERIMETER SWALES
- ___ DIVERSION DIKE AND SWALE COMBINATIONS
- ___ PIPE SLOPE DRAINS
- ___ PAVED FLUMES
- T ROCK BEDDING AT CONSTRUCTION EXIT
- ___ TIMBER MATTING AT CONSTRUCTION EXIT
- ___ CHANNEL LINERS
- ___ SEDIMENT TRAPS
- ___ SEDIMENT BASINS
- ___ STORM INLET SEDIMENT TRAP
- P STONE OUTLET STRUCTURES
- ___ CURBS AND GUTTERS
- ___ STORM SEWERS
- P VELOCITY CONTROL DEVICES
- ___ OTHER:

NOTE: TOP OF BMP'S SHOULD NOT BE HIGHER THAN ROADWAY ELEVATION AS NOT TO FLOOD ROADWAY UNLESS PRIOR APPROVAL FROM ENGINEER IS OBTAINED.

3. STORM WATER MANAGEMENT:

Storm water drainage will be provided by open ditch flow. This system will carry the drainage within the Right of Way to the Smith Branch of the San Gabriel River.

4. STORM WATER MANAGEMENT ACTIVITIES: (Sequence of Construction)

1. *Prepare Right of Way and place temporary erosion control measures as soon as practical.*
2. *Clear and grub Right of Way.*
3. *Complete roadway excavation and embankment to subgrade, install additional rock filter dams around slopes in ditches.*
4. *Establish grass growth on all slopes utilizing seeding.*
5. *Construct base and pavement section within project limits.*
6. *When construction activity is complete and the site is stabilized, remove all temporary structural erosion controls and reseed any areas disturbed by their removal.*

5. NON-STORM WATER DISCHARGES:

Filter non-storm water discharges, or hold in retention basins, before being allowed to mix with storm water. These discharges consist of, but not limited to, non-polluted ground water, spring water, foundation or footing drain water, water used for dust control or pavement washing and vehicle washwater containing no detergents.

C. OTHER REQUIREMENTS & PRACTICES

1. MAINTENANCE:

Maintain all erosion and sediment controls in good working order. Perform any necessary cleaning/repairs/replacements at the earliest possible date prior to next rain event, but no later than 7 calendar days, Ensure the surrounding ground has dried sufficiently to prevent damage from equipment. "Too Wet" is the only reason for not adhering to time frames described. When construction activities permanently or temporarily cease and are not expected to resume for 14 or more days on a disturbed portion of the site, stabilization measures must be initiated immediately.

2. INSPECTION:

A Construction Observer will perform a regularly scheduled SW3P inspection every 7 calendar days. An Inspection and Maintenance Report, signed by the Construction Observer and the Contractor, will be filed for each inspection. Revise/clean/repair/replace each BMP control device in accordance with the current Field Inspection and Maintenance Report (Form 2118) and Item 1 (Maintenance) above.

3. WASTE MATERIALS:

On a daily basis, or as may be directed, collect all waste materials, trash and debris from the construction site and deposit into a metal dumpster having a secure cover and which meets all state and local city solid waste management requirements. Empty the dumpster as required by regulation, or as may be directed, at a local approved landfill site. Do not bury construction waste on the construction project site.

4. HAZARDOUS WASTE & SPILL REPORTING:

As a minimum, any products in the following categories are considered to be hazardous: Paints, Acids, Solvents, Fuels, Asphalt Products, Chemical Additives for Soil Stabilization, and Concrete Curing Compounds or Additives. When storing hazardous material on the project site, or at a Project Specific Location, take all practicable precaution to prevent and/or contain any spillage of these materials. In the event of a spill, contact the spill coordinator immediately.

5. SANITARY WASTE:

Use a licensed sanitary waste management contractor to collect all sanitary waste from portable units as may be required by local regulation, or as directed.

6. CONSTRUCTION VEHICLE TRACKING:

On a regular basis, or as may be directed, dampen haul roads for dust control and stabilize construction entrances/exits. Provide for a motorized broom or vacuum type sweeper to be available on a daily basis, or as may be directed, to remove sediment from paved roadways abutting or traversing the project site.

7. MANAGEMENT PRACTICES:

A. Construct disposal areas, stockpiles, haul roads and PSL's in a manner that will minimize and control the amount of sediment that may enter receiving waters. Do not locate disposal areas in any wetland, waterbody or streambed.

B. Locate construction staging areas, vehicle maintenance and PSL's areas in a manner to minimize the runoff of pollutants.

C. When working in or near a wetland, install and maintain operating soil erosion and sediment controls at all times during construction and isolate the work from the wetland.

D. Clear all waterways as soon as practicable of temporary embankment, temporary bridges, matting, falsework, piling, debris or other obstructions placed during construction operations that are not a part of the finished work.

E. Procedures and/or practices should be taken to control dust.

F. Sediment to be removed from roadways daily or when work begins after weather events if construction activities have ceased due to weather event.

G. The Contractor will be required to contain wash water from concrete trucks in a manner that will prevent same from entering any waterway.

H. The Contractor is responsible for insuring that all Subcontractors are aware and comply with all components of the Temporary Erosion Control Plans.

STATE OF TEXAS
JEFFERY T. SEILER
77187
REGISTERED PROFESSIONAL ENGINEER

6/23/2017

, P.E.
Signature of Registrant & Date

Seiler Lankes Group TBPE License No. 12670
PLANNING • ENGINEERING • CONSTRUCTION

WILLIAMSON COUNTY

STORM WATER POLLUTION PREVENTION PLAN (SW3P)

TEMPLATE REVISION DATE: 06/12/2015

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
GRAPHICS	6			SE LP
	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK	TEXAS		WILLIAMSON	
CHECK	CONTROL	SECTION	JOB	110

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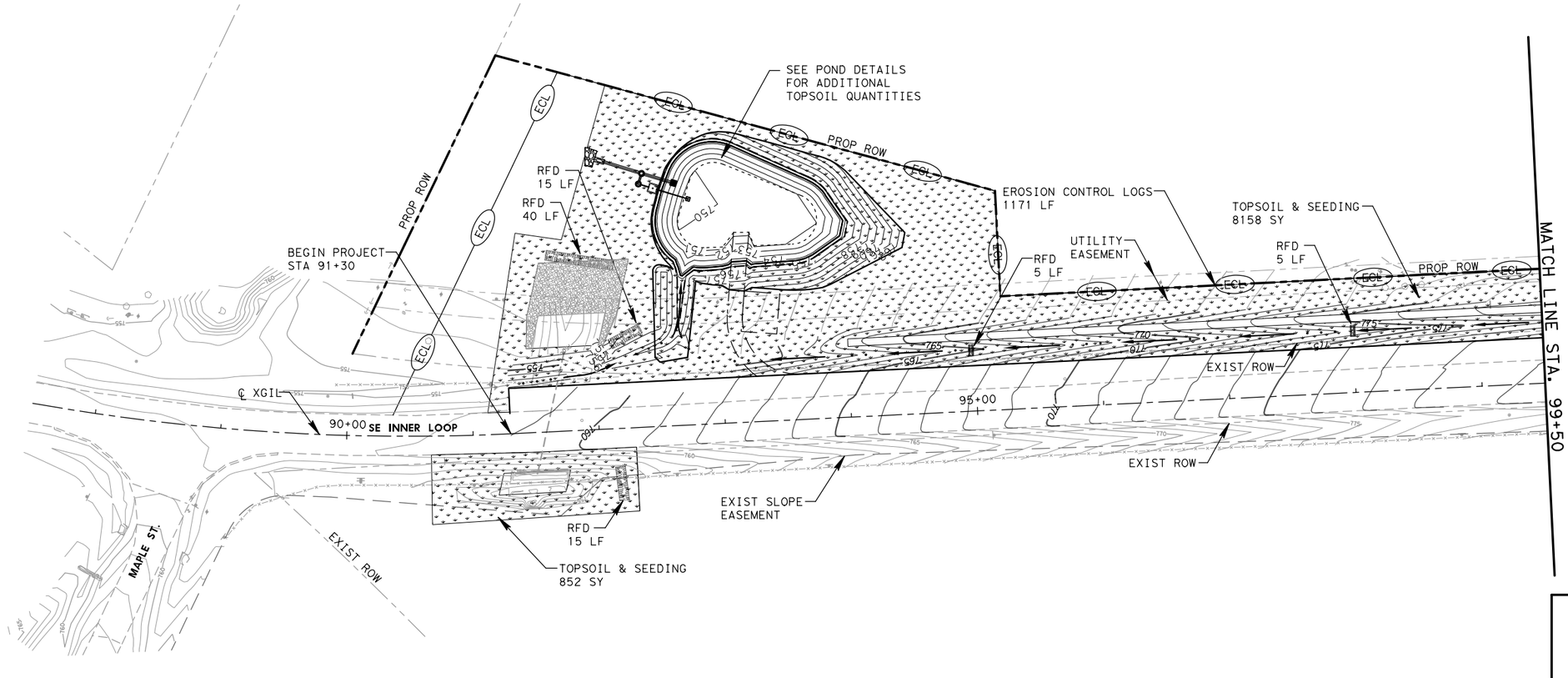

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SCALE IN FEET

NOTES:

1. PERIMETER CONTROLS SHALL BE IN PLACE PRIOR TO COMMENCING ANY SOIL DISTURBING ACTIVITIES.
2. QUANTITIES SHOWN ARE APPROXIMATE AND MAY BE ADJUSTED TO MEET FIELD CONDITIONS.
3. CONSTRUCTION EXIT LOCATIONS ARE TO BE AS DIRECTED BY THE CONSTRUCTION OBSERVER.
4. PLACE SOIL RETENTION BLANKETS ON ROADWAY SIDESLOPES STEEPER THAN 5:1 AND FLATTER THAN 3:1.

LEGEND	
ECL	EROSION CONTROL LOGS
	ROCK FILTER DAM TYPE 2
	TOPSOIL (4") & SEEDING FOR EROSION CONTROL

ESTIMATED QUANTITIES

ITEM-DESC	DESCRIPTION	UNITS	QUANTITY
0160-WC02	TOPSOIL (4")	SY	9010
0161-WC001	EROSION CONTROL COMPOST (3")	SY	2253*
0162-WC103	MULCH TOPDRESSING (5")	SY	2253*
0164-WC05	SEEDING FOR EROSION CONTROL	SY	9010
0169-6001	SOIL RETENTION BLANKETS (CL1)(TYA)	SY	1427
0506-6002	ROCK FILTER DAMS (INSTALL)(TY2)	LF	80
0506-6020	CONSTRUCTION EXITS (INSTALL)(TY1)	SY	78
0506-6041	BIODEG EROSION CONTROL LOGS (INSTALL)	LF	1171

(* - TO BE PLACED AS DIRECTED BY THE CONSTRUCTION OBSERVER.)

STATE OF TEXAS
JEFFERY T. SEILER
77187
REGISTERED PROFESSIONAL ENGINEER
6/23/2017

NO.	REVISION	BY	DATE

WILLIAMSON COUNTY
1848

Seiler Lankes Group
TBPE License No. 12170
PLANNING • ENGINEERING • CONSTRUCTION

GEORGETOWN INNER LOOP

EROSION CONTROL PLAN

BEGIN TO STA 99+50

SHEET 1 OF 3

DESIGNED:	PROJECT NUMBER		ROADWAY	
CHECKED:			SE INNER LOOP	
DRAWN:	STATE	COUNTY	CITY	SHEET No.
CHECKED:	TEXAS	WILLIAMSON	GEORGETOWN	111

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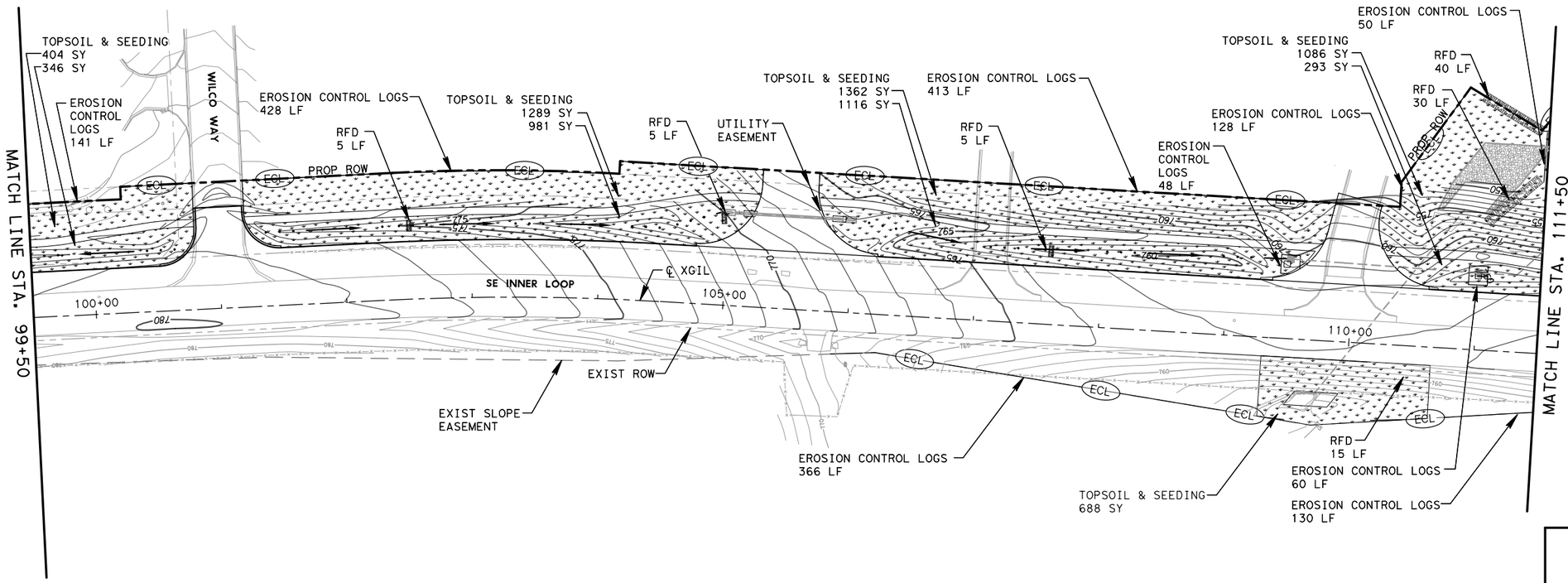

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SCALE IN FEET

NOTES:

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3. CONSTRUCTION EXIT LOCATIONS ARE TO BE AS DIRECTED BY THE CONSTRUCTION OBSERVER.
4. PLACE SOIL RETENTION BLANKETS ON ROADWAY SIDESLOPES STEEPER THAN 5:1 AND FLATTER THAN 3:1.

LEGEND	
ECL	EROSION CONTROL LOGS
	ROCK FILTER DAM TYPE 2
	TOPSOIL (4") & SEEDING FOR EROSION CONTROL

ESTIMATED QUANTITIES			
ITEM-DESC	DESCRIPTION	UNITS	QUANTITY
0160-WC02	TOPSOIL (4")	SY	7565
0161-WC001	EROSION CONTROL COMPOST (3")	SY	1891*
0162-WC103	MULCH TOPDRESSING (5")	SY	1891*
0164-WC05	SEEDING FOR EROSION CONTROL	SY	7565
0169-6001	SOIL RETENTION BLANKETS (CL 1)(TY A)	SY	4354
0506-6002	ROCK FILTER DAMS (INSTALL)(TY2)	LF	85
0506-6020	CONSTRUCTION EXITS (INSTALL)(TY1)	SY	
0506-6041	BIODEG EROSION CONTROL LOGS (INSTALL)	LF	1716

(* - TO BE PLACED AS DIRECTED BY THE CONSTRUCTION OBSERVER.)

STATE OF TEXAS
JEFFERY T. SEILER
77187
REGISTERED PROFESSIONAL ENGINEER
6/23/2017

NO.	REVISION	BY	DATE

WILLIAMSON COUNTY
1848

Seiler Lankes Group
TBPE License No. 12670
PLANNING • ENGINEERING • CONSTRUCTION

GEORGETOWN INNER LOOP

EROSION CONTROL PLAN

STA. 99+50 - STA. 111+50

SHEET 2 OF 3

DESIGNED:	PROJECT NUMBER		ROADWAY	
CHECKED:			SE INNER LOOP	
DRAWN:	STATE	COUNTY	CITY	SHEET No.
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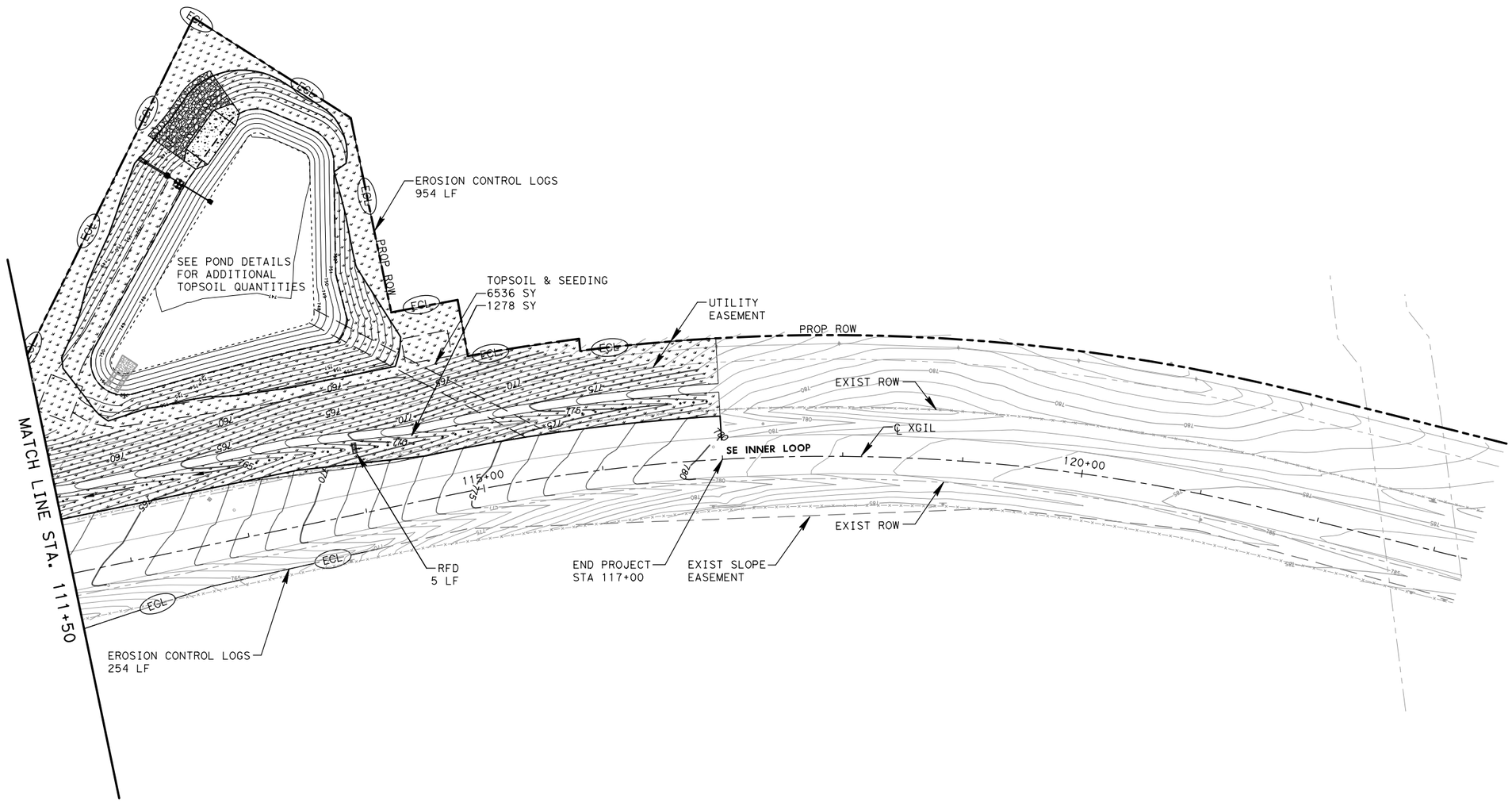

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SCALE IN FEET

NOTES:

1. PERIMETER CONTROLS SHALL BE IN PLACE PRIOR TO COMMENCING ANY SOIL DISTURBING ACTIVITIES.
2. QUANTITIES SHOWN ARE APPROXIMATE AND MAY BE ADJUSTED TO MEET FIELD CONDITIONS.
3. CONSTRUCTION EXIT LOCATIONS ARE TO BE AS DIRECTED BY THE CONSTRUCTION OBSERVER.
4. PLACE SOIL RETENTION BLANKETS ON ROADWAY SIDESLOPES STEEPER THAN 5:1 AND FLATTER THAN 3:1.

LEGEND	
ECL	EROSION CONTROL LOGS
	ROCK FILTER DAM TYPE 2
	TOPSOIL (4") & SEEDING FOR EROSION CONTROL

ESTIMATED QUANTITIES

ITEM-DESC	DESCRIPTION	UNITS	QUANTITY
0160-WC02	TOPSOIL (4")	SY	7814
0161-WC001	EROSION CONTROL COMPOST (3")	SY	1954*
0162-WC103	MULCH TOPDRESSING (5")	SY	1954*
0164-WC05	SEEDING FOR EROSION CONTROL	SY	7814
0169-6001	SOIL RETENTION BLANKETS (CL 1)(TY A)	SY	3092
0506-6002	ROCK FILTER DAMS (INSTALL)(TY2)	LF	5
0506-6020	CONSTRUCTION EXITS (INSTALL)(TY1)	SY	78
0506-6041	BIODEG EROSION CONTROL LOGS (INSTALL)	LF	1208

(* - TO BE PLACED AS DIRECTED BY THE CONSTRUCTION OBSERVER.)

STATE OF TEXAS
JEFFERY T. SEILER
77187
REGISTERED PROFESSIONAL ENGINEER
6/23/2017

NO.	REVISION	BY	DATE

WILLIAMSON COUNTY
1848

Seiler Lankes Group
TBPE License No. 12170
PLANNING • ENGINEERING • CONSTRUCTION

GEORGETOWN INNER LOOP

EROSION CONTROL PLAN

STA. 111+50 - TO END

SHEET 3 OF 3

DESIGNED:	PROJECT NUMBER		ROADWAY	
CHECKED:			SE INNER LOOP	
DRAWN:	STATE	COUNTY	CITY	SHEET No.
CHECKED:	TEXAS	WILLIAMSON	GEORGETOWN	113

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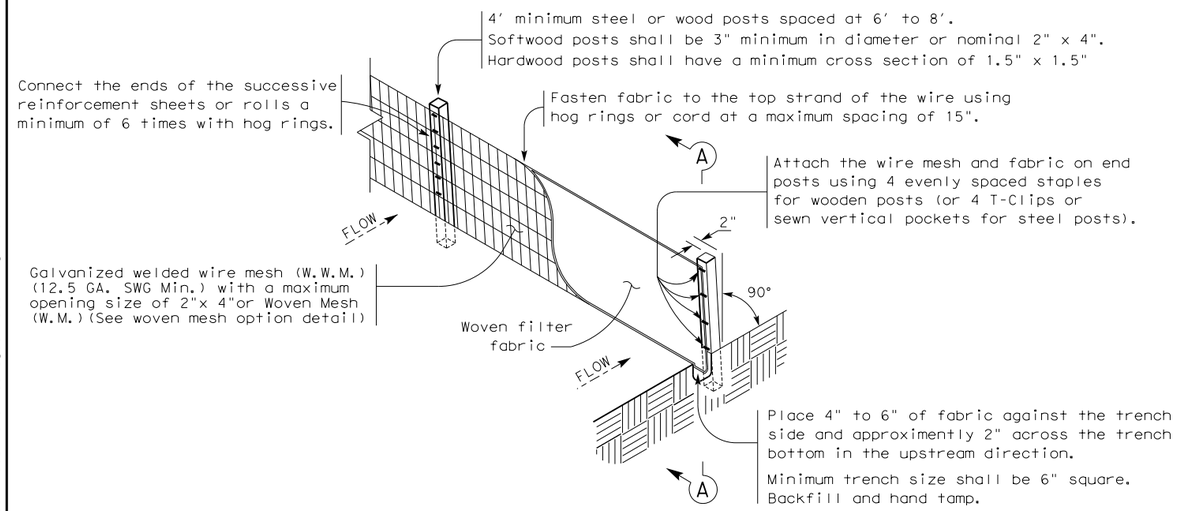
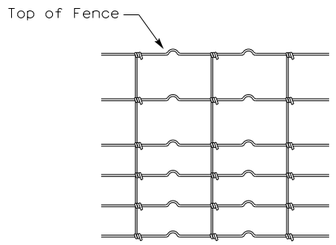
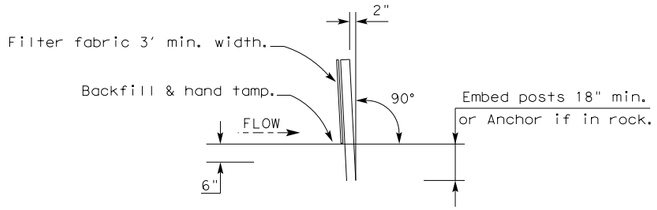


TEMPORARY SEDIMENT CONTROL FENCE

SCF





SECTION A-A

HINGE JOINT KNOT WOVEN MESH (OPTION) DETAIL

Galvanized hinge joint knot woven mesh (12.5 GA.SWG Min.) requires a minimum of five horizontal wires spaced at a maximum of 12 inches apart and all vertical wires spaced at a maximum of 12 inches apart.

SEDIMENT CONTROL FENCE USAGE GUIDELINES

A sediment control fence may be constructed near the downstream perimeter of a disturbed area along a contour to intercept sediment from overland runoff. A 2 year storm frequency may be used to calculate the flow rate to be filtered.

Sediment control fence should be sized to filter a maximum flow through rate of 100 GPM/FT^2. Sediment control fence is not recommended to control erosion from a drainage area larger than 2 acres.

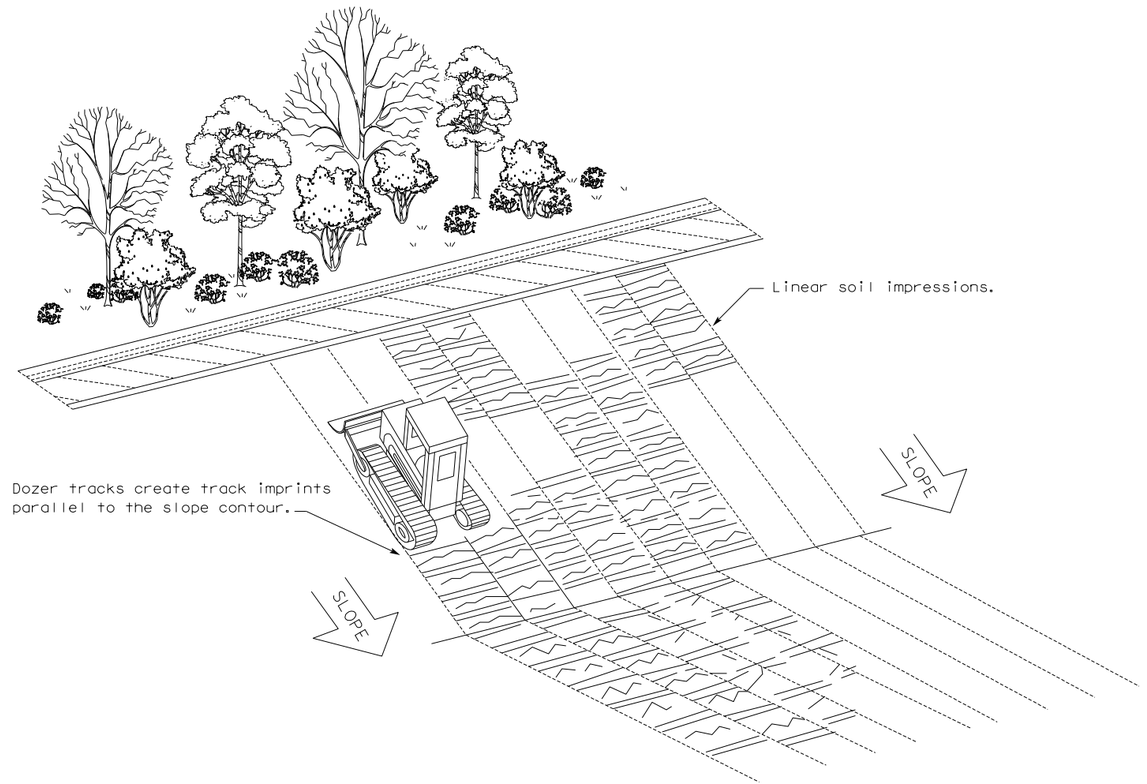
LEGEND

Sediment Control Fence

SCF

GENERAL NOTES

1. Vertical tracking is required on projects where soil distributing activities have occurred unless otherwise approved.
2. Perform vertical tracking on slopes to temporarily stabilize soil.
3. Provide equipment with a track undercarriage capable of producing linear soil impressions measuring a minimum of 12" in length by 2" to 4" in width by 1/2" to 2" in depth.
4. Do not exceed 12" between track impressions.
5. Install continous linear track impressions where the minimum 12" length impressions are perpendicular to the slope or direction of water flow.



VERTICAL TRACKING

Texas Department of Transportation

Design Division Standard

TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

FENCE & VERTICAL TRACKING

EC(1)-16

FILE: ec116	DN: TxDOT	CK: KM	DW: VP	DN/CK: LS
© TxDOT: JULY 2016	CONT	SECT	JOB	HIGHWAY
REVISIONS				SE INNER LP
	DIST	COUNTY		SHEET NO.
		WILLIAMSON		114

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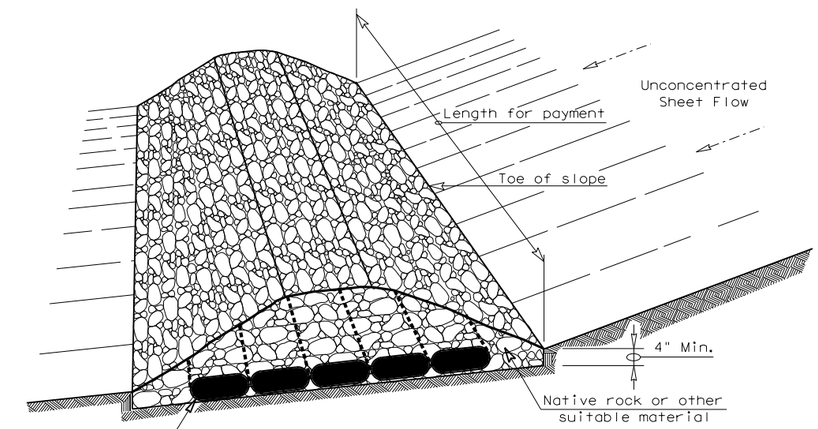
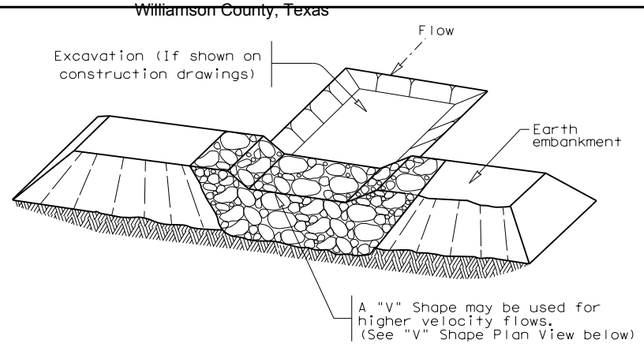


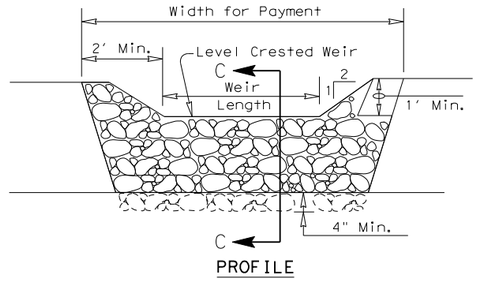
FILTER DAM AT TOE OF SLOPE

RFD1

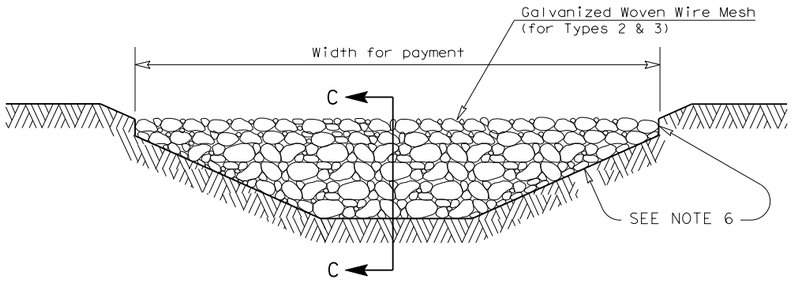


FILTER DAM AT SEDIMENT TRAP

RFD1 — OR — RFD2



PROFILE

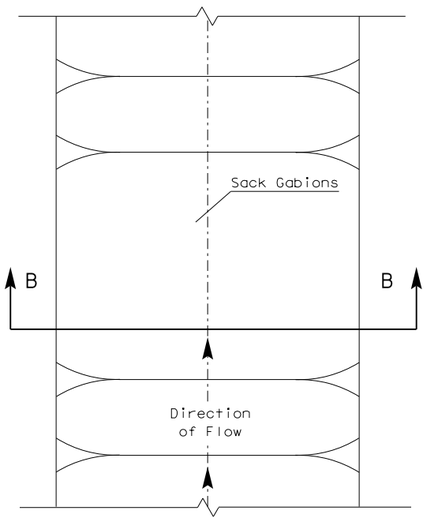


FILTER DAM AT CHANNEL SECTIONS

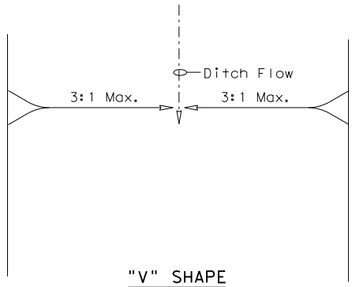
RFD1 — OR — RFD2 — OR — RFD3

GENERAL NOTES

1. If shown on the plans or directed by the Engineer, filter dams should be placed near the toe of slopes where erosion is anticipated, upstream and/or downstream at drainage structures, and in roadway ditches and channels to collect sediment.
2. Materials (aggregate, wire mesh, sandbags, etc.) shall be as indicated by the specification for "Rock Filter Dams for Erosion and Sedimentation Control".
3. The rock filter dam dimensions shall be as indicated on the SW3P plans.
4. Side slopes should be 2:1 or flatter. Dams within the safety zone shall have sideslopes of 6:1 or flatter.
5. Maintain a minimum of 1' between top of rock filter dam weir and top of embankment for filter dams at sediment traps.
6. Filter dams should be embedded a minimum of 4" into existing ground.
7. The sediment trap for ponding of sediment laden runoff shall be of the dimensions shown on the plans.
8. Rock filter dam types 2 & 3 shall be secured with 20 gauge galvanized woven wire mesh with 1" diameter hexagonal openings. The aggregate shall be placed on the mesh to the height & slopes specified. The mesh shall be folded at the upstream side over the aggregate and tightly secured to itself on the downstream side using wire ties or hog rings. For in stream use, the mesh should be secured or staked to the stream bed prior to aggregate placement.
9. Sack Gabions should be staked down with ¾" dia. rebar stakes, and have a double-twisted hexagonal weave with a nominal mesh opening of 2 ½" x 3 ¼"
10. Flow outlet should be onto a stabilized area (vegetation, rock, etc.).
11. The guidelines shown hereon are suggestions only and may be modified by the Engineer.



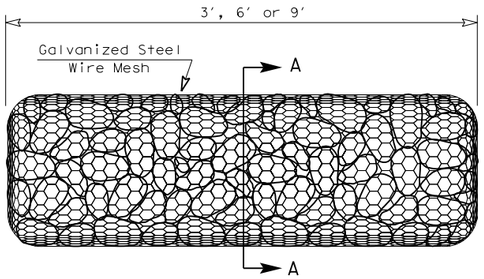
PLAN VIEW



"V" SHAPE
PLAN VIEW

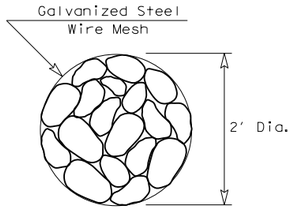
¾" Dia.
Rebar Stakes

SECTION B-B

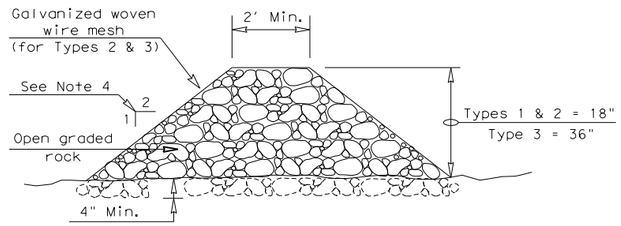


TYPE 4 (SACK GABIONS)

RFD4



SECTION A-A



SECTION C-C

ROCK FILTER DAM USAGE GUIDELINES

Rock Filter Dams should be constructed downstream from disturbed areas to intercept sediment from overland runoff and/or concentrated flow. The dams should be sized to filter a maximum flow through rate of 60 GPM/FT^2 of cross sectional area. A 2 year storm frequency may be used to calculate the flow rate.

Type 1 (18" high with no wire mesh) (3" to 6" aggregate): Type 1 may be used at the toe of slopes, around inlets, in small ditches, and at dike or swale outlets. This type of dam is recommended to control erosion from a drainage area of 5 acres or less. Type 1 may not be used in concentrated high velocity flows (approximently 8 Ft/Sec or more) in which aggregate wash out may occur. Sandbags may be used at the embedded foundation (4" deep min.) for better filtering efficiency of low flows if called for on the plans or directed by the Engineer.

Type 2 (18" high with wire mesh) (3" to 6" aggregate): Type 2 may be used in ditches and at dike or swale outlets.

Type 3 (36" high with wire mesh) (4" to 8" aggregate): Type 3 may be used in stream flow and should be secured to the stream bed.

Type 4 (Sack gabions) (3" to 6" aggregate): Type 4 May be used in ditches and smaller channels to form an erosion control dam.

Type 5: Provide rock filter dams as shown on plans.

PLAN SHEET LEGEND

Type 1 Rock Filter Dam	RFD1
Type 2 Rock Filter Dam	RFD2
Type 3 Rock Filter Dam	RFD3
Type 4 Rock Filter Dam	RFD4

Texas Department of Transportation — Design Division Standard

TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

ROCK FILTER DAMS

EC(2)-16

FILE: ec216	DN: TxDOT	CK: KM	DW: VP		DN/CK: LS
© TxDOT: JULY 2016	CONT	SECT	JOB		HIGHWAY
REVISIONS					SE INNER LP
	DIST	COUNTY			SHEET NO.
		WILLIAMSON			115

DATE: 6/24/2017 10:52
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DATE: 6/24/2017 10:52
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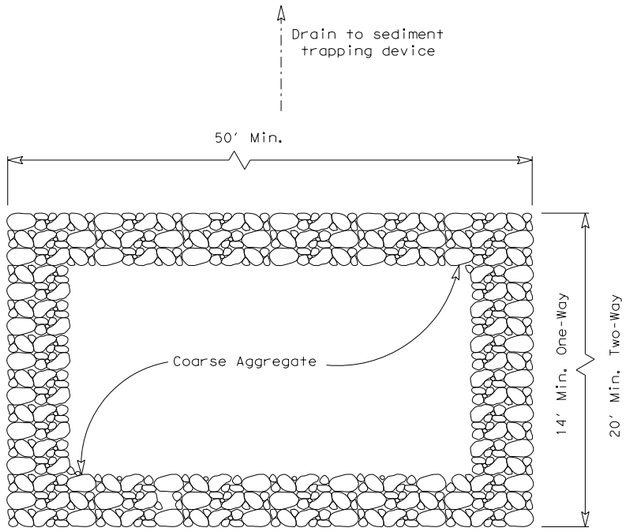
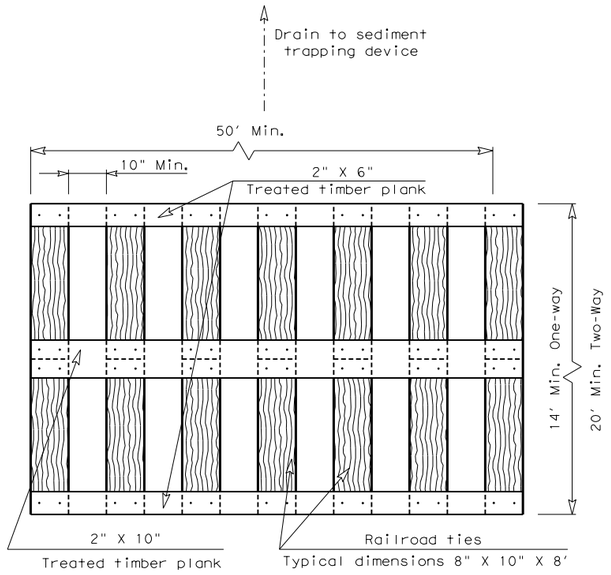
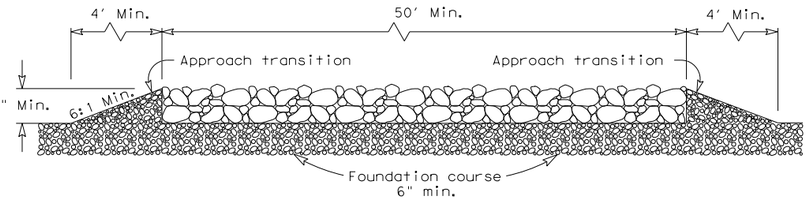


PLAN VIEW



PLAN VIEW



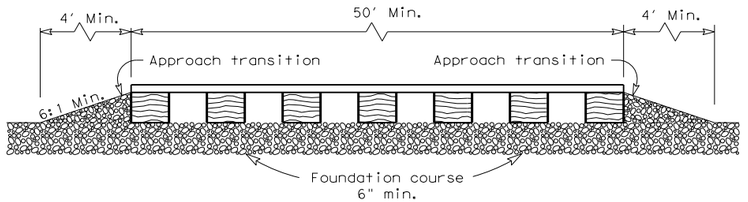
ELEVATION VIEW

CONSTRUCTION EXIT (TYPE 1)

ROCK CONSTRUCTION (LONG TERM)

GENERAL NOTES (TYPE 1)

1. The length of the type 1 construction exit shall be as indicated on the plans, but not less than 50′.
2. The coarse aggregate should be open graded with a size of 4" to 8".
3. The approach transitions should be no steeper than 6:1 and constructed as directed by the Engineer.
4. The construction exit foundation course shall be flexible base, bituminous concrete, portland cement concrete or other materialas approved by the Engineer.
5. The construction exit shall be graded to allow drainage to a sediment trapping device.
6. The guidelines shown hereon are suggestions only and may be modified by the Engineer.
7. Construct exits with a width of at least 14 ft. for one-way and 20 ft. for two-way traffic for the full width of the exit, or as directed by the engineer.



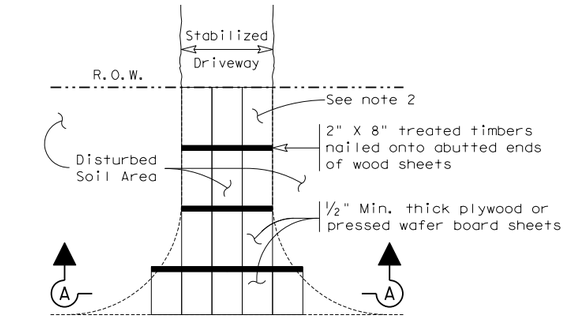
ELEVATION VIEW

CONSTRUCTION EXIT (TYPE 2)

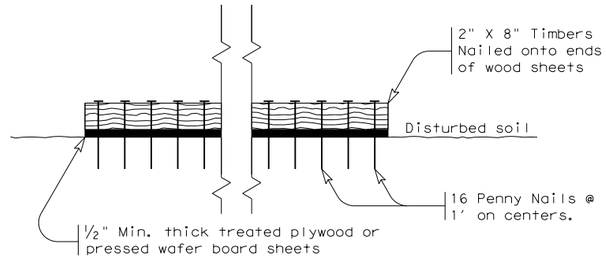
TIMBER CONSTRUCTION (LONG TERM)

GENERAL NOTES (TYPE 2)

1. The length of the type 2 construction exit shall be as indicated on the plans, but not less than 50′.
2. The treated timber planks shall be attached to the railroad ties with ½"x 6" min. lag bolts. Other fasteners may be used as approved by the Engineer.
3. The treated timber planks shall be #2 grade min., and should be free from large and loose knots.
4. The approach transitions shall be no steeper than 6:1 and constructed as directed by the Engineer.
5. The construction exit foundation course shall be flexible base, bituminous concrete, portland cement concrete or other material as approved by the Engineer.
6. The construction exit should be graded to allow drainage to a sediment trapping device.
7. The guidelines shown hereon are suggestions only and may be modified by the Engineer.
8. Construct exits with a width of at least 14 ft. for one-way and 20 ft. for two-way traffic for the full width of the exit, or as directed by the engineer.



PLAN VIEW



SECTION A-A

CONSTRUCTION EXIT (TYPE 3)

SHORT TERM

GENERAL NOTES (TYPE 3)

1. The length of the type 3 construction exit shall be as shown on the plans, or as directed by the Engineer.
2. The type 3 construction exit may be constructed from open graded crushed stone with a size of two to four inches spread a min. of 4" thick to the limits shown on the plans.
3. The treated timber planks shall be #2 grade min., and should be free from large and loose knots.
4. The guidelines shown hereon are suggestions only and may be modified by the Engineer.

Texas Department of Transportation

Design Division Standard

TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

CONSTRUCTION EXITS

EC(3)-16

FILE: ec316	DN: TxDOT	CK: KM	DW: VP	DN/CK: LS
©TxDOT: JULY 2016	CONT	SECT	JOB	HIGHWAY
REVISIONS				SE INNER LP
	DIST	COUNTY		SHEET NO.
		WILLIAMSON		116

117
MONUMENT SIGN DETAILS HERE

118
ELECTRIC DETAIL (MISC) HERE

SUMMARY OF ELECTRICAL SERVICE DATA

ELEC. SERVICE NO.	SHEET NO.	STA	OFFSET	ALIGN	ELECTRICAL SERVICE DESCRIPTION (SEE ED(5)-14)	SERVICE CONDUIT SIZE	SERVICE CONDUCTORS NO./SIZE	SAFETY SWITCH AMPS	MAIN CKT BRKR POLE/AMP	TWO-POLE CONTRACTOR AMPS (*)	PANEL BD./ LOADCENTER AMP RATING	CIRCUIT NO.		BRANCH CKT BRKR POLE/AMP	BRANCH CIRCUIT AMPS	KVA LOAD
1	88	93+71.30	78.03' LT	BL XGIL	ELEC SERV TY A (120/240)060(NS)SS(E)TP(O)	1-1/4"	3/#8	N/A	2P/60	N/A	100	A	WQ POND	1P/15	4.5	0.6
2	89	111+68.65	119.77' LT	BL XGIL	ELEC SERV TY A (120/240)060(NS)SS(E)TP(O)	1-1/4"	3/#8	N/A	2P/60	N/A	100	B	WQ POND	1P/15	4.5	0.6

STATE OF TEXAS
ERIK N. SCOTT
115070
PROFESSIONAL ENGINEER
LICENSED

June 23, 2017

NO.	REVISION	BY	DATE

WILLIAMSON COUNTY
1848

RTG RODRIGUEZ TRANSPORTATION GROUP
FIRM #587

RS&H
RS&H, Inc.
8140 North Mo Pac Expy, Building 2,
Suite 100, Austin, Texas 78759
512-279-5427 FAX 512-459-2233
Texas Registration No. F-3401

GEORGETOWN INNER LOOP

ELECTRICAL SERVICE DATA SHEET

SHEET 1 OF 1

DESIGNED:	PROJECT NUMBER		ROADWAY	
CHECKED:			SE INNER LOOP	
DRAWN:	STATE	COUNTY	CITY	SHEET No.
CHECKED:	TEXAS	WILLIAMSON	GEORGETOWN	119

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GENERAL NOTES FOR ALL ELECTRICAL WORK

1. The location of all conduits, junction boxes, ground boxes, and electrical services is diagrammatic and may be shifted to accommodate field conditions.

2. Provide new and unused materials. Ensure that all materials and installations comply with the applicable articles of the National Electrical Code (NEC), TxDOT standards and specifications, National Electrical Manufacturers Association (NEMA), and are listed by Underwriters Laboratories (UL) or a Nationally Recognized Testing Lab (NRTL). NRTLs such as Canadian Standard Association (CSA), Intertek Testing Services NA Inc., or FM Approvals LLC can be considered equivalent to UL. Where reference is made to NEMA listed devices, International Electrotechnical Commission (IEC) listed devices will not be considered an acceptable equal to a NEMA listed device. Acceptable devices may have both a NEMA and IEC listing. Faulty fabrication or poor workmanship in any material, equipment, or installation is justification for rejection. Replace or reinstall rejected material or equipment at no additional cost to the Department.

3. Miscellaneous nuts, bolts and hardware, except for high strength bolts, may be stainless steel when plans specify galvanized, provided the bolt size is ½ in. or less in diameter.

4. Provide the following test equipment as required by the Engineer to confirm compliance with the contract and the NEC: voltmeter, ammeter, megohm meter (1000 volt DC), ground resistance tester, torque wrenches, and torque screwdrivers. Ensure all equipment has been properly calibrated within the last year. Provide calibration certification to the Engineer upon request. Operate test equipment during inspection as requested by the Engineer.

5. Install grounding as shown on the plans and in accordance with the NEC. Ensure all metallic conduits; metal poles; luminaires; and metal enclosures are bonded to the equipment grounding conductor. Provide stranded bare copper or green insulated grounding conductors. Ground rods, connectors, and bonding jumpers are subsidiary to the various bid items.

6. When required by the Engineer, notify the Department in writing of materials from the Material Producers List (MPL) intended for use on each project. Prequalified materials are listed on the MPL on TxDOT's website under "Roadway Illumination and Electrical Supplies." No substitutions will be allowed for materials on this list.

CONDUIT

A. MATERIALS

1. Provide conduit, junction boxes, fittings, and hardware as per TxDOT Departmental Material Specification (DMS) 11030 "Conduit" and Item 618 "Conduit" of TxDOT's "Standard Specifications For Construction And Maintenance Of Highways, Streets, And Bridges," latest edition. Provide conduits listed under Item 618 on the MPL under "Roadway Illumination and Electrical Supplies." Provide conduit types according to the descriptive code or as shown on the plans. Do not substitute other types of conduits for those shown. Provide liquidtight flexible metal conduit (LFMC) when flexible conduit is called for on galvanized steel rigid metallic conduit (RMC) systems. Provide liquidtight flexible nonmetallic conduit (LFNC) when flexible conduit is called for on polyvinyl chloride (PVC) systems.

2. Provide galvanized steel RMC for all exposed conduits, unless otherwise shown on the plans. Properly bond all metal conduits.

3. Unless otherwise shown on the plans, provide junction boxes with a minimum size as shown in the following table, which applies to the greatest number of conductors entering the box through one conduit with no more than four conduits per box. When a mixture of conductor sizes is present, count the conductors as if all are of the larger size. For situations not applicable to the table, size junction boxes in accordance with NEC.

AWG	3 CONDUCTORS	5 CONDUCTORS	7 CONDUCTORS
#1	10" x 10" x 4"	12" x 12" x 4"	16" x 16" x 4"
#2	8" x 8" x 4"	10" x 10" x 4"	12" x 12" x 4"
#4	8" x 8" x 4"	10" x 10" x 4"	10" x 10" x 4"
#6	8" x 8" x 4"	8" x 8" x 4"	10" x 10" x 4"
#8	8" x 8" x 4"	8" x 8" x 4"	8" x 8" x 4"

4. Junction boxes with an internal volume of less than 100 cu. in. and supported by entering raceways must have threaded entries or hubs identified for the intended purpose and supported by connection of two or more rigid metal conduits. Secure conduit within 3 ft. of the enclosure or within 18 in. of the enclosure if all conduit entries are on the same side. Mechanically secure all junction boxes with an internal volume greater than 100 cu. inches.

5. Provide hot dipped galvanized cast iron or sand cast aluminum outlet boxes for junction boxes containing only 10 AWG or 12 AWG conductors. Do not use die cast aluminum boxes. Size outlet boxes according to the NEC.

6. Do not use intermediate metal conduit (IMC) or electrical metallic tubing (EMT) unless specifically required by the plan sheets. When EMT is called for, provide junction boxes made from galvanized steel sheeting, listed and approved for outdoor use, unless otherwise noted on the plans. Size all galvanized steel junction boxes in accordance with the NEC. Provide junction boxes for IMC conduit systems that meet the same requirements for junction boxes used with RMC systems.

7. Provide PVC junction boxes intended for outdoor use on PVC conduit systems, unless otherwise noted on the plans.

8. Provide PVC elbows in PVC conduit systems, unless otherwise shown on the plans. Use only a flat, high tensile strength polyester fiber pull tape for pulling conductors through the PVC conduit system. When galvanized steel RMC elbows are specifically called for in the plans and any portion of the RMC elbow is buried less than 18 in., ground the RMC elbow by means of a grounding bushing on a rigid metal extension. Grounding of the rigid metal elbow is not required if the entire RMC elbow is encased in a minimum of 2 in. of concrete. PVC extensions are allowed on these concrete encased rigid metal elbows. RMC or PVC elbows are subsidiary to various bid items.

9. When required, provide High-Density Polyethylene (HDPE) conduit with factory installed internal conductors according to Item 622 "Duct Cable." At the Contractor's request and with approval by the Engineer, substitute HDPE conduit with no conductors for bored schedule 40 or schedule 80 PVC conduit bid under Item 618. Ensure bored HDPE substituted for PVC is schedule 40 and of the same size PVC called for in the plans. Ensure the substituted HDPE meets the requirements of Item 622, except that the conduit is supplied without factory-installed conductors. Make the transition of the HDPE conduit to PVC (or RMC elbow when required) at the bore pit. Provide conduit of the size and schedule as shown on the plans. Do not extend substituted conduit into ground boxes or foundations. Provide PVC or galvanized steel RMC elbows as called for at all ground boxes and foundations.

10. Use two-hole straps when supporting 2 in. and larger conduits. On electrical service poles, properly sized stainless steel or hot dipped galvanized one-hole standoff straps are allowed on the service riser conduit.

B. CONSTRUCTION METHODS

1. Provide and install expansion joint conduit fittings on all structure-mounted conduits at the structure's expansion joints to allow for movement of the conduit. In addition, provide and install expansion joint fittings on all continuous runs of galvanized steel RMC conduit externally exposed on structures such as bridges at maximum intervals of 150 ft. When requested by the project Engineer, supply manufacturer's specification sheet for expansion joint conduit fittings. Repair or replace expansion joint fittings that do not allow for movement at no additional cost to the Department. Provide the method of determining the amount of expansion to the Engineer upon request. Do not use LFMC or LFNC as a substitute for the required expansion conduit fittings.

2. Space all conduit supports at maximum intervals of 5 ft. Install conduit spacers when attaching metal conduit to surface of concrete structures. See "Conduit Mounting Options" on ED(2). Install conduit support within 3 ft. of all enclosures and conduit terminations.

3. Do not attach conduit supports directly to pre-stressed concrete beams except as shown specifically in the plans or as approved by the Engineer.

4. Unless otherwise shown on the plans, jack or bore conduit placed beneath existing roadways, driveways, sidewalks, or after the base or surfacing operation has begun. Backfill and compact the bore pits below the conduit per Item 476 "Jacking, Boring, or Tunneling Pipe or Box" prior to installing conduit or duct cable to prevent bending of the connections.

5. When placing conduit in the sub-grade of new roadways, backfill all trenches with excavated material unless otherwise noted on the plans. When placing conduit in the sub-base of new roadways, backfill all trenches with cement-stabilized base as per requirements of Items 110 "Excavation", 400 "Excavation and Backfill for Structures", 401 "Flowable Backfill", 402 "Trench Excavation Protection", and 403 "Temporary Special Shoring."

6. Provide and place warning tape approximately 10 in. above all trenched conduit as per Item 618.

7. During construction, temporarily cap or plug open ends of all conduit and raceways immediately after installation to prevent entry of dirt, debris and animals. Temporary caps constructed of durable duct tape are allowed. Tightly fix the tape to the conduit opening. Clean out the conduit and prove it clear in accordance with Item 618 prior to installing any conductors.

8. Ensure conduit entry into the top of any enclosure is waterproof by installing conduit sealing hubs or using boxes with threaded bosses. This includes surface mounted safety switches, meter cans, service enclosures, auxiliary enclosures and junction boxes. Grounding bushings on water tight sealing hubs are not required.

9. Fit the ends of all PVC conduit terminations with bushings or bell end fittings. Provide and install a grounding type bushing on all metal conduit terminations.

10. Install a bonding jumper from each grounding bushing to the nearest ground rod, grounding lug, or equipment grounding conductor. Ensure all bonding jumpers are the same size as the equipment grounding conductor. Bonding of conduit used as a casing under roadways for duct cable is not required, if the duct extends the full length through the casing.

11. At all electrical services, install a 6 AWG solid copper grounding electrode conductor.

12. Place conduits entering ground boxes so that the conduit openings are between 3 in. and 6 in. from the bottom of the box. See the ground box detail on sheet ED(4).

13. Seal ends of all conduits with duct seal, expandable foam, or by other methods approved by the Engineer. Seal conduit immediately after completion of conductor installation and pull tests. Do not use duct tape as a permanent conduit sealant. Do not use silicone caulk as a conduit sealant.

14. File smooth the cut ends of all mounting strut and conduit. Before installing, paint the field cut ends of all mounting strut and RMC (threaded or non-threaded) with zinc rich paint (94% or more zinc content) to alleviate overspray. Use zinc rich paint to touch up galvanized material as allowed under Item 445 "Galvanizing." Do not paint non-galvanized material with a zinc rich paint as an alternative for materials required to be galvanized.

Texas Department of Transportation | Traffic Operations Division Standard

ELECTRICAL DETAILS CONDUITS & NOTES

ED(1)-14

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©TxDOT	October 2014	CONT	SECT	JOB	HIGHWAY
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			WILLIAMSON		120

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DATE: 6/23/2017
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ELECTRICAL CONDUCTORS

A. MATERIAL INFORMATION

1. Provide Type XHHW insulated conductors in accordance with Departmental Material Specification (DMS)11040 "Conductors" and Item 620 "Electrical Conductors." Provide conductors as listed on the Material Producers List (MPL) on the Department web site under "Roadway Illumination and Electrical Supplies" Item 620. Color code insulated conductors in conformance with the NEC. Identify grounded (neutral) conductors with white insulation. Identify grounding conductors (ground wires) with green insulation or bare conductors. Identify ungrounded (hot) conductors with any color insulation except green, white, or gray. Keep color scheme consistent throughout the wiring system. Identify conductors 6 American Wire Gauge (AWG) and smaller by continuous color jacket. Identify electrical conductors 4 AWG and larger by continuous color jacket or by colored tape. When identifying conductors with colored tape, mark at least 6 in. of the conductor's insulation with half laps of tape.
2. Provide a solid copper 6 AWG grounding electrode conductor to bond the electrical service equipment to the concrete encased grounding electrode or the ground rod at the service location. Connect the grounding electrode conductor to the ground rod with a UL listed connector in accordance with DMS 11040. Connect the grounding electrode conductor to the concrete encased grounding electrode as shown in the plans.
3. Where two or more circuits are present in one conduit or enclosure, permanently identify the conductors of each branch circuit by attaching a non-metallic tag around both circuit conductors at each accessible location. Provide tags with two straps, large enough to indicate circuit number, letter, or other identification as shown in the plans. Print circuit identification on the tag with a permanent marker.
4. Use listed compression or screw type pressure connectors, terminal blocks, or split bolt connectors for splicing as specified in DMS 11040. Use hot melt adhesive tape to fill the gap and seal the ends of heat shrink tubing. Provide UL listed gel-filled insulating splice covers. Splicing materials, insulating materials, breakaway disconnects, splice covers, and fuse holders are subsidiary to various bid items.

B. CONSTRUCTION METHODS

1. Use only a flat, high tensile strength polyester fiber pull tape for pulling conductors through the conduit system. After installing conductors in conduit, perform conductor pull test. If a conductor cannot be freely pulled, make any needed alterations or repairs at no additional cost to the department. Perform insulation resistance tests in accordance with Item 620. Coordinate with the Engineer to witness the tests.
2. Leave 2 ft. minimum, 3 ft. maximum length for each conductor up to the splice in ground boxes. Leave 3 ft. minimum, 4 ft. maximum length of conductor in ground boxes when pulled through with no splice. Leave 1 ft. minimum, 1.5 ft. maximum length of conductor at enclosures, weatherheads and pole bases.
3. Make splices only in junction boxes, ground boxes, pole bases, or electrical enclosures and use only listed compression or screw type pressure connectors, terminal blocks, or split bolt connectors. Insulate splices with heavy wall heat shrink tubing or gel-filled insulating splice covers to provide a watertight splice. Overlap conductor insulation with heat shrink tubing a minimum of 2 in. past both sides of the splice. Where heat shrink tubing may not shrink sufficiently to provide a watertight seal around the individual conductors, prior to heating the tubing, increase the diameter of the conductor insulation using hot melt adhesive tape to provide a watertight seal between the individual conductors and the heat shrink tubing. Ensure the tape extends past the heat shrink tubing. Use hot melt adhesive tape to fill the gap and seal the ends of heat shrink tubing. Heat shrink tubing that appears to have been burned, or overheated, is considered defective and must be replaced.
4. Size and install gel-filled insulating splice covers according to manufacturer's specifications when used in place of heat shrink tubing.
5. Wire nuts with factory applied waterproof sealant may be used for 8 AWG or smaller conductors in above ground junction boxes, but not in pole bases or ground boxes. Install wire nuts in an upright position to prevent the accumulation of water.
6. Support conductors in illumination poles with a J-hook at the top of the pole.
7. When terminating conductors, remove the insulation and jacketing material without nicking the individual strands of the conductor. Conductors with nicked individual conductor strands or removed strands will be considered damaged.
8. Replace conductors and cables that are damaged beyond repair or that fail an insulation resistance test at no additional cost to the department.
9. Do not repair damaged conductors with duct tape, electrical tape, or wire nuts. Use only approved splicing methods.
10. Do not terminate more than one conductor under a single connector, unless the connector is rated for multiple conductors. Do not exceed the pressure connector's listing for maximum number and size of conductors allowed.
11. Install breakaway connectors on conductors bid under Item 620 whenever those conductors pass through a breakaway support device. Follow manufacturer's instructions when terminating conductors to breakaway connectors. Properly torque threaded connections. Proper terminations are critical to the safe operation of breakaway devices. Trim waterproofing boots on breakaway connectors to fit snugly around the conductor to ensure waterproof connection. Only one conductor may enter a single opening in a boot. Provide waterproof boots with the correct number of openings. Leave unused openings factory sealed. Use prequalified breakaway connectors as shown on the MPL.
12. Provide and install a separate stranded equipment grounding conductor (EGC) in all conduits that contain circuit wiring of 50 volts or more. Unless shown elsewhere, size the EGC to be the same size as the largest current carrying conductor contained in the conduit. Ensure all EGCs are bonded together at every accessible location. For traffic signal installations, provide a minimum size 8 AWG EGC. The EGC is paid for under Item 620.

C. TEMPORARY WIRING

1. Install temporary conductors and electrical equipment in accordance with the NEC article "Temporary Installations" and Department standard sheets.
2. Provide a ground fault circuit interrupter (GFCI) for power outlets for portable electrical equipment, power tools, ice machines, ice storage bins and refrigerators located outdoors at grade. GFCI may be any one of the following: molded cord and plug set, receptacle, or circuit breaker type.
3. Use listed wire nuts with factory applied sealant for temporary wiring where approved.
4. Enclose conductor splices within a listed enclosure or ground box, or ensure the splices are more than 10 ft. above grade vertically and more than 5 ft. horizontally from any metal structure. Where installing temporary conductors in areas subject to vehicle traffic or mobile construction equipment, ensure the vertical clearance to ground is at least 18 ft. when measured at the lowest point. Ground messenger wires that support power conductors in conformance with the NEC.
5. Protect and when necessary repair any existing electrical conduits uncovered during the construction process in a timely manner and in conformance with the NEC.

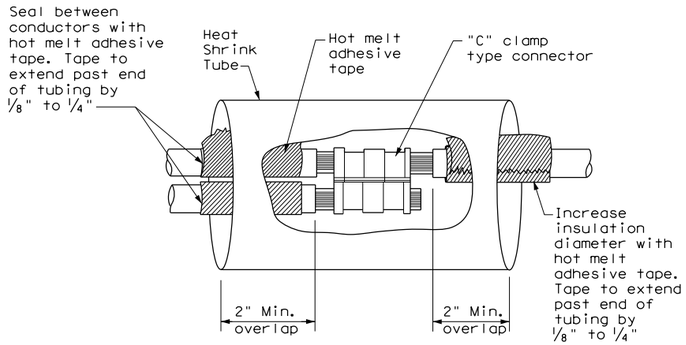
GROUND RODS & GROUNDING ELECTRODES

A. MATERIAL INFORMATION

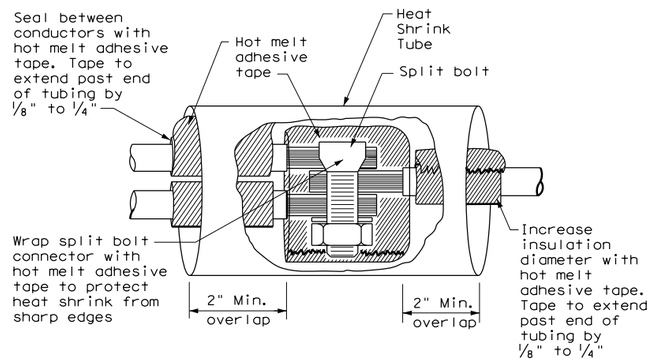
1. Provide and install a grounding electrode at electrical services. Provide ground rods according to DMS 11040 and the plans. Larger diameter or longer length rods may be called for in some specific locations, see the individual plans sheets. Concrete encased grounding electrodes may be called for in specific locations including electrical service, see individual plan sheets.

B. CONSTRUCTION METHODS

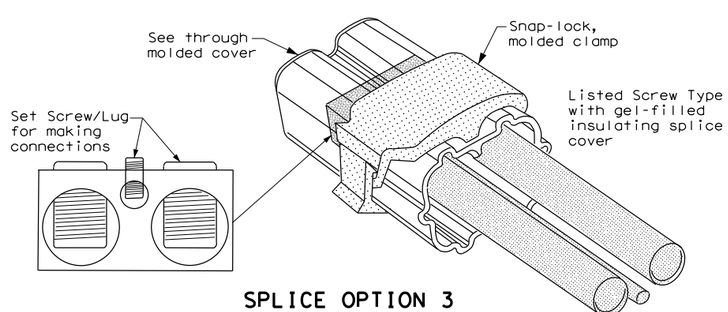
1. Furnish auxiliary ground rods for lightning protection and install in soil, concrete, or both, as called for in the plans. For ground rods installed in concrete, ensure the connection of the conductor to the ground rod is readily accessible for inspection or repairs. For ground rods installed in soil, ensure that the upper end is between 2 to 4 in. below finished grade.
2. Do not place ground rods in the same drilled hole as a timber pole.
3. Install ground rods so the imprinted part number is at the upper end of the rod.
4. Remove all non-conductive coatings such as concrete splatter from the rod at the clamp location.
5. Route all conductors as short and straight as possible for connection to lightning protection ground rods. When a bend is required, ensure a minimum radius bend of four inches for these conductors.
6. Unless otherwise called for in the plans, protect grounding electrode conductors with non-metallic conduit. When protecting grounding electrode conductors with metal conduit, provide and install a grounding type bushing and properly sized bonding jumper on each end of the metal conduit.
7. Written authorization is required before installing a ground rod in a horizontal trench for rocky soil or a solid rock bottom.



SPLICE OPTION 1
Compression Type



SPLICE OPTION 2
Split Bolt Type



SPLICE OPTION 3
Listed Screw Type

Texas Department of Transportation | Traffic Operations Division Standard

ELECTRICAL DETAILS CONDUCTORS

ED(3)-14

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ELECTRICAL SERVICES NOTES

1. Provide new materials. Ensure installation and materials comply with the applicable provisions of the National Electrical Code (NEC) and National Electrical Manufacturers Association (NEMA) standards. Ensure material is Underwriters Laboratories (UL) listed. Provide and install electrical service conduits, conductors, disconnects, contactors, circuit breaker panels, and branch circuit breakers as shown on the Electrical Service Data chart in the plans. Faulty fabrication or poor workmanship in material, equipment, or installation is justification for rejection. Where manufacturers provide warranties and guarantees as a customary trade practice, furnish these to the State.
2. Provide electrical services in accordance with Electrical Details standard sheets, Departmental Material Specification (DMS) 11080 "Electrical Services,"DMS 11081 "Electrical Services-Type A," DMS 11082 "Electrical Services-Type C," DMS 11083 "Electrical Services-Type D," DMS 11084 "Electrical Services-Type T," DMS 11085 "Electrical Services-Pedestal (PS)", and Item 628 "Electrical Services" of the Standard Specifications. Provide electrical service types A, C, and D, as listed on the Material Producers List (MPL) on the Department web site under "Roadway Illumination and Electrical Supplies," Item 628. Provide other service types as detailed on the plans.
3. Provide all work, materials, services, and any incidentals needed to install a complete electrical service as specified in the plans.
4. Coordinate with the Engineer and the utility provider for metering and compliance with utility requirements. Primary line extensions, connection charges, meter charges, and other charges by the utility company to provide power to the location are paid for in accordance with Item 628. Get approval for the costs associated with these charges prior to engaging the utility company to do the work. Consult with the utility provider to determine costs and requirements, and coordinate the work as approved.
5. The enclosure manufacturer will provide Master Lock Type 2 with brass tumblers keyed #2195 for all custom electrical enclosures. Installing Contractor is to provide Master Lock #2195 Type 2 with brass tumblers for "off the shelf" enclosures. Master Lock #2195 keys and locks become property of the State. Unless otherwise approved, do not energize electrical service equipment until locks are installed.
6. Enclosures with external disconnects that de-energize all equipment inside the enclosure do not need a dead front trim. Protect incoming line terminations from incidental contact as required by the NEC.
7. When galvanized is specified for nuts, screws, bolts or miscellaneous hardware, stainless steel may be used.
8. Provide wiring and electrical components rated for 75°C. Provide red, black, and white colored XHHW service entrance conductors of minimum size 6 American Wire Gauge (AWG). Identify size 6 AWG conductors by continuous color jacket. Identify electrical conductors sized 4 AWG and larger by continuous color jacket or by colored tape. Mark at least 6 inches of the conductor's insulation with half laps of colored tape, when identifying conductors. Ensure each service entrance conductor exits through a separately bushed non-metallic opening in the weatherhead. The lengths of the conductors outside the weatherhead are to be 12 inches minimum, 18 inches maximum, or as required by utility.
9. All electrical service conduit and conductors attached to the electrical service including the riser or the elbow below ground are subsidiary to the electrical service. For an underground utility feed, all service conduit and conductors after the elbow, including service conduit and conductors for the utility pole riser when furnished by the Contractor, will be paid for separately.
10. Provide rigid metal conduit (RMC) for all conduits on service, except for the ½ in. PVC conduit containing the electrical service grounding electrode conductor. Size the service entrance conduit as shown in the plans. Ensure conduit for branch circuit entry to enclosure is the same size as that shown on the layout sheets for branch circuit conduit. Extend all rigid metal conduits a minimum of 6 inches underground and then couple to the type and schedule of the conduit shown on the layout for that particular branch circuit. Install a grounding bushing on the RMC where it terminates in the service enclosure.
11. Use of liquidtight flexible metal conduit (LFMC) is allowed between the meter and service enclosure when they are mounted 90 to 180 degrees to each other. Size the LFMC the same size as service entrance conduit. LFMC must not exceed 3 feet in length. Strap LFMC within 1 foot of each end. LFMC less than 12 inches in length need not be strapped. Each end of LFMC must have a grounding bushing or be terminated with a grounding fitting. The LFMC must contain a grounded (neutral) conductor. Ensure any bend in LFMC never exceeds 180 degrees. A pull test is required on all installed conductors, with at least six inches of free conductor movement demonstrated to the satisfaction of the Engineer.
12. Ensure all mounting hardware and installation details of services conform to utility company specifications.
13. For all electrical service enclosures listed under Item 628 on the MPL, the UL 508 enclosure manufacturers will prepare and submit a schematic drawing unique to each service. Before shipment to the job site, place the applicable laminated schematic drawings and the laminated plan sheet showing the electrical service data chart used to build the enclosure in the enclosure's data pocket. The installing contractor will copy and laminate the actual project plan sheets detailing all equipment and branch circuits supplied by that service. The laminated plan sheets are to be placed in the service enclosure's document pocket. Reduce 11 in. x 17 in. plan sheets to 8 ½ in. x 11 in. before laminating. If the installation differs from the plan sheets, the installing contractor is to redline plan sheets before laminating.
14. When providing an "Off The Shelf" Type D or Type T service, provide laminated plan sheets detailing equipment and branch circuits supplied by that service. Reduce 11 in. x 17 in. plan sheets to 8 ½ in. x 11 in before laminating. Deliver these drawings before completion of the work to the Engineer, instead of placing in enclosure that has no door pocket.
15. Do not install conduit in the back wall of a service enclosure where it would penetrate the equipment mounting panel inside the enclosure. Provide grounding bushings on all metal conduits, and terminate bonding jumpers to grounding bus. Grounding bushings are not required when the end of the metal conduit is fitted with a conduit sealing hub or threaded boss, such as a meter base hub.

SERVICE ASSEMBLY ENCLOSURE

1. Provide threaded hub for all conduit entries into the top of enclosure.
2. Type galvanized steel (GS) enclosures may be used for Type C panelboards and for Type D and T services that do not use an enclosure mounted photocell or lighting contactor. Provide GS enclosures in accordance with DMS 11080, 11082, 11083, and 11084.
3. Provide aluminum (AL) and stainless steel (SS) enclosures for Types A, C, and D in accordance with DMS 11080, 11081, 11082, 11083, and 11084. Do not paint stainless steel.
4. Provide pedestal service (PS) enclosures in accordance with ED(9) and DMS 11080 and 11085. Do not provide GS pedestal services. If GS is shown in the PS descriptive code, provide an AL enclosure.

MAIN DISCONNECT & BRANCH CIRCUIT BREAKERS

1. Field drill flange-mounted remote operator handle if needed, to ensure handle is lockable in both the "On" and "Off" positions.
2. When the utility company provides a transformer larger than 50 KVA, verify that the available fault current is less than the circuit breaker's ampere interrupting capacity (AIC) rating and provide documentation from the electric utility provider to the Engineer.

PHOTOELECTRIC CONTROL

1. Provide photocell as listed on the MPL. Move, adjust, or shield the photocell from stray or ambient night time light to ensure proper operation. Mount photocell facing north when practical. Mount top of pole photocells as shown on Top Mounted Photocell Detail.

* ELECTRICAL SERVICE DATA

Elec. Service ID	Plan Sheet Number	Electrical Service Description	Service Conduit **Size	Service Conductors No./Size	Safety Switch Amps	Main Ckt. Bkr. Pole/Amps	Two-Pole Contractor Amps	Panelbd/ Loadcenter Amp Rating	Branch Circuit ID	Branch Ckt. Bkr. Pole/Amps	Branch Circuit Amps	KVA Load
SB 183	289	ELC SRV TY A 240/480 100(SS)AL(E)SF(U)	2"	3/#2	100	2P/100	100	N/A	Lighting NB	2P/40	26	28.1
									Lighting SB	2P/40	25	
									Underpass	1P/20	15	
NB Access	30	ELC SRV TY D 120/240 060(NS)SS(E)TS(O)	1 ¼"	3/#6	N/A	2P/60		100	Sig. Controller	1P/30	23	5.3
							30		Luminaires	2P/20	9	
									CCTV	1P/20	3	
2nd & Main	58	ELC SRV TY T 120/240 000(NS)GS(N)SP(O)	1 ¼"	3/#6	N/A	N/A	N/A	70	Flashing Beacon 1	1P/20	4	1.0
									Flashing Beacon 2	1P/20	4	

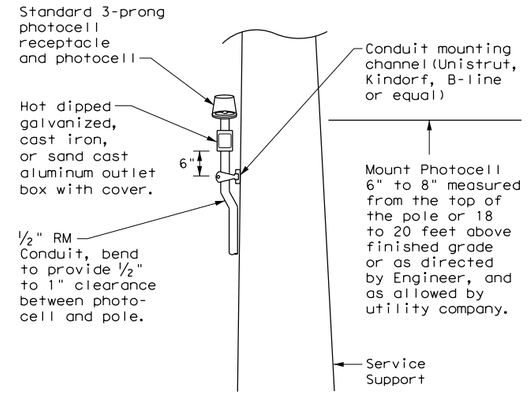
* Example only, not for construction. All new electrical services must have electrical service data chart specific to that service as shown in the plans.

** Verify service conduit size with utility. Size may change due to utility meter requirements. Ensure conduit size meets the National ELectrical Code.

EXPLANATION OF ELECTRICAL SERVICE DESCRIPTIVE CODE

ELEC SERV TY X XXX/XXX XXX (XX) XX (X) XX (X)

- Schematic Type
- Service Voltage V / V
- Disconnect Amp Rating 000 indicates main lug only/ Typically Type T
- (SS)= Safety Switch Ahead of Meter-Check with Utility
- (NS)= No safety Switch Ahead of Meter-Check with Utility
- Enclosure Type
  - GS= Galvanized steel("off the shelf")
  - SS= Stainless steel(Custom Enclosure)See MPL
  - AL= Aluminum (Custom Enclosure)See MPL
- Photocell Mounting Location
  - (E)= Inside Service/Enclosure Mounted
  - (T)= Top of pole
  - (L)= Luminaire mounted
  - (N)= None/No Photocell or Lighting Contactor Required
- Service Support Type
  - GC= Granite concrete
  - OC= Other concrete
  - TP= Timber pole
  - SP= Steel pole
  - SF= Steel frame
  - OT= Pole by others or paid for separately
  - EX= Existing pole
  - TS= Service on traffic signal pole
  - PS= Pedestal Service
- O= Overhead Service Feed from Utility
- U= Underground Service Feed from Utility



TOP MOUNTED PHOTOCELL

Install conduit strap maximum 3 feet from box. 5 foot maximum spacing between straps supporting conduit.

Texas Department of Transportation

Traffic Operations Division Standard

ELECTRICAL DETAILS SERVICE NOTES & DATA

ED(5)-14

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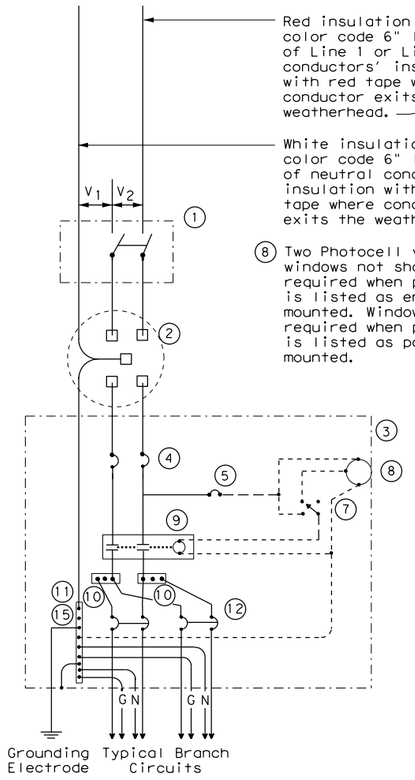
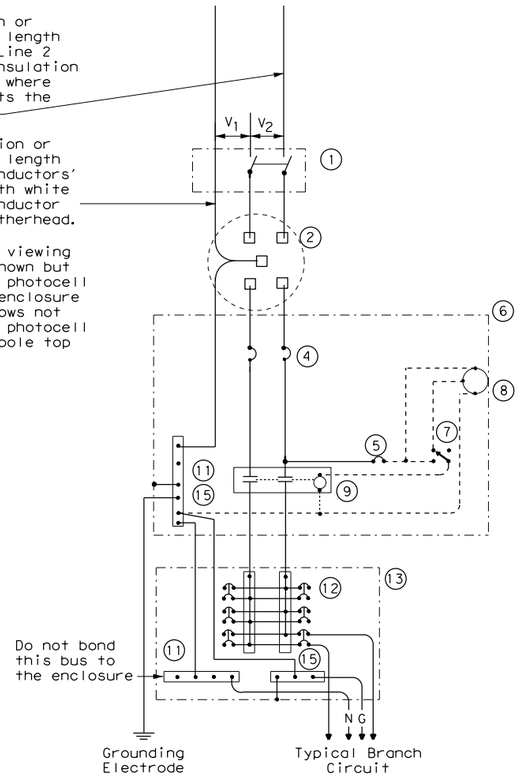
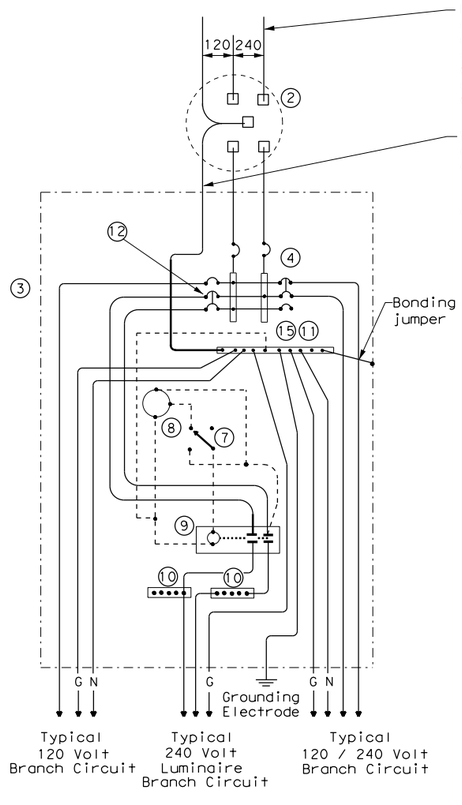


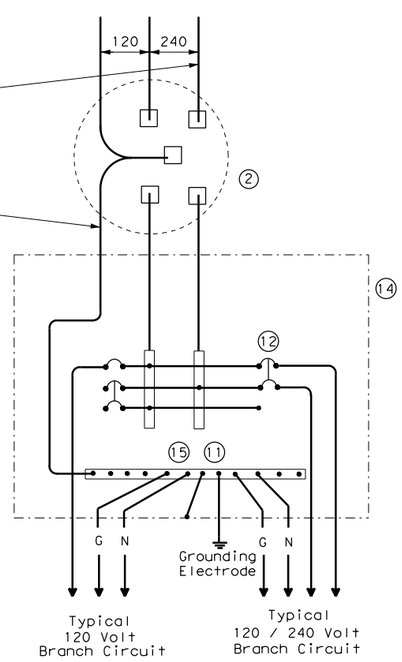
SCHEMATIC TYPE A
THREE WIRE



SCHEMATIC TYPE C
THREE WIRE



SCHEMATIC TYPE D - CUSTOM
120/240 VOLTS - THREE WIRE



SCHEMATIC TYPE T
120/240 VOLTS - THREE WIRE

Galvanized steel-"Buy Off The Shelf" only. When required install photocell top of the pole or on luminaire only, no lighting contractor will be installed.

WIRING LEGEND	
———	Power Wiring
- - - - - - - -	Control Wiring
—N—	Neutral Conductor
—G—	Equipment grounding conductor-always required

SCHEMATIC LEGEND	
1	Safety Switch (when required)
2	Meter (when required-verify with electric utility provider)
3	Service Assembly Enclosure
4	Main Disconnect Breaker (See Electrical Service Data)
5	Circuit Breaker, 15 Amp (Control Circuit)
6	Auxiliary Enclosure
7	Control Station ("H-O-A" Switch)
8	Photo Electric Control (enclosure-mounted shown)
9	Lighting Contactor
10	Power Distribution Terminal Blocks
11	Neutral Bus
12	Branch Circuit Breaker (See Electrical Service Data)
13	Separate Circuit Breaker Panelboard
14	Load Center
15	Ground Bus

Texas Department of Transportation

Traffic Operations Division Standard

ELECTRICAL DETAILS SERVICE ENCLOSURE AND NOTES

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SUPPORT TYPE STEEL POLE (SP) AND STEEL FRAME (SF)

1. Provide steel pole and steel frame supports as per TxDOT Departmental Material Specification (DMS)11080 "Electrical Services." Mount all equipment and conduit on 12 gauge galvanized steel or stainless steel channel strut, 1 ½ in. or 1 ⅝ in. wide by 1 in. up to 3 ¾ in. deep Unistrut, Kindorf, B-line or equal. Bolt or weld all channel and hardware to vertical members as approved. Do not stack channel. File smooth and paint field cut ends of all channel with zinc-rich paint before installing.

2. Provide poles for overhead service with an eyebolt or similar fitting for attachment of the service drop to the pole in conformance with the electric utility provider's specifications.

3. Provide and install galvanized ¾ in. x 18 in. x 4 in. (dia. x length x hook length) anchor bolts for underground service supports. Provide and install galvanized ¾ in. x 56 in. x 4 in. anchor bolts for overhead service supports. Ensure anchor bolts have 3 in of thread, with 3 ¼ in. to 3 ½ in. of the exposed anchor bolt projecting above finished foundation. Provide and install leveling nuts for all anchor bolts.

4. Bond one of the anchor bolts to the rebar cage with 6 AWG bare stranded copper conductor. Use listed mechanical connectors rated for embedment in concrete. See Inset B.

5. Furnish and install rigid metallic ells in all steel pole and steel frame foundations for all conduits entering the service from underground.

6. Use class C concrete for foundations. Ensure reinforcing steel is Grade 60 with 3" of unobstructed concrete cover.

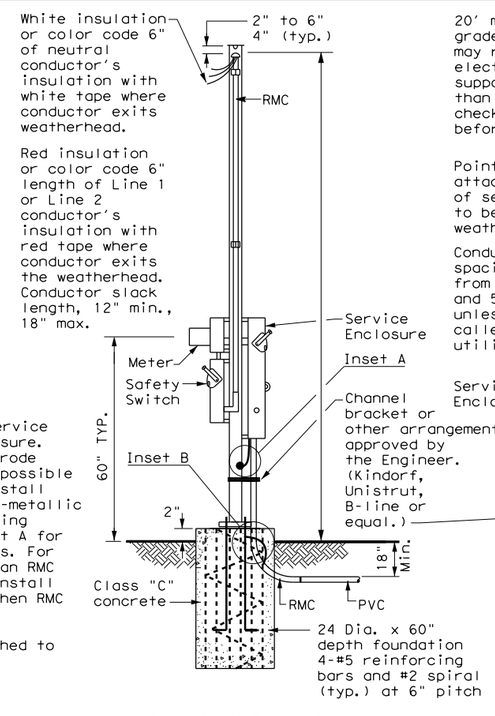
7. Drill and tap steel poles and frames for ½ in. X 13 UNC tank ground fitting. For steel pole service supports, provide and install tank ground fitting 4 in. to 6 in. below electrical service enclosure. Provide properly sized hole through the bottom of the enclosure for the service grounding electrode conductor. Ensure electrical service grounding electrode conductor is as short and straight as possible from the enclosure to the tank ground fitting. For steel frame service supports, provide and install tank ground fitting on steel frame post. Install service grounding electrode conductor in a non-metallic conduit or tubing from the enclosure to the steel frame post. Connect electrical service grounding electrode conductor to the tank ground fitting. See steel frame and steel pole details and Inset A for more information. Size service entrance conduit and branch circuit conduit as shown in the plans. For underground conduit runs from the electrical service, extend RMC from the service enclosure to an RMC elbow, and then connect the schedule type and size of conduit shown in the plans. Provide and install grounding bushings where RMC terminates in the enclosure. Grounding bushings are not required when RMC is fitted into a sealing hub or threaded boss.

8. If Steel pole or frame is painted, bond each separate painted piece with a bonding jumper attached to a tapped hole.

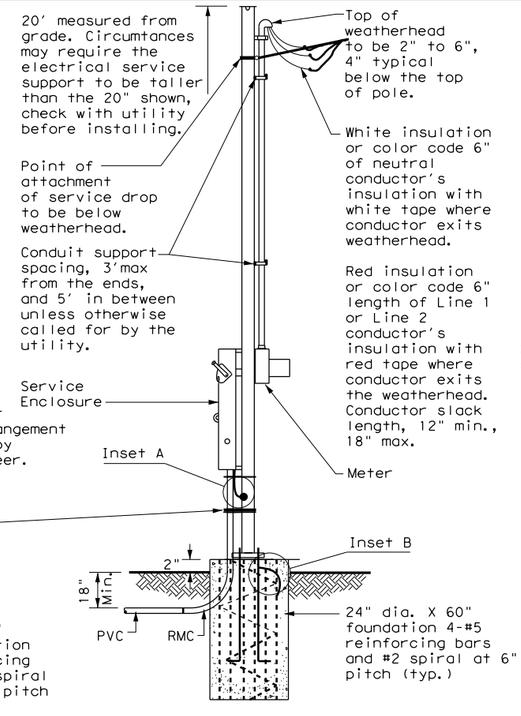
9. Provide ¼" - 20 machine screws for bonding. Do not use sheet metal screws. Remove all non-conductive material at contact points. Terminate bonding jumpers with listed devices. Install minimum size 6 AWG stranded copper bonding jumpers. Make up all threaded bonding connections wrench tight.

10. Avoid contact of the service drop and service entrance conductors with the metal pole to prevent abrasion of the insulated conductors.

11. Shop drawings are not required for service support structure unless specifically stated elsewhere or directed by the Engineer.

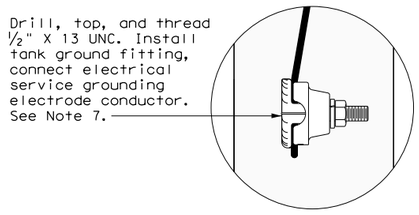


WITH SAFETY SWITCH



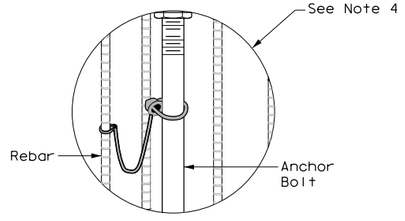
WITHOUT SAFETY SWITCH

SERVICE SUPPORT TYPE SP (O) - OVERHEAD SERVICE

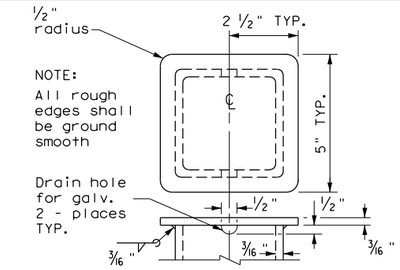


FRONT VIEW

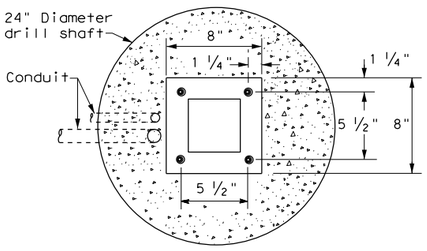
INSET A



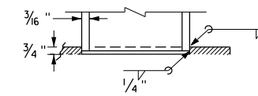
INSET B



POLE TOP PLATE

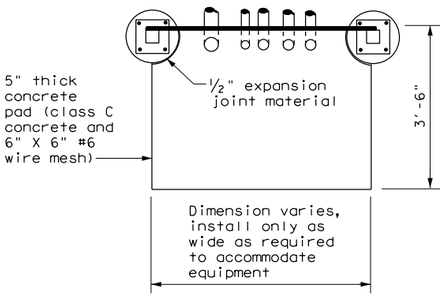


BASE PLATE DETAIL



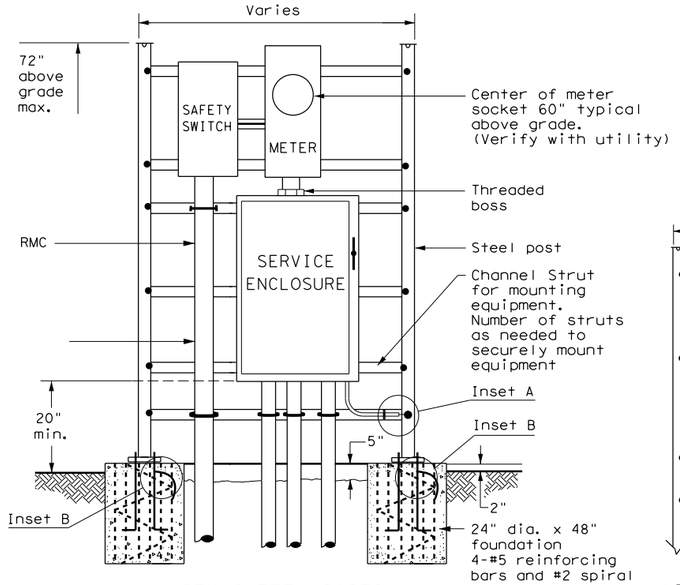
BOTTOM OF POLE

SERVICE SUPPORT TYPE SF & SP



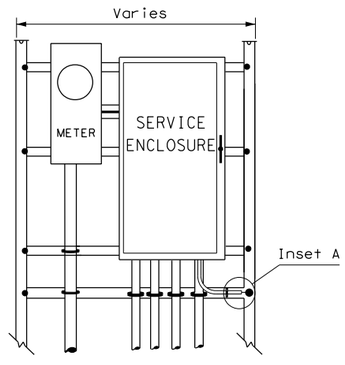
TOP VIEW

SERVICE SUPPORT TY SF (O) & SF (U)

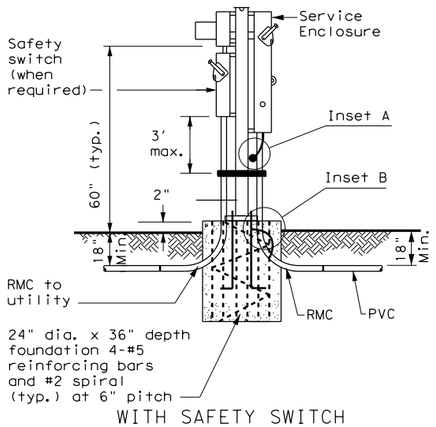


WITH SAFETY SWITCH

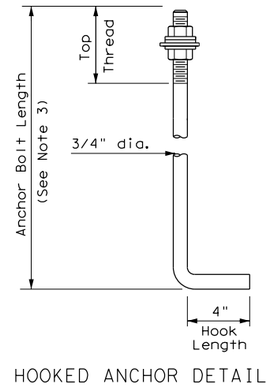
FRONT VIEW



WITHOUT SAFETY SWITCH



WITH SAFETY SWITCH



HOOKED ANCHOR DETAIL

SERVICE SUPPORT TYPE SP(U) - UNDERGROUND SERVICE

SERVICE SUPPORT TYPE SF(U) - UNDERGROUND SERVICE

Texas Department of Transportation — Traffic Operations Division Standard

ELECTRICAL DETAILS SERVICE SUPPORT TYPES SF & SP

ED(7)-14

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TIMBER POLE (TP) SERVICE SUPPORT NOTES

1. Ensure electrical service support is a class 5 treated timber pole as per Item 627 "Treated Timber Poles." Embed timber pole to depth required in Item 627.
2. Conduit and electrical conductors attached to the electrical service pole and underground within 12 in. of service pole are not paid for directly but are subsidiary to the electrial service.
3. Install pole-top mounted photocell (T) on north side of pole, or in service enclosure (E) as required. See Electrical Service Data chart in plan set.
4. Gain pole as required to provide flat surface for each channel. Gain timber pole to 5/8 in. max. depth and 1 7/8 in. max. height. Gain pole in a neat and workmanlike manner.
5. Mount meter and service equipment on stainless steel or galvanized channel (Unistrut, Kindorf, or equal). Provide channel sized 1 in. to 3 3/4 in. maximum depth, and 1 1/2 in. to 1 5/8 in. maximum width. File smooth the cut ends of galvanized channel and paint with zinc rich paint before installing on pole. Secure each channel section to timber pole with two galvanized or SS lag bolts, 1/4 in. minimum diameter by 1 1/2 in. minimum length. Use a galvanized or SS flat washer on each lag bolt. Do not stack channel.
6. When excess length must be trimmed from poles, trim from the top end only.

(1) Class 5 pole, height as required

(2) Service drop from utility company (attached below weatherhead)

(3) Service conduit (RMC) and service entrance conductors - One Red, One Black, One White (See Electrical Service Data)

(4) Safety switch (when required)

(5) Meter (when required)

(6) Service enclosure

(7) 6 AWG bare grounding electrode conductor in 1/2 in. PVC to ground rod - extend 1/2 in. PVC 6 in. underground.

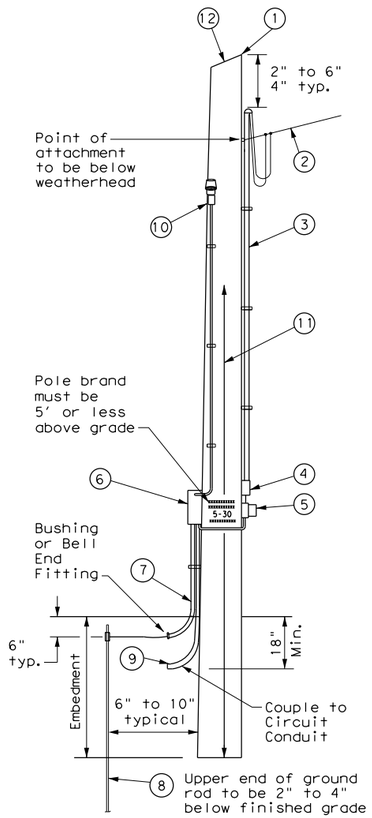
(8) 5/8 in. x 8 ft. Copper clad ground rod - drive ground rod to a depth of 2 in. to 4 in. below grade.

(9) RMC same size as branch circuit conduit.

(10) See pole-top mounted photocell detail on ED(5).

(11) When required by the serving utility provide bare 6 AWG copper conductor. Run wire from pole top to butt wrap or copper butt plate. Protect conductor with non-conductive material to a height of 8 ft. above finished grade.

(12) When required by utility, cut top of pole at an angle to enhance rain run off.

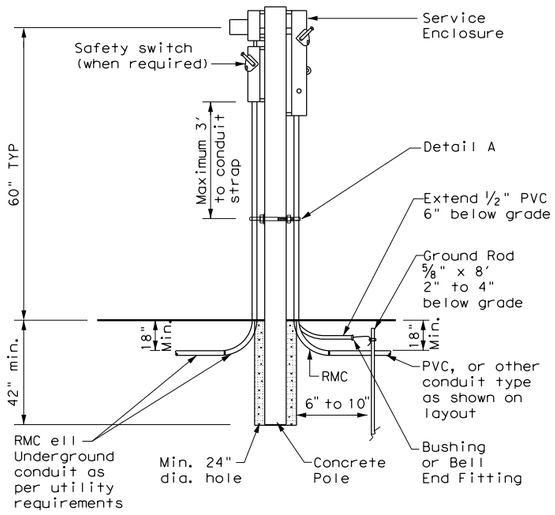


SERVICE SUPPORT TYPE TP (O)

GRANITE CONCRETE (GC) & OTHER CONCRETE (OC) NOTES

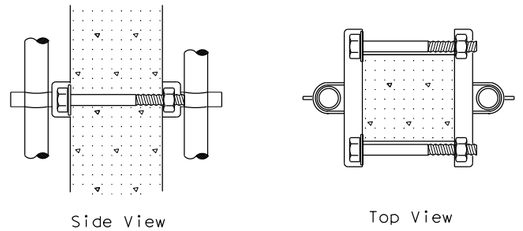
Ensure electrical service support structures bid as type Granite Concrete (GC) or Other Concrete (OC) meet the following requirements.

1. Provide GC and OC poles that meet the requirements of DMS 11080 "Electrical Services."
2. Provide prestressed concrete poles suitable for direct embedment into the ground without special foundations.
3. Verify poles are marked as required on DMS 11080. Location of marking should be approximately 4' above final grade. Use the two-point pickup locations when handling pole in horizontal position, and one-point pickup location for use in raising the pole to a vertical position. These marks are small but conspicuous.
4. Embed poles 42 in. or 10% of the length plus 2 ft., whichever is greater.
5. Ensure all installation details of services are in accordance with utility company specifications.
6. Install a one point rack or eye bolt bracket 6 inches to 12 inches below the weatherhead as an overhead service drop anchoring point for the electric utility.
7. Furnish and install galvanized or stainless steel channel strut 1 1/2 in. or 1 5/8 in. wide by 1 in. up to 3 3/4 in. deep (Unistrut, Kindorf, B-line or equal). Attach channel strut with stainless steel concrete anchors (max. 1" depth), square U-bolts or back to back channel strut with long bolts, or other secure mounting as approved by the Engineer. Ensure bolts are galvanized in accordance with ASTM A153. Do not stack channel struts.
8. Backfill the holes thoroughly by tamping in 6 in. lifts. After tamping to grade, place additional backfill material in a 6 inch high cone around the pole to allow for settling. Use material equal in composition and density to the surrounding area. Backfilling will not be paid for directly but is subsidiary to various bid items.



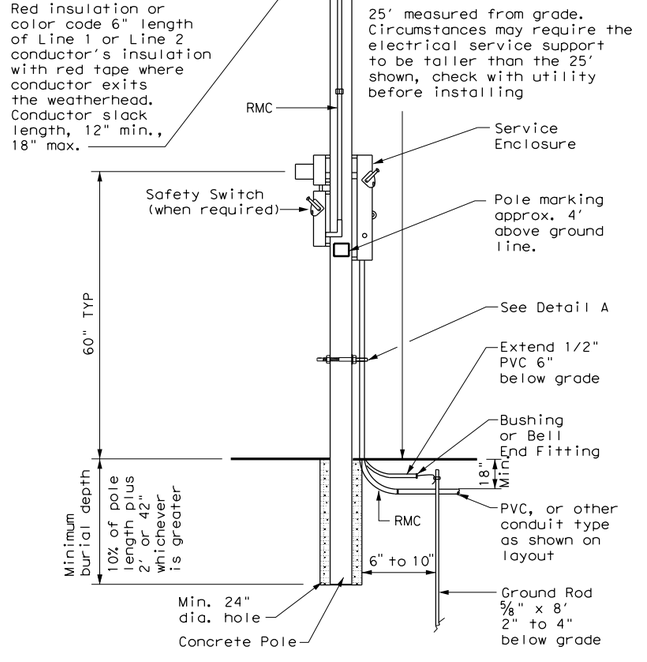
CONCRETE SERVICE SUPPORT

Underground (U)



DETAIL A

See Note 7. Before installing channel that has been cut, file sharp edges and paint with zinc-rich paint. Ensure there is no paint splatter on the pole.



CONCRETE SERVICE SUPPORT

Overhead (O)

Texas Department of Transportation — Traffic Operations Division Standard

ELECTRICAL DETAILS SERVICE SUPPORT TYPES GC, OC, & TP

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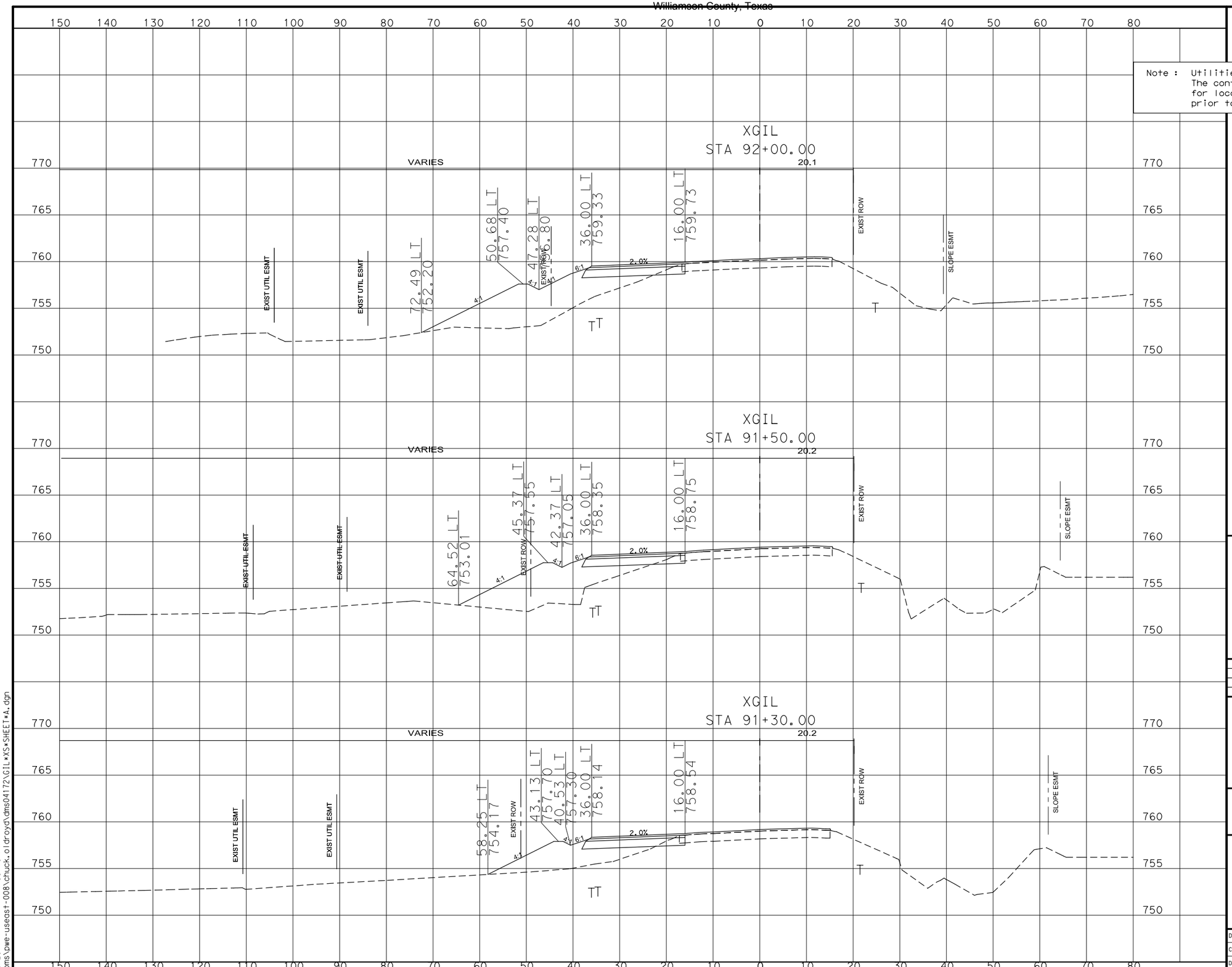

STATE OF TEXAS
ROBERT CARRILLO
80169
REGISTERED PROFESSIONAL ENGINEER
6/28/2017
Robert Carrillo, PE

NO.	REVISION	BY	DATE

RODRIGUEZ TRANSPORTATION GROUP
CONSULTING ENGINEERS
FIRM #587

GEORGETOWN INNER LOOP

DESIGN CROSS SECTIONS
STATION 91+30 TO 117+00

DESIGNED:	PROJECT NUMBER		ROADWAY
CHECKED:			INNER LOOP DRIVE
DRAWN:	STATE	COUNTY	CITY / SHEET No.
CHECKED:	TEXAS	WILLIAMSON	GEORGETOWN / 1

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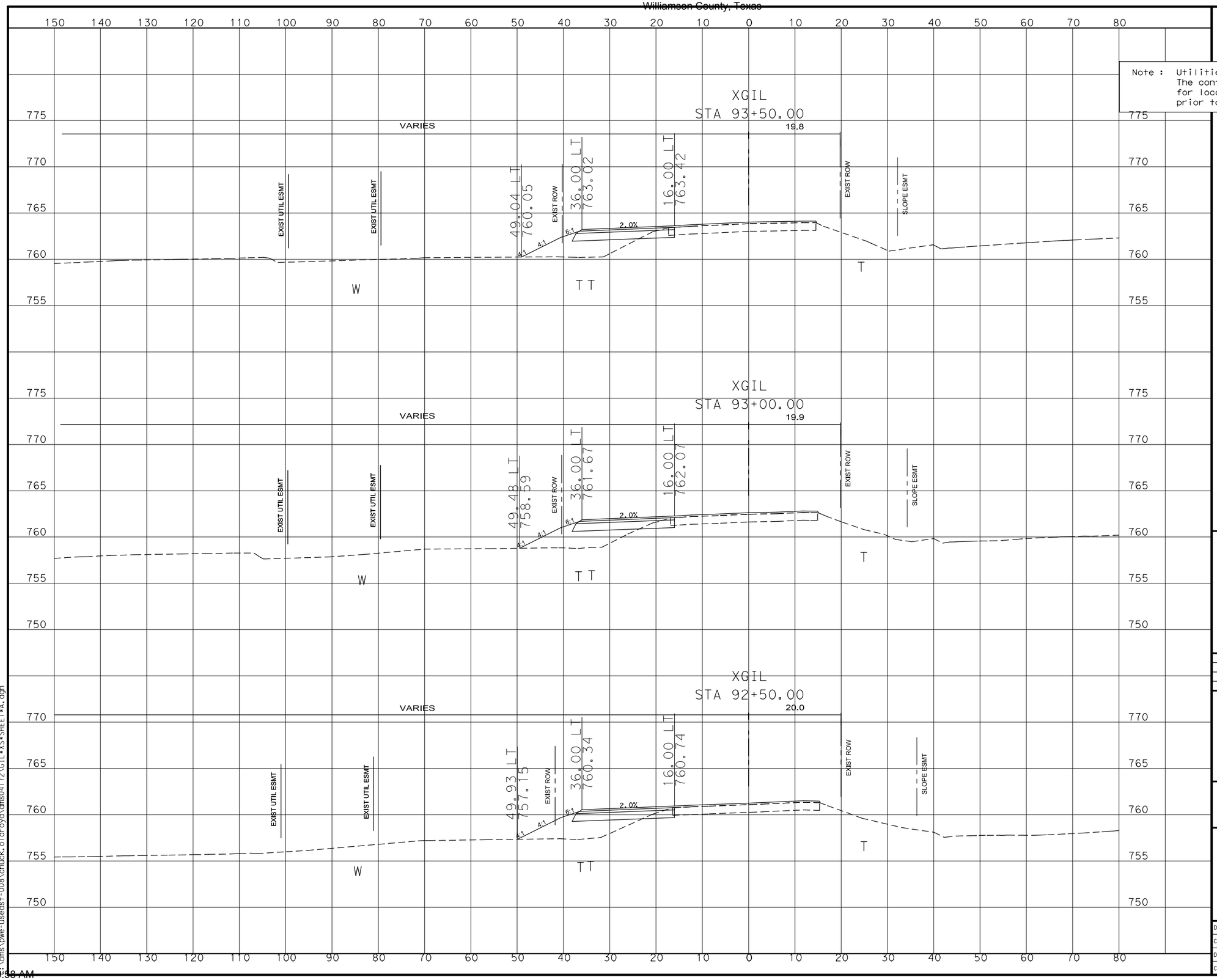

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STATE OF TEXAS
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6/28/2017
Robert Carrillo, PE

NO.	REVISION	BY	DATE

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CONSULTING ENGINEERS
FIRM #587

GEORGETOWN INNER LOOP

DESIGN CROSS SECTIONS
STATION 91+30 TO 117+00

DESIGNED:	PROJECT NUMBER		ROADWAY	
CHECKED:			INNER LOOP DRIVE	
DRAWN:	STATE	COUNTY	CITY	SHEET No.
CHECKED:	TEXAS	WILLIAMSON	GEORGETOWN	2

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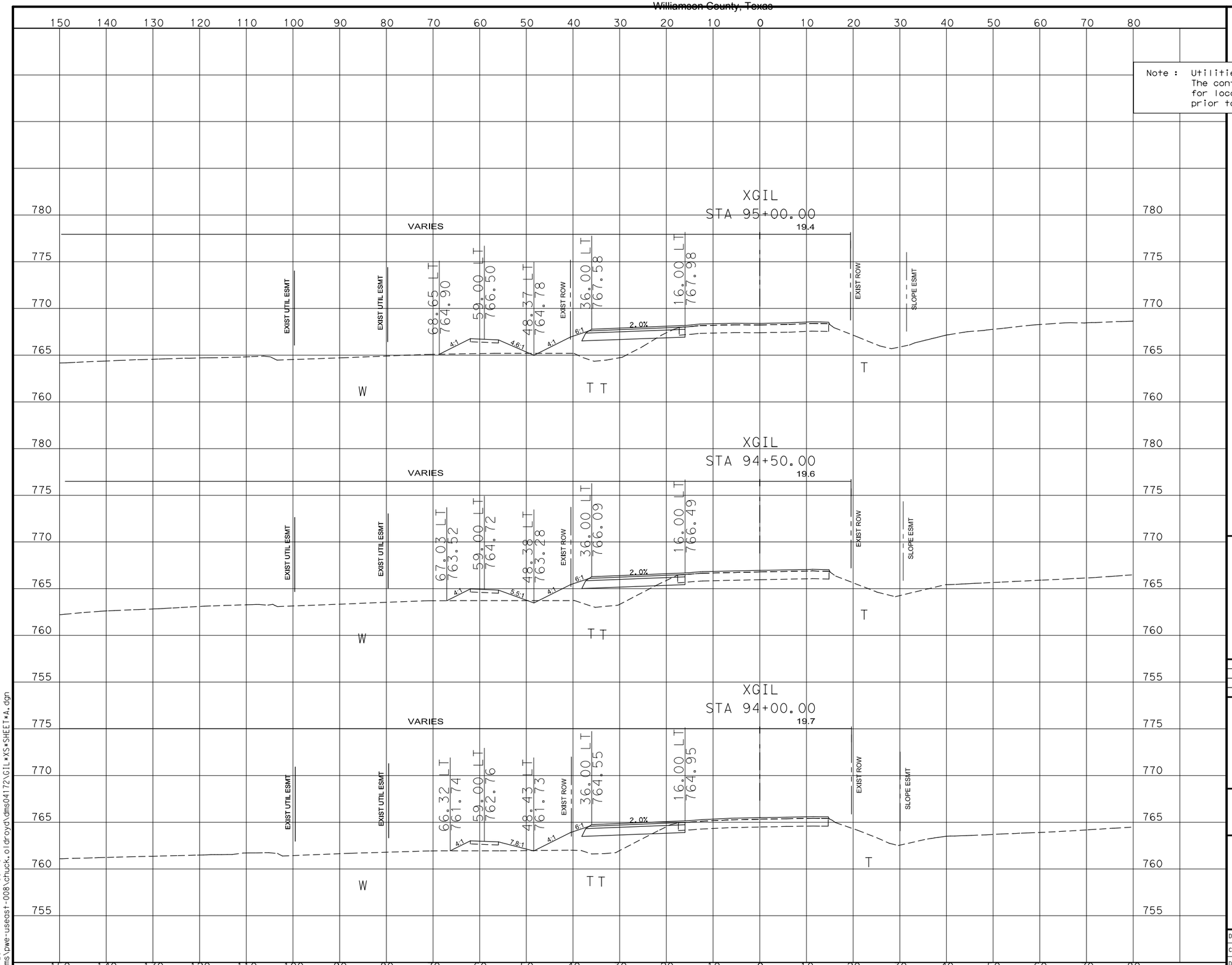
Note : Utilities are displayed at an assumed depth. The contractor shall be responsible for locating existing utilities prior to construction.



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6/28/2017
Robert Carrillo, PE

NO.	REVISION	BY	DATE

RODRIGUEZ TRANSPORTATION GROUP
CONSULTING ENGINEERS
FIRM #587

GEORGETOWN INNER LOOP

DESIGN CROSS SECTIONS
STATION 91+30 TO 117+00

DESIGNED:	PROJECT NUMBER		ROADWAY	
CHECKED:			INNER LOOP DRIVE	
DRAWN:	STATE	COUNTY	CITY	SHEET No.
CHECKED:	TEXAS	WILLIAMSON	GEORGETOWN	3

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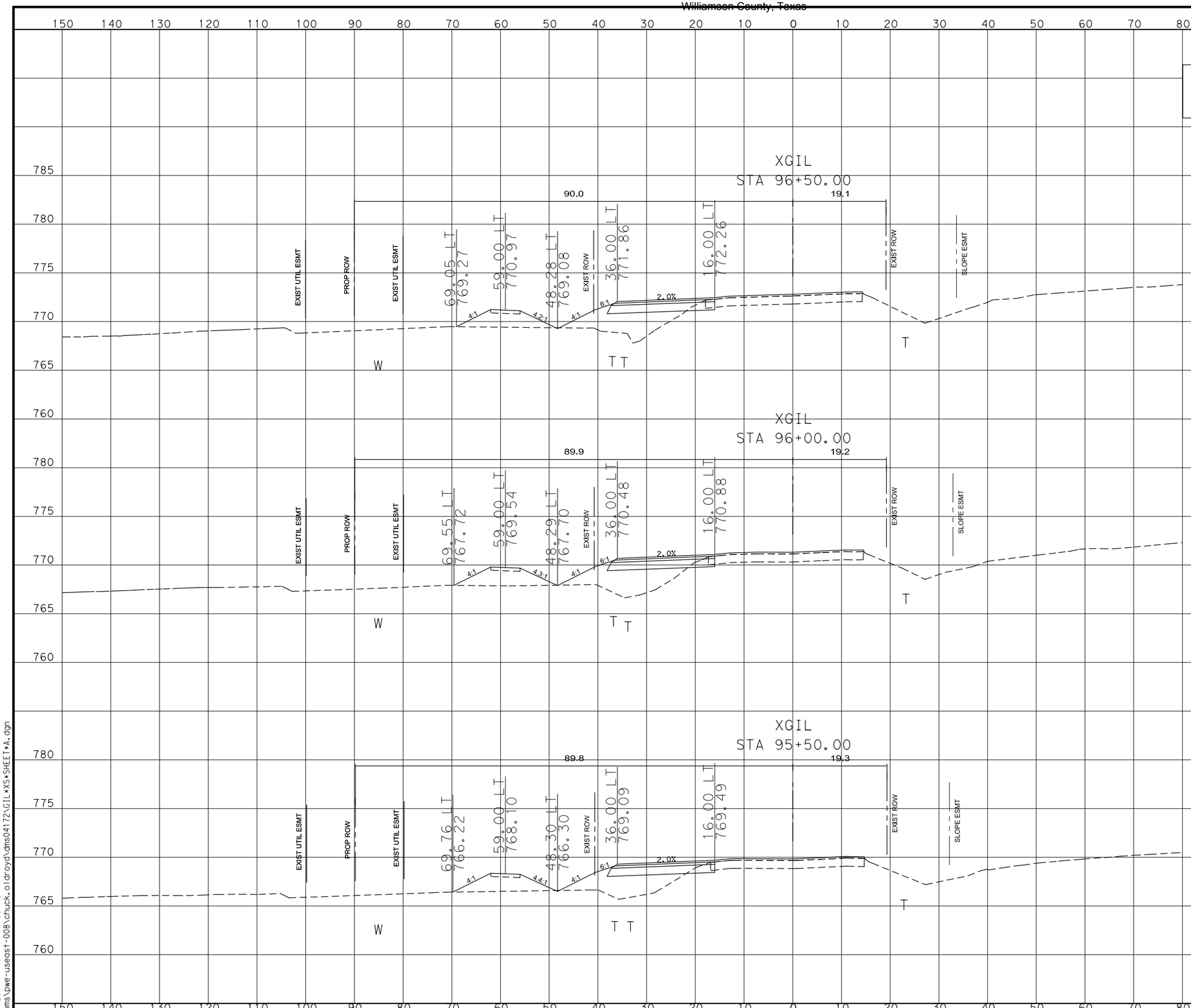
Note : Utilities are displayed at an assumed depth. The contractor shall be responsible for locating existing utilities prior to construction.



STATE OF TEXAS
ROBERT CARRILLO
80169
REGISTERED PROFESSIONAL ENGINEER
6/28/2017
Robert Carrillo, PE

NO.	REVISION	BY	DATE

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FIRM #587

GEORGETOWN INNER LOOP

DESIGN CROSS SECTIONS
STATION 91+30 TO 117+00

DESIGNED:	PROJECT NUMBER		ROADWAY	
CHECKED:			INNER LOOP DRIVE	
DRAWN:	STATE	COUNTY	CITY	SHEET No.
CHECKED:	TEXAS	WILLIAMSON	GEORGETOWN	4

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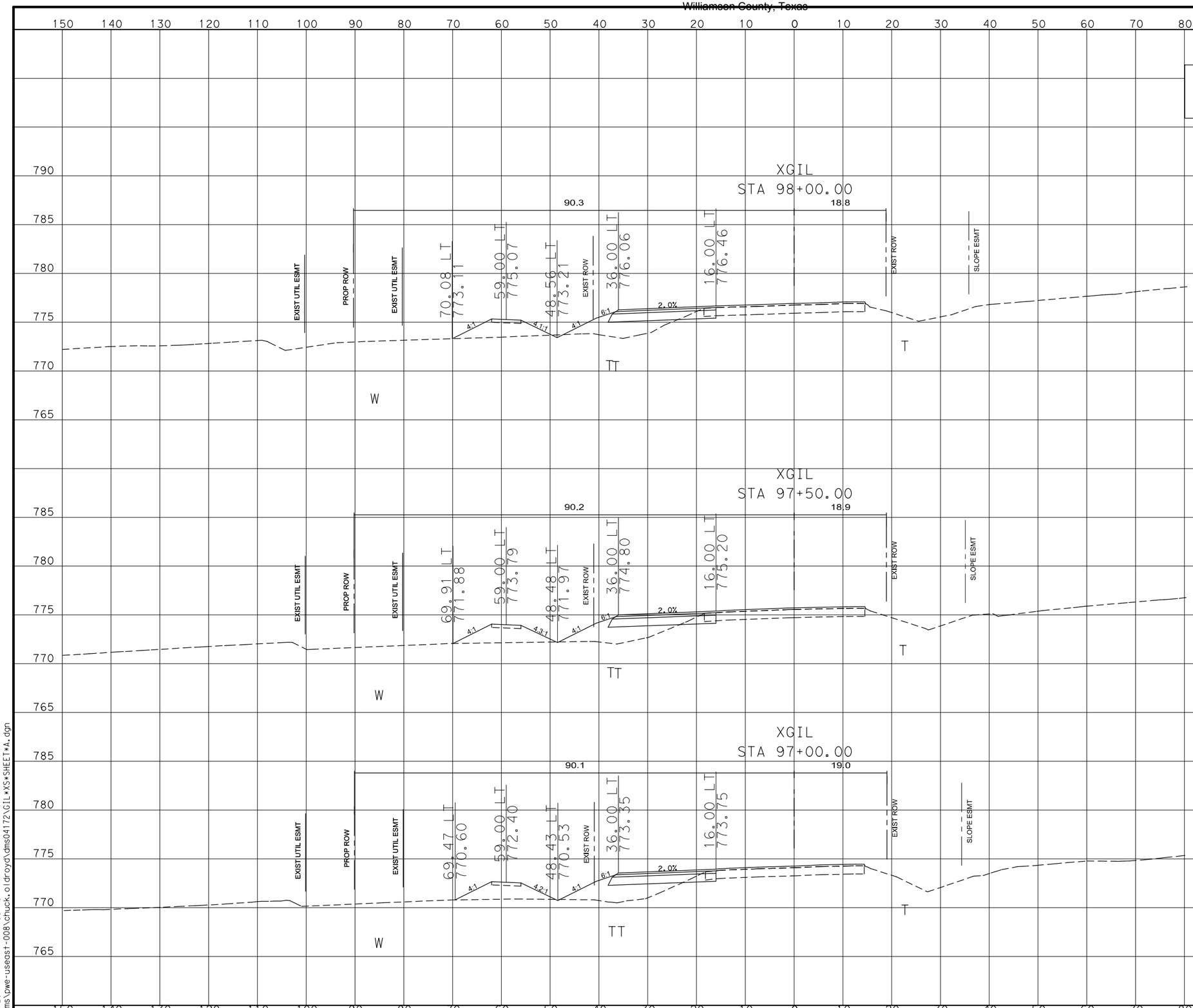

ROBERT CARRILLO
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DESIGN CROSS SECTIONS
STATION 91+30 TO 117+00

DESIGNED:	PROJECT NUMBER		ROADWAY	
CHECKED:			INNER LOOP DRIVE	
DRAWN:	STATE	COUNTY	CITY	SHEET No.
CHECKED:	TEXAS	WILLIAMSON	GEORGETOWN	5

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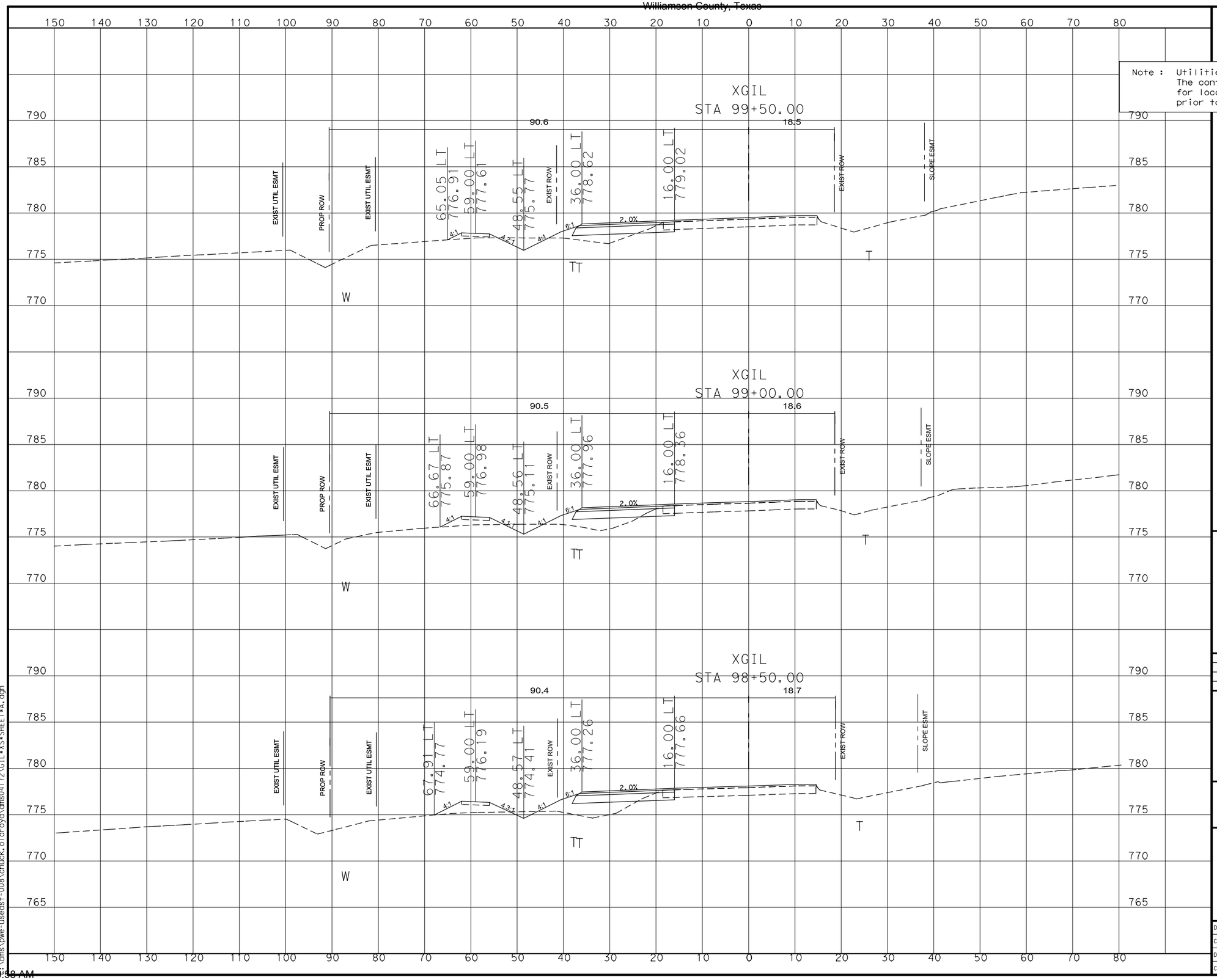

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FIRM #587

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DESIGN CROSS SECTIONS
STATION 91+30 TO 117+00

DESIGNED:	PROJECT NUMBER		ROADWAY	
CHECKED:			INNER LOOP DRIVE	
DRAWN:	STATE	COUNTY	CITY	SHEET No.
CHECKED:	TEXAS	WILLIAMSON	GEORGETOWN	6

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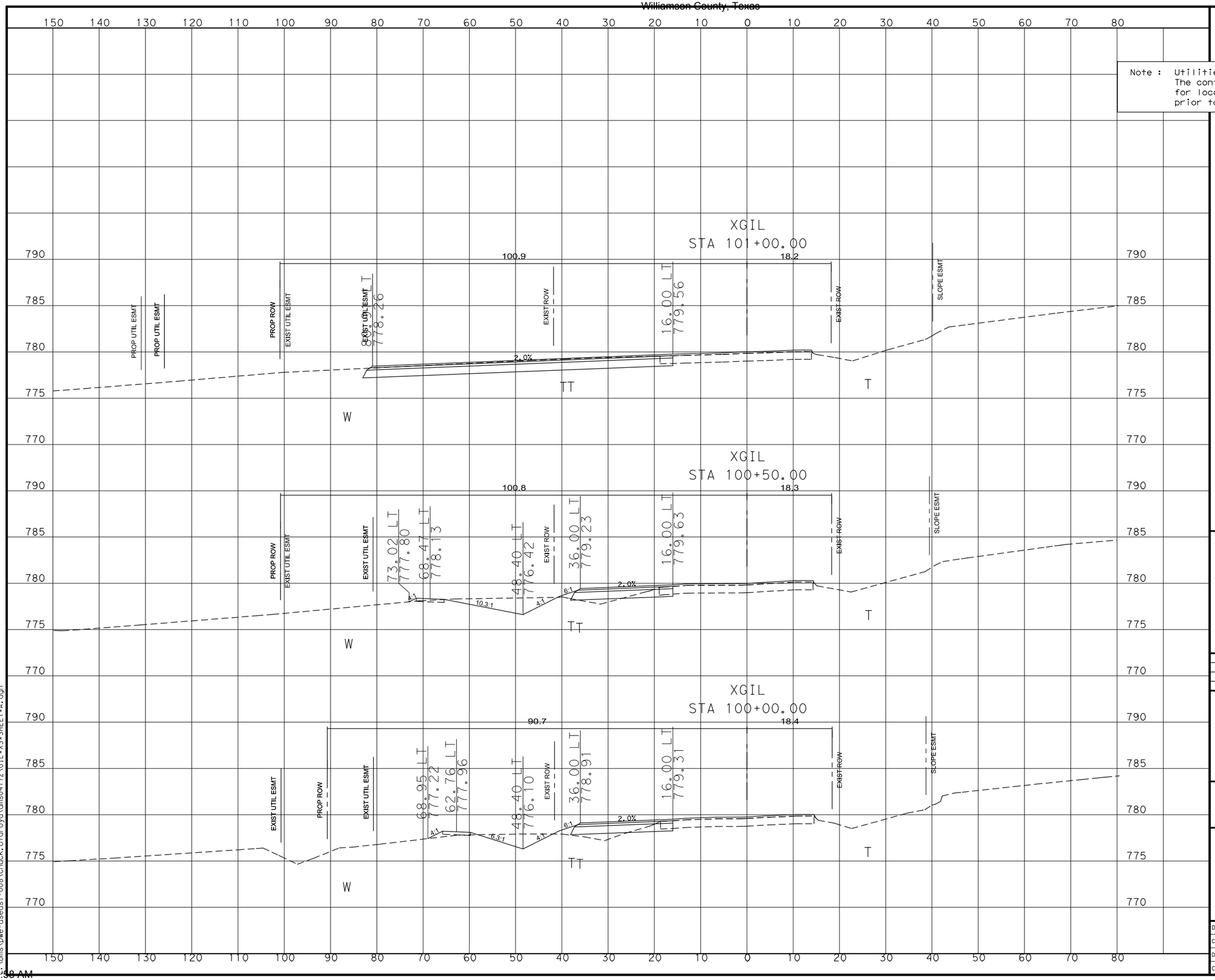

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GEORGETOWN INNER LOOP

DESIGN CROSS SECTIONS
STATION 91+30 TO 117+00

DESIGNED:	PROJECT NUMBER		ROADWAY	
CHECKED:			INNER LOOP DRIVE	
DRAWN:	STATE	COUNTY	CITY	SHEET No.
CHECKED:	TEXAS	WILLIAMSON	GEORGETOWN	7

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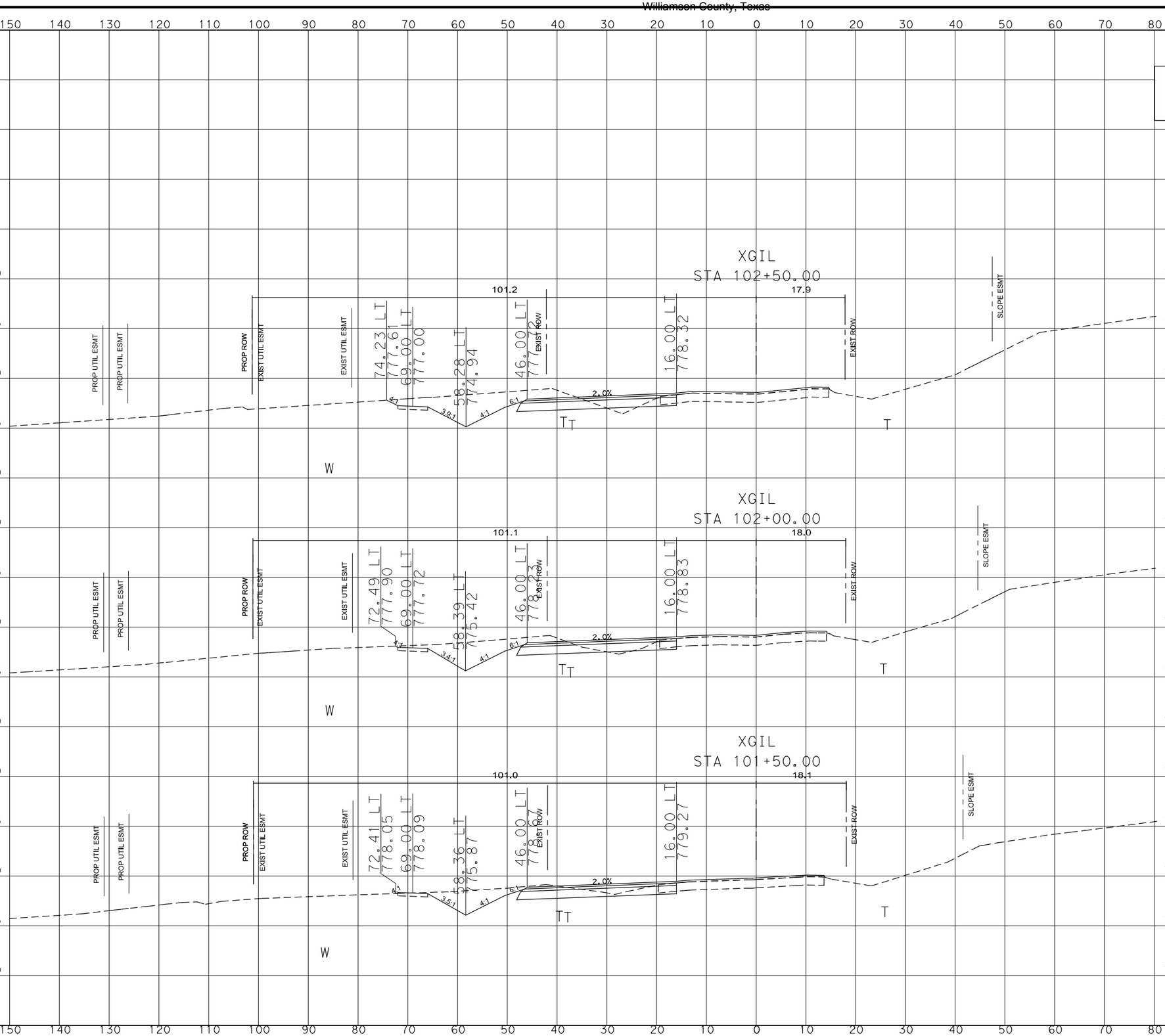

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6/28/2017

Robert Carrillo, PE

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FIRM #587

GEORGETOWN INNER LOOP

DESIGN CROSS SECTIONS
STATION 91+30 TO 117+00

DESIGNED:	PROJECT NUMBER		ROADWAY	
CHECKED:			INNER LOOP DRIVE	
DRAWN:	STATE	COUNTY	CITY	SHEET NO.
CHECKED:	TEXAS	WILLIAMSON	GEORGETOWN	8

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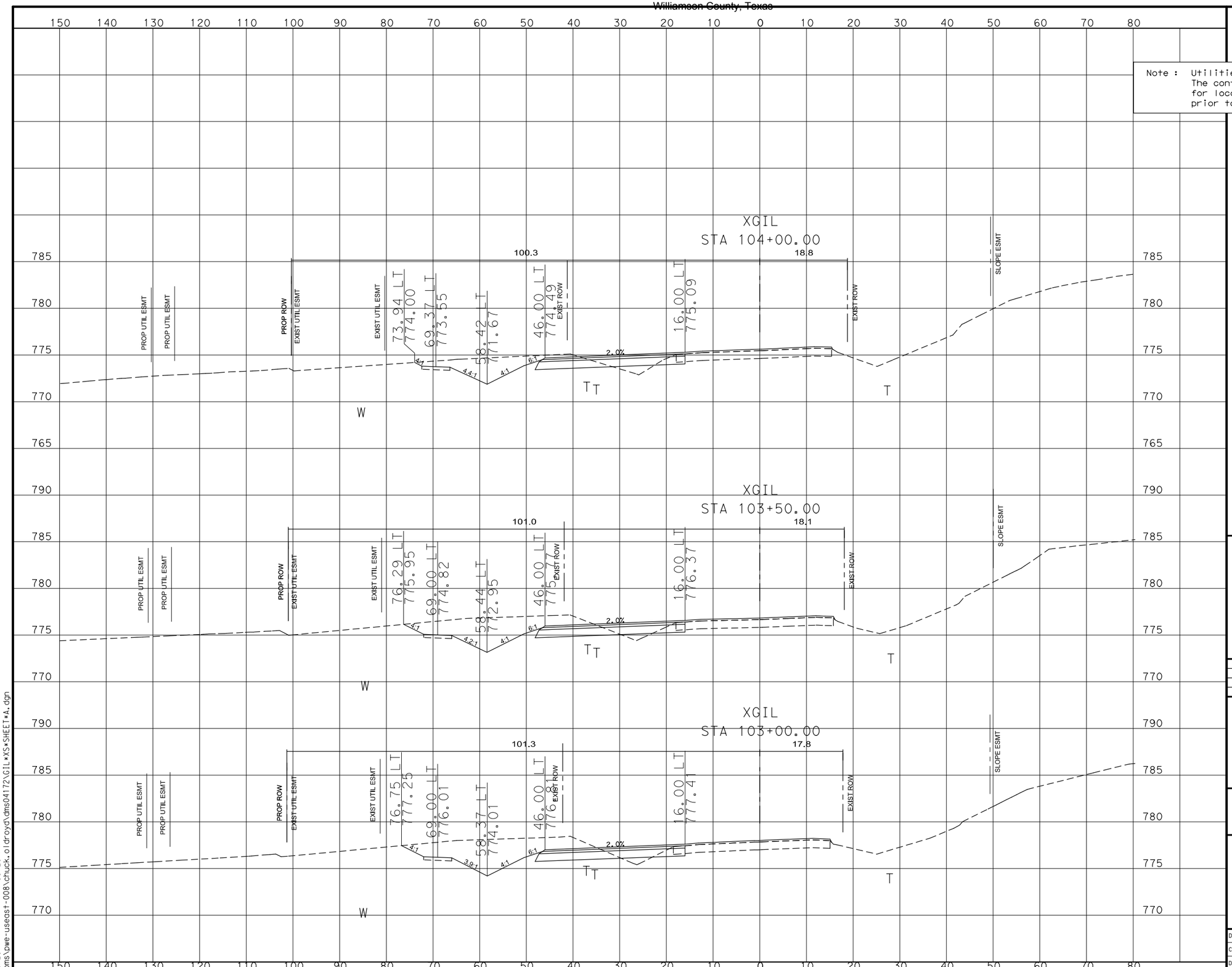

ROBERT CARRILLO
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REGISTERED PROFESSIONAL ENGINEER
6/28/2017

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CHECKED:			INNER LOOP DRIVE	
DRAWN:	STATE	COUNTY	CITY	SHEET No.
CHECKED:	TEXAS	WILLIAMSON	GEORGETOWN	9

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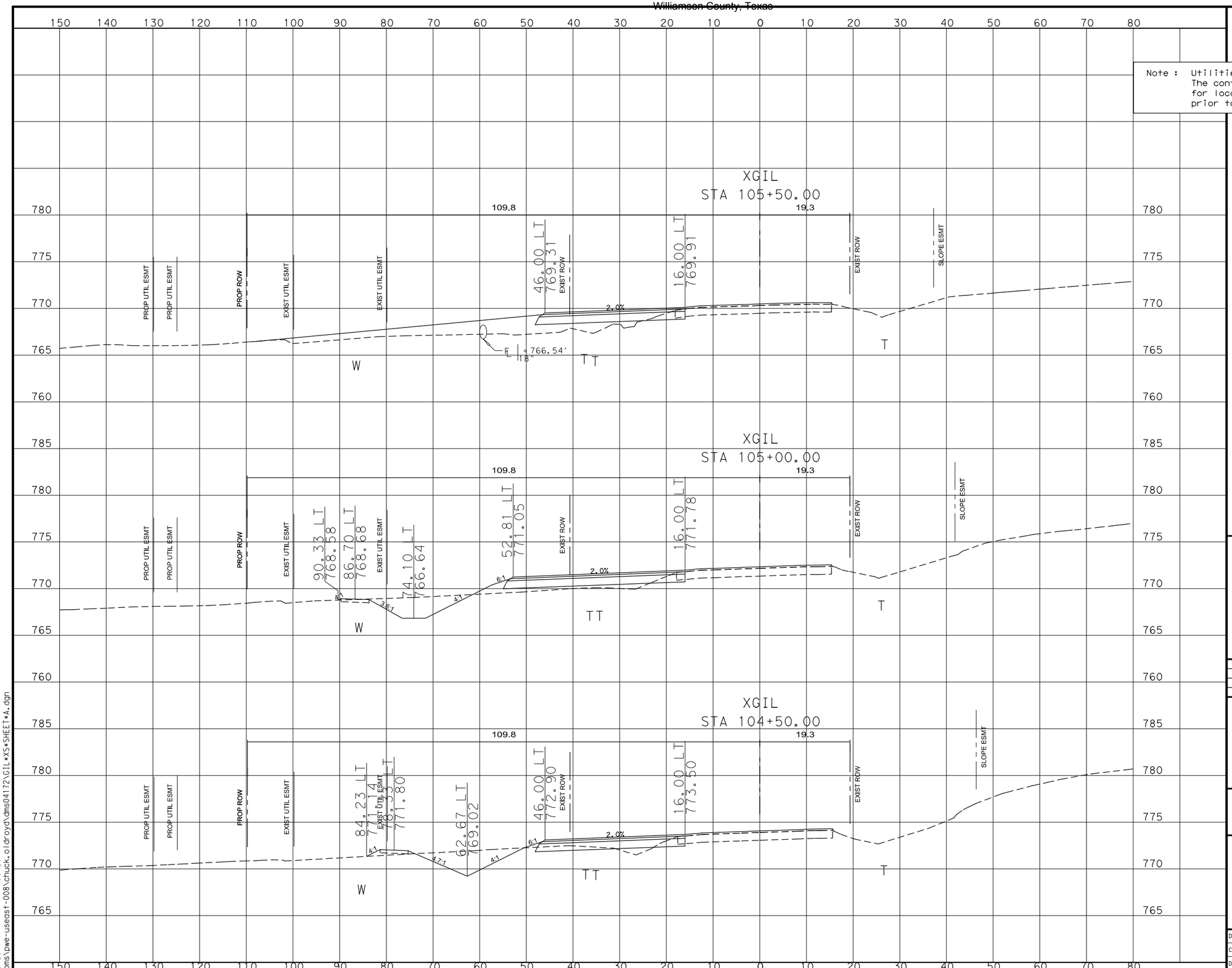

ROBERT CARRILLO
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6/28/2017
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CHECKED:			INNER LOOP DRIVE	
DRAWN:	STATE	COUNTY	CITY	SHEET No.
CHECKED:	TEXAS	WILLIAMSON	GEORGETOWN	10

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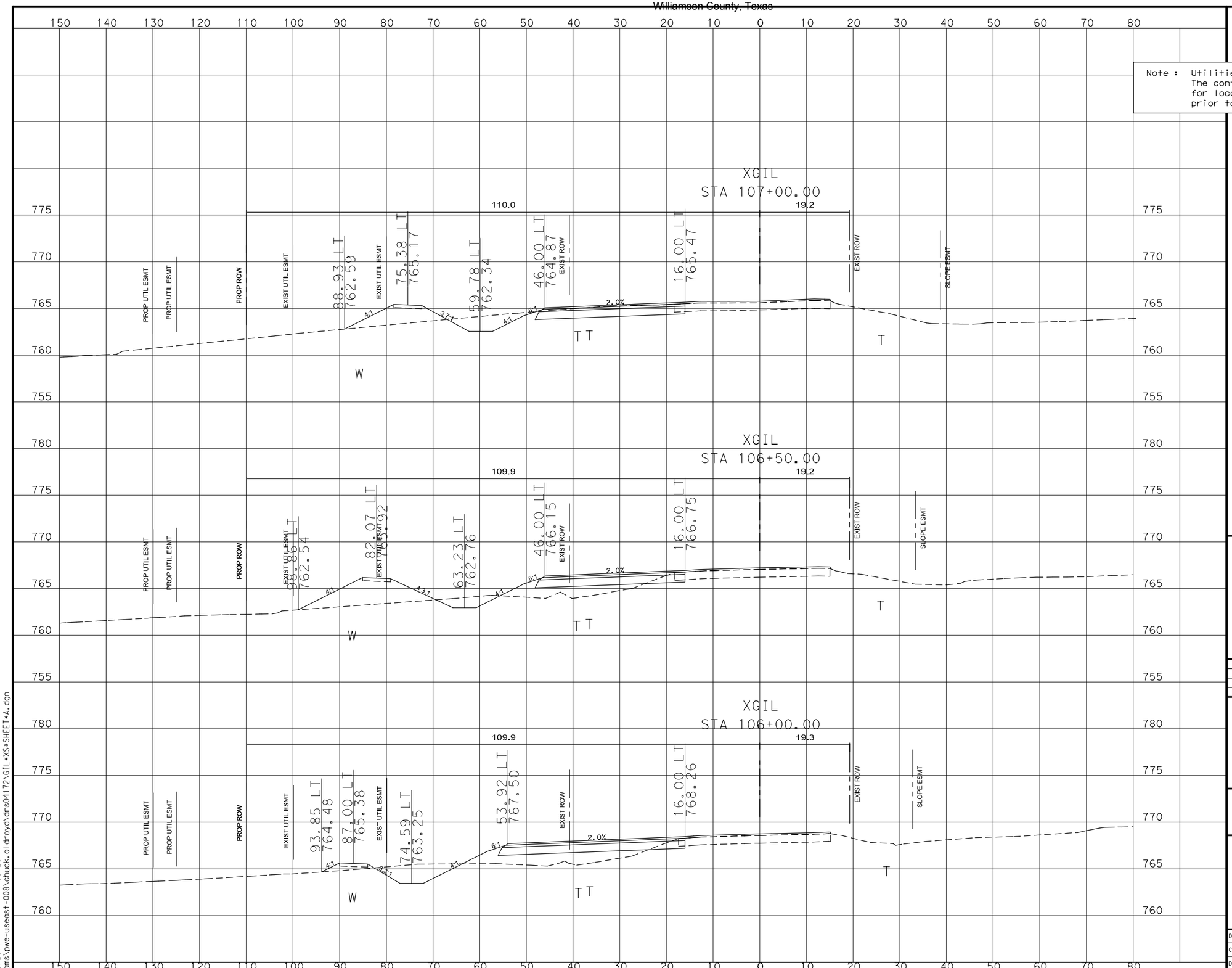

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DESIGN CROSS SECTIONS
STATION 91+30 TO 117+00

DESIGNED:	PROJECT NUMBER		ROADWAY
CHECKED:			INNER LOOP DRIVE
DRAWN:	STATE	COUNTY	CITY / SHEET No.
CHECKED:	TEXAS	WILLIAMSON	GEORGETOWN / 11

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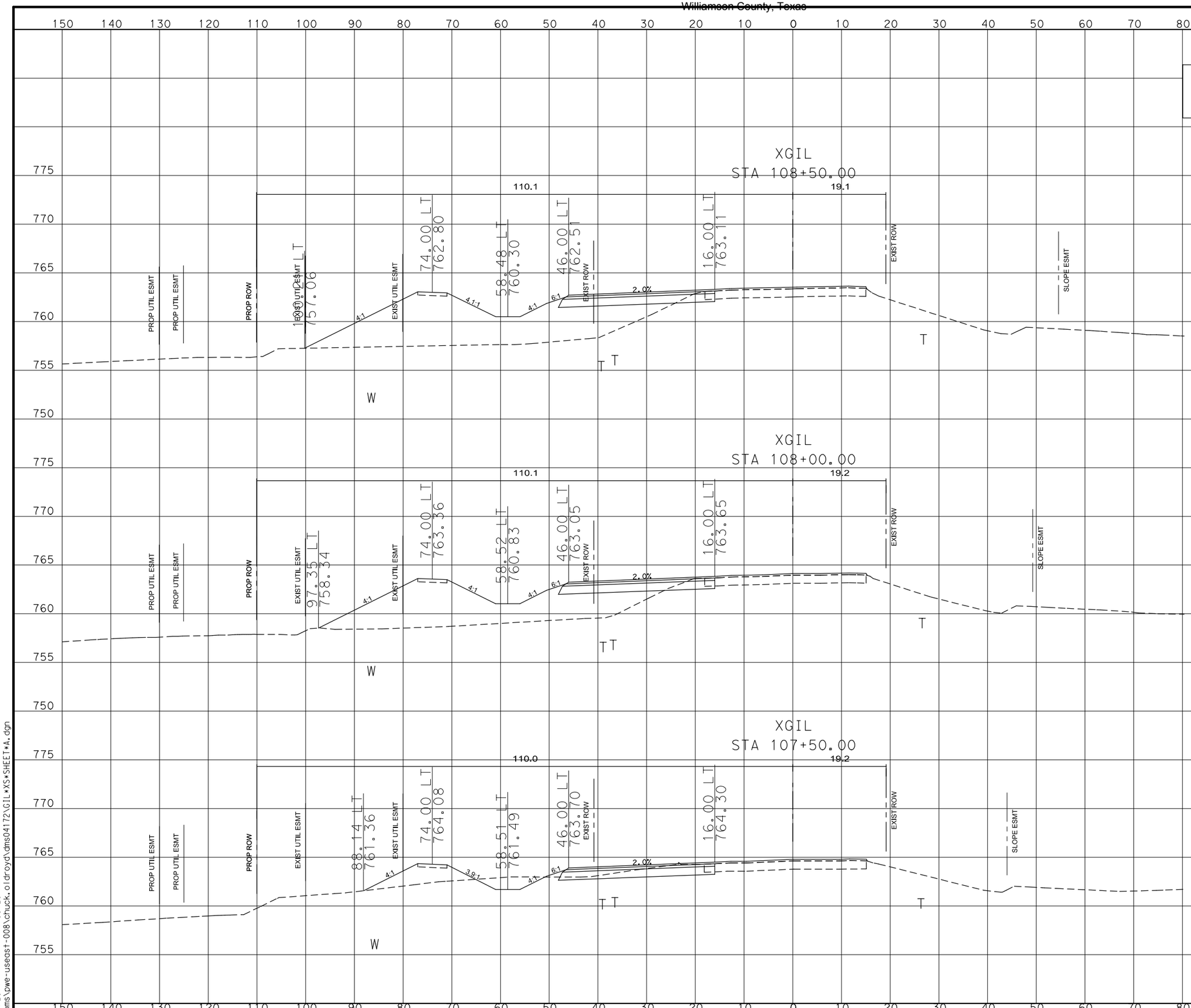

STATE OF TEXAS
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6/28/2017
Robert Carrillo, PE

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FIRM #587

GEORGETOWN INNER LOOP

DESIGN CROSS SECTIONS
STATION 91+30 TO 117+00

DESIGNED:	PROJECT NUMBER		ROADWAY	
CHECKED:			INNER LOOP DRIVE	
DRAWN:	STATE	COUNTY	CITY	SHEET No.
CHECKED:	TEXAS	WILLIAMSON	GEORGETOWN	12

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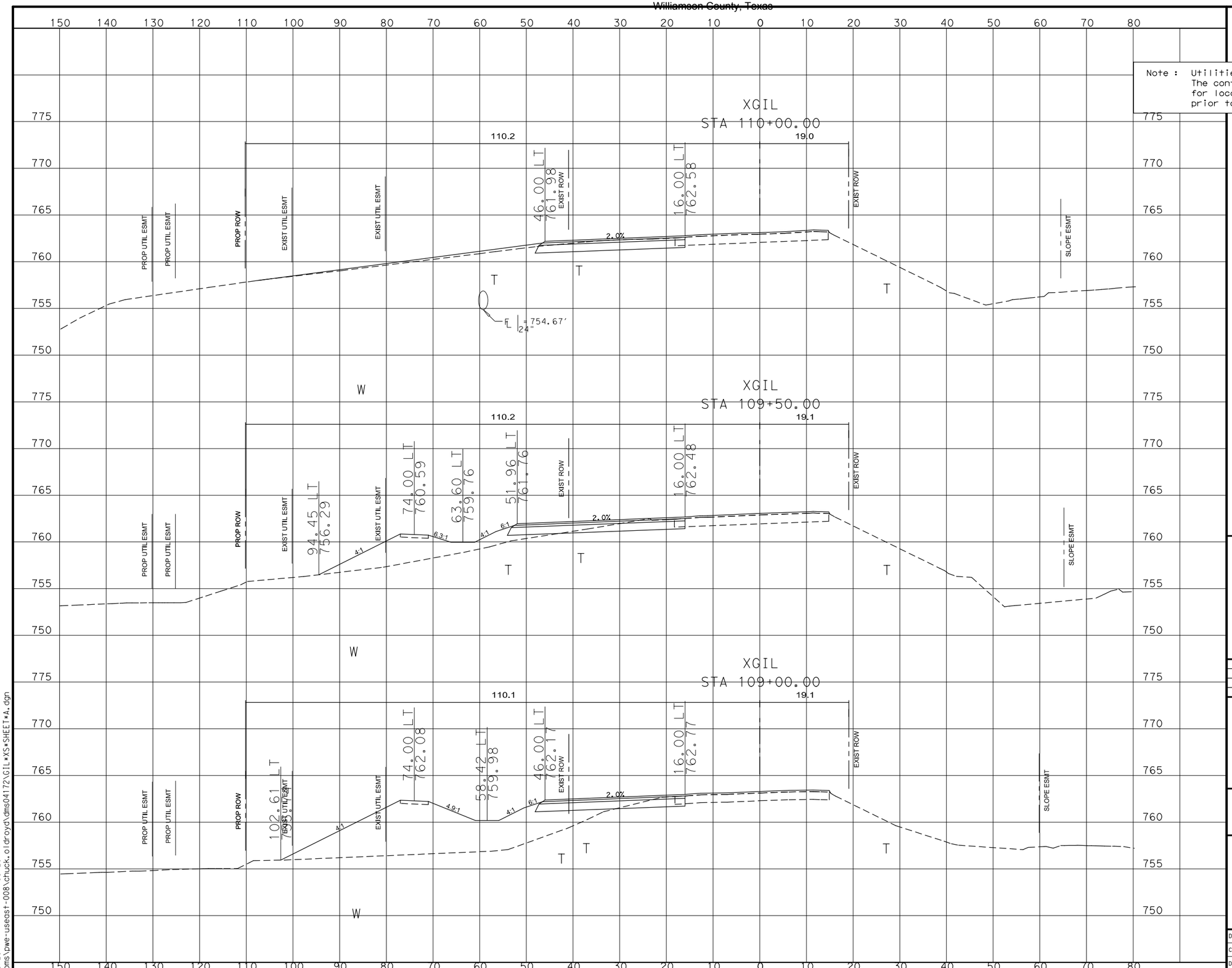

STATE OF TEXAS
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DESIGN CROSS SECTIONS
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DESIGNED:	PROJECT NUMBER		ROADWAY
CHECKED:			INNER LOOP DRIVE
DRAWN:	STATE	COUNTY	CITY / SHEET No.
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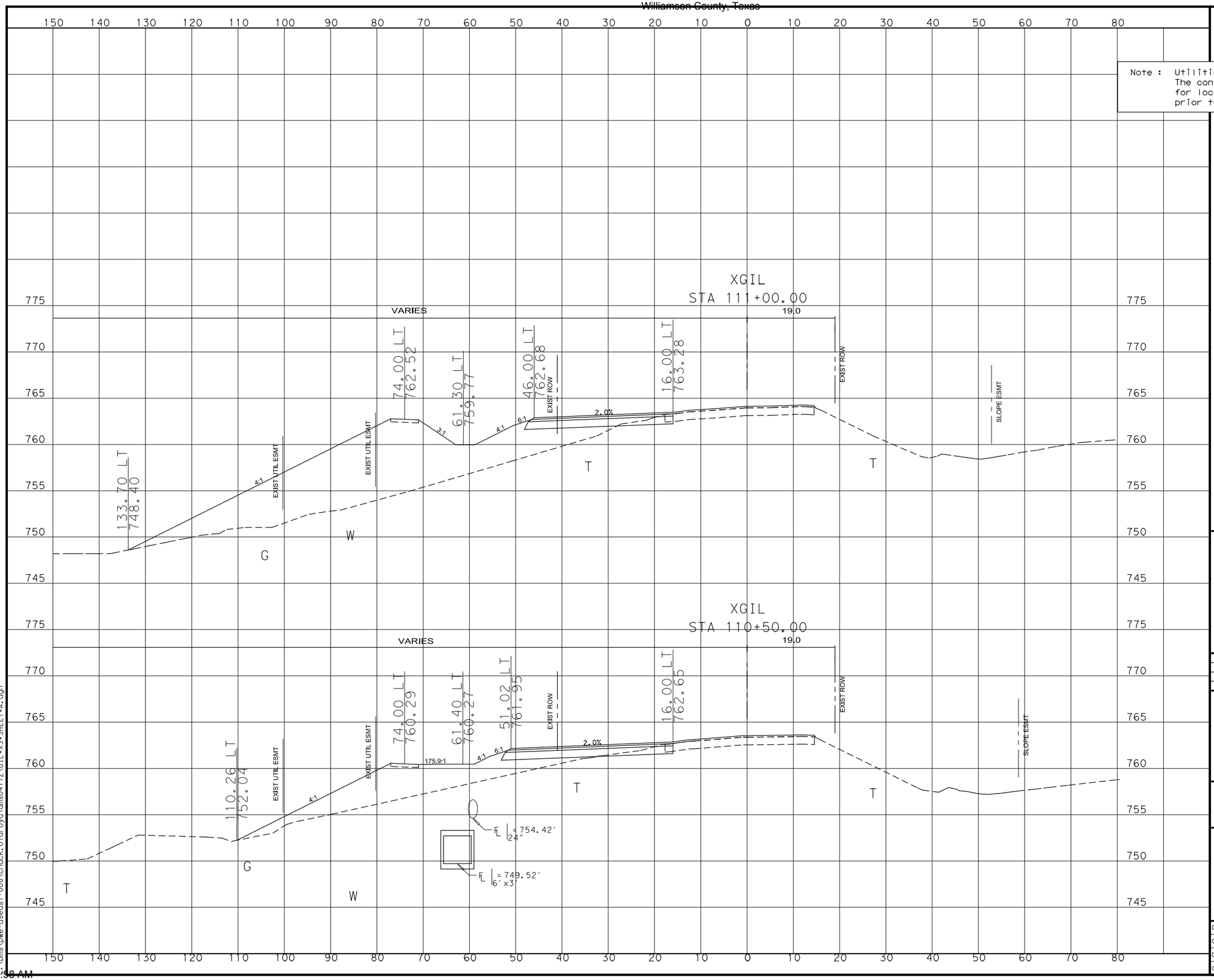

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STATION 91+30 TO 117+00

DESIGNED:	PROJECT NUMBER		ROADWAY	
CHECKED:			INNER LOOP DRIVE	
DRAWN:	STATE	COUNTY	CITY	SHEET No.
CHECKED:	TEXAS	WILLIAMSON	GEORGETOWN	14

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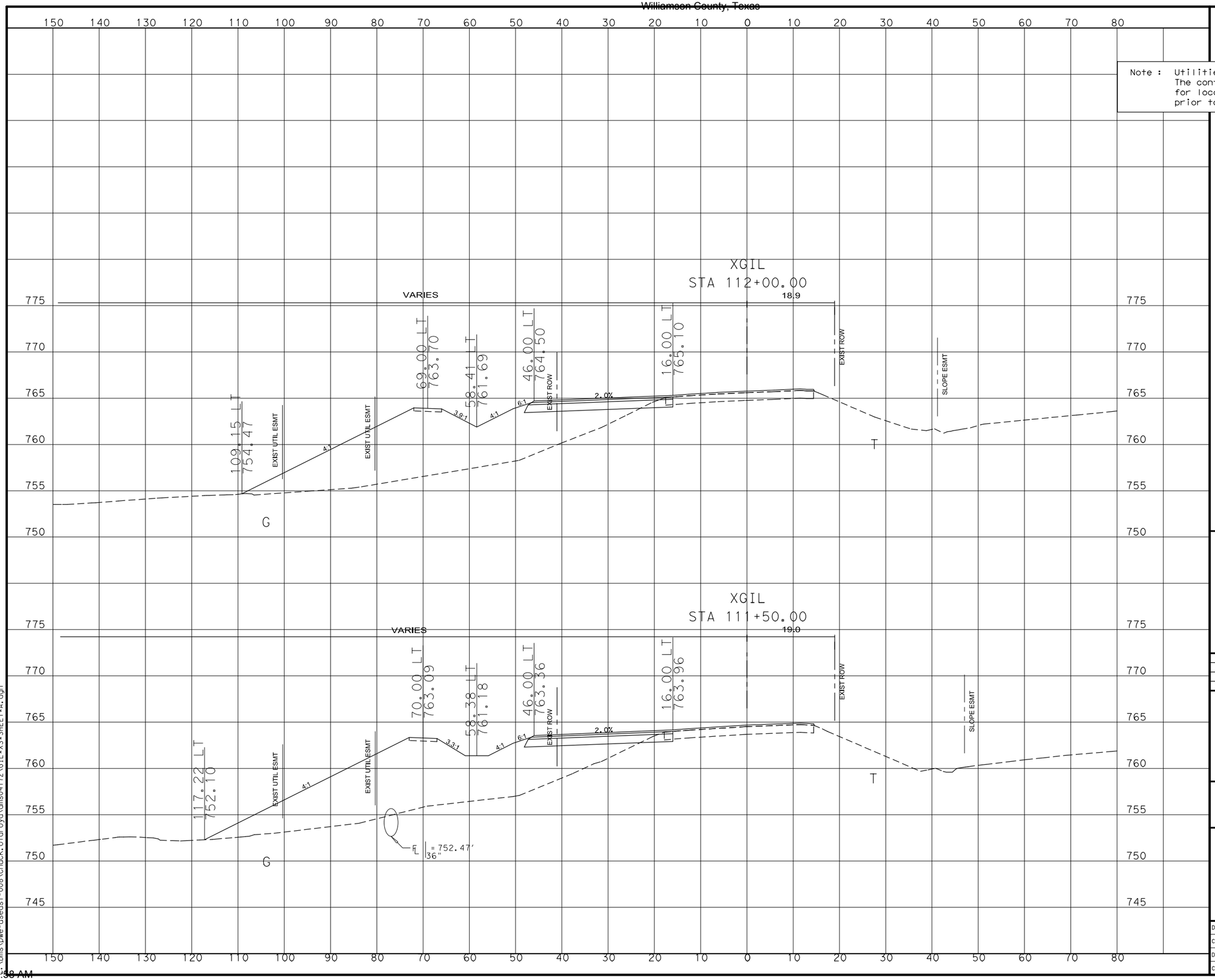

STATE OF TEXAS
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CHECKED:			INNER LOOP DRIVE	
DRAWN:	STATE	COUNTY	CITY	SHEET No.
CHECKED:	TEXAS	WILLIAMSON	GEORGETOWN	15

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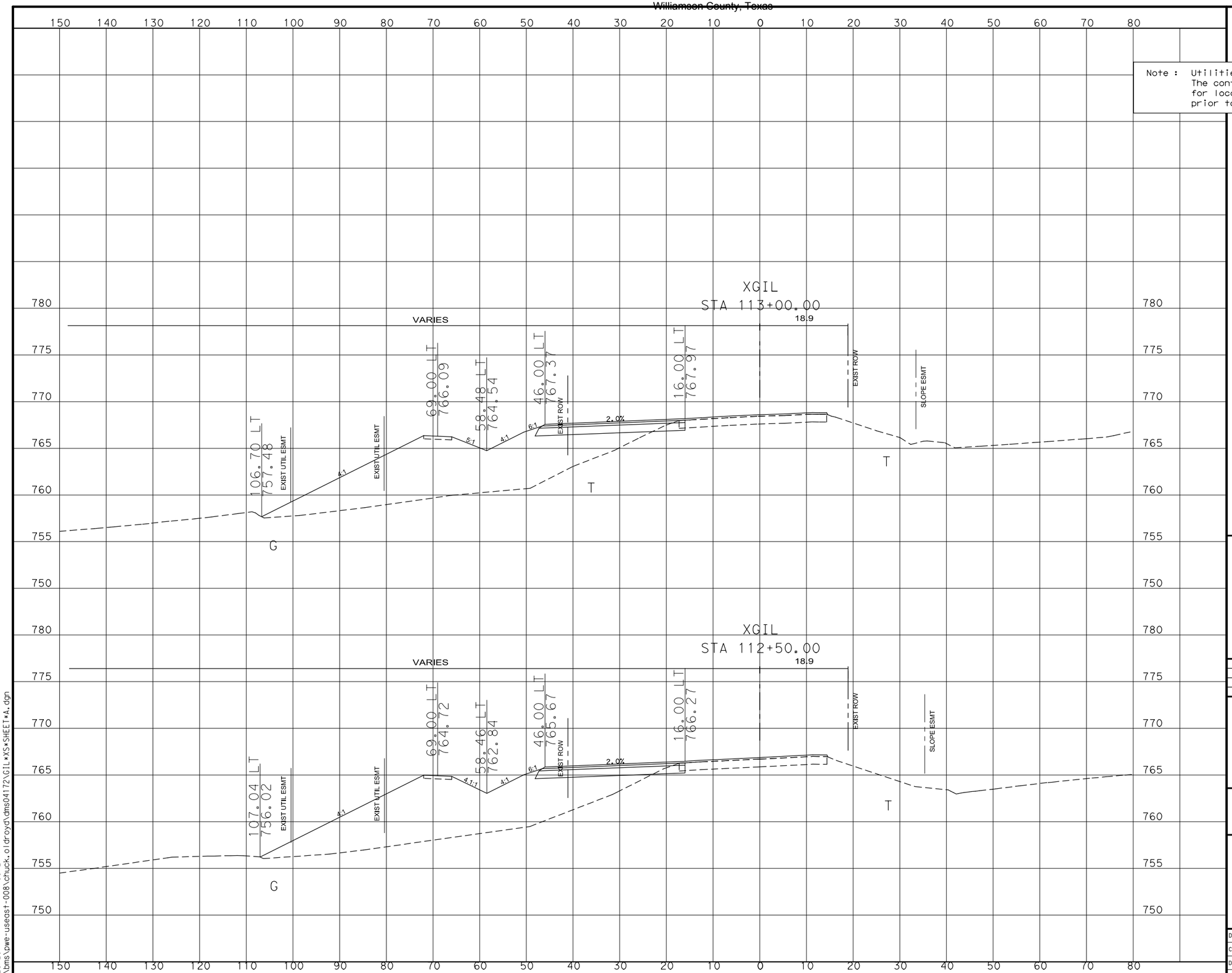

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STATION 91+30 TO 117+00

DESIGNED:	PROJECT NUMBER		ROADWAY	
CHECKED:			INNER LOOP DRIVE	
DRAWN:	STATE	COUNTY	CITY	SHEET No.
CHECKED:	TEXAS	WILLIAMSON	GEORGETOWN	16

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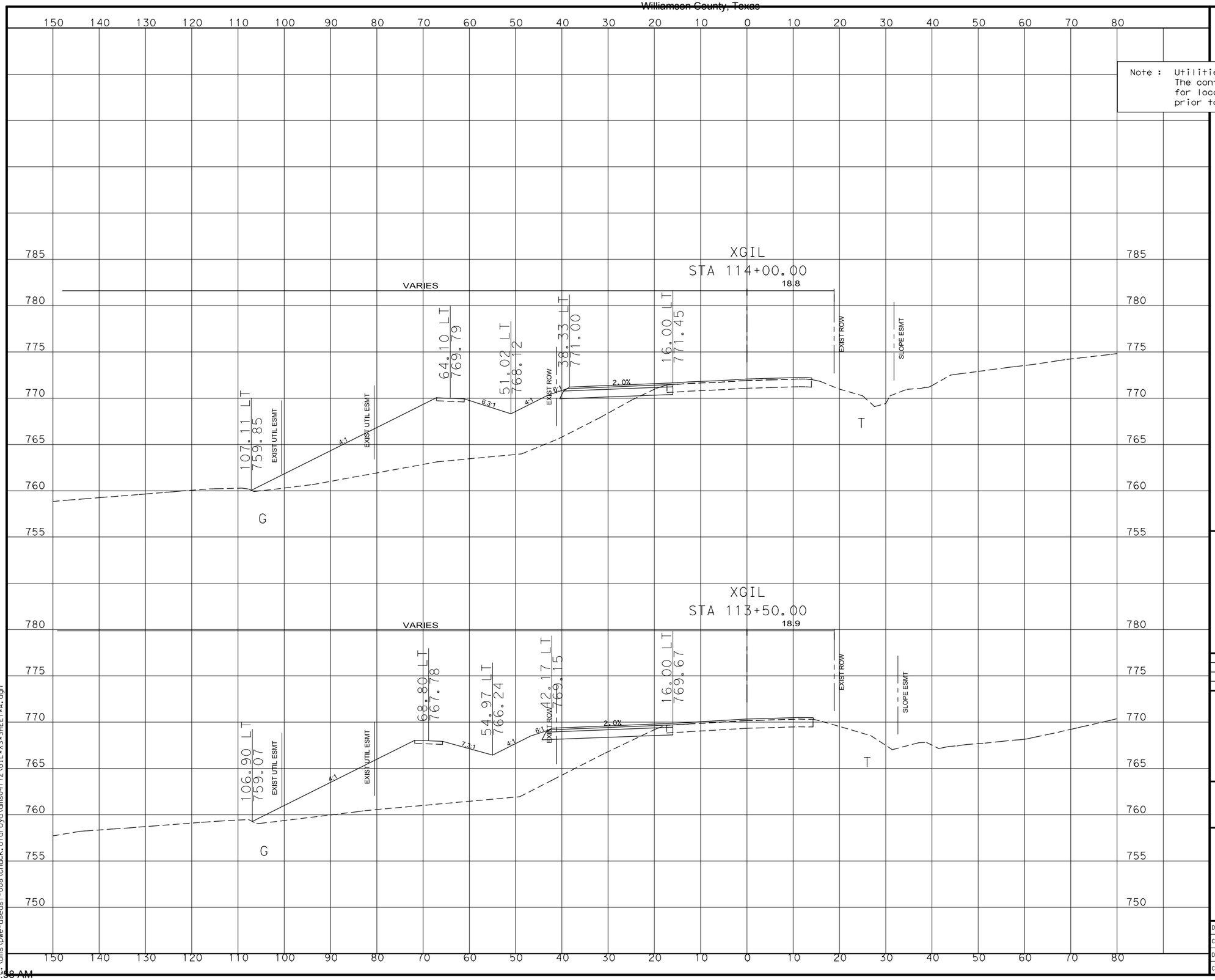

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CHECKED:			INNER LOOP DRIVE	
DRAWN:	STATE	COUNTY	CITY	SHEET No.
CHECKED:	TEXAS	WILLIAMSON	GEORGETOWN	17

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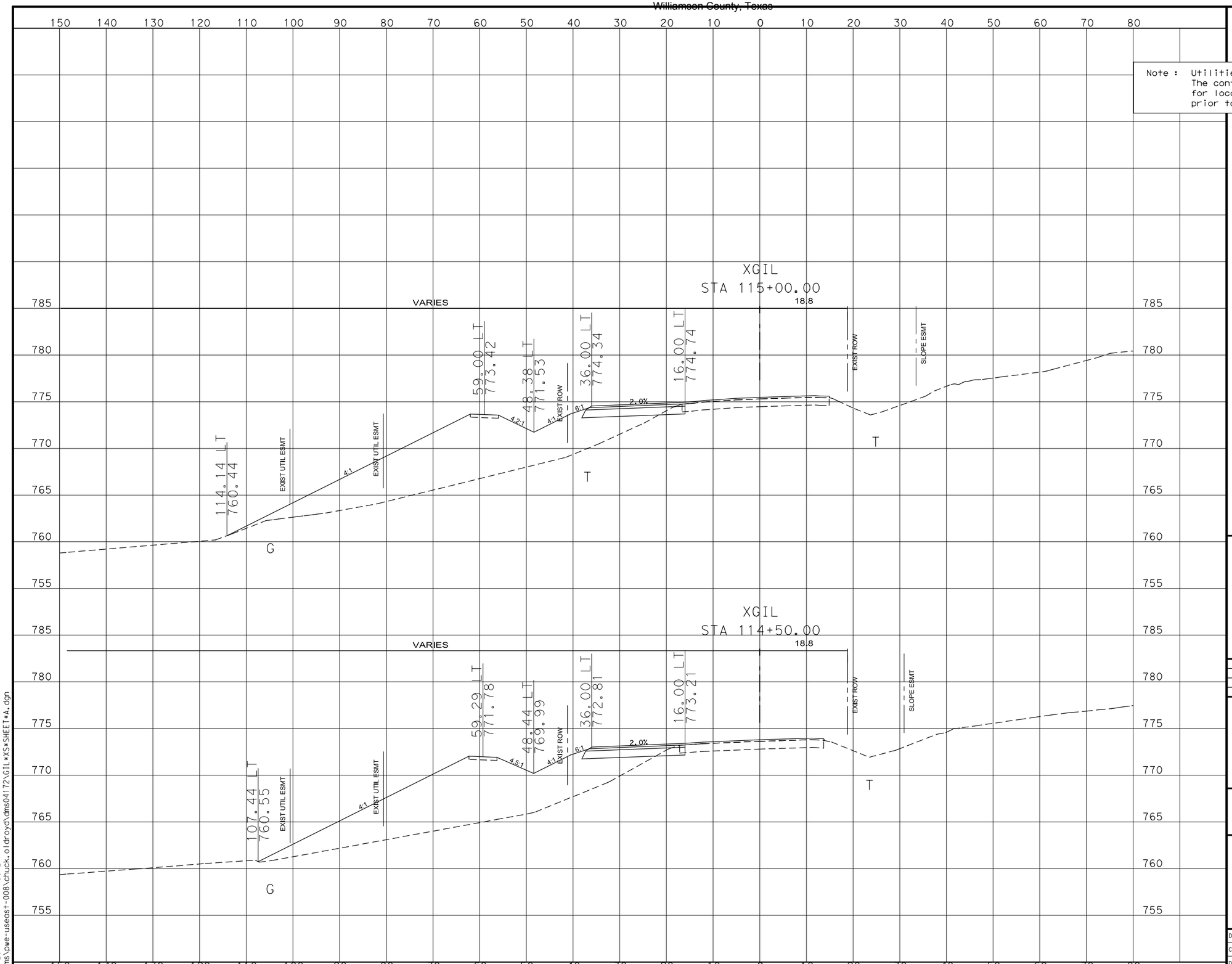

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DRAWN:	STATE	COUNTY	CITY	SHEET No.
CHECKED:	TEXAS	WILLIAMSON	GEORGETOWN	18

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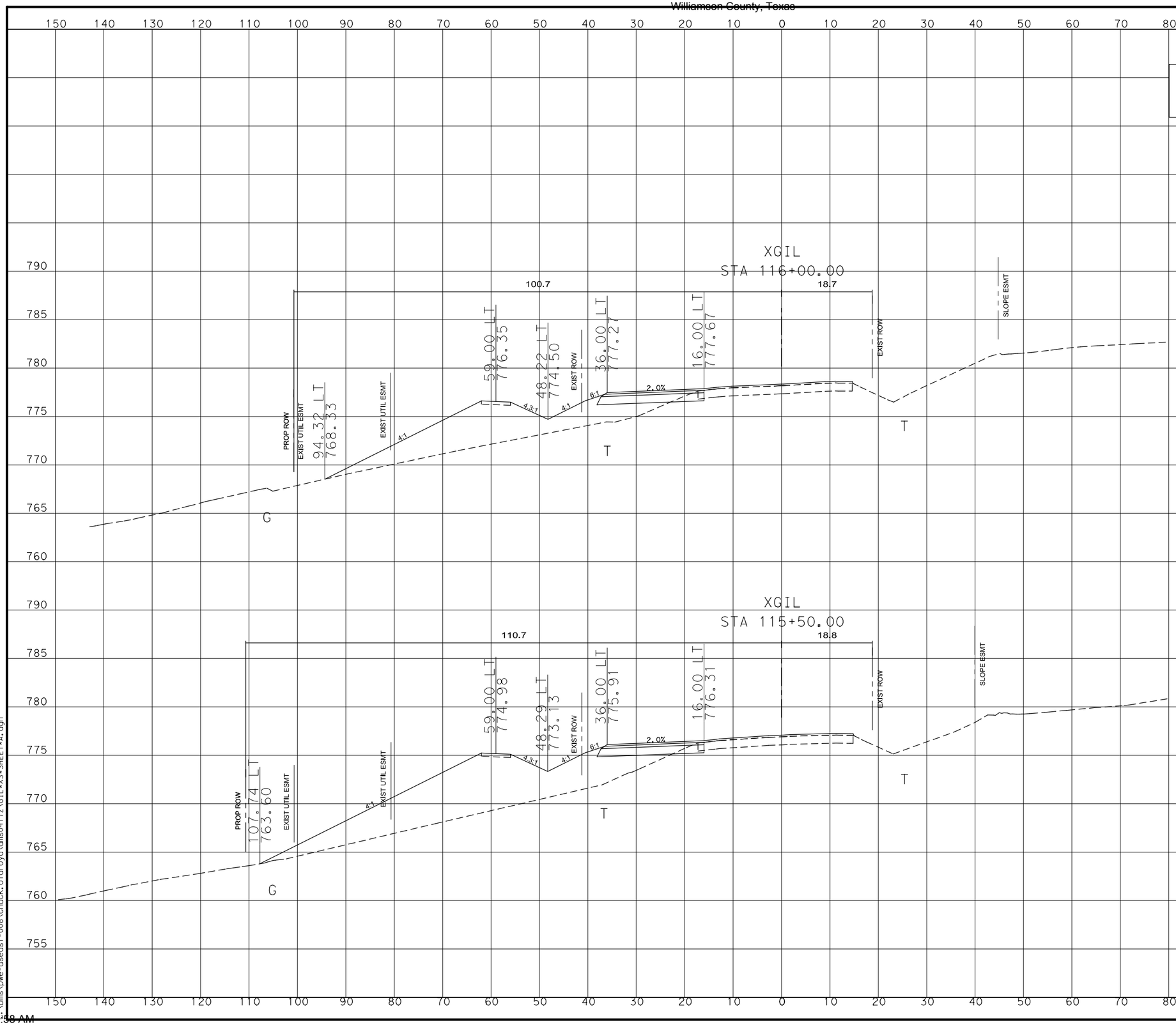

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CHECKED:	TEXAS	WILLIAMSON	GEORGETOWN	19

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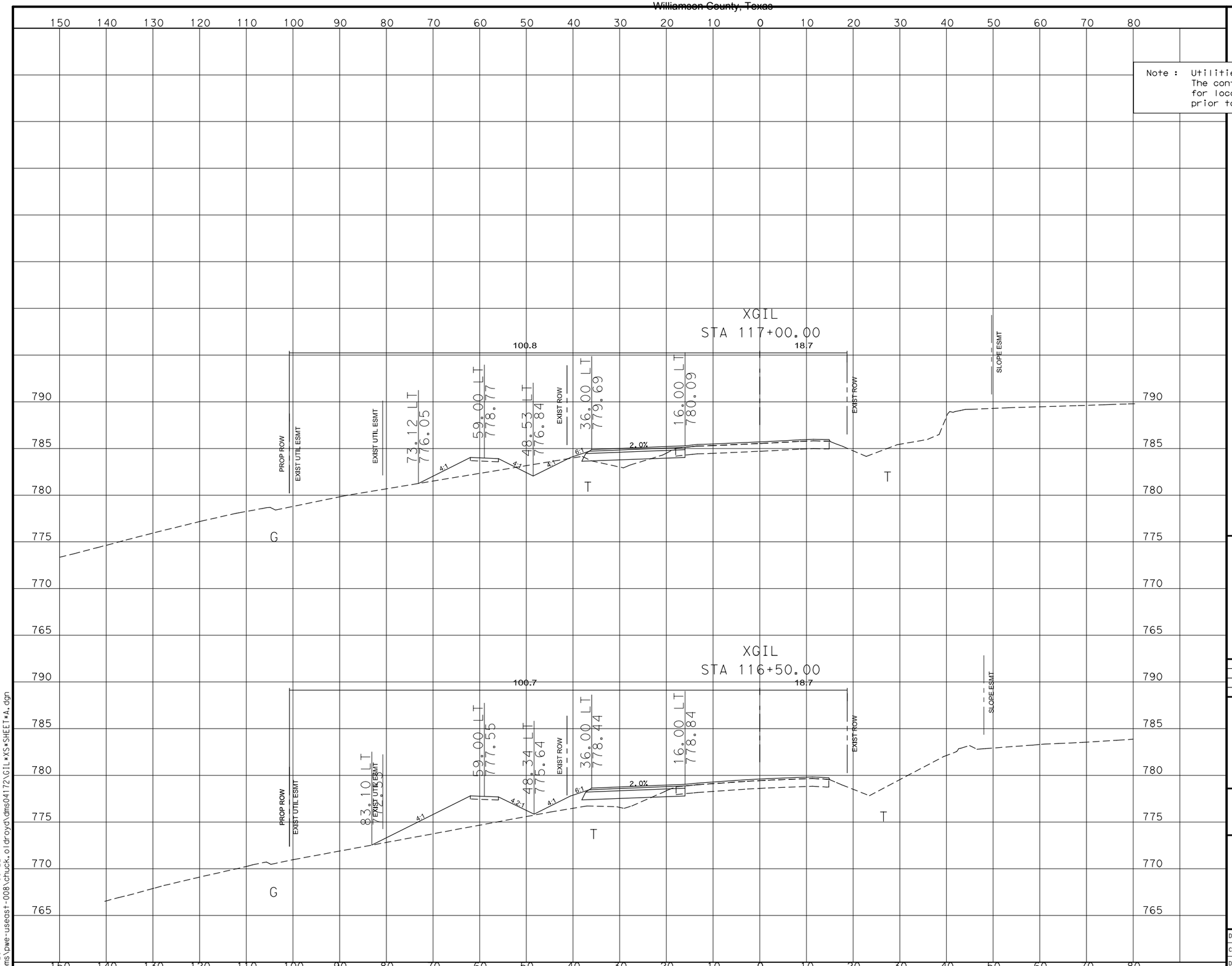

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CHECKED:	TEXAS	WILLIAMSON	GEORGETOWN	20

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Bid 1706-168

Williamson County, Texas

Dwg Info: G:\CFA\2014\0308801_Williamson_County_2013_Road_Bond\MUN\18 Inner Loop - Central Maintenance\DESIGN\C-001-COVR.dwg - Tab: C001 COVER - Plotted: 6/27/2017 3:54 PM By: HARSHA SHETTY

INDEX OF SHEETS

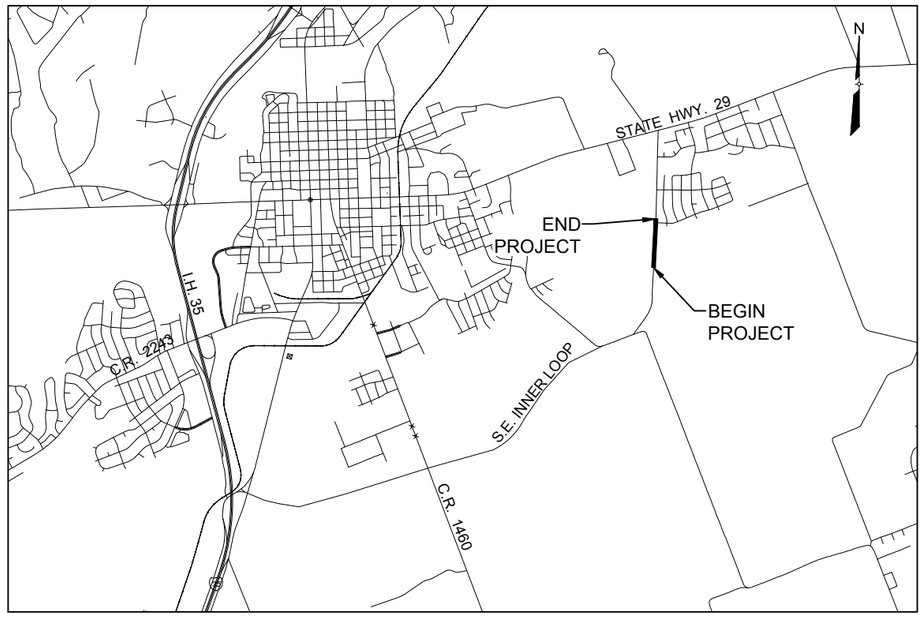
C-001	TITLE SHEET
C-002	GENERAL NOTES
C-003	LEGEND, SYMBOLS AND ABBREVIATIONS
C-100	KEY MAP
C-101	16" WATERLINE 'A' PLAN AND PROFILE
C-102	VALVE ADJUSTMENTS TO GRADE
C-501	STANDARD UTILITY DETAILS

WILLIAMSON COUNTY
RECONSTRUCTION OF INNER LOOP AT CENTRAL MAINTENANCE
16" WATER LINE RELOCATION

TOTAL LENGTH OF PROJECT: 91 LF

PROJECT LIMITS: FROM THE CENTRAL MAINTENANCE FACILITY TO BOLTON ROAD

RELOCATION OF 16" WATER LINE, WITH VALVES, APPURTENANCES, INCLUDING RECONNECTION TO EXISTING MAINS AND SERVICES



VICINITY MAP
(NOT TO SCALE)

REV. NO.	REVISION DESCRIPTION	(C)ORRECT, (A)DD, (V)OID SHEET NUMBERS	APPR'D BY:	DATE

OWNER INFORMATION

OWNER:
CITY OF GEORGETOWN, TEXAS
300 INDUSTRIAL AVENUE
GEORGETOWN, TEXAS 78626

CONTACT:
MICHAEL HALLMARK
512-930-3569

DESIGNER:
COBB FENDLEY
505 E. HUNTLAND DR. SUITE 100
AUSTIN, TEXAS 78752

CONTACT:
LANCE PARISHER, P.E.
512-834-9798

SUBMITTED FOR APPROVAL:

STATE OF TEXAS
JAMES LANCE PARISHER
106221
LICENSED
PROFESSIONAL ENGINEER

06/28/17

LANCE PARISHER P.E. DATE
COBB FENDLEY, INC.

APPROVALS:

DATE
CITY OF GEORGETOWN, TEXAS

CobbFendley
TBPE NO. 274 / TBPLS NO. 10046701
505 EAST HUNTLAND DRIVE, SUITE 100
AUSTIN, TEXAS 78752
512.834.9798 | FAX 512.834.7277
WWW.COBBFENDLEY.COM

7/19/2017 9:58 AM

Bid 1706-168

GENERAL NOTES

1. ALL CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE CITY OF GEORGETOWN STANDARD SPECIFICATIONS.
2. ALL RESPONSIBILITY FOR THE ADEQUACY OF THESE PLANS REMAINS WITH THE ENGINEER WHO PREPARED THEM. IN REVIEWING THESE PLANS, THE CITY OF GEORGETOWN MUST RELY ON THE ADEQUACY OF THE WORK OF THE DESIGN ENGINEER.
3. DESIGN PROCEDURES SHALL BE IN COMPLIANCE WITH THE CITY OF GEORGETOWN ENGINEERING DESIGN GUIDELINES AND UNIFIED DEVELOPMENT CODE. ALL WAIVERS OR VARIANCES ARE LISTED BELOW:
4. AFTER THE CONSTRUCTION PERMIT HAS BEEN ISSUED AND PRIOR TO THE BEGINNING CONSTRUCTION, THE OWNER OR HIS REPRESENTATIVE SHALL CONVENE A PRE-CONSTRUCTION CONFERENCE BETWEEN THE CITY OF GEORGETOWN, DESIGN ENGINEER, CONTRACTOR(S), WILLIAMSON COUNTY (IF IN THE ETJ), OTHER UTILITY COMPANIES, AND ANY OTHER AFFECTED PARTIES. THE CITY OF GEORGETOWN SHALL BE NOTIFIED AT LEAST 48 HOURS PRIOR TO THE PROPOSED MEETING TIME (512-930-3569).
5. THE CONTRACTOR SHALL GIVE THE CITY OF GEORGETOWN CONSTRUCTION INSPECTOR AT LEAST 48 HOURS NOTICE BEFORE BEGINNING EACH PHASE OF CONSTRUCTION.
6. ANY CHANGES OR REVISIONS TO THESE APPROVED PLANS MUST BE SUBMITTED BY THE DESIGN ENGINEER AND APPROVED BY THE CITY OF GEORGETOWN PRIOR TO CONSTRUCTION OF THE REVISION.
7. ANY EXISTING UTILITIES, PAVEMENT, CURBS, SIDEWALKS, STRUCTURES, TREES, ETC., NOT PLANNED FOR DESTRUCTION OR REMOVAL OR OTHER PUBLIC INFRASTRUCTURE DAMAGED OR REMOVED WILL BE BY THE CONTRACTOR AT HIS EXPENSE BEFORE ACCEPTANCE OF THE PROJECT.
8. BENCHMARKS:
   SEE "SURVEY CONTROL DATA" PLANS IN "RECONSTRUCTION OF COUNTY ROAD 258, ROADWAY AND DRAINAGE IMPROVEMENTS" PLAN SET FOR BENCHMARK INFORMATION, PREPARED BY:
   CIVIL ENGINEERING CONSULTANTS
   11550 IH-10 WEST, SUITE 395
   SAN ANTONIO, TEXAS 78230
   (210) 641-9999
9. BLASTING OR BURNING SHALL NOT BE PERMITTED ON THIS PROJECT.
10. THE CONTRACTOR SHALL VERIFY ALL DEPTHS AND LOCATIONS OF EXISTING UTILITIES PRIOR TO BEGINNING CONSTRUCTION. ANY DISCREPANCIES WITH THE CONSTRUCTION PLANS FOUND IN THE FIELD SHALL BE BROUGHT TO THE ATTENTION OF THE DESIGN ENGINEER IMMEDIATELY. THE DESIGN ENGINEER SHALL BE RESPONSIBLE FOR REVISING THE PLANS AS APPROPRIATE AND SUBMITTING A REVISION TO THE CITY. USE ONE CALL UTILITY SYSTEM: DIAL 1-800-344-8377, 48 HOURS BEFORE YOU DIG.
11. EXCESS SOIL SHALL BE REMOVED AT THE CONTRACTOR'S EXPENSE. NOTIFY THE CITY OF GEORGETOWN IF THE DISPOSAL SITE IS INSIDE THE CITY'S JURISDICTIONAL BOUNDARIES.
12. ALL AREAS DISTURBED OR EXPOSED DURING CONSTRUCTION SHALL BE REVEGETATED IN ACCORDANCE WITH THE PLANS AND SPECIFICATIONS. REVEGETATION OF ALL DISTURBED AREAS OR EXPOSED AREAS SHALL CONSIST OF SODDING OR SEEDING; AT THE CONTRACTOR'S OPTION.
13. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO INSPECT TEMPORARY EROSION CONTROLS ON A DAILY BASIS. ADJUST THE CONTROLS AND/OR REMOVE ANY SEDIMENT BUILDUP AS NECESSARY.
14. CONTRACTOR WILL BE RESPONSIBLE FOR KEEPING ROADS AND DRIVES ADJACENT TO AND NEAR THE SITE FREE FROM SOIL, SEDIMENT AND DEBRIS. CONTRACTOR WILL NOT REMOVE SOIL, SEDIMENT OR DEBRIS FROM ANY AREA OR VEHICLE BY MEANS OF WATER, ONLY SHOVELING AND SWEEPING WILL BE ALLOWED. CONTRACTOR WILL BE RESPONSIBLE FOR DUST CONTROL FROM THE SITE.
15. PRIOR TO ANY CONSTRUCTION, THE CONTRACTOR SHALL APPLY FOR AND SECURE ALL PROPER PERMITS FROM THE APPROPRIATE AUTHORITIES.
16. ALL WET UTILITIES SHALL BE INSTALLED AND ALL DENSITIES MUST HAVE PASSED INSPECTIONS(S) PRIOR TO THE INSTALLATION OF DRY UTILITIES.
17. A TRAFFIC CONTROL PLAN, IN ACCORDANCE WITH THE TEXAS MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES, SHALL BE SUBMITTED TO THE CITY FOR REVIEW AND APPROVAL PRIOR TO ANY PARTIAL OR COMPLETE ROADWAY CLOSURES. TRAFFIC CONTROL PLANS SHALL BE SITE SPECIFIC AND BE SEALED BY A REGISTERED TEXAS PROFESSIONAL ENGINEER.

EROSION AND SEDIMENTATION CONTROL NOTES

1. EROSION CONTROL MEASURES, SITE WORK, AND RESTORATION WORK SHALL BE IN ACCORDANCE WITH THE CITY OF GEORGETOWN'S SUBDIVISION CODE AND CONSTRUCTION STANDARDS MANUAL, EXCEPT AS NOTED BELOW AND APPROVED BY CITY COUNCIL:
2. SLOPES SHALL BE SODDED OR SEEDED WITH THE APPROPRIATE GRASS, GRASS MIXTURES, OR GROUND COVER SUITABLE TO THE AREA AND SEASON TO WHICH THEY ARE APPLIED.
3. SILT FENCES, ROCK BERMS AND SIMILARLY RECOGNIZED TECHNIQUES AND MATERIALS SHALL BE EMPLOYED DURING CONSTRUCTION TO PREVENT POINT SOURCE SEDIMENTATION LOADING OF DOWNSTREAM FACILITIES. SUCH INSTALLATION SHALL BE REGULARLY INSPECTED BY THE CITY OF GEORGETOWN FOR EFFECTIVENESS. ADDITIONAL MEASURES MAY BE REQUIRED IF, IN THE OPINION OF THE CITY ENGINEER, THEY ARE WARRANTED.
4. ALL TEMPORARY EROSION CONTROL MEASURES SHALL NOT BE REMOVED UNTIL FINAL INSPECTION AND APPROVAL OF THE PROJECT BY THE ENGINEER.
5. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO MAINTAIN ALL TEMPORARY EROSION CONTROL STRUCTURES AND TO REMOVE EACH STRUCTURE AS APPROVED BY THE ENGINEER.

WATER NOTES

1. PIPE MATERIAL FOR WATER MAINS SHALL BE PVC (AWWA C-900, MIN CLASS 150), OR DUCTILE IRON (AWWA C-100, MIN 150). WATER SERVICES (2" OR LESS) SHALL BE POLYETHYLENE TUBING (200 PSI, DR9).
2. UNLESS OTHERWISE ACCEPTED BY THE CITY ENGINEER, DEPTH OF COVER FOR ALL LINES OUT OF THE PAVEMENT SHALL BE 36" MIN. AND DEPTH OF COVER FOR ALL LINES UNDER PAVEMENT SHALL BE A MIN. OF 36" BELOW SUBGRADE.
3. WHERE A WATER OR WASTEWATER LINE CROSSES BELOW A STORM SEWER STRUCTURE AND THE TOP OF THE PIPE IS WITHIN 18" OF THE BOTTOM OF THE UTILITY STRUCTURE, THE PIPE SHALL BE ENCASED WITH CONCRETE FOR A DISTANCE OF AT LEAST 1' ON EITHER SIDE OF THE DITCH LINE OF THE UTILITY STRUCTURE OR THE STORM SEWER. CONCRETE ENCASEMENT WILL NOT BE REQUIRED FOR DUCTILE IRON PIPE WITH SIZES LARGER THAN 12". CONCRETE ENCASEMENT SHALL CONFORM TO THE CITY OF GEORGETOWN STANDARD DETAIL.
4. ALL PIPE BEDDING MATERIAL SHALL CONFORM TO THE CITY OF GEORGETOWN STANDARD DETAIL.
5. ALL FIRE HYDRANT LEADS SHALL BE DUCTILE IRON PIPE (AWWA C-100, MIN. CLASS 150).
6. ALL IRON PIPE AND FITTINGS SHALL BE WRAPPED WITH A MINIMUM 8-MIL POLYETHYLENE FILM PRIOR TO PLACING CONCRETE.
7. THE CONTRACTOR SHALL CONTACT THE CITY INSPECTOR TO COORDINATE UTILITY TIE-INS AND NOTIFY HIM AT LEAST 48 HOURS PRIOR TO CONNECTION TO EXISTING LINES.
8. THE CONTRACTOR, AT HIS EXPENSE, SHALL PERFORM QUALITY TESTING FOR ALL WATER PIPE INSTALLED AND PRESSURE PIPE HYDROSTATIC TESTING OF ALL WATER LINES CONSTRUCTED AND SHALL PROVIDE EQUIPMENT INCLUDING PUMPS, GAUGES, SUPPLIES, AND LABOR NECESSARY TO PERFORM THE TESTS. QUALITY AND PRESSURE TESTING SHALL BE MONITORED BY CITY OF GEORGETOWN PERSONNEL. WATER SAMPLES WILL BE COLLECTED BY THE CITY OF GEORGETOWN TO VERIFY EACH TREATED LINE HAS ATTAINED AN INITIAL CHLORINE CONCENTRATION OF 50 PPM.
9. THE CONTRACTOR SHALL COORDINATE TESTING WITH THE CITY OF GEORGETOWN AND PROVIDE NO LESS THAN 24 HOURS NOTICE PRIOR TO PERFORMING STERILIZATION, QUALITY TESTING OR PRESSURE TESTING.
10. THE CONTRACTOR SHALL NOT OPEN OR CLOSE ANY VALVES UNLESS AUTHORIZED BY THE CITY OF GEORGETOWN.
11. ALL VALVE BOXES AND COVERS SHALL BE CAST IRON.
12. A DOUBLE CHECK BACKFLOW DEVICE IN A VAULT SHALL BE INSTALLED ADJACENT THE RIGHT OF WAY OR PUBLIC EASEMENT ON PRIVATE PROPERTY ON ALL PRIVATE FIRE LINES.
13. ALL WATER SERVICE AND VALVE LOCATIONS SHALL BE APPROPRIATELY MARKED AS FOLLOWS:

    WATER SERVICE "W" ON TOP OF CURB
    VALVE "V" ON FACE OF CURB
14. THE CONTRACTOR IS HEREBY NOTIFIED THAT CONNECTING TO, SHUTTING DOWN, OR TERMINATING EXISTING UTILITY LINES MAY HAVE TO OCCUR AT OFF-PEAK HOURS. SUCH HOURS ARE USUALLY OUTSIDE NORMAL WORKING HOURS AND POSSIBLY BETWEEN 12 A.M. AND 6 A.M.
15. ALL FIRE HYDRANTS SHALL BE NATIONAL STANDARD HOSE THREAD.
16. LIBERTY HILL FIRE DEPARTMENT:
    FIRE HYDRANTS MUST BE INSTALLED WITH THE CENTER OF THE FIVE (5) INCH STEAMER OPENING AT LEAST 18 INCHES ABOVE FINISHED GRADE. THE FIVE (5) INCH OPENING MUST FACE THE DRIVEWAY OR STREET AND MUST BE TOTALLY UNOBSTRUCTED TO THE STREET. FIRE HYDRANT DESIGN SHALL BE 2- 2.5" NST OUTLETS, 1 - 5.0" STORZ CONNECTION WITH A CAP TO INCLUDE A HEX NUT TO FIT A HYDRANT WRENCH ALONG WITH A REFLECTIVE BAND. THE FIRE HYDRANT SHALL BE PAINTED SILVER IN COLOR AND DESIGNATED BY A BLUE REFLECTOR IN THE CENTER OF THE STREET.
17. ALL MATERIAL TESTS, INCLUDING SOIL DENSITY TESTS AND RELATED SOIL ANALYSIS, SHALL BE ACCOMPLISHED BY AN INDEPENDENT LABORATORY FUNDED BY THE DEVELOPER IN ACCORDANCE WITH THE SPECIFICATIONS.
18. FULL-BODIED DRESSER TAPPING SADDLE REQUIRED FOR SIZE-ON-SIZE TAPS.
19. PRESSURE TESTING AND THREE BACTERIOLOGICAL SAMPLES SHALL BE TAKEN ON EACH NEW WATER LINE PRIOR TO TIE-IN TO EXISTING LINES.
20. TRACER WIRE TEST STATIONS ARE REQUIRED AT EACH TAPPING VALVE WHERE TIE-INS ARE CONSTRUCTED.

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CobbFendley
TBPE NO. 274 / TBPLS NO. 10046701
505 EAST HUNTLAND DRIVE, SUITE 100
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512.834.9798 | FAX 512.834.7727
WWW.COBBFENDLEY.COM

GENERAL NOTES

INNER LOOP @ CENTRAL MAINTENANCE
16" WATERLINE RELOCATION
WILLIAMSON COUNTY, TEXAS

WILLIAMSON COUNTY 1848

PROJ. NO. 1403-088-02-09F
DESIGN: G. LITTLEFIELD
DRAWN: G. LITTLEFIELD
CHECK: J. HASTINGS
APPR: L. PARISHER
DATE: JULY 23, 2017

STATE OF TEXAS
JAMES LANCE PARISHER
106221
LICENSED
PROFESSIONAL ENGINEER
06/23/2017

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Williamson County, Texas
Dwg. Info: G:\CFA\2014\0308801_Williamson_County_2013_Road_Bond\MUN\18 Inner Loop - Central Maintenance\DESIGN\C-002-GNOT.dwg - Tab: C002 GENERAL NOTES - Plotted: 6/27/2017 3:54 PM By: HARSHA SHETTY

SURVEY LEGEND

BENCHMARK	POWER POLE
BOLLARD	POWER POLE WITH LIGHT
BORE HOLE	POWER POLE WITH RISER
CABLE TV JUNCTION BOX	PULL BOX
CABLE TV PEDESTAL	RISER
CLEANOUT	ROOF DRAIN
COMMUNICATIONS MANHOLE	SEPTIC LID
CONC. HWY. MONUMENT FOUND TYPE II	SIGN
CONCRETE MONUMENT FOUND	SPRINKLER HEAD
CONCRETE MONUMENT SET	STORM MANHOLE
COTTON SPINDLE FOUND	TELECOM JUNCTION BOX
COTTON SPINDLE SET	TELECOM MANHOLE
ELECTRIC JUNCTION BOX	TELECOM PEDESTAL
ELECTRIC MANHOLE	TEST HOLE
ELECTRIC METER	TRAFFIC SIGNAL BOX
ELECTRIC PEDESTAL	TRAFFIC SIGNAL POLE
ELECTRIC TRANSFORMER PAD	TREE
FIRE HYDRANT	TREE TO BE REMOVED
GAS MANHOLE	UNDERGROUND CABLE TV MARKER
GAS METER	UNDERGROUND ELECTRIC MARKER
GAS TEST LEAD	UNDERGROUND FIBER OPTIC MARKER
GAS VALVE	UNDERGROUND GAS PIPELINE MARKER
GROUND LIGHT	UNDERGROUND PIPELINE MARKER
GUARD POST	UNDERGROUND TELECOM MARKER
GUY WIRE	UNDERGROUND WATER MARKER
IRON PIPE FOUND	VALVE, MISCELLANEOUS
IRON ROD FOUND	VENT
IRON ROD SET	WASTEWATER MANHOLE
IRRIGATION CONTROL VALVE	WATER FAUCET
LIGHT, STANDARD	WATER MANHOLE
MAILBOX	WATER METER
MANHOLE	WATER VALVE
MONITORING WELL	WELL
NAIL FOUND	
NAIL SET	

EXISTING UTILITIES AND FEATURES

RIGHT OF WAY	
EASEMENT	
W W	WATER LINE
RW RW	REUSE WATER
W W W	WATER, ABANDONED
WW WW	WASTEWATER LINE
FM FM	FORCE MAIN
WW WW	WASTEWATER, ABANDONED
SD SD	STORM DRAIN
	STORM CULVERT
G G	GAS LINE
OE OE	OVERHEAD ELECTRIC
UT UT	U.G. TELECOM
FO FO	FIBER OPTIC
UE UE	U.G. ELECTRIC
TV	CABLE TV
O O	CHAINLINK FENCE
□ □	IRON FENCE
	ROCK FENCE
X X	WIRE FENCE
// //	WOOD FENCE
	GUARD RAIL
	APPROXIMATE TREE LINE

ABBREVIATIONS

ASPH	ASPHALT
B–B	BACK TO BACK
BKFL	BACKFILL
℄	BASELINE
BE	BEVELED END
BM	BENCHMARK
BTM	BOTTOM
℄	CENTERLINE
CI	CAST IRON
CONC	CONCRETE
CONSTR	CONSTRUCTION
CMP	CORRUGATED METAL PIPE
DE	DRAINAGE EASEMENT
DI	DUCTILE IRON
ESMT	EASEMENT
ELEC	ELECTRIC
EL	ELEVATION
ELL	ELBOW
EXIST	EXISTING
FB	FIELDBOOK
FH	FIRE HYDRANT
F/C	FRAME AND COVER
FUT	FUTURE
HP	HIGH PRESURE (>60 PSIG)
LP	LOW PRESSURE (<60 PSIG)
LT	LEFT
MH	MANHOLE
NFIF	NOT FOUND IN FIELD
O/S	OFFSET
OHWM	ORDINARY HIGH WATER MARK
PE	POLYETHYLENE
PVC	POLYVINYL CHLORIDE
PVMT	PAVEMENT
℄	PROPERTY LINE
PROP	PROPOSED
REF	REFERENCE
RCB	REINFORCED CONCRETE BOX
RCP	REINFORCED CONCRETE PIPE
RT	RIGHT
ROW	RIGHT OF WAY
SHT	SHEET
SW	SIDEWALK
STA	STATION
STL	STEEL
SD	STORM DRAIN
TELE	TELEPHONE / TELECOM
TBM	TEMPORARY BENCH MARK
TXDOT	TEXAS DEPARTMENT OF TRANSPORTATION
TGS	TEXAS GAS SERVICE CO.
UE	UTILITY EASEMENT
WE	WATER EASEMENT
WL	WATERLINE
WM	WATER METER
WV	WATER VALVE
WW	WASTEWATER
WWE	WASTEWATER EASEMENT

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CobbFendley
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AUSTIN, TEXAS 78752
512.834.9788 | FAX 512.834.7727
WWW.COBBFENDLEY.COM

LEGEND, SYMBOLS AND ABBREVIATIONS

INNER LOOP @ CENTRAL MAINTENANCE
16" WATERLINE RELOCATION
WILLIAMSON COUNTY, TEXAS

WILLIAMSON COUNTY 1848

PROJ. NO. 1403-088-02-09F
DESIGN: G. LITTLEFIELD
DRAWN: G. LITTLEFIELD
CHECK: J. HASTINGS
APPR: L. PARISHER
DATE: JULY 23, 2017

STATE OF TEXAS
JAMES CANCE PARISHER
106221
LICENSED
PROFESSIONAL ENGINEER
06/23/2017

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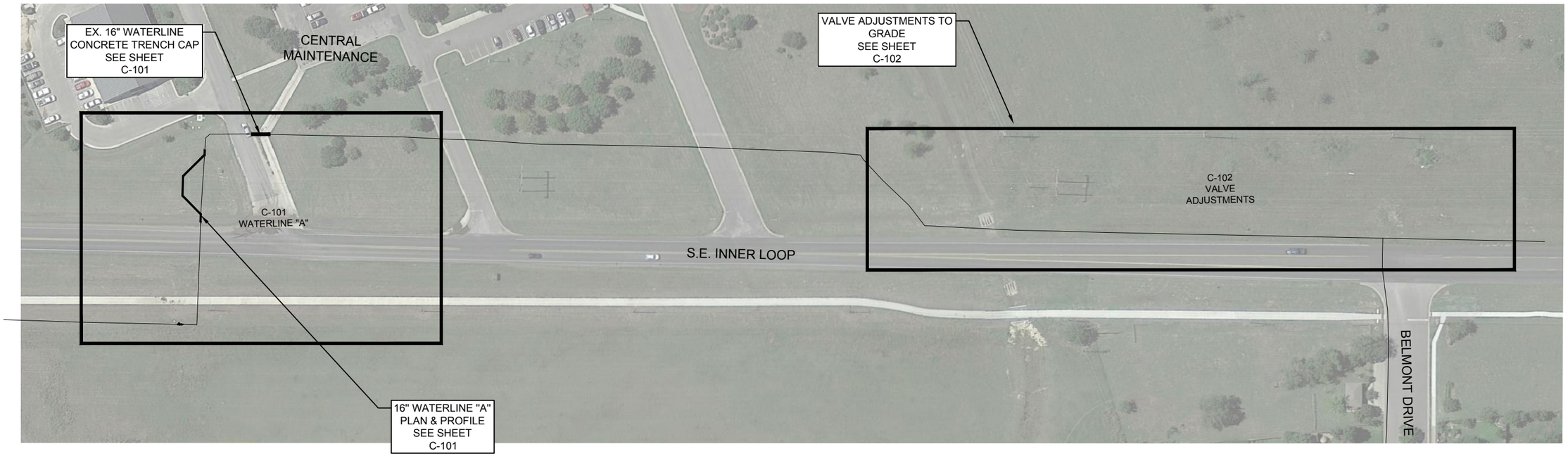
3 of 7

Williamson County, Texas
Dwg Info: G:\CFA\2014\0308801_Williamson_County_-2013_Road_Bond\MUN\18 Inner Loop - Central Maintenance\DESIGN\C-002-GNOT.dwg - Tab: C003 LEGEND SYMBOLS AND ABBREVIATIONS - Plotted: 6/27/2017 3:54 PM By: HARSHA SHETTY

Bid 1706-168

Williamson County, Texas



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0 60' 120'
SCALE: 1" = 60'

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KEY-MAP

INNER LOOP @ CENTRAL MAINTENANCE
16" WATERLINE RELOCATION
WILLIAMSON COUNTY, TEXAS

WILLIAMSON COUNTY 1848

PROJ. NO. 1403-088-02-09F
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7/18/2017 11:58 AM

Bid 1706-168

Williamson County, Texas

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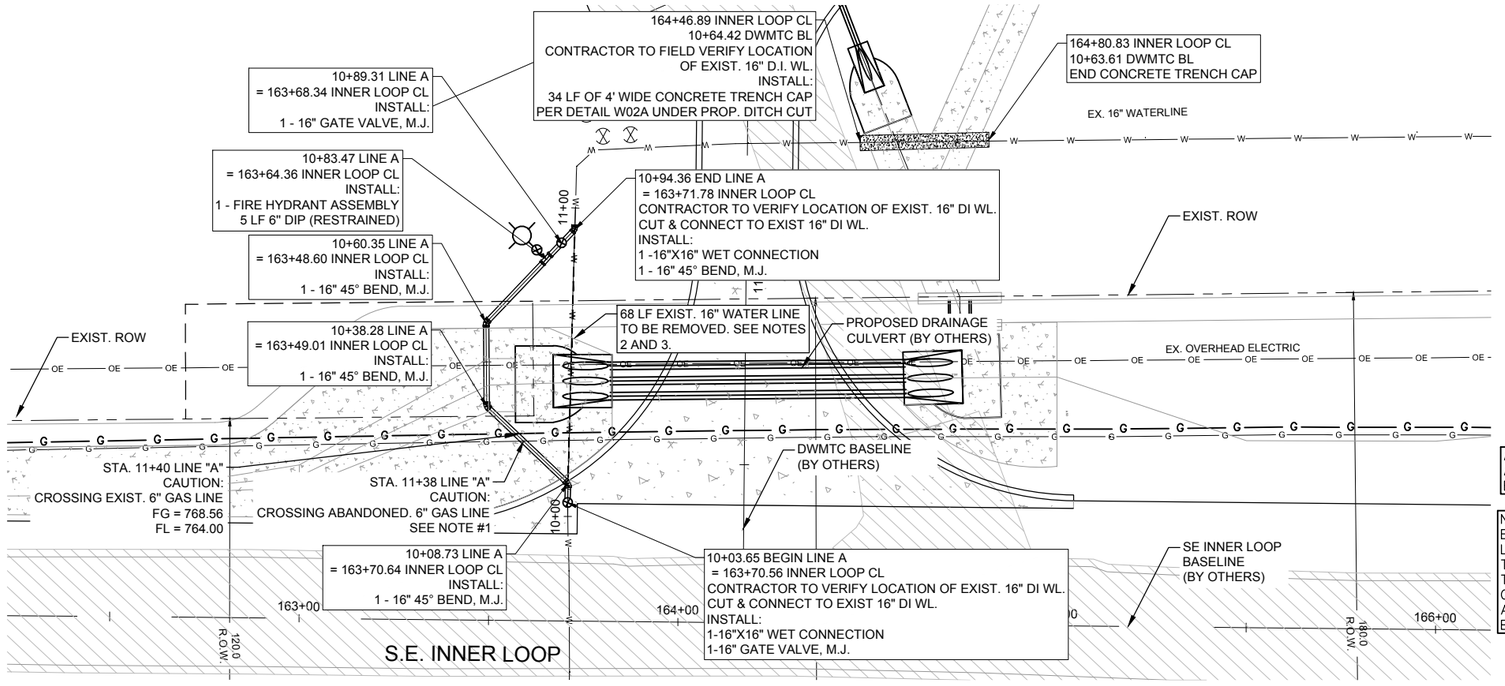

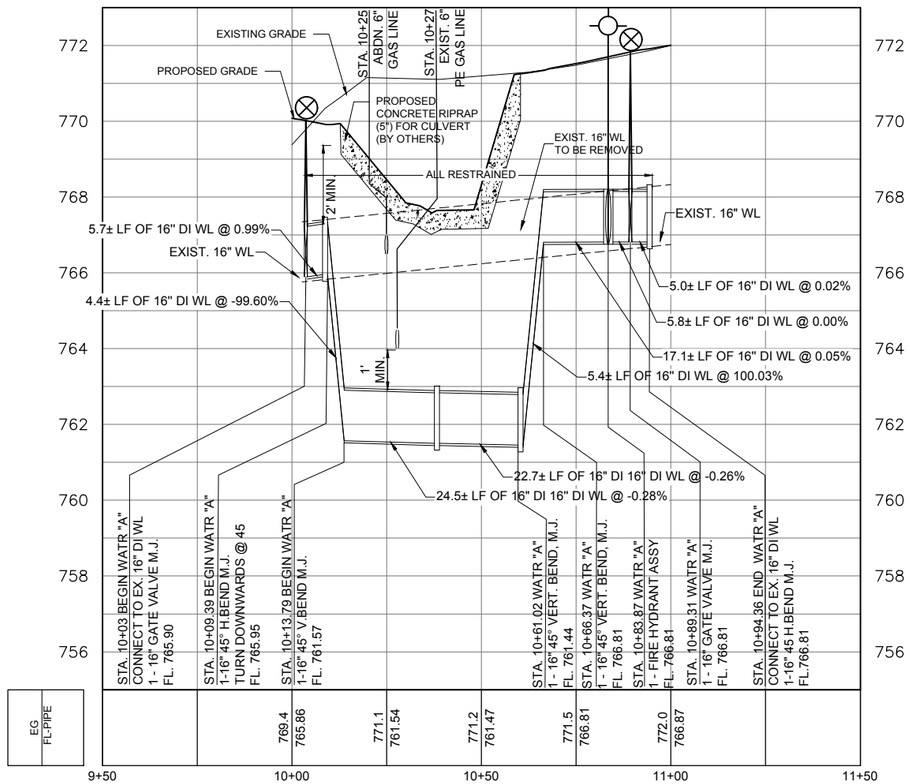

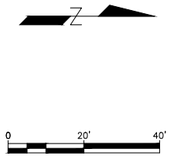

LEGEND

- PROP. WATER LINE
- RIGHT OF WAY
- EASEMENT
- ATT — ATT — PROPOSED AT&T
- W — W — WATER LINE
- WW — WW — WASTEWATER LINE
- SD — SD — STORM DRAIN
- G — G — EXIST. GAS LINE
- TEL — TEL — U.G. TELECOM
- FO — FO — FIBER OPTIC
- OE — OE — OVERHEAD ELECTRIC
- E — E — U.G. ELECTRIC
- O — O — CHAINLINK FENCE
- ROCK FENCE
- X — X — WIRE FENCE
- // — // — WOOD FENCE
- ESC — ESC — EROSION AND SEDIMENTATION CONTROL DEVICES
- PROPOSED ROADWAY
- EXISTING ROADWAY
- FLUSH VALVE
- FIRE HYDRANT

GENERAL NOTES:

1. THE LOCATIONS OF EXISTING UNDERGROUND UTILITIES ARE SHOWN IN AN APPROXIMATE WAY ONLY. THE CONTRACTOR SHALL DETERMINE THE EXACT LOCATION OF ALL EXISTING UTILITIES BEFORE COMMENCING WORK AND AGREES TO BE FULLY RESPONSIBLE FOR ANY AND ALL DAMAGES THAT MIGHT BE OCCASIONED BY THE FAILURE TO EXACTLY LOCATE AND PRESERVE ANY AND ALL UNDERGROUND UTILITIES. WHEN THE CONTRACTOR IS USING TRENCHLESS INSTALLATION METHODS, THE CONTRACTOR SHALL LOCATE ALL UTILITIES FOR THE ENTIRE LENGTH OF THE INSTALLATION PRIOR TO ANY ACTIVITIES.
2. EXISTING 16" AND 12" PVC WATER MAIN(S) IS TO BE PROTECTED AND REMAIN IN SERVICE UNTIL THE NEW 16" AND 12" MAIN(S) IS CONSTRUCTED, TESTED, APPROVED AND SERVICE LINES RECONNECTED AND THE NEW MAIN IS PLACED IN SERVICE.
3. EXISTING WATER SERVICE LINES AND METERS ARE TO BE PROTECTED AND REMAIN IN SERVICE UNTIL NEW SERVICE LINES ARE CONSTRUCTED, TESTED, APPROVED AND RECONNECTED AND IN SERVICE.
4. EXISTING WATER MAINS THAT ARE TO BE ABANDONED IN PLACE AND ARE UNDER THE PROPOSED ROADWAY ARE TO BE CUT, CAPPED, AND FILLED WITH FLOWABLE FILL. EXISTING WATER LINES THAT ARE TO BE ABANDONED IN PLACE AND ARE NOT UNDER THE PROPOSED ROADWAY WILL BE CAPPED.
5. IF THERE ARE TREES WITHIN THE PROJECT LIMITS, THE CONTRACTOR IS TO PROTECT THE TREE ROOT ZONES DURING CONSTRUCTION.
6. ANY DISCREPANCIES FROM WHAT IS SHOWN SHALL BE IMMEDIATELY BROUGHT TO THE ATTENTION OF THE ENGINEER.

PROFILE SCALE
1"=20' HORIZ.
1"=2' VERT.

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16" WATERLINE "A" - PLAN AND PROFILE

INNER LOOP @ CENTRAL MAINTENANCE
16" WATERLINE RELOCATION
WILLIAMSON COUNTY, TEXAS

WILLIAMSON COUNTY 1848

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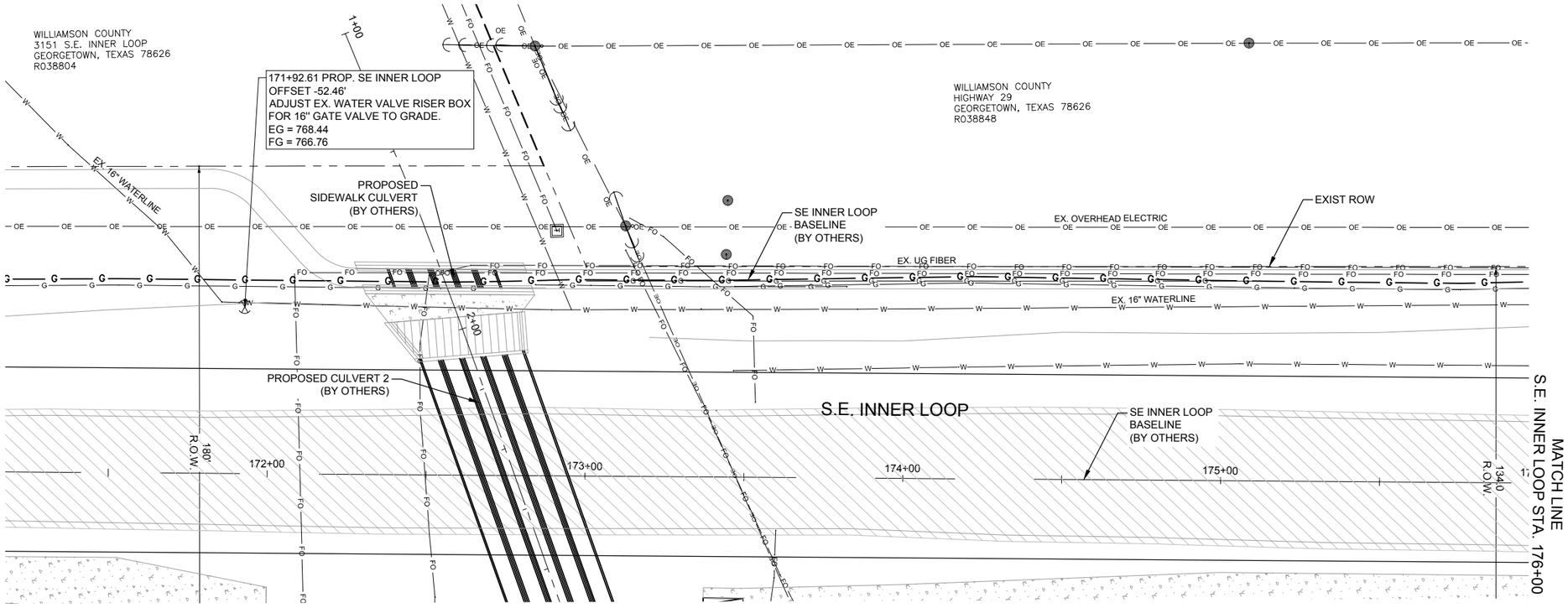

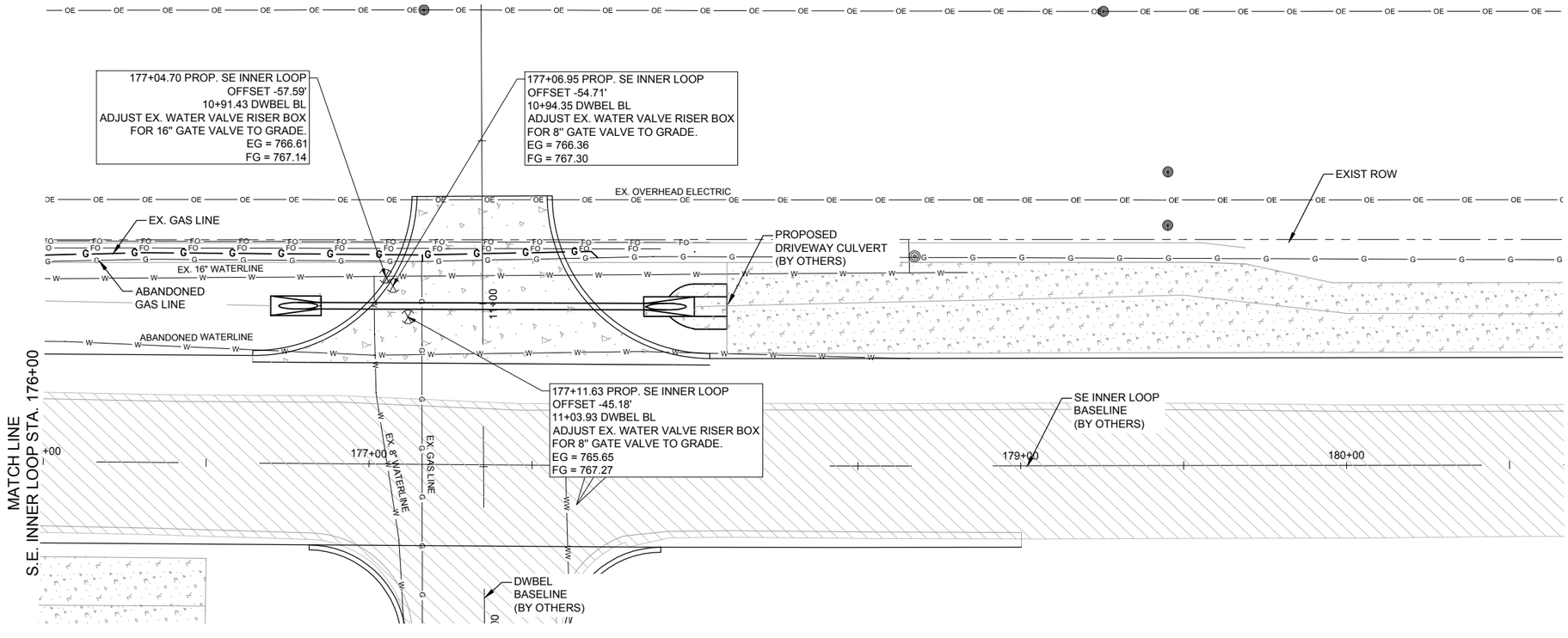

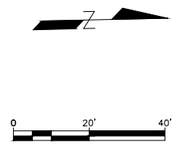

LEGEND

- PROP. WATER LINE
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- W — W — WATER LINE
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- PROPOSED ROADWAY
- EXISTING ROADWAY
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2. EXISTING 16" AND 12" PVC WATER MAIN(S) IS TO BE PROTECTED AND REMAIN IN SERVICE UNTIL THE NEW 16" AND 12" MAIN(S) IS CONSTRUCTED, TESTED, APPROVED AND SERVICE LINES RECONNECTED AND THE NEW MAIN IS PLACED IN SERVICE.
3. EXISTING WATER SERVICE LINES AND METERS ARE TO BE PROTECTED AND REMAIN IN SERVICE UNTIL NEW SERVICE LINES ARE CONSTRUCTED, TESTED, APPROVED AND RECONNECTED AND IN SERVICE.
4. EXISTING WATER MAINS THAT ARE TO BE ABANDONED IN PLACE AND ARE UNDER THE PROPOSED ROADWAY ARE TO BE CUT, CAPPED, AND FILLED WITH FLOWABLE FILL. EXISTING WATER LINES THAT ARE TO BE ABANDONED IN PLACE AND ARE NOT UNDER THE PROPOSED ROADWAY WILL BE CAPPED.
5. IF THERE ARE TREES WITHIN THE PROJECT LIMITS, THE CONTRACTOR IS TO PROTECT THE TREE ROOT ZONES DURING CONSTRUCTION.
6. ANY DISCREPANCIES FROM WHAT IS SHOWN SHALL BE IMMEDIATELY BROUGHT TO THE ATTENTION OF THE ENGINEER.

PROFILE SCALE
1"=20' HORIZ.
1"=2' VERT.

REV. NO.	REVISION DESCRIPTION	APPROVED BY:	DATE

Bid 1706-168

CobbFendley
TBPE NO. 274 / TBPLS NO. 10046701
505 EAST HUNTLAND DRIVE, SUITE 100
AUSTIN, TEXAS 78752
512.834.9788 | FAX 512.834.7727
WWW.COBBFENDLEY.COM

VALVE ADJUSTMENTS TO GRADE

INNER LOOP @ CENTRAL MAINTENANCE
16" WATERLINE RELOCATION
WILLIAMSON COUNTY, TEXAS

WILLIAMSON COUNTY 1848

PROJ. NO.	1403-088-02-09F
DESIGN:	G. LITTLEFIELD
DRAWN:	G. LITTLEFIELD
CHECK:	J. HASTINGS
APPR:	L. PARISHER
DATE:	JULY 23, 2017

STATE OF TEXAS
JAMES LANCE PARISHER
106221
LICENSED
PROFESSIONAL ENGINEER
06/23/2017

THESE DESIGN DOCUMENTS ARE NOT TO BE USED FOR CONSTRUCTION PRIOR TO REGULATORY SIGNATURE AND PERMIT.

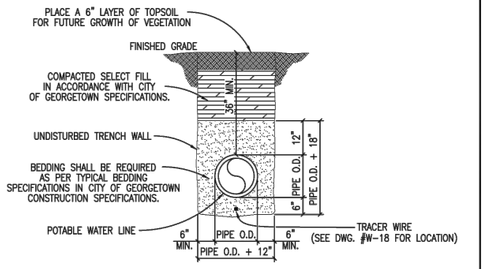
SHEET
C-102
6 of 7

Dwg. Info: G:\CFA\2014\0308801_Williamson_County_2013_Road_Bond\MUN\18 Inner Loop – Central Maintenance\DESIGN\C-101-PP01.DWG – Tab: ADJUSTMENTS – Plotted: 6/28/2017 4:11 PM By: HARSHA SHETTY

Bid 1706-168

Williamson County, Texas

Dwg Info: G:\CFA\2014\0308801_Williamson_County_2013_Road_Bond\MUN\18 Inner Loop - Central Maintenance\DESIGN\C-501-DETL-COGT.dwg - Tab: DETL-01 - Plotted: 6/27/2017 3:56 PM By: HARSHA SHETTY

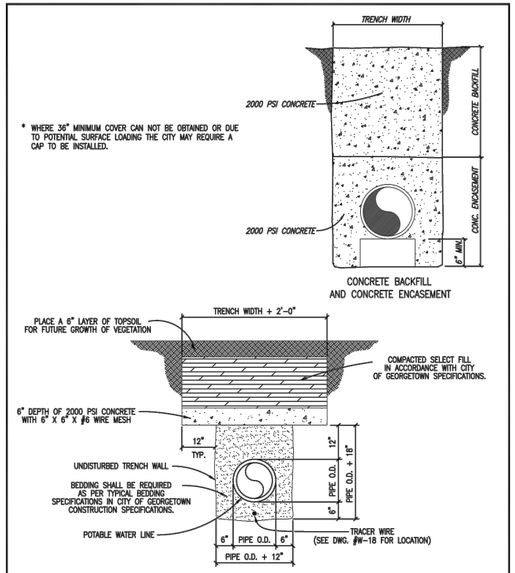


TRENCH WIDTHS
*PIPE LESS THAN 20" DIAMETER
1'-0" + PIPE O.D.
*20" DIAMETER PIPE AND LARGER
2'-0" + PIPE O.D.

The Architect/Engineer assumes responsibility for appropriate use of this standard.

CITY OF GEORGETOWN
CONSTRUCTION STANDARDS AND DETAILS
TRENCH AND EMBEDMENT DETAIL UNDER NON-PAVED AREAS

ADOPTED 6/21/2006
W02
SCALE: NTS | DATE: 1/2003
DRAWN BY: MRS | APPROVED BY: TRB

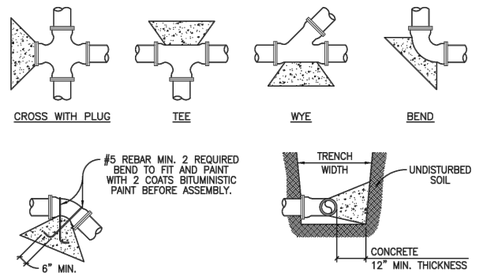


TRENCH WIDTHS
*PIPE LESS THAN 20" DIAMETER
1'-0" + PIPE O.D.
*20" DIAMETER PIPE AND LARGER
2'-0" + PIPE O.D.

The Architect/Engineer assumes responsibility for appropriate use of this standard.

CITY OF GEORGETOWN
CONSTRUCTION STANDARDS AND DETAILS
CONCRETE TRENCH CAP DETAIL

ADOPTED 6/21/2006
W02A
SCALE: NTS | DATE: 1/2003
DRAWN BY: MRS | APPROVED BY: TRB



*DEADMAN — TYPICAL SECTION

ALL THRUST BLOCKS SHALL BE FORMED. LAID FORMS SHALL BE INSPECTED BY THE CITY OF GEORGETOWN PRIOR TO THE POURING OF CONCRETE AND SHALL ALSO BE INSPECTED BY THE CITY OF GEORGETOWN PRIOR TO COVERING. TYPICAL LOCATIONS WHICH REQUIRE CONCRETE REACTION (THRUST) BLOCKS, FOR PRESSURE MAINS FOUR INCHES (4") AND GREATER. CONCRETE SHALL HAVE 2,500 P.S.I. MINIMUM STRENGTH AT TWENTY EIGHT (28) DAYS AND BEAR AGAINST UNDISTURBED STABLE SOILS, AREA OF CONTACT SHALL BE GOVERNED BY PIPE SIZE, MAXIMUM PRESSURE IN PIPE, AND BEARING CAPACITY OF SOIL. PROTECT FITTINGS, BOLTS, ETC. BY COVERING WITH VISQUEEN OR OTHER ACCEPTABLE MATERIAL. CONCRETE SHALL BE A MINIMUM OF TWELVE INCHES (12") THICK.

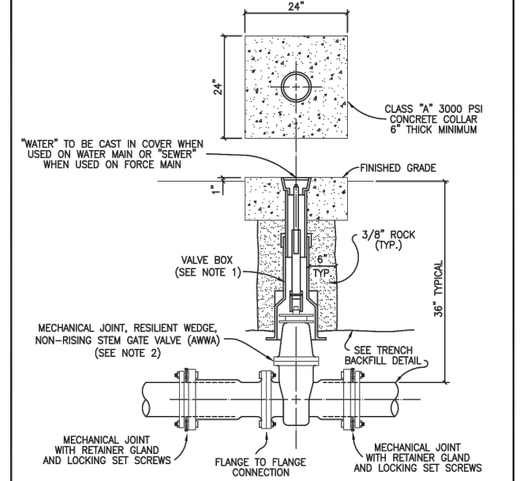
PIPE SIZE	THRUST BLOCK AREA REQUIRED	PIPE SIZE	THRUST BLOCK AREA REQUIRED	REMARKS
4"	2.0 SQ. FT.	18"	30.0 SQ. FT.	VALUES ARE FOR 90° BENDS, BASED ON 2000 P.S.F. SAFE BEARING LOAD AND PIPE PRESSURE OF 150 P.S.I. PLUS 33% SAFETY FACTOR FOR OTHER SOILS AND PRESSURES, THE AREA REQUIRED IS IN DIRECT PROPORTION.
6"	4.0 SQ. FT.	20"	37.0 SQ. FT.	
8"	6.6 SQ. FT.	24"	53.0 SQ. FT.	
10"	10.0 SQ. FT.	27"	80.0 SQ. FT.	
12"	14.0 SQ. FT.	30"	98.0 SQ. FT.	
14"	18.0 SQ. FT.	36"	127.0 SQ. FT.	
16"	24.0 SQ. FT.			

* THE ENGINEER OF RECORD SHALL CALCULATE THE SIZE OF THE DEADMAN REQUIRED AS WELL AS ANY INSTALLATION WHICH IS NOT COVERED BY THE ABOVE.

The Architect/Engineer assumes responsibility for appropriate use of this standard.

CITY OF GEORGETOWN
CONSTRUCTION STANDARDS AND DETAILS
TYPICAL THRUST BLOCKS FOR WATER AND FORCE MAIN

ADOPTED 6/21/2006
W11
SCALE: NTS | DATE: 1/2003
DRAWN BY: MRS | APPROVED BY: TRB



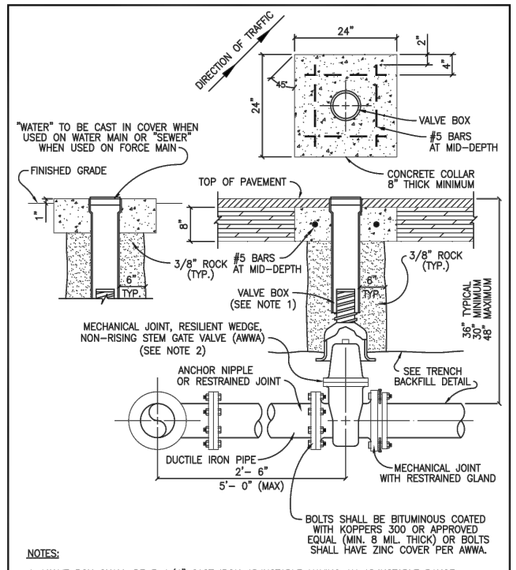
NOTES:

1. SEE VALVE SETTING DETAIL, DWG. #W-07.
2. ACCEPTABLE GATE VALVES ARE:
   A. MUELLER – 2360 SERIES
   B. CLOW

The Architect/Engineer assumes responsibility for appropriate use of this standard.

CITY OF GEORGETOWN
CONSTRUCTION STANDARDS AND DETAILS
INLINE VALVE INSTALLATION

ADOPTED 6/21/2006
W21
SCALE: NTS | DATE: 1/2003
DRAWN BY: MRS | APPROVED BY: TRB



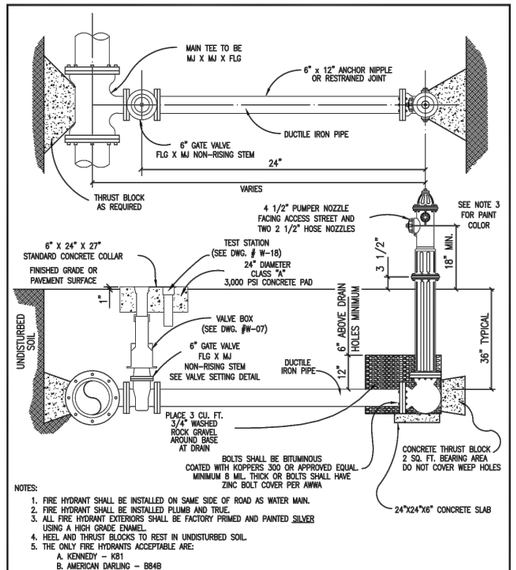
NOTES:

1. VALVE BOX SHALL BE 5 1/4" CAST IRON ADJUSTABLE HAVING AN ADJUSTABLE RANGE OF + OR – 6 INCHES FROM INSTALLED FINISH GRADE.
2. ACCEPTABLE GATE VALVES ARE:
   A. AMERICAN FLOW CONTROL – SERIES 2500
   B. MUELLER – 2360 SERIES
   C. CLOW

The Architect/Engineer assumes responsibility for appropriate use of this standard.

CITY OF GEORGETOWN
CONSTRUCTION STANDARDS AND DETAILS
TYPICAL VALVE SETTING

ADOPTED 6/21/2006
W07
SCALE: NTS | DATE: 1/2003
DRAWN BY: MRS | APPROVED BY: TRB



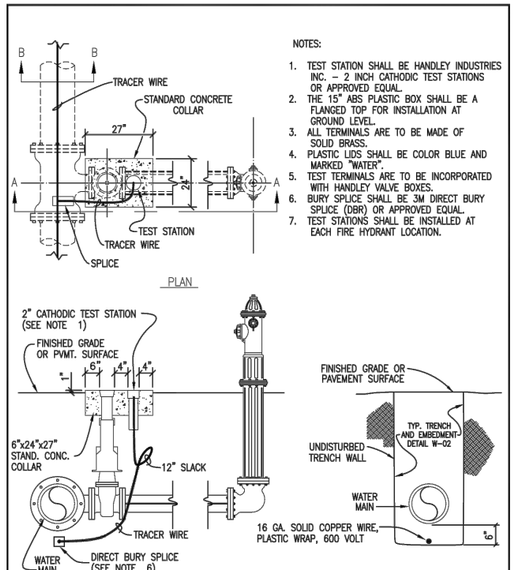
NOTES:

1. FIRE HYDRANT SHALL BE INSTALLED ON SAME SIDE OF ROAD AS WATER MAIN.
2. FIRE HYDRANT SHALL BE INSTALLED PLUMB AND TRUE.
3. ALL FIRE HYDRANT EXTERIORS SHALL BE FACTORY PRIMED AND PAINTED SILVER USING A HIGH GRADE ENAMEL.
4. HEEL AND THRUST BLOCKS TO REST IN UNDISTURBED SOIL.
5. THE ONLY FIRE HYDRANTS ACCEPTABLE ARE:
   A. KENNEDY – K81
   B. AMERICAN DARLING – B84B
   C. CLOW MEDALLION
6. DOUBLE BLUE REFLECTOR "HYE-LITES" BRAND, MANUFACTURED BY PAVEMENT MARKERS INC. TO BE INSTALLED AT CENTERLINE OF STREET PERPENDICULAR TO HYDRANT.
7. ALL METALLIC PIPES AND FITTINGS SHALL BE WRAPPED WITH 8 MIL. POLYETHELENE FILM.

The Architect/Engineer assumes responsibility for appropriate use of this standard.

CITY OF GEORGETOWN
CONSTRUCTION STANDARDS AND DETAILS
TYPICAL FIRE HYDRANT INSTALLATION

ADOPTED 6/21/2006
W10
SCALE: NTS | DATE: 1/2003
DRAWN BY: MRS | APPROVED BY: TRB



NOTES:

1. TEST STATION SHALL BE HANDLEY INDUSTRIES INC. – 2 INCH CATHODIC TEST STATIONS OR APPROVED EQUAL.
2. THE 15" ABS PLASTIC BOX SHALL BE A FLANGED TOP FOR INSTALLATION AT GROUND LEVEL.
3. ALL TERMINALS ARE TO BE MADE OF SOLID BRASS.
4. PLASTIC LIDS SHALL BE COLOR BLUE AND MARKED "WATER".
5. TEST TERMINALS ARE TO BE INCORPORATED WITH HANDLEY VALVE BOXES.
6. BURY SPLICE SHALL BE 3M DIRECT BURY SPLICE (DBR) OR APPROVED EQUAL.
7. TEST STATIONS SHALL BE INSTALLED AT EACH FIRE HYDRANT LOCATION.

The Architect/Engineer assumes responsibility for appropriate use of this standard.

CITY OF GEORGETOWN
CONSTRUCTION STANDARDS AND DETAILS
TRACER WIRE INSTALLATION AND TEST STATION LOCATION

ADOPTED 6/21/2006
W18
SCALE: NTS | DATE: 1/2003
DRAWN BY: MRS | APPROVED BY: TRB

REV. NO.	REVISION DESCRIPTION	APPROVED BY:	DATE

CobbFendley
TBPE NO. 274 / TBPLS NO. 10046701
505 EAST HUNTLAND DRIVE, SUITE 100
AUSTIN, TEXAS 78752
512.834.9788 | FAX 512.834.7727
WWW.COBBFENDLEY.COM

STANDARD WATER UTILITY DETAILS - SHEET 1
INNER LOOP @ CENTRAL MAINTENANCE
16" WATERLINE RELOCATION
WILLIAMSON COUNTY, TEXAS

WILLIAMSON COUNTY 1848

PROJ. NO. 1403-088-02-09F
DESIGN: G. LITTLEFIELD
DRAWN: G. LITTLEFIELD
CHECK: J. HASTINGS
APPR: L. PARISHER
DATE: JULY 23, 2017

STATE OF TEXAS
JAMES LANCE PARISHER
106221
LICENSED
PROFESSIONAL ENGINEER
06/23/2017

THESE DESIGN DOCUMENTS ARE NOT TO BE USED FOR CONSTRUCTION PRIOR TO REGULATORY SIGNATURE AND PERMIT

SHEET
C-501
7 of 7

7/18/2017 10:58 AM

BID FORM
WILLIAMSON COUNTY, TEXAS

PROJECT: **1706-168 INNER LOOP IMPROVEMENTS** **BIDDER:** _____

Full compensation for compliance with each and every provision of the Request for Bids, the Bid, the Specifications, and the Contract will be considered as included in the unit prices for the work set forth below, and no separate payment will be made for compliance with each and every provision of the Request for Bids, the Bid, the Specifications, and the Contract, unless separate payment is expressly provided for therein.

BID ITEM	TECH SPEC[1]	DESCRIPTION	BID QUANTITY	UNIT MEASURE	UNIT COST	AMOUNT BID
1	100-6002	PREPARING ROW	71.4	STA		$ -
2	104-6009	REMOVING CONC (RIPRAP)	511	SY		$ -
3	104-6015	REMOVING CONC (SIDEWALKS)	301	SY		$ -
4	104-6017	REMOVING CONC (DRIVEWAYS)	762	SY		$ -
5	104-6022	REMOVING CONC (CURB AND GUTTER)	116	SY		$ -
6	104-6029	REMOVING CONC (CURB OR CURB & GUTTER)	380	LF		$ -
7	105-6036	REMOVING STAB BASE & ASPH PAV (15"-20")	1157	SY		$ -
8	110-6001	EXCAVATION (ROADWAY)	10076	CY		$ -
9	110-6002	EXCAVATION (CHANNEL)	785	CY		$ -
10	110-6003	EXCAVATION (SPECIAL)	9368	CY		$ -
11	132-6003	EMBANKMENT (FINAL) (ORD COMP) (TY B)	18077	CY		$ -
12	160-6004	FURNISHING AND PLACING TOPSOIL (6")	9569	SY		$ -
13	160-WC02	FURNISHING AND PLACING TOPSOIL (4")	51516	SY		$ -
14	161-WC01	EROSION CONTROL COMPOST (3")	12878	SY		$ -
15	162-WC103	MULCH TOPDRESSING (5")	12878	SY		$ -
16	164-WC04	SEEDING FOR EROSION CONTROL (TEMP) (COOL) (TY 4)	28360	SY		$ -

[1]Refer to the Technical Specifications section for a description of the specific reference number.

BID FORM
WILLIAMSON COUNTY, TEXAS

PROJECT: 1706-168 INNER LOOP IMPROVEMENTS **BIDDER:** _____

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BID ITEM	TECH SPEC[1]	DESCRIPTION	BID QUANTITY	UNIT MEASURE	UNIT COST	AMOUNT BID
17	164-WC05	SEEDING FOR EROSION CONTROL (PERM) (WARM) (TY 5)	54540	SY		$ -
18	164-WC07	SEEDING FOR EROSION CONTROL (TEMP & PERM) (TY 7)	1767	SY		$ -
19	164-WC010	SEEDING FOR EROSION CONTROL (TEMP) (WARM) (TY 10)	30543	SY		$ -
20	166-6002	FERTILIZER	3.4	TON		$ -
21	168-WC01	VEGETATIVE WATERING	2243	MG		$ -
22	169-6001	SOIL RETENTION BLANKETS (CL 1) (TY A)	9236	SY		$ -
23	247-6044	FL BS (CMP IN PLC) (TY A GR 4) (FNAL POS)	6193	CY		$ -
24	310-6001	PRIME COAT (MULTI OPTION)	3907	GAL		$ -
25	316-6193	AGGR (TY-D GR-5 SAC-B)	246	CY		$ -
26	316-6413	ASPH (AC-15P, HFRS-2P OR CRS-2P)	10459	GAL		$ -
27	341-6008	D-GR HMA TY-B PG64-22	3907	TON		$ -
28	341-6027	D-GR HMA TY-C SAC-B PG70-22	5042	TON		$ -
29	341-6066	D-GR HMA TY-C PG70-22 (LEVEL-UP)	462	TON		$ -
30	351-6001	FLEXIBLE PAVEMENT STRUCTURE REPAIR (5")	1830	SY		$ -
31	351-6011	FLEXIBLE PAVEMENT STRUCTURE REPAIR (18")	2186	SY		$ -
32	354-6021	PLANE ASPH CONC PAV (0" TO 2")	420	SY		$ -

[1]Refer to the Technical Specifications section for a description of the specific reference number.

BID FORM
WILLIAMSON COUNTY, TEXAS

PROJECT: 1706-168 INNER LOOP IMPROVEMENTS **BIDDER:** _____

Full compensation for compliance with each and every provision of the Request for Bids, the Bid, the Specifications, and the Contract will be considered as included in the unit prices for the work set forth below, and no separate payment will be made for compliance with each and every provision of the Request for Bids, the Bid, the Specifications, and the Contract, unless separate payment is expressly provided for therein.

BID ITEM	TECH SPEC[1]	DESCRIPTION	BID QUANTITY	UNIT MEASURE	UNIT COST	AMOUNT BID
33	400-6005	CEM STABIL BKFL	715	CY		$ -
34	400-6006	CUT & RESTORING PAV	45	SY		$ -
35	400-6008	CUT & RESTORE ASPH PAVING	110	SY		$ -
36	401-6001	FLOWABLE BACKFILL	154	CY		$ -
37	402-6001	TRENCH EXCAVATION PROTECTION	97	LF		$ -
38	403-6001	TEMPORARY SPL SHORING	2930	SF		$ -
39	416-6088	DRILL SHAFT (RDWY ILL POLE) (24 IN)	40	LF		$ -
40	420-6141	CL C CONC (CURB)	2.7	CY		$ -
41	432-6002	RIPRAP (CONC) (5 IN)	615	CY		$ -
42	432-6024	RIPRAP (STONE COMMON)(DRY)(12 IN)	11	CY		$ -
43	432-6027	RIPRAP (STONE COMMON)(DRY)(24 IN)	394	CY		$ -
44	432-6032	RIPRAP (STONE PROTECTION)(15 IN)	128	CY		$ -
45	450-6048	RAIL (HANDRAIL) (TY B)	255	LF		$ -
46	460-6012	CMP AR (GAL STL DES-5)	93	LF		$ -
47	462-6006	CONC BOX CULV (5 FT X 2 FT)	739	LF		$ -
48	462-6007	CONC BOX CULV (5 FT X 3 FT)	24	LF		$ -

[1]Refer to the Technical Specifications section for a description of the specific reference number.

BID FORM
WILLIAMSON COUNTY, TEXAS

PROJECT: 1706-168 INNER LOOP IMPROVEMENTS **BIDDER:** _____

Full compensation for compliance with each and every provision of the Request for Bids, the Bid, the Specifications, and the Contract will be considered as included in the unit prices for the work set forth below, and no separate payment will be made for compliance with each and every provision of the Request for Bids, the Bid, the Specifications, and the Contract, unless separate payment is expressly provided for therein.

BID ITEM	TECH SPEC[1]	DESCRIPTION	BID QUANTITY	UNIT MEASURE	UNIT COST	AMOUNT BID
49	464-6003	RC PIPE (CL III) (18 IN)	452	LF		$ -
50	464-6005	RC PIPE (CL III) (24 IN)	273	LF		$ -
51	464-6008	RC PIPE (CL III)(36 IN)	146	LF		$ -
52	464-6009	RC PIPE (CL III)(42 IN)	434	LF		$ -
53	464-6010	RC PIPE (CL III)(48 IN)	350	LF		$ -
54	464-6024	RC PIPE (CL V)(12 IN)	37	LF		$ -
55	464-6025	RC PIPE (CL V) (18 IN)	349	LF		$ -
56	464-6026	RC PIPE (CL V) (24 IN)	234	LF		$ -
57	465-6002	MANH (COMPL)(PRM)(48IN)	3	EA		$ -
58	465-6126	INLET (COMPL)(PSL)(FG)(3FTX3FT-3FTX3FT)	1	EA		$ -
59	465-6128	INLET (COMPL)(PSL)(FG)(4FTX4FT-4FTX4FT)	2	EA		$ -
60	465-6153	INLET (COMPL)(PAZD)(RC)(4FTX4FT)	1	EA		$ -
61	465-9901	WQ RISER STRUCTURE	2	EA		$ -
62	466-6178	WINGWALL (PW-1) (HW=3 FT)	2	EA		$ -
63	466-6179	WINGWALL (PW-1) (HW=4 FT)	4	EA		$ -
64	467-6326	SET (TY II) (12 IN) (RCP) (6:1) (P)	2	EA		$ -

[1]Refer to the Technical Specifications section for a description of the specific reference number.

BID FORM
WILLIAMSON COUNTY, TEXAS

PROJECT: 1706-168 INNER LOOP IMPROVEMENTS **BIDDER:** _____

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BID ITEM	TECH SPEC[1]	DESCRIPTION	BID QUANTITY	UNIT MEASURE	UNIT COST	AMOUNT BID
65	467-6358	SET (TY II) (18 IN) (RCP) (4:1) (C')	4	EA		$ -
66	467-6359	SET (TY II) (18 IN) (RCP) (4: 1) (P)	4	EA		$ -
67	467-6363	SET (TY II) (18 IN) (RCP) (6: 1) (P)	18	EA		$ -
68	467-6388	SET (TY II) (24 IN) (RCP) (3:1) (C)	1	EA		$ -
69	467-6391	SET (TY II) (24 IN) (RCP) (4: 1) (P)	3	EA		$ -
70	467-6395	SET (TY II) (24 IN) (RCP) (6: 1) (P)	5	EA		$ -
71	467-6450	SET (TY II) (36 IN) (RCP) (4:1) (C)	1	EA		$ -
72	467-6461	SET (TY II) (42 IN) (RCP) (3:1) (C)	5	EA		$ -
73	467-6465	SET (TY II) (42 IN) (RCP) (6:1) (C)	5	EA		$ -
74	467-6477	SET (TY II) (48 IN) (RCP) (4:1) (C)	9	EA		$ -
75	467-6479	SET (TY II) (48 IN) (RCP) (6:1) (C)	9	EA		$ -
76	467-6559	SET (TY II) (DES 5) (CMP) (6:1) (C')	14	EA		$ -
77	480-6001	CLEAN EXIST CULVERTS	2	EA		$ -
78	481-6023	PIPE (PVC) (SCH 80) (6 IN)	69	LF		$ -
79	496-6004	REMOV STR (SET)	21	EA		$ -
80	496-6006	REMOV STR (HEADWALL)	1	EA		$ -

[1]Refer to the Technical Specifications section for a description of the specific reference number.

BID FORM
WILLIAMSON COUNTY, TEXAS

PROJECT: 1706-168 INNER LOOP IMPROVEMENTS **BIDDER:** _____

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BID ITEM	TECH SPEC[1]	DESCRIPTION	BID QUANTITY	UNIT MEASURE	UNIT COST	AMOUNT BID
81	496-6007	REMOV STR (PIPE)	480	LF		$ -
82	496-6008	REMOV STR (BOX CULVERT)	18	LF		$ -
83	496-6045	REMOV STR (FLAG POLE)	1	EA		$ -
84	500-6001	MOBILIZATION	1	LS		$ -
85	502-6001	BARRICADES, SIGNS AND TRAFFIC HANDLING	10	MO		$ -
86	506-6002	ROCK FILTER DAMS (INSTALL) (TY 2)	320	LF		$ -
87	506-6003	ROCK FILTER DAMS (INSTALL) (TY 3)	106	LF		$ -
88	506-6011	ROCK FILTER DAMS (REMOVE)	426	LF		$ -
89	506-6020	CONSTRUCTION EXITS (INSTALL) (TY 1)	452	SY		$ -
90	506-6024	CONSTRUCTION EXITS (REMOVE)	452	SY		$ -
91	506-6038	TEMP SEDMT CONT FENCE (INSTALL)	2549	LF		$ -
92	506-6039	TEMP SEDMT CONT FENCE (REMOVE)	2549	LF		$ -
93	506-6041	BIODEG EROSN CONT LOGS (INSTL) (12")	4752	LF		$ -
94	506-6043	BIODEG EROSN CONT LOGS (REMOVE)	4752	LF		$ -
95	508-6001	CONSTRUCTING DETOURS	481	SY		$ -
96	512-6009	PORT CTB (FUR & INST) (LOW PROF) (TY 1)	2860	LF		$ -

[1]Refer to the Technical Specifications section for a description of the specific reference number.

BID FORM
WILLIAMSON COUNTY, TEXAS

PROJECT: 1706-168 INNER LOOP IMPROVEMENTS **BIDDER:** _____

Full compensation for compliance with each and every provision of the Request for Bids, the Bid, the Specifications, and the Contract will be considered as included in the unit prices for the work set forth below, and no separate payment will be made for compliance with each and every provision of the Request for Bids, the Bid, the Specifications, and the Contract, unless separate payment is expressly provided for therein.

BID ITEM	TECH SPEC[1]	DESCRIPTION	BID QUANTITY	UNIT MEASURE	UNIT COST	AMOUNT BID
97	512-6010	PORT CTB (FUR & INST) (LOW PROF) (TY 2)	160	LF		$ -
98	512-6033	PORT CTB (MOVE) (LOW PROF) (TY 1)	180	LF		$ -
99	512-6034	PORT CTB (MOVE) (LOW PROF) (TY 2)	40	LF		$ -
100	512-6057	PORT CTB (REMOVE) (LOW PROF) (TY 1)	2860	LF		$ -
101	512-6058	PORT CTB (REMOVE) (LOW PROF) (TY 2)	160	LF		$ -
102	529-6008	CONC CURB & GUTTER (TY II)	162	LF		$ -
103	529-6030	CONC CURB & GUTTER (VALLEY GUTTER)	1752	LF		$ -
104	530-6004	DRIVEWAYS (CONC)	2692	SY		$ -
105	530-6005	DRIVEWAYS (ACP)	3122	SY		$ -
106	531-6002	CONC SIDEWALKS (5")	1405	SY		$ -
107	531-6003	CONC SIDEWALKS (6")	1838	SY		$ -
108	531-6005	CURB RAMPS (TY 2)	1	EA		$ -
109	531-6010	CURB RAMPS (TY 7)	2	EA		$ -
110	610-6007	REMOVE RD IL ASM (SHOE-BASE)	2	EA		$ -
111	618-6016	CONDT (PVC) (SCH 40) (1")	422	LF		$ -
112	618-6033	CONDT (PVC) (SCH 40) (4")	369	LF		$ -

[1]Refer to the Technical Specifications section for a description of the specific reference number.

BID FORM
WILLIAMSON COUNTY, TEXAS

PROJECT: 1706-168 INNER LOOP IMPROVEMENTS **BIDDER:** _____

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BID ITEM	TECH SPEC[1]	DESCRIPTION	BID QUANTITY	UNIT MEASURE	UNIT COST	AMOUNT BID
113	618-6034	CONDT (PVC) (SCH 40) (4") (BORE)	104	LF		$ -
114	618-6042	CONDT (PVC)(SCH 80)(1 1/4")	40	LF		$ -
115	620-6006	ELECT CONDR (NO. 10) INSULATED	2079	LF		$ -
116	620-6007	ELEC CONDR (NO. 8) BARE	40	LF		$ -
117	620-6008	ELEC CONDR (NO. 8) INSULATED	80	LF		$ -
118	624-6001	GROUND BOX TY A (122311)	2	EA		$ -
119	624-6010	GROUND BOX TY D (162922) W/APRON	6	EA		$ -
120	628-6011	ELC SRV TY A 120/240 060(NS)SS(E)TP(O)	2	EA		$ -
121	636-6001	ALUMINUM SIGNS (TY A)	88	SF		$ -
122	636-6007	REPLACE EXISTING ALUMINUM SIGNS(TY A)	13.75	SF		$ -
123	644-6056	IN SM RD SN SUP&AM TYTWT(1)UA(P)	6	EA		$ -
124	644-6060	IN SM RD SN SUP&AM TYTWT(1)WS(P)	24	EA		$ -
125	644-6061	IN SM RD SN SUP&AM TY TWT (1) WS (T)	2	EA		$ -
126	644-6070	RELOCATE SM RD SN SUP&AM TY S80	2	EA		$ -
127	644-6071	RELOCATE SM RD SN SUP&AM TY TWT	7	EA		$ -
128	644-6076	REMOVE SM RD SN SUP&AM	13	EA		$ -

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BID FORM
WILLIAMSON COUNTY, TEXAS

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BID ITEM	TECH SPEC[1]	DESCRIPTION	BID QUANTITY	UNIT MEASURE	UNIT COST	AMOUNT BID
129	658-6047	INSTL OM ASSM (OM-2Y)(WC)GND	29	EA		$ -
130	662-6004	WK ZN PAV MRK NON-REMOV (W)4"(SLD)	11395	LF		$ -
131	662-6012	WK ZN PAV MRK NON-REMOV (W)8"(SLD)	587	LF		$ -
132	662-6014	WK ZN PAV MRK NON-REMOV (W)12"(SLD)	20	LF		$ -
133	662-6034	WK ZN PAV MRK NON-REMOV (Y)4"(SLD)	9732	LF		$ -
134	662-6063	WK ZN PAV MRK REMOV (W)4"(SLD)	9044	LF		$ -
135	662-6095	WK ZN PAV MRK REMOV (Y)4"(SLD)	9657	LF		$ -
136	662-6109	WK ZN PAV MRK SHT TERM (TAB) TY W	349	EA		$ -
137	662-6211	WK ZN PAV MRK SHT TERM (TAB) TY Y-2	883	EA		$ -
138	666-6029	REFL PAV MRK TY I (W) 8" (DOT)(090 MIL)	44	LF		$ -
139	666-6035	REFL PAV MRK TY I (W) 8" (SLD)(090 MIL)	932	LF		$ -
140	666-6036	REFL PAV MRK TY I (W)8"(SLD)(100MIL)	1205	LF		$ -
141	666-6042	REFL PAV MRK TY I (W)12"(SLD)(100MIL)	657	LF		$ -
142	666-6047	REFL PAV MRK TY I (W) 24" (SLD)(090 MIL)	24	LF		$ -
143	666-6048	REFL PAV MRK TY I (W)24"(SLD)(100MIL)	121	LF		$ -
144	666-6053	REFL PAV MRK TY I (W) (ARROW)(090 MIL)	10	EA		$ -

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BID FORM
WILLIAMSON COUNTY, TEXAS

PROJECT: 1706-168 INNER LOOP IMPROVEMENTS **BIDDER:** _____

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BID ITEM	TECH SPEC[1]	DESCRIPTION	BID QUANTITY	UNIT MEASURE	UNIT COST	AMOUNT BID
145	666-6054	REFL PAV MRK TY I (W)(ARROW)(100MIL)	25	EA		$ -
146	666-6077	REFL PAV MRK TY I (W) (WORD)(090 MIL)	6	EA		$ -
147	666-6078	REFL PAV MRK TY I (W)(WORD)(100MIL)	9	EA		$ -
148	666-6141	REFL PAV MRK TY I (Y)12"(SLD)(100MIL)	308	LF		$ -
149	666-6170	REFL PAV MRK TY II (W) 4" (SLD)	14877	LF		$ -
150	666-6174	REFL PAV MRK TY II (W) 6" (SLD)	46	LF		$ -
151	666-6176	REFL PAV MRK TY II (W) 8" (DOT)	44	LF		$ -
152	666-6178	REFL PAV MRK TY II (W) 8" (SLD)	2137	LF		$ -
153	666-6180	REFL PAV MRK TY II (W) 12" (SLD)	657	LF		$ -
154	666-6182	REFL PAV MRK TY II (W) 24" (SLD)	145	LF		$ -
155	666-6184	REFL PAV MRK TY II (W) (ARROW)	35	EA		$ -
156	666-6192	REFL PAV MRK TY II (W) (WORD)	15	EA		$ -
157	666-6205	REFL PAV MRK TY II (Y) 4" (BRK)	2694	LF		$ -
158	666-6207	REFL PAV MRK TY II (Y) 4" (SLD)	16994	LF		$ -
159	666-6212	REFL PAV MRK TY II (Y) 12" (SLD)	308	LF		$ -
160	666-6302	RE PM W/RET REQ TY I (W) 4" (SLD) (090MIL)	4898	LF		$ -

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BID FORM
WILLIAMSON COUNTY, TEXAS

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BID ITEM	TECH SPEC[1]	DESCRIPTION	BID QUANTITY	UNIT MEASURE	UNIT COST	AMOUNT BID
161	666-6303	RE PM W/RET REQ TY I (W)4"(SLD)(100MIL)	9671	LF		$ -
162	666-6309	RE PM W/RET REQ TY I (W)6"(SLD)(100MIL)	46	LF		$ -
163	666-6311	RE PM W/RET REQ TY I (Y) 4" (BRK) (090MIL)	828	LF		$ -
164	666-6312	RE PM W/RET REQ TY I (Y)4"(BRK)(100MIL)	1866	LF		$ -
165	666-6314	RE PM W/RET REQ TY I (Y) 4" (SLD) (090MIL)	6411	LF		$ -
166	666-6315	RE PM W/RET REQ TY I (Y)4"(SLD)(100MIL)	10583	LF		$ -
167	668-6055	PRE PM TY B (ACC PRK)(BL&WH)(W/BORDR)LG	2	EA		$ -
168	672-6007	REFL PAV MRKR TY I-C	151	EA		$ -
169	672-6009	REFL PAV MRKR TY II-A-A	585	EA		$ -
170	677-6001	ELIM EXT PAV MRK & MRKS (4")	16488	LF		$ -
171	6001-6001	PORTABLE CHANGEABLE MESSAGE SIGN	80	DAY		$ -
172	9001-9901	IMPERMEABLE LINER	9113	SY		$ -
173	9002-9901	DETENTION POND CONTROL SYSTEM	2	EA		$ -
174	9003-9901	POND ACCESS GATE	2	EA		$ -
175	GT101-1	TRENCH EXCAVATION SAFETY PROTECTION SYSTEM (ALL DEPTHS)	130	LF		$ -
176	GT101-2	PIPE, 6" DIA. DUCTILE IRON CLASS 350 (RESTRAINED), COMPLETE IN PLACE, INCLUDING EXCAVATION AND BACKFILL	5	LF		$ -

[1]Refer to the Technical Specifications section for a description of the specific reference number.

BID FORM
WILLIAMSON COUNTY, TEXAS

PROJECT: 1706-168 INNER LOOP IMPROVEMENTS **BIDDER:** _____

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BID ITEM	TECH SPEC[1]	DESCRIPTION	BID QUANTITY	UNIT MEASURE	UNIT COST	AMOUNT BID
177	GT101-3	PIPE, 16" DUCTILE IRON CLASS 350 (RESTRAINED), COMPLETE IN PLACE, INCLUDING EXCAVATION AND BACKFILL	91	LF		$ -
178	GT101-4	WET CONNECTIONS, 16"X16" DIA.	2	EA		$ -
179	GT101-5	VALVES, GATE 16" DIA.	2	EA		$ -
180	GT101-6	FIRE HYDRANT ASSEMBLY	1	EA		$ -
181	GT101-7	DUCTILE IRON FITTINGS	2	TON		$ -
182	GT101-8	CONCRETE TRENCH CAP, 4 FT. WIDTH	55	LF		$ -
183	GT101-9	ADJUST WATER VALVE BOX TO GRADE	10	EA		$ -
184	GT101-10	RELOCATE OR ADJUST EXISTING FIRE HYDRANT ASSEMBLY	2	EA		$ -
185	WC9030-1	LED DECORATIVE ILLUMINATION ASSEMBLY	5	EA		$ -

NON-BID ITEMS TO BE INCLUDED IN BID AND CONTRACT AMOUNT. DO NOT MAKE CHANGES TO THIS SECTION.

186	341-WC01	FORCE ACCOUNT - ESTIMATED PLACEMENT AND PRODUCTION BONUS / PENTALTY (TY B)	28000	DOL	$ 1.00	$ 28,000.00
187	341-WC02	FORCE ACCOUNT - ESTIMATED PLACEMENT AND PRODUCTION BONUS / PENTALTY (TY C SURFACE)	30000	DOL	$ 1.00	$ 30,000.00
188	585-WC01	FORCE ACCOUNT - ESTIMATED RIDE QUALITY BONUS / PENALTY	5000	DOL	$ 1.00	$ 5,000.00
188	999-WC01	FORCE ACCOUNT	50000	DOL	$ 1.00	$ 50,000.00
189	999-WC02	FORCE ACCOUNT - FIBER RELOCATION	250000	DOL	$ 1.00	$ 250,000.00

[1]Refer to the Technical Specifications section for a description of the specific reference number.

BID FORM
WILLIAMSON COUNTY, TEXAS

PROJECT: **1706-168 INNER LOOP IMPROVEMENTS** **BIDDER:** _____

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BID ITEM	TECH SPEC[1]	DESCRIPTION	BID QUANTITY	UNIT MEASURE	UNIT COST	AMOUNT BID
190	999-WC03	FORCE ACCOUNT - MONUMENT SIGN AND ILLUMINATION POLE	10000	DOL	$ 1.00	$ 10,000.00

TOTAL AMOUNT OF BID

_____ **Dollars and** _____ **Cents** $ 373,000.00

NOTE: THE COURT MAY EITHER REJECT ALL BIDS OR AWARD A CONTRACT TO THE LOWEST AND BEST BID.

[1]Refer to the Technical Specifications section for a description of the specific reference number.

BID AFFIDAVIT

This form must be completed, signed, notarized and returned with Bid package

The undersigned certifies that the IFB and the Bidder's Bid have been carefully reviewed and are submitted as correct and final. Bidder further certifies and agrees to furnish any and/or all goods and/or services upon which prices are extended at the price Bid, and upon the conditions contained in the IFB.

I hereby certify that the foregoing Bid has not been prepared in collusion with any other Bidder or other person or persons engaged in the same line of business prior to the official opening of this Bid. Further, I certify that the Bidder is not now, nor has been for the past six (6) months, directly or indirectly concerned in any pool or agreement or combination, to control the price of services/commodities Bid on, or to influence any person or persons to submit a Bid or not to submit a Bid thereon."

Name of Bidder:	
Address of Bidder:	
Email:	
Telephone:	
Printed Name of Person Submitting Affidavit:	
Signature of Person Submitting Affidavit:	

Cooperative Purchasing Program

Check one of the following options below. A non-affirmative Bid will in no way have a negative impact on the County's evaluation of the Bid.

☐	I will offer the quoted prices to all authorized entities during the term of the County's Contract.
☐	I will not offer the quoted prices to all authorized entities.

If no box is checked, the Bidder agrees to make best efforts in good faith to offer the quoted prices to all authorized entities.

BEFORE ME, the undersigned authority, a Notary Public, personally appeared _____ (*Name of Signer*), who after being by me duly sworn, did depose and say: "I, _____, (*Name of Signer*) am a duly authorized officer of/agent for _____ (*Name of Bidder*) and have been duly authorized to execute the foregoing on behalf of the said _____ (*Name of Bidder*).

SUBSCRIBED AND SWORN to before me by the above-named _____

on this the _____ day of _____, 20_____.

_____

Notary Public in and for

The State of _____

The County of _____

SIGNATURE AND NOTARY NOT REQUIRED IF COMPLETING IN BIDSYNC ELECTRONICALLY.

CONFLICT OF INTEREST QUESTIONNAIRE

For vendor or other person doing business with local governmental entity

Form CIQ

This questionnaire is being filed in accordance with chapter 176 of the Local Government Code by a person doing business with the governmental entity.

By law this questionnaire must be filed with the records administrator of the local government not later than the 7th business day after the date the person becomes aware of facts that require the statement to be filed. See Section 176.006, Local Government Code.

A person commits an offense if the person violates Section 176.006, Local Government Code. An offense under this section is a Class C misdemeanor.

OFFICE USE ONLY

Date Received

1 **Name of person doing business with local governmental entity.**

2 ☐ **Check this box if you are filing an update to a previously filed questionnaire.**

(The law requires that you file an updated completed questionnaire with the appropriate filing authority not later than September 1 of the year for which an activity described in Section 176.006(a), Local Government Code, is pending and not later than the 7th business day after the date the originally filed questionnaire becomes incomplete or inaccurate.)

3 **Describe each affiliation or business relationship with an employee or contractor of the local governmental entity who makes recommendations to a local government officer of the local governmental entity with respect to expenditure of money.**

4 **Describe each affiliation or business relationship with a person who is a local government officer and who appoints or employs a local government officer of the local governmental entity that is the subject of this questionnaire.**

CONFLICT OF INTEREST QUESTIONNAIRE

For vendor or other person doing business with local governmental entity

Form CIQ
Page 2

5 **Name of local government officer with whom filer has affiliation or business relationship.**
(Complete this section only if the answer to A, B, or C is YES.)

This section, item 5 including subparts A, B, C & D, must be completed for each officer with whom the filer has affiliation or other relationship. Attach additional pages to this Form CIQ as necessary.

A. Is the local government officer named in this section receiving or likely to receive taxable income from the filer of the questionnaire?

☐ Yes ☐ No

B. Is the filer of the questionnaire receiving or likely to receive taxable income from or at the direction of the local government officer named in this section AND the taxable income is not from the local governmental entity?

☐ Yes ☐ No

C. Is the filer of this questionnaire affiliated with a corporation or other business entity that the local government officer serves as an officer or director, or holds an ownership of 10 percent or more?

☐ Yes ☐ No

D. Describe each affiliation or business relationship.

6. Describe any other affiliation or business relationship that might cause conflict of interest:

7

Signature of person doing business with the governmental entity	Date

Signature not required if completing in BIDSYNC electronically.

Bidder References

List the last (3) companies or governmental agencies, where the same or similar goods and/or services as contained in this IFB package, were recently provided by Bidder.

Reference 1

Client Name: Location:

Contact Name: Title:

Phone: E-mail

Contract Date To: Contract Date From: Contract Value: $

Scope of Work:

Reference 2

Client Name: Location:

Contact Name: Title:

Phone: E-mail

Contract Date To: Contract Date From: Contract Value: $

Scope of Work:

Reference 3

Client Name: Location:

Contact Name: Title:

Phone: E-mail

Contract Date To: Contract Date From: Contract Value: $

Scope of Work:

Question and Answers for Bid #1706-168 - Inner Loop Improvements

Overall Bid Questions
There are no questions associated with this bid.