Solicitation 1708-186

CR 119 Construction

Bid Designation: Public



Williamson County, Texas

Bid 1708-186
CR 119 Construction

Bid Number	1708-186
Bid Title	CR 119 Construction
Expected Expenditure	**$8,300,000.00** (This price is expected - not guaranteed)
Bid Start Date	In Held
Bid End Date	Oct 25, 2017 11:00:00 AM CDT
Question & Answer End Date	Oct 20, 2017 5:00:00 PM CDT
Bid Contact	Will Hutchinson Purchasing Specialist III 512-**943**-1553 will.hutchinson@wilco.org
Contract Duration	**1 year**
Contract Renewal	Not Applicable
Prices Good for	**365 days**
Pre-Bid Conference	**Oct 11, 2017 2:00:00 PM CDT** **Attendance is optional** **Location: 901 S Austin Avenue** **Georgetown, TX 78626**
Bid Comments	**Construction of 2.3 mile of roadway consisting of grading, flexible base, asphalt pavement, bridge, traffic signal, signing, concrete culvert, and pavement markings.**

Item Response Form

Item	**1708-186--01-01 -** Attach Documents Here
Quantity	**1 each**

Prices are not requested for this item.

Delivery Location **Williamson County, Texas**

No Location Specified

Qty 1

Description
Attach Documents Here

Item	**1708-186--01-02 -** Total Bid Price
Quantity	**1 lump sum**
Unit Price	

Delivery Location **Williamson County, Texas**

No Location Specified

Qty 1

Description
Lump Sum Total here

PUBLIC ANNOUNCEMENT AND GENERAL INFORMATION

WILLIAMSON COUNTY PURCHASING DEPARTMENT
SOLICITATION 1708-186
CR 119 Construction

BIDS MUST BE RECEIVED ON OR BEFORE:
Oct 25, 2017 11:00:00 AM CDT

BIDS WILL BE PUBLICLY OPENED:
Oct 25, 2017 11:00:00 AM 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 – Invitation for Bid (IFB)

SECTION 1 - DEFINITIONS

Addendum/Addenda – means any written or graphic instruments issued by the County prior to the consideration of Bids which modify or interpret the Bid Documents by additions, deletions, clarifications, or corrections.

Agreement/Ensuing Agreement(s) – means the Successful Bidder may be required by the County to sign an additional Agreement containing terms necessary to ensure compliance with the IFB and the Bidder's Bid. Such Ensuing Agreement(s) shall contain the Bid specifications, terms and conditions that are derived from the IFB.

Bid Documents – means the Legal Notice, IFB including attachments, and any Addenda issued by the County prior to the consideration of any Bids.

Bid – means the completed and signed bid form, (sometimes referred to as the Price Sheet), and ALL required forms and documentation listed in the IFB package which have been submitted in accordance with the terms and conditions described in the IFB package. A Bid submitted in accordance with this IFB is irrevocable during the specified period for evaluation and acceptance of Bids unless a waiver is obtained from the Williamson County Purchasing Agent.

Bidder – means a person or entity who submits a Bid in response to this IFB.

Contract – means this IFB and the Bid of the Successful Bidder shall become a Contract between the Successful Bidder and the County once the Successful Bidder's Bid is properly accepted by the Williamson County Commissioners Court.

Commissioner's Court – means the Williamson County Commissioners Court.

County – means Williamson County, a political subdivision of the State of Texas.

Invitation for Bid (IFB) – means this document, together with the attachments thereto and any future Addenda issued by the County.

Successful Bidder – means the liable Bidder to whom the County intends to award the Contract.

SECTION 2 - BID FORMAT AND SUBMISSION

2.1 ORGANIZATION OF BID CONTENTS FOR SUBMITTAL

Each Bid should be organized and items submitted in the order described below:

A. Transmittal Letter. Please see Section 2.3, Transmittal Letter, for more information.

B. Price Sheet.

C. Conflict of Interest Questionnaire. Please see Section 2.2, Conflict of Interest, for more information in regards to this. Please note that even if you deem there to be no Conflict of Interest, this signed questionnaire must be included in your package.

D. References. Please see Section 3.15, References, for more information.

E. Bid Affidavit.

F. Form 1295. Please see Section 2.4, Certificate of Interested Parties – Form 1295.

2.2 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 amended.

As of January 1, 2006, all Bidders are responsible for complying with Local Government Code, Title 5, Subtitle C, Chapter 176. Additional information may be obtained from the County's website at the following link:

http://www.wilco.org/CountyDepartments/Purchasing/ConflictofInterestDisclosure/tabid/689/language/en US/Default.aspx

Each Bidder must disclose any existing or potential conflict of interest relative to the performance of the requirements of this IFB. **Examples of potential conflicts of interest may include an existing business or personal relationship between the Bidder, its principal, or any affiliate or subcontractor with the County or any other entity or person involved in any way with the project that is subject to this IFB**. Similarly, any personal or business relationship between the Bidder, the principals, or any affiliate or subcontractor with any employee, or official of the County or its suppliers must be disclosed. Any such relationship that might be perceived or represented as a conflict must be disclosed. Failure to disclose any such relationship or reveal personal relationships with the County employees or officials may be cause for termination.

The County will decide if an actual or perceived conflict should result in Bid disqualification.

By submitting a Bid in response to this IFB, all Bidders affirm they have not given, nor intend to give, at any time hereafter, any economic opportunity, future employment, gift, loan, gratuity, special discount, trip, favor, or service to a the County public servant or any employee, official or representative of same, in connection with this procurement.

Each Bidder must provide a Conflict of Interest Statement with their Bid Package. Package may be deemed incomplete without this form.

2.3 TRANSMITTAL LETTER

The Bidder should submit a Transmittal Letter that provides the following information:

A. Name and address of individual or business entity submitting the Bid.

B. Name, physical address, email address, business and fax number of the Bidder's principal contact person regarding all contractual matters relating to this IFB.

C. The Bid's Federal Employer Identification Number.

D. If the Proposal being submitted will have an effect on air quality for the County (as it relates to any state, federal, or voluntary air quality standard), then the Respondent is encouraged to provide information in narrative indicating the anticipated air quality impact. See Section 4.36, Air Quality for more information.

2.4 CERTIFICATE OF INTERESTED PARTIES – FORM 1295

As of January 1, 2016, all Successful 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. The law applies only to a Contract of the County on or after January 1, 2016 that either:

A. Requires an action or vote by the Commissioners Court before the Contract may be signed (all contracts that fall under the jurisdiction of the Commissioners Court approval, such as contracts resulting from an Initiation for Bid (IFB), RFP, Request for Qualifications (RFQ), etc., excluding, but not limited to, certain Juvenile Service contracts, contracts funded with Sheriff's seized fun monies, etc.); or
B. Has a value of at least $1,000,000.

By January 1, 2016, the Texas Ethics Commission will make 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

A Respondent must:

A. Use the online application to process the required information on Form 1295.

B. Print a copy of the form which will contain a unique certification number.

C. An authorized agent of the Bidder must sign the printed copy of the form.

D. Have the form notarized.

E. File the completed Form 1295 and certification of filing (scanning and emailing form is sufficient) with Williamson County Purchasing Agent at the time the signed Contract is submitted for approval.

After the Commissioners Court award of the Contract, the County shall notify the Texas Ethics Commission, using the Texas Ethics Commission's filing application, of the receipt of the filed Form 1295 and certification of filing not later than the 30th day after the date the Contract binds all parties to the Contract. The Texas Ethics Commission will post the completed Form 1295 to its website within seven business days after receiving notice from the County.

2.5 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 the County.

2.6 BID SUBMITTAL DEADLINE

The Bid is due no later than the submittal date and time set forth in the Public Announcement and General Information listed in this IFB package. Contents of each Bid shall be submitted in accordance with this IFB.

2.7 DELIVERY OF BIDS

The County uses BidSync to distribute and receive Bids and proposals. It is preferred that Bids submitted electronically through BidSync; however, Bidders can submit a hard copy.

Refer to www.bidsync.com for further information on how to submit electronically.

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 in this IFB package, to:

Williamson County Purchasing Department
Attn: **Bid Name and Number**
901 South Austin Avenue
Georgetown, Texas 78626

Also, all Bidders should list their Name and Address, and the Date of the Bid opening on the outside the box or envelope and note "Sealed Bid Enclosed." The County will not accept any Bids received after the submittal deadline, and shall return such Bids unopened to the Bidder. The County will not accept any responsibility for Bids being delivered by third party carriers.

Bids will be opened publically and the names of Bidders and pricing will be read aloud.

SECTION 3 - INSTRUCTIONS AND GENERAL REQUIREMENTS

3.1 INSTRUCTIONS

Read this document carefully, and follow all instructions and requirements. All Bidders are responsible for fulfilling all requirements and specifications. Be sure to have a clear understanding of this IFB.

General requirements apply to all advertised IFBs; however, these may be superseded, in whole or in part, by the bid specifications, Addenda and modifications issued as a part of this IFB. Be sure your Bid package is complete.

3.2 AMBIGUITY, CONFLICT, OR OTHER ERRORS IN THIS IFB

If a Bidder discovers any ambiguity, conflict, discrepancy, omission or other error in this IFB, the Bidder shall immediately notify the 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 the County prior to the date and time fixed for submission of Bids of an error or ambiguity in the IFB known to the Bidder, or an error or ambiguity that reasonably should have been known to the Bidder, then the Bidder shall be deemed to have waived the error or ambiguity or its later resolution.

The County may also modify the IFB, no later than forty-eight (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 one (1).

3.3 NOTIFICATION OF MOST CURRENT ADDRESS

All Bidders in receipt of this IFB shall notify the Williamson County Purchasing Department of any address changes, contact person changes, and/or telephone number changes no later than forty-eight (48) hours prior to the date and time fixed for submission of Bids.

3.4 SIGNATURE OF BIDDER

A. If the Bidder is a Corporation or Limited Liability Company, the legal name of the Corporation Limited Liability Company shall be provided together with the signature of the officer or officers authorized to sign on behalf of such entity.

B. If the Bidder is a General Partnership, the true name of the firm shall be provided with the signature of each partner authorized to sign.

C. If the Bidder is a Limited Partnership, the name of the Limited Partner's General Partner shall provided with the signature of the officer authorized to sign on behalf of the General Partner.

D. If the Bidder is a Sole Proprietor(s) (individual), each Sole Proprietor(s) shall sign.

E. If signature is by an agent, other than the Sole Proprietor(s) or an officer of a Corporation, Limited Liability Company, General Partner or a member of a General Partnership, a power of attorney equivalent document must be submitted to the Williamson County Purchasing Department.

3.5 ASSUMED BUSINESS NAME

If the Bidder operates business under an Assumed Business Name, the Bidder must have on file with the

Williamson County Clerk a current Assumed Name Certificate and provide a file marked copy of same.

3.6 BID OBLIGATION

The contents of the IFB, Bid, and any clarification thereof submitted by the Successful Bidder shall become part of the contractual obligation and incorporated by reference into the Contract and any Ensuing Agreement(s).

3.7 COMPLIANCE WITH IFB SPECIFICATIONS

It is intended that this IFB describe the requirements and the Bid format in sufficient detail to secure comparable Bids. Failure to comply with all provisions of the IFB may, at the sole discretion of the County, result in disqualification.

3.8 WITHDRAWAL OF BID

The Bidder may withdraw its Bid by submitting a written request with the company letterhead and the signature of an authorized individual, as described in Section 3.4, Signature of Bidder, to the Williamson County Purchasing Department any time prior to the submission deadline.

The Bidder may submit a new Bid prior to the deadline. Alterations of the Bid in any manner will not be considered if submitted after the deadline. Withdrawal of a Bid after the deadline will be subject to written approval of the Williamson County Purchasing Agent.

3.9 EVALUATION AND AWARD

The County reserves the right to use all pertinent information (also learned from sources other than disclosed in the Bid process) that might affect the County's judgment as to the appropriateness of award to the lowest and best evaluated Bid. This information may be appended to the Bid evaluation process results. Information on a Bidder from reliable sources, and not within the Bidder's Bid, may also be noted and made part of the evaluation file. The County shall have sole discretion for determining the reliability of the source.

To ensure the proper and fair evaluation of a solicitation, the County prohibits unsolicited communication initiated by the Bidder to the County Official or Employee evaluating or considering the Bids prior to the time an award has been made. Unsolicited communication may be ground for disqualifying the offending Bidder from consideration or award of the solicitation, or any future solicitation.

Communication between the Bidder and the County will be initiated by the appropriate County Official Employee in order to obtain information or clarification needed to develop a proper and accurate evaluation of the solicitation.

The County intends to award a Contract to the most responsible and responsive Bidder whose Bid will be most advantageous to the County. In accordance with Texas Government Code and Local Government Code, the County may consider, to the extent allowed by law, the following:

A. Price;
B. The Bidder's experience and reputation;
C. Quality of the Bidder's goods and/or services;
D. The Bidder's safety record;
E. The Bidder's proposed personnel;
F. The Bidder's financial capabilities; and
G. Any other relevant factors specifically listed in this IFB or authorized by law.

3.10 CONDISERATION OF LOCATION OF PRINCIPAL OFFICE

Pursuant to Texas Local Government Code, Section 271.905, in purchasing any real property or personal property that is not affixed to real property, if the County receives one or more Bids from a Bidder whose principal place of business is in Williamson County and whose Bid is within three (3) percent of the lowest Bid price received by the County from a Bidder who is not a resident of Williamson County, the County may enter into a contract with:

A. The lowest Bidder; or the Bidder whose principal place of business is in Williamson County if the Commissioners Court determines, in writing, that the local Bidder offers the County the best combination of contract price and additional economic development opportunities Williamson County created by the contract award, including the employment of residents Williamson County and increased tax revenues to Williamson County.

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 goods and/or services covered in this IFB, and to waive informalities or defects in the Bid or to accept such Bid, if it shall deem to be in the best interest of the County.

Awards should be made approximately sixty (60) business days after the Bid opening date. Results may be obtained by viewing the Williamson County vendor portal at the following link:

http://www.wilco.org/CountyDepartments/Purchasing/SearchforaPastBid/tabid/5213/language/en-US/Default.aspx

3.11 RESPONSIBILITY

It is expected that a prospective Bidder will be able to affirmatively demonstrate responsibility. A prospective Bidder should be able to 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 that can be determined thru references provided; and
D. Be otherwise qualified and eligible to receive an award.

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

3.12 FIRM PRICING

For unit price items, 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. The Bidder must submit a firm price that must be good from the date of Bid opening for the fixed period of time set out in this IFB. Unless the IFB expressly states otherwise, this period shall be until the end of the Initial Contract Period.

Bids which do not state a fixed price, or which are subject to change without notice, will not be considered. The Court may award a Contract for the period implied or expressly stated in the lowest and best Bid.

3.13 PURCHASE ORDERS

If required by the Williamson County Purchasing Department, a purchase order(s) may be generated to the Successful Bidder for goods and/or services. If a purchase order is issued, the purchase order number must appear on all itemized invoices and/or requests for payment.

3.14 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.

3.15 REFERENCES

The County may require the Bidder to supply a list of at least three (3) references where like services and/or goods have been supplied by their firm within the past five (5) years, to include names, titles, phone numbers and email addresses of key personnel, and dates of performance.

The County may contact some or all of the references in order to determine the Respondent performance record on work similar to that described in this RFP. The County reserves the right to contact references other than those provided in the response and to use the information gained from them in the evaluation process.

References, if requested, should be provided in accordance with this IFB. Bid may not be deemed complete without the inclusion of requested references.

SECTION 4 - TERMS AND CONDITIONS

4.1 VENUE AND GOVERNING LAW

The Bidder hereby agrees and acknowledges that venue and jurisdiction of any suit, right, or cause of action arising out of or in connection with this IFB, the Contract and any Ensuing Agreement(s), shall lie exclusively in either Williamson County, Texas or in the Austin Division of the Western Federal District of Texas, and the parties hereto expressly consent and submit to such jurisdiction. Furthermore, except to the extent that this IFB, the Contract and any Ensuing Agreement(s) is governed by the laws of the United States, this IFB, the Contract and any Ensuing Agreement(s) shall be governed by and construed in accordance with the laws of the State of Texas, excluding, however, its choice of law rules.

4.2 INCORPORATION BY REFERENCE AND PRECEDENCE

A. The Contract shall be derived from the IFB and its Addenda (if applicable), and the Bidder's Bid. In the event of a dispute under the Contract, applicable documents will be referred to for the purpose of clarification or for additional detail in the following order of precedence:

   1. The IFB and its Addenda (if applicable); and

   2. The Bidder's Bid.

B. In the event the County requires that an Ensuing Agreement be executed following award and a dispute arises between the terms and conditions of the Ensuing Agreement, the IFB and its Addenda (if applicable), and the Bidder's Bid, applicable documents will be referred to for the purpose of clarification or for additional detail in the following order of precedence:

   1. Terms and conditions of the Ensuing Agreement;

   2. The IFB its Addenda; and

   3. The Bidder's Bid.

4.3 OWNERSHIP OF BID

Each Bid shall become the property of the County upon submittal and will not be returned to Bidders unless received after the submittal deadline.

4.4 DISQUALIFICATION OF BIDDER

Upon signing and submittal of the Bid, a Bidder offering to sell supplies, materials, services, or equipment to the County, certifies that the Bidder has not violated the antitrust laws of the State of Texas codified in Business & Commerce Code, Section 15.01, or the Federal Antitrust Laws, and has not communicated directly or indirectly the offer made to any competitor or any other person engaged in such line of business. Any or all Bids may be rejected if the County believes that collusion exists among the Bidders.

4.5 FUNDING

The County intends to budget and make sufficient funds available and authorize funds for expenditure to finance the costs of the Contract. All Bidders understand and agree that the County's payment of amounts under the Contract shall be contingent on the County receiving appropriations or other expenditure authority sufficient to allow the County, in the exercise of reasonable administrative discretion, to make payments under this Contract.

4.6 ASSIGNMENT, SUCCESSORS AND ASSIGNS

The Successful Bidder may not assign, sell, or otherwise transfer the Contract or any other rights or interests obtained under the Contract without written permission of the Commissioners Court. The Contract and any Ensuing Agreement(s) shall be binding upon and inure to the benefit of the contracting parties hereto and their respective successors and permitted assigns.

4.7 IMPLIED REQUIREMENTS

Products or services not specifically described or required in the IFB, but are necessary to provide the functional capabilities described by the Bidder, shall be implied and deemed to be included in the Bid.

4.8 TERMINATION

A. **Termination for Cause:** The County reserves the right to terminate the Contract and/or any Ensuing Agreement(s) for default if the Successful Bidder breaches any of the Bid specifications, terms and conditions, including warranties of the Bidder, if any, or if the Successful Bidder becomes insolvent or commits acts of bankruptcy. Such right of termination is in addition to and not in lieu of any other remedies the County may have at law or in equity or as may otherwise provided hereunder. Default may be construed as, but not limited to, failure to deliver the proper goods and/or services within the proper amount of time, and/or to properly perform any and all other requirements to the County's satisfaction, and/or to meet all other obligations and requirements.

B. **Termination for Convenience:** The County may terminate the Contract and/or any Ensuing Agreement(s) for convenience and without cause or further liability, upon no less than thirty (30) calendar days written notice to the Successful Bidder. The County reserves the right to extend this period if it is in the best interest of the County. In the event the County exercises its right to terminate without cause, it is understood and agreed that only the amounts due to the Successful Bidder for goods, commodities and/or services provided and expenses incurred to and including the date of termination, will be due and payable. No penalty will be assessed for the County termination for convenience.

4.9 NON-PERFORMANCE

It is the objective of the County to obtain complete and satisfactory performance of the requirements set forth herein. In addition to any other remedies available at law, in equity or that may be set out herein, failure to perform may result in a deduction of payment equal to the amount of the goods and/or services that were not provided and/or performed to the County's satisfaction.

In the event of such non-performance, the County shall have the right, but shall not be obligated, to complete the services itself or by others and/or purchase the goods from other sources. If the County elects to acquire the goods or perform the services itself or by others, pursuant to the foregoing, the Successful Bidder shall reimburse the County, within ten (10) calendar days of demand, 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 the nonperformance which the Successful Bidder fails to meet pursuant to the requirements set out herein. In the event the Successful Bidder refuses to reimburse the County as set out in this provision, the County shall have the right to deduct such reimbursement amounts from any amounts that may be then owing or that may become owing in the future to the Successful Bidder.

4.10 PROPRIETARY INFORMATION AND THE TEXAS PUBLIC INFORMATION ACT

All material submitted to the County shall become public property and subject to the Texas Public Information Act upon receipt. If a Bidder does not desire proprietary information in the Bid to be

disclosed, each page must be clearly identified and marked proprietary at time of submittal or, more preferably, all proprietary information may be placed in a folder or appendix and be clearly identified and marked as being proprietary. Failure to clearly identify and mark information as being proprietary as set forth under this provision will result in all unmarked information being deemed non-proprietary and available to the public. For all information that has not been clearly identified and marked as proprietary by the Bidder, the County may choose to place such information on the County's website and/or a similar public database without obtaining any type of prior consent from the Bidder.

The County will, to the extent allowed by law, endeavor to protect from public disclosure the information that has been identified and marked as proprietary. The final decision as to what information must be disclosed, however, lies with the Texas Attorney General.

To the extent, if any, that any provision in this IFB or in the Bidder's Bid is in conflict with Texas Government Code, Chapter 552, as amended (the "Public Information Act"), the same shall be of no force or effect. Furthermore, it is expressly understood, and agreed, that the County, and 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 the County as to whether or not the same are available to the public. It is further understood that the County, and its officers and employees, shall have the right to rely on the advice, decisions and opinions of the Attorney General, and that the 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 the County by a party hereto, in reliance of any advice, decision or opinion of the Attorney General of the State of Texas.

4.11 RIGHT TO AUDIT

The Successful Bidder agrees that the County or its duly authorized representatives shall, until the expiration of three (3) years after termination or expiration of the services to be performed, have access to and the right to examine and photocopy any and all books, documents, papers and records of the Successful Bidder, which are directly pertinent to the services to be performed or goods to be delivered for the purposes of making audits, examinations, excerpts and transcriptions. The Successful Bidder agrees that the County shall have access during normal working hours to all necessary facilities and shall be provided adequate and appropriate work space in order to conduct audits in compliance with the provisions of this section. The County shall give the Successful Bidder reasonable advance notice of intended audits.

4.12 TESTING AND INSPECTIONS

The County reserves the right to inspect and test equipment, supplies, materials and goods for quality and compliance with this IFB, and ability to meet the needs of the user. Demonstration units must be available for review. Should the goods or services fail to meet requirements and/or be unavailable for evaluation, the County can deem the Bidder to be in breach and terminate the Contract and/or any Ensuing Agreement(s).

4.13 BID PREPARATION COSTS

The cost of developing Bids is the sole responsibility of the Bidders and shall not be charged to the County. There is no expressed or implied obligation for the County to reimburse the Bidders for any expense incurred in preparing a Bid in response to this IFB and the County will not reimburse the Bidders for such expenses.

4.14 INDEMNIFICATION

The Successful Bidder shall indemnify, defend and save harmless, the County, its officials, employees, agents and agent's employees from, and against, all claims, liability, and expenses including reasonable attorneys' fees, arising from activities of the Bidder, its agents, servants or employees, performed

hereunder that result from the negligent act, error, or omission of the Bidder or any of the Bidder agents, servants or employees, as well as all claims of loss or damage to the Bidder's and the County property, equipment, and/or supplies.

Furthermore, the County, its officials, employees, agents and agents' employees shall not be liable for damages to the Successful Bidder arising from any act of any third party, including, but not limited to, theft. The Successful Bidder further agrees to indemnify, defend and save harmless, the County from its officials, employee, agents and agents' employees against all claims of whatever nature arising from any accident, injury, or damage whatsoever, caused to any person, or the property of any person, occurring in relation to the Successful Bidder's performance of any services requested hereunder during the term of the Contract and/or any Ensuing Agreement(s).

The Successful Bidder shall timely report all claims, demands, suits, actions, proceedings, liens or judgements to the County and shall, upon the receipt of any claim, demand, suit, action, proceeding, lien or judgement, not later than the fifteenth (15^{th}) day of each month; provide the County with a written report on each such matter, setting forth the status of each matter, the schedule or planned proceedings with respect to each matter and the cooperation or assistance, if any, of the County required by the Successful Bidder in the defense of each matter. The Successful Bidder's duty to defend, indemnify and hold the County harmless shall be absolute. It shall not abate or end by reason of the expiration or termination of the Contract and/or any Ensuing Agreement(s), unless otherwise agreed by the County in writing. The provisions of this section shall survive the termination of the Contract and shall remain in full force and effect with respect to all such matters no matter when they arise.

In the event of any dispute between the parties, as to whether a claim, demand, suit, action, proceeding, lien or judgement, that appears to have been caused by or appears to have arisen out of or in connection with acts or omissions of the County, the Bidder shall nevertheless fully defend such claim, demand, suit or action, proceeding, lien or judgement, until and unless there is a determination by a court of competent jurisdiction that the acts and omissions of the Bidder are not an issue in the matter.

The Successful Bidder's indemnification shall cover, and the Successful Bidder agrees to, indemnify the County, in the event the County is found to have been negligent for having selected the Successful Bidder to perform the work described in this request. The provision by the Successful Bidder of insurance shall not limit the liability of the Successful Bidder under the Contract and/or any Ensuing Agreement(s).

4.15 WAIVER OF SUBROGATION

The Successful Bidder and the Successful Bidder's insurance carrier waive any and all rights whatsoever with regard to subrogation against the County as an indirect party to any suit arising out of personal or property damages resulting from the Bidder's performance under this Contract and any Ensuing Agreement(s).

4.16 RELATIONSHIP OF THE PARTIES

The Successful Bidder shall be an independent contractor and shall assume all of the rights, obligations, liabilities, applicable to it as such independent contractor hereunder and any provisions herein which may appear to give the County the right to direct the Successful Bidder as to details of doing work herein covered, or to exercise a measure of control over the work, shall be deemed to mean that the Successful Bidder shall follow the desires of the County in the results of the work only. The County shall not retain or have the right to control the Successful Bidder's means, methods or details pertaining to the Successful Bidder's performance of the work. The County and the Successful Bidder hereby agree and declare that the Successful Bidder is an independent contractor and as such meets the qualifications of an "Independent Contractor" under Texas Workers Compensation Act, Texas Labor Code, Section 406.141, that the Successful Bidder is not an employee of the County, and that the Successful Bidder and its employees, agents and subcontractors shall not be entitled to workers compensation coverage or any other type of insurance coverage held by the County.

4.17 SOLE PROVIDER

The Successful Bidder agrees and acknowledges that it shall not be considered a sole provider of the goods and/or services described herein and that the County may contract with other providers of such goods and/or services if the County deems, at its sole discretion, that multiple providers of the same goods and/or services will serve the best interest of the County.

4.18 FORCE MAJEURE

If the party obligated to perform is prevented from performance by an act of war, order of legal authority, act of God, or other unavoidable cause not attributable to the fault or negligence of said party, the other party shall grant such party relief from the performance. The burden of proof for the need of such relief shall rest upon the party obligated to perform. To obtain release based on force majeure, the party obligated to perform shall file a written request with the other party.

4.19 SEVERABILITY

If any provision of this IFB, the Contract or any Ensuing Agreement(s) shall be held invalid or unenforceable by any court of competent jurisdiction, such holding shall not invalidate or render unenforceable any other provision thereof, but rather the entire IFB, Contract or any Ensuing Agreement (s) will be construed as if not containing the particular invalid or unenforceable provision or provisions, and the rights and obligation of the parties shall be construed and enforced in accordance therewith. The parties acknowledge that if any provision of this IFB, the Contract or any Ensuing Agreement(s) is determined to be invalid or unenforceable, it is the desire and intention of each that such provision be reformed and construed in such a manner that it will, to the maximum extent practicable, give effect to the intent of this IFB, the Contract or any Ensuing Agreement(s) and be deemed to be validated and enforceable.

4.20 EQUAL OPPORTUNITY

Neither party shall discriminate against any employee or applicant for employment because of race, color, sex, religion or national origin.

4.21 NOTICE

Any notice to be given shall be in writing and may be distributed by personal delivery, or by registered or certified mail, return receipt requested, addressed to the proper party, at the following address:

The County: Williamson County Purchasing Department
Attn: Purchasing Agent
901 South Austin Avenue
Georgetown, Texas 78626

The Bidder: Address set out in Bidder's Transmittal Letter.

Notices given in accordance with this provision shall be effective upon (1) receipt by the party to which notice is given, or (2) on the third (3rd) calendar day following mailing, whichever occurs first.

4.22 SALES AND USE TAX EXEMPTION

The County is a body, corporate and politic, under the laws of the State of Texas and claims exemption from sales and use taxes under Texas Tax Code, Section 151.309, as amended, and the services and/or goods subject hereof are being secured for use by the County.

4.23 COMPLIANCE WITH LAWS

The County and the Successful Bidder shall comply with all federal, state, and local laws, statutes, ordinances, rules and regulations, and the orders and decrees of any courts or administrative bodies or tribunals in any matter affecting the performance of the Contract and any Ensuing Agreement(s), including, without limitation, Workers' Compensation laws, salary and wage statutes and regulations, licensing laws and regulations. When required, the Successful Bidder shall furnish the County with certification of compliance with said laws, statues, ordinances, rules, regulations, orders, and decrees above specified.

4.24 INCORPORATION OF EXHIBITS, APPENDICES AND ATTACHMENTS

All of the Exhibits, Appendices and Attachments referred to herein are incorporated by reference as if set forth verbatim herein. Any conflicting terms in the Contract documents will be resolved at the sole discretion of the Commissioners Court.

4.25 NO WAIVER OF IMMUNITIES

Nothing herein shall be deemed to waive, modify or amend any legal defense available at law or in equity to the County, its past or present officers, employees, or agents, nor to create any legal rights or claim on behalf of any third party. The 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.

4.26 NO WAIVER

The failure or delay of any party to enforce at any time or any period of time any of the provisions of this IFB, the Contract or any Ensuing Agreement(s) shall not constitute a present or future waiver of such provisions nor the right of either party to enforce each and every provision. Furthermore, no term or provision hereof shall be deemed waived and no breach excused unless such waiver or consent shall be in writing and signed by the party claimed to have waived or consented. Any consent by any party to, or waiver of, a breach by the other, whether expressed or implied, shall not constitute a consent to, waiver of or excuse for any other, different or subsequent breach.

4.27 CURRENT REVENUES

The obligations of the parties under the Contract and any Ensuing Agreement(s) do not constitute a general obligation or indebtedness of the County for which the County is obligated to levy, pledge, or collect any of taxation. It is understood and agreed that the County shall have the right to terminate the Contract and any Ensuing Agreement(s) at the end of any the County fiscal year if the governing body of the County does not appropriate sufficient funds as determined by the County's budget for the fiscal year in question. The County may effect such termination by giving written notice of termination to the Successful Bidder at the end of its then-current fiscal year.

4.28 FOB DESTINATION

To the extent applicable to this IFB, 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 Bid, 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 Destination point.

4.29 BINDING EFFECT

This Contract and any Ensuing Agreement(s) shall be binding upon and inure to the benefit of the parties

and their respective permitted assigns and successors.

4.30 ASSIGNMENT

The Successful Bidder's interest and duties hereunder may not be assigned or delegated to a third party without the express written consent of the County.

4.31 SAFETY

The Successful Bidder is responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with any services to be provided hereunder. The safety program shall comply with all applicable requirements of the current federal Occupational Safety and Health Act and all other applicable federal, state and local laws and regulations.

4.32 GENERAL OBLIGATIONS AND RELIANCE

The Successful Bidder shall perform all services and/or provide all goods, as well as those reasonably inferable and necessary for completion and provision of services and/or goods required hereunder. The Successful Bidder shall keep the County informed of the progress and quality of the services. The Successful Bidder agrees and acknowledges that the County is relying on the Successful Bidder's represented expertise and ability to provide the goods and/or services described herein. The Successful Bidder agrees to use its best efforts, skill, judgment, and abilities to perform its obligations in accordance with the highest standards used in the profession and to further the interests of the County accordance with the County's requirements and procedures. The Successful Bidder's duties, set forth herein, shall at no time be in any way diminished by reason of any approval by the County, n shall the Successful Bidder be released from any liability by reason of such approval by the County, it being understood that the County at all times is ultimately relying upon the Successful Bidder's skill and knowledge in performing the services and providing any goods required hereunder.

4.33 ESTIMATED QUANTITIES

To the extent applicable to this IFB, the estimated quantity of each item listed in this IFB is only estimate; the actual quantity to be purchased may be more or less. The County is not obligated purchase any minimum amount, and the County may purchase any reasonable amount greater than t estimate for the same unit price. Any limit on quantities available must be stated expressly in the Bid.

4.34 CONTRACTUAL DEVELOPMENT

The contents of the IFB and the Successful Bidder's Bid will become an integral part of the Contract, but may be modified, at the County's sole discretion, by provisions of an Ensuing Agreement. Therefore, the Bidder must agree to an inclusion of an Ensuing Agreement of the Bid specifications, terms and conditions of this IFB. If an Ensuing Agreement is required under this IFB, information relative to t Agreement will be located in the Special Provisions Section of this IFB.

4.35 SURVIVABILITY

All applicable agreements that were entered into between the Successful Bidder and the County, under the terms and conditions of the Contract and/or any Ensuing Agreement(s), shall survive the expiration or termination thereof for ninety (90) days unless a new contract has been awarded.

The County may exercise, by written notice to the Successful Bidder no later than ten (10) calendar days of the Contract expiration, this clause for emergencies only.

4.36 AIR QUALITY

In determining the overall best Bid, the County may, to the extent applicable, exercise the option granted to local governments under the Texas Local Government Code, Section 271.907.

This option allows the County to evaluate Bids and give preference to goods and/or services of a Bidder that demonstrates that the Bidder meets or exceeds any and all state or federal environmental standards, including voluntary standards, relating to air quality. If the Bid being submitted will have an effect on air quality for the County (as it relates to any state, federal, or voluntary air quality standard), then the Bidder is encouraged to provide information in narrative indicating the anticipated air quality impact. All Bidders are expected to meet all mandated state and federal air quality standards.

4.37 ENTIRE AGREEMENT

The Contract and any Ensuing Agreement(s) shall supersede all prior Agreements, written or oral between the Successful Bidder and the County and shall constitute the entire Agreement and understanding between the parties with respect to the services and/or goods to be provided. Each of the provisions herein shall be binding upon the parties and may not be waived, modified, amended or altered, except by writing signed by the Successful Bidder and the County.

4.38 PAYMENT

The County's payment for goods and services shall be governed by the Texas Government Code, Chapter 2251. An invoice shall be deemed overdue the thirty-first (31st) day after the later of the following:

A. The date the County receives the goods under the Contract;
B. The date the performance of the service under the Contract is completed; or
C. The date the Williamson County Auditor receives an invoice for the goods or services.

Interest charges for any overdue payments shall be paid by the 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 the 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 (1) percent, and the prime rate published in the Wall Street Journal on the first (1st) 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 the Successful Bidder, the County shall notify the Successful Bidder of the error not later than the twenty-first (21st) day after the date the County receives the invoice. If the error is resolved in favor of the Successful Bidder, the Successful Bidder shall be entitled to receive interest on the unpaid balance of the invoice submitted by the Successful Bidder beginning on the date that the payment for the invoice became overdue. If the error is resolved in favor of the County, the 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 the Texas Government Code, Chapter 2251, if the corrected invoice is not paid by the appropriate date.

As a minimum, invoices shall include:

A. Name, address, and telephone number of the Successful Bidder and similar information in the event the payment is to be made to a different address.

B. The County Contract, Purchase Order.

C. Identification of items or service as outlined in the Contract.

D. Quantity or quantities, applicable unit prices, total prices and total amount.

E. Any additional payment information which may be called for by the Contract.

Payment inquiries should be directed to the following address:

Williamson County Auditor's Office, Accounts Payable Department
Email: accountspayable@wilco.org
Phone: 512-943-1500

4.39 CONTRACTUAL FORMATION AND ENSUING AGREEMENT

The IFB and the Bidder's Bid, when properly accepted by the Commissioners Court, shall constitute a Contract equally binding between the Successful Bidder and the County.

If an Ensuing Agreement is required by this IFB, that information will be provided in Special Provisions section of this IFB. The Successful Bidder shall be required to execute the Agreement at the Williamson County Purchasing Department approximately ten (10) calendar days after the Successful Bidder is notified of award. The Ensuing Agreement shall be in the same form as the Agreement which is attached to the end of this IFB. The only anticipated changes in the Ensuing Agreement will be to include additional exhibits, to fill in blanks to identify the Successful Bidder, and terms relating to the compensation, or to revise the Agreement to accommodate corrections, changes in the scope of services, or changes pursuant to Addenda issued. **Bidders should raise any questions regarding the terms of the Agreement in the form of written questions or submittals as described in the Public Announcement and General Information portion of this IFB.** Because the signed Ensuing Agreement will be substantively and substantially derived from the attached Agreement, each Bidder is urged to seek independent legal counsel as to any questions about the terms, conditions or provisions contained in the Agreement *before* submitting a Bid. Again, the attached Agreement, if applicable, contains important legal provisions and is considered part and parcel of this IFB. Failure or refusal to sign aforesaid Agreement shall be grounds for the County to revoke any award which has been issued, forfeit Bid security, if applicable, and select another Bidder.

4.40 COOPERATIVE PURCHASING PROGRAM

During the term of the Contract resulting from this IFB, the County would like to afford the same prices, terms and conditions to other political subdivisions or public entities. Another entity's participation in the Contract resulting from this IFB is subject to a properly authorized Purchasing Cooperative Inter-local Agreement with the County. Any liability created by purchase orders issued against the Contract shall be the sole responsibility of the governmental agency placing the order.

4.41 INSURANCE REQUIREMENTS

To the extent applicable Insurance information will appear in the Additional Stipulations section that is in this IFB Package.

4.42 BIDDERS BOND, WARRANTY BOND, PERFORMANCE AND PAYMENT BONDS

To the extent applicable Bond information will appear in the Additional Stipulations section that is in this IFB Package.

4.43 LEGAL LIABILITY INFORMATION

The Successful Bidder shall disclose all legal liability information by listing any pending litigation anticipated litigation that your firm is involved in including, but not limited to, potential or actual legal matters with private parties and any local, state, federal or international governmental entities. The County reserves the right to consider legal liability information in the recommendation of any proposed contract to the Commissioners Court.

4.44 INCLEMENT WEATHER

In case of inclement weather or any other unforeseen event causing the County to close for business on the date of a Bid submission deadline, the Bid closing will automatically be postponed until the next business day the County is open. If inclement weather conditions or any other unforeseen event causes delays in carrier service operations, the County may issue an Addendum to all known Bidders interested in the project to extend the deadline. It will be the responsibility of the Bidder to notify the County of their interest in the project if these conditions are impacting their ability to turn in a submission within the stated deadline. The County reserves the right to make the final judgement call to extend any deadline.

4.45 PREVAILING WAGE RATES

To the extent this procurement is for the construction of a public work, including a building, highway, road, excavation, and repair work or other project development or improvement, paid for in whole or in part from public funds, without regard to whether the work is done under public supervision or direction, Texas Government Code, Chapter 2258, shall apply and the contractor shall pay not less than the wage scale of the various classes of labor as shown on the "Prevailing Wage Schedule" provided by the County. Pursuant to Texas Government Code, Section 2258.022(a)(2), the County has determined the general prevailing rate of the "Prevailing Wage Schedule" in the locality in which the public work is to be performed for each craft or type of worker needed to execute the contract and the prevailing rate for legal holiday and overtime work by using the prevailing wage rate as determined by the United States Department of Labor in accordance with the United States Code, Section 276a (Davis-Bacon Act).

The specified wage rates are minimum rates only, and are not representations that qualified labor adequate to perform the work is available locally at the prevailing wage rates. The County is not bound to pay—and will not consider—any claims for additional compensation made by any contractor because the contractor pays wages in excess of the applicable minimum rate contained in the Contract Documents. The "Prevailing Wage Schedule" is not a representation that quantities of qualified labor adequate to perform the work may be found locally at the specified wage rates.

For classifications not shown, workers shall not be paid less than the wage indicated for laborers. The contractor shall notify each worker commencing work on the project the worker's job classification and the established minimum wage rate required to be paid, as well as the actual amount being paid. The notice must be delivered to and signed in acknowledgement of receipt by the employee and must list both the monetary wages and fringe benefits to be paid or furnished for each classification in which the worker is assigned duties. When requested by the County, competent evidence of compliance with the Texas Prevailing Wage Law shall be furnished by contractor. A copy of each worker wage rate notification shall be submitted to the County with the Application for Payment for the period during which the worker began on-site activities.

Should the contractor at any time become aware that a particular skill or trade not reflected on the County's "Prevailing Wage Schedule" will be or is being employed in the work, whether by the contractor or by a subcontractor, the contractor shall promptly inform the County and shall specify a wage rate for that skill or trade, which shall bind the contractor.

The contractor and any subcontractor shall pay to the County a penalty of sixty dollars ($60.00) for each worker employed for each calendar day, or portion thereof, that the worker is paid less than the wage rates stipulated in the "Prevailing Wage Schedule" or any supplement thereto. The contractor and each subcontractor shall keep, or cause to be kept, an accurate record showing the names and occupations of all workers employed in connection with the work, and showing the actual per diem wages paid to each worker, which records shall be open at all reasonable hours for the inspection by the County.

Within thirty-one (31) days of receipt of information concerning a violation of the Texas Government Code Chapter 2258, the County shall make an initial determination as to whether good cause exists to believe a violation occurred. The County's decision on the initial determination shall be reduced to writing and sent to the contractor or subcontractor against whom the violation was alleged, and to the affected

worker. When a good cause finding is made, the County shall retain the full amounts claimed by the claimant or claimants as the difference between wages paid and wages due under the "Prevailing Wage Schedule" and any supplements thereto, together with the applicable penalties, such amounts being subtracted from successive progress payments pending a final decision on the violation.

After the County makes its initial determination, the affected contractor or subcontractor and worker have fourteen (14) calendar days in which to resolve the issue of whether a violation occurred, including the amount that should be retained by the County or paid to the affected worker. If the contractor or subcontractor and affected worker reach an agreement concerning the worker's claim, the contractor shall promptly notify the County in a written document signed by the worker. It the contractor or Subcontractor and affected worker do not agree before the fifteenth (15th) calendar day after the County determination, the contractor or subcontractor and affected worker must participate in binding arbitration in accordance with the Texas General Arbitration Act, Chapter 171, (Texas Civil Practice and Remedies Code). The parties to the arbitration have ten (10) calendar days after the expiration of the fifteen (15) calendar days referred to above, to agree on an arbitrator; if by the eleventh (11th) calendar day there is no agreement to an arbitrator, a district court shall appoint an arbitrator on the petition of any of the parties to the arbitration.

If an arbitrator determines that a violation has occurred, the arbitrator shall assess and award against the contractor or subcontractor the amount of penalty as provided above and the amount owed the worker. The County may use any amounts retained hereunder to pay the worker the amount as designated in the arbitration award. If the County has not retained enough from the contractor or subcontractor to pay the worker in accordance with the arbitration award, the worker has a right of action against the contractor and subcontractor as appropriate, and the surety of either to receive the amount owed, attorneys' fees and court costs. The contractor shall promptly furnish a copy of the arbitration award to the County.

Money retained pursuant to the provisions above shall be used to pay the claimant or claimants the difference between the amount the worker received in wages for labor on the project at the rate paid by the contractor or subcontractor and the amount the worker would have received at the general prevailing wage rate as provided by the agreement of the claimant and the contractor or subcontractor affected, or in the arbitrator's award. The full statutory penalty of sixty dollars ($60.00) per calendar day of violation per worker shall be retained by Williamson County to offset its administrative costs, pursuant to Texas Government Code, Section, 2258.023. Any retained funds in excess of these amounts shall be paid to the contractor on the earlier of the next progress payment or final payment. Provided, however, that the County shall have no duty to release any funds to either the claimant or the contractor until it has received the notices of agreement or the arbitration award as provided under the provision herein-above.

4.46 CONFIDENTIALITY

The Bidder expressly agrees that it will not use any direct or incidental confidential information that may be obtained while working in a governmental setting for its own benefit, and agrees that it will not access unauthorized areas or confidential information and it will not disclose any information to unauthorized third parties, and will take care to guard the security of the information at all times.



WILLIAMSON COUNTY

PROJECT CONSTRUCTION MANUAL

FOR

CR 119

SOLICITATION 1708-186

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

SEPTEMBER 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:

CR 119

Williamson County is seeking qualified contractors to construct 2.3 miles of roadway consisting of grading, flexible base, asphalt pavement, bridge, traffic signal, concrete culvert, and pavement markings. Estimated time of completion is 450 calendar days to substantial completion, and 30 calendar days to final completion, with an estimated cost of $8,300,000.00.

Sealed bids will be publicly opened and read aloud in the Williamson County Purchasing Department, 901 South Austin Avenue, Georgetown, Texas on October 25th at 3:00 pm.

Bids must be received on or before Wednesday, October 25th 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 October 11th at 3:30 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 William Hutchinson, 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 October 3, 2017; 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. **1708-186 – CR 119**

Article 2. Engineer of Record

The Project has been designed by **Stantec Consulting Services, Inc. and Kimley-Horn and Associates, Inc.**, 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 **450** 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: TX150016 01/02/2015 TX16

Superseded General Decision Number: TX20140016

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: Executive Order (EO) 13658 establishes an hourly minimum wage of $10.10 for 2015 that applies to all contracts subject to the Davis-Bacon Act for which the solicitation is 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 $10.10 (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract. 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	01/02/2015

* 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.

==========

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
&#65533;

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				1 Person	$
Liability				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

Stantec Consulting Services, Inc. and Kimley-Horn and Associates, Inc. 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

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GENERAL NOTES: Revised October 23, 2015

Basis of Estimate

Item	Description	**Rate	Basis	Quantity
160	**Topsoil**	1 CY/7 SY	123,095 SY	123,095 SY
164	**Seed for Erosion Control**			
	(Item 164)(Temp)	4840 SY/AC	123,095 SY	123,095 SY
	(Item 164)(Perm)	4840 SY/AC	61,548 SY	61,548 SY
**166	**Fertilizer (13-13-13)**	1/8 LB/SY	123,095 SY	7.7 TON
168	**Vegetative Watering**			
	(Item 164)(Temp)	10 GAL/SY	123,095 SY	3,077 MG
	(Item 164)(Perm)	20 GAL/SY	61,548 SY	615 MG
**204	**Sprinkling**			
	(Dust)	30 GAL/CY		
	(Item 132)	30 GAL/CY		
	(Item 247)	30 GAL/CY		
247	**FL BS (CMP IN PLC)**			
	(TY A GR 4)	27 CF/CY	477,441 CF	17,683 CY
310	**Prime Coat (MC-30 or AE-P)**	0.20 GAL/SY	61,750 SY	12,350 GAL
341	**Dense-Graded Hot-Mix Asphalt**			
	TY B PG 64-22	115 LB/SY/IN	177,200 SY	10,189 TON
	TY C PG 70-22	115 LB/SY/IN	113,843 SY	6,546 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 sawcut 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.

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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 to contact 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. The Construction Observer will report all minimum vertical clearance information on State maintained roadways to the Austin District Permit Office.

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.

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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 will subsidiary to the various bid items of the contract.

Correct unstable material (e.g. dry, wet, loose, etc.) to a depth of 6 inches below existing grade. This work will be considered subsidiary to pertinent bid items. Drying required deeper than 6 in. below existing grade will be paid for in accordance with Item 6.03., "Extra Work and Actual Field Cost."

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.

Furnish embankment with a PI of less than 40. Embankment within two feet of the pavement base course should not contain sulfate contents greater than 3000 ppm, if the embankment will be treated with lime.

Work to correct unstable material (e.g. dry, wet, loose, etc.) to a depth of 6" below existing subgrade elevation, prior to beginning any embankment placement. Consider this work to be subsidiary to the various bid items. Any work to correct unstable material below the 6" depth, below the existing subgrade, will be paid for as 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 Flexbase 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.

If embankment will be treated with lime, cement or other calcium based additives and placed directly beneath the pavement section, furnish embankment with a sulfate content less than or equal to 3000 ppm, determine by Tex-145-E based on preliminary tests and subsequent tests found necessary by the Construction Observer.

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

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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, 164, & 168
Use Wilco Special Provisions 160-WC 001, 164-WC 001, 168-WC 001.

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 5 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%

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

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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 260 - LIME TREATMENT (ROAD-MIXED)
Furnish hydrated lime (slurry) for subgrade.

Apply Commercial Lime Slurry as directed or as indicated in the plans and specifications.
Measure the sulfate content, in accordance to Tex-145-E, for subgrade soil to be treated.
If the sulfate content is less than or equal to 3000 ppm, apply, mix, and mellow the subgrade soil with lime slurry in accordance to the standard specification. Hydrated lime or lime slurry can be used when the sulfate content is below 3000 ppm.

If the sulfate content is greater than 3000 ppm., but less than or equal to 7000 ppm., perform the following after applying and mixing lime slurry into the subgrade:

- Apply an additional 4 percentage points of moisture above optimum moisture
- Mix in the additional moisture
- Allow the mixture to mellow at least 7 days

Use lime slurry when sulfate content is greater than 3000 ppm, but less than or equal to 7000 ppm.

If the sulfate content is greater than 7000 ppm, do not apply lime slurry. Undercut to the same depth schedule for lime treatment and replace with select material, in accordance to the plan notes for Item 110 and 132.

ITEM 300 – ASPHALTS, OILS, AND EMULSIONS
Asphalt season starts April 1 and ends October 15.

PPA and REOBS are not allowed.

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 percent 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.

When TY E is allowed, furnish coarse fractionated recycled asphalt pavement (CF-RAP). CF-RAP aggregate stockpiles must be approved on a stockpile-by-stockpile basis, unless approved by the Construction Observer. Do not exceed stockpiles greater than 2000 tons.

CF-RAP shall meet the below gradation requirements or Grade 4 or finer. CF-RAP shall meet deleterious material and decantation requirements in accordance with Table 3.

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Furnish CF-RAP meeting the following gradation requirements, after ignition burn off of pre-existing asphalt, unless otherwise approved:

Sieve	Cumulative % Retained
5/8”	0
1/2”	10-25
3/8”	60-80
#4	85-100
#8	90-100

ITEM 310 & 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 MC and grade 30 or Type AE Grade P.

Any oil or asphaltic material being paid for on the project shall use tank strap method as shown in TxDOT Seal Coat and Surface Treatment Manual 2010-1.

Prior to compaction and after grading of the final course of flexible base, apply half the specified rate of prime coat. Allow the prime coat to penetrate before rolling. Once compaction requirements are met, apply the remaining half of prime coat.

Distribute prime coat smoothly and evenly at the rate of 0.20 gallons per square yard.

ITEM 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

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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
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 1of 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.

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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 a recycled asphalt content greater than 20% is utilized.

RAP is not allowed for any surface mix applications.

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.

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.

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

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 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 2" washed, crushed stone with 0% passing a No. 4 sieve to backfill for bridge ends. Consider subsidiary to the pertinent Items. Provide weep holes out the face of the backwall, as directed.

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ITEM 416 - DRILLED SHAFT FOUNDATIONS
Stake all Foundations, for approval, before beginning drilling operations, as directed. Examples of types of foundations are Bridge Supports, Traffic Signal Pole Foundation, Roadway Illumination Assembly Foundations, Sign Support Locations, etc.

Calculate the vertical signal head clearance before placing any Traffic Signal Pole Foundation.

Obtain approval before placing additional exposed Traffic Pole Foundation.

Set anchor bolts for Mast-Arm Signal Poles and Strain Poles. Set two in tension and two in compression. Obtain approval of anchor bolt placement as directed before placing concrete.

Field cut holes for anchor bolts only as directed.

Class "C" concrete will be required for drilled shaft foundations involving overhead sign structures.

Remove spoils, daily, out of flood plain, or as directed.

ITEM - 420, 425, 441, & 462
Notify TxDOT Contact for Bridge Inventory prior to opening each phase of bridge or bridge class culvert construction to traffic. Notification is required for all new and modified bridge class structures. Notify TxDOT Contact within 24 hours of Bridge demolition. Structure shall be inventoried by Austin District Bridge Section within 90 days of structure opening to traffic.

TxDOT Contact: Austin District Bridge Engineer, Kathleen Newton, at Kathleen.Newton@txdot.gov & (512-832-7376).

ITEM 420 – CONCRETE SUBSTRUCTURES
Use prestressed concrete panels.

Do not use PMDF in areas where a "Free Joint" is indicated in the plans.

Check the sign plans for locations of clearance signs and brackets on structures, which will require inserts in the pre-stressed beams. Forward such locations to the beam fabricator.

The "H" values shown on Bridge Layouts are estimated column heights. Calculate the actual column heights based on field conditions.

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.

Prior to the completion of work, stencil the National Bridge Inventory (NBI) number (structure number) on each structure built/shown on this project, as directed. Verify with the Construction

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Observer that the NBI number, which is shown on each Bridge Layout, is the number to use. Stencil the NBI number in an approved location on each bridge. Consider subsidiary to the pertinent 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 427 - SURFACE FINISHES FOR CONCRETE
Consider Surface Finishes for concrete as subsidiary to the pertinent Items.

Follow form liner manufacturer's recommended procedures for form liner construction.

The form liner will release clean and free of the concrete, without pulling or breaking concrete from the textured surface.

Seal all form liner joints, in a manner acceptable to prevent leakage at the surface.

Perform an Ordinary Surface Finish to the faces of concrete units, such as Retaining Walls, Inlets, etc., that will have backfill material against them.

Perform Low-Pressure water blasting to the concrete surfaces, if forms are not removed in time.

For Surface Area I: Perform the Rub Finish as soon as possible after form removal. Complete the finish application within 5 calendar days from the pour date. Should the completion of the finish work fall behind, or exceed the 5-day period, pours of any additional structures will cease, until such time as the surface finish of existing structures is completed.

Provide form liner surface finishes of the types and at locations shown in the plans.

Provide a Surface Area I, **Rub Finish** to all concrete structures, except those with form liner surfaces.

Submit a containment plan that details the procedures and type and size of equipment proposed to keep public property, private property and the environment from being adversely affected by the cleaning and painting operations. Approval of the plan is required before cleaning and painting operations begin. Provide a system capable of collecting all falling paint chips and other debris. Store, characterize, and dispose of all recovered debris in accordance with 30 TAC 335, "Industrial Solid Waste and Municipal Hazardous Waste." Discharge liquids in accordance with the TCEQ Texas Pollution Discharge Elimination Program (30 TAC 305, "Effluent Guidelines and Standards for TPDES Permits") and Texas Surface Water Quality Standards (30 TAC 307). Alternatively, liquids may be captured, stored, and characterized for disposal at an authorized facility in accordance with 30 TAC 315, "Pretreatment Regulation for Existing and New Sources of Pollution," or 30 TAC 335, "Industrial Solid Waste and Municipal Hazardous Waste."

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

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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 that riprap placed around ground mounted large signs and overhead sign structures.

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 462, 464, 465, 466, & 467
Place FLOWABLE FILL in areas, underneath the Roadway, where there will be less than 3 feet of depth from top of pipe or structure to the subgrade elevation. Payment made under Item 401.

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.

Do not use precast box culverts.

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 465 – JUNCTION BOXES, MANHOLES AND INLETS
Adjust inlet locations to the upstream side of driveways to accommodate driveway relocation.

Consider excavation and backfill, frames, grates, rings and covers subsidiary to pertinent Items.

Provide temporary drainage at each curb inlet and maintain until the final course of asphaltic concrete pavement is placed.

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 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 502 - BARRICADES, SIGNS, AND TRAFFIC HANDLING
Use Wilco Special Provision 502---WC001

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 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.

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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 **1** lane(s) 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.

Maintain a minimum of **1** through lane(s) in each direction, during the daylight hours, 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.

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Place the Flex Base for the Driveways using Ordinary Compaction.

ITEM 540 - METAL BEAM GUARD FENCE
Before beginning the installation of the proposed MBGF, stake the locations for approval. Adjust the limits of the Metal Beam Guard Fence (MBGF) to meet field conditions, as directed, before erection.

Furnish new, round, domed and unpainted timber posts. Furnish steel posts at locations where the minimum embedment shown on the plans for wooden posts cannot be achieved. Field verify the steel post lengths before fabrication. Consider the steel posts subsidiary to pertinent Items.

Install all permanent MBGF and delineators, when the roadway is constructed in one-half widths, on that section, before opening the road to traffic.

Adjust existing rail as per plans and in accordance with the latest TxDOT standard. Removal, replacement, or installation of mow strip block out material will be subsidiary. Constructing new or backfilling, using class B concrete, unused mow strip block outs will be subsidiary

Provide Rail Elements that meet AASHTO M 180 TY I Galvanization (1.80 Oz per SY).

ITEM 560 - MAILBOX ASSEMBLIES
Supplement each new mailbox installation with Type 2 object marker placed on the mailbox support in a vertical position 6 in. below the bottom of the mailbox.

Reflective tape may be used to simulate a Type 2 marker placed on tubular supports. Use tape that meets DMS-8600. The simulated marker will consist of three (3)--2¾-inch x 2¾-inch pieces of yellow high intensity tape spaced 1inch apart.

The Type 2 marker will consist of OM-2SR or OM-2VP object markers if delineator post supports are used. Bi-directional brackets may be required on Size 2 mailbox installations. Consider subsidiary to the pertinent Items.

ITEM 585 - RIDE QUALITY FOR PAVEMENT SURFACES
Choose the Pay Adjustment Schedule according to the guidelines specified.

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 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.

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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 in. 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.

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.

Complete spot mowing, as directed.

ITEM 734 - LITTER REMOVAL
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 liter on the right of way, within project limits. Consider this work subsidiary to the Roadside Mowing Item.

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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. Consider this work subsidiary to the pertinent Items.

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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.

< > REFERENCE 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 105	REMOVING TREATED AND UNTREATED BASE AND ASPHALT PAVEMENT
ITEM 110	EXCAVATION (132)
ITEM 132	EMBANKMENT (100)(160)<204><210><216>(260)(400)
ITEM 160	TOPSOIL (168)
ITEM 164	SEEDING FOR EROSION CONTROL (162)(166)(168)
ITEM 166	FERTILIZER<520>
ITEM 168	VEGETATIVE WATERING
ITEM 247	FLEXIBLE BASE (105)<204> <210><216><520>
ITEM 260	LIME TREATMENT (ROAD MIXED) (105)<204><210><216>(247)<300>(310)<520>
ITEM 310	PRIME COAT <300><316>
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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)(440)(448)
ITEM 420	CONCRETE SUBSTRUCTURES <400><404><421>(422)<426><427><440><441><448>
ITEM 422	CONCRETE SUPERSTRUCTURES (420)<421><424><438><440><448><454><780>
ITEM 425	PRECAST PRESTRESSED CONCRETE STRUCTURAL MEMBERS <409>(420)<421><424><426><427><434><440><442><445><448>
ITEM 432	RIPRAP (247)(420)<421><431><440>
ITEM 450	RAILING (420)<421>(422)<424><440><442><445><446><448><540>
ITEM 454	BRIDGE EXPANSION JOINTS <429><442><785>
ITEM 462	CONCRETE BOX CULVERTS AND DRAINS (400)(402)(403)(420)<421>(422)<424><440>(464)(467)<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>(462)(464)
ITEM 476	JACKING, BORING OR TUNNELING PIPE (402)(403)(464)
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 530	INTERSECTIONS, DRIVEWAYS, AND TURNOUTS (247)(260)<263><275><276><292><316><330><334><340><360><421><440>
ITEM 540	METAL BEAM GUARD FENCE <421><441><445><529>
ITEM 544	GUARDRAIL END TREATMENTS
ITEM 552	WIRE FENCE <445><492>
ITEM 585	RIDE QUALITY FOR PAVEMENT SURFACES
ITEM 618	CONDUIT (400)(476)
ITEM 620	ELECTRICAL CONDUCTORS <610><628>
ITEM 624	GROUND BOXES (421)(440)
ITEM 628	ELECTRICAL SERVICES (441)(445)(449)(618)(620)(627)(656)
ITEM 636	ALUMINUM SIGNS (TYPE A) (643)
ITEM 644	SMALL ROADSIDE SIGN ASSEMBLIES (421)(440)<441><442><445>(634)(636)<643>(646)(656)
ITEM 656	FOUNDATIONS FOR SIGNS, TRAFFIC SIGNALS AND ROADWAY ILLUMINATION ASSEMBLIES (400)(416)(420)(421)(440)(449)(618)<644>
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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>(5699)
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ITEM 680	INSTALLATION OF HIGHWAY TRAFFIC SIGNALS <300><302><316>(610)(618)(620)(624)(625)(627)(628)(634)(636)(656)(682)(684)(686)(688)(6000)(6002)(6003)(8524)
ITEM 682	VEHICLE AND PEDESTRIAN SIGNAL HEADS
ITEM 684	TRAFFIC SIGNAL CABLES
ITEM 686	TRAFFIC SIGNAL POLE ASSEMBLIES (STEEL) (441)(442)(445)(449)(656)
ITEM 688	TRAFFIC SIGNAL DETECTORS
ITEM 730	ROADSIDE MOWING

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 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

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—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 September 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
Atmos	Crossing: Sta. 69+00 to Sta. 70+00	July 2018

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 500
Mobilization

Item 500, "Mobilization," 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 500.3., "Payment." The 6th and 7th bullet is deleted and replaced by the following:

- Upon Final Completion, 97% of the mobilization lump sum bid will be paid. Previous payments under this Item will be deducted from this amount, and

- Payment for the remainder of the lump sum bid for "Mobilization" will be made with the Final Payment after all submittals are received, final quantities have been determined, and when any separate vegetative establishment and maintenance, test, and performance periods provided for in the Contract have been successfully completed and the County has issued the Certificate of Acceptance.

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

APPENDIX A

QUALITY CONTROL / QUALITY ASSURANCE PROGRAM

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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.

- 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.

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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.

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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.

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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
Inspection Check Lists

		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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Road Bond Program
Inspection Check Lists

	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)?	☐	☐	☐

Williamson County Road Bond Program Inspection Check Lists

	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)

	Yes	No	NA
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)

	Yes	No	NA
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)

	Yes	No	NA
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
Road Bond Program
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
Road Bond Program
Inspection Check Lists

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?	☐	☐	☐

Williamson County
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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
Road Bond Program
Inspection Check Lists

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?	☐	☐	☐

Williamson County
Road Bond Program
Inspection Check Lists

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?

Williamson County
Road Bond Program
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"?	☐	☐	☐

_____

_____

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 °F | 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 °F | *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

MAY 2016



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 on the current Material Producer List for Lime. Only materials appearing on 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 on 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 on the current Material Producer List for Fly Ash. Only materials from CST/M&P approved sources appearing on 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 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

MATERIAL OR PRODUCT		TEST FOR	TEST NUMBER	PROJECT TESTS: LOCATION OR TIME OF SAMPLING (D)	PROJECT TESTS: 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, and 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.

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.

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.

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 on 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 CST/M&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 CST/M&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 on 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 on 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 on 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.

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
	Micro Deval	Tex-461-A	Stockpile	1 per project or as necessary for control	Compare result to published value listed on the current Material Producer List for BRSQC. Submit sample to CST/M&P for Soundness and L.A. 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 CST/M&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 CST/M&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 CST/M&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.

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 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 on the current Material Producer list for CRSQC, meets the project specifications. If not, sample and submit to CST/M&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 on 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 on the current CRSQC, meets the project specifications. If not, sample and submit to CST/M&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.

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 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 on the Material Producer Lists. If not, sample and submit to CST/M&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 on 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 CST/M&P. See remarks.	When requested by CST	Only products listed on 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 on 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 CST/M&P approved sources listed on the Material Producer Lists 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 CST/M&P	3 couplers per lot (500 couplers) for each type, model, bar size and grade	Only materials from CST/M&P approved sources listed on 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 CST/M&P.	1 per batch or shipment	Verify the source is listed on 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)**

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 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. Test two cylinders at 7 days, and if the average value is below the design strength as defined in Item 421 Table 8, test the remaining 2 cylinders 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 2 remaining cylinders are not required to be tested.
CONCRETE	Slump	Tex-415-A		1 test per 4 strength specimens	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			
	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. Test often for slump, air, and temperature 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.

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 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 on the Material Producer Lists. If not, sample and submit to CST/M&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 on the current CRSQC, meets the project specifications. If not, sample and submit to CST/M&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 on the current CRSQC, meets the project specifications. If not, sample and submit to CST/M&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 on the Material Producer List. If not, sample and submit to CST/M&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).

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
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 CST/M&P; tested by CST/M&P. See remarks.	1 per batch or shipment	Sample in accordance with Tex-500-C. Sampling may be waived when the source is listed on the Material Producer List for Joint Sealers. **(C)**
CURING COMPOUND	Compliance with DMS-4650		Sampled at jobsite; tested by CST/M&P. See remarks.	When requested by CST	Only products listed on 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 on 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 CST/M&P approved sources listed on 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 CST/M&P; tested by CST/M&P. See remarks.	Refer to Tex-711-I for sampling rates	Only materials from CST/M&P approved sources listed on 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 CST/M&P. See remarks.	1 batch per shipment	Verify the source is listed on 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)**

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
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	Sample 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 will be one test (2 specimens) for each 3,000 SY of concrete or fraction thereof or per day and split sample verification testing will 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	1 test for every 10 contractor job control tests.	Sample in accordance with Tex-407-A. Slump is not required for slip-formed pavement. 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			
	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.

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 – 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, document the analysis 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 on the current Material Producer list for BRSQC, meets the project specifications. If not, sample in accordance with Tex-221-F and submit to CST/M&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 on 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 CST/M&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.

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		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 CST/M&P		Sampling must be in accordance with Tex-735-I. Verify the source is listed on 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 on the current Material Producer List for BRSQC, meets the project specifications. If not, sample in accordance with Tex-221-F and submit to CST/M&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 on the current Material Producer List for BRSQC, meets the project specifications. If not, sample in accordance with Tex-221-F and submit to CST/M&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 CST/M&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 CST/M&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 on the current Material Producer List for BRSQC, meets the project specifications. If not, sample in accordance with Tex-221-F and submit to CST/M&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 on the current Material Producer list for BRSQC, meets the project specifications. If not, sample in accordance with Tex-221-F and submit to CST/M&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 CST/M&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 CST/M&P		Sample in accordance with Tex-735-I. Verify the source is listed on the current Material Producer List for Silt Fence, Filter Fabric, and Fabric Underseals. If not sample and submit to CST/M&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 on the current Material Producer list for BRSQC meets the project specifications. If not, sample in accordance with Tex-221-F and submit to CST/M&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 on the current BRSQC, meets the project specifications. If not, sample and submit to CST/M&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 on the current Material Producer list for BRSQC meets the project specifications. If not, sample in accordance with Tex-221-F and submit to CST/M&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 CST/M&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 on the current Material Producer List for Cement. If not, sample and submit to CST/M&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.

RABA KISTNER

GEOTECHNICAL ENGINEERING STUDY

FOR

COUNTY ROAD 119
BETWEEN LIMMER LOOP AND CHANDLER ROAD
WILLIAMSON COUNTY, TEXAS

Bid 1708-186

RABA KISTNER CONSULTANTS

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Project No. AAA15-056-00
October 30, 2015

Arnold Gonzales, Jr. , P.E., CFM
BURY, Inc.
221 West 6th Street,
New Braunfels, Texas 78130

RE: Geotechnical Engineering Study
County Road 119
Between Limmer Loop and Chandler Road
Williamson County, Texas

Dear Mr. Gonzales:

RABA KISTNER Consultants Inc. (RKCI) is pleased to submit the revised report of our Geotechnical Engineering Study for the above-referenced project. This study was performed in accordance with RKCI Proposal No. PAA15-106-00, dated August 14, 2015. The purpose of this study was to drill borings within the proposed roadway alignment, to perform laboratory testing to classify and characterize subsurface conditions, and to prepare an engineering report presenting foundation design recommendations for the bridge structure and pavement design and construction guidelines for the extension of County Road 119.

The following report contains our design recommendations and considerations based on our current understanding of the project information provided to us. There may be alternatives for value engineering of the foundation and pavement systems, and RKCI recommends that a meeting be held with the Owner and design team to evaluate these alternatives.

We appreciate the opportunity to be of service to you on this project. Should you have any questions about the information presented in this report, or if we may be of additional assistance with value engineering or on the materials testing-quality control program during construction, please call.

Very truly yours,

RABA KISTNER CONSULTANTS, INC.

Yvonne Garcia Thomas, P.E.P
Project Engineer

Gabriel Ornelas, Jr., P.E., PMP
Vice President

STATE OF TEXAS
GABRIEL ORNELAS, JR.
87851
LICENSED PROFESSIONAL ENGINEER
10/30/2015

GO/YGT: tlc

Attachments

Copies Submitted: Above (1-Electronic; 1-Bound)

Williamson County, Texas

9/28/2017 8:04 AM

GEOTECHNICAL ENGINEERING STUDY

For

COUNTY ROAD 119
BETWEEN LIMMER LOOP AND CHANDLER ROAD
WILLIAMSON COUNTY, TEXAS

Prepared for

BURY, INC.
Austin, Texas

Prepared by

RABA KISTNER CONSULTANTS, INC.
Austin, Texas

PROJECT NO. AAA15-056-00

October 30, 2015

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The following figures are attached and complete this report:

Boring Location Map ..... Figure 1
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Important Information About Your Geotechnical Engineering Report

Project No. AAA15-056-00 1
October 30, 2015

INTRODUCTION

RABA KISTNER Consultants Inc. (RKCI) has completed the authorized subsurface exploration and foundation and pavement analysis for the proposed extension of County Road 119, between Limmer Loop (County Road 164) and Chandler Road, in Williamson County, Texas. This report briefly describes the procedures utilized during this study and presents our findings along with our recommendations for foundation design of the bridge structure and pavement design and construction guidelines of the roadway.

PROJECT DESCRIPTION

The roadway alignment being considered in this study is the extension of County Road 119, between Limmer Loop and Chandler Road, in Williamson County, Texas. The proposed roadway is anticipated to be 12,500 lineal feet in plan dimension and extend from about Station (STA) 11+23 to STA 135+50. Based on information provided to us by the project civil engineer, Mr. Arnold Gonzales, Jr., P.E., CFM, with BURY, we understand the road classification for extension of County Road 119 is a Rural Collector Street. Furthermore, we understand the roadway will be subject to a 2015 two-way Average Daily Traffic (ADT) of 2,500 vehicles per day.

Based on our review of the provided Plan and Profiles (Sheet No. 77 through 102) for the alignment, we understand the following cut and fill scenarios will occur along the roadway alignment.

Approximate Station No.	Estimated (-)Cut/(+)Fill Along Roadway Alignment
11+23 to 19+00	-1
19+00 to 135+50	+1 to +6

Based on preliminary profile plan of the of the bridge structure provided by BURY, we understand a four lane bridge is planned. We understand the bridge extends from approximately STA 123+15 to STA 124+05 and is estimated to be approximately 90 ft long. The bridge will be located on County Road 119 approximately 1/4 of a mile south of Chandler Road. We also understand the roadway will include five box culvert stream crossings.

LIMITATIONS

This engineering report has been prepared in accordance with accepted Geotechnical Engineering practices in the region of central Texas and for the use of BURY (CLIENT) and its representatives for design purposes. This report may not contain sufficient information for purposes of other parties or other uses. This report is not intended for use in determining construction means and methods. The attachments and report text should not be used separately.

The recommendations submitted in this report are based on the data obtained from fifteen (15) borings drilled at this site, our understanding of the project information provided to us, and the assumption that site grading will result in only minor changes in the existing topography. If the project information

described in this report is incorrect, is altered, or if new information is available, we should be retained to review and modify our recommendations.

This report may not reflect the actual variations of the subsurface conditions across the site. The nature and extent of variations across the site may not become evident until construction commences. The construction process itself may also alter subsurface conditions. If variations appear evident at the time of construction, it may be necessary to reevaluate our recommendations after performing on-site observations and tests to establish the engineering impact of the variations.

The scope of our Geotechnical Engineering Study does not include an environmental assessment of the air, soil, rock, or water conditions either on or adjacent to the site. No environmental opinions are presented in this report.

If final grade elevations are significantly different from those discussed in this report (more than plus or minus 1 ft), our office should be informed about these changes. If needed and/or if desired, we will reexamine our analyses and make supplemental recommendations.

BORINGS AND LABORATORY TESTS

Subsurface conditions at the site were evaluated by 15 borings drilled at the locations shown on the Boring Location Map, Figure 1. These locations are approximate and distances were measured using a hand-held, recreational-grade GPS locator. The borings were drilled to depths of 10 ft below the existing ground surface using a truck-mounted drilling rig. During drilling operations, the following samples were collected:

Type of Sample	Number Collected
Split-Spoon with Standard Penetration Test (SPT)	14
Texas Cone Penetrometer (TCP)	13
Undisturbed Shelby Tube	59

Each sample was visually classified in the laboratory by a member of our geotechnical engineering staff. The geotechnical engineering properties of the strata were evaluated by the following tests:

Type of Test	Number Conducted
Natural Moisture Content	81
Atterberg Limits	12
Sulfate Content	6

The results of all laboratory tests are presented in graphical or numerical form on the boring logs illustrated on Figures 2 through 16. A key to classification terms and symbols used on the logs is presented on Figure 17. The results of the laboratory and field testing are also tabulated on Figure 18 for ease of reference.

Standard Penetration Test (SPT) N-values are also noted on the boring logs and Figure 17. SPT N-value refers to the number of blows a 30-inch free falling 140-lb hammer penetrates 12 inches into the subsurface materials. Where hard or dense materials were encountered, the tests were terminated at 50 blows even if one foot of penetration had not been achieved. When all 50 blows fall within the first 6 inches (seating blows), refusal "ref" for 6 inches or less will be noted.

Texas Cone Penetration test results are noted as "blows per ft" on the boring logs and Figure 17, where "blows per ft" refers to the number of blows by a 170 lb. falling hammer. The cone is driven 12 blows or approximately 6 inches, to seat it in the soil or rock. The number of blow counts proceeding is recorded for 1 ft penetration into the soil/weak rock. Where hard or dense materials were encountered, the tests were terminated at 100 blows even if one foot of penetration had not been achieved.

Samples will be retained in our laboratory for 30 days after submittal of this report. Other arrangements may be provided at the request of the Client.

SULFATE TESTING

Laboratory testing has been conducted in order to determine the concentration of soluble sulfates in the subgrade soils and to investigate the potential for adverse reaction to lime in certain sulfate-containing soils. The adverse reaction, referred to as sulfate-induced heave, has been known to cause cohesive subgrade soils to swell in short periods of time, resulting in pavement heaving and possible failure. The results of three samples are presented below.

Boring No.	Depth (ft)	Description	Sulfate Content (ppm*)
P-2	0 - 2	Dark Brown Clay	140
P-4	2 - 4	Dark Brown Clay	600
P-6	4-1/2 - 6	Tan Clay	360
P-8	2 - 4	Tan Clay	120
P-10	2 - 4	Dark Brown Clay	120
P-12	4 - 6	Tan Clay	100

*ppm= parts per million

Based on the laboratory test results, the reported value of sulfate content for the clays were determined to range from 100 to 600 ppm. Reported values of sulfate content above 3,000 ppm are known to cause sulfate-induced heaving when the soils are mixed with lime. Although the tested samples resulted in sulfate contents of less than 3,000 ppm, it should be noted that isolated pockets of higher sulfate content could possibly exist and therefore a sufficient screening program should be implemented during construction of lime stabilized subgrade.

Samples will be retained in our laboratory for 30 days after submittal of this report. Other arrangements may be provided at the request of the Client.

GENERAL SITE CONDITIONS

SITE DESCRIPTION

The project boundary for the roadway is between Limmer Loop and Chandler Road in Hutto, Texas. The roadway alignment is planned to extend north from the existing portion of County Road 119 to Chandler Road over several parcels of undeveloped land. Surface drainage is visually estimated to range from fair to poor.

GEOLOGY

A review of the *Geologic Atlas of Texas, Austin Sheet*, indicates that this site is naturally underlain with the soils/rock of the Austin Chalk, which is a form of limestone with intermittent seams of chalky marl and clay. Compared to other limestone formations in the Austin area such as Edwards Limestone, the Austin Chalk is comparatively softer in induration but is still considered a very hard rock substance and often contains harder, massive seams, layers, and/or ridges. The Austin Chalk also can contain karstic features in the form of open and/or clay-filled vugs, voids, and/or solution cavities that form as a result of solution movement through fractures in the rock mass.

Key geotechnical engineering considerations for development supported on this formation will be the depth to rock, the expansive nature of the overlying clays, the condition of the rock, and the presence/absence of karstic features.

STRATIGRAPHY

The subsurface stratigraphy at this site can be described by 3 generalized strata. Each stratum has been designated by grouping soils that possess similar physical and engineering characteristics. The boring logs should be consulted for more specific stratigraphic information. The lines designating the interfaces between strata on the boring logs represent approximate boundaries. Transitions between strata may be gradual.

Stratum I generally consists of very stiff to hard, dark brown, fat (CH) clay. These clays are classified as highly plastic with measured plasticity indices (PI) ranging from 35 to 52. Measured moisture contents generally range from 17 to 31 percent. This stratum generally extends to depths ranging from approximately 4 to 8 ft below the existing ground surface in our borings.

Stratum II generally consists of hard, tan lean (CL) clay, with calcareous deposits. Plasticity indices range from 22 and 28. Measured moisture contents generally range from 9 to 19 percent. SPT N-values generally range from 14 blows per foot to 50 blows per foot of penetration. This stratum extends to at least the boring termination depths in Borings P-1 through P-13.

Stratum III generally consists of hard, tan chalk (limestone). Texas Cone Penetrometers (TCP) generally range from 100 blows per 1/2-inch to 100 blows per 1-3/4-inches of penetration. Bridge Borings B-1 and B-2 were terminated in this stratum.

GROUNDWATER

Groundwater was not observed in the borings either during or immediately upon completion of the drilling operations. It is possible for groundwater to exist beneath this site at shallow depths on a transient basis, particularly at the soil to rock interface following periods of precipitation. Fluctuations in groundwater levels occur due to variation in rainfall and surface water run-off. The construction process itself may also cause variations in the groundwater level.

FOUNDATION ANALYSIS

EXPANSIVE SOIL-RELATED MOVEMENTS

The anticipated ground movements due to swelling of the underlying soils at the site were estimated based on our understanding of anticipated cut/fill along the roadway alignment using the empirical procedure, Texas Department of Transportation (TxDOT) Tex-124-E, Method for Determining the Potential Vertical Rise (PVR). A surcharge load of 1 psi (concrete slab and sand cushion), an active zone of 15 ft and/or to the depth of rock, and dry moisture conditions were assumed in estimating the above PVR values.

Approximate Station No.	Estimated PVR
11+23 to 19+00	2 in. or less
19+00 to 26+00	2-1/2 in.
26+00 to 36+00	3 in.
36+00 to 135+50	2 in. or less

The above PVR values were estimated assuming borrow fill material will consist of 2014 TxDOT Standard Specifications, Item 132, Type A select borrow fill as recommended in this report. Utilization of materials with greater plasticity indices other than what has been recommended may result in increased PVR values.

The TxDOT method of estimating expansive soil-related movements is based on empirical correlations utilizing the measured plasticity indices and assuming typical seasonal fluctuations in moisture content. If desired, other methods of estimating expansive soil-related movements are available, such as estimations based on swell tests and/or soil-suction analyses. However, the performance of these tests and the detailed analysis of expansive soil-related movements were beyond the scope of the current study. It should also be noted that actual movements can exceed the calculated PVR values due to isolated changes in moisture content (such as due to leaks, landscape watering) or if water seeps into the soils to greater depths than the assumed active zone depth due to deep trenching or excavations.

OVEREXCAVATION AND SELECT FILL REPLACEMENT

To reduce expansive soil-related movements in at-grade construction, a portion of the upper highly expansive subgrade clays can be removed by overexcavating and backfilling with suitable material. The following sections along the roadway alignment will require additional undercutting to reduce expansive soil related movements to 2 inches or less.

Approximate Station No.	Overexcation and Select Fill Replacement to Reduce PVR to 2 inches or less
19+00 to 26+00	1 ft
26+00 to 36+00	2 ft

To maintain the above estimated PVR values, subsequent fill placed should consist of 2014 TxDOT Standard Specifications, Item 132, Type A select borrow fill as shown in the *Roadway Embankment Select Fill Material* section of this report. Recommendations for the selection and placement of borrow fill materials are addressed in a subsequent section of this report.

ROADWAY EMBANKMENT FILL PLACEMENT

In general, the majority of the roadway alignment will require 1 to 6 ft of fill material to raise grade. In areas where fill placement will be required, it has been assumed that additional placed fill material will also be comprised of *Roadway Embankment Select Fill Material* as discussed in this report.

FOUNDATION RECOMMENDATIONS

DRILLED, STRAIGHT-SHAFT PIERS

We have computed allowable downward axial capacities for 24, 30, 36, and 42 in. diameter drilled piers for the proposed bridge piers. Straight-shaft piers should be designed as friction and end bearing units using the capacities presented on the drilled pier capacity curves. Side shear resistance was neglected to the elevations noted on the drilled pier capacity curves as well as in the bottom one shaft diameter.

Pier capacity curves were developed using the TxDOT Geotechnical Manual dated December 2012. The capacity and uplift capacity curves are presented graphically in Figure 19 and 20. The capacity curves are based on the TCP blow count data from our borings. The indicated capacities on these figures are for total loads. Dead loads should not exceed two-thirds of the computed capacities.

It should be noted, TxDOT considers a “disregard depth” in the design of drilled straight-shaft piers which considers the amount of subsurface soil to neglect due to erosion from scour, future excavation, seasonal moisture changes, lateral migration of water, etc. In cases where the bridge crosses over an existing stream the upper 10 ft and/or the depth of scour (whichever is deeper) should be neglected. The portion of the foundation passing through embankment fill should also be neglected.

At the time this report was prepared, a scour analysis had not been performed to determine whether the disregard depth of 10 ft was appropriate. We have neglected the subsurface soils above the chalk stratum in developing the pier capacity curves. Should the results of a scour analysis indicate reducing the depth of disregard, RKCI should be retained to reevaluate the drilled pier capacities.

The pier shafts will be subject to potential uplift forces if the surrounding expansive soils within the active zone are subjected to alternate drying and wetting conditions. The active zone assumed for calculation of the uplift force was assumed to be 15 ft below the existing ground surface at our boring locations.

The maximum potential uplift force acting on the shaft may be estimated by:

$$F_u = 65*D$$

Where:

F_u = uplift force in kips; and
D = diameter of the shaft in feet.

Resistance to uplift forces exerted on the drilled, straight-shaft piers will be provided by the sustained compressive axial force (dead load) plus the allowable uplift resistance provided by the soil. The resistance provided by the soil depends on the shear strength of the soils/rock adjacent to the pier shaft and below the depth of the active zone. The allowable uplift resistance provided by the soils/rock at this site may be estimated using the allowable uplift capacity curves presented graphically in Figures 20a through 20c. Side shear resistance was neglected to the elevations presented in the notes on the uplift capacity curves.

Reinforcing steel will be required in each pier shaft to withstand a net force equal to the uplift force minus the uplift resistive force and the sustained compressive load carried by that pier. We recommend that each pier be reinforced to withstand this net force or an amount equal to 1 percent of the cross-sectional area of the shaft, whichever is greater.

Chapter 5, Section 3 - Drilled Shafts of the Texas Department of Transportation (TxDOT) Geotechnical Manual, dated December 2012, provides a table of Maximum Allowable Drilled Shaft Service Loads. Table 5-1 lists the maximum recommended structural loads for drilled shafts. We recommend that the design team review and consider this information in the event that it is applicable to this project.

LATERAL RESISTANCE

Resistance to lateral loads and the expected pier behavior under the applied loading conditions will depend not only on subsurface conditions, but also on loading conditions, the pier size, and the engineering properties of the pier. As this information is not yet available, analysis of pier behavior is not possible at this time. Once preliminary pier sizes, concrete strength, and reinforcement are known, piers should be analyzed to determine the resulting lateral deflection, maximum bending moment, and ultimate bending moment. This type of analysis is typically performed utilizing a computer analysis program and usually requires a trial and error procedure to appropriately size the piers and meet project tolerances.

To assist the design engineer in this procedure, we are providing the following soil parameters for use in analysis. These parameters are in accordance with the input requirements of one of the more commonly used computer programs for laterally loaded piles, the LPile program. If a different program is used for analysis, different parameters and limitations may be required than what were assumed in selecting the parameters given below. Thus, if a program other than LPile is used, RKCI must be notified of the analysis method, so that we can review and revise our recommendations if required.

Above the neglected elevations presented on the drilled pier capacity curves of each abutment/bent, the LPile recommendations presented in the table below should be utilized up to the proposed final ground surface elevation.

The soil-related parameters required for input into the "LPile" are summarized in the table below, the worst case:

Boring B-1, Abutment 3

Assumed Behavior for Analysis	Elevation (ft)	c (ksf)	ks (pci)	kc (pci)	ε_{50}	γ (pcf)
Soft Clay (Matlock)	712 to 722	0.3	30	-	0.02	95
Soft Clay (Matlock)	710 to 712	1.0	500	200	0.007	95
Stiff Clay without Free Water (Reese)	690 to 710	4.0	2000	2000	0.004	115

c = undrained cohesion
k_s = p-y modulus (static)
k_c = p-y modulus (cyclic)
ε_{50} = strain factor
γ = effective unit weight
q_a = uniaxial compressive strength

Boring B-1, Bridge Bent 2

Assumed Behavior for Analysis	Elevation (ft)	c (ksf)	ks (pci)	kc (pci)	ε_{50}	γ (pcf)
Soft Clay (Matlock)	708 to 719	0.3	30	-	0.02	95
Stiff Clay without Free Water (Reese)	692 to 708	4.0	2000	2000	0.004	115

Boring B-2, Bridge Abutment 1

Assumed Behavior for Analysis	Elevation (ft)	c (ksf)	ks (pci)	kc (pci)	ε_{50}	γ (pcf)
Soft Clay (Matlock)	713 to 723	0.3	30	-	0.02	33
Soft Clay (Matlock)	711 to 713	1.0	500	200	0.007	33
Stiff Clay without Free Water (Reese)	692 to 711	4.0	2000	2000	0.004	115

As stated above a "disregard depth" should be considered in the design of drilled straight-shaft piers. For bridges which cross an existing stream, at least the upper 10 ft should be neglected as well as the portion of the foundation passing through embankment fill. As previously mentioned, a scour analysis had not been performed. The disregard depth has been conservatively lowered to the elevation of the chalk. Reduced L-pile parameters were utilized within this zone of neglection for modeling analysis.

The values presented above for subgrade modulus and the strain at 50% are generally based on recommended values for the LPile program for the strength of materials encountered in our boring and are not necessarily based on laboratory test results.

The parameters presented in the above table do **not** include factors of safety. We recommend that a factor of safety of at least 2 be introduced to the analysis by doubling the applied lateral loads and moments.

It should be noted that where piers are spaced closer than three shaft diameters center to center, a modification factor should be applied to the p-y curves to account for a group effect. We recommend the following p-Multipliers for the corresponding center to center pier spacings.

Spacing (in shaft diameters)	p-Multiplier
3	1.0
2	0.75
1	0.50

PIER SPACING

Where possible, we recommend that the piers be spaced at a center to center distance of at least three shaft diameters on-center for straight-shaft piers. Such spacing will not require a reduction in the load carrying capacity of the individual piers.

If design and/or construction restraints require that piers be spaced closer than the recommended three shaft diameters, RKCI must re-evaluate the allowable bearing, skin friction, and lateral capacities presented above for the individual piers. Reductions in load carrying capacities may be required depending upon individual loading and spacing conditions.

RETAINING STRUCTURES

We understand a bridge structure is planned along County Road 119. In the event wingwalls are utilized for design of the bridge structure, the wingwalls will act as retaining walls and should be designed for lateral earth pressures. Drainage conditions will also need to be considered in design. The following sections provide information for evaluating lateral earth pressures, drainage issues, and parameters for footing design.

LATERAL EARTH PRESSURES

Equivalent fluid density values for computation of lateral soil pressures acting on retaining walls were evaluated for various types of backfill materials that may be placed behind the retaining walls. These values, as well as corresponding lateral earth pressure coefficients and estimated unit weights, are presented below in preferential order for use as backfill materials.

Back Fill Type	Estimated Total Unit Weight (pcf)	Active Condition		At Rest Condition	
		Earth Pressure Coefficient, k_a	Equivalent Fluid Density (pcf)	Earth Pressure Coefficient, k_o	Equivalent Fluid Density (pcf)
Washed Gravel	135	0.29	40	0.45	60
Crushed Limestone	145	0.24	35	0.38	55
Clean Sand	120	0.33	40	0.5	60
Pit Run Clayey Gravels or Sands	135	0.32	45	0.48	65
Clays	120	0.59	70	0.74	90

The values tabulated above under "Active Conditions" pertain to flexible retaining walls free to tilt outward as a result of lateral earth pressures. For rigid, non-yielding walls the values under "At-Rest Conditions" should be used.

The values presented above assume the surface of the backfill materials to be level. Sloping the surface of the backfill materials will increase the surcharge load acting on the structures. The above values also do not include the effect of surcharge loads such as construction equipment, vehicular loads, or future storage near the structures. Nor do the values account for possible hydrostatic pressures resulting from groundwater seepage entering and ponding within the retained backfill materials. As discussed later, the walls should be provided with a drain system to allow for the dissipation of water. Surcharge loads and groundwater pressures should be considered in designing any structures subjected to lateral pressures.

The on-site clays exhibit significant shrink/swell characteristics. The use of clay soils as backfill against the proposed retaining structures is not recommended. These soils generally provide higher design active earthen pressures, as indicated above, but may also exert additional active pressures associated with swelling. Controlling the moisture and density of these materials during placement will help reduce the likelihood and magnitude of future active pressures due to swelling, but this is no guarantee.

BACKFILL COMPACTION

Placement and compaction of backfill behind the retaining walls will be critical, particularly at locations where backfill will support adjacent near-grade foundations and/or flatwork. If the backfill is not properly compacted in these areas, the adjacent foundations/flatwork can be subject to settlement.

To reduce potential settlement of adjacent foundations/flatwork, the backfill materials should be placed and compacted as recommended in the *Select Fill* section of this report. Each lift or layer of the backfill should be tested during the backfilling operations to document the degree of compaction. Within at least a 5-ft zone of the wall backside, we recommend that compaction be accomplished using hand-guided compaction equipment capable of achieving the maximum density in a series of 3 to 5 passes.

DRAINAGE

The use of drainage systems is a positive design step toward reducing the possibility of hydrostatic pressure acting against the retaining structures. Drainage may be provided by the use of a drain trench and pipe. The drain pipe should consist of a slotted, heavy duty, corrugated polyethylene pipe and should be installed and bedded according to the manufacturer's recommendations. The drain trench should be filled with gravel (meeting the requirements of ASTM D 448 coarse concrete aggregate Size No. 57 or 67) and extend from the base of the structure to within 2 ft of the top of the structure. The bottom of the drain trench will provide an envelope of gravel around the pipe with minimum dimensions consistent with the pipe manufacturer's recommendations. The gravel should be wrapped with a suitable geotextile fabric (such as Mirafi 140N or equivalent) to help minimize the intrusion of fine-grained soil particles into the drain system. The pipe should be sloped and equipped with clean-out access fittings consistent with state-of-the-practice plumbing procedures.

As an alternative to a full-height gravel drain trench behind the proposed retaining structures, consideration may be given to utilizing a manufactured geosynthetic material for wall drainage. A number of products are available to control hydrostatic pressures acting on earth retaining structures, including Amerdrain (manufactured by American Wick Drain Corp.), Miradrain (manufactured by Mirafi, Inc.), Enkadrain (manufactured by American Enka Company), and Geotech Insulated Drainage Panel (manufactured by Geotech Systems Corp.). The geosynthetics are placed directly against the retaining structures and are hydraulically connected to the gravel envelope located at the base of the structures.

Weepholes may be provided along the length of the proposed retaining structures, if desired, in addition to one of the two alternative drainage measures presented above. Based on our experience, weepholes, as the only drainage measure, often become clogged with time and do not provide the required level of drainage from behind retaining structures. We recommend that RKCI review the final retaining structure drainage design before construction.

WINGWALL FOOTINGS

Proposed retaining wall footings may be supported on shallow footings bearing in the native clay subgrade. Footings may be designed using a maximum allowable bearing pressure of 2,300 psf. A coefficient of sliding friction of 0.50 may be assumed in evaluation of the factor of safety against sliding. The wing wall footings may also be supported on drilled shafts.

FOUNDATION CONSTRUCTION CONSIDERATIONS

SITE DRAINAGE

Drainage is an important key to the successful performance of any foundation. Good surface drainage should be established prior to and maintained after construction to help prevent water from ponding within or adjacent to the bridge.

SITE PREPARATION

Areas to support select fill should be stripped of all vegetation and organic topsoil. Exposed subgrades should be thoroughly proofrolled in order to locate and densify any weak, compressible zones. A minimum of 5 passes of a fully-loaded dump truck or a similar heavily-loaded piece of construction equipment should be used for planning purposes. Proofrolling operations should be observed by the Geotechnical Engineer or his representative to document subgrade condition and preparation. Weak or soft areas identified during proofrolling should be removed and replaced with suitable, compacted on-site clays, free of organics, oversized materials, and degradable or deleterious materials.

Upon completion of the proofrolling operations and just prior to fill placement, the exposed subgrade should be moisture conditioned by scarifying to a minimum depth of 6 inches and recompacting to a minimum of 95 percent of the maximum density determined from TxDOT, Tex-114-E, Compaction Test. The moisture content of the subgrade should be maintained within the range of optimum moisture content to 3 percentage points above optimum moisture content until permanently covered.

SELECT FILL

Materials used as select fill for final site grading preferably should be crushed stone or gravel aggregate. We recommend that materials specified for use as select fill meet the TxDOT 2004 Standard Specifications for Construction and Maintenance of Highways, Streets and Bridges, Item 247, Flexible Base, Type A, or Type C, Grades 1 through 3.

Select fill should be placed in loose lifts not exceeding 8 inches in thickness and compacted to at least 95 percent of maximum density as determined by TxDOT, Tex-113-E, Compaction Test. The moisture content of the fill should be maintained within the range of 2 percentage points below to 2 percentage points above the optimum moisture content until final compaction.

Soils classified as CH, CL, MH, ML, SM, GM, OH, OL, SC and Pt under the USCS are **not** considered suitable for use as select fill materials at this site. The Stratum I and II materials are **not** considered suitable for use as select fill materials.

ROADWAY EMBANKMENT FILL MATERIALS

Materials used as borrow fill for final site grading preferably shall consist of the following as indicated in the plans:

- 2014 TxDOT Item 132, Type A - Granular fill
- 2014 TxDOT Item 132, Type C - Material meeting specifications requirements shown on plans

Select borrow fill should be placed in accordance to TxDOT Item 132 and compacted utilizing density control.

Alternatively, materials classified in accordance with the Unified Soil Classification System (USCS) such as clayey gravel (GC), clayey sand (SC), and lean clay (CL), may be considered satisfactory for use as borrow fill materials along the roadway alignment/bridge embankment. Alternative select fill materials shall have a maximum liquid limit not exceeding 40, a plasticity index between 7 and 20, and a maximum particle size not exceeding 4 inches or one-half the loose lift thickness, whichever is smaller. In addition, if these materials are utilized, grain size analyses and Atterberg Limits must be performed during placement at a rate of one test each per 5,000 cubic yards of material due to the high degree of variability associated with pit-run materials.

If the above listed alternative materials are being considered for bidding purposes, the materials should be submitted to the Geotechnical Engineer for pre-approval at a minimum of 10 working days or more prior to the bid date. Failure to do so will be the responsibility of the contractor. The contractor will also be responsible for ensuring that the properties of all delivered alternate select fill materials are similar to those of the pre-approved submittal. It should also be noted that when using alternative fill materials, difficulties may be experienced with respect to moisture control during and subsequent to fill placement, as well as with erosion, particularly when exposed to inclement weather. This may result in sloughing of beam trenches and/or pumping of the fill materials.

SHALLOW FOUNDATION EXCAVATIONS

Shallow foundation excavations should be observed by the Geotechnical Engineer or their representative prior to placement of reinforcing steel and concrete. This is necessary to observe that the bearing soils at the bottom of the excavations are similar to those encountered in our borings and that excessive loose materials and water are not present in the excavations. If soft pockets of soil are encountered in the foundation excavations, they should be removed and replaced with a compacted non-expansive fill material or lean concrete up to the design foundation bearing elevations.

DRILLED PIERS

Each drilled pier excavation must be examined by an RKCI representative who is familiar with the geotechnical aspects of the soil stratigraphy, the structural configuration, foundation design details and assumptions, prior to placing concrete. This is to observe that:

- The shaft has been excavated to the specified dimensions at the correct depth established by the previously mentioned criteria;
- An acceptable portion of the shaft penetrates appropriate bearing material;
- The shaft has been drilled plumb within specified tolerances along its total length; and
- Upon completion of each drilled pier, piers side walls and bottom should be clear of excessive cuttings, buildup and soft, compressible materials. A final pass may be needed to ensure build is completely removed from the bottom of the excavation.

Reinforcement and Concrete Placement

Reinforcing steel should be checked for size and placement prior to concrete placement. Placement of concrete should be accomplished as soon as possible after excavation to reduce changes in the moisture content or the state of stress of the foundation materials. No foundation element should be left open overnight without concreting.

In the event groundwater is encountered during drilled pier construction, a tremie should be utilized to control the vertical drop of the concrete to the bottom of the pier hole.

Temporary Casing

Groundwater seepage was observed in our borings at the time of our subsurface exploration, and was generally encountered at the clay to shale interface about 28 to 29 ft below the existing ground surface. Groundwater seepage is likely to be encountered at the time of construction, depending on climatic conditions prevalent at the time of construction. Therefore, we recommend that the bid documents require the foundation contractor to specify unit costs for different lengths of casing that may be required.

EXCAVATION SLOPING AND BENCHING

If utility trenches or other excavations extend to or below a depth of 5 ft below construction grade, the contractor or others shall be required to develop a trench safety plan to protect personnel entering the

trench or trench vicinity. The collection of specific geotechnical data and the development of such a plan, which could include designs for sloping and benching or various types of temporary shoring, are beyond the scope of the current study. Any such designs and safety plans shall be developed in accordance with current OSHA guidelines and other applicable industry standards.

EXCAVATION EQUIPMENT

Our boring logs are not intended for use in determining construction means and methods and may therefore be misleading if used for that purpose. We recommend that earth-work and utility contractors interested in bidding on the work perform their own tests in the form of test pits to determine the quantities of the different materials to be excavated, as well as the preferred excavation methods and equipment for this site.

PAVEMENT RECOMMENDATIONS

We understand street classifications for County Road 119 is a "Rural Collector" street. Roadways within Williamson County should be designed and constructed using the *Williamson County Pavement Design Guidelines for Streets and Roadways*.

SWELL/HEAVE POTENTIAL

The anticipated ground movements due to swelling of the underlying soils at the site were estimated for the stratigraphic conditions encountered in our borings. A range in Potential Vertical Rise (PVR) on the order of 3 to 4 inches was estimated for conditions encountered in our soil borings.

NATIVE SUBGRADE STRENGTH CHARACTERIZATION

We have assumed the subgrade in the pavement areas will primarily consist of on-site Stratum I dark brown clay (CH) placed and compacted as recommended in the *On-Site Clay Fill* section of this report. Based on our experience, RKCI has assigned a design California Bearing Ratio (CBR) value of 3.0 for use in the pavement design analysis.

MASS FILL SUBGRADE STRENGTH CHARACTERIZATION

Based on a review of the proposed plan and profiles sheets, fill placement will be required along the roadway alignment. *At the time this document was prepared, a borrow fill material source had not been selected. For the purpose of our pavement analysis, we have assumed borrow fills will be similar to the materials described in the Embankment Roadway Fill Materials section, Type A-Granular fill.*

For the purpose of our analyses, we have assumed a subgrade modulus of 10,000 psi for the Type A-Granular fill.

SWELL/HEAVE POTENTIAL

As presented in a previous section of this report, we have provided overexcavation and select fill replacement scenarios to achieve PVR values of 2 inches or less along the alignment. The design team

should carefully consider the performance criteria of the roadway and determine the most appropriate option. We highly recommend implementation of the PVR reduction option to mitigate expansive clay soils by using select borrow as fill materials for mass embankment fill. Note the use of highly expansive clay soils, such as those encountered at this site will impact the long-term performance of the roadway. The pavement will be more susceptible to differential movements of the pavement and longitudinal cracking due to expansive soils.

DESIGN TRAFFIC VOLUME

Based on information provided to us by BURY, we understand the road classification for extension of County Road 119 is a Rural Collector Street. Furthermore, we understand the roadway will be subject to a two-way Average Daily Traffic (ADT) of 2,500 vehicles per day.

DESIGN EQUIVALENT 18-KIP SINGLE AXLE LOAD

The design equivalent 18-kip single axle load was estimated utilizing the AASHTOWare DARWin 3.1.01, Pavement Design and Analysis System. DARWin is a software program published by the American Association of State Highway and Transportation Officials (AASHTO) and is based on the 1993 edition of the AASHTO "Guide for the Design of Pavement Structures."

Utilizing a design two-way ADT of 2,500 vehicles per day, the design equivalent 18-kip single axle load was determined to be approximately **620,000**. The remaining parameters were utilized in our estimate:

Performance Period	Design Two Way Traffic (ADT)	Number of Lanes in Design Direction	Percent of Trucks in Design Lane	Percent of Trucks in Design Direction	Average Daily Traffic Growth	Truck Factor	Minimum Percent Trucks
20 years	2,500	2	90%	50%	4%	0.58	9%

Refer to attached DARWin Pavement Design and Analysis output files for accumulated 18-kip ESAL's estimated for a 20 year design life.

DESIGN PARAMETERS – AASHTO DARWIN

As previously noted, we have been asked to consider design criteria for a street classification of a Rural Collector street. The following pavement design parameters were utilized in our analysis.

Equivalent 18-kip Single Axle Load Applications (ESAL's)	Reliability	Serviceability Initial/Terminal	Standard Deviation	Roadbed Soil Resilient Modulus (psi)
620,000	90%	4.2/2	0.44	4,500

To determine the required design Structural Number (SN) value, we utilized a software program entitled "AASHTOWare DARWin 3.1.01, Pavement Design and Analysis System," which is published by the American Association of State Highway and Transportation Officials (AASHTO) and is based on the 1993

edition of the AASHTO "Guide for the Design of Pavement Structures." The value presented above is based upon the traffic and subgrade conditions as well as the other design inputs shown.

The required structural number is related to the assumed CBR value of the pavement subgrade and the amount of traffic that the pavement will carry over its service life. The CBR provides an estimate of the relative strength of the subgrade and consequently indicates the ability of the pavement section to carry load. This assumed CBR value is utilized in conjunction with the above specified parameters to determine the required SN for use in design of flexible pavements, which was determined to be **3.67.**

RECOMMENDED PAVEMENT SECTION

Based on the above criteria and utilizing the AASHTOWare DARWin Pavement Design and Analysis System program, we recommend the flexible pavement section presented below. Clay fill utilized for fill grading in pavement areas, should be placed and compacted as discussed in the *On-Site Fill* section of this report.

Layer Description	TxDOT Spec. Item No.	Layer Thickness			
		Option 1 without Geogrid	Option 2 with Geogrid	Option 3 without Geogrid	Option 4 with Geogrid
Type "C" Surface Course	340 or 341	2.0 in.	2.0 in.	3.0 in.	3.0 in.
Type "B" Surface Course	340 or 341	2.0 in.	2.0 in.	2.0 in.	2.0 in.
Flexible Base	247	15.0 in.	13.0 in.	12.0 in.	10.0 in.
TriAx TX5 Geogrid	--	no	yes	no	yes
Lime-Treated Subgrade	260	8.0 in.	8.0 in.	8.0 in.	8.0 in.
Combined Total		**27.0 in.**	**25.0 in.**	**25.0 in.**	**23.0 in.**

Note: Assumes fill subgrade is comprised of Type A borrow fill.

LONGITUDINAL CRACKING

It should be understood that asphalt pavement sections in highly expansive soil environments, can develop longitudinal cracking along unprotected pavement edges. In the semi-arid climate of central Texas this condition typically occurs along the unprotected edges of pavements where the adjoining grounds are not developed, i.e. not landscaped/irrigated or otherwise maintained.

The longitudinal cracking generally occurs between 2 to 4 feet inside of and parallel to the unprotected edges of the pavement. The occurrence of these cracks can be more prevalent in the absence of lateral restraint and steep embankments. Differential drying and shrinkage of the highly expansive clay subgrade between the exposed pavement edge and that beneath the pavement section commonly causes the cracking. This problem can best be addressed by providing either a horizontal or vertical moisture barrier at the unprotected pavement edge.

A horizontal barrier is commonly in the form of a paved shoulder extending 8 feet or greater beyond the edge of the pavement. Other methods of shoulder treatment, such as using geofabrics beyond the edge of the roadway, are sometimes used in an effort to help reduce longitudinal cracking. Although this alternative does not eliminate the longitudinal cracking phenomenon, the location of the cracking is transferred to the shoulder rather than within the traffic lane.

Vertical barriers installed along the unprotected edges of roadway pavements are also effective in preventing non-uniform drying and shrinkage of the subgrade clays. These barriers are typically in the form of a vertical moisture barrier/membrane extending a minimum of 6 feet below the top of the subgrade at the pavement edge. Both types of barriers must be sealed at the edge of the pavement to prevent a crack that would facilitate the drying of the subgrade clays.

A more economical alternative, which will not limit the shrinkage of the underlying subgrade clays but may help reduce the occurrence of longitudinal, cracking, is the use of a geogrid base reinforcement in the pavement section. Geogrid gives the pavement section a tensile strength component that is not otherwise inherent in a typical flexible base pavement section.

OPTIONS FOR REDUCING EXPANSIVE SOIL RELATED MOVEMENTS

Subgrade soils that are highly expansive when water is introduced (i.e. highly plastic soils) will heave, causing the pavement to become rough or uneven over time. Pavement roughness is generally defined as an expression of irregularities in the pavement surface that adversely affect the ride quality of a vehicle (and thus the user). Roughness is an important pavement characteristic because it affects not only ride quality but also vehicle costs, fuel consumption, and maintenance costs. Pavement heave can be reduced through various measures but cannot be totally eliminated without full removal of the problematic soil. Measures available for reducing heave include:

- Soil Stabilization with Lime or Other Pozzolans
- Removal and Replacement of High PI Soils
- Drains or Barriers to Collect or Inhibit Moisture Infiltration

Soil stabilization with lime is typically used to reduce the swelling potential of the upper portion of the pavement subgrade containing moderately plastic soils. Lime and water are mixed with the top 6 to 12 inches (or possibly more) of the subgrade and allowed to mellow or cure for a period of time. After mellowing the soil-lime mixture is compacted to form a strong soil matrix that can improve pavement performance and potentially reduce soil heave. However, in highly plastic soils, lime stabilization of only the top portion of the expansive subgrade may not provide an acceptable reduction in PVR. For a more substantial reduction in PVR, removal and replacement of the high PI soil may be the only method available to reduce the potential vertical rise of the pavement to an acceptable level. As stated previously though, it must be recognized that partial removal of expansive clay soil only reduces the potential (or risk) of the damage swell can cause to a pavement and does not completely eliminate this risk.

In addition, capturing water infiltration via French drains, pavement edge drains, or inhibiting water through the use of vertical moisture barriers would reduce the potential for heave since one important component of the heaving mechanism, water, would be reduced.

The pavement sections derived in the previous sections are structurally adequate for the given traffic levels and existing clay subgrade strength, but are not intended be able to overcome the long-term effects of pavement roughness due to heave, which can only be addressed by the measures discussed in this section.

PAVEMENT CONSTRUCTION CONSIDERATIONS

SUBGRADE PREPARATION

Subgrade preparation should be conducted in accordance with the City of Hutto specifications for preparing subgrade, Item No. 201, *Subgrade Preparation*. Areas to support pavements should be stripped of all vegetation and organic topsoil. Exposed subgrade should be thoroughly proofrolled in order to locate and densify any weak, compressible zones. A minimum of 5 passes of a fully-loaded dump truck or a similar heavily-loaded piece of construction equipment should be used for planning purposes. Proofrolling operations should be observed by the Geotechnical Engineer or his representative to document subgrade condition and preparation. Weak or soft areas identified during proofrolling should be removed and replaced with a suitable, compacted backfill.

The exposed subgrade should be moisture conditioned. This should be done after completion of the proofrolling operations and just prior to flexible base placement. Moisture conditioning is done by scarifying to a minimum depth of 6 inches and recompacting to a minimum of 95 percent of the maximum density determined from the Texas Department of Transportation Compaction Test (TxDOT, Tex-114-E). The moisture content of the subgrade should be maintained within the range of optimum moisture content to 3 percentage points above optimum until permanently covered.

DRAINAGE CONSIDERATIONS

As with any soil-supported structure, the satisfactory performance of a pavement system is contingent on the provision of adequate surface and subsurface drainage. Insufficient drainage can result in pavement failure thus reducing the performance and service life of the pavement systems. Surface and subsurface drainage considerations crucial to the performance of pavements at this site include (but are not limited to) the following:

1. Any known natural or man-made subsurface seepage at the site which may occur at sufficiently shallow depths as to influence moisture contents within the subgrade should be intercepted by drainage ditches or below grade French drains.
2. Final site grading should eliminate isolated depressions adjacent to curbs which may allow surface water to pond and infiltrate into the underlying soils. **Curbs should completely penetrate base materials and should be installed to sufficient depth to reduce infiltration of water beneath the curbs.**
3. Pavement surfaces should be maintained to help minimize surface ponding and to provide rapid sealing of any developing cracks. These measures will help reduce infiltration of surface water downward through the pavement section.

ROADWAY EMBANKMENT FILL MATERIALS

Materials used as borrow fill along the roadways should be comprised of 2014 TxDOT Standard Specification Item 132, Type A- Granular fill. Select borrow fill should be placed in accordance to TxDOT Item 132 and compacted utilizing Density Control.

LIME TREATMENT OF SUBGRADE

Lime treatment of the subgrade soils should be in accordance with the TxDOT Standard Specifications, Item 260. A sufficient quantity of hydrated lime should be mixed with the subgrade soils to reduce the soil-lime mixture plasticity index to 15 or less. For estimating purposes, we recommend that 6 percent lime by weight be assumed for treatment. For construction purposes, we recommend that the optimum lime content of the subgrade soils be determined by laboratory testing. Lime-treated subgrade soils should be compacted to a minimum of 95 percent of the maximum density at a moisture content within the range of optimum moisture content to 3 percentage points above the optimum moisture content as determined by Tex-121-E. Lime treatment should extend at least 3 ft beyond the curb.

If lime treatment is considered as a method to improve pavement subgrade conditions, it is also recommended to perform additional laboratory testing to determine the concentration of soluble sulfates in the subgrade soils, in order to investigate the potential for a recently reported adverse reaction to lime in certain sulfate-containing soils. The adverse reaction, referred to as sulfate-induced heave, has been known to cause cohesive subgrade soils to swell in short periods of time, resulting in pavement heaving and possible failure.

GEOGRID REINFORCEMENT

The geogrid reinforcement should be Tensar TX-5. An approved source of geogrid is The Tensar Corporation, Morrow, GA or their designated representative. The geogrid component shall be integrally formed and produced from a punched sheet of polypropylene which is then oriented in three substantially equilateral directions so that the resulting ribs shall have a high degree of molecular orientation, which continues at least in part through the mass of the integral node. The resulting geogrid structure shall have apertures that are triangular in shape, and shall have ribs with a depth-to-width ratio greater than 1.0.

The geogrid shall have the nominal characteristics shown in the table below, and shall be certified in writing by the manufacturer to be TX-5:

Properties	Longitudinal	Diagonal	Transverse	General
Rib pitch, mm(in)	40 (1.60)	40 (1.60)	--	--
Mid-rib depth, mm (in)	--	1.3 (0.05)	1.2 (0.05)	--
Mid-rib width, mm (in)	--	0.9 (0.04)	1.1 (0.045)	--
Rib Shape	--	--	--	rectangular
Aperture Shape	--	--	--	triangular

The geogrid should be placed at the bottom of the flexible (granular) base section. An alternative to the above geogrid should not be considered without approval from RKCI.

FLEXIBLE BASE COURSE

The flexible base course should be crushed limestone conforming to TxDOT Standard Specifications, Item 247, Type A, Grades 1 or 5. Base course should be placed in lifts with a maximum thickness of 6 inches and compacted to a minimum of 100 percent of the maximum density at a moisture content within the range of 2 percentage points below to 2 percentage points above the optimum moisture content as determined by Tex-113-E.

ASPHALTIC CONCRETE SURFACE COURSE

The asphaltic concrete surface course should conform to TxDOT Standard Specifications, Item 340, Types B and C. The asphaltic concrete should be compacted to a minimum of 92 percent of the maximum theoretical specific gravity (Rice) of the mixture determined according to Test Method Tex-227-F. Pavement specimens, which shall be either cores or sections of asphaltic pavement, will be tested according to Test Method Tex-207-F. The nuclear-density gauge or other methods which correlate satisfactorily with results obtained from project roadway specimens may be used when approved by the Engineer. Unless otherwise shown on the plans, the Contractor shall be responsible for obtaining the required roadway specimens at their expense and in a manner and at locations selected by the Engineer.

EXCAVATION SLOPING AND BENCHING

If utility trenches or other excavations extend to or below a depth of 5 ft below construction grade, the contractor or others shall be required to develop a trench safety plan to protect personnel entering the trench or trench vicinity. The collection of specific geotechnical data and the development of such a plan, which could include designs for sloping and benching or various types of temporary shoring, are beyond the scope of the current study. Any such designs and safety plans shall be developed in accordance with current OSHA guidelines and other applicable industry standards.

EXCAVATION EQUIPMENT

As indicated on the boring logs, hard tan marl interbedded with limestone layers and seams was encountered below approximate depths of 6 to 8 ft below the ground surface in our borings. Excavations at these depths will require removal of the underlying marl formation. The marl may also be encountered near the surface in some areas of this site. Thus, the need of rock excavation equipment should be anticipated for construction at this site. Our boring logs are not intended for use in determining construction means and methods and may therefore be misleading if used for that purpose. We recommend that earth-work and utility contractors interested in bidding on the work perform their own tests in the form of test pits to determine the quantities of the different materials to be excavated, as well as the preferred excavation methods and equipment for this site.

MISCELLANEOUS PAVEMENT RELATED CONSIDERATIONS

Drainage Considerations

As with any soil-supported structure, the satisfactory performance of a pavement system is contingent on the provision of adequate surface and subsurface drainage. Insufficient drainage which allows saturation of the pavement subgrade and/or the supporting granular pavement materials will greatly reduce the performance and service life of the pavement systems.

Surface and subsurface drainage considerations crucial to the performance of pavements at this site include (but are not limited to) the following:

- Any known natural or man-made subsurface seepage at the site which may occur at sufficiently shallow depths as to influence moisture contents within the subgrade should be intercepted by drainage ditches or below grade French drains.
- Final site grading should eliminate isolated depressions adjacent to curbs, which may allow surface water to pond and infiltrate into the underlying soils. Curbs should be installed to a sufficient depth to reduce infiltration of water beneath the curbs and into the pavement base materials.
- Pavement surfaces should be maintained to help minimize surface ponding and to provide rapid sealing of any developing cracks. These measures will help reduce infiltration of surface water downward through the pavement section.

Utilities

Materials utilized as backfill could consist of on-site natural spoils from trench excavations. Additional materials to be utilized as backfill should be approved by the Geotechnical Engineer. Excavations should be in accordance with provisions and direction of the Engineer Drawings and Specifications. All excavation and backfilling should be in compliance with City of Hutto Standard Specifications.

Backfill material shall be placed in loose lifts not exceeding 12 inches and the actual lift thickness shall be determined by the type of compaction equipment utilized to compact the fill to meet the appropriate fill compaction required.

Our experience indicates that significant settlement of backfill can occur in utility trenches, particularly when trenches are deep, when backfill materials are placed in thick lifts with insufficient compaction, and when water can access and infiltrate the trench backfill materials. The potential for water to access the backfill is increased where water can infiltrate flexible base materials due to insufficient penetration of curbs, and at sites where geological features can influence water migration into utility trenches (such as fractures within a rock mass or at contacts between rock and clay formations). It is our belief that another factor which can significantly impact settlement is the migration of fines within the backfill into the open voids in the underlying free-draining bedding material.

To reduce the potential for settlement in utility trenches, we recommend that consideration be given to the following:

- All backfill materials should be placed and compacted in controlled lifts appropriate for the type of backfill and the type of compaction equipment being utilized and all backfilling procedures should be tested and documented.
- Consideration should be given to wrapping free-draining bedding gravels with a geotextile fabric (similar to Mirafi 140N) to reduce the infiltration and loss of fines from backfill material into the interstitial voids in bedding materials.

Curb and Gutter

It is good practice to construct curbs such that the depth of the curb extends through the entire depth of the granular base material to act as a protective barrier against the infiltration of water into the granular base. Pavements that do not have this protective barrier to moisture tend to develop longitudinal cracks 1 to 2 ft from the edge of the pavement. Once these cracks develop, further degradation and weakening of the underlying granular base may occur due to water seepage through the cracks.

Pavement Maintenance

Regular pavement maintenance is critical in maintaining pavement performance over a period of several years. All cracks that develop in asphalt pavements should be regularly sealed. Areas of moderate to severe fatigue cracking (also known as alligator cracking) should be sawcut and removed. The underlying base should be checked for contamination or loss of support and any insufficiencies fixed or removed and the entire area patched. Other typical TxDOT or City of Hutto maintenance techniques should be followed as required.

Construction Traffic

Construction traffic on prepared subgrade, granular base or asphalt treated base (black base) should be restricted as much as possible until the protective asphalt surface pavement is applied. Significant damage to the underlying layers resulting in weakening may occur if heavily loaded vehicles are allowed to use these areas.

CONSTRUCTION RELATED SERVICES

CONSTRUCTION MATERIALS TESTING AND OBSERVATION SERVICES

As presented in the attachment to this report, *Important Information About Your Geotechnical Engineering Report*, subsurface conditions can vary across a project site. The conditions described in this report are based on interpolations derived from a limited number of data points. Variations will be encountered during construction, and only the geotechnical design engineer will be able to determine if these conditions are different than those assumed for design.

Construction problems resulting from variations or anomalies in subsurface conditions are among the most prevalent on construction projects and often lead to delays, changes, cost overruns, and disputes.

These variations and anomalies can best be addressed if the geotechnical engineer of record, RKCI is retained to perform construction observation and testing services during the construction of the project. This is because:

- RKCI has an intimate understanding of the geotechnical engineering report's findings and recommendations. RKCI understands how the report should be interpreted and can provide such interpretations on site, on the client's behalf.
- RKCI knows what subsurface conditions are anticipated at the site.
- RKCI is familiar with the goals of the owner and project design professionals, having worked with them in the development of the geotechnical workscope. This enables RKCI to suggest remedial measures (when needed) which help meet the owner's and the design teams' requirements.
- RKCI has a vested interest in client satisfaction, and thus assigns qualified personnel whose principal concern is client satisfaction. This concern is exhibited by the manner in which contractors' work is tested, evaluated and reported, and in selection of alternative approaches when such may become necessary.
- RKCI cannot be held accountable for problems which result due to misinterpretation of our findings or recommendations when we are not on hand to provide the interpretation which is required.

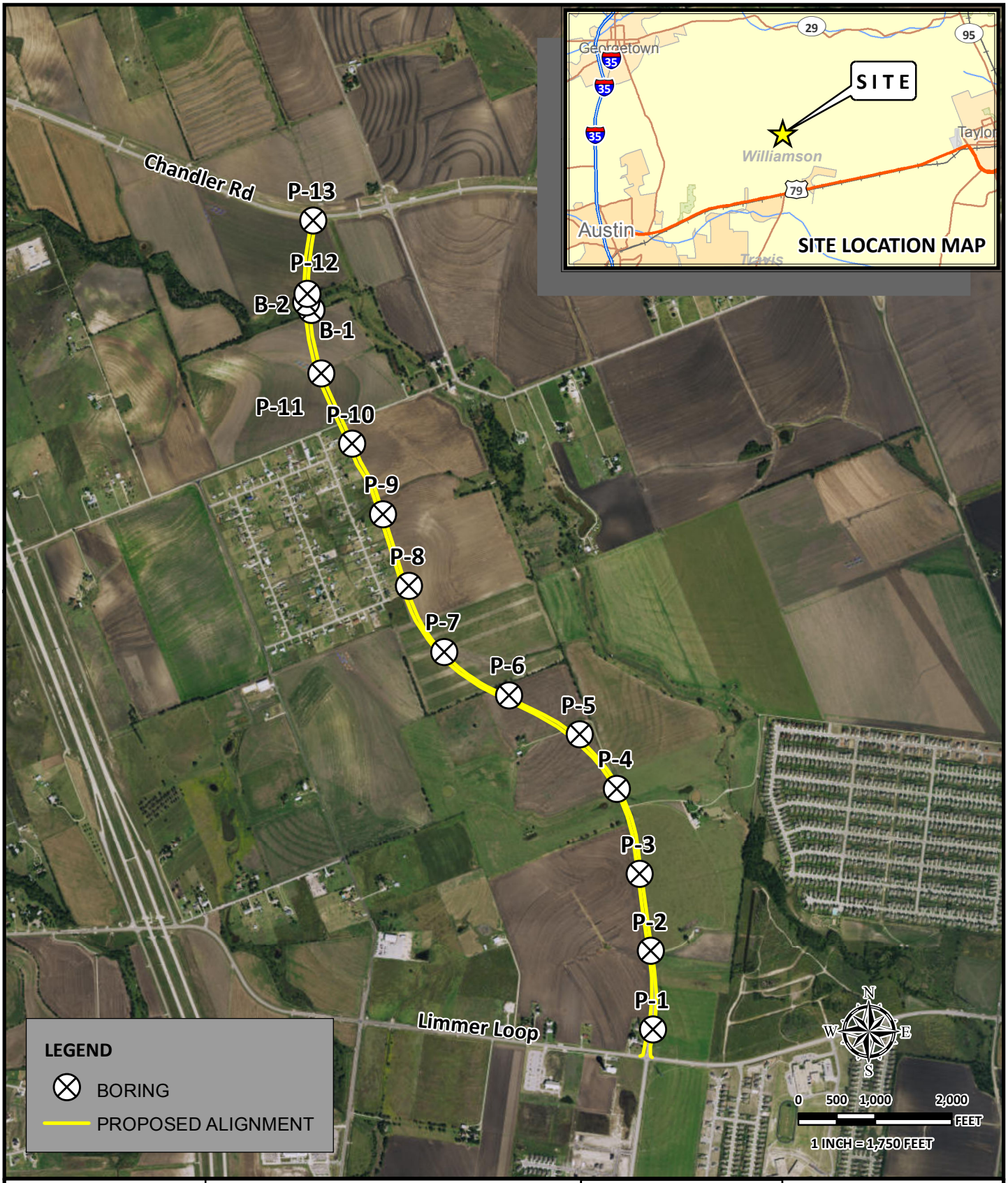
BUDGETING FOR CONSTRUCTION TESTING

Appropriate budgets need to be developed for the required construction testing and observation activities. At the appropriate time before construction, we advise that RKCI and the project designers meet and jointly develop the testing budgets, as well as review the testing specifications as it pertains to this project.

Once the construction testing budget and scope of work are finalized, we encourage a preconstruction meeting with the selected contractor to review the scope of work to make sure it is consistent with the construction means and methods proposed by the contractor. RKCI looks forward to the opportunity to provide continued support on this project, and would welcome the opportunity to meet with the Project Team to develop both a scope and budget for these services.

* * * * * * * * * * * * * * * * * *

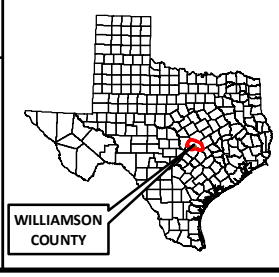
ATTACHMENTS



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(512)339-6174 FAX
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TBPE Firm Number 3257

BORING LOCATION MAP

COUNTY ROAD 119
BETWEEN LIMMER LOOP AND CHANDLER ROAD
WILLIAMSON COUNTY, TEXAS



PROJECT No.:	AAA15-056-00
ISSUE DATE:	10/12/2015
DRAWN BY:	KRB
CHECKED BY:	RTS
REVIEWED BY:	YGT

FIGURE 1

NOTE: This Drawing is Provided for Illustration Only, May Not be to Scale and is Not Suitable for Design or Construction Purposes

DRILLING LOG

	County	Hole	B-1	District	
WinCore	Highway	Structure		Date	09/19/15
Version 3.0	CSJ	Station		Grnd. Elev.	725.00 ft
		Offset		GW Elev.	N/A

Elev. (ft)	LOG	Texas Cone Penetrometer	Strata Description	Triaxial Test: Lateral Press. (psi)	Triaxial Test: Deviator Stress (psi)	Properties: MC	Properties: LL	Properties: PI	Properties: Wet Den. (pcf)	Additional Remarks
			FAT CLAY, Very Soft, Dark Brown							
		3 (6) 4 (6)				26				
5										
719.0			LEAN CLAY, Very Soft, Tan							
		4 (6) 3 (6)				21				
10										
713.0			CHALK, Hard, Tan							
						16	42	28		ref/5"
		50 (0.75) 50 (0.5)								
15										
						12				ref/5"
		50 (0.75) 50 (0.25)								
20										
						14				ref/4"
		50 (0.5) 50 (0.13)								
25										
						11				- gray at about 28 ft ref/3"
		50 (1.5) 50 (0.25)								
30										
						9				
690.0										
35										
40										

Remarks:
30.5842720 N, -97.5721220 W

The ground water elevation was not determined during the course of this boring.

Driller: Core Tech Drilling **Logger: Dustin Sablatura** **Organization: Raba-Kistner Consultants, Inc.**

FIGURE: 2

DRILLING LOG

	County	Hole	B-2	District	
WinCore	Highway	Structure		Date	09/19/15
Version 3.0	CSJ	Station		Grnd. Elev.	727.00 ft
		Offset		GW Elev.	719.90 ft

Elev. (ft)	LOG	Texas Cone Penetrometer	Strata Description	Triaxial Test: Lateral Press. (psi)	Triaxial Test: Deviator Stress (psi)	Properties: MC	Properties: LL	Properties: PI	Properties: Wet Den. (pcf)	Additional Remarks
			FAT CLAY, Soft, Dark Brown			27				
						20	64	43		
722.0		5 (6) 7 (6)								
5			LEAN CLAY, Very Stiff, Tan							
						14				
						15				
		10 (6) 44 (6)								
10										
715.0			CHALK, Hard, Tan							
						17				
		50 (0.75) 50 (0.5)								
15										
						20				
		50 (0.5) 50 (0.5)								
20										
						20				
		50 (3.5) 50 (3)								
25										
						17				
		50 (0.25) 50 (0.13)								
30										
						16				
692.0		50 (1) 50 (0.25)								
35										
40										

Remarks:
30.5845470 N, -97.5723360 W

1. Groundwater seepage was noted at an approximate depth of 8 ft below the ground surface during drilling operations. A water level reading of 7.1 ft below the ground surface was noted after 24 hours.
2. Borehole was backfilled with auger cuttings.

Driller: Core Tech Drilling **Logger: Dustin Sablatura** **Organization: Raba-Kistner Consultants, Inc.**

FIGURE: 3

LOG OF BORING NO. P-1

County Road 119
Between Limmer Loop and Chandler Road
Williamson County, Texas

RABA KISTNER
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger

LOCATION: N 30.55816; W 97.55871

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WEIGHT, pcf	SHEAR STRENGTH, TONS/FT^2	PLASTICITY INDEX	% -200
			CLAY (CH), Fat, Hard, Dark Brown				50	
			CLAY (CL), Lean, Hard, Tan, chalky					
			-with ferric staining from 6 to 8 ft	50				
			Boring Terminated					

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0
PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT: 10 20 30 40 50 60 70 80

NOTES:
1. Groundwater not encountered during drilling operations.
2. Borehole was backfilled with auger cuttings.

DEPTH DRILLED:	10.0 ft	**DEPTH TO WATER:**	Dry	**PROJ. No.:**	AAA15-056-00
DATE DRILLED:	9/18/2015	**DATE MEASURED:**	9/18/2015	**FIGURE:**	4

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. P-2

County Road 119
Between Limmer Loop and Chandler Road
Williamson County, Texas

RABA KISTNER
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger

LOCATION: N 30.56099; W 97.55872

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WEIGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT / WATER CONTENT / LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
0			**CLAY (CH),** Fat, Hard, Dark Brown					
			- very stiff below 2 ft				52	
5			**CLAY (CL),** Lean, Very Stiff, Tan, chalky					
10			Boring Terminated					
			NOTES: 1. Groundwater not encountered during drilling operations. 2. Borehole was backfilled with auger cuttings.					
15								
20								
25								
30								
35								

DEPTH DRILLED:	10.0 ft	**DEPTH TO WATER:**	Dry	**PROJ. No.:**	AAA15-056-00
DATE DRILLED:	9/18/2015	**DATE MEASURED:**	9/18/2015	**FIGURE:**	5

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. P-3

County Road 119
Between Limmer Loop and Chandler Road
Williamson County, Texas

RABA KISTNER
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger

LOCATION: N 30.56375; W 97.55911

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WEIGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT / WATER CONTENT / LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
0			**CLAY (CH),** Fat, Hard, Dark Brown					
5			- very stiff below 4 ft				52	
			CLAY (CL), Lean, Very Stiff, Tan, chalky, with ferric staining					
10			Boring Terminated					
15			NOTES: 1. Groundwater not encountered during drilling operations. 2. Borehole was backfilled with auger cuttings.					
20								
25								
30								
35								

DEPTH DRILLED:	10.0 ft	**DEPTH TO WATER:**	Dry	**PROJ. No.:**	AAA15-056-00
DATE DRILLED:	9/18/2015	**DATE MEASURED:**	9/18/2015	**FIGURE:**	6

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. P-4

County Road 119
Between Limmer Loop and Chandler Road
Williamson County, Texas

RABA KISTNER
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger

LOCATION: N 30.56683; W 97.55494

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WEIGHT, pcf	SHEAR STRENGTH, TONS/FT^2	PLASTICITY INDEX	% -200
0			**CLAY (CH),** Fat, Hard, Dark Brown				39	
5			- very stiff below 4 ft					
			CLAY (CL), Lean, Very Stiff, Tan, chalky					
10			Boring Terminated					
15			NOTES: 1. Groundwater not encountered during drilling operations. 2. Borehole was backfilled with auger cuttings.					
20								
25								
30								
35								

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0
PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT
10 20 30 40 50 60 70 80

DEPTH DRILLED:	10.0 ft	**DEPTH TO WATER:**	Dry	**PROJ. No.:**	AAA15-056-00
DATE DRILLED:	9/18/2015	**DATE MEASURED:**	9/18/2015	**FIGURE:**	7

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. P-5

County Road 119
Between Limmer Loop and Chandler Road
Williamson County, Texas

RABA KISTNER
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger

LOCATION: N 30.56881; W 97.56144

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WEIGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT / WATER CONTENT / LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			CLAY (CH), Fat, Hard, Dark Brown					
			CLAY (CL), Lean, Hard, Tan, chalky					
5							22	
				50				
10			Boring Terminated					
			NOTES: 1. Groundwater not encountered during drilling operations. 2. Borehole was backfilled with auger cuttings.					
15								
20								
25								
30								
35								

DEPTH DRILLED: 10.0 ft
DATE DRILLED: 9/18/2015

DEPTH TO WATER: Dry
DATE MEASURED: 9/18/2015

PROJ. No.: AAA15-056-00
FIGURE: 8

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. P-6

County Road 119
Between Limmer Loop and Chandler Road
Williamson County, Texas

RABA KISTNER
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger **LOCATION:** N 30.57028; W 97.56433

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WEIGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT / WATER CONTENT / LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			CLAY (CH), Fat, Hard, Dark Brown					
5			**CLAY (CL),** Chalky, Lean, Very Stiff to Hard, Tan	26 40 50				
10			Boring Terminated					
			NOTES: 1. Groundwater not encountered during drilling operations. 2. Borehole was backfilled with auger cuttings.					
15								
20								
25								
30								
35								

DEPTH DRILLED:	10.0 ft	**DEPTH TO WATER:**	Dry	**PROJ. No.:**	AAA15-056-00
DATE DRILLED:	9/18/2015	**DATE MEASURED:**	9/18/2015	**FIGURE:**	9

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. P-7

County Road 119
Between Limmer Loop and Chandler Road
Williamson County, Texas

RABA KISTNER
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger **LOCATION:** N 30.57189; W 97.56698

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WEIGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT / WATER CONTENT / LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
0			**CLAY (CH),** Fat, Hard, Dark Brown				35	
5			**CLAY (CH-CL),** Lean, Hard, Tan, chalky					
10			Boring Terminated NOTES: 1. Groundwater not encountered during drilling operations. 2. Borehole was backfilled with auger cuttings.					
15								
20								
25								
30								
35								

DEPTH DRILLED: 10.0 ft **DEPTH TO WATER:** Dry **PROJ. No.:** AAA15-056-00
DATE DRILLED: 9/19/2015 **DATE MEASURED:** 9/19/2015 **FIGURE:** 10

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. P-8

County Road 119
Between Limmer Loop and Chandler Road
Williamson County, Texas

RABA KISTNER
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger

LOCATION: N 30.57429; W 97.56838

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WEIGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT / WATER CONTENT / LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
0			**CLAY (CH),** Fat, Hard, Dark Brown					
			CLAY (CL), Lean, Hard, Tan, chalky					
5								
				50				
10			Boring Terminated					
			NOTES: 1. Groundwater not encountered during drilling operations. 2. Borehole was backfilled with auger cuttings.					
15								
20								
25								
30								
35								

DEPTH DRILLED:	10.0 ft	**DEPTH TO WATER:**	Dry	**PROJ. No.:**	AAA15-056-00
DATE DRILLED:	9/19/2015	**DATE MEASURED:**	9/19/2015	**FIGURE:**	11

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. P-9

County Road 119
Between Limmer Loop and Chandler Road
Williamson County, Texas

RABA KISTNER
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger **LOCATION:** N 30.57688; W 97.56937

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WEIGHT, pcf	SHEAR STRENGTH, TONS/FT^2	PLASTICITY INDEX	% -200
			CLAY (CH), Fat, Very Stiff to Hard, Dark Brown				42	
5			**CLAY (CL),** Fat, Hard, Tan, chalky	40				
10			Boring Terminated					
			NOTES: 1. Groundwater not encountered during drilling operations. 2. Borehole was backfilled with auger cuttings.					
15								
20								
25								
30								
35								

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0
PLASTIC LIMIT WATER CONTENT LIQUID LIMIT
10 20 30 40 50 60 70 80

DEPTH DRILLED:	10.0 ft	**DEPTH TO WATER:**	Dry	**PROJ. No.:**	AAA15-056-00
DATE DRILLED:	9/19/2015	**DATE MEASURED:**	9/19/2015	**FIGURE:**	12

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. P-10

County Road 119
Between Limmer Loop and Chandler Road
Williamson County, Texas

RABA KISTNER
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger

LOCATION: N 30.57944; W 97.57058

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WEIGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT / WATER CONTENT / LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
0			**CLAY (CH),** Fat, Hard, Dark Brown					
5			**CLAY (CL),** Lean, Hard, Tan, chalky				26	
10			Boring Terminated NOTES: 1. Groundwater not encountered during drilling operations. 2. Borehole was backfilled with auger cuttings.					
15								
20								
25								
30								
35								

DEPTH DRILLED:	10.0 ft	**DEPTH TO WATER:**	Dry	**PROJ. No.:**	AAA15-056-00
DATE DRILLED:	9/19/2015	**DATE MEASURED:**	9/19/2015	**FIGURE:**	13

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. P-11

County Road 119
Between Limmer Loop and Chandler Road
Williamson County, Texas

RABA KISTNER
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger **LOCATION:** N 30.58199; W 97.57178

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WEIGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT / WATER CONTENT / LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
0			**CLAY (CH),** Fat, Hard, Dark Brown					
5			**CLAY (CL),** Lean, Very Stiff to Hard, Tan, chalky				27	
10				21				
			Boring Terminated					

NOTES:
1. Groundwater not encountered during drilling operations.
2. Borehole was backfilled with auger cuttings.

DEPTH DRILLED:	10.0 ft	**DEPTH TO WATER:**	Dry	**PROJ. No.:**	AAA15-056-00
DATE DRILLED:	9/19/2015	**DATE MEASURED:**	9/19/2015	**FIGURE:**	14

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. P-12

County Road 119
Between Limmer Loop and Chandler Road
Williamson County, Texas

RABA KISTNER
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger

LOCATION: N 30.58486; W 97.57228

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WEIGHT, pcf	SHEAR STRENGTH, TONS/FT^2	PLASTICITY INDEX	% -200
0			**CLAY (CH),** Fat, Very Stiff, Dark Brown					
5			**CLAY (CH),** Chalky, Fat, Very Stiff, Tan					
10			Boring Terminated NOTES: 1. Groundwater not encountered during drilling operations. 2. Borehole was backfilled with auger cuttings.					
15								
20								
25								
30								
35								

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0
PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT
10 20 30 40 50 60 70 80

DEPTH DRILLED:	10.0 ft	**DEPTH TO WATER:**	Dry	**PROJ. No.:**	AAA15-056-00
DATE DRILLED:	9/18/2015	**DATE MEASURED:**	9/18/2015	**FIGURE:**	15

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. P-13

County Road 119
Between Limmer Loop and Chandler Road
Williamson County, Texas

RABA KISTNER
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger

LOCATION: N 30.58747; W 97.57196

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WEIGHT, pcf	SHEAR STRENGTH, TONS/FT²	PLASTICITY INDEX	% -200
0			**CLAY (CH),** Fat, Very Stiff, Dark Brown				48	
			CLAY (CH), Fat, Stiff to Very Stiff, Tan, chalky					
5				14				
			- hard below 8 ft	ref/6"				
10			Boring Terminated					
15								
20								
25								
30								
35								

SHEAR STRENGTH, TONS/FT²: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0
PLASTIC LIMIT WATER CONTENT LIQUID LIMIT
10 20 30 40 50 60 70 80

NOTES:
1. Groundwater not encountered during drilling operations.
2. Borehole was backfilled with auger cuttings.

DEPTH DRILLED:	10.0 ft	**DEPTH TO WATER:**	Dry	**PROJ. No.:**	AAA15-056-00
DATE DRILLED:	9/18/2015	**DATE MEASURED:**	9/18/2015	**FIGURE:**	16

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

KEY TO TERMS AND SYMBOLS

MATERIAL TYPES

SOIL TERMS


CALCAREOUS


CALICHE


CLAY


CLAYEY


GRAVEL


GRAVELLY


PEAT


SAND


SANDY


SILT


SILTY


FILL

ROCK TERMS


CHALK


CLAYSTONE


CLAY-SHALE


CONGLOMERATE


DOLOMITE


IGNEOUS


LIMESTONE


MARL


METAMORPHIC


SANDSTONE


SHALE


SILTSTONE

OTHER


ASPHALT


BASE


CONCRETE/CEMENT


BRICKS / PAVERS


WASTE


NO INFORMATION

WELL CONSTRUCTION AND PLUGGING MATERIALS


BLANK PIPE


SCREEN


BENTONITE


CEMENT GROUT


BENTONITE & CUTTINGS


CONCRETE/CEMENT


CUTTINGS


GRAVEL


SAND


VOLCLAY

SAMPLE TYPES


AIR ROTARY


GRAB SAMPLE


CORE


GEOPROBE SAMPLER


ROTOSONIC -DAMAGED


MUD ROTARY


NO RECOVERY


NX CORE


PITCHER


ROTOSONIC -INTACT


SHELBY TUBE


SPLIT BARREL


SPLIT SPOON


TEXAS CONE PENETROMETER


DISTURBED

STRENGTH TEST TYPES


POCKET PENETROMETER


TORVANE


UNCONFINED COMPRESSION


TRIAXIAL COMPRESSION UNCONSOLIDATED-UNDRAINED


TRIAXIAL COMPRESSION CONSOLIDATED-UNDRAINED

NOTE: VALUES SYMBOLIZED ON BORING LOGS REPRESENT SHEAR STRENGTHS UNLESS OTHERWISE NOTED

PROJECT NO. AAA15-056-00

RABAKISTNER

REVISED 04/2012

KEY TO TERMS AND SYMBOLS (CONT'D)

TERMINOLOGY

Terms used in this report to describe soils with regard to their consistency or conditions are in general accordance with the discussion presented in Article 45 of SOILS MECHANICS IN ENGINEERING PRACTICE, Terzaghi and Peck, John Wiley & Sons, Inc., 1967, using the most reliable information available from the field and laboratory investigations. Terms used for describing soils according to their texture or grain size distribution are in accordance with the UNIFIED SOIL CLASSIFICATION SYSTEM, as described in American Society for Testing and Materials D2487-06 and D2488-00, Volume 04.08, Soil and Rock; Dimension Stone; Geosynthetics; 2005.

The depths shown on the boring logs are not exact, and have been estimated to the nearest half-foot. Depth measurements may be presented in a manner that implies greater precision in depth measurement, i.e 6.71 meters. The reader should understand and interpret this information only within the stated half-foot tolerance on depth measurements.

RELATIVE DENSITY

Penetration Resistance Blows per ft	Relative Density
0 - 4	Very Loose
4 - 10	Loose
10 - 30	Medium Dense
30 - 50	Dense
> 50	Very Dense

COHESIVE STRENGTH

Resistance Blows per ft	Consistency	Cohesion TSF
0 - 2	Very Soft	0 - 0.125
2 - 4	Soft	0.125 - 0.25
4 - 8	Firm	0.25 - 0.5
8 - 15	Stiff	0.5 - 1.0
15 - 30	Very Stiff	1.0 - 2.0
> 30	Hard	> 2.0

PLASTICITY

Plasticity Index	Degree of Plasticity
0 - 5	None
5 - 10	Low
10 - 20	Moderate
20 - 40	Plastic
> 40	Highly Plastic

ABBREVIATIONS

B = Benzene
T = Toluene
E = Ethylbenzene
X = Total Xylenes
BTEX = Total BTEX
TPH = Total Petroleum Hydrocarbons
ND = Not Detected
NA = Not Analyzed
NR = Not Recorded/No Recovery
OVA = Organic Vapor Analyzer
ppm = Parts Per Million

Qam, Qas, Qal = Quaternary Alluvium
Qat = Low Terrace Deposits
Qbc = Beaumont Formation
Qt = Fluviatile Terrace Deposits
Qao = Seymour Formation
Qle = Leona Formation
Q-Tu = Uvalde Gravel
Ewi = Wilcox Formation
Emi = Midway Group
Mc = Catahoula Formation
El = Laredo Formation
Kknm = Navarro Group and Marlbrook Marl
Kpg = Pecan Gap Chalk
Kau = Austin Chalk

Kef = Eagle Ford Shale
Kbu = Buda Limestone
Kdr = Del Rio Clay
Kft = Fort Terrett Member
Kgt = Georgetown Formation
Kep = Person Formation
Kek = Kainer Formation
Kes = Escondido Formation
Kew = Walnut Formation
Kgr = Glen Rose Formation
Kgru = Upper Glen Rose Formation
Kgrl = Lower Glen Rose Formation
Kh = Hensell Sand

KEY TO TERMS AND SYMBOLS (CONT'D)

TERMINOLOGY

SOIL STRUCTURE

Slickensided	Having planes of weakness that appear slick and glossy.
Fissured	Containing shrinkage or relief cracks, often filled with fine sand or silt; usually more or less vertical.
Pocket	Inclusion of material of different texture that is smaller than the diameter of the sample.
Parting	Inclusion less than 1/8 inch thick extending through the sample.
Seam	Inclusion 1/8 inch to 3 inches thick extending through the sample.
Layer	Inclusion greater than 3 inches thick extending through the sample.
Laminated	Soil sample composed of alternating partings or seams of different soil type.
Interlayered	Soil sample composed of alternating layers of different soil type.
Intermixed	Soil sample composed of pockets of different soil type and layered or laminated structure is not evident.
Calcareous	Having appreciable quantities of carbonate.
Carbonate	Having more than 50% carbonate content.

SAMPLING METHODS

RELATIVELY UNDISTURBED SAMPLING

Cohesive soil samples are to be collected using three-inch thin-walled tubes in general accordance with the Standard Practice for Thin-Walled Tube Sampling of Soils (ASTM D1587) and granular soil samples are to be collected using two-inch split-barrel samplers in general accordance with the Standard Method for Penetration Test and Split-Barrel Sampling of Soils (ASTM D1586). Cohesive soil samples may be extruded on-site when appropriate handling and storage techniques maintain sample integrity and moisture content.

STANDARD PENETRATION TEST (SPT)

A 2-in.-OD, 1-3/8-in.-ID split spoon sampler is driven 1.5 ft into undisturbed soil with a 140-pound hammer free falling 30 in. After the sampler is seated 6 in. into undisturbed soil, the number of blows required to drive the sampler the last 12 in. is the Standard Penetration Resistance or "N" value, which is recorded as blows per foot as described below.

SPLIT-BARREL SAMPLER DRIVING RECORD

Blows Per Foot	Description
25	25 blows drove sampler 12 inches, after initial 6 inches of seating.
50/7"	50 blows drove sampler 7 inches, after initial 6 inches of seating.
Ref/3"	50 blows drove sampler 3 inches during initial 6-inch seating interval.

NOTE: To avoid damage to sampling tools, driving is limited to 50 blows during or after seating interval.

RESULTS OF SOIL SAMPLE ANALYSES

PROJECT NAME: County Road 119
Between Limmer Loop and Chandler Road
Williamson County, Texas

FILE NAME: AAA15-056-00.GPJ 3/14/2016

Boring No.	Sample Depth (ft)	Blows per ft	Water Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	USCS	Dry Unit Weight (pcf)	% -200 Sieve	Shear Strength (tsf)	Strength Test
B-1	5.0 to 6.5		26								
	9.8 to 11.1		21								
	13.8 to 14.1		16	42	14	28	CL				
	18.8 to 19.1		12								
	23.7 to 23.9		14								
	28.8 to 29.1		11								
	33.8 to 34.1		9								
B-2	0.0 to 2.0		27							1.50	PP
	2.0 to 4.0		20	64	21	43	CH			2.25	PP
	5.0 to 6.5										
	6.5 to 8.0		14							0.75	PP
	8.0 to 10.0		15							2.25	PP
	10.0 to 11.5										
	13.5 to 13.9	ref/5"	17								
	15.0 to 15.3										
	18.5 to 18.9	ref/5"	20								
	20.0 to 20.2										
	23.5 to 23.8	ref/4"	20								
	25.0 to 25.8										
	28.5 to 28.8	ref/3"	17								
	30.0 to 30.1										
	33.5 to 33.7		16								
P-1	0.0 to 2.0		25	75	25	50	CH			2.25	PP
	2.0 to 4.0		21							2.25	PP
	4.0 to 6.0		14							2.25	PP
	6.0 to 8.0		17							2.25	PP
	8.5 to 10.0	50	14								
P-2	0.0 to 2.0		25							2.25	PP
	2.0 to 4.0		30	75	23	52	CH			1.50	PP
	4.0 to 6.0		31							1.25	PP
	6.0 to 8.0		18							1.00	PP
	8.0 to 10.0		19							2.00	PP
P-3	0.0 to 2.0		26							2.25	PP
	2.0 to 4.0		26							2.25	PP
	4.0 to 6.0		27	76	24	52	CH			1.75	PP
	6.0 to 8.0		24							1.00	PP
	8.0 to 10.0		24							1.00	PP
P-4	0.0 to 2.0		17	59	20	39	CH			2.25	PP
	2.0 to 4.0		22							2.25	PP

PP = Pocket Penetrometer TV = Torvane UC = Unconfined Compression FV = Field Vane UU = Unconsolidated Undrained Triaxial

CU = Consolidated Undrained Triaxial

PROJECT NO. AAA15-056-00

RABAKISTNER

FIGURE 18a

RESULTS OF SOIL SAMPLE ANALYSES

PROJECT NAME: County Road 119
Between Limmer Loop and Chandler Road
Williamson County, Texas

FILE NAME: AAA15-056-00.GPJ 3/14/2016

Boring No.	Sample Depth (ft)	Blows per ft	Water Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	USCS	Dry Unit Weight (pcf)	% -200 Sieve	Shear Strength (tsf)	Strength Test
P-4	4.0 to 6.0		23							1.75	PP
	6.0 to 8.0		27							1.00	PP
	8.0 to 10.0		22							1.00	PP
P-5	0.0 to 2.0		26							2.25	PP
	2.0 to 4.0		15							2.25	PP
	4.0 to 6.0		15							2.25	PP
	6.0 to 8.0		14	39	17	22	CL			2.25	PP
	8.0 to 9.5	50	15								
P-6	0.0 to 2.0		16							2.25	PP
	2.0 to 4.0		13							2.25	PP
	4.5 to 6.0	26	13								
	6.5 to 8.0	40	14								
	8.5 to 10.0	50	13								
P-7	0.0 to 2.0		16							2.25	PP
	2.0 to 4.0		14	50	15	35	CH			2.25	PP
	4.0 to 6.0		11							2.25	PP
	6.0 to 8.0		14							2.25	PP
	8.0 to 10.0		11							2.25	PP
P-8	0.0 to 2.0		11							2.25	PP
	2.0 to 4.0		11							2.25	PP
	4.0 to 6.0		11							2.25	PP
	6.0 to 8.0		13							2.25	PP
	8.5 to 10.0	50	15								
P-9	0.0 to 2.0		17	65	23	42	CH			2.25	PP
	2.0 to 4.0		27							1.50	PP
	4.0 to 6.0		14							2.25	PP
	6.0 to 8.0		15							2.25	PP
	8.0 to 9.5	40	15								
P-10	0.0 to 2.0		12							2.25	PP
	2.0 to 4.0		21							2.25	PP
	4.0 to 6.0		12							2.25	PP
	6.0 to 8.0		15	41	15	26	CL			2.25	PP
	8.0 to 10.0		17							2.25	PP
P-11	0.0 to 2.0		16							2.25	PP
	2.0 to 4.0		23							2.00	PP
	4.0 to 6.0		14							2.25	PP
	6.0 to 8.0		13	42	15	27	CL			2.25	PP
	8.5 to 10.0	21	16								
P-12	0.0 to 2.0		32							1.50	PP

PP = Pocket Penetrometer TV = Torvane UC = Unconfined Compression FV = Field Vane UU = Unconsolidated Undrained Triaxial

CU = Consolidated Undrained Triaxial

PROJECT NO. AAA15-056-00

RABAKISTNER

FIGURE 18b

RESULTS OF SOIL SAMPLE ANALYSES

PROJECT NAME: County Road 119
Between Limmer Loop and Chandler Road
Williamson County, Texas

FILE NAME: AAA15-056-00.GPJ 3/14/2016

Boring No.	Sample Depth (ft)	Blows per ft	Water Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	USCS	Dry Unit Weight (pcf)	% -200 Sieve	Shear Strength (tsf)	Strength Test
P-12	2.0 to 4.0		22							1.50	PP
	4.0 to 6.0		22							1.00	PP
	6.0 to 8.0		19							1.25	PP
	8.0 to 10.0		18							1.25	PP
P-13	0.0 to 2.0		19	69	21	48	CH			1.00	PP
	2.0 to 4.0		16							1.50	PP
	4.0 to 6.0		15							1.75	PP
	6.5 to 8.0	14	27								
	8.0 to 8.5	ref/6"	11								

PP = Pocket Penetrometer TV = Torvane UC = Unconfined Compression FV = Field Vane UU = Unconsolidated Undrained Triaxial

CU = Consolidated Undrained Triaxial

PROJECT NO. AAA15-056-00

RABAKISTNER

FIGURE 18c

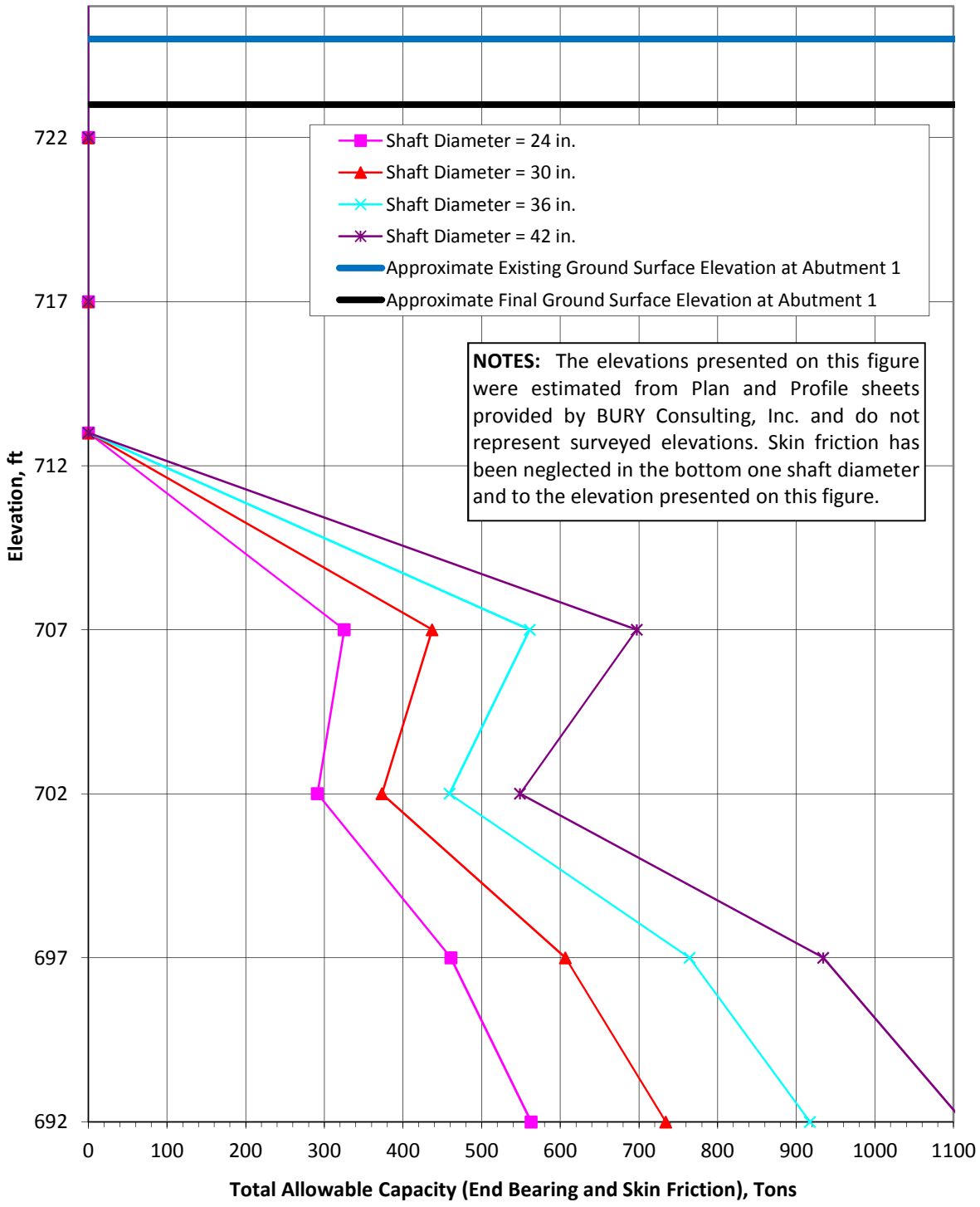
DRILLED PIER AXIAL CAPACITY CURVE

Straight Shaft Piers

County Road 119 - Between Limmer Loop and Chandler Rd

Williamson County, Texas

(Boring B-2, Abutment 1)



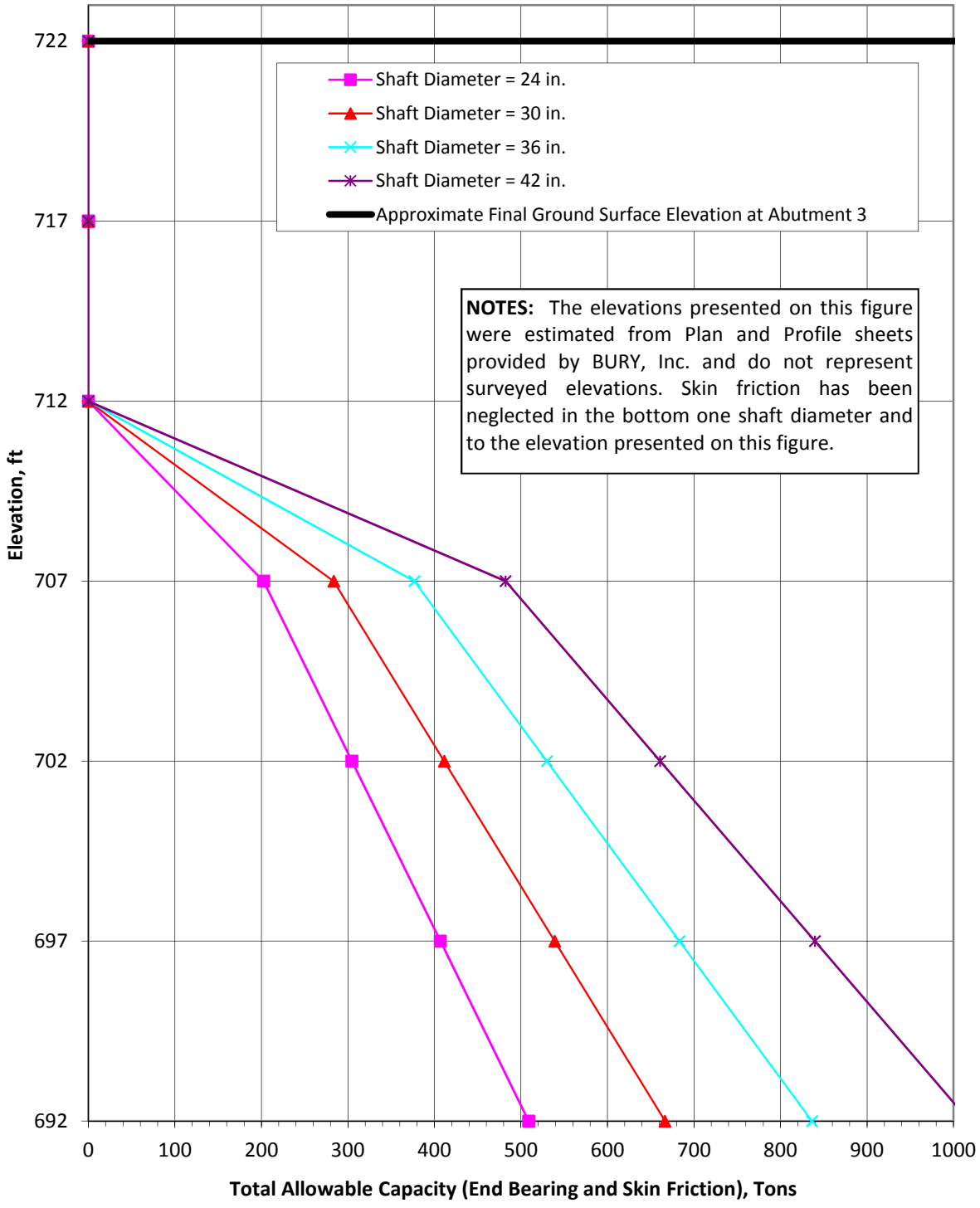
DRILLED PIER AXIAL CAPACITY CURVE

Straight Shaft Piers

CR 119 - Between Limmer Loop & Chandler Rd

Williamson County

(Boring B-1, Abutment 3)



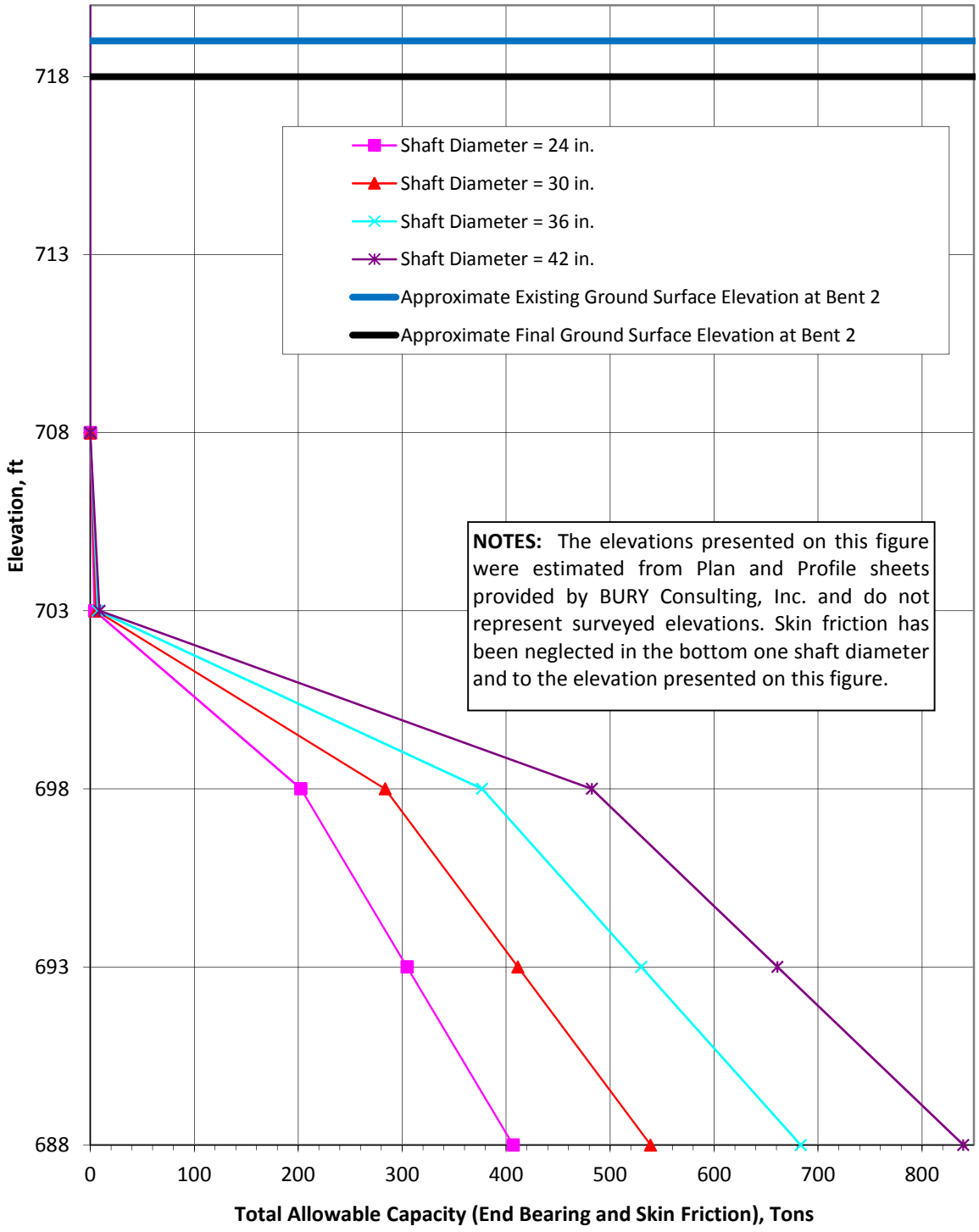
DRILLED PIER AXIAL CAPACITY CURVE

Straight Shaft Piers

County Road 119 - Between Limmer Loop and Chandler Rd

Williamson County, Texas

(Boring B-1, Bent 2)



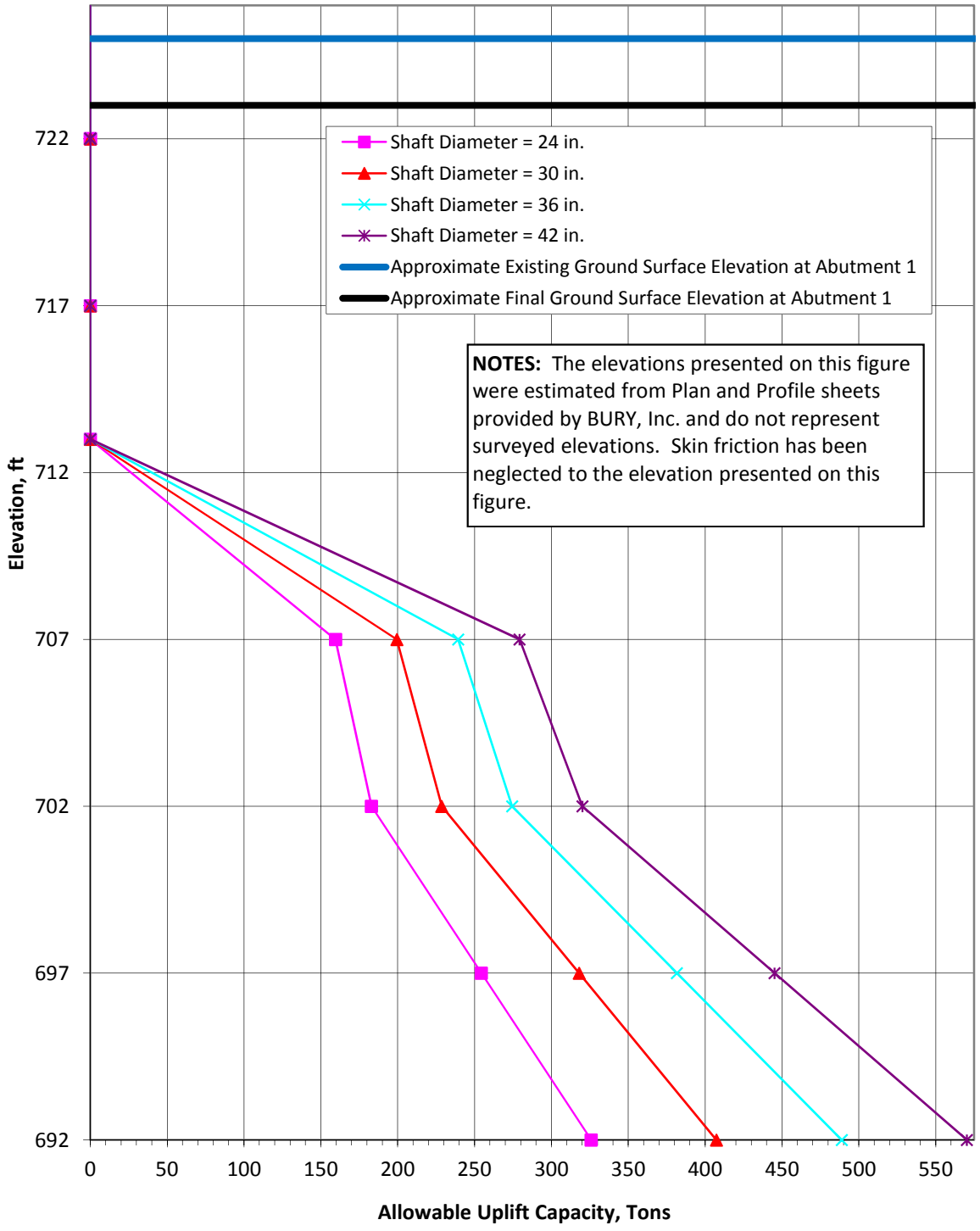
DRILLED PIER UPLIFT CAPACITY CURVE

Straight Shaft Piers

County Road 119 - Between Limmer Loop and Chandler Rd

Williamson County, Texas

(Boring B-2, Abutment 1)



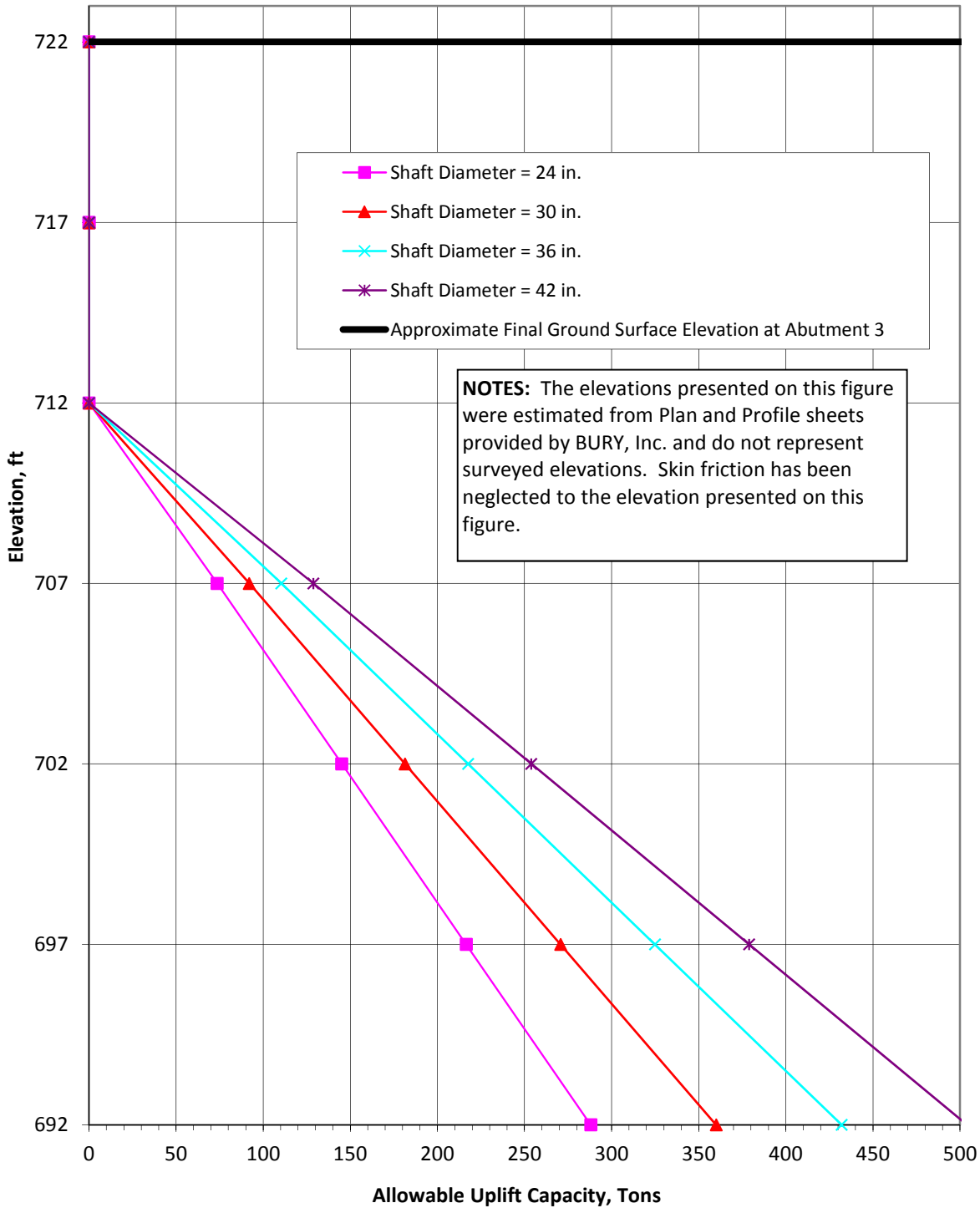
DRILLED PIER UPLIFT CAPACITY CURVE

Straight Shaft Piers

CR 119 - Between Limmer Loop & Chandler Rd

Williamson County

(Boring B-1, Abutment 3)



AAA15-056-00
Figure 20b

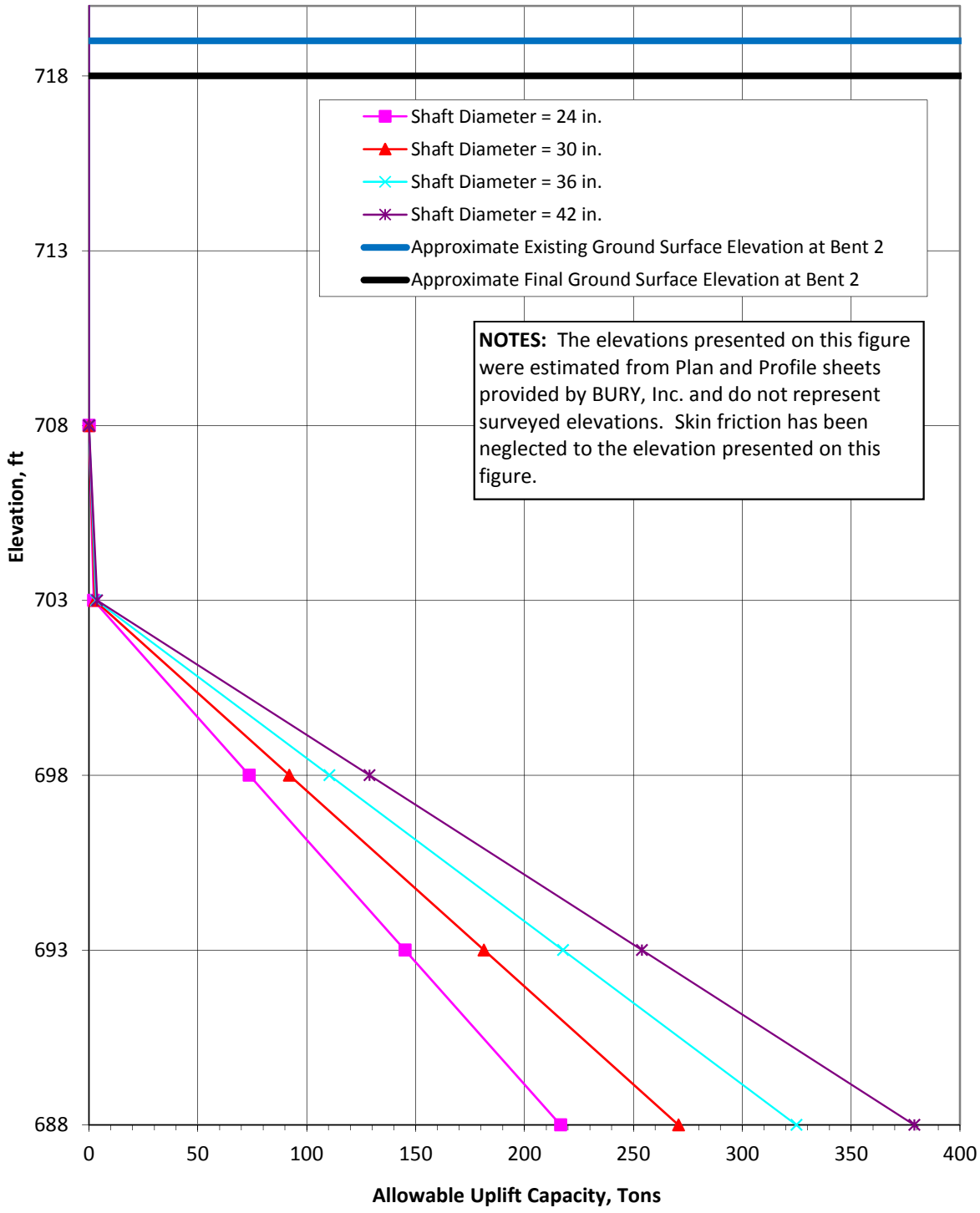
DRILLED PIER UPLIFT CAPACITY CURVE

Straight Shaft Piers

County Road 119 - Between Limmer Loop and Chandler Rd

Williamson County, Texas

(Boring B-1, Bent 2)



Important Information about This

Geotechnical-Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

Geotechnical Services Are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical-engineering study conducted for a civil engineer may not fulfill the needs of a constructor — a construction contractor — or even another civil engineer. Because each geotechnical- engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client. No one except you should rely on this geotechnical-engineering report without first conferring with the geotechnical engineer who prepared it. *And no one — not even you* — should apply this report for any purpose or project except the one originally contemplated.

Read the Full Report

Serious problems have occurred because those relying on a geotechnical-engineering report did not read it all. Do not rely on an executive summary. Do not read selected elements only.

Geotechnical Engineers Base Each Report on a Unique Set of Project-Specific Factors

Geotechnical engineers consider many unique, project-specific factors when establishing the scope of a study. Typical factors include: the client's goals, objectives, and risk-management preferences; the general nature of the structure involved, its size, and configuration; the location of the structure on the site; and other planned or existing site improvements, such as access roads, parking lots, and underground utilities. Unless the geotechnical engineer who conducted the study specifically indicates otherwise, do not rely on a geotechnical-engineering report that was:

- not prepared for you;
- not prepared for your project;
- not prepared for the specific site explored; or
- completed before important project changes were made.

Typical changes that can erode the reliability of an existing geotechnical-engineering report include those that affect:

- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light-industrial plant to a refrigerated warehouse;
- the elevation, configuration, location, orientation, or weight of the proposed structure;
- the composition of the design team; or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project changes—even minor ones—and request an assessment of their impact. *Geotechnical engineers cannot accept responsibility or liability for problems that occur because their reports do not consider developments of which they were not informed.*

Subsurface Conditions Can Change

A geotechnical-engineering report is based on conditions that existed at the time the geotechnical engineer performed the study. *Do not rely on a geotechnical-engineering report whose adequacy may have been affected by*: the passage of time; man-made events, such as construction on or adjacent to the site; or natural events, such as floods, droughts, earthquakes, or groundwater fluctuations. *Contact the geotechnical engineer before applying this report to determine if it is still reliable.* A minor amount of additional testing or analysis could prevent major problems.

Most Geotechnical Findings Are Professional Opinions

Site exploration identifies subsurface conditions only at those points where subsurface tests are conducted or samples are taken. Geotechnical engineers review field and laboratory data and then apply their professional judgment to render an opinion about subsurface conditions throughout the site. Actual subsurface conditions may differ — sometimes significantly — from those indicated in your report. Retaining the geotechnical engineer who developed your report to provide geotechnical-construction observation is the most effective method of managing the risks associated with unanticipated conditions.

A Report's Recommendations Are Not Final

Do not overrely on the confirmation-dependent recommendations included in your report. *Confirmation-dependent recommendations are not final,* because geotechnical engineers develop them principally from judgment and opinion. Geotechnical engineers can finalize their recommendations *only* by observing actual subsurface conditions revealed during construction. *The geotechnical engineer who developed your report cannot assume responsibility or liability for the report's confirmation-dependent recommendations if that engineer does not perform the geotechnical-construction observation required to confirm the recommendations' applicability.*

A Geotechnical-Engineering Report Is Subject to Misinterpretation

Other design-team members' misinterpretation of geotechnical-engineering reports has resulted in costly

problems. Confront that risk by having your geotechnical engineer confer with appropriate members of the design team after submitting the report. Also retain your geotechnical engineer to review pertinent elements of the design team's plans and specifications. Constructors can also misinterpret a geotechnical-engineering report. Confront that risk by having your geotechnical engineer participate in prebid and preconstruction conferences, and by providing geotechnical construction observation.

Do Not Redraw the Engineer's Logs

Geotechnical engineers prepare final boring and testing logs based upon their interpretation of field logs and laboratory data. To prevent errors or omissions, the logs included in a geotechnical-engineering report should *never* be redrawn for inclusion in architectural or other design drawings. Only photographic or electronic reproduction is acceptable, *but recognize that separating logs from the report can elevate risk.*

Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can make constructors liable for unanticipated subsurface conditions by limiting what they provide for bid preparation. To help prevent costly problems, give constructors the complete geotechnical-engineering report, *but* preface it with a clearly written letter of transmittal. In that letter, advise constructors that the report was not prepared for purposes of bid development and that the report's accuracy is limited; encourage them to confer with the geotechnical engineer who prepared the report (a modest fee may be required) and/or to conduct additional study to obtain the specific types of information they need or prefer. A prebid conference can also be valuable. *Be sure constructors have sufficient time* to perform additional study. Only then might you be in a position to give constructors the best information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions.

Read Responsibility Provisions Closely

Some clients, design professionals, and constructors fail to recognize that geotechnical engineering is far less exact than other engineering disciplines. This lack of understanding has created unrealistic expectations that have led to disappointments, claims, and disputes. To help reduce the risk of such outcomes, geotechnical engineers commonly include a variety of explanatory provisions in their reports. Sometimes labeled "limitations," many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Environmental Concerns Are Not Covered

The equipment, techniques, and personnel used to perform an *environmental* study differ significantly from those used to perform a *geotechnical* study. For that reason, a geotechnical-engineering report does not usually relate any environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated environmental problems have led to numerous project failures.* If you have not yet obtained your own environmental information, ask your geotechnical consultant for risk-management guidance. *Do not rely on an environmental report prepared for someone else.*

Obtain Professional Assistance To Deal with Mold

Diverse strategies can be applied during building design, construction, operation, and maintenance to prevent significant amounts of mold from growing on indoor surfaces. To be effective, all such strategies should be devised for the *express purpose* of mold prevention, integrated into a comprehensive plan, and executed with diligent oversight by a professional mold-prevention consultant. Because just a small amount of water or moisture can lead to the development of severe mold infestations, many mold- prevention strategies focus on keeping building surfaces dry. While groundwater, water infiltration, and similar issues may have been addressed as part of the geotechnical- engineering study whose findings are conveyed in this report, the geotechnical engineer in charge of this project is not a mold prevention consultant; *none of the services performed in connection with the geotechnical engineer's study were designed or conducted for the purpose of mold prevention. Proper implementation of the recommendations conveyed in this report will not of itself be sufficient to prevent mold from growing in or on the structure involved.*

Rely, on Your GBC-Member Geotechnical Engineer for Additional Assistance

Membership in the Geotechnical Business Council of the Geoprofessional Business Association exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project. Confer with you GBC-Member geotechnical engineer for more information.

GEOTECHNICAL BUSINESS COUNCIL
of the Geoprofessional Business Association

8811 Colesville Road/Suite G106, Silver Spring, MD 20910
Telephone: 301/565-2733 Facsimile: 301/589-2017
e-mail: info@geoprofessional.org www.geoprofessional.org

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San Antonio, TX

Austin, TX	Dallas , TX	McAllen, TX
Brownsville, TX	El Paso, TX	Mexico
Corpus Christi , TX	Houston, TX	Salt Lake City, UT

INDEX :

SEE NEXT SHEET

WILLIAMSON COUNTY

CR 119

ROAD CLASSIFICATION: SUBURBAN COLLECTOR
CR 119 DESIGN SPEED: 45 MPH
CR 118 DESIGN SPEED: 35 MPH
2015 ADT = 2,500
2035 ADT = 5,200

AREA OF DISTURBED SOIL = 35.4 ACRES

WATERSHED: SAN GABRIEL

CONSTRUCTION OF A NEW 2-LANE ROADWAY AND TURN LANES, CONSISTING OF GRADING, CULVERTS, DRIVEWAYS, ASPHALT CONCRETE PAVEMENT, CONCRETE RIPRAP, CONCRETE DRIVEWAYS, PAVEMENT MARKINGS AND SIGNING.

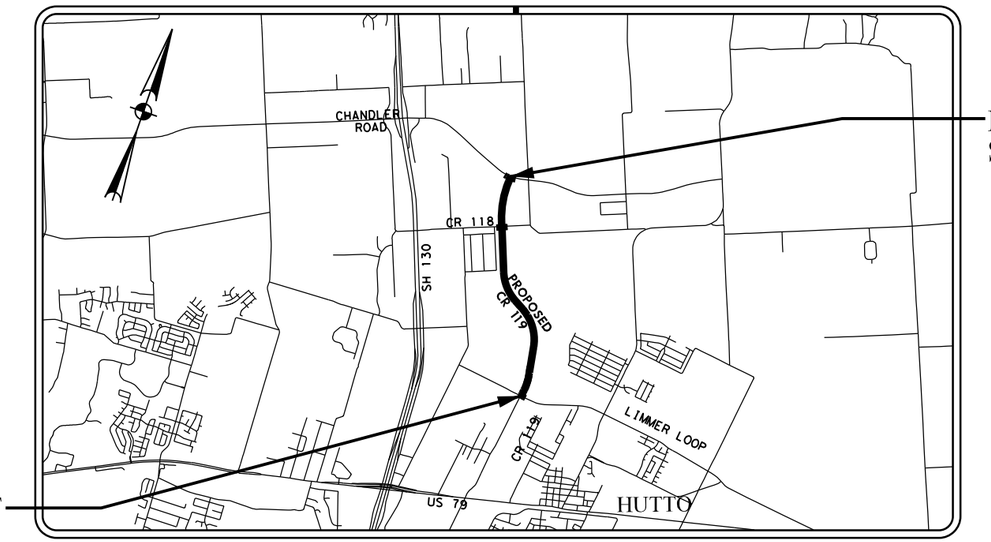
LIMITS: FROM LIMMER LOOP TO CHANDLER ROAD

WILLIAMSON COUNTY PROJECT NO. _____

NET LENGTH OF ROADWAY = 12,287.22 FT (2.327 MI)
NET LENGTH OF BRIDGES = 139.78 FT (0.026 MI)
NET LENGTH OF PROJECT = 12,427.00 FT (2.354 MI)

BRIDGE CLASS CULVERT B LENGTH = 23.120 LF
BRIDGE CLASS CULVERT D LENGTH = 26.660 LF
BRIDGE COTTONWOOD CREEK LENGTH = 90.000 LF

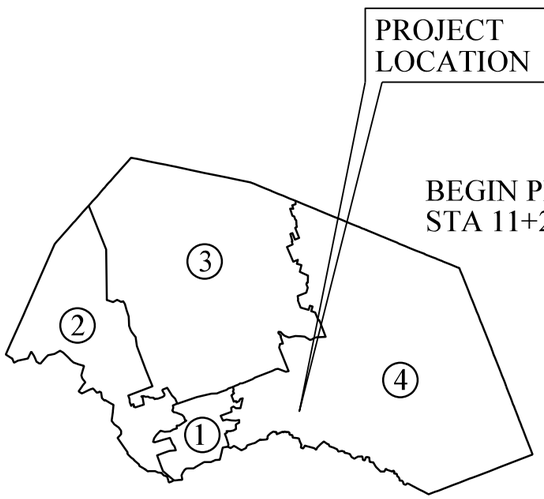
TxDOT STANDARD SPECIFICATIONS FOR CONSTRUCTION OF HIGHWAYS, STREETS AND BRIDGES ADOPTED NOVEMBER 1, 2014 AND ALL APPLICABLE SPECIAL PROVISIONS AND SPECIAL SPECIFICATIONS AS INDICATED IN THE BID DOCUMENTS SHALL GOVERN ON THIS PROJECT.



EXCEPTIONS: NONE
RAILROADS: NONE
STATION EQUATIONS: NONE

LOCATION MAP

NTS



WILLIAMSON COUNTY, TX.

PLANS PREPARED BY:

Stantec
221 West Sixth Street, Suite 600
Austin, Texas 78701
Tel. (512) 328-0011 Fax (512) 328-0325
TBPE Registration Number F-6324
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STATE OF TEXAS
ARNOLD GONZALES, JR.
98234
LICENSED
PROFESSIONAL ENGINEER

6/15/2017

APPROVED BY:

JUDGE DAN A. GATTIS DATE
WILLIAMSON COUNTY JUDGE

APPROVED BY:

LARRY MADSEN DATE
WILLIAMSON COUNTY COMMISSIONER
PRECINCT NO. 4

APPROVED BY:

RICHARD RIDINGS, P.E. DATE
HNTB CORPORATION
ROAD BOND MANAGEMENT TEAM

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98234
LICENSED
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6/22/2017

THE STANDARD SHEETS SPECIFICALLY IDENTIFIED ABOVE BY THE SYMBOL (**) HAVE BEEN SELECTED BY ME OR UNDER MY SUPERVISION AND ARE APPLICABLE TO THIS PROJECT.

CR 119

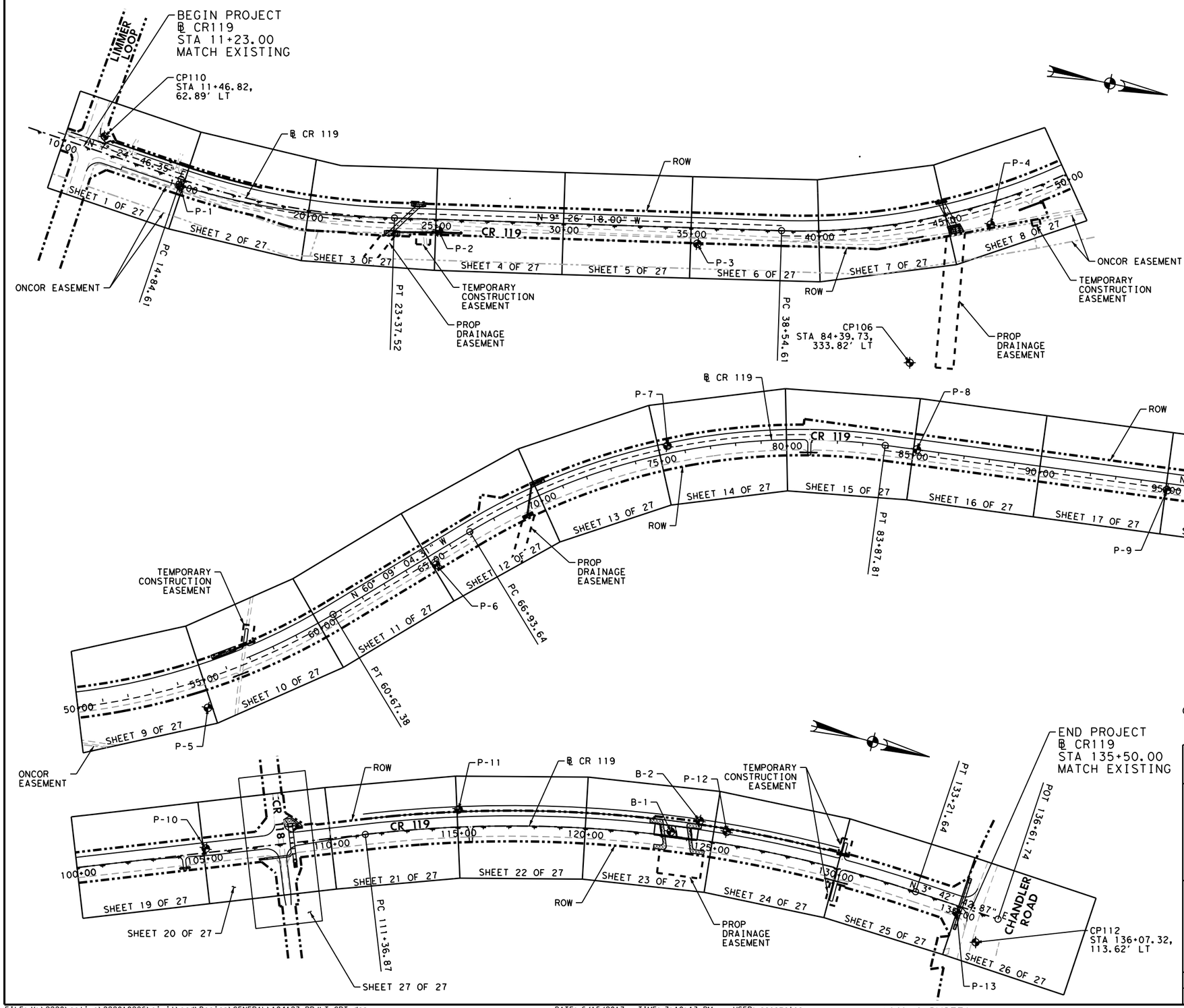
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INDEX OF SHEETS

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6	TEXAS		CR119	14	WILLIAMSON				02



SURVEY DATA:
THE BASIS OF BEARING OF THE SURVEY SHOWN HEREON IS TEXAS STATE PLANE COORDINATE SYSTEM, CENTRAL ZONE (4203), NAD 83(96), UTILIZING WESTERN DATA SYSTEMS CONTINUALLY OPERATING REFERENCE STATION (CORS) NETWORK.

THE SURVEY HEREON HAS BEEN CONVERTED TO SURFACE COORDINATES SCALED ABOUT BURY+PARTNERS CONTROL POINT #106 (CP106)

USE COMBINED SCALE FACTOR (CSF) 0.99987755 TO CONVERT BACK TO GRID COORDINATES. GRID AND SURFACE COORDINATES FOR CP106 ARE THE SAME AND ARE AS FOLLOWS:

BURY SURVEY CONTROL
CP106 = N:10183225.405, E:3166309.965, ELEV: 752.90'
CP110 = N:10177295.973, E:3169647.298, ELEV: 703.40'
CP112 = N:10188278.903, E:3165440.220, ELEV: 733.41'

ELEVATIONS HEREON ARE REFERENCED TO THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD 88) UTILIZING WESTERN DATA SYSTEMS CONTINUALLY OPERATING REFERENCE STATION (CORS) NETWORK BASED ON NGS GEOID03 AND VERIFIED TO LCRA GPS CONTROL MONUMENTS AT THE TIME OF THIS SURVEY.

BENCHMARK: LCRA CS03 – 3" ALUMINUM DISC IN CONCRETE LOCATED ON THE WEST SIDE OF THE WESTERLY DRAINAGE DITCH ALONG FM 1660, DUE NORTH FROM COUNTY ROAD 164, IN THE CITY OF HUTTO, ±37' SOUTHEAST OF A UTILITY POLE WITH CROSS-STREET OVERHEAD LINES AND ±28' NORTHWEST OF A HIGHWAY INTERSECTION SIGN POST.
ELEV: 670.446' (AS PUBLISHED)(NAVD 88)
ELEV: 670.30' (AS FOUND)(NAVD88)

ALL CONTROL POINT STATIONING REFERENCE CR 119 BASELINE.

0 200 400

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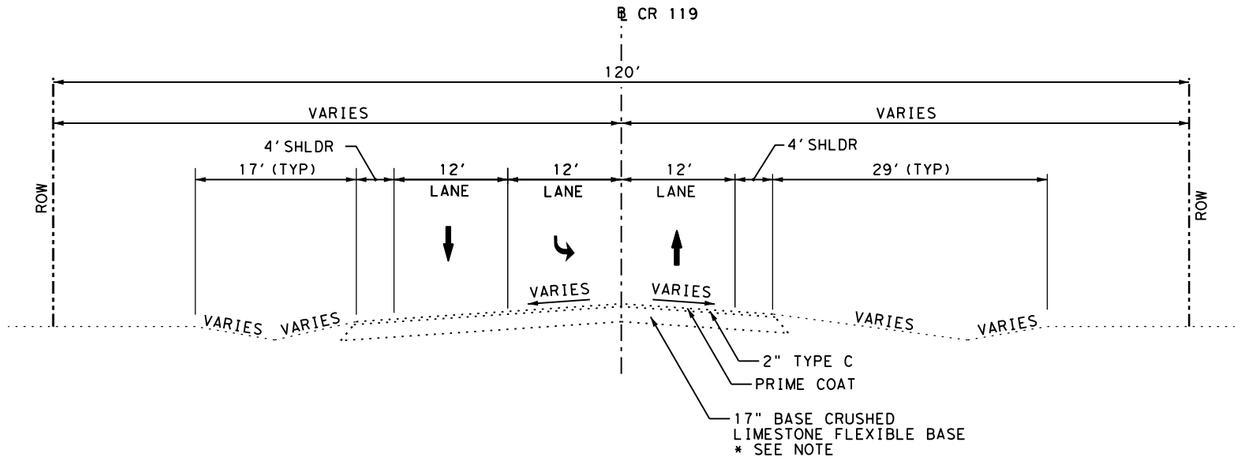
PROJECT LAYOUT AND CONTROL POINTS

SHEET 01 OF 01

FED. RD. DIV. RD.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				03

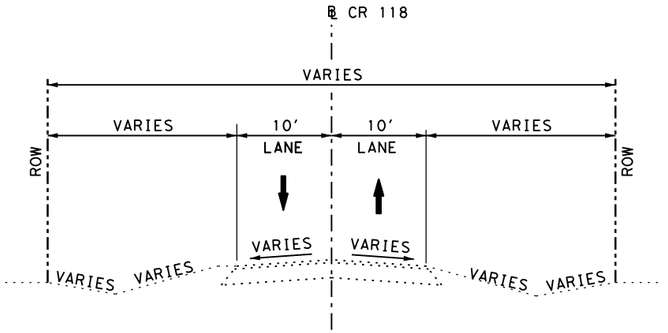
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EXISTING CR 119 TYPICAL SECTION

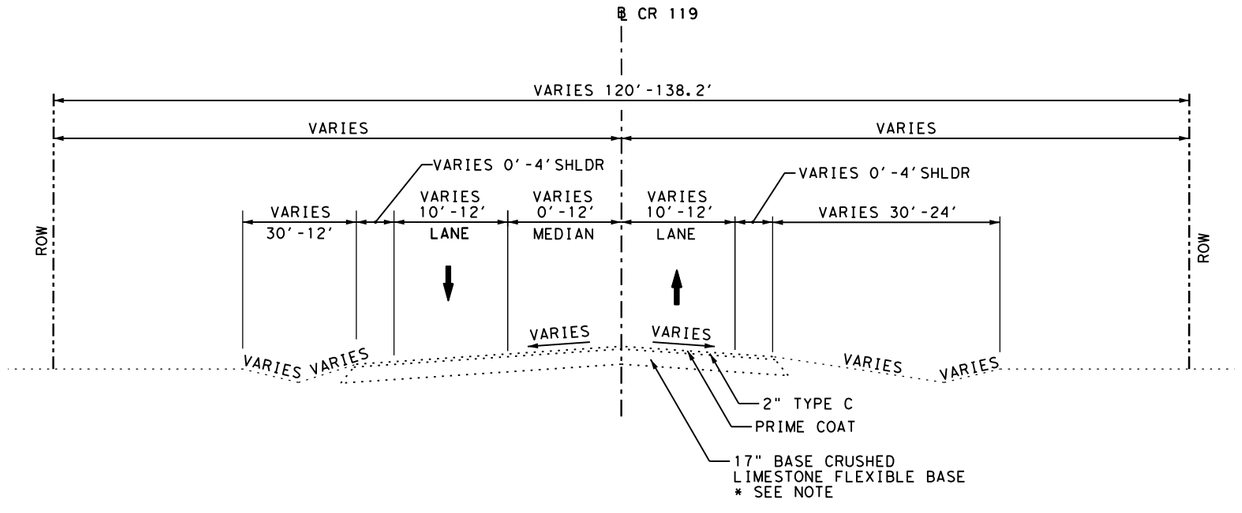
STA 11+23.00 TO STA 14+50.00
N.T.S.



EXISTING CR 118 TYPICAL SECTION

STA 11+82.52 TO STA 16+00.00
N.T.S.

* NOTE:
1. EXISTING CR 119 PAVEMENT SECTION HAS BEEN TAKEN FROM EXISTING RECORD DRAWINGS AND HAS NOT BEEN FIELD-VERIFIED. ENGINEER MAKES NO GUARANTEE TO THE ACCURACY OF THE EXISTING PAVEMENT SECTION. REFER TO "HUTTO BYPASS PHASE 1-A IMPROVEMENTS" PLANS, DATED 2-8-2007 FOR MORE INFORMATION.



EXISTING CR 119 TYPICAL SECTION

STA 14+50.00 TO STA 21+50.00
N.T.S.

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CR 119

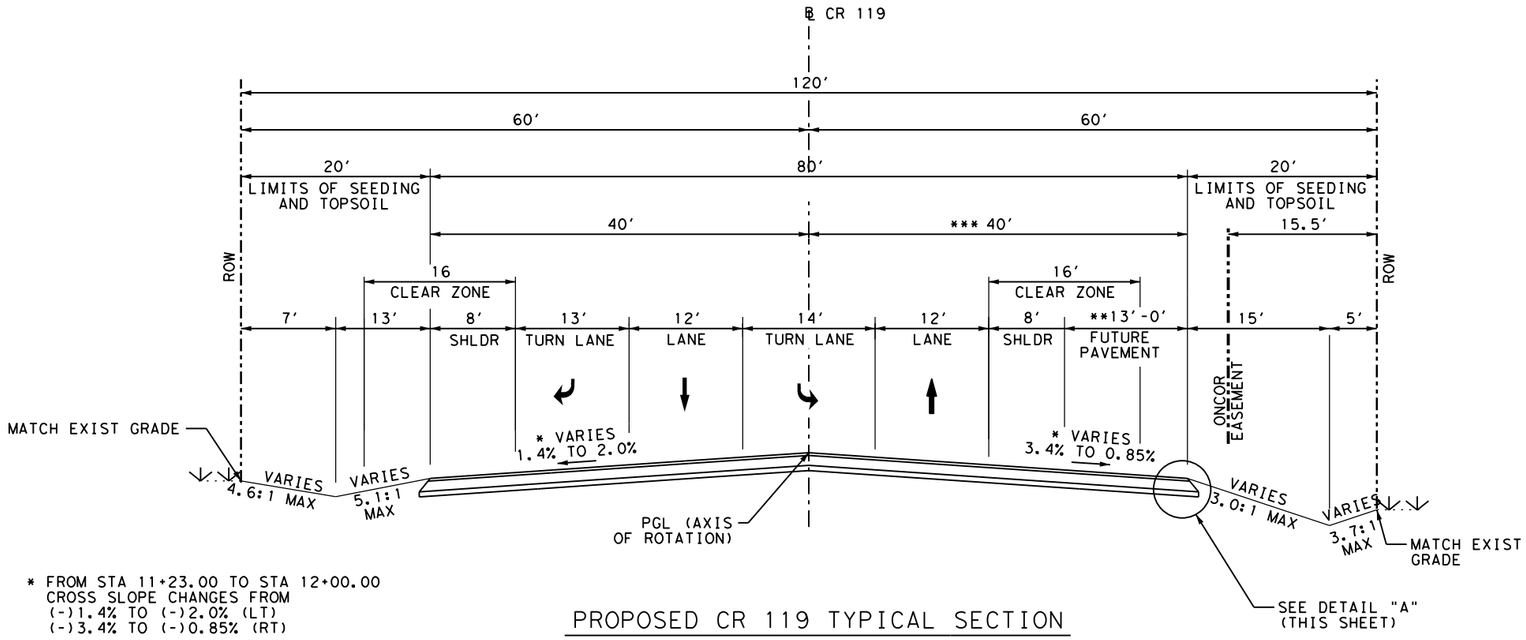
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EXISTING TYPICAL SECTIONS

SHEET 01 OF 06

FED. RD. DIV. RD.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				04



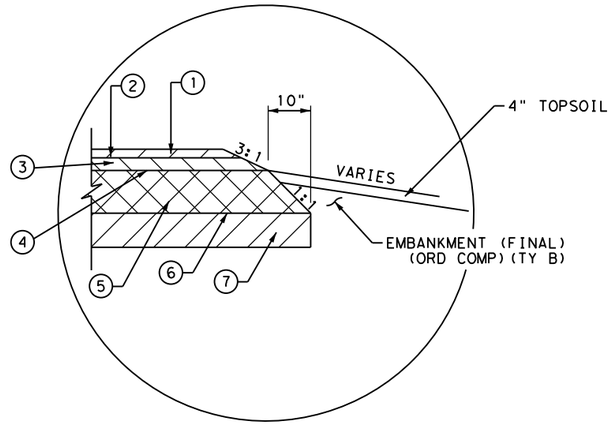
* FROM STA 11+23.00 TO STA 12+00.00
CROSS SLOPE CHANGES FROM
(-)1.4% TO (-)2.0% (LT)
(-)3.4% TO (-)0.85% (RT)

** 13' FROM STA 11+23.00 TO STA 12+50.00
0' FROM STA 12+50.00 TO STA 14+17.94

*** 27' FROM STA 12+50.00 TO STA 13+92.50

PROPOSED CR 119 TYPICAL SECTION

STA 11+23.00 TO STA 13+92.50
N.T.S.

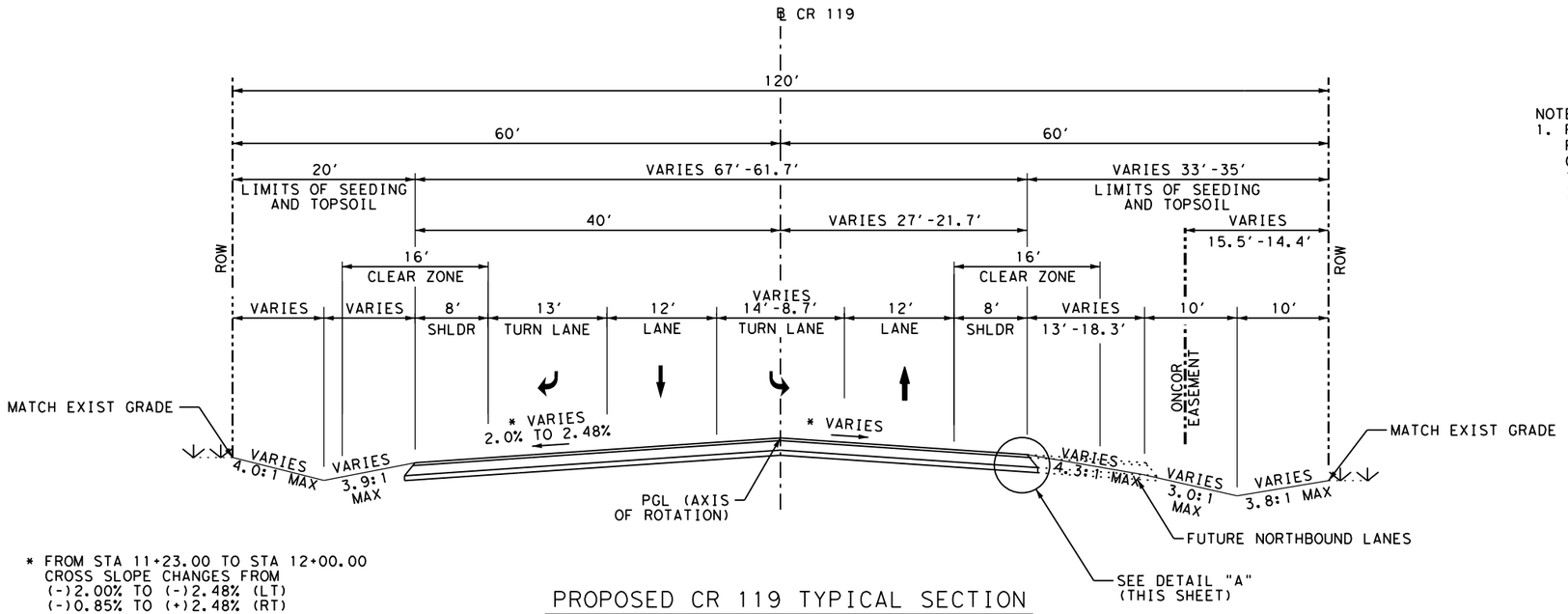


DETAIL "A"

N.T.S.

LEGEND FOR DETAIL "A"

① 2" D-GR HMA (TY C) (PG 70-22)
② SEAL COAT
③ 3" D-GR HMA (TY B) (PG 64-22)
④ PRIME COAT (MC 30 OR AE-P)
⑤ 10" FLEX BASE (COMP IN PLACE) (TY A GR 5) (PLACE IN 3 EQUAL LIFTS)
⑥ GEOGRID TYPE II (PLACE BETWEEN FLEX BASE AND SUBGRADE)
⑦ 8" LIME TREATED SUBGRADE (DC) (6% BY WEIGHT)



* FROM STA 11+23.00 TO STA 12+00.00
CROSS SLOPE CHANGES FROM
(-)2.00% TO (-)2.48% (LT)
(-)0.85% TO (+)2.48% (RT)

PROPOSED CR 119 TYPICAL SECTION

STA 13+92.50 TO STA 16+06.14
N.T.S.

NOTE:
1. REFER TO GEOTECHNICAL REPORT PROVIDED BY RABA KISTNER CONSULTANTS, INC., DATED 10/30/15 FOR ADDITIONAL INFORMATION.

STATE OF TEXAS
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98234
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6/15/2017

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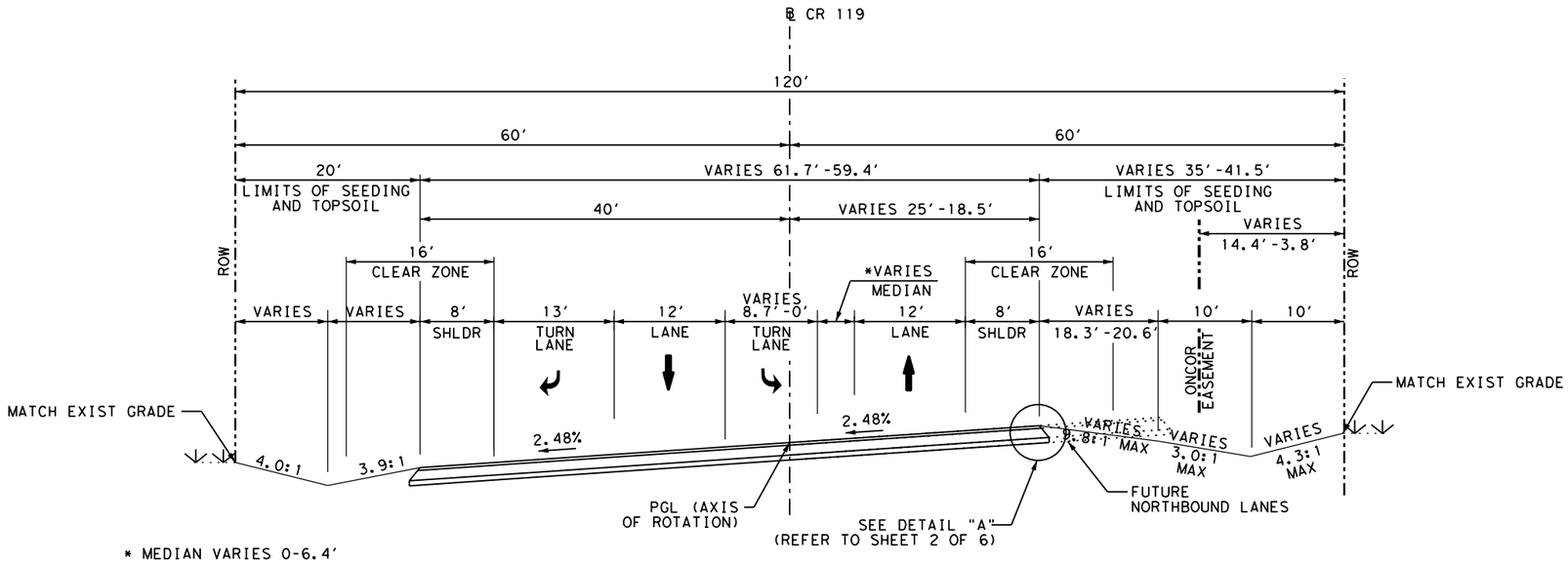
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PROPOSED TYPICAL SECTIONS

SHEET 02 OF 06

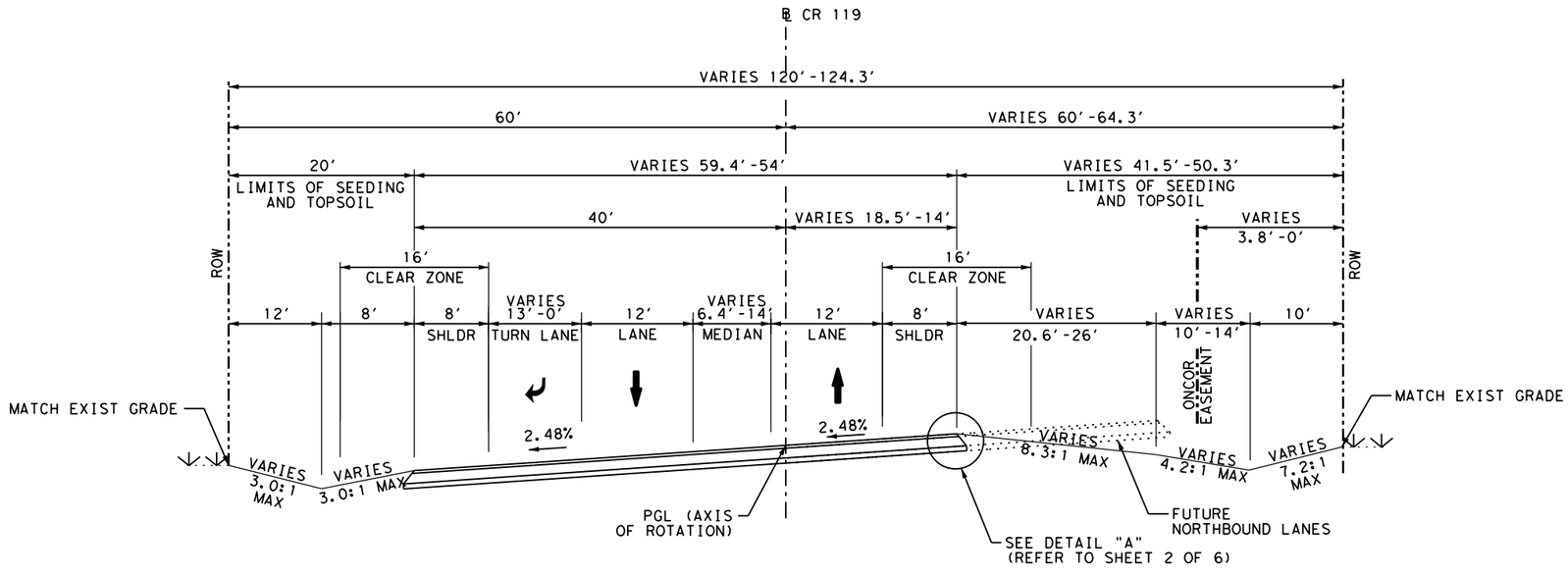
FED. RD. DIV. RD.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				05



* MEDIAN VARIES 0-6.4'

PROPOSED CR 119 TYPICAL SECTION

STA 16+06.14 TO STA 16+77.66
N.T.S.



PROPOSED CR 119 TYPICAL SECTION

STA 16+77.66 TO STA 18+46.71
N.T.S.

STATE OF TEXAS
ARNOLD GONZALES, JR.
98234
LICENSED
PROFESSIONAL ENGINEER

6/15/2017

CR 119

WILLIAMSON COUNTY
1848

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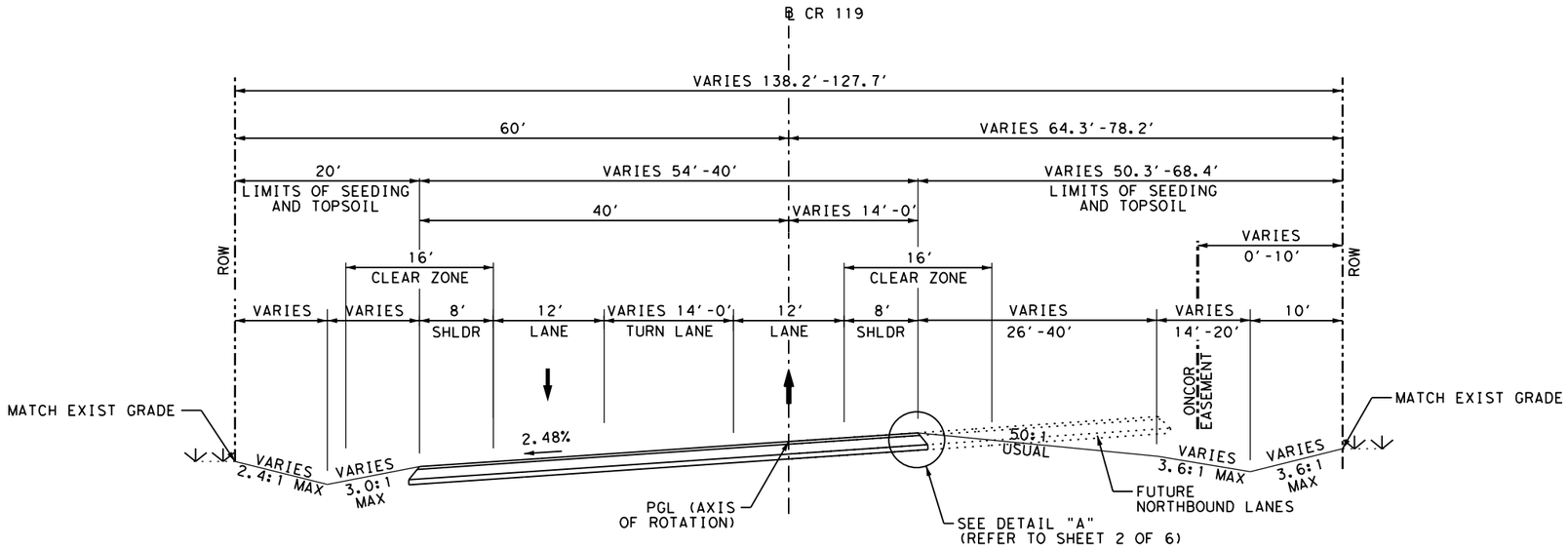
PROPOSED TYPICAL SECTIONS

SHEET 03 OF 06

FED. RD. DIV. RD.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				06

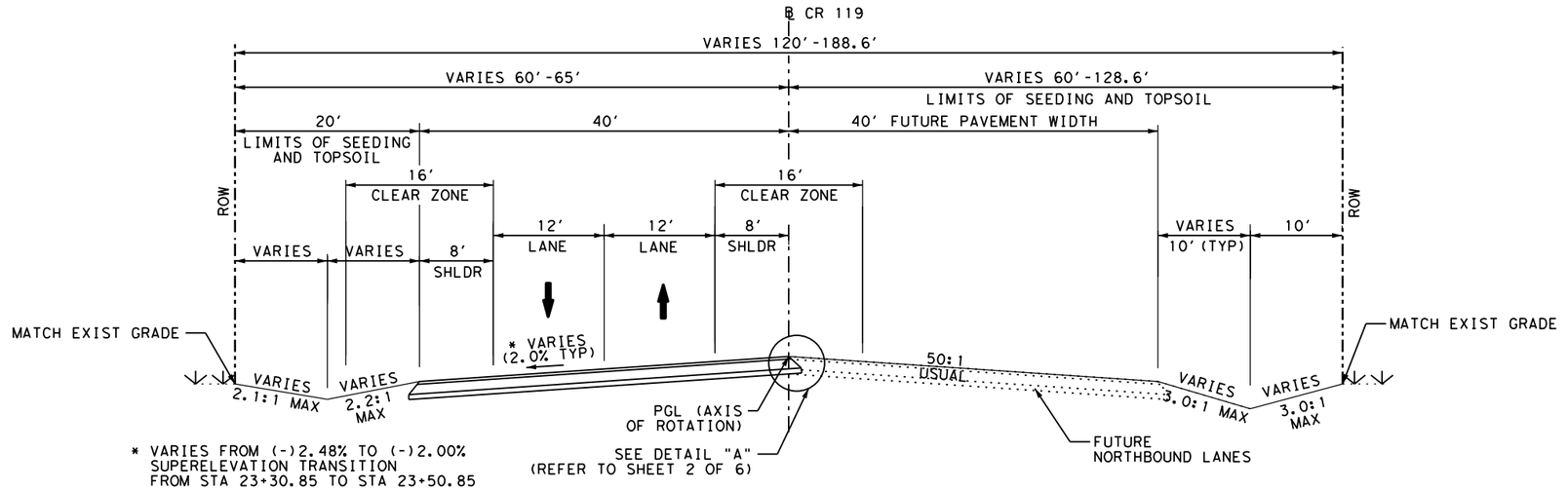
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PROPOSED CR 119 TYPICAL SECTION

STA 18+46.71 TO STA 23+37.52
N.T.S.



* VARIES FROM (-)2.48% TO (-)2.00%
SUPERELEVATION TRANSITION
FROM STA 23+30.85 TO STA 23+50.85

VARIES FROM (-)2.00% TO (+)2.63%
SUPERELEVATION TRANSITION
FROM STA 38+34.61 TO STA 38+64.61

SUPERELEVATION (-)2.63%
FROM STA 38+64.61 TO STA 60+57.38

VARIES FROM (+)2.63% TO (-)2.00%
SUPERELEVATION TRANSITION
FROM STA 64+60.31 TO STA 68+10.31

PROPOSED CR 119 TYPICAL SECTION

STA 23+37.52 TO STA 68+10.31
STA 82+71.14 TO STA 102+64.60
STA 111+47.45 TO STA 135+50.00
N.T.S.

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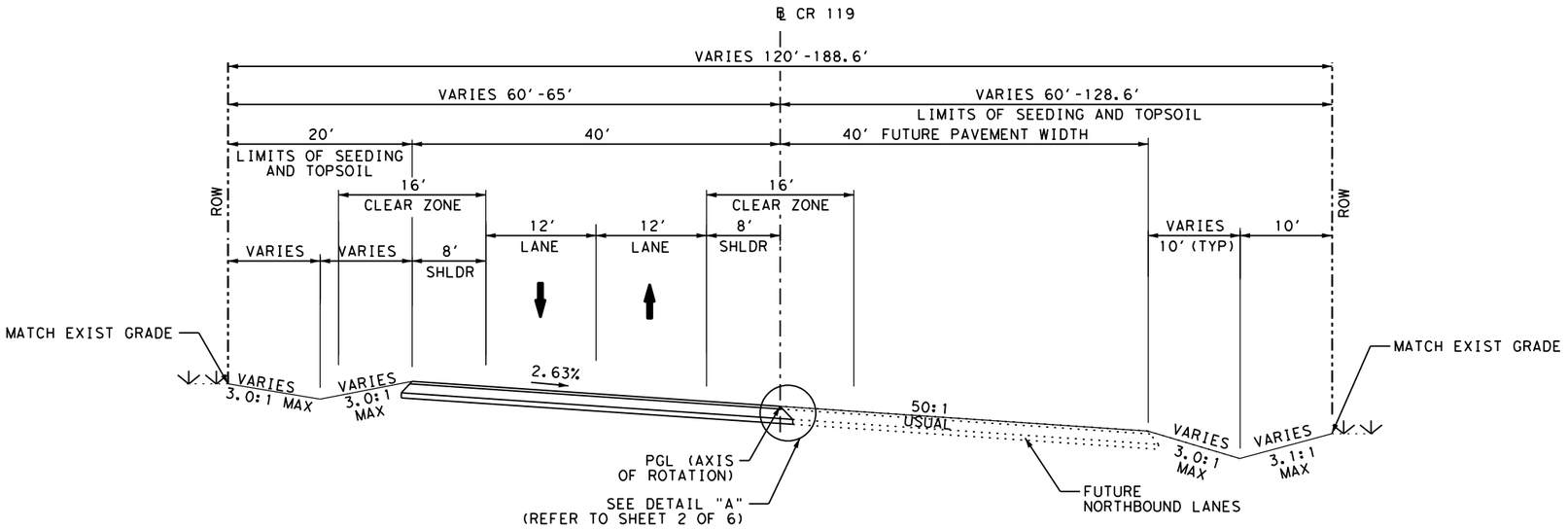
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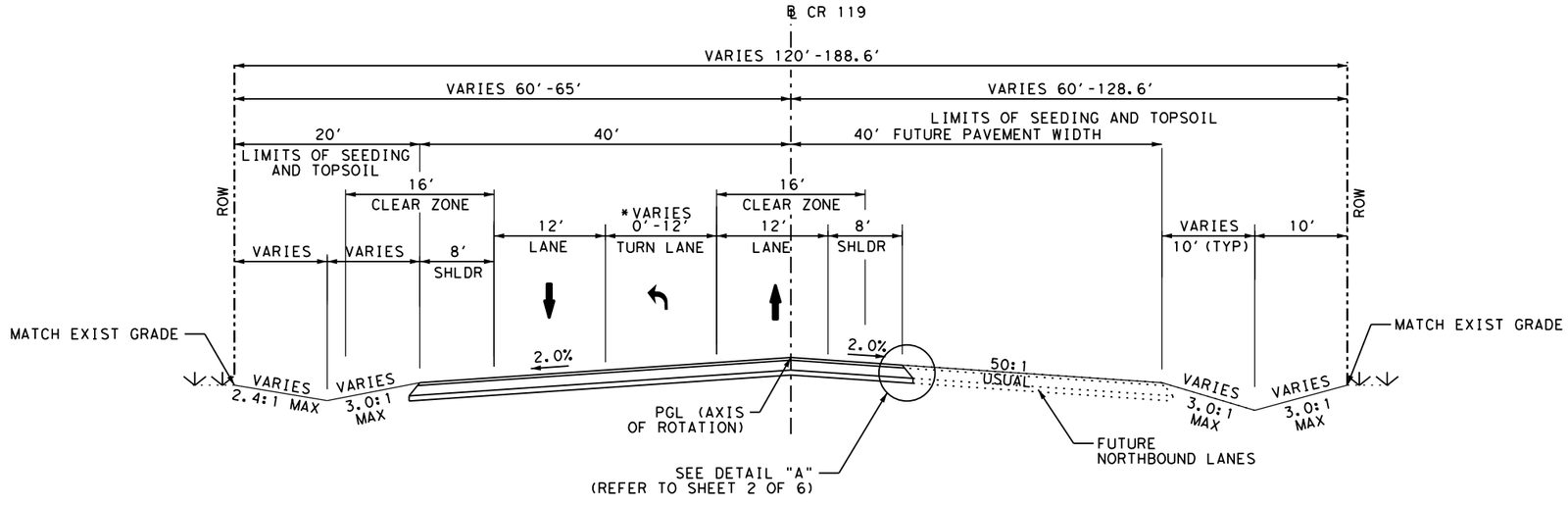
SHEET 04 OF 06

FED. RD. DIV. RD.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				07



PROPOSED CR 119 TYPICAL SECTION

STA 68+10.31 TO STA 82+71.14
N.T.S.



PROPOSED CR 119 TYPICAL SECTION

STA 102+64.60 TO STA 111+47.45
N.T.S.

* TRANSITION FROM 0' TO 12'
FROM STA 102+64.60 TO STA 105+34.60

TRANSITION FROM 12' TO 0'
FROM STA 108+77.45 TO STA 111+47.45

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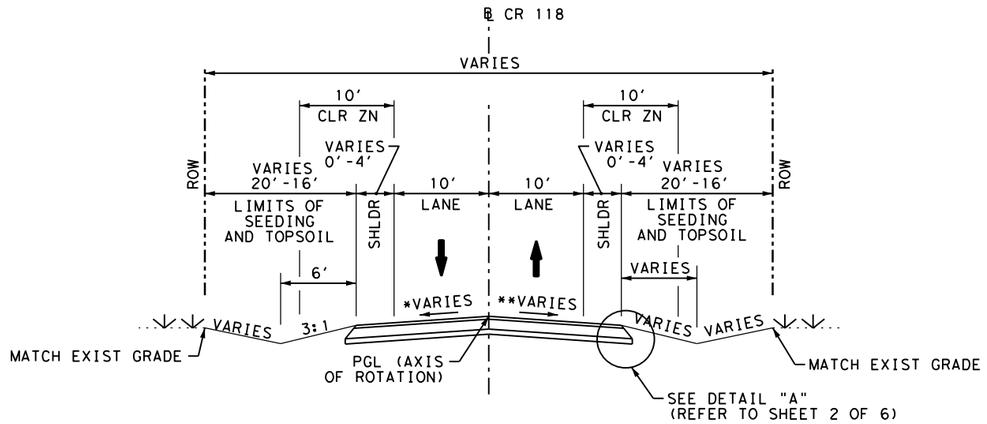
PROPOSED TYPICAL SECTIONS

SHEET 05 OF 06

FED. RD. DIV. RD.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				08

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PROPOSED CR 118 TYPICAL SECTION

* STA 11+72.52 TO STA 12+22.52
TRANSITION FROM (-)5.00% TO (-)3.44%

* STA 15+50.00 TO STA 16+00.00
TRANSITION FROM (-)2.05% TO (-)2.30%

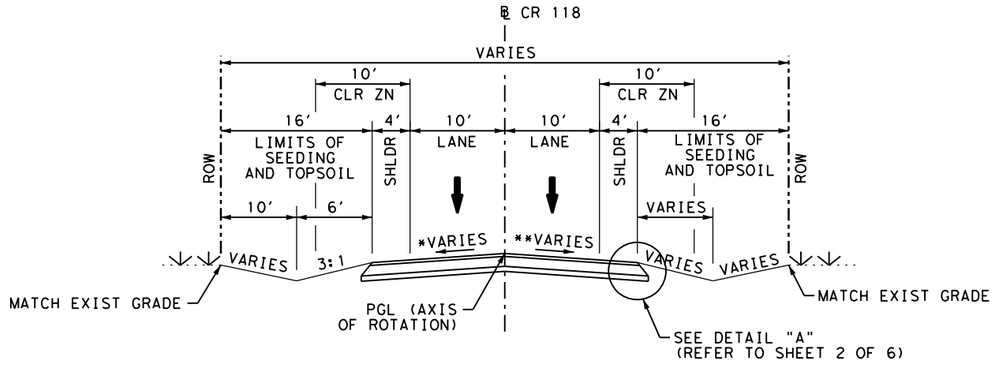
** STA 11+72.52 TO STA 12+22.52
TRANSITION FROM (-)4.30% TO (-)3.10%

** STA 15+50.00 TO STA 16+00.00
TRANSITION FROM (-)2.35% TO (-)4.10%

N.T.S.

NOTE:

1. PROPOSED PAVEMENT STRUCTURE FOR CR 118 WILL FOLLOW SAME DESIGN SPECIFIED FOR CR 119.



PROPOSED CR 118 TYPICAL SECTION

* STA 12+22.52 TO STA 12+68.10
TRANSITION FROM (-)3.44 TO (-)2.00%

* STA 14+21.12 TO STA 15+40.00
NO TRANSITION (-)2.00%

* STA 15+40.00 TO STA 15+50.00
TRANSITION FROM (-)2.00% TO (-)2.05%

** STA 12+22.52 TO STA 12+68.10
TRANSITION FROM (-)3.10% TO (-)2.00%

** STA 14+21.12 TO STA 15+40.00
NO TRANSITION (-)2.0%

** STA 15+40.00 TO STA 15+50.00
TRANSITION FROM (-)2.00% TO (-)2.35%

N.T.S.

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PROPOSED TYPICAL SECTIONS

SHEET 06 OF 06

FED. RD. DIV. RD.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				09

Williamson County **Sheet:**
Project: 15WCXXX

GENERAL NOTES: Revised April 21, 2017

Basis of Estimate

Item	Description	**Rate	Basis	Quantity
160	**Furnishing and Placing Topsoil (4")**	1 CY/7 SY	123,095 SY	123,095 SY
164	**Seed for Erosion Control** (Item 164) (Temp) (Cool) (TY 4) (Item 164) (Perm) (Warm) (TY 5)	 4840 SY/AC 4840 SY/AC	 123,095 SY 61,548 SY	 123,195 SY 61,548 SY
**166	**Fertilizer (13-13-13)**	1/8 LB/SY	123,095 SY	7.7 TON
168	**Vegetative Watering** (Item 164) (Temp) (Item 164) (Perm)	 10 GAL/SY 20 GAL/SY	 123,095 SY 61,548 SY	 3,077 MG 615 MG
**204	**Sprinkling** (Dust) (Item 132) (Item 247)	 30 GAL/CY 30 GAL/CY 30 GAL/CY	 CY CY CY	 GAL GAL GAL
247	**FL BS (CMP IN PLC)** (TY A GR 4)	 27 CF/CY	 477,441 CF	 17,683 CY
310	**Prime Coat (MC-30 or AE-P)**	0.20 GAL/SY	61,750 SY	12,350 GAL
341	**Dense-Graded Hot-Mix Asphalt** TY B PG 64-22 TY C PG 70-22	 115 LB/SY/IN 115 LB/SY/IN	 177,200 SY 113,843 SY	 10,189 TON 6,546 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.

Williamson County **Sheet:**
Project: 15WCXXX

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 to contact 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. The Construction Observer will report all minimum vertical clearance information on State maintained roadways to the Austin District Permit Office.

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.

STATE OF TEXAS
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6/22/2017

CR 119

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GENERAL NOTES

SHEET 01 OF 11

FED. RD. DIV. RD.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
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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.

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.

DSHS Asbestos and Demolition Notification.
Complete and provide the Texas Department of State Health Services (DSHS) notification form to the Engineer at least 30 calendar days prior to bridge or bridge class culvert removal or renovation. Notify the Construction Observer via email of any changes to the work start date.

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 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.

STATE OF TEXAS
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GENERAL NOTES

SHEET 02 OF 11

FED. RD. DIV. RD.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
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Williamson County **Sheet:**
Project: 15WCXXX

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.

ITEMS 160, 164, & 168
Use Wilco Special Provisions 160-WC 001, 164-WC 001, 168-WC 001.

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 164 – SEEDING FOR EROSION CONTROL
Item 164-WC11 (Type 11 seed) is to be used in eastern areas of the county for Temporary Warm and Permanent applications where use of off-site herbicides limits establishment of seasonal seeding. The quantity shown in the plans is 1.5 times the total seeding area to provide quantity for the Temporary and Permanent Warm use of the grass. Item 164-WC04 (Type 4 seed) should also be included at 0.5 of the total seeding area to provide Temporary Cool season coverage.

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.

Williamson County **Sheet:**
Project: 15WCXXX

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 5 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.

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GENERAL NOTES

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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 260 – LIME TREATMENT (ROAD-MIXED)
Apply Commercial Lime Slurry as directed or as indicated in the plans and specifications.

Measure the sulfate content, in accordance to Tex-145-E, for subgrade soil to be treated. Perform one test per 500 ft. measured along roadway centerline.

If the sulfate content is less than or equal to 3000 ppm, apply, mix, and mellow the subgrade soil with lime slurry in accordance to the standard specification. Hydrated lime or lime slurry can be used when the sulfate content is below 3000 ppm.

If the sulfate content is greater than 3000 ppm, but less than or equal to 7000 ppm, perform the following after applying and mixing lime slurry into the subgrade:

- Apply an additional 4 percentage points of moisture above optimum moisture
- Mix in the additional moisture
- Allow the mixture to mellow at least 7 days

Use lime slurry when sulfate content is greater than 3000 ppm, but less than or equal to 7000 ppm.

If the sulfate content is greater than 7000 ppm, do not apply lime slurry. Undercut to the same depth schedule for lime treatment and replace with select material, in accordance to the plan notes for Item 110 and 132.

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

PPA and REOBs are not allowed.

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.

When TY E is allowed, furnish coarse fractionated recycled asphalt pavement (CF-RAP). CF-RAP aggregate stockpiles must be approved on a stockpile-by-stockpile basis, unless approved by the Construction Observer. Do not exceed stockpiles greater than 2000 tons.

CF-RAP shall meet the below gradation requirements or Grade 4 or finer. CF-RAP shall meet deleterious material and decantation requirements in accordance with Table 3.

Furnish CF-RAP meeting the following gradation requirements, after ignition burn off of pre-existing asphalt, unless otherwise approved:

Sieve	Cumulative % Retained
5/8"	0
1/2"	10-25
3/8"	60-80
#4	85-100
#8	90-100

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.

Use bituminous material of the type MC and grade 30.

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. MC 30 is not allowed in Travis County.

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.



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GENERAL NOTES

SHEET 04 OF 11

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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 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)[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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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 two (2) inch washed, crushed stone with 0% passing a No. 4 sieve to backfill for bridge ends. Consider subsidiary to the pertinent Items. Provide weep holes out the face of the backwall, as directed

ITEM 416 – DRILLED SHAFT FOUNDATIONS
Stake all Foundations, for approval, before beginning drilling operations, as directed. Examples of types of foundations are Bridge Supports, Traffic Signal Pole Foundation, Roadway Illumination Assembly Foundations, Sign Support Locations, etc.

Calculate the vertical signal head clearance before placing any Traffic Signal Pole Foundation.

Obtain approval before placing additional exposed Traffic Pole Foundation.

Set anchor bolts for Mast-Arm Signal Poles and Strain Poles. Set two in tension and two in compression. Obtain approval of anchor bolt placement as directed before placing concrete.

Field cut holes for anchor bolts only as directed.

Class "C" concrete will be required for drilled shaft foundations involving overhead sign structures.

Remove spoils, daily, out of flood plain, or as directed.

ITEMS 420, 425, & 462
For projects on state maintained roadways, notify TxDOT local Area Office (Georgetown Area Office at 512-930-5402) prior to opening each phase of bridge or bridge class culvert construction to traffic. Notification is required for all new and modified bridge class structures. Notify TxDOT local Area Office (Georgetown Area Office at 512-930-5402) within 24 hours of Bridge demolition. Structure shall be inventoried by Austin District Bridge Section within 90 days of structure opening to traffic.

TxDOT Contact: Austin District Bridge Engineer at 512-832-7000.

ITEM 420 – CONCRETE SUBSTRUCTURES
Use Permanent Metal Deck Forms (PMDF) or prestressed concrete panels.

Do not use PMDF in areas where a "Free Joint" is indicated in the plans.

Check the sign plans for locations of clearance signs and brackets on structures, which will require inserts in the pre-stressed beams. Forward such locations to the beam fabricator.

Where Retaining Walls are integral parts of the abutment header, do not place the abutment cap prior to backfilling the wall and the abutment area up to the elevation of the bottom of the abutment cap.

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The "H" values shown on Bridge Layouts are estimated column heights. Calculate the actual column heights based on field conditions.

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.

Prior to the completion of work, stencil the National Bridge Inventory (NBI) number (structure number) on each structure built/shown on this project, as directed. Verify with the Construction Observer that the NBI number, which is shown on each Bridge Layout, is the number to use. Stencil the NBI number in an approved location on each bridge. Consider subsidiary to the pertinent Items.

The Contractor's attention is directed to the "Phased Bridge Const. Slab Modifications, Austin District Standard" Sheet. Overall depth of slab is increased to 8½ inches.

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 425 & 441 – PRECAST PRESTRESSED CONCRETE STRUCTURAL MEMBERS & STEEL STRUCTURES
Hold a Prephase meeting for the erection of concrete & steel members such as, Precast-Prestressed Concrete Beams, Precast-Prestressed Concrete Panels, and Structural Steel Beams, etc., prior to the work, as directed.

ITEM 427 – SURFACE FINISHES FOR CONCRETE
Consider Surface Finishes for concrete as subsidiary to the pertinent Items.

Follow form liner manufacturer's recommended procedures for form liner construction.

The form liner will release clean and free of the concrete, without pulling or breaking concrete from the textured surface.

Seal all form liner joints, in a manner acceptable to prevent leakage at the surface.

Perform an Ordinary Surface Finish to the faces of concrete units, such as Retaining Walls, Inlets, etc., that will have backfill material against them.

Perform Low-Pressure water blasting to the concrete surfaces, if forms are not removed in time.

For Surface Area I: Perform the Rub Finish as soon as possible after form removal. Complete the finish application within 5 calendar days from the pour date. Should the completion of the finish work fall behind, or exceed the 5-day period, pours of any additional structures will cease, until such time as the surface finish of existing structures is completed.

Provide form liner surface finishes of the types and at locations shown in the plans.

Provide a Surface Area I, **Rub Finish** to all concrete structures, except those with form liner surfaces.

Submit a containment plan that details the procedures and type and size of equipment proposed to keep public property, private property and the environment from being adversely affected by the cleaning and painting operations. Approval of the plan is required before cleaning and painting operations begin. Provide a system capable of collecting all falling paint chips and other debris. Store, characterize, and dispose of all recovered debris in accordance with 30 TAC 335, "Industrial Solid Waste and Municipal Hazardous Waste." Discharge liquids in accordance with the TCEQ Texas Pollution Discharge Elimination Program (30 TAC 305, "Effluent Guidelines and Standards for TPDES Permits") and Texas Surface Water Quality Standards (30 TAC 307). Alternatively, liquids may be captured, stored, and characterized for disposal at an authorized facility in accordance with 30 TAC 315, "Pretreatment Regulation for Existing and New Sources of Pollution," or 30 TAC 335, "Industrial Solid Waste and Municipal Hazardous Waste."

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.

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.

ITEM 454 – BRIDGE EXPANSION JOINTS
Apply protection System II to structural steel armor joint.

For Header-Type Expansion Joints, refer to TxDOT's website for approved systems.

For Asphalt-Plug Expansion Joints, refer to TxDOT's website for approved systems.

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ITEMS 462, 464, 465, 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 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.

Do not use precast box culverts.

Do not use precast storm drains.

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 465 – JUNCTION BOXES, MANHOLES AND INLETS
Curb Inlet heights (H) shown in plans are for contractor information. Curb & gutter at curb inlets should be constructed to match profile and cross slope of roadway.

Adjust inlet locations to the upstream side of driveways to accommodate driveway relocation.

Consider excavation and backfill, frames, grates, rings and covers subsidiary to pertinent Items.

Provide temporary drainage at each curb inlet and maintain until the final course of asphaltic concrete pavement is placed.

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 SETs 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.

Notify GEC at least 30 days prior to any Bridge Removal that will require a 10-Calendar-Day, Prior-To-Work Notification to Texas Department of State Health Services (DSHS). If the work does not happen on the notified date then another 10-Calendar-Day, Prior-To-Work Notification will be required.

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.

The Demolition Plan will meet the requirements of the Corps of Engineers' Section 404 Permit. No debris will be allowed to fall into Cottonwood Creek or its floodway. Saw-cut the old bridge columns to a minimum of two (2) feet or more below the finished ground line, unless otherwise directed.

No demolition work over, around, or in Cottonwood Creek will be allowed to proceed until the Construction Observer has approved the Demolition Plan. There may be other requirements associated with this item, to be determined dependent on the Demolition Plan submitted.

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).

The structural steel to be removed may contain lead paint. Submit a proposed demolition plan for approval by the Construction Observer at least 60 days prior to the desired demolition date. Demolition plan should limit disturbing where lead paint is located when possible. If flame cutting methods will be used and lead paint cannot be avoided, the County will arrange to have the paint

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removed at the indicated flame-cutting locations. The paint will be removed by a separate contractor for a width of four (4) inches. No paint removal will be required if other demolition methods are employed.

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 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 1 lane(s) 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 1 through lane(s) in each direction, during the daylight hours, 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.

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ITEM 540 – METAL BEAM GUARD FENCE (MBGF)
Before beginning the installation of the proposed Metal Beam Guard Fence (MBGF), stake the locations for approval. Adjust the limits of the MBGF to meet field conditions, as directed, before erection.

Furnish new, round, domed and unpainted timber posts. Furnish steel posts at locations where the minimum embedment shown on the plans for wooden posts cannot be achieved. Field verify the steel post lengths before fabrication. Consider the steel posts subsidiary to pertinent Items.

Install all permanent MBGF and delineators, when the roadway is constructed in one-half widths, on that section, before opening the road to traffic.

Adjust existing rail as per plans and in accordance with the latest TxDOT standard. Removal, replacement, or installation of mow strip block out material will be subsidiary. Constructing new or backfilling, using class B concrete, unused mow strip block outs will be subsidiary

Provide Rail Elements that meet AASHTO M 180 TY I Galvanization (1.80 oz. per SY).

Rail and rail elements that are in compliance with current standards and are undamaged should stockpiled at a location, approved by the Construction Observer, within the project limits for pick up by the County.

ITEM 560 – MAILBOX ASSEMBLIES
Supplement each new mailbox installation with Type 2 object marker placed on the mailbox support in a vertical position six (6) inches below the bottom of the mailbox.

Reflective tape may be used to simulate a Type 2 marker placed on tubular supports. Use tape that meets DMS-8600. The simulated marker will consist of three (3) – 2¾-inch x 2¾-inch pieces of yellow high intensity tape spaced one (1) inch apart.

The Type 2 marker will consist of OM-2SR or OM-2VP object markers if delineator post supports are used. Bi-directional brackets may be required on Size 2 mailbox installations. Consider subsidiary to the pertinent Items.

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.

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.

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Williamson County **Sheet:**
Project: 15WCXXX

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 Department.

General Notes Sheet U



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ESTIMATE SUMMARY

ALT	ITEM-CODE ITEM NO.	ITEM-CODE DESC. CODE	SP NO	DESCRIPTION	UNITS	TOTAL EST.	TOTAL FINAL
	100	6002		PREPARING ROW	STA	127.30	
	*105	6030		REMOVING STAB BASE & ASPH PAV (8"-14")	SY	4,596.00	
	110	6001		EXCAVATION (ROADWAY)	CY	45,980.00	
	132	6003		EMBANKMENT (FINAL)(ORD COMP)(TY B)	CY	34,615.00	
	160	WC 02		FURNISHING AND PLACING TOPSOIL (4")	SY	112,138.00	
	164	WC 11		SEEDING FOR EROSION CONTROL (PERM) (TY I)	SY	112,138.00	
	164	WC 11		SEEDING FOR EROSION CONTROL (TEMP) (TY IV)	SY	56,069.00	
	166	6002		FERTILIZER	TON	7.00	
	168	WC 001		VEGETATIVE WATERING	MG	2,803.00	
	169	6006		SOIL RETENTION BLANKETS (CL 2)(TY F)	SY	4,120.00	
	247	6044		FL BS (CMP IN PLC)(TY A GR 4)(FINAL POS)	CY	17,683.00	
	260	6002		LIME (HYDRATED LIME(SLURRY))	TON	1,144.00	
	260	6027		LIME TRT (EXST MATL)(8")	SY	63,562.00	
	310	6027		PRIME COAT (MC-30 OR AE-P)	GAL	12,350.00	
	316	6005		ASPH (TIER II)	GAL	15,495.00	
	316	6193		AGGR (TY-D GR-5 SAC-B)	CY	413.00	
	341	6008		D-GR HMA TY-B PG64-22	TON	10,189.00	
	341	6026		D-GR HMA TY- C SAC-A PG70-22	TON	6,546.00	
	403	6001		TEMP SPL SHORING	SF	1,484.00	
	416	6004		DRILL SHAFT (36 IN)	LF	210.00	
	420	6013		CL C CONC (ABUT)	CY	48.60	
	420	6029		CL C CONC (CAP)	CY	20.50	
	420	6037		CL C CONC (COLUMN)	CY	5.90	
	422	6001		REINF CONC SLAB	SF	5,520.00	
	422	6015		APPROACH SLAB	CY	91.40	
	425	6036		PRESTR CONC GIRDER (TX28)	LF	713.90	
	432	6001		RIPRAP (CONC)(4 IN)	CY	503.40	
	432	6002		RIPRAP (CONC)(5 IN)	CY	178.35	
	432	6033		RIPRAP (STONE PROTECTION)(18 IN)	CY	108.00	
	432	6045		RIPRAP (MOW STRIP)(4 IN)	CY	85.40	
	450	6006		RAIL (TY T223)	LF	272.00	
	454	6001		SEALED EXPANSION JOINT (4 IN) (SEJ - A)	LF	94.00	
	462	6003		CONC BOX CULV (4 FT X 2 FT)	LF	20.00	
	462	6006		CONC BOX CULV (5 FT X 2 FT)	LF	210.00	
	462	6007		CONC BOX CULV (5FT X 3FT)	LF	266.00	
	462	6010		CONC BOX CULV (6FT X 3FT)	LF	688.00	
	462	6014		CONC BOX CULV (7 FT X 3 FT)	LF	479.00	
	464	6003		RC PIPE (CL III)(18 IN)	LF	595.00	
	464	6005		RC PIPE (CL III)(24 IN)	LF	825.00	
	464	6009		RC PIPE (CL III)(42 IN)	LF	145.00	
	465	2003		INLET (COMPL)(TY H)	EA	2.00	
	465	6128		INLET (COMPL)(PSL)(FG)(4FTX4FT-4FTX4FT)	EA	6.00	
	466	6135		HEADWALL (CH-PW-S)(DIA = 42 IN)	EA	1.00	
	466	6179		WINGWALL (PW-1)(HW=4 FT)	EA	2.00	
	466	6180		WINGWALL (PW-1)(HW=5 FT)	EA	4.00	
	466	6206		WINGWALL (SW-0)(HW=3FT)	EA	2.00	
	466	6207		WINGWALL (SW-0)(HW=4FT)	EA	3.00	
	467	6174		SET (TY I) (S=5FT) (HW=3FT) (6:1)(P)	EA	1.00	
	467	6363		SET (TY II)(18 IN) (RCP)(6:1) (P)	EA	12.00	
	467	6395		SET (TY II)(24 IN) (RCP)(6:1) (P)	EA	8.00	
	467	6134		SET (TY I)(S= 4 FT)(HW= 2 FT)(6:1) (P)	EA	2.00	
	496	6004		REMOV STR (SET)	EA	9.00	
	496	6007		REMOV STR (PIPE)	LF	196.00	
	496	6031		REMOV STR (CATTLE GUARD)	EA	1.00	
	496	6043		REMOV STR (SMALL FENCE)	LF	2,438.00	
	502	6001		BARRICADES, SIGNS AND TRAFFIC HANDLING	MO	12.00	
	506	6002		ROCK FILTER DAMS (INSTALL)(TY 2)	LF	215.00	
	506	6003		ROCK FILTER DAMS (INSTALL)(TY 3)	LF	419.00	
	**506	6011		ROCK FILTER DAMS (REMOVE)	LF	634.00	

ESTIMATE SUMMARY

ALT	ITEM-CODE ITEM NO.	ITEM-CODE DESC. CODE	SP NO	DESCRIPTION	UNITS	TOTAL EST.	TOTAL FINAL
	**506	6020		CONSTRUCTION EXITS (INSTALL)(TY 1)	SY	400.00	
	506	6024		CONSTRUCTION EXITS (REMOVE)	SY	400.00	
	506	6038		TEMP SEDMT CONT FENCE (INSTALL)	LF	14,254.00	
	506	6039		TEMP SEDMT CONT FENCE (REMOVE)	LF	14,254.00	
	508	6001		CONSTRUCTING DETOURS	SY	664.00	
	530	6005		DRIVEWAYS (ACP)	SY	1,304.00	
	540	6001		MTL W-BEAM GD FEN (TIM POST)	LF	1,201.00	
	540	6003		MTL THRIE-BEAM GD FEN (TIM POST)	EA	4.00	
	540	6016		DOWNSTREAM ANCHOR TERMINAL SECTION	EA	1.00	
	544	6001		GUARDRAIL END TREATMENT (INSTALL)	EA	11.00	
	552	6003		WIRE FENCE (TY C)	LF	2,562.00	
	644	6001		IN SM RD SN SUP&AM TY10BWG (1) SA (WS)	EA	13.00	
	658	6047		INSTL OM ASSM (OM-2Y)(WC)GND	EA	20.00	
	658	6014		INSTL DEL ASSM (D-SW)SZ (BRF)CTB(BI)	EA	6.00	
	658	6061		INSTL DEL ASSM (D-SW)SZ 1(BRF)GF2	EA	39.00	
	662	6004		WK ZN PAV MRK NON-REMOV (W) 4" (SLD)	LF	10,295.00	
	662	6016		WK ZN PAV MRK NON-REMOV (W) 24" (SLD)	LF	32.00	
	662	6032		WK ZN PAV MRK NON-REMOV (Y) 4" (BRK)	LF	954.00	
	662	6033		WK ZN PAV MRK NON-REMOV (Y) 4"(DOT)	LF	94.00	
	662	6034		WK ZN PAV MRK NON-REMOV (Y) 4" (SLD)	LF	3,287.00	
	666	6030		REFL PAV MRK TY I (W) 8" (DOT)(100 MIL)	LF	50.00	
	666	6036		REFL PAV MRK TY I (W) 8" (SLD)(100 MIL)	LF	762.00	
	666	6048		REFL PAV MRK TY I (W) 24" (SLD)(100 MIL)	LF	335.00	
	666	6054		REFL PAV MRK TY I (W) (ARROW)(100 MIL)	EA	8.00	
	666	6078		REFL PAV MRK TY I (W) (WORD)(100 MIL)	EA	8.00	
	666	6147		REFL PAV MRK TY I (Y) 24" (SLD)(100 MIL)	LF	600.00	
	666	6170		REF PAV MRK TY II (W) 4" (SLD)	LF	25,876.00	
	666	6176		REFL PAV MRK TY II (W) 8" (DOT)	LF	50.00	
	666	6178		REF PAV MRK TY II (W) 8" (SLD)	LF	762.00	
	666	6182		REF PAV MRK TY II (W) 24" (SLD)	LF	335.00	
	666	6184		REF PAV MRK TY II (W)(ARROW)	EA	8.00	
	666	6192		REF PAV MRK TY II (W)(WORD)	EA	8.00	
	666	6207		REF PAV MRK TY II (Y) 4" (SLD)	LF	30,306.00	
	666	6214		REF PAV MRK TY II (Y) 24" (SLD)	LF	600.00	
	666	6303		RE PM W/RET REQ TY I (W) 4" (SLD)(100 MIL)	LF	25,876.00	
	666	6315		RE PM W/RET REQ TY I (Y) 4" (SLD)(100 MIL)	LF	30,306.00	
	672	6007		REFL PAV MRKR TY I-C	EA	57.00	
	672	6009		REFL PAV MRKR TY II-A-A	EA	540.00	
	677	6001		ELIM EXT PAV MRK & MRKS (4")	LF	3,520.00	
	677	6007		ELIM EXT PAV MRK & MRKS (24")	LF	145.00	
	730	6107		FULL-WIDTH MOWING	CYC	3.00	
	WC5001	6002		GEOGRID BASE REINFORCEMENT TY II	SY	63,562.00	
	WC	5003		WOODEN PRIVACY FENCE	LF	2,216.00	

* FOR CONTRACTOR'S INFORMATION ONLY.
** TO BE REPLACED AS DIRECTED.

STATE OF TEXAS
ARNOLD GONZALES, JR.
98234
LICENSED
PROFESSIONAL ENGINEER

6/22/2017

CR 119

WILLIAMSON COUNTY 1848

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ESTIMATE OF QUANTITIES

QUANTITY SUMMARY

SHEET 01 OF 01

FED. RD. DIV. RD.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				18

ROADWAY QUANTITY SUMMARY

SHEET NO.	STA TO STA	100 6002 PREPARING ROW	105 6030 REMOVING STAB BASE & ASPH PAV (8"-14")	110 6001 EXCAVATION (ROADWAY)	132 6003 EMBANKMENT (FINAL) (ORD COMP) (TY B)	247 6044 FL BS (CMP IN PLC) (TY A GR 4) (FINAL POS)	260 6002 LIME (HYDRATED LIME (SLURRY))	260 6027 LIME TRT (EXST MATL) (8")	310 6027 PRIME COAT (MC-30 OR AE-P)	316 6005 ASPH (TIER II)	316 6193 AGGR (TY-D GR-5 SAC-B)	341 6008 D-GR HMA TY-B PG64-22	341 6026 D-GR HMA TY-C SAC-A PG70-22
		STA	SY	CY	CY	CY	TON	SY	GAL	GAL	CY	TON	TON
1 OF 27	BEGIN TO 15+00	3.8	* 2106	1849	142	668	44	2,435	473	591	16	390	253
2 OF 27	15+00 TO 20+00	5	* 2109	4386	36	932	61	3,407	650	813	22	537	354
3 OF 27	20+00 TO 25+00	5	* 381	1187	1810	710	47	2,606	497	621	17	410	265
4 OF 27	25+00 TO 30+00	5		2617	177	670	44	2,453	468	585	16	386	248
5 OF 27	30+00 TO 35+00	5		1306	370	670	44	2,453	468	585	16	386	248
6 OF 27	35+00 TO 40+00	5		2810	150	670	44	2,453	468	585	16	386	248
7 OF 27	40+00 TO 45+00	5		3114	660	670	44	2,453	468	585	16	386	248
8 OF 27	45+00 TO 50+00	5		2805	738	670	44	2,453	468	585	16	386	248
9 OF 27	50+00 TO 55+00	5		2430	230	670	44	2,453	468	585	16	386	248
10 OF 27	55+00 TO 60+00	5		2353	375	670	44	2,453	468	585	16	386	248
11 OF 27	60+00 TO 65+00	5		2263	247	670	44	2,453	468	585	16	386	248
12 OF 27	65+00 TO 70+00	5		463	2520	670	44	2,453	468	585	16	386	248
13 OF 27	70+00 TO 75+00	5		592	1723	670	44	2,453	468	585	16	386	248
14 OF 27	75+00 TO 80+00	5		1718	538	670	44	2,453	468	585	16	386	248
15 OF 27	80+00 TO 85+00	5		1358	457	670	44	2,453	468	585	16	386	248
16 OF 27	85+00 TO 90+00	5		2712	82	670	44	2,453	468	585	16	386	248
17 OF 27	90+00 TO 95+00	5		2427	60	670	44	2,453	468	585	16	386	248
18 OF 27	95+00 TO 100+00	5		664	2351	670	44	2,453	468	585	16	386	248
19 OF 27	100+00 TO 105+00	5		3368	142	708	47	2,597	492	615	16	406	261
20 OF 27	105+00 TO 110+00	5		816	2349	839	55	3,069	588	735	20	485	313
21 OF 27	110+00 TO 115+00	5		876	2029	686	45	2,516	480	600	16	396	255
22 OF 27	115+00 TO 120+00	5		1766	747	670	44	2,453	468	585	16	386	248
23 OF 27	120+00 TO 125+00	5		308	4710	536	35	1,962	374	468	12	309	198
24 OF 27	125+00 TO 130+00	5		648	2932	670	44	2,453	468	585	16	386	248
25 OF 27	130+00 TO 135+00	5		290	7200	670	44	2,453	468	585	16	386	248
26 OF 27	135+00 TO END	0.5		55	1378	134	9	491	94	117	3	77	50
27 OF 27	CR 118	3		799	462	410	6	337	278	405	11	230	141
DRIVEWAYS													
1 OF 6	1 & 2				** 28	** 19.7							
2 OF 6	3 & 4			** 28	** 297	** 70.5							
3 OF 6	5 & 6			** 55	** 12	** 76.9							
4 OF 6	7 & 8			** 70		** 51.8							
5 OF 6	9 & 10			** 19	** 4	** 44.6							
6 OF 6	11 & 12				** 661	** 72.9							
PROJECT TOTALS		127.3	4596	45980	34615	17,683	1144	63562	12350	15495	413	10189	6546

* FOR CONTRACTOR'S INFORMATION ONLY.
QUANTITY IS SUBSIDIARY TO ITEM 110.

** FOR CONTRACTOR'S INFORMATION ONLY.
QUANTITY IS SUBSIDIARY TO ITEM 530.

STATE OF TEXAS
ARNOLD GONZALES, JR.
98234
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6/15/2017

CR 119

WILLIAMSON COUNTY
1848

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ESTIMATE OF QUANTITIES

ROADWAY SUMMARY

SHEET 01 OF 02

FED. RD. DIV. RD.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				19

ROADWAY QUANTITY SUMMARY

SHEET NO.	STA TO STA	432 6001 RIPRAP (CONC) (4 IN)	432 6045 RIPRAP (MOW STRIP) (4 IN)	496 6031 REMOV STR (CATTLE GUARD)	496 6043 REMOV STR (SMALL FENCE)	502 6001 BARRICADES, SIGNS AND TRAFFIC HANDLING	530 6005 DRIVEWAYS (ACP)	540 6001 MTL W-BEAM GD FEN (TIM POST)	540 6003 MTL THRIE-BEAM GD FEN (TIM POST)	540 6016 DOWNSTREAM ANCHOR TERMINAL SECTION	544 6001 GUARDRAIL END TREATMENT (INSTALL)	552 6003 WIRE FENCE (TY C)	730 6107 FULL-WIDTH MOWING	WC5001 6002 GEOGRID BASE REINFORCEMENT TY II	WC 5003 WOODEN PRIVACY FENCE
		CY	CY	EA	LF	MO	SY	LF	EA	EA	EA	LF	CYC	SY	LF
1 OF 27	BEGIN TO 15+00					12								2434.5	
2 OF 27	15+00 TO 20+00	26.8												3406.5	
3 OF 27	20+00 TO 25+00	114.6	8.6	1	302			137			1	310		2605.5	
4 OF 27	25+00 TO 30+00	23.4	5.2		500			51			1	500		2452.5	
5 OF 27	30+00 TO 35+00				500							500		2452.5	
6 OF 27	35+00 TO 40+00				500							500		2452.5	
7 OF 27	40+00 TO 45+00		5.5		636			70			1	524		2452.5	
8 OF 27	45+00 TO 50+00	35.3	7.0					118			1	144		2452.5	
9 OF 27	50+00 TO 55+00													2452.5	
10 OF 27	55+00 TO 60+00	21.3												2452.5	
11 OF 27	60+00 TO 65+00													2452.5	
12 OF 27	65+00 TO 70+00													2452.5	
13 OF 27	70+00 TO 75+00													2452.5	
14 OF 27	75+00 TO 80+00													2452.5	
15 OF 27	80+00 TO 85+00													2452.5	5
16 OF 27	85+00 TO 90+00													2452.5	500
17 OF 27	90+00 TO 95+00													2452.5	500
18 OF 27	95+00 TO 100+00		14.6					270			2			2452.5	432
19 OF 27	100+00 TO 105+00	86.5												2596.5	500
20 OF 27	105+00 TO 110+00	55.8	9.0					205		1				3069	279
21 OF 27	110+00 TO 115+00		6.0								1			2515.5	
22 OF 27	115+00 TO 120+00													2452.5	
23 OF 27	120+00 TO 125+00	23.8	21.4					350	4		3	84		1962	
24 OF 27	125+00 TO 130+00	116.0	8.1								1			2452.5	
25 OF 27	130+00 TO 135+00													2452.5	
26 OF 27	135+00 TO END													490.5	
27 OF 27	CR 118													337	
DRIVEWAYS															
1 OF 6	1 & 2						76								
2 OF 6	3 & 4						274								
3 OF 6	5 & 6						298								
4 OF 6	7 & 8						201								
5 OF 6	9 & 10						173								
6 OF 6	11 & 12						282								
PROJECT TOTALS		503.4	85.4	1	2438	12	1304	1201	4	1	11	2562	3	63562	2216



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ESTIMATE OF QUANTITIES

ROADWAY SUMMARY

SHEET 02 OF 02

FED. RD. DIV. RD.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				20

TRAFFIC CONTROL QUANTITY SUMMARY

SHEET NO.	STA TO STA	403 6001 TEMP SPL SHORING	508 6001 CONSTRUCTING DETOURS	662 6004 WK ZN PAV MRK NON-REMOV (W) 4" (SLD)	662 6016 WK ZN PAV MRK NON-REMOV (W) 24" (SLD)	662 6032 WK ZN PAV MRK NON-REMOV (Y) 4" (BRK)	662 6033 WK ZN PAV MRK NON-REMOV (Y) 4"(DOT)	662 6034 WK ZN PAV MRK NON-REMOV (Y) 4" (SLD)	677 6001 ELIM EXT PAV MRK & MRKS (4")	677 6007 ELIM EXT PAV MRK & MRKS (24")
		SF	SY	LF	LF	LF	LF	LF	LF	LF
PHASE I										
1 OF 13	BEGIN TO 20+00		363	1716	10		94	1716	3300	145
2 OF 13	20+00 TO 30+00	1484	301	301				301	220	
3 OF 13	30+00 TO 40+00									
4 OF 13	40+00 TO 50+00									
5 OF 13	50+00 TO 60+00									
6 OF 13	60+00 TO 70+00									
7 OF 13	70+00 TO 80+00									
8 OF 13	80+00 TO 90+00									
9 OF 13	90+00 TO 100+00									
10 OF 13	100+00 TO 110+00									
11 OF 13	110+00 TO 120+00									
12 OF 13	120+00 TO 130+00									
13 OF 13	130+00 TO END									
1 OF 1	CR 118									
PHASE II										
1 OF 7	BEGIN TO 10+00			273	22			546		
2 OF 7	10+00 TO 20+00			405		4		724		
3 OF 7	20+00 TO 30+00			2000		250				
4 OF 7	30+00 TO 40+00			2000		250				
5 OF 7	40+00 TO 50+00			2000		250				
6 OF 7	50+00 TO 58+00			1600		200				
7 OF 7	25+50 TO END									
PROJECT TOTALS		1484	664	10295	32	954	94	3287	3520	145

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ESTIMATE OF QUANTITIES

TRAFFIC CONTROL SUMMARY

SHEET 01 OF 01

FED. RD. DIV. RD.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				21

DRAINAGE QUANTITY SUMMARY

*SHEET NO.	STA TO STA	462 6003	464 6003	464 6005	465 6128	467 6134	467 6363	467 6395	496 6004	496 6007
		CONC BOX CULV (4 FT X 2 FT)	RC PIPE (CL III) (18 IN)	RC PIPE (CL III) (24 IN)	INLET (COMPL) (PSL) (FG) (4FTX4FT-4FTX4FT)	SET (TY I) (S= 4 FT) (HW= 2 FT) (6:1) (P)	SET (TY II) (18 IN) (RCP) (6:1) (P)	SET (TY II) (24 IN) (RCP) (6:1) (P)	REMOV STR (SET)	REMOV STR (PIPE)
		LF	LF	LF	EA	EA	EA	EA	EA	LF
1 OF 27	BEGIN TO 15+00			350	2				9	175
2 OF 27	15+00 TO 20+00			280				1		
3 OF 27	20+00 TO 25+00		8	145	1			1		21
4 OF 27	25+00 TO 30+00		99		1					
5 OF 27	30+00 TO 35+00									
6 OF 27	35+00 TO 40+00									
7 OF 27	40+00 TO 45+00		37				2			
8 OF 27	45+00 TO 50+00		154		1		2			
9 OF 27	50+00 TO 55+00									
10 OF 27	55+00 TO 60+00		190		1		4			
11 OF 27	60+00 TO 65+00									
12 OF 27	65+00 TO 70+00									
13 OF 27	70+00 TO 75+00									
14 OF 27	75+00 TO 80+00									
15 OF 27	80+00 TO 85+00		38				2			
16 OF 27	85+00 TO 90+00									
17 OF 27	90+00 TO 95+00									
18 OF 27	95+00 TO 100+00									
19 OF 27	100+00 TO 105+00	20				2				
20 OF 27	105+00 TO 110+00									
21 OF 27	110+00 TO 115+00									
22 OF 27	115+00 TO 120+00									
23 OF 27	120+00 TO 125+00									
24 OF 27	125+00 TO 130+00		69	50			2	6		
25 OF 27	130+00 TO 135+00									
26 OF 27	135+00 TO END									
27 OF 27	CR 118									
PROJECT TOTALS		20	595	825	6	2	12	8	9	196

* REFERENCES ROADWAY PLAN AND PROFILE SHEETS

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ESTIMATE OF QUANTITIES

DRAINAGE SUMMARY

SHEET 01 OF 01

FED. RD. DIV. RD.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				22

CULVERT QUANTITY SUMMARY

DRAINAGE PLAN & PROFILE SHEET	STATION	432 6002 RIPRAP (CONC) (5 IN)	432 6033 RIPRAP (STONE PROTECTION) (18 IN)	462 6006 CONC BOX CULV (5 FT X 2 FT)	462 6007 CONC BOX CULV (5FT X 3FT)	462 6010 CONC BOX CULV (6FT X 3FT)	462 6014 CONC BOX CULV (7 FT X 3 FT)	464 6009 RC PIPE (CL III) (42 IN)	465 2003 INLET (COMPL) (TY H)	466 6135 HEADWALL (CH-PW-S) (DIA = 42 IN)	466 6179 WINGWALL (PW-1) (HW=4 FT)	466 6180 WINGWALL (PW-1) (HW=5 FT)	466 6206 WINGWALL (SW-0) (HW=3F T)	466 6207 WINGWALL (SW-0) (HW=4F T)	467 6174 SET (TY I) (S=5FT) (HW=3FT) (6:1) (P)
		CY	CY	LF	LF	LF	LF	LF	EA	EA	EA	EA	EA	EA	EA
CULVERT A	23+80.00	25				280					2				
CULVERT B	45+10.00	10	72				306					2			
CULVERT C	69+64.40	9	14					145	2	1					
CULVERT D	96+95.00	25				408						2			
CULVERT E-1	108+51.63	20	15		266									2	
CULVERT E-2	108+42.96		7	210										1	1
CULVERT G-1	135+10.90						173						2		
PROJECT TOTALS		89	108	210	266	688	479	145	2	1	2	4	2	3	1

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6/15/2017

CR 119

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ESTIMATE OF QUANTITIES

CULVERT SUMMARY

SHEET 01 OF 01

FED. RD. DIV. RD.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				23

EROSION CONTROL QUANTITY SUMMARY

SHEET NO.	STA TO STA	160 WC 02 FURNISHING AND PLACING TOPSOIL (4")	164 WC 11 SEEDING FOR EROSION CONTROL (PERM) (TY I)	164 WC 11 SEEDING FOR EROSION CONTROL (TEMP) (TY IV)	166 6002 * FERTILIZER	168 WC 001 VEGETATIVE WATERING	169 6006 SOIL RETENTION BLANKETS (CL 2) (TY F)	506 6002 ROCK FILTER DAMS (INSTALL) (TY 2)	506 6003 ROCK FILTER DAMS (INSTALL) (TY 3)	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	TON	MG	SY	LF	LF	LF	SY	SY	LF	LF
1 OF 14	BEGIN TO 20+00	5,764	5,764	2,882	0.4	144		20		20	200	200	889	889
2 OF 14	20+00 TO 30+00	8,533	8,533	4,267	0.5	213		20		20			1,110	1,110
3 OF 14	30+00 TO 40+00	8,911	8,911	4,456	0.6	223							1,044	1,044
4 OF 14	40+00 TO 50+00	14,979	14,979	7,489	0.9	374		40		40			1,080	1,080
5 OF 14	50+00 TO 60+00	8,841	8,841	4,421	0.6	221		25		25			1,064	1,064
6 OF 14	60+00 TO 70+00	9,839	9,839	4,919	0.6	246							480	480
7 OF 14	70+00 TO 80+00	8,829	8,829	4,414	0.6	221							1,020	1,020
8 OF 14	80+00 TO 90+00	9,057	9,057	4,528	0.6	226		10		10			1,000	1,000
9 OF 14	90+00 TO 100+00	9,389	9,389	4,694	0.6	235		20		20			910	910
10 OF 14	100+00 TO 110+00	8,514	8,514	4,257	0.5	213	265	30	15	45			1,326	1,326
11 OF 14	110+00 TO 120+00	8,687	8,687	4,343	0.5	217							990	990
12 OF 14	120+00 TO 130+00	5,113	5,113	2,557	0.3	128	1,280	30		30			820	820
13 OF 14	130+00 TO END	5,681	5,681	2,841	0.4	142		20		20	200	200	517	517
14 OF 14	DETAILS	***	***	***	***	***	2,575		404	404			2,004	2,004
PROJECT TOTALS		112,138	112,138	56,069	*7.0	2,803	4,120	215	419	** 634	** 400	400	14,254	14,254

* FOR CONTRACTOR'S INFORMATION ONLY.
** TO BE PLACED AS DIRECTED.
*** QUANTITIES INCLUDED WITHIN RESPECTIVE STATION RANGES.

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EROSION CONTROL SUMMARY

SHEET 01 OF 01

FED. RD. DIV. RD.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				24

PAVEMENT MARKING QUANTITY SUMMARY

SHEET NO.	STA TO STA	644 6001	658 6047	658 6014	658 6061	666 6030	666 6036	666 6048	666 6054	666 6078	666 6147	666 6170	666 6176	666 6178	666 6182
		IN SM RD SN SUP&AM TY1OBWG (1) SA (WS)	INSTL OM ASSM (OM-2Y) (WC)GND	INSTL DEL ASSM (D-SW)SZ (BRF)CTB(BI)	INSTL DEL ASSM (D-SW)SZ 1(BRF)GF2	REFL PAV MRK TY I (W) 8" (DOT) (100 MIL)	REFL PAV MRK TY I (W) 8" (SLD) (100 MIL)	REFL PAV MRK TY I (W) 24" (SLD) (100 MIL)	REFL PAV MRK TY I (W) (ARROW) (100 MIL)	REFL PAV MRK TY I (W) (WORD) (100 MIL)	REFL PAV MRK TY I (Y) 24" (SLD) (100 MIL)	REF PAV MRK TY II (W) 4" (SLD)	REFL PAV MRK TY II (W) 8" (DOT)	REF PAV MRK TY II (W) 8" (SLD)	REF PAV MRK TY II (W) 24" (SLD)
		EA	EA	EA	EA	LF	LF	LF	EA	EA	LF	LF	LF	LF	LF
1 OF 15	BEGIN TO 10+00						147			1	60	544		147	
2 OF 15	10+00 TO 20+00	3	3			50	400	280	6	5	300	1,930	50	400	280
3 OF 15	20+00 TO 30+00		2		5							2,000			
4 OF 15	30+00 TO 40+00											2,000			
5 OF 15	40+00 TO 50+00		2		6							2,000			
6 OF 15	50+00 TO 60+00		2									2,000			
7 OF 15	60+00 TO 70+00		1									2,000			
8 OF 15	70+00 TO 80+00											2,000			
9 OF 15	80+00 TO 90+00											2,000			
10 OF 15	90+00 TO 100+00		2		5							2,000			
11 OF 15	100+00 TO 110+00	3	3		4		100	35	1	1	210	2,100		100	35
12 OF 15	110+00 TO 120+00	1	1		2							2,000			
13 OF 15	120+00 TO 130+00		4	6	17							2,000			
14 OF 15	130+00 TO END	4						20				1,120			20
15 OF 15	LIMMER LOOP/CR 118	2					115		1	1	30	182		115	
PROJECT TOTALS		13	20	6	39	50	762	335	8	8	600	25,876	50	762	335

PAVEMENT MARKING QUANTITY SUMMARY

SHEET NO.	STA TO STA	666 6184	666 6192	666 6207	666 6214	666 6303	666 6315	672 6007	672 6009
		REF PAV MRK TY II (W) (ARROW)	REF PAV MRK TY II (W) (WORD)	REF PAV MRK TY II (Y) 4" (SLD)	REF PAV MRK TY II (Y) 24" (SLD)	RE PM W/RET REQ TY I (W) 4" (SLD) (100 MIL)	RE PM W/RET REQ TY I (Y) 4" (SLD) (100 MIL)	REFL PAV MRKR TY I-C	REFL PAV MRKR TY II-A-A
		EA	EA	LF	LF	LF	LF	EA	EA
1 OF 15	BEGIN TO 10+00		1	774	60	544	774	7	36
2 OF 15	10+00 TO 20+00	6	5	2,600	300	1,930	2,600	39	126
3 OF 15	20+00 TO 30+00			2,680		2,000	2,680		68
4 OF 15	30+00 TO 40+00			2,000		2,000	2,000		24
5 OF 15	40+00 TO 50+00			2,000		2,000	2,000		24
6 OF 15	50+00 TO 60+00			2,000		2,000	2,000		24
7 OF 15	60+00 TO 70+00			2,000		2,000	2,000		24
8 OF 15	70+00 TO 80+00			2,000		2,000	2,000		24
9 OF 15	80+00 TO 90+00			2,000		2,000	2,000		24
10 OF 15	90+00 TO 100+00			2,000		2,000	2,000		24
11 OF 15	100+00 TO 110+00	1	1	2,472	210	2,100	2,472	5	24
12 OF 15	110+00 TO 120+00			2,100		2,000	2,100		44
13 OF 15	120+00 TO 130+00			2,000		2,000	2,000		24
14 OF 15	130+00 TO END			1,000		1,120	1,000		12
15 OF 15	LIMMER LOOP/CR118	1	1	2,680	30	182	2,680	6	38
PROJECT TOTALS		8	8	30,306	600	25,876	30,306	57	540

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6/15/2017

CR 119

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PAVEMENT MARKING SUMMARY

SHEET 01 OF 01

FED. RD. DIV. RD.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				25

SUMMARY OF SMALL SIGNS

SM RD SGN ASSM TY XXXXX(X)XX(X-XXXX)

Post Type: FRP = Fiberglass, TWT = Thin-Wall, 10BWG = 10 BWG, 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"; 1EXT or 2EXT = # of Ext. BM = Extruded Wind Beam, WC = 1.12 #/ft Wing Chan., EXAL = Extruded Aluminum

PLAN SHEET NO.	SIGN NO.	SIGN NOMENCLATURE	SIGN TEXT	DIMENSIONS	ALUMINUM TYPE A	ALUMINUM TYPE C	Post Type	Posts	Anchor Type	Mounting Designation
2 of 15	1	D3-1G	LIMMER LOOP	12 x VARIES	X		10BWG	1	WS	P
2 of 15		R1-1	STOP	36" x 36"	X					
2 of 15		W4-4p	CROSS TRAFFIC DOES NOT STOP	24" x 12"	X					
2 of 15	2	R2-1	SPEED LIMIT 45	30" x 36"	X		10BWG	1	WS	P
2 of 15	3	R3-8D	LANE CONTROL	48" x 30"	X		10BWG	1	WS	T
11 of 15	4	R2-1	SPEED LIMIT 45	30" x 36"	X		TWT	1	WS	P
11 of 15	5	D3-1G	CR119	12 x VARIES	X		10BWG	1	WS	P
11 of 15		R1-1	STOP	30" x 30"	X					
11 of 15		W4-4p	CROSS TRAFFIC DOES NOT STOP	24" x 12"	X					
11 of 15	6	D3-1G	CR119	12 x VARIES	X		10BWG	1	WS	P
11 of 15		R1-1	STOP	30" x 30"	X					
11 of 15		W4-4p	CROSS TRAFFIC DOES NOT STOP	24" x 12"	X					
12 of 15	7	R2-1	SPEED LIMIT 45	30" x 36"	X		10 BWG	1	WS	P
14 of 15	8	R2-1	SPEED LIMIT 45	30" x 36"	X		10 BWG	1	WS	P
14 of 15	9	D3-1G	CHANDLER ROAD	12 x VARIES	X		10 BWG	1	WS	P
14 of 15		R1-1	STOP	36" x 36"	X					
14 OF 15	10	D1-1	← CR119	66" x 18"	X		TWT	1	WS	T
14 OF 15	11	D1-1	→ CR119	66" x 18"	X		TWT	1	WS	T
15 OF 15	12	R3-7L	LEFT LANE MUST TURN LEFT	30" x 30"	X		TWT	1	WS	P
15 OF 15	13	R3-8LK	LANE CONFIGURATION	30" x 30"	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.

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CR 119

WILLIAMSON COUNTY 1848

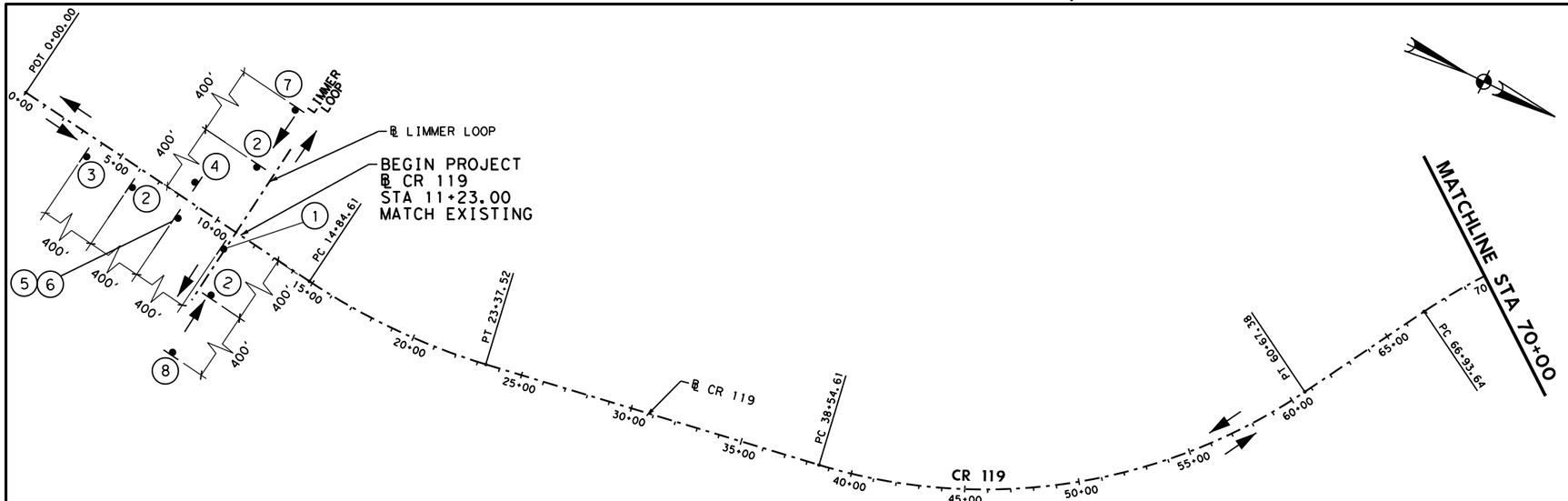
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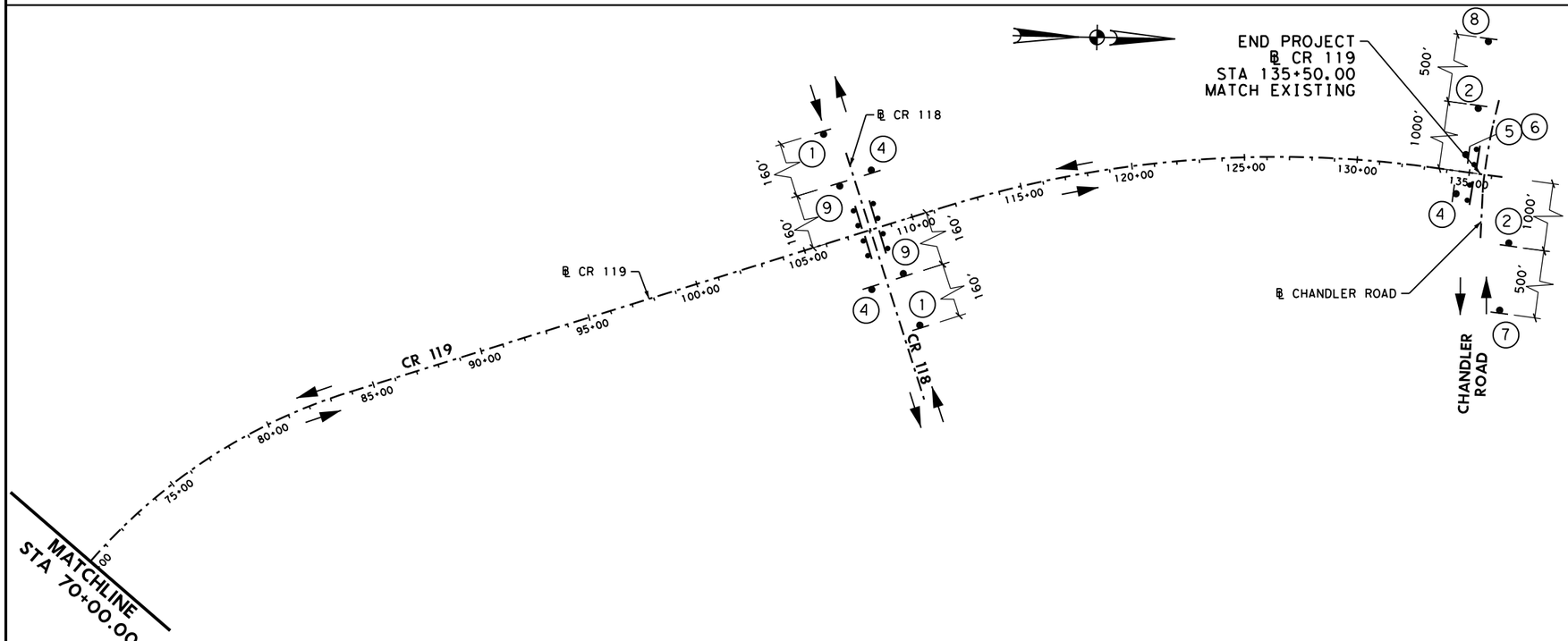
SMALL SIGN SUMMARY

SHEET 01 OF 01

FED. RD. DIV. RD.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				26



ROADWAY	EXISTING SPEED LIMIT (MPH)
CR 119-SOUTH OF LIMMER LOOP	50
CR 119-NORTH OF LIMMER LOOP	35
CR 118	35
LIMMER LOOP	50
CHANDLER ROAD	55



LEGEND

- ADVANCE WARNING SIGNS
- TRAFFIC FLOW ARROW
- TY III BARRICADE

1. ROAD WORK AHEAD — CW20-1D
2. WORK ZONE / TRAFFIC FINES DOUBLE / WHEN WORKERS ARE PRESENT — G20-9, R20-5, R20-5 PLAQUE
3. OBEY WARNING SIGNS STATE LAW — R20-3
4. END ROAD WORK — G20-2a
5. BEGIN ROAD WORK NEXT X MILES / NAME ADDRESS CITY STATE / CONTRACTOR — G20-5T
6. G20-6
7. ROAD WORK ⇦ NEXT 2 MILES — G20-1bL
8. ROAD WORK NEXT 2 MILES ⇨ — G20-1bR
9. ROAD WORK ⇦ NEXT 1 MILES NEXT 1 MILES ⇨ — G20-1a

NOTE:
ALL ADVANCE WARNING SIGNS SHALL CONFORM WITH THE LATEST TxDOT BARRICADE AND CONSTRUCTION STANDARDS.

0 150 300 600

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TRAFFIC CONTROL

ADVANCE WARNING SIGNS

FED. RD. DIV. RD.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				27

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100% SUBMITTAL

1. GENERAL:

A. IN AREAS WHERE TRAFFIC IS PRESENT, TRAFFIC MUST BE HANDLED DURING CONSTRUCTION IN SUCH A MANNER AS TO CREATE THE LEAST INCONVENIENCE TO THE TRAVELING PUBLIC AND PROVIDE FOR MAXIMUM SAFETY BY MEANS OF ADEQUATE WARNING AND PROTECTION DEVICES.

B. WORK ACTIVITIES OTHER THAN PROVIDED IN THE CONTRACT SHALL BE APPROVED IN ADVANCE.

C. THE CONTRACTOR SHALL MAINTAIN ADEQUATE DRAINAGE THROUGHOUT CONSTRUCTION, WITH THE STORM WATER POLLUTION PREVENTION PLAN IN PLACE. CONTRACTOR SHALL INSTALL AND MAINTAIN ADDITIONAL STORMWATER CONTROL DEVICES AS NECESSARY.

D. ACCESS TO ALL PROPERTIES (BUSINESSES, RESIDENCES, ETC.) MUST BE MAINTAINED AT ALL TIMES.

E. CONTRACTOR SHALL MINIMIZE DISRUPTION TO TRAVELING PUBLIC AND SHALL MAINTAIN THROUGH ACCESS TO ALL INTERSECTIONS WITHIN THE PROJECT LIMITS AT ALL TIMES UNLESS OTHERWISE PERMITTED BY THE CONSTRUCTION OBSERVER. NO ADJACENT INTERSECTIONS MAY BE WORKED ON SIMULTANEOUSLY.

F. CONTRACTOR SHALL MAINTAIN ONE LANE IN EACH DIRECTION AT ALL TIMES FOR CR 119, LIMMER LOOP, AND CHANDLER ROAD.

2. BARRICADES, CONSTRUCTION SIGNS AND WARNING LIGHTS:

A. ALL TRAFFIC CONTROL DEVICES SHALL BE COMPLIANT WITH THE LATEST EDITION AND REVISION OF THE TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (TMUTCD), PART 6 - TEMPORARY TRAFFIC CONTROL.

B. THE CONTRACTOR SHALL INSTALL AND MAINTAIN AN ADEQUATE NUMBER OF TRAFFIC CONTROL DEVICES TO DELINEATE TRAFFIC FOR DETOURS OR CLOSURES, AS APPROVED BY THE CONSTRUCTION OBSERVER.

C. ALL CONSTRUCTION TRAFFIC SHALL BE REGULATED SO AS TO CAUSE A MINIMUM OF INCONVENIENCE TO THE TRAVELING PUBLIC. 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.

3. SPECIAL NOTES:

A. PLACEMENT OF PERMANENT SIGNS MAY BE DELAYED UNTIL LATER PHASES AS APPROVED BY THE ENGINEER. IF DELAYED, THE CONTRACTOR SHALL MAINTAIN ADEQUATE TEMPORARY SIGNING.

B. EXISTING SIGNAGE SHALL BE SALVAGED. SALVAGED SIGNS ARE PROPERTY OF WILLIAMSON COUNTY.

C. BETWEEN LIMMER LOOP AND STA 24+00, FINAL 2" TY D SURFACE COURSE PLACEMENT SHALL BE DELAYED UNTIL COMPLETION OF PAVEMENT CONSTRUCTION OPERATIONS ELSEWHERE. TEMPORARY PAVEMENT MARKINGS BETWEEN LIMMER LOOP AND STA 24+00 SHALL BE PLACED ON TY B BASE COURSE. CONTRACTOR SHALL CONSTRUCT 50' LONG, TY B HMAC TRANSITION AT NORTH AND SOUTH ENDS OF THIS ZONE, WHICH SHALL BE REMOVED IN ADVANCE OF 2" TY D SURFACE COURSE PLACEMENT.

SEQUENCE OF CONSTRUCTION:

1. CALL THE TEXAS ONE CALL CENTER AT 1-800-545-6005.
2. INSTALL ADVANCE WARNING SIGNS, TEMPORARY EROSION CONTROLS AND TREE PROTECTION FENCING AS SHOWN IN PLANS PRIOR TO ANY ROW PREPARATION.
3. CONSTRUCT PROJECT AS DETAILED IN PLAN SET.
4. COMPLETE ANY NECESSARY FINAL DRESS-UP OF AREAS DISTURBED BY REMOVAL OF TEMPORARY EROSION CONTROL MEASURES.

PHASE 1 CONSTRUCTION:

STEP 1

1. INSTALL TEMPORARY PAVEMENT ALONG EXISTING CR 119 NORTH OF LIMMER LOOP.

STEP 2

1. REMOVE EXISTING PAVEMENT MARKINGS AND MARKERS. INSTALL TEMPORARY STRIPING ALONG EXISTING CR 119 AND TEMPORARY PAVEMENT NORTH OF LIMMER LOOP.
2. PLACE TEMPORARY TRAFFIC CONTROL MEASURES AS SHOWN IN TRAFFIC CONTROL PLAN AND SHIFT EXISTING TRAFFIC NORTH OF LIMMER LOOP ONTO EASTERN HALF OF PROPOSED CR 119 ALIGNMENT.
3. CLOSE EXISTING SHOULDER OF CHANDLER ROAD TO CONSTRUCT PROPOSED TIE-IN TO CR 119 UTILIZING TCP(2-1)-12.
4. CONSTRUCT PROPOSED CR 119 IMPROVEMENTS. CONSTRUCT DRIVEWAYS, DRAINAGE CULVERTS AND FEATURES, FENCE, ETC. AS SHOWN ON PHASE 1 STEP 2 TRAFFIC CONTROL PLAN.
5. INSTALL BARRICADES AND ROAD CLOSURE SIGNS ON NEW DRIVEWAYS UNTIL OPEN FOR PUBLIC USE.

STEP 3

1. SETUP PROPOSED DETOUR AS SHOWN AND CLOSE CR 118 TO THRU TRAFFIC AT INTERSECTION OF PROPOSED CR 119.
2. CONTRACTOR SHALL PLAN WORK TO MINIMIZE DURATION OF CLOSURE, NOT TO EXCEED FOUR (4) WEEKS.
3. CONSTRUCT PROPOSED CR 118 IMPROVEMENTS.
4. OPEN CR 118 TO THROUGH TRAFFIC.

PHASE 2 CONSTRUCTION:

1. SOUTH OF LIMMER LOOP INTERSECTION, SHIFT NORTHBOUND AND SOUTHBOUND CR 119 TRAFFIC ONTO PREVIOUSLY CONSTRUCTED PROPOSED CR 119 PAVEMENT.
2. CONSTRUCT PROPOSED CR 119 IMPROVEMENTS. CONSTRUCT DRIVEWAYS, DRAINAGE CULVERTS AND FEATURES, FENCE, OBLITERATE EXISTING ROADWAY, ETC. AS SHOWN ON PHASE 2 TCP.
3. INSTALL ALL TRAFFIC CONTROL SIGNING, STRIPING, AND PAVEMENT MARKERS.
4. OPEN CR 119 TO THRU TRAFFIC.

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TRAFFIC CONTROL
TRAFFIC CONTROL PLAN
NARRATIVE

SHEET 01 OF 01

FED. RD. DIV. RD.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				28

PROPOSED CR 119 TRAFFIC CONTROL BASELINE

```
*     20   DES CHA BL_CR119_TEMP              $ PROPOSED CR119 TCP ALIGNMENT DATA

Chain BL_CR119_TEMP contains:
TEMPBLCR119006 CUR BL_CR119_TEMP-1 TEMPBLCR119007

Beginning chain BL_CR119_TEMP description
================================================================================

Point TEMPBLCR119006  X    3,169,666.8879 Y  10,176,842.8337 Sta      170+00.00

Course from TEMPBLCR119006 to PC BL_CR119_TEMP-1 N 7° 24' 46.35" E Dist 866.0056

                                  Curve Data
                                 *----------*
Curve BL_CR119_TEMP-1
P.I.  Station          181+83.70  X      3,169,819.6064  Y     10,178,016.6361
Delta       =      15° 43' 42.79" (LT)
Degree      =       2° 29' 28.04"
Tangent     =            317.6899
Length      =            631.3846
Radius      =          2,300.0000
External    =             21.8370
Long Chord  =            629.4039
Mid. Ord.   =             21.6316
P.C.  Station          178+66.01  X      3,169,778.6186  Y     10,177,701.6014
P.T.  Station          184+97.39  X      3,169,773.6599  Y     10,178,330.9858
C.C.                              X      3,167,497.8415  Y     10,177,998.3438
Back        = N   7° 24' 46.35" E
Ahead       = N   8° 18' 56.44" W
Chord Bear  = N   0° 27' 05.05" W

Course from PT BL_CR119_TEMP-1 to TEMPBLCR119007 N 8° 18' 56.44" W Dist 123.8291

Point TEMPBLCR119007  X    3,169,755.7509 Y  10,178,453.5130 Sta      186+21.22

================================================================================
Ending chain BL_CR119_TEMP description
```

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6/15/2017

CR 119

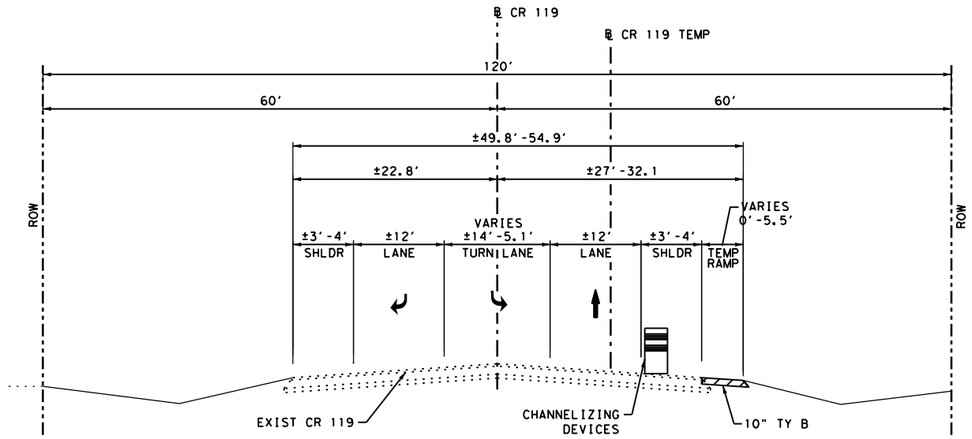
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TRAFFIC CONTROL
TRAFFIC CONTROL PLAN
HORIZONTAL ALIGNMENT DATA

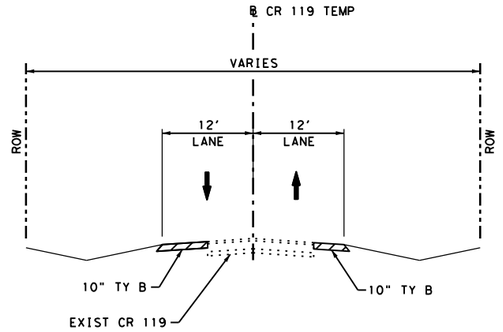
SHEET 01 OF 01

FED. RD. DIV. RD.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				29



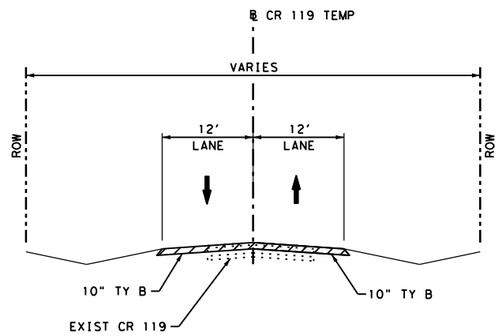
PHASE I STEP I TCP TYPICAL

℄ CR 119 STA 11+43.23 TO STA 17+88.72
℄ CR 119 TEMP STA 174+43.23 TO STA 180+90.71
N.T.S.



PHASE I STEP I TCP TYPICAL

℄ CR 119 STA 18+92.96 TO STA 21+45.64
℄ CR 119 TEMP STA 181+95.62 TO STA 184+49.96
N.T.S.



PHASE I STEP I TCP TYPICAL

℄ CR 119 STA 21+45.64 TO STA 22+50.00
℄ CR 119 TEMP STA 184+49.96 TO STA 185+54.90
N.T.S.

NOTE:

1. CONTRACTOR SHALL INSTALL A 3:1 SAFETY WEDGE FOR DROPOFFS GREATER THAN 2 INCHES AT THE END OF EACH WORK DAY.



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CR 119

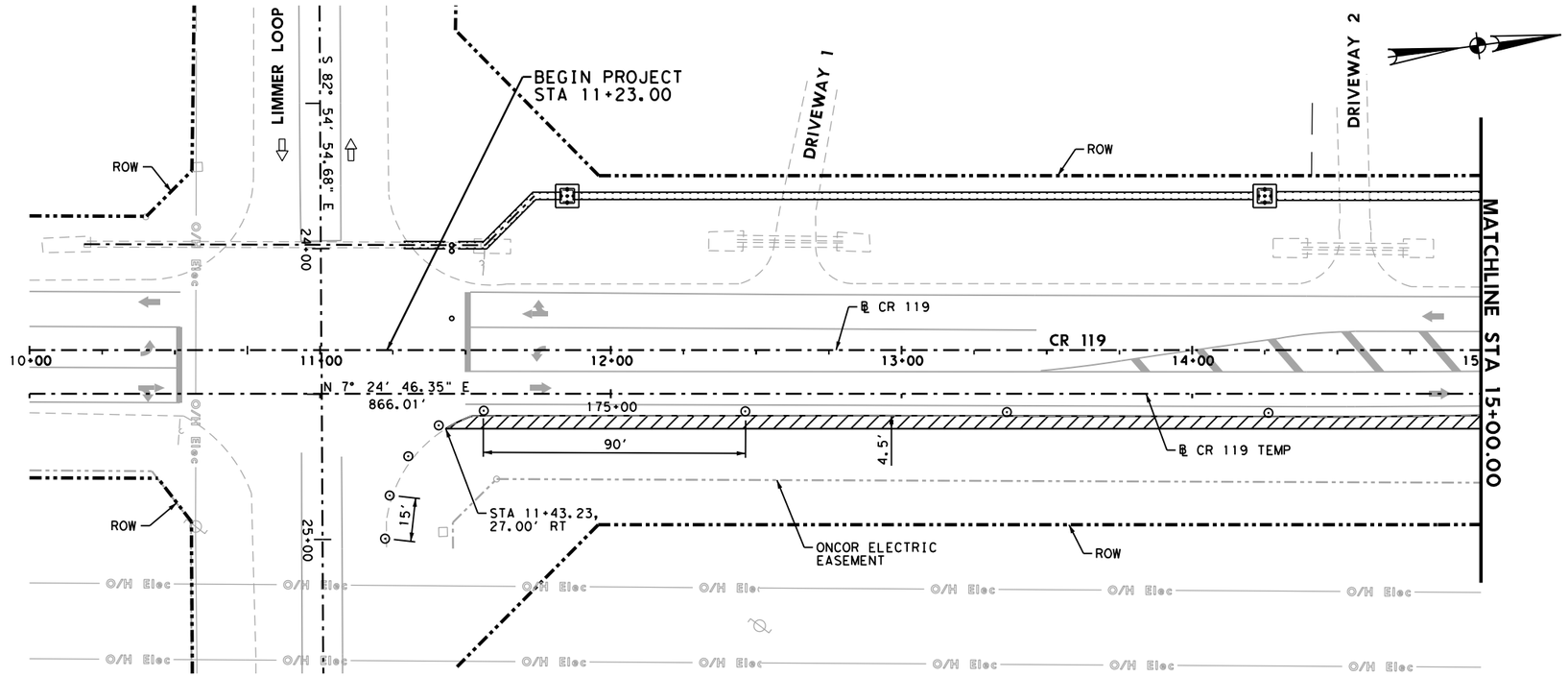
WILLIAMSON COUNTY 1848

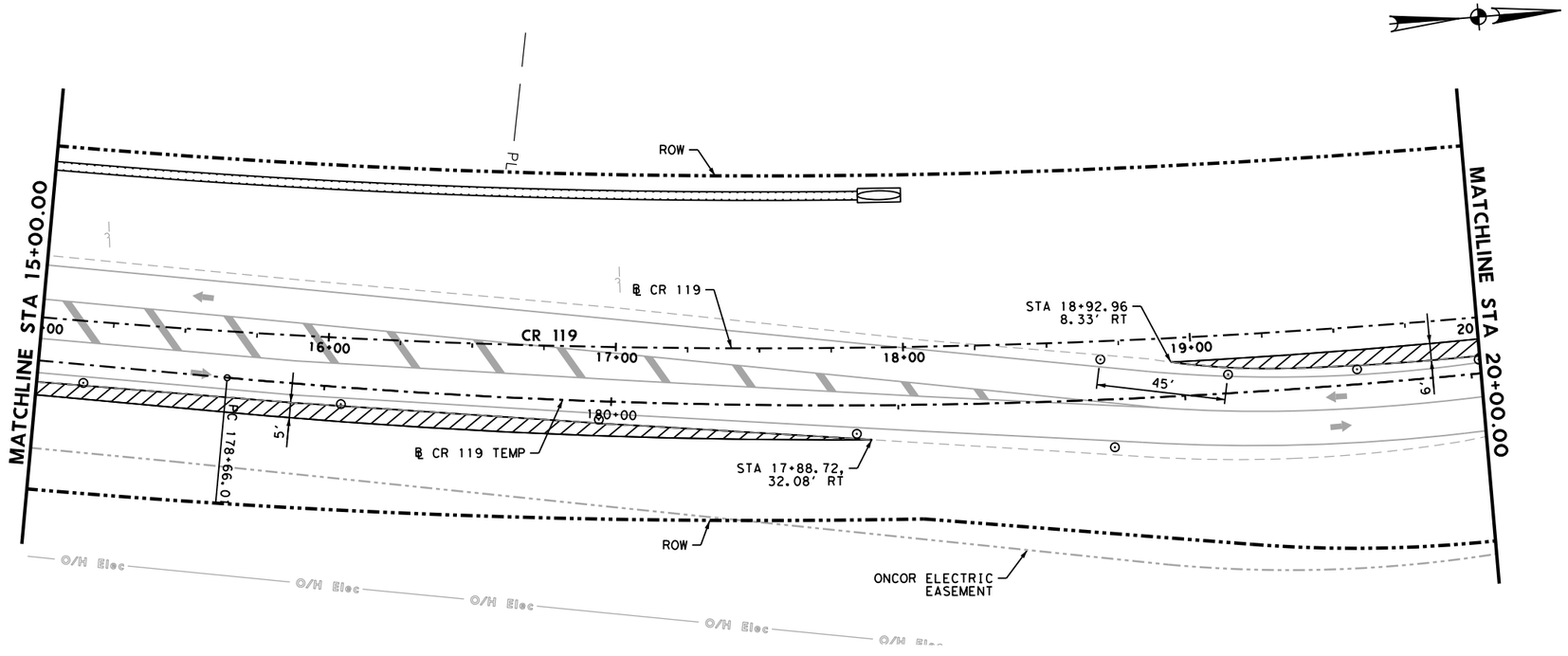
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TRAFFIC CONTROL
TRAFFIC CONTROL PLAN
PHASE 1 STEP 1 TYPICAL SECTIONS

SHEET 01 OF 01

FED. RD. DIV. RD.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				30





LEGEND

A	WK ZN PAV MRK NON-REMOV (Y)4"(SLD) W/RAIS PAV MRKR (REFL) TY II-A-A @ 80'C-C
B	WK ZN PAV MRK NON-REMOV (W)4"(SLD)
C	WK ZN PAV MRK NON-REMOV (Y)4"(DOT)
D	WK ZN PAV MRK NON-REMOV (W)24"(SLD)
PL	PROPERTY LINE
	EASEMENT
	RIGHT OF WAY BOUNDARY
	TYPE III BARRICADE
	CHANNELIZING DEVICE @ 90'C-C ON TANGENT AND @ 45'C-C ON TAPER
	CONSTRUCTION SIGN
	EXIST DIRECTION OF TRAFFIC FLOW
	PROPOSED DIRECTION OF TRAFFIC FLOW
	ROADWAY TO BE OBLITERATED
	PERMANENT CONSTRUCTION THIS PHASE
	TEMPORARY CONSTRUCTION THIS PHASE
	PERMANENT CONSTRUCTION PREVIOUS PHASE
	TEMPORARY CONSTRUCTION PREVIOUS PHASE
	CONCRETE RIPRAP
	18" ROCK RIPRAP

0 25 50

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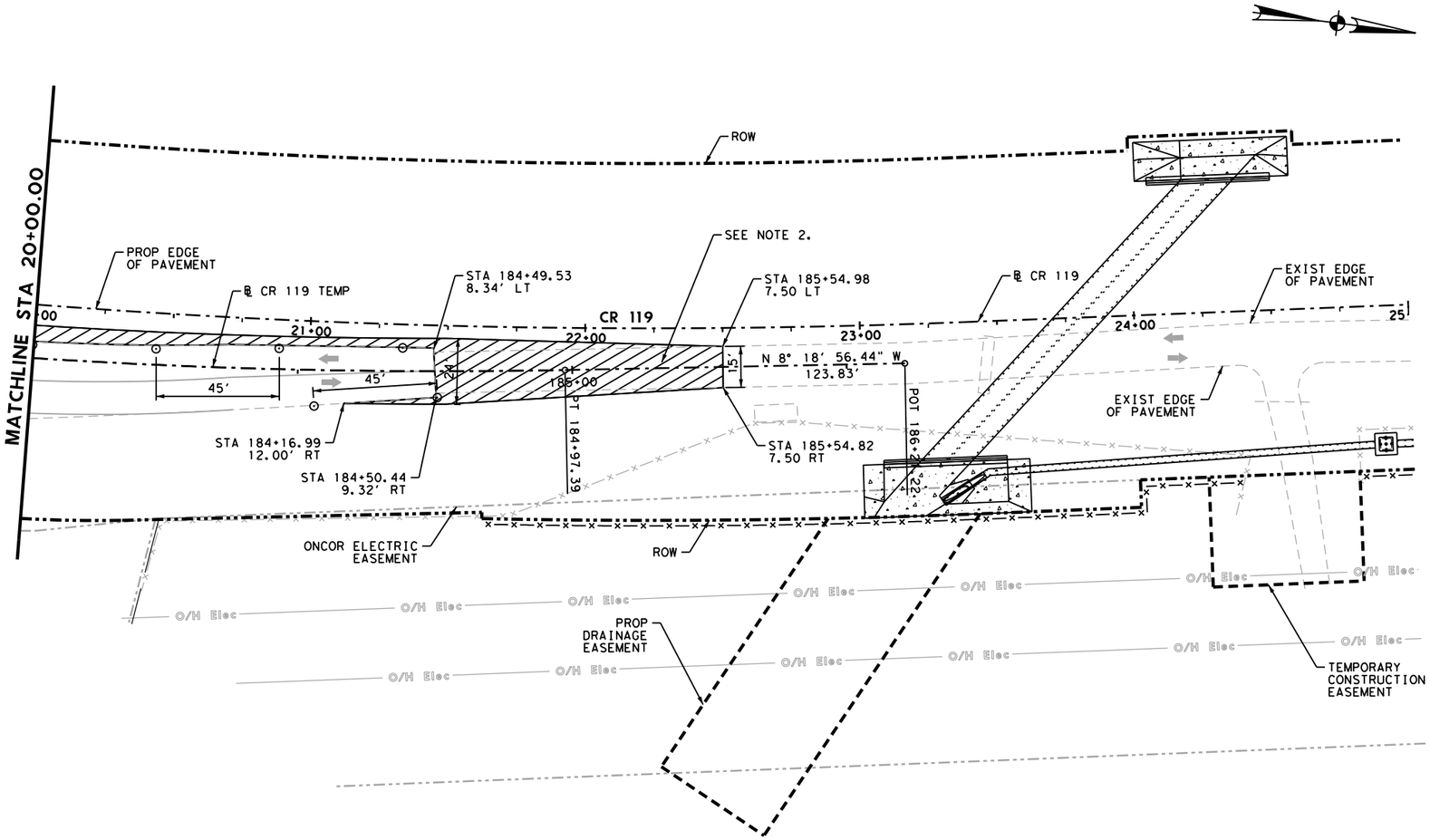
TRAFFIC CONTROL PLAN

PHASE 1 STEP 1

BEGIN PROJECT TO STA 20+00

SHEET 01 OF 02

FED. RD. DIV. RD.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				31



LEGEND

- [A] WK ZN PAV MRK NON-REMOV (Y)4"(SLD) W/RAIS PAV MRKR (REFL) TY II-A-A @ 80'C-C
- [B] WK ZN PAV MRK NON-REMOV (W)4"(SLD)
- [C] WK ZN PAV MRK NON-REMOV (Y)4"(DOT)
- [D] WK ZN PAV MRK NON-REMOV (W)24"(SLD)
- PL PROPERTY LINE
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- ROADWAY TO BE OBLITERATED
- PERMANENT CONSTRUCTION THIS PHASE
- TEMPORARY CONSTRUCTION THIS PHASE
- PERMANENT CONSTRUCTION PREVIOUS PHASE
- TEMPORARY CONSTRUCTION PREVIOUS PHASE
- CONCRETE RIPRAP
- 18" ROCK RIPRAP

NOTES:

1. CONTRACTOR SHALL MAINTAIN POSITIVE DRAINAGE DURING CONSTRUCTION.
2. PROVIDE ONE-LANE, TWO WAY TRAFFIC (DAY TIME CLOSURE) AS DETAILED IN TCP(1-2)-12 WITH FLAGGERS. ROADWAY SHALL BE OPENED TO TWO-WAY TRAFFIC EACH NIGHT.

0 25 50

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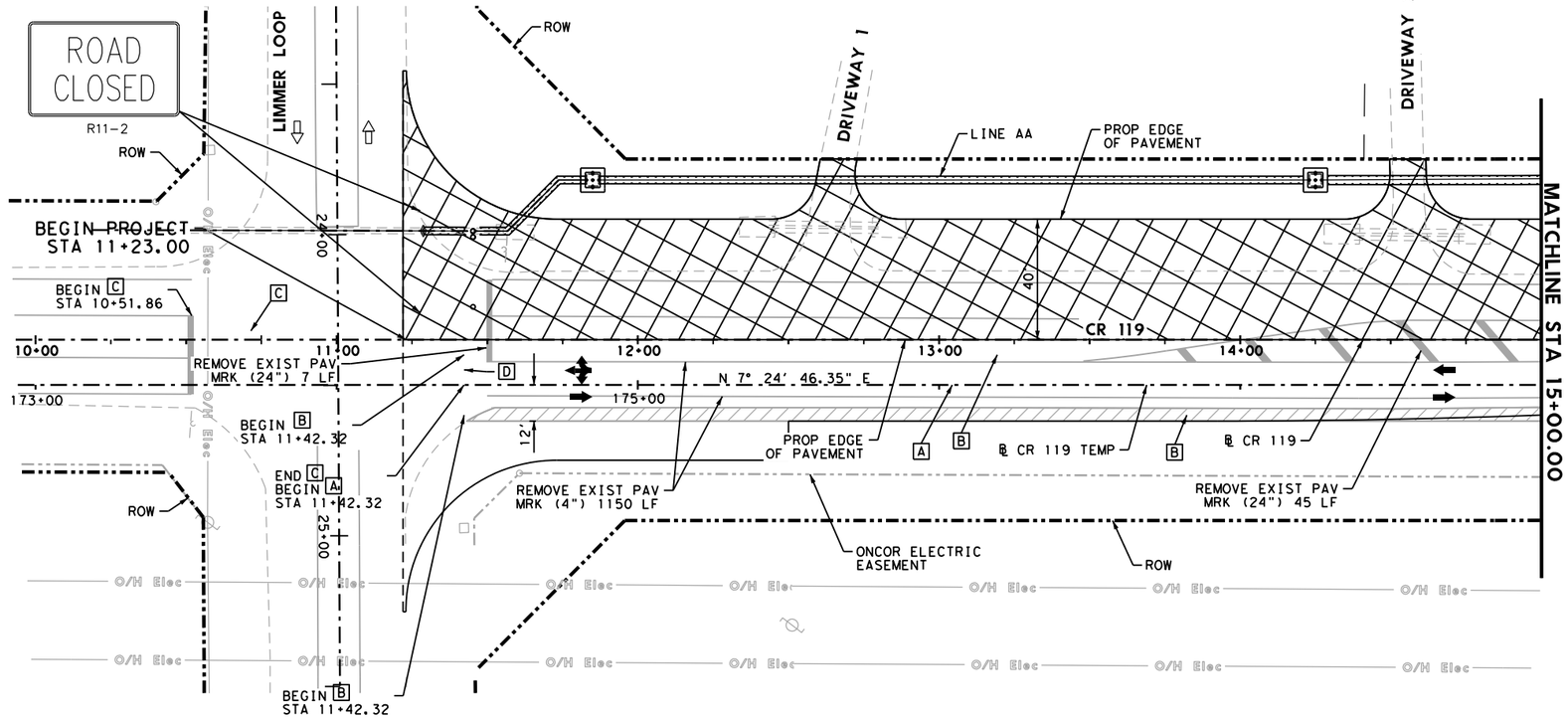
TRAFFIC CONTROL PLAN

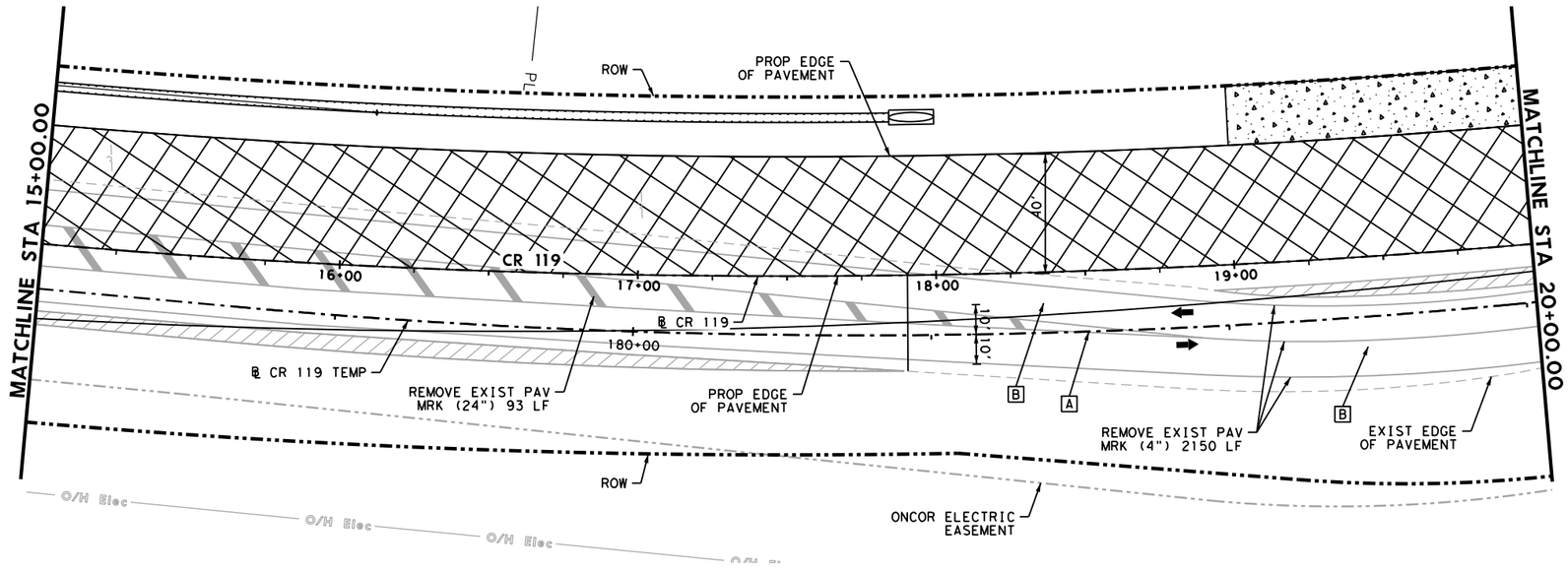
PHASE 1 STEP 1

STA 20+00 TO STA 30+00

SHEET 02 OF 02

FED. RD. DIV. RD.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				32





LEGEND

- A — WK ZN PAV MRK NON-REMOV (Y)4"(SLD) W/RAIS PAV MRKR (REFL) TY II-A-A @ 80'C-C
- B — WK ZN PAV MRK NON-REMOV (W)4"(SLD)
- C — WK ZN PAV MRK NON-REMOV (Y)4"(DOT)
- D — WK ZN PAV MRK NON-REMOV (W)24"(SLD)
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- CONCRETE RIPRAP
- 18" ROCK RIPRAP

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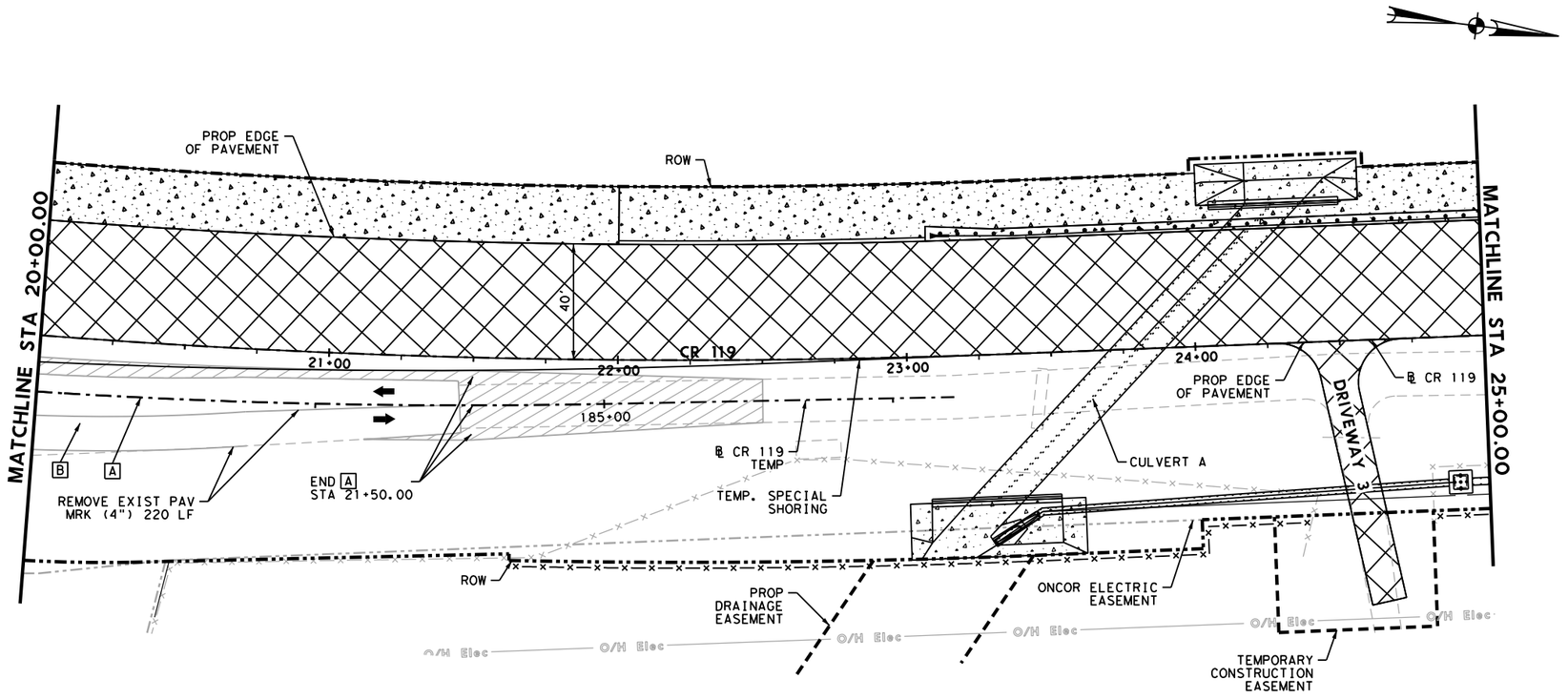
TRAFFIC CONTROL PLAN

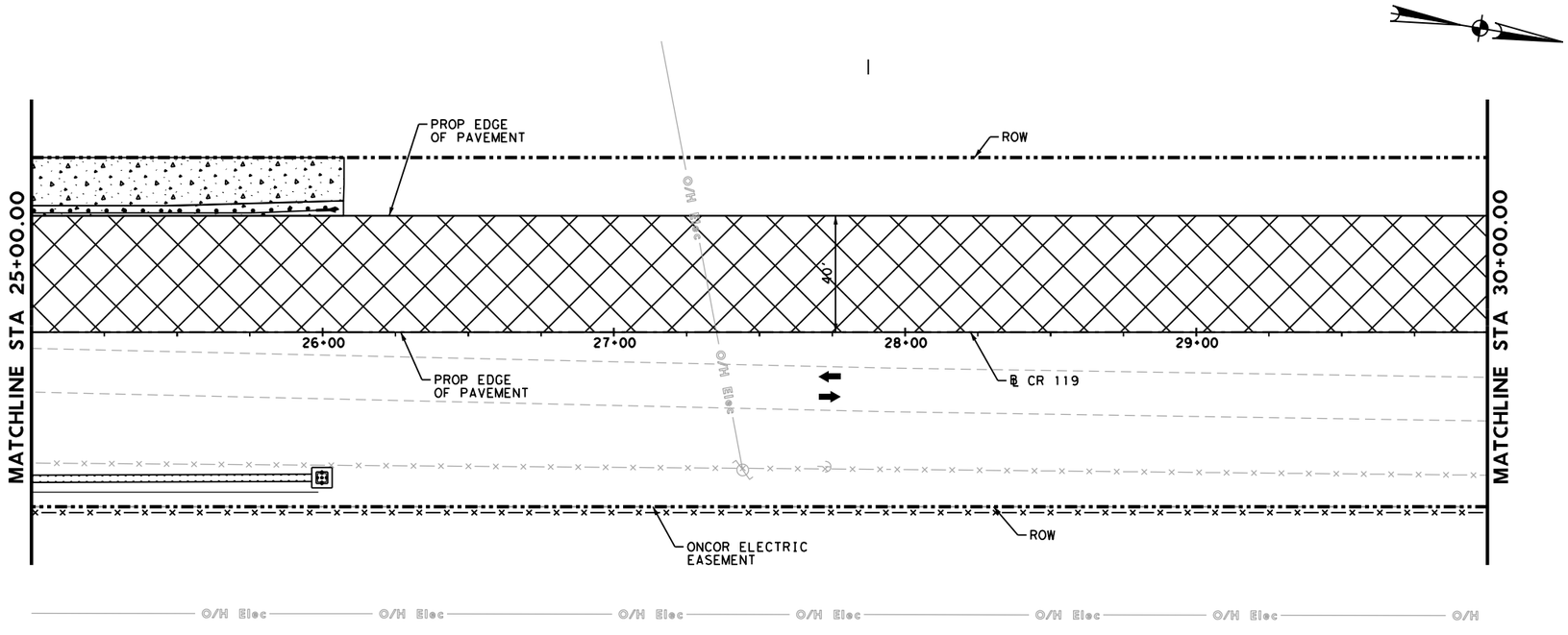
PHASE 1 STEP 2

BEGIN PROJECT TO STA 20+00

SHEET 01 OF 13

FED. RD. DIV. RD.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				33





LEGEND

- A — WK ZN PAV MRK NON-REMOV (Y)4"(SLD) W/RAIS PAV MRKR (REFL) TY II-A-A @ 80'C-C
- B — WK ZN PAV MRK NON-REMOV (W)4"(SLD)
- C — WK ZN PAV MRK NON-REMOV (Y)4"(DOT)
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NOTE:
1. CONTRACTOR SHALL MAINTAIN POSITIVE DRAINAGE DURING CONSTRUCTION.

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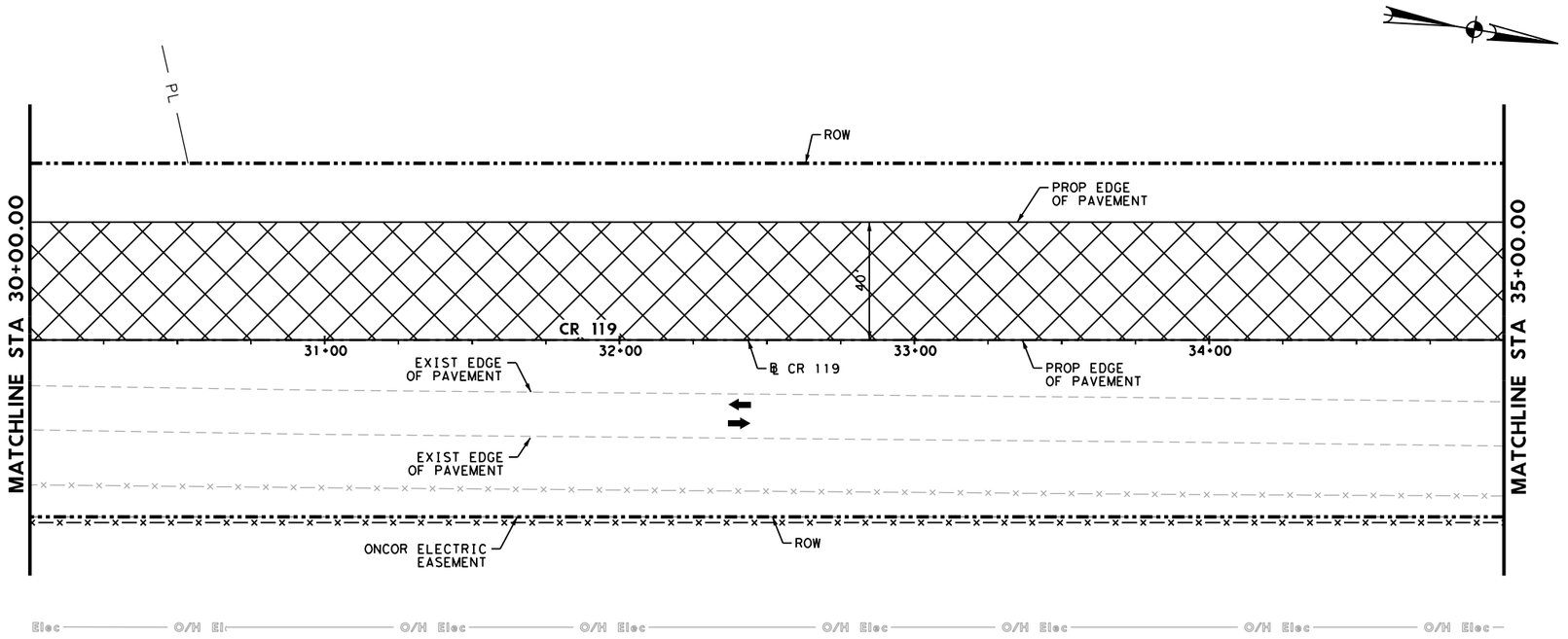
TRAFFIC CONTROL PLAN

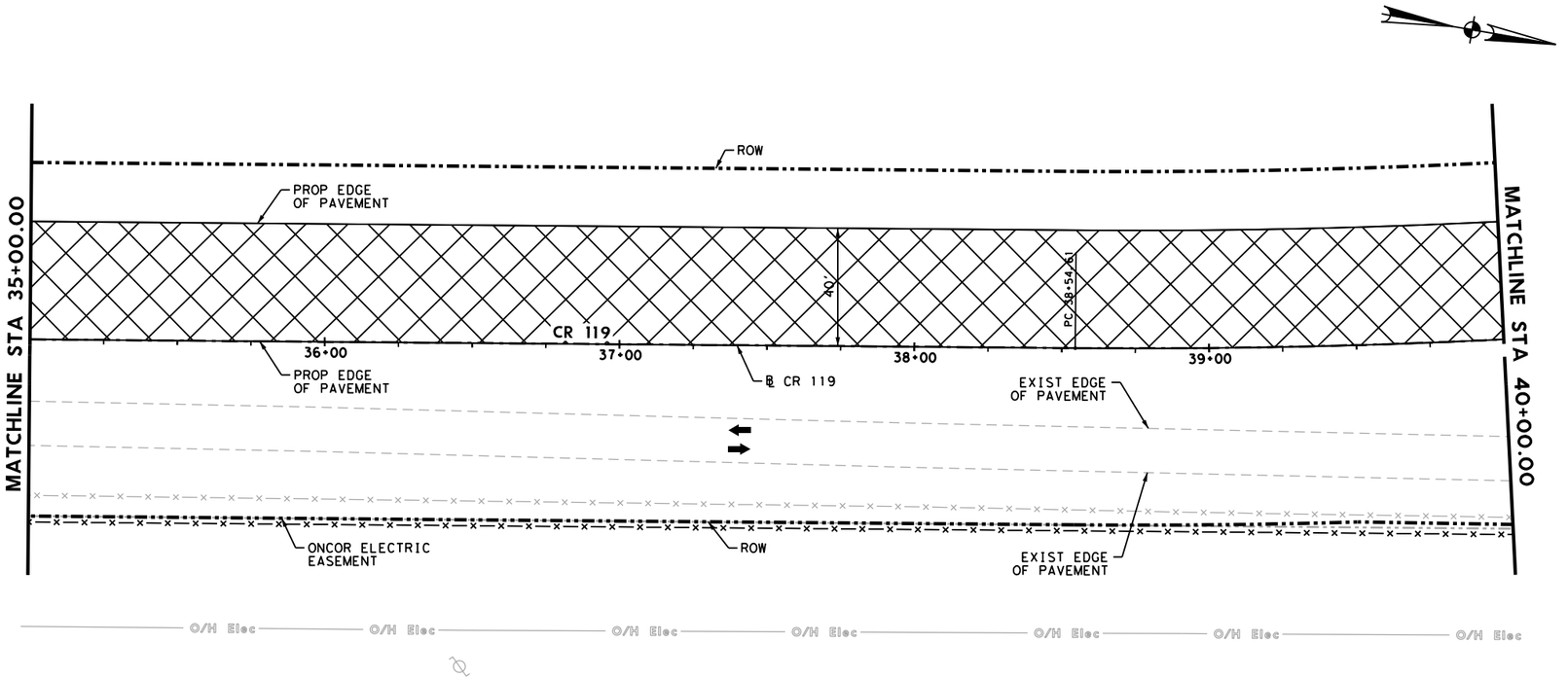
PHASE 1 STEP 2

STA 20+00 TO STA 30+00

SHEET 02 OF 13

FED. RD. DIV. RD.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				34





LEGEND

- [A] WK ZN PAV MRK NON-REMOV (Y)4"(SLD) W/RAIS PAV MRKR (REFL) TY II-A-A @ 80'C-C
- [B] WK ZN PAV MRK NON-REMOV (W)4"(SLD)
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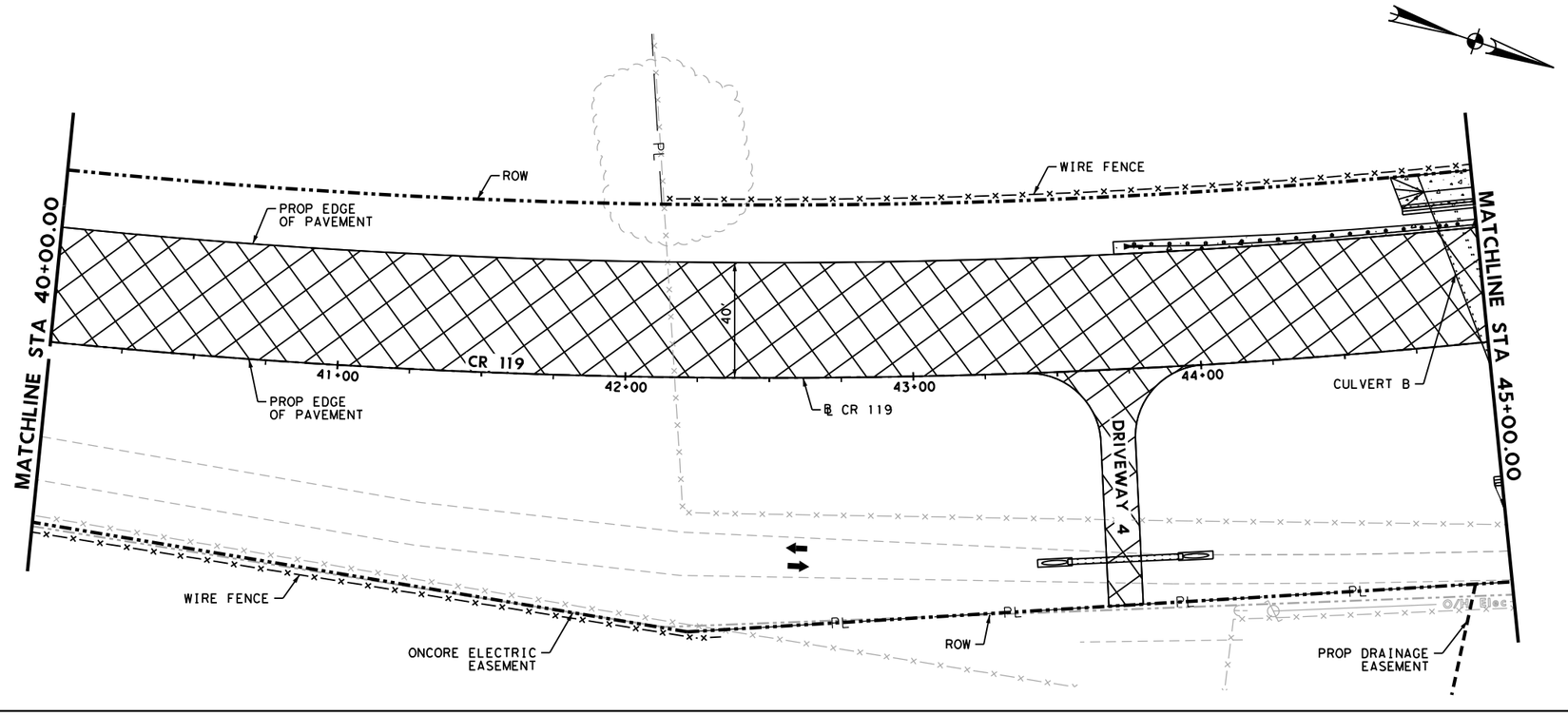
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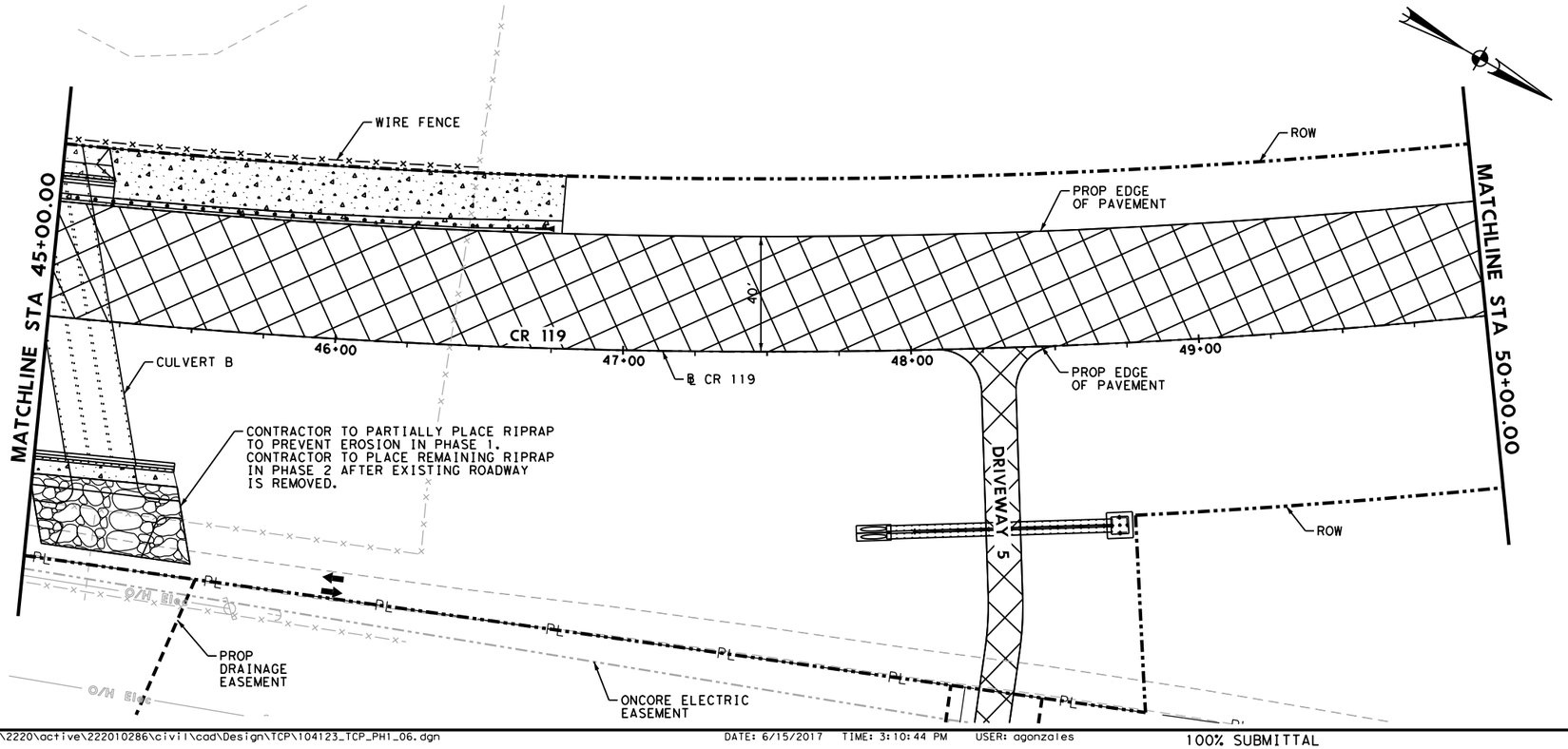
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STA 30+00 TO STA 40+00

SHEET 03 OF 13

FED. RD. DIV. RD.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				35





LEGEND

A	WK ZN PAV MRK NON-REMOV (Y)4"(SLD) W/RAIS PAV MRKR (REFL) TY II-A-A @ 80'C-C
B	WK ZN PAV MRK NON-REMOV (W)4"(SLD)
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	18" ROCK RIPRAP

NOTE:
1. CONTRACTOR SHALL MAINTAIN POSITIVE DRAINAGE DURING CONSTRUCTION.

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TRAFFIC CONTROL PLAN

PHASE 1 STEP 2

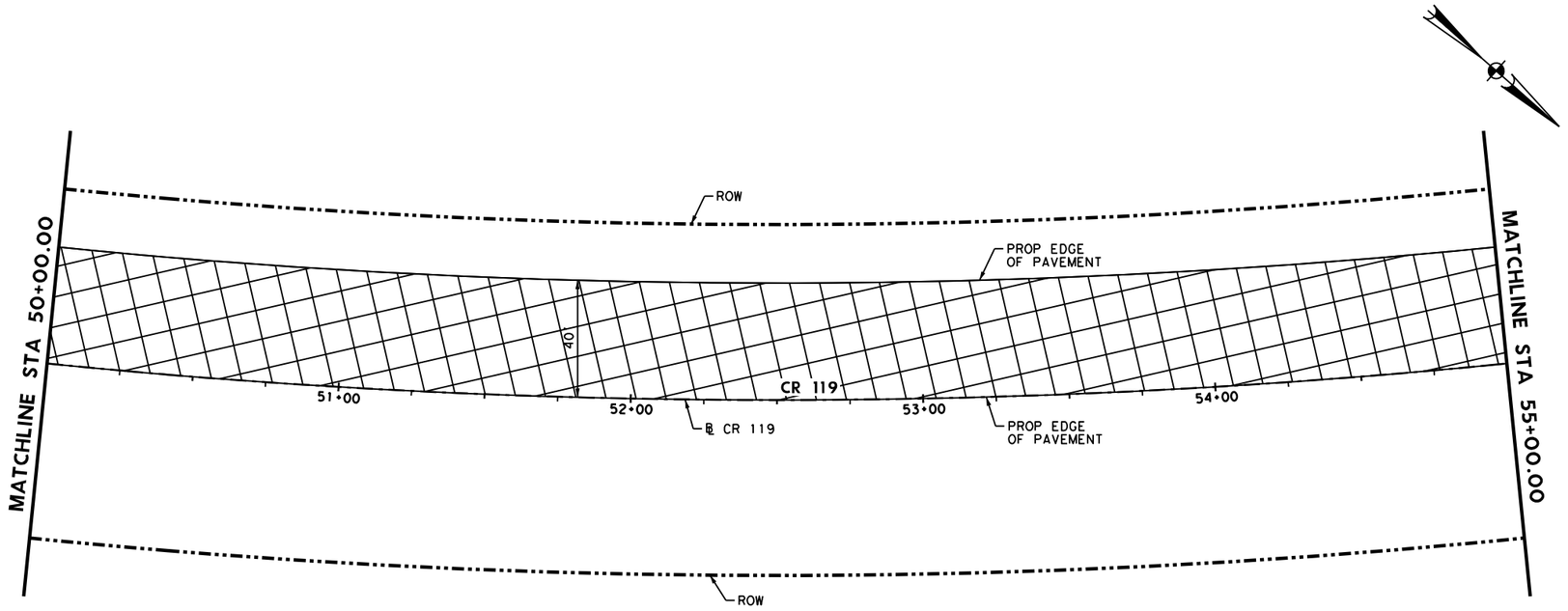
STA 40+00 TO STA 50+00

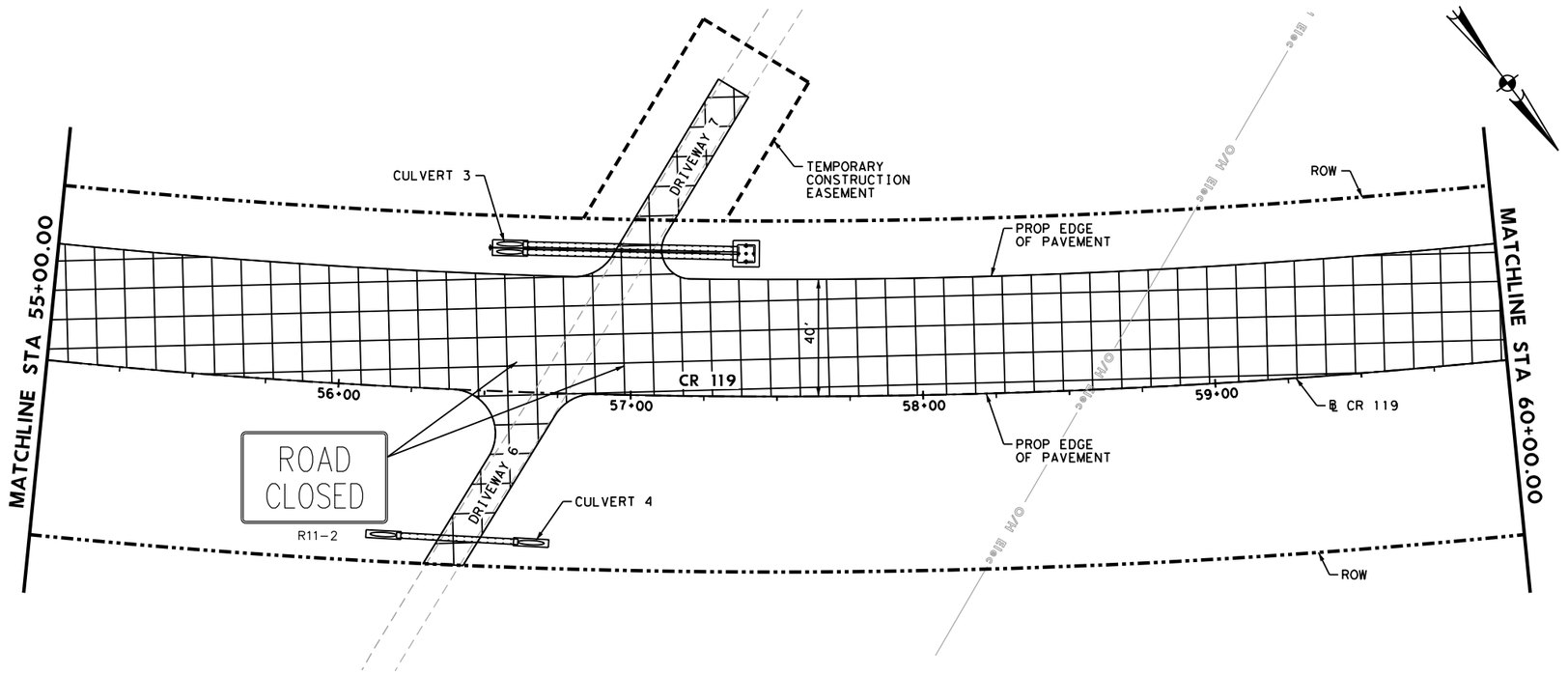
SHEET 04 OF 13

FED. RD. DIV. RD.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				36

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100% SUBMITTAL





LEGEND

- [A] WK ZN PAV MRK NON-REMOV (Y)4"(SLD) W/RAIS PAV MRKR (REFL) TY II-A-A @ 80'C-C
- [B] WK ZN PAV MRK NON-REMOV (W)4"(SLD)
- [C] WK ZN PAV MRK NON-REMOV (Y)4"(DOT)
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- CONCRETE RIPRAP
- 18" ROCK RIPRAP

0 25 50

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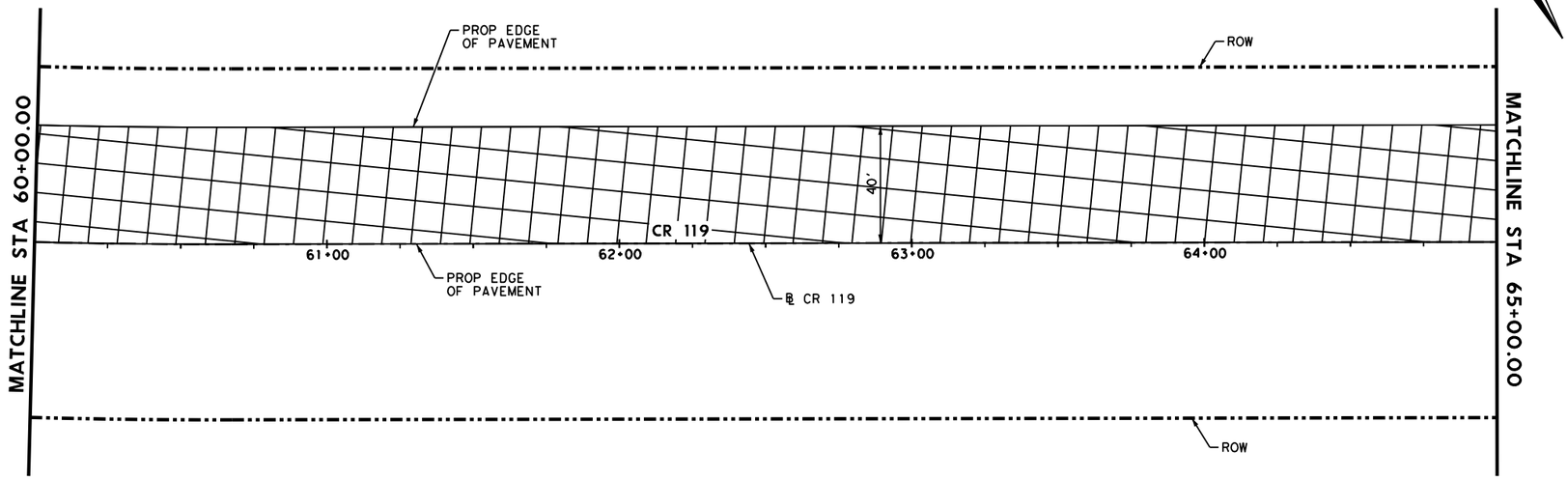
TRAFFIC CONTROL PLAN

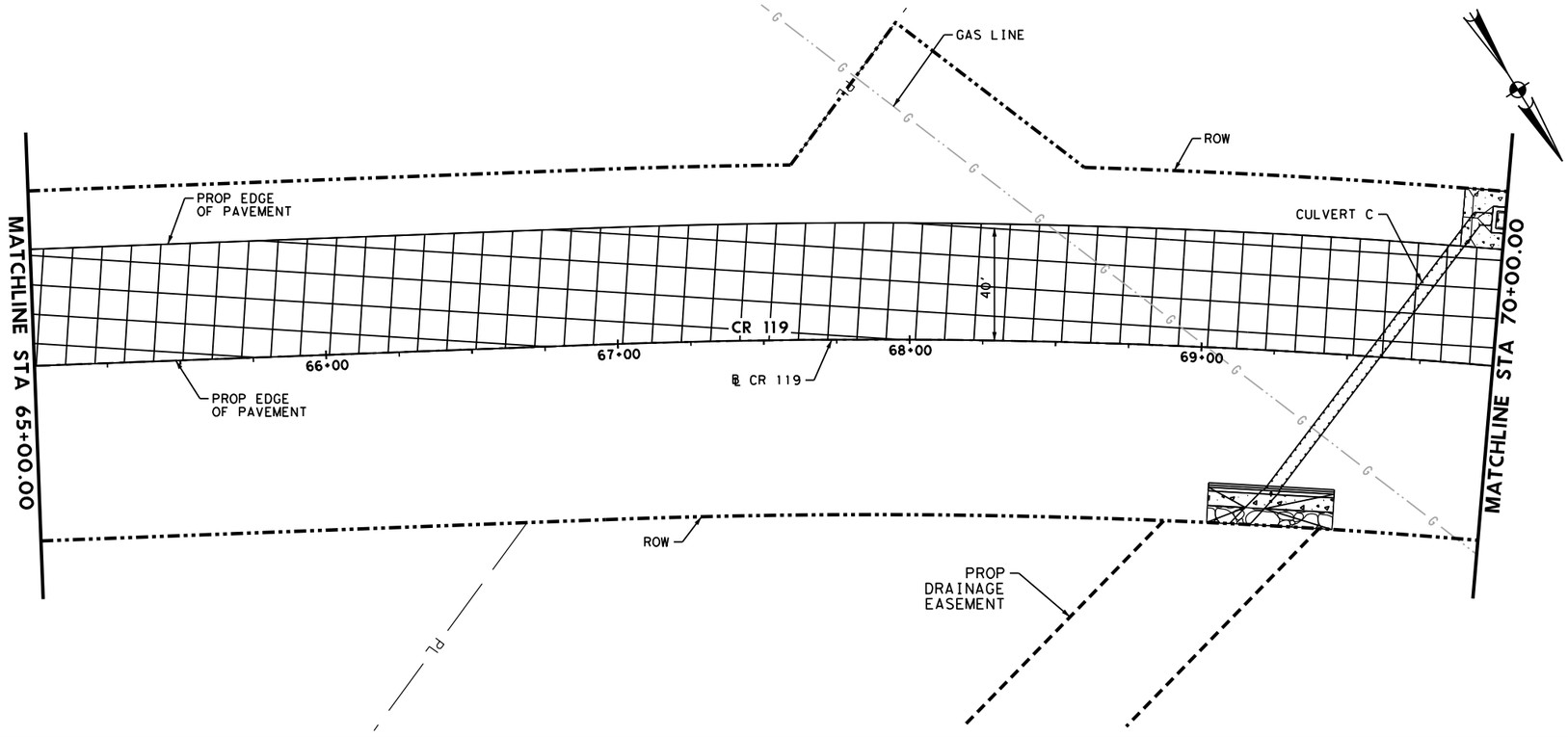
PHASE 1 STEP 2

STA 50+00 TO STA 60+00

SHEET 04 OF 13

FED. RD. DIV. RD.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				37





LEGEND

- [A] WK ZN PAV MRK NON-REMOV (Y)4"(SLD) W/RAIS PAV MRKR (REFL) TY II-A-A @ 80'C-C
- [B] WK ZN PAV MRK NON-REMOV (W)4"(SLD)
- [C] WK ZN PAV MRK NON-REMOV (Y)4"(DOT)
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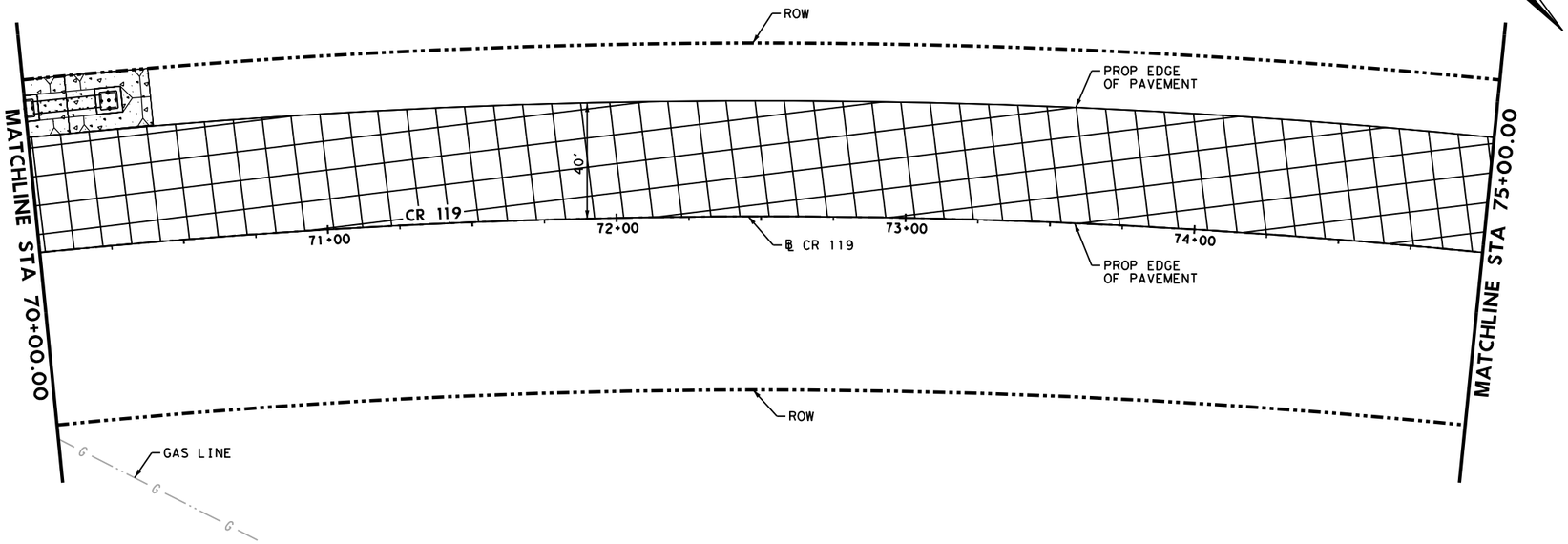
TRAFFIC CONTROL PLAN

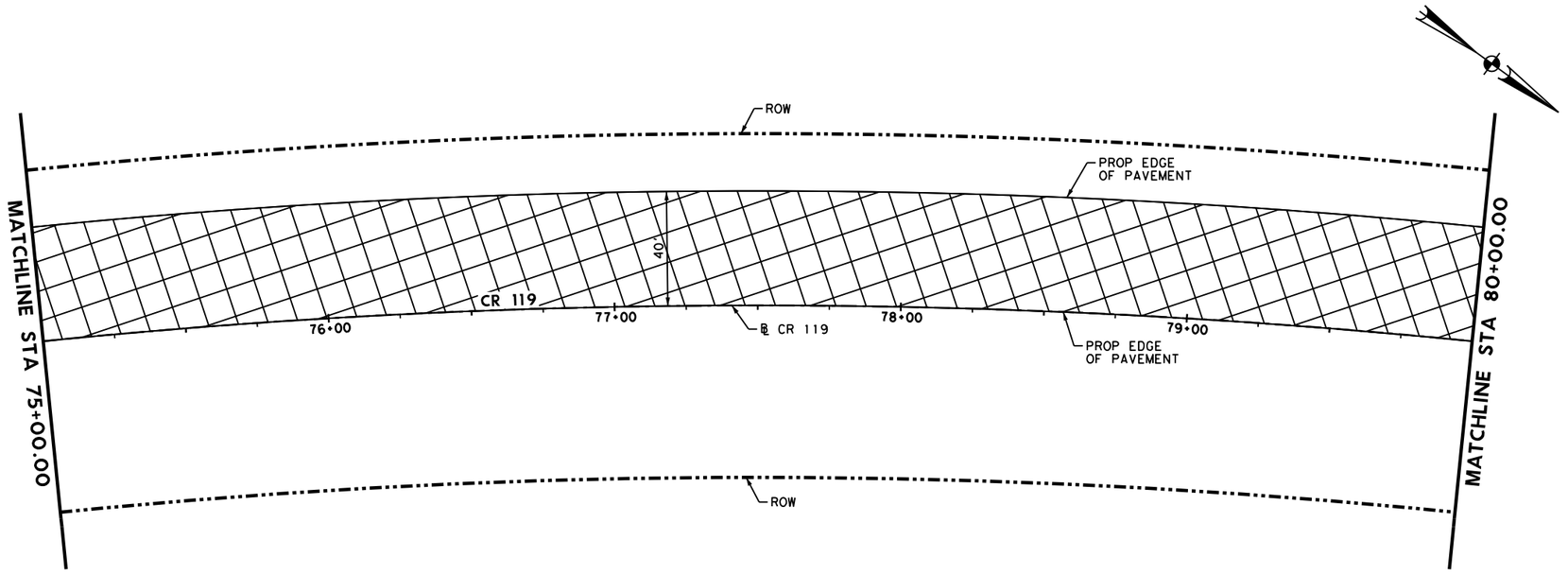
PHASE 1 STEP 2

STA 60+00 TO STA 70+00

SHEET 06 OF 13

FED. RD. DIV. RD.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				38





LEGEND

- [A] WK ZN PAV MRK NON-REMOV (Y)4"(SLD) W/RAIS PAV MRKR (REFL) TY II-A-A @ 80'C-C
- [B] WK ZN PAV MRK NON-REMOV (W)4"(SLD)
- [C] WK ZN PAV MRK NON-REMOV (Y)4"(DOT)
- [D] WK ZN PAV MRK NON-REMOV (W)24"(SLD)
- PL PROPERTY LINE
- EASEMENT
- RIGHT OF WAY BOUNDARY
- TYPE III BARRICADE
- CHANNELIZING DEVICE @ 90'C-C ON TANGENT AND @ 45'C-C ON TAPER
- CONSTRUCTION SIGN
- EXIST DIRECTION OF TRAFFIC FLOW
- PROPOSED DIRECTION OF TRAFFIC FLOW
- ROADWAY TO BE OBLITERATED
- PERMANENT CONSTRUCTION THIS PHASE
- TEMPORARY CONSTRUCTION THIS PHASE
- PERMANENT CONSTRUCTION PREVIOUS PHASE
- TEMPORARY CONSTRUCTION PREVIOUS PHASE
- CONCRETE RIPRAP
- 18" ROCK RIPRAP

0 25 50

STATE OF TEXAS
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98234
LICENSED
PROFESSIONAL ENGINEER

6/15/2017

CR 119

WILLIAMSON COUNTY
1848

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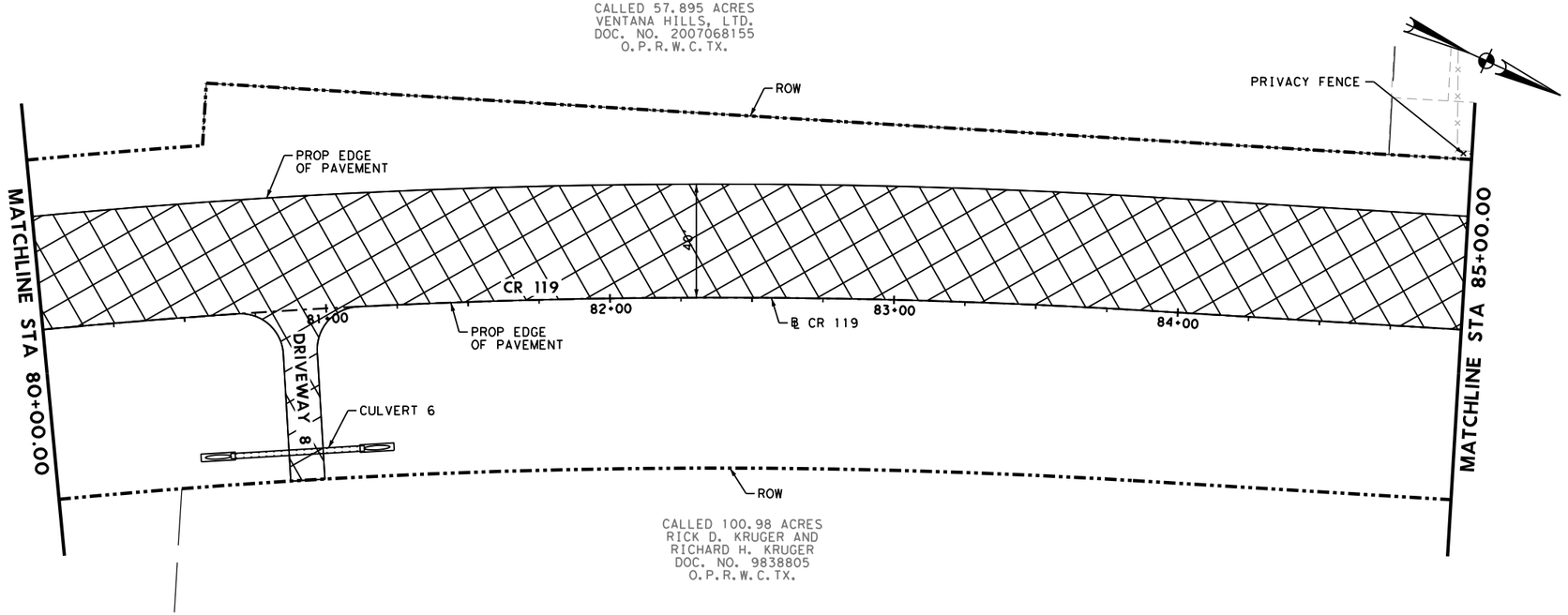
TRAFFIC CONTROL PLAN

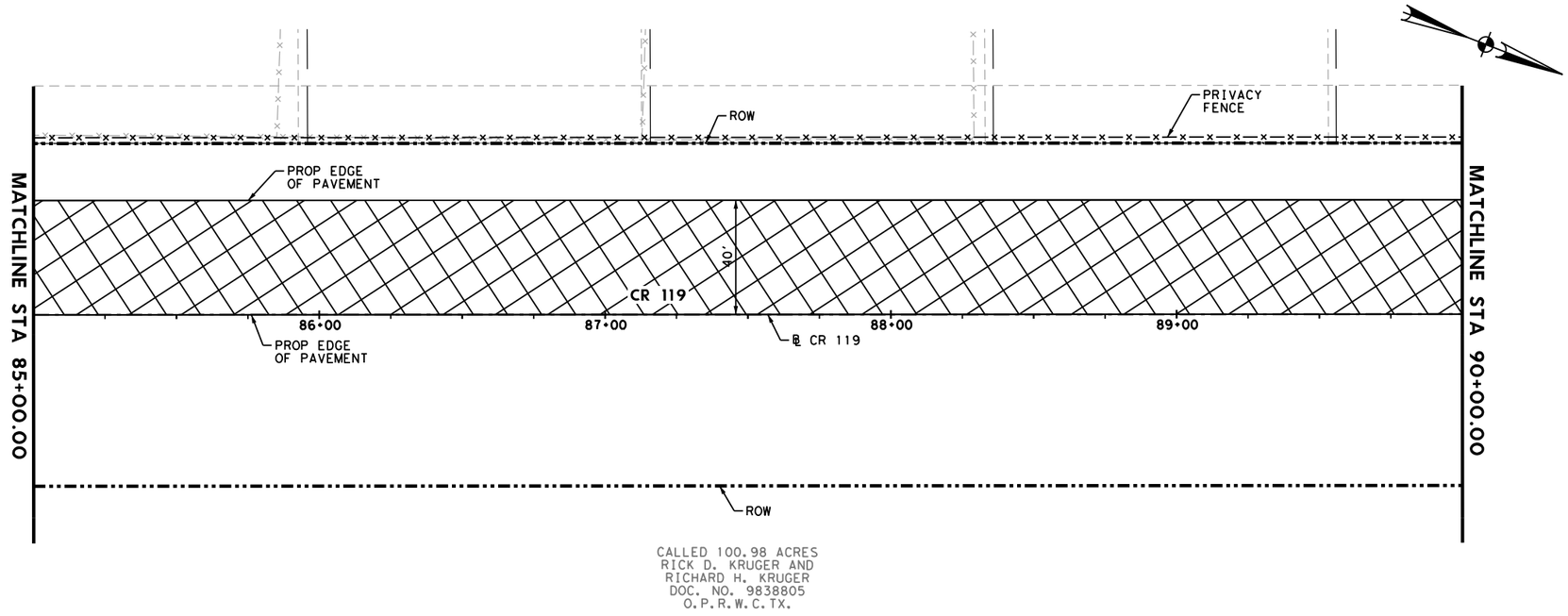
PHASE 1 STEP 2

STA 70+00 TO STA 80+00

SHEET 07 OF 13

FED. RD. DIV. RD.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				39





LEGEND

- A — WK ZN PAV MRK NON-REMOV (Y)4"(SLD) W/RAIS PAV MRKR (REFL) TY II-A-A @ 80'C-C
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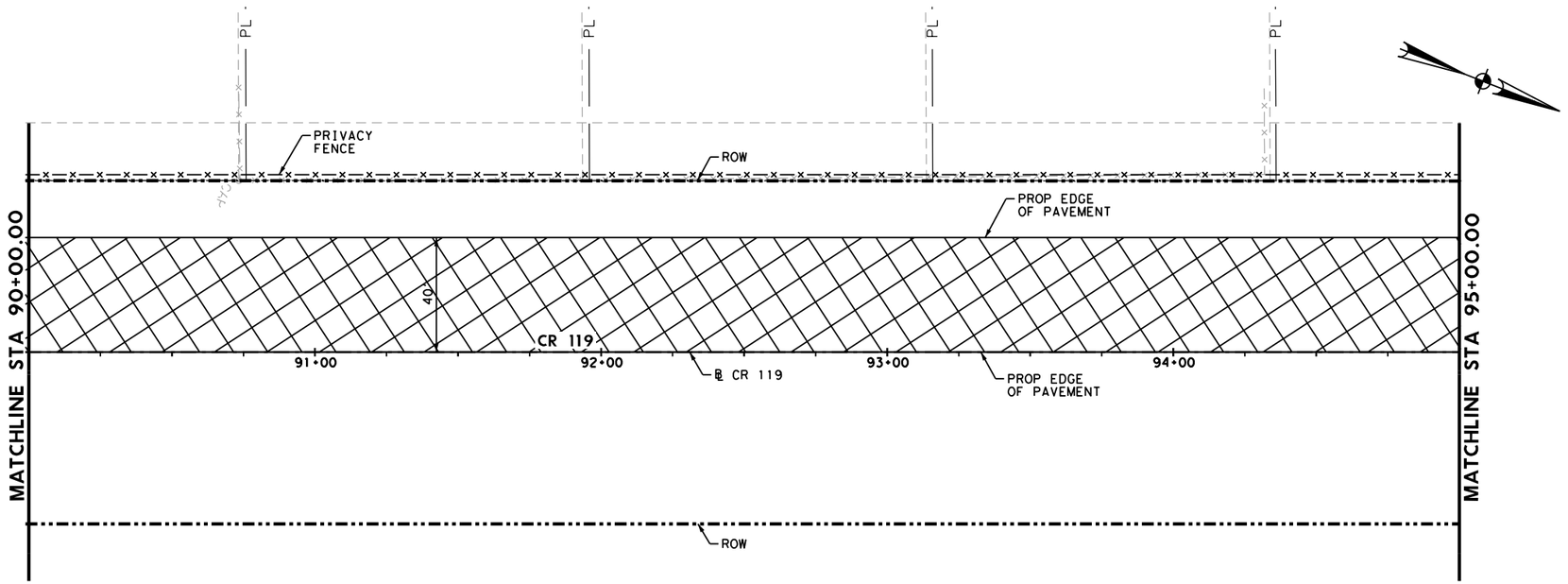
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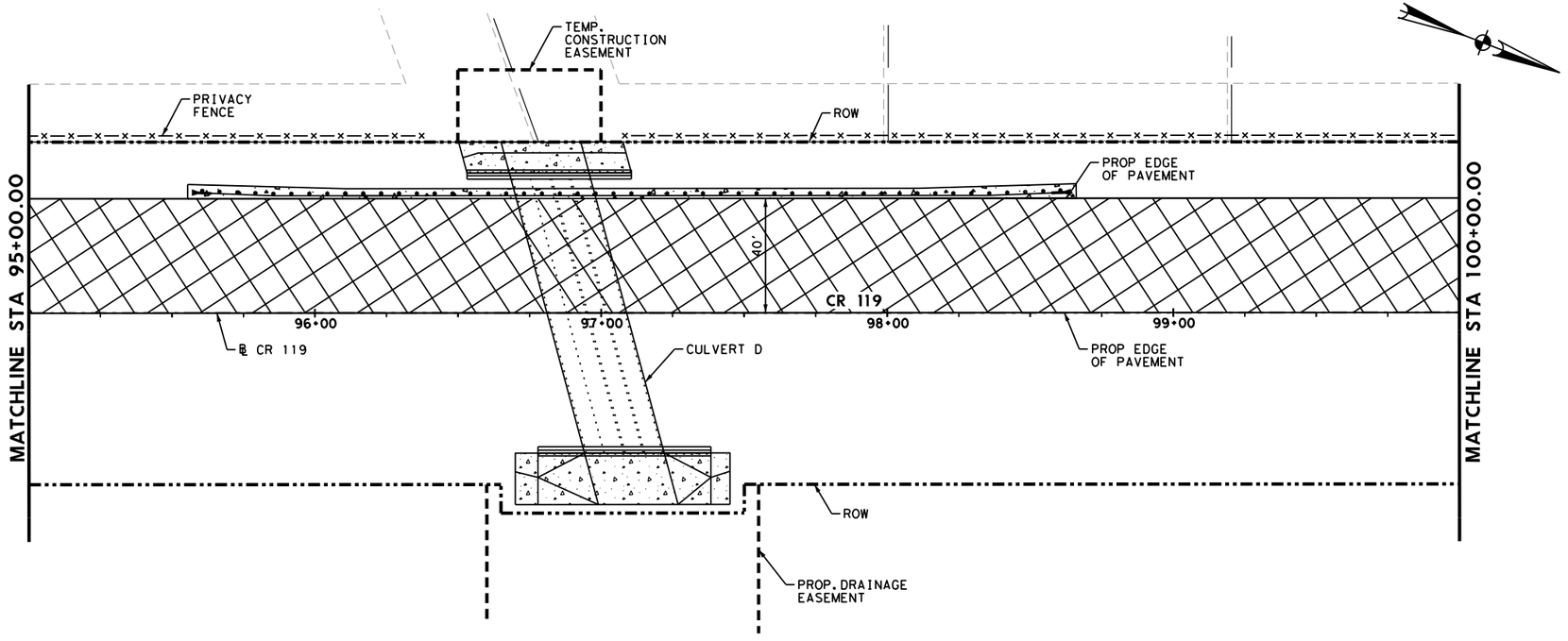
PHASE 1 STEP 2

STA 80+00 TO STA 90+00

SHEET 08 OF 13

FED. RD. DIV. RD.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				40





LEGEND

- A — WK ZN PAV MRK NON-REMOV (Y)4"(SLD) W/RAIS PAV MRKR (REFL) TY II-A-A @ 80'C-C
- B — WK ZN PAV MRK NON-REMOV (W)4"(SLD)
- C — WK ZN PAV MRK NON-REMOV (Y)4"(DOT)
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TRAFFIC CONTROL PLAN

PHASE 1 STEP 2

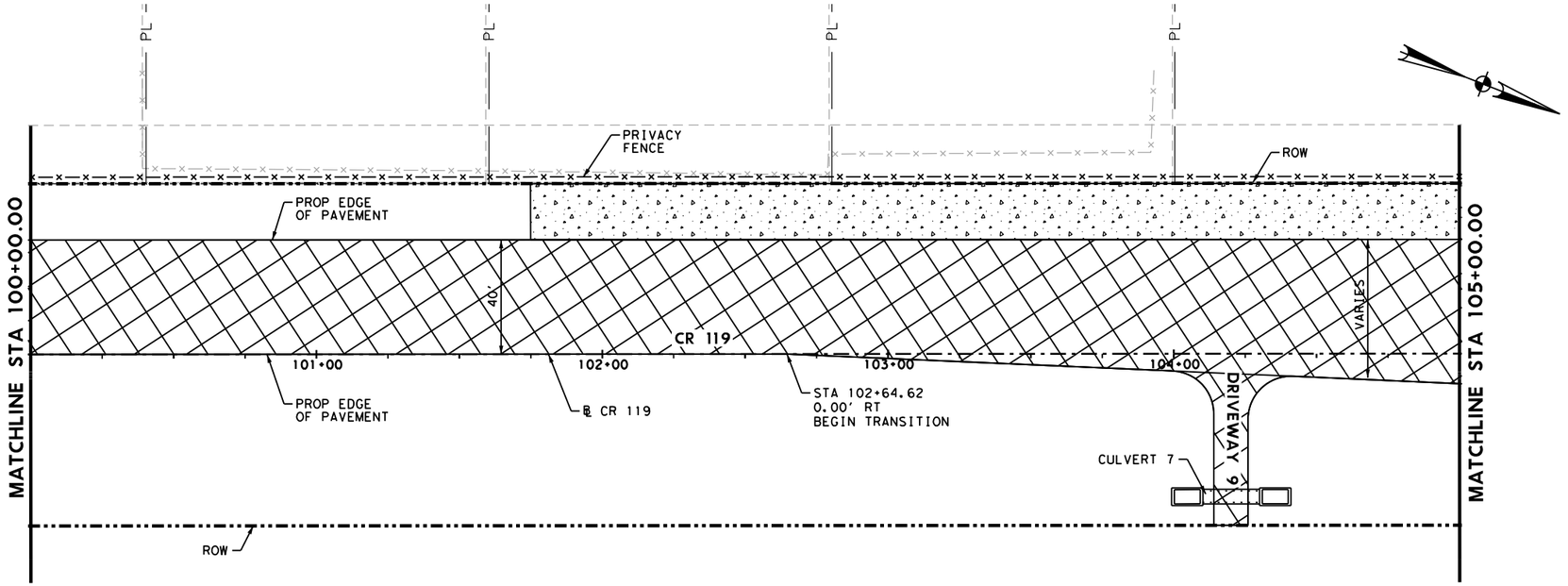
STA 90+00 TO STA 100+00

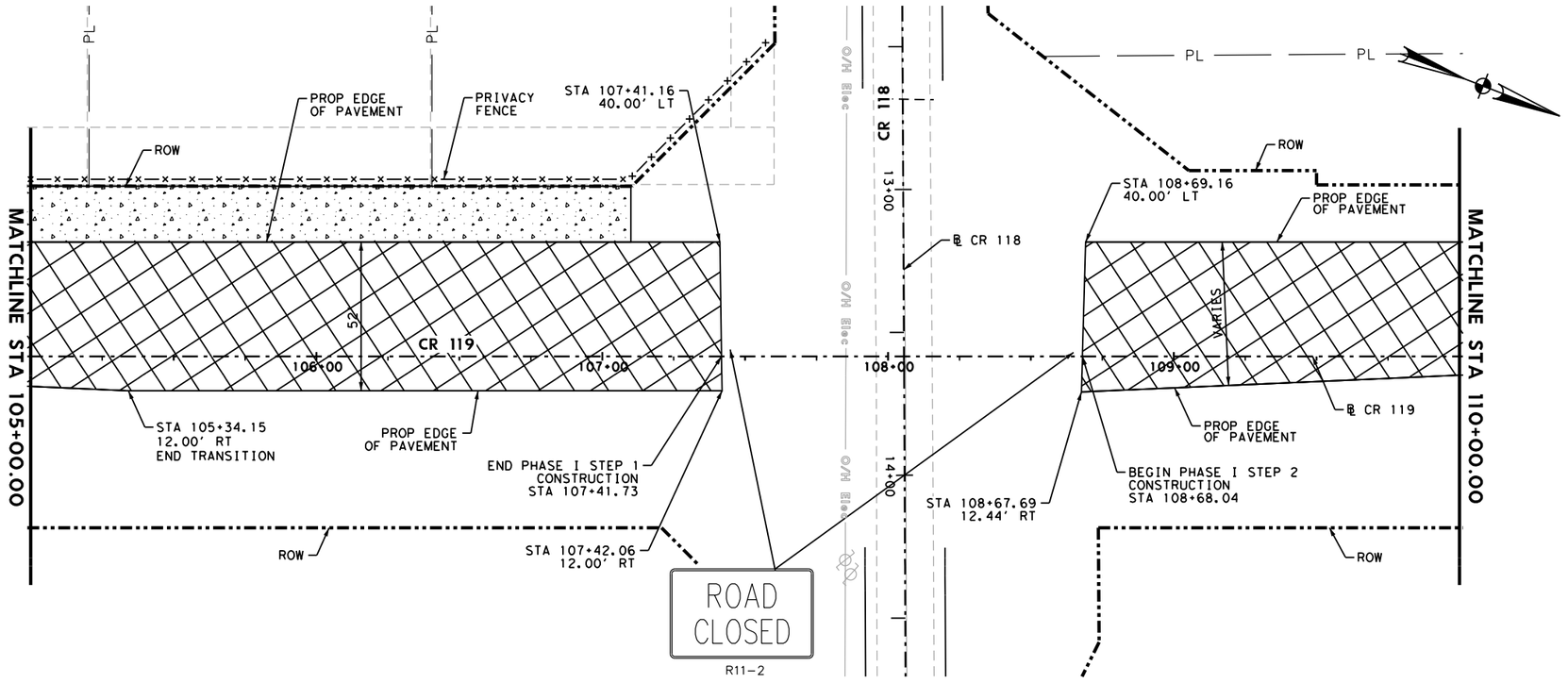
SHEET 09 OF 13

FED. RD. DIV. RD.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				41

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LEGEND

- A — WK ZN PAV MRK NON-REMOV (Y)4"(SLD) W/RAIS PAV MRKR (REFL) TY II-A-A @ 80'C-C
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NOTE:
1. REFER TO CR 118 TRAFFIC CONTROL PLAN PHASE 1 FOR ADDITIONAL INFORMATION.
2. REFER TO DETOUR LAYOUT AND ROAD CLOSURE SHEET FOR ADDITIONAL INFORMATION.

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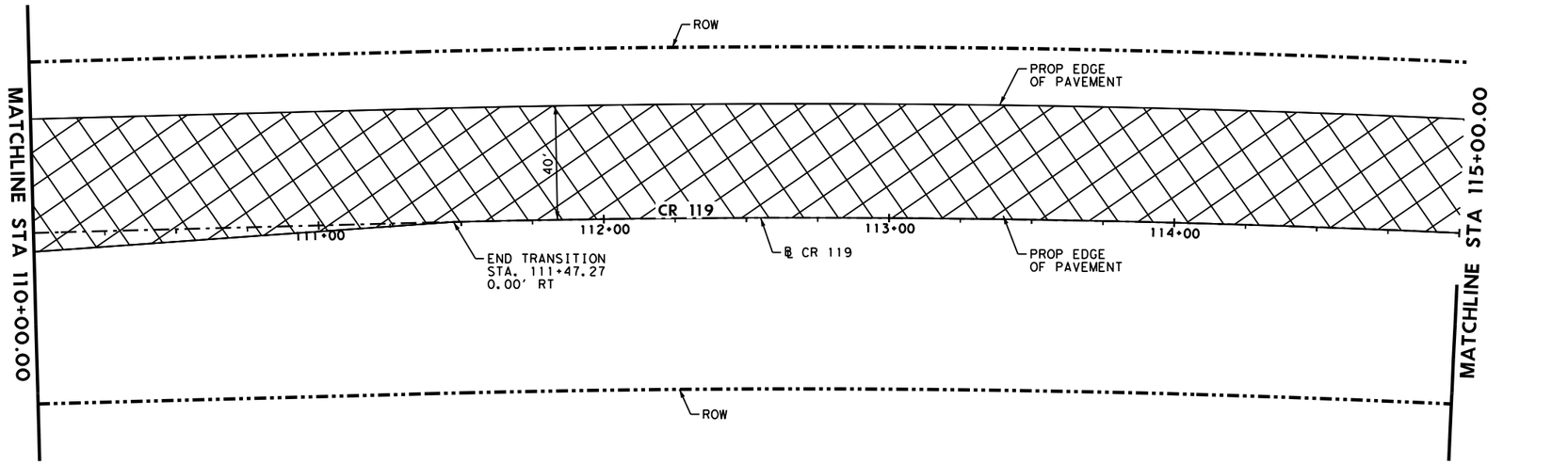
TRAFFIC CONTROL PLAN

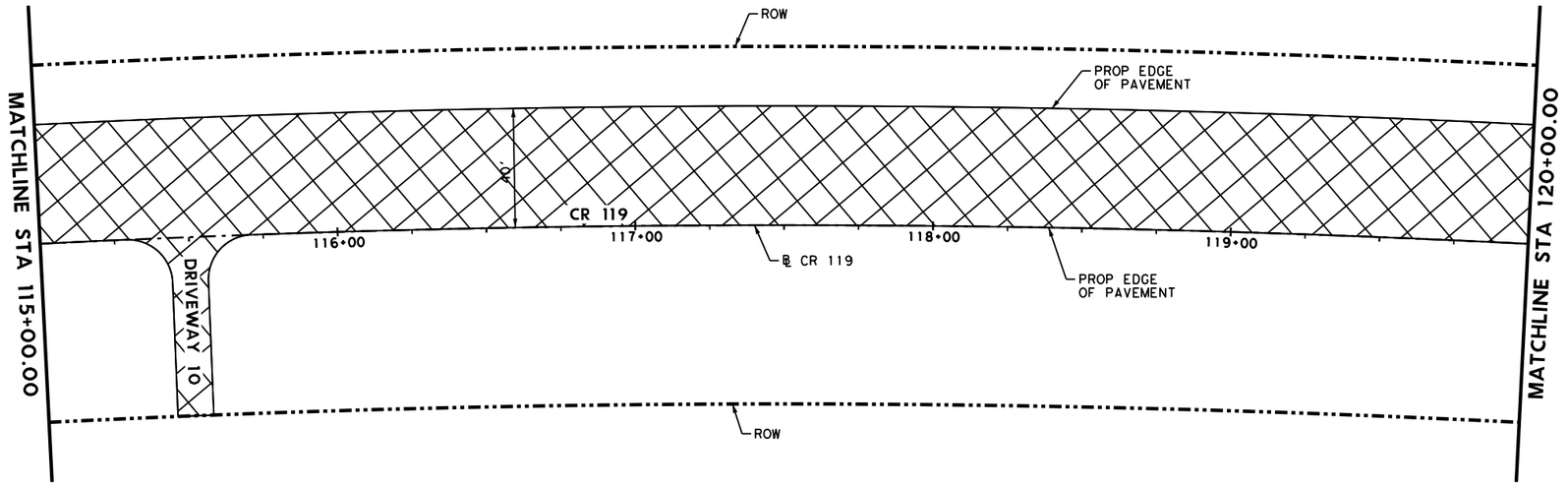
PHASE 1 STEP 2

STA 100+00 TO STA 100+00

SHEET 10 OF 13

FED. RD. DIV. RD.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				42





LEGEND

- [A] WK ZN PAV MRK NON-REMOV (Y)4"(SLD) W/RAIS PAV MRKR (REFL) TY II-A-A @ 80'C-C
- [B] WK ZN PAV MRK NON-REMOV (W)4"(SLD)
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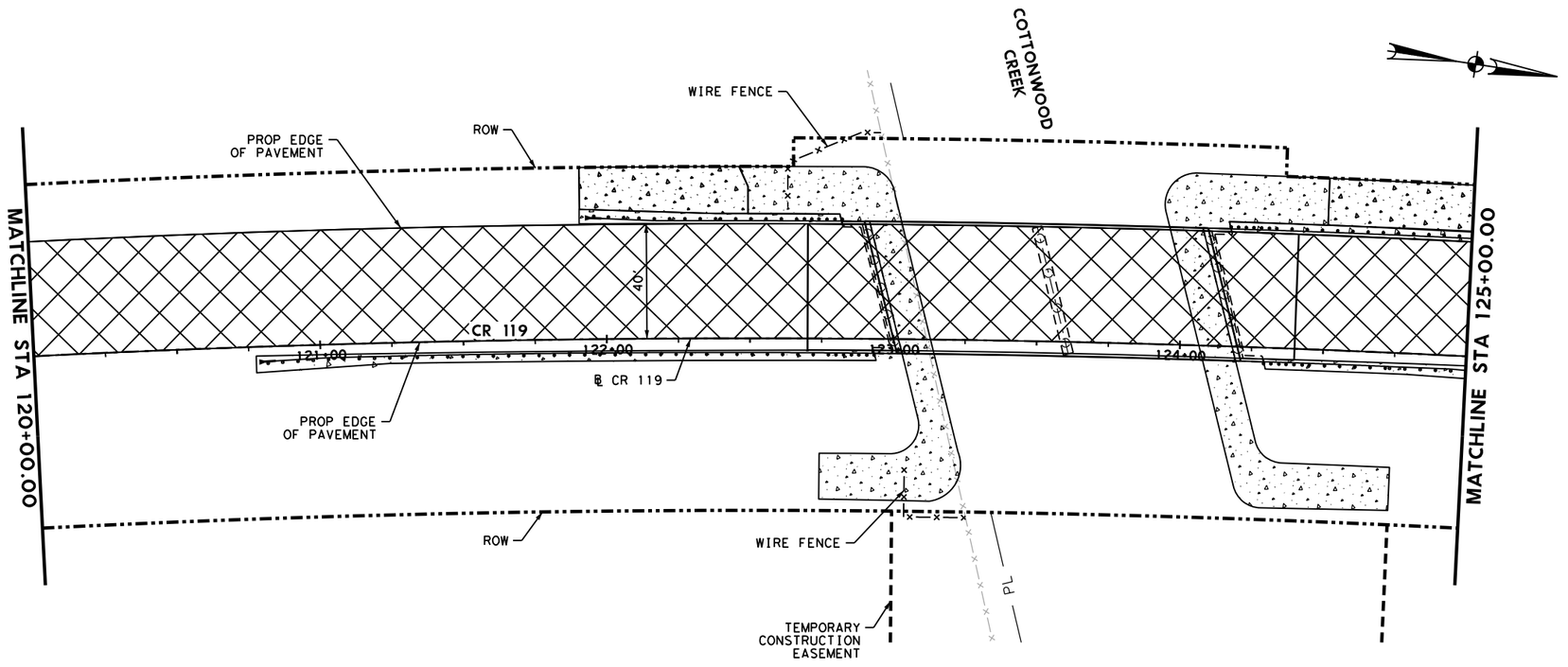
TRAFFIC CONTROL PLAN

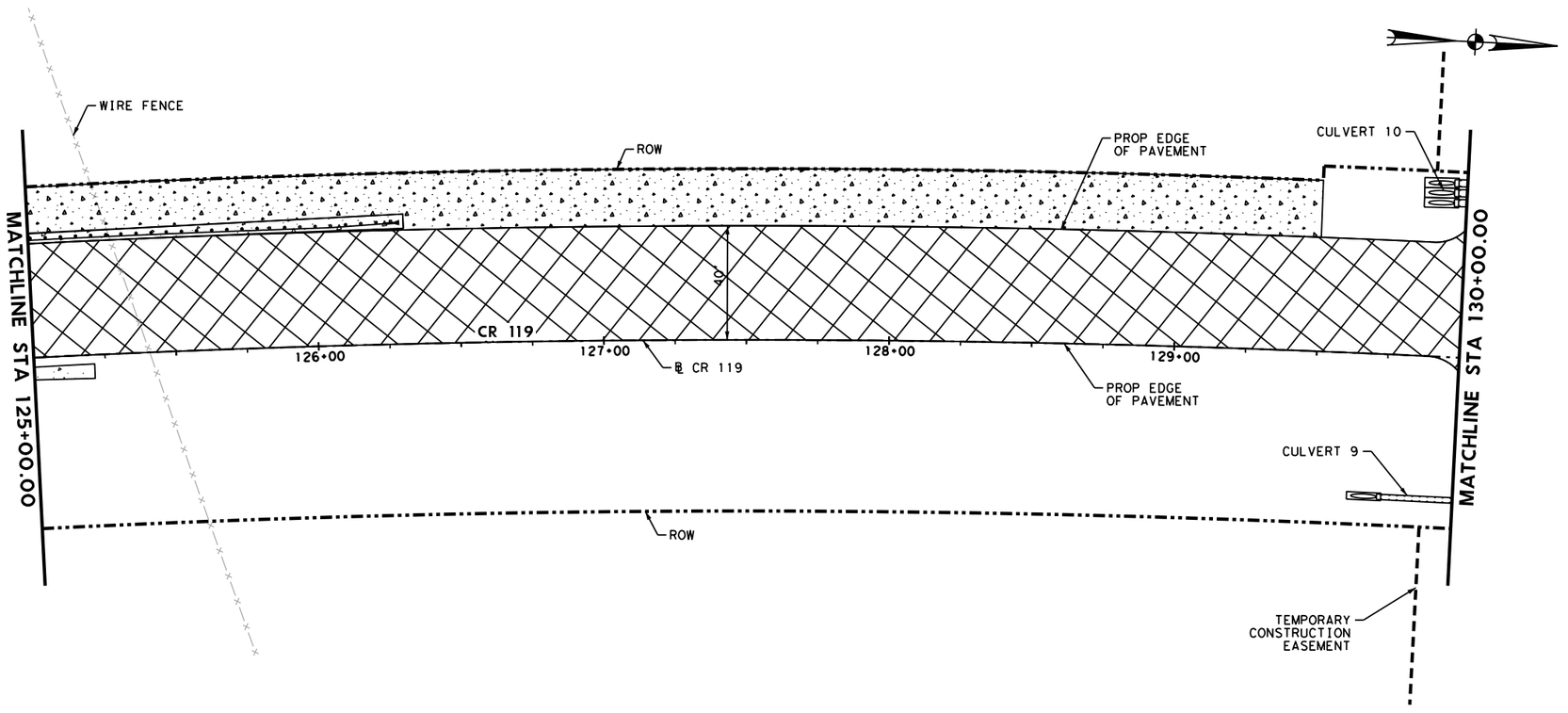
PHASE 1 STEP 2

STA 110+00 TO STA 120+00

SHEET 11 OF 13

FED. RD. DIV. RD.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				43





LEGEND

- A — WK ZN PAV MRK NON-REMOV (Y)4"(SLD) W/RAIS PAV MRKR (REFL) TY II-A-A @ 80'C-C
- B — WK ZN PAV MRK NON-REMOV (W)4"(SLD)
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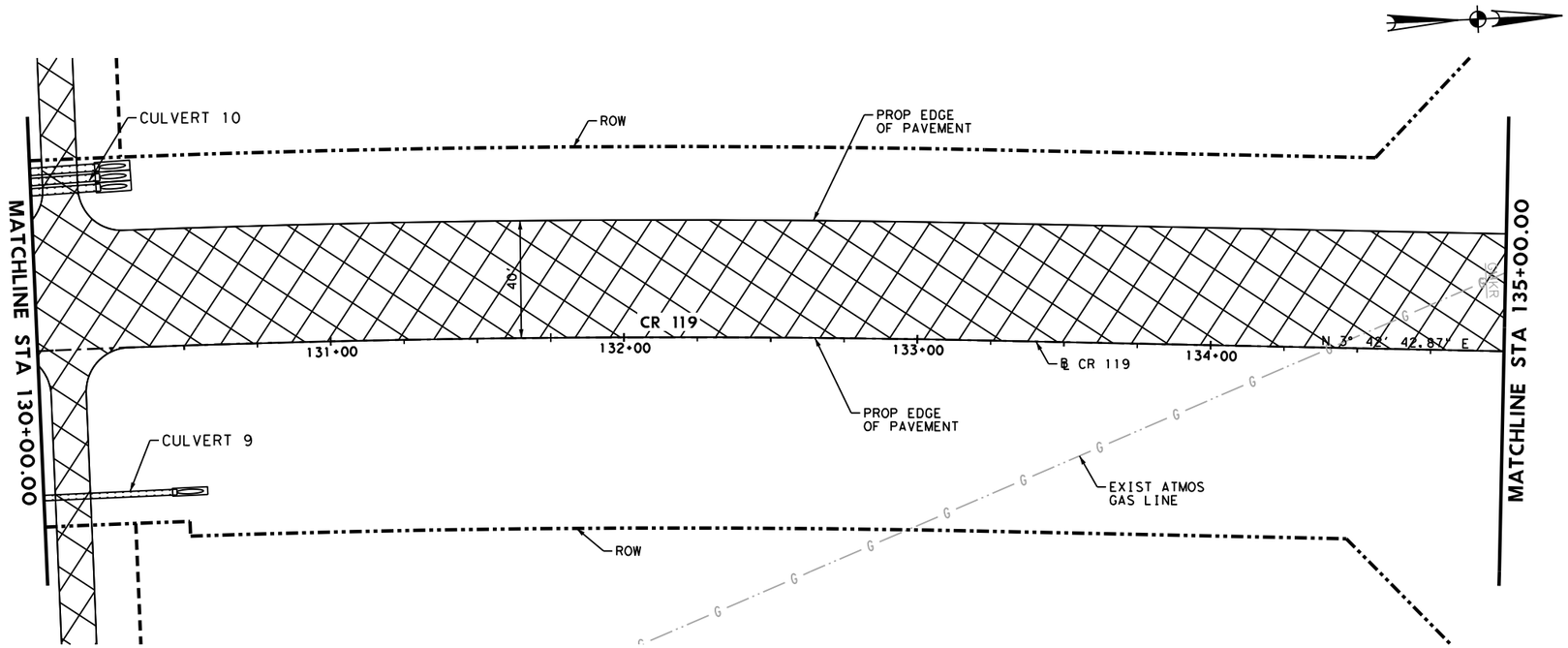
TRAFFIC CONTROL PLAN

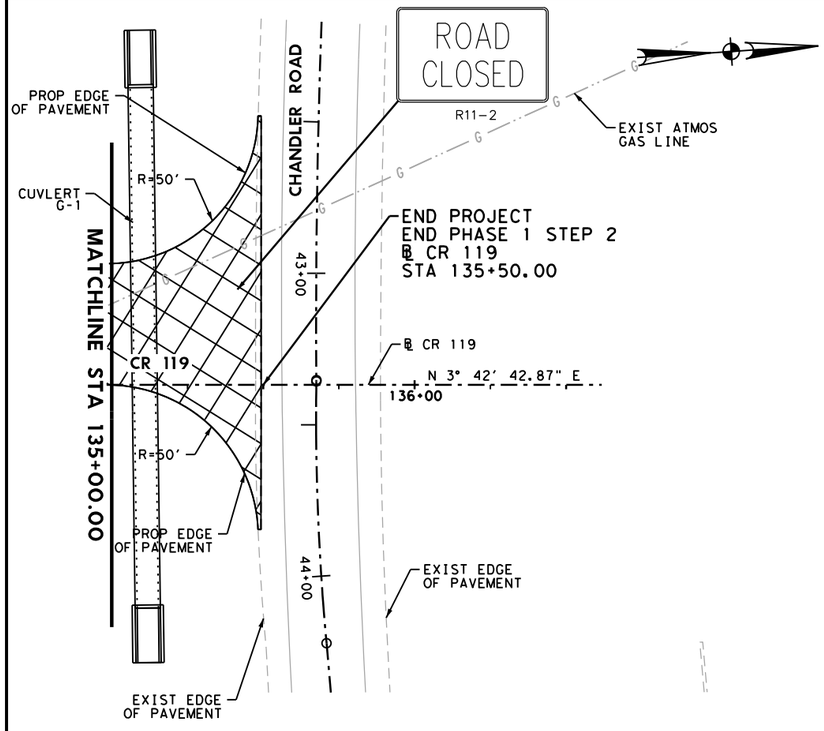
PHASE 1 STEP 2

STA 120+00 TO STA 130+00

SHEET 12 OF 13

FED. RD. DIV. RD.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				44





LEGEND

- A — WK ZN PAV MRK NON-REMOV (Y)4"(SLD) W/RAIS PAV MRKR (REFL) TY II-A-A @ 80'C-C
- B — WK ZN PAV MRK NON-REMOV (W)4"(SLD)
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NOTE:

1. REFER TO DETOUR LAYOUT AND ROAD CLOSURE SHEET FOR ADDITIONAL INFORMATION.

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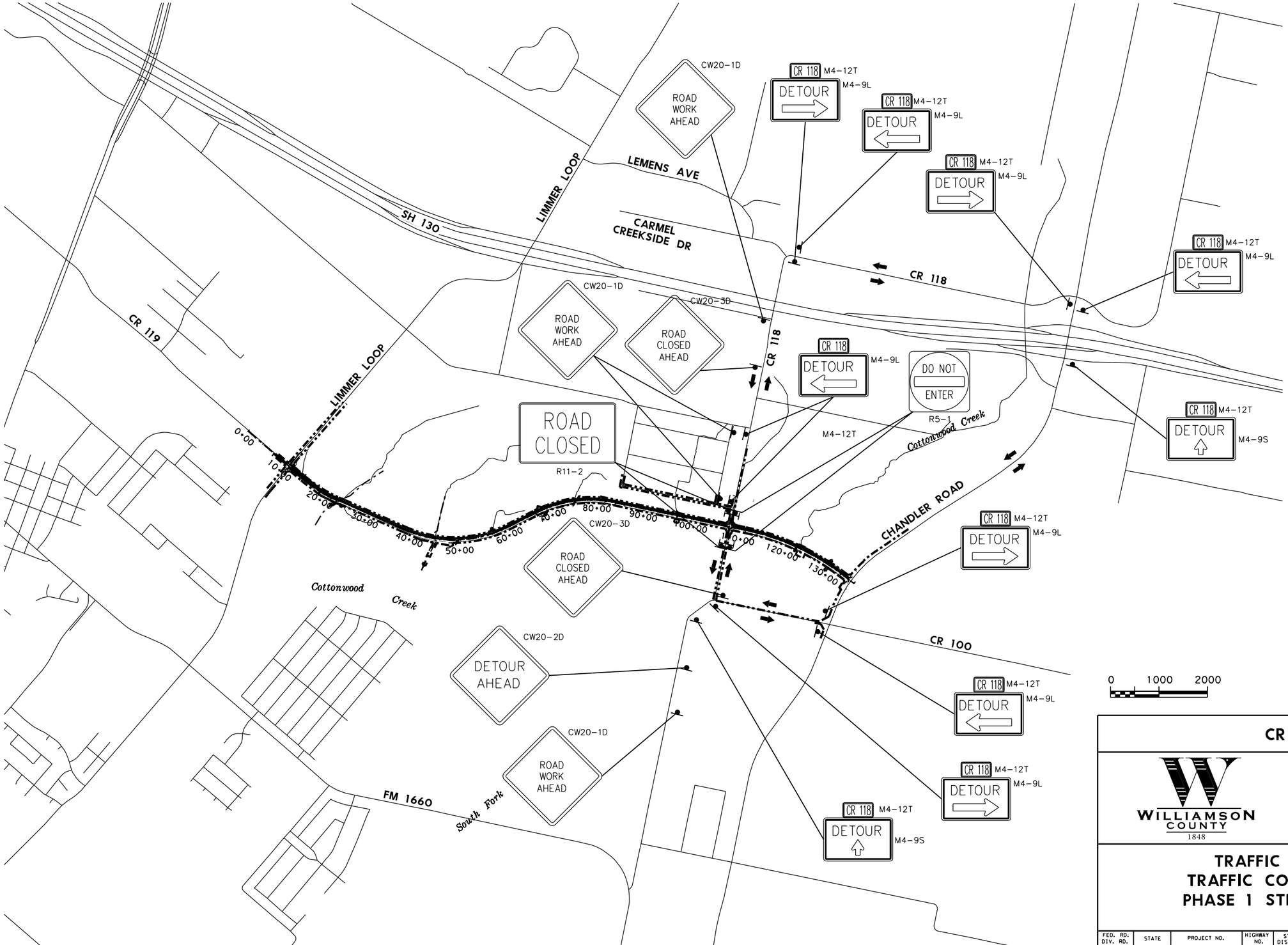
TRAFFIC CONTROL PLAN

PHASE 1 STEP 2

STA 130+00 TO END PROJECT

SHEET 13 OF 13

FED. RD. DIV. RD.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				45



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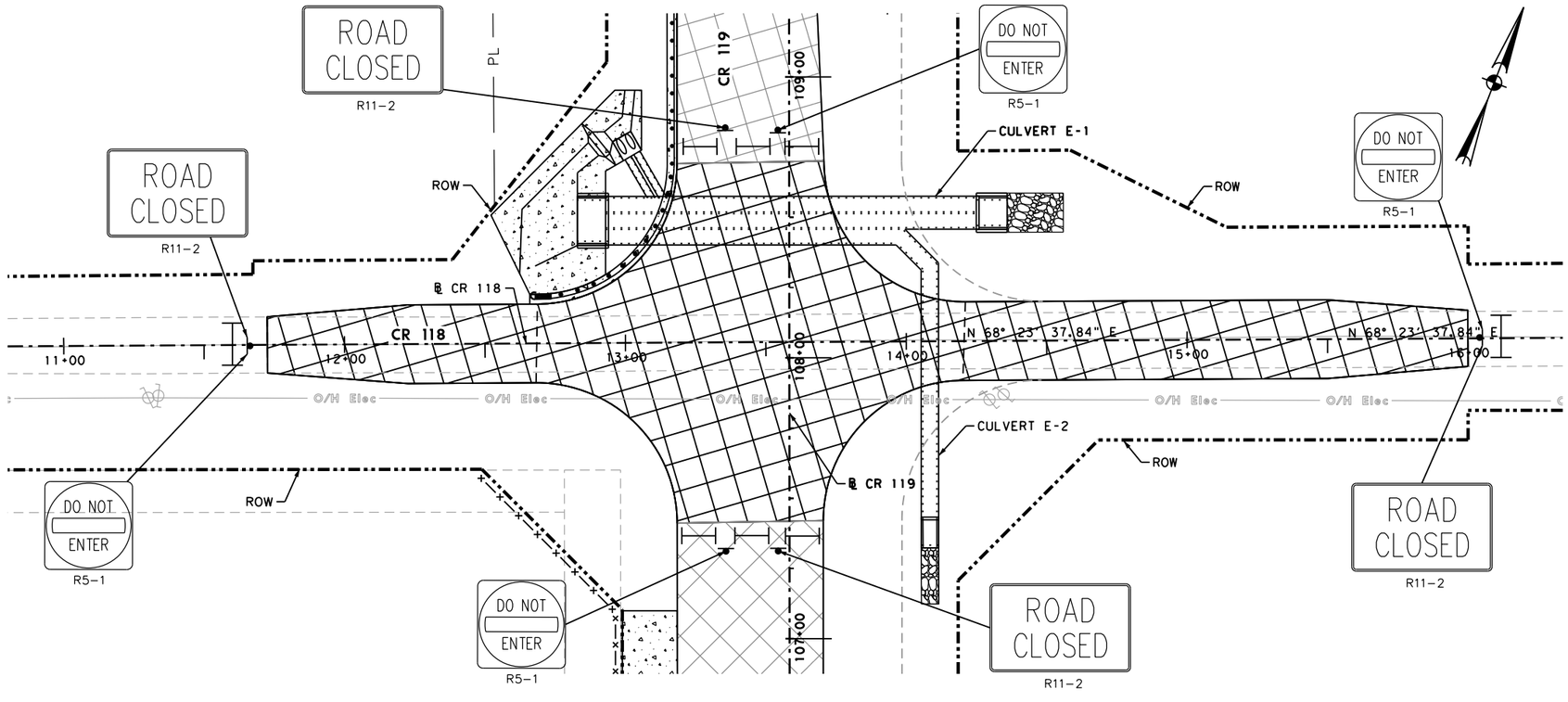
TRAFFIC CONTROL
TRAFFIC CONTROL PLAN
PHASE 1 STEP 3 DETOUR

SHEET 01 OF 01

FED. RD. DIV. RD.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				46

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100% SUBMITTAL



NOTE:
1. ONCE CONSTRUCTION BEGINS ON CR 118, CONTRACTOR SHALL MINIMIZE DURATION OF CR 118 ROAD CLOSURE AND OPEN TO THROUGH TRAFFIC AS SOON AS POSSIBLE. ONCE IMPROVEMENTS TO CR 118 ARE COMPLETE, CONTRACTOR TO OPEN TO THROUGH TRAFFIC.
2. REFER TO DETOUR LAYOUT AND ROAD CLOSURE SHEET FOR ADDITIONAL INFORMATION.

LEGEND

- [A] WK ZN PAV MRK NON-REMOV (Y)4"(SLD) W/RAIS PAV MRKR (REFL) TY II-A-A @ 80'C-C
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0 25 50

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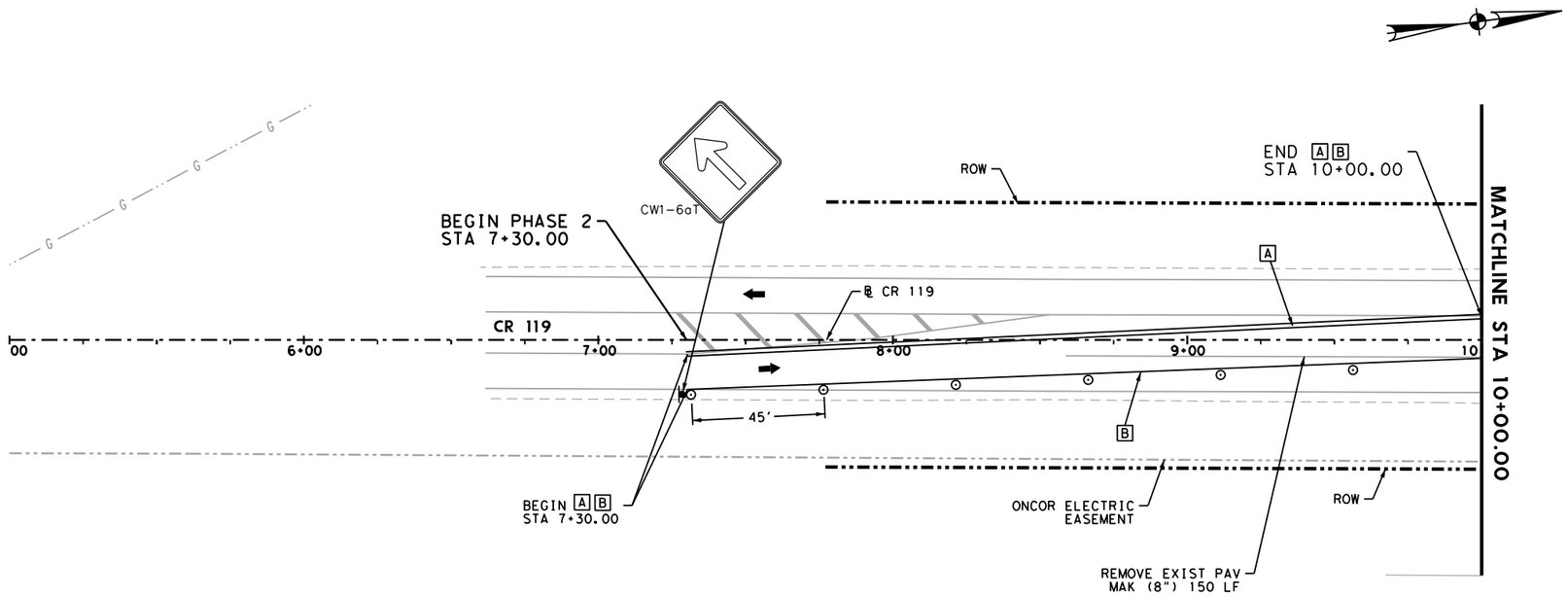
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TRAFFIC CONTROL
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PHASE 1 STEP 3

STA 11+72.52 TO STA 16+00.00

SHEET 01 OF 01

FED. RD. DIV. RD.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				47



LEGEND

- A — WK ZN PAV MRK NON-REMOV (Y)4"(SLD) W/RAIS PAV MRKR (REFL) TY II-A-A @ 80'C-C
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NOTES:
1. REFER TO PHASE 2 TCP NARRATIVE SPECIAL NOTES FOR PAVEMENT MARKING AND SURFACE COURSE CONSTRUCTION INFORMATION.

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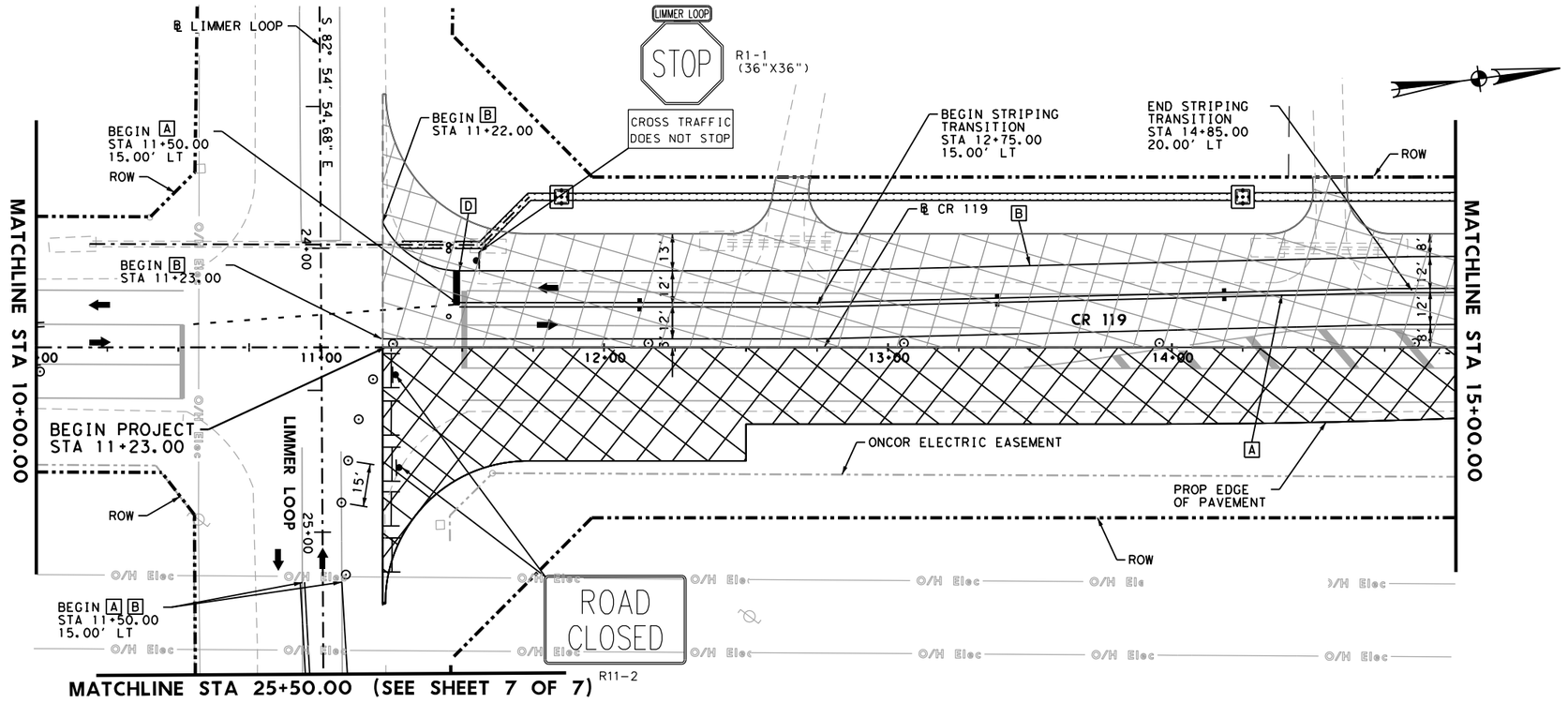
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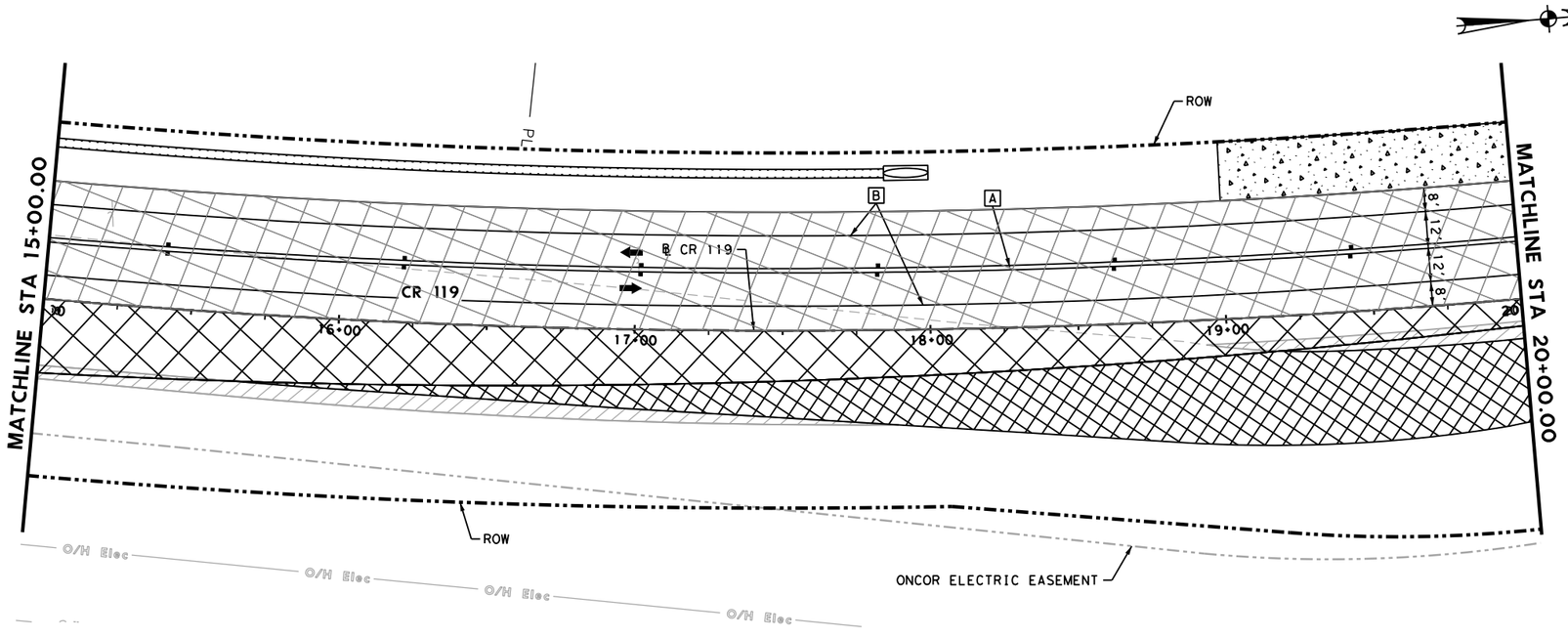
TRAFFIC CONTROL
TRAFFIC CONTROL PLAN
PHASE 2 STEP 1

STA 7+27.33 TO STA 10+00

SHEET 01 OF 07

FED. RD. DIV. RD.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				48





LEGEND

- A — WK ZN PAV MRK NON-REMOV (Y)4"(SLD) W/RAIS PAV MRKR (REFL) TY II-A-A @ 80'C-C
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- CONCRETE RIPRAP
- 18" ROCK RIPRAP

NOTES:
1. REFER TO PHASE 2 TCP NARRATIVE SPECIAL NOTES FOR PAVEMENT MARKING AND SURFACE COURSE CONSTRUCTION INFORMATION.

0 25 50

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ARNOLD GONZALES, JR.
98234
LICENSED
PROFESSIONAL ENGINEER

6/15/2017

CR 119

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TRAFFIC CONTROL PLAN

PHASE 2 STEP 1

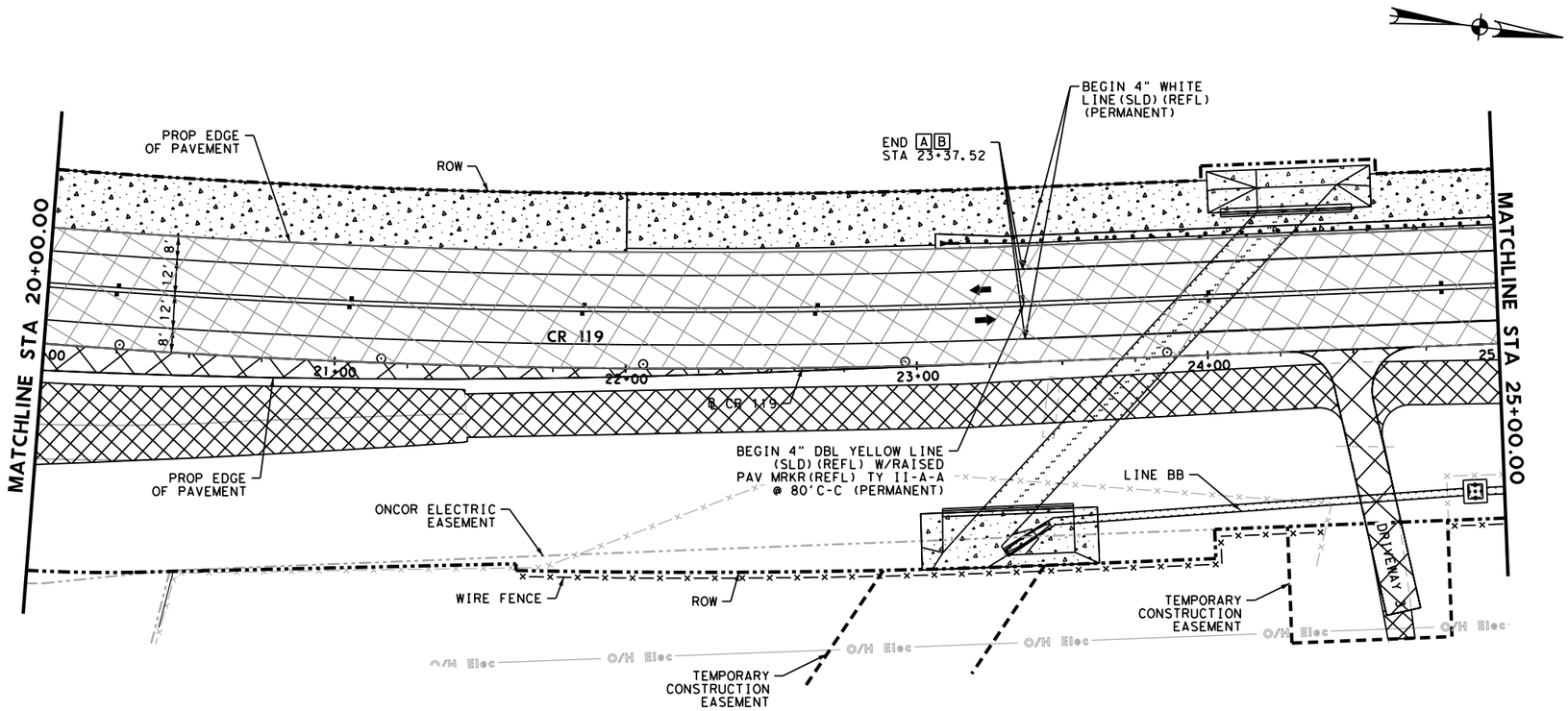
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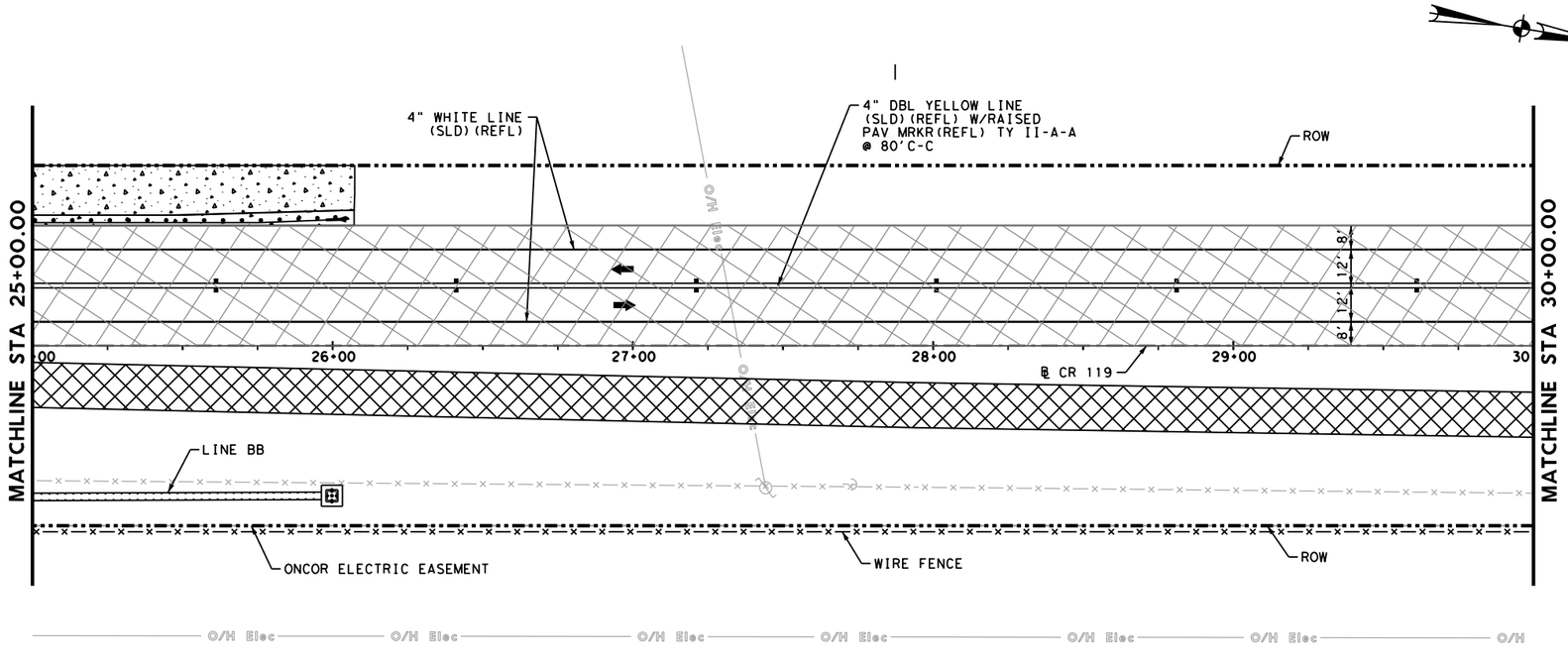
SHEET 02 OF 07

FED. RD. DIV. RD.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				49

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100% SUBMITTAL





LEGEND

- A — WK ZN PAV MRK NON-REMOV (Y)4"(SLD) W/RAIS PAV MRKR (REFL) TY II-A-A @ 80'C-C
- B — WK ZN PAV MRK NON-REMOV (W)4"(SLD)
- C — WK ZN PAV MRK NON-REMOV (Y)4"(DOT)
- D — WK ZN PAV MRK NON-REMOV (W)24"(SLD)
- PL — PROPERTY LINE
- EASEMENT
- RIGHT OF WAY BOUNDARY
- TYPE III BARRICADE
- CHANNELIZING DEVICE @ 90'C-C ON TANGENT AND @ 45'C-C ON TAPER
- CONSTRUCTION SIGN
- EXIST DIRECTION OF TRAFFIC FLOW
- PROPOSED DIRECTION OF TRAFFIC FLOW
- ROADWAY TO BE OBLITERATED
- PERMANENT CONSTRUCTION THIS PHASE
- TEMPORARY CONSTRUCTION THIS PHASE
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- TEMPORARY CONSTRUCTION PREVIOUS PHASE
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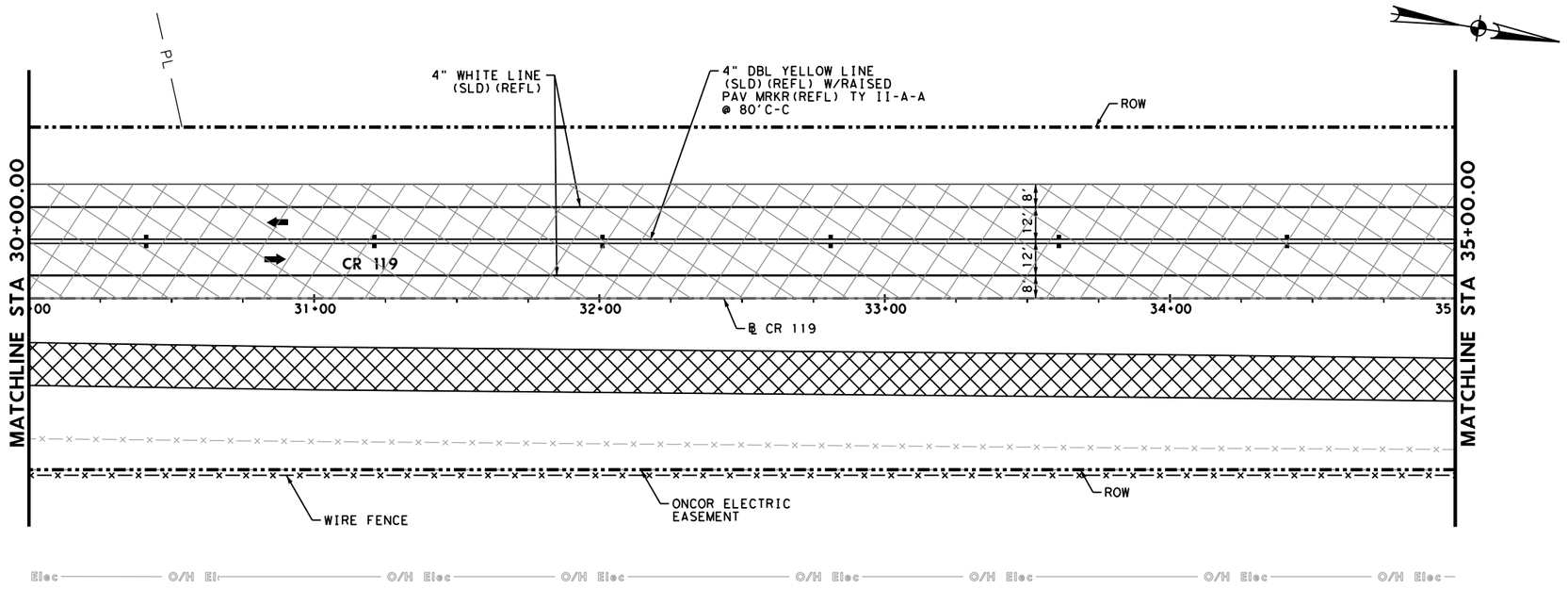
TRAFFIC CONTROL PLAN

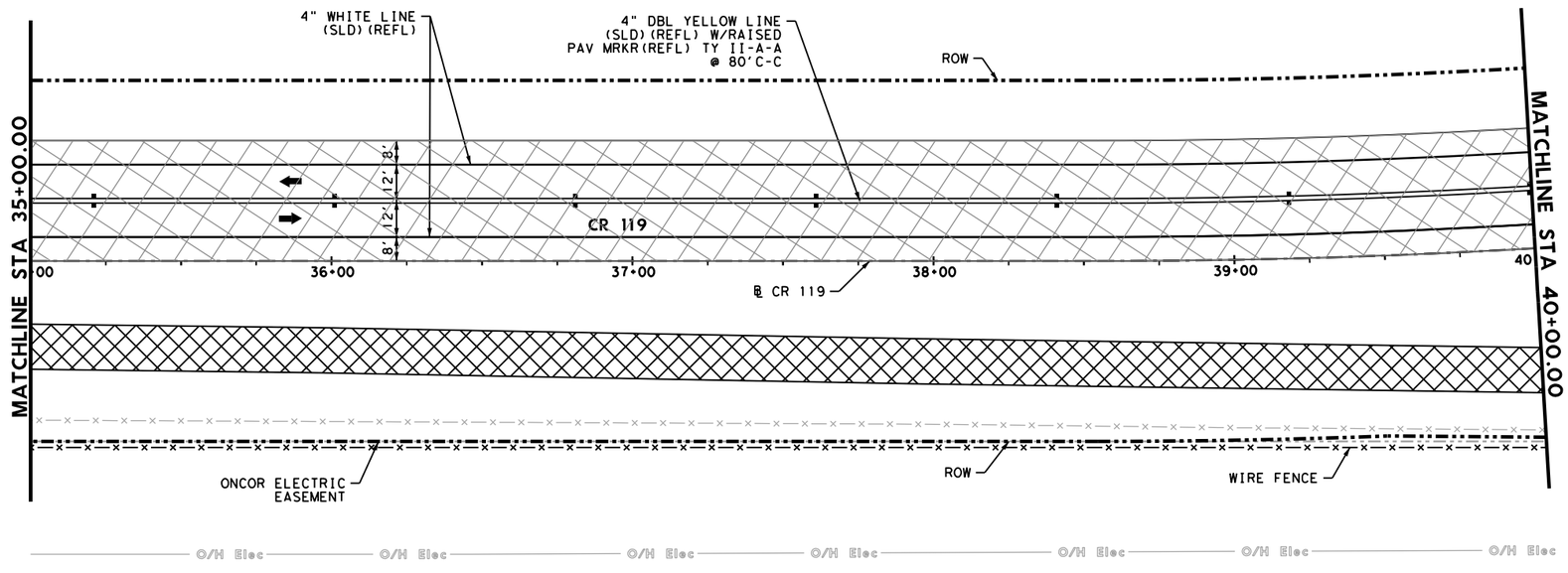
PHASE 2 STEP 1

STA 20+00 TO STA 30+00

SHEET 03 OF 07

FED. RD. DIV. RD.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				50





LEGEND

- A — WK ZN PAV MRK NON-REMOV (Y)4"(SLD) W/RAIS PAV MRKR (REFL) TY II-A-A @ 80'C-C
- B — WK ZN PAV MRK NON-REMOV (W)4"(SLD)
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NOTES:
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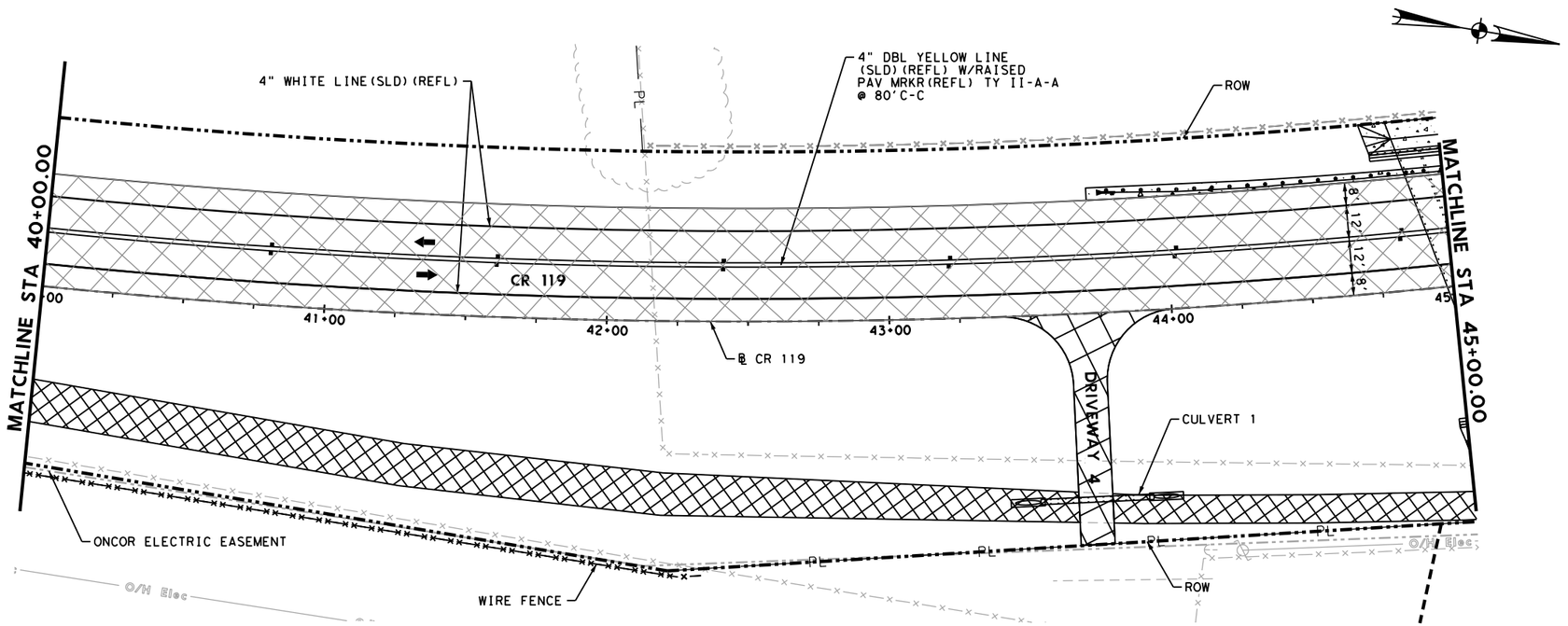
TRAFFIC CONTROL PLAN

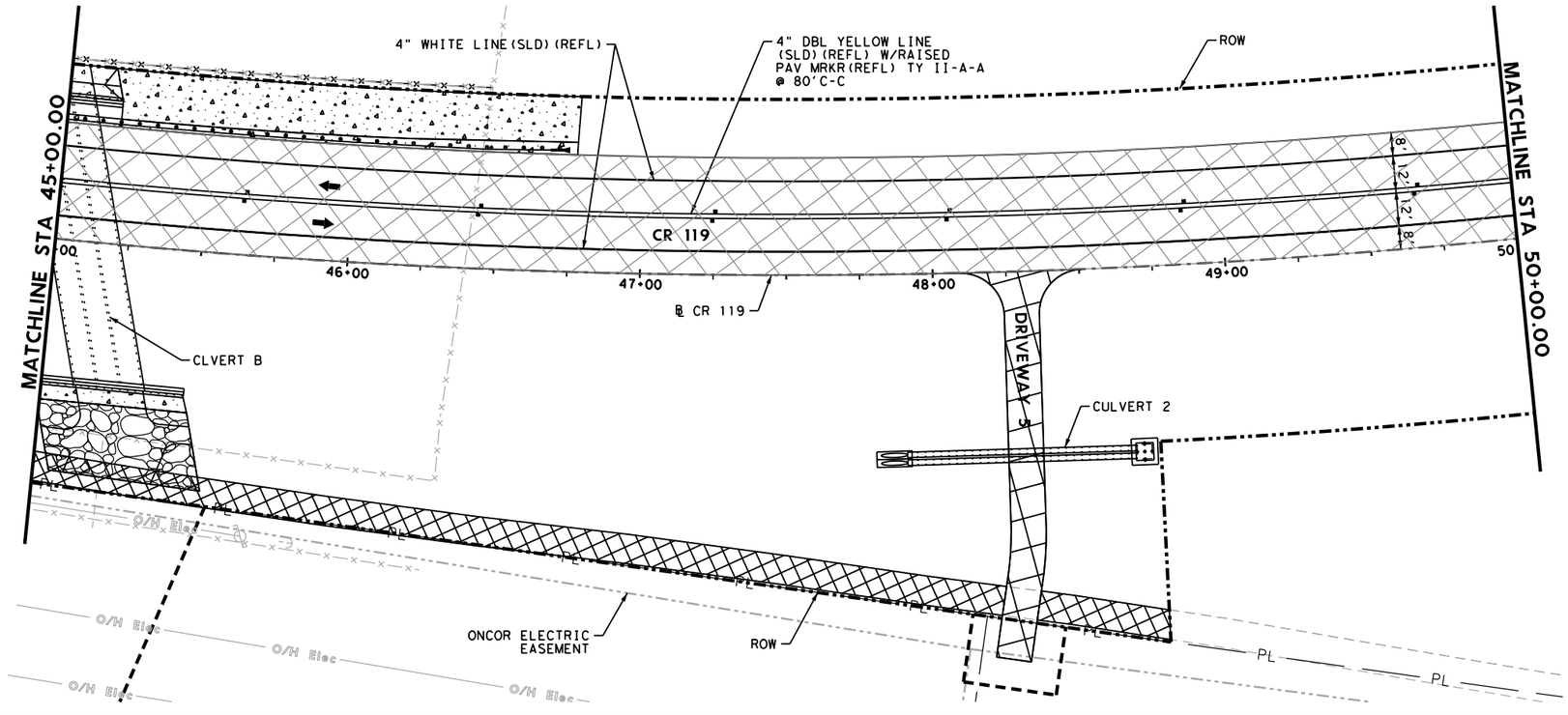
PHASE 2 STEP 1

STA 30+00 TO STA 40+00

SHEET 04 OF 07

FED. RD. DIV. RD.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				51





LEGEND

- A — WK ZN PAV MRK NON-REMOV (Y) 4" (SLD) W/RAIS PAV MRKR (REFL) TY II-A-A @ 80'C-C
- B — WK ZN PAV MRK NON-REMOV (W) 4" (SLD)
- C — WK ZN PAV MRK NON-REMOV (Y) 4" (DOT)
- D — WK ZN PAV MRK NON-REMOV (W) 24" (SLD)
- PL — PROPERTY LINE
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NOTES:
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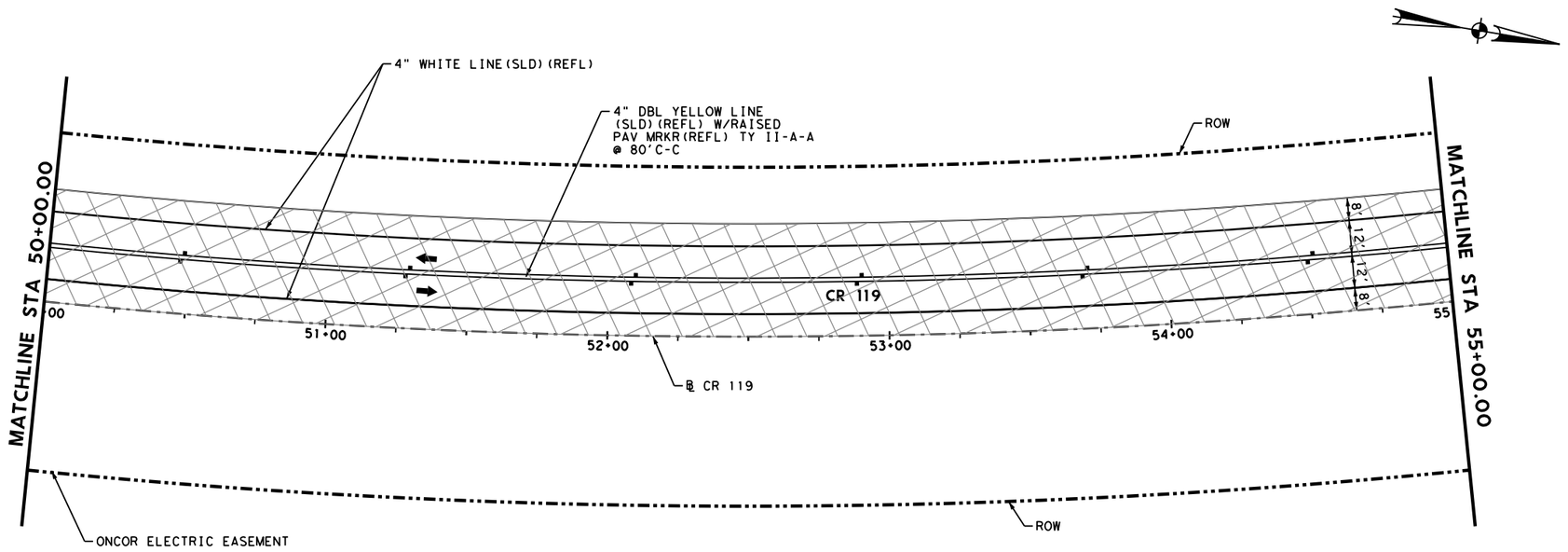
TRAFFIC CONTROL PLAN

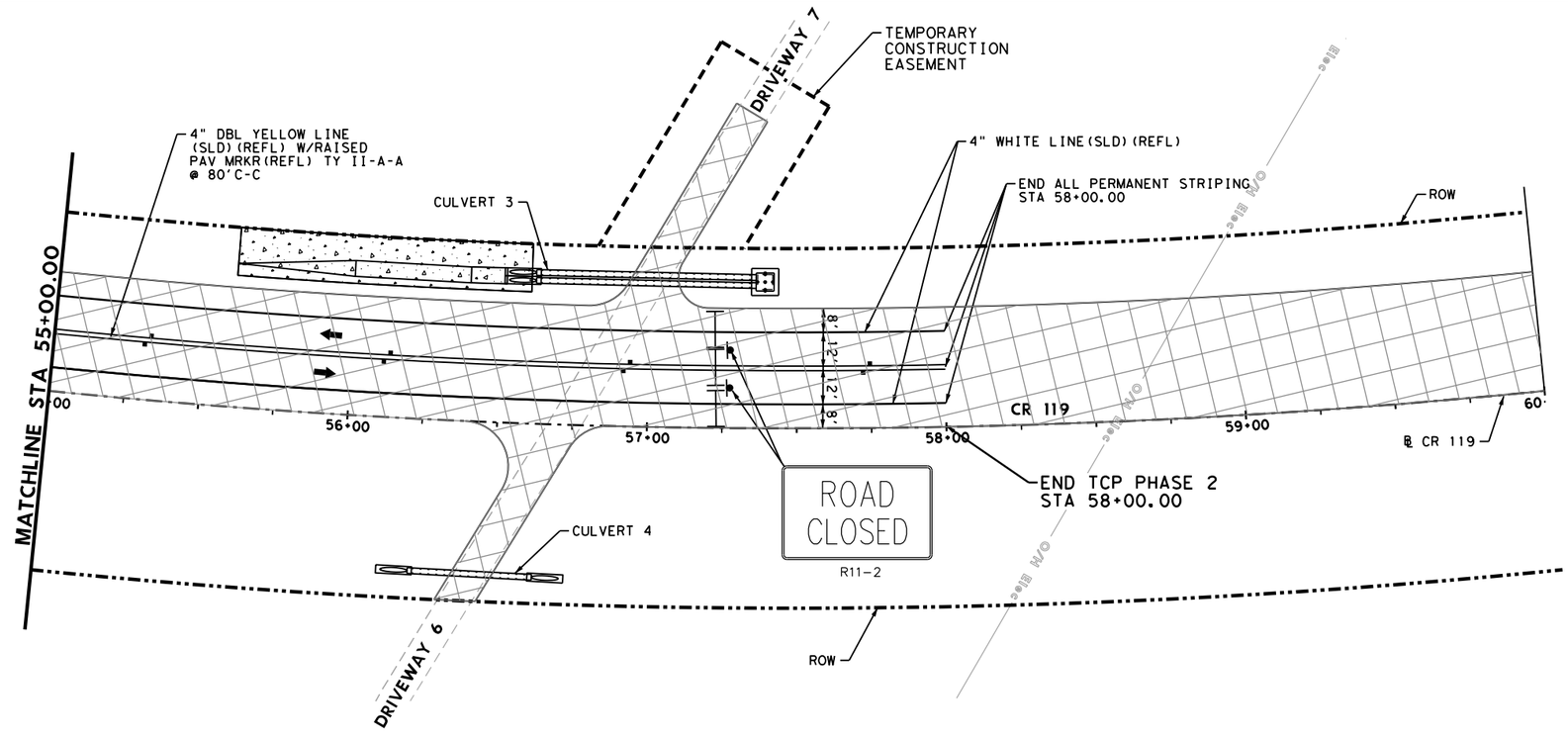
PHASE 2 STEP 1

STA 40+00 TO STA 50+00

SHEET 05 OF 07

FED. RD. DIV. RD.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				52





LEGEND

- [A] WK ZN PAV MRK NON-REMOV (Y)4"(SLD) W/RAIS PAV MRKR (REFL) TY II-A-A @ 80'C-C
- [B] WK ZN PAV MRK NON-REMOV (W)4"(SLD)
- [C] WK ZN PAV MRK NON-REMOV (Y)4"(DOT)
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NOTES:
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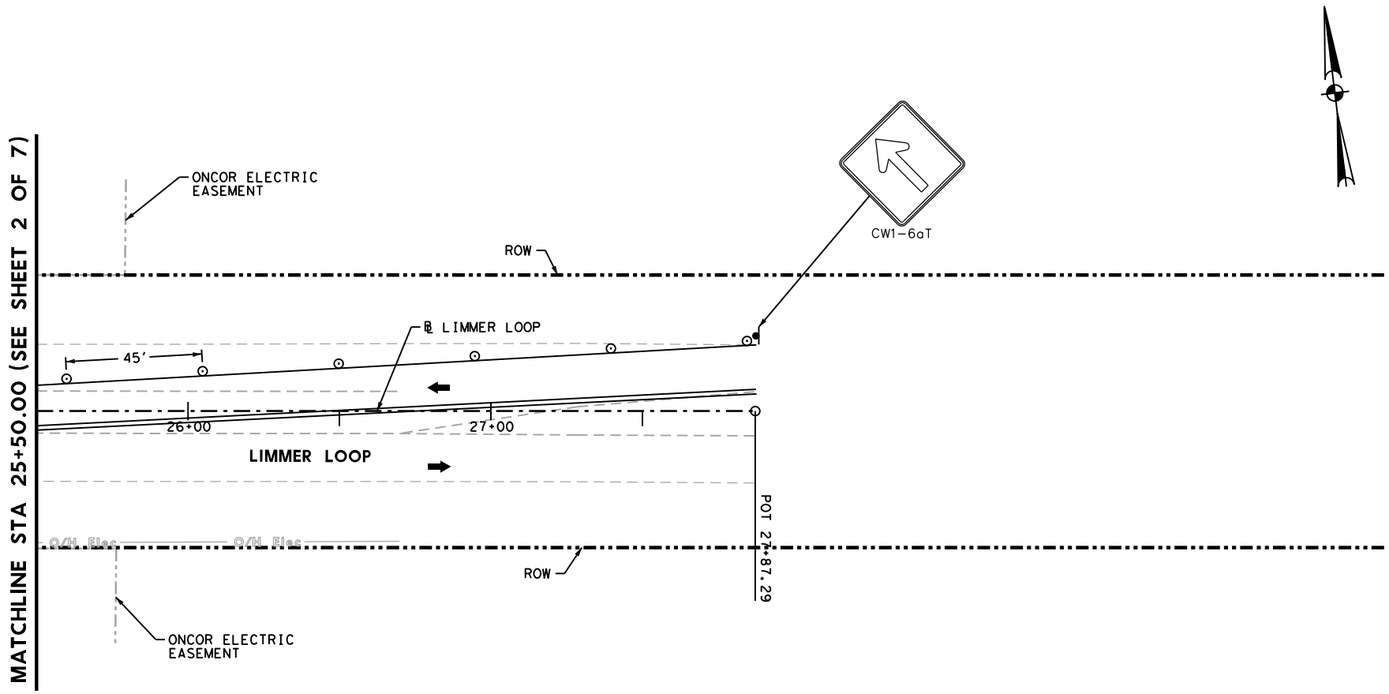
TRAFFIC CONTROL PLAN

PHASE 2 STEP 1

STA 50+00 TO STA 58+00

SHEET 06 OF 07

FED. RD. DIV. RD.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				53



LEGEND

- [A] WK ZN PAV MRK NON-REMOV (Y)4"(SLD) W/RAIS PAV MRKR (REFL) TY II-A-A @ 80'C-C
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1848

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TRAFFIC CONTROL PLAN

PHASE 2 STEP 1

STA 25.50+00 TO END PROJECT

SHEET 07 OF 07

FED. RD. DIV. RD.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				54

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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.

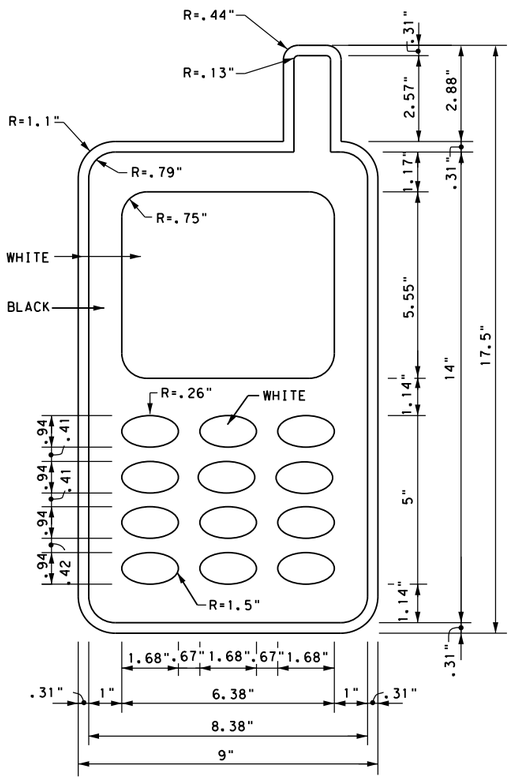
11. Except for devices required by Note 10, traffic control devices should be in place only while work is actually in progress or a definite need exists.

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

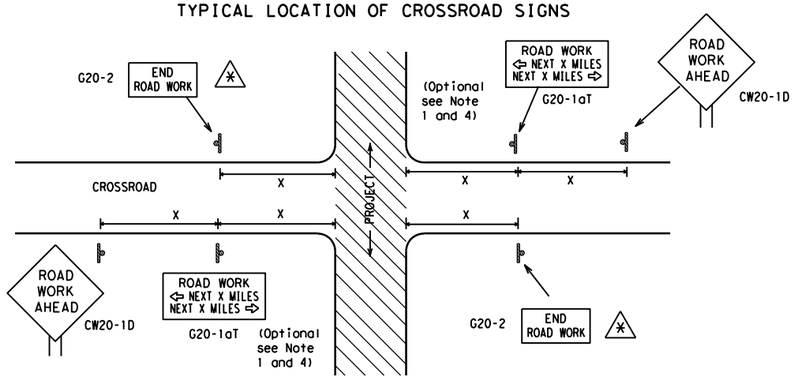
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©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS				CR119
4-03 5-10 8-14	DIST	COUNTY		SHEET NO.
9-07 7-13	06	WILLIAMSON		55

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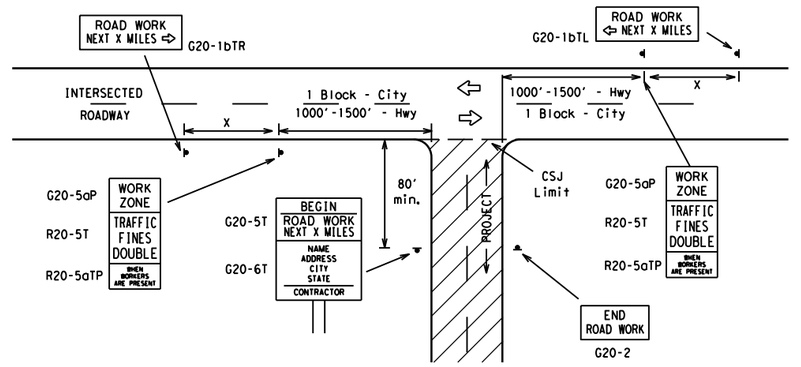
TYPICAL LOCATION OF CROSSROAD SIGNS



✱ 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

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]

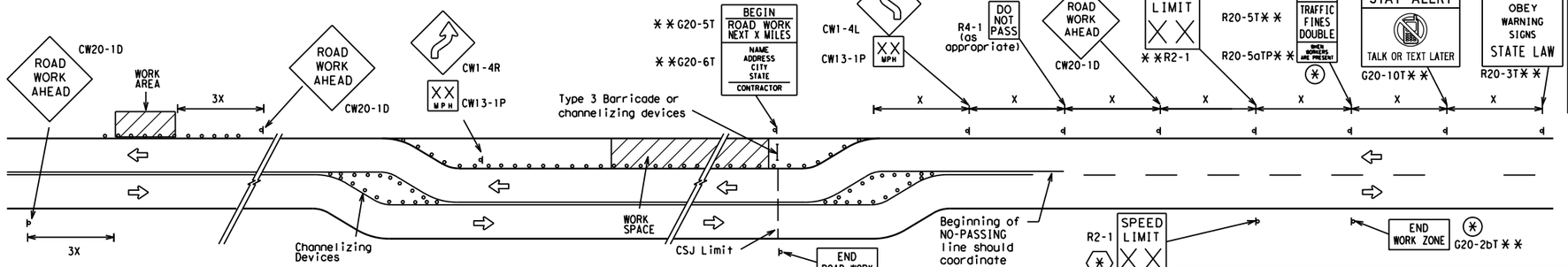
✱ For typical sign spacings on divided highways, expressways and freeways, see Part 6 of the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD) typical application diagrams or TCP Standard Sheets.

△ 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.

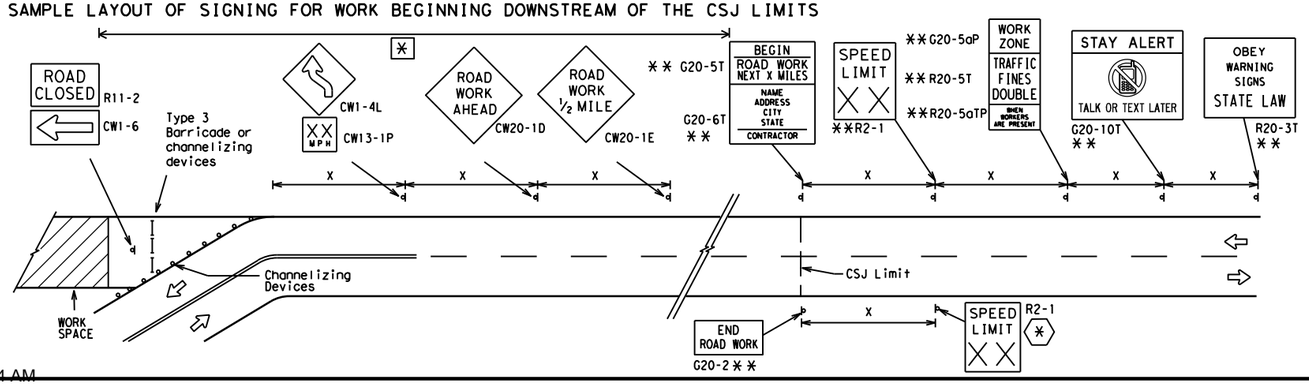
WORK AREAS IN MULTIPLE LOCATIONS WITHIN CSJ LIMITS



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.

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Texas Department of Transportation

Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION PROJECT LIMIT

BC(2)-14

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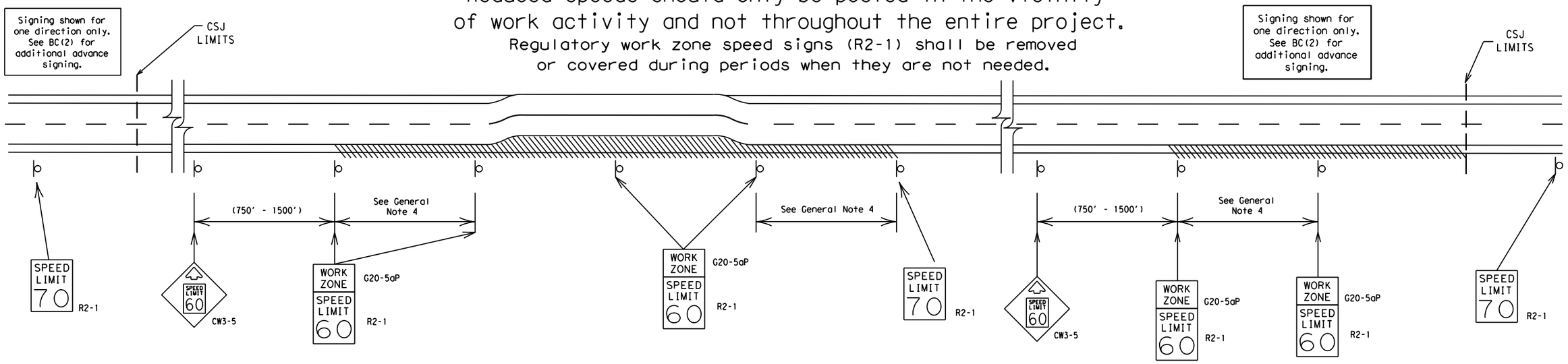
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TYPICAL APPLICATION OF WORK ZONE SPEED LIMIT SIGNS

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

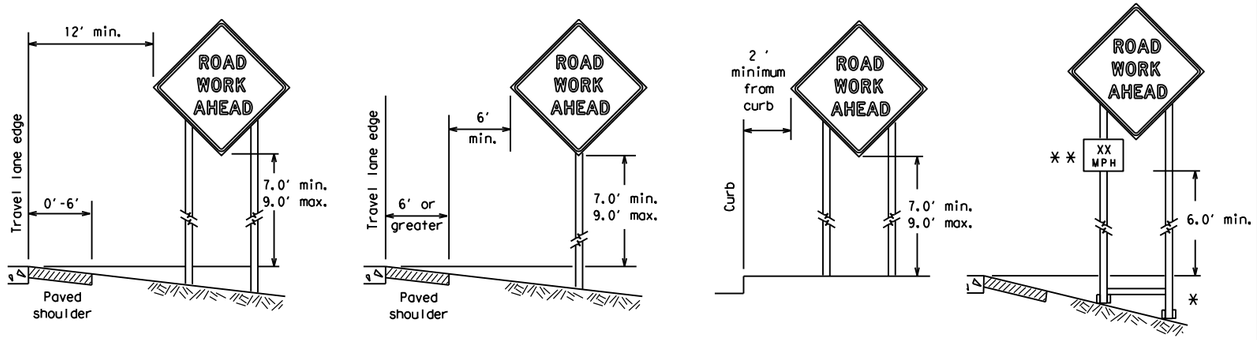
BARRICADE AND CONSTRUCTION WORK ZONE SPEED LIMIT

BC(3)-14

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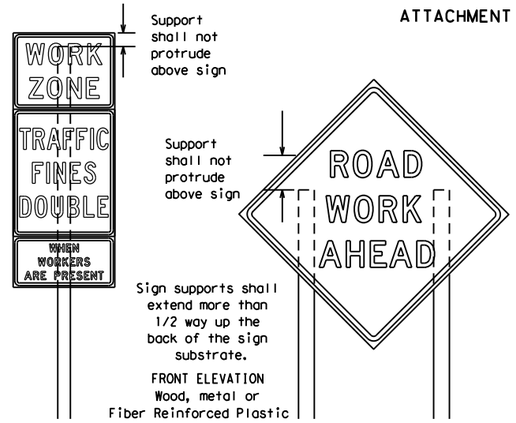
TYPICAL MINIMUM CLEARANCES FOR LONG TERM AND INTERMEDIATE TERM SIGNS

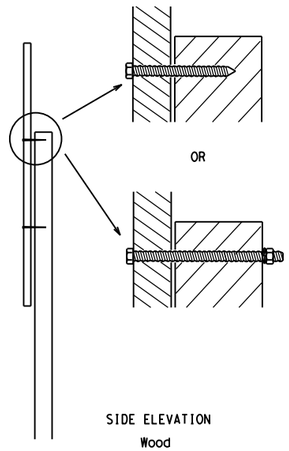


* When placing skid supports on unlevel ground, the leg post lengths must be adjusted so the sign appears straight and plumb. Objects shall NOT be placed under skids as a means of leveling.

** 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





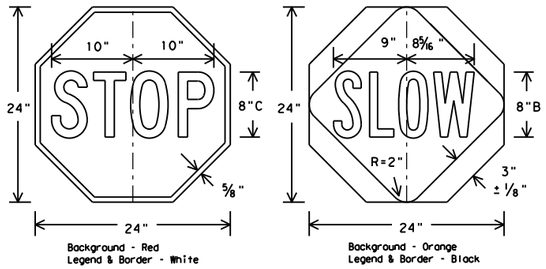
Attachment to wooden supports will be by bolts and nuts or screws. Use TxDOT's or manufacturer's recommended procedures for attaching sign substrates to other types of sign supports

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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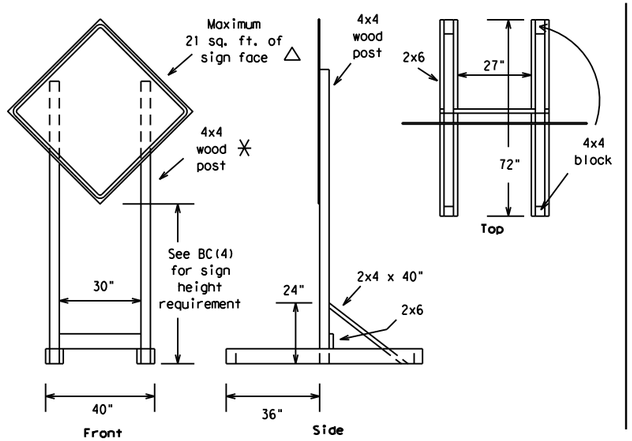
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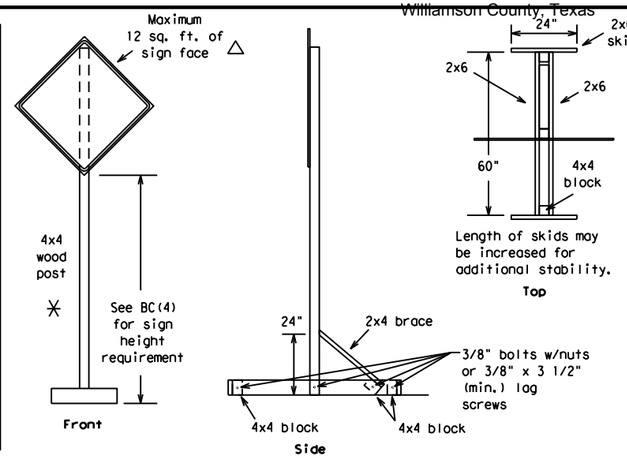
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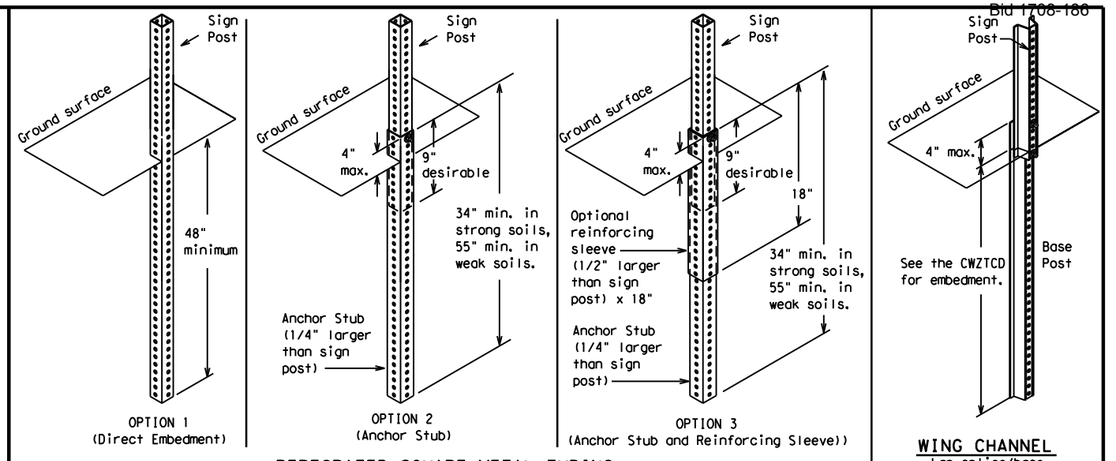
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SKID MOUNTED WOOD SIGN SUPPORTS

LONG/INTERMEDIATE TERM STATIONARY - PORTABLE SKID MOUNTED SIGN SUPPORTS □

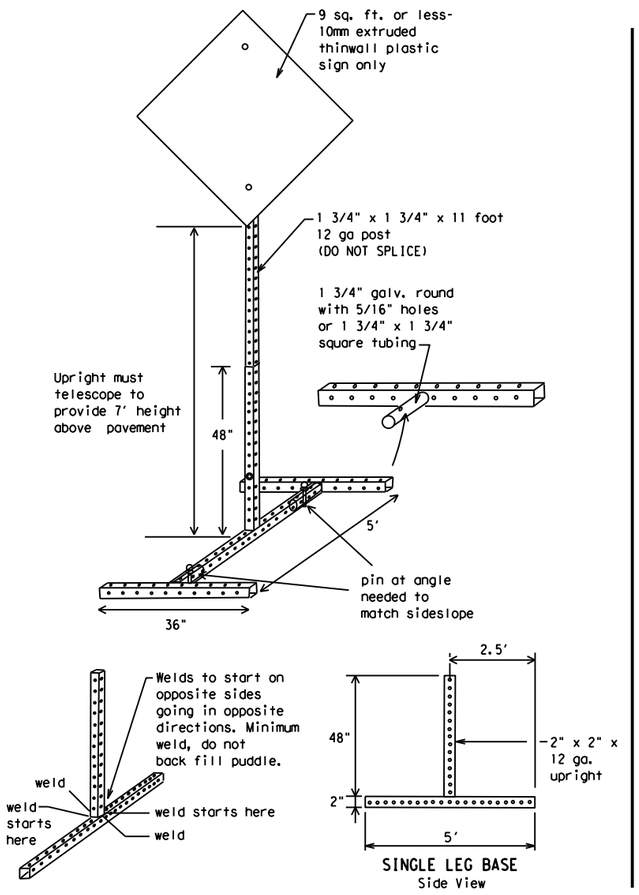


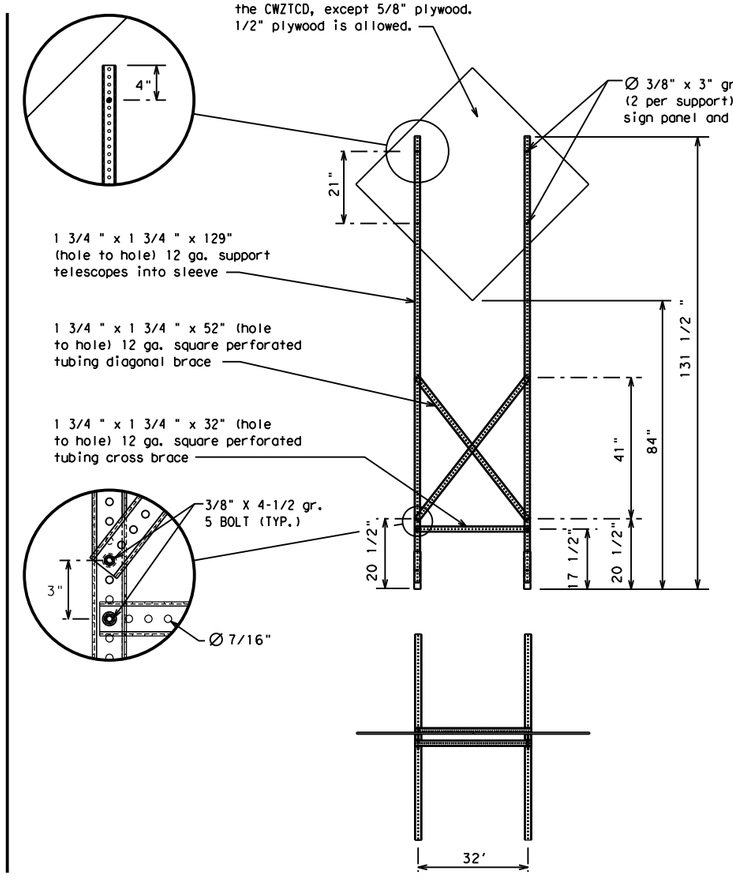
PERFORATED SQUARE METAL TUBING

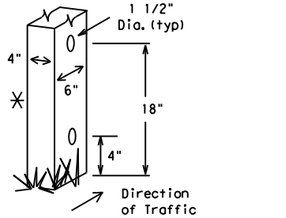
WING CHANNEL
Lap-splice/base bolted anchor

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.

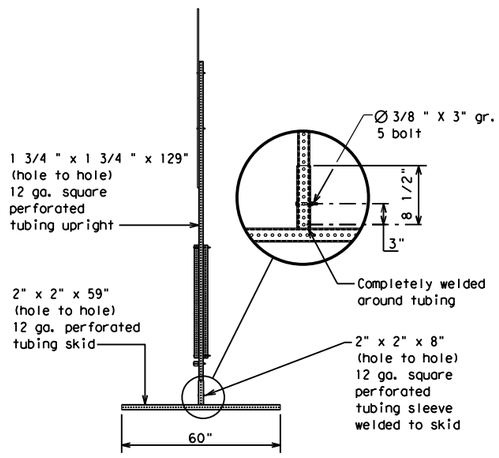






Nominal Post Size	Number of Posts	Maximum Sq. feet of Sign Face	Minimum Soil Embedment	Drilled Hole(s) Required
4 x 4	1	12	36"	NO
4 x 4	2	21	36"	NO
4 x 6	1	21	36"	YES
4 x 6	2	36	36"	YES

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.

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

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

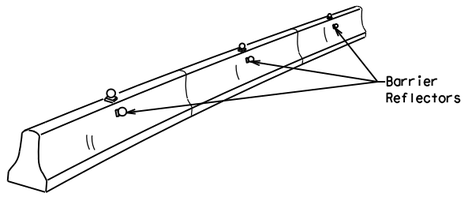
FILE: bc-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS				CR119
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13	06	WILLIAMSON		60

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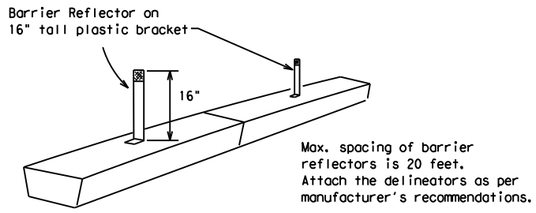
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1. Barrier Reflectors shall be pre-qualified, and conform to the color and reflectivity requirements of DMS-8600. A list of prequalified Barrier Reflectors can be found at the Material Producer List web address shown on BC(1).
2. Color of Barrier Reflectors shall be as specified in the TMUTCD. The cost of the reflectors shall be considered subsidiary to Item 512.

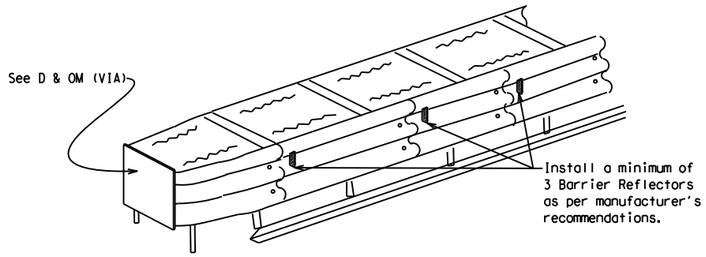


CONCRETE TRAFFIC BARRIER (CTB)

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)

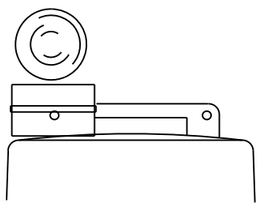


DELINEATION OF END TREATMENTS

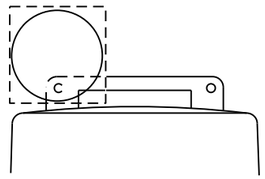
END TREATMENTS FOR
CTB'S USED
IN WORK ZONES

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

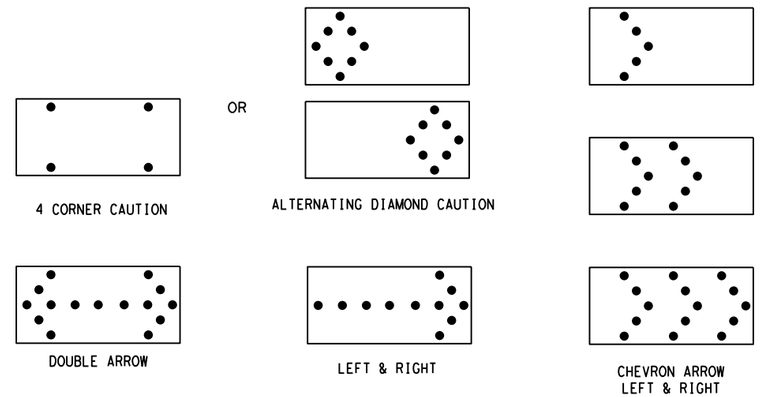
1. Type A flashing warning lights are intended to warn drivers that they are approaching or are in a potentially hazardous area.
2. Type A random flashing warning lights are not intended for delineation and shall not be used in a series.
3. A series of sequential flashing warning lights placed on channelizing 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

FILE: bc-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS 9-07 8-14 7-13				CR119
	DIST	COUNTY		SHEET NO.
	06	WILLIAMSON		61

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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:

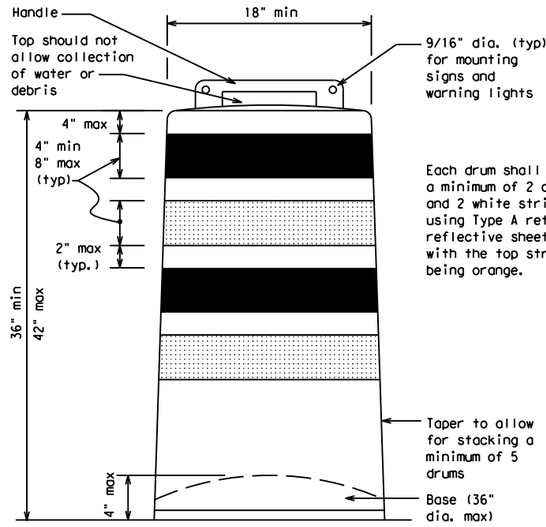
1. Plastic drums shall be a two-piece design; the "body" of the drum shall be the top portion and the "base" shall be the bottom.
2. The body and base shall lock together in such a manner that the body separates from the base when impacted by a vehicle traveling at a speed of 20 MPH or greater but prevents 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.

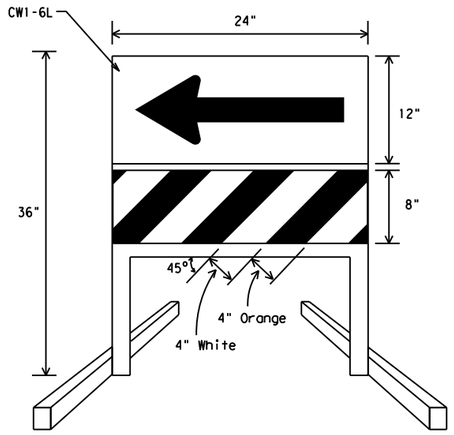
RETROREFLECTIVE SHEETING

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

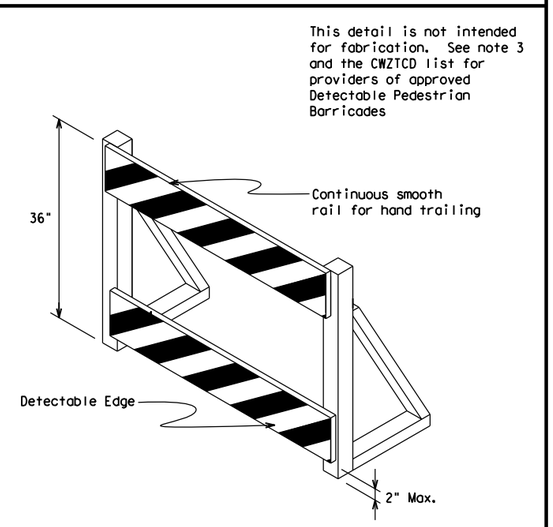
1. Unballasted bases shall be large enough to hold up to 50 lbs. of sand. This base, when filled with the ballast material, should weigh between 35 lbs (minimum) and 50 lbs (maximum). The ballast may be sand in one to three sandbags separate from the base, sand in a sand-filled plastic base, or other 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.





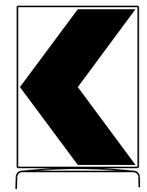
DIRECTION INDICATOR BARRICADE

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.

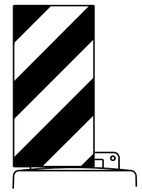


DETECTABLE PEDESTRIAN BARRICADES

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.

SHEET 8 OF 12

Texas Department of Transportation

Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

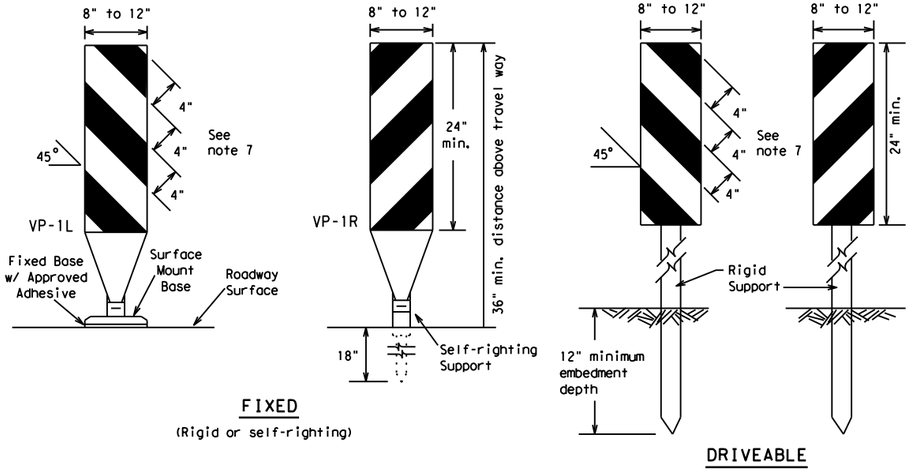
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©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS				CR119
4-03 7-13	DIST	COUNTY		SHEET NO.
9-07 8-14	06	WILLIAMSON		62

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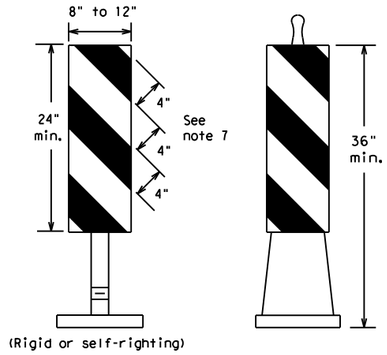
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FIXED
(Rigid or self-righting)

DRIVEABLE

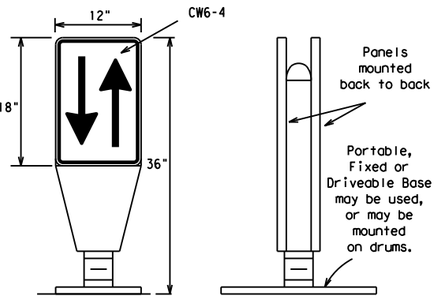


(Rigid or self-righting)

PORTABLE

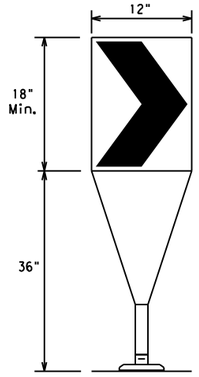
1. Vertical Panels (VP's) are normally used to channelize traffic or divide opposing lanes of traffic.
2. VP's may be used in daytime or nighttime situations. They may be used at the edge of shoulder drop-offs and other areas such as lane transitions where positive daytime and nighttime delineation is 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)



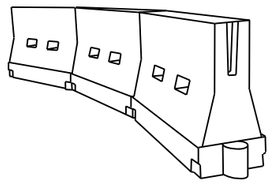
Fixed Base w/ Approved Adhesive (Driveable Base, or Flexible Support can be used)

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

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BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

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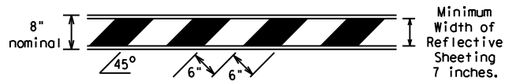
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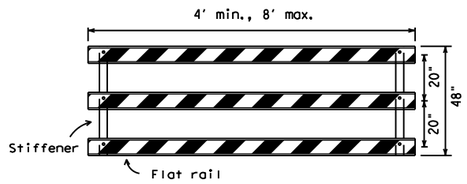
TYPE 3 BARRICADES

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.



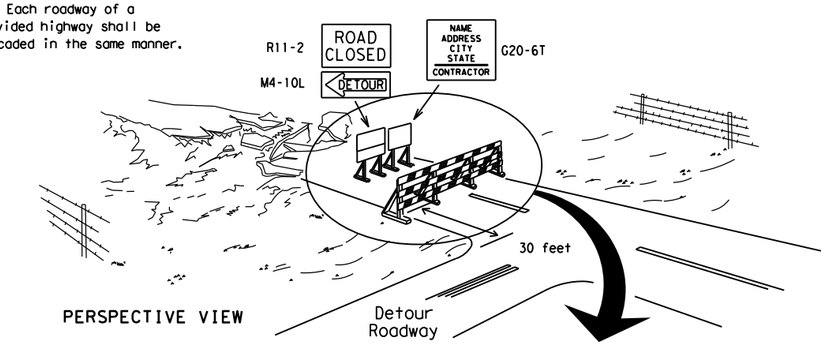
TYPICAL STRIPING DETAIL FOR BARRICADE RAIL



Stiffener may be inside or outside of support, but no more than 2 stiffeners shall be allowed on one barricade.

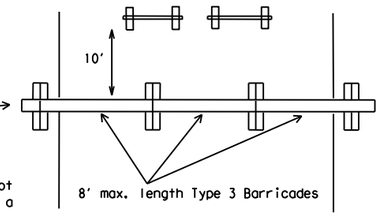
TYPICAL PANEL DETAIL FOR SKID OR POST TYPE BARRICADES

Each roadway of a divided highway shall be barricaded in the same manner.



PERSPECTIVE VIEW

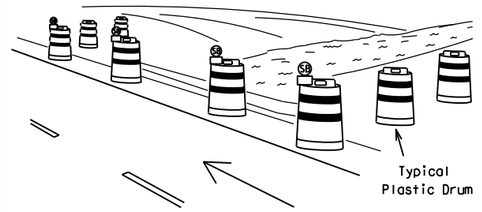
The three rails on Type 3 barricades shall be reflectorized orange and reflective white stripes on one side facing one-way traffic and both sides for two-way traffic.
Barricade striping should slant downward in the direction of detour.



PLAN VIEW

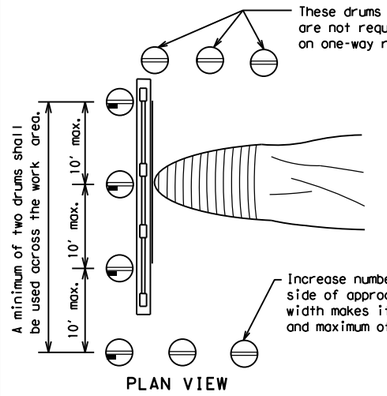
1. Signs should be mounted on independent supports at a 7 foot mounting height in center of roadway. The signs should be a minimum of 10 feet behind Type 3 Barricades.
2. Advance signing shall be as specified elsewhere in the plans.

TYPE 3 BARRICADE (POST AND SKID) TYPICAL APPLICATION



PERSPECTIVE VIEW

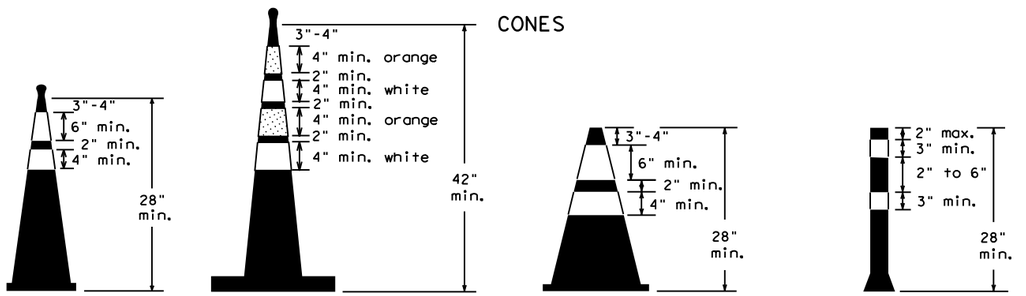
1. Where positive redirectional capability is provided, drums may be omitted.
2. Plastic construction fencing may be used with drums for safety as required in the plans.
3. Vertical Panels on flexible support may be substituted for drums when the shoulder width is less than 4 feet.
4. When the shoulder 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

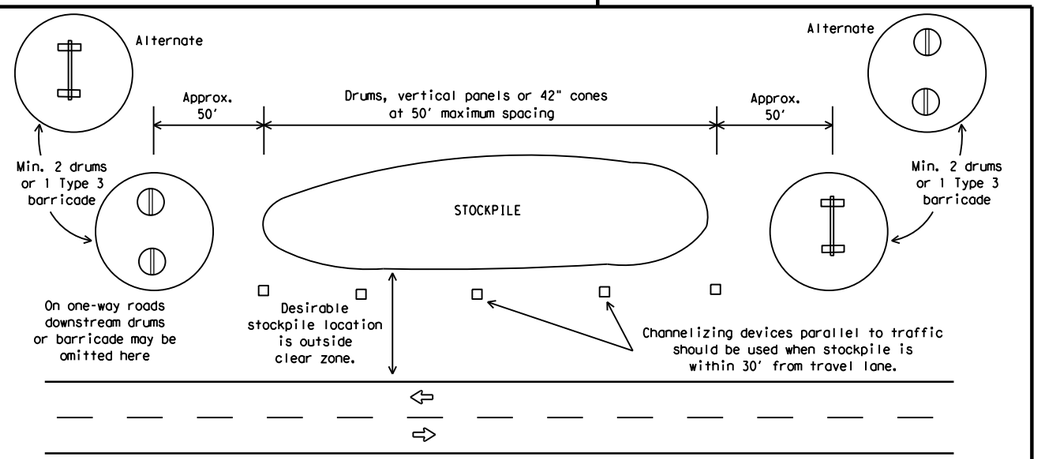
CULVERT WIDENING OR OTHER ISOLATED WORK WITHIN THE PROJECT LIMITS



28" Cones shall have a minimum weight of 9 1/2 lbs.

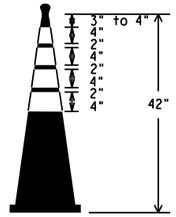
42" 2-piece cones shall have a minimum weight of 30 lbs. including base.

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.

Texas Department of Transportation — Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(10)-14

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	06	WILLIAMSON		64

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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.

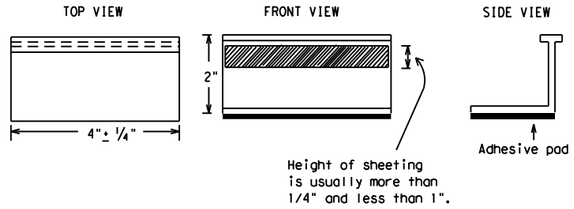
MAINTAINING WORK ZONE PAVEMENT MARKINGS

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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SHEET 11 OF 12

Texas Department of Transportation — Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION PAVEMENT MARKINGS

BC(11)-14

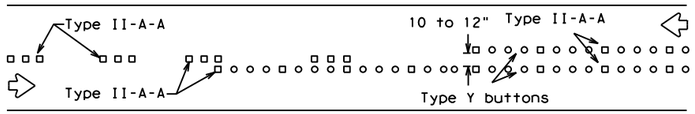
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© TxDOT February 1998	CONT	SECT	JOB	HIGHWAY
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1-02 7-13	06	WILLIAMSON		65
11-02 8-14				

105

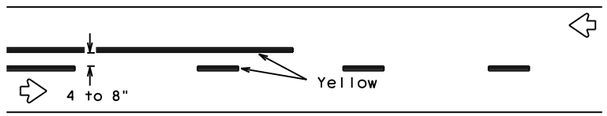
PAVEMENT MARKING PATTERNS



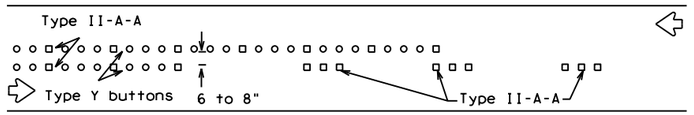
REFLECTORIZED PAVEMENT MARKINGS - PATTERN A



RAISED PAVEMENT MARKERS - PATTERN A



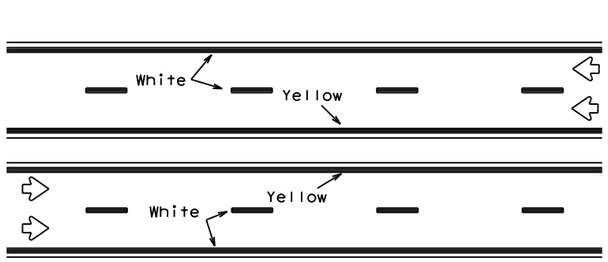
REFLECTORIZED PAVEMENT MARKINGS - PATTERN B



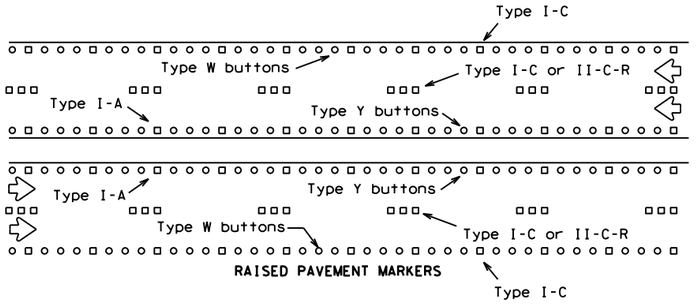
RAISED PAVEMENT MARKERS - PATTERN B

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



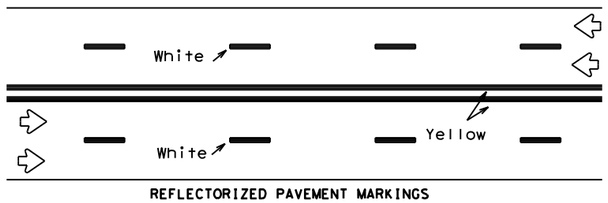
REFLECTORIZED PAVEMENT MARKINGS



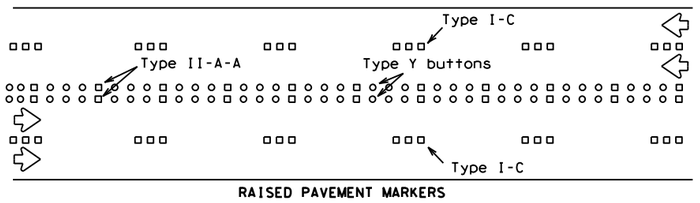
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

EDGE & LANE LINES FOR DIVIDED HIGHWAY



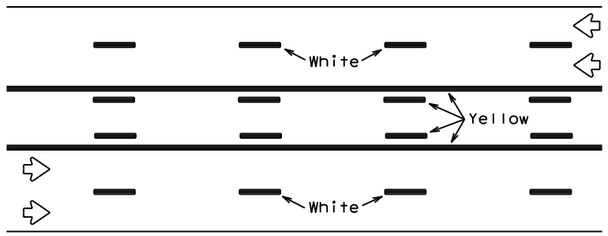
REFLECTORIZED PAVEMENT MARKINGS



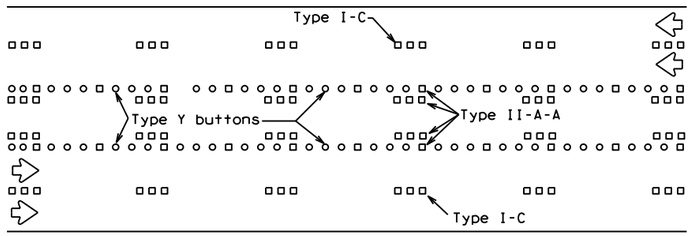
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS



REFLECTORIZED PAVEMENT MARKINGS



RAISED PAVEMENT MARKERS

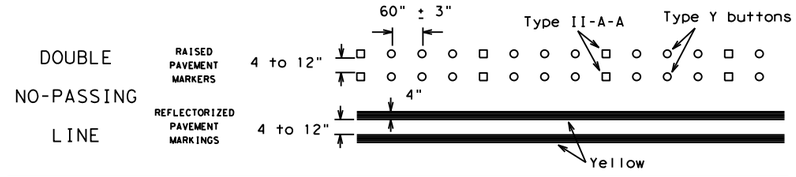
Prefabricated markings may be substituted for reflectorized pavement markings.

TWO-WAY LEFT TURN LANE

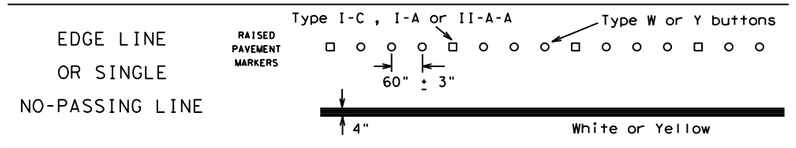
STANDARD WORK ZONE PAVEMENT MARKINGS DETAILS

SOLID LINES

DOUBLE NO-PASSING LINE

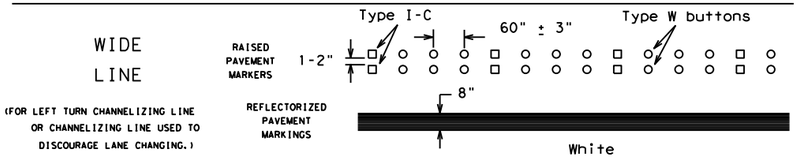


EDGE LINE OR SINGLE NO-PASSING LINE



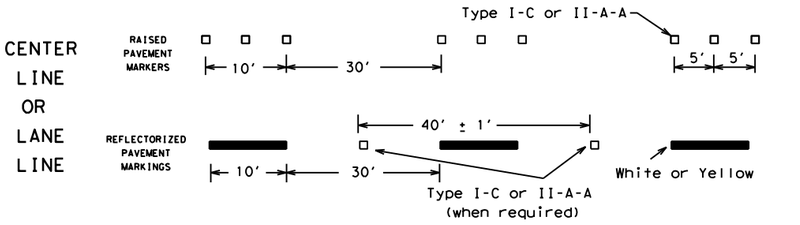
WIDE LINE

(FOR LEFT TURN CHANNELIZING LINE OR CHANNELIZING LINE USED TO DISCOURAGE LANE CHANGING.)

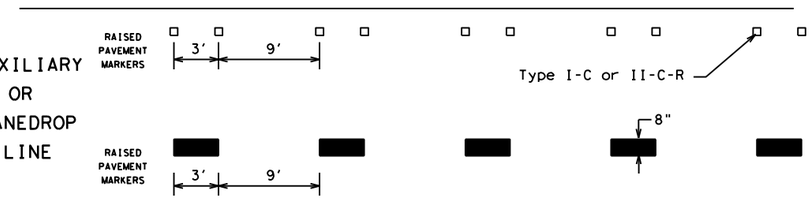


BROKEN LINES

CENTER LINE OR LANE LINE

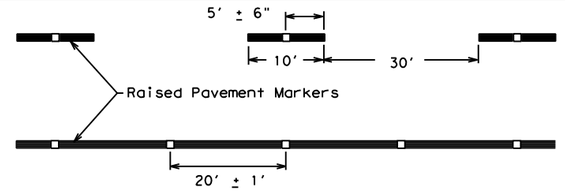


AUXILIARY OR LANEDROP LINE



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

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© TxDOT February 1998	CONT	SECT	JOB	HIGHWAY
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2-98 7-13	06	WILLIAMSON		66
11-02 8-14				

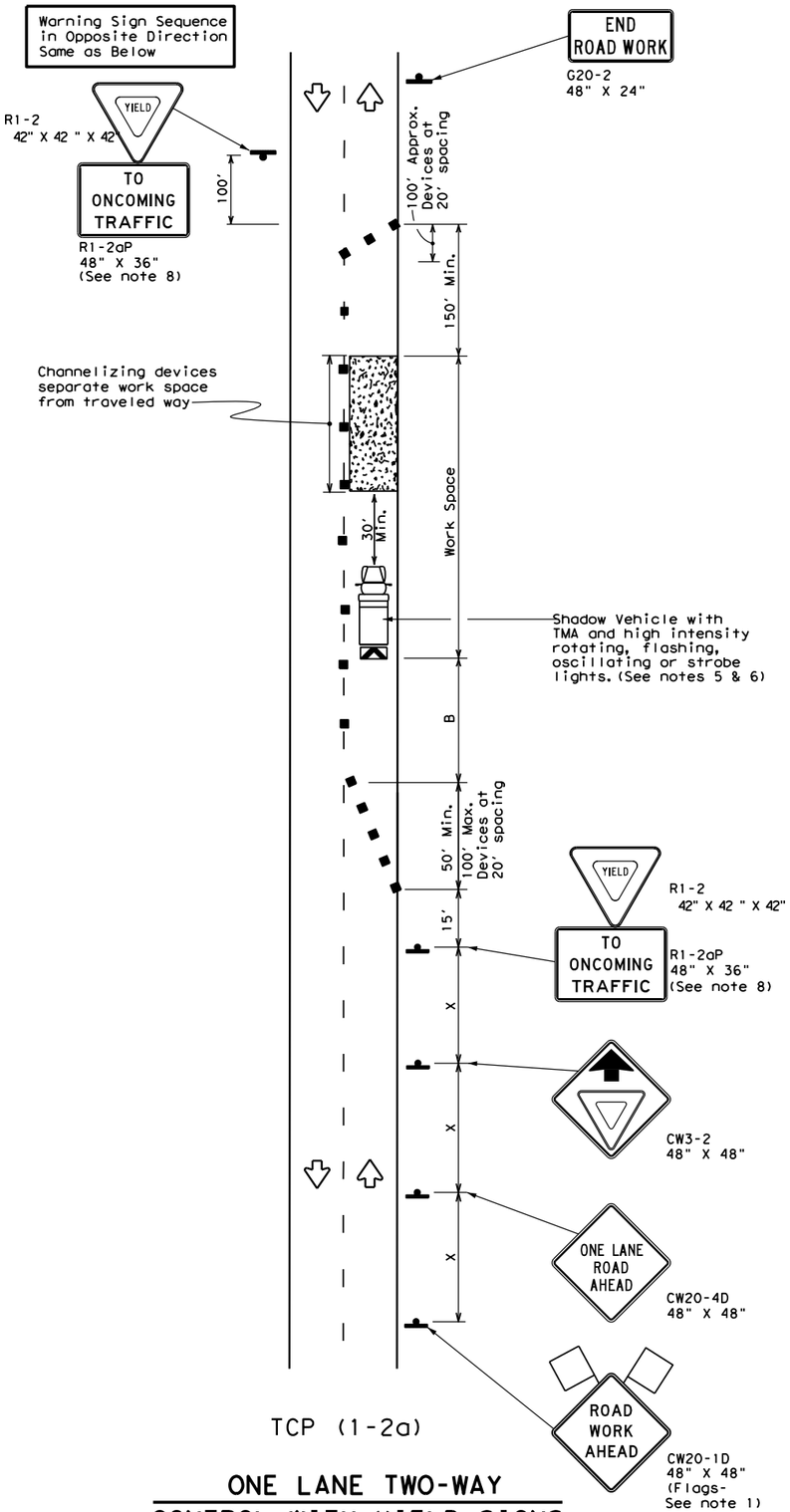
106

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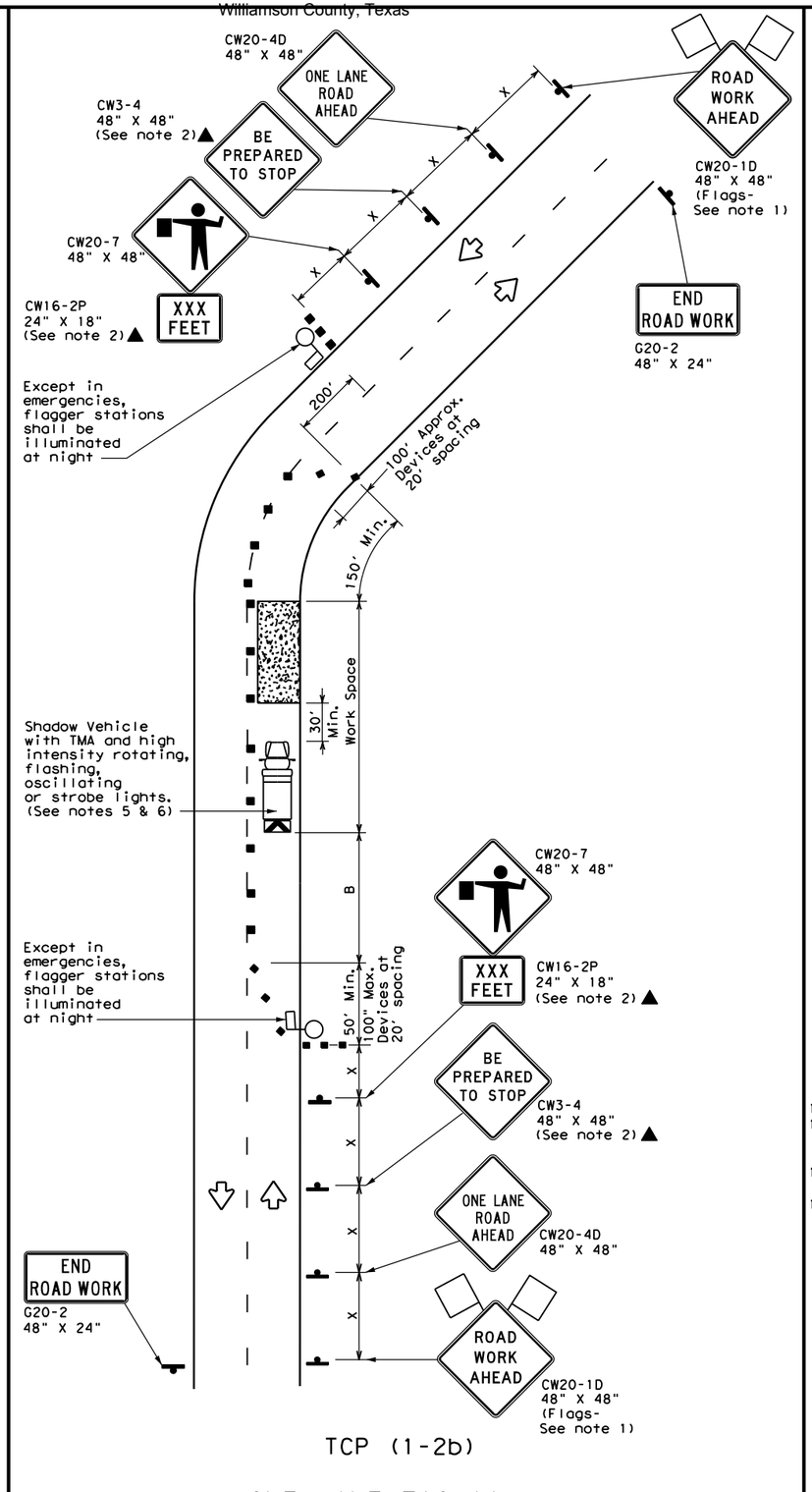
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TCP (1-2a)

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	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 CW20-4D "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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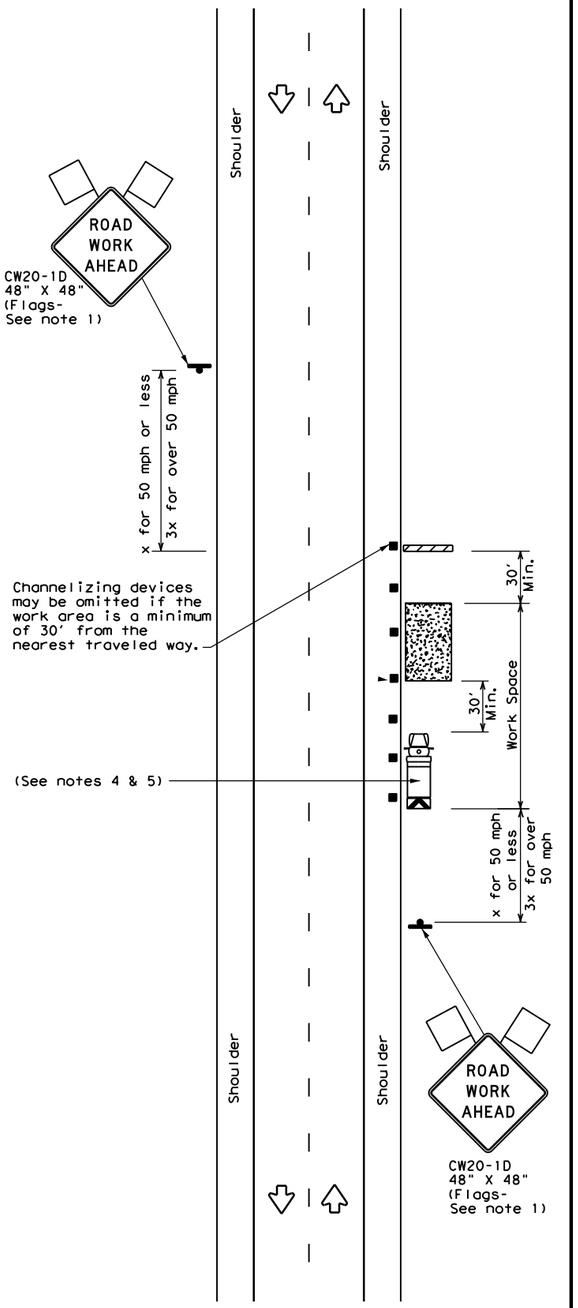
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2-94	DIST	COUNTY		SHEET NO.
1-97	06	WILLIAMSON		67
4-98				

152

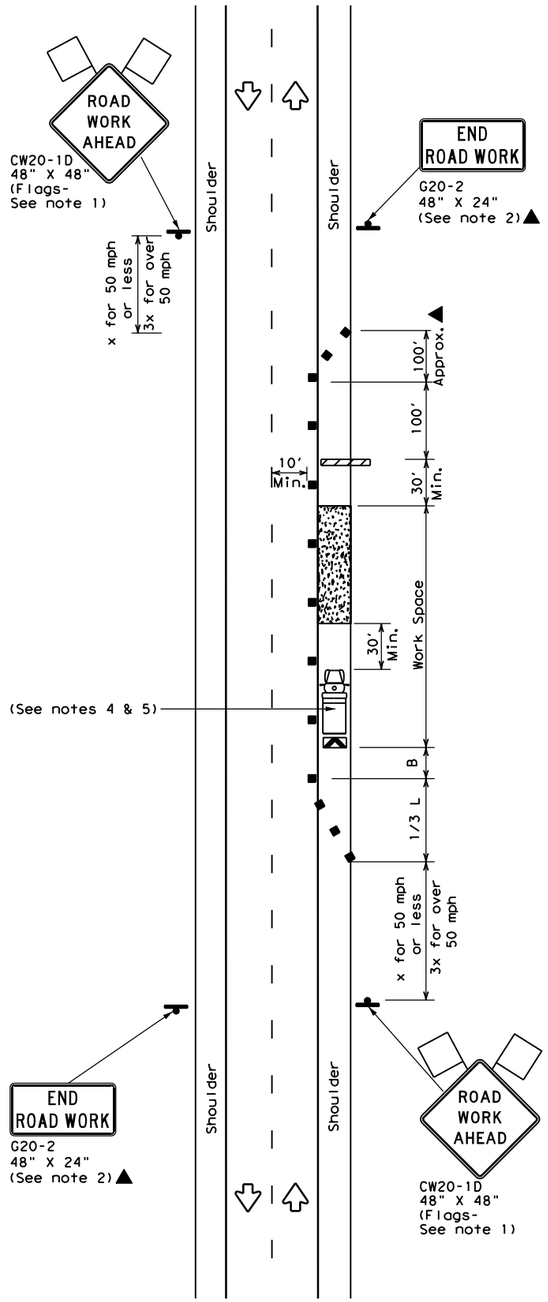
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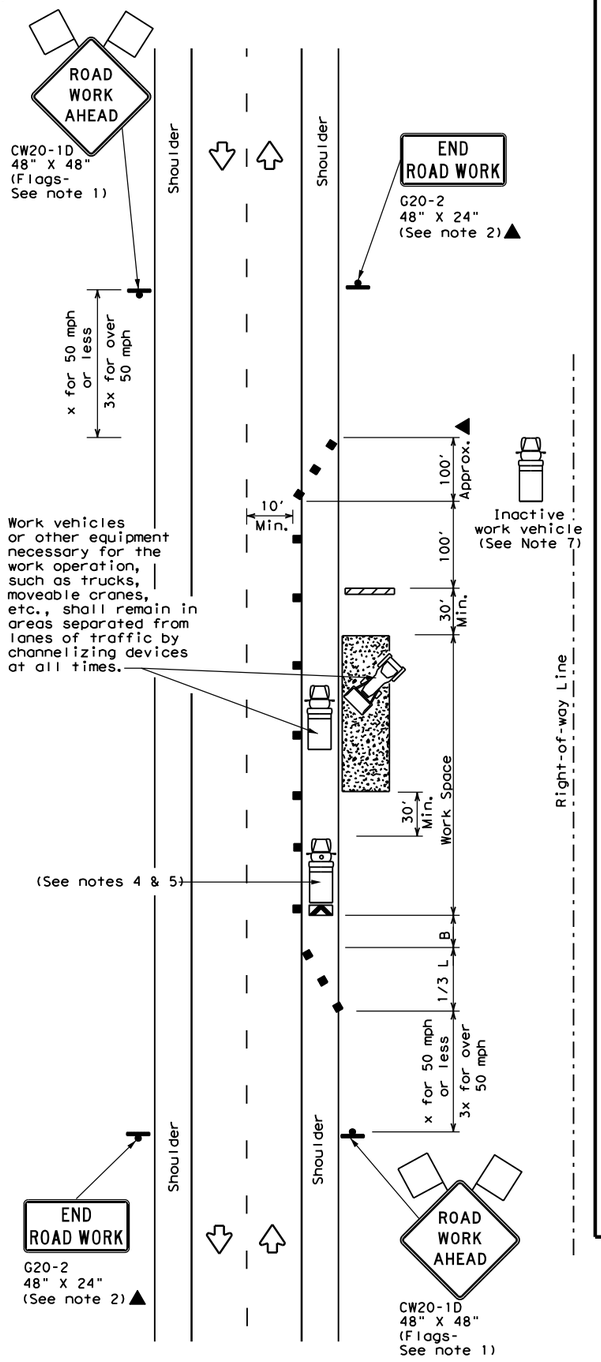
TCP (2-1a)

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	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 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

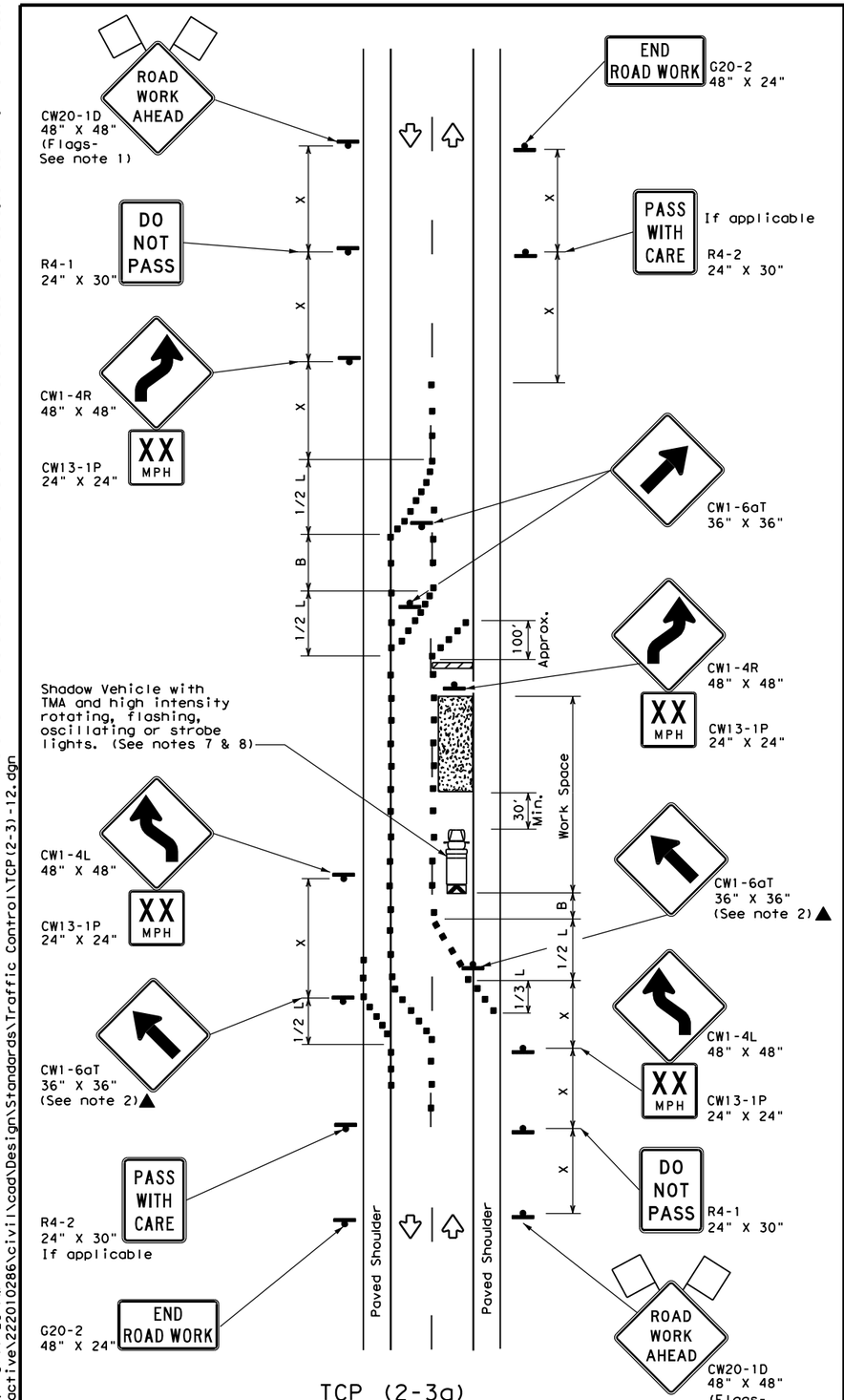
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2-94 2-12	CONT	SECT	JOB	HIGHWAY
8-95				CR119
1-97	DIST	COUNTY		SHEET NO.
4-98	06	WILLIAMSON		68
161				

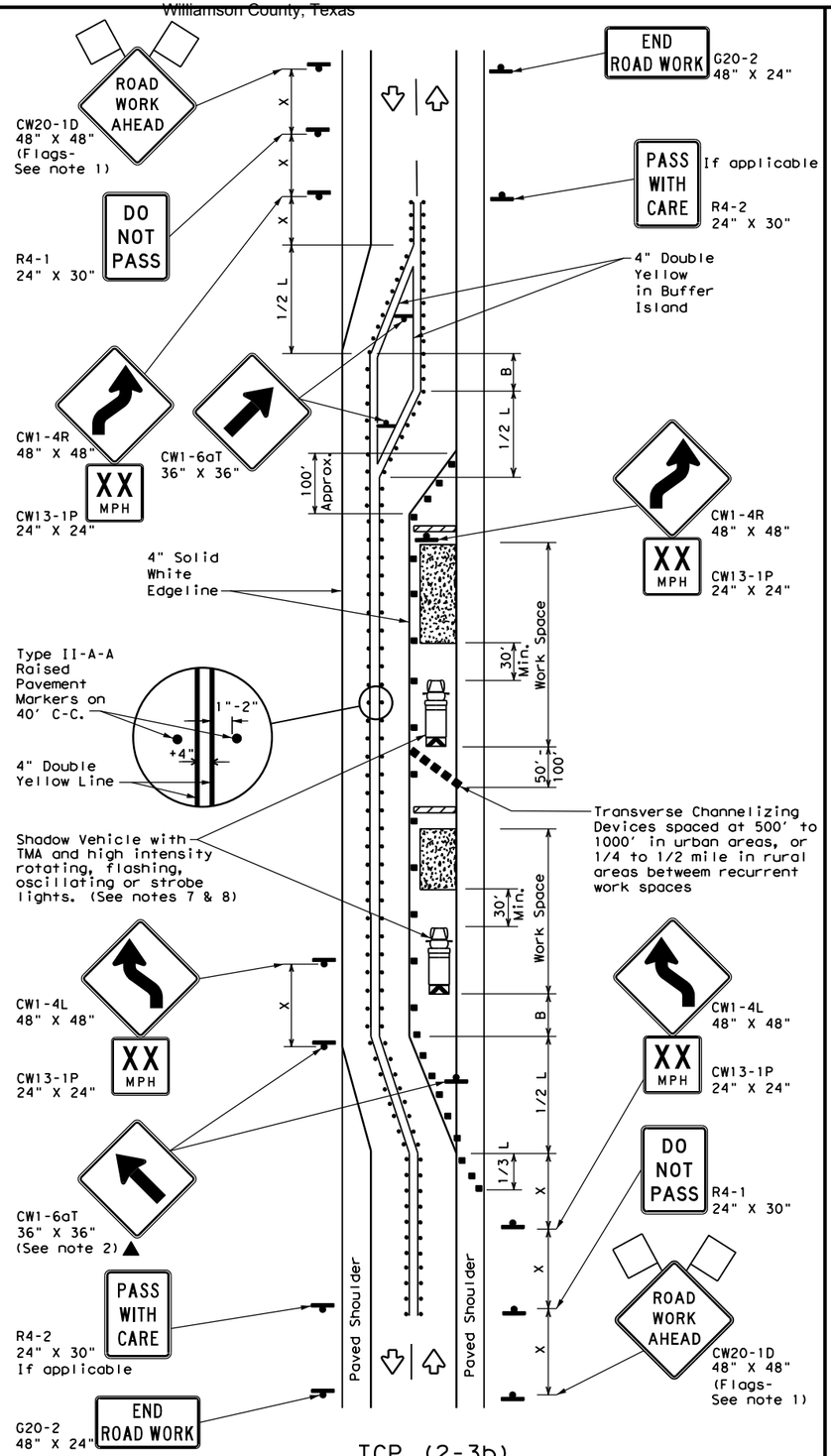
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TCP (2-3a)
2-LANE ROADWAY WITH PAVED SHOULDERS

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

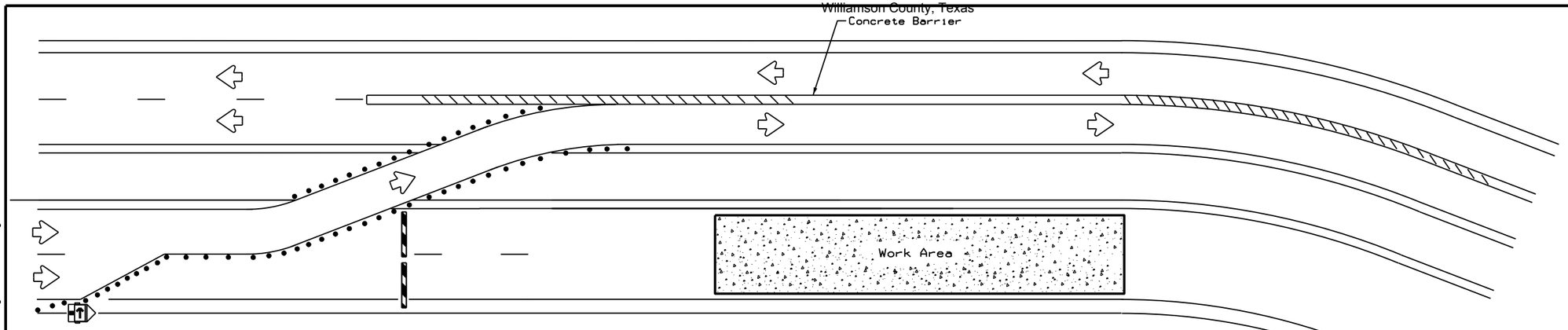
TCP(2-3)-12

© TxDOT December 1985

DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT

REVISIONS	CONT	SECT	JOB	HIGHWAY
8-95 2-12				CR119
1-97				
4-98	DIST	COUNTY		SHEET NO.
3-03	06	WILLIAMSON		69
163				

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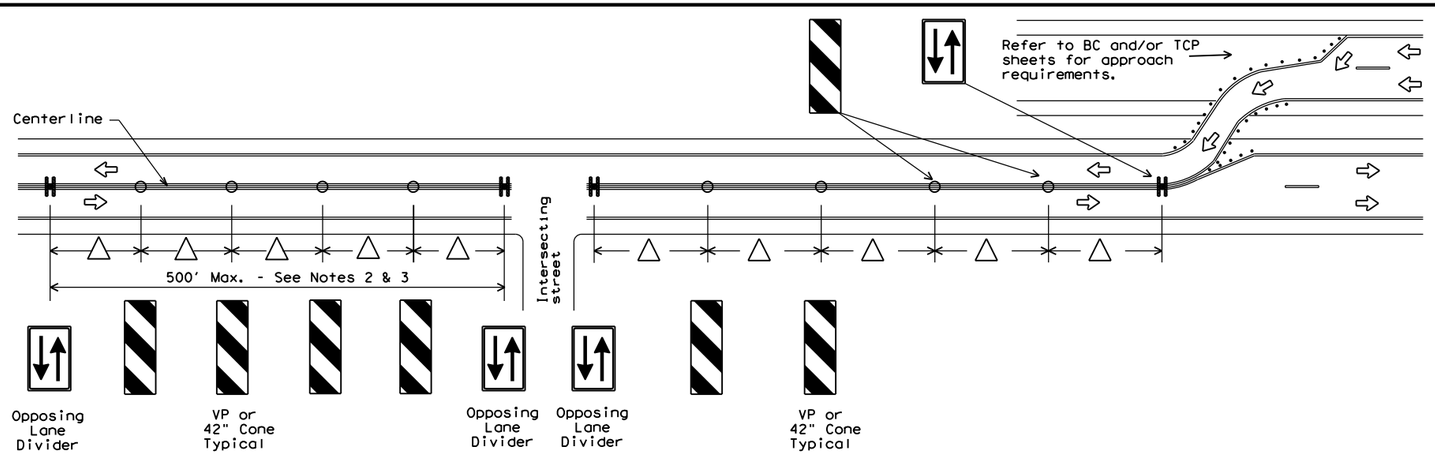


LEGEND	
	Type 3 Barricade
• • •	Channelizing Devices
	Trailer Mounted Flashing Arrow Board
	Sign
\ \ \ \	Safety glare fence

NOTES:

1. Length of Safety Glare Fence will be specified elsewhere in the plans.
2. The cumulative nominal length of the modular units shall equal the length of the individual sections of temporary concrete traffic barrier on which they are installed so the joint between barrier sections will not be spanned by any one unit.
3. Panel/blades will be designed such that reflective sheeting conforming with Departmental Material Specification DMS-8300, Sign Face Materials, Type B or C Yellow, minimum size of 2 inches by 12 inches can be attached to the edge of the panel/blade. The sheeting shall be attached to one panel/blade per section of concrete barrier not to exceed a spacing of 30 feet. Barrier reflectors are not necessary when panel/blades are installed with reflective sheeting as described.
4. Payment for these devices will be under statewide Special Specification "Modular Glare Screens for Headlight Barrier."
5. This detail is only intended to show types of locations where Glare Screens would be appropriate. Required signing and other devices shall be as shown elsewhere in the plans.

BARRIER DELINEATION WITH MODULAR GLARE SCREENS



VERTICAL PANELS & OPPOSING TRAFFIC LANE DIVIDERS (OTLD) SEPARATING TWO-WAY TRAFFIC ON NORMALLY DIVIDED HIGHWAYS

NOTES:

1. When two-lane, two way traffic control must be maintained on one roadway of a normally divided highway, opposing traffic shall be separated with either temporary traffic barriers, channelizing devices, or a temporary raised island throughout the length of the two way operation. The above Typical Application is intended to show the appropriate application of channelizing devices when they are used for this purpose. This is not a traffic control plan. If this detail is to be used for other types of roads or applications, those locations should be stated elsewhere in the plans.

△ 2. Space devices according to the Tangent Spacing shown on the Device Spacing table on BC(9) but not exceeding 100'.

3. Every fifth device should be an OTLD except when spaced closer to accommodate an intersection. An OTLD should be the first device on each side of intersecting streets or roads.

4. Locations where surface mount bases with adhesives or self-righting devices will be required in order to maintain them in their proper position should be noted elsewhere in the plans.

DEPARTMENTAL MATERIAL SPECIFICATIONS	
SIGN FACE MATERIALS	DMS-8300
DELINEATORS AND OBJECT MARKERS	DMS-8600
MODULAR GLARE SCREENS FOR HEADLIGHT BARRIER	DMS-8610

Only pre-qualified products shall be used. A copy of the "Compliant Work Zone Traffic Control Devices List" (CWZTCD) describes pre-qualified products and their sources and may be found at the following web address:
http://www.txdot.gov/txdot_library/publications/construction.htm

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN TYPICAL DETAILS

WZ(TD)-13

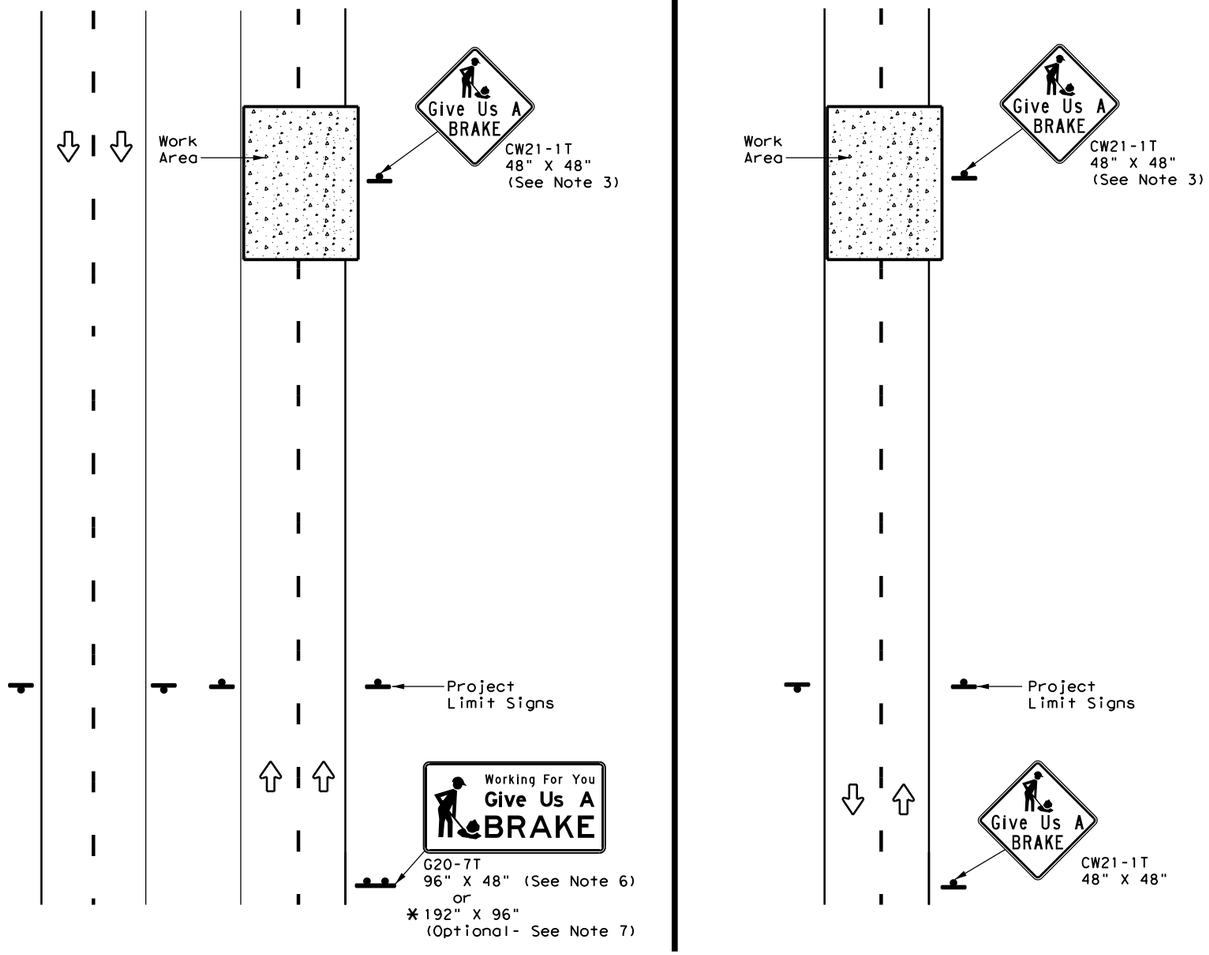
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©TxDOT	February 1998	CONT	SECT	JOB	HIGHWAY
REVISIONS					CR119
4-98		DIST	COUNTY		SHEET NO.
3-03		06	WILLIAMSON		70
7-13					

110

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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

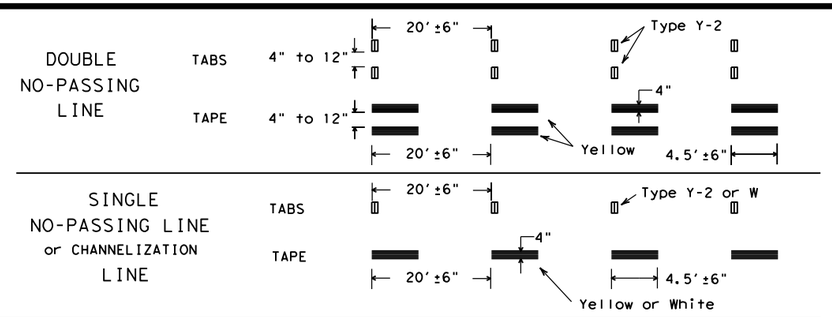
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©TxDOT August 1995	CONT	SECT	JOB	HIGHWAY
REVISIONS				CR119
6-96 5-98 7-13	DIST	COUNTY		SHEET NO.
8-96 3-03	06	WILLIAMSON		71

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WORK ZONE SHORT TERM PAVEMENT MARKINGS DETAILS



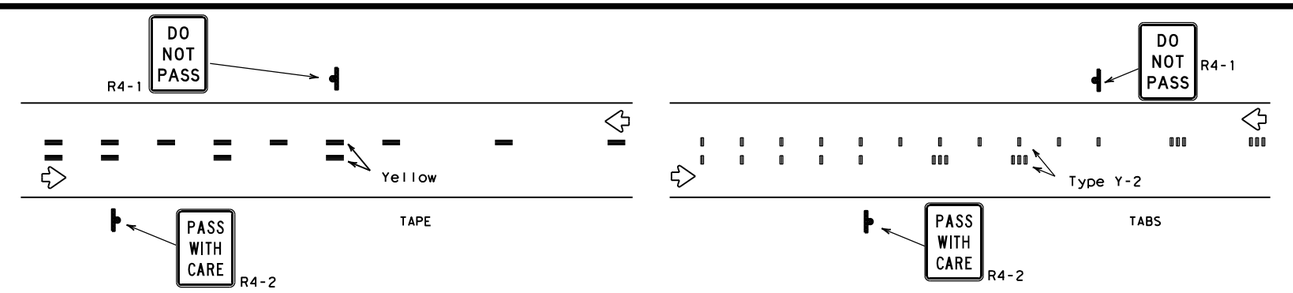
NOTES:

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.

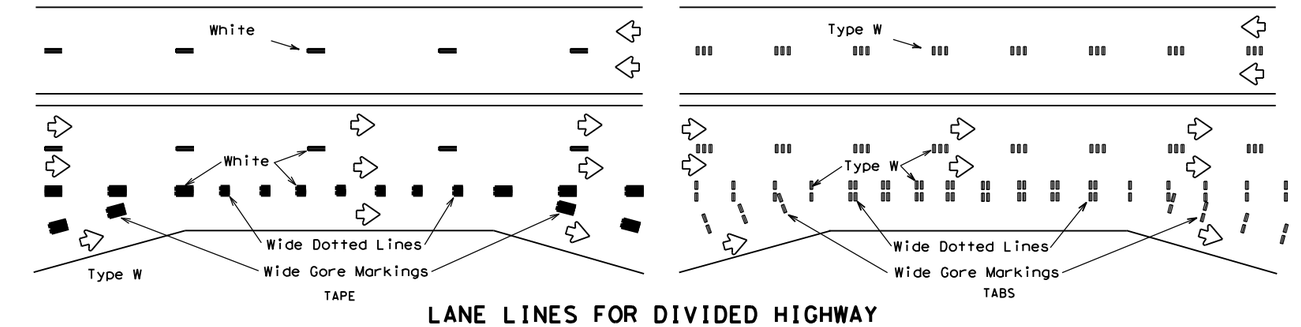
TEMPORARY FLEXIBLE, REFLECTIVE ROADWAY MARKER TABS (TABS)

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.

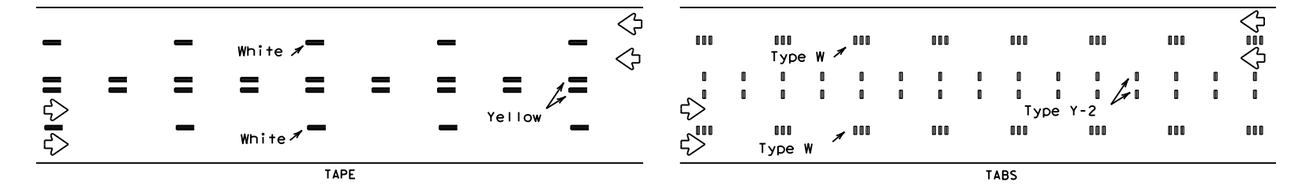
WORK ZONE SHORT TERM PAVEMENT MARKINGS PATTERNS



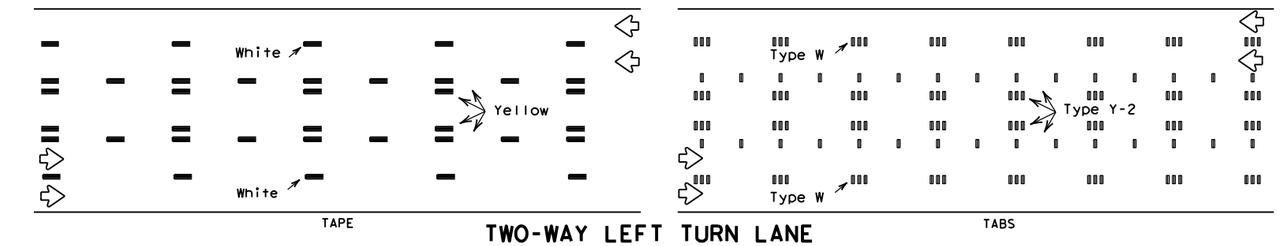
CENTER LINE & NO-PASSING ZONE BARRIER LINES FOR TWO LANE TWO-WAY HIGHWAYS



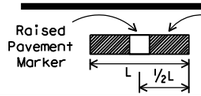
LANE LINES FOR DIVIDED HIGHWAY



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					CR119
1-97		DIST	COUNTY		SHEET NO.
3-03		06	WILLIAMSON		72
7-13					

PROPOSED CR 119 BASELINE

```
*       18   DES CHA BL CR119                    $ PROPOSED CR119 ROAD BASELINE

Chain BL CR119 contains:
 CRBL01 CUR CRBL01 CUR CRBL02 CUR CRBL03 CUR CRBL04 CRBL06

Beginning chain BL CR119 description
================================================================================

Point CRBL01          X   3,169,690.7188 Y  10,177,142.2617 Sta      10+00.00

Course from CRBL01 to PC CRBL01 N 7° 24' 46.35" E Dist 484.6074

                                   Curve Data
                                  *----------*
Curve CRBL01
P.I.  Station              19+14.17  X      3,169,808.6631  Y     10,178,048.7877
Delta      =           16° 51' 04.35" (LT)
Degree     =            1° 58' 32.58"
Tangent    =               429.5590
Length     =               852.9163
Radius     =             2,900.0000
External   =                31.6413
Long Chord =               849.8456
Mid. Ord.  =                31.2998
P.C.  Station              14+84.61  X      3,169,753.2420  Y     10,177,622.8188
P.T.  Station              23+37.52  X      3,169,738.2214  Y     10,178,472.5316
C.C.                                 X      3,166,877.4797  Y     10,177,996.9722
Back       = N   7° 24' 46.35" E
Ahead      = N   9° 26' 18.00" W
Chord Bear = N   1° 00' 45.83" W

Course from PT CRBL01 to PC CRBL02 N 9° 26' 18.00" W Dist 1,517.0873

                                   Curve Data
                                  *----------*
Curve CRBL02
P.I.  Station              50+39.37  X      3,169,295.1566  Y     10,181,137.8016
Delta      =           50° 42' 46.31" (LT)
Degree     =            2° 17' 30.59"
Tangent    =             1,184.7585
Length     =             2,212.7661
Radius     =             2,500.0000
External   =               266.5236
Long Chord =             2,141.2405
Mid. Ord.  =               240.8470
P.C.  Station              38+54.61  X      3,169,489.4404  Y     10,179,969.0816
P.T.  Station              60+67.38  X      3,168,267.5660  Y     10,181,727.4712
C.C.                                 X      3,167,023.2837  Y     10,179,559.1166
Back       = N   9° 26' 18.00" W
Ahead      = N  60° 09' 04.31" W
Chord Bear = N  34° 47' 41.15" W

Course from PT CRBL02 to PC CRBL03 N 60° 09' 04.31" W Dist 626.2674

                                   Curve Data
                                  *----------*
Curve CRBL03
P.I.  Station              75+74.71  X      3,166,960.1949  Y     10,182,477.6892
Delta      =           38° 49' 39.01" (RT)
Degree     =            2° 17' 30.59"
Tangent    =               881.0634
Length     =             1,694.1694
Radius     =             2,500.0000
External   =               150.7118
Long Chord =             1,661.9375
Mid. Ord.  =               142.1427
P.C.  Station              66+93.64  X      3,167,724.3781  Y     10,182,039.1726
P.T.  Station              83+87.81  X      3,166,639.8081  Y     10,183,298.4359
C.C.                                 X      3,168,968.6604  Y     10,184,207.5271
Back       = N  60° 09' 04.31" W
Ahead      = N  21° 19' 25.30" W
Chord Bear = N  40° 44' 14.80" W

Course from PT CRBL03 to PC CRBL04 N 21° 19' 25.30" W Dist 2,749.0539

                                   Curve Data
                                  *----------*
Curve CRBL04
P.I.  Station             122+46.97  X      3,165,236.4777  Y     10,186,893.3987
Delta      =           25° 02' 08.17" (RT)
Degree     =            1° 08' 45.30"
Tangent    =             1,110.1032
Length     =             2,184.7685
Radius     =             5,000.0000
External   =               121.7506
Long Chord =             2,167.4293
Mid. Ord.  =               118.8564
P.C.  Station             111+36.87  X      3,165,640.1518  Y     10,185,859.2921
P.T.  Station             133+21.64  X      3,165,308.3455  Y     10,188,001.1731
C.C.                                 X      3,170,297.8564  Y     10,187,677.4746
Back       = N  21° 19' 25.30" W
Ahead      = N   3° 42' 42.87" E
Chord Bear = N   8° 48' 21.22" W

Course from PT CRBL04 to CRBL06 N 3° 42' 42.87" E Dist 340.1037

Point CRBL06          X   3,165,330.3637 Y  10,188,340.5634 Sta     136+61.74

================================================================================
Ending chain BL CR119 description
```

PROPOSED CR 118 BASELINE

```
*       19   DES CHA BL CR118                    $ PROPOSED CR118 ROAD BASELINE

Chain BL CR118 contains:
 BL11801 BL11802

Beginning chain BL CR118 description
================================================================================

Point BL11801         X   3,165,427.3828 Y  10,185,418.7291 Sta      10+00.00

Course from BL11801 to BL11802 N 68° 23' 37.84" E Dist 1,167.7182

Point BL11802         X   3,166,513.0536 Y  10,185,848.7115 Sta      21+67.72

================================================================================
Ending chain BL CR118 description
```

PROPOSED LIMMER LOOP BASELINE

```
*       20   DES CHA BL LIMMER             $ PROPOSED LIMMER LOOP BASELINE

Chain BL LIMMER contains:
 BLLIM01 BLLIM02

Beginning chain BL LIMMER description
================================================================================

Point BLLIM01         X   3,169,272.1100 Y  10,177,295.4905 Sta      20+00.00

Course from BLLIM01 to BLLIM02 S 82° 54' 54.68" E Dist 787.2935

Point BLLIM02         X   3,170,053.3923 Y  10,177,198.3870 Sta      27+87.29

================================================================================
Ending chain BL LIMMER description
```

PROPOSED DRIVEWAY 1 BASELINE

```
*       18   DES CHA DRWY1                  $ PROPOSED DRIVEWAY 1 BASELINE

Chain DRWY1 contains:
 DRWY105 DRWY110

Beginning chain DRWY1 description
================================================================================

Point DRWY105         X   3,169,648.9166 Y  10,177,419.9968 Sta      10+00.00

Course from DRWY105 to DRWY110 S 71° 36' 15.52" E Dist 78.7277

Point DRWY110         X   3,169,723.6213 Y  10,177,395.1521 Sta      10+78.73

================================================================================
Ending chain DRWY1 description
```

PROPOSED DRIVEWAY 2 BASELINE

```
*       19   DES CHA DRWY2                  $ PROPOSED DRIVEWAY 2 BASELINE

Chain DRWY2 contains:
 DRWY205 DRWY210

Beginning chain DRWY2 description
================================================================================

Point DRWY205         X   3,169,670.1180 Y  10,177,603.9413 Sta      10+00.00

Course from DRWY205 to DRWY210 S 84° 01' 08.95" E Dist 80.0187

Point DRWY210         X   3,169,749.7012 Y  10,177,595.6037 Sta      10+80.02

================================================================================
Ending chain DRWY2 description
```

PROPOSED DRIVEWAY 3 BASELINE

```
*       20   DES CHA DRWY3                  $ PROPOSED DRIVEWAY 3 BASELINE

Chain DRWY3 contains:
 DRWY305 DRWY310

Beginning chain DRWY3 description
================================================================================

Point DRWY305         X   3,169,720.3178 Y  10,178,580.2314 Sta      10+00.00

Course from DRWY305 to DRWY310 N 69° 55' 37.99" E Dist 96.0492

Point DRWY310         X   3,169,810.5327 Y  10,178,613.1967 Sta      10+96.05

================================================================================
Ending chain DRWY3 description
```

PROPOSED DRIVEWAY 4 BASELINE

```
*       21   DES CHA DRWY4                  $ PROPOSED DRIVEWAY 4 BASELINE

Chain DRWY4 contains:
 DRWY405 DRWY410

Beginning chain DRWY4 description
================================================================================

Point DRWY405         X   3,169,353.3005 Y  10,180,465.2190 Sta      10+00.00

Course from DRWY405 to DRWY410 N 68° 44' 59.35" E Dist 101.9193

Point DRWY410         X   3,169,448.2900 Y  10,180,502.1587 Sta      11+01.92

================================================================================
Ending chain DRWY4 description
```

STATE OF TEXAS
ARNOLD GONZALES, JR.
98234
LICENSED
PROFESSIONAL ENGINEER

6/15/2017

CR 119

WILLIAMSON COUNTY 1848

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Austin, Texas 78701
Tel. (512) 328-0011 Fax (512) 328-0325
TBPE Registration Number F-6324
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ROADWAY

HORIZONTAL ALIGNMENT DATA

SHEET 01 OF 04

FED. RD. DIV. RD.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				73

PROPOSED DRIVEWAY 5 BASELINE

```
*       22   DES CHA DRWY5                          $ PROPOSED DRIVEWAY 5 BASELINE

Chain DRWY5 contains:
 DRWY505 CUR CUR505 DRWY510

Beginning chain DRWY5 description
================================================================================

Point DRWY505          X   3,169,148.1855 Y  10,180,876.2318 Sta       10+00.00

Course from DRWY505 to PC CUR505 N 58° 12' 26.63" E Dist 86.3394

                                    Curve Data
                                   *----------*
Curve CUR505
P.I.  Station                10+95.55  X      3,169,229.3963  Y     10,180,926.5701
Delta          =      9° 55' 42.73" (RT)
Degree         =     54° 03' 09.39"
Tangent        =             9.2072
Length         =            18.3683
Radius         =          106.0000
External       =             0.3991
Long Chord     =            18.3453
Mid. Ord.      =             0.3976
P.C.  Station                10+86.34  X      3,169,221.5706  Y     10,180,921.7194
P.T.  Station                11+04.71  X      3,169,237.9413  Y     10,180,929.9989
C.C.                                   X      3,169,277.4163  Y     10,180,831.6235
Back         = N  58° 12' 26.63" E
Ahead        = N  68° 08' 09.36" E
Chord Bear   = N  63° 10' 17.99" E

Course from PT CUR505 to DRWY510 N 68° 08' 09.37" E Dist 34.9240

Point DRWY510          X   3,169,270.3531 Y  10,180,943.0048 Sta       11+39.63

================================================================================
Ending chain DRWY5 description
```

PROPOSED DRIVEWAY 6 BASELINE

```
*       23   DES CHA DRWY6                          $ PROPOSED DRIVEWAY 6 BASELINE

Chain DRWY6 contains:
 DRWY605 DRWY610

Beginning chain DRWY6 description
================================================================================

Point DRWY605          X   3,168,575.0567 Y  10,181,497.0518 Sta        9+80.00

Course from DRWY605 to DRWY610 N 68° 40' 42.86" E Dist 112.1705

Point DRWY610          X   3,168,679.5497 Y  10,181,537.8370 Sta       10+92.17

================================================================================
Ending chain DRWY6 description
```

PROPOSED DRIVEWAY 7 BASELINE

```
*       24   DES CHA DRWY7                          $ PROPOSED DRIVEWAY 7 BASELINE

Chain DRWY7 contains:
 DRWY705 DRWY710

Beginning chain DRWY7 description
================================================================================

Point DRWY705          X   3,168,439.5100 Y  10,181,443.0874 Sta        9+20.00

Course from DRWY705 to DRWY710 N 68° 08' 23.30" E Dist 165.5715

Point DRWY710          X   3,168,593.1761 Y  10,181,504.7368 Sta       10+85.57

================================================================================
Ending chain DRWY7 description
```

PROPOSED DRIVEWAY 8 BASELINE

```
*       1   DESCRIBE CHAIN DRWY8

Chain DRWY8 contains:
 DRWY805 DRWY810

Beginning chain DRWY8 description
================================================================================

Point DRWY805          X   3,166,764.3529 Y  10,183,028.1086 Sta       10+00.00

Course from DRWY805 to DRWY810 N 61° 51' 03.29" E Dist 80.0000

Point DRWY810          X   3,166,834.8907 Y  10,183,065.8500 Sta       10+80.00

================================================================================
Ending chain DRWY8 description
```

PROPOSED DRIVEWAY 9 BASELINE

```
*       1   DESCRIBE CHAIN DRWY9

Chain DRWY9 contains:
DRWY905 DRWY910

Beginning chain DRWY9 description
================================================================================

Point DRWY905          X   3,165,900.8311 Y  10,185,191.5005 Sta       10+00.00

Course from DRWY905 to DRWY910 N 68° 40' 34.70" E Dist 80.0000

Point DRWY910          X   3,165,975.3543 Y  10,185,220.5914 Sta       10+80.00

================================================================================
Ending chain DRWY9 description
```

PROPOSED DRIVEWAY 10 BASELINE

```
*       1   DESCRIBE CHAIN DRWY10

Chain DRWY10 contains:
 DRWY1005 DRWY1010

Beginning chain DRWY10 description
================================================================================

Point DRWY1005         X   3,165,505.9830 Y  10,186,249.9069 Sta       10+00.00

Course from DRWY1005 to DRWY1010 N 73° 24' 37.63" E Dist 80.0000

Point DRWY1010         X   3,165,582.6530 Y  10,186,272.7480 Sta       10+80.00

================================================================================
Ending chain DRWY10 description
```

PROPOSED DRIVEWAY 11 BASELINE

```
*       1   DESCRIBE CHAIN DRWY11

Chain DRWY11 contains:
 DRWY1105 DRWY1110

Beginning chain DRWY11 description
================================================================================

Point DRWY1105         X   3,165,297.8715 Y  10,187,689.7634 Sta       10+00.00

Course from DRWY1105 to DRWY1110 S 89° 51' 33.05" E Dist 135.0000

Point DRWY1110         X   3,165,432.8711 Y  10,187,689.4316 Sta       11+35.00

================================================================================
Ending chain DRWY11 description
```

PROPOSED DRIVEWAY 12 BASELINE

```
*       2   DESCRIBE CHAIN DRWY12

Chain DRWY12 contains:
 DRWY1205 DRWY1210

Beginning chain DRWY12 description
================================================================================

Point DRWY1205         X   3,165,182.8719 Y  10,187,690.0461 Sta       10+00.00

Course from DRWY1205 to DRWY1210 S 89° 51' 33.05" E Dist 115.0000

Point DRWY1210         X   3,165,297.8715 Y  10,187,689.7634 Sta       11+15.00

================================================================================
Ending chain DRWY12 description
```

STATE OF TEXAS
ARNOLD GONZALES, JR.
98234
LICENSED
PROFESSIONAL ENGINEER

6/15/2017

CR 119

WILLIAMSON COUNTY
1848

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TBPE Registration Number F-6324
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ROADWAY

HORIZONTAL ALIGNMENT DATA

SHEET 02 OF 04

FED. RD. DIV. RD.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				74

EXISTING CULVERT A CENTERLINE

```
*        1   DESCRIBE CHAIN CULV_A_EXIST

Chain CULV_A_EXIST contains:
CULVA100 CULVA101 CULVA102 CULVA103 CULVA104 CULVA105 CULVA106 CULVA107 CULVA1-
08 CULVA109 CULVA110 CULVA111 CULVA112

Beginning chain CULV_A_EXIST description
================================================================================
Point CULVA100        X   3,170,424.8934 Y  10,178,366.0000 Sta      10+00.00
Course from CULVA100 to CULVA101 S 88° 04' 01.54" W Dist 296.4794
Point CULVA101        X   3,170,128.5827 Y  10,178,356.0000 Sta      12+96.48
Course from CULVA101 to CULVA102 N 79° 12' 38.89" W Dist 151.6975
Point CULVA102        X   3,169,979.5668 Y  10,178,384.3972 Sta      14+48.18
Course from CULVA102 to CULVA103 N 68° 09' 39.82" W Dist 186.2706
Point CULVA103        X   3,169,806.6642 Y  10,178,453.6896 Sta      16+34.45
Course from CULVA103 to CULVA104 N 51° 23' 39.02" W Dist 44.1190
Point CULVA104        X   3,169,772.1872 Y  10,178,481.2181 Sta      16+78.57
Course from CULVA104 to CULVA105 N 77° 12' 47.39" W Dist 9.4608
Point CULVA105        X   3,169,762.9610 Y  10,178,483.3120 Sta      16+88.03
Course from CULVA105 to CULVA106 S 88° 46' 41.91" W Dist 20.7777
Point CULVA106        X   3,169,742.1880 Y  10,178,482.8690 Sta      17+08.81
Course from CULVA106 to CULVA107 N 83° 52' 13.67" W Dist 8.7398
Point CULVA107        X   3,169,733.4982 Y  10,178,483.8022 Sta      17+17.54
Course from CULVA107 to CULVA108 N 31° 08' 37.63" W Dist 30.9959
Point CULVA108        X   3,169,717.4675 Y  10,178,510.3307 Sta      17+48.54
Course from CULVA108 to CULVA109 N 54° 49' 00.66" W Dist 58.9665
Point CULVA109        X   3,169,669.2733 Y  10,178,544.3067 Sta      18+07.51
Course from CULVA109 to CULVA110 N 58° 10' 21.20" W Dist 179.5513
Point CULVA110        X   3,169,516.7194 Y  10,178,638.9954 Sta      19+87.06
Course from CULVA110 to CULVA111 N 74° 45' 56.05" W Dist 384.8658
Point CULVA111        X   3,169,145.3782 Y  10,178,740.1262 Sta      23+71.92
Course from CULVA111 to CULVA112 N 65° 54' 09.02" W Dist 471.4221
Point CULVA112        X   3,168,715.0396 Y  10,178,932.6034 Sta      28+43.35
================================================================================
Ending chain CULV_A_EXIST description
```

EXISTING CULVERT B CENTERLINE

```
*        1   DESCRIBE CHAIN CULV_B_EXIST

Chain CULV_B_EXIST contains:
CULVB100 CULVB101 CULVB102 CULVB103 CULVB104 CULVB105 CULVB106 CULVB107 CULVB1-
08 CULVB109 CULVB110 CULVB111 CULVB112 CULVB113

Beginning chain CULV_B_EXIST description
================================================================================
Point CULVB100        X   3,170,003.4581 Y  10,180,716.0000 Sta      10+00.00
Course from CULVB100 to CULVB101 S 78° 07' 32.91" W Dist 501.7783
Point CULVB101        X   3,169,512.4170 Y  10,180,612.7524 Sta      15+01.78
Course from CULVB101 to CULVB102 N 51° 55' 15.15" W Dist 46.7675
Point CULVB102        X   3,169,475.6035 Y  10,180,641.5962 Sta      15+48.55
Course from CULVB102 to CULVB103 N 76° 04' 13.25" W Dist 58.5177
Point CULVB103        X   3,169,418.8067 Y  10,180,655.6832 Sta      16+07.06
Course from CULVB103 to CULVB104 S 74° 10' 42.48" W Dist 37.8381
Point CULVB104        X   3,169,382.4020 Y  10,180,645.3670 Sta      16+44.90
Course from CULVB104 to CULVB105 S 58° 34' 47.64" W Dist 10.1732
Point CULVB105        X   3,169,373.7205 Y  10,180,640.0636 Sta      16+55.07
Course from CULVB105 to CULVB106 S 71° 08' 24.85" W Dist 19.8904
Point CULVB106        X   3,169,354.8980 Y  10,180,633.6340 Sta      16+74.97
Course from CULVB106 to CULVB107 S 66° 49' 04.33" W Dist 18.3023
Point CULVB107        X   3,169,338.0735 Y  10,180,626.4292 Sta      16+93.27
Course from CULVB107 to CULVB108 S 50° 32' 28.53" W Dist 101.4745
Point CULVB108        X   3,169,259.7268 Y  10,180,561.9399 Sta      17+94.74
Course from CULVB108 to CULVB109 S 41° 57' 35.89" W Dist 59.7352
Point CULVB109        X   3,169,219.7872 Y  10,180,517.5200 Sta      18+54.48
Course from CULVB109 to CULVB110 S 86° 59' 37.66" W Dist 23.3104
Point CULVB110        X   3,169,196.5089 Y  10,180,516.2975 Sta      18+77.79
Course from CULVB110 to CULVB111 N 63° 58' 53.24" W Dist 56.2834
Point CULVB111        X   3,169,145.9297 Y  10,180,540.9869 Sta      19+34.07
Course from CULVB111 to CULVB112 S 68° 18' 29.36" W Dist 420.9773
Point CULVB112        X   3,168,754.7638 Y  10,180,385.3876 Sta      23+55.05
Course from CULVB112 to CULVB113 S 71° 16' 39.70" W Dist 354.5086
Point CULVB113        X   3,168,419.0139 Y  10,180,271.5969 Sta      27+09.56
================================================================================
Ending chain CULV_B_EXIST description
```

PROPOSED CULVERT A CENTERLINE

```
*        1   DESCRIBE CHAIN CULV_A_PROP

Chain CULV_A_PROP contains:
CULVA200 CULVA201 CULVA202 CULVA203 CULVA204 CULVA205 CULVA206 CULVA207 CULVA2-
08 CULVA209

Beginning chain CULV_A_PROP description
================================================================================
Point CULVA200        X   3,170,424.8934 Y  10,178,366.0000 Sta      10+00.00
Course from CULVA200 to CULVA201 S 88° 04' 01.54" W Dist 296.4794
Point CULVA201        X   3,170,128.5827 Y  10,178,356.0000 Sta      12+96.48
Course from CULVA201 to CULVA202 N 79° 12' 38.89" W Dist 151.6975
Point CULVA202        X   3,169,979.5668 Y  10,178,384.3972 Sta      14+48.18
Course from CULVA202 to CULVA203 N 70° 58' 21.52" W Dist 60.1011
Point CULVA203        X   3,169,922.7495 Y  10,178,403.9913 Sta      15+08.28
Course from CULVA203 to CULVA204 N 63° 16' 41.72" W Dist 124.9592
Point CULVA204        X   3,169,811.1358 Y  10,178,460.1802 Sta      16+33.24
Course from CULVA204 to CULVA205 N 59° 44' 09.97" W Dist 24.9791
Point CULVA205        X   3,169,789.5610 Y  10,178,472.7693 Sta      16+58.22
Course from CULVA205 to CULVA206 N 54° 26' 38.64" W Dist 140.6063
Point CULVA206        X   3,169,675.1711 Y  10,178,554.5315 Sta      17+98.82
Course from CULVA206 to CULVA207 N 61° 56' 23.28" W Dist 179.5580
Point CULVA207        X   3,169,516.7194 Y  10,178,638.9954 Sta      19+78.38
Course from CULVA207 to CULVA208 N 74° 45' 56.05" W Dist 384.8658
Point CULVA208        X   3,169,145.3782 Y  10,178,740.1262 Sta      23+63.25
Course from CULVA208 to CULVA209 N 65° 54' 09.02" W Dist 471.4221
Point CULVA209        X   3,168,715.0396 Y  10,178,932.6034 Sta      28+34.67
================================================================================
Ending chain CULV_A_PROP description
```

PROPOSED CULVERT B CENTERLINE

```
*        1   DESCRIBE CHAIN CULV_B_PROP

Chain CULV_B_PROP contains:
CULVB200 CULVB201 CULVB202 CULVB203 CULVB204 CULVB205 CULVB206 CULVB207 CULVB2-
08 CULVB209

Beginning chain CULV_B_PROP description
================================================================================
Point CULVB200        X   3,170,003.4581 Y  10,180,716.0000 Sta      10+00.00
Course from CULVB200 to CULVB201 S 81° 46' 26.42" W Dist 111.7601
Point CULVB201        X   3,169,892.8479 Y  10,180,700.0096 Sta      11+11.76
Course from CULVB201 to CULVB202 S 83° 35' 18.55" W Dist 525.5814
Point CULVB202        X   3,169,370.5538 Y  10,180,641.3186 Sta      16+37.34
Course from CULVB202 to CULVB203 S 65° 22' 21.18" W Dist 35.7304
Point CULVB203        X   3,169,338.0735 Y  10,180,626.4292 Sta      16+73.07
Course from CULVB203 to CULVB204 S 50° 32' 28.53" W Dist 101.4579
Point CULVB204        X   3,169,259.7396 Y  10,180,561.9504 Sta      17+74.53
Course from CULVB204 to CULVB205 S 41° 57' 44.44" W Dist 59.7517
Point CULVB205        X   3,169,219.7872 Y  10,180,517.5200 Sta      18+34.28
Course from CULVB205 to CULVB206 S 86° 59' 37.66" W Dist 23.3104
Point CULVB206        X   3,169,196.5089 Y  10,180,516.2975 Sta      18+57.59
Course from CULVB206 to CULVB207 N 63° 58' 53.24" W Dist 56.2834
Point CULVB207        X   3,169,145.9297 Y  10,180,540.9869 Sta      19+13.88
Course from CULVB207 to CULVB208 S 68° 18' 29.36" W Dist 420.9773
Point CULVB208        X   3,168,754.7638 Y  10,180,385.3876 Sta      23+34.85
Course from CULVB208 to CULVB209 S 71° 16' 39.70" W Dist 354.5086
Point CULVB209        X   3,168,419.0139 Y  10,180,271.5969 Sta      26+89.36
================================================================================
Ending chain CULV_B_PROP description
```

STATE OF TEXAS
ARNOLD GONZALES, JR.
98234
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PROFESSIONAL ENGINEER

6/15/2017

CR 119

WILLIAMSON COUNTY
1848

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ROADWAY

HORIZONTAL ALIGNMENT DATA

SHEET 03 OF 04

FED. RD. DIV. RD.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				75

PROPOSED CULVERT C CENTERLINE

```
*       1   Describe Chain CULV_C_PROP

Chain CULV_C_PROP contains:
CULVC100 CULVC101 CULVC102 CULVC103 CULVC104 CULVC105

Beginning chain CULV_C_PROP description
================================================================================
Point CULVC100          X   3,167,775.0823 Y  10,182,258.2557 Sta       10+00.00
Course from CULVC100 to CULVC101 S 76° 00' 35.52" W Dist 112.5584
Point CULVC101          X   3,167,665.8627 Y  10,182,231.0441 Sta       11+12.56
Course from CULVC101 to CULVC102 S 76° 00' 35.53" W Dist 97.6743
Point CULVC102          X   3,167,571.0857 Y  10,182,207.4309 Sta       12+10.23
Course from CULVC102 to CULVC103 S 76° 00' 35.53" W Dist 15.8878
Point CULVC103          X   3,167,555.6691 Y  10,182,203.5900 Sta       12+26.12
Course from CULVC103 to CULVC104 S 73° 33' 55.53" W Dist 119.7964
Point CULVC104          X   3,167,440.7671 Y  10,182,169.6971 Sta       13+45.92
Course from CULVC104 to CULVC105 S 73° 33' 55.52" W Dist 41.0692
Point CULVC105          X   3,167,401.3759 Y  10,182,158.0778 Sta       13+86.99
================================================================================
Ending chain CULV_C_PROP description
```

PROPOSED CULVERT D CENTERLINE

```
*       1   Describe Chain CULV_D_PROP

Chain CULVD_OLD contains:
CULVD01 CULVD02 CULVD03 CULVD04 CULVD05

Beginning chain CULVD_OLD description
================================================================================
Point CULVD01           X   3,166,304.8528 Y  10,184,599.3636 Sta       10+00.00
Course from CULVD01 to CULVD02 S 66° 27' 40.15" W Dist 72.7525
Point CULVD02           X   3,166,238.1541 Y  10,184,570.3084 Sta       10+72.75
Course from CULVD02 to CULVD03 S 53° 40' 34.70" W Dist 165.3501
Point CULVD03           X   3,166,104.9343 Y  10,184,472.3638 Sta       12+38.10
Course from CULVD03 to CULVD04 S 48° 28' 53.03" W Dist 142.9371
Point CULVD04           X   3,165,997.9114 Y  10,184,377.6161 Sta       13+81.04
Course from CULVD04 to CULVD05 S 49° 31' 51.29" W Dist 109.4553
Point CULVD05           X   3,165,914.6427 Y  10,184,306.5755 Sta       14+90.49
================================================================================
Ending chain CULVD_OLD description
```

PROPOSED CULVERT E-1 CENTERLINE

```
*       1   Describe Chain CULV_E1_PROP

Chain CULV_E1_PROP contains:
CULVE100 CULVE101 CULVE102 CULVE103 CULVE104 CULVE105 CULVE106 CULVE107

Beginning chain CULV_E1_PROP description
================================================================================
Point CULVE100          X   3,166,489.7509 Y  10,185,860.9939 Sta       10+00.00
Course from CULVE100 to CULVE101 S 68° 23' 37.84" W Dist 550.5755
Point CULVE101          X   3,165,977.8605 Y  10,185,658.2585 Sta       15+50.58
Course from CULVE101 to CULVE102 S 72° 05' 33.17" W Dist 78.0089
Point CULVE102          X   3,165,903.6308 Y  10,185,634.2723 Sta       16+28.58
Course from CULVE102 to CULVE103 S 78° 21' 21.07" W Dist 29.5045
Point CULVE103          X   3,165,874.7334 Y  10,185,628.3174 Sta       16+58.09
Course from CULVE103 to CULVE104 S 88° 36' 45.65" W Dist 44.6429
Point CULVE104          X   3,165,830.1036 Y  10,185,627.2365 Sta       17+02.73
Course from CULVE104 to CULVE105 S 68° 40' 34.63" W Dist 173.0000
Point CULVE105          X   3,165,668.9471 Y  10,185,564.3273 Sta       18+75.73
Course from CULVE105 to CULVE106 S 14° 28' 58.23" W Dist 31.5308
Point CULVE106          X   3,165,661.0615 Y  10,185,533.7985 Sta       19+07.26
Course from CULVE106 to CULVE107 S 68° 11' 21.66" W Dist 259.6327
Point CULVE107          X   3,165,420.0142 Y  10,185,437.3344 Sta       21+66.90
================================================================================
Ending chain CULV_E1_PROP description
```

PROPOSED CHANNEL F CENTERLINE

```
*       1   Describe Chain CULVF_OLD

Chain CULVF_OLD contains:
CULVF01 CULVF02 CULVF03 CULVF04 CULVF05 CULVF06 CULVF07 CULVF08 CULVF09 CULVF1-
0 CULVF11 CULVF12 CULVF13 CULVF14 CULVF15 CULVF16 CULVF17 CULVF18

Beginning chain CULVF_OLD description
================================================================================
Point CULVF01           X   3,165,698.3270 Y  10,187,262.1200 Sta       10+00.00
Course from CULVF01 to CULVF02 S 86° 03' 24.18" W Dist 26.1834
Point CULVF02           X   3,165,672.2056 Y  10,187,260.3194 Sta       10+26.18
Course from CULVF02 to CULVF03 S 56° 40' 08.47" W Dist 41.5569
Point CULVF03           X   3,165,637.4844 Y  10,187,237.4849 Sta       10+67.74
Course from CULVF03 to CULVF04 S 81° 53' 17.30" W Dist 116.5205
Point CULVF04           X   3,165,522.1297 Y  10,187,221.0431 Sta       11+84.26
Course from CULVF04 to CULVF05 S 56° 46' 07.60" W Dist 17.3573
Point CULVF05           X   3,165,507.6110 Y  10,187,211.5310 Sta       12+01.62
Course from CULVF05 to CULVF06 S 42° 08' 54.26" W Dist 48.6716
Point CULVF06           X   3,165,474.9497 Y  10,187,175.4454 Sta       12+50.29
Course from CULVF06 to CULVF07 S 13° 37' 14.42" W Dist 58.6133
Point CULVF07           X   3,165,461.1467 Y  10,187,118.4806 Sta       13+08.90
Course from CULVF07 to CULVF08 S 45° 18' 43.15" W Dist 77.2661
Point CULVF08           X   3,165,406.2146 Y  10,187,064.1435 Sta       13+86.17
Course from CULVF08 to CULVF09 S 67° 38' 06.26" W Dist 164.1100
Point CULVF09           X   3,165,254.4491 Y  10,187,001.6989 Sta       15+50.28
Course from CULVF09 to CULVF10 S 38° 10' 39.33" W Dist 31.2972
Point CULVF10           X   3,165,235.1043 Y  10,186,977.0962 Sta       15+81.58
Course from CULVF10 to CULVF11 S 51° 24' 20.46" W Dist 20.5028
Point CULVF11           X   3,165,219.0797 Y  10,186,964.3066 Sta       16+02.08
Course from CULVF11 to CULVF12 S 55° 08' 41.15" W Dist 47.4922
Point CULVF12           X   3,165,180.1077 Y  10,186,937.1646 Sta       16+49.57
Course from CULVF12 to CULVF13 S 70° 16' 14.69" W Dist 29.2801
Point CULVF13           X   3,165,152.5463 Y  10,186,927.2803 Sta       16+78.85
Course from CULVF13 to CULVF14 N 84° 45' 16.16" W Dist 45.9782
Point CULVF14           X   3,165,106.7607 Y  10,186,931.4838 Sta       17+24.83
Course from CULVF14 to CULVF15 N 43° 04' 51.63" W Dist 109.5975
Point CULVF15           X   3,165,031.9022 Y  10,187,011.5325 Sta       18+34.43
Course from CULVF15 to CULVF16 N 55° 48' 16.60" W Dist 20.7100
Point CULVF16           X   3,165,014.7724 Y  10,187,023.1719 Sta       18+55.14
Course from CULVF16 to CULVF17 N 60° 27' 47.42" W Dist 28.2106
Point CULVF17           X   3,164,990.2281 Y  10,187,037.0793 Sta       18+83.35
Course from CULVF17 to CULVF18 N 73° 44' 06.31" W Dist 58.4200
Point CULVF18           X   3,164,934.1462 Y  10,187,053.4415 Sta       19+41.77
================================================================================
```

PROPOSED CULVERT E-2 CENTERLINE

```
*       1   Describe Chain CULV_E2_PROP

Chain CULV_E2_PROP contains:
CULVE200 CULVE201 CULVE202 CULVE203 CULVE204 CULVE205

Beginning chain CULV_E2_PROP description
================================================================================
Point CULVE200          X   3,165,845.5899 Y  10,185,470.5137 Sta       10+00.00
Course from CULVE200 to CULVE201 N 21° 19' 25.30" W Dist 132.5224
Point CULVE201          X   3,165,797.3999 Y  10,185,593.9638 Sta       11+32.52
Course from CULVE201 to CULVE202 N 66° 19' 25.37" W Dist 14.7587
Point CULVE202          X   3,165,783.8835 Y  10,185,599.8904 Sta       11+47.28
Course from CULVE202 to CULVE203 S 68° 40' 34.63" W Dist 120.0000
Point CULVE203          X   3,165,672.0986 Y  10,185,556.2540 Sta       12+67.28
Course from CULVE203 to CULVE204 S 26° 10' 28.15" W Dist 25.0213
Point CULVE204          X   3,165,661.0615 Y  10,185,533.7985 Sta       12+92.30
Course from CULVE204 to CULVE205 S 68° 11' 21.66" W Dist 259.6327
Point CULVE205          X   3,165,420.0142 Y  10,185,437.3344 Sta       15+51.94
================================================================================
Ending chain CULV_E2_PROP description
```

PROPOSED CHANNEL G1 CENTERLINE

```
<*      1   Describe Chain CULV_G1_PROP

Chain CULV_G1_PROP contains:
 RF01 RF02 RF03 RF04 RF05

Beginning chain CULV_G1_PROP description
================================================================================
Point RF01              X   3,164,978.2224 Y  10,188,227.7506 Sta       10+00.00
Course from RF01 to RF02 S 80° 51' 22.88" E Dist 176.8650
Point RF02              X   3,165,152.8400 Y  10,188,199.6450 Sta       11+76.86
Course from RF02 to RF03 S 86° 50' 28.69" E Dist 259.7369
Point RF03              X   3,165,412.1823 Y  10,188,185.3330 Sta       14+36.60
Course from RF03 to RF04 S 75° 02' 54.51" E Dist 67.4958
Point RF04              X   3,165,477.3930 Y  10,188,167.9190 Sta       15+04.10
Course from RF04 to RF05 S 58° 41' 00.94" E Dist 52.5700
Point RF05              X   3,165,522.3041 Y  10,188,140.5950 Sta       15+56.67
================================================================================
Ending chain CULV_G1_PROP description
```



6/15/2017

CR 119

WILLIAMSON COUNTY 1848

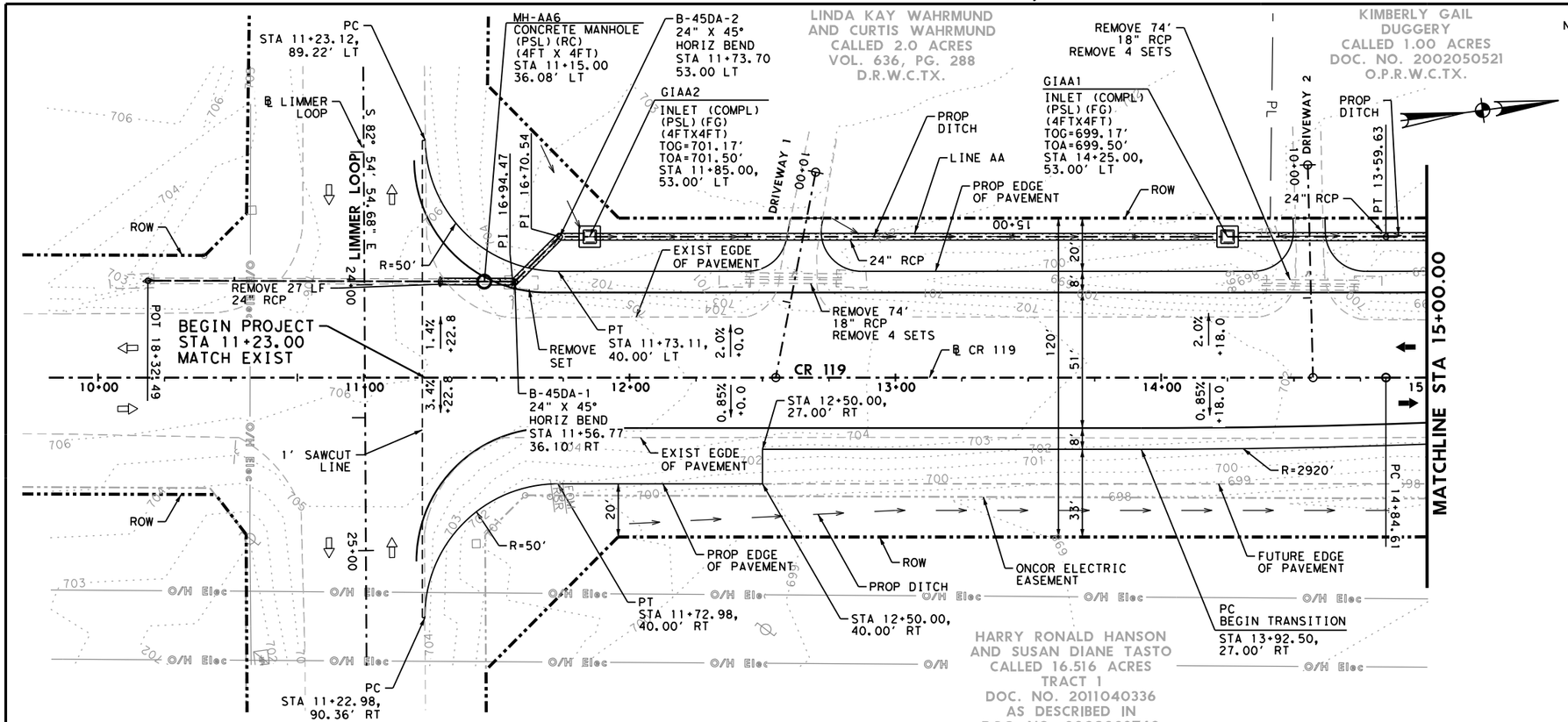
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ROADWAY

HORIZONTAL ALIGNMENT DATA

SHEET 04 OF 04

FED. RD. DIV. RD.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				76

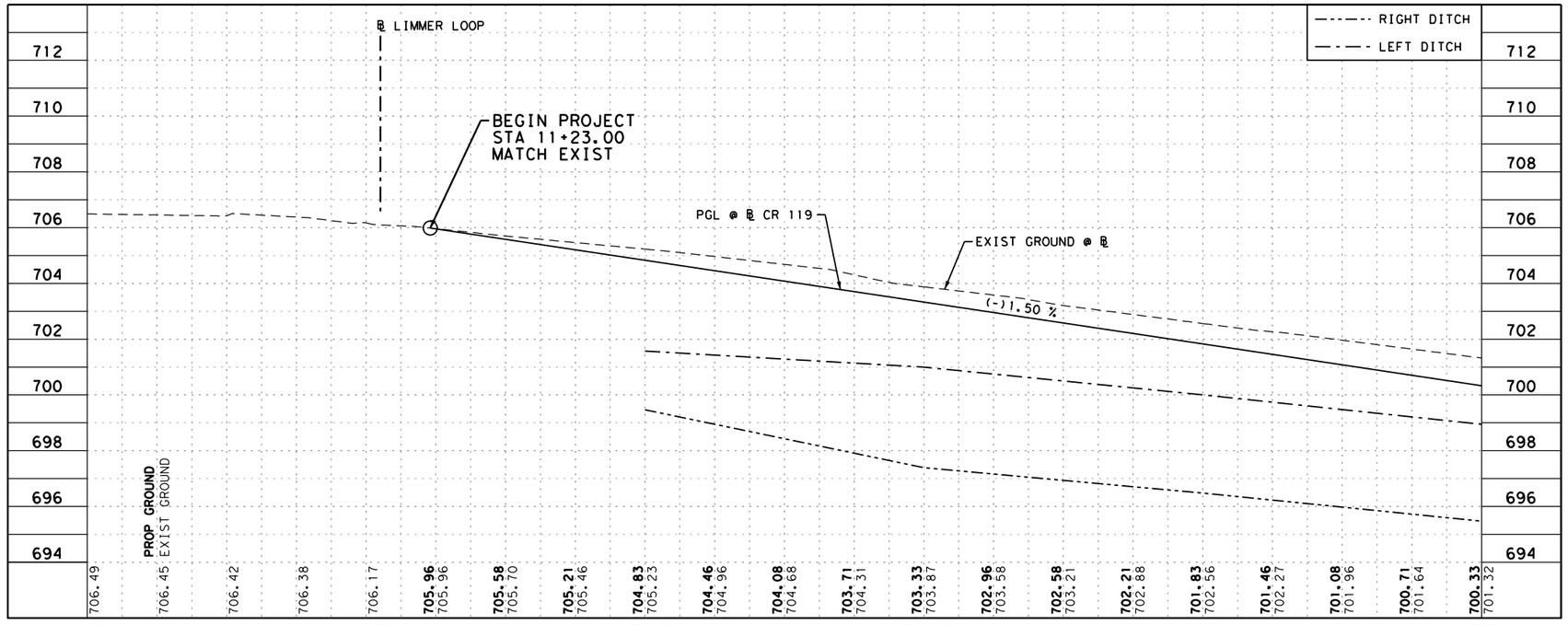


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LEGEND

- TRAFFIC FLOW ARROW
- RIGHT OF WAY BOUNDARY
- EASEMENT
- EXISTING WIRE FENCE
- PROPOSED WIRE FENCE
- EXISTING GAS LINE
- DITCH FLOW ARROWS
- 535 EXISTING CONTOURS



0 12.5 25 50 (H)
0 2.5 5 (V)



6/15/2017

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PLAN AND PROFILE

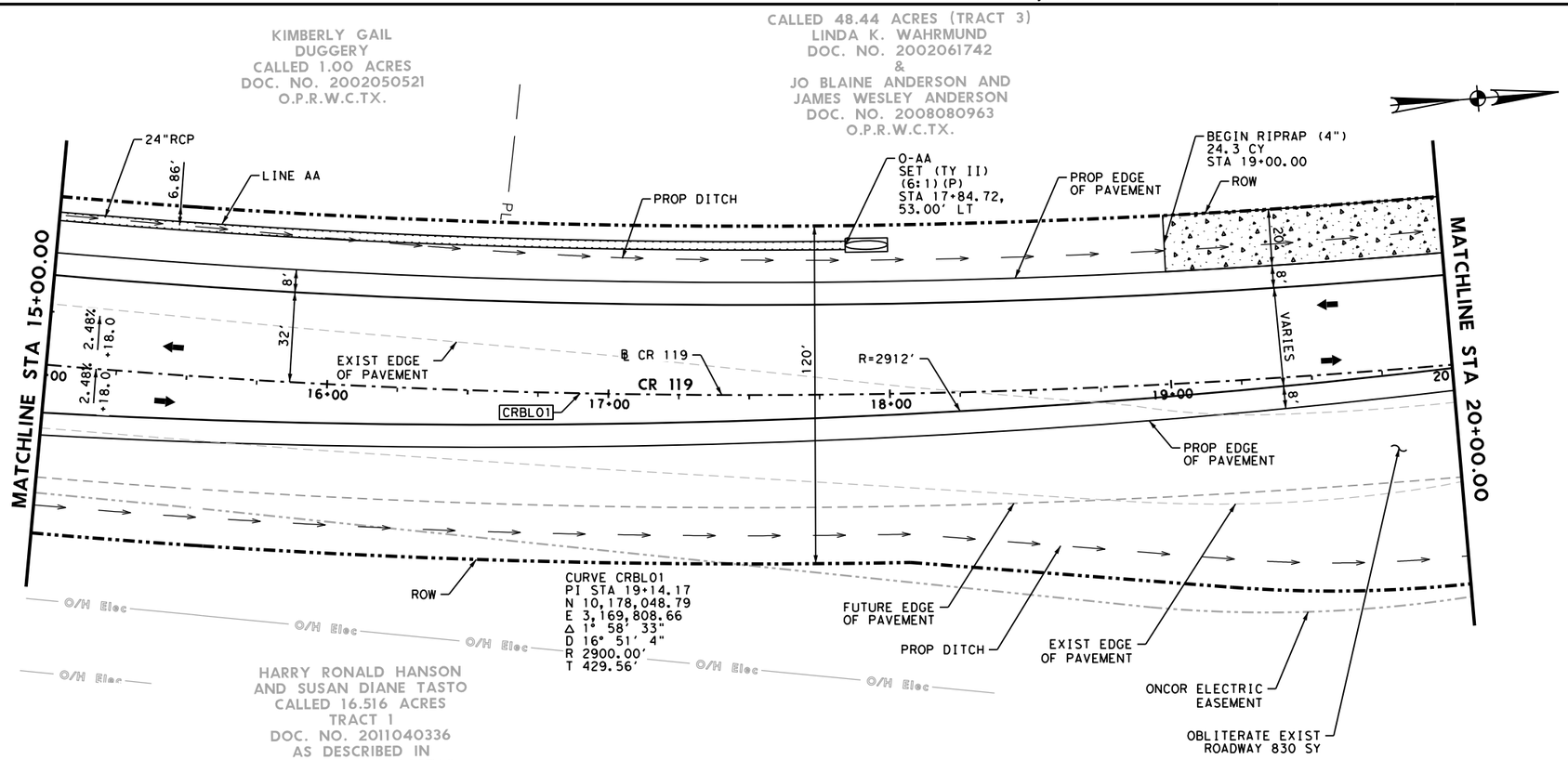
BEGIN PROJECT TO STA 15+00

SHEET 01 OF 27

FED. RD. DIV. RD.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				77

FILE: V:\2220\active\222010286\civil\cad\Design\ROADWAY\104123_RDWY_PP_01.dgn DATE: 6/15/2017 TIME: 3:11:37 PM USER: agonzales

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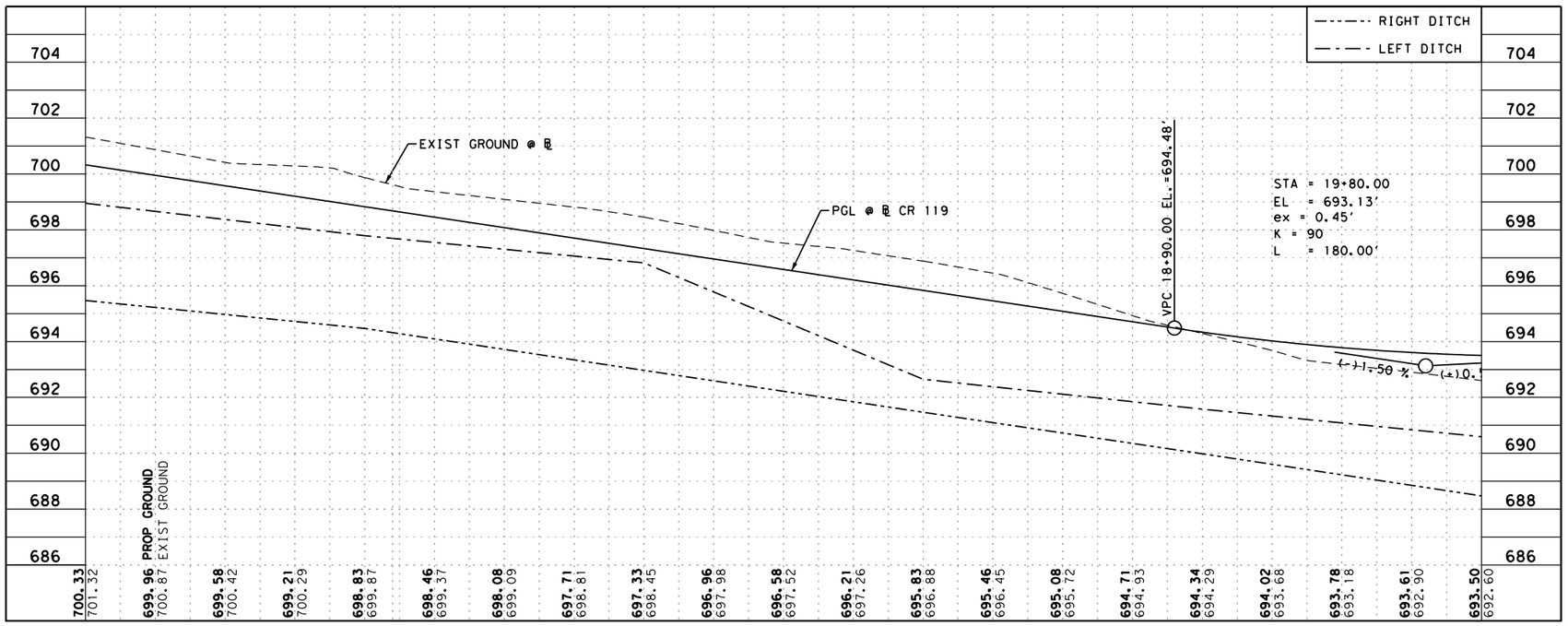


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LEGEND

- TRAFFIC FLOW ARROW
- RIGHT OF WAY BOUNDARY
- EASEMENT
- EXISTING WIRE FENCE
- PROPOSED WIRE FENCE
- EXISTING GAS LINE
- DITCH FLOW ARROWS
- 535 EXISTING CONTOURS



0 12.5 25 50 (H)
0 2.5 5 (V)

STATE OF TEXAS
ARNOLD GONZALES, JR.
98234
LICENSED
PROFESSIONAL ENGINEER

6/15/2017

CR 119

WILLIAMSON COUNTY 1848

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ROADWAY

PLAN AND PROFILE

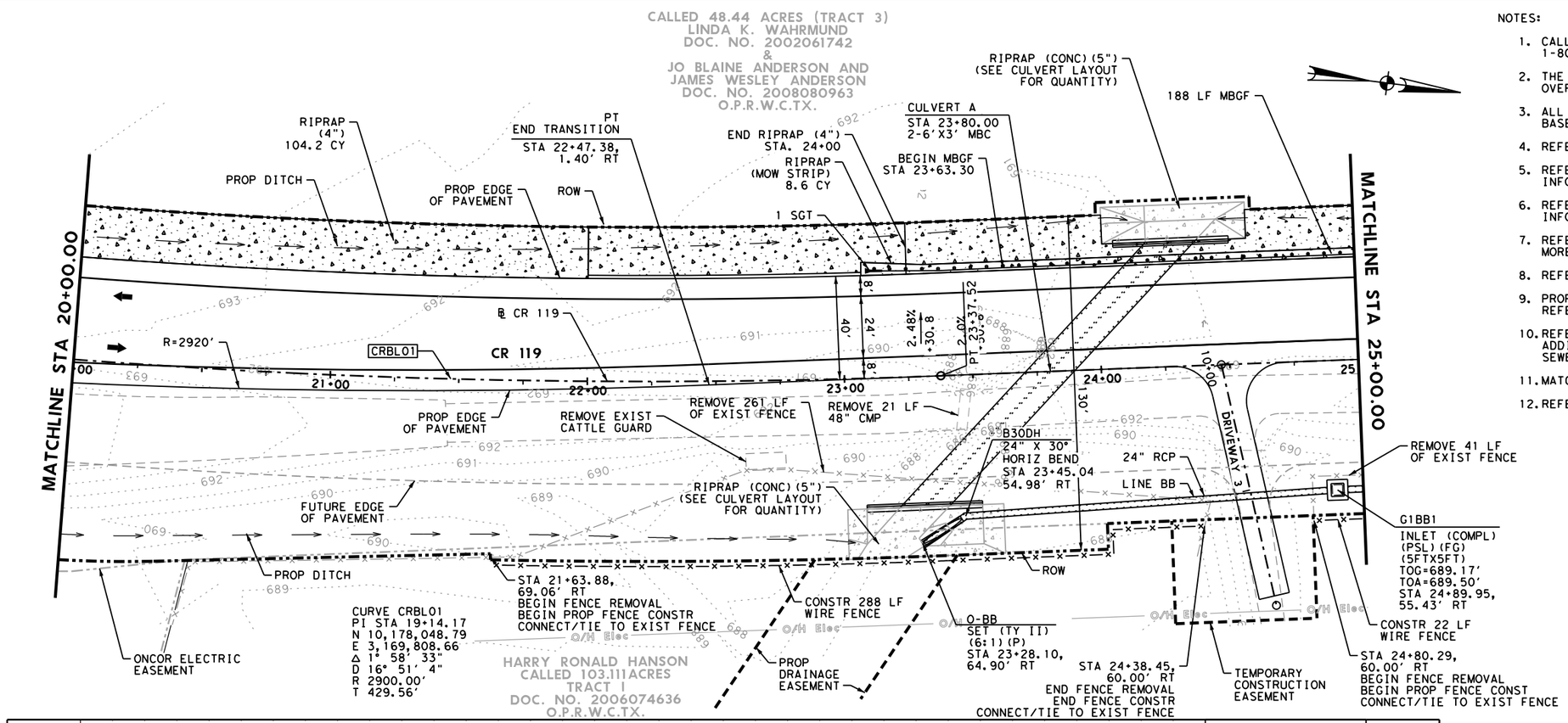
STA 15+00 TO STA 20+00

SHEET 02 OF 27

FED. RD. DIV. RD.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				78

FILE: V:\2220\active\222010286\civil\cad\Design\ROADWAY\104123_RDWY_PP_02.dgn DATE: 6/15/2017 TIME: 3:11:38 PM USER: agonzales

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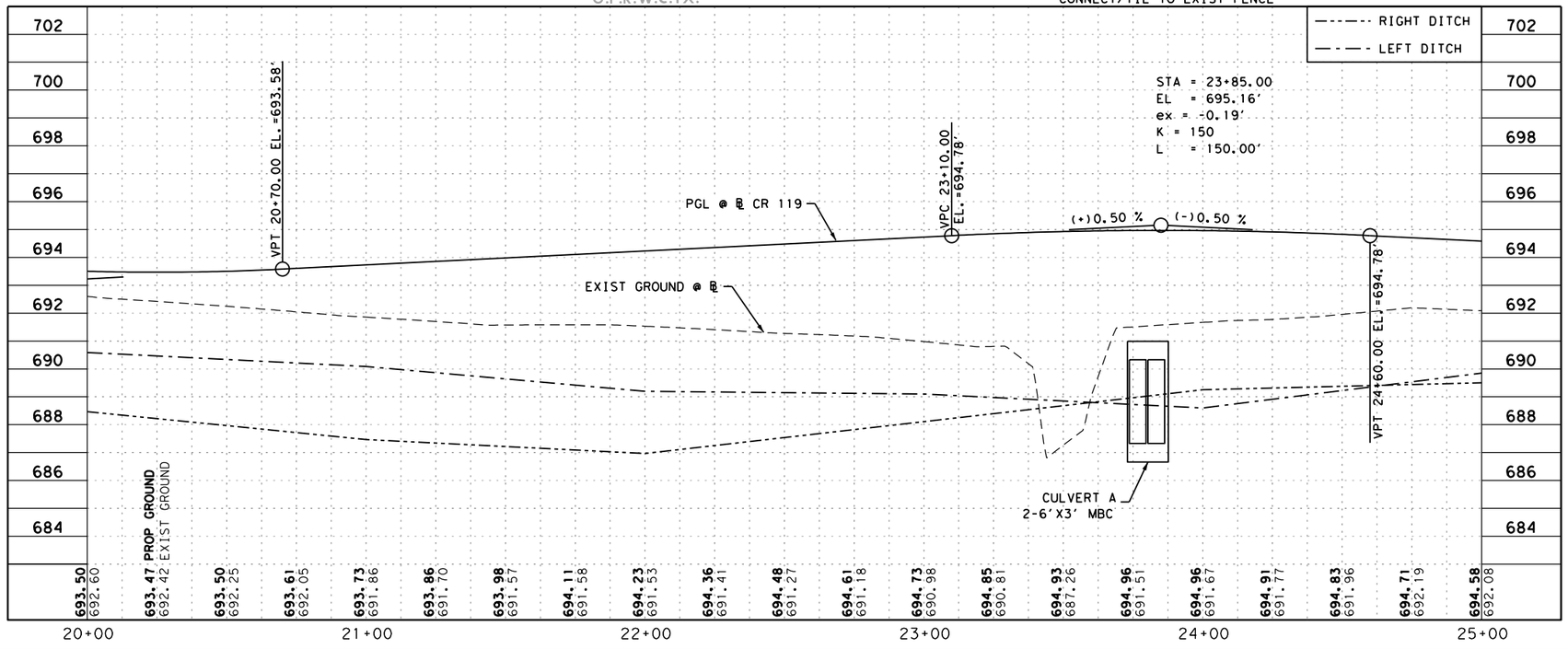


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LEGEND

- TRAFFIC FLOW ARROW
- RIGHT OF WAY BOUNDARY
- EASEMENT
- EXISTING WIRE FENCE
- PROPOSED WIRE FENCE
- EXISTING GAS LINE
- DITCH FLOW ARROWS
- EXISTING CONTOURS



0 12.5 25 50 (H)
0 2.5 5 (V)



6/15/2017

CR 119

WILLIAMSON COUNTY 1848

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PLAN AND PROFILE

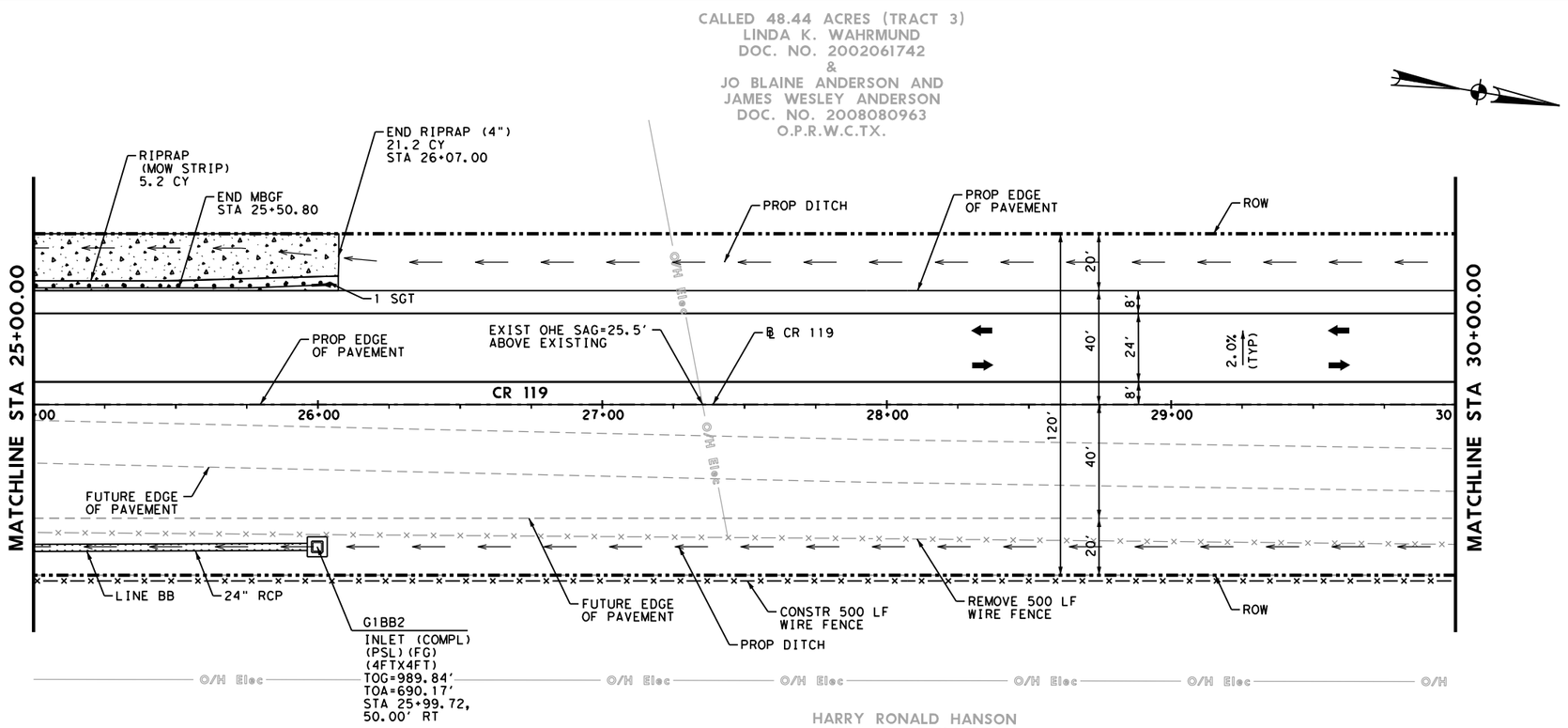
STA 20+00 TO STA 25+00

SHEET 03 OF 27

FED. RD. DIV. RD.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				79

FILE: V:\2220\active\222010286\civil\cad\Design\ROADWAY\104123_RDWY_PP_03.dgn DATE: 6/15/2017 TIME: 3:11:41 PM USER: agonzales

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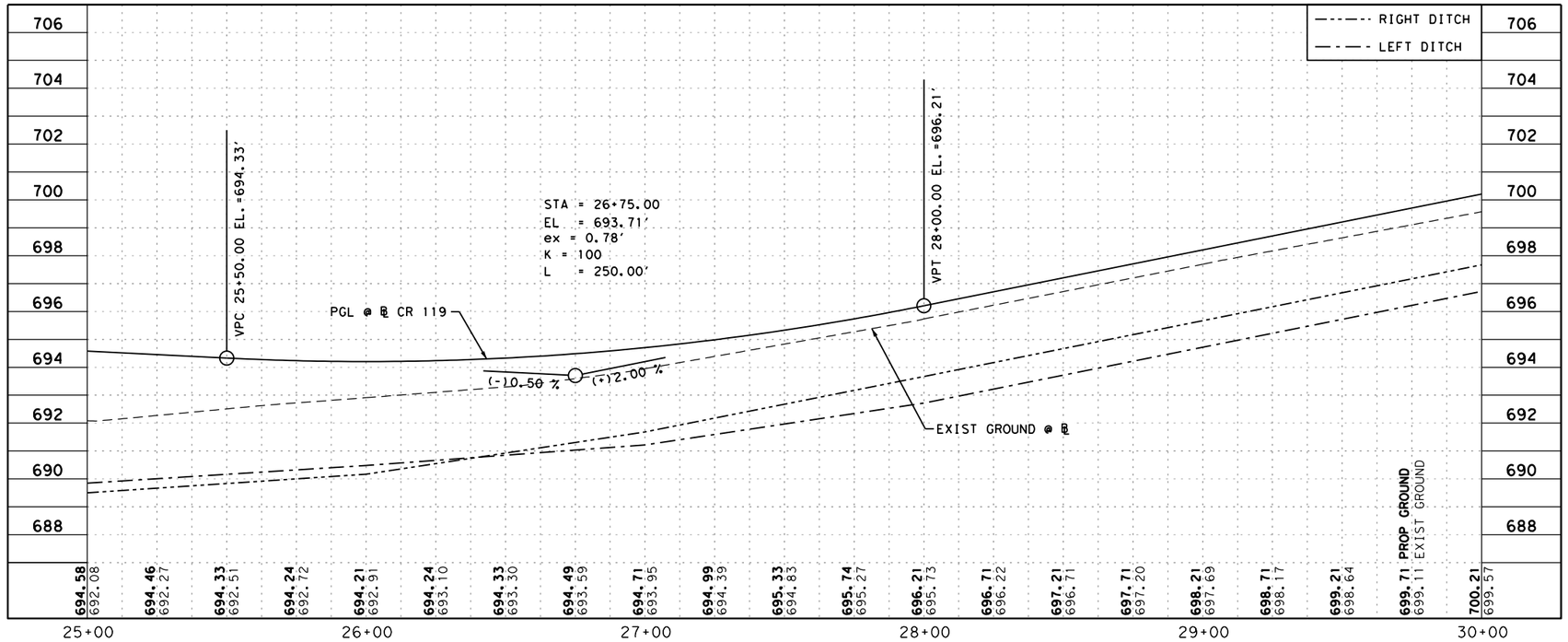


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LEGEND

- TRAFFIC FLOW ARROW
- RIGHT OF WAY BOUNDARY
- EASEMENT
- EXISTING WIRE FENCE
- PROPOSED WIRE FENCE
- EXISTING GAS LINE
- DITCH FLOW ARROWS
- 535 EXISTING CONTOURS



0 12.5 25 50 (H)
0 2.5 5 (V)

STATE OF TEXAS
ARNOLD GONZALES, JR.
98234
LICENSED
PROFESSIONAL ENGINEER

6/15/2017

CR 119

WILLIAMSON COUNTY 1848

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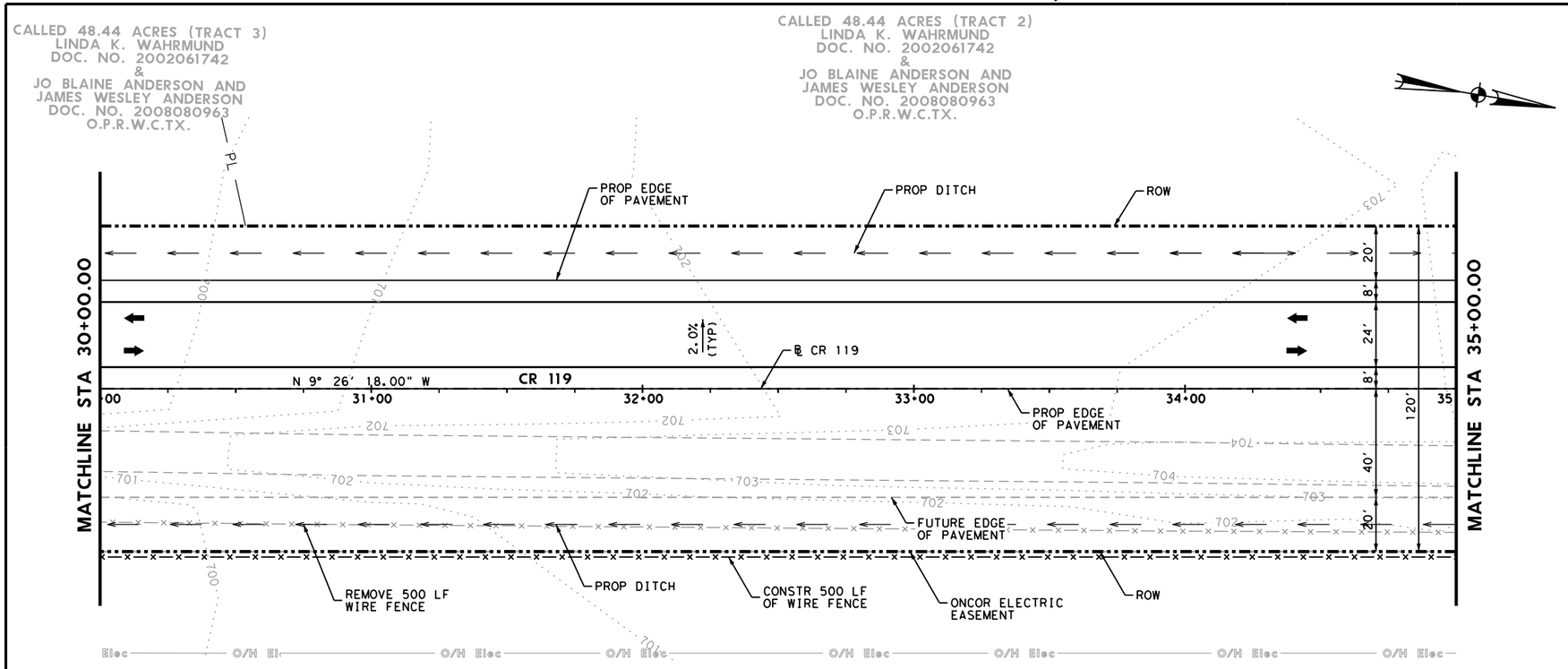
STA 25+00 TO STA 30+00

SHEET 04 OF 27

FED. RD. DIV. RD.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				80

FILE: V:\2220\active\222010286\civil\cad\Design\ROADWAY\104123_RDWY_PP_04.dgn DATE: 6/15/2017 TIME: 3:11:42 PM USER: agonzales

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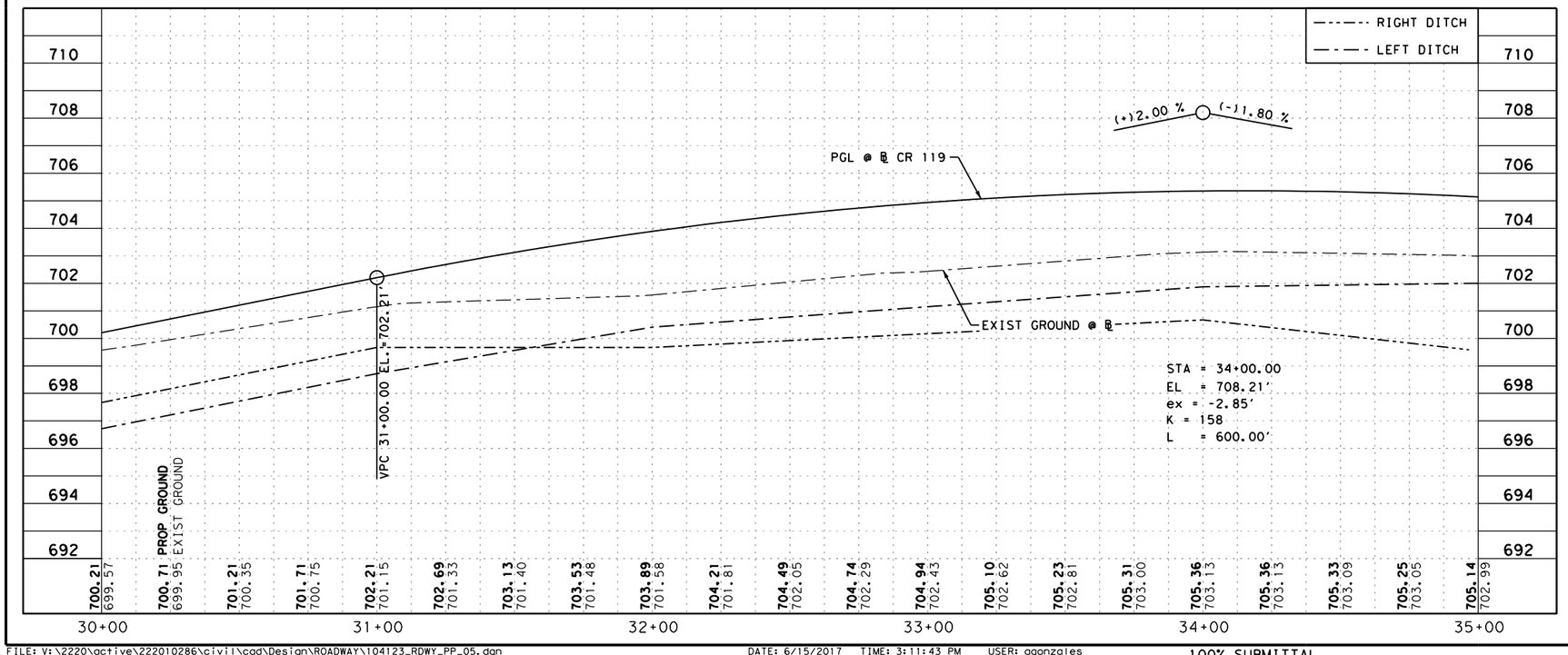


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LEGEND

- TRAFFIC FLOW ARROW
- RIGHT OF WAY BOUNDARY
- EASEMENT
- EXISTING WIRE FENCE
- PROPOSED WIRE FENCE
- EXISTING GAS LINE
- DITCH FLOW ARROWS
- EXISTING CONTOURS (535)



0 12.5 25 50 (H)
0 2.5 5 (V)

STATE OF TEXAS
ARNOLD GONZALES, JR.
98234
LICENSED
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6/15/2017

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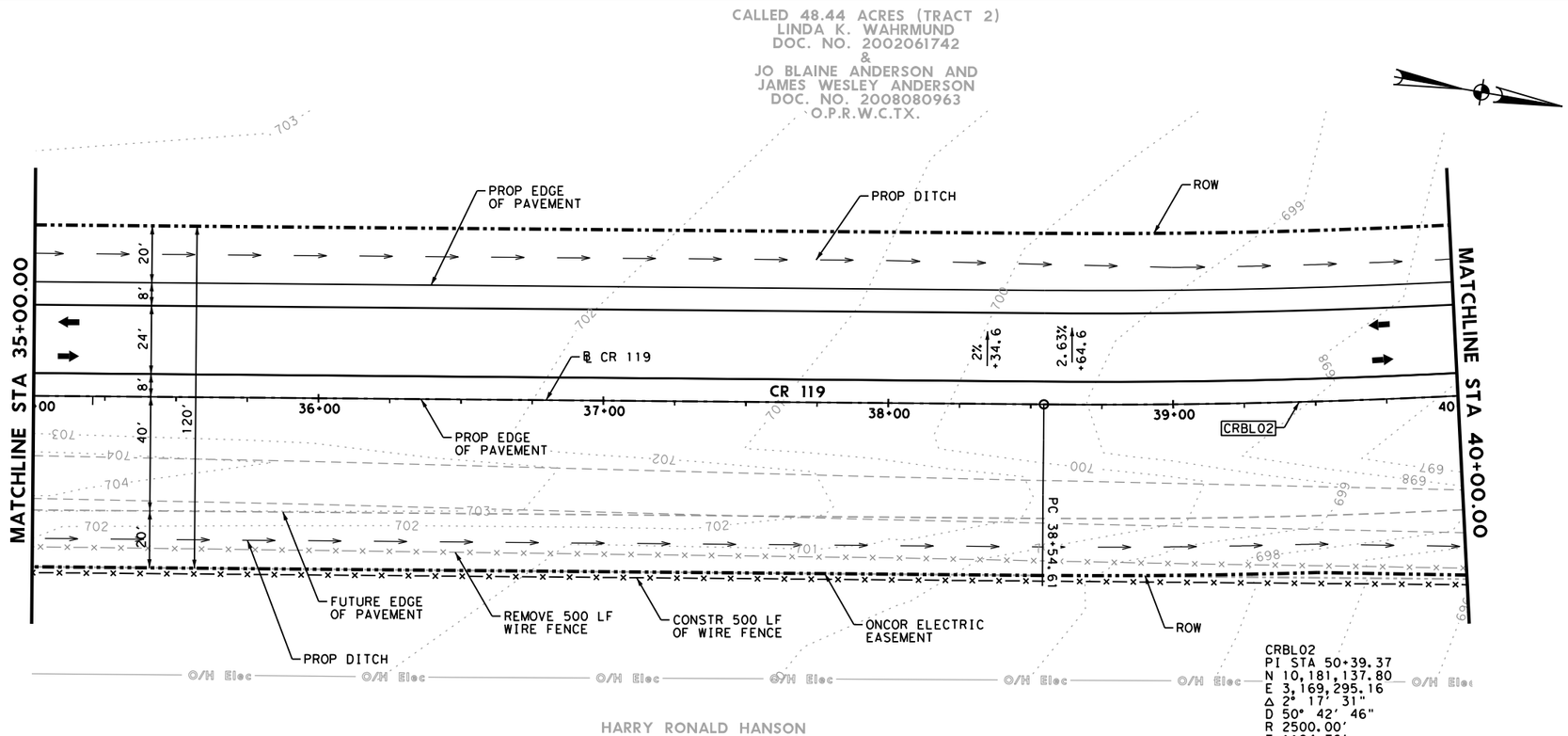
PLAN AND PROFILE

STA 30+00 TO STA 35+00 SHEET 05 OF 27

FED. RD. DIV. RD.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				81

FILE: V:\2220\active\222010286\civil\cad\Design\ROADWAY\104123_RDWY_PP_05.dgn DATE: 6/15/2017 TIME: 3:11:43 PM USER: agonzales

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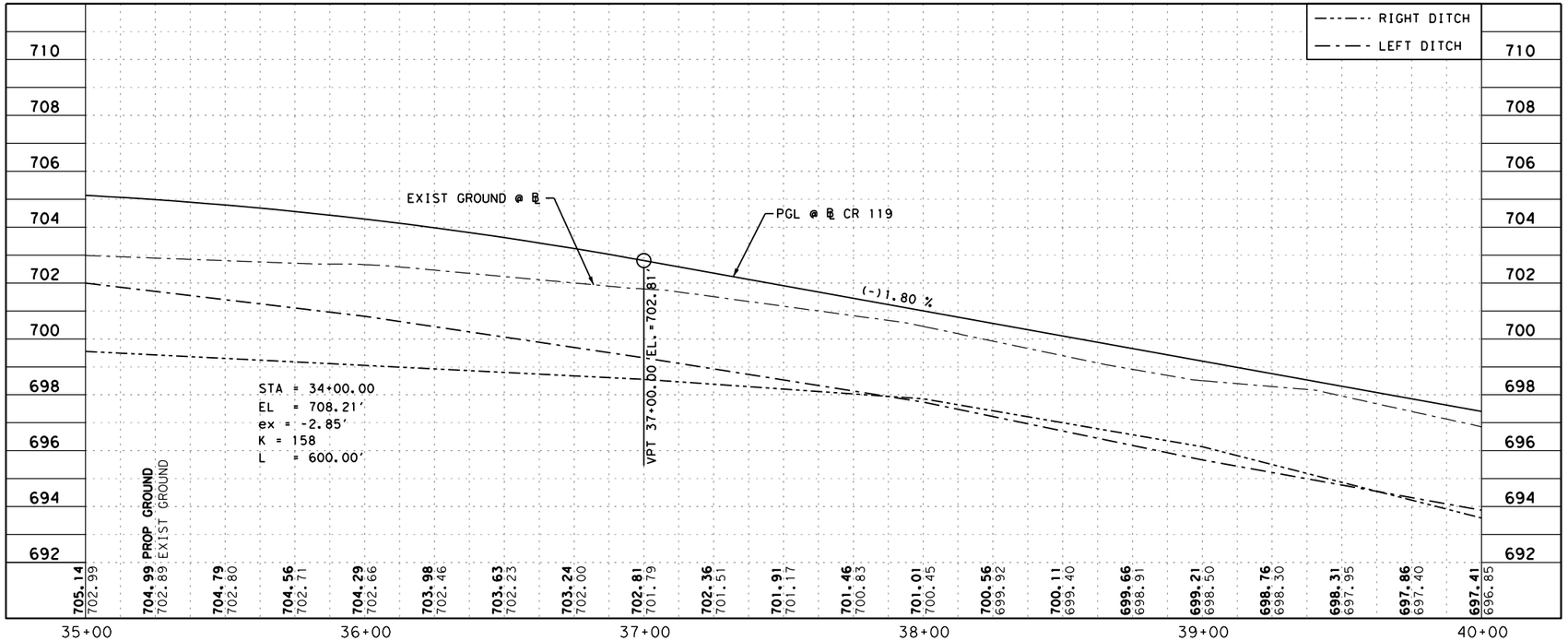


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LEGEND

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- RIGHT OF WAY BOUNDARY
- EASEMENT
- EXISTING WIRE FENCE
- PROPOSED WIRE FENCE
- EXISTING GAS LINE
- DITCH FLOW ARROWS
- 535 EXISTING CONTOURS



0 12.5 25 50 (H)
0 2.5 5 (V)

STATE OF TEXAS
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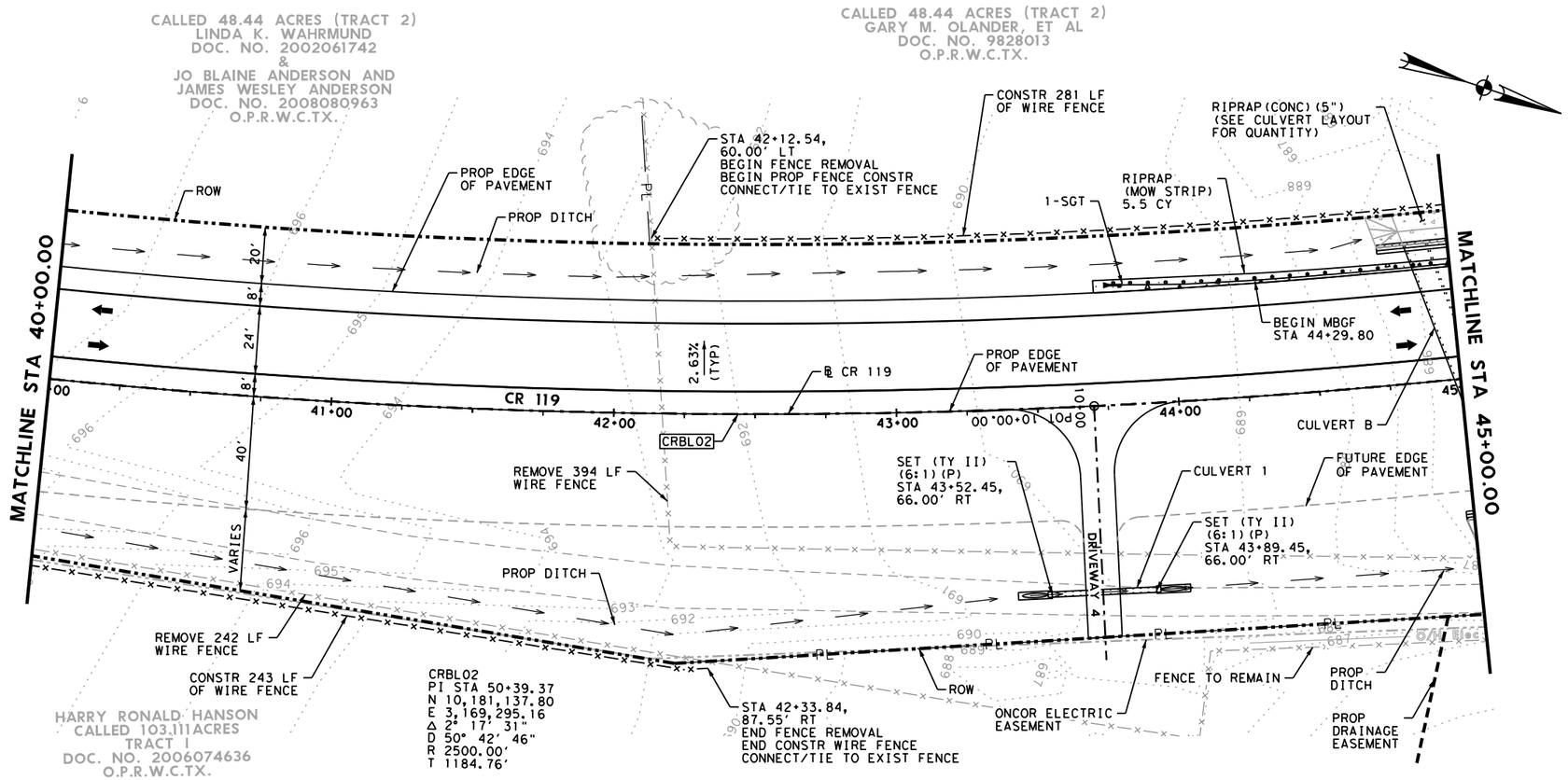
STA 35+00 TO STA 40+00

SHEET 06 OF 27

FED. RD. DIV. NO.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				82

FILE: V:\2220\active\222010286\civil\cad\Design\ROADWAY\104123_RDWY_PP_06.dgn DATE: 6/15/2017 TIME: 3:11:45 PM USER: agonzales

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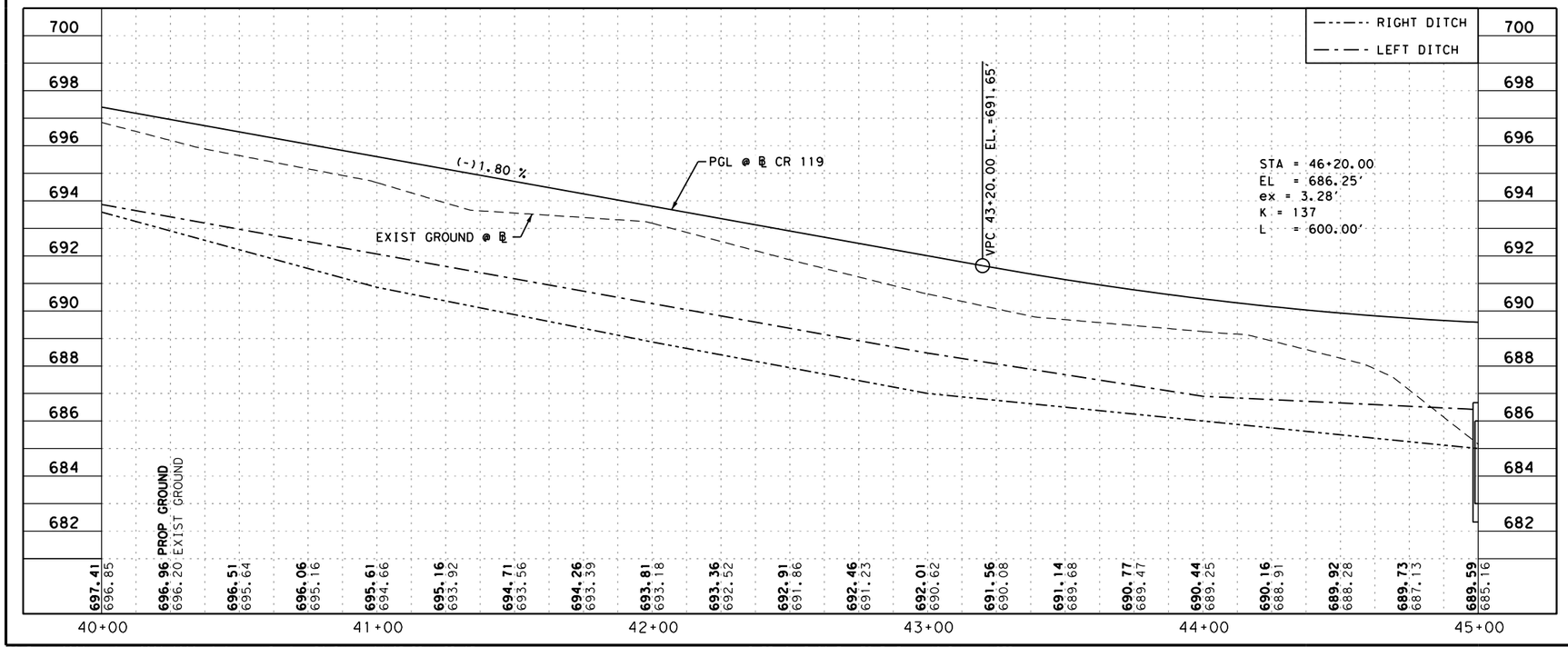


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LEGEND

- TRAFFIC FLOW ARROW
- RIGHT OF WAY BOUNDARY
- EASEMENT
- EXISTING WIRE FENCE
- PROPOSED WIRE FENCE
- EXISTING GAS LINE
- DITCH FLOW ARROWS
- EXISTING CONTOURS



0 12.5 25 50 (H)
0 2.5 5 (V)

STATE OF TEXAS
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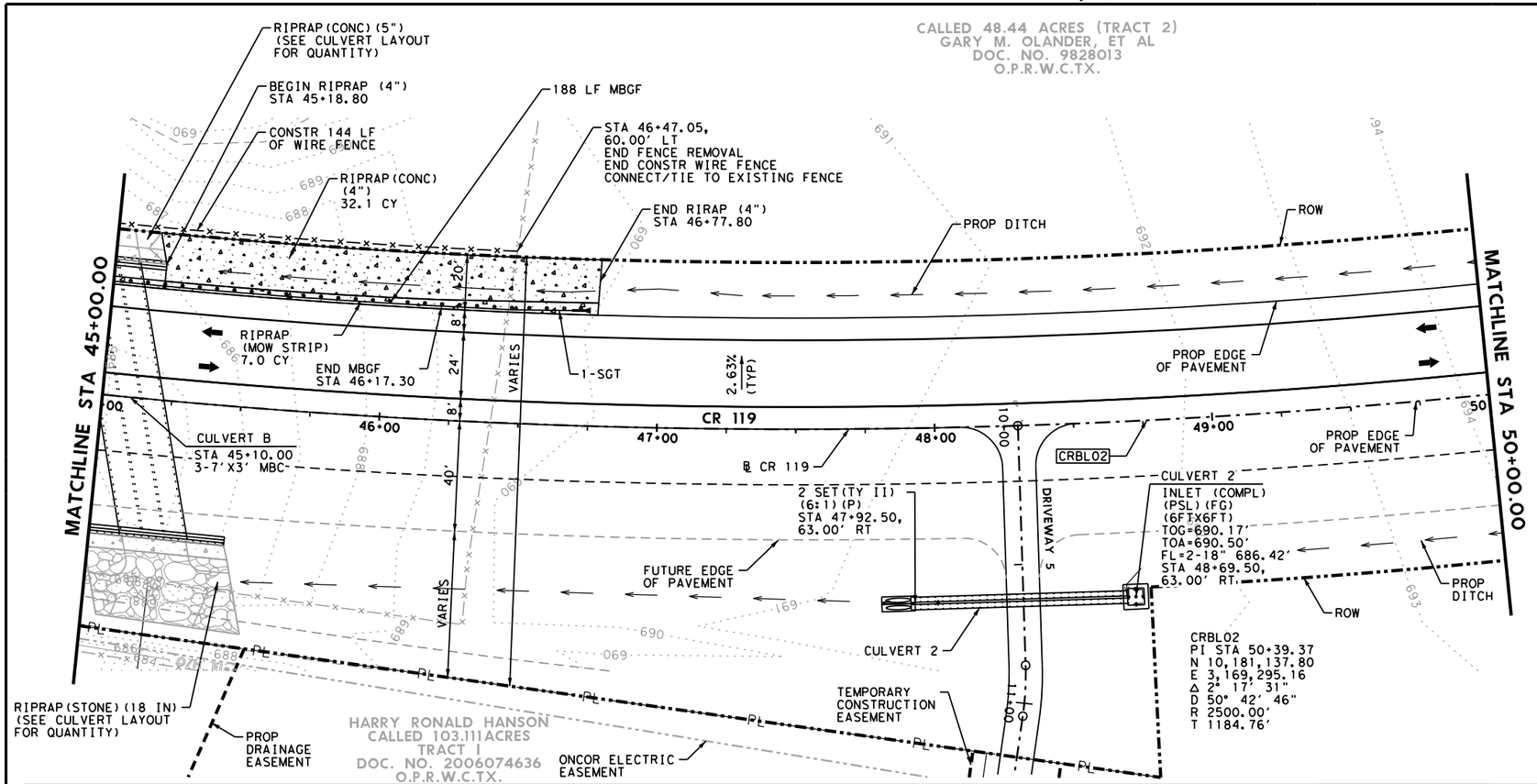
ROADWAY

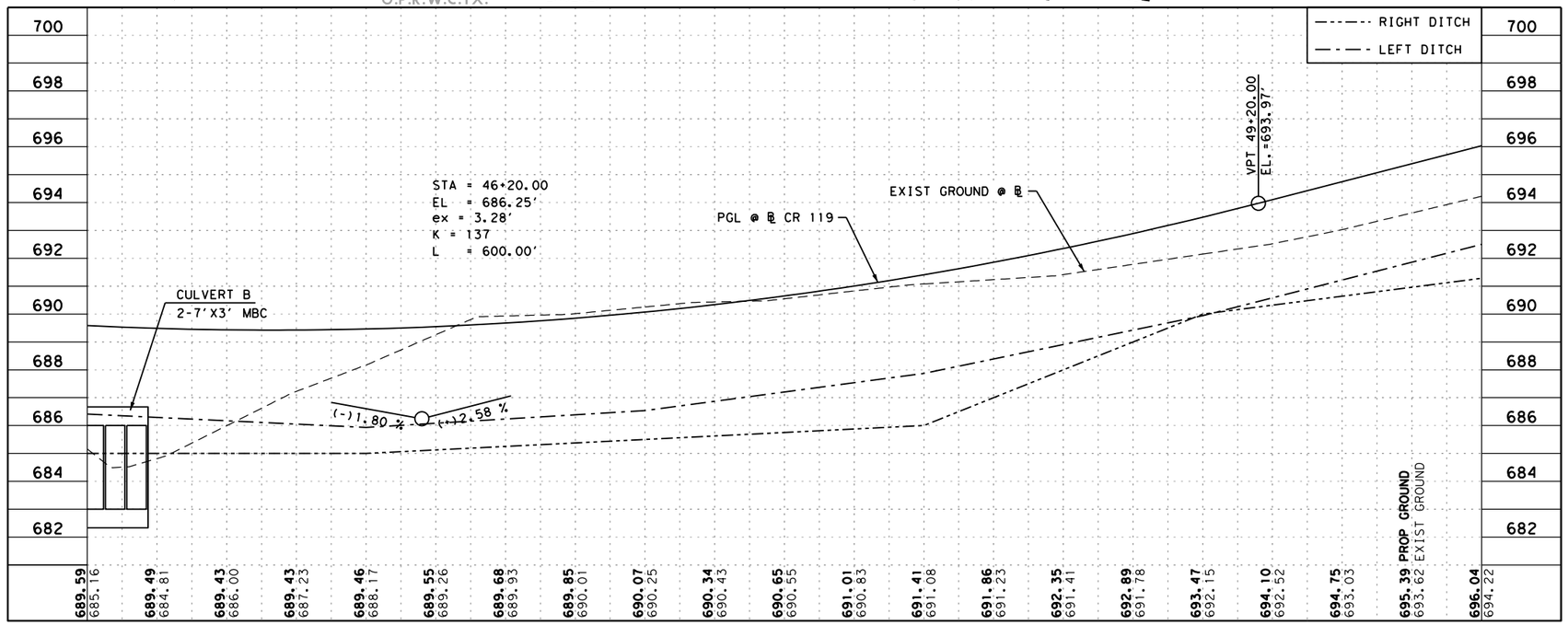
PLAN AND PROFILE

STA 40+00 TO STA 45+00

SHEET 07 OF 27

FED. RD. DIV. RD.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				83





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11. MATCH EXIST X-SLOPES AT TIE-IN LOCATIONS.
12. REFER TO STORM SEWER PROFILES FOR MORE INFORMATION.

LEGEND

- TRAFFIC FLOW ARROW
- RIGHT OF WAY BOUNDARY
- EASEMENT
- EXISTING WIRE FENCE
- PROPOSED WIRE FENCE
- EXISTING GAS LINE
- DITCH FLOW ARROWS
- EXISTING CONTOURS

0 12.5 25 50 (H)
0 2.5 5 (V)

STATE OF TEXAS
ARNOLD GONZALES, JR.
98234
LICENSED
PROFESSIONAL ENGINEER

6/15/2017

CR 119

WILLIAMSON COUNTY
1848

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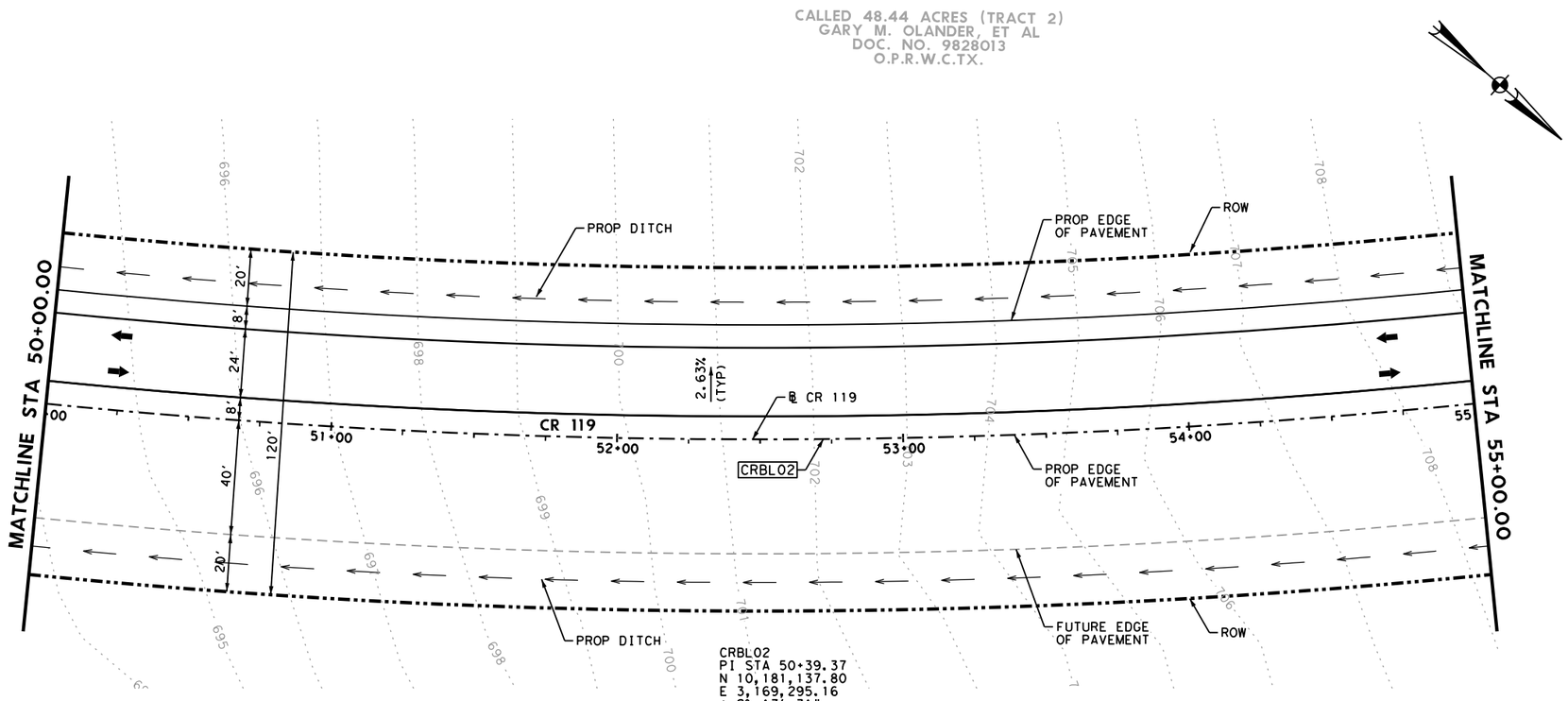
ROADWAY

PLAN AND PROFILE

STA 45+00 TO STA 50+00

SHEET 08 OF 27

FED. RD. DIV. RD.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				84

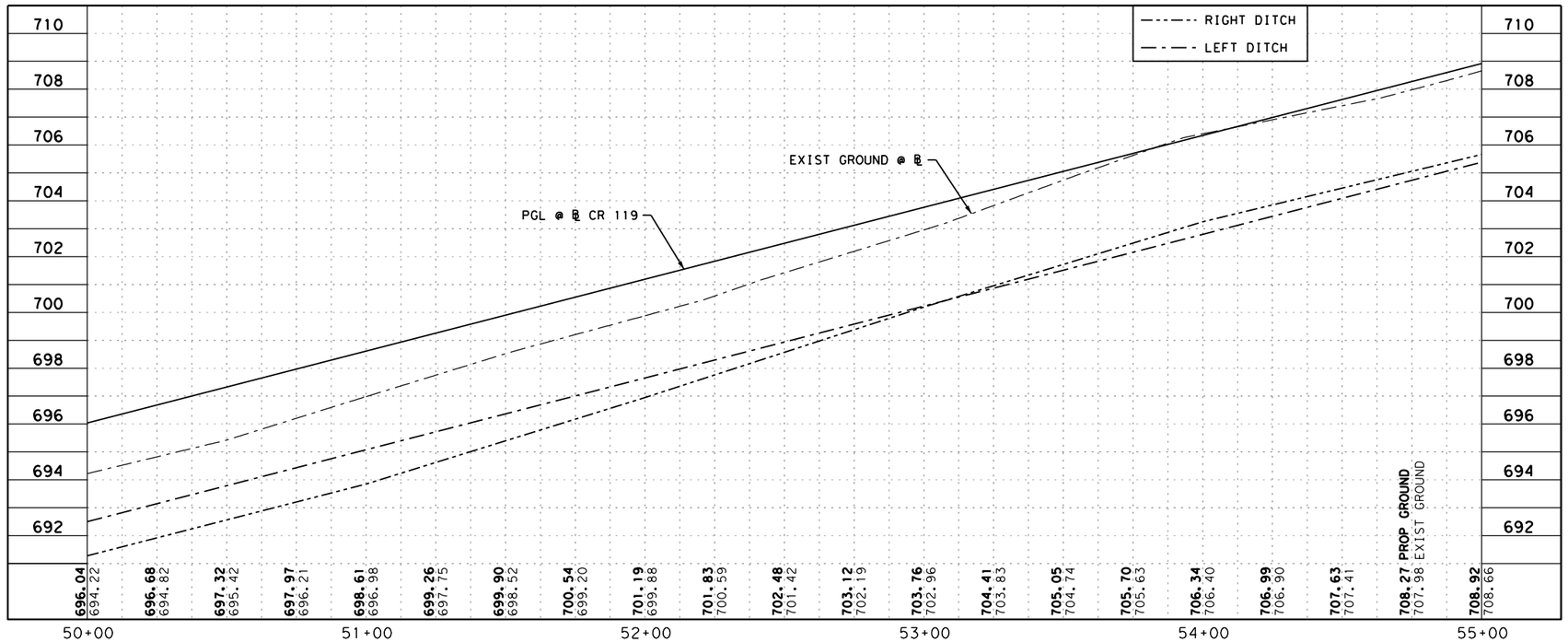


NOTES:

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LEGEND

- TRAFFIC FLOW ARROW
- RIGHT OF WAY BOUNDARY
- EASEMENT
- EXISTING WIRE FENCE
- PROPOSED WIRE FENCE
- EXISTING GAS LINE
- DITCH FLOW ARROWS
- 535 EXISTING CONTOURS



0 12.5 25 50 (H)
0 2.5 5 (V)

STATE OF TEXAS
ARNOLD GONZALES, JR.
98234
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PROFESSIONAL ENGINEER

6/15/2017

CR 119

WILLIAMSON COUNTY 1848

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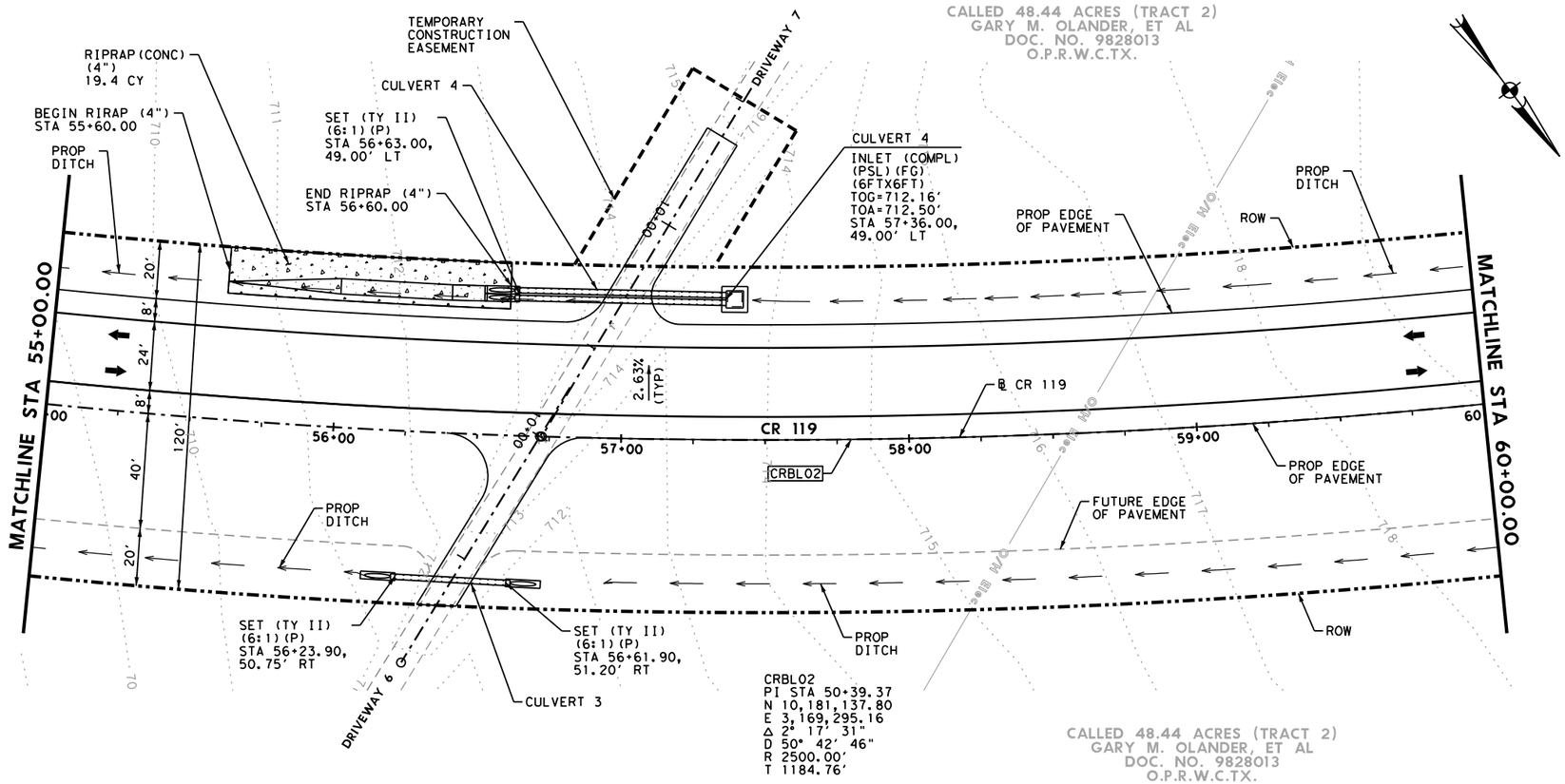
ROADWAY

PLAN AND PROFILE

STA 50+00 TO STA 55+00

SHEET 09 OF 27

FED. RD. DIV. RD.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				85

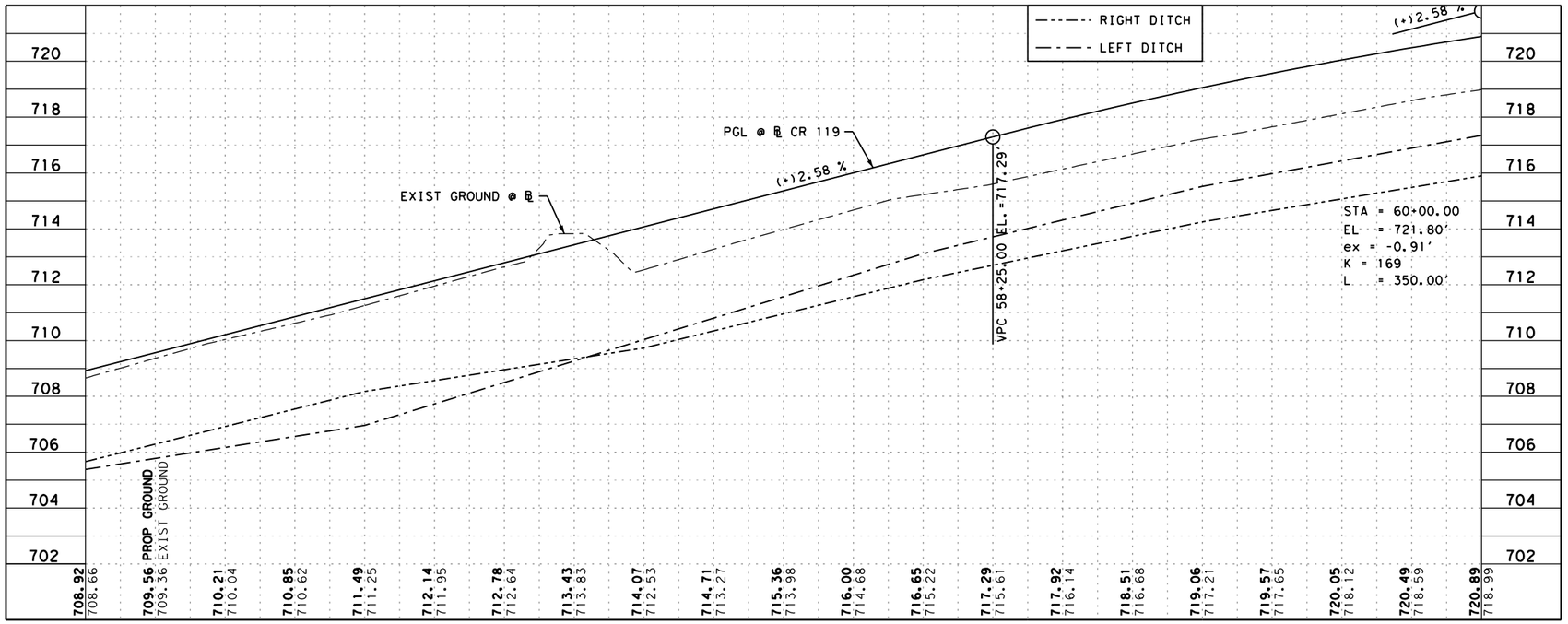


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LEGEND

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- RIGHT OF WAY BOUNDARY
- EASEMENT
- EXISTING WIRE FENCE
- PROPOSED WIRE FENCE
- EXISTING GAS LINE
- DITCH FLOW ARROWS
- EXISTING CONTOURS



0 12.5 25 50 (H)
0 2.5 5 (V)

STATE OF TEXAS
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98234
LICENSED PROFESSIONAL ENGINEER

6/15/2017

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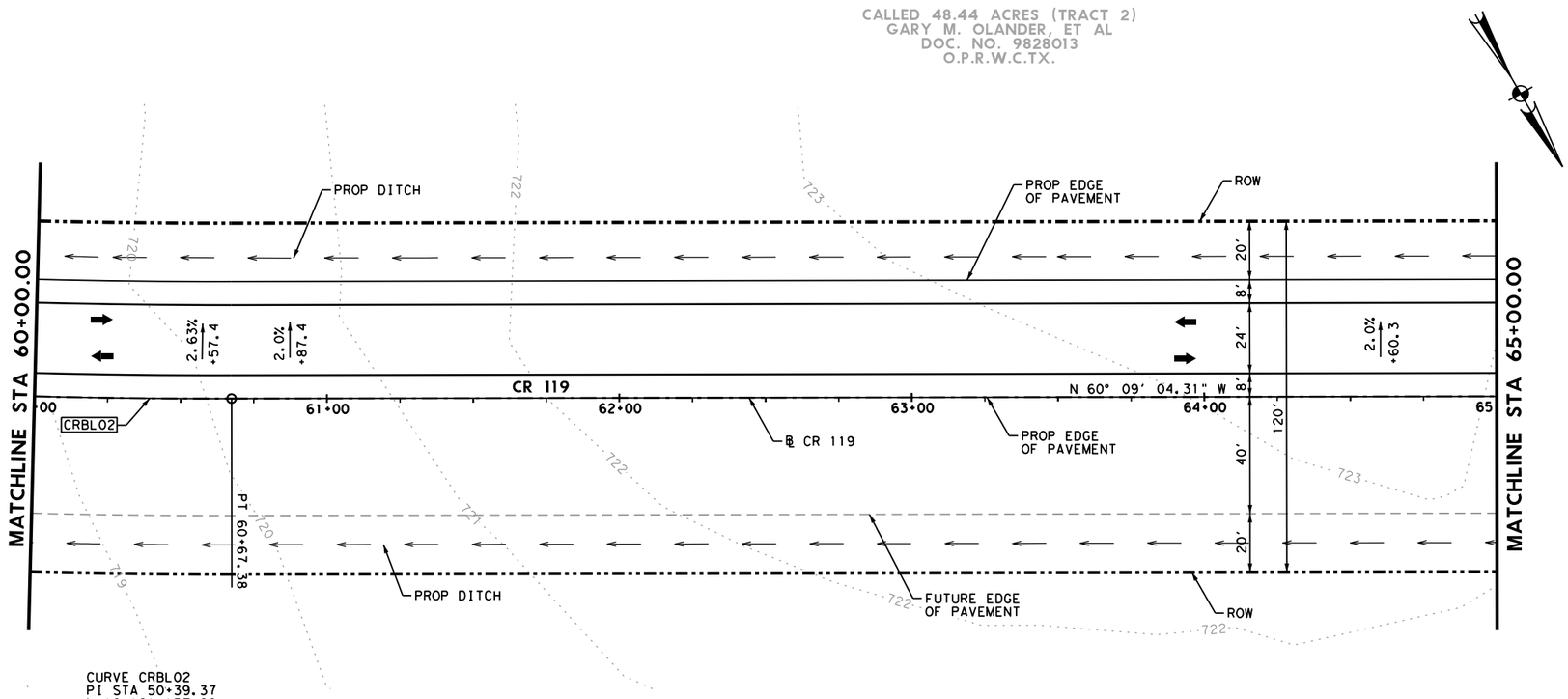
ROADWAY

PLAN AND PROFILE

STA 55+00 TO STA 60+00

SHEET 10 OF 27

FED. RD. DIV. RD.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				86

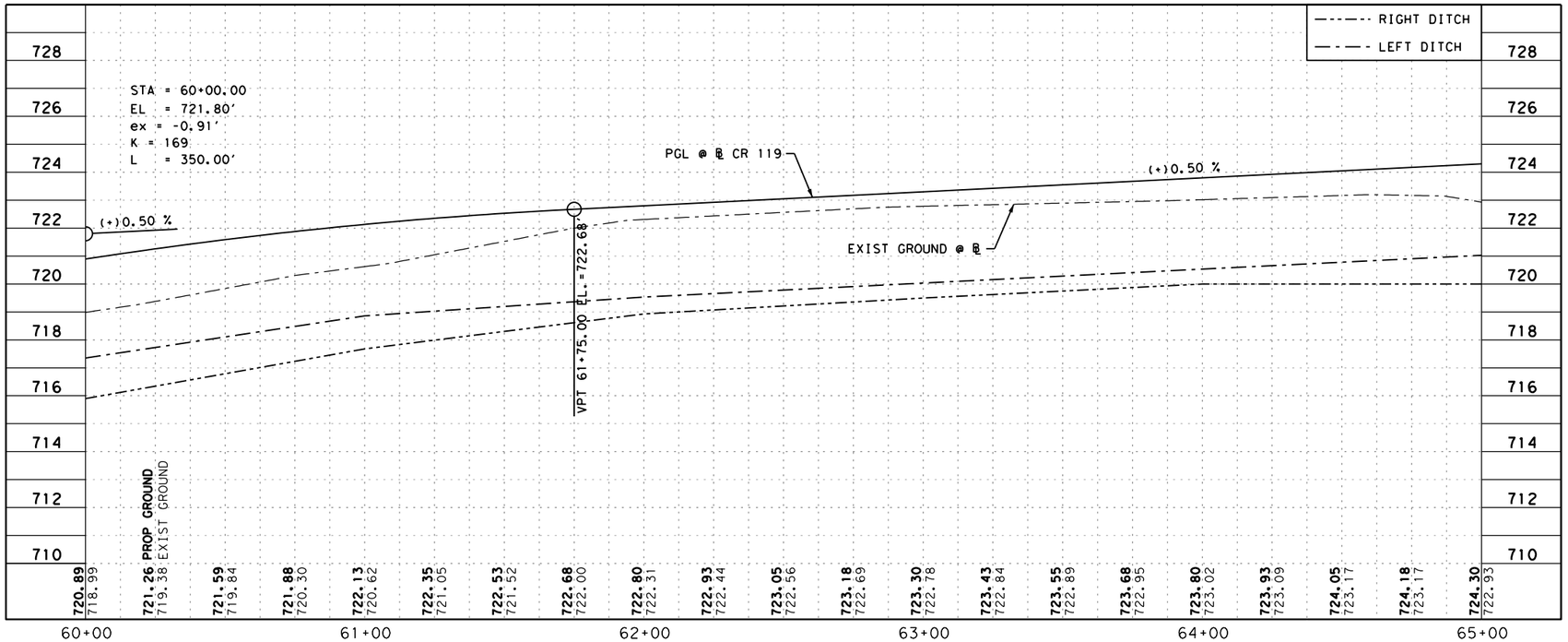


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LEGEND

- TRAFFIC FLOW ARROW
- RIGHT OF WAY BOUNDARY
- EASEMENT
- EXISTING WIRE FENCE
- PROPOSED WIRE FENCE
- EXISTING GAS LINE
- DITCH FLOW ARROWS
- 535 EXISTING CONTOURS



0 12.5 25 50 (H)
0 2.5 5 (V)

STATE OF TEXAS
ARNOLD GONZALES, JR.
98234
LICENSED
PROFESSIONAL ENGINEER

6/15/2017

CR 119

WILLIAMSON COUNTY
1848

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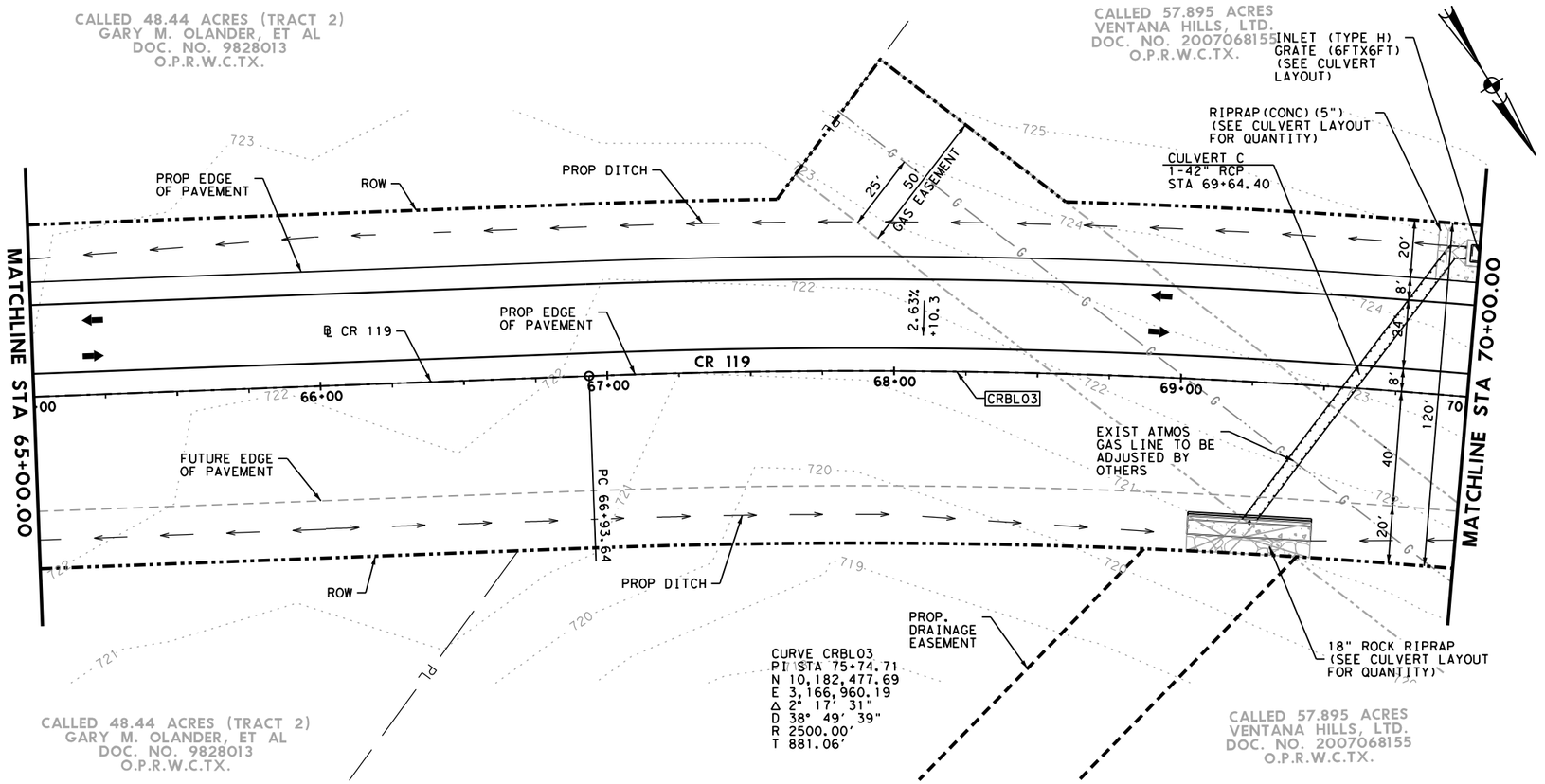
ROADWAY

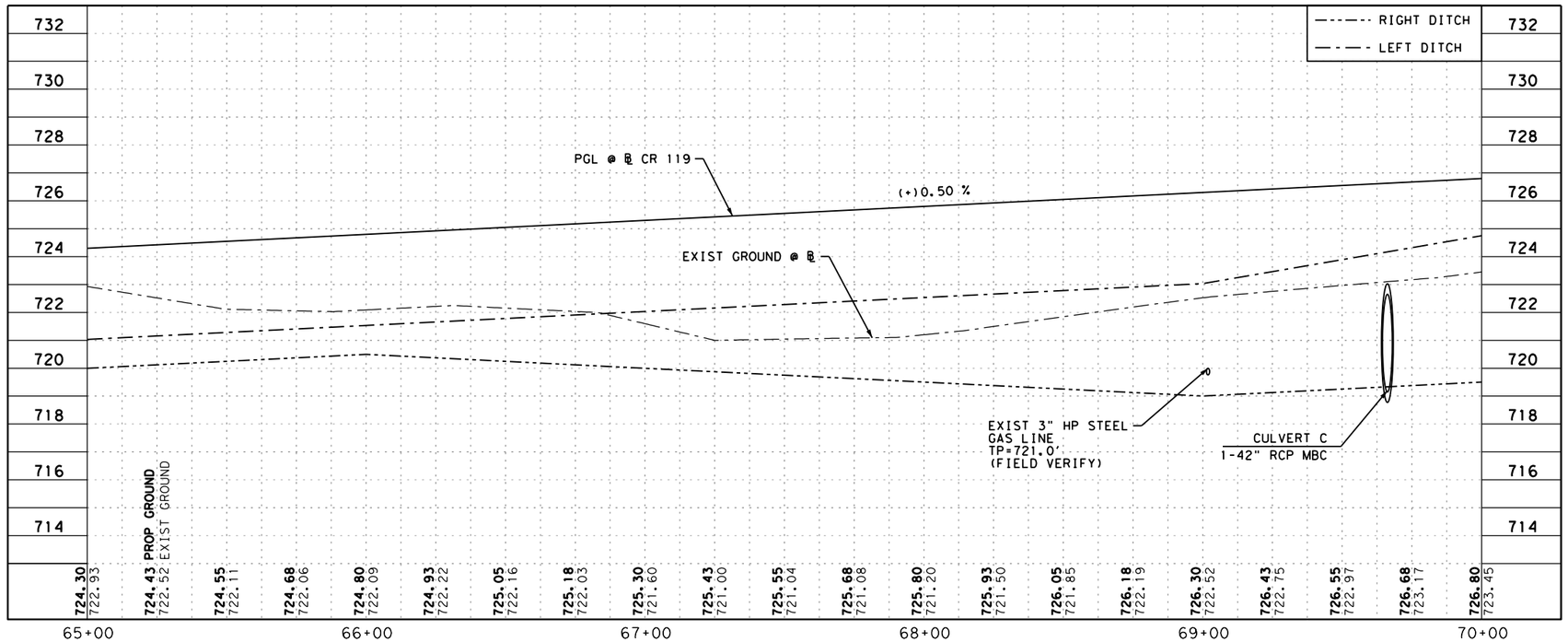
PLAN AND PROFILE

STA 60+00 TO STA 65+00

SHEET 11 OF 27

FED. RD. DIV. RD.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				87





NOTES:

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LEGEND

- TRAFFIC FLOW ARROW
- RIGHT OF WAY BOUNDARY
- EASEMENT
- EXISTING WIRE FENCE
- PROPOSED WIRE FENCE
- EXISTING GAS LINE
- DITCH FLOW ARROWS
- 535 EXISTING CONTOURS

0 12.5 25 50 (H)
0 2.5 5 (V)

ARNOLD GONZALES, JR. 98234 LICENSED PROFESSIONAL ENGINEER
STATE OF TEXAS
6/15/2017

CR 119

WILLIAMSON COUNTY 1848

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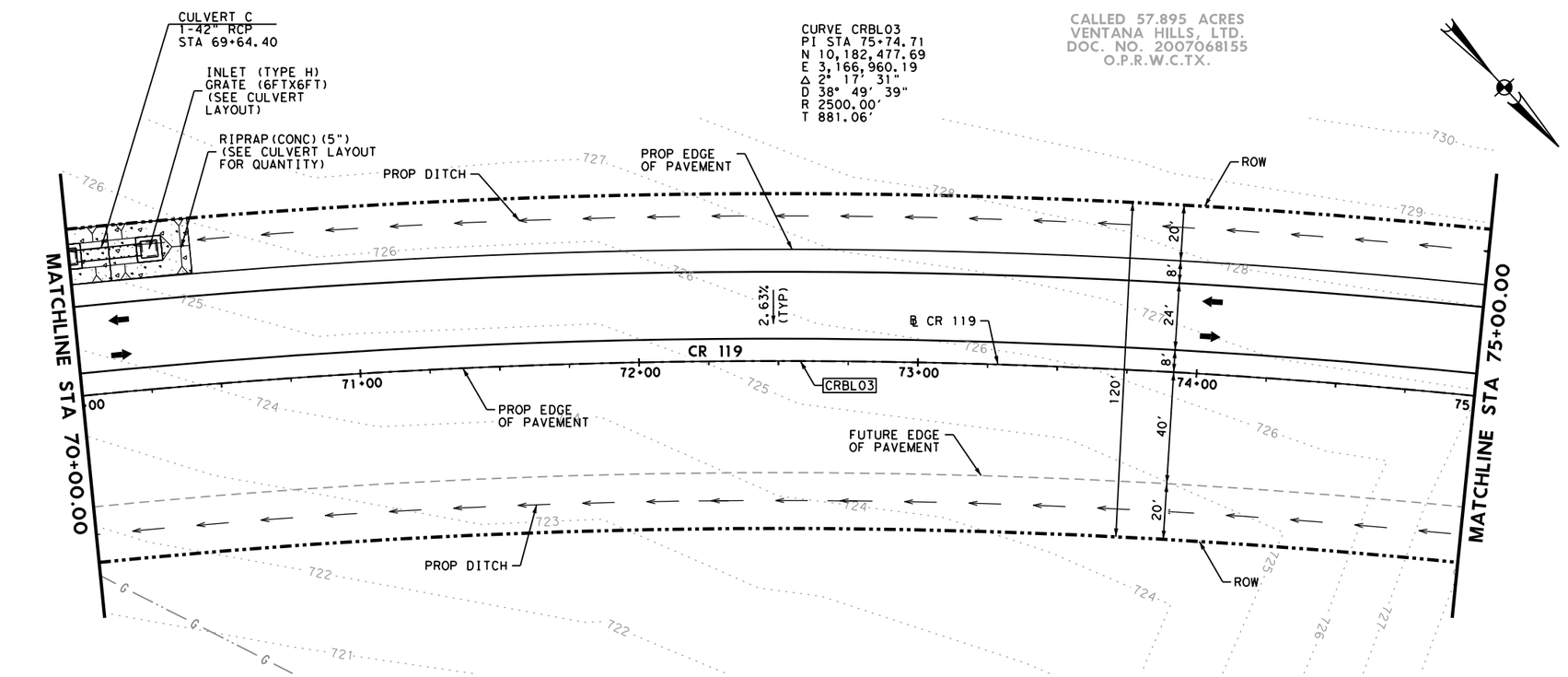
ROADWAY

PLAN AND PROFILE

STA 65+00 TO STA 70+00

SHEET 12 OF 27

FED. RD. DIV. RD.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				88

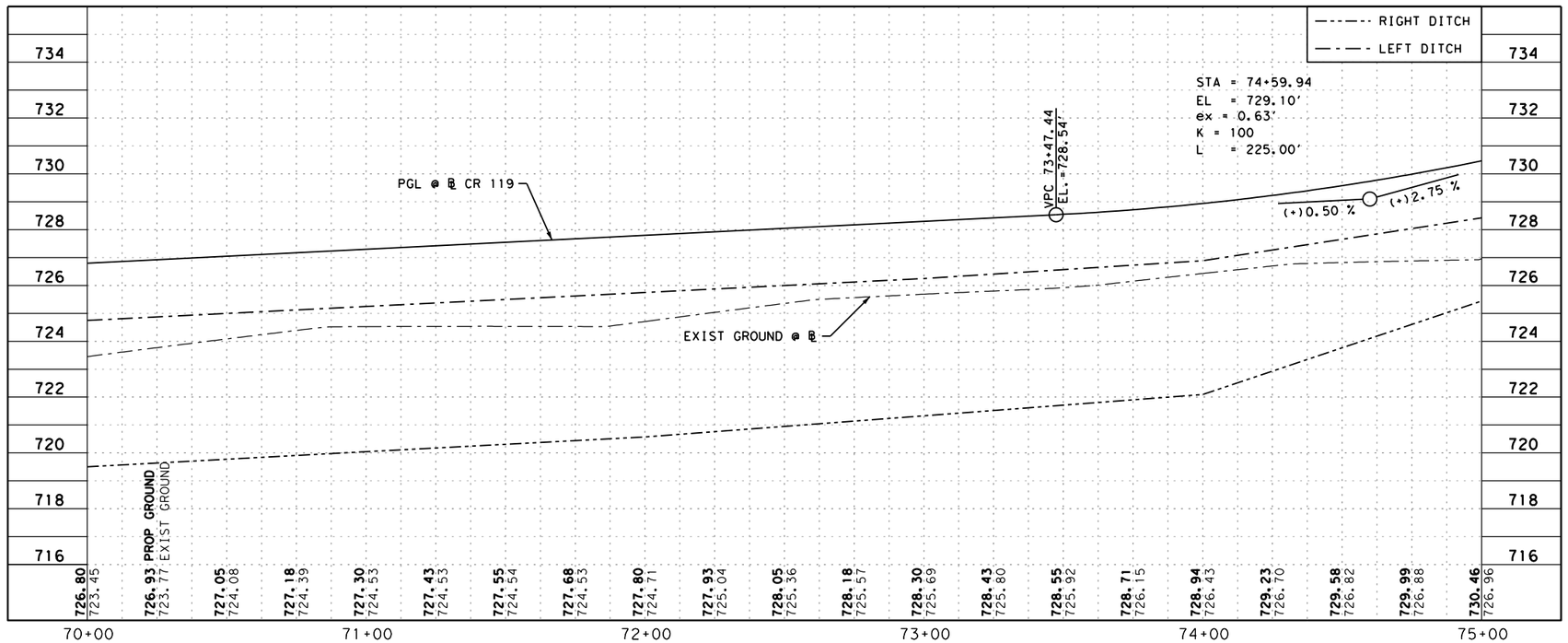


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12. REFER TO STORM SEWER PROFILES FOR MORE INFORMATION.

LEGEND

- TRAFFIC FLOW ARROW
- RIGHT OF WAY BOUNDARY
- EASEMENT
- EXISTING WIRE FENCE
- PROPOSED WIRE FENCE
- EXISTING GAS LINE
- DITCH FLOW ARROWS
- 535 EXISTING CONTOURS



0 12.5 25 50 (H)
0 2.5 5 (V)

ARNOLD GONZALES, JR. 98234 LICENSED PROFESSIONAL ENGINEER
STATE OF TEXAS
6/15/2017

CR 119

WILLIAMSON COUNTY 1848

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PLAN AND PROFILE

STA 70+00 TO STA 75+00

SHEET 13 OF 27

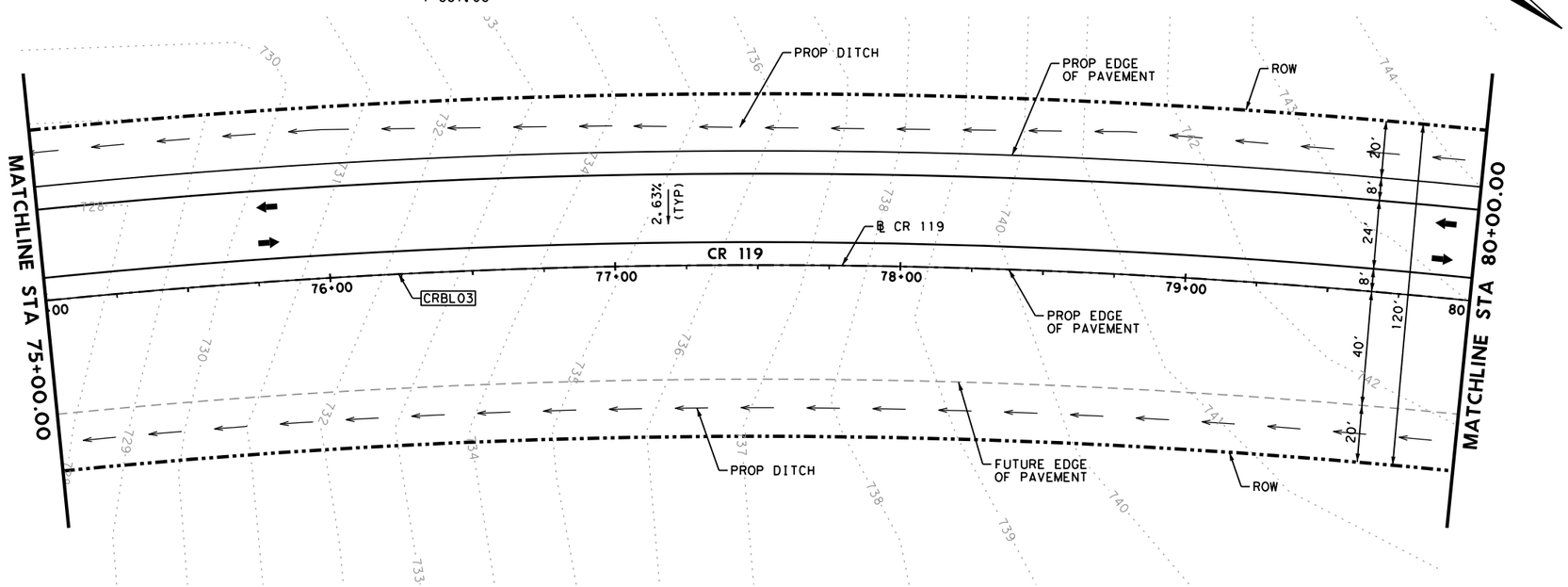
FED. RD. DIV. RD.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				89

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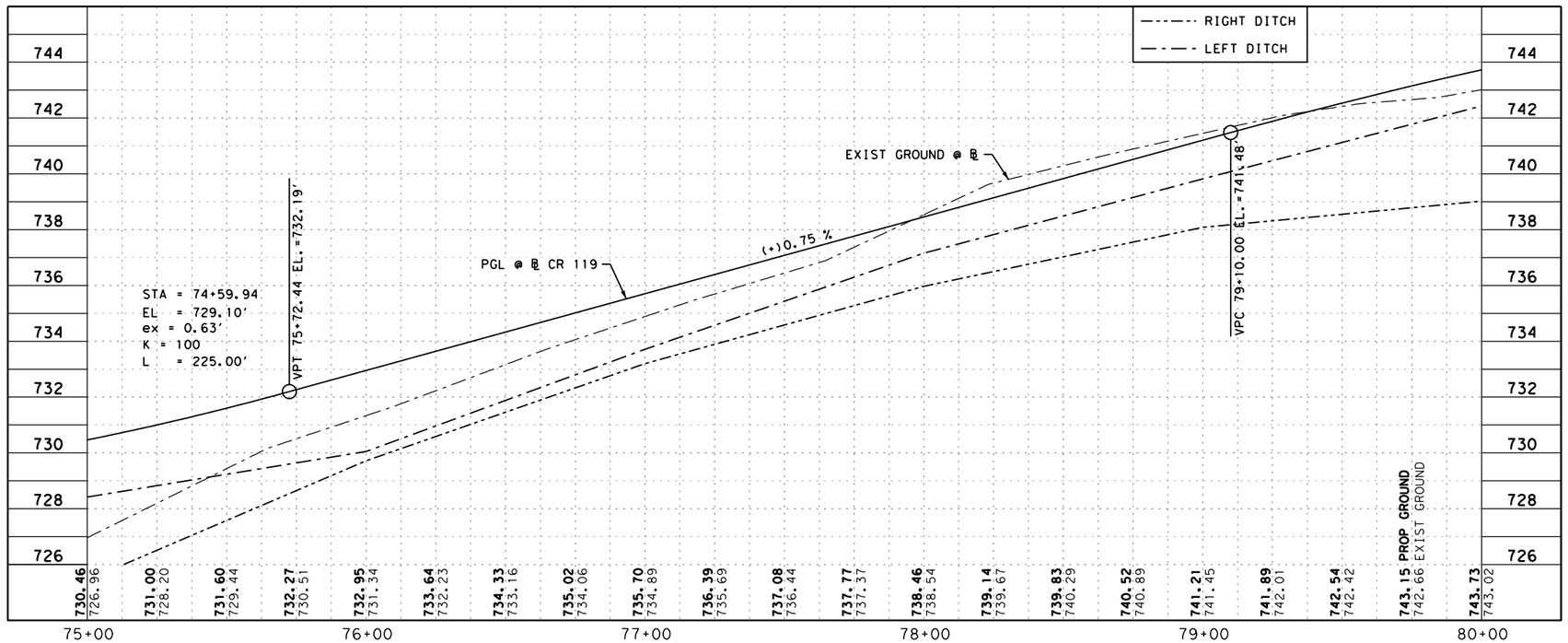
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CURVE CRBL03
PI STA 75+74.71
N 10,182,477.69
E 3,166,960.19
Δ 2° 17' 31"
D 38° 49' 39"
R 2500.00'
T 881.06'

CALLED 57.895 ACRES
VENTANA HILLS, LTD.
DOC. NO. 2007068155
O.P.R.W.C.TX.



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VENTANA HILLS, LTD.
DOC. NO. 2007068155
O.P.R.W.C.TX.



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LEGEND

- TRAFFIC FLOW ARROW
- RIGHT OF WAY BOUNDARY
- EASEMENT
- EXISTING WIRE FENCE
- PROPOSED WIRE FENCE
- EXISTING GAS LINE
- DITCH FLOW ARROWS
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6/15/2017

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ROADWAY

PLAN AND PROFILE

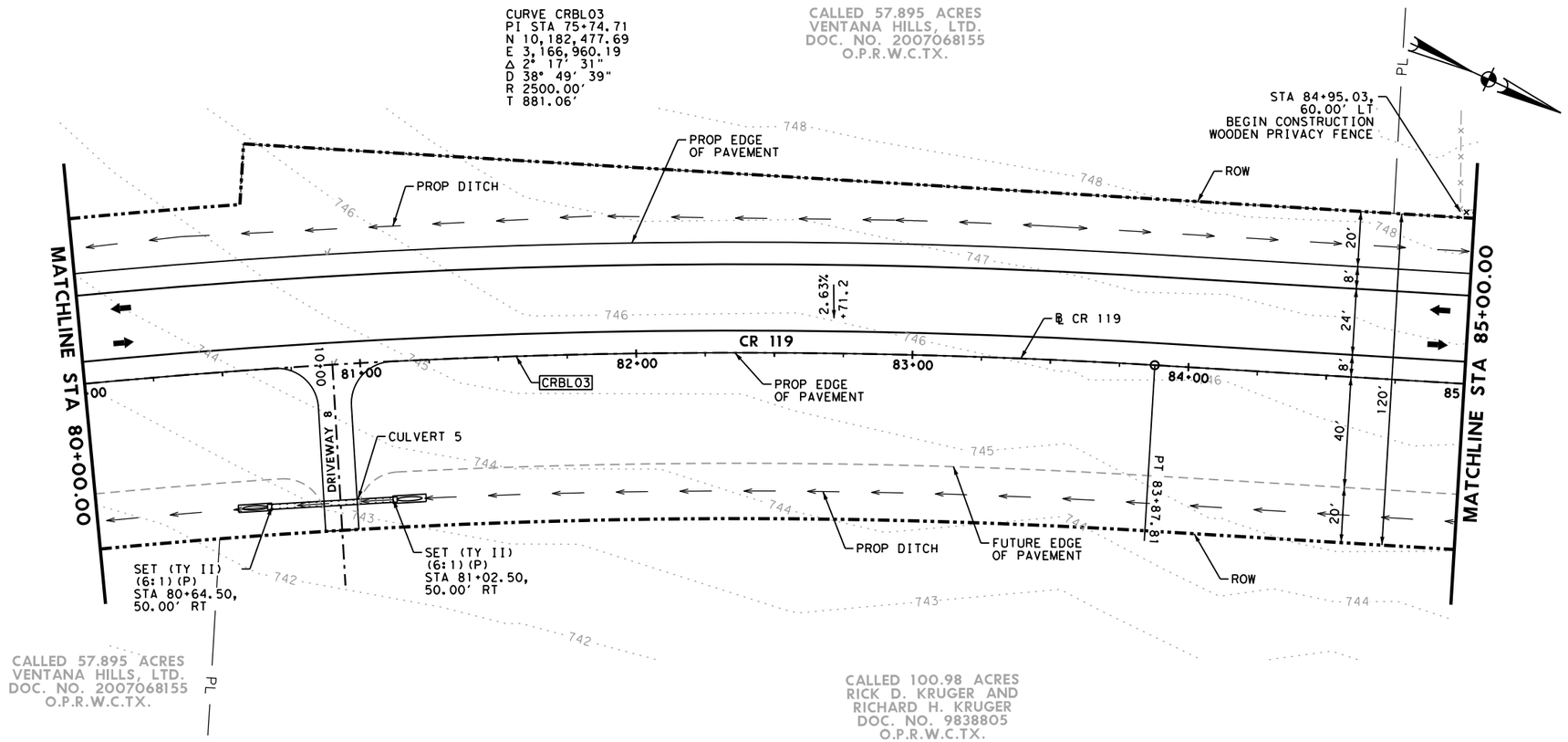
STA 75+00 TO STA 80+00

SHEET 14 OF 27

FED. RD. DIV. RD.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				90

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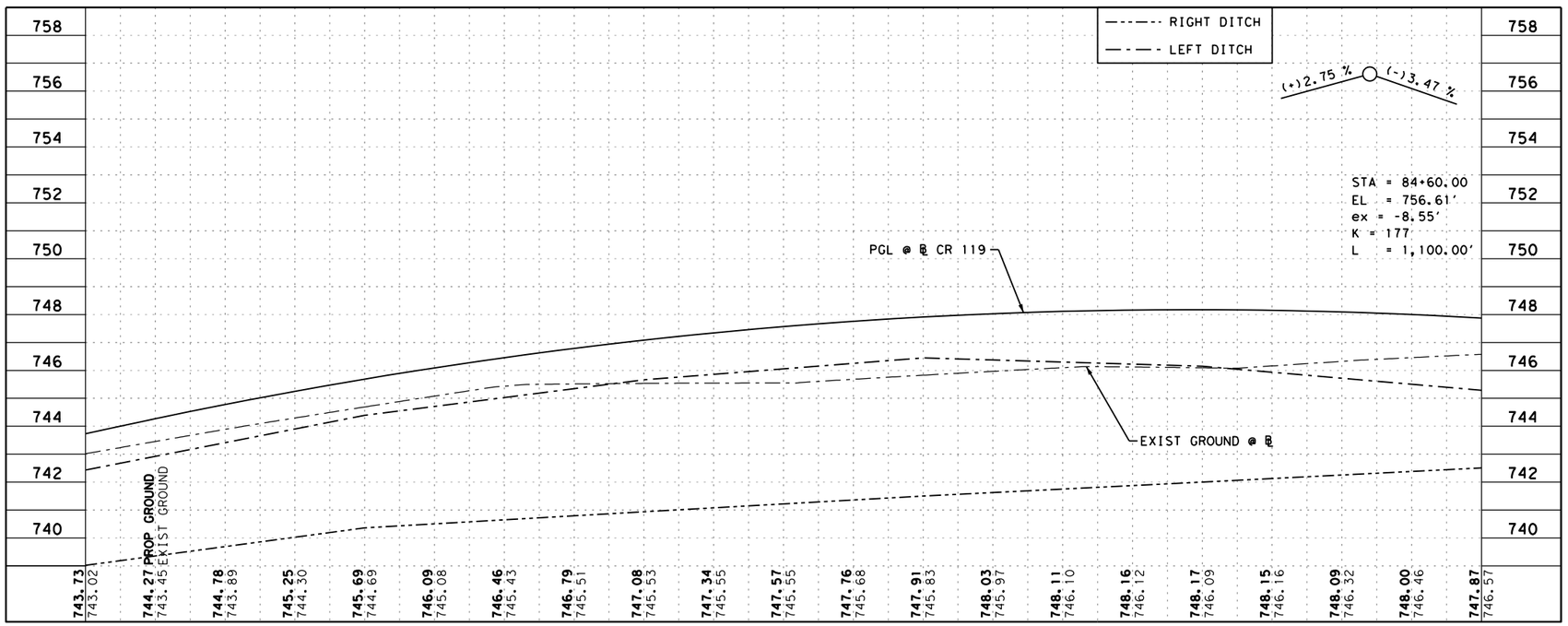


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12. REFER TO STORM SEWER PROFILES FOR MORE INFORMATION.
13. REFER TO WOODEN PRIVACY FENCE DETAIL FOR ADDITIONAL INFORMATION.

LEGEND

- TRAFFIC FLOW ARROW
- RIGHT OF WAY BOUNDARY
- EASEMENT
- EXISTING WIRE FENCE
- PROPOSED WIRE FENCE
- EXISTING GAS LINE
- DITCH FLOW ARROWS
- 535 EXISTING CONTOURS



0 12.5 25 50 (H)
0 2.5 5 (V)



6/15/2017

CR 119

WILLIAMSON COUNTY 1848

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ROADWAY

PLAN AND PROFILE

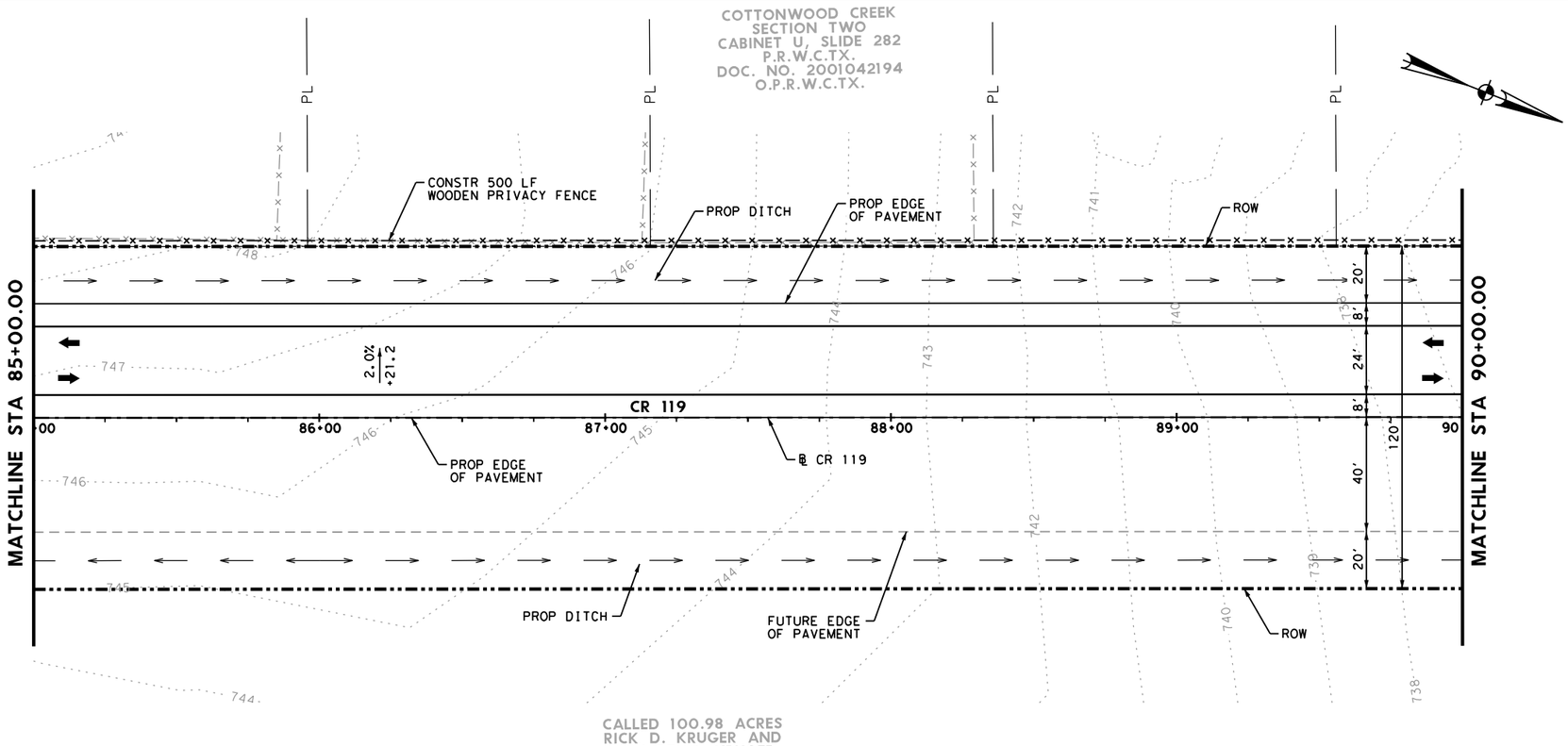
STA 80+00 TO STA 85+00

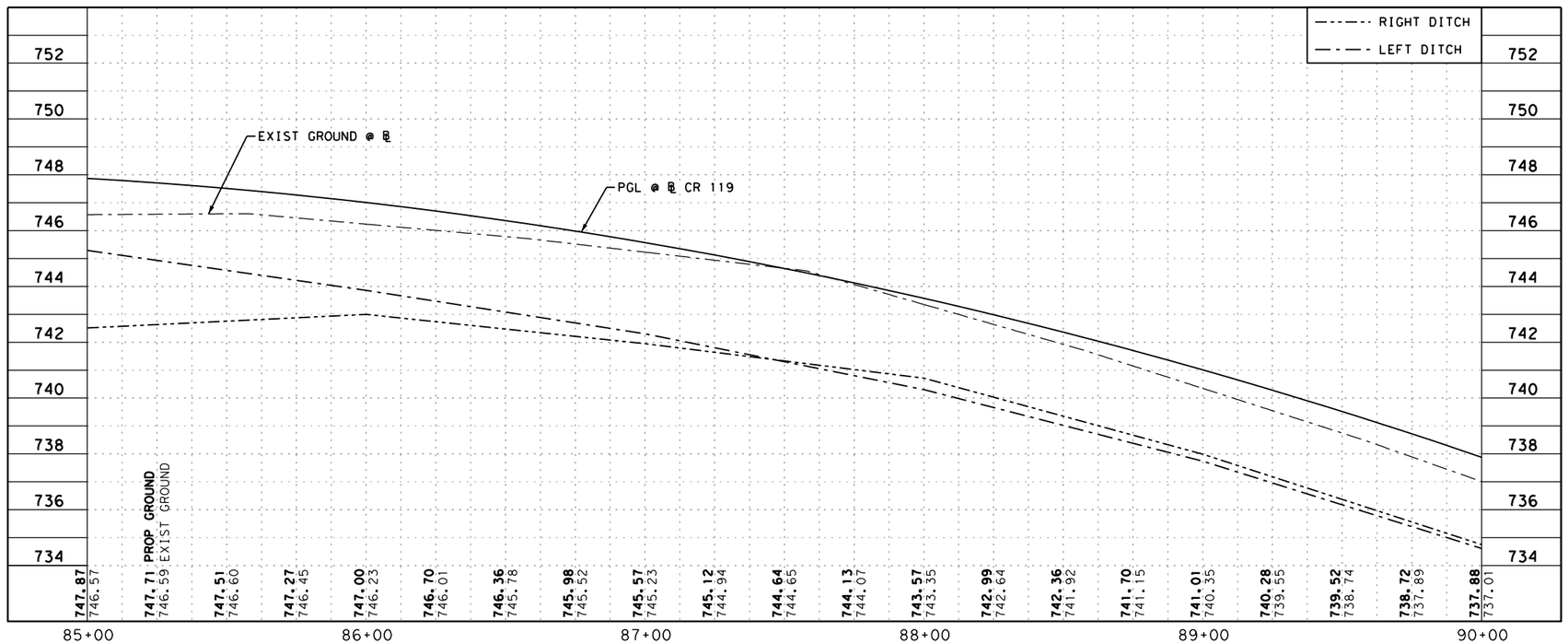
SHEET 15 OF 27

FED. RD. DIV. RD.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				91

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LEGEND

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- RIGHT OF WAY BOUNDARY
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- 535 EXISTING CONTOURS

0 12.5 25 50 (H)
0 2.5 5 (V)

STATE OF TEXAS
ARNOLD GONZALES, JR.
98234
LICENSED
PROFESSIONAL ENGINEER
6/15/2017

CR 119

WILLIAMSON COUNTY 1848

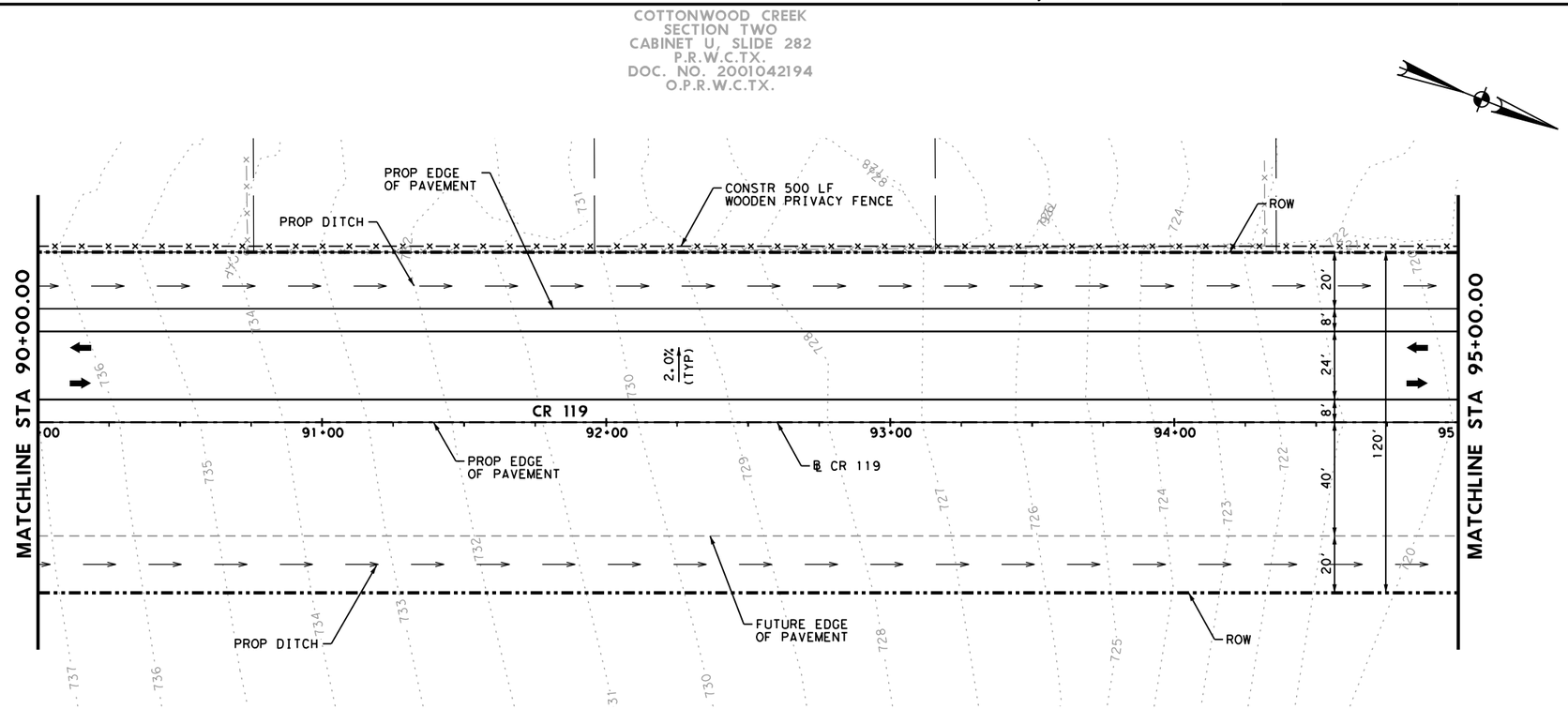
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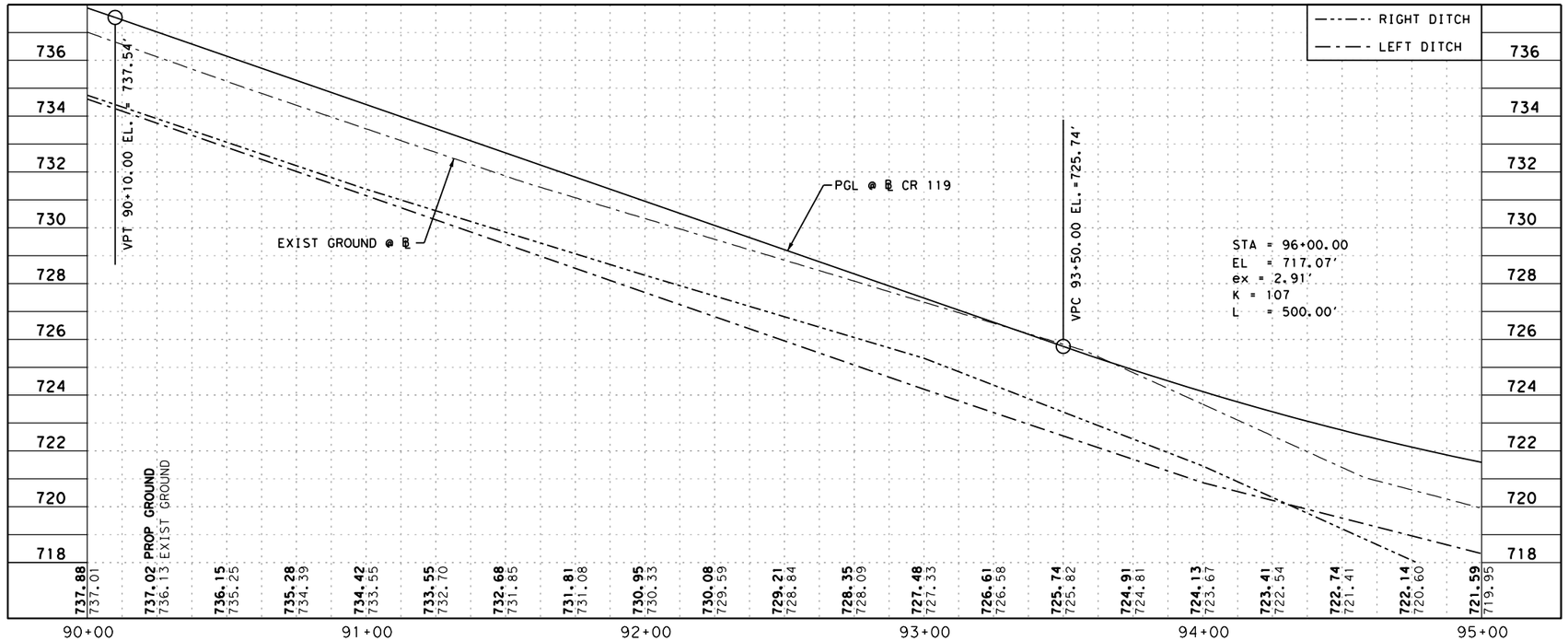
ROADWAY

PLAN AND PROFILE

STA 85+00 TO STA 90+00 SHEET 16 OF 27

FED. RD. DIV. RD.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				92





NOTES:

1. CALL THE TEXAS STATE WIDE ONE CALL LOCATOR NUMBER 1-800-344-8377, 48 HOURS BEFORE BEGINNING ANY EXCAVATION.
2. THE CONTRACTOR WILL BE RESPONSIBLE FOR PROTECTING OVERHEAD AND UNDERGROUND FACILITIES ADJACENT TO WORK AREA.
3. ALL STATIONS AND OFFSETS REFERENCE THE PROPOSED CR 119 BASELINE, UNLESS OTHERWISE NOTED IN THE PLANS.
4. REFER TO INTERSECTION LAYOUT SHEETS FOR MORE INFORMATION.
5. REFER TO DRIVEWAY LAYOUT SHEETS FOR ADDITIONAL INFORMATION.
6. REFER TO HORIZONTAL ALIGNMENT DATA SHEET FOR MORE INFORMATION.
7. REFER TO SIGNING AND PAVEMENT MARKING LAYOUT SHEETS FOR MORE INFORMATION.
8. REFER TO DRAINAGE SHEETS FOR MORE INFORMATION.
9. PROPOSED FENCING SHOWN OFFSET FROM ROW FOR VISUAL REFERENCE. FENCE TO BE CONSTRUCTED ALONG ROW.
10. REFER TO MINOR CULVERT SUMMARY AND DETAILS SHEET FOR ADDITIONAL INFORMATION ON DRIVEWAY CULVERTS AND STORM SEWER.
11. MATCH EXIST X-SLOPES AT TIE-IN LOCATIONS.
12. REFER TO STORM SEWER PROFILES FOR MORE INFORMATION.
13. REFER TO WOODEN PRIVACY FENCE DETAIL FOR ADDITIONAL INFORMATION.

LEGEND

- TRAFFIC FLOW ARROW
- RIGHT OF WAY BOUNDARY
- EASEMENT
- EXISTING WIRE FENCE
- PROPOSED WIRE FENCE
- EXISTING GAS LINE
- DITCH FLOW ARROWS
- 535 EXISTING CONTOURS

0 12.5 25 50 (H)
0 2.5 5 (V)

STATE OF TEXAS
ARNOLD GONZALES, JR.
98234
LICENSED
PROFESSIONAL ENGINEER

6/15/2017

CR 119

WILLIAMSON COUNTY
1848

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PLAN AND PROFILE

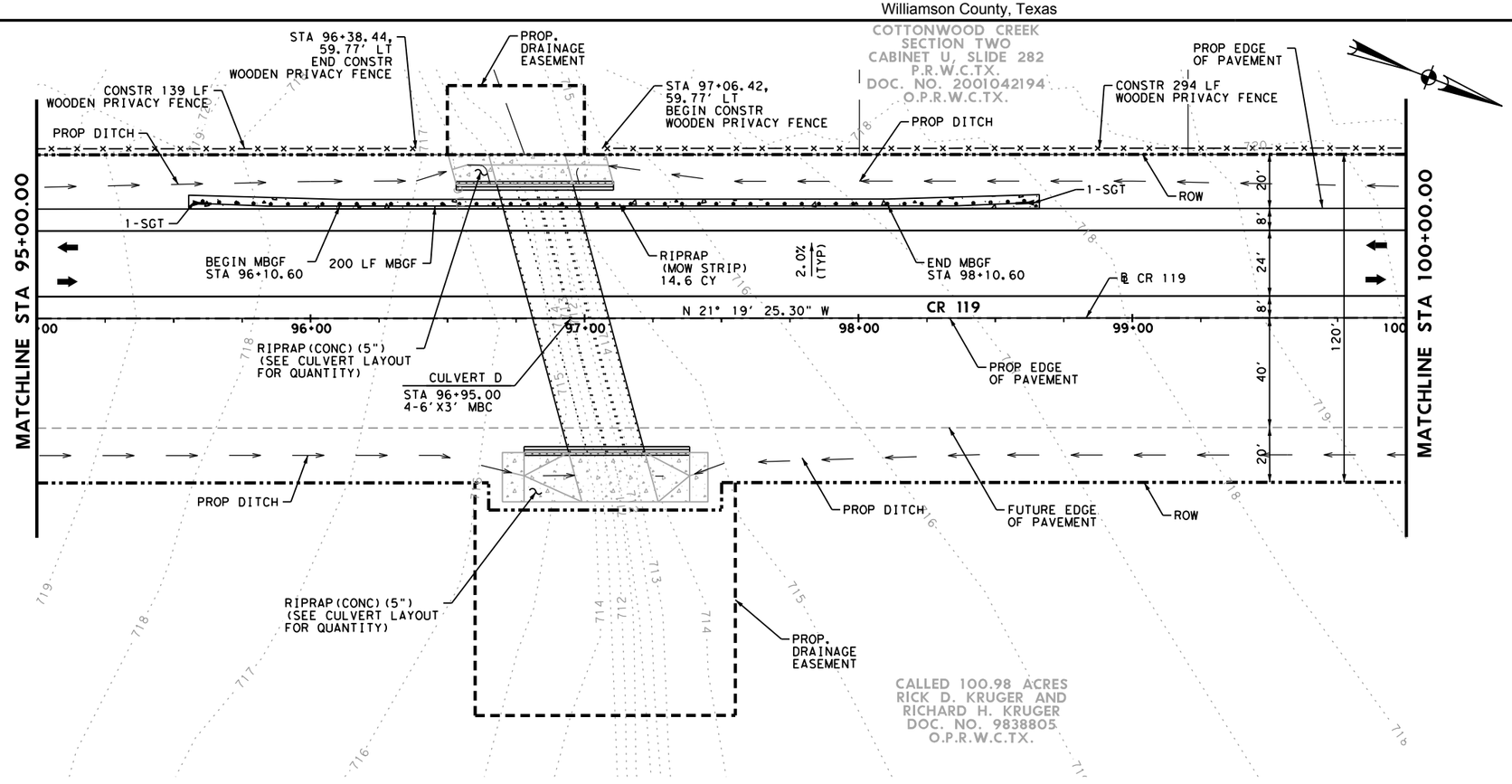
STA 90+00 TO STA 95+00

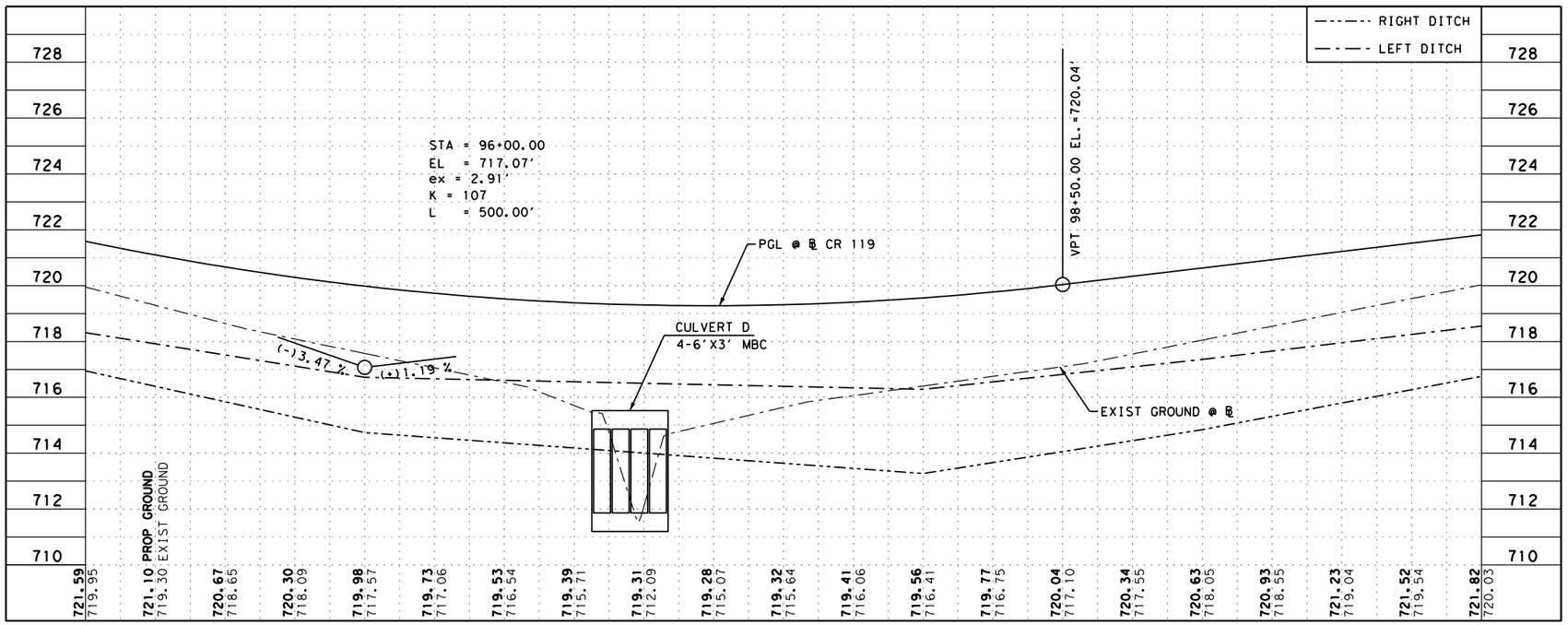
SHEET 17 OF 27

FED. RD. DIV. RD.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				93

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NOTES:

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13. REFER TO WOODEN PRIVACY FENCE DETAIL FOR ADDITIONAL INFORMATION.

LEGEND

- TRAFFIC FLOW ARROW
- RIGHT OF WAY BOUNDARY
- EASEMENT
- EXISTING WIRE FENCE
- PROPOSED WIRE FENCE
- EXISTING GAS LINE
- DITCH FLOW ARROWS
- 535 EXISTING CONTOURS

0 12.5 25 50 (H)
0 2.5 5 (V)

STATE OF TEXAS
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LICENSED
PROFESSIONAL ENGINEER
6/15/2017

CR 119

WILLIAMSON COUNTY 1848

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ROADWAY

PLAN AND PROFILE

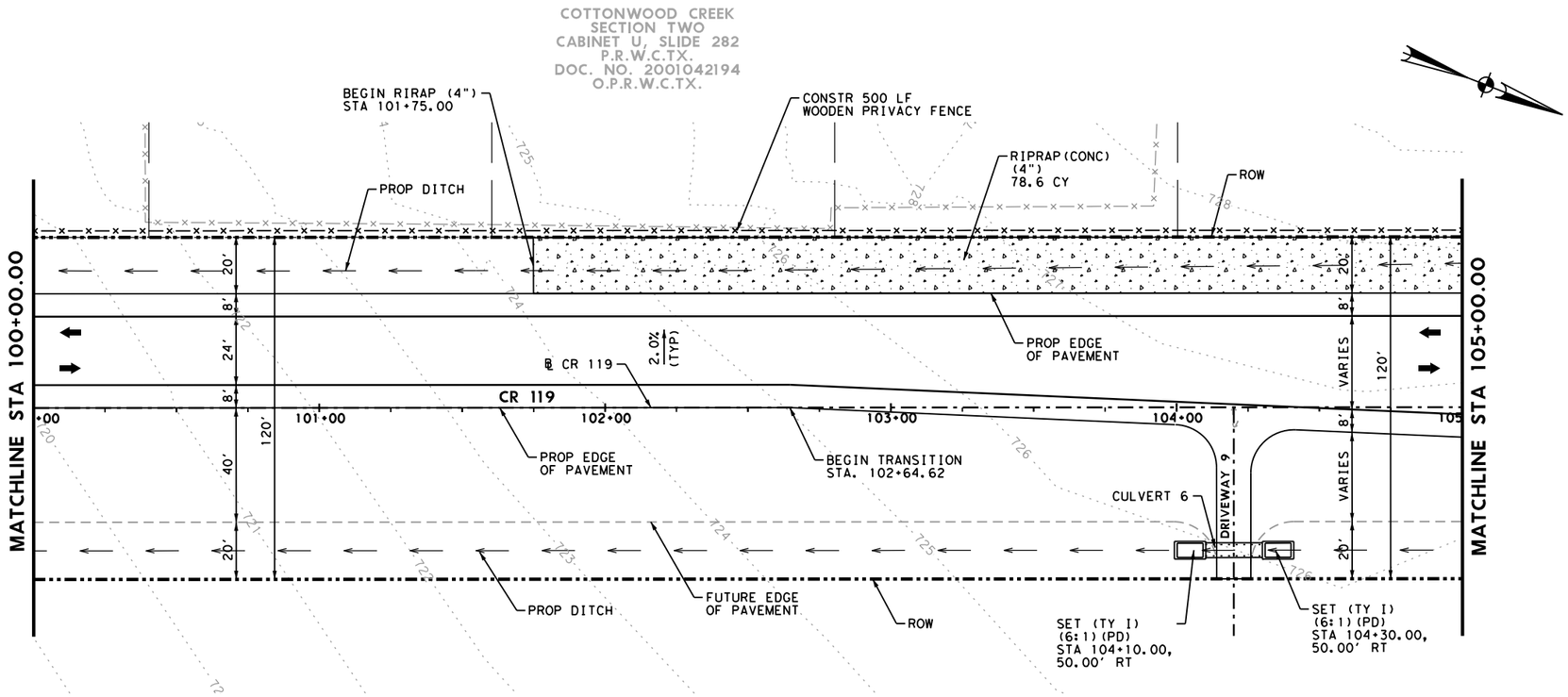
STA 95+00 TO STA 100+00

SHEET 18 OF 27

FED. RD. DIV. NO.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				94

FILE: V:\2220\active\222010286\civil\cad\Design\ROADWAY\104123_RDWY_PP_18.dgn DATE: 6/15/2017 TIME: 3:12:02 PM USER: agonzales

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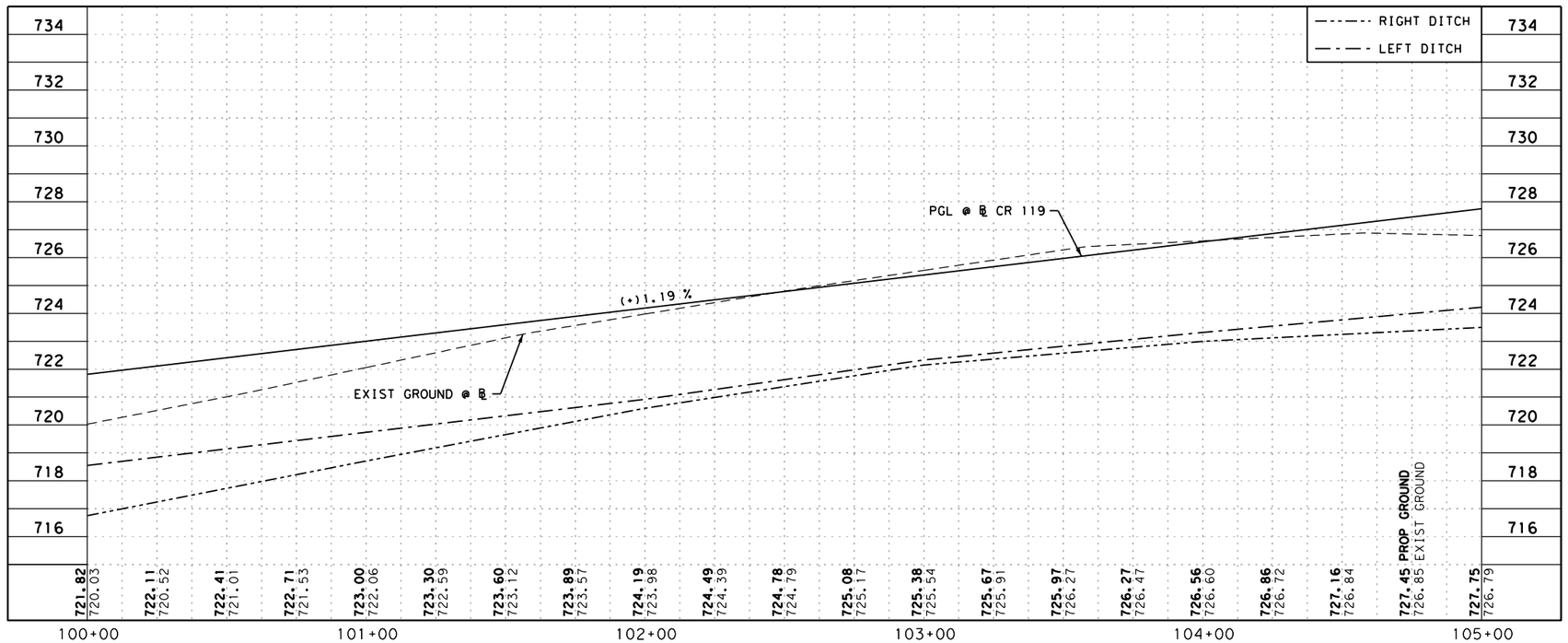


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13. REFER TO WOODEN PRIVACY FENCE DETAIL FOR ADDITIONAL INFORMATION.

LEGEND

- TRAFFIC FLOW ARROW
- RIGHT OF WAY BOUNDARY
- EASEMENT
- EXISTING WIRE FENCE
- PROPOSED WIRE FENCE
- EXISTING GAS LINE
- DITCH FLOW ARROWS
- 535 EXISTING CONTOURS



0 12.5 25 50 (H)
0 2.5 5 (V)

STATE OF TEXAS
ARNOLD GONZALES, JR.
98234
LICENSED
PROFESSIONAL ENGINEER

6/15/2017

CR 119

WILLIAMSON COUNTY
1848

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ROADWAY

PLAN AND PROFILE

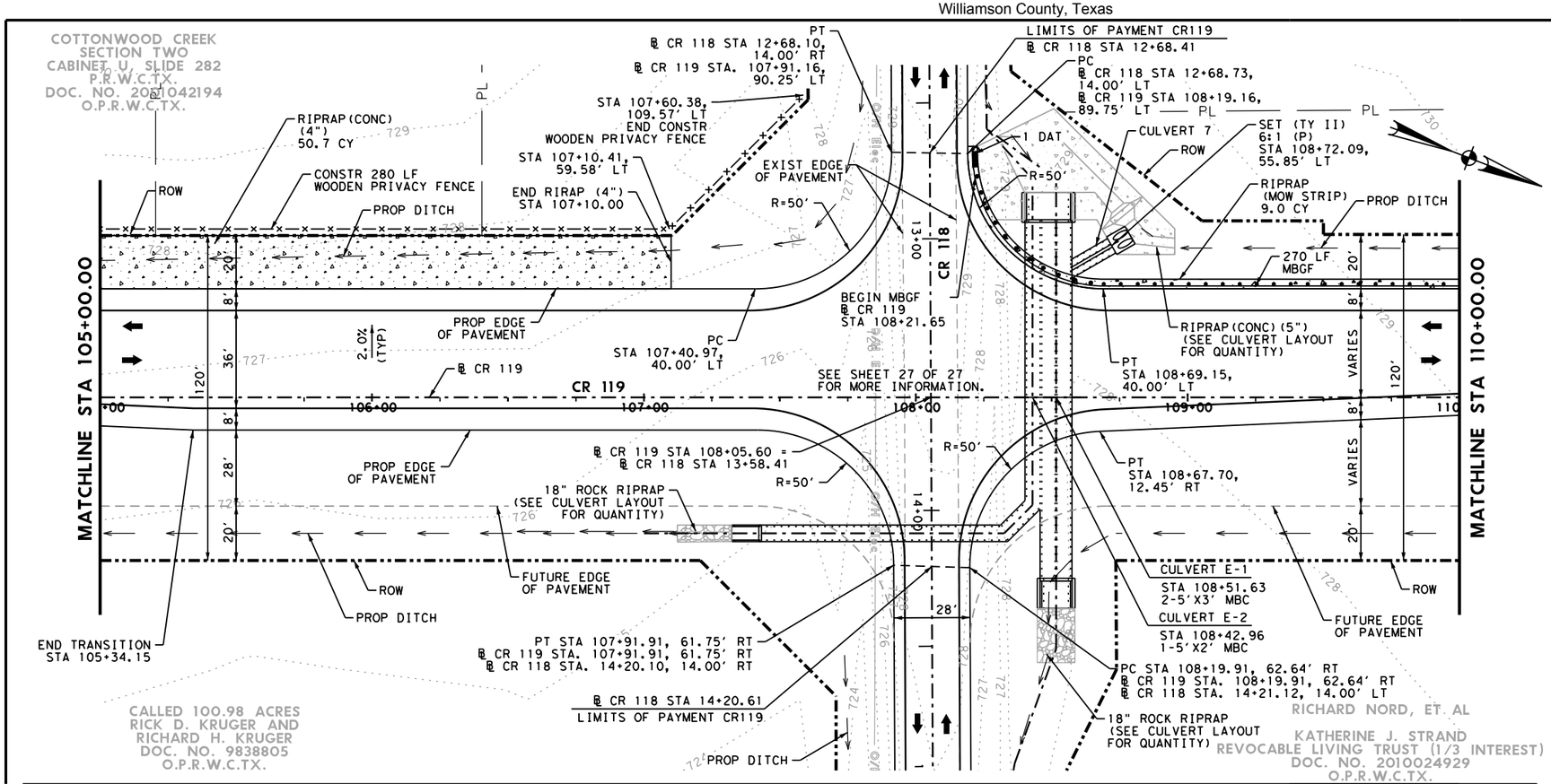
STA 100+00 TO STA 105+00

SHEET 19 OF 27

FED. RD. DIV. NO.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				95

FILE: V:\2220\active\222010286\civil\cad\Design\ROADWAY\104123_RDWY_PP_19.dgn DATE: 6/15/2017 TIME: 3:12:03 PM USER: agonzales

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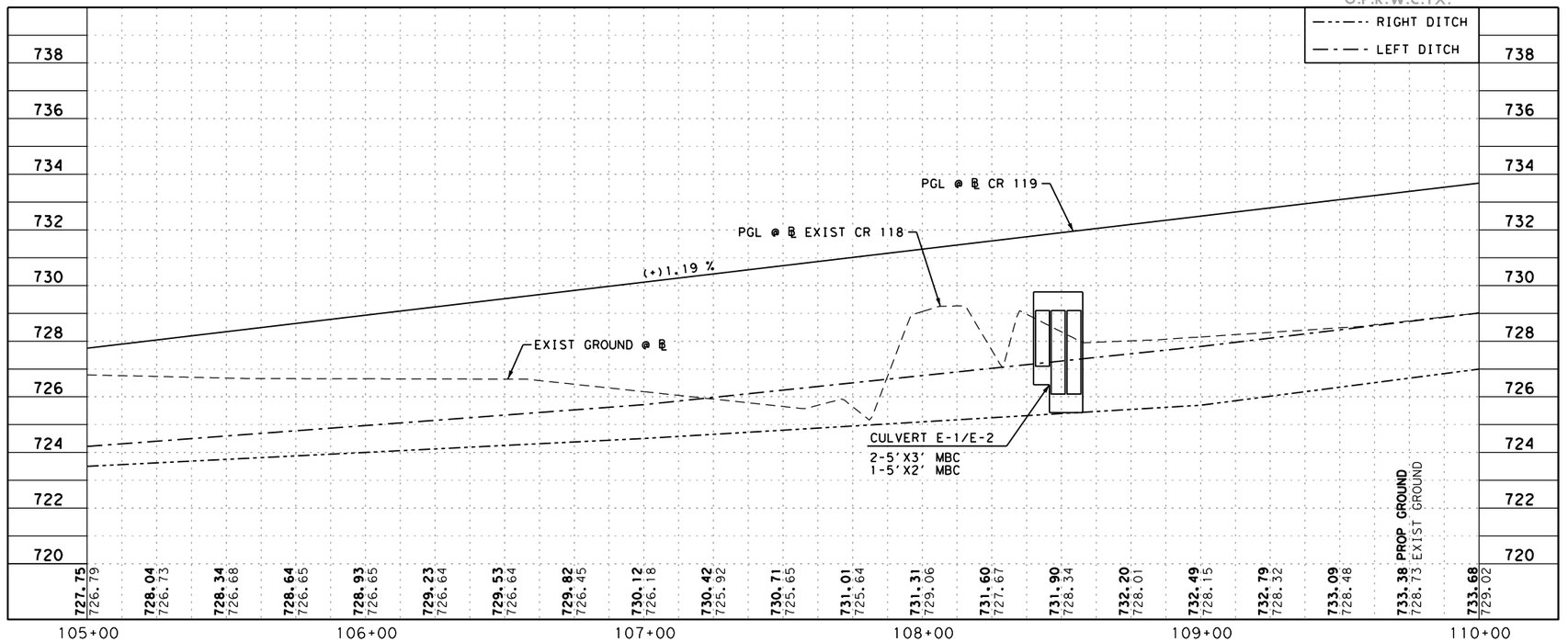


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LEGEND

- TRAFFIC FLOW ARROW
- RIGHT OF WAY BOUNDARY
- EASEMENT
- EXISTING WIRE FENCE
- PROPOSED WIRE FENCE
- EXISTING GAS LINE
- DITCH FLOW ARROWS
- 535 EXISTING CONTOURS



0 12.5 25 50 (H)
0 2.5 5 (V)

STATE OF TEXAS ARNOLD GONZALES, JR. 98234 LICENSED PROFESSIONAL ENGINEER

6/15/2017

CR 119

WILLIAMSON COUNTY 1848

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ROADWAY

PLAN AND PROFILE

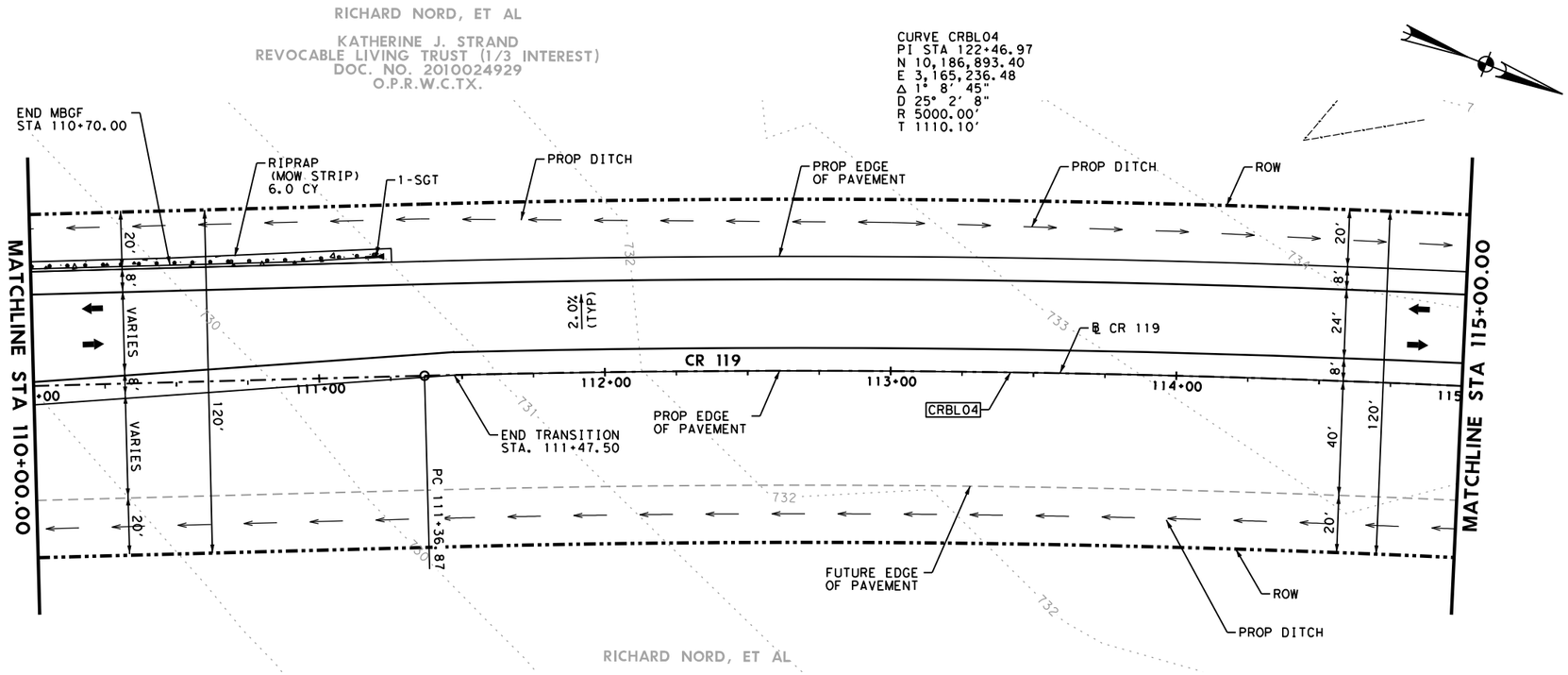
STA 105+00 TO STA 110+00

SHEET 20 OF 27

FED. RD. DIV. NO.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				96

FILE: V:\2220\active\222010286\civil\cad\Design\ROADWAY\104123_RDWY_PP_20.dgn DATE: 6/15/2017 TIME: 3:12:05 PM USER: agonzales

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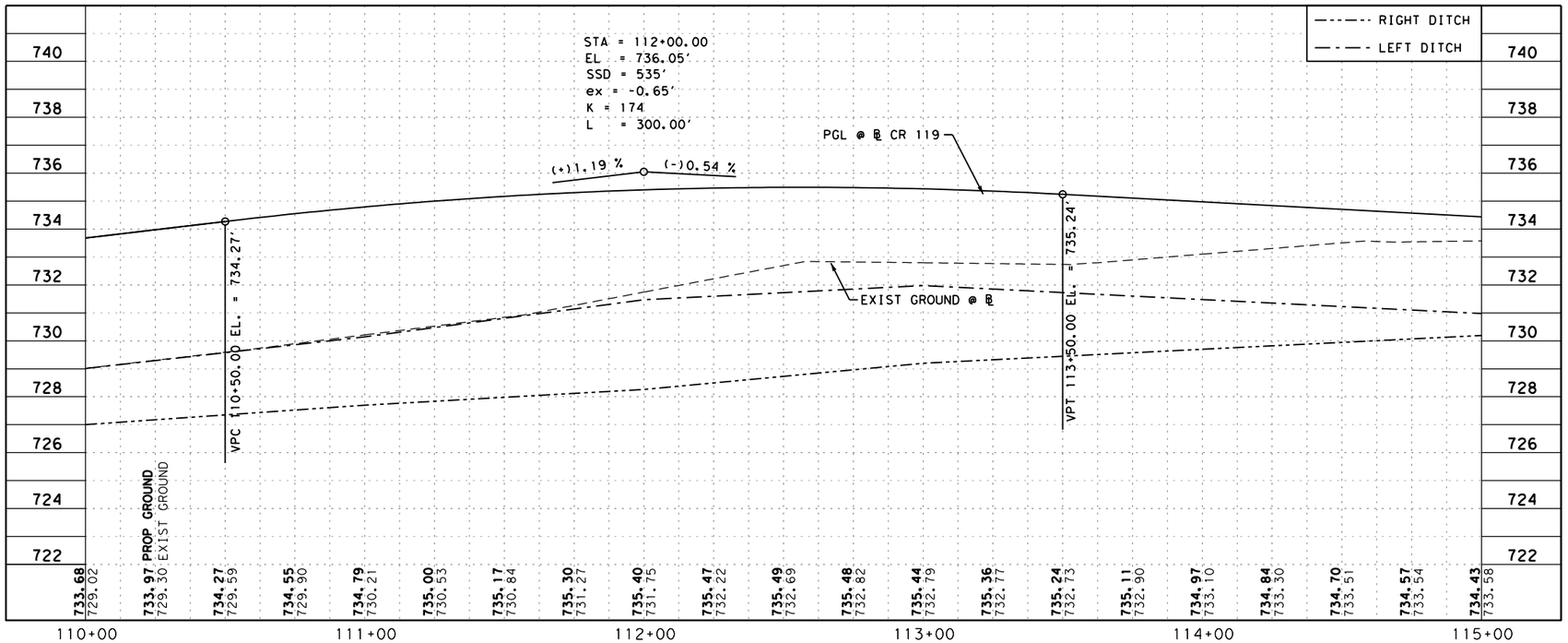


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LEGEND

- TRAFFIC FLOW ARROW
- RIGHT OF WAY BOUNDARY
- EASEMENT
- EXISTING WIRE FENCE
- PROPOSED WIRE FENCE
- EXISTING GAS LINE
- DITCH FLOW ARROWS
- 535 EXISTING CONTOURS



0 12.5 25 50 (H)
0 2.5 5 (V)

STATE OF TEXAS
ARNOLD GONZALES, JR.
98234
LICENSED
PROFESSIONAL ENGINEER

6/15/2017

CR 119

WILLIAMSON COUNTY
1848

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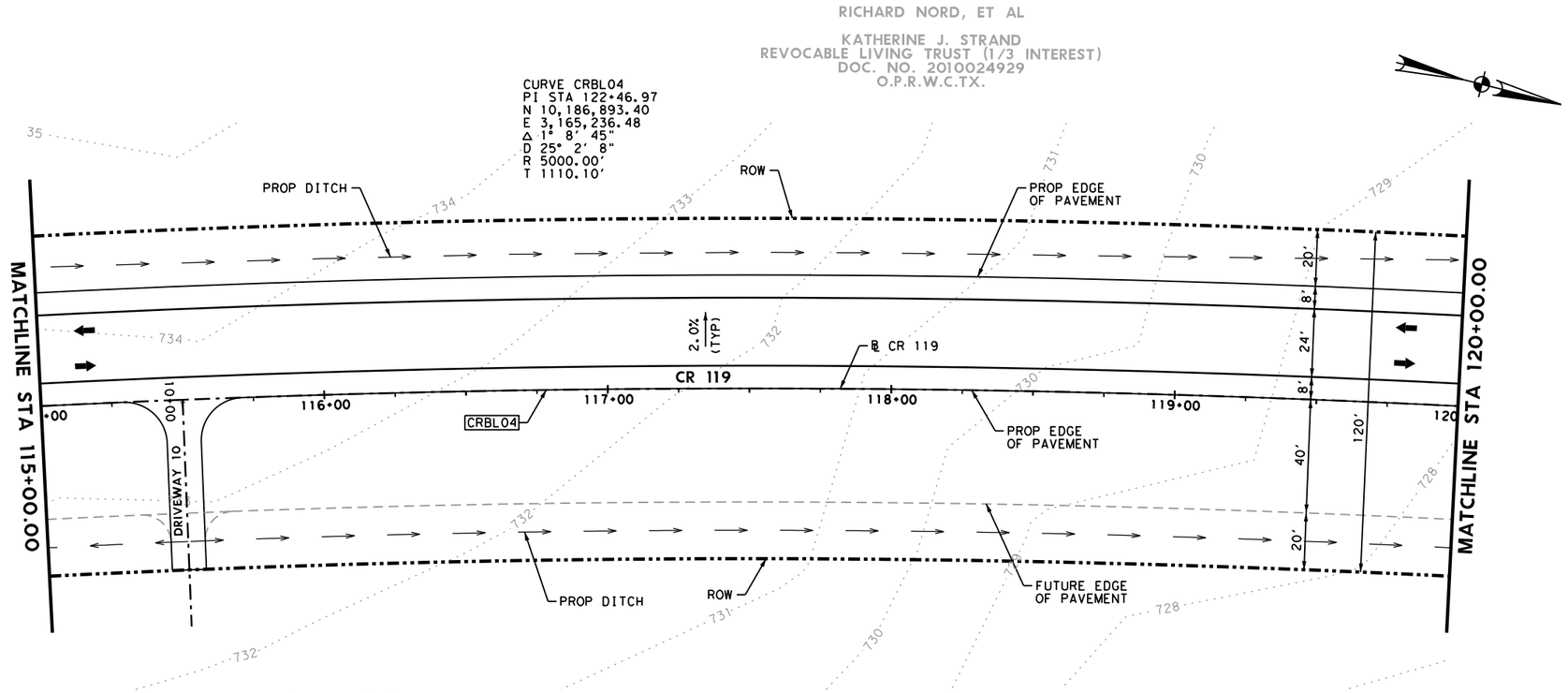
ROADWAY

PLAN AND PROFILE

STA 110+00 TO STA 115+00

SHEET 21 OF 27

FED. RD. DIV. RD.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				97

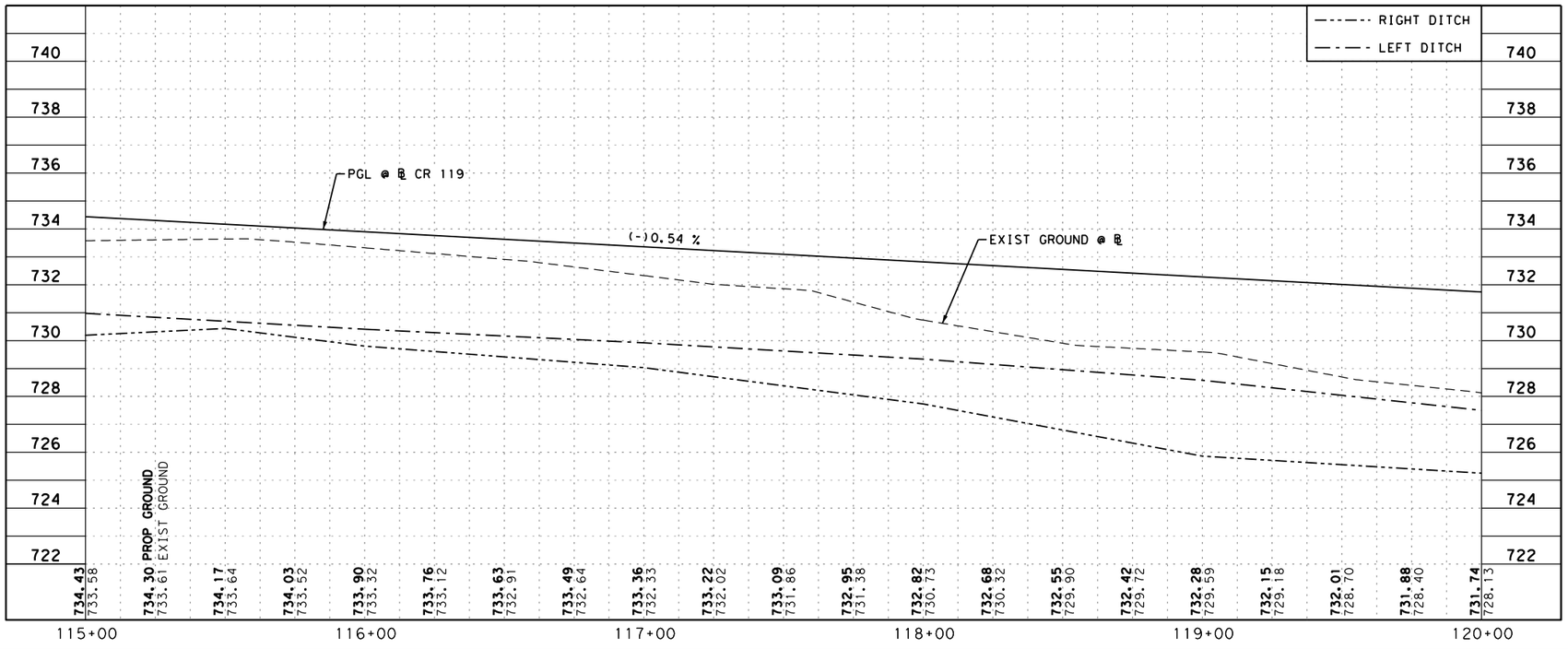


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LEGEND

- TRAFFIC FLOW ARROW
- RIGHT OF WAY BOUNDARY
- EASEMENT
- EXISTING WIRE FENCE
- PROPOSED WIRE FENCE
- EXISTING GAS LINE
- DITCH FLOW ARROWS
- EXISTING CONTOURS



0 12.5 25 50 (H)
0 2.5 5 (V)

STATE OF TEXAS
ARNOLD GONZALES, JR.
98234
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6/15/2017

CR 119

WILLIAMSON COUNTY 1848

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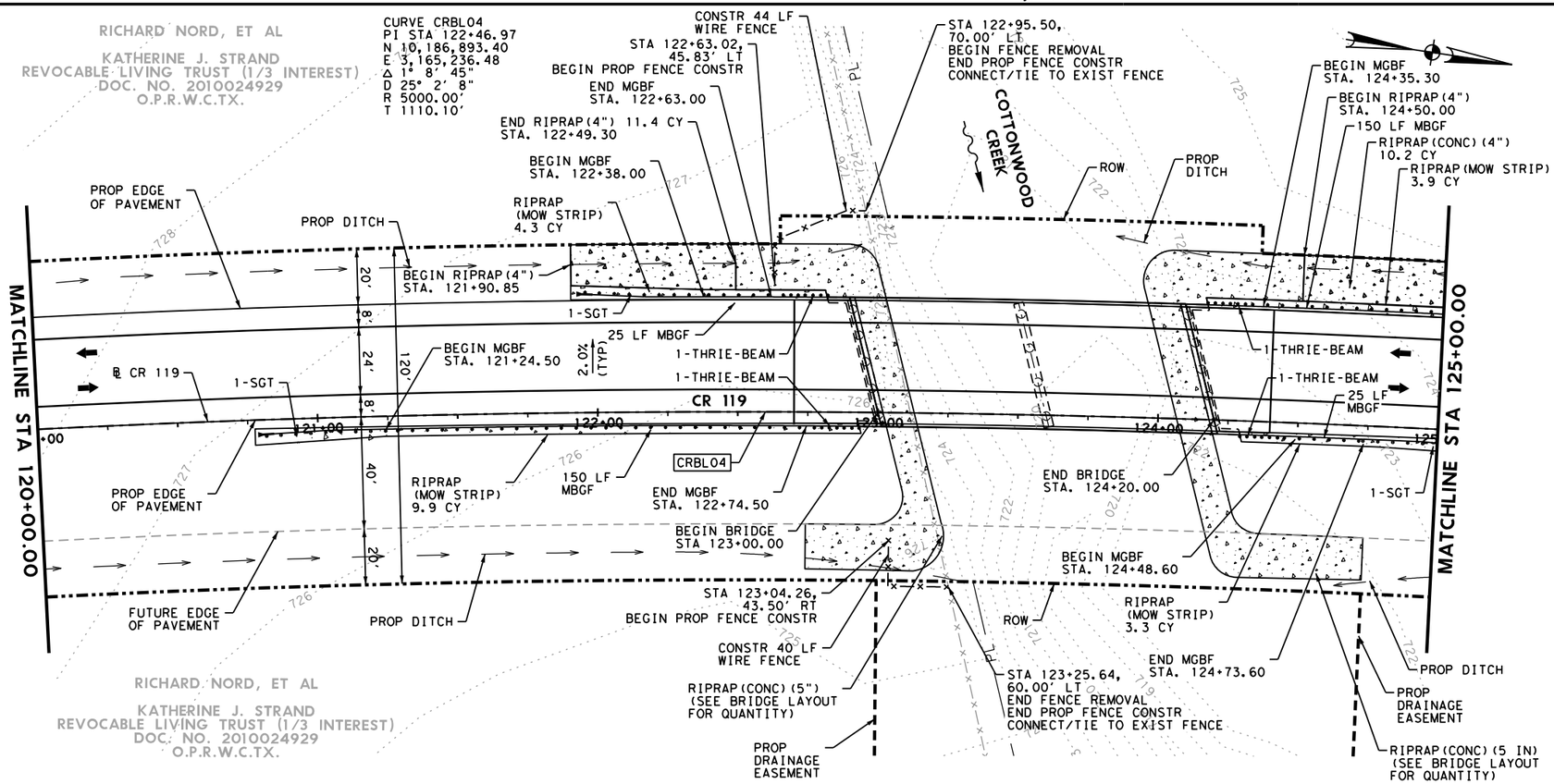
ROADWAY

PLAN AND PROFILE

STA 115+00 TO STA 120+00

SHEET 22 OF 27

FED. RD. DIV. RD.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				98

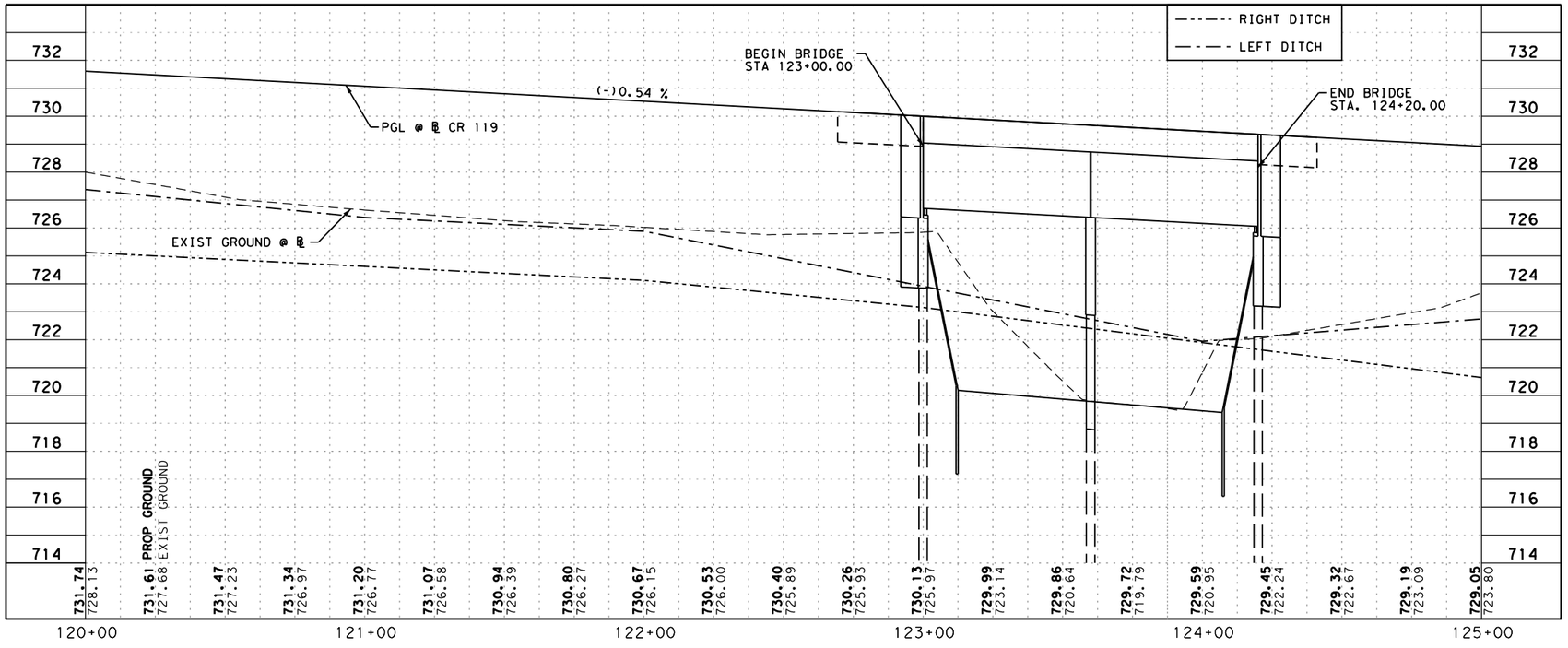


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LEGEND

- TRAFFIC FLOW ARROW
- RIGHT OF WAY BOUNDARY
- EASEMENT
- EXISTING WIRE FENCE
- PROPOSED WIRE FENCE
- EXISTING GAS LINE
- DITCH FLOW ARROWS
- 535 EXISTING CONTOURS



0 12.5 25 50 (H)
0 2.5 5 (V)

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PLAN AND PROFILE

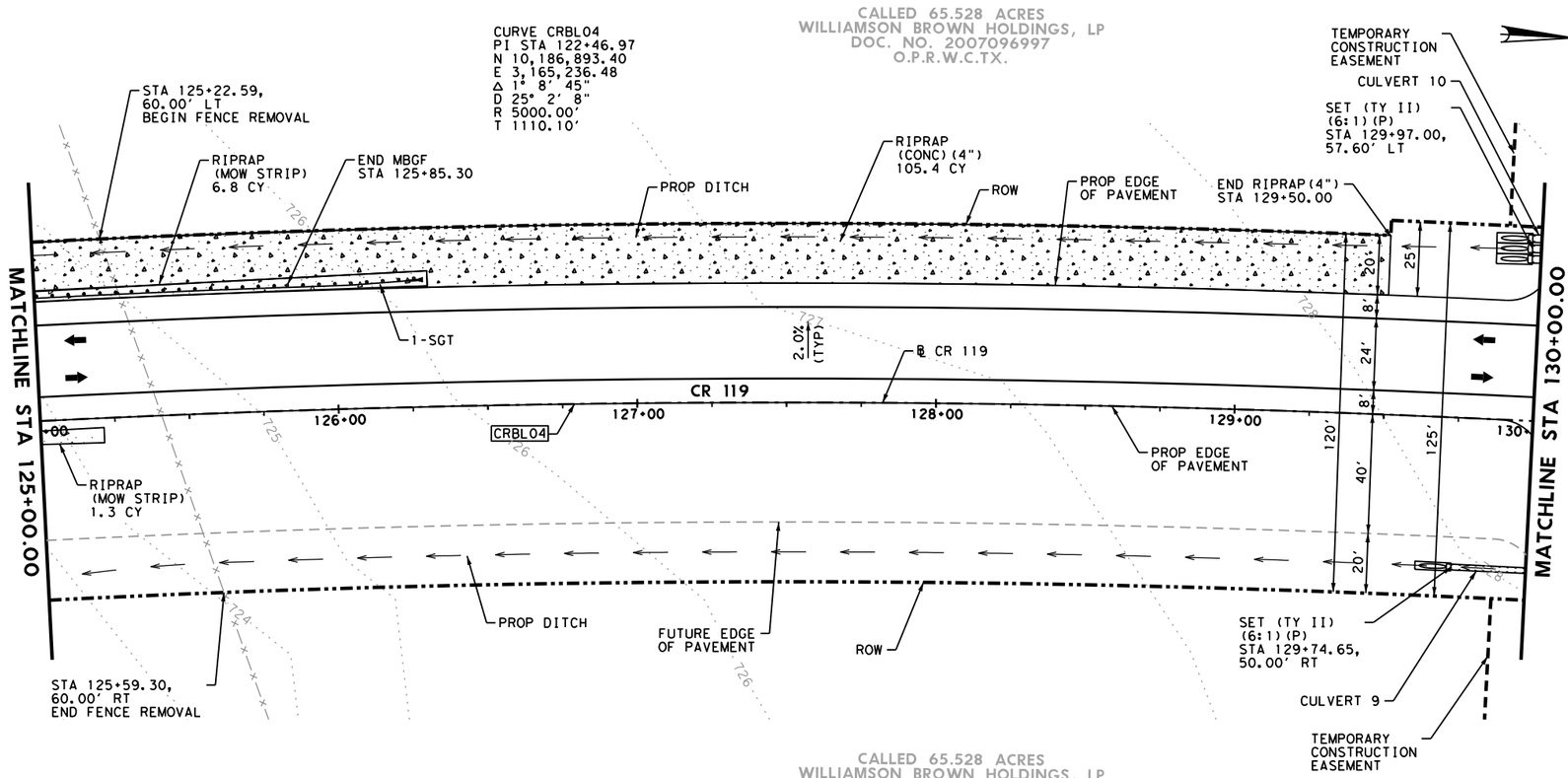
STA 120+00 TO STA 125+00

SHEET 23 OF 27

FED. RD. DIV. RD.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				99

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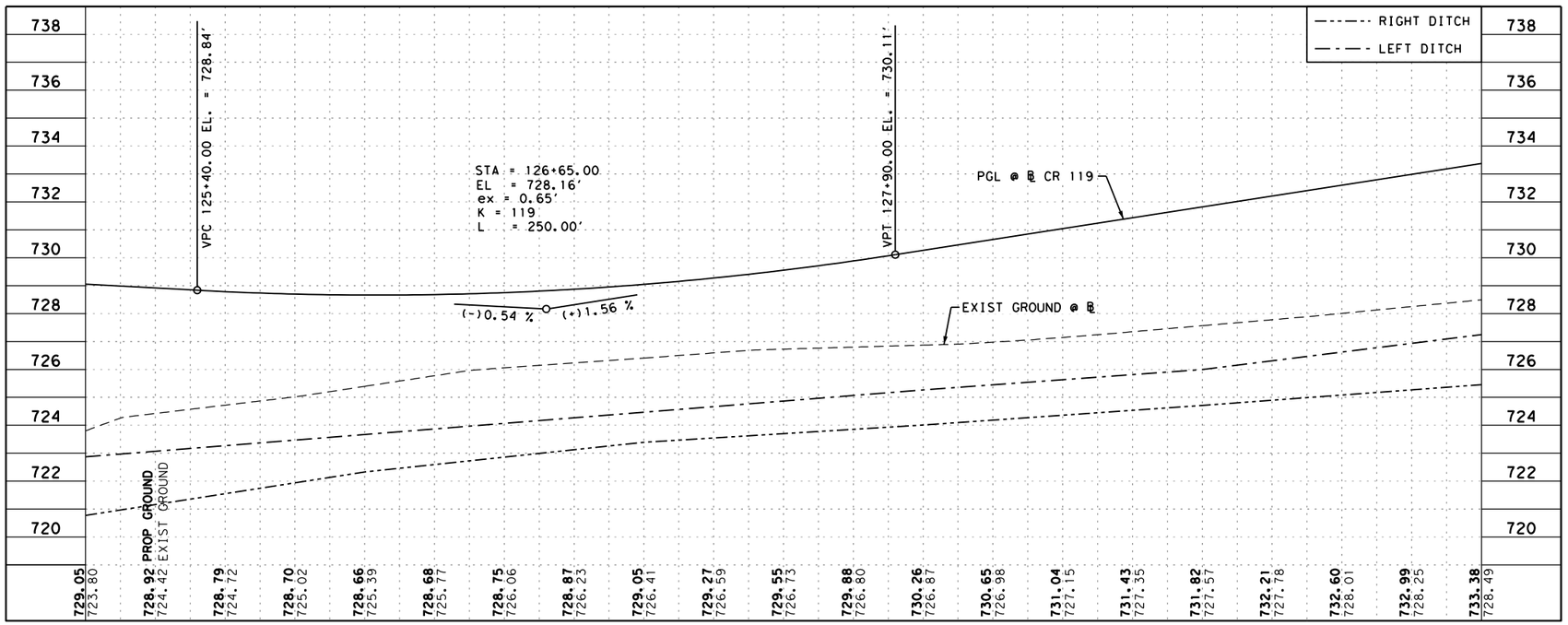


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LEGEND

- TRAFFIC FLOW ARROW
- RIGHT OF WAY BOUNDARY
- EASEMENT
- EXISTING WIRE FENCE
- PROPOSED WIRE FENCE
- EXISTING GAS LINE
- DITCH FLOW ARROWS
- 535 EXISTING CONTOURS



0 12.5 25 50 (H)
0 2.5 5 (V)

STATE OF TEXAS
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6/15/2017

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ROADWAY

PLAN AND PROFILE

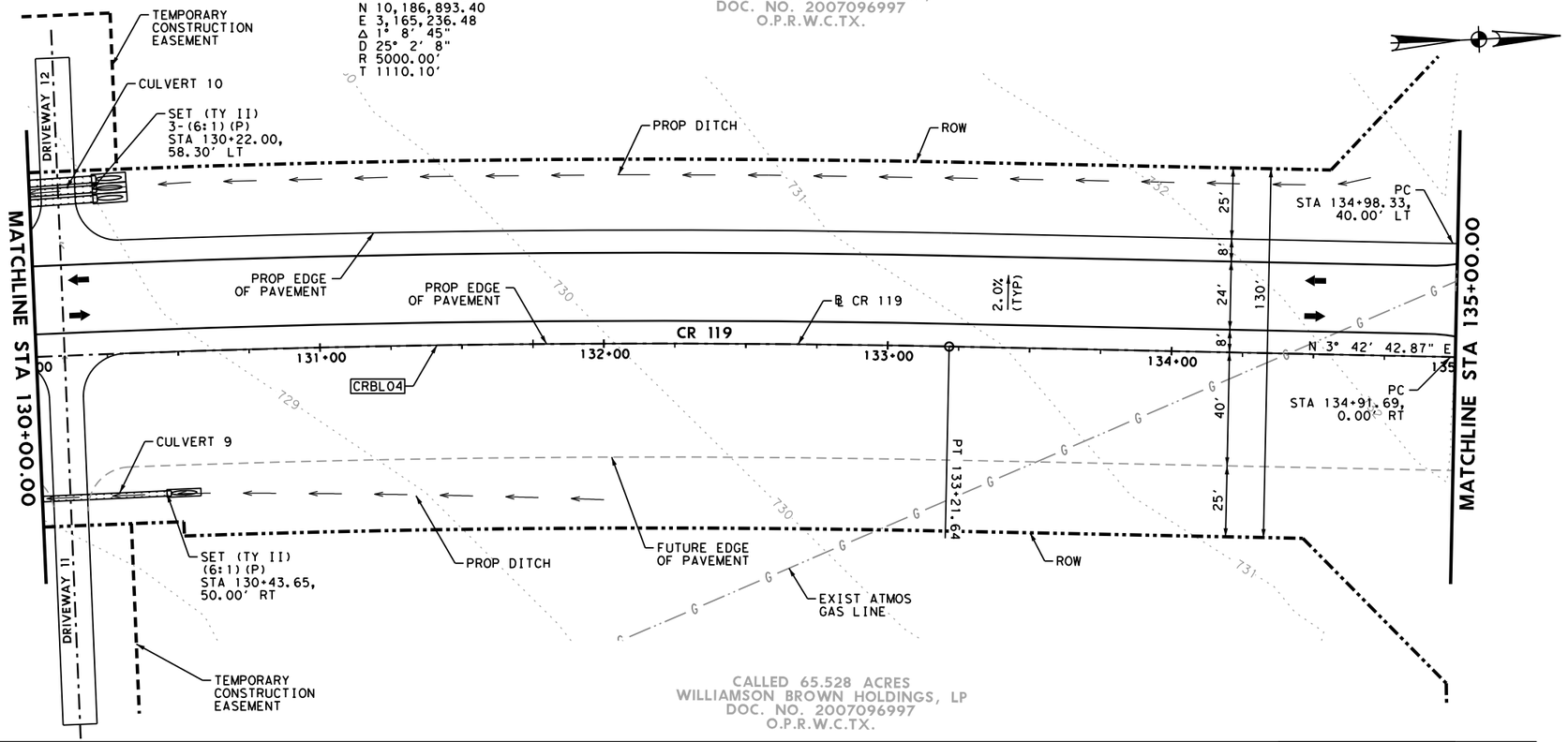
STA 125+00 TO STA 130+00

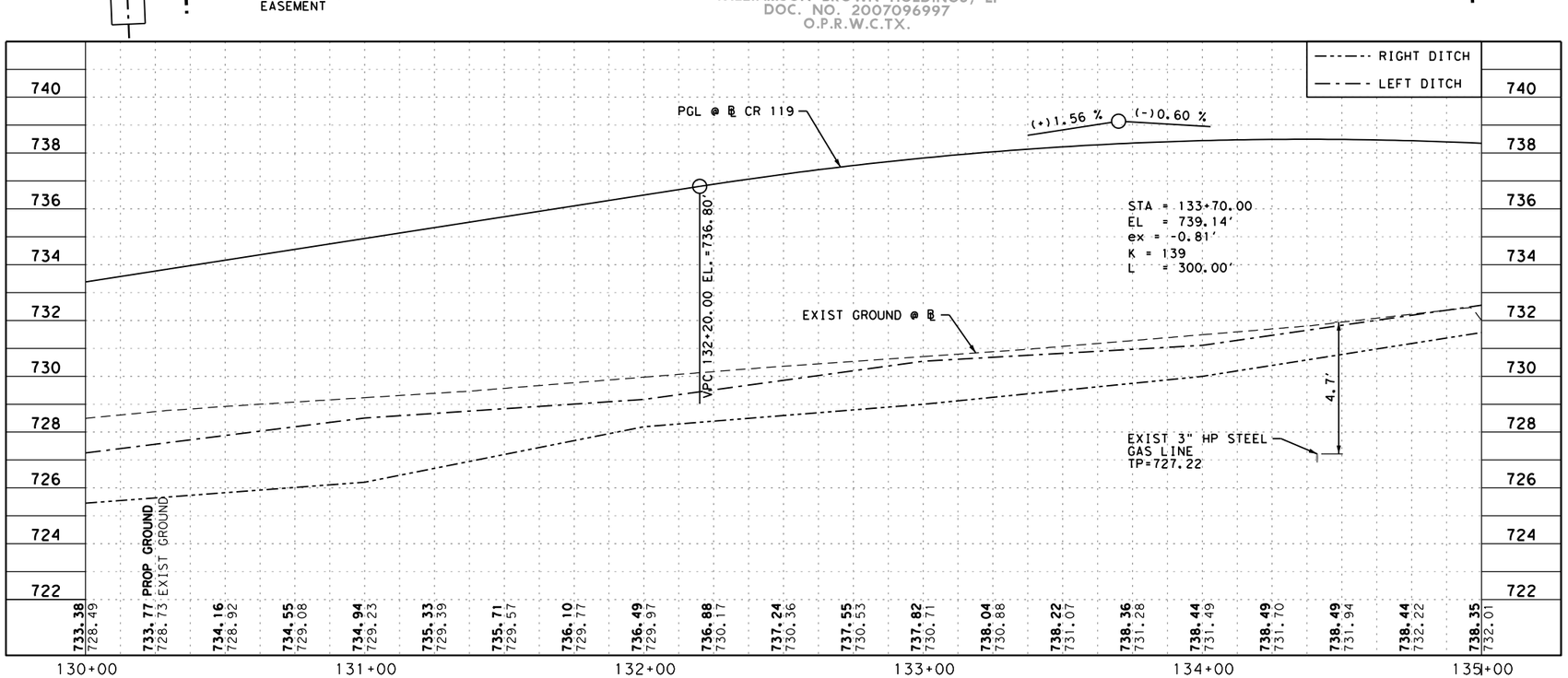
SHEET 24 OF 27

FED. RD. DIV. RD.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				100

FILE: V:\2220\active\222010286\civil\cad\Design\ROADWAY\104123_RDWY_PP_24.dgn DATE: 6/15/2017 TIME: 3:12:16 PM USER: agonzales

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NOTES:

1. CALL THE TEXAS STATE WIDE ONE CALL LOCATOR NUMBER 1-800-344-8377, 48 HOURS BEFORE BEGINNING ANY EXCAVATION.
2. THE CONTRACTOR WILL BE RESPONSIBLE FOR PROTECTING OVERHEAD AND UNDERGROUND FACILITIES ADJACENT TO WORK AREA.
3. ALL STATIONS AND OFFSETS REFERENCE THE PROPOSED CR 119 BASELINE, UNLESS OTHERWISE NOTED IN THE PLANS.
4. REFER TO INTERSECTION LAYOUT SHEETS FOR MORE INFORMATION.
5. REFER TO DRIVEWAY LAYOUT SHEETS FOR ADDITIONAL INFORMATION.
6. REFER TO HORIZONTAL ALIGNMENT DATA SHEET FOR MORE INFORMATION.
7. REFER TO SIGNING AND PAVEMENT MARKING LAYOUT SHEETS FOR MORE INFORMATION.
8. REFER TO DRAINAGE SHEETS FOR MORE INFORMATION.
9. PROPOSED FENCING SHOWN OFFSET FROM ROW FOR VISUAL REFERENCE. FENCE TO BE CONSTRUCTED ALONG ROW.
10. REFER TO MINOR CULVERT SUMMARY AND DETAILS SHEET FOR ADDITIONAL INFORMATION ON DRIVEWAY CULVERTS AND STORM SEWER.
11. MATCH EXIST X-SLOPES AT TIE-IN LOCATIONS.
12. REFER TO STORM SEWER PROFILES FOR MORE INFORMATION.
13. REFER TO WOODEN PRIVACY FENCE DETAIL FOR ADDITIONAL INFORMATION.

LEGEND

- TRAFFIC FLOW ARROW
- RIGHT OF WAY BOUNDARY
- EASEMENT
- EXISTING WIRE FENCE
- PROPOSED WIRE FENCE
- EXISTING GAS LINE
- DITCH FLOW ARROWS
- 535 EXISTING CONTOURS

0 12.5 25 50 (H)
0 2.5 5 (V)

STATE OF TEXAS
ARNOLD GONZALES, JR.
98234
LICENSED
PROFESSIONAL ENGINEER

6/15/2017

CR 119

WILLIAMSON COUNTY 1848

Stantec
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ROADWAY

PLAN AND PROFILE

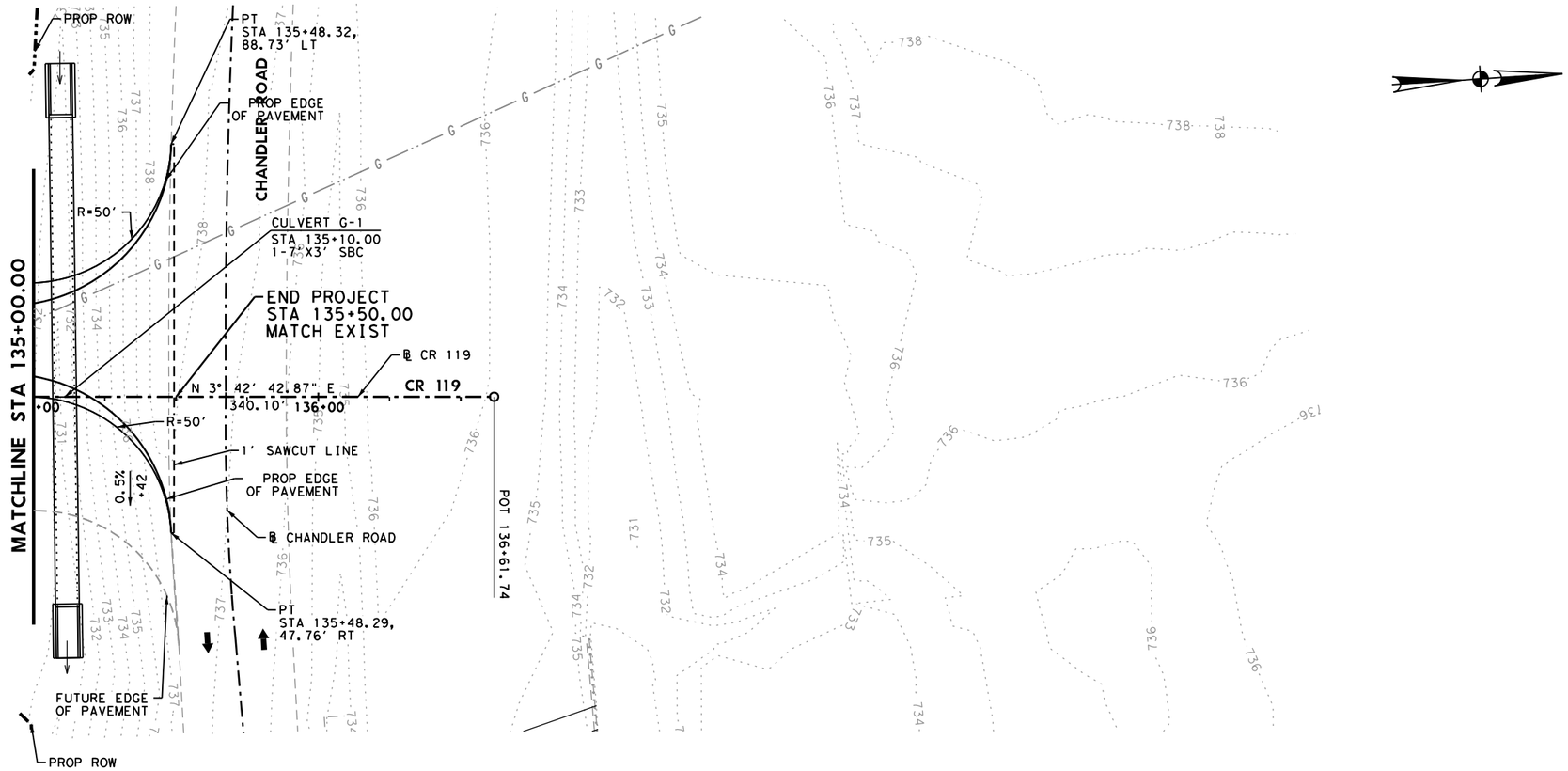
STA 130+00 TO STA 135+00

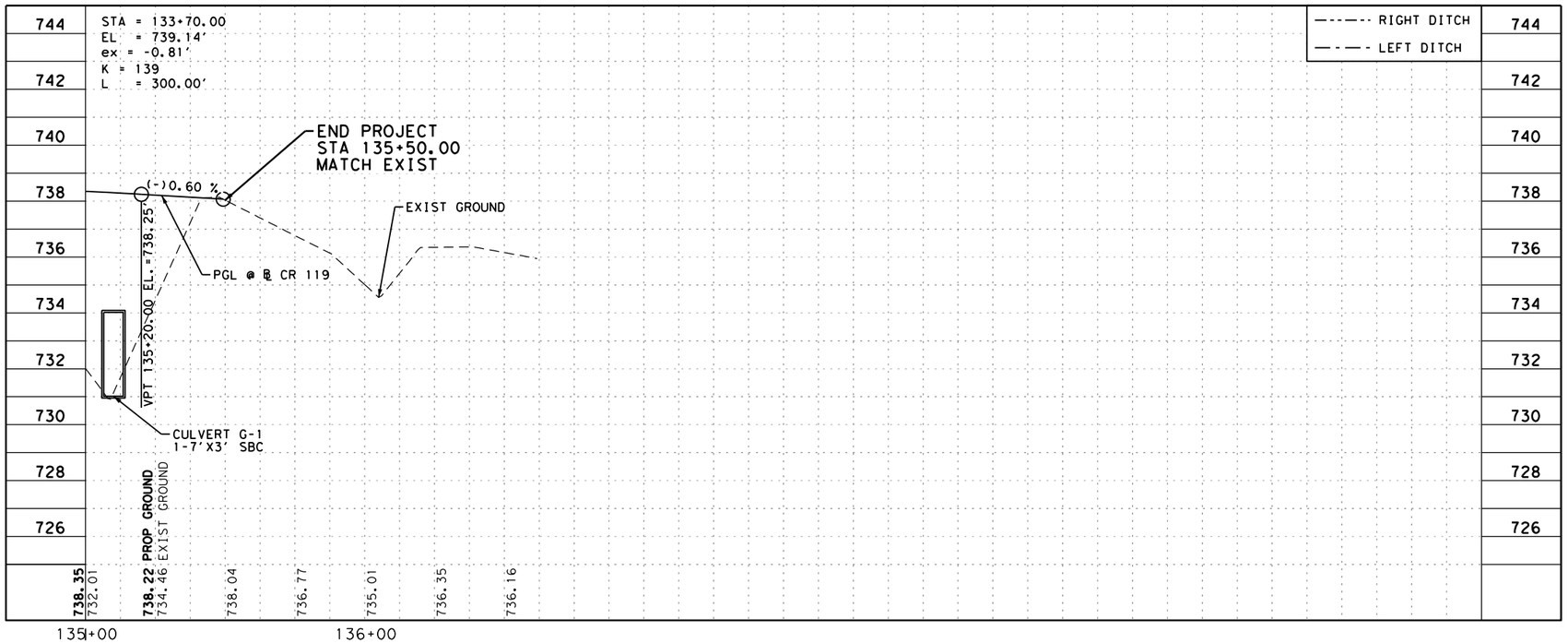
SHEET 25 OF 27

FED. RD. DIV. RD.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				101

FILE: V:\2220\active\222010286\civil\cad\Design\ROADWAY\104123_RDWY_PP_25.dgn DATE: 6/15/2017 TIME: 3:12:17 PM USER: agonzales

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NOTES:

1. CALL THE TEXAS STATE WIDE ONE CALL LOCATOR NUMBER 1-800-344-8377, 48 HOURS BEFORE BEGINNING ANY EXCAVATION.
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4. REFER TO INTERSECTION LAYOUT SHEETS FOR MORE INFORMATION.
5. REFER TO DRIVEWAY LAYOUT SHEETS FOR ADDITIONAL INFORMATION.
6. REFER TO HORIZONTAL ALIGNMENT DATA SHEET FOR MORE INFORMATION.
7. REFER TO SIGNING AND PAVEMENT MARKING LAYOUT SHEETS FOR MORE INFORMATION.
8. REFER TO DRAINAGE SHEETS FOR MORE INFORMATION.
9. PROPOSED FENCING SHOWN OFFSET FROM ROW FOR VISUAL REFERENCE. FENCE TO BE CONSTRUCTED ALONG ROW.
10. REFER TO MINOR CULVERT SUMMARY AND DETAILS SHEET FOR ADDITIONAL INFORMATION ON DRIVEWAY CULVERTS AND STORM SEWER.
11. MATCH EXIST X-SLOPES AT TIE-IN LOCATIONS.
12. REFER TO STORM SEWER PROFILES FOR MORE INFORMATION.
13. REFER TO WOODEN PRIVACY FENCE DETAIL FOR ADDITIONAL INFORMATION.

LEGEND

- TRAFFIC FLOW ARROW
- RIGHT OF WAY BOUNDARY
- EASEMENT
- EXISTING WIRE FENCE
- PROPOSED WIRE FENCE
- EXISTING GAS LINE
- DITCH FLOW ARROWS
- 535 EXISTING CONTOURS

0 12.5 25 50 (H)
0 2.5 5 (V)

STATE OF TEXAS
ARNOLD GONZALES, JR.
98234
LICENSED
PROFESSIONAL ENGINEER

6/15/2017

CR 119

WILLIAMSON COUNTY
1848

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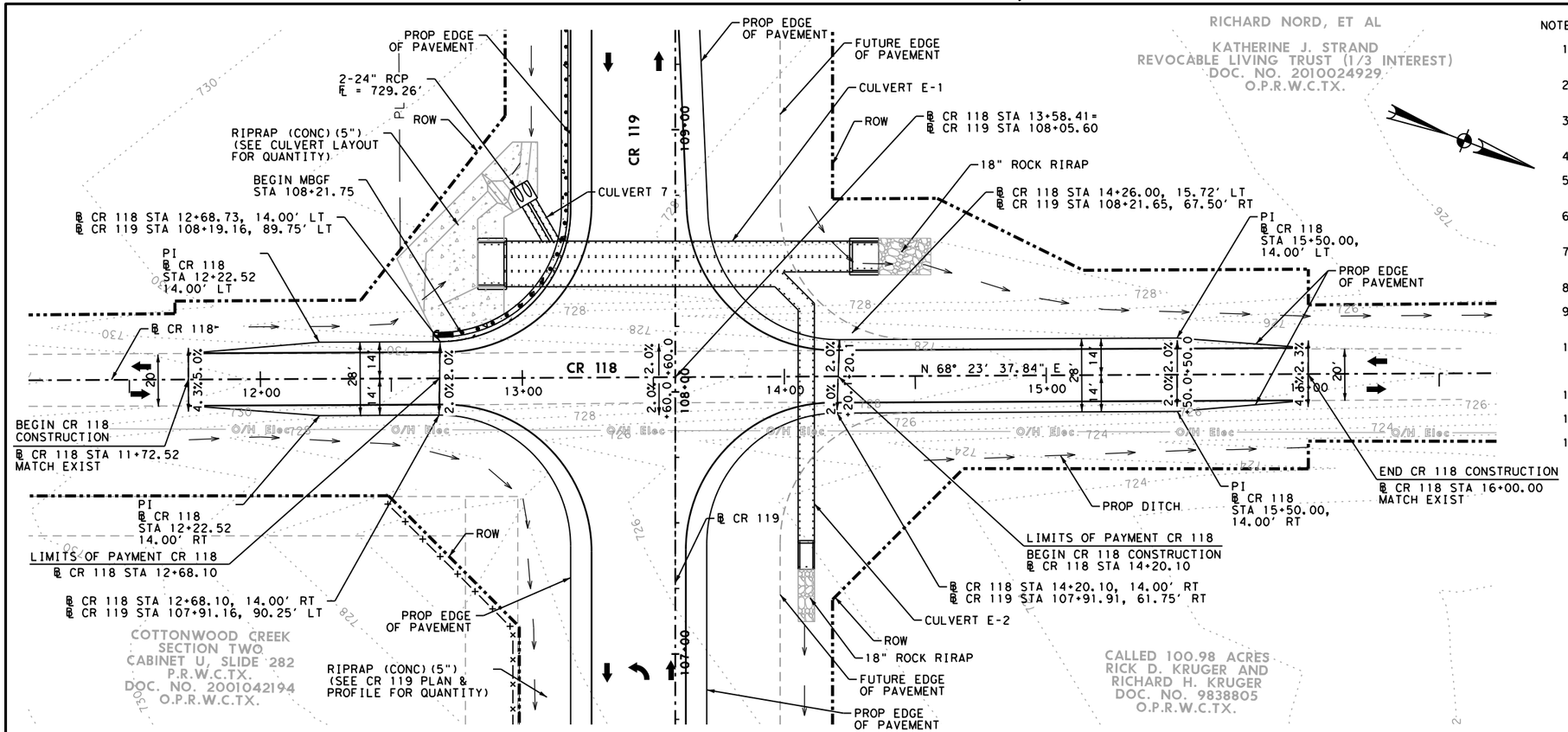
ROADWAY

PLAN AND PROFILE

STA 135+00 TO END PROJECT

SHEET 26 OF 27

FED. RD. DIV. RD.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				102

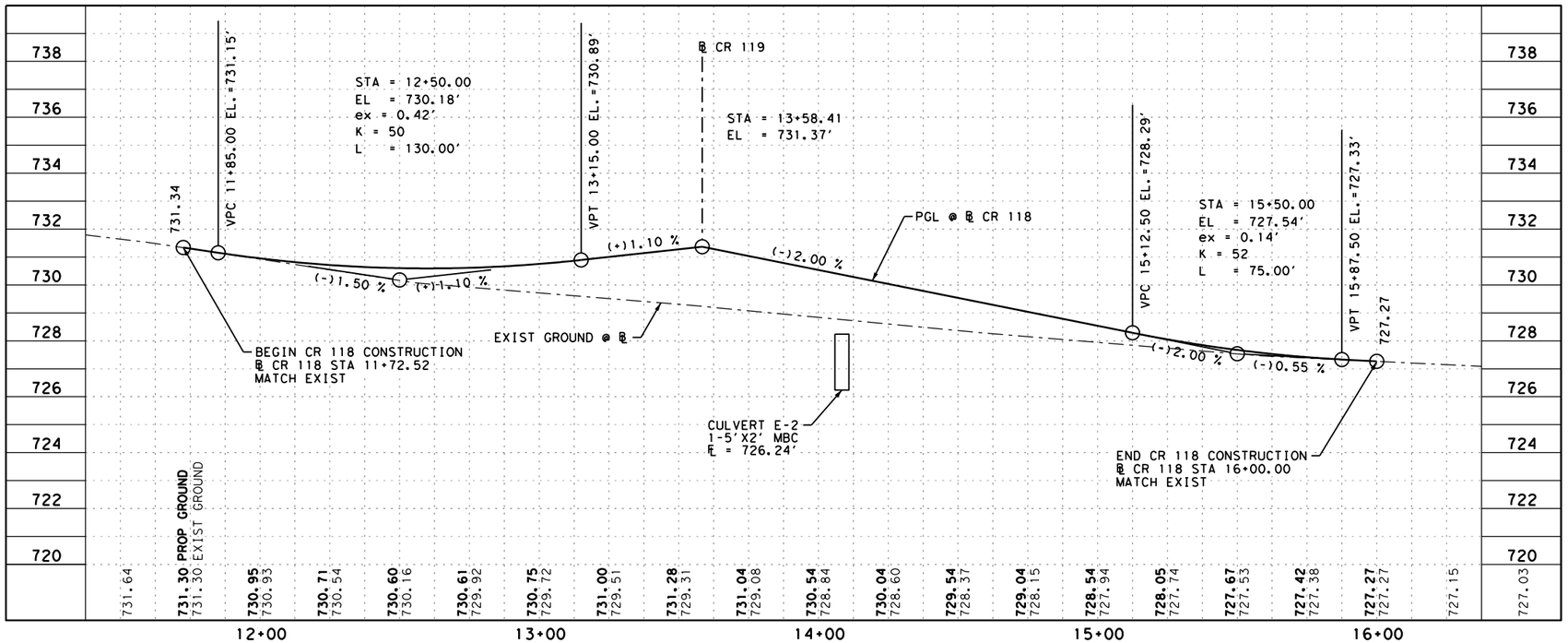


NOTES:

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10. REFER TO MINOR CULVERT SUMMARY AND DETAILS SHEET FOR ADDITIONAL INFORMATION ON DRIVEWAY CULVERTS AND STORM SEWER.
11. MATCH EXIST X-SLOPES AT TIE-IN LOCATIONS.
12. REFER TO STORM SEWER PROFILES FOR MORE INFORMATION.
13. REFER TO WOODEN PRIVACY FENCE DETAIL FOR ADDITIONAL INFORMATION.

LEGEND

- TRAFFIC FLOW ARROW
- RIGHT OF WAY BOUNDARY
- EASEMENT
- EXISTING WIRE FENCE
- PROPOSED WIRE FENCE
- EXISTING GAS LINE
- DITCH FLOW ARROWS
- 535 EXISTING CONTOURS



0 12.5 25 50 (H)
0 5 10 (V)

STATE OF TEXAS
ARNOLD GONZALES, JR.
98234
LICENSED PROFESSIONAL ENGINEER

6/15/2017

CR 119

WILLIAMSON COUNTY 1848

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ROADWAY PLAN AND PROFILE CR 118

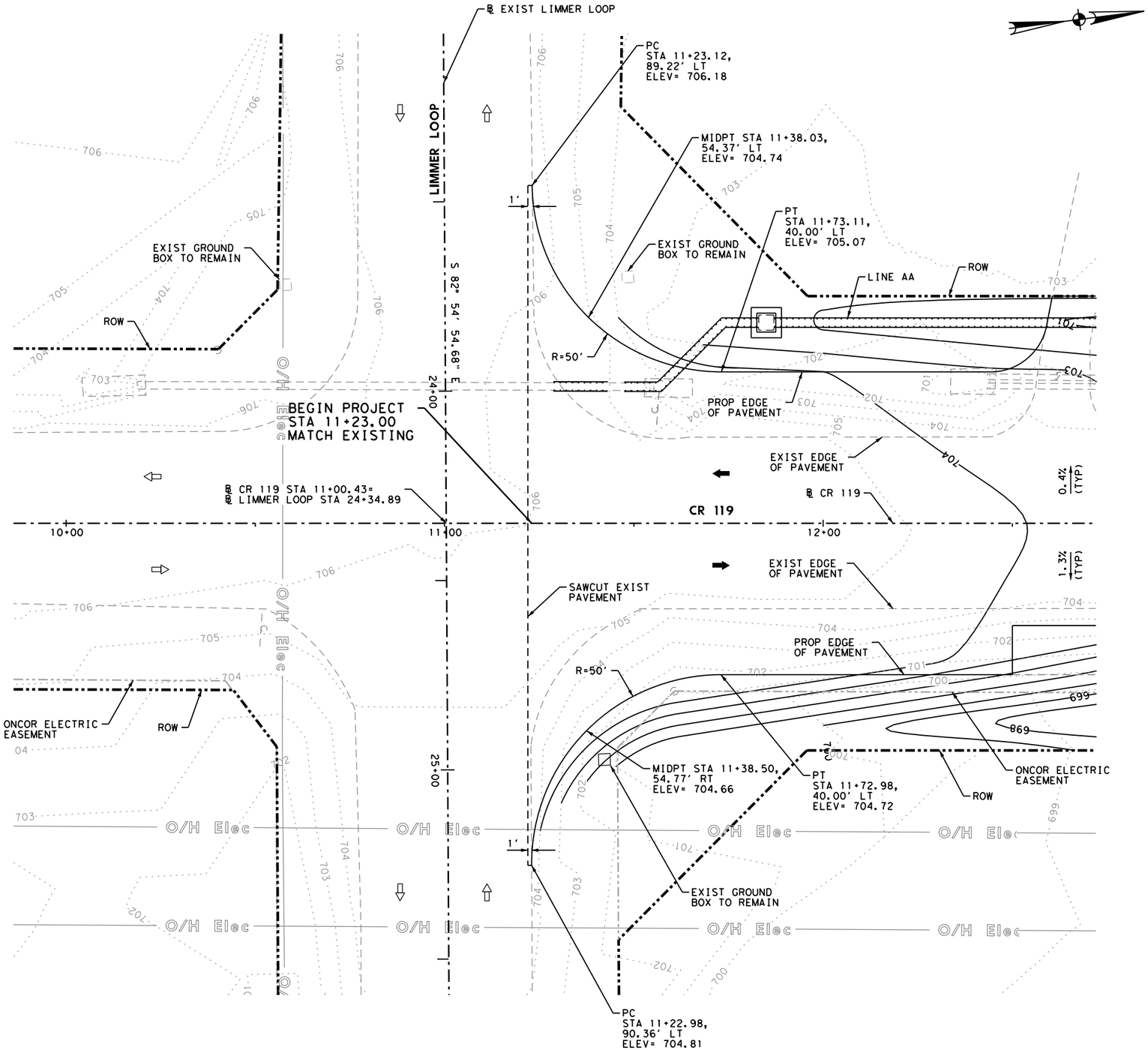
STA 11+00 TO STA 17+00

SHEET 27 OF 27

FED. RD. DIV. NO.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				103

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NOTES:

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2. THE CONTRACTOR WILL BE RESPONSIBLE FOR PROTECTING OVERHEAD AND UNDERGROUND FACILITIES ADJACENT TO WORK AREA.
3. ALL DIMENSIONS ARE TO EDGE OF PVMT UNLESS OTHERWISE NOTED.
4. ALL STATIONS AND OFFSETS REFERENCE THE PROPOSED CR 119 BASELINE, UNLESS OTHERWISE NOTED.
5. REFER TO DRAINAGE SHEETS FOR MORE INFORMATION.
6. REFER TO TABLE OF CROSS SLOPES SHEET FOR MORE INFORMATION.
7. ALL ELEVATIONS SHOWN HEREON ARE TO FINAL PAVEMENT GRADE, UNLESS OTHERWISE NOTED.

LEGEND

- TRAFFIC FLOW ARROW
- RIGHT OF WAY BOUNDARY
- 696 PROPOSED CONTOURS
- 696 EXISTING CONTOURS

0 7.5 15 30

STATE OF TEXAS
ARNOLD GONZALES, JR.
98234
LICENSED
PROFESSIONAL ENGINEER

6/15/2017

CR 119

WILLIAMSON COUNTY
1848

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ROADWAY INTERSECTION LAYOUT CR 119 AT LIMMER LOOP

SHEET 01 OF 01

FED. RD. DIV. RD.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				104

PT @ CR 118
STA 12+68.10,
14.00' RT
ELEV= 730.53

MIDPT
@ CR 119 STA 107+76.60,
54.73' LT
ELEV= 730.37

PRIVACY
FENCE

ROW

R=50'

PC @ CR 119
STA 107+41.00,
40.00' LT
ELEV= 730.21

VARIES

1%
+35

PROP EDGE
OF PAVEMENT

CR 118

13+00

PC @ CR 118
STA 12+68.73,
14.00' LT
ELEV= 730.54

MIDPT
@ CR 119 STA 108+33.89,
54.56' RT
ELEV= 731.27

PL

PL

ROW

CULVERT 5

PROP EDGE
OF PAVEMENT

R=50'

CULVERT E

1%
+75

PT @ CR 119
STA 108+69.16,
40.00' LT
ELEV= 732.01

VARIES

@ CR 119

CR 119

107+00

108+00

109+00

R=50'

PC @ CR 119
STA 107+41.91,
12.00' RT
ELEV= 729.22

R=50'

PT @ CR 119
STA 108+67.69,
12.44' RT
ELEV= 731.75

PROP EDGE
OF PAVEMENT

FUTURE EDGE
OF PAVEMENT

FUTURE EDGE
OF PAVEMENT

ROW

ROW

MIDPT
@ CR 119 STA 107+77.18,
26.56' RT
ELEV= 729.89

MIDPT
@ CR 119 STA 108+34.00,
27.92' RT
ELEV= 730.89

PT @ CR 118
STA 14+20.10,
14.00' RT
ELEV= 730.09

PC @ CR 118
STA 14+21.12,
14.00' LT
ELEV= 730.07

14+00

15+00

O/H Elec

NOTES:

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3. ALL DIMENSIONS ARE TO EDGE OF PVMT UNLESS OTHERWISE NOTED.
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6. REFER TO TABLE OF CROSS SLOPES SHEET FOR MORE INFORMATION.
7. ALL ELEVATIONS SHOWN HEREON ARE TO FINAL PAVEMENT GRADE, UNLESS OTHERWISE NOTED.

LEGEND

- TRAFFIC FLOW ARROW
- RIGHT OF WAY BOUNDARY
- 696 PROPOSED CONTOURS
- 696 EXISTING CONTOURS

0 7.5 15 30

STATE OF TEXAS
ARNOLD GONZALES, JR.
98234
LICENSED
PROFESSIONAL ENGINEER

6/15/2017

CR 119

WILLIAMSON COUNTY
1848

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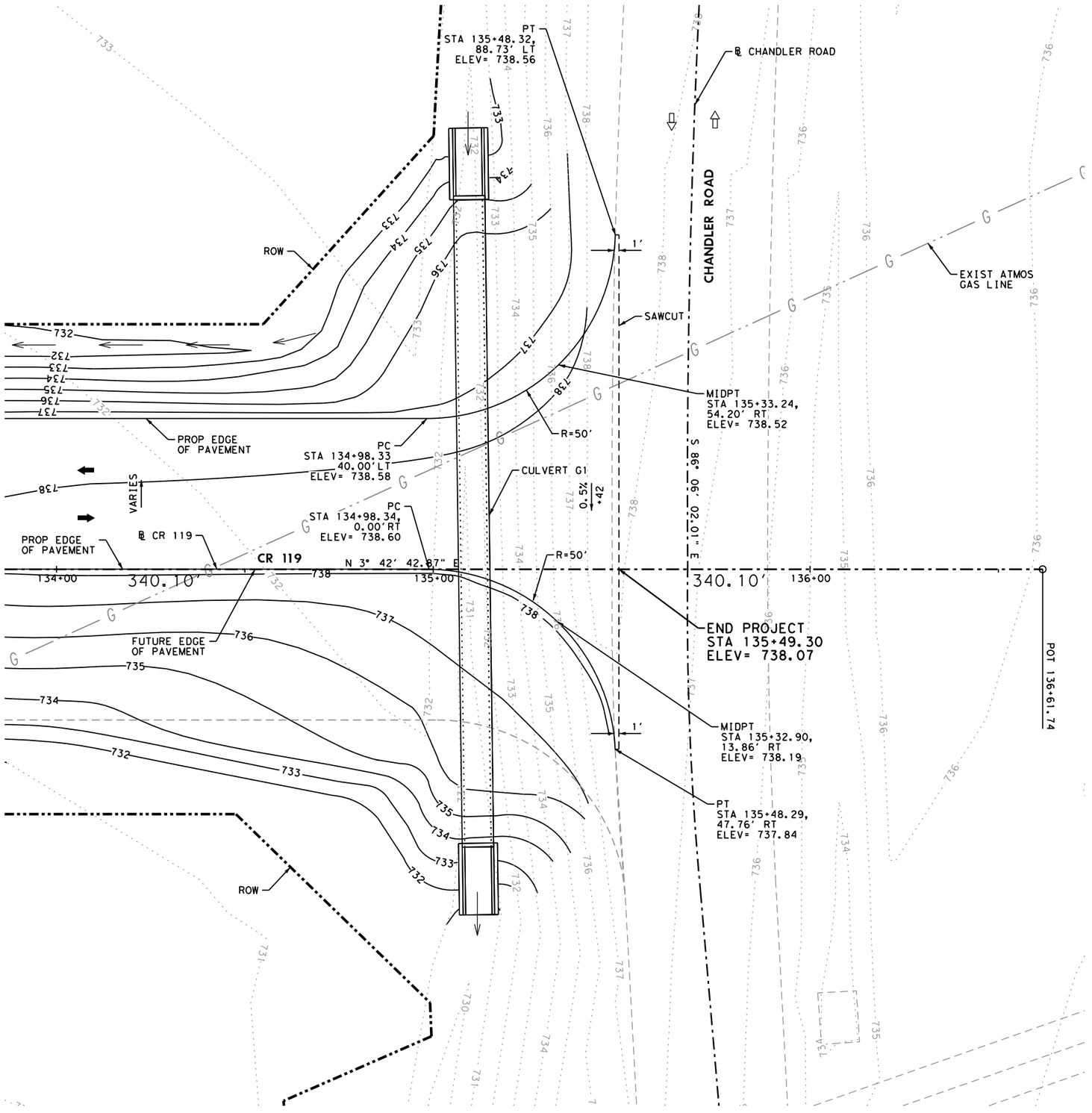
ROADWAY
INTERSECTION LAYOUT
CR 119 AT CR 118

SHEET 01 OF 01

FED. RD. DIV. RD.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				105

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NOTES:

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LEGEND

- TRAFFIC FLOW ARROW
- RIGHT OF WAY BOUNDARY
- 696 PROPOSED CONTOURS
- 696 EXISTING CONTOURS

0 7.5 15 30

STATE OF TEXAS
ARNOLD GONZALES, JR.
98234
LICENSED
PROFESSIONAL ENGINEER

6/15/2017

CR 119

WILLIAMSON COUNTY 1848

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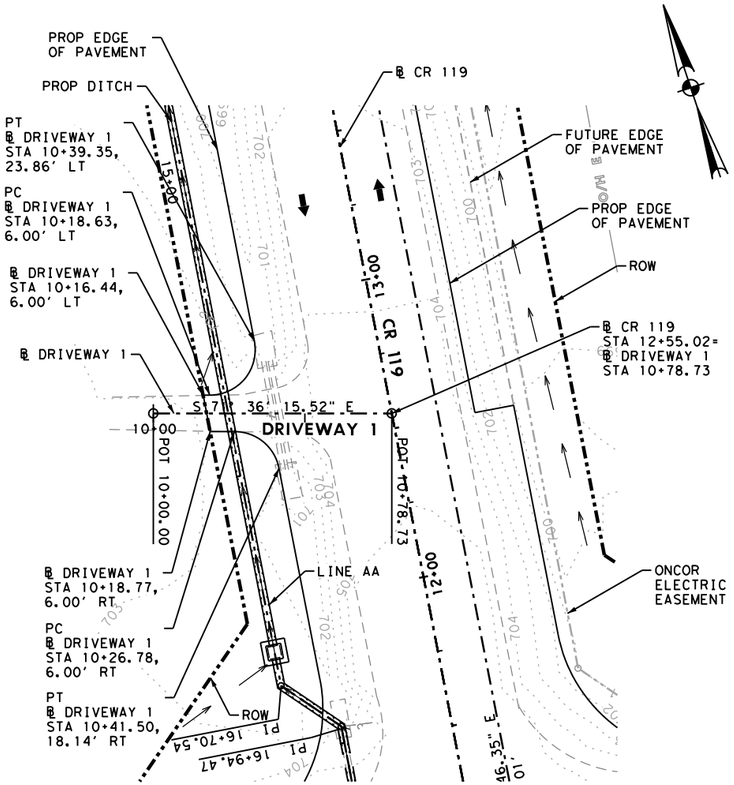
ROADWAY
INTERSECTION LAYOUT
CR 119 AT CHANDLER ROAD

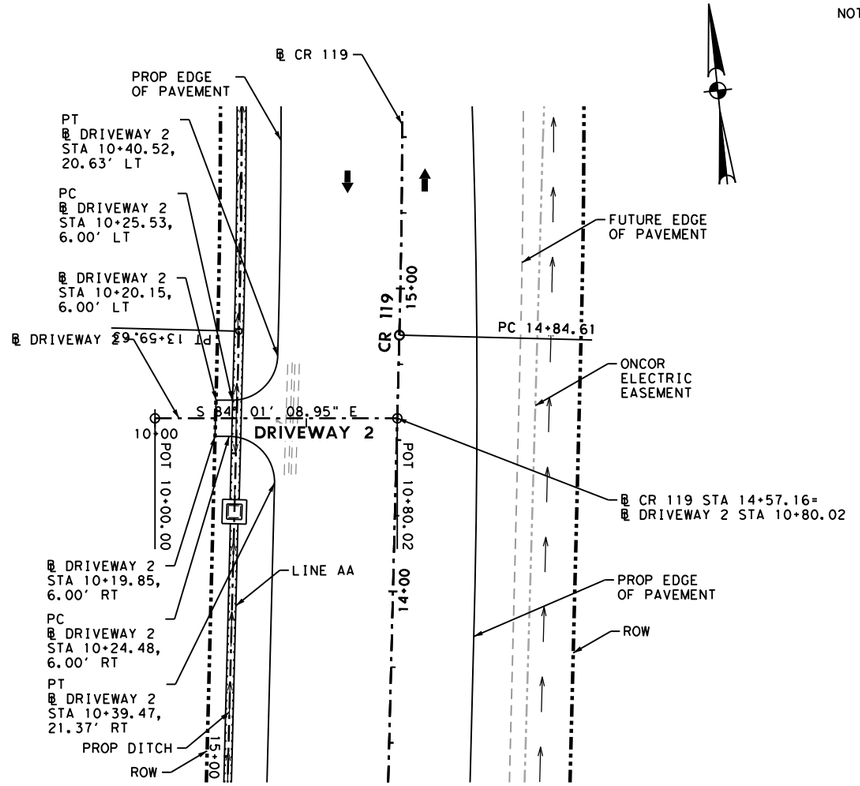
SHEET 01 OF 01

FED. RD. DIV. RD.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				106

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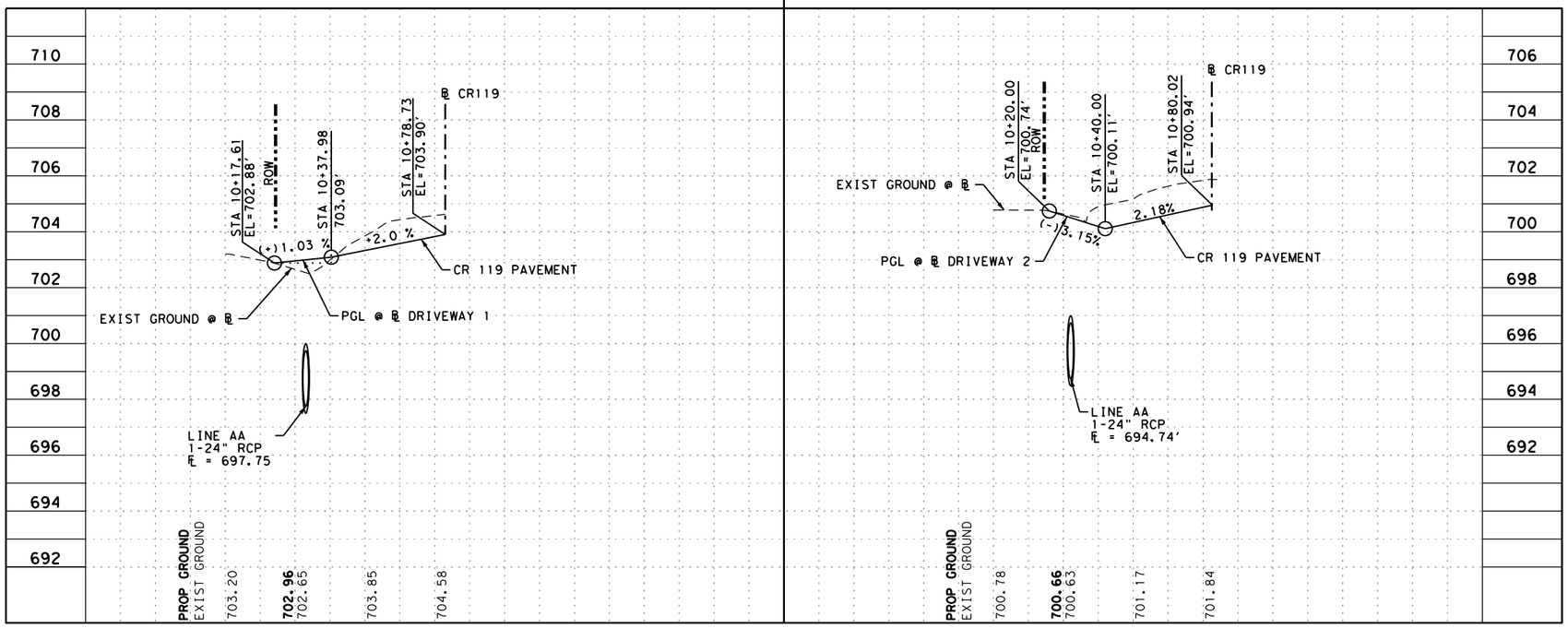


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5. REFER TO DRIVEWAY DETAIL SHEET FOR ADDITIONAL INFORMATION.

LEGEND

- TRAFFIC FLOW ARROW
- RIGHT OF WAY BOUNDARY
- EASEMENT
- EXISTING WIRE FENCE
- PROPOSED WIRE FENCE (TxDOT TY C) (STEEL POST)
- EXISTING GAS LINE
- DITCH FLOW ARROWS
- 696 EXISTING CONTOURS



0 12.5 25 50 (H)
0 2.5 5 (V)

STATE OF TEXAS
ARNOLD GONZALES, JR.
98234
LICENSED
PROFESSIONAL ENGINEER

6/15/2017

CR 119

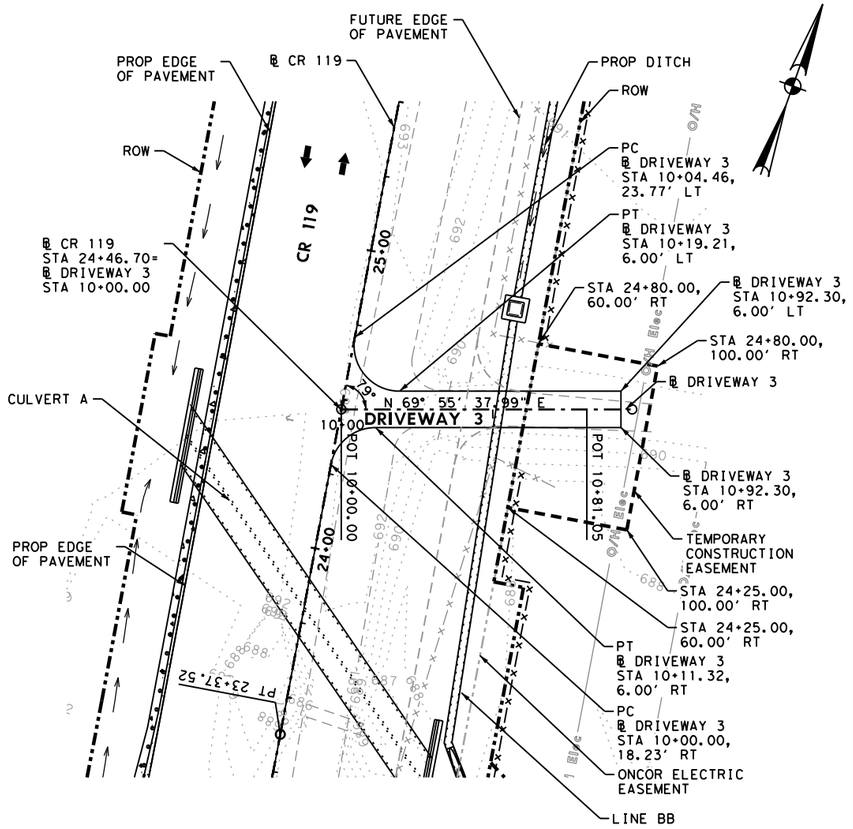
WILLIAMSON COUNTY 1848

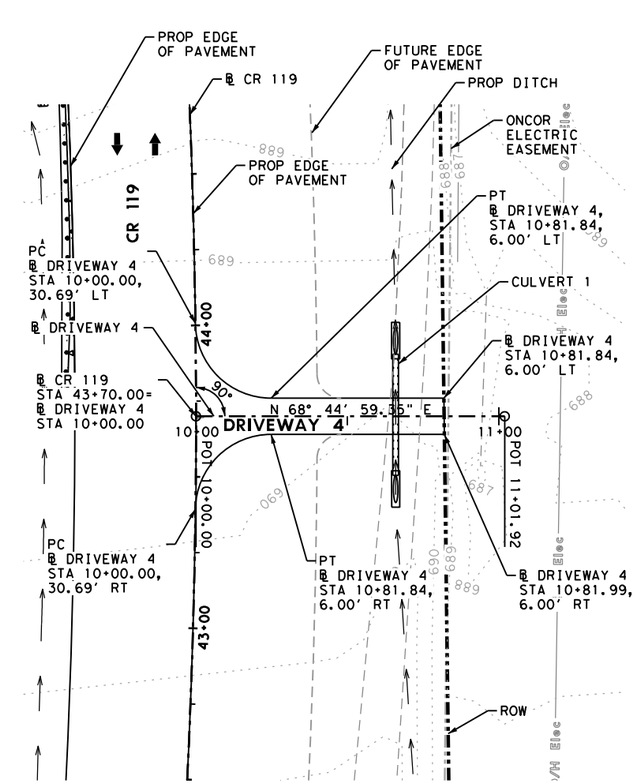
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DRIVEWAY PLAN AND PROFILE DRIVEWAY 1 & 2

SHEET 01 OF 06

FED. RD. DIV. RD.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				107



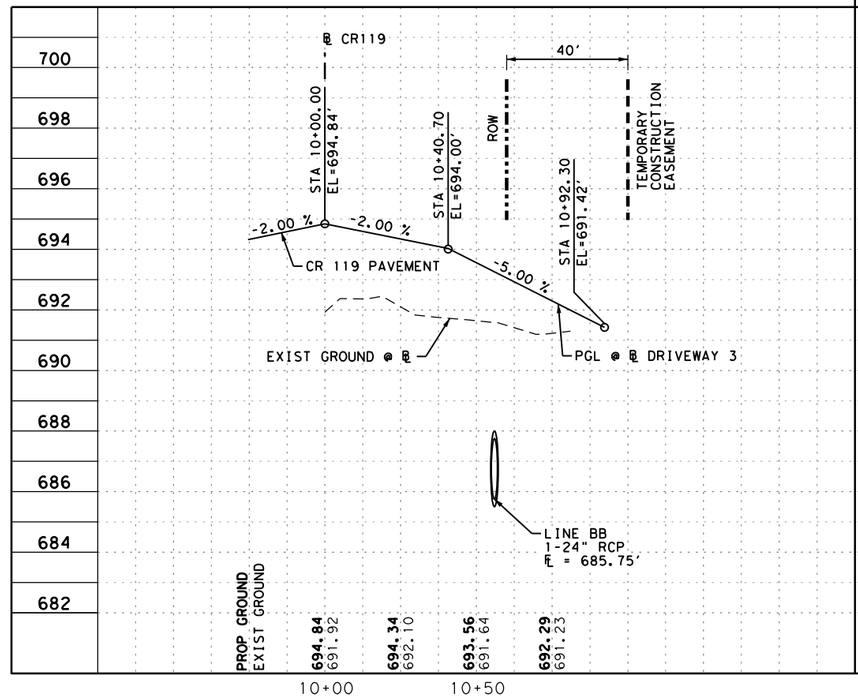


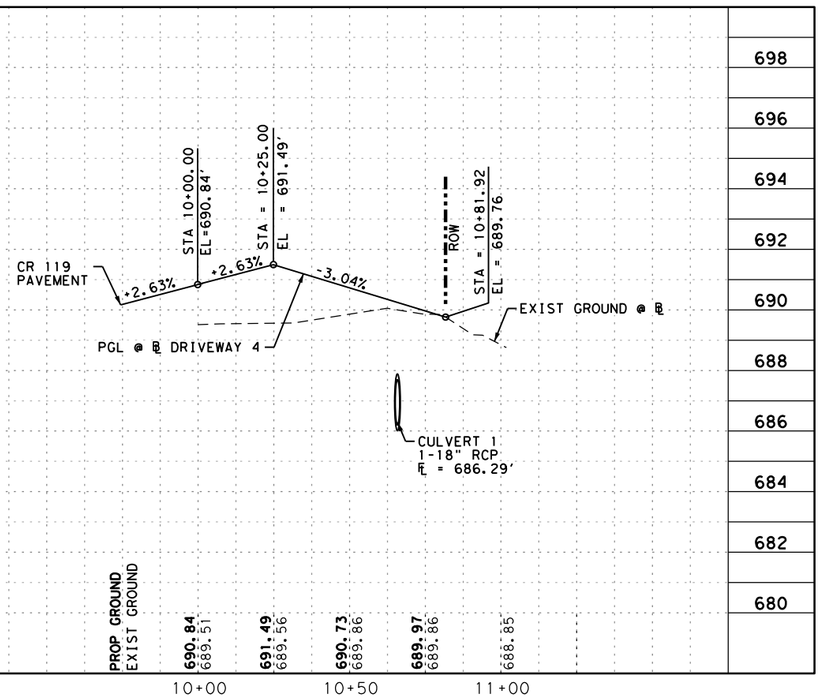
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LEGEND

- TRAFFIC FLOW ARROW
- RIGHT OF WAY BOUNDARY
- EASEMENT
- EXISTING WIRE FENCE
- PROPOSED WIRE FENCE (TxDOT TY C) (STEEL POST)
- EXISTING GAS LINE
- DITCH FLOW ARROWS
- 696 EXISTING CONTOURS





0 12.5 25 50 (H)
0 2.5 5 (V)

STATE OF TEXAS
ARNOLD GONZALES, JR.
98234
LICENSED
PROFESSIONAL ENGINEER

6/15/2017

CR 119

WILLIAMSON COUNTY 1848

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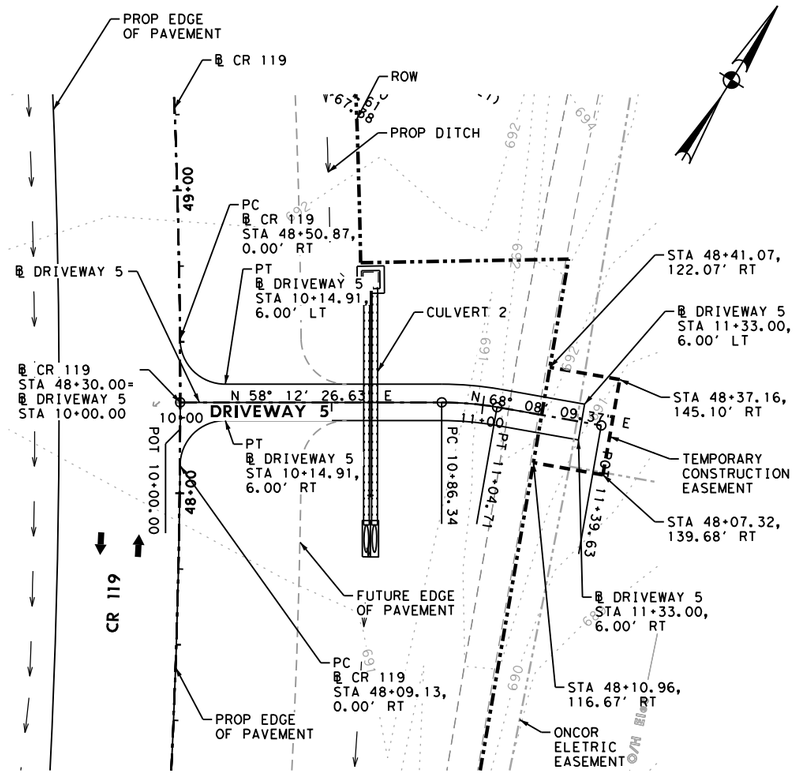
DRIVEWAY PLAN AND PROFILE DRIVEWAY 3 & 4

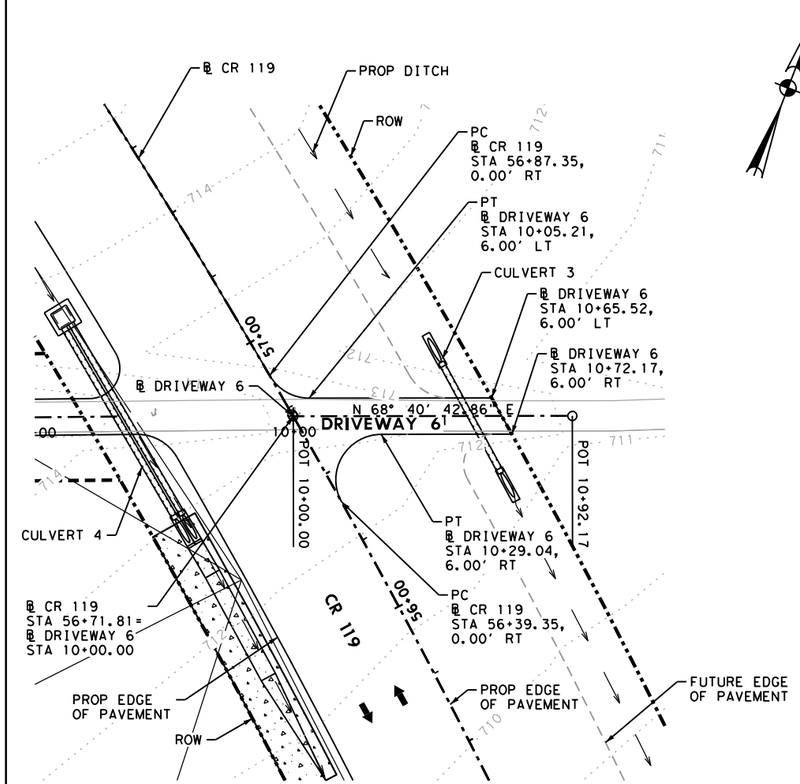
SHEET 02 OF 06

FED. RD. DIV. RD.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				108

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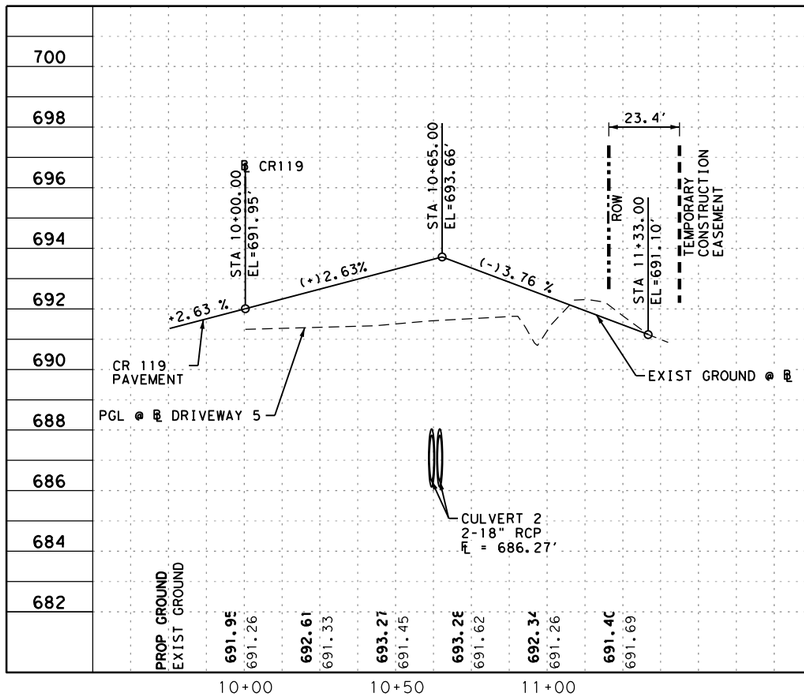


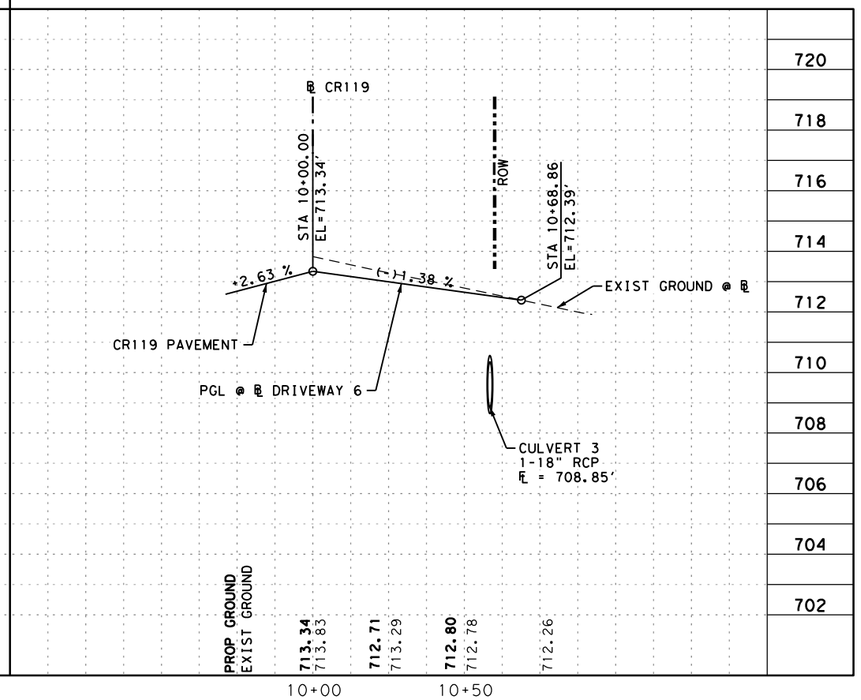
NOTES:

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5. REFER TO DRIVEWAY DETAIL SHEET FOR ADDITIONAL INFORMATION.

LEGEND

- TRAFFIC FLOW ARROW
- RIGHT OF WAY BOUNDARY
- EASEMENT
- EXISTING WIRE FENCE
- PROPOSED WIRE FENCE (TxDOT TY C) (STEEL POST)
- EXISTING GAS LINE
- DITCH FLOW ARROWS
- 696 EXISTING CONTOURS





0 12.5 25 50 (H)
0 2.5 5 (V)

STATE OF TEXAS
ARNOLD GONZALES, JR.
98234
LICENSED
PROFESSIONAL ENGINEER

6/15/2017

CR 119

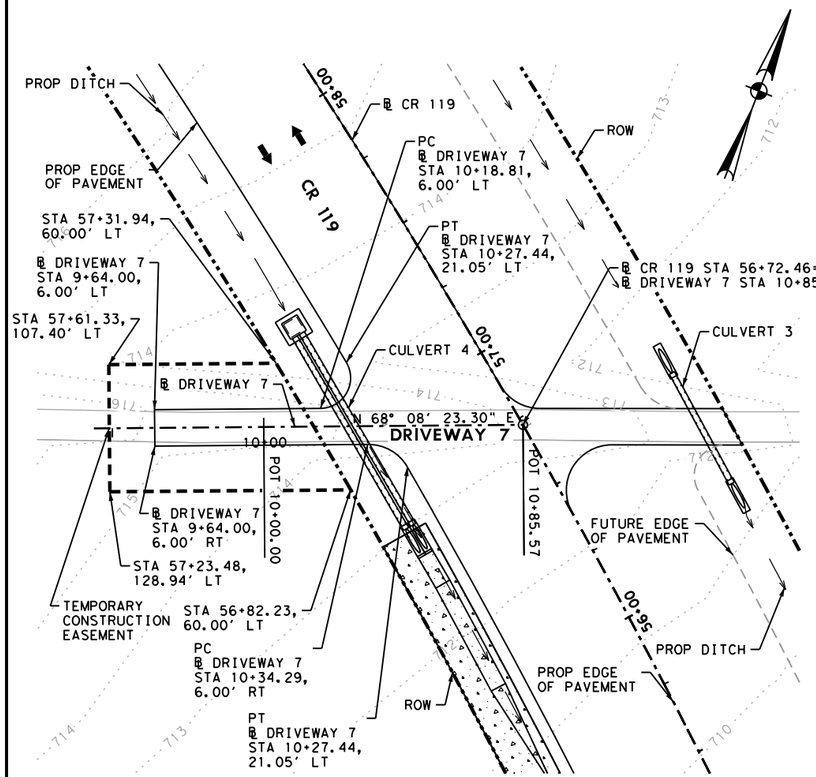
WILLIAMSON COUNTY 1848

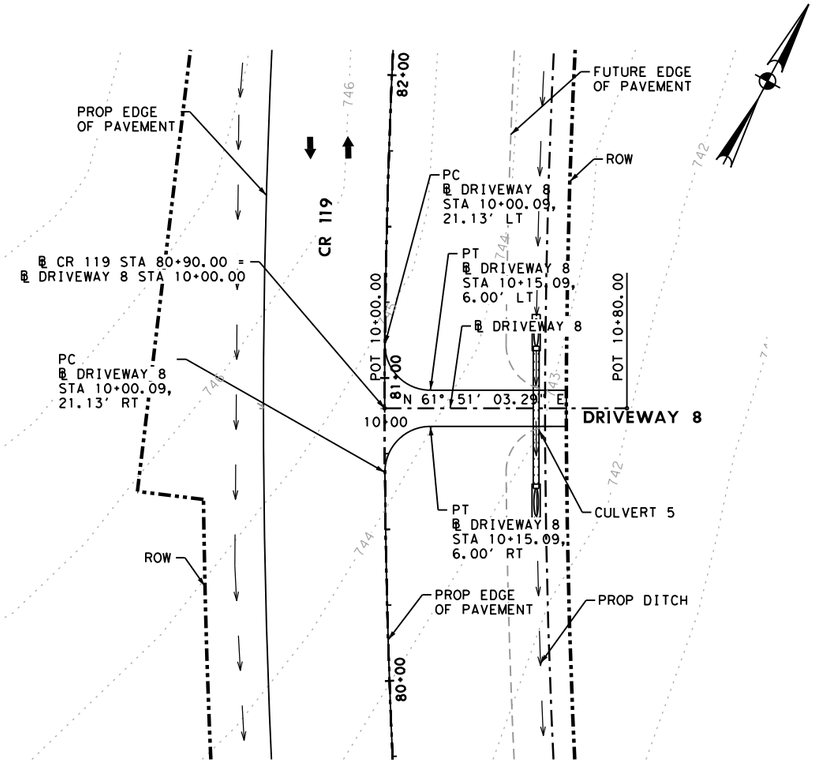
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DRIVEWAY PLAN AND PROFILE DRIVEWAY 5 & 6

SHEET 03 OF 06

FED. RD. DIV. RD.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				109



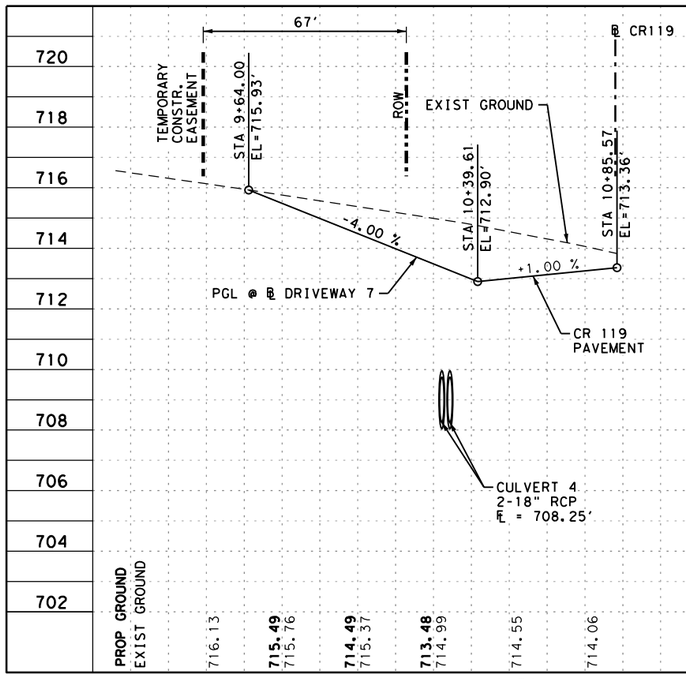


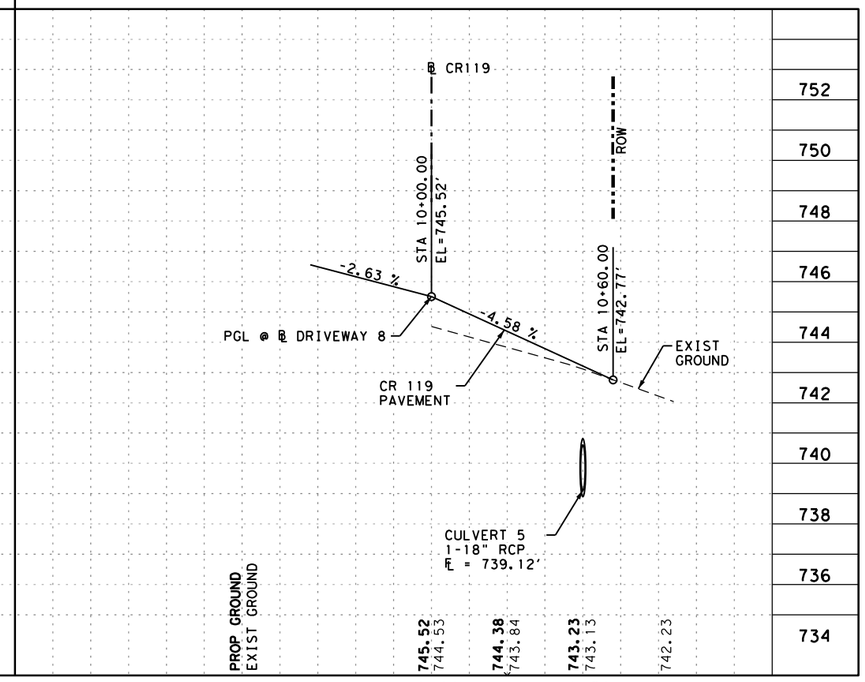
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- DITCH FLOW ARROWS
- 696 EXISTING CONTOURS





0 12.5 25 50 (H)
0 2.5 5 (V)

STATE OF TEXAS
ARNOLD GONZALES, JR.
98234
LICENSED
PROFESSIONAL ENGINEER

6/15/2017

CR 119

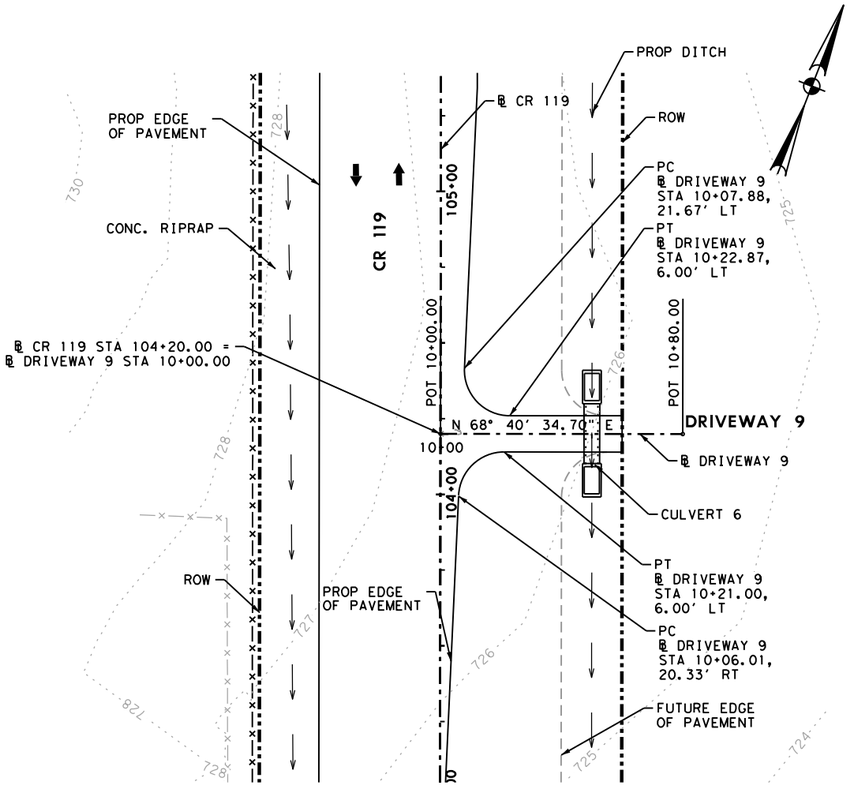
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1848

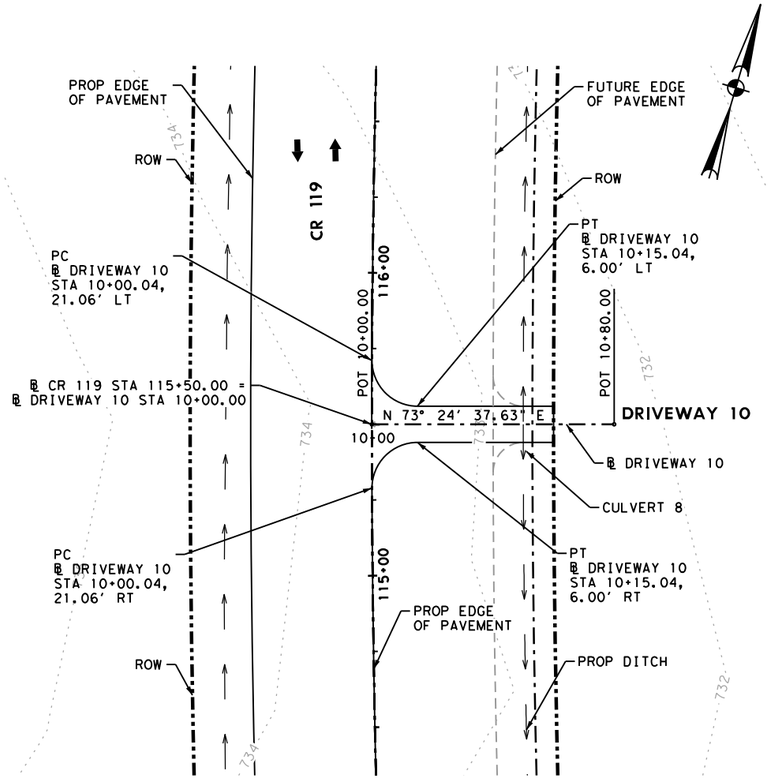
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DRIVEWAY PLAN AND PROFILE DRIVEWAY 7 & 8

SHEET 04 OF 06

FED. RD. DIV. RD.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				110



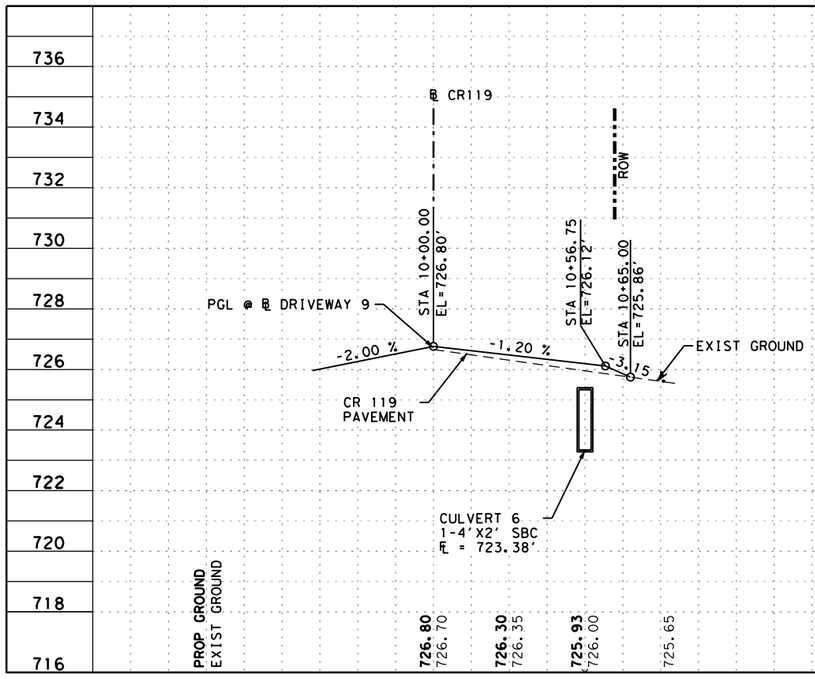


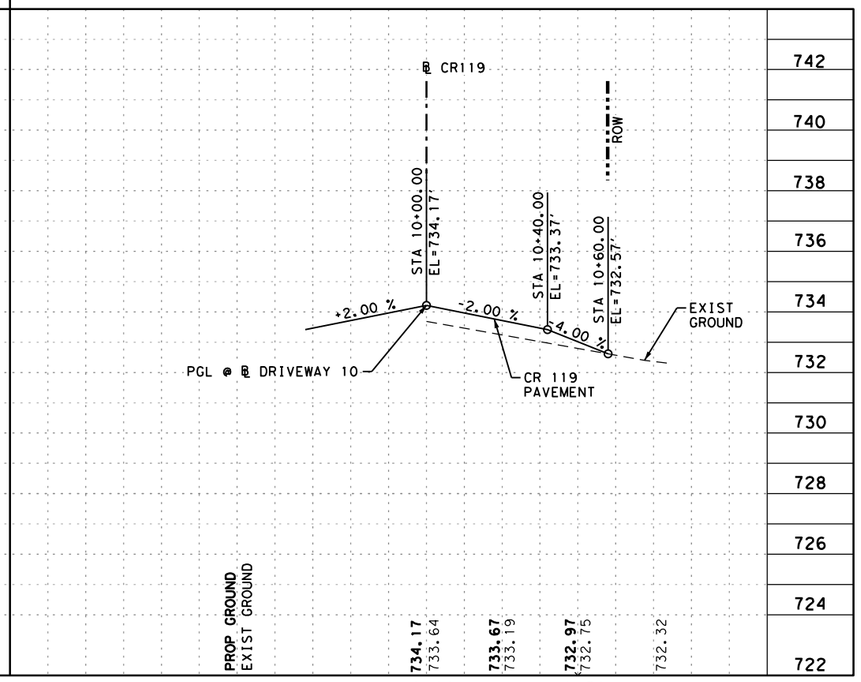
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0 12.5 25 50 (H)
0 2.5 5 (V)

STATE OF TEXAS
ARNOLD GONZALES, JR.
98234
LICENSED
PROFESSIONAL ENGINEER

6/15/2017

CR 119

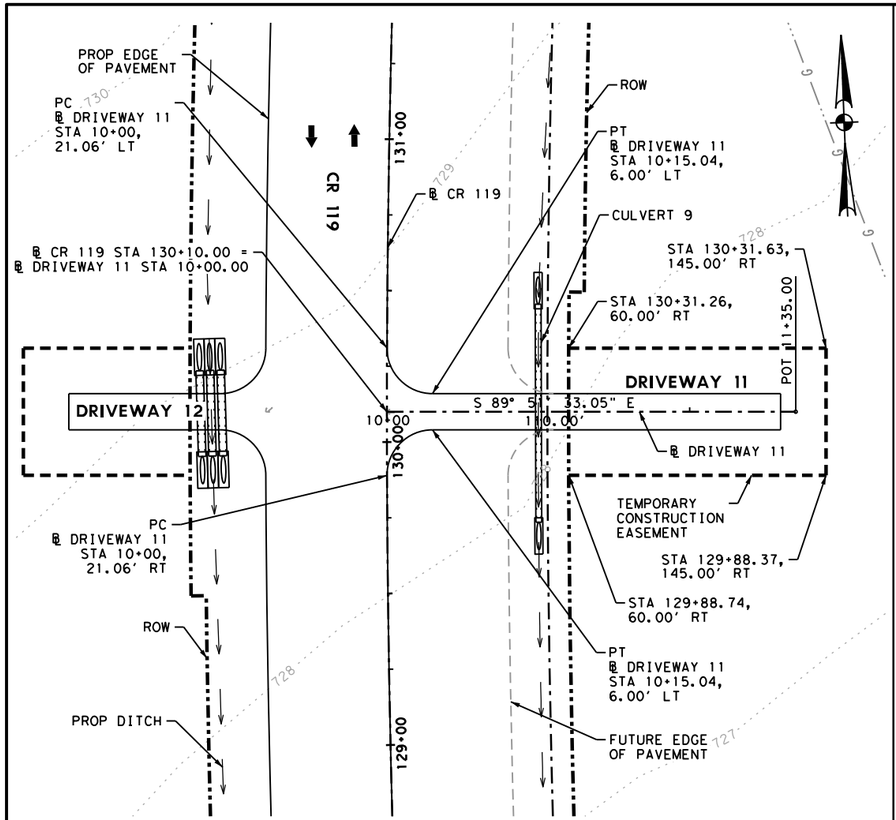
WILLIAMSON COUNTY 1848

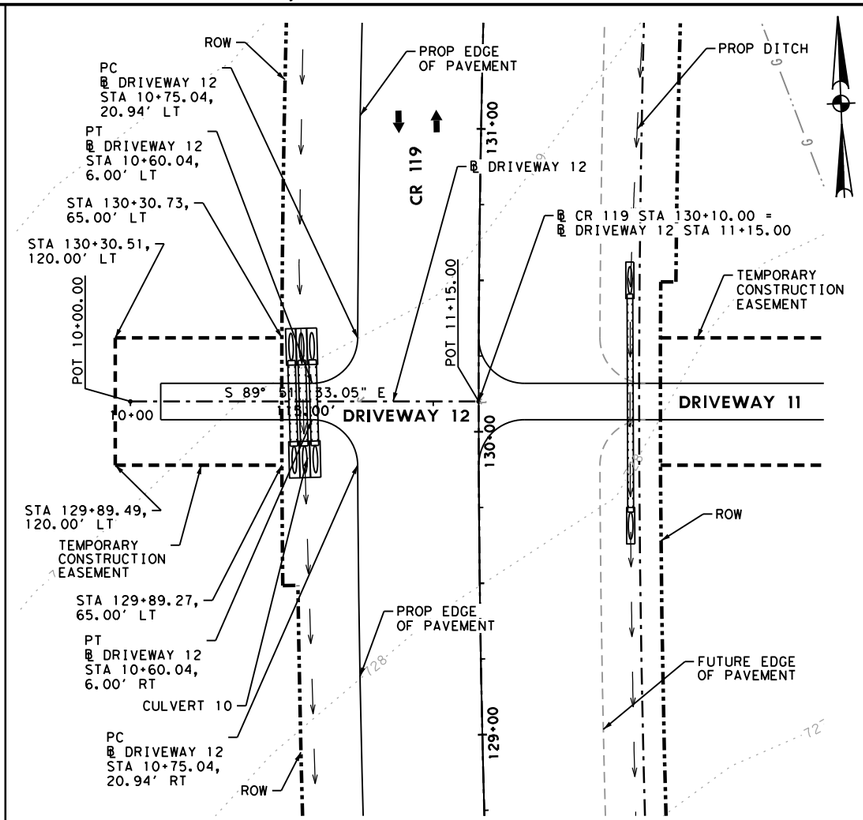
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DRIVEWAY PLAN AND PROFILE DRIVEWAY 9 & 10

SHEET 05 OF 06

FED. RD. DIV. RD.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				111



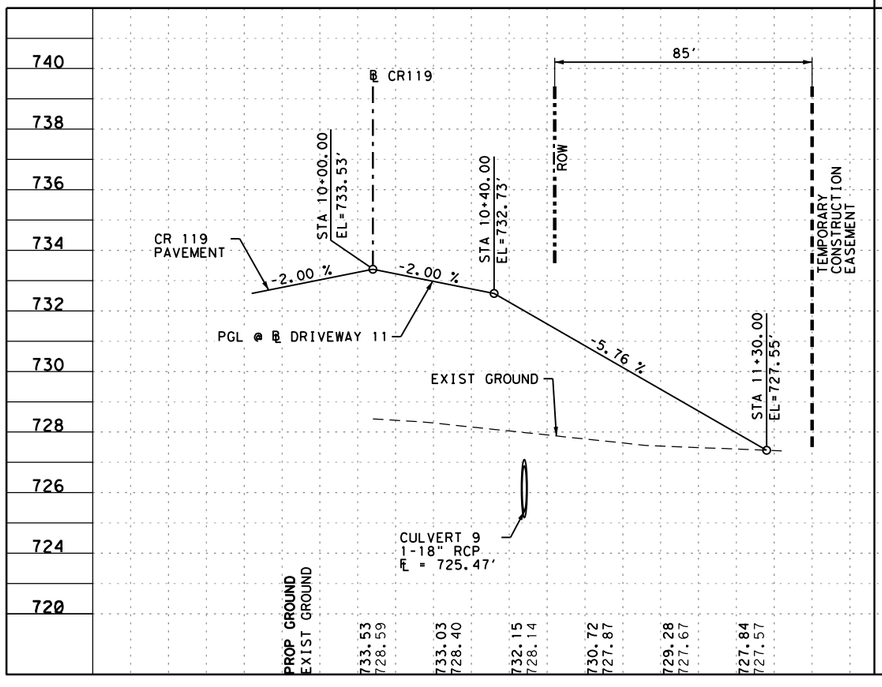


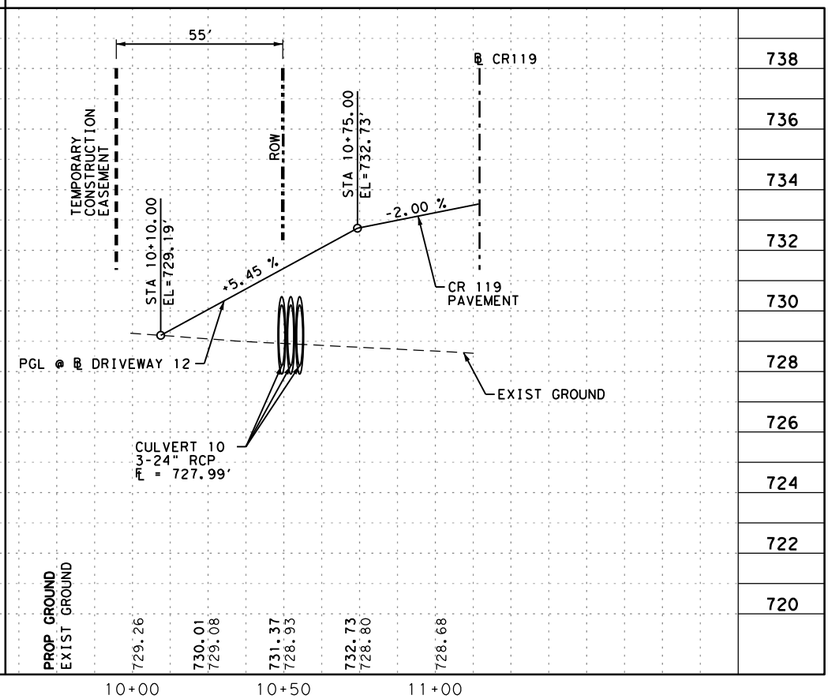
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- 696 EXISTING CONTOURS





0 12.5 25 50 (H)
0 2.5 5 (V)

STATE OF TEXAS
ARNOLD GONZALES, JR.
98234
LICENSED
PROFESSIONAL ENGINEER

6/15/2017

CR 119

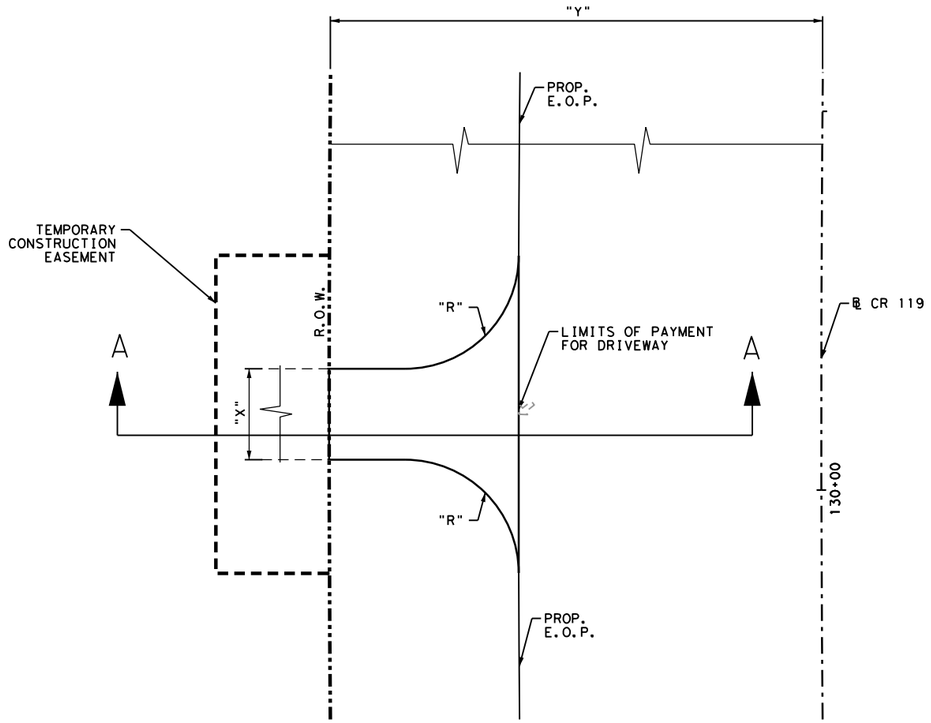
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DRIVEWAY PLAN AND PROFILE DRIVEWAY 11 & 12

SHEET 06 OF 06

FED. RD. DIV. RD.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				112

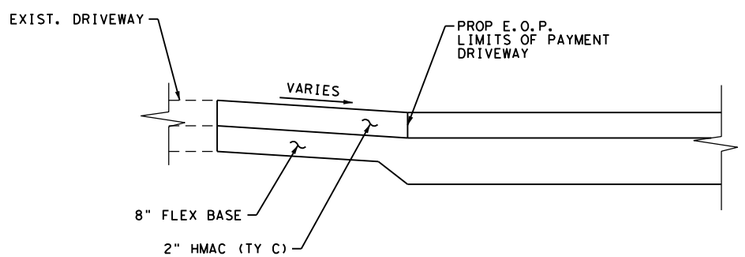


PLAN
N.T.S.

DRIVEWAY NUMBER	LOCATION	ROAD	TYPE	"R"	"X"	"Y"	SY
1	12+55.02 (LT)	CR 119	ASPHALT	15'	12'	61.1'	39
2	14+57.16 (RT)	CR 119	ASPHALT	15'	12'	60.0'	37
3	24+46.70 (LT)	CR 119	ASPHALT	15'	12'	92.3	135
4	43+70.00 (LT)	CR 119	ASPHALT	25'	12'	82.0'	139
5	48+30.00 (RT)	CR 119	ASPHALT	15'	12'	133.0'	188
6	56+71.81 (RT)	CR 119	ASPHALT	15'	12'	68.8'	110
7	56+72.46 (LT)	CR 119	ASPHALT	15'	12'	75.6'	110
8	80+90.00 (RT)	CR 119	ASPHALT	15'	12'	60.0'	91
9	104+20.00 (RT)	CR 119	ASPHALT	15'	12'	60.0'	82
10	115+50.00 (RT)	CR 119	ASPHALT	15'	12'	60.0'	91
11	130+10.00 (RT)	CR 119	ASPHALT	15'	12'	60.0'	91
12	130+10.00 (LT)	CR 119	ASPHALT	15'	12'	65.0'	37

NOTES:

1. FINAL TIE-IN LOCATIONS AND ELEVATIONS SHALL BE AS SHOWN IN THE PLANS OR AS DETERMINED BY THE ENGINEER IN THE FIELD.
2. SEE DRIVEWAY PLAN AND PROFILE SHEETS FOR LIMITS OF TEMPORARY CONSTRUCTION EASEMENT, IF APPLICABLE.
3. PAYMENT FOR DRIVEWAYS SHALL BE IN ACCORDANCE WITH ITEM 530.



SECTION A-A
N.T.S.

STATE OF TEXAS
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6/15/2017

CR 119

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DRIVEWAY DETAILS

SHEET 01 OF 01

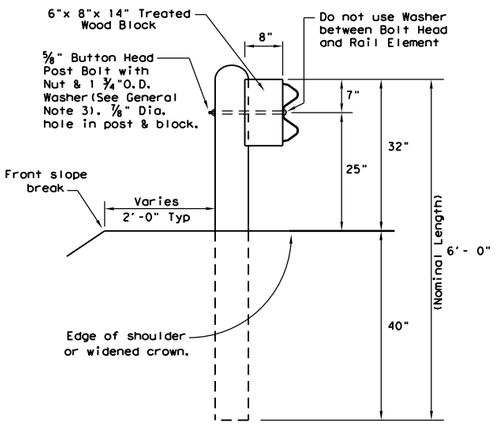
FED. RD. DIV. RD.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				113

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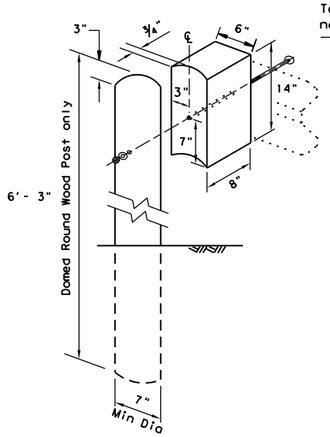
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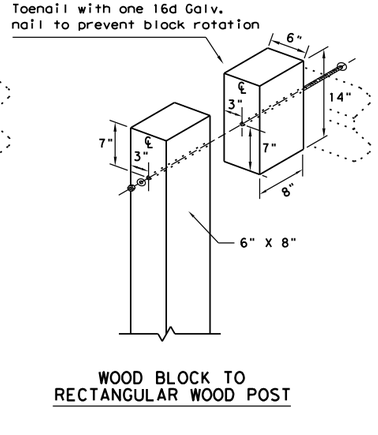
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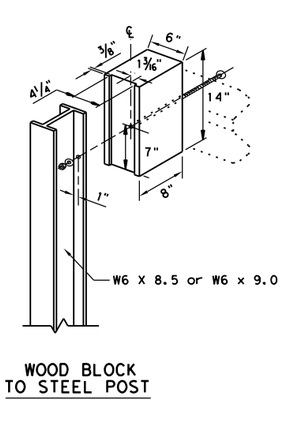
TYPICAL POST



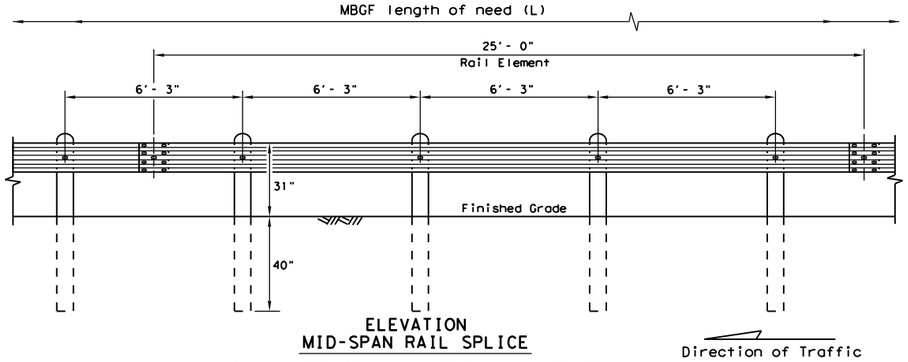
WOOD BLOCK TO ROUND WOOD POST



WOOD BLOCK TO RECTANGULAR WOOD POST



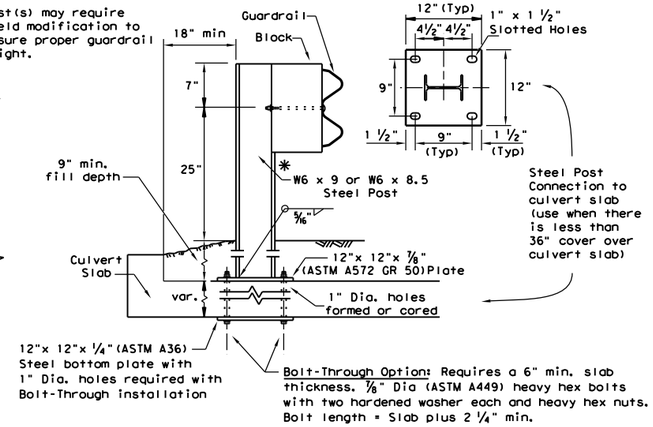
WOOD BLOCK TO STEEL POST



ELEVATION
MID-SPAN RAIL SPLICE

Showing a 25'- 0" section of W-Beam rail, 12'- 6" rail sections may also be supplied (See General Note 2)

Direction of Traffic



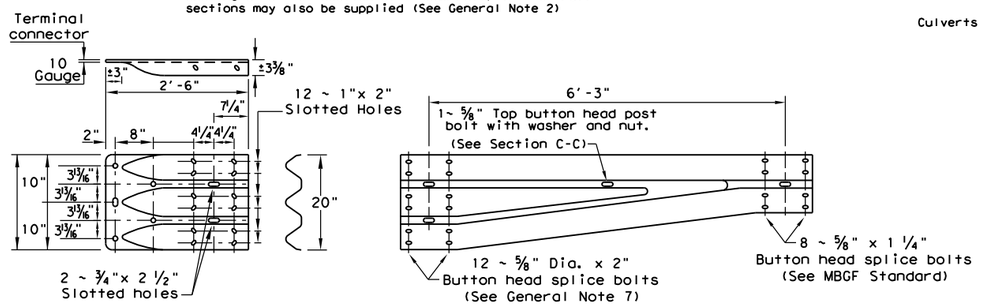
LOW FILL CULVERT POST

Culverts of 25 ft. or less, see GF(31)LS standard for "Long Span" option.

Epoxy Note:
Epoxy Anchor Option: This option may only be used if the culvert slab is 8" min. thick. Threaded anchor rods must be ⅞" Dia. ASTM A449 or A193 Grade B7 with heavy hex nut, and one hardened washer each. Embed anchor rods 6" with Hilti HIT RE 500 epoxy adhesive. Other Type III Class C epoxy adhesives meeting the requirements of DMS-6100, "Epoxies and Adhesives", may be used if it can be demonstrated that they meet or exceed the strength of Hilti HIT RE 500 with the same embedment depth and threaded rod dia. Follow the manufacturer's requirements for installing epoxied threaded rods. Extend rods ¼" min. beyond nut.

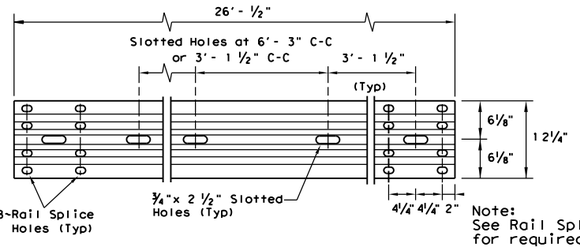
GENERAL NOTES

1. The type of post (round wood post, rectangular wood post, or steel post) will be as shown in the plans. The exact position of MBGF shall be shown in the plans or as directed by the Engineer. Steel posts to be galvanized in accordance with Item 445, "Galvanizing."
2. Rail element shall meet the requirements of Item 540, "Metal Beam Guard Fence" except as modified in the plans. The Contractor may furnish rail elements of 25'- 0", or 12'- 6" (nom.) lengths. Rail elements may have slotted holes at 3'-1½" C-C or 6'-3" C-C. A special length of rail may be manufactured to accommodate the downstream anchor terminal (DAT) and the transition sections of guardrail.
3. Button head "post" bolts (ASTM A307) shall be of sufficient length to extend through the full thickness of the nut (ASTM A563) and Type A (1 ¾" O.D.)washer and not more than 1" beyond it. Button head "splice" bolts (ASTM A307) are ⅝" x 1 ¼" (or 2" long at triple rail splices) with a ⅝" double recessed nut (ASTM A563). Thrie beam "connection" ⅞" dia. (ASTM A325) hex bolts shall be of sufficient length to extend through the full thickness of the rail, washers, and nuts.
4. Fittings (bolts, nuts, and washers) shall be galvanized in accordance with Item 445, "Galvanizing." Fittings shall be subsidiary to the bid item.
5. Crown shall be widened to accommodate the Metal Beam Guard Fence.
6. The lateral approach to the guard fence, shall have a maximum slope of 1V:10H.
7. If shown elsewhere in the plans or as directed by the Engineer, the guard fence may be flared at a rate of 25:1 or flatter.
8. Unless otherwise shown in the plans, guard fence placed in the vicinity of curbs shall be positioned so that the face of curb is located directly below or behind the face of the rail. Rail placed over curbs shall be installed so that the post bolt is located approximately 25 inches above the gutter pan or edge of shoulder.
9. If solid rock is encountered within 0 to 18" of the finished grade, drill a 22" dia. hole, or drill two 12" dia. front to back overlapping holes, 24" into the rock. If solid rock is encountered below 18", drill a 12" dia. hole, 12" into the rock or to the standard embedment depth, whichever maybe less. Any excess post length, after meeting these depths, may be field cut to ensure proper guardrail mounting height. Backfill with a cohesionless material.
10. Posts shall not be set in concrete, of any depth.
11. Special fabrication will be required at installations having a curvature of less than 150 ft. radius.
12. Unless otherwise shown in the plans, a composite material post and/or block that meets the requirements of DMS-7210, "Composite Material Posts and Blocks for Metal Beam Guard Fence" may be substituted for posts and/or blocks of similar dimensions. The Construction Division, TxDOT maintains a Material Producer List (MPL) for producers of materials conforming to DMS-7210. Only producers on the MPL may furnish composite material posts and/or blocks.
13. For posts located partially or wholly between precast box culvert units, the use of a cast-in-place concrete closure between boxes is required. See Detail "A" on Bridge Standard SCP-MD.



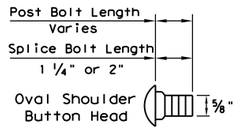
THRIE-BEAM TERMINAL CONNECTION
(SEE GENERAL NOTES 6 & 7 FOR REQUIRED HARDWARE)

NON-SYMMETRICAL TRANSITION TO W-BEAM (10 Gauge)

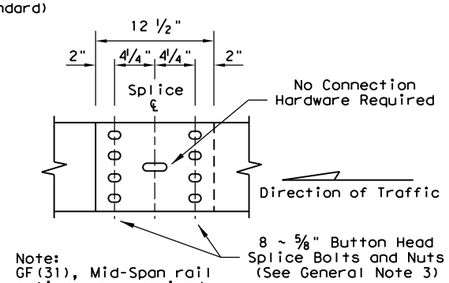


ELEVATION 25'- 0"(NOM.) W-BEAM SECTION
12'- 6" RAIL SECTIONS MAY ALSO BE SUPPLIED (SEE GENERAL NOTE 2)

Note:
See Rail Splice Detail for required hardware.

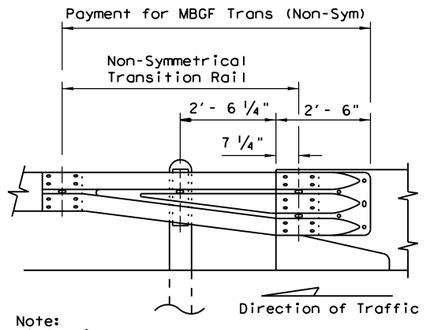


BUTTON HEAD BOLT
Post and Splice Bolts (See General Note 3)



Note:
GF(31), Mid-Span rail splices are required with 6'-3" post spacings.

MID-SPAN
RAIL SPLICE DETAIL



Note:
All rail elements shall be lapped in the direction of adjacent traffic.

DOWNSTREAM RAIL ATTACHMENT

Texas Department of Transportation — Design Division Standard

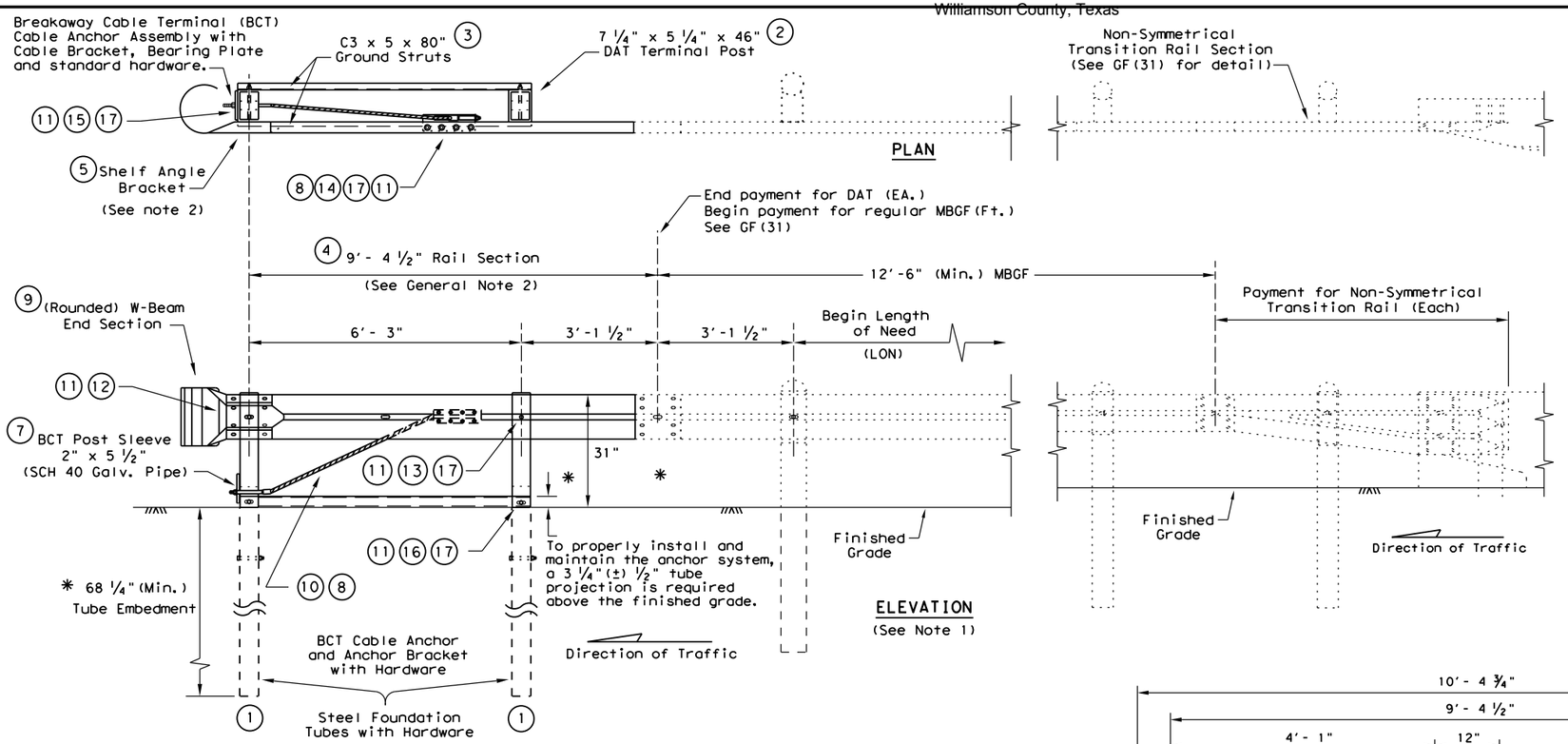
METAL BEAM GUARD FENCE

GF(31)-14

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©TxDOT: December 2011	CONT	SECT	JOB	HIGHWAY
REVISIONS				CR119
	DIST	COUNTY		SHEET NO.
	06	WILLIAMSON		114

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DOWNSTREAM ANCHOR TERMINAL (DAT)

Only for downstream use, when located outside the horizontal clearance area of opposing traffic.

GENERAL NOTES

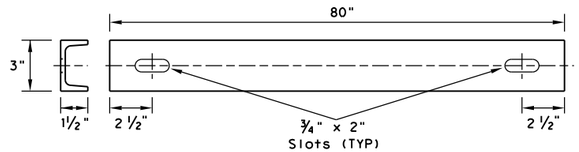
1. The detail shown is the minimum Length of Need (LON) for a DAT connected to a concrete rail.
2. The rail section at the end post is supported by the Shelf Angle Bracket. The rail element is not attached to the end post.
3. The foundation tubes shall not project more than 3 3/4" above the finished grade.
4. All hardware for DAT shall be ASTM A307 unless otherwise shown.
5. Refer to GF(31) sheet for terminal connection details.

MOW STRIP INSTALLATION

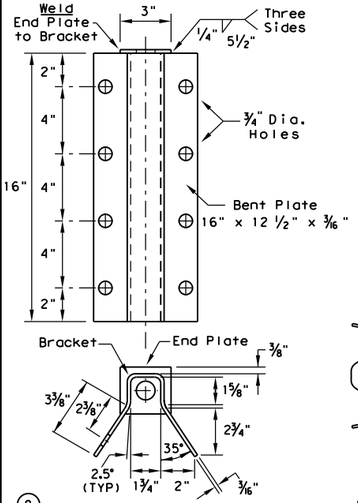
If a mow strip is required with the DAT installation the leave-out area around the steel foundation tubes and the two channel struts may be omitted. This will require a full pour at the foundation tubes.

#	(DAT) PARTS LIST	QTY
(1)	Steel Foundation Tube	2
(2)	DAT Terminal Post	2
(3)	Channel Strut	2
(4)	Terminal Rail Element	1
(5)	Shelf Angle Bracket	1
(6)	BCT Bearing Plate	1
(7)	BCT Post Sleeve	1
(8)	Guardrail Anchor Bracket	1
(9)	(Rounded) W-Beam End Section	1
(10)	BCT Cable Anchor	1
(11)	Recessed Nut, Guardrail	20
(12)	1 1/4" Button Head Bolt	4
(13)	10" Button Head Bolt	2
(14)	5/8" x 2" Hex Head Bolt	8
(15)	5/8" x 8" Hex Head Bolt	4
(16)	5/8" x 10" Hex Head Bolt	2
(17)	5/8" Flat Washer	18

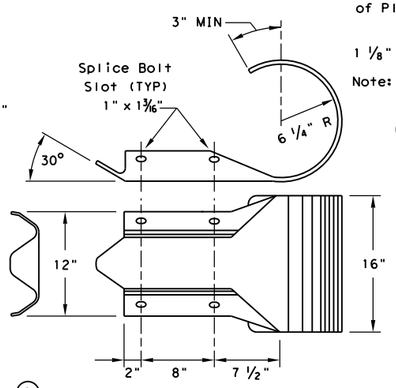
(4) TERMINAL RAIL ELEMENT FOR DAT



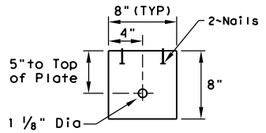
(3) CHANNEL STRUT
C3 x 5 x 80", Grade A36



(8) GUARDRAIL ANCHOR BRACKET

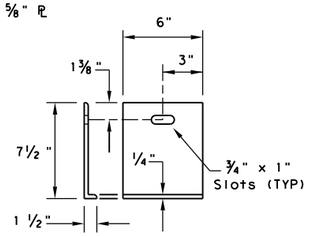


(9) W-BEAM END SECTION (ROUNDED) (12 GA.)

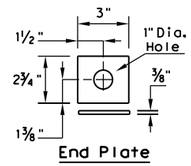


Note: Drive nails and bend over to prevent plate rotation

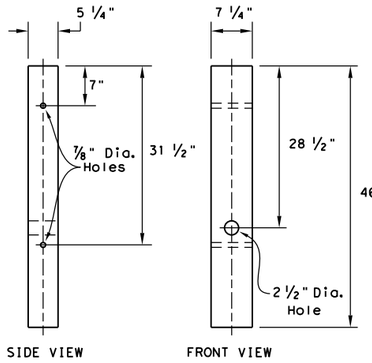
(6) BEARING PLATE
8"x 8"x 5/8" PL



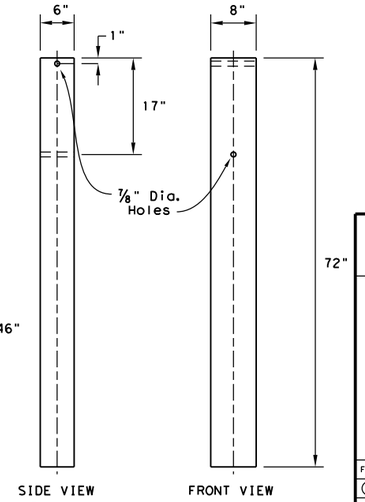
(5) SHELF ANGLE BRACKET



End Plate



(2) TERMINAL POST
7 1/4"x 5 1/4"x 46" Wood Post



(1) STEEL FOUNDATION TUBE
6"x 8"x 1/8" x 72" Steel Tube

Texas Department of Transportation — Design Division Standard

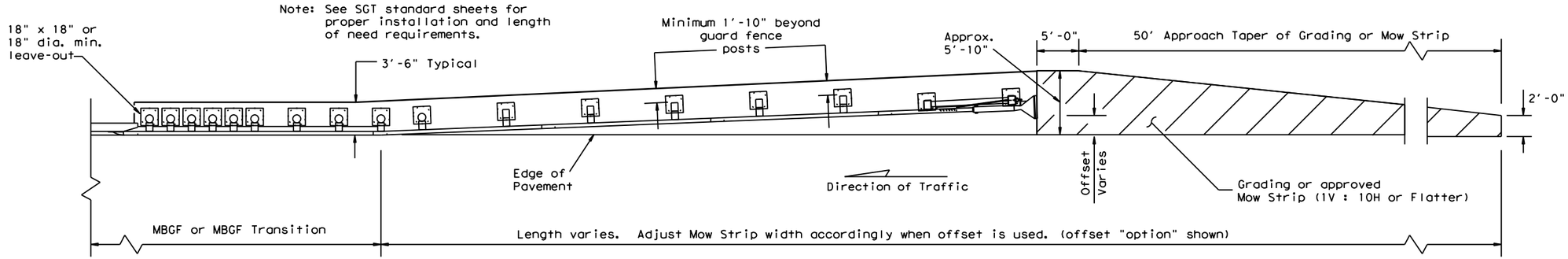
METAL BEAM GUARD FENCE
(Downstream Anchor Terminal)

GF(31)DAT-14

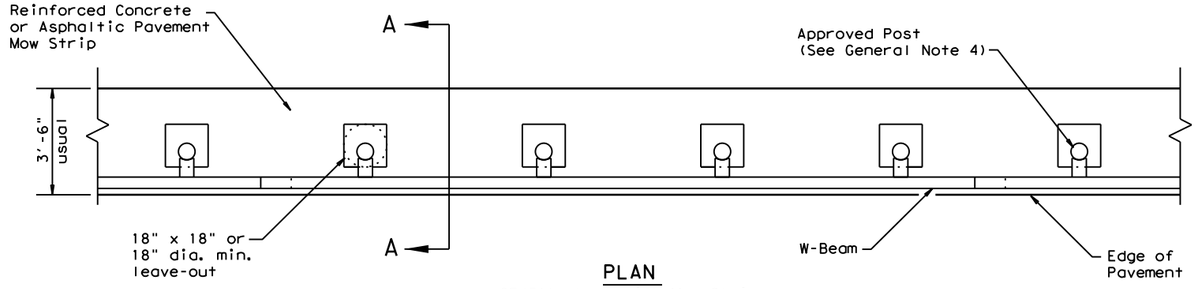
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©TxDOT: December 2011	CONT	SECT	JOB	HIGHWAY
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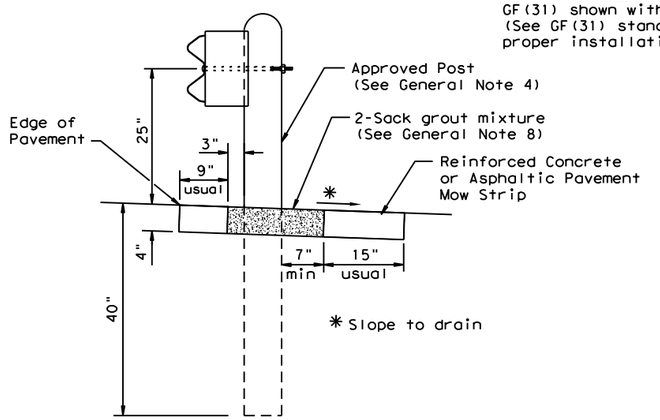


GRADING AND MOW STRIP AT GUARDRAIL END TREATMENTS



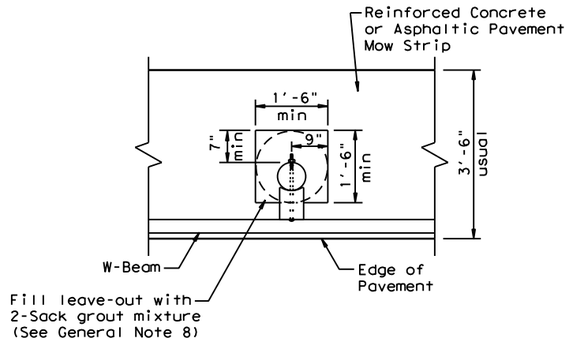
PLAN

GF(31) shown with Mow Strip
(See GF(31) standard sheet for proper installation)



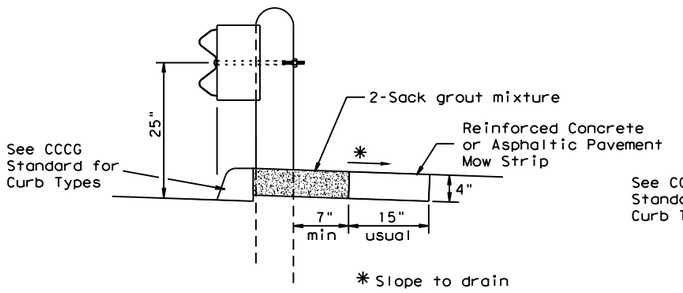
SECTION A-A

Typical



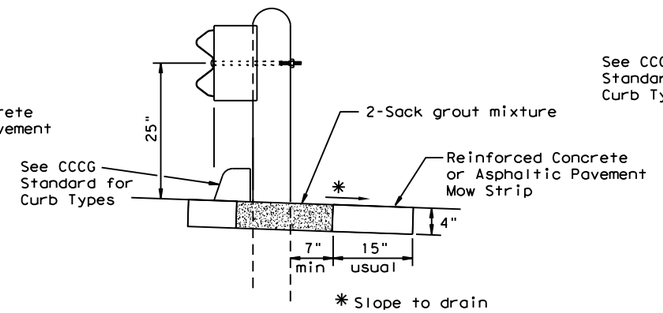
MOW STRIP DETAIL

Reinforced Concrete or Asphaltic Pavement Mow Strip with 18" x 18" or 18" dia. minimum leave-out.



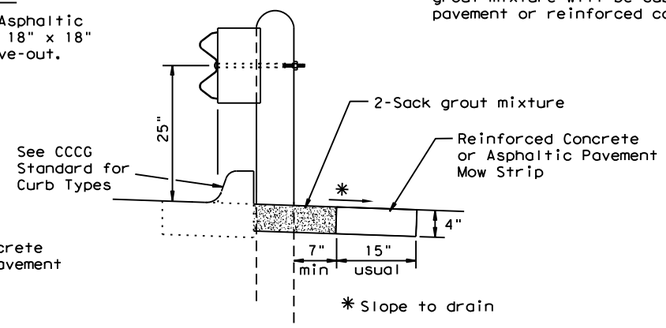
CURB OPTION (1)

This option will increase the post embedment through out the system.



CURB OPTION (2)

Curb shown on top of mow strip



CURB OPTION (3)

Note: Site Condition(s)

Site conditions may exist where grading is required for the proper installation of metal guard fence and end treatments.

Approach grading or mow strip may be decreased or eliminated, as directed by the Engineer.

GENERAL NOTES

1. This mow strip design is for use with metal beam guard fence, guard fence transitions, and guard fence end treatments (See SGT standards for proper SGT installation).
2. Mow strips shall be asphaltic pavement or reinforced concrete (wire mesh or synthetic fiber), as shown on the plans and will be paid for under the pertinent bid item. Asphaltic pavement shall meet the requirements of the item, and be placed in accordance with the pertinent bid item as shown in the plans. Reinforced concrete shall be placed in accordance with Item 432, "Riprap." The use of the synthetic fiber in lieu of steel reinforcing is acceptable, provided the fiber producer is on the Department Material Producer List (MPL), maintained by TxDOT, Construction Division.
3. The leave-out behind the post shall be a minimum of 7".
4. The type of approved post will be as shown in the plans. See the applicable standard sheets for additional details and information.
5. Other curb placement options may be used. Curbs are not considered part of the mow strip and will be paid for under other pertinent bid item.
6. Thickness of the mow strip will be 4".
7. The limits of payment for asphaltic pavement or reinforced concrete will include leave-outs for the posts.
8. The leave-outs shall be filled with no more than a 2-sack grout mixture and placed in accordance with Section 421.2.F, "Mortar and Grout." Payment for furnishing and placing the grout mixture will be subsidiary to the pay item of asphaltic pavement or reinforced concrete.

Texas Department of Transportation

Design Division Standard

METAL BEAM GUARD FENCE

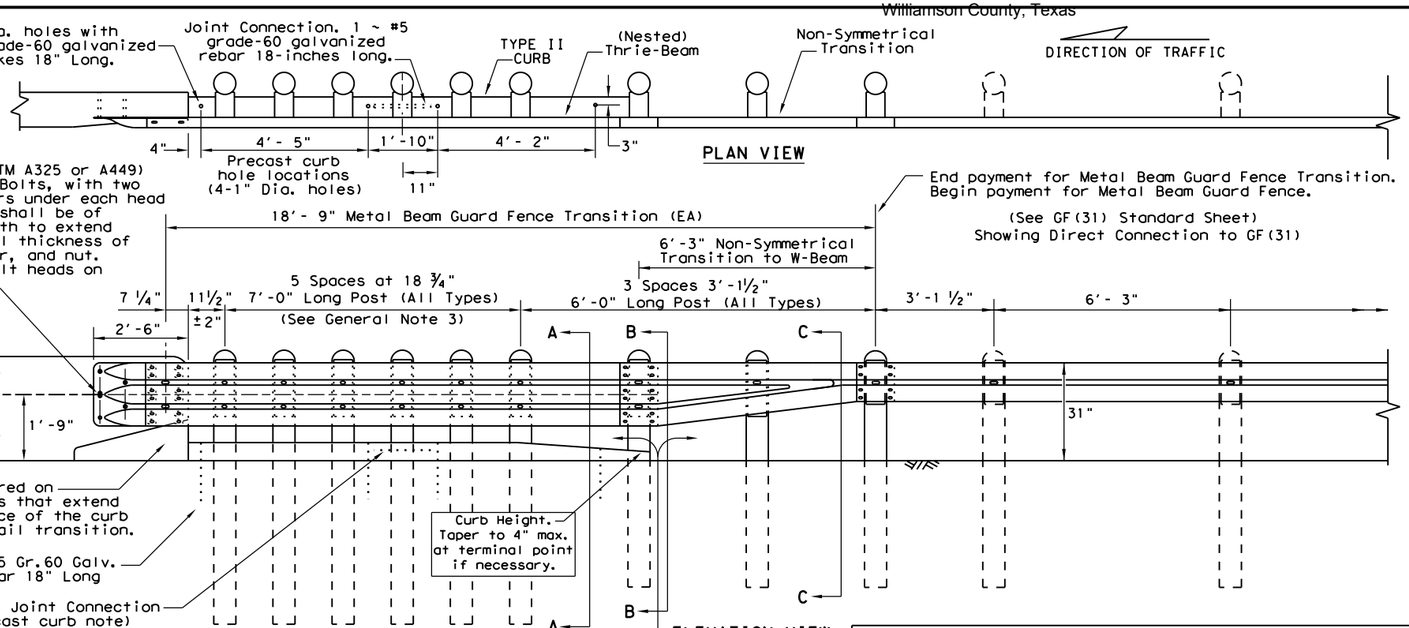
(MOW STRIP)

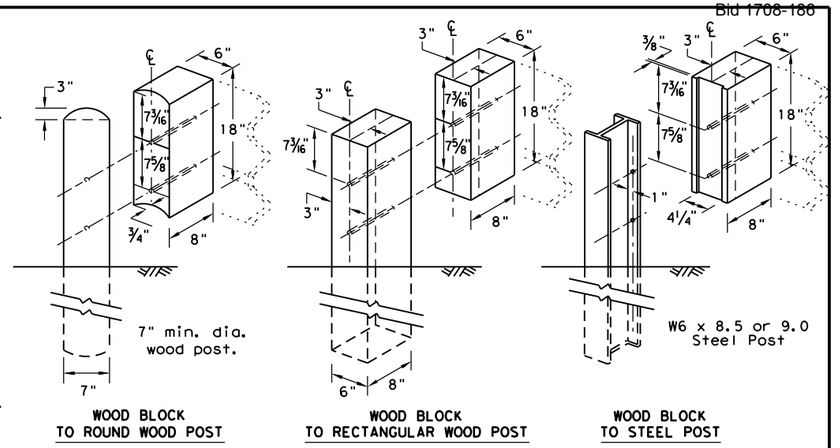
GF(31)MS-11

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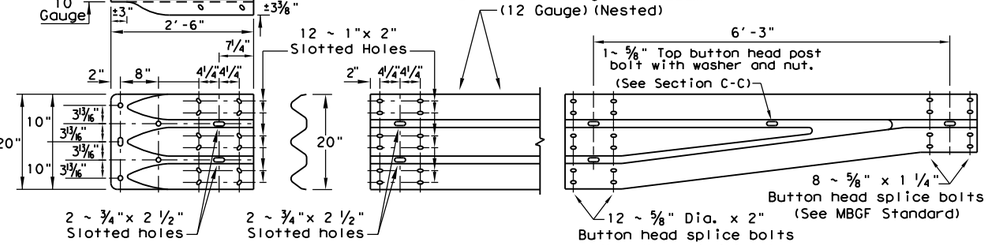


GENERAL NOTES

1. Concrete curb may be cast-in-place or precast as shown on this sheet. When used in conjunction with thrie-beam guard fence transitions, curb shall be Type II (Typically 5-3/4" height above surface; See CCCG standard sheet) unless otherwise shown in the plans. If other curb heights are shown in the plans in conjunction with the transition, the curb height may be from 4" to 8" with a relatively vertical face. Concrete curb shall be continuous to the seventh post.

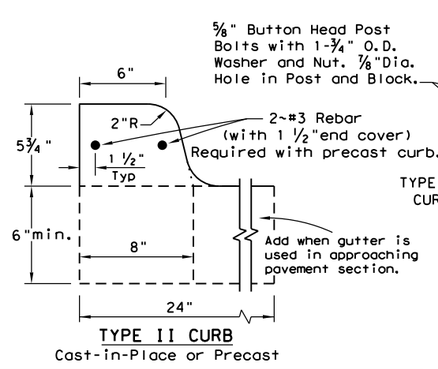
   Contact the Design Division for drainage cut out options needed within the curb section of the transition.
2. The type of post (round wood post, rectangular wood post or steel post) will be as shown in the plans.
3. The post length shall be marked on all 7'- 0" long posts by the Manufacturer. The mark shall be located within the top 1 ft. region of the post, at least 5/8" in height, and visible after installation. Wooden posts shall be marked with a brand, and steel posts with a stencil before galvanizing.
4. Rail element shall meet the requirements of Item 540, "Metal Beam Guard Fence" except as modified on the plans. The thrie-beam terminal connector and the thrie-beam transition to w-beam shall be of the same material, but shall not be less than 10 gauge.

   Contractor shall verify that the locations of bolt holes match those in the thrie-beam terminal connector prior to ordering materials.
5. Unless otherwise shown in the plans, transitions shall be placed with the block face in front of or directly above the curb face.
6. Galvanized washers used with the 5/8" dia. post bolts shall be Type A 1-3/4" O.D. washers. The (12) plate washers (FWR03) required at the terminal connector splice.
7. Button head "post" bolts (ASTM A307) shall be of sufficient length to extend through the full thickness of the nut (ASTM A563) and washer and not more than 1" beyond it. Button head "splice" bolts (ASTM A307) 5/8" dia.x 2" (at triple rail splices) with 5/8" double recessed nuts.
8. Fittings (bolts, nuts, and washers) shall be galvanized in accordance with Item 445, "Galvanizing". Fittings shall be subsidiary to the bid item.
9. Crown shall be widened to accommodate transitions.
10. If solid rock is encountered. See the MBGF standard sheet for the proper installation guidance.
11. Posts shall not be set in concrete.
12. Unless otherwise shown in the plans, a composite material (post or block) that meets the requirements of DMS-7210, "Composite Material Posts and Blocks for Metal Beam Guard Fence" may be substituted for (post or block) of similar dimensions. TxDOT's Construction Division maintains a Material Producer List (MPL) for producers of materials conforming to DMS-7210. Only producers on the MPL can furnish composite material posts and/or blocks.



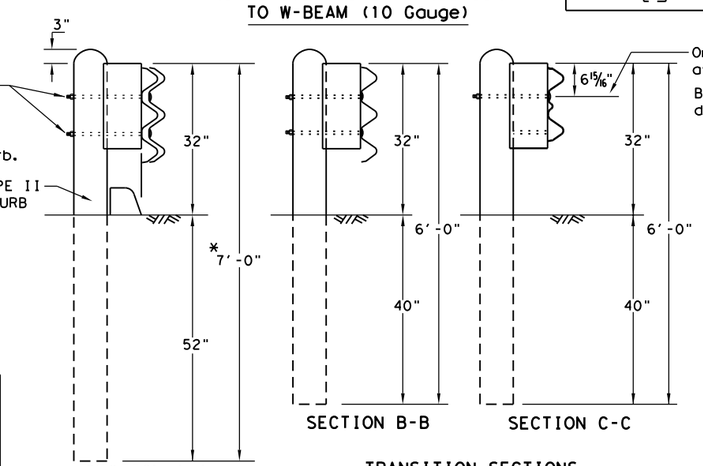
THRIE-BEAM TERMINAL CONNECTION
(See General Notes 6 & 7 for required hardware)

NON-SYMMETRICAL TRANSITION TO W-BEAM (10 Gauge)



TYPE II CURB
Cast-in-Place or Precast

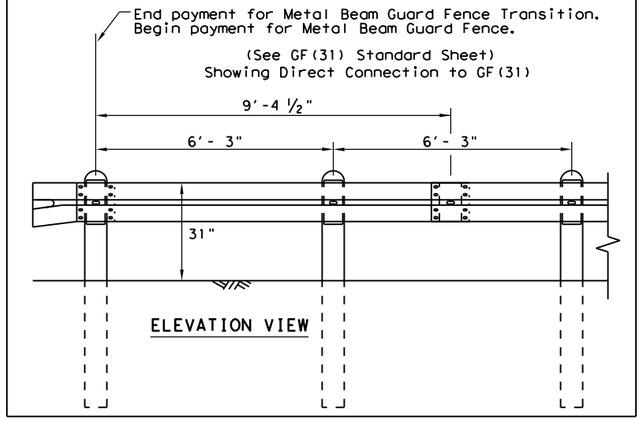
PRECAST CURB:
Type II Precast Curb secured with 4~#5 Gr.60 Galv. Rebar stakes 18" long. The 12'- 2" section of curb may be cast in two sections.
Section ① 5'- 8" long
Section ② 6'- 6" long with the last 3'- 6" of curb tapered to a 4" height.
The Joint Connection is two 9" long 1" Dia. female ends connected with 1~#5 Gr.60 Galv.Rebar 18" long.



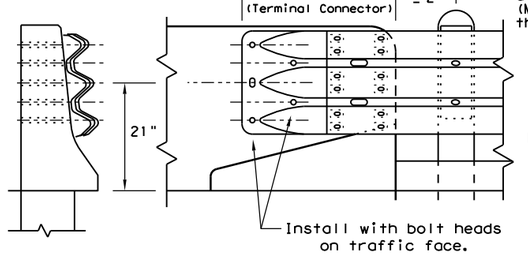
*Note: (All post types) (See General Note 3)

TRANSITION SECTIONS

ALTERNATE CONNECTION OPTION



ELEVATION VIEW



CONNECTION TO CONCRETE BRIDGE RAIL AND TRAFFIC BARRIERS

(12) Galvanized rectangular washers (FWR03) are required under the recessed nut at the terminal connector splice to nested thrie-beam. (See General Notes 6 & 7).

DIRECTION OF TRAFFIC

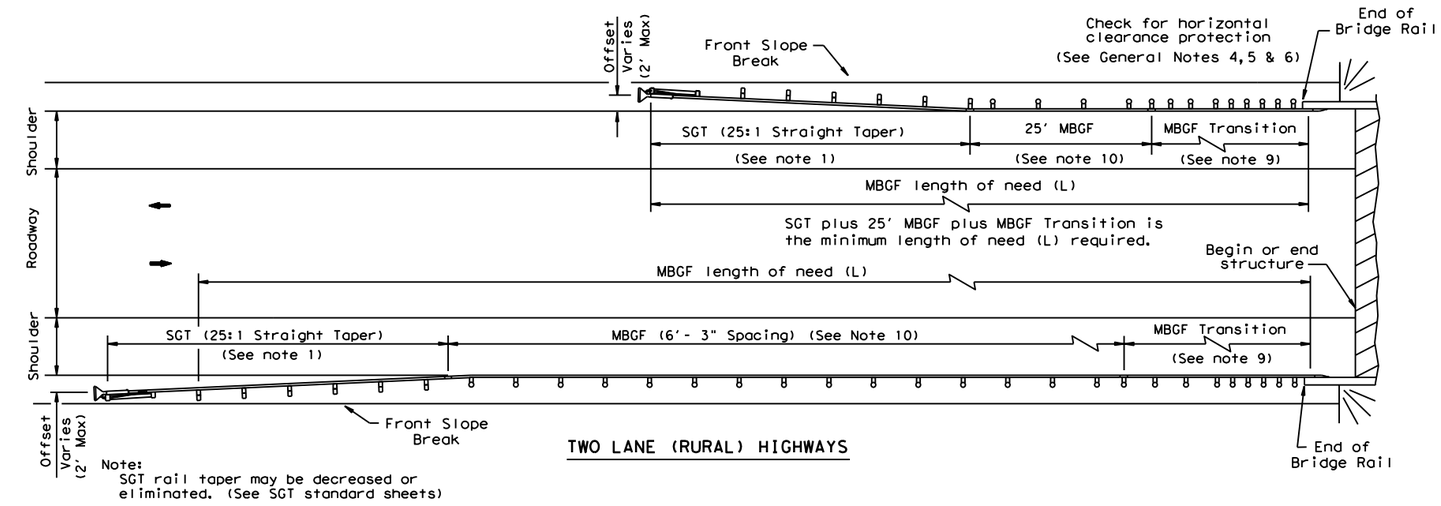
Texas Department of Transportation — Design Division Standard

METAL BEAM GUARD FENCE TRANSITION
(Thrie-Beam Transition)
GF(31)TR-14

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©TxDOT: December 2011 REVISIONS	CONT	SECT	JOB	HIGHWAY
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	DIST	COUNTY		SHEET NO.
	06	WILLIAMSON		117

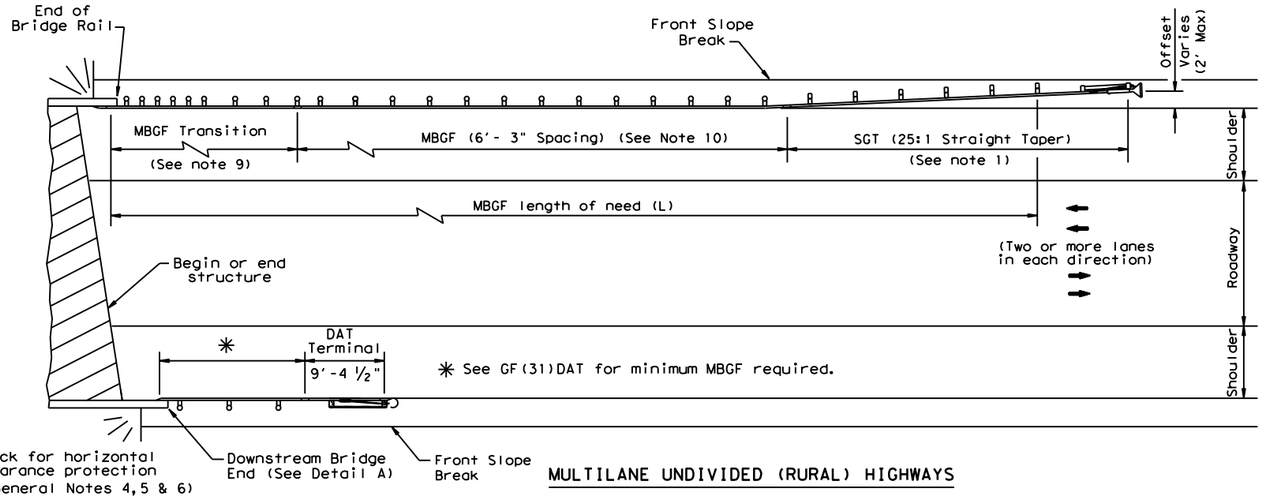
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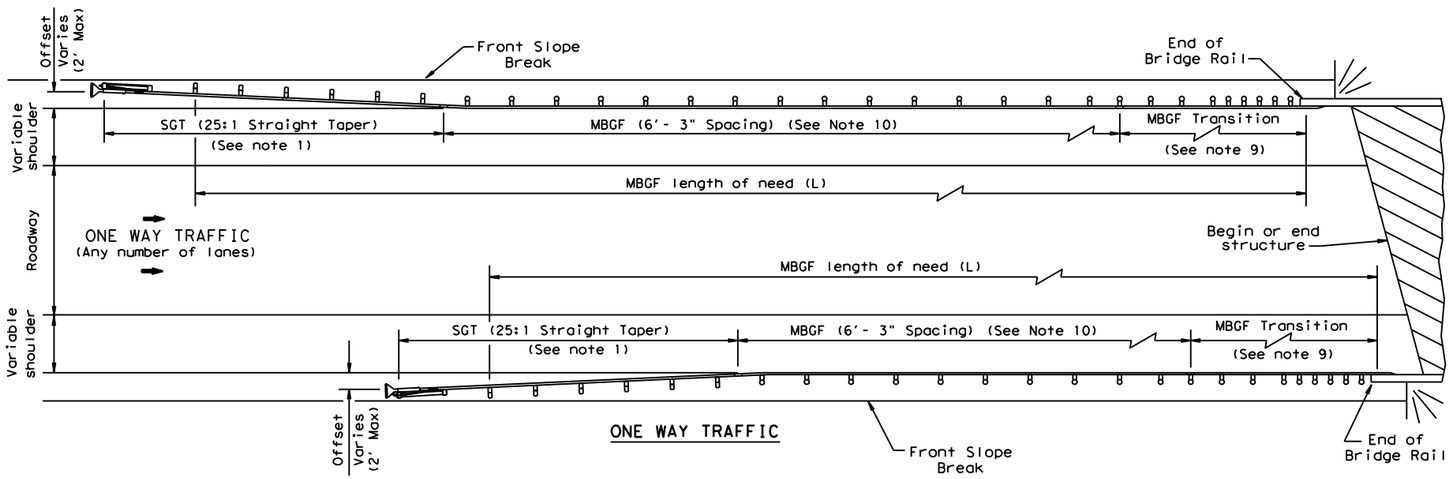


TWO LANE (RURAL) HIGHWAYS

Note:
SGT rail taper may be decreased or eliminated. (See SGT standard sheets)



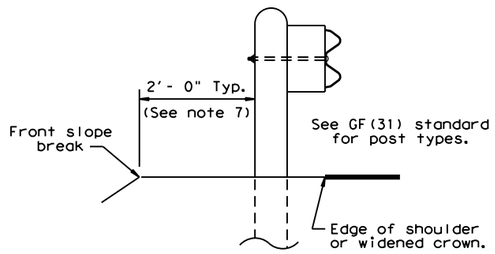
MULTILANE UNDIVIDED (RURAL) HIGHWAYS



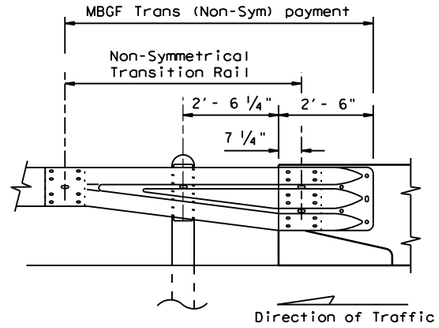
ONE WAY TRAFFIC

GENERAL NOTES

1. For more detail: See GF(31), SGT( )31, GF(31)TR, and GF(31)TL2 standard sheets.
2. Quantities of metal beam guard fence (MBGF) at individual bridge ends are as shown in the plans.
3. Use average daily traffic (ADT) for the current year to determine MBGF length of need in accordance with the Roadway Design Manual unless otherwise specified. Where significant traffic volume growth is anticipated on low volume (0-750 ADT) highways, use length determinations for the higher volume category.
4. MBGF may not be required to shield departure end of bridge unless other obstacles within the horizontal clearance limits or opposing traffic indicate a MBGF consideration.
5. Downstream anchor terminals (DAT) are only for downstream end anchorage use, outside the horizontal clearance area of opposing traffic.
6. Direct connection of MBGF to concrete rails are only for downstream rail connections outside the horizontal clearance area of opposing traffic. (This requires a minimum of three standard line posts plus the DAT terminal, See Detail A)
7. The crown shall be widened to accommodate MBGF. Typically the "front slope" break should be 2'- 0" from the back of the MBGF post. This applies to new construction on new alignment or where existing roadway cross section is to be widened to increase roadway width. This does not apply to rehabilitation work where existing roadway crown width is to be retained (See Typical Cross Section at MBGF).
8. For restrictive bridge widths: The MBGF should be properly transitioned from the existing bridge rail to the adjoining MBGF (See MBGF Transition Standards). Metal beam guard fence at these bridge location(s) shall be flared at the rate of 25:1 or flatter, and be of the length necessary to locate the terminal end at the 2 ft. "maximum" offset from the shoulder edge in the approach direction.
9. Transition length and post spacing will vary depending on the transition type. Transition type will be shown elsewhere in the plans.
10. A minimum 25' length of MBGF will be required.



TYPICAL CROSS SECTION AT MBGF



Note:
All rail elements shall be lapped in the direction of adjacent traffic.

DETAIL A
Showing Downstream Rail Attachment

Texas Department of Transportation — Design Division Standard

BRIDGE END DETAILS

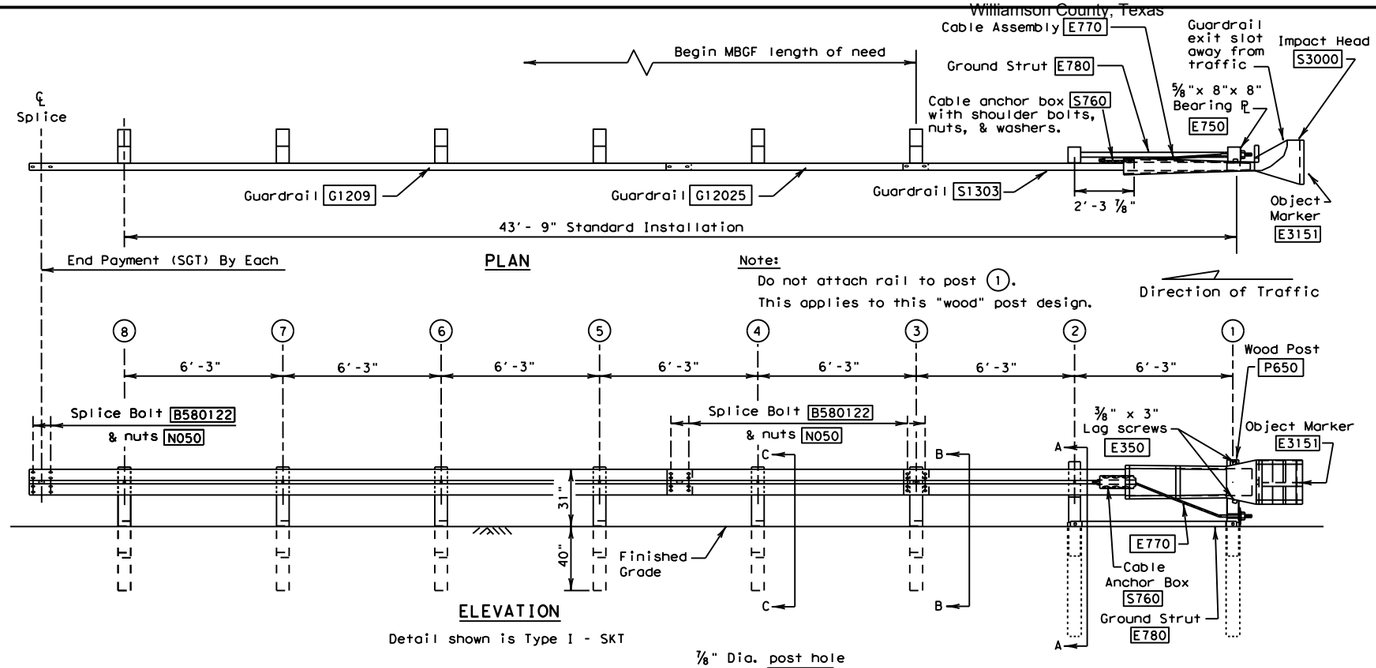
(METAL BEAM GUARD FENCE APPLICATIONS TO RIGID RAILS)

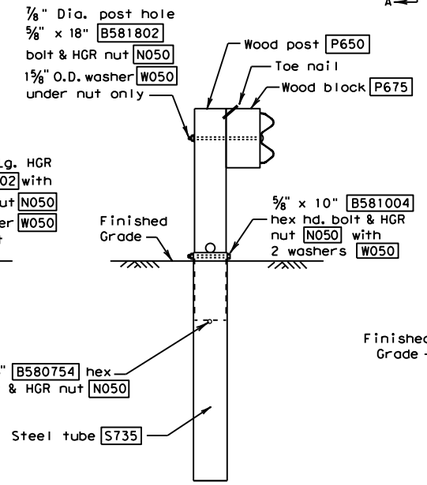
BED-14

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04-2014 Added 25' MBGF to Two Lane (Rural) Highway section. Eng. CGL, Cod. VP	DIST	COUNTY		SHEET NO.
	06	WILLIAMSON		118

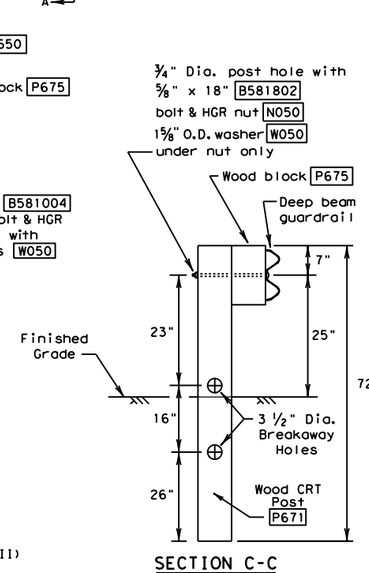
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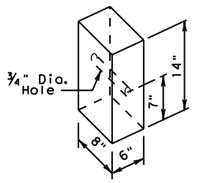




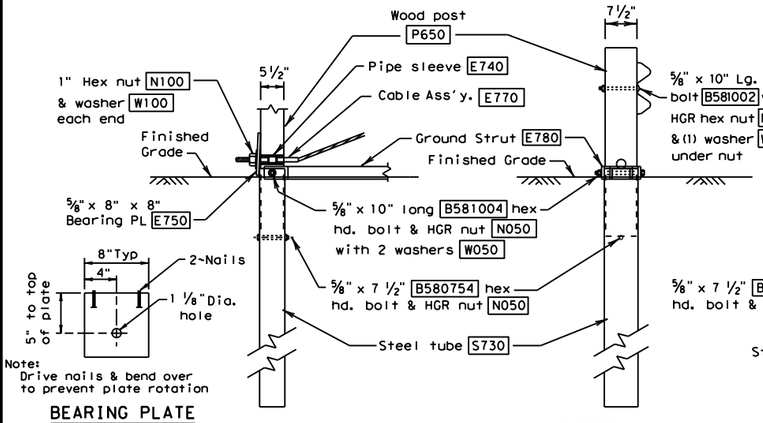
SECTION B-B
Typical Post & Tube System, Posts 3 & 4 with (Type II) & Posts 3 Thru 8 with (Type III)



SECTION C-C
Typ. at Posts 3 Thru 8 with (Type I)



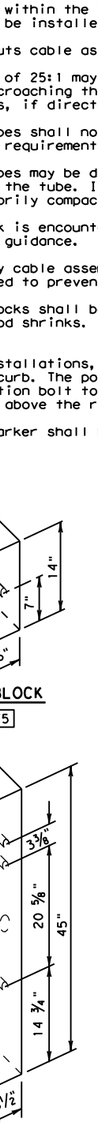
WOOD BLOCK
P675



BEARING PLATE

PARTIAL VIEW AT POST #1

SECTION A-A
(at post 2)



All measurements should be taken from bottom of posts.

UNIVERSAL WOOD POST
P650

POST & TUBE OPTIONS
Type I post (1) thru (2)
Type II post (1) thru (4)
Type III post (1) thru (8)

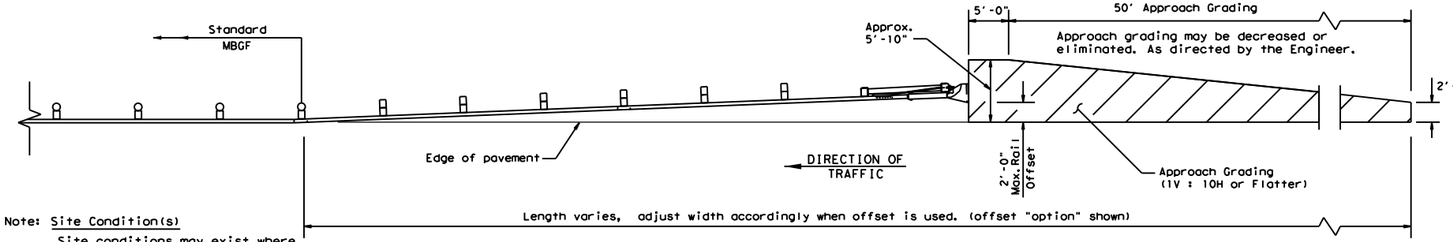
GENERAL NOTES

1. For additional information contact: Interstate Steel Inc. (432) 263-3725
2. The Type of SGT unit will be specified elsewhere in the plans. The numbers in the circles indicate post position. The Type of SGT unit chosen is a maintenance consideration and does not affect the systems performance.

	Post & Tube Options		Post Only
Type I	Posts (1) thru (2)		Posts (3) thru (8)
Type II	Posts (1) thru (4)		Posts (5) thru (8)
Type III	Posts (1) thru (8)		None

3. SGT's placed within the "minimum" 150 ft. radius, shall be installed straight. Standard rail elements may be installed within the radius, without special fabrication.
4. All bolts, nuts cable assemblies, cable anchors, steel tubes & bearing plates shall be galvanized.
5. A flare rate of 25:1 may be used over the first 50 ft. of the system to prevent the terminal head from encroaching the shoulder. The flare may be decreased or eliminated for specific installations, if directed by the Engineer.
6. The steel tubes shall not protrude more than 4 inches above ground. Site grading may be necessary to meet this requirement.
7. The steel tubes may be driven with an approved driving head. They shall not be driven with the wood post in the tube. If the steel tubes are placed in drilled holes, the backfill material must be satisfactorily compacted to prevent tube settlement.
8. If solid rock is encountered. See the Manufacturer's installation manual for the proper installation guidance.
9. The breakaway cable assembly must be taut. A locking device, (vice grips or channel lock pliers) should be used to prevent the cable from twisting when tightening the nuts.
10. The wood blocks shall be "toe nailed" to the rectangular wood posts to prevent them from turning when the wood shrinks. The bearing plate on the front post shall also be "toe nailed" to prevent rotation.
11. For curb installations, the soil tubes and posts shall be installed at the proper ground elevation behind the curb. The posts will then require field drilling new holes to accommodate the rail to post connection bolt to maintain the proper height of the rail above the gutter pan. The excess post length above the rail will be removed if directed by the Engineer.
12. An object marker shall be installed on the front of the impact head as detailed on D&OM(VIA).

Item #	POST & TUBE OPTIONS Type I	Type II	Type III	BILL OF MATERIAL DESCRIPTION
S1303	1	1	1	Guardrail (12 Ga.) 12'- 6" SKT
G12025	1	1	1	Guardrail (12 Ga.) 9'- 4 ½"
G1209	1	1	1	Guardrail (12 Ga.) 25'- 0"
S730	2	2	2	Steel Tube - 6" x 8" x 72" x ⅛" min. or ⅜"
S735	0	2	6	Steel Tube - 6" x 8" x 54" x ⅛" min. or ⅜"
P650	2	4	8	Wood Posts - 5 ½" x 7 ½" x 45"
P671	6	4	0	Wood CRT Posts - 6" x 8" x 72"
P675	6	6	6	Wood Block - 6" x 8" x 14"
E740	1	1	1	Pipe Sleeve - 2" Std. Pipe x 5 ½"
E750	1	1	1	Bearing Plate - ⅝" x 8" x 8"
S760	1	1	1	Cable Anchor Box
E770	1	1	1	Cable Assembly
E780	1	1	1	Ground Strut
S3000	1	1	1	Impact Head
				HARDWARE
B580754	2	4	8	⅝" x 7 ½" Hex Hd. Bolt
B581004	2	4	8	⅝" x 10" Hex Hd. Bolt (Top of Tubes)
W050	11	15	23	⅝" Washers
B581002	1	1	1	⅝" x 10" HGR Post Bolt (Post 2)
B580122	16	16	16	⅝" x 1 ¼" HGR Splice Bolt
B581802	6	6	6	⅝" x 18" HGR Post Bolt (Posts (3) thru (8))
N050	35	39	47	⅝" HGR Nut (24-Spl, Varies-Posts, 2-Strut)
E350	2	2	2	⅜" x 3" Lag Screw
N100	2	2	2	1" Hex Nut (Anchor Cable)
W100	2	2	2	1" Washer (Anchor Cable)
SB12A	8	8	8	Cable Anchor Box Shoulder Bolts
N012A	8	8	8	½" Structural Nut
W012A	8	8	8	½" Structural Washer
E3151	1	1	1	Object Marker - (18" x 18")



Note: Site Condition(s)
Site conditions may exist where grading is required for the proper installation of metal guard fence and end treatments.

APPROACH GRADING AT GUARDRAIL END TREATMENTS

Texas Department of Transportation
Design Division Standard

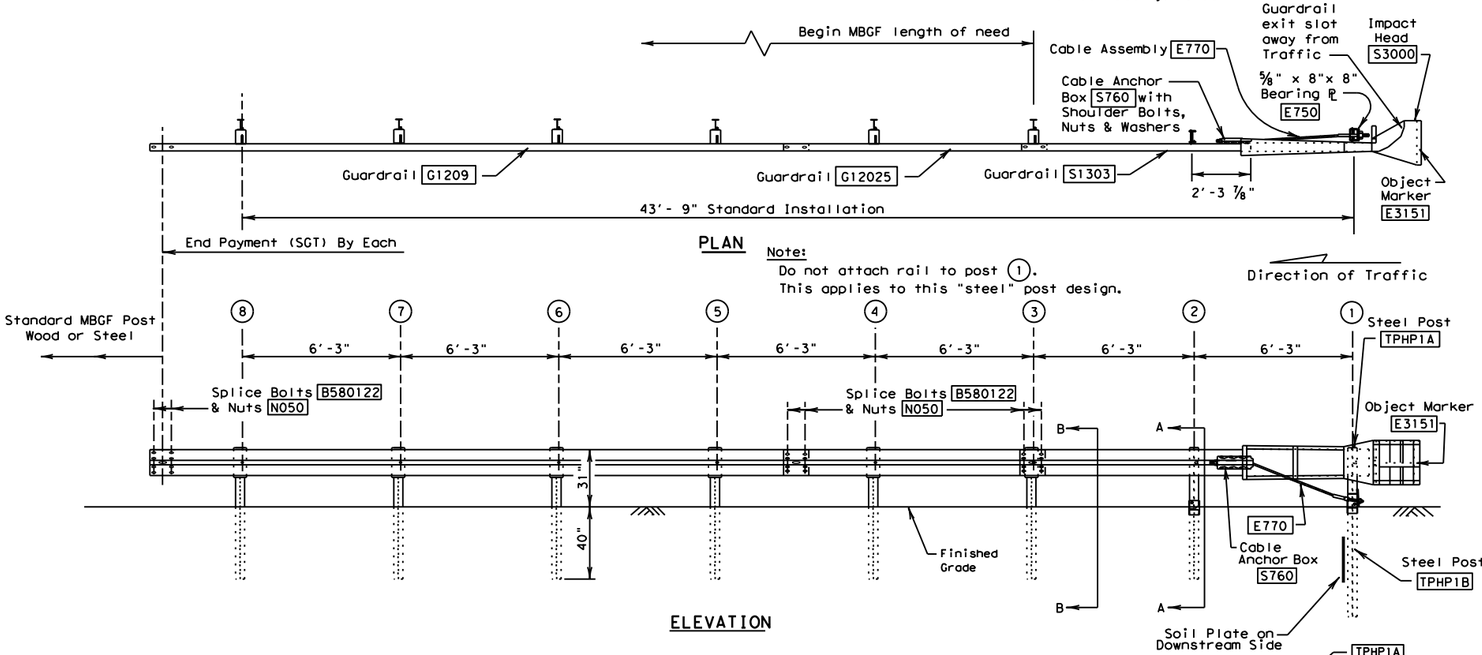
SINGLE GUARDRAIL TERMINAL (SKT-31) (WOOD POST)

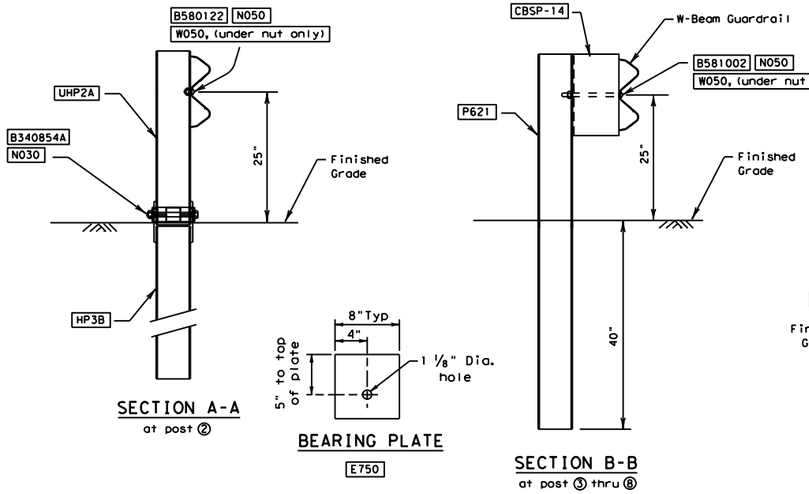
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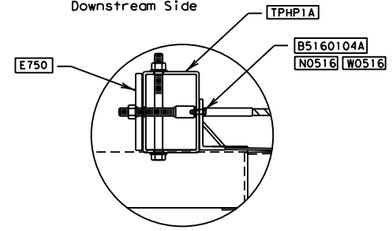
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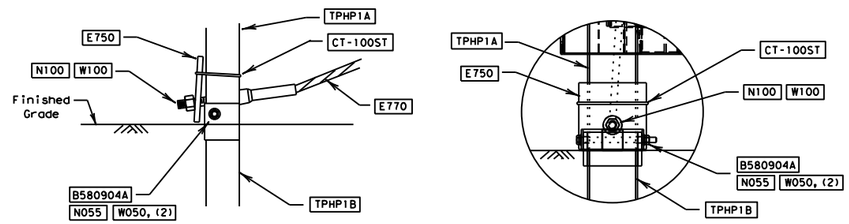
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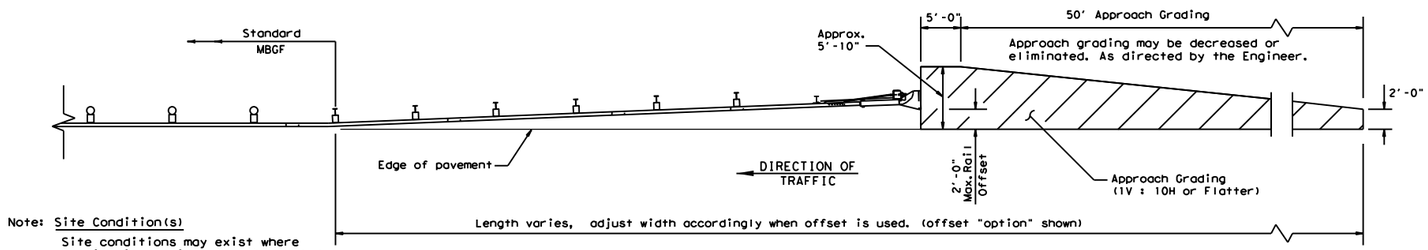




IMPACT HEAD CONNECTION DETAIL



POST #1 CONNECTION DETAILS



Note: Site Conditions

Site conditions may exist where grading is required for the proper installation of metal guard fence and end treatments.

APPROACH GRADING AT GUARDRAIL END TREATMENTS

GENERAL NOTES

1. For additional information contact: Interstate Steel Inc., (432) 263-3725.
2. All bolts, nuts cable assemblies, cable anchors, steel posts & bearing plates shall be galvanized.
3. SGT's placed within the "minimum" 150 ft. radius, shall be installed straight. Standard rail elements may be installed within the radius without special fabrication.
4. A flare rate of 25:1 may be used to prevent the terminal head from encroaching on the shoulder. The flare may be decreased or eliminated for specific installations, if directed by the Engineer.
5. The lower sections of the post shall not protrude more than 4 inches above finished ground. Site grading may be necessary to meet this requirement.
6. The lower section of the steel posts should not be driven with the upper post attached. If the post is placed in a drilled hole, the backfill material must be satisfactorily compacted to prevent settlement.
7. If solid rock is encountered. See manufacturer's installation manual for the proper installation guidance.
8. The breakaway cable assembly must be taut. A locking device, (vice grips or channel lock pliers) should be used to prevent the cable from twisting when tightening the nuts.
9. Hinge bolts shall not be set below finished grade. At curb locations the posts shall be installed at the proper grade elevation behind the curb. The posts will then require field drilling new holes to accommodate the rail to post connection bolt to maintain the proper height of the rail above the gutter pan. The excess post length above the rail will be removed as directed by the Engineer.
10. An object marker shall be installed on the front of the impact head as detailed on D&OM(VIA).

ITEM NO.	QTY	BILL OF MATERIALS
S1303	1	GUARDRAIL (12 GA) 12'- 6" SKT Panel
G12025	1	GUARDRAIL (12 GA) 9' - 4 ½"
G1209	1	GUARDRAIL (12 GA) 25'- 0"
TPHP1A	1	FIRST POST ASSEMBLY TOP, TUBE
TPHP1B	1	FIRST POST ASSEMBLY BOTTOM, 6'- 0"
UHP2A	1	SECOND POST ASSEMBLY TOP
HP3B	1	SECOND POST ASSEMBLY BOTTOM, 3'- 5⅞"
P621	6	STANDARD STEEL LINE POST 6'- 0" (POST 3 THRU 8)
E750	1	BEARING PLATE
S760	1	CABLE ANCHOR BOX
E770	1	BCT CABLE ANCHOR ASSEMBLY
CT-100ST	1	CABLE TIE - STEEL
CBSP-14	6	ROUTED BLOCK
S3000	1	IMPACT HEAD
HARDWARE		
B580122	25	⅝" Dia. x 1 ¼" SPLICE BOLT
B580904A	1	⅝" Dia. x 9" HEX BOLT GR. 5
B340854A	1	¾" Dia. x 8 ½" HEX BOLT GR. 5
B581002	6	⅝" Dia. x 10" H.G.R. BOLT (Post 3 thru 8)
N055	1	⅝" Dia. HEX NUT (Post 1 only)
N050	31	⅝" Dia. H.G.R. NUT (at splices & at Post 2 thru 8)
W050	9	H.G.R. WASHER (At Post 1(2) & 2 thru 8)
N100	2	1" ANCHOR CABLE HEX NUT
W100	2	1" ANCHOR CABLE WASHER
B5160104A	2	⅝" x 1" HEX BOLT, GR. 5
N0516	2	⅝" HEX NUT
W0516	4	⅝" WASHER
SB12A	8	CABLE ANCHOR BOX SHOULDER BOLT
N030	1	¾" HEX NUT
N012A	8	½" STR. NUT
W012A	8	½" STR. WASHER
E3151	1	OBJECT MARKER (18" x 18")

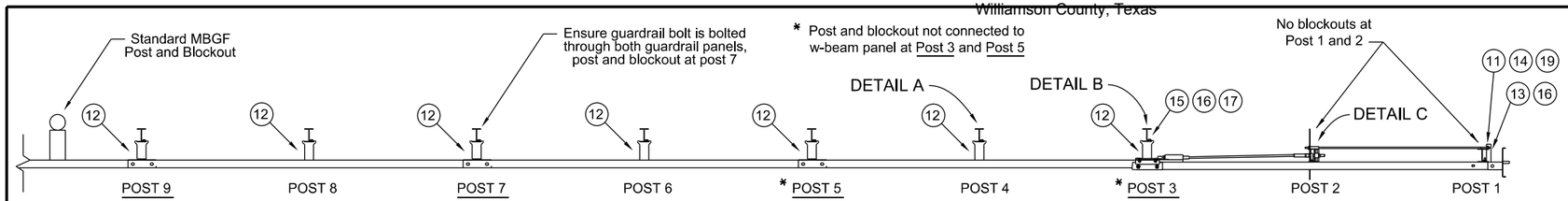
Texas Department of Transportation — Design Division Standard

SINGLE GUARDRAIL TERMINAL (SKT-31) (STEEL POST) SGT(8S)31-14

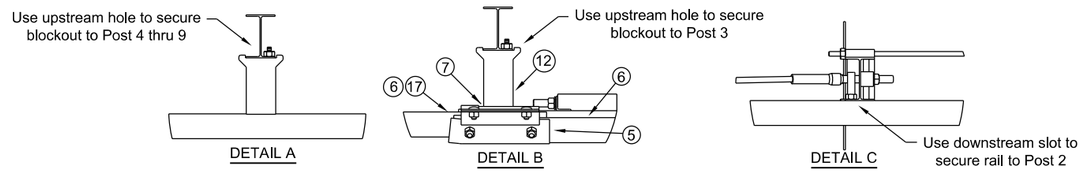
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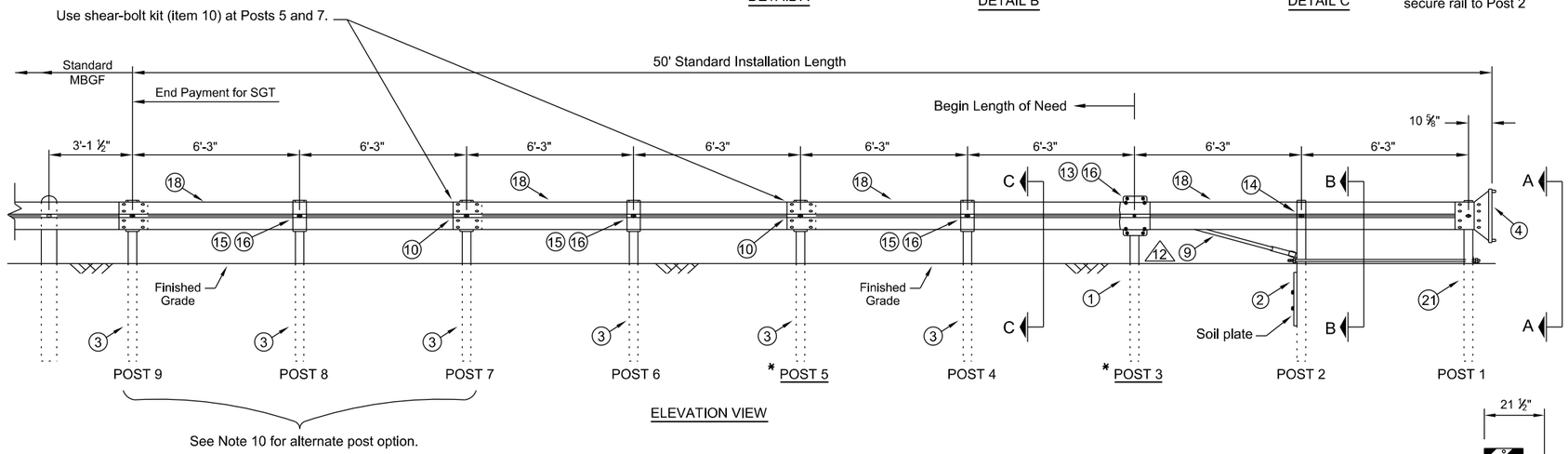
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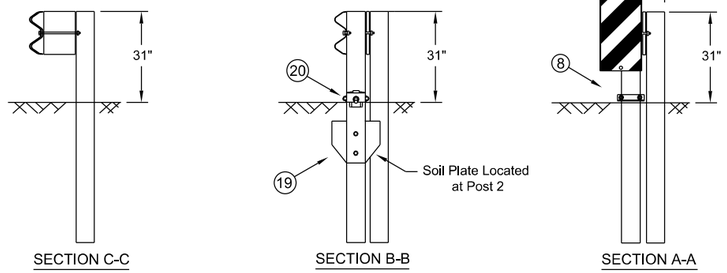
PLAN VIEW

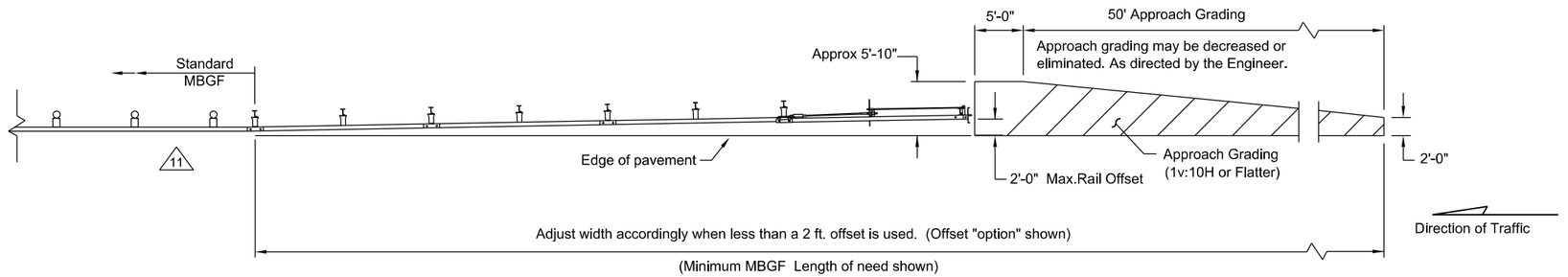




ELEVATION VIEW

See Note 10 for alternate post option.





APPROACH GRADING AT GUARDRAIL END TREATMENTS

GENERAL NOTES

1. For additional information contact: Lindsay Transportation Solutions - Barrier Systems, 180 River Road, Rio Vista, CA 94571, (707) 374-6800
2. All dimensions are shown in inches except as otherwise indicated.
3. All cable assemblies, cable anchor, ground struts, slider pieces, impact heads, nuts, bolts and all steel components shall be galvanized unless otherwise is noted.
4. X-LITE placed within the minimum 150 ft. radius shall be installed straight. Standard rail elements may be installed within the radius without special fabrication.
5. A flare rate of 37.5:1 may be used over the first 50 ft. of the system to prevent the terminal head from encroaching on the shoulder the flare may be decreased or eliminated for specific installations, or as directed by the engineer.
6. At curbed locations the post shall be installed at the proper grade of elevation behind the curb. The post will then require field drilling new holes to accommodate the rail to post connection bolt to maintain the proper height of the rail above the gutter pan. The excess post length above the rail will be removed as directed by the engineer.
7. If rock excavation is encountered, the soil plate maybe modified if approved by the project engineer.
8. When site conditions permit, post may be driven. If posts are placed in a drilled hole, the backfill material must be satisfactorily compacted to prevent settlement.
9. An object marker shall be installed on the impact head as detailed on D&OM(VIA)
10. The X-LITE is a steel post SGT that is suitable for locations calling for wood post or steel post MBGF systems. When used with wood post guardrail system, post 7 thru 9 may be replaced with CRT posts.

△11 Minimum length of MBGF shown. See current guard fence Standards for further information.

△12 The breakaway cable assembly must be taut. A locking device (vice-grips or channel lock-pliers) should be used to prevent the cable from twisting when tightening the nut.

ITEM	PART NO.	DESCRIPTION	QTY
1	BSI-1310027-00	X-LITE, CRIMPED POST HOLES, GALV	1
2	BSI-1012086-00	POST II, X-LITE, GALV	1
3	BSI-1012078-00	LINE POST, X-LITE, GALV	6
4	BSI-1012103-00	IMPACT HEAD, X-LITE, GALV	1
5	BSI-1012093-00	SLIDER PANEL, FRONT, X-LITE, GALV	1
6	BSI-1012090-00	SLIDER BRACKET, X-LITE	1
7	BSI-1012096-00	BACK SLIDER PANEL, X-LITE, GALV	1
8	BSI-1102001-KT	GROUND STRUT KIT, X-LITE	1
9	BSI-1012104-00	CABLE ANCHOR ASSEMBLY, X-LITE	1
10	K080123	KIT, X-TENSION SHEAR BOLT,	2
11	BSI-1102027-00	WASHER, SQUARE, X-LITE, GALV	1
12	B090534	W-BEAM COMPOSITE BLOCKOUT 8 IN,	7
13	4001115	GUARDRAIL BOLT 5/8"-11X1 1/4"	24
14	2000302	BOLT CH 5/8"-11X2	2
15	2001635	BOLT CH 5/8"-11X10" GRADE 5 MGAL	7
16	4001116	GUARDRAIL NUT RECESSED 5/8"-11	33
17	2001580	WASHER 1 F436 FLAT RD STRUCT	1
18	4000443	W-BEAM GUARDRAIL RWM02a	4
19	BSI-1106016-KT	X-LITE, SOIL PLATE KIT	1
20	BSI-1303005-00	BRACKET, X-LITE CABLE RETENTION	1
21	BSI-1310024-00	X-LITE, CRIMPED POST SLOTS, GALV	1
22	MANXLT	X-LITE TANGENT INSTALLATION MANUAL	1

Texas Department of Transportation

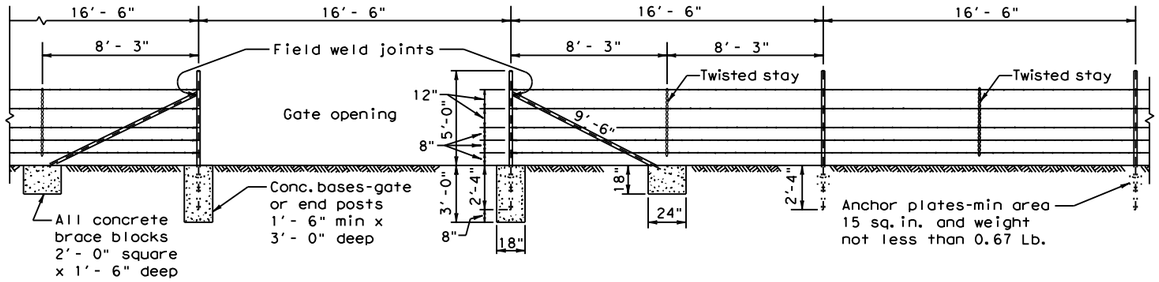
Design Division Standard

SINGLE GUARDRAIL TERMINAL (X-LITE) STEEL POST

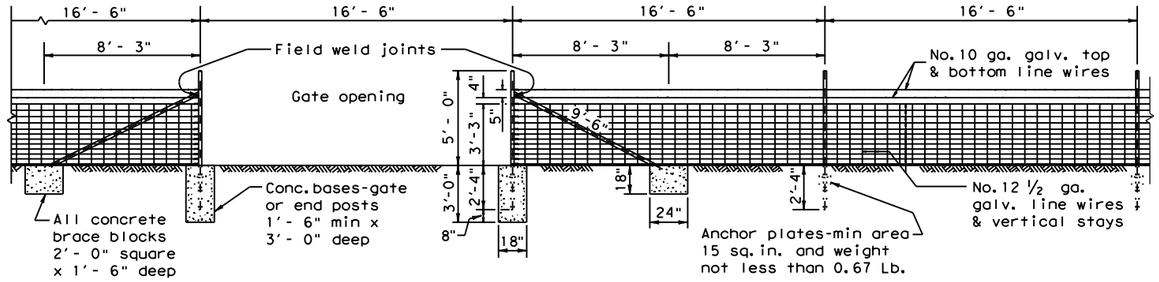
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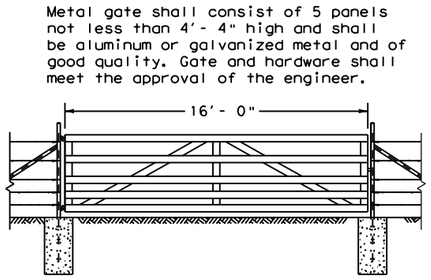


SECTION GALVANIZED BARBED WIRE FENCE WITH METAL POSTS
BRACING DETAIL USED AT ENDS AND GATES
TYPE "C" FENCE
(See General Note 8)

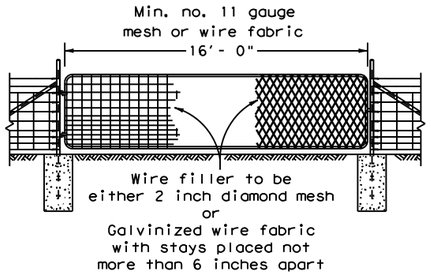


SECTION GALVANIZED WOVEN WIRE FENCE WITH METAL POSTS
BRACING DETAIL USED AT ENDS AND GATES
TYPE "D" FENCE
(See General Note 8)

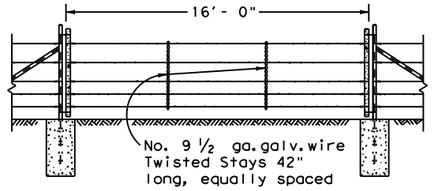
Note:
For Steel pipe and T-Post requirements. (See General Notes 6 & 7)



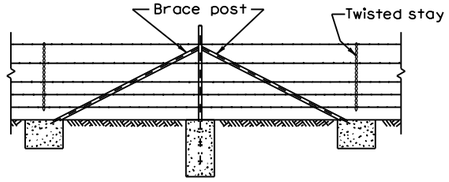
DETAIL TYPE 1 GATE



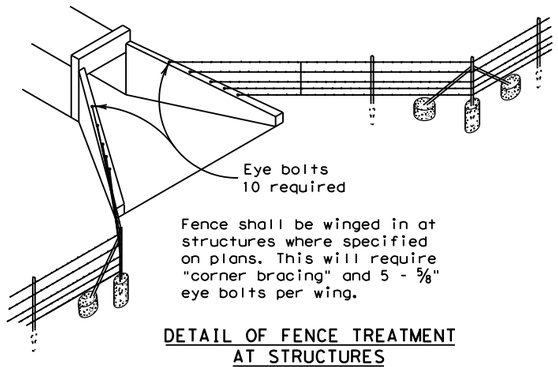
DETAIL TYPE 2 GATE



DETAIL TYPE 3 GATE

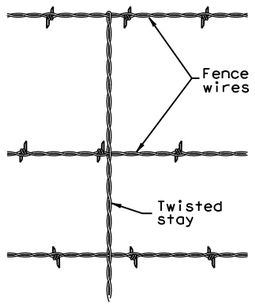


CORNER OR PULL POST ASSEMBLY

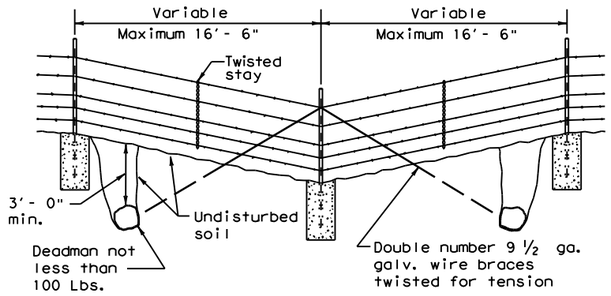


Fence shall be winged in at structures where specified on plans. This will require "corner bracing" and 5 - ⅝" eye bolts per wing.

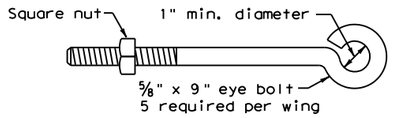
DETAIL OF FENCE TREATMENT AT STRUCTURES



DETAIL OF STAY
(Barbed Wire Fence)



DETAIL OF FENCE SAG



DETAIL OF EYE BOLT

GENERAL NOTES

1. Any high point which interferes with the placing of wire mesh shall be excavated to provide a 2 inch clearance.
2. Latches for Type 1 and Type 2 gates shall be good commercial quality and design latch of the spring, fork or chain type. All latches shall be suitable to the gate and shall be approved by the Engineer.
3. Hinges for Type 2 gates shall be a commercial design approved by the Engineer suitable for post and gate.
4. Concrete shall be of the design and consistency approved by the Engineer and shall contain not less than 4 sacks of cement per cubic yard. Concrete footings are to be crowned at the top to shed water.
5. Steel anchor plates shall be of a design and thickness sufficient to prevent turning of the post in firm soil.
6. Steel pipe end posts, corner and pull posts shall be a minimum of 2" Std. pipe (2.375" O.D., 0.154" wall thickness) with a 1¼" Std. pipe brace (1.660" O.D., 0.140" wall thickness), with a 2"x2"x1/4" angle, or other as approved by the Engineer. Fasteners for securing barbed wire or woven wire fence to metal posts shall be a minimum of 11 gauge galvanized steel wire. Tubular posts shall be fitted with water malleable iron caps.
7. If Steel pipe is used for posts and braces, use standard pipe in accordance with ASTM A 53, Class B or A 501. For T-Posts use steel that meets ASTM A 702. Metal line posts shall be not less than 6'-6" in length and shall weigh not less than (1.33 lbs./lin.ft.). These Items shall be in accordance with Item 552, "Wire Fence."
8. Barbed Wire shall be in accordance with ASTM A 121, Class 1 Design designation 12-2-4-1 4R or 12-2-5-1 4R, or as approved by the Engineer.

   Woven Wire Fence (Type D) shall be in accordance with ASTM A 116, Class 1 No. 12-1/2 Grade 60 (See Table 1 ASTM A 116) to the height and design shown on the plans, or as approved by the Engineer.
9. The location of gates and corner posts will be as indicated elsewhere in these plans.

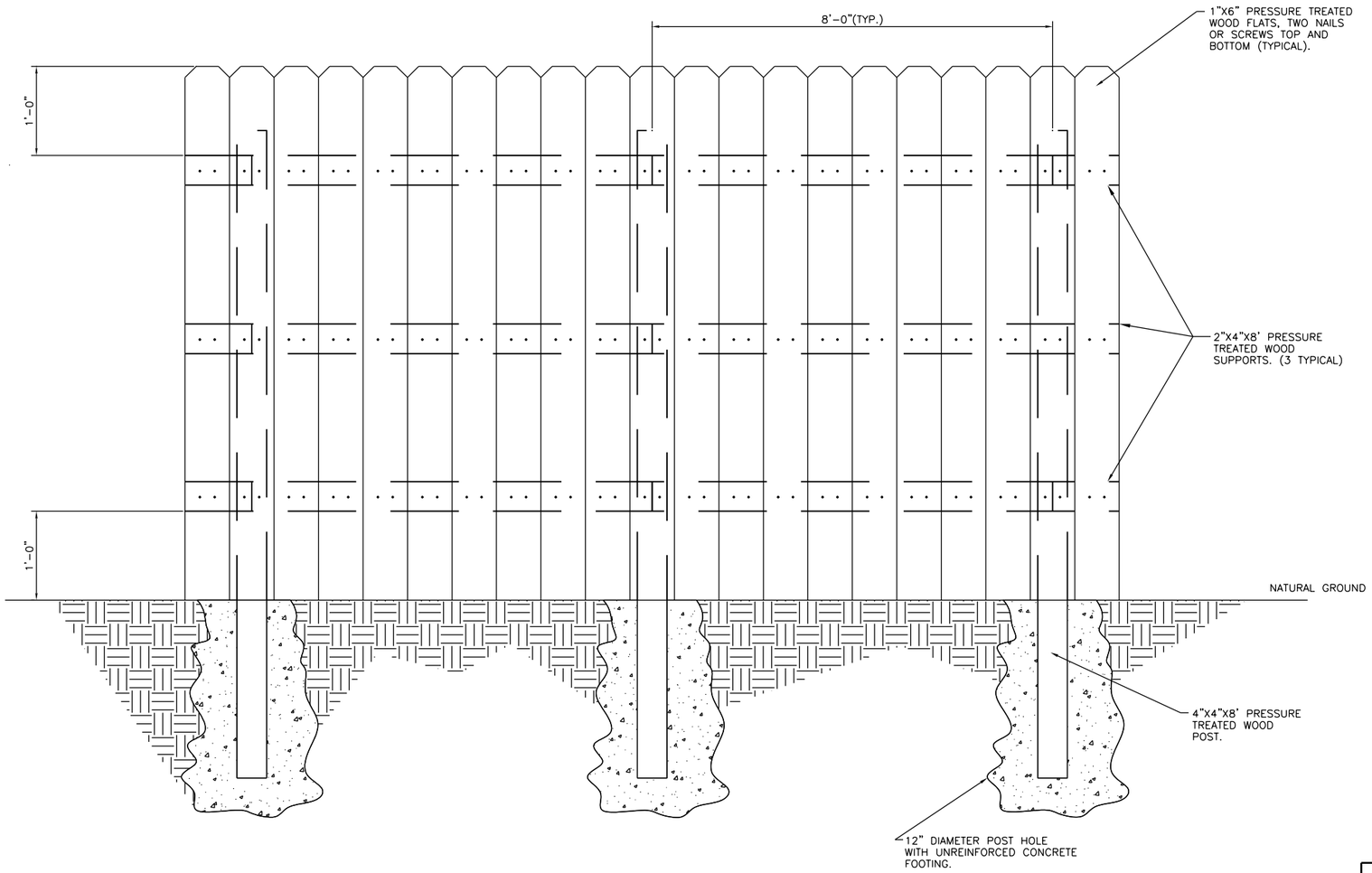
Texas Department of Transportation
Design Division Standard

BARBED WIRE AND WOVEN WIRE FENCE (STEEL POSTS)

WF(2)-10

FILE: wf210.dgn	DN: TxDOT	CK: AM	DW: BD/VP	CK:
© TxDOT 1996	CONT	SECT	JOB	HIGHWAY
REVISIONS				CR119
	DIST	COUNTY		SHEET NO.
	06	WILLIAMSON		122

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6' PRIVACY FENCE

N.T.S.

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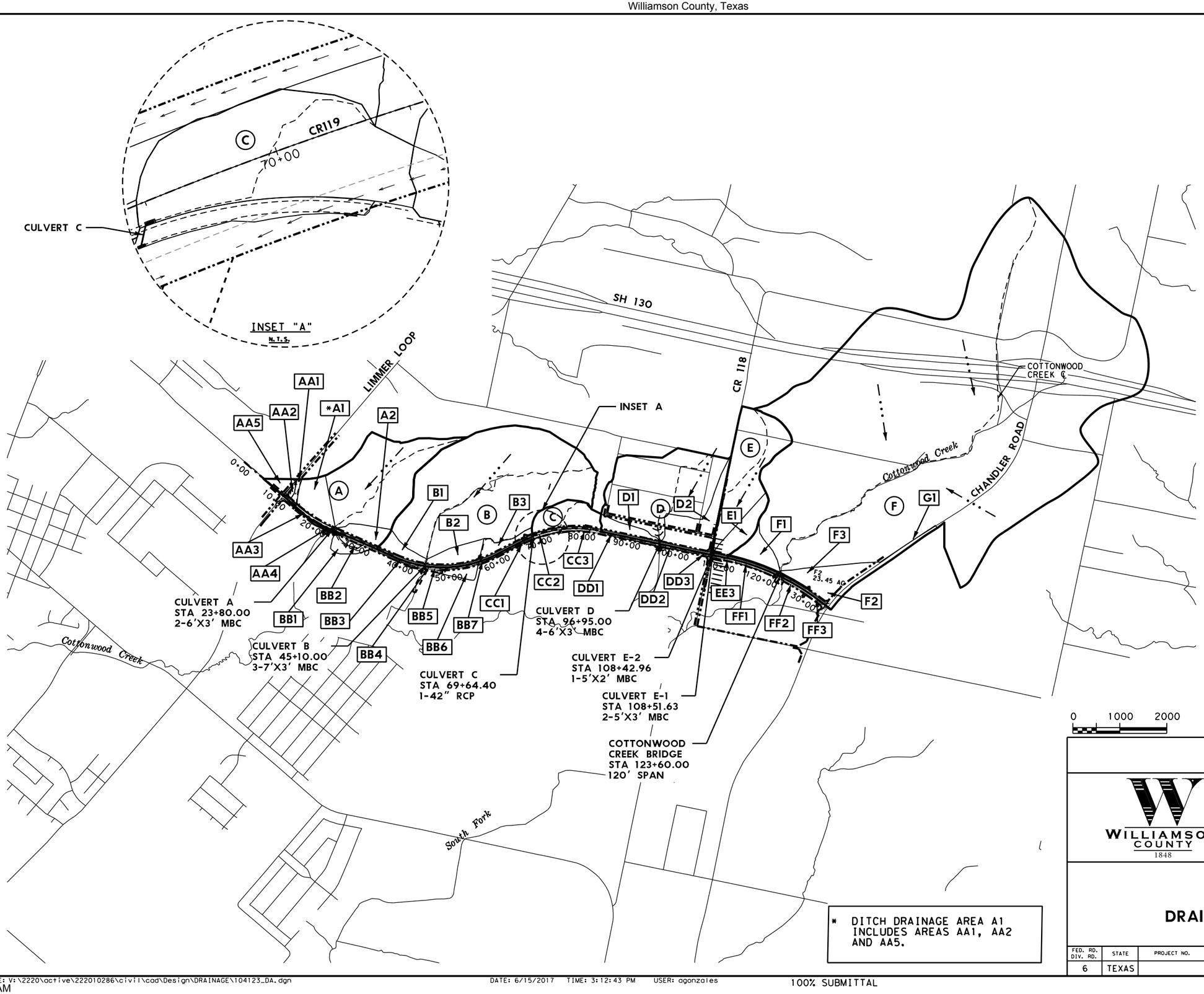
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1848

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ROADWAY WOODEN PRIVACY FENCE DETAIL

SHEET 01 OF 01

FED. RD. DIV. RD.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				123



NOTES:

1. REFER TO HYDROLOGIC CALCULATIONS SHEET FOR 25 AND 100-YEAR FLOWS FOR CROSS CULVERTS AND 10-YEAR FLOWS FOR DITCHES.

- TIME OF CONCENTRATION PATH
- DRAINAGE BASIN BOUNDARY
- (A) CROSS DRAINAGE BASIN ID
- FLOW ARROW
- [XX] DITCH DRAINAGE AREA ID

0 1000 2000

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DRAINAGE

DRAINAGE AREA MAP

SHEET 01 OF 01

FED. RD. DIV. RD.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				124

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TABLE 5.2 - TIME OF CONCENTRATION CALCULATIONS

BASIN INFORMATION		SHEET FLOW (<= 300 FEET)				SHALLOW CONCENTRATED FLOW			OPEN CHANNEL FLOW				SHEET FLOW		SHALLOW CONCENTRATED FLOW			OPEN CHANNEL FLOW			TOTAL		SCS UH
DRAINAGE BASIN	AREA (ACRES)	US ELEV. (FT)	DS ELEV. (FT)	LENGTH (FT)	MANNING'S N VALUE	DS ELEV. (FT)	LENGTH (FT)	PAVED (P) OR UNPAVED (U)	DS ELEV. (FT)	LENGTH (FT)	HYDRAULIC RADIUS (FT)	MANNING'S N VALUE	SLOPE (FT/FT)	T_{T1} (HR)	SLOPE (FT/FT)	VELOCITY (FT/SEC)	T_{T2} (HR)	SLOPE (FT/FT)	VELOCITY (FT/SEC)	T_{T3} (HR)	TIME OF CONCENTRATION $T_C = T_{T1} + T_{T2} + T_{T3}$ (HR)	(MIN)	LAG TIME $T_L = 0.60T_C$ (MIN)
A	100.55	736.00	735.20	300	0.170	710.00	1,534	U	691.10	1,805	0.92	0.035	0.003	0.94	0.016	2.07	0.21	0.010	4.12	0.12	1.27	75.98	45.59
B	200.35	736.10	734.10	300	0.170	724.00	783	U	686.10	3,791	1.22	0.035	0.007	0.65	0.013	1.83	0.12	0.010	4.86	0.22	0.99	59.16	35.49
C	16.22	752.00	747.80	300	0.170	729.00	715	U	702.50	934	0.57	0.035	0.014	0.48	0.026	2.62	0.08	0.028	4.93	0.05	0.61	36.72	22.03
D	106.50	751.80	745.80	300	0.170	738.50	455	U	713.40	1,900	1.14	0.035	0.020	0.42	0.016	2.04	0.06	0.013	5.34	0.10	0.58	34.80	20.88
E	62.10	782.00	777.77	300	0.170	746.40	1,958	U	726.00	1,278	1.14	0.035	0.014	0.48	0.016	2.04	0.27	0.016	5.87	0.06	0.81	48.54	29.12

TABLE 5.1 - SCS - CN CALCULATIONS

BASIN INFORMATION		SUB-AREA 1				SUB AREA 2				SUB AREA 5				CHECK SUM OF PERCENTS	TOTAL WEIGHTED AVG. CN	ADJUSTED TOTAL WEIGHTED AVG. CN
DRAINAGE BASIN	PROPOSED AREA (ACRES)	COVER TYPE	SOIL GROUP	PERCENT OF TOTAL AREA	CN	COVER TYPE	SOIL GROUP	PERCENT OF TOTAL AREA	CN	COVER TYPE	SOIL GROUP	PERCENT OF TOTAL AREA	CN			
A	100.55	P	D	1.3	93	CR	D	98.7	86	R	D	-	87	100	86	74
B	200.35	P	D	-	93	CR	D	100	86	R	D	-	87	100	86	74
C	16.22	P	D	-	93	CR	D	93.6	86	R	D	6.4	87	100	86	74
D	106.50	P	D	-	93	CR	D	10.9	86	R	D	89.1	87	100	87	75
E	62.10	P	D	-	93	CR	D	100	86	R	D	-	87	100	86	74

HEC-HMS PEAK FLOW DATA

CULVERT BASIN	PROPOSED CULVERT/BRIDGE STATION	EXISTING CONDITIONS								
		AREA ($MILES^2$)	T_C (MIN)	LAG TIME (MIN)	WEIGHTED CN	RAINFALL TYPE	INTENSITY 25YR	INTENSITY 100YR	FLOW (CFS) 25YR	FLOW (CFS) 100YR
A Culvert A	23+80.00	0.16	75.98	45.59	74	III	7.9	10.0	201.70	280.40
B Culvert B	45+10.00	0.31	59.16	35.49	74	III	7.9	10.0	459.10	637.30
C Culvert C	69+64.40	0.03	36.72	22.03	74	III	7.9	10.0	58.20	80.80
D Culvert D	96+95.00	0.17	34.80	20.88	75	III	7.9	10.0	321.00	442.60
E Culvert E	108+45.00	0.10	48.54	29.12	74	III	7.9	10.0	159.80	221.90

TABLE 6.1 - PROPOSED TIME OF CONCENTRATION CALCULATIONS - UPSTREAM DITCH

AREA INFORMATION		SHEET FLOW (<= 300 FEET)				SHALLOW CONCENTRATED FLOW			OPEN CHANNEL FLOW				SHEET FLOW		SHALLOW CONCENTRATED FLOW			OPEN CHANNEL FLOW			TOTAL	
DRAINAGE AREA	AREA (ACRES)	US ELEV. (FT)	DS ELEV. (FT)	LENGTH (FT)	MANING'S N VALUE	DS ELEV. (FT)	LENGTH (FT)	PAVED (P) OR UNPAVED (U)	DS ELEV. (FT)	LENGTH (FT)	HYDRAULIC RADIUS (FT)	MANNING'S N VALUE	SLOPE (FT/FT)	T_{T1} (HR)	SLOPE (FT/FT)	VELOCITY (FT/SEC)	T_{T2} (HR)	SLOPE (FT/FT)	VELOCITY (FT/SEC)	T_{T3} (HR)	TIME OF CONCENTRATION $T_C = T_{T1} + T_{T2} + T_{T3}$ (HR)	(MIN)
A1	20.07	708.50	708.25	150	0.17	689.50	954	U	688.50	286	0.75	0.015	0.002	0.65	0.020	2.26	0.12	0.003	4.85	0.02	0.78	47.05
A2	2.45	706.75	704.00	300	0.17	702.30	237	U	689.50	843	0.75	0.035	0.009	0.57	0.007	1.37	0.05	0.015	4.33	0.05	0.68	40.50
B1	6.15	706.75	705.10	300	0.17	689.50	550	U	686.00	112	0.75	0.035	0.005	0.70	0.028	2.72	0.06	0.031	6.21	0.01	0.76	45.84
B2	10.29	720.00	716.30	300	0.17	690.50	1047	U	686.00	220	0.75	0.035	0.012	0.51	0.025	2.53	0.11	0.020	5.02	0.01	0.64	38.14
B3	8.06	741.25	736.55	300	0.17	723.70	459	U	713.00	1048	0.75	0.035	0.016	0.46	0.028	2.70	0.05	0.010	3.55	0.08	0.59	35.49
D1	5.32	753.50	749.60	150	0.24	745.70	198	U	715.50	1194	0.75	0.035	0.026	0.29	0.020	2.27	0.02	0.025	5.59	0.06	0.37	22.15
D2	15.24	760.50	752.95	300	0.24	739.10	1013	U	715.50	1823	0.75	0.035	0.025	0.50	0.014	1.89	0.15	0.013	4.00	0.13	0.78	46.78
E1	4.34	748.65	742.70	300	0.17	731.00	646	U	727.00	280	0.75	0.035	0.020	0.42	0.018	2.17	0.08	0.014	4.20	0.02	0.52	31.31
F1	11.52	750.20	744.50	300	0.17	726.00	820	U	723.00	196	0.75	0.035	0.019	0.43	0.023	2.42	0.09	0.015	4.34	0.01	0.53	32.07
F2	4.24	740.90	736.85	300	0.17	728.80	453	U	728.36	80	0.75	0.035	0.013	0.49	0.018	2.15	0.00	0.106	11.46	0.00	0.49	29.55
F3	21.85	749.40	745.40	300	0.17	725.60	1509	U	724.50	305	0.75	0.035	0.013	0.49	0.013	1.85	0.23	0.004	2.11	0.04	0.76	45.60
G1	4.93	756.80	755.50	72	0.011	N/A	N/A	N/A	728.15	2545	0.75	0.035	0.018	0.02	N/A	N/A	0.00	0.011	3.64	0.19	0.21	12.58

NOTES:

1). RUNOFF FOR DRAINAGE BASINS WAS COMPUTED USING HEC-HMS V 3.5 WITH THE FOLLOWING PARAMETERS.
   A. LOSS COMPUTATIONS: SCS CN METHOD
   B. UNIT HYDROGRAPH: SCS UNIT HYDROGRAPH
   C. ASSUME FAIR CONDITIONS FOR CN
   D. CN VALUES WERE ADJUSTED PER THE REPORT NAMED:
      CLIMATIC ADJUSTMENTS OF NATURAL RESOURCE CONSERVATION SERVICE (NRCS)
      RUNOFF CURVE NUMBERS: FINAL REPORT
      DAVID B. THOMPSON ET. AL., OCTOBER 2003
2). RUNOFF FOR DRAINAGE BASINS WAS COMPUTED USING EXCEL WITH THE FOLOWING PARAMETERS:
   A. TIME OF CONCENTRATION: TR 55
   B. ROW AND ROADWAY C-VALUES: WILLIAMSON COUNTY DESIGN CRITERIA MANUAL TABLE 2.6-2
   C. OFFSITE AREA C VALUES: WILLIAMSON COUNTY DESIGN CRITERIA MANUAL EQUATION 2.6-4 WITH TABLE 2.6-3.
   D. INTENSITY: WILLIAMSON COUNTY DESIGN CRITERIA MANUAL EQN 2.6-2 WITH TABLE 2.6-1.
   E. RUNOFF VALUES: WILLIAMSON COUNTY DESIGN CRITERIA MANUAL EQUATION 2.6-5 WITH TABLE 2.6-4.

COVER TYPES

P = PAVED PARKING LOTS, ROOFS, DRIVEWAYS, STREETS, ROADS, ETC.
CR = ROW CROPS - CONTOURED WITH GOOD CONDITIONS
BG = BARE GROUND
BR = BRUSH - WEED - GRASS MIXTURE WITH BRUSH THE MAJOR ELEMENT, FAIR CONDITION
R = 1/4 ACRE RESIDENTIAL LOTS
CM = COMMERCIAL
MU = MIXED USE RESIDENTIAL

HYDROLOGIC SOIL GROUPS
A = SAND, LOAMY SAND, OR SANDY LOAM
B = SILT LOAM OR LOAM
C = SANDY CLAY LOAM
D = CLAY LOAM, SILTY CLAY LOAM, SANDY CLAY, SILTY CLAY, OR CLAY

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DRAINAGE

HYDROLOGIC CALCULATIONS

SHEET 01 OF 02

FED. RD. DIV. RD.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				125

TABLE 6.2 - TIME OF CONCENTRATION CALCULATIONS - DOWNSTREAM DITCH

AREA INFORMATION		SHEET FLOW (<= 300 FEET)				SHALLOW CONCENTRATED FLOW			OPEN CHANNEL FLOW				SHEET FLOW		SHALLOW CONCENTRATED FLOW			OPEN CHANNEL FLOW			TOTAL	
DRAINAGE AREA	AREA (ACRES)	US ELEV. (FT)	DS ELEV. (FT)	LENGTH (FT)	MANNING'S N VALUE	DS ELEV. (FT)	LENGTH (FT)	PAVED (P) OR UNPAVED (U)	DS ELEV. (FT)	LENGTH (FT)	HYDRAULIC RADIUS (FT)	MANNING'S N VALUE	SLOPE (FT/FT)	T_{t1} (HR)	SLOPE (FT/FT)	VELOCITY (FT/SEC)	T_{t2} (HR)	SLOPE (FT/FT)	VELOCITY (FT/SEC)	T_{t3} (HR)	TIME OF CONCENTRATION $T_c = T_{t1} + T_{t2} + T_{t3}$ (HR)	(MIN)
AA1	1.36	708.30	705.40	300	0.17	700.50	238	U	N/A	N/A	N/A	N/A	0.010	0.56	0.021	2.32	0.03	N/A	N/A	0.00	0.59	35.35
AA2	1.18	708.90	704.10	300	0.011	702.00	123	U	N/A	N/A	N/A	N/A	0.016	0.05	0.017	2.11	0.02	N/A	N/A	0.00	0.07	4.05
AA3	1.31	706.00	704.00	58	0.011	700.50	19	U	691.10	1,157	0.75	0.035	0.034	0.01	0.182	6.88	0.00	0.008	3.17	0.10	0.11	6.74
AA4	0.19	695.00	692.00	28	0.240	691.70	30	U	691.30	40	0.75	0.035	0.106	0.04	0.010	1.61	0.01	0.010	3.51	0.00	0.05	3.08
AA5	2.91	708.50	708.00	42	0.011	705.50	347	U	702.50	69	0.75	0.035	0.012	0.01	0.007	1.37	0.07	0.044	7.35	0.00	0.09	5.10
BB1	3.85	701.50	699.80	296	0.170	690.75	592	U	N/A	N/A	N/A	N/A	0.006	0.68	0.015	2.00	0.08	N/A	N/A	0.00	0.77	45.93
BB2	2.31	705.20	700.00	48	0.011	N/A	N/A	N/A	690.50	806	0.75	0.035	0.108	0.01	N/A	N/A	0.00	0.012	3.82	0.06	0.06	3.85
BB3	1.39	705.20	700.00	56	0.011	N/A	N/A	N/A	696.80	853	0.75	0.035	0.092	0.01	N/A	N/A	0.00	0.004	2.15	0.11	0.12	7.01
BB4	0.28	691.10	686.50	74	0.011	N/A	N/A	N/A	682.65	103	0.75	0.035	0.062	0.01	N/A	N/A	0.00	0.037	6.80	0.00	0.01	0.83
BB5	0.71	692.00	688.70	75	0.011	N/A	N/A	N/A	682.65	244	0.75	0.035	0.044	0.01	N/A	N/A	0.00	0.025	5.54	0.01	0.02	1.41
BB6	4.43	713.10	708.25	67	0.011	N/A	N/A	N/A	690.00	786	0.75	0.035	0.072	0.01	N/A	N/A	0.00	0.023	5.35	0.04	0.05	2.96
BB7	1.31	725.15	720.00	45	0.011	N/A	N/A	N/A	709.65	914	0.75	0.035	0.113	0.01	N/A	N/A	0.00	0.011	3.74	0.07	0.07	4.39
CC1	0.45	725.15	720.00	49	0.011	N/A	N/A	N/A	718.75	286	0.75	0.035	0.106	0.01	N/A	N/A	0.00	0.004	2.32	0.03	0.04	2.39
CC2	2.71	745.50	740.00	46	0.011	N/A	N/A	N/A	718.75	1,096	0.75	0.035	0.118	0.01	N/A	N/A	0.00	0.019	4.89	0.06	0.07	4.04
CC3	0.99	747.15	743.50	46	0.011	N/A	N/A	N/A	740.25	441	0.75	0.035	0.079	0.01	N/A	N/A	0.00	0.007	3.02	0.04	0.05	2.80
DD1	1.51	747.10	743.50	59	0.011	N/A	N/A	N/A	712.50	1,067	0.75	0.035	0.061	0.01	N/A	N/A	0.00	0.029	5.99	0.05	0.06	3.46
DD2	0.98	727.15	723.00	63	0.011	N/A	N/A	N/A	713.00	640	0.75	0.035	0.066	0.01	N/A	N/A	0.00	0.016	4.39	0.04	0.05	2.93
DD3	0.55	729.20	725.90	91	0.011	N/A	N/A	N/A	723.30	287	0.75	0.035	0.036	0.01	N/A	N/A	0.00	0.009	3.35	0.02	0.04	2.28
EE1	0.16	728.40	724.00	27	0.011	N/A	N/A	N/A	722.70	164	0.75	0.035	0.164	0.00	N/A	N/A	0.00	0.008	3.13	0.01	0.02	1.05
EE2	0.20	728.40	725.90	49	0.011	N/A	N/A	N/A	724.74	158	0.75	0.035	0.051	0.01	N/A	N/A	0.00	0.007	3.01	0.01	0.02	1.32
EE3	1.03	734.15	731.00	56	0.011	N/A	N/A	N/A	725.00	706	0.75	0.035	0.056	0.01	N/A	N/A	0.00	0.009	3.24	0.06	0.07	4.12
FF1	1.03	734.15	731.00	50	0.011	N/A	N/A	N/A	723.00	730	0.75	0.035	0.063	0.01	N/A	N/A	0.00	0.011	3.68	0.06	0.06	3.73
FF2	0.55	733.35	725.15	78	0.011	N/A	N/A	N/A	721.00	520	0.75	0.035	0.106	0.01	N/A	N/A	0.00	0.008	3.14	0.05	0.05	3.25
FF3	0.49	738.10	730.00	57	0.011	N/A	N/A	N/A	726.00	260	0.75	0.035	0.143	0.01	N/A	N/A	0.00	0.015	4.36	0.02	0.02	1.33

CONTINUED

TABLE 6.3 - PROPOSED DITCH RUNOFF CALCULATIONS

Area ID	Total Area	ROW Area (0.22)	Roadway Area (0.95)	offsite area (0.20+0.10+0.05+0.08)	Weighted C	T_c Used	i_{10}	i_{25}	i_{100}	Q_{10}	Q_{25}	Q_{100}
A1	20.07	0.81	7.46	11.81	0.61	47.05	3.40	4.01	5.08	41.89	54.38	78.28
A2	2.45	0.47	0.94	1.05	0.59	40.50	3.74	4.41	5.58	5.40	7.01	10.07
B1	6.15	0.47	0.94	4.74	0.49	45.84	3.45	4.08	5.16	10.49	13.62	19.59
B2	10.29	0.55	1.10	8.64	0.47	38.14	3.89	4.58	5.80	18.99	24.62	35.38
B3	8.06	0.57	1.14	6.36	0.49	35.49	4.07	4.79	6.06	16.04	20.78	29.85
D1	5.32	0.57	1.14	3.62	0.52	22.15	5.39	6.33	7.98	14.89	19.23	27.54
D2	15.24	2.19	1.53	11.52	0.45	46.78	3.41	4.02	5.09	23.48	30.48	43.88
E1	4.34	0.12	0.25	3.97	0.45	31.31	4.40	5.18	6.54	8.67	11.22	16.10
F1	11.52	0.52	1.04	9.97	0.47	32.07	4.33	5.10	6.44	23.34	30.23	43.38
F2	4.24	0.25	0.50	3.50	0.48	29.55	4.56	5.36	6.77	9.25	11.97	17.16
F3	21.85	0.33	0.65	20.87	0.44	45.60	3.47	4.09	5.18	33.50	43.48	62.58
G1	4.93	2.05	1.79	1.09	0.53	12.58	7.21	8.44	10.63	18.91	24.36	34.85
AA1	1.36	0.08	0.17	1.11	0.48	35.35	4.08	4.81	6.07	2.67	3.46	4.97
AA2	1.18	0.34	0.54	0.31	0.61	10.00	7.98	9.33	11.75	5.72	7.36	10.54
AA3	1.31	0.62	0.66	0.03	0.59	10.00	7.98	9.33	11.75	6.22	8.00	11.44
AA4	0.19	0.06	0.12	0.00	0.70	10.00	7.98	9.33	11.75	1.05	1.35	1.93
AA5	2.91	0.54	0.50	1.87	0.48	10.00	7.98	9.33	11.75	11.14	14.33	20.51
BB1	3.85	0.06	0.12	3.66	0.44	45.93	3.45	4.07	5.15	5.88	7.63	10.99
BB2	2.31	0.41	0.82	1.08	0.58	10.00	7.98	9.33	11.75	10.63	13.68	19.57
BB3	1.39	0.57	0.82	0.00	0.65	10.00	7.98	9.33	11.75	7.23	9.30	13.31
BB4	0.28	0.13	0.13	0.02	0.58	10.00	7.98	9.33	11.75	1.30	1.68	2.40
BB5	0.71	0.42	0.30	0.00	0.52	10.00	7.98	9.33	11.75	2.97	3.82	5.47
BB6	4.43	0.38	0.77	3.28	0.50	10.00	7.98	9.33	11.75	17.75	22.84	32.69
BB7	1.31	0.43	0.86	0.02	0.70	10.00	7.98	9.33	11.75	7.34	9.44	13.51
CC1	0.45	0.15	0.31	0.00	0.72	10.00	7.98	9.33	11.75	2.61	3.36	4.80
CC2	2.71	0.53	2.12	0.05	0.80	10.00	7.98	9.33	11.75	17.22	22.16	31.71
CC3	0.99	0.23	0.60	0.16	0.69	10.00	7.98	9.33	11.75	5.49	7.07	10.11

CONTINUED

TABLE 6.3 - PROPOSED DITCH RUNOFF CALCULATIONS

Area ID	Total Area	ROW Area (0.22)	Roadway Area (0.95)	offsite area (0.20+0.10+0.05+0.08)	Weighted C	T_c Used	i_{10}	i_{25}	i_{100}	Q_{10}	Q_{25}	Q_{100}
DD1	1.51	0.50	1.02	0.00	0.71	10.00	7.98	9.33	11.75	8.62	11.09	15.87
DD2	0.98	0.33	0.66	0.00	0.72	10.00	7.98	9.33	11.75	5.59	7.19	10.30
DD3	0.55	0.20	0.36	0.00	0.69	10.00	7.98	9.33	11.75	3.04	3.91	5.60
EE1	0.16	0.10	0.06	0.00	0.49	10.00	7.98	9.33	11.75	0.61	0.78	1.12
EE2	0.20	0.10	0.06	0.04	0.47	10.00	7.98	9.33	11.75	0.76	0.97	1.39
EE3	1.03	0.35	0.69	0.00	0.71	10.00	7.98	9.33	11.75	5.86	7.54	10.80
FF1	1.03	0.34	0.68	0.01	0.70	10.00	7.98	9.33	11.75	5.81	7.48	10.70
FF2	0.96	0.33	0.65	0.00	0.72	10.00	7.98	9.33	11.75	5.51	7.10	10.15
FF3	0.49	0.15	0.31	0.03	0.69	10.00	7.98	9.33	11.75	2.71	3.48	4.98

NOTES:
1. SEE NOTES ON PREVIOUS SHEET FOR THE SOURCES USED FOR CALCULATION PARAMETERS.

STATE OF TEXAS
ARNOLD GONZALES, JR.
98234
LICENSED
PROFESSIONAL ENGINEER

6/15/2017

CR 119

WILLIAMSON COUNTY
1848

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DRAINAGE

HYDROLOGIC CALCULATIONS

SHEET 02 OF 02

FED. RD. DIV. RD.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				126

HEC-RAS Plan: EXIST River: 01 Reach: CULV_A_EXIST

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
CULV_A_EXIST	2800.01	25 YR	201.70	701.07	701.48	701.48	701.60	0.029555	2.77	72.90	312.30	1.01
CULV_A_EXIST	2800.01	100 YR	280.40	701.07	701.54	701.54	701.69	0.027853	3.04	92.36	329.29	1.01
CULV_A_EXIST	2598.42	25 YR	201.70	698.40	698.91	698.76	698.97	0.007072	1.95	103.65	257.54	0.54
CULV_A_EXIST	2598.42	100 YR	280.40	698.40	699.00		699.08	0.007243	2.19	127.83	270.22	0.56
CULV_A_EXIST	2234.69	25 YR	201.70	693.98	694.35	694.35	694.52	0.025904	3.27	61.71	186.54	1.00
CULV_A_EXIST	2234.69	100 YR	280.40	693.98	694.43	694.43	694.64	0.024512	3.62	77.53	193.15	1.01
CULV_A_EXIST	1914.61	25 YR	201.70	691.22	693.70		693.70	0.000029	0.39	621.68	412.31	0.05
CULV_A_EXIST	1914.61	100 YR	280.40	691.22	694.06		694.06	0.000030	0.44	776.22	451.94	0.05
CULV_A_EXIST	1819.16	25 YR	201.70	690.95	693.70		693.70	0.000006	0.20	1244.25	650.00	0.02
CULV_A_EXIST	1819.16	100 YR	280.40	690.95	694.06		694.06	0.000007	0.22	1476.89	650.00	0.02
CULV_A_EXIST	1812.50	25 YR	201.70	690.93	693.70		693.70	0.000006	0.20	1212.44	620.00	0.02
CULV_A_EXIST	1812.50	100 YR	280.40	690.93	694.06		694.06	0.000007	0.23	1434.31	620.00	0.02
CULV_A_EXIST	1720.61	25 YR	201.70	687.66	693.69	689.49	693.70	0.000057	0.92	224.42	575.00	0.07
CULV_A_EXIST	1720.61	100 YR	280.40	687.66	694.03	689.81	694.06	0.000087	1.19	241.14	575.00	0.09
CULV_A_EXIST	1698.42		Culvert									
CULV_A_EXIST	1676.54	25 YR	201.70	686.06	688.65		688.72	0.002628	2.10	96.11	101.28	0.38
CULV_A_EXIST	1676.54	100 YR	280.40	686.06	688.82		688.91	0.003610	2.45	114.27	120.85	0.44
CULV_A_EXIST	1634.17	25 YR	201.70	686.42	688.29	688.29	688.50	0.008261	4.04	67.58	172.03	0.69
CULV_A_EXIST	1634.17	100 YR	280.40	686.42	688.41	688.41	688.64	0.008656	4.44	87.70	185.08	0.72
CULV_A_EXIST	1628.35	25 YR	201.70	686.40	688.19	688.19	688.38	0.008868	4.10	70.04	175.04	0.71
CULV_A_EXIST	1628.35	100 YR	280.40	686.40	688.30	688.30	688.52	0.009294	4.49	88.78	187.02	0.74
CULV_A_EXIST	1496.86	25 YR	201.70	684.07	686.97		687.08	0.002638	3.09	95.32	133.91	0.42
CULV_A_EXIST	1496.86	100 YR	280.40	684.07	687.13		687.26	0.003050	3.53	117.59	145.31	0.45
CULV_A_EXIST	1409.55	25 YR	201.70	685.86	686.48	686.40	686.62	0.014504	3.02	66.80	147.15	0.79
CULV_A_EXIST	1409.55	100 YR	280.40	685.86	686.60		686.77	0.013733	3.29	85.35	159.05	0.79
CULV_A_EXIST	1261.86	25 YR	201.70	683.97	684.87		684.99	0.008650	2.79	72.19	121.27	0.64
CULV_A_EXIST	1261.86	100 YR	280.40	683.97	685.02		685.17	0.008746	3.07	91.42	134.61	0.66
CULV_A_EXIST	1000.00	25 YR	201.70	680.00	681.25	681.25	681.56	0.021712	4.47	45.11	74.61	1.01
CULV_A_EXIST	1000.00	100 YR	280.40	680.00	681.42	681.42	681.78	0.020723	4.78	58.62	84.59	1.01

Plan: EXIST 01 CULV_A_EXIST RS: 1698.42 Culv Group: Culvert #1 Profile: 25 YR

Q Culv Group (cfs)	37.46	Culv Full Len (ft)	16.87
# Barrels	1	Culv Vel US (ft/s)	2.98
Q Barrel (cfs)	37.46	Culv Vel DS (ft/s)	3.64
E.G. US. (ft)	693.70	Culv Inv El Up (ft)	685.50
W.S. US. (ft)	693.69	Culv Inv El Dn (ft)	685.60
E.G. DS (ft)	688.72	Culv Frctn Ls (ft)	4.77
W.S. DS (ft)	688.65	Culv Exit Loss (ft)	0.14
Delta EG (ft)	4.98	Culv Entr Loss (ft)	0.07
Delta WS (ft)	5.03	Q Weir (cfs)	164.24
E.G. IC (ft)	693.13	Weir Sta Lft (ft)	234.00
E.G. OC (ft)	693.70	Weir Sta Rgt (ft)	282.00
Culvert Control	Outlet	Weir Submerg	0.00
Culv WS Inlet (ft)	689.50	Weir Max Depth (ft)	1.43
Culv WS Outlet (ft)	688.65	Weir Avg Depth (ft)	1.20
Culv Nml Depth (ft)		Weir Flow Area (sq ft)	57.49
Culv Crt Depth (ft)	1.82	Min El Weir Flow (ft)	692.29

Plan: EXIST 01 CULV_A_EXIST RS: 1698.42 Culv Group: Culvert #1 Profile: 100 YR

Q Culv Group (cfs)	38.30	Culv Full Len (ft)	17.56
# Barrels	1	Culv Vel US (ft/s)	3.05
Q Barrel (cfs)	38.30	Culv Vel DS (ft/s)	3.54
E.G. US. (ft)	694.06	Culv Inv El Up (ft)	685.50
W.S. US. (ft)	694.03	Culv Inv El Dn (ft)	685.60
E.G. DS (ft)	688.91	Culv Frctn Ls (ft)	4.97
W.S. DS (ft)	688.82	Culv Exit Loss (ft)	0.10
Delta EG (ft)	5.15	Culv Entr Loss (ft)	0.07
Delta WS (ft)	5.22	Q Weir (cfs)	241.47
E.G. IC (ft)	693.53	Weir Sta Lft (ft)	234.00
E.G. OC (ft)	694.06	Weir Sta Rgt (ft)	282.00
Culvert Control	Outlet	Weir Submerg	0.00
Culv WS Inlet (ft)	689.50	Weir Max Depth (ft)	1.78
Culv WS Outlet (ft)	688.82	Weir Avg Depth (ft)	1.55
Culv Nml Depth (ft)		Weir Flow Area (sq ft)	74.41
Culv Crt Depth (ft)	1.84	Min El Weir Flow (ft)	692.29



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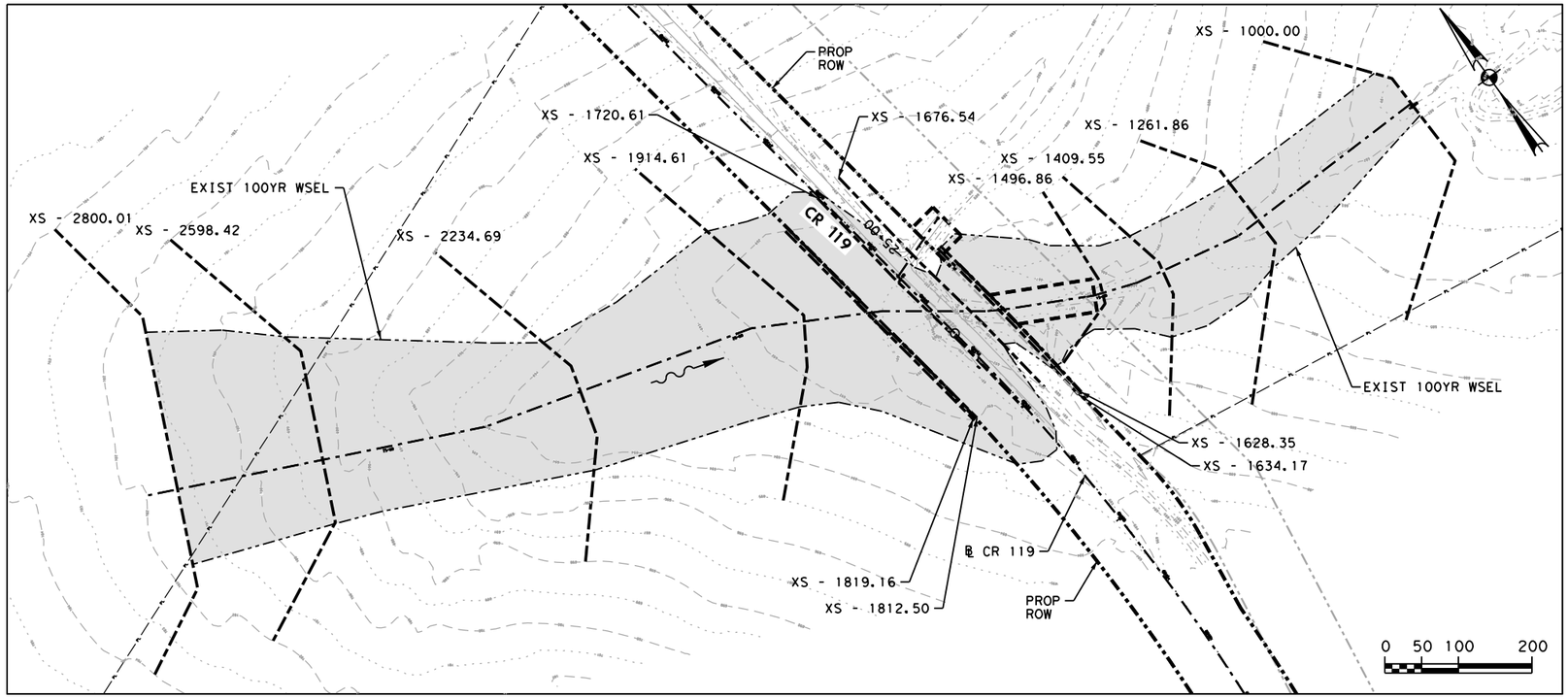
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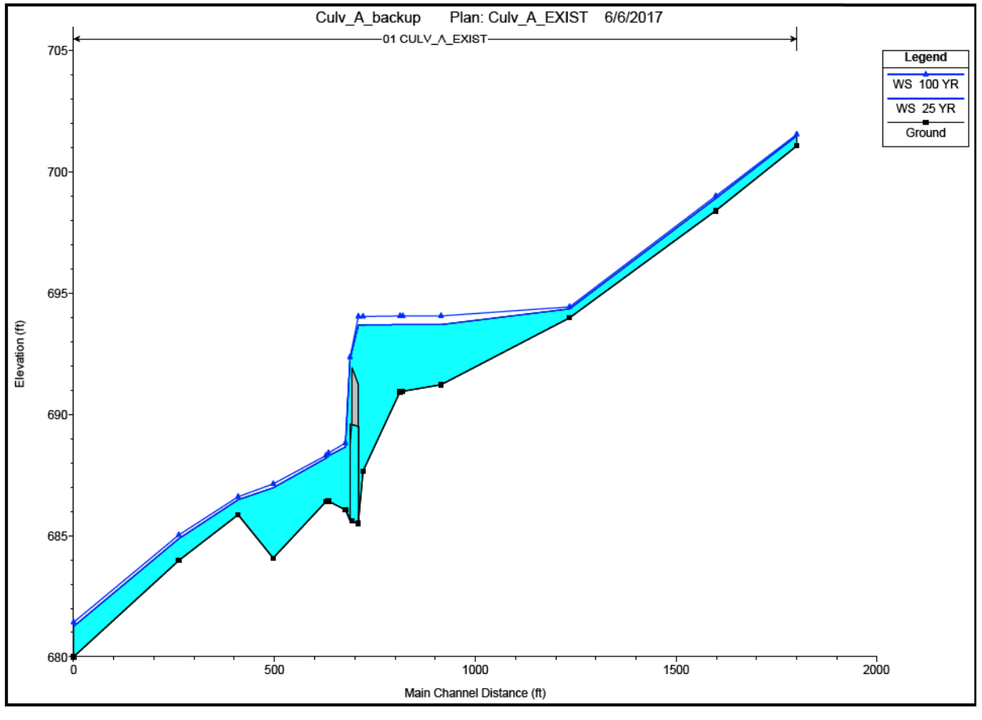
EXISTING DRAINAGE HYDRAULIC CALCULATIONS CULVERT A

STA 23+80.00

SHEET 01 OF 06

FED. RD. DIV. RD.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				127







6/15/2017

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EXISTING DRAINAGE HYDRAULIC CALCULATIONS CULVERT A

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SHEET 02 OF 06

FED. RD. DIV. RD.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				128

Plan: EXIST 01 CULV_A_EXIST RS: 1812.50 Profile: 25 YR

E.G. Elev (ft)	693.70	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.00	Wt. n-Val.	0.035	0.035	0.035
W.S. Elev (ft)	693.70	Reach Len. (ft)	91.89	91.89	91.89
Crit W.S. (ft)		Flow Area (sq ft)	482.56	159.60	570.28
E.G. Slope (ft/ft)	0.000006	Area (sq ft)	482.56	159.60	570.28
Q Total (cfs)	201.70	Flow (cfs)	80.48	32.37	88.85
Top Width (ft)	620.00	Top Width (ft)	242.38	60.05	317.57
Vel Total (ft/s)	0.17	Avg. Vel. (ft/s)	0.17	0.20	0.16
Max Chl Dpth (ft)	2.77	Hydr. Depth (ft)	1.99	2.66	1.80
Conv. Total (cfs)	81010.0	Conv. (cfs)	32324.3	13000.1	35685.6
Length Wtd. (ft)	91.89	Wetted Per. (ft)	243.49	60.05	318.69
Min Ch El (ft)	690.93	Shear (lb/sq ft)	0.00	0.00	0.00
Alpha	1.03	Stream Power (lb/ft s)	530.00	0.00	0.00
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	1.11	1.70	1.37
C & E Loss (ft)	0.00	Cum SA (acres)	1.00	1.56	0.99

Plan: EXIST 01 CULV_A_EXIST RS: 1676.54 Profile: 25 YR

E.G. Elev (ft)	688.72	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.07	Wt. n-Val.		0.035	
W.S. Elev (ft)	688.65	Reach Len. (ft)	42.37	42.37	42.37
Crit W.S. (ft)		Flow Area (sq ft)		96.11	
E.G. Slope (ft/ft)	0.002628	Area (sq ft)		96.11	
Q Total (cfs)	201.70	Flow (cfs)		201.70	
Top Width (ft)	101.28	Top Width (ft)		101.28	
Vel Total (ft/s)	2.10	Avg. Vel. (ft/s)		2.10	
Max Chl Dpth (ft)	2.59	Hydr. Depth (ft)		0.95	
Conv. Total (cfs)	3934.2	Conv. (cfs)		3934.2	
Length Wtd. (ft)	42.37	Wetted Per. (ft)		101.50	
Min Ch El (ft)	686.06	Shear (lb/sq ft)		0.16	
Alpha	1.00	Stream Power (lb/ft s)	399.89	0.00	0.00
Frctn Loss (ft)	0.18	Cum Volume (acre-ft)	0.14	0.88	0.07
C & E Loss (ft)	0.04	Cum SA (acres)	0.39	1.37	0.18

Plan: EXIST 01 CULV_A_EXIST RS: 1812.50 Profile: 100 YR

E.G. Elev (ft)	694.06	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.00	Wt. n-Val.	0.035	0.035	0.035
W.S. Elev (ft)	694.06	Reach Len. (ft)	91.89	91.89	91.89
Crit W.S. (ft)		Flow Area (sq ft)	569.30	181.09	683.92
E.G. Slope (ft/ft)	0.000007	Area (sq ft)	569.30	181.09	683.92
Q Total (cfs)	280.40	Flow (cfs)	111.62	42.11	126.67
Top Width (ft)	620.00	Top Width (ft)	242.38	60.05	317.57
Vel Total (ft/s)	0.20	Avg. Vel. (ft/s)	0.20	0.23	0.19
Max Chl Dpth (ft)	3.13	Hydr. Depth (ft)	2.35	3.02	2.15
Conv. Total (cfs)	106854.0	Conv. (cfs)	42535.1	16046.5	48272.4
Length Wtd. (ft)	91.89	Wetted Per. (ft)	243.85	60.05	319.05
Min Ch El (ft)	690.93	Shear (lb/sq ft)	0.00	0.00	0.00
Alpha	1.02	Stream Power (lb/ft s)	530.00	0.00	0.00
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	1.34	2.02	1.63
C & E Loss (ft)	0.00	Cum SA (acres)	1.03	1.71	1.02

Plan: EXIST 01 CULV_A_EXIST RS: 1676.54 Profile: 100 YR

E.G. Elev (ft)	688.91	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.09	Wt. n-Val.		0.035	
W.S. Elev (ft)	688.82	Reach Len. (ft)	42.37	42.37	42.37
Crit W.S. (ft)		Flow Area (sq ft)		114.27	
E.G. Slope (ft/ft)	0.003610	Area (sq ft)		114.27	
Q Total (cfs)	280.40	Flow (cfs)		280.40	
Top Width (ft)	120.85	Top Width (ft)		120.85	
Vel Total (ft/s)	2.45	Avg. Vel. (ft/s)		2.45	
Max Chl Dpth (ft)	2.76	Hydr. Depth (ft)		0.95	
Conv. Total (cfs)	4666.9	Conv. (cfs)		4666.9	
Length Wtd. (ft)	42.37	Wetted Per. (ft)		121.10	
Min Ch El (ft)	686.06	Shear (lb/sq ft)		0.21	
Alpha	1.00	Stream Power (lb/ft s)	399.89	0.00	0.00
Frctn Loss (ft)	0.23	Cum Volume (acre-ft)	0.19	1.09	0.10
C & E Loss (ft)	0.04	Cum SA (acres)	0.42	1.51	0.21

Plan: EXIST 01 CULV_A_EXIST RS: 1720.61 Profile: 25 YR

E.G. Elev (ft)	693.70	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.01	Wt. n-Val.		0.035	0.035
W.S. Elev (ft)	693.69	Reach Len. (ft)	44.07	44.07	44.07
Crit W.S. (ft)	689.49	Flow Area (sq ft)		200.29	24.12
E.G. Slope (ft/ft)	0.000057	Area (sq ft)	437.00	226.82	663.23
Q Total (cfs)	201.70	Flow (cfs)		184.34	17.36
Top Width (ft)	575.00	Top Width (ft)	227.58	47.21	300.21
Vel Total (ft/s)	0.90	Avg. Vel. (ft/s)		0.92	0.72
Max Chl Dpth (ft)	6.03	Hydr. Depth (ft)		4.91	3.35
Conv. Total (cfs)	26620.8	Conv. (cfs)		24330.1	2290.7
Length Wtd. (ft)	44.07	Wetted Per. (ft)		41.39	7.21
Min Ch El (ft)	687.66	Shear (lb/sq ft)		0.02	0.01
Alpha	1.01	Stream Power (lb/ft s)	575.00	0.00	0.00
Frctn Loss (ft)		Cum Volume (acre-ft)	0.14	1.29	0.07
C & E Loss (ft)		Cum SA (acres)	0.51	1.45	0.33

Plan: EXIST 01 CULV_A_EXIST RS: 1634.17 Profile: 25 YR

E.G. Elev (ft)	688.50	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.21	Wt. n-Val.	0.035	0.035	0.035
W.S. Elev (ft)	688.29	Reach Len. (ft)	5.82	5.82	5.82
Crit W.S. (ft)	688.29	Flow Area (sq ft)	25.79	40.17	1.61
E.G. Slope (ft/ft)	0.008261	Area (sq ft)	25.79	40.17	3.57
Q Total (cfs)	201.70	Flow (cfs)	38.00	162.21	1.49
Top Width (ft)	172.03	Top Width (ft)	109.25	37.38	25.40
Vel Total (ft/s)	2.98	Avg. Vel. (ft/s)	1.47	4.04	0.93
Max Chl Dpth (ft)	1.86	Hydr. Depth (ft)	0.24	1.07	0.12
Conv. Total (cfs)	2219.2	Conv. (cfs)	418.1	1784.7	16.4
Length Wtd. (ft)	5.82	Wetted Per. (ft)	109.28	37.53	13.74
Min Ch El (ft)	686.42	Shear (lb/sq ft)	0.12	0.55	0.06
Alpha	1.52	Stream Power (lb/ft s)	276.22	0.00	0.00
Frctn Loss (ft)	0.05	Cum Volume (acre-ft)	0.13	0.82	0.07
C & E Loss (ft)	0.01	Cum SA (acres)	0.34	1.31	0.17

Plan: EXIST 01 CULV_A_EXIST RS: 1720.61 Profile: 100 YR

E.G. Elev (ft)	694.06	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.02	Wt. n-Val.		0.035	0.035
W.S. Elev (ft)	694.03	Reach Len. (ft)	44.07	44.07	44.07
Crit W.S. (ft)	689.81	Flow Area (sq ft)		214.50	26.63
E.G. Slope (ft/ft)	0.000087	Area (sq ft)	516.28	243.27	767.82
Q Total (cfs)	280.40	Flow (cfs)		255.13	25.27
Top Width (ft)	575.00	Top Width (ft)	227.58	47.21	300.21
Vel Total (ft/s)	1.16	Avg. Vel. (ft/s)		1.19	0.95
Max Chl Dpth (ft)	6.37	Hydr. Depth (ft)		5.26	3.69
Conv. Total (cfs)	29976.5	Conv. (cfs)		27274.6	2702.0
Length Wtd. (ft)	44.07	Wetted Per. (ft)		41.39	7.21
Min Ch El (ft)	687.66	Shear (lb/sq ft)		0.03	0.02
Alpha	1.01	Stream Power (lb/ft s)	575.00	0.00	0.00
Frctn Loss (ft)		Cum Volume (acre-ft)	0.19	1.57	0.10
C & E Loss (ft)		Cum SA (acres)	0.53	1.59	0.37

Plan: EXIST 01 CULV_A_EXIST RS: 1634.17 Profile: 100 YR

E.G. Elev (ft)	688.64	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.23	Wt. n-Val.	0.035	0.035	0.035
W.S. Elev (ft)	688.41	Reach Len. (ft)	5.82	5.82	5.82
Crit W.S. (ft)	688.41	Flow Area (sq ft)	39.25	44.73	3.72
E.G. Slope (ft/ft)	0.008656	Area (sq ft)	39.25	44.73	7.31
Q Total (cfs)	280.40	Flow (cfs)	77.16	198.58	4.66
Top Width (ft)	185.08	Top Width (ft)	111.75	37.38	35.95
Vel Total (ft/s)	3.20	Avg. Vel. (ft/s)	1.97	4.44	1.25
Max Chl Dpth (ft)	1.99	Hydr. Depth (ft)	0.35	1.20	0.18
Conv. Total (cfs)	3013.9	Conv. (cfs)	829.4	2134.5	50.1
Length Wtd. (ft)	5.82	Wetted Per. (ft)	111.78	37.53	20.86
Min Ch El (ft)	686.42	Shear (lb/sq ft)	0.19	0.64	0.10
Alpha	1.47	Stream Power (lb/ft s)	276.22	0.00	0.00
Frctn Loss (ft)	0.05	Cum Volume (acre-ft)	0.18	1.01	0.10
C & E Loss (ft)	0.00	Cum SA (acres)	0.36	1.43	0.20

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EXISTING DRAINAGE HYDRAULIC CALCULATIONS CULVERT A

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SHEET 03 OF 06

FED. RD. DIV. RD.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				129

HEC-RAS Plan: PROP River: 02 Reach: CULV_A_PROP

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
CULV_A_PROP	2791.33	25 YR	201.70	701.07	701.57	701.48	701.63	0.011597	2.03	99.25	334.90	0.66
CULV_A_PROP	2791.33	100 YR	280.40	701.07	701.54	701.54	701.69	0.027853	3.04	92.36	329.29	1.01
CULV_A_PROP	2589.74	25 YR	201.70	698.40	698.81		698.91	0.015727	2.54	79.35	240.50	0.78
CULV_A_PROP	2589.74	100 YR	280.40	698.40	699.00		699.08	0.007243	2.19	127.83	270.22	0.56
CULV_A_PROP	2226.01	25 YR	201.70	693.98	694.47	694.35	694.56	0.009435	2.37	85.28	196.31	0.63
CULV_A_PROP	2226.01	100 YR	280.40	693.98	694.43	694.43	694.64	0.024512	3.62	77.53	193.15	1.01
CULV_A_PROP	1905.78	25 YR	201.70	691.22	692.05		692.12	0.006255	2.04	98.71	207.93	0.52
CULV_A_PROP	1905.78	100 YR	280.40	691.22	692.74		692.76	0.000574	1.03	276.70	304.02	0.18
CULV_A_PROP	1819.31	25 YR	201.70	690.95	691.66		691.70	0.003662	1.84	126.89	264.33	0.42
CULV_A_PROP	1819.31	100 YR	280.40	690.95	692.73		692.74	0.000126	0.67	479.84	357.49	0.09
CULV_A_PROP	1813.00	25 YR	201.70	689.65	691.62	690.83	691.69	0.001503	2.24	104.02	221.95	0.31
CULV_A_PROP	1813.00	100 YR	280.40	689.65	692.70	691.11	692.73	0.000331	1.49	211.75	344.56	0.16
CULV_A_PROP	1728.52		Culvert									
CULV_A_PROP	1639.90	25 YR	201.70	685.15	687.73	686.25	687.77	0.000583	1.71	142.33	145.29	0.20
CULV_A_PROP	1639.90	100 YR	280.40	685.15	688.03	686.49	688.07	0.000615	1.91	191.00	216.96	0.21
CULV_A_PROP	1633.45	25 YR	225.40	685.00	687.54		687.72	0.002945	3.41	66.54	57.71	0.44
CULV_A_PROP	1633.45	100 YR	314.30	685.00	687.75	686.95	688.01	0.003810	4.10	89.60	144.06	0.51
CULV_A_PROP	1598.73	25 YR	225.40	684.91	687.29	686.85	687.56	0.007401	4.30	59.16	89.59	0.67
CULV_A_PROP	1598.73	100 YR	314.30	684.91	687.60		687.84	0.005617	4.20	92.02	114.26	0.60
CULV_A_PROP	1568.73	25 YR	225.40	684.82	687.28		687.39	0.002318	2.81	96.30	129.49	0.39
CULV_A_PROP	1568.73	100 YR	314.30	684.82	687.61		687.71	0.001885	2.86	144.07	162.90	0.36
CULV_A_PROP	1538.73	25 YR	225.40	684.74	686.91	686.47	687.26	0.007086	4.77	49.57	62.50	0.67
CULV_A_PROP	1538.73	100 YR	314.30	684.74	687.11	687.11	687.57	0.010095	5.54	64.81	92.97	0.80
CULV_A_PROP	1508.28	25 YR	225.40	684.66	686.99		687.08	0.001902	2.56	109.98	124.44	0.35
CULV_A_PROP	1508.28	100 YR	314.30	684.66	687.17		687.28	0.002312	3.02	133.12	137.16	0.40
CULV_A_PROP	1409.55	25 YR	225.40	685.86	686.52	686.44	686.67	0.014370	3.12	72.30	150.76	0.79
CULV_A_PROP	1409.55	100 YR	314.30	685.86	686.65		686.83	0.013516	3.38	92.91	163.72	0.79
CULV_A_PROP	1261.86	25 YR	225.40	683.97	684.92		685.05	0.008653	2.88	78.26	125.63	0.64
CULV_A_PROP	1261.86	100 YR	314.30	683.97	685.08		685.24	0.008731	3.16	99.44	139.80	0.66
CULV_A_PROP	1000.00	25 YR	225.40	680.00	681.31	681.31	681.63	0.021500	4.58	49.17	77.74	1.02
CULV_A_PROP	1000.00	100 YR	314.30	680.00	681.48	681.48	681.86	0.020560	4.91	64.00	88.26	1.02

Plan: PROP 02 CULV_A_PROP RS: 1728.52 Culv Group: Culvert #1 Profile: 25 YR

Q Culv Group (cfs)	201.70	Culv Full Len (ft)	
# Barrels	2	Culv Vel US (ft/s)	8.15
Q Barrel (cfs)	100.85	Culv Vel DS (ft/s)	14.27
E.G. US. (ft)	691.69	Culv Inv El Up (ft)	688.08
W.S. US. (ft)	691.62	Culv Inv El Dn (ft)	685.15
E.G. DS (ft)	687.77	Culv Frctn Ls (ft)	1.68
W.S. DS (ft)	687.73	Culv Exit Loss (ft)	1.72
Delta EG (ft)	3.92	Culv Entr Loss (ft)	0.52
Delta WS (ft)	3.89	Q Weir (cfs)	
E.G. IC (ft)	691.39	Weir Sta Lft (ft)	
E.G. OC (ft)	691.69	Weir Sta Rgt (ft)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (ft)	690.14	Weir Max Depth (ft)	
Culv WS Outlet (ft)	686.33	Weir Avg Depth (ft)	
Culv Nml Depth (ft)	1.09	Weir Flow Area (sq ft)	
Culv Crt Depth (ft)	2.06	Min El Weir Flow (ft)	694.33

Plan: PROP 02 CULV_A_PROP RS: 1728.52 Culv Group: Culvert #1 Profile: 100 YR

Q Culv Group (cfs)	280.40	Culv Full Len (ft)	
# Barrels	2	Culv Vel US (ft/s)	7.79
Q Barrel (cfs)	140.20	Culv Vel DS (ft/s)	15.73
E.G. US. (ft)	692.73	Culv Inv El Up (ft)	688.08
W.S. US. (ft)	692.70	Culv Inv El Dn (ft)	685.15
E.G. DS (ft)	688.07	Culv Frctn Ls (ft)	1.78
W.S. DS (ft)	688.03	Culv Exit Loss (ft)	2.40
Delta EG (ft)	4.66	Culv Entr Loss (ft)	0.47
Delta WS (ft)	4.68	Q Weir (cfs)	
E.G. IC (ft)	692.73	Weir Sta Lft (ft)	
E.G. OC (ft)	692.58	Weir Sta Rgt (ft)	
Culvert Control	Inlet	Weir Submerg	
Culv WS Inlet (ft)	691.08	Weir Max Depth (ft)	
Culv WS Outlet (ft)	686.64	Weir Avg Depth (ft)	
Culv Nml Depth (ft)	1.36	Weir Flow Area (sq ft)	
Culv Crt Depth (ft)	2.57	Min El Weir Flow (ft)	694.33

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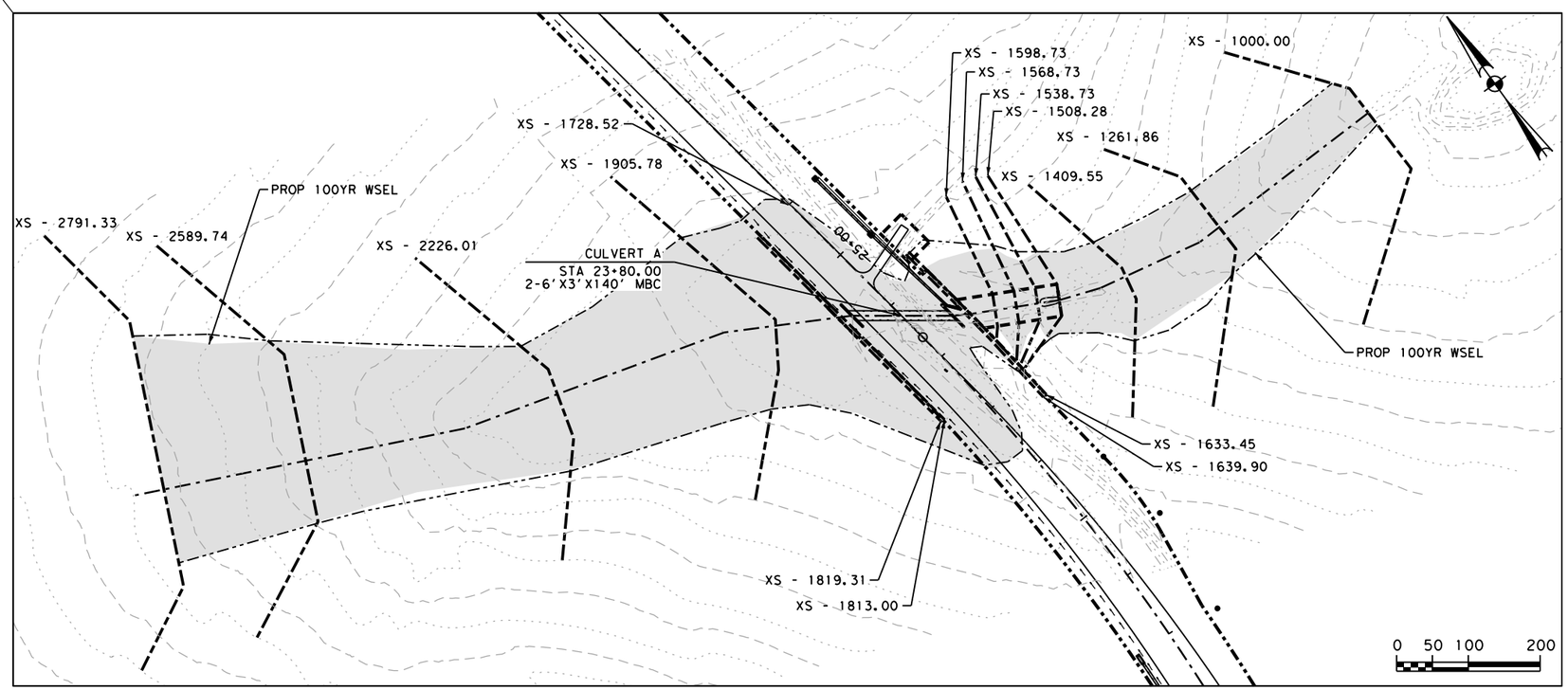
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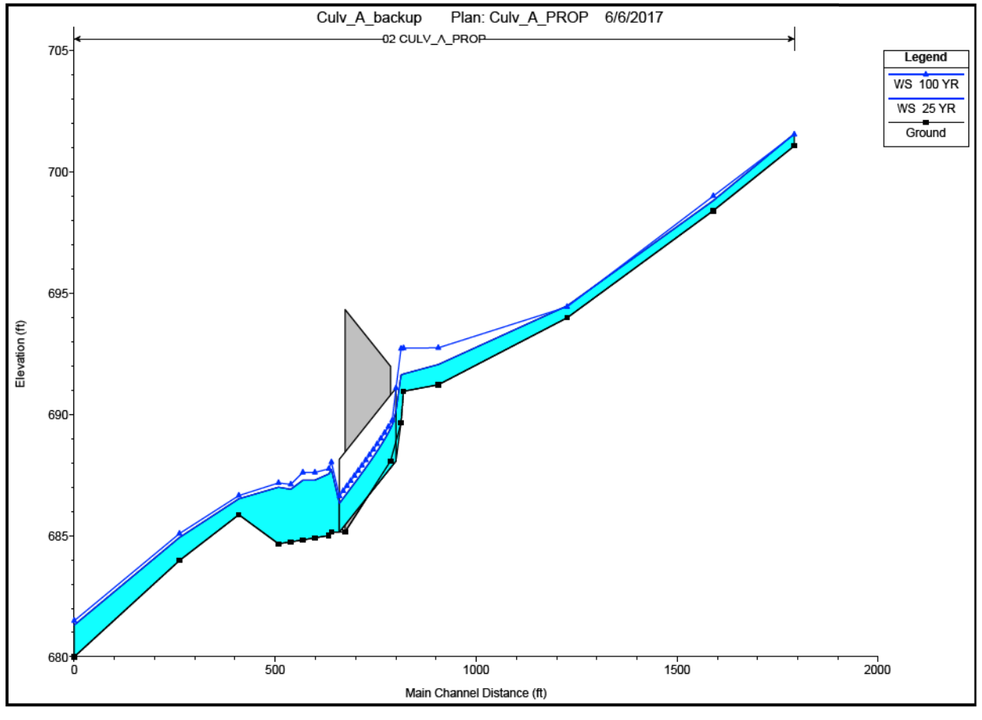
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SHEET 04 OF 06

FED. RD. DIV. RD.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				130





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SHEET 05 OF 06

FED. RD. DIV. RD.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				131

Plan: PROP 02 CULV_A_PROP RS: 1819.31 Profile: 25 YR

E.G. Elev (ft)	691.70	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.04	Wt. n-Val.	0.035	0.035	0.035
W.S. Elev (ft)	691.66	Reach Len. (ft)	6.31	6.31	6.31
Crit W.S. (ft)		Flow Area (sq ft)	54.75	29.76	42.38
E.G. Slope (ft/ft)	0.003662	Area (sq ft)	54.75	29.76	42.38
Q Total (cfs)	201.70	Flow (cfs)	81.18	54.88	65.64
Top Width (ft)	264.33	Top Width (ft)	124.90	48.93	90.51
Vel Total (ft/s)	1.59	Avg. Vel. (ft/s)	1.48	1.84	1.55
Max Chl Dpth (ft)	0.71	Hydr. Depth (ft)	0.44	0.61	0.47
Conv. Total (cfs)	3333.1	Conv. (cfs)	1341.5	906.8	1084.8
Length Wtd. (ft)	6.31	Wetted Per. (ft)	124.90	48.93	90.52
Min Ch El (ft)	690.95	Shear (lb/sq ft)	0.10	0.14	0.11
Alpha	1.03	Stream Power (lb/ft s)	363.97	0.00	0.00
Frctn Loss (ft)	0.01	Cum Volume (acre-ft)	0.06	1.06	0.04
C & E Loss (ft)	0.00	Cum SA (acres)	0.33	1.62	0.49

Plan: PROP 02 CULV_A_PROP RS: 1639.90 Profile: 25 YR

E.G. Elev (ft)	687.77	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.04	Wt. n-Val.	0.035	0.035	0.035
W.S. Elev (ft)	687.73	Reach Len. (ft)	6.45	6.45	6.45
Crit W.S. (ft)	686.25	Flow Area (sq ft)	4.35	107.33	30.65
E.G. Slope (ft/ft)	0.000583	Area (sq ft)	4.35	107.33	30.65
Q Total (cfs)	201.70	Flow (cfs)	2.27	183.38	16.05
Top Width (ft)	145.29	Top Width (ft)	11.90	49.48	83.91
Vel Total (ft/s)	1.42	Avg. Vel. (ft/s)	0.52	1.71	0.52
Max Chl Dpth (ft)	2.58	Hydr. Depth (ft)	0.37	2.17	0.37
Conv. Total (cfs)	8356.8	Conv. (cfs)	94.2	7597.6	665.0
Length Wtd. (ft)	6.45	Wetted Per. (ft)	11.93	49.85	83.91
Min Ch El (ft)	685.15	Shear (lb/sq ft)	0.01	0.08	0.01
Alpha	1.33	Stream Power (lb/ft s)	276.21	0.00	0.00
Frctn Loss (ft)	0.01	Cum Volume (acre-ft)	0.06	0.98	0.03
C & E Loss (ft)	0.04	Cum SA (acres)	0.18	1.42	0.08

Plan: PROP 02 CULV_A_PROP RS: 1819.31 Profile: 100 YR

E.G. Elev (ft)	692.74	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.01	Wt. n-Val.	0.035	0.035	0.035
W.S. Elev (ft)	692.73	Reach Len. (ft)	6.31	6.31	6.31
Crit W.S. (ft)		Flow Area (sq ft)	210.17	82.05	187.63
E.G. Slope (ft/ft)	0.000126	Area (sq ft)	210.17	82.05	187.63
Q Total (cfs)	280.40	Flow (cfs)	123.19	55.26	101.95
Top Width (ft)	357.49	Top Width (ft)	154.29	48.93	154.26
Vel Total (ft/s)	0.58	Avg. Vel. (ft/s)	0.59	0.67	0.54
Max Chl Dpth (ft)	1.78	Hydr. Depth (ft)	1.36	1.68	1.22
Conv. Total (cfs)	24951.2	Conv. (cfs)	10962.1	4916.9	9072.2
Length Wtd. (ft)	6.31	Wetted Per. (ft)	154.33	48.93	154.37
Min Ch El (ft)	690.95	Shear (lb/sq ft)	0.01	0.01	0.01
Alpha	1.02	Stream Power (lb/ft s)	363.97	0.00	0.00
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	0.14	1.41	0.08
C & E Loss (ft)	0.00	Cum SA (acres)	0.64	1.76	0.70

Plan: PROP 02 CULV_A_PROP RS: 1639.90 Profile: 100 YR

E.G. Elev (ft)	688.07	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.05	Wt. n-Val.	0.035	0.035	0.035
W.S. Elev (ft)	688.03	Reach Len. (ft)	6.45	6.45	6.45
Crit W.S. (ft)	686.49	Flow Area (sq ft)	8.58	121.96	60.46
E.G. Slope (ft/ft)	0.000615	Area (sq ft)	11.36	121.96	60.46
Q Total (cfs)	280.40	Flow (cfs)	5.79	233.18	41.43
Top Width (ft)	216.96	Top Width (ft)	52.35	49.48	115.14
Vel Total (ft/s)	1.47	Avg. Vel. (ft/s)	0.67	1.91	0.69
Max Chl Dpth (ft)	2.88	Hydr. Depth (ft)	0.51	2.46	0.53
Conv. Total (cfs)	11305.3	Conv. (cfs)	233.2	9401.6	1670.5
Length Wtd. (ft)	6.45	Wetted Per. (ft)	16.75	49.85	115.14
Min Ch El (ft)	685.15	Shear (lb/sq ft)	0.02	0.09	0.02
Alpha	1.45	Stream Power (lb/ft s)	276.21	0.00	0.00
Frctn Loss (ft)	0.01	Cum Volume (acre-ft)	0.11	1.23	0.05
C & E Loss (ft)	0.06	Cum SA (acres)	0.27	1.56	0.11

Plan: PROP 02 CULV_A_PROP RS: 1813.00 Profile: 25 YR

E.G. Elev (ft)	691.69	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.07	Wt. n-Val.	0.035	0.035	0.035
W.S. Elev (ft)	691.62	Reach Len. (ft)	173.10	173.10	173.10
Crit W.S. (ft)	690.83	Flow Area (sq ft)	12.97	76.65	14.40
E.G. Slope (ft/ft)	0.001503	Area (sq ft)	17.95	76.65	51.06
Q Total (cfs)	201.70	Flow (cfs)	12.92	171.55	17.24
Top Width (ft)	221.95	Top Width (ft)	58.24	48.21	115.50
Vel Total (ft/s)	1.94	Avg. Vel. (ft/s)	1.00	2.24	1.20
Max Chl Dpth (ft)	1.97	Hydr. Depth (ft)	0.47	1.59	0.62
Conv. Total (cfs)	5201.9	Conv. (cfs)	333.1	4424.2	444.6
Length Wtd. (ft)	173.10	Wetted Per. (ft)	27.57	48.35	23.22
Min Ch El (ft)	689.65	Shear (lb/sq ft)	0.04	0.15	0.06
Alpha	1.18	Stream Power (lb/ft s)	363.97	0.00	0.00
Frctn Loss (ft)		Cum Volume (acre-ft)	0.06	1.05	0.03
C & E Loss (ft)		Cum SA (acres)	0.32	1.61	0.47

Plan: PROP 02 CULV_A_PROP RS: 1633.45 Profile: 25 YR

E.G. Elev (ft)	687.72	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.18	Wt. n-Val.	0.035	0.035	
W.S. Elev (ft)	687.54	Reach Len. (ft)	34.72	34.72	34.72
Crit W.S. (ft)		Flow Area (sq ft)	0.46	66.08	
E.G. Slope (ft/ft)	0.002945	Area (sq ft)	0.46	66.08	
Q Total (cfs)	225.40	Flow (cfs)	0.08	225.32	
Top Width (ft)	57.71	Top Width (ft)	21.65	36.07	
Vel Total (ft/s)	3.39	Avg. Vel. (ft/s)	0.18	3.41	
Max Chl Dpth (ft)	2.54	Hydr. Depth (ft)	0.02	1.83	
Conv. Total (cfs)	4153.7	Conv. (cfs)	1.5	4152.2	
Length Wtd. (ft)	34.72	Wetted Per. (ft)	21.65	36.70	
Min Ch El (ft)	685.00	Shear (lb/sq ft)	0.00	0.33	
Alpha	1.01	Stream Power (lb/ft s)	276.44	0.00	0.00
Frctn Loss (ft)	0.15	Cum Volume (acre-ft)	0.06	0.97	0.03
C & E Loss (ft)	0.01	Cum SA (acres)	0.18	1.41	0.07

Plan: PROP 02 CULV_A_PROP RS: 1813.00 Profile: 100 YR

E.G. Elev (ft)	692.73	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.03	Wt. n-Val.	0.035	0.035	0.035
W.S. Elev (ft)	692.70	Reach Len. (ft)	173.10	173.10	173.10
Crit W.S. (ft)	691.11	Flow Area (sq ft)	42.97	129.11	39.67
E.G. Slope (ft/ft)	0.000331	Area (sq ft)	124.95	129.11	215.32
Q Total (cfs)	280.40	Flow (cfs)	44.63	191.98	43.79
Top Width (ft)	344.56	Top Width (ft)	126.08	48.21	170.27
Vel Total (ft/s)	1.32	Avg. Vel. (ft/s)	1.04	1.49	1.10
Max Chl Dpth (ft)	3.05	Hydr. Depth (ft)	1.56	2.68	1.71
Conv. Total (cfs)	15409.0	Conv. (cfs)	2452.4	10550.1	2406.5
Length Wtd. (ft)	173.10	Wetted Per. (ft)	27.57	48.35	23.22
Min Ch El (ft)	689.65	Shear (lb/sq ft)	0.03	0.06	0.04
Alpha	1.07	Stream Power (lb/ft s)	363.97	0.00	0.00
Frctn Loss (ft)		Cum Volume (acre-ft)	0.11	1.40	0.05
C & E Loss (ft)		Cum SA (acres)	0.62	1.75	0.68

Plan: PROP 02 CULV_A_PROP RS: 1633.45 Profile: 100 YR

E.G. Elev (ft)	688.01	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.25	Wt. n-Val.	0.035	0.035	
W.S. Elev (ft)	687.75	Reach Len. (ft)	34.72	34.72	34.72
Crit W.S. (ft)	686.95	Flow Area (sq ft)	15.83	73.77	
E.G. Slope (ft/ft)	0.003810	Area (sq ft)	15.83	73.77	
Q Total (cfs)	314.30	Flow (cfs)	11.60	302.70	
Top Width (ft)	144.06	Top Width (ft)	107.07	36.99	
Vel Total (ft/s)	3.51	Avg. Vel. (ft/s)	0.73	4.10	
Max Chl Dpth (ft)	2.75	Hydr. Depth (ft)	0.15	1.99	
Conv. Total (cfs)	5092.1	Conv. (cfs)	187.9	4904.2	
Length Wtd. (ft)	34.72	Wetted Per. (ft)	107.07	37.65	
Min Ch El (ft)	685.00	Shear (lb/sq ft)	0.04	0.47	
Alpha	1.32	Stream Power (lb/ft s)	276.44	0.00	0.00
Frctn Loss (ft)	0.16	Cum Volume (acre-ft)	0.11	1.21	0.05
C & E Loss (ft)	0.00	Cum SA (acres)	0.26	1.55	0.10

STATE OF TEXAS
ARNOLD GONZALES, JR.
98234
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PROFESSIONAL ENGINEER

6/15/2017

CR 119

WILLIAMSON COUNTY 1848

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PROPOSED DRAINAGE HYDRAULIC CALCULATIONS CULVERT A

STA 23+80.00

SHEET 06 OF 06

FED. RD. DIV. RD.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				132

HEC-RAS Plan: EXIST River: 03 Reach: CULV_B_EXIST

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
CULV_B_EXIST	2675.44	25 YR	459.10	694.00	695.91		695.98	0.002289	2.19	209.88	187.71	0.36
CULV_B_EXIST	2675.44	100 YR	637.30	694.00	696.12		696.22	0.002549	2.54	253.40	228.32	0.39
CULV_B_EXIST	2407.57	25 YR	459.10	693.80	694.32	694.32	694.52	0.024299	3.61	127.37	320.95	1.00
CULV_B_EXIST	2407.57	100 YR	637.30	693.80	694.42	694.42	694.67	0.022641	3.99	160.44	333.56	1.00
CULV_B_EXIST	2083.57	25 YR	459.10	687.89	689.54		689.76	0.009199	3.80	120.78	133.88	0.71
CULV_B_EXIST	2083.57	100 YR	637.30	687.89	690.15		690.29	0.003446	2.96	216.14	177.96	0.46
CULV_B_EXIST	1941.88	25 YR	459.10	683.28	689.66	684.71	689.67	0.000057	0.92	533.07	161.83	0.07
CULV_B_EXIST	1941.88	100 YR	637.30	683.28	690.20	685.01	690.22	0.000074	1.13	630.21	225.05	0.08
CULV_B_EXIST	1806.76	25 YR	459.10	686.31	689.64		689.66	0.000224	1.05	455.69	281.75	0.13
CULV_B_EXIST	1806.76	100 YR	637.30	686.31	690.19		690.20	0.000187	1.11	636.57	399.95	0.12
CULV_B_EXIST	1801.29	25 YR	459.10	686.16	689.64		689.66	0.000200	1.01	473.23	283.24	0.12
CULV_B_EXIST	1801.29	100 YR	637.30	686.16	690.19		690.20	0.000172	1.07	654.20	403.85	0.12
CULV_B_EXIST	1689.40	25 YR	459.10	682.98	689.63		689.64	0.000091	0.96	549.93	257.20	0.09
CULV_B_EXIST	1689.40	100 YR	637.30	682.98	690.17		690.19	0.000098	1.09	703.40	310.69	0.09
CULV_B_EXIST	1678.78	25 YR	459.10	681.76	689.59	686.20	689.64	0.000209	1.66	276.86	250.34	0.14
CULV_B_EXIST	1678.78	100 YR	637.30	681.76	690.11	686.55	690.18	0.000280	2.07	308.60	327.34	0.16
CULV_B_EXIST	1660.06		Culvert									
CULV_B_EXIST	1640.00	25 YR	459.10	681.34	685.50	685.50	686.56	0.014749	8.25	55.75	27.99	1.00
CULV_B_EXIST	1640.00	100 YR	637.30	681.34	686.41	686.41	687.14	0.007106	7.16	111.82	104.04	0.73
CULV_B_EXIST	1609.30	25 YR	459.10	680.23	685.34		685.73	0.003757	5.20	103.24	80.44	0.53
CULV_B_EXIST	1609.30	100 YR	637.30	680.23	685.54	685.20	686.13	0.005266	6.44	121.89	97.55	0.64
CULV_B_EXIST	1566.16	25 YR	459.10	680.34	685.27		685.55	0.002950	4.65	133.21	123.28	0.47
CULV_B_EXIST	1566.16	100 YR	637.30	680.34	685.50		685.87	0.003777	5.52	163.07	140.26	0.54
CULV_B_EXIST	1425.92	25 YR	459.10	683.40	684.75		684.89	0.007419	2.98	154.51	215.55	0.61
CULV_B_EXIST	1425.92	100 YR	637.30	683.40	684.92		685.09	0.007402	3.35	191.66	228.87	0.63
CULV_B_EXIST	1286.33	25 YR	459.10	682.31	683.55		683.73	0.009320	3.36	136.55	183.75	0.69
CULV_B_EXIST	1286.33	100 YR	637.30	682.31	683.75		683.96	0.008891	3.64	174.93	201.46	0.69
CULV_B_EXIST	1112.21	25 YR	459.10	680.88	682.26	682.02	682.44	0.006025	3.80	147.84	189.22	0.60
CULV_B_EXIST	1112.21	100 YR	637.30	680.88	682.46	682.21	682.67	0.006201	4.25	187.43	212.28	0.63
CULV_B_EXIST	1025.79	25 YR	459.10	680.21	681.31	681.31	681.64	0.015098	5.31	108.92	168.92	0.92
CULV_B_EXIST	1025.79	100 YR	637.30	680.21	681.49	681.49	681.87	0.014679	5.83	140.93	191.83	0.94

Plan: EXIST 03 CULV_B_EXIST RS: 1660.06 Culv Group: Culvert #1 Profile: 25 YR

Q Culv Group (cfs)	207.61	Culv Full Len (ft)	
# Barrels	1	Culv Vel US (ft/s)	10.57
Q Barrel (cfs)	207.61	Culv Vel DS (ft/s)	13.12
E.G. US. (ft)	689.64	Culv Inv El Up (ft)	681.99
W.S. US. (ft)	689.59	Culv Inv El Dn (ft)	681.51
E.G. DS (ft)	686.56	Culv Frctn Ls (ft)	0.83
W.S. DS (ft)	685.50	Culv Exit Loss (ft)	1.38
Delta EG (ft)	3.08	Culv Entr Loss (ft)	0.87
Delta WS (ft)	4.09	Q Weir (cfs)	251.49
E.G. IC (ft)	689.64	Weir Sta Lft (ft)	200.80
E.G. OC (ft)	689.39	Weir Sta Rgt (ft)	261.80
Culvert Control	Inlet	Weir Submerg	0.00
Culv WS Inlet (ft)	686.99	Weir Max Depth (ft)	1.43
Culv WS Outlet (ft)	685.27	Weir Avg Depth (ft)	1.36
Culv Nml Depth (ft)	5.00	Weir Flow Area (sq ft)	82.95
Culv Crt Depth (ft)	4.10	Min El Weir Flow (ft)	688.35

Plan: EXIST 03 CULV_B_EXIST RS: 1660.06 Culv Group: Culvert #1 Profile: 100 YR

Q Culv Group (cfs)	223.03	Culv Full Len (ft)	20.81
# Barrels	1	Culv Vel US (ft/s)	11.36
Q Barrel (cfs)	223.03	Culv Vel DS (ft/s)	11.41
E.G. US. (ft)	690.18	Culv Inv El Up (ft)	681.99
W.S. US. (ft)	690.11	Culv Inv El Dn (ft)	681.51
E.G. DS (ft)	687.14	Culv Frctn Ls (ft)	0.74
W.S. DS (ft)	686.41	Culv Exit Loss (ft)	1.30
Delta EG (ft)	3.04	Culv Entr Loss (ft)	1.00
Delta WS (ft)	3.70	Q Weir (cfs)	414.27
E.G. IC (ft)	690.18	Weir Sta Lft (ft)	200.80
E.G. OC (ft)	690.18	Weir Sta Rgt (ft)	261.80
Culvert Control	Outlet	Weir Submerg	0.00
Culv WS Inlet (ft)	686.99	Weir Max Depth (ft)	1.97
Culv WS Outlet (ft)	686.41	Weir Avg Depth (ft)	1.90
Culv Nml Depth (ft)	5.00	Weir Flow Area (sq ft)	115.69
Culv Crt Depth (ft)	4.23	Min El Weir Flow (ft)	688.35



6/15/2017

CR 119

WILLIAMSON COUNTY 1848

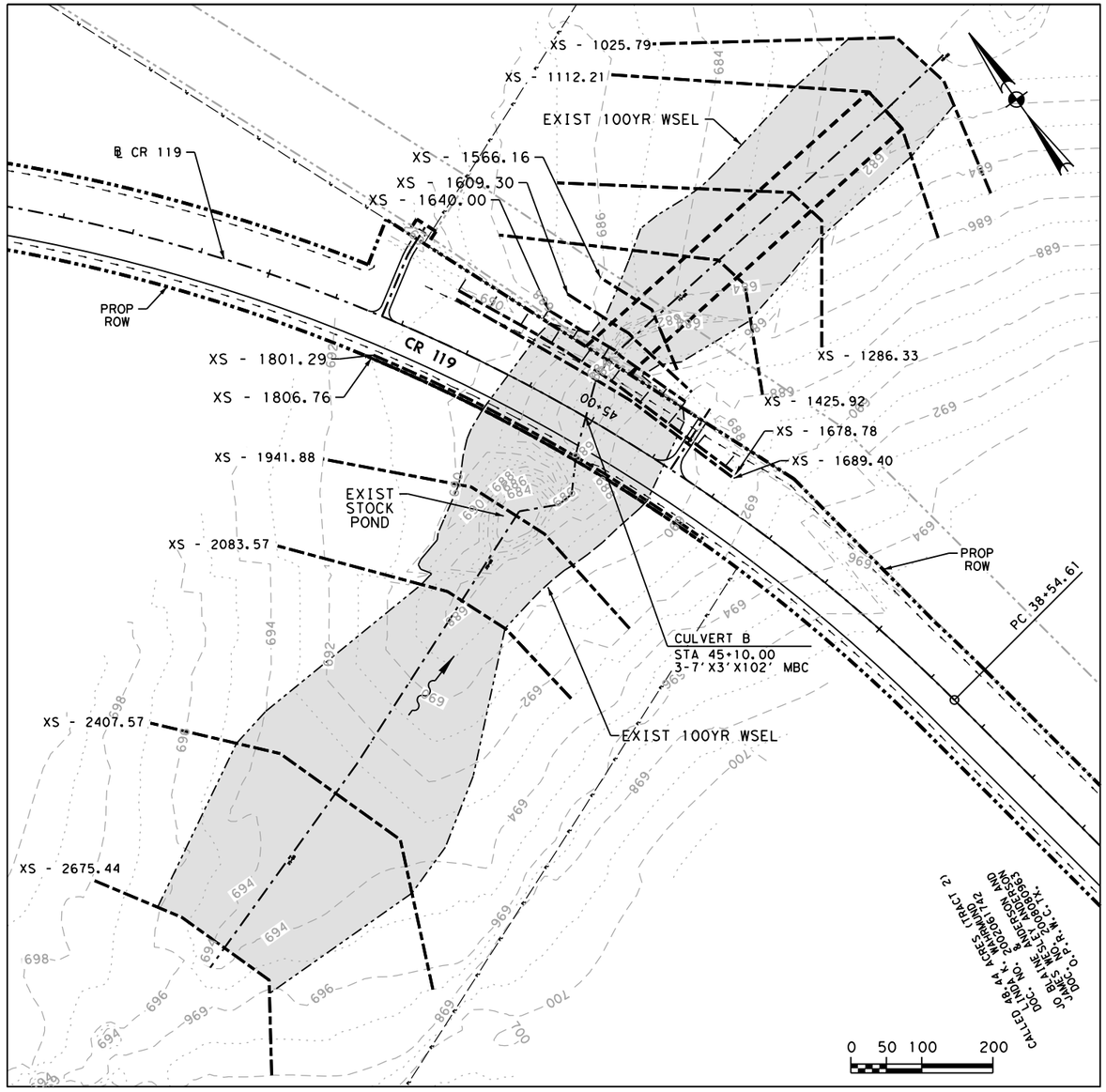
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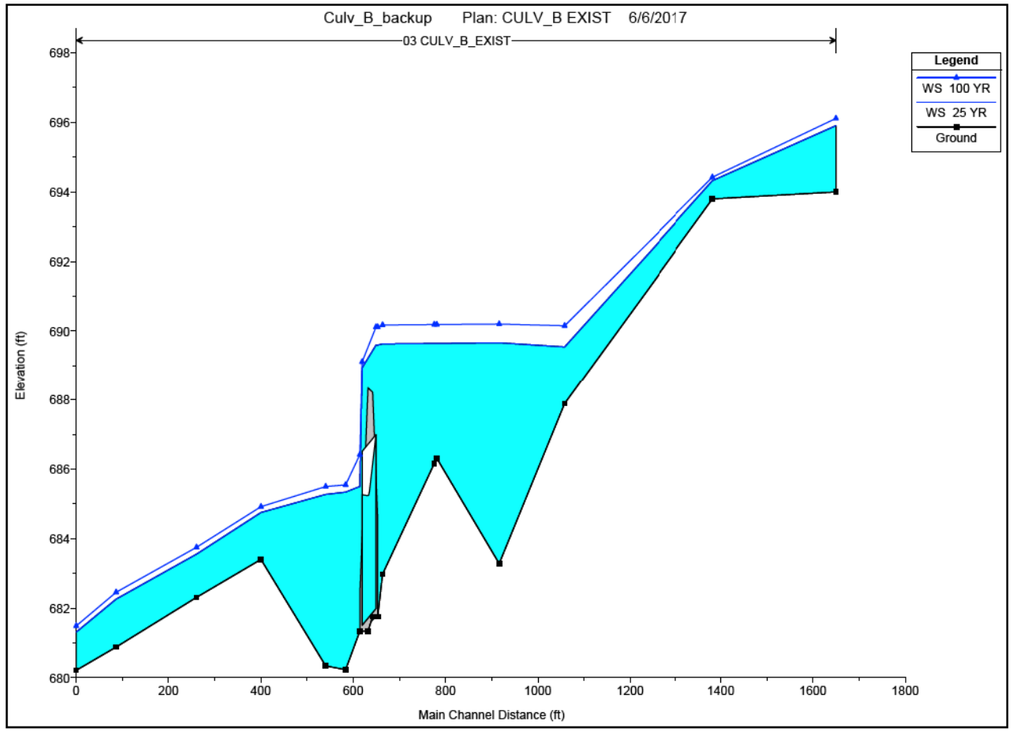
EXISTING DRAINAGE HYDRAULIC CALCULATIONS CULVERT B

STA 45+10.00

SHEET 01 OF 06

FED. RD. DIV. RD.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				133





STATE OF TEXAS
ARNOLD GONZALES, JR.
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6/15/2017

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EXISTING DRAINAGE HYDRAULIC CALCULATIONS CULVERT B

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SHEET 02 OF 06

FED. RD. DIV. RD.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				134

Plan: EXIST 03 CULV_B_EXIST RS: 1689.40 Profile: 25 YR

E.G. Elev (ft)	689.64	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.01	Wt. n-Val.	0.035	0.035	0.035
W.S. Elev (ft)	689.63	Reach Len. (ft)	10.62	10.62	10.62
Crit W.S. (ft)		Flow Area (sq ft)	38.64	440.35	70.94
E.G. Slope (ft/ft)	0.000091	Area (sq ft)	38.64	440.35	70.94
Q Total (cfs)	459.10	Flow (cfs)	13.47	420.89	24.75
Top Width (ft)	257.20	Top Width (ft)	48.25	120.41	88.53
Vel Total (ft/s)	0.83	Avg. Vel. (ft/s)	0.35	0.96	0.35
Max Chl Dpth (ft)	6.65	Hydr. Depth (ft)	0.80	3.66	0.80
Conv. Total (cfs)	48196.4	Conv. (cfs)	1414.0	44184.7	2597.8
Length Wtd. (ft)	10.62	Wetted Per. (ft)	48.28	121.19	88.56
Min Ch El (ft)	682.98	Shear (lb/sq ft)	0.00	0.02	0.00
Alpha	1.22	Stream Power (lb/ft s)	465.28	0.00	0.00
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	0.24	1.78	0.16
C & E Loss (ft)	0.00	Cum SA (acres)	0.47	1.78	0.36

Plan: EXIST 03 CULV_B_EXIST RS: 1640.00 Profile: 25 YR

E.G. Elev (ft)	686.56	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.06	Wt. n-Val.	0.035	0.035	
W.S. Elev (ft)	685.50	Reach Len. (ft)	30.70	30.70	30.70
Crit W.S. (ft)	685.50	Flow Area (sq ft)	0.14	55.61	
E.G. Slope (ft/ft)	0.014749	Area (sq ft)	0.14	55.61	
Q Total (cfs)	459.10	Flow (cfs)	0.14	458.96	
Top Width (ft)	27.99	Top Width (ft)	1.78	26.21	
Vel Total (ft/s)	8.23	Avg. Vel. (ft/s)	0.96	8.25	
Max Chl Dpth (ft)	4.16	Hydr. Depth (ft)	0.08	2.12	
Conv. Total (cfs)	3780.3	Conv. (cfs)	1.1	3779.2	
Length Wtd. (ft)	30.70	Wetted Per. (ft)	1.78	27.46	
Min Ch El (ft)	681.34	Shear (lb/sq ft)	0.07	1.86	
Alpha	1.00	Stream Power (lb/ft s)	232.12	0.00	0.00
Frctn Loss (ft)	0.20	Cum Volume (acre-ft)	0.23	1.55	0.14
C & E Loss (ft)	0.33	Cum SA (acres)	0.44	1.68	0.30

Plan: EXIST 03 CULV_B_EXIST RS: 1689.40 Profile: 100 YR

E.G. Elev (ft)	690.19	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.02	Wt. n-Val.	0.035	0.035	0.035
W.S. Elev (ft)	690.17	Reach Len. (ft)	10.62	10.62	10.62
Crit W.S. (ft)		Flow Area (sq ft)	70.76	505.72	126.92
E.G. Slope (ft/ft)	0.000098	Area (sq ft)	70.76	505.72	126.92
Q Total (cfs)	637.30	Flow (cfs)	29.27	551.84	56.18
Top Width (ft)	310.69	Top Width (ft)	72.61	120.41	117.67
Vel Total (ft/s)	0.91	Avg. Vel. (ft/s)	0.41	1.09	0.44
Max Chl Dpth (ft)	7.19	Hydr. Depth (ft)	0.97	4.20	1.08
Conv. Total (cfs)	64267.3	Conv. (cfs)	2952.0	55649.5	5665.8
Length Wtd. (ft)	10.62	Wetted Per. (ft)	72.65	121.19	117.70
Min Ch El (ft)	682.98	Shear (lb/sq ft)	0.01	0.03	0.01
Alpha	1.29	Stream Power (lb/ft s)	465.28	0.00	0.00
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	0.34	2.17	0.25
C & E Loss (ft)	0.00	Cum SA (acres)	0.63	1.86	0.48

Plan: EXIST 03 CULV_B_EXIST RS: 1640.00 Profile: 100 YR

E.G. Elev (ft)	687.14	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.72	Wt. n-Val.	0.035	0.035	0.035
W.S. Elev (ft)	686.41	Reach Len. (ft)	30.70	30.70	30.70
Crit W.S. (ft)	686.41	Flow Area (sq ft)	8.19	80.27	23.36
E.G. Slope (ft/ft)	0.007106	Area (sq ft)	8.19	80.27	23.36
Q Total (cfs)	637.30	Flow (cfs)	14.69	574.73	47.88
Top Width (ft)	104.04	Top Width (ft)	23.05	27.08	53.91
Vel Total (ft/s)	5.70	Avg. Vel. (ft/s)	1.79	7.16	2.05
Max Chl Dpth (ft)	5.07	Hydr. Depth (ft)	0.36	2.96	0.43
Conv. Total (cfs)	7560.0	Conv. (cfs)	174.2	6817.7	568.0
Length Wtd. (ft)	30.70	Wetted Per. (ft)	23.09	28.36	53.91
Min Ch El (ft)	681.34	Shear (lb/sq ft)	0.16	1.26	0.19
Alpha	1.44	Stream Power (lb/ft s)	232.12	0.00	0.00
Frctn Loss (ft)	0.19	Cum Volume (acre-ft)	0.33	1.88	0.22
C & E Loss (ft)	0.07	Cum SA (acres)	0.55	1.77	0.38

Plan: EXIST 03 CULV_B_EXIST RS: 1678.78 Profile: 25 YR

E.G. Elev (ft)	689.64	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.04	Wt. n-Val.		0.035	
W.S. Elev (ft)	689.59	Reach Len. (ft)	38.78	38.78	38.78
Crit W.S. (ft)	686.20	Flow Area (sq ft)		276.86	
E.G. Slope (ft/ft)	0.000209	Area (sq ft)	33.95	429.37	66.53
Q Total (cfs)	459.10	Flow (cfs)		459.10	
Top Width (ft)	250.34	Top Width (ft)	46.51	122.41	81.42
Vel Total (ft/s)	1.66	Avg. Vel. (ft/s)		1.66	
Max Chl Dpth (ft)	7.83	Hydr. Depth (ft)		4.54	
Conv. Total (cfs)	31785.5	Conv. (cfs)		31785.5	
Length Wtd. (ft)	38.78	Wetted Per. (ft)		62.26	
Min Ch El (ft)	681.76	Shear (lb/sq ft)		0.06	
Alpha	1.00	Stream Power (lb/ft s)	468.19	0.00	0.00
Frctn Loss (ft)		Cum Volume (acre-ft)	0.23	1.68	0.14
C & E Loss (ft)		Cum SA (acres)	0.46	1.75	0.34

Plan: EXIST 03 CULV_B_EXIST RS: 1609.30 Profile: 25 YR

E.G. Elev (ft)	685.73	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.40	Wt. n-Val.	0.035	0.035	0.035
W.S. Elev (ft)	685.34	Reach Len. (ft)	43.14	43.14	43.14
Crit W.S. (ft)		Flow Area (sq ft)	1.03	82.85	19.36
E.G. Slope (ft/ft)	0.003757	Area (sq ft)	1.03	82.85	19.36
Q Total (cfs)	459.10	Flow (cfs)	0.95	430.51	27.64
Top Width (ft)	80.44	Top Width (ft)	4.77	28.05	47.62
Vel Total (ft/s)	4.45	Avg. Vel. (ft/s)	0.92	5.20	1.43
Max Chl Dpth (ft)	5.11	Hydr. Depth (ft)	0.22	2.95	0.41
Conv. Total (cfs)	7490.5	Conv. (cfs)	15.6	7024.1	450.9
Length Wtd. (ft)	43.14	Wetted Per. (ft)	4.88	29.36	47.62
Min Ch El (ft)	680.23	Shear (lb/sq ft)	0.05	0.66	0.10
Alpha	1.29	Stream Power (lb/ft s)	223.35	0.00	0.00
Frctn Loss (ft)	0.14	Cum Volume (acre-ft)	0.23	1.51	0.14
C & E Loss (ft)	0.03	Cum SA (acres)	0.44	1.66	0.29

Plan: EXIST 03 CULV_B_EXIST RS: 1678.78 Profile: 100 YR

E.G. Elev (ft)	690.18	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.07	Wt. n-Val.		0.035	
W.S. Elev (ft)	690.11	Reach Len. (ft)	38.78	38.78	38.78
Crit W.S. (ft)	686.55	Flow Area (sq ft)		308.60	
E.G. Slope (ft/ft)	0.000280	Area (sq ft)	65.42	493.06	116.11
Q Total (cfs)	637.30	Flow (cfs)		637.30	
Top Width (ft)	327.34	Top Width (ft)	95.77	122.41	109.16
Vel Total (ft/s)	2.07	Avg. Vel. (ft/s)		2.07	
Max Chl Dpth (ft)	8.35	Hydr. Depth (ft)		5.06	
Conv. Total (cfs)	38087.9	Conv. (cfs)		38087.9	
Length Wtd. (ft)	38.78	Wetted Per. (ft)		62.26	
Min Ch El (ft)	681.76	Shear (lb/sq ft)		0.09	
Alpha	1.00	Stream Power (lb/ft s)	468.19	0.00	0.00
Frctn Loss (ft)		Cum Volume (acre-ft)	0.33	2.05	0.22
C & E Loss (ft)		Cum SA (acres)	0.61	1.83	0.45

Plan: EXIST 03 CULV_B_EXIST RS: 1609.30 Profile: 100 YR

E.G. Elev (ft)	686.13	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.58	Wt. n-Val.	0.035	0.035	0.035
W.S. Elev (ft)	685.54	Reach Len. (ft)	43.14	43.14	43.14
Crit W.S. (ft)	685.20	Flow Area (sq ft)	3.21	88.70	29.98
E.G. Slope (ft/ft)	0.005266	Area (sq ft)	3.21	88.70	29.98
Q Total (cfs)	637.30	Flow (cfs)	3.36	571.03	62.91
Top Width (ft)	97.55	Top Width (ft)	16.18	28.05	53.32
Vel Total (ft/s)	5.23	Avg. Vel. (ft/s)	1.04	6.44	2.10
Max Chl Dpth (ft)	5.31	Hydr. Depth (ft)	0.20	3.16	0.56
Conv. Total (cfs)	8782.1	Conv. (cfs)	46.2	7868.9	866.9
Length Wtd. (ft)	43.14	Wetted Per. (ft)	16.29	29.36	53.34
Min Ch El (ft)	680.23	Shear (lb/sq ft)	0.06	0.99	0.18
Alpha	1.37	Stream Power (lb/ft s)	223.35	0.00	0.00
Frctn Loss (ft)	0.19	Cum Volume (acre-ft)	0.32	1.82	0.20
C & E Loss (ft)	0.06	Cum SA (acres)	0.54	1.75	0.34

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WILLIAMSON COUNTY
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EXISTING DRAINAGE HYDRAULIC CALCULATIONS CULVERT B

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SHEET 03 OF 06

FED. RD. DIV. RD.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				135

HEC-RAS Plan: PROP River: 03 Reach: CULV_B_PROP

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
CULV_B_PROP	2655.25	25 YR	459.10	694.00	695.82		695.91	0.002817	2.36	194.49	181.35	0.40
CULV_B_PROP	2655.25	100 YR	637.30	694.00	696.04		696.15	0.003154	2.71	236.19	220.48	0.43
CULV_B_PROP	2387.37	25 YR	459.10	693.80	694.42	694.32	694.55	0.011671	2.87	160.79	333.69	0.72
CULV_B_PROP	2387.37	100 YR	637.30	693.80	694.54		694.70	0.011433	3.21	199.94	348.02	0.73
CULV_B_PROP	2063.38	25 YR	459.10	687.89	689.30	689.30	689.70	0.019697	5.05	90.91	116.47	1.01
CULV_B_PROP	2063.38	100 YR	637.30	687.89	689.52	689.52	689.97	0.018999	5.41	117.70	132.19	1.01
CULV_B_PROP	1921.68	25 YR	459.10	683.28	688.07		688.10	0.000199	1.39	330.19	99.10	0.13
CULV_B_PROP	1921.68	100 YR	637.30	683.28	688.97		689.00	0.000187	1.52	433.07	131.30	0.13
CULV_B_PROP	1786.57	25 YR	459.10	686.31	687.58	687.58	687.98	0.019753	5.08	90.35	114.91	1.01
CULV_B_PROP	1786.57	100 YR	637.30	686.31	688.86		688.94	0.001606	2.28	279.25	179.68	0.32
CULV_B_PROP	1781.10	25 YR	459.10	683.25	687.62	685.39	687.82	0.000128	3.74	195.40	121.80	0.32
CULV_B_PROP	1781.10	100 YR	637.30	683.25	688.75	685.89	688.93	0.000098	3.82	286.12	176.74	0.29
CULV_B_PROP	1723.77		Culvert									
CULV_B_PROP	1655.09	25 YR	459.10	682.60	686.26		686.32	0.000081	2.65	485.06	267.97	0.24
CULV_B_PROP	1655.09	100 YR	637.30	682.60	686.94		687.00	0.000067	2.69	671.33	275.16	0.23
CULV_B_PROP	1637.34	25 YR	527.50	682.55	685.98		686.25	0.002759	4.19	125.87	47.85	0.46
CULV_B_PROP	1637.34	100 YR	735.20	682.55	686.56		686.91	0.002992	4.76	154.57	51.55	0.48
CULV_B_PROP	1623.41	25 YR	527.50	682.50	685.88	684.73	686.20	0.003348	4.58	115.30	44.26	0.50
CULV_B_PROP	1623.41	100 YR	735.20	682.50	686.43	685.23	686.85	0.003709	5.23	140.53	47.56	0.54
CULV_B_PROP	1589.64	25 YR	527.50	682.40	685.76	684.64	686.09	0.003420	4.61	114.45	44.15	0.50
CULV_B_PROP	1589.64	100 YR	735.20	682.40	686.29	685.13	686.72	0.003853	5.30	138.67	47.33	0.55
CULV_B_PROP	1542.39	25 YR	527.50	682.26	685.58	684.50	685.92	0.003620	4.72	111.76	43.40	0.52
CULV_B_PROP	1542.39	100 YR	735.20	682.26	686.06	685.00	686.53	0.004260	5.52	133.30	46.21	0.57
CULV_B_PROP	1424.04	25 YR	527.50	681.91	685.23	684.08	685.51	0.003062	4.22	125.05	51.18	0.48
CULV_B_PROP	1424.04	100 YR	735.20	681.91	685.64	684.55	686.03	0.003794	5.02	146.55	54.20	0.54
CULV_B_PROP	1287.36	25 YR	527.50	681.50	683.74	683.74	684.65	0.014812	7.66	68.89	37.45	1.00
CULV_B_PROP	1287.36	100 YR	735.20	681.50	684.23	684.23	685.32	0.014164	8.36	87.90	40.38	1.00
CULV_B_PROP	1111.76	25 YR	527.50	680.88	682.33	682.10	682.53	0.006206	4.06	162.50	198.07	0.62
CULV_B_PROP	1111.76	100 YR	735.20	680.88	682.53	682.30	682.78	0.006575	4.59	204.56	221.52	0.65
CULV_B_PROP	1025.84	25 YR	527.50	680.21	681.36	681.36	681.73	0.015021	5.13	118.21	175.40	0.91
CULV_B_PROP	1025.84	100 YR	735.20	680.21	681.57	681.57	681.98	0.013629	5.55	157.23	203.06	0.90

Plan: PROP 03 CULV_B_PROP RS: 1723.77 Culv Group: Culvert #1 Profile: 25 YR

Q Culv Group (cfs)	459.10	Culv Full Len (ft)	101.50
# Barrels	3	Culv Vel US (ft/s)	7.29
Q Barrel (cfs)	153.03	Culv Vel DS (ft/s)	7.29
E.G. US. (ft)	687.82	Culv Inv El Up (ft)	683.16
W.S. US. (ft)	687.62	Culv Inv El Dn (ft)	682.65
E.G. DS (ft)	686.32	Culv Frctn Ls (ft)	0.33
W.S. DS (ft)	686.26	Culv Exit Loss (ft)	0.76
Delta EG (ft)	1.50	Culv Entr Loss (ft)	0.41
Delta WS (ft)	1.37	Q Weir (cfs)	
E.G. IC (ft)	687.58	Weir Sta Lft (ft)	
E.G. OC (ft)	687.82	Weir Sta Rgt (ft)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (ft)	686.16	Weir Max Depth (ft)	
Culv WS Outlet (ft)	685.65	Weir Avg Depth (ft)	
Culv Nml Depth (ft)		Weir Flow Area (sq ft)	
Culv Crt Depth (ft)	2.46	Min El Weir Flow (ft)	688.85

Plan: PROP 03 CULV_B_PROP RS: 1723.77 Culv Group: Culvert #1 Profile: 100 YR

Q Culv Group (cfs)	518.14	Culv Full Len (ft)	101.50
# Barrels	3	Culv Vel US (ft/s)	8.22
Q Barrel (cfs)	172.71	Culv Vel DS (ft/s)	8.22
E.G. US. (ft)	688.94	Culv Inv El Up (ft)	683.16
W.S. US. (ft)	688.75	Culv Inv El Dn (ft)	682.65
E.G. DS (ft)	687.00	Culv Frctn Ls (ft)	0.42
W.S. DS (ft)	686.94	Culv Exit Loss (ft)	0.99
Delta EG (ft)	1.94	Culv Entr Loss (ft)	0.53
Delta WS (ft)	1.80	Q Weir (cfs)	119.16
E.G. IC (ft)	688.80	Weir Sta Lft (ft)	277.42
E.G. OC (ft)	688.94	Weir Sta Rgt (ft)	358.32
Culvert Control	Outlet	Weir Submerg	0.00
Culv WS Inlet (ft)	686.16	Weir Max Depth (ft)	0.95
Culv WS Outlet (ft)	685.65	Weir Avg Depth (ft)	0.67
Culv Nml Depth (ft)		Weir Flow Area (sq ft)	54.35
Culv Crt Depth (ft)	2.66	Min El Weir Flow (ft)	688.85

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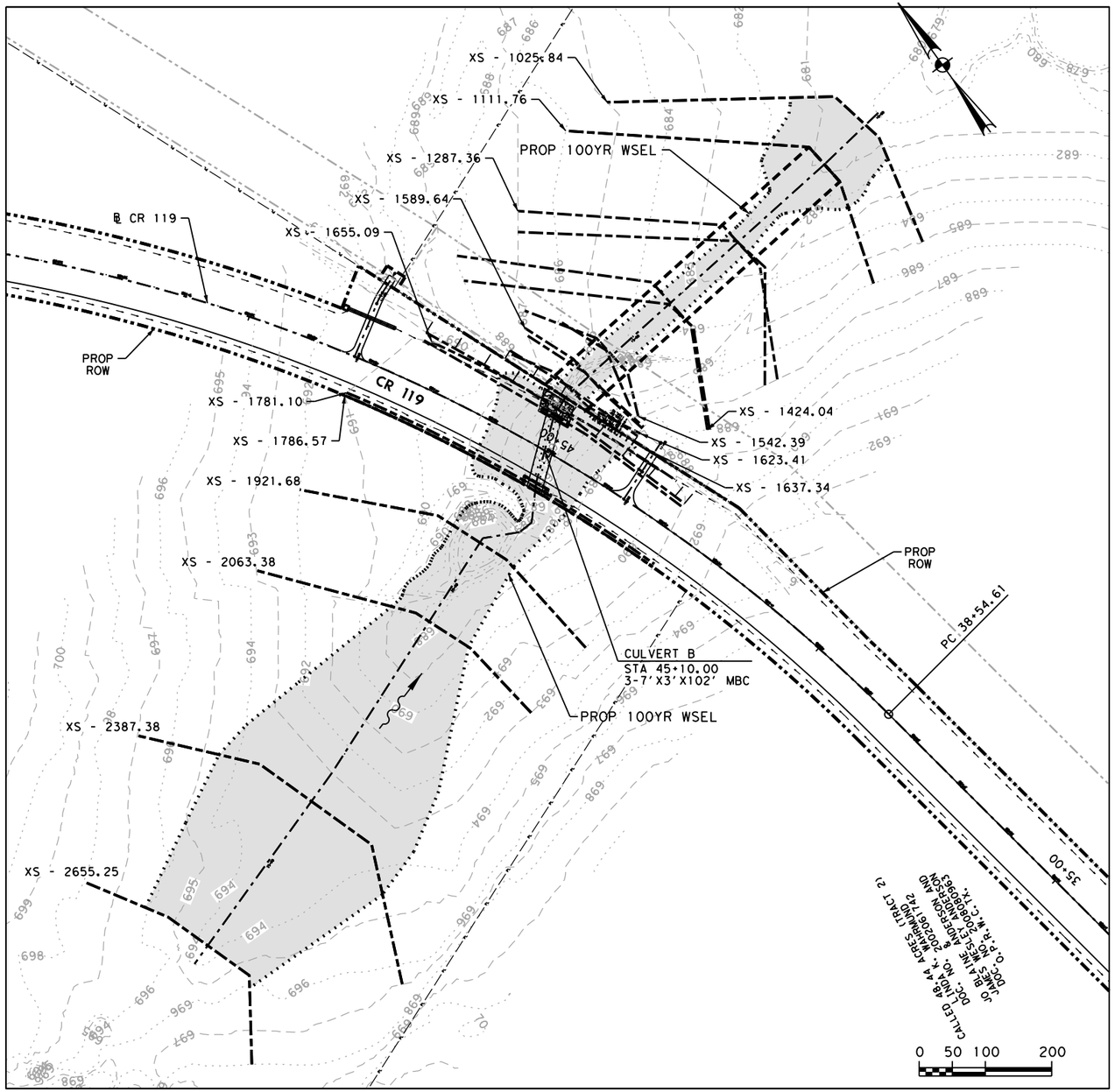
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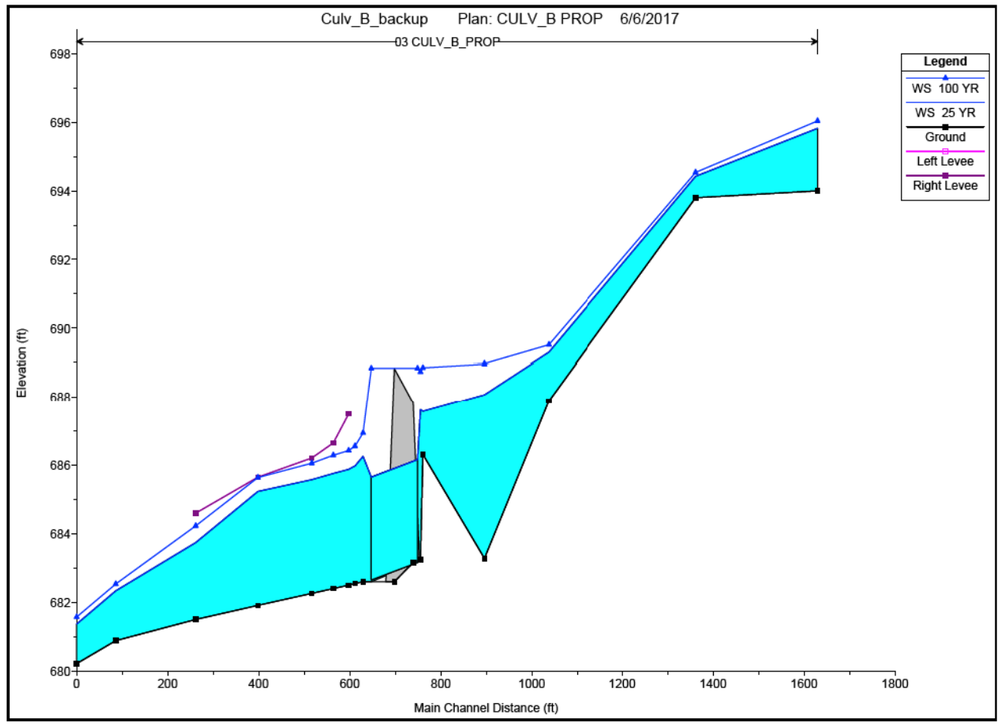
PROPOSED DRAINAGE HYDRAULIC CALCULATIONS CULVERT B

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SHEET 04 OF 06

FED. RD. DIV. RD.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				136





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SHEET 05 OF 06

FED. RD. DIV. RD.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				137

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100% SUBMITTAL

Plan: PROP 03 CULV_B_PROP RS: 1786.57 Profile: 25 YR

E.G. Elev (ft)	687.98	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.40	Wt. n-Val.		0.035	
W.S. Elev (ft)	687.58	Reach Len. (ft)	5.47	5.47	5.47
Crit W.S. (ft)	687.58	Flow Area (sq ft)		90.35	
E.G. Slope (ft/ft)	0.019753	Area (sq ft)		90.35	
Q Total (cfs)	459.10	Flow (cfs)		459.10	
Top Width (ft)	114.91	Top Width (ft)		114.91	
Vel Total (ft/s)	5.08	Avg. Vel. (ft/s)		5.08	
Max Chl Dpth (ft)	1.27	Hydr. Depth (ft)		0.79	
Conv. Total (cfs)	3266.6	Conv. (cfs)		3266.6	
Length Wtd. (ft)	5.47	Wetted Per. (ft)		114.95	
Min Ch El (ft)	686.31	Shear (lb/sq ft)		0.97	
Alpha	1.00	Stream Power (lb/ft s)	532.38	0.00	0.00
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	0.23	1.50	0.11
C & E Loss (ft)	0.06	Cum SA (acres)	0.63	0.82	0.40

Plan: PROP 03 CULV_B_PROP RS: 1655.09 Profile: 25 YR

E.G. Elev (ft)	686.32	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.06	Wt. n-Val.	0.035	0.012	0.035
W.S. Elev (ft)	686.26	Reach Len. (ft)	17.75	17.75	17.75
Crit W.S. (ft)		Flow Area (sq ft)	197.55	96.38	191.13
E.G. Slope (ft/ft)	0.000081	Area (sq ft)	197.55	96.38	191.13
Q Total (cfs)	459.10	Flow (cfs)	104.09	255.12	99.89
Top Width (ft)	267.97	Top Width (ft)	122.06	26.36	119.54
Vel Total (ft/s)	0.95	Avg. Vel. (ft/s)	0.53	2.65	0.52
Max Chl Dpth (ft)	3.66	Hydr. Depth (ft)	1.62	3.66	1.60
Conv. Total (cfs)	50969.0	Conv. (cfs)	11555.9	28323.1	11090.0
Length Wtd. (ft)	17.75	Wetted Per. (ft)	122.15	26.36	119.63
Min Ch El (ft)	682.60	Shear (lb/sq ft)	0.01	0.02	0.01
Alpha	4.48	Stream Power (lb/ft s)	424.81	0.00	0.00
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	0.22	1.41	0.11
C & E Loss (ft)	0.06	Cum SA (acres)	0.35	0.74	0.18

Plan: PROP 03 CULV_B_PROP RS: 1786.57 Profile: 100 YR

E.G. Elev (ft)	688.94	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.08	Wt. n-Val.		0.035	
W.S. Elev (ft)	688.86	Reach Len. (ft)	5.47	5.47	5.47
Crit W.S. (ft)		Flow Area (sq ft)		279.25	
E.G. Slope (ft/ft)	0.001606	Area (sq ft)		279.25	
Q Total (cfs)	637.30	Flow (cfs)		637.30	
Top Width (ft)	179.68	Top Width (ft)		179.68	
Vel Total (ft/s)	2.28	Avg. Vel. (ft/s)		2.28	
Max Chl Dpth (ft)	2.55	Hydr. Depth (ft)		1.55	
Conv. Total (cfs)	15900.9	Conv. (cfs)		15900.9	
Length Wtd. (ft)	5.47	Wetted Per. (ft)		179.78	
Min Ch El (ft)	686.31	Shear (lb/sq ft)		0.16	
Alpha	1.00	Stream Power (lb/ft s)	532.38	0.00	0.00
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	0.33	1.96	0.17
C & E Loss (ft)	0.01	Cum SA (acres)	0.75	0.85	0.48

Plan: PROP 03 CULV_B_PROP RS: 1655.09 Profile: 100 YR

E.G. Elev (ft)	687.00	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.06	Wt. n-Val.	0.035	0.012	0.035
W.S. Elev (ft)	686.94	Reach Len. (ft)	17.75	17.75	17.75
Crit W.S. (ft)		Flow Area (sq ft)	282.34	114.46	274.54
E.G. Slope (ft/ft)	0.000067	Area (sq ft)	282.34	114.46	274.54
Q Total (cfs)	637.30	Flow (cfs)	168.01	307.64	161.65
Top Width (ft)	275.16	Top Width (ft)	125.15	26.36	123.65
Vel Total (ft/s)	0.95	Avg. Vel. (ft/s)	0.60	2.69	0.59
Max Chl Dpth (ft)	4.34	Hydr. Depth (ft)	2.26	4.34	2.22
Conv. Total (cfs)	78143.7	Conv. (cfs)	20600.5	37721.8	19821.4
Length Wtd. (ft)	17.75	Wetted Per. (ft)	125.31	26.36	123.79
Min Ch El (ft)	682.60	Shear (lb/sq ft)	0.01	0.02	0.01
Alpha	4.07	Stream Power (lb/ft s)	424.81	0.00	0.00
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	0.31	1.69	0.16
C & E Loss (ft)	0.09	Cum SA (acres)	0.42	0.77	0.22

Plan: PROP 03 CULV_B_PROP RS: 1781.10 Profile: 25 YR

E.G. Elev (ft)	687.82	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.19	Wt. n-Val.	0.035	0.012	0.035
W.S. Elev (ft)	687.62	Reach Len. (ft)	126.01	126.01	126.01
Crit W.S. (ft)	685.39	Flow Area (sq ft)	55.31	107.35	32.73
E.G. Slope (ft/ft)	0.000128	Area (sq ft)	76.70	107.35	32.85
Q Total (cfs)	459.10	Flow (cfs)	39.56	401.69	17.85
Top Width (ft)	121.80	Top Width (ft)	68.53	24.54	28.73
Vel Total (ft/s)	2.35	Avg. Vel. (ft/s)	0.72	3.74	0.55
Max Chl Dpth (ft)	4.37	Hydr. Depth (ft)	1.84	4.37	1.24
Conv. Total (cfs)	40637.9	Conv. (cfs)	3501.6	35556.2	1580.1
Length Wtd. (ft)	126.01	Wetted Per. (ft)	30.38	24.54	26.99
Min Ch El (ft)	683.25	Shear (lb/sq ft)	0.01	0.03	0.01
Alpha	2.23	Stream Power (lb/ft s)	531.79	0.00	0.00
Frctn Loss (ft)		Cum Volume (acre-ft)	0.22	1.49	0.11
C & E Loss (ft)		Cum SA (acres)	0.63	0.81	0.39

Plan: PROP 03 CULV_B_PROP RS: 1637.34 Profile: 25 YR

E.G. Elev (ft)	686.25	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.27	Wt. n-Val.		0.035	
W.S. Elev (ft)	685.98	Reach Len. (ft)	13.93	13.93	13.93
Crit W.S. (ft)		Flow Area (sq ft)		125.87	
E.G. Slope (ft/ft)	0.002759	Area (sq ft)		125.87	
Q Total (cfs)	527.50	Flow (cfs)		527.50	
Top Width (ft)	47.85	Top Width (ft)		47.85	
Vel Total (ft/s)	4.19	Avg. Vel. (ft/s)		4.19	
Max Chl Dpth (ft)	3.43	Hydr. Depth (ft)		2.63	
Conv. Total (cfs)	10043.1	Conv. (cfs)		10043.1	
Length Wtd. (ft)	13.93	Wetted Per. (ft)		48.86	
Min Ch El (ft)	682.55	Shear (lb/sq ft)		0.44	
Alpha	1.00	Stream Power (lb/ft s)	454.71	0.00	0.00
Frctn Loss (ft)	0.04	Cum Volume (acre-ft)	0.18	1.36	0.07
C & E Loss (ft)	0.01	Cum SA (acres)	0.33	0.72	0.16

Plan: PROP 03 CULV_B_PROP RS: 1781.10 Profile: 100 YR

E.G. Elev (ft)	688.93	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.18	Wt. n-Val.	0.035	0.012	0.035
W.S. Elev (ft)	688.75	Reach Len. (ft)	126.01	126.01	126.01
Crit W.S. (ft)	685.89	Flow Area (sq ft)	88.98	134.87	62.27
E.G. Slope (ft/ft)	0.000098	Area (sq ft)	169.83	134.87	79.84
Q Total (cfs)	637.30	Flow (cfs)	76.57	515.02	45.71
Top Width (ft)	176.74	Top Width (ft)	97.59	24.54	54.61
Vel Total (ft/s)	2.23	Avg. Vel. (ft/s)	0.86	3.82	0.73
Max Chl Dpth (ft)	5.50	Hydr. Depth (ft)	2.96	5.50	2.36
Conv. Total (cfs)	64361.1	Conv. (cfs)	7733.2	52012.1	4615.9
Length Wtd. (ft)	126.01	Wetted Per. (ft)	30.38	24.54	26.99
Min Ch El (ft)	683.25	Shear (lb/sq ft)	0.02	0.03	0.01
Alpha	2.40	Stream Power (lb/ft s)	531.79	0.00	0.00
Frctn Loss (ft)		Cum Volume (acre-ft)	0.31	1.93	0.16
C & E Loss (ft)		Cum SA (acres)	0.74	0.84	0.47

Plan: PROP 03 CULV_B_PROP RS: 1637.34 Profile: 100 YR

E.G. Elev (ft)	686.91	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.35	Wt. n-Val.		0.035	
W.S. Elev (ft)	686.56	Reach Len. (ft)	13.93	13.93	13.93
Crit W.S. (ft)		Flow Area (sq ft)		154.57	
E.G. Slope (ft/ft)	0.002992	Area (sq ft)		154.57	
Q Total (cfs)	735.20	Flow (cfs)		735.20	
Top Width (ft)	51.55	Top Width (ft)		51.55	
Vel Total (ft/s)	4.76	Avg. Vel. (ft/s)		4.76	
Max Chl Dpth (ft)	4.01	Hydr. Depth (ft)		3.00	
Conv. Total (cfs)	13440.2	Conv. (cfs)		13440.2	
Length Wtd. (ft)	13.93	Wetted Per. (ft)		52.73	
Min Ch El (ft)	682.55	Shear (lb/sq ft)		0.55	
Alpha	1.00	Stream Power (lb/ft s)	454.71	0.00	0.00
Frctn Loss (ft)	0.05	Cum Volume (acre-ft)	0.26	1.63	0.11
C & E Loss (ft)	0.01	Cum SA (acres)	0.39	0.75	0.19

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WILLIAMSON COUNTY 1848

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SHEET 06 OF 06

FED. RD. DIV. RD.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				138

CULVERT C

Label	Start Node	Stop Node	Length (ft)	Flow (cfs)	Slope (ft/ft)	Diameter (in)	Manning's n	Friction Slope (ft/ft)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Velocity (In) (ft/s)	Velocity (Out) (ft/s)	Upstream Structure Velocity Head (ft)	Velocity Head (Out) (ft)	Upstream Structure Headloss Coefficient	Headloss (ft)	Invert (Start) (ft)	Invert (Stop) (ft)
100 YR																		
C-3	ILHG C1	ILHG C2	29	40.4	0.006	42	0.013	0.002	724.3	724.25	4.2	4.2	0.27	0.27	1.25	0.05	720.02	719.85
C-2	ILHG C2	B45DH	6.5	80.8	0.008	42	0.013	0.006	723.29	723.25	8.4	8.4	1.1	1.1	0.5	0.04	719.75	719.7
C-1	B45DH	C-1	119.1	80.8	0.008	42	0.013	0.008	722.51	721.35	9.77	10.55	1.48	1.73	0.5	1.16	719.7	718.75
25 YR																		
C-3	ILHG C1	ILHG C2	29	29.1	0.006	42	0.013	0.001	723.3	723.29	3.11	3.04	0.15	0.14	1.25	0.01	720.02	719.85
C-2	ILHG C2	B45DH	6.5	58.2	0.008	42	0.013	0.003	722.63	722.63	6.88	6.77	0.74	0.71	0.5	0	719.75	719.7
C-1	B45DH	C-1	119.1	58.2	0.008	42	0.013	0.007	722.09	720.82	8.32	9.83	1.07	1.5	0.5	1.27	719.7	718.75

LINE AA (10 YR.)

Label	Start Node	Stop Node	Length (ft)	Flow (cfs)	Slope (ft/ft)	Size	Manning's n	Friction Slope (ft/ft)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Velocity (In) (ft/s)	Velocity (Out) (ft/s)	Upstream Structure Velocity Head (ft)	Velocity Head (Out) (ft)	Upstream Structure Headloss Coefficient	Headloss (ft)	Invert (Start) (ft)	Invert (Stop) (ft)
A-6	HW AA5	MH-AA6	136.5	11.23	0.005	24.0 in	0.013	0.005	703.98	703.25	5.6	5.69	0.49	0.5	1.5	0.73	702.76	702.05
A-5	MH-AA6	B-45DHA1	3.4	11.04	0.079	24.0 in	0.013	0.058	701.24	701.22	5.66	4.56	0.5	0.32	0.5	0.02	700.05	699.78
A-4	B-45DHA1	B-45DHA2	24	11.04	0.078	24.0 in	0.013	0.075	700.97	699.34	5.66	4.56	0.5	0.32	0.5	1.63	699.78	697.91
A-3	B-45DHA2	GI AA2	11.3	11.03	0.078	24.0 in	0.013	0.035	699.1	699	5.65	3.52	0.5	0.19	0.5	0.1	697.91	697.02
A-2	GI AA2	GI AA1	236	16.68	0.008	24.0 in	0.013	0.008	698.39	696.4	6.73	7.21	0.7	0.81	0.5	1.99	696.92	695.02
A-1	GI AA1	O-AA	367.2	11.39	0.006	24.0 in	0.013	0.006	696.13	693.81	5.72	6.01	0.51	0.56	0.5	2.32	694.92	692.65

LINE BB (10 YR.)

Label	Start Node	Stop Node	Length (ft)	Flow (cfs)	Slope (ft/ft)	Size	Manning's n	Friction Slope (ft/ft)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Velocity (In) (ft/s)	Velocity (Out) (ft/s)	Upstream Structure Velocity Head (ft)	Velocity Head (Out) (ft)	Upstream Structure Headloss Coefficient	Headloss (ft)	Invert (Start) (ft)	Invert (Stop) (ft)
B-1	GI BB2	GI BB1	106.3	10.71	0.006	24 Inch	0.013	0.002	688.39	688.18	3.6	3.41	0.2	0.18	1.25	0.21	686.59	685.92
B-2	GI BB1	B-30DH	143	10.56	0.005	24 Inch	0.013	0.002	688.09	687.78	3.36	3.36	0.18	0.18	0.5	0.31	685.92	685.2
B-3	B-30DH	O-BB	19.8	10.46	0.005	24 Inch	0.013	0.002	687.65	687.61	3.33	3.33	0.17	0.17	0.75	0.04	685.2	685.1

CULVERT C OUTFALL

Label	Elevation (Ground) (ft)	Set Rim to Ground Elevation?	Elevation (Invert) (ft)	Boundary Condition Type	Boundary Element	Elevation (User Defined Tailwater) (ft)	Hydraulic Grade (ft)	Flow (Total Out) (cfs)
100 YR								
C-1	723.25	TRUE	718.75	User Defined Tailwater		721.35	721.35	80.8
25 YR								
C-1	723.25	TRUE	718.75	User Defined Tailwater		720.82	720.82	58.20

Culvert C Tailwater Calculations (Manning's Calculation)

Roughness Coefficient	Channel Slope (ft/ft)	Left Side Slope (ft/ft)	Right Side Slope (ft/ft)	Bottom Width (ft)	Discharge (cfs)	Normal Depth (ft)	Flow Area (sq ft)	Wetted Perimeter (ft)	Hydraulic Radius (ft)	Top Width (ft)	Critical Depth (ft)	Critical Slope (ft/ft)	Velocity (ft/s)
25 YR													
0.035	0.01886	3.00	3.00	6.50	90.78	1.44	15.59	15.61	1.00	15.14	1.45	0.01838	5.82
100 YR													
0.04	0.01886	3.00	3.00	6.50	117.13	1.64	18.74	16.88	1.11	16.34	1.67	0.01773	6.25

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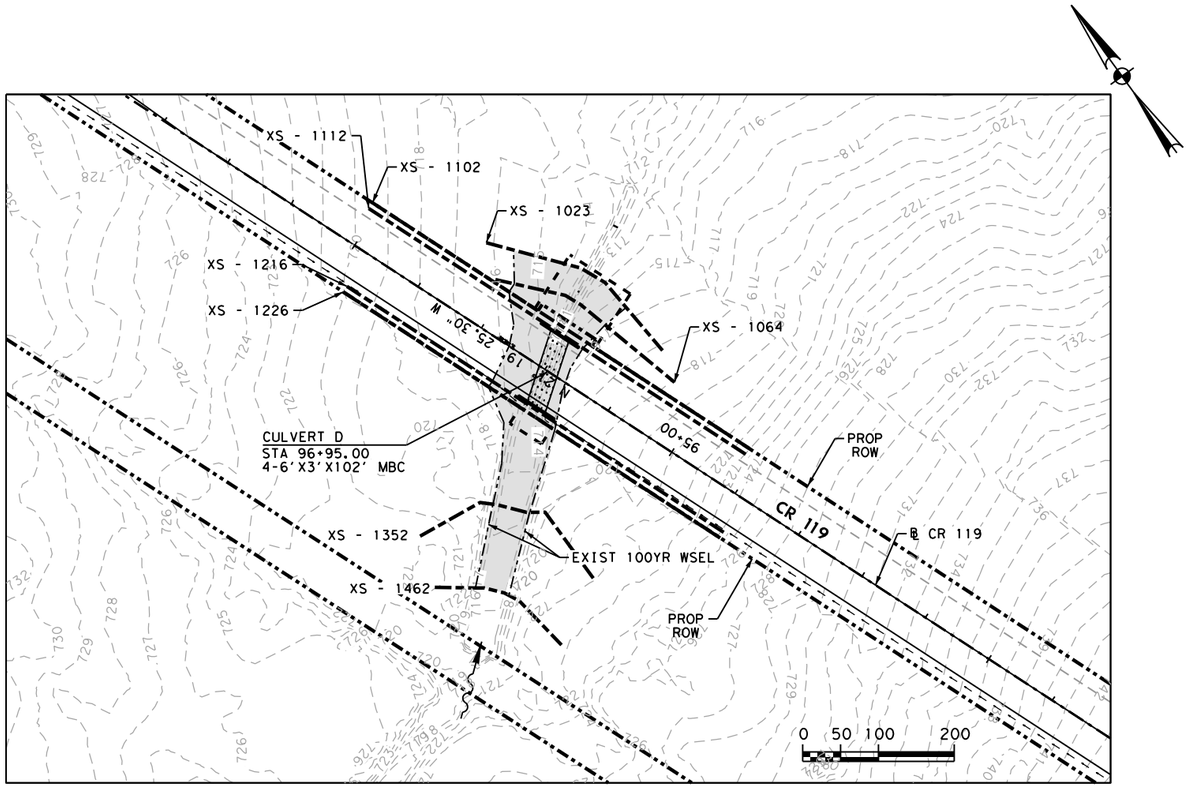
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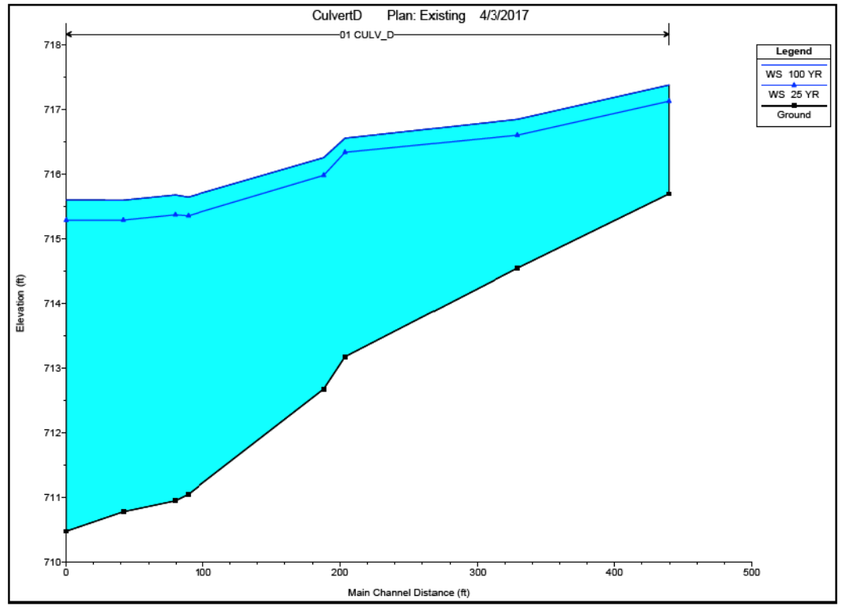
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STORM SEWER

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SHEET 01 OF 01

FED. RD. DIV. NO.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				139





HEC-RAS Plan: Existing River: 01 Reach: CULV_D

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
CULV_D	1462.26	100 YR	422.60	715.69	717.37	717.37	718.06	0.012103	6.67	63.33	46.35	1.01
CULV_D	1462.26	25 YR	321.00	715.69	717.12	717.12	717.71	0.012653	6.17	51.99	44.24	1.00
CULV_D	1351.68	100 YR	422.60	714.54	716.84		717.19	0.004436	4.75	89.00	51.07	0.63
CULV_D	1351.68	25 YR	321.00	714.54	716.60		716.87	0.003943	4.18	76.76	48.82	0.59
CULV_D	1226.32	100 YR	422.60	713.17	716.55		716.70	0.002724	3.13	135.14	101.19	0.48
CULV_D	1226.32	25 YR	321.00	713.17	716.33		716.45	0.002278	2.80	114.46	88.22	0.43
CULV_D	1216.79	100 YR	422.60	712.67	716.25	716.13	716.60	0.013623	4.76	88.81	93.66	0.86
CULV_D	1216.79	25 YR	321.00	712.67	715.97	715.94	716.35	0.017563	4.93	65.12	78.72	0.96
CULV_D	1111.62	100 YR	422.60	711.04	715.64		715.93	0.003869	4.61	115.01	107.05	0.53
CULV_D	1111.62	25 YR	321.00	711.04	715.35		715.60	0.003865	4.22	88.15	78.43	0.52
CULV_D	1102.09	100 YR	422.60	710.94	715.67		715.86	0.003248	3.64	131.63	120.60	0.47
CULV_D	1102.09	25 YR	321.00	710.94	715.37		715.55	0.003728	3.46	99.00	92.29	0.49
CULV_D	1064.13	100 YR	422.60	710.77	715.59		715.77	0.001724	3.97	162.76	133.99	0.37
CULV_D	1064.13	25 YR	321.00	710.77	715.28		715.45	0.001673	3.67	125.41	108.12	0.36
CULV_D	1022.53	100 YR	422.60	710.47	715.59	714.36	715.69	0.001000	3.00	216.67	170.53	0.29
CULV_D	1022.53	25 YR	321.00	710.47	715.28	713.98	715.37	0.001000	2.82	167.58	142.93	0.28

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EXISTING DRAINAGE HYDRAULIC CALCULATIONS CULVERT D

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SHEET 01 OF 04

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6	TEXAS		CR119	14	WILLIAMSON				140

HEC-RAS Plan: Proposed River: 01 Reach: CULV_D

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
CULV_D	1462.26	100 YR	422.60	715.69	717.41	717.37	718.07	0.011150	6.49	65.09	46.67	0.97
CULV_D	1462.26	25 YR	321.00	715.69	717.14	717.12	717.71	0.012196	6.10	52.62	44.36	0.99
CULV_D	1351.68	100 YR	422.60	714.54	716.62		717.08	0.006572	5.43	77.79	49.01	0.76
CULV_D	1351.68	25 YR	321.00	714.54	716.41	716.06	716.76	0.005662	4.73	67.88	47.12	0.69
CULV_D	1226.32	100 YR	422.60	714.00	716.26		716.44	0.003186	3.38	124.96	93.59	0.52
CULV_D	1226.32	25 YR	321.00	714.00	715.53		715.88	0.008756	4.77	67.32	64.23	0.82
CULV_D	1216.79	100 YR	422.60	712.67	716.28	714.29	716.39	0.000886	2.61	161.76	127.75	0.26
CULV_D	1216.79	25 YR	321.00	712.67	715.67	714.03	715.77	0.001052	2.49	129.11	52.76	0.28
CULV_D	1205.00		Culvert									
CULV_D	1111.62	100 YR	422.60	711.60	714.91	713.23	715.04	0.001269	2.95	143.21	215.32	0.31
CULV_D	1111.62	25 YR	321.00	711.60	714.45	712.97	714.56	0.001269	2.68	119.99	194.53	0.30
CULV_D	1102.09	100 YR	454.40	711.10	714.93		715.01	0.001079	2.33	194.72	89.35	0.28
CULV_D	1102.09	25 YR	343.20	711.10	714.46		714.54	0.001007	2.19	156.52	74.83	0.27
CULV_D	1064.13	100 YR	454.40	710.77	714.86		714.97	0.001033	2.72	168.66	73.22	0.28
CULV_D	1064.13	25 YR	343.20	710.77	714.41		714.50	0.001001	2.44	140.45	56.51	0.27
CULV_D	1022.53	100 YR	454.40	710.50	714.80	712.80	714.93	0.001000	2.92	173.78	102.61	0.29
CULV_D	1022.53	25 YR	343.20	710.50	714.35	712.46	714.46	0.001000	2.65	135.81	70.07	0.28

Plan: Proposed 01 CULV_D RS: 1205.00 Culv Group: Culvert #1 Profile: 25 YR

Q Culv Group (cfs)	321.00	Culv Full Len (ft)	
# Barrels	4	Culv Vel US (ft/s)	7.55
Q Barrel (cfs)	80.25	Culv Vel DS (ft/s)	4.68
E.G. US. (ft)	715.77	Culv Inv El Up (ft)	712.67
W.S. US. (ft)	715.67	Culv Inv El Dn (ft)	711.60
E.G. DS (ft)	714.57	Culv Frctn Ls (ft)	0.53
W.S. DS (ft)	714.46	Culv Exit Loss (ft)	0.23
Delta EG (ft)	1.20	Culv Entr Loss (ft)	0.44
Delta WS (ft)	1.21	Q Weir (cfs)	
E.G. IC (ft)	715.51	Weir Sta Lft (ft)	
E.G. OC (ft)	715.77	Weir Sta Rgt (ft)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (ft)	714.44	Weir Max Depth (ft)	
Culv WS Outlet (ft)	714.46	Weir Avg Depth (ft)	
Culv Nml Depth (ft)	1.17	Weir Flow Area (sq ft)	
Culv Crt Depth (ft)	1.77	Min El Weir Flow (ft)	721.06

Plan: Proposed 01 CULV_D RS: 1205.00 Culv Group: Culvert #1 Profile: 100 YR

Q Culv Group (cfs)	422.60	Culv Full Len (ft)	36.91
# Barrels	4	Culv Vel US (ft/s)	8.28
Q Barrel (cfs)	105.65	Culv Vel DS (ft/s)	5.87
E.G. US. (ft)	716.39	Culv Inv El Up (ft)	712.67
W.S. US. (ft)	716.28	Culv Inv El Dn (ft)	711.60
E.G. DS (ft)	715.05	Culv Frctn Ls (ft)	0.41
W.S. DS (ft)	714.92	Culv Exit Loss (ft)	0.40
Delta EG (ft)	1.34	Culv Entr Loss (ft)	0.53
Delta WS (ft)	1.37	Q Weir (cfs)	
E.G. IC (ft)	716.11	Weir Sta Lft (ft)	
E.G. OC (ft)	716.39	Weir Sta Rgt (ft)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (ft)	714.80	Weir Max Depth (ft)	
Culv WS Outlet (ft)	714.60	Weir Avg Depth (ft)	
Culv Nml Depth (ft)	1.41	Weir Flow Area (sq ft)	
Culv Crt Depth (ft)	2.13	Min El Weir Flow (ft)	721.06

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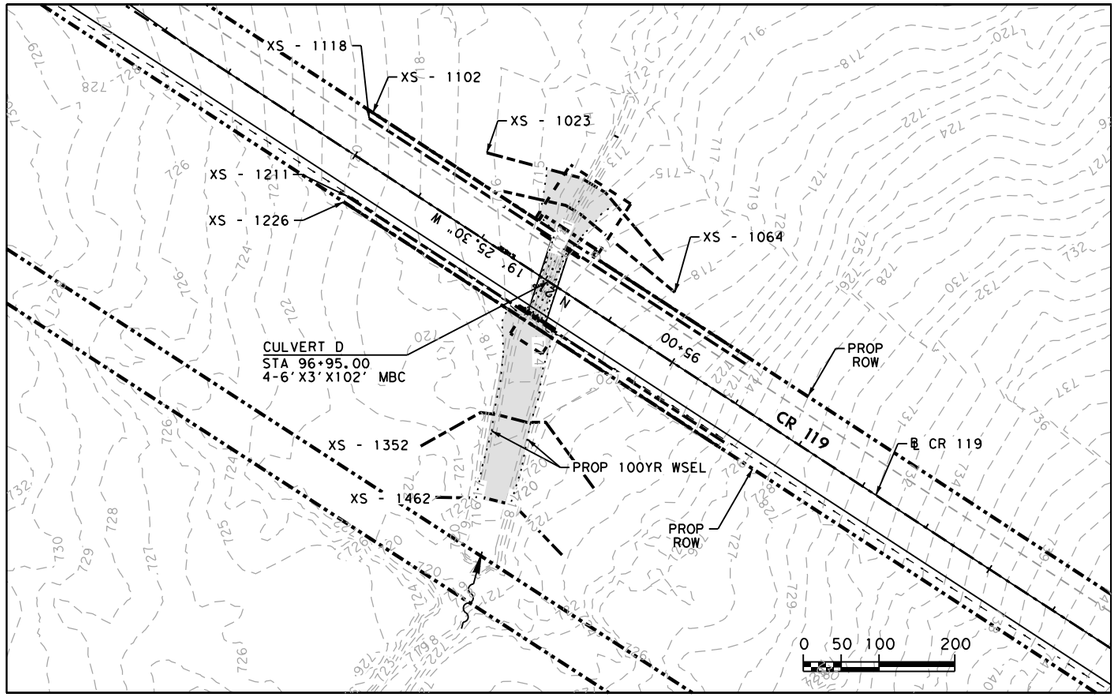
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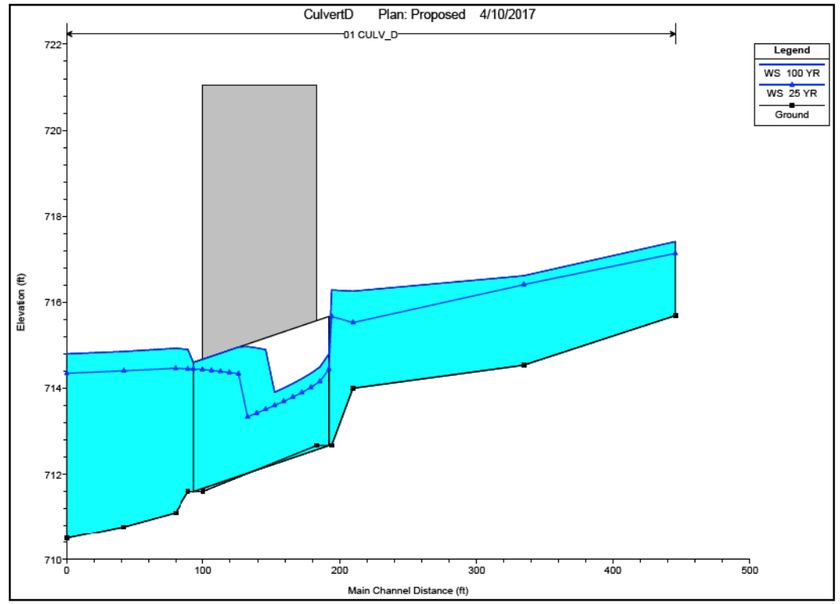
PROPOSED DRAINAGE HYDRAULIC CALCULATIONS CULVERT D

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SHEET 02 OF 04

FED. RD. DIV. RD.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				141





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SHEET 03 OF 04

FED. RD. DIV. RD.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				142

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Plan: Proposed 01 CULV_D RS: 1226.32 Profile: 25 YR

E.G. Elev (ft)	715.88	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.35	Wt. n-Val.		0.030	
W.S. Elev (ft)	715.53	Reach Len. (ft)	15.00	15.53	16.00
Crit W.S. (ft)		Flow Area (sq ft)		67.32	
E.G. Slope (ft/ft)	0.008756	Area (sq ft)		67.32	
Q Total (cfs)	321.00	Flow (cfs)		321.00	
Top Width (ft)	64.23	Top Width (ft)		64.23	
Vel Total (ft/s)	4.77	Avg. Vel. (ft/s)		4.77	
Max Chl Dpth (ft)	1.53	Hydr. Depth (ft)		1.05	
Conv. Total (cfs)	3430.4	Conv. (cfs)		3430.4	
Length Wtd. (ft)	15.53	Wetted Per. (ft)		64.52	
Min Ch El (ft)	714.00	Shear (lb/sq ft)		0.57	
Alpha	1.00	Stream Power (lb/ft s)	600.00	0.00	0.00
Frctn Loss (ft)	0.04	Cum Volume (acre-ft)	0.01	0.35	0.00
C & E Loss (ft)	0.08	Cum SA (acres)	0.19	0.27	0.01

Plan: Proposed 01 CULV_D RS: 1226.32 Profile: 100 YR

E.G. Elev (ft)	716.44	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.18	Wt. n-Val.		0.030	
W.S. Elev (ft)	716.26	Reach Len. (ft)	15.00	15.53	16.00
Crit W.S. (ft)		Flow Area (sq ft)		124.96	
E.G. Slope (ft/ft)	0.003186	Area (sq ft)		124.96	
Q Total (cfs)	422.60	Flow (cfs)		422.60	
Top Width (ft)	93.59	Top Width (ft)		93.59	
Vel Total (ft/s)	3.38	Avg. Vel. (ft/s)		3.38	
Max Chl Dpth (ft)	2.26	Hydr. Depth (ft)		1.34	
Conv. Total (cfs)	7486.9	Conv. (cfs)		7486.9	
Length Wtd. (ft)	15.53	Wetted Per. (ft)		93.93	
Min Ch El (ft)	714.00	Shear (lb/sq ft)		0.26	
Alpha	1.00	Stream Power (lb/ft s)	600.00	0.00	0.00
Frctn Loss (ft)	0.02	Cum Volume (acre-ft)	0.02	0.44	0.01
C & E Loss (ft)	0.02	Cum SA (acres)	0.25	0.30	0.09

Plan: Proposed 01 CULV_D RS: 1216.79 Profile: 25 YR

E.G. Elev (ft)	715.77	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.10	Wt. n-Val.		0.035	
W.S. Elev (ft)	715.67	Reach Len. (ft)	105.00	105.00	105.00
Crit W.S. (ft)	714.03	Flow Area (sq ft)		129.11	
E.G. Slope (ft/ft)	0.001052	Area (sq ft)		129.14	
Q Total (cfs)	321.00	Flow (cfs)		321.00	
Top Width (ft)	52.76	Top Width (ft)		52.76	
Vel Total (ft/s)	2.49	Avg. Vel. (ft/s)		2.49	
Max Chl Dpth (ft)	3.00	Hydr. Depth (ft)		2.47	
Conv. Total (cfs)	9897.4	Conv. (cfs)		9897.4	
Length Wtd. (ft)	105.00	Wetted Per. (ft)		53.21	
Min Ch El (ft)	712.67	Shear (lb/sq ft)		0.16	
Alpha	1.00	Stream Power (lb/ft s)	600.01	0.00	0.00
Frctn Loss (ft)		Cum Volume (acre-ft)	0.01	0.32	0.00
C & E Loss (ft)		Cum SA (acres)	0.19	0.25	0.01

Plan: Proposed 01 CULV_D RS: 1216.79 Profile: 100 YR

E.G. Elev (ft)	716.39	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.11	Wt. n-Val.		0.035	
W.S. Elev (ft)	716.28	Reach Len. (ft)	105.00	105.00	105.00
Crit W.S. (ft)	714.29	Flow Area (sq ft)		161.76	
E.G. Slope (ft/ft)	0.000886	Area (sq ft)	0.53	164.70	12.48
Q Total (cfs)	422.60	Flow (cfs)		422.60	
Top Width (ft)	127.75	Top Width (ft)	12.44	61.66	53.65
Vel Total (ft/s)	2.61	Avg. Vel. (ft/s)		2.61	
Max Chl Dpth (ft)	3.61	Hydr. Depth (ft)		3.02	
Conv. Total (cfs)	14197.9	Conv. (cfs)		14197.9	
Length Wtd. (ft)	105.00	Wetted Per. (ft)		54.42	
Min Ch El (ft)	712.67	Shear (lb/sq ft)		0.16	
Alpha	1.00	Stream Power (lb/ft s)	600.01	0.00	0.00
Frctn Loss (ft)		Cum Volume (acre-ft)	0.02	0.39	0.01
C & E Loss (ft)		Cum SA (acres)	0.25	0.27	0.08

Plan: Proposed 01 CULV_D RS: 1111.62 Profile: 25 YR

E.G. Elev (ft)	714.57	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.11	Wt. n-Val.		0.035	
W.S. Elev (ft)	714.46	Reach Len. (ft)	9.00	9.53	9.00
Crit W.S. (ft)	712.97	Flow Area (sq ft)		120.37	
E.G. Slope (ft/ft)	0.001257	Area (sq ft)	52.11	120.66	
Q Total (cfs)	321.00	Flow (cfs)		321.00	
Top Width (ft)	195.56	Top Width (ft)	143.90	51.66	
Vel Total (ft/s)	2.67	Avg. Vel. (ft/s)		2.67	
Max Chl Dpth (ft)	2.86	Hydr. Depth (ft)		2.40	
Conv. Total (cfs)	9055.2	Conv. (cfs)		9055.2	
Length Wtd. (ft)	9.53	Wetted Per. (ft)		51.03	
Min Ch El (ft)	711.60	Shear (lb/sq ft)		0.19	
Alpha	1.00	Stream Power (lb/ft s)	600.00	0.00	0.00
Frctn Loss (ft)	0.01	Cum Volume (acre-ft)	0.01	0.29	0.00
C & E Loss (ft)	0.02	Cum SA (acres)	0.02	0.12	0.01

Plan: Proposed 01 CULV_D RS: 1111.62 Profile: 100 YR

E.G. Elev (ft)	715.05	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.13	Wt. n-Val.		0.035	
W.S. Elev (ft)	714.92	Reach Len. (ft)	9.00	9.53	9.00
Crit W.S. (ft)	713.23	Flow Area (sq ft)		143.75	
E.G. Slope (ft/ft)	0.001254	Area (sq ft)	122.96	145.06	
Q Total (cfs)	422.60	Flow (cfs)		422.60	
Top Width (ft)	215.68	Top Width (ft)	160.99	54.69	
Vel Total (ft/s)	2.94	Avg. Vel. (ft/s)		2.94	
Max Chl Dpth (ft)	3.32	Hydr. Depth (ft)		2.78	
Conv. Total (cfs)	11933.2	Conv. (cfs)		11933.2	
Length Wtd. (ft)	9.53	Wetted Per. (ft)		52.58	
Min Ch El (ft)	711.60	Shear (lb/sq ft)		0.21	
Alpha	1.00	Stream Power (lb/ft s)	600.00	0.00	0.00
Frctn Loss (ft)	0.01	Cum Volume (acre-ft)	0.02	0.34	0.01
C & E Loss (ft)	0.02	Cum SA (acres)	0.04	0.13	0.02

Plan: Proposed 01 CULV_D RS: 1102.09 Profile: 25 YR

E.G. Elev (ft)	714.54	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.07	Wt. n-Val.		0.035	
W.S. Elev (ft)	714.46	Reach Len. (ft)	37.00	37.96	57.00
Crit W.S. (ft)		Flow Area (sq ft)		156.52	
E.G. Slope (ft/ft)	0.001007	Area (sq ft)		156.52	
Q Total (cfs)	343.20	Flow (cfs)		343.20	
Top Width (ft)	74.83	Top Width (ft)		74.83	
Vel Total (ft/s)	2.19	Avg. Vel. (ft/s)		2.19	
Max Chl Dpth (ft)	3.36	Hydr. Depth (ft)		2.09	
Conv. Total (cfs)	10817.5	Conv. (cfs)		10817.5	
Length Wtd. (ft)	37.96	Wetted Per. (ft)		75.36	
Min Ch El (ft)	711.10	Shear (lb/sq ft)		0.13	
Alpha	1.00	Stream Power (lb/ft s)	600.00	0.00	0.00
Frctn Loss (ft)	0.04	Cum Volume (acre-ft)	0.00	0.26	0.00
C & E Loss (ft)	0.00	Cum SA (acres)	0.00	0.11	0.01

Plan: Proposed 01 CULV_D RS: 1102.09 Profile: 100 YR

E.G. Elev (ft)	715.01	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.08	Wt. n-Val.		0.035	
W.S. Elev (ft)	714.93	Reach Len. (ft)	37.00	37.96	57.00
Crit W.S. (ft)		Flow Area (sq ft)		194.72	
E.G. Slope (ft/ft)	0.001079	Area (sq ft)		194.72	
Q Total (cfs)	454.40	Flow (cfs)		454.40	
Top Width (ft)	89.35	Top Width (ft)		89.35	
Vel Total (ft/s)	2.33	Avg. Vel. (ft/s)		2.33	
Max Chl Dpth (ft)	3.83	Hydr. Depth (ft)		2.18	
Conv. Total (cfs)	13836.0	Conv. (cfs)		13836.0	
Length Wtd. (ft)	37.96	Wetted Per. (ft)		89.93	
Min Ch El (ft)	711.10	Shear (lb/sq ft)		0.15	
Alpha	1.00	Stream Power (lb/ft s)	600.00	0.00	0.00
Frctn Loss (ft)	0.04	Cum Volume (acre-ft)	0.01	0.31	0.01
C & E Loss (ft)	0.00	Cum SA (acres)	0.02	0.11	0.02

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CR 119

WILLIAMSON COUNTY
1848

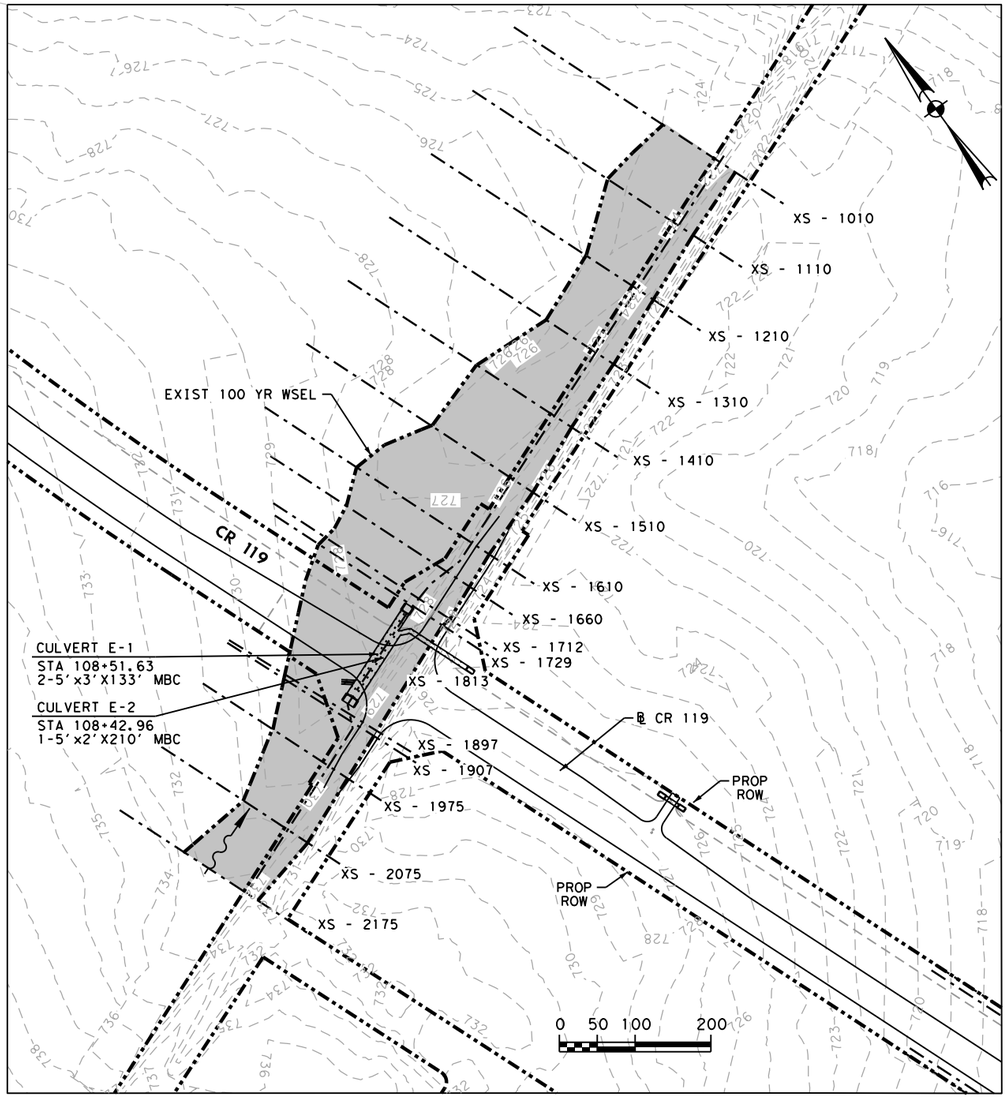
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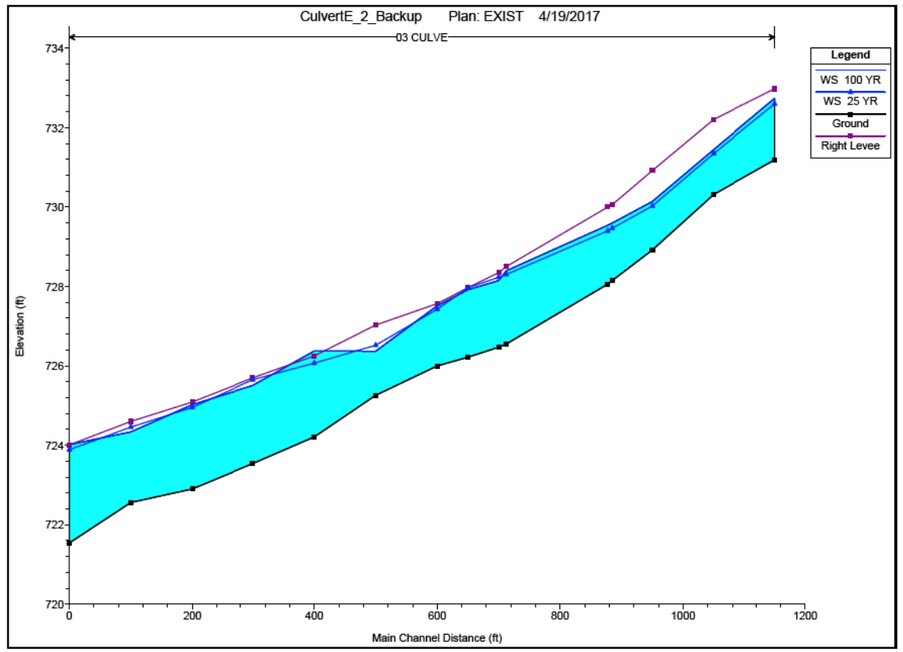
PROPOSED DRAINAGE HYDRAULIC CALCULATIONS CULVERT D

STA 96+95.00

SHEET 04 OF 04

FED. RD. DIV. RD.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				143





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WILLIAMSON COUNTY
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EXISTING DRAINAGE HYDRAULIC CALCULATIONS CULVERT E-1

STA 108+51.63 & STA 108+42.96

SHEET 01 OF 05

FED. RD. DIV. RD.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				144

HEC-RAS Plan: EXIST River: 03 Reach: CULVE

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
CULVE	2174.913	100 YR	221.90	731.19	732.74	732.53	732.86	0.006739	3.34	80.05	115.28	0.60
CULVE	2174.913	25 YR	159.80	731.19	732.60	732.44	732.70	0.006892	3.05	64.62	112.70	0.59
CULVE	2074.909	100 YR	221.90	730.32	731.45	731.45	731.74	0.021613	5.34	52.68	98.44	1.05
CULVE	2074.909	25 YR	159.80	730.32	731.35	731.35	731.58	0.020482	4.75	42.98	93.41	1.00
CULVE	1974.905	100 YR	221.90	728.92	730.14	729.95	730.27	0.008409	3.25	76.62	120.58	0.65
CULVE	1974.905	25 YR	159.80	728.92	730.03	729.85	730.13	0.007783	2.81	63.30	115.32	0.61
CULVE	1907.012	100 YR	221.90	728.15	729.60	729.45	729.72	0.008594	3.42	82.28	148.32	0.65
CULVE	1907.012	25 YR	159.80	728.15	729.47	729.34	729.57	0.009409	3.18	63.62	136.41	0.63
CULVE	1896.926	100 YR	221.90	728.06	729.54	729.37	729.65	0.008036	3.34	84.04	148.54	0.64
CULVE	1896.926	25 YR	159.80	728.06	729.40	729.27	729.50	0.009081	3.16	64.10	135.17	0.67
CULVE	1729.158	100 YR	221.90	726.55	728.40	728.22	728.48	0.006278	3.21	97.92	186.50	0.53
CULVE	1729.158	25 YR	159.80	726.55	728.30	728.13	728.37	0.005353	2.85	81.15	171.40	0.53
CULVE	1711.737	100 YR	221.90	726.47	728.15	728.15	728.36	0.016493	4.83	67.61	158.43	0.92
CULVE	1711.737	25 YR	159.80	726.47	728.23	728.05	728.31	0.005228	2.89	81.25	171.72	0.53
CULVE	1659.989	100 YR	221.90	726.22	727.92	727.92	728.10	0.014750	4.66	72.83	182.29	0.88
CULVE	1659.989	25 YR	159.80	726.22	727.96	727.83	728.04	0.005636	2.98	81.61	192.66	0.55
CULVE	1609.989	100 YR	221.90	726.00	727.52	727.52	727.70	0.016075	4.70	70.39	177.23	0.91
CULVE	1609.989	25 YR	159.80	726.00	727.43	727.43	727.59	0.015552	4.30	55.82	159.48	0.88
CULVE	1509.989	100 YR	221.90	725.26	726.37	726.37	726.57	0.022449	4.27	61.73	146.44	1.01
CULVE	1509.989	25 YR	159.80	725.26	726.52	726.27	726.58	0.004766	2.14	85.19	166.97	0.47
CULVE	1409.988	100 YR	221.90	724.21	726.37	725.90	726.38	0.000040	0.32	420.41	234.50	0.05
CULVE	1409.988	25 YR	159.80	724.21	726.07	725.79	726.14	0.003954	2.66	77.89	120.85	0.47
CULVE	1309.988	100 YR	221.90	723.54	725.51	725.51	725.78	0.014756	5.17	56.91	93.76	0.90
CULVE	1309.988	25 YR	159.80	723.54	725.65	725.35	725.74	0.003991	2.93	70.80	102.28	0.48
CULVE	1209.987	100 YR	221.90	722.90	725.02	725.02	725.30	0.013001	5.15	59.21	103.89	0.85
CULVE	1209.987	25 YR	159.80	722.90	724.96	724.90	725.14	0.009472	4.22	52.25	98.77	0.72
CULVE	1109.987	100 YR	221.90	722.56	724.34	724.34	724.58	0.013342	4.99	62.92	116.25	0.85
CULVE	1109.987	25 YR	159.80	722.56	724.46	724.22	724.54	0.003886	2.90	77.41	125.94	0.47
CULVE	1009.986	100 YR	221.90	721.54	724.02	724.02	724.03	0.000088	0.52	334.22	404.53	0.07
CULVE	1009.986	25 YR	159.80	721.54	723.89	723.89	724.07	0.005779	3.96	65.48	201.91	0.59

HEC-RAS Plan: PROP_2 River: 03 Reach: CULVE

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
CULVE	2174.913	100 YR	221.90	731.25	732.74	732.54	732.84	0.006514	3.25	90.34	153.58	0.59
CULVE	2174.913	25 YR	159.80	731.25	732.61	732.44	732.69	0.006820	3.01	70.88	142.46	0.59
CULVE	2074.909	100 YR	221.90	730.32	731.45	731.45	731.74	0.021544	5.32	52.72	98.32	1.05
CULVE	2074.909	25 YR	159.80	730.32	731.35	731.35	731.58	0.020174	4.71	43.22	93.51	1.00
CULVE	1974.905	100 YR	221.90	728.92	730.09	730.09	730.38	0.008111	7.15	68.90	115.73	1.48
CULVE	1974.905	25 YR	159.80	728.92	729.96	729.95	730.21	0.008427	6.42	54.70	110.04	1.45
CULVE	1907.012	100 YR	221.90	726.40	729.83	727.95	729.88	0.000106	1.98	182.08	158.25	0.21
CULVE	1907.012	25 YR	159.80	726.40	729.17	727.67	729.24	0.000167	2.08	95.50	103.73	0.25
CULVE	1896.926	100 YR	221.90	726.30	729.84	727.64	729.88	0.000068	1.70	206.16	163.04	0.17
CULVE	1896.926	25 YR	159.80	726.30	729.19	727.40	729.23	0.000094	1.70	116.78	109.56	0.19
CULVE	1813.042		Culvert									
CULVE	1729.158	100 YR	176.90	725.90	728.30	727.17	728.34	0.000860	1.81	132.02	169.96	0.24
CULVE	1729.158	25 YR	159.80	725.90	728.18	727.10	728.23	0.000979	1.87	112.87	156.30	0.25
CULVE	1711.737	100 YR	178.00	725.84	728.30	727.09	728.33	0.000700	1.66	145.99	180.46	0.22
CULVE	1711.737	25 YR	160.60	725.84	728.18	727.02	728.22	0.000792	1.71	125.49	166.93	0.23
CULVE	1659.989	100 YR	178.00	725.80	727.57	727.57	728.18	0.017296	6.27	28.40	123.51	1.00
CULVE	1659.989	25 YR	160.60	725.80	727.48	727.48	728.05	0.017141	6.07	26.44	81.49	0.99
CULVE	1609.989	100 YR	178.00	725.10	727.67	727.67	727.68	0.000037	0.31	304.91	291.35	0.05
CULVE	1609.989	25 YR	160.60	725.10	727.67	727.67	727.67	0.000030	0.28	304.92	291.36	0.04
CULVE	1509.989	100 YR	178.00	724.61	726.54	726.30	726.60	0.004045	2.60	94.47	169.35	0.47
CULVE	1509.989	25 YR	160.60	724.61	726.49	726.27	726.55	0.004138	2.58	86.67	162.96	0.47
CULVE	1409.988	100 YR	178.00	724.21	726.13	725.84	726.20	0.004034	2.73	83.73	125.51	0.47
CULVE	1409.988	25 YR	160.60	724.21	726.07	725.80	726.15	0.004086	2.66	77.48	120.34	0.47
CULVE	1309.988	100 YR	178.00	723.54	725.71	725.40	725.81	0.003855	2.96	77.46	108.53	0.47
CULVE	1309.988	25 YR	160.60	723.54	725.67	725.36	725.75	0.003794	2.86	72.43	103.99	0.47
CULVE	1209.987	100 YR	178.00	722.90	724.97	724.94	725.19	0.010417	4.53	54.49	100.11	0.75
CULVE	1209.987	25 YR	160.60	722.90	724.93	724.91	725.14	0.010471	4.42	50.37	97.15	0.75
CULVE	1109.987	100 YR	178.00	722.56	724.57	724.26	724.64	0.003037	2.72	91.68	137.39	0.43
CULVE	1109.987	25 YR	160.60	722.56	724.51	724.23	724.58	0.003118	2.68	84.17	131.13	0.43
CULVE	1009.986	100 YR	178.00	721.54	723.89	723.89	724.14	0.007986	4.63	53.97	97.33	0.69
CULVE	1009.986	25 YR	160.60	721.54	723.84	723.84	724.09	0.007839	4.49	49.76	95.12	0.68



CR 119

WILLIAMSON COUNTY 1848

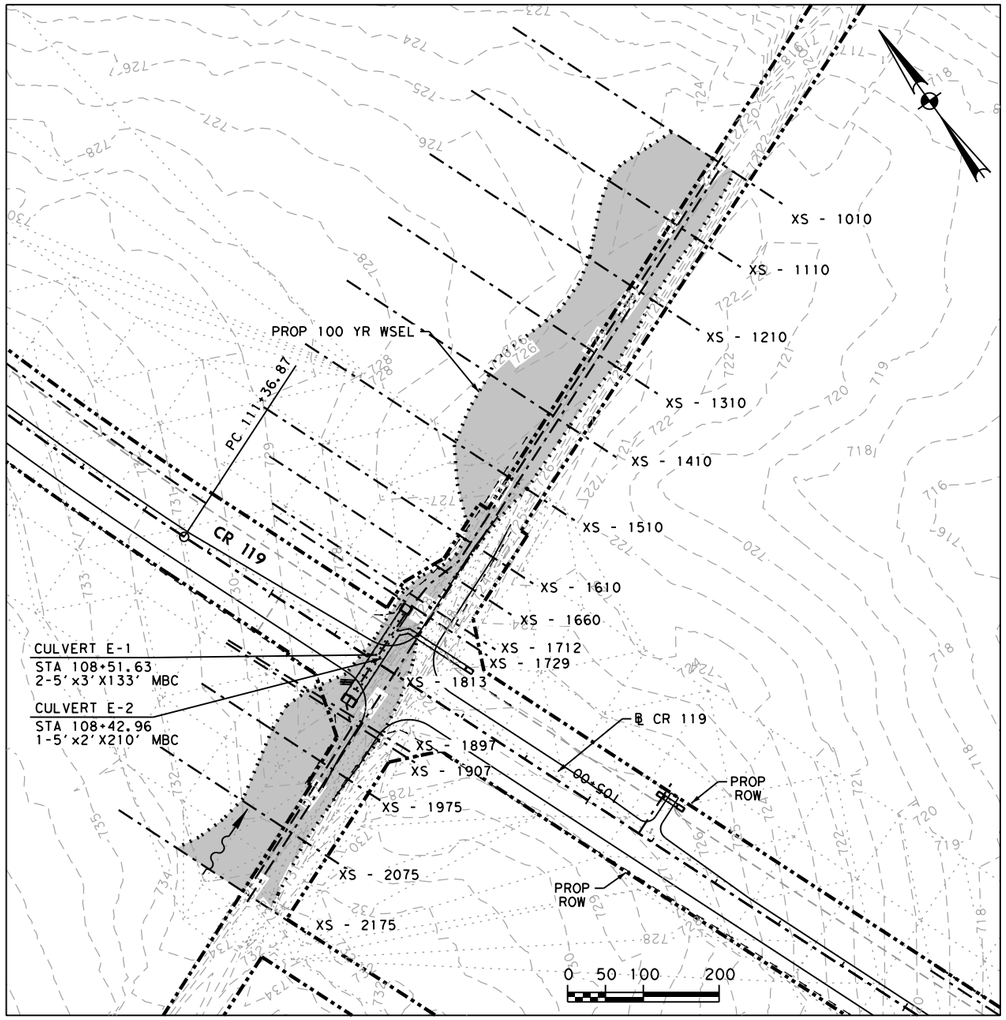
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DRAINAGE HYDRAULIC CALCULATIONS CULVERT E-1

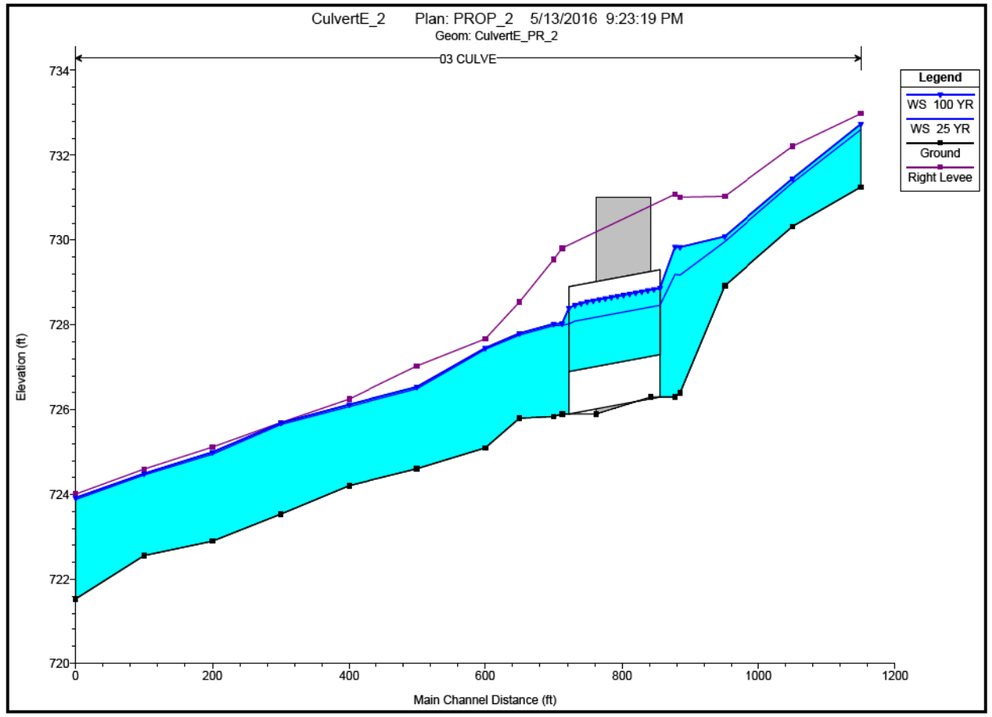
STA 108+42.96

SHEET 02 OF 05

FED. RD. DIV. RD.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				145



HEC-RAS PROFILE SHOWING DIVERSION OF FLOW TO 5'x2' BOX, CULVERT E-2



NOTE:
1. EXISTING FLOWS ALONG THE NORTH DITCH OF CR 118 IN THE VICINITY OF THE PROPOSED CR 119 CROSSING WERE ANALYZED WITH A HEC-RAS MODEL TO DETERMINED THE CAPACITY OF THE EXISTING DITCH, AND THE AMOUNT OF WEIR FLOW OVER CR118 UNDER EXISTING CONDITIONS. AN ADDITIONAL HEC-RAS MODEL PLAN WAS DEVELOPED TO REFLECT PROPOSED CONDITIONS WITH CULVERT E-1 (2-5'X4'MBC) CROSSING UNDER THE PROPOSED CR 119, WITH CULVERT E-2 (1-5'X3'SBC) DIVERTING A PORTION OF THE FLOW TO THE EASTERN DITCH OF CR 119 SOUTH OF THE CR 118 INTERSECTION. THE GOAL OF THE SPLIT OUTFALL CULVERT DESIGN IS TO DIVERT A PORTION OF THE FLOW IN THE NORTH DITCH OF CR 118 TO CULVERT E-2 IN AN EFFORT TO MINIMIZE THE WEIR FLOW OVER CR 118. A FLOW BALANCE ANALYSIS WAS PERFORMED USING STORMCAD TO IDENTIFY THE FLOW IN EACH BARREL OF THE CULVERT E-1 AND E-2 AND WAS CALIBRATED TO RESULT IN A UNIFIED HGL ELEVATION AT ALL THREE BARRELS. THE RESULTANT FLOWS FROM CULVERT E-1 (2-5'X4'MBC) WERE THEN ENTERED INTO THE PROPOSED CONDITION HEC-RAS MODEL AND THE RESULTS ARE INCLUDED ON THIS SHEET.

STATE OF TEXAS
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PROFESSIONAL ENGINEER

6/15/2017

Plan: PROP_2 03 CULVE RS: 1813.042 Culv Group: Culvert #1 Profile: 25 YR

Q Culv Group (cfs)	126.46	Culv Full Len (ft)	
# Barrels	2	Culv Vel US (ft/s)	6.36
Q Barrel (cfs)	63.23	Culv Vel DS (ft/s)	5.54
E.G. US. (ft)	729.23	Culv Inv El Up (ft)	726.30
W.S. US. (ft)	729.19	Culv Inv El Dn (ft)	725.90
E.G. DS (ft)	728.23	Culv Frctn Ls (ft)	0.26
W.S. DS (ft)	728.18	Culv Exit Loss (ft)	0.43
Delta EG (ft)	1.00	Culv Entr Loss (ft)	0.31
Delta WS (ft)	1.00	Q Weir (cfs)	
E.G. IC (ft)	729.04	Weir Sta Lft (ft)	
E.G. OC (ft)	729.23	Weir Sta Rgt (ft)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (ft)	728.29	Weir Max Depth (ft)	
Culv WS Outlet (ft)	728.18	Weir Avg Depth (ft)	
Culv Nml Depth (ft)	1.61	Weir Flow Area (sq ft)	
Culv Crt Depth (ft)	1.71	Min El Weir Flow (ft)	731.09

Plan: PROP_2 03 CULVE RS: 1813.042 Culv Group: Culvert #1 Profile: 100 YR

Q Culv Group (cfs)	169.93	Culv Full Len (ft)	
# Barrels	2	Culv Vel US (ft/s)	7.48
Q Barrel (cfs)	84.97	Culv Vel DS (ft/s)	7.08
E.G. US. (ft)	729.68	Culv Inv El Up (ft)	726.30
W.S. US. (ft)	729.64	Culv Inv El Dn (ft)	725.90
E.G. DS (ft)	728.34	Culv Frctn Ls (ft)	0.36
W.S. DS (ft)	728.30	Culv Exit Loss (ft)	0.74
Delta EG (ft)	1.54	Culv Entr Loss (ft)	0.43
Delta WS (ft)	1.54	Q Weir (cfs)	
E.G. IC (ft)	729.67	Weir Sta Lft (ft)	
E.G. OC (ft)	729.87	Weir Sta Rgt (ft)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (ft)	728.57	Weir Max Depth (ft)	
Culv WS Outlet (ft)	728.30	Weir Avg Depth (ft)	
Culv Nml Depth (ft)	2.24	Weir Flow Area (sq ft)	
Culv Crt Depth (ft)	2.08	Min El Weir Flow (ft)	731.09

CR 119

WILLIAMSON COUNTY 1848

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TBPE Registration Number F-6324
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PROPOSED DRAINAGE HYDRAULIC CALCULATIONS CULVERT E-1

STA 108+51.63 & STA 108+42.96

SHEET 03 OF 03

FED. RD. DIV. NO.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				146

Plan: PROP_2 03 CULVE RS: 1907.012 Profile: 25 YR

E.G. Elev (ft)	729.24	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.07	Wt. n-Val.	0.035	0.015	0.015
W.S. Elev (ft)	729.17	Reach Len. (ft)	7.28	7.40	7.52
Crit W.S. (ft)	727.67	Flow Area (sq ft)	21.26	74.20	0.04
E.G. Slope (ft/ft)	0.000167	Area (sq ft)	21.26	74.20	0.04
Q Total (cfs)	159.80	Flow (cfs)	5.36	154.43	0.01
Top Width (ft)	103.73	Top Width (ft)	68.33	35.03	0.38
Vel Total (ft/s)	1.67	Avg. Vel. (ft/s)	0.25	2.08	0.25
Max Chl Dpth (ft)	2.77	Hydr. Depth (ft)	0.31	2.12	0.10
Conv. Total (cfs)	12356.3	Conv. (cfs)	414.5	11941.1	0.7
Length Wtd. (ft)	7.40	Wetted Per. (ft)	68.33	35.83	0.42
Min Ch El (ft)	726.40	Shear (lb/sq ft)	0.00	0.02	0.00
Alpha	1.50	Stream Power (lb/ft s)	300.00	0.00	207.26
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	0.84	0.53	0.48
C & E Loss (ft)	0.01	Cum SA (acres)	2.09	0.48	0.21

Plan: PROP_2 03 CULVE RS: 1729.158 Profile: 25 YR

E.G. Elev (ft)	728.23	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.05	Wt. n-Val.	0.035	0.035	
W.S. Elev (ft)	728.18	Reach Len. (ft)	12.35	12.35	12.35
Crit W.S. (ft)	727.10	Flow Area (sq ft)	43.55	69.32	
E.G. Slope (ft/ft)	0.000979	Area (sq ft)	43.55	69.32	
Q Total (cfs)	159.80	Flow (cfs)	30.26	129.54	
Top Width (ft)	156.30	Top Width (ft)	115.12	41.18	
Vel Total (ft/s)	1.42	Avg. Vel. (ft/s)	0.69	1.87	
Max Chl Dpth (ft)	3.73	Hydr. Depth (ft)	0.38	1.68	
Conv. Total (cfs)	5108.0	Conv. (cfs)	967.2	4140.8	
Length Wtd. (ft)	12.35	Wetted Per. (ft)	115.13	41.53	
Min Ch El (ft)	725.90	Shear (lb/sq ft)	0.02	0.10	
Alpha	1.46	Stream Power (lb/ft s)	337.48	0.00	259.55
Frctn Loss (ft)	0.01	Cum Volume (acre-ft)	0.83	0.40	0.48
C & E Loss (ft)	0.00	Cum SA (acres)	1.72	0.33	0.21

Plan: PROP_2 03 CULVE RS: 1907.012 Profile: 100 YR

E.G. Elev (ft)	729.88	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.05	Wt. n-Val.	0.035	0.015	0.015
W.S. Elev (ft)	729.83	Reach Len. (ft)	7.28	7.40	7.52
Crit W.S. (ft)	727.95	Flow Area (sq ft)	84.14	97.23	0.71
E.G. Slope (ft/ft)	0.000106	Area (sq ft)	84.14	97.23	0.71
Q Total (cfs)	221.90	Flow (cfs)	28.76	192.76	0.38
Top Width (ft)	158.25	Top Width (ft)	121.55	35.03	1.67
Vel Total (ft/s)	1.22	Avg. Vel. (ft/s)	0.34	1.98	0.53
Max Chl Dpth (ft)	3.43	Hydr. Depth (ft)	0.69	2.78	0.42
Conv. Total (cfs)	21568.4	Conv. (cfs)	2795.3	18736.3	36.8
Length Wtd. (ft)	7.39	Wetted Per. (ft)	121.56	35.83	1.87
Min Ch El (ft)	726.40	Shear (lb/sq ft)	0.00	0.02	0.00
Alpha	2.31	Stream Power (lb/ft s)	300.00	0.00	207.26
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	0.93	0.60	0.49
C & E Loss (ft)	0.00	Cum SA (acres)	2.31	0.49	0.24

Plan: PROP_2 03 CULVE RS: 1729.158 Profile: 100 YR

E.G. Elev (ft)	728.34	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.04	Wt. n-Val.	0.035	0.035	
W.S. Elev (ft)	728.30	Reach Len. (ft)	12.35	12.35	12.35
Crit W.S. (ft)	727.17	Flow Area (sq ft)	57.83	74.19	
E.G. Slope (ft/ft)	0.000860	Area (sq ft)	57.83	74.19	
Q Total (cfs)	176.90	Flow (cfs)	42.38	134.52	
Top Width (ft)	169.86	Top Width (ft)	128.02	41.84	
Vel Total (ft/s)	1.34	Avg. Vel. (ft/s)	0.73	1.81	
Max Chl Dpth (ft)	3.85	Hydr. Depth (ft)	0.45	1.77	
Conv. Total (cfs)	6033.5	Conv. (cfs)	1445.4	4588.1	
Length Wtd. (ft)	12.35	Wetted Per. (ft)	128.03	42.20	
Min Ch El (ft)	725.90	Shear (lb/sq ft)	0.02	0.09	
Alpha	1.46	Stream Power (lb/ft s)	337.48	0.00	259.55
Frctn Loss (ft)	0.01	Cum Volume (acre-ft)	0.92	0.41	0.49
C & E Loss (ft)	0.00	Cum SA (acres)	1.82	0.33	0.23

Plan: PROP_2 03 CULVE RS: 1896.926 Profile: 25 YR

E.G. Elev (ft)	729.23	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.04	Wt. n-Val.	0.035	0.015	0.015
W.S. Elev (ft)	729.19	Reach Len. (ft)	165.14	164.94	164.68
Crit W.S. (ft)	727.40	Flow Area (sq ft)	25.87	90.77	0.14
E.G. Slope (ft/ft)	0.000094	Area (sq ft)	25.87	90.77	0.14
Q Total (cfs)	159.80	Flow (cfs)	5.42	154.34	0.04
Top Width (ft)	109.56	Top Width (ft)	71.15	37.64	0.78
Vel Total (ft/s)	1.37	Avg. Vel. (ft/s)	0.21	1.70	0.29
Max Chl Dpth (ft)	2.89	Hydr. Depth (ft)	0.36	2.41	0.18
Conv. Total (cfs)	16484.9	Conv. (cfs)	559.5	15921.2	4.2
Length Wtd. (ft)	164.94	Wetted Per. (ft)	71.15	38.53	0.86
Min Ch El (ft)	726.30	Shear (lb/sq ft)	0.00	0.01	0.00
Alpha	1.49	Stream Power (lb/ft s)	300.00	0.00	207.11
Frctn Loss (ft)		Cum Volume (acre-ft)	0.83	0.51	0.48
C & E Loss (ft)		Cum SA (acres)	2.08	0.48	0.21

Plan: PROP_2 03 CULVE RS: 1711.737 Profile: 25 YR

E.G. Elev (ft)	728.22	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.04	Wt. n-Val.	0.035	0.035	
W.S. Elev (ft)	728.18	Reach Len. (ft)	50.02	50.00	50.00
Crit W.S. (ft)	727.02	Flow Area (sq ft)	51.71	73.78	
E.G. Slope (ft/ft)	0.000792	Area (sq ft)	51.71	73.78	
Q Total (cfs)	160.60	Flow (cfs)	34.44	126.16	
Top Width (ft)	166.93	Top Width (ft)	124.22	42.71	
Vel Total (ft/s)	1.28	Avg. Vel. (ft/s)	0.67	1.71	
Max Chl Dpth (ft)	3.89	Hydr. Depth (ft)	0.42	1.73	
Conv. Total (cfs)	5708.1	Conv. (cfs)	1223.9	4484.2	
Length Wtd. (ft)	50.00	Wetted Per. (ft)	124.22	43.07	
Min Ch El (ft)	725.84	Shear (lb/sq ft)	0.02	0.08	
Alpha	1.46	Stream Power (lb/ft s)	352.42	0.00	269.88
Frctn Loss (ft)	0.11	Cum Volume (acre-ft)	0.82	0.37	0.48
C & E Loss (ft)	0.05	Cum SA (acres)	1.69	0.32	0.21

Plan: PROP_2 03 CULVE RS: 1896.926 Profile: 100 YR

E.G. Elev (ft)	729.88	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.04	Wt. n-Val.	0.035	0.015	0.015
W.S. Elev (ft)	729.84	Reach Len. (ft)	165.14	164.94	164.68
Crit W.S. (ft)	727.64	Flow Area (sq ft)	89.75	115.31	1.10
E.G. Slope (ft/ft)	0.000068	Area (sq ft)	89.75	115.31	1.10
Q Total (cfs)	221.90	Flow (cfs)	25.47	195.90	0.54
Top Width (ft)	163.04	Top Width (ft)	123.25	37.64	2.15
Vel Total (ft/s)	1.08	Avg. Vel. (ft/s)	0.28	1.70	0.49
Max Chl Dpth (ft)	3.54	Hydr. Depth (ft)	0.73	3.06	0.51
Conv. Total (cfs)	26872.5	Conv. (cfs)	3084.0	23723.7	64.8
Length Wtd. (ft)	164.94	Wetted Per. (ft)	123.26	38.53	2.38
Min Ch El (ft)	726.30	Shear (lb/sq ft)	0.00	0.01	0.00
Alpha	2.21	Stream Power (lb/ft s)	300.00	0.00	207.11
Frctn Loss (ft)		Cum Volume (acre-ft)	0.92	0.59	0.49
C & E Loss (ft)		Cum SA (acres)	2.29	0.48	0.24

Plan: PROP_2 03 CULVE RS: 1711.737 Profile: 100 YR

E.G. Elev (ft)	728.33	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.03	Wt. n-Val.	0.035	0.035	
W.S. Elev (ft)	728.30	Reach Len. (ft)	50.02	50.00	50.00
Crit W.S. (ft)	727.09	Flow Area (sq ft)	67.13	78.86	
E.G. Slope (ft/ft)	0.000700	Area (sq ft)	67.13	78.86	
Q Total (cfs)	178.00	Flow (cfs)	46.83	131.17	
Top Width (ft)	180.46	Top Width (ft)	137.10	43.37	
Vel Total (ft/s)	1.22	Avg. Vel. (ft/s)	0.70	1.66	
Max Chl Dpth (ft)	4.01	Hydr. Depth (ft)	0.49	1.82	
Conv. Total (cfs)	6729.8	Conv. (cfs)	1770.7	4959.2	
Length Wtd. (ft)	50.00	Wetted Per. (ft)	137.10	43.74	
Min Ch El (ft)	725.84	Shear (lb/sq ft)	0.02	0.08	
Alpha	1.46	Stream Power (lb/ft s)	352.42	0.00	269.88
Frctn Loss (ft)	0.10	Cum Volume (acre-ft)	0.90	0.39	0.49
C & E Loss (ft)	0.06	Cum SA (acres)	1.78	0.32	0.23

STATE OF TEXAS
ARNOLD GONZALES, JR.
98234
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PROFESSIONAL ENGINEER

6/15/2017

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PROPOSED DRAINAGE HYDRAULIC CALCULATIONS CULVERT E-1

STA 108+51.63 & STA 108+42.96

SHEET 04 OF 05

FED. RD. DIV. RD.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				147

CULVERT E1-E2 100 YR

Label	Start Node	Stop Node	Length (ft)	Flow (cfs)	Slope (ft/ft)	Size	Manning's n	Friction Slope (ft/ft)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Velocity (In) (ft/s)	Velocity (Out) (ft/s)	Upstream Structure Velocity Head (ft)	Velocity Head (Out) (ft)	Upstream Structure Headloss Coefficient	Headloss (ft)	Invert (Start) (ft)	Invert (Stop) (ft)
100 YR - NORTH BARREL																		
E1N-2	E1N	T-1	28.3	71.4	0.003	5' x 3' SBC	0.015	0.003	729.33	729.26	4.76	4.76	0.35	0.35	1.5	0.07	726.3	726.22
E1N-1	T-1	O-E1N	114.7	87.5	0.003	5' x 3' SBC	0.015	0.004	728.82	728.03	6.73	8.22	0.7	1.05	0.75	0.79	726.22	725.9
E1N-L	E3	T-1	25.3	16.1	0.015	2-24 Inch	0.013	0.001	729.29	729.26	2.56	2.56	0.1	0.1	1.5	0.03	726.6	726.22
100 YR - MIDDLE BARREL																		
E1S-1	E1S	H-2	143	84.1	0.003	5' x 3' SBC	0.015	0.004	728.86	728.03	6.57	7.9	0.67	0.97	1.5	0.83	726.3	725.9
100 YR - SOUTH BARREL																		
E2-3	E2	E2.2	114.7	50.3	0.008	5' x 3' SBC	0.015	0.005	728.77	728.49	6.87	5.03	0.73	0.39	1.5	0.27	727.3	726.4
E2-2	E2.2	E2.1	15.2	50.3	0.003	5' x 3' SBC	0.015	0.003	728.26	728.23	5.4	5.35	0.45	0.44	0.5	0.03	726.4	726.35
E2-1	E2.1	O-E2	100.2	50.3	0.004	5' x 3' SBC	0.015	0.005	727.91	727.44	6.46	6.53	0.65	0.66	0.5	0.47	726.35	725.9
25 YR - NORTH BARREL																		
E1N-2	E1N	T-1	28.3	53.83	0.003	5' x 3' SBC	0.015	0.001	728.76	728.74	4.37	4.28	0.3	0.28	1.5	0.03	726.3	726.22
E1N-1	T-1	O-E1N	114.7	65.05	0.003	5' x 3' SBC	0.015	0.003	728.39	727.99	5.99	6.22	0.56	0.6	0.75	0.4	726.22	725.9
E1N-L	E3	T-1	25.3	11.22	0.015	2-24 Inch	0.013	0.001	728.75	728.74	1.79	1.79	0.05	0.05	1.5	0.02	726.6	726.22
25 YR - MIDDLE BARREL																		
E1S-1	E1S	H-2	143	62.35	0.003	5' x 3' SBC	0.015	0.003	728.43	727.99	5.84	5.97	0.53	0.55	1.5	0.44	726.3	725.9
25 YR - SOUTH BARREL																		
E2-3	E2	E2.2	114.7	32.4	0.008	5' x 3' SBC	0.015	0.006	728.39	727.95	5.93	4.19	0.55	0.27	1.5	0.45	727.3	726.4
E2-2	E2.2	E2.1	15.2	32.4	0.003	5' x 3' SBC	0.015	0.003	727.77	727.74	4.72	4.65	0.35	0.34	0.5	0.03	726.4	726.35
E2-1	E2.1	O-E2	100.2	32.4	0.004	5' x 3' SBC	0.015	0.004	727.5	727.14	5.65	5.23	0.5	0.42	0.5	0.36	726.35	725.9

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PROPOSED DRAINAGE HYDRAULIC CALCULATIONS CULVERT E-2

STA 108+51.63 & STA 108+42.96

SHEET 05 OF 05

FED. RD. DIV. RD.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				148

HEC-RAS Plan: CWCreekCE River:Cottonwood Reach:Reach1

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach1	65334	25yr-Existing	150	807.54	808.81	808.81	809.14	0.015474	5.11	34.18	163.38	0.92
Reach1	65334	100yr-Existing	235	807.54	809.09	809.09	809.47	0.013445	5.65	52.44	213.72	0.9
Reach1	65334	100yr-Ultimate	264	807.54	809.22	809.22	809.56	0.010901	5.43	63.63	237.66	0.82
Reach1	64699	25yr-Existing	197	796.03	797.69	797.69	798.22	0.017654	5.82	33.83	257.37	1
Reach1	64699	100yr-Existing	309	796.03	798.1	798.1	798.75	0.014803	6.47	48.62	326.87	0.96
Reach1	64699	100yr-Ultimate	346	796.03	798.22	798.22	798.9	0.013963	6.64	53.71	352.72	0.94
Reach1	64203	25yr-Existing	219	788.38	790.61	790.09	790.84	0.004679	3.95	60.93	190	0.55
Reach1	64203	100yr-Existing	343	788.38	790.89	790.64	791.22	0.005685	4.85	87.5	276.21	0.62
Reach1	64203	100yr-Ultimate	384	788.38	790.98	790.83	791.32	0.005693	5	97.27	289.01	0.63
Reach1	64009	25yr-Existing	239	786.17	788.15	788.15	788.67	0.017673	5.8	41.24	40.42	1
Reach1	64009	100yr-Existing	374	786.17	788.62	788.62	789.14	0.01215	5.86	68.77	93.77	0.87
Reach1	64009	100yr-Ultimate	419	786.17	788.71	788.71	789.26	0.011996	6.06	75.25	102.87	0.87
Reach1	63923		Culvert									
Reach1	63851	25yr-Existing	259	779.89	781.28	781.08	781.59	0.009907	4.46	58.1	53.38	0.75
Reach1	63851	100yr-Existing	405	779.89	782.74	781.42	782.86	0.001518	2.78	145.76	66.39	0.33
Reach1	63851	100yr-Ultimate	454	779.89	783.75	781.52	783.82	0.000574	2.1	216.8	104.92	0.21
Reach1	63770	25yr-Existing	259	778.8	780.64	779.96	780.78	0.002958	2.91	88.89	62.43	0.43
Reach1	63770	100yr-Existing	405	778.8	782.68	780.28	782.73	0.000374	1.71	247.75	127.9	0.17
Reach1	63770	100yr-Ultimate	454	778.8	783.74	780.38	783.76	0.00014	1.27	434.2	238.89	0.11
Reach1	63705	25yr-Existing	280	777.78	780.49	779	780.55	0.000765	1.92	145.58	68.91	0.23
Reach1	63705	100yr-Existing	438	777.78	782.66	779.32	782.68	0.000156	1.3	382.65	176.21	0.12
Reach1	63705	100yr-Ultimate	491	777.78	783.73	779.43	783.74	0.000068	0.98	610.53	275.08	0.08
Reach1	63561	25yr-Existing	457	776.12	780.43	777.86	780.47	0.000407	1.77	271.29	158.99	0.18
Reach1	63561	100yr-Existing	717	776.12	782.64	778.33	782.66	0.000116	1.37	581.47	404.11	0.11
Reach1	63561	100yr-Ultimate	814	776.12	783.71	778.48	783.73	0.000072	1.22	738.7	515.84	0.09
Reach1	63379		Culvert									
Reach1	62555	25yr-Existing	457	768.7	772.21	772.21	773.64	0.012017	9.7	48.17	507.13	0.97
Reach1	62555	100yr-Existing	717	768.7	773.22	773.22	775.15	0.011143	11.28	64.96	558.9	0.98
Reach1	62555	100yr-Ultimate	814	768.7	773.61	773.61	773.61	0.00006	0.85	1369.19	580.57	0.07
Reach1	62065	25yr-Existing	500	765.18	766.9	766.63	767.15	0.006594	4.05	129.09	766.79	0.63
Reach1	62065	100yr-Existing	784	765.18	767.24	766.93	767.59	0.006908	4.86	169.21	808.84	0.67
Reach1	62065	100yr-Ultimate	893	765.18	767.38	767.03	767.53	0.003251	3.52	306.74	829.78	0.47
Reach1	61766	25yr-Existing	585	763.86	765.69	765.22	765.83	0.003864	3.53	213.71	784.04	0.5
Reach1	61766	100yr-Existing	917	763.86	765.99	765.54	766.17	0.00417	4.12	279.82	830.98	0.53
Reach1	61766	100yr-Ultimate	1050	763.86	766.09	765.62	766.3	0.004187	4.28	304.2	840.3	0.54
Reach1	61241	25yr-Existing	704	759.54	761.46	761.46	762	0.015993	6.02	121.73	846.44	0.97
Reach1	61241	100yr-Existing	1100	759.54	761.89	761.89	762.52	0.012814	6.6	180.13	912.12	0.92
Reach1	61241	100yr-Ultimate	1270	759.54	762.04	762.04	762.71	0.012158	6.83	203.49	922.71	0.91
Reach1	60621	25yr-Existing	811	751.61	755.57	755.03	755.78	0.004341	4.67	266.84	336.74	0.56
Reach1	60621	100yr-Existing	1270	751.61	756.02	755.51	756.3	0.004566	5.43	368.15	377.89	0.59
Reach1	60621	100yr-Ultimate	1470	751.61	756.2	755.6	756.49	0.004472	5.62	412.23	408.27	0.59
Reach1	60149	25yr-Existing	920	747.31	752.19	751.97	752.79	0.009902	6.94	170.36	227.91	0.83
Reach1	60149	100yr-Existing	1440	747.31	752.81	752.39	753.45	0.008403	7.56	282.53	339.14	0.8
Reach1	60149	100yr-Ultimate	1680	747.31	753	752.9	753.69	0.008381	7.9	316.63	364.43	0.81
Reach1	59726	25yr-Existing	1090	743.42	749.35	748.95	749.86	0.005095	7.08	308.27	230.76	0.64
Reach1	59726	100yr-Existing	1710	743.42	749.97	749.88	750.53	0.005352	8.02	482.9	406.64	0.67
Reach1	59726	100yr-Ultimate	2000	743.42	750.19	750.09	750.74	0.005252	8.21	564.76	458.06	0.67
Reach1	59156	25yr-Existing	1090	740.84	745.65	745.27	746.25	0.008452	7.66	302.33	243.86	0.79
Reach1	59156	100yr-Existing	1710	740.84	746.25	746.25	746.89	0.008133	8.52	485.72	346.49	0.8
Reach1	59156	100yr-Ultimate	2000	740.84	746.42	746.42	747.09	0.008411	8.94	546.23	368.37	0.82
Reach1	58071	25yr-Existing	1310	732.55	737.83	737.83	738.51	0.006369	7.44	242.44	225.22	0.72
Reach1	58071	100yr-Existing	2060	732.55	738.46	738.46	739.08	0.005603	7.84	429.92	404.7	0.69
Reach1	58071	100yr-Ultimate	2430	732.55	738.58	738.58	739.3	0.006391	8.54	470.56	415.66	0.74
Reach1	57199	25yr-Existing	1450	725.45	732.49		732.96	0.003137	6.34	366.79	240.24	0.52
Reach1	57199	100yr-Existing	2300	725.45	733.22		733.71	0.003185	7.04	558.6	284.84	0.54
Reach1	57199	100yr-Ultimate	2710	725.45	733.46		733.99	0.003317	7.41	630.48	297.25	0.55
Reach1	55891	25yr-Existing	1530	721.68	725.42	725.42	726.31	0.014833	7.57	202.06	113.62	1
Reach1	55891	100yr-Existing	2440	721.68	726.17	726.17	727.23	0.011814	8.29	305.72	174.77	0.94
Reach1	55891	100yr-Ultimate	2880	721.68	726.5	726.5	727.58	0.010354	8.45	367.8	201.23	0.9

HEC-RAS Plan: CWCreekCE River:Cottonwood Reach:Reach1

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach1	55718	25yr-Existing	1530	720.43	723.96		724.4	0.004293	5.29	289.05	109.55	0.57
Reach1	55718	100yr-Existing	2440	720.43	724.56		725.28	0.005655	6.84	366.52	167.76	0.68
Reach1	55718	100yr-Ultimate	2880	720.43	724.79	724.09	725.64	0.006119	7.44	410.61	202.72	0.71
Reach1	55604	25yr-Existing	1530	718.66	723.61		723.95	0.003281	5.8	382.52	187.46	0.53
Reach1	55604	100yr-Existing	2440	718.66	724.08		724.65	0.004861	7.64	476.94	214.39	0.66
Reach1	55604	100yr-Ultimate	2880	718.66	724.27		724.94	0.005539	8.4	517.81	225.38	0.71
Reach1	55171	25yr-Existing	1570	716.76	722.42	722.32	722.71	0.00423	6.09	474.36	492.66	0.58
Reach1	55171	100yr-Existing	2500	716.76	722.87		723.16	0.003918	6.37	705.88	532.85	0.57
Reach1	55171	100yr-Ultimate	2950	716.76	723.04		723.34	0.00393	6.57	798.71	539.29	0.58
Reach1	54880	25yr-Existing	1640	713.83	720.95	720.95	721.53	0.004748	7.71	347.76	311.64	0.62
Reach1	54880	100yr-Existing	2630	713.83	721.43	721.43	722.05	0.005303	8.69	548	470.14	0.67
Reach1	54880	100yr-Ultimate	3110	713.83	721.61	721.61	722.24	0.005472	9.04	635.76	496.25	0.68
Reach1	54259	25yr-Existing	1720	711.77	716.84		717.44	0.00461	7.14	305.09	129.78	0.63
Reach1	54259	100yr-Existing	2760	711.77	717.6		718.49	0.005679	8.91	411.62	158.6	0.72
Reach1	54259	100yr-Ultimate	3260	711.77	717.91	717.33	718.93	0.006286	9.77	463.96	185.43	0.77
Reach1	53686	25yr-Existing	1770	706.36	713.14	713.14	714.32	0.006671	9.95	242.41	105.86	0.77
Reach1	53686	100yr-Existing	2830	706.36	714.44	714.44	715.5	0.005157	10.17	427.48	185.83	0.71
Reach1	53686	100yr-Ultimate	3350	706.36	714.79	714.79	715.85	0.005059	10.43	498.42	221.49	0.71
Reach1	53361	25yr-Existing	1780	704.87	712.15	709.27	712.52	0.001256	5.05	396.05	118.05	0.36
Reach1	53361	100yr-Existing	2860	704.87	713.28	710.53	713.82	0.001569	6.3	562.36	242.03	0.41
Reach1	53361	100yr-Ultimate	3390	704.87	713.71	711.04	714.31	0.001688	6.79	638.97	313.59	0.43
Reach1	53230	25yr-Existing	1780	703.95	712.06	708.67	712.35	0.000952	4.47	438.83	289.49	0.31
Reach1	53230	100yr-Existing	2860	703.95	713.13	709.95	713.6	0.001301	5.78	608.51	707.17	0.37
Reach1	53230	100yr-Ultimate	3390	703.95	713.55	710.56	714.07	0.001413	6.25	692.47	838.81	0.39
Reach1	53149	25yr-Existing	1800	703.38	712.12	707.44	712.21	0.000293	2.74	925.86	743.14	0.18
Reach1	53149	100yr-Existing	2890	703.38	713.26	708.47	713.36	0.000325	3.18	1441.05	998.98	0.19
Reach1	53149	100yr-Ultimate	3420	703.38	713.7	708.91	713.81	0.00033	3.31	1647.15	1074.33	0.19
Reach1	53129		Mult Open									



6/15/2017

CR 119

WILLIAMSON COUNTY
1848

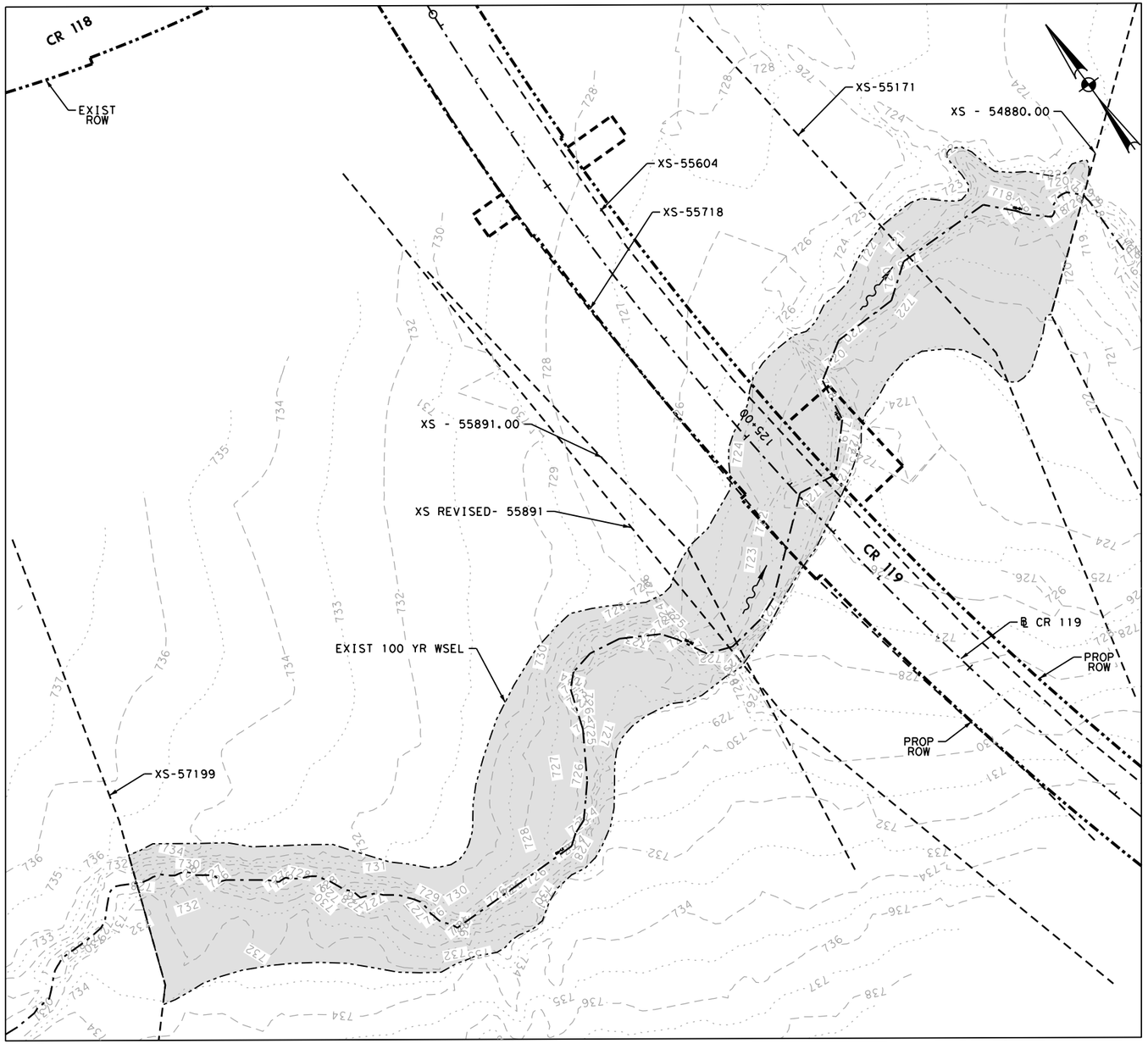
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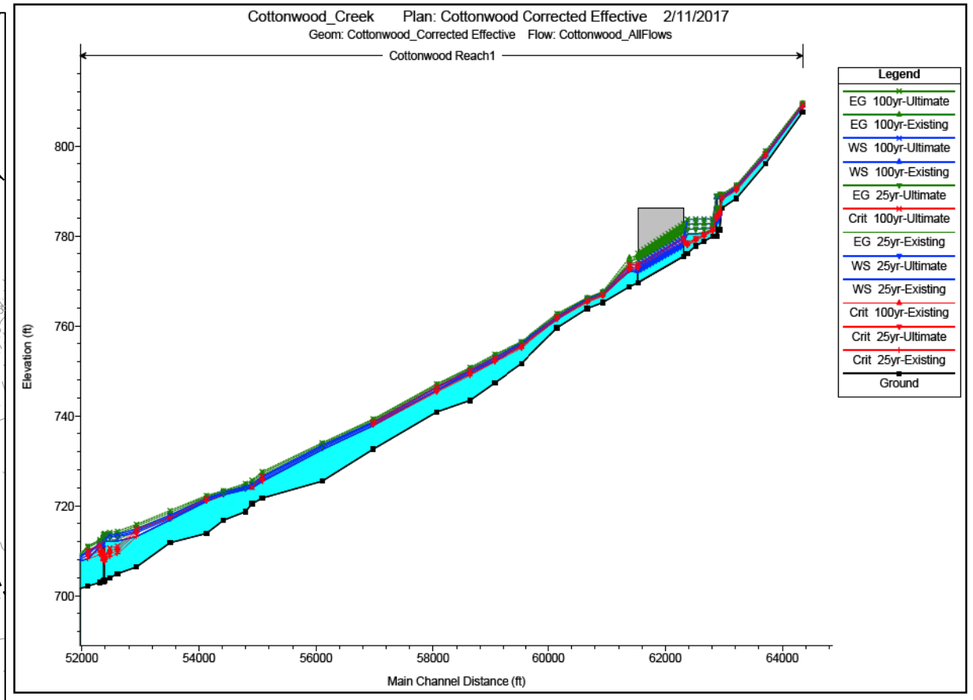
EXISTING DRAINAGE CORRECTED EFFECTIVE HYDRAULIC CALCULATIONS COTTONWOOD CREEK

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SHEET 01 OF 07

FED. RD. DIV. RD.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				149





STATE OF TEXAS
ARNOLD GONZALES, JR.
98234
LICENSED
PROFESSIONAL ENGINEER

6/15/2017

CR 119

WILLIAMSON COUNTY
1848

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EXISTING DRAINAGE CORRECTED EFFECTIVE HYDRAULIC CALCULATIONS COTTONWOOD CREEK

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SHEET 02 OF 07

FED. RD. DIV. RD.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				150

HEC-RAS Plan: CWPropCond Locations: User Defined

River	Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Cottonwood	Reach1	65334	25yr-Existing	150.00	807.54	808.81	808.81	809.14	0.015474	5.11	34.18	163.38	0.92
Cottonwood	Reach1	65334	100yr-Existing	235.00	807.54	809.09	809.09	809.47	0.013445	5.65	52.44	213.72	0.90
Cottonwood	Reach1	65334	100yr-Ultimate	264.00	807.54	809.22	809.22	809.56	0.010901	5.43	63.63	237.66	0.82
Cottonwood	Reach1	64699	25yr-Existing	197.00	796.03	797.69	797.69	798.22	0.017654	5.82	33.83	257.37	1.00
Cottonwood	Reach1	64699	100yr-Existing	309.00	796.03	798.10	798.10	798.75	0.014803	6.47	48.62	326.87	0.96
Cottonwood	Reach1	64699	100yr-Ultimate	346.00	796.03	798.22	798.22	798.90	0.013963	6.64	53.71	352.72	0.94
Cottonwood	Reach1	64203	25yr-Existing	219.00	788.38	790.61	790.09	790.84	0.004679	3.95	60.93	190.00	0.55
Cottonwood	Reach1	64203	100yr-Existing	343.00	788.38	790.89	790.64	791.22	0.005685	4.85	87.50	276.21	0.62
Cottonwood	Reach1	64203	100yr-Ultimate	384.00	788.38	790.98	790.83	791.32	0.005693	5.00	97.27	289.01	0.63
Cottonwood	Reach1	64009	25yr-Existing	239.00	786.17	788.15	788.15	788.67	0.017673	5.80	41.24	40.42	1.00
Cottonwood	Reach1	64009	100yr-Existing	374.00	786.17	788.62	788.62	789.14	0.012150	5.86	68.77	93.77	0.87
Cottonwood	Reach1	64009	100yr-Ultimate	419.00	786.17	788.71	788.71	789.26	0.011996	6.06	75.25	102.87	0.87
Cottonwood	Reach1	63923		Culvert									
Cottonwood	Reach1	63851	25yr-Existing	259.00	779.89	781.28	781.08	781.59	0.009907	4.46	58.10	53.38	0.75
Cottonwood	Reach1	63851	100yr-Existing	405.00	779.89	782.74	781.42	782.86	0.001518	2.78	145.76	66.39	0.33
Cottonwood	Reach1	63851	100yr-Ultimate	454.00	779.89	783.75	781.52	783.82	0.000574	2.10	216.80	104.92	0.21
Cottonwood	Reach1	63770	25yr-Existing	259.00	778.80	780.64	779.96	780.78	0.002958	2.91	88.89	62.43	0.43
Cottonwood	Reach1	63770	100yr-Existing	405.00	778.80	782.68	780.28	782.73	0.000374	1.71	247.75	127.90	0.17
Cottonwood	Reach1	63770	100yr-Ultimate	454.00	778.80	783.74	780.38	783.76	0.000140	1.27	434.20	238.89	0.11
Cottonwood	Reach1	63705	25yr-Existing	280.00	777.78	780.49	779.00	780.55	0.000765	1.92	145.58	68.91	0.23
Cottonwood	Reach1	63705	100yr-Existing	438.00	777.78	782.66	779.32	782.68	0.000156	1.30	382.65	176.21	0.12
Cottonwood	Reach1	63705	100yr-Ultimate	491.00	777.78	783.73	779.43	783.74	0.000068	0.98	610.53	275.08	0.08
Cottonwood	Reach1	63561	25yr-Existing	457.00	776.12	780.43	777.86	780.47	0.000407	1.77	271.29	158.99	0.18
Cottonwood	Reach1	63561	100yr-Existing	717.00	776.12	782.64	778.33	782.66	0.000116	1.37	581.47	404.11	0.11
Cottonwood	Reach1	63561	100yr-Ultimate	814.00	776.12	783.71	778.48	783.73	0.000072	1.22	738.70	515.84	0.09
Cottonwood	Reach1	63379		Culvert									
Cottonwood	Reach1	62555	25yr-Existing	457.00	768.70	772.21	772.21	773.64	0.012017	9.70	48.17	507.13	0.97
Cottonwood	Reach1	62555	100yr-Existing	717.00	768.70	773.22	773.22	775.15	0.011143	11.28	64.96	558.90	0.98
Cottonwood	Reach1	62555	100yr-Ultimate	814.00	768.70	773.61	773.61	773.61	0.000060	0.85	1369.19	580.57	0.07
Cottonwood	Reach1	62065	25yr-Existing	500.00	765.18	766.90	766.63	767.15	0.006594	4.05	129.09	766.79	0.63
Cottonwood	Reach1	62065	100yr-Existing	784.00	765.18	767.24	766.93	767.59	0.006908	4.86	169.21	808.84	0.67
Cottonwood	Reach1	62065	100yr-Ultimate	893.00	765.18	767.38	767.03	767.53	0.003251	3.52	306.74	829.78	0.47
Cottonwood	Reach1	61766	25yr-Existing	585.00	763.86	765.69	765.22	765.83	0.003864	3.53	213.71	784.04	0.50
Cottonwood	Reach1	61766	100yr-Existing	917.00	763.86	765.99	765.54	766.17	0.004170	4.12	279.82	830.98	0.53
Cottonwood	Reach1	61766	100yr-Ultimate	1050.00	763.86	766.09	765.62	766.30	0.004187	4.28	304.20	840.30	0.54
Cottonwood	Reach1	61241	25yr-Existing	704.00	759.54	761.46	761.46	762.00	0.015993	6.02	121.73	846.44	0.97
Cottonwood	Reach1	61241	100yr-Existing	1100.00	759.54	761.89	761.89	762.52	0.012814	6.60	180.13	912.12	0.92
Cottonwood	Reach1	61241	100yr-Ultimate	1270.00	759.54	762.04	762.04	762.71	0.012158	6.83	203.49	922.71	0.91
Cottonwood	Reach1	60621	25yr-Existing	811.00	751.61	755.57	755.03	755.78	0.004342	4.67	266.81	336.73	0.56
Cottonwood	Reach1	60621	100yr-Existing	1270.00	751.61	756.10	755.51	756.35	0.003999	5.18	386.41	392.03	0.55
Cottonwood	Reach1	60621	100yr-Ultimate	1470.00	751.61	756.21	755.60	756.50	0.004409	5.59	414.32	409.34	0.58
Cottonwood	Reach1	60149	25yr-Existing	920.00	747.31	752.19	751.97	752.79	0.009903	6.94	170.35	227.89	0.83
Cottonwood	Reach1	60149	100yr-Existing	1440.00	747.31	752.69	752.39	753.45	0.010329	8.14	261.56	320.92	0.88
Cottonwood	Reach1	60149	100yr-Ultimate	1680.00	747.31	752.99	752.90	753.68	0.008562	7.96	314.19	363.20	0.82
Cottonwood	Reach1	59726	25yr-Existing	1090.00	743.42	749.35	748.95	749.86	0.005094	7.08	308.28	230.77	0.64
Cottonwood	Reach1	59726	100yr-Existing	1710.00	743.42	750.10	749.88	750.55	0.004397	7.41	528.13	433.40	0.61
Cottonwood	Reach1	59726	100yr-Ultimate	2000.00	743.42	750.20	750.09	750.74	0.005139	8.14	570.22	459.15	0.66
Cottonwood	Reach1	59156	25yr-Existing	1090.00	740.84	745.65	745.41	746.25	0.008454	7.66	302.24	243.71	0.79
Cottonwood	Reach1	59156	100yr-Existing	1710.00	740.84	746.10	745.43	746.92	0.010448	9.38	436.56	333.62	0.91
Cottonwood	Reach1	59156	100yr-Ultimate	2000.00	740.84	746.40	745.43	747.09	0.008640	9.04	540.24	367.32	0.84
Cottonwood	Reach1	58071	25yr-Existing	1310.00	732.55	737.83	737.83	738.51	0.006369	7.44	242.44	225.22	0.72
Cottonwood	Reach1	58071	100yr-Existing	2060.00	732.55	738.46	738.46	739.08	0.005603	7.84	429.92	404.70	0.69
Cottonwood	Reach1	58071	100yr-Ultimate	2430.00	732.55	738.58	738.58	739.30	0.006391	8.54	470.56	415.66	0.74
Cottonwood	Reach1	57199	25yr-Existing	1450.00	725.45	732.49	732.05	732.96	0.003149	6.34	366.07	240.12	0.52
Cottonwood	Reach1	57199	100yr-Existing	2300.00	725.45	733.21	732.80	733.71	0.003202	7.06	557.32	284.69	0.54
Cottonwood	Reach1	57199	100yr-Ultimate	2710.00	725.45	733.47	733.01	733.99	0.003294	7.39	632.33	297.49	0.55
Cottonwood	Reach1	55891	25yr-Existing	1530.00	721.68	725.43	725.43	726.31	0.014704	7.55	202.73	113.80	1.00
Cottonwood	Reach1	55891	100yr-Existing	2440.00	721.68	726.17	726.17	727.23	0.011714	8.27	306.75	175.43	0.94
Cottonwood	Reach1	55891	100yr-Ultimate	2880.00	721.68	726.49	726.49	727.58	0.010430	8.47	366.70	200.82	0.90
Cottonwood	Reach1	55718	25yr-Existing	1530.00	720.43	723.09	723.09	724.03	0.010964	7.78	199.63	130.93	0.96
Cottonwood	Reach1	55718	100yr-Existing	2440.00	720.43	724.83	723.81	725.42	0.003170	6.31	410.21	281.40	0.57
Cottonwood	Reach1	55718	100yr-Ultimate	2880.00	720.43	725.22	724.11	725.88	0.003123	6.69	458.27	313.93	0.58

HEC-RAS Plan: CWPropCond Locations: User Defined

River	Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Cottonwood	Reach1	55698		Bridge									
Cottonwood	Reach1	55604	25yr-Existing	1530.00	718.60	723.09	720.66	723.18	0.000541	2.35	649.79	337.31	0.22
Cottonwood	Reach1	55604	100yr-Existing	2440.00	718.60	723.59	721.17	723.76	0.000904	3.30	741.66	398.69	0.28
Cottonwood	Reach1	55604	100yr-Ultimate	2880.00	718.60	723.79	721.39	724.00	0.001078	3.72	780.82	428.80	0.31
Cottonwood	Reach1	55171	25yr-Existing	1570.00	716.76	722.52	722.32	722.75	0.003278	5.47	526.58	500.32	0.51
Cottonwood	Reach1	55171	100yr-Existing	2500.00	716.76	722.87	722.62	723.16	0.003882	6.34	708.55	533.41	0.57
Cottonwood	Reach1	55171	100yr-Ultimate	2950.00	716.76	723.06	722.75	723.35	0.003830	6.50	806.94	541.80	0.57
Cottonwood	Reach1	54880	25yr-Existing	1640.00	713.83	720.75	720.75	721.49	0.006030	8.45	298.70	187.90	0.70
Cottonwood	Reach1	54880	100yr-Existing	2630.00	713.83	721.47	721.47	722.05	0.004901	8.41	569.51	478.38	0.65
Cottonwood	Reach1	54880	100yr-Ultimate	3110.00	713.83	721.65	721.65	722.24	0.005133	8.79	655.83	500.88	0.66
Cottonwood	Reach1	54259	25yr-Existing	1720.00	711.77	716.82	716.33	717.43	0.004738	7.21	302.05	129.34	0.64
Cottonwood	Reach1	54259	100yr-Existing	2760.00	711.77	717.58	717.12	718.48	0.005783	8.96	407.96	156.86	0.73
Cottonwood	Reach1	54259	100yr-Ultimate	3260.00	711.77	717.88	717.43	718.92	0.006418	9.84	458.62	182.36	0.78
Cottonwood	Reach1	53686	25yr-Existing	1770.00	706.36	713.17	713.17	714.32	0.006440	9.82	246.12	106.75	0.76
Cottonwood	Reach1	53686	100yr-Existing	2830.00	706.36	714.46	714.46	715.49	0.005053	10.08	431.14	187.35	0.70
Cottonwood	Reach1	53686	100yr-Ultimate	3350.00	706.36	714.81	714.81	715.85	0.004943	10.33	503.55	225.93	0.70
Cottonwood	Reach1	53361	25yr-Existing	1780.00	704.87	712.15	709.27	712.52	0.001256	5.05	396.05	118.05	0.36
Cottonwood	Reach1	53361	100yr-Existing	2860.00	704.87	713.28	710.53	713.82	0.001569	6.30	562.37	242.04	0.41
Cottonwood	Reach1	53361	100yr-Ultimate	3390.00	704.87	713.71	711.04	714.31	0.001688	6.79	638.99	313.61	0.43
Cottonwood	Reach1	53230	25yr-Existing	1780.00	703.95	712.06	708.67	712.35	0.000952	4.47	438.83	289.49	0.31
Cottonwood	Reach1	53230	100yr-Existing	2860.00	703.95	713.13	709.95	713.60	0.001301	5.78	608.52	707.20	0.37
Cottonwood	Reach1	53230	100yr-Ultimate	3390.00	703.95	713.55	710.56	714.07	0.001413	6.25	692.51	838.94	0.39
Cottonwood	Reach1	53149	25yr-Existing	1800.00	703.38	712.12	707.44	712.21	0.000293	2.74	925.86	743.14	0.18
Cottonwood	Reach1	53149	100yr-Existing	2890.00	703.38	713.26	708.47	713.36	0.000325	3.18	1441.07	998.98	0.19
Cottonwood	Reach1	53149	100yr-Ultimate	3420.00	703.38	713.70	708.91	713.81	0.000330	3.31	1647.24	1074.34	0.19
Cottonwood	Reach1	53129		Mult Open									



6/15/2017

CR 119

WILLIAMSON COUNTY 1848

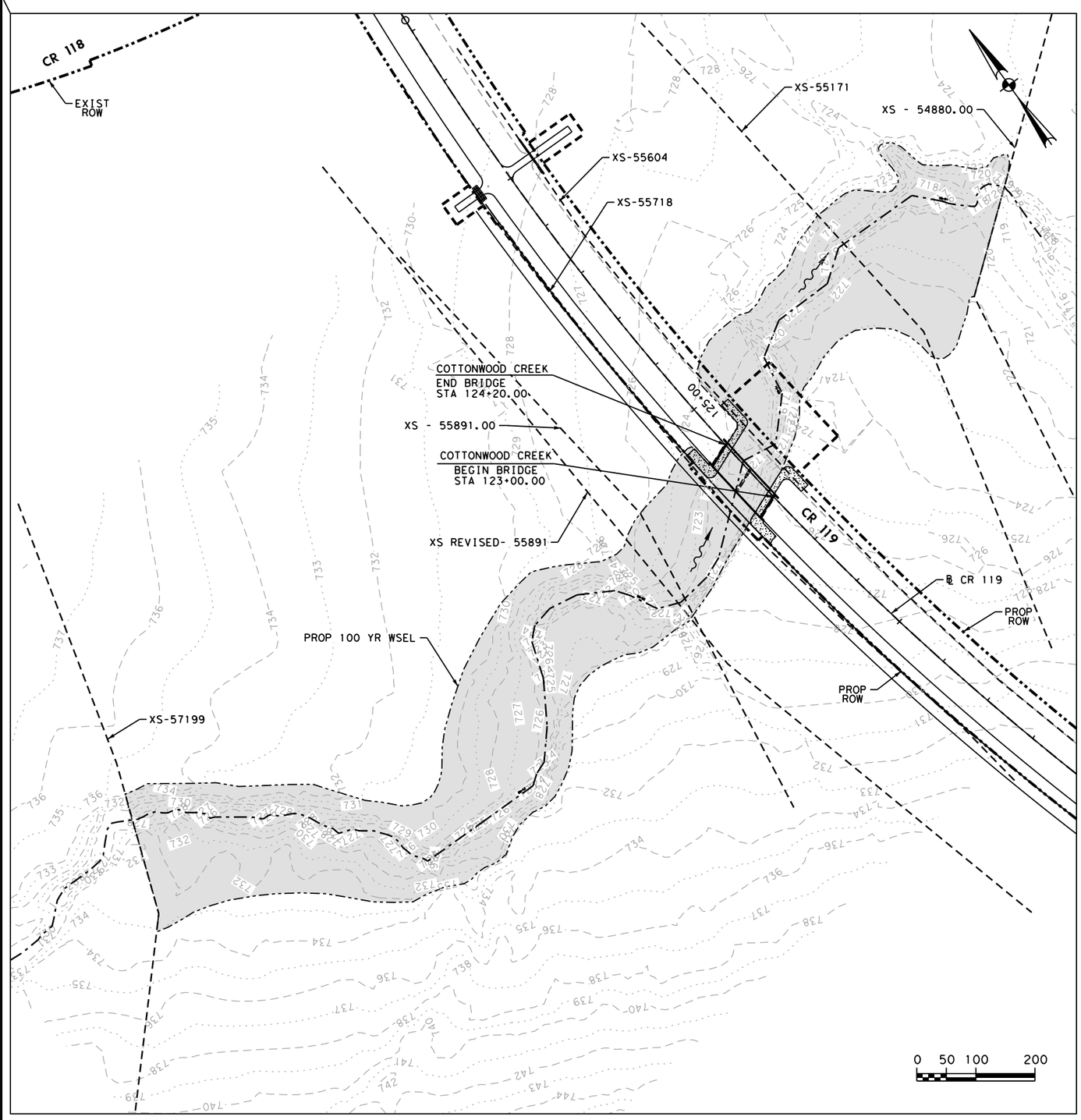
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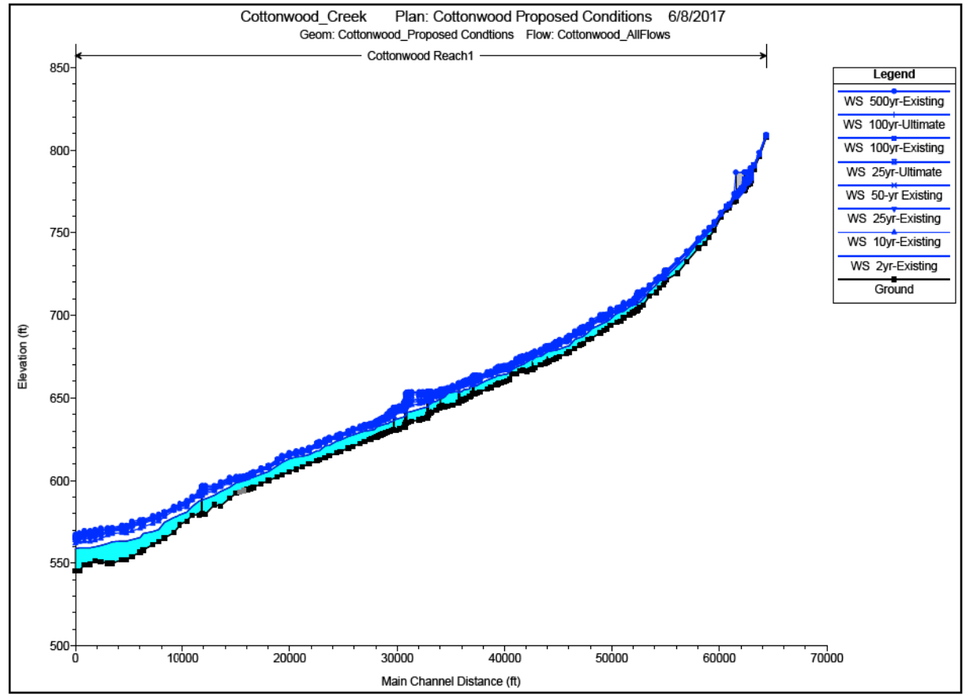
PROPOSED DRAINAGE HYDRAULIC CALCULATIONS COTTONWOOD CREEK

STA 123+60.00

SHEET 03 OF 07

FED. RD. DIV. RD.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				151





STATE OF TEXAS
ARNOLD GONZALES, JR.
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CR 119

WILLIAMSON COUNTY
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PROPOSED DRAINAGE
PROPOSED HYDRAULIC CALCULATIONS
COTTONWOOD CREEK

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SHEET 04 OF 07

FED. RD. DIV. RD.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				152

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100% SUBMITTAL

Plan: CWPropCond Cottonwood Reach1 RS: 55698 Profile: 25yr-Existing

E.G. US. (ft)	724.03	Element	Inside BR US	Inside BR DS
W.S. US. (ft)	723.09	E.G. Elev (ft)	724.08	723.27
Q Total (cfs)	1530.00	W.S. Elev (ft)	723.09	723.09
Q Bridge (cfs)	1530.00	Crit W.S. (ft)	723.11	720.97
Q Weir (cfs)		Max Chl Dpth (ft)	2.66	4.49
Weir Sta Lft (ft)		Vel Total (ft/s)	7.91	3.37
Weir Sta Rgt (ft)		Flow Area (sq ft)	193.51	453.80
Weir Submerg		Froude # Chl	0.86	0.28
Weir Max Depth (ft)		Specif Force (cu ft)	588.23	1046.06
Min El Weir Flow (ft)	728.45	Hydr Depth (ft)	1.78	3.82
Min El Prs (ft)	726.43	W.P. Total (ft)	114.53	140.28
Delta EG (ft)	0.85	Conv. Total (cfs)	13673.7	42139.6
Delta WS (ft)	0.00	Top Width (ft)	108.56	118.75
BR Open Area (sq ft)	562.34	Frctn Loss (ft)		
BR Open Vel (ft/s)	7.91	C & E Loss (ft)		
Coef of Q		Shear Total (lb/sq ft)	1.32	0.27
Br Sel Method	Yarnell	Power Total (lb/ft s)	0.00	0.00

Plan: CWPropCond Cottonwood Reach1 RS: 55698 Profile: 100yr-Ultimate

E.G. US. (ft)	725.88	Element	Inside BR US	Inside BR DS
W.S. US. (ft)	725.22	E.G. Elev (ft)	725.56	724.14
Q Total (cfs)	2880.00	W.S. Elev (ft)	724.16	723.67
Q Bridge (cfs)	2880.00	Crit W.S. (ft)	724.16	721.90
Q Weir (cfs)		Max Chl Dpth (ft)	3.73	5.07
Weir Sta Lft (ft)		Vel Total (ft/s)	9.27	5.51
Weir Sta Rgt (ft)		Flow Area (sq ft)	310.65	522.49
Weir Submerg		Froude # Chl	0.87	0.43
Weir Max Depth (ft)		Specif Force (cu ft)	1323.44	1661.25
Min El Weir Flow (ft)	728.45	Hydr Depth (ft)	2.79	4.40
Min El Prs (ft)	726.43	W.P. Total (ft)	122.94	142.60
Delta EG (ft)	1.88	Conv. Total (cfs)	27971.6	52722.1
Delta WS (ft)	1.43	Top Width (ft)	111.47	118.77
BR Open Area (sq ft)	562.34	Frctn Loss (ft)	0.46	0.01
BR Open Vel (ft/s)	9.27	C & E Loss (ft)	0.47	0.13
Coef of Q		Shear Total (lb/sq ft)	1.67	0.68
Br Sel Method	Energy only	Power Total (lb/ft s)	0.00	0.00

Plan: CWPropCond Cottonwood Reach1 RS: 55698 Profile: 100yr-Existing

E.G. US. (ft)	725.42	Element	Inside BR US	Inside BR DS
W.S. US. (ft)	724.83	E.G. Elev (ft)	725.12	723.87
Q Total (cfs)	2440.00	W.S. Elev (ft)	723.83	723.50
Q Bridge (cfs)	2440.00	Crit W.S. (ft)	723.83	721.62
Q Weir (cfs)		Max Chl Dpth (ft)	3.40	4.90
Weir Sta Lft (ft)		Vel Total (ft/s)	8.89	4.86
Weir Sta Rgt (ft)		Flow Area (sq ft)	274.56	502.55
Weir Submerg		Froude # Chl	0.87	0.39
Weir Max Depth (ft)		Specif Force (cu ft)	1068.48	1450.08
Min El Weir Flow (ft)	728.45	Hydr Depth (ft)	2.48	4.23
Min El Prs (ft)	726.43	W.P. Total (ft)	120.38	141.93
Delta EG (ft)	1.66	Conv. Total (cfs)	23155.1	49565.4
Delta WS (ft)	1.24	Top Width (ft)	110.58	118.76
BR Open Area (sq ft)	562.34	Frctn Loss (ft)	0.41	0.01
BR Open Vel (ft/s)	8.89	C & E Loss (ft)	0.46	0.10
Coef of Q		Shear Total (lb/sq ft)	1.58	0.54
Br Sel Method	Energy only	Power Total (lb/ft s)	0.00	0.00

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WILLIAMSON COUNTY
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PROPOSED DRAINAGE
PROPOSED HYDRAULIC CALCULATIONS
COTTONWOOD CREEK

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SHEET 05 OF 07

FED. RD. DIV. RD.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				153

Plan: CWPropCond Cottonwood Reach1 RS: 55891 Profile: 25yr-Existing

E.G. Elev (ft)	726.31	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.88	Wt. n-Val.		0.035	
W.S. Elev (ft)	725.43	Reach Len. (ft)	166.27	173.42	169.81
Crit W.S. (ft)	725.43	Flow Area (sq ft)		202.73	
E.G. Slope (ft/ft)	0.014704	Area (sq ft)		202.73	
Q Total (cfs)	1530.00	Flow (cfs)		1530.00	
Top Width (ft)	113.80	Top Width (ft)		113.80	
Vel Total (ft/s)	7.55	Avg. Vel. (ft/s)		7.55	
Max Chl Dpth (ft)	3.75	Hydr. Depth (ft)		1.78	
Conv. Total (cfs)	12617.7	Conv. (cfs)		12617.7	
Length Wtd. (ft)	173.41	Wetted Per. (ft)		114.21	
Min Ch El (ft)	721.68	Shear (lb/sq ft)		1.63	
Alpha	1.00	Stream Power (lb/ft s)	1750.88	0.00	0.00
Frctn Loss (ft)	2.19	Cum Volume (acre-ft)	225.99	560.51	228.46
C & E Loss (ft)	0.02	Cum SA (acres)	159.17	103.98	180.58

Plan: CWPropCond Cottonwood Reach1 RS: 55718 Profile: 25yr-Existing

E.G. Elev (ft)	724.03	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.94	Wt. n-Val.	0.040	0.032	
W.S. Elev (ft)	723.09	Reach Len. (ft)	18.00	18.00	18.00
Crit W.S. (ft)	723.09	Flow Area (sq ft)	3.63	196.00	
E.G. Slope (ft/ft)	0.010964	Area (sq ft)	4.16	196.00	
Q Total (cfs)	1530.00	Flow (cfs)	4.20	1525.80	
Top Width (ft)	130.93	Top Width (ft)	34.56	96.37	
Vel Total (ft/s)	7.66	Avg. Vel. (ft/s)	1.16	7.78	
Max Chl Dpth (ft)	2.66	Hydr. Depth (ft)	0.16	2.03	
Conv. Total (cfs)	14612.0	Conv. (cfs)	40.1	14571.9	
Length Wtd. (ft)	18.00	Wetted Per. (ft)	22.44	96.74	
Min Ch El (ft)	720.43	Shear (lb/sq ft)	0.11	1.39	
Alpha	1.03	Stream Power (lb/ft s)	1581.14	0.00	0.00
Frctn Loss (ft)		Cum Volume (acre-ft)	225.98	559.71	228.46
C & E Loss (ft)		Cum SA (acres)	159.11	103.56	180.58

Plan: CWPropCond Cottonwood Reach1 RS: 55891 Profile: 100yr-Existing

E.G. Elev (ft)	727.23	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.05	Wt. n-Val.	0.040	0.035	0.040
W.S. Elev (ft)	726.17	Reach Len. (ft)	166.27	173.42	169.81
Crit W.S. (ft)	726.17	Flow Area (sq ft)	14.34	292.10	0.31
E.G. Slope (ft/ft)	0.011714	Area (sq ft)	14.34	292.10	0.31
Q Total (cfs)	2440.00	Flow (cfs)	24.12	2415.51	0.37
Top Width (ft)	175.43	Top Width (ft)	52.98	120.54	1.91
Vel Total (ft/s)	7.95	Avg. Vel. (ft/s)	1.68	8.27	1.19
Max Chl Dpth (ft)	4.49	Hydr. Depth (ft)	0.27	2.42	0.16
Conv. Total (cfs)	22544.7	Conv. (cfs)	222.9	22318.4	3.4
Length Wtd. (ft)	173.18	Wetted Per. (ft)	52.99	120.98	1.93
Min Ch El (ft)	721.68	Shear (lb/sq ft)	0.20	1.77	0.12
Alpha	1.07	Stream Power (lb/ft s)	1750.88	0.00	0.00
Frctn Loss (ft)	0.95	Cum Volume (acre-ft)	509.37	700.90	535.08
C & E Loss (ft)	0.23	Cum SA (acres)	252.52	104.25	263.13

Plan: CWPropCond Cottonwood Reach1 RS: 55718 Profile: 100yr-Existing

E.G. Elev (ft)	725.42	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.59	Wt. n-Val.	0.040	0.032	0.040
W.S. Elev (ft)	724.83	Reach Len. (ft)	18.00	18.00	18.00
Crit W.S. (ft)	723.81	Flow Area (sq ft)	42.63	363.87	3.70
E.G. Slope (ft/ft)	0.003170	Area (sq ft)	201.96	363.87	3.70
Q Total (cfs)	2440.00	Flow (cfs)	136.76	2296.72	6.52
Top Width (ft)	281.40	Top Width (ft)	180.29	96.61	4.49
Vel Total (ft/s)	5.95	Avg. Vel. (ft/s)	3.21	6.31	1.76
Max Chl Dpth (ft)	4.40	Hydr. Depth (ft)	1.90	3.77	0.82
Conv. Total (cfs)	43338.6	Conv. (cfs)	2429.1	40793.6	115.9
Length Wtd. (ft)	18.00	Wetted Per. (ft)	22.44	97.00	4.79
Min Ch El (ft)	720.43	Shear (lb/sq ft)	0.38	0.74	0.15
Alpha	1.08	Stream Power (lb/ft s)	1581.14	0.00	0.00
Frctn Loss (ft)	0.10	Cum Volume (acre-ft)	508.95	699.60	535.07
C & E Loss (ft)	0.21	Cum SA (acres)	252.08	103.81	263.11

Plan: CWPropCond Cottonwood Reach1 RS: 55891 Profile: 100yr-Ultimate

E.G. Elev (ft)	727.58	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.08	Wt. n-Val.	0.040	0.035	0.040
W.S. Elev (ft)	726.49	Reach Len. (ft)	166.27	173.42	169.81
Crit W.S. (ft)	726.49	Flow Area (sq ft)	35.11	330.38	1.21
E.G. Slope (ft/ft)	0.010430	Area (sq ft)	35.11	330.38	1.21
Q Total (cfs)	2880.00	Flow (cfs)	79.26	2798.61	2.14
Top Width (ft)	200.82	Top Width (ft)	76.51	120.54	3.77
Vel Total (ft/s)	7.85	Avg. Vel. (ft/s)	2.26	8.47	1.76
Max Chl Dpth (ft)	4.81	Hydr. Depth (ft)	0.46	2.74	0.32
Conv. Total (cfs)	28200.1	Conv. (cfs)	776.1	27403.1	20.9
Length Wtd. (ft)	173.08	Wetted Per. (ft)	76.52	120.98	3.82
Min Ch El (ft)	721.68	Shear (lb/sq ft)	0.30	1.78	0.21
Alpha	1.13	Stream Power (lb/ft s)	1750.88	0.00	0.00
Frctn Loss (ft)	0.90	Cum Volume (acre-ft)	621.71	745.07	661.26
C & E Loss (ft)	0.21	Cum SA (acres)	279.93	104.25	308.80

Plan: CWPropCond Cottonwood Reach1 RS: 55718 Profile: 100yr-Ultimate

E.G. Elev (ft)	725.88	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.66	Wt. n-Val.	0.040	0.032	0.040
W.S. Elev (ft)	725.22	Reach Len. (ft)	18.00	18.00	18.00
Crit W.S. (ft)	724.11	Flow Area (sq ft)	51.32	401.30	5.65
E.G. Slope (ft/ft)	0.003123	Area (sq ft)	277.47	401.30	5.65
Q Total (cfs)	2880.00	Flow (cfs)	184.95	2683.68	11.38
Top Width (ft)	313.93	Top Width (ft)	211.79	96.61	5.54
Vel Total (ft/s)	6.28	Avg. Vel. (ft/s)	3.60	6.69	2.02
Max Chl Dpth (ft)	4.79	Hydr. Depth (ft)	2.29	4.15	1.02
Conv. Total (cfs)	51536.9	Conv. (cfs)	3309.5	48023.7	203.6
Length Wtd. (ft)	18.00	Wetted Per. (ft)	22.44	97.00	5.90
Min Ch El (ft)	720.43	Shear (lb/sq ft)	0.45	0.81	0.19
Alpha	1.08	Stream Power (lb/ft s)	1581.14	0.00	0.00
Frctn Loss (ft)	0.09	Cum Volume (acre-ft)	621.12	743.62	661.25
C & E Loss (ft)	0.22	Cum SA (acres)	279.38	103.82	308.79

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PROPOSED DRAINAGE
PROPOSED HYDRAULIC CALCULATIONS
COTTONWOOD CREEK

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SHEET 06 OF 07

FED. RD. DIV. RD.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				154

Plan: CWPropCond Cottonwood Reach1 RS: 55604 Profile: 25yr-Existing

E.G. Elev (ft)	723.18	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.09	Wt. n-Val.		0.035	
W.S. Elev (ft)	723.09	Reach Len. (ft)	317.03	374.55	256.98
Crit W.S. (ft)	720.66	Flow Area (sq ft)		649.79	
E.G. Slope (ft/ft)	0.000541	Area (sq ft)	142.81	693.38	
Q Total (cfs)	1530.00	Flow (cfs)		1530.00	
Top Width (ft)	337.31	Top Width (ft)	142.56	194.74	
Vel Total (ft/s)	2.35	Avg. Vel. (ft/s)		2.35	
Max Chl Dpth (ft)	4.49	Hydr. Depth (ft)		3.69	
Conv. Total (cfs)	65751.3	Conv. (cfs)		65751.3	
Length Wtd. (ft)	342.75	Wetted Per. (ft)		176.59	
Min Ch El (ft)	718.60	Shear (lb/sq ft)		0.12	
Alpha	1.00	Stream Power (lb/ft s)	1766.14	0.00	0.00
Frctn Loss (ft)	0.38	Cum Volume (acre-ft)	225.96	558.88	228.46
C & E Loss (ft)	0.04	Cum SA (acres)	159.07	103.28	180.58

Plan: CWPropCond Cottonwood Reach1 RS: 55171 Profile: 25yr-Existing

E.G. Elev (ft)	722.75	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.23	Wt. n-Val.	0.035	0.035	0.037
W.S. Elev (ft)	722.52	Reach Len. (ft)	502.16	290.73	136.71
Crit W.S. (ft)	722.32	Flow Area (sq ft)	93.73	104.78	328.06
E.G. Slope (ft/ft)	0.003278	Area (sq ft)	93.73	104.78	328.06
Q Total (cfs)	1570.00	Flow (cfs)	310.50	572.93	686.57
Top Width (ft)	500.32	Top Width (ft)	58.72	29.93	411.67
Vel Total (ft/s)	2.98	Avg. Vel. (ft/s)	3.31	5.47	2.09
Max Chl Dpth (ft)	5.76	Hydr. Depth (ft)	1.60	3.50	0.80
Conv. Total (cfs)	27420.3	Conv. (cfs)	5422.9	10006.4	11991.1
Length Wtd. (ft)	254.46	Wetted Per. (ft)	58.92	31.06	411.79
Min Ch El (ft)	716.76	Shear (lb/sq ft)	0.33	0.69	0.16
Alpha	1.69	Stream Power (lb/ft s)	1137.19	0.00	0.00
Frctn Loss (ft)	1.11	Cum Volume (acre-ft)	225.10	555.45	227.49
C & E Loss (ft)	0.15	Cum SA (acres)	158.34	102.32	179.36

Plan: CWPropCond Cottonwood Reach1 RS: 55604 Profile: 100yr-Existing

E.G. Elev (ft)	723.76	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.17	Wt. n-Val.		0.035	0.040
W.S. Elev (ft)	723.59	Reach Len. (ft)	317.03	374.55	256.98
Crit W.S. (ft)	721.17	Flow Area (sq ft)		737.93	3.73
E.G. Slope (ft/ft)	0.000904	Area (sq ft)	222.52	790.85	3.82
Q Total (cfs)	2440.00	Flow (cfs)		2438.76	1.24
Top Width (ft)	398.69	Top Width (ft)	176.57	195.22	26.91
Vel Total (ft/s)	3.29	Avg. Vel. (ft/s)		3.30	0.33
Max Chl Dpth (ft)	4.99	Hydr. Depth (ft)		4.18	0.16
Conv. Total (cfs)	81162.9	Conv. (cfs)		81121.6	41.3
Length Wtd. (ft)	338.06	Wetted Per. (ft)		177.10	22.95
Min Ch El (ft)	718.60	Shear (lb/sq ft)		0.24	0.01
Alpha	1.01	Stream Power (lb/ft s)	1766.14	0.00	0.00
Frctn Loss (ft)	0.56	Cum Volume (acre-ft)	508.88	698.58	535.07
C & E Loss (ft)	0.04	Cum SA (acres)	252.01	103.53	263.11

Plan: CWPropCond Cottonwood Reach1 RS: 55171 Profile: 100yr-Existing

E.G. Elev (ft)	723.16	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.29	Wt. n-Val.	0.035	0.035	0.037
W.S. Elev (ft)	722.87	Reach Len. (ft)	502.16	290.73	136.71
Crit W.S. (ft)	722.62	Flow Area (sq ft)	114.72	115.33	478.50
E.G. Slope (ft/ft)	0.003882	Area (sq ft)	114.72	115.33	478.50
Q Total (cfs)	2500.00	Flow (cfs)	462.95	731.50	1305.55
Top Width (ft)	533.41	Top Width (ft)	60.66	29.93	442.82
Vel Total (ft/s)	3.53	Avg. Vel. (ft/s)	4.04	6.34	2.73
Max Chl Dpth (ft)	6.11	Hydr. Depth (ft)	1.89	3.85	1.08
Conv. Total (cfs)	40122.2	Conv. (cfs)	7429.9	11739.7	20952.7
Length Wtd. (ft)	236.89	Wetted Per. (ft)	60.89	31.06	442.96
Min Ch El (ft)	716.76	Shear (lb/sq ft)	0.46	0.90	0.26
Alpha	1.50	Stream Power (lb/ft s)	1137.19	0.00	0.00
Frctn Loss (ft)	1.03	Cum Volume (acre-ft)	507.65	694.69	533.65
C & E Loss (ft)	0.08	Cum SA (acres)	251.15	102.56	261.72

Plan: CWPropCond Cottonwood Reach1 RS: 55604 Profile: 100yr-Ultimate

E.G. Elev (ft)	724.00	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.21	Wt. n-Val.		0.035	0.040
W.S. Elev (ft)	723.79	Reach Len. (ft)	317.03	374.55	256.98
Crit W.S. (ft)	721.39	Flow Area (sq ft)		772.59	8.23
E.G. Slope (ft/ft)	0.001078	Area (sq ft)	258.50	829.17	10.74
Q Total (cfs)	2880.00	Flow (cfs)		2874.93	5.07
Top Width (ft)	428.80	Top Width (ft)	189.90	195.22	43.68
Vel Total (ft/s)	3.69	Avg. Vel. (ft/s)		3.72	0.62
Max Chl Dpth (ft)	5.19	Hydr. Depth (ft)		4.38	0.36
Conv. Total (cfs)	87724.7	Conv. (cfs)		87570.3	154.4
Length Wtd. (ft)	336.24	Wetted Per. (ft)		177.10	22.95
Min Ch El (ft)	718.60	Shear (lb/sq ft)		0.29	0.02
Alpha	1.02	Stream Power (lb/ft s)	1766.14	0.00	0.00
Frctn Loss (ft)	0.62	Cum Volume (acre-ft)	621.02	742.53	661.25
C & E Loss (ft)	0.02	Cum SA (acres)	279.30	103.53	308.78

Plan: CWPropCond Cottonwood Reach1 RS: 55171 Profile: 100yr-Ultimate

E.G. Elev (ft)	723.35	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.30	Wt. n-Val.	0.035	0.035	0.038
W.S. Elev (ft)	723.06	Reach Len. (ft)	502.16	290.73	136.71
Crit W.S. (ft)	722.75	Flow Area (sq ft)	125.95	120.81	560.19
E.G. Slope (ft/ft)	0.003830	Area (sq ft)	125.95	120.81	560.19
Q Total (cfs)	2950.00	Flow (cfs)	529.46	784.99	1635.55
Top Width (ft)	541.80	Top Width (ft)	61.99	29.93	449.88
Vel Total (ft/s)	3.66	Avg. Vel. (ft/s)	4.20	6.50	2.92
Max Chl Dpth (ft)	6.30	Hydr. Depth (ft)	2.03	4.04	1.25
Conv. Total (cfs)	47666.7	Conv. (cfs)	8555.1	12684.0	26427.6
Length Wtd. (ft)	230.76	Wetted Per. (ft)	62.24	31.06	450.02
Min Ch El (ft)	716.76	Shear (lb/sq ft)	0.48	0.93	0.30
Alpha	1.43	Stream Power (lb/ft s)	1137.19	0.00	0.00
Frctn Loss (ft)	1.02	Cum Volume (acre-ft)	619.62	738.44	659.56
C & E Loss (ft)	0.09	Cum SA (acres)	278.38	102.57	307.32

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98234
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6/15/2017

CR 119

WILLIAMSON COUNTY 1848

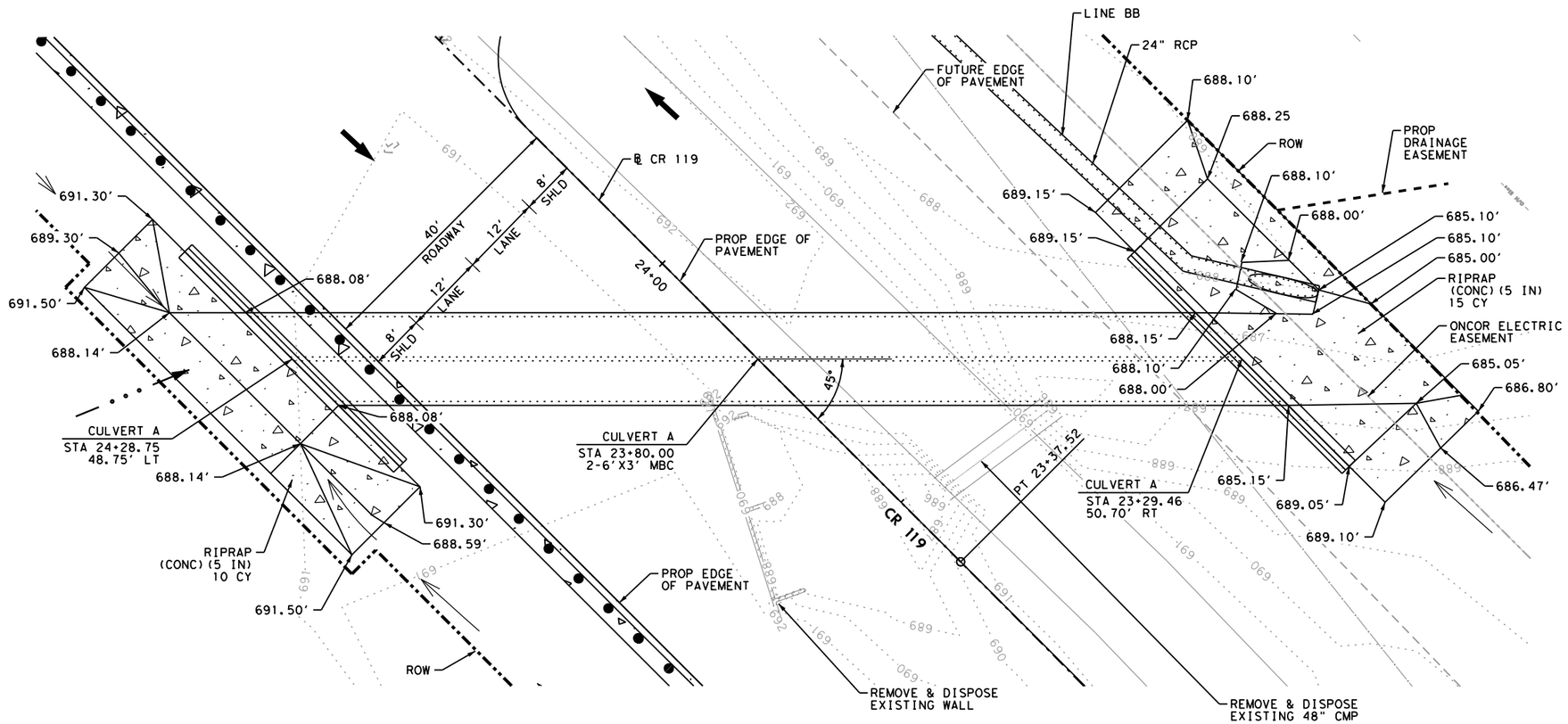
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PROPOSED DRAINAGE
PROPOSED HYDRAULIC CALCULATIONS
COTTONWOOD CREEK

STA 123+60.00

SHEET 07 OF 07

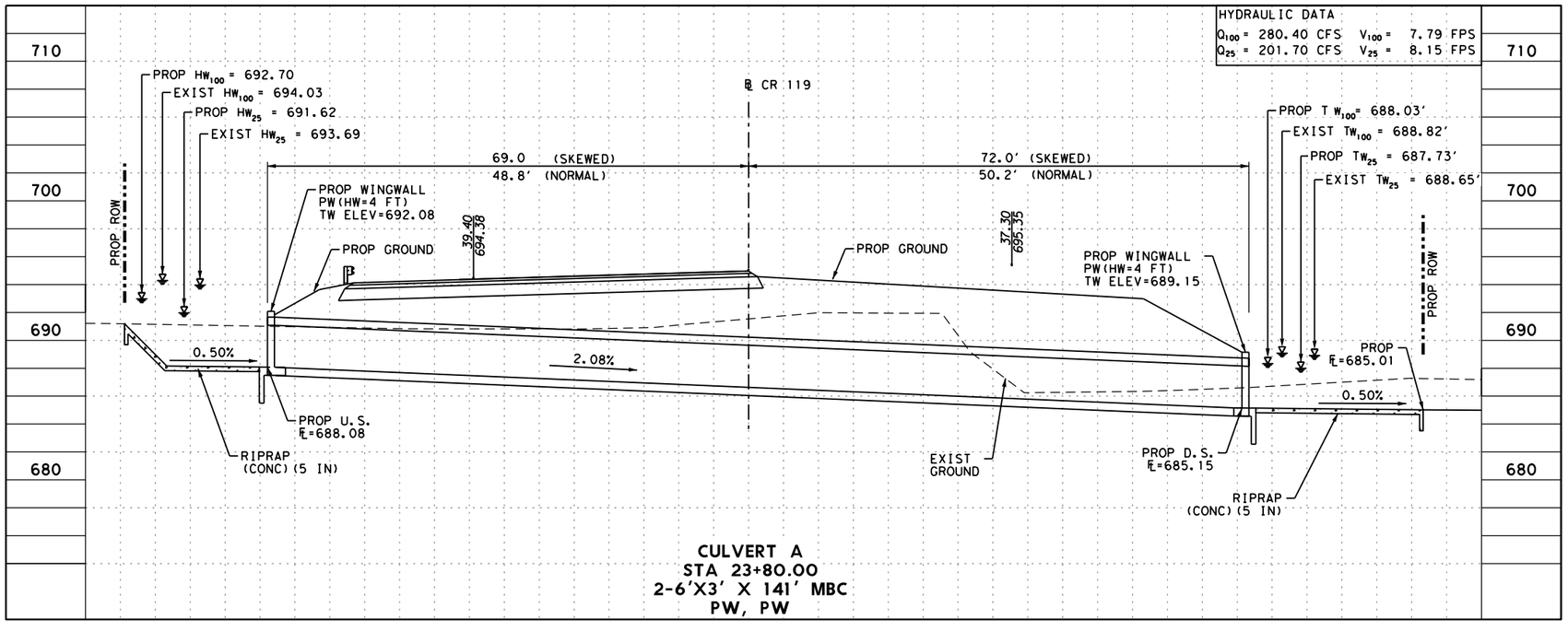
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6	TEXAS		CR119	14	WILLIAMSON				155



NOTES:
1. ALL UTILITIES SHOWN ARE APPROXIMATE LOCATIONS. CONTRACTOR SHALL VERIFY DEPTHS AND LOCATIONS PRIOR TO THE START OF CONSTRUCTION.
2. REFER TO DRAINAGE GRADING PLANS FOR ADDITIONAL INFORMATION.
3. REFER TO BOX CULVERT SUPPLEMENT (BCS) SHEET FOR ADDITIONAL WINGALL/HEADWALL DETAILS.
4. REFER TO CROSS SECTIONS FOR ADDITIONAL DITCH DETAILS.
5. THE CULVERT HAS BEEN DESIGN FOR THE 25-YEAR STORM EVENT AND CHECKED FOR THE 100-YEAR STORM EVENT. THE EXISTING 25-YEAR WATER SURFACE ELEVATION AT THE UPSTREAM RIGHT-OF-WAY WAS USED AS THE ALLOWABLE 25-YEAR PROPOSED HEADWATER ELEVATION.

LEGEND

- RIGHT OF WAY BOUNDARY
- 535 PROPOSED CONTOURS
- 580 EXISTING CONTOURS
- PROPOSED DRAINAGE EASEMENT
- EXISTING EASEMENT
- FLOW ARROW
- 4" CONCRETE RIPRAP
- 18" ROCK RIPRAP
- SIDE DITCH FLOW



CULVERT A
STA 23+80.00
2-6'X3' X 141' MBC
PW, PW

0 5 10 20 (H)
0 5 10 (V)

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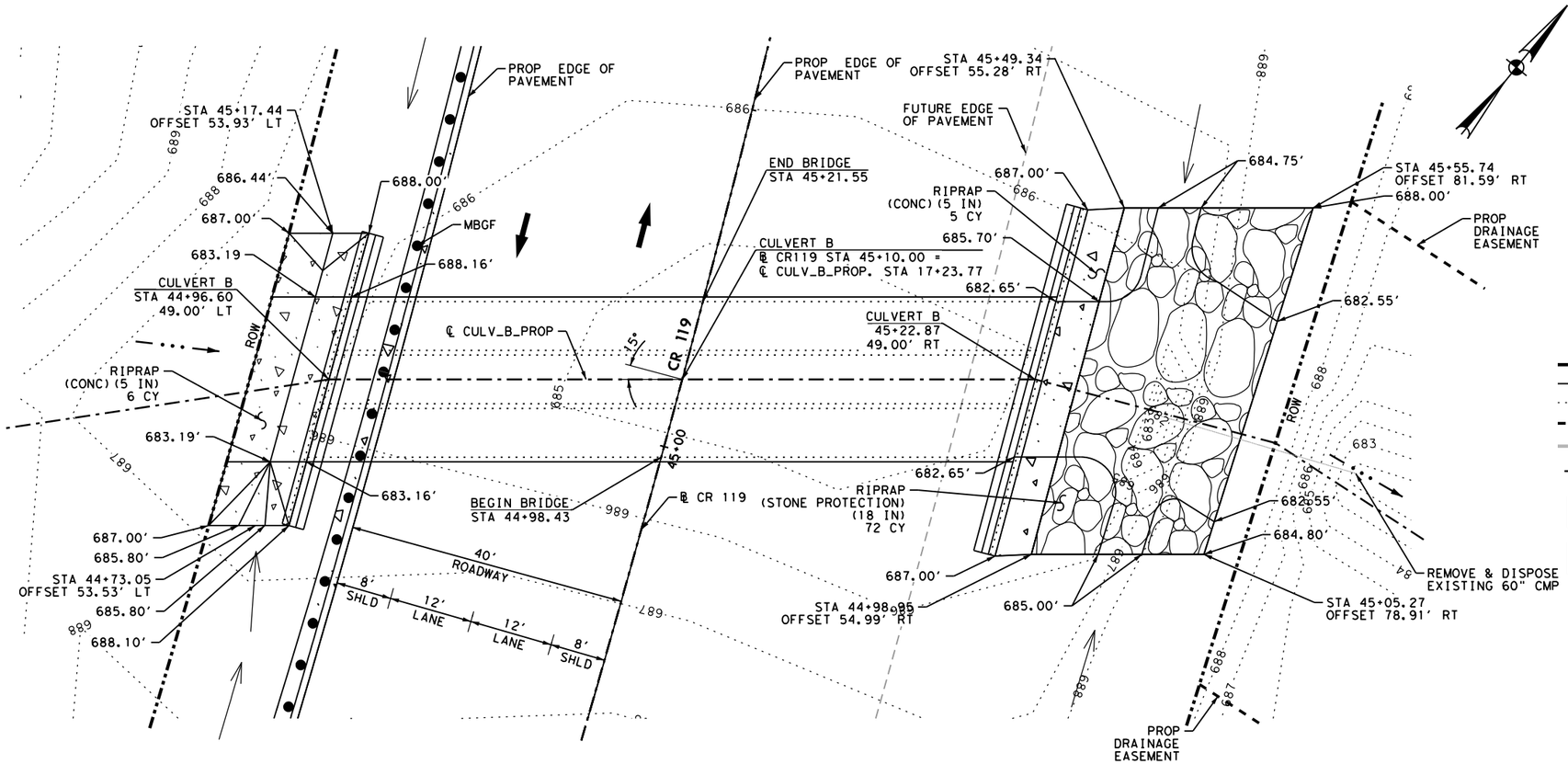
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DRAINAGE PLAN AND PROFILE CULVERT A STA 23+80.00

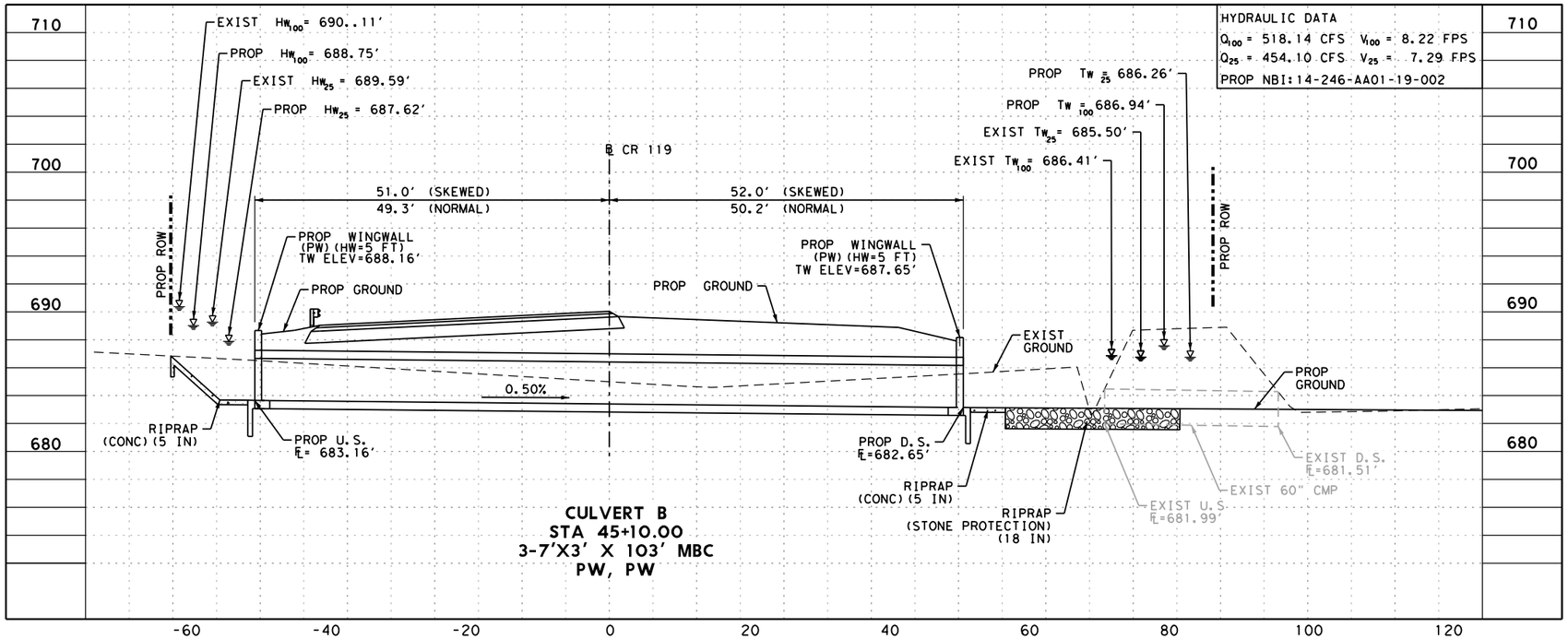
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6	TEXAS		CR119	14	WILLIAMSON				



NOTES:
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3. REFER TO BOX CULVERT SUPPLEMENT (BCS) SHEET FOR ADDITIONAL WINGALL/HEADWALL DETAILS.
4. REFER TO CROSS SECTIONS FOR ADDITIONAL DITCH DETAILS.
5. THE CULVERT HAS BEEN DESIGN FOR THE 25-YEAR STORM EVENT AND CHECKED FOR THE 100-YEAR STORM EVENT. THE EXISTING 25-YEAR WATER SURFACE ELEVATION AT THE UPSTREAM RIGHT-OF-WAY WAS USED AS THE ALLOWABLE 25-YEAR PROPOSED HEADWATER ELEVATION.

LEGEND

- RIGHT OF WAY BOUNDARY
- 535 PROPOSED CONTOURS
- 580 EXISTING CONTOURS
- PROPOSED DRAINAGE EASEMENT
- EXISTING EASEMENT
- FLOW ARROW
- 4" CONCRETE RIPRAP
- 18" ROCK RIPRAP
- SIDE DITCH FLOW



CULVERT B
STA 45+10.00
3-7'X3' X 103' MBC
PW, PW

0 5 10 20 (H)
0 5 10 (V)

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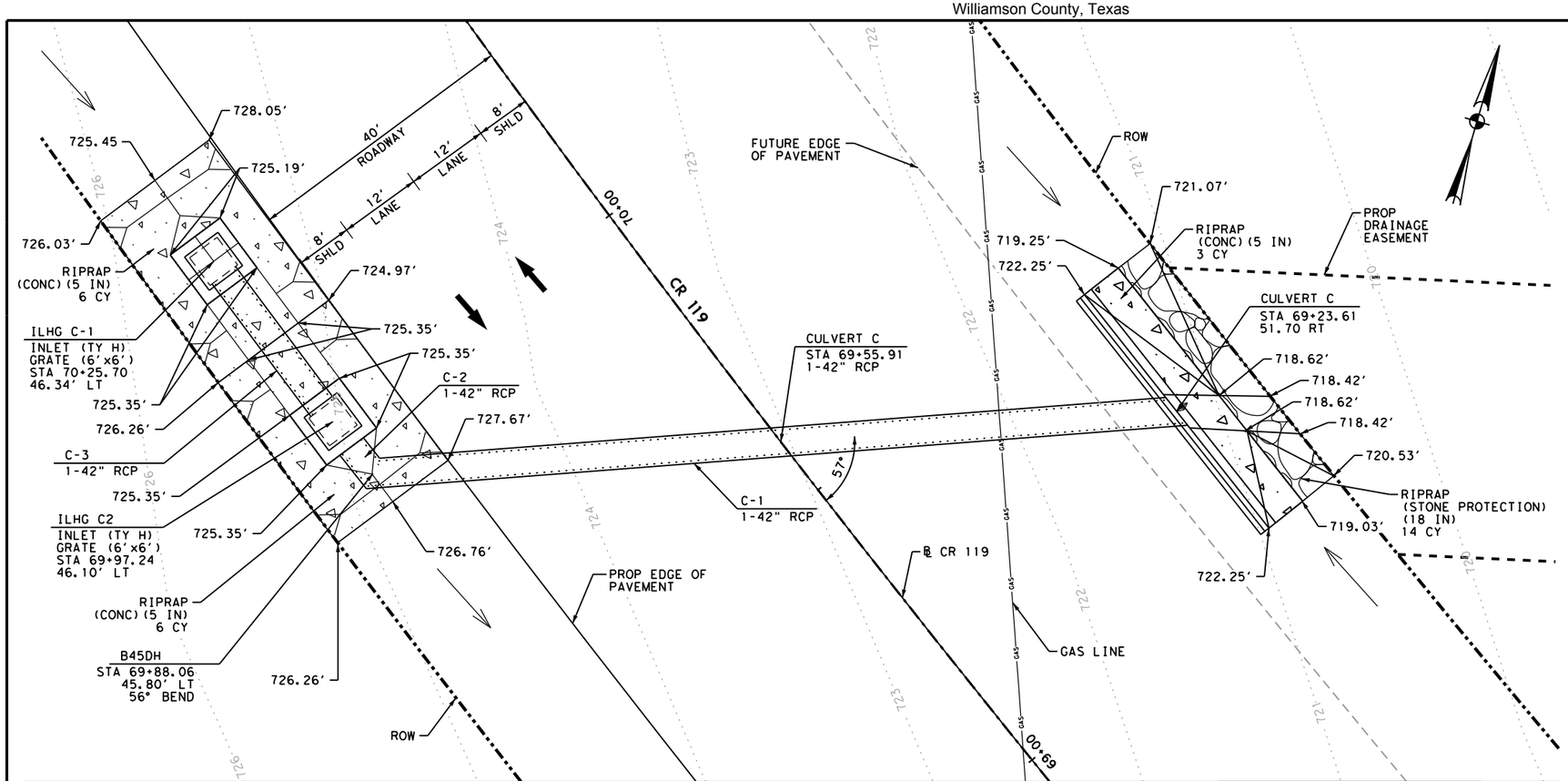
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DRAINAGE PLAN AND PROFILE CULVERT B

STA 45+10.00

SHEET 01 OF 01

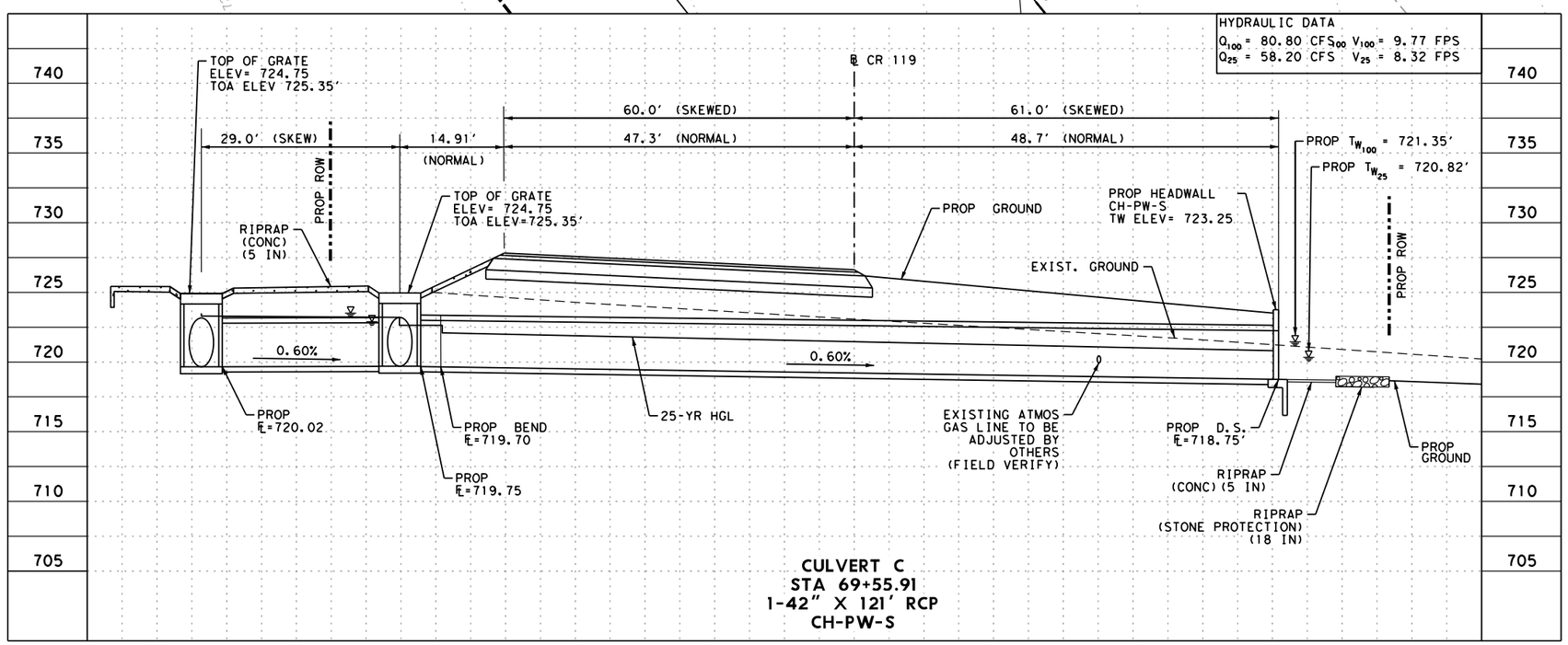
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6	TEXAS		CR119	14	WILLIAMSON				157



NOTES:
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3. REFER TO BOX CULVERT SUPPLEMENT (BCS) SHEET FOR ADDITIONAL WINGALL/HEADWALL DETAILS.
4. REFER TO CROSS SECTIONS FOR ADDITIONAL DITCH DETAILS.
5. THE GRATE INLETS HAVE BEEN DESIGNED FOR THE 25-YEAR STORM EVENT AND CHECKED FOR THE 100-YEAR STORM EVENT. THE EXISTING 25-YEAR WATER SURFACE ELEVATION AT THE UPSTREAM RIGHT-OF-WAY WAS USED AS THE ALLOWABLE 25-YEAR HYDRAULIC GRADE LINE (HGL) ELEVATION AT EACH GREAT INLET.

LEGEND

- RIGHT OF WAY BOUNDARY
- 535 PROPOSED CONTOURS
- 580 EXISTING CONTOURS
- PROPOSED DRAINAGE EASEMENT
- EXISTING EASEMENT
- FLOW ARROW
- 4" CONCRETE RIPRAP
- 18" ROCK RIPRAP
- SIDE DITCH FLOW



CULVERT C
STA 69+55.91
1-42" X 121' RCP
CH-PW-S

0 5 10 20 (H)
0 5 10 (V)



6/15/2017

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DRAINAGE PLAN AND PROFILE CULVERT C

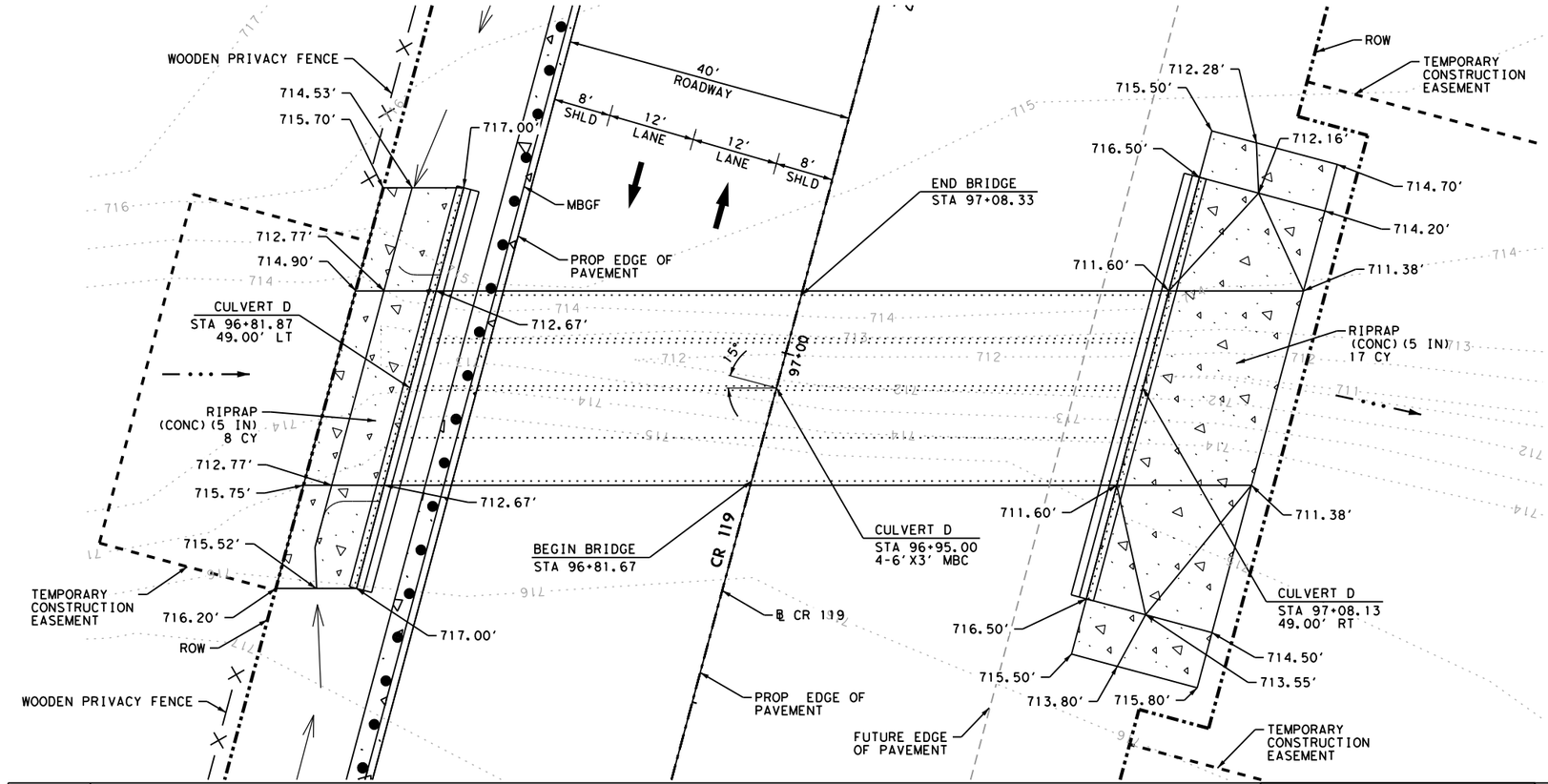
STA 69+64.40

SHEET 01 OF 01

FED. RD. DIV. NO.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				158

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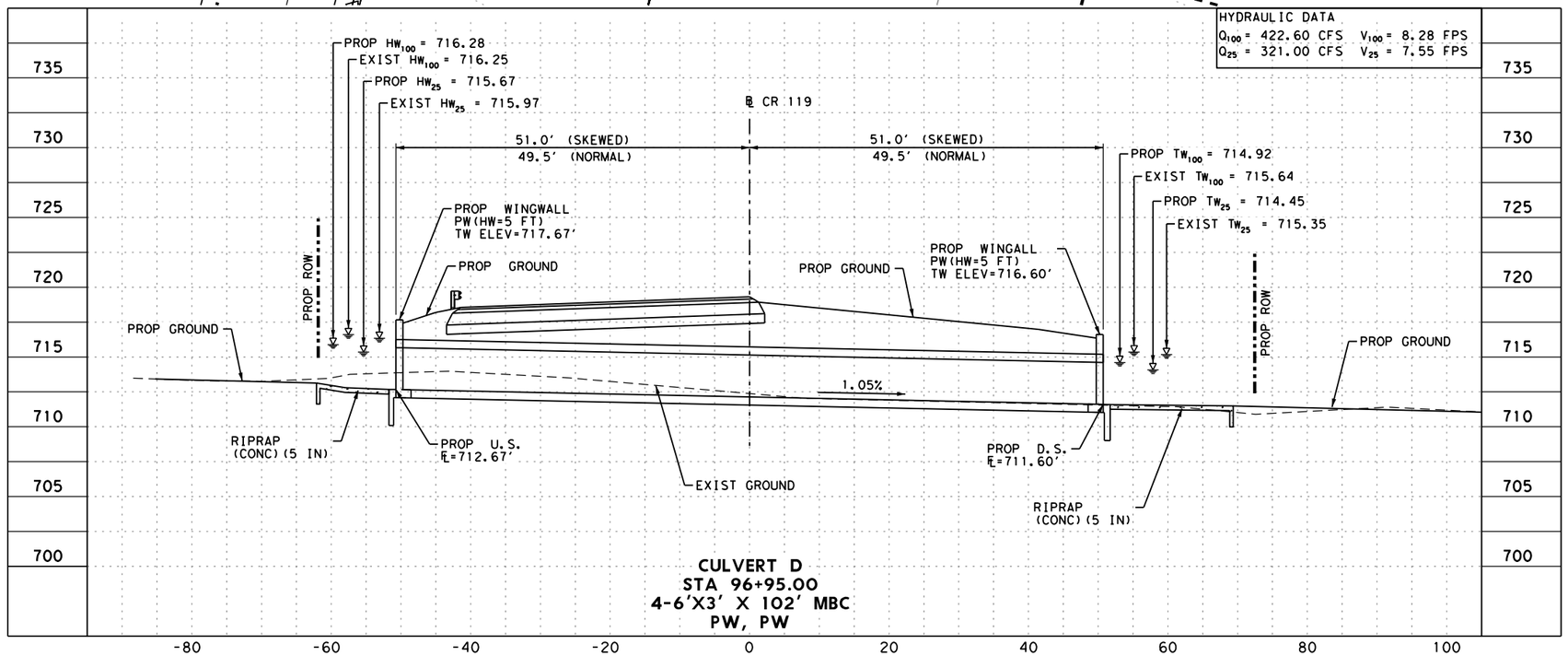
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NOTES:
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2. REFER TO DRAINAGE GRADING PLANS FOR ADDITIONAL INFORMATION.
3. REFER TO BOX CULVERT SUPPLEMENT (BCS) SHEET FOR ADDITIONAL WINGALL/HEADWALL DETAILS.
4. REFER TO CROSS SECTIONS FOR ADDITIONAL DITCH DETAILS.
5. THE CULVERT HAS BEEN DESIGN FOR THE 25-YEAR STORM EVENT AND CHECKED FOR THE 100-YEAR STORM EVENT. THE EXISTING 25-YEAR WATER SURFACE ELEVATION AT THE UPSTREAM RIGHT-OF-WAY WAS USED AS THE ALLOWABLE 25-YEAR PROPOSED HEADWATER ELEVATION.

LEGEND

- RIGHT OF WAY BOUNDARY
- 535 PROPOSED CONTOURS
- 580 EXISTING CONTOURS
- PROPOSED DRAINAGE EASEMENT
- EXISTING EASEMENT
- FLOW ARROW
- 4" CONCRETE RIPRAP
- 18" ROCK RIPRAP



CULVERT D
STA 96+95.00
4-6'X3' X 102' MBC
PW, PW

0 5 10 20 (H)
0 5 10 (V)

STATE OF TEXAS
ARNOLD GONZALES, JR.
98234
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CR 119

WILLIAMSON COUNTY 1848

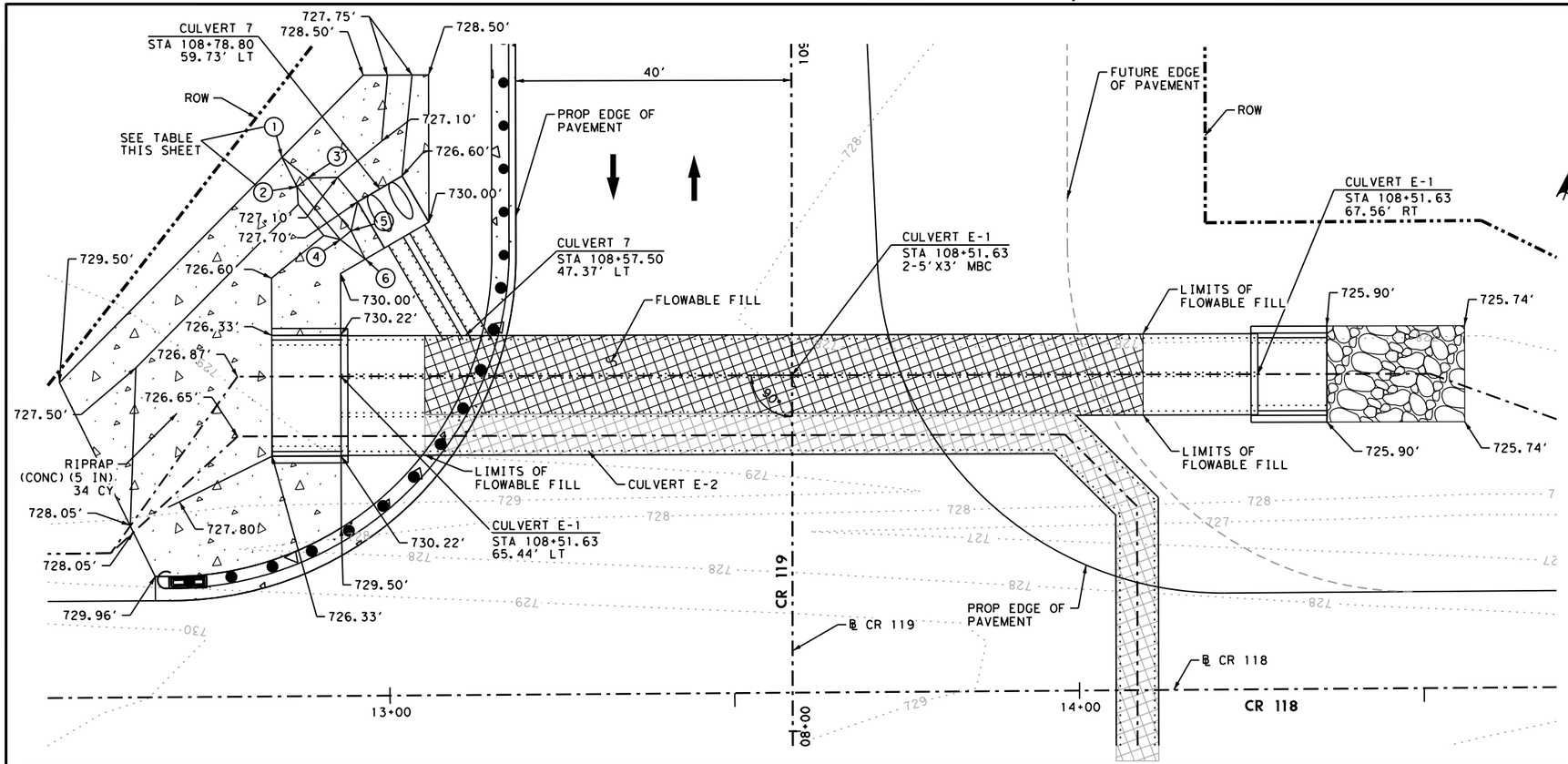
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DRAINAGE PLAN AND PROFILE CULVERT D

STA 96+95.00

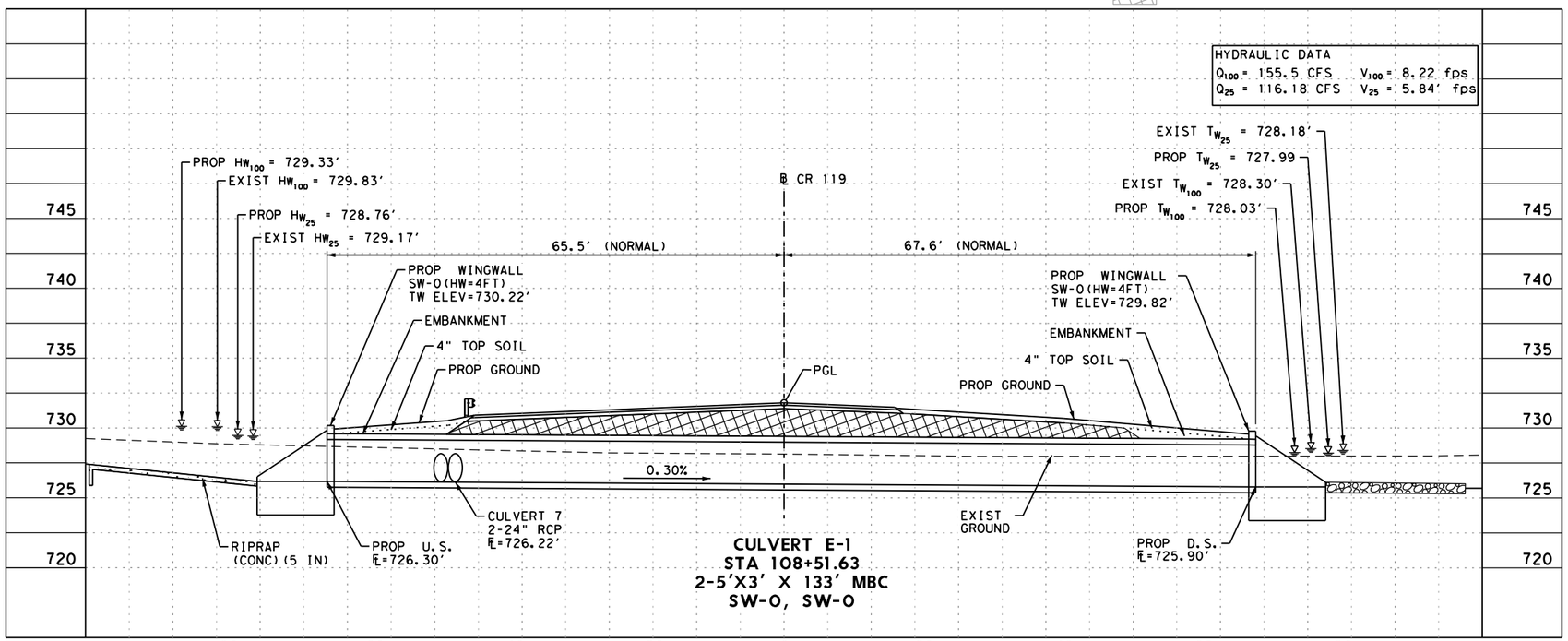
SHEET 01 OF 01

FED. RD. DIV. RD.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				159



POINT	CR 119 STA.	OFF.	ELEV.
①	108+83.44	73.92(LT)	729.00'
②	108+79.15	71.71(LT)	727.50'
③	108+80.41	70.16(LT)	727.50'
④	108+71.48	65.45(LT)	727.50'
⑤	108+72.74	63.90(LT)	727.50'
⑥	108+68.63	61.84(LT)	730.00

NOTES:
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3. REFER TO BOX CULVERT SUPPLEMENT (BCS) SHEET FOR ADDITIONAL WINGALL/HEADWALL DETAILS.
4. REFER TO CROSS SECTIONS FOR ADDITIONAL DITCH DETAILS.
5. THE CULVERT HAS BEEN DESIGN FOR THE 25-YEAR STORM EVENT AND CHECKED FOR THE 100-YEAR STORM EVENT. THE EXISTING 25-YEAR WATER SURFACE ELEVATION AT THE UPSTREAM RIGHT-OF-WAY WAS USED AS THE ALLOWABLE 25-YEAR PROPOSED HEADWATER ELEVATION.
6. FLOWABLE FILL SHALL BE SUBSIDIARY TO BOX CULVERT.



LEGEND

- RIGHT OF WAY BOUNDARY
- 535 PROPOSED CONTOURS
- 580 EXISTING CONTOURS
- DRAINAGE EASEMENT
- FLOW ARROW
- 4" CONCRETE RIPRAP
- 18" ROCK RIPRAP
- FLOWABLE FILL

0 5 10 20 (H)
0 5 10 (V)

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CR 119

WILLIAMSON COUNTY
1848

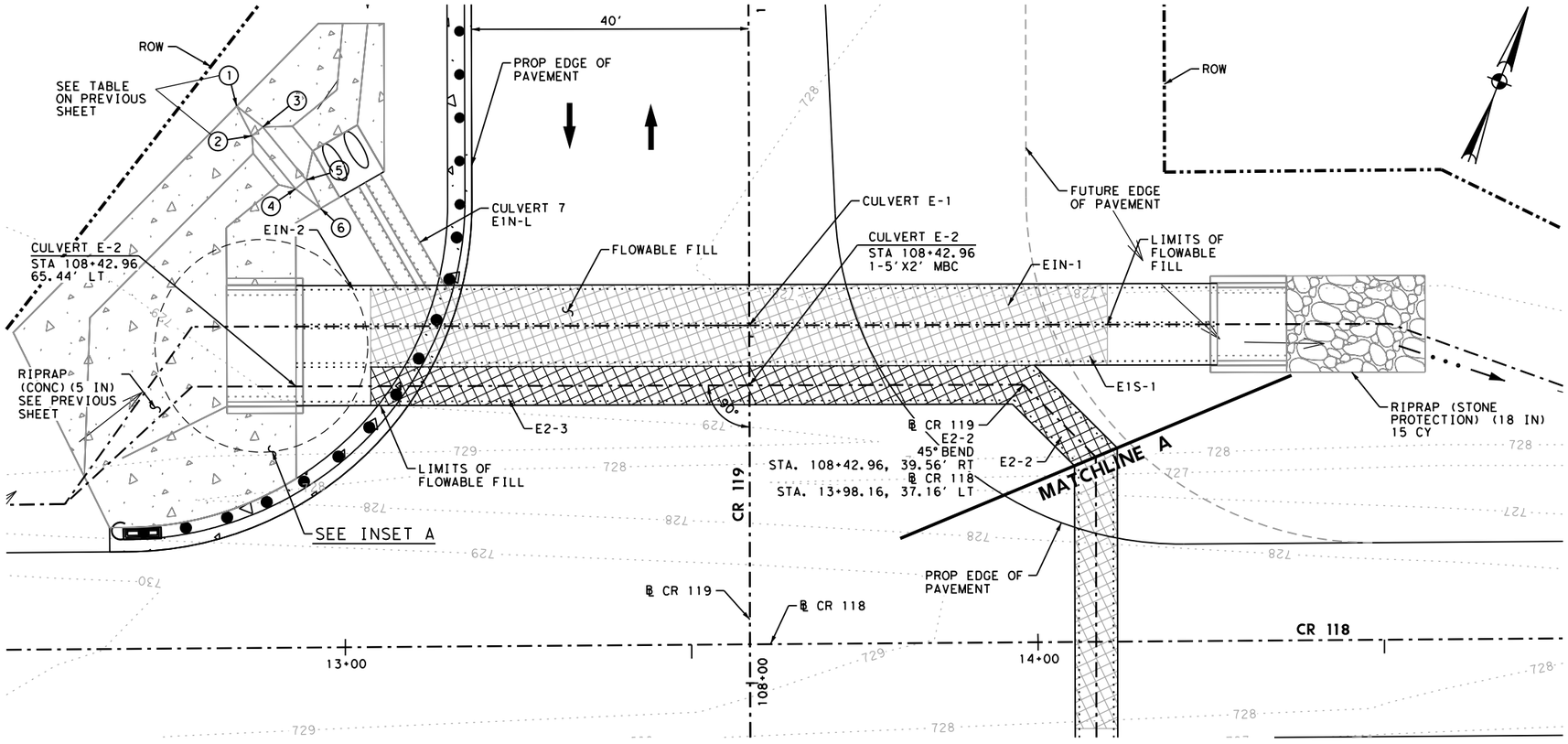
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DRAINAGE PLAN AND PROFILE CULVERT E-1

STA 108+51.63

SHEET 01 OF 01

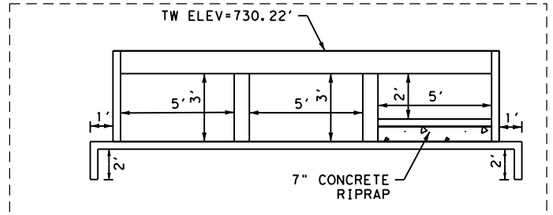
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6	TEXAS		CR119	14	WILLIAMSON				160



NOTES:
1. ALL UTILITIES SHOWN ARE APPROXIMATE LOCATIONS. CONTRACTOR SHALL VERIFY DEPTHS AND LOCATIONS PRIOR TO THE START OF CONSTRUCTION.
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6. FLOWABLE FILL SHALL BE SUBSIDIARY TO BOX CULVERT.

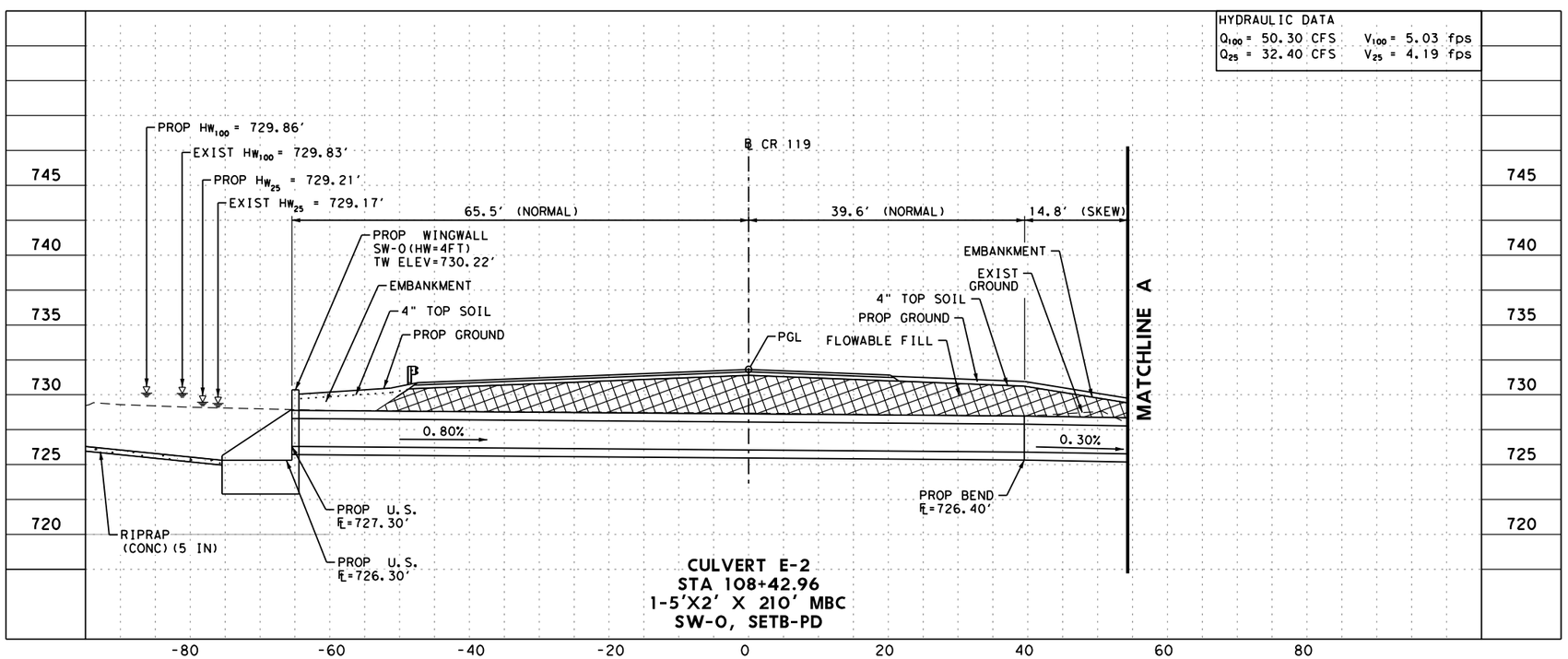
LEGEND

- RIGHT OF WAY BOUNDARY
- 535 — PROPOSED CONTOURS
- 580 — EXISTING CONTOURS
- PROPOSED DRAINAGE EASEMENT
- EXISTING EASEMENT
- FLOW ARROW
- FLOWABLE FILL 4" CONCRETE RIPRAP
- 18" ROCK RIPRAP



* SEE SW-0 & MC-S=20 (MOD) FOR ADDITIONAL INFORMATION.

INSET A



CULVERT E-2
STA 108+42.96
1-5'X2' X 210' MBC
SW-0, SETB-PD

0 5 10 20 (H)
0 5 10 (V)

ARNOLD GONZALES, JR. 98234 LICENSED PROFESSIONAL ENGINEER
STATE OF TEXAS

6/15/2017

CR 119

WILLIAMSON COUNTY 1848

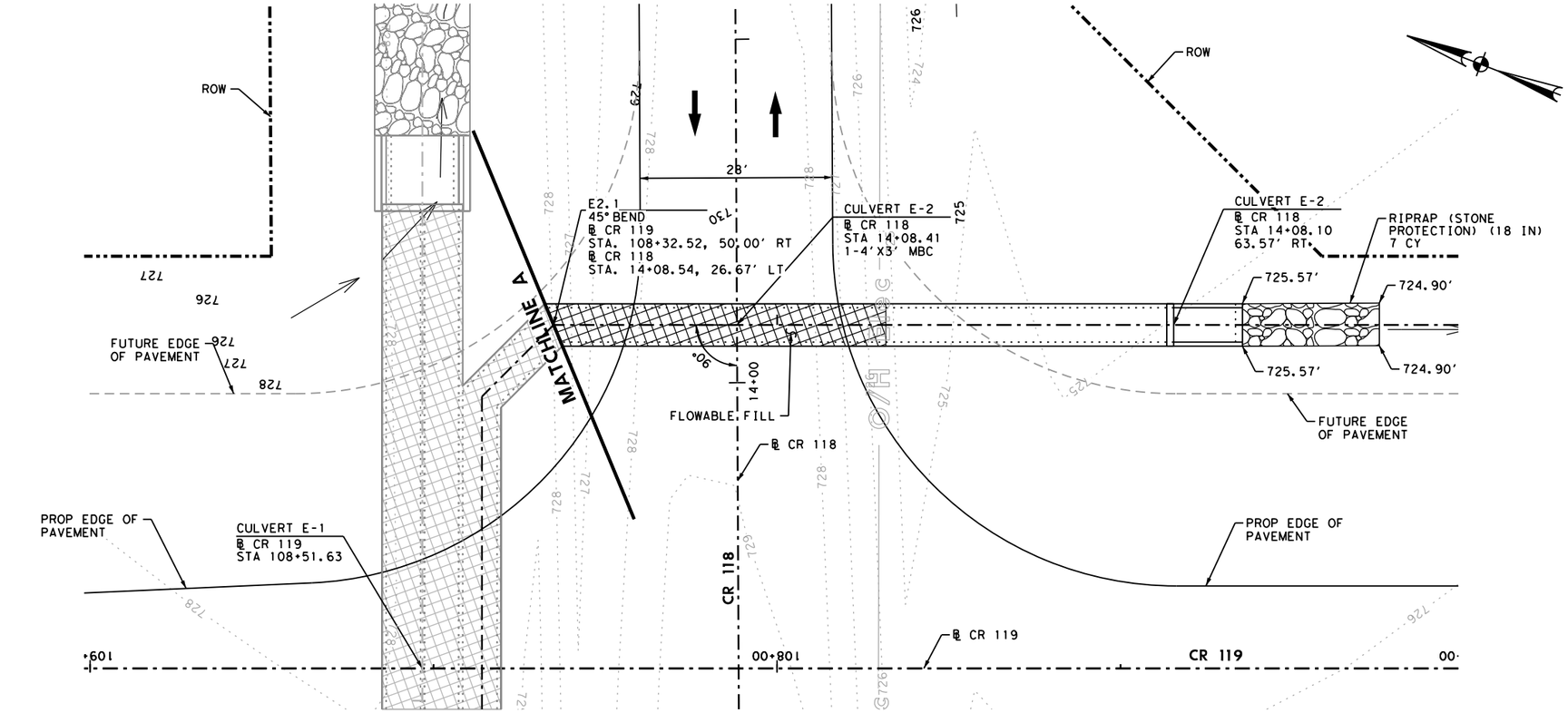
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DRAINAGE PLAN AND PROFILE CULVERT E-2

STA 108+48.83

SHEET 01 OF 02

FED. RD. DIV. RD.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				161

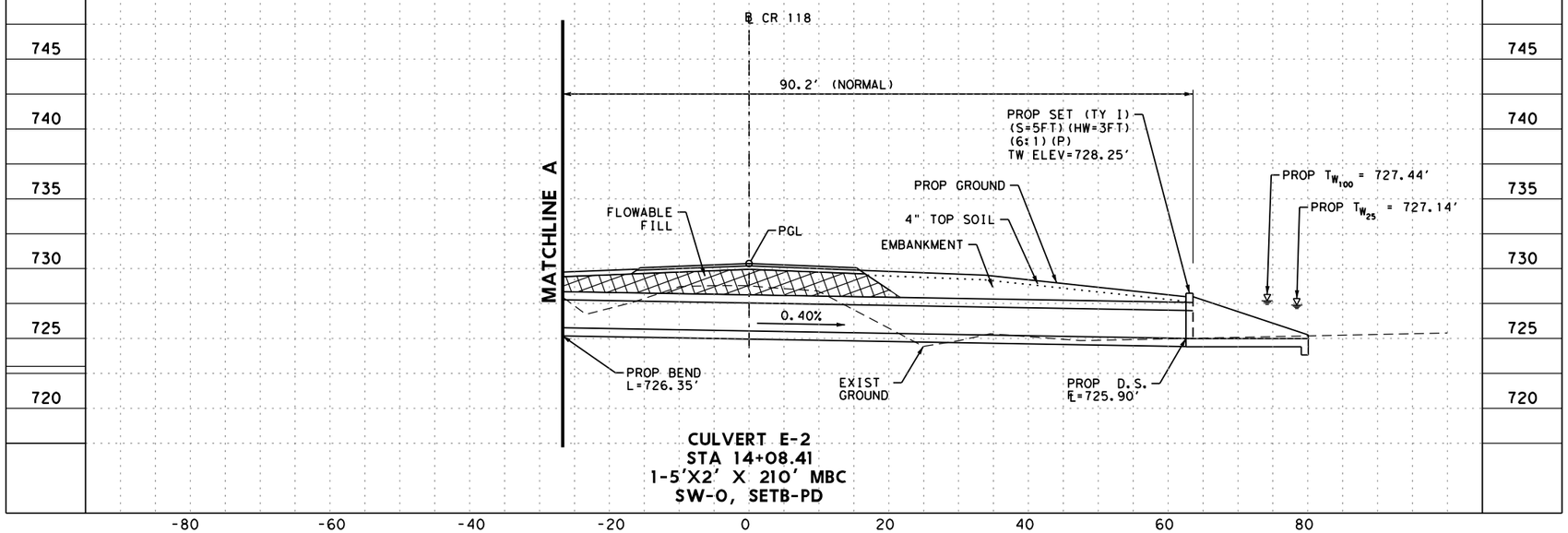


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4. REFER TO CROSS SECTIONS FOR ADDITIONAL DITCH DETAILS.
5. THE CULVERT HAS BEEN DESIGN FOR THE 25-YEAR STORM EVENT AND CHECKED FOR THE 100-YEAR STORM EVENT. THE EXISTING 25-YEAR WATER SURFACE ELEVATION AT THE UPSTREAM RIGHT-OF-WAY WAS USED AS THE ALLOWABLE 25-YEAR PROPOSED HEADWATER ELEVATION.
6. FLOWABLE FILL SHALL BE SUBSIDIARY TO BOX CULVERT.

LEGEND

- RIGHT OF WAY BOUNDARY
- 535 — PROPOSED CONTOURS
- 580 — EXISTING CONTOURS
- PROPOSED DRAINAGE EASEMENT
- EXISTING EASEMENT
- FLOW ARROW
- 4" CONCRETE RIPRAP
- 18" ROCK RIPRAP
- FLOWABLE FILL

HYDRAULIC DATA
Q_{100} = 50.30 cfs V_{100} = 6.53 fps
Q_{25} = 32.40 cfs V_{25} = 5.23 fps



CULVERT E-2
STA 14+08.41
1-5'X2' X 210' MBC
SW-0, SETB-PD

0 5 10 20 (H)
0 5 10 (V)

STATE OF TEXAS
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CR 119

WILLIAMSON COUNTY 1848

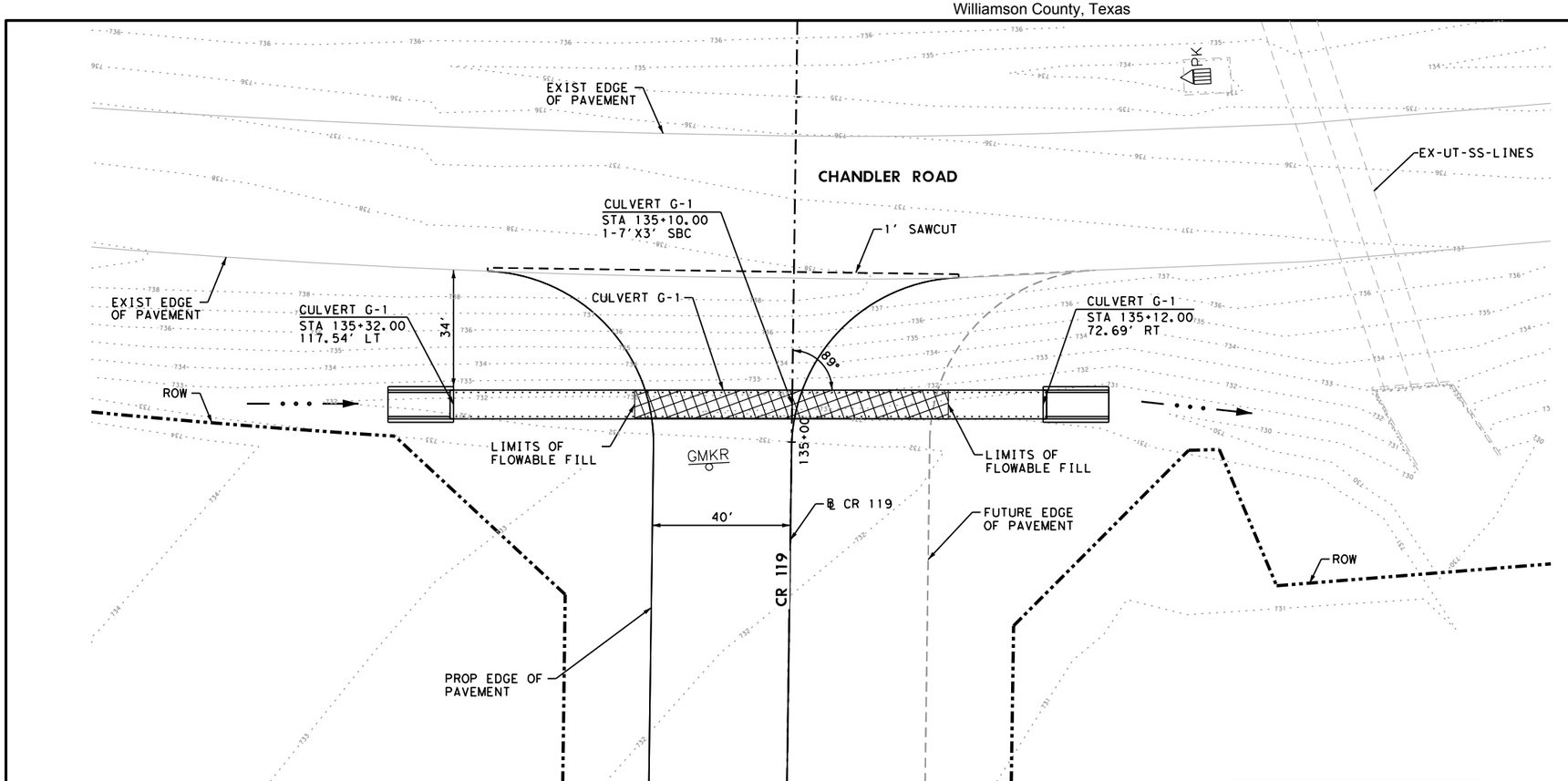
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DRAINAGE PLAN AND PROFILE CULVERT E-2

STA 108+48.83

SHEET 02 OF 02

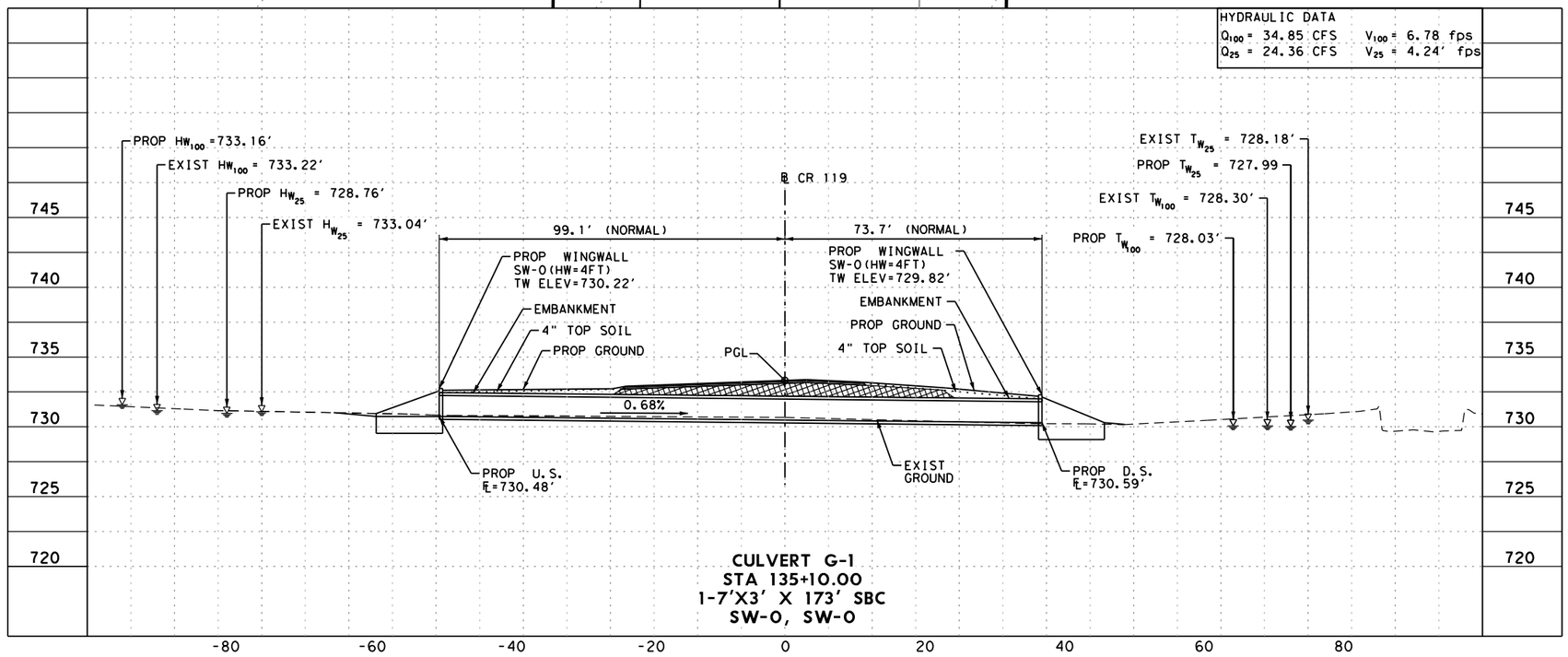
FED. RD. DIV. NO.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				162



NOTES:
1. ALL UTILITIES SHOWN ARE APPROXIMATE LOCATIONS. CONTRACTOR SHALL VERIFY DEPTHS AND LOCATIONS PRIOR TO THE START OF CONSTRUCTION.
2. REFER TO DRAINAGE GRADING PLANS FOR ADDITIONAL INFORMATION.
3. REFER TO BOX CULVERT SUPPLEMENT (BCS) SHEET FOR ADDITIONAL WINGALL/HEADWALL DETAILS.
4. REFER TO CROSS SECTIONS FOR ADDITIONAL DITCH DETAILS.
5. THE CULVERT HAS BEEN DESIGN FOR THE 25-YEAR STORM EVENT AND CHECKED FOR THE 100-YEAR STORM EVENT. THE EXISTING 25-YEAR WATER SURFACE ELEVATION AT THE UPSTREAM RIGHT-OF-WAY WAS USED AS THE ALLOWABLE 25-YEAR PROPOSED HEADWATER ELEVATION.
6. FLOWABLE FILL SHALL BE SUBSIDIARY TO BOX CULVERT.

LEGEND

- RIGHT OF WAY BOUNDARY
- 535 PROPOSED CONTOURS
- 580 EXISTING CONTOURS
- DRAINAGE EASEMENT
- FLOW ARROW
- 4" CONCRETE RIPRAP
- 18" ROCK RIPRAP
- FLOWABLE FILL



CULVERT G-1
STA 135+10.00
1-7'X3' X 173' SBC
SW-0, SW-0

0 10 20 40 (H)
0 10 20 (V)

STATE OF TEXAS
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DRAINAGE PLAN AND PROFILE CULVERT G-1

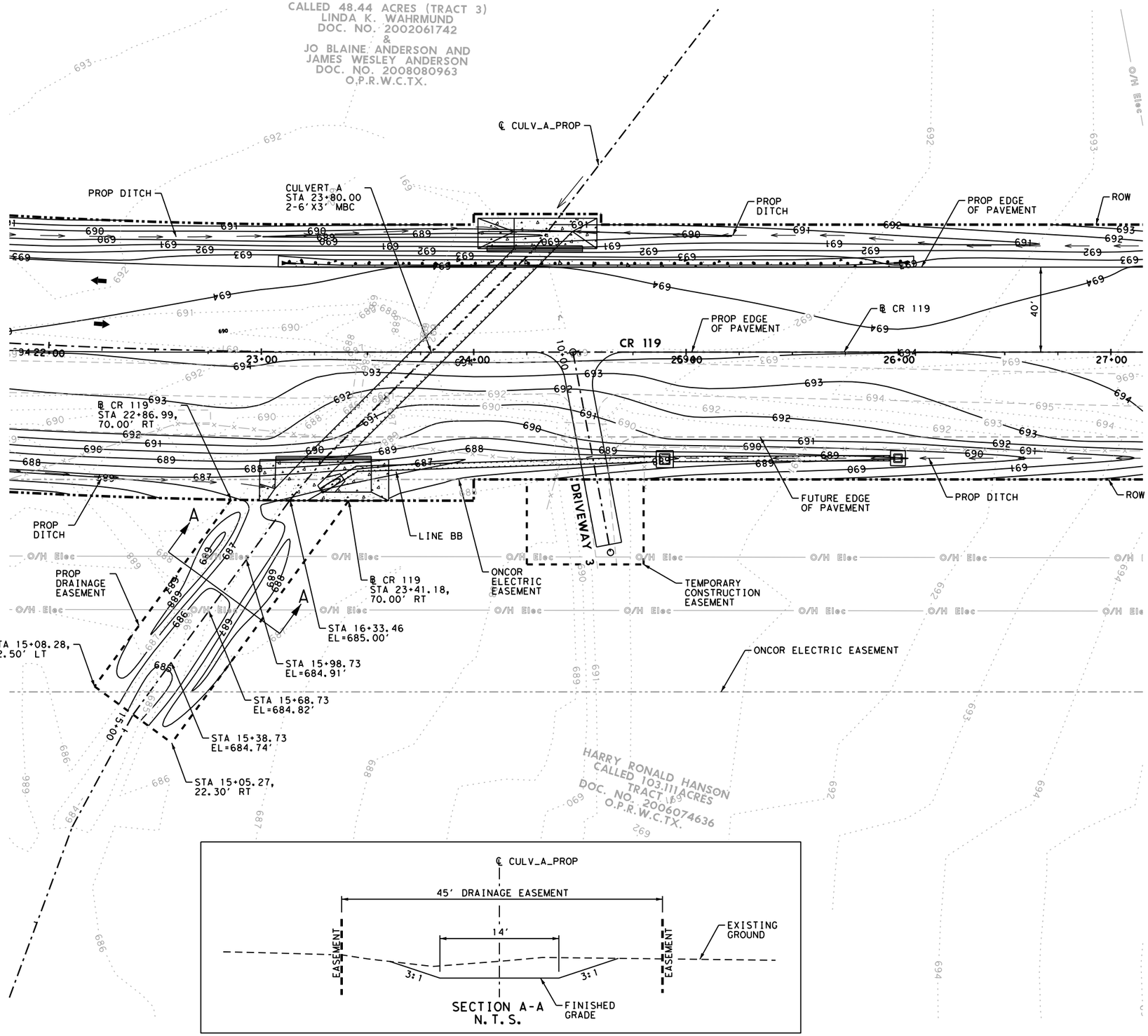
STA 135+10.00

SHEET 01 OF 01

FED. RD. DIV. RD.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				163

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LEGEND

- RIGHT OF WAY BOUNDARY
- 535 PROPOSED CONTOURS
- 580 EXISTING CONTOURS
- PROPOSED DRAINAGE EASEMENT
- EXISTING EASEMENT
- FLOW ARROW
- 4" CONCRETE RIPRAP
- 18" ROCK RIPRAP

NOTES:

1. ALL STATIONING AND OFFSETS REFERENCE THE PROPOSED CULVERT A CENTERLINE, UNLESS OTHERWISE NOTED IN THE PLANS.

0 25 50

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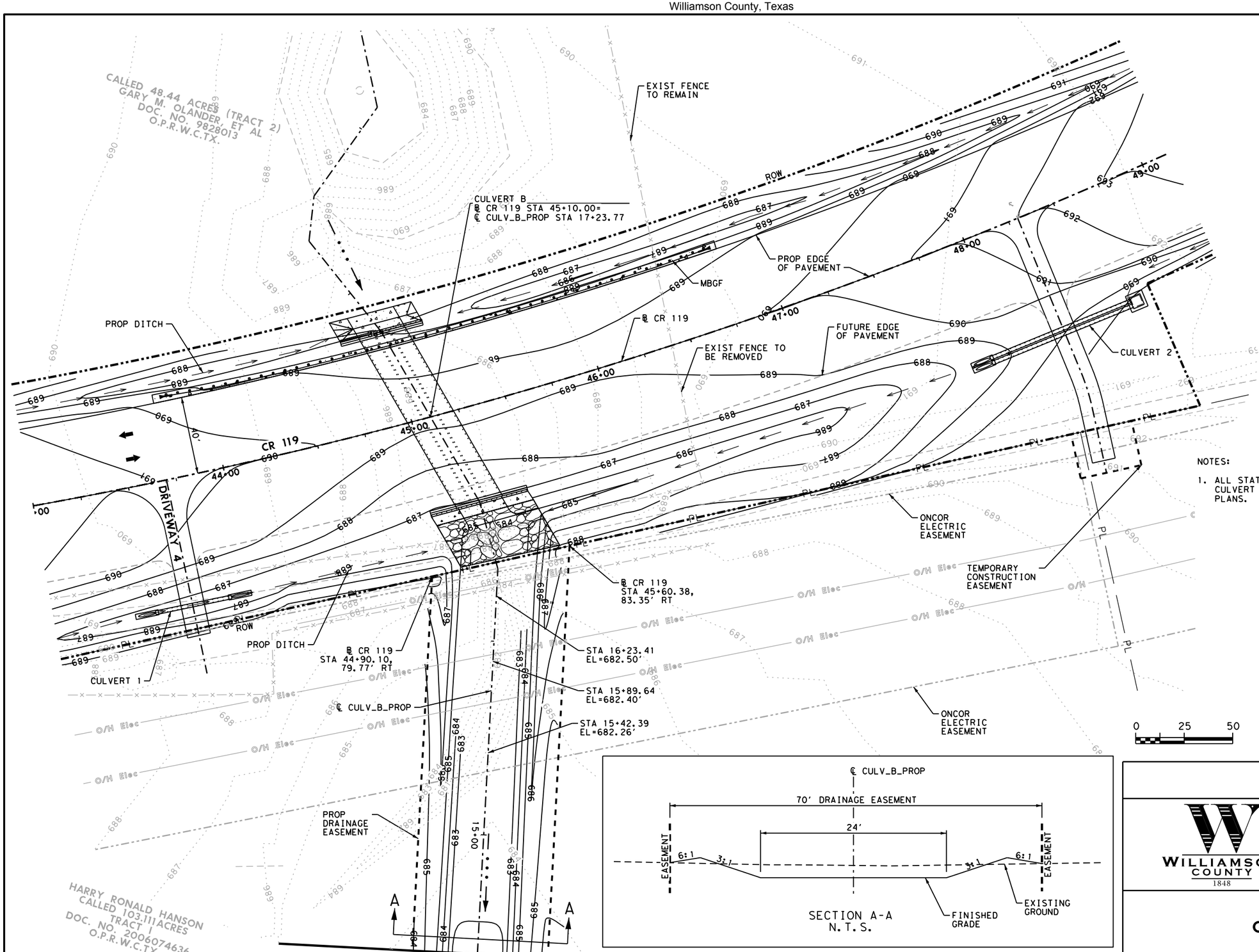
DRAINAGE GRADING PLAN CULVERT A

SHEET 01 OF 01

FED. RD. DIV. RD.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				164

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LEGEND

- RIGHT OF WAY BOUNDARY
- 535 PROPOSED CONTOURS
- 580 EXISTING CONTOURS
- FLOW ARROW
- 4" CONCRETE RIPRAP
- 18" ROCK RIPRAP
- EXISTING FENCE
- PROPOSED FENCE
- DRAINAGE EASEMENT

NOTES:

1. ALL STATIONING AND OFFSETS REFERENCE THE PROPOSED CULVERT B CENTERLINE, UNLESS OTHERWISE NOTED IN THE PLANS.

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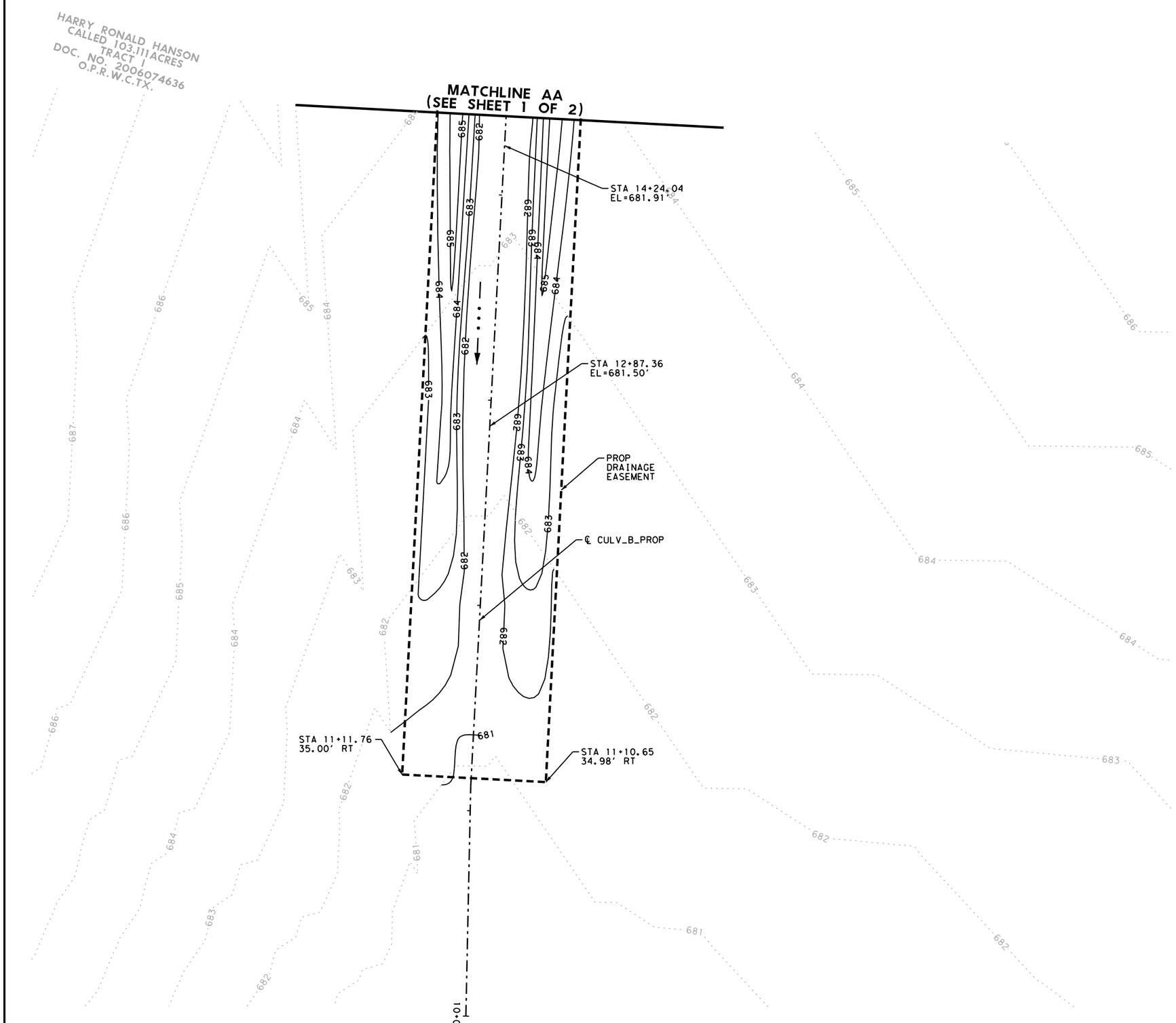
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DRAINAGE GRADING PLAN CULVERT B

SHEET 01 OF 02

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6	TEXAS		CR119	14	WILLIAMSON				165



LEGEND

- RIGHT OF WAY BOUNDARY
- 535 PROPOSED CONTOURS
- 580 EXISTING CONTOURS
- PROPOSED DRAINAGE EASEMENT
- EXISTING EASEMENT
- FLOW ARROW
- 4" CONCRETE RIPRAP
- 18" ROCK RIPRAP

NOTES:

1. ALL STATIONING AND OFFSETS REFERENCE THE PROPOSED CULVERT B CENTERLINE, UNLESS OTHERWISE NOTED IN THE PLANS.
2. SEE SHEET 1 OF 2 FOR EASEMENT GRADING TYPICAL SECTION.

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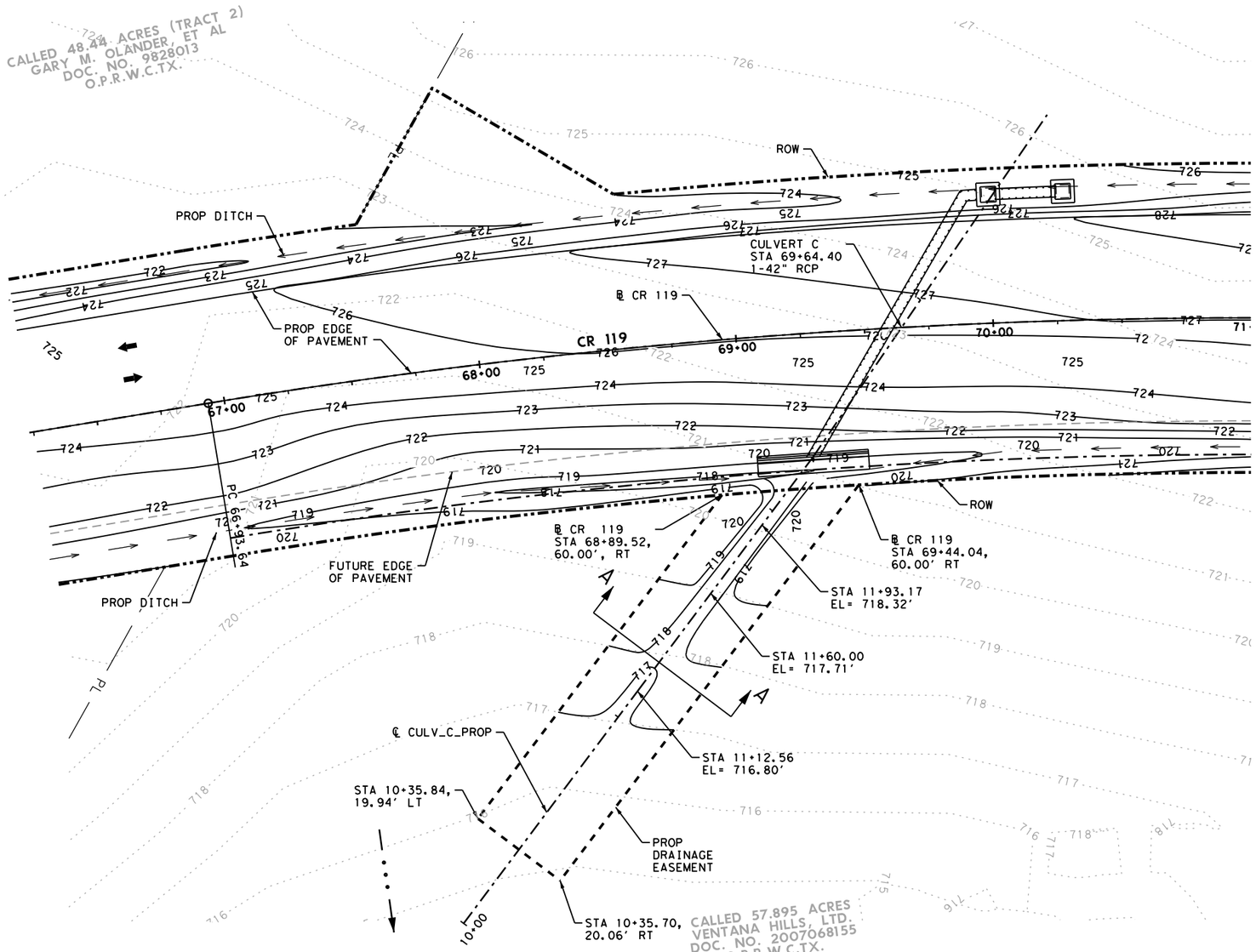
DRAINAGE GRADING PLAN CULVERT B

SHEET 02 OF 02

FED. RD. DIV. RD.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				166

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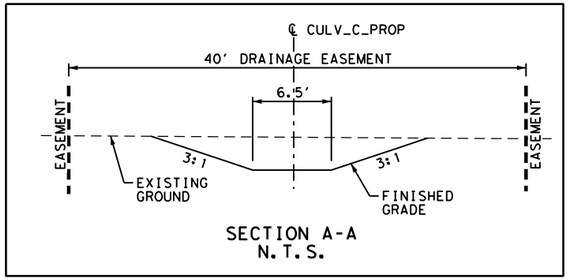


LEGEND

- RIGHT OF WAY BOUNDARY
- 535 PROPOSED CONTOURS
- 580 EXISTING CONTOURS
- PROPOSED DRAINAGE EASEMENT
- EXISTING EASEMENT
- FLOW ARROW
- 4" CONCRETE RIPRAP
- 18" ROCK RIPRAP

NOTES:

1. ALL STATIONING AND OFFSETS REFERENCE THE PROPOSED CULVERT C CENTERLINE, UNLESS OTHERWISE NOTED IN THE PLANS.



SECTION A-A
N.T.S.

0 25 50

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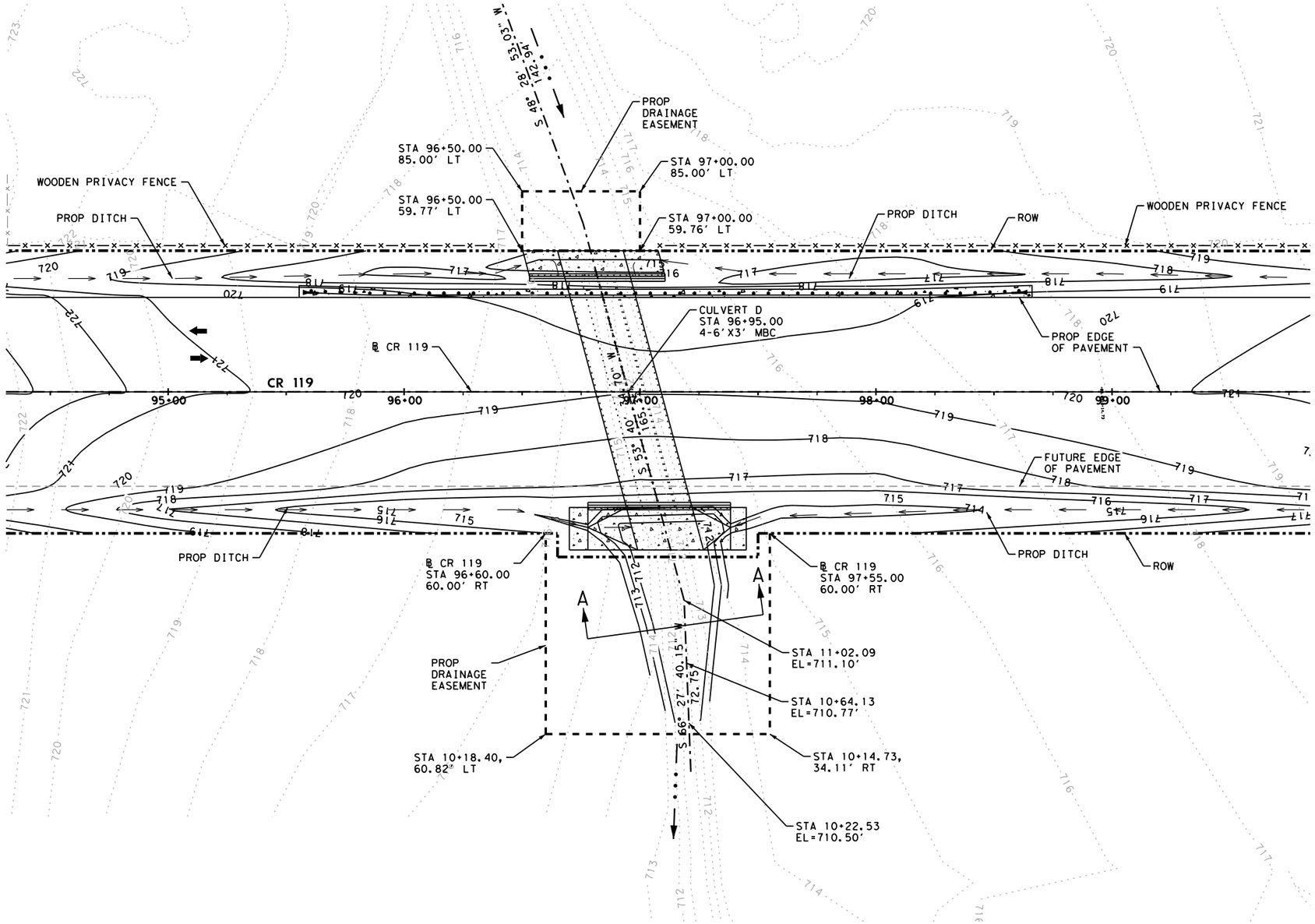
WILLIAMSON COUNTY 1848

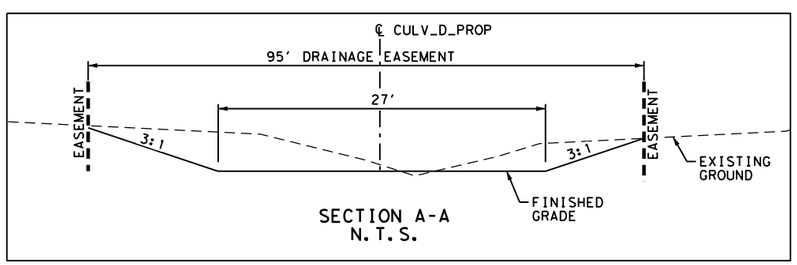
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DRAINAGE GRADING PLAN CULVERT C

SHEET 01 OF 01

FED. RD. DIV. RD.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				167





LEGEND

- RIGHT OF WAY BOUNDARY
- 535 PROPOSED CONTOURS
- 580 EXISTING CONTOURS
- PROPOSED DRAINAGE EASEMENT
- EXISTING EASEMENT
- FLOW ARROW
- 4" CONCRETE RIPRAP
- 18" ROCK RIPRAP

NOTES:

1. ALL STATIONING AND OFFSETS REFERENCE THE PROPOSED CULVERT D CENTERLINE, UNLESS OTHERWISE NOTED IN THE PLANS.

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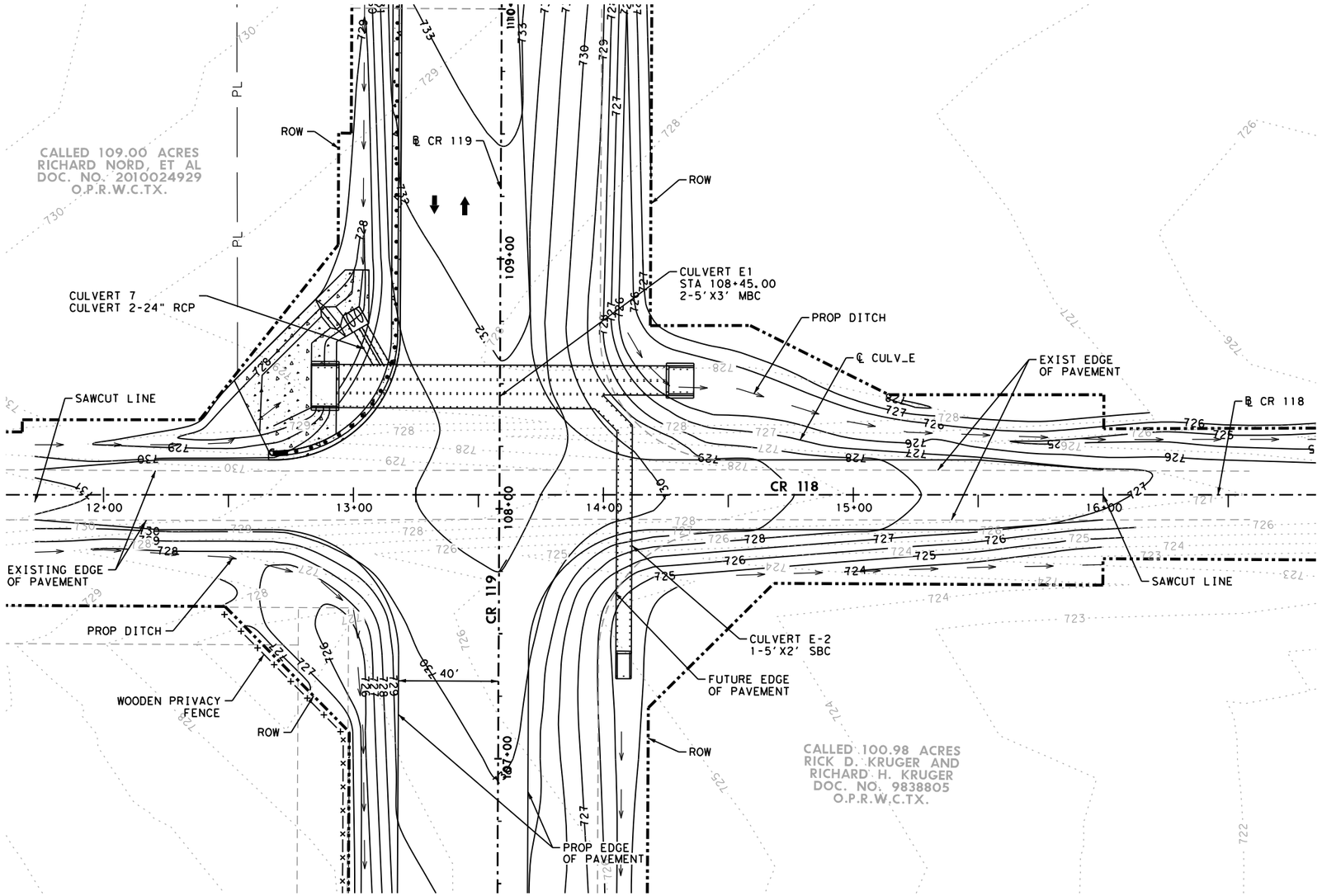
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DRAINAGE GRADING PLAN CULVERT D

SHEET 01 OF 01

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6	TEXAS		CR119	14	WILLIAMSON				168



LEGEND

- RIGHT OF WAY BOUNDARY
- 535 PROPOSED CONTOURS
- 580 EXISTING CONTOURS
- PROPOSED DRAINAGE EASEMENT
- EXISTING EASEMENT
- FLOW ARROW
- 4" CONCRETE RIPRAP
- 18" ROCK RIPRAP

NOTES:

1. ALL STATIONING AND OFFSETS REFERENCE THE PROPOSED CULVERT E CENTERLINE, UNLESS OTHERWISE NOTED IN THE PLANS.
2. REFER TO CR 118 CROSS SECTIONS FOR ADDITIONAL INFORMATION.

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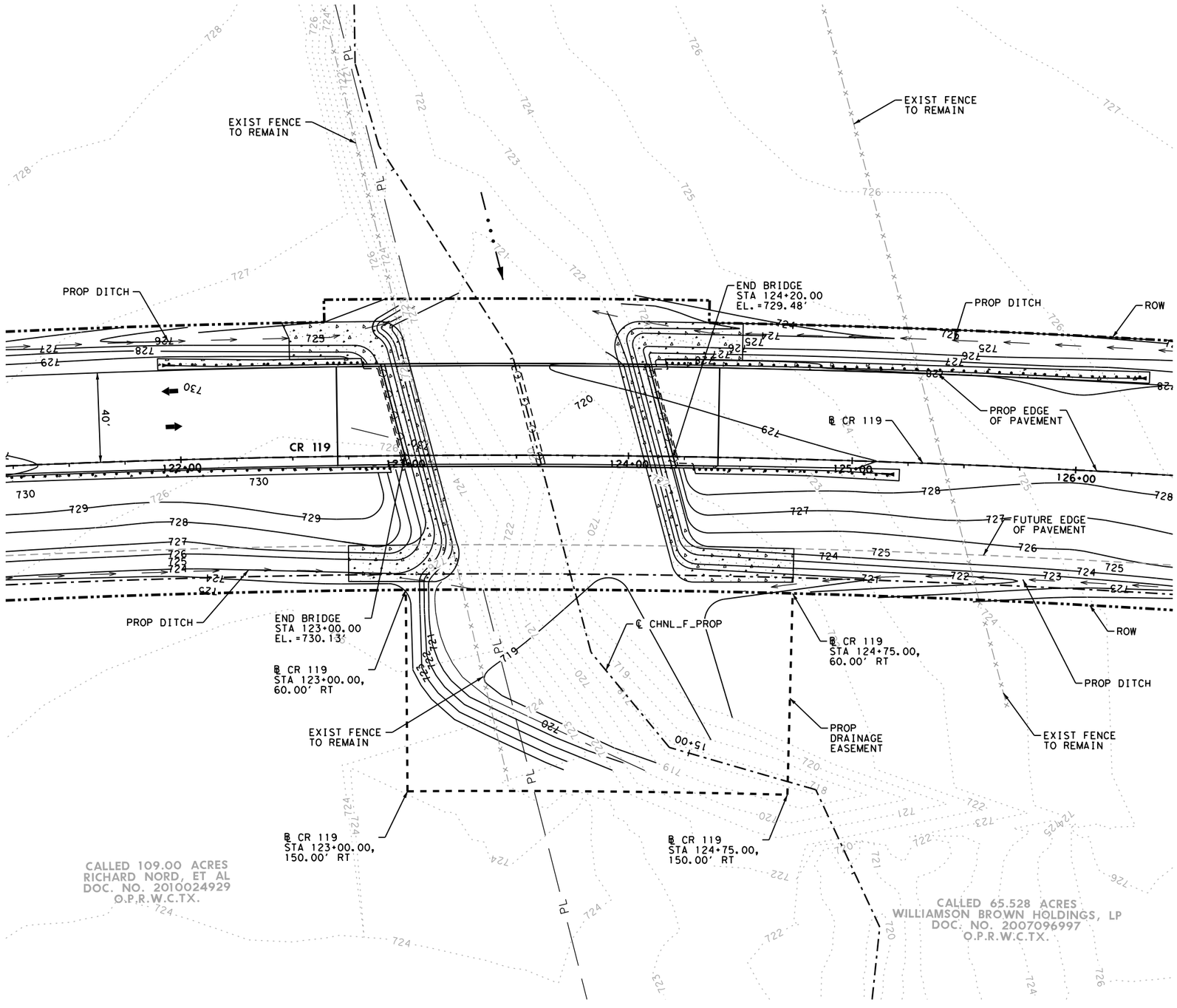
DRAINAGE GRADING PLAN CULVERT E

SHEET 01 OF 01

FED. RD. DIV. RD.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				169

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LEGEND

- RIGHT OF WAY BOUNDARY
- 535 PROPOSED CONTOURS
- 580 EXISTING CONTOURS
- PROPOSED DRAINAGE EASEMENT
- EXISTING EASEMENT
- FLOW ARROW
- 4" CONCRETE RIPRAP
- 18" ROCK RIPRAP

0 25 50

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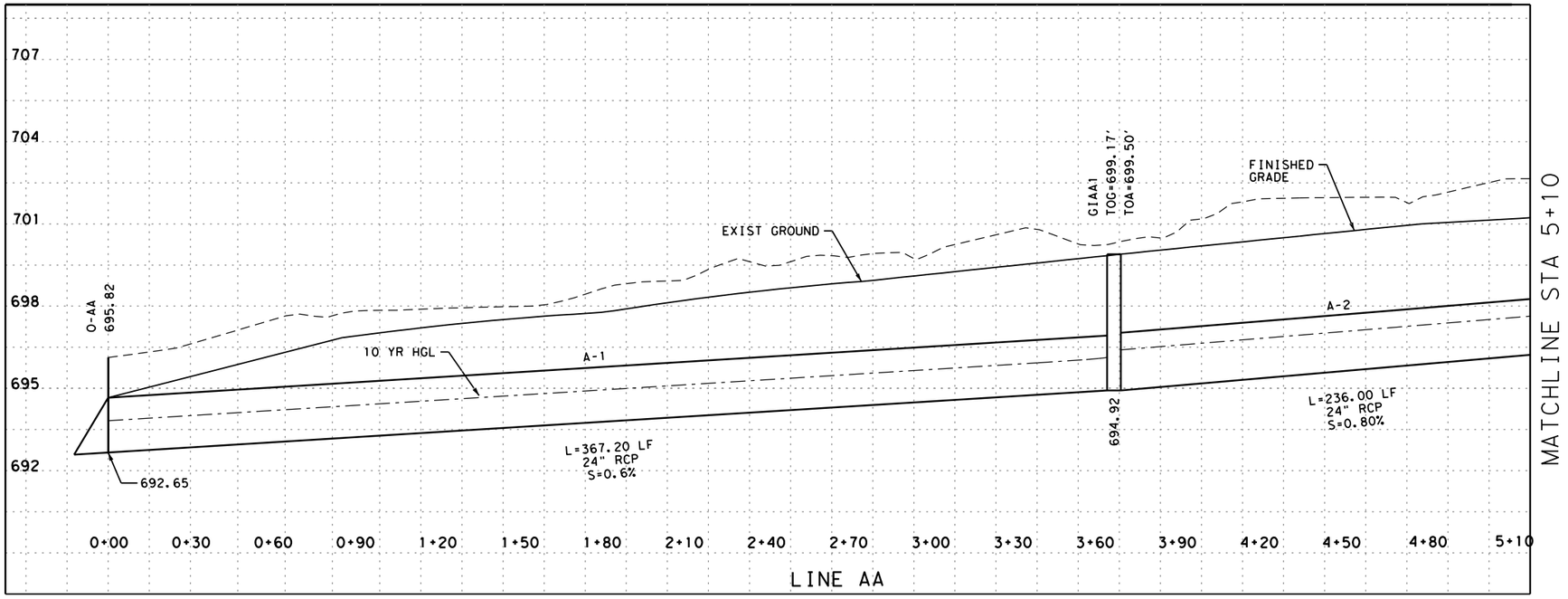
DRAINAGE GRADING PLAN COTTONWOOD CREEK

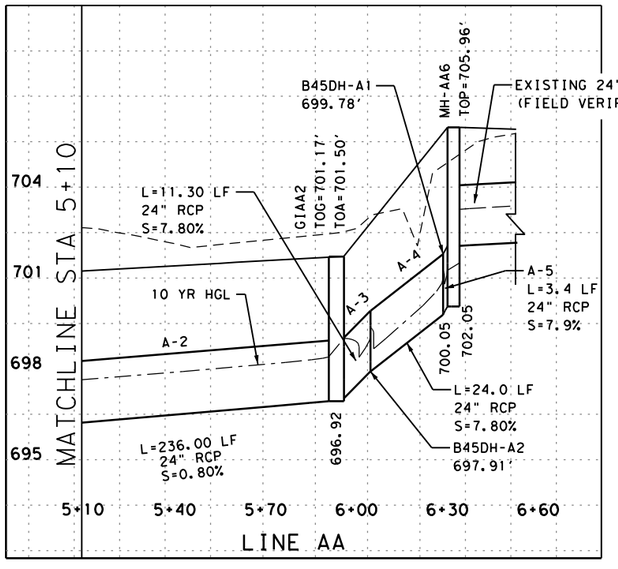
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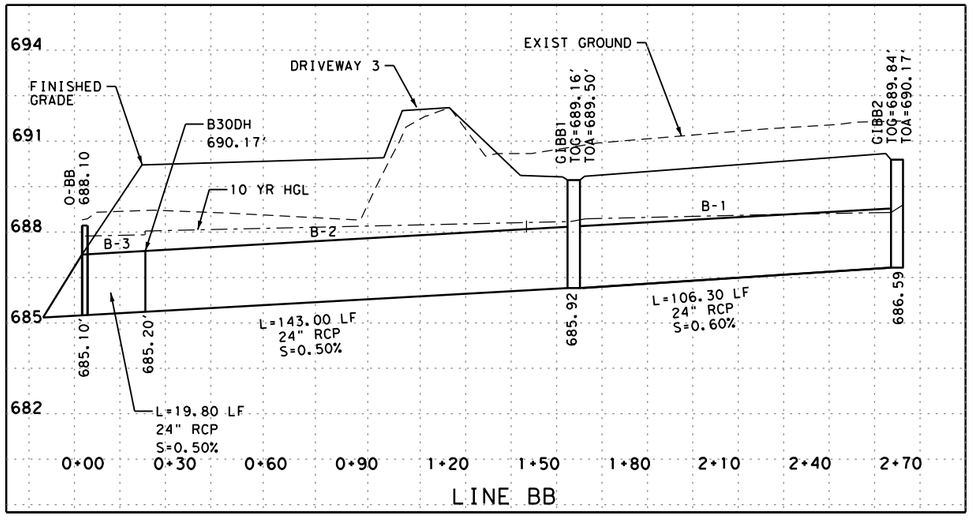
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6	TEXAS		CR119	14	WILLIAMSON				170

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0 12.5 25 50 (H)
0 2.5 5 (V)

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DRAINAGE STORM SEWER PROFILES

SHEET 01 OF 01

FED. RD. DIV. RD.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				171

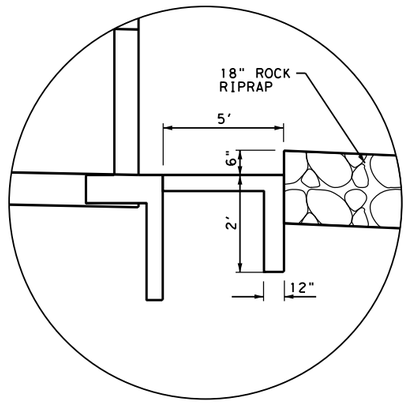
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MINOR CULVERT SUMMARY												
CULVERT / LINE	UPSTREAM NODE TYPE	DOWNSTREAM NODE TYPE	SIZE (IN)	SHAPE	NUMBER OF BARRELS	LENGTH	INVERT UPSTREAM	INVERT DOWNSTREAM	UPSTREAM NODE		DOWNSTREAM NODE	
									STATION	OFFSET	STATION	OFFSET
CULVERT 1	SET	SET	18	Circular	1	50.0	686.50	686.00	43+50.00	66.00' RT	43+90.00	66.00' RT
CULVERT 2	INLET	SET	18	Circular	2	66.6	686.42	686.00	48+55.00	63.00' RT	48+00.25	63.00' RT
CULVERT 3	SET	SET	18	Circular	1	69.0	709.34	708.27	56+75.00	51.50' RT	56+25.00	50.76' RT
CULVERT 4	INLET	SET	18	Circular	2	92.3	708.42	707.96	57+35.00	49.00' LT	56+50.00	49.00' LT
CULVERT 5	SET	SET	18	Circular	1	43.0	739.24	738.84	81+03.29	50.00' RT	80+77.78	50.00' RT
CULVERT 6	SET	SET	30	Circular	2	29.6	723.47	723.32	104+35.09	50.00' RT	104+05.51	50.00' RT
CULVERT 7	SET	SET	24	Circular	2	25.3	726.60	726.22	108+72.09	55.85' LT	N/A	N/A
CULVERT 9	SET	SET	18	Circular	1	82.2	725.82	725.15	130+44.96	50.00' RT	129+62.72	50.00' RT
CULVERT 10	SET	SET	24	Circular	3	59.1	728.36	727.90	130+30.81	58.62' LT	129+90.17	57.43' RT

TABLE 9.1 - GRATE INLET ANALYSIS

Inlet	Q_{10}	Q_{25}	Q_{100}	Length	Width	Perimeter	Open Area	10-Yr Depth (ft)		25-Yr Depth (ft)		100-Yr Depth Check (ft)	
	(cfs)	(cfs)	(cfs)	X (ft)	Y (ft)	(lf)	(sf)	Wier	Orifice	Wier	Orifice	Wier	Orifice
B3	16.04	--	29.85	5	5	20	12.5	0.61	0.28	--	--	0.93	0.98
C1	--	29.10	40.4	6	6	24	18	--	--	0.81	0.45	1.01	0.87
C2	--	29.10	40.4	6	6	24	18	--	--	0.81	0.45	1.01	0.87
AA1	2.67	--	4.97	4	4	16	8	0.21	0.02	--	--	0.32	0.07
AA2	5.72	--	10.54	4	4	16	8	0.36	0.09	--	--	0.54	0.30
BB1	5.88	--	10.99	3	3	12	4.5	0.44	0.29	--	--	0.67	1.03
BB2	10.63	--	19.57	3	3	12	4.5	0.66	0.96	--	--	0.99	3.26
BB6	17.75	--	32.69	5	5	20	12.5	0.66	0.35	--	--	0.99	1.18

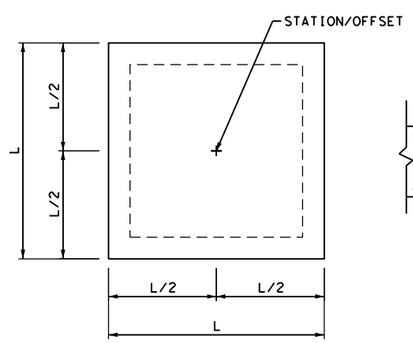


CULVERT RIPRAP DETAIL
N.T.S.

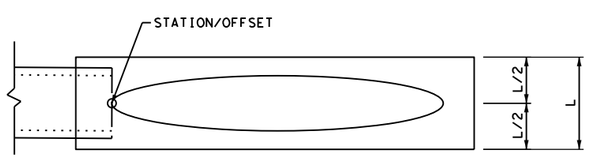
NOTES:
1. ALL STATIONS AND OFFSETS REFERENCE CR 119 BASELINE.
2. REFER TO STORM SEWER PROFILES FOR ADDITIONAL INFORMATION.

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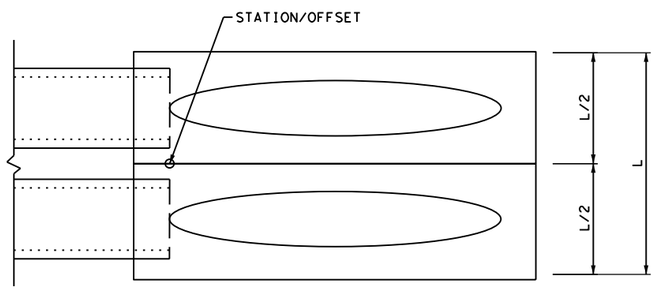
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INLET / JUNCTION BOX



SINGLE CULVERT



MULTIPLE CULVERTS

CR 119

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DRAINAGE
MINOR CULVERT INLET SUMMARY

SHEET 01 OF 01

FED. RD. DIV. RD.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				172

DITCH SUMMARY RT				
STATION	OFFSET RIGHT TO CENTER	ELEVATION	SLOPE %	BOTTOM WIDTH (FT)
12+00.00	56.50	699.47	--	3
13+00.00	50.00	697.47	-2.00	3
14+00.00	50.00	696.47	-1.00	3
15+00.00	50.00	695.47	-1.00	3
16+00.00	50.00	694.47	-1.00	3
17+00.00	50.00	692.97	-1.50	3
18+00.00	50.00	691.47	-1.50	3
19+00.00	60.79	689.97	-1.50	3
20+00.00	68.12	688.47	-1.50	3
21+00.00	60.66	687.47	-1.00	3
22+00.00	60.00	686.97	-0.50	3
23+00.00	60.95	686.47	-0.50	3
24+00.00	50.74	690.39	0.50	3
25+00.00	50.00	689.50	0.50	8
26+00.00	50.00	690.17	1.50	7
27+00.00	50.00	691.67	2.00	3
28+00.00	48.50	693.67	2.00	3
29+00.00	48.50	695.67	2.00	3
30+00.00	50.00	697.67	1.00	3
31+00.00	50.00	698.67	1.00	3
32+00.00	50.00	699.67	0.50	3
33+00.00	50.00	700.17	0.50	3
34+00.00	50.00	700.67	--	3
35+00.00	50.00	699.55	--	0
36+00.00	50.00	699.05	-0.50	0
37+00.00	50.00	698.55	-0.50	0
38+00.00	50.00	697.86	-0.69	0
39+00.00	50.00	696.14	-1.72	0
40+00.00	52.91	693.59	-2.55	0
41+00.00	61.73	690.86	-2.73	0
42+00.00	74.74	688.87	-1.99	0
43+00.00	69.68	687.00	-1.87	0
44+00.00	66.04	686.00	-1.00	0
45+00.00	67.77	685.00	-1.00	0
46+00.00	61.10	685.00	--	0
47+00.00	60.30	685.50	0.50	0
48+00.00	63.00	686.00	0.50	5.24
49+00.00	50.00	690.00	--	3
50+00.00	50.00	691.28	1.28	0
51+00.00	50.00	693.84	2.56	0
52+00.00	50.00	696.95	3.11	0
53+00.00	50.00	700.19	3.24	0
54+00.00	50.00	703.25	3.06	0
55+00.00	50.00	705.66	2.41	0
56+00.00	50.00	708.18	2.52	0
57+00.00	51.25	709.73	1.55	2.5
58+00.00	50.00	712.18	2.45	0
59+00.00	50.00	714.25	2.07	0
60+00.00	50.00	715.90	1.65	0
61+00.00	50.00	717.68	1.78	0
62+00.00	50.00	718.93	1.25	0
63+00.00	50.00	719.50	0.57	0
64+00.00	50.00	720.00	0.50	0
65+00.00	49.57	721.00	1.00	0
66+00.00	49.58	720.50	-0.50	3
67+00.00	50.00	720.00	-0.50	3
68+00.00	50.00	719.50	-0.50	3
69+00.00	54.00	719.00	-0.50	3
70+00.00	50.01	719.50	--	
71+00.00	50.01	720.04	0.54	0
72+00.00	50.02	720.57	0.53	0
73+00.00	50.02	721.33	0.76	0
74+00.00	50.02	722.09	0.76	0
75+00.00	50.02	725.44	3.35	0
76+00.00	50.02	729.72	4.28	0
77+00.00	50.02	733.20	3.48	3
78+00.00	50.01	735.97	2.77	3
79+00.00	50.01	738.00	2.03	3
80+00.00	50.56	738.50	0.50	0

DITCH SUMMARY RT				
STATION	OFFSET RIGHT TO CENTER	ELEVATION	SLOPE %	BOTTOM WIDTH (FT)
81+00.00	50.00	739.00	0.50	0
82+00.00	50.00	740.94	1.94	0
83+00.00	50.41	741.50	0.56	0
84+00.00	50.27	742.00	0.50	0
85+00.00	50.00	742.50	0.50	0
86+00.00	50.00	743.00	0.50	0
87+00.00	50.00	741.95	-1.05	0
88+00.00	50.00	740.71	-1.24	0
89+00.00	50.00	737.99	-2.72	0
90+00.00	50.00	734.75	-3.24	0
91+00.00	50.00	731.38	-3.37	0
92+00.00	50.00	728.30	-3.08	0
93+00.00	50.00	725.32	-2.98	0
94+00.00	50.00	721.46	-3.86	0
95+00.00	50.00	716.95	-4.51	0
96+00.00	50.00	714.74	-2.21	0
97+00.00	Culvert D	711.60	-3.14	0
98+00.00	51.25	713.27	1.67	2.5
99+00.00	51.25	714.84	1.57	2.49
100+00.00	50.35	716.75	1.91	4.29
101+00.00	50.95	718.71	1.96	3.1
102+00.00	50.00	720.60	1.89	5
103+00.00	50.00	722.15	1.55	5
104+00.00	49.41	723.00	0.85	4.8
105+00.00	51.09	723.50	0.50	4.13
106+00.00	51.36	724.00	0.50	5
107+00.00	50.62	724.50	0.50	5
108+00.00	Culv E1	725.70	--	CR 118
109+00.00	50.00	726.70	1.00	0
110+00.00	50.00	727.20	0.50	0
111+00.00	50.00	727.70	0.50	0
112+00.00	50.00	728.26	0.56	0
113+00.00	50.00	729.20	0.94	0
114+00.00	50.00	729.70	0.50	0
115+00.00	50.00	730.20	0.50	0
116+00.00	50.00	729.80	--	
117+00.00	50.00	729.03	-0.77	0
118+00.00	50.00	727.73	-1.30	0
119+00.00	50.00	725.86	-1.87	0
120+00.00	50.00	725.25	-0.61	0
121+00.00	50.00	724.75	-0.50	0
122+00.00	50.00	724.25	-0.50	0
123+00.00	53.59	723.75	-0.50	0
124+00.00	Bridge	719.00	--	Cottonwood
125+00.00	52.86	720.77	1.77	0
126+00.00	50.00	722.33	1.56	0
127+00.00	50.00	723.39	1.06	0
128+00.00	50.00	724.01	0.62	0
129+00.00	50.00	724.71	0.70	0
130+00.00	Culvert 9	725.47	0.76	0
131+00.00	51.70	726.20	0.73	0
132+00.00	55.00	728.19	1.99	0
133+00.00	54.91	730.34	2.15	6.25
134+00.00	53.78	731.03	0.69	6.28
135+00.00	74.63	731.57	--	Limmer

NOTES:
1. REFER TO THE DRAINAGE REPORT FOR HYDRAULIC INFORMATIC FOR DITCH DESIGNS.
2. REFER TO ROADWAY CROSS SECTIONS FOR MORE INFORMATION ON DITCH SHAPES.

STATE OF TEXAS
ARNOLD GONZALES, JR.
98234
LICENSED
PROFESSIONAL ENGINEER

7/10/2017

CR 119

WILLIAMSON COUNTY
1848

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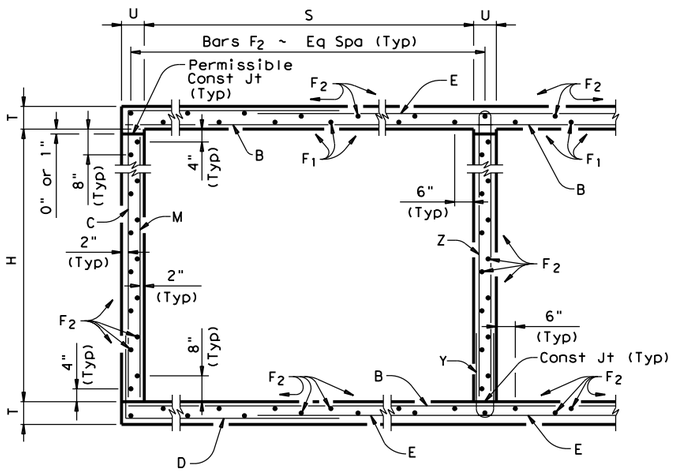
DRAINAGE
DITCH SUMMARY
DITCH RT

SHEET 01 OF 02

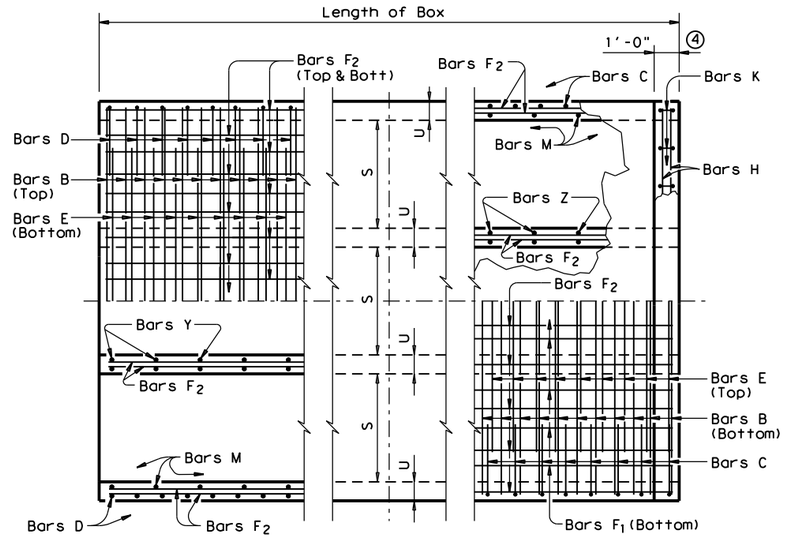
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6	TEXAS		CR119	14	WILLIAMSON				173

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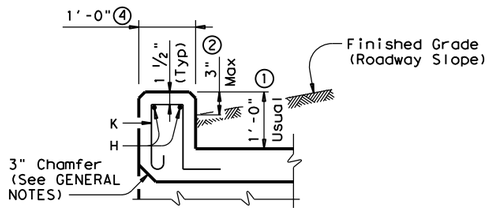
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TYPICAL SECTION

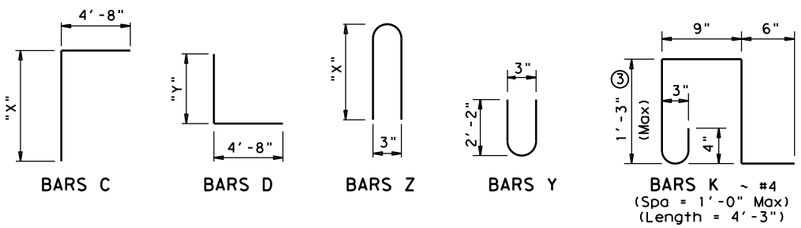


PART PLANS



SECTION THRU CURB

H	Bar Dimensions	
	"X"	"Y"
2'-0"	2'-5"	2'-2"
3'-0"	3'-5"	2'-2"
4'-0"	4'-5"	2'-2"
5'-0"	5'-5"	2'-2"



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 bridge rail, refer to T6-CM standard. For structures with traffic rail, other than T6, refer to RAC standard.

② 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.

③ 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.

④ 1'-0" typical. 2'-0" when RAC standard is referred to elsewhere in the plans.

Deformed welded wire reinforcement (WWR) meeting the requirements of ASTM A1064 may be used to replace conventional reinforcement shown at the Contractor's option. The area of required reinforcement may be reduced by the ratio of 60 ksi / 70 ksi. Spacing of WWR is limited to 4" Min and 18" Max. When required, provide lap splices in the WWR of the same length required for the equivalent bar size, rounded up for wire sizes between conventional bar sizes.

Example Conversion: Replacement of No. 6 Gr 60 at 6" Spacing with WWR.
WWR required = (0.44 sq in/ 0.5') x (60 ksi/70 ksi) = 0.754 sq in/ft.
If D30.6 wire is used to meet the 0.754 sq in/ft requirement in this example, the required spacing = (0.306 sq in/ 0.754 sq in/ft) x 12 in/ft = 4.87" Max spacing.
Required lap length for the provided D30.6 wire is 2'-2" (Lap required for uncoated No. 5 bars, as shown in Item 440).

GENERAL NOTES:
Designed according to AASHTO LRFD Specifications.
Designed to the maximum fill height shown.
All reinforcing steel shall be Grade 60.
All concrete shall be Class "C" with these exceptions: use Class "S" for top slabs of culverts with overlay, with 1-to-2 course surface treatment, or with the top slab as the final riding surface.
Class "C" concrete shall have a minimum compressive strength of 3,600 psi. Class "S" concrete shall have a minimum compressive strength of 4,000 psi.
The use of permanent forms is not allowed.
The bottom edge of the top slab shall be chamfered 3" at the entrance.
Reinforcing bars shall be adjusted to provide a minimum of 1 ¼" clear cover.
Construction joints shown at the flow line may be raised a maximum of 6" at the Contractor's option. If this option is used, Bars M may be cut off or raised, Bars C and D may be reversed, and Bars Y and Z may be reversed.
See standard MC-MD for skewed ends, angle sections and lengthening details.

HL93 LOADING SHEET 1 OF 2

Texas Department of Transportation — Bridge Division Standard

MULTIPLE BOX CULVERTS CAST-IN-PLACE
5'-0" SPAN
0' TO 20' FILL

MC-5-20

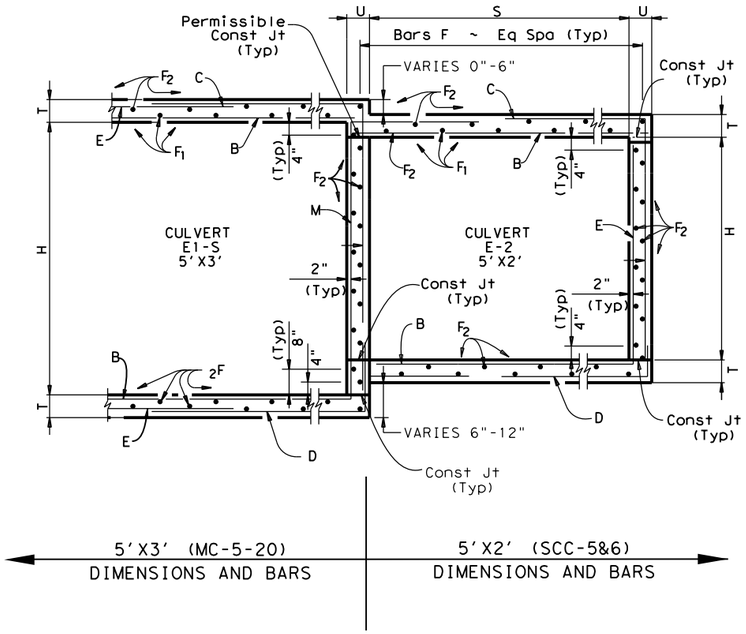
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REVISIONS				CR119
10-12: Added WWR	DIST	COUNTY		SHEET NO.
	06	WILLIAMSON		J 76

BILLS OF REINFORCING STEEL (For Box Length = 40 feet)

NUMBER OF SPANS	SECTION DIMENSIONS				Bars B					Bars C & D							Bars E					Bars F_1 ~#4				Bars F_2 ~#4 at 1'-6" Max			Bars M~#4 at 1'-6" Max			Bars Y & Z~#4 at 1'-0" Max					Bars H 4~#4		Bars K	
													Bar C		Bar D																									
	S	H	T	U	No.	Size	Spa	Length	Wt	No.	Size	Spa	Length	Wt	Length	Wt	No.	Size	Spa	Length	Wt	No.	Spa	Length	Wt	No.	Length	Wt	No.	Length	Wt	No.	Bar Y Length	Bar Y Wt	Bar Z Length	Bar Z Wt	Length	Weight	No.	Weight
2	5'-0"	2'-0"	7"	7"	194	#4	5"	11'- 6"	1,490	162	#4	6"	7'- 1"	767	6'-10"	739	162	#5	6"	5'- 8"	957	14	8"	39'-9"	372	38	39'-9"	1,009	56	2'- 0"	75	41	4'- 6"	123	5'- 0"	137	11'- 6"	31	26	74
3	5'-0"	2'-0"	7"	7"	194	#4	5"	17'- 1"	2,214	162	#4	6"	7'- 1"	767	6'-10"	739	162	#5	6"	11'- 3"	1,901	21	8"	39'-9"	558	54	39'-9"	1,434	56	2'- 0"	75	82	4'- 6"	246	5'- 0"	274	17'- 1"	46	36	102
4	5'-0"	2'-0"	7"	7"	194	#4	5"	22'- 8"	2,937	162	#4	6"	7'- 1"	767	6'-10"	739	162	#5	6"	16'-10"	2,844	28	8"	39'-9"	743	70	39'-9"	1,859	56	2'- 0"	75	123	4'- 6"	370	5'- 0"	411	22'- 8"	61	48	136
5	5'-0"	2'-0"	7"	7"	194	#4	5"	28'- 3"	3,661	162	#4	6"	7'- 1"	767	6'-10"	739	162	#5	6"	22'- 5"	3,788	35	8"	39'-9"	929	86	39'-9"	2,284	56	2'- 0"	75	164	4'- 6"	493	5'- 0"	548	28'- 3"	75	60	170
6	5'-0"	2'-0"	7"	7"	194	#4	5"	33'-10"	4,385	162	#4	6"	7'- 1"	767	6'-10"	739	162	#5	6"	28'- 0"	4,731	42	8"	39'-9"	1,115	102	39'-9"	2,708	56	2'- 0"	75	205	4'- 6"	616	5'- 0"	685	33'-10"	90	70	199
2	5'-0"	3'-0"	7"	7"	194	#4	5"	11'- 6"	1,490	138	#4	7"	8'- 1"	745	6'-10"	630	162	#5	6"	5'- 8"	957	14	8"	39'-9"	372	44	39'-9"	1,168	56	3'- 0"	112	41	4'- 6"	123	7'- 0"	192	11'- 6"	31	26	74
3	5'-0"	3'-0"	7"	7"	194	#4	5"	17'- 1"	2,214	138	#4	7"	8'- 1"	745	6'-10"	630	162	#5	6"	11'- 3"	1,901	21	8"	39'-9"	558	62	39'-9"	1,646	56	3'- 0"	112	82	4'- 6"	246	7'- 0"	383	17'- 1"	46	36	102
4	5'-0"	3'-0"	7"	7"	194	#4	5"	22'- 8"	2,937	138	#4	7"	8'- 1"	745	6'-10"	630	162	#5	6"	16'-10"	2,844	28	8"	39'-9"	743	80	39'-9"	2,124	56	3'- 0"	112	123	4'- 6"	370	7'- 0"	575	22'- 8"	61	48	136
5	5'-0"	3'-0"	7"	7"	194	#4	5"	28'- 3"	3,661	138	#4	7"	8'- 1"	745	6'-10"	630	162	#5	6"	22'- 5"	3,788	35	8"	39'-9"	929	98	39'-9"	2,602	56	3'- 0"	112	164	4'- 6"	493	7'- 0"	767	28'- 3"	75	60	170
6	5'-0"	3'-0"	7"	7"	194	#4	5"	33'-10"	4,385	138	#4	7"	8'- 1"	745	6'-10"	630	162	#5	6"	28'- 0"	4,731	42	8"	39'-9"	1,115	116	39'-9"	3,080	56	3'- 0"	112	205	4'- 6"	616	7'- 0"	959	33'-10"	90	70	199
2	5'-0"	4'-0"	7"	7"	194	#4	5"	11'- 6"	1,490	138	#4	7"	9'- 1"	837	6'-10"	630	162	#5	6"	5'- 8"	957	14	8"	39'-9"	372	44	39'-9"	1,168	56	4'- 0"	150	41	4'- 6"	123	9'- 0"	246	11'- 6"	31	26	74
3	5'-0"	4'-0"	7"	7"	194	#4	5"	17'- 1"	2,214	138	#4	7"	9'- 1"	837	6'-10"	630	162	#5	6"	11'- 3"	1,901	21	8"	39'-9"	558	62	39'-9"	1,646	56	4'- 0"	150	82	4'- 6"	246	9'- 0"	493	17'- 1"	46	36	102
4	5'-0"	4'-0"	7"	7"	194	#4	5"	22'- 8"	2,937	138	#4	7"	9'- 1"	837	6'-10"	630	162	#5	6"	16'-10"	2,844	28	8"	39'-9"	743	80	39'-9"	2,124	56	4'- 0"	150	123	4'- 6"	370	9'- 0"	739	22'- 8"	61	48	136
5	5'-0"	4'-0"	7"	7"	194	#4	5"	28'- 3"	3,661	138	#4	7"	9'- 1"	837	6'-10"	630	162	#5	6"	22'- 5"	3,788	35	8"	39'-9"	929	98	39'-9"	2,602	56	4'- 0"	150	164	4'- 6"	493	9'- 0"	986	28'- 3"	75	60	170
6	5'-0"	4'-0"	7"	7"	194	#4	5"	33'-10"	4,385	138	#4	7"	9'- 1"	837	6'-10"	630	162	#5	6"	28'- 0"	4,731	42	8"	39'-9"	1,115	116	39'-9"	3,080	56	4'- 0"	150	205	4'- 6"	616	9'- 0"	1,232	33'-10"	90	70	199
2	5'-0"	5'-0"	7"	7"	194	#4	5"	11'- 6"	1,490	138	#4	7"	10'- 1"	930	6'-10"	630	162	#5	6"	5'- 8"	957	14	8"	39'-9"	372	50	39'-9"	1,328	56	5'- 0"	187	41	4'- 6"	123	11'- 0"	301	11'- 6"	31	26	74
3	5'-0"	5'-0"	7"	7"	194	#4	5"	17'- 1"	2,214	138	#4	7"	10'- 1"	930	6'-10"	630	162	#5	6"	11'- 3"	1,901	21	8"	39'-9"	558	70	39'-9"	1,859	56	5'- 0"	187	82	4'- 6"	246	11'- 0"	603	17'- 1"	46	36	102
4	5'-0"	5'-0"	7"	7"	194	#4	5"	22'- 8"	2,937	138	#4	7"	10'- 1"	930	6'-10"	630	162	#5	6"	16'-10"	2,844	28	8"	39'-9"	743	90	39'-9"	2,390	56	5'- 0"	187	123	4'- 6"	370	11'- 0"	904	22'- 8"	61	48	136
5	5'-0"	5'-0"	7"	7"	194	#4	5"	28'- 3"	3,661	138	#4	7"	10'- 1"	930	6'-10"	630	162	#5	6"	22'- 5"	3,788	35	8"	39'-9"	929	110	39'-9"	2,921	56	5'- 0"	187	164	4'- 6"	493	11'- 0"	1,205	28'- 3"	75	60	170
6	5'-0"	5'-0"	7"	7"	194	#4	5"	33'-10"	4,385	138	#4	7"	10'- 1"	930	6'-10"	630	162	#5	6"	28'- 0"	4,731	42	8"	39'-9"	1,115	130	39'-9"	3,452	56	5'- 0"	187	205	4'- 6"	616	11'- 0"	1,506	33'-10"	90	70	199

QUANTITIES

Per foot of Barrel		Curb		Total	
Conc (CY)	Reinf (Lb)	Conc (CY)	Reinf (Lb)	Conc (CY)	Reinf (Lb)
0.637	141.7	0.9	105	26.4	5,774
0.922	205.2	1.3	148	38.2	8,356
1.206	268.6	1.7	197	49.9	10,942
1.491	332.1	2.1	245	61.7	13,529
1.775	395.5	2.5	289	73.5	16,110
0.702	144.7	0.9	105	29.0	5,894
1.008	210.9	1.3	148	41.6	8,583
1.314	277.0	1.7	197	54.3	11,277
1.620	343.2	2.1	245	66.9	13,972
1.926	409.3	2.5	289	79.5	16,662
0.767	149.3	0.9	105	31.6	6,078
1.095	216.9	1.3	148	45.1	8,823
1.422	284.4	1.7	197	58.6	11,571
1.750	351.9	2.1	245	72.1	14,321
2.078	419.4	2.5	289	85.6	17,065
0.832	158.0	0.9	105	34.2	6,423
1.181	228.2	1.3	148	48.5	9,276
1.530	298.4	1.7	197	62.9	12,132
1.880	368.6	2.1	245	77.3	14,989
2.229	438.8	2.5	289	91.7	17,841



Deformed welded wire reinforcement (WWR) meeting the requirements of ASTM A1064 may be used to replace conventional reinforcement shown at the Contractor's option. The area of required reinforcement may be reduced by the ratio of 60 ksi / 70 ksi. Spacing of WWR is limited to 4" Min and 18" Max. When required, provide lap splices in the WWR of the same length required for the equivalent bar size, rounded up for wire sizes between conventional bar sizes.

Example Conversion: Replacement of No. 6 Gr 60 at 6" Spacing with WWR.
WWR required = (0.44 sq in/ 0.5') x (60 ksi/70 ksi) = 0.754 sq in/ft.
If D30.6 wire is used to meet the 0.754 sq in/ft requirement in this example, the required spacing = (0.306 sq in/ 0.754 sq in/ft) x 12 in/ft = 4.87" Max spacing.
Required lap length for the provided D30.6 wire is 2'-2" (Lap required for uncoated No. 5 bars, as shown in Item 440).



6/15/2017

HL93 LOADING SHEET 2 OF 2

Texas Department of Transportation — Bridge Division Standard

MULTIPLE BOX CULVERTS CAST-IN-PLACE

5'-0" SPAN
0' TO 20' FILL

MC-5-20 (MOD)

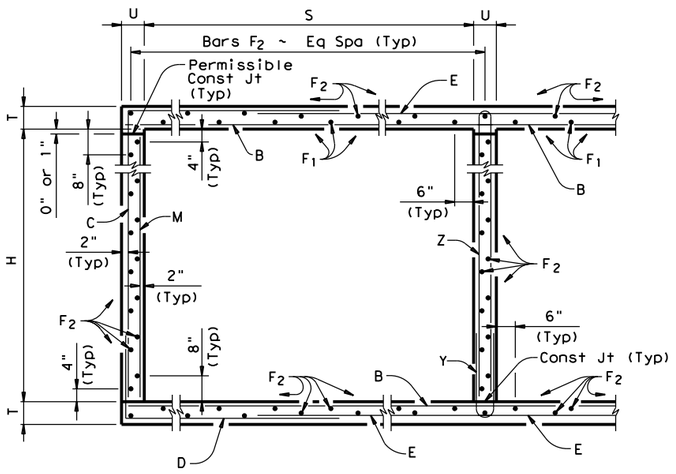
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©TxDOT February 2010	CONT	SECT	JOB	HIGHWAY
REVISIONS				CR119
10-12: Added WWR	DIST	COUNTY		SHEET NO.
	06	WILLIAMSON		177

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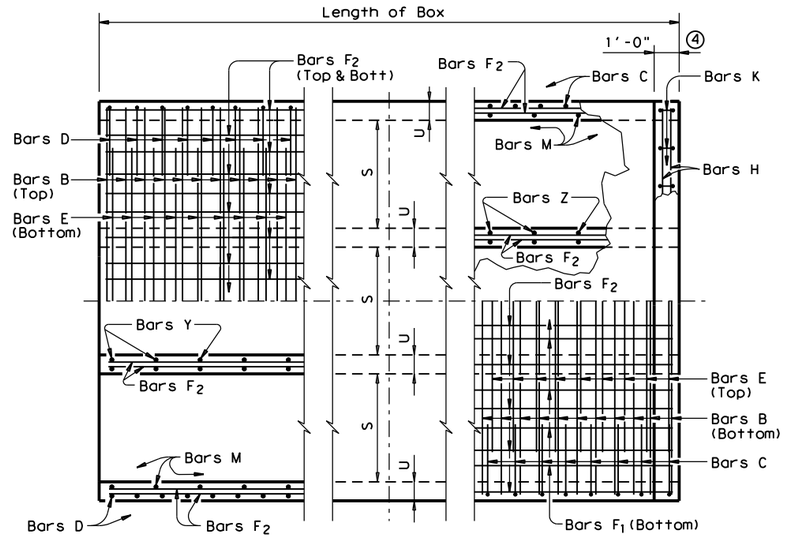
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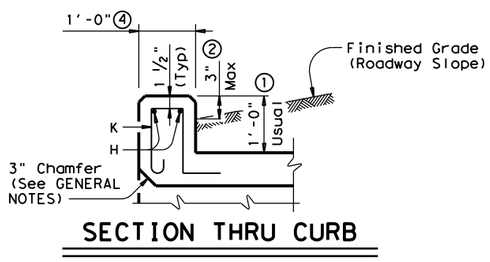
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TYPICAL SECTION

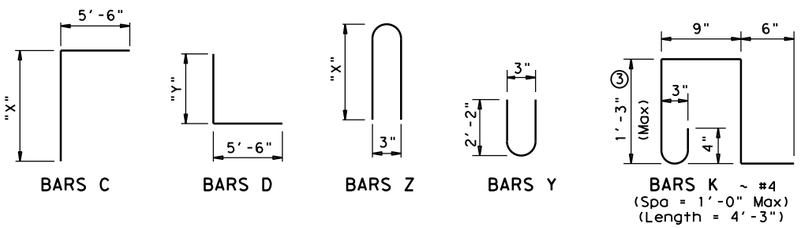


PART PLANS



SECTION THRU CURB

H	Bar Dimensions	
	"X"	"Y"
3'-0"	3'-5"	2'-2"
4'-0"	4'-5"	2'-2"
5'-0"	5'-5"	2'-2"
6'-0"	6'-5"	2'-2"



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 bridge rail, refer to T6-CM standard. For structures with traffic rail, other than T6, refer to RAC standard.

② 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.

③ 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.

④ 1'-0" typical. 2'-0" when RAC standard is referred to elsewhere in the plans.

Deformed welded wire reinforcement (WWR) meeting the requirements of ASTM A1064 may be used to replace conventional reinforcement shown at the Contractor's option. The area of required reinforcement may be reduced by the ratio of 60 ksi / 70 ksi. Spacing of WWR is limited to 4" Min and 18" Max. When required, provide lap splices in the WWR of the same length required for the equivalent bar size, rounded up for wire sizes between conventional bar sizes.

Example Conversion: Replacement of No. 6 Gr 60 at 6" Spacing with WWR.
WWR required = (0.44 sq in/ 0.5') x (60 ksi/70 ksi) = 0.754 sq in/ft.
If D30.6 wire is used to meet the 0.754 sq in/ft requirement in this example, the required spacing = (0.306 sq in/ 0.754 sq in/ft) x 12 in/ft = 4.87" Max spacing.
Required lap length for the provided D30.6 wire is 2'-2" (Lap required for uncoated No. 5 bars, as shown in Item 440).

GENERAL NOTES:
Designed according to AASHTO LRFD Specifications.
Designed to the maximum fill height shown.
All reinforcing steel shall be Grade 60.
All concrete shall be Class "C" with these exceptions: use Class "S" for top slabs of culverts with overlay, with 1-to-2 course surface treatment, or with the top slab as the final riding surface.
Class "C" concrete shall have a minimum compressive strength of 3,600 psi. Class "S" concrete shall have a minimum compressive strength of 4,000 psi.
The use of permanent forms is not allowed.
The bottom edge of the top slab shall be chamfered 3" at the entrance.
Reinforcing bars shall be adjusted to provide a minimum of 1 1/4" clear cover.
Construction joints shown at the flow line may be raised a maximum of 6" at the Contractor's option. If this option is used, Bars M may be cut off or raised, Bars C and D may be reversed, and Bars Y and Z may be reversed.
See standard MC-MD for skewed ends, angle sections and lengthening details.

HL93 LOADING SHEET 1 OF 2

Texas Department of Transportation — Bridge Division Standard

MULTIPLE BOX CULVERTS CAST-IN-PLACE
6'-0" SPAN
0' TO 16' FILL

MC-6-16

FILE: mc616ste.dgn	DN: GAF	CK: LMW	DW: BWH/TxDOT	CK: GAF
©TxDOT February 2010	CONT	SECT	JOB	HIGHWAY
REVISIONS				CR119
10-12: Added WWR	DIST	COUNTY		SHEET NO.
	06	WILLIAMSON		J78

BILLS OF REINFORCING STEEL (For Box Length = 40 feet)

NUMBER OF SPANS	SECTION DIMENSIONS				Bars B					Bars C & D							Bars E					Bars F_1 ~#4				Bars F_2 ~#4 at 1'-6" Max			Bars M~#4 at 1'-6" Max			Bars Y & Z~#4 at 1'-0" Max					Bars H 4~#4		Bars K		QUANTITIES: Per foot of Barrel		Curb		Total	
													Bar C		Bar D																																
	S	H	T	U	No.	Size	Spa	Length	Wt	No.	Size	Spa	Length	Wt	Length	Wt	No.	Size	Spa	Length	Wt	No.	Spa	Length	Wt	No.	Length	Wt	No.	Length	Wt	No.	Bar Y Length	Bar Y Wt	Bar Z Length	Bar Z Wt	Length	Weight	No.	Weight	Conc (CY)	Reinf (Lb)	Conc (CY)	Reinf (Lb)	Conc (CY)	Reinf (Lb)
2	6'-0"	3'-0"	7"	7"	162	#5	6"	13'- 6"	2,281	162	#4	6"	8'-11"	965	7'- 8"	830	194	#5	5"	6'- 0"	1,214	16	9"	39'-9"	425	50	39'-9"	1,328	56	3'- 0"	112	41	4'- 6"	123	7'- 0"	192	13'- 6"	36	30	85	0.789	186.8	1.0	121	32.6	7,591
3	6'-0"	3'-0"	7"	7"	162	#5	6"	20'- 1"	3,393	162	#4	6"	8'-11"	965	7'- 8"	830	194	#5	5"	12'- 7"	2,546	24	9"	39'-9"	637	71	39'-9"	1,885	56	3'- 0"	112	82	4'- 6"	246	7'- 0"	383	20'- 1"	54	42	119	1.138	274.9	1.5	173	47.0	11,170
4	6'-0"	3'-0"	7"	7"	162	#5	6"	26'- 8"	4,506	162	#4	6"	8'-11"	965	7'- 8"	830	194	#5	5"	19'- 2"	3,878	32	9"	39'-9"	850	92	39'-9"	2,443	56	3'- 0"	112	123	4'- 6"	370	7'- 0"	575	26'- 8"	71	56	159	1.487	363.2	2.0	230	61.5	14,759
5	6'-0"	3'-0"	7"	7"	162	#5	6"	33'- 3"	5,618	162	#4	6"	8'-11"	965	7'- 8"	830	194	#5	5"	25'- 9"	5,210	40	9"	39'-9"	1,062	113	39'-9"	3,000	56	3'- 0"	112	164	4'- 6"	493	7'- 0"	767	33'- 3"	89	70	199	1.836	451.4	2.5	288	75.9	18,345
6	6'-0"	3'-0"	7"	7"	162	#5	6"	39'-10"	6,730	162	#4	6"	8'-11"	965	7'- 8"	830	194	#5	5"	32'- 4"	6,542	48	9"	39'-9"	1,275	134	39'-9"	3,558	56	3'- 0"	112	205	4'- 6"	616	7'- 0"	959	39'-10"	106	82	233	2.186	539.7	3.0	339	90.4	21,926
2	6'-0"	4'-0"	7"	7"	162	#5	6"	13'- 6"	2,281	162	#4	6"	9'-11"	1,073	7'- 8"	830	194	#5	5"	6'- 0"	1,214	16	9"	39'-9"	425	50	39'-9"	1,328	56	4'- 0"	150	41	4'- 6"	123	9'- 0"	246	13'- 6"	36	30	85	0.853	191.8	1.0	121	35.1	7,791
3	6'-0"	4'-0"	7"	7"	162	#5	6"	20'- 1"	3,393	162	#4	6"	9'-11"	1,073	7'- 8"	830	194	#5	5"	12'- 7"	2,546	24	9"	39'-9"	637	71	39'-9"	1,885	56	4'- 0"	150	82	4'- 6"	246	9'- 0"	493	20'- 1"	54	42	119	1.224	281.3	1.5	173	50.5	11,426
4	6'-0"	4'-0"	7"	7"	162	#5	6"	26'- 8"	4,506	162	#4	6"	9'-11"	1,073	7'- 8"	830	194	#5	5"	19'- 2"	3,878	32	9"	39'-9"	850	92	39'-9"	2,443	56	4'- 0"	150	123	4'- 6"	370	9'- 0"	739	26'- 8"	71	56	159	1.595	371.0	2.0	230	65.8	15,069
5	6'-0"	4'-0"	7"	7"	162	#5	6"	33'- 3"	5,618	162	#4	6"	9'-11"	1,073	7'- 8"	830	194	#5	5"	25'- 9"	5,210	40	9"	39'-9"	1,062	113	39'-9"	3,000	56	4'- 0"	150	164	4'- 6"	493	9'- 0"	986	33'- 3"	89	70	199	1.966	460.6	2.5	288	81.1	18,710
6	6'-0"	4'-0"	7"	7"	162	#5	6"	39'-10"	6,730	162	#4	6"	9'-11"	1,073	7'- 8"	830	194	#5	5"	32'- 4"	6,542	48	9"	39'-9"	1,275	134	39'-9"	3,558	56	4'- 0"	150	205	4'- 6"	616	9'- 0"	1,232	39'-10"	106	82	233	2.337	550.2	3.0	339	96.5	22,345
2	6'-0"	5'-0"	7"	7"	162	#5	6"	13'- 6"	2,281	162	#4	6"	10'-11"	1,181	7'- 8"	830	194	#5	5"	6'- 0"	1,214	16	9"	39'-9"	425	56	39'-9"	1,487	56	5'- 0"	187	41	4'- 6"	123	11'- 0"	301	13'- 6"	36	30	85	0.918	200.7	1.0	121	37.7	8,150
3	6'-0"	5'-0"	7"	7"	162	#5	6"	20'- 1"	3,393	162	#4	6"	10'-11"	1,181	7'- 8"	830	194	#5	5"	12'- 7"	2,546	24	9"	39'-9"	637	79	39'-9"	2,098	56	5'- 0"	187	82	4'- 6"	246	11'- 0"	603	20'- 1"	54	42	119	1.311	293.0	1.5	173	53.9	11,894
4	6'-0"	5'-0"	7"	7"	162	#5	6"	26'- 8"	4,506	162	#4	6"	10'-11"	1,181	7'- 8"	830	194	#5	5"	19'- 2"	3,878	32	9"	39'-9"	850	102	39'-9"	2,708	56	5'- 0"	187	123	4'- 6"	370	11'- 0"	904	26'- 8"	71	56	159	1.703	385.4	2.0	230	70.1	15,644
5	6'-0"	5'-0"	7"	7"	162	#5	6"	33'- 3"	5,618	162	#4	6"	10'-11"	1,181	7'- 8"	830	194	#5	5"	25'- 9"	5,210	40	9"	39'-9"	1,062	125	39'-9"	3,319	56	5'- 0"	187	164	4'- 6"	493	11'- 0"	1,205	33'- 3"	89	70	199	2.096	477.6	2.5	288	86.3	19,393
6	6'-0"	5'-0"	7"	7"	162	#5	6"	39'-10"	6,730	162	#4	6"	10'-11"	1,181	7'- 8"	830	194	#5	5"	32'- 4"	6,542	48	9"	39'-9"	1,275	148	39'-9"	3,930	56	5'- 0"	187	205	4'- 6"	616	11'- 0"	1,506	39'-10"	106	82	233	2.488	569.9	3.0	339	102.5	23,136
2	6'-0"	6'-0"	7"	7"	162	#5	6"	13'- 6"	2,281	194	#4	5"	11'-11"	1,544	7'- 8"	994	194	#5	5"	6'- 0"	1,214	16	9"	39'-9"	425	62	39'-9"	1,646	56	6'- 0"	224	41	4'- 6"	123	13'- 0"	356	13'- 6"	36	30	85	0.983	220.2	1.0	121	40.3	8,928
3	6'-0"	6'-0"	7"	7"	162	#5	6"	20'- 1"	3,393	194	#4	5"	11'-11"	1,544	7'- 8"	994	194	#5	5"	12'- 7"	2,546	24	9"	39'-9"	637	87	39'-9"	2,310	56	6'- 0"	224	82	4'- 6"	246	13'- 0"	712	20'- 1"	54	42	119	1.397	315.2	1.5	173	57.4	12,779
4	6'-0"	6'-0"	7"	7"	162	#5	6"	26'- 8"	4,506	194	#4	5"	11'-11"	1,544	7'- 8"	994	194	#5	5"	19'- 2"	3,878	32	9"	39'-9"	850	112	39'-9"	2,974	56	6'- 0"	224	123	4'- 6"	370	13'- 0"	1,068	26'- 8"	71	56	159	1.811	410.2	2.0	230	74.4	16,638
5	6'-0"	6'-0"	7"	7"	162	#5	6"	33'- 3"	5,618	194	#4	5"	11'-11"	1,544	7'- 8"	994	194	#5	5"	25'- 9"	5,210	40	9"	39'-9"	1,062	137	39'-9"	3,638	56	6'- 0"	224	164	4'- 6"	493	13'- 0"	1,424	33'- 3"	89	70	199	2.225	505.2	2.5	288	91.5	20,495
6	6'-0"	6'-0"	7"	7"	162	#5	6"	39'-10"	6,730	194	#4	5"	11'-11"	1,544	7'- 8"	994	194	#5	5"	32'- 4"	6,542	48	9"	39'-9"	1,275	162	39'-9"	4,302	56	6'- 0"	224	205	4'- 6"	616	13'- 0"	1,780	39'-10"	106	82	233	2.639	600.2	3.0	339	108.6	24,346

Deformed welded wire reinforcement (WWR) meeting the requirements of ASTM A1064 may be used to replace conventional reinforcement shown at the Contractor's option. The area of required reinforcement may be reduced by the ratio of 60 ksi / 70 ksi. Spacing of WWR is limited to 4" Min and 18" Max. When required, provide lap splices in the WWR of the same length required for the equivalent bar size, rounded up for wire sizes between conventional bar sizes.

Example Conversion: Replacement of No. 6 Gr 60 at 6" Spacing with WWR.
WWR required = (0.44 sq in/ 0.5') x (60 ksi/70 ksi) = 0.754 sq in/ft.
If D30.6 wire is used to meet the 0.754 sq in/ft requirement in this example, the required spacing = (0.306 sq in/ 0.754 sq in/ft) x 12 in/ft = 4.87" Max spacing.
Required lap length for the provided D30.6 wire is 2'-2" (Lap required for uncoated No. 5 bars, as shown in Item 440).

HL93 LOADING SHEET 2 OF 2

Texas Department of Transportation — Bridge Division Standard

MULTIPLE BOX CULVERTS CAST-IN-PLACE
6'-0" SPAN
0' TO 16' FILL

MC-6-16

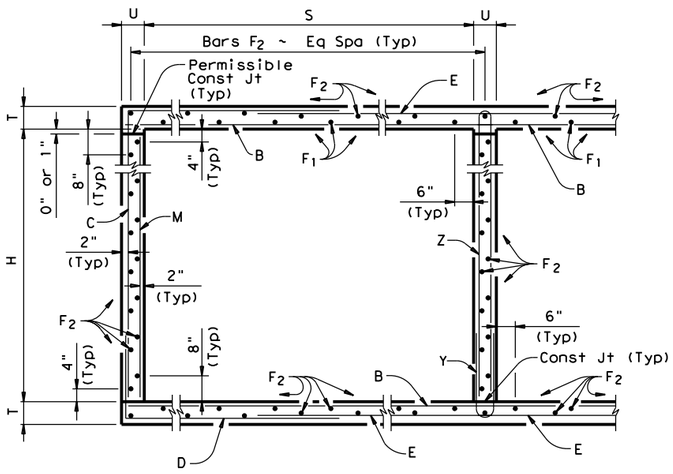
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©TxDOT February 2010	CONT	SECT	JOB	HIGHWAY
REVISIONS				CR119
10-12: Added WWR	DIST	COUNTY		SHEET NO.
	06	WILLIAMSON		179

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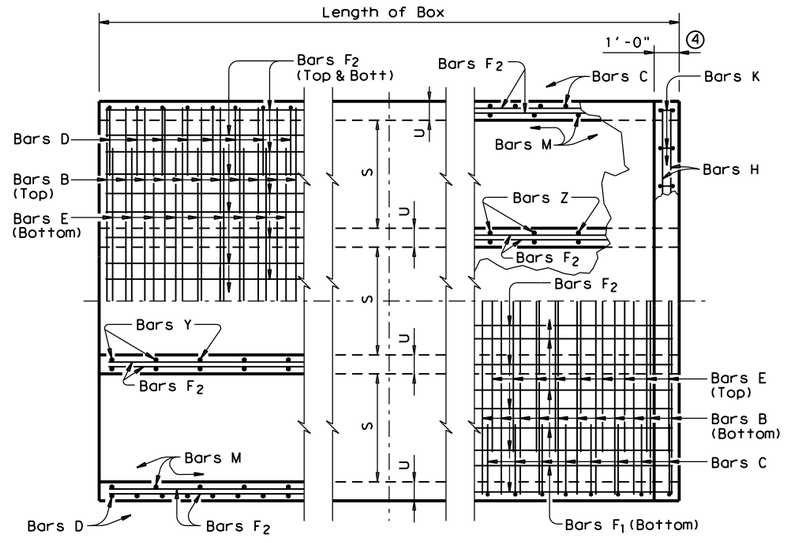
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DISCLAIMER:
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TYPICAL SECTION



PART PLANS

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 bridge rail, refer to T6-CM standard. For structures with traffic rail, other than T6, refer to RAC standard.

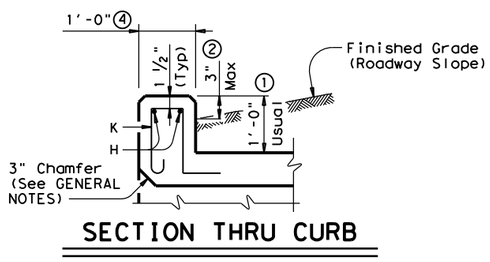
② For vehicle safety, the following requirements must be met:
- For structures without bridge rail, curbs shall project no more than 3" above finished grade.
- For structures with bridge rail, curbs shall be flush with finished grade.
Curb heights shall be reduced, if necessary, to meet the above requirements. No changes will be made in quantities and no additional compensation will be allowed for this work.

③ 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.

④ 1'-0" typical. 2'-0" when RAC standard is referred to elsewhere in the plans.

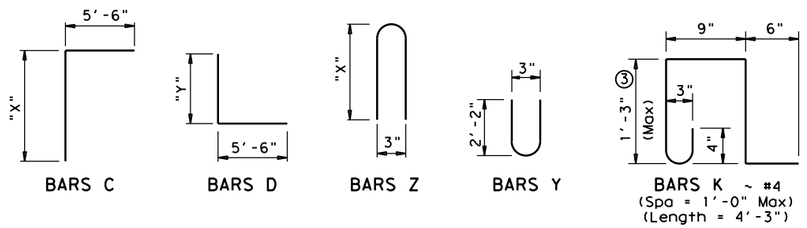
Deformed welded wire reinforcement (WWR) meeting the requirements of ASTM A1064 may be used to replace conventional reinforcement shown at the Contractor's option. The area of required reinforcement may be reduced by the ratio of 60 ksi / 70 ksi. Spacing of WWR is limited to 4" Min and 18" Max. When required, provide lap splices in the WWR of the same length required for the equivalent bar size, rounded up for wire sizes between conventional bar sizes.

Example Conversion: Replacement of No. 6 Gr 60 at 6" Spacing with WWR.
WWR required = (0.44 sq in/ 0.5') x (60 ksi/70 ksi) = 0.754 sq in/ft.
If D30.6 wire is used to meet the 0.754 sq in/ft requirement in this example, the required spacing = (0.306 sq in/ 0.754 sq in/ft) x 12 in/ft = 4.87" Max spacing.
Required lap length for the provided D30.6 wire is 2'-2" (Lap required for uncoated No. 5 bars, as shown in Item 440).



SECTION THRU CURB

H	Bar Dimensions	
	"X"	"Y"
3'-0"	3'-5"	2'-2"
4'-0"	4'-5"	2'-2"
5'-0"	5'-5"	2'-2"
6'-0"	6'-5"	2'-2"
7'-0"	7'-5"	2'-2"



GENERAL NOTES:
Designed according to AASHTO LRFD Specifications.
Designed to the maximum fill height shown.
All reinforcing steel shall be Grade 60.
All concrete shall be Class "C" with these exceptions: use Class "S" for top slabs of culverts with overlay, with 1-to-2 course surface treatment, or with the top slab as the final riding surface.
Class "C" concrete shall have a minimum compressive strength of 3,600 psi. Class "S" concrete shall have a minimum compressive strength of 4,000 psi.
The use of permanent forms is not allowed.
The bottom edge of the top slab shall be chamfered 3" at the entrance.
Reinforcing bars shall be adjusted to provide a minimum of 1 ¼" clear cover.
Construction joints shown at the flow line may be raised a maximum of 6" at the Contractor's option. If this option is used, Bars M may be cut off or raised, Bars C and D may be reversed, and Bars Y and Z may be reversed.
See standard MC-MD for skewed ends, angle sections and lengthening details.

HL93 LOADING SHEET 1 OF 2

Texas Department of Transportation — Bridge Division Standard

MULTIPLE BOX CULVERTS CAST-IN-PLACE
7'-0" SPAN
0' TO 10' FILL

MC-7-10

FILE: mc710ste.dgn	DN: GAF	CK: LMW	DW: BWH/TxDOT	CK: GAF
©TxDOT February 2010	CONT	SECT	JOB	HIGHWAY
REVISIONS				CR119
10-12: Added WWR	DIST	COUNTY		SHEET NO.
	06	WILLIAMSON		180

BILLS OF REINFORCING STEEL (For Box Length = 40 feet)

NUMBER OF SPANS	SECTION DIMENSIONS				Bars B					Bars C & D							Bars E					Bars F_1 ~#4				Bars F_2 ~#4 at 1'-6" Max			Bars M~#4 at 1'-6" Max			Bars Y & Z~#4 at 10" Max					Bars H 4~#4		Bars K		QUANTITIES: Per foot of Barrel		Curb		Total	
													Bar C		Bar D																															
	S	H	T	U	No.	Size	Spa	Length	Wt	No.	Size	Spa	Length	Wt	Length	Wt	No.	Size	Spa	Length	Wt	No.	Spa	Length	Wt	No.	Length	Wt	No.	Spa	Length	Wt	No.	Bar Y Length	Bar Y Wt	Bar Z Length	Bar Z Wt	Length	Weight	No.	Weight	Conc (CY)	Reinf (Lb)	Conc (CY)	Reinf (Lb)	Conc (CY)	Reinf (Lb)
2	7'-0"	3'-0"	7"	7"	194	#5	5"	15'- 6"	3,136	162	#4	6"	8'-11"	965	7'- 8"	830	194	#5	5"	8'- 0"	1,619	20	8"	39'-9"	531	54	39'-9"	1,434	56	3'- 0"	112	49	4'- 6"	147	7'- 0"	229	15'- 6"	41	34	97	0.875	225.1	1.2	138	36.2	9,141
3	7'-0"	3'-0"	7"	7"	194	#5	5"	23'- 1"	4,671	162	#4	6"	8'-11"	965	7'- 8"	830	194	#5	5"	15'- 7"	3,153	30	8"	39'-9"	797	77	39'-9"	2,045	56	3'- 0"	112	98	4'- 6"	295	7'- 0"	458	23'- 1"	62	48	136	1.267	333.2	1.7	198	52.4	13,524
4	7'-0"	3'-0"	7"	7"	194	#5	5"	30'- 8"	6,205	162	#4	6"	8'-11"	965	7'- 8"	830	194	#5	5"	23'- 2"	4,688	40	8"	39'-9"	1,062	100	39'-9"	2,655	56	3'- 0"	112	147	4'- 6"	442	7'- 0"	687	30'- 8"	82	64	182	1.660	441.2	2.3	264	68.7	17,910
5	7'-0"	3'-0"	7"	7"	194	#5	5"	38'- 3"	7,740	162	#4	6"	8'-11"	965	7'- 8"	830	194	#5	5"	30'- 9"	6,222	50	8"	39'-9"	1,328	123	39'-9"	3,266	56	3'- 0"	112	196	4'- 6"	589	7'- 0"	916	38'- 3"	102	80	227	2.052	549.2	2.9	329	85.0	22,297
6	7'-0"	3'-0"	7"	7"	194	#5	5"	45'-10"	9,274	162	#4	6"	8'-11"	965	7'- 8"	830	194	#5	5"	38'- 4"	7,756	60	8"	39'-9"	1,593	146	39'-9"	3,877	56	3'- 0"	112	245	4'- 6"	736	7'- 0"	1,146	45'-10"	122	94	267	2.445	657.2	3.4	389	101.2	26,678
2	7'-0"	4'-0"	7"	7"	194	#5	5"	15'- 6"	3,136	162	#4	6"	9'-11"	1,073	7'- 8"	830	194	#5	5"	8'- 0"	1,619	20	8"	39'-9"	531	54	39'-9"	1,434	56	4'- 0"	150	49	4'- 6"	147	9'- 0"	295	15'- 6"	41	34	97	0.940	230.4	1.2	138	38.8	9,353
3	7'-0"	4'-0"	7"	7"	194	#5	5"	23'- 1"	4,671	162	#4	6"	9'-11"	1,073	7'- 8"	830	194	#5	5"	15'- 7"	3,153	30	8"	39'-9"	797	77	39'-9"	2,045	56	4'- 0"	150	98	4'- 6"	295	9'- 0"	589	23'- 1"	62	48	136	1.354	340.1	1.7	198	55.9	13,801
4	7'-0"	4'-0"	7"	7"	194	#5	5"	30'- 8"	6,205	162	#4	6"	9'-11"	1,073	7'- 8"	830	194	#5	5"	23'- 2"	4,688	40	8"	39'-9"	1,062	100	39'-9"	2,655	56	4'- 0"	150	147	4'- 6"	442	9'- 0"	884	30'- 8"	82	64	182	1.768	449.7	2.3	264	73.0	18,253
5	7'-0"	4'-0"	7"	7"	194	#5	5"	38'- 3"	7,740	162	#4	6"	9'-11"	1,073	7'- 8"	830	194	#5	5"	30'- 9"	6,222	50	8"	39'-9"	1,328	123	39'-9"	3,266	56	4'- 0"	150	196	4'- 6"	589	9'- 0"	1,178	38'- 3"	102	80	227	2.182	559.4	2.9	329	90.2	22,705
6	7'-0"	4'-0"	7"	7"	194	#5	5"	45'-10"	9,274	162	#4	6"	9'-11"	1,073	7'- 8"	830	194	#5	5"	38'- 4"	7,756	60	8"	39'-9"	1,593	146	39'-9"	3,877	56	4'- 0"	150	245	4'- 6"	736	9'- 0"	1,473	45'-10"	122	94	267	2.596	669.1	3.4	389	107.2	27,151
2	7'-0"	5'-0"	7"	7"	194	#5	5"	15'- 6"	3,136	162	#4	6"	10'-11"	1,181	7'- 8"	830	194	#5	5"	8'- 0"	1,619	20	8"	39'-9"	531	60	39'-9"	1,593	56	5'- 0"	187	49	4'- 6"	147	11'- 0"	360	15'- 6"	41	34	97	1.005	239.6	1.2	138	41.4	9,722
3	7'-0"	5'-0"	7"	7"	194	#5	5"	23'- 1"	4,671	162	#4	6"	10'-11"	1,181	7'- 8"	830	194	#5	5"	15'- 7"	3,153	30	8"	39'-9"	797	85	39'-9"	2,257	56	5'- 0"	187	98	4'- 6"	295	11'- 0"	720	23'- 1"	62	48	136	1.440	352.3	1.7	198	59.3	14,289
4	7'-0"	5'-0"	7"	7"	194	#5	5"	30'- 8"	6,205	162	#4	6"	10'-11"	1,181	7'- 8"	830	194	#5	5"	23'- 2"	4,688	40	8"	39'-9"	1,062	110	39'-9"	2,921	56	5'- 0"	187	147	4'- 6"	442	11'- 0"	1,080	30'- 8"	82	64	182	1.876	464.9	2.3	264	77.3	18,860
5	7'-0"	5'-0"	7"	7"	194	#5	5"	38'- 3"	7,740	162	#4	6"	10'-11"	1,181	7'- 8"	830	194	#5	5"	30'- 9"	6,222	50	8"	39'-9"	1,328	135	39'-9"	3,585	56	5'- 0"	187	196	4'- 6"	589	11'- 0"	1,440	38'- 3"	102	80	227	2.312	577.6	2.9	329	95.4	23,431
6	7'-0"	5'-0"	7"	7"	194	#5	5"	45'-10"	9,274	162	#4	6"	10'-11"	1,181	7'- 8"	830	194	#5	5"	38'- 4"	7,756	60	8"	39'-9"	1,593	160	39'-9"	4,248	56	5'- 0"	187	245	4'- 6"	736	11'- 0"	1,800	45'-10"	122	94	267	2.747	690.1	3.4	389	113.3	27,994
2	7'-0"	6'-0"	7"	7"	194	#5	5"	15'- 6"	3,136	162	#4	6"	11'-11"	1,290	7'- 8"	830	194	#5	5"	8'- 0"	1,619	20	8"	39'-9"	531	66	39'-9"	1,752	56	6'- 0"	224	49	4'- 6"	147	13'- 0"	426	15'- 6"	41	34	97	1.069	248.9	1.2	138	44.0	10,093
3	7'-0"	6'-0"	7"	7"	194	#5	5"	23'- 1"	4,671	162	#4	6"	11'-11"	1,290	7'- 8"	830	194	#5	5"	15'- 7"	3,153	30	8"	39'-9"	797	93	39'-9"	2,469	56	6'- 0"	224	98	4'- 6"	295	13'- 0"	851	23'- 1"	62	48	136	1.527	364.5	1.7	198	62.8	14,778
4	7'-0"	6'-0"	7"	7"	194	#5	5"	30'- 8"	6,205	162	#4	6"	11'-11"	1,290	7'- 8"	830	194	#5	5"	23'- 2"	4,688	40	8"	39'-9"	1,062	120	39'-9"	3,186	56	6'- 0"	224	147	4'- 6"	442	13'- 0"	1,277	30'- 8"	82	64	182	1.984	480.1	2.3	264	81.7	19,468
5	7'-0"	6'-0"	7"	7"	194	#5	5"	38'- 3"	7,740	162	#4	6"	11'-11"	1,290	7'- 8"	830	194	#5	5"	30'- 9"	6,222	50	8"	39'-9"	1,328	147	39'-9"	3,903	56	6'- 0"	224	196	4'- 6"	589	13'- 0"	1,702	38'- 3"	102	80	227	2.441	595.7	2.9	329	100.5	24,157
6	7'-0"	6'-0"	7"	7"	194	#5	5"	45'-10"	9,274	162	#4	6"	11'-11"	1,290	7'- 8"	830	194	#5	5"	38'- 4"	7,756	60	8"	39'-9"	1,593	174	39'-9"	4,620	56	6'- 0"	224	245	4'- 6"	736	13'- 0"	2,128	45'-10"	122	94	267	2.899	711.3	3.4	389	119.4	28,840
2	7'-0"	7'-0"	7"	7"	194	#5	5"	15'- 6"	3,136	162	#4	6"	12'-11"	1,398	7'- 8"	830	194	#5	5"	8'- 0"	1,619	20	8"	39'-9"	531	66	39'-9"	1,752	56	7'- 0"	262	49	4'- 6"	147	15'- 0"	491	15'- 6"	41	34	97	1.134	254.2	1.2	138	46.6	10,304
3	7'-0"	7'-0"	7"	7"	194	#5	5"	23'- 1"	4,671	162	#4	6"	12'-11"	1,398	7'- 8"	830	194	#5	5"	15'- 7"	3,153	30	8"	39'-9"	797	93	39'-9"	2,469	56	7'- 0"	262	98	4'- 6"	295	15'- 0"	982	23'- 1"	62	48	136	1.613	371.4	1.7	198	66.2	15,055
4	7'-0"	7'-0"	7"	7"	194	#5	5"	30'- 8"	6,205	162	#4	6"	12'-11"	1,398	7'- 8"	830	194	#5	5"	23'- 2"	4,688	40	8"	39'-9"	1,062	120	39'-9"	3,186	56	7'- 0"	262	147	4'- 6"	442	15'- 0"	1,473	30'- 8"	82	64	182	2.092	488.7	2.3	264	86.0	19,810
5	7'-0"	7'-0"	7"	7"	194	#5	5"	38'- 3"	7,740	162	#4	6"	12'-11"	1,398	7'- 8"	830	194	#5	5"	30'- 9"	6,222	50	8"	39'-9"	1,328	147	39'-9"	3,903	56	7'- 0"	262	196	4'- 6"	589	15'- 0"	1,964	38'- 3"	102	80	227	2.571	605.9	2.9	329	105.7	24,565
6	7'-0"	7'-0"	7"	7"	194	#5	5"	45'-10"	9,274	162	#4	6"	12'-11"	1,398	7'- 8"	830	194	#5	5"	38'- 4"	7,756	60	8"	39'-9"	1,593	174	39'-9"	4,620	56	7'- 0"	262	245	4'- 6"	736	15'- 0"	2,455	45'-10"	122	94	267	3.050	723.1	3.4	389	125.4	29,313

Deformed welded wire reinforcement (WWR) meeting the requirements of ASTM A1064 may be used to replace conventional reinforcement shown at the Contractor's option. The area of required reinforcement may be reduced by the ratio of 60 ksi / 70 ksi. Spacing of WWR is limited to 4" Min and 18" Max. When required, provide lap splices in the WWR of the same length required for the equivalent bar size, rounded up for wire sizes between conventional bar sizes.

Example Conversion: Replacement of No. 6 Gr 60 at 6" Spacing with WWR.
WWR required = (0.44 sq in/ 0.5') x (60 ksi/70 ksi) = 0.754 sq in/ft.
If D30.6 wire is used to meet the 0.754 sq in/ft requirement in this example, the required spacing = (0.306 sq in/ 0.754 sq in/ft) x 12 in/ft = 4.87" Max spacing.
Required lap length for the provided D30.6 wire is 2'-2" (Lap required for uncoated No. 5 bars, as shown in Item 440).

HL93 LOADING SHEET 2 OF 2

Texas Department of Transportation — Bridge Division Standard

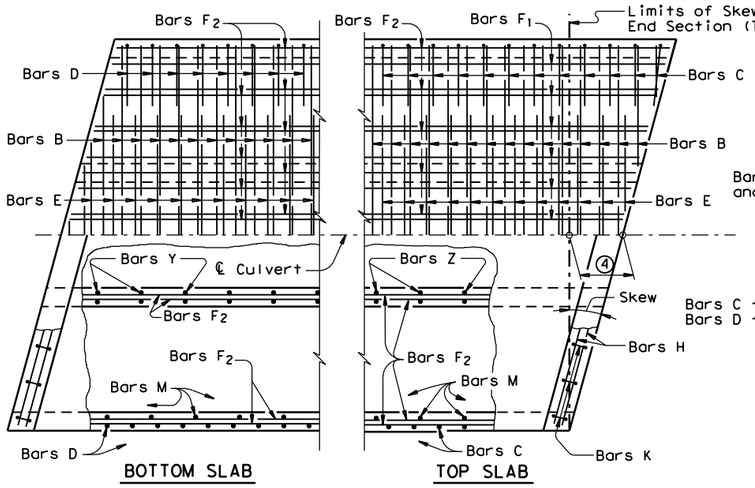
MULTIPLE BOX CULVERTS CAST-IN-PLACE
7'-0" SPAN
0' TO 10' FILL

MC-7-10

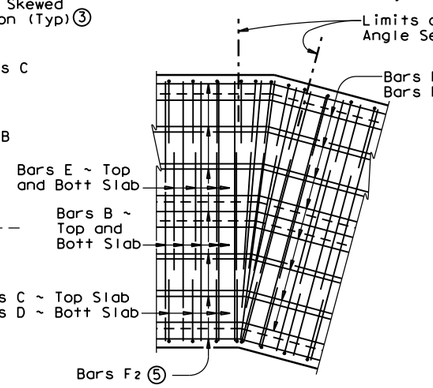
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REVISIONS				CR119
10-12: Added WWR	DIST	COUNTY		SHEET NO.
	06	WILLIAMSON		181

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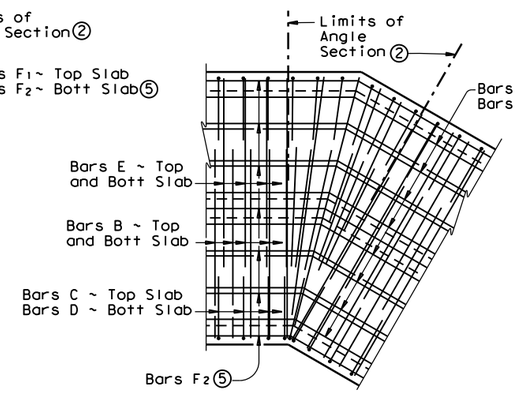
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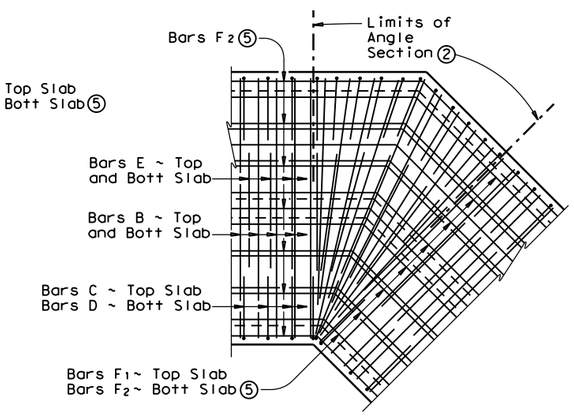
PLAN OF SKEWED ENDS ~ FROM 0° TO 15° ⑦



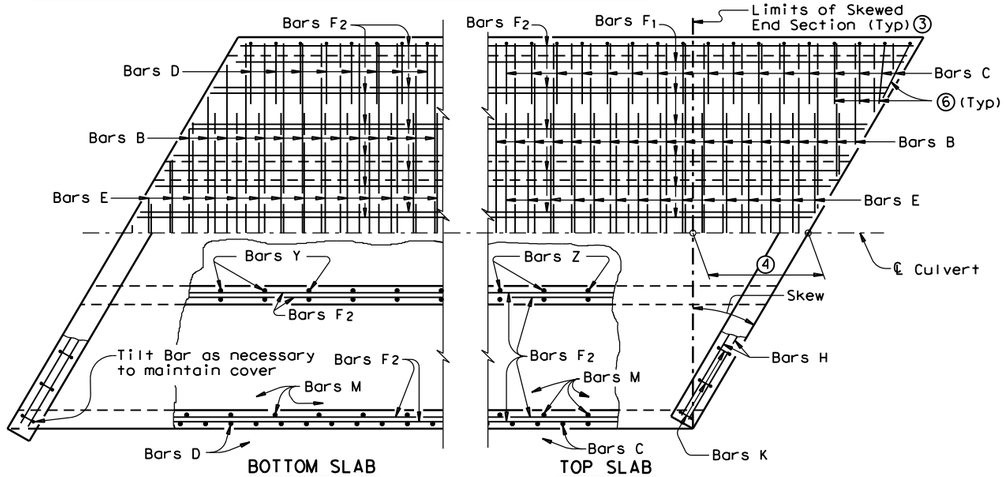
PLAN OF ANGLE SECTION ~ FROM 0° TO 15°



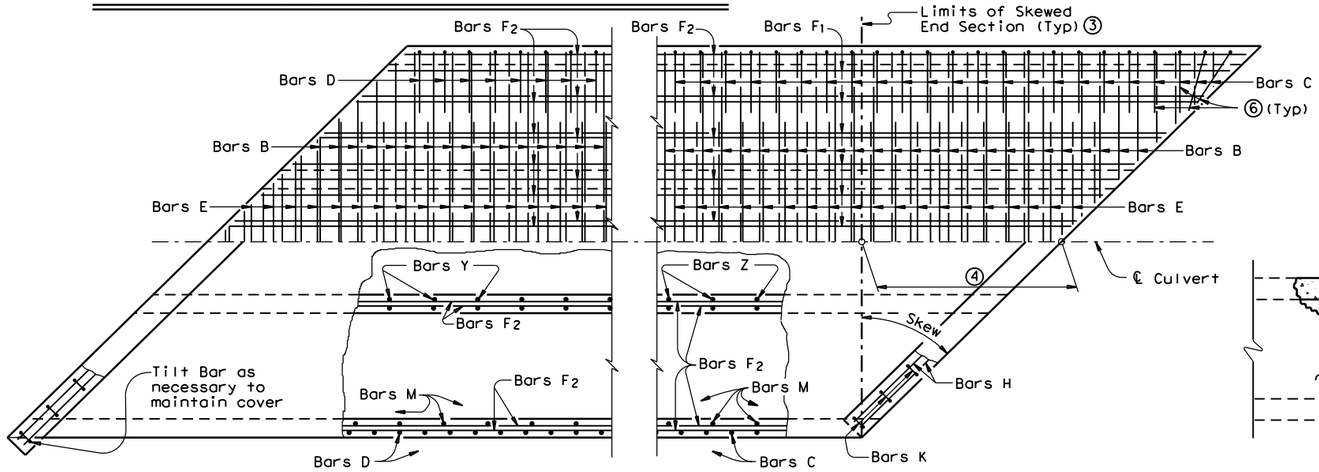
PLAN OF ANGLE SECTION ~ OVER 15° TO 30°



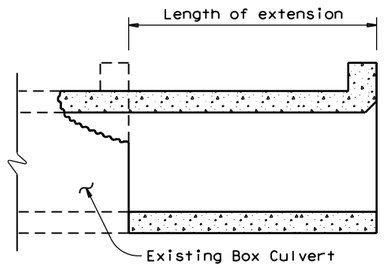
PLAN OF ANGLE SECTION ~ OVER 30° TO 45°



PLAN OF SKEWED ENDS ~ OVER 15° TO 30°



PLAN OF SKEWED ENDS ~ OVER 30° TO 45°



LENGTHENING DETAIL ①

GENERAL NOTES:

Designed according to AASHTO LRFD Specifications.

All reinforcing steel shall be Grade 60.

All concrete shall be Class "C" with these exceptions: use Class "S" for top slabs of culverts with overlay, with 1-to-2 course surface treatment, or with the top slab as the final riding surface.

Class "C" concrete shall have a minimum compressive strength of 3,600 psi. Class "S" concrete shall have a minimum compressive strength of 4,000 psi.

Refer to Multiple Box Culverts Cast-in-Place standard for details of straight sections of culvert. For skewed sections and angle sections refer to Multiple Box Culverts Cast-in-Place standard for slab and wall dimensions, bar sizes, maximum bar spacing, and any other details not shown. For Skewed ends with curbs, adjust length of Bars H, number of Bars K, curb concrete volume and reinforcing steel weight by dividing the values shown on the culvert standards by the cosine of the skew angle.

The use of permanent forms is not allowed.

Laps for Bars H, when required, shall be 1'-9" for uncoated bars and 2'-7" for epoxy coated.

① For box culverts with less than 2'-0" of fill, the top slab shall be broken back to provide a minimum 1'-10" lap of the existing longitudinal bars with the longitudinal bars in the extension. If the depth of fill is 2'-0" or greater, the top slab shall be broken back to provide a 1'-0" minimum embedment of existing longitudinal reinforcing into the extension. Alternatively, if the fill height is greater than 2'-0", the existing curb may be left in place and 2'-0" long #6 bars shall be drilled and grouted 1'-0" into the existing top slab at 1'-6" center to center spacing. Wings and apron shall be broken back as necessary to install the extension. Exposed wingwall and apron reinforcing may be removed or cleaned and included in the extension. When lengthening existing box culverts with dimensions different than current standard dimensions, horizontal and vertical transitions shall be formed as directed by the Engineer. Bottom slabs shall match to maintain an uninterrupted flow line. Existing and new reinforcing shall be field bent into transition maintaining specified cover requirements. For top slabs of culverts with overlay, with 1-to-2 course surface treatment, or with the top slab as the final riding surface, the "H" dimension may be adjusted to provide a smooth riding surface.

② When the spacing between Bars B or Bars E becomes less than half of the normal spacing, bars shall be cut to avoid fouling

③ The length of Bars B and E will vary in the skewed end sections

④ [One half of overall width] x [Tan of the skew angle]

⑤ Bars F1 and F2 shall be continuous through the angle section. They shall be bent to remain parallel to the walls of the Box Culvert.

⑥ When necessary to avoid fouling in acute corners, the slab extension leg of Bars C and Bars D may be shortened to a minimum of 1'-6" for skews of 30° and 45°.

⑦ For skews of 15° or less, the contractor has the option of placing Bars B, C, D and E parallel to the skewed end while maintaining spacing along centerline box. Lengths of Bars B and E shown on the standards shall be increased to accommodate the skew.

HL93 LOADING

Texas Department of Transportation | Bridge Division Standard

MULTIPLE BOX CULVERTS CAST-IN-PLACE MISCELLANEOUS DETAILS

MC-MD

FILE: mc-mdste.dgn	DN: GAF	CK: LMW	DW: BWH/TxDOT	CK: GAF
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REVISIONS				CR119
	DIST	COUNTY		SHEET NO.
	06	WILLIAMSON		182

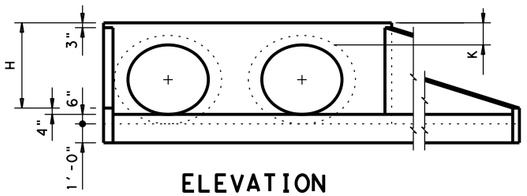
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TABLE OF VARIABLE DIMENSIONS AND QUANTITIES FOR ONE HEADWALL (4)

SLOPE	DIA OF PIPE, D	Values for one Pipe						Values to be added for each addt'l Pipe		
		W	X	Y	L	Reinf (Lbs)	Conc (CY) (1)	X and W	Reinf (Lbs)	Conc (CY) (1)
2:1	12"	7'- 7 3/4"	4'- 3"	2'-10"	5'- 8"	115	0.9	2'- 5 3/4"	26	0.3
	15"	8'-10 1/2"	4'- 7 1/4"	3'- 4"	6'- 8"	131	1.1	3'- 0 3/4"	32	0.4
	18"	10'- 1 1/4"	4'-11 1/2"	3'-10"	7'- 8"	163	1.3	3'- 9 1/4"	48	0.5
	21"	11'- 3 3/4"	5'- 3 3/4"	4'- 4"	8'- 8"	181	1.6	4'- 4 1/4"	54	0.6
	24"	12'- 6 1/2"	5'- 8"	4'-10"	9'- 8"	208	1.8	5'- 0 3/4"	67	0.8
	27"	13'- 9"	6'- 0 1/4"	5'- 4"	10'- 8"	225	2.1	5'- 6 1/2"	73	0.9
	30"	14'-11 3/4"	6'- 4 1/2"	5'-10"	11'- 8"	259	2.5	6'- 1 1/2"	86	1.1
	33"	16'- 3"	6'- 9 1/2"	6'- 4"	12'- 8"	284	2.8	6'- 7 1/4"	92	1.2
	36"	17'- 6 1/4"	7'- 2 1/4"	6'-10"	13'- 8"	316	3.2	7'- 2 1/4"	107	1.4
	42"	20'- 1"	8'- 0 1/4"	7'-10"	15'- 8"	383	4.0	8'- 3"	138	1.8
	48"	23'- 6"	8'-10 1/4"	9'- 4"	18'- 8"	468	5.4	9'- 3 3/4"	167	2.4
	54"	26'- 0 3/4"	9'- 8"	10'- 4"	20'- 8"	549	6.4	10'- 7 1/4"	198	3.0
	60"	28'- 7 1/2"	10'- 6"	11'- 4"	22'- 8"	620	7.5	11'- 8"	243	3.6
	66"	31'- 2 1/4"	11'- 3 3/4"	12'- 4"	24'- 8"	710	8.8	12'- 4 1/2"	269	4.0
	72"	33'- 8 3/4"	12'- 1 3/4"	13'- 4"	26'- 8"	789	10.1	13'- 2 1/2"	303	4.6
3:1	12"	10'- 1 1/4"	4'- 3"	4'- 3"	8'- 6"	154	1.3	2'- 5 3/4"	28	0.3
	15"	11'- 9 1/4"	4'- 7 1/4"	5'- 0"	10'- 0"	184	1.6	3'- 0 3/4"	37	0.5
	18"	13'- 5"	4'-11 1/2"	5'- 9"	11'- 6"	225	2.0	3'- 9 1/4"	55	0.6
	21"	15'- 0 3/4"	5'- 3 3/4"	6'- 6"	13'- 0"	254	2.4	4'- 4 1/4"	62	0.8
	24"	16'- 8 3/4"	5'- 8"	7'- 3"	14'- 6"	291	2.8	5'- 0 3/4"	77	1.0
	27"	18'- 4 1/2"	6'- 0 1/4"	8'- 0"	16'- 0"	329	3.3	5'- 6 1/2"	88	1.2
	30"	20'- 0 1/4"	6'- 4 1/2"	8'- 9"	17'- 6"	377	3.9	6'- 1 1/2"	103	1.4
	33"	21'- 8 3/4"	6'- 9 1/2"	9'- 6"	19'- 0"	413	4.4	6'- 7 1/4"	111	1.6
	36"	23'- 5 1/2"	7'- 2 1/4"	10'- 3"	20'- 6"	462	5.1	7'- 2 1/4"	126	1.9
	42"	26'-10 1/2"	8'- 0 1/4"	11'- 9"	23'- 6"	571	6.4	8'- 3"	168	2.4
	48"	31'- 7 1/4"	8'-10 1/4"	14'- 0"	28'- 0"	712	8.7	9'- 3 3/4"	210	3.2
	54"	35'- 0 1/4"	9'- 8"	15'- 6"	31'- 0"	830	10.5	10'- 7 1/4"	249	4.0
	60"	38'- 5 1/4"	10'- 6"	17'- 0"	34'- 0"	954	12.4	11'- 8"	306	4.8
	66"	41'-10 1/4"	11'- 3 3/4"	18'- 6"	37'- 0"	1092	14.5	12'- 4 1/2"	338	5.5
4:1	12"	12'- 6 3/4"	4'- 3"	5'- 8"	11'- 4"	203	1.7	2'- 5 3/4"	32	0.4
	15"	14'- 7 3/4"	4'- 7 1/4"	6'- 8"	13'- 4"	242	2.2	3'- 0 3/4"	43	0.6
	18"	16'- 8 3/4"	4'-11 1/2"	7'- 8"	15'- 4"	296	2.8	3'- 9 1/4"	61	0.8
	21"	18'- 9 3/4"	5'- 3 3/4"	8'- 8"	17'- 4"	343	3.4	4'- 4 1/4"	73	1.0
	24"	20'-10 3/4"	5'- 8"	9'- 8"	19'- 4"	394	4.0	5'- 0 3/4"	90	1.3
	27"	23'- 0"	6'- 0 1/4"	10'- 8"	21'- 4"	445	4.8	5'- 6 1/2"	103	1.5
	30"	25'- 1"	6'- 4 1/2"	11'- 8"	23'- 4"	510	5.5	6'- 1 1/2"	120	1.8
	33"	27'- 2 3/4"	6'- 9 1/2"	12'- 8"	25'- 4"	572	6.4	6'- 7 1/4"	134	2.0
	36"	29'- 4 1/2"	7'- 2 1/4"	13'- 8"	27'- 4"	631	7.3	7'- 2 1/4"	152	2.4
	42"	33'- 8"	8'- 0 1/4"	15'- 8"	31'- 4"	781	9.4	8'- 3"	198	3.0
	48"	39'- 8"	8'-10 1/4"	18'- 8"	37'- 4"	991	12.8	9'- 3 3/4"	255	4.0
6:1	12"	17'- 5 3/4"	4'- 3"	8'- 6"	17'- 0"	295	2.9	2'- 5 3/4"	38	0.5
	15"	20'- 5"	4'- 7 1/4"	10'- 0"	20'- 0"	367	3.7	3'- 0 3/4"	51	0.8
	18"	23'- 4 1/2"	4'-11 1/2"	11'- 6"	23'- 0"	445	4.7	3'- 9 1/4"	73	1.0
	21"	26'- 4"	5'- 3 3/4"	13'- 0"	26'- 0"	531	5.8	4'- 4 1/4"	89	1.3
	24"	29'- 3 1/4"	5'- 8"	14'- 6"	29'- 0"	605	7.0	5'- 0 3/4"	110	1.7
	27"	32'- 2 3/4"	6'- 0 1/4"	16'- 0"	32'- 0"	702	8.3	5'- 6 1/2"	129	2.0
	30"	35'- 2 1/4"	6'- 4 1/2"	17'- 6"	35'- 0"	801	9.7	6'- 1 1/2"	150	2.4
	33"	38'- 2 1/4"	6'- 9 1/2"	19'- 0"	38'- 0"	913	11.3	6'- 7 1/4"	170	2.8



ELEVATION

Showing dimensions

(1) Quantities shown are for concrete pipe and will increase slightly for metal pipe installations.

(2) 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.

(3) Provide a 1'-0" footing as shown where required to maintain 4" Min cover for pipes.

(4) Quantities shown are for one structure end only (one headwall).

(5) Min Length = $6" + 3" \times \left(\frac{12 \times H - 7}{12 \times L}\right)$

Max Length = $12 \times H - 3" \times \left(\frac{12 \times H - 7}{12 \times L}\right) - 1"$

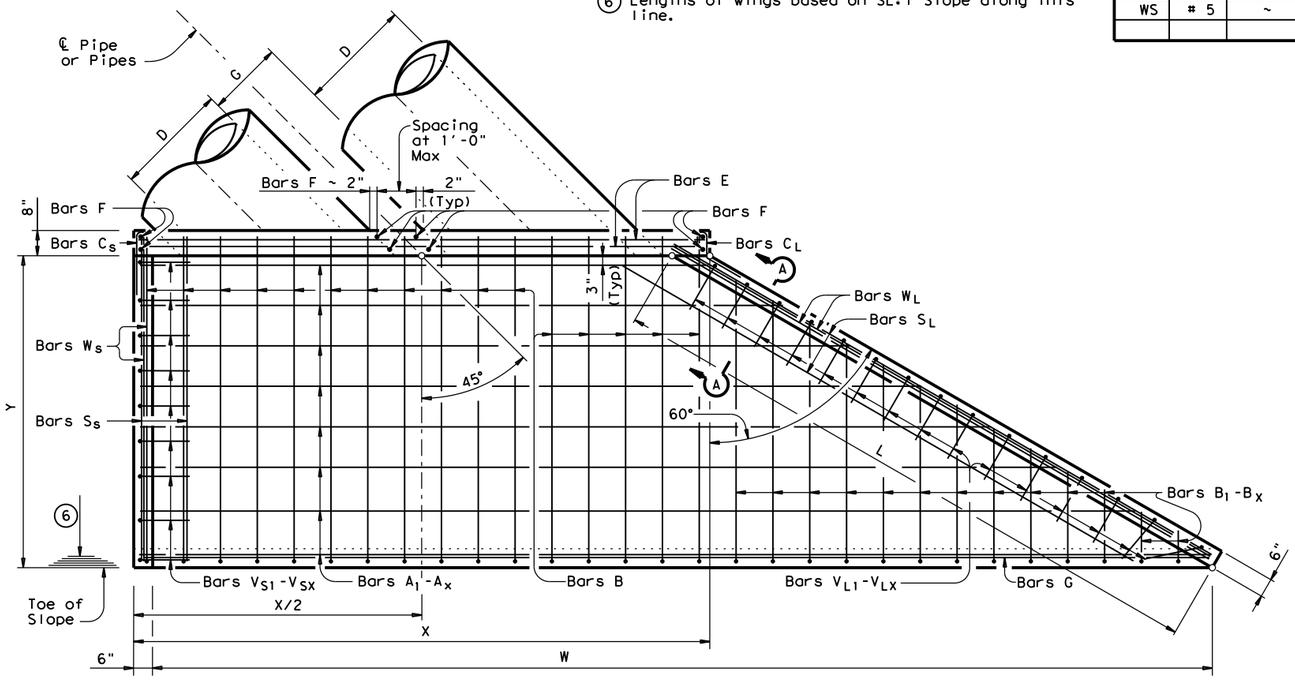
(6) Lengths of wings based on SL:1 Slope along this line.

TABLE OF REINFORCING STEEL (4)

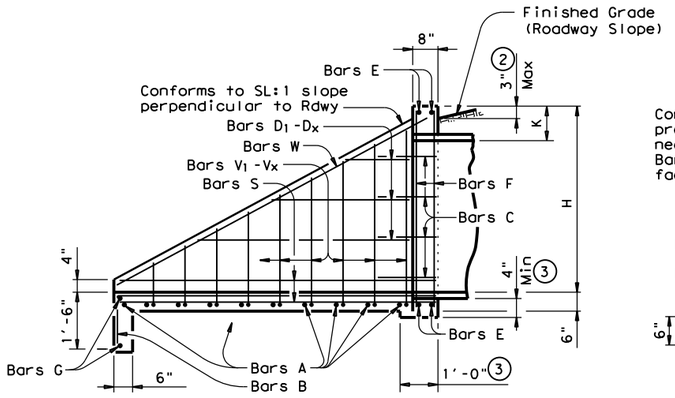
Bar	Size	Spa	No.
A	# 4	1'-0"	~
B	# 3	1'-6"	~
CL	# 4	1'-0"	~
CS	# 4	1'-0"	~
D	# 3	1'-0"	~
E	# 5	~	4
F	# 5	~	~
G	# 3	~	2
SL	# 4	~	3
SS	# 4	~	3
V	# 4	1'-0"	~
WL	# 5	~	2
WS	# 5	~	2

TABLE OF CONSTANT DIMENSIONS

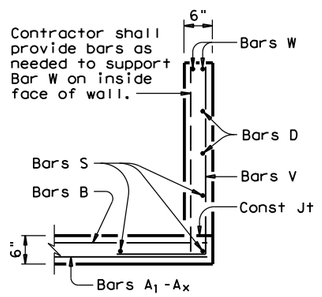
DIA OF PIPE, D	G	K	H
12"	9"	1'- 0"	2'- 0"
15"	11"	1'- 0"	2'- 3"
18"	1'- 2"	1'- 0"	2'- 6"
21"	1'- 4"	1'- 0"	2'- 9"
24"	1'- 7"	1'- 0"	3'- 0"
27"	1'- 8"	1'- 0"	3'- 3"
30"	1'-10"	1'- 0"	3'- 6"
33"	1'-11"	1'- 0"	3'- 9"
36"	2'- 1"	1'- 0"	4'- 0"
42"	2'- 4"	1'- 0"	4'- 6"
48"	2'- 7"	1'- 3"	5'- 3"
54"	3'- 0"	1'- 3"	5'- 9"
60"	3'- 3"	1'- 3"	6'- 3"
66"	3'- 3"	1'- 3"	6'- 9"
72"	3'- 4"	1'- 3"	7'- 3"



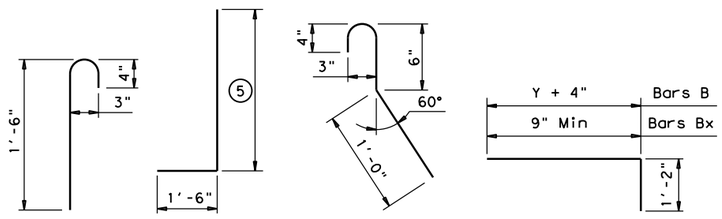
PLAN



TYPICAL WING ELEVATION



SECTION A-A



GENERAL NOTES:

Designed according to AASHTO LRFD Specifications.

Reinforcing steel shall be placed with the center of the outside layer of bars 2" from the surface of the concrete.

All reinforcing steel shall be Grade 60.

All concrete shall be Class "C" and shall have a minimum compressive strength of 3600 psi.

No bridge rails of any type may be mounted directly to these culvert headwalls.

Texas Department of Transportation — Bridge Division Standard

CONCRETE HEADWALLS
WITH FLARED WINGS FOR 45° SKEW PIPE CULVERTS

CH-FW-45

FILE: chfw45se.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: GAF
©TxDOT February 2010	CONT	SECT	JOB	HIGHWAY
REVISIONS				CR119
	DIST	COUNTY		SHEET NO.
	06	WILLIAMSON		183

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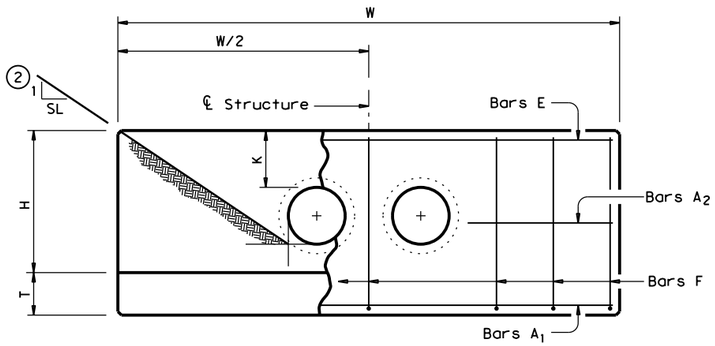
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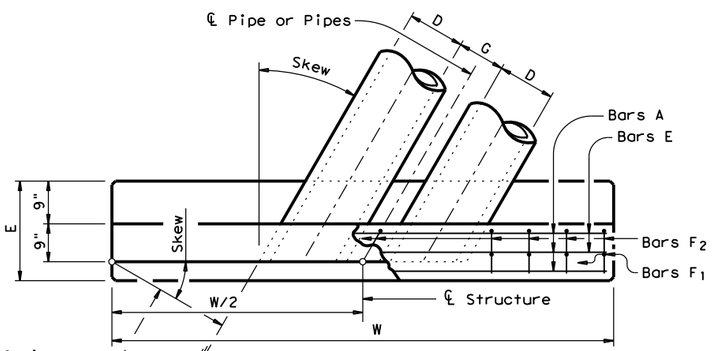
DATE: 6/15/2017 3:14:09 PM
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TABLE OF VARIABLE DIMENSIONS AND QUANTITIES FOR ONE HEADWALL (4)

SLOPE	DIA OF PIPE, D	15 Degrees						30 Degrees						45 Degrees					
		Values for one Pipe			Values to be added for each addt'l Pipe			Values for one Pipe			Values to be added for each addt'l Pipe			Values for one Pipe			Values to be added for each addt'l Pipe		
		W	Reinf (Lbs)	Conc (CY) (1)	W	Reinf (Lbs)	Conc (CY) (1)	W	Reinf (Lbs)	Conc (CY) (1)	W	Reinf (Lbs)	Conc (CY) (1)	W	Reinf (Lbs)	Conc (CY) (1)	W	Reinf (Lbs)	Conc (CY) (1)
2:1	12"	9'- 4"	124	1.1	1'- 9 3/4"	15	0.2	10'- 5"	130	1.2	2'- 0"	16	0.2	12'- 9"	159	1.5	2'- 5 3/4"	17	0.3
	15"	10'- 7"	136	1.3	2'- 3"	17	0.2	11'-10"	159	1.5	2'- 6"	18	0.2	14'- 6"	191	1.8	3'- 0 3/4"	20	0.3
	18"	11'-11"	165	1.5	2'- 9"	19	0.3	13'- 3"	174	1.7	3'- 1"	29	0.3	16'- 3"	207	2.1	3'- 9 1/4"	33	0.4
	21"	13'- 2"	203	1.9	3'- 2 1/4"	31	0.4	14'- 9"	233	2.1	3'- 6 3/4"	33	0.4	18'- 0"	276	2.6	4'- 4 1/4"	36	0.5
	24"	14'- 6"	240	2.1	3'- 8 1/4"	34	0.4	16'- 2"	251	2.4	4'- 1 3/4"	36	0.5	19'-10"	318	2.9	5'- 0 3/4"	39	0.6
	27"	15'- 9"	258	2.5	4'- 0 3/4"	38	0.5	17'- 7"	292	2.8	4'- 6 1/4"	39	0.6	21'- 7"	342	3.4	5'- 6 1/4"	44	0.7
	30"	17'- 1"	297	2.8	4'- 5 3/4"	40	0.6	19'- 1"	311	3.1	5'- 0"	42	0.6	23'- 4"	388	3.8	6'- 1 3/4"	47	0.8
	33"	18'- 5"	320	3.3	4'- 9 3/4"	43	0.6	20'- 6"	358	3.6	5'- 4 3/4"	46	0.7	25'- 1"	439	4.4	6'- 7 1/4"	51	0.9
	36"	19'- 8"	401	4.0	5'- 3"	47	0.9	21'-11"	422	4.5	5'-10 3/4"	50	0.9	26'-10"	517	5.5	7'- 2 1/4"	55	1.2
	42"	22'- 3"	476	5.0	6'- 0 3/4"	53	1.1	24'-10"	528	5.6	6'- 8 3/4"	56	1.2	30'- 5"	634	6.9	8'- 3"	76	1.4
	48"	25'-11"	577	6.6	6'- 9 3/4"	60	1.3	28'-10"	637	7.3	7'- 7 1/4"	79	1.5	35'- 4"	791	9.0	9'- 3 3/4"	88	1.8
	54"	28'- 6"	711	7.8	7'- 9"	83	1.6	31'- 9"	781	8.7	8'- 8"	87	1.8	38'-11"	958	10.7	10'- 7 1/4"	97	2.2
	60"	31'- 1"	805	9.2	8'- 6 1/4"	91	1.9	34'- 8"	881	10.2	9'- 6 1/4"	97	2.1	42'- 5"	1113	12.5	11'- 8"	124	2.6
	66"	33'- 8"	907	10.6	9'- 0 3/4"	98	2.1	37'- 6"	1028	11.8	10'- 1 1/4"	102	2.4	46'- 0"	1235	14.5	12'- 4 1/4"	132	2.9
	72"	36'- 3"	1071	12.1	9'- 8"	105	2.4	40'- 5"	1207	13.5	10'- 9 1/4"	110	2.6	49'- 6"	1446	16.6	13'- 2 1/4"	141	3.2
3:1	12"	13'- 6"	178	1.6	1'- 9 3/4"	15	0.2	15'- 0"	189	1.8	2'- 0"	15	0.2	18'- 5"	237	2.2	2'- 5 3/4"	17	0.2
	15"	15'- 3"	212	1.9	2'- 3"	17	0.2	17'- 0"	223	2.1	2'- 6"	17	0.3	20'-10"	276	2.6	3'- 0 3/4"	20	0.3
	18"	17'- 1"	231	2.3	2'- 9"	19	0.3	19'- 1"	259	2.5	3'- 1"	29	0.3	23'- 4"	318	3.1	3'- 9 1/4"	32	0.4
	21"	18'-11"	306	2.7	3'- 2 1/4"	31	0.4	21'- 1"	339	3.0	3'- 6 3/4"	33	0.4	25'-10"	413	3.7	4'- 4 1/4"	36	0.5
	24"	20'- 8"	345	3.1	3'- 8 3/4"	35	0.4	23'- 1"	384	3.5	4'- 1 3/4"	36	0.5	28'- 3"	462	4.2	5'- 0 3/4"	40	0.6
	27"	22'- 6"	376	3.7	4'- 0 3/4"	38	0.5	25'- 1"	438	4.1	4'- 6 1/4"	39	0.6	30'- 9"	522	5.0	5'- 6 1/4"	44	0.7
	30"	24'- 4"	422	4.1	4'- 5 3/4"	40	0.6	27'- 2"	466	4.6	5'- 0"	42	0.6	33'- 3"	578	5.6	6'- 1 3/4"	47	0.8
	33"	26'- 2"	476	4.8	4'-10"	43	0.6	29'- 2"	522	5.3	5'- 4 3/4"	46	0.7	35'- 9"	644	6.5	6'- 7 1/4"	51	0.9
	36"	27'-11"	590	5.9	5'- 3 1/4"	47	0.8	31'- 2"	645	6.6	5'-10 3/4"	50	0.9	38'- 2"	787	8.0	7'- 2 1/4"	56	1.2
	42"	31'- 7"	684	7.3	6'- 0 1/4"	53	1.1	35'- 3"	776	8.2	6'- 8 3/4"	56	1.2	43'- 2"	933	10.0	8'- 3"	79	1.4
	48"	36'- 9"	880	9.6	6'- 9 3/4"	61	1.3	41'- 0"	953	10.7	7'- 7 1/4"	81	1.5	50'- 2"	1166	13.1	9'- 3 3/4"	88	1.8
	54"	40'- 5"	1065	11.4	7'- 9"	85	1.6	45'- 0"	1185	12.7	8'- 8"	89	1.8	55'- 2"	1435	15.5	10'- 7 1/4"	97	2.2
	60"	44'- 0"	1224	13.3	8'- 6 1/4"	93	1.9	49'- 1"	1356	14.8	9'- 6 1/4"	96	2.1	60'- 1"	1627	18.2	11'- 8"	124	2.6
	66"	47'- 7"	1357	15.4	9'- 1"	98	2.1	53'- 1"	1497	17.2	10'- 1 1/4"	103	2.3	65'- 1"	1834	21.1	12'- 4 1/4"	130	2.9
	72"	51'- 3"	1624	17.7	9'- 8"	105	2.3	57'- 2"	1787	19.7	10'- 9 1/4"	109	2.6	70'- 0"	2210	24.1	13'- 2 1/4"	139	3.2
4:1	12"	17'- 7"	232	2.1	1'- 9 3/4"	15	0.2	19'- 8"	259	2.4	2'- 0"	16	0.2	24'- 0"	314	2.9	2'- 5 3/4"	18	0.2
	15"	19'-11"	272	2.5	2'- 3"	17	0.2	22'- 3"	301	2.8	2'- 6"	18	0.3	27'- 3"	361	3.5	3'- 0 3/4"	21	0.3
	18"	22'- 3"	313	3.0	2'- 9"	19	0.3	24'-10"	344	3.3	3'- 1"	29	0.3	30'- 5"	427	4.0	3'- 9 1/4"	32	0.4
	21"	24'- 7"	407	3.6	3'- 2 1/4"	31	0.4	27'- 5"	446	4.0	3'- 6 3/4"	33	0.4	33'- 7"	549	4.9	4'- 4 1/4"	36	0.5
	24"	26'-11"	455	4.1	3'- 8 3/4"	35	0.4	30'- 0"	499	4.5	4'- 1 3/4"	36	0.5	36'- 9"	609	5.6	5'- 0 3/4"	40	0.6
	27"	29'- 3"	514	4.8	4'- 0 3/4"	38	0.5	32'- 7"	562	5.4	4'- 6 1/4"	40	0.6	39'-11"	703	6.6	5'- 6 1/4"	43	0.7
	30"	31'- 7"	568	5.4	4'- 5 3/4"	40	0.6	35'- 3"	620	6.0	5'- 0"	42	0.6	43'- 2"	768	7.4	6'- 1 3/4"	49	0.8
	33"	33'-11"	634	6.2	4'-10"	43	0.7	37'-10"	710	7.0	5'- 4 3/4"	46	0.7	46'- 4"	848	8.5	6'- 7 1/4"	52	0.9
	36"	36'- 3"	776	7.7	5'- 3"	48	0.9	40'- 5"	868	8.6	5'-10 3/4"	49	0.9	49'- 6"	1058	10.6	7'- 2 1/4"	56	1.1
	42"	40'-11"	921	9.6	6'- 0 1/4"	53	1.0	45'- 7"	1022	10.7	6'- 8 3/4"	57	1.2	55'-10"	1262	13.1	8'- 3"	78	1.4
	48"	47'- 7"	1152	12.6	6'-10"	61	1.3	53'- 1"	1268	14.0	7'- 7 1/4"	80	1.5	65'- 1"	1579	17.2	9'- 3 3/4"	86	1.8
	54"	52'- 3"	1416	14.9	7'- 9 1/4"	86	1.6	58'- 4"	1589	16.6	8'- 8"	89	1.8	71'- 5"	1916	20.4	10'- 7 1/4"	95	2.2
	60"	56'-11"	1606	17.5	8'- 6 3/4"	92	1.9	63'- 6"	1798	19.5	9'- 6 1/4"	95	2.1	77'- 9"	2184	23.9	11'- 8"	122	2.6
	66"	61'- 7"	1811	20.2	9'- 0 3/4"	97	2.1	68'- 8"	2011	22.5	10'- 1 1/4"	101	2.4	84'- 2"	2464	27.6	12'- 4 1/4"	131	2.9
	72"	66'- 3"	2142	23.2	9'- 8"	104	2.4	73'-11"	2371	25.9	10'- 9 1/4"	108	2.6	90'- 6"	2929	31.7	13'- 2 1/4"	138	3.2
6:1	12"	25'-11"	342	3.1	1'- 9 3/4"	15	0.2	28'-10"	374	3.5	2'- 0"	16	0.2	35'- 4"	456	4.3	2'- 5 3/4"	17	0.2
	15"	29'- 3"	390	3.7	2'- 3"	17	0.2	32'- 7"	442	4.2	2'- 6"	18	0.2	39'-11"	549	5.1	3'- 0 3/4"	20	0.3
	18"	32'- 7"	459	4.4	2'- 9"	20	0.3	36'- 4"	515	4.9	3'- 1"	29	0.3	44'- 7"	629	6.0	3'- 9 1/4"	33	0.4
	21"	36'- 0"	608	5.3	3'- 2 1/4"	31	0.4	40'- 2"	660	5.9	3'- 6 3/4"	33	0.4	49'- 2"	823	7.2	4'- 4 1/4"	38	0.5
	24"	39'- 4"	672	6.0	3'- 8 3/4"	35	0.4	43'-11"	748	6.7	4'- 1 3/4"	36	0.5	53'- 9"	920	8.2	5'- 0 3/4"	42	0.6
	27"	42'- 8"	770	7.1	4'- 0 3/4"	38	0.5	47'- 8"	852	8.0	4'- 6 1/4"	41	0.5	58'- 4"	1039	9.7	5'- 6 1/4"	45	0.7
	30"	46'- 1"	839	8.0	4'- 5 3/4"	40	0.6	51'- 5"	949	8.9	5'- 0"	44	0.6	62'-11"	1154	10.9	6'- 1 3/4"	48	0.8
	33"	49'- 5"	947	9.2	4'-10"	45	0.7	55'- 2"	1040	10.3	5'- 4 3/4"	48	0.7	67'- 6"	1284	12.6	6'- 7 1/4"	50	0.9
	36"	52'-10"	1151	11.4	5'- 3"	49	0.8	58'-11"	1287	12.7	5'-10 3/4"	51	1.0	72'- 1"	1575	15.6	7'- 2 1/4"	55	1.1
	42"	59'- 6"	1365	14.2	6'- 0 1/4"	55	1.0	66'- 5"	1522	15.8	6'- 8 3/4"	57	1.2	81'- 4"	1867	19.4	8'- 3"	76	1.4
	48"	69'- 4"	1729	18.5	6'-10"	59	1.3	77'- 4"	1934	20.7	7'- 7 1/4"	79	1.5	94'- 9"	2360	25.3	9'- 3 3/4"	86	1.8
	54"	76'- 1"	2130	22.0	7'- 9 1/4"	83	1.6	84'-10"	2370	24.6	8'- 8"	87	1.8	103'-11"	2904	30.1	10'- 7 1/4"	95	2.2
	60"	82'-10"	2414	25.8	8'- 6 3/4"	90	1.9	92'- 5"	2673	28.8	9'- 6 1/4"	94	2.1	113'-2"	3286	35.3	11'- 8"	122	2.6
	66"	89'- 7"	2712	29.9	9'- 0 3/4"	96	2.1	99'-11"	3030	33.3	10'- 1 1/4"	101	2.4	122'-4"	3689	40.8	12'- 4 1/4"	130	2.9
	72"	96'- 3"	3210	34.2	9'- 8"	102	2.4	107'-5"	3572	38.2	10'- 9 1/4"	108	2.6	131'-6"	4364	46.8	13'- 2 1/4"	139	3.2



ELEVATION

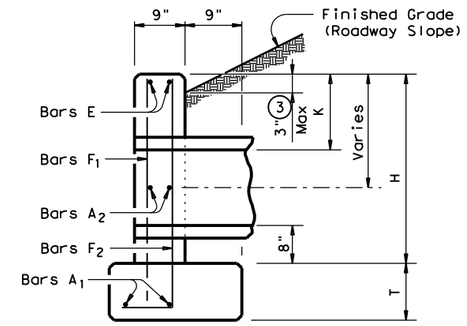


PLAN OF SKEWED PIPES

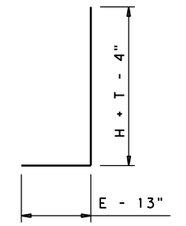
Showing 30° Skew

Lengths of wings based on SL:1 Slope along this line.

(2) Toe of Slope



℄ SECTION



BARS F2

TABLE OF CONSTANT DIMENSIONS

DIA OF PIPE, D	G	K	H	T	E
12"	9"	1'- 0"	2'- 8"	9"	1'- 9"
15"	11"	1'- 0"	2'-11"	9"	1'- 9"
18"	1'- 2"	1'- 0"	3'- 2"	9"	1'- 9"
21"	1'- 4"	1'- 0"	3'- 5"	9"	2'- 0"
24"	1'- 7"	1'- 0"	3'- 8"	9"	2'- 0"
27"	1'- 8"	1'- 0"	3'-11"	9"	2'- 3"
30"	1'-10"	1'- 0"	4'- 2"	9"	2'- 3"
33"	1'-11"	1'- 0"	4'- 5"	9"	2'- 6"
36"	2'- 1"	1'- 0"	4'- 8"	1'- 0"	2'- 6"
42"	2'- 4"	1'- 0"	5'- 2"	1'- 0"	2'- 9"
48"	2'- 7"	1'- 3"	5'-11"	1'- 0"	3'- 0"
54"	3'- 0"	1'- 3"	6'- 5"	1'- 0"	3'- 3"
60"	3'- 3"	1'- 3"	6'-11"	1'- 0"	3'- 6"
66"	3'- 3"	1'- 3"	7'- 5"	1'- 0"	3'- 9"
72"	3'- 4"	1'- 3"	7'-11"	1'- 0"	4'- 0"

TABLE OF REINFORCING STEEL (4)

Bar	Size	Spa	No.
A1	# 5	~	2
A2	# 5	1'-6"	~
E	# 5	~	2
F	# 5	1'-0"	~

(1) Quantities shown are for concrete pipe and will increase slightly for metal pipe installations.

(2) Indicated slope is perpendicular to centerline Pipe or Pipes.

(3) 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.

(4) Quantities shown are for one structure end only (one headwall).

GENERAL NOTES:

Designed according to AASHTO LRFD Specifications.

Reinforcing steel shall be placed with the center of the outside layer of bars 2" from the surface of the concrete.

All reinforcing steel shall be Grade 60.

All concrete shall be Class "C" and shall have a minimum compressive strength of 3600 psi.

No bridge rails of any type may be mounted directly to these culvert headwalls.

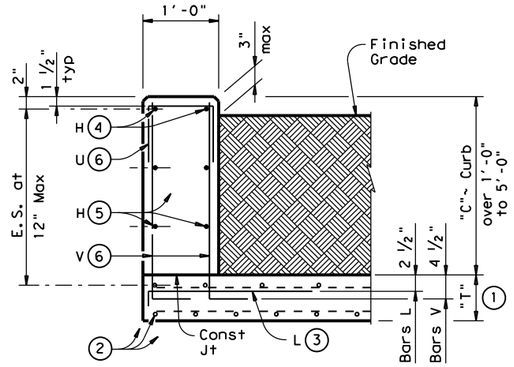
Texas Department of Transportation

Bridge Division Standard

CONCRETE HEADWALLS WITH PARALLEL WINGS FOR SKEWED PIPE CULVERTS

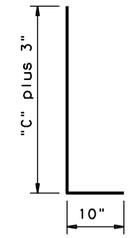
CH-PW-S

FILE: chpwsste.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: GAF
©TxDOT February 2010	CONT	SECT	JOB	HIGHWAY
REVISIONS				CR119
	DIST	COUNTY		SHEET NO.
	06	WILLIAMSON		184

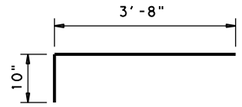


TYPICAL SECTION

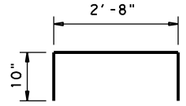
Used for Curbs over 1'-0" to 5'-0"



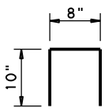
BARS V (#5) 6
Spaced at 12" max



BARS L (#5) 3
Spaced at 12" max



OPTIONAL BARS L (#5) 3 7
Spaced at 12" max



BARS U (#4) 6
Spaced at 12" max

1. "T" is equal to the culvert top slab thickness. For Precast Boxes with slabs less than 7", see SCP-MD Standard for additional details.
2. Normal culvert slab bars adjusted as necessary to clear obstructions.
3. Place bars L as shown. Tilt hook as necessary to maintain cover.
4. Place normal culvert curb bars H (#4) as shown. Adjust as necessary to clear obstructions.
5. Additional bars H (#4) as required to maintain 12" max spa.
6. Replace normal culvert curb bars K with one bar U and two bars V as shown spaced at 12" max. Adjust length of bars V as necessary to maintain clear cover.
7. Optional bars L are to be used only for precast box culverts with 3'-0" closure pour.
8. Quantities shown are for contractor's information only. Quantities are per linear foot of curb length. The values for each section type in table can be interpolated for intermediate values of curb height, "C". Quantity includes bars K (when applicable).

TABLE OF ESTIMATED CURB QUANTITIES 8

Curb Height "C"	Conc (CY/LF)	Reinf Steel (Lb/LF)
1'-0"	0.037	8.9
1'-6"	0.056	14.3
2'-0"	0.074	15.4
2'-6"	0.093	17.7
3'-0"	0.111	18.8
3'-6"	0.130	21.2
4'-0"	0.148	22.2
4'-6"	0.167	24.6
5'-0"	0.185	25.6

GENERAL NOTES:

Designed according to current AASHTO LRFD Specifications.

These extended curb details have sufficient strength to allow for future retrofit of Type T6 railing. These details are suitable for use with PR1, PR2 and PR3 type rails. These details are not suitable for the mounting of other rail types. For new construction using T6 railing, use the T6-CM standards.

All reinforcing shall be Grade 60. Adjust reinforcing as necessary to provide 1 ¼" cover.

All concrete for curbs shall be Class "C" with a minimum compressive strength of 3600 psi.

This Curb shall be considered as part of the Box Culvert for payment.

For vehicle safety, the top of the curb shall project no more than 3" above the finished grade.

Texas Department of Transportation | Bridge Division Standard

EXTENDED CURB DETAILS

FOR BOX CULVERTS WITH CURBS OVER 1'-0" TO 5'-0" TALL

ECD

FILE: ecdstde1.dgn	DN: GAF	CK:	DW: TxDOT	CK: GAF
©TxDOT February 2010	CONT	SECT	JOB	HIGHWAY
REVISIONS				CR119
	DIST	COUNTY		SHEET NO.
	06	WILLIAMSON		185

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DATE: 6/15/2017 3:14:10 PM
FILE: V:\2220\active\222010286\civil\cad\Design\Standards\Drainage\ECD.dgn

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DATE: 6/15/2017 3:14:10 PM
FILE: V:\2220\active\222010286\civil\cad\Design\Standards\Drainage\PW.dgn

TABLE OF DIMENSIONS & REINFORCING STEEL
(Wings for One Structure End)

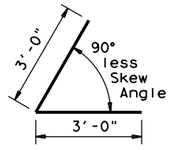
Dimensions					Variable Reinforcing				Estimated ④ Quantities per ft of wing (2~Wings)		Estimated Quantities per ft of Toewall (1~Toewall)	
					Bars J1		Bars J2					
Maximum Wingwall Height Hw	W	X	Y	Z	Size	Spa	Size	Spa	Reinf (Lb/Ft)	Conc (CY/Ft)	Reinf (Lb/Ft)	Conc (CY/Ft)
2'-6"	2'-10"	10"	1'- 0"	7"	#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)

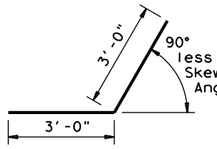
Bar	Size	No.	Spa
D1	#6	~	1'-0"
D2	#6	~	1'-0"
E1	#4	~	1'-0"
F	#4	~	1'-0"
G	#6	~	8"
M1	#4	4	~
P	#4	~	1'-0"
V	#4	~	1'-0"

TABLE OF TOEWALL REINFORCING

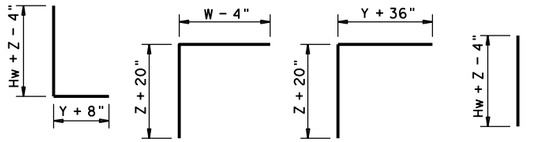
Bar	Size	No	Spa
J3	#4	~	1'-0"
M2	#4	2	~
E2	#4	~	1'-0"



BARS D1



BARS D2



BARS J1 BARS J2 BARS J3 BARS V

WING DIMENSION CALCULATIONS:

Formulas: (All values are in Feet)

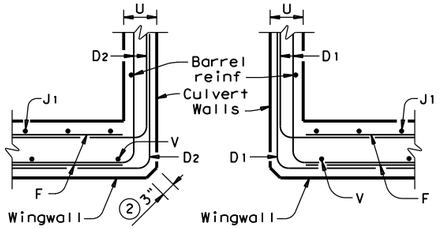
Hw = H + T + C
Lw = (Hw) (SL) ÷ Cosine θ for Ty PW-1
= (Hw - 1') (SL) ÷ Cosine θ for Ty PW-2 and Hw ≥ 4'
= (Hw - 0.5') (SL) ÷ Cosine θ for Ty PW-2 and Hw < 4'

For Cast-in-place culverts:
Ltw = [(N) (S) + (N + 1) (U)] ÷ Cosine θ

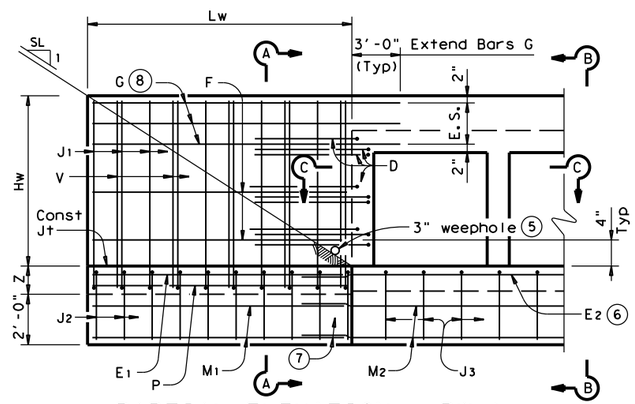
For Precast culverts:
Ltw = [(N) (2 U + S) + (N - 1) (0.5')] ÷ Cosine θ
Total Wingwall Area (Two Wings ~ SF)
= (2)(Hw)(Lw) for Ty PW-1
= (2)(Hw)(Lw) - 6 SF for Ty PW-2 and Hw ≥ 4'
= (2)(Hw)(Lw) - 1.5 SF for Ty PW-2 and Hw < 4'

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

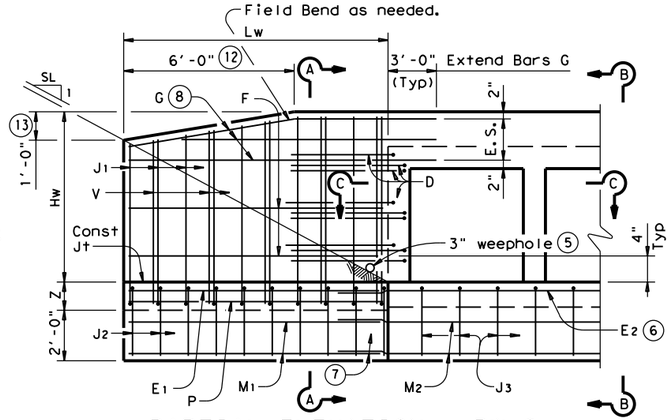
See applicable box culvert standard for S, H, T and U values.



SECTION C-C

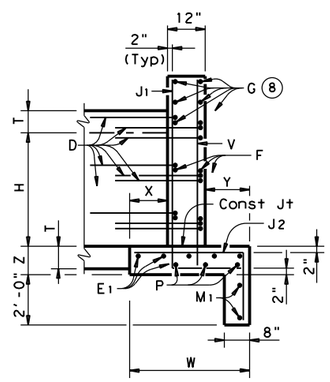


PARTIAL ELEVATION - PW-1

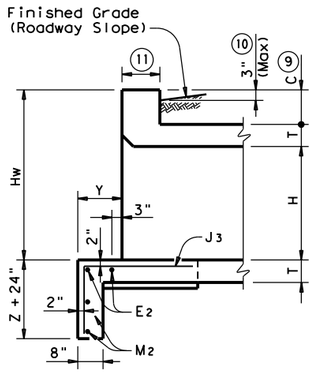


PARTIAL ELEVATION - PW-2

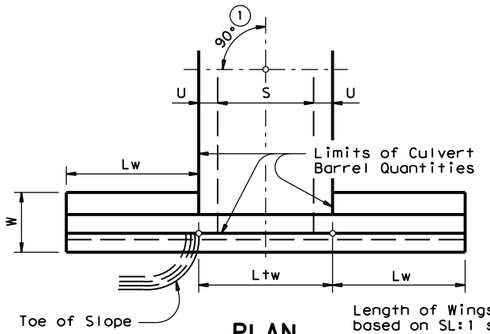
SECTION C-C



SECTION A-A
(Showing Wing Reinf)

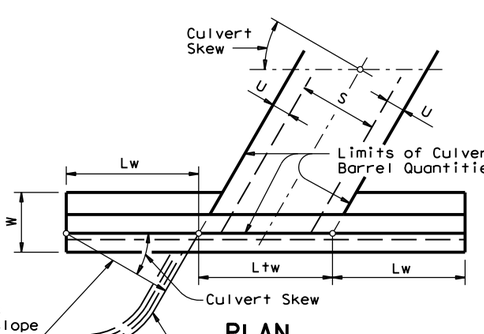


SECTION B-B
(Showing Wing Reinf)



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.				CR119
	DIST	COUNTY		SHEET NO.
	06	WILLIAMSON		186

TABLE OF DIMENSIONS & REINFORCING STEEL
(Wings for One Structure End)

Dimensions					Variable Reinforcing				Estimated ③ Quantities 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
D	#5	~	1'-0"
E	#4	~	1'-0"
F	#4	~	1'-0"
G	#6	4	~
M	#4	4	~
P	#4	~	1'-0"
R	#5	6	~
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'

Lw = (Hw - 0.333') (SL)

For Cast-in-place culverts:

Ltw = (N) (S) + (N + 1) (U)

For Precast culverts:

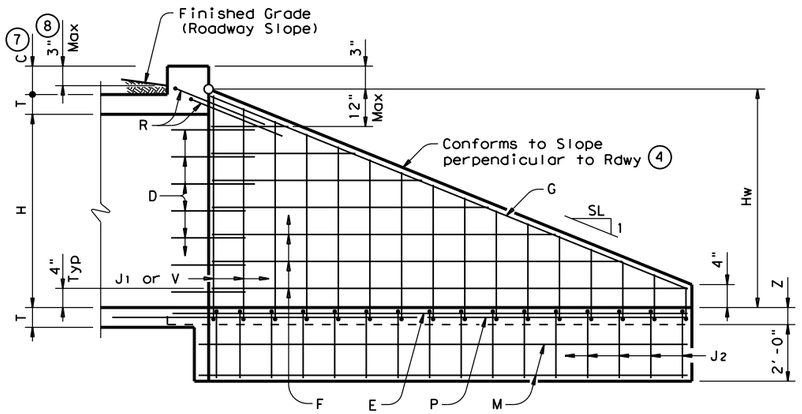
Ltw = (N) (2U + S) + (N - 1) (0.5')

Total Wingwall Area (Two Wings ~ S.F.) = (Hw + 0.333') (Lw)

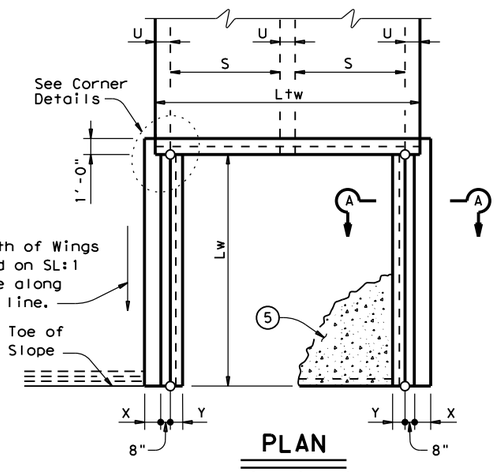
Hw = Height of Wingwall
SL:1 = Side Slope Ratio (Horizontal:1 Vertical)
Lw = Length of Wingwall
Ltw = Culvert Toewall Length
N = Number of Culvert Spans

See applicable box culvert standard for H, S, T, and U values.

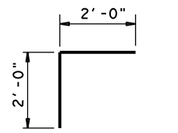
1. Extend Bars P 3'-0" minimum into bottom slab of Box Culvert.
2. Adjust to fit as necessary to maintain 1 ¼" clear cover and 4" minimum between bars.
3. Quantities shown are based on an average wing height for two wings (one structure end). To determine total quantities for two wings multiply the tabulated values by 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. 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.
8. 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.



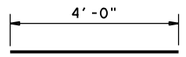
INSIDE ELEVATION
(Showing reinforcing. Culvert and Culvert Toewall reinforcing not shown for clarity.)



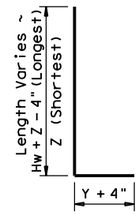
PLAN
(Showing Dimensions)



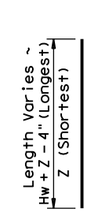
BARS R



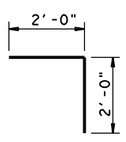
BARS D



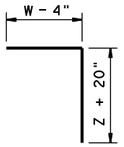
BARS J1



BARS V



BARS L



BARS J2

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.

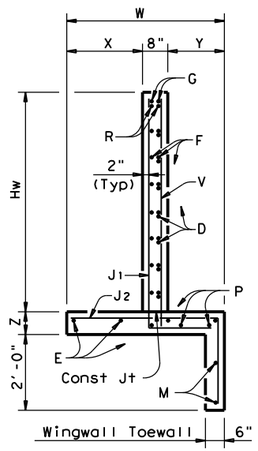
All concrete shall be Class "C" and shall have a minimum compressive strength of 3600 psi.

All reinforcing bars shall be adjusted to provide a minimum of 1 ¼" clear cover.

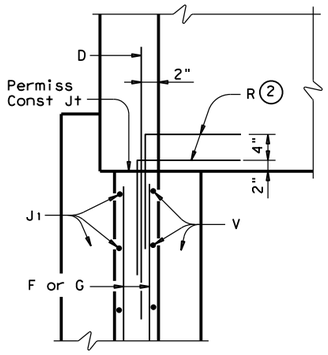
When structure is founded on solid rock, depth of toewalls for culverts and wingwalls may be reduced or eliminated as directed by the Engineer.

See BCS sheet for additional dimensions and information.

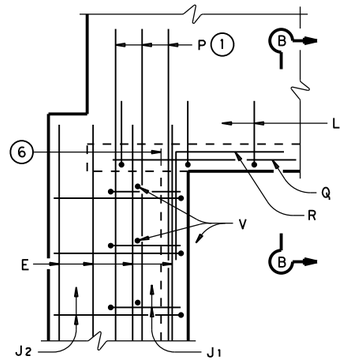
The quantities for concrete and reinforcing steel resulting from the formulas given on this sheet are for Contractor's information only.



SECTION A-A

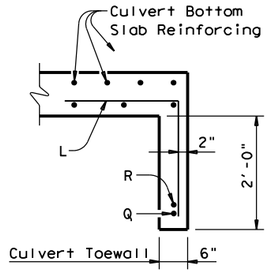


WINGWALL



FOOTING AND TOEWALL

CORNER DETAILS



SECTION B-B ⑤

Texas Department of Transportation — Bridge Division Standard

CONCRETE WINGWALLS
WITH STRAIGHT WINGS FOR 0° SKEW BOX CULVERTS

SW-O

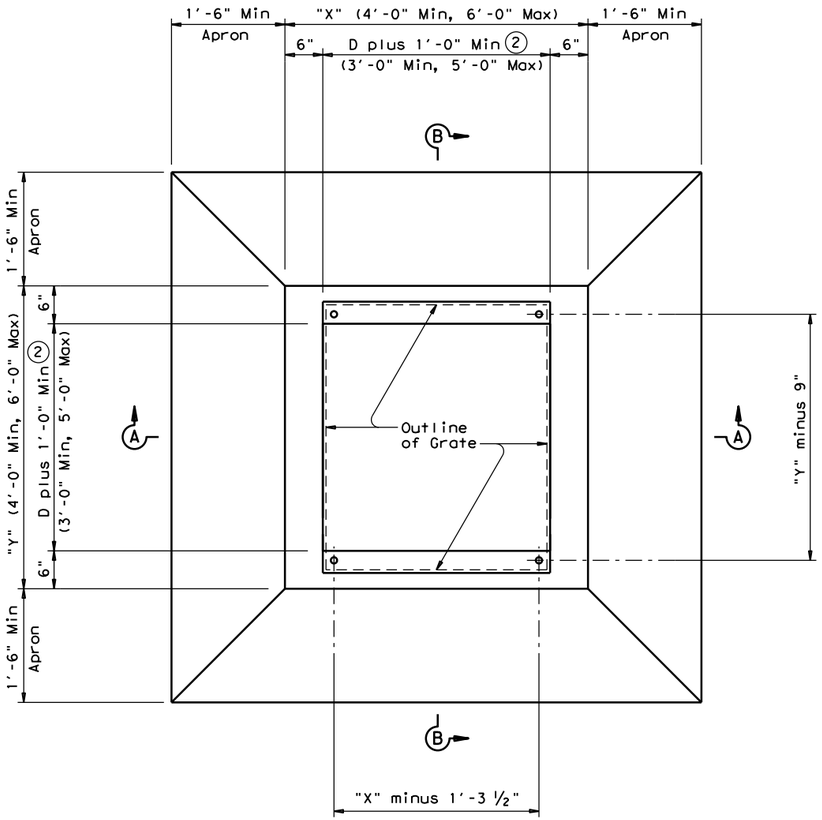
FILE: sw-0stde.dgn	DN: GAF	CK: CAT	DW: TxDOT	CK: GAF
©TxDOT February 2010	CONT	SECT	JOB	HIGHWAY
REVISIONS				CR119
11-10: Add note for synthetic fibers.	DIST	COUNTY		SHEET NO.
	06	WILLIAMSON		187

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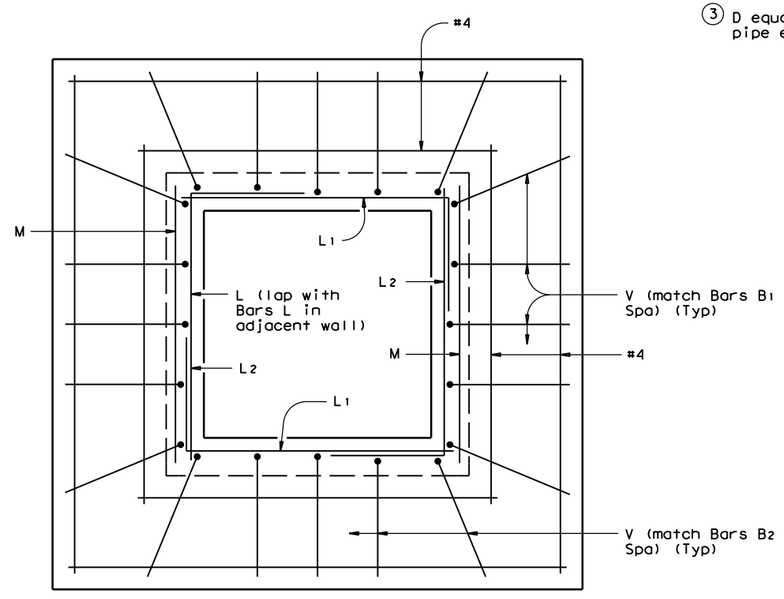
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LEVELS DISPLAYED PATH:



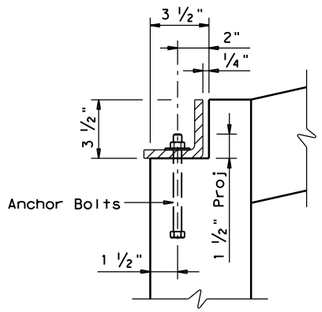
PLAN



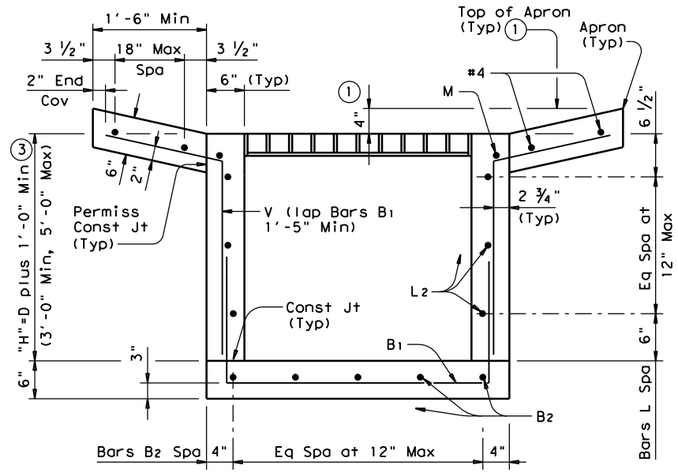
TYPICAL APRON PLAN

(Showing reinforcing in walls and in apron)

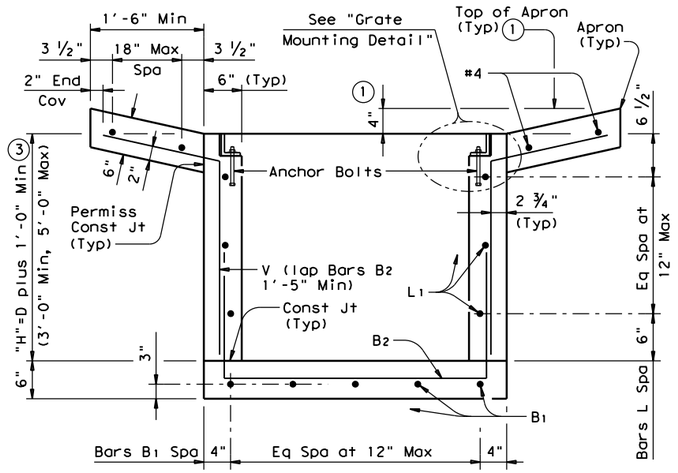
1. May be changed as directed by the Engineer.
2. D equals the maximum inside diameter of any pipe entering the wall shown or the opposite wall.
3. D equals the maximum inside diameter of any pipe entering the inlet.



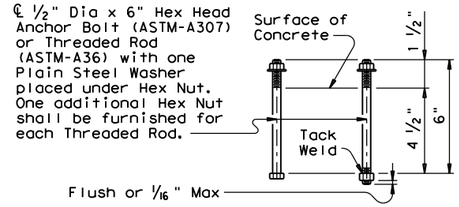
GRATE MOUNTING DETAIL



SECTION A-A



SECTION B-B



ANCHOR BOLT OPTIONS

6/15/2017

SHEET 1 OF 2

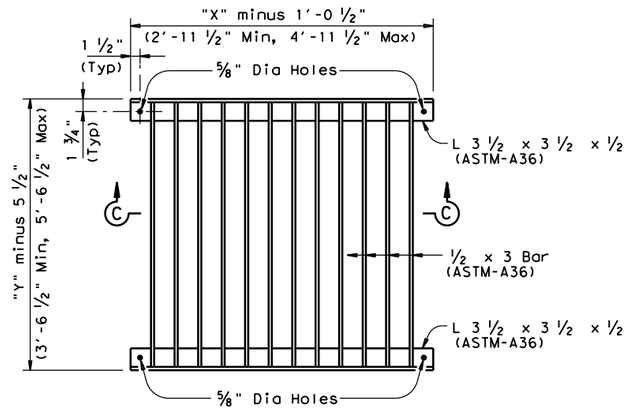
Texas Department of Transportation
Bridge Division

HORIZONTAL INLET TYPE H WITH GRATE (MAX 48" DIA PIPES)

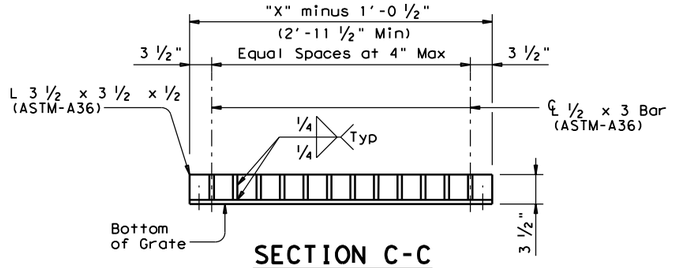
IL-H-G

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©TxDOT February 2010	DISTRICT	FEDERAL AID PROJECT		SHEET
REVISIONS 11-10: Changed angle size.	06			188
	COUNTY	CONTROL	SECT	JOB	HIGHWAY
	WILLIAMSON				GB19

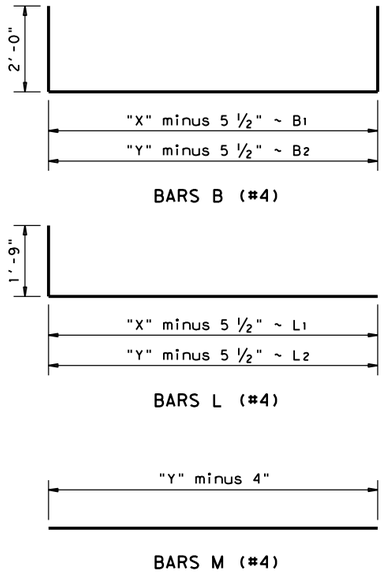
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TYPICAL GRATE PLAN



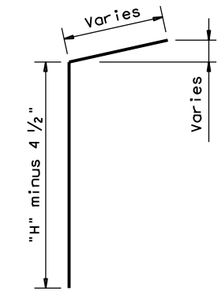
SECTION C-C



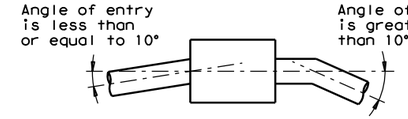
BARS B (#4)

BARS L (#4)

BARS M (#4)

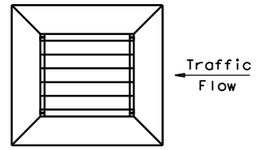


BARS V (#4)



PIPE CONNECTION DETAIL

Connecting pipes should enter within 10° of normal to inlet wall. If necessary, pipe elbow or curved approach alignment should be used to stay within this limit.



GRATE ORIENTATION DETAIL

If possible, horizontal grate inlet should be oriented such that both traffic and ditch water approach parallel to bars on grate. If this is not possible, orientation must favor traffic flow. Grate is not to be used under direct traffic, rather it is to be used in ditches and medians away from the roadway.

GENERAL NOTES:

When approved, precast inlets with equivalent structural capacity may be furnished. Sealed engineering calculations and drawings shall be submitted for approval prior to construction.

Shop drawings will not be required.

Apron shall be cast-in-place.

In areas of conflict between reinforcing steel, blockouts, pipes, anchor bolts or other reinforcing steel, the reinforcement shall be bent or adjusted to clear as directed by the Engineer.

Anchor Bolts are ½" Dia ASTM A307 Grade A bolts (or A36 threaded rods with one tack welded hex head nut each) with one hex head nut and one plain steel washer.

Structural Steel for grates shall conform to the requirements of ASTM Designation A-36 or AISI Designation M1010-M1020.

All reinforcing steel shall be Grade 60 unless otherwise noted.

All steel components except reinforcing, shall be galvanized after fabrication. Galvanizing damaged during transport or construction shall be repaired in accordance with the specifications.

All concrete shall be Class "A" (f'c = 3,000 psi).

Texas Department of Transportation
Bridge Division

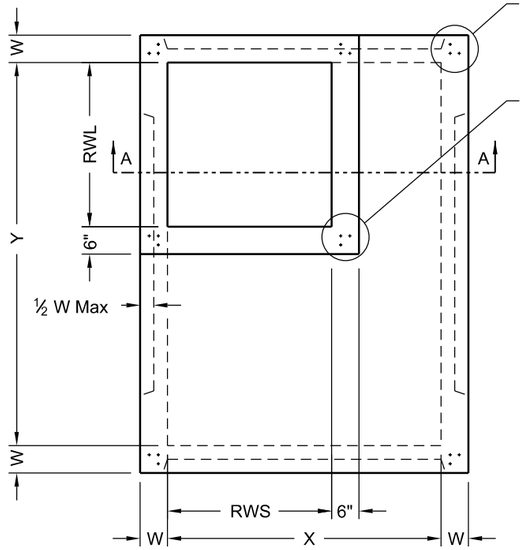
HORIZONTAL INLET TYPE H WITH GRATE (MAX 48" DIA PIPES)

IL-H-G

FILE: ilhste01.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT February 2010	DISTRICT	FEDERAL AID PROJECT		SHEET
REVISIONS	06			189
11-10: Changed angle size.	COUNTY		CONTROL SECT JOB	HIGHWAY
	WILLIAMSON			CR 119

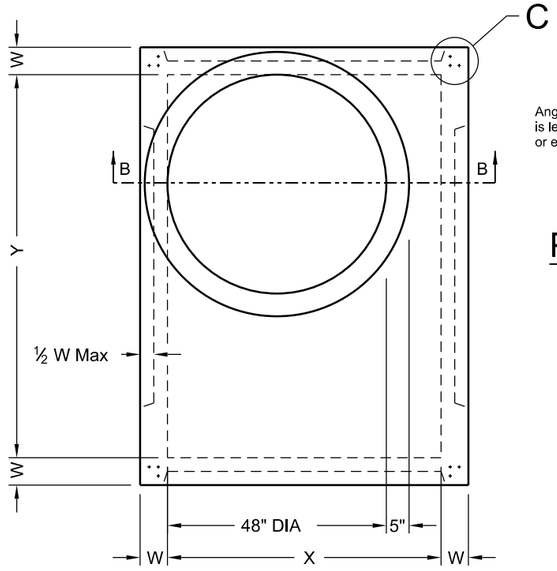
6/15/2017

PATH:
LEVELS DISPLAYED



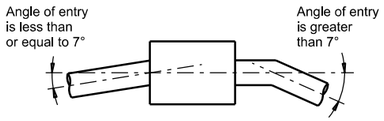
PLAN VIEW "A"

SQUARE REDUCED RISER OPTION



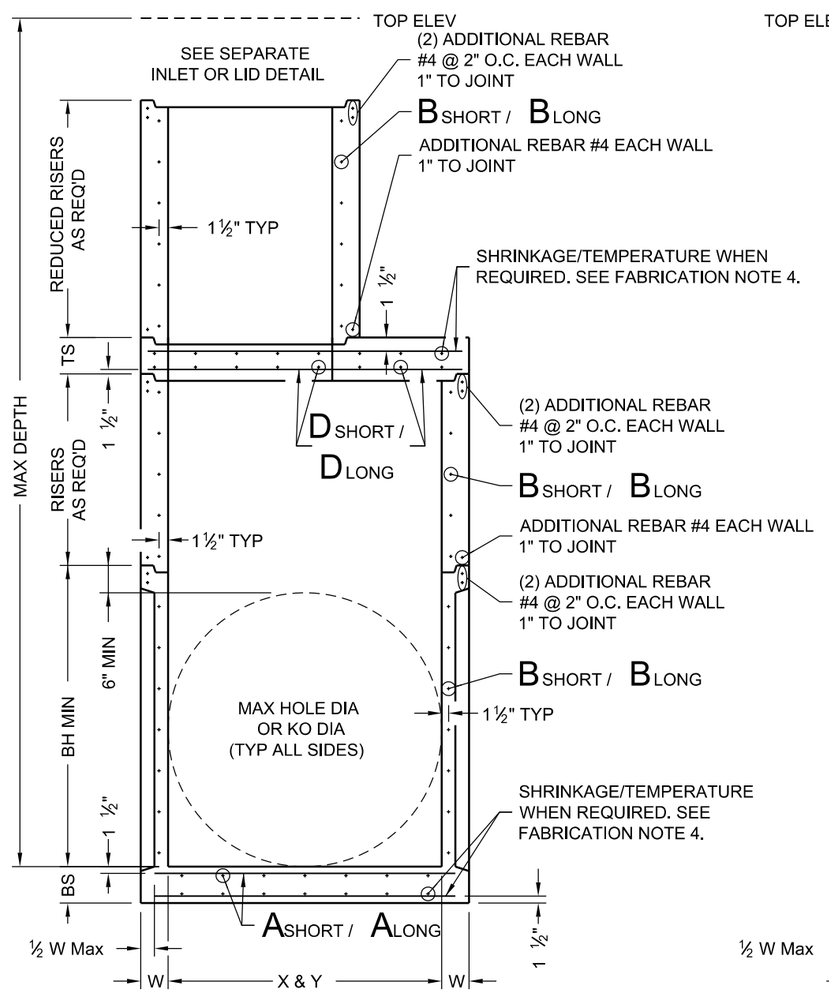
PLAN VIEW "B"

ROUND REDUCED RISER OPTION



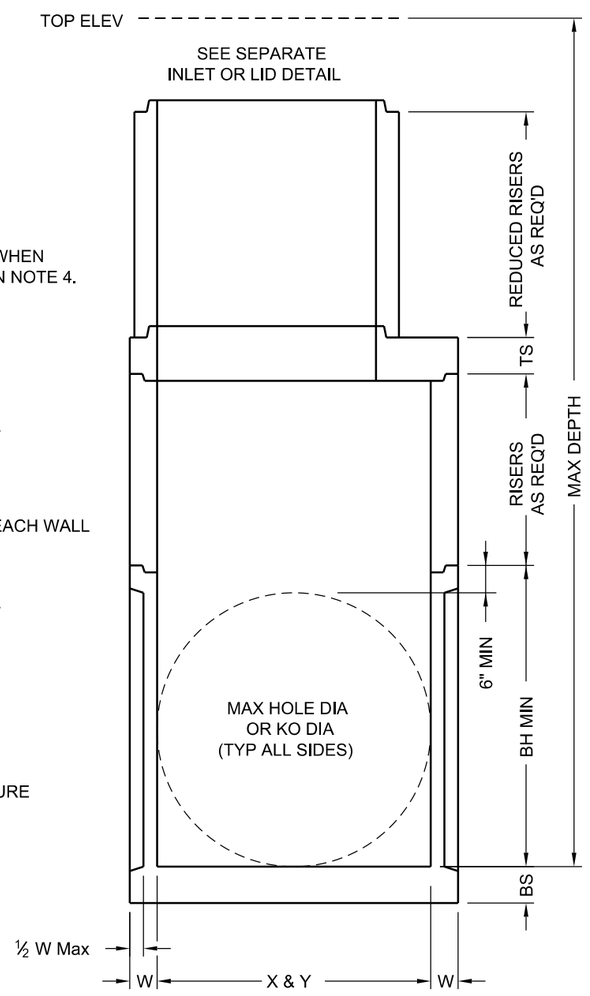
PIPE CONNECTION DETAIL

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
©TxDOT January 2015	CONT	SECT	JOB	HIGHWAY
REVISIONS				CR119
	DIST	COUNTY		SHEET NO.
	06	WILLIAMSON		190

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DATE: 6/15/2017 3:14:12 PM
FILE: V:\2220\active\220010286\civil\cad\Design\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".

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DESIGN DATA FOR PRECAST BASE AND JUNCTION BOX

PDD

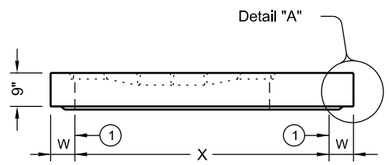
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©TxDOT January 2015	CONT	SECT	JOB	HIGHWAY
REVISIONS				CR119
	DIST	COUNTY		SHEET NO.
	06	WILLIAMSON		191

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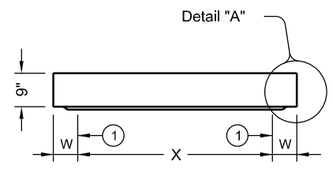
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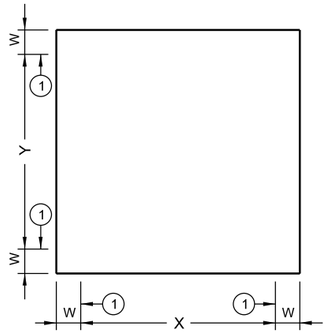
STYLE 'FG'

STYLE 'SFG'
ELEVATION VIEW

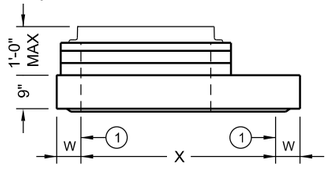
PLAN VIEW
CAST-IN FRAME & GRATE
STYLES 'FG' & 'SFG'



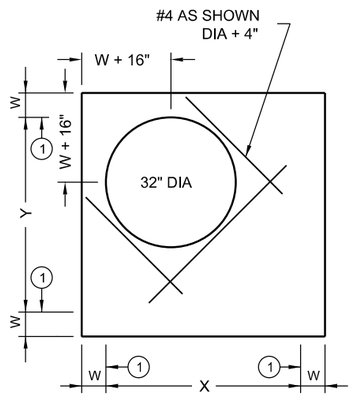
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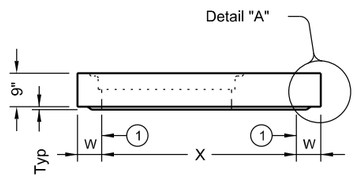
PLAN VIEW
NO OPENINGS
STYLE 'SL'



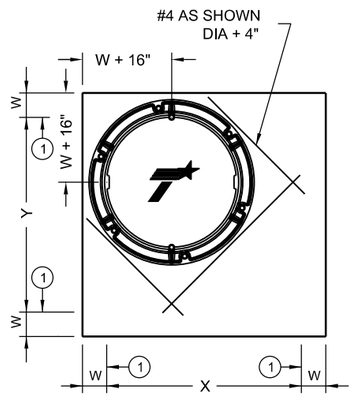
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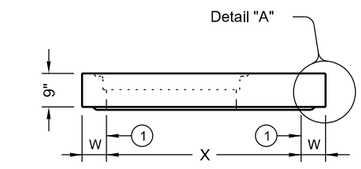
PLAN VIEW
SHIP LOOSE RING & COVER
STYLE 'RH'



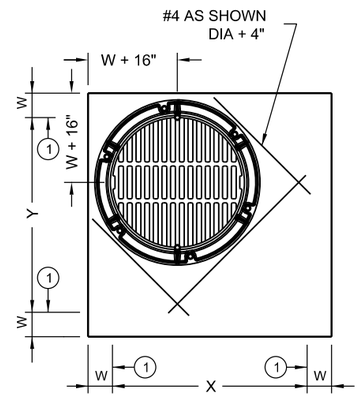
ELEVATION VIEW



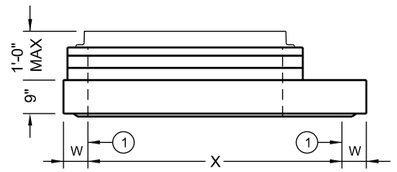
PLAN VIEW
32" DIA CAST-IN RING & COVER
STYLE 'RC'



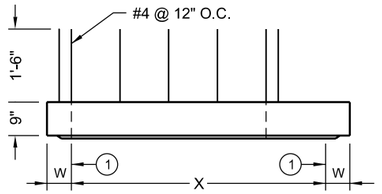
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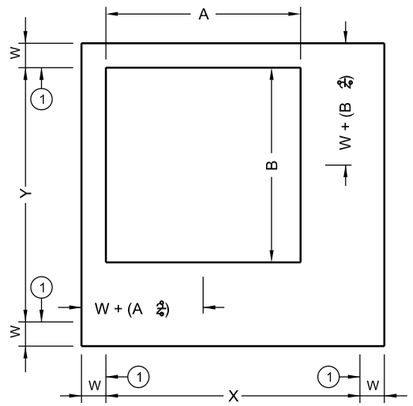
PLAN VIEW
32" DIA CAST-IN RING & GRATE
STYLE 'RG'



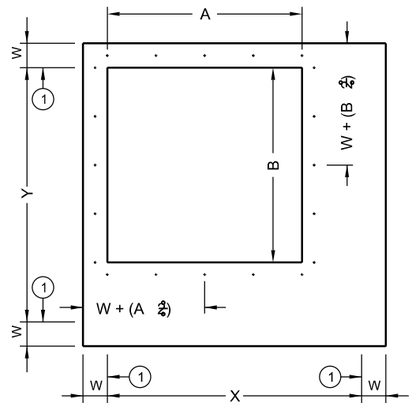
ELEVATION VIEW



ELEVATION VIEW



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.

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PRECAST SLAB LID

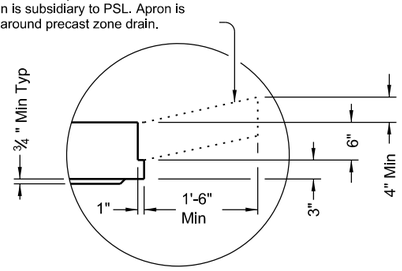
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©TxDOT January 2015	CONT	SECT	JOB	HIGHWAY
REVISIONS				CR119
	DIST	COUNTY		SHEET NO.
	06	WILLIAMSON		192

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
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REVISIONS				CR119
	DIST	COUNTY		SHEET NO.
	06	WILLIAMSON		193

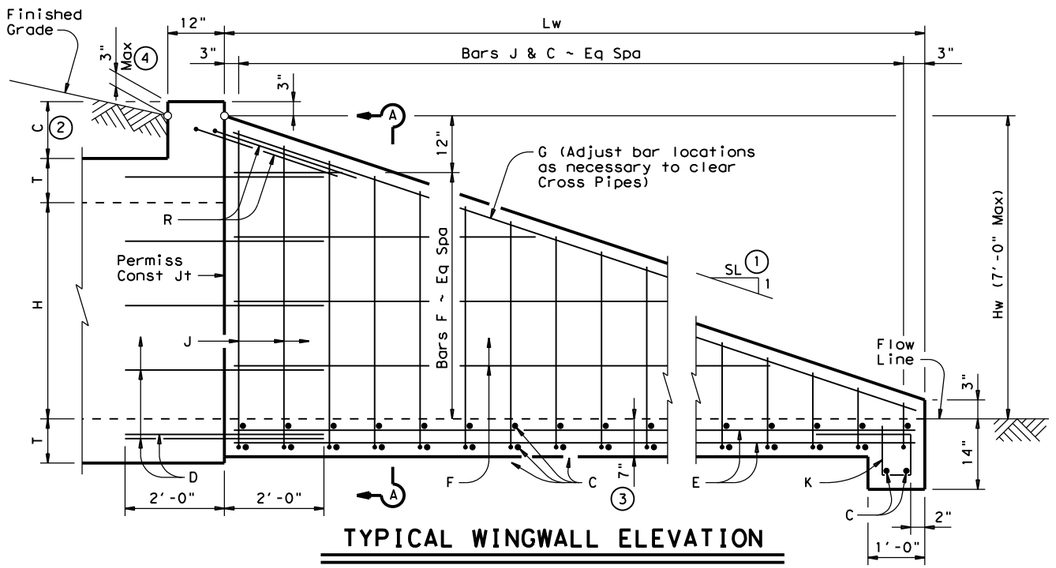
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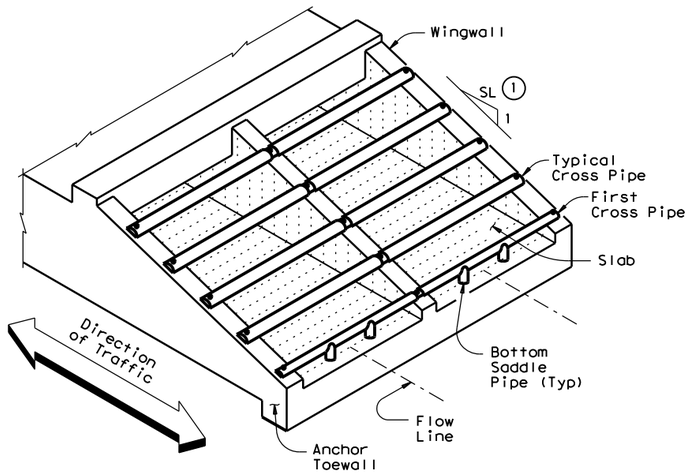
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TYPICAL WINGWALL ELEVATION

(Cross Pipes not shown for clarity)



ISOMETRIC VIEW OF TYPICAL INSTALLATION

(Showing Bolted Anchor Option)

Formulas: (All values are in Feet)

Hw = H + T + C - 0.250'

Lw = (Hw - 0.250') (SL)

For Cast-in-place culverts:

Atw = (N) (S) + (N + 1) (U)

For Precast culverts:

Atw = (N) (2U + S) + (N - 1) (0.500')

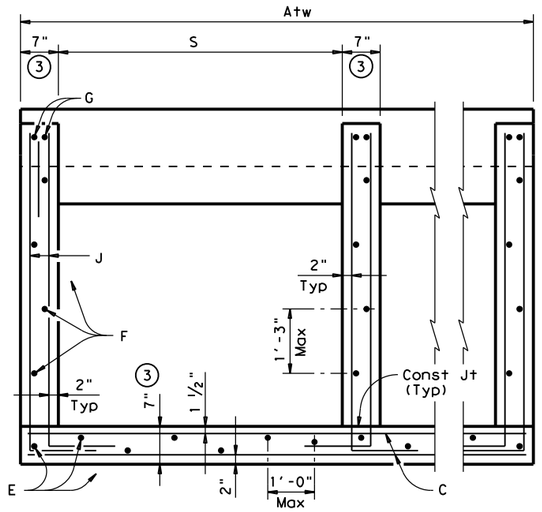
Total Wingwall Area (S.F.)
= (0.5) (Hw + 0.250') (Lw) (N + 1)

Total Concrete Volume (C.Y.)
= [(Wingwall Area) (0.583') +
(Lw) (Atw) (0.583') +
(Atw) (1.000') (1.167' - 0.583')] ÷ (27)

Total Reinforcing (Lbs)
= (1.55) (Lw) (Atw) +
(4.43) (Atw) +
(K) (Hw) (N + 1) ($\sqrt{Lw}$)

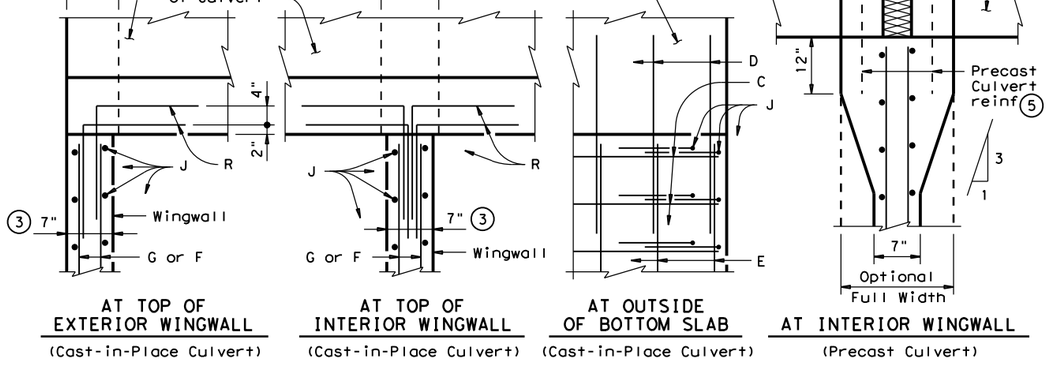
C = Height of Curb above top of Top Slab
Hw = Height of Wingwall
K = Constant Value for use in formulas
Slope SL:1 K
6:1 ~ 10.41
Atw = Anchor Toewall Length
Lw = Length of Wingwall
N = Number of Culvert Barrels
S = Clear Span of each Barrel
SL:1 = Side Slope Ratio (Horizontal : 1 Vertical)

See applicable box culvert standard for H, S, T, and U values.



SECTION A-A

(Showing typical Wingwall and Wing Slab reinforcing)
(Pipe Runners not shown for clarity)



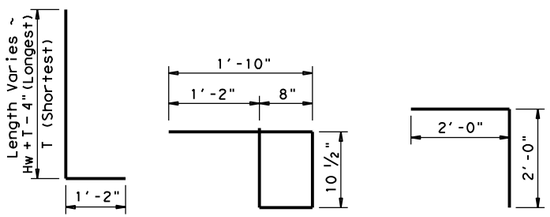
AT TOP OF EXTERIOR WINGWALL (Cast-in-Place Culvert)

AT TOP OF INTERIOR WINGWALL (Cast-in-Place Culvert)

AT OUTSIDE OF BOTTOM SLAB (Cast-in-Place Culvert)

AT INTERIOR WINGWALL (Precast Culvert)

PLAN VIEWS OF CORNER DETAILS



BARS J

BARS K
(Length = 4'-3")

BARS R

TABLE OF REINFORCING BAR SIZES & SPACING		
Bar	Size	Spacing
C	#4	10" Max
D	#4	match F & E
E	#4	1'- 0" Max
F	#4	1'- 3" Max
G	#6	Shown
J	#4	10" Max
K	#4	1'- 0" Max
R	#4	Shown

(1) Slope will be 6:1 or flatter.

(2) 0" 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.

(3) Wingwall and slab thicknesses may be the same as the adjacent culvert wall and slab thicknesses (7" Minimum). If thicknesses greater than the minimum (7") are used, no changes will be made in quantities and no additional compensation will be allowed.

(4) 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.

(5) For Culverts with C = 0", the precast culvert reinforcing may extend 1'-0" minimum into Wingwall. Wingwall Bars D and R may be omitted. Otherwise, refer to the "Wingwall Connection Detail" on the SCP-MD standard.

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 Cross Pipes.

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.

All concrete shall be Class "C" and shall have a minimum compressive strength of 3600 psi.

All reinforcing steel shall be Grade 60. All reinforcing shall be adjusted as necessary to provide a minimum clear cover of 1 ¼".

The quantities for concrete, reinforcing steel, and Cross Pipes resulting from the formulas given herein are for Contractor's information only.

Cross Pipes, Sleeve Pipes, and Saddle 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 the concrete reinforcing, shall be galvanized after fabrication. Galvanizing damaged during transport or construction shall be repaired in accordance with the specifications.

See BCS standard sheet for additional dimensions and information.

Alternate design drawings bearing the seal of a professional engineer will be acceptable for precast construction of the Safety End Treatments.

Texas Department of Transportation

Bridge Division Standard

SAFETY END TREATMENT

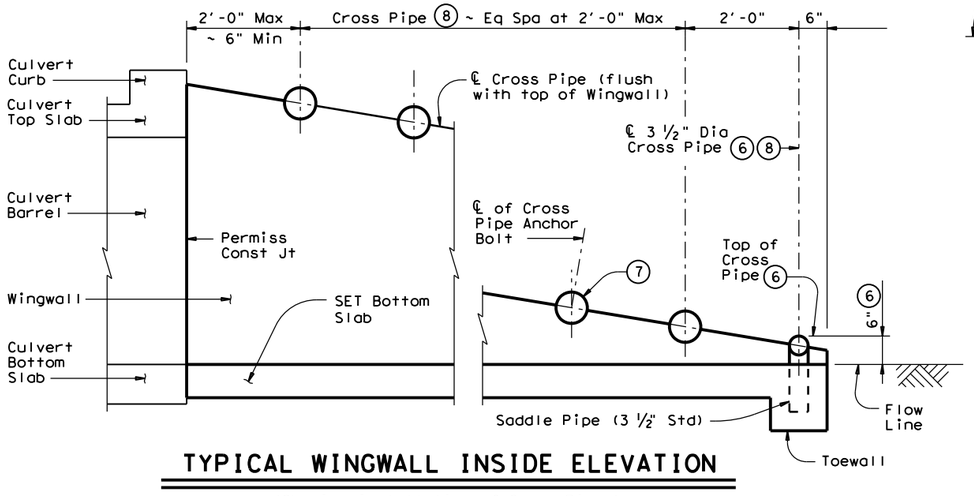
FOR BOX CULVERTS
(MAXIMUM Hw = 7'-0")
TYPE I ~ PARALLEL DRAINAGE

SETB-PD

FILE: setbpdse.dgn	DN: GAF	CK: CAT	DW: JRP	CK: GAF
©TxDOT February 2010 REVISIONS	CONT	SECT	JOB	HIGHWAY
				CR119
	DIST	COUNTY		SHEET NO.
	06	WILLIAMSON		194

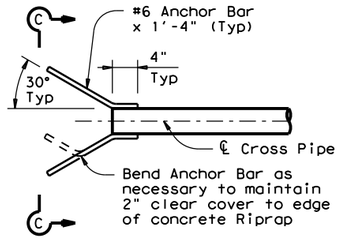
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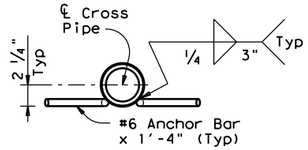


TYPICAL WINGWALL INSIDE ELEVATION

(Showing installation of Cross Pipes)

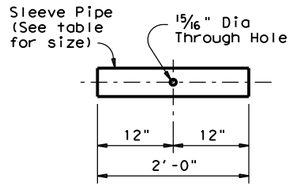


PART PLAN



SECTION C-C

OPTIONAL ANCHOR BAR DETAILS



SLEEVE PIPE DETAILS (9)

REQUIRED PIPE SIZES (8)		
Culvert Span Sizes	Cross Pipe Size	Sleeve Pipe Size (9)
First Pipe	3 ½" STD	2 ½" STD
30" to 42"	4" STD	3" STD
48" to 72"	5" STD	4" STD
78" to 120"	6" STD	5" STD

STANDARD PIPE SIZES		
Pipe Size	Pipe O.D.	Pipe I.D.
2 ½" STD	2.875"	2.469"
3" STD	3.500"	3.068"
3 ½" STD	4.000"	3.548"
4" STD	4.500"	4.026"
5" STD	5.563"	5.047"
6" STD	6.625"	6.065"

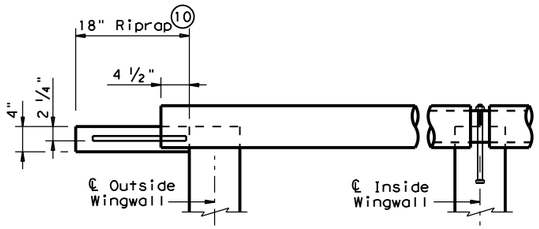
(6) The proper installation of the first Cross Pipe is critical for vehicle safety. The top of the first Cross Pipe must be placed at no more than 6" above the flow line.

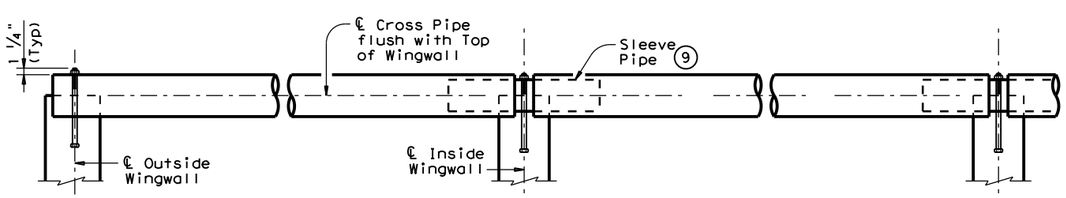
(7) The third Cross Pipe from the bottom of the Culvert shall always be installed using a bolted connection. Care shall be taken to ensure that concrete does not flow into this Cross Pipe so as to permit disassembly of the bolted connection to allow cleanout access.

(8) Cross Pipes and Sleeve Pipes (if required) shall be as shown in the REQUIRED PIPE SIZES table. Saddle Pipes for the 3 ½" first Cross Pipe shall also be 3 ½".

(9) At Contractor's option, the Cross Pipe may be continuous across the Inside Wingwalls. If such option is selected, the Sleeve Pipe shall be omitted and a 15⁄16" diameter through hole made in the Cross Pipe to accept the anchor bolt at the centerline of each Interior Wingwall.

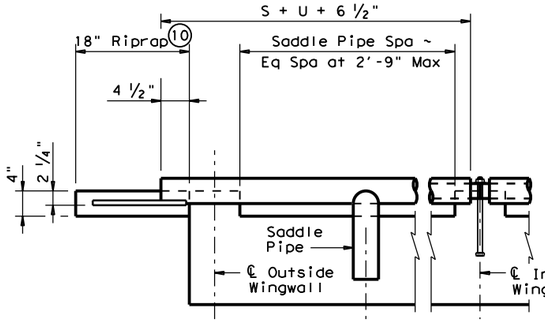
(10) Riprap will be required when using the optional Anchor Bar details and shall be included in the Price Bid for Safety End Treatment. Such Riprap shall be concrete Riprap in accordance with Item 432, "Riprap".

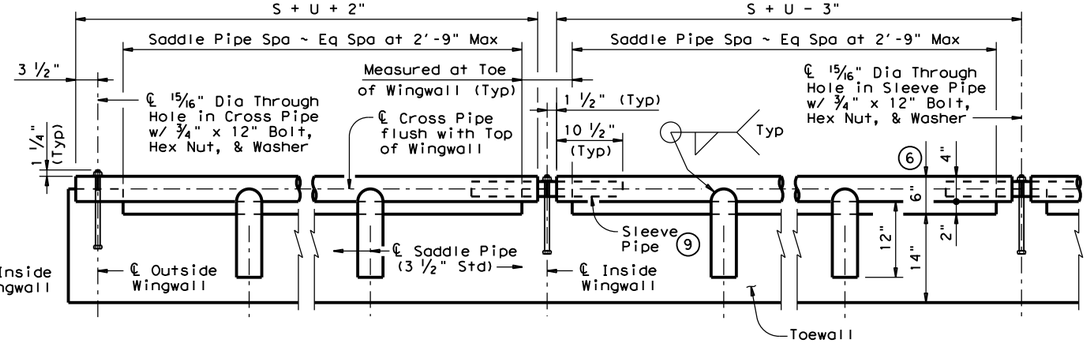




SECTION THROUGH INSTALLATION OF TYPICAL FULL CROSS PIPE

(Anchor details and dimensions are similar to those shown below in SECTION THROUGH INSTALLATION OF 3 ½" FIRST CROSS PIPE detail.)





SECTION THROUGH INSTALLATION OF 3 ½" FIRST CROSS PIPE

OUTSIDE CULVERT BARREL WITH OPTIONAL ANCHOR BARS & RIPRAP

OUTSIDE CULVERT BARREL WITH BOLTED ANCHOR

INSIDE CULVERT BARREL

CROSS PIPE INSTALLATION DETAILS

SHEET 2 OF 2

Texas Department of Transportation

Bridge Division Standard

SAFETY END TREATMENT

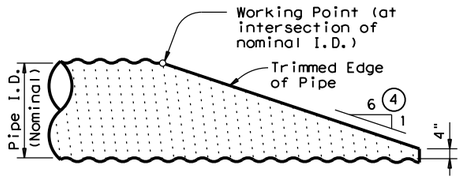
FOR BOX CULVERTS
(MAXIMUM Hw = 7'-0")
TYPE I ~ PARALLEL DRAINAGE

SETB-PD

FILE: setbpdse.dgn	DN: GAF	CK: CAT	DW: JRP	CK: GAF
©TxDOT February 2010	CONT	SECT	JOB	HIGHWAY
REVISIONS				CR119
	DIST	COUNTY		SHEET NO.
	06	WILLIAMSON		195

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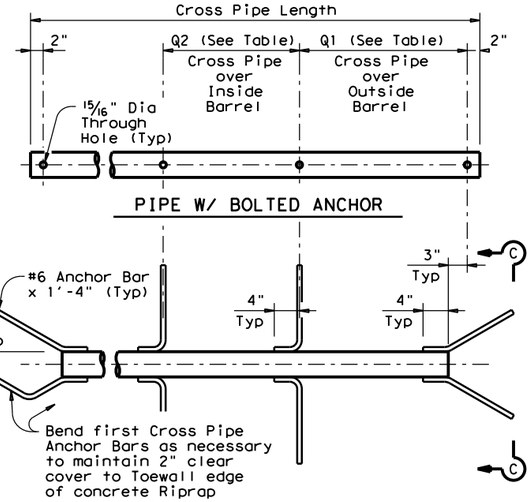
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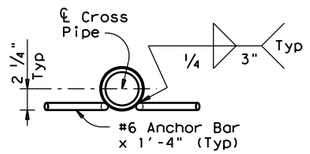


NOTE: All Cross Pipes, calculations, and dimensions are based on the pipe culverts mitered as shown in this detail. Alternate styles of mitered ends will require that appropriate adjustments be made to the values presented on this standard.

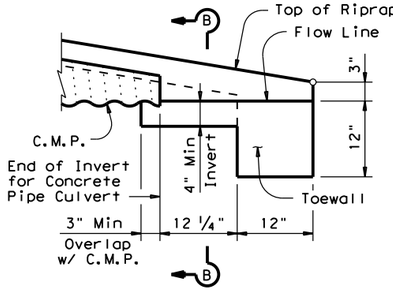
SIDE ELEVATION OF TYPICAL PIPE CULVERT MITER

(Showing Corrugated Metal Pipe Culvert.)
(Details at Concrete Pipe Culvert are similar.)



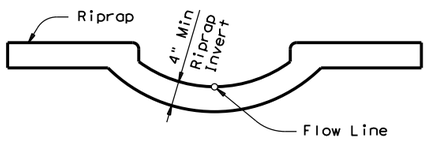


SECTION C-C



DETAIL "A"

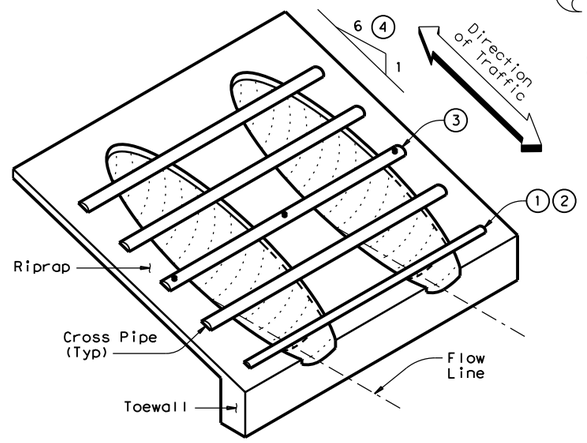
(Showing Invert with Corrugated Metal Pipe Culvert. Concrete Pipe Culvert details are similar. Cross Pipes not shown for clarity.)



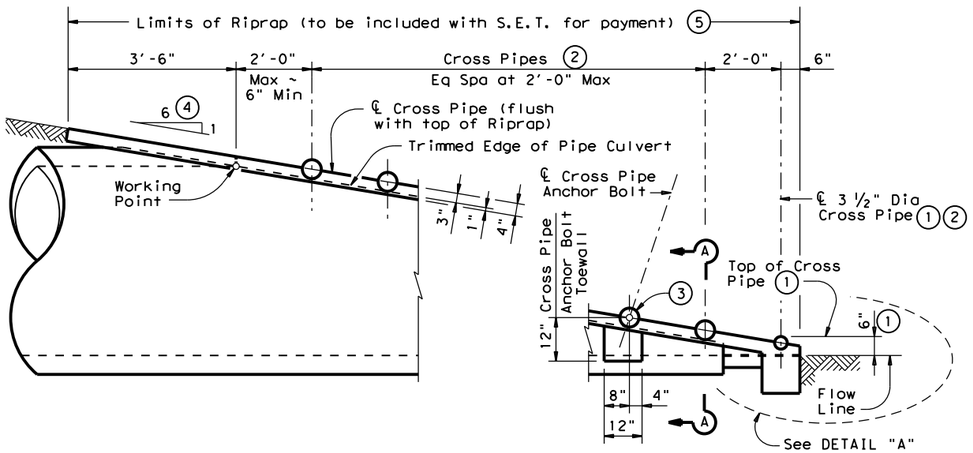
SECTION B-B

(Cross Pipes not shown for clarity.)

CROSS PIPE DETAILS

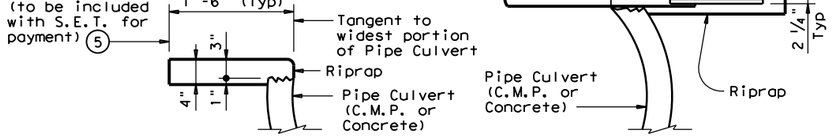


ISOMETRIC VIEW OF TYPICAL INSTALLATION



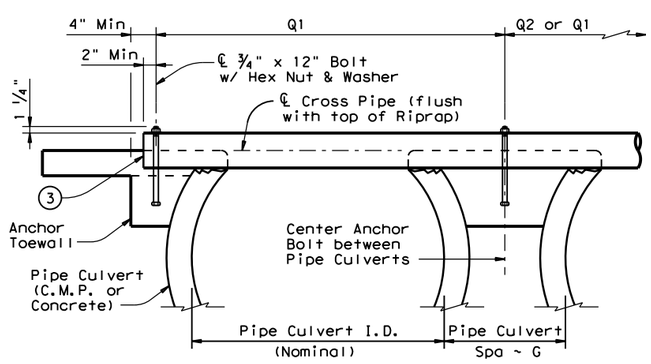
SIDE ELEVATION OF CAST-IN-PLACE CONCRETE

(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

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 ½" 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.

Texas Department of Transportation

Bridge Division Standard

SAFETY END TREATMENT

FOR 12" DIA TO 72" DIA
PIPE CULVERTS
TYPE II ~ PARALLEL DRAINAGE

SETP-PD

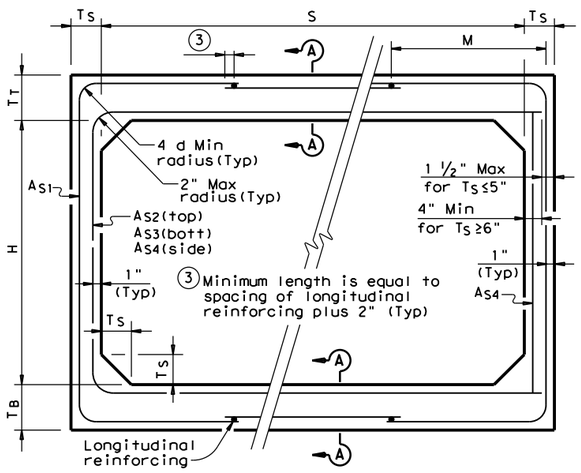
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©TxDOT February 2010	CONT	SECT	JOB	HIGHWAY
REVISIONS				CR119
11-10: Add note for synthetic fibers.	DIST	COUNTY		SHEET NO.
	06	WILLIAMSON		196

BOX DATA

SECTION DIMENSIONS					Fill Height	M (Min)	REINFORCING (in²/ft) ②								① Liff Weight (Tons)
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}	
4	2	7.5	6	5	<2	-	0.18	0.27	0.15	0.12	0.18	0.18	0.18	0.14	4.5
4	2	5	5	5	2<3	38	0.18	0.19	0.17	0.12	-	-	-	-	3.6
4	2	5	5	5	3-5	38	0.13	0.13	0.13	0.12	-	-	-	-	3.6
4	2	5	5	5	10	38	0.12	0.12	0.12	0.12	-	-	-	-	3.6
4	2	5	5	5	15	38	0.14	0.16	0.16	0.12	-	-	-	-	3.6
4	2	5	5	5	20	38	0.18	0.20	0.21	0.12	-	-	-	-	3.6
4	2	5	5	5	25	38	0.23	0.25	0.25	0.12	-	-	-	-	3.6
4	2	5	5	5	30	38	0.28	0.30	0.30	0.12	-	-	-	-	3.6
4	3	7.5	6	5	<2	-	0.18	0.31	0.18	0.12	0.18	0.18	0.18	0.14	5.0
4	3	5	5	5	2<3	38	0.15	0.23	0.20	0.12	-	-	-	-	4.1
4	3	5	5	5	3-5	38	0.12	0.16	0.16	0.12	-	-	-	-	4.1
4	3	5	5	5	10	38	0.12	0.14	0.14	0.12	-	-	-	-	4.1
4	3	5	5	5	15	38	0.12	0.18	0.18	0.12	-	-	-	-	4.1
4	3	5	5	5	20	38	0.14	0.23	0.24	0.12	-	-	-	-	4.1
4	3	5	5	5	25	38	0.17	0.29	0.29	0.12	-	-	-	-	4.1
4	3	5	5	5	30	38	0.21	0.35	0.35	0.12	-	-	-	-	4.1
4	4	7.5	6	5	<2	-	0.18	0.33	0.20	0.12	0.18	0.18	0.18	0.14	5.5
4	4	5	5	5	2<3	38	0.12	0.26	0.23	0.12	-	-	-	-	4.6
4	4	5	5	5	3-5	38	0.12	0.18	0.18	0.12	-	-	-	-	4.6
4	4	5	5	5	10	38	0.12	0.15	0.15	0.12	-	-	-	-	4.6
4	4	5	5	5	15	38	0.12	0.19	0.20	0.12	-	-	-	-	4.6
4	4	5	5	5	20	38	0.12	0.25	0.25	0.12	-	-	-	-	4.6
4	4	5	5	5	25	38	0.14	0.31	0.31	0.12	-	-	-	-	4.6
4	4	5	5	5	30	38	0.17	0.37	0.37	0.12	-	-	-	-	4.6

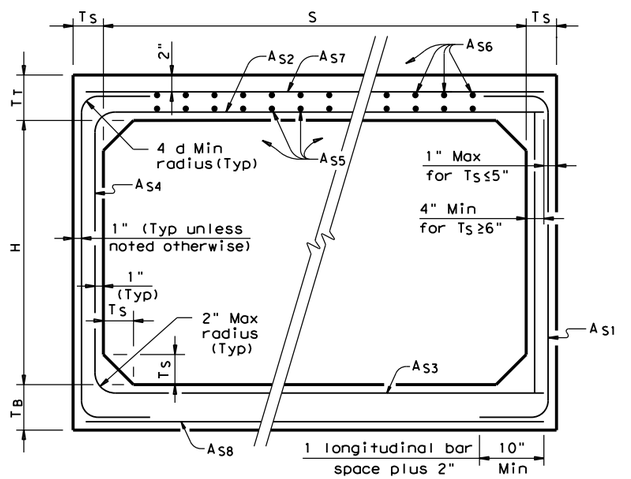
① For Box Length = 8'-0"

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.



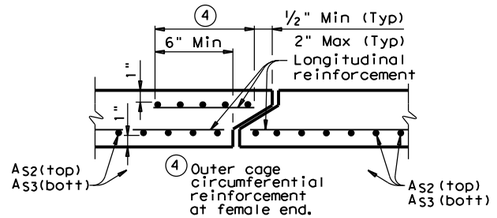
CORNER OPTION "A" CORNER OPTION "B"

FILL HEIGHT 2 FT AND GREATER



CORNER OPTION "A" CORNER OPTION "B"

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

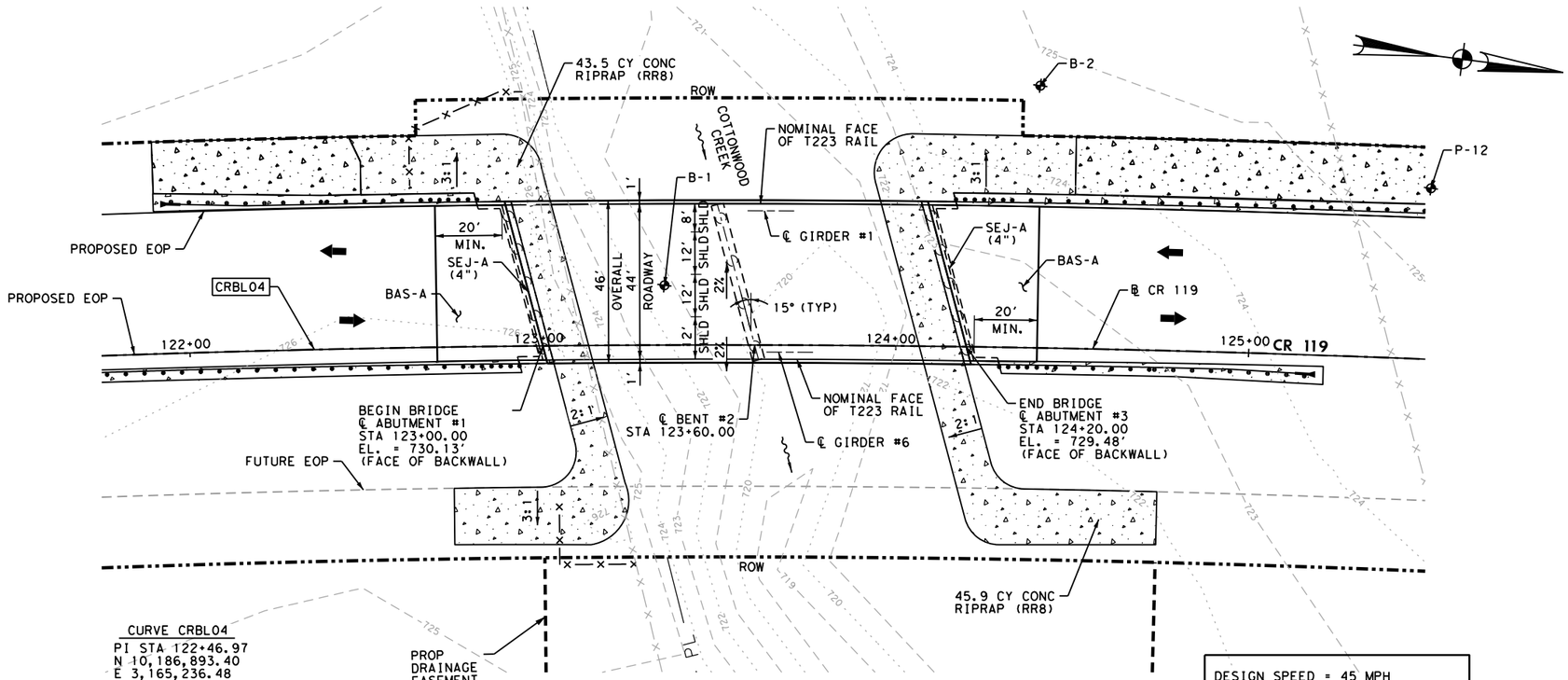
4'-0" SPAN

SCP-4

FILE: scp04sts.dgn	DN: GAF	CK: LMW	DW: BWH/TxDOT	CK: GAF
©TxDOT February 2010	CONT	SECT	JOB	HIGHWAY
REVISIONS				CR119
	DIST	COUNTY		SHEET NO.
	06	WILLIAMSON		197

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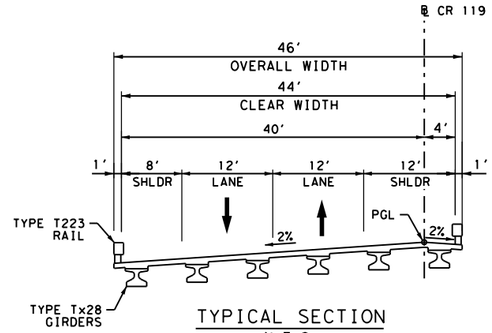


CURVE CRBL04
PI STA 122+46.97
N 10,186,893.40
E 3,165,236.48
Δ 1° 8' 45"
D 25° 2' 8"
R 5000.00'
T 1110.10'

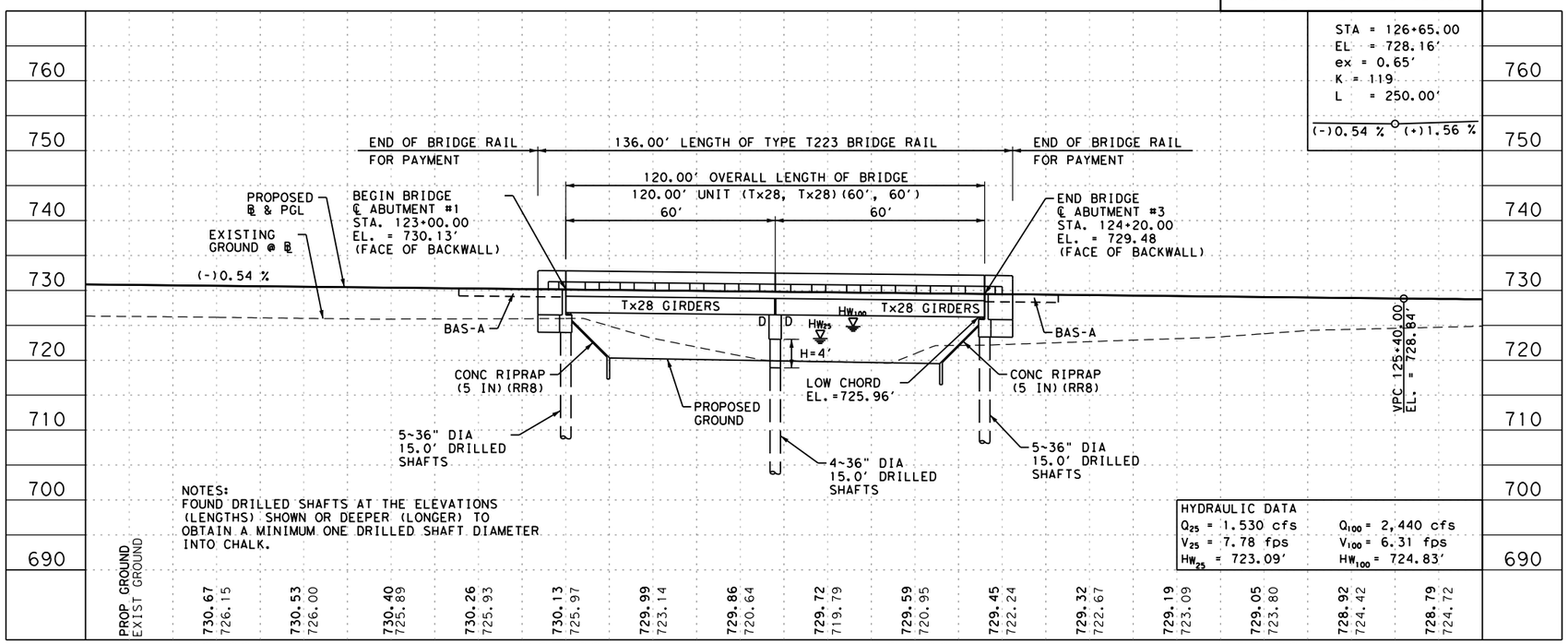
DESIGN SPEED = 45 MPH
ADT (2015) = 2,500 VPD
ADT (2035) = 5,200 VPD
FUNC CLASS = RURAL COLLECTOR
PROP NBI: 14-246-AA04-95-001

NOTES:

1. CALL THE TEXAS STATE WIDE ONE CALL LOCATOR NUMBER 1-800-344-8377, 48 HOURS BEFORE BEGINNING ANY EXCAVATION.
2. THE CONTRACTOR WILL BE RESPONSIBLE FOR PROTECTING OVERHEAD AND UNDERGROUND FACILITIES ADJACENT TO WORK AREA.
3. ALL STATIONS AND OFFSETS REFERENCE THE PROPOSED CR 119 BASELINE, UNLESS OTHERWISE NOTED IN THE PLANS.
4. REFER TO HORIZONTAL ALIGNMENT DATA SHEET FOR ADDITIONAL INFORMATION.
5. REFER TO SIGNING AND PAVEMENT MARKING LAYOUT SHEETS FOR MORE INFORMATION.
6. REFER TO DRAINAGE SHEETS FOR MORE INFORMATION.
7. DESIGNED IN ACCORDANCE WITH AASHTO LRFD SPECIFICATIONS.
8. ALL ABUTMENTS AND BENTS ARE ALONG BEARING S 67°41'32.53" W.
9. "D" DENOTES BENTS WITH DOWEL BARS "D" AND SLOTTED HOLES AT THE ENDS OF THE EXTERIOR GIRDERS.
10. THE H(AVG) VALUES SHOWN ARE ESTIMATED COLUMN HEIGHTS. THE CONTRACTOR IS RESPONSIBLE FOR CALCULATING THE ACTUAL COLUMN HEIGHTS BASED ON FIELD CONDITIONS.
11. REFER TO CROSS SECTIONS FOR MORE INFORMATION.



TYPICAL SECTION
N.T.S.



NOTES:
FOUND DRILLED SHAFTS AT THE ELEVATIONS (LENGTHS) SHOWN OR DEEPER (LONGER) TO OBTAIN A MINIMUM ONE DRILLED SHAFT DIAMETER INTO CHALK.

STA = 126+65.00
EL = 728.16'
ex = 0.65'
K = 119
L = 250.00'
(-)0.54 % (+)1.56 %

HYDRAULIC DATA
Q_{25} = 1.530 cfs Q_{100} = 2,440 cfs
V_{25} = 7.78 fps V_{100} = 6.31 fps
HW_{25} = 723.09' HW_{100} = 724.83'

0 10 20 40 (H)
0 10 20 (V)



6/15/2017

CR 119

WILLIAMSON COUNTY
1848

Stantec
221 West Sixth Street, Sulte 600
Austtn, Texas 78701
Tel (512) 328-0011 Fax (512) 328-0325
TBPE Registration Number F-6324
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BRIDGE

BRIDGE LAYOUT COTTONWOOD CREEK

SHEET 01 OF 01

FED. RD. DIV. RD.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				198

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100% SUBMITTAL

BRIDGE SUMMARY OF ESTIMATED QUANTITIES

BID ITEM DESCRIPTION / BRIDGE ELEMENT	416 6004 DRILL SHAFT (36 IN)	420 6013 CL C CONC (ABUT)	420 6029 CL C CONC (CAP)	420 6037 CL C CONC (COLUMN)	422 6001 REINF CONC SLAB	422 6015 APPROACH SLAB	425 6036 PRESTR CONC GIRDER (TX28)	432 6002 RIRPAP (CONC) (5 IN)	450 6006 RAIL (TY T223)	454 6001 SEALED EXPANSION JOINT (4 IN) (SEJ - A)
	LF	CY	CY	CY	SF	CY	LF	CY	LF	LF
120.00' PRESTR CONC GIRDER UNIT					5520.0		713.90		272.00	
ABUTMENT #1	75	24.3				45.7		43.5		47.00
BENT #2	60		20.5	5.9						
ABUTMENT #3	75	24.3				45.7		45.9		47.00
PROJECT TOTALS	210	48.6	20.5	5.9	5520.0	91.4	713.90	89.3	272.00	94.00

BEARING SEAT ELEVATIONS

	GIRDER 1	GIRDER 2	GIRDER 3	GIRDER 4	GIRDER 5	GIRDER 6
ABUT 1 (FWD)	725.935	726.083	726.232	726.380	726.529	726.597
	GIRDER 1	GIRDER 2	GIRDER 3	GIRDER 4	GIRDER 5	GIRDER 6
BENT 2 (BK)	725.623	725.772	725.920	726.069	726.217	726.286
(FWD)	725.613	725.761	725.910	726.058	726.207	726.275
	GIRDER 1	GIRDER 2	GIRDER 3	GIRDER 4	GIRDER 5	GIRDER 6
ABUT 3 (BK)	725.301	725.450	725.598	725.747	725.895	725.964

BEAM SLOPES (FT/FT)

	GIRDER 1	GIRDER 2	GIRDER 3	GIRDER 4	GIRDER 5	GIRDER 6
SPAN 1	-0.0054	-0.0054	-0.0054	-0.0054	-0.0054	-0.0054
	GIRDER 1	GIRDER 2	GIRDER 3	GIRDER 4	GIRDER 5	GIRDER 6
SPAN 2	-0.0054	-0.0054	-0.0054	-0.0054	-0.0054	-0.0054

NOTE:
DRILL SHAFT TIP ELEVATIONS TO BE VERIFIED IN THE FIELD, AND INCLUDED IN THE FINAL ACCEPTANCE OF THE PLANS.

FINAL DRILL SHAFT TIP ELEVATIONS

	DS 1	DS 2	DS 3	DS 4	DS 5
ABUT 1					

	DS 1	DS 2	DS 3	DS 4
BENT 2				

	DS 1	DS 2	DS 3	DS 4	DS 5
ABUT 3					

CR 119

WILLIAMSON COUNTY 1848

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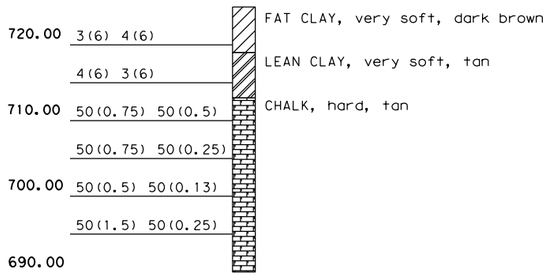
BRIDGE

ESTIMATED QUANTITIES & BEARING SEAT ELEVATIONS

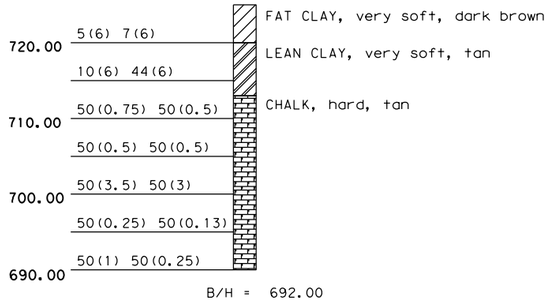
SHEET 01 OF 01

FED. RD. DIV. RD.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				199

TEST HOLE No. B-1
@ CR 119
STA. 124+39.65
74.23' LT
EL. = 725.00



TEST HOLE No. B-2
@ CR 119
STA. 124+39.65
74.23' LT
EL. = 727.00



NOTE:

REFER TO GEOTECHNICAL ENGINEERING STUDY, COUNTY ROAD 119 BETWEEN LIMMER LOOP AND CHANDLER ROAD PREPARED BY RABA KISTNER CONSULTANTS DATED OCTOBER 30, 2015 FOR ADDITIONAL INFORMATION.



6/15/2017

CR 119

WILLIAMSON COUNTY
1848

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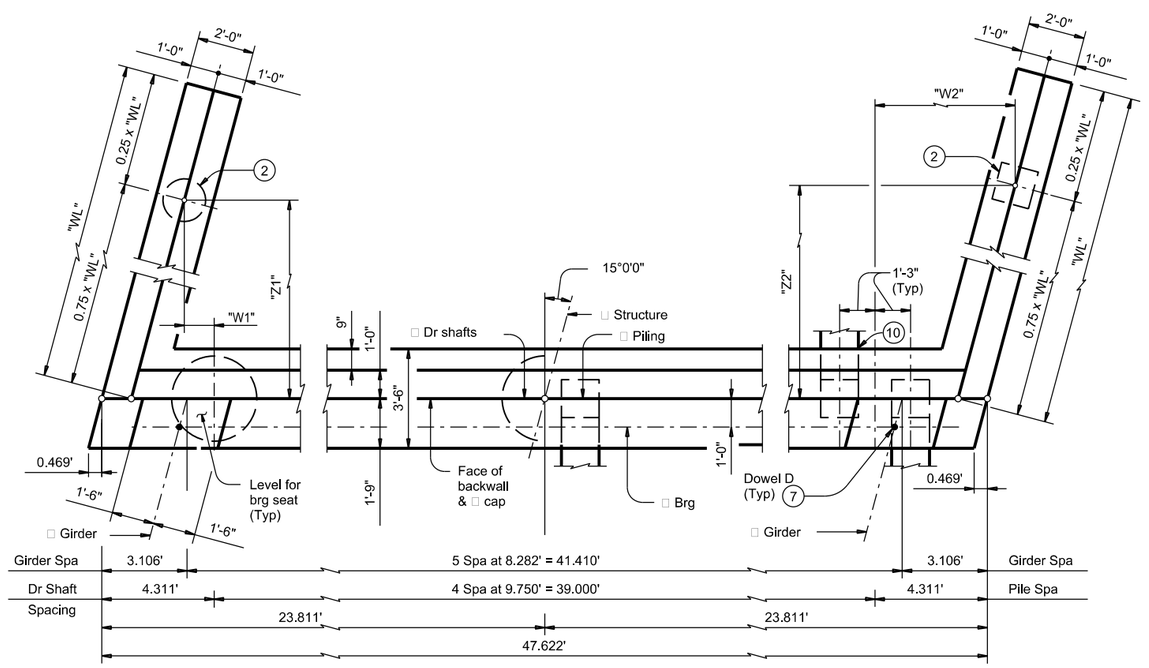
BRIDGE BORING LOG

SHEET 01 OF 01

FED. RD. DIV. RD.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				200

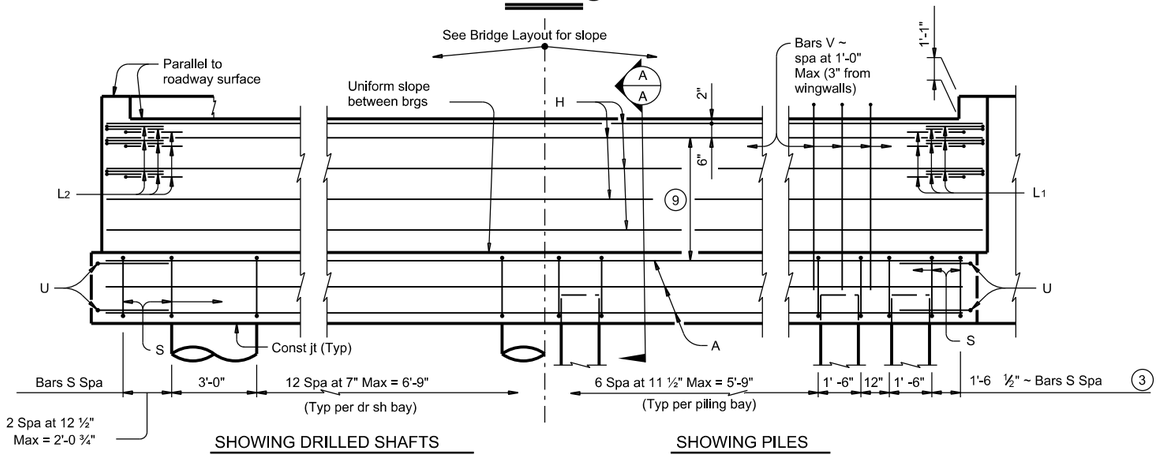
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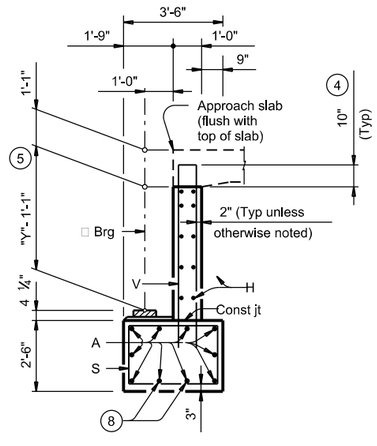
SHOWING DRILLED SHAFTS SHOWING PILES

PLAN (1)



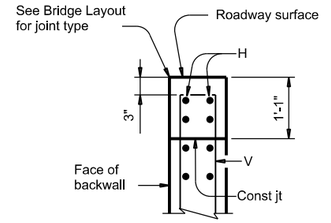
SHOWING DRILLED SHAFTS SHOWING PILES

ELEVATION



SECTION A-A

(With approach slab) (6)



BACKWALL DETAIL

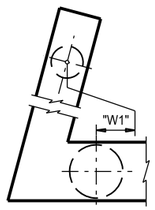
(Without approach slab) (6)

TABLE OF FOUNDATION LOADS

Span Length	All Girder Types	
Ft	Tons/Shaft	Tons/Pile
40	55	51
45	59	53
50	63	55
55	67	57
60	70	59
65	74	61
70	77	63
75	81	65
80	84	66
85	88	68
90	91	70
95	94	72
100	98	73
105	101	75
110	105	77
115	108	79
120	111	80
125	115	82

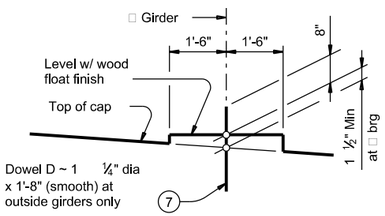
TABLE A

Header Slope	Girder Type	Wingwall Type	Wingwall Lgth "WL"	"W1"	"Z1"	"W2"	"Z2"
2:1	Tx28	Cantilevered	8.000'	Not Applicable			
	Tx34	Cantilevered	9.000'				
	Tx40	Cantilevered	10.000'				
	Tx46	Cantilevered	11.000'				
	Tx54	Founded	13.000'	0.753'	9.418'	5.800'	9.418'
3:1	Tx28	Cantilevered	12.000'	Not Applicable			
	Tx34	Founded	14.000'	0.558'	10.142'	5.994'	10.142'
	Tx40	Founded	15.000'	0.364'	10.867'	6.188'	10.867'
	Tx46	Founded	17.000'	-0.024'	12.316'	6.576'	12.316'
	Tx54	Founded	19.000'	-0.412'	13.764'	6.964'	13.764'



DETAIL A

Negative values for the "W1" dimension indicates a wingwall foundation on the other side of the cap foundation from what is shown in plan view. See Detail A.



BEARING SEAT DETAIL

(Bearing surface must be clean and free of all loose material before placing bearing pad.)

1. See Table A for variable dimensions based on header slope and girder type.
2. See Table A to determine if wingwall foundations are required.
3. For piling larger than 16" adjust Bars S spacing as required to avoid piling.
4. Increase as required to maintain 3" from finished grade.
5. See Span details for "Y" value.
6. See Bridge Layout to determine if approach slab is present.
7. Omit Dowels D at end of multi-span unit. Deduct 14 lbs from reinforcing steel total.
8. With pile foundations, move Bars A shown to clear piles.
9. Spacing based on girder type:
   Tx28 ~ 3 spaces at 1'-0" Max
   Tx34 ~ 3 spaces at 1'-0" Max
   Tx40 ~ 4 spaces at 1'-0" Max
   Tx46 ~ 4 spaces at 1'-0" Max
   Tx54 ~ 5 spaces at 1'-0" Max
10. See Detail A on FD standard.

GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications.
See Bridge Layout for header slope and foundation type, size and length.
See Common Foundation Details (FD) standard sheet for all foundation details and notes.
See Concrete Riprap (CRR) standard sheet for riprap attachment details, if applicable.
See applicable rail details for rail anchorage in wingwalls.
Details are drawn showing right forward skew. See Bridge Layout for actual skew direction.
These abutment details may be used with standard SIG-44-15 only.

Cover dimensions are clear dimensions, unless noted otherwise.
Reinforcing bar dimensions shown are out-to-out of bar.

MATERIAL NOTES:

Provide Class C concrete (f'c = 3,600 psi).
Provide Class C (HPC) concrete if shown elsewhere in the plans.
Provide Grade 60 reinforcing steel.

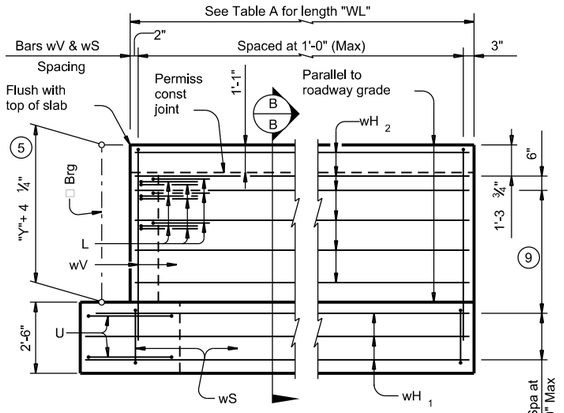
HL93 LOADING SHEET 1 OF 3

Texas Department of Transportation — Bridge Division Standard

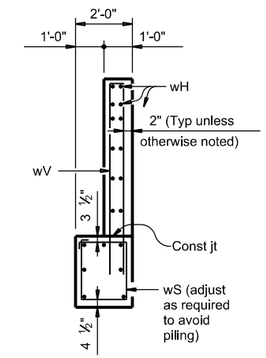
ABUTMENTS
TYPE TX28 THRU TX54
PRESTR CONC I-GIRDERS
44' ROADWAY 15° SKEW

AIG-44-15

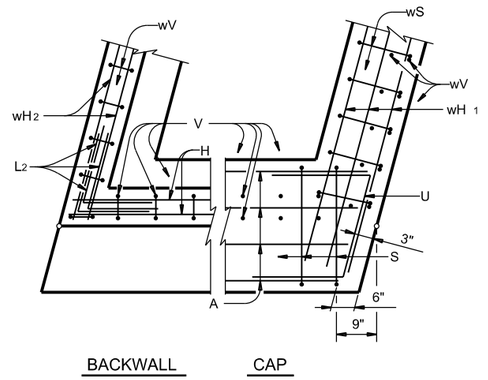
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REVISIONS				CR119
	DIST	COUNTY		SHEET NO.
	06	WILLIAMSON		201



WINGWALL ELEVATION

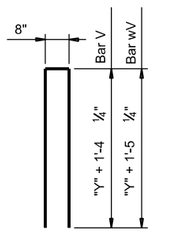


SECTION B-B

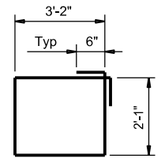


BACKWALL CAP

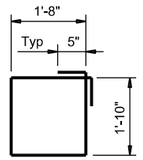
CORNER DETAILS



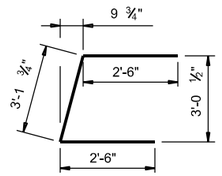
BARS V & wV (5)



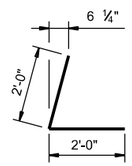
BARS S



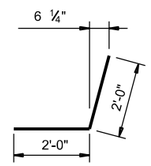
BARS wS



BARS U



BARS L 2



BARS L 1

(5) See Span details for "Y" value.

(9) Spacing based on girder type:
Tx28 ~ 3 spaces at 1'-0" Max
Tx34 ~ 3 spaces at 1'-0" Max
Tx40 ~ 4 spaces at 1'-0" Max
Tx46 ~ 4 spaces at 1'-0" Max
Tx54 ~ 5 spaces at 1'-0" Max

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HL93 LOADING SHEET 2 OF 3

Texas Department of Transportation — Bridge Division Standard

ABUTMENTS

TYPE TX28 THRU TX54
PRESTR CONC I-GIRDERS
44' ROADWAY 15° SKEW

AIG-44-15

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TABLES OF ESTIMATED QUANTITIES WITH 2:1 HEADER SLOPE (11)

TYPE Tx28 Girders

Bar	No.	Size	Length	Weight
A	10	#11	46'-7"	2,475
D (7)	2	1 ¼"D	1'-8"	14
H	8	#6	47'-3"	568
L1	9	#6	4'-0"	54
L2	9	#6	4'-0"	54
S	58	#5	11'-6"	696
U	4	#6	8'-2"	49
V	47	#5	10'-0"	490
wH1	14	#6	9'-5"	198
wH2	20	#6	7'-8"	230
wS	18	#4	7'-10"	94
wV	18	#5	10'-2"	191
Reinforcing Steel		Lb		5,113
Class "C" Concrete		CY		24.3

TYPE Tx34 Girders

Bar	No.	Size	Length	Weight
A	10	#11	46'-7"	2,475
D (7)	2	1 ¼"D	1'-8"	14
H	8	#6	47'-3"	568
L1	9	#6	4'-0"	54
L2	9	#6	4'-0"	54
S	58	#5	11'-6"	696
U	4	#6	8'-2"	49
V	47	#5	11'-0"	539
wH1	14	#6	10'-5"	219
wH2	20	#6	8'-8"	260
wS	20	#4	7'-10"	105
wV	20	#5	11'-2"	233
Reinforcing Steel		Lb		5,266
Class "C" Concrete		CY		26.1

TYPE Tx40 Girders

Bar	No.	Size	Length	Weight
A	10	#11	46'-7"	2,475
D (7)	2	1 ¼"D	1'-8"	14
H	10	#6	47'-3"	710
L1	9	#6	4'-0"	54
L2	9	#6	4'-0"	54
S	58	#5	11'-6"	696
U	4	#6	8'-2"	49
V	47	#5	12'-0"	588
wH1	14	#6	11'-5"	240
wH2	24	#6	9'-8"	348
wS	22	#4	7'-10"	115
wV	22	#5	12'-2"	279
Reinforcing Steel		Lb		5,622
Class "C" Concrete		CY		28.0

TYPE Tx46 Girders

Bar	No.	Size	Length	Weight
A	10	#11	46'-7"	2,475
D (7)	2	1 ¼"D	1'-8"	14
H	10	#6	47'-3"	710
L1	9	#6	4'-0"	54
L2	9	#6	4'-0"	54
S	58	#5	11'-6"	696
U	4	#6	8'-2"	49
V	47	#5	13'-0"	637
wH1	14	#6	12'-5"	261
wH2	24	#6	10'-8"	385
wS	24	#4	7'-10"	126
wV	24	#5	13'-2"	330
Reinforcing Steel		Lb		5,791
Class "C" Concrete		CY		30.0

TYPE Tx54 Girders

Bar	No.	Size	Length	Weight
A	10	#11	46'-7"	2,475
D (7)	2	1 ¼"D	1'-8"	14
H	12	#6	47'-3"	852
L1	9	#6	4'-0"	54
L2	9	#6	4'-0"	54
S	58	#5	11'-6"	696
U	4	#6	8'-2"	49
V	47	#5	14'-4"	703
wH1	14	#6	14'-5"	303
wH2	28	#6	12'-8"	533
wS	28	#4	7'-10"	147
wV	28	#5	14'-6"	423
Reinforcing Steel		Lb		6,303
Class "C" Concrete		CY		33.3

TABLES OF ESTIMATED QUANTITIES WITH 3:1 HEADER SLOPE

TYPE Tx28 Girders

Bar	No.	Size	Length	Weight
A	10	#11	46'-7"	2,475
D (7)	2	1 ¼"D	1'-8"	14
H	8	#6	47'-3"	568
L1	9	#6	4'-0"	54
L2	9	#6	4'-0"	54
S	58	#5	11'-6"	696
U	4	#6	8'-2"	49
V	47	#5	10'-0"	490
wH1	14	#6	13'-5"	282
wH2	20	#6	11'-8"	350
wS	26	#4	7'-10"	136
wV	26	#5	10'-2"	276
Reinforcing Steel		Lb		5,444
Class "C" Concrete		CY		26.9

TYPE Tx34 Girders

Bar	No.	Size	Length	Weight
A	10	#11	46'-7"	2,475
D (7)	2	1 ¼"D	1'-8"	14
H	8	#6	47'-3"	568
L1	9	#6	4'-0"	54
L2	9	#6	4'-0"	54
S	58	#5	11'-6"	696
U	4	#6	8'-2"	49
V	47	#5	11'-0"	539
wH1	14	#6	15'-5"	324
wH2	20	#6	13'-8"	411
wS	30	#4	7'-10"	157
wV	30	#5	11'-2"	349
Reinforcing Steel		Lb		5,690
Class "C" Concrete		CY		29.5

TYPE Tx40 Girders

Bar	No.	Size	Length	Weight
A	10	#11	46'-7"	2,475
D (7)	2	1 ¼"D	1'-8"	14
H	10	#6	47'-3"	710
L1	9	#6	4'-0"	54
L2	9	#6	4'-0"	54
S	58	#5	11'-6"	696
U	4	#6	8'-2"	49
V	47	#5	12'-0"	588
wH1	14	#6	16'-5"	345
wH2	24	#6	14'-8"	529
wS	32	#4	7'-10"	167
wV	32	#5	12'-2"	406
Reinforcing Steel		Lb		6,087
Class "C" Concrete		CY		31.6

TYPE Tx46 Girders

Bar	No.	Size	Length	Weight
A	10	#11	46'-7"	2,475
D (7)	2	1 ¼"D	1'-8"	14
H	10	#6	47'-3"	710
L1	9	#6	4'-0"	54
L2	9	#6	4'-0"	54
S	58	#5	11'-6"	696
U	4	#6	8'-2"	49
V	47	#5	13'-0"	637
wH1	14	#6	18'-5"	387
wH2	24	#6	16'-8"	601
wS	36	#4	7'-10"	188
wV	36	#5	13'-2"	494
Reinforcing Steel		Lb		6,359
Class "C" Concrete		CY		34.5

TYPE Tx54 Girders

Bar	No.	Size	Length	Weight
A	10	#11	46'-7"	2,475
D (7)	2	1 ¼"D	1'-8"	14
H	12	#6	47'-3"	852
L1	9	#6	4'-0"	54
L2	9	#6	4'-0"	54
S	58	#5	11'-6"	696
U	4	#6	8'-2"	49
V	47	#5	14'-4"	703
wH1	14	#6	20'-5"	429
wH2	28	#6	18'-8"	785
wS	40	#4	7'-10"	209
wV	40	#5	14'-6"	605
Reinforcing Steel		Lb		6,925
Class "C" Concrete		CY		38.1

(7) Omit Dowels D at end of multi-span unit. Deduct 14 lbs from reinforcing steel total.

(11) Quantities shown are for one abutment only (with approach slab). With no approach slab, add 1.8 CY Class "C" concrete and 284 lbs reinforcing steel for 4 additional Bars H.

HL93 LOADING SHEET 3 OF 3

Texas Department of Transportation — Bridge Division Standard

ABUTMENTS

TYPE TX28 THRU TX54

PRESTR CONC I-GIRDERS

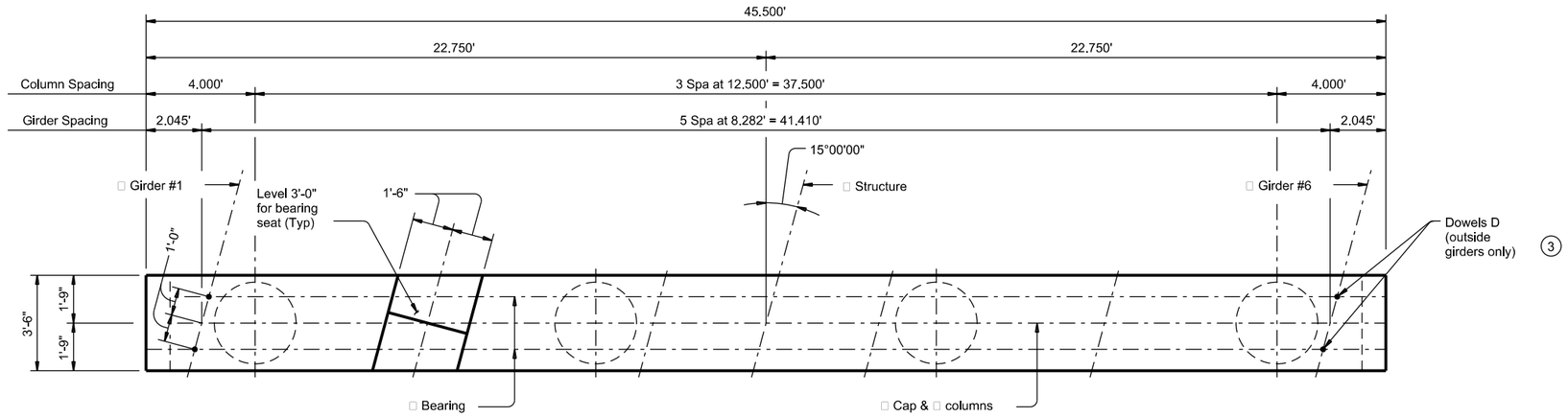
44' ROADWAY 15° SKEW

AIG-44-15

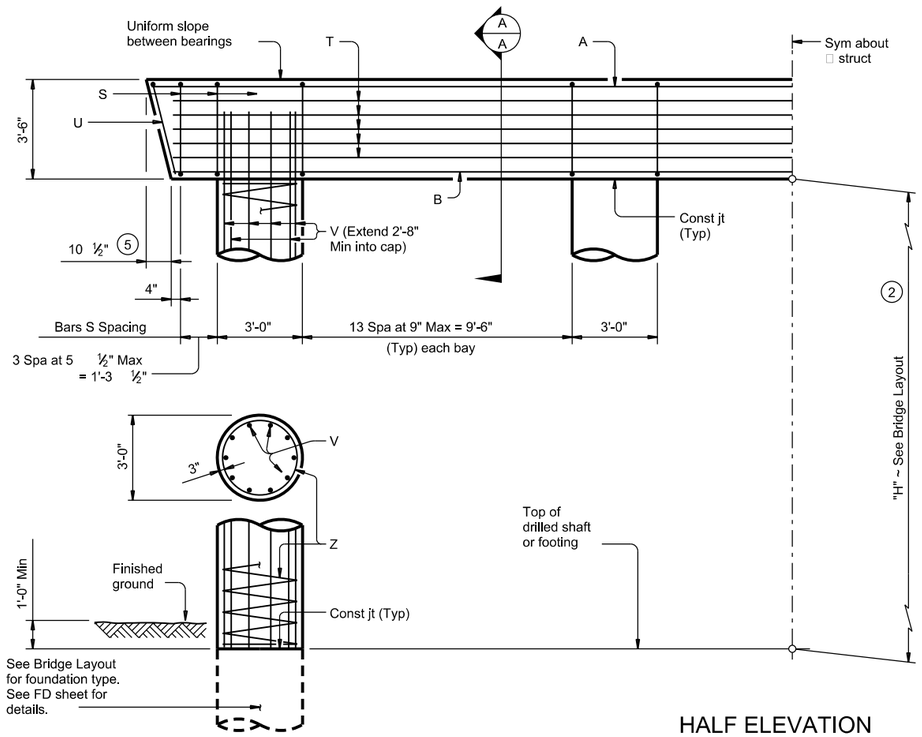
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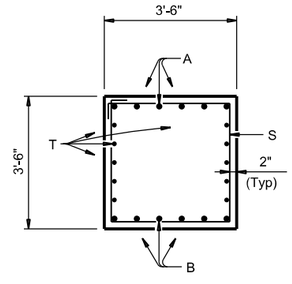
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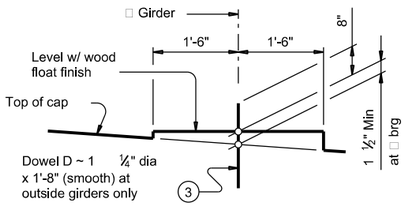
PLAN



HALF ELEVATION



SECTION A-A



BEARING SEAT DETAIL

(Bearing surface must be clean and free of all loose material before placing bearing pad.)

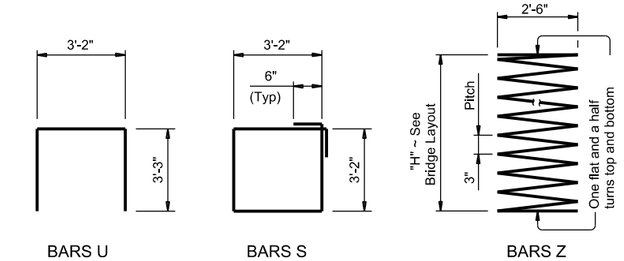


TABLE OF ESTIMATED QUANTITIES (1)

Bar	No.	Size	Length	Weight
A	6	#11	45'- 0"	1,435
B	6	#11	43'- 6"	1,387
D (3)	4	1 ¼"D	1'- 8"	28
S	50	#5	13'- 8"	713
T	10	#5	43'- 6"	454
U	2	#5	9'- 8"	20
V	40	#9	38'- 8"	5,259
Z	4	#4	1,154'- 7"	3,085
Reinforcing Steel			Lb	12,381
Class "C" Concrete (Cap)			CY	20.5
Class "C" Concrete (Col)			CY	37.7

FOUNDATION LOADS (4)

Span Average	Drilled Shaft Loads	Pile Load (Tons/Pile)		
		3 Pile Ftg	4 Pile Ftg	5 Pile Ftg
Ft	Tons/Shaft			
40	114	41	32	26
45	123	44	34	28
50	132	47	36	30
55	140	50	38	31
60	149	53	40	33
65	157	56	42	35
70	166	59	45	36
75	174	61	47	38
80	183	64	49	40
85	191	67	51	41
90	200	70	53	43
95	208	73	55	45
100	217	76	57	47
105	225	78	59	48
110	233	81	61	50
115	242	84	64	52
120	250	87	66	53
125	258	89	68	55

GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications.
See Bridge Layout for foundation type, size and length.
See Common Foundation Details (FD) standard sheet for all foundation details and notes.
See Shear Key (IGSK) standard sheet for all shear key details and notes, if applicable.
Bent selected must be based on the average span length rounded up to the next 5 ft. increment.
Details are drawn showing right forward skew. See Bridge Layout for actual skew direction.
These bent details may be used with standard SIG-44-15 only.

Cover dimensions are clear dimensions, unless noted otherwise.
Reinforcing bar dimensions shown are out-to-out of bar.

MATERIAL NOTES:

Provide Class C concrete (f'c = 3,600 psi).
Provide Class C (HPC) concrete if shown elsewhere in the plans.
Provide Grade 60 reinforcing steel.

HL93 LOADING

(1) Quantities shown are based on an "H" value of 36'. For each linear foot variation in "H" value, make the following adjustments:
Bars V length, 1'-0"
Bars Z length, 31'-5"
Reinforcing steel, 220 Lb
Class "C" conc (col), 1.0 CY

(2) This standard may not be used for "H" heights exceeding 36'. In areas of very soft soil or where scour is anticipated, allowable "H" heights must be evaluated by the Engineer prior to the use of this standard.

(3) Omit Dowels D at end of multi-span units. Adjust reinforcing steel total accordingly.

(4) Foundation Loads based on "H" = 36'.

(5) Measured parallel to top of cap cross-slope.

Texas Department of Transportation

Bridge Division Standard

INTERIOR BENTS

TYPE TX28 THRU TX54
PRESTR CONC I-GIRDERS
44' ROADWAY 15° SKEW

BIG-44-15

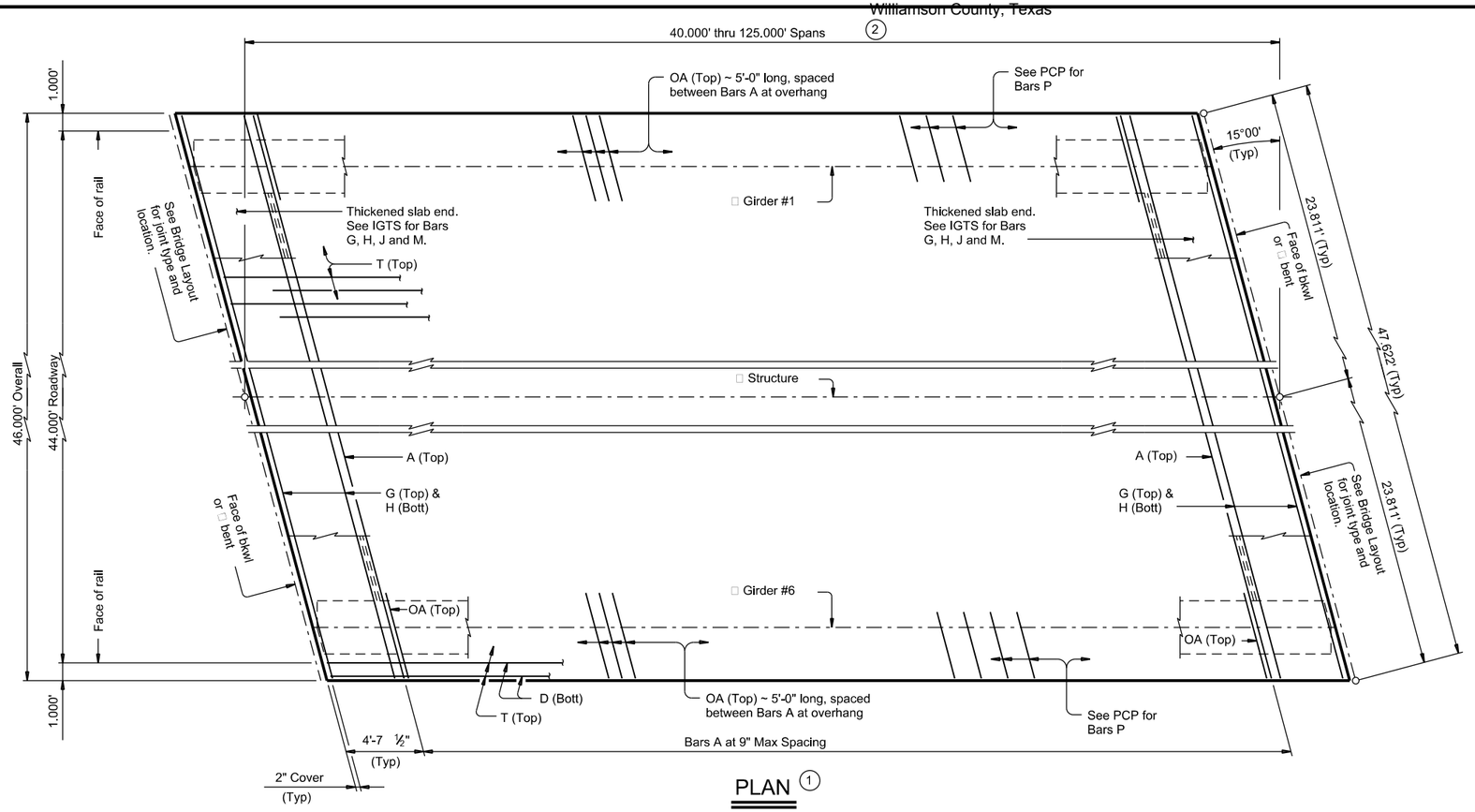
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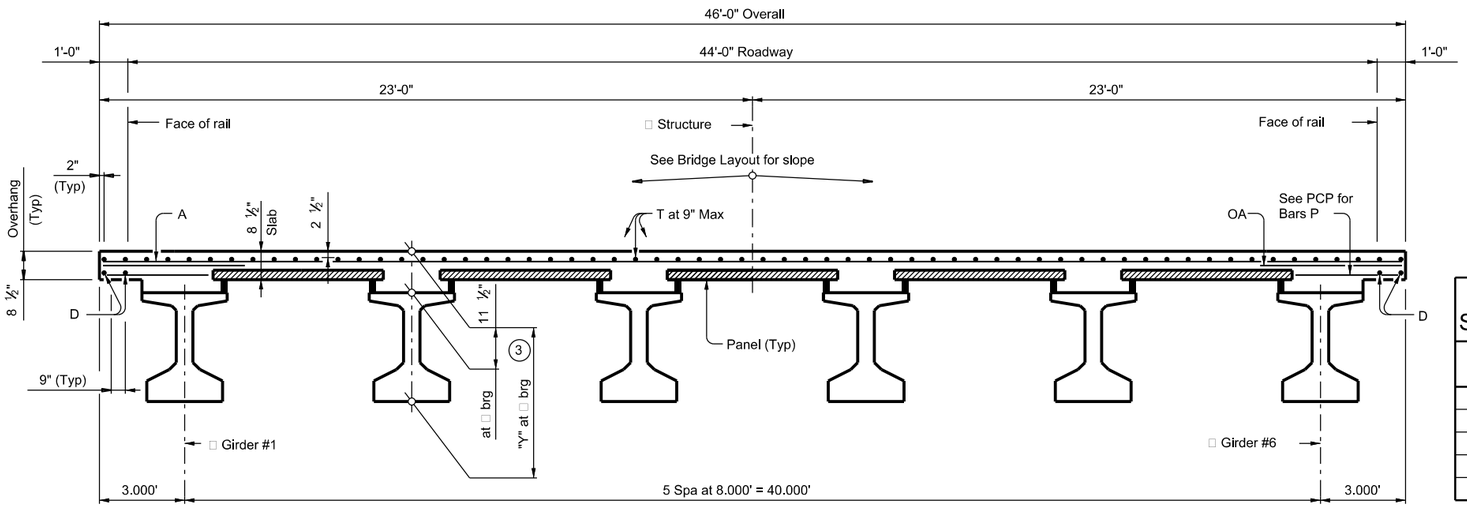
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PLAN (1)



TYPICAL TRANSVERSE SECTION
(Showing girder type Tx46)

TABLE OF SECTION DEPTHS	
GIRDER TYPE	"Y" AT ℄ BRG (3)
	Ft/In
Tx28	3'-3 ½"
Tx34	3'-9 ½"
Tx40	4'-3 ½"
Tx46	4'-9 ½"
Tx54	5'-5 ½"

BAR TABLE	
BAR	SIZE
A	#4
D	#4
G	#4
H	#4
J	#4
M	#4
OA	#5
P	#4
T	#4

(1) If multi-span units (with slab continuous over interior bents) are indicated on the Bridge Layout, see standard IGCS for adjustment to slab reinforcement and quantities.

(2) Span lengths for prestressed concrete I-Girder type:
Type Tx28 for spans lengths 40.000' thru 70.000'.
Type Tx34 for spans lengths 40.000' thru 85.000'.
Type Tx40 for spans lengths 40.000' thru 95.000'.
Type Tx46 for spans lengths 40.000' thru 110.000'.
Type Tx54 for spans lengths 40.000' thru 125.000'.

(3) "Y" value shown is based on theoretical beam camber, dead load deflection from an 8 ½" cast-in-place concrete slab and a constant roadway grade. The Contractor will adjust this value as necessary for any roadway vertical curve.

HL93 LOADING SHEET 1 OF 2

Texas Department of Transportation — Bridge Division Standard

PRESTRESSED CONCRETE I-GIRDER SPANS (TYPE Tx28 THRU Tx54)

44' ROADWAY 15° SKEW

SIG-44-15

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TABLE OF DEAD LOAD DEFLECTIONS

TYPE Tx28 GIRDERS

SPAN LENGTH	"A"	"B"
Ft	Ft	Ft
40	0.009	0.013
45	0.015	0.021
50	0.023	0.032
55	0.034	0.048
60	0.048	0.068
65	0.068	0.095
70	0.092	0.129

TYPE Tx34 GIRDERS

SPAN LENGTH	"A"	"B"
Ft	Ft	Ft
40	0.006	0.008
45	0.009	0.012
50	0.014	0.019
55	0.020	0.028
60	0.029	0.041
65	0.041	0.057
70	0.055	0.077
75	0.073	0.102
80	0.095	0.134
85	0.122	0.171

TYPE Tx40 GIRDERS

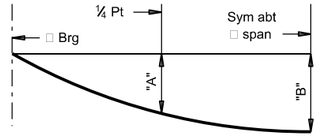
SPAN LENGTH	"A"	"B"
Ft	Ft	Ft
40	0.004	0.005
45	0.006	0.008
50	0.009	0.013
55	0.014	0.019
60	0.019	0.027
65	0.026	0.037
70	0.036	0.050
75	0.048	0.067
80	0.062	0.087
85	0.080	0.112
90	0.101	0.142
95	0.126	0.177

TYPE Tx46 GIRDERS

SPAN LENGTH	"A"	"B"
Ft	Ft	Ft
40	0.002	0.003
45	0.004	0.006
50	0.006	0.009
55	0.009	0.013
60	0.013	0.018
65	0.018	0.025
70	0.024	0.034
75	0.033	0.046
80	0.043	0.060
85	0.054	0.076
90	0.068	0.096
95	0.085	0.120
100	0.105	0.148
105	0.129	0.181
110	0.156	0.219

TYPE Tx54 GIRDERS

SPAN LENGTH	"A"	"B"
Ft	Ft	Ft
40	0.001	0.002
45	0.003	0.004
50	0.004	0.006
55	0.006	0.008
60	0.009	0.012
65	0.012	0.017
70	0.016	0.023
75	0.021	0.030
80	0.028	0.039
85	0.036	0.050
90	0.046	0.064
95	0.057	0.080
100	0.070	0.098
105	0.085	0.120
110	0.103	0.145
115	0.123	0.173
120	0.147	0.206
125	0.173	0.243



DEAD LOAD DEFLECTION DIAGRAM

Calculated deflections shown are due to the concrete slab on interior girders only (Ec = 5000 ksi). Adjust values as required for exterior girders and if optional slab forming is used. These values may require field verification.

TABLE OF ESTIMATED QUANTITIES

SPAN LENGTH	REINF CONCRETE SLAB	Prestressed Concrete Girders			TOTAL REINF STEEL (5)
		ABUT TO INT BT (4)	INT BT TO INT BT (4)	ABUT TO ABUT (4)	
Ft	SF	LF	LF	LF	Lb
40	1,840	236.95	237.00	236.89	4,232
45	2,070	266.95	267.00	266.89	4,761
50	2,300	296.95	297.00	296.89	5,290
55	2,530	326.95	327.00	326.89	5,819
60	2,760	356.95	357.00	356.89	6,348
65	2,990	386.95	387.00	386.89	6,877
70	3,220	416.95	417.00	416.89	7,406
75	3,450	446.95	447.00	446.89	7,935
80	3,680	476.95	477.00	476.89	8,464
85	3,910	506.95	507.00	506.89	8,993
90	4,140	536.95	537.00	536.89	9,522
95	4,370	566.95	567.00	566.89	10,051
100	4,600	596.95	597.00	596.89	10,580
105	4,830	626.95	627.00	626.89	11,109
110	5,060	656.95	657.00	656.89	11,638
115	5,290	686.95	687.00	686.89	12,167
120	5,520	716.95	717.00	716.89	12,696
125	5,750	746.95	747.00	746.89	13,225

(4) Fabricator will adjust lengths for girder slopes as required.

(5) Reinforcing steel weight is calculated using an approximate factor of 2.3 lbs/SF.

GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications.

Multi-span units, with slab continuous over interior bents, may be formed with the details shown on this sheet and standard IGCS.

See IGTS standard for Thickened Slab End details and quantity adjustments.

See PCP and PCP-FAB for panel details not shown.

See IGMS standard for miscellaneous details.

See applicable rail details for rail anchorage in slab.

See PMDF standard for details and quantity adjustments if this option is used.

This standard is drawn showing right forward skew. See Bridge Layout for actual skew direction.

This standard does not support the use of transition bents.

Cover dimensions are clear dimensions, unless noted otherwise.

MATERIAL NOTES:

Provide Class S concrete (f'c = 4,000 psi).

Provide Class S (HPC) concrete if shown elsewhere in the plans.

Provide Grade 60 reinforcing steel.

Provide bar laps, where required, as follows:

Uncoated ~ #4 = 1'-5"

Epoxy coated ~ #4 = 2'-1"

Deformed Welded Wire Reinforcement (WWR) (ASTM A1064) of equal size and spacing may be substituted for Bars A, D, OA, P or T unless noted otherwise.

HL93 LOADING SHEET 2 OF 2

Texas Department of Transportation

Bridge Division Standard

PRESTRESSED CONCRETE I-GIRDER SPANS (TYPE Tx28 THRU Tx54)

44' ROADWAY 15° SKEW

SIG-44-15

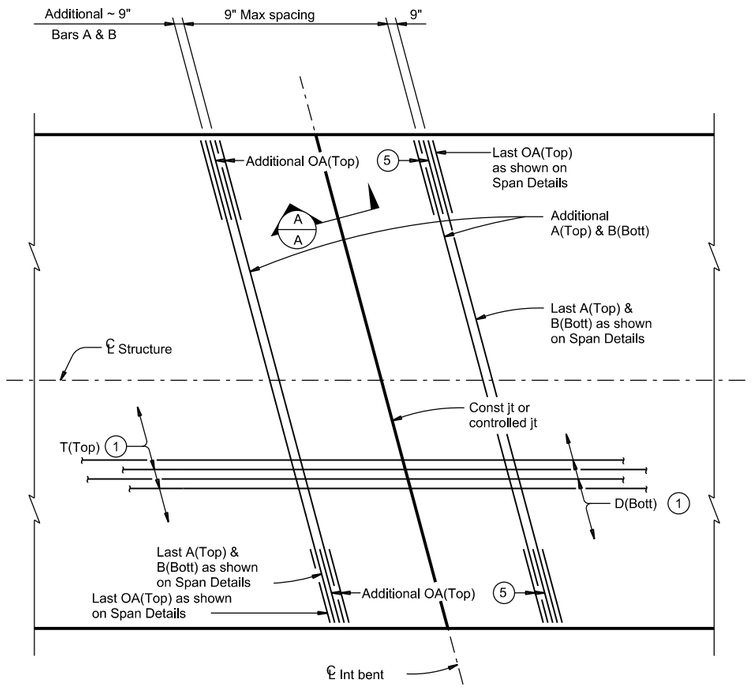
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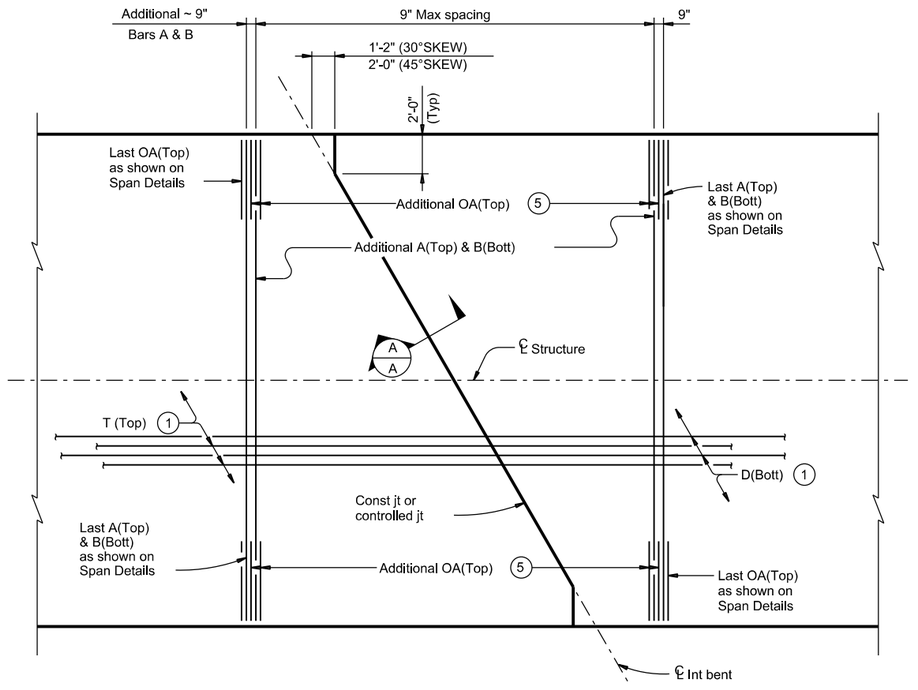
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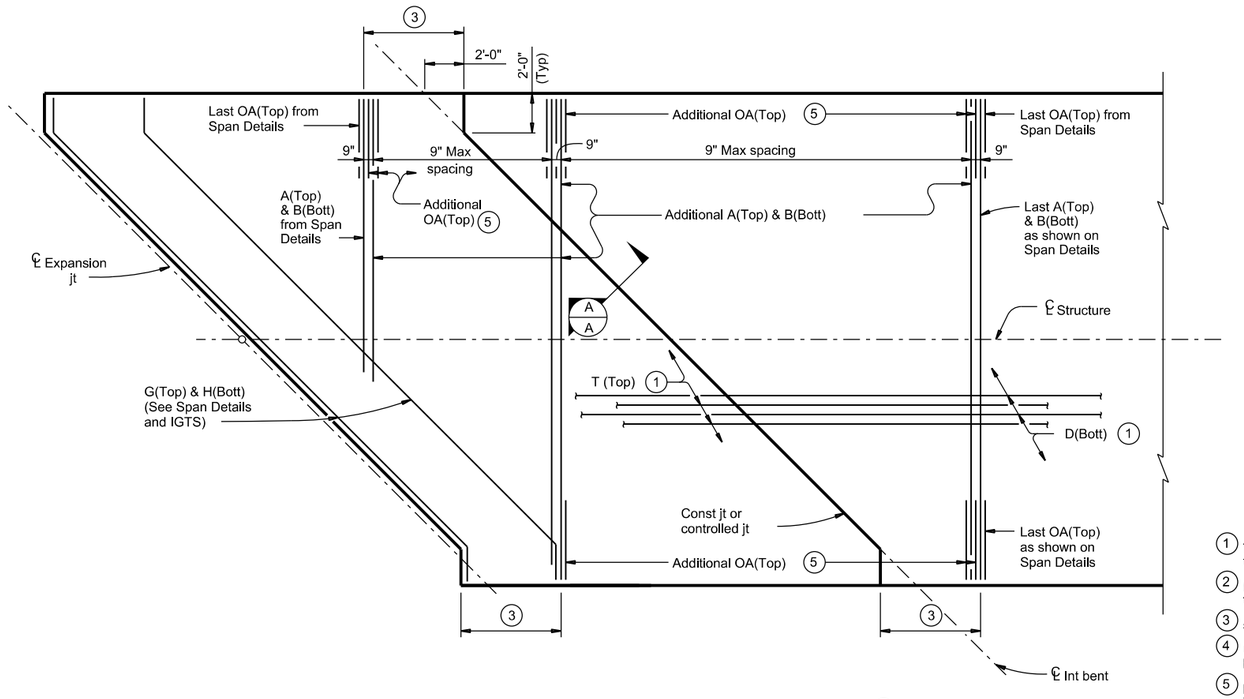
PLAN FOR 0° OR 15° SKEW

(Showing 15°skew)



PLAN FOR 30° OR 45° SKEW

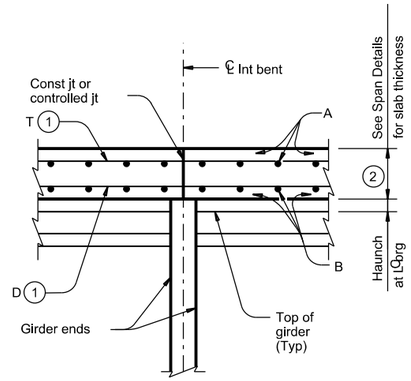
(Showing 30°skew)



PLAN FOR 45° SKEW 4

(Showing short Span condition)

BARS OA(#5)



SECTION A-A

Bars OA(Top) not shown for clarity.

1. Top and bottom mats must be continuous through joint.
2. Maintain a constant slab thickness over the bent.
3. 5'-4" as shown on Span Details.
4. Use these details when no full slab width bars A and B are shown on Span Details.
5. Bars OA(Top) at 9" Max spacing between Bars A(Top).

TABLE OF ALLOWABLE UNIT LENGTH

Max Rdwy Grade, Percent	Unit Length Factor
0.00	4.1
1.00	3.9
2.00	3.7
3.00	3.5
4.00	3.3
5.00	3.1

Unit length must not exceed the length of the shortest end span times the Unit Length Factor shown in table or 400', whichever is less.

BAR TABLE

BAR	SIZE
A	#4
B	#4
D	#4
T	#4
OA	#5

The details shown on this sheet are applicable for two and three span units comprised of the same girder type. Units may be comprised of different span lengths. See "Table of Allowable Unit Length".

GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications.

This standard is drawn showing right forward skew. See Bridge Layout for actual skew direction.

CONSTRUCTION NOTES:

Where multi-span units are indicated on the Bridge Layout, the thickened slab end details and reinforcement shown on IGTS standard (Bars AA, G, H, J, K, and M) and on the Span Details will be omitted where slabs are continuous over interior bents. At these locations, the slab details and reinforcement will be as shown on this sheet or on PCP standard (if using this option).

Thickened slab end reinforcement and details still apply at expansion joint locations (ends of units).

See Span Details for remainder of slab reinforcement and details.

MATERIAL NOTES:

Provide Grade 60 reinforcing steel.

Provide Class "S" concrete (f'c = 4,000 psi). Provide Class "S" (HPC) if shown elsewhere on the plans.

Provide bar laps, where required, as follows:
Uncoated ~ #4 = 1'-5"
Epoxy Coated ~ #4 = 2'-1"

The details shown on this sheet are applicable for use only with the Prestressed Concrete I-Girder Standard Designs shown on standards IGSD-24, IGSD-28, IGSD-30, IGSD-32, IGSD-38, IGSD-40 and IGSD-44.

HL93 LOADING

Texas Department of Transportation

Bridge Division Standard

CONTINUOUS SLAB DETAILS

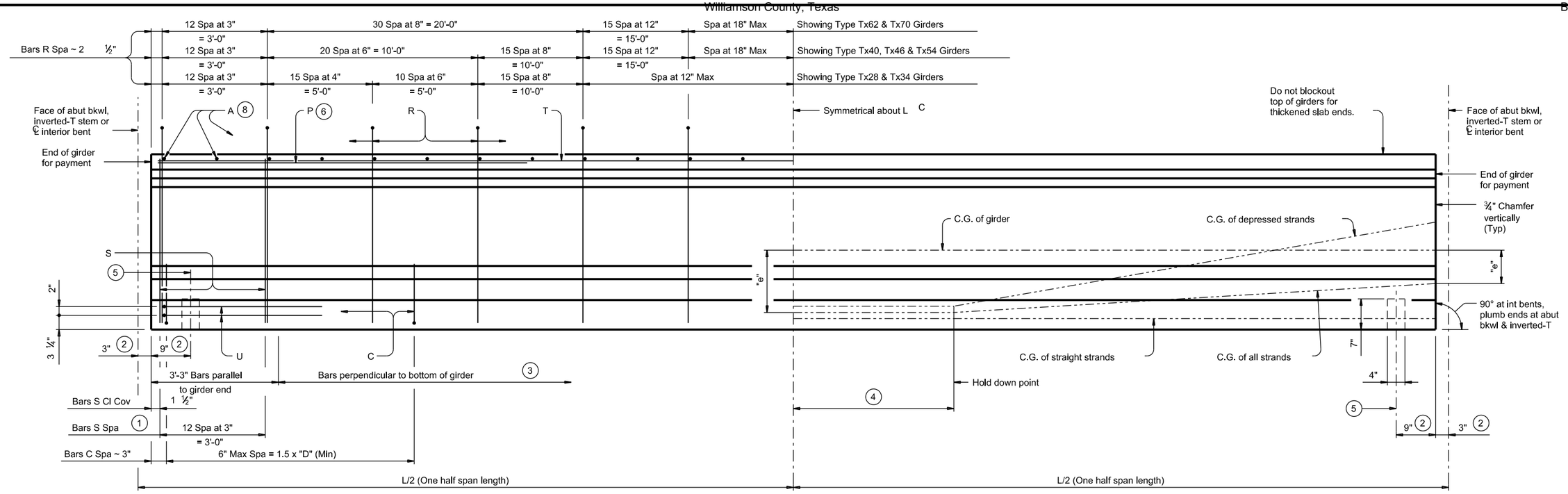
PRESTR CONC I-GIRDER SPANS

IGCS

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©TxDOT October 2015	CONT	SECT	JOB	HIGHWAY
REVISIONS				CR119
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GIRDER ELEVATION

(1) Bundle with Bars R.

(2) Measured along L Girder at interior bents; perpendicular to abutment bkwl or inverted-T stem.

(3) The average of the top and bottom spacing of Bars R cannot exceed the required spacing.

(4) L/20, but not less than 5'-0" (-0,+2').

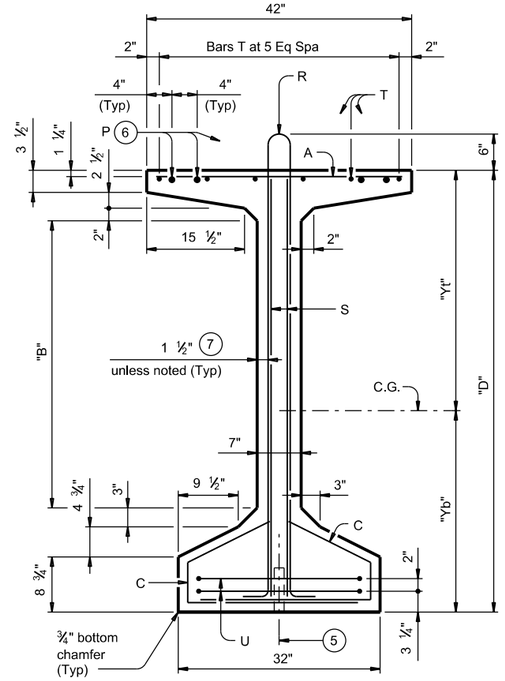
(5) □ 4" x 1 ½" Vertical Slotted Hole at doweled girder end [labeled (D) on Bridge Layout]. Required for outside girder only or as shown on substructure details. Anchorage holes may be tapered (4 ¾" x 1 ⅝") at base. If holes are formed with sheet metal, forms may be left in place.

(6) Bars P (#6 x 15'-0") are only required when "e" at girder ends exceeds 0.25 x "D". At the fabricator's option bars larger than #6 may be used. When L is less than 50 ft, Bars P are to be the same length as Bars T.

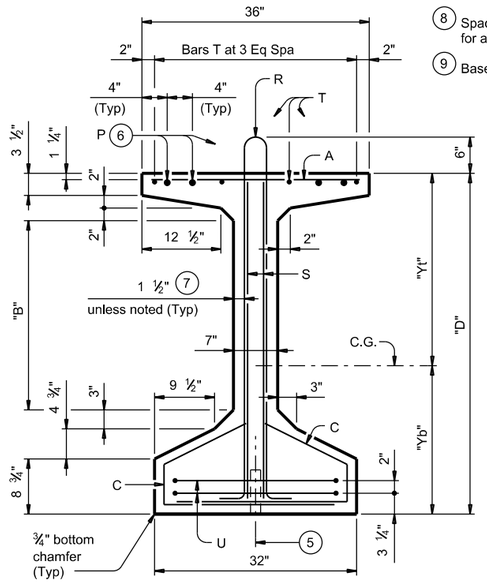
(7) 1 ⅜" Clear Cover to Bars S.

(8) Space Bars A at 6" Max for girders requiring overhang bracket hangers. Space at 12" Max for all other girders. Tie to Bars R as necessary. See standard IGMS for "Deck Forming Notes".

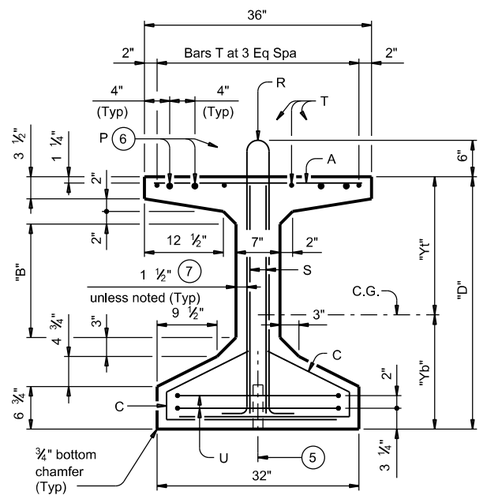
(9) Based on 155 pcf total weight of concrete and reinforcing steel.



TYPE Tx62 & Tx70



TYPE Tx46 & Tx54



TYPE Tx28, Tx34 & Tx40

GIRDER DIMENSIONS AND SECTION PROPERTIES

Girder Type	"D" (in.)	"B" (in.)	"Yt" (in.)	"Yb" (in.)	Area (in.²)	"Ix" (in.⁴)	"Iy" (in.⁴)	Weight (9) (plf)
Tx28	28	6	15.02	12.98	585	52,772	40,559	630
Tx34	34	12	18.49	15.51	627	88,355	40,731	675
Tx40	40	18	21.90	18.10	669	134,990	40,902	720
Tx46	46	22	25.90	20.10	761	198,089	46,478	819
Tx54	54	30	30.49	23.51	817	299,740	46,707	880
Tx62	62	37 ½"	33.72	28.28	910	463,072	57,351	980
Tx70	70	45 ½"	38.09	31.91	966	628,747	57,579	1,040

GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications.
Provide Class H concrete.
Provide Grade 60 reinforcing steel.
An equal area of deformed Welded Wire Reinforcement (WWR) (ASTM A1064) may be substituted for Bars A, C, R or T unless otherwise noted.
It is permissible for bars or strands to come in contact with materials used in forming anchor holes.

Cover dimensions are clear dimensions, unless noted otherwise.
Reinforcing bar dimensions shown are out-to-out of bar.

HL93 LOADING SHEET 1 OF 2

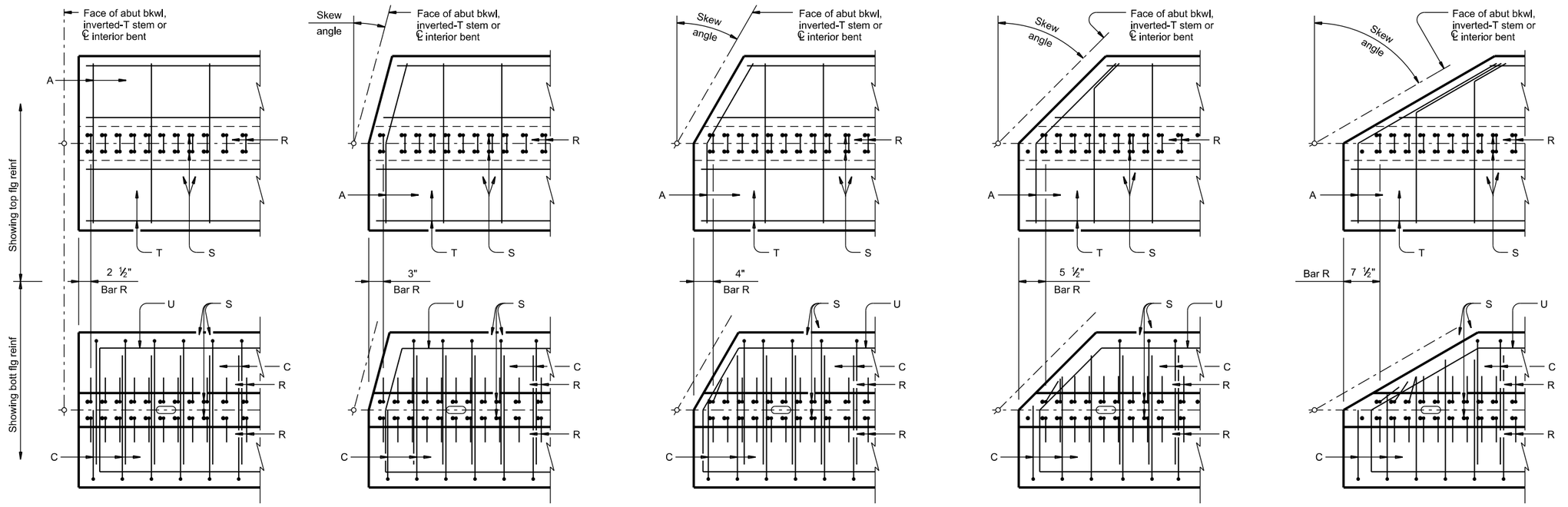
Texas Department of Transportation — Bridge Division Standard

PRESTRESSED CONCRETE I-GIRDER DETAILS

IGD

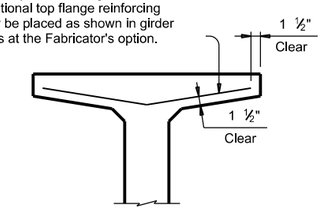
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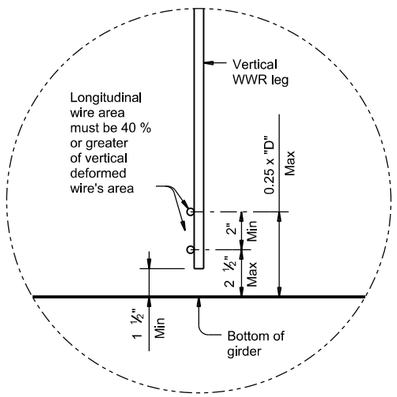


PLAN OF GIRDER ENDS (10)

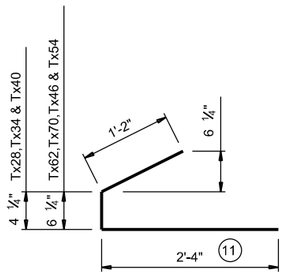
To control top flange cracking that may occur during form removal, additional top flange reinforcing may be placed as shown in girder ends at the Fabricator's option.



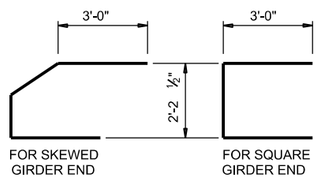
OPTIONAL TOP FLANGE REINFORCING DETAIL



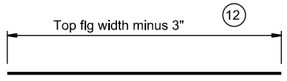
OPTIONAL WELDED WIRE REINFORCEMENT (WWR) DETAIL



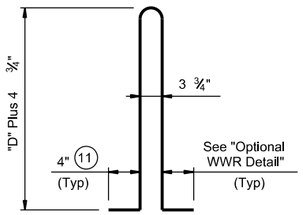
BARS C (#4)



BARS U (#5)



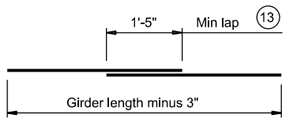
BARS A (#3)



BARS R (#4) (14)



BARS S (#6)



BARS T (#4)

(10) Reinforcing patterns shown are provided as guides to determine reinforcement placement in skewed ends. Place Bars S as close to girder end as cover requirements permit, which may prevent them to be bundled with Bars R.

(11) Bars may be cut or bent at skewed end as required.

(12) Increase as necessary for bars at skewed end.

(13) No portion of bar less than 10 ft.

(14) For Welded Wire Reinforcement (WWR) option, area of Bars R may be reduced in proportion to the increase in reinforcement yield strength over 60 ksi. Yield strength of WWR is limited to 75 ksi.

HL93 LOADING SHEET 2 OF 2

Texas Department of Transportation — Bridge Division Standard

PRESTRESSED CONCRETE I-GIRDER DETAILS

IGD

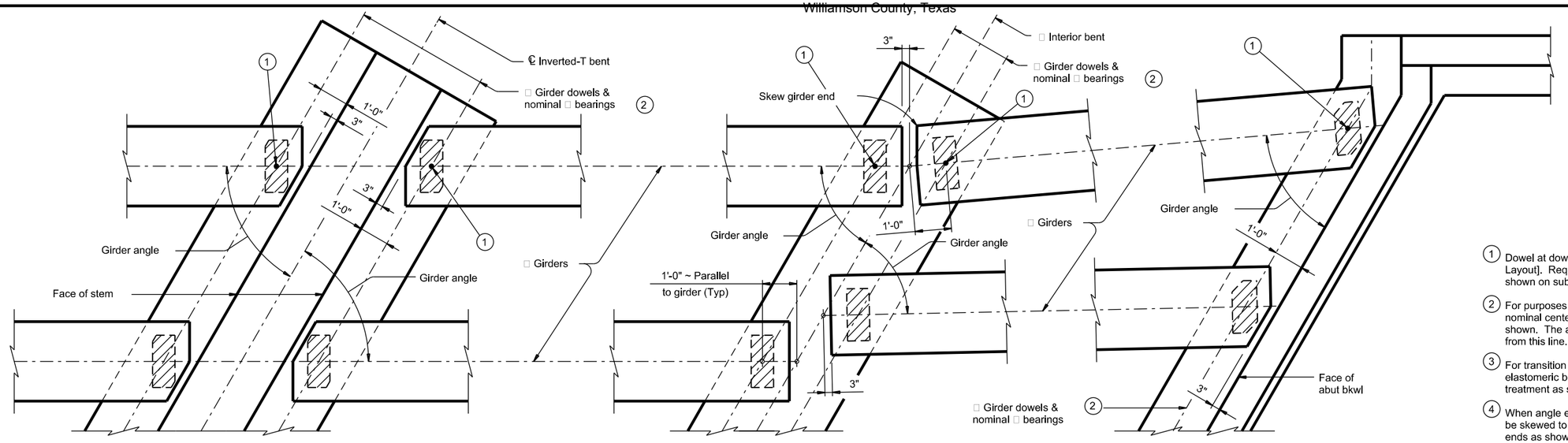
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AT INVERTED-T BENT W/SKEW

AT CONVENTIONAL INTERIOR BENT W/SKEW

AT ABUTMENT W/SKEW (3)

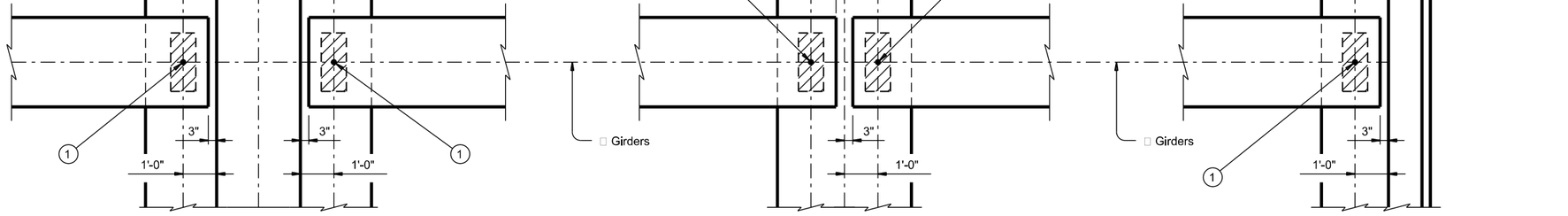
(1) Dowel at doweled girder end [labeled (D) on Bridge Layout]. Required for outside girder only or as shown on substructure details.

(2) For purposes of computing bearing seat elevations, nominal centerline of bearing must be defined as shown. The actual center of bearing pad may vary from this line.

(3) For transition bents with backwall, girder and elastomeric bearings must receive the same treatment as shown for abutments.

(4) When angle exceeds 0°, one or both girders ends must be skewed to maintain the clearance between girder ends as shown in view.

(5) See Table of Bearing Pad Dimensions for bearing size. Girder end skew angles in Table not applicable for this situation. Table reflects girder conflicts of this type on radial bents only.



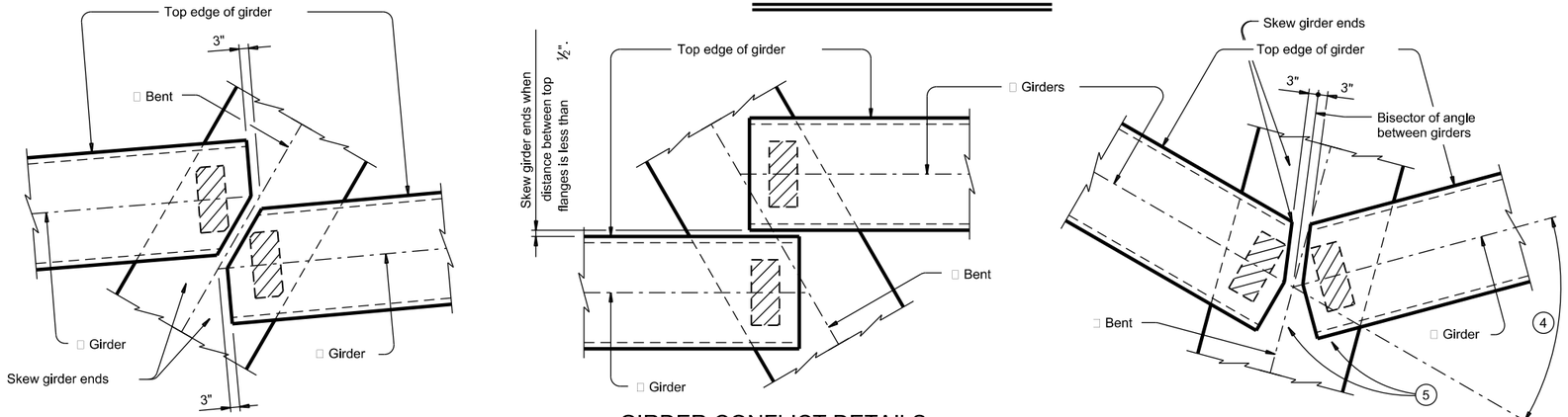
AT INVERTED-T BENT

AT CONVENTIONAL INTERIOR BENT

AT ABUTMENT (3)

GIRDER END DETAILS

GENERAL NOTES:
These details accommodate skew angles up to 60°.
Shop drawings for approval are required.
A bearing layout which identifies location and orientation of all bearings must be developed by the bearing fabricator. Permanently mark each bearing in accordance with the bearing layout. A copy of the bearing layout is to be provided to the Engineer.
Cost of furnishing and installing elastomeric bearings, including beveled and embedded steel plates, must be included in unit price bid for "Prestressed Concrete Girders".



GIRDER CONFLICT DETAILS

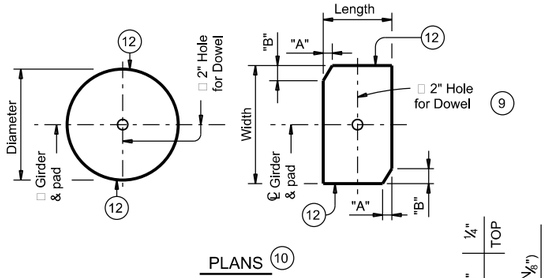
HL93 LOADING SHEET 1 OF 3

Texas Department of Transportation — Bridge Division Standard

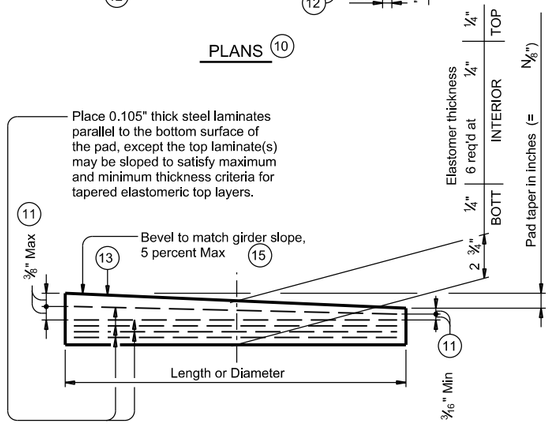
ELASTOMERIC BEARING AND GIRDER END DETAILS
PRESTR CONCRETE I-GIRDERS

IGEB

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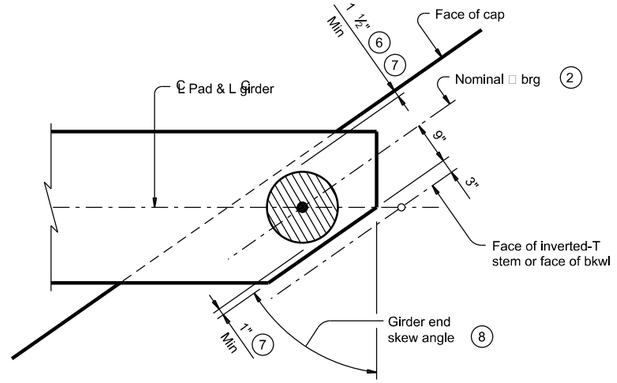
PLANS (10)



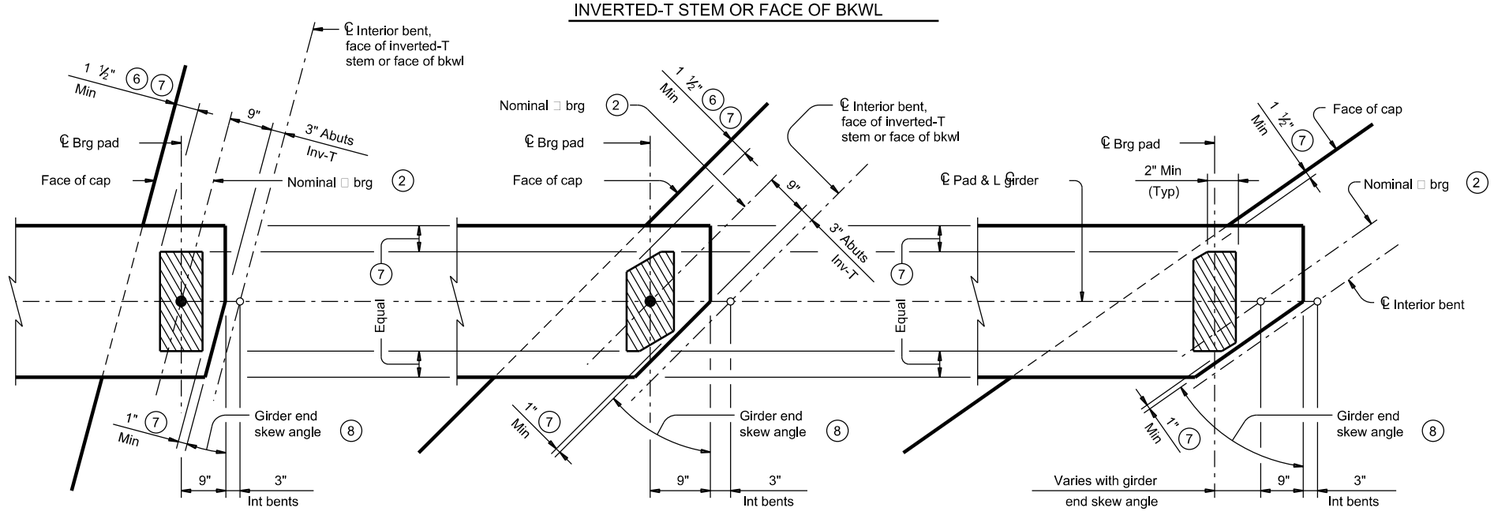
ELEVATION

LAMINATED ELASTOMERIC BEARING PAD

(50 DUROMETER)



ROUND BEARINGS FOR SKEWED GIRDER ENDS AT FACE OF INVERTED-T STEM OR FACE OF BKWL



SKEWED GIRDER ENDS AT INT BENTS, FACE OF INVERTED-T STEM OR FACE OF BKWL

SKEWED GIRDER ENDS AT CONVENTIONAL INTERIOR BENTS (16)

(NO GIRDER DOWELS)

BEARING PAD PLACEMENT DIAGRAMS

TABLE OF MINIMUM SUBSTRUCTURE DIMENSIONS (14)

Girder Type	Abutments	Int Bents	Inv-T Bents
	Face of Bkwl to Face of Cap	Overall Cap Width	Corbel Width
Tx28 thru Tx54	1'-9"	3'-6"	1'-10 ½"
Tx62 & Tx70	2'-0"	4'-0"	2'-1 ½"

TABLE OF BEARING PAD DIMENSIONS

Bent Type	Girder Type	Bearing Type (13)	Girder End Skew Angle Range	Pad Size Lgth x Wdth	Pad Clip Dimensions "A"	Pad Clip Dimensions "B"
ABUTMENTS, INVERTED-T AND TRANSITION BENTS WITH BACKWALLS	Tx28,Tx34, Tx40,Tx46 & Tx54	G-1-"N"	0° thru 21°	8" x 21"	---	---
		G-2-"N"	21°+ thru 30°	8" x 21"	1 ½"	2 ½"
		G-3-"N"	30°+ thru 45°	9" x 21"	4 ½"	4 ½"
		G-4-"N"	45°+ thru 60°	15" Dia	---	---
	Tx62 & Tx70	G-5-"N"	0° thru 21°	9" x 21"	---	---
		G-6-"N"	21°+ thru 30°	9" x 21"	1 ½"	2 ½"
		G-7-"N"	30°+ thru 45°	10" x 21"	4 ½"	4 ½"
		G-8-"N"	45°+ thru 60°	10" x 21"	7 ¼"	4 ¼"
CONVENTIONAL INTERIOR BENTS	Tx28,Tx34, Tx40,Tx46 & Tx54	---	---	---	---	---
		---	---	---	---	---
		G-1-"N"	0° thru 60°	8" x 21"	---	---
	Tx62 & Tx70	G-5-"N"	0° thru 60°	9" x 21"	---	---
CONVENTIONAL INTERIOR BENTS WITH SKEWED GIRDER ENDS (GIRDER CONFLICTS) (16)	Tx28,Tx34, Tx40,Tx46 & Tx54	G-1-"N"	0° thru 18°	8" x 21"	---	---
		G-2-"N"	18°+ thru 30°	8" x 21"	1 ½"	2 ½"
		G-9-"N"	30°+ thru 45°	8" x 21"	3"	3"
		G-10-"N"	45°+ thru 60°	9" x 21"	6"	3 ½"
	Tx62 & Tx70	G-5-"N"	0° thru 18°	9" x 21"	---	---
		G-5-"N"	18°+ thru 30°	9" x 21"	---	---
		G-11-"N"	30°+ thru 45°	9" x 21"	1 ½"	1 ½"
		G-12-"N"	45°+ thru 60°	9" x 21"	3"	1 ¾"

(2) For purposes of computing bearing seat elevations, nominal centerline of bearing must be defined as shown. The actual center of bearing pad may vary from this line.

(6) 3" for inverted-T.

(7) Place centerline pad as near nominal centerline bearing as possible between limits shown.

(8) Girder end skew angle is equal to 90° minus the girder angle except at some conflicting girders.

(9) Provide 2" dia hole only at locations required. See Substructure details for location.

(10) See Table of Bearing Pad Dimensions for dimensions.

(11) Maximum and minimum layer thicknesses shown are for elastomer only, on tapered layers.

(12) Locate Permanent Mark here.

(13) Indicate BEARING TYPE on all pads. For tapered pads, locate BEARING TYPE on the high side. The Fabricator must include the value of "N" (amount of taper in ⅛" increments) in this mark.
Examples: N=0, (for 0" taper)
N=1, (for ⅛" taper)
N=2, (for ¼" taper)
(etc.)
Fabricated pad top surface slope must not vary from plan girder slope by more than $\left(\frac{0.04 \times N}{\text{Length or Dia}}\right)$.

(14) Substructure dimensions must satisfy the minimums provided to accommodate the elastomeric bearings shown on this standard.

(15) See sheet 3 of 3 for beveled plate use when slopes exceed 5 percent.

(16) If girder end is skewed for a girder conflict at an interior bent and a beveled sole plate is required, use bearing type for abutments at this location. Location of bearing centerline is to be set as for abutments in this case.

HL93 LOADING SHEET 2 OF 3

Texas Department of Transportation — Bridge Division Standard

ELASTOMERIC BEARING AND GIRDER END DETAILS

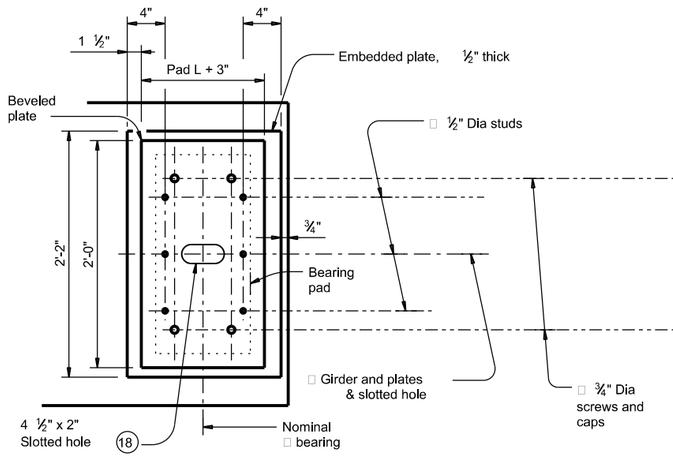
PRESTR CONCRETE I-GIRDERS

IGEB

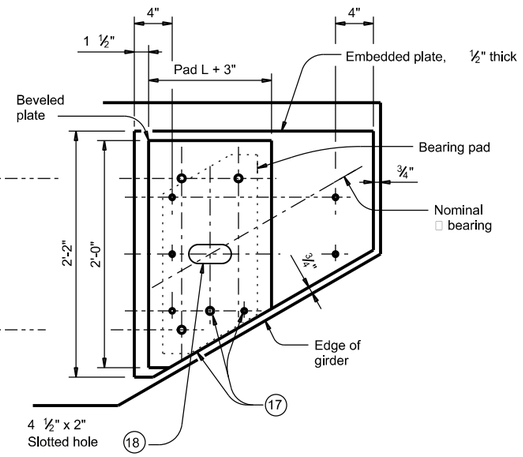
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	DIST 06	COUNTY WILLIAMSON		SHEET NO. 211

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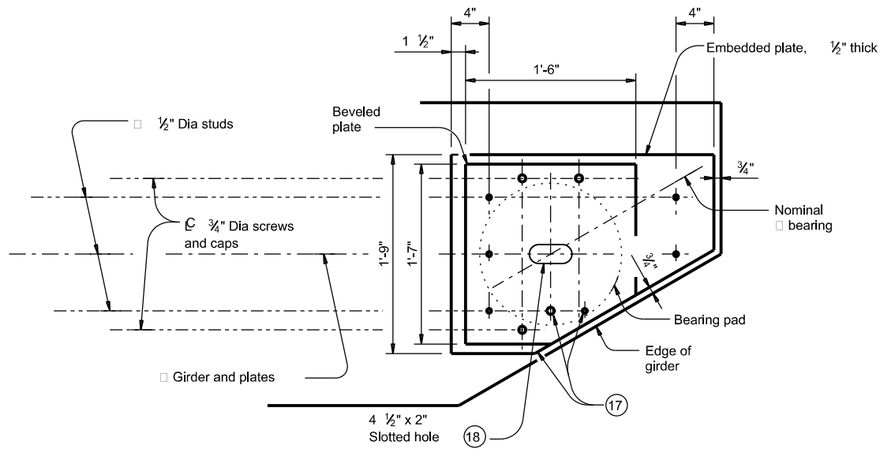
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NORMAL GIRDER END
RECTANGULAR BEARING PAD

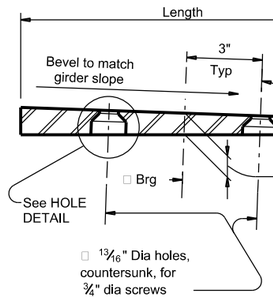


SKEWED GIRDER END
CLIPPED RECTANGULAR BEARING PAD

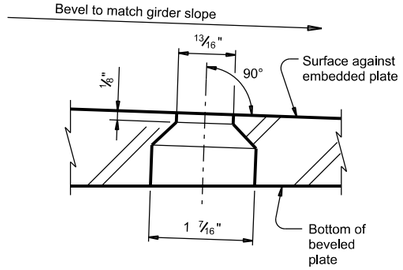


SKEWED GIRDER END
15" DIA BEARING PAD

PLAN VIEW OF SOLE PLATE DETAILS



SECTION

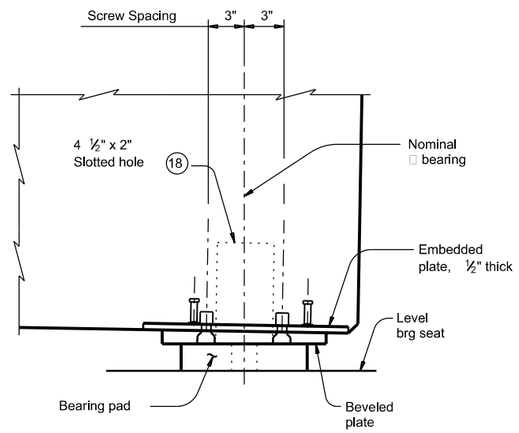


HOLE DETAIL

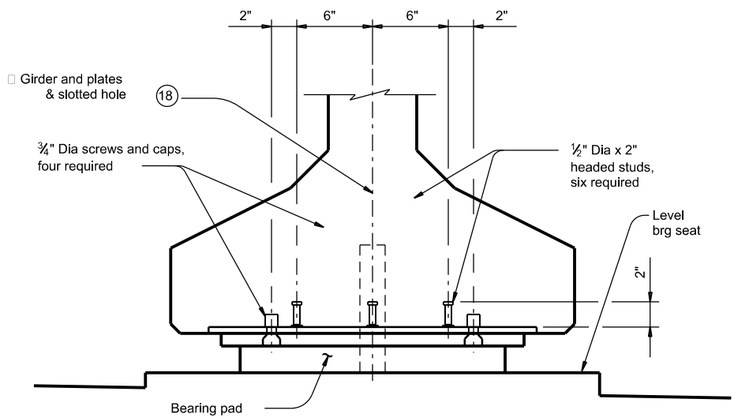
(17) Cut beveled and embedded plates to match girder end skew. Adjust location of screw and stud as shown when necessary.

(18) Slotted hole is required at doweled girder end locations.

BEVELED PLATE DETAILS



SIDE ELEVATION



END ELEVATION

GIRDER DETAILS

SOLE PLATE NOTES:

Provide constant thickness elastomeric bearings with beveled and embedded steel sole plates in accordance with these details when the girder slope exceeds 5 percent or if otherwise required in the plans. Provide for all girders in the span.

On the shop drawings, dimension sole plates to the nearest 1/16" based on required thickness at centerline of bearing and slope of girder. Thickness tolerance variation from the approved shop drawings is 1/16"+/-, except variation from a plane parallel to the theoretical top surface can not exceed 1/16" total. Bearing surface tolerances listed in Item 424 apply to embedded and beveled plates.

Steel plate must conform to ASTM A36, A572 Gr 50, or A709 Gr 36 or Gr 50. Hot dip galvanize both the embedded plate and beveled sole plate after fabrication. Seal weld caps to embedded plate before galvanizing.

When determining if relocation of screw holes and studs are necessary for skewed girder ends, minimum clearance from screw or stud centerline to plate edge is 1.25".

Tap threads in the embedded plate only. Drill and tap prior to galvanizing.

¾" Dia screws must be electroplated, socket flat head countersunk cap screws conforming to ASTM F835. Electroplating must conform to ASTM B633, SC 2, Type I. Provide screws long enough to maintain a ¾" minimum embedment into the embedded plate and galvanized cap. Provide galvanized steel caps (16 ga Min) with a nominal 1" inside diameter and ½" deep or deeper than 1".

Install beveled sole plates prior to shipping girders. Installed screw heads must not protrude below the bottom of the beveled plate.

HL93 LOADING SHEET 3 OF 3

Texas Department of Transportation

Bridge Division Standard

ELASTOMERIC BEARING AND GIRDER END DETAILS
PRESTR CONCRETE I-GIRDERS

IGEB

FILE: igebsts1.dgn	DN: AEE	CK: JMH	DW: SFS	CK: TxDOT
©TxDOT October 2015 REVISIONS	CONT	SECT	JOB	HIGHWAY
				CR119
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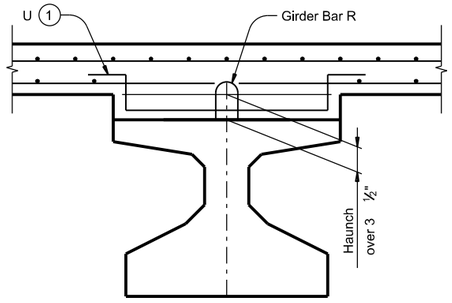
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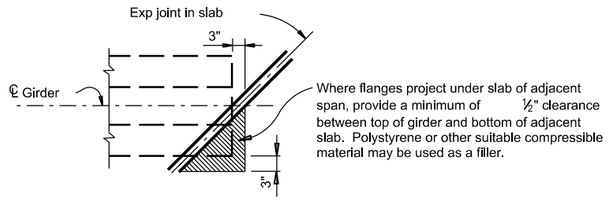
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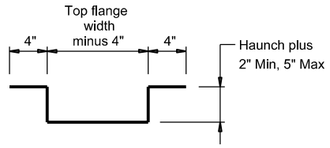
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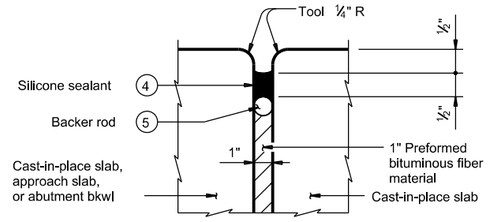
HAUNCH REINFORCING DETAIL



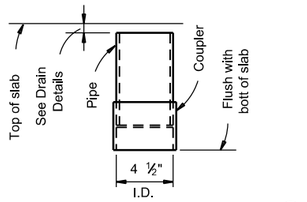
TREATMENT AT GIRDER END FOR SKEWED SPANS



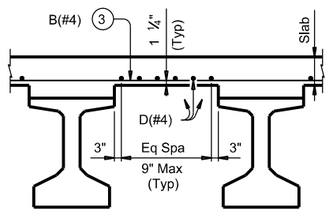
BARS U (#4)



TYPE A JOINT DETAIL 6

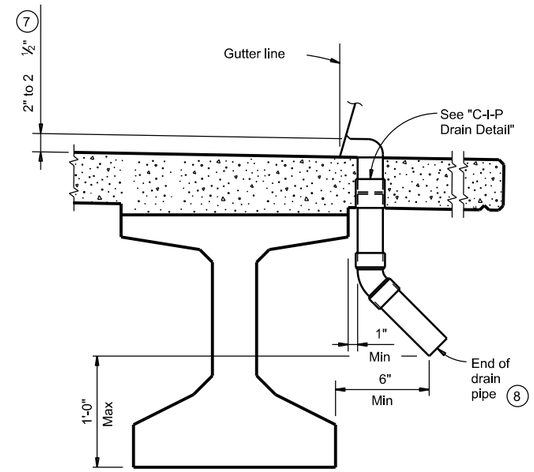


C-I-P DRAIN DETAIL 2



TYPICAL PART TRANSVERSE SLAB SECTION WITHOUT PCP

Top reinforcing steel not shown for clarity.



DRAIN DETAIL 9

1 Space Bars U with girder Bars R in all areas where measured haunch exceeds 3 ½".

2 Roughen outside of PVC with coarse rasp or equal to ensure bond with cast-in-place concrete.

3 Bars B(#4) spaced at 9" Max with 2" end cover. Overhang option, Contractor's may end alternating bars B(#4) at centerline outside girder.

4 Class 7 silicone sealant that conforms to DMS-6310. Install when ambient temperature is between 55°F and 85°F and rising. Engineer to determine allowable hours for sealant application.

5 1 ¼" backer rod must be compatible with joint sealant. Use of multiple pieces to create a backer rod cross section is not permitted. Top of backer rod must be convex as shown.

6 The maximum distance between Type A expansion joints is 100'. See Bridge Layout for location of joints. Type A joints are subsidiary to Item 422, "Concrete Superstructures".

7 Drain entrance formed in rail or sidewalk.

8 Water may not be discharged onto girders.

9 All drain pipe and fittings to be 4" diameter (Sch 40) PVC. See Item 481 "Pipe for Drains" for pipe, connections and solvent welding. Bend reinforcing steel to clear PVC 1". Drain length and location is as directed by the Engineer. Drains are not permitted over roadways or railways, or within 10'-0" of bent caps. Degrease outside of exposed PVC, apply acrylic water base primer, then coat with same surface finishing material as used for outside girder face. Variations of the above designs, as required for the type of rail used and its location on the structure, may be installed with the approval and direction of the Engineer.

GENERAL NOTES:
Designed according to AASHTO LRFD Bridge Design Specifications.
All items (reinforcing steel, drains, joint formers, etc.) shown on this sheet are subsidiary to other bid items.

Cover dimensions are clear dimensions, unless noted otherwise.
Reinforcing bar dimensions shown are out-to-out of bar.

DECK FORMWORK NOTES:
Overhang bracket hangers are limited to a safe working load of 3,600 lbs, applied to and along the axis of a coil rod at 45 degrees from vertical, regardless of higher loads permitted by hanger manufacturers. Do not place a hanger less than 12" from girder end. Space hangers accordingly.

SHEET 1 OF 2

Texas Department of Transportation

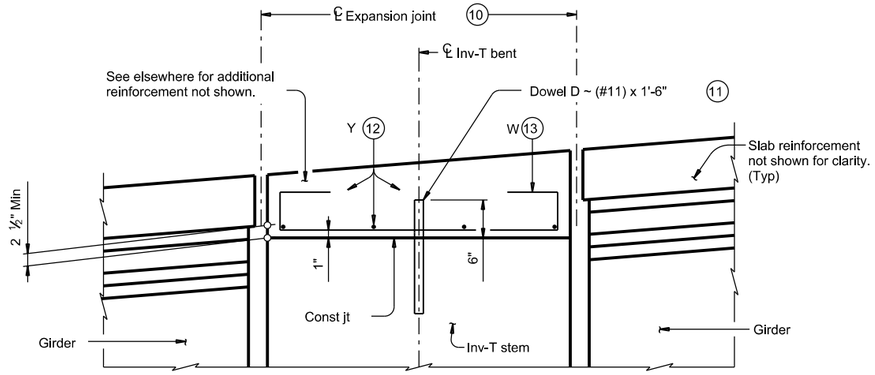
Bridge Division Standard

MISCELLANEOUS SLAB DETAILS

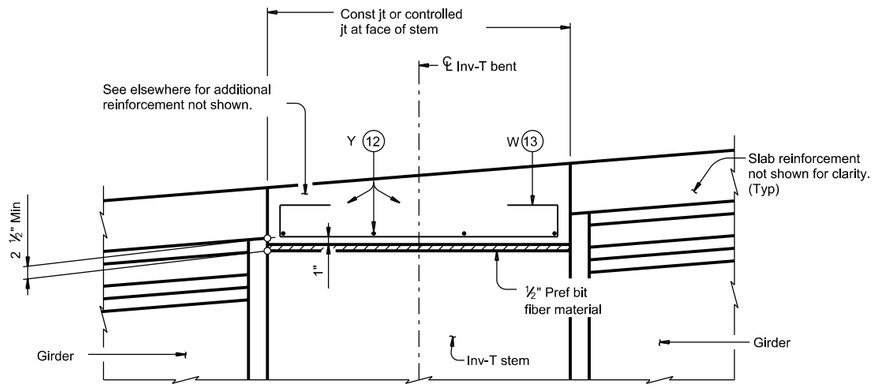
PRESTR CONCRETE I-GIRDERS

IGMS

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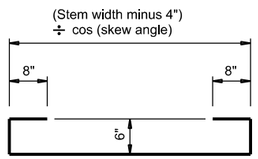


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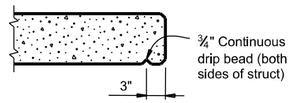


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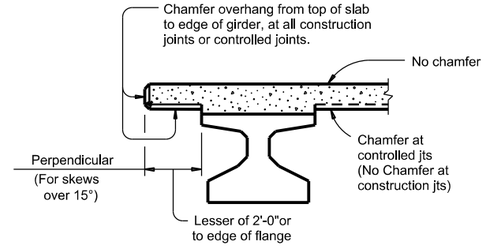
REINFORCEMENT OVER INV-T BENTS



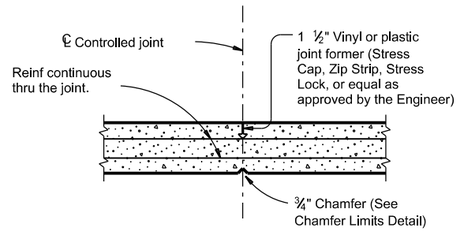
BARS W (#4)



DRIP BEAD DETAIL



CHAMFER LIMITS DETAIL (14)



CONTROLLED JOINT DETAIL

(Saw-cutting is not allowed)

(10) See Layout for joint type.

(11) Dowels D (#11) spaced at 5 Ft Max. See Inv-T bents for quantity and location.

(12) Space Bars Y (#4) at 12" Max. Use 2" end cover. Number of Bars Y must satisfy spacing limit. Place parallel to bent.

(13) Space Bars W at 12" Max (3" from end of cap). Tilt if necessary to maintain cover requirements. Place parallel to longitudinal slab reinforcement.

(14) See Span details for type of joint and joint locations.

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SHEET 2 OF 2

Texas Department of Transportation | Bridge Division Standard

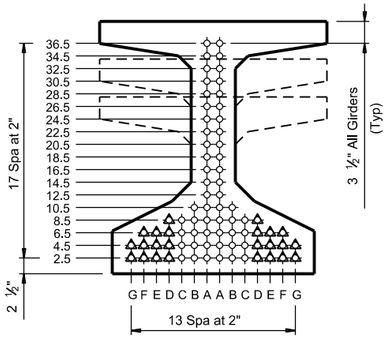
MISCELLANEOUS SLAB DETAILS

PRESTR CONCRETE I-GIRDERS

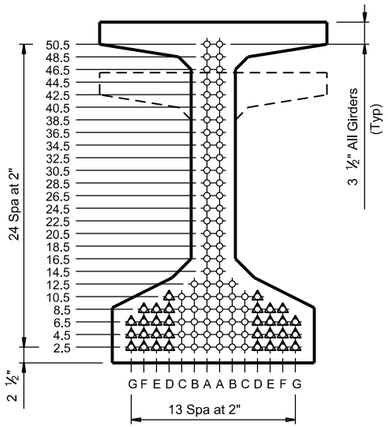
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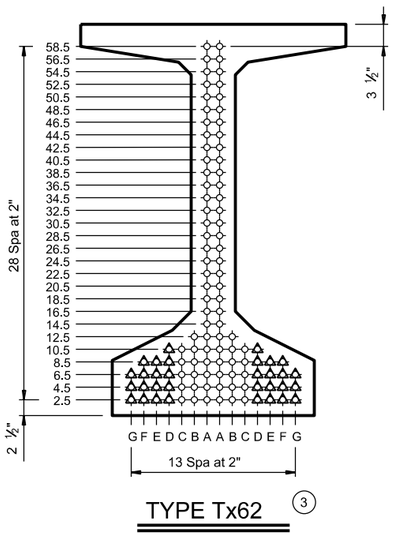
STRUCTURE	SPAN LENGTH	GIRDER NO.	GIRDER TYPE	DESIGNED GIRDERS (DEPRESSED STRANDS) PRESTRESSING STRANDS NON-STD STRAND PATTERN	TOTAL NO.	SIZE (in)	STRGTH fpu (ksi)	"e" ℄ (in)	"e" END (in)	DEPRESSED NO.	DEPRESSED TO (in)	CONCRETE RELEASE STRGTH ① f'cd (ksi)	CONCRETE MINIMUM 28 DAY COMP STRGTH f'c (ksi)	OPTIONAL DESIGN DESIGN LOAD COMP STRESS (TOP C) (SERVICE I) fct(ksi)	DESIGN LOAD TENSILE STRESS (BOTT C) (SERVICE III) fcb(ksi)	REQUIRED MINIMUM ULTIMATE MOMENT CAPACITY (STRENGTH I) (ft-kips)	LIVE LOAD DISTRIBUTION FACTOR ② Moment	LIVE LOAD DISTRIBUTION FACTOR ② Shear
Type Tx28 Girders 44' Roadway 8 ½" Slab	40	ALL		Tx28	14	1/2	270	10.48	10.48	0	0.0	4.000	5.000	1.046	-1.477	1379	0.760	0.960
	45	ALL		Tx28	14	1/2	270	10.48	10.48	0	0.0	4.000	5.000	1.323	-1.807	1507	0.740	0.970
	50	ALL		Tx28	18	1/2	270	10.04	10.04	0	0.0	4.000	5.000	1.634	-2.176	1773	0.710	0.970
	55	ALL		Tx28	22	1/2	270	9.75	9.03	4	8.5	4.000	5.500	1.980	-2.594	2079	0.700	0.980
	60	ALL		Tx28	28	1/2	270	9.48	6.62	4	24.5	4.000	6.100	2.355	-3.023	2374	0.680	0.980
	65	ALL		Tx28	34	1/2	270	8.95	5.77	6	24.5	4.600	6.700	2.761	-3.476	2675	0.660	0.980
	70	ALL		Tx28	40	1/2	270	8.58	5.88	6	24.5	5.400	7.000	3.201	-3.973	3010	0.650	0.990
Type Tx34 Girders 44' Roadway 8 ½" Slab	40	ALL		Tx34	12	1/2	270	13.01	13.01	0	0.0	4.000	5.000	0.828	-1.138	1590	0.790	0.940
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	85	ALL		Tx34	50	1/2	270	10.21	7.01	10	26.5	6.000	7.300	3.663	-4.266	4204	0.640	0.980
Type Tx40 Girders 44' Roadway 8 ½" Slab	40	ALL		Tx40	12	1/2	270	15.60	15.60	0	0.0	4.000	5.000	0.686	-0.924	1809	0.820	0.930
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	95	ALL		Tx40	52	1/2	270	12.60	7.60	10	36.5	5.500	6.300	3.713	-4.167	5146	0.640	0.970
Type Tx46 Girders 44' Roadway 8 ½" Slab	40	ALL		Tx46	12	1/2	270	17.60	17.60	0	0.0	4.000	5.000	0.605	-0.738	1886	0.850	0.920
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	90	ALL		Tx46	38	1/2	270	15.81	11.08	6	36.5	4.000	5.100	2.915	-3.040	4975	0.680	0.950
	95	ALL		Tx46	44	1/2	270	15.42	9.97	8	38.5	4.400	5.300	3.238	-3.345	5413	0.670	0.950
	100	ALL		Tx46	50	1/2	270	14.96	9.84	8	40.5	4.900	5.700	3.577	-3.663	5863	0.660	0.950
	105	ALL		Tx46	54	1/2	270	14.71	9.97	8	40.5	5.300	6.200	3.932	-3.994	6325	0.650	0.950
	110	ALL		Tx46	60	1/2	270	14.20	9.54	10	38.5	5.800	6.900	4.303	-4.336	6798	0.640	0.950
Type Tx54 Girders 44' Roadway 8 ½" Slab	40	ALL		Tx54	12	1/2	270	21.01	21.01	0	0.0	4.000	5.000	0.504	-0.603	1952	0.880	0.910
	45	ALL		Tx54	12	1/2	270	21.01	21.01	0	0.0	4.000	5.000	0.629	-0.731	2306	0.850	0.910
	50	ALL		Tx54	14	1/2	270	21.01	21.01	0	0.0	4.000	5.000	0.771	-0.879	2723	0.820	0.910
	55	ALL		Tx54	16	1/2	270	20.76	20.76	0	0.0	4.000	5.000	0.928	-1.040	3172	0.800	0.920
	60	ALL		Tx54	16	1/2	270	20.76	20.76	0	0.0	4.000	5.000	1.097	-1.211	3167	0.780	0.920
	65	ALL		Tx54	16	1/2	270	20.76	20.76	0	0.0	4.000	5.000	1.278	-1.390	3117	0.760	0.920
	70	ALL		Tx54	18	1/2	270	20.56	20.56	0	0.0	4.000	5.000	1.476	-1.586	3475	0.750	0.920
	75	ALL		Tx54	20	1/2	270	20.41	20.41	0	0.0	4.000	5.000	1.683	-1.783	3848	0.730	0.930
	80	ALL		Tx54	22	1/2	270	20.28	20.28	0	0.0	4.000	5.000	1.907	-1.999	4262	0.720	0.930
	85	ALL		Tx54	26	1/2	270	20.08	19.47	4	8.5	4.000	5.000	2.144	-2.226	4690	0.710	0.930
	90	ALL		Tx54	30	1/2	270	19.81	18.61	6	12.5	4.000	5.000	2.394	-2.462	5131	0.700	0.930
	95	ALL		Tx54	34	1/2	270	19.48	17.71	6	16.5	4.000	5.000	2.657	-2.709	5584	0.690	0.930
	100	ALL		Tx54	40	1/2	270	19.11	14.01	6	40.5	4.000	5.000	2.934	-2.966	6050	0.680	0.940
	105	ALL		Tx54	46	1/2	270	18.66	11.70	8	48.5	4.200	5.000	3.223	-3.232	6528	0.670	0.940
	110	ALL		Tx54	50	1/2	270	18.37	11.97	8	48.5	4.600	5.400	3.526	-3.509	7018	0.660	0.940
	115	ALL		Tx54	56	1/2	270	17.94	10.79	10	50.5	4.900	5.900	3.841	-3.796	7521	0.650	0.940
	120	ALL		Tx54	60	1/2	270	17.61	11.94	10	44.5	5.500	6.500	4.177	-4.110	8097	0.650	0.940
	125	ALL		Tx54	66	1/2	270	17.07	10.89	12	46.5	5.800	7.300	4.519	-4.417	8626	0.640	0.940
Type Tx62 Girders 44' Roadway 8 ½" Slab	60	ALL		Tx62	18	1/2	270	25.33	25.33	0	0.0	4.000	5.000	0.860	-1.010	3761	0.800	0.910
	65	ALL		Tx62	18	1/2	270	25.33	25.33	0	0.0	4.000	5.000	1.004	-1.166	3984	0.790	0.910
	70	ALL		Tx62	18	1/2	270	25.33	25.33	0	0.0	4.000	5.000	1.155	-1.323	3942	0.770	0.910
	75	ALL		Tx62	18	1/2	270	25.33	25.33	0	0.0	4.000	5.000	1.318	-1.495	4025	0.760	0.920
	80	ALL		Tx62	20	1/2	270	25.18	25.18	0	0.0	4.000	5.000	1.488	-1.667	4427	0.740	0.920
	85	ALL		Tx62	22	1/2	270	25.05	25.05	0	0.0	4.000	5.000	1.671	-1.855	4873	0.730	0.920
	90	ALL		Tx62	24	1/2	270	24.94	24.94	0	0.0	4.000	5.000	1.864	-2.052	5334	0.720	0.920
	95	ALL		Tx62	28	1/2	270	24.78	24.49	4	6.5	4.000	5.000	2.067	-2.257	5808	0.710	0.920
	100	ALL		Tx62	32	1/2	270	24.40	23.28	6	12.5	4.000	5.000	2.280	-2.470	6296	0.700	0.920
	105	ALL		Tx62	36	1/2	270	24.11	22.44	6	16.5	4.000	5.000	2.503	-2.692	6797	0.690	0.930
	110	ALL		Tx62	42	1/2	270	23.78	18.35	6	44.5	4.000	5.000	2.735	-2.922	7311	0.680	0.930
	115	ALL		Tx62	46	1/2	270	23.43	15.08	8	56.5	4.000	5.000	2.978	-3.160	7837	0.670	0.930
	120	ALL		Tx62	50	1/2	270	23.14	16.42	8	50.5	4.500	5.300	3.231	-3.406	8377	0.660	0.930
	125	ALL		Tx62	56	1/2	270	22.71	14.13	10	58.5	4.700	5.500	3.500	-3.676	8995	0.660	0.930
	130	ALL		Tx62	60	1/2	270	22.38	15.38	10	52.5	5.200	6.200	3.772	-3.939	9563	0.650	0.930
	135	ALL		Tx62	66	1/2	270	21.84	13.47	12	58.5	5.400	6.300	4.055	-4.211	10143	0.640	0.940



TYPE Tx28,Tx34 & Tx40 ③



TYPE Tx46 & Tx54 ③



TYPE Tx62 ③

DESIGN NOTES:

Designed in accordance with AASHTO LRFD Bridge Design Specifications.

Optional designs for girders 120 feet or longer must have a calculated residual camber equal to or greater than that of the designed girder.

Prestress losses for the designed girders have been calculated for a relative humidity of 60 percent. Optional designs must likewise conform.

FABRICATION NOTES:

Provide Class H concrete.

Provide Grade 60 reinforcing steel.

When shown on this sheet, the Fabricator has the option of furnishing either the designed depressed strand girder or an approved optional design. All optional design submittals must be signed, sealed and dated by a registered Professional Engineer.

For depressed strand designed girders, locate strands as low as possible on the 2" grid system unless a Non-Standard Strand Pattern is indicated. Fill row "2.5", then row "4.5", then row "6.5", etc., beginning each row in the "A" position and working outward until the required number of strands is reached. All strands in the "A" position must be depressed, maintaining the 2" spacing so that, at the girder ends, the upper two strands are in the position shown in the table.

Strands for the designed girder must be low relaxation strands pretensioned to 75 percent of fpu each.

Seal cracks in girder ends exceeding 0.005" in width as directed by the Engineer. The Fabricator is permitted to decrease the spacing of Bars R and S by providing additional bars to help limit crack width provided the decreased spacing results in no less than 1" clear between bars. The Fabricator must take an approved corrective action if cracks greater than 0.005" form on a repetitive basis.

① Based on the following allowable stresses (ksi):

Compression = 0.65 f'ci

Tension = 0.24 $\sqrt{f'ci}$

Optional designs must likewise conform.

② Portion of full HL93.

③ Full-length debonded strands are only permitted in strand positions marked . Double wrap full-length debonded strands in outermost position of each row. Full-length debonding must comply with Item 425.4.2.2.2.4

HL93 LOADING

Texas Department of Transportation — Bridge Division Standard

PRESTRESSED CONCRETE I-GIRDER STANDARD DESIGNS

44' ROADWAY

IGSD-44

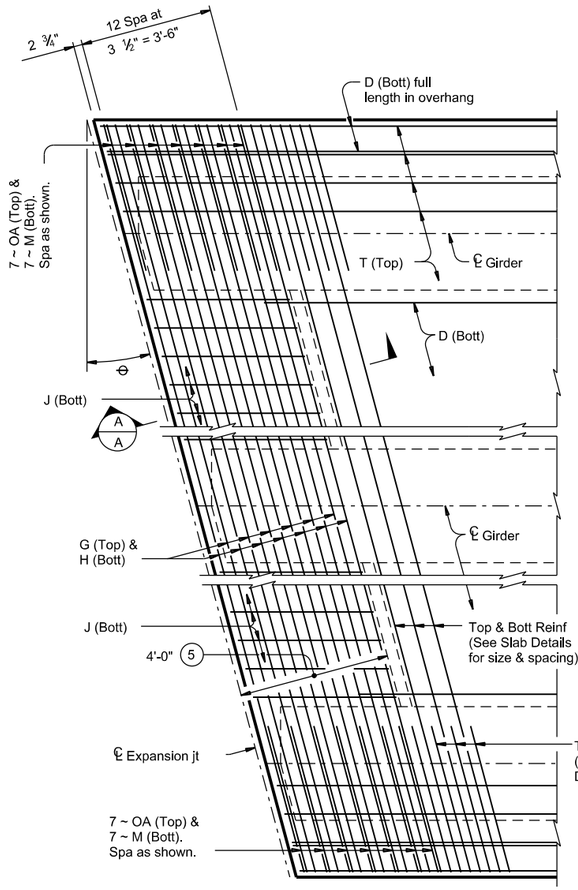
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		06	WILLIAMSON		215

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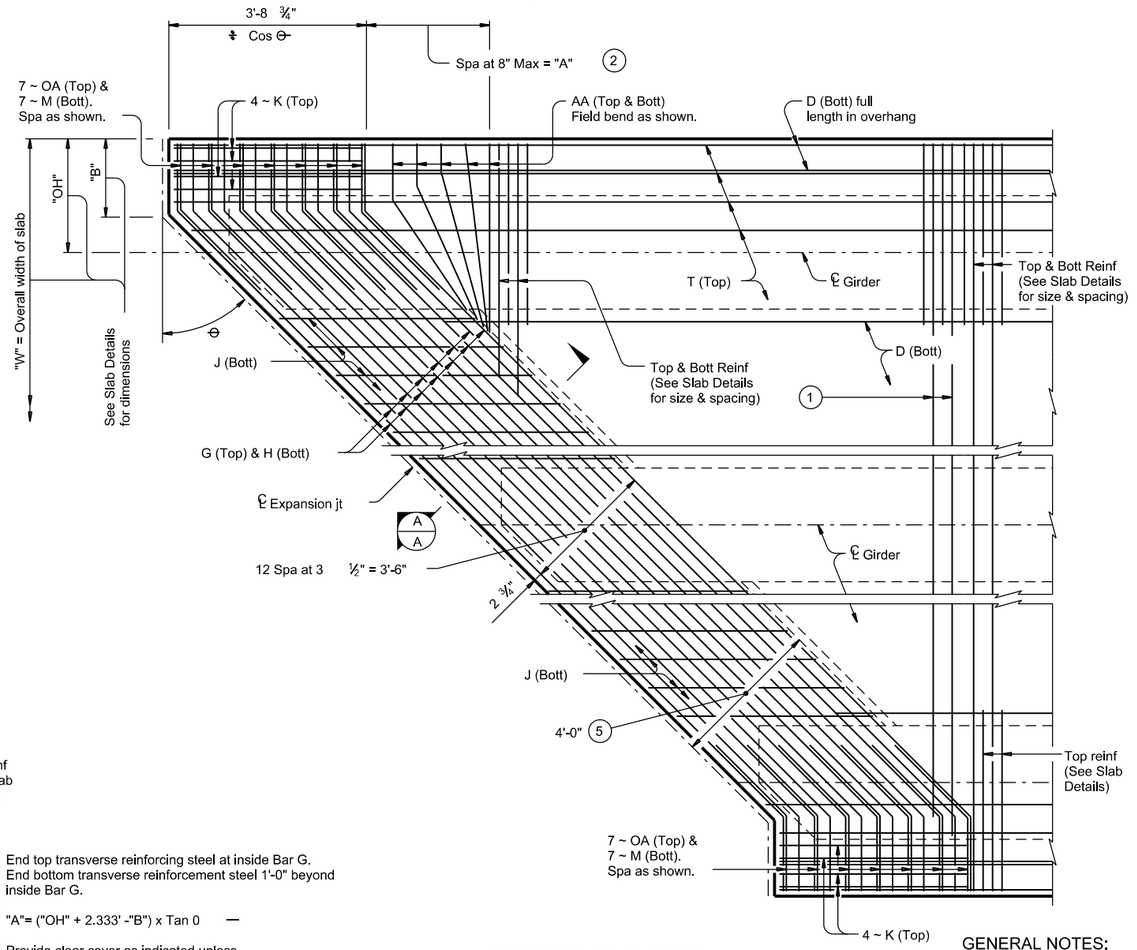
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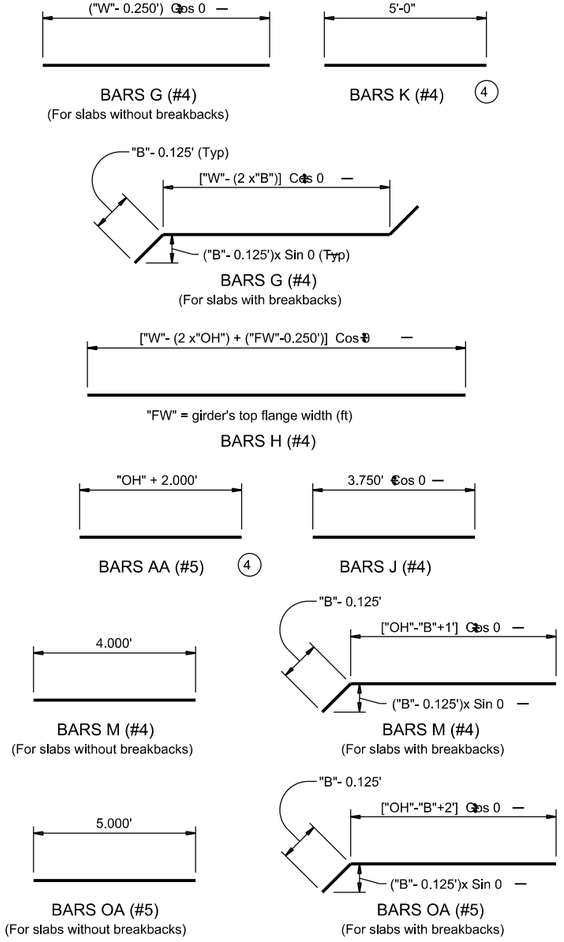


PARTIAL PLAN FOR SLABS WITHOUT BREAKBACK



PARTIAL PLAN FOR SLABS WITH BREAKBACK

1. End top transverse reinforcing steel at inside Bar G. End bottom transverse reinforcement steel 1'-0" beyond inside Bar G.
2. "A"= ("OH" + 2.333' -"B") x Tan 0 —
3. Provide clear cover as indicated unless otherwise shown on Span Details.
4. Only required on slabs with breakbacks.
5. Thickened slab end dimensioned perpendicular to face of bkwl, centerline interior bent or face of inverted-T stem.



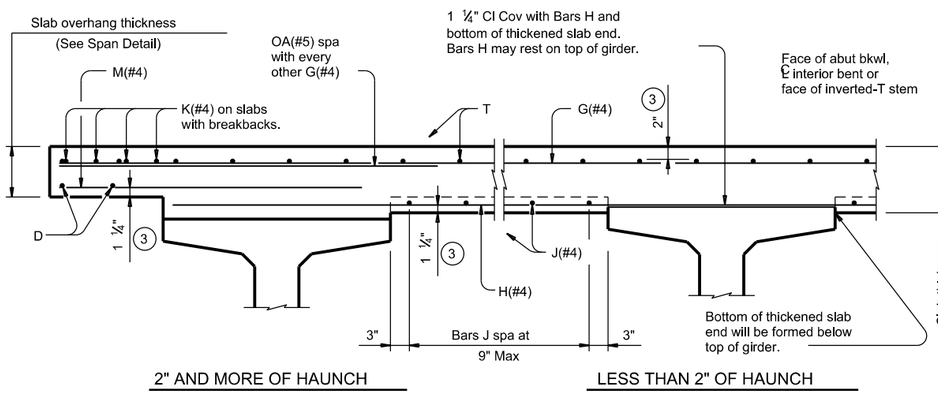
GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications.
These details are restricted to Prestressed Concrete I-Girder Spans.
These details are to be used in conjunction with the Span Details and PCP standard (if prestressed concrete panels are used).
When Option 2 from PCP standard is used, provide Bars AA, G, K and OA in the slab.

MATERIAL NOTES:

Provide Grade 60 reinforcing steel.
If slab reinforcing steel is shown on the Slab Details to be epoxy coated, then Bars AA, G, K, H, J, M and OA must be epoxy coated.
Provide bar laps, where required, as follows:
Uncoated ~ #4 = 1'-5"
Epoxy Coated ~ #4 = 2'-1"

Cover dimensions are clear dimensions, unless noted otherwise.
Reinforcing bar dimensions shown are out-to-out of bar.

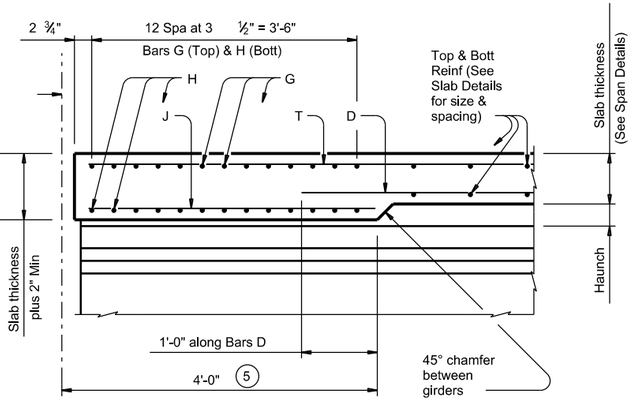


2" AND MORE OF HAUNCH

LESS THAN 2" OF HAUNCH

TYPICAL TRANSVERSE SECTION

(Showing Prestressed Conc I-Girders at L Brg) C



SECTION A-A

(Showing with 2" and more of haunch)

HL93 LOADING

Texas Department of Transportation | Bridge Division Standard

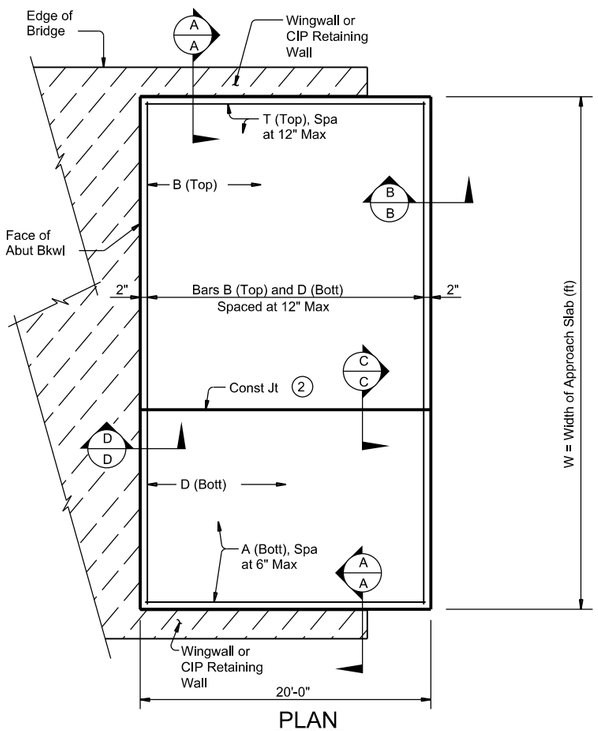
THICKENED SLAB END DETAILS

PRESTRESSED CONCRETE I-GIRDER SPANS

IGTS

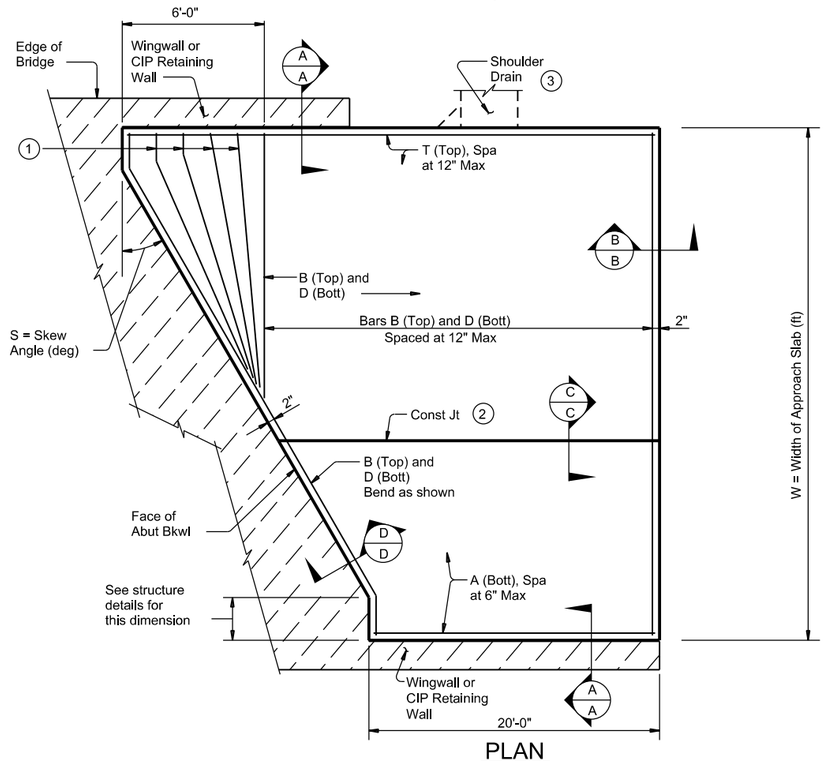
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©TxDOT	October 2015	CONT	SECT	JOB	HIGHWAY
REVISIONS					CR119
		DIST	COUNTY		SHEET NO.
		06	WILLIAMSON		216

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PLAN

(Showing Non-Skewed Approach Slab)



PLAN

(Showing Skewed Approach Slab)

BAR TABLE	
BAR	SIZE
A	#8
B	#5
D	#5
T	#5

APPROXIMATE QUANTITIES (4)

Reinf steel weight = 8.5 Lbs/SF of Approach Slab

Volume of Appr Slab Conc (CY) = 0.802W + 0.02W² Tan S

W = Width of Approach Slab (ft)

S = Skew Angle (deg)

(1) Flare Bars B and D in this region (1'-6" Max Spa, 3" Min Spa). Minimum flared bar length = 2'-6". Bend bars as necessary.

(2) Provide longitudinal construction joints that align with longitudinal construction joints in the bridge slab with bridges built in stages. Other longitudinal construction joints must receive approval of the Engineer.

(3) See details elsewhere in plans for shoulder drain location and details.

(4) For Contractor's information only.

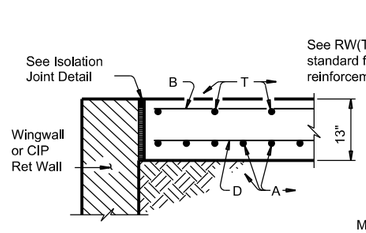
(5) Multiple piece tie bars are acceptable at longitudinal construction joints provided minimum laps shown are achieved.

(6) See details elsewhere in plans for required cross-slope.

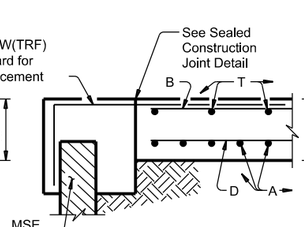
(7) Place in accordance with Item 438.

(8) Backer rod shall be 25% larger than joint opening and shall be compatible with the sealant.

(9) Place ½" Preformed Bituminous Fiber Material between concrete railing and top of approach slab as shown when concrete railing projects over the approach slab.

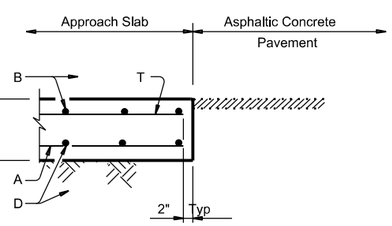


SHOWING WINGWALL OR CIP RETAINING WALL

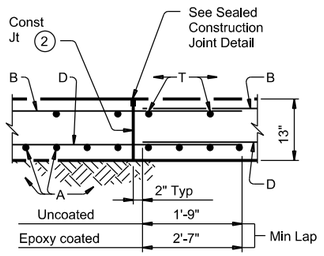


SHOWING MSE WALL

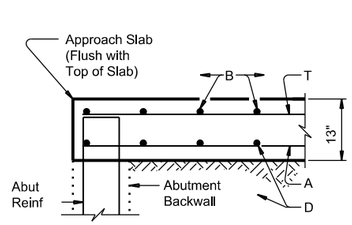
SECTION A-A



SECTION B-B



SECTION C-C (5)



SECTION D-D

GENERAL NOTES:

Construct approach slab in accordance with Item 422.

Provide Class "S" concrete with a minimum compressive strength of 4,000 psi.

Provide Grade 60 reinforcing steel.

Construct the subgrade or subbase from the bridge for a minimum distance of 100 feet prior to the approach slab, unless otherwise indicated on the plans.

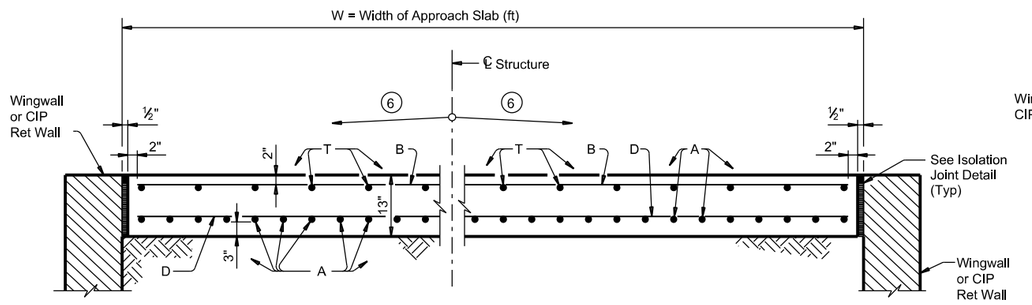
Compact and finish the subgrade or foundation for the approach slab to the typical cross-section and to the lines and grades shown on the plans.

Cure for 4 days using water or membrane curing per Item 422.

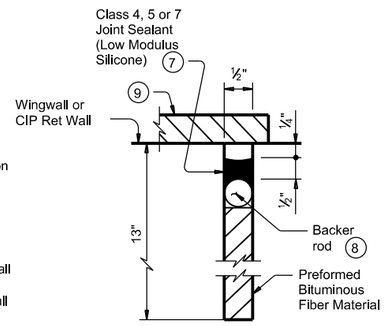
Sealant, backer rod and preformed bituminous fiber material are subsidiary to approach slab concrete.

Provide a 1" bondbreaker (asphaltic concrete pavement or asphalt stabilized base) between the approach slab and cement stabilized backfill or cement treated base. Other bondbreakers may be used if approved by the Engineer.

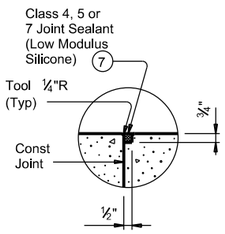
Cover dimensions are clear dimensions, unless noted otherwise.



TYPICAL TRANSVERSE SECTION



ISOLATION JOINT DETAIL



SEALED CONSTRUCTION JOINT DETAIL

Texas Department of Transportation

Bridge Division Standard

BRIDGE APPROACH SLAB

ASPHALTIC CONCRETE PAVEMENT

BAS-A

FILE: basaste1.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT January 2015	CONT	SECT	JOB	HIGHWAY
REVISIONS				CR119
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	06	WILLIAMSON		217

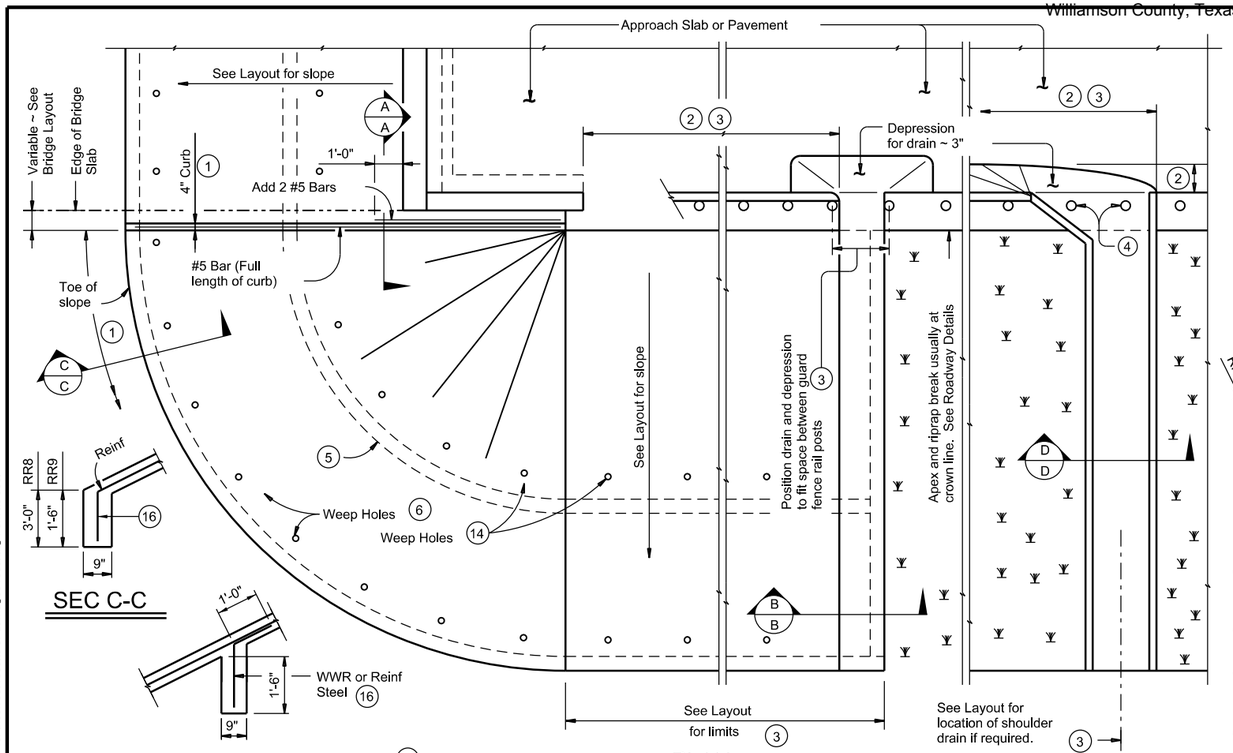
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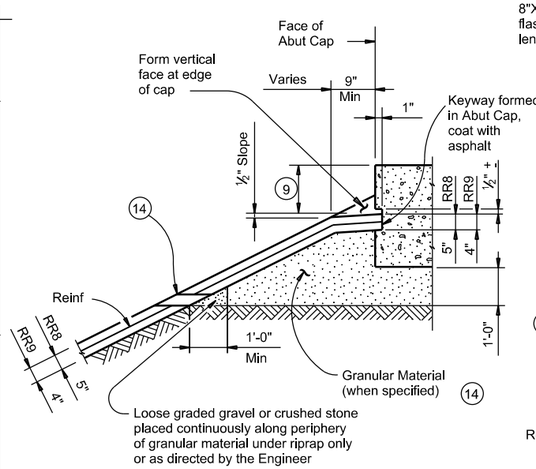
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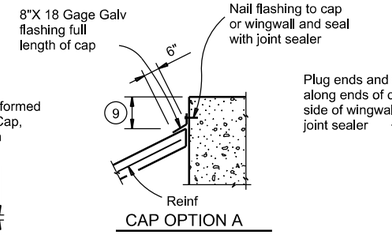
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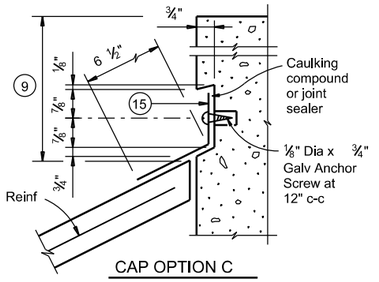
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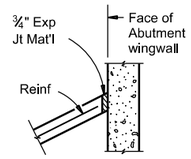
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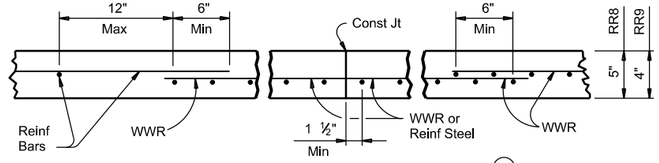






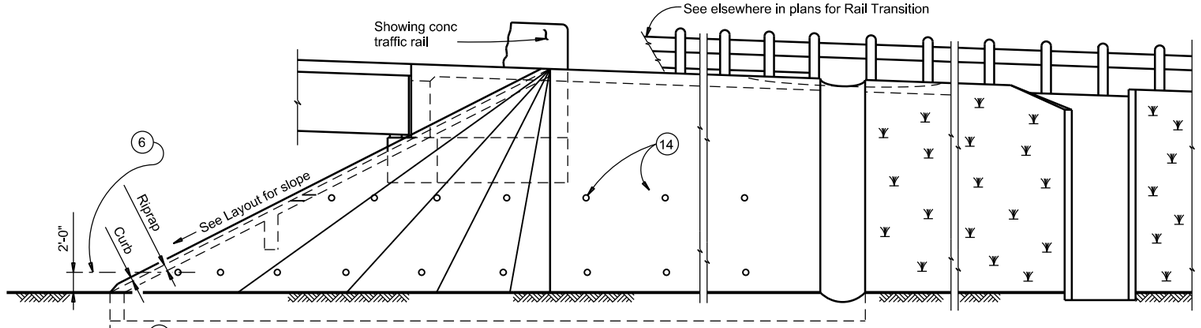


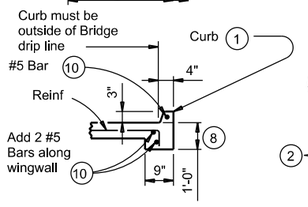
SECTIONS THRU RIPRAP AT CAP

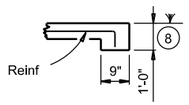


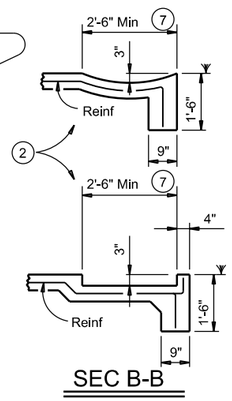
See General Notes for optional sythetic fiber reinforcement.

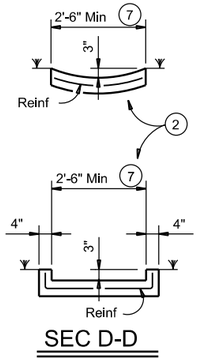
1. When riprap is shown extended around header on layout, extend slab and toewall as shown and eliminate 4" curb.
2. Limits and configuration of drains and depressions are as shown elsewhere in plans or as directed by the Engineer.
3. Location of shoulder drain must consider limitations imposed by rail 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.

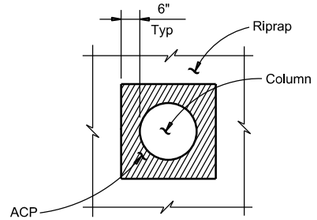












FOR CONTRACTOR'S INFORMATION ONLY:
5" of RR8 = 0.015 CY/SF
4" of RR9 = 0.012 CY/SF
#3 Reinf at 18" c-c = 0.501 Lbs/SF
6x6-D3xD3 = 0.408 Lbs/SF

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

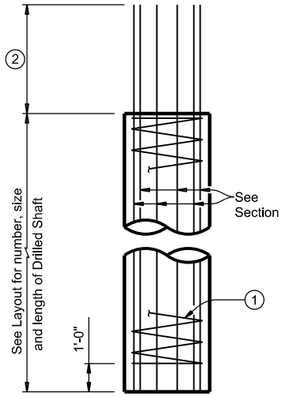
CONCRETE RIPRAP AND SHOULDER DRAINS
EMBANKMENTS AT BRIDGE ENDS (TYPES RR8 & RR9)

CRR

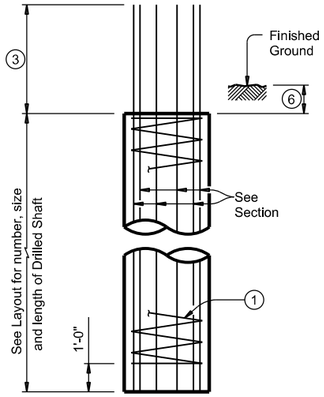
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©TxDOT January 2015 REVISIONS	CONT	SECT	JOB	HIGHWAY
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	06	WILLIAMSON		218

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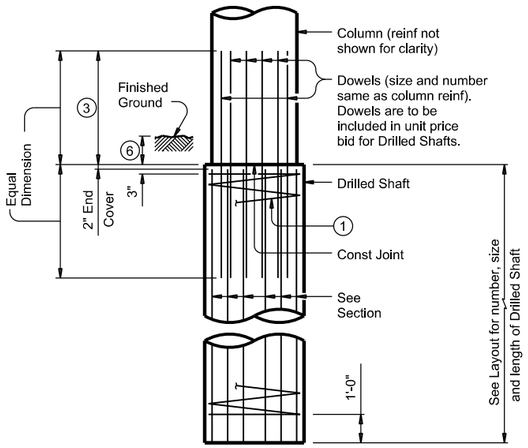
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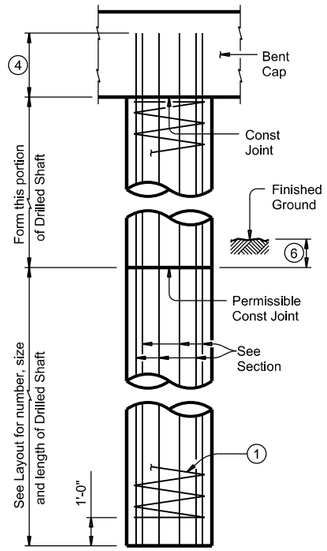
ABUTMENTS, WINGWALLS AND MULTI-DRILLED SHAFT FOOTINGS



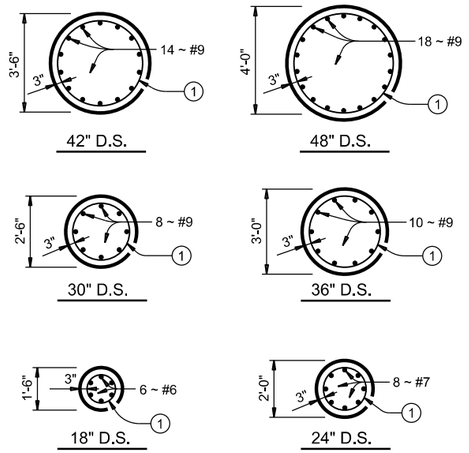
INTERIOR BENTS DRILLED SHAFT DIA EQUAL TO COLUMN DIA



INTERIOR BENTS DRILLED SHAFT DIA GREATER THAN COLUMN DIA



OPTIONAL INTERIOR BENT DRILLED SHAFT DETAIL (5)

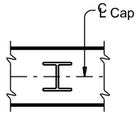


DRILLED SHAFT SECTIONS

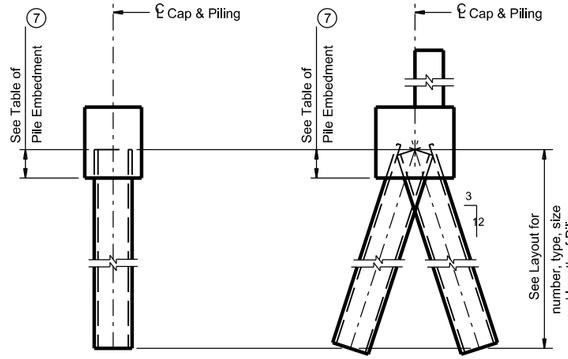
DRILLED SHAFT DETAILS

TABLE OF PILE EMBEDMENT	
Pile Type	Embedment Depth (Ft)
16" Sq Concrete 18" Sq Concrete HP14 Steel HP16 Steel	1'-0"
20" Sq Concrete 24" Sq Concrete HP18 Steel	1'-6"

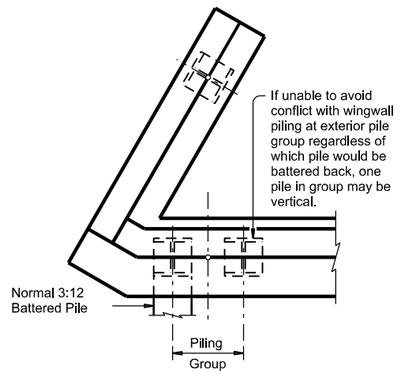
See standard CP for additional details on concrete pile embedment.



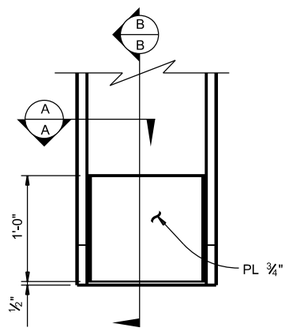
ORIENTATION OF STEEL H-PILING



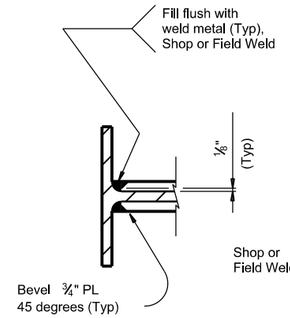
PILING DETAILS
(Concrete or Steel H)



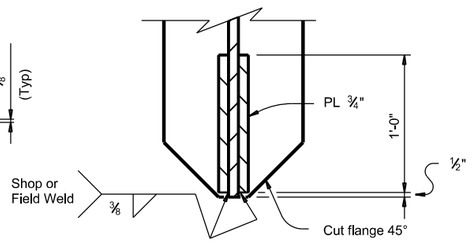
DETAIL "A"
(Showing Plan View of a 30° Skewed Abutment)



ELEVATION



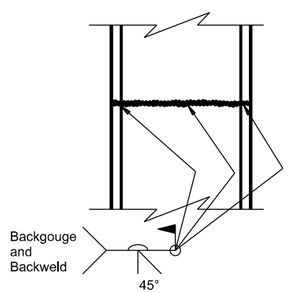
SECTION A-A



SECTION B-B

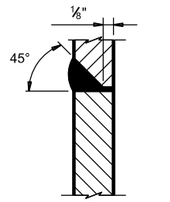
STEEL H-PILE TIP REINFORCEMENT

See Item 407 "Steel Piling" to determine when tip reinforcement is required and for options to the details shown.



STEEL H-PILE SPLICE DETAIL

Use when required.



SECTION THRU FLANGE OR WEB

(1) #3 Spiral at 6" pitch (One and a half flat turns top & bottom).

(2) Min extension into supported element:
#6 Bars = 1'-6"
#7 Bars = 1'-8"
#9 Bars = 2'-3"

(3) Min lap with Column reinf:
#7 Bars = 2'-9"
#9 Bars = 4'-6"

(4) Min extension into supported element:
#6 Bars = 1'-6"
#7 Bars = 1'-8"
#9 Bars = 2'-8"

(5) Drilled Shafts may extend to the bottom of bent caps for "H" heights of 6 ft and less (as shown on the Bridge Layout), if approved. This option can only be used when the Drilled Shaft diameter equals the Column diameter. Obtain approval of the forming method above the ground line prior to construction. No adjustments in payment will be made if this option is used.

(6) 1'-0" Min

(7) Or as shown on plans.

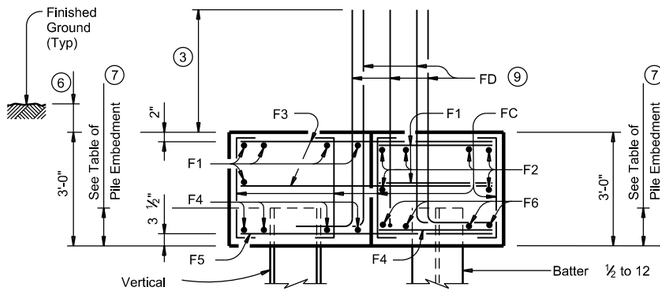
SHEET 1 OF 2

Texas Department of Transportation | Bridge Division Standard

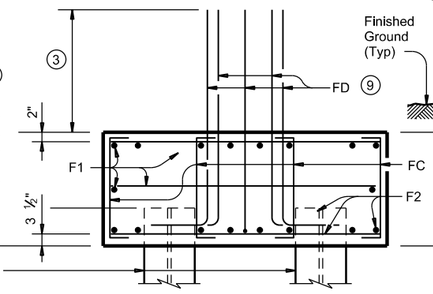
COMMON FOUNDATION DETAILS

FD

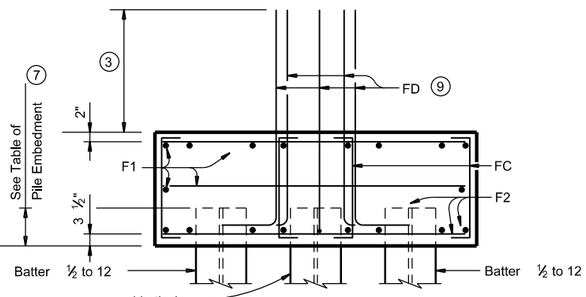
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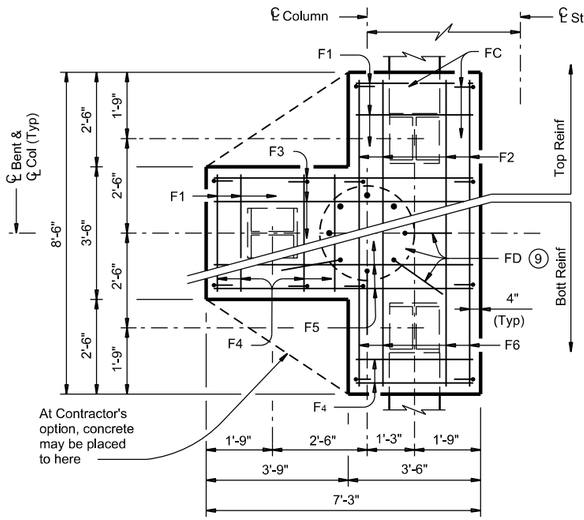
ELEVATION



ELEVATION



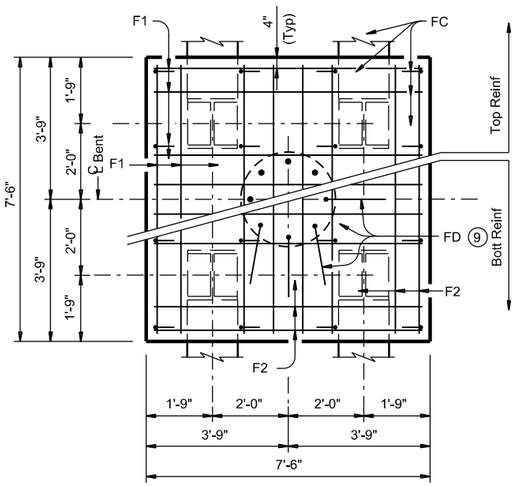
ELEVATION



PLAN

THREE PILE FOOTING ⑧

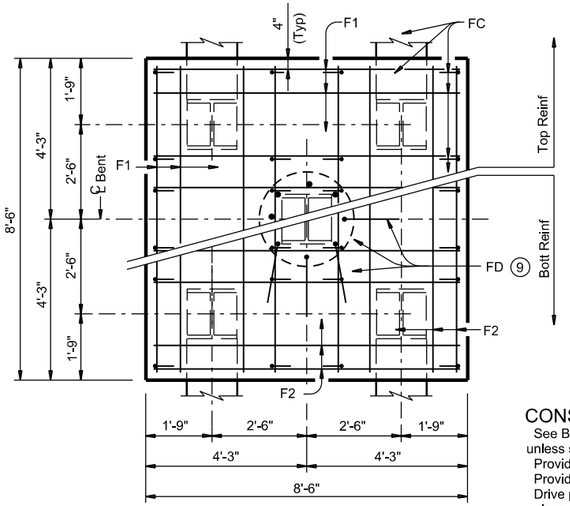
For 36" Dia and smaller columns.



PLAN

FOUR PILE FOOTING ⑧

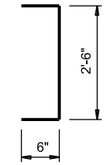
For 42" Dia and smaller columns.



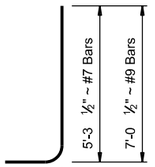
PLAN

FIVE PILE FOOTING ⑧

For 42" Dia and smaller columns.



BARS FC



BARS FD ⑨

TABLE OF FOOTING QUANTITIES FOR 30" COLUMNS

ONE 3 PILE FOOTING				
Bar	No.	Size	Length	Weight
F1	11	#4	3'- 2"	23
F2	6	#4	8'- 2"	33
F3	6	#4	6'- 11"	28
F4	8	#9	3'- 2"	86
F5	4	#9	6'- 11"	94
F6	4	#9	8'- 2"	111
FC	12	#4	3'- 6"	28
FD ⑩	8	#9	8'- 8"	236
Reinforcing Steel			Lb	639
Class "C" Concrete			CY	4.8

ONE 4 PILE FOOTING				
Bar	No.	Size	Length	Weight
F1	20	#4	7'- 2"	96
F2	16	#8	7'- 2"	306
FC	16	#4	3'- 6"	37
FD ⑪	8	#9	8'- 8"	236
Reinforcing Steel			Lb	675
Class "C" Concrete			CY	6.3

ONE 5 PILE FOOTING				
Bar	No.	Size	Length	Weight
F1	20	#4	8'- 2"	109
F2	16	#9	8'- 2"	444
FC	24	#4	3'- 6"	56
FD ⑪	8	#9	8'- 8"	236
Reinforcing Steel			Lb	845
Class "C" Concrete			CY	8.0

CONSTRUCTION NOTES:

See Bridge Layout for foundation type required. Use these foundation details unless shown otherwise.

Provide Class C Concrete (f'c = 3600 psi), unless shown otherwise.

Provide Grade 60 reinforcing steel.

Drive piling under abutment wingwalls to a minimum resistance of 10 Tons/Pile unless shown otherwise.

GENERAL NOTES:

Designed according to AASHTO LRFD Specifications.

Cover dimensions are clear dimensions, unless noted otherwise.
Reinforcing bar dimensions shown are out-to-out of bar.

DESIGNER NOTES:

Do not use the Drilled Shaft details shown on this standard for retaining wall, noise wall, barrier or sign foundations without structural evaluation.

Do not use the footings shown on this standard in direct contact with salt water or exposed to salt water spray.

Maximum allowable pile loads for the footings shown are :

72 Tons/Pile with 24" Dia Columns
80 Tons/Pile with 30" Dia Columns
100 Tons/Pile with 36" Dia Columns
120 Tons/Pile with 42" Dia Columns

③ Min lap with Column reinf:
#7 Bars = 2'-9"
#9 Bars = 4'-6"

⑥ 1'-0" Min

⑦ Or as shown on plans.

⑧ See Layout for Type, Size and length of Piling.

⑨ Number and size of FD bars must match Column reinforcing. Tie FD bars to the top of the bottom reinforcing mat.

⑩ For 24" Columns, use #7 FD bars (6'-6") in place of #9 bars and deduct 130 lbs.
For 36" Columns, add 2 FD bars (59 lbs).

⑪ For 24" Columns, use #7 FD bars (6'-6") in place of #9 bars and deduct 130 lbs.
For 36" Columns, add 2 FD bars (59 lbs).
For 42" Columns, add 6 FD bars (177 lbs)
(42" Columns disallowed on 3 Pile Footings)

Texas Department of Transportation

Bridge Division Standard

COMMON FOUNDATION DETAILS

FD

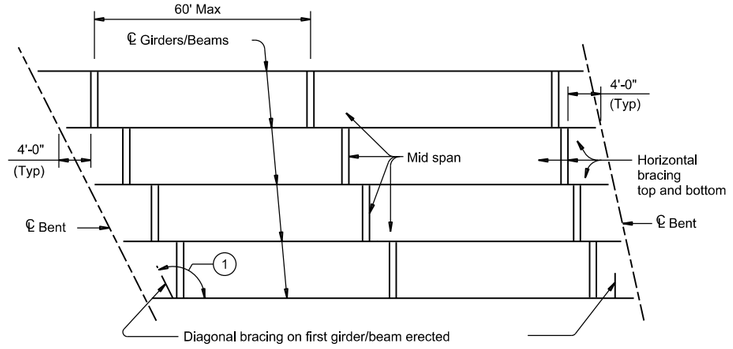
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©TxDOT January 2015	CONT	SECT	JOB	HIGHWAY
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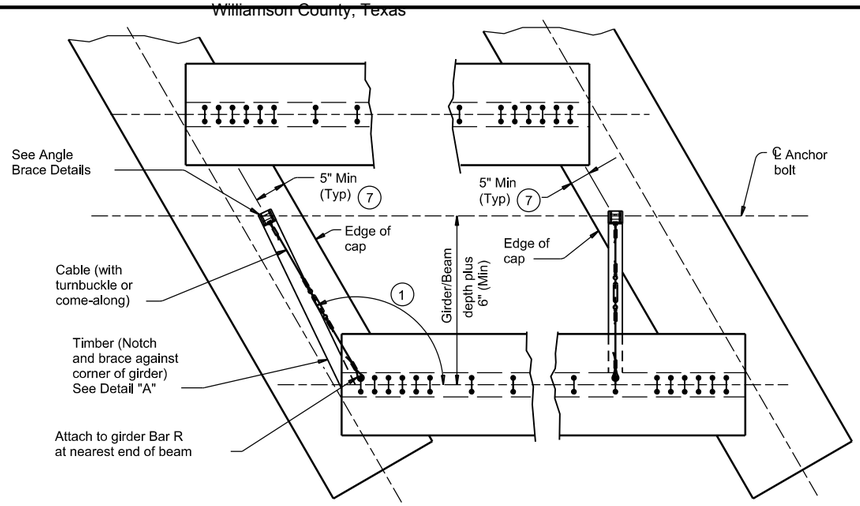
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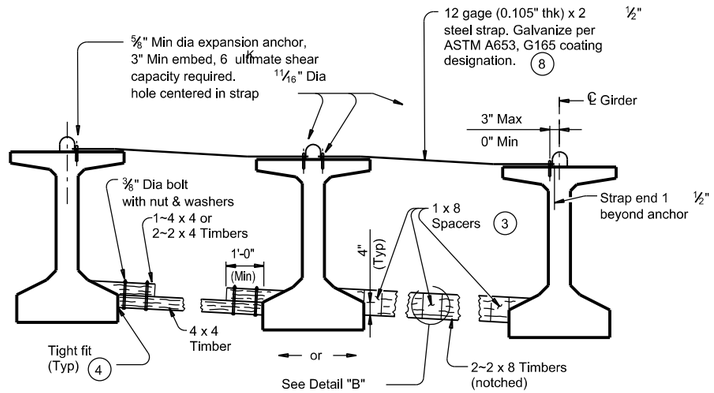
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ERECTION BRACING

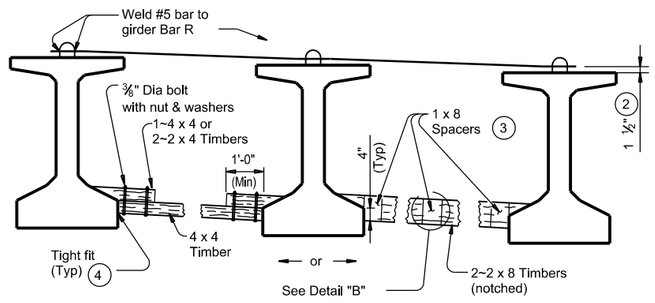


PLAN



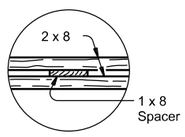
FOR ERECTION BRACING, OPTION 1

(This option is not allowed when slab is formed with PMDF or plywood.)



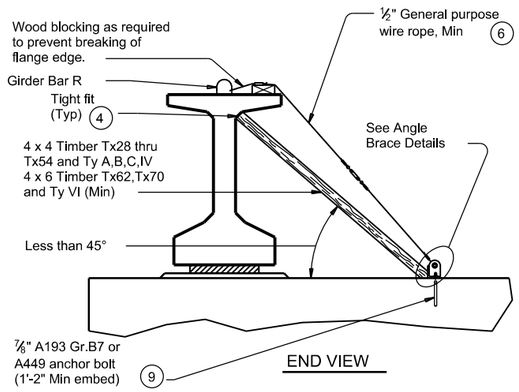
FOR ERECTION BRACING, OPTION 2

HORIZONTAL BRACING DETAILS 5



PLAN

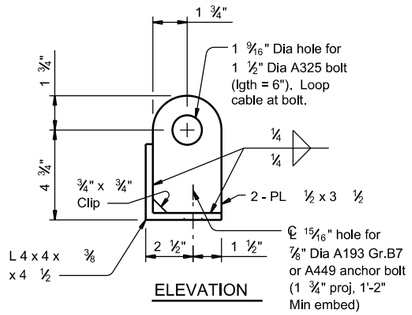
DETAIL "B"



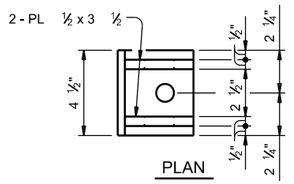
END VIEW

DIAGONAL BRACING DETAILS 5

(To be used on both ends of the first girder/beam erected in the span in each phase.)



ELEVATION



PLAN

ANGLE BRACE DETAILS

HAULING & ERECTION:

The Contractor's attention is directed to the possible lateral instability of prestressed concrete girders and beams over 130' long, especially during hauling and erection. The use of the following methods to improve stability is encouraged: Locate lifting devices at the maximum practical distance from girder ends; use external lateral stiffening devices during hauling and erection; lift with vertical lines using two machines; and take care in handling to minimize inertial and impact forces.

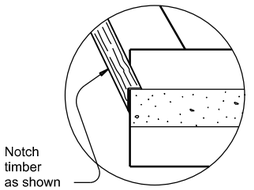
ERECTION BRACING:

Erection bracing details shown are considered the minimum for fulfilling the bracing requirements of Item 425.

Required erection bracing must be placed immediately after erection of each girder and remain in place until additional bracing as required for slab placement is in place. This standard is needed in all cases to meet requirements for Slab Placement Bracing.

PHASED CONSTRUCTION:

Place erection and slab placement bracing for all girders in a phase as shown in these details. For phases after first, also place erection and slab placement bracing between outer girder of completed phase and adjacent girder of current phase. When the phase construction joint is between girders, top bracing can be omitted.



DETAIL "A"

(1) If angle shown exceeds 120 degrees, move diagonal brace to other side of girder/beam and place square to girder/beam. This may prevent exterior girder from being erected first.

(2) Place and weld #5 bars as shown during erection. If forming deck with prestressed panels, bars can be temporarily removed, one at a time, during panel erection. Re-install bar prior to additional panel erection. Bars can rest on panels and be bent down and welded to girder Bars R (See Sheet 2 of 2).

(3) Clear distance between spacers must not exceed 3'. Nail together with 16d nails.

(4) Use wedges as necessary to obtain tight fit. Nail wedges to timbers.

(5) Pressure treated landscape timbers can not be used.

(6) All hardware used with cable must be able to develop a minimum 25 kips breaking strength. Use thimbles at all loops in cable. Install cable clamps with saddles bearing against the live end and U-bolts bearing aginst the dead end.

(7) It is acceptable to tie anchor bolts to cap reinforcement.

(8) Prior to installing, field bend strap to lay flush on both girders' top flange and slope between flange tips.

(9) Anchor bolt may be drilled and epoxied in place. Provide 25k minimum pullout. Core drill hole.

SHEET 1 OF 2

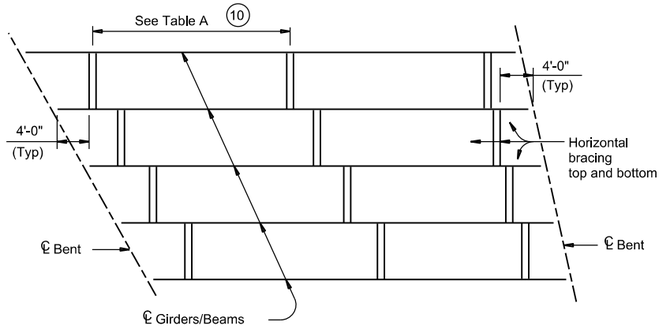
Texas Department of Transportation | Bridge Division Standard

MINIMUM ERECTION AND BRACING REQUIREMENTS

PRESTRESSED CONCRETE I-GIRDERS AND I-BEAMS

MEBR(C)

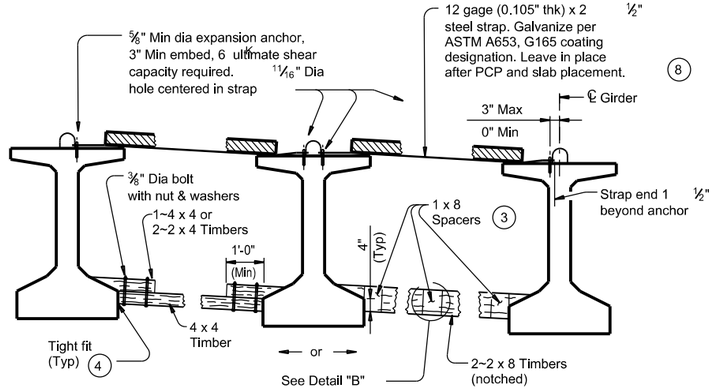
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©TxDOT October 2015 REVISIONS	CONT	SECT	JOB	HIGHWAY CR119
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SLAB PLACEMENT BRACING

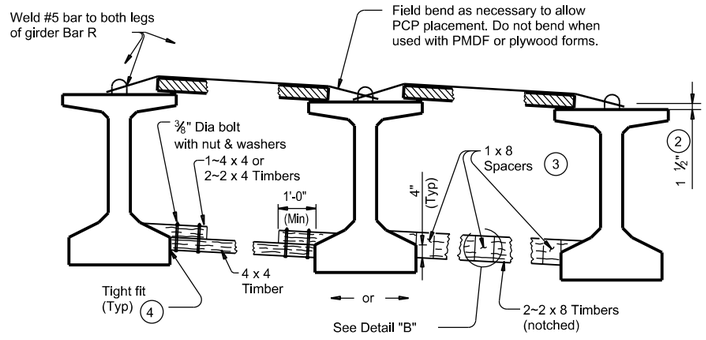
TABLE A

OPTION 1-RIGID BRACING (STEEL STRAP)			OPTION 2-FLEXIBLE BRACING (NO. 5 OVER PCP)		
Girder or Beam Type	Maximum Bracing Spacing		Girder or Beam Type	Maximum Bracing Spacing	
	Slab Overhang less than 4'-0" (11)	Slab Overhang 4'-0" and greater (11)		Slab Overhang less than 4'-0" (11)	Slab Overhang 4'-0" and greater (11)
Tx28	¼ points	¼ points	Tx28	¼ points	⅛ points
Tx34	¼ points	¼ points	Tx34	¼ points	⅛ points
Tx40	¼ points	⅛ points	Tx40	¼ points	⅛ points
Tx46	¼ points	⅛ points	Tx46	¼ points	⅛ points
Tx54	¼ points	⅛ points	Tx54	¼ points	⅛ points
Tx62	¼ points	⅛ points	Tx62	¼ points	⅛ points
Tx70	¼ points	⅛ points	Tx70	¼ points	⅛ points
A	⅛ points	⅛ points	A	2.0 ft	1.5 ft
B	⅛ points	⅛ points	B	3.0 ft	2.0 ft
C	⅛ points	⅛ points	C	4.5 ft	2.0 ft
IV	¼ points	⅛ points	IV	¼ points	4.0 ft
VI	¼ points	⅛ points	VI	¼ points	4.0 ft



FOR SLAB PLACEMENT BRACING, OPTION 1 - RIGID

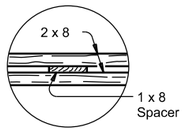
(Showing slab formed with PCP. This option is not allowed when slab is formed with PMDF or plywood.)



FOR SLAB PLACEMENT BRACING, OPTION 2 - FLEXIBLE

(Showing slab formed with PCP.)

HORIZONTAL BRACING DETAILS (5)



PLAN

DETAIL "B"

(2) Place and weld #5 bars as shown during erection. If forming deck with prestressed panels, bars can be temporarily removed, one at a time, during panel erection. Re-install bar prior to additional panel erection. Bars can rest on panels and be bent down and welded to girder Bars R.

(3) Clear distance between spacers must not exceed 3'. Nail together with 16d nails.

(4) Use wedges as necessary to obtain tight fit. Nail wedges to timbers.

(5) Pressure treated landscape timbers can not be used.

(8) Prior to installing, field bend strap to lay flush on both girders' top flange and slope between flange tips.

(10) Bracing spacing (¼ and ⅛ points) measured between first and last typical brace location.

(11) Measure slab overhang from centerline of girder or beam. When overhang varies in span, determine bracing spacing based on largest overhang.

SLAB PLACEMENT BRACING:

The details for slab placement bracing are considered minimum for fulfilling the requirements of Specification Items 422 and 425.

Required slab placement bracing must remain in place until slab concrete has attained a compressive strength of 3000 psi.

GENERAL NOTES:

Bracing details for spans longer than 150' are not provided. The Contractor must submit proposed bracing details for such conditions to the Engineer for approval prior to erection.

Systems equal to or better than those shown may be used provided details of such systems are submitted to and approved by the Engineer prior to erection.

Use of these systems or details does not relieve the Contractor of the responsibility for the adequacy of the bracing and the safety of the structure.

Removal of bracing for short periods of time to align girders and beams is permissible.

All turn-buckles, come-alongs, anchors and other connections must be capable of developing the full strength of the cable shown.

Furnish anchor bolts and nuts in accordance with Item 449, "Anchor Bolts".

Texas Department of Transportation

Bridge Division Standard

MINIMUM ERECTION AND BRACING REQUIREMENTS

PRESTRESSED CONCRETE I-GIRDERS AND I-BEAMS

MEBR(C)

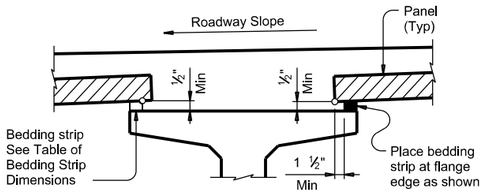
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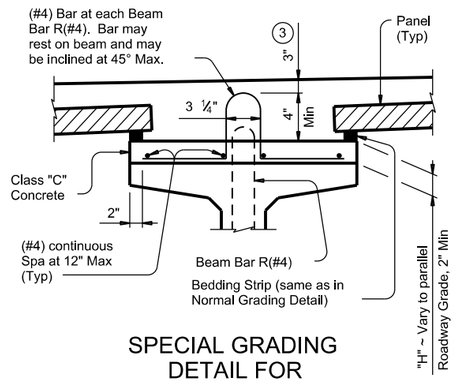
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NORMAL GRADING DETAIL (1)

Showing Prestressed Concrete I-Girders.
(Other Beam Types Similar)



SPECIAL GRADING DETAIL FOR CONCRETE BEAMS

Showing Prestressed Concrete I-Girders.
(Other Beam Types Similar)

TABLE OF BEDDING STRIP DIMENSIONS		
WIDTH	HEIGHT (2)	
	Min	Max
1" (Min)	½"	2"
1 ¼"	½"	2 ½"
1 ½"	½"	3"
1 ¾"	½"	3 ½"
2" (Min)	½"	4"

(1) To reduce the quantity of cast-in-place concrete, bedding strip thickness may be increased in ¼" increments. Bedding strips must be comprised of one layer. Bond bedding strips to the beams with an adhesive compatible with bedding strips. Bedding strips over 2.5" high may need to be bonded to panels. The same thickness strip must be used under any one panel edge and the maximum change in thickness between adjacent panels is ¼". Alternatively, bedding strips may be cut to grade. Panels may be supported by an alternate method, using a commercial product, if approved by the Engineer of Bridge Design, Bridge Division. If bedding strips exceed 4" high, use Special Grading Detail for Concrete Beams or submit an alternate method to the Bridge Division for approval.

(2) Height must not exceed twice the width.

(3) Provide clear cover as indicated unless otherwise shown on Span Details.

(4) See Span Details and Thickened Slab End Details for top slab reinforcement and clear cover. Transverse top slab reinforcement may rest on top of prestressed concrete panels if necessary to maintain clear cover.

(5) Space Bars UP(#4) with Beam Bars R(#4) in all areas where measured haunch exceeds 3" or 3 ½" with Prestressed Concrete I-Girders. Epoxy coating for Bars UP is not required.

(6) Do not locate construction Joints on top of a panel.

(7) Butt adjacent bedding strips together with adhesive. Cut v-notches, approx ¼" deep, in the top of the bedding strips at 8' o.c..

CONSTRUCTION NOTES:

Erected panels must bear uniformly on bedding strips of extruded polystyrene placed along top flange edges.

If additional blocking is needed, special grading details for supporting the panels and extra reinforcing between beam and slab will be considered subsidiary to deck construction.

Bars U, shown on PCP-FAB, may be bent over or cut off if necessary.

Care must be taken to ensure proper cleaning of construction debris and consolidation of concrete mortar under the edges of the panels. Bedding strips must be placed at beam flange edges so that adequate space is provided for the mortar to flow a minimum of 1 ½" under the panels as the slab concrete is placed.

To allow the proper amount of mortar to flow between beam and panel, the minimum vertical opening must be at least ½". Roadway cross-slope reduces the opening available for entry of the mortar. Bedding strips varying in thickness across the beam are therefore required.

For clear span between U-beams less than or equal to 18", see Permissible Slab Forming Detail on Miscellaneous Slab Detail sheets, UBMS.

MATERIAL NOTES:

Provide Grade 60 reinforcing steel in the cast-in-place slab. See Table of Reinforcing Steel for size and spacing of reinforcement.

If the top and bottom layer of reinforcing steel is shown on the Span Details to be epoxy coated, then the D, E, P, & Z bars must be epoxy coated.

Provide bar Laps, where required, as follows:
Uncoated ~ #4 = 1'-5"
Epoxy Coated ~ #4 = 2'-1"

GENERAL NOTES:

Designed according to AASHTO LRFD Specifications.

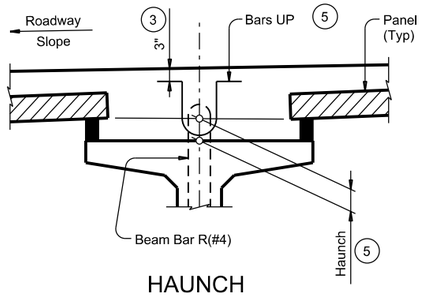
Panel placement may follow either Option 1 or Option 2 except Option 1 must be used if the skew exceeds 45 degrees.

Use of Prestressed Concrete Panels is not permitted for horizontally curved steel plate or tub girders. See Span Details for other possible restrictions on their use.

These details are to be used in conjunction with the Span Details, PCP-FAB and other applicable Standard drawings.

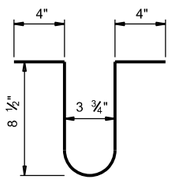
Any additional reinforcement or concrete required on this standard is considered subsidiary to the bid Item "Reinforced Concrete Slab".

Cover dimensions are clear dimensions, unless noted otherwise.
Reinforcing bar dimensions shown are out-to-out of bar.

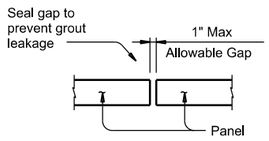


HAUNCH REINFORCING DETAIL

Showing Prestressed Concrete I-Girders.
(Other Beam Types Similar)

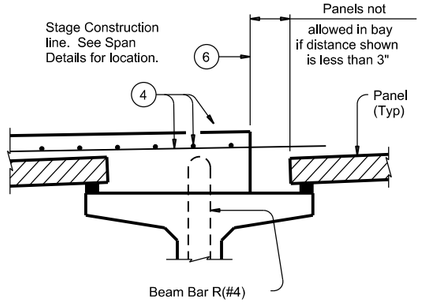


BARS UP (#4) (5)

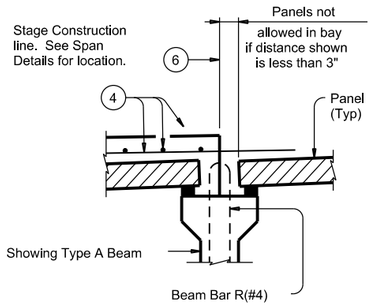


TYPICAL SECTION AT PANEL JOINT

(Panel reinforcing not shown for clarity.)
The gap cannot be considered as a panel fabrication tolerance.



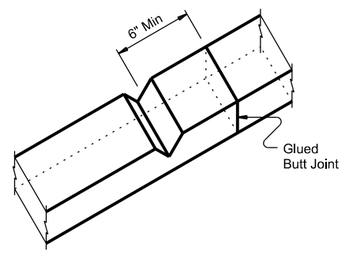
PRESTR CONC I-GIRDERS



PRESTR CONC I-BEAMS

STAGE CONSTRUCTION LIMITATIONS

(Other Beam Types Similar)



BEDDING STRIP DETAIL (7)

HL93 LOADING SHEET 1 OF 4

Texas Department of Transportation — Bridge Division Standard

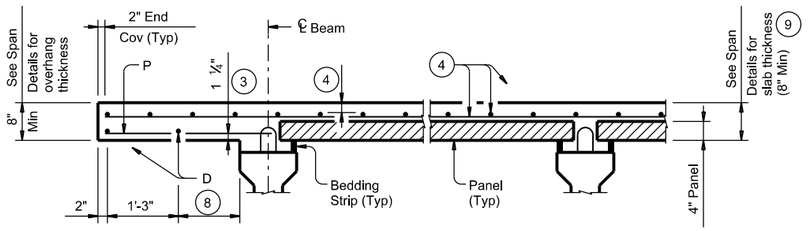
PRESTRESSED CONCRETE PANELS
DECK DETAILS

PCP

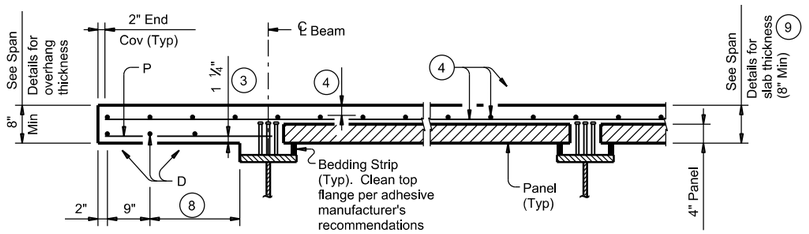
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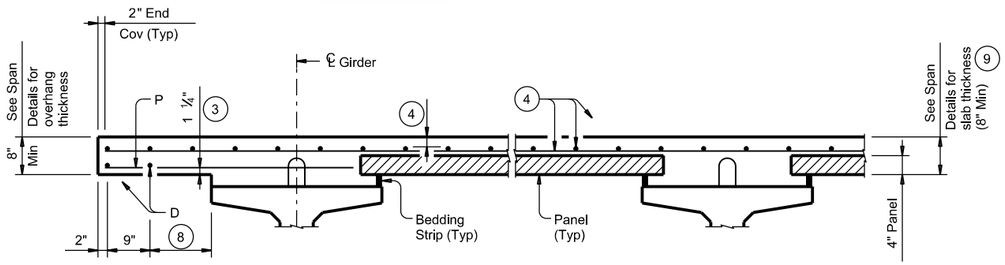
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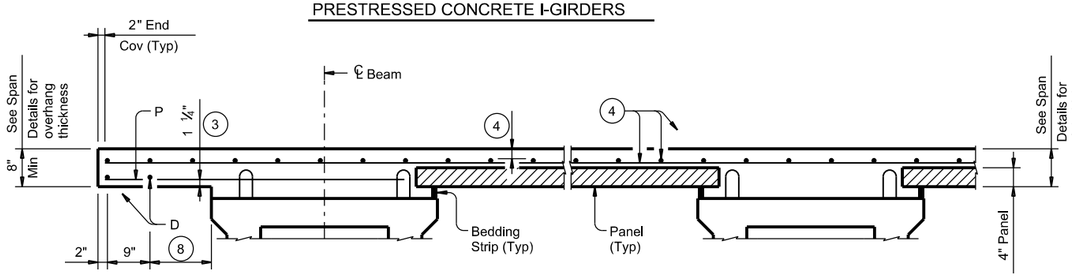
PRESTRESSED CONCRETE I-BEAMS



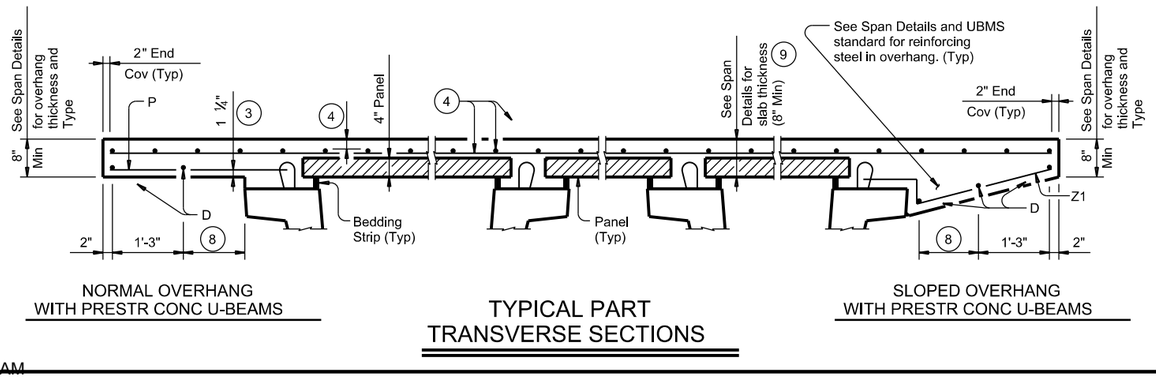
STEEL BEAMS



PRESTRESSED CONCRETE I-GIRDERS



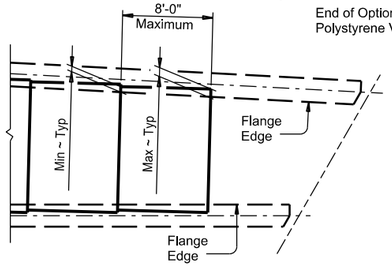
PRESTRESSED CONCRETE X-BEAMS



NORMAL OVERHANG WITH PRESTR CONC U-BEAMS

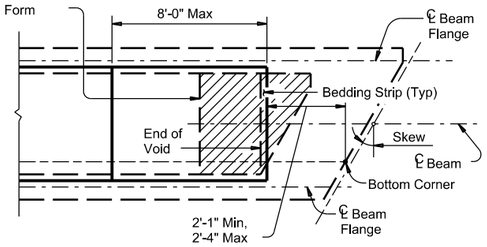
SLOPED OVERHANG WITH PRESTR CONC U-BEAMS

TYPICAL PART TRANSVERSE SECTIONS

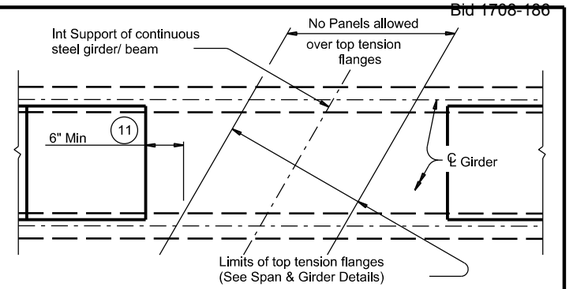


AT FLARED BEAMS OR GIRDERS

See PCP-FAB standard for Min and Max dimensions based on Bm/Girder type.



OVER CONC U-BEAMS



AT INT SUPPORTS OF CONTINUOUS STEEL GIRDERS

PART PLANS OF PANEL PLACEMENT

(3) Provide clear cover as indicated unless otherwise shown on Span Details.

(4) See Span Details and Thickened Slab End Details for top slab reinforcement and clear cover. Transverse top slab reinforcement may rest on top of prestressed concrete panels if necessary to maintain clear cover.

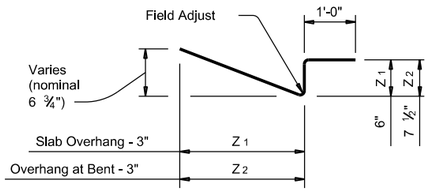
(7) Butt adjacent bedding strips together with adhesive. Cut v-notches, approx ¼" deep, in the top of the bedding strips at 8' o.c..

(8) Equally space additional bar if more than 1'-3" Max.

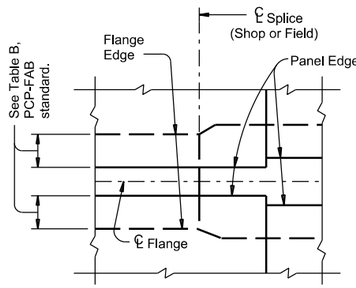
(9) The actual thickness constructed may exceed the slab thickness shown on the Span Details but the extra thickness may be no more than 2" (1" for Prestressed Concrete U-Beams and Steel Beams). Bearing Seat Elevations or finished grade may be adjusted.

(10) Field adjust Bars Z1(#4) to match actual slope of slab overhangs. Width of slab overhang will vary along span with curved slab edges. Adjust Bar Z1(#4) dimensions to maintain proper cover. Bars Z2(#4) are located at Inv-T stems only.

(11) Location of concrete placement sequence boundaries and bolted field splices should be considered by the contractor in determining panel limits.

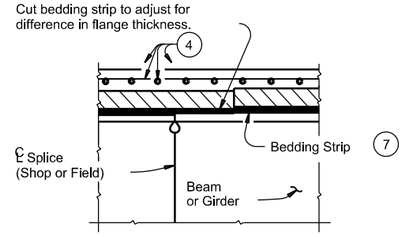


BARS Z (#4) (10)



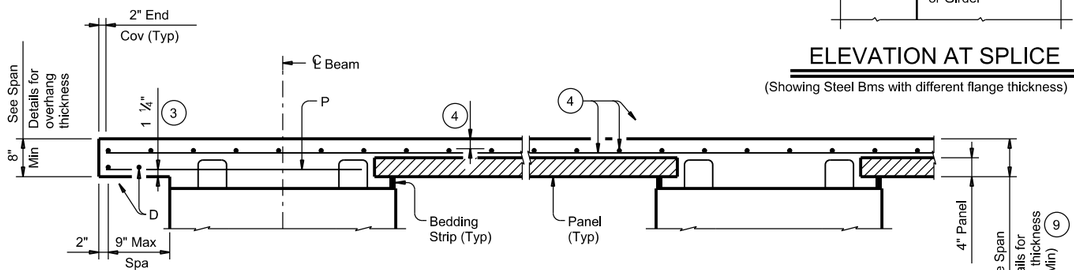
PLAN AT SPLICE

(Showing Steel Bms with flange width transition)



ELEVATION AT SPLICE

(Showing Steel Bms with different flange thickness)



PRESTRESSED CONCRETE SPREAD SLAB BEAMS

Bars P over exterior beams are still required when no overhang is used. In this case, only one Bar D, 2" from slab edge, is required.

HL93 LOADING SHEET 2 OF 4

Texas Department of Transportation

Bridge Division Standard

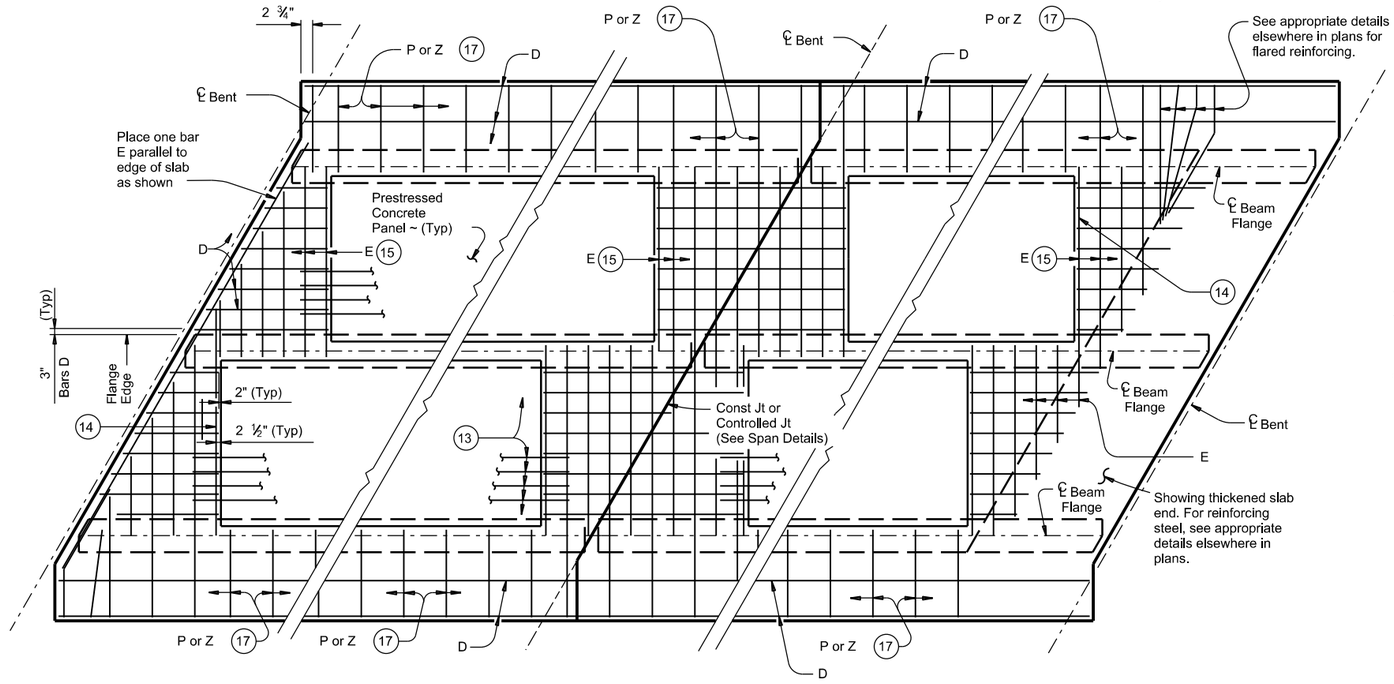
PRESTRESSED CONCRETE PANELS
DECK DETAILS

PCP

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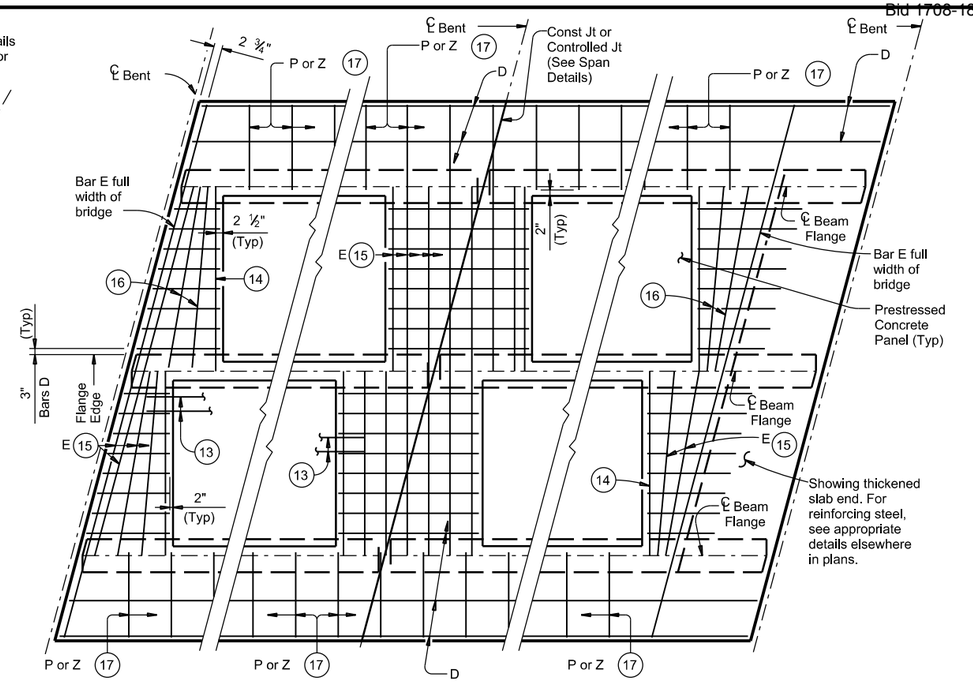
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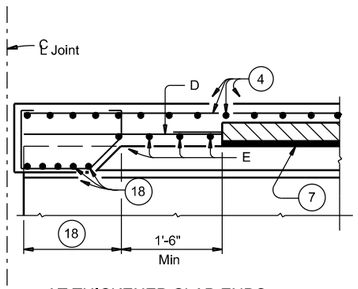
AT ALL SPAN ENDS UNLESS NOTED OTHERWISE | AT INTERIOR BENTS | AT THICKENED END SLABS

OPTION 1 ~ PLAN OF SLABS WITH NORMAL REINFORCEMENT

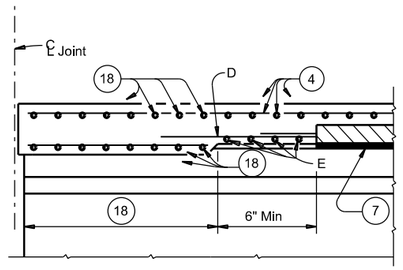


AT ALL SPAN ENDS UNLESS NOTED OTHERWISE | AT INTERIOR BENTS | AT THICKENED END SLABS

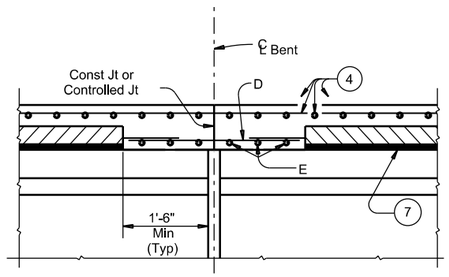
OPTION 1 ~ PLAN OF SLABS WITH SKEWED REINFORCEMENT



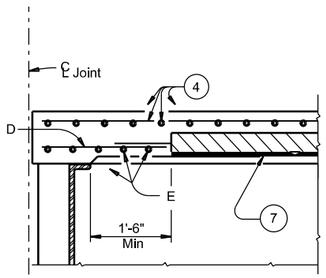
AT THICKENED SLAB ENDS FOR PRESTR CONC U-BMS



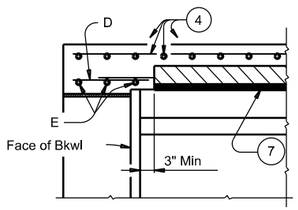
AT THICKENED SLAB ENDS FOR PRESTR CONC I-BMS AND STEEL BMS



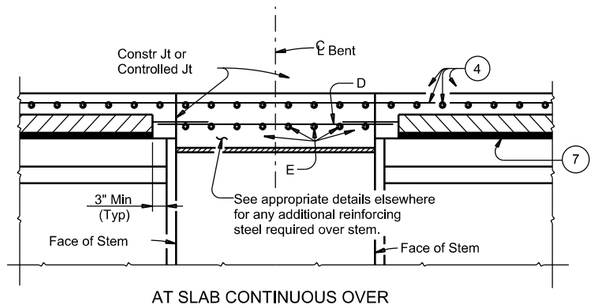
AT SLAB CONTINUOUS OVER CONVENTIONAL INTERIOR BENTS FOR ALL SIMPLE SPAN BMS



AT CONVENTIONAL END DIAPHRAGMS FOR STEEL BMS



AT SLAB OVER ABUTMENT BACKWALL FOR ALL BMS



AT SLAB CONTINUOUS OVER INVERTED-T BENTS FOR ALL BMS

OPTION 1 ~ ELEVATIONS AT BEAM ENDS

(4) See Span Details and Thickened Slab End Details for top slab reinforcement and clear cover. Transverse top slab reinforcement may rest on top of prestressed concrete panels if necessary to maintain clear cover.

(7) Butt adjacent bedding strips together with adhesive. Cut v-notches, approx ¼" deep, in the top of the bedding strips at 8' o.c.

(12) Max Spacing as listed unless otherwise shown.

(13) At connection with cast-in-place slab, extend longitudinal panel reinforcement. See PCP-FAB for details.

(14) Maintain one Bar E(#4) parallel to panel ends (Typ).

(15) Bars E(#4) not continuous over beam flanges must overlap beam flange 6" Min.

(16) Add flared Bars E(#4) (Min Spa = 6", Max Spa = 12") as required at panel ends.

(17) Where possible, Bars E(#4) may be extended into overhangs to replace Bars P(#4). Bars Z(#4) are required for sloped overhangs with U-Beams.

(18) See appropriate thickened slab end details for reinforcing and limits of thickened slab end.

TABLE OF REINFORCING STEEL (12)

BAR	SIZE	Max Spa (in.)
D	#4	9
E	#4	9
P	#4	18
UP	#4	~
Z	#4	18

HL93 LOADING SHEET 3 OF 4

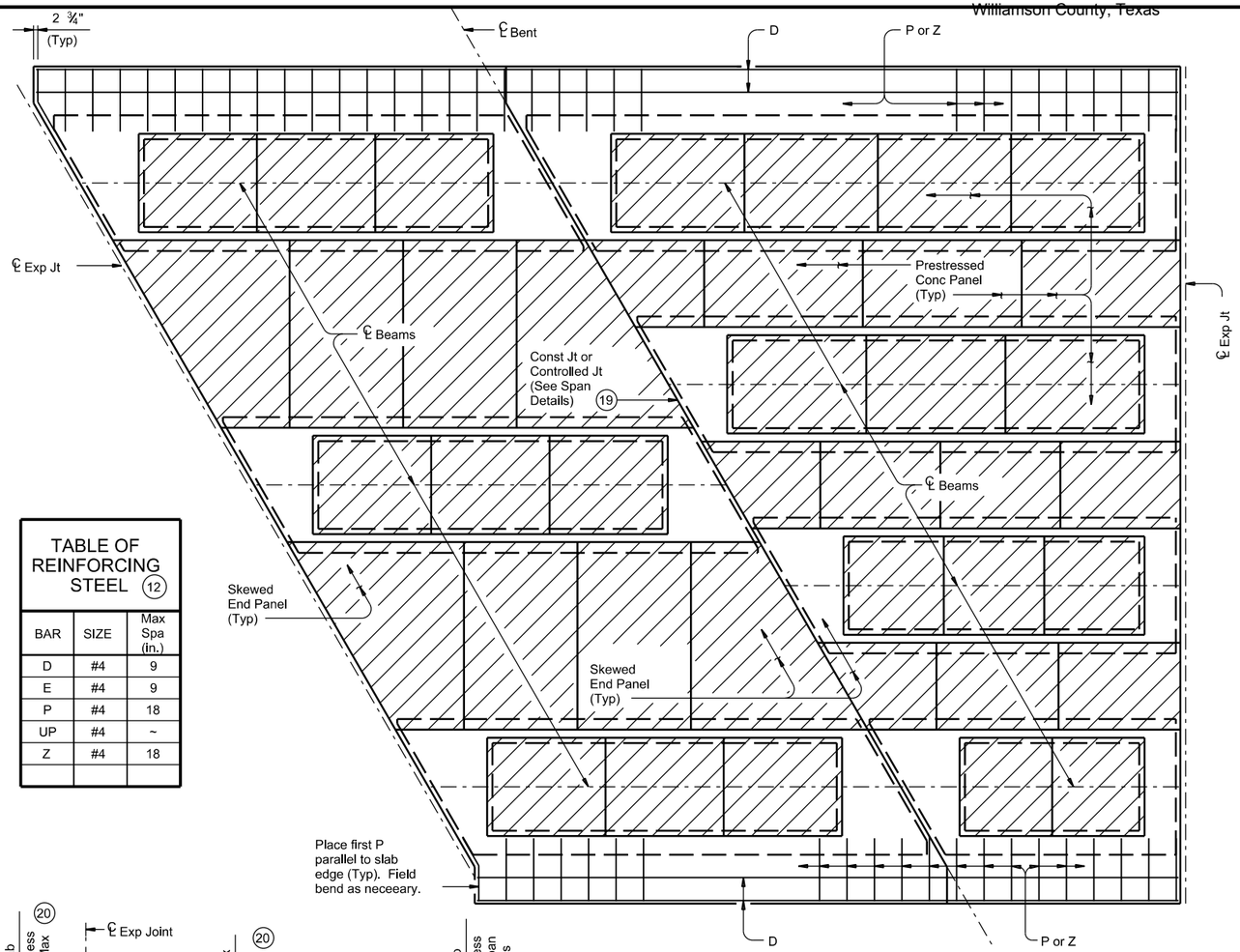
Texas Department of Transportation

Bridge Division Standard

PRESTRESSED CONCRETE PANELS
DECK DETAILS

PCP

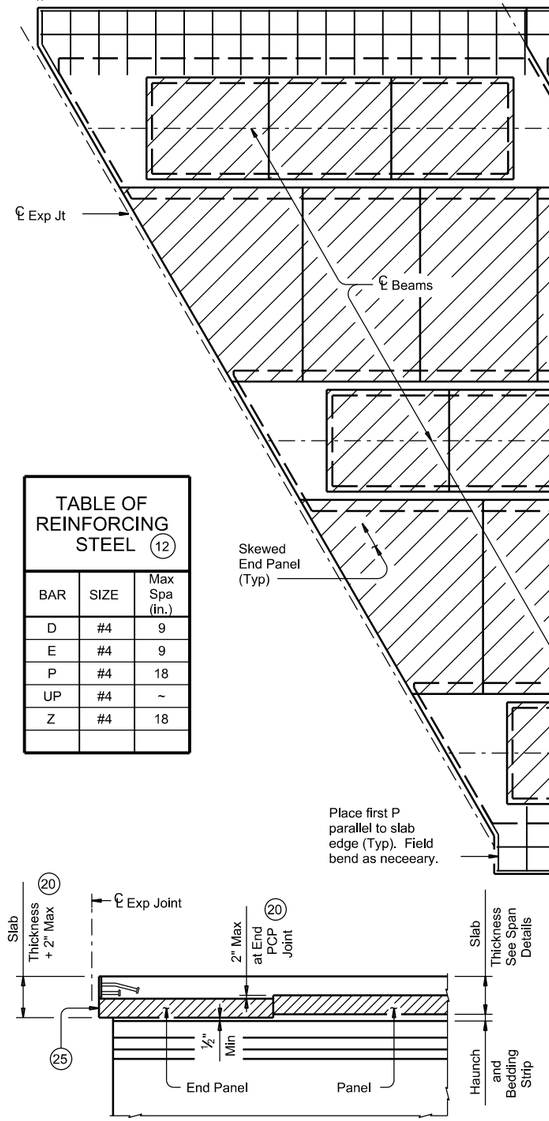
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©TxDOT January 2015	CONT	SECT	JOB	HIGHWAY
REVISIONS				CR119
	DIST	COUNTY		SHEET NO.
	06	WILLIAMSON		225



OPTION 2 ~ PLAN OF SLAB

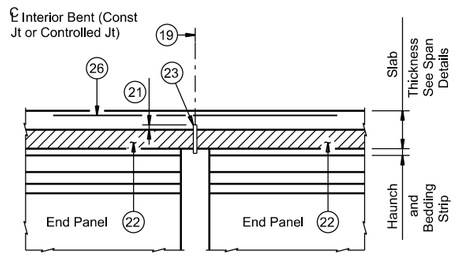
(Showing U-Beams; other beams similar)

TABLE OF REINFORCING STEEL (12)		
BAR	SIZE	Max Spa (in.)
D	#4	9
E	#4	9
P	#4	18
UP	#4	~
Z	#4	18



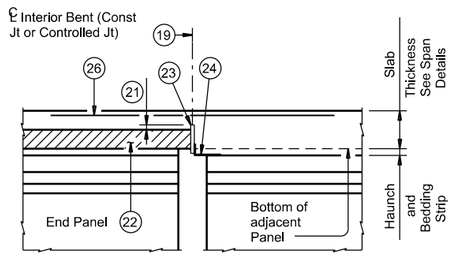
JOINTS (BETWEEN BEAMS/GIRDERS OR AT INV-T STEM)

For SEJ-A, SEJ-S(O), AJ and Type A Expansion Joints only.



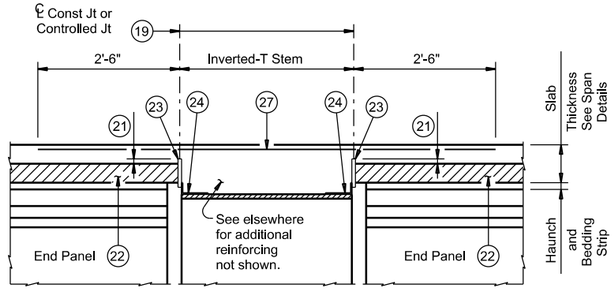
CONVENTIONAL INTERIOR BENT

Panel against Panel between Bms/Girders.



CONVENTIONAL INTERIOR BENT

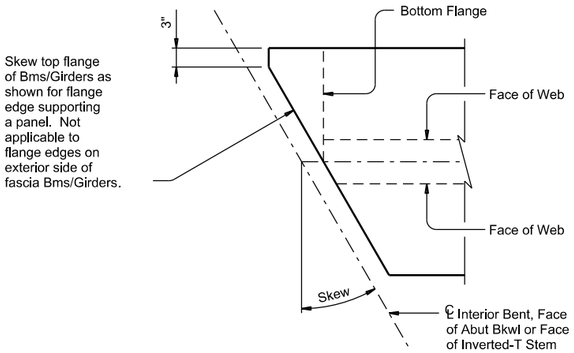
Panel against Bm/Girder End in Adacent Span.



INVERTED-T BENT

Panels against Inverted-T Stem

OPTION 2 ~ ELEVATIONS AT BEAM ENDS (4)



Skew top flange of Bms/Girders as shown for flange edge supporting a panel. Not applicable to flange edges on exterior side of fascia Bms/Girders.

OPTION 2 ~ SHOWING MODIFICATION TO BEAM/GIRDER TOP FLANGE FOR SKEWS OVER 5°

Showing I-Bm/I-Girder, U-Bms and Steel Bms similar.

(4) See Span Details and Thickened Slab End Details for top slab reinforcement and clear cover. Transverse top slab reinforcement may rest on top of prestressed concrete panels if necessary to maintain clear cover.

(12) Max Spacing as listed unless otherwise shown.

(19) Top Plastic Joint Former at Controlled Joints (Stress Cap, Zip Strip, Stress Lock, etc.) is not required with these Details.

(20) End panel may be set up to 2" lower to accommodate expansion joint hardware, provided bedding strip is not less than ½" thick.

(21) 1" Min, 1 ½" Max, support as necessary.

(22) Place panel within ½" of ¾" thick board.

(23) ¾" thick timber board, leave in place. Place straight, within ¼" of Centerline of Bent or face of Invt-T, across bridge width and end board at exterior flange edge of fascia beams/girders. Do not extend into overhang.

(24) Permanent galvanized steel sheet form. Removable formwork is acceptable.

(25) Place end panel within ½" of expansion joint opening. End panel cannot encroach on required expansion joint opening.

(26) Place additional (#4) bar 5'-0" in length between every slab bars T. Center (#4) bar on Joint.

(27) Place additional (#4) bar continuous 2'-6" beyond each side of Inverted-T Stem between every slab bars T.

SPECIAL OPTION 2 CONSTRUCTION NOTES:

Placing panels adjacent to expansion joints and bent centerlines prior to completing interior panel placement is recommended. Saw cutting panels to fit is acceptable when approved by the Engineer. Minimum distance from a saw cut edge to a panel strand is 1 ½".

Do not extend the longitudinal panel reinforcement into the cast-in-place slab.

Top flanges of beams and girders on skewed bridges must be modified as shown on this drawing. The Contractor is responsible for coordinating this modification with the beam fabricator prior to submitting shop drawings for approval.

Fabricator may optionally skew the whole end. When electing to skew whole end, girder end details and bearing type at conventional interior bent must be changed to use condition at abutment. Fabricator must coordinate change in bearing type, bearing centerline location, and dowel location with Engineer and Contractor. Show appropriate changes on girder and bearing shop drawings.

Bending of anchor studs of expansion joints shown on standards AJ, SEJ-A and SEJ-S(O) is permissible if necessary to clear top of end panels. The Contractor is responsible for coordinating modifications with the joint fabricator. Submit shop drawings for approval when modifications to expansion joint hardware are made.

Bedding strips under skewed end panels must conform to the requirements of Item 425 except their minimum compressive strength must be 60 psi.

Provide Bars AA, G, K and OA from standard IGTS(MOD) in the slab.

HL93 LOADING SHEET 4 OF 4

Texas Department of Transportation — Bridge Division Standard

PRESTRESSED CONCRETE PANELS
DECK DETAILS

PCP

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	06	WILLIAMSON		226

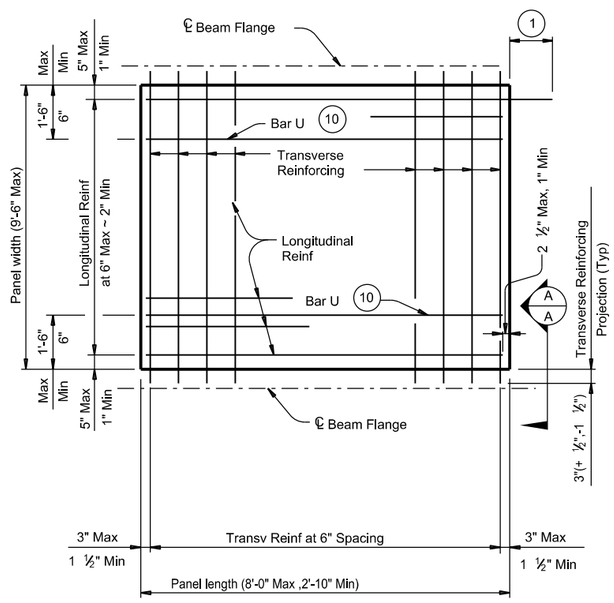
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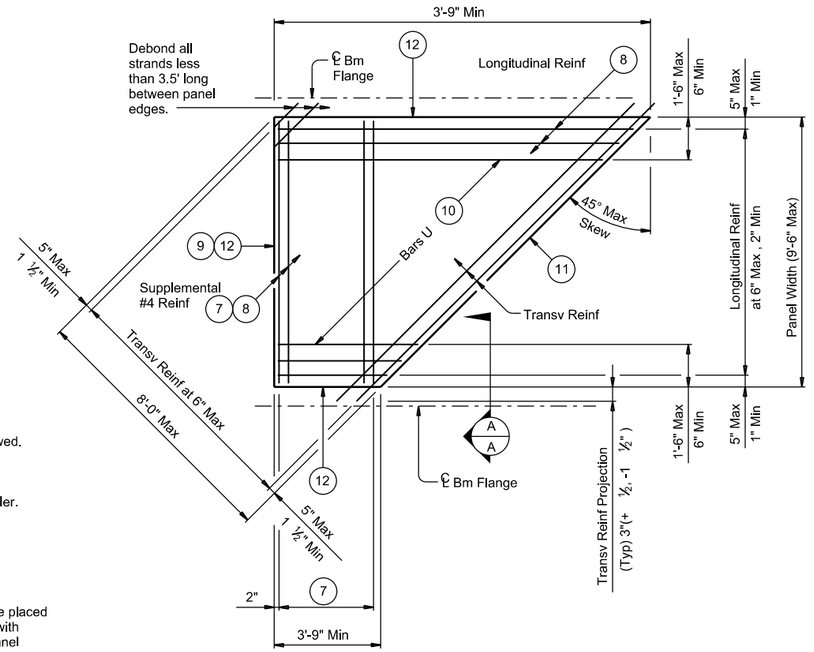
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TYPICAL NON-SKEWED PANEL PLAN



TYPICAL SKEWED END PANEL PLAN

(Only to be used with details shown elsewhere in the plans.)

TABLE A (4) (5)			
Beam Type	Normal (In.)	Min (In.)	Max (In.)
A	3	2 ½	3 ½
B	3	2 ½	3 ½
C	4	3 4	½
IV	6	4 7	½
VI	6 ½	4 ½	8 ½
U40 - 54	5 ½	5 ½	7
Tx28-70	6	4 7	½
XB20 - 40	4	3 4	½
XSB12 - 15	4	3 4	½

TABLE B (4) (5)			
Top Flange Width	Normal (In.)	Min (In.)	Max (In.)
11" to 12"	2 ¾	2 ½	2 ¾
Over 12" to 15"	3 ¼	3 3	¼
Over 15" to 18"	4	3 4	¾
Over 18"	5	3 ½	6 ¼

1. At connection with cast-in-place slab, extend longitudinal panel reinforcement 1'-0" (+2",-0") past panel end. Alternatively, provide (#3) x 2'-0" dowels at 6" Max Spacing and extend dowels 1'-0" past panel end.
2. Four loops required per panel.
3. Four loops required per panel. ⅜" or ½" strands may be used.
4. Normal dimensions must be used on spans with parallel beams. Maximum and Minimum dimensions apply only to spans with flared beams.
5. See Normal Grading Detail on PCP standard for lap requirements and bedding strip dimensions. Some laps shown in tables cannot utilize all bedding strip widths.
6. One Splice allowed per panel. No more than two sheets of WWR are allowed.
7. Provide (#4) bars under transverse reinforcing, 10 Spaces at 4" = 3'-4". Omit for 5 degree (1:12) skew and smaller.
8. End Cover 2 ½" Max, 1" Min.
9. Recess strands on indicated panel edge in accordance with Item 424.
10. At the fabricator's option, Bars U may be placed parallel to transverse panel reinforcing with horizontal legs in plane of transverse panel reinforcing.
11. Use length of indicated panel edge as panel width for purpose of determining type of transverse reinforcing.
12. Timber form work permissible this edge.

GENERAL NOTES:

Provide Class H concrete for panels. Release strength f'ci=3500 psi. Minimum 28 day strength f'c=5000 psi.

Do not use epoxy-coated reinforcing steel bar or strand in panels.

Remove laitance from top panel surface.

Finish top of panel to a roughness between a No.6 and No.9 concrete surface profile, inclusive, as specified by the International Concrete Repair Institute (ICRI).

Shop drawings for the fabrication of panels will not require the Engineer's approval if fabrication is in accordance with the details shown on this standard.

A panel layout which identifies location of each panel must be developed by the Fabricator. Permanently mark each panel in accordance with the panel layout. A copy of the layout is to be provided to the Engineer.

TRANSVERSE PANEL REINFORCEMENT:

For panel widths over 5', use ⅜" or ½" Dia (270k) prestressing strands with a tension of 14.4 kips per strand.

For panel widths over 3'-6" up to and including 5', use ⅜" or ½" Dia (270k) prestressing strands with a tension of 14.4 kip per strand. Optionally, #4 Grade 60 reinforcing bars may be used in lieu of prestressed strands.

For panel widths up to 3'-6", use #4 Grade 60 reinforcing bars (prestressed strands alone are not allowed).

Place transverse panel reinforcement at panel centroid and space at 6" Max.

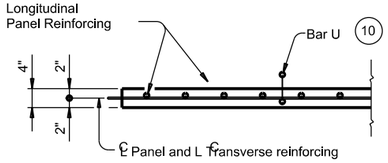
LONGITUDINAL PANEL REINFORCEMENT:

Any of the following options may be used for longitudinal panel reinforcement:

1. (#3) Grade 60 reinforcing steel at 6" Max Spacing. No splices allowed.
2. ⅜" Dia prestressing strands at 4 ½" Max Spacing (unstressed). No splices allowed.
3. ½" Dia prestressing strands at 6" Max Spacing (unstressed). No splices allowed.
4. Deformed Welded Wire Reinforcement (WWR) (ASTM A1064) providing 0.22 sq in per foot of panel width. Wires larger than D11 not permitted. Provide transverse wires to ensure proper handling of reinforcing. One splice per panel is allowed. See WWR Splice Detail.

No combination of longitudinal reinforcement options in a panel is allowed.

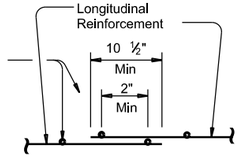
Place longitudinal panel reinforcement above or below transverse panel reinforcement. Must be placed above transverse panel reinforcement for skewed end panels with supplemental #4 reinforcement.



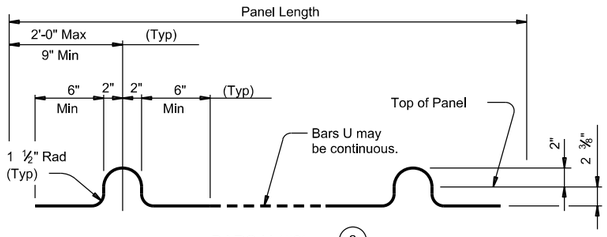
SECTION A-A

(Not Showing supplemental #4 bars for Skewed End Panels.)

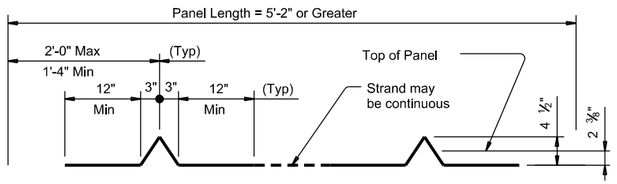
No splice required for wires parallel to strands (transverse panel reinforcement)



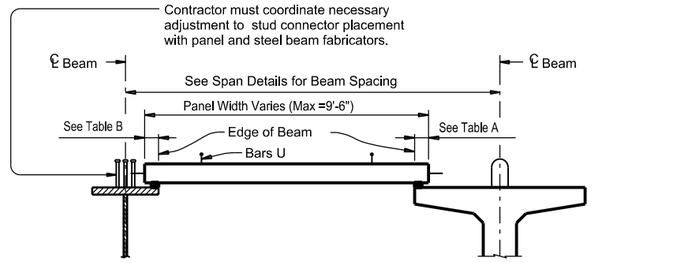
WELDED WIRE REINFORCEMENT (WWR) SPLICE DETAIL (6)



BARS U (#3) (2)



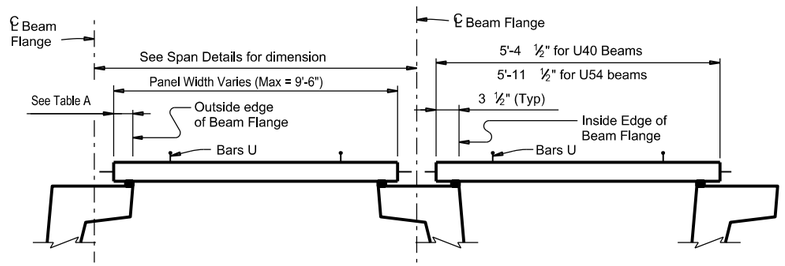
OPTIONAL STRAND FOR BARS U (3)



STEEL BEAMS

PRESTRESSED CONCRETE BEAMS OR GIRDERS

Typ unless noted otherwise



PRESTRESSED CONCRETE U-BEAMS

TYPICAL SECTIONS FOR DETERMINING PANEL WIDTH

HL93 LOADING

Texas Department of Transportation

Bridge Division Standard

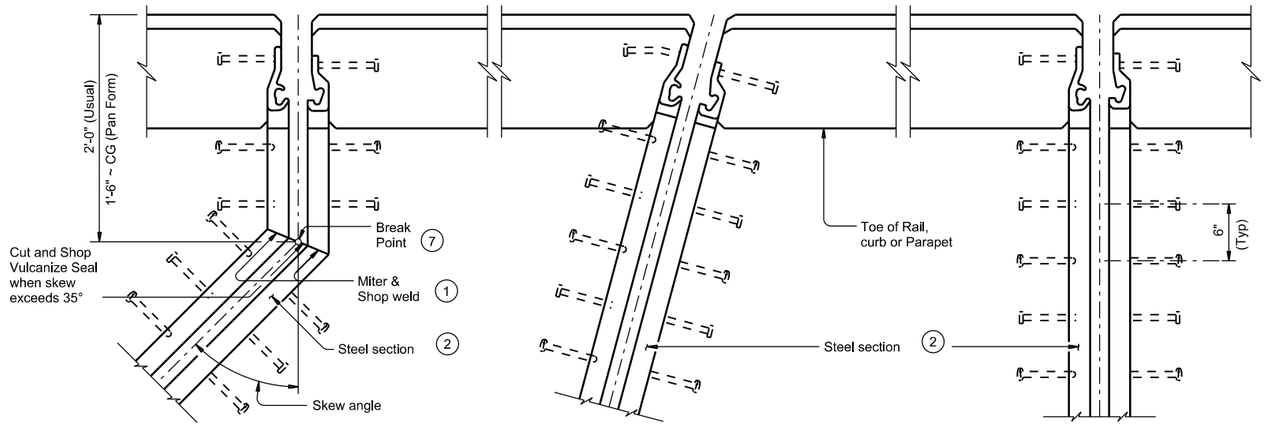
PRESTRESSED CONCRETE PANEL FABRICATION DETAILS

PCP-FAB

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	06	WILLIAMSON		227

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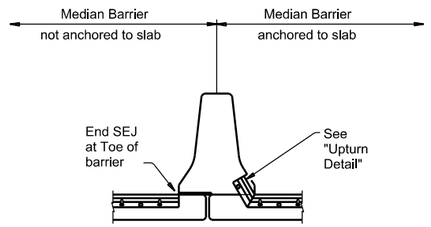
SHOWING SKEWS WITH SLAB BREAKBACKS

SHOWING SKEWS WITHOUT SLAB BREAKBACKS

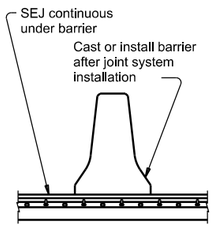
SHOWING WITHOUT SKEWS AND SLAB BREAKBACKS

PLANS OF END CONDITIONS

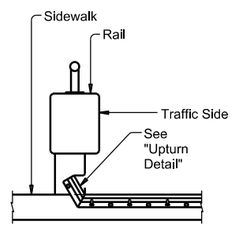
Used for Watson Bowman Acme and D.S. Brown joint systems. Shown with Upturns



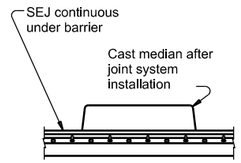
WITH OPEN DECK JOINT BELOW MEDIAN BARRIER



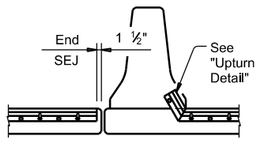
AT MEDIAN BARRIER



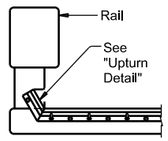
AT SIDEWALK BEHIND BRIDGE RAIL



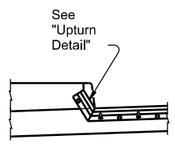
AT RAISED MEDIAN



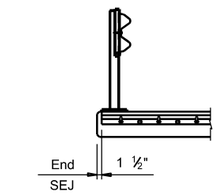
WITH OPEN DECK JOINT ADJACENT TO MEDIAN BARRIER



AT CONCRETE BRIDGE RAIL



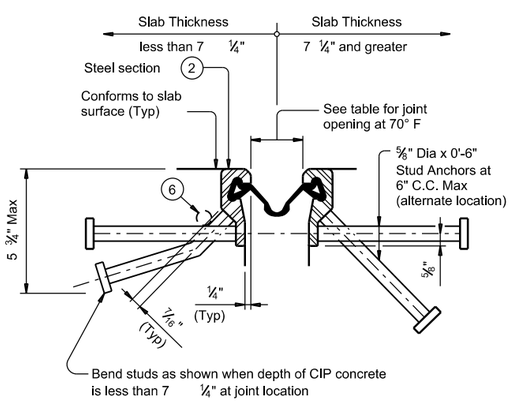
AT SIDEWALK



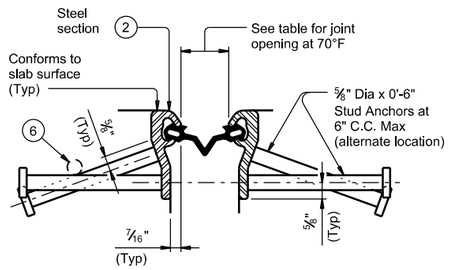
AT STEEL POST BRIDGE RAIL

TYPICAL SECTIONS (5)

Used for Watson Bowman Acme and D.S. Brown joint systems



SECTION THRU WATSON BOWMAN ACME JOINT



SECTION THRU D.S. BROWN JOINT

TABLE OF SEALED EXPANSION JOINT INFORMATION

MANUFACTURER	STEEL SECTION (2)	STRIP SEAL			
		4" JOINT		5" JOINT	
		Seal Type	Joint Opening (3)	Seal Type	Joint Opening (3)
D.S. Brown	Type SSCM2	A2R-400	1 ¾"	A2R-XTRA	2"
Watson Bowman Acme	Type R	SE-400	1 ¾"	SE-500	2"
R.J. Watson	As Shown	SF-400	2 ½"	N/A	N/A

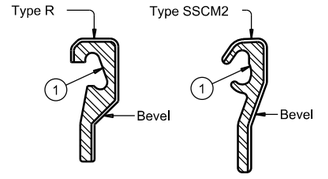
REDUCED LONGITUDINAL MOVEMENT RANGE

SKEW (deg)	JOINT SIZE	
	4"	5"
0	4.0"	5.0"
15	4.0"	5.0"
30	3.5"	4.3"
45	2.8"	3.5"

DESIGN NOTES:

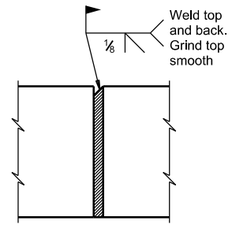
Joints installed on a skew have reduced ability to accommodate longitudinal movement. Use table values to determine the correct joint size for skewed installations.

For other skews over 25 degrees, calculate reduced movement range by multiplying joint size by cosine (skew).



WELD LIMITS

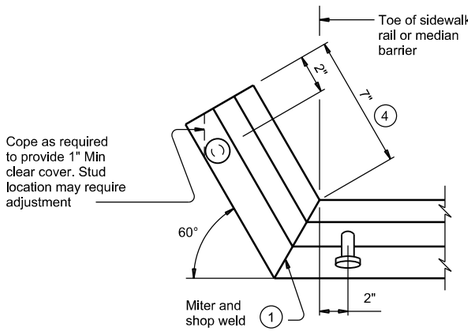
WELD LIMITS



REAR VIEW

FIELD SPLICE DETAIL

Used for Watson Bowman Acme and D.S. Brown joint systems



UPTURN DETAIL

Used for Watson Bowman Acme and D.S. Brown joint systems

FABRICATION NOTES:

Temporarily shop assemble corresponding sections of Sealed Expansion Joints, check for fit, and match mark for shipment. Secure corresponding sections together for shipment with shipping angle. Do not use erection bolts.

The seal must be continuous and included in the price bid for Sealed Expansion Joint.

Ship steel sections in convenient lengths of 10'-0" Min and 24'-0" Max unless necessary for stage construction or widenings. One shop splice is permitted in each shipping length provided no piece is less than 2'-0" long and sufficient studs are added to limit the stud to shop splice distance to 2" Min and 4" Max.

Weld studs in accordance with AWS D1.1.

Butt weld all shop and field splices and grind smooth areas in contact with seal. Make all necessary field splice joint preparations in the shop.

Paint portions of steel sections not in contact with concrete with the primer specified for System II paint.

Shop drawings for the fabrication of Sealed Expansion Joints will not require the Engineer's approval if fabrication is in accordance with the details shown on this standard.

CONSTRUCTION NOTES:

Secure the Sealed Expansion Joint in position and place to the proper grade and alignment by welding braces to adjacent reinforcing steel, to prestressed beam stirrups, or to anchors cast in concrete diaphragms. Include cost of temporary bracing in the price bid for Sealed Expansion Joint.

Remove shipping angle immediately after each joint half is secured in place. Grind smooth, and touch up with organic zinc-rich paint.

Clean and prepare seal cavity for seal installation as per the manufacturer's installation procedures.

GENERAL NOTES:

Provide Sealed Expansion Joints in the size and at locations shown on the plans.

Minimum slab and overhang thickness required for the use of SEJ-A is 6 ½".

(1) Remove all burrs which will be in contact with seal prior to making splice.

(2) Shape of steel section shown is typical. Variations in sections must be approved by the Engineer.

(3) These openings are also the recommended minimum installation openings.

(4) Reduce for sidewalk or parapet heights less than 6".

(5) Other conditions affecting the joint profile should be noted elsewhere.

(6) Move transverse bars that are in conflict with SEJ studs, in either the bridge slab or approach slab, to rest at the junction of the studs.

(7) See Span details for location of break point.

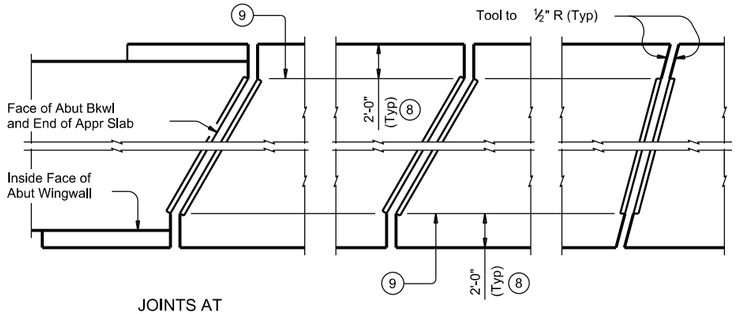
SHEET 1 OF 2

Texas Department of Transportation — Bridge Division Standard

SEALED EXPANSION JOINT TYPE A WITHOUT OVERLAY

SEJ-A

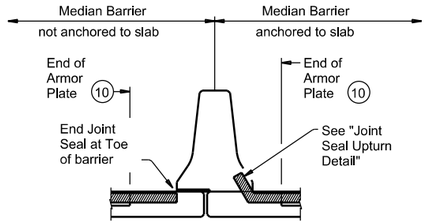
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REVISIONS				CR119
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	06	WILLIAMSON		228



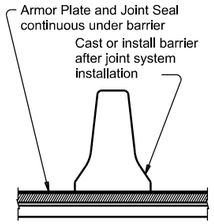
JOINTS AT ABUTMENTS | SKEWS OVER 15° | SKEWS THRU 15°

PLANS OF ARMOR PLATES

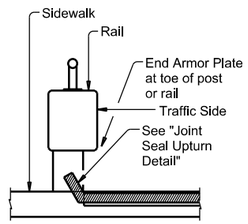
Used for R.J. Watson joint systems



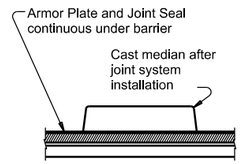
WITH OPEN DECK JOINT BELOW MEDIAN BARRIER



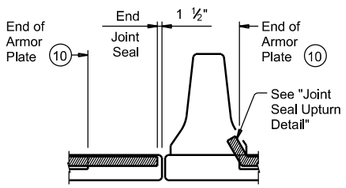
AT MEDIAN BARRIER



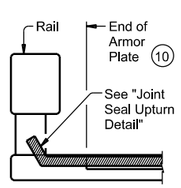
AT SIDEWALK BEHIND BRIDGE RAIL



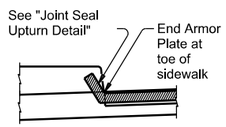
AT RAISED MEDIAN



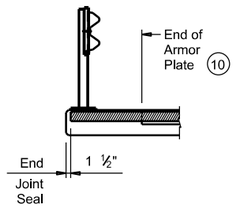
WITH OPEN DECK JOINT ADJACENT TO MEDIAN BARRIER



AT CONCRETE BRIDGE RAIL



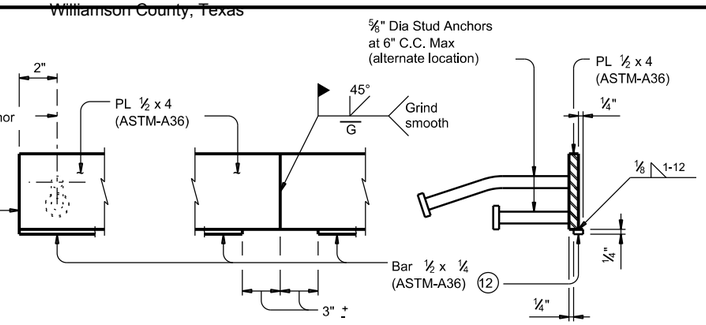
AT SIDEWALK



AT STEEL POST BRIDGE RAIL

TYPICAL SECTIONS (5)

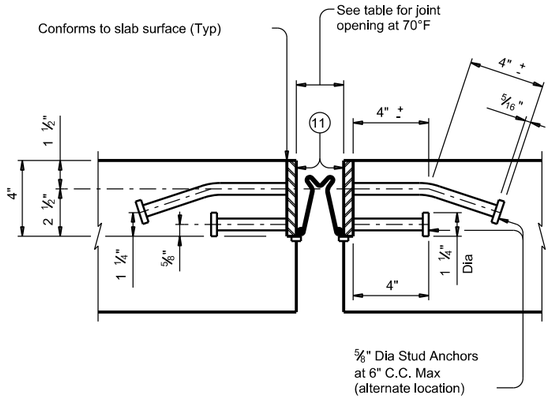
Used for R.J. Watson joint systems



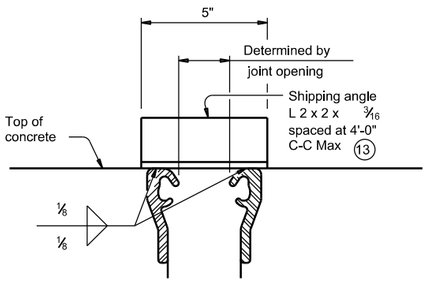
END VIEW | FIELD SPLICE (Studs not shown for clarity) | SECTION

ELEVATION OF ARMOR PLATE

Used for R.J. Watson joint systems.



SECTION THRU R J WATSON JOINT

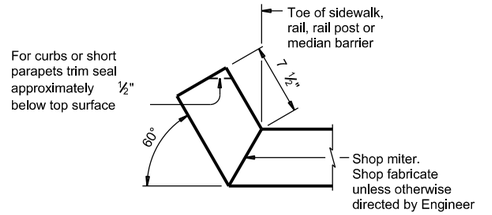


SHOWING D.S. BROWN (Ty SSCM2)

Watson Bowman Acme (Type R) and R J Watson similar

SHIPPING ANGLE

An alternate method of securing joint sections may be used if approved by the Bridge Division. Erection bolts are not allowed.



JOINT SEAL UPTURN DETAIL

Used for R.J. Watson joint systems

(5) Other conditions affecting the joint profile should be noted elsewhere.

(8) Unless shown otherwise, terminate armor plate at slab break point if break is more than 2'-0" from slab edge.

(9) At Fabricator's option, armor plate may extend up to 6" beyond this point for skews through 15°.

(10) See "Plans of Armor Plates".

(11) Coat with manufacturer's supplied epoxy primer above bar before installing sealant.

(12) In lieu of bar, use ¾", 16 gauge, stainless steel strap. Attach to armor plate with a fastener for attaching steel to steel base material, such as Hilti X-EGN or X-S13.

(13) Align shipping angle perpendicular to joint.

CONSTRUCTION NOTE FOR R.J. WATSON JOINT:
Splice and install seal in accordance with the manufacturer's directions and with the adhesive provided by the manufacturer.

SHEET 2 OF 2

Texas Department of Transportation | Bridge Division Standard

SEALED EXPANSION JOINT TYPE A WITHOUT OVERLAY

SEJ-A

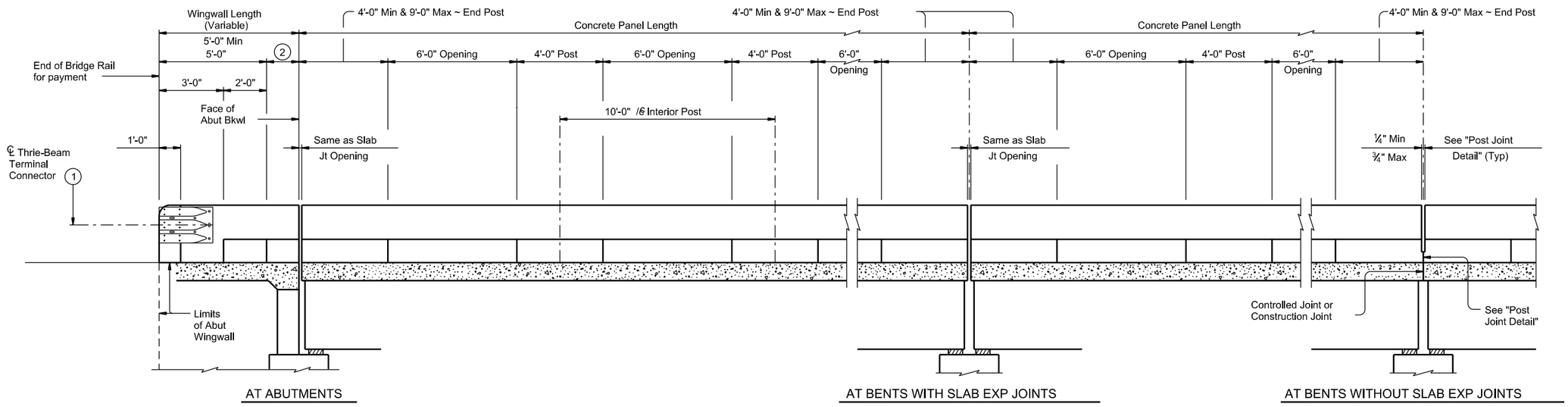
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REVISIONS				CR119
	DIST	COUNTY		SHEET NO.
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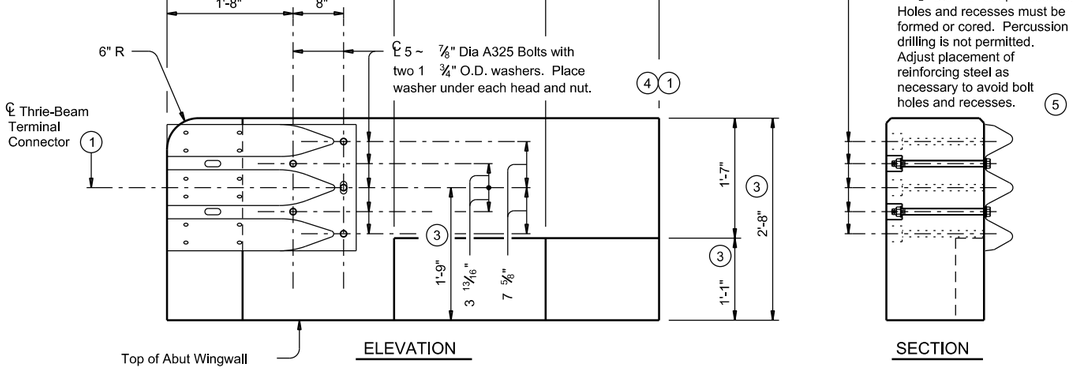
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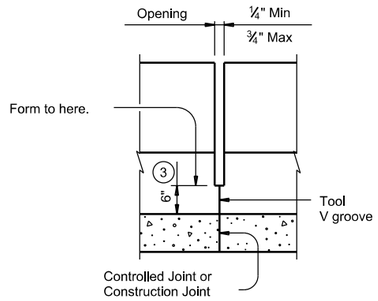
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ROADWAY ELEVATION OF RAIL



TERMINAL CONNECTION DETAILS



POST JOINT DETAIL

Provide at all interior bents without slab expansion joints.

1. Terminal Connectors and associated hardware are to be paid for under the Item "Metal Beam Guard Fence". Attach Metal Beam Guard Fence Transitions to the bridge rail and extend along the embankment unless otherwise shown in the plans.
2. Wingwall Length minus 5'-0" (Varies)
3. Increase 2" for structures with overlay.
4. Provide bolts of sufficient length to extend ½" to ¾" beyond nut.
5. Bolt recesses are only required when pedestrian sidewalks are adjacent to back of rail.

SHEET 1 OF 3

Texas Department of Transportation | Bridge Division Standard

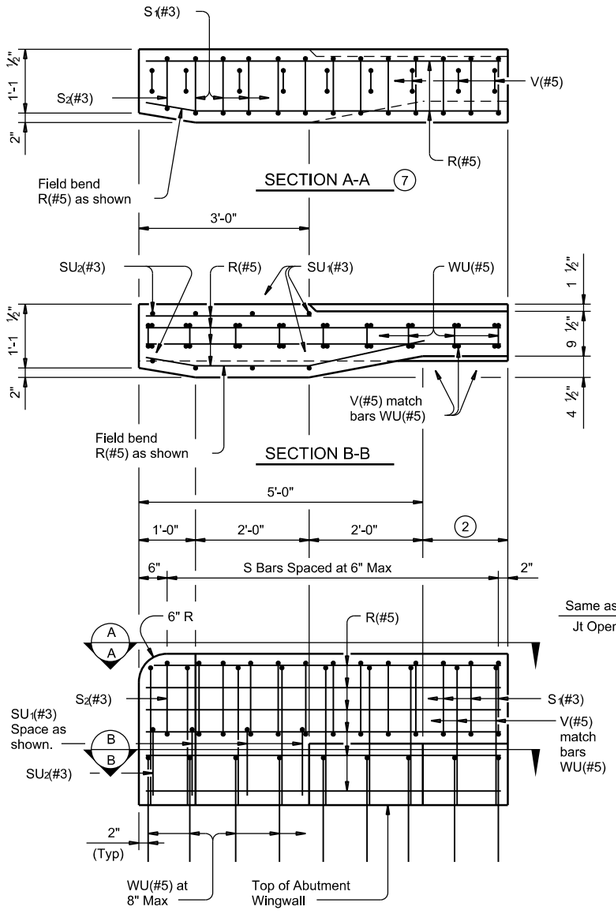
TRAFFIC RAIL

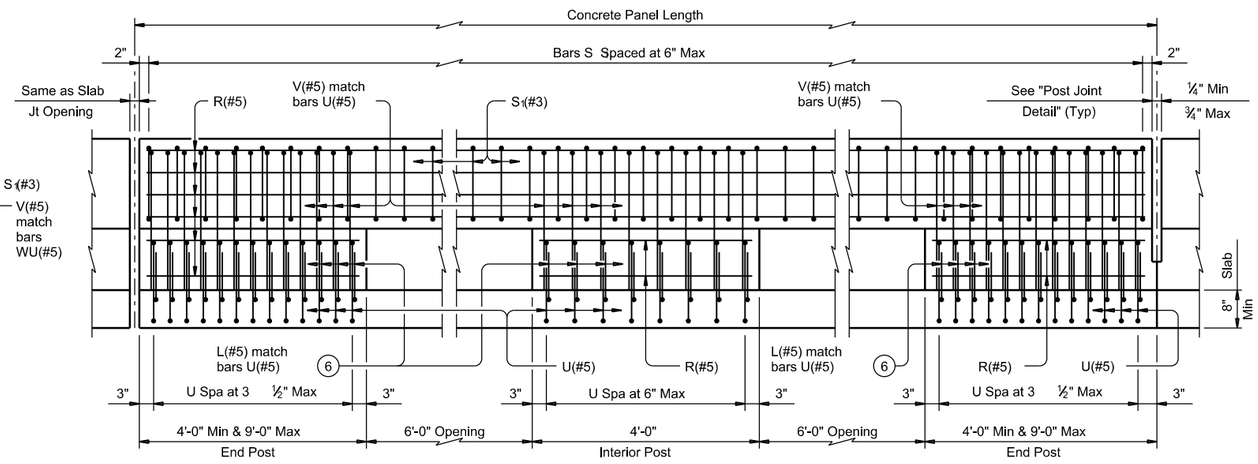
TYPE T223

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ELEVATION SHOWING TYPICAL REINFORCING PLACEMENT

(2) Wingwall Length minus 5'-0" (Varies)

(6) Bars L(#5) are part of rail reinforcing and are included in unit price bid for railing. Space with Bars U. Bars L match slab bar cover. Bars L may be bundled with top slab reinforcing if spacing is equivalent.

(7) Bars SU (#3), SU (#3) and WU(#5) not shown for clarity.

Texas Department of Transportation

Bridge Division Standard

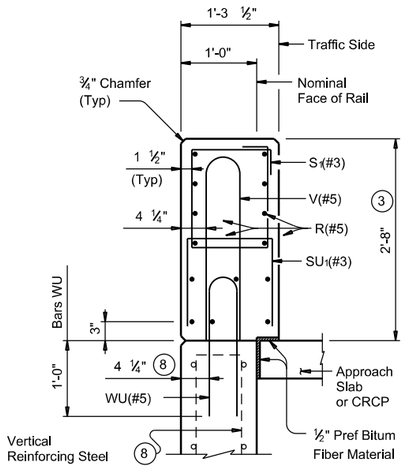
TRAFFIC RAIL

TYPE T223

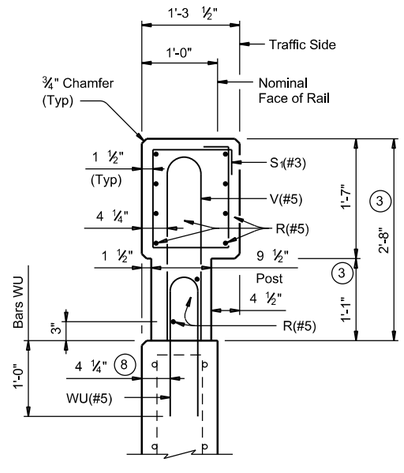
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	06	WILLIAMSON		231

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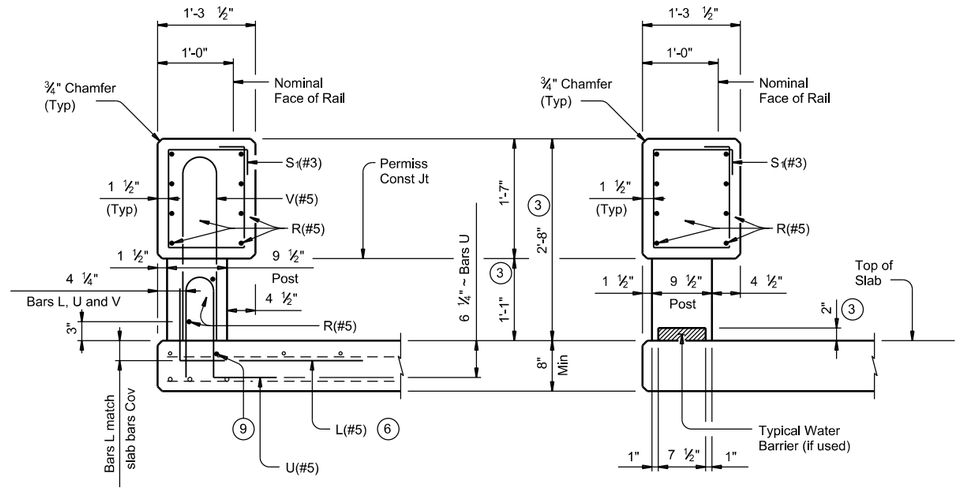
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SECTION C-C
ON ABUTMENT WINGWALLS
OR CIP RETAINING WALLS



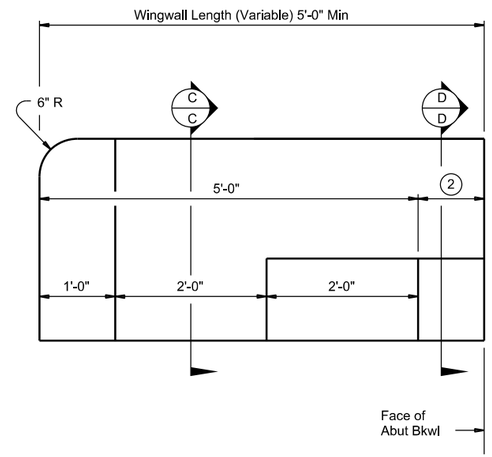
SECTION D-D
ON ABUTMENT WINGWALLS
OR CIP RETAINING WALLS



AT POST
ON BRIDGE SLAB

AT OPENING
ON BRIDGE SLAB

SECTIONS THRU RAIL



ELEVATION AT ABUTMENT WINGWALL

CONSTRUCTION NOTES:

Face of rail and parapet must be vertical transversely unless otherwise shown in the plans or approved by the Engineer.

Provide water barriers at openings draining onto undercrossing roadways and sidewalks. They may be cast-in-place or precast in convenient lengths and bonded to the bridge deck with an approved epoxy cement.

MATERIAL NOTES:

All steel components except reinforcing must be galvanized unless otherwise shown on plans.

Provide Class "C" concrete. Provide Class "C" (HPC) if required elsewhere. Chamfer all exposed corners.

Provide Grade 60 reinforcing steel.

Epoxy coat all rail reinforcement if slab bars are epoxy coated.

Deformed Welded Wire Reinforcing (WWR) (ASTM A1064) of equal size and spacing may be substituted for Bars U, V, and WU unless noted otherwise. Provide the same laps as required for reinforcing bars.

Provide bar laps, where required, as follows:

Uncoated ~ #5 = 1'-9"

Epoxy coated ~ #5 = 2'-7"

GENERAL NOTES:

This rail has been evaluated and accepted to be of equal strength to railings with like geometry, which have been crash tested to meet NCHRP Report 350 TL-4 criteria. This rail can be used for speeds of 50 mph and greater when a TL-3 rated guard fence transition is used. When a TL-2 rated guard fence transition is used, this rail can only be used for speeds of 45 mph and less.

Do not use this railing on bridges with expansion joints providing more than 5" movement.

Rail anchorage details shown on this standard may require modification for select structure types. See appropriate details elsewhere in plans for these modifications.

Shop drawings will not be required for this rail.

Average weight of railing with no overlay is 358 plf.

(2) Wingwall Length minus 5'-0" (Varies)

(3) Increase 2" for structures with overlay.

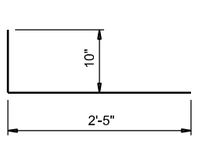
(6) Bars L(#5) are part of rail reinforcing and are included in unit price bid for railing. Space with Bars U. Bars L match slab bar cover. Bars L may be bundled with top slab reinforcing if spacing is equivalent.

(8) When vertical reinforcing has closer clear cover over horizontal reinforcing in abutment wingwalls on traffic side of wall, move the horizontal wingwall/retaining wall reinforcing to the inside of Bars WU where bars conflict.

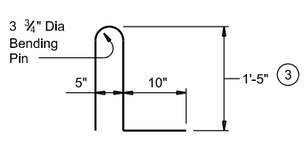
(9) Top longitudinal slab bar may be adjusted laterally 3" plus or minus to tie reinforcing.

(10) At the Contractor's option, Bars V may be replaced by extending Bars U to 2'-5" above the roadway surface without overlay.

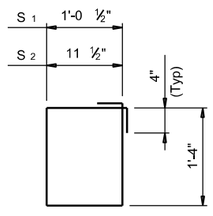
Cover dimensions are clear dimensions, unless noted otherwise.
Reinforcing bar dimensions shown are out-to-out of bar.



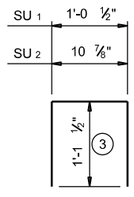
BARS L (#5)



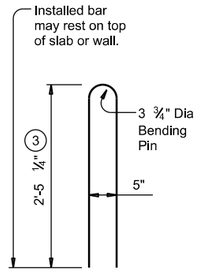
BARS U (#5) (10)



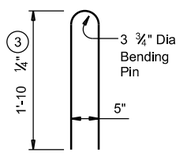
BARS S (#3)



BARS SU (#3)



BARS V (#5) (10)



BARS WU (#5)

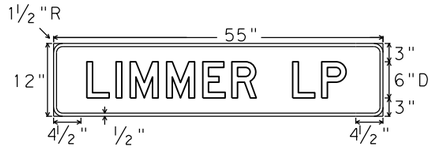
SHEET 3 OF 3

Texas Department of Transportation — Bridge Division Standard

TRAFFIC RAIL

TYPE T223

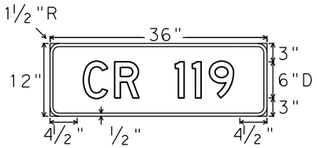
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		DIST	COUNTY		SHEET NO.
		06	WILLIAMSON		232



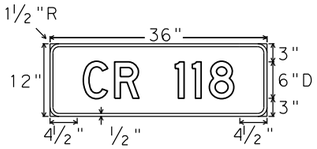
1.5" Radius, 0.5" Border, White on Green;
[LIMMER LOOP] ClearviewHwy-3-W



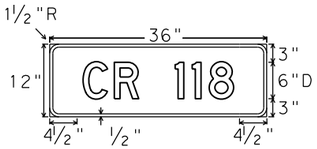
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[CHANDLER ROAD] ClearviewHwy-3-W



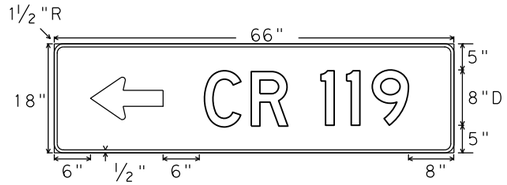
1.5" Radius, 0.5" Border, White on Green;
[CR 119] ClearviewHwy-3-W



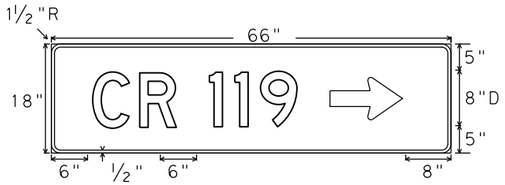
1.5" Radius, 0.5" Border, White on Green;
[CR 118] ClearviewHwy-3-W



1.5" Radius, 0.5" Border, Black on Orange;
[CR 118] ClearviewHwy-3-W

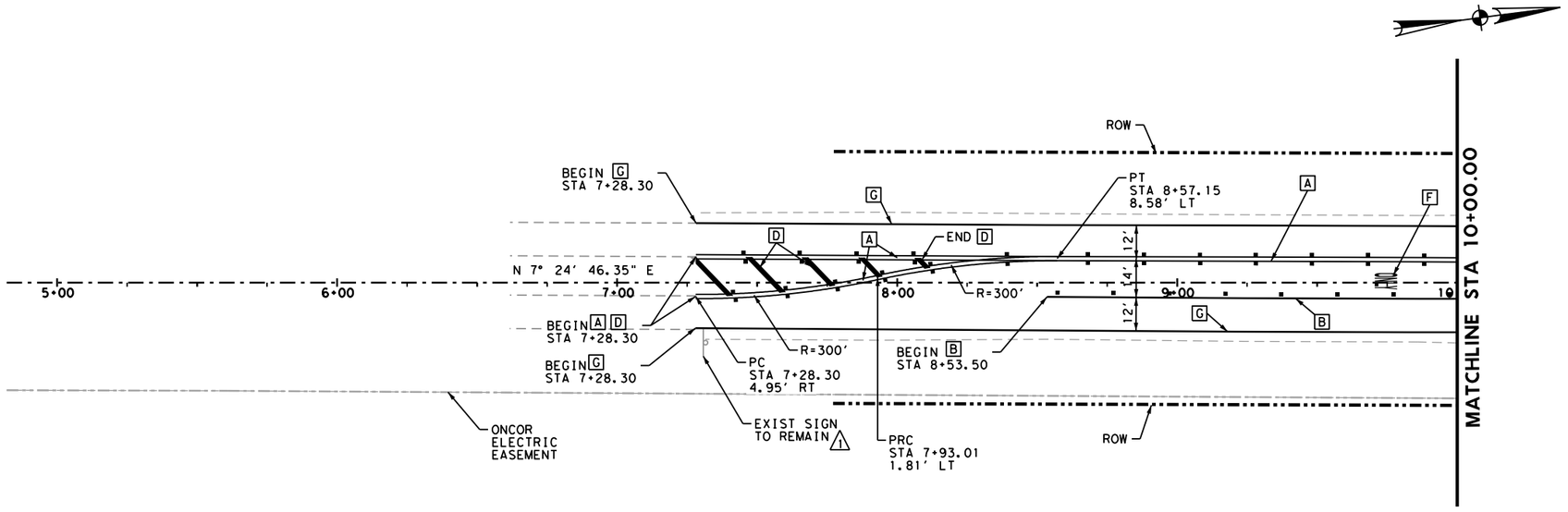


1.5" Radius, 0.5" Border, White on Green;
Standard Arrow Custom 12.0"X7.0" 180°;
[CR 119] ClearviewHwy-3-W



1.5" Radius, 0.5" Border, White on Green;
Standard Arrow Custom 12.0"X7.0" 0°;
[CR 119] ClearviewHwy-3-W

SMALL SIGN DETAILS



LEGEND

- A 4 INCH WIDE YELLOW LINE (SLD)(REFL) W/RAIS PAV MRKR (REFL) TY II A-A @ 20'C-C
- B 8 INCH WIDE WHITE LINE (SLD)(REFL) W/RAIS PAV MRKR (REFL) TY I-C @ 20'C-C
- C 24 INCH WIDE WHITE LINE (SLD)(REFL) STOP BAR
- D 24 INCH WIDE YELLOW LINE (SLD)(REFL)
- E RIGHT/LEFT/THRU ARROW (REFL)
- F WORD "ONLY" WHITE (REFL)
- G 4 INCH WIDE WHITE LINE (SLD)(REFL)
- H 6 INCH WIDE WHITE LINE (BRK)(REFL)
- I 24 INCH WIDE WHITE LINE (SLD)(REFL)
- J 4 INCH WIDE YELLOW LINE (BRK)(REFL)
- K 8 INCH WIDE WHITE DOT(REFL)
- L 4 INCH WIDE DBL YELLOW LINE (SLD)(REFL) W/RAIS PAV MRKR (REFL) TY II A-A @ 80'C-C

RIGHT OF WAY BOUNDARY
(#) PROPOSED SIGN
[#] EXISTING SIGN TO BE REMOVED
⚠# EXISTING SIGN TO REMAIN
OM ASSM OM-2Y(WC)GND
DEL ASSM (D-SW)SZ 1(BRF)GF2
DEL ASSM (D-SW)SZ (BRF)CTB)BI)

0 25 50

STATE OF TEXAS
ARNOLD GONZALES, JR.
98234
LICENSED
PROFESSIONAL ENGINEER

6/15/2017

CR 119

WILLIAMSON COUNTY
1848

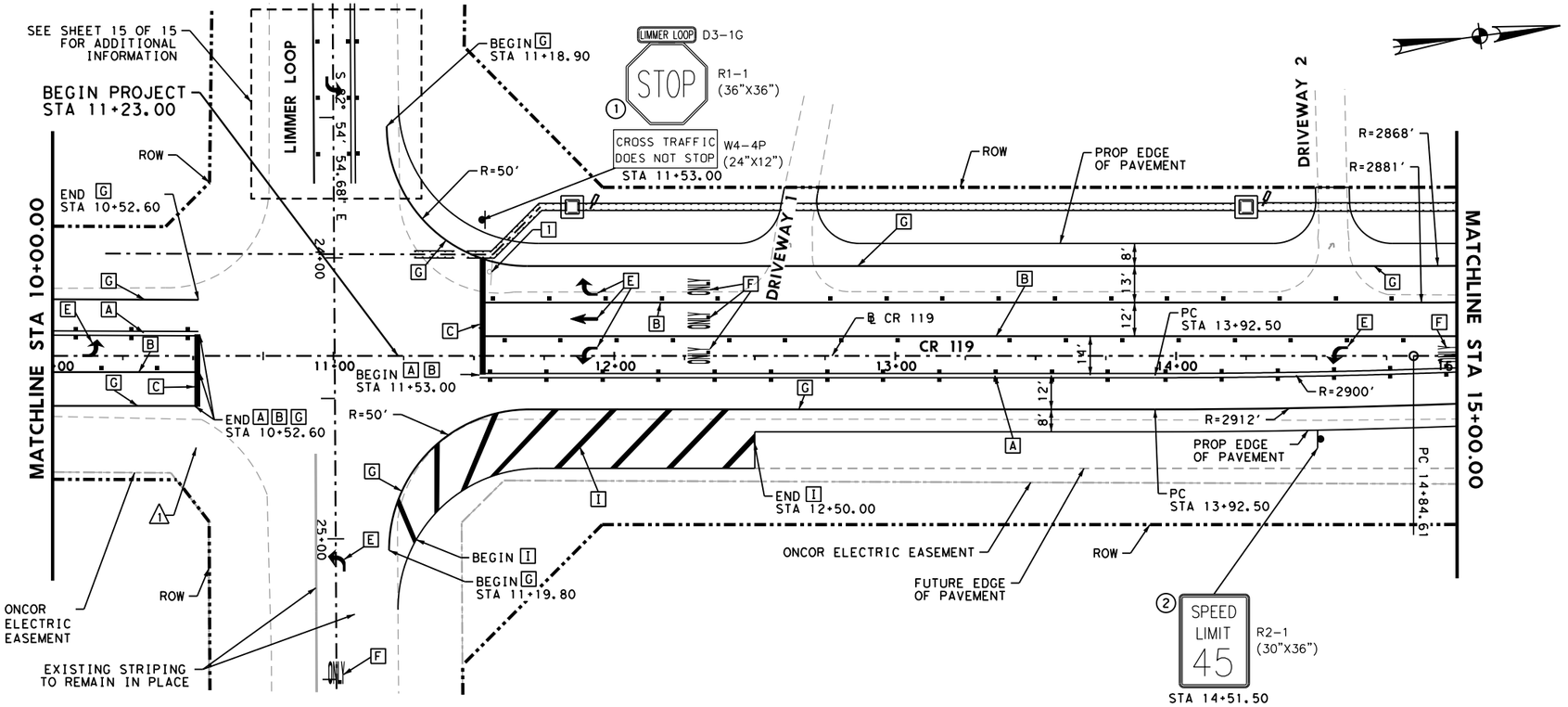
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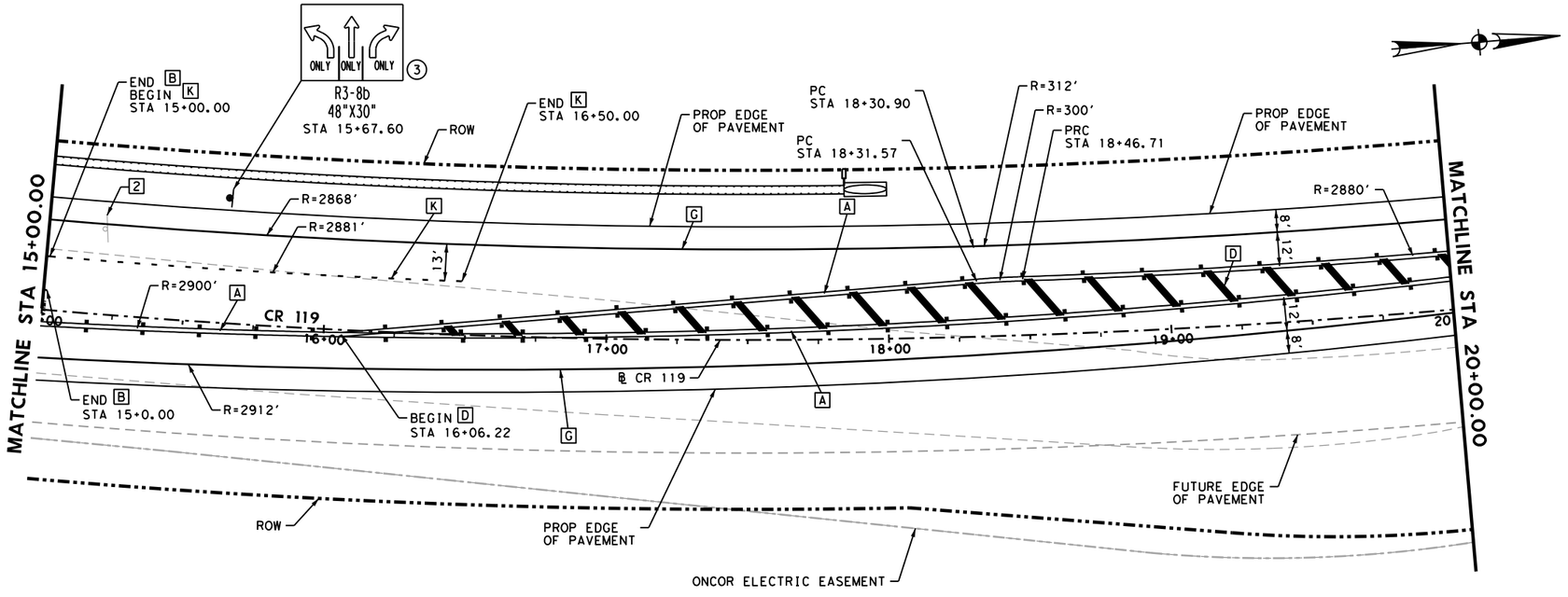
TRAFFIC SIGNING AND PAVEMENT MARKING LAYOUT

BEGIN PROJECT TO STA 10+00

SHEET 01 OF 15

FED. RD. DIV. RD.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				233





LEGEND

- A 4 INCH WIDE YELLOW LINE (SLD)(REFL) W/RAIS PAV MRKR (REFL) TY II A-A @ 20'C-C
- B 8 INCH WIDE WHITE LINE (SLD)(REFL) W/RAIS PAV MRKR (REFL) TY I-C @ 20'C-C
- C 24 INCH WIDE WHITE LINE (SLD)(REFL) STOP BAR
- D 24 INCH WIDE YELLOW LINE (SLD)(REFL)
- E RIGHT/LEFT/THRU ARROW (REFL)
- F WORD "ONLY" WHITE (REFL)
- G 4 INCH WIDE WHITE LINE (SLD)(REFL)
- H 6 INCH WIDE WHITE LINE (BRK)(REFL)
- I 24 INCH WIDE WHITE LINE (SLD)(REFL)
- J 4 INCH WIDE YELLOW LINE (BRK)(REFL)
- K 8 INCH WIDE WHITE DOT(REFL)
- L 4 INCH WIDE DBL YELLOW LINE (SLD)(REFL) W/RAIS PAV MRKR (REFL) TY II A-A @ 80'C-C

RIGHT OF WAY BOUNDARY
PROPOSED SIGN
EXISTING SIGN TO BE REMOVED
EXISTING SIGN TO REMAIN
OM ASSM OM-2Y(WC)GND
DEL ASSM (D-SW)SZ 1(BRF)GF2
DEL ASSM (D-SW)SZ (BRF)CTB)BI)

NOTES:
1. REFER TO SIGNING AND PAVEMENT MARKING LAYOUT SHEET 1 OF 15 FOR SMALL SIGN DETAILS.

0 25 50

STATE OF TEXAS ARNOLD GONZALES, JR. 98234 LICENSED PROFESSIONAL ENGINEER
6/15/2017

CR 119

WILLIAMSON COUNTY 1848

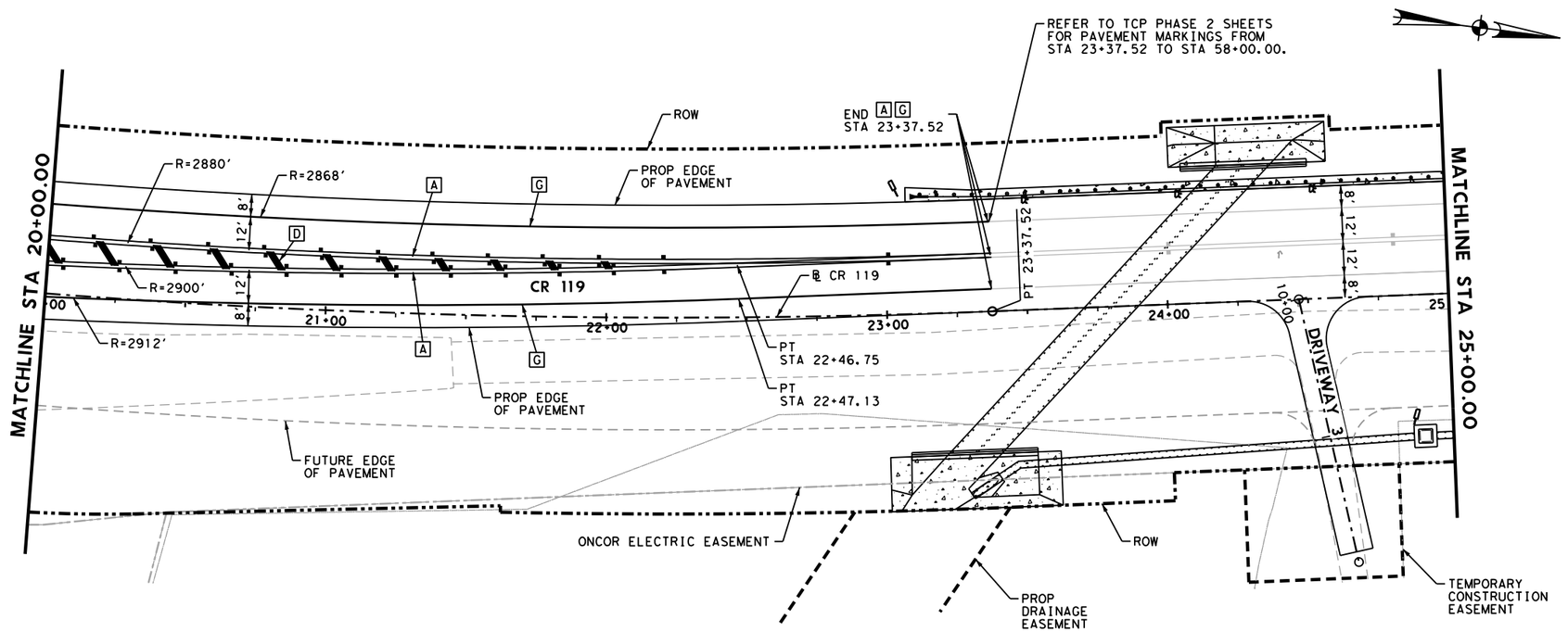
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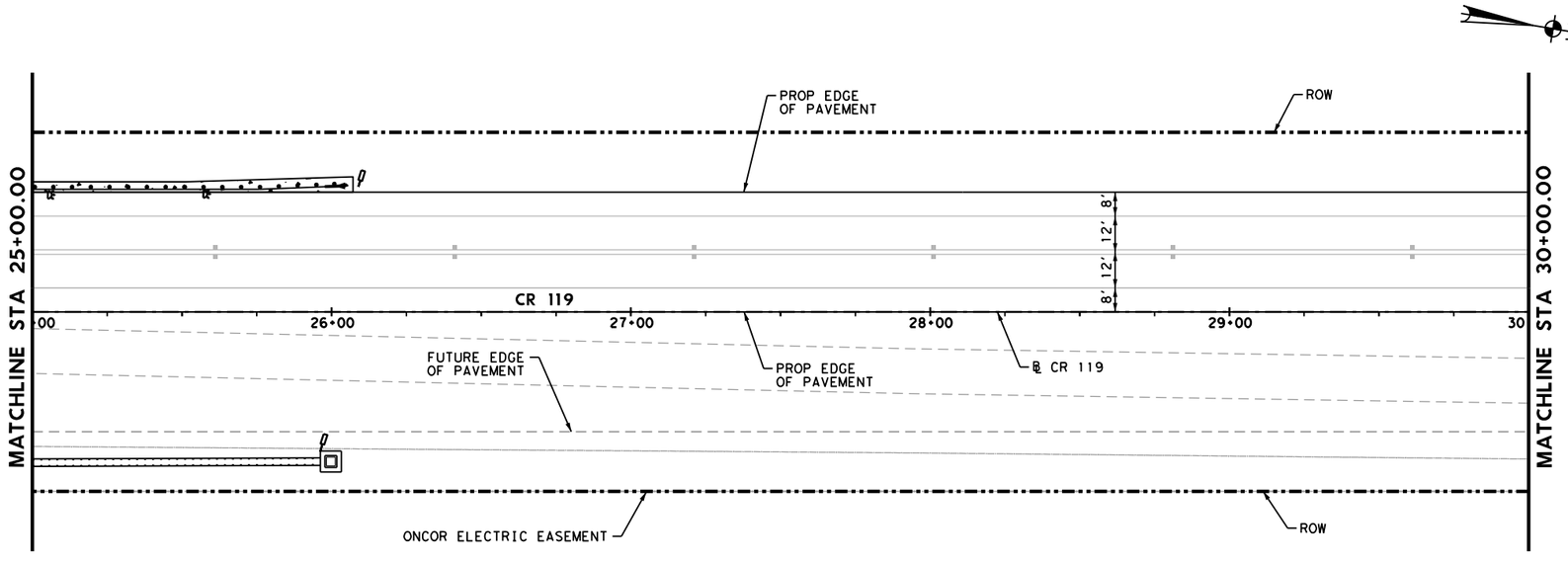
TRAFFIC SIGNING AND PAVEMENT MARKING LAYOUT

STA 10+00 TO STA 20+00

SHEET 02 OF 15

FED. RD. DIV. RD.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				234





LEGEND

- A 4 INCH WIDE YELLOW LINE (SLD)(REFL) W/RAIS PAV MRKR (REFL) TY II A-A @ 20'C-C
- B 8 INCH WIDE WHITE LINE (SLD)(REFL) W/RAIS PAV MRKR (REFL) TY I-C @ 20'C-C
- C 24 INCH WIDE WHITE LINE (SLD)(REFL) STOP BAR
- D 24 INCH WIDE YELLOW LINE (SLD)(REFL)
- E RIGHT/LEFT/THRU ARROW (REFL)
- F WORD "ONLY" WHITE (REFL)
- G 4 INCH WIDE WHITE LINE (SLD)(REFL)
- H 6 INCH WIDE WHITE LINE (BRK)(REFL)
- I 24 INCH WIDE WHITE LINE (SLD)(REFL)
- J 4 INCH WIDE YELLOW LINE (BRK)(REFL)
- K 8 INCH WIDE WHITE DOT(REFL)
- L 4 INCH WIDE DBL YELLOW LINE (SLD)(REFL) W/RAIS PAV MRKR (REFL) TY II A-A @ 80'C-C

RIGHT OF WAY BOUNDARY

(#) PROPOSED SIGN

[#] EXISTING SIGN TO BE REMOVED

<#> EXISTING SIGN TO REMAIN

OM ASSM OM-2Y(WC)GND

DEL ASSM (D-SW)SZ 1(BRF)GF2

DEL ASSM (D-SW)SZ (BRF)CTB)BI)

NOTES:
1. REFER TO SIGNING AND PAVEMENT MARKING LAYOUT SHEET 1 OF 15 FOR SMALL SIGN DETAILS.
2. REFER TO TCP PHASE 2 SHEETS FOR PAVEMENT MARKINGS FROM STA 23+37.52 TO STA 58+00.00.

0 25 50

STATE OF TEXAS
ARNOLD GONZALES, JR.
98234
LICENSED
PROFESSIONAL ENGINEER

6/15/2017

CR 119

WILLIAMSON COUNTY 1848

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TRAFFIC SIGNING AND PAVEMENT MARKING LAYOUT

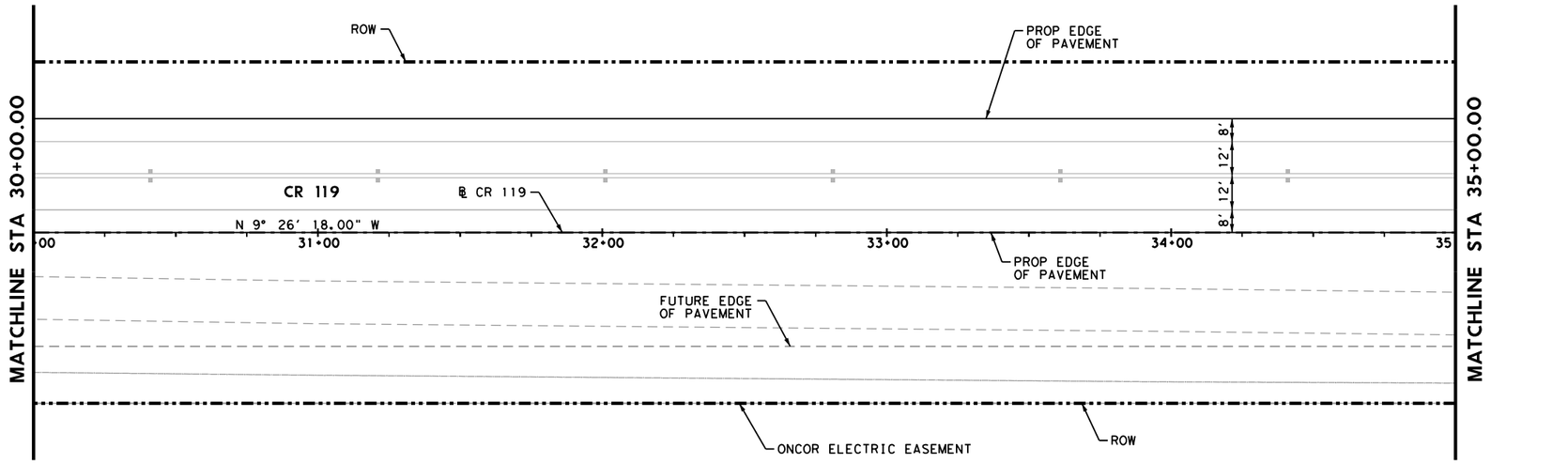
STA 20+00 TO STA 30+00

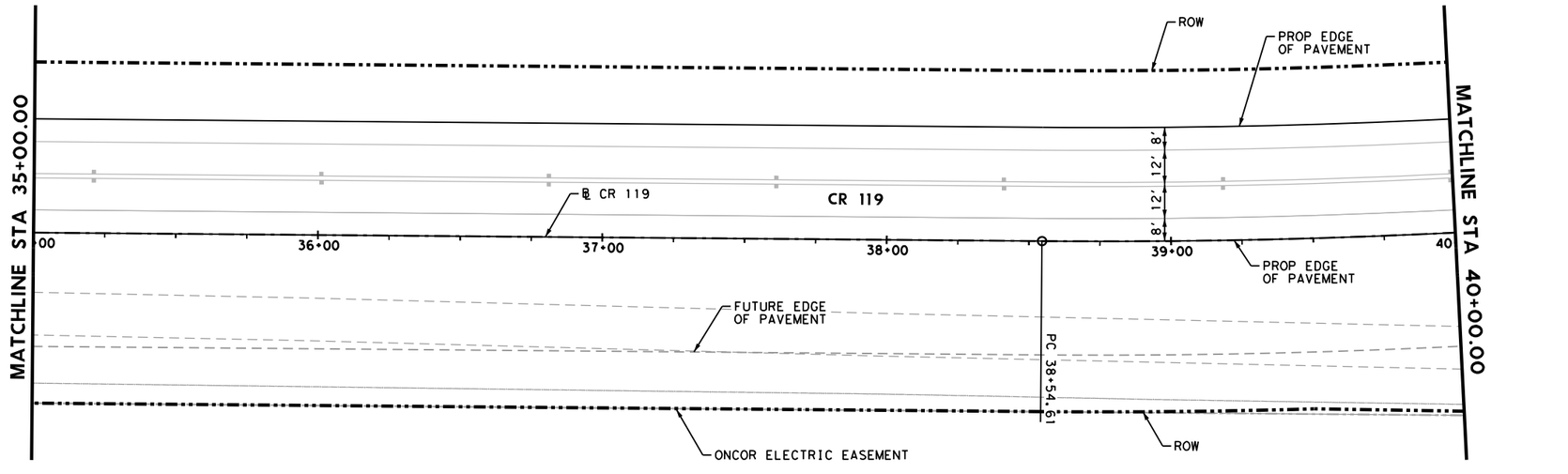
SHEET 03 OF 15

FED. RD. DIV. RD.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				235

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LEGEND

- [A] 4 INCH WIDE YELLOW LINE (SLD)(REFL) W/RAIS PAV MRKR (REFL) TY II A-A @ 20'C-C
- [B] 8 INCH WIDE WHITE LINE (SLD)(REFL) W/RAIS PAV MRKR (REFL) TY I-C @ 20'C-C
- [C] 24 INCH WIDE WHITE LINE (SLD)(REFL) STOP BAR
- [D] 24 INCH WIDE YELLOW LINE (SLD)(REFL)
- [E] RIGHT/LEFT/THRU ARROW (REFL)
- [F] WORD "ONLY" WHITE (REFL)
- [G] 4 INCH WIDE WHITE LINE (SLD)(REFL)
- [H] 6 INCH WIDE WHITE LINE (BRK)(REFL)
- [I] 24 INCH WIDE WHITE LINE (SLD)(REFL)
- [J] 4 INCH WIDE YELLOW LINE (BRK)(REFL)
- [K] 8 INCH WIDE WHITE DOT(REFL)
- [L] 4 INCH WIDE DBL YELLOW LINE (SLD)(REFL) W/RAIS PAV MRKR (REFL) TY II A-A @ 80'C-C

RIGHT OF WAY BOUNDARY

(#) PROPOSED SIGN

[#] EXISTING SIGN TO BE REMOVED

EXISTING SIGN TO REMAIN

OM ASSM OM-2Y(WC)GND

DEL ASSM (D-SW)SZ 1(BRF)GF2

DEL ASSM (D-SW)SZ (BRF)CTB)BI)

NOTES:
1. REFER TO SIGNING AND PAVEMENT MARKING LAYOUT SHEET 1 OF 15 FOR SMALL SIGN DETAILS.
2. REFER TO TCP PHASE 2 SHEETS FOR PAVEMENT MARKINGS FROM STA 23+37.52 TO STA 58+00.00.

0 25 50

STATE OF TEXAS
ARNOLD GONZALES, JR.
98234
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6/15/2017

CR 119

WILLIAMSON COUNTY 1848

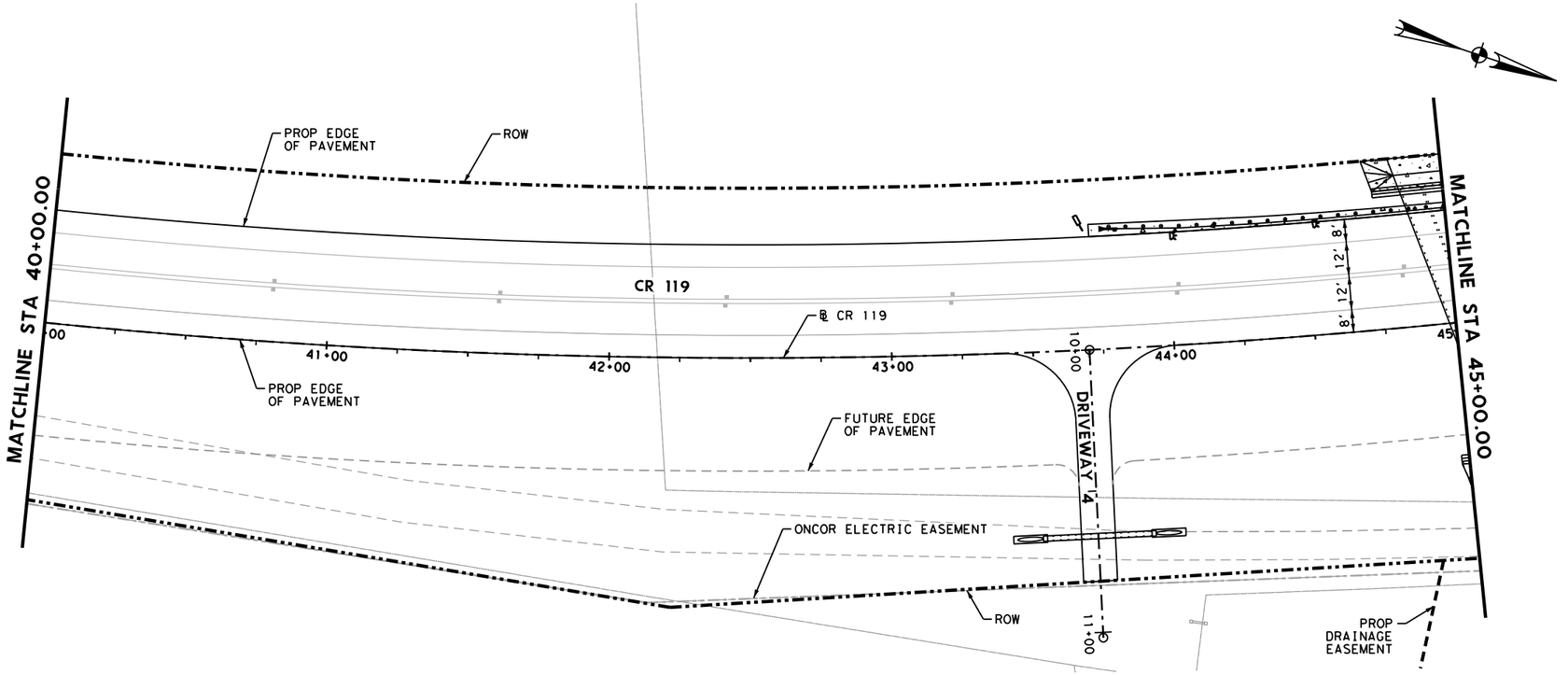
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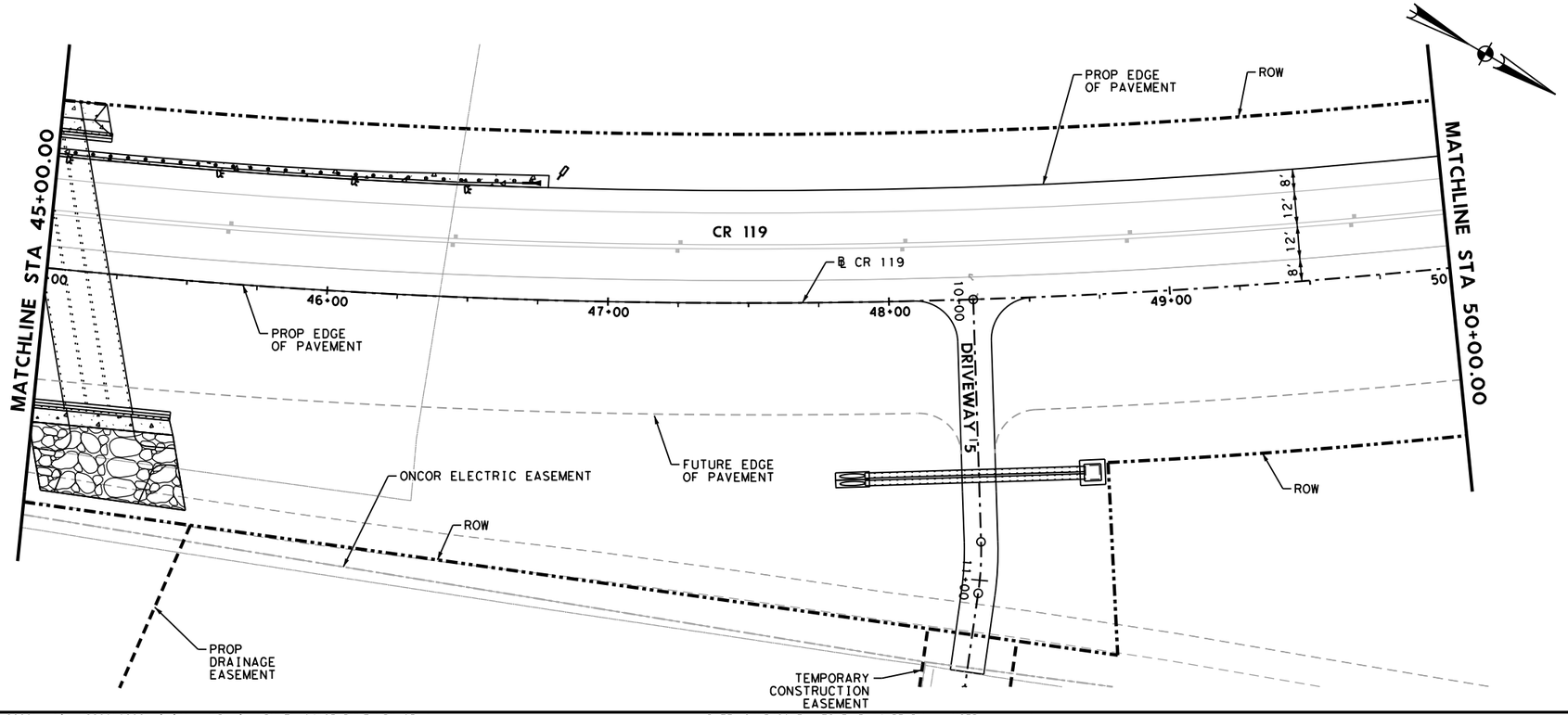
TRAFFIC SIGNING AND PAVEMENT MARKING LAYOUT

STA 30+00 TO STA 40+00

SHEET 04 OF 15

FED. RD. DIV. RD.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				236





LEGEND

- A 4 INCH WIDE YELLOW LINE (SLD)(REFL) W/RAIS PAV MRKR (REFL) TY II A-A @ 20'C-C
- B 8 INCH WIDE WHITE LINE (SLD)(REFL) W/RAIS PAV MRKR (REFL) TY I-C @ 20'C-C
- C 24 INCH WIDE WHITE LINE (SLD)(REFL) STOP BAR
- D 24 INCH WIDE YELLOW LINE (SLD)(REFL)
- E RIGHT/LEFT/THRU ARROW (REFL)
- F WORD "ONLY" WHITE (REFL)
- G 4 INCH WIDE WHITE LINE (SLD)(REFL)
- H 6 INCH WIDE WHITE LINE (BRK)(REFL)
- I 24 INCH WIDE WHITE LINE (SLD)(REFL)
- J 4 INCH WIDE YELLOW LINE (BRK)(REFL)
- K 8 INCH WIDE WHITE DOT(REFL)
- L 4 INCH WIDE DBL YELLOW LINE (SLD)(REFL) W/RAIS PAV MRKR (REFL) TY II A-A @ 80'C-C

RIGHT OF WAY BOUNDARY

(#) PROPOSED SIGN

[#] EXISTING SIGN TO BE REMOVED

EXISTING SIGN TO REMAIN

OM ASSM OM-2Y(WC)GND

DEL ASSM (D-SW)SZ 1(BRF)GF2

DEL ASSM (D-SW)SZ (BRF)CTB)BI)

NOTES:
1. REFER TO SIGNING AND PAVEMENT MARKING LAYOUT SHEET 1 OF 15 FOR SMALL SIGN DETAILS.
2. REFER TO TCP PHASE 2 SHEETS FOR PAVEMENT MARKINGS FROM STA 23+37.52 TO STA 58+00.00.

0 25 50

STATE OF TEXAS
ARNOLD GONZALES, JR.
98234
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6/15/2017

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WILLIAMSON COUNTY 1848

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TRAFFIC SIGNING AND PAVEMENT MARKING LAYOUT

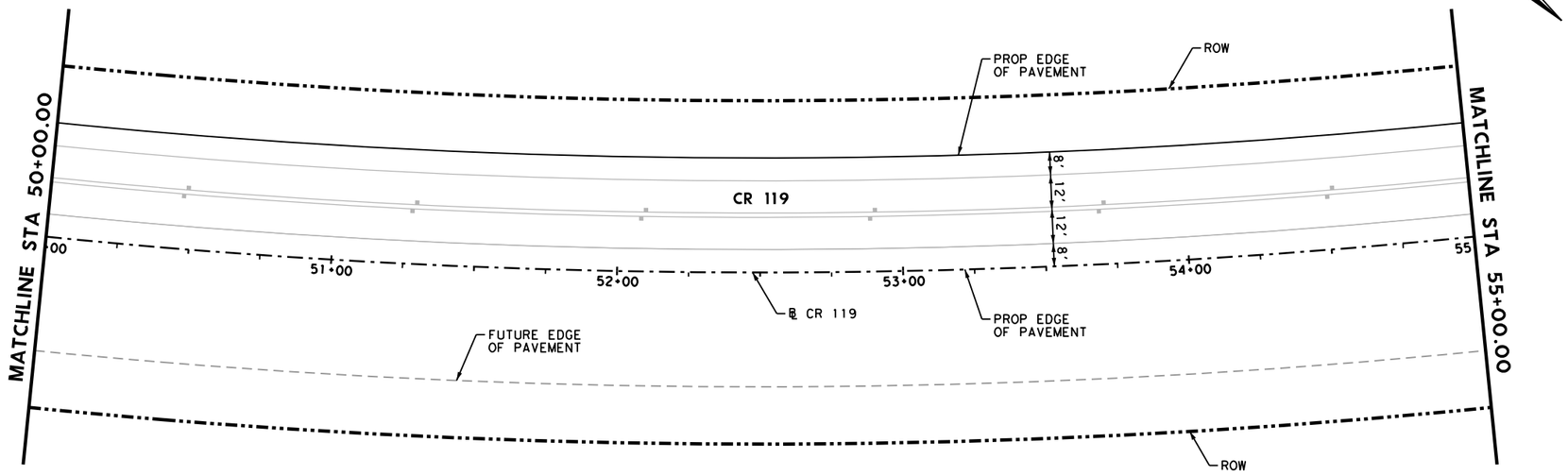
STA 40+00 TO STA 50+00

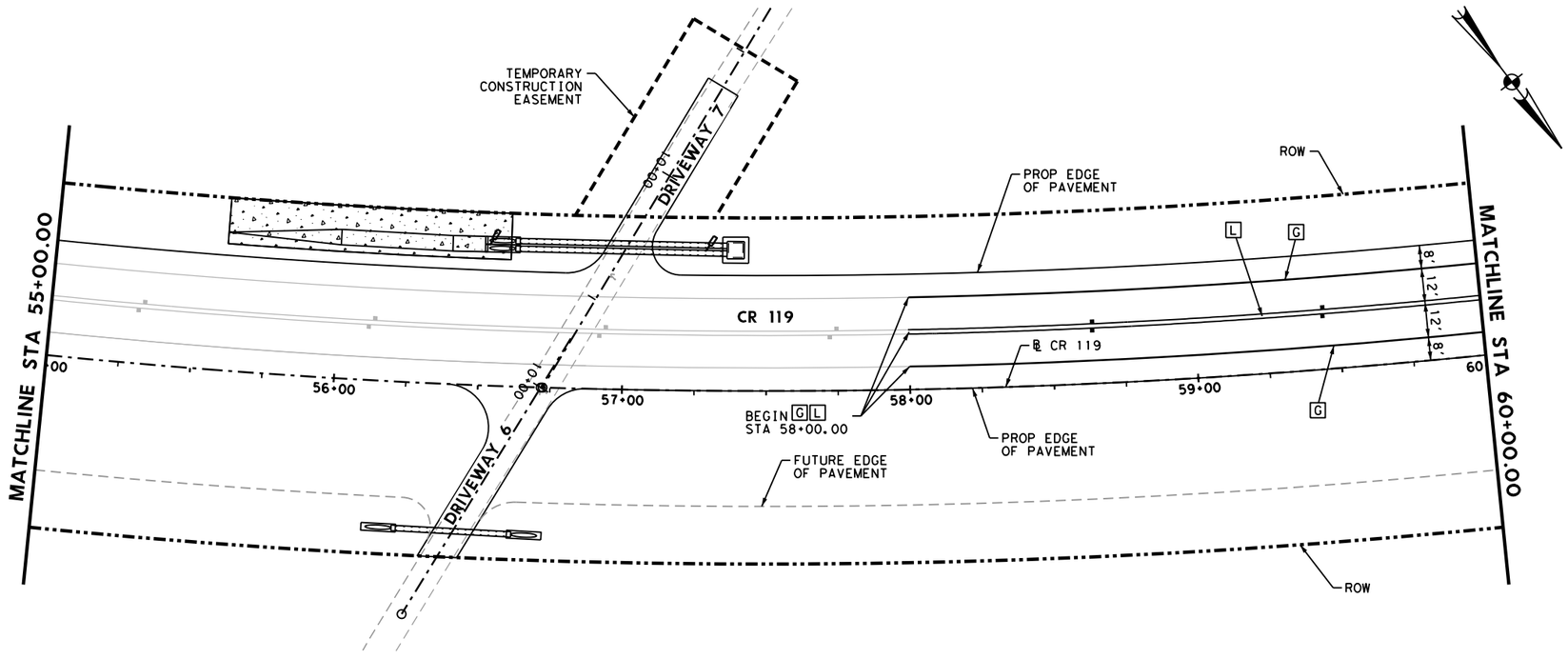
SHEET 05 OF 15

FED. RD. DIV. RD.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				237

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LEGEND

- A 4 INCH WIDE YELLOW LINE (SLD)(REFL) W/RAIS PAV MRKR (REFL) TY II A-A @ 20'C-C
- B 8 INCH WIDE WHITE LINE (SLD)(REFL) W/RAIS PAV MRKR (REFL) TY I-C @ 20'C-C
- C 24 INCH WIDE WHITE LINE (SLD)(REFL) STOP BAR
- D 24 INCH WIDE YELLOW LINE (SLD)(REFL)
- E RIGHT/LEFT/THRU ARROW (REFL)
- F WORD "ONLY" WHITE (REFL)
- G 4 INCH WIDE WHITE LINE (SLD)(REFL)
- H 6 INCH WIDE WHITE LINE (BRK)(REFL)
- I 24 INCH WIDE WHITE LINE (SLD)(REFL)
- J 4 INCH WIDE YELLOW LINE (BRK)(REFL)
- K 8 INCH WIDE WHITE DOT(REFL)
- L 4 INCH WIDE DBL YELLOW LINE (SLD)(REFL) W/RAIS PAV MRKR (REFL) TY II A-A @ 80'C-C

RIGHT OF WAY BOUNDARY
PROPOSED SIGN
EXISTING SIGN TO BE REMOVED
EXISTING SIGN TO REMAIN
OM ASSM OM-2Y(WC)GND
DEL ASSM (D-SW)SZ 1(BRF)GF2
DEL ASSM (D-SW)SZ (BRF)CTB)BI)

NOTES:
1. REFER TO SIGNING AND PAVEMENT MARKING LAYOUT SHEET 1 OF 15 FOR SMALL SIGN DETAILS.
2. REFER TO TCP PHASE 2 SHEETS FOR PAVEMENT MARKINGS FROM STA 23+37.52 TO STA 58+00.00.

0 25 50

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6/15/2017

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WILLIAMSON COUNTY 1848

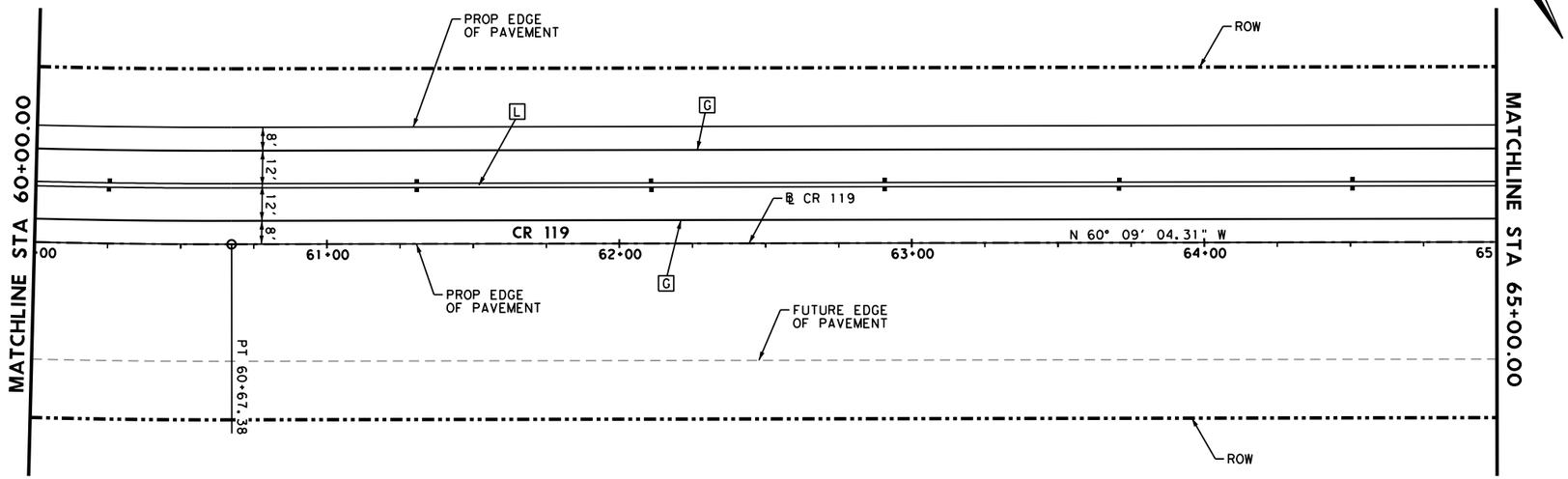
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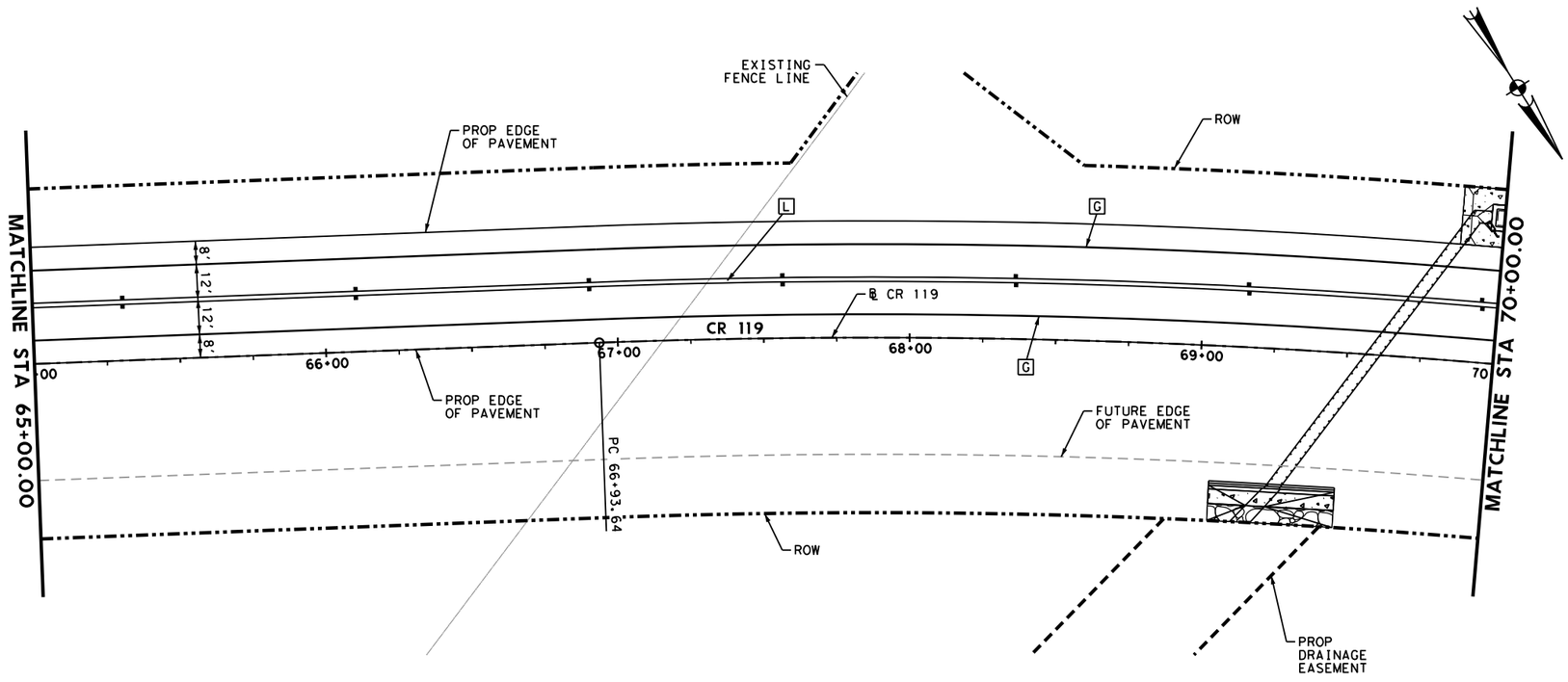
TRAFFIC SIGNING AND PAVEMENT MARKING LAYOUT

STA 50+00 TO STA 60+00

SHEET 06 OF 15

FED. RD. DIV. RD.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				238





LEGEND

- [B] 8 INCH WIDE WHITE LINE (SLD)(REFL) W/RAIS PAV MRKR (REFL) TY I-C @ 20'C-C
- [C] 24 INCH WIDE WHITE LINE (SLD)(REFL) STOP BAR
- [D] 24 INCH WIDE YELLOW LINE (SLD)(REFL)
- [E] RIGHT/LEFT/THRU ARROW (REFL)
- [F] WORD "ONLY" WHITE (REFL)
- [G] 4 INCH WIDE WHITE LINE (SLD)(REFL)
- [H] 6 INCH WIDE WHITE LINE (BRK)(REFL)
- [I] 24 INCH WIDE WHITE LINE (SLD)(REFL)
- [J] 4 INCH WIDE YELLOW LINE (BRK)(REFL)
- [K] 8 INCH WIDE WHITE DOT(REFL)
- [L] 4 INCH WIDE DBL YELLOW LINE (SLD)(REFL) W/RAIS PAV MRKR (REFL) TY II A-A @ 80'C-C

RIGHT OF WAY BOUNDARY

(#) PROPOSED SIGN

[#] EXISTING SIGN TO BE REMOVED

⚠# EXISTING SIGN TO REMAIN

OM ASSM OM-2Y(WC)GND

DEL ASSM (D-SW)SZ 1(BRF)GF2

DEL ASSM (D-SW)SZ (BRF)CTB)BI)

NOTES:
1. REFER TO SIGNING AND PAVEMENT MARKING LAYOUT SHEET 1 OF 15 FOR SMALL SIGN DETAILS.

0 25 50

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6/15/2017

CR 119

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TRAFFIC SIGNING AND PAVEMENT MARKING LAYOUT

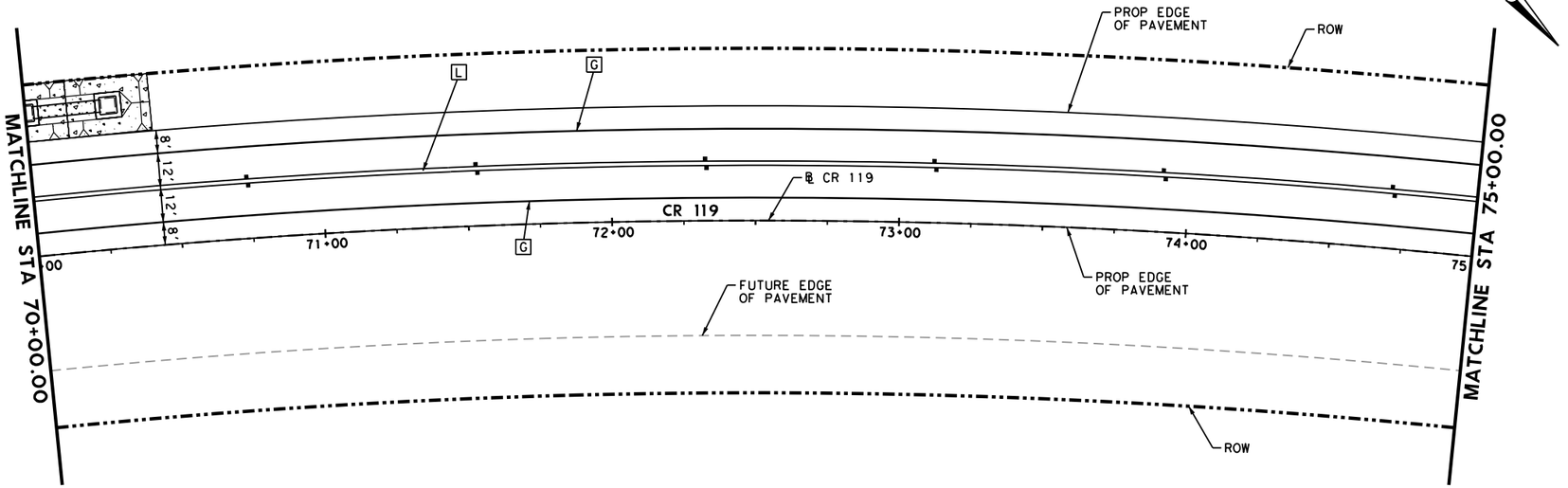
STA 60+00 TO STA 70+00

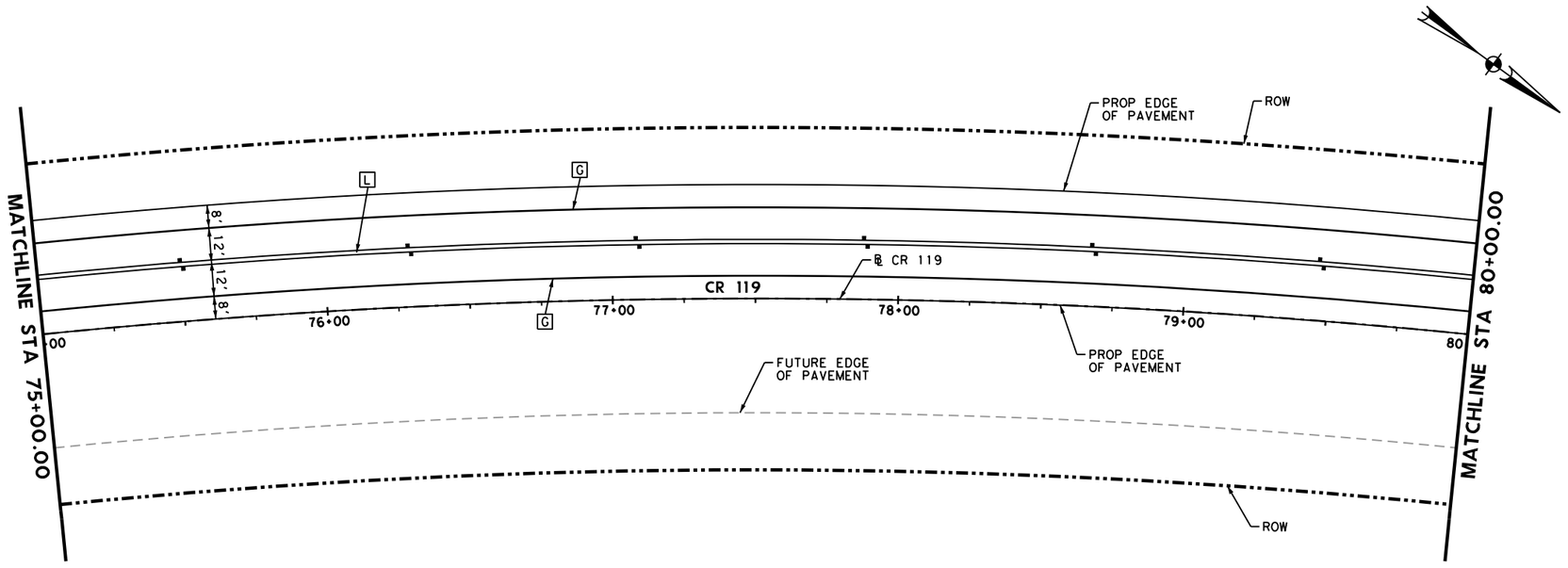
SHEET 07 OF 15

FED. RD. DIV. RD.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				239

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LEGEND

- [B] 8 INCH WIDE WHITE LINE (SLD)(REFL) W/RAIS PAV MRKR (REFL) TY I-C @ 20'C-C
- [C] 24 INCH WIDE WHITE LINE (SLD)(REFL) STOP BAR
- [D] 24 INCH WIDE YELLOW LINE (SLD)(REFL)
- [E] RIGHT/LEFT/THRU ARROW (REFL)
- [F] WORD "ONLY" WHITE (REFL)
- [G] 4 INCH WIDE WHITE LINE (SLD)(REFL)
- [H] 6 INCH WIDE WHITE LINE (BRK)(REFL)
- [I] 24 INCH WIDE WHITE LINE (SLD)(REFL)
- [J] 4 INCH WIDE YELLOW LINE (BRK)(REFL)
- [K] 8 INCH WIDE WHITE DOT(REFL)
- [L] 4 INCH WIDE DBL YELLOW LINE (SLD)(REFL) W/RAIS PAV MRKR (REFL) TY II A-A @ 80'C-C

RIGHT OF WAY BOUNDARY

(#) PROPOSED SIGN

[#] EXISTING SIGN TO BE REMOVED

EXISTING SIGN TO REMAIN

OM ASSM OM-2Y(WC)GND

DEL ASSM (D-SW)SZ 1(BRF)GF2

DEL ASSM (D-SW)SZ (BRF)CTB)BI)

NOTES:
1. REFER TO SIGNING AND PAVEMENT MARKING LAYOUT SHEET 1 OF 15 FOR SMALL SIGN DETAILS.

0 25 50

STATE OF TEXAS
ARNOLD GONZALES, JR.
98234
LICENSED
PROFESSIONAL ENGINEER

6/15/2017

CR 119

WILLIAMSON COUNTY 1848

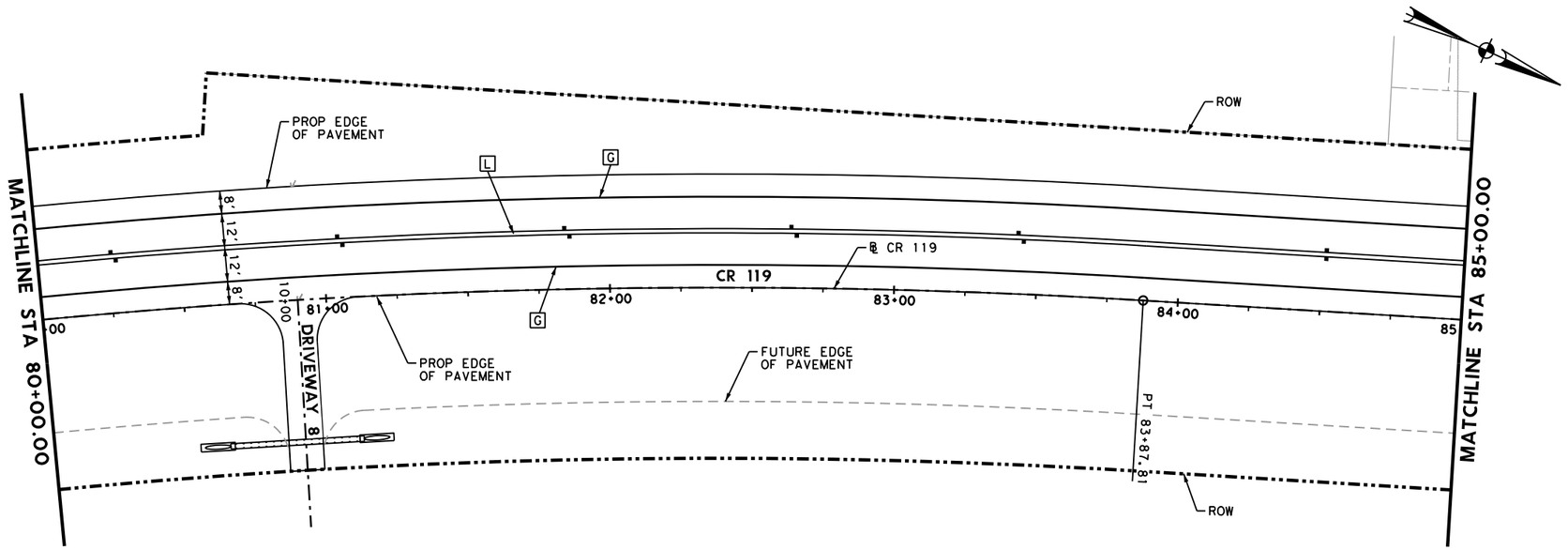
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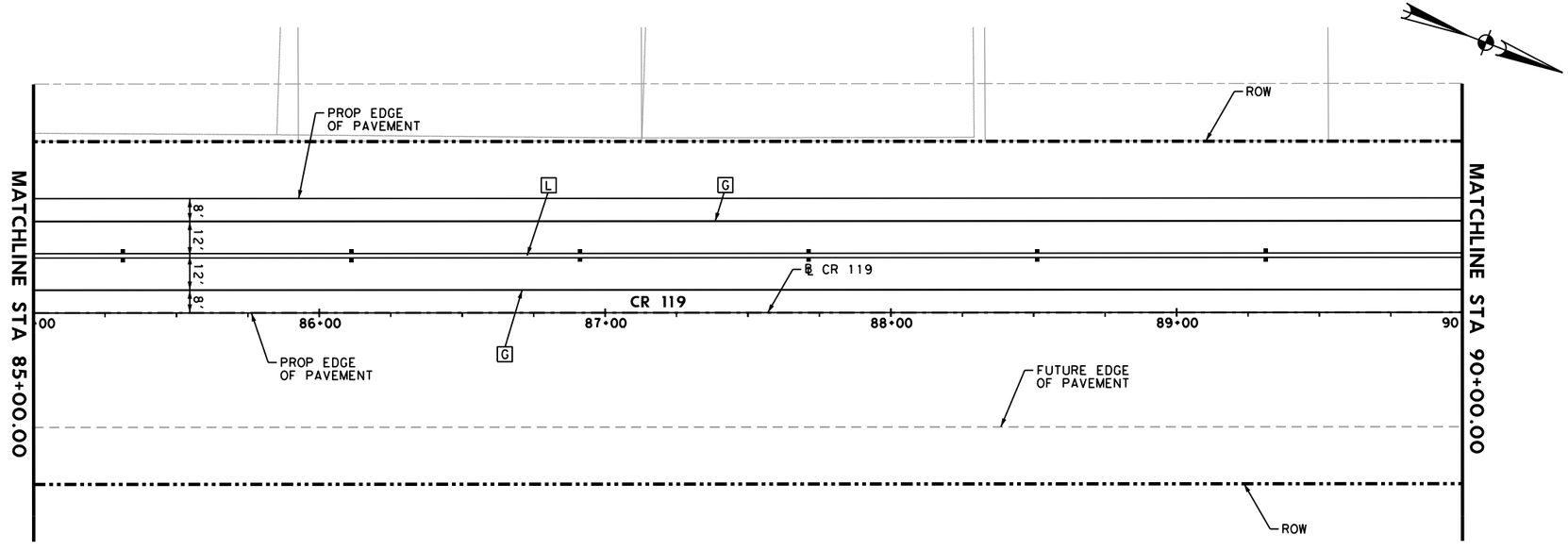
TRAFFIC SIGNING AND PAVEMENT MARKING LAYOUT

STA 70+00 TO STA 80+00

SHEET 08 OF 15

FED. RD. DIV. RD.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				240





LEGEND

- [B] 8 INCH WIDE WHITE LINE (SLD)(REFL) W/RAIS PAV MRKR (REFL) TY I-C @ 20'C-C
- [C] 24 INCH WIDE WHITE LINE (SLD)(REFL) STOP BAR
- [D] 24 INCH WIDE YELLOW LINE (SLD)(REFL)
- [E] RIGHT/LEFT/THRU ARROW (REFL)
- [F] WORD "ONLY" WHITE (REFL)
- [G] 4 INCH WIDE WHITE LINE (SLD)(REFL)
- [H] 6 INCH WIDE WHITE LINE (BRK)(REFL)
- [I] 24 INCH WIDE WHITE LINE (SLD)(REFL)
- [J] 4 INCH WIDE YELLOW LINE (BRK)(REFL)
- [K] 8 INCH WIDE WHITE DOT(REFL)
- [L] 4 INCH WIDE DBL YELLOW LINE (SLD)(REFL) W/RAIS PAV MRKR (REFL) TY II A-A @ 80'C-C

RIGHT OF WAY BOUNDARY

(#) PROPOSED SIGN

[#] EXISTING SIGN TO BE REMOVED

EXISTING SIGN TO REMAIN

OM ASSM OM-2Y(WC)GND

DEL ASSM (D-SW)SZ 1(BRF)GF2

DEL ASSM (D-SW)SZ (BRF)CTB)BI)

NOTES:
1. REFER TO SIGNING AND PAVEMENT MARKING LAYOUT SHEET 1 OF 15 FOR SMALL SIGN DETAILS.

0 25 50

STATE OF TEXAS
ARNOLD GONZALES, JR.
98234
LICENSED
PROFESSIONAL ENGINEER

6/15/2017

CR 119

WILLIAMSON COUNTY 1848

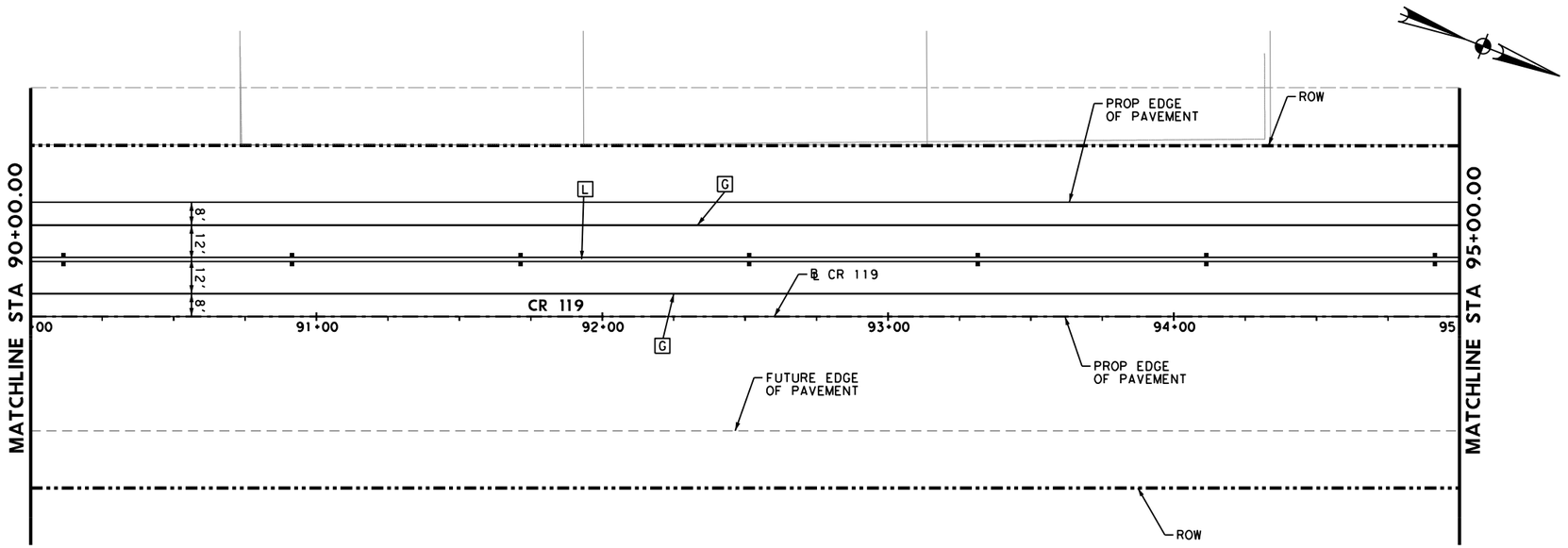
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TRAFFIC SIGNING AND PAVEMENT MARKING LAYOUT

STA 80+00 TO STA 90+00

SHEET 09 OF 15

FED. RD. DIV. RD.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				241



LEGEND

- [B] 8 INCH WIDE WHITE LINE (SLD)(REFL) W/RAIS PAV MRKR (REFL) TY I-C @ 20'C-C
- [C] 24 INCH WIDE WHITE LINE (SLD)(REFL) STOP BAR
- [D] 24 INCH WIDE YELLOW LINE (SLD)(REFL)
- [E] RIGHT/LEFT/THRU ARROW (REFL)
- [F] WORD "ONLY" WHITE (REFL)
- [G] 4 INCH WIDE WHITE LINE (SLD)(REFL)
- [H] 6 INCH WIDE WHITE LINE (BRK)(REFL)
- [I] 24 INCH WIDE WHITE LINE (SLD)(REFL)
- [J] 4 INCH WIDE YELLOW LINE (BRK)(REFL)
- [K] 8 INCH WIDE WHITE DOT(REFL)
- [L] 4 INCH WIDE DBL YELLOW LINE (SLD)(REFL) W/RAIS PAV MRKR (REFL) TY II A-A @ 80'C-C

RIGHT OF WAY BOUNDARY

(#) PROPOSED SIGN

[#] EXISTING SIGN TO BE REMOVED

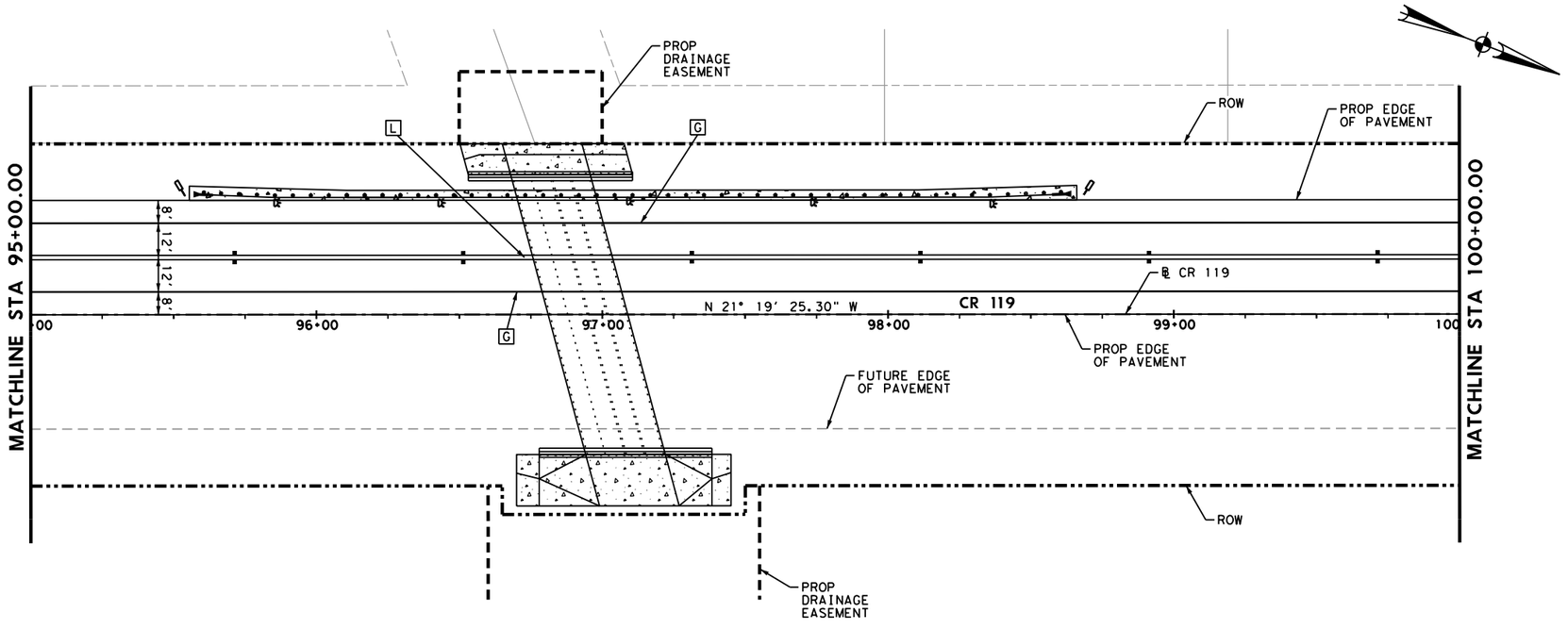
EXISTING SIGN TO REMAIN

OM ASSM OM-2Y(WC)GND

DEL ASSM (D-SW)SZ 1(BRF)GF2

DEL ASSM (D-SW)SZ (BRF)CTB)BI)

NOTES:
1. REFER TO SIGNING AND PAVEMENT MARKING LAYOUT SHEET 1 OF 15 FOR SMALL SIGN DETAILS.



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6/15/2017

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WILLIAMSON COUNTY 1848

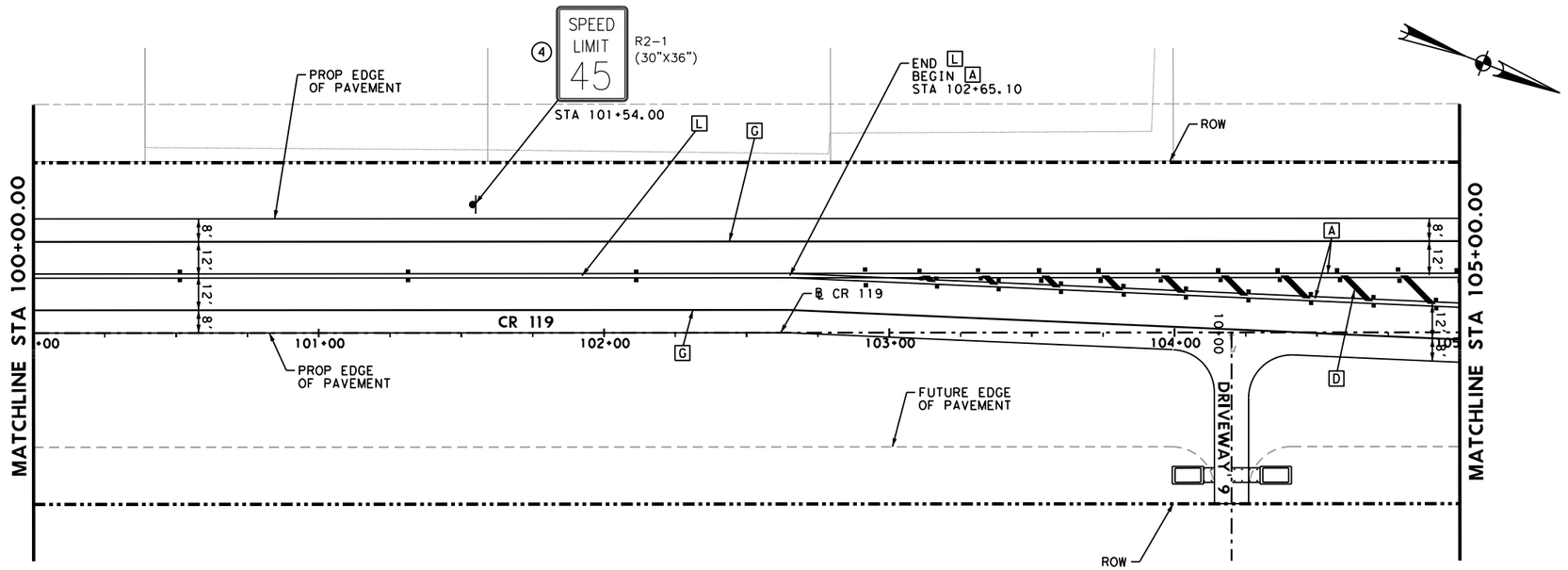
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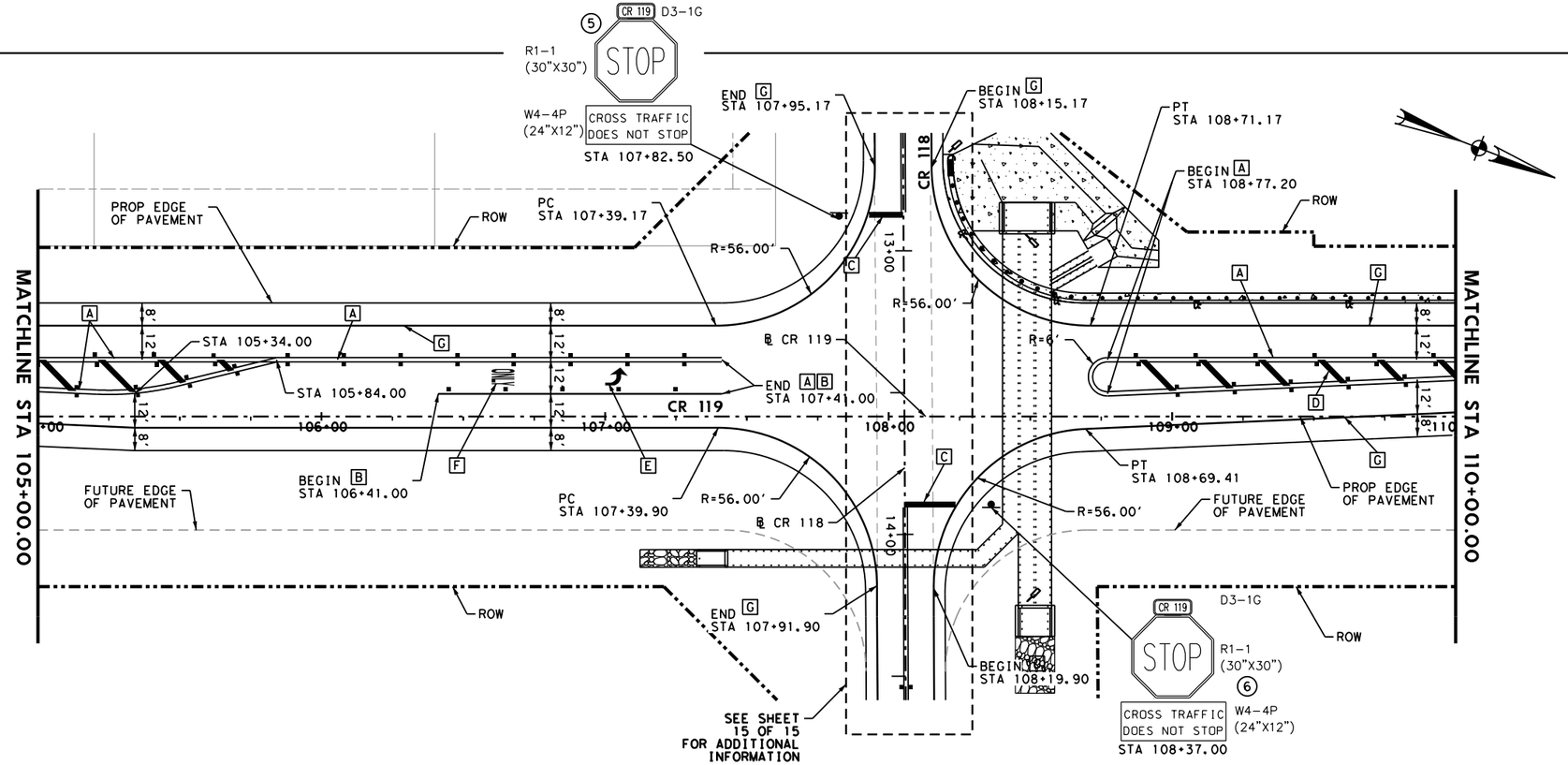
TRAFFIC SIGNING AND PAVEMENT MARKING LAYOUT

STA 90+00 TO STA 100+00

SHEET 10 OF 15

FED. RD. DIV. RD.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				242





LEGEND

- B 8 INCH WIDE WHITE LINE (SLD)(REFL) W/RAIS PAV MRKR (REFL) TY I-C @ 20'C-C
- C 24 INCH WIDE WHITE LINE (SLD)(REFL) STOP BAR
- D 24 INCH WIDE YELLOW LINE (SLD)(REFL)
- E RIGHT/LEFT/THRU ARROW (REFL)
- F WORD "ONLY" WHITE (REFL)
- G 4 INCH WIDE WHITE LINE (SLD)(REFL)
- H 6 INCH WIDE WHITE LINE (BRK)(REFL)
- I 24 INCH WIDE WHITE LINE (SLD)(REFL)
- J 4 INCH WIDE YELLOW LINE (BRK)(REFL)
- K 8 INCH WIDE WHITE DOT(REFL)
- L 4 INCH WIDE DBL YELLOW LINE (SLD)(REFL) W/RAIS PAV MRKR (REFL) TY II A-A @ 80'C-C

RIGHT OF WAY BOUNDARY
(#) PROPOSED SIGN
[#] EXISTING SIGN TO BE REMOVED
EXISTING SIGN TO REMAIN
OM ASSM OM-2Y(WC)GND
DEL ASSM (D-SW)SZ 1(BRF)GF2
DEL ASSM (D-SW)SZ (BRF)CTB)BI)

NOTES:
1. REFER TO SIGNING AND PAVEMENT MARKING LAYOUT SHEET 1 OF 15 FOR SMALL SIGN DETAILS.

0 25 50

STATE OF TEXAS
ARNOLD GONZALES, JR.
98234
LICENSED PROFESSIONAL ENGINEER

6/15/2017

CR 119

WILLIAMSON COUNTY 1848

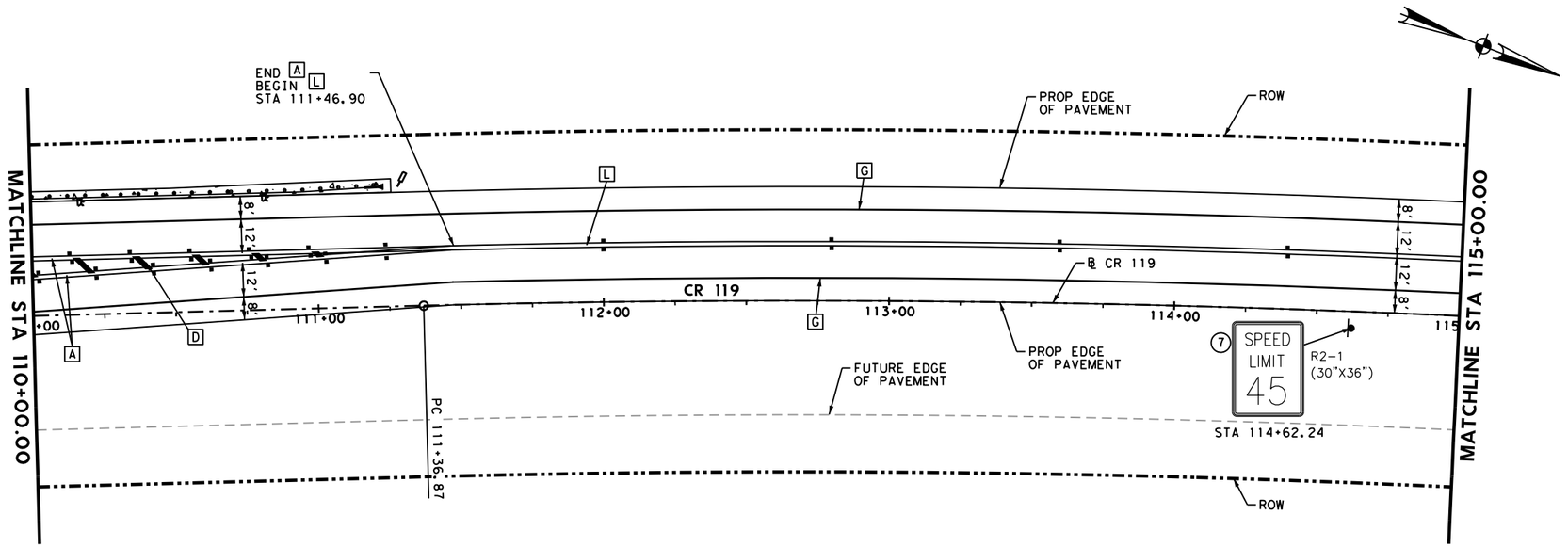
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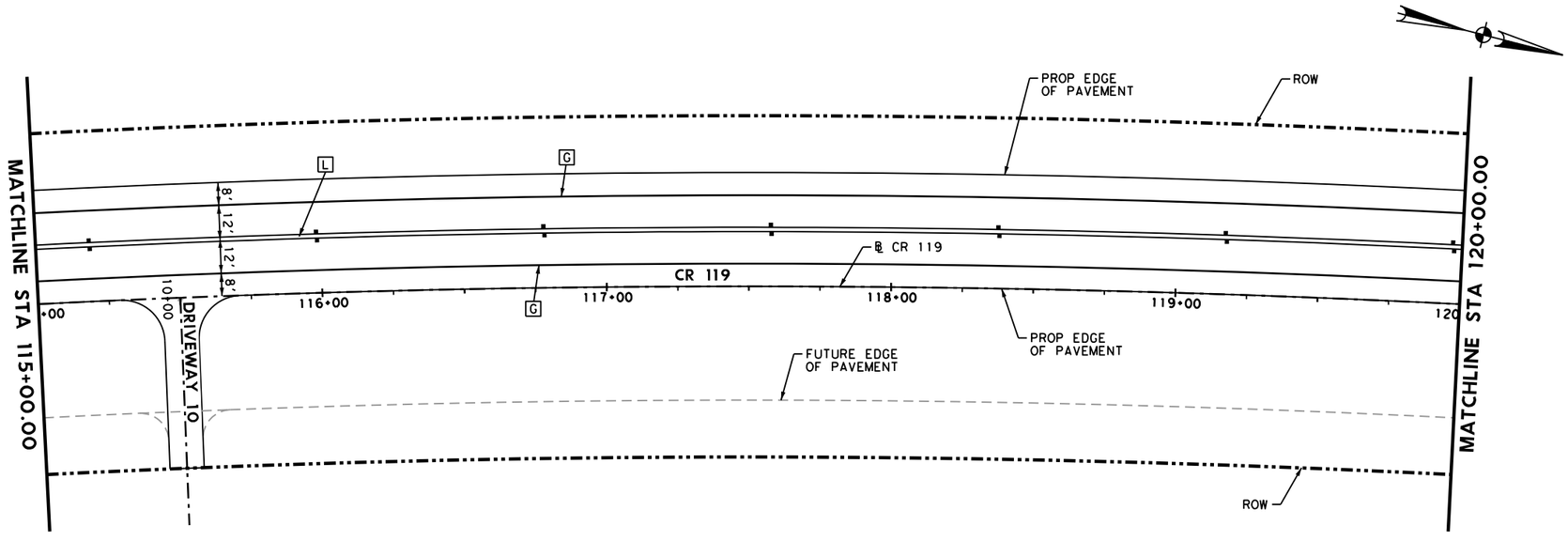
TRAFFIC SIGNING AND PAVEMENT MARKING LAYOUT

STA 100+00 TO STA 110+00

SHEET 11 OF 15

FED. RD. DIV. RD.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				243





LEGEND

- B 8 INCH WIDE WHITE LINE (SLD)(REFL) W/RAIS PAV MRKR (REFL) TY I-C @ 20'C-C
- C 24 INCH WIDE WHITE LINE (SLD)(REFL) STOP BAR
- D 24 INCH WIDE YELLOW LINE (SLD)(REFL)
- E RIGHT/LEFT/THRU ARROW (REFL)
- F WORD "ONLY" WHITE (REFL)
- G 4 INCH WIDE WHITE LINE (SLD)(REFL)
- H 6 INCH WIDE WHITE LINE (BRK)(REFL)
- I 24 INCH WIDE WHITE LINE (SLD)(REFL)
- J 4 INCH WIDE YELLOW LINE (BRK)(REFL)
- K 8 INCH WIDE WHITE DOT(REFL)
- L 4 INCH WIDE DBL YELLOW LINE (SLD)(REFL) W/RAIS PAV MRKR (REFL) TY II A-A @ 80'C-C

RIGHT OF WAY BOUNDARY
(#) PROPOSED SIGN
[#] EXISTING SIGN TO BE REMOVED
EXISTING SIGN TO REMAIN
OM ASSM OM-2Y(WC)GND
DEL ASSM (D-SW)SZ 1(BRF)GF2
DEL ASSM (D-SW)SZ (BRF)CTB)BI)

NOTES:
1. REFER TO SIGNING AND PAVEMENT MARKING LAYOUT SHEET 1 OF 15 FOR SMALL SIGN DETAILS.

0 25 50

STATE OF TEXAS
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6/15/2017

CR 119

WILLIAMSON COUNTY 1848

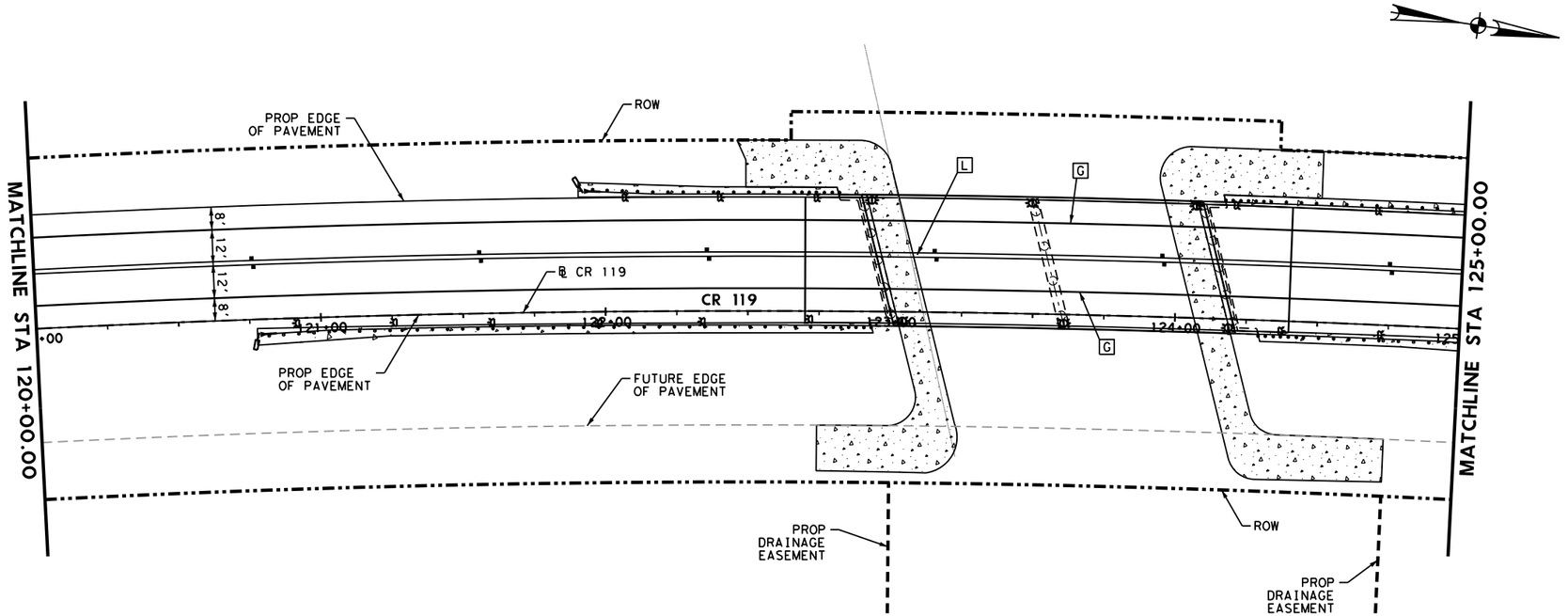
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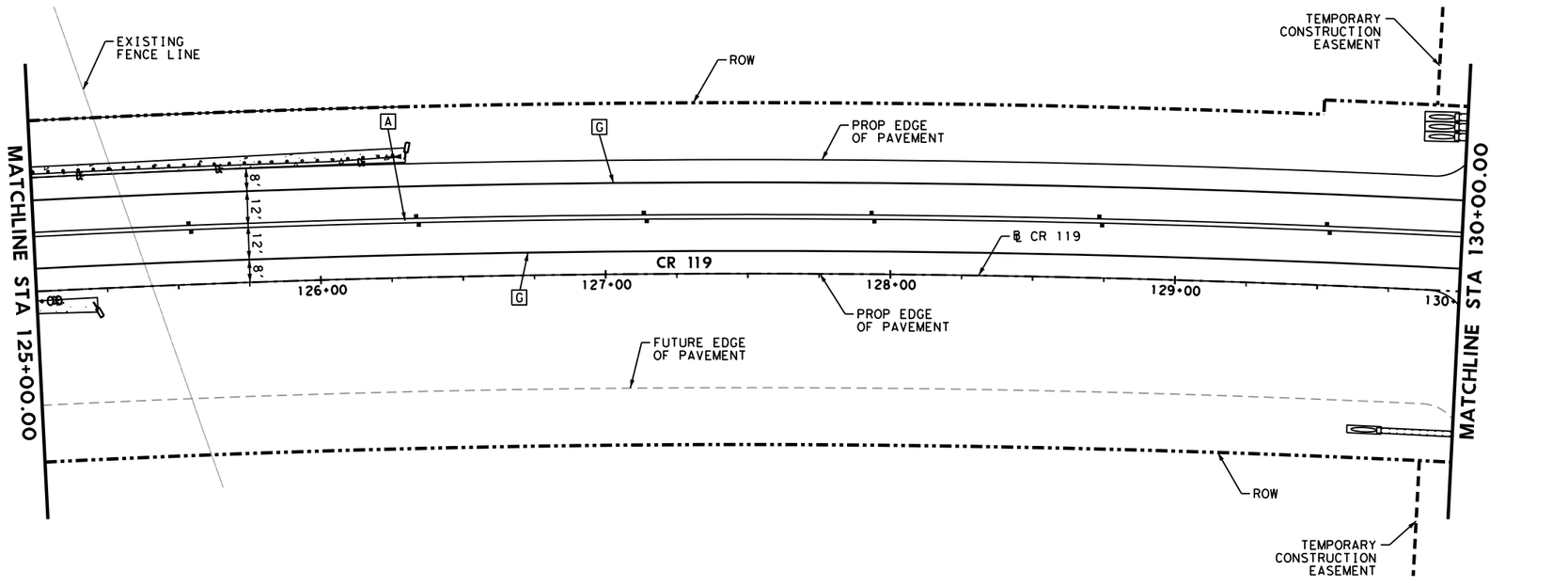
TRAFFIC SIGNING AND PAVEMENT MARKING LAYOUT

STA 110+00 TO STA 120+00

SHEET 12 OF 15

FED. RD. DIV. RD.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				244





LEGEND

- [A] 4 INCH WIDE YELLOW LINE (SLD)(REFL) W/RAIS PAV MRKR (REFL) TY II A-A @ 20'C-C
- [B] 8 INCH WIDE WHITE LINE (SLD)(REFL) W/RAIS PAV MRKR (REFL) TY I-C @ 20'C-C
- [C] 24 INCH WIDE WHITE LINE (SLD)(REFL) STOP BAR
- [D] 24 INCH WIDE YELLOW LINE (SLD)(REFL)
- [E] RIGHT/LEFT/THRU ARROW (REFL)
- [F] WORD "ONLY" WHITE (REFL)
- [G] 4 INCH WIDE WHITE LINE (SLD)(REFL)
- [H] 6 INCH WIDE WHITE LINE (BRK)(REFL)
- [I] 24 INCH WIDE WHITE LINE (SLD)(REFL)
- [J] 4 INCH WIDE YELLOW LINE (BRK)(REFL)
- [K] 8 INCH WIDE WHITE DOT(REFL)
- [L] 4 INCH WIDE DBL YELLOW LINE (SLD)(REFL) W/RAIS PAV MRKR (REFL) TY II A-A @ 80'C-C

RIGHT OF WAY BOUNDARY

(#) PROPOSED SIGN

[#] EXISTING SIGN TO BE REMOVED

EXISTING SIGN TO REMAIN

OM ASSM OM-2Y(WC)GND

DEL ASSM (D-SW)SZ 1(BRF)GF2

DEL ASSM (D-SW)SZ (BRF)CTB)BI)

NOTES:
1. REFER TO SIGNING AND PAVEMENT MARKING LAYOUT SHEET 1 OF 15 FOR SMALL SIGN DETAILS.

0 25 50

STATE OF TEXAS
ARNOLD GONZALES, JR.
98234
LICENSED
PROFESSIONAL ENGINEER

6/15/2017

CR 119

WILLIAMSON COUNTY 1848

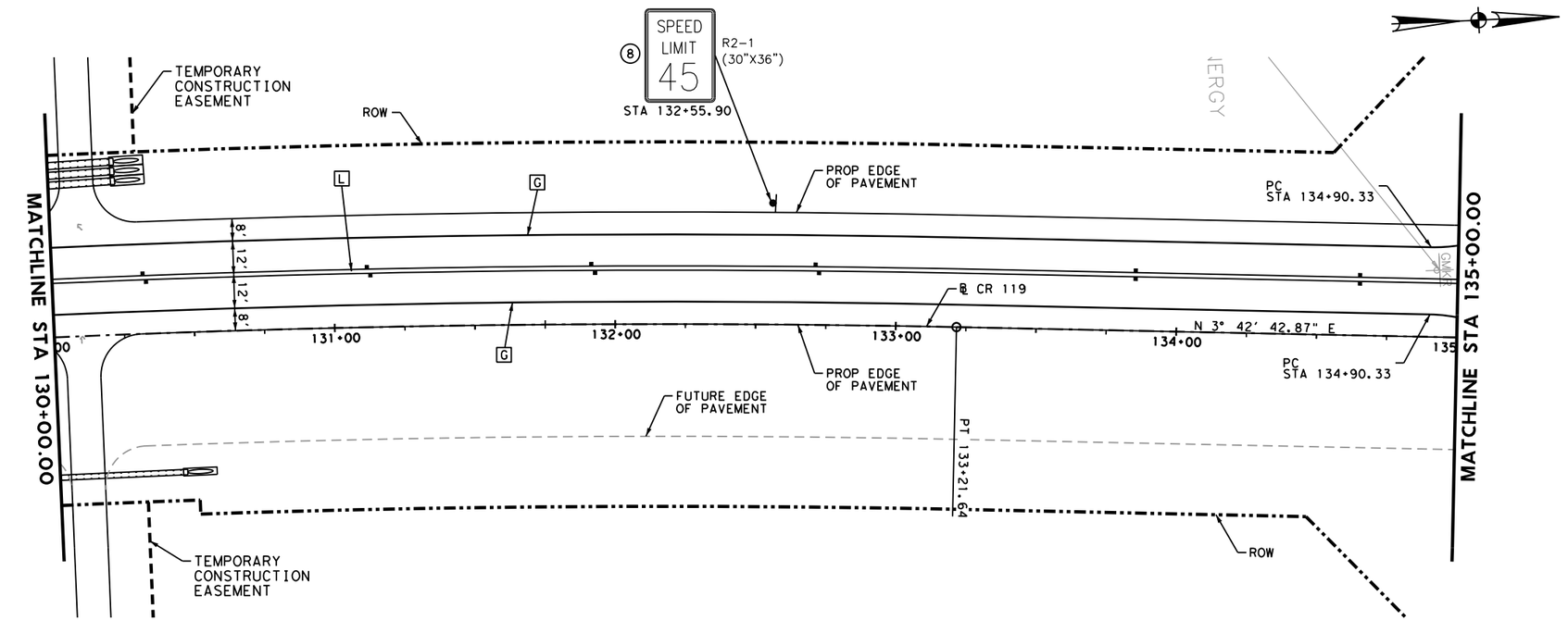
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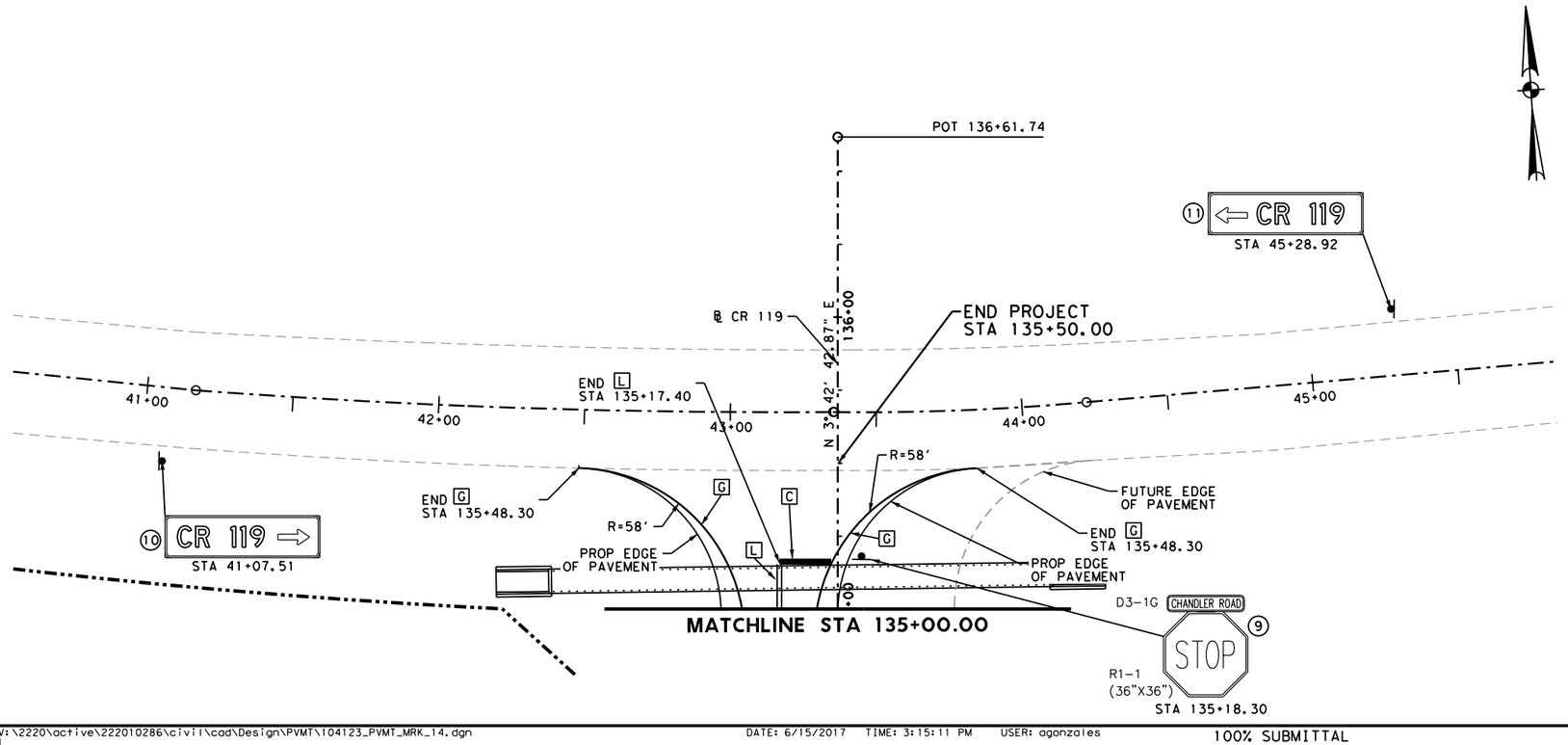
TRAFFIC SIGNING AND PAVEMENT MARKING LAYOUT

STA 120+00 TO STA 130+00

SHEET 13 OF 15

FED. RD. DIV. RD.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				245





LEGEND

- [B] 8 INCH WIDE WHITE LINE (SLD)(REFL) W/RAIS PAV MRKR (REFL) TY I-C @ 20'C-C
- [C] 24 INCH WIDE WHITE LINE (SLD)(REFL) STOP BAR
- [D] 24 INCH WIDE YELLOW LINE (SLD)(REFL)
- [E] RIGHT/LEFT/THRU ARROW (REFL)
- [F] WORD "ONLY" WHITE (REFL)
- [G] 4 INCH WIDE WHITE LINE (SLD)(REFL)
- [H] 6 INCH WIDE WHITE LINE (BRK)(REFL)
- [I] 24 INCH WIDE WHITE LINE (SLD)(REFL)
- [J] 4 INCH WIDE YELLOW LINE (BRK)(REFL)
- [K] 8 INCH WIDE WHITE DOT(REFL)
- [L] 4 INCH WIDE DBL YELLOW LINE (SLD)(REFL) W/RAIS PAV MRKR (REFL) TY II A-A @ 80'C-C

RIGHT OF WAY BOUNDARY
(#) PROPOSED SIGN
[#] EXISTING SIGN TO BE REMOVED
EXISTING SIGN TO REMAIN
OM ASSM OM-2Y(WC)GND
DEL ASSM (D-SW)SZ 1(BRF)GF2
DEL ASSM (D-SW)SZ (BRF)CTB)BI)

NOTES:
1. REFER TO SIGNING AND PAVEMENT MARKING LAYOUT SHEET 1 OF 15 FOR SMALL SIGN DETAILS.

0 25 50

STATE OF TEXAS
ARNOLD GONZALES, JR.
98234
LICENSED
PROFESSIONAL ENGINEER
6/15/2017

CR 119

WILLIAMSON COUNTY 1848

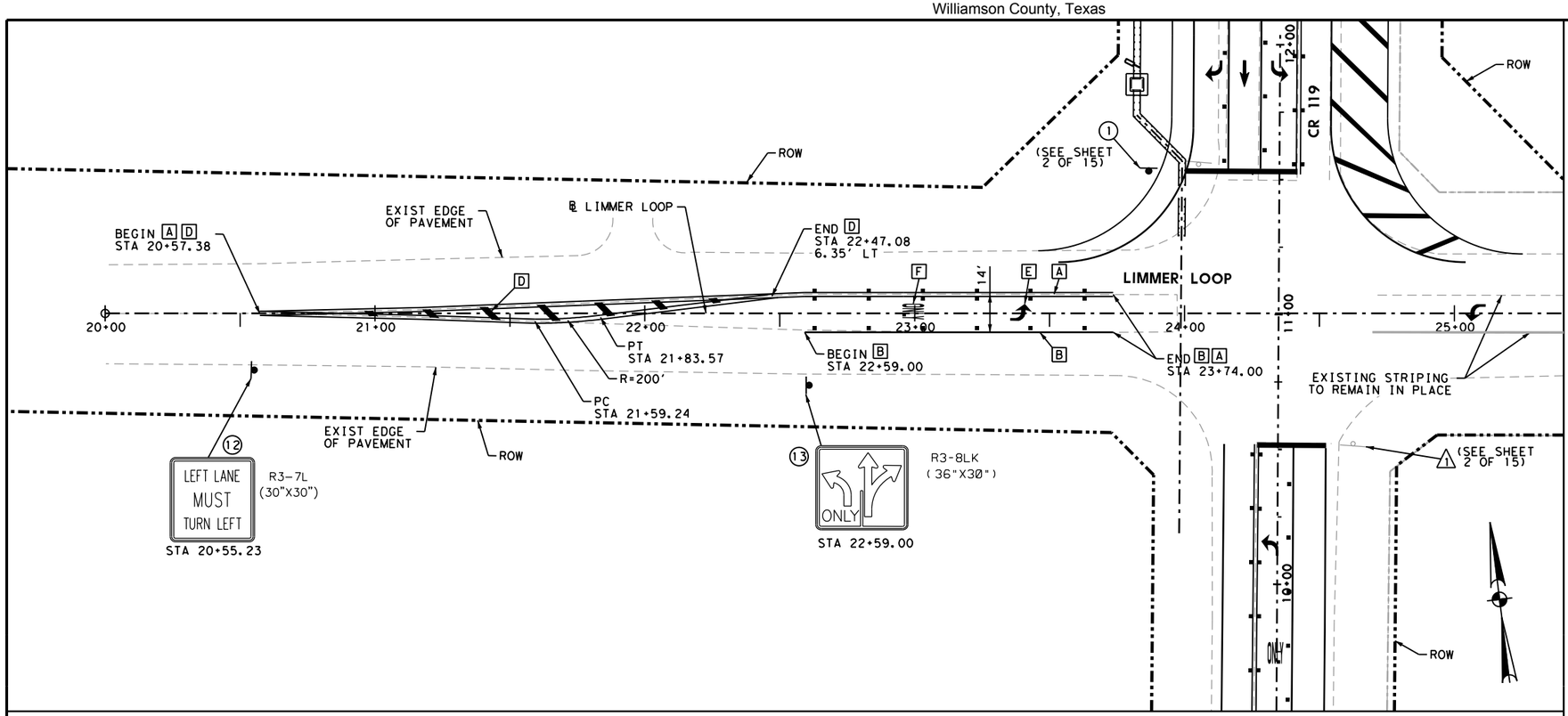
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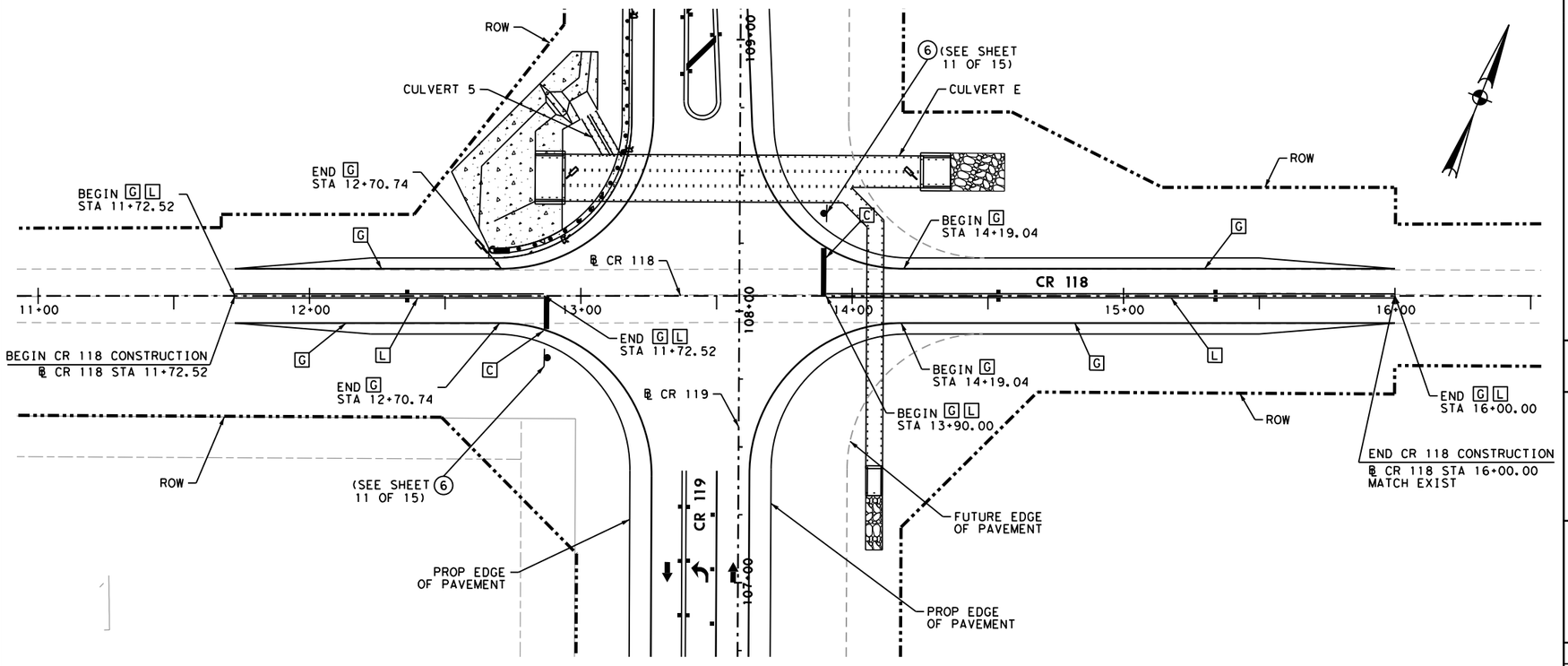
TRAFFIC SIGNING AND PAVEMENT MARKING LAYOUT

STA 130+00 TO END PROJECT

SHEET 14 OF 15

FED. RD. DIV. RD.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				246





LEGEND

- A 4 INCH WIDE YELLOW LINE (SLD)(REFL) W/RAIS PAV MRKR (REFL) TY II A-A @ 20'C-C
- B 8 INCH WIDE WHITE LINE (SLD)(REFL) W/RAIS PAV MRKR (REFL) TY I-C @ 20'C-C
- C 24 INCH WIDE WHITE LINE (SLD)(REFL) STOP BAR
- D 24 INCH WIDE YELLOW LINE (SLD)(REFL)
- E RIGHT/LEFT/THRU ARROW (REFL)
- F WORD "ONLY" WHITE (REFL)
- G 4 INCH WIDE WHITE LINE (SLD)(REFL)
- H 6 INCH WIDE WHITE LINE (BRK)(REFL)
- I 24 INCH WIDE WHITE LINE (SLD)(REFL)
- J 4 INCH WIDE YELLOW LINE (BRK)(REFL)
- K 8 INCH WIDE WHITE DOT(REFL)
- L 4 INCH WIDE DBL YELLOW LINE (SLD)(REFL) W/RAIS PAV MRKR (REFL) TY II A-A @ 80'C-C

RIGHT OF WAY BOUNDARY

(#) PROPOSED SIGN

[#] EXISTING SIGN TO BE REMOVED

⚠ EXISTING SIGN TO REMAIN

OM ASSM OM-2Y(WC)GND

DEL ASSM (D-SW)SZ 1(BRF)GF2

DEL ASSM (D-SW)SZ (BRF)CTB)BI)

NOTES:
1. REFER TO SIGNING AND PAVEMENT MARKING LAYOUT SHEET 1 OF 15 FOR SMALL SIGN DETAILS.
2. REFER TO SIGNING AND PAVEMENT MARKING LAYOUT SHEET 2 OF 15 FOR LIMMER LOOP INTERSECTION SIGNING.
3. REFER TO SIGNING AND PAVEMENT MARKING LAYOUT SHEET 11 OF 15 FOR CR118 INTERSECTION SIGNING.

0 25 50

STATE OF TEXAS
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98234
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6/15/2017

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TRAFFIC SIGNING AND PAVEMENT MARKING LAYOUT

STA 20+57.38 TO STA 23+73.55

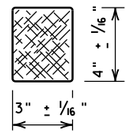
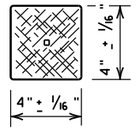
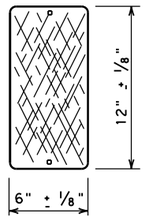
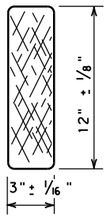
SHEET 15 OF 15

FED. RD. DIV. RD.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				247

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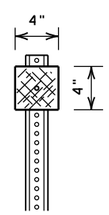
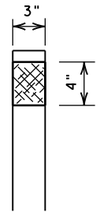
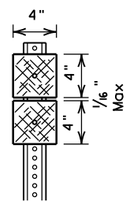
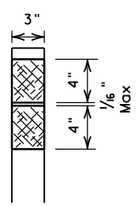
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REFLECTOR UNIT SIZES FOR DELINEATORS AND OBJECT MARKERS

	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

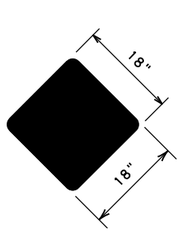
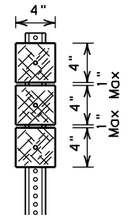
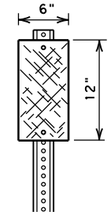
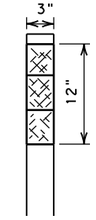
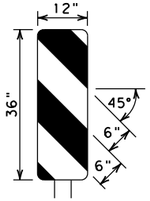
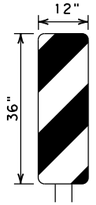
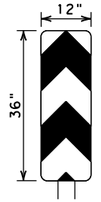
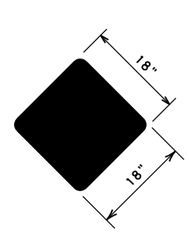
NUMBER OF REFLECTORS OR DIRECTION
X = 3-Size 2 reflector units (Type 2 only)
Y = 1-Size 3 reflector unit (Type 2 only)
Z = 3-Size 1 or 1-Size 4 reflector unit(s) (Type 2 only)
L = Left Side (Type 3 Object Marker only)
R = Right Side (Type 3 Object Marker only)
C = Center (Type 3 Object Marker only)

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

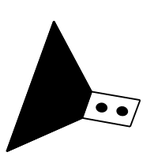
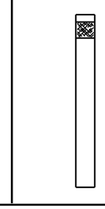
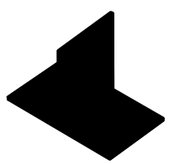
OBJECT MARKERS

	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

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

BARRIER REFLECTORS (BRF)

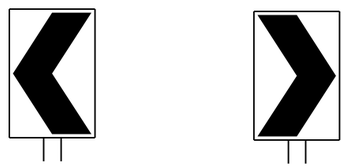
	GF1	GF2	CTB
DEVICE			

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.

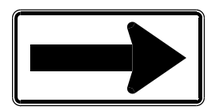
CHEVRONS

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"	

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				CR119
10-09 3-15	DIST	COUNTY		SHEET NO.
4-10	06	WILLIAMSON		248

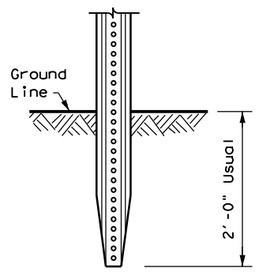
20A

Williamson County, Texas
Bid 1708-186

POST TYPE AND SUPPORT FOUNDATION DETAILS

WING CHANNEL (WC)

GND

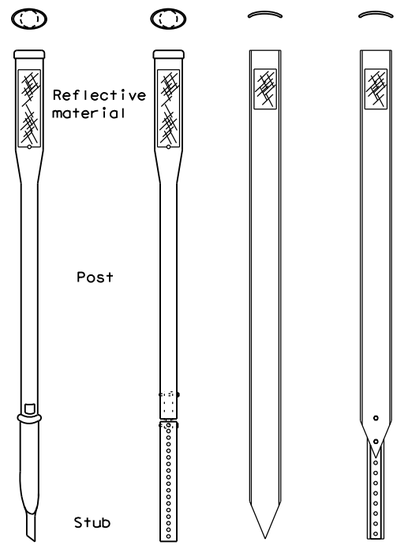


NOTES

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.

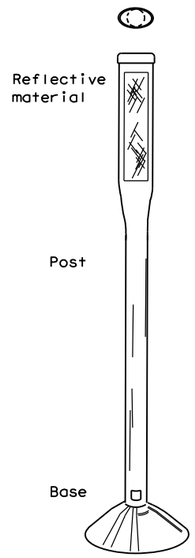
FLEXIBLE POSTS (FLX)

GND



EMBEDDED

SRF



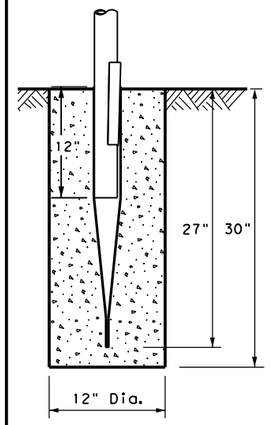
SURFACE MOUNT

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.

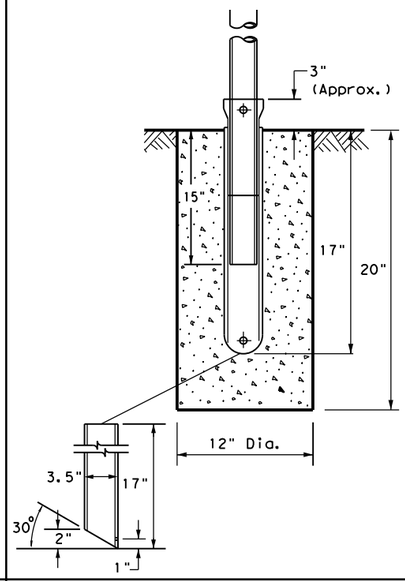
WEDGE ANCHOR SYSTEMS

WAS



STEEL

WAP



PLASTIC

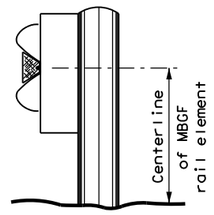
NOTE

1. Install per manufacturer's recommendations.

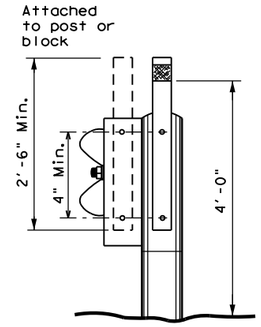
TYPE OF BARRIER MOUNTS

GUARD FENCE ATTACHMENT

GF1

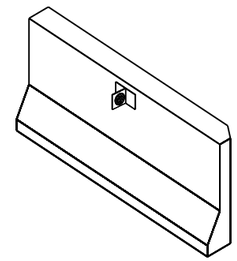


GF2



CONCRETE BARRIER / BRIDGE RAIL

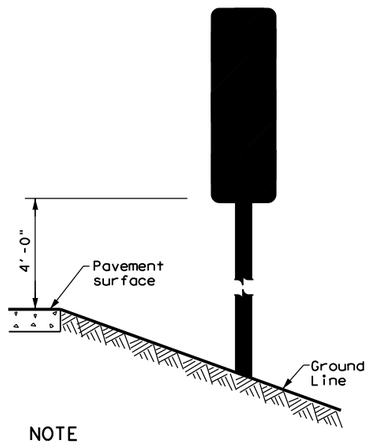
CTB



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.

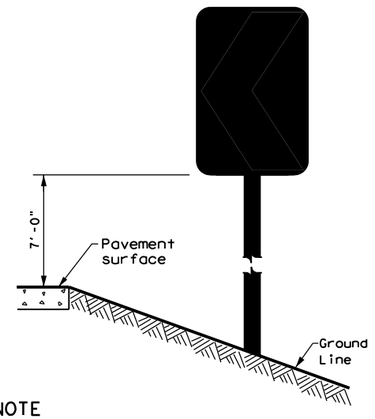
TYPES 1, 3, AND 4 OBJECT MARKERS AND CHEVRONS



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)

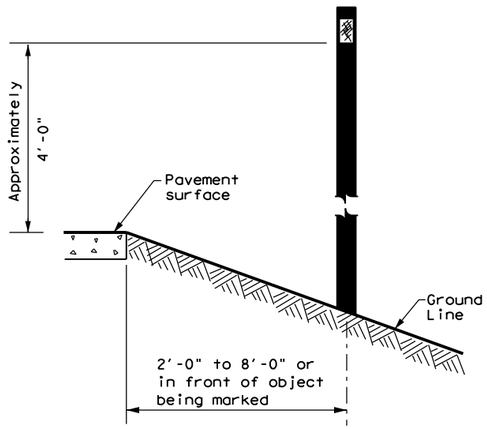
CHEVRONS AND ONE DIRECTION LARGE ARROW SIGN



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

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REVISIONS				CR119
10-09 3-15	DIST	COUNTY		SHEET NO.
4-10	06	WILLIAMSON		249

20B

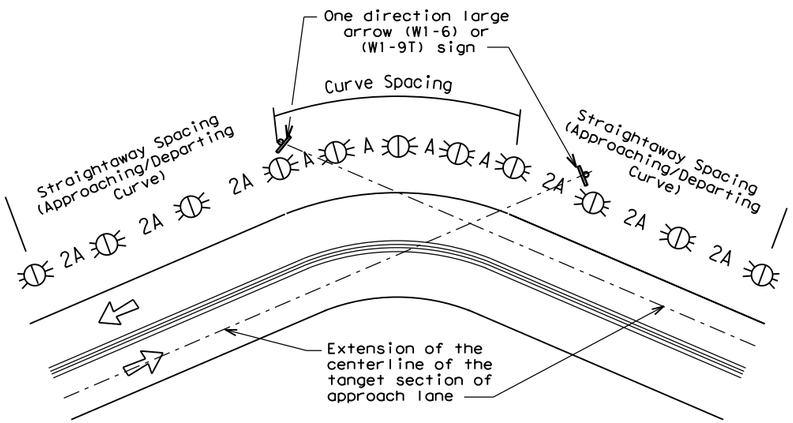
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USE OF WARNING DEVICES AT CURVES WITH ADVISORY SPEED LIMITS

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

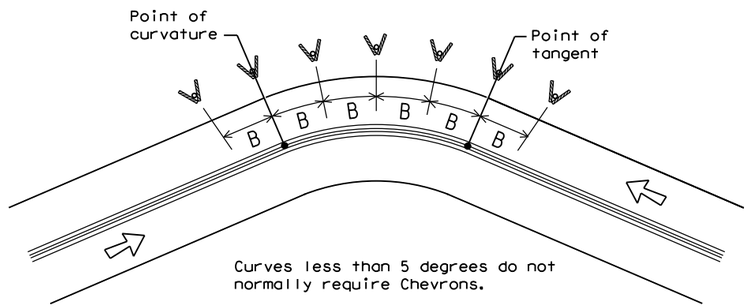


Curves less than 1 degree do not normally require delineators.

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

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3-15	DIST	COUNTY		SHEET NO.
8-15	06	WILLIAMSON		250

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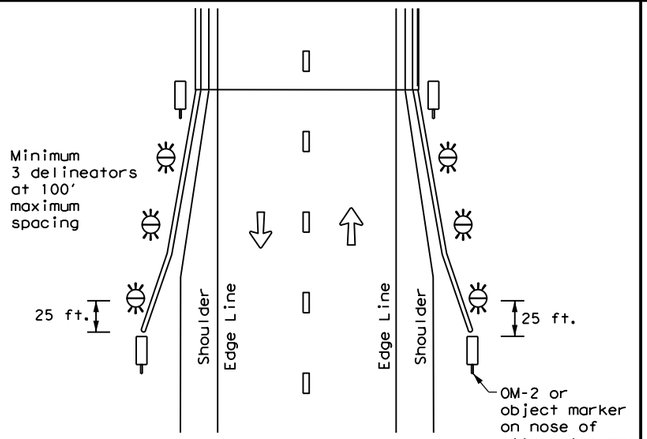
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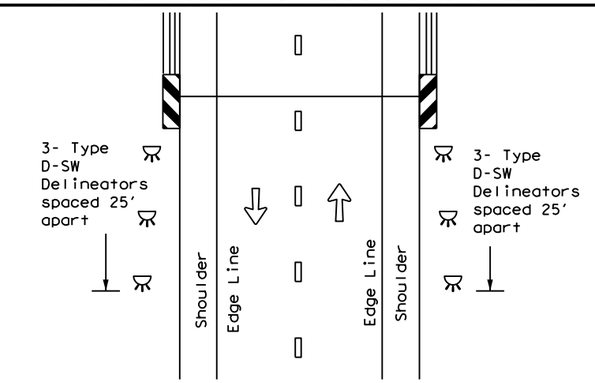
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TWO-WAY, TWO LANE ROADWAY WITH REDUCED WIDTH APPROACH



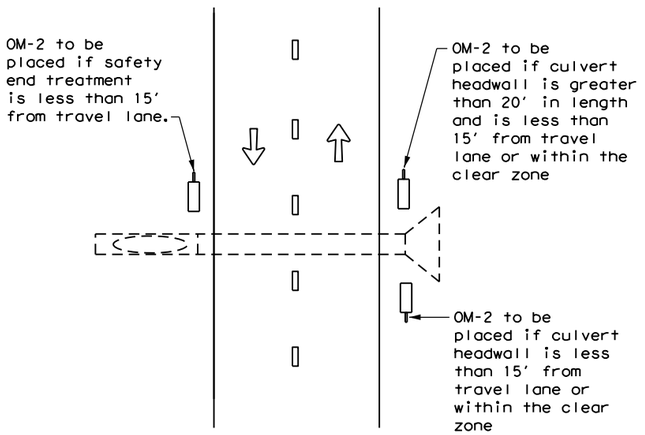
DETAIL 1

TWO-WAY, TWO LANE ROADWAY BRIDGE WITH NO APPROACH RAIL



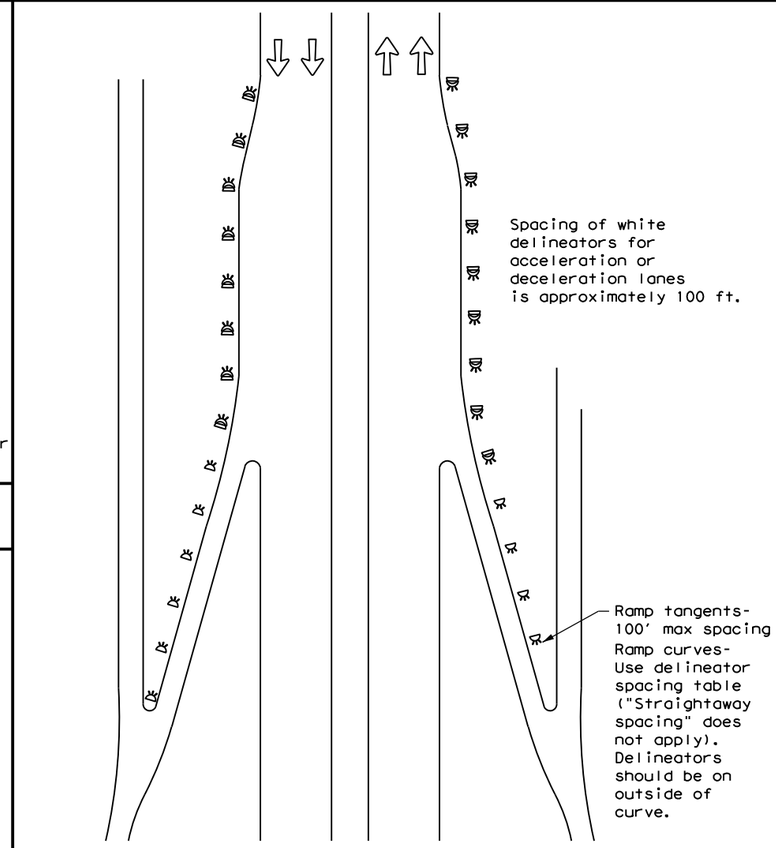
DETAIL 2

FOR CULVERTS WITHOUT MBGF



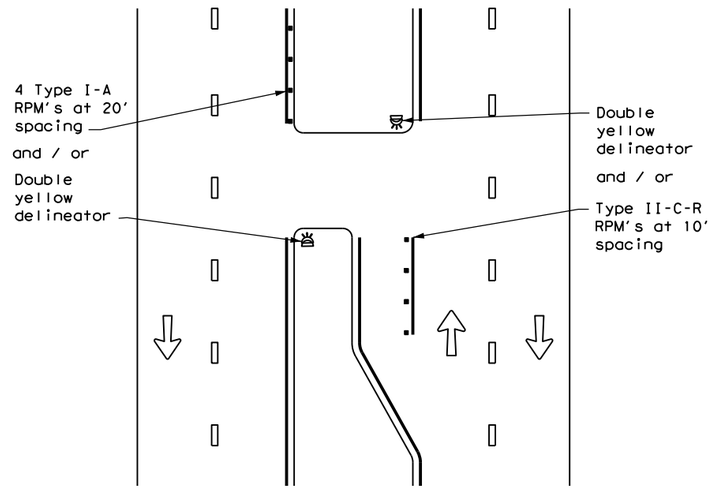
DETAIL 3

FREEWAY DELINEATION FOR RAMPS AND ACCELERATION/DECELERATION LANES



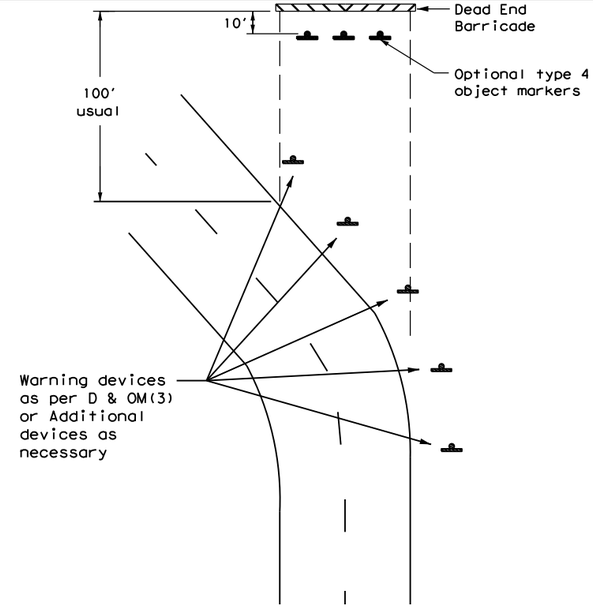
DETAIL 4

CROSSOVERS



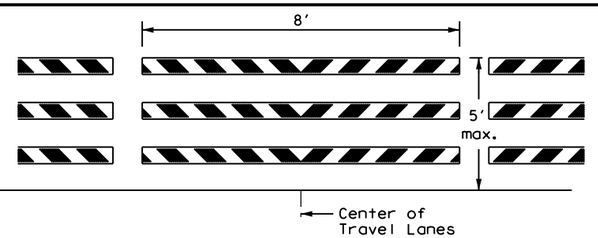
DETAIL 5

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: dam4-15.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
©TxDOT August 2004	CONT	SECT	JOB	HIGHWAY
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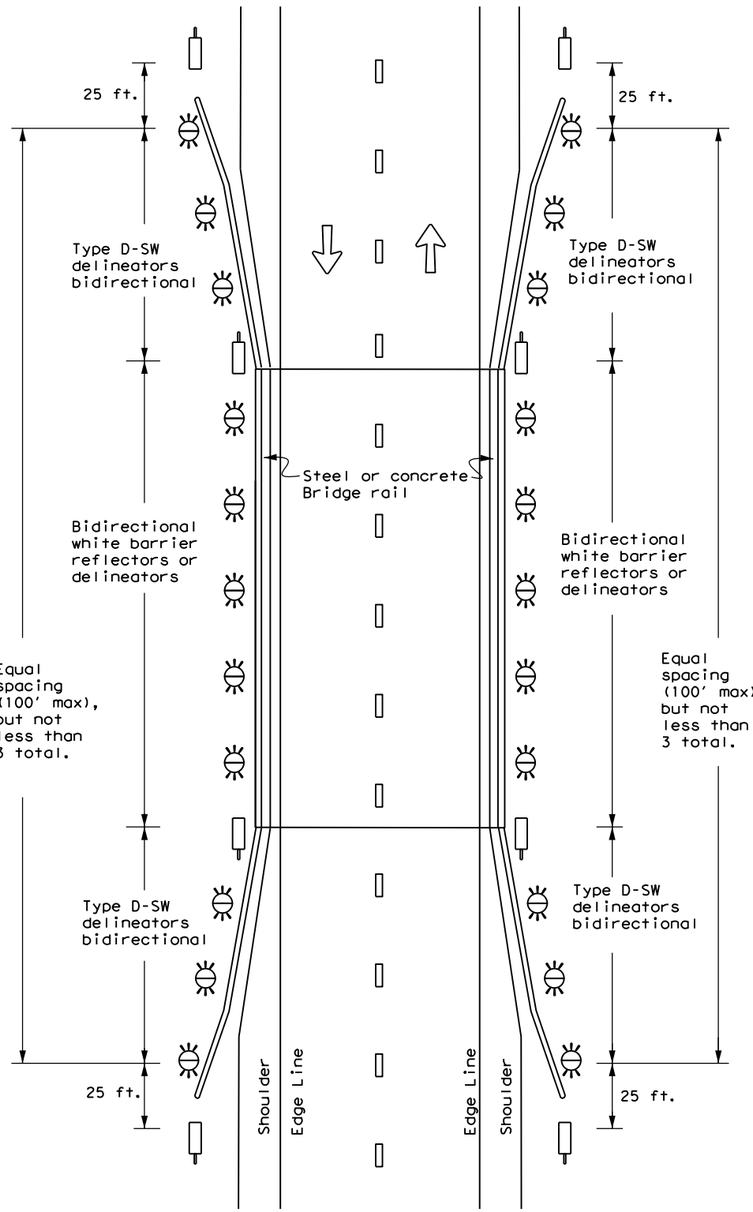
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9/28/2017 8:04 AM

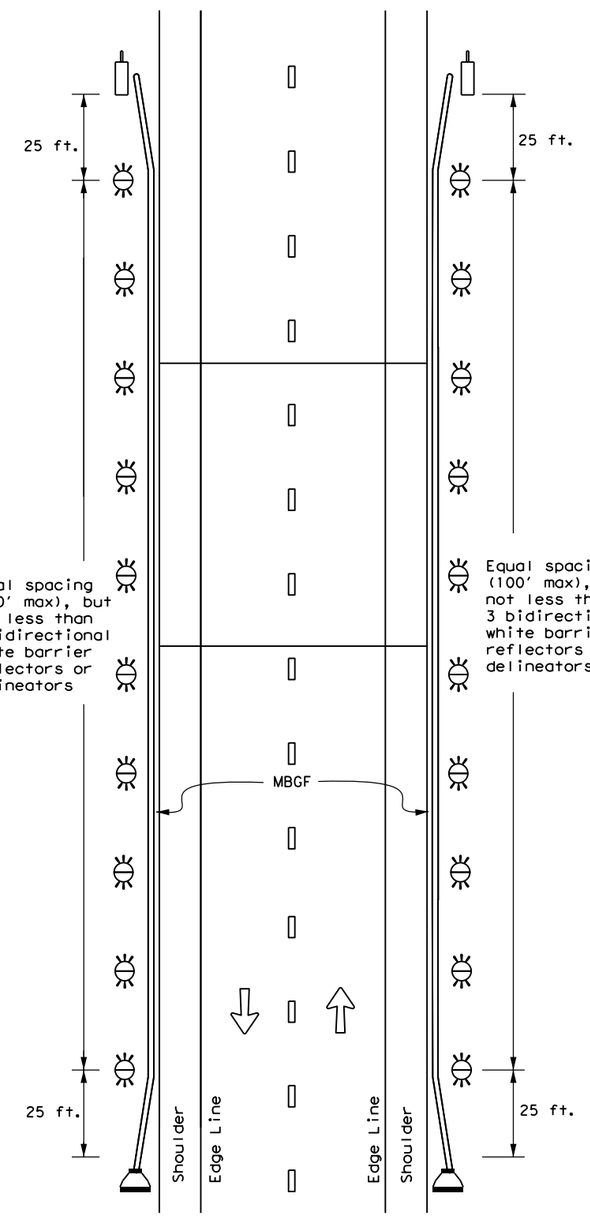
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TWO-WAY, TWO LANE ROADWAY WITH REDUCED WIDTH APPROACH RAIL



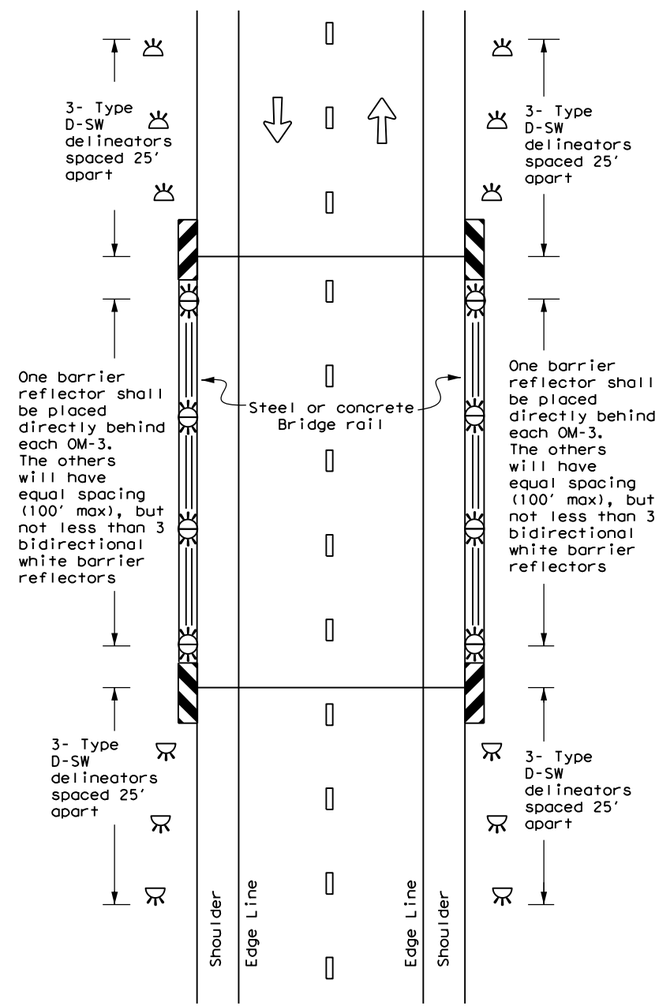
TWO-WAY, TWO LANE ROADWAY WITH METAL BEAM GUARD FENCE (MBGF)



NOTE:

If terminal ends include an object marker, there is no need to install an OM-2 in front of terminal.

TWO-WAY, TWO LANE ROADWAY BRIDGE WITH NO APPROACH RAIL



LEGEND

	Bidirectional Delineator
	Delineator
	OM-3
	OM-2
	Terminal End
	TRAFFIC FLOW

Texas Department of Transportation

Traffic Operations Division Standard

DELINEATOR & OBJECT MARKER PLACEMENT DETAILS

D & OM(5)-15

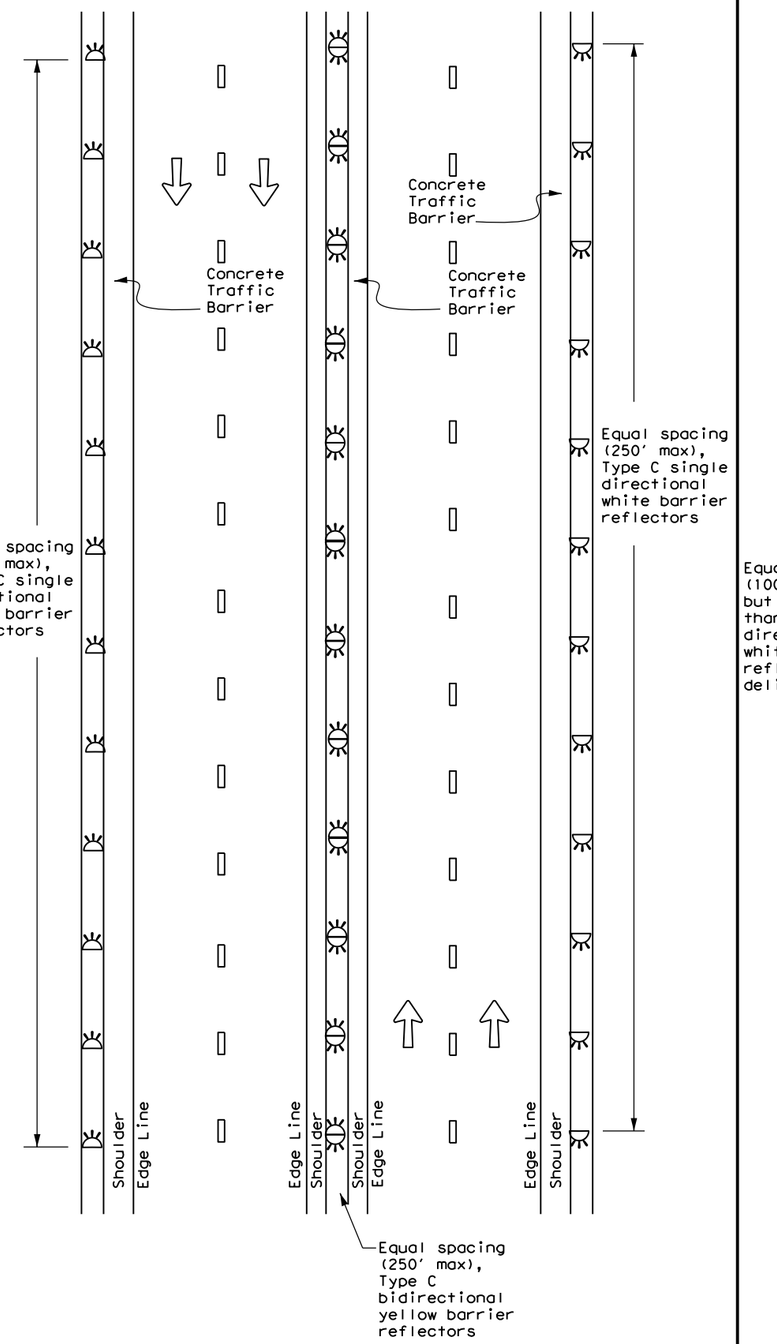
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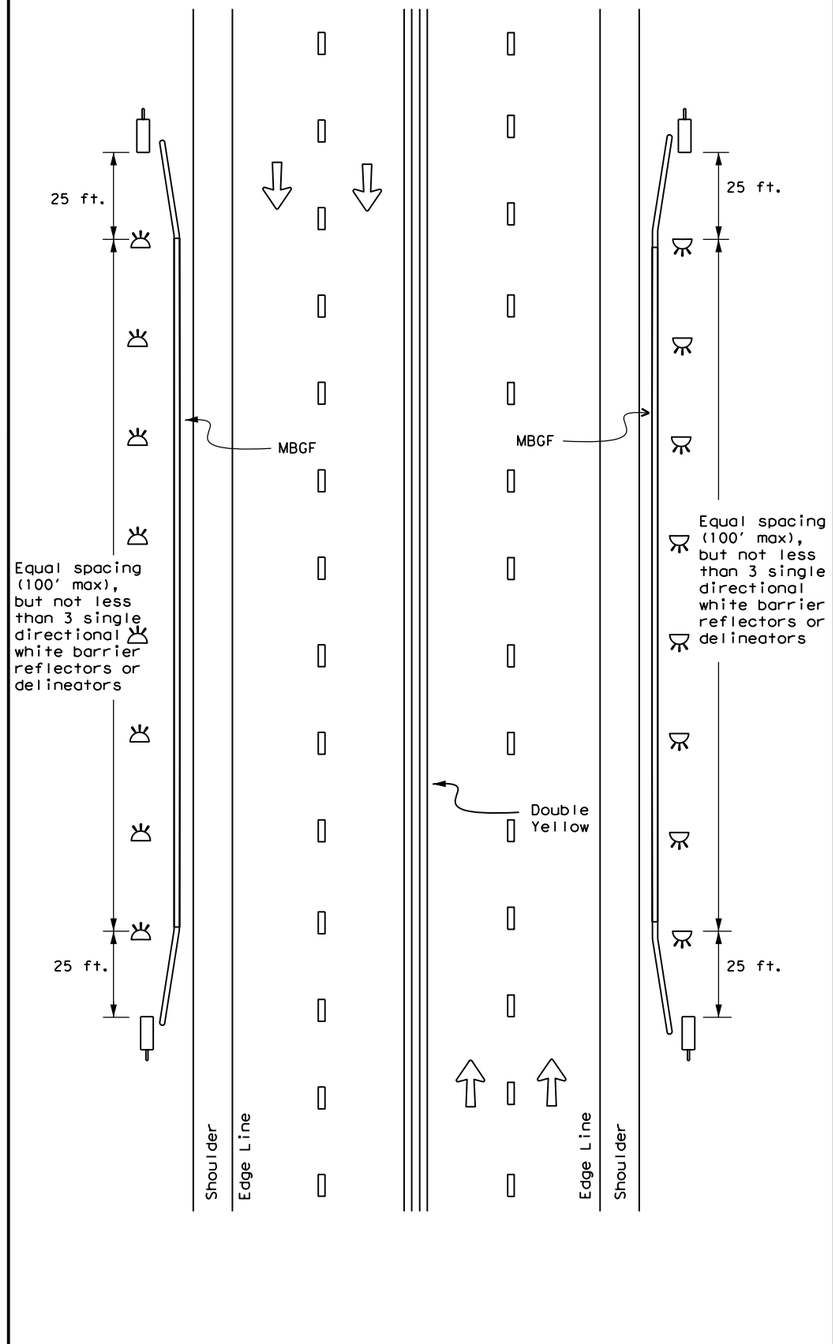
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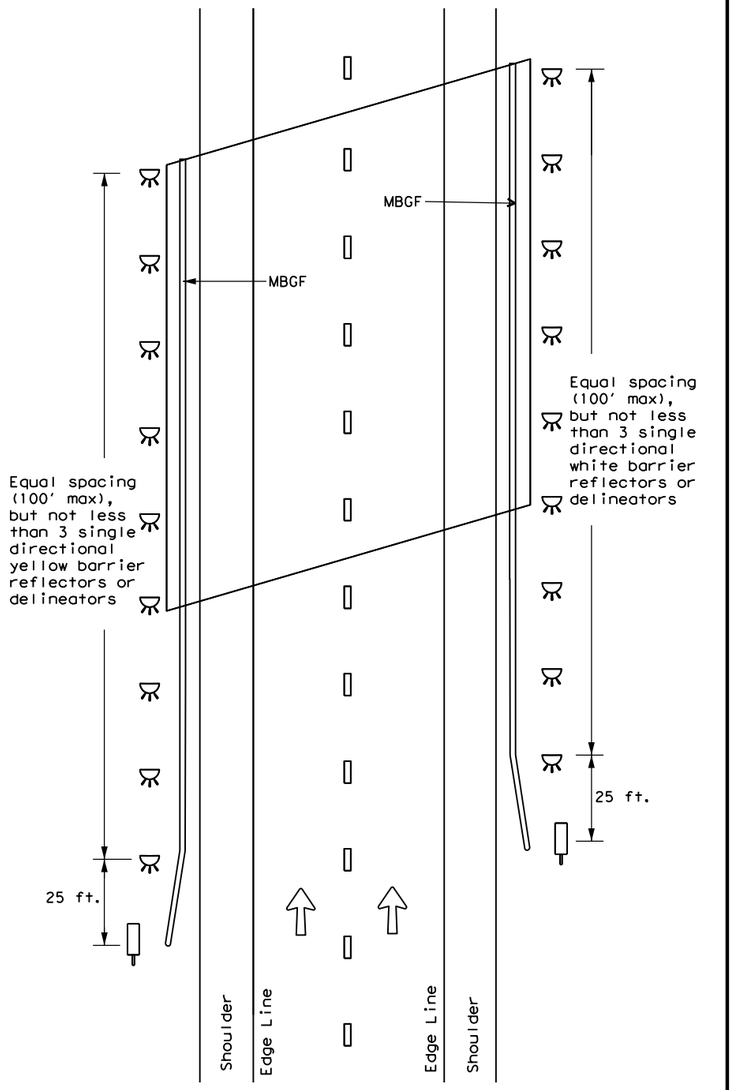
CONTINUOUS CONCRETE BARRIER



MULTI-LANE UNDIVIDED, TWO-WAY ROADWAY WITH METAL BEAM FENCE (MBGF)



DIVIDED ROADWAY WITH METAL BEAM GUARD FENCE



LEGEND

	Bidirectional Delineator
	Delineator
	OM-3
	OM-2
	Terminal End
	TRAFFIC FLOW

Texas Department of Transportation

Traffic Operations Division Standard

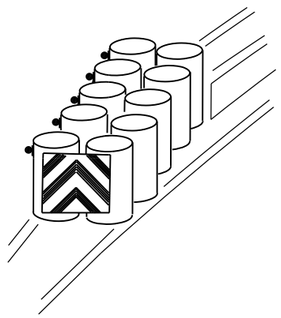
DELINEATOR & OBJECT MARKER PLACEMENT DETAILS

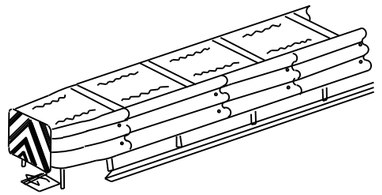
D & OM(6)-15

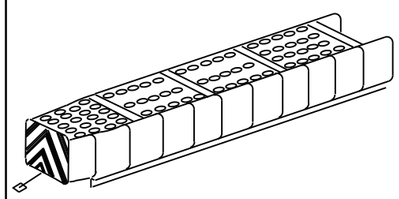
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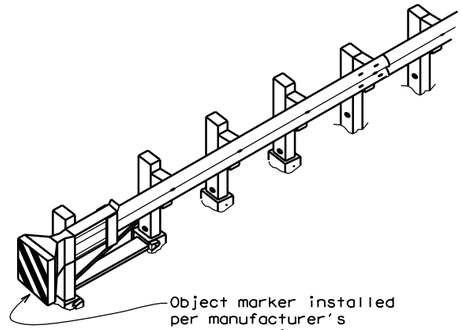
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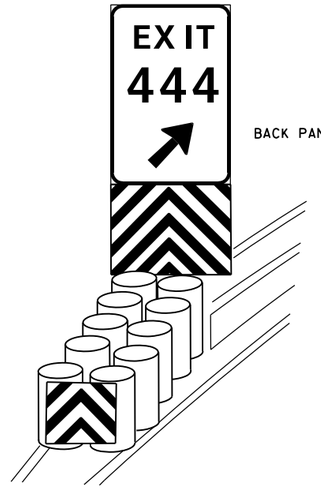
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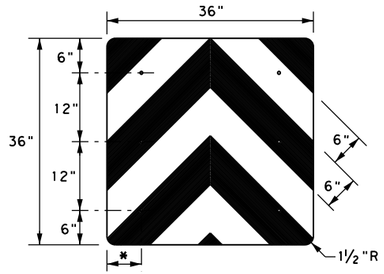


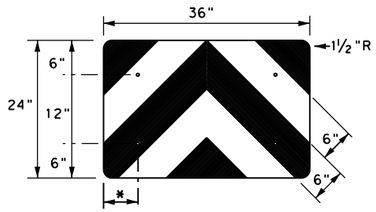




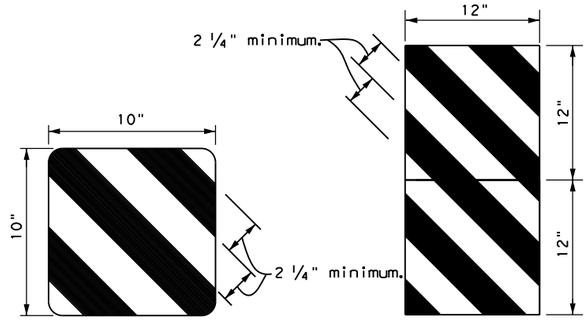




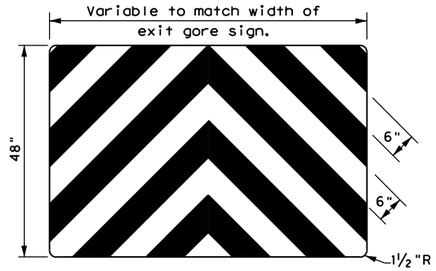


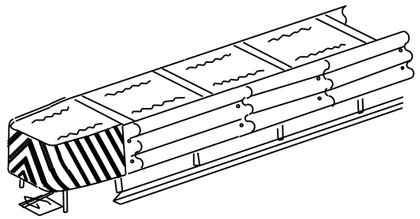


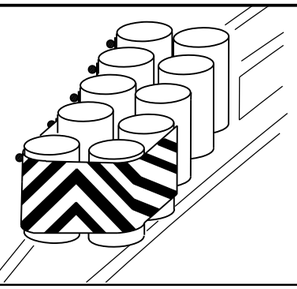
* Adjust to fit attenuator per manufacturer's recommendation, or as directed by the Engineer

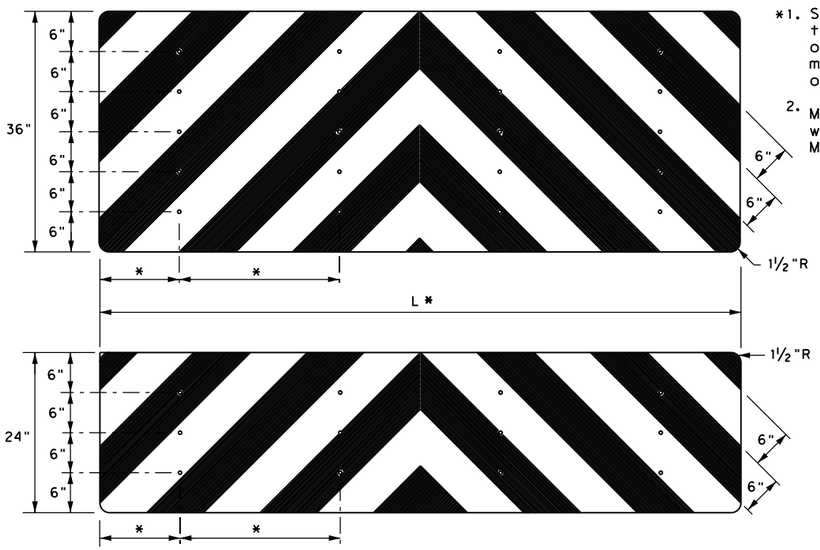


OBJECT MARKERS SMALLER THAN 3 FT^2









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

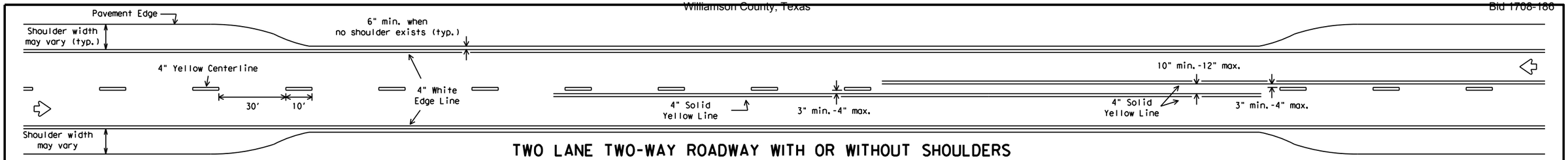
DELINEATOR & OBJECT MARKER FOR VEHICLE IMPACT ATTENUATORS

D & OM(VIA)-15

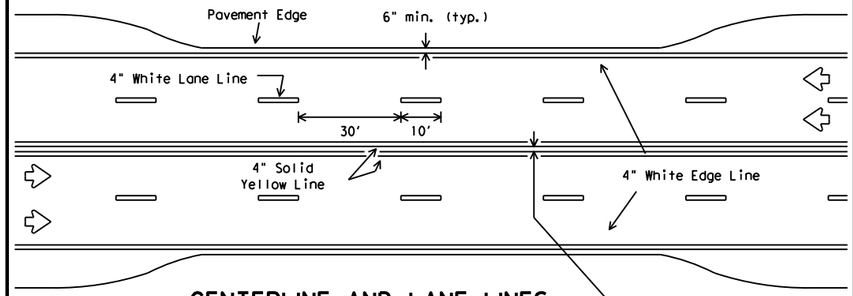
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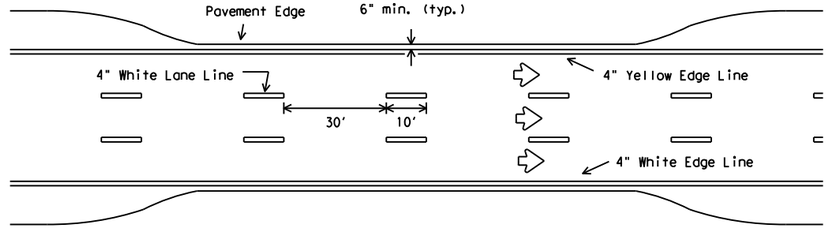
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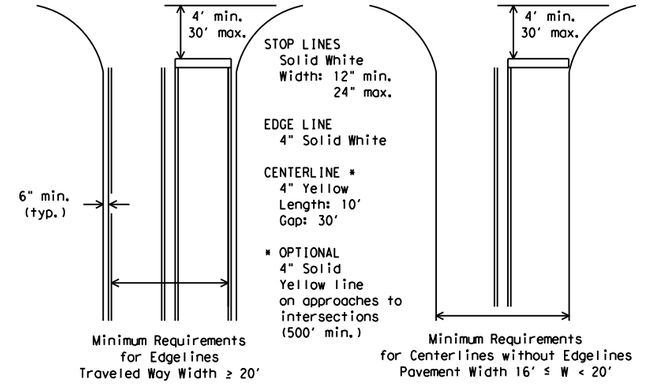
TWO LANE TWO-WAY ROADWAY WITH OR WITHOUT SHOULDERS



CENTERLINE AND LANE LINES FOUR LANE TWO-WAY ROADWAY WITH OR WITHOUT SHOULDERS

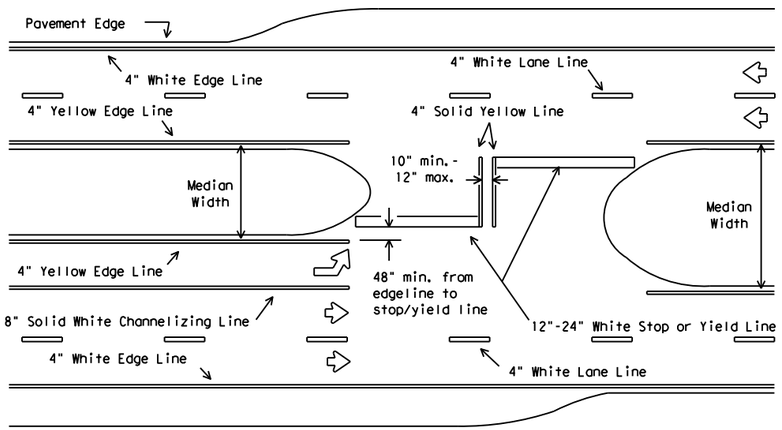


EDGE LINE AND LANE LINES ONE-WAY ROADWAY WITH OR WITHOUT SHOULDERS



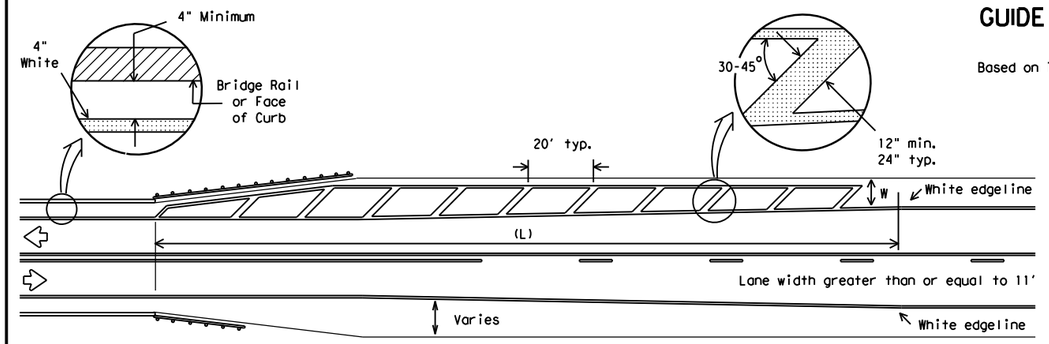
GUIDE FOR PLACEMENT OF STOP LINES, EDGE LINE & CENTERLINE

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 cross-hatching should be:

L = 8 x 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:

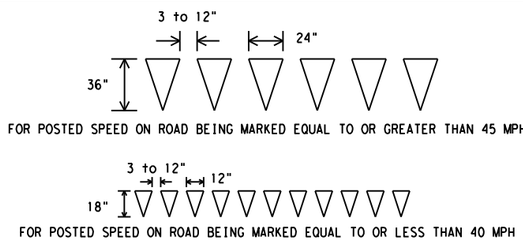
L = 4(40)² / 60 = 106.67 ft. rounded to 110 ft.

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

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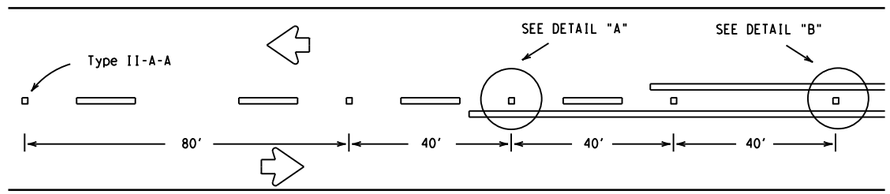
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3-03	06	WILLIAMSON		255
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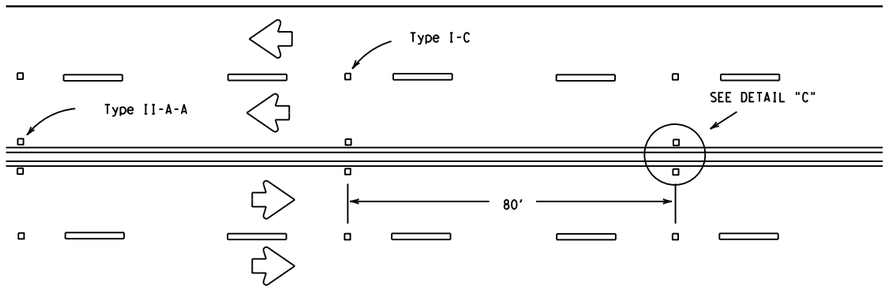
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REFLECTIVE RAISED PAVEMENT MARKERS FOR VEHICLE POSITIONING GUIDANCE

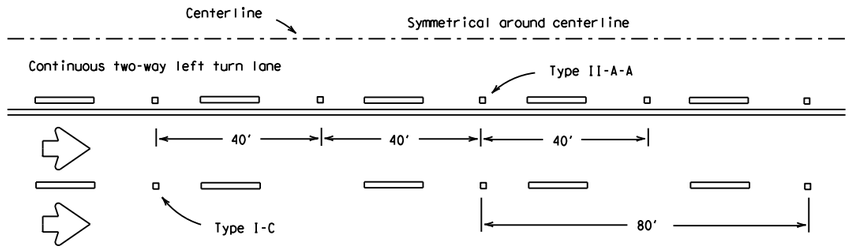


CENTERLINE FOR ALL TWO LANE ROADWAYS

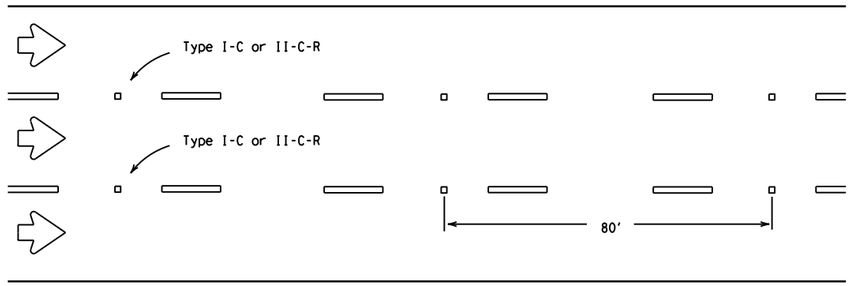


CENTERLINE & LANE LINES FOR FOUR LANE TWO-WAY HIGHWAYS

Raised pavement marker Type I-C, clear face toward normal traffic, shall be placed on 80-foot centers.

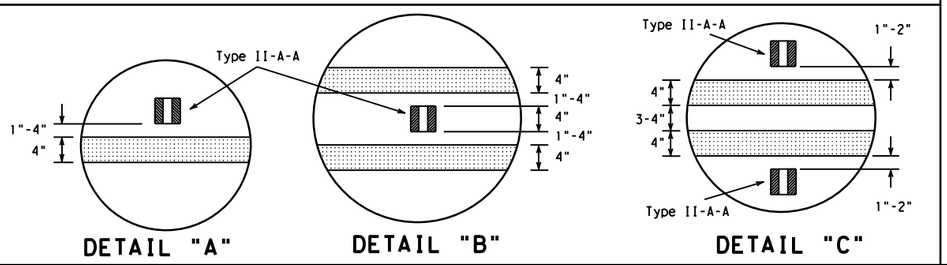


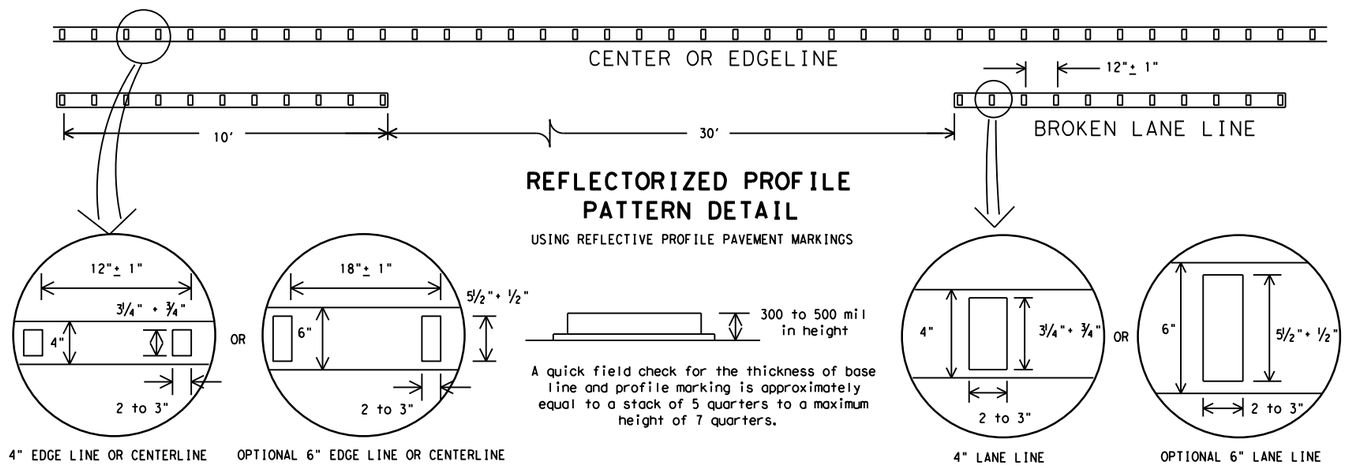
CENTERLINE AND LANE LINES FOR TWO-WAY LEFT TURN LANE



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.





4" EDGE LINE OR CENTERLINE — OPTIONAL 6" EDGE LINE OR CENTERLINE — 4" LANE LINE — OPTIONAL 6" LANE LINE

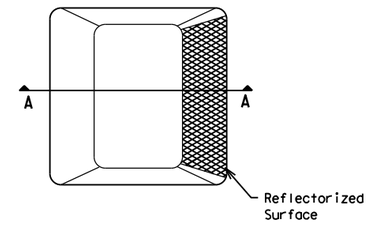
NOTE:
Profile markings shall not be placed on roadways with a posted speed limit of 45 MPH or less.

GENERAL NOTES

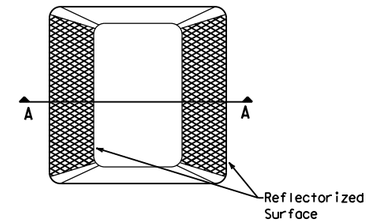
1. All raised pavement markers placed in broken lines shall be placed in line with and midway between the stripes.
2. On concrete pavements the raised pavement markers should be placed to one side of the longitudinal joints.

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

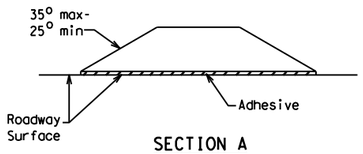
All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.



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

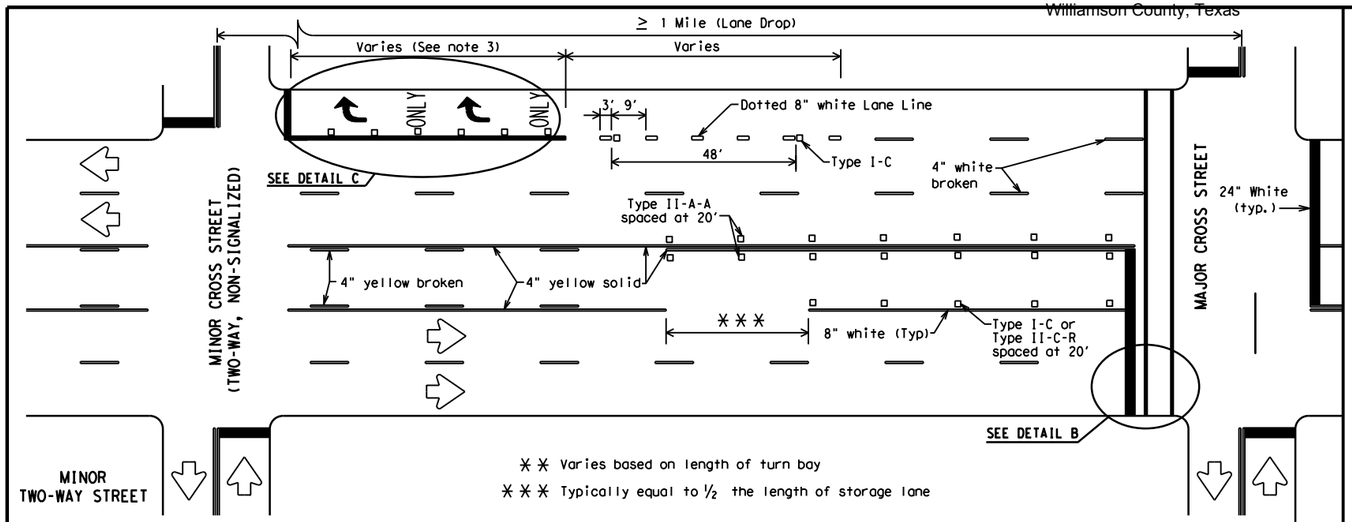
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DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT

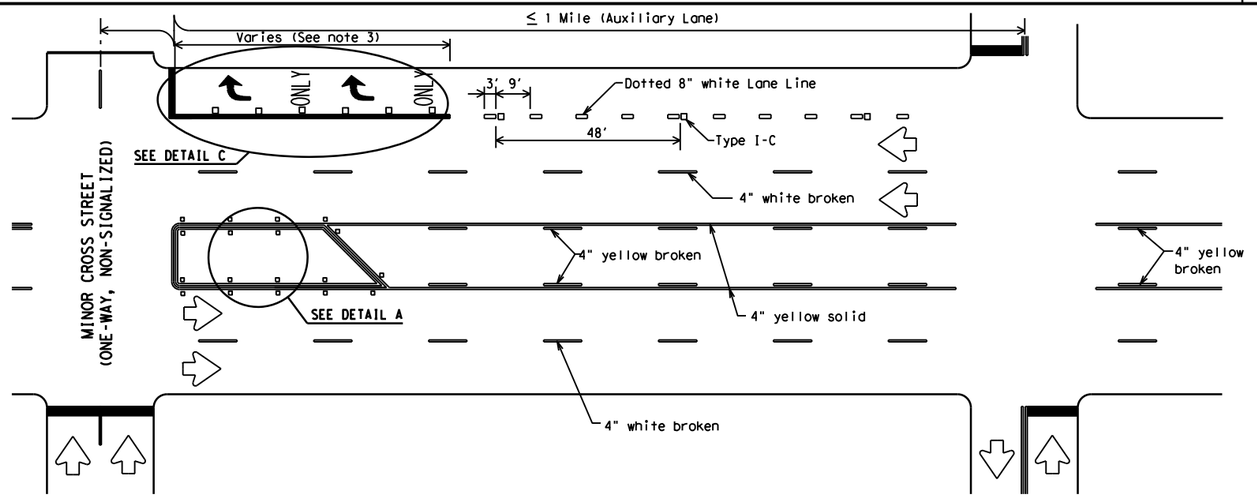
REVISIONS	CONT	SECT	JOB	HIGHWAY
4-92 2-10				CR119
5-00 2-12	DIST	COUNTY		SHEET NO.
8-00	06	WILLIAMSON		256
2-08				

22B

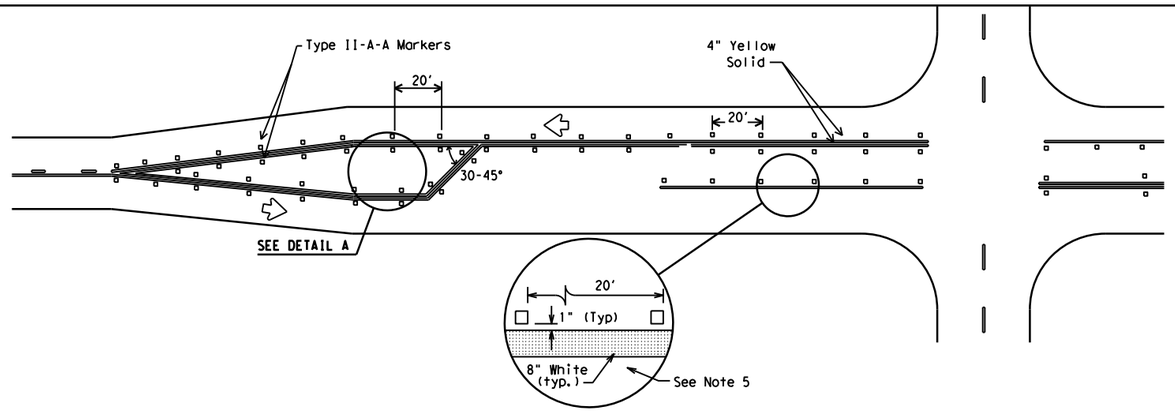
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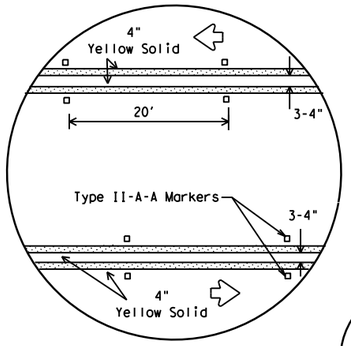
TYPICAL TWLTL AT TWO-WAY CROSS STREET AND RIGHT TURN LANE DROP



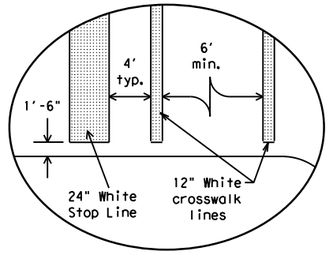
TYPICAL TWLTL AT ONE-WAY STREET AND RIGHT TURN AUXILIARY LANE



TYPICAL TWO-LANE HIGHWAY INTERSECTION WITH LEFT TURN BAYS

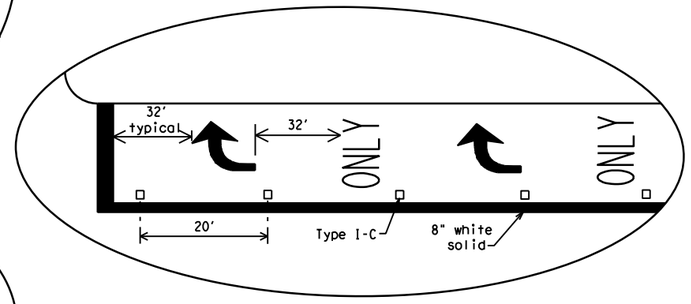


DETAIL A



Final placement of Stop Bar and Crosswalk shall be approved by the Engineer in the field.

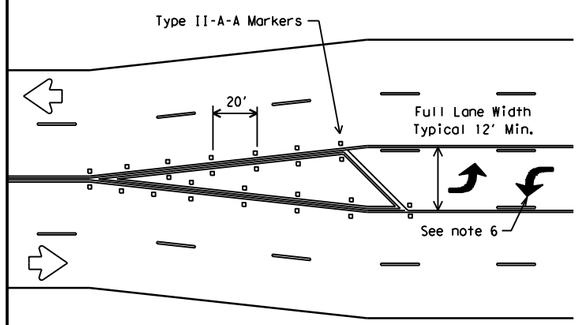
DETAIL B



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				CR119
3-03	DIST	COUNTY		SHEET NO.
2-10	06	WILLIAMSON		257

22C

DATE: 6/15/2017 3:15:19 PM
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9/28/2017 8:04 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)

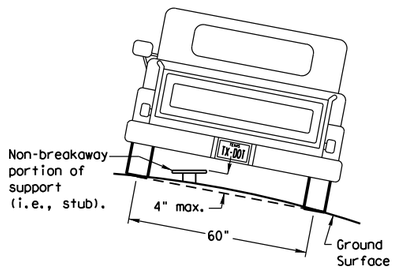
Anchor Type

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))

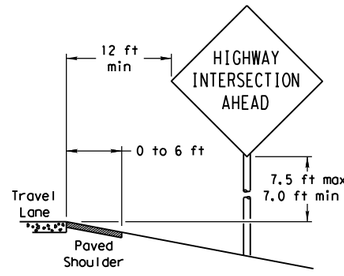
REQUIRED CLEARANCE FOR BREAKAWAY SUPPORT



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).

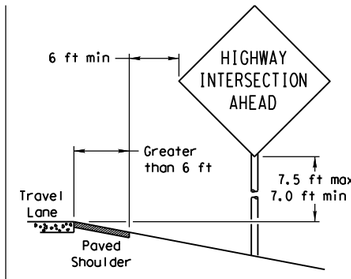
SIGN LOCATION

PAVED SHOULDERS



LESS THAN 6 FT. WIDE

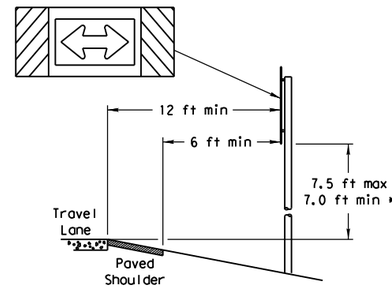
When the shoulder is 6 ft. or less in width, the sign must be placed at least 12 ft. from the edge of the travel lane.



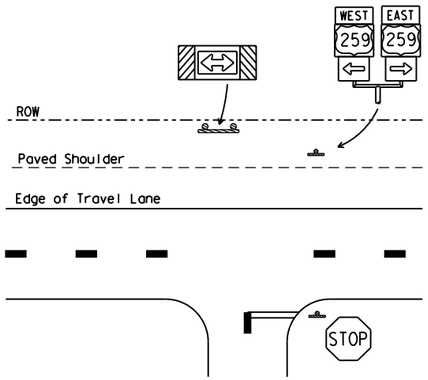
GREATER THAN 6 FT. WIDE

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.

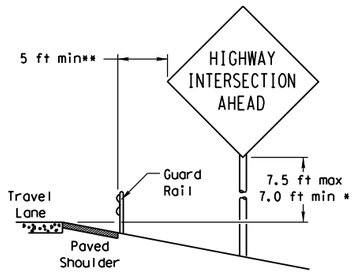
T-INTERSECTION



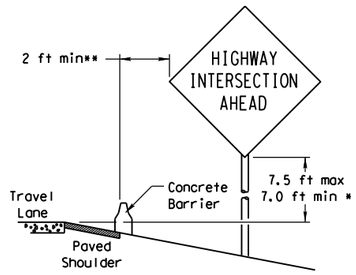
When this sign is needed at the end of a two-lane, two way roadway, the right edge of the sign should be in line with the centerline of the roadway. Place as close to ROW as practical.



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

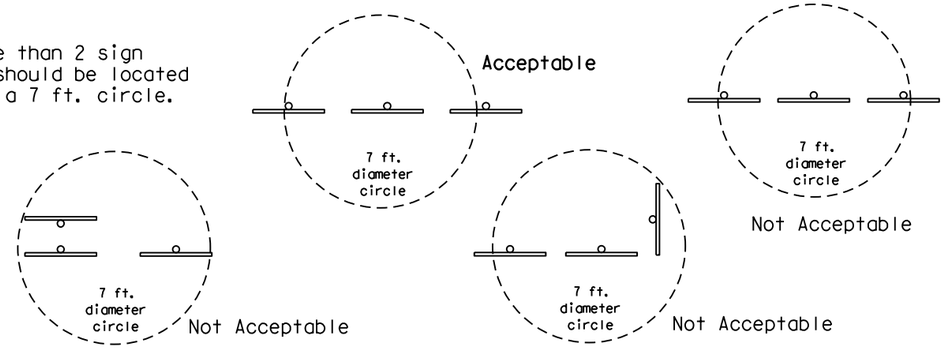
(2) a minimum of 7 to a maximum of 7.5 feet above the grade at the base of the support when sign is installed on the backslope.

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.

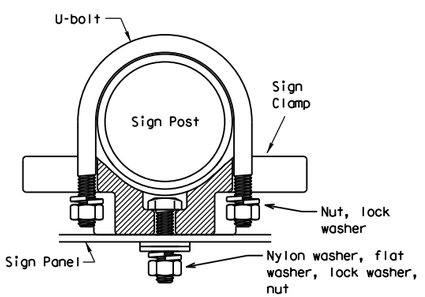
The website address is:
http://www.txdot.gov/publications/traffic.htm

No more than 2 sign posts should be located within a 7 ft. circle.



TYPICAL SIGN ATTACHMENT DETAIL

Single Signs

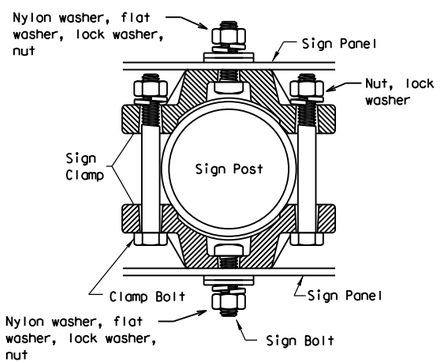


Bolts used to mount sign panels to the clamp are 5/16-18 UNC galvanized square head with nut, nylon washer, flat washer and lock washer. The bolt length is 1 inch for aluminum.

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.

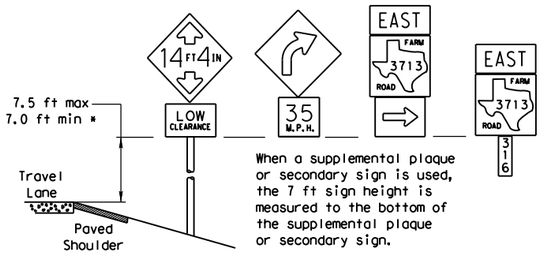
Sign clamps may be either the specific size clamp or the universal clamp.

Back-to-Back Signs



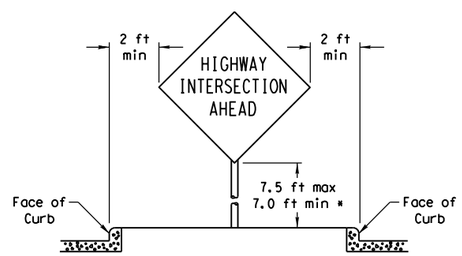
Pipe Diameter	Approximate Bolt Length	
	Specific Clamp	Universal Clamp
2" nominal	3"	3 or 3 1/2"
2 1/2" nominal	3 or 3 1/2"	3 1/2 or 4"
3" nominal	3 1/2 or 4"	4 1/2"

SIGNS WITH PLAQUES



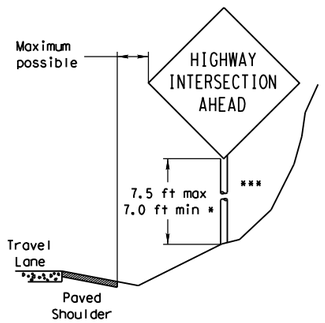
When a supplemental plaque or secondary sign is used, the 7 ft sign height is measured to the bottom of the supplemental plaque or secondary sign.

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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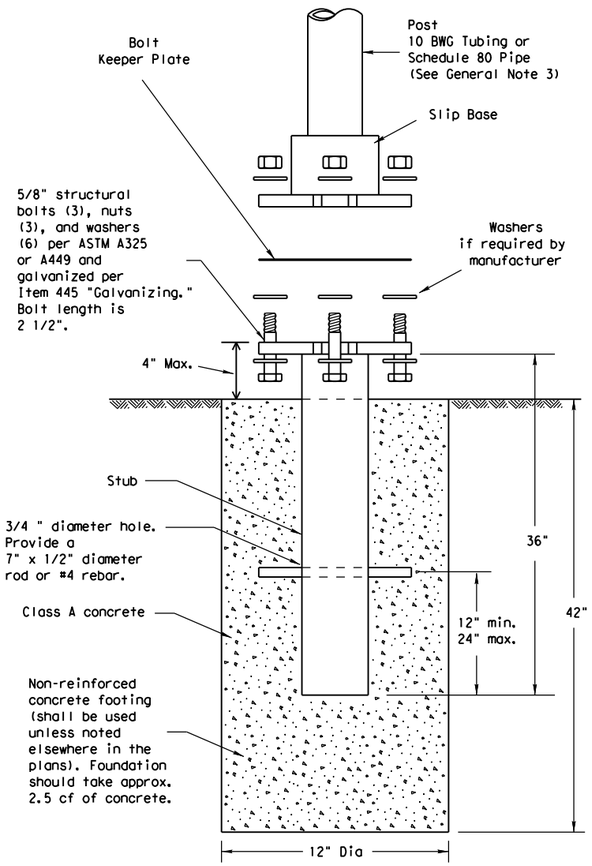
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9-08 REVISIONS

CONT	SECT	JOB	HIGHWAY
			CR119
DIST	COUNTY		SHEET NO.
06	WILLIAMSON		258

26A

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.

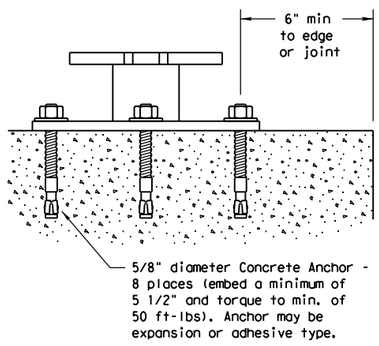
   Schedule 80 Pipe (2.875" outside diameter)
   - 0.276" nominal wall thickness
   - Steel tubing per ASTM A500 Gr C
   - Other seamless or electric-resistance welded steel tubing or pipe with equivalent outside diameter and wall thickness may be used if they meet the following:
     - 46,000 PSI minimum 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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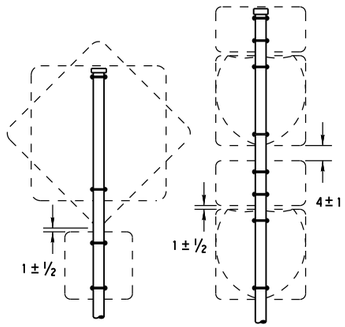
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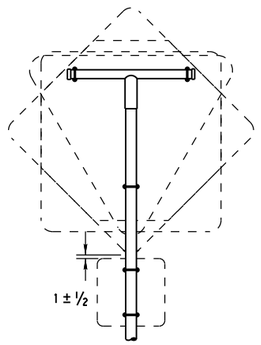
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9-08	CONT	SECT	JOB	HIGHWAY
				CR119
	DIST	COUNTY		SHEET NO.
	06	WILLIAMSON		259

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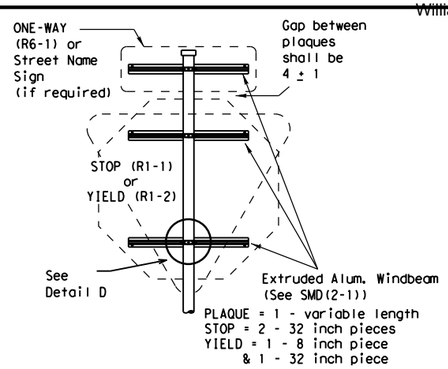
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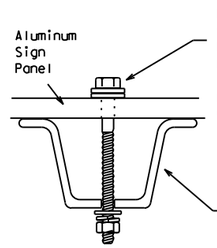
SM RD SGN ASSM TY XXXXX(1)XX(P)



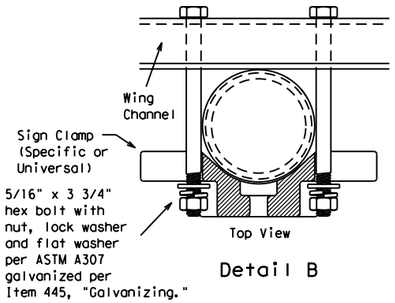
SM RD SGN ASSM TY XXXXX(1)XX(T)



SM RD SGN ASSM TY XXXXX(1)XX(P-BM)



Detail A



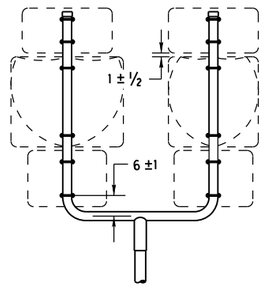
Detail B

GENERAL NOTES:

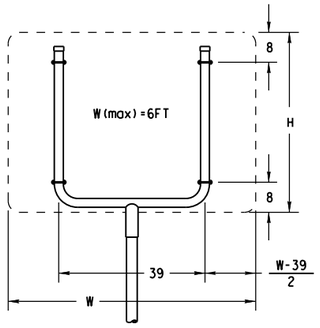
1.

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

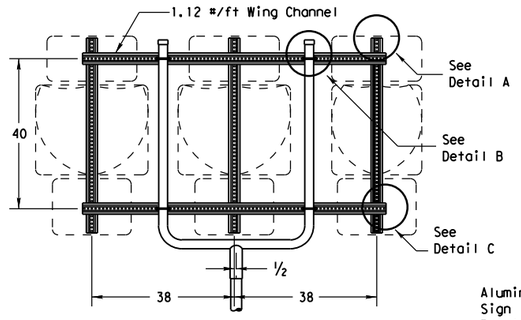
2. The Engineer may require that a Schedule 80 post be used in place of a 10 BWG where a sign height is abnormally high due to a fill slope.
3. Sign supports shall not be spliced except where shown. Sign support posts shall not be spliced.
4. Aluminum sign blanks shall conform to Departmental Material 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.



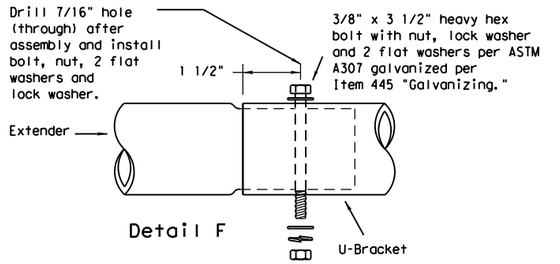
SM RD SGN ASSM TY XXXXX(1)XX(U)



SM RD SGN ASSM TY XXXXX(1)XX(U)

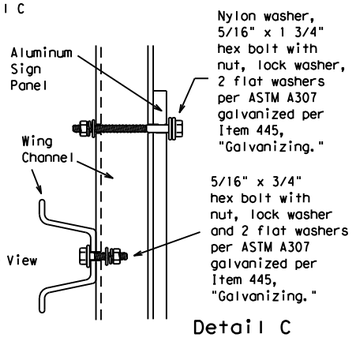


SM RD SGN ASSM TY XXXXX(1)XX(U-WC)
(See Note 11)

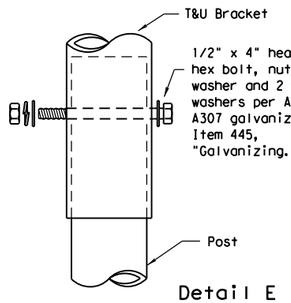


Detail F

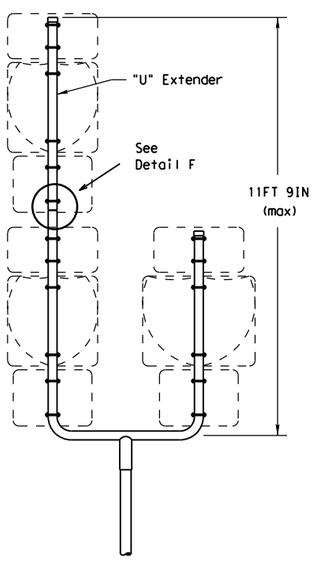
Splices shall only be allowed behind the sign substrate.



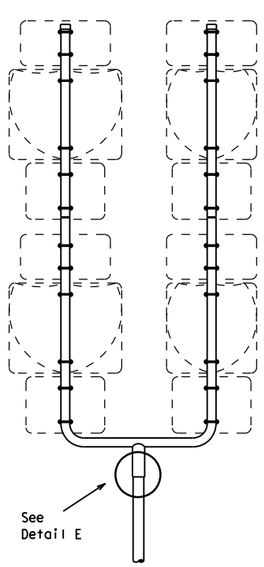
Detail C



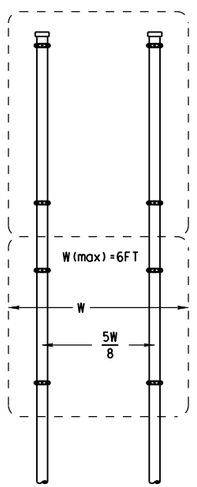
Detail E



SM RD SGN ASSM TY S80(1)XX(U-1EXT)

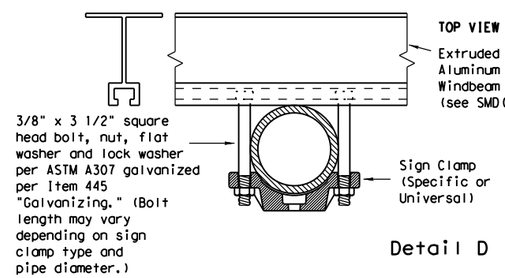


SM RD SGN ASSM TY S80(1)XX(U-2EXT)

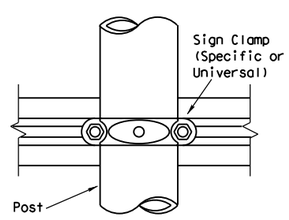


SM RD SGN ASSYM TY XXXXX(2)XX(P)

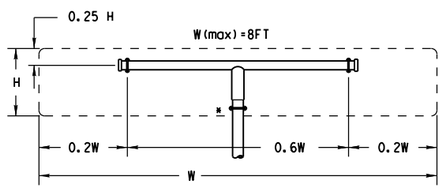
SIDE VIEW



Detail D



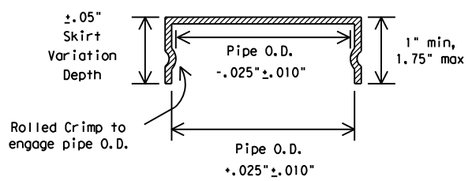
REQUIRED SUPPORT		
	SIGN DESCRIPTION	SUPPORT
Regulatory	48-inch STOP sign (R1-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	60-inch YIELD sign (R1-2)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	48x16-inch ONE-WAY sign (R6-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	36x48, 48x36, and 48x48-inch signs	TY 10BWG(1)XX(T)
	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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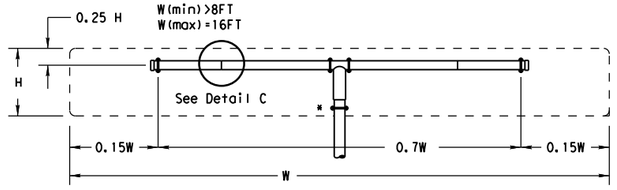
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			CR119
DIST	COUNTY		SHEET NO.
06	WILLIAMSON		260

9-08 REVISIONS

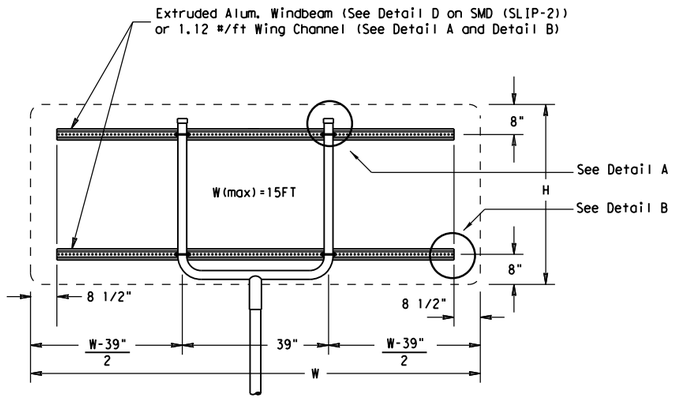
26C

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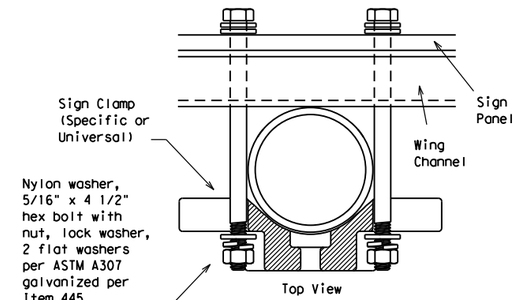
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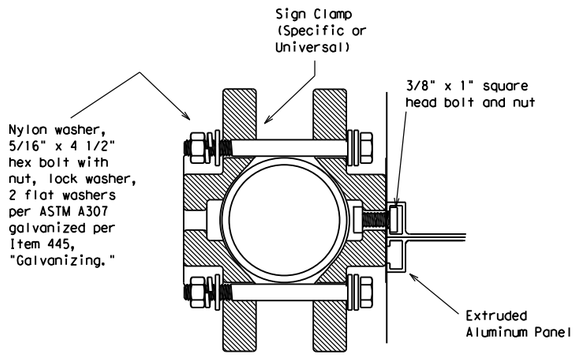
SM RD SGN ASSM TY XXXXX(1)XX(T-2EXT)
(* - See Note 12)



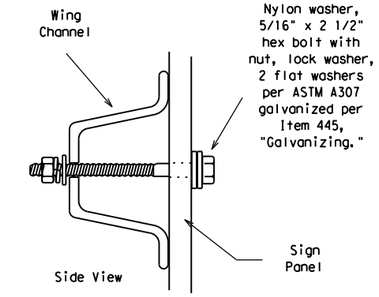
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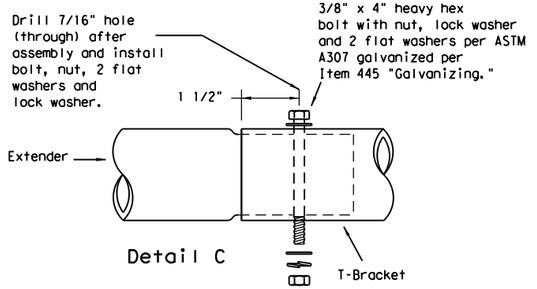
Detail A



Detail D
EXTRUDED ALUMINUM SIGN WITH T BRACKET

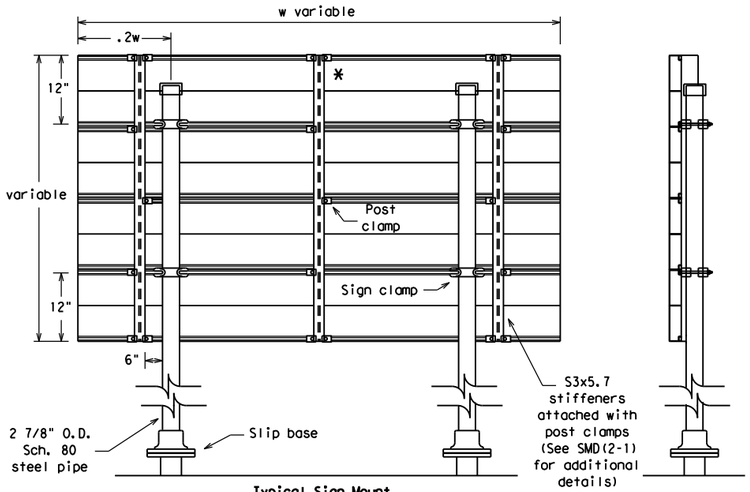


Detail B



Detail C

Splices shall only be allowed behind the sign substrate.

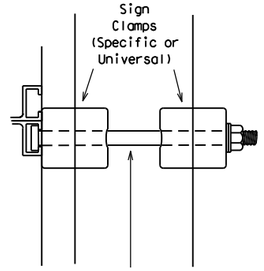


Typical Sign Mount

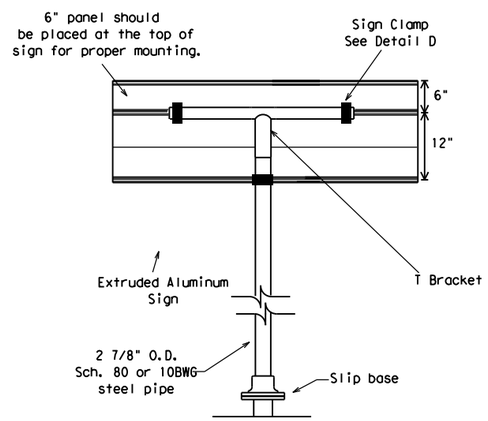
SM RD SGN ASSM TY S80(2)XX(P-EXAL)

* Additional stiffener placed at approximate center of signs when sign width is greater than 10'.

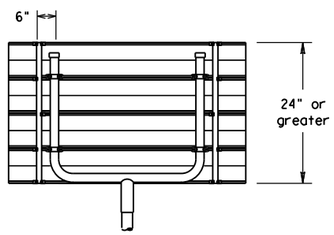
See Detail E
for clamp installation



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

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.

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
			CR119

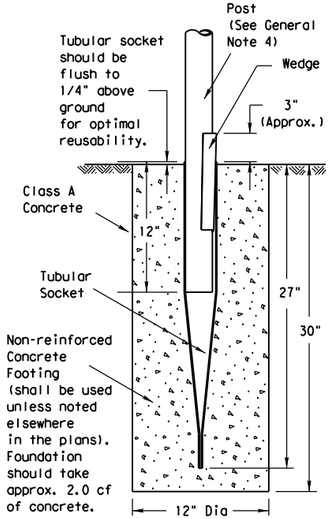
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06	WILLIAMSON	261

9-08 REVISIONS

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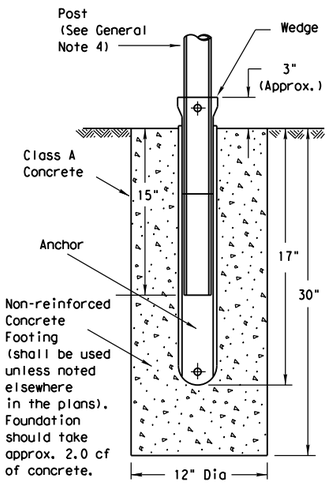
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Wedge Anchor Steel System



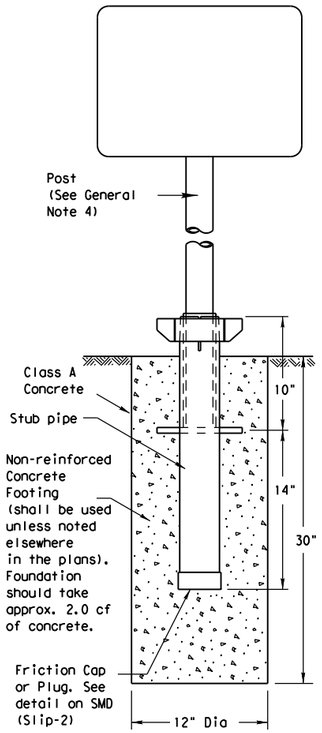
SM RD SGN ASSM TY TWT(X)WS(X)

Wedge Anchor High Density Polyethylene (HDPE) System

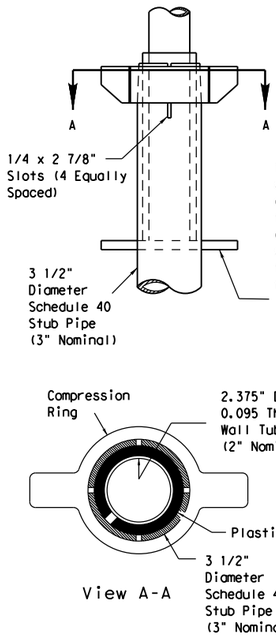


SMD RD SGN ASSM TY TWT(X)WP(X)

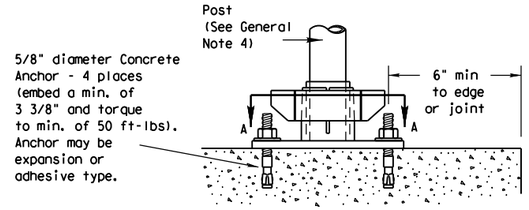
Universal Anchor System with Thin-Walled Tubing Post



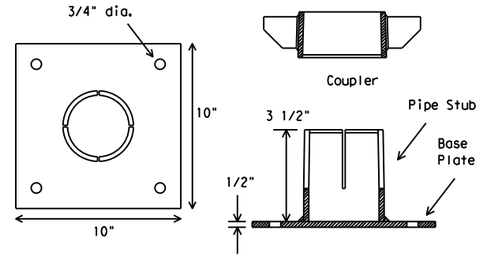
SM RD SGN ASSM TY TWT(X)UA(P)



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.

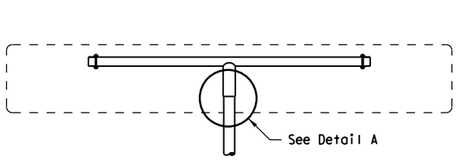


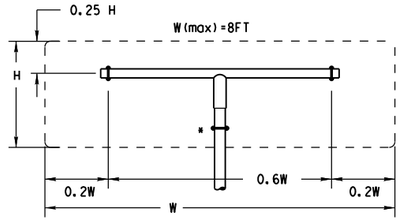
Concrete anchor consists of 5/8" diameter stud bolt with UNC series bolt threads on the upper end. A heavy hex nut per ASTM A563 and hardened washer per ASTM F436. The stud bolt shall have minimum yield and ultimate tensile strengths of 50 and 75 ksi, respectively. Nuts, bolts and washers shall be galvanized 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.



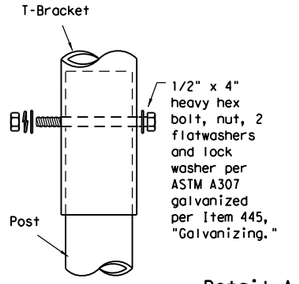
SM RD SGN ASSM TY TWT(X)UB(P)

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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9-08 REVISIONS

CONT	SECT	JOB	HIGHWAY
			CR119

DIST	COUNTY	SHEET NO.
06	WILLIAMSON	262

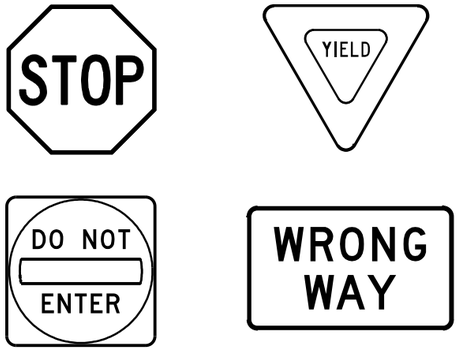
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REQUIREMENTS FOR RED BACKGROUND REGULATORY SIGNS

(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

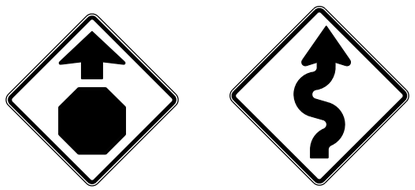
(EXCLUDING STOP, YIELD, DO NOT ENTER AND WRONG WAY SIGNS)



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				CR119
12-03 7-13	DIST	COUNTY		SHEET NO.
9-08	06	WILLIAMSON		263

4

A. GENERAL SITE DATA

1. PROJECT LIMITS: *From LIMMER LOOP TO CHANDLER ROAD*

Begin Project Coordinates : Latitude (N): 30°33'26" N Longitude (W): 97°33'32" W

2. PROJECT SITE MAPS:

- *Project Location Map: The Title Sheet*
- *Drainage Patterns: Drainage Area Maps (Sheet 123)*
- *Slopes Anticipated After Major Gradings or Areas of Soil Disturbance: Typical Sections (Sheets 4-9)*
- *Location of Erosion and Sediment Controls: SW3P Site Maps (Sheets 234-256)*
- *Surface Waters and Discharge Locations: Drainage and Culvert Layouts (Sheets 143-147,177)*
- *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:

Construction of a new 2-lane roadway and turn lanes, consisting of grading, culverts, driveways, asphalt concrete pavement, concrete riprap, concrete driveways, pavement markings and signing.

4. MAJOR SOIL DISTURBING ACTIVITIES:

- _X_ *Demolition of existing pavement*
- _X_ *Placement of road base*
- _X_ *Exstensive ditch grading*
- _X_ *Construction of an arch culvert bridge*
- _X_ *Temporary detour pavement*
- _X_ *Other:*

5. EXISTING CONDITION OF SOIL & VEGETATIVE COVER AND % OF EXISTING VEGETATIVE COVER:

Description of existing vegetative cover: Agricultural and farmland

Percentage of existing vegetative cover: 20%

Existing vegetative cover: (mark one)

- ___ *Thick or uniformly established*
- _X_ *Thin and Patchy*
- ___ *None or minimal cover*

Description of soils: Hydrologic Soils Group D

6. TOTAL PROJECT AREA: *35.4* Acres

7. TOTAL AREA TO BE DISTURBED: *35.4* Acres (*XX %*)

8. WEIGHTED RUNOFF COEFFICIENT

BEFORE CONSTRUCTION: *0.44*
AFTER CONSTRUCTION: *0.62*

9. NAME OF RECEIVING WATERS:

Storm water runoff from the proposed construction would flow through grass-lined ditches before entering Cottonwood Creek. this project is located in the Brushy Creek-Segment 1244.

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
- _P_ MULCHING (Hay or Straw)
- _P_ BUFFER ZONES
- ___ PLANTING
- _P_ SEEDING
- ___ SODDING
- ___ PRESERVATION OF NATURAL RESOURCES
- ___ FLEXIBLE CHANNEL LINER
- ___ RIGID CHANNEL LINER
- _T_ SOIL RETENTION BLANKET
- ___ 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)

- _T_ SILT FENCES
- ___ 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
- _P_ PAVED FLUMES
- _T_ ROCK BEDDING AT CONSTRUCTION EXIT
- ___ TIMBER MATTING AT CONSTRUCTION EXIT
- ___ CHANNEL LINERS
- ___ SEDIMENT TRAPS
- ___ SEDIMENT BASINS
- _T_ STORM INLET SEDIMENT TRAP
- ___ STONE OUTLET STRUCTURES
- ___ CURBS AND GUTTERS
- _P_ STORM SEWERS
- ___ VELOCITY CONTROL DEVICES
- _X_ OTHER: *(Specify Practice)*

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:

The proposed facility was designed in consideration of hydraulic design standards to convey stormwater in a manner that is protective of public safety and property. The control of erosion from the facility is inherent to the design. Additional factors affecting post-construction stormwater at the project location include: (mark all that apply)

- _X_ *Existing or new vegetation provides natural filtration.*
- _X_ *The design includes provisions for permanent erosion controls provided by strategically placed pervious and impervious surfaces.*
- ___ *Project includes permanent sedimentation controls (other than grass).*
- _X_ *Velocities do not require dissipation devices.*
- ___ *Velocity-dissipation devices included in the design.*
- ___ *Other : _____*

4. STORM WATER MANAGEMENT ACTIVITIES: (Sequence of Construction)

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
ARNOLD GONZALES, JR.
98234
LICENSED
PROFESSIONAL ENGINEER

6/15/2017

ARNOLD GONZALES JR, P.E.
Signature of Registrant & Date

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Austin, Texas 78701
Tel. (512) 328-0011 Fax (512) 328-0325
TBPE Registration Number F-6324
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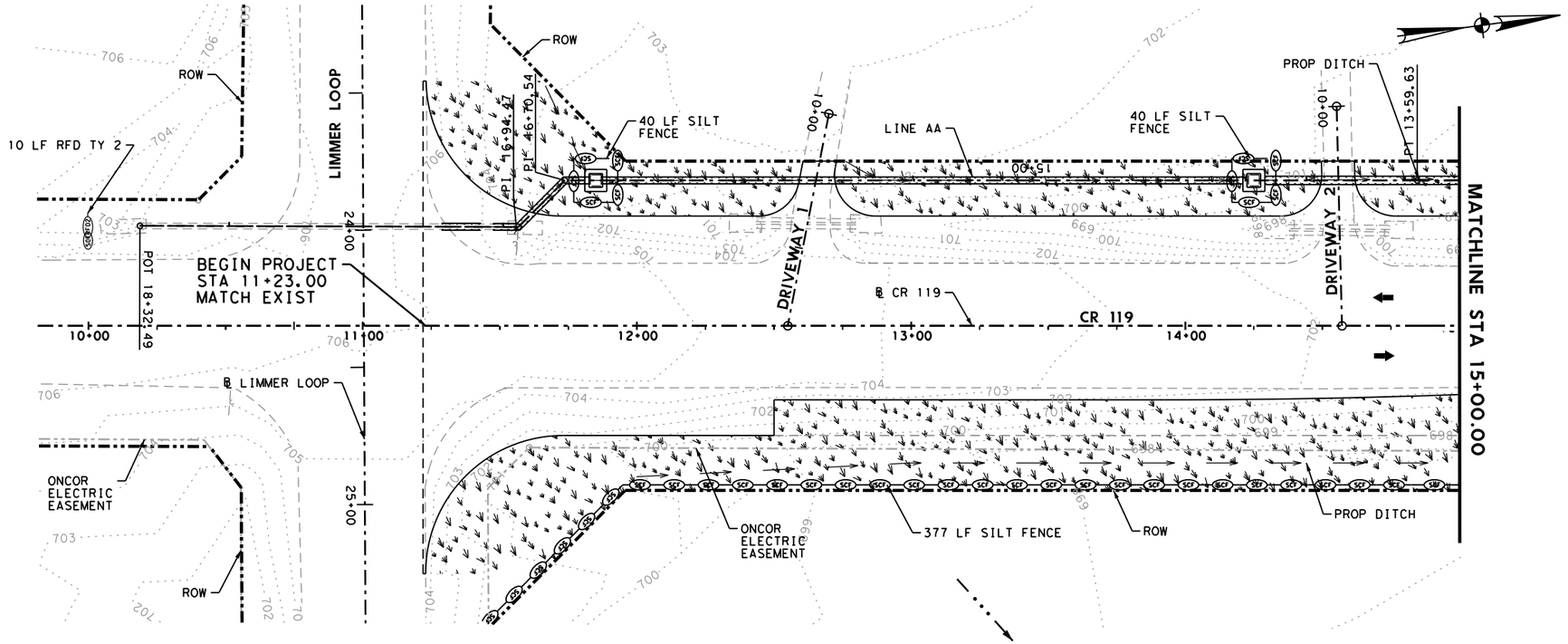
WILLIAMSON COUNTY

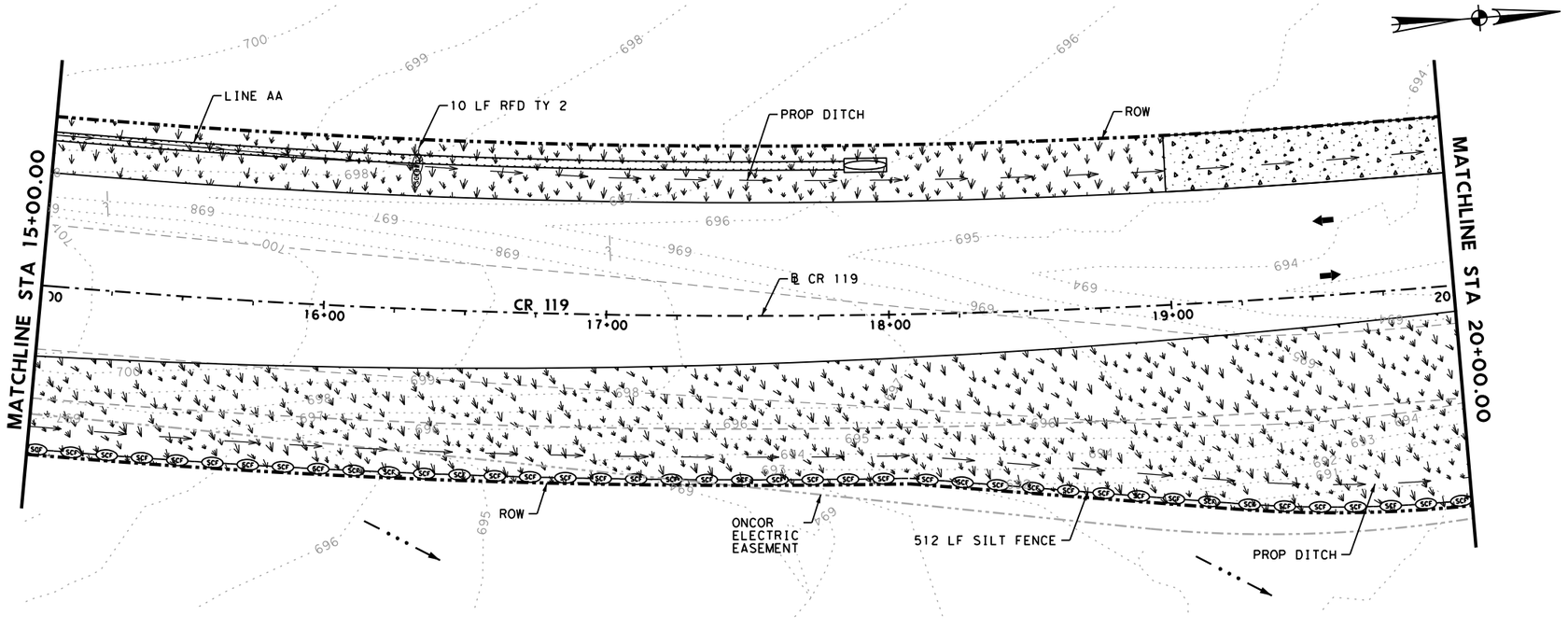
STORM WATER POLLUTION PREVENTION PLAN (SW3P)

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	14	WILLIAMSON	
CHECK	CONTROL	SECTION	JOB	264
	6	TEXAS	CR119	

FILE NAME
DATE
DESIGNER





NOTES:

1. CALL THE TEXAS STATE WIDE ONE CALL LOCATOR NUMBER 1-800-344-8377, 48 HOURS BEFORE BEGINNING ANY EXCAVATION.
2. THE CONTRACTOR WILL BE RESPONSIBLE FOR PROTECTING OVERHEAD AND UNDERGROUND FACILITIES IF ADJACENT TO WORK AREA.
3. PROPOSED FENCING SHOWN OFFSET FROM ROW FOR VISUAL REFERENCE. FENCE TO BE CONSTRUCTED ALONG ROW.
4. TYPE I CLASS A SOIL RETENTION BLANKETS SHALL BE PLACED ALONG ALL DISTURBED AREAS UPON COMPLETION OF SEEDING OPERATIONS.
5. REFER TO DRAINAGE PLANS FOR ADDITIONAL INFORMATION.

LEGEND

- RIGHT OF WAY BOUNDARY
- 535 EXISTING CONTOURS
- EXISTING WIRE FENCE
- PROPOSED WIRE FENCE (TY C) (STEEL POST)
- FLOW ARROW
- DITCH FLOW ARROWS
- SILT FENCE
- ROCK FILTER DAM (TY2)
- ROCK FILTER DAM (TY3)
- SOIL RETENTION BLANKETS (TY F)
- CONCRETE RIPRAP
- 18" ROCK RIPRAP
- PERMANENT SEEDING

0 25 50

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98234
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PROFESSIONAL ENGINEER

6/22/2017

CR 119

WILLIAMSON COUNTY 1848

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EROSION CONTROL PLAN

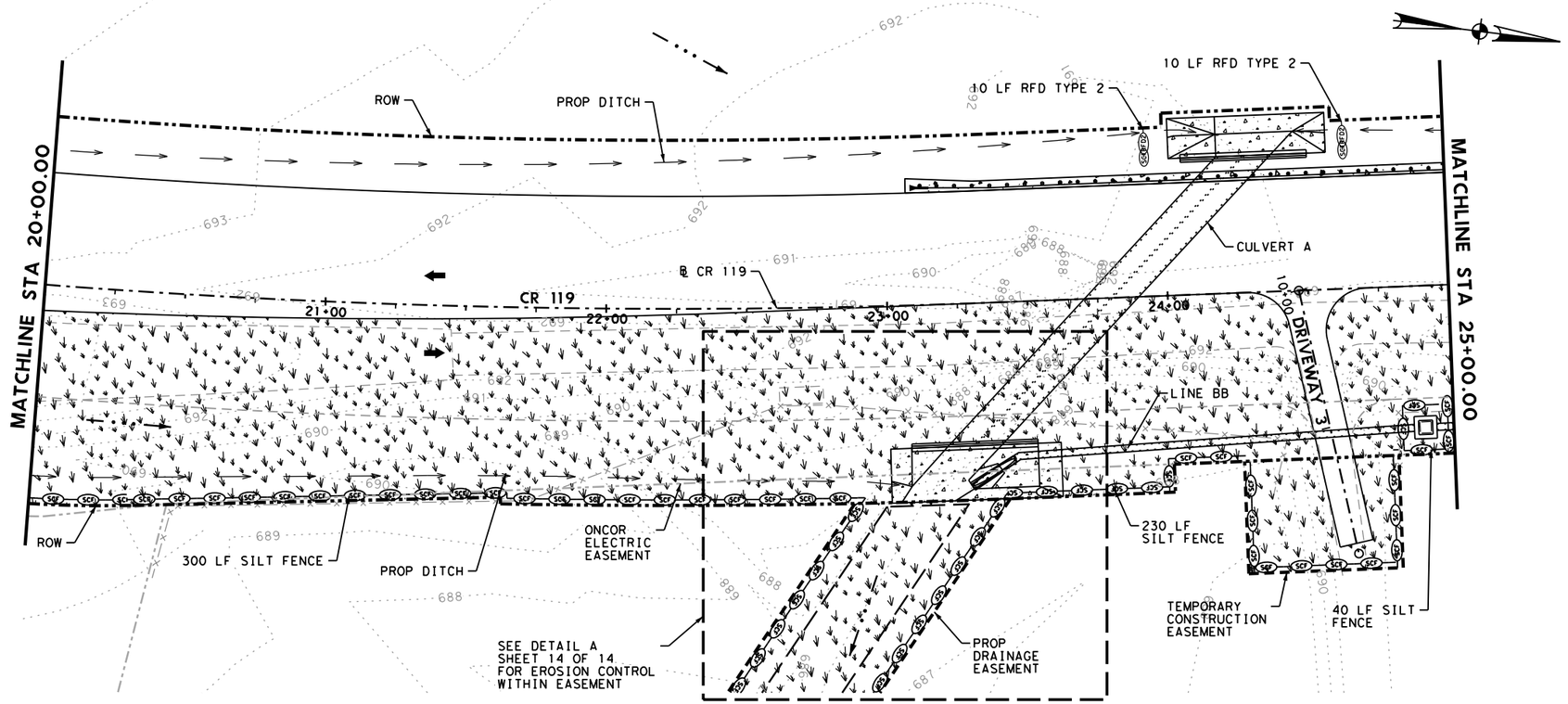
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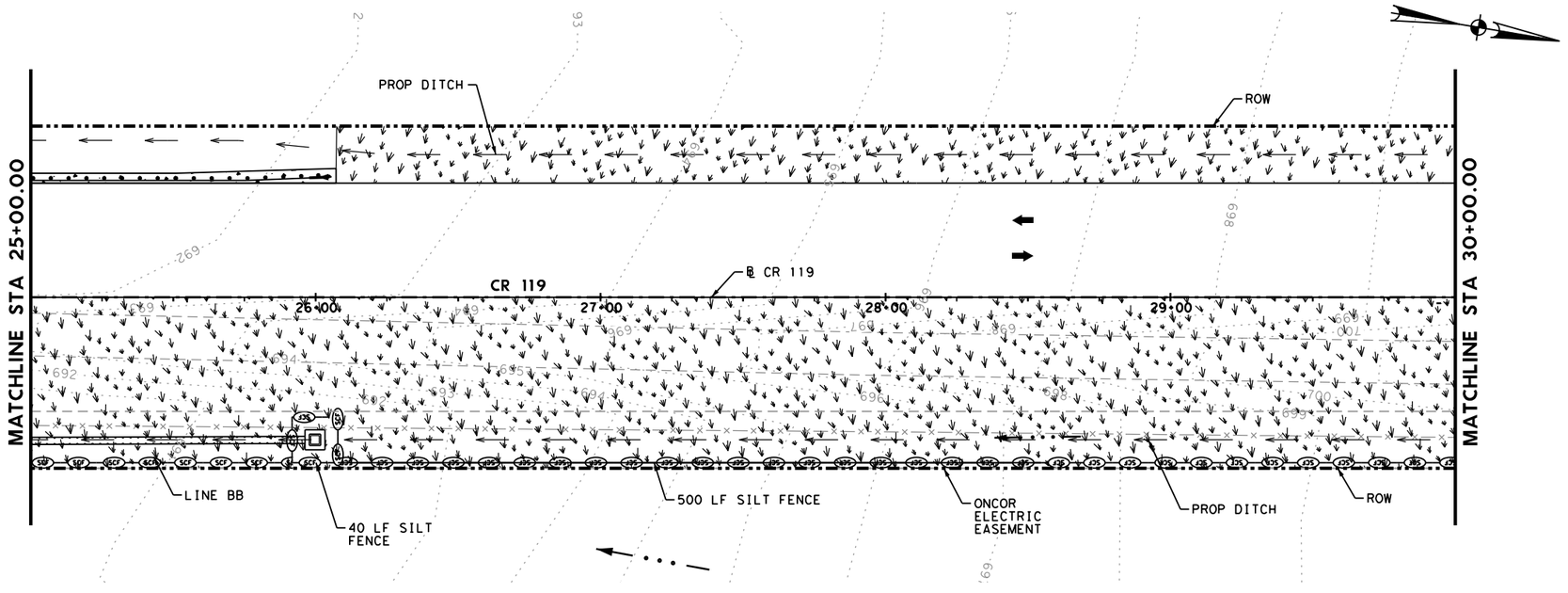
SHEET 01 OF 14

FED. RD. DIV. RD.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				265

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- DITCH FLOW ARROWS
- SILT FENCE
- ROCK FILTER DAM (TY2)
- ROCK FILTER DAM (TY3)
- SOIL RETENTION BLANKETS (TY F)
- CONCRETE RIPRAP
- 18" ROCK RIPRAP
- PERMANENT SEEDING

0 25 50

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6/22/2017

CR 119

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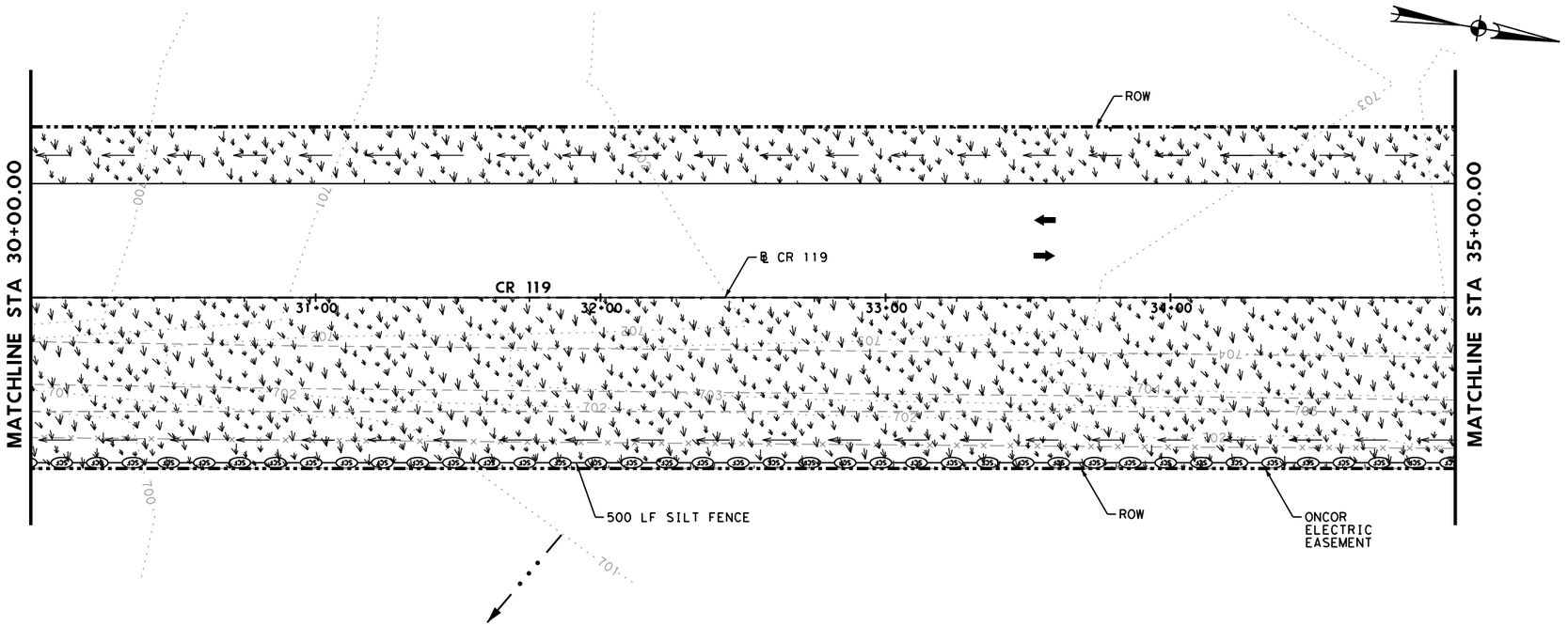
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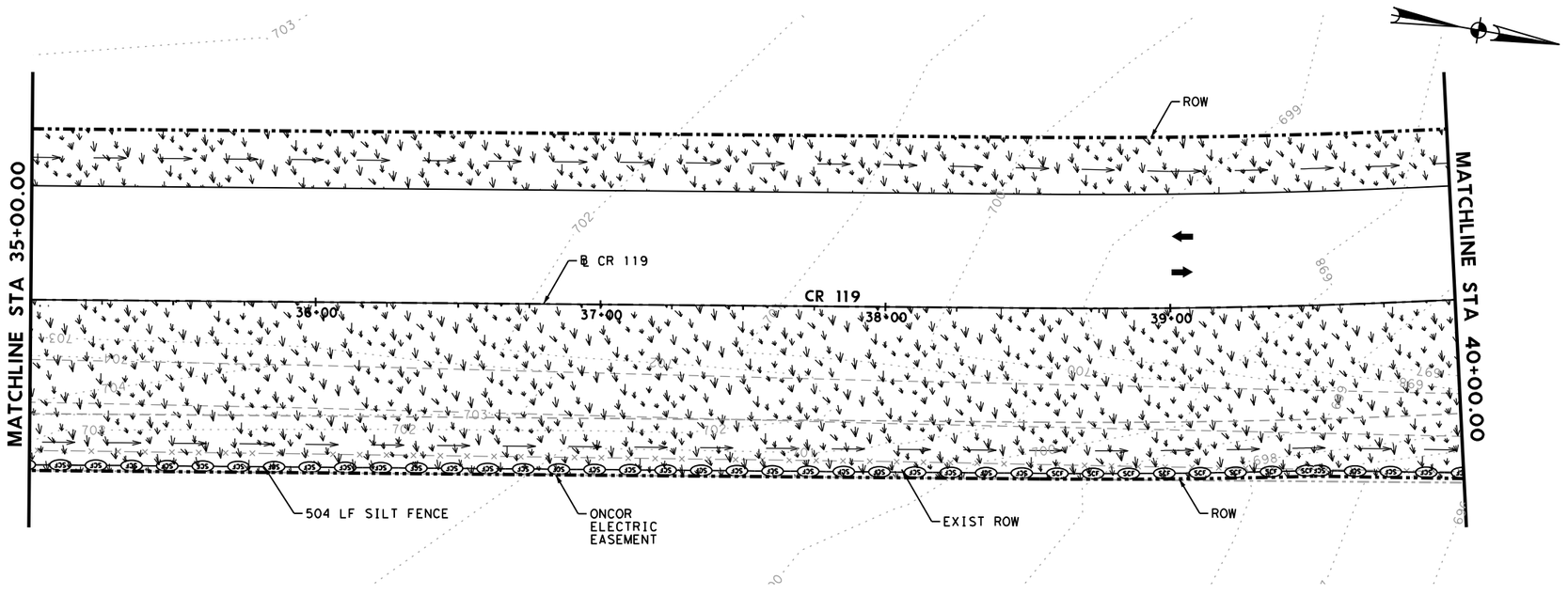
EROSION CONTROL PLAN

STA 20+00 TO STA 30+00

SHEET 02 OF 14

FED. RD. DIV. RD.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				266





NOTES:

1. CALL THE TEXAS STATE WIDE ONE CALL LOCATOR NUMBER 1-800-344-8377, 48 HOURS BEFORE BEGINNING ANY EXCAVATION.
2. THE CONTRACTOR WILL BE RESPONSIBLE FOR PROTECTING OVERHEAD AND UNDERGROUND FACILITIES IF ADJACENT TO WORK AREA.
3. PROPOSED FENCING SHOWN OFFSET FROM ROW FOR VISUAL REFERENCE. FENCE TO BE CONSTRUCTED ALONG ROW.
4. TYPE I CLASS A SOIL RETENTION BLANKETS SHALL BE PLACED ALONG ALL DISTURBED AREAS UPON COMPLETION OF SEEDING OPERATIONS.
5. REFER TO DRAINAGE PLANS FOR ADDITIONAL INFORMATION.

LEGEND

- RIGHT OF WAY BOUNDARY
- 535 EXISTING CONTOURS
- EXISTING WIRE FENCE
- PROPOSED WIRE FENCE (TY C) (STEEL POST)
- FLOW ARROW
- DITCH FLOW ARROWS
- SILT FENCE
- ROCK FILTER DAM (TY2)
- ROCK FILTER DAM (TY3)
- SOIL RETENTION BLANKETS (TY F)
- CONCRETE RIPRAP
- 18" ROCK RIPRAP
- PERMANENT SEEDING

0 25 50

STATE OF TEXAS
ARNOLD GONZALES, JR.
98234
LICENSED
PROFESSIONAL ENGINEER

6/22/2017

CR 119

WILLIAMSON COUNTY 1848

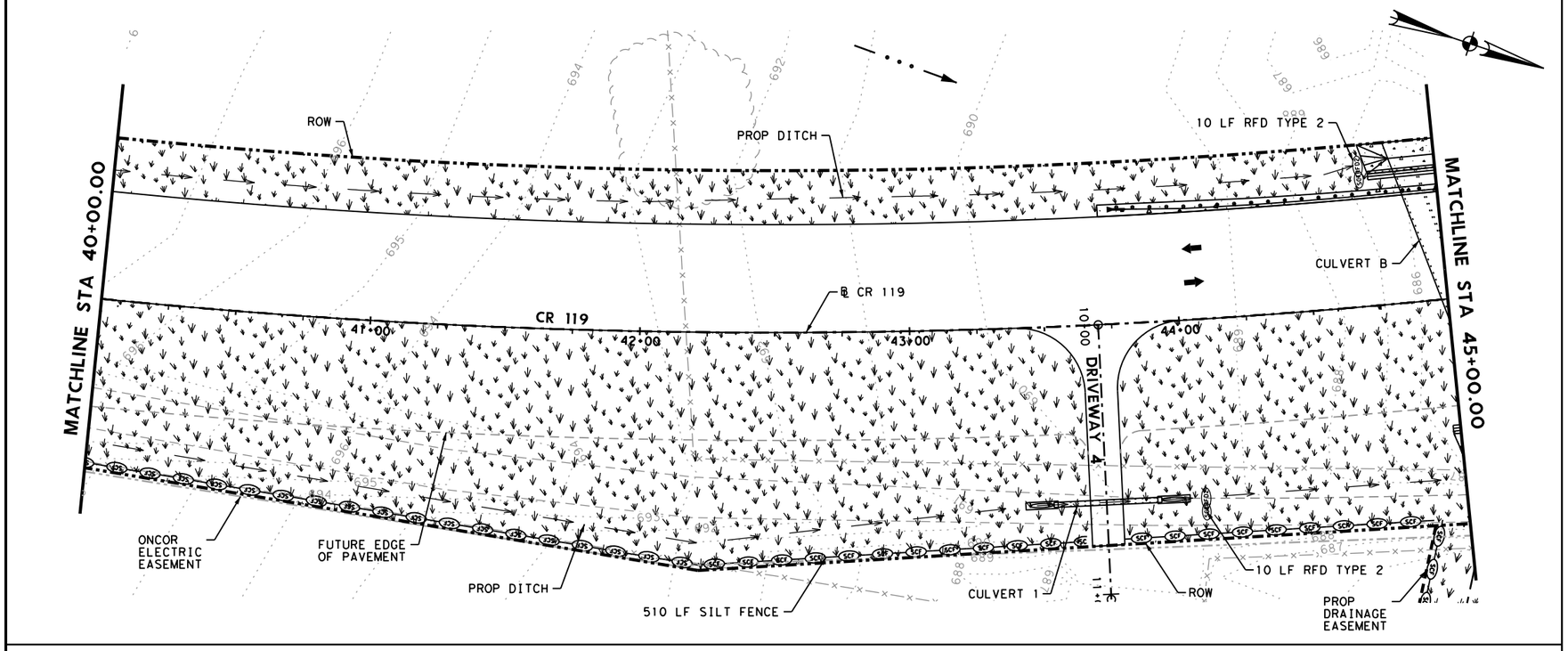
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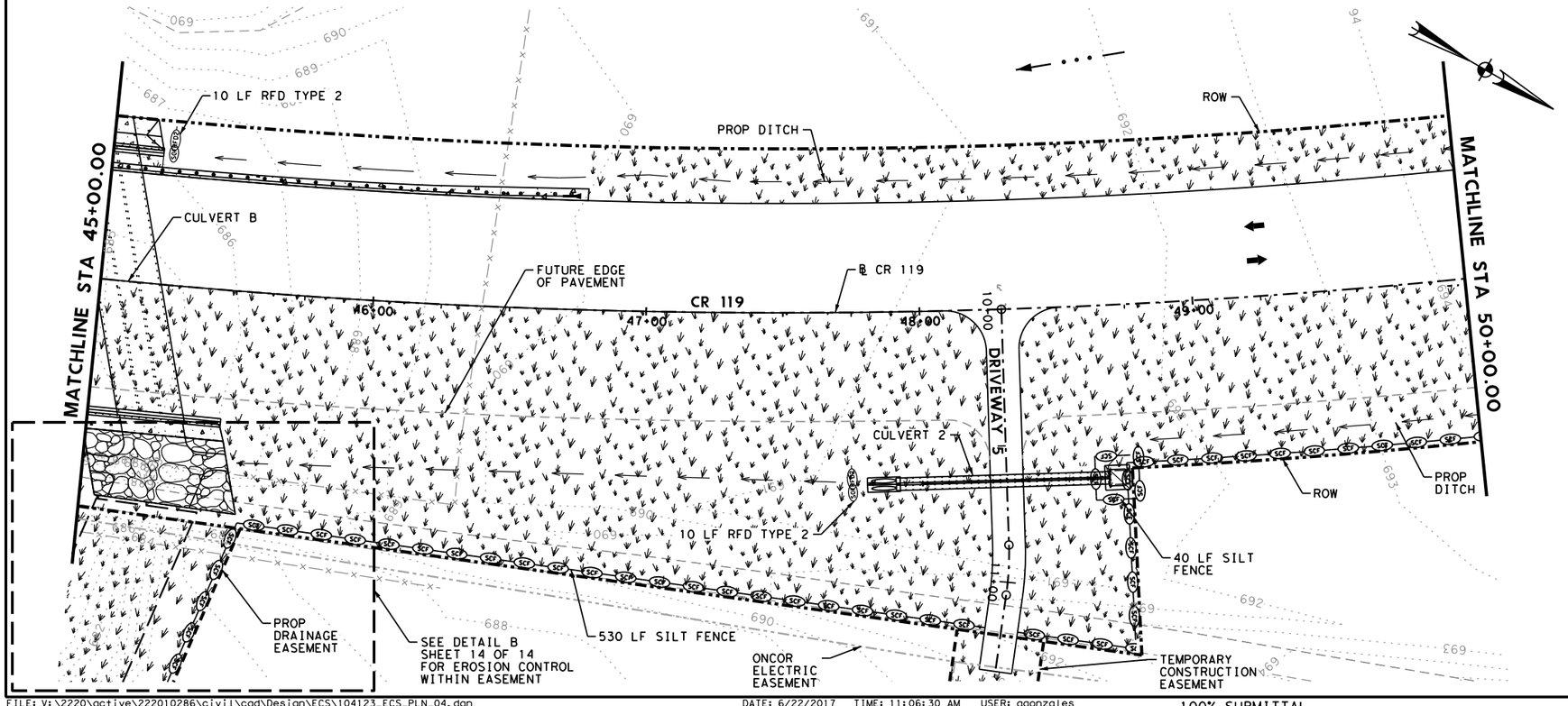
EROSION CONTROL PLAN

STA 30+00 TO STA 40+00

SHEET 03 OF 14

FED. RD. DIV. RD.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				267





NOTES:

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LEGEND

- RIGHT OF WAY BOUNDARY
- 535 EXISTING CONTOURS
- EXISTING WIRE FENCE
- PROPOSED WIRE FENCE (TY C) (STEEL POST)
- FLOW ARROW
- DITCH FLOW ARROWS
- SILT FENCE
- ROCK FILTER DAM (TY2)
- ROCK FILTER DAM (TY3)
- SOIL RETENTION BLANKETS (TY F)
- CONCRETE RIPRAP
- 18" ROCK RIPRAP
- PERMANENT SEEDING

0 25 50

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WILLIAMSON COUNTY 1848

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EROSION CONTROL PLAN

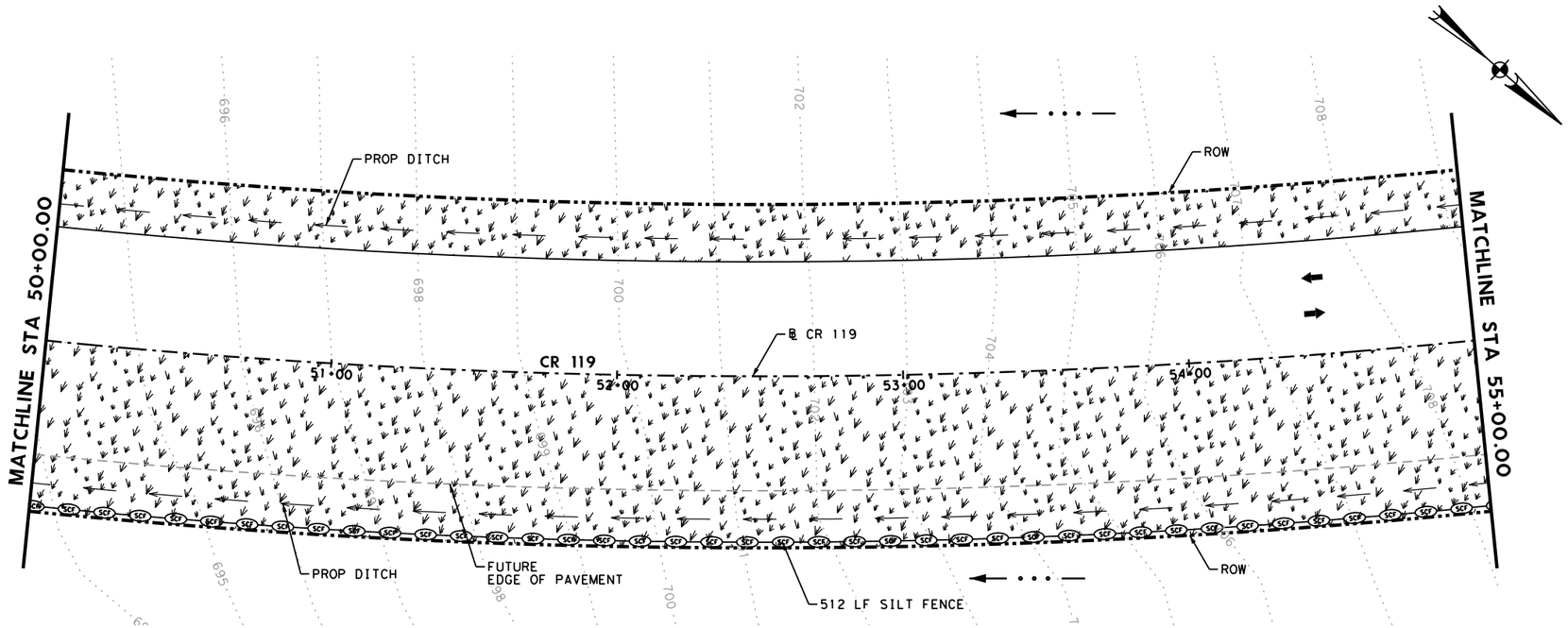
STA 40+00 TO STA 50+00

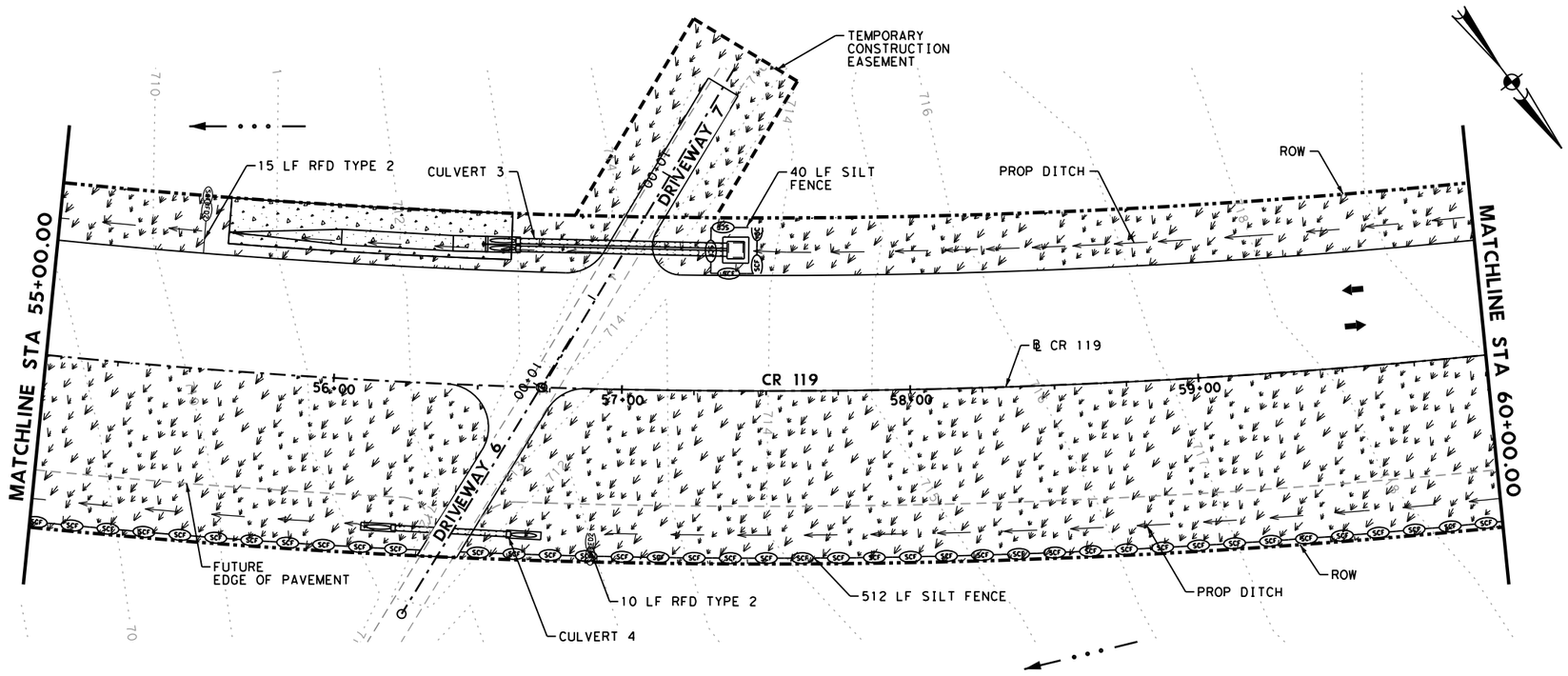
SHEET 04 OF 14

FED. RD. DIV. RD.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				268

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NOTES:

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LEGEND

- RIGHT OF WAY BOUNDARY
- 535 EXISTING CONTOURS
- EXISTING WIRE FENCE
- PROPOSED WIRE FENCE (TY C) (STEEL POST)
- FLOW ARROW
- DITCH FLOW ARROWS
- SILT FENCE
- ROCK FILTER DAM (TY2)
- ROCK FILTER DAM (TY3)
- SOIL RETENTION BLANKETS (TY F)
- CONCRETE RIPRAP
- 18" ROCK RIPRAP
- PERMANENT SEEDING

0 25 50

STATE OF TEXAS
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98234
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EROSION CONTROL PLAN

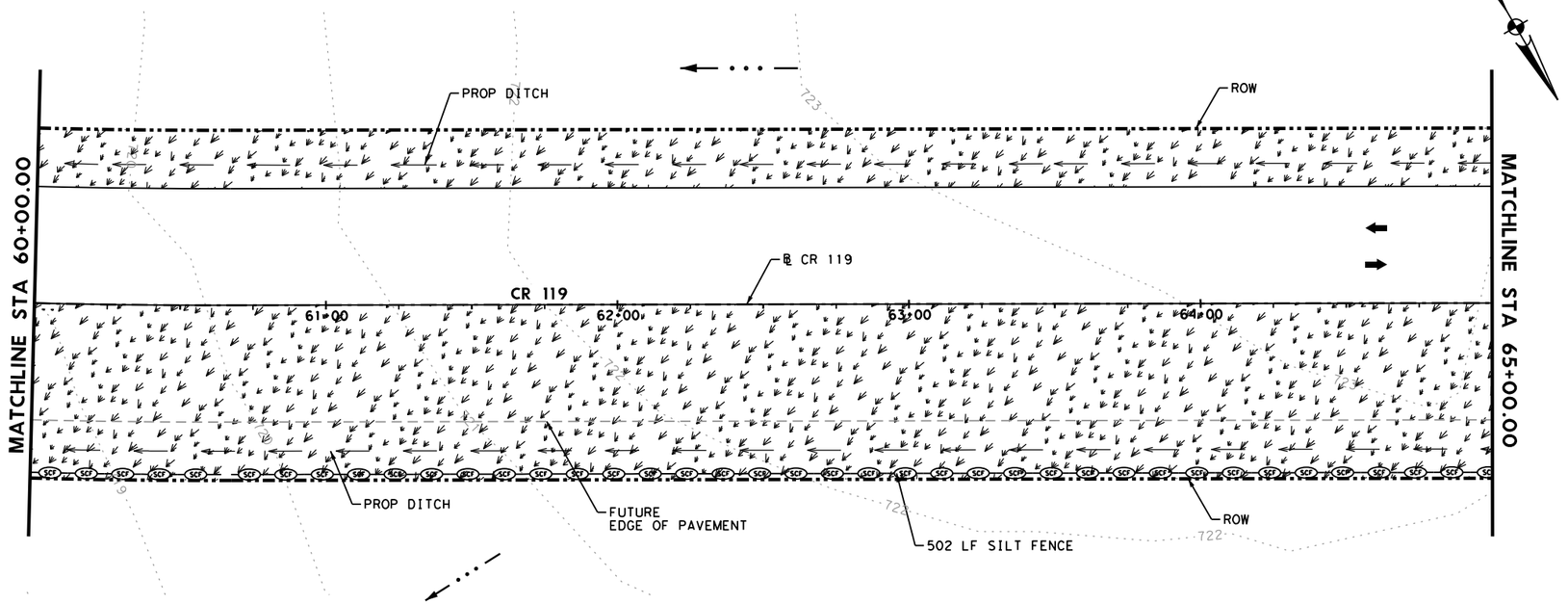
STA 50+00 TO STA 60+00

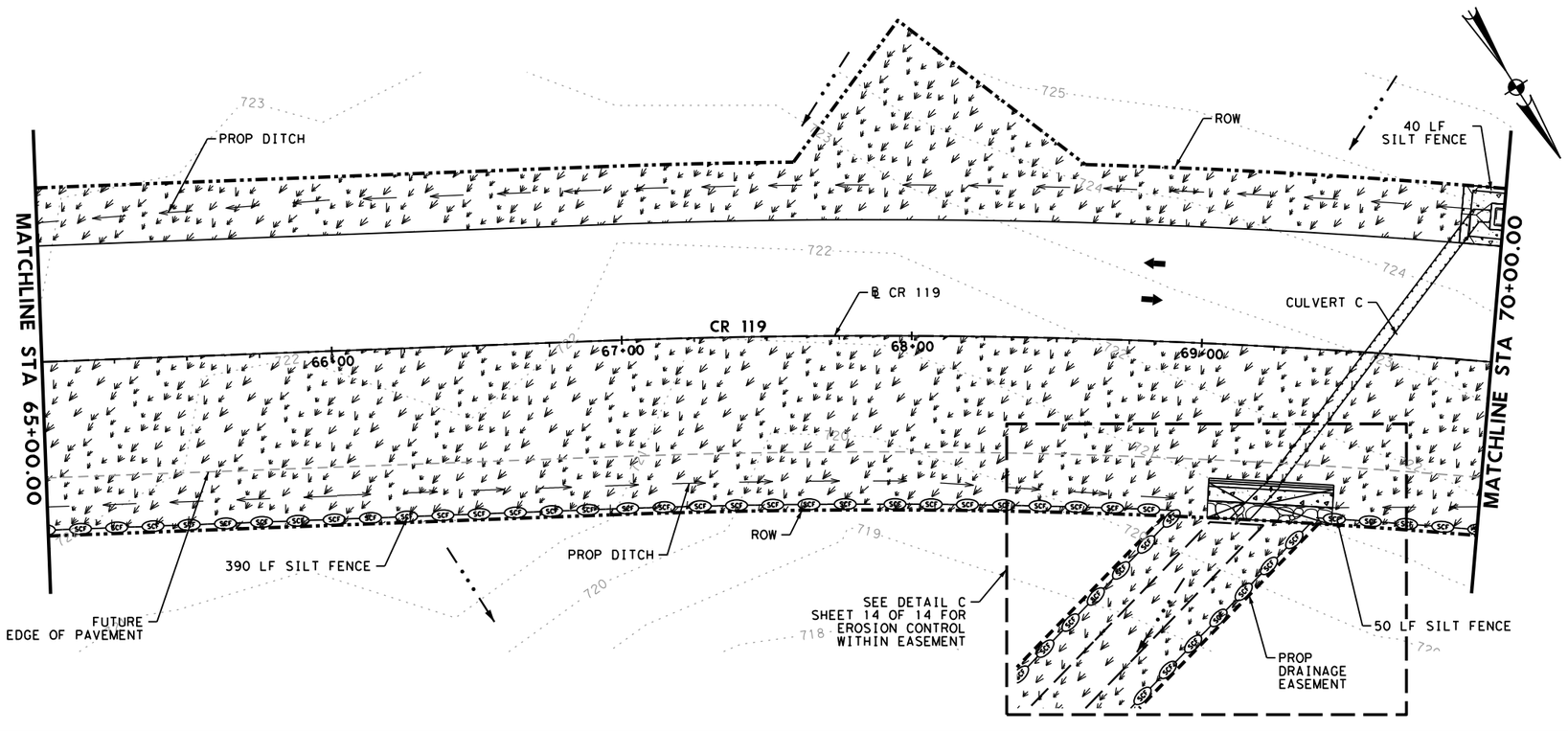
SHEET 05 OF 14

FED. RD. DIV. RD.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				269

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NOTES:

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LEGEND

- RIGHT OF WAY BOUNDARY
- 535 EXISTING CONTOURS
- EXISTING WIRE FENCE
- PROPOSED WIRE FENCE (TY C) (STEEL POST)
- FLOW ARROW
- DITCH FLOW ARROWS
- SILT FENCE
- ROCK FILTER DAM (TY2)
- ROCK FILTER DAM (TY3)
- SOIL RETENTION BLANKETS (TY F)
- CONCRETE RIPRAP
- 18" ROCK RIPRAP
- PERMANENT SEEDING

0 25 50

STATE OF TEXAS
ARNOLD GONZALES, JR.
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EROSION CONTROL PLAN

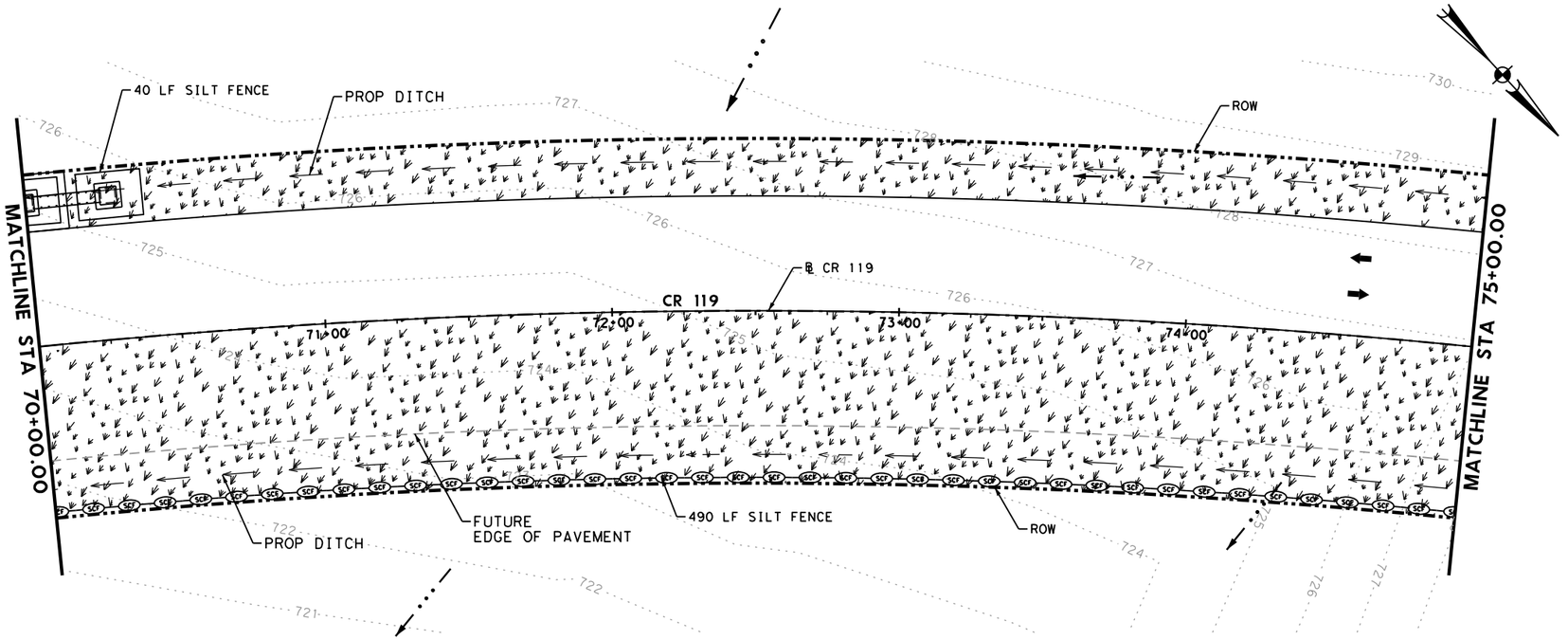
STA 60+00 TO STA 70+00

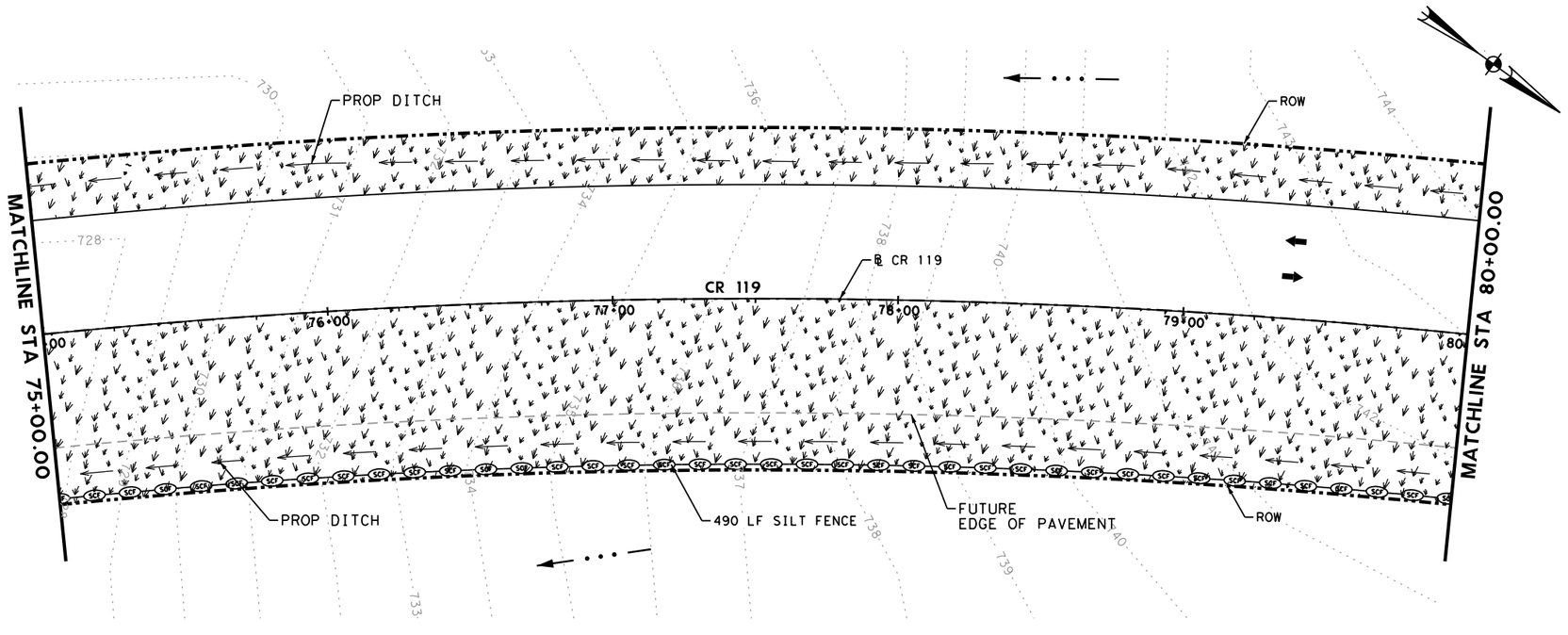
SHEET 06 OF 14

FED. RD. DIV. RD.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				270

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NOTES:

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LEGEND

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- 535 EXISTING CONTOURS
- EXISTING WIRE FENCE
- PROPOSED WIRE FENCE (TY C) (STEEL POST)
- FLOW ARROW
- DITCH FLOW ARROWS
- SILT FENCE
- ROCK FILTER DAM (TY2)
- ROCK FILTER DAM (TY3)
- SOIL RETENTION BLANKETS (TY F)
- CONCRETE RIPRAP
- 18" ROCK RIPRAP
- PERMANENT SEEDING

0 25 50

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ARNOLD GONZALES, JR.
98234
LICENSED
PROFESSIONAL ENGINEER

6/22/2017

CR 119

WILLIAMSON COUNTY
1848

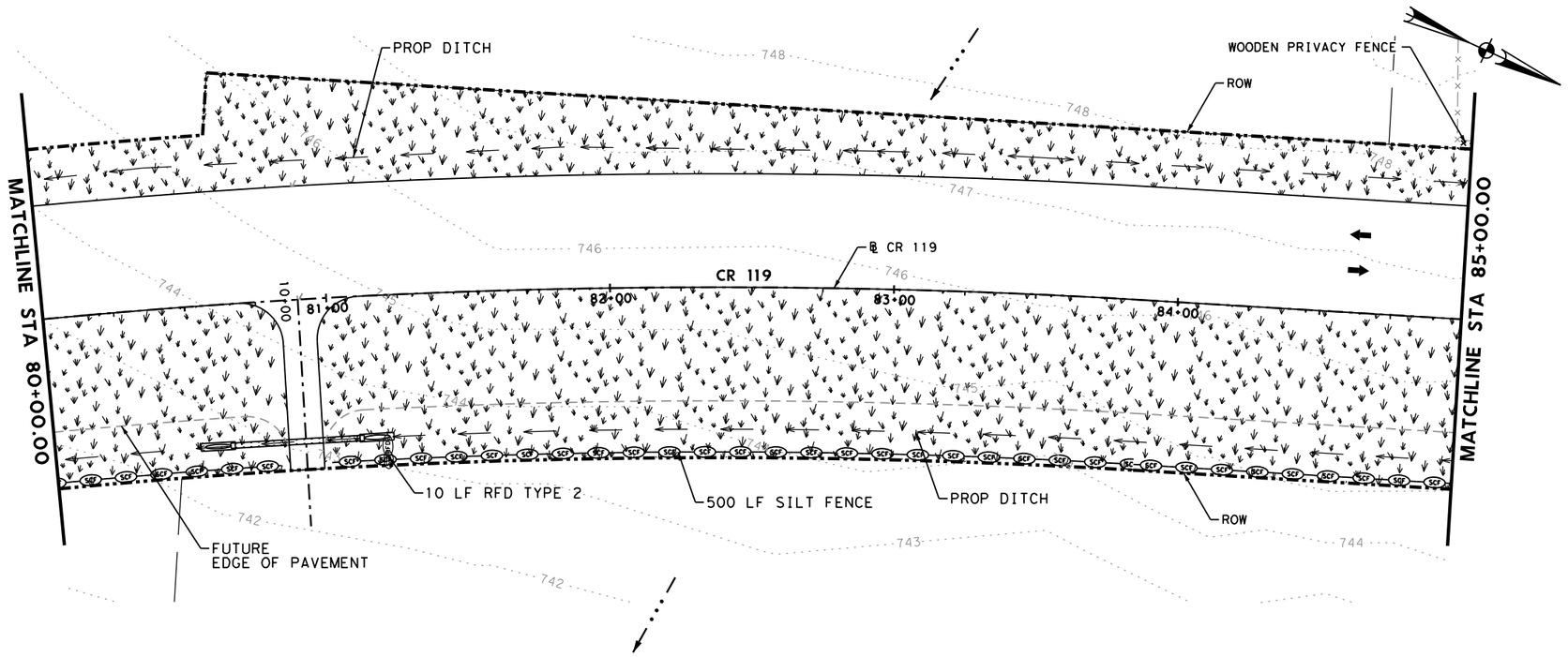
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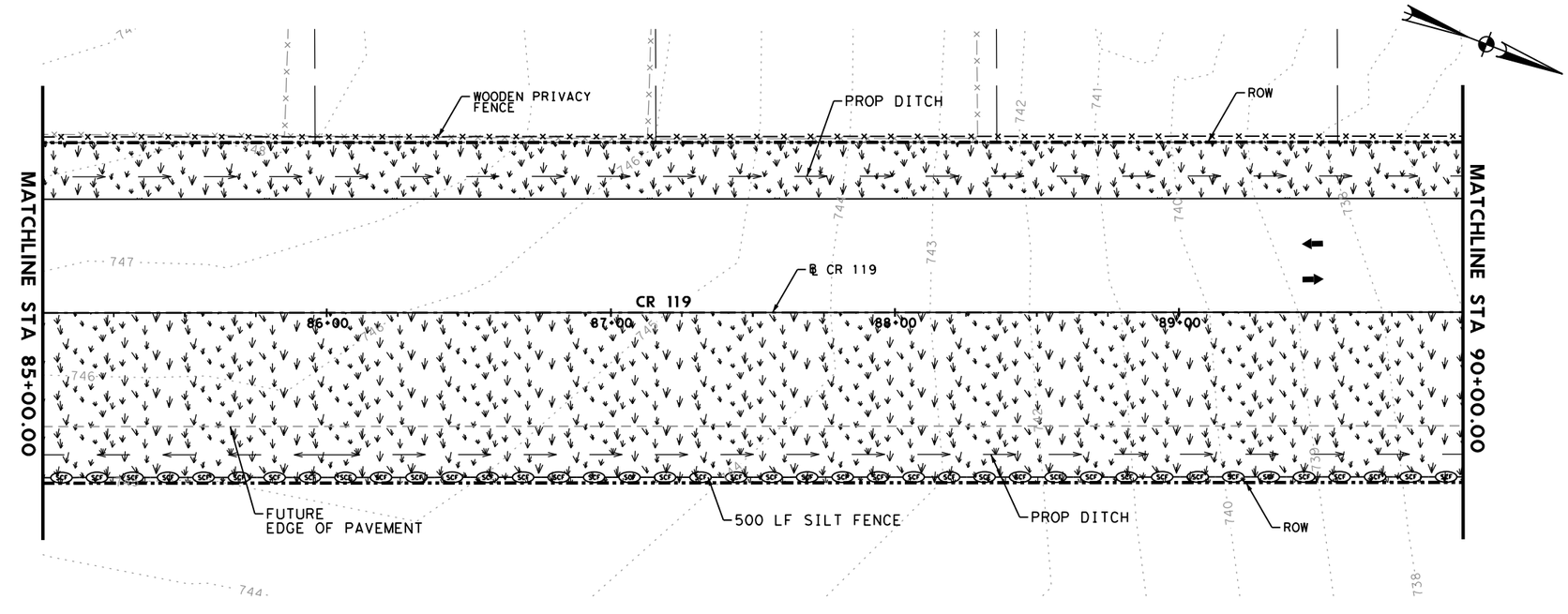
EROSION CONTROL PLAN

STA 70+00 TO STA 80+00

SHEET 07 OF 14

FED. RD. DIV. RD.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				271





NOTES:

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LEGEND

- RIGHT OF WAY BOUNDARY
- 535 EXISTING CONTOURS
- EXISTING WIRE FENCE
- PROPOSED WIRE FENCE (TY C) (STEEL POST)
- FLOW ARROW
- DITCH FLOW ARROWS
- SILT FENCE
- ROCK FILTER DAM (TY2)
- ROCK FILTER DAM (TY3)
- SOIL RETENTION BLANKETS (TY F)
- CONCRETE RIPRAP
- 18" ROCK RIPRAP
- PERMANENT SEEDING

0 25 50

STATE OF TEXAS
ARNOLD GONZALES, JR.
98234
LICENSED
PROFESSIONAL ENGINEER

6/22/2017

CR 119

WILLIAMSON COUNTY 1848

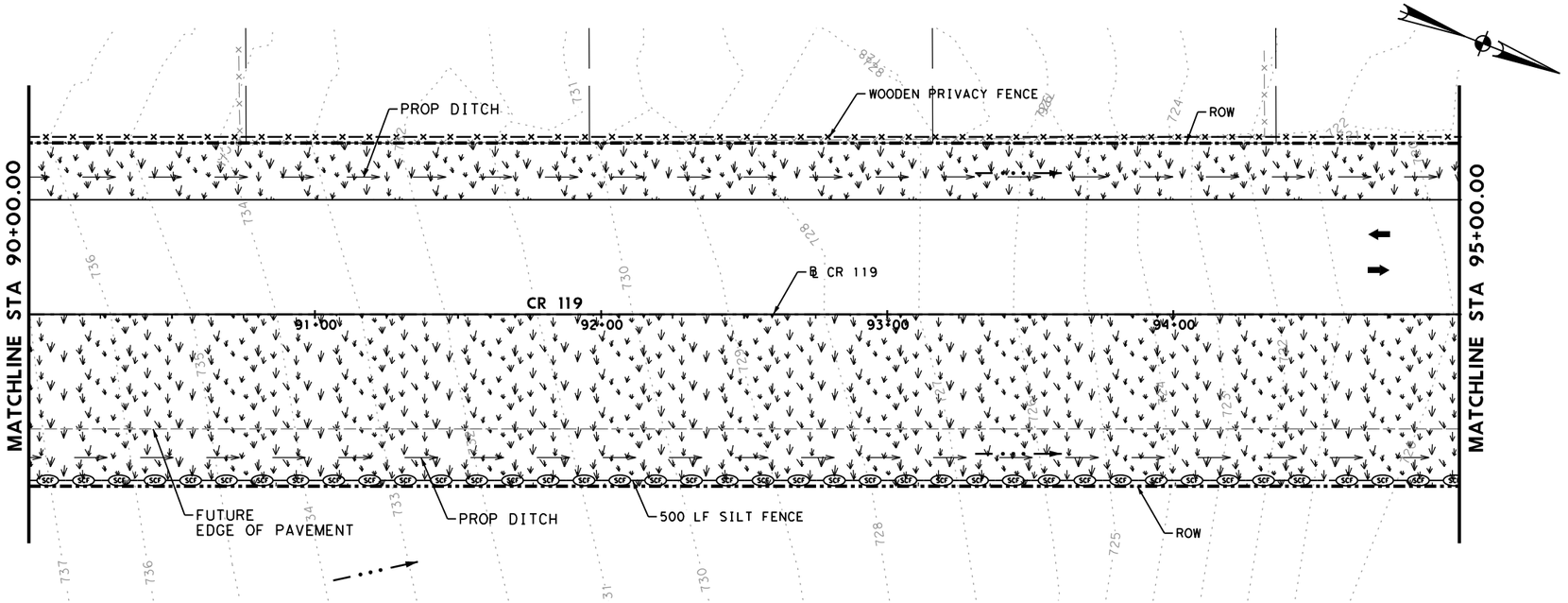
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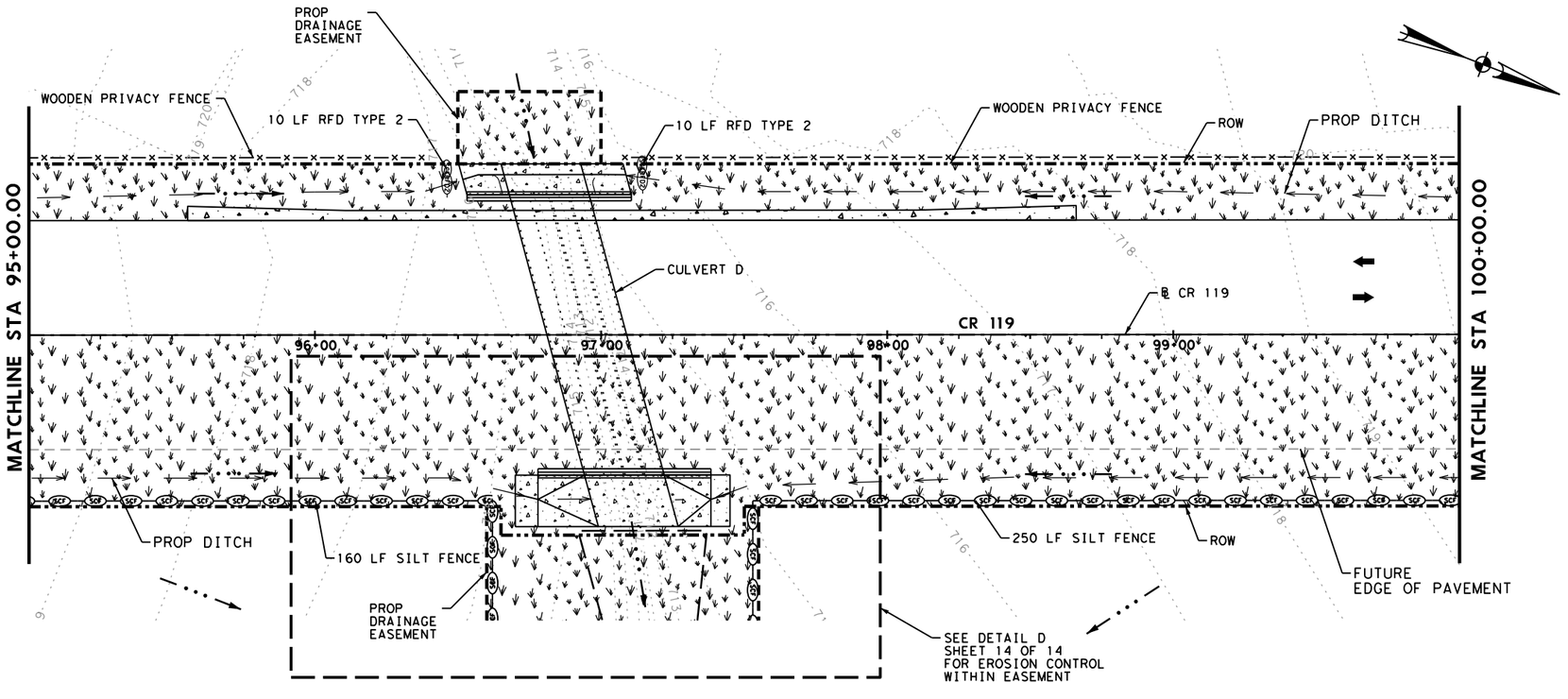
EROSION CONTROL PLAN

STA 80+00 TO STA 90+00

SHEET 08 OF 14

FED. RD. DIV. RD.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				272





NOTES:

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LEGEND

- RIGHT OF WAY BOUNDARY
- 535 EXISTING CONTOURS
- EXISTING WIRE FENCE
- PROPOSED WIRE FENCE (TY C) (STEEL POST)
- FLOW ARROW
- DITCH FLOW ARROWS
- SILT FENCE
- ROCK FILTER DAM (TY2)
- ROCK FILTER DAM (TY3)
- SOIL RETENTION BLANKETS (TY F)
- CONCRETE RIPRAP
- 18" ROCK RIPRAP
- PERMANENT SEEDING

0 25 50

STATE OF TEXAS
ARNOLD GONZALES, JR.
98234
LICENSED
PROFESSIONAL ENGINEER

6/22/2017

CR 119

WILLIAMSON COUNTY
1848

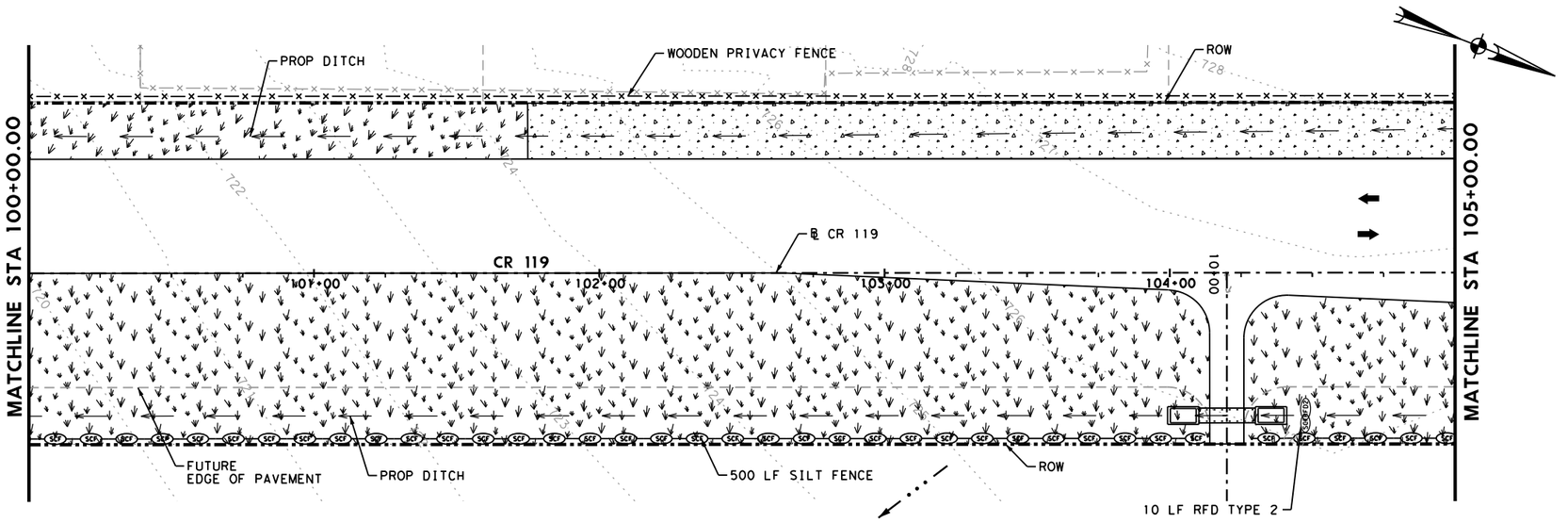
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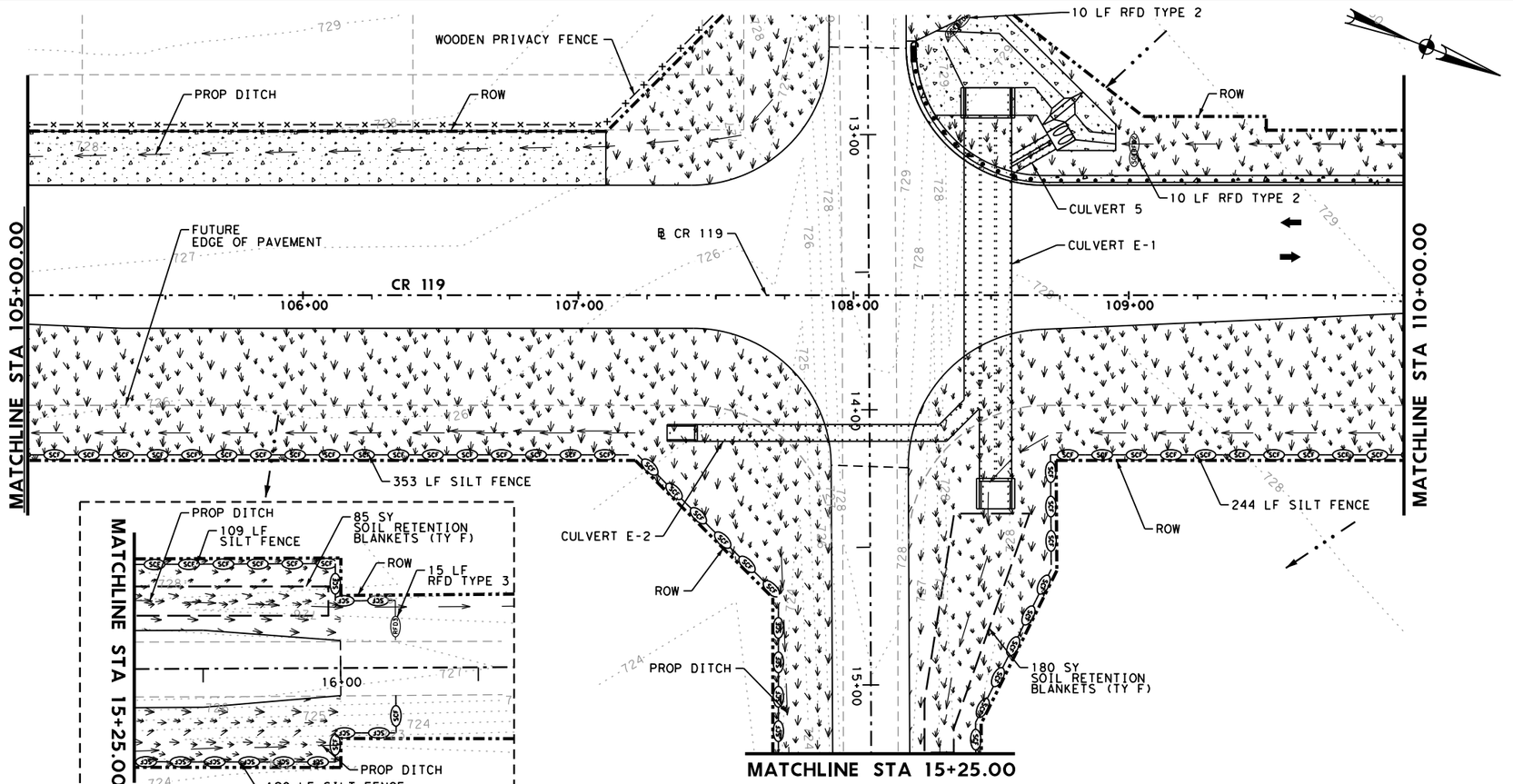
EROSION CONTROL PLAN

STA 90+00 TO STA 100+00

SHEET 09 OF 14

FED. RD. DIV. RD.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				273





NOTES:

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LEGEND

- RIGHT OF WAY BOUNDARY
- 535 EXISTING CONTOURS
- EXISTING WIRE FENCE
- PROPOSED WIRE FENCE (TY C) (STEEL POST)
- FLOW ARROW
- DITCH FLOW ARROWS
- SILT FENCE
- ROCK FILTER DAM (TY2)
- ROCK FILTER DAM (TY3)
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- CONCRETE RIPRAP
- 18" ROCK RIPRAP
- PERMANENT SEEDING

0 25 50

STATE OF TEXAS
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6/22/2017

CR 119

WILLIAMSON COUNTY 1848

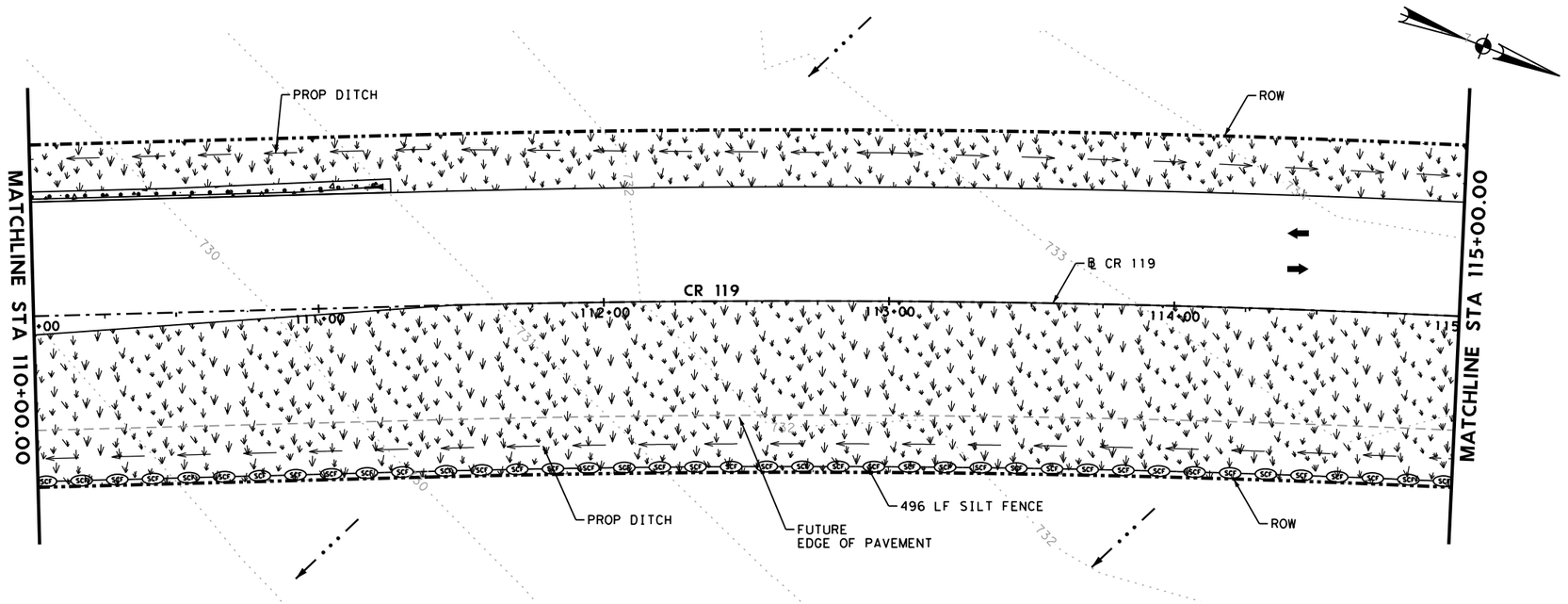
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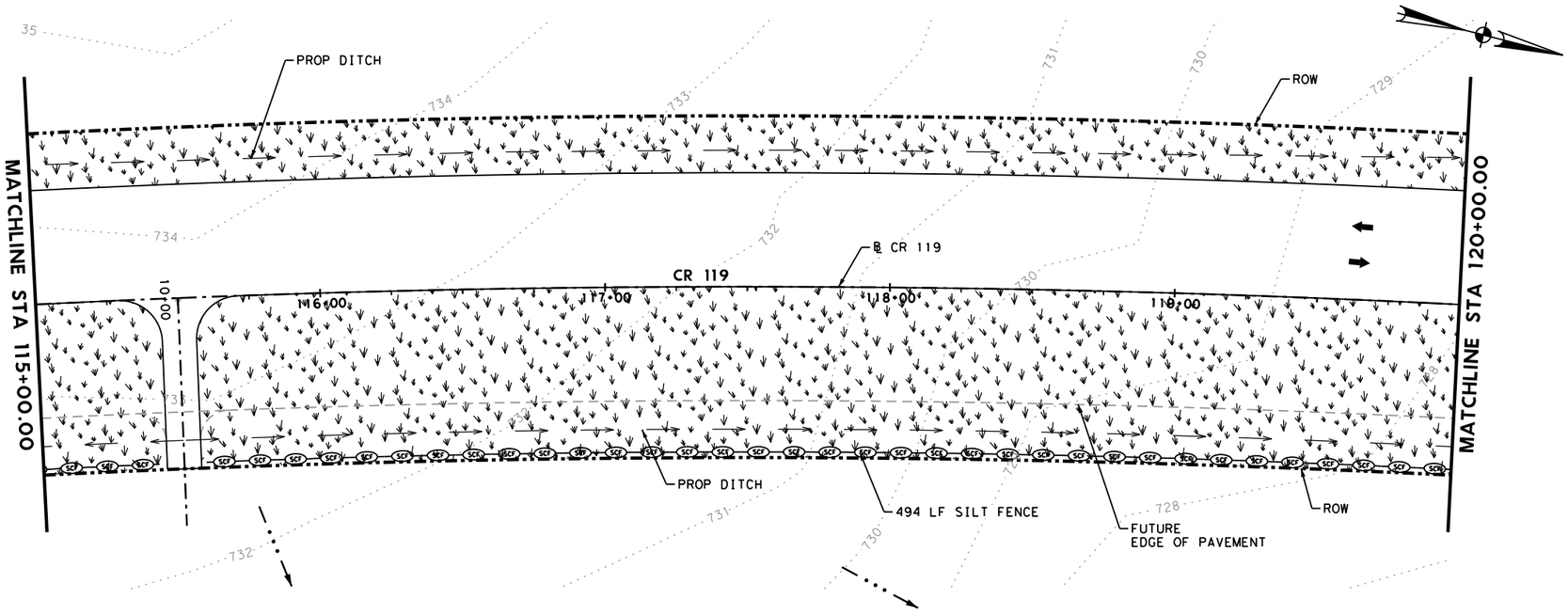
EROSION CONTROL PLAN

STA 100+00 TO STA 110+00

SHEET 10 OF 14

FED. RD. DIV. NO.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				274





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LEGEND

- RIGHT OF WAY BOUNDARY
- 535 EXISTING CONTOURS
- EXISTING WIRE FENCE
- PROPOSED WIRE FENCE (TY C) (STEEL POST)
- FLOW ARROW
- DITCH FLOW ARROWS
- SCF SILT FENCE
- RFD2 ROCK FILTER DAM (TY2)
- RFD3 ROCK FILTER DAM (TY3)
- SOIL RETENTION BLANKETS (TY F)
- CONCRETE RIPRAP
- 18" ROCK RIPRAP
- PERMANENT SEEDING

0 25 50

STATE OF TEXAS
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6/22/2017

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WILLIAMSON COUNTY 1848

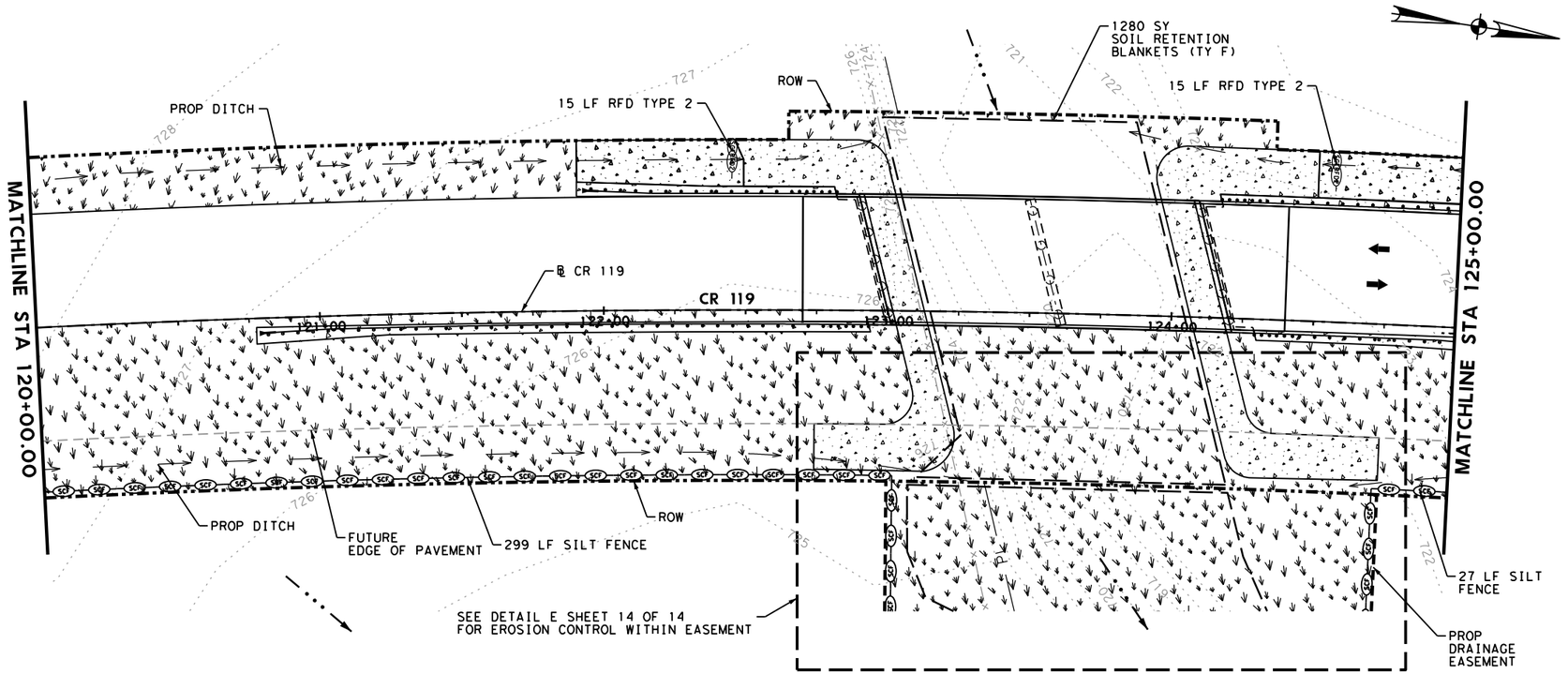
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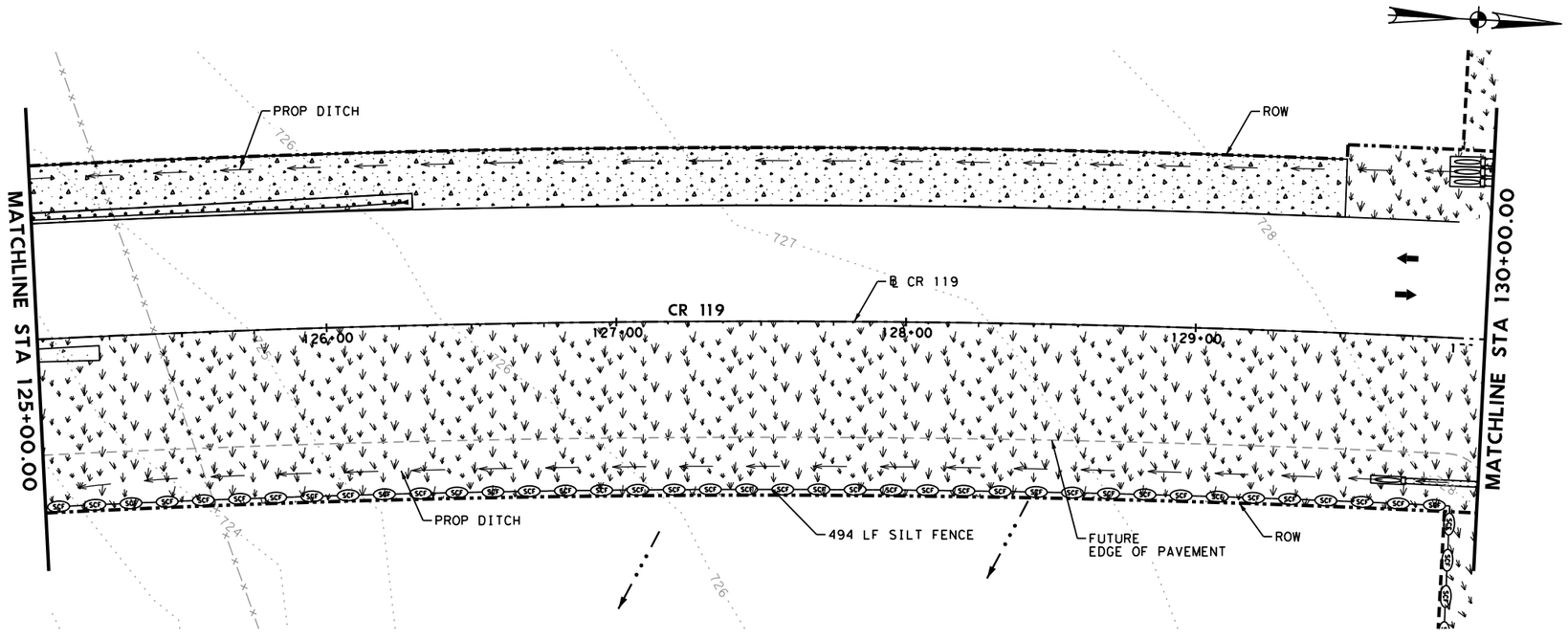
EROSION CONTROL PLAN

STA 110+00 TO STA 120+00

SHEET 11 OF 14

FED. RD. DIV. RD.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				275





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- RIGHT OF WAY BOUNDARY
- 535 EXISTING CONTOURS
- EXISTING WIRE FENCE
- PROPOSED WIRE FENCE (TY C) (STEEL POST)
- FLOW ARROW
- DITCH FLOW ARROWS
- SCF SILT FENCE
- RFD2 ROCK FILTER DAM (TY2)
- RFD3 ROCK FILTER DAM (TY3)
- SOIL RETENTION BLANKETS (TY F)
- CONCRETE RIPRAP
- 18" ROCK RIPRAP
- PERMANENT SEEDING

0 25 50

STATE OF TEXAS
ARNOLD GONZALES, JR.
98234
LICENSED
PROFESSIONAL ENGINEER

6/22/2017

CR 119

WILLIAMSON COUNTY 1848

Stantec
221 West Sixth Street, Suite 600
Austin, Texas 78701
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EROSION CONTROL PLAN

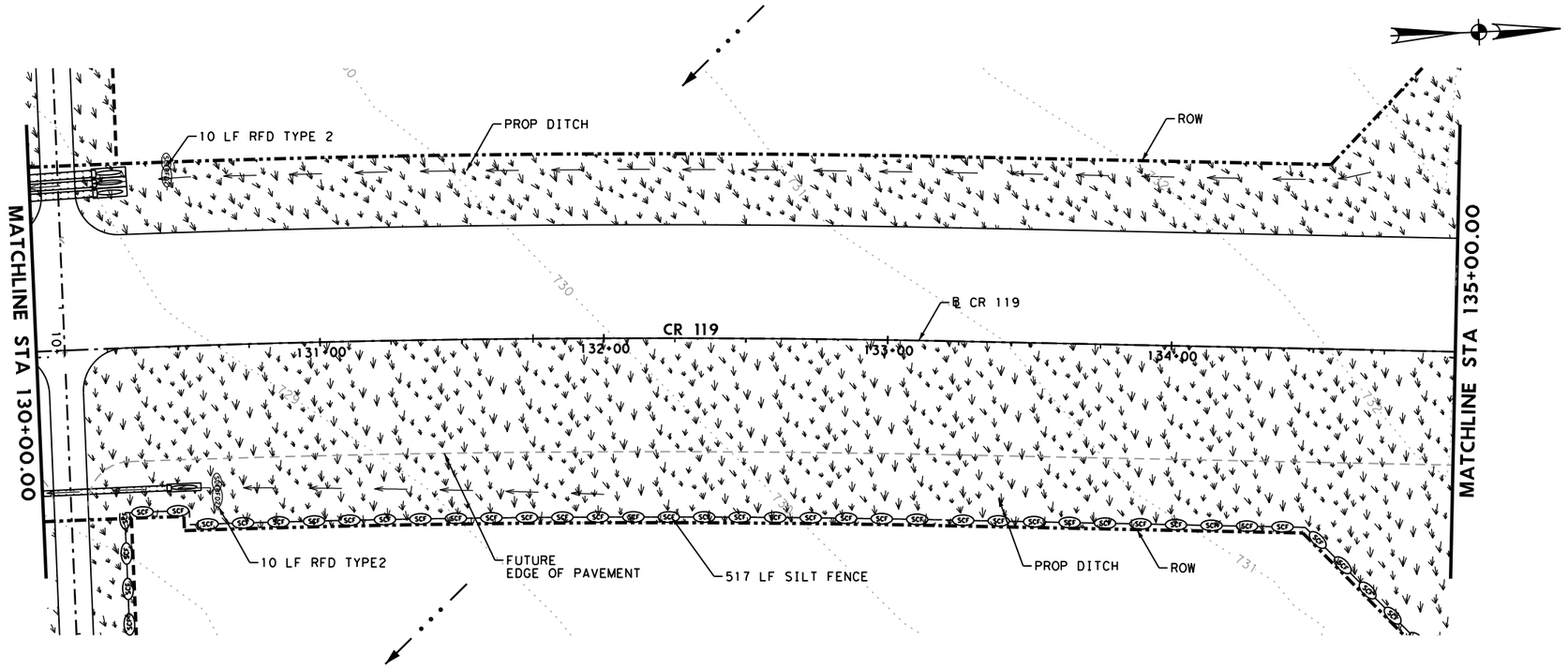
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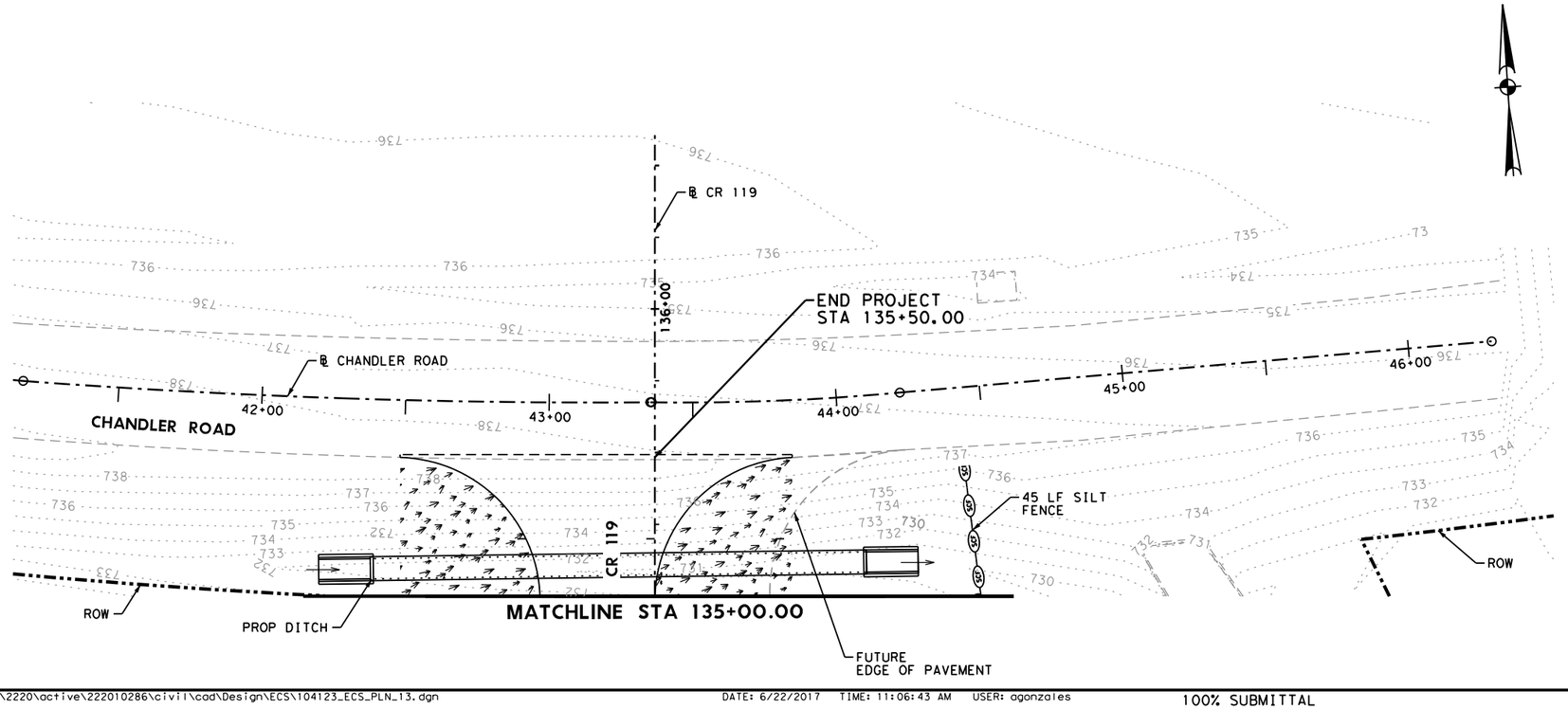
SHEET 12 OF 14

FED. RD. DIV. RD.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				276

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100% SUBMITTAL





NOTES:

1. CALL THE TEXAS STATE WIDE ONE CALL LOCATOR NUMBER 1-800-344-8377, 48 HOURS BEFORE BEGINNING ANY EXCAVATION.
2. THE CONTRACTOR WILL BE RESPONSIBLE FOR PROTECTING OVERHEAD AND UNDERGROUND FACILITIES IF ADJACENT TO WORK AREA.
3. PROPOSED FENCING SHOWN OFFSET FROM ROW FOR VISUAL REFERENCE. FENCE TO BE CONSTRUCTED ALONG ROW.
4. TYPE I CLASS A SOIL RETENTION BLANKETS SHALL BE PLACED ALONG ALL DISTURBED AREAS UPON COMPLETION OF SEEDING OPERATIONS.
5. REFER TO DRAINAGE PLANS FOR ADDITIONAL INFORMATION.

LEGEND

- RIGHT OF WAY BOUNDARY
- 535 EXISTING CONTOURS
- EXISTING WIRE FENCE
- PROPOSED WIRE FENCE (TY C) (STEEL POST)
- FLOW ARROW
- DITCH FLOW ARROWS
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PROFESSIONAL ENGINEER

6/22/2017

CR 119

WILLIAMSON COUNTY 1848

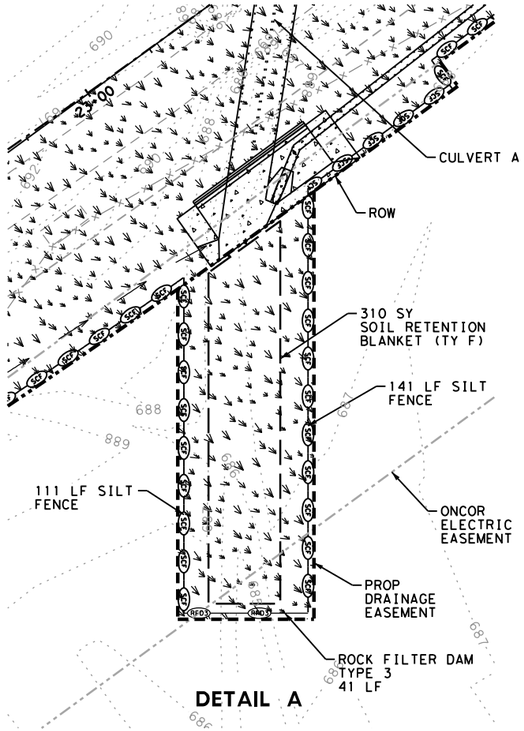
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EROSION CONTROL PLAN

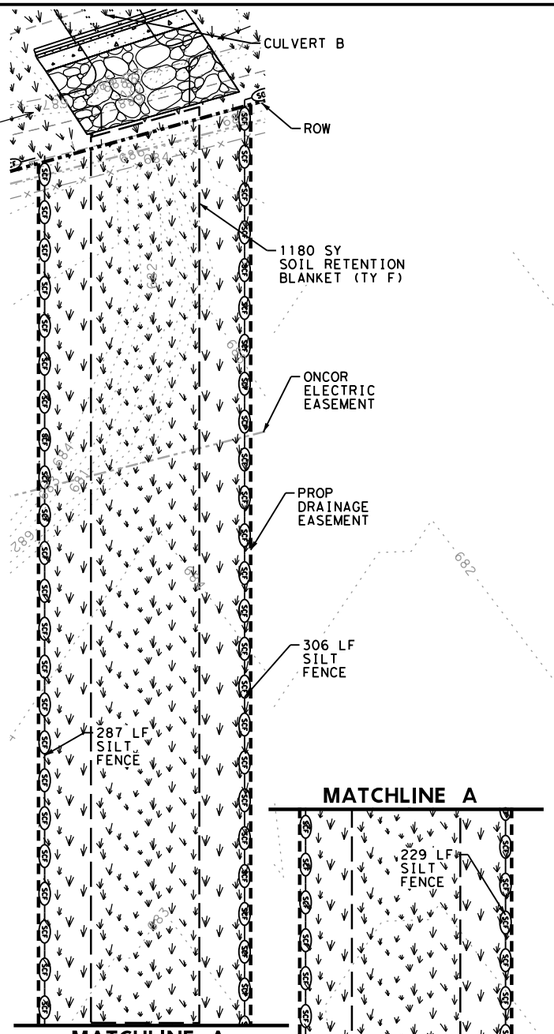
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SHEET 13 OF 14

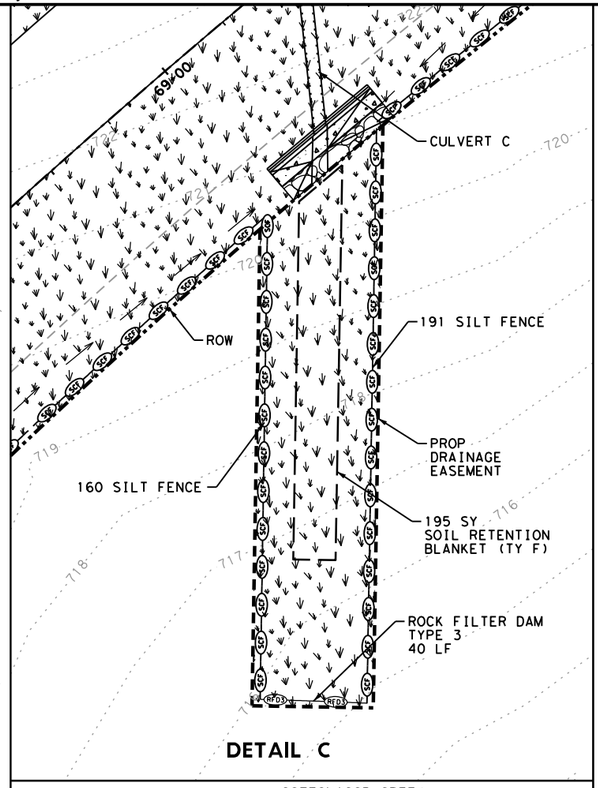
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6	TEXAS		CR119	14	WILLIAMSON				277



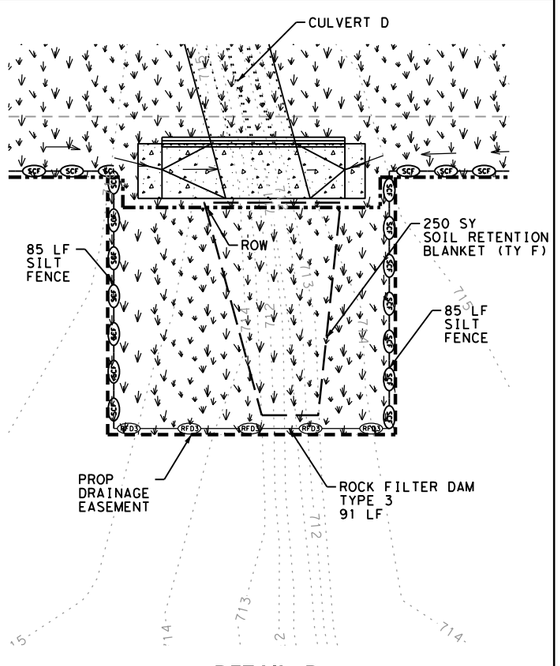
DETAIL A



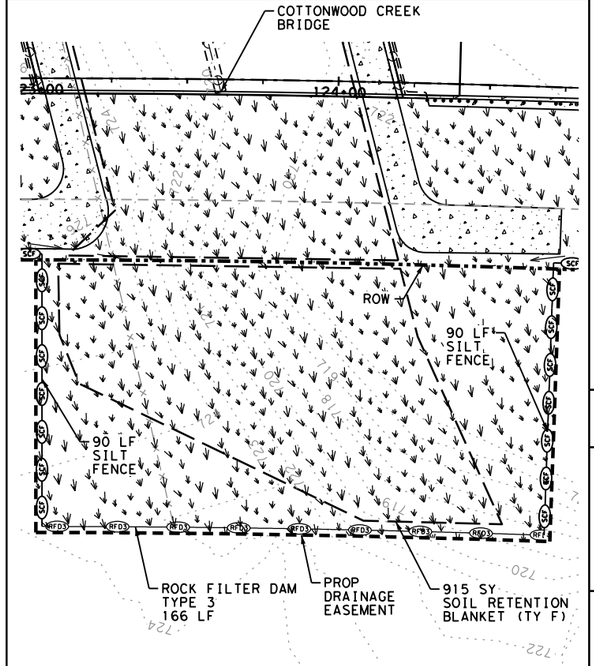
DETAIL B



DETAIL C



DETAIL D



DETAIL E

NOTES:

1. CALL THE TEXAS STATE WIDE ONE CALL LOCATOR NUMBER 1-800-344-8377, 48 HOURS BEFORE BEGINNING ANY EXCAVATION.
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4. TYPE I CLASS A SOIL RETENTION BLANKETS SHALL BE PLACED ALONG ALL DISTURBED AREAS UPON COMPLETION OF SEEDING OPERATIONS.
5. REFER TO DRAINAGE PLANS FOR ADDITIONAL INFORMATION.
6. PAY LIMITS FOR DETAIL A,B,C,D, AND E, THIS SHEET INCLUDE AREAS ONLY WITHIN EASEMENTS. FOR ALL OTHER SW3P QUANTITIES, REFER TO EROSION CONTROL SHEETS 1-13.

LEGEND

- RIGHT OF WAY BOUNDARY
- 535 EXISTING CONTOURS
- EXISTING WIRE FENCE
- PROPOSED WIRE FENCE (TY C) (STEEL POST)
- FLOW ARROW
- DITCH FLOW ARROWS
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STATE OF TEXAS
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98234
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PROFESSIONAL ENGINEER

6/22/2017

CR 119

WILLIAMSON COUNTY
1848

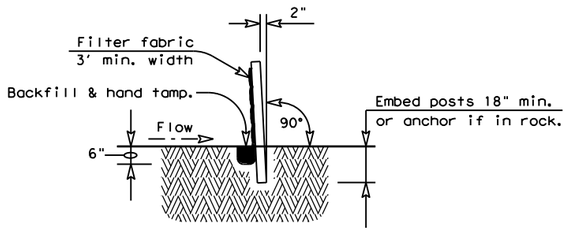
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EROSION CONTROL DETAILS

SHEET 14 OF 14

FED. RD. DIV. RD.	STATE	PROJECT NO.	HIGHWAY NO.	STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	TEXAS		CR119	14	WILLIAMSON				278

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SECTION A-A

GENERAL NOTES

1. The guidelines shown hereon are suggestions only and may be modified by the Engineer.

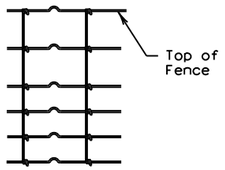
PLAN SHEET LEGEND

Sediment Control Fence —— SCF ——

SEDIMENT CONTROL FENCE USAGE GUIDELINES

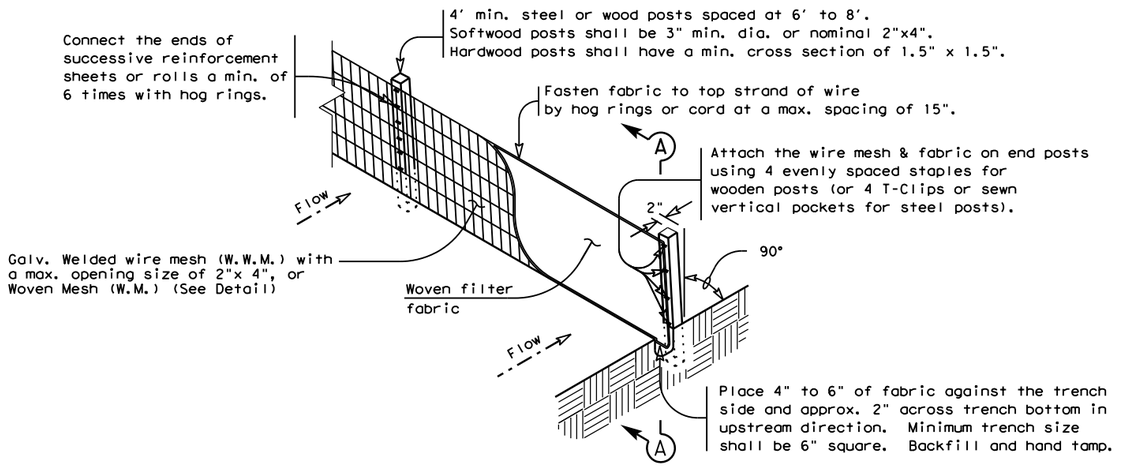
A sediment control fence may be constructed near the downstream perimeter of a disturbed area along a contour to intercept sediment from overland runoff. A 2 year storm frequency may be used to calculate the flow rate to be filtered.

Sediment control fence should be sized to filter a max. 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.



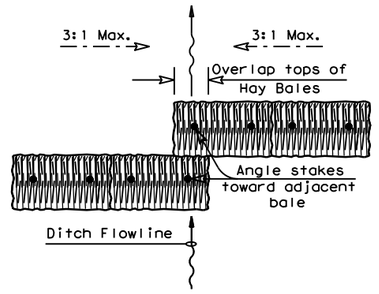
Galv. Hinge joint knot woven mesh (12.5 Ga. Min.) requires a minimum of five horizontal wires spaced at a max. 12 inches apart and all vertical wires spaced at a max. 12 inches apart.

Hinge Joint Knot Woven Mesh (Option)

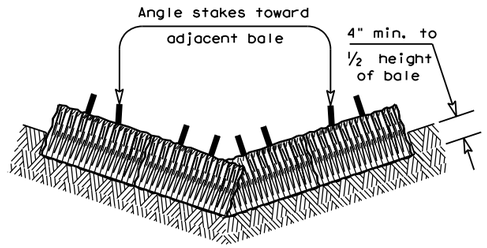


TEMPORARY SEDIMENT CONTROL FENCE

SCF



PLAN VIEW



PROFILE VIEW

PLANS SHEET LEGEND

Baled Hay —— BH ——

BALED HAY USAGE GUIDELINES

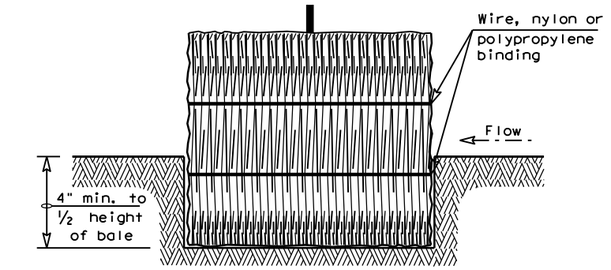
A Baled Hay installation may be constructed near the downstream perimeter of a disturbed area along a contour to intercept sediment from overland runoff. A two year storm frequency may be used to calculate the flow rate to be filtered. The installation should be sized to filter a maximum flow thru rate of 5 GPM/FT^2 of cross sectional area. Baled hay may be used at the following locations:

1. Where the runoff approaching the baled hay flows over disturbed soil for less than 100'. If the slope of the disturbed soil exceeds 10%, the length of slope upstream the baled hay should be less than 50'.
2. Where the installation will be required for less than 3 months.
3. Where the contributing drainage area is less than ½ acre.

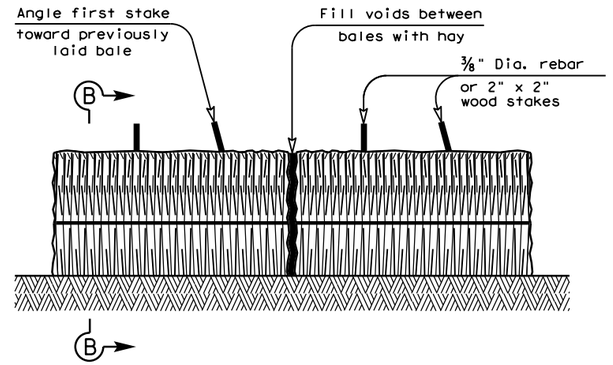
For Baled Hay installations in small ditches, the additional following considerations apply:

1. The ditch sideslopes should be graded as flat as possible to maximize the drainage flowrate thru the hay.
2. The ditch should be graded large enough to contain the overtopping drainage when sediment has filled to the top of the baled hay.

Bales should be replaced usually every 2 months or more often during wet weather when loss of structural integrity is accelerated.



SECTION B-B



BALED HAY FOR EROSION CONTROL

BH

GENERAL NOTES

1. Hay bales shall be a minimum of 30" in length and weigh a minimum of 50 Lbs.
2. Hay bales shall be bound by either wire or nylon or polypropylene string. The bales shall be composed entirely of vegetative matter.
3. Hay bales shall be embedded in the soil a minimum of 4" and where possible ½ the height of the bale.
4. Hay bales shall be placed in a row with ends tightly abutting the adjacent bales. The bales shall be placed with bindings parallel to the ground.
5. Hay bales shall be securely anchored in place with ⅜" Dia. rebar or 2" x 2" wood stakes, driven through the bales. The first stake shall be angled towards the previously laid bale to force the bales together.
6. 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

FENCE & BALED HAY

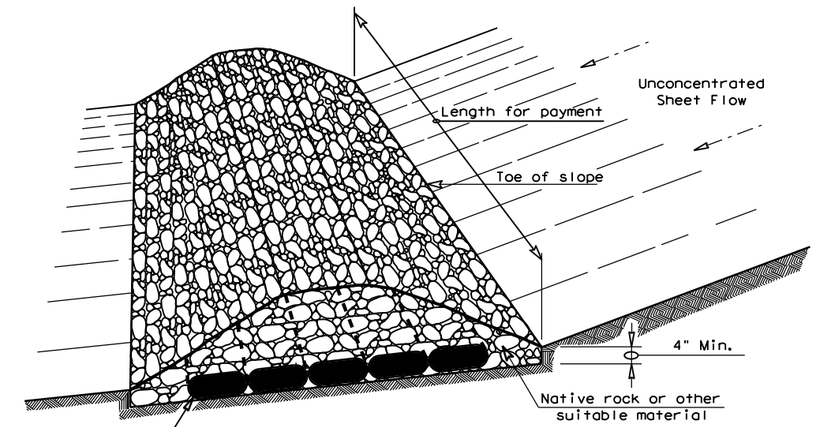
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	06	WILLIAMSON		279

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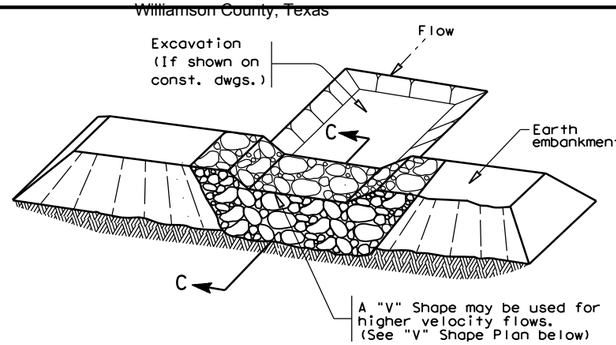
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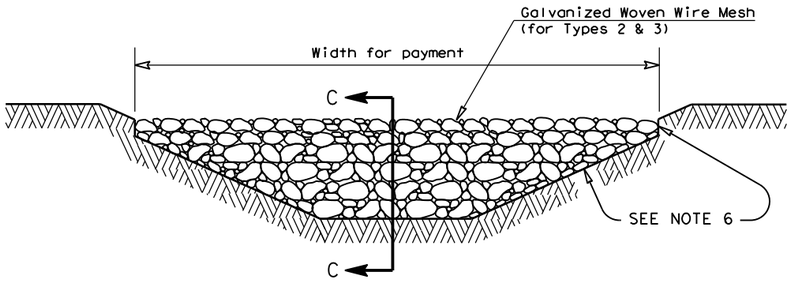
FILTER DAM AT TOE OF SLOPE

RFD1
TYPE 1



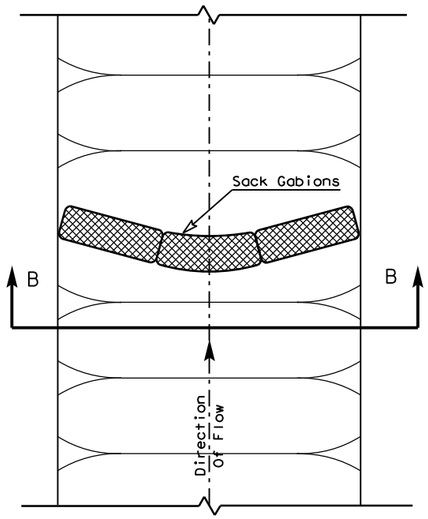
FILTER DAM AT SEDIMENT TRAP

RFD1 OR RFD2
TYPE 1 OR TYPE 2

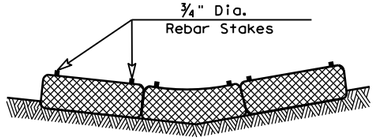


FILTER DAM AT CHANNEL SECTIONS

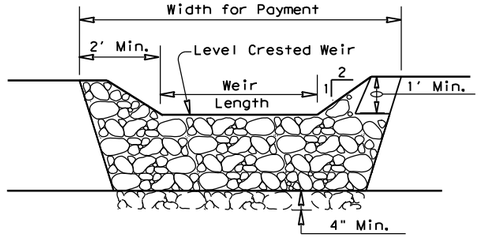
RFD1 OR RFD2 OR RFD3
TYPE 1 OR TYPE 2



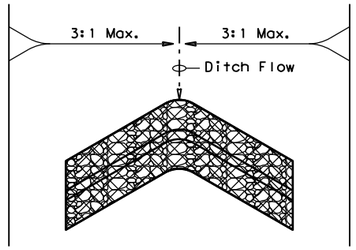
PLAN VIEW



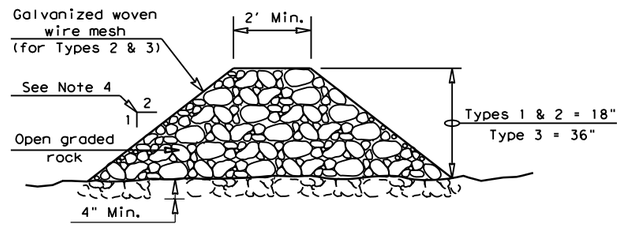
SECTION B-B



PROFILE



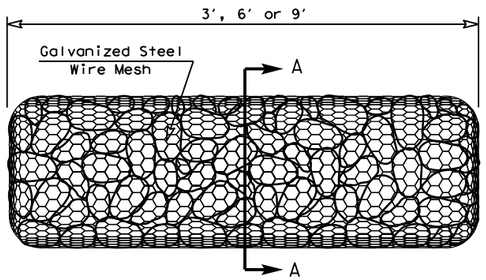
"V" SHAPE
(Plan View)



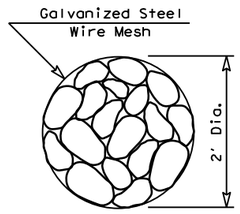
SECTION C-C

PLANS SHEET LEGEND

Type 1 Rock Filter Dam — RFD1
Type 2 Rock Filter Dam — RFD2
Type 3 Rock Filter Dam — RFD3



TYPE 4 (SACK GABIONS)



SECTION A-A

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): 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 (approx. 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): Type 2 may be used in ditches and at dike or swale outlets.

Type 3 (36" high with wire mesh): Type 3 may be used in stream flow and should be secured to the stream bed.

Type 4 (Sack gabions): Type 4 May be used in ditches and smaller channels to form an erosion control dam.

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. 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 3/4" dia. rebar stakes.
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.

Texas Department of Transportation
Design Division Standard

TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

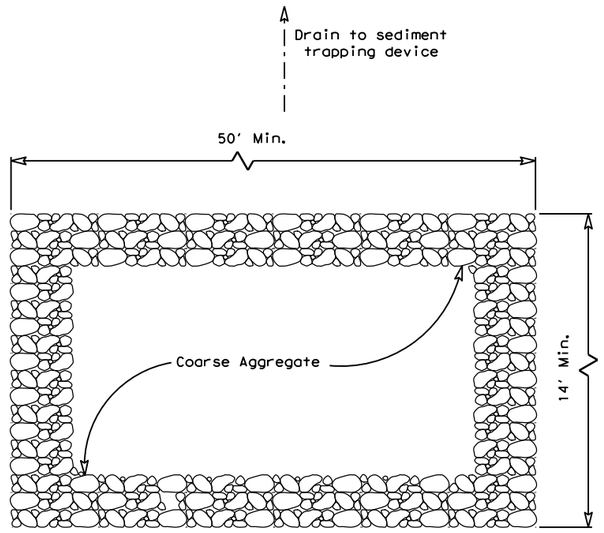
ROCK FILTER DAMS

EC(2)-93

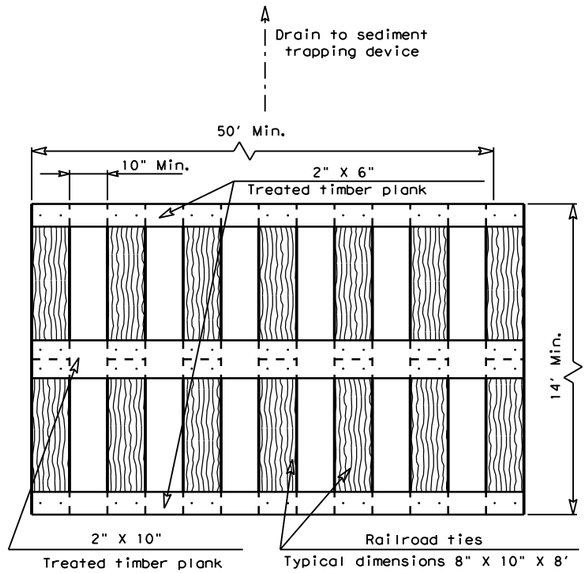
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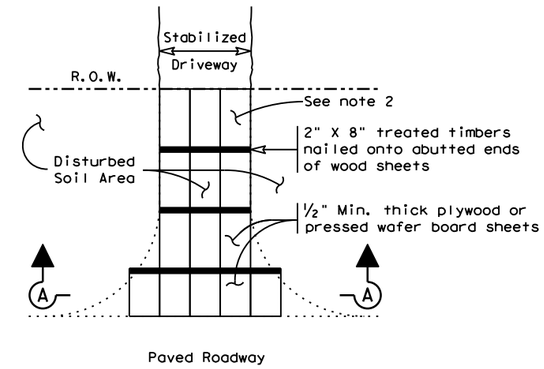
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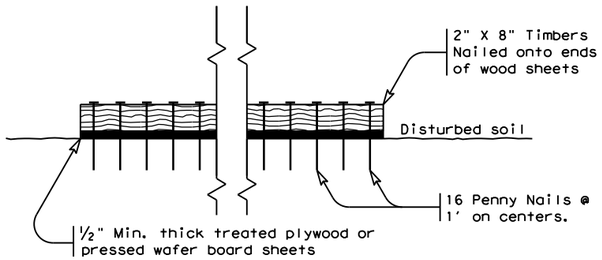
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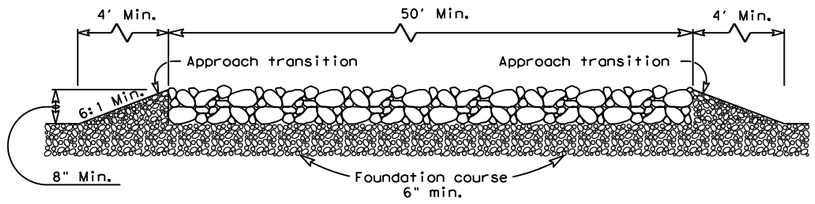
PLAN



PLAN



SECTION A-A

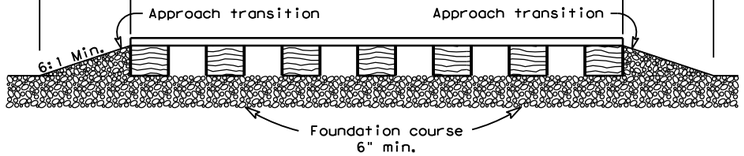


PROFILE

CONSTRUCTION EXIT (TYPE 1)

GENERAL NOTES

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 material as 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.



PROFILE

CONSTRUCTION EXIT (TYPE 2)

GENERAL NOTES

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.

CONSTRUCTION EXIT (TYPE 3)

GENERAL NOTES

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.

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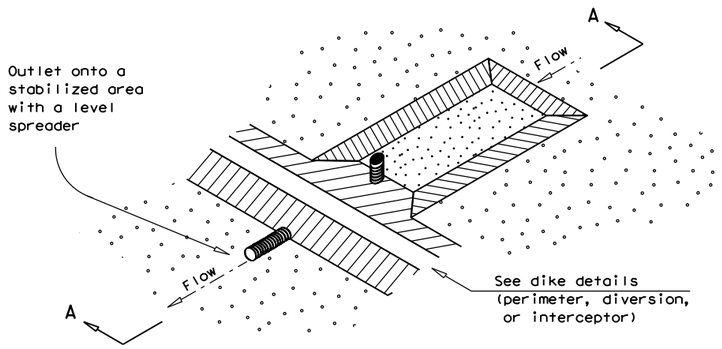
TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

CONSTRUCTION EXITS

EC(3)-93

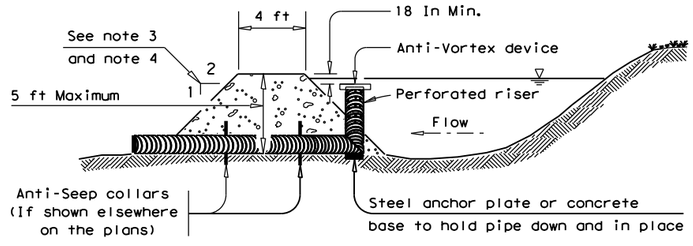
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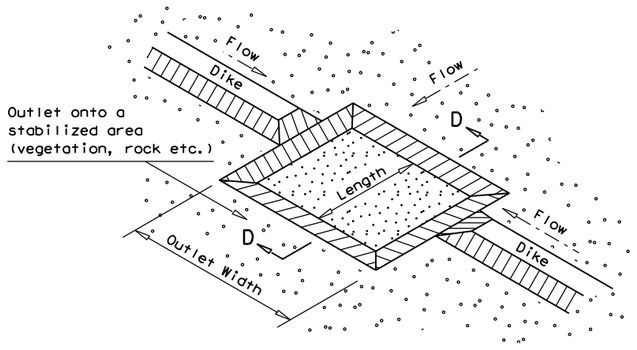


SEDIMENT BASIN AND/OR TRAP WITH PIPE OUTLET

ST/PO

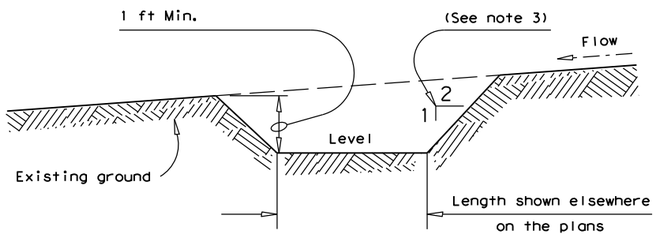


SECTION A-A

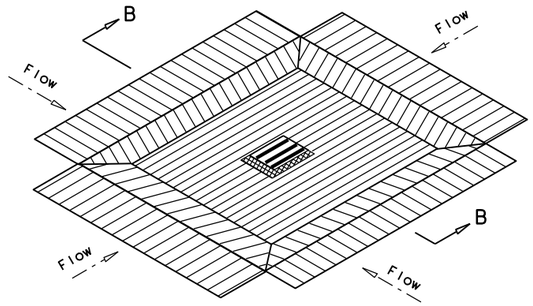


SEDIMENT TRAP WITH LEVEL STABILIZED OUTLET

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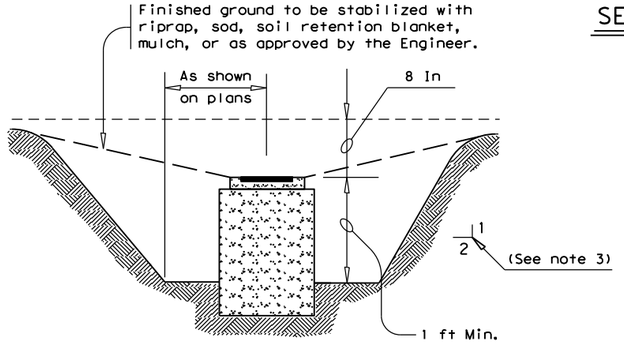


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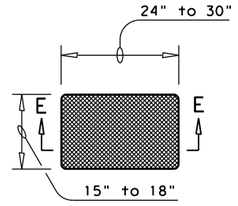


DROP INLET SEDIMENT TRAP

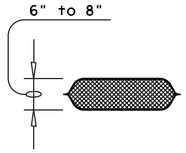
ST-DI



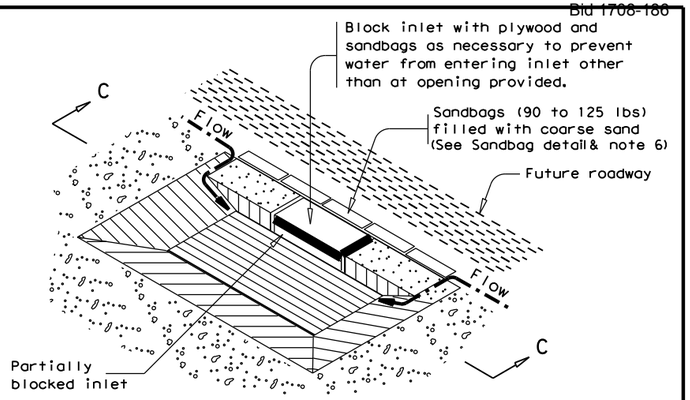
SECTION B-B



SANDBAG DETAIL

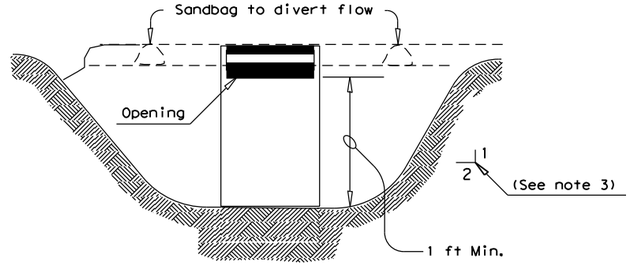


SECTION E-E



CURB INLET SEDIMENT TRAP

ST-CI



SECTION C-C

PLANS SHEET LEGEND

ST/PO
Sediment Basin and/or Trap with Pipe Outlet

ST-DI
Drop Inlet Sediment Trap

ST-CI
Curb Inlet Sediment Trap

ST
Sediment Trap with Level Stabilized Outlet

SEDIMENT BASIN & TRAP USAGE GUIDELINES

A sediment basin and/or trap may be used to precipitate sediment out of runoff draining from an unstabilized area.

Basins: The drainage area for a sediment basin should not exceed 100 acres. The basin capacity shall be at least 1800 CF/Acre of drainage area (0.5" over the drainage area). If the disturbed area draining to the basin is larger than 10 acres, the basin capacity should be 3600 CF/Acre (1.0" over the drainage area).

The basin should have a 40 hour draw-down time with an emergency spillway. The spillway may be designed to pass the peak rate of runoff from a 25 year frequency storm. The 100 year storm should be investigated to consider possible flooding impacts.

The entrance into the basin should be protected from erosion. The basin should be cleaned when the capacity has been reduced by 1/3.

Traps: The drainage area for a sediment trap should not exceed 5 acres. The trap capacity should be 1800 CF/Acre (0.5" over the drainage area).

Sediment traps should be placed in the following locations:
1. Within drainage ditches spaced @ 500'± on center
2. Immediately preceding ditch inlets
3. Just before the drainage enters a water course
4. Just before the drainage leaves the right of way

The trap outlet may either be through a perforated riser and pipe assembly designed to achieve a 40 hour draw-down time or over a level stabilized area (vegetation, rock, etc.).

The trap should be cleaned when the capacity has been reduced by ½ or the sediment has accumulated to a depth of 1', whichever is less.

GENERAL NOTES

1. Pipe outlet material shall conform to the Item "Pipe Underdrains" or as accepted by the Engineer.
2. All pipe connections shall be watertight.
3. Side slopes within the safety clear zone of a roadway shall be 6:1 or flatter. Protect the traveling public from inlet stacks within the clear zone.
4. Sediment basins shall have side slopes of 3:1 or flatter.
5. The dimensions and limits of excavation for sediment basins and traps will be as shown elsewhere on the plans.
6. The sandbag material shall be made of polypropylene, polyethylene or polyamide woven fabric, min. unit weight 4 ounces/SY, Mullen burst strength exceeding 300 psi and ultraviolet stability exceeding 70%.
7. The guidelines shown hereon are suggestions only and may be modified by the Engineer.

Texas Department of Transportation
Design Division Standard

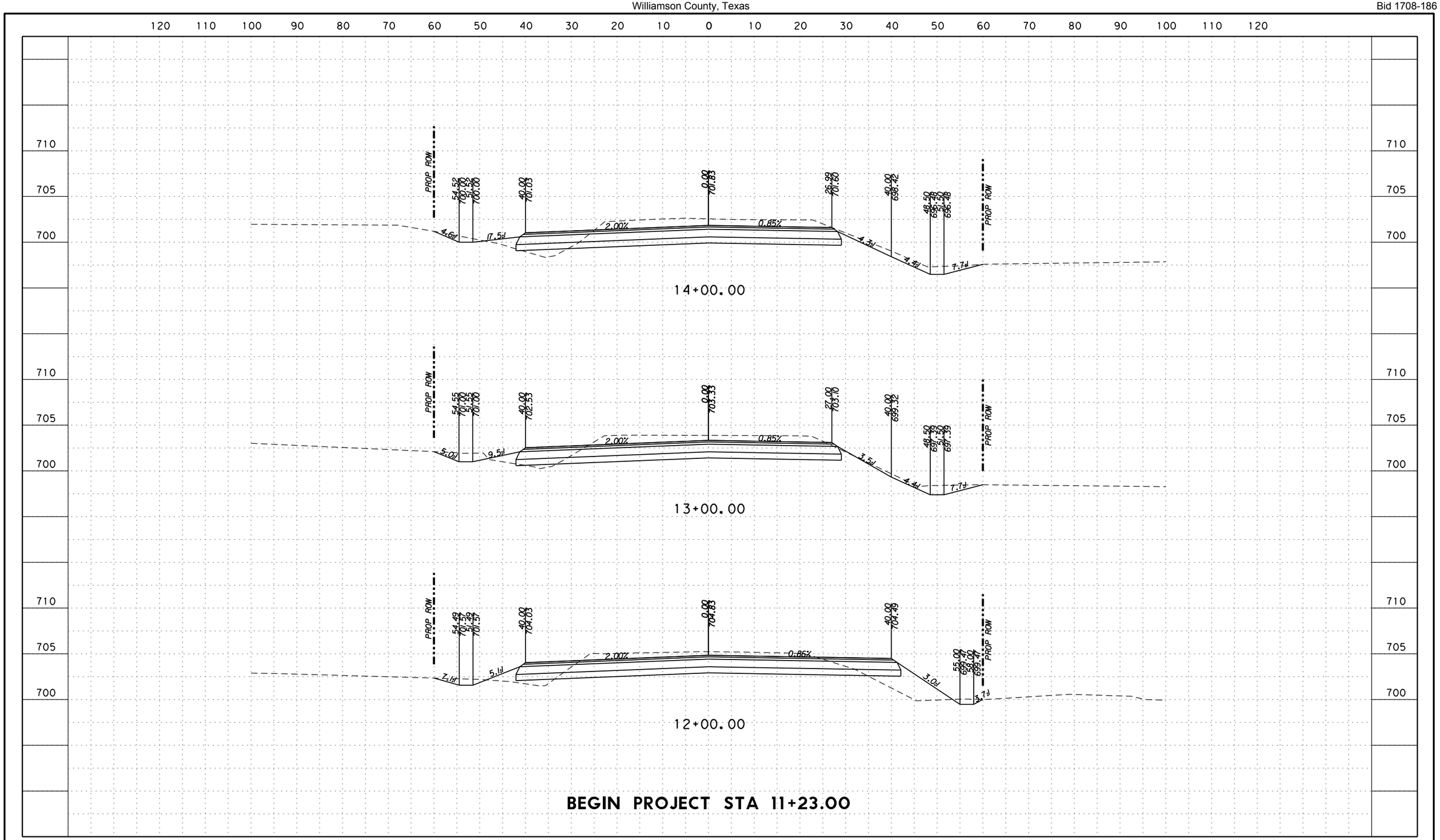
TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

SEDIMENT BASINS AND TRAPS (EARTHWORK FOR EROSION CONTROL)

EC(6)-93

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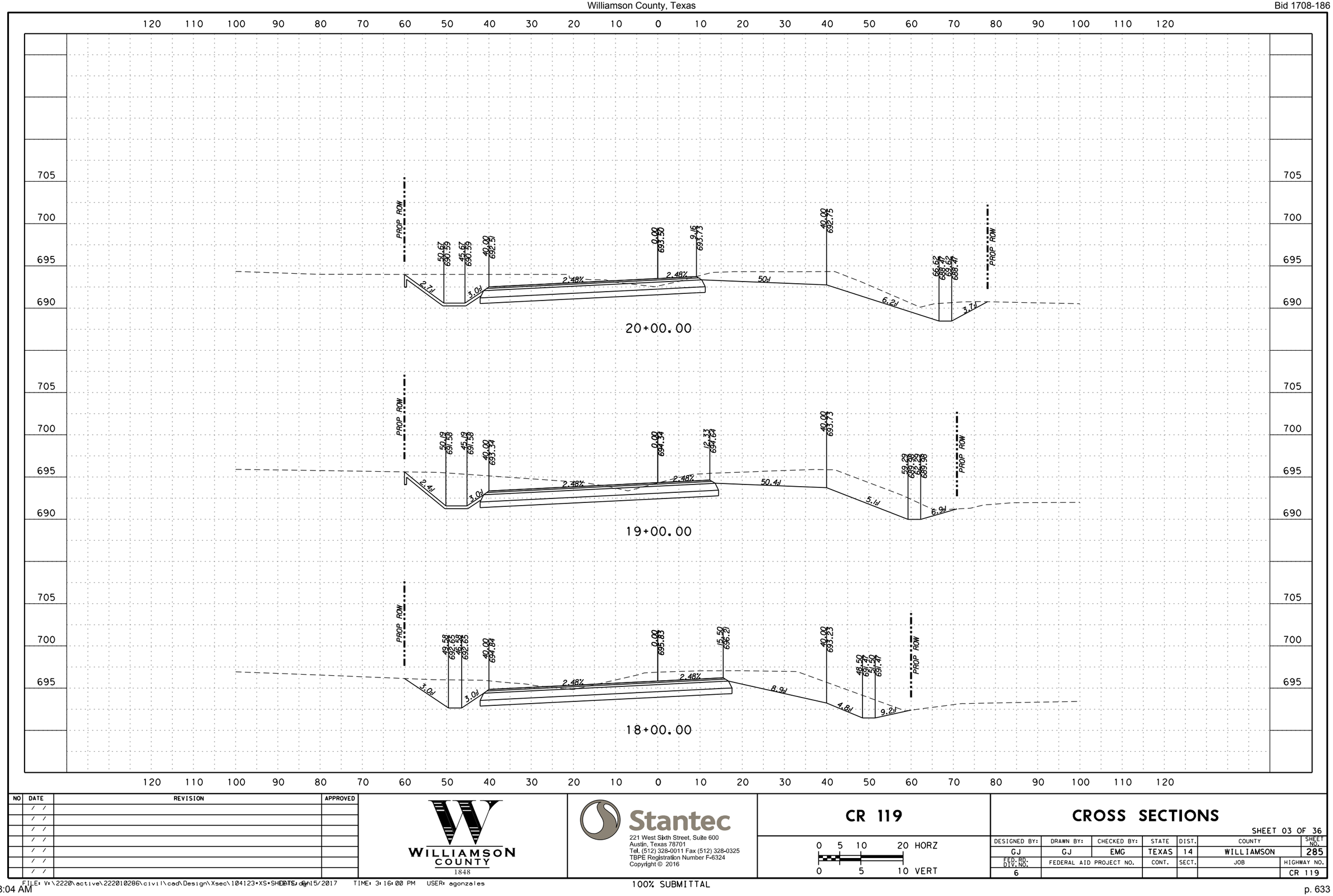
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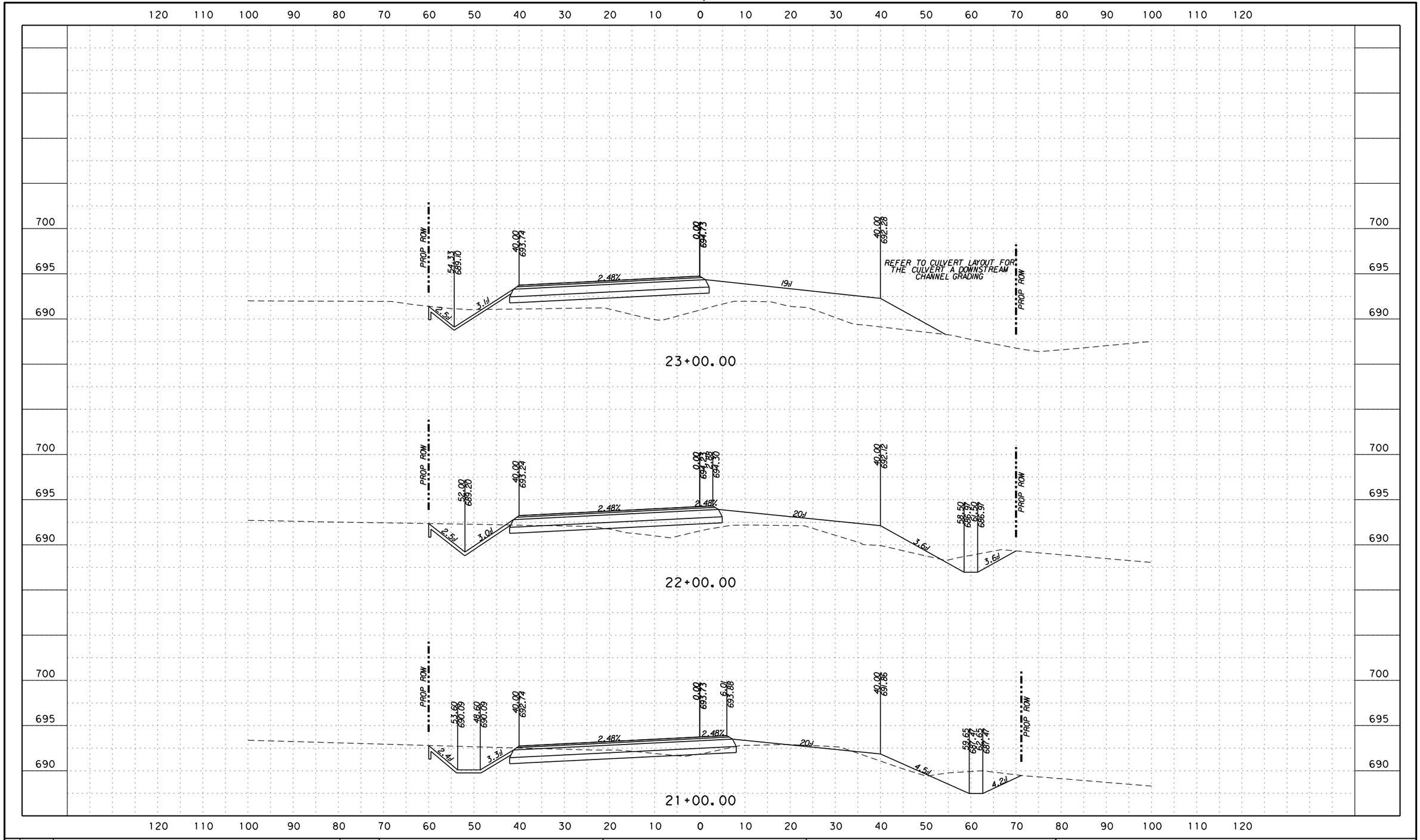
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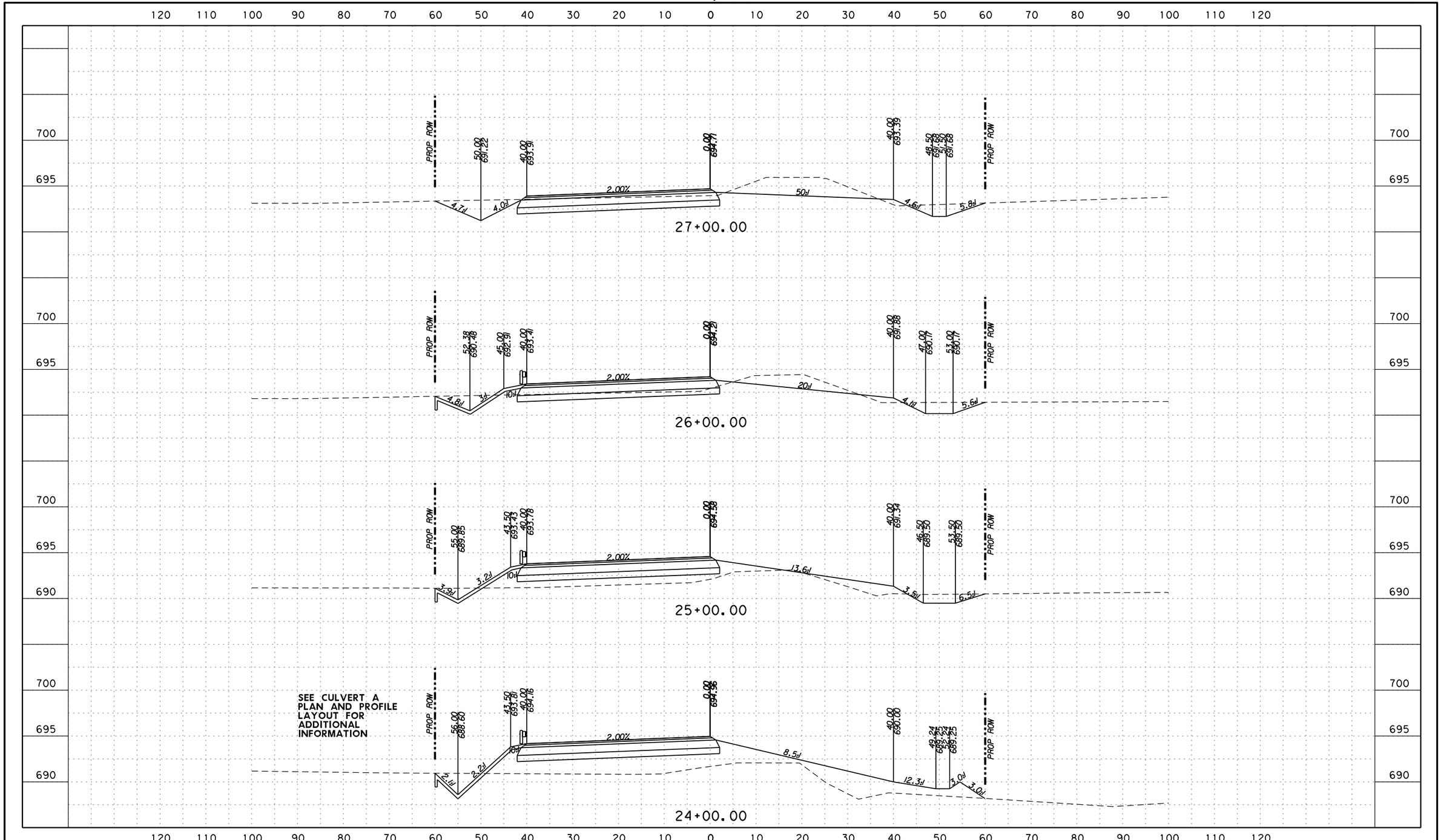
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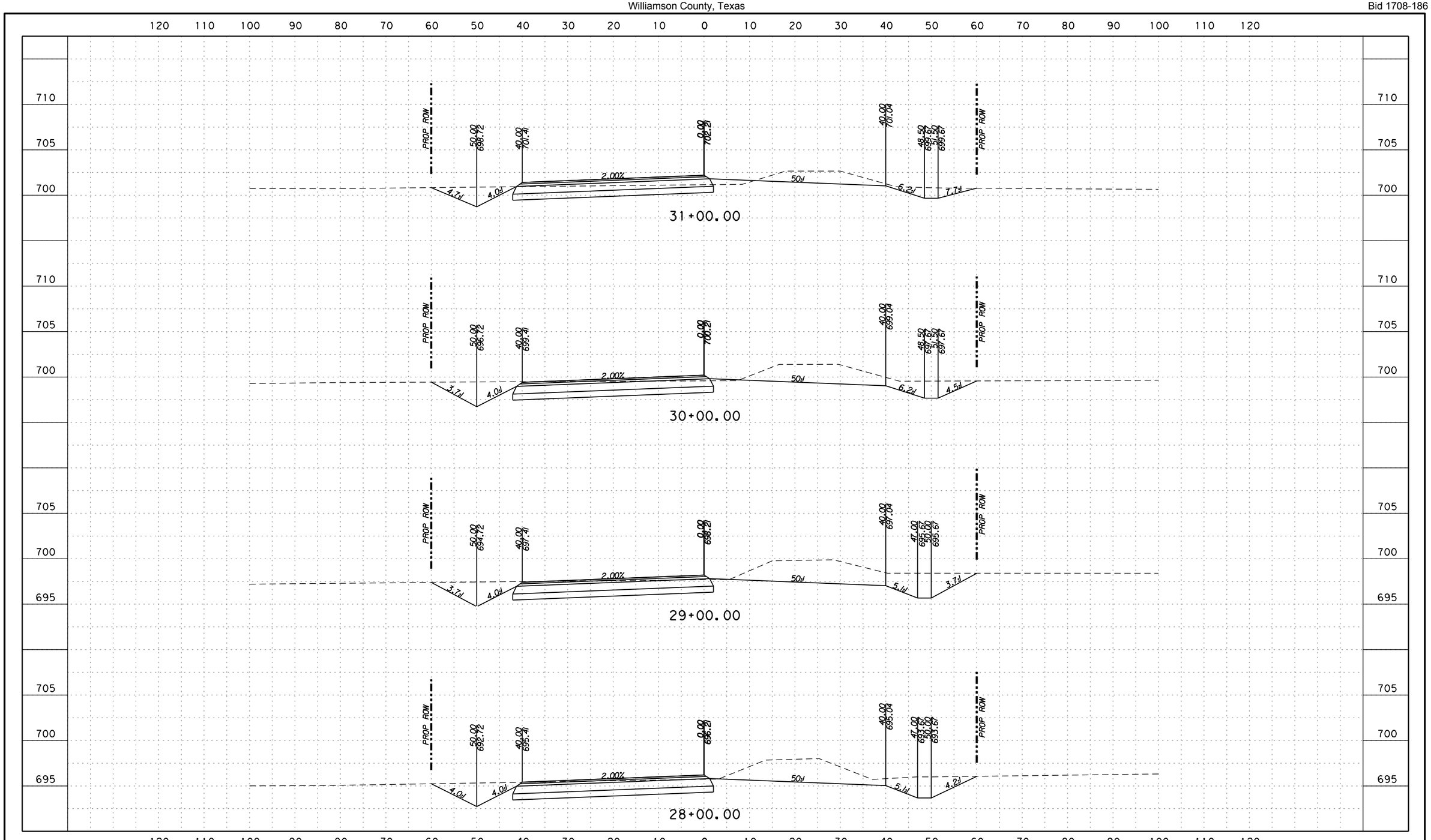
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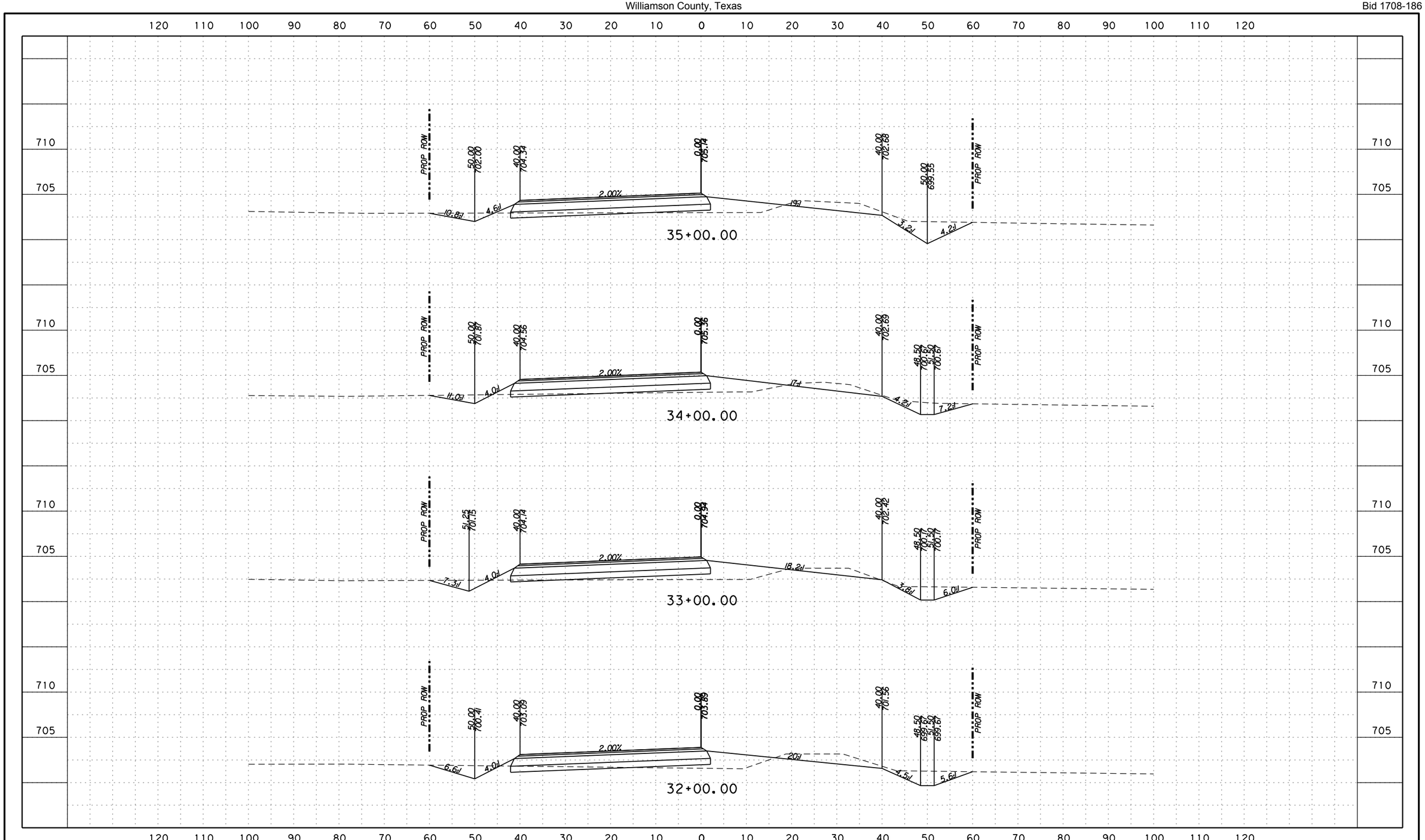
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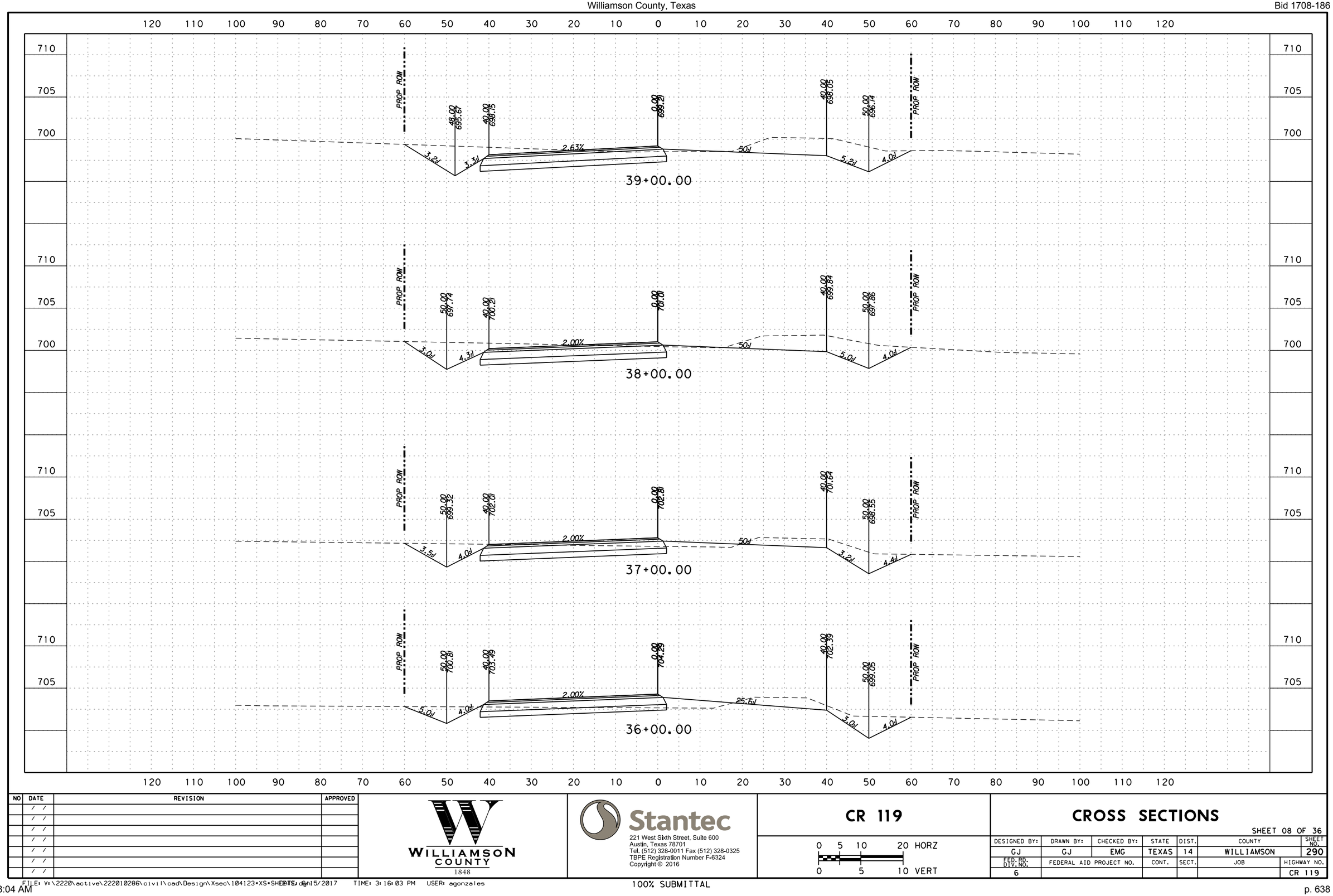
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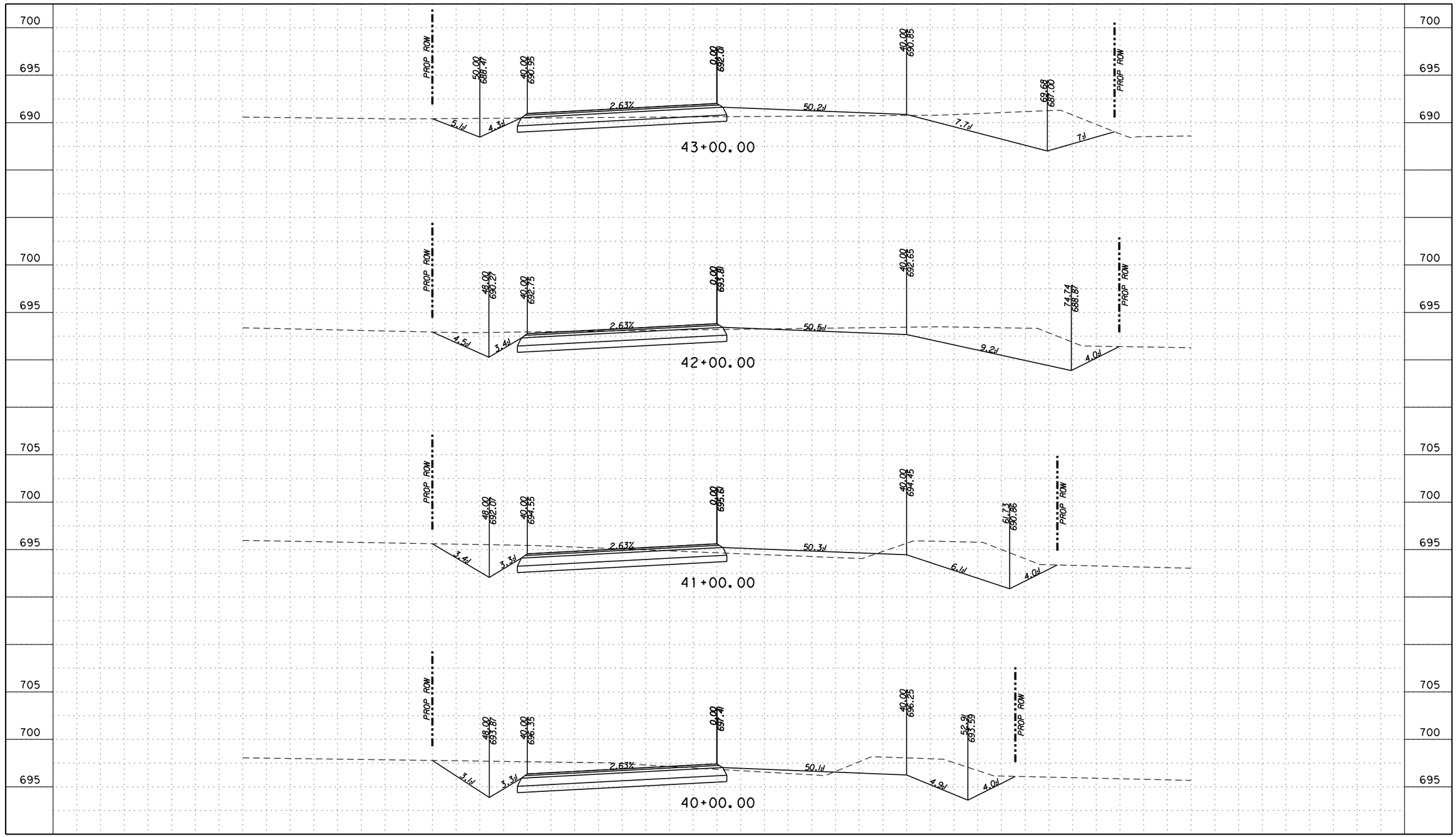
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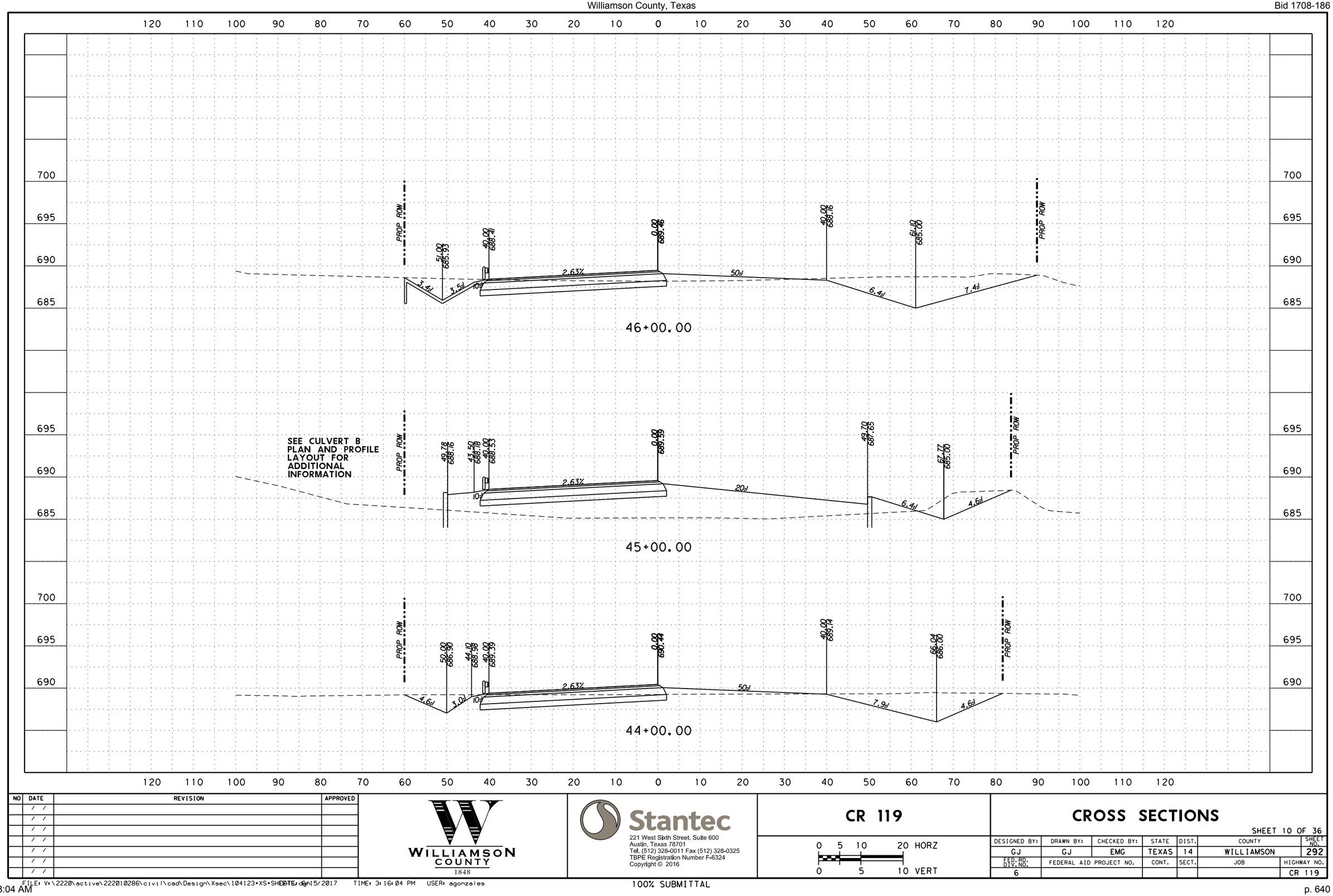
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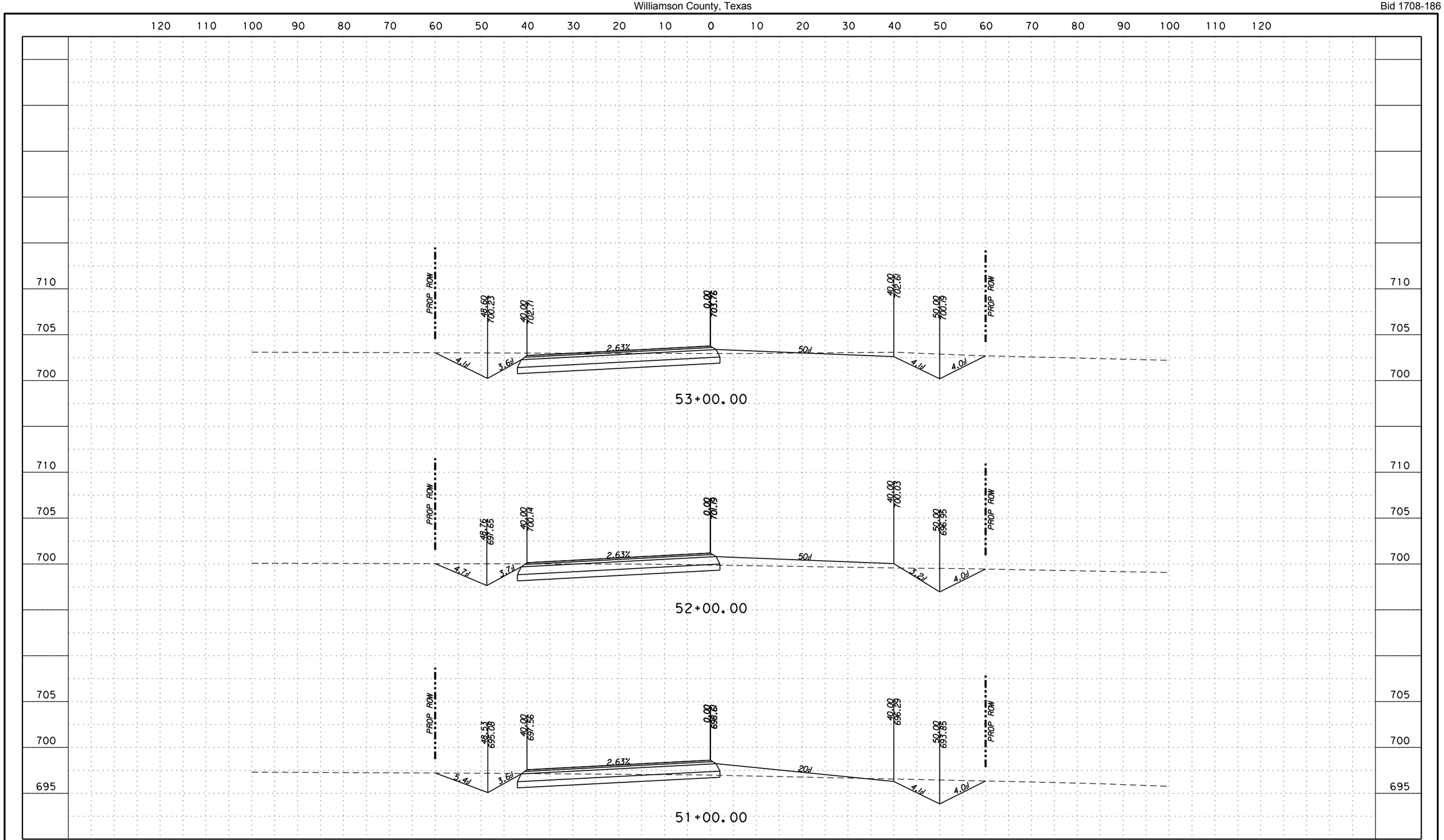
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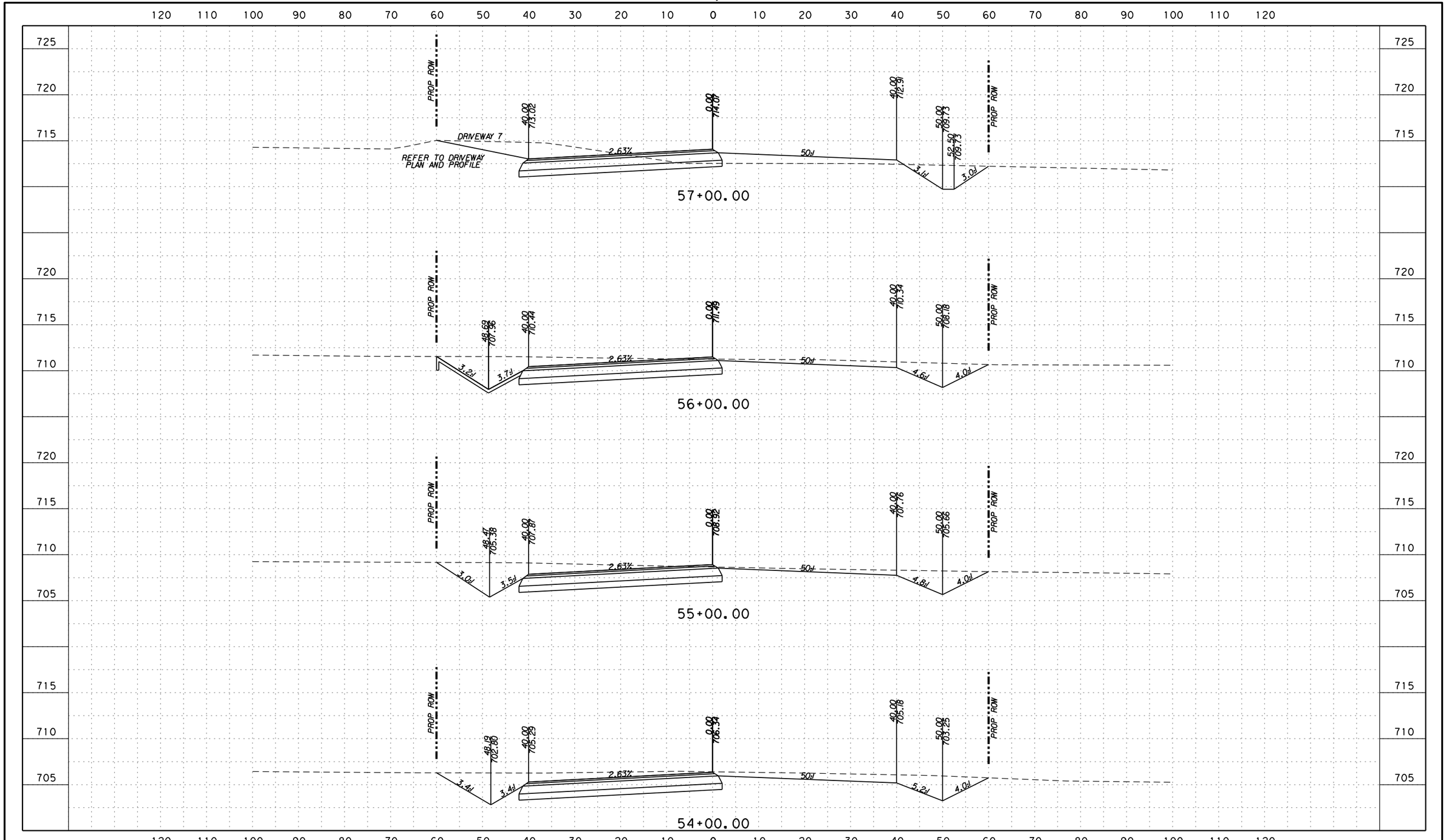
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DESIGNED BY:	DRAWN BY:	CHECKED BY:	STATE	DIST.	COUNTY	SHEET NO.
GJ	GJ	EMG	TEXAS	14	WILLIAMSON	294
FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		CONT.	SECT.	JOB	HIGHWAY NO.
6						CR 119

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CROSS SECTIONS

SHEET 13 OF 36

DESIGNED BY:	DRAWN BY:	CHECKED BY:	STATE	DIST.	COUNTY	SHEET NO.
GJ	GJ	EMG	TEXAS	14	WILLIAMSON	295
FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		CONT.	SECT.	JOB	HIGHWAY NO.
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SHEET 14 OF 36

DESIGNED BY:	DRAWN BY:	CHECKED BY:	STATE	DIST.	COUNTY	SHEET NO.
GJ	GJ	EMG	TEXAS	14	WILLIAMSON	296
FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		CONT.	SECT.	JOB	HIGHWAY NO.
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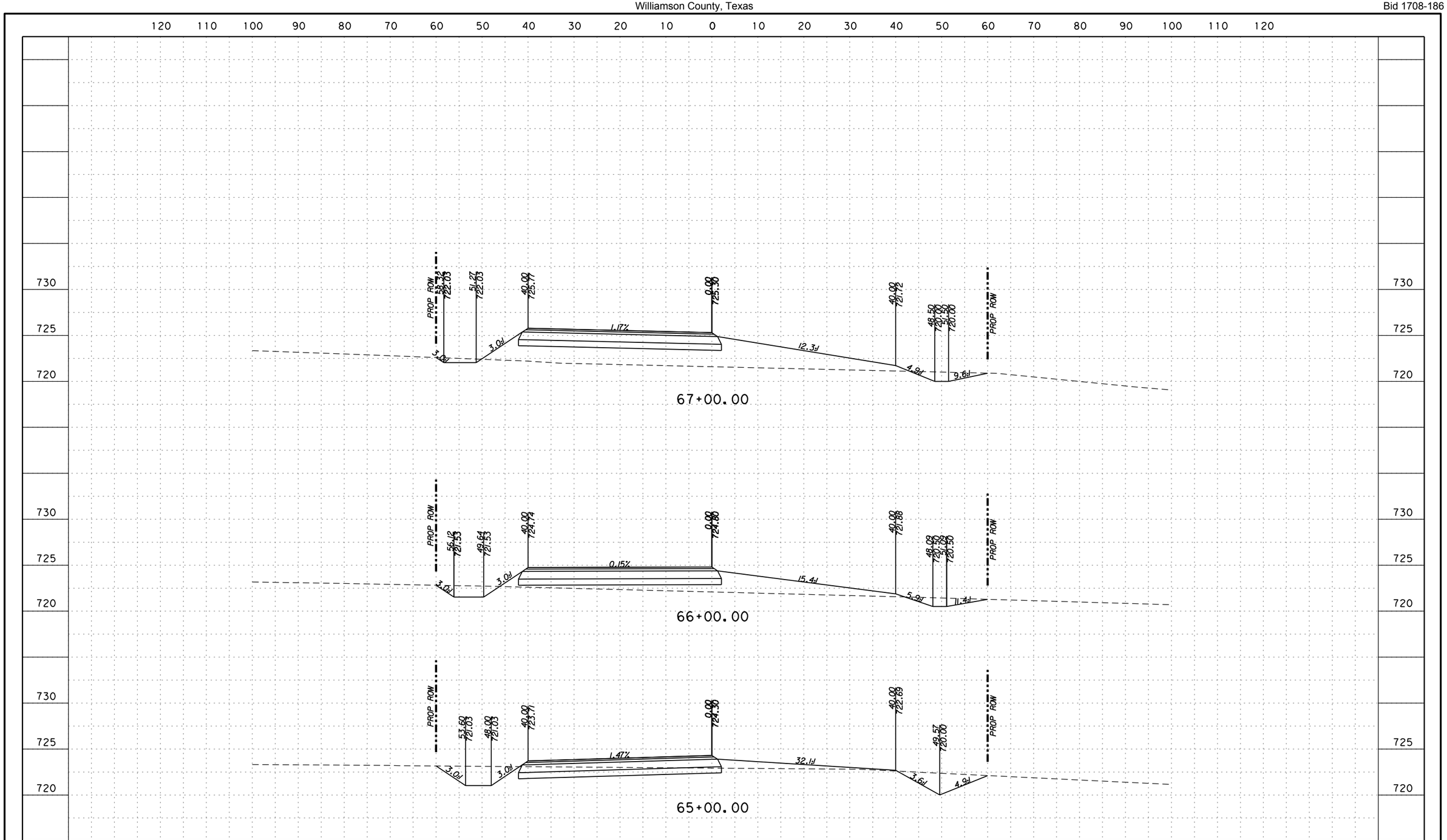
CROSS SECTIONS

SHEET 15 OF 36

DESIGNED BY:	DRAWN BY:	CHECKED BY:	STATE	DIST.	COUNTY	SHEET NO.
GJ	GJ	EMG	TEXAS	14	WILLIAMSON	297
FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		CONT.	SECT.	JOB	HIGHWAY NO.
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SHEET 16 OF 36

DESIGNED BY:	DRAWN BY:	CHECKED BY:	STATE	DIST.	COUNTY	SHEET NO.
GJ	GJ	EMG	TEXAS	14	WILLIAMSON	298
FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		CONT.	SECT.	JOB	HIGHWAY NO.
6						CR 119

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120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120

735 730 725 720

SEE CULVERT C PLAN AND PROFILE LAYOUT FOR ADDITIONAL INFORMATION

PROP ROW 53.00 734.75 49.40 724.75 40.00 727.85 0.00 728.80 40.00 722.43 50.01 719.50 PROP ROW

11.8% 3.0% 2.63% 9.9% 7.4% 4.8%

70+00.00

PROP ROW 55.82 723.03 723.03 40.00 727.35 0.00 726.30 40.00 721.31 52.50 719.50 55.00 719.00 PROP ROW

3.0% 3.0% 2.63% 8.5% 5.4% 3.1%

69+00.00

PROP ROW 57.44 722.53 52.93 722.53 40.00 726.80 0.00 725.80 40.00 720.21 48.50 719.50 51.50 719.50 PROP ROW

3.0% 3.0% 2.49% 7.5% 12.0% 4.3% 3.8%

68+00.00

120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120

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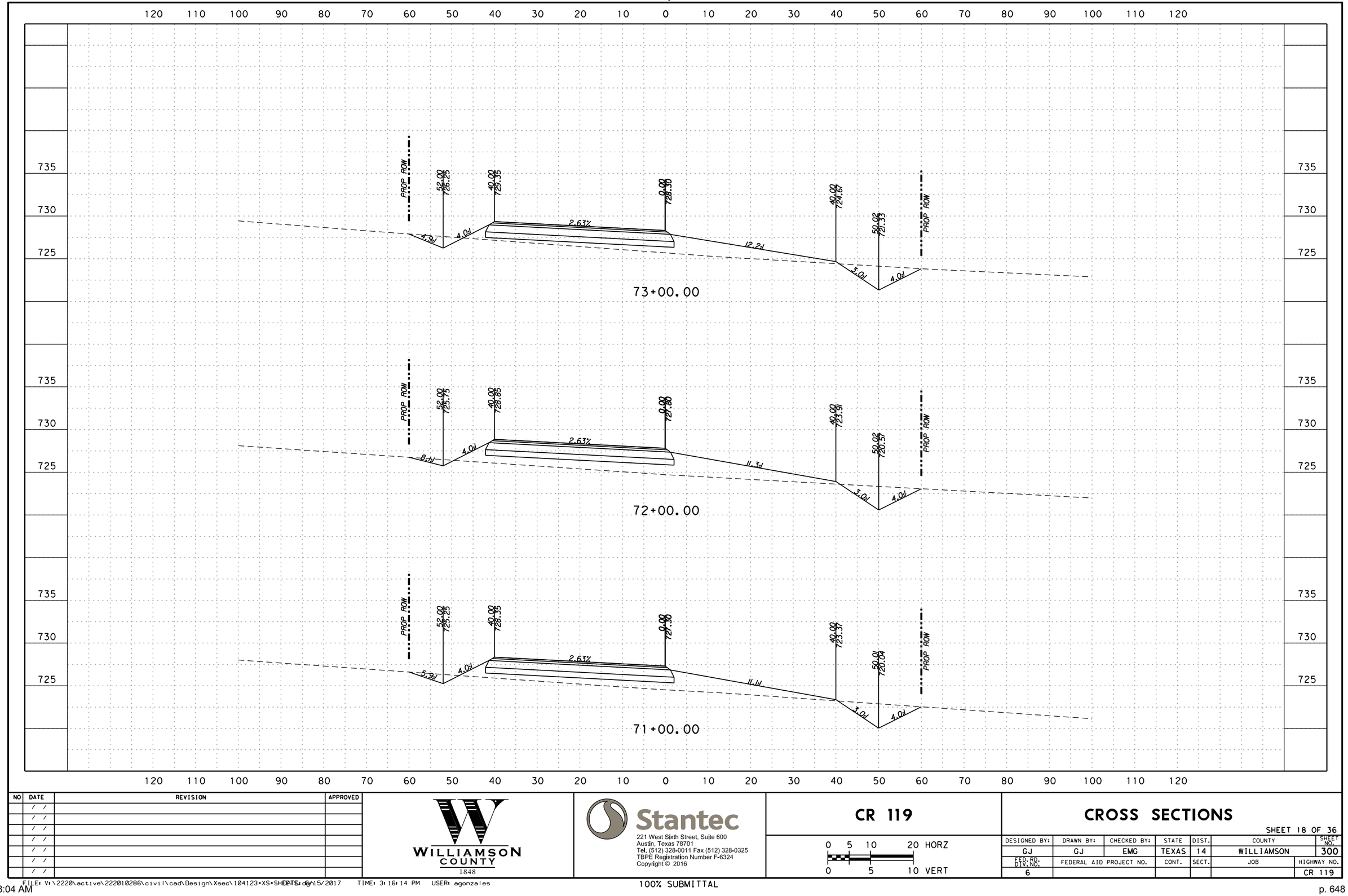
CROSS SECTIONS

SHEET 17 OF 36

DESIGNED BY:	DRAWN BY:	CHECKED BY:	STATE	DIST.	COUNTY	SHEET NO.
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FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		CONT.	SECT.	JOB	HIGHWAY NO.
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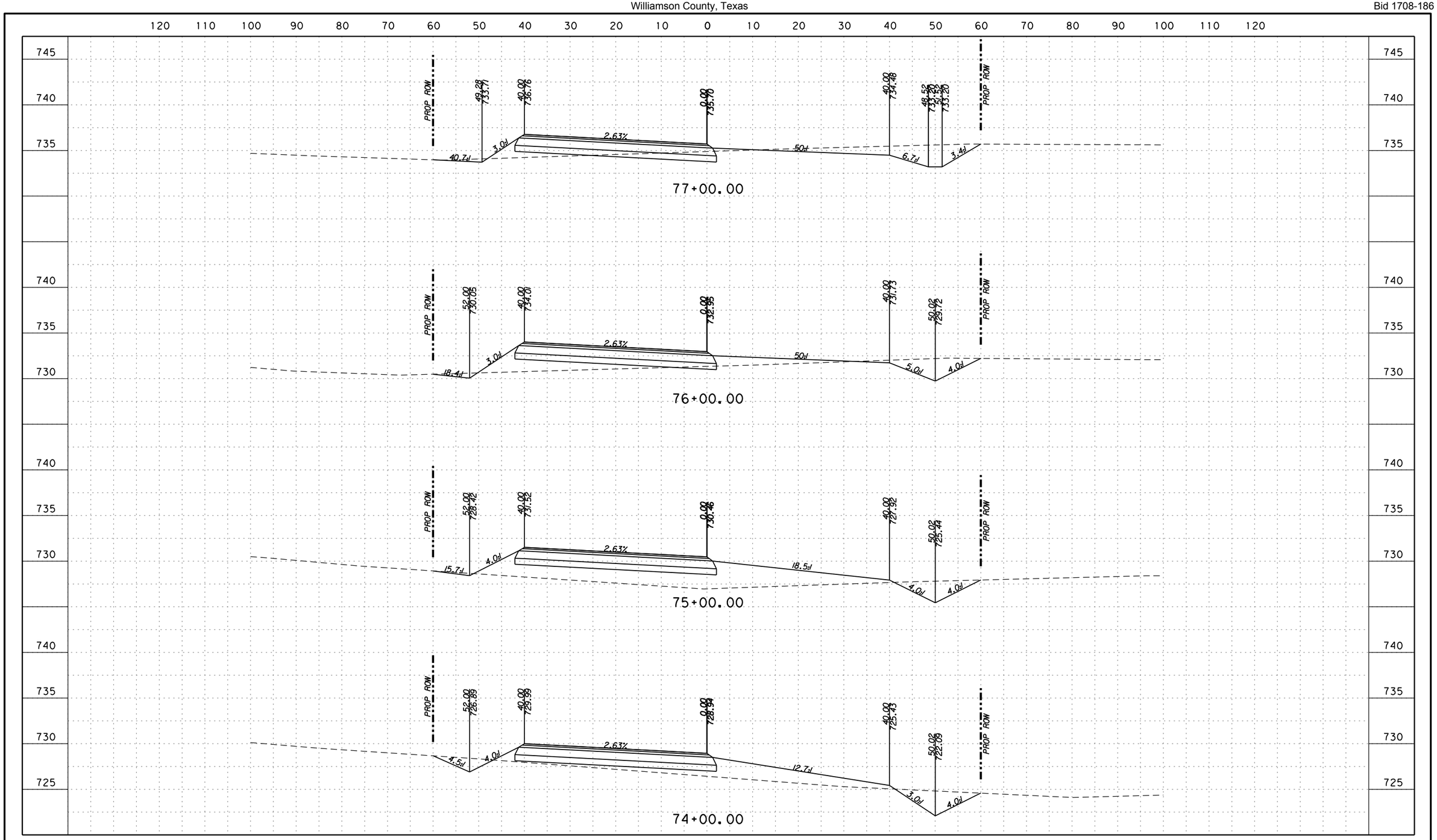
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SHEET 18 OF 36

DESIGNED BY:	DRAWN BY:	CHECKED BY:	STATE	DIST.	COUNTY	SHEET NO.
GJ	GJ	EMG	TEXAS	14	WILLIAMSON	300
FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		CONT.	SECT.	JOB	HIGHWAY NO.
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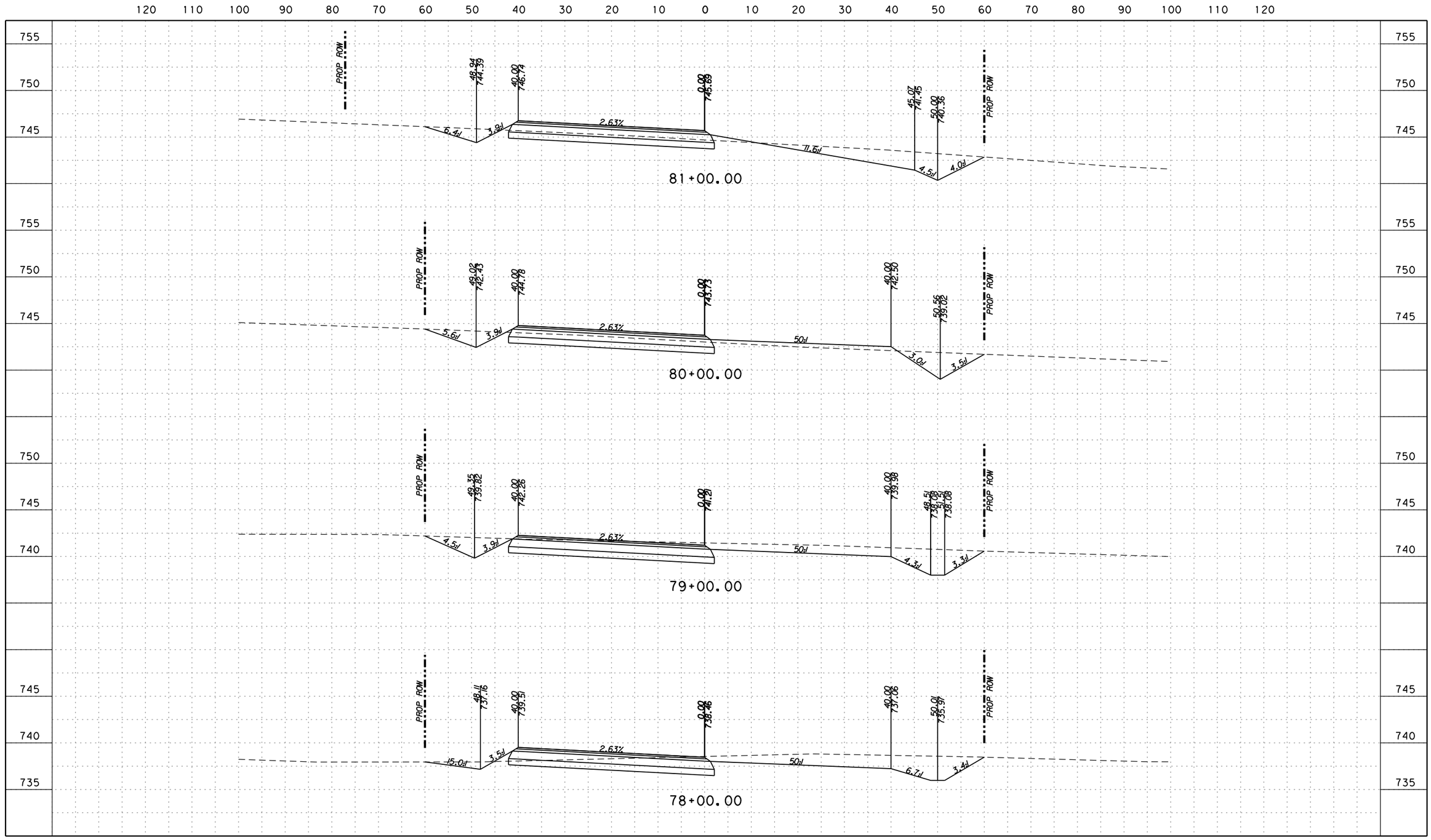
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SHEET 19 OF 36

DESIGNED BY:	DRAWN BY:	CHECKED BY:	STATE	DIST.	COUNTY	SHEET NO.
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FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		CONT.	SECT.	JOB	HIGHWAY NO.
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GJ	GJ	EMG	TEXAS	14	WILLIAMSON	302
FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		CONT.	SECT.	JOB	HIGHWAY NO.
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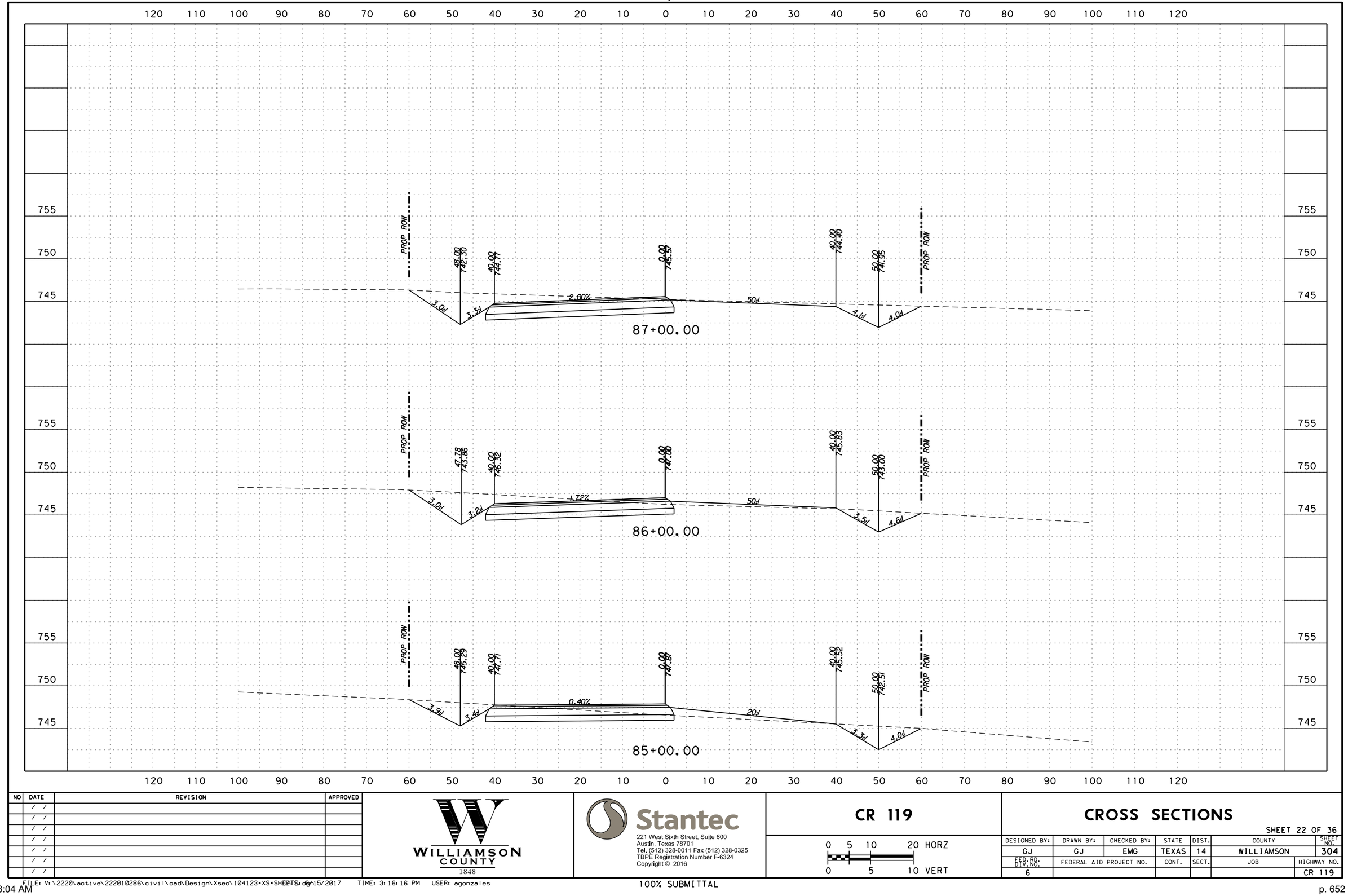
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SHEET 21 OF 36

DESIGNED BY:	DRAWN BY:	CHECKED BY:	STATE	DIST.	COUNTY	SHEET NO.
GJ	GJ	EMG	TEXAS	14	WILLIAMSON	303
FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		CONT.	SECT.	JOB	HIGHWAY NO.
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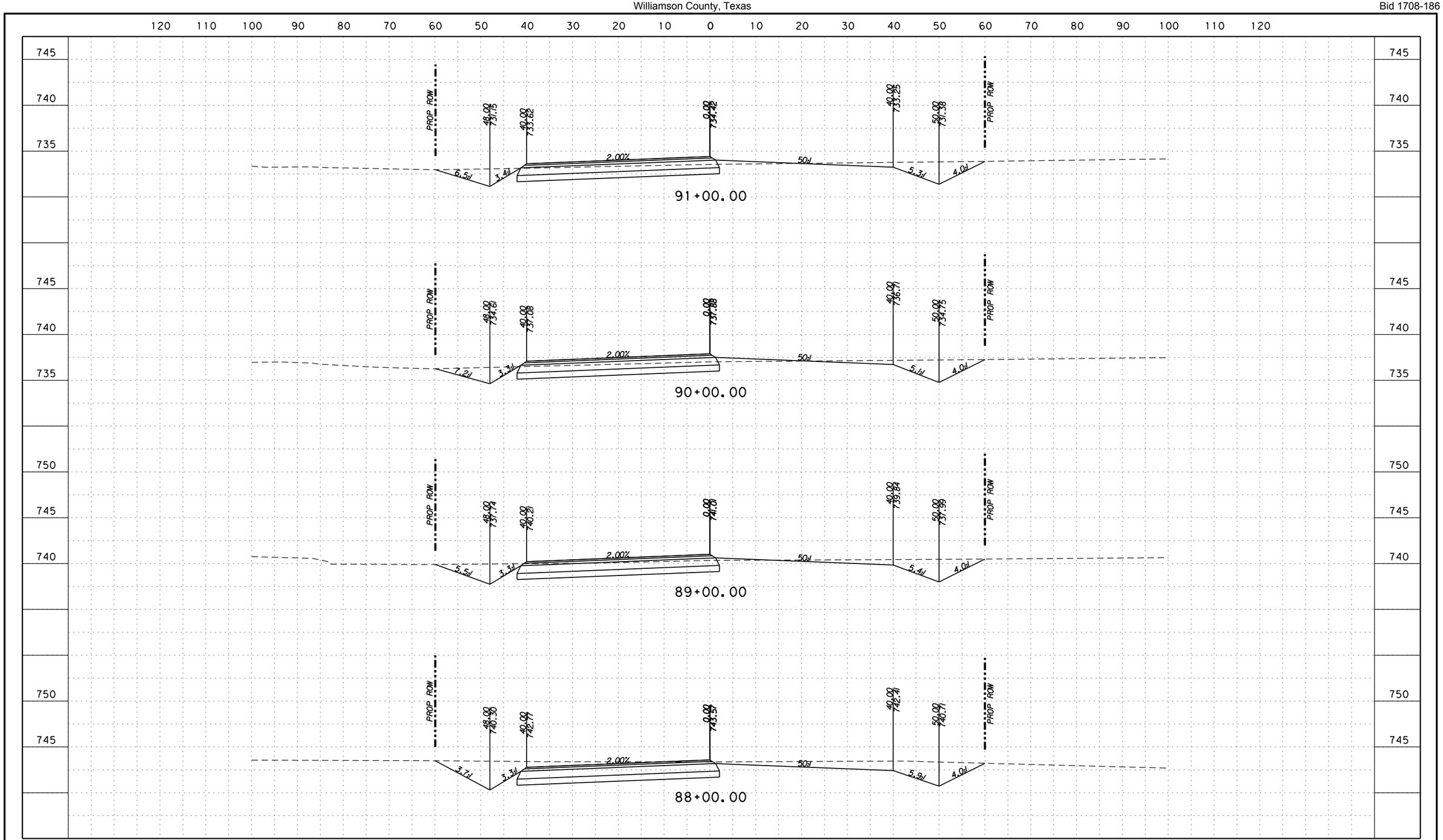
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SHEET 22 OF 36

DESIGNED BY:	DRAWN BY:	CHECKED BY:	STATE	DIST.	COUNTY	SHEET NO.
GJ	GJ	EMG	TEXAS	14	WILLIAMSON	304
FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		CONT.	SECT.	JOB	HIGHWAY NO.
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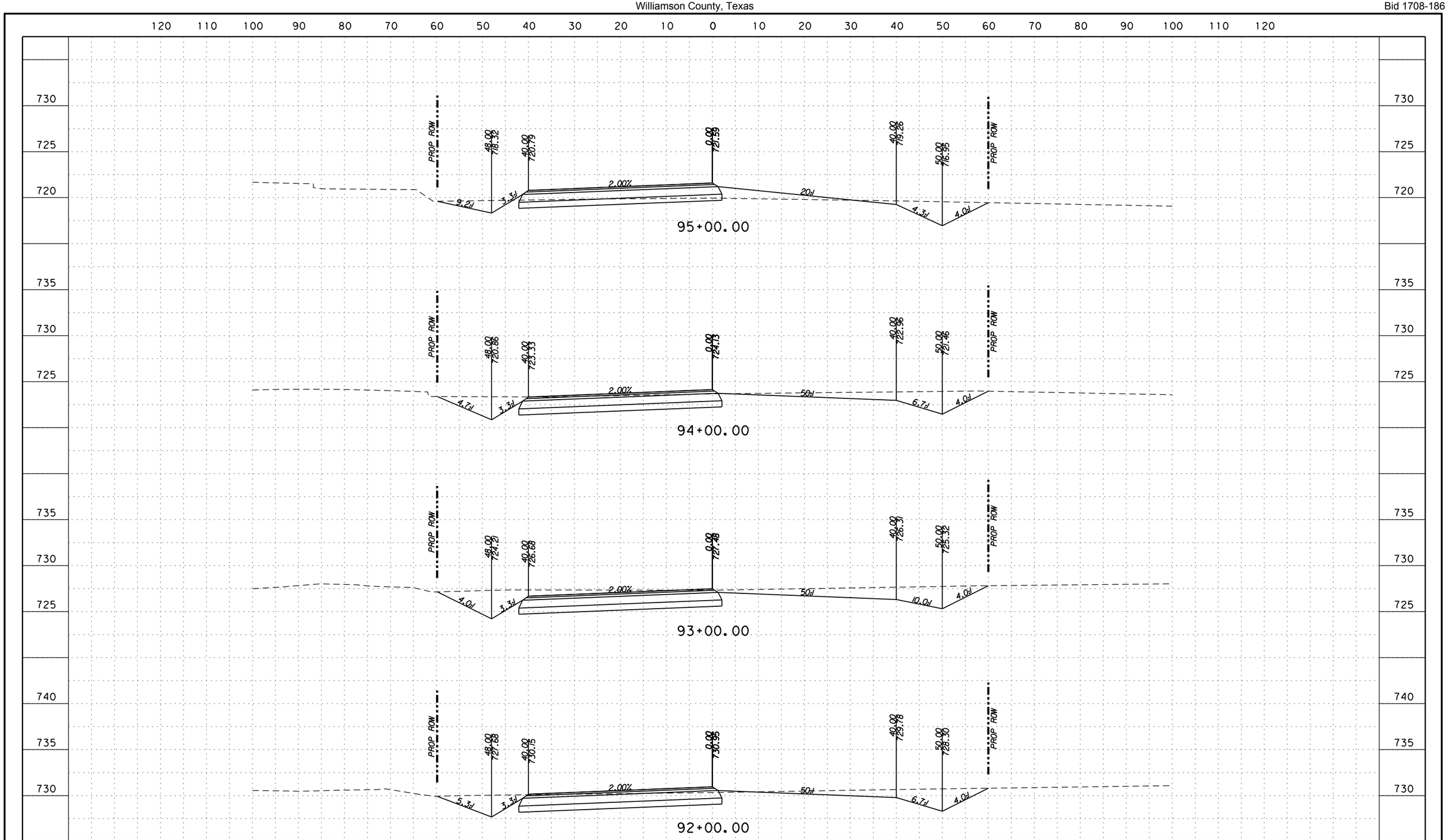
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SHEET 23 OF 36

DESIGNED BY:	DRAWN BY:	CHECKED BY:	STATE	DIST.	COUNTY	SHEET NO.
GJ	GJ	EMG	TEXAS	14	WILLIAMSON	305
FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		CONT.	SECT.	JOB	HIGHWAY NO.
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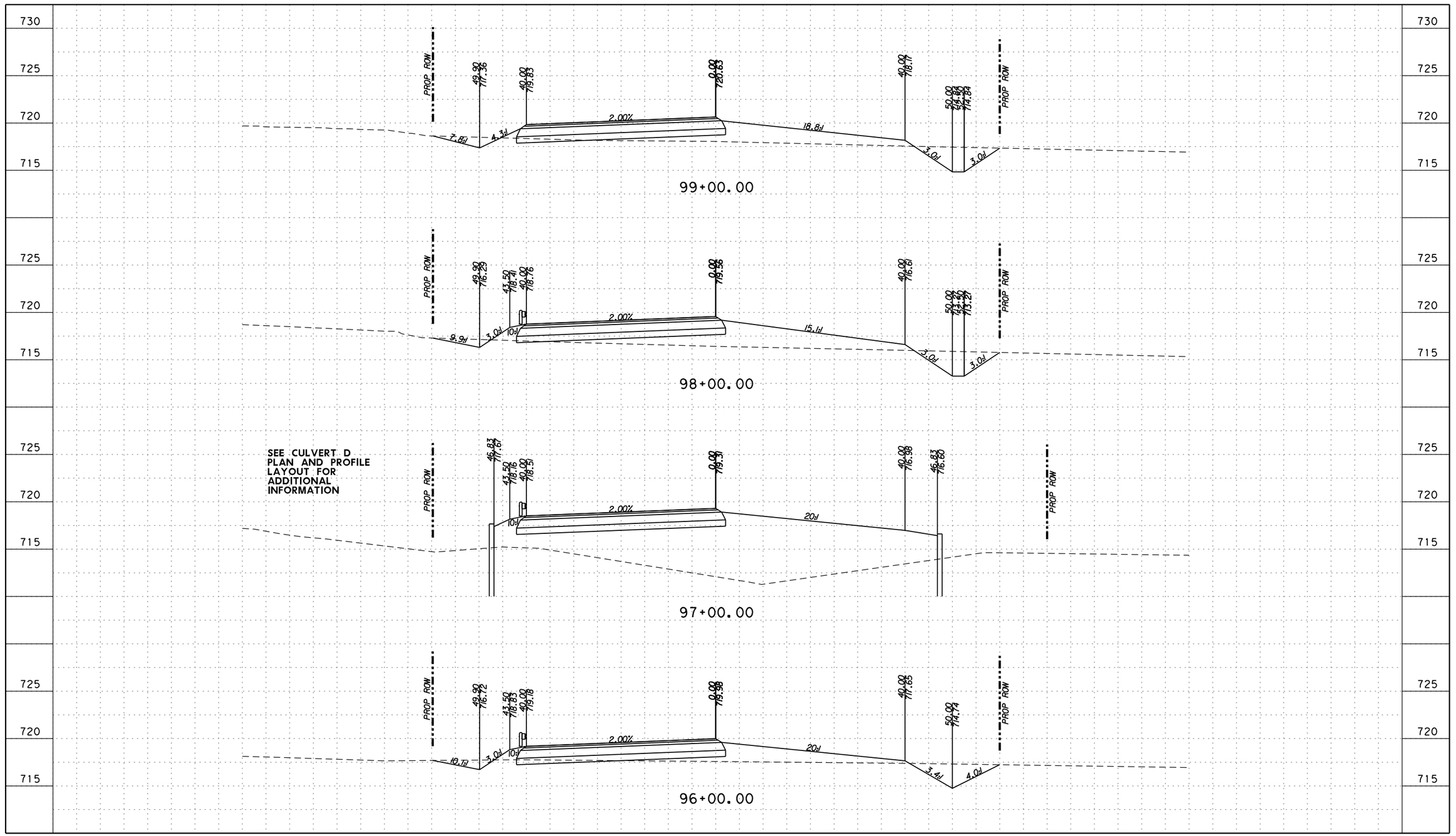
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SHEET 24 OF 36

DESIGNED BY:	DRAWN BY:	CHECKED BY:	STATE	DIST.	COUNTY	SHEET NO.
GJ	GJ	EMG	TEXAS	14	WILLIAMSON	306
FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		CONT.	SECT.	JOB	HIGHWAY NO.
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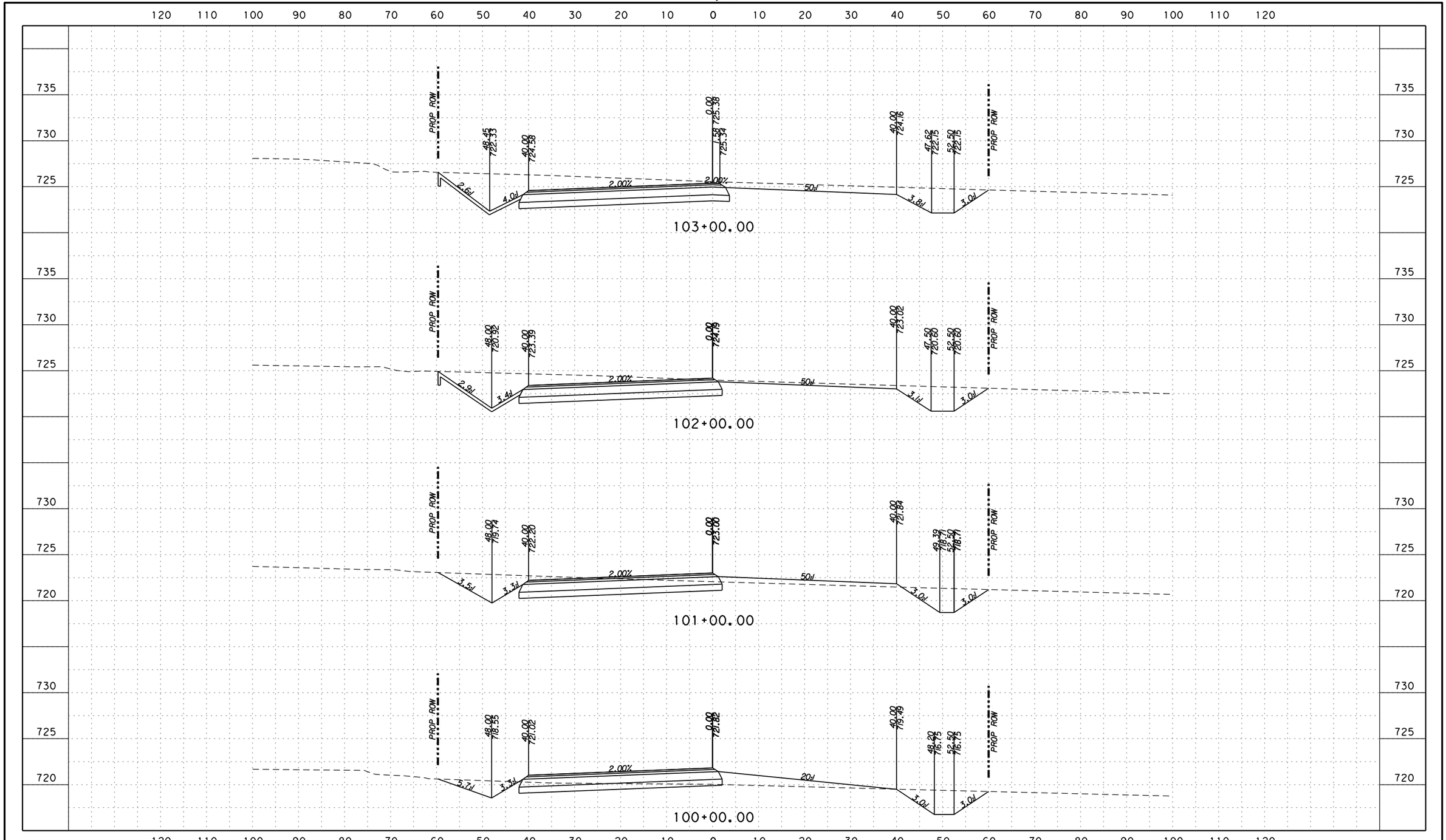
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SHEET 25 OF 36

DESIGNED BY:	DRAWN BY:	CHECKED BY:	STATE	DIST.	COUNTY	SHEET NO.
GJ	GJ	EMG	TEXAS	14	WILLIAMSON	307
FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		CONT.	SECT.	JOB	HIGHWAY NO.
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SHEET 26 OF 36

DESIGNED BY:	DRAWN BY:	CHECKED BY:	STATE	DIST.	COUNTY	SHEET NO.
GJ	GJ	EMG	TEXAS	14	WILLIAMSON	308
FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		CONT.	SECT.	JOB	HIGHWAY NO.
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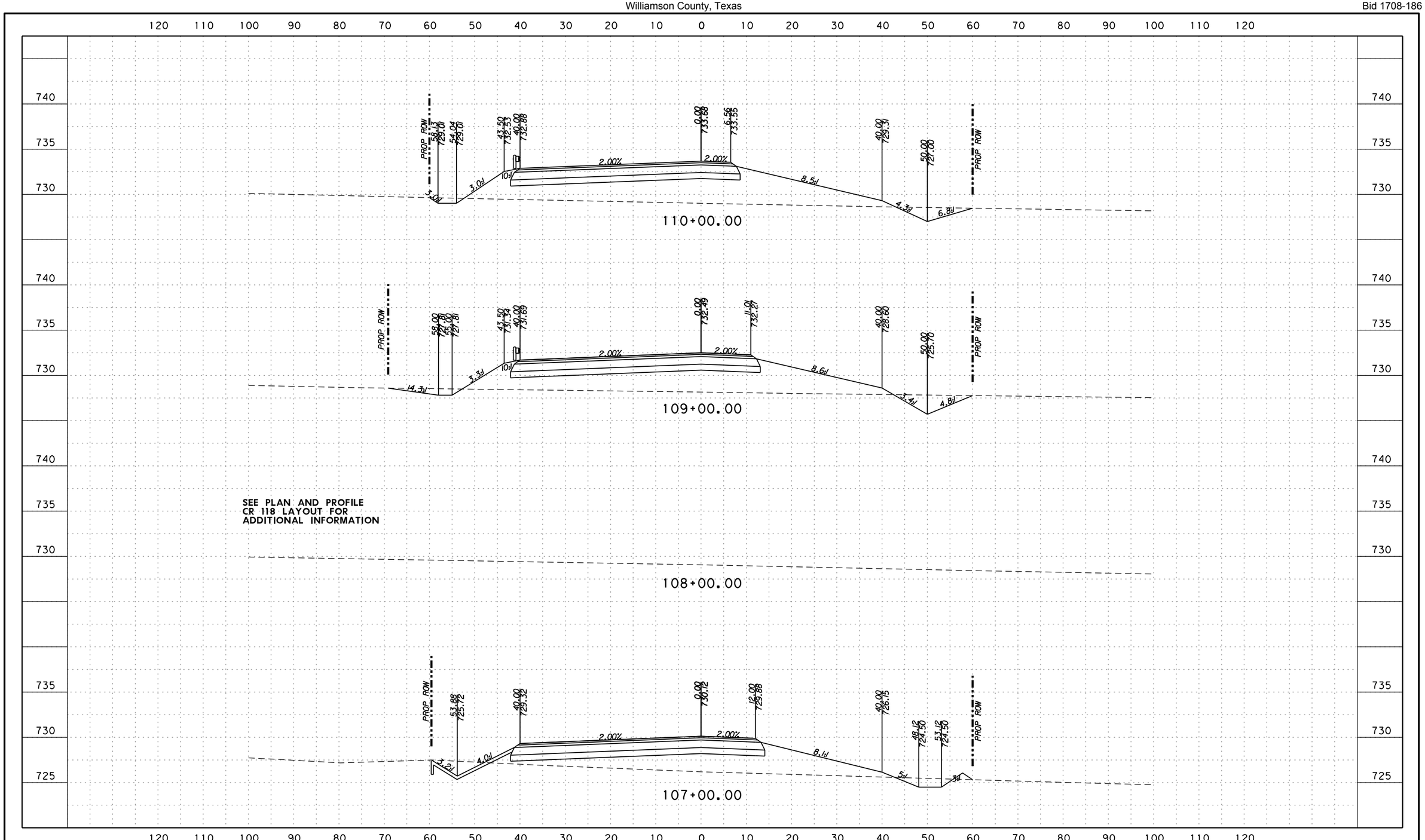
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SHEET 27 OF 36

DESIGNED BY:	DRAWN BY:	CHECKED BY:	STATE	DIST.	COUNTY	SHEET NO.
GJ	GJ	EMG	TEXAS	14	WILLIAMSON	309
FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		CONT.	SECT.	JOB	HIGHWAY NO.
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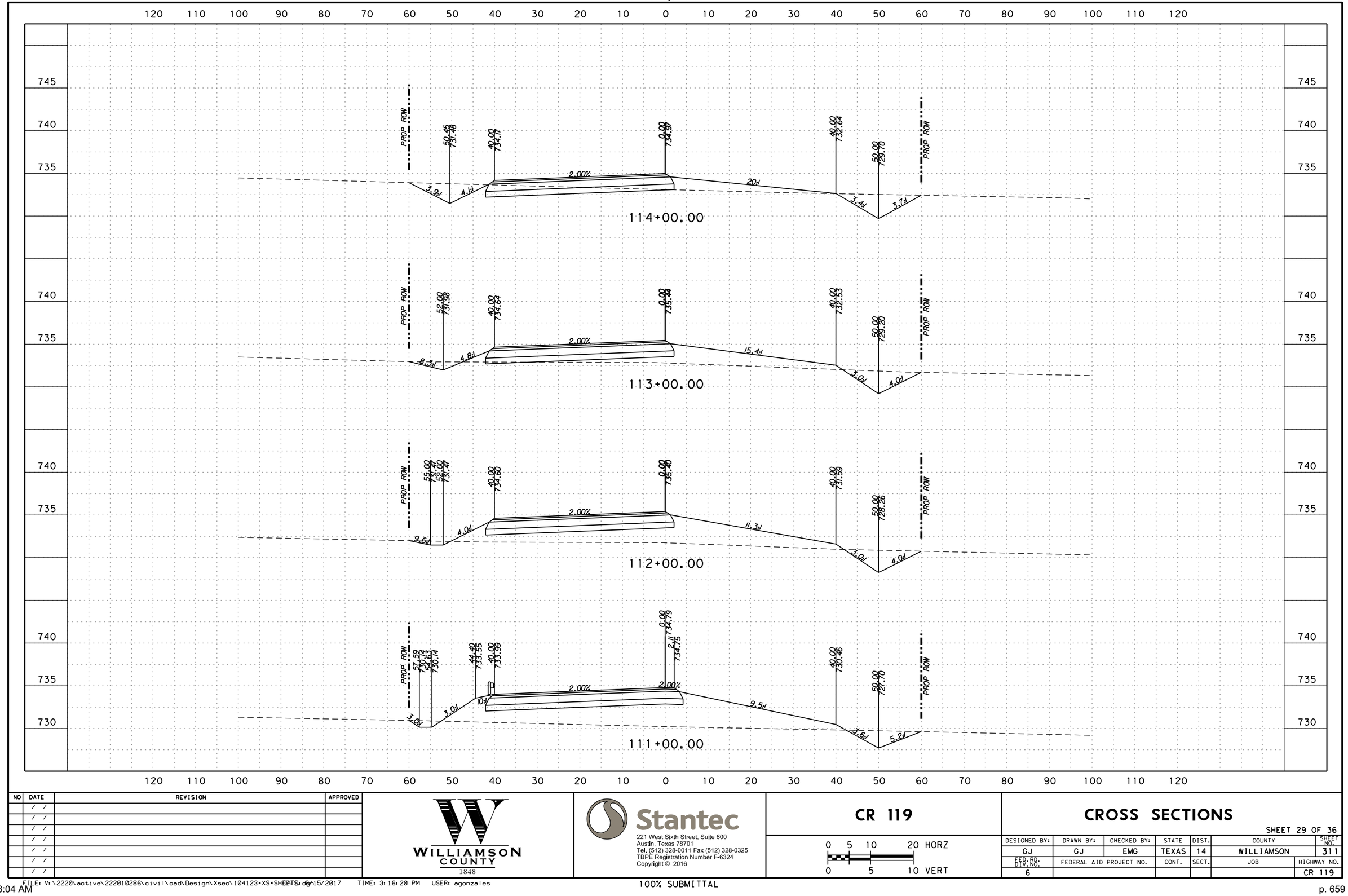
CROSS SECTIONS

SHEET 28 OF 36

DESIGNED BY:	DRAWN BY:	CHECKED BY:	STATE	DIST.	COUNTY	SHEET NO.
GJ	GJ	EMG	TEXAS	14	WILLIAMSON	310
FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		CONT.	SECT.	JOB	HIGHWAY NO.
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SHEET 29 OF 36

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GJ	GJ	EMG	TEXAS	14	WILLIAMSON	311
FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		CONT.	SECT.	JOB	HIGHWAY NO.
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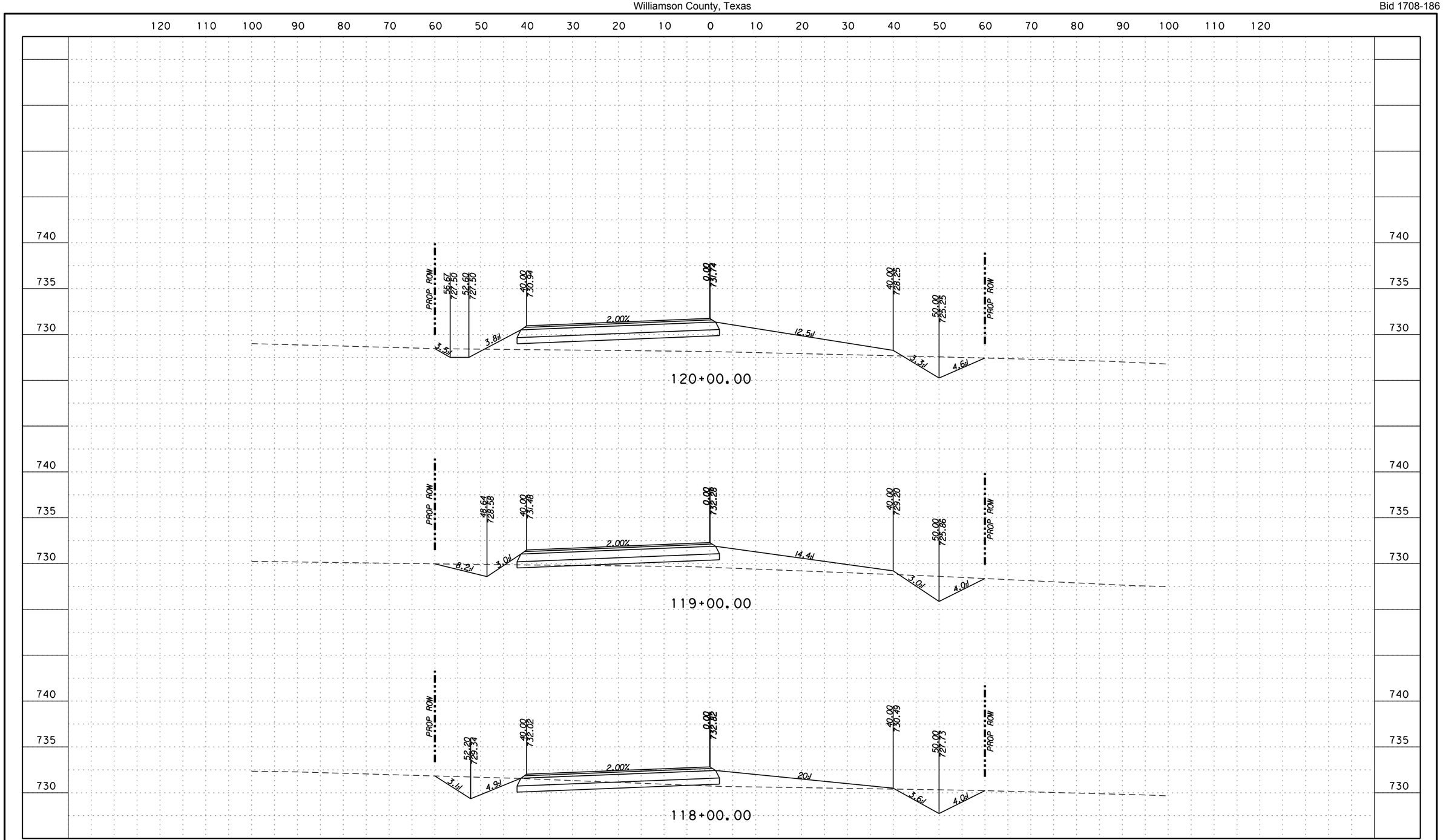
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SHEET 30 OF 36

DESIGNED BY:	DRAWN BY:	CHECKED BY:	STATE	DIST.	COUNTY	SHEET NO.
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FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		CONT.	SECT.	JOB	HIGHWAY NO.
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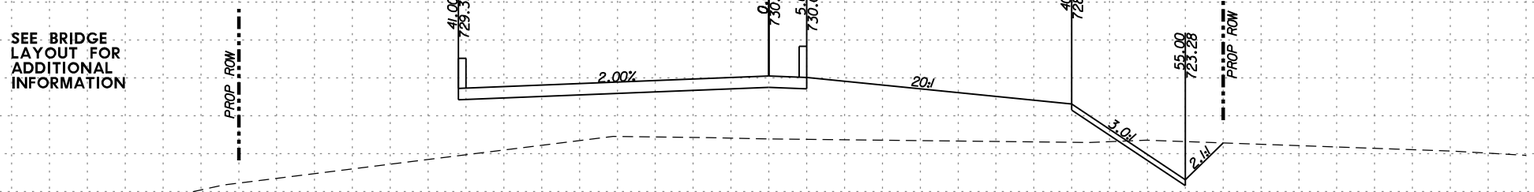
SHEET 31 OF 36

DESIGNED BY:	DRAWN BY:	CHECKED BY:	STATE	DIST.	COUNTY	SHEET NO.
GJ	GJ	EMG	TEXAS	14	WILLIAMSON	313
FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		CONT.	SECT.	JOB	HIGHWAY NO.
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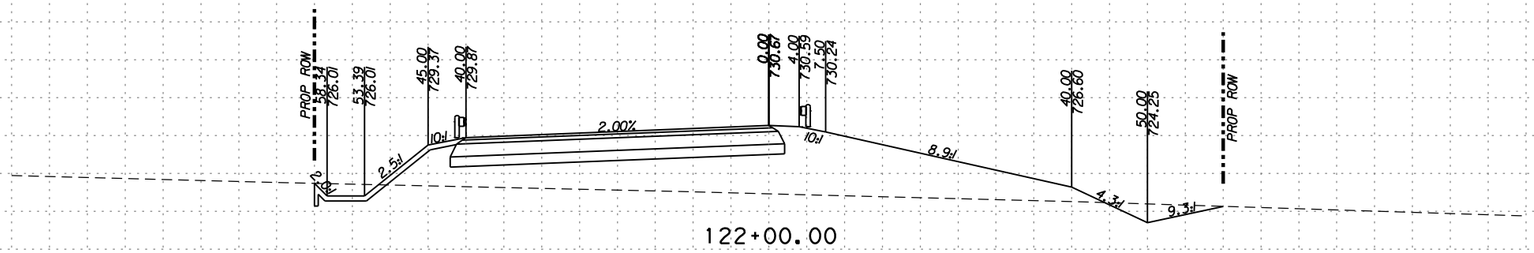
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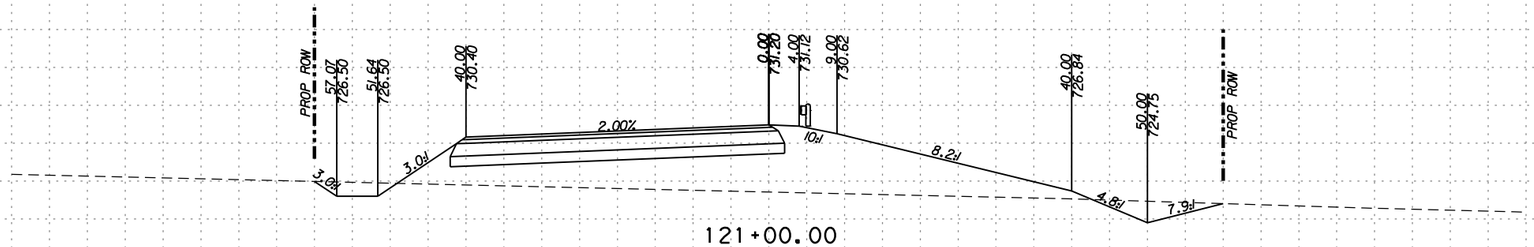
SEE BRIDGE LAYOUT FOR ADDITIONAL INFORMATION



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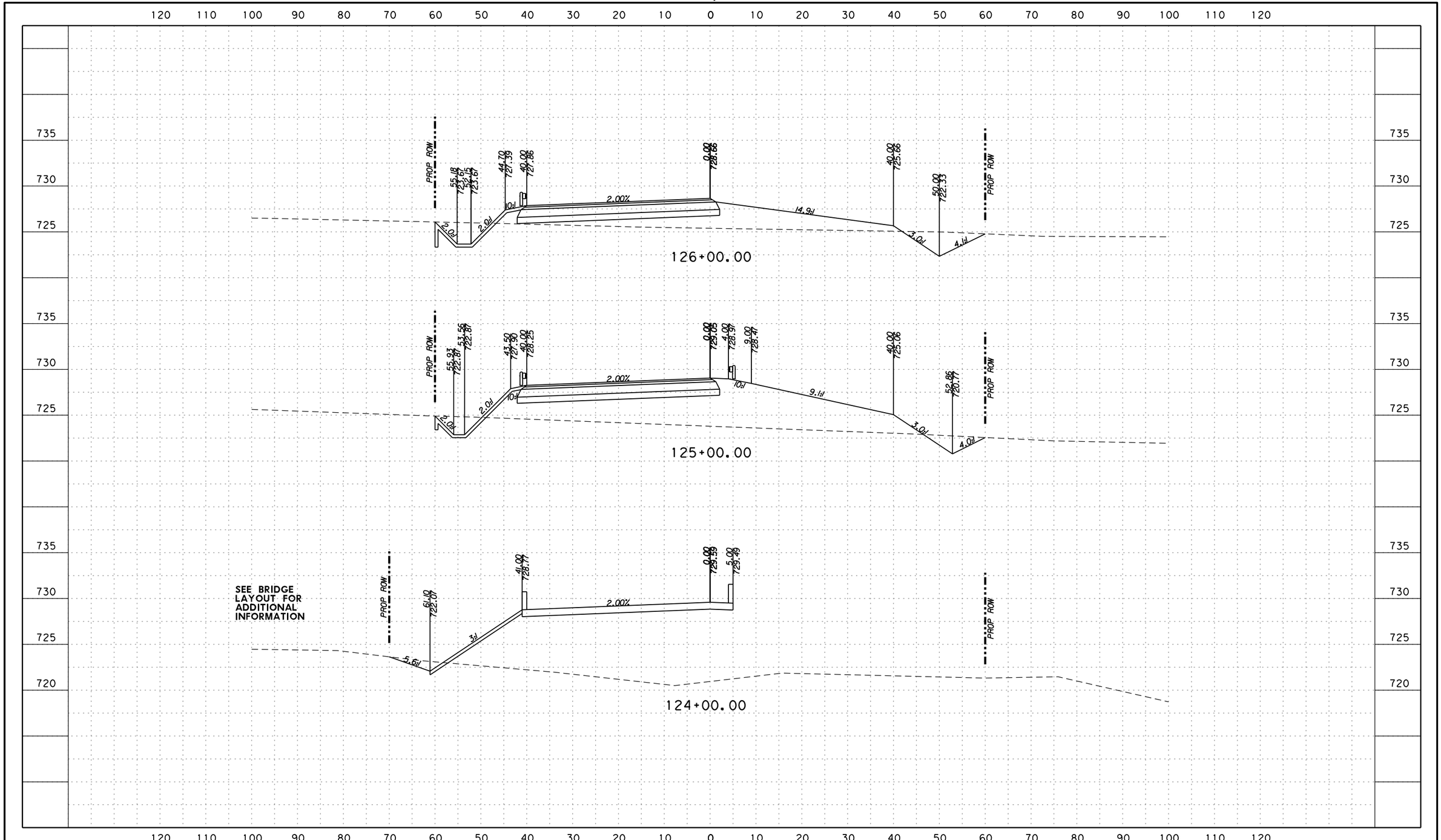
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SHEET 32 OF 36

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GJ	GJ	EMG	TEXAS	14	WILLIAMSON	314
FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		CONT.	SECT.	JOB	HIGHWAY NO.
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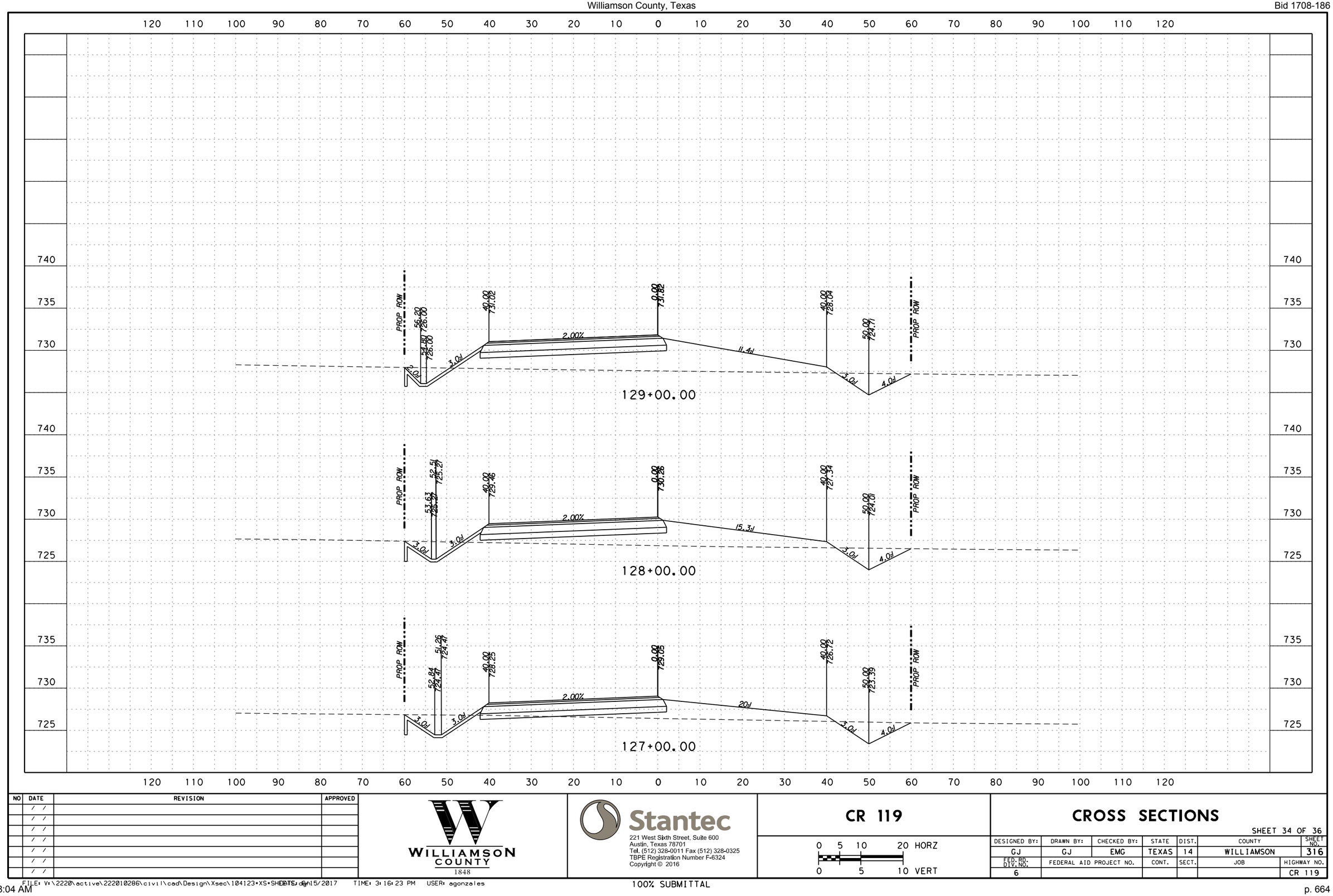
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FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		CONT.	SECT.	JOB	HIGHWAY NO.
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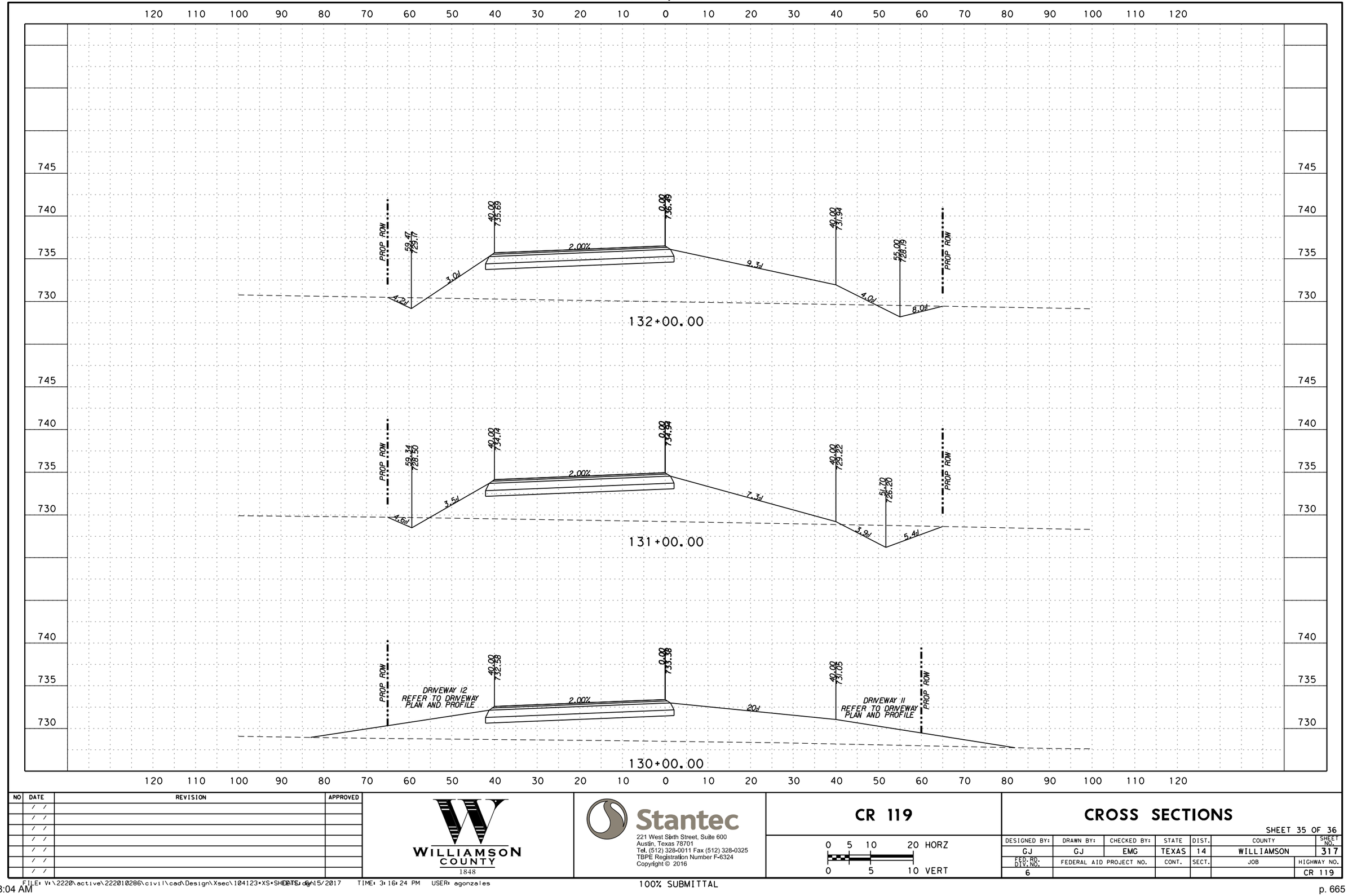
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SHEET 34 OF 36

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FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		CONT.	SECT.	JOB	HIGHWAY NO.
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SHEET 35 OF 36

DESIGNED BY:	DRAWN BY:	CHECKED BY:	STATE	DIST.	COUNTY	SHEET NO.
GJ	GJ	EMG	TEXAS	14	WILLIAMSON	317
FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		CONT.	SECT.	JOB	HIGHWAY NO.
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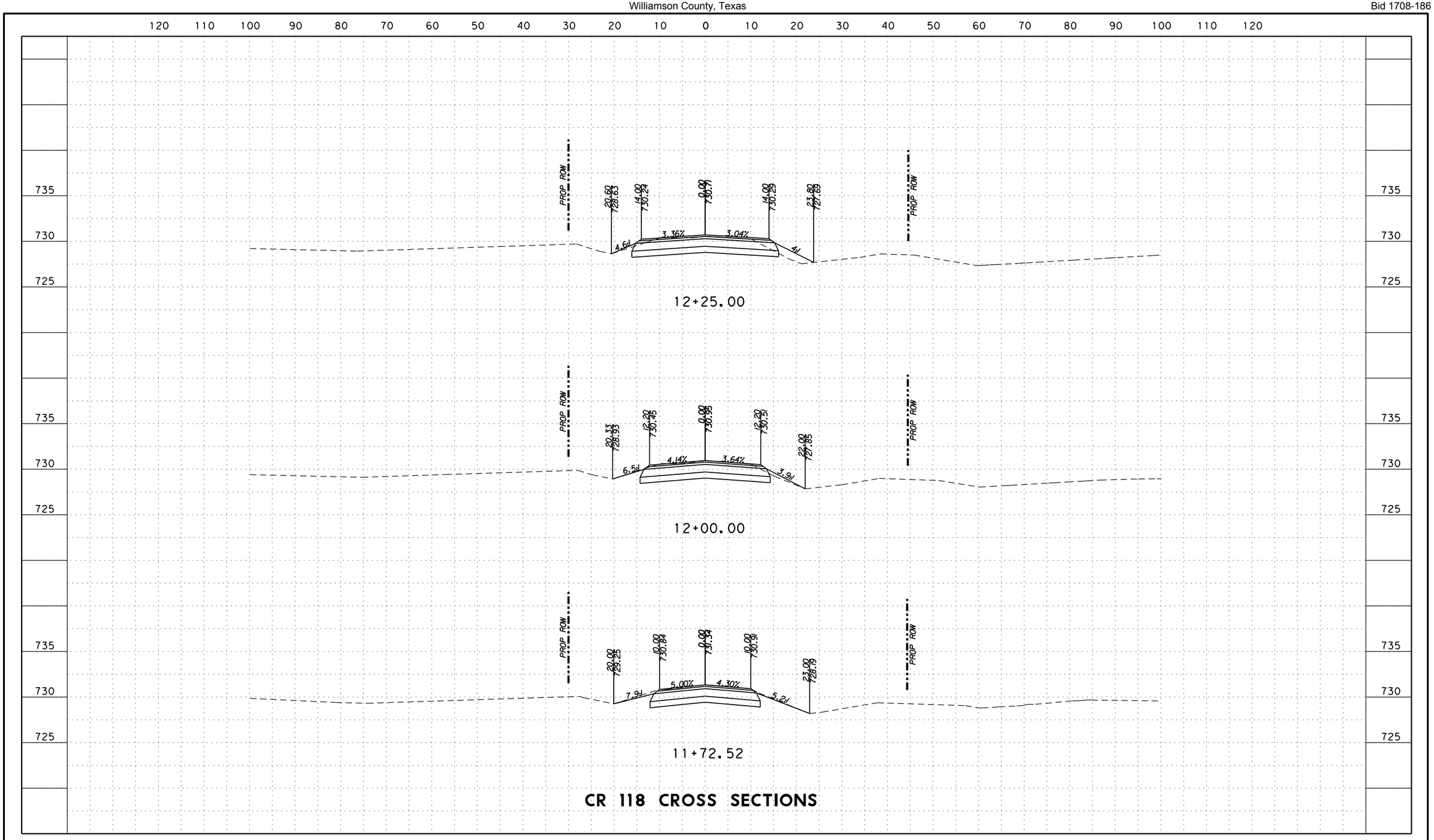
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SHEET 36 OF 36

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FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		CONT.	SECT.	JOB	HIGHWAY NO.
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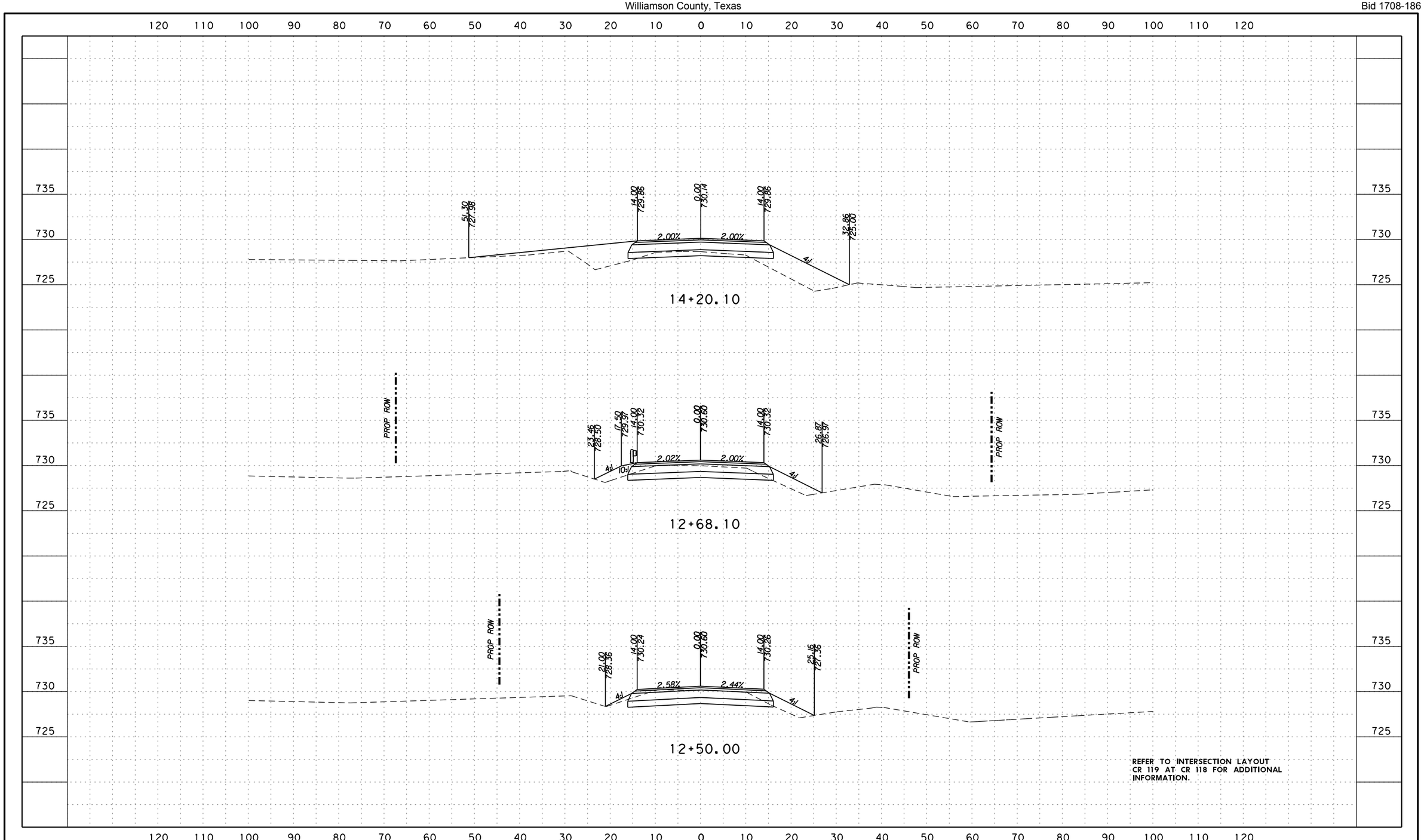
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SHEET 01 OF 07

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FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		CONT.	SECT.	JOB	HIGHWAY NO.
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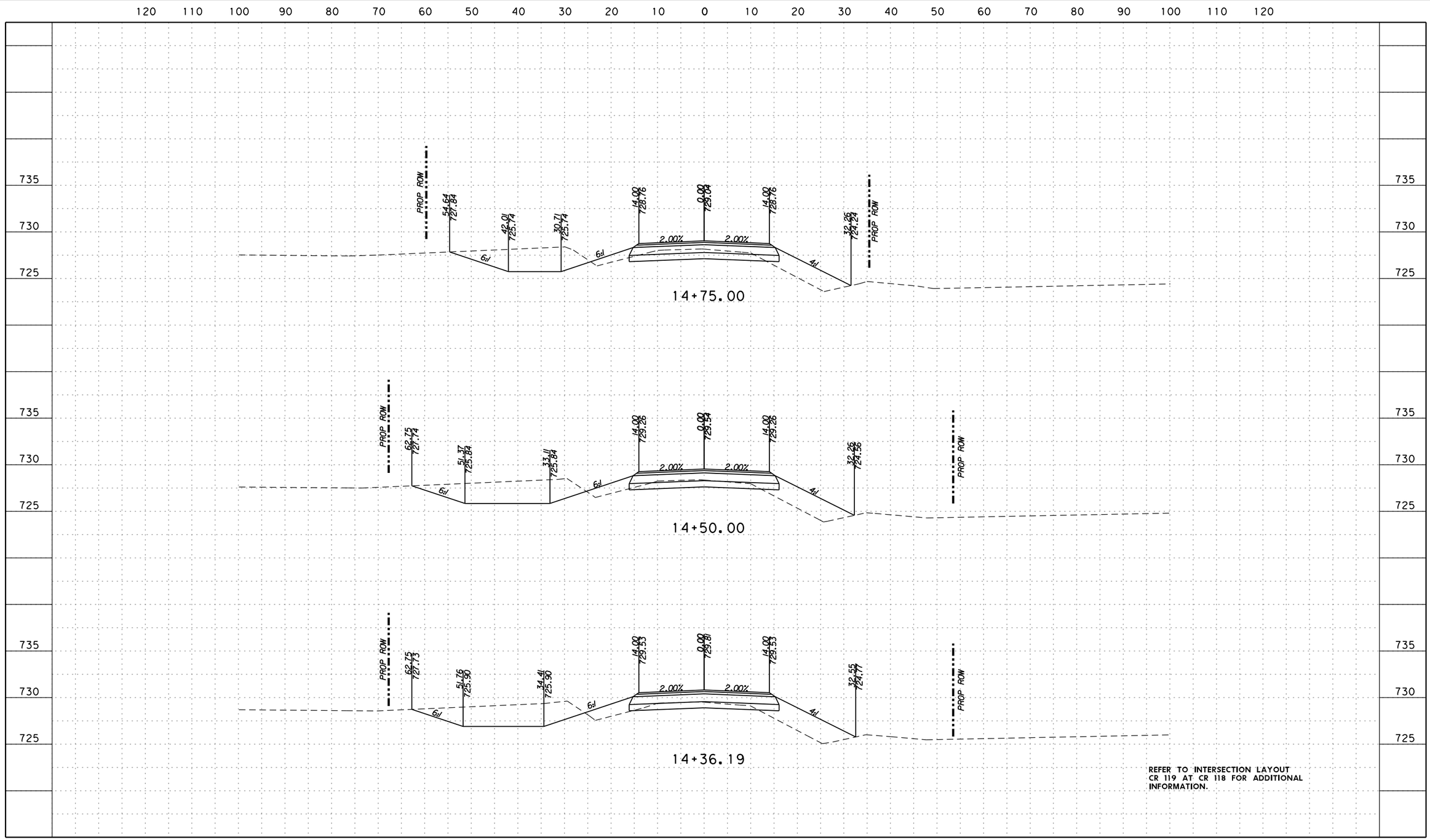
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REFER TO INTERSECTION LAYOUT CR 119 AT CR 118 FOR ADDITIONAL INFORMATION.

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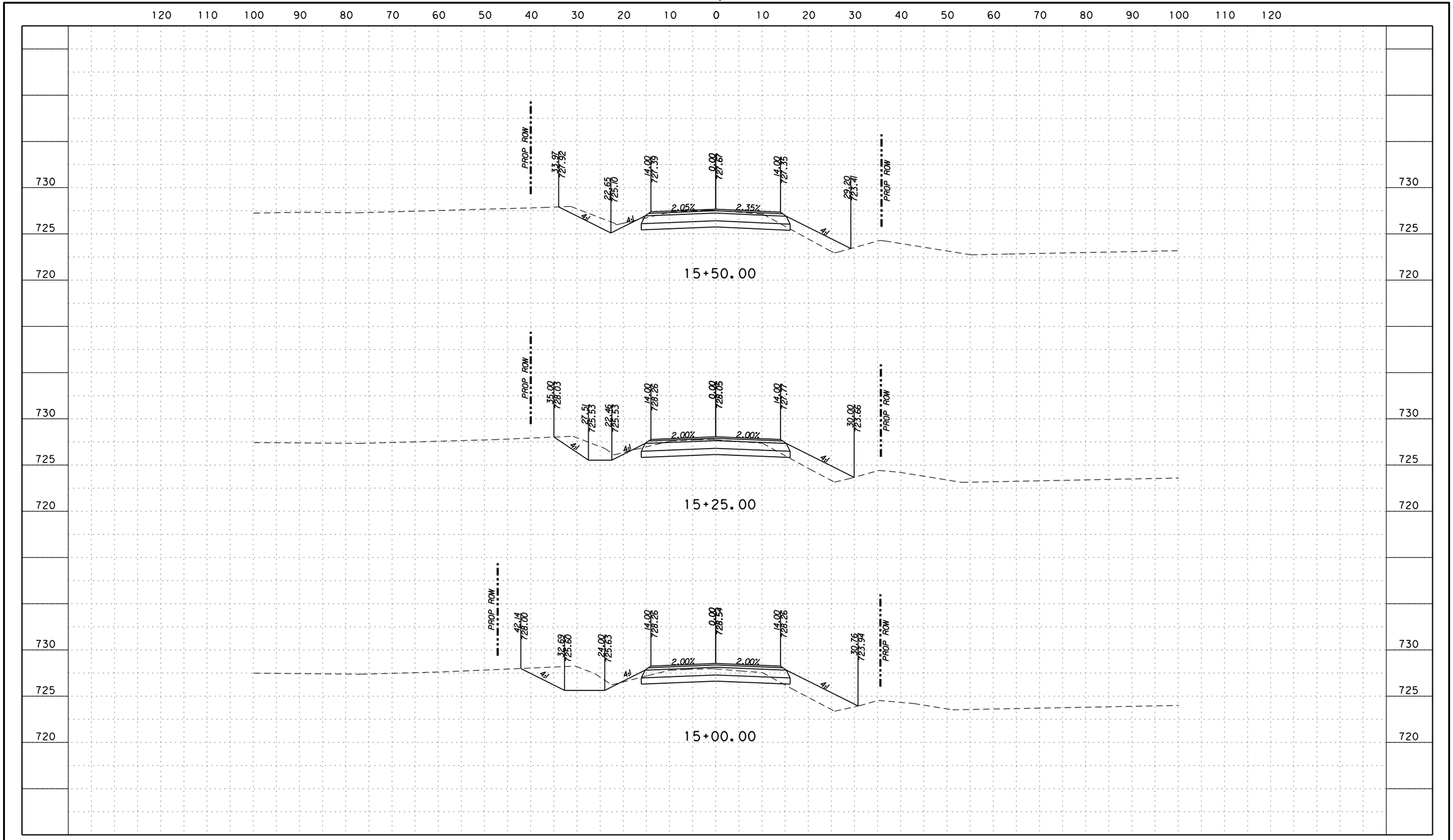
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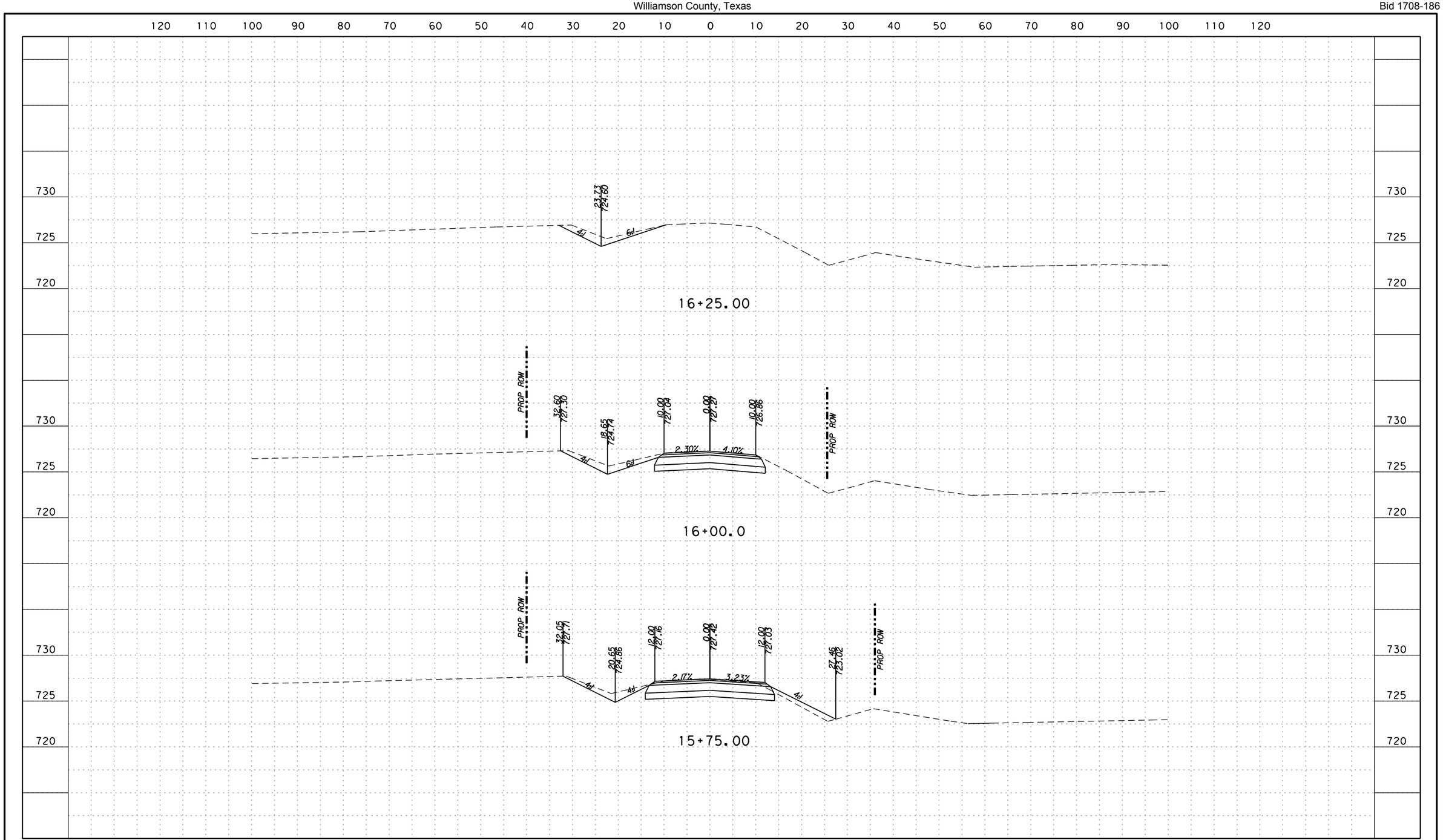
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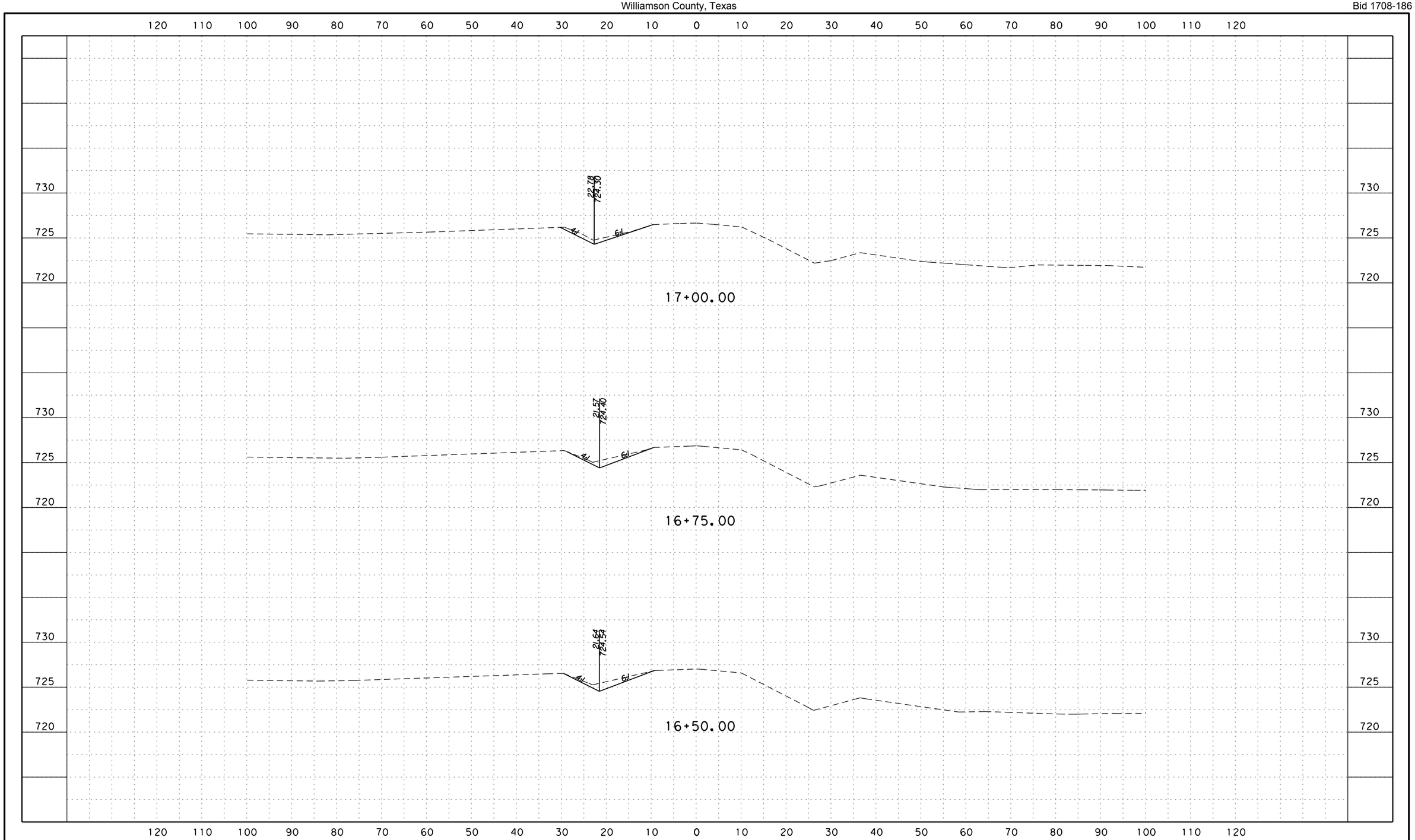
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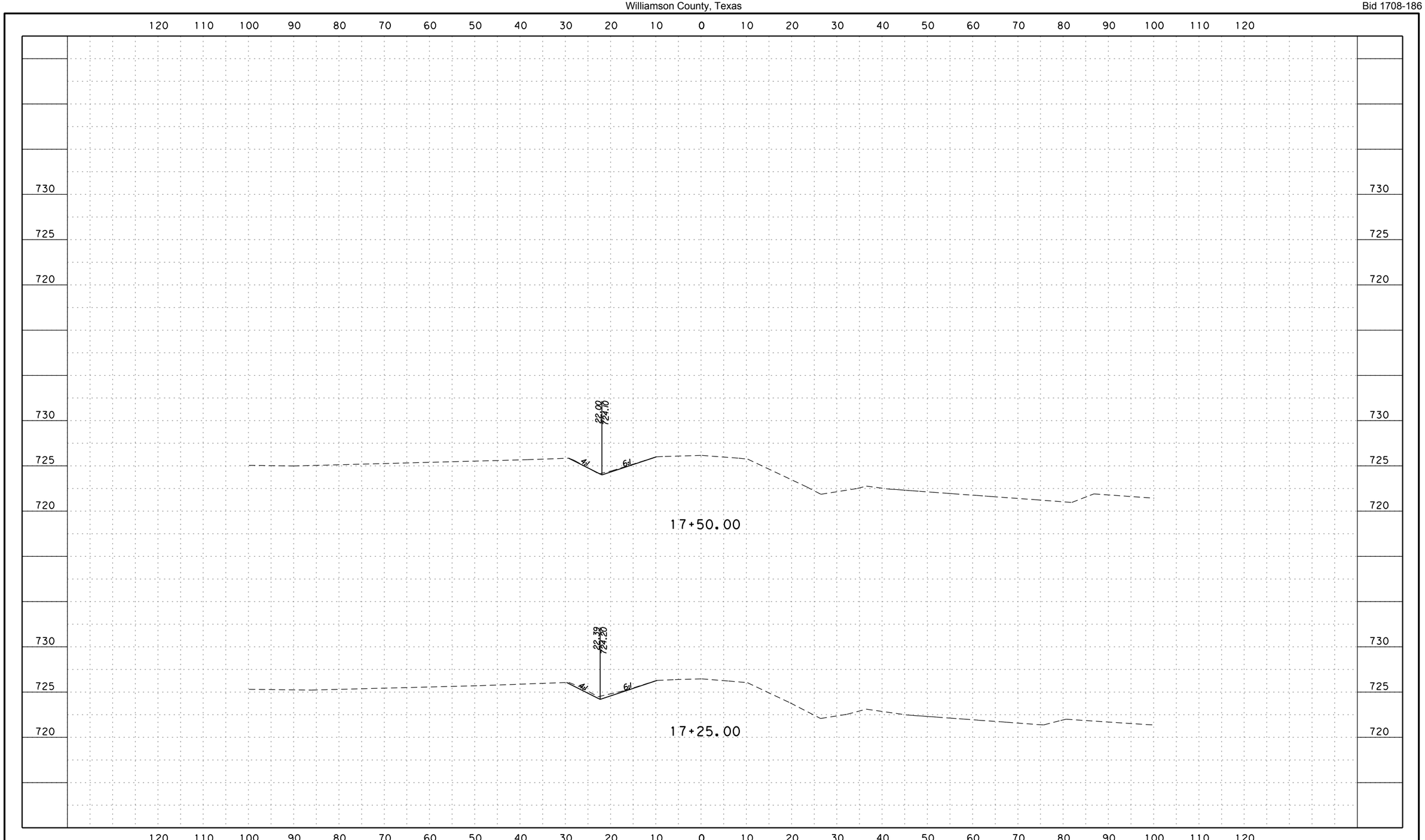
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SHEET 07 OF 07

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WILLIAMSON COUNTY

CR 119 AND LIMMER LOOP PROPOSED SIGNAL PLANS
PRECINCT NUMBER 4

LIMITS: CR 119 AND LIMMER LOOP

FOR THE CONSTRUCTION OF THE PROPOSED TRAFFIC SIGNAL

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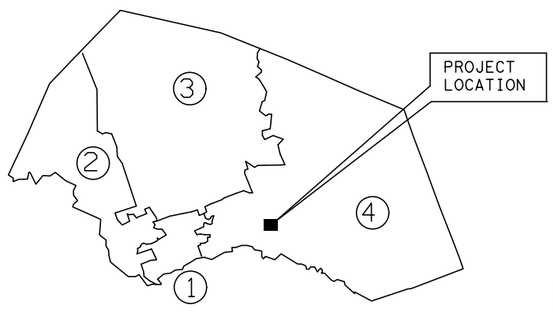
INDEX OF SHEETS

SHEET NO.	DESCRIPTION
1	TITLE SHEET
2 - 9	GENERAL NOTES
10	QUANTITIES
11	EXISTING CONDITIONS LAYOUT
12	PROPOSED SIGNAL LAYOUT
13	SIGNAL ELEVATIONS
14	ELECTRICAL WIRING
15	PHASING AND SIGNS
16	DETECTION LAYOUT
17 - 28	ED(1-12) - 14
29	LD(2)- 03
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34	MA-C-12
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36	TS-FD-12
37	LUM-A-12
38	TS-CF-04
39	MA-DPD-12
40 - 43	PED-12A (1-4)
44	PED POLE SPREAD FOOTING DETAIL
45	ENCR ELECTRICAL SERVICE DETAIL

THE STANDARD DRAWINGS SHOWN IN THE INDEX OF SHEETS ABOVE AND IDENTIFIED HEREIN BY THE SYMBOL * HAVE BEEN SELECTED BY ME OR UNDER MY DIRECT SUPERVISION AS BEING APPLICABLE TO THIS PROJECT.

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.:



WILLIAMSON COUNTY



VICINITY MAP
N.T.S.

EXCEPTIONS: NONE
EQUATIONS: NONE
RAILROAD CROSSINGS: NONE
AREA OF DISTURBANCE: <1 ACRES

WILLIAMSON COUNTY
1848

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Kimley»Horn
TX FIRM NO. F-928

PREPARED BY:
BRIAN VAN DE WALLE

BRIAN VAN DE WALLE
P.E. DATE

PRELIMINARY
FOR REVIEW ONLY
Not for construction, bidding, or permit purposes.
Kimley»Horn
Engineer BRIAN D. VAN DE WALLE
P.E. No. 68525 Date 8/25/2017

APPROVED BY:
WILLIAMSON COUNTY

DAN A GATTIS DATE
WILLIAMSON COUNTY JUDGE

APPROVED BY:
WILLIAMSON COUNTY

LARRY MADSEN DATE
WILLIAMSON COUNTY COMMISSIONER, PRECINCT 4

APPROVED BY:
HNTB CORPORATION

RICHARD L RIDINGS, PE DATE
ROAD BOND MANAGEMENT TEAM

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.

Williamson County **Sheet:** A
Project: New Traffic Signal at CR 119 / Limmer Loop

GENERAL NOTES: April 21, 2017 Version

Basis of Estimate

Item	Description	**Rate	Basis	Quantity
160	**Furnishing and Placing Topsoil (4")**	1 CY/9 SY	SY	SY
164	**Seed for Erosion Control**			
	(Item 164) (Temp) (Cool) (TY 4)	4840 SY/AC	SY	SY
	(Item 164) (Perm) (Warm) (TY 5)	4840 SY/AC	SY	SY
	(Item 164) (Temp & Perm) (TY 7)	4840 SY/AC	SY	SY
	(Item 164) (Temp) (Warm) (TY 10)	4840 SY/AC	SY	SY
	(Item 164) (Temp & Perm) (TY 11)	4840 SY/AC	SY	SY
166	**Fertilizer (13-13-13)**	1/8 LB/SY	SY	TON
168	**Vegetative Watering** (Item 164) (Temp)	10 GAL/SY	SY	MG

** For Informational Purposes Only

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

SMA-80(1)-12 Single Mast Arm Assembly (80 MPH) – Populated Tables
TS-FD-12 Pole Foundation - Populated Tables
New Detail – Ribbon Curb
New Detail – Spread Footing for Pedestrian Pole

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.

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

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.

Williamson County **Sheet:** B
Project: New Traffic Signal at CR 119 / Limmer Loop

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 to contact at all times when work is being performed, including subcontractor work. The Superintendent will be available and on-call 24 hours a day.

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. The Construction Observer will report all minimum vertical clearance information on State maintained roadways to the Austin District Permit Office.

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.

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WILLIAMSON COUNTY
CR 119 & LIMMER LOOP

GENERAL NOTES
(1 OF 8)

STATE	COUNTY	CITY	SHEET NO.
TEXAS	WILLIAMSON	HUTTO	2
PROJECT NO.		ROADWAY	

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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 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.

DSHS Asbestos and Demolition Notification.
Complete and provide the Texas Department of State Health Services (DSHS) notification form to the Engineer at least 30 calendar days prior to bridge or bridge class culvert removal or renovation. Notify the Construction Observer via email of any changes to the work start date.

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 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.

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WILLIAMSON COUNTY
CR 119 & LIMMER LOOP

GENERAL NOTES
(2 OF 8)

STATE	COUNTY	CITY	SHEET NO.
TEXAS	WILLIAMSON	HUTTO	3
PROJECT NO.		ROADWAY	

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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 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 164 – SEEDING FOR EROSION CONTROL
Item 164-WC11 (Type 11 seed) is to be used in eastern areas of the county for Temporary Warm and Permanent applications where use of off-site herbicides limits establishment of seasonal seeding. The quantity shown in the plans is 1.5 times the total seeding area to provide quantity for the Temporary and Permanent Warm use of the grass. Item 164-WC04 (Type 4 seed) should also be included at 0.5 of the total seeding area to provide Temporary Cool season coverage.

ITEM 416 – DRILLED SHAFT FOUNDATIONS
Stake all Foundations, for approval, before beginning drilling operations, as directed. Examples of types of foundations are Bridge Supports, Traffic Signal Pole Foundation, Roadway Illumination Assembly Foundations, Sign Support Locations, etc.

Calculate the vertical signal head clearance before placing any Traffic Signal Pole Foundation.

Obtain approval before placing additional exposed Traffic Pole Foundation.

Set anchor bolts for Mast-Arm Signal Poles and Strain Poles. Set two in tension and two in compression. Obtain approval of anchor bolt placement as directed before placing concrete.

Field cut holes for anchor bolts only as directed.

Remove spoils, daily, out of flood plain, or as directed.

ITEM 421 – HYDRAULIC CEMENT CONCRETE
Sulfate resistant concrete is not required for any class of concrete.

Over-design requirements for compressive strength are waived for non-structural concrete, as defined in Table 8, Item 421.4.1.

Minimum air-entrainment requirements are waived for all classes of concrete, except for Class S, DC, or CO concrete. For all classes of concrete, except for Class S, P, or CO concrete or non-structural concrete, as defined in Table 8, the entrained air content must not exceed 8% air.

For all non-pavement applications using Class S, or CO concrete, target 5.5% entrained air. If the air content exceeds the target air content by more than 3 percentage points, the load of concrete will be rejected.

All Class P concrete must be air-entrained. Target an entrained air content of 4.0%. To meet the air-entraining requirements, use an approved air-entraining admixture. If the air content is greater than 7%, the load of concrete will be rejected.

ITEM 449 – ANCHOR BOLTS
Pipe joint compound, as used in this Item, is an electrically conducting protective thread lubricant compound to be used on the foundation anchor bolts for high mast illumination poles. (Crouse-Hinds TL-2, 0z/Gedney STL, Thomas & Betts Kopr-Shield).

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.

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WILLIAMSON COUNTY
CR 119 & LIMMER LOOP

GENERAL NOTES
(3 OF 8)

STATE	COUNTY	CITY	SHEET NO.
TEXAS	WILLIAMSON	HUTTO	4
PROJECT NO.		ROADWAY	

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

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.

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.

ITEMS 618, 620, 628, 684, & 686
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.

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."

Consider the polymer concrete barrier boxes subsidiary to Item 618, "Conduit."

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.

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

ITEM 620 – ELECTRICAL CONDUCTORS
For both transformer and shoe-base type illumination poles, provide double-pole breakaway fuse holder from manufacturers pre-qualified by the Traffic Operations Division. Fuse holder is shown on the producer list under Items 610 & 620.

Provide and install approved 10-amp time delay fuses.

Provide breakaway disconnects in all breakaway poles. For Flashing Beacons (Item 685) and Pedestal Poles (Item 687) within the project provide single-pole breakaway disconnects. Use

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GENERAL NOTES
(4 OF 8)

STATE	COUNTY	CITY	SHEET NO.
TEXAS	WILLIAMSON	HUTTO	5
PROJECT NO.		ROADWAY	

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Bussman HEBW, Littelfuse LEB, Ferraz-Shawmut FEB, or equal on ungrounded conductors. For all grounded conductors use Bussman HET, Littelfuse LET, Ferraz-Shawmut FEBN, or equal. These breakaway connectors have a white colored marking and a permanently installed solid neutral.

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

The traffic signal system will require 120/240-Volt Power Service provided by the Local Electric Utility Company. Contractor shall make all arrangements for power.

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 656 – FOUNDATIONS FOR TRAFFIC CONTROL DEVICES
Field cut holes for anchor bolts only as directed.

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 680 – HIGHWAY TRAFFIC SIGNALS
Install all of the materials necessary for a complete signal system as follows:

Furnish all other materials, tools, and labor required to provide a completed installation in accordance with the plans and specifications. Furnished materials provided by the Contractor will be new undepreciated stock.

Place the traffic signal into operation after the entire traffic signal has been completed, all required striping is complete, and all conflicting signing is removed. The responsible Signal Shop will be present to program the controller and assist with detection setup.

All illumination fixtures will be 250-watt, high-pressure sodium fixtures.

Furnish and install all permanent signs mounted on the traffic signal wires and traffic signal poles, which include pedestal pole assemblies. Furnish all hardware for installation. Consider all costs associated with the furnishing and installation of the permanent signs and the necessary hardware subsidiary to the pertinent Items.

Use a Vulcan swinger sign mounting bracket or equivalent for all signs mounted on span wires.

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GENERAL NOTES
(5 OF 8)

STATE	COUNTY	CITY	SHEET NO.
TEXAS	WILLIAMSON	HUTTO	6
PROJECT NO.		ROADWAY	

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Williamson County **Sheet:** K
Project: New Traffic Signal at CR 119 / Limmer Loop

After the completion of the entire signal installation (including striping), a 30-day test period begins. After it has been determined, by the County, that the field wiring and controller operation are satisfactory after this test period, and all other requirements of the project have been met, the County will relieve the Contractor of any other responsibilities for the operation of the signal.

Use qualified personnel to respond to and diagnose all trouble calls during the thirty-day test period. Repair any malfunction to Contractor-supplied signal equipment. Provide to the Construction Observer a local telephone number, not subject to frequent changes and available on a 24-hour basis, for reporting trouble calls. Response time to reported calls must be less than 2 hours. Make appropriate repairs within 24 hours. Place a logbook in the controller cabinet and keep a record of each trouble call reported. Notify the Construction Observer of each trouble call. Do not clear the error log in the conflict monitor during the thirty-day test period without the approval of the Construction Observer.

Remove the existing stop sign panels (or assemblies) after the traffic signals are in operation.

ITEM 682 – VEHICLE AND PEDESTRIAN SIGNAL HEADS
Install signal head attachments so the wiring to each passes from the signal pole through the attachment hardware to the signal head. Refer to District Standard for more conductor attachment information. Attachment methods not shown on the district standard are to be approved by the Construction Observer before work begins. Use UV rated tie wraps.

Ensure the signal heads are made of aluminum and are hooded and covered until the signal system is put into operation.

Each signal head will be one-way with the proper number of sections shown on the plans. Each head color will be bright yellow (Federal Yellow #13538 of Federal Standard 595). The inside of the visors will have a flat black finish.

Installed traffic signal heads within the project will have backplates unless otherwise shown on the plans. Backplates will be black aluminum.

Provide pedestrian signal head assemblies, which have a flush "egg-crated" or "Z" pattern visor for all lamps, and a one-piece reflector assembly for incandescent lamps only.

Provide louvers, which have five (5) vanes with a black finish on inside surfaces when required within the project. Fasten a hardware cloth screen, securely, with ⅝" or smaller mesh size to the front face of each louver to prevent entry by birds.

Mount signal heads level and plumb as directed.

Replace, at Contractor's expense, all burned out or defective lamps for a period of four (4) weeks from the date of the initial turn on. At the end of this 4-week period, the Construction Observer will relieve the Contractor of any maintenance of this portion of the signal system.

Use the four point mounting system (TY A) for signal heads, except in cases of skewed or vertical heads when (TY B) will be used.

Williamson County **Sheet:** L
Project: New Traffic Signal at CR 119 / Limmer Loop

Place LED's at the proper angle with the ground. The wording "top" or the "up arrow" indicates the proper fixed alignment within the signal head. Hang the head parallel to the ground once attached and not angled down as with incandescent heads. Ensure the signal head to be level and within tolerances. LED's are designed to direct the indication towards the roadway surface. Variance in head leveling will cause the LED indication to appear dim during slight movement. Ensure each LED head to be properly leveled and sight tested before final acceptance.

ITEM 684 – TRAFFIC SIGNAL CABLES
Leave at least two (2) feet for each cable run in each pull box and leave at least two (2) feet in each steel pole in addition to the required length for each separate cable. Provide an extra five (5) feet of each conductor terminating in the controller cabinet. Ensure conductors are continuous without splice from terminal point to terminal point or as directed. Do not use wire nuts.

Provide a separate multi-conductor signal cable (14 AWG) inside pedestal poles and mast-arm signal poles from the terminal strip to each signal head as shown on the plans.

ITEM 686 – TRAFFIC SIGNAL POLE ASSEMBLIES (STEEL)
Provide and install damping plates on all mast arms of 40 ft. and over. For mast arms less than 40 ft., refer to SMA and DMA Vibration Notes for guidance. Consider the cost for the provision and installation of damping plates as subsidiary to the various bid Items found within this project.

Provide double nuts on top and bottom of the base plate as shown on the standards.

Provide signal pole assemblies as shown on plans. Luminaire lamps and the installation of the arms and lamps are considered subsidiary to the pertinent Items.

When luminaires are to be installed on mast arm poles, provide a separate terminal strip in the signal pole access compartment. The terminal strip shall be a 4-circuit Buchanan-Type 104SN, Kulka-Type 985-GP-4 CU, or equivalent.

Provide a 10-amp time-delay fuse for traffic signal poles onto which luminaires are to be installed. Place the fuse in the fuse block indicated within note #4 found on State standard MA-D-12.

ITEM 687 – PEDESTAL POLE ASSEMBLIES
Furnish and install pedestal pole assemblies as shown on plans. Furnish all other materials, tools, and labor required to provide a completed installation in accordance with the plans and specifications. Furnished materials provided by the Contractor will be new undepreciated stock.

ITEM 688 – PEDESTRIAN DETECTORS AND VEHICLE LOOP DETECTORS
Pedestrian push buttons will be mounted at a height of 3'-6" (42") above the sidewalk or landing and will be of the type that have permanent-type signs within the detector unit (9" x 12" sign & push button station on Signal Poles and 5" x 7" sign & push button station on Pedestrian Poles), which explains their purpose and indicates which crosswalk signal is actuated.

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GENERAL NOTES
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STATE	COUNTY	CITY	SHEET NO.
TEXAS	WILLIAMSON	HUTTO	7
PROJECT NO.		ROADWAY	

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Repair or replace any push button detector, which proves to be inoperable for a period of four (4) weeks from the initial flash turn on date. At the end of this 4-week period, the Construction Observer will relieve the Contractor of any maintenance of this portion of the signal system.

Pedestrian Push buttons will be of substantial tamper proof construction. The push button will be ADA and TS 2 compliant. The push button will have a powder coated aluminum bezel with stainless steel actuator. The push button will utilize a momentary contact solid-state switching mechanism. The push button will provide visual and audible feedback to the pedestrian. The low movement push button will be functional in icing conditions. All fastening hardware will be stainless steel.

Provide the traffic signal cable (TY C) (2 Cndr) (12 AWG) necessary to install the push buttons.

The audible feedback will be solely a confirmation chirp, be able to be turned on and off, and not conflict with any ADA issues.

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 Department.

ITEM 6002 – VIDEO IMAGING VEHICLE DETECTION SYSTEM (VIVDS)
Install the VIVDS cameras onto the mast arms with the attachment mechanisms provided with the camera system. Place the traffic signal cable (TY A) (3-conductor) (16 AWG) and the VIVDS communication cable coaxial in continuous and separate runs from each VIVDS camera to the controller. Consider the costs associated with the above work subsidiary to the pertinent Items.

Aim and adjust the cameras, install the cables and VIVDS cards into the controller cabinet and complete any other necessary work to bring the traffic signal into operation.

Provide the traffic signal cable and coaxial cable above and any incidentals necessary to install them.

Provide a Video Processor System (VPS) that can provide up to 32 detector outputs to the controller from up to eight (8) camera/video processor units (C/VPU). Route the detector outputs through the Bus Interface Unit (BIU) or approved product, which replaces the functions of the BIU. Field of view for each C/VPU shall provide a minimum of 32 virtual detection zones for vehicle detection.

Provide 5 cameras for this project, including one (1) spare camera.

Provide a set-up system. Load required set-up software onto all of the District Signal Shop's notebook computers and provide all necessary licensing. Computers shall not be provided by the Contractor as part of the set-up system.

Provide and install all cables necessary to provide complete VIVDS operation. Provide a minimum of 10 cables to direct connect the notebook to the VIVDS port.

Phase red and green load switch outputs from up to 16 phases of a NEMA TS2 Type 2 controller shall be provided as inputs to the VPU for use with internal detector extend/delay timing functions. The C/VPU shall be able to condition the detector outputs and detection zones based on the state of the associated phase number and color.

The serial communication port on the front of the VPU shall be a DB-9 RS-232 connector. Supply a package that will operate with Windows XP and NT and provide the functionality defined in both sections 7.0 and 8.0 in both a direct connect and remote communications mode. The software resident in the VPU and the personal computer shall be capable of transmitting and receiving all information needed for zone set up, monitoring vehicle detection by viewing flashing detection zone overlays, and uploading/downloading and interrogating all stored data within the VPU. Remote communications with the VCU shall be possible with the addition of external communication devices (modem, Codec, etc.) using the RS-232 and video output ports on the front of the VPU.

The VPU operational software shall be stored internally in flash memory and be capable of being updated without the removal and replacement of memory devices.

Provide surge protection in the controller cabinet protecting the camera video and power inputs/outputs. All surge protection shall be DIN rail mounted.

Install the VIVDS detection zones as directed. Have qualified personnel on site at the time of the signal turn-on to assist with the installation of detection zones.

If the camera locations shown in the plans do not allow for proper sight of the proposed detection zones, relocate the cameras as needed and as directed. This labor and material cost will not be paid separately, but is subsidiary to this Item.

The video output from the C/VPU shall be in color or black/white with active detection zones overlaid on full motion video.

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1			
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Engineer BRIAN D. VAN DE WALLE
P.E. No. 68525 Date 8/25/2017
8/25/2017

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WILLIAMSON COUNTY
CR 119 & LIMMER LOOP

GENERAL NOTES
(7 OF 8)

STATE	COUNTY	CITY	SHEET NO.
TEXAS	WILLIAMSON	HUTTO	8
PROJECT NO.		ROADWAY	

FILENAME: \\AUSFP01\Data\Project\AUS*TPTO\068501514 - CR 119 Limmer Loop Signal Design\CAD\SHEETS\CR119gen1.dgn 8/25/2017 11:28:21 AM

Williamson County **Sheet:** O
Project: New Traffic Signal at CR 119 / Limmer Loop

Required Items for ITEM 6002 – VIDEO IMAGING VEHICLE DETECTION SYSTEM:

Spec. Item	Description	Not Required	Required	State Supplied
2.F	REMOTE COMMUNICATIONS LINK	**X**		
5.0	VIVDS PROCESSOR UNIT		**1**	
6.A	CAMERA ASSEMBLY		**5**	
7.0	FIELD COMMUNICATIONS LINK			
	6 Twisted-Pair Cable / 18 AWG	**X**		
	Coaxial Cable w/Three (3) 16 AWG CNDRS		**X**	
	Fiber Optic Cable	**X**		
8.0	VIVDS SET-UP SYSTEM			
	Field PC	**X**		
	Field Software for District Shop laptops		**X**	
	Field Video Monitor / Ea. Inter.		**X**	
9.0	TEMPORARY USE AND RETESTING	**X**		
10.0	OPERATION FROM CENTRAL			
	Workstation Computer & Peripherals	**X**		
	Central Control Software	**X**		
11.0	INSTALLATION AND TRAINING			
	Eight (8) Hours		**X**	
	Sixteen (16) Hours	**X**		

Williamson County **Sheet:** P
Project: New Traffic Signal at CR 119 / Limmer Loop

The list of material below is for the Contractor's information only.
It is the responsibility of the Contractor to verify all items and quantities listed below.

LIST OF MATERIAL/LABOR
SUBSIDIARY TO ITEM 680

DESCRIPTION	UNIT	QUANTITY
8 FT LUMINAIRE ARM	EA	3
250W HPS LUMINAIRE	EA	3
8 PHASE NEMA CONTROLLER COMPLETE W/ CABINET AND ACCESSORIES	EA	1
REGULATORY SIGN PANEL (R10-17)	EA	4
SINGLE STREET NAME SIGN PANEL	EA	4
REMOVE EXISTING STOP SIGN PANEL	EA	4
CONCRETE PAD (8' X 9' X 6", Class B)	SF	72

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CR 119 & LIMMER LOOP

GENERAL NOTES
(8 OF 8)

STATE	COUNTY	CITY	SHEET NO.
TEXAS	WILLIAMSON	HUTTO	9
PROJECT NO.		ROADWAY	

FILENAME: \\AUSFP01\Data\Project\AUS*TPTO\068501514 - CR 119 Limmer Loop Signal Design\CADD\SHEETS\CR119gn01.dgn 8/25/2017 11:28:30 AM

ESTIMATED QUANTITIES				
ITEM	CODE	DESCRIPTION	UNIT	QUANTITY
0416	6003	DRILL SHAFT (30 IN)	LF	34
0416	6004	DRILL SHAFT (36 IN)	LF	15
0618	6046	CONDT (PVC) (SCH 80) (2")	LF	555
0618	6047	CONDT (PVC) (SCH 80) (2") (BORE)	LF	1,160
0620	6007	ELEC CONDR (NO.8) BARE	LF	1,580
0620	6008	ELEC CONDR (NO.8) INSULATED	LF	1,650
0620	6009	ELEC CONDR (NO.6) BARE	LF	275
0620	6010	ELEC CONDR (NO.6) INSULATED	LF	550
0624	6010	GROUND BOX TY D (162922)W/APRON	EA	3
0624	6014	GROUND BOX TY 1 (122422)W/APRON	EA	5
0628	6229	ELC SRV TY D 120/240 100(NS)GS(N)TP(O)	EA	1
0636	6001	ALUMINUM SIGNS (TY A)	SF	58
0666	6048	REFL PAV MRK TY I (W)24"(SLD)(100MIL)	LF	50
0680	6002	INSTALL HWY TRF SIG (ISOLATED)	EA	1
0682	6001	VEH SIG SEC (12")LED(GRN)	EA	8
0682	6002	VEH SIG SEC (12")LED(GRN ARW)	EA	4
0682	6003	VEH SIG SEC (12")LED(YEL)	EA	8
0682	6004	VEH SIG SEC (12")LED(YEL ARW)	EA	8
0682	6005	VEH SIG SEC (12")LED(RED)	EA	8
0682	6006	VEH SIG SEC (12")LED(RED ARW)	EA	4
0682	6023	BACK PLATE (12")(3 SEC)	EA	8
0682	6024	BACK PLATE (12")(4 SEC)	EA	4
0684	6031	TRF SIG CBL (TY A)(14 AWG)(5 CONDR)	LF	801
0684	6033	TRF SIG CBL (TY A)(14 AWG)(7 CONDR)	LF	816
0686	6029	INS TRF SIG PL AM (S)1 ARM(28')	EA	1
0686	6031	INS TRF SIG PL AM(S)1 ARM(28')LUM	EA	1
0686	6035	INS TRF SIG PL AM(S)1 ARM(32')LUM	EA	1
0686	6051	INS TRF SIG PL AM(S)1 ARM(48')LUM	EA	1
6002	6001	VIVDS PROCESSOR SYSTEM	EA	1
6002	6002	VIVDS CAMERA ASSEMBLY	EA	5
6002	6003	VIVDS SET-UP SYSTEM	EA	1
6002	6004	VIVDS CENTRAL CONTROL	EA	1
6002	6005	VIVDS COMMUNICATION CABLE (COAXIAL)	LF	806
6058	6001	BATTERY BACK-UP SYSTEM FOR SIGNAL CABINETS	EA	1

ESTIMATED QUANTITIES (ALTERNATE BID)				
ITEM	CODE	DESCRIPTION	UNIT	QUANTITY
0132	6001	EMBANKMENT (FINAL)(ORD COMP)(TY A)	CY	65
0162	6002	BLOCK SODDING	SY	292
0416	6002	DRILL SHAFT (24 IN)	LF	10
0432	6041	RIPRAP (SPECIAL)	CY	4.5
0531	6008	CURB RAMPS (TY 5)	EA	4
0618	6046	CONDT (PVC) (SCH 80) (2")	LF	140
0666	6042	REFL PAV MRK TY I (W)12"(SLD)(100MIL)	LF	180
0682	6018	PED SIG SEC (LED)(COUNTDOWN)	EA	8
0684	6031	TRF SIG CBL (TY A)(14 AWG)(5 CONDR)	LF	1,102
0684	6082	TRF SIG CBL (TY A)(18 AWG)(2 CONDR)	LF	1,274
0687	6001	PED POLE ASSEMBLY	EA	4
0688	6001	PED DETECT PUSH BUTTON (APS)	EA	8
0688	6003	PED DETECTOR CONTROLLER UNIT	EA	1
*9999	6001	PED POLE SPREAD FOOTING	EA	2

* QUANTITY SUBSIDIARY TO ITEM 687

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8/25/2017

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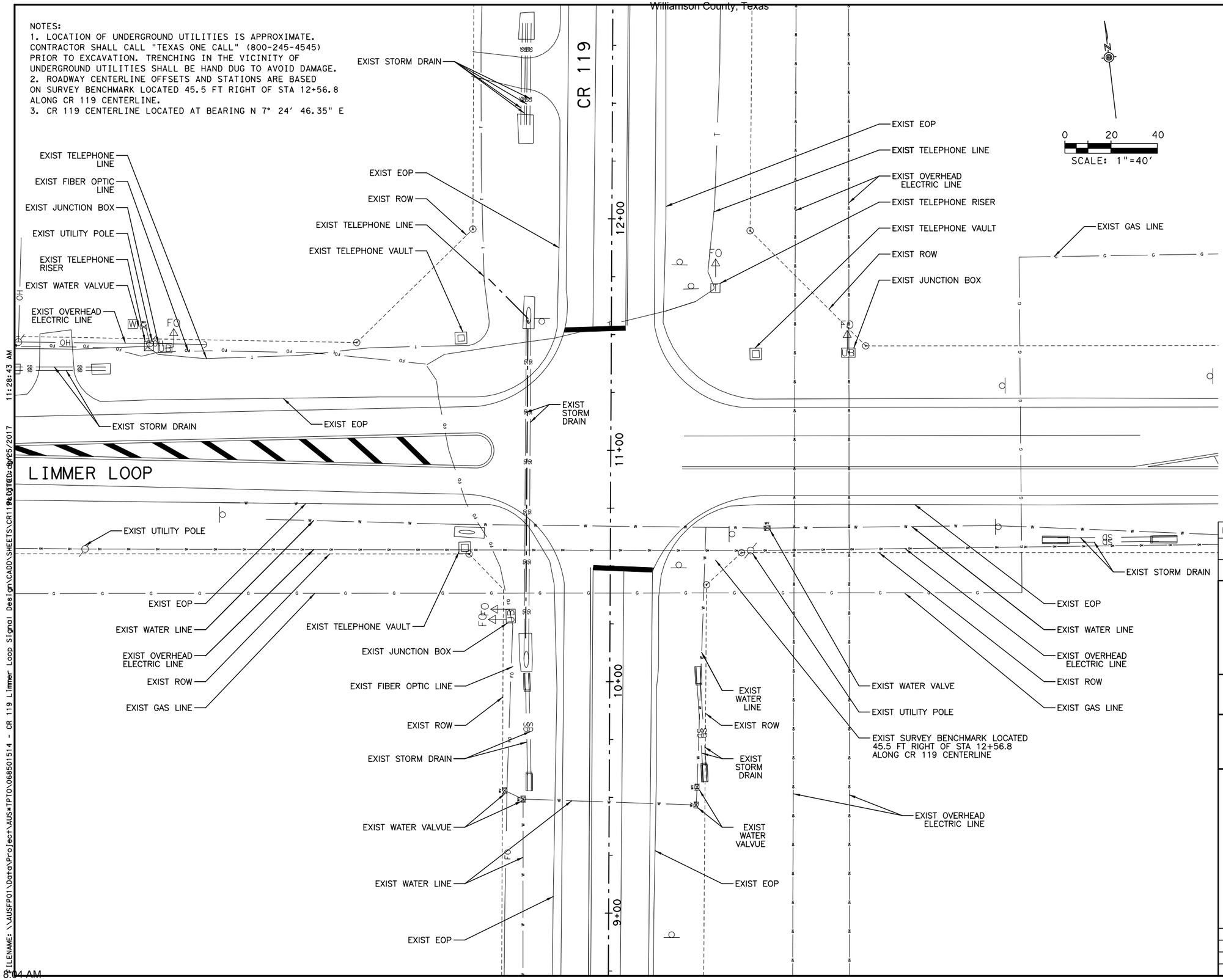
WILLIAMSON COUNTY
CR 119 & LIMMER LOOP

QUANTITIES

STATE	COUNTY	CITY	SHEET NO.
TEXAS	WILLIAMSON	HUTTO	
PROJECT NO.		ROADWAY	10

FILENAME: \\AUSFP01\Data\Project\AUS*TPTO\068501514 - CR 119 Limmer Loop Signal Design\CADD\SHEETS\CR119qu00.dgn
11:28:39 AM
9/28/2017 8:04 AM

NOTES:
1. LOCATION OF UNDERGROUND UTILITIES IS APPROXIMATE. CONTRACTOR SHALL CALL "TEXAS ONE CALL" (800-245-4545) PRIOR TO EXCAVATION. TRENCHING IN THE VICINITY OF UNDERGROUND UTILITIES SHALL BE HAND DUG TO AVOID DAMAGE.
2. ROADWAY CENTERLINE OFFSETS AND STATIONS ARE BASED ON SURVEY BENCHMARK LOCATED 45.5 FT RIGHT OF STA 12+56.8 ALONG CR 119 CENTERLINE.
3. CR 119 CENTERLINE LOCATED AT BEARING N 7° 24' 46.35" E



LEGEND

G	EXIST GAS LINE
OH	EXIST OVERHEAD ELECTRIC
FO	EXIST FIBER OPTIC CABLE
SD	EXIST STORM DRAIN
W	EXIST WATER LINE
	FIRE HYDRANT
	VALVE
	RIGHT OF WAY
T	EXIST TELEPHONE LINE
	EXIST SIGN
	EXIST GUY WIRE
WV	EXIST WATER VALVE
W	EXIST WATER METER
	EXIST IRRIGATION CONTROL VALVE
	EXIST UTILITY POLE
WW	EXIST WASTEWATER MANHOLE
FO	EXIST FIBER OPTIC MARKER

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CR 119 & LIMMER LOOP

EXISTING CONDITIONS LAYOUT

SCALE: 1" = 40'

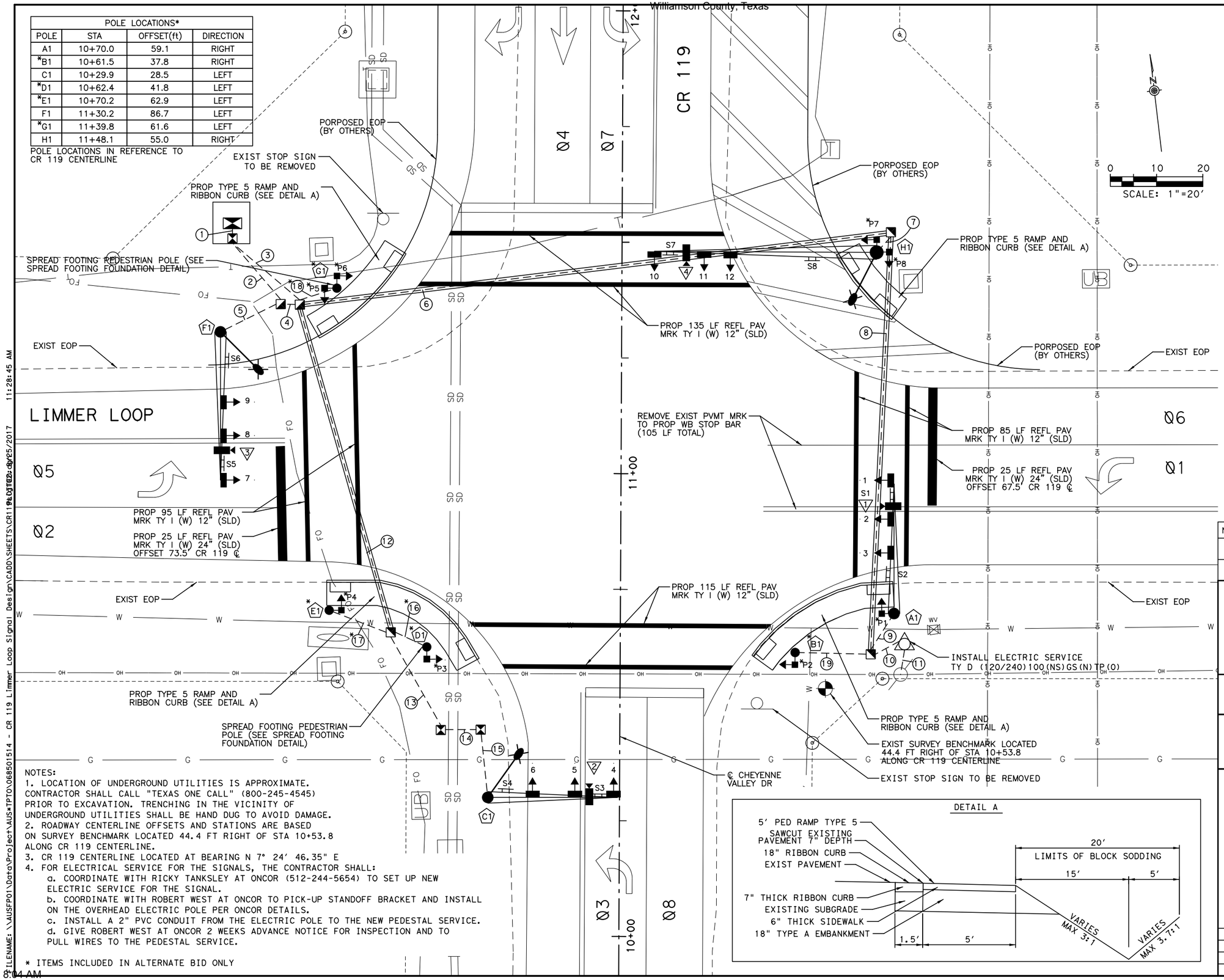
STATE	COUNTY	CITY	SHEET NO.
TEXAS	WILLIAMSON	HUTTO	11
PROJECT NO.		ROADWAY	

FILENAME: \\AUSFP01\Data\Project\AUS*TPTO\068501514 - CR 119 Limmer Loop Signal Design\CADD\SHEETS\CR119_LOOP_EXIST_COND.dgn 8/25/2017 11:28:43 AM

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POLE LOCATIONS*			
POLE	STA	OFFSET(ft)	DIRECTION
A1	10+70.0	59.1	RIGHT
*B1	10+61.5	37.8	RIGHT
C1	10+29.9	28.5	LEFT
*D1	10+62.4	41.8	LEFT
*E1	10+70.2	62.9	LEFT
F1	11+30.2	86.7	LEFT
*G1	11+39.8	61.6	LEFT
H1	11+48.1	55.0	RIGHT

POLE LOCATIONS IN REFERENCE TO CR 119 CENTERLINE



NOTES:
1. LOCATION OF UNDERGROUND UTILITIES IS APPROXIMATE. CONTRACTOR SHALL CALL "TEXAS ONE CALL" (800-245-4545) PRIOR TO EXCAVATION. TRENCHING IN THE VICINITY OF UNDERGROUND UTILITIES SHALL BE HAND DUG TO AVOID DAMAGE.
2. ROADWAY CENTERLINE OFFSETS AND STATIONS ARE BASED ON SURVEY BENCHMARK LOCATED 44.4 FT RIGHT OF STA 10+53.8 ALONG CR 119 CENTERLINE.
3. CR 119 CENTERLINE LOCATED AT BEARING N 7° 24' 46.35" E
4. FOR ELECTRICAL SERVICE FOR THE SIGNALS, THE CONTRACTOR SHALL:
   a. COORDINATE WITH RICKY TANKSLEY AT ONCOR (512-244-5654) TO SET UP NEW ELECTRIC SERVICE FOR THE SIGNAL.
   b. COORDINATE WITH ROBERT WEST AT ONCOR TO PICK-UP STANDOFF BRACKET AND INSTALL ON THE OVERHEAD ELECTRIC POLE PER ONCOR DETAILS.
   c. INSTALL A 2" PVC CONDUIT FROM THE ELECTRIC POLE TO THE NEW PEDESTAL SERVICE.
   d. GIVE ROBERT WEST AT ONCOR 2 WEEKS ADVANCE NOTICE FOR INSPECTION AND TO PULL WIRES TO THE PEDESTAL SERVICE.

* ITEMS INCLUDED IN ALTERNATE BID ONLY

DETAIL A

LEGEND

- SIGNAL HEAD & LABEL
- SIGNAL POLE & MAST ARM
- VIVDS CAMERA
- ILSN SIGN
- MAST ARM SIGN
- PED-POLE
- PED RAMP
- ELECTRICAL SERVICE
- SIGNAL CABINET
- TYPE D GROUND BOX
- TYPE 1 GROUND BOX
- CONDUIT-TRENCHED
- CONDUIT-BORED
- LUMINAIRE
- RADIO
- OPTICOM
- SIGNAL POLE LABEL
- VIVDS LABEL
- CONDUIT LABEL
- RAISED PVMT MARKER
- EXIST GAS LINE
- EXIST OVERHEAD ELECTRIC
- EXIST FIBER OPTIC CABLE
- EXIST STORM DRAIN
- EXIST WATER LINE
- FIRE HYDRANT
- VALVE
- RIGHT OF WAY
- EXIST TELEPHONE LINE
- EXISTING SIGN

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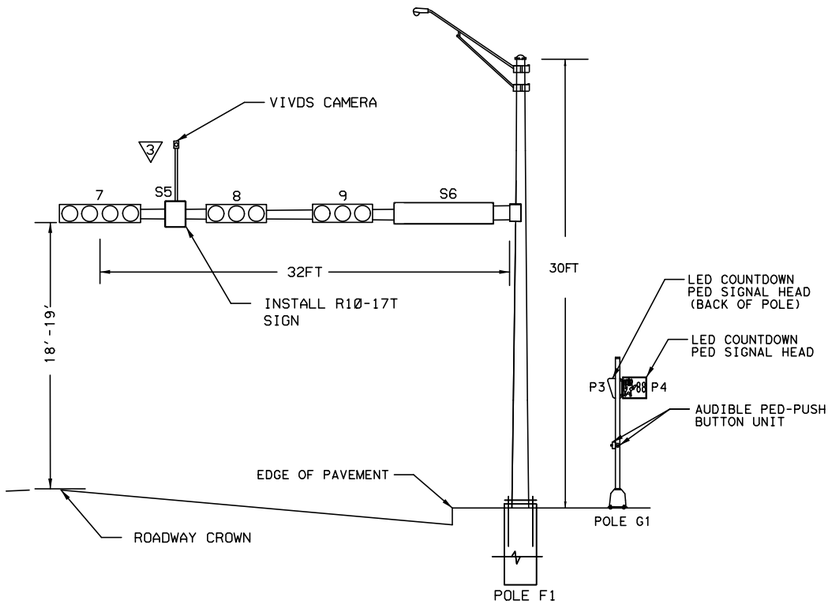
WILLIAMSON COUNTY
CR 119 & LIMMER LOOP

PROPOSED SIGNAL LAYOUT

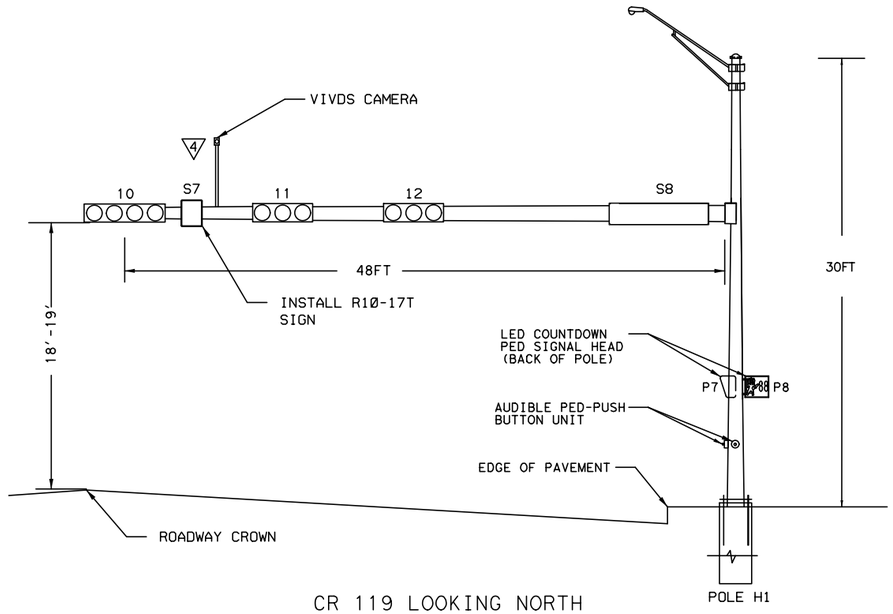
SCALE: 1" = 20'

STATE	COUNTY	CITY	SHEET NO.
TEXAS	WILLIAMSON	HUTTO	12
PROJECT NO.		ROADWAY	

FILENAME: \\AUSFP01\Data\Project\AUS*TPTO\068501514 - CR 119 Limmer Loop Signal Design\CADD\SHEETS\CR119_SIGLAY01.dgn 8/25/2017 11:28:45 AM

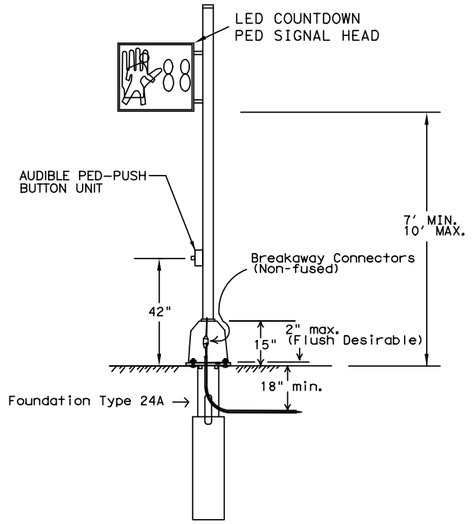


LIMMER LOOP LOOKING WEST

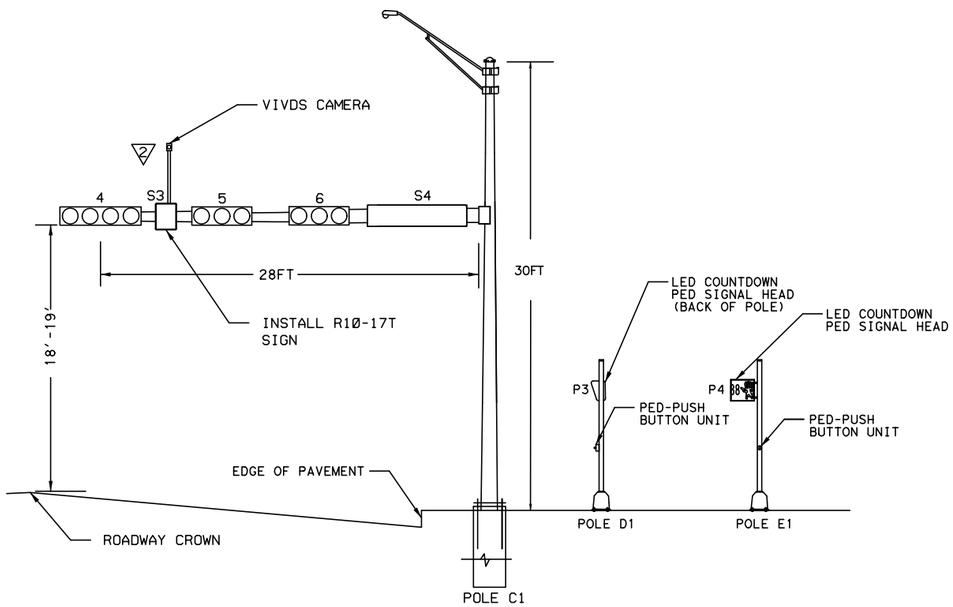


CR 119 LOOKING NORTH

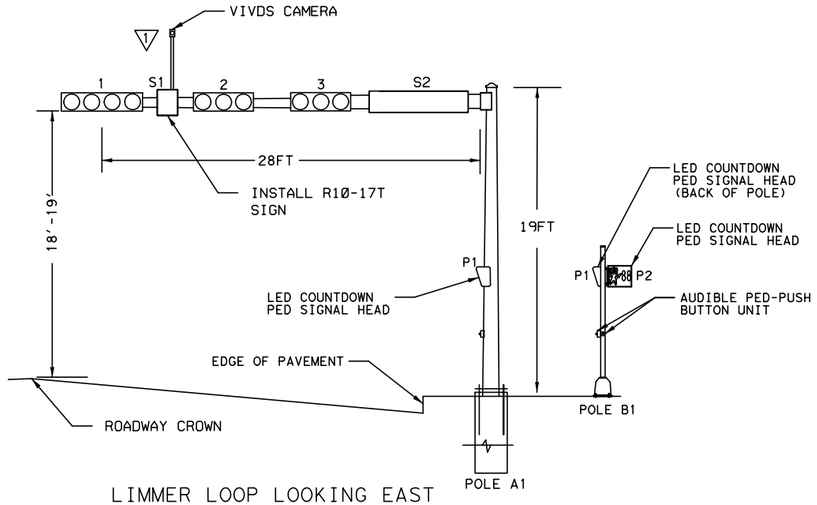
NOTES:
1. ADJUST TOP OF SIGNAL POLE FOUNDATIONS TO BE LEVEL WITH CROWN OF ROADWAY.



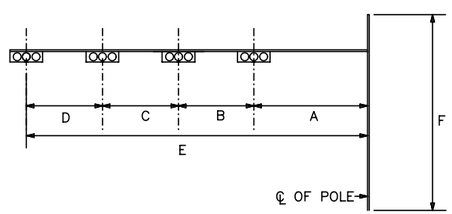
PEDESTRIAN POLE DETAILS
POLES B1(P2), E1(P4)
(SEE SPREAD FOOTING DETAIL FOR POLES G1 AND D1)



CR 119 LOOKING SOUTH



LIMMER LOOP LOOKING EAST



POLE	TYPE	MAST ARM	FDN	A	B	C	D	E	F
A1	28-80	28 III-80	30-A	12	7.5	8.5	-	28	19
C1	28L-80	28 III-80	30-A	9.5	9.0	8.5	-	28	30
F1	32L-80	32 III-80	30-A	15.0	7.0	9.5	-	32	30
H1	48L-80	48 III-80	36-A	31.5	5.5	11.0	-	48	30

NOT TO SCALE

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SIGNAL ELEVATIONS

STATE	COUNTY	CITY	SHEET NO.
TEXAS	WILLIAMSON	HUTTO	13
PROJECT NO.		ROADWAY	

FILENAME: \\AUSFP01\Data\Project\AUS\TPTO\068501514 - CR 119 Limmer Loop Signal Design\CADD\SHEETS\CR119LimmerLoop_SignalElevations.dgn 8/25/2017 11:28:47 AM

PERMANENT CABLE TERMINATION CHART

STATUS		INSTALL	INSTALL	INSTALL*	INSTALL*	INSTALL*	INSTALL*	INSTALL	INSTALL	INSTALL*	INSTALL*	INSTALL*	INSTALL*	INSTALL	INSTALL	INSTALL*	INSTALL*	INSTALL*	INSTALL*	INSTALL*	INSTALL*	INSTALL	INSTALL
CNDR NO.	CONDUCTOR COLOR	CABLE 1 5 CNDR FROM A1 TO CNTRL	CABLE 2 7 CNDR FROM A1 TO CNTRL	CABLE 3 2 CNDR FROM A1 TO CNTRL	CABLE 4 5 CNDR FROM A1 TO CNTRL	CABLE 5 2 CNDR FROM B1 TO CNTRL	CABLE 6 5 CNDR FROM B1 TO CNTRL	CABLE 7 5 CNDR FROM C1 TO CNTRL	CABLE 8 7 CNDR FROM C1 TO CNTRL	CABLE 9 2 CNDR FROM D1 TO CNTRL	CABLE 10 5 CNDR FROM D1 TO CNTRL	CABLE 11 2 CNDR FROM E1 TO CNTRL	CABLE 12 5 CNDR FROM E1 TO CNTRL	CABLE 13 5 CNDR FROM F1 TO CNTRL	CABLE 14 7 CNDR FROM F1 TO CNTRL	CABLE 15 2 CNDR FROM G1 TO CNTRL	CABLE 16 2 CNDR FROM G1 TO CNTRL	CABLE 17 5 CNDR FROM G1 TO CNTRL	CABLE 18 2 CNDR FROM H1 TO CNTRL	CABLE 19 2 CNDR FROM H1 TO CNTRL	CABLE 20 5 CNDR FROM H1 TO CNTRL	CABLE 21 5 CNDR FROM H1 TO CNTRL	CABLE 22 7 CNDR FROM H1 TO CNTRL
1	BLACK	SH 2, 3 Y PHASE 02	SH 1 Y ARW PHASE 05	PED CALL PHASE 08	SPARE	PED CALL PHASE 02	P2 DW PHASE 02	SH 5, 6 Y PHASE 04	SH 4 Y ARW PHASE 07	PED CALL PHASE 02	P3 DW PHASE 02	PED CALL PHASE 04	SPARE	SH 8, 9 Y PHASE 06	SH 7 Y ARW PHASE 01	PED CALL PHASE 04	PED CALL PHASE 06	P6 DW PHASE 06	PED CALL PHASE 06	PED CALL PHASE 08	P7 DW PHASE 06	SH 11, 12 Y PHASE 08	SH 10 Y ARW PHASE 03
2	WHITE	SH COM	SH COM	PED COM	PED COM	PED COM	PED COM	SH COM	SH COM	PED COM	PED COM	PED COM	PED COM	SH COM	SH COM	PED COM	PED COM	PED COM	PED COM	PED COM	PED COM	SH COM	SH COM
3	RED	SH 2, 3 R PHASE 02	SH 1 R ARW PHASE 05	NA	P1 DW PHASE 08	NA	SPARE	SH 5, 6 R PHASE 04	SH 4 R ARW PHASE 07	NA	SPARE	NA	P4 DW PHASE 04	SH 8, 9 R PHASE 06	SH 7 R ARW PHASE 01	NA	NA	P5 DW PHASE 04	NA	NA	P8 DW PHASE 08	SH 11, 12 R PHASE 08	SH 10 R ARW PHASE 03
4	GREEN	SH 2, 3 G PHASE 02	SH 1 G ARW PHASE 05	NA	P1 W PHASE 08	NA	SPARE	SH 5, 6 G PHASE 04	SH 4 G ARW PHASE 07	NA	SPARE	NA	P4 W PHASE 04	SH 8, 9 G PHASE 06	SH 7 G ARW PHASE 01	NA	NA	P5 W PHASE 04	NA	NA	P8 W PHASE 08	SH 11, 12 G PHASE 08	SH 10 G ARW PHASE 03
5	ORANGE	SPARE	SH 1 Y FLS ARW PHASE 06	NA	SPARE	NA	P2 W PHASE 02	SPARE	SH 4 Y FLS ARW PHASE 07	NA	P3 W PHASE 02	NA	SPARE	SPARE	SH 7 Y FLS ARW PHASE 02	NA	NA	P6 W PHASE 06	NA	NA	P7 W PHASE 06	SPARE	SH 10 Y FLS ARW PHASE 04
6	BLUE	NA	SPARE	NA	NA	NA	NA	NA	SPARE	NA	NA	NA	NA	NA	SPARE	NA	NA	NA	NA	NA	NA	NA	SPARE
7	WHITE/BLACK	NA	SPARE	NA	NA	NA	NA	NA	SPARE	NA	NA	NA	NA	NA	SPARE	NA	NA	NA	NA	NA	NA	NA	SPARE

* ITEMS INCLUDED IN ALTERNATE BID ONLY

PERMANENT WIRING CHART

WIRE SIZE AND TYPE

RUN NO	ACTION	ITEM 618 CONDUIT SIZE AND TYPE			ACTION	ITEM 620 ELECTRICAL CONDUCTORS				ITEM 684 SIGNAL CABLE TYPE A				ITEM 6002 VIVDS COAX	LENGTH OF RUN	RUN NO
		2" PVC (TRENCHED)	2" PVC (BORED)	2" PVC (TRENCHED) (ALT BID)*		NO. 6 BARE	NO. 6 INSULATED	NO. 8 BARE	NO. 8 INSULATED	5 CNDR NO. 14	7 CNDR NO. 14	5 CNDR NO. 14 (ALT BID)*	2 CNDR NO. 18 (ALT BID)*			
1	I	6			I	1	2	5		4	4	6	8	4	5	1
2	I	3			I			3		4	4	6			20	2
3	I	3			I	1	2	2					8	4	25	3
4	I	3			I			3	2	3	3	6		1	10	4
5	I	3			I			3	2	1	1			1	20	5
6	I		4		I	1	2	3	4	2	2	3	4	2	135	6
7	I	3			I			3	2	1	1	1	2	1	10	7
8	I		4		I	1	2	3	6	1	1	2	2	1	95	8
9	I	3			I			3		1	1	1	1	1	15	9
10	I	2			I	1	2	1	6						15	10
11	I	1			I			1							15	11
12	I		3		I			3	2	1	1	2	2	1	80	12
13	I	3			I			3	2	1	1			1	30	13
14	I	3			I			3	2	1	1			1	10	14
15	I	3			I			3	2	1	1			1	20	15
16*	I			2	I			2				1	1		15	16*
17*	I			2	I			2				1	1		20	17*
18*	I			2	I			2				1	2		15	18*
19*	I			2	I			2				1	1		20	19*
SUBTOTAL	(IN FEET)	555	1160	140		275	550	1580	1560	680	680	1060	1250	680		

I - INSTALL, E - EXISTING

* ITEMS INCLUDED IN ALTERNATE BID ONLY

INSIDE POLES	NO. 8 INSULATED	14 AWG 5/C	14 AWG 7/C	14 AWG 5/C (ALT BID)	18 AWG 2/C (ALT BID)	VIVDS COAX
A1		19	19	7	3	19
B1*				7	3	
C1	30	19	19			19
D1*				7	3	
E1*				7	3	
F1	30	19	19			19
G1*				7	6	
H1	30	19	19	7	6	19
SUB TOTAL (IN FEET)	90	76	76	42	24	76

* ITEMS INCLUDED IN ALTERNATE BID ONLY

INSIDE ARMS	14 AWG 5/C	14 AWG 7/C	VIVDS COAX
A1	25	30	25
C1	20	30	25
F1	25	35	30
H1	40	50	45
SUB TOTAL (IN FEET)	110	145	125

ELECTRICAL SERVICE DATA NO. 1

SERVICE TYPE	ELECTRICAL SERVICE DESCRIPTION	SERVICE CONDUIT SIZE (RMC)	SERVICE CONDUCTORS NO/ SIZE	MAIN DISCONNECT CKT.BRK. POLE/AMP	TWO POLE CONTACTOR AMPS	PANEL B.D/ LOADCENTER AMP RATING (MIN)	CIRCUIT NO.	BRANCH CKT./BRK POLE AMPS	BRANCH CIRCUIT AMPS	KVA LOAD
TYPE D	ELEC SERV TY D(120/240)100(NS)GS(N)TP(O)	1 1/4"	3/#6	2P/100	0	100	SIGNAL	1P/40	30	8.4
							ILLUMINATION	2P/15	10	

95%

NO.	REVISION	BY	DATE
1			
2			

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Kimley-Horn and Associates, Inc.
Firm Registration No: 928
Engineer BRIAN D. VAN DE WALLE
P.E. No. 68525 Date 8/25/2017

8/25/2017

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CR 119 & LIMMER LOOP

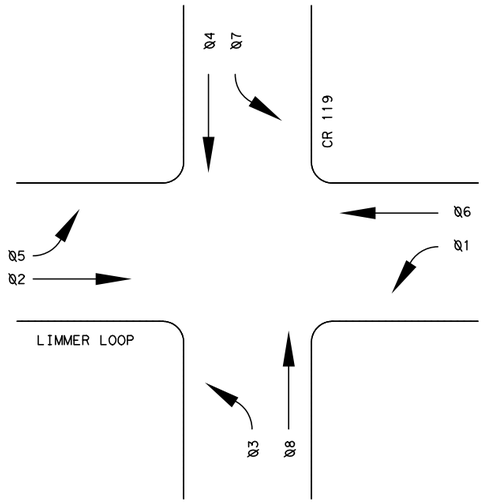
ELECTRICAL WIRING

STATE	COUNTY	CITY	SHEET NO.
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PROJECT NO.		ROADWAY	

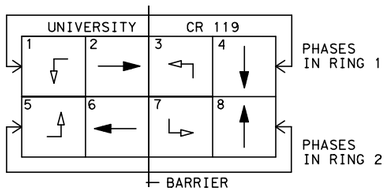
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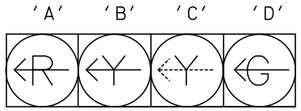
ORIENTATION VIEW



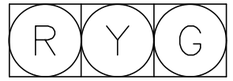
PHASING DIAGRAM



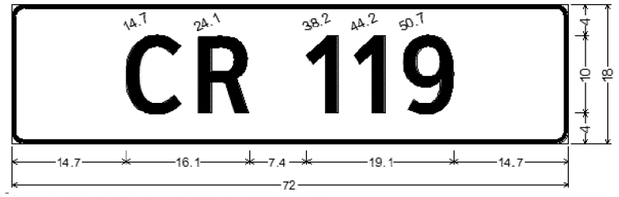
NOTES:
1. DISPLAY 'D' IS GREEN ARROW FOR THE PROTECTED LEFT-TURN PHASE.
2. DISPLAY 'C' IS TO BE CONFIGURED AS A FLASHING AMBER ARROW FOR PERMISSIVE LEFT-TURN AND IS RUN AS AN OVERLAP TIED TO THE OPPOSING THROUGH PHASE.
3. DISPLAY 'B' IS THE AMBER CLEARANCE FOR THE PROTECTED AND PERMISSIVE PHASE (OVERLAP) OF THE LEFT-TURN MOVEMENT.
4. PROVIDE MMU THAT SHALL SUPPORT THE FLASHING YELLOW ARROW OPERATION.
5. CONFIGURE MMU FOR FLASHING YELLOW ARROW PER MANUFACTURER INSTRUCTIONS.



HEAD 1,4,7,10
(HANGERS NOT SHOWN)

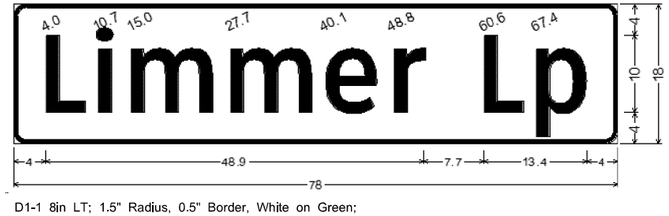


HEADS 2,3,5,6,8,9,11,12
(HANGERS NOT SHOWN)



S2, S6

D1-1 8in LT; 1.5" Radius, 0.5" Border, White on Green;
[CR 119] ClearviewHwy-3-W;

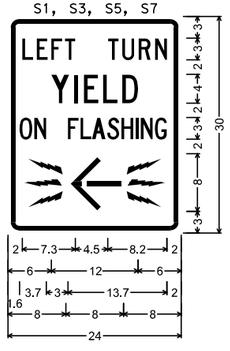


S4, S8

D1-1 8in LT; 1.5" Radius, 0.5" Border, White on Green;

[Limmer Lp] ClearviewHwy-3-W specified length;

S1, S3, S5, S7



R10-17VAR_24x30;
1.5" Radius, 0.6" Border, 0.4" Indent, Black on White;
[LEFT TURN] C;
[YIELD] C 97% spacing;
[ON FLASHING] C 50% spacing;

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Engineer BRIAN D. VAN DE WALLE
P.E. No. 68525 Date 8/25/2017
8/25/2017

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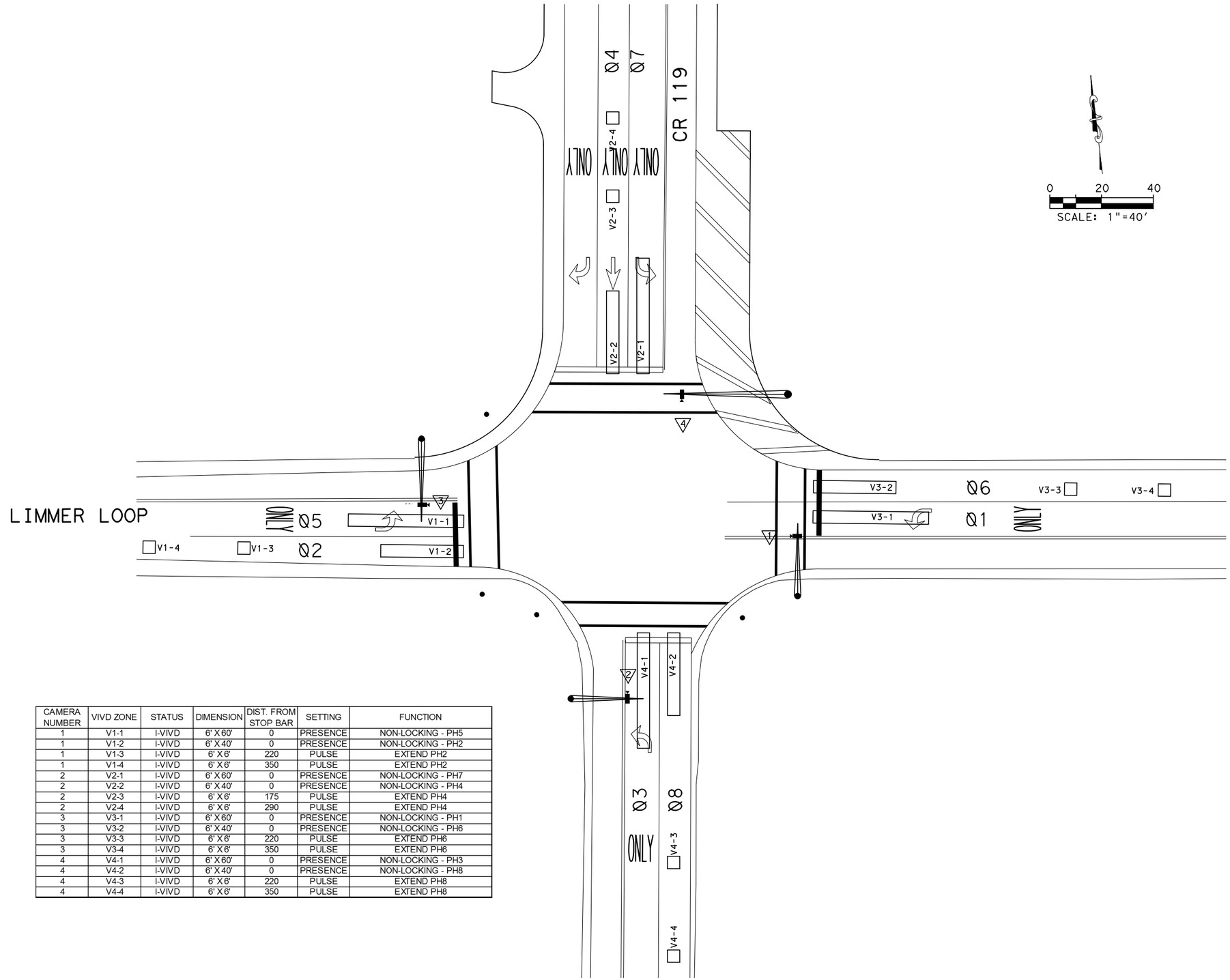
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PHASING AND SIGNS

STATE	COUNTY	CITY	SHEET NO.
TEXAS	WILLIAMSON	HUTTO	
PROJECT NO.		ROADWAY	15

FILENAME: \\AUSFP01\Data\Project\AUS*TPTO\068501514 - CR 119 Limmer Loop Signal Design\CADD\SHEETS\CR119_LOOP_SIGNAL_PHASING.dgn
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CAMERA NUMBER	VIVD ZONE	STATUS	DIMENSION	DIST. FROM STOP BAR	SETTING	FUNCTION
1	V1-1	I-VIVD	6' X 60'	0	PRESENCE	NON-LOCKING - PH5
1	V1-2	I-VIVD	6' X 40'	0	PRESENCE	NON-LOCKING - PH2
1	V1-3	I-VIVD	6' X 6'	220	PULSE	EXTEND PH2
1	V1-4	I-VIVD	6' X 6'	350	PULSE	EXTEND PH2
2	V2-1	I-VIVD	6' X 60'	0	PRESENCE	NON-LOCKING - PH7
2	V2-2	I-VIVD	6' X 40'	0	PRESENCE	NON-LOCKING - PH4
2	V2-3	I-VIVD	6' X 6'	175	PULSE	EXTEND PH4
2	V2-4	I-VIVD	6' X 6'	290	PULSE	EXTEND PH4
3	V3-1	I-VIVD	6' X 60'	0	PRESENCE	NON-LOCKING - PH1
3	V3-2	I-VIVD	6' X 40'	0	PRESENCE	NON-LOCKING - PH6
3	V3-3	I-VIVD	6' X 6'	220	PULSE	EXTEND PH6
3	V3-4	I-VIVD	6' X 6'	350	PULSE	EXTEND PH6
4	V4-1	I-VIVD	6' X 60'	0	PRESENCE	NON-LOCKING - PH3
4	V4-2	I-VIVD	6' X 40'	0	PRESENCE	NON-LOCKING - PH8
4	V4-3	I-VIVD	6' X 6'	220	PULSE	EXTEND PH8
4	V4-4	I-VIVD	6' X 6'	350	PULSE	EXTEND PH8

LEGEND

- SIGNAL HEAD & LABEL
- SIGNAL POLE & MAST ARM
- VIVDS CAMERA
- ILSN SIGN
- MAST ARM SIGN
- PED-POLE
- PED RAMP
- ELECTRICAL SERVICE
- SIGNAL CABINET
- TYPE D GROUND BOX
- TYPE 1 GROUND BOX
- CONDUIT-TRENCHED
- CONDUIT-BORED
- LUMINAIRE
- RADIO
- OPTICOM
- SIGNAL POLE LABEL
- VIVDS LABEL
- CONDUIT LABEL
- RAISED PVMT MARKER
- G — EXIST GAS LINE
- OH — EXIST OVERHEAD ELECTRIC
- FO — EXIST FIBER OPTIC CABLE
- SD — EXIST STORM DRAIN
- W — EXIST WATER LINE
- FIRE HYDRANT
- VALVE
- RIGHT OF WAY
- T — EXIST TELEPHONE LINE
- EXISTING SIGN

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Engineer BRIAN D. VAN DE WALLE
P. E. No. 68525 Date 8/25/2017

8/25/2017

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DETECTION LAYOUT

SCALE: 1" = 40'

STATE	COUNTY	CITY	SHEET NO.
TEXAS	WILLIAMSON	HUTTO	16
PROJECT NO.		ROADWAY	

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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

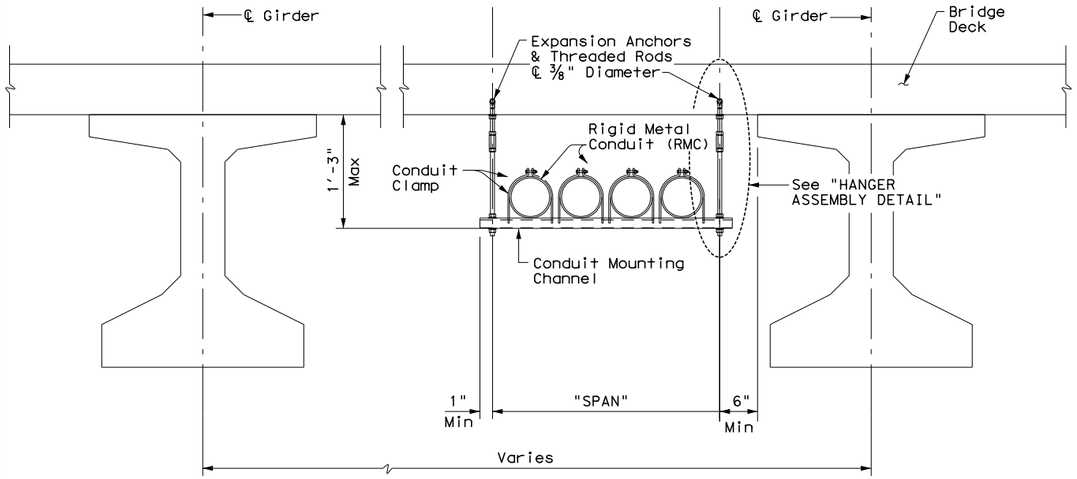
ELECTRICAL DETAILS CONDUITS & NOTES

ED(1)-14

FILE:	ed1-14.dgn	DN:	CK:	DW:	CK:
© TxDOT	October 2014	CONT	SECT	JOB	HIGHWAY
REVISIONS					
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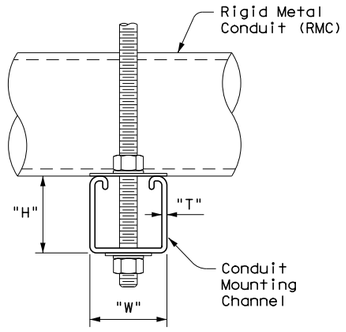
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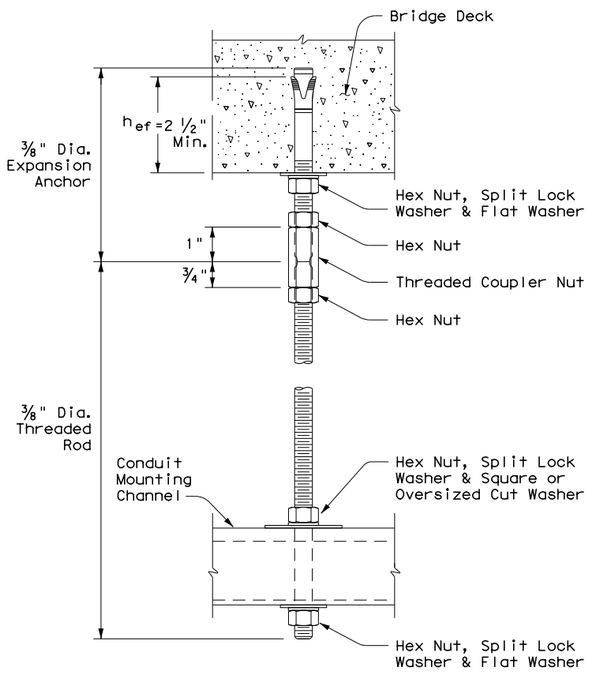


CONDUIT HANGING DETAIL

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.

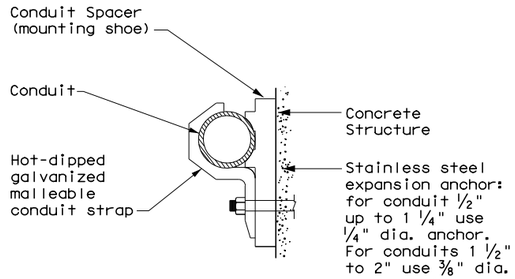
Channels with round or short slotted hole patterns are allowed, if the load carrying capacity is not reduced by more than 15%.

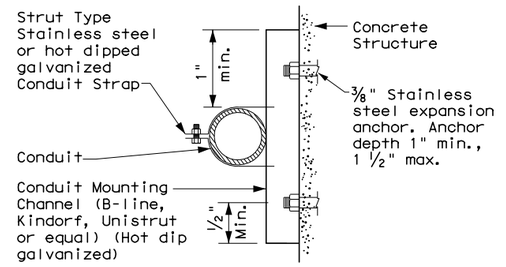




HANGER ASSEMBLY DETAIL

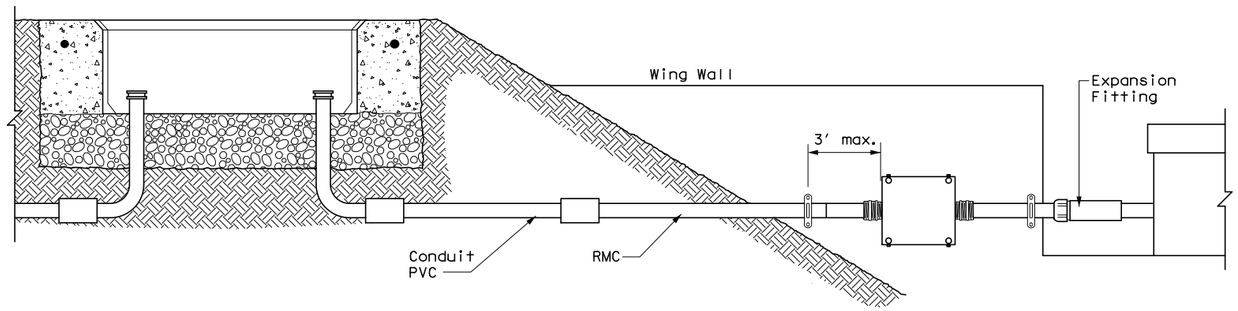
ELECTRIC CONDUIT TO BRIDGE DECK ATTACHMENT





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.

Texas Department of Transportation

Traffic Operations Division Standard

ELECTRICAL DETAILS CONDUIT SUPPORTS

ED(2)-14

FILE: ed2-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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REVISIONS				
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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.

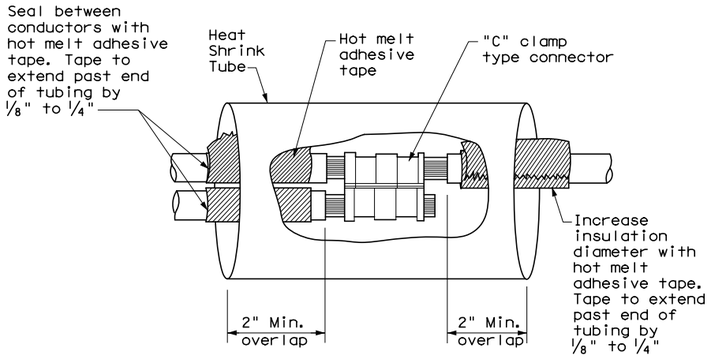
GROUND RODS & GROUNDING ELECTRODES

A. MATERIAL INFORMATION

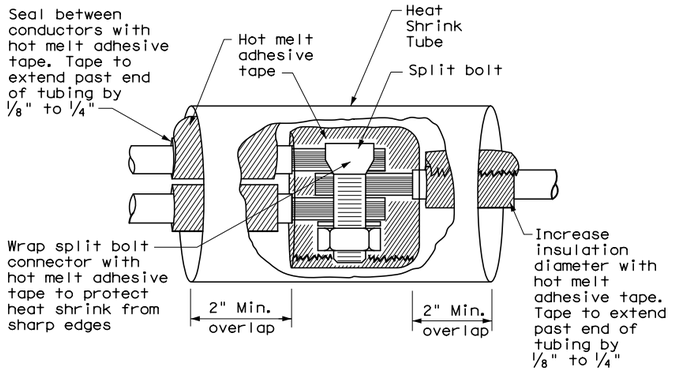
1. Provide and install a grounding electrode at electrical services. Provide ground rods according to DMS 11040 and the plans. Larger diameter or longer length rods may be called for in some specific locations, see the individual plans sheets. Concrete encased grounding electrodes may be called for in specific locations including electrical service, see individual plan sheets.

B. CONSTRUCTION METHODS

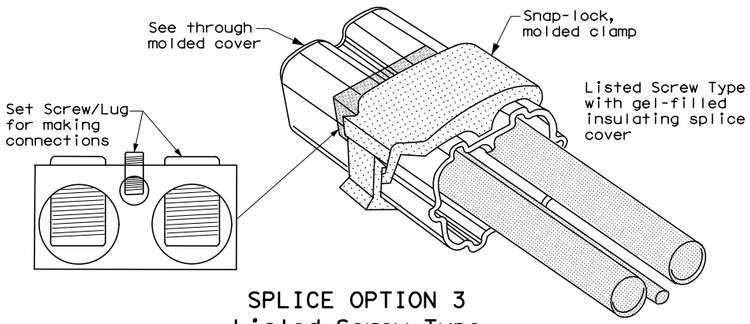
1. Furnish auxiliary ground rods for lightning protection and install in soil, concrete, or both, as called for in the plans. For ground rods installed in concrete, ensure the connection of the conductor to the ground rod is readily accessible for inspection or repairs. For ground rods installed in soil, 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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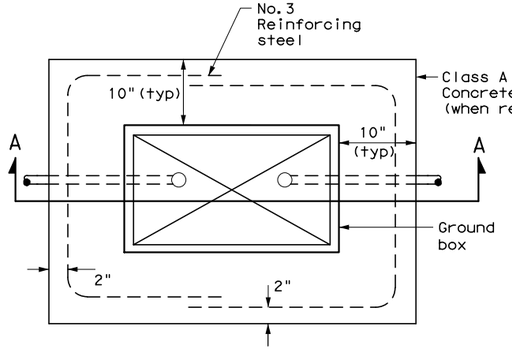
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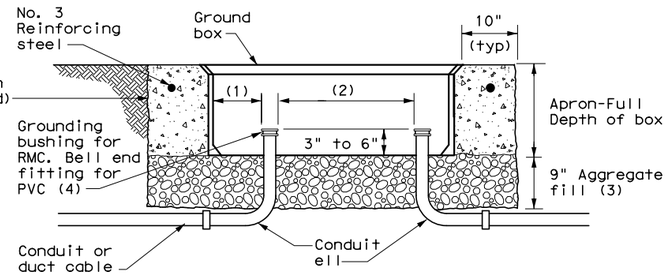
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PLAN VIEW



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.

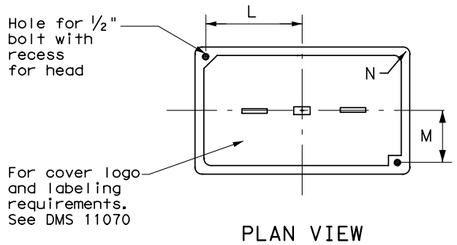
(2) Maintain sufficient space between conduits to allow for proper installation of bushing.

(3) Place aggregate under the box, not in the box. Aggregate should not encroach on the interior volume of the box.

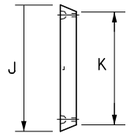
(4) Install a grounding bushing on the upper end of all RMC terminating in a ground box. Ground RMC elbows when any part of the elbow is less than 18 in. below the bottom of the ground box. Install a PVC bushing or bell end fitting on the upper end of all PVC conduits terminating in a ground box.

GROUND 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

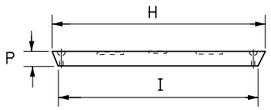
GROUND BOX COVER DIMENSIONS								
TYPE	DIMENSIONS (INCHES)							
	H	I	J	K	L	M	N	P
A, B & E	23 1/4	23	13 3/4	13 1/2	9 7/8	5 1/8	1 3/8	2
C & D	30 1/2	30 1/4	17 1/2	17 1/4	13 1/4	6 3/4	1 3/8	2



PLAN VIEW



END



SIDE

GROUND BOX COVER

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.

Texas Department of Transportation

Traffic Operations Division Standard

ELECTRICAL DETAILS
GROUND BOXES

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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	

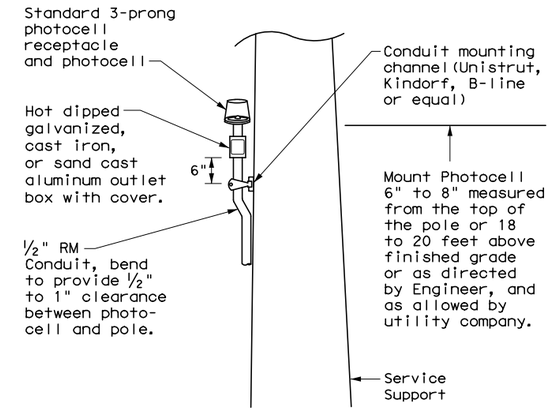
* Example only, not for construction. All new electrical services must have electrical service data chart specific to that service as shown in the plans.

** 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

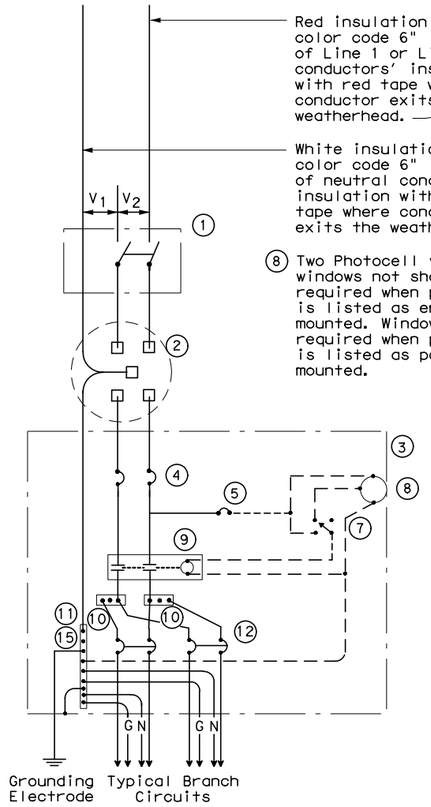
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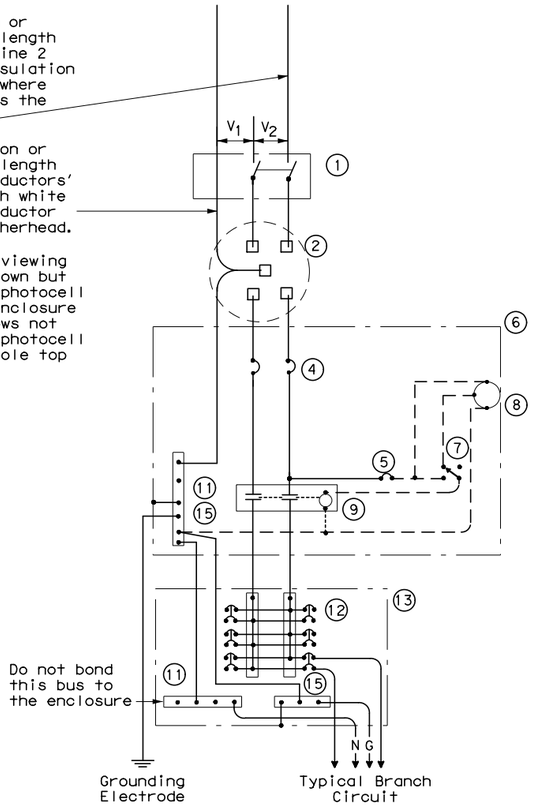
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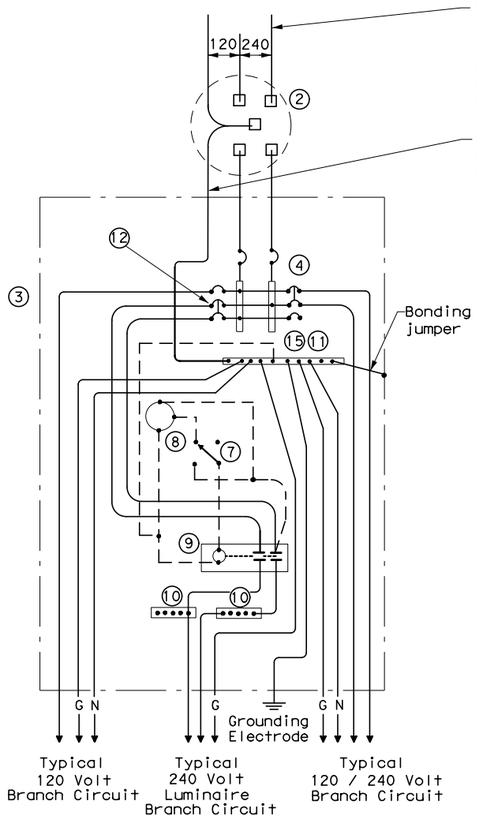


SCHEMATIC TYPE A
THREE WIRE

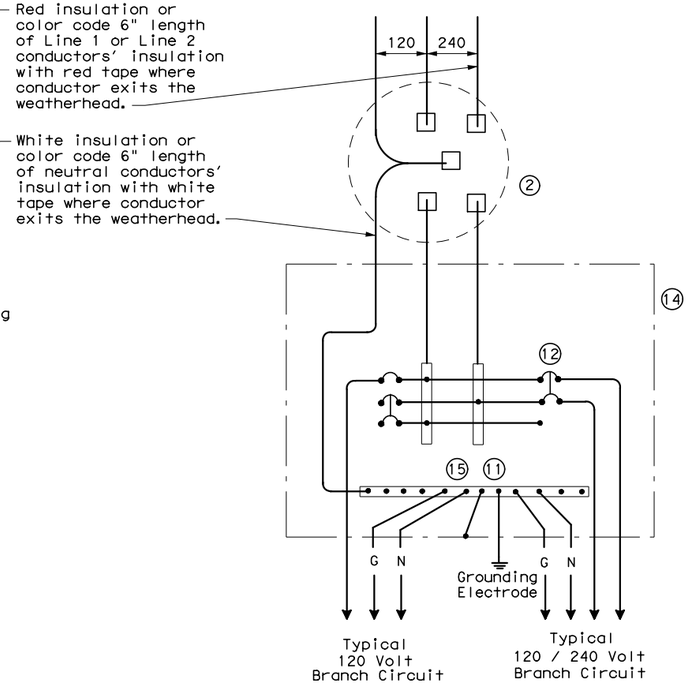
8 Two Photocell viewing windows not shown but required when photocell is listed as enclosure mounted. Windows not required when photocell is listed as pole top mounted.



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

ED(6)-14

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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.

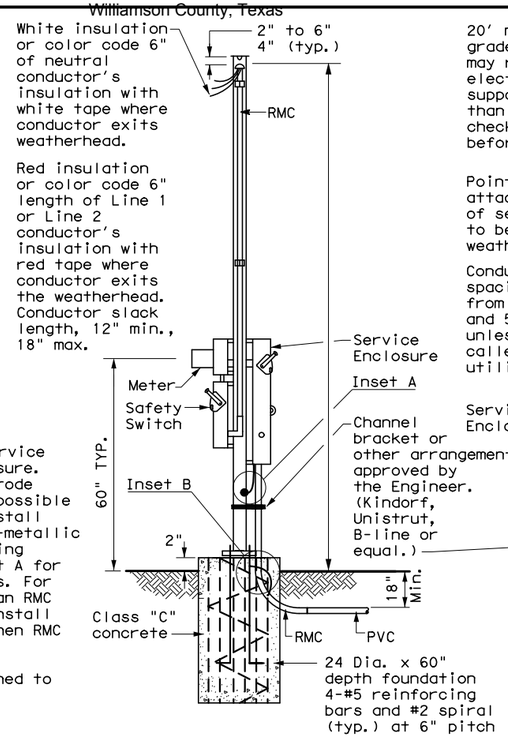
7. Drill and tap steel poles and frames for ½ in. X 13 UNC tank ground fitting. For steel pole service supports, provide and install tank ground fitting 4 in. to 6 in. below electrical service enclosure. Provide properly sized hole through the bottom of the enclosure for the service grounding electrode 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.

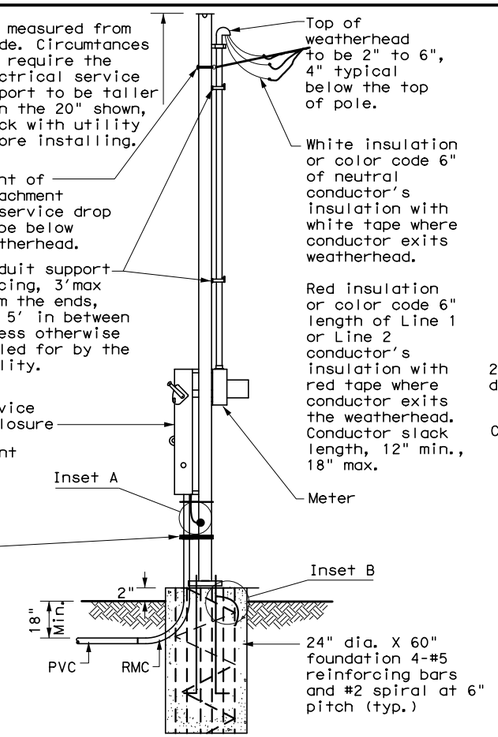
9. Provide ¼" - 20 machine screws for bonding. Do not use sheet metal screws. Remove all non-conductive material at contact points. Terminate bonding jumpers with listed devices. Install minimum size 6 AWG stranded copper bonding jumpers. Make up all threaded bonding connections wrench tight.

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.

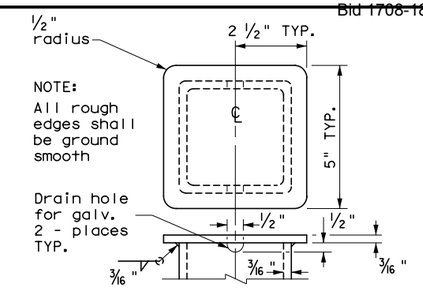


WITH SAFETY SWITCH

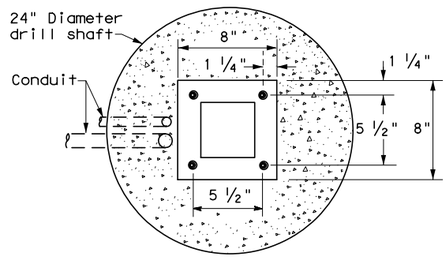


WITHOUT SAFETY SWITCH

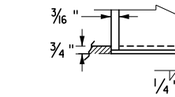
SERVICE SUPPORT TYPE SP (O) - OVERHEAD SERVICE



POLE TOP PLATE

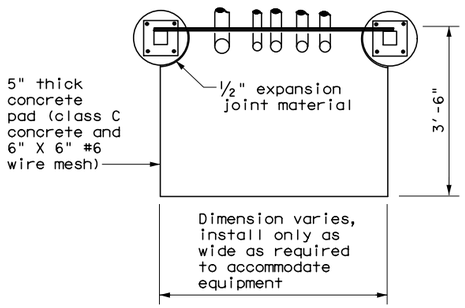


BASE PLATE DETAIL



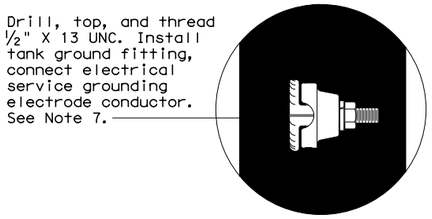
BOTTOM OF POLE

SERVICE SUPPORT TYPE SF & SP



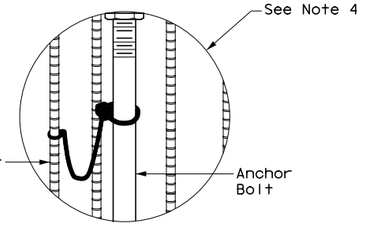
TOP VIEW

SERVICE SUPPORT TY SF (O) & SF (U)

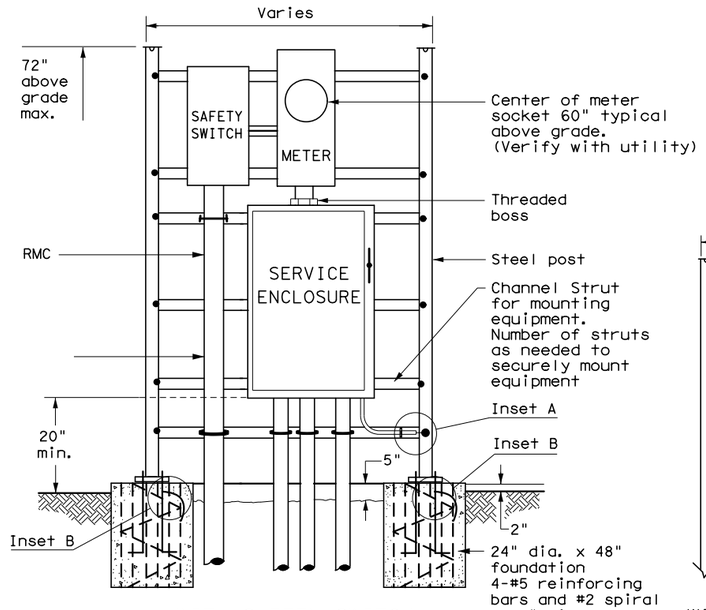


FRONT VIEW

INSET A

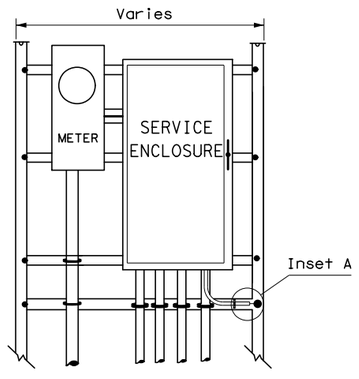


INSET B



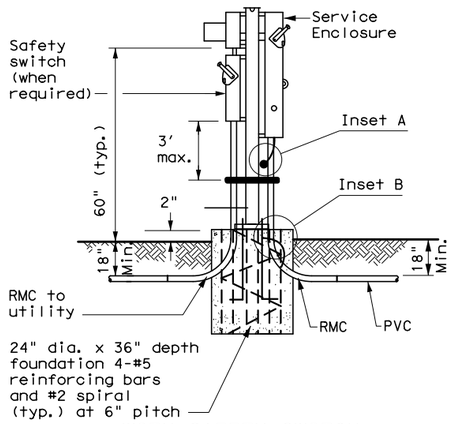
WITH SAFETY SWITCH

FRONT VIEW

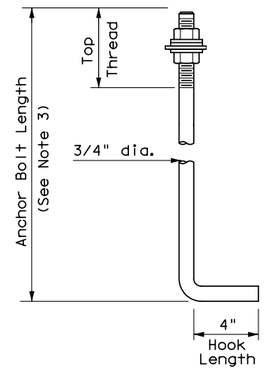


WITHOUT SAFETY SWITCH

SERVICE SUPPORT TYPE SF(U) - UNDERGROUND SERVICE



WITH SAFETY SWITCH



HOOKED ANCHOR DETAIL

SERVICE SUPPORT TYPE SP(U) - UNDERGROUND SERVICE

Texas Department of Transportation

Traffic Operations Division Standard

ELECTRICAL DETAILS SERVICE SUPPORT TYPES SF & SP

ED(7)-14

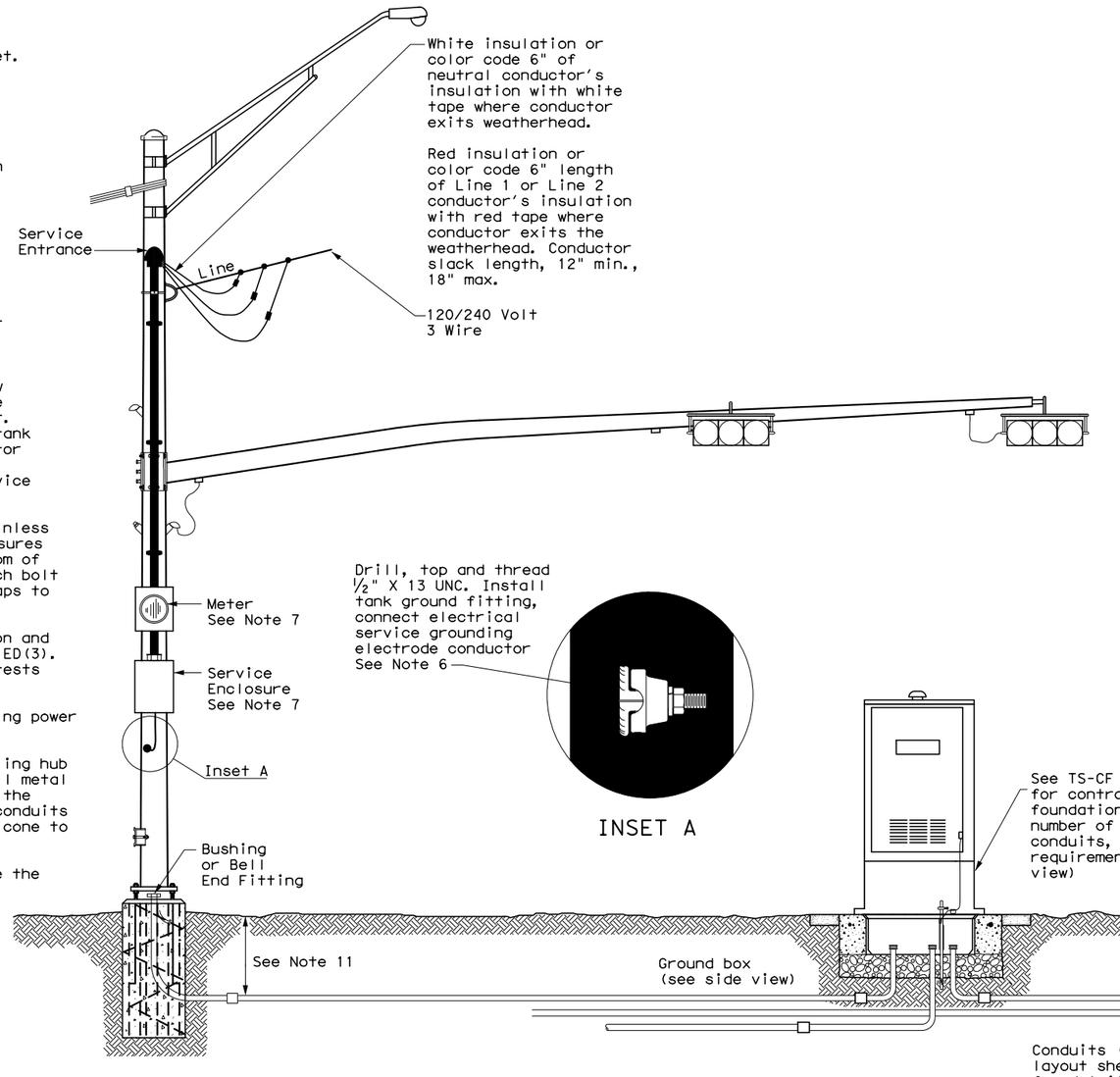
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TRAFFIC SIGNAL NOTES

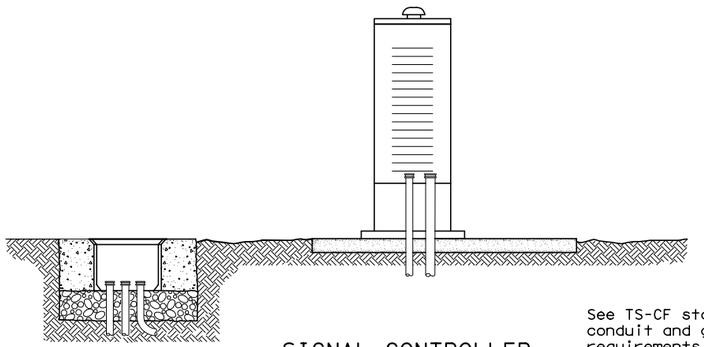
1. Do not pass luminaire conductors through the signal controller cabinet.
2. Include an equipment grounding conductor in all conduits throughout the electrical system. Bond all exposed metal parts to the grounding conductor.
3. Provide roadway luminaires, when required, in accordance with the material and construction sections of Item 610, "Roadway Illumination Assemblies," except for performance testing of luminaires. Test installed roadway luminaires for proper operation as a part of the associated traffic signal system test.
4. If internally illuminated street name signs are approved for use, ground the fixture to the pole with a 12 AWG green XHHW conductor.
5. Bond anchor bolts to rebar cage in two locations using #3 bars or 6 AWG stranded copper conductors. Use listed mechanical connectors rated for embedment in concrete. See TXDOT standard TS-FD for further details.
6. Drill and tap signal poles for ½ in. X 13 UNC tank ground fitting. Provide and install tank ground fitting 4 in. to 6 in. directly below electrical service enclosure. Provide properly sized hole through the bottom of the enclosure for the service grounding electrode conductor. Connect the electrical service grounding electrode conductor to the tank ground fitting. Ensure electrical service grounding electrode conductor is as short and straight as possible from the enclosure to the tank ground fitting. See Inset A detail for further information. Size service entrance conduit and branch circuit conduit as shown in the plans.
7. Mount electrical service enclosure and meter to signal pole with stainless steel bands. Ensure bands are a minimum width of ¾ in. Secure enclosures to bands using two-bolt brackets. Install brackets near top and bottom of each enclosure. Install properly sized stainless steel washers on each bolt in the enclosure. Band or drill and tap properly sized stand-off straps to signal pole for attaching conduit.
8. Conduct pull tests and insulation resistance tests on all illumination and power conductors as required in Item 620 "Electrical Conductors" and ED(3). To prevent electronics damage, do not conduct insulation resistance tests on traffic signal cables after termination.
9. Lock all enclosures and bolt down all ground box covers before applying power to the signal installation.
10. Terminate conduits entering the top of enclosures with a conduit-sealing hub or threaded boss such as meter hub. Install a grounding bushing on all metal conduits not connected to conduit-sealing hub or threaded boss. Bond the grounding bushing to the ground bus with a bonding jumper. Seal all conduits entering enclosures with duct seal or expanding foam. Do not use silicone to seal conduit ends.
11. For all conduits, ensure the burial depth is a minimum of 18". Ensure the minimum burial depth for conduit placed under a roadway is 24".



SIGNAL POLE WITH SERVICE

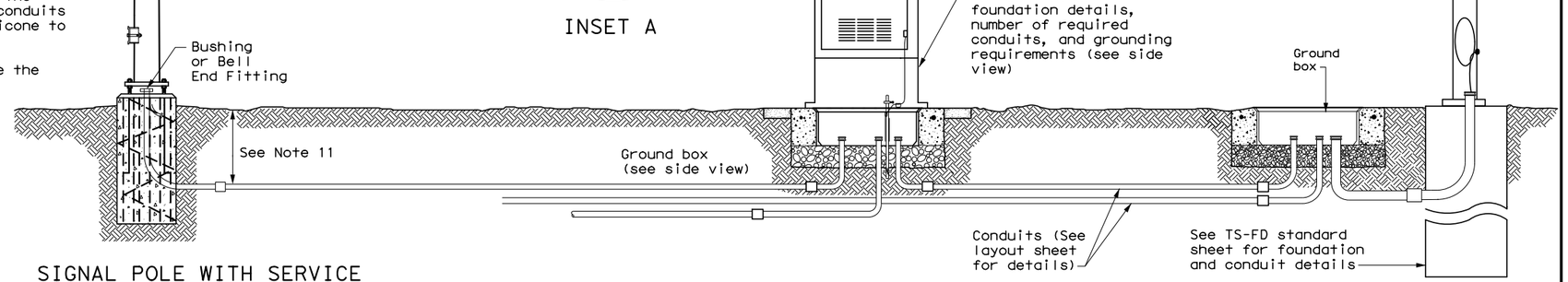
Type T electrical service mounted on signal pole shown as an example. See electrical details, layout sheets, and electrical service data chart for additional details.

INSET A

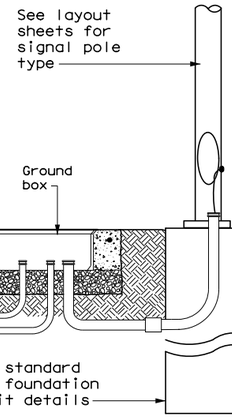


SIGNAL CONTROLLER SIDE VIEW

See TS-CF standard for conduit and grounding requirements. See layout sheets for ground box locations and any additional conduits that are required.



SIGNAL CONTROLLER FRONT VIEW



SIGNAL POLE

Texas Department of Transportation — Traffic Operations Division Standard

ELECTRICAL DETAILS TYPICAL TRAFFIC SIGNAL SYSTEM DETAILS

ED(8)-14

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PEDESTAL SERVICE NOTES

1. Manufacture pedestal electrical services in accordance with Departmental Material Specifications (DMS)11080 "Electrical Services", 11085 "Electrical Services-Pedestal (PS)" and Item 628 "Electrical Services. "Provide pedestal electrical services as listed on the Material Producers list (MPL) on the Department's web site under "Roadway Illumination and Electrical Supplies," Item 628. Ensure all mounting hardware and installation details of services meet utility company specifications. Contact the local utility company for approval of pedestal details prior to installing the electrical pedestal service. Submit any changes required by the utility company prior to manufacturing the pedestal enclosure.

2. When a meter socket is required, provide a socket with a minimum 100 amp rating that complies with local utility requirements.

3. Provide Class A or C concrete for pedestal service foundations in accordance with Item 420, "Concrete Substructures," except that concrete will not be paid for directly but is considered subsidiary to Item 628.

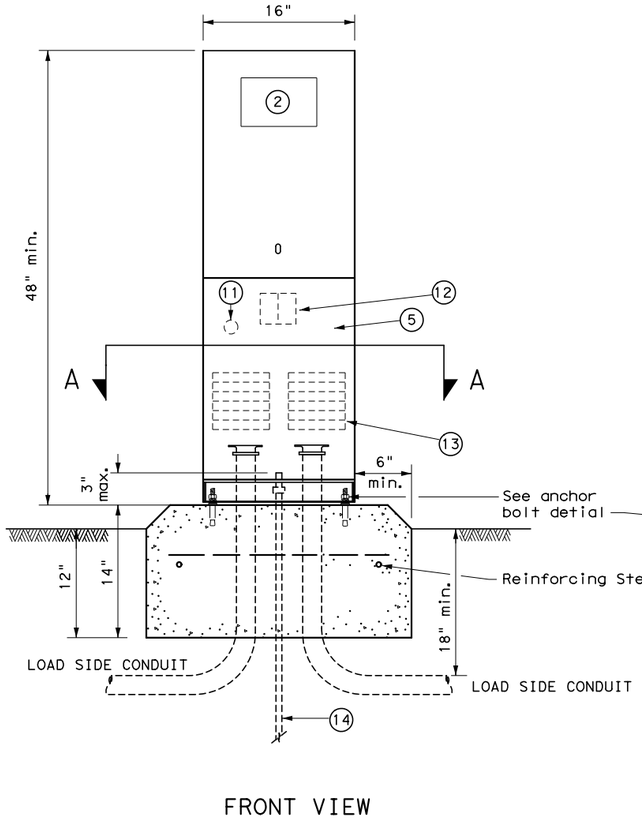
4. Provide #4 reinforcing steel for foundations in accordance with Item 440, "Reinforcement for Concrete."

5. Install ½ in. X 2 ⅛ in. minimum length concrete single expansion type anchors for mounting pedestal enclosure to foundation. Anchor location to match mounting holes in each corner of enclosure. Secure each of the four corners of the pedestal enclosure to the anchors in the foundation with a ½ in. galvanized or stainless steel machine thread bolt, a properly sized locknut and a flat washer.

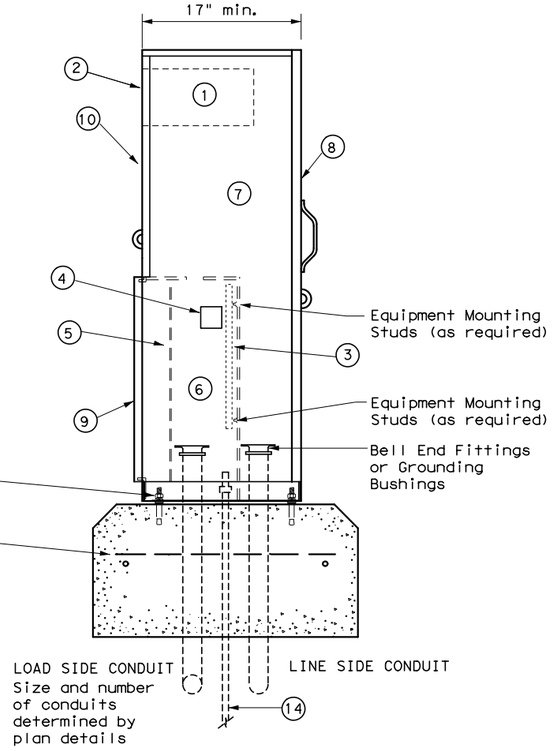
6. Finish top of concrete foundation in a neat and workmanlike manner. If leveling washers are used, ensure no more than ⅛ in. gap at any corner. Do not exceed a maximum dip or rise in the foundation of ⅛ in. per foot. When properly installed, ensure the top of the service enclosure is level front to back and side to side within ¼ in. Repair rocking or movement of the service enclosure at no additional cost to the department.

7. Do not use liquidtight flexible metal conduit (LFMC) on pedestal type services.

8. Ensure all elbows in the foundation are sized as per utility provider's conduit requirements for underground conduit and feeders. PVC extensions may be installed provided the ends of the rigid metal conduits are more than 2 in. below the top of the concrete foundation. Where extension conduits are metal, grounding bushings must be installed with a bonding jumper properly terminated.

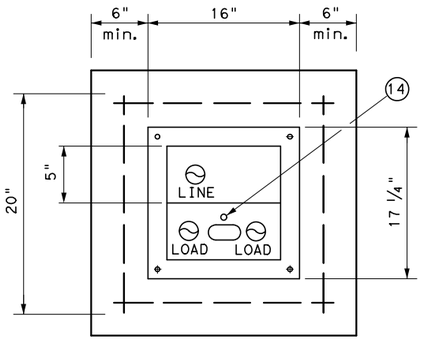


FRONT VIEW

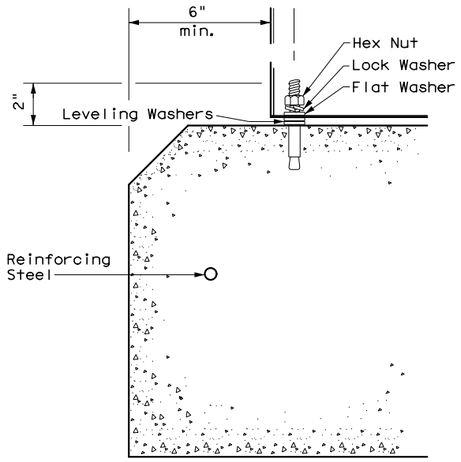


SIDE VIEW

TYPE C shown, TYPE A similar except that TYPE A shall have individual circuit breakers (CB) mounted on an equipment mounting panel. CB Handles shall protrude through hinged deadfront trim.



SECTION A-A



ANCHOR BOLT DETAIL

LEGEND	
1	Meter Socket, (when required)
2	Meter Socket Window, (when required)
3	Equipment Mounting Panel
4	Photo Electric Control Window, (When required)
5	Hinged Deadfront Trim
6	Load Side Conduit Trim
7	Line Side Conduit Area
8	Utility Access Door, with handle
9	Pedestal Door
10	Hinged Meter Access
11	Control Station (H-O-A Switch)
12	Main Disconnect
13	Branch Circuit Breakers
14	Copper Clad Ground Rod - 5/8" X 10'

Texas Department of Transportation

Traffic Operations Division Standard

ELECTRICAL DETAILS
ELECTRICAL SERVICE SUPPORT
PEDESTAL SERVICE TYPE PS

ED(9)-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 1½ in. to 1⅝ 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, ¼ in. minimum diameter by 1½ 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 ½ in. PVC to ground rod - extend ½ in. PVC 6 in. underground.

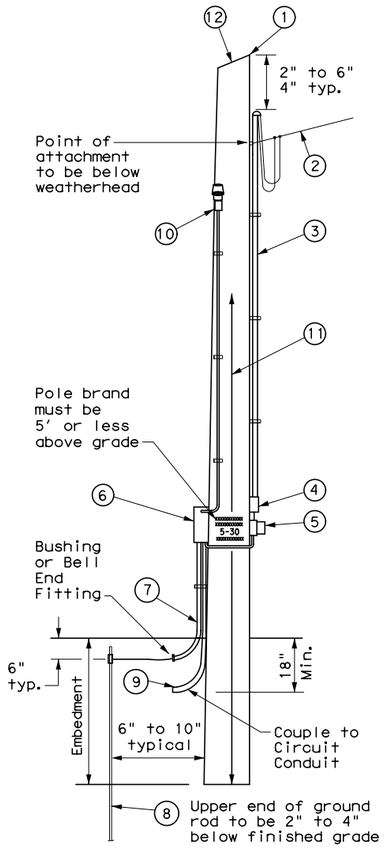
(8) 5/8 in. x 8 ft. Copper clad ground rod - drive ground rod to a depth of 2 in. to 4 in. below grade.

(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.

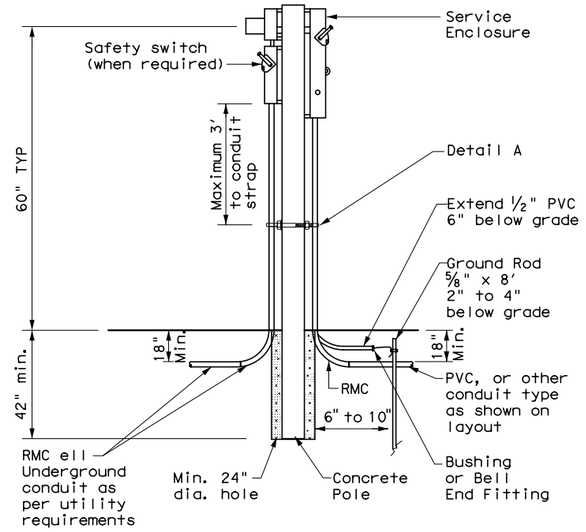


SERVICE SUPPORT TYPE TP (O)

GRANITE CONCRETE (GC) & OTHER CONCRETE (OC) NOTES

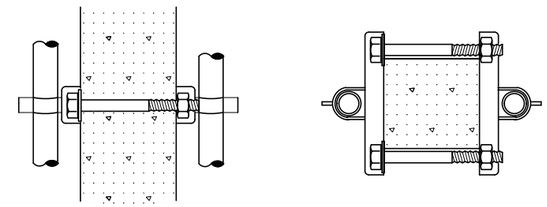
Ensure electrical service support structures bid as type Granite Concrete (GC) or Other Concrete (OC) meet the following requirements.

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 ½ in. or 1 ⅝ in. wide by 1 in. up to 3 ¾ 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.



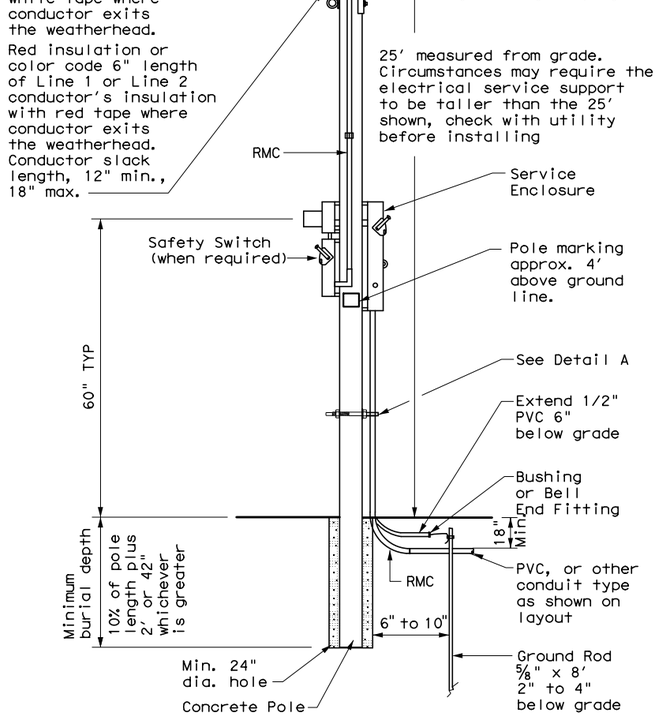
CONCRETE SERVICE SUPPORT

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

ED(10)-14

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DUCT CABLE & HDPE CONDUIT NOTES

1. Provide duct cable in accordance with Departmental Material Specification (DMS) 11060 "Duct Cable" and Item 622 "Duct Cable." Provide duct cable as listed on the Material Producer List (MPL) on the Department web site under "Roadway Illumination and Electrical Supplies" Item 622.

2. Provide High-Density Polyethylene (HDPE) conduit in accordance with DMS 11060 and Item 618, "Conduit." Provide HDPE as listed on the MPL on the Department web site under "Roadway Illumination and Electrical Supplies," Item 618.

3. Supply duct cable with a minimum 2 in. diameter, unless otherwise shown in the plans. Provide duct cable and HDPE conduit as shown by descriptive code or on the plans. Bend duct cable and HDPE conduit as recommended by the manufacturer, with a minimum bending radius of 26 in. for 2 in. duct. Follow manufacturers' recommendations when handling duct cable and HDPE conduit reels and during installation of duct cable and HDPE conduit.

4. Do not splice conductors within duct cable or HDPE conduit. Couple duct cable and HDPE entering a ground box or foundation to a PVC elbow. When galvanized steel RMC elbows are called for in the plans and any portion of the RMC elbow is buried less than 18" from possible contact, ground the RMC elbow.

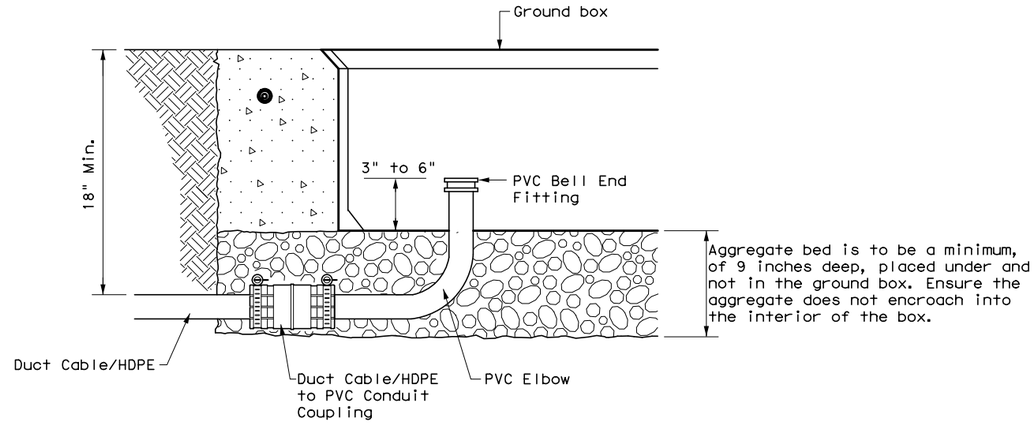
5. Furnish and install duct cable with factory installed conductors, sized as shown in the plans and as required by the National Electrical Code (NEC). The NEC contains specific requirements for duct cable in Article, "Nonmetallic Underground Conduit with Conductors: Type NUCC."

6. When conduit casing is called for in the plans, extend duct cable or HDPE conduit through the conduit casing in one continuous length without connection to the casing.

7. Seal the ends of duct cable or HDPE conduit with duct seal, expandable foam, or other approved method after completing the pull tests required by Item 622.

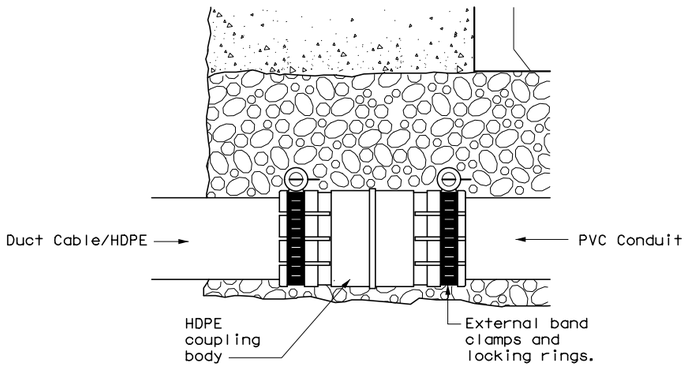
8. Provide minimum cover of 24 in. under roadways, 18 in. in other locations, or as shown on the plans.

9. Furnish and install listed fittings to couple duct cable or HDPE conduit to other types of conduit. Duct cable and HDPE conduit may be field-threaded and spliced with PVC or RMC threaded couplings; connected with listed tie-wrap fittings; connected using listed coupling made of HDPE with stainless steel external banding clamps and locking rings; connected with approved electrofusion conduit couplings; or connected using an approved chemical fusion method using an epoxy or adhesive specifically designed for HDPE couplings and connectors all installed in accordance with their manufacturer's instructions. Do not use PVC glue on HDPE. Do not use water pipe fittings, or connect conduit with heat shrink tubing.

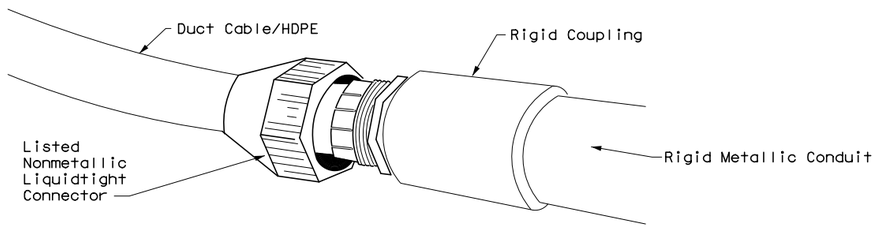


DUCT CABLE/HDPE AT GROUND BOX

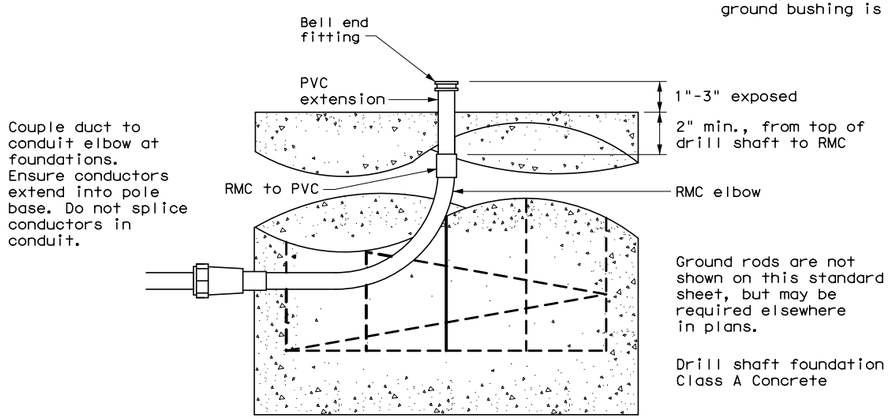
When the upper end of an RMC Ell does not enter the ground box, it may be extended with a SCH-40 PVC conduit nipple and bell end, provided there is a minimum of 18" of cover over all parts of the elbow. If not, a rigid extension and ground bushing is required.



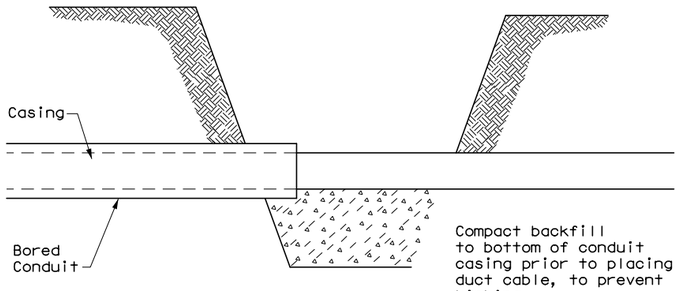
DUCT CABLE/HDPE TO PVC



DUCT CABLE/HDPE TO RMC



DUCT CABLE / HDPE AT FOUNDATION



BORE PIT DETAIL

Texas Department of Transportation — Traffic Operations Division Standard

ELECTRICAL DETAILS DUCT CABLE/ HDPE CONDUIT

ED(11)-14

FILE: ed11-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT October 2014 REVISIONS	CONT	SECT	JOB	HIGHWAY
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71L

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BATTERY BOX GROUND BOXES NOTES

A. MATERIALS

1. Provide polymer concrete or fiberglass reinforced plastic (FRP) battery box ground box and cover in accordance with Departmental Material Specification (DMS) 11071 "Battery Box Ground Boxes." Battery box will accommodate up to 4 batteries, each measuring 8 in. x 13.5 in. x 10 in. (W x L x D). Label battery box ground box cover in accordance with DMS 11071.

2. Supply a marine grade batteries with covers. Secure the marine grade batteries with covers to the stainless steel rack in the bottom of the ground box with tie down straps.

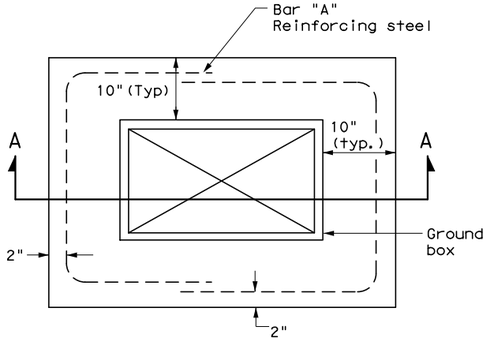
B. CONSTRUCTION METHODS

1. Ensure conduit entry will not interfere with placement of the batteries in the battery box ground box.

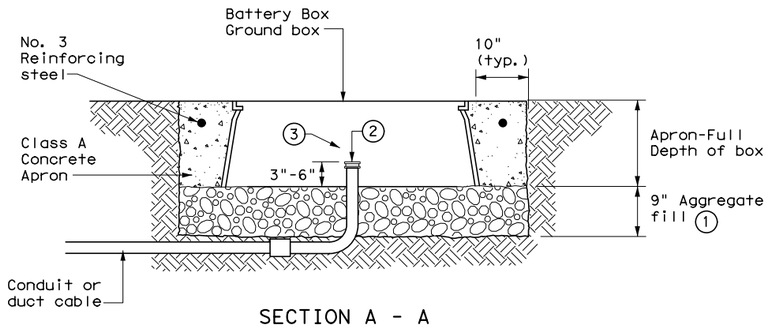
2. Remove all gravel and dirt from conduit. Cap all conduits prior to placing aggregate and setting battery box ground box. Provide Grade 3 or 4 coarse aggregate as shown on Table 2 of Item 302 "Aggregates for Surface Treatments." Ensure the aggregate bed is in place and is a minimum of 9 in. deep prior to setting the box. Install battery box ground box on top of aggregate.

3. Cast battery 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. Battery box ground box aprons, including concrete and reinforcing steel, are subsidiary to battery box ground boxes when called for by descriptive code.

4. Bolt covers down when not working in battery box ground boxes. Keep bolt holes in the box clear of dirt.



PLAN VIEW



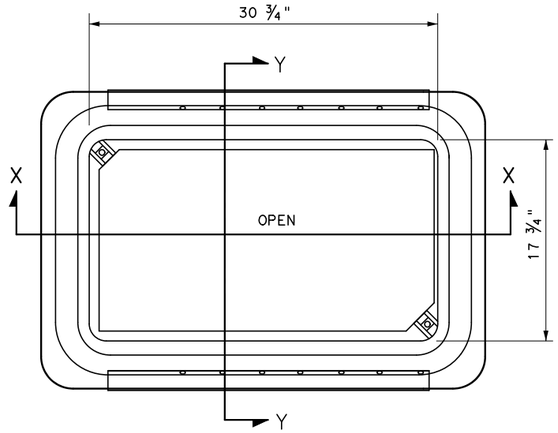
SECTION A - A

APRON FOR BATTERY BOX GROUND BOXES

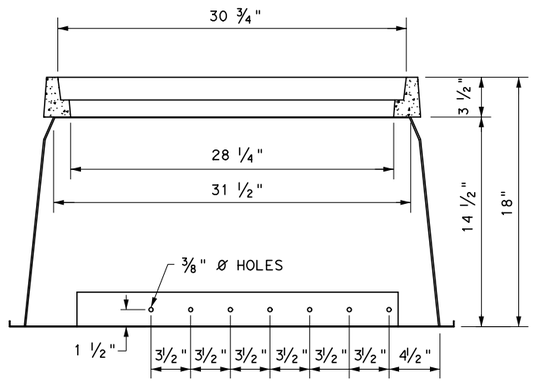
(1) Place aggregate under the box and not in the box. Aggregate should not encroach on the interior volume of the box.

(2) Install bushing or bell end fitting on the upper end of all ells.

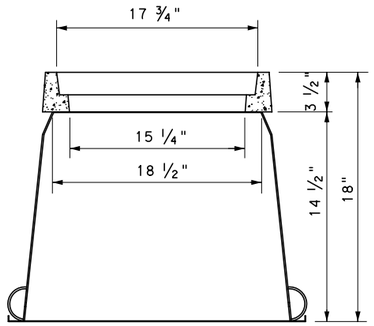
(3) Install all conduits in a neat and workmanlike manner.



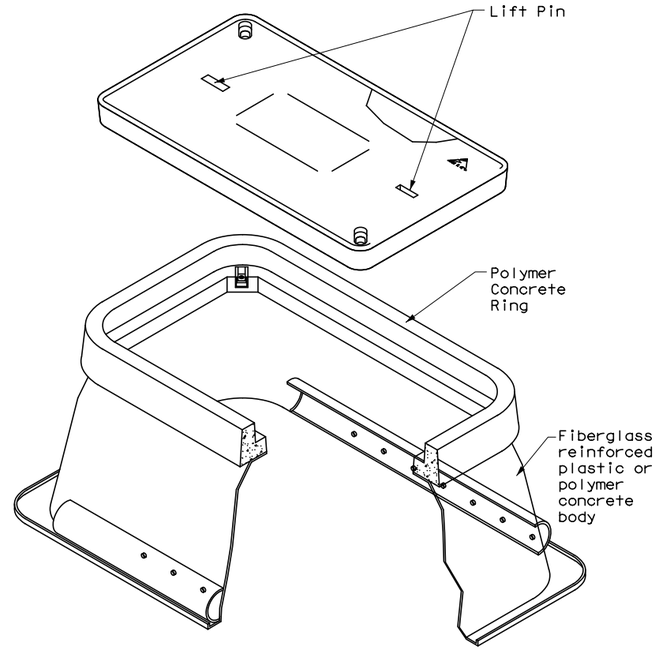
BATTERY BOX TOP VIEW



SECTION X-X



SECTION Y-Y



Texas Department of Transportation

Traffic Operations Division Standard

ELECTRICAL DETAILS BATTERY BOX GROUND BOXES

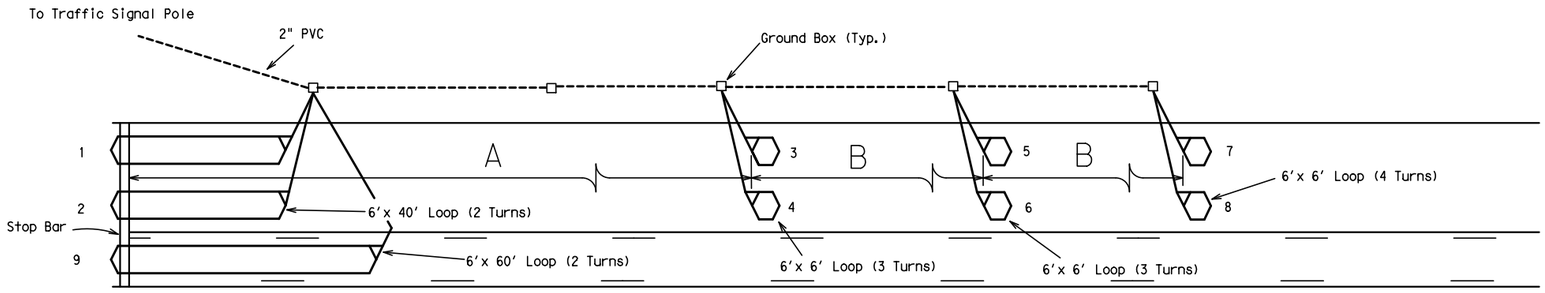
ED(12)-14

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© TxDOT October 2014	CONT	SECT	JOB	HIGHWAY
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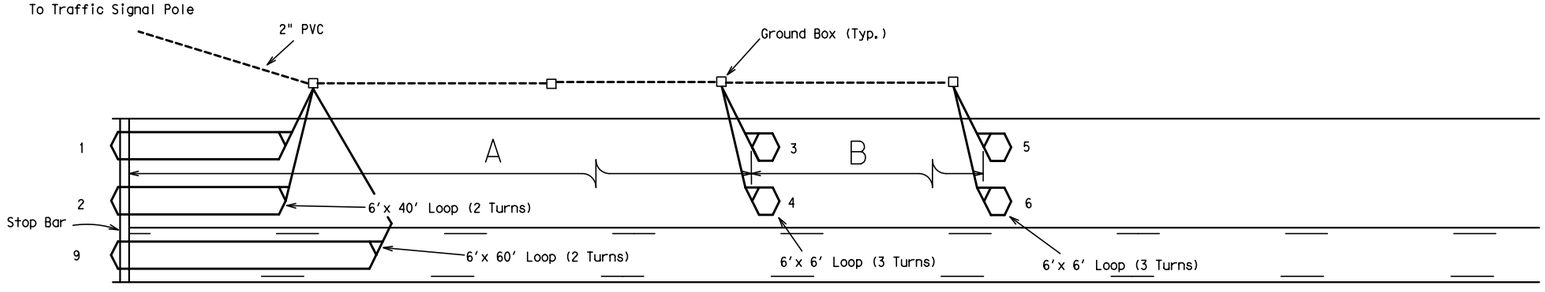
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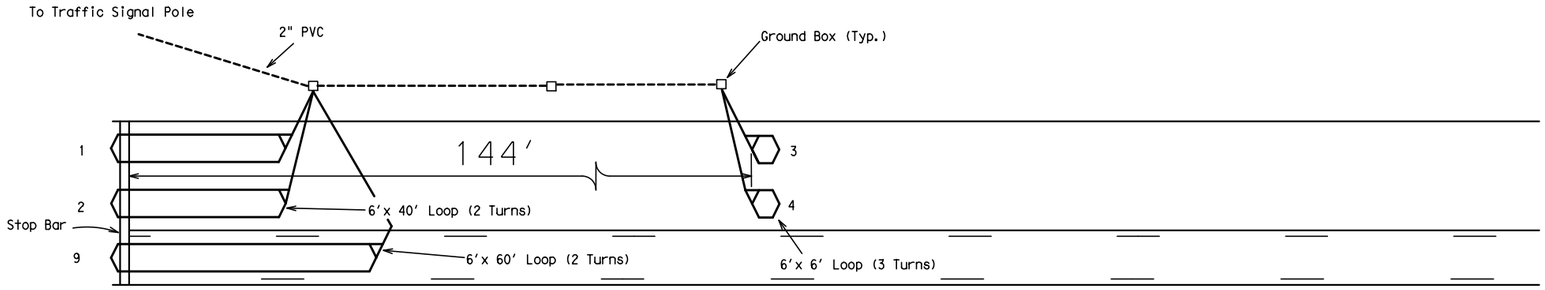
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55 MPH (A=225', B=95') 60 MPH (A=275', B=100')
65 MPH (A=320', B=110') 70 MPH (A=350', B=125')



35 MPH (A=90', B=100') 40 MPH (A=110', B=130')
45 MPH (A=175', B=115') 50 MPH (A=220', B=130')



30 MPH

GENERAL NOTES:

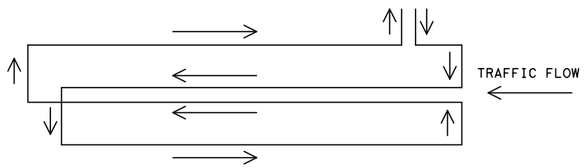
Loops 1 and 2 shall be connected to the controller cabinet by means of the same loop lead-in (2/C #14 AWG).

Loops 3 thru 6 shall be connected to the controller cabinet by means of the same loop lead-in (2/C #14 AWG).

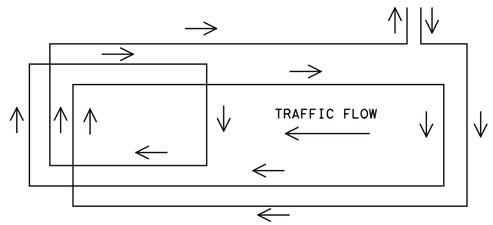
Loops 7 and 8 shall be connected to the controller cabinet by means of the same loop lead-in (2/C #14 AWG).

Loop 9 shall be connected to the controller cabinet by means of a loop lead-in (2/C #14 AWG). Loop 9 shall be placed only when a left turn lane exists.

LOOP WINDING DETAILS



QUADRAPOLE LOOP



POWER HEADER LOOP

Texas Department of Transportation
Traffic Operations Division

LOOP DETECTOR PLACEMENT DETAILS

LD(2)-03

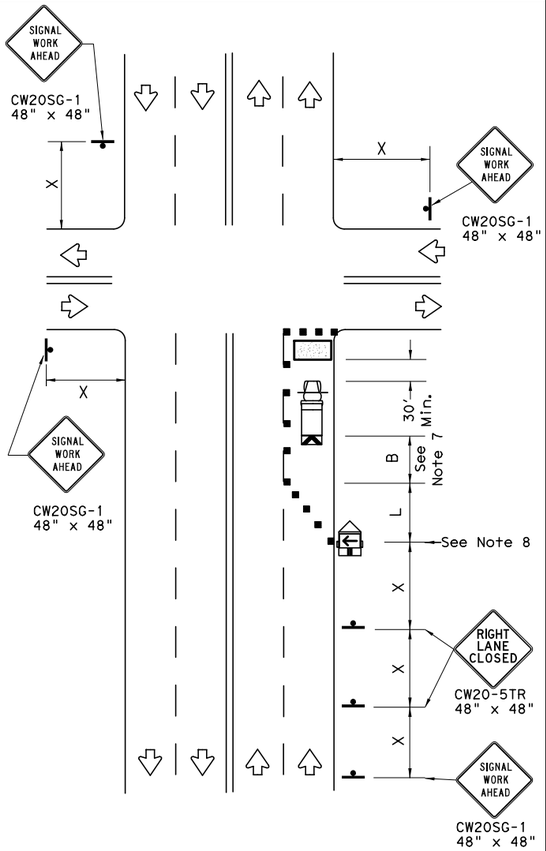
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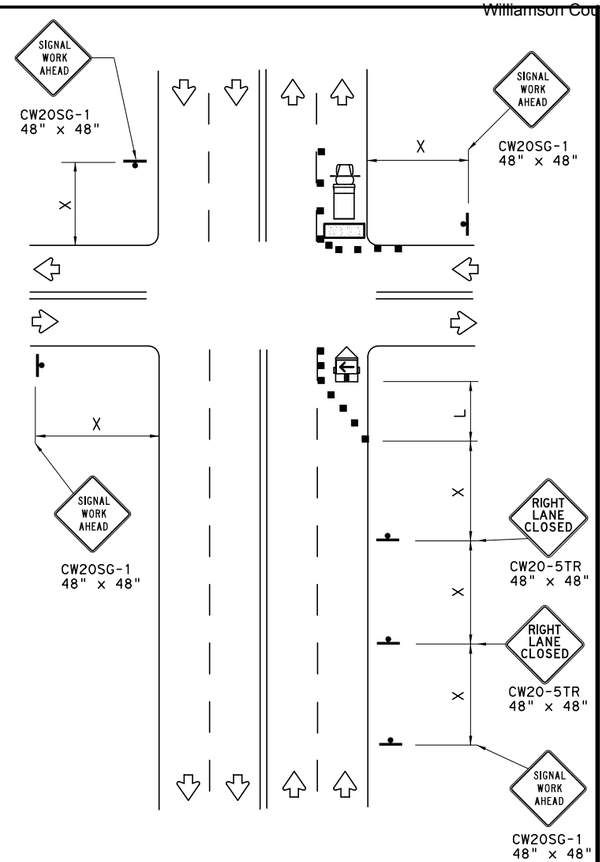
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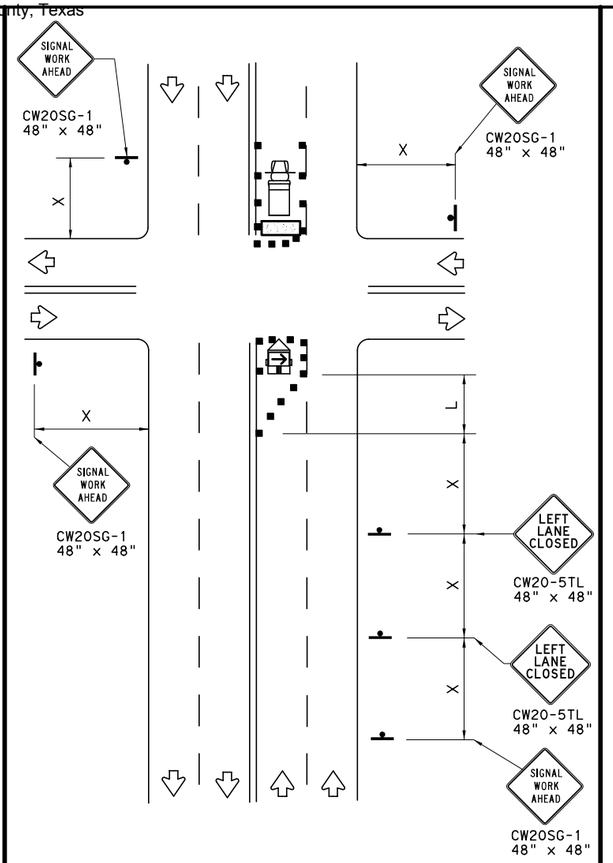
NEAR SIDE LANE CLOSURE

SHORT DURATION OR SHORT TERM STATIONARY



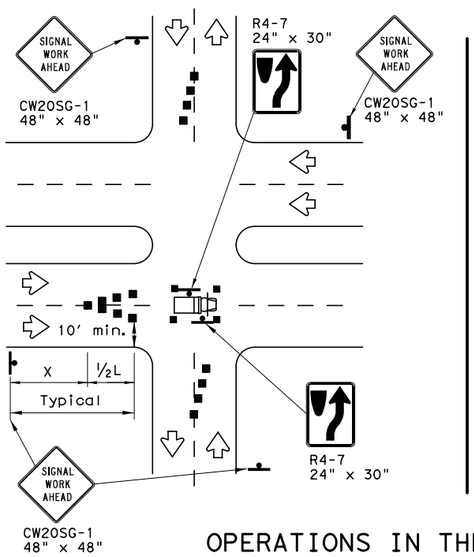
FAR SIDE RIGHT LANE CLOSURE

SHORT DURATION OR SHORT TERM STATIONARY



FAR SIDE LEFT LANE CLOSURE

SHORT DURATION OR SHORT TERM STATIONARY



OPERATIONS IN THE INTERSECTION

SHORT DURATION

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)

WORKERS IN BUCKET TRUCKS SHALL NOT WORK ABOVE OPEN LANES OF TRAFFIC.

GENERAL NOTES

1. The minimum size channelizing device is the 28" cone. 42" Two-piece cones, drums, vertical panels or barricades will be required when the device must be left unattended at night.
2. Obstructions or hazards at the work area shall be clearly marked and delineated at all times.
3. Flaggers and Flagger Symbol (CW20-7) signs may be required according to field conditions.
4. Vehicles parked in roadway shall be equipped with at least two high intensity rotating, flashing, oscillating or strobe type lights.
5. High level warning devices (flag trees) may be used at corners of the vehicle.
6. When work operations are performed on existing signals, the signals may be placed in flashing red mode when approved by the engineer. If existing signals do not have power, All-Way Stop (R1-1 and R1-3P) signs may be implemented when approved by the engineer.
7. For Short-Term Stationary work the buffer space "B" from the above table should be used if field conditions permit. For Short Duration (less than 1 hour) any buffer space provided will enhance the safety of the setup.
8. The arrow board at this location may be omitted for Short Duration work if the work vehicle has an arrow board in operation. As an option, the arrow board may be placed at the end of the taper in the closed lane if space is not available at the beginning of the taper.
9. Signs and devices for the NEAR SIDE LANE CLOSURE may be altered for a left lane closure by using a LEFT LANE CLOSED (CW20-5TL) and adding channelizing devices on the centerline to protect the work space from opposing traffic.

Texas Department of Transportation — Traffic Operations Division Standard

TRAFFIC SIGNAL WORK TYPICAL DETAILS

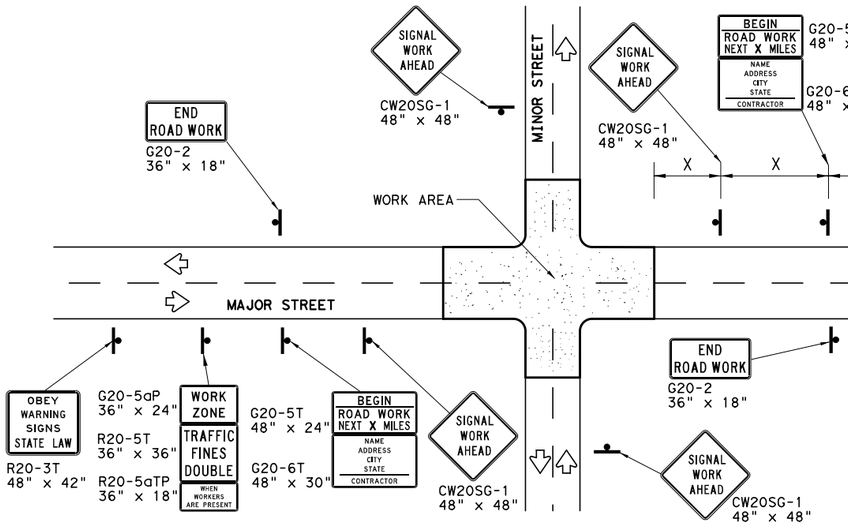
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FILE: wzbts-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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TYPICAL ADVANCE SIGNAL PROJECT SIGNING

FOR LONG TERM and INTERMEDIATE-TERM STATIONARY WORK OPERATIONS

NOTES

1. Project signing as shown shall be in place whenever signal contract work is in progress.
2. For closely adjoining projects, advance signing may not be required in advance of each intersection, but only in advance of the intersections at the project limits. Actual locations will be as directed by the Engineer.
3. Advance signs shall be removed when signal construction operations are no longer under way, as directed by the Engineer.
4. Warning sign spacing shown is typical for both directions.
5. See the Table on sheet 1 of 2 for Typical warning sign spacing.

GENERAL NOTES FOR WORK ZONE SIGNS

1. Signs shall be installed and maintained in a straight and plumb condition.
2. Wooden sign posts shall be painted white.
3. Barricades shall NOT be used as sign supports.
4. Nails shall NOT be used to attach signs to any support.
5. All signs shall be installed in accordance with the plans or as directed by the Engineer.
6. The Contractor shall furnish the sign design shown in the plans or in the "Standard Highway Sign Designs for Texas" (SHSD).
7. The Contractor shall furnish sign supports and substrates listed in the "Compliant Work Zone Traffic Control Device List" (CWZTCD), installed as per the manufacturer's recommendations.
8. Temporary signs that have damaged or cracked substrates and/or damaged or marred reflective sheeting shall be replaced as directed by the Engineer.
9. 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".
10. Damaged wood posts shall be replaced. Splicing wood posts will not be allowed.

DURATION OF WORK

1. Work zone durations are defined in Part 6, Section 6G.02 of the Texas Manual on Uniform Traffic Control Devices (TMUTCD).

SIGN MOUNTING HEIGHT

1. Sign height of Long-term/Intermediate-term warning signs shall be as shown on Figure 6F-1 of the TMUTCD.
2. Sign height of Short-term/Short Duration warning signs shall be as shown on Figure 6F-2 of the TMUTCD.
3. Regulatory signs shall be mounted at least 7 feet, but not more than 9 feet, above the paved surface regardless of work duration.

REMOVING OR COVERING

1. When sign messages may be confusing or do not apply, the signs shall be removed or completely covered, unless otherwise approved by the Engineer.
2. 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. Burlap, or heavy materials such as plywood or aluminum shall not be used to cover signs.
3. Duct tape or other adhesive material shall NOT be affixed to a sign face.
4. Signs and anchor stubs shall be removed and holes back filled upon completion of the work.

REFLECTIVE SHEETING

1. All signs shall be retroreflective and constructed of sheeting meeting the requirements of the DMS and color usage table shown on this sheet.

SIGN SUPPORT WEIGHTS

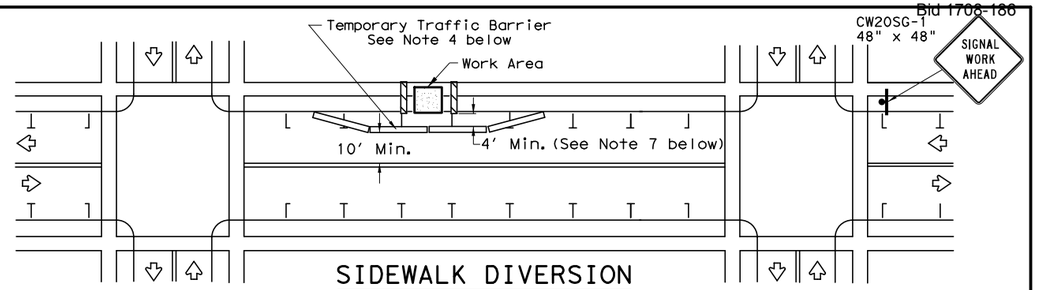
1. Weights used to keep signs from turning over should be sandbags filled with dry, cohesionless material.
2. The sandbags will be tied shut to keep the sand from spilling and to maintain a constant weight.
3. Rock, concrete, iron, steel or other solid objects will not be permitted for use as sign support 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 fastners. 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.

LEGEND	
	Sign
	Channelizing Devices
	Type 3 Barricade

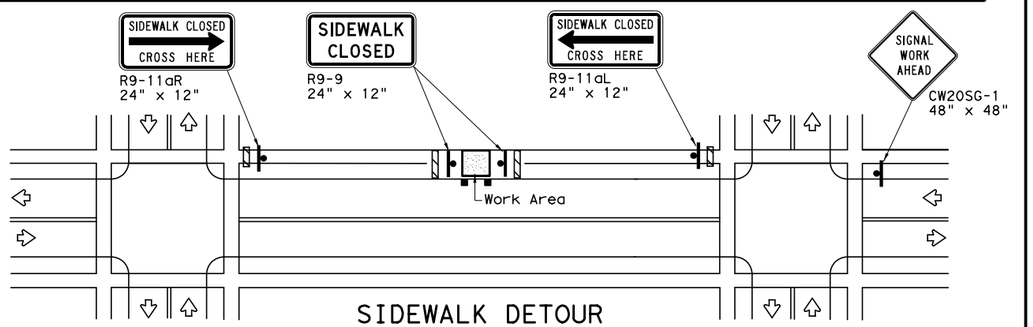
DEPARTMENTAL MATERIAL SPECIFICATIONS	
SIGN FACE MATERIALS	DMS-8300
FLEXIBLE ROLL-UP REFLECTIVE SIGNS	DMS-8310

COLOR	USAGE	SHEETING MATERIAL
ORANGE	BACKGROUND	TYPE B_{FL} OR TYPE C_{FL} SHEETING
WHITE	BACKGROUND	TYPE A SHEETING
BLACK	LEGEND & BORDERS	ACRYLIC NON-REFLECTIVE SHEETING

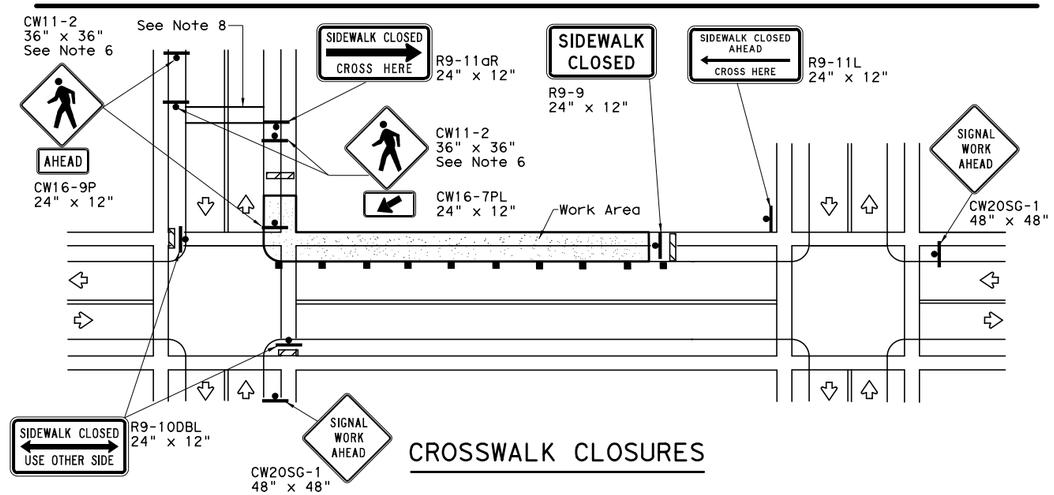
Only pre-qualified products shall be used. A copy of the "Compliant Work Zone Traffic Control Devices List" (CWZTCD) describes pre-qualified products and their sources and may be found at the following web address:
http://www.txdot.gov/txdot_library/publications/construction.htm



SIDEWALK DIVERSION



SIDEWALK DETOUR



CROSSWALK CLOSURES

PEDESTRIAN CONTROL

1. Holes, trenches or other hazards shall be adequately protected by covering, delineating or surrounding the hazard with orange plastic pedestrian fencing or longitudinal channelizing devices, or as directed by the Engineer.
2. "CROSSWALK CLOSURES" as detailed above will require the Engineer's approval prior to installation.
3. R9 series signs shown may be placed on supports detailed on the BC standards or CWZTCD list, or when fabricated from approved lightweight plastic substrates, they may be mounted on top of a plastic drum at or near the location shown.
4. For speeds less than 45 mph longitudinal channelizing devices may be used instead of traffic barriers when approved by the Engineer. Attenuation of blunt ends and installation of water filled devices shall be as per BC(9) and manufacturer's recommendations.
5. Location of devices are for general guidance. Actual device spacing and location must be field adjusted to meet actual conditions.
6. Where pedestrians with visual disabilities normally use the closed sidewalk Detectable Pedestrian Barricades should be used instead of the Type 3 Barricades shown.
7. The width of existing sidewalk should be maintained if practical.
8. Pavement markings for mid-block crosswalks shall be paid for under the appropriate bid items.
9. When crosswalks or other pedestrian facilities are closed or relocated, temporary facilities shall be detectable and shall include accessibility features consistent with the features present in the existing pedestrian facility.

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC SIGNAL WORK BARRICADES AND SIGNS

WZ(BTS-2)-13

FILE: wzbts-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT April 1992	CONT	SECT	JOB	HIGHWAY
REVISIONS				
2-98 10-99 7-13	DIST	COUNTY		SHEET NO.
4-98 3-03				37

115

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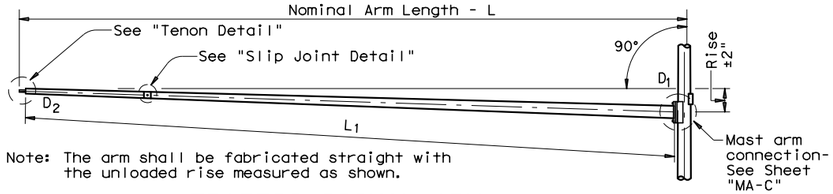
Arm Length	ROUND POLES					POLYGONAL POLES					Foundation Type
	D_B	D_{19}	D_{24}	D_{30}	① thk	D_B	D_{19}	D_{24}	D_{30}	① thk	
ft.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	
20	10.5	7.8	7.1	6.3	.179	11.5	8.5	7.7	6.8	.179	30-A
24	11.0	8.3	7.6	6.8	.179	12.0	9.0	8.2	7.3	.179	30-A
28	11.5	8.8	8.1	7.3	.179	12.5	9.5	8.7	7.8	.179	30-A
32	12.5	9.8	9.1	8.3	.179	12.0	9.0	8.2	7.3	.239	30-A
36	12.0	9.3	8.6	7.8	.239	12.5	9.5	8.7	7.8	.239	36-A
40	12.0	9.3	8.6	7.8	.239	13.5	10.5	9.7	8.8	.239	36-A
44	12.5	9.8	9.1	8.3	.239	14.0	11.0	10.2	9.3	.239	36-A
48	13.0	10.3	9.6	8.8	.239	15.0	12.0	11.2	10.3	.239	36-A

Arm Length	ROUND ARMS					POLYGONAL ARMS				
	L_1	D_1	D_2	① thk	Rise	L_1	D_1	② D_2	① thk	Rise
ft.	ft.	in.	in.	in.		ft.	in.	in.	in.	
20	19.1	6.5	3.8	.179	1′-9"	19.1	7.0	3.5	.179	1′-8"
24	23.1	7.5	4.3	.179	1′-10"	23.1	7.5	3.5	.179	1′-9"
28	27.1	8.0	4.2	.179	1′-11"	27.1	8.0	3.5	.179	1′-10"
32	31.0	9.0	4.7	.179	2′-1"	31.0	9.0	3.5	.179	2′-0"
36	35.0	9.5	4.6	.179	2′-4"	35.0	10.0	3.5	.179	2′-1"
40	39.0	9.5	4.1	.239	2′-8"	39.0	9.5	3.5	.239	2′-3"
44	43.0	10.0	4.1	.239	2′-11"	43.0	10.0	3.5	.239	2′-6"
48	47.0	10.5	4.1	.239	3′-4"	47.0	11.0	3.5	.239	2′-9"

D_B = Pole Base O.D.
D_{19} = Pole Top O.D. with no Luminaire and no ILSN
D_{24} = Pole Top O.D. with ILSN w/out Luminaire
D_{30} = Pole Top O.D. with Luminaire
D_1 = Arm Base O.D.
D_2 = Arm End O.D.
L_1 = Shaft Length
L = Nominal Arm Length

① Thickness shown are minimums, thicker materials may be used.

② D_2 may be increased by up to 1" for polygonal arms.



Note: The arm shall be fabricated straight with the unloaded rise measured as shown.

TRAFFIC SIGNAL ARM

(Fixed Mount)

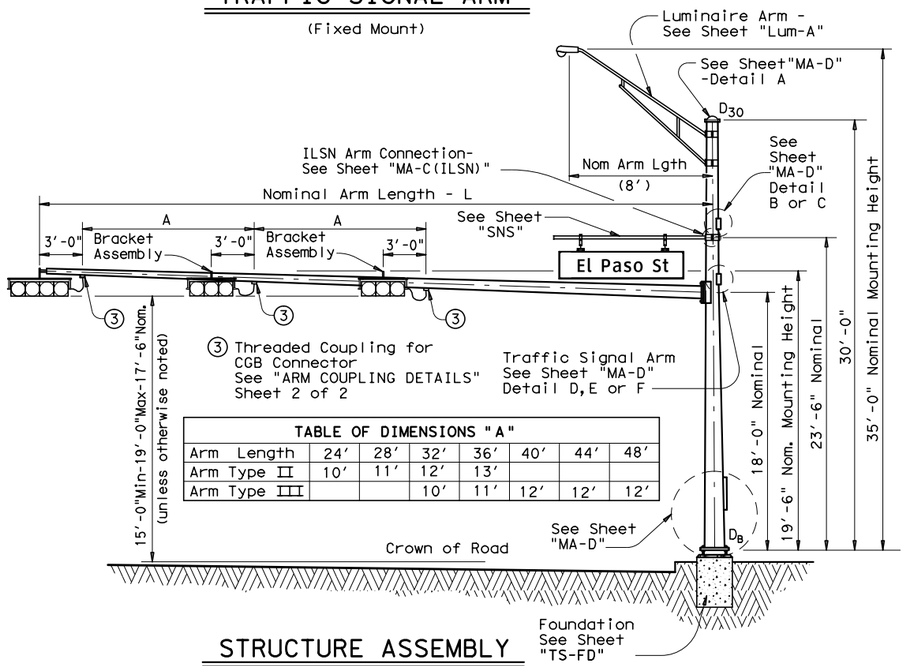


TABLE OF DIMENSIONS "A"

Arm Length	24′	28′	32′	36′	40′	44′	48′
Arm Type II	10′	11′	12′	13′			
Arm Type III			10′	11′	12′	12′	12′

STRUCTURE ASSEMBLY

SHIPPING PARTS LIST

Ship each pole with the following attached: enlarged hand hole, pole cap, fixed-arm connection bolts and washers and any additional hardware listed in the table.

Nominal Arm Length	30′ Poles With Luminaire		24′ Poles With ILSN		19′ Poles With No Luminaire and No ILSN	
	Above hardware plus: One (or two if ILSN attached) small hand hole, clamp-on simplex		Above hardware plus one small hand hole		See note above	
ft	Designation	Quantity	Designation	Quantity	Designation	Quantity
20	20L-80		20S-80		20-80	
24	24L-80		24S-80		24-80	
28	28L-80	1	28S-80		28-80	1
32	32L-80	1	32S-80		32-80	
36	36L-80		36S-80		36-80	
40	40L-80		40S-80		40-80	
44	44L-80		44S-80		44-80	
48	48L-80	1	48S-80		48-80	

Traffic Signal Arms (1 per Pole) Ship each arm with the listed equipment attached

Nominal Arm Length	Type I Arm (1 Signal)		Type II Arm (2 Signals)		Type III Arm (3 Signals)	
	1 CGB connector		1 Bracket Assembly and 2 CGB Connectors		2 Bracket Assemblies and 3 CGB Connectors	
ft	Designation	Quantity	Designation	Quantity	Designation	Quantity
20	20I-80					
24	24I-80		24II-80			
28	28I-80		28II-80		28III-80	2
32			32II-80		32III-80	1
36			36II-80		36III-80	
40					40III-80	
44					44III-80	
48					48III-80	1

Luminaire Arms (1 per 30′ pole)

Nominal Arm Length	Quantity
8′ Arm	3

ILSN Arm (Max. 2 per pole) Ship with clamps, bolts and washers

Nominal Arm Length	Quantity
7′ Arm	
9′ Arm	

Anchor Bolt Assemblies (1 per pole)

Anchor Bolt Diameter	Anchor Bolt Length	Quantity
1 ½"	3′-4"	3
1 ¾"	3′-10"	1

Each anchor bolt assembly consists of the following: Top and Bottom templates, 4 anchor bolts, 8 nuts, 8 flat washers, and 4 nut anchor devices (Type 2) per Standard Drawing "TS-FD".

Templates may be removed for shipment.

PRELIMINARY
FOR REVIEW ONLY
Not for construction, bidding, or permit purposes.
Kimley»Horn
Engineer BRIAN D. VAN DE WALLE
P.E. No. 68525 Date 8/25/2017

Texas Department of Transportation
Traffic Operations Division

TRAFFIC SIGNAL SUPPORT STRUCTURES

SINGLE MAST ARM ASSEMBLY

(80 MPH WIND ZONE)

SMA-80(1)-12

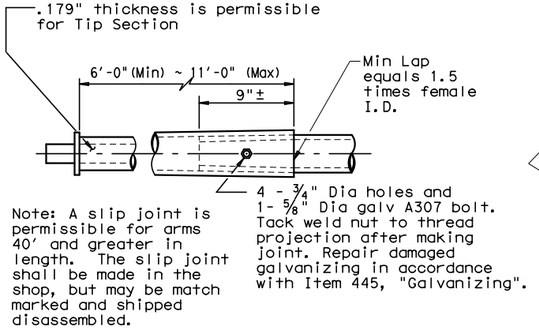
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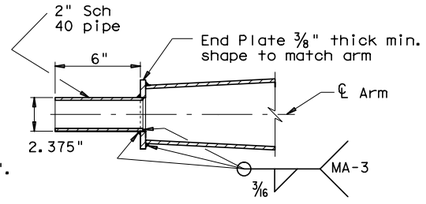
122A

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SLIP JOINT DETAIL



TENON DETAIL

VIBRATION WARNING

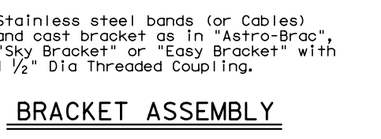
Mast Arms of SMA and DMA structures and clamp-on Arms of LMA structures of approximately 40 ft or longer are subject to harmonic vertical vibrations in light wind conditions due to the aeroelastic characteristics of a few of the myriads of possible combinations of the following: signal numbers, weights and positions; existence/solidity of backplates; presence of additional attachments to the arm, such as signs and cameras; arm-wind orientation; and arm-pole stiffness.

Such vibrations may cause fatigue damage to the structure and may lead to galloping in moderate wind conditions which may further damage the structure and alarm the public. Tests have indicated that when wind is blowing toward the back side of signal heads having un-vented backplates attached the probability of unacceptable harmonic vibration and/or galloping is rather high.

If backplates are not required for improved visibility they should not be applied to the signal heads or, if they must be applied, they should be vented as a first and inexpensive measure to mitigate vibrations.

The traffic signal mast arms shall be visually inspected in 5 to 20 mph wind conditions after installation of signal heads and any attachments, including any required backpates. If vertical movements with a total excursion (maximum upward excursion to maximum downward excursion) of more than approximately 8" are observed at the arm tip, a damping plate shall be fitted to the arm. See "Damping Plate Mounting Details" on standard sheet, MA-DPD-10.

This visual inspection shall be repeated after each modification of the structure that could affect its aeroelastic response. Excessive vibrations shall not be allowed to continue for more than two days.



BRACKET ASSEMBLY

GENERAL NOTES:

Design conforms to 1994 AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals and Interim Specifications thereto. Design Wind Speed equals 80 mph plus a 1.3 gust factor.

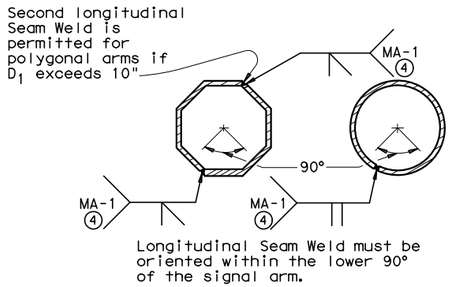
Poles are designed to support one 8'-0" luminaire arm, one 9'-0" internally lighted street name sign and one traffic signal arm with a length as tabulated. The specified luminaire load applied at the end of the luminaire arm equals 60 lbs vertical dead load plus the horizontal wind load on an effective projected area of 1.6 sq ft. The specified internally lighted street name sign load applied 4.5 ft from the centerline of the pole equals 85 lbs vertical dead load plus horizontal wind load on an effective projected area of 11.5 sq ft. The specified signal load applied at the end of the traffic signal arm equals 180 lbs vertical dead load plus the horizontal wind load on an effective projected area of 32.4 sq ft (actual area times drag coefficient).

See Standard Sheet "MA-D" for pole details, "MA-C" for traffic signal arm connection details, "MA-C (ILSN)" for internally lighted street name sign arm connection details, "LUM-A" for luminaire arm and connection details, "SNS" for internally lighted street name sign details, and "TS-FD" for anchor bolt and foundation details. See "MA-C" for material specifications.

Fabrication shall be in accordance with Item 686, "Traffic Signal Pole Assemblies (Steel)" and with the details, dimensions, and weld procedures shown herein. Weld references call for preapproved weld procedures which the Fabricator must obtain prior to fabrication. Materials, fabrication tolerances, and shipping practices shall meet the requirements of this sheet and Item 686, "Traffic Signal Pole Assemblies (Steel)".

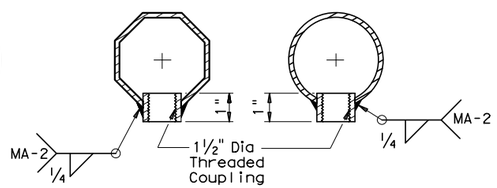
Unless otherwise noted, all parts shall be galvanized in accordance with Item 445, "Galvanizing", after fabrication.

Deviation from the details and dimensions shown herein require submission of shop drawings in accordance with Item 441, "Steel Structures". Alternate designs are not acceptable.



ARM WELD DETAIL

④ 60% Min. penetration 100% pemetration within 6" of circumferential base welds.



ARM COUPLING DETAILS

Texas Department of Transportation
Traffic Operations Division

TRAFFIC SIGNAL SUPPORT STRUCTURES

SINGLE MAST ARM ASSEMBLY

(80 MPH WIND ZONE)

SMA-80(2)-12

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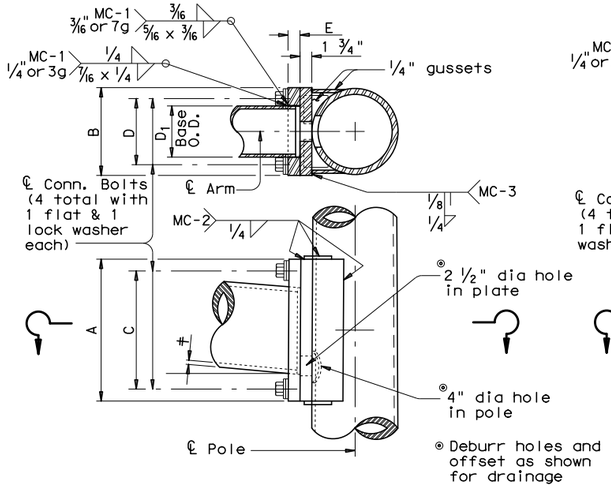
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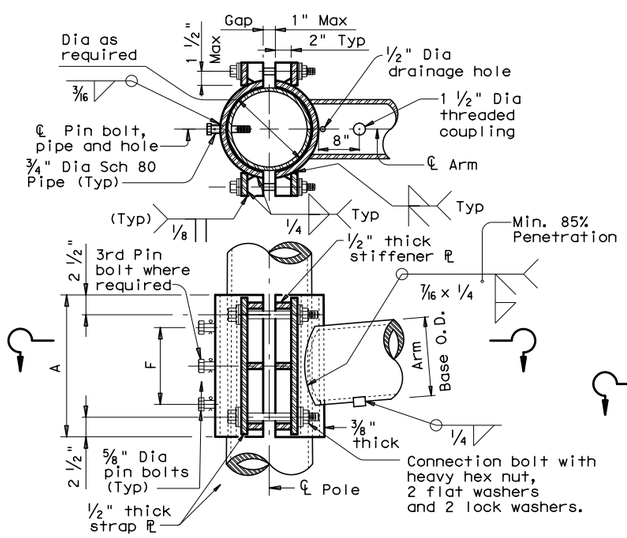
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FILE:

ARM SIZE D_1 in.	ARM SIZE ∓ in.	A in.	B in.	C in.	D in.	E in.	CONN BOLT DIA in.
6.5	.179	12	9	9	6	1 3/4	1
7.5	.179	13	9	10	6	1 3/4	1
8.0	.179	14	10	11	7	2	1 1/4
9.0	.179	16	11	13	8	2	1 1/4
9.5	.179	17	12	14	9	2	1 1/4
9.5	.239	18	12	15	9	2	1 1/4
10.0	.239	18	12	15	9	2	1 1/4
10.5	.239	18	13	15	10	3	1 1/2
11.0	.239	18	13	15	10	3	1 1/2



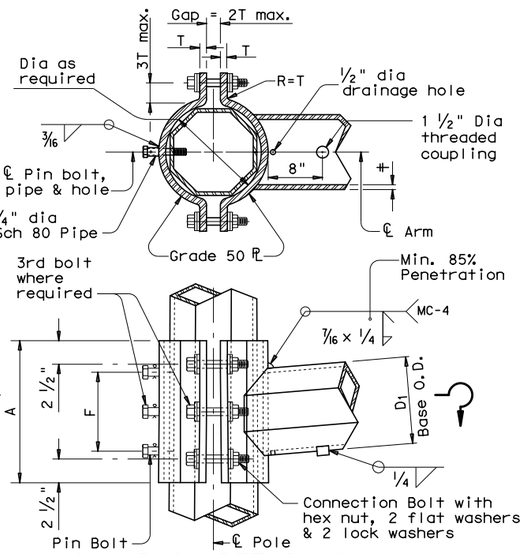
FIXED MOUNT DETAIL 1

ARM SIZE D_1 in.	ARM SIZE ∓ in.	A in.	F in.	CONN. BOLTS No. ea.	CONN. BOLTS Dia in.	PIN BOLTS No. ea.	PIN BOLTS Dia in.
6.5	.179	12	6	4	1	2	5/8
7.5	.179	14	8	4	1	2	5/8
8.0	.179	14	8	4	1	2	5/8
9.0	.179	16	10	4	1	2	5/8
9.5	.179	18	12	4	1 1/4	3	5/8
9.5	.239	18	12	4	1 1/4	3	5/8
10.0	.239	18	12	4	1 1/4	3	5/8



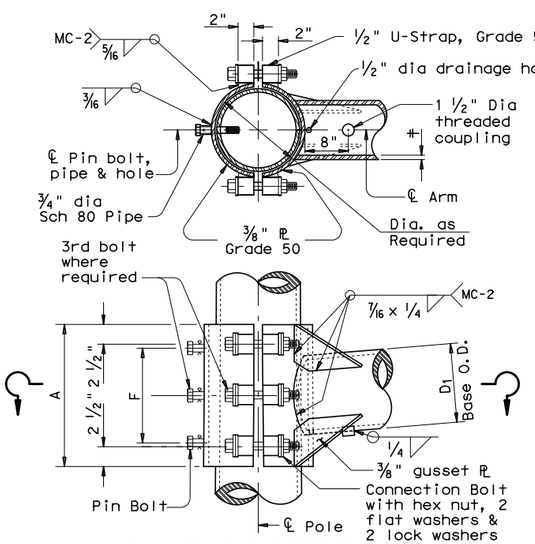
CLAMP-ON DETAIL 1

ARM SIZE D_1 in.	ARM SIZE ∓ in.	A in.	F in.	T in.	CONN. BOLTS No. ea.	CONN. BOLTS Dia in.	PIN BOLTS No. ea.	PIN BOLTS Dia in.
7.0	.179	12	6	3/4	4	3/4	2	5/8
7.5	.179	14	8	3/4	4	3/4	2	5/8
8.0	.179	14	8	3/4	4	3/4	2	5/8
9.0	.179	16	10	7/8	4	1	2	5/8
10.0	.179	18	10	7/8	4	1	2	5/8
9.5	.239	18	10	1	6	1	3	5/8
10.0	.239	18	10	1	6	1	3	5/8

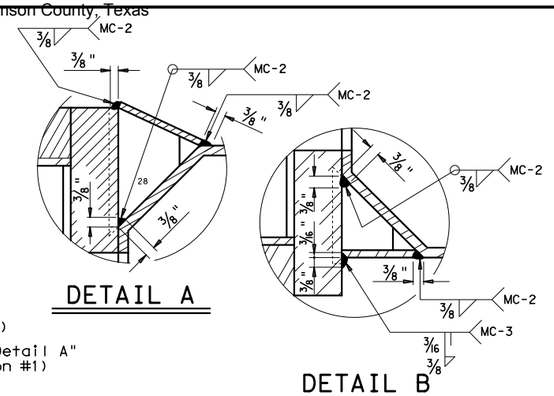


CLAMP-ON DETAIL 2

ARM SIZE D_1 in.	ARM SIZE ∓ in.	A in.	F in.	CONN. BOLTS No. ea.	CONN. BOLTS Dia in.	PIN BOLTS No. ea.	PIN BOLTS Dia in.
6.5	.179	12	6	4	1	2	5/8
7.5	.179	14	8	4	1	2	5/8
8.0	.179	14	8	4	1	2	5/8
9.0	.179	16	10	4	1	2	5/8
9.5	.179	18	12	6	1	3	5/8
9.5	.239	18	12	6	1	3	5/8
10.0	.239	18	12	6	1	3	5/8

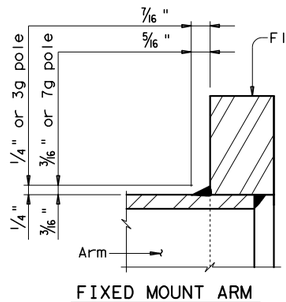


CLAMP-ON DETAIL 3

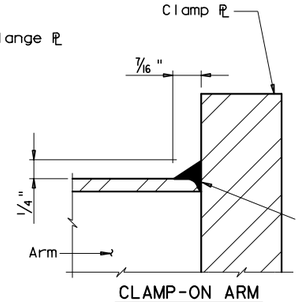


DETAIL A

DETAIL B



FIXED MOUNT ARM



CLAMP-ON ARM

ARM BASE WELD DETAILS

MATERIALS	
Round Shafts or Polygonal Shafts ①	ASTM A595 Gr.A, A588, A1008 HSLAS Gr.50 Class 2, A1011 HSLAS Gr.50 Class 2, A572 Gr.50 or A1011 SS Gr.50 ②
Plates ①	ASTM A36, A588, or A572 Gr.50
Connection Bolts	ASTM A325 or A449, except where noted
Pin Bolts	ASTM A325
Pipe ①	ASTM A53 Gr.B, A501, A1008 HSLAS-F Gr.50, A1011 HSLAS-F Gr.50
Misc. Hardware	Galvanized steel or stainless steel or as noted

① ASTM A572, A1008 HSLAS, A1011 HSLAS, A1008 HSLAS-F, A1011 HSLAS-F or A1011 SS may have higher yield strengths but shall not have less elongation than the grade indicated.

② ASTM A1011 SS Gr.50 material shall also have a minimum elongation of 18 percent in 8 inches or 23 percent in 2 inches. Material thickness in excess of those stipulated under A1011 SS will be acceptable providing the material meets all other A1011 SS requirements and the requirements of this item.

GENERAL NOTES:

Clamp-on details are used for the second arm on dual mast arm assemblies. A Maximum 1 1/2" wide vertical slotted hole shall be cut in the front clamp plate to facilitate drainage during galvanizing. The slot shall be centered behind the arm and shall be no longer than the arm diameter minus 1"

Fixed mount details are used for single mast arm assemblies and for the first arm on dual mast arm assemblies.

Where duplicate parts occur on a detail, welds shown for one part shall apply to all similar parts on the detail.

Pin bolts are required to prevent rotation of clamp-on arms under design wind forces.

NOTE:

Pin bolts shall be A325 with threads excluded from the shear plane. Pin bolt and 3/4" dia pipe shall have 3/16" dia holes for a 1/8" dia galvanized cotter pin. Back clamp plate shall be furnished with a 3/4" dia hole for each pin bolt. An 11/16" dia hole for each pin bolt shall be field drilled through the pole after arm orientations have been approved by the Engineer.

Texas Department of Transportation
Traffic Operations Division

STANDARD ASSEMBLY FOR TRAFFIC SIGNAL SUPPORT STRUCTURES

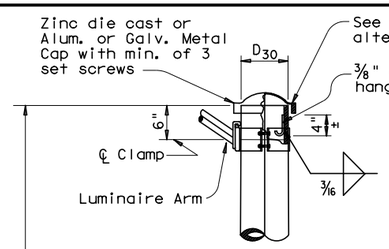
MAST ARM CONNECTIONS

MA-C-12

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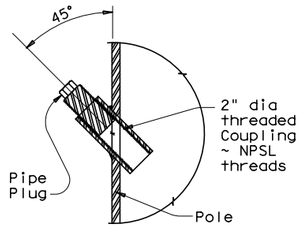
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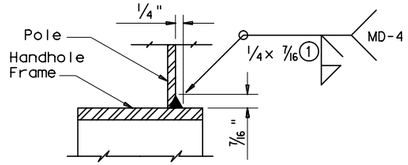


DETAIL A

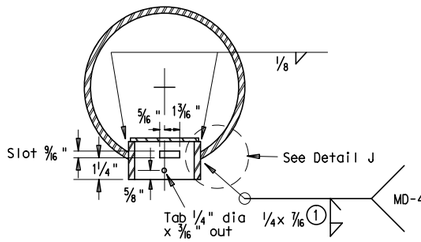
(for pole with luminaire)



POLE COUPLING DETAIL

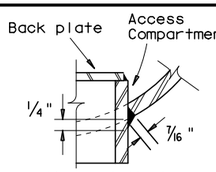


DETAIL G

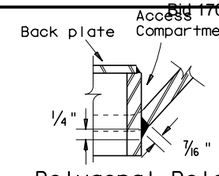


SECTION X-X

Opening for access compartment shall be no more than 1/16 inch wider than the access compartment itself.

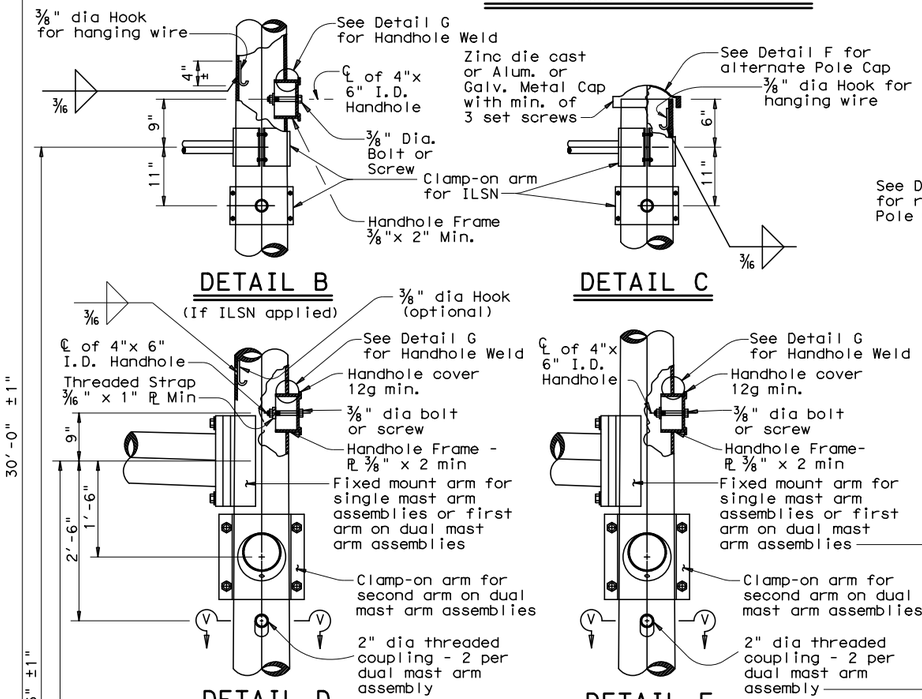


Round Pole



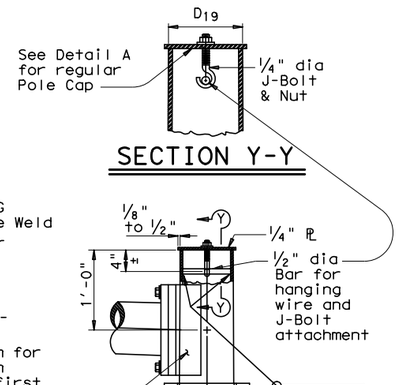
Polygonal Pole

DETAIL J

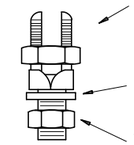


DETAIL B

DETAIL C



SECTION Y-Y

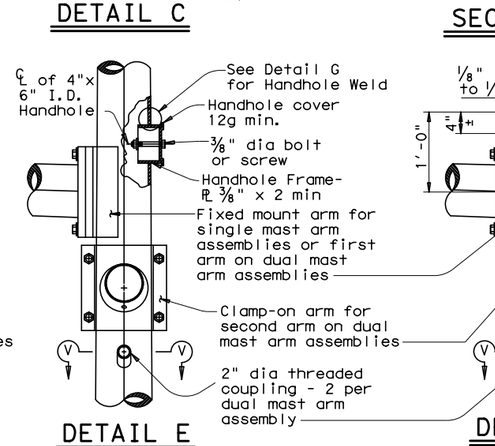


COPPER GROUND CONNECTOR

ACCESS COMPARTMENT

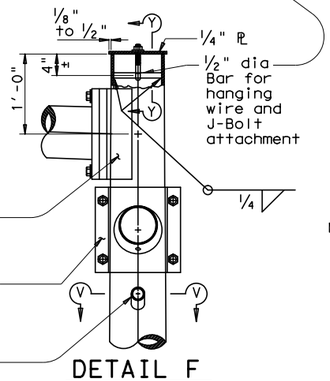
DETAIL D

(for 30' pole with luminaire and ILSN sign)



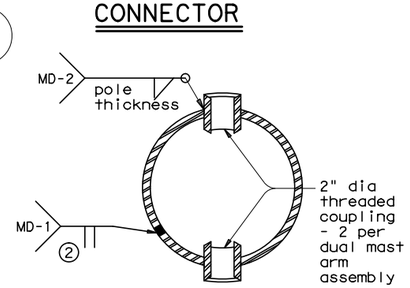
DETAIL E

(for 24' pole with ILSN sign and no luminaire)



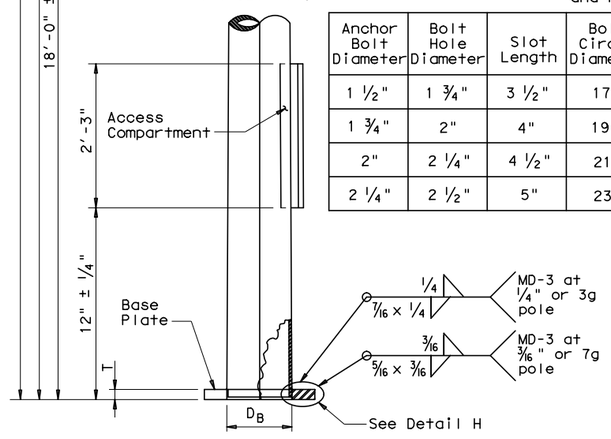
DETAIL F

(for 19' pole with no ILSN sign and no luminaire)

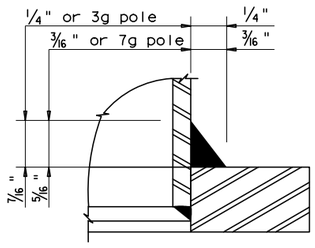


SECTION V-V

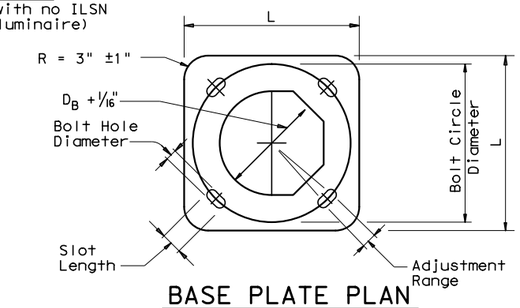
Anchor Bolt Diameter	Bolt Hole Diameter	Slot Length	Bolt Circle Diameter	Base PL Dim. L x T	Adjust. Range
1 1/2"	1 3/4"	3 1/2"	17"	18" x 1 1/2"	13.4°
1 3/4"	2"	4"	19"	20" x 1 3/4"	13.5°
2"	2 1/4"	4 1/2"	21"	22" x 2"	13.6°
2 1/4"	2 1/2"	5"	23"	24" x 2 1/4"	13.7°



POLE ELEVATION



DETAIL H



BASE PLATE PLAN

(1) 85% Min. penetration

(2) 60% Min. penetration 100% pemetration within 6" of circumferential base welds.

NOTES:

1. The cover shall be one piece formed from ABS plastic, shall be a pearl gray color, and shall be suitable for exposure to harsh sunlight and extreme weather. Cover shall latch with two screw latches and shall fit tightly to the enclosure ring to create a rainproof seal. Latch screws shall be 1/4-20 stainless flat socket head screws with tamper proof feature.
2. The pole manufacturer shall provide with each pole a separate kit consisting of: one cover with two latching assemblies, two terminal strips (Marathon #985GP12CU or approved equal), four #8-32 x 1 1/4" self tapping type "F" stainless steel pan head screws, and one ground connector (Blackburn TTC, Burndy KC22J12T13, or Ilsco SSS-5). The traffic signal contractor shall install the kit items in the field.
3. The screw hole spacing on the enclosure back plate shall be for two Marathon #985GP12 terminal strips, one Marathon #985GP06CU terminal strip, and one Bussmann #BM6032B fuse block.
4. Install one Bussmann #BM6032B, Littelfuse #L60030M-2C, or Ferraz-Shawmut #30352 fuse block for poles where luminaires are to be installed.

Texas Department of Transportation
Traffic Operations Division

TRAFFIC SIGNAL SUPPORT STRUCTURES MAST ARM POLE DETAILS

MA-D-12

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DN: MS	CK: JSY	DW: FDN	CK: CAL

REVISIONS
8-99
1-12

CONT	SECT	JOB	HIGHWAY
DIST	COUNTY		SHEET NO.
			35

DATE: 9/28/2017 8:04 AM
FILE:

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FOUNDATION DESIGN TABLE

FDN TYPE	DRILLED SHAFT DIA	REINFORCING STEEL		EMBEDDED DRILLED SHAFT LENGTH-ft ④, ⑤, ⑥			ANCHOR BOLT DESIGN ①				FOUNDATION DESIGN LOAD ②		TYPICAL APPLICATION
		VERT BARS	SPIRAL & PITCH	TEXAS CONE PENETROMETER N blows/ft			ANCHOR BOLT DIA	Fy (ksi)	BOLT CIR DIA	ANCHOR TYPE	MOMENT K-ft	SHEAR Kips	
				10	15	40							
24-A	24"	4- #5	#2 at 12"	5.7	5.3	4.5	¾"	36	12 ¾"	1	10	1	Pedestal pole, pedestal mounted controller.
30-A	30"	8- #9	#3 at 6"	11.3	10.3	8.0	1 ½"	55	17"	2	87	3	Mast arm assembly. (see Selection Table)
36-A	36"	10- #9	#3 at 6"	13.2	12.0	9.4	1 ¾"	55	19"	2	131	5	Mast arm assembly. (see Selection Table) 30' strain pole with or without luminaire.
36-B	36"	12- #9	#3 at 6"	15.2	13.6	10.4	2"	55	21"	2	190	7	Mast arm assembly. (see Selection Table) Strain pole taller than 30' & strain pole with mast arm
42-A	42"	14- #9	#3 at 6"	17.4	15.6	11.9	2 ¼"	55	23"	2	271	9	Mast arm assembly. (see Selection Table)

NOTES:

① Anchor bolt design develops the foundation capacity given under Foundation Design Loads.

② Foundation Design Loads are the allowable moments and shears at the base of the structure.

③ Foundations may be listed separately or grouped according to similarity of location and type. Quantities are for the Contractor's information only.

④ Field Penetrometer readings at a depth of approximately 3 to 5 feet may be used to adjust shaft lengths.

⑤ If rock is encountered, the Drilled Shaft shall extend a minimum of two diameters into solid rock.

⑥ Decimal lengths in Design Table are to allow interpolation for other penetrometer values. Round to nearest foot for entry into Summary Table.

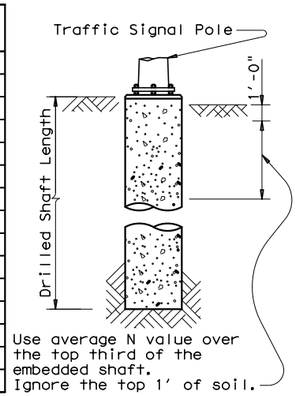
FOUNDATION SUMMARY TABLE ③

LOCATION IDENTIFICATION	AVG. N BLOW /ft.	FDN TYPE	NO. EA	DRILLED SHAFT LENGTH ⑥ (FEET)				
				24-A	30-A	36-A	36-B	42-A
A1	10	30-A	1		11.3			
C1	10	30-A	1		11.3			
F1	10	30-A	1		11.3			
H1	10	36-A	1			15.2		
PED POLES								
E1	10	24-A	1	5.7				
B1	10	24-A	1	5.7				
TOTAL DRILLED SHAFT LENGTHS				11*	34	15		

* ITEM SUBSIDIARY TO ITEM 687

FOUNDATION SELECTION TABLE FOR STANDARD MAST ARM PLUS ILSN SUPPORT ASSEMBLIES (ft)

		FDN 30-A	FDN 36-A	FDN 36-B	FDN 42-A
80 MPH DESIGN WIND SPEED	MAX SINGLE ARM LENGTH	32'	48'		
	MAXIMUM DOUBLE ARM LENGTH COMBINATIONS	24' X 24'			
		28' X 28'			
		32' X 28'	32' X 32'		
			36' X 36'		
			40' X 36'		
			44' X 28'	44' X 36'	
100 MPH DESIGN WIND SPEED	MAX SINGLE ARM LENGTH		36'	44'	
	MAXIMUM DOUBLE ARM LENGTH COMBINATIONS		24' X 24'		
			28' X 28'		
			32' X 24'	32' X 32'	
				36' X 36'	
				40' x24'	40' X 36'
					44' x 36'

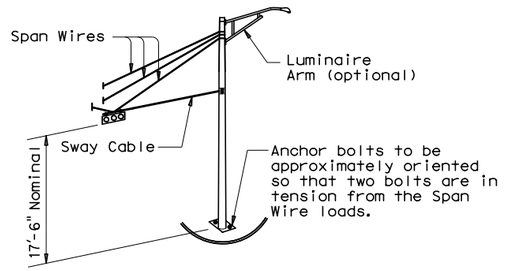


ANCHOR BOLT & TEMPLATE SIZES

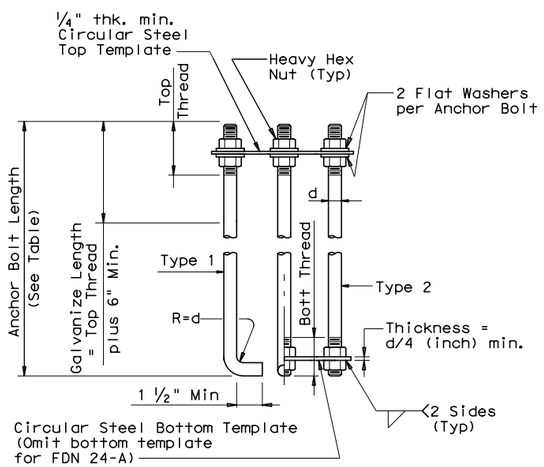
BOLT DIA IN.	⑦ BOLT LENGTH	TOP THREAD	BOTTOM THREAD	BOLT CIRCLE	R2	R1
¾"	1'-6"	3"	—	12 ¾"	7 ⅛"	5 ⅝"
1 ½"	3'-4"	6"	4"	17"	10"	7"
1 ¾"	3'-10"	7"	4 ½"	19"	11 ¼"	7 ¾"
2"	4'-3"	8"	5"	21"	12 ½"	8 ½"
2 ¼"	4'-9"	9"	5 ½"	23"	13 ¾"	9 ¼"

⑦ Min dimensions given, longer bolts are acceptable.

EXAMPLE:
1. For 80mph design wind speed, foundation 30-A can support up to a 32' arm with another arm up to 28'
2. For 100mph design wind speed, foundation 36-A can support a single 36' mast arm.

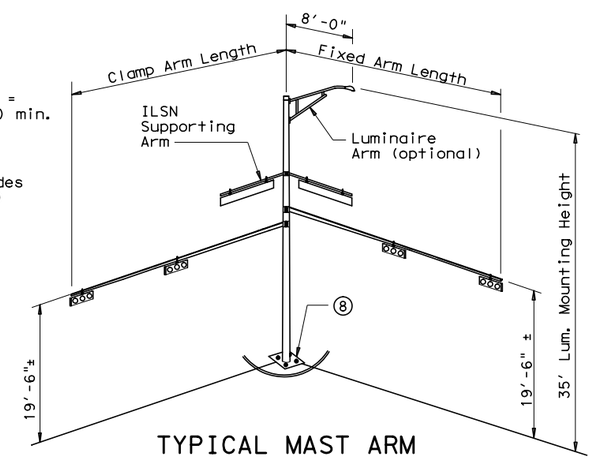


TYPICAL STRAIN POLE ASSEMBLY



HOOKED ANCHOR (TYPE 1) NUT ANCHOR (TYPE 2)

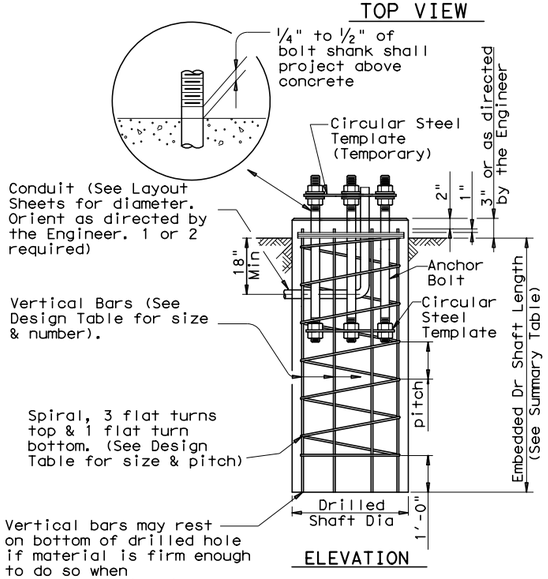
ANCHOR BOLT ASSEMBLY



TYPICAL MAST ARM ASSEMBLY

⑧ Orient anchor bolts orthogonal with the fixed arm direction to ensure that two bolts are in tension under dead load.

TOP VIEW



ELEVATION

FOUNDATION DETAILS

GENERAL NOTES:

Design conforms to 1994 AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals and interim revisions thereto.

Reinforcing steel shall conform to Item 440, "Reinforcing Steel".

Concrete shall be Class "C".

Threads for anchor bolts and nuts shall be rolled or cut threads of 8UN series up to 2" in diameter or UNC series for all sizes. Bolts and nuts shall have Class 2A and 2B fit tolerances. Galvanized nuts shall be tapped after galvanizing.

Anchor bolts that are larger than 1" in diameter shall conform to "alloy steel" or "medium-strength mild steel" per Item 449, "Anchor Bolts". Anchor bolts that are 1" in diameter or less shall conform to ASTM A36. Galvanize a minimum of the top end thread length plus 6" for all anchor bolts unless otherwise noted. Exposed washers and exposed nuts shall be galvanized. All galvanizing shall be in accordance with Item 445, "Galvanizing".

Templates and embedded nuts need not be galvanized. Lubricate and tighten anchor bolts when erecting the structure in accordance with Item 449, "Anchor Bolts".

PRELIMINARY
FOR REVIEW ONLY
Not for construction, bidding, or permit purposes.
Kimley»Horn
Engineer: BRIAN D. VAN DE WALLE
P.E. No. 68525 Date: 8/25/2017

Texas Department of Transportation
Traffic Operations Division

TRAFFIC SIGNAL POLE FOUNDATION

TS-FD-12

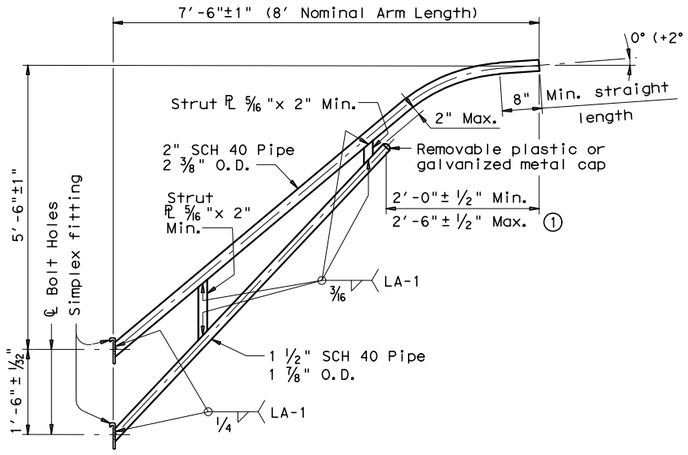
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CONT	SECT	JOB	HIGHWAY
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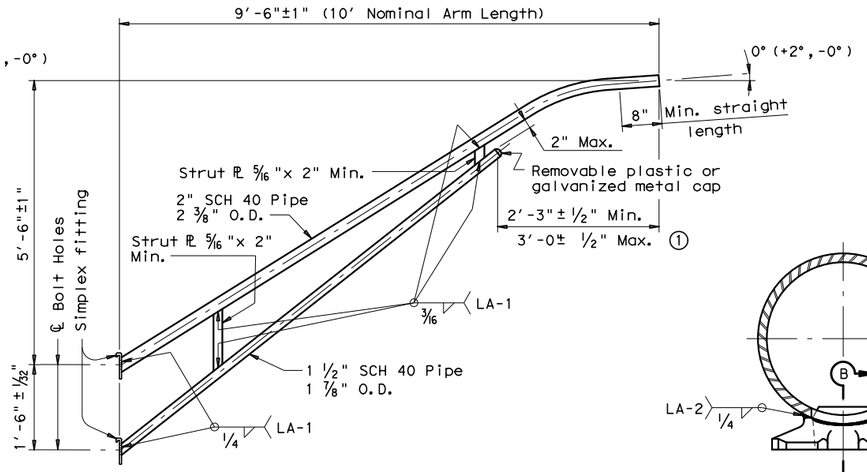
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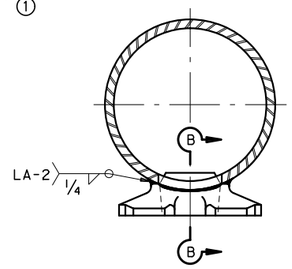
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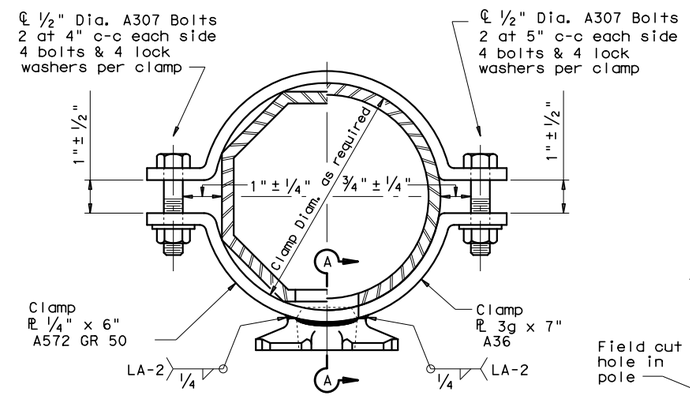
8-FOOT LUMINAIRE ARM



10-FOOT LUMINAIRE ARM

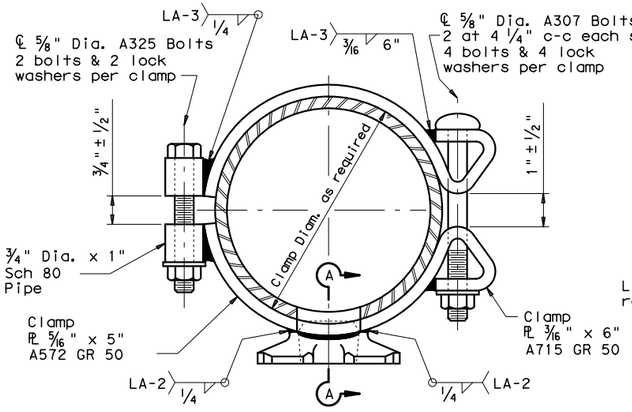


DIRECT ATTACHMENT DETAIL



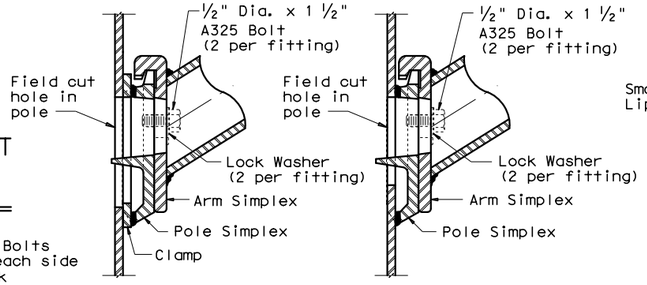
CLAMP ATTACHMENT DETAIL NO. 1 (HALF SECTION)

CLAMP ATTACHMENT DETAIL NO. 2 (HALF SECTION)



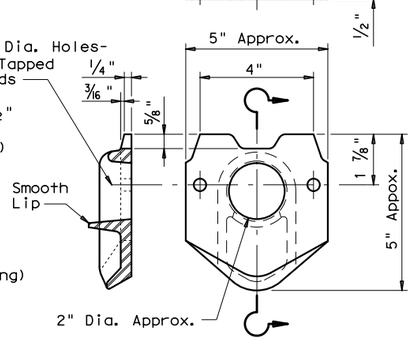
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CLAMP ATTACHMENT DETAIL NO. 4 (HALF SECTION)

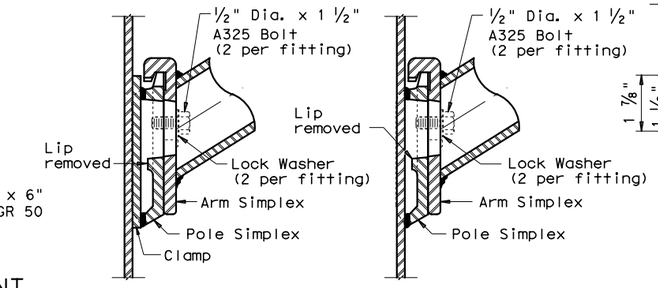


UPPER SIMPLEX FITTING

UPPER SIMPLEX FITTING



POLE SIMPLEX DETAIL

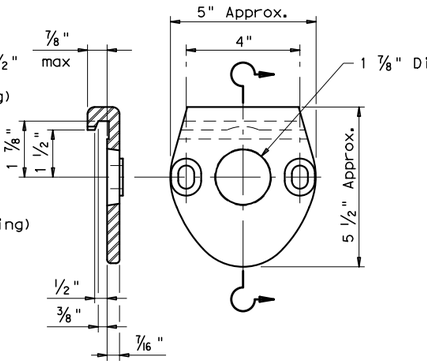


LOWER SIMPLEX FITTING

LOWER SIMPLEX FITTING

SECTON A-A

SECTON B-B



ARM SIMPLEX DETAIL

MATERIALS	
Pole or Arm Simplex	ASTM A27 Gr.65-35 or A148 Gr.80-50, A576 Gr.1021 (3), or A36 (Arm only)
Arm Pipes	ASTM A53 Gr.B, A501, A1008 HSLAS-F Gr.50 (4), or A1011 HSLAS-F Gr.50 (4)
Arm Strut Plates (2)	ASTM A36, A572 Gr.50 (4), or A588
Misc.	ASTM designations as noted

(1) Dimensional limits are given to show acceptable variation in design. All of a Fabricator's production of a particular arm length shall have the same dimensions within specified tolerances.

(2) Any of the materials listed for plates may be used where the drawings do not specify a particular ASTM designation.

(3) A576 must be suitable for forging and also meet minimum tensile strength of 65 ksi, minimum yield of 35 ksi, and elongation in 2 inches of 22 percent.

(4) ASTM A572, A1008 HSLAS-F, and A1011 HSLAS-F may have higher yield strengths but shall not have less elongation than the grade indicated.

GENERAL NOTES:

Design conforms to 1994 AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals and Interim Revisions thereto. Design Wind Speed equals 90 mph plus a 1.3 gust factor. Arms are designed to support a 60 lb. luminaire having an effective projected area (actual area times drag coefficient) of 1.6 sq. ft.

Materials and fabrication shall be in accordance with Item 686, "Traffic Signal Pole Assemblies (Steel)" and with the details, dimensions, and weld procedures shown herein. Weld references call for preapproved weld procedures which the Fabricator must obtain prior to fabrication. In the absense of specified Fabricaton tolerances, dimensions shall be within the tolerances generally obtainable in normal fabrication practice.

Unless otherwise noted, all parts shall be galvanized after fabrication in accordance with Item 445, "Galvanizing".

Deviation from the details and dimensions shown herein require submission of shop drawings in accordance with Item 441, "Steel Structures". Alternate designs are not acceptable.

Each pole simplex fitting shall be supplied with 2 ASTM A325 bolts and 2 lock washers of the size specified. The bolts and lock washers shall be secured to the pole with the other hardware items called for in the plans. When clamp attachment is specified, the Fabricator shall ship the clamp assembly securely attached to the pole at the location shown on the plans.

If clamp assemblies are ordered without poles, the Fabricator shall ship one upper and one lower clamp assembly together in a single package, including all nuts and washers required for the clamps and simplex fittings.

Texas Department of Transportation
Traffic Operations Division

STANDARD ASSEMBLY DRAWINGS FOR LUMINAIRE SUPPORT STRUCTURES

ARM DETAILS

LUM-A-12

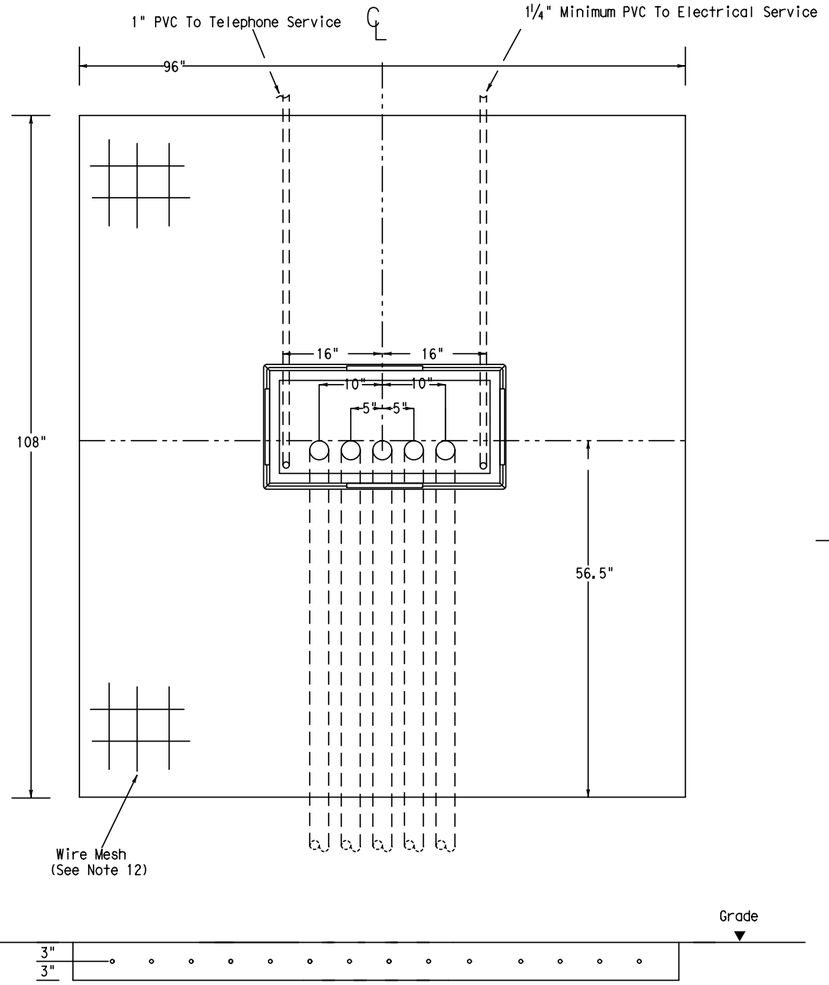
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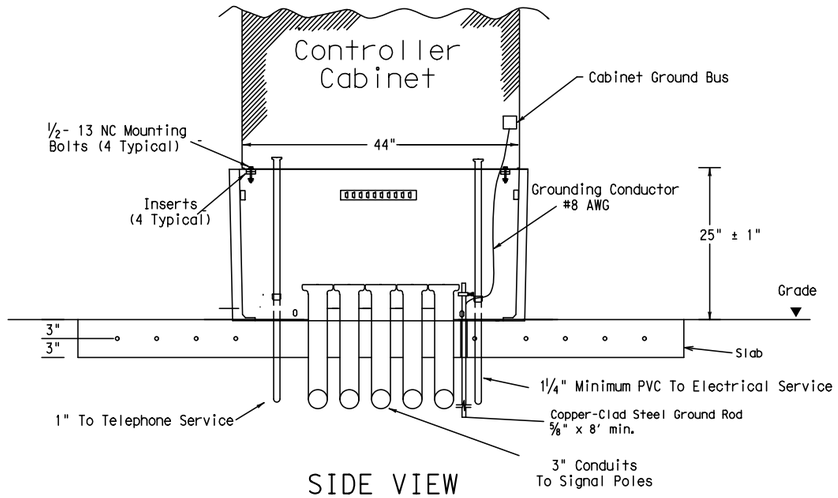
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DIST	COUNTY		SHEET NO.
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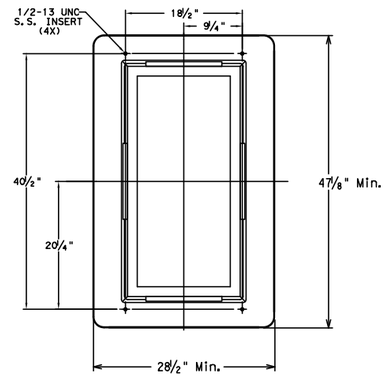
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TOP VIEW
(Slab & Base)





SIDE VIEW
(Slab & Base)



CABINET BASE

TRAFFIC SIGNAL CONTROLLER BASE:

1. Provide a traffic signal controller base (cabinet base) manufactured of polymer concrete material consisting of calcareous and siliceous stone; glass fibers and thermoset polyester resin. The polymer concrete cabinet base must be reinforced on the inside of the cabinet base with fiberglass matting. Provide one of the following bases: Armorcast Part # A6001848X24, Quazite Model # PG3048Z709, or other as approved by TxDOT Traffic Operation Division.
2. The polymer concrete material must have a minimum compressive strength of 10,300 pounds per square inch (psi), minimum flexural strength of 3600 psi, and minimum shear strength of 3600 psi.
3. The polymer concrete cabinet base must conform to the dimensions shown and must accommodate a standard TxDOT basemount cabinet.
4. Supply the cabinet base with four ½"-13 UNC stainless steel inserts for attachment of the cabinet to the base. Inserts must withstand a minimum torque of 50 ft-lb and a minimum straight pull out strength of 750 lbs.
5. Provide the cabinet base with 4 cable racks mounted one on each side of the base 2" to 7 " from the top edge of the base. Unless approved otherwise, cable racks must be 1-1/2 x ⅝ x ⅜ inch steel channel with eight T-slots spaced at 1-1/2 inches. The cable racks must easily accommodate the insertion of tie wraps to attach field wiring to the racks to serve as strain relief. Secure cable racks to the base using ½"-13 UNC stainless steel screws and inserts.
6. The cabinet base, when secured to the concrete slab with controller cabinet attached, must withstand a minimum wind load of 125 mph or a 850 lb force applied at 49" above the bottom of the base without causing the base or cabinet to come out of their anchored position or cause any permanent deformation. The manufacturer must supply certification by an independent testing laboratory or sealed by a Texas Licensed Professional Engineer. Provide the cabinet base with hardware for attachment to a concrete slab.
7. The traffic signal base must be permanently marked either by impress or by permanent ink with the manufacturer's model number and name or logo.
8. Seal the base to the concrete with a silicone caulk bead and fastened to the slab per manufacturer's instructions.

CONCRETE SLAB:

9. Traffic signal controller pad must be a portland cement concrete slab poured in place, must conform to the dimensions shown, and must be level.
10. Bond a #8 AWG copper ground wire and an 8 ft ground rod bonded to the reinforcing mesh by a suitable UL Listed clamp and terminated to the cabinet grounding bus for the purpose of providing a local ground for the electrical grounding conductor. The electrical grounding conductor specified in Item 680-3.A.4 is required and must be terminated to the cabinet ground bus.
11. Install a PVC sleeve to prevent the ground rod from direct embedment in the slab.
12. Provide welded wire mesh 6X6-W2.9 X W2.9 for reinforcement. Provide joints and splices in the mesh with a minimum 6-inch overlap. Center the mesh between top and bottom and provide a minimum 3 inch cover on the edges.
13. Provide Class B concrete minimum for the slab in accordance with Item 421. Construct the slab in accordance with Item 531.

CONDUITS:

14. Stub up and run 3-inch conduits through the slab to the various traffic signal poles and ground boxes as shown on the layouts. Install the number of conduits as shown on layouts plus two additional 3 inch conduits for future use. Terminate the conduits with a bushing between 2 and 4-inches above the slab.
15. Extend conduits for future use at least 18-inches from the edge of the slab, terminate underground with a coupling, and cap and seal so that the seal can be removed without damaging the coupling. This must also apply to unused telephone conduit.
16. Stub up two separate conduits through the slab from the electrical and telephone services. Run the conduit for the electrical feed directly to the electrical service enclosure. Run the conduit for the telephone line directly to the telephone service, usually located on the same pole as the electrical service. Telephone must not under any circumstance share a conduit with any other function.
17. Terminate electric and telephone conduits above the slab with a coupling. After the base is installed, extend the conduits above the top of the base and secure to the base using a steel one-hole strap or similar suitable substitute.

CONTROLLER CABINET:

18. Anchor the controller cabinet to the base using four stainless steel 1/2-13 NC bolts.
19. The silicone caulk bead specified in Item 680.3.B must be RTV 133.

PAYMENT:

20. Bid TS-CF as subsidiary to Item 680.

Texas Department of Transportation
Traffic Operations Division

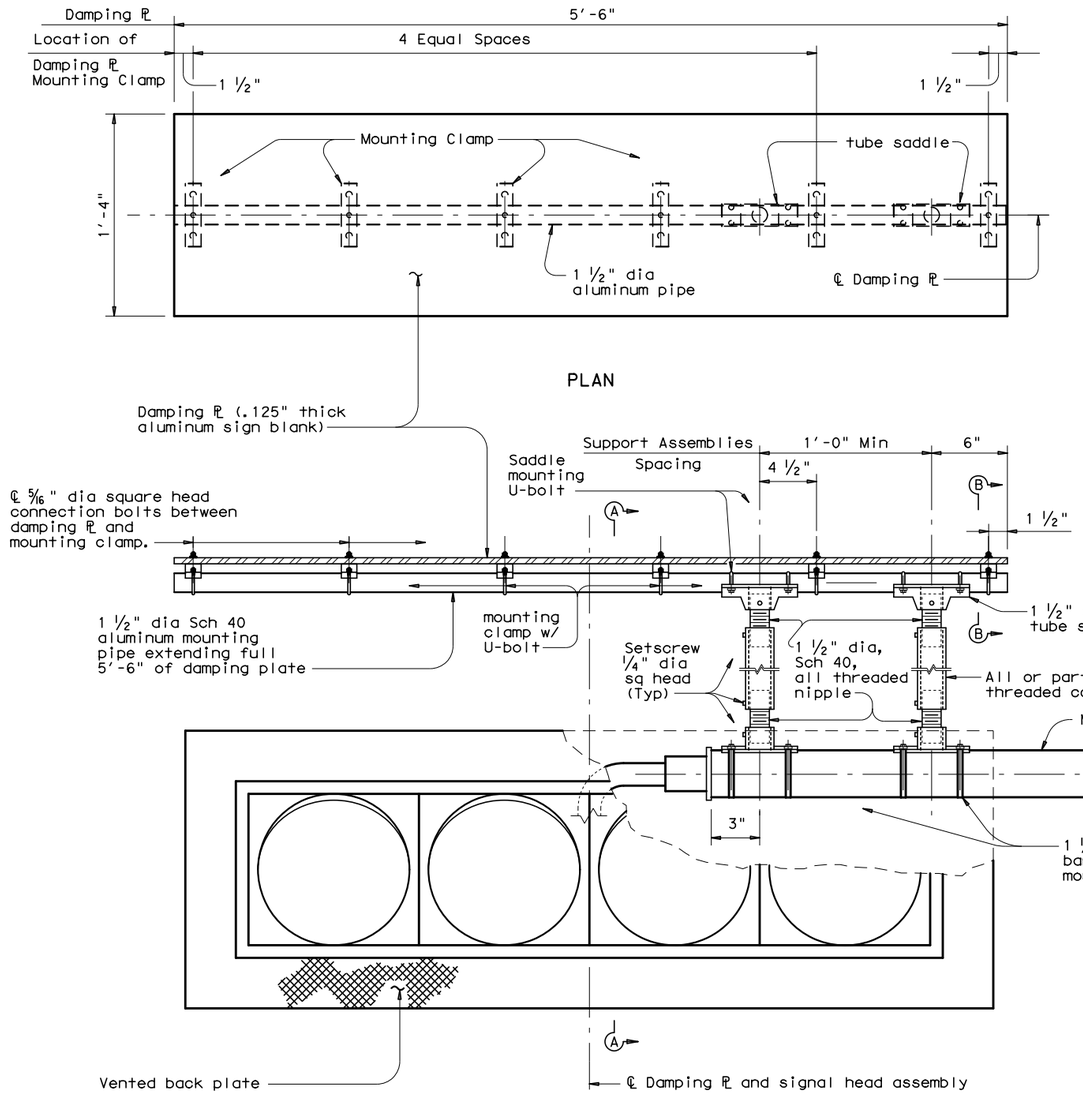
TRAFFIC SIGNAL CONTROLLER CABINET BASE AND PAD

TS-CF-04

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	DIST	COUNTY		SHEET NO.

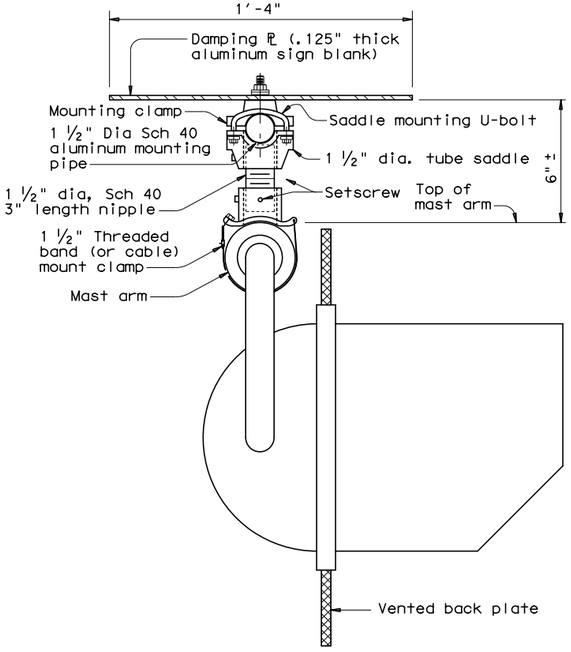
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FILE:

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DAMPING PLATE MOUNTING DETAILS

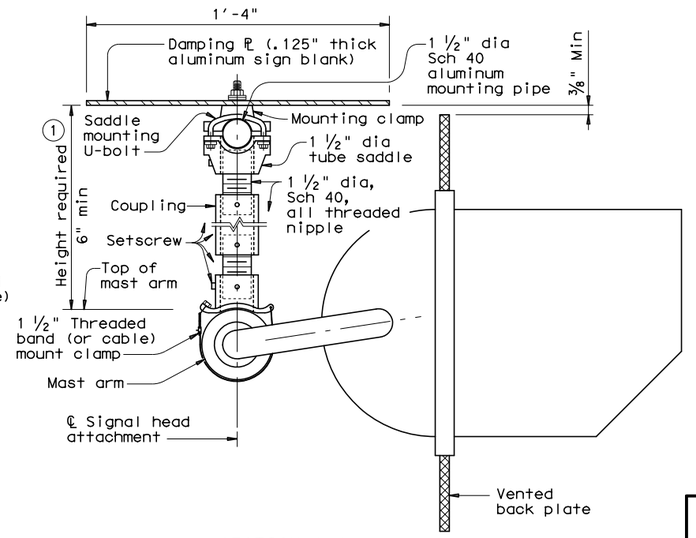
(Showing alternate placement of signal head)



SECTION A-A

(Showing standard placement of signal head)

(Mounting clamp U-bolt is not shown for clarity)



SECTION A-A

(Showing alternate placement of signal head)

(Mounting clamp U-bolt is not shown for clarity)

1 Recommended supporting assemblies to achieve required height			
Height required	One nipple each length	Two nipples each length plus	One coupling each length
6"-6 ¾"	3"	-	-
7"-8 ½"	4"	-	-
9"-10 ½"	6"	-	-
11"-15 ½"	-	4"	5"
16"-24"	-	6"	10"

GENERAL NOTES:

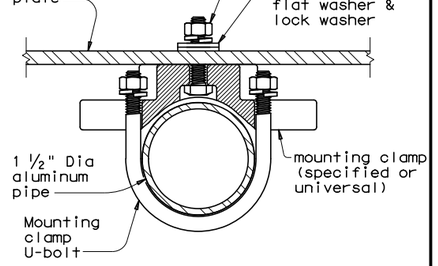
In accordance with the findings of TxDOT sponsored research, the installation of a damping plate in accordance with the details shown here at the end of signal mast arms of SMA and DMA standard structures reduces excessive harmonic vertical vibration, and thus fatigue damage. Any deviation from these details may reduce the effectiveness of this damping device.

Aluminum sign blank for damping plate shall conform to Departmental Material Specifications DMS-7110. Materials for mast arm mounting clamp and tube saddle shall be aluminum castings or aluminum alloys as in accordance with manufacturers' stipulations. Mounting pipe, pipe nipple and coupling shall be aluminum alloy 6061-T6 or 6063-T6. Damping plate mounting clamp and u-bolt assemblies shall conform to Standard sheet SMD(GEN)-08. U-bolts for saddle mounting shall have a minimum yield strength of 36 ksi.

Damping plate shall be mounted horizontally. Position centerline of damping plate to align with centerline of signal head assembly. Vertical clearance between signal head (with or without backing plate) and bottom of damping plate shall be maintained as shown. The attachments shown here are examples only, other supporting details which meet both alignment and vertical clearance requirements are also acceptable.

Unless stipulated by the manufacturers, all steel parts shall be galvanized finish in accordance with Standard Specification Item 445, "Galvanizing".

Contractor shall verify applicable field dimensions before the installation.



SECTION B-B

(Showing damping plate attachment)

Texas Department of Transportation
Traffic Operations Division

MAST ARM DAMPING PLATE DETAILS

MA-DPD-12

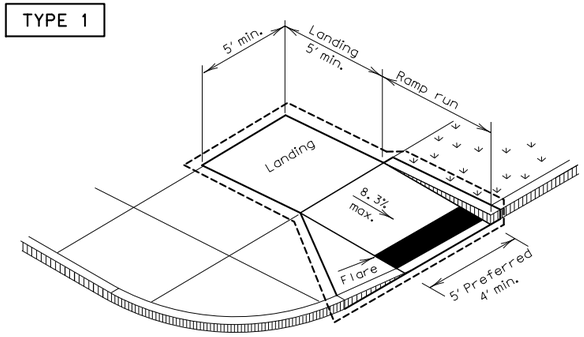
©TxDOT January 2012	DN:	CK:	DW:	CK:
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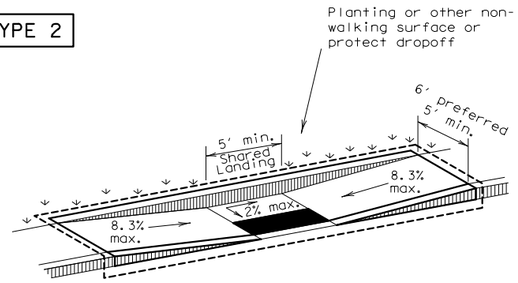
DATE:
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TYPE 1



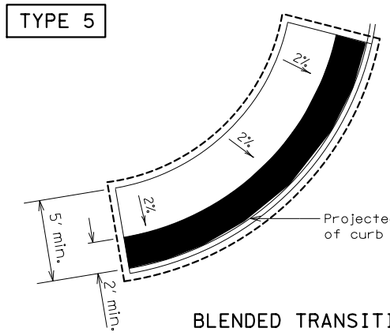
PERPENDICULAR CURB RAMP

TYPE 2



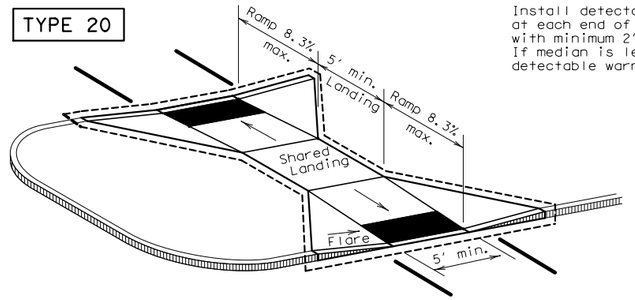
PARALLEL CURB RAMP
(Use only where water will not pond in the landing.)

TYPE 5



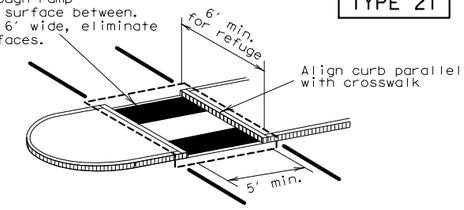
BLENDED TRANSITION

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.

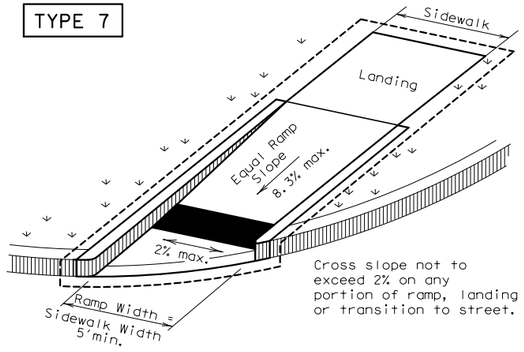
TYPE 21



Curb details are shown elsewhere in the plans.

CURB RAMPS AT MEDIAN ISLANDS

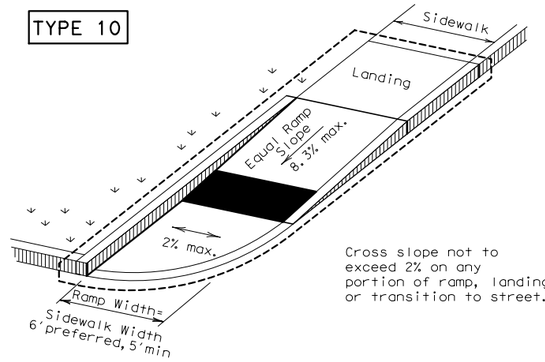
TYPE 7



Cross slope not to exceed 2% on any portion of ramp, landing or transition to street.

(Sidewalk set back from curb)

TYPE 10

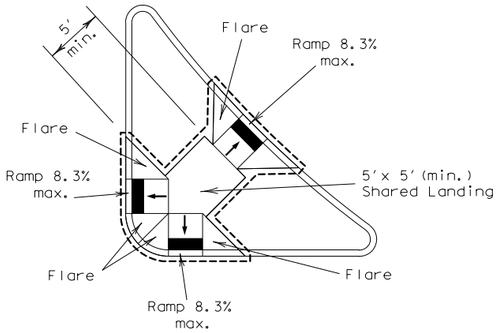


Cross slope not to exceed 2% on any portion of ramp, landing or transition to street.

(Sidewalk adjacent to curb)

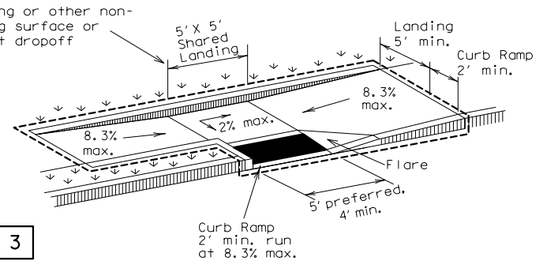
DIRECTIONAL RAMPS WITHIN RADIUS

TYPE 22

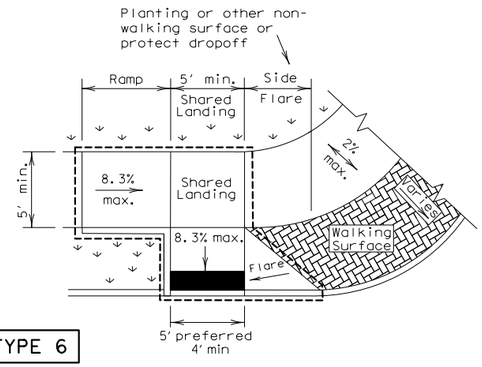


COMBINATION ISLAND RAMPS

TYPE 3

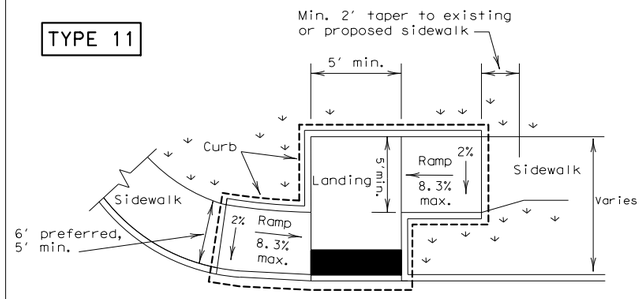


TYPE 6



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:	DW:	CK:
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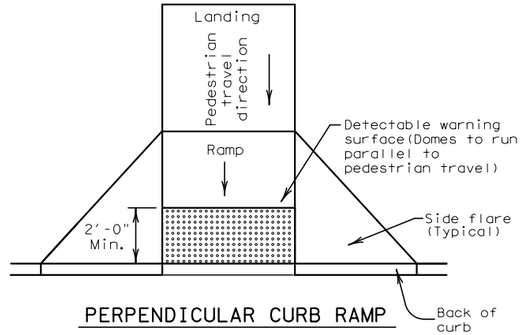
General Notes

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.

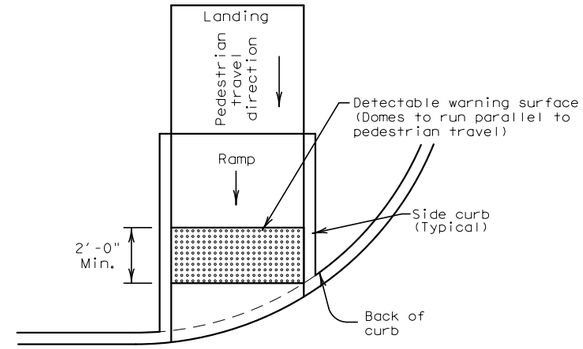
Detectable Warning Material

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.



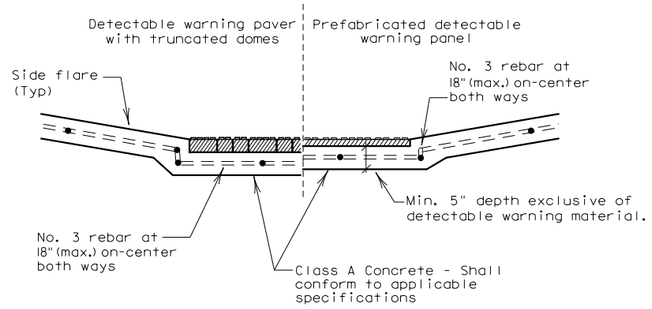
PERPENDICULAR CURB RAMP

Typical placement of detectable warning surface on sloping ramp run.

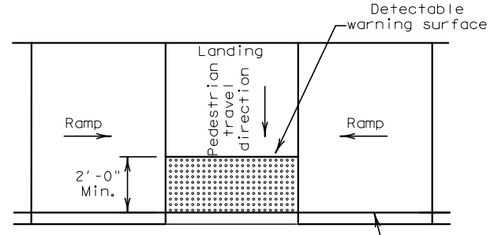


DIRECTIONAL CURB RAMP

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.

SHEET 2 OF 4

Texas Department of Transportation | Design Division Standard

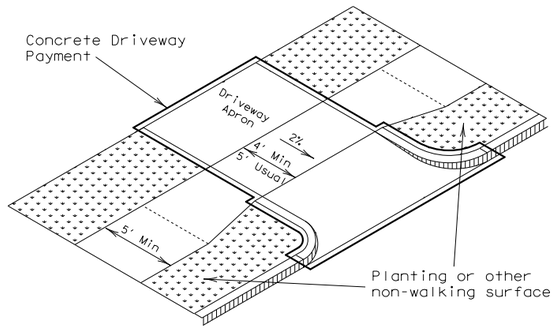
PEDESTRIAN FACILITIES CURB RAMPS

PED-12A

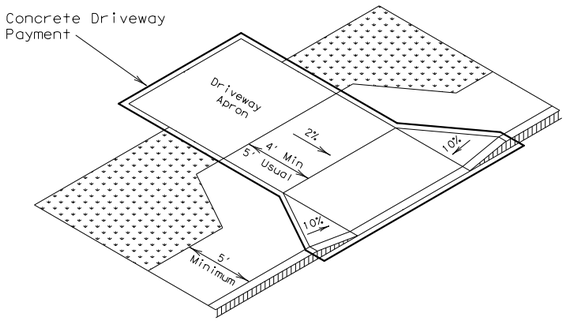
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VP June 13, 2012	DIST	COUNTY		SHEET NO.
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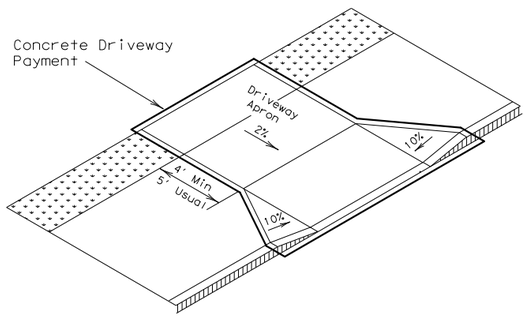
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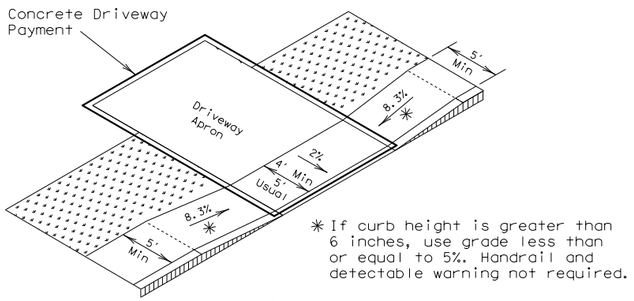
Setback sidewalk



Apron offset sidewalk



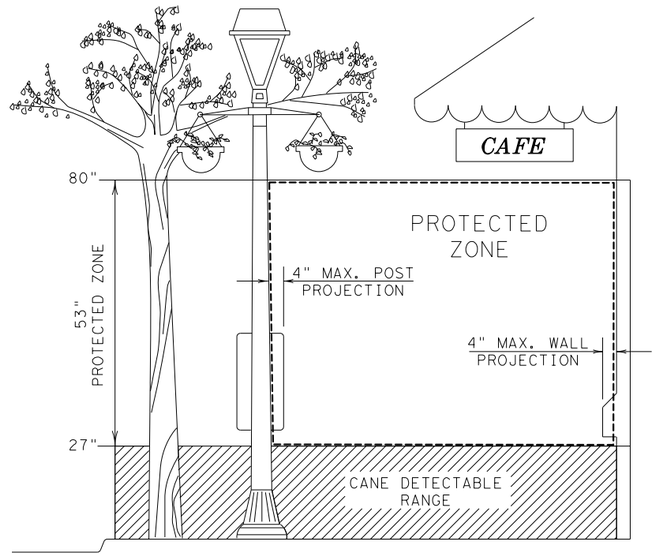
Wide sidewalk



✳ If curb height is greater than 6 inches, use grade less than or equal to 5%. Handrail and detectable warning not required.

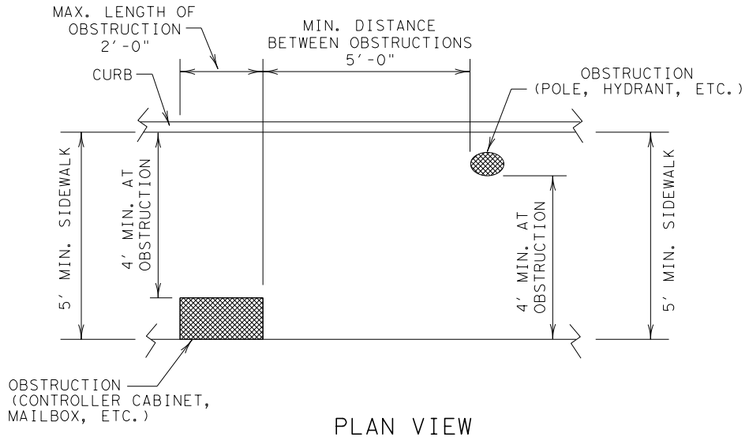
Ramp sidewalk

SIDEWALK TREATMENT AT DRIVEWAYS



PROTECTED ZONE

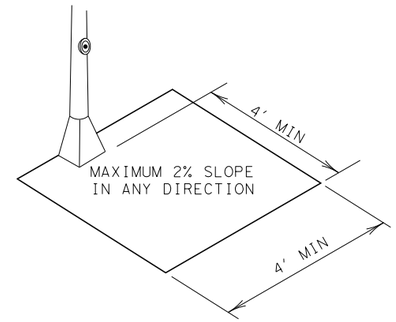
In pedestrian circulation area, maximum 4" projection for post or wall mounted objects between 27"and 80" above the surface.



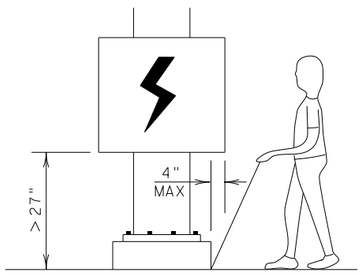
PLAN VIEW

PLACEMENT OF STREET FIXTURES

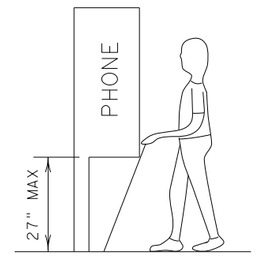
(ITEMS NOT INTENDED FOR PUBLIC USE. MINIMUM 4' x 4' CLEAR GROUND SPACE REQUIRED AT PUBLIC USE FIXTURES.)



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

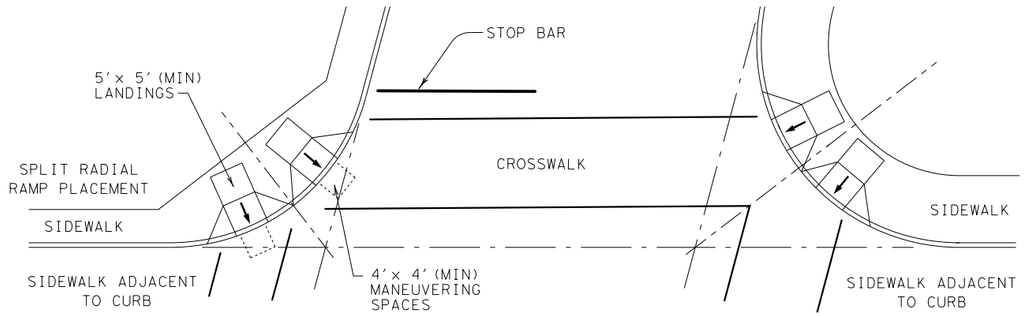
Texas Department of Transportation | Design Division Standard

PEDESTRIAN FACILITIES CURB RAMPS

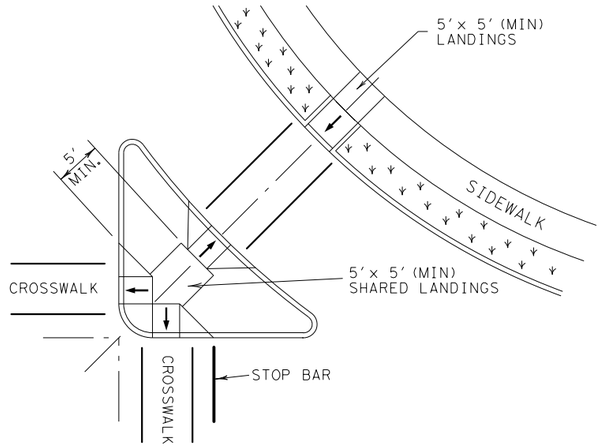
PED-12A

FILE: ped12a.dgn	DN: TxDOT	CK: RM	DW: TxDOT	CK: VP
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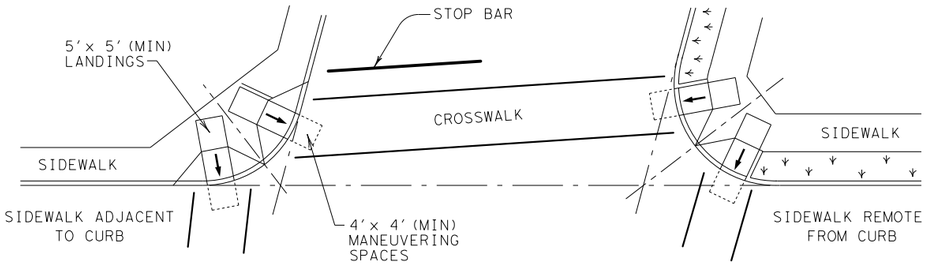
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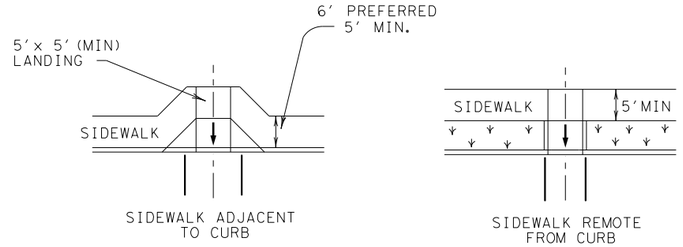
SKEWED INTERSECTION WITH "LARGE" RADIUS



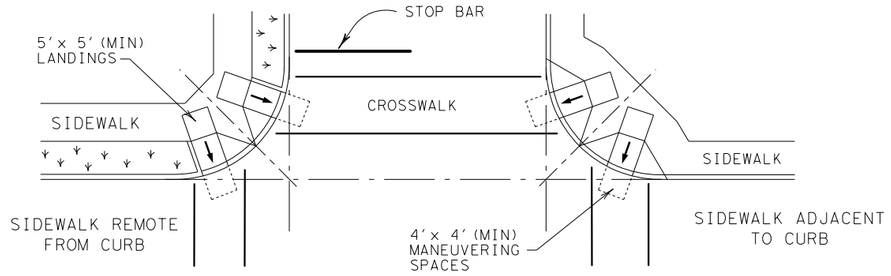
AT INTERSECTION
W/FREE RIGHT TURN & ISLAND



SKEWED INTERSECTION WITH "SMALL" RADIUS



MID-BLOCK PLACEMENT
PERPENDICULAR RAMPS



NORMAL INTERSECTION WITH "SMALL" RADIUS

TYPICAL CROSSING LAYOUTS

SHEET 4 OF 4

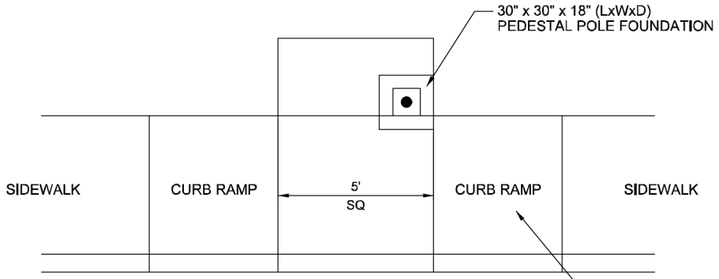
Texas Department of Transportation | Design Division Standard

PEDESTRIAN FACILITIES CURB RAMPS

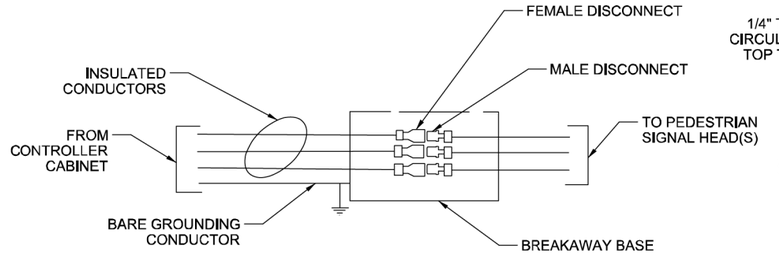
PED-12A

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REVISIONS							
VP June 13, 2012		DIST	COUNTY			SHEET NO.	
							42

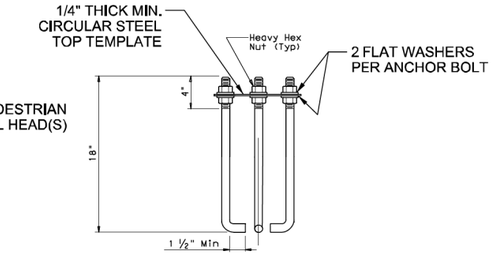
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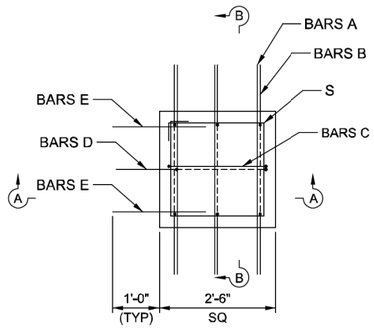
30"X30" FOUNDATION SIDEWALK DETAIL
(NOT TO SCALE)



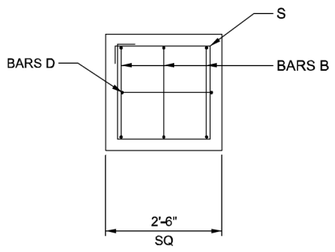
BREAKAWAY IN-LINE FUSEHOLDERS
(NOT TO SCALE)



HOOKED ANCHOR
(NOT TO SCALE)

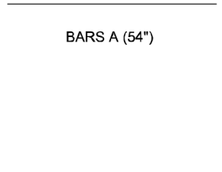


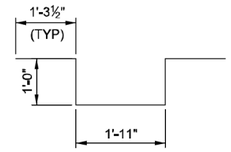
PLAN - TOP



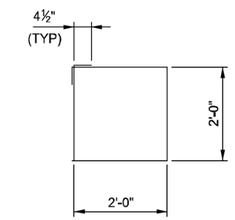
PLAN - BOTTOM

PEDESTAL POLE FOUNDATION PLAN VIEW (NOT TO SCALE)

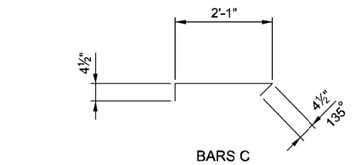




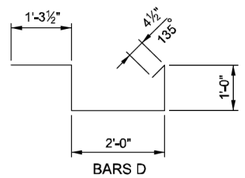
BARS B



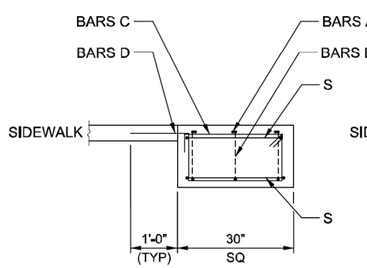
S - STIRRUP



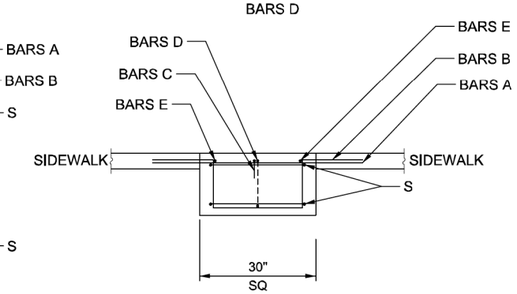
BARS C



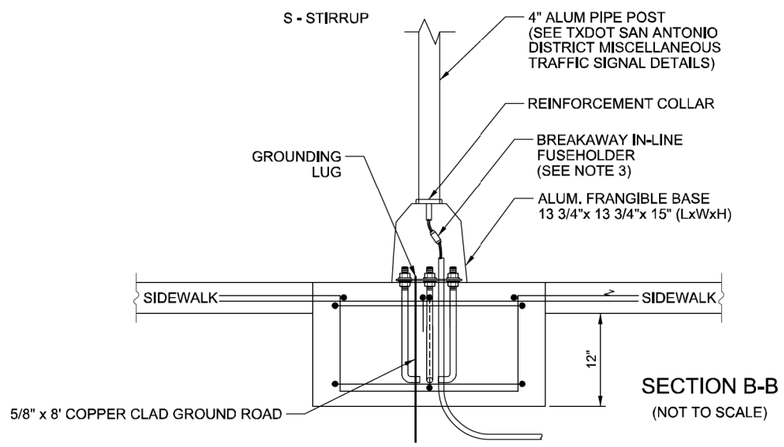
BARS D



SECTION A-A



SECTION B-B



SECTION B-B
(NOT TO SCALE)

NOTES:
1. THE PEDESTAL POLE ASSEMBLY DEPICTED ON THIS SHEET IS DESIGNED FOR SIGNAL HEADS WHERE ELECTRICAL POWER IS NEEDED WITH A BREAKAWAY POLE.
2. 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.
3. ALL ELECTRICAL CONNECTORS FOR BREAKAWAY POLES SHALL BE WATER TIGHT BREAKAWAY FUSEHOLDERS (BUCHANNAN 65U, BUSSMAN HEBW, LETTELFUSE LEB, HMC FLOOD-SEAL, FERRAZ-SHAWMUT, OR EQUAL). FUSES SHALL BE 10 AMP TIME DELAY.
4. CONDUIT IN FOUNDATION AND WITHIN 6 INCHES OF FOUNDATION IS SUBSIDIARY TO THE ITEM, 'PEDESTAL POLE ASSEMBLY'.
5. PER MANUFACTURER'S RECOMMENDATIONS, ENGAGE ALL THREADS ON THE PEDESTAL POLE BASE PIPE UNLESS THE PIPE IS FULLY SEATED INTO BASE.

95%

NO.	REVISION	BY	DATE
1			
2			

PRELIMINARY
FOR REVIEW ONLY
Not for construction, bidding, or permit purposes.
Kimley»Horn
Engineer BRIAN D. VAN DE WALLE
P. E. No. 68525 Date 8/25/2017
8/25/2017

Kimley»Horn F-928

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WILLIAMSON COUNTY
CR 119 & LIMMER LOOP

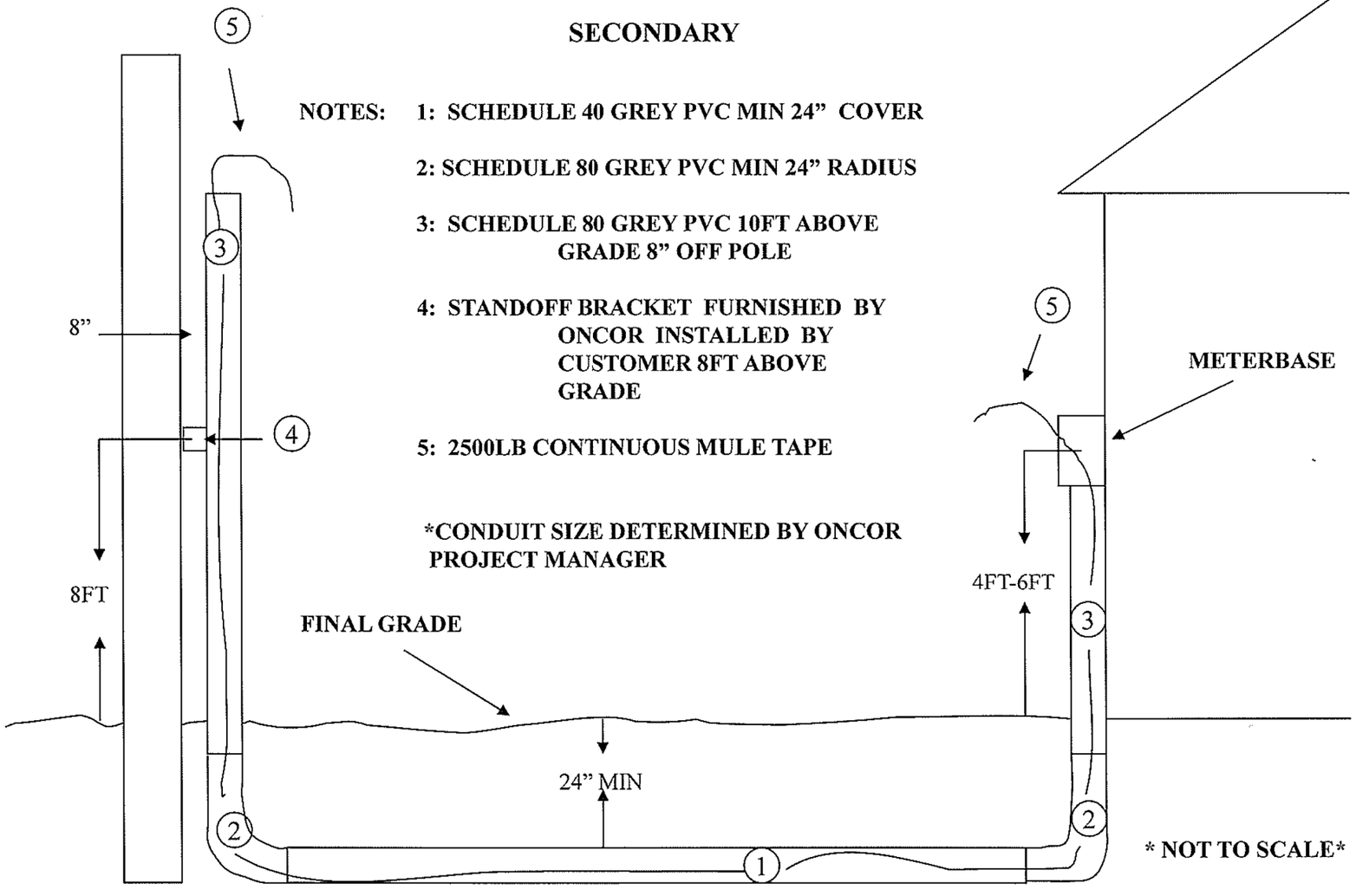
PED POLE SPREAD FOOTING DETAIL

STATE	COUNTY	CITY	SHEET NO.
TEXAS	WILLIAMSON	HUTTO	44
PROJECT NO.		ROADWAY	

FILENAME: \\AUSFP01\Data\Project\AUS*TPTO\068501514 - CR 119 Limmer Loop Signal Design\CADD\DTLS\SPREADFTG.dgn 8/25/2017 11:29:39 AM PLOTTED BY:

ONCOR ELECTRIC DELIVERY

SECONDARY



NOTES:

1: SCHEDULE 40 GREY PVC MIN 24" COVER

2: SCHEDULE 80 GREY PVC MIN 24" RADIUS

3: SCHEDULE 80 GREY PVC 10FT ABOVE GRADE 8" OFF POLE

4: STANDOFF BRACKET FURNISHED BY ONCOR INSTALLED BY CUSTOMER 8FT ABOVE GRADE

5: 2500LB CONTINUOUS MULE TAPE

*CONDUIT SIZE DETERMINED BY ONCOR PROJECT MANAGER

* NOT TO SCALE*

95%

NO.	REVISION	BY	DATE
1			
2			

PRELIMINARY
FOR REVIEW ONLY
Not for construction, bidding, or permit purposes.
Kimley»Horn
Engineer BRIAN D. VAN DE WALLE
P.E. No. 68525 Date 8/25/2017
8/25/2017

Kimley»Horn F-928

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WILLIAMSON COUNTY
CR 119 & LIMMER LOOP

ENCR ELECTRICAL SERVICE DETAIL

STATE	COUNTY	CITY	SHEET NO.
TEXAS	WILLIAMSON	HUTTO	
PROJECT NO.		ROADWAY	45

FILENAME: \\AUSFP01\Data\Project\AUS*TPTO\068501514 - CR 119 Limmer Loop Signal Design\CADD\DTLS\ENCR*DETAILS.dgn 8/25/2017 11:30:03 AM

BID FORM
WILLIAMSON COUNTY, TEXAS

PROJECT: 1708-186 CR 119 **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	127.3	STA		$ -
2	110	6001	EXCAVATION (ROADWAY)	45980	CY		$ -
3	132	6003	EMBANKMENT (FINAL)(ORD COMP)(TY B)	34615	CY		$ -
4	160	WC 001	FURNISHING AND PLACING TOPSOIL (4")	123095	SY		$ -
5	164	WC 001	SEEDING FOR EROSION CONTROL	123095	SY		$ -
6	164	WC 001	SEEDING FOR EROSION CONTROL (TEMP)	61548	SY		$ -
7	166	6002	FERTILIZER	7.70	TON		$ -
8	168	WC 001	VEGETATIVE WATERING	3077	MG		$ -
9	169	6006	SOIL RETENTION BLANKETS (CL 2)(TY F)	5300	SY		$ -
10	247	6044	FL BS (CMP IN PLC)(TY A GR 4)(FINAL POS)	17683	CY		$ -
11	260	6002	LIME (HYDRATED LIME(SLURRY))	1144	TON		$ -
12	260	6027	LIME TRT (EXST MATL)(8")	63562	SY		$ -
13	310	6027	PRIME COAT (MC-30 OR AE-P)	12350	GAL		$ -
14	316	6005	ASPH (TIER II)	15495	GAL		$ -
15	310	6027	AGGR (TY-D GR-5 SAC-B)	413	CY		$ -
16	341	6008	D-GR HMA TY-B PG64-22	10189	TON		$ -

[1]Refer to the Technical Specifications section for a description of the specific reference number.

BID FORM
WILLIAMSON COUNTY, TEXAS

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BID ITEM	TECH SPEC[1]		DESCRIPTION	BID QUANTITY	UNIT MEASURE	UNIT COST	AMOUNT BID
17	341	6026	D-GR HMA TY- C SAC-A PG70-22	6546	TON		$ -
18	403	6001	TEMP SPL SHORING	1484	SF		$ -
19	416	6004	DRILL SHAFT (36 IN)	210	LF		$ -
20	420	6013	CL C CONC (ABUT)	48.6	CY		$ -
21	420	6029	CL C CONC (CAP)	20.5	CY		$ -
22	420	6037	CL C CONC (COLUMN)	5.9	CY		$ -
23	422	6001	REINF CONC SLAB	5520	SF		$ -
24	422	6015	APPROACH SLAB	91.4	CY		$ -
25	425	6036	PRESTR CONC GIRDER (TX28)	713.9	LF		$ -
26	432	6001	RIPRAP (CONC)(4 IN)	503.4	CY		$ -
27	432	6002	RIPRAP (CONC)(5 IN)	178.3	CY		$ -
28	432	6033	RIPRAP (STONE PROTECTION)(18 IN)	108.0	CY		$ -
29	432	6045	RIPRAP (MOW STRIP)(4 IN)	85.4	CY		$ -
30	450	6006	RAIL (TY T223)	272	LF		$ -
31	454	6001	SEALED EXPANSION JOINT (4 IN) (SEJ - A)	94	LF		$ -
32	462	6003	CONC BOX CULV (4FT X 2FT)	20	LF		$ -

[1]Refer to the Technical Specifications section for a description of the specific reference number.

BID FORM
WILLIAMSON COUNTY, TEXAS

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BID ITEM	TECH SPEC[1]		DESCRIPTION	BID QUANTITY	UNIT MEASURE	UNIT COST	AMOUNT BID
33	462	6006	CONC BOX CULV (5FT X 2FT)	210	LF		$ -
34	462	6007	CONC BOX CULV (5FT X 3FT)	266	LF		$ -
35	462	6010	CONC BOX CULV (6FT X 3FT)	688	LF		$ -
36	462	6014	CONC BOX CULV (7 FT X 3 FT)	479	LF		$ -
37	464	6003	RC PIPE (CL III)(18 IN)	595	LF		$ -
38	464	6005	RC PIPE (CL III)(24 IN)	825	LF		$ -
39	464	6009	RC PIPE (CL III)(42 IN)	145	LF		$ -
40	465	2003	INLET (COMPL)(TY H)	2	EA		$ -
41	465	6128	INLET (COMPL)(PSL)(FG)(4FTX4FT-4FTX4FT)	6	EA		$ -
42	466	6135	HEADWALL (CH-PW-S)(DIA = 42 IN)	1	EA		$ -
43	466	6179	WINGWALL (PW-1)(HW=4 FT)	2	EA		$ -
44	466	6180	WINGWALL (PW-1)(HW=5 FT)	4	EA		$ -
45	466	6206	WINGWALL (SW-0)(HW=3FT)	2	EA		$ -
46	466	6207	WINGWALL (SW-0)(HW=4FT)	3	EA		$ -
47	466	6134	SET (TY I) (S=5FT) (HW=2FT) (6:1)(P)	2	EA		$ -
48	467	6174	SET (TY I) (S=5FT) (HW=3FT) (6:1)(P)	1	EA		$ -

[1]Refer to the Technical Specifications section for a description of the specific reference number.

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BID ITEM	TECH SPEC[1]		DESCRIPTION	BID QUANTITY	UNIT MEASURE	UNIT COST	AMOUNT BID
49	467	6363	SET (TY II)(18 IN) (RCP)(6:1) (P)	12	EA		$ -
50	467	6395	SET (TY II)(24 IN) (RCP)(6:1) (P)	8	EA		$ -
51	496	6004	REMOV STR (SET)	9	EA		$ -
52	496	6007	REMOV STR (PIPE)	196	LF		$ -
53	496	6031	REMOV STR (CATTLE GUARD)	1	EA		$ -
54	496	6043	REMOV STR (SMALL FENCE)	2438	LF		$ -
55	500	5001	MOBILIZATION	1	LS		$ -
56	502	6001	BARRICADES, SIGNS AND TRAFFIC HANDLING	12	MO		$ -
57	506	6002	ROCK FILTER DAMS (INSTALL)(TY 2)	150	LF		$ -
58	506	6003	ROCK FILTER DAMS (INSTALL)(TY 3)	375	LF		$ -
59	506	6011	ROCK FILTER DAMS (REMOVE)	525	LF		$ -
60	506	6020	CONSTRUCTION EXITS (INSTALL)(TY 1)	800	SY		$ -
61	506	6024	CONSTRUCTION EXITS (REMOVE)	800	SY		$ -
62	506	6038	TEMP SEDMT CONT FENCE (INSTALL)	14929	LF		$ -
63	506	6039	TEMP SEDMT CONT FENCE (REMOVE)	14929	LF		$ -
64	508	6001	CONSTRUCTING DETOURS	664	SY		$ -

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BID ITEM	TECH SPEC[1]		DESCRIPTION	BID QUANTITY	UNIT MEASURE	UNIT COST	AMOUNT BID
65	530	6005	DRIVEWAYS (ACP)	1304	SY		$ -
66	540	6001	MTL W-BEAM GD FEN (TIM POST)	1201	LF		$ -
67	540	6003	MTL THRIE-BEAM GD FEN (TIM POST)	4	EA		$ -
68	540	6016	DOWNSTREAM ANCHOR TERMINAL SECTION	1	EA		$ -
69	544	6001	GUARDRAIL END TREATMENT (INSTALL)	11	EA		$ -
70	552	6003	WIRE FENCE (TY C)	2562	LF		$ -
71	644	6001	IN SM RD SN SUP&AM TY10BWG (1) SA (WS)	13	EA		$ -
72	658	6047	INSTL OM ASSM (OM-2Y)(WC)GND	20	EA		$ -
73	658	6014	INSTL DEL ASSM (D-SW)SZ (BRF)CTB(BI)	6	EA		$ -
74	658	6061	INSTL DEL ASSM (D-SW)SZ 1(BRF)GF2	39	EA		$ -
75	662	6004	WK ZN PAV MRK NON-REMOV (W) 4" (SLD)	10295	LF		$ -
76	662	6016	WK ZN PAV MRK NON-REMOV (W) 24" (SLD)	32	LF		$ -
77	662	6032	WK ZN PAV MRK NON-REMOV (Y) 4"(BRK)	954	LF		$ -
78	662	6033	WK ZN PAV MRK NON-REMOV (Y) 4"(DOT)	94	LF		$ -
79	662	6034	WK ZN PAV MRK NON-REMOV (Y) 4" (SLD)	3287	LF		$ -
80	666	6030	REFL PAV MRK TY I (W) 8" (DOT)(100 MIL)	50	LF		$ -

[1]Refer to the Technical Specifications section for a description of the specific reference number.

BID FORM
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BID ITEM	TECH SPEC[1]		DESCRIPTION	BID QUANTITY	UNIT MEASURE	UNIT COST	AMOUNT BID
81	666	6036	REFL PAV MRK TY I (W) 8" (SLD)(100 MIL)	762	LF		$ -
82	666	6048	REFL PAV MRK TY I (W) 24" (SLD)(100 MIL)	335	LF		$ -
83	666	6054	REFL PAV MRK TY I (W) (ARROW)(100 MIL)	8	EA		$ -
84	666	6078	REFL PAV MRK TY I (W) (WORD)(100 MIL)	8	EA		$ -
85	666	6147	REFL PAV MRK TY I (Y) 24" (SLD)(100 MIL)	600	LF		$ -
86	666	6170	REF PAV MRK TY II (W) 4" (SLD)	25876	LF		$ -
87	666	6176	REFL PAV MRK TY II (W) 8" (DOT)	50	LF		$ -
88	666	6178	REF PAV MRK TY II (W) 8" (SLD)	762	LF		$ -
89	666	6182	REF PAV MRK TY II (W) 24" (SLD)	335	LF		$ -
90	666	6184	REF PAV MRK TY II (W)(ARROW)	8	EA		$ -
91	666	6192	REF PAV MRK TY II (W)(WORD)	8	EA		$ -
92	666	6207	REF PAV MRK TY II (Y) 4" (SLD)	30306	LF		$ -
93	666	6214	REF PAV MRK TY II (Y) 24" (SLD)	600	LF		$ -
94	666	6303	RE PM W/RET REQ TY I (W) 4" (SLD)(100 MIL)	25876	LF		$ -
95	666	6315	RE PM W/RET REQ TY I (Y) 4" (SLD)(100 MIL)	30306	LF		$ -
96	672	6007	REFL PAV MRKR TY I-C	57	EA		$ -

[1]Refer to the Technical Specifications section for a description of the specific reference number.

BID FORM
WILLIAMSON COUNTY, TEXAS

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BID ITEM	TECH SPEC[1]		DESCRIPTION	BID QUANTITY	UNIT MEASURE	UNIT COST	AMOUNT BID
97	672	6009	REFL PAV MRKR TY II-A-A	540	EA		$ -
98	677	6001	ELIM EXT PAV MRK & MRKS (4")	3520	LF		$ -
99	677	6007	ELIM EXT PAV MRK & MRKS (24")	145	LF		$ -
100	730	6107	FULL-WIDTH MOWING	3	CYC		$ -
101	WC5001	6002	GEOGRID BASE REINFORCEMENT TY II	63562	SY		$ -
102	WC	5003	WOODEN PRIVACY FENCE	2216	LF		$ -
103	618	6046	CONDT (PVC) (SCH 80) (2")	555	LF		$ -
104	416	6003	DRILL SHAFT (30 IN)	34	LF		$ -
105	416	6004	DRILL SHAFT (36 IN)	15	LF		$ -
106	500	6001	MOBILIZATION	1	LS		$ -
107	618	6046	CONDT (PVC) (SCH 80) (2")	555	LF		$ -
108	618	6047	CONDT (PVC) (SCH 80) (2") (BORE)	1160	LF		$ -
109	620	6007	ELEC CONDR (NO.8) BARE	1580	LF		$ -
110	620	6008	ELEC CONDR (NO.8) INSULATED	1650	LF		$ -
111	620	6009	ELEC CONDR (NO.6) BARE	275	LF		$ -
112	620	6010	ELEC CONDR (NO.6) INSULATED	550	LF		$ -
113	624	6010	GROUND BOX TY D (162922)W/APRON	3	EA		$ -

[1]Refer to the Technical Specifications section for a description of the specific reference number.

BID FORM
WILLIAMSON COUNTY, TEXAS

PROJECT: **1708-186 CR 119** **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
114	624	6014	GROUND BOX TY 1 (122422)W/APRON	5	EA		$ -
115	628	6229	ELC SRV TY D 120/240 100(NS)GS(N)TP(O)	1	EA		$ -
116	636	6001	ALUMINUM SIGNS (TY A)	58	SF		$ -
117	666	6048	REFL PAV MRK TY I (W)24"(SLD)(100MIL)	50	LF		$ -
118	680	6002	INSTALL HWY TRF SIG (ISOLATED)	1	EA		$ -
119	682	6001	VEH SIG SEC (12")LED(GRN)	8	EA		$ -
120	682	6002	VEH SIG SEC (12")LED(GRN ARW)	4	EA		$ -
121	682	6003	VEH SIG SEC (12")LED(YEL)	8	EA		$ -
122	682	6004	VEH SIG SEC (12")LED(YEL ARW)	8	EA		$ -
123	682	6005	VEH SIG SEC (12")LED(RED)	8	EA		$ -
124	682	6006	VEH SIG SEC (12")LED(RED ARW)	4	EA		$ -
125	682	6023	BACK PLATE (12")(3 SEC)	8	EA		$ -
126	682	6024	BACK PLATE (12")(4 SEC)	4	EA		$ -
127	684	6031	TRF SIG CBL (TY A)(14 AWG)(5 CONDR)	801	LF		$ -
128	684	6033	TRF SIG CBL (TY A)(14 AWG)(7 CONDR)	816	LF		$ -
129	686	6029	INS TRF SIG PL AM (S)1 ARM(28')	1	EA		$ -
130	686	6031	INS TRF SIG PL AM(S)1 ARM(28')LUM	1	EA		$ -

[1]Refer to the Technical Specifications section for a description of the specific reference number.

BID FORM
WILLIAMSON COUNTY, TEXAS

PROJECT: **1708-186 CR 119** **BIDDER:** _____

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BID ITEM	TECH SPEC[1]		DESCRIPTION	BID QUANTITY	UNIT MEASURE	UNIT COST	AMOUNT BID
131	686	6035	INS TRF SIG PL AM(S)1 ARM(32')LUM	1	EA		$ -
132	686	6051	INS TRF SIG PL AM(S)1 ARM(48')LUM	1	EA		$ -
133	6002	6001	VIVDS PROCESSOR SYSTEM	1	EA		$ -
134	6002	6002	VIVDS CAMERA ASSEMBLY	5	EA		$ -
135	6002	6003	VIVDS SET-UP SYSTEM	1	EA		$ -
136	6002	6004	VIVDS CENTRAL CONTROL	1	EA		$ -
137	6002	6005	VIVDS COMMUNICATION CABLE (COAXIAL)	806	LF		$ -
138	6058	6001	BATTERY BACK-UP SYSTEM FOR SIGNAL CABINETS	1	EA		$ -

[1]Refer to the Technical Specifications section for a description of the specific reference number.

BID FORM
WILLIAMSON COUNTY, TEXAS

PROJECT: **1708-186 CR 119** **BIDDER:** _____

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BID ITEM	TECH SPEC[1]		DESCRIPTION	BID QUANTITY	UNIT MEASURE	UNIT COST	AMOUNT BID
NON-BID ITEMS TO BE INCLUDED IN BID AND CONTRACT AMOUNT. DO NOT MAKE CHANGES TO THIS SECTION.							
139	999	WC-001	FORCE ACCOUNT	25000	DOL	$ 1.00	$ 25,000.00
140	999	WC-002	FORCE ACCOUNT - CORE HOLES FOR BRIDGE	10	EA	$ 200.00	$ 2,000.00
141	341	WC01	FORCE ACCOUNT - ESTIMATED PLACEMENT AND PRODUCTION BONUS/PENALTY (TY B)	57300	DOL	$ 1.00	$ 57,300.00
142	341	WC02	FORCE ACCOUNT - ESTIMATED PLACEMENT AND PRODUCTION BONUS/PENALTY (TY C SURFACE)	46700	DOL	$ 1.00	$ 46,700.00
143	585	WC01	FORCE ACCOUNT - ESTIMATED RIDE QUALITY BONUS/PENALTY	10500	DOL	$ 1.00	$ 10,500.00

TOTAL AMOUNT OF BID

_____ **Dollars and** _____ **Cents** $ 141,500.00

ADD ALTERNATE BID ITEM							
144	132	6001	EMBANKMENT (FINAL)(ORD COMP)(TY A)	65	CY		$ -
145	162	6002	BLOCK SODDING	292	SY		$ -
146	618	6046	CONDT (PVC) (SCH 80) (2")	140	LF		$ -
147	432	6041	RIPRAP (SPECIAL)	5	CY		$ -
148	531	6008	CURB RAMPS (TY 5)	4	EA		$ -
149	618	6046	CONDT (PVC) (SCH 80) (2")	140	LF		$ -
150	666	6042	REFL PAV MRK TY I (W)12"(SLD)(100MIL)	180	LF		$ -
151	682	6018	PED SIG SEC (LED)(COUNTDOWN)	8	EA		$ -

[1]Refer to the Technical Specifications section for a description of the specific reference number.

BID FORM
WILLIAMSON COUNTY, TEXAS

PROJECT: **1708-186 CR 119** **BIDDER:** _____

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BID ITEM	TECH SPEC[1]		DESCRIPTION	BID QUANTITY	UNIT MEASURE	UNIT COST	AMOUNT BID
152	620	6008	TRF SIG CBL (TY A)(14 AWG)(5 CONDR)	1102	LF		$ -
153	684	6082	TRF SIG CBL (TY C)(18 AWG)(2 CONDR)	1274	LF		$ -
154	687	6001	PED POLE ASSEMBLY	4	EA		$ -
155	688	6001	PED DETECT PUSH BUTTON (APS)	8	EA		$ -
156	688	6003	PED DETECTOR CONTROLLER UNIT	1	EA		$ -

TOTAL AMOUNT OF BID + ADD ALTERNATE

_____ **Dollars and** _____ **Cents** $ 141,500.00

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.

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.

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.

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 #1708-186 - CR 119 Construction

Overall Bid Questions
There are no questions associated with this bid.