

Change Order #3 Dicker Road

Owner: Hidalgo County Precinct #2

To: Earthworks Enterprise, LLC
PO Box 595
Penitas, Texas 78576

From: B2Z Engineering

Project: Dicker Road
Contract: C-19-017-11-05
Project #: STP 1902(323)MM
CSJ: 0921-02-312
Limits: Spur 115(23rd Street) to FM 2061(Jackson Road)

Change Order #3 has been approved to make the following Contract Changes:

Description:

Change Order #3 - McAllen PUB has entered into an interlocal agreement with Hidalgo County to install a 12" waterline on the north side of Dicker Road. The waterline will be installed within the existing ROW, on a 5' alignment and 4' deep. It crosses existing driveways, culvert crossings and irrigation crossing that have been set up for cut and restore or to go around the structure. The waterline is a C-900 series, 12" PVC that will include fire hydrants, water valves, tees and services. It will service both the Cities of McAllen and Hidalgo with the limits extending east from the Hidalgo County Irrigation District #3 canal at Sta 29+00 and ending at Sta 115+00, west of McColl Intersection. The line does not cross the existing canal crossing at Sta 28+50 or the McAllen Main Canal between Sta 84+00 to 91+00. The waterline includes two 20" steel casing and waterline crossings at Sta 29+50 and 88+00(north and south), and another 24" concrete casing crossing (east and west) at 10th Street.

The plans and specifications were prepared by TEDSI Infrastructure for McAllen PUB. McAllen PUB provided a copy to the County and Contractor to prepare an estimate for a new change order. The waterline items and prices were acceptable to McAllen, and the PUB entered into agreement with Hidalgo County to install, inspect, test and complete the water line as shown. The County will collect the change order funds from McAllen PUB. B2Z will enter into a separate agreement with McAllen PUB to inspect the line and backfill installation, and the contractor will test the line when completed.

Purpose:

To install a 12" waterline on the north side of Dicker Road and provide the City of McAllen and the City of Hidalgo with water and services from Dicker Road.

The change order has been signed by the Contractor and AE. The McAllen PUB provided the funding to complete the project and there is no federal funding involved. There is no additional

ROW required and the County has approved the waterline plans, specifications, quantities and interlocal agreement for Change Order #3, to include the additional work on Dicker Road. The changes do not impact the original environmental assessment, does not impact TDLR elements, does not impact wetlands, or waters of the US, archeological, historical or social issues; endangered species or any other regulated areas within the project will not see change. This change order does not cause a disturbance that would require a Construction Site Notice (CSN) or Notice of Intent (NOI). Traffic will not be delayed with the installation of the waterline.

B2Z and the Precinct #2 have reviewed Change Order #3 to explain the breakdown of items and payment according to the governing Specification 1L-9L. See TxDOT Change Order Form 2146-L used to introduce new bid items and prices. New plan sheets include City of McAllen PUB sheets 1-107 and governing specifications necessary for the waterline. Specifications and cost estimate are attached as part of this Change Order. The Interlocal Agreement between Hidalgo County and McAllen PUB is attached. The B2Z agreement for the McAllen PUB is attached for inspection and material testing services.

CHANGE IN CONTRACT PRICE:	CHANGE IN CONTRACT TIME:
Original Contract Price <u>\$16,519,063.02</u>	Original Contract Time <u>460 working Days</u>
Previous Change Orders <u>-\$349,251.06</u>	Previous Change Orders 0 Working Days

Contract Price prior to this Change Order <u>\$16,169,811.96</u>	Contract Time prior to this Change Order <u>460 Working Days</u>
Net increase/decrease of the Change Order <u>\$636,335.00</u>	Net increase/decrease of the Change Order <u>0 Working Days</u>
Contract Price with all approved Change Orders <u>\$16,806,146.96</u>	Contract Time with all approved Change Orders <u>460 Working Days</u>

CONSTRUCTION CONTRACT CHANGE ORDER NUMBER: 3

1. CONTRACTOR: Earthworks Enterprise, LLC
2. Change Order Work Limits: Sta. 29+00 to Sta. 114+00
3. Type of Change (on federal-aid non-exempt projects): Minor (Major/Minor)
4. Describe the change and the reason for the change order. When necessary, include exceptions to this agreement.

McAllen PUB has approached Hidalgo County to install a 12" waterline on the north side of Dicker Road that will provide water to both McAllen and Hidalgo. McAllen PUB approved an interlocal agreement with the County to install the waterline. McAllen PUB supplied the PS&E, prepared by TEDSI Infrastructure to construct the waterline. The new plan sheets and items will be included in the plans. The funding is to be provided by McAllen and no time will be added.

CCSJ: 0921-02-312
Project: STP 1902(323)MM
Highway: Dicker Road
County: Hidalgo
District: Pharr
Contract Number: C-19-017-11-05

5. New or revised plan sheet(s) are attached and numbered: City of McAllen PUB Sheets 1 -107, & Specifications

Each signatory hereby warrants that each has the authority to execute this Change Order.

By signing this change order, the contractor agrees to waive any and all claims for additional compensation due to any and all other expenses; additional changes for time, overhead and profit; or loss of compensation as a result of this change. Further, the contractor agrees that this agreement is made in accordance with Item 4 and the Contract. Exceptions should be noted in the response for #5 above. THE CONTRACTOR _____ Date _____ By _____ Typed/Printed Name _____ Typed/Printed Title _____	The following information must be provided Time Ext. #: <u>0</u> Days added on this C.O.: <u>0</u> Amt. added by this change order: <u>\$636,335.00</u> For TxDOT use only: Days participating: _____ Amount participating: _____ Signature _____ Date _____ Name/Title _____
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RECOMMENDED FOR EXECUTION:

Name/Title _____ Date _____

Name/Title _____ Date _____
☐ APPROVED ☐ REQUEST APPROVAL

Name/Title _____ Date _____

Name/Title _____ Date _____
☐ APPROVED ☐ REQUEST APPROVAL

Name/Title _____ Date _____

Name/Title _____ Date _____
☐ APPROVED ☐ REQUEST APPROVAL

Name/Title _____ Date _____

Name/Title _____ Date _____
☐ APPROVED

Engineer's Seal:

CONSTRUCTION CONTRACT CHANGE ORDER NUMBER: 3

Estimated Cost:

CCSJ: 0921-02-312

Paid by Invoice? (☐ Yes ☒ No)

TABLE A: Force Account Work and Materials Placed into Stock

LABOR	HOURLY RATE	EQUIPMENT	HOURLY RATE

TABLE B: Contract Items

				ORIGINAL + PREVIOUSLY REVISED		NEW		
ITEM	DESCRIPTION	UNIT	UNIT PRICE	QUANTITY	ITEM COST	QUANTITY	ITEM COST	OVERRUN/ UNDERRUN
9003-001	TR EXCAV PROT(Depth 5' to 10')	LF	3.00	0.00	0.00	8,100.00	24,300.00	24,300.00
9003-002	CROSSING # 1-20" STEEL CASING	LF	180.00	0.00	0.00	140.00	25,200.00	25,200.00
9003-003	CROSSING # 2-20" STEEL CASING	LF	230.00	0.00	0.00	140.00	32,200.00	32,200.00
9003-004	12"X12" CUT-IN-TEE	EA	6,400.00	0.00	0.00	2.00	12,800.00	12,800.00
9003-005	12" C-900 DR-18 PVC	LF	41.25	0.00	0.00	7,816.00	322,410.00	322,410.00
9003-006	8" C-900 DR-18 PVC	LF	35.00	0.00	0.00	100.00	3,500.00	3,500.00
9003-007	12" C-900 WL & 24" RCP Casing	LF	41.25	0.00	0.00	180.00	7,425.00	7,425.00
9003-008	FIRE HYDRANT ASSEMBLY	EA	5,800.00	0.00	0.00	9.00	52,200.00	52,200.00
9003-009	12" GATE VALVE AND BOX	EA	3,300.00	0.00	0.00	14.00	46,200.00	46,200.00
9003-010	8" GATE VALVE AND BOX	EA	2,100.00	0.00	0.00	3.00	6,300.00	6,300.00
9003-011	2" AIR REL COMBINATION VALVE	EA	1,500.00	0.00	0.00	2.00	3,000.00	3,000.00
9003-012	12"X12" - 45 DEGREE ELBOW	EA	1,600.00	0.00	0.00	22.00	35,200.00	35,200.00
9003-013	12"X12"X12"- TEE FITTING	EA	1,800.00	0.00	0.00	2.00	3,600.00	3,600.00
9003-014	12"X12"X8"- FITTING	EA	1,800.00	0.00	0.00	2.00	3,600.00	3,600.00
9003-015	8" CAP BEHIND EXIST TEE	EA	700.00	0.00	0.00	3.00	2,100.00	2,100.00
9003-016	1" SINGLE WATER SERVICE LINE	EA	1,300.00	0.00	0.00	4.00	5,200.00	5,200.00
9003-017	TEMP 2" BLOW-OFF ASSEMBLY	EA	2,100.00	0.00	0.00	2.00	4,200.00	4,200.00
9003-018	REPAIR EXISTING DRIVEWAYS	EA	1,300.00	0.00	0.00	13.00	16,900.00	16,900.00
9003-019	ADDITIONAL WK, SPEC 1330-1.02	LS	30,000.00	0.00	0.00	1.00	30,000.00	30,000.00
TOTALS					0.00		636,335.00	636,335.00

CONSTRUCTION CONTRACT CHANGE ORDER NUMBER: 3**TABLE B: Contract Items (Continued)**

CCSJ: 0921-02-312

[illegible]



McALLEN

PUBLIC UTILITY

ALBERT CARDENAS, Chairman
TONY AGUIRRE, Jr., Vice-Chairman
CHARLES E. AMOS, Trustee
ERNEST R. WILLIAMS, Trustee
JAMES E. DARLING, Ex-Officio Member

MARCO A. VEGA, P.E., General Manager

February 4, 2020

The Honorable Eduardo "Eddie" Cantu
Commissioner - Precinct No. 2
County of Hidalgo
300 W. Hall Acres, Suite G
Pharr, Texas 78577

RE: Dicker Rd. - Interlocal Agreement between the County of Hidalgo and McAllen Public Utility

Dear Commissioner Cantu:

This is to advise you that the McAllen Public Utility Board of Trustees at their regular meeting of January 28, 2020 accepted a price proposal from Earthworks, LLC, the project contractor for the Dicker Rd. roadway widening project, in the amount of \$636,335 for the installation of a 12-inch waterline. McAllen Public Utility respectfully requests that the County of Hidalgo consider approval of a change order to the project in question in order to effectuate the work scope related to the waterline installation, as entertained in the Interlocal Agreement, dated June 6, 2019 between the County and McAllen Public Utility. Please refer to the attached cost proposal document for your consideration.

Should you have any questions, you may call me at (956)681-1630. I will be glad to assist you.

Sincerely,

Juan J. Rodriguez
Assistant General Manager

c: Honorable Richard F. Cortez, County Judge, County of Hidalgo
Marco A. Vega, P.E., General Manager, McAllen Public Utility
Armando Garza, Jr., Chief Administrator, County of Hidalgo - Precinct No. 2
Saul Muñoz, Project Manager, B2Z Engineering
Carlos Gonzalez, P.E., Utility Engineer, McAllen Public Utility

23rd ST/DICKER RD WATER LINE SANITARY SEWER FORCE MAIN PROJECT FOR CITY OF McALLEN McALLEN PUBLIC UTILITY



PUBLIC UTILITY BOARD

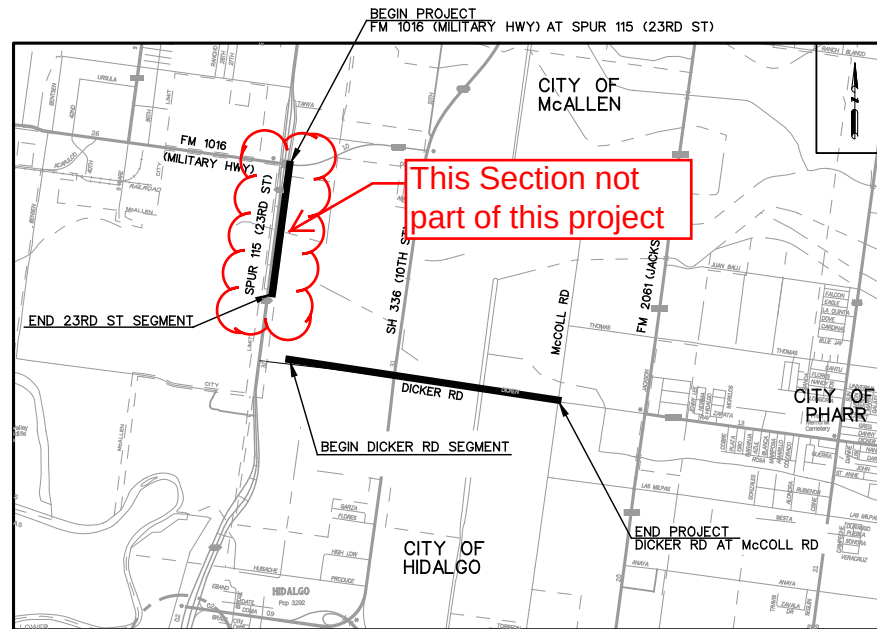
ALBERT CARDENAS.....CHAIRMAN
CHARLES AMOS.....TRUSTEE
ANTONIO AGUIRRE JR.....TRUSTEE
ERNEST R WILLIAMS.....TRUSTEE
JIM DARLING.....MAYOR/EX-OFFICIO MEMBER
MARCO A VEGA, P.E. MPU GENERAL MANAGER



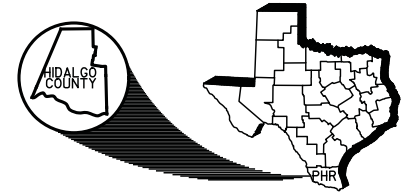
CITY OF McALLEN OFFICIALS

JIM DARLING.....MAYOR
JAVIER VILLALOBOS.....COMMISSIONER-DISTRICT 1
JOAQUIN ZAMORA.....COMMISSIONER-DISTRICT 2
OMAR QUINTANILLA.....COMMISSIONER-DISTRICT 3
TANIA RAMIREZ.....COMMISSIONER-DISTRICT 4
VICTOR HADDAD.....COMMISSIONER-DISTRICT 5
VERONICA WHITACRE.....COMMISSIONER-DISTRICT 6
ROEL RODRIGUEZ, P.E. CITY MANAGER

LIMITS: SPUR 115 (23RD ST) AT FM 1016 (MILITARY HWY) TO 0.43 MI NORTH
OF SPUR 115 (23RD ST) AT DICKER RD = 4333 FT - 0.82 MI
LIMITS: 0.16 MIEAST OF DICKER RD AT SPUR 115 (23RD) ST TO
DICKER RD AT MCCOLL RD = 9495 FT - 1.80 MI
NET LENGTH PROJECT: 13,828FT - 2.62 MI

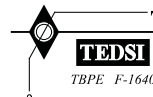


LOCATION MAP
N.T.S.



CITY OF McALLEN CONCURRENCE		DATE
NAME	TITLE	
CITY OF HIDALGO CONCURRENCE		DATE
NAME	TITLE	

PLANS PREPARED BY:



TEDSI INFRASTRUCTURE GROUP
Consulting Engineers
1201 E. Expressway 83
Mission, Texas 78572
(956) 424-7898

INDEX OF SHEETS

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7	SUMMARY OF ESTIMATED QUANTITIES
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NO.	DATE	REVISION	APP.
STANDARD SHEETS LISTED ON THE INDEX OF SHEETS (SHEETS 60 THRU 107) HAVE BEEN SELECTED BY ME OR UNDER MY RESPONSIBLE SUPERVISION AS BEING APPLICABLE TO THIS PROJECT.			
  AUTHORIZED 11-21-2019			
 CITY OF McALLEN			
 TEDSI INFRASTRUCTURE GROUP <i>Consulting Engineers</i> 1201 E. Expressway 83 Mission, Texas 78572 (956) 424-7000			
23rd STREET/DICKER ROAD WATER LINE PROJECT			
INDEX OF SHEETS			
FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
6			2
STATE	DIST.	COUNTY	
TEXAS	PHR	HIDALGO	
CONT.	SECT.	JOB	HIGHWAY NO.

GENERAL NOTES

1. THESE NOTES ARE INTENDED TO SUPPLEMENT THE TECHNICAL SPECIFICATIONS AND SHOULD NOT BE CONSIDERED A SUBSTITUTE FOR THE DETAILED REQUIREMENTS SET FORTH IN THE SPECIFICATIONS.
2. ALL IMPROVEMENTS SHALL BE CONSTRUCTED IN ACCORDANCE WITH PLANS AND SPECIFICATIONS. WHERE THERE IS A CONFLICT BETWEEN THE DRAWINGS AND THE SPECIFICATIONS, THE SPECIFICATIONS SHALL GOVERN.
3. ALL WORK SHALL BE SUBJECT TO INSPECTION BY THE CITY OF MCALLEN AND ENGINEER.
4. PRIOR TO CONSTRUCTION, THE CONTRACTOR SHALL PROVIDE DETAILED SHOP DRAWINGS OF ALL MATERIALS AND EQUIPMENT TO BE FURNISHED UNDER THIS CONTRACT. APPROVAL OF SUBMITTALS DOES NOT RELIEVE THE CONTRACTOR FROM COMPLYING WITH THE PLANS AND SPECIFICATIONS.
5. THE CONTRACTOR SHALL NOTIFY THE CITY OF MCALLEN AND ENGINEER WITHIN 48 HOURS PRIOR TO COMMENCING ANY CONSTRUCTION ACTIVITY.
6. THE CONTRACTOR SHALL MAINTAIN A SET OF REDLINE DRAWINGS RECORDING AS-BUILT CONDITIONS DURING CONSTRUCTION. THESE MARKED DRAWINGS SHALL BE SUBMITTED TO THE CITY OF MCALLEN UPON COMPLETION OF THE PROJECT.
7. THE TYPE, SIZE AND LOCATION OF ALL UNDERGROUND UTILITIES DEPICTED ON THE CONSTRUCTION PLANS WERE RESEARCHED WITH RESPECT TO THE BEST AVAILABLE DATA AND THEREFORE SHOWN APPROXIMATE, ALTHOUGH EVERY EFFORT HAS BEEN MADE TO ACCURATELY DEPICT ALL UTILITIES, NOT ALL (PUBLIC AND PRIVATE) MAY BE SHOWN. NEITHER THE ENGINEER NOR THE CITY OF MCALLEN IS RESPONSIBLE FOR THE ACCURACY OF THE LOCATION OF THE UTILITIES SHOWN ON THE CONSTRUCTION PLANS. CONTRACTOR TO CONTACT ALL UTILITIES COMPANIES IN THE AREA FOR FIELD VERIFICATION OF EXISTING FACILITIES. UTILITY COMPANY'S SHALL INCLUDE BUT NOT BE LIMITED TO THE FOLLOWING:
CITY OF McALLEN - (956) 681-1600
AEP - (800) 344-8377
AT&T - (800) 778-9140
DCP MIDSTREAM - (888) 204-1781
DEWBRE PETROLEUM - (361) 388-7978
HIDALGO COUNTY DRAINAGE DISTRICT #1 - (956) 292-7080
HIDALGO COUNTY IRRIGATION DISTRICT #2 - (956) 787-1422
HIDALGO COUNTY WATER DISTRICT #3 - (956) 686-8303
MIRAMAR PETROLEUM - (361) 884-2927, (956) 330-8645
MISSION PIPELINE - (713) 796-3619
SPRINT - (800) 521-0579
TEXAS GAS - (800) 344-8377
TXDOT PHARR - (956) 702-6250
VALLEY TELEPHONE COOP - (800) 446-2031
TEXAS 811 UTILITY - (800) 344-8377
8. CONTRACTOR TO EXPOSE ANY EXISTING UTILITY THAT MAY BE IN CONFLICT PRIOR TO START OF CONSTRUCTION. THE CONTRACTOR SHALL DETERMINE THE DEPTH AND LOCATION OF EXISTING UNDERGROUND UTILITIES PRIOR TO ANY EXCAVATION OR TRENCHING AND SHALL BE REQUIRED TO TAKE ANY PRECAUTIONARY MEASURES TO PROTECT ALL LINES SHOWN AND/OR ANY OTHER UNDERGROUND UTILITIES NOT OF RECORD OR NOT SHOWN ON THE PLANS.
9. THE CONTRACTOR SHALL EXERCISE EXTREME CAUTION WHEN WORKING NEAR EXISTING UTILITIES. ANY CONTRACTOR/SUBCONTRACTOR PERFORMING WORK ON THIS PROJECT SHALL FAMILIARIZE HIMSELF WITH THE SITE AND SHALL BE SOLELY RESPONSIBLE FOR ANY DAMAGE TO EXISTING FACILITIES RESULTING DIRECTLY OR INDIRECTLY FROM HIS OPERATION. SAID EXISTING IMPROVEMENTS SHALL INCLUDE BUT NOT BE LIMITED TO BERMS, DITCHES, FENCES, AND PLANTS. ANY REMOVAL OR DAMAGE TO EXISTING IMPROVEMENTS SHALL BE REPLACED OR REPAIRED BY THE CONTRACTOR AT HIS EXPENSE AND SHALL BE APPROVED BY THE CITY OF MCALLEN. ALL COSTS FOR INTERRUPTION OF GAS, ELECTRICAL, COMMUNICATIONS AND/OR WATER SERVICE RESULTING FROM RELATED CONSTRUCTION ACTIVITY SHALL BE BORNE BY THE CONTRACTOR.
10. ANY TREES DAMAGED BY CONSTRUCTION SHALL BE REPLACE NEW AT NO ADDITIONAL COST TO THE CITY OF MCALLEN. NEW TREES SHALL BE THE SAME DIMENSION AS EXISTING TREE.
11. ALL EXISTING CITY OF MCALLEN UTILITIES (WATER/SEWER) SHOWN ARE FROM BEST INFORMATION AVAILABLE. NEITHER THE ENGINEER NOR THE CITY OF MCALLEN IS RESPONSIBLE FOR THE ACCURACY OF LOCATION.
12. WATER LINE PIPE SHALL CONFORM TO AWWA C905 REQUIREMENTS (14 INCHES OR LARGER) AND HAVE A PRESSURE CLASS OR PRESSURE RATING OF NO LESS THAN 150 PSI. WATER LINE SHALL BE FLUSHED AND DISINFECTED PRIOR TO INSTALLATION IN ACCORDANCE WITH ANSI/AWWA C651. FORCE MAIN SEWER PIPE SHALL CONFORM TO AWWA C900 REQUIREMENTS (12 INCHES OR SMALLER) AND HAVE A PRESSURE CLASS OR PRESSURE RATING OF NO LESS THAN 165 PSI.
13. THE DRAWINGS DO NOT ALWAYS INDICATE ALL HORIZONTAL AND/OR VERTICAL BENDS AND TRANSITIONS. WHEN NECESSARY, MAKE HORIZONTAL AND/OR VERTICAL TRANSITIONS BY A DEFLECTION AT THE JOINTS OF THE INSTALLATION OF FITTINGS. DO NOT DEFLECT PIPE JOINTS MORE THAN 80% OF THE MANUFACTURER'S RECOMMENDATIONS.
14. STATION LOCATIONS FOR CONNECTIONS, BENDS AND CASINGS ARE APPROXIMATE. FIELD CONDITIONS AND SUB-SURFACES CONDITIONS WILL DICTATE FINAL LOCATIONS.
15. CONTRACTOR TO INSURE A COVER NOT LESS THAN 4 (FOUR) FEET OVER THE TOP OF THE WATER/SEWER LINE.
16. CONTRACTOR TO INSTALL A WATER/SEWER LINE IDENTIFIER/WARNING TAPE AT A MINIMUM OF 18 INCHES OVER TOP OF PIPE, ABOVE PIPELINE. LOCATOR WIRE TO BE INSTALLED WITH SANITARY SEWER FORCE MAIN, SEE DETAILS. INSTALLATION OF TAPE/LOCATOR WIRE WILL NOT BE PAID FOR DIRECTLY BUT WILL BE SUBSIDIARY TO VARIOUS WATER/SEWER LINE INSTALLATION ITEMS.
17. SET HYDRANTS PLUMB AND LOCATE PUMPER NOZZLES PERPENDICULAR TO ROADWAY. SET HYDRANTS TO GRADE WITH NOZZLES AT LEAST 18 INCHES ABOVE GROUND. TOP OF HYDRANT HEIGHT NOT TO EXCEED 3 FEET ABOVE GROUND.
18. A GEOTECHNICAL REPORT WAS PREPARED BY RABA KISTNER, INC. A COPY OF THE REPORT CAN BE REQUESTED FROM THE CITY OF MCALLEN.
19. THE CONTRACTOR SHALL COORDINATE WITH CITY OF MCALLEN AND ENGINEER PRIOR TO EXCAVATING MATERIAL.
20. FOR ANY TRENCH EXCAVATION AT A DEPTH OF FIVE (5) FEET OR GREATER OR WHERE SHOWN ON PLANS, PROVIDE TRENCH SAFETY SYSTEM. TRENCH SAFETY SYSTEMS SHALL BE IN ACCORDANCE WITH THE LATEST STANDARDS OF THE TEXAS HEALTH AND SAFETY CODE AND OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA).

NO.	DATE	REVISION	APP.
  AUTHORIZED 05-30-2018			
 CITY OF McALLEN			
 TEDSI INFRASTRUCTURE GROUP Consulting Engineers 1201 E. Expressway 83 Mission, Texas 78572 (956) 424-7000			
23rd STREET/DICKER ROAD WATER LINE PROJECT			
GENERAL NOTES			
SHEET 1 OF 2			
FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
6			3
STATE	DIST.	COUNTY	
TEXAS	PHR	HIDALGO	
CONT.	SECT.	JOB	HIGHWAY NO.

5/30/2018
12:53 PM
P:\2013\2013-1827-01 McAllen PUB 23rd St Water Main Improvement\Design\CS\N Roadway_SA_01\23rd-General Notes.dgn

GENERAL NOTES
(CONTINUATION)

21. TRENCH PROTECTION SAFETY WILL BE PAID BY LINEAR FOOT. UNIT PRICE IS BASED ON DEPTH. ANY ADDITIONAL EXPENSES WILL NOT BE PAID FOR DIRECTLY BUT WILL BE SUBSIDIARY TO THE TRENCH PROTECTION SAFETY ITEMS.
22. TRENCHES OR EXCAVATIONS MAY NOT BE LEFT OPEN OVERNIGHT UNLESS AUTHORIZED IN WRITING BY THE CITY OF MCALLEN. AS PER OSHA REQUIREMENTS, THE CONTRACTOR SHALL PROTECT EXPOSED PITS THAT MUST REMAIN OPEN DURING NON-WORKING HOURS. IN SUCH CASES, THE CONTRACTOR MUST PROVIDE 1/2" STEEL PLATES OVER PLATES WITH ANCHORING AS PER SPECIFICATIONS TO BE PROVIDED BY THE CITY OF MCALLEN.
23. THE CONTRACTOR SHALL REMOVE FROM THE PROJECT & DISPOSE ALL SURPLUS MATERIAL NOT DEEMED SALVAGEABLE BY THE ENGINEER. THIS WILL NOT BE PAID FOR DIRECTLY BUT WILL BE SUBSIDIARY TO VARIOUS ITEMS.
24. DO NOT BLOCK DRAINAGE WHEN HANDLING AND STOCKPILING EXCAVATED MATERIAL. SURPLUS MATERIAL FROM EXCAVATION, INCLUDING DIRT, TRASH, ETC. SHALL BE PROPERLY DISPOSED OF AT A SITE ACCEPTABLE TO THE CITY OF MCALLEN. IF THE CONTRACTOR PLACES EXCESS MATERIAL IN THE AREA WITHOUT WRITTEN PERMISSION, THE CONTRACTOR WILL BE RESPONSIBLE FOR ALL DAMAGE RESULTING FROM SUCH FILL AND SHALL REMOVE THE MATERIAL AT ITS OWN COST. SURPLUS MATERIAL IS SUBJECT TO INTERLOCAL AGREEMENTS BETWEEN THE LAND OWNER, COUNTY AND CITY OF MCALLEN.
25. ANY DE-WATERING ASSOCIATED WITH BORE PIT CONSTRUCTION SHALL BE CONSIDERED SUBSIDIARY TO THE VARIOUS BID ITEMS. IF BORE PIT AREAS CAN NOT BE DEWATERED, STABILIZING MATERIAL (LEAN CONCRETE OR CEMENT STABILIZED FILL) SHALL BE USED TO ESTABLISH WORKING PLATFORM. THE LATTER WILL NOT BE PAID FOR DIRECTLY BUT SHALL BE CONSIDERED SUBSIDIARY TO THE VARIOUS BID ITEMS.
26. ALL CONSTRUCTION, GRADING, BACKFILL AND RELATED WORK REQUIRED TO COMPLETE THIS PROJECT SHALL COMPLY WITH CURRENT CITY OF MCALLEN STANDARDS.
27. THE CONTRACTOR IS RESPONSIBLE FOR SCHEDULING CONSTRUCTION MATERIALS TESTING THROUGH THE CITY OF MCALLEN'S DESIGNATED FIELD REPRESENTATIVE 24 HOURS PRIOR TO TESTING. CONTRACTOR IS RESPONSIBLE FOR ADHERING CLOSELY TO TESTING SCHEDULE AND AVOIDING ANY DELAYS IN THE FIELD.
28. ANCHOR ALL UNDERGROUND PRESSURE PIPING AS NECESSARY TO PREVENT MOVEMENT UNDER PRESSURE TEST AND SERVICES. THRUST BLOCKS WILL NOT BE PAID FOR DIRECTLY BUT WILL BE SUBSIDIARY TO THE VARIOUS BID ITEMS.
29. PIPE SHALL BE BACKFILLED WITH JOINTS EXPOSED FOR TESTING, BEFORE NEW JOINTS ARE COVERED. PRESSURE LINES ARE TO BE HYDROSTATICALLY TESTED AT NOT LESS THAN 150 PSI FOR A PERIOD OF TWO HOURS. THE CITY OF MCALLEN SHALL OBSERVE AND APPROVE OR REJECT THE TEST. REPAIRS, IF REQUIRED, SHALL BE MADE AND THE LINE SHALL BE RETESTED UNTIL APPROVED. TEST SHALL NOT BEGIN UNTIL THRUST BLOCKS HAVE AGED A MINIMUM OF 24 HOURS.
30. CONTRACTOR SHALL BE RESPONSIBLE FOR REMOVING AND RELOCATING METAL BEAM GUARD FENCES IN CONFLICT ALONG PROJECT LIMITS.
31. CONTRACTOR IS RESPONSIBLE FOR MAINTAINING AND PROTECTING THE INTEGRITY OF EXISTING POWER POLES DURING CONSTRUCTION.
32. ANY DAMAGE TO FENCES, WALKS, OR PRIVATE PROPERTY SHALL BE REPAIRED BY THE CONTRACTOR AT HIS EXPENSE.
33. EQUIPMENT AND MATERIAL STAGING AND REFUELING AREAS SHOULD BE LOCATED IN UPLAND AREAS TO AVOID AND/OR MINIMIZE THE POTENTIAL FOR LEAKING FUELS, OIL, ETC. TO ENTER THE FLOODWAY AND PILOT CHANNEL. PREFERABLY STAGING AREAS SHOULD BE LOCATED IN PREVIOUSLY DISTURBED AREAS.

GENERAL NOTES
(CONTINUATION)

34. TRENCH PROTECTION FOR DIRECTIONAL DRILLING AND JACK AND BORE WILL NOT BE PAID FOR DIRECTLY BUT SHALL BE CONSIDERED SUBSIDIARY TO VARIOUS BID ITEMS.
35. CONTRACTOR TO MAINTAIN 24-HOUR EMERGENCY SERVICE EQUIPMENT AND PERSONNEL DURING CONSTRUCTION WORK ON USIBWC RIGHT-OF-WAY. CONTRACTOR WILL BE REQUIRED TO TAKE IMMEDIATE ACTION UPON NOTIFICATION BY USIBWC TO BACKFILL AND COMPACT ALL EXCAVATED TRENCHES AND REMOVE ALL EXCESS MATERIAL FROM THE FLOODPLAIN AND LEVEES.

HACKNEY LAKE FLOODWAY
NOTES

INTERNATIONAL BOUNDARY AND WATER COMMISSION (IBWC)
CONTRACTOR SHALL FOLLOW "CRITERIA FOR CONSTRUCTION ACTIVITIES WITHIN THE LIMITS OF USIBWC FLOODWAYS" ATTACHED TO BID MANUAL.

TEXAS PARKS AND WILDLIFE (TPWD)
CONTRACTOR SHALL FOLLOW RECOMMENDATIONS FROM TPWD AS LISTED ON LETTER SUBMITTED TO CITY OF MCALLEN PUBLIC UTILITY. LETTER ATTACHED TO BID MANUAL.

U.S. DEPARTMENT OF THE ARMY, GALVESTON DISTRICT CORPS OF ENGINEERS (COE)
CONTRACTOR SHALL FOLLOW RECOMMENDATIONS FROM COE AS LISTED ON LETTER SUBMITTED TO CITY OF MCALLEN PUBLIC UTILITY. LETTER ATTACHED TO BID MANUAL.

U.S. DEPARTMENT OF INTERIOR, FISH AND WILDLIFE SERVICE (FWS)
CONTRACTOR SHALL FOLLOW RECOMMENDATIONS FROM FWS AS LISTED ON LETTER SUBMITTED TO CITY OF MCALLEN PUBLIC UTILITY. LETTER ATTACHED TO BID MANUAL.

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY (TCEQ)
CONTRACTOR SHALL FOLLOW RECOMMENDATIONS FROM TCEQ AS LISTED ON LETTER SUBMITTED TO CITY OF MCALLEN PUBLIC UTILITY. LETTER ATTACHED TO BID MANUAL.

EROSION AND SEDIMENT CONTROL
NOTES

1. TEMPORARY EROSION CONTROL AND SILTATION CONTROL MEASURES (TESC) SHALL BE INSTALLED PRIOR TO ANY SITE WORK.
2. THE MEASURED USED FOR CONTROL SHALL INCLUDE AS APPROPRIATE SILT FENCING, SEDIMENT TRAPS AND CONSTRUCTION EXITS AS SHOWN IN THE PLAN DETAILS. ADDITIONAL MEASURES MAY BE USED UPON APPROVAL BY THE CITY OF MCALLEN.
3. WHERE VEGETATIVE LINING IS USED, TESC MEASURES SHALL NOT BE REMOVED UNTIL SUCH TIME THE VEGETATION HAS BEEN ESTABLISHED.
4. SILT FENCES AND ALL OTHER TESC MEASURES SHALL BE INSPECTED IMMEDIATELY AFTER EACH RAINFALL EVENT GREATER THAN 0.1 INCHES OF RAINFALL AND AT LEAST DAILY DURING PROLONGED RAINFALL EVENTS.
5. SEDIMENT DEPOSITS SHALL BE REMOVED FROM ALL TESC MEASURES AND TEMPORARY DRAINAGE FACILITIES UPON REACHING A DEPTH OF 6 INCHES.

EROSION AND SEDIMENT CONTROL
NOTES (CONTINUATION)

6. THE CONTRACTOR IS RESPONSIBLE FOR PREPARING AND OBTAINING THE NECESSARY EROSION CONTROL PERMITS FROM THE TEXAS COMMISSION ON ENVIRONMENTAL QUALITY (TCEQ). ANY PENALTIES OR FINES FOR FAILURE TO IMPLEMENT OR MAINTAIN TESC MEASURES SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR.
7. THE CONTRACTOR SHALL BE RESPONSIBLE FOR POSTING CONSTRUCTION SITE NOTICE AND ANY ADDITIONAL PERMITS REQUIRED BY TCEQ.
8. THE CONTRACTOR SHALL BE RESPONSIBLE FOR MAINTENANCE OF ALL TESC. DAMAGED OR MISSING TESC SHALL BE REPLACED BY THE CONTRACTOR AT NO ADDITIONAL COST.
9. CONTRACTOR TO PROVIDE A MINIMUM OF 6 CONSTRUCTION EXITS (TY 2) WHEN WORKING INSIDE HACKNEY LAKE FLOODWAY. CONSTRUCTION EXITS CAN BE RELOCATED AS NECESSARY DURING CONSTRUCTION. RELOCATION OF CONSTRUCTION EXITS WILL NOT BE PAID FOR SEPARATELY BUT WILL BE INCLUDED IN THE LUMP SUM AMOUNT FOR THE SW3P PLAN.
10. THERE WILL BE NO TEMPORARY SEEDING FOR THIS PROJECT.
11. WATERING RATES FOR PERMANENT SEED SHALL BE 3,397 GAL/ACRE. PROJECT TOTAL AREA TO BE WATERED = 2.2 ACRES. AFTER PROJECT IS COMPLETE, CONTRACTOR TO WATER 10 TIMES (ONCE EVERY THREE DAYS).

NO.	DATE	REVISION	APP.
  AUTHORIZED 05-30-2018			
 CITY OF McALLEN			
 TEDSI INFRASTRUCTURE GROUP Consulting Engineers 1201 E. Expressway 83 Mission, Texas 78572 (956) 424-7000			
23rd STREET/DICKER ROAD WATER LINE PROJECT			
GENERAL NOTES			
SHEET 2 OF 2			
FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
6			4
STATE	DIST.	COUNTY	
TEXAS	PHR	HIDALGO	
CONT.	SECT.	JOB	HIGHWAY NO.

TCP
GENERAL NOTES

1. FOLLOW TCP CONSTRUCTION PHASING, UNLESS OTHERWISE APPROVED BY THE ENGINEER.
2. THE CONTRACTOR MAY SUBMIT AN ALTERNATE TCP TO THE ENGINEER FOR APPROVAL. PRIOR TO SUBMITTING AN ALTERNATE TCP, THE CONTRACTOR SHALL OBTAIN APPROVAL BY THE ENGINEER.
3. EXISTING ROADS AND/OR PRIVATE DRIVES SHALL BE KEPT OPEN TO TRAFFIC AT ALL TIMES, UNLESS OTHERWISE PROVIDED FOR OR APPROVED BY THE ENGINEER. THE CONTRACTOR SHALL BE REQUIRED TO MAINTAIN, AT ALL TIMES, AT LEAST ONE WAY SURFACED ROADWAY UNLESS OTHERWISE SPECIFIED IN THE PLANS
4. CONTRACTOR SHALL AT ALL TIMES ALLOW ACCESS TO EXISTING DRIVEWAYS OR PROVIDE /MAINTAIN ALTERNATIVE ALL WEATHER ROUTES.
5. NOTIFY THE ENGINEER IN WRITING WHEN MAJOR TRAFFIC CHANGES ARE TO BE MADE. NOTIFICATIONS MUST BE GIVEN A MINIMUM OF THREE WORKING DAYS PRIOR TO THE CHANGE.
6. COORDINATE THE TRAFFIC CONTROL PLAN AND THE VARIOUS SEQUENCES OF CONSTRUCTION WITH ADJACENT CONSTRUCTION PROJECTS IF APPLICABLE, TO ENSURE THE UNINTERRUPTED AND SAFE FLOW OF TRAFFIC.
7. IF NEEDED, DETOUR SIGNING SHALL BE IN ACCORDANCE WITH THE T.M.U.T.C.D.
8. REMOVE OR COVER ALL EXISTING SIGNS WHICH ARE IN CONFLICT WITH THE TRAFFIC CONTROL PLAN.
9. ALL TEMPORARY SIGNING AND STRIPING SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR.
10. ALL EXISTING REGULATORY SIGNS SHALL NOT BE REMOVED UNTIL TEMPORARY SIGN SUPPORTS HAVE BEEN INSTALLED TO ALLOW FOR IMMEDIATE REPLACEMENT OF PROPOSED RELOCATED SIGNS.
11. CONTRACTOR SHALL UTILIZE TRAFFIC CONTROL DEVICES AS SHOWN ON THE PLANS ON A PER PHASE BASIS. THEREFORE, ANY DEVICES UTILIZED IN A PREVIOUS PHASE THAT CONFLICT WITH THE TRAFFIC CONTROL FOR THE CURRENT PHASE SHALL BE REMOVED.
12. NO PHASE OF CONSTRUCTION SHALL START UNTIL SUBSTANTIAL COMPLETION OF THE PREVIOUS PHASE UNLESS OTHERWISE APPROVED BY THE ENGINEER.
13. ADJUST STOP SIGNS AS NEEDED ON INTERSECTING STREETS DURING THE VARIOUS CONSTRUCTION PHASES. DO NOT REMOVE ANY EXISTING STOP SIGNS UNTIL TEMPORARY SIGNS ARE IN PLACE.
14. ALL SIGNS, BARRICADES, WORK ZONE MARKINGS AND DEVICES SHALL BE IN ACCORDANCE WITH THE T.M.U.T.C.D. , LATEST REVISION AND SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR.
15. ADEQUATE SIGNS AND BARRICADES SHALL BE INSTALLED BY THE CONTRACTOR AND APPROVED BY THE ENGINEER PRIOR TO OPENING ANY ROADWAY SECTION TO TRAFFIC. THE ENGINEER MAY DIRECT THE CONTRACTOR TO FURNISH ADDITIONAL SIGNS, BARRICADES AND CHANNELIZING DEVICES, AS REQUIRED TO MAINTAIN TRAFFIC AND MOTORIST SAFETY DURING CONSTRUCTION. ANY SUCH ADDITIONAL SIGNS /BARRICADES, ETC. SHALL BE CONSIDERED AS PART OF PAY ITEM "BARRICADES, SIGNS AND TRAFFIC HANDLING".
16. THE CONTRACTOR SHALL INSURE THAT BARRICADES, SIGNS, CHANNELIZING DEVICES, WARNING LIGHTS AND TRAFFIC HANDLING DEVICES ARE MAINTAINED IN A CLEAN AND FUNCTIONAL CONDITION AT ALL TIME, INCLUDING MAINTENANCE DUE TO ACTS OF VANDALISM OR ACCIDENT. THE CONTRACTOR SHALL HAVE ENOUGH SIGNS AND BARRICADES AVAILABLE, AT ALL TIMES, TO REPLACE THOSE DAMAGED.
17. PROVIDE ADDITIONAL SIGNS AND BARRICADES AS NECESSARY TO ADDRESS FIELD CONSTRUCTIBILITY AND VISIBILITY. THESE ADDITIONAL SIGNS WILL BE CONSIDERED SUBSIDIARY TO ITEM "BARRICADES, SIGNS AND TRAFFIC HANDLING".
18. ALL DRUMS USED ON THIS PROJECT FOR TRAFFIC CONTROL SHALL BE PLASTIC. PLASTIC DRUMS SHALL BE USED IN ACCORDANCE WITH THE PLANS AND MANUFACTURERS RECOMMENDATION, OR AS DIRECTED BY THE ENGINEER.
19. WHEN CONNECTING PROPOSED ROADWAY AND/OR DETOURS TO SECTIONS OF EXISTING PAVEMENT BEING USED BY TRAFFIC AND SUCH OPERATIONS RESULT IN A DROP-OFF OF MORE THAN TWO INCHES, A 3:1 SLOPE WILL BE REQUIRED. THE SLOPE MUST BE CONSTRUCTED WITH A COMPACTED MATERIAL CAPABLE OF SUPPORTING VEHICLES, AS APPROVED BY THE ENGINEER. THIS WORK SHALL BE DONE EXPEDITIOUSLY DURING DAYLIGHT HOURS. FLAGGERS AND APPROPRIATE SIGNING TO SAFELY GUIDE TRAFFIC THROUGH THE WORK AREA WILL BE REQUIRED, AS DIRECTED BY THE ENGINEER.
20. THE CONTRACTOR IS RESPONSIBLE FOR KEEPING ROADWAYS ADJACENT TO THE PROJECT FREE OF CONSTRUCTION MUD AND DEBRIS.
21. ALL TEMPORARY SIGNING AND TRAFFIC CONTROL DEVICES SHALL BE REMOVED FROM THE PROJECT. MATERIALS FURNISHED, INSTALLED AND REMOVED BY THE CONTRACTOR SHALL BECOME THE PROPERTY OF THE CONTRACTOR, UNLESS OTHERWISE SHOWN ON THE PLANS.
22. RESTORE TRAFFIC AND SITE TO ORIGINAL CONDITION UPON COMPLETION OF THE PROJECT. CLEAN UP AND RESTORE AREAS DISTURBED DURING CONSTRUCTION TO A CONDITION AS GOOD OR BETTER THAN THAT WHICH EXISTED PRIOR TO CONSTRUCTION.

NO.	DATE	REVISION	APP.																								
 <i>Eric R. Dietrich</i> AUTHORIZED 03-18-2015  CITY OF McALLEN  TEDSI INFRASTRUCTURE GROUP Consulting Engineers 1201 E. Expressway 83 Mission, Texas 78572 (956) 424-7000 23rd STREET/DICKER ROAD WATER LINE PROJECT TCP GENERAL NOTES SHEET 1 OF 1 <table border="1" style="width: 100%;"><tr><td>FED. RD. DIV. NO.</td><td colspan="2">PROJECT NO.</td><td>SHEET NO.</td></tr><tr><td>6</td><td colspan="2"></td><td>5</td></tr><tr><td>STATE</td><td>DIST.</td><td colspan="2">COUNTY</td></tr><tr><td>TEXAS</td><td>PHR</td><td colspan="2">HIDALGO</td></tr><tr><td>CONT.</td><td>SECT.</td><td>JOB</td><td>HIGHWAY NO.</td></tr><tr><td></td><td></td><td></td><td></td></tr></table>				FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.	6			5	STATE	DIST.	COUNTY		TEXAS	PHR	HIDALGO		CONT.	SECT.	JOB	HIGHWAY NO.				
FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.																								
6			5																								
STATE	DIST.	COUNTY																									
TEXAS	PHR	HIDALGO																									
CONT.	SECT.	JOB	HIGHWAY NO.																								

SEQUENCE OF CONSTRUCTION

1. NOTIFY UTILITY COMPANIES TO SPOT AND/OR EXPOSE EXISTING UNDERGROUND UTILITIES PRIOR TO EXCAVATION
2. IF ALTERNATIVE SELECT FILL MATERIAL IS TO BE USED, SUBMIT TO THE GEOTECHNICAL ENGINEER FOR PRE-APPROVAL AT A MINIMUM OF 10 WORKING DAYS PRIOR TO START OF CONSTRUCTION
3. NOTIFY CITY OF MCALLEN AND ENGINEER 48 HOURS IN ADVANCE OF START OF CONSTRUCTION.
4. INSTALL ADVANCED/GENERAL TRAFFIC CONTROL DEVICES
5. INSTALL APPLICABLE TRAFFIC CONTROL DEVICES AS PER TCP (2-1)-12 OR TCP (2-6)-12
6. INSTALL AND MAINTAIN EROSION AND SEDIMENT CONTROL DEVICES
7. WATER LINE/SANITARY SEWER FORCE MAIN INSTALLATION (TRENCHING, BORING AND DIRECTIONAL DRILLING AS APPLICABLE) BY SEGMENTS
8. CLEAN UP AND DISPOSAL OF EXCESS SOIL BY SEGMENTS AS DIRECTED BY CITY OF MCALLEN
9. REMOVAL OF EROSION AND SEDIMENT CONTROL DEVICES
10. FINAL CLEAN UP

NO.	DATE	REVISION	APP.
  AUTHORIZED 05-30-2018			
 CITY OF McALLEN			
 TEDSI INFRASTRUCTURE GROUP Consulting Engineers 1201 E. Expressway 83 Mission, Texas 78572 (956) 424-7000			
23rd STREET/DICKER ROAD WATER LINE PROJECT			
SEQUENCE OF CONSTRUCTION			
SHEET 1 OF 1			
FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
6			6
STATE	DIST.	COUNTY	
TEXAS	PHR	HIDALGO	
CONT.	SECT.	JOB	HIGHWAY NO.

11/21/2019
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P:\2013\2013-1127-01 McAllen PUB 23rd St Water Main Improvement\Design\CSJ\Roadway SA 01\23rd-Quantities.dgn

NO.	DATE	REVISION	APP.
 CITY OF McALLEN			
TEDSI INFRASTRUCTURE GROUP <i>Consulting Engineers</i> TEDSI 1261 E. Expressway 83 Mission, Texas 78572 (956) 424-7898			
 23rd STREET/DICKER ROAD WATER LINE PROJECT			
SUMMARY OF ESTIMATED QUANTITIES			
FED. RD. DIV. NO.		PROJECT NO.	
6		SHEET 1 OF 1	
STATE		SHEET NO.	
TEXAS		7	
CONT.	DIST.	COUNTY	
	PHR	HIDALGO	
	SECT.	HIGHWAY NO.	
	JOB		

DESCRIBE CHAIN 23RD

Beginning chain 23RD description

Point 2301 N 16,581,161.36 E 1,065,151.75 Sta 200+00.00

Course from 2301 to 2302 S 9° 02' 07.12" W Dist 7,500.00

Point 2302 N 16,573,754.42 E 1,063,973.93 Sta 275+00.00

Ending chain 23RD description

DESCRIBE CHAIN DICKER

Chain DICKER contains:

D1 CUR DICKER-1 CUR DICKER-2 CUR DICKER-3 D2 CUR DICKER-4 CUR DICKER-5 D3 CUR DICKER-6 CUR DICKER-7 CUR DICKER-8 CUR DICKER-9 D4 D5 D6

Beginning chain DICKER description

Point D1 N 16,574,167.17 E 1,064,017.66 Sta 10+00.00

Course from D1 to PC DICKER-1 S 81° 18' 03.05" E Dist 1,677.16

Curve Data

Curve DICKER-1

P.I. Station 30+91.25 N 15,573,850.88 E 1,066,084.85
Delta = 10° 15' 41.44" (RT)
Degree = 1° 14' 32.54"
Tangent = 414.09
Length = 825.96
Radius = 4,611.81
External = 18.55
Long Chord = 824.86
Mid. Ord. = 18.48
P.C. Station 26+77.16 N 16,573,913.51 E 1,065,675.53
P.T. Station 35+03.12 N 16,573,716.33 E 1,066,476.47
C.C. N 16,569,354.75 E 1,064,978.01
Back = S 81° 18' 03.05" E
Ahead = S 71° 02' 21.61" E
Chord Bear = S 76° 10' 12.33" E

Curve Data

Curve DICKER-2

P.I. Station 39+30.44 N 15,573,575.64 E 1,066,879.97
Delta = 10° 35' 16.68" (LT)
Degree = 1° 14' 32.70"
Tangent = 427.32
Length = 852.21
Radius = 4,611.64
External = 19.76
Long Chord = 851.00
Mid. Ord. = 19.67
P.C. Station 35+03.12 N 16,573,716.33 E 1,066,476.47
P.T. Station 43+55.33 N 16,573,511.48 E 1,067,302.45
C.C. N 16,578,070.84 E 1,067,994.86
Back = S 70° 46' 36.37" E
Ahead = S 81° 21' 53.05" E
Chord Bear = S 76° 04' 14.71" E

Course from PT DICKER-2 to PC DICKER-3 S 81° 21' 53.05" E Dist 844.93

Curve Data

Curve DICKER-3

P.I. Station 52+50.31 N 16,573,377.10 E 1,068,187.27
Delta = 5° 35' 00.00" (RT)
Degree = 5° 35' 00.02"
Tangent = 50.04
Length = 100.00
Radius = 1,026.19
External = 1.22
Long Chord = 99.96
Mid. Ord. = 1.22
P.C. Station 52+00.27 N 16,573,384.62 E 1,068,137.80
P.T. Station 53+00.27 N 16,573,364.81 E 1,068,235.78
C.C. N 16,572,370.06 E 1,067,983.73
Back = S 81° 21' 53.05" E
Ahead = S 75° 46' 53.05" E
Chord Bear = S 78° 34' 23.05" E

Course from PT DICKER-3 to D2 S 75° 46' 53.05" E Dist 354.70

Point D2 N 16,573,277.69 E 1,068,579.61 Sta 56+54.96

Course from D2 to PC DICKER-4 S 81° 22' 54.61" E Dist 2,629.18

Curve Data

Curve DICKER-4

P.I. Station 83+00.01 N 16,572,881.33 E 1,071,194.80
Delta = 0° 55' 41.20" (RT)
Degree = 2° 55' 23.69"
Tangent = 15.87
Length = 31.75
Radius = 1,960.00
External = 0.06
Long Chord = 31.75
Mid. Ord. = 0.06
P.C. Station 82+84.14 N 16,572,883.71 E 1,071,179.10
P.T. Station 83+15.89 N 16,572,878.70 E 1,071,210.45
C.C. N 16,570,945.84 E 1,070,885.40
Back = S 81° 22' 54.61" E
Ahead = S 80° 27' 13.41" E
Chord Bear = S 80° 55' 04.01" E

Course from PT DICKER-4 to PC DICKER-5 S 80° 27' 13.41" E Dist 268.29

Curve Data

Curve DICKER-5

P.I. Station 86+00.05 N 16,572,831.57 E 1,071,490.68
Delta = 0° 55' 41.20" (LT)
Degree = 2° 55' 23.69"
Tangent = 15.87
Length = 31.75
Radius = 1,960.00
External = 0.06
Long Chord = 31.75
Mid. Ord. = 0.06
P.C. Station 85+84.18 N 16,572,834.21 E 1,071,475.03
P.T. Station 86+15.93 N 16,572,829.20 E 1,071,506.38
C.C. N 16,574,767.07 E 1,071,800.08
Back = S 80° 27' 13.41" E
Ahead = S 81° 22' 54.61" E
Chord Bear = S 80° 55' 04.01" E

HORIZONTAL DATUM IS NAD 83.
TEXAS STATE PLANE SOUTH ZONE (4205).
VERTICAL DATUM IS NAVD 88.

COORDINATES AND DISTANCES ARE IN SURVEY FEET DISPLAYED IN SURFACE AND MAY BE CONVERTED TO GRID BY DIVIDING BY TXDOT SURFACE ADJUSTMENT FACTOR OF 1.00004.

NO.	DATE	REVISION	APP.
  AUTHORIZED 03-18-2015			
 McALLEN			
 TEDSI INFRASTRUCTURE GROUP Consulting Engineers 1201 E. Expressway 83 Mission, Texas 78572 (956) 424-7000			
23rd STREET/DICKER ROAD WATER LINE PROJECT			
HORIZONTAL ALIGNMENT DATA			
SHEET 1 OF 2			
FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
6			6
STATE	DIST.	COUNTY	
TEXAS	PHR	HIDALGO	
CONT.	SECT.	HIGHWAY NO.	

Course from PT DICKER-5 to D3 S 81° 22' 54.61" E Dist 270.47

Point D3 N 16,572,788.67 E 1,071,773.80 Sta 88+86.40

Course from D3 to PC DICKER-6 S 81° 22' 54.61" E Dist 186.33

Curve Data

Curve DICKER-6

P.I. Station 90+99.46 N 16,572,756.74 E 1,071,984.45
Delta = 1° 33' 45.77" (LT)
Degree = 2° 55' 23.69"
Tangent = 26.73
Length = 53.46
Radius = 1,960.00
External = 0.18
Long Chord = 53.46
Mid. Ord. = 0.18
P.C. Station 90+72.73 N 16,572,760.74 E 1,071,958.02
P.T. Station 91+26.18 N 16,572,753.46 E 1,072,010.98
C.C. N 16,574,698.62 E 1,072,251.72
Back = S 81° 22' 54.61" E
Ahead = S 82° 09' 47.50" E
Chord Bear = S 82° 09' 47.50" E

Course from PT DICKER-6 to PC DICKER-7 S 82° 56' 40.38" E Dist 146.32

Curve Data

Curve DICKER-7

P.I. Station 92+99.53 N 16,572,732.16 E 1,072,183.01
Delta = 1° 34' 47.33" (RT)
Degree = 2° 55' 23.69"
Tangent = 27.02
Length = 54.04
Radius = 1,960.00
External = 0.19
Long Chord = 54.04
Mid. Ord. = 0.19
P.C. Station 92+72.51 N 16,572,735.48 E 1,072,156.19
P.T. Station 93+26.55 N 16,572,728.11 E 1,072,209.73
C.C. N 16,570,790.32 E 1,071,915.44
Back = S 82° 56' 40.38" E
Ahead = S 81° 21' 53.05" E
Chord Bear = S 82° 09' 16.72" E

Course from PT DICKER-7 to PC DICKER-8 S 81° 21' 53.05" E Dist 3,921.66

Curve Data

Curve DICKER-8

P.I. Station 133+15.15 N 16,572,128.98 E 1,076,153.07
Delta = 8° 54' 43.37" (RT)
Degree = 2° 55' 23.69"
Tangent = 66.94
Length = 133.83
Radius = 1,960.00
External = 1.14
Long Chord = 133.80
Mid. Ord. = 1.14
P.C. Station 132+48.21 N 16,572,139.29 E 1,076,086.93
P.T. Station 133+82.04 N 16,572,114.18 E 1,076,218.35
C.C. N 16,570,202.68 E 1,075,785.03
Back = S 81° 08' 21.96" E
Ahead = S 77° 13' 38.59" E
Chord Bear = S 79° 11' 00.27" E

Course from PT DICKER-8 to PC DICKER-9 S 77° 13' 38.59" E Dist 170.05

Curve Data

Curve DICKER-9

P.I. Station 136+25.97 N 16,572,060.25 E 1,076,456.25
Delta = 4° 19' 02.76" (LT)
Degree = 2° 55' 23.69"
Tangent = 73.88
Length = 147.69
Radius = 1,960.00
External = 1.39
Long Chord = 147.66
Mid. Ord. = 1.39
P.C. Station 135+52.09 N 16,572,076.59 E 1,076,384.20
P.T. Station 136+99.78 N 16,572,049.39 E 1,076,529.33
C.C. N 16,573,988.09 E 1,076,817.52
Back = S 77° 13' 38.59" E
Ahead = S 81° 32' 41.35" E
Chord Bear = S 79° 23' 09.97" E

Course from PT DICKER-9 to D4 S 81° 32' 41.35" E Dist 741.25

Point D4 N 16,571,940.40 E 1,077,262.52 Sta 144+41.03

Course from D4 to D5 S 79° 46' 35.25" E Dist 175.81

HORIZONTAL DATUM IS NAD 83.
TEXAS STATE PLANE SOUTH ZONE (4205).
VERTICAL DATUM IS NAVD 88.

COORDINATES AND DISTANCES ARE IN US
SURVEY FEET DISPLAYED IN SURFACE AND
MAY BE CONVERTED TO GRID BY DIVIDING
BY TXDOT SURFACE ADJUSTMENT FACTOR
OF 1.00004.

NO.	DATE	REVISION	APP.
 <i>Eric R. Dietrich</i> AUTHORIZED 03-18-2015			
 CITY OF McALLEN			
 TEDSI INFRASTRUCTURE GROUP Consulting Engineers 1201 E. Expressway 83 Mission, Texas 78572 (956) 424-7000			
23rd STREET/DICKER ROAD WATER LINE PROJECT			
HORIZONTAL ALIGNMENT DATA			
SHEET 2 OF 2			
FED. RD. DIV. NO. 6	PROJECT NO.		SHEET NO. 9
STATE TEXAS	DIST. PHR	COUNTY HIDALGO	
CONT.	SECT.	JOB	HIGHWAY NO.

HORIZONTAL DATUM IS NAD 83.
TEXAS STATE PLANE SOUTH ZONE (4205).
VERTICAL DATUM IS NAVD 88.

COORDINATES AND DISTANCES ARE IN US
SURVEY FEET DISPLAYED IN SURFACE AND
MAY BE CONVERTED TO GRID BY DIVIDING
BY TXDOT SURFACE ADJUSTMENT FACTOR
OF 1.00004.

Chain 23RD03 contains:

3006 3001 3002 3003 3004 3005

Beginning chain 23RD03 description

Point 3006 N 16,579,490.844 E
1,064,504.639 Sta 299+00.00
Course from 3006 to 3001 S 80° 57' 52.93" E Dist 122.467

Point 3001 N 16,579,471.612 E
1,064,625.586 Sta 300+22.47
Course from 3001 to 3002 S 35° 57' 52.92" E Dist 14.142

Point 3002 N 16,579,460.165 E
1,064,633.891 Sta 300+36.61
Course from 3002 to 3003 S 9° 02' 07.12" W Dist 396.590

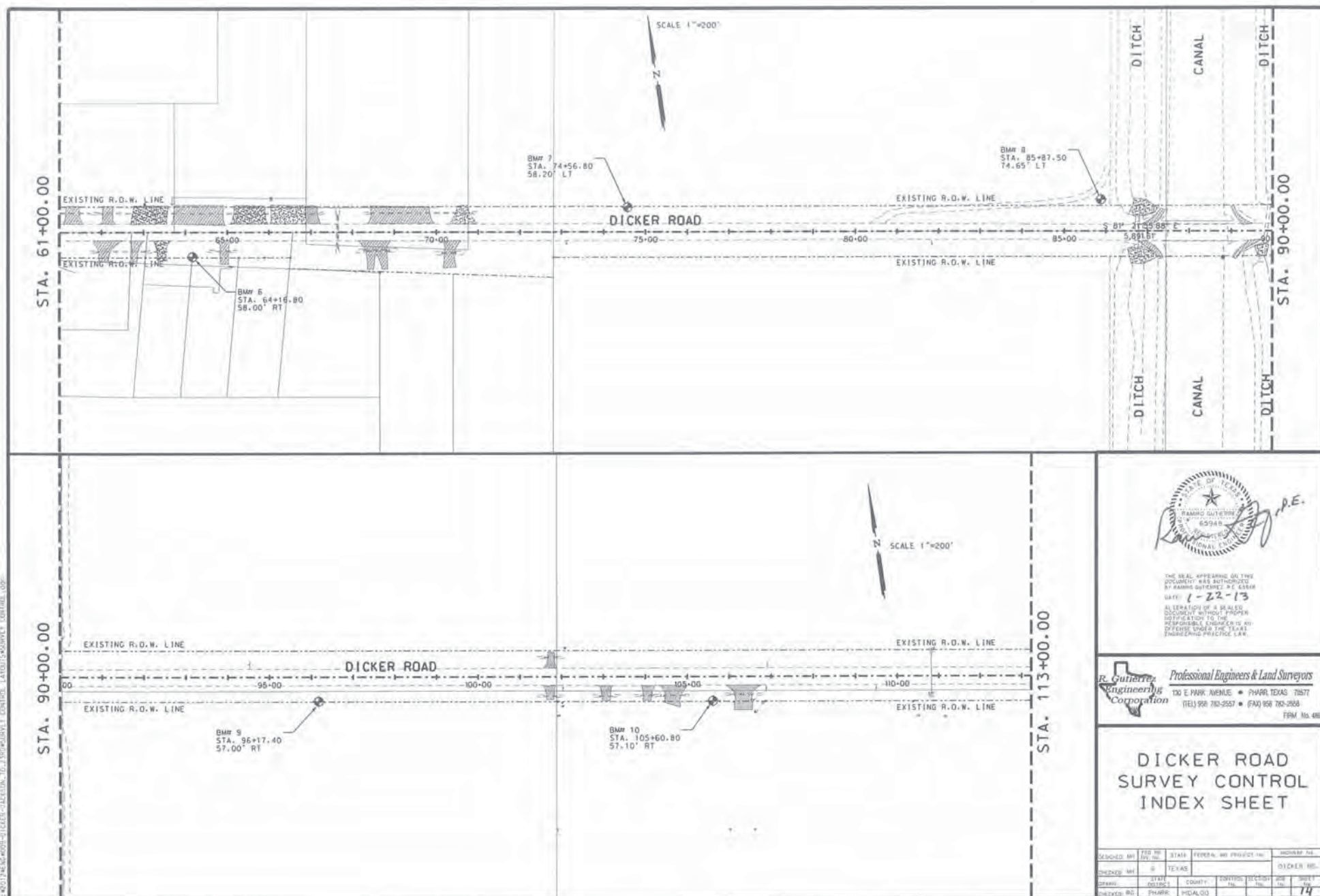
Point 3003 N 16,579,068.496 E
1,064,571.610 Sta 304+33.20
Course from 3003 to 3004 S 35° 57' 52.88" E Dist 14.142

Point 3004 N 16,579,057.051 E
1,064,579.915 Sta 304+47.34
Course from 3004 to 3005 S 80° 57' 52.88" E Dist 304.984

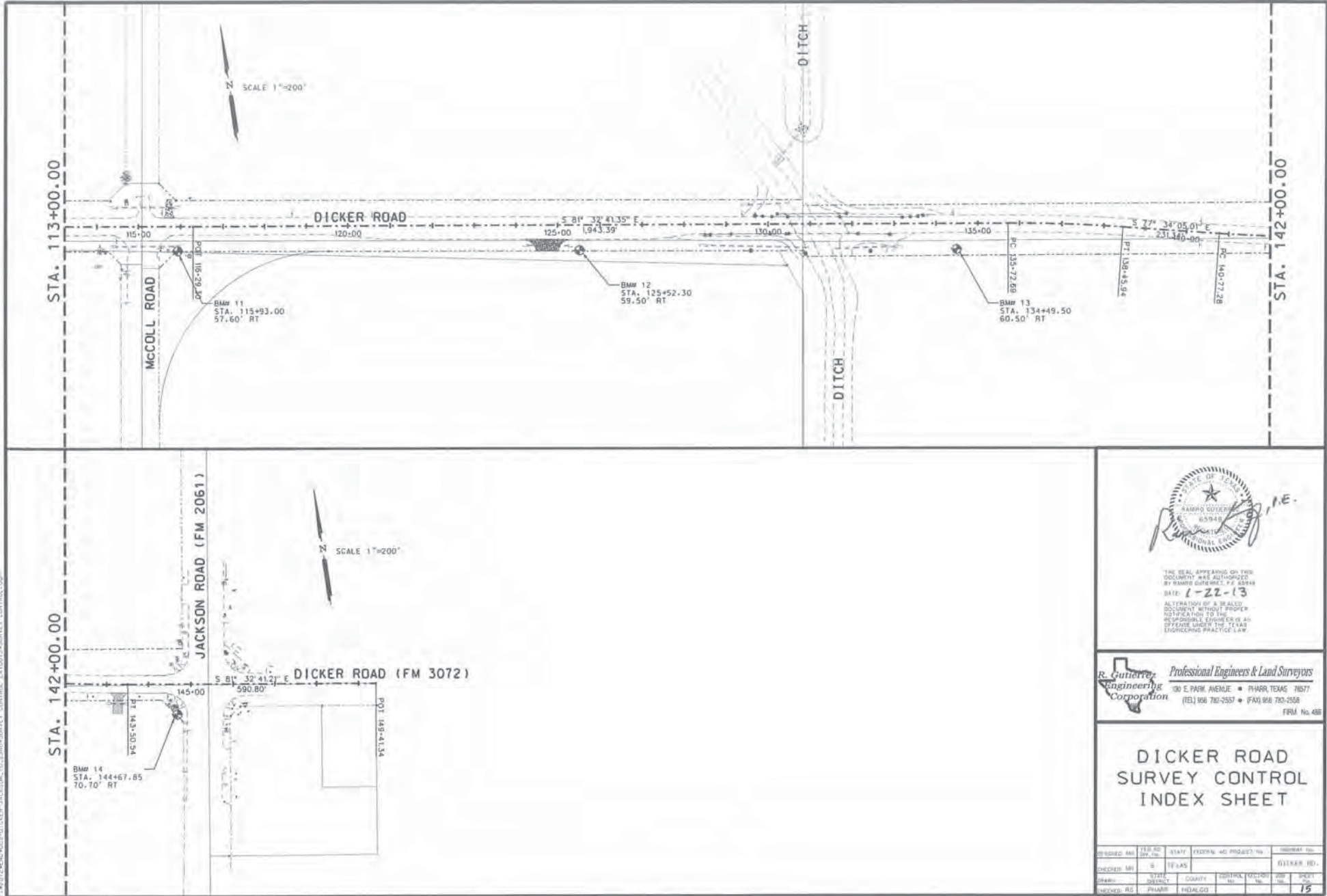
Point 3005 N 16,579,009.155 E
1,064,881.114 Sta 307+52.32

Ending chain 23RD03 description

NO.	DATE	REVISION	APP.
  AUTHORIZED 05-30-2018			
 CITY OF McALLEN			
 TEDSI INFRASTRUCTURE GROUP Consulting Engineers 1201 E. Expressway 83 Mission, Texas 78572 (956) 424-7000			
23rd STREET/DICKER ROAD WATER LINE PROJECT			
8" SANITARY SEWER FORCE MAIN HORIZONTAL ALIGNMENT DATA			
SHEET 1 OF 1			
FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
6			9A
STATE	DIST.	COUNTY	
TEXAS	PHR	HIDALGO	
CONT.	SECT.	JOB	HIGHWAY NO.



I:\47011\ME\ROADS-DICKER-JACKSON-IG-2306\DWG\INDEX SHEET.dwg

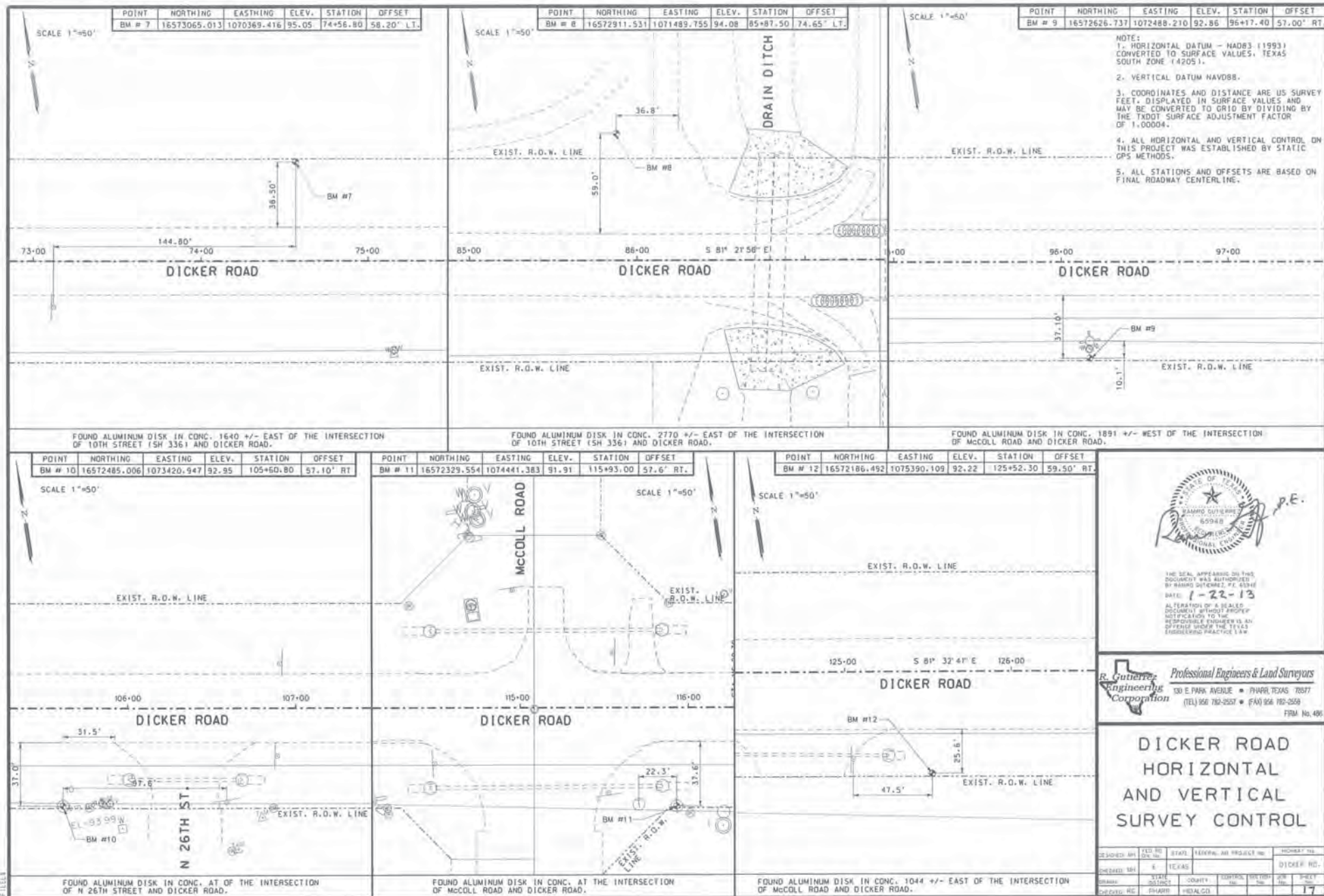


THE SEAL APPEARING ON THIS DOCUMENT IS AUTHORIZED BY BOARD ORDER NO. 125948 DATE: 1-22-13
ALTERATION OF A SEALED DOCUMENT WITHOUT PROPER NOTIFICATION TO THE RESPONSIBLE ENGINEER IS AN OFFENSE UNDER THE TEXAS ENGINEERING PRACTICE LAW.

R. Gutierrez
Professional Engineers & Land Surveyors
100 E. PARK AVENUE • PHAROS, TEXAS 78677
(TEL) 956 782-2557 • (FAX) 956 782-2558
FPM No. 458

DICKER ROAD SURVEY CONTROL INDEX SHEET

DESIGNED BY	CHKD BY	DATE	PROJECT NO.	PROJECT NAME
DESIGNED: RS	CHKD: MH	6/11/13	13	DICKER RD.
STATE	COUNTY	CITY	PROJECT NO.	PROJECT NAME
TEXAS	PHAROS	PHAROS	13	DICKER RD.



POINT	NORTHING	EASTING	ELEV.	STATION	OFFSET
BM # 13	16572053.584	1076277.457	90.32	134+50.50	60.50' RT.

SCALE 1"=50'

EXIST. R.O.W. LINE

133+00 134+00 135+00

DICKER ROAD

10.5'

39.1'

BM #13

EXIST. R.O.W. LINE

POINT	NORTHING	EASTING	ELEV.	STATION	OFFSET
BM #14	16571859.261	1077276.935	91.91	144+68.00	70.70' RT.

SCALE 1"=50'

EXIST. R.O.W. LINE

JACKSON ROAD (FM 2061)

145+00

146+00

S 81° 32' 41" E

DICKER ROAD

DICKER ROAD (FM 3072)

BM #14

23.9'

18.7'

FOUND ALUMINUM DISK IN CONC. 1091' +/- WEST OF THE INTERSECTION
OF JACKSON ROAD AND DICKER ROAD.

FOUND ALUMINUM DISK IN CONC. AT THE INTERSECTION
OF JACKSON ROAD (FM 2061) AND DICKER ROAD.

THE SEAL, APPEARING ON THIS DOCUMENT WAS AUTHORIZED BY RAYMOND F. BROWN, JR.

DATE: 1-22-13

A TRIANGULAR & SEALED DOCUMENT WITHOUT FRONTR

DICKER ROAD HORIZONTAL AND VERTICAL SURVEY CONTROL

REASON: WH	FED PD Date: 11/1/80	STATE	FEDERAL AG PROJECT #	PROPERTY #		
CHARGED: MH	8	TEXAS		DICKER RD.		
SPRING	STATE INSTRUC	COUNTY	CONTRACT No.	SECTION No.	JOB No.	SHEET No.
CHARGED: RD	PHARR	NDLM CO				18

Start at STA. 29+00

HIDALGO COUNTY
WATER IMPROVEMENT
DISTRICT No. 3

NOTE: STATION LOCATIONS AND OFFSETS ARE
APPROXIMATE. FIELD AND SUBSURFACE
CONDITIONS WILL DETERMINE FINAL LOCATIONS.

LEGEND

- GAS —
- TELE —
- SAN —
- X—X—X—X—
- W —
- EXIST. GAS LINE
- EXIST. UG PHONE LINE
- EXIST. SANITARY LINE
- EXIST. CHAINLINK FENCE
- EXIST. WATER LINE
- PROP. WATER LINE (TRENCHING)
- PROP. WATER LINE (BORE & JACK)
- PROP. WATER LINE (DIRECTIONAL DRILLING)
- PROP. WATER LINE (INSIDE CASING, NO BORING OR JACKING)
- PROP. FIRE HYDRANT
- PROP. GATE VALVE & BOX
- PROP. BUTTERFLY VALVE & BOX
- PROP. COMBINATION VACUUM & AIR RELEASE VALVE & BOX
- PROP. BACKFLOW PREVENTER DEVICE
- PROP. METER
- PROP. 90 DEGREE ELBOW W/ CONC THRUST BLOCK
- PROP. 45 DEGREE ELBOW W/ CONC THRUST BLOCK
- PROP. 22.5 DEGREE ELBOW W/ CONC THRUST BLOCK
- PROP. 11.25 DEGREE ELBOW W/ CONC THRUST BLOCK
- PROP. TEE W/ CONC THRUST BLOCK
- PROP. WYE
- PROP. REDUCER
- DRIVEWAY NUMBER
- ASPHALT DRIVEWAY TO BE RESTORED (PAY ITEM INCLUDES REMOVAL)

0 10 20 30 40 50
HORZ SCALE 1" = 50'

0 1 2 3 4 5
VERT SCALE 1" = 5'

NO. DATE REVISION APP.



AUTHORIZED 03-18-2015

**CITY OF
McALLEN**

TEDSI INFRASTRUCTURE GROUP
Consulting Engineers
1201 E. Expressway 83
Mission, Texas 78572
(956) 424-7000

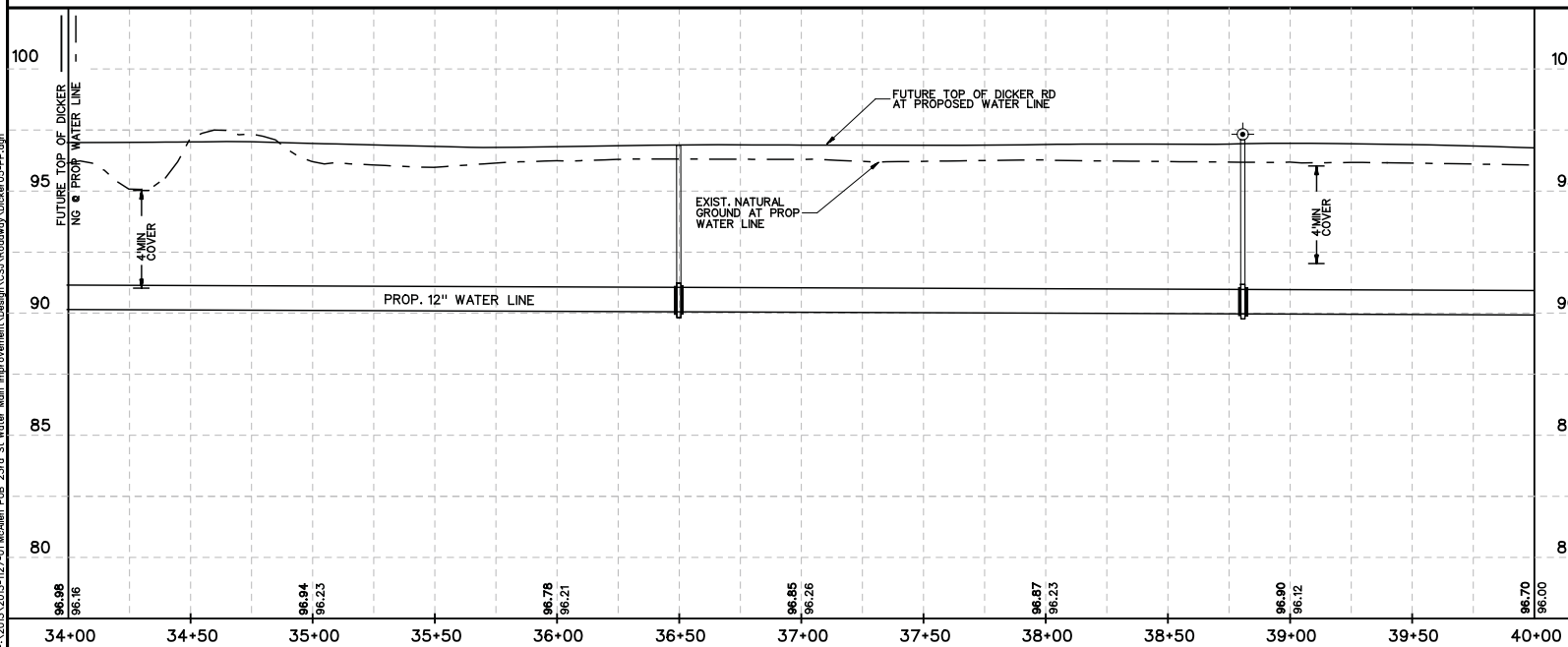
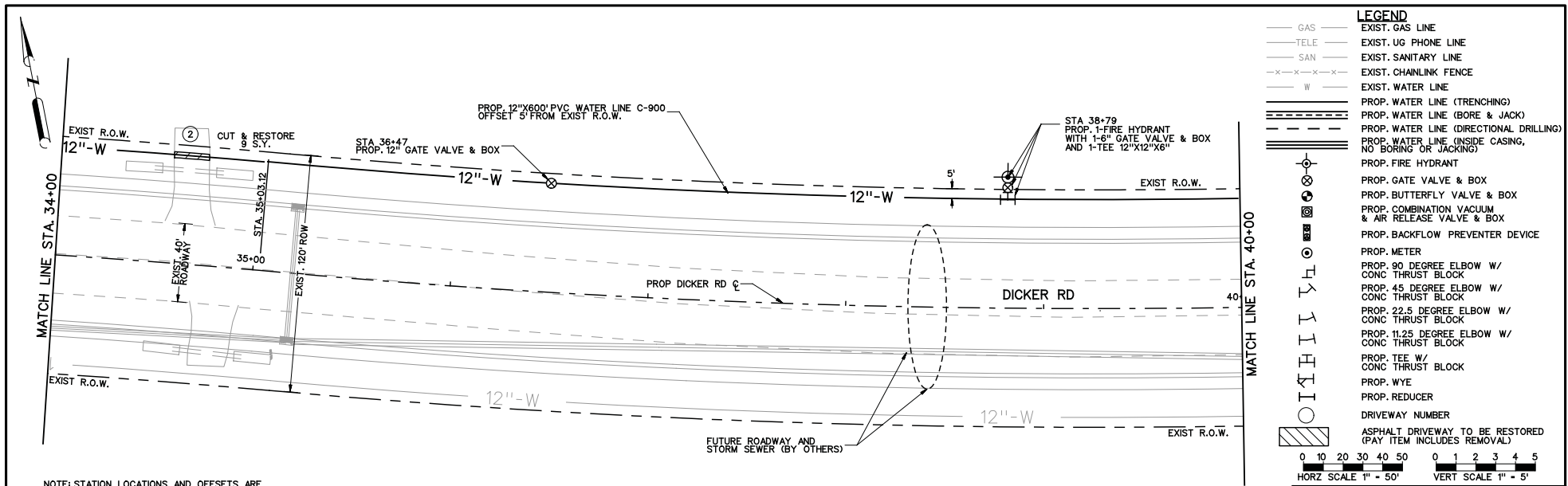
**23rd STREET/DICKER ROAD
WATER LINE PROJECT
12" LINE
PLAN & PROFILE
STA 28+00 TO STA 34+00**

SHEET 20 OF 33

FED. RD. DIV. NO.	PROJECT NO.	SHEET NO.
6		38
STATE	DIST.	COUNTY
TEXAS	PHR	HIDALGO
CONT.	SECT.	JOB
		HIGHWAY NO.

3/18/2015
10:02:21 AM
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3/18/2015
10:02:22 AM
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NO.	DATE	REVISION	APP.

ERIC R. DIETRICH
94970
PROFESSIONAL ENGINEER
STATE OF TEXAS

AUTHORIZED 03-18-2015

CITY OF
McALLEN

TEDSI INFRASTRUCTURE GROUP
Consulting Engineers
1201 E. Expressway 83
Mission, Texas 78572
(956) 424-7000

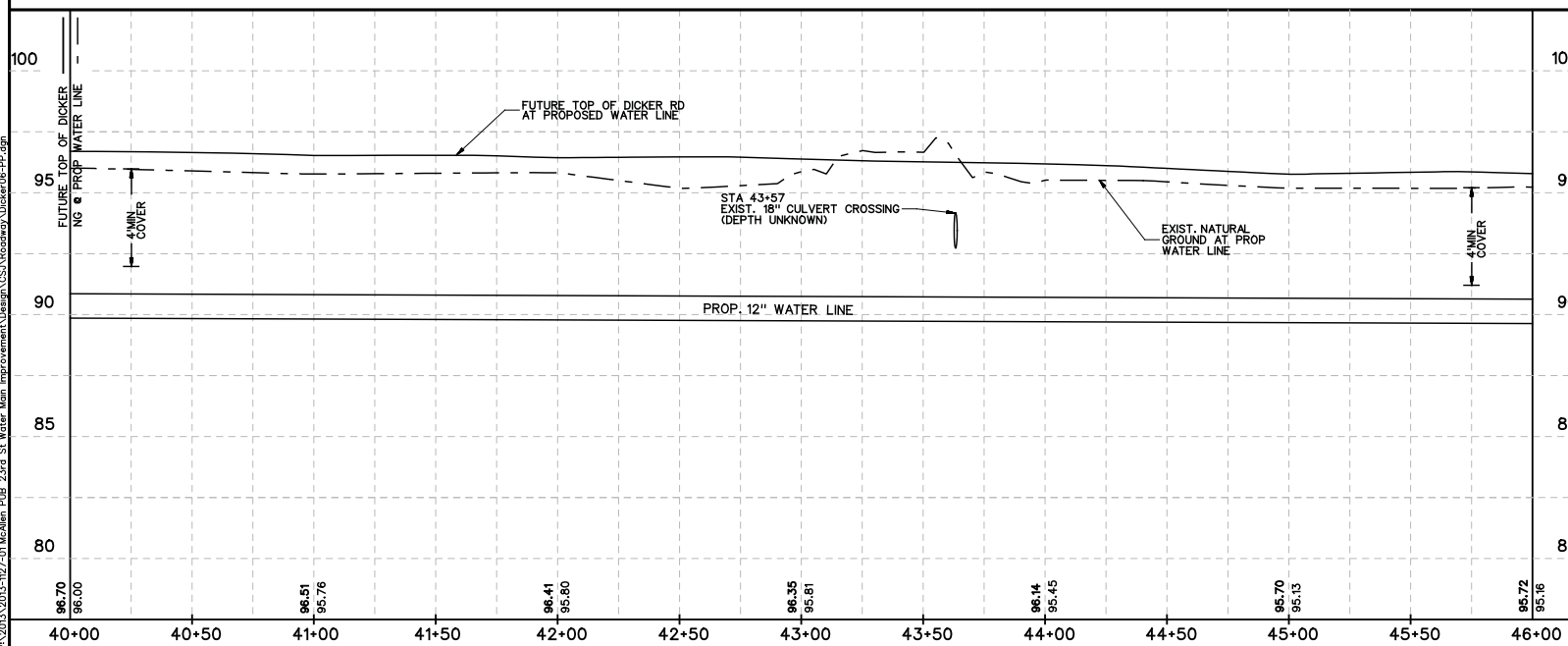
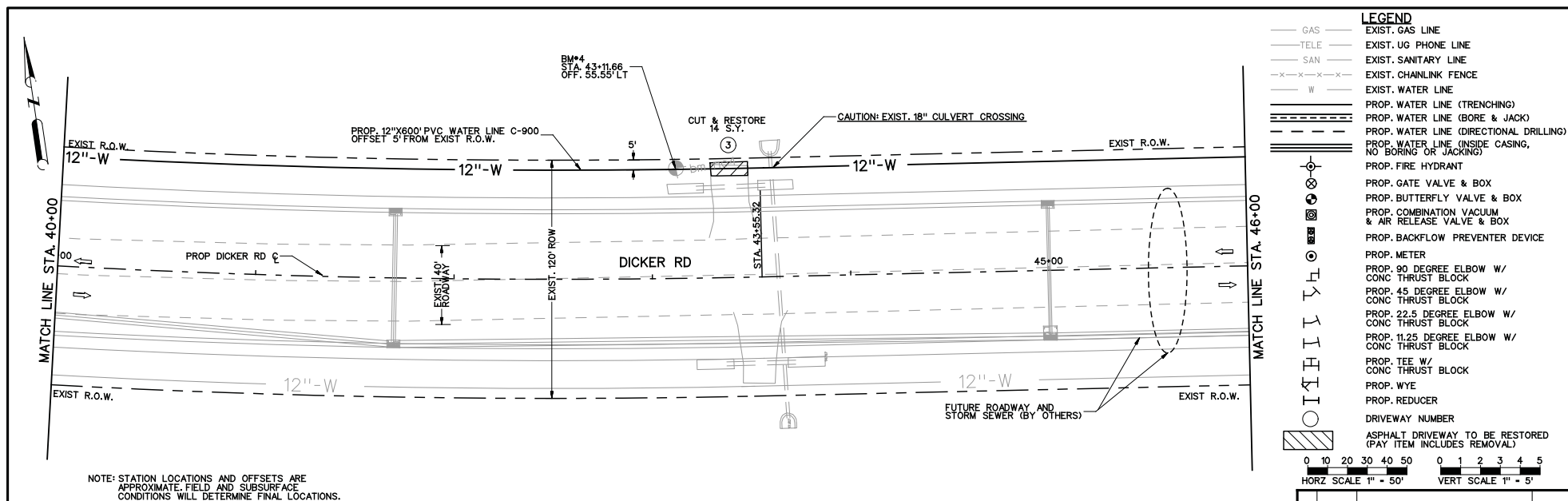
23rd STREET/DICKER ROAD
WATER LINE PROJECT
12" LINE
PLAN & PROFILE
STA 34+00 TO STA 40+00

SHEET 21 OF 33

FED. RD. DIV. NO.	PROJECT NO.	SHEET NO.
6		39

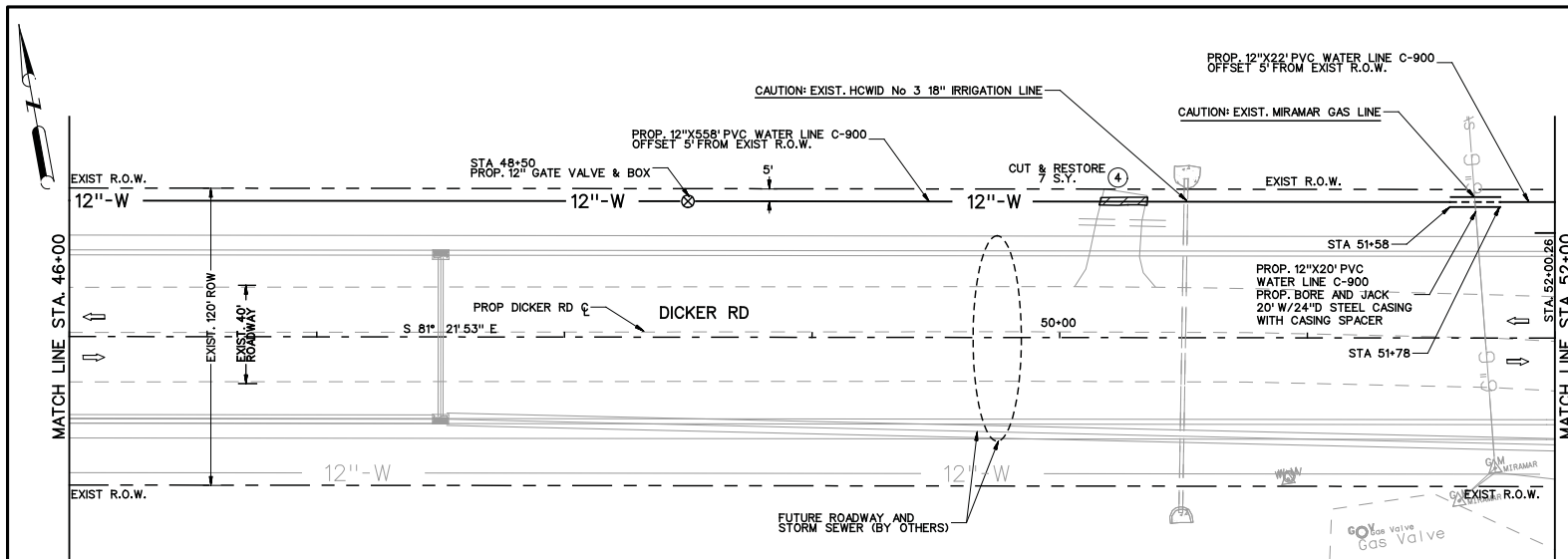
STATE	DIST.	COUNTY
TEXAS	PHR	HIDALGO

CONT.	SECT.	JOB	HIGHWAY NO.



NO.	DATE	REVISION	APP.
0			
5	<u>AUTHORIZED 03-18-2015</u>		
0	 CITY OF McALLEN		
5	 TEDSI <i>Consulting Engineers</i> 1201 E. Expressway 83 Mission, Texas 78572 (956) 424-7898		
23rd STREET/DICKER ROAD WATER LINE PROJECT 12" LINE PLAN & PROFILE STA 40+00 TO STA 46+00			
SHEET 22 OF 33			
0	FED. RD. DIV. NO. 6		PROJECT NO.
0	STATE TEXAS	DIST.	COUNTY HIDALGO
0	CONT.	SECT.	HIGHWAY NO.

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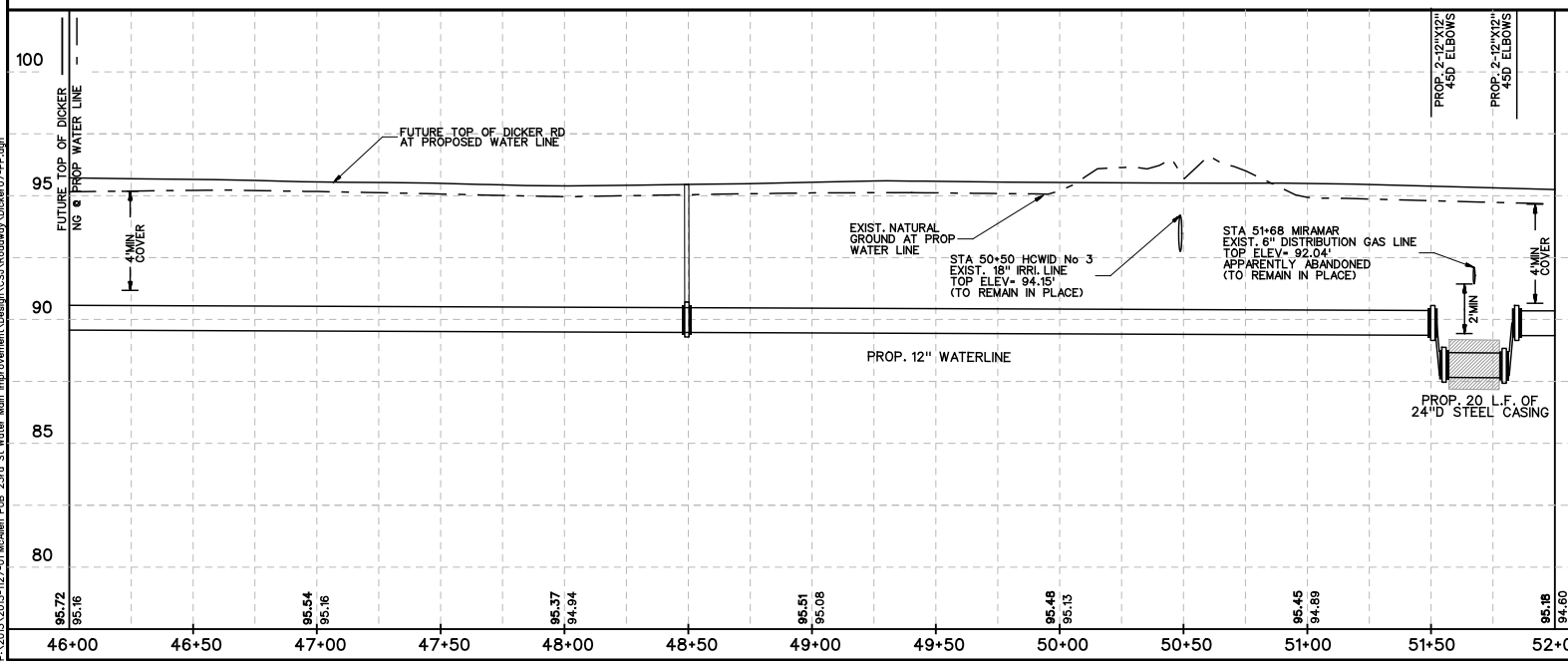


NOTE: STATION LOCATIONS AND OFFSETS ARE APPROXIMATE. FIELD AND SUBSURFACE CONDITIONS WILL DETERMINE FINAL LOCATIONS.

LEGEND

- GAS —
- EXIST. GAS LINE
- TELE —
- EXIST. UG PHONE LINE
- SAN —
- EXIST. SANITARY LINE
- - - - - EXIST. CHAINLINK FENCE
- W —
- EXIST. WATER LINE
- ===== PROP. WATER LINE (TRENCHING)
- ===== PROP. WATER LINE (BORE & JACK)
- ===== PROP. WATER LINE (DIRECTIONAL DRILLING)
- ===== PROP. WATER LINE (INSIDE CASING, NO BORING OR JACKING)
- PROP. FIRE HYDRANT
- PROP. GATE VALVE & BOX
- PROP. BUTTERFLY VALVE & BOX
- PROP. COMBINATION VACUUM & AIR RELEASE VALVE & BOX
- PROP. BACKFLOW PREVENTER DEVICE
- PROP. METER
- PROP. 90 DEGREE ELBOW W/ CONC THRUST BLOCK
- PROP. 45 DEGREE ELBOW W/ CONC THRUST BLOCK
- PROP. 22.5 DEGREE ELBOW W/ CONC THRUST BLOCK
- PROP. 11.25 DEGREE ELBOW W/ CONC THRUST BLOCK
- PROP. TEE W/ CONC THRUST BLOCK
- PROP. WYE
- PROP. REDUCER
- DRIVEWAY NUMBER
- ▨ ASPHALT DRIVEWAY TO BE RESTORED (PAY ITEM INCLUDES REMOVAL)

HORIZ SCALE 1" = 50'
VERT SCALE 1" = 5'



NO.	DATE	REVISION	APP.

ERIC R. DIETRICH
94970
AUTHORIZED 03-18-2015

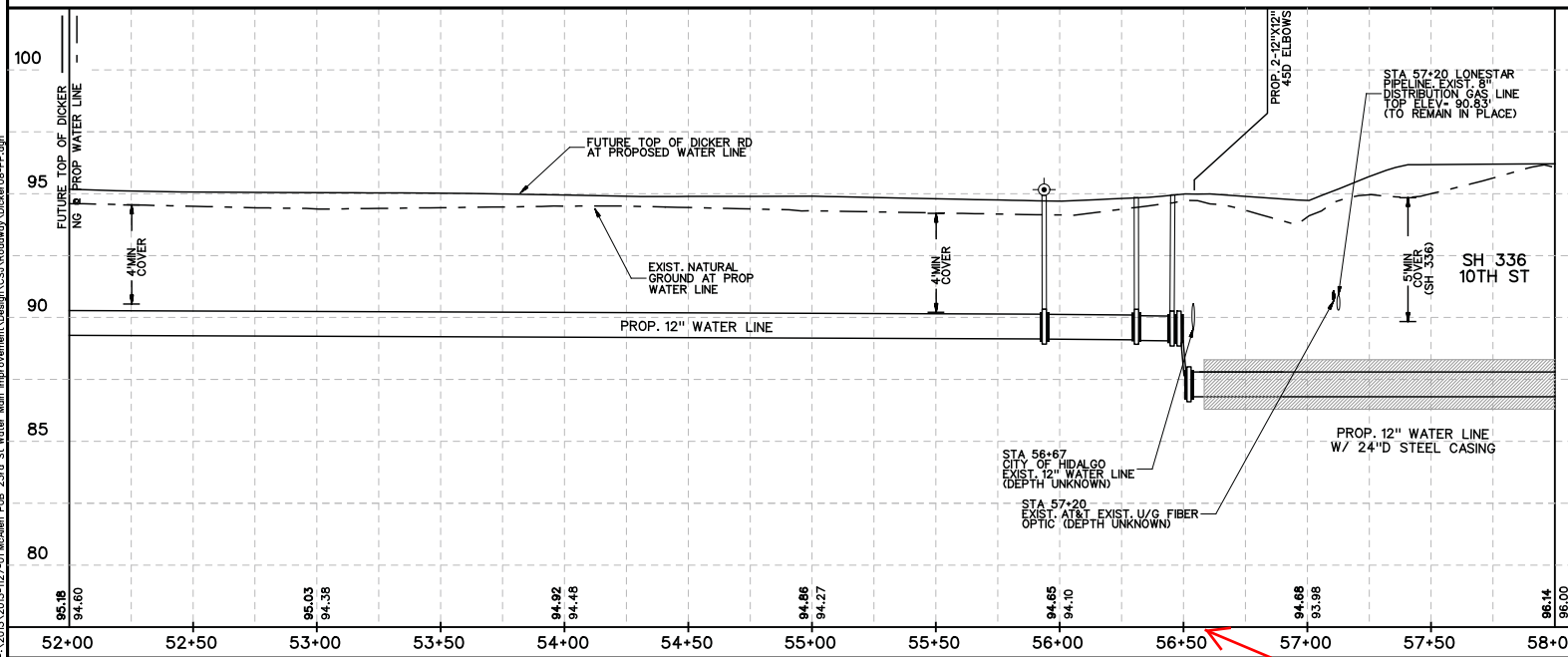
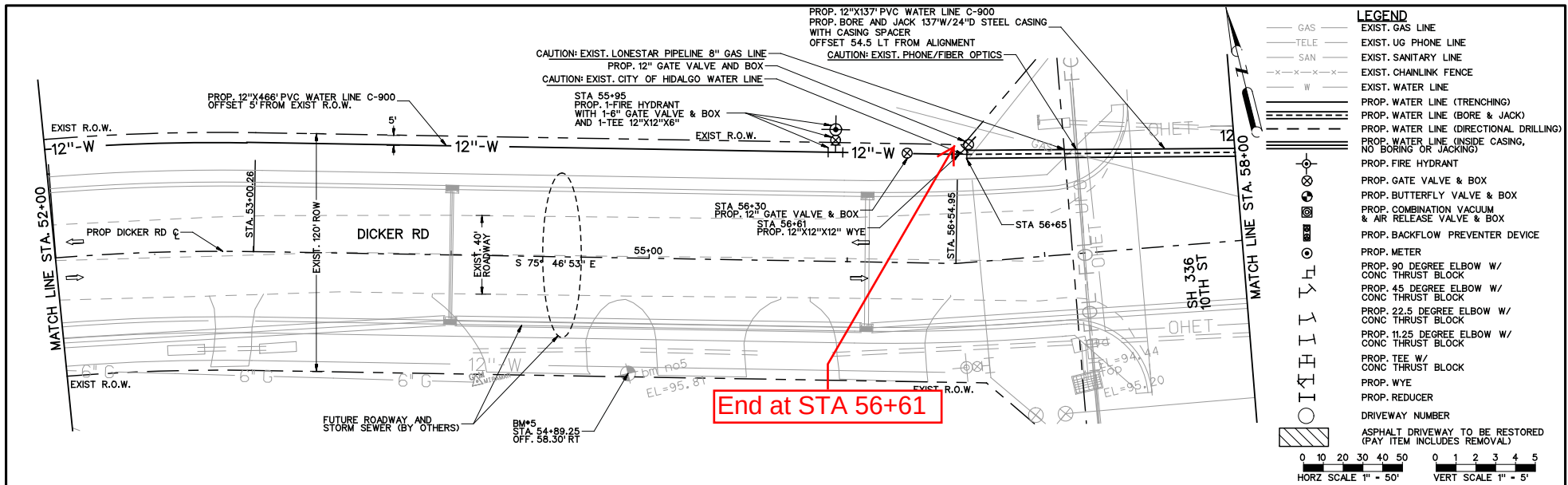
CITY OF McALLEN

TEDSI INFRASTRUCTURE GROUP
Consulting Engineers
1201 E. Expressway 83
Mission, Texas 78572
(956) 424-7000

**23rd STREET/DICKER ROAD
WATER LINE PROJECT
12" LINE
PLAN & PROFILE
STA 46+00 TO STA 52+00**

SHEET 23 OF 33

FED. RD. DIV. NO.	PROJECT NO.	SHEET NO.
6		41
STATE	DIST.	COUNTY
TEXAS	PHR	HIDALGO
CONT.	SECT.	JOB
		HIGHWAY NO.



NO.	DATE	REVISION	APP.

ERIC R. DIETRICH
94970
AUTHORIZED 03-18-2015

CITY OF McALLEN

TEDSI INFRASTRUCTURE GROUP
Consulting Engineers
1201 E. Expressway 83
Mission, Texas 78572
(956) 424-7000

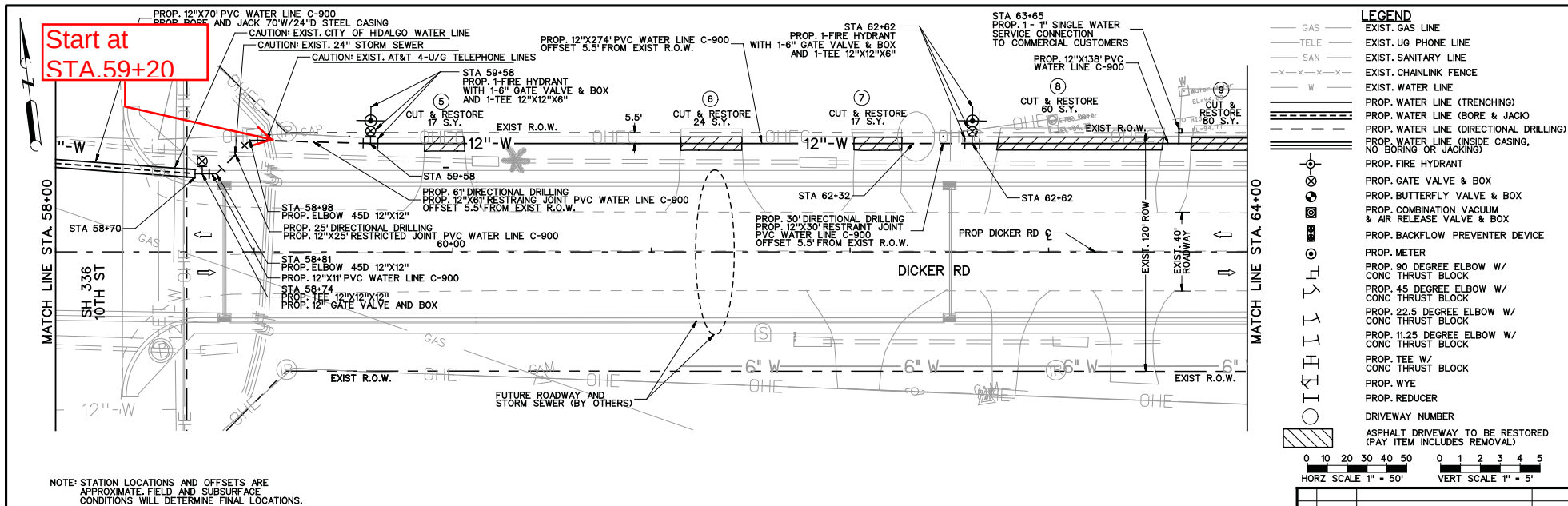
**23rd STREET/DICKER ROAD
WATER LINE PROJECT
12" LINE
PLAN & PROFILE
STA 52+00 TO STA 58+00**

FED. RD. DIV. NO.	PROJECT NO.	SHEET NO.
6		42
STATE	DIST.	COUNTY
TEXAS	PHR	HIDALGO
CONT.	SECT.	JOB
		HIGHWAY NO.

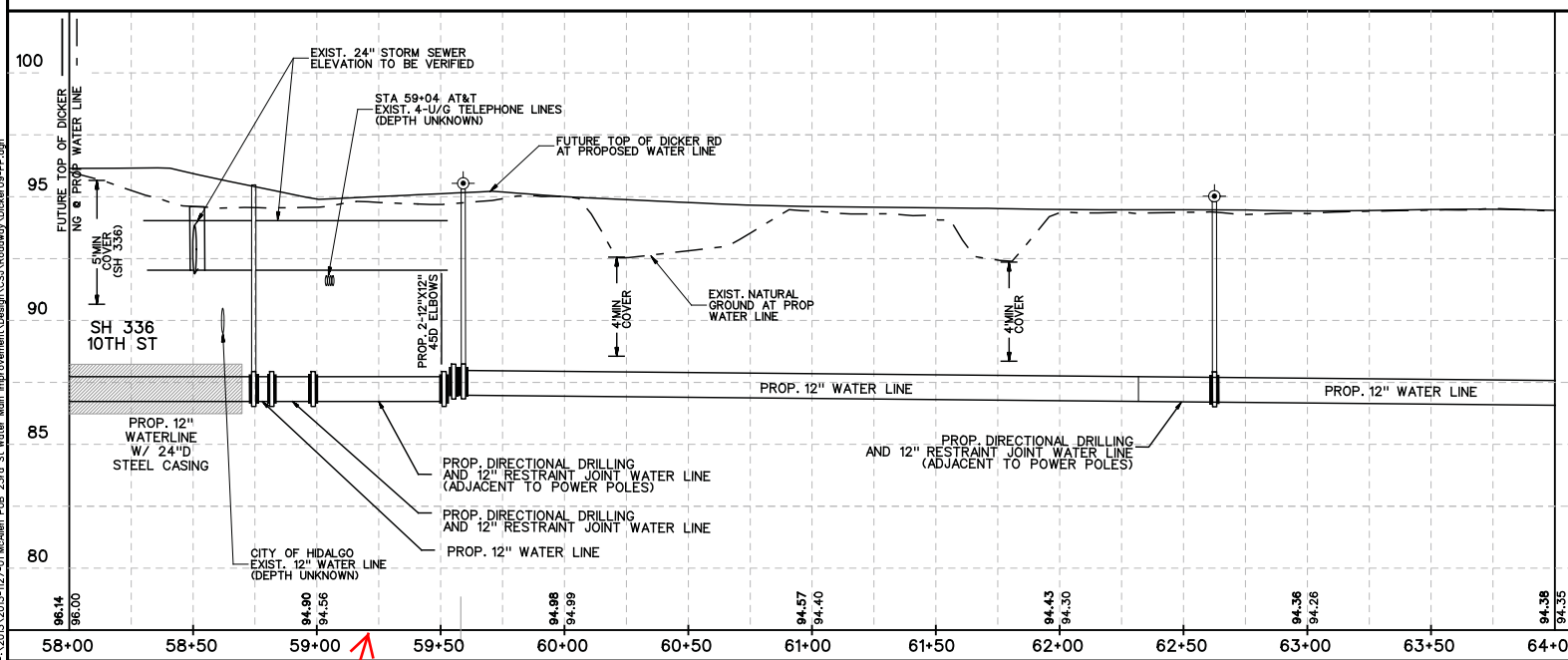
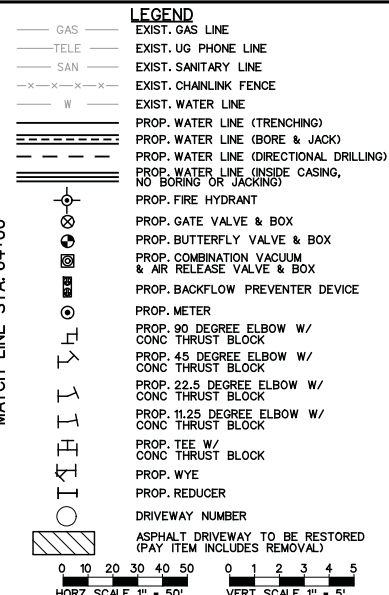
SHEET 24 OF 33

End at STA 56+61

Start at
STA. 59+20



NOTE: STATION LOCATIONS AND OFFSETS ARE APPROXIMATE. FIELD AND SUBSURFACE CONDITIONS WILL DETERMINE FINAL LOCATIONS.



Start at STA. 59+20



AUTHORIZED 03-18-2015

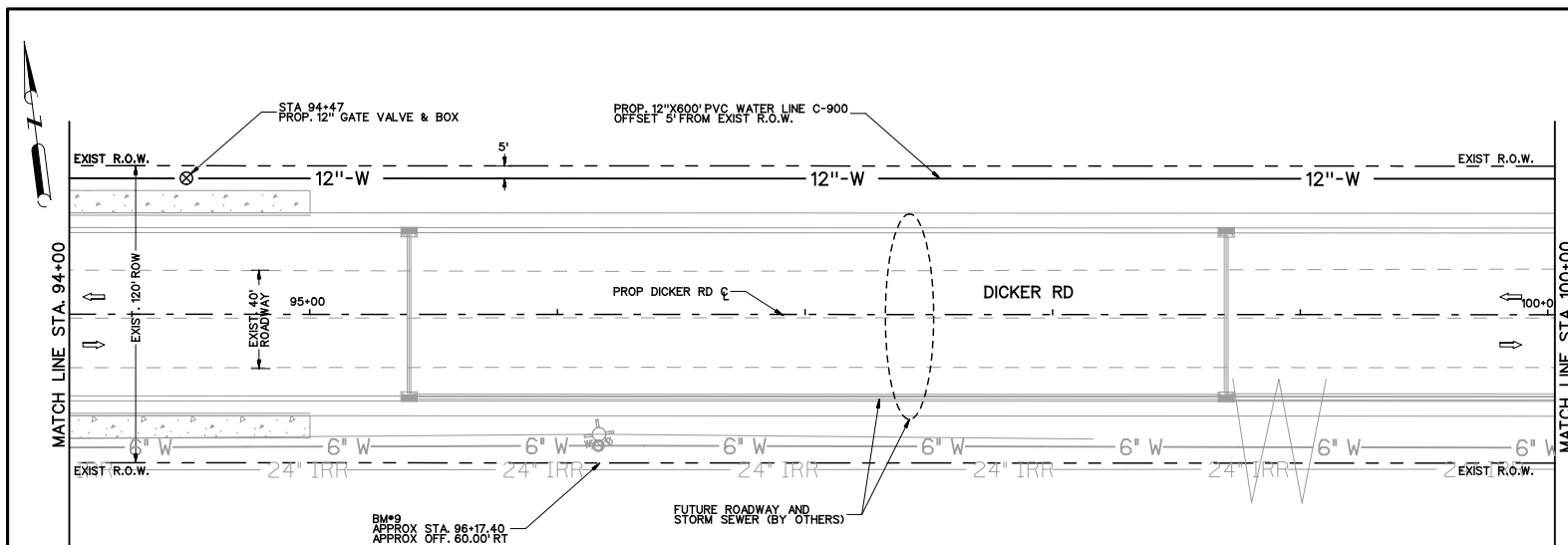
CITY OF
McALLEN

TEDSI INFRASTRUCTURE GROUP
Consulting Engineers
1201 E. Expressway 83
Mission, Texas 78572
(956) 424-7000

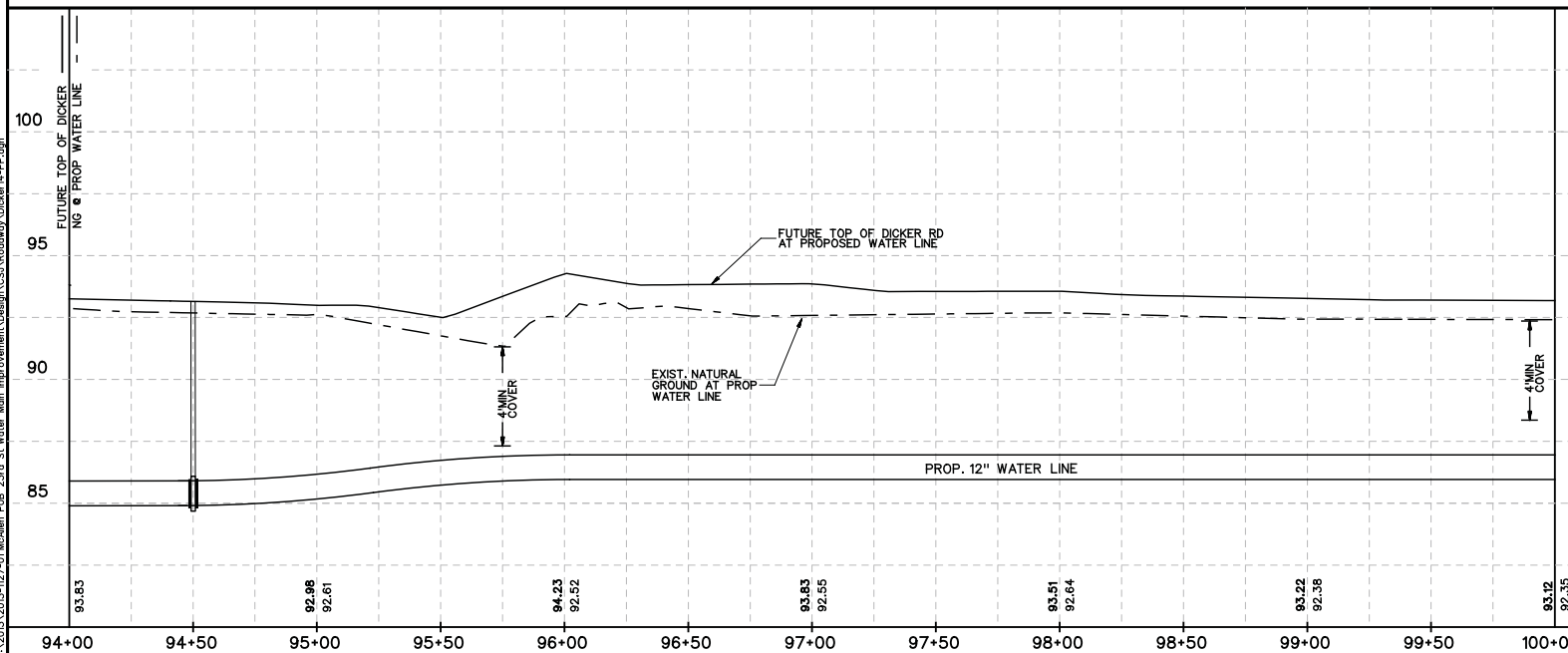
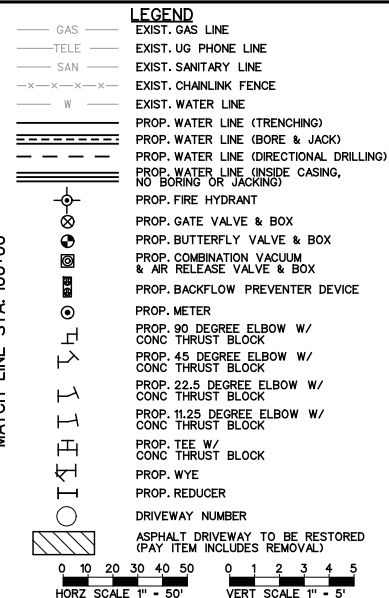
**23rd STREET/DICKER ROAD
WATER LINE PROJECT
12" LINE
PLAN & PROFILE
STA 58+00 TO STA 64+00**

SHEET 25 OF 33		
FED. RD. DIV. NO.	PROJECT NO.	SHEET NO.
STATE	DIST.	COUNTY
TEXAS	PHR	HIDALGO
CONT.	SECT.	JOB
HIGHWAY NO.		

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NOTE: STATION LOCATIONS AND OFFSETS ARE APPROXIMATE. FIELD AND SUBSURFACE CONDITIONS WILL DETERMINE FINAL LOCATIONS.



NO.	DATE	REVISION	APP.

AUTHORIZED 03-18-2015

CITY OF McALLEN

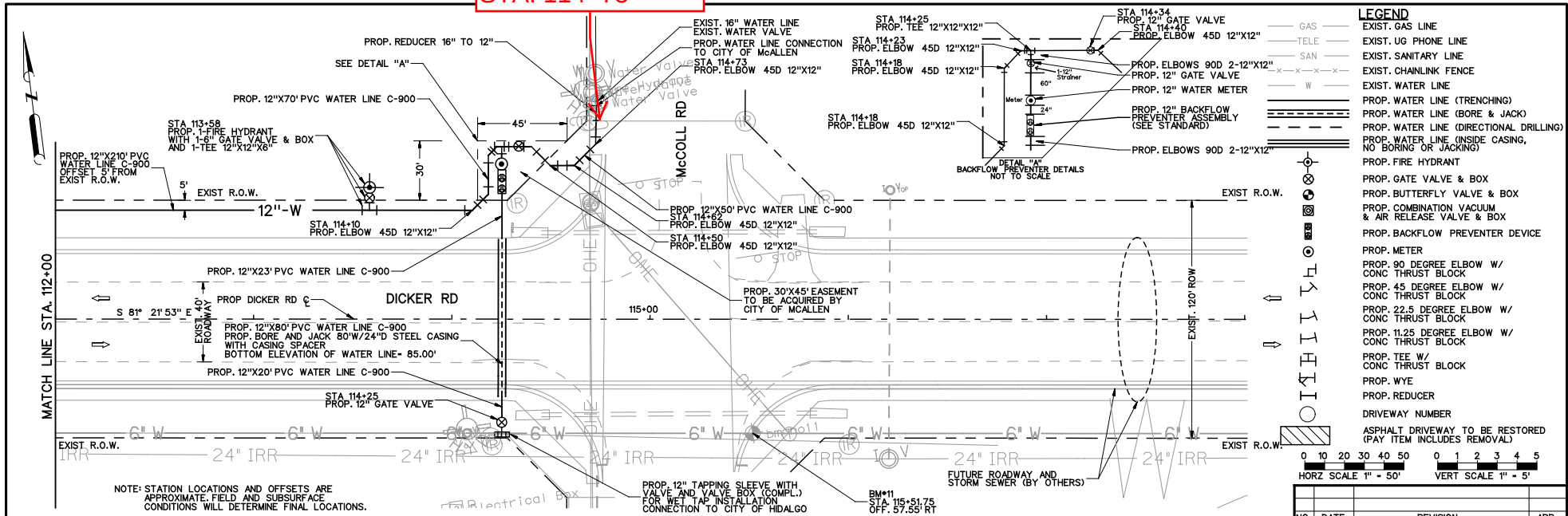
TEDSI INFRASTRUCTURE GROUP
Consulting Engineers
1201 E. Expressway 83
Mission, Texas 78572
(956) 424-7000

**23rd STREET/DICKER ROAD
WATER LINE PROJECT
12" LINE
PLAN & PROFILE
STA 94+00 TO STA 100+00**

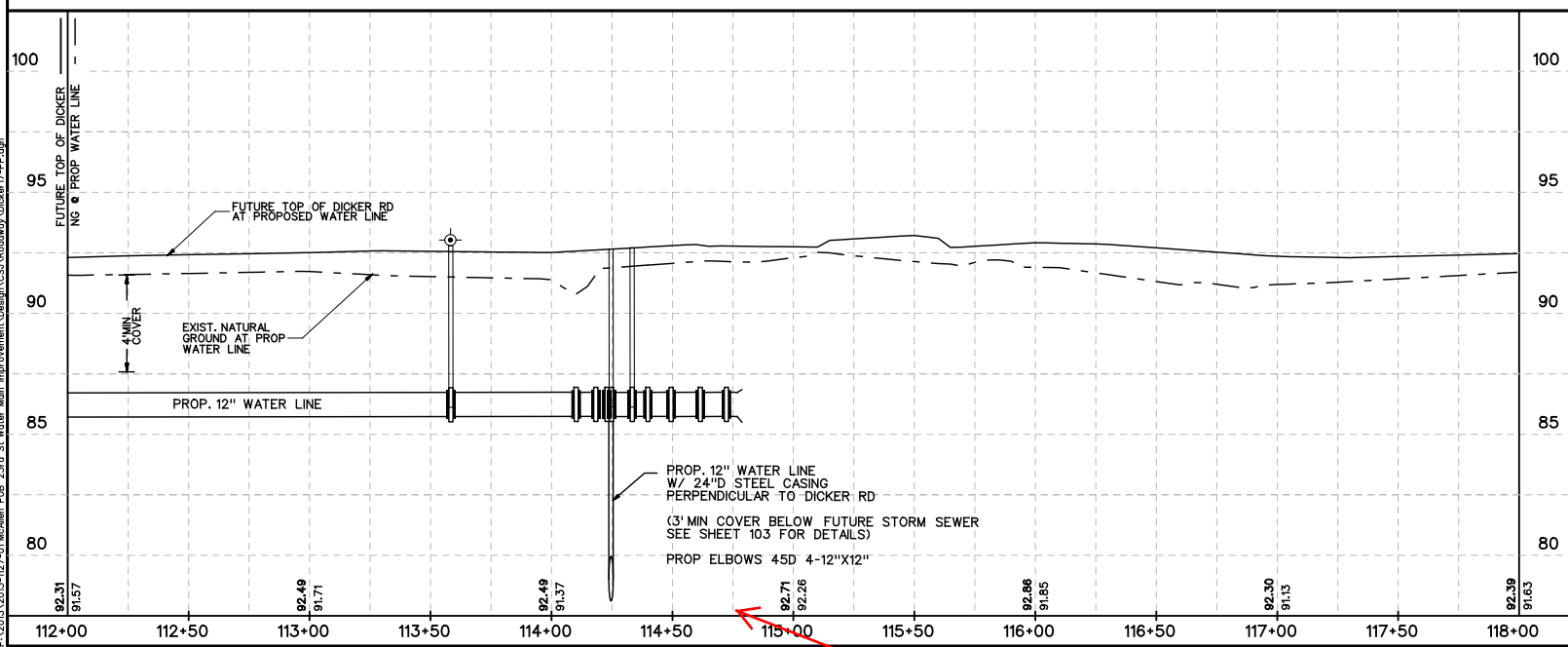
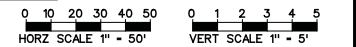
SHEET 30 OF 33

FED. RD. DIV. NO.	PROJECT NO.	SHEET NO.
6		48
STATE	DIST.	COUNTY
TEXAS	PHR	HIDALGO
CONT.	SECT.	JOB
		HIGHWAY NO.

End of Project
STA. 114+75



- LEGEND**
- EXIST. GAS LINE
 - EXIST. UG PHONE LINE
 - EXIST. SANITARY LINE
 - EXIST. CHANLINK FENCE
 - EXIST. WATER LINE
 - PROP. WATER LINE (TRENCHING)
 - PROP. WATER LINE (BORE & JACK)
 - PROP. WATER LINE (DIRECTIONAL DRILLING)
 - PROP. WATER LINE (INSIDE CASING, NO BORING OR JACKING)
 - PROP. FIRE HYDRANT
 - PROP. GATE VALVE & BOX
 - PROP. BUTTERFLY VALVE & BOX
 - PROP. COMBINATION VACUUM & AIR RELEASE VALVE & BOX
 - PROP. BACKFLOW PREVENTER DEVICE
 - PROP. METER
 - PROP. 90 DEGREE ELBOW W/ CONC THRUST BLOCK
 - PROP. 45 DEGREE ELBOW W/ CONC THRUST BLOCK
 - PROP. 22.5 DEGREE ELBOW W/ CONC THRUST BLOCK
 - PROP. 11.25 DEGREE ELBOW W/ CONC THRUST BLOCK
 - PROP. TEE W/ CONC THRUST BLOCK
 - PROP. WYE
 - PROP. REDUCER
 - DRIVEWAY NUMBER
 - ASPHALT DRIVEWAY TO BE RESTORED (PAY ITEM INCLUDES REMOVAL)



End of Project
STA. 114+75

NO.	DATE	REVISION	APP.

ERIC R. DIETRICH
94970
AUTHORIZED 03-18-2015

CITY OF McALLEN

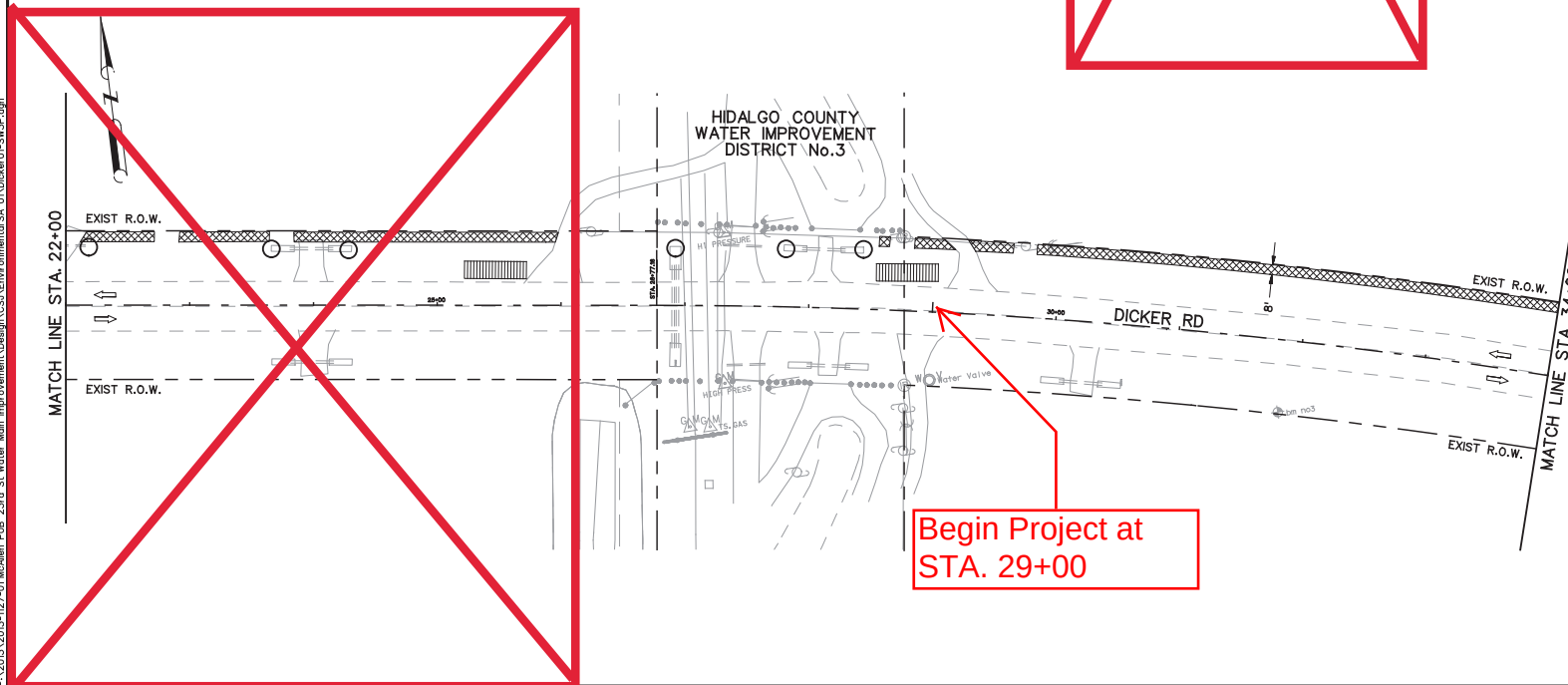
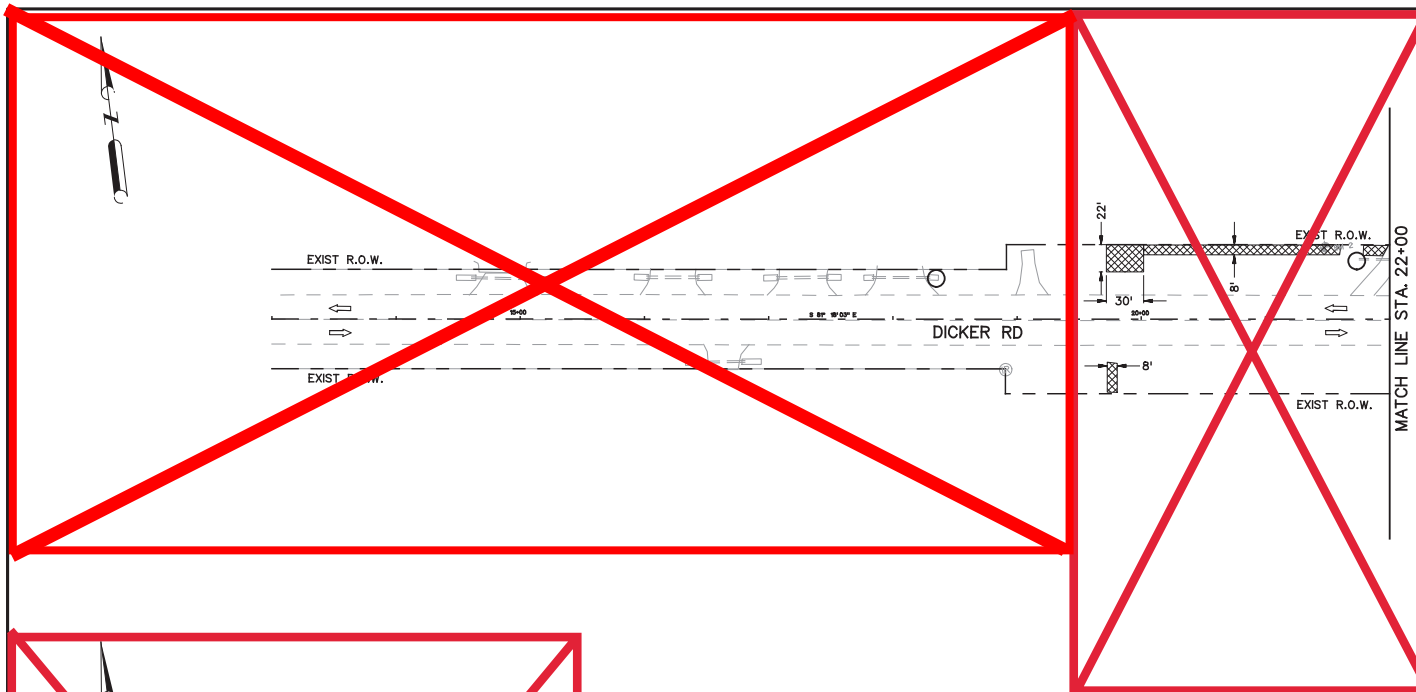
TEDSI INFRASTRUCTURE GROUP
 Consulting Engineers
 1201 E. Expressway 85
 Mission, Texas 78572
 (956) 424-7000

23rd STREET/DICKER ROAD WATER LINE PROJECT
 12" LINE
 PLAN & PROFILE
 STA 112+00 TO END PROJECT

SHEET 33 OF 33

FED. RD. DIV. NO.	PROJECT NO.	SHEET NO.
6		51
STATE	DIST.	COUNTY
TEXAS	PHR	HIDALGO
CONT.	SECT.	JOB
		HIGHWAY NO.

5/30/2018
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Begin Project at
STA. 29+00

SW3P LEGEND

- DROP INLET SEDIMENT TRAP
- TEMPORARY SEDIMENT CONTROL FENCE
- CONSTRUCTION EXIT (TY 2)
- SEEDING AREA

NOTES:

THE CONTRACTOR SHALL BE RESPONSIBLE FOR SEDIMENT TRAPS, DAMAGED/MISSING SEDIMENT TRAPS SHALL BE REPLACED BY THE CONTRACTOR AT NO ADDITIONAL COST.

CONTRACTOR TO PROVIDE A MINIMUM OF 6 CONSTRUCTION EXITS (TY 2) WHEN WORKING INSIDE HACKNEY LAKE FLOODWAY. CONSTRUCTION EXITS CAN BE RELOCATED AS NECESSARY DURING CONSTRUCTION. RELOCATION OF CONSTRUCTION EXITS WILL NOT BE PAID FOR SEPARATELY BUT WILL BE INCLUDED IN THE LUMP SUM AMOUNT FOR THE SW3P PLAN.

NO TEMPORARY SEEDING FOR THIS PROJECT.

WATERING RATES FOR PERMANENT SEED SHALL BE 3397 GAL/ACRE. PROJECT TOTAL AREA TO BE WATERED = 2.2 ACRES AFTER PROJECT IS COMPLETE, CONTRACTOR TO WATER 10 TIMES (ONCE EVERY THREE DAYS).

NO.	DATE	REVISION	APP.

AUTHORIZED 05-30-2018

CITY OF McALLEN

TEDSI INFRASTRUCTURE GROUP
Consulting Engineers
1201 E. Expressway 83
Mission, Texas 78572
(956) 424-7000

**23rd STREET/DICKER ROAD
WATER LINE PROJECT
SW3P LAYOUT
STA 13+00 TO STA 34+00**

HORZ SCALE
1" = 100'

FED. RD. DIV. NO. 6

STATE TEXAS

CONT.

PROJECT NO.

DIST. PHR

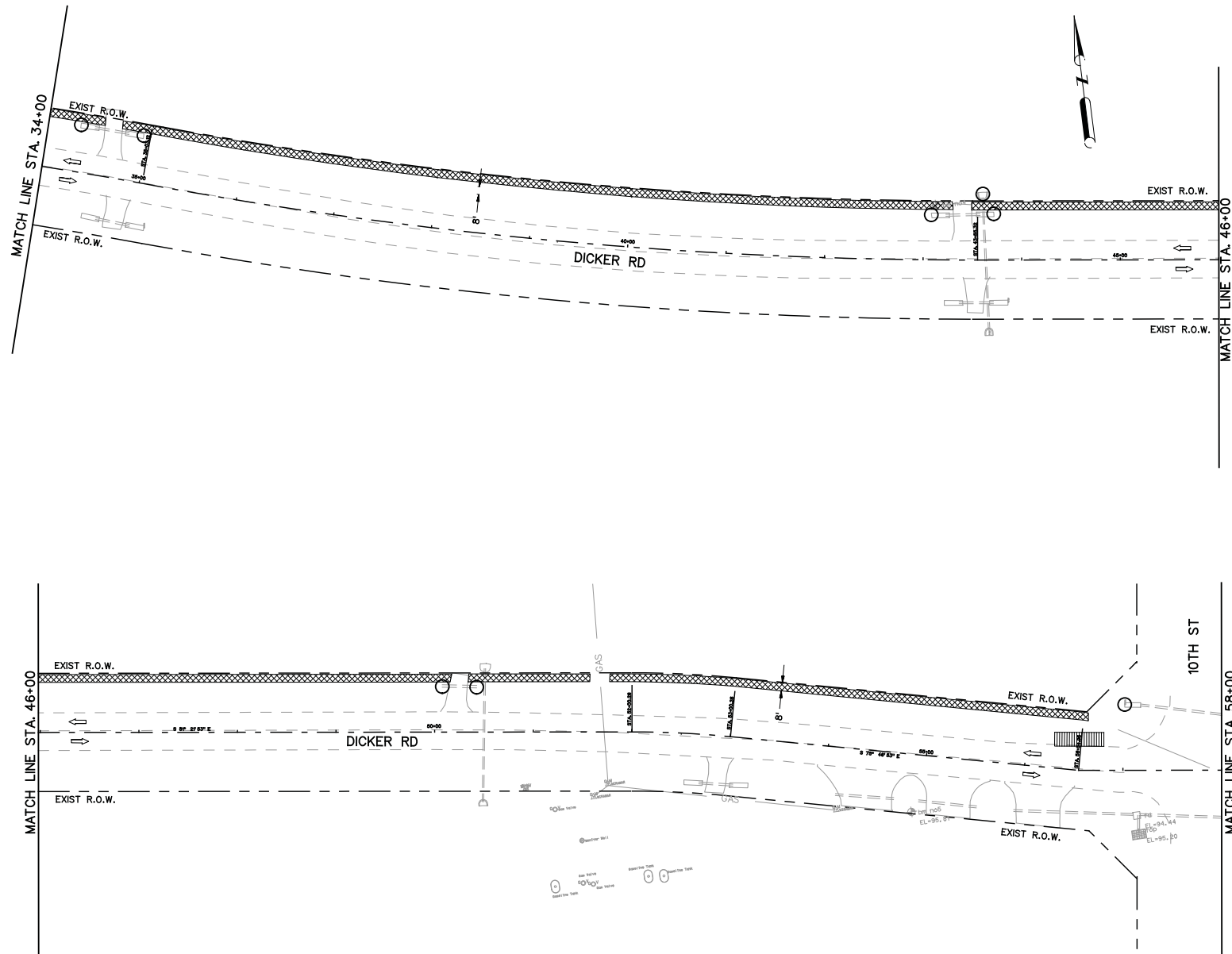
SECT. JOB

SHEET NO. 55

COUNTY HIDALGO

HIGHWAY NO.

3/18/2015
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SW3P LEGEND

- DROP INLET SEDIMENT TRAP
- TEMPORARY SEDIMENT CONTROL FENCE
- CONSTRUCTION EXIT (TY 2)
- SEEDING AREA

NOTES:

THE CONTRACTOR SHALL BE RESPONSIBLE FOR SEDIMENT TRAPS, DAMAGED/MISSING SEDIMENT TRAPS SHALL BE REPLACED BY THE CONTRACTOR AT NO ADDITIONAL COST.

CONTRACTOR TO PROVIDE A MINIMUM OF 6 CONSTRUCTION EXITS (TY 2) WHEN WORKING INSIDE HACKNEY LAKE FLOODWAY. CONSTRUCTION EXITS CAN BE RELOCATED AS NECESSARY DURING CONSTRUCTION. RELOCATION OF CONSTRUCTION EXITS WILL NOT BE PAID FOR SEPARATELY BUT WILL BE INCLUDED IN THE LUMP SUM AMOUNT FOR THE SW3P PLAN.

NO TEMPORARY SEEDING FOR THIS PROJECT.

WATERING RATES FOR PERMANENT SEED SHALL BE 3397 GAL/ACRE. PROJECT TOTAL AREA TO BE WATERED = 2.2 ACRES. AFTER PROJECT IS COMPLETE, CONTRACTOR TO WATER 10 TIMES (ONCE EVERY THREE DAYS).

NO.	DATE	REVISION	APP.

Eric R. Dietrich
AUTHORIZED 03-18-2015

CITY OF McALLEN

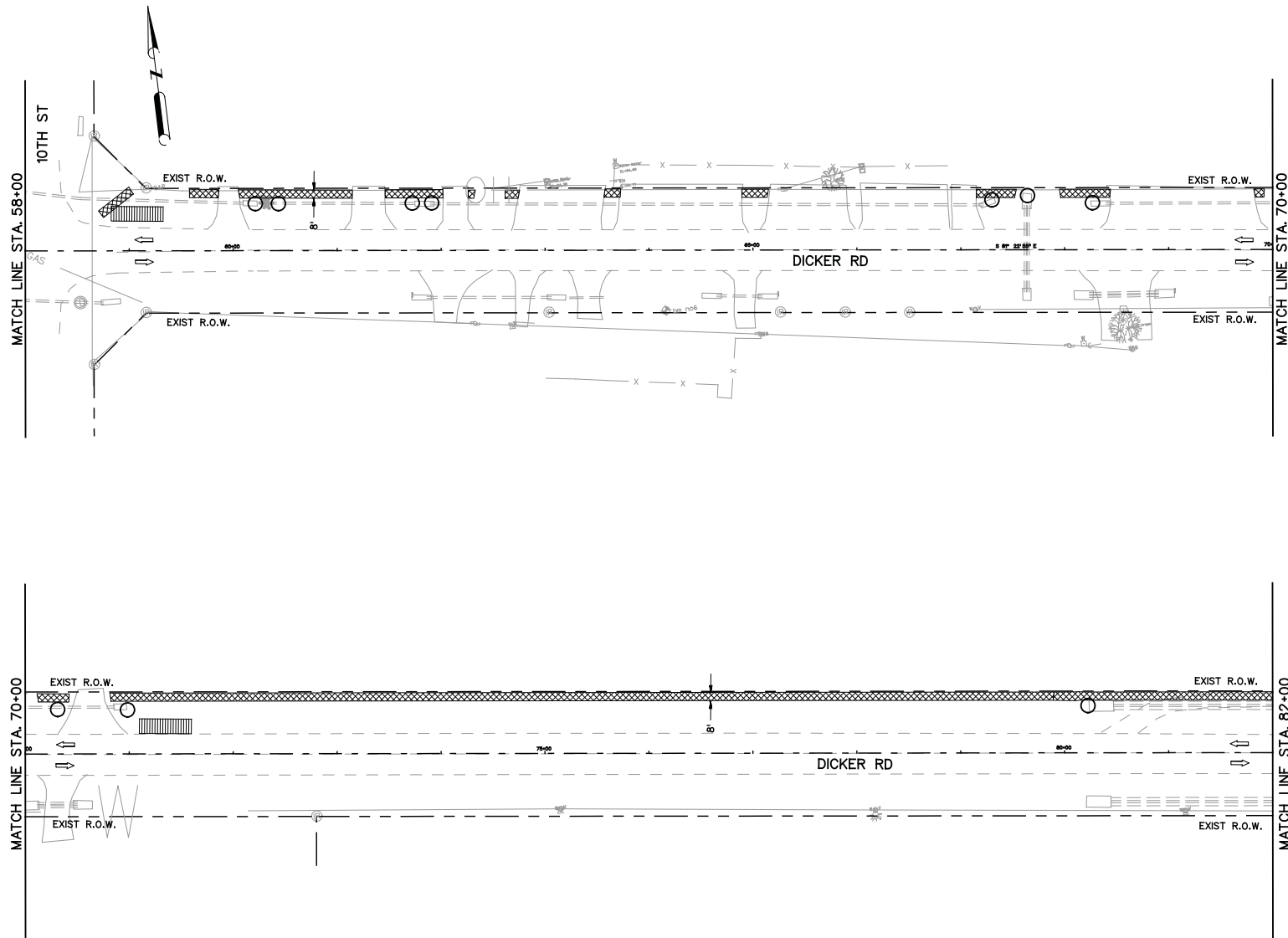
TEDSI INFRASTRUCTURE GROUP
Consulting Engineers
1201 E. Expressway 83
Mission, Texas 78572
(956) 424-7000

**23rd STREET/DICKER ROAD
WATER LINE PROJECT
SW3P LAYOUT
STA 34+00 TO STA 58+00**

HORZ SCALE 1" = 100' SHEET 5 OF 8

FED. RD. DIV. NO.	PROJECT NO.	SHEET NO.
6		56
STATE	DIST.	COUNTY
TEXAS	PHR	HIDALGO
CONT.	SECT.	JOB
		HIGHWAY NO.

3/18/2015
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SW3P LEGEND

- DROP INLET SEDIMENT TRAP
- xx—xx TEMPORARY SEDIMENT CONTROL FENCE
- ▨ CONSTRUCTION EXIT (TY 2)
- ▩ SEEDING AREA

NOTES:

THE CONTRACTOR SHALL BE RESPONSIBLE FOR SEDIMENT TRAPS. DAMAGED/MISSING SEDIMENT TRAPS SHALL BE REPLACED BY THE CONTRACTOR AT NO ADDITIONAL COST.

CONTRACTOR TO PROVIDE A MINIMUM OF 6 CONSTRUCTION EXITS (TY 2) WHEN WORKING INSIDE HACKNEY LAKE FLOODWAY. CONSTRUCTION EXITS CAN BE RELOCATED AS NECESSARY DURING CONSTRUCTION. RELOCATION OF CONSTRUCTION EXITS WILL NOT BE PAID FOR SEPARATELY BUT WILL BE INCLUDED IN THE LUMP SUM AMOUNT FOR THE SW3P PLAN.

NO TEMPORARY SEEDING FOR THIS PROJECT.

WATERING RATES FOR PERMANENT SEED SHALL BE 3397 GAL/ACRE. PROJECT TOTAL AREA TO BE WATERED = 2.2 ACRES. AFTER PROJECT IS COMPLETE, CONTRACTOR TO WATER 10 TIMES (ONCE EVERY THREE DAYS).

NO.	DATE	REVISION	APP.

Eric R. Dietrich

AUTHORIZED 03-18-2015

CITY OF McALLEN

TEDSI INFRASTRUCTURE GROUP
Consulting Engineers
1201 E. Expressway 83
Mission, Texas 78572
(956) 424-7000

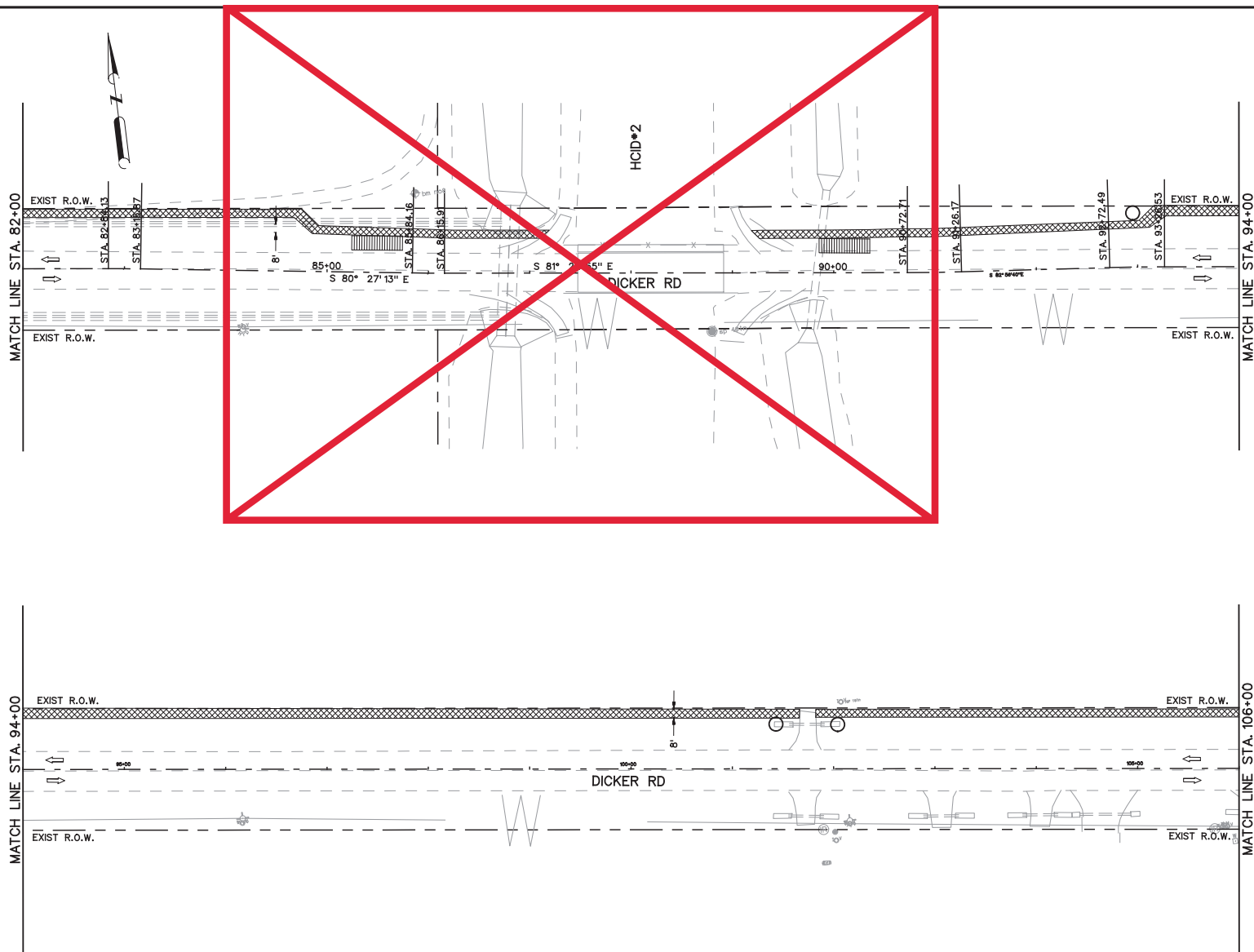
**23rd STREET/DICKER ROAD
WATER LINE PROJECT
SW3P LAYOUT
STA 58+00 TO STA 82+00**

HORIZ SCALE 1" = 100'

SHEET 6 OF 8

FED. RD. DIV. NO.	PROJECT NO.	SHEET NO.
6		57
STATE	DIST.	COUNTY
TEXAS	PHR	HIDALGO
CONT.	SECT.	JOB
		HIGHWAY NO.

3/18/2015
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SW3P LEGEND

- DROP INLET SEDIMENT TRAP
- XX—XX TEMPORARY SEDIMENT CONTROL FENCE
- ▨ CONSTRUCTION EXIT (TY 2)
- ▩ SEEDING AREA

NOTES:

THE CONTRACTOR SHALL BE RESPONSIBLE FOR SEDIMENT TRAPS, DAMAGED/MISSING SEDIMENT TRAPS SHALL BE REPLACED BY THE CONTRACTOR AT NO ADDITIONAL COST.

CONTRACTOR TO PROVIDE A MINIMUM OF 6 CONSTRUCTION EXITS (TY 2) WHEN WORKING INSIDE HACKNEY LAKE FLOODWAY. CONSTRUCTION EXITS CAN BE RELOCATED AS NECESSARY DURING CONSTRUCTION. RELOCATION OF CONSTRUCTION EXITS WILL NOT BE PAID FOR SEPARATELY BUT WILL BE INCLUDED IN THE LUMP SUM AMOUNT FOR THE SW3P PLAN.

NO TEMPORARY SEEDING FOR THIS PROJECT.

WATERING RATES FOR PERMANENT SEED SHALL BE 3397 GAL/ACRE. PROJECT TOTAL AREA TO BE WATERED = 2.2 ACRES AFTER PROJECT IS COMPLETE, CONTRACTOR TO WATER 10 TIMES (ONCE EVERY THREE DAYS).

NO.	DATE	REVISION	APP.



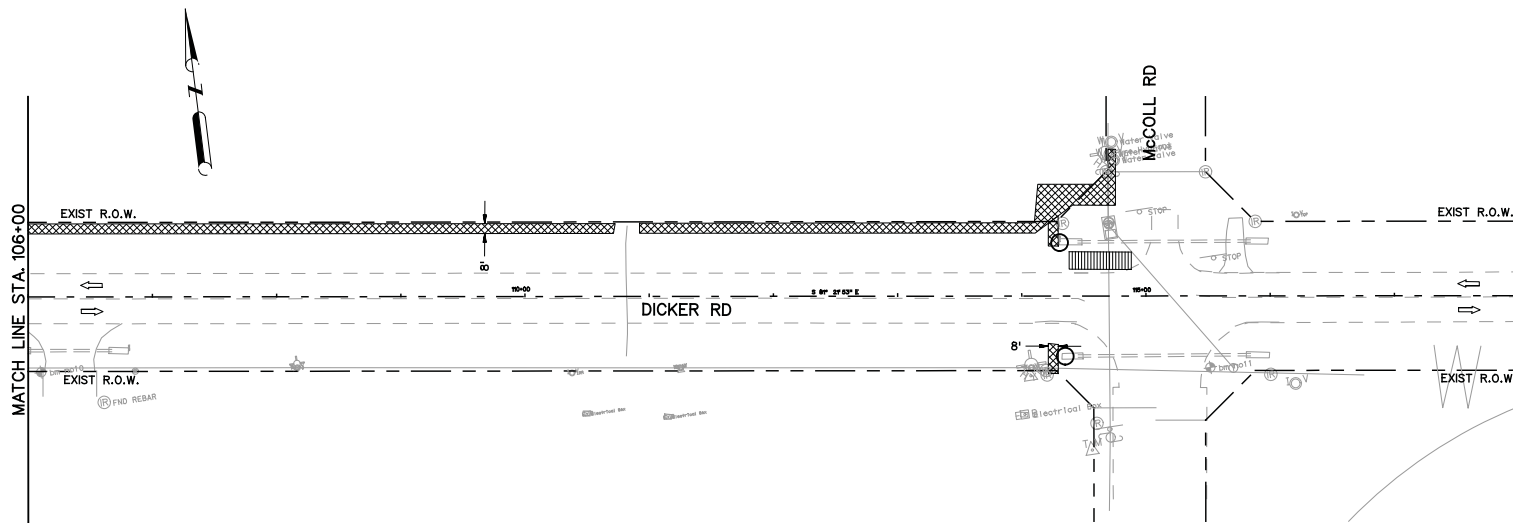
AUTHORIZED 03-18-2015

CITY OF McALLEN

TEDSI INFRASTRUCTURE GROUP
Consulting Engineers
1201 E. Expressway 83
Mission, Texas 78572
(956) 424-7000

**23rd STREET/DICKER ROAD
WATER LINE PROJECT
SW3P LAYOUT
STA 82+00 TO STA 106+00**

HORZ. SCALE 1" = 100'		0 20 40 60 80 100		SHEET 7 OF 8	
FED. RD. DIV. NO.	PROJECT NO.				SHEET NO.
6					58
STATE	DIST.	COUNTY			
TEXAS	PHR	HIDALGO			
CONT.	SECT.	JOB	HIGHWAY NO.		



SW3P LEGEND

- DROP INLET SEDIMENT TRAP
- TEMPORARY SEDIMENT CONTROL FENCE
- CONSTRUCTION EXIT (TY 2)
- SEEDING AREA

NOTES:

THE CONTRACTOR SHALL BE RESPONSIBLE FOR SEDIMENT TRAPS. DAMAGED/MISSING SEDIMENT TRAPS SHALL BE REPLACED BY THE CONTRACTOR AT NO ADDITIONAL COST.

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NO.	DATE	REVISION	APP.

Eric R. Dietrich

AUTHORIZED 03-18-2015

CITY OF McALLEN

TEDSI INFRASTRUCTURE GROUP
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**23rd STREET/DICKER ROAD
WATER LINE PROJECT
SW3P LAYOUT
STA 106+00 TO END PROJECT**

HORIZ SCALE 1" = 100'

SHEET 8 OF 8

FED. RD. DIV. NO.	PROJECT NO.	SHEET NO.
6		59
STATE	DIST.	COUNTY
TEXAS	PHR	HIDALGO
CONT.	SECT.	JOB
		HIGHWAY NO.

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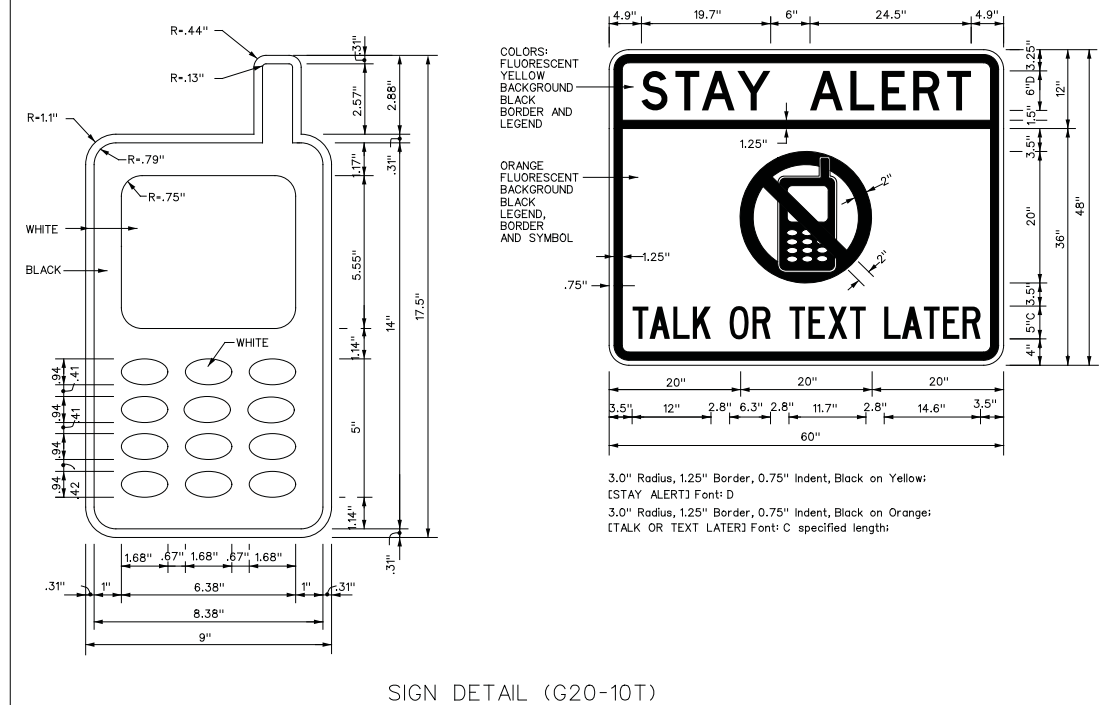
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BARRICADE AND CONSTRUCTION (BC) STANDARD SHEETS GENERAL NOTES:

- 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).
- The development and design of the Traffic Control Plan (TCP) is the responsibility of the Engineer.
- 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.
- 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.
- 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.
- 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.
- 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.
- 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.
- 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.
- 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.
- 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.
- The Engineer has the final decision on the location of all traffic control devices.
- 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:

- 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.



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

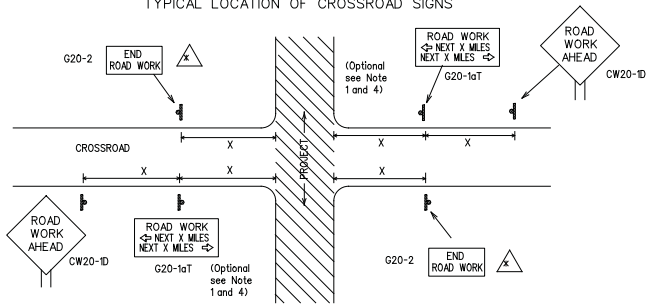
SHEET 1 OF 12

		Traffic Operations Division Standard	
BARRICADE AND CONSTRUCTION GENERAL NOTES AND REQUIREMENTS			
BC(1)-14			
FILE: bc-14.dgn	DATE: November 2002	DATE: November 2002	DATE: November 2002
© TxDOT	REVISIONS	CONT	SECT
4-03	5-10	8-14	
9-07	7-13		
DIST	COUNTY	SHEET NO.	
PHR	HIDALGO	60	

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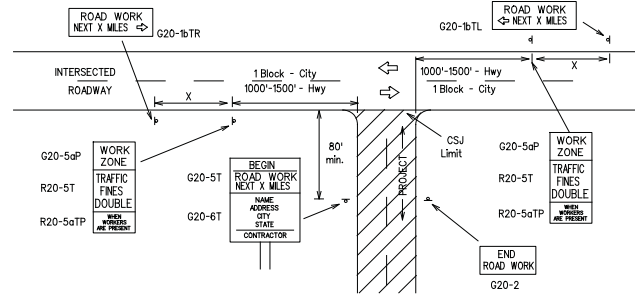
TYPICAL LOCATION OF CROSSROAD SIGNS



May be mounted on back of "ROAD WORK AHEAD" (CW20-1D) sign with approval of Engineer. (See note 2 below)

- 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.
- 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.
- 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.
- The "ROAD WORK NEXT X MILES" (G20-1T) 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.
- Additional traffic control devices may be shown elsewhere in the plans for higher volume crossroads.
- 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.

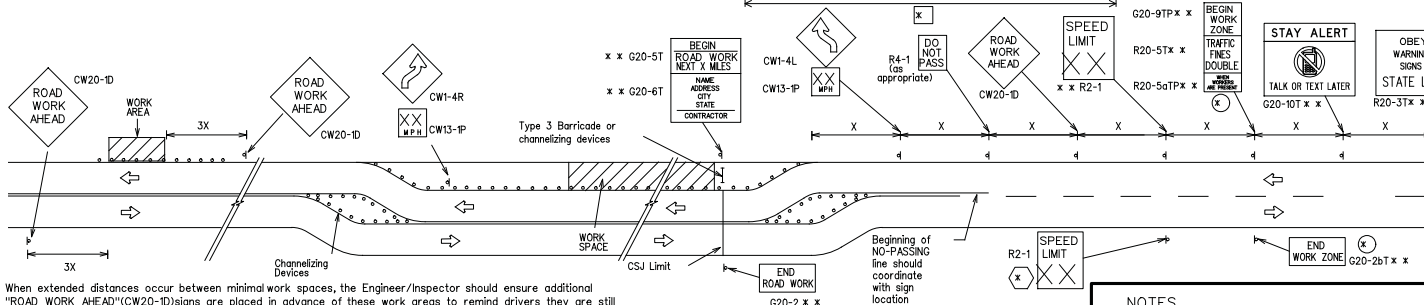
T-INTERSECTION



CSJ LIMITS AT T-INTERSECTION

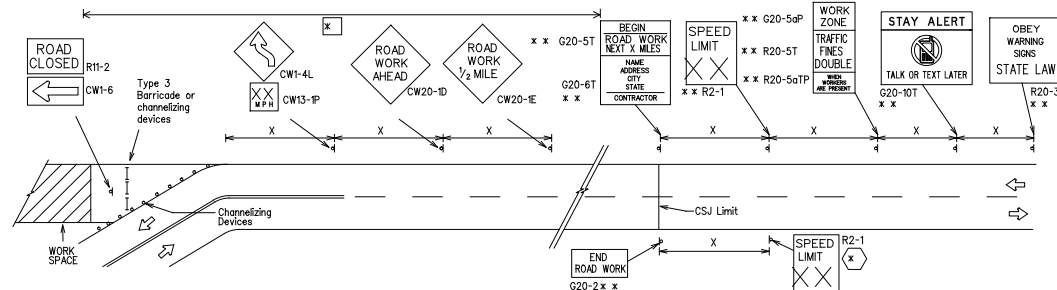
- The Engineer will determine the types and location of any additional traffic control devices, such as a flagger and accompanying signs, or other signs, that should be used when work is being performed at or near an intersection.
- If construction closes the road at a T-intersection the Contractor shall 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.

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 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.

TYPICAL CONSTRUCTION WARNING SIGN SIZE AND SPACING

Sign Number or Series	SIZE		SPACING	
	Conventional Road	Expressway/Freeway	Posted Speed MPH	Sign Spacing "X" Feet (Approx.)
CW20 ⁴	48" x 48"	48" x 48"	30	120
CW21			35	160
CW22			40	240
CW23			45	320
CW25	36" x 36"	48" x 48"	50	400
CW1, CW2, CW7, CW8, CW9, CW11, CW14			55	500 ²
			60	600 ²
			65	700 ²
CW3, CW4, CW5, CW6, CW8-3, CW10, CW12	48" x 48"	48" x 48"	70	800 ²
			75	900 ²
			80	1000 ²
			*	*

* 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

- Special or larger size signs may be used as necessary.
- Distance between signs should be increased as required to have 1500 feet advance warning.
- Distance between signs should be increased as required to have 1/2 mile or more advance warning.
- 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".
- Only diamond shaped warning sign sizes are indicated.
- 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.

LEGEND

—	Type 3 Barricade
○ ○ ○	Channelizing Devices
—	Sign
X	See Typical Construction Warning Sign Size and Spacing chart or the TMUTCD for sign spacing requirements.

SHEET 2 OF 12



BARRICADE AND CONSTRUCTION PROJECT LIMIT

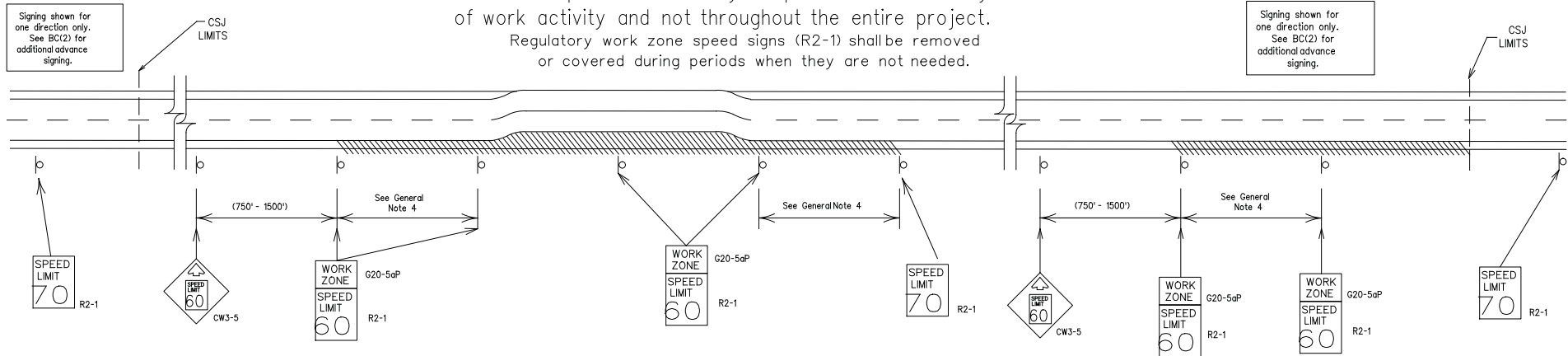
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TYPICAL APPLICATION OF WORK ZONE SPEED LIMIT SIGNS

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:

- rough road or damaged pavement surface
- substantial alteration of roadway geometrics (diversions)
- construction detours
- grade
- width
- 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

- Regulatory work zone speed limits should be used only for sections of construction projects where speed controls of major importance.
- Regulatory work zone speed limit signs shall be placed on supports at a 7 foot minimum mounting height.
- Speed zone signs are illustrated for one direction of travel and are normally posted for each direction of travel.
- 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
- Regulatory speed limit signs shall have black legend and border on a white reflective background (See "Reflective Sheeting" on BC(4)).
- 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.
- Turning signs from view, laying signs over or down will not be allowed, unless as otherwise noted under "REMOVING OR COVERING" on BC(4).
- Techniques that may help reduce traffic speeds include but are not limited to:
 - Law enforcement.
 - Flagger stationed next to sign.
 - Portable changeable message sign (PCMS).
 - Low-power (drone) radar transmitter.
 - Speed monitor trailers or signs.
- Speeds shown on details above are for illustration only. Work Zone Speed Limits should only be posted as approved for each project.
- 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.

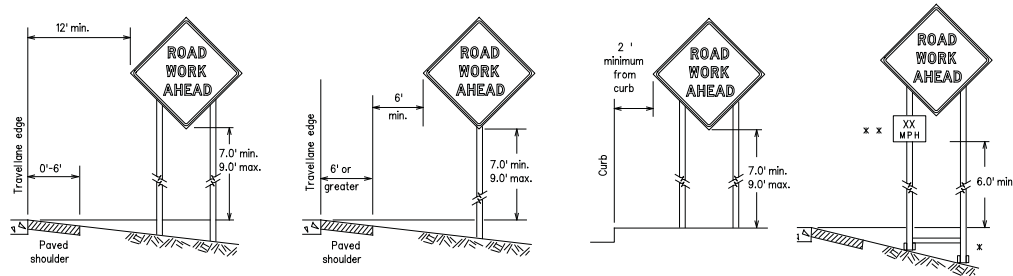
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		Traffic Operations Division Standard	
BARRICADE AND CONSTRUCTION WORK ZONE SPEED LIMIT			
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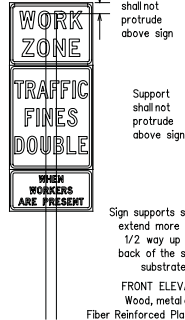
TYPICAL MINIMUM CLEARANCES FOR LONG TERM AND INTERMEDIATE TERM SIGNS



x When placing skid supports on uneven 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.

x x 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



Sign supports shall extend more than 1/2 way up the back of the sign substrate.

FRONT ELEVATION
Wood, metal or
Fiber Reinforced Plastic

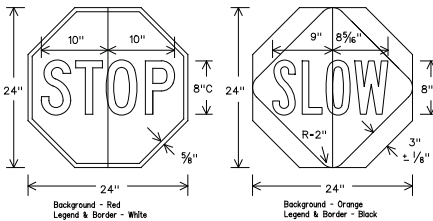
Splicing embedded perforated square metal tubing in order to extend post height will only be allowed when the splice is made using four bolts, two above and two below the splice point. Splice must be located entirely behind the sign substrate, not near the base of the support. Splice insert lengths should be at least 5 times nominal post size, centered on the splice and of at least the same gauge material.

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.

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 pointed 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 Design 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 required.
 - 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 or Type R, 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 milblack 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

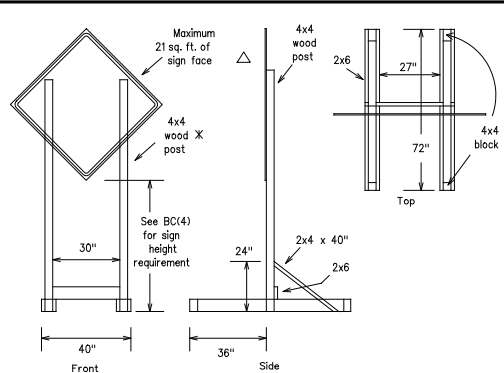
1. Flags may be used to draw attention to warning signs. When used the flag shall be 16 inches square or larger and shall be orange or fluorescent red-orange in color. Flags shall not be allowed to cover any portion of the sign face.

SHEET 4 OF 12

		Traffic Operations Division Standard	
BARRICADE AND CONSTRUCTION TEMPORARY SIGN NOTES			
BC(4)-14			
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REVISED	November 2002	CONT	SECT
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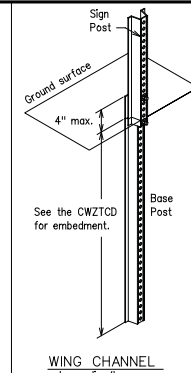
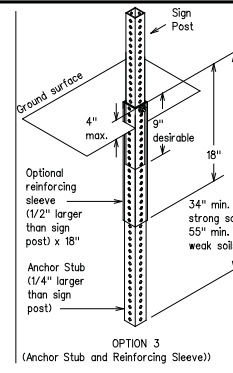
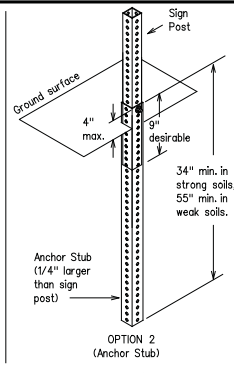
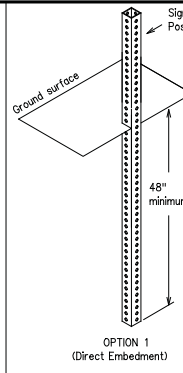
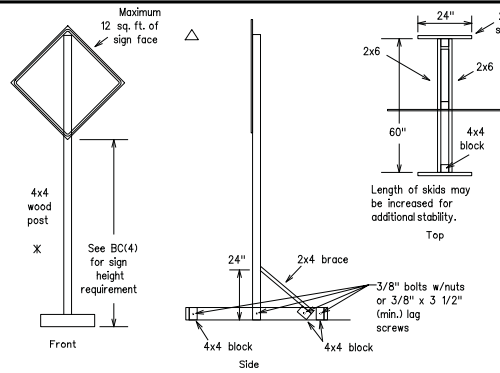
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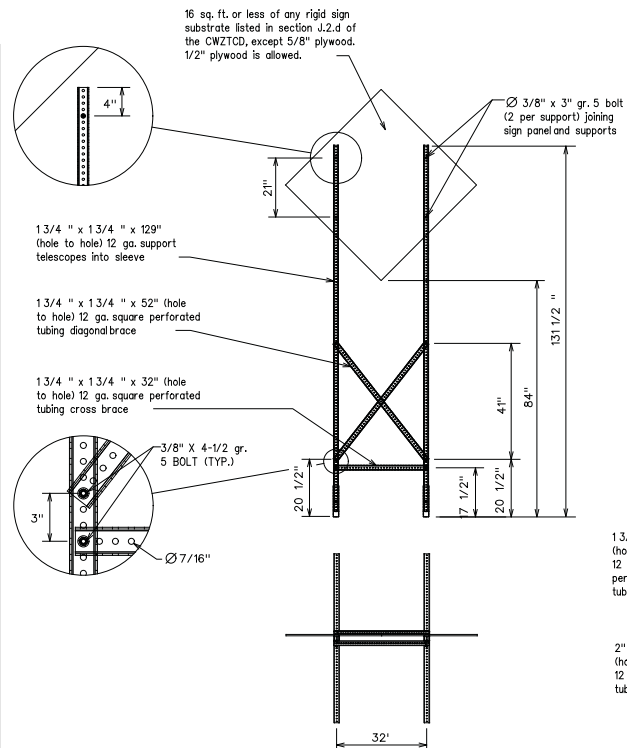
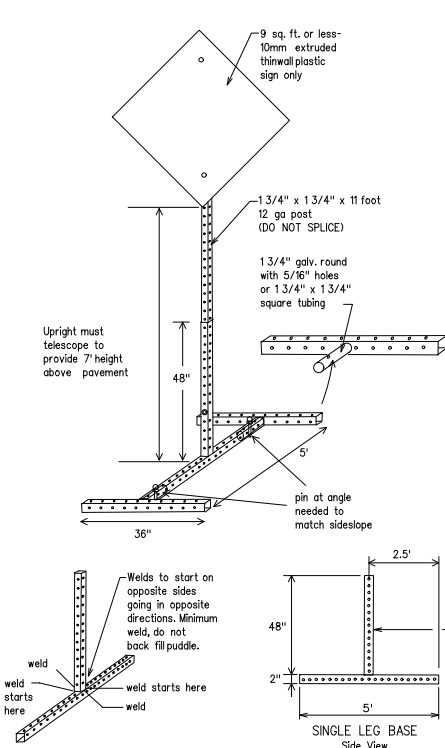
SKID MOUNTED WOOD SIGN SUPPORTS

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



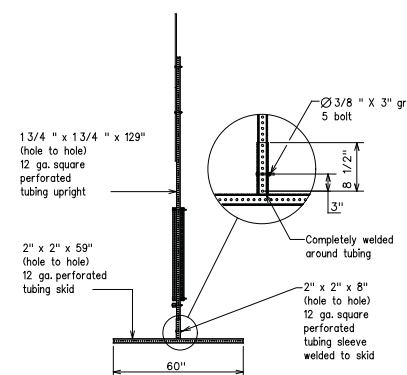
GROUND MOUNTED SIGN SUPPORTS

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.



WOOD POST SYSTEM FOR GROUND MOUNTED SIGN SUPPORTS

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



WEDGE ANCHORS

Both steel and plastic Wedge Anchor Systems as shown on the SMD Standard Sheets may be used as temporary sign supports for signs up to 10 square feet of sign face. They may be set in concrete or in sturdy soils if approved by the Engineer. (See web address for "Traffic Engineering Standard Sheets" on BC(1)).

OTHER DESIGNS

MORE DETAILS OF APPROVED LONG/INTERMEDIATE AND SHORT TERM SUPPORTS CAN BE FOUND ON THE CWZTCD LIST. SEE BC(1) FOR WEBSITE LOCATION.

GENERAL NOTES

1. Nails may be used in the assembly of wooden sign supports, but 3/8" bolts with nuts or 3/8" x 3 1/2" lag screws must be used on every joint for final connection.
2. No more than 2 sign posts shall be placed within a 7 ft. circle, except for specific materials noted on the CWZTCD List.
3. When project is completed, all sign supports and foundations shall be removed from the project site. This will be considered subsidiary to Item 502.

- ☐ See BC(4) for definition of "Work Duration."
- ☒ Wood sign posts MUST be one piece. Splicing will NOT be allowed. Posts shall be painted white.
- ☐ See the CWZTCD for the type of sign substrate that can be used for each approved sign support.

SHEET 5 OF 12



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 phrase, 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 (H, 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 TMTCD.
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	WORD OR PHRASE	ABBREVIATION
Access Road	ACCS RD	Major	MAJ
Alternate	ALT	Miles	MI
Avenue	AVE	Miles Per Hour	MPH
Best Route	BEST RTE	Minor	MNR
Boulevard	BLVD	Monday	MON
Bridge	BRDG	Normal	NORM
Cannot	CANT	North	N
Center	CTR	Northbound	(route) N
Construction Ahead	CONST AHD	Parking	PKING
CROSSING	XING	Road	RD
Detour Route	DETOUR RTE	Right Lane	RT LN
Do Not	DONT	Saturday	SAT
East	E	Service Road	SERV RD
Eastbound	(route) E	Shoulder	SHLDR
Emergency	EMER	Slippery	SLIP
Emergency Vehicle	EMER VEH	South	S
Entrance, Enter	ENT	Southbound	(route) S
Express Lane	EXP LN	Speed	SPD
Expressway	EXPWY	Street	ST
XXXX Feet	XXXX FT	Sunday	SUN
Fog Ahead	FG AHD	Telephone	PHONE
Freeway	FRWY, FWY	Temporary	TEMP
Freeway Blocked	FWY BLKD	Thursday	THURS
Friday	FRI	To Downtown	TO DWN TN
Hazardous Driving	HAZ DRIVING	Traffic	TRAF
Hazardous Material	HAZMAT	Travelers	TRVLRS
High Occupancy	HOV	Tuesday	TUES
Vehicle	HWY	Time Minutes	TIME MIN
Hour(s)	HR, HRS	UPPER Level	UPPER LEVEL
Information	INFO	Vehicles (a)	VEH, VEHs
It Is	ITS	Warning	WARN
Junction	JCT	Wednesday	WED
Left	LFT	Weight Limit	WT LIMIT
Left Lane	LFT LN	West	W
Lane Closed	LN CLOSED	Westbound	(route) W
Lower Level	LWR LEVEL	Wet Pavement	WET PVMT
Maintenance	MAINT	Will Not	WONT

Roadway designation * H=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
ROAD CLOSED AT SH XXX

FRONTAGE ROAD CLOSED
SHOULDER CLOSED XXX FT

ROAD CLSD AT FM XXXX
RIGHT X LANES CLOSED

RIGHT LN CLOSED XXX FT
RIGHT X LANES OPEN

CENTER LANE CLOSED
NIGHT LANE CLOSURES

DAYTIME LANE CLOSURES
I-XX SOUTH EXIT CLOSED

VARIOUS LANES CLOSED
EXIT XXX CLOSED X MILE

RIGHT LN TO BE CLOSED
X LANES CLOSED TUE - FRI

MALL DRIVEWAY CLOSED
XXXXXXX BLVD CLOSED

Other Condition List

ROADWORK XXX FT
FLAGGER XXXX FT

RIGHT LN NARROWS XXXX FT
MERGING TRAFFIC XXXX FT

LOOSE GRAVEL XXXX FT
DETOUR X MILE

ROADWORK PAST SH XXXX
BUMP XXXX FT

TRAFFIC SIGNAL XXXX FT
LANES SHIFT

ROAD REPAIRS XXXX FT
LANE NARROWS XXXX FT

TWO-WAY TRAFFIC XX MILE
CONST TRAFFIC XXX FT

UNEVEN LANES XXXX FT
ROUGH ROAD XXXX FT

ROADWORK NEXT FRI-SUN
US XXX EXIT X MILES

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
DETOUR NEXT X EXITS

USE EXIT XXX
STAY ON US XXX SOUTH

TRUCKS USE US XXX N
WATCH FOR TRUCKS

EXPECT DELAYS
REDUCE SPEED XXX FT

USE OTHER ROUTES
STAY IN LANE

FORM X LINES RIGHT
USE XXXXX RD EXIT

USE EXIT I-XX NORTH
USE I-XX E TO I-XX N

WATCH FOR TRUCKS
EXPECT DELAYS

PREPARE TO STOP
END SHOULDER USE

WATCH FOR WORKERS

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 MONDAY

MAY X-X XX PM - XX AM
NEXT FRI-SUN

XX AM TO XX PM
NEXT TUE AUG XX

TONIGHT XX PM- XX AM

* * 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.

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.

WORDING ALTERNATIVES

1. The words RIGHT, LEFT and ALL can be interchanged as appropriate.
2. Roadway designations H, 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.

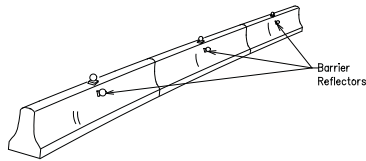
SHEET 6 OF 12

 Texas Department of Transportation		Traffic Operations Division Standard	
BARRICADE AND CONSTRUCTION PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)			
BC(6)-14			
FILE: bc-14.dgn	DWG: TxDOT	CHK: TxDOT	DWG: TxDOT
© TxDOT November 2002	CONT: SECT	JOB: HIGHWAY	
REVISIONS			
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7-13			

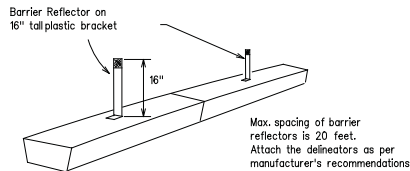
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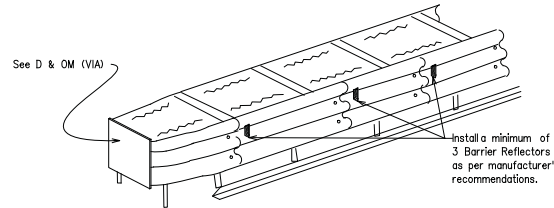
- Barrier Reflectors shall be pre-qualified, and conform to the color and reflectivity requirements of DMS-8600. A list of prequalified Barrier Reflectors can be found at the Material Producer List web address shown on BC(7).
- Color of Barrier Reflectors shall be as specified in the TMUTCD. The cost of the reflectors shall be considered subsidiary to item 512.



CONCRETE TRAFFIC BARRIER (CTB)



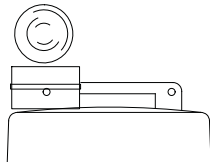
LOW PROFILE CONCRETE BARRIER (LPCB)



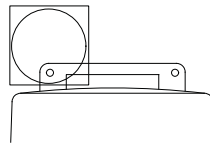
DELINEATION OF END TREATMENTS

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.



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

- Warning lights shall meet the requirements of the TMUTCD.
- Warning lights shall NOT be installed on barricades.
- 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 or C sheeting meeting the requirements of Departmental Material Specification DMS-8300.
- 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".
- The Engineer/Inspector or the plans shall specify the location and type of warning lights to be installed on the traffic control devices.
- 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.
- 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.
- The location of warning lights and warning reflectors on drums shall be as shown elsewhere in the plans.

WARNING LIGHTS MOUNTED ON PLASTIC DRUMS

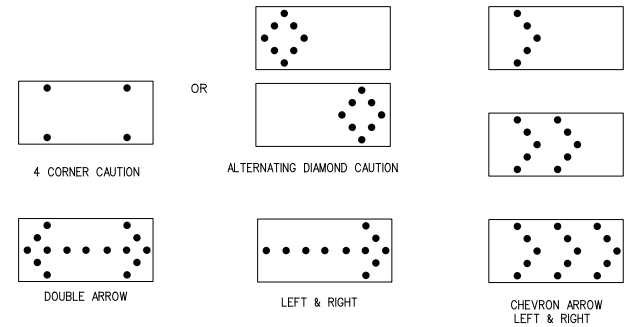
- Type A flashing warning lights are intended to warn drivers that they are approaching or are in a potentially hazardous area.
- Type A random flashing warning lights are not intended for delineation and shall not be used in a series.
- A series of sequential flashing warning lights placed on channelizing 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.
- 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.
- Type A, Type C and Type D warning lights shall be installed at locations as detailed on other sheets in the plans.
- Warning lights shall not be installed on a drum that has a sign, chevron or vertical panel.
- 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

- 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.
- 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.
- The warning reflector shall have a minimum retroreflective surface area (one-side) of 30 square inches.
- Round reflectors shall be fully reflectorized, including the area where attached to the drum.
- 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.
- 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.
- When used near two-way traffic, both sides of the warning reflector shall be reflectorized.
- The warning reflector should be mounted on the side of the handle nearest approaching traffic.
- 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.

- 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.
- 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.
- 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.
- The Flashing Arrow Board should be able to display the following symbols:



- The "CAUTION" display consists of four corner lamps flashing simultaneously, or the Alternating Diamond Caution mode as shown.
- The straight line caution display is NOT ALLOWED.
- 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.
- 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.
- The sequential arrow display is NOT ALLOWED.
- The flashing arrow display is the TxDOT standard; however, the sequential Chevron display may be used during daylight operations.
- The Flashing Arrow Board shall be mounted on a vehicle, trailer or other suitable support.
- A Flashing Arrow Board SHALL NOT BE USED to laterally shift traffic.
- A full matrix POMS 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.
- 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

- 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).
- Refer to the CWZTCD for the requirements of Level 2 or Level 3 TMAs.
- Refer to the CWZTCD for a list of approved TMAs.
- TMAs are required on freeways unless otherwise noted in the plans.
- 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.
- 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.

		Traffic Operations Division Standard	
BARRICADE AND CONSTRUCTION ARROW PANEL, REFLECTORS, WARNING LIGHTS & ATTENUATOR			
BC(7)-14			
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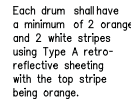
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1. For long term stationary work zones on freeways, drums shall be used as the primary channelizing device.
2. For intermediate term stationary work zones on freeways, drums should be used as the primary channelizing device but may be replaced in tangent 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" (CWZTOD).
5. Drums, cones, 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.

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 normal road surface conditions.
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-reflective 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 bases to be held down while separating the drum body from the base.
8. Plastic drums shall contain no hazardous materials, solvents, oil, grease, high-density polyethylene (HDPE) or other approved material.
9. Drum body shall have a maximum unblasted weight of 11 lbs.
10. Drum and base shall be marked with manufacturer's name and model number.

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.

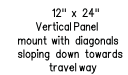
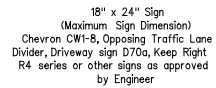
- Unballasted bases shall be large enough to hold up to 50 lbs. of sand. This base, when filled with the ballast material, should weigh between 35 lbs (minimum) and 50 lbs (maximum). The ballast may be sand in one to three sandbags separate from the base, and in a sand-filled plastic base, or other ballasting devices as approved by the Engineer. Stacking of sandbags will be allowed, however height of sandbags above pavement surface may not exceed 12 inches.
- Bases with the minimum weight between 40 lbs. and 50 lbs. Built-in ballast can be constructed of an integral/crum rubber base or a solid rubber base.
- Recycled truck tire sidewalls may be used for ballast on drums approved for this type of ballast on the CWTCD list.
- 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.
- When used in conjunction with 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.
- Ballast shall not be placed on top of drums.
- Adhesives may be used to secure base of drums to pavement.



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 driver through the transition and into the intended travel lane.
3. The Direction Indicator Barricade shall consist of One-Direction Large Arrow (CW-16) sign in the size shown with a black arrow on a background of Type B optiType C Orange retroreflective sheeting attached to 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. Sheetings 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 CWZCTD List. Ballast shall be as approved by the manufacturers instructions.



- When existing pedestrian facilities are disrupted, closed, or relocated in a TTC zone, the temporary facilities should be detectable and include accessibility features consistent with those present in the permanent facility.
- 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 should be present to correct the disruption.
- Detectable pedestrian barricades similar to the one pictured above, longitudinal channeling devices, some concrete barriers, and wood or chain link fencing with a continuous detectable edging can satisfactorily delineate a pedestrian path.
- Tape, rope, or plastic chain strung between poles are not detectable, nor do 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.
- Warning signs should not be attached to detectable pedestrian barricades.
- Detectable pedestrian barricades may use 8" nominal barrier rails as shown on BC100 provided that the top of the rail is smooth and free of sharp edges or hand-trailing with no splinters, burrs, or sharp edges.



SIGNS, CHEVRONS, AND VERTICAL PANELS MOUNTED ON PLASTIC DRUMS

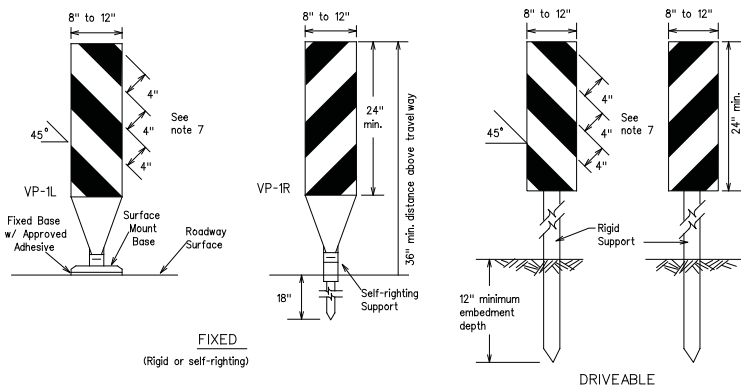
1. Signs used on plastic drums shall be manufactured using substrates listed on the CW2TCD.
2. Chevrons and other work zone signs with an orange background shall be manufactured with Type B or Type C Orange, sheeting meeting the color and retroreflectivity requirements of DMS-8300, "Sign Face Material," 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 16 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 patterns. 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-R, R9-10, R9-11 and R9-11a SideWalk Closed signs which are 24 inches wide may be mounted on plastic drums, with approval of the Engineer.

 Texas Department of Transportation					Traffic Operations Division Standard				
BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES									
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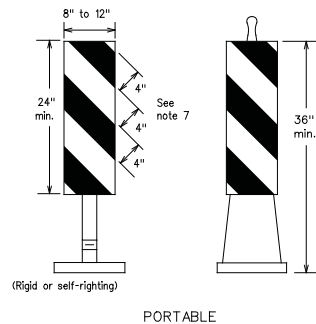
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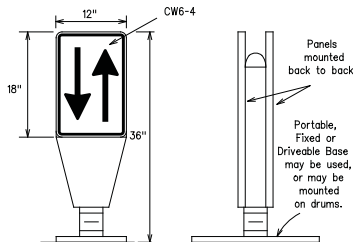
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- Vertical Panels (VP's) are normally used to channelize traffic or divide opposing lanes of traffic.
- VP's may be used in daytime or nighttime situations. They may be used at the edge of shoulder drop-offs and other areas such as lane transitions 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.
- 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.
- VP's used on expressways and freeways or other high speed roadways, may have more than 270 square inches of retroreflective area facing traffic.
- Self-righting supports are available with portable base. See "Compliant Work Zone Traffic Control Devices List" (CWZTCD).
- Sheeting for the VP's shall be retroreflective Type A conforming to Departmental Material Specification DMS-8300, unless noted otherwise.
- Where the height of reflective material on the vertical panels is 36 inches or greater, a panel stripe of 6 inches shall be used.

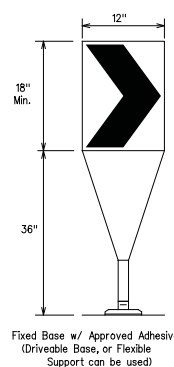


VERTICAL PANELS (VPs)



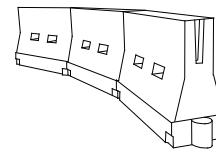
- Opposing Traffic Lane Dividers (OTLD) are delineation devices designed to convert a normal one-way roadway section to two-way operation. OTLD's are used on temporary centerlines. The upward and downward arrows on the sign's face indicate the direction of traffic on either side of the divider. The base is secured to the pavement with an adhesive or rubber weight to minimize movement caused by a vehicle impact or wind gust.
- The OTLD may be used in combination with 42" cones or VP's.
- Spacing between the OTLD shall not exceed 500 feet. 42" cones or VP's placed between the OTLD's should not exceed 100 foot spacing.
- The OTLD shall be orange with a black non-reflective legend. Sheeting for the OTLD shall be retroreflective Type B or Type C conforming to Departmental Material Specification DMS-8300, unless noted otherwise. The legend shall meet the requirements of DMS-8300.

OPPOSING TRAFFIC LANE DIVIDERS (OTLD)



- The chevron shall be a vertical rectangle with a minimum size of 12 by 18 inches.
- 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.
- 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.
- To be effective, the chevron should be visible for at least 500 feet.
- Chevrons shall be orange with a black nonreflective legend. Sheeting for the chevron shall be retroreflective Type B or Type C conforming to Departmental Material Specification DMS-8300, unless noted otherwise. The legend shall meet the requirements of DMS-8300.
- 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



LONGITUDINAL CHANNELIZING DEVICES (LCD)

- 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.
- LCDs may be used instead of a line of cones or drums.
- LCDs shall be placed in accordance to application and installation requirements specific to the device, and used only when shown on the CWZTCD list.
- LCDs should not be used to provide positive protection for obstacles, pedestrians or workers.
- LCDs shall be supplemented with retroreflective delineation as required for temporary barriers on BC(7) when placed roughly parallel to the travel lanes.
- 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

- 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.
- 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.
- 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.
- 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.
- 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 cones 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

GENERAL NOTES

- 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).
- 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.
- 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).
- 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.
- Portable bases shall be fabricated from virgin and/or recycled rubber. The portable bases shall weigh a minimum of 30 lbs.
- 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.
- 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.

Posted Speed	Formula	Minimum Desirable Taper Lengths x x			Suggested Maximum Spacing of Channelizing Devices	
		10' Offset	11' Offset	12' Offset	On a Taper	On a Tangent
30	L = WS/60	150'	165'	180'	30'	60'
35		205'	225'	245'	35'	70'
40	L = WS	265'	295'	320'	40'	80'
45		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'

* X Taper lengths have been rounded off.
L=Length of Taper (FT.) W=Width of Offset (FT.)
S=Posted Speed (MPH)

SUGGESTED MAXIMUM SPACING OF CHANNELIZING DEVICES AND MINIMUM DESIRABLE TAPER LENGTHS

SHEET 9 OF 12



BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(9)-14

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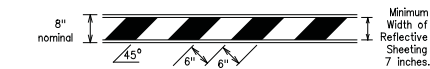
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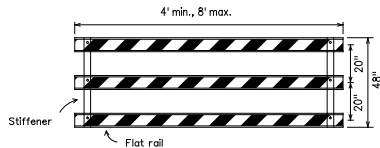
TYPE 3 BARRICADES

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 stocked 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 fire 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.

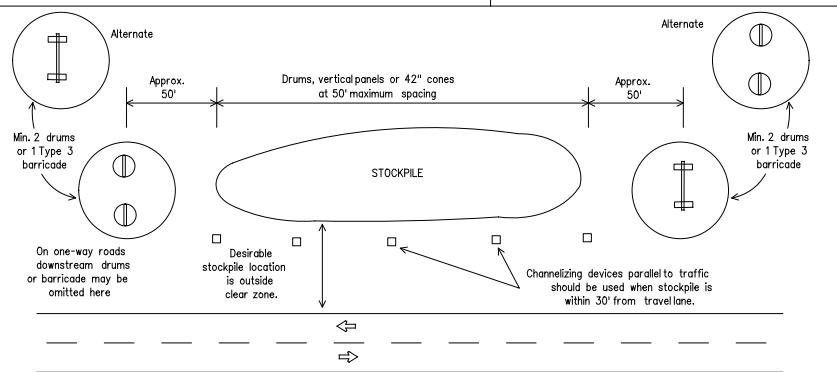


TYPICAL STRIPING DETAIL FOR BARRICADE RAIL



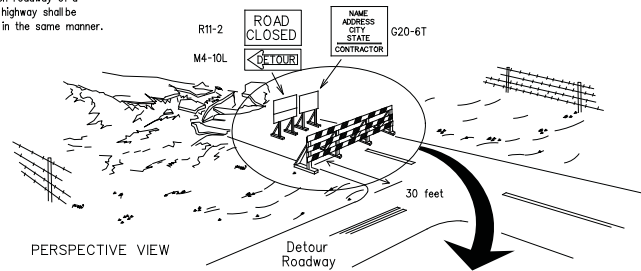
Stiffener may be inside or outside of support, but no more than 2 stiffeners shall be allowed on one barricade.

TYPICAL PANEL DETAIL FOR SKID OR POST TYPE BARRICADES



TRAFFIC CONTROL FOR MATERIAL STOCKPILES

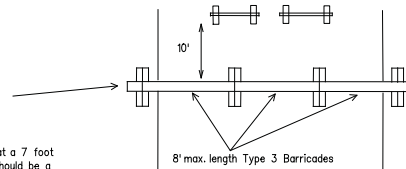
Each roadway of a divided highway shall be barricaded in the same manner.



PERSPECTIVE VIEW

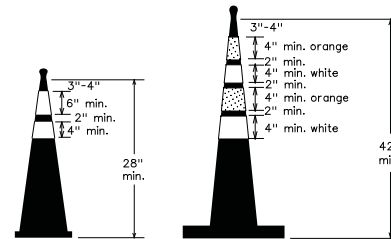
The three rails on Type 3 barricades shall be reflectorized orange and reflective white stripes on one side facing one-way traffic and both sides for two-way traffic. Barricade striping should slant downward in the direction of detour.

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.

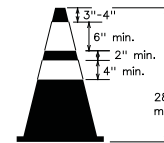


PLAN VIEW

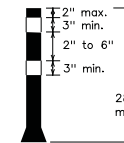
TYPE 3 BARRICADE (POST AND SKID) TYPICAL APPLICATION



Two-Piece cones



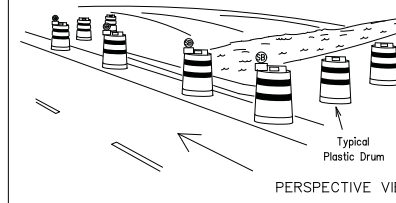
One-Piece cones



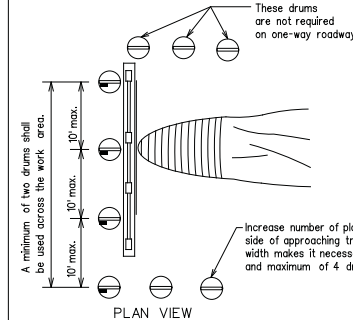
Tubular Marker

28" Cones shall have a minimum weight of 9 1/2 lbs.
42" 2-piece cones shall have a minimum weight of 30 lbs, including base.

1. Traffic cones and tubular markers shall be predominantly orange, and meet the height and weight requirements shown above.
2. One-piece cones have the body and base of the cone molded in one consolidated unit. Two-piece cones have a cone shaped body and a separate rubber base, or ballast, that is added to keep the device upright and in place.
3. Two-piece cones may have a handle or loop extending up to 8" above the minimum height shown, in order to aid in retrieving the device.
4. Cones or tubular markers used at night shall have white or white and orange reflective bands as shown above. The reflective bands shall have a smooth, sealed outer surface and meet the requirements of Departmental Material Specification DMS-8300 Type A.
5. 28" cones and tubular markers are generally suitable for short duration and short-term stationary work as defined on BC(4). These should not be used for intermediate-term or long-term stationary work unless personnel is on-site to maintain them in their proper upright position.
6. 42" two-piece cones, vertical panels or drums are suitable for all work zone durations.
7. Cones or tubular markers used on each project should be of the same size and shape.



PERSPECTIVE VIEW



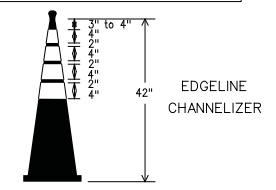
PLAN VIEW

CULVERT WIDENING OR OTHER ISOLATED WORK WITHIN THE PROJECT LIMITS

1. Where positive redirection capability is provided, drums may be omitted.
2. Plastic construction fencing may be used with drums for safety as required in the plans.
3. Vertical Panels on flexible support may be substituted for drums when the shoulder width is less than 4 feet.
4. When the shoulder width is greater than 12 feet, steady-burn lights may be omitted if drums are used.
5. Drums must extend the length of the culvert widening.

LEGEND	
	Plastic drum
	Plastic drum with steady burn light or yellow warning reflector
	Steady burn warning light or yellow warning reflector

THIS DEVICE SHALL NOT BE USED ON PROJECTS LET AFTER MARCH 2014.



EDGELINE CHANNELIZER

1. This device is intended only for use in place of a vertical panel to channelize traffic by indicating the edge of the travel lane. It is not intended to be used in transitions or tapers.
2. This device shall not be used to separate lanes of traffic (opposing or otherwise) or warn of objects.
3. This device is based on a 42 inch, two-piece cone with an alternate striping pattern: four 4 inch retroreflective bands, with an approximate 2 inch gap between bands. The color of the band should correspond to the color of the edgeline (yellow for left edgeline, white for right edgeline) for which the device is substituted or for which it supplements. The reflectorized bands shall be retroreflective Type A conforming to Departmental Material Specification DMS-8300, unless otherwise noted.
4. The base must weigh a minimum of 30 lbs.

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		Traffic Operations Division Standard			
BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES					
BC(10)-14					
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WORK ZONE PAVEMENT MARKINGS

GENERAL

1. The Contractor shall be responsible for maintaining work zone and existing pavement markings in accordance with the standard specifications and special provisions, on all roadways open to traffic within the CSJ limits unless otherwise stated in the plans.
2. Color, patterns and dimensions shall be in conformance with the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD).
3. Additional supplemental pavement marking details may be found in the plans or specifications.
4. Pavement markings shall be installed in accordance with the TMUTCD and as shown on the plans.
5. When short term markings are required on the plans, short term markings shall conform with the TMUTCD, the plans and details as shown on the Standard Plan Sheet WZ(STPM).
6. When standard pavement markings are not in place and the roadway is opened to traffic, DO NOT PASS signs shall be erected to mark the beginning of the sections where passing is prohibited and PASS WITH CARE signs at the beginning of sections where passing is permitted.
7. All work zone pavement markings shall be installed in accordance with Item 662, "Work Zone Pavement Markings."

RAISED PAVEMENT MARKERS

1. Raised pavement markers are to be placed according to the patterns on BC(12).
2. All raised pavement markers used for work zone markings shall meet the requirements of Item 672, "RAISED PAVEMENT MARKERS" and Departmental Material Specification DMS-4200 or DMS-4300.

PREFABRICATED PAVEMENT MARKINGS

1. Removable prefabricated pavement markings shall meet the requirements of DMS-8241.
2. Non-removable prefabricated pavement markings (foilback) shall meet the requirements of DMS-8240.

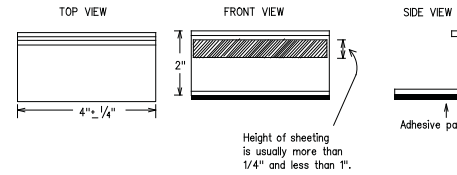
MAINTAINING WORK ZONE PAVEMENT MARKINGS

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 TGP(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).

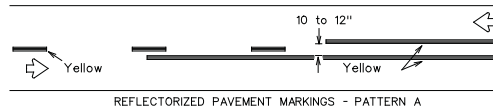
DEPARTMENTAL MATERIAL SPECIFICATIONS	
PAVEMENT MARKERS (REFLECTORIZED)	DMS-4200
TRAFFIC BUTTONS	DMS-4300
EPOXY AND ADHESIVES	DMS-6100
BITUMINOUS ADHESIVE FOR PAVEMENT MARKERS	DMS-6130
PERMANENT PREFABRICATED PAVEMENT MARKINGS	DMS-8240
TEMPORARY REMOVABLE, PREFABRICATED PAVEMENT MARKINGS	DMS-8241
TEMPORARY 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).

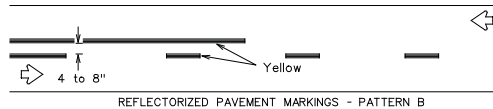
SHEET 11 OF 12

 Texas Department of Transportation		Traffic Operations Division Standard			
BARRICADE AND CONSTRUCTION PAVEMENT MARKINGS					
BC(11)-14					
FILE: bc-14.dgn	DWG: TxDOT	CHK: TxDOT	DWG: TxDOT		
© TxDOT February 1998	CONT	SECT	JOB		
REVISIONS		HIGHWAY			
2-98	9-07				
1-02	7-13	DIST	COUNTY		
11-02	8-14	PHR	HIDALGO		
			SHEET NO.		
			70		

PAVEMENT MARKING PATTERNS



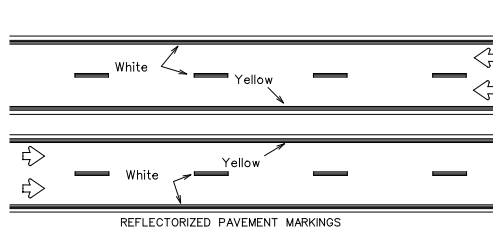
REFLECTORIZED PAVEMENT MARKINGS - PATTERN A



REFLECTORIZED PAVEMENT MARKINGS - 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.

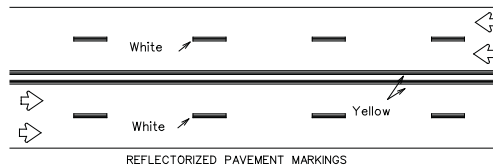
CENTER LINE & NO-PASSING ZONE BARRIER LINES FOR TWO-LANE, TWO-WAY HIGHWAYS



REFLECTORIZED PAVEMENT MARKINGS

Prefabricated markings may be substituted for reflectORIZED pavement markings.

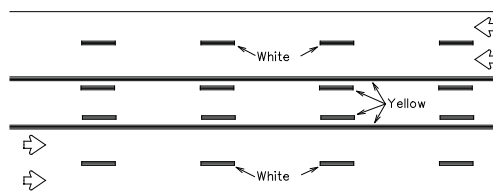
EDGE & LANE LINES FOR DIVIDED HIGHWAY



REFLECTORIZED PAVEMENT MARKINGS

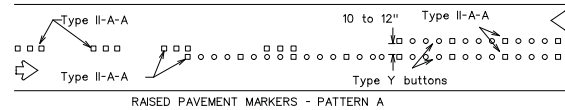
Prefabricated markings may be substituted for reflectORIZED pavement markings.

LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS

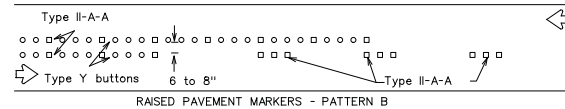


REFLECTORIZED PAVEMENT MARKINGS

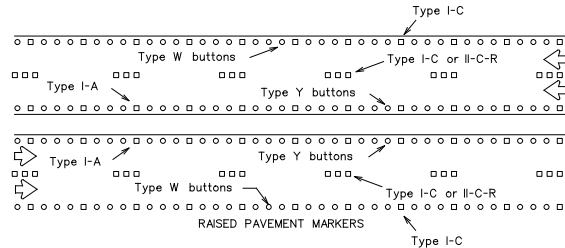
Prefabricated markings may be substituted for reflectORIZED pavement markings.



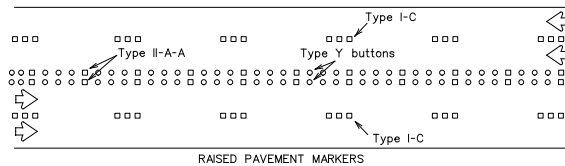
RAISED PAVEMENT MARKERS - PATTERN A



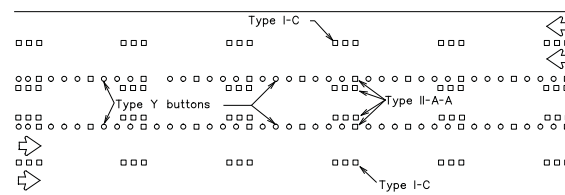
RAISED PAVEMENT MARKERS - PATTERN B



RAISED PAVEMENT MARKERS



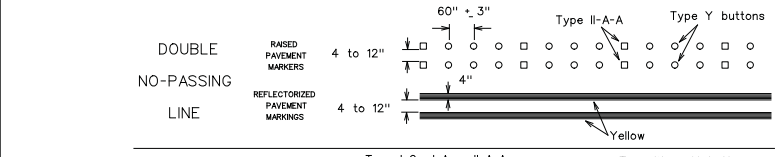
RAISED PAVEMENT MARKERS



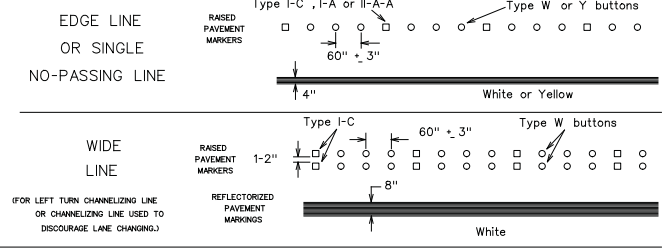
RAISED PAVEMENT MARKERS

TWO-WAY LEFT TURN LANE

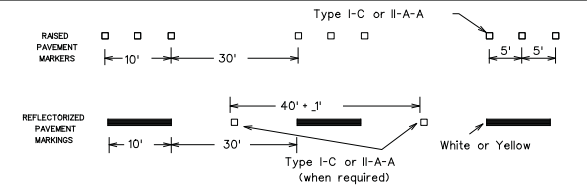
STANDARD WORK ZONE PAVEMENT MARKINGS DETAILS



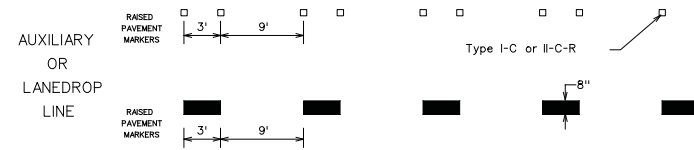
SOLID LINES



CENTER LINE OR LANE LINE

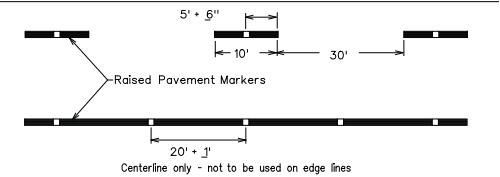


BROKEN LINES



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.



SHEET 12 OF 12



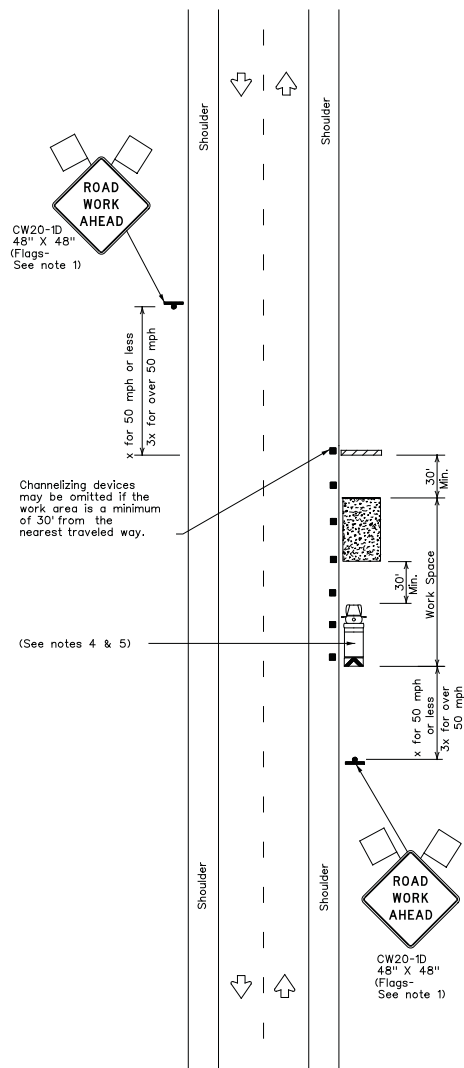
BARRICADE AND CONSTRUCTION PAVEMENT MARKING PATTERNS

BC(12)-14

FILE: bc-14.dgn	DW: TxDOT	CHK: TxDOT	DW: TxDOT	CHK: TxDOT
© TxDOT February 1998	CONT	SECT	JOB	HIGHWAY
1-97 9-07	REVISED			
2-98 7-13				
11-02 8-14				
PHR	COUNTY	HIDALGO	SHEET NO.	71

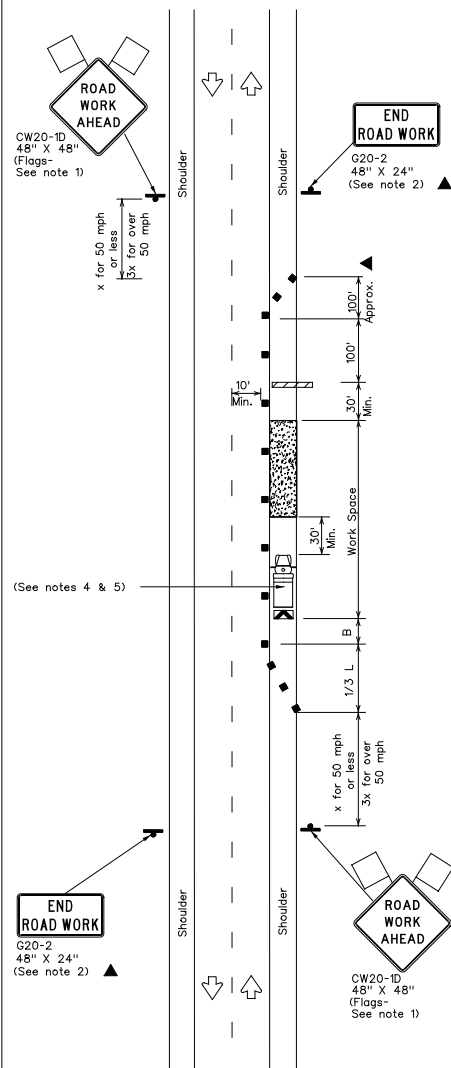
DISCLAIMER: The use of this standard is governed by the "Texas Engineering Practice Act". No warranty of any kind is made by the Texas Department of Transportation for the use of this standard or for the results or damages resulting from its use.

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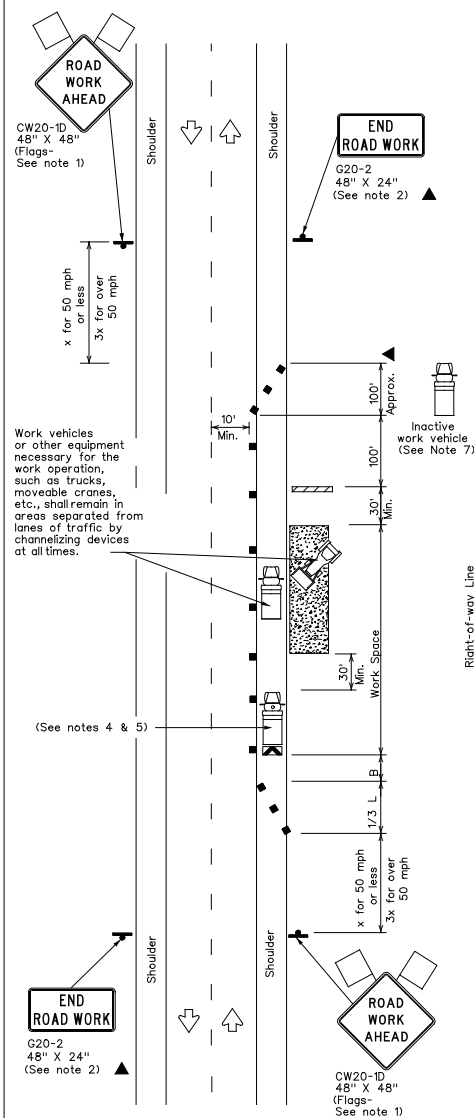
TCP (2-1a)

WORK SPACE NEAR SHOULDER



TCP (2-1b)

WORK SPACE ON SHOULDER



TCP (2-1c)

WORK VEHICLES ON SHOULDER

LEGEND		
	Type 3 Barricade	 Channelizing Devices
	Heavy Work Vehicle	 Truck Mounted Attenuator (TMA)
	Trailer Mounted Flashing Arrow Board	 Portable Changeable Message Sign (PCMS)
	Sign	 Traffic Flow
	Flag	 Flagger

Posted Speed x	Formula	Minimum Desirable Tower Lengths x x		Suggested Maximum Spacing of Channelizing Devices		Minimum Sign Spacing "x" Distance	Suggested Longitudinal Buffer Space "B"	
		10' Offset	12' Offset	On a Tangent	On a Tangent			
30	L = $\frac{WS}{60}$	150'	165'	180'	30'	60'	120'	90'
35		205'	225'	245'	35'	70'	160'	120'
40		265'	295'	320'	40'	80'	240'	155'
45		345'	495'	540'	45'	90'	320'	195'
50	L = WS	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

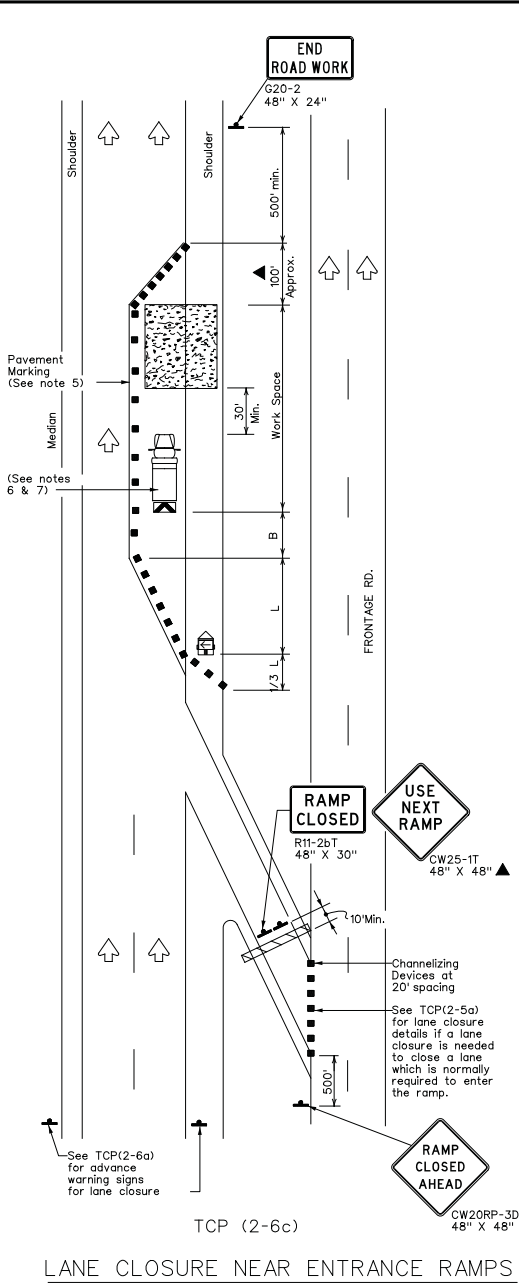
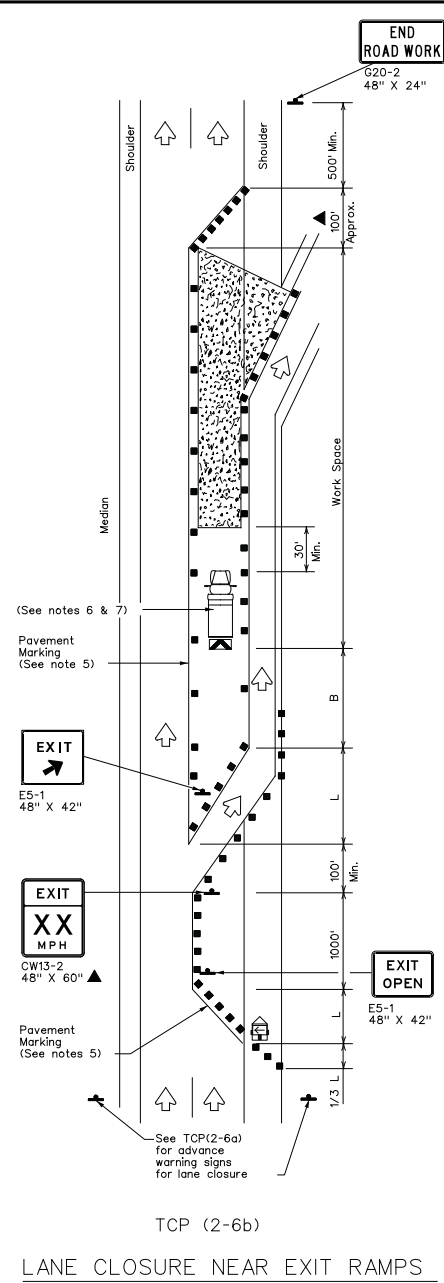
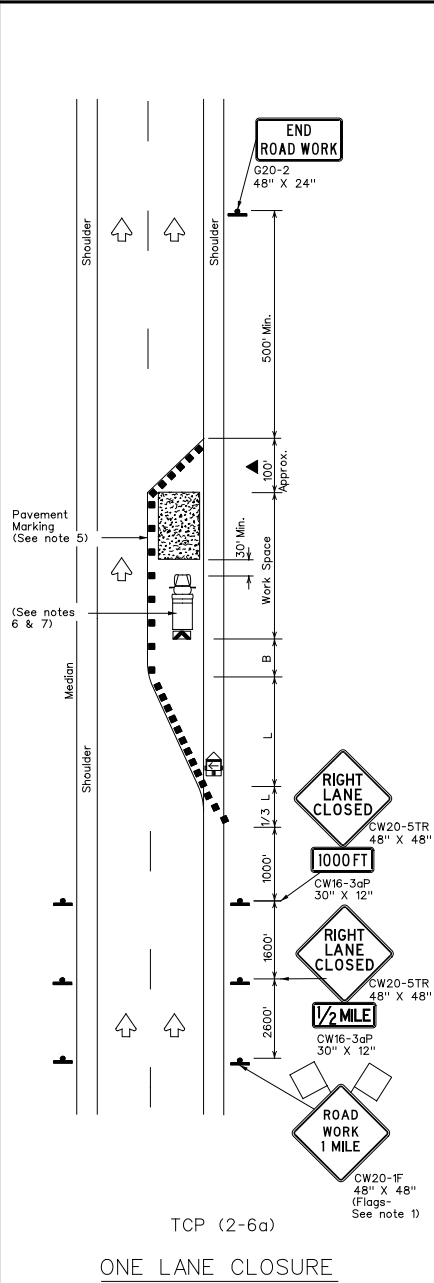
xx Taper lengths have been rounded off.

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. Flaps 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 activity with an 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 TCPS-17 for shoulder work on divided highways, expressways and freeways.
7. Heavy 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.



LEGEND

Type 3 Barricade	Channelizing Devices
Heavy Work Vehicle	Truck Mounted Attenuator (TMA)
Trailer Mounted Flashing Arrow Board	Portable Changeable Message Sign (PCMS)
Sign	Traffic Flow
Flag	Flagger

Posted Speed x	Formula	Minimum Desirable Taper Lengths x x			Suggested Maximum Spacing of Channelizing Devices		Minimum Sign Spacing Distance	Suggested Longitudinal Buffer Space "B"
		10' Offset	11' Offset	12' Offset	On a Taper	On a Tangent		
30	L = WS 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		450'	495'	540'	45'	90'	320'	195'
50		500'	550'	600'	50'	100'	400'	240'
55	L = WS	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'

x Conventional Roads Only
x x 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	LONG TERM STATIONARY

GENERAL NOTES

- Flags attached to signs where shown, are REQUIRED.
- 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.
- Channelizing devices used to close lanes may be supplemented with the Chevron Alignment Sign placed on every other channelizing device. Chevrons may be attached to plastic drums as per BC Standards.
- Channelizing devices used along the work space or along tangent sections may be supplemented with vertical panels (VP) placed on every other channelizing device. If night time conditions make it difficult to see at least two VPs, the VPs may be placed on each channelizing device.
- The placement of pavement markings may be omitted on intermediate-term stationary work zones with the approval of the Engineer.
- Shadow Vehicle with TMA and high intensity rotating, flashing, oscillating or strobe lights. 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.
- Additional Shadow Vehicles with TMAs may be positioned in each closed lane, on the shoulder or off the paved surface, next to those shown in order to protect a wider work space.

Texas Department of Transportation

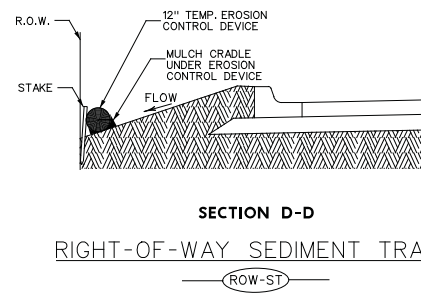
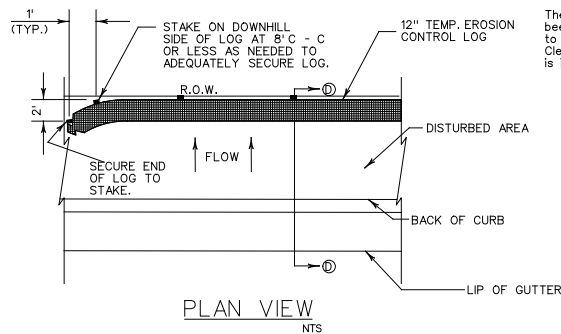
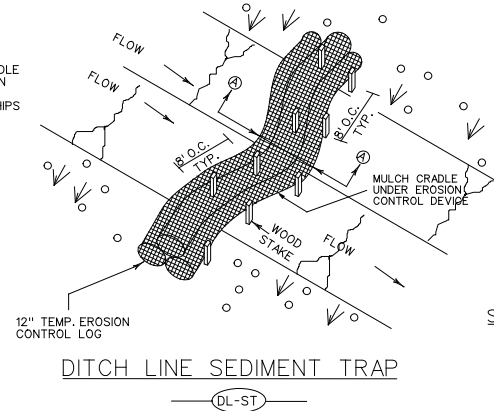
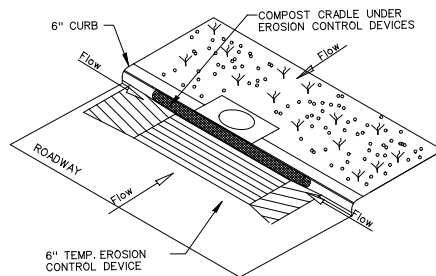
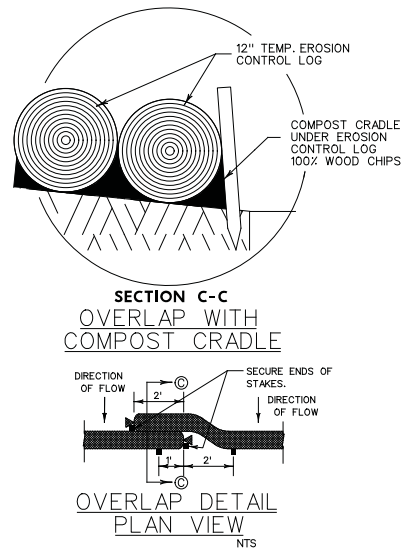
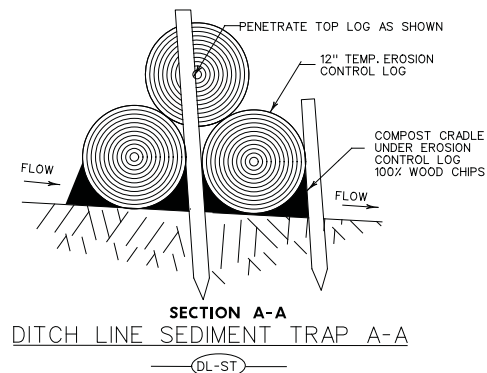
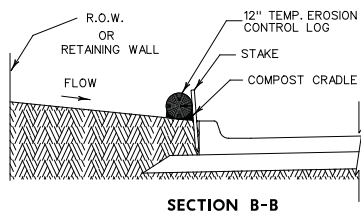
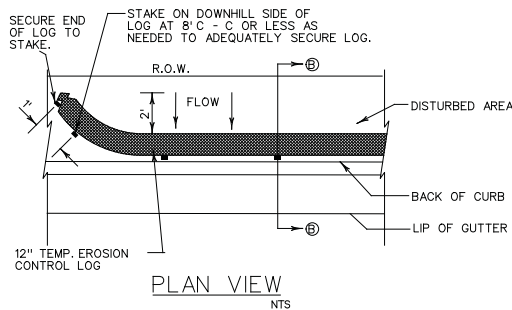
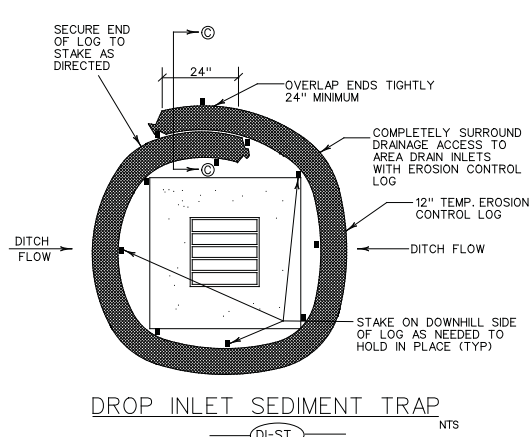
TRAFFIC CONTROL PLAN
LANE CLOSURES ON
DIVIDED HIGHWAYS

TCP(2-6)-18

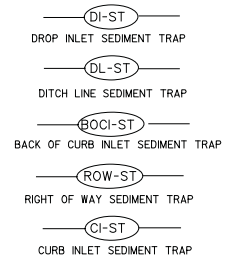
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© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS				
2-94 4-98				
8-95 2-12				
1-97 2-18				
DIST		COUNTY		SHEET NO.
PHR		HIDALGO		73

166

LEVELS DISPLAYED															
1	2	3	4	5	6	7	8	9	0	11	12	13	14	15	16
7	18	9	20	21	22	23	24	25	26	27	28	29	30	31	32
33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48
49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	



PLANS SHEET LEGEND



SEDIMENT BASIN & TRAP USAGE GUIDELINES

A sediment trap may be used to precipitate sediment out of runoff draining from an unstabilized area.

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. Immediately preceding drain inlets
2. Just before the drainage enters a water course
3. Just before the drainage leaves the right of way
4. Just before the drainage leaves the construction limits where drainage flows away from the project

The trap should be cleaned when the capacity has been reduced by $\frac{1}{2}$ or the sediment has accumulated to a depth of 1', whichever is less. Cleaning and removal of accumulated sediment deposits is incidental and will not be paid for separately.

GENERAL NOTES

- 1. LENGTHS OF EROSION CONTROL LOGS SHALL BE IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS AND AS REQUIRED FOR THE PROPOSED INSTALLATION. THE LENGTH OF LOGS SHALL BE 30' FOR 12" DIAMETER LOGS.
- 2. UNLESS OTHERWISE DIRECTED, USE BIODEGRADABLE OR PHOTO DEGRADABLE CONFINEMENT MESH. THE LOG WILL REMAIN IN PLACE AS PART OF A VEGETATIVE SYSTEM, FOR TEMPORARY INSTALLATIONS, UNLESS A CYCLOABLE COVER IS USED.
- 3. STUFF LOGS WITH SUFFICIENT FILTER MATERIAL TO ACHIEVE DENSITY THAT WILL HOLD SHAPE WITHOUT EXCESSIVE DEFORMATION.
- 4. STAKES SHALL BE WOOD
- 5. 4' LONG, EMBEDDED SUCH THAT PROTRUDES ABOVE LOG.
- 6. COMPOST GRADLE MATERIAL IS INCIDENTAL AND WILL NOT BE PAID FOR SEPARATELY.

PHARR DISTRICT STANDARD

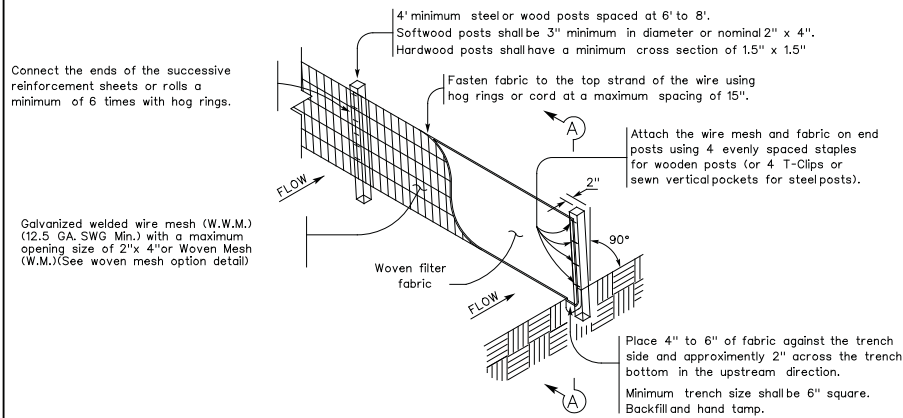


TEMPORARY EROSION
CONTROL LOGS
TECL-17 (PHR)

FED. RD. DIV. NO. 6	PROJECT NO.		HIGHWAY NO.
STATE	DISTRICT	COUNTY	SHEET NO.
TEXAS	PHARR		75
CONTROL	SECTION	JOB	

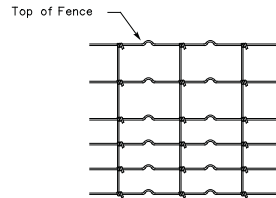
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F121013-2013-1127-01 McAllen PUB 23rd St Water Main Improvement Design\CS\Standards SA 01\SW3P\ec116.dgn



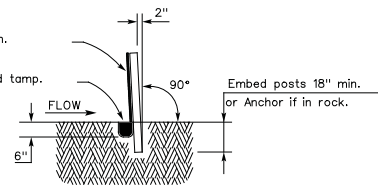
TEMPORARY SEDIMENT CONTROL FENCE

SCF



Filter fabric 3' min. width.

Backfill & hand tamp.



SECTION A-A

HINGE JOINT KNOT WOVEN MESH (OPTION) DETAIL

Galvanized hinge joint knot woven mesh (12.5 GA.SWG Min.) requires a minimum of five horizontal wires spaced at a maximum of 12 inches apart and all vertical wires spaced at a maximum of 12 inches apart.

SEDIMENT CONTROL FENCE USAGE GUIDELINES

A sediment control fence may be constructed near the downstream perimeter of a disturbed area along a contour to intercept sediment from overland runoff. A 2 year storm frequency may be used to calculate the flow rate to be filtered.

Sediment control fence should be sized to filter a maximum flow through rate of 100 GPM/FT. Sediment control fence is not recommended to control erosion from a drainage area larger than 2 acres.

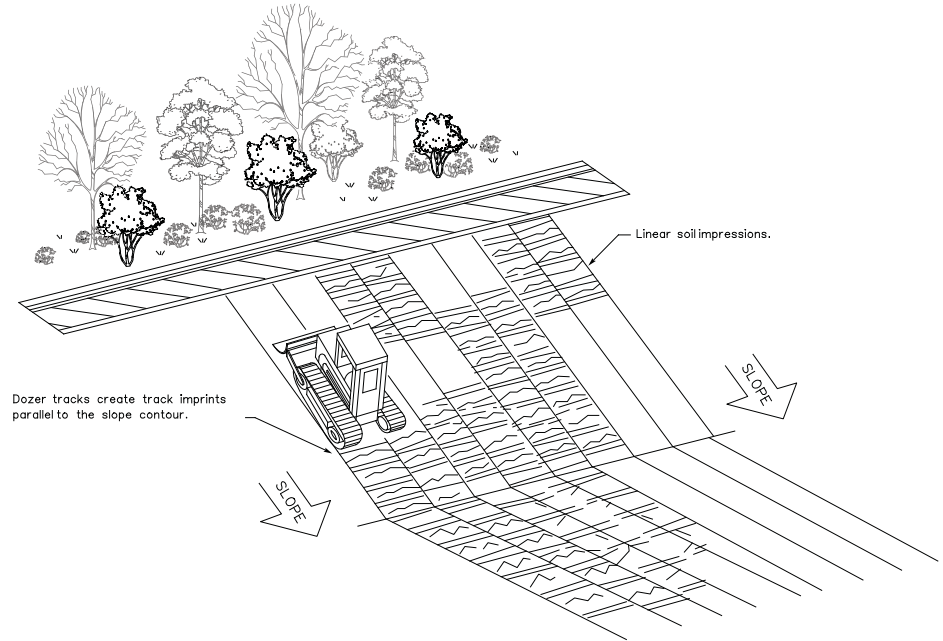
LEGEND

Sediment Control Fence

SCF

GENERAL NOTES

1. Vertical tracking is required on projects where soil distributing activities have occurred unless otherwise approved.
2. Perform vertical tracking on slopes to temporarily stabilize soil.
3. Provide equipment with a track undercarriage capable of producing linear soil impressions measuring a minimum of 12" in length by 2" to 4" in width by 1/2" to 2" in depth.
4. Do not exceed 12" between track impressions.
5. Install continuous linear track impressions where the minimum 12" length impressions are perpendicular to the slope or direction of water flow.

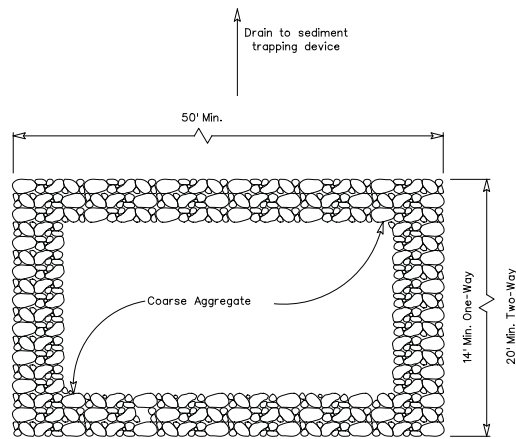


VERTICAL TRACKING

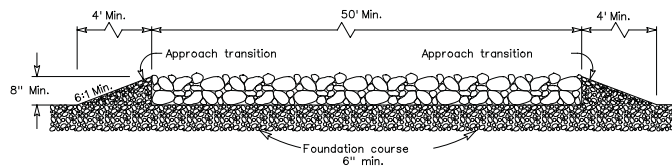
		Design Division Standard	
TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES FENCE & VERTICAL TRACKING			
EC(1)-16			
FILE: ec116	DW TxDOT	OK KM	DW VP
© TxDOT: JULY 2016	CONT	SECT	JOB
REVISIONS		HIGHWAY	
DIST	COUNTY		SHEET NO.
PHR	HIDALGO		80

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DATE: 5/23/2018
FILE: P:\2013\2013-1127-01 McAllen PUB 23rd St Water Main Improvement\Design\Standards SA 01\SWP\ec316.dgn



PLAN VIEW

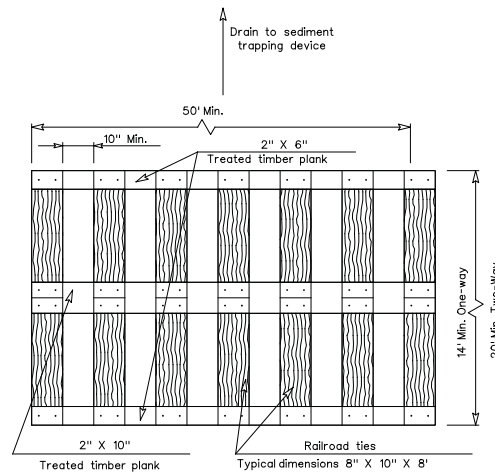


ELEVATION VIEW

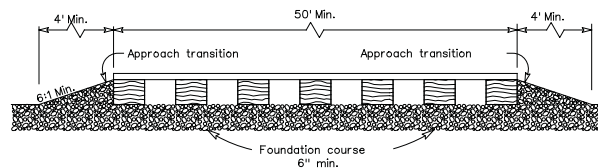
CONSTRUCTION EXIT (TYPE 1)
ROCK CONSTRUCTION (LONG TERM)

GENERAL NOTES (TYPE 1)

1. The length of the type 1 construction exit shall be as indicated on the plans, but not less than 50'.
2. The coarse aggregate should be open graded with a size of 4" to 8".
3. The approach transitions should be no steeper than 6:1 and constructed as directed by the Engineer.
4. The construction exit foundation course shall be flexible base, bituminous concrete, portland cement concrete or other materials approved by the Engineer.
5. The construction exit shall be graded to allow drainage to a sediment trapping device.
6. The guidelines shown hereon are suggestions only and may be modified by the Engineer.
7. Construct exits with a width of at least 14 ft. for one-way and 20 ft. for two-way traffic for the full width of the exit, or as directed by the engineer.



PLAN VIEW

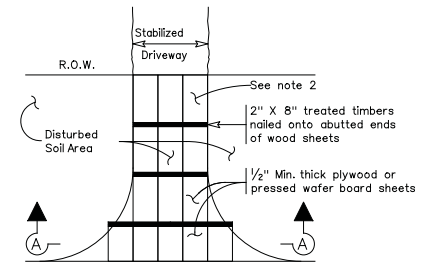


ELEVATION VIEW

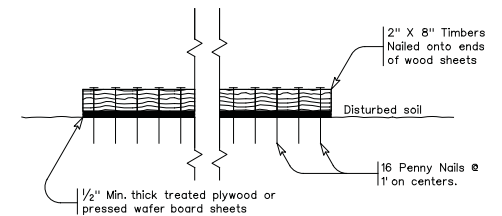
CONSTRUCTION EXIT (TYPE 2)
TIMBER CONSTRUCTION (LONG TERM)

GENERAL NOTES (TYPE 2)

1. The length of the type 2 construction exit shall be as indicated on the plans, but not less than 50'.
2. The treated timber planks shall be attached to the railroad ties with 1/2" x 6" min. lag bolts. Other fasteners may be used as approved by the Engineer.
3. The treated timber planks shall be #2 grade min., and should be free from large and loose knots.
4. The approach transitions shall be no steeper than 6:1 and constructed as directed by the Engineer.
5. The construction exit foundation course shall be flexible base, bituminous concrete, portland cement concrete or other material as approved by the Engineer.
6. The construction exit should be graded to allow drainage to a sediment trapping device.
7. The guidelines shown hereon are suggestions only and may be modified by the Engineer.
8. Construct exits with a width of at least 14 ft. for one-way and 20 ft. for two-way traffic for the full width of the exit, or as directed by the engineer.



PLAN VIEW



SECTION A-A
CONSTRUCTION EXIT (TYPE 3)
SHORT TERM

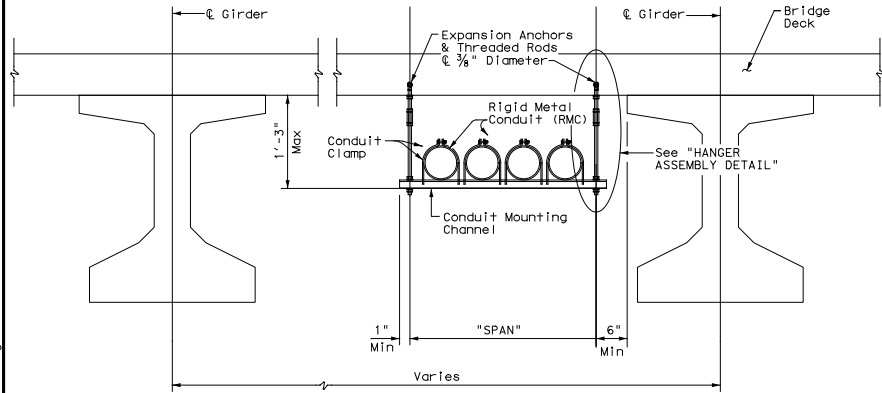
GENERAL NOTES (TYPE 3)

1. The length of the type 3 construction exit shall be as shown on the plans, or as directed by the Engineer.
2. The type 3 construction exit may be constructed from open graded crushed stone with a size of two to four inches spread a min. of 4" thick to the limits shown on the plans.
3. The treated timber planks shall be #2 grade min., and should be free from large and loose knots.
4. The guidelines shown hereon are suggestions only and may be modified by the Engineer.

 Texas Department of Transportation				<i>Design Division Standard</i>	
TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES CONSTRUCTION EXITS EC(3)-16					
FILE: ec316	DW TxDOT	OK KM	DW VP	DW OK LS	
© TxDOT: JULY 2016	CONT	SECT	JOB	HIGHWAY	
REVISIONS					
DIST		COUNTY			SHEET NO.
PHR		HIDALGO			81

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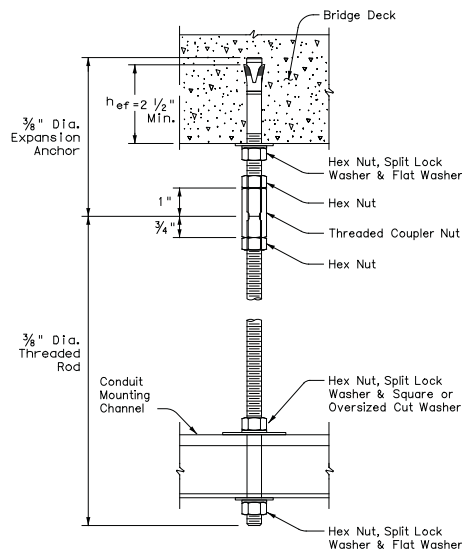
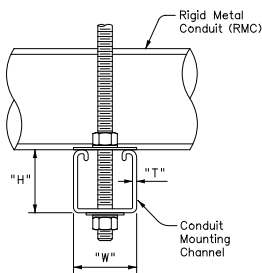
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CONDUIT HANGING DETAIL

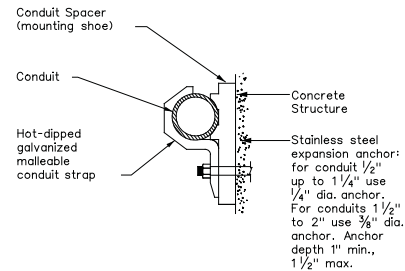
"SPAN"	"W" x "H"	"T"
less than 2'	1 5/8" x 1 3/8"	12 Ga.
2'-0" to 2'-6"	1 5/8" x 1 5/8"	12 Ga.
>2'-6" to 3'-0"	1 5/8" x 2 7/16"	12 Ga.

Channels with round or short slotted hole patterns are allowed, if the load carrying capacity is not reduced by more than 15%.



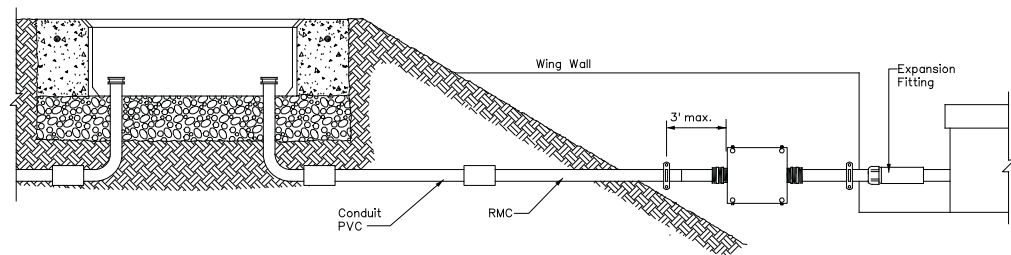
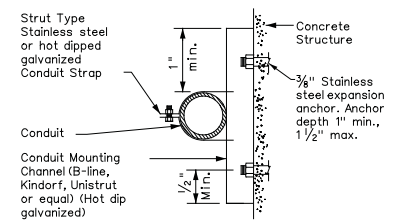
HANGER ASSEMBLY DETAIL

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, (e_f) as shown. Increase (e_f) as needed to ensure sufficient thread length for proper torquing 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 (e_f). No lateral loads shall be introduced after conduit installation.

		Traffic Operations Division Standard	
ELECTRICAL DETAILS			
CONDUIT SUPPORTS			
ED(2)-14			
FILE: e42-14.dgn	DW: TxDOT	DW: TxDOT	DW: TxDOT
© TxDOT October 2014	CONT: SECT	JOB: HIGHWAY	
REVISIONS		DIST: COUNTY	SHEET NO.
		PHR: HIDALGO	83

ELECTRICAL CONDUCTORS

A. MATERIAL INFORMATION

1. Provide Type XHHW insulated conductors in accordance with Departmental Material Specification (DMS)11040 "Conductors" and Item 620 "Electrical Materials." 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 larger 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.

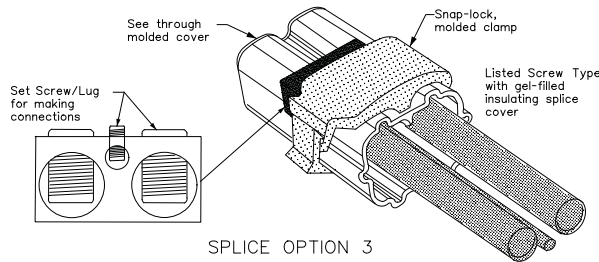
GROUND RODS & GROUNDING ELECTRODES

A. MATERIAL INFORMATION

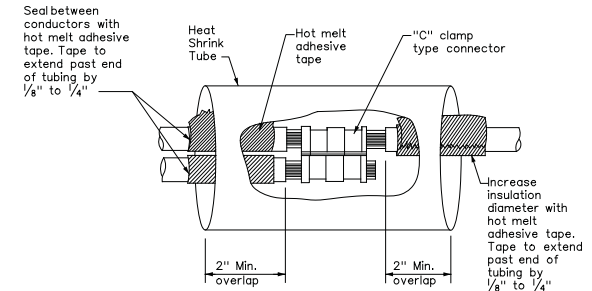
1. Provide and install a grounding electrode at electrical services. Provide ground rods according to DMS 11040 and the plans. Larger diameter or longer length rods may be called for in some specific locations, see the individual plans sheets. Concrete encased grounding electrodes may be called for in specific locations including electrical service, see individual plan sheets.

B. CONSTRUCTION METHODS

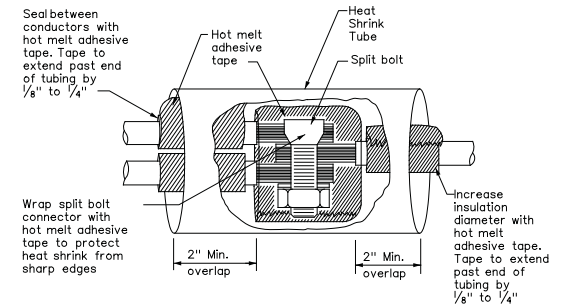
1. Furnish auxiliary ground rods for lightning protection and install in soil, concrete, or both, as called for in the plans. For ground rods installed in concrete, ensure the connection of the conductor to the ground rod is readily accessible for inspection or repairs. For ground rods installed in soil, 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 3
Listed Screw Type



SPLICE OPTION 1
Compression Type

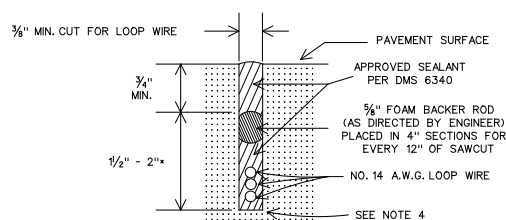


SPLICE OPTION 2
Split Bolt Type

		Traffic Operations Division Standard	
ELECTRICAL DETAILS CONDUCTORS			
ED(3)-14			
FILE: ed3-14.dgn	DW: TxDOT	OK: TxDOT	DW: TxDOT
© TxDOT October 2014	CONT	SECT	JOB
REVISIONS		HIGHWAY	
DIST		COUNTY	
PHR		HIDALGO	
		SHEET NO.	
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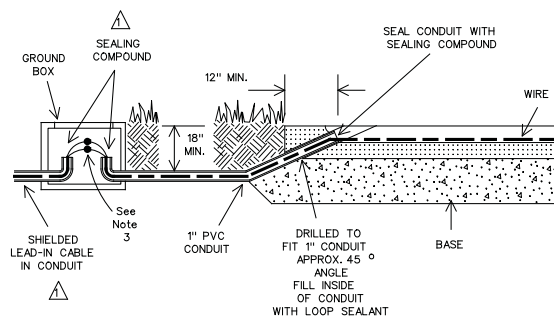
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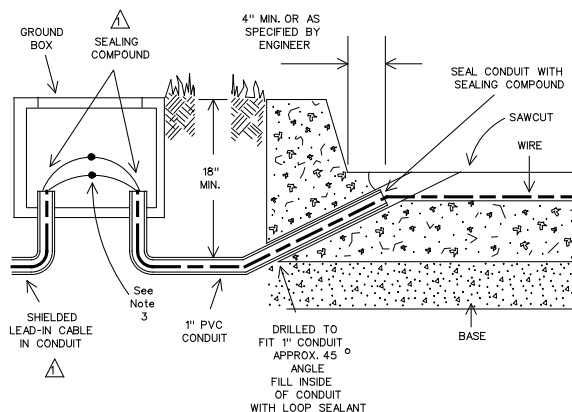


LOOP SAW CUT CROSS-SECTION

- * SAWCUTS IN BRIDGE DECKS ARE TYPICALLY 1" DEPTH MAXIMUM
SAWCUTS IN BRIDGE DECKS AND ACROSS EXPANSION JOINTS
SHALL BE AS APPROVED BY ENGINEER



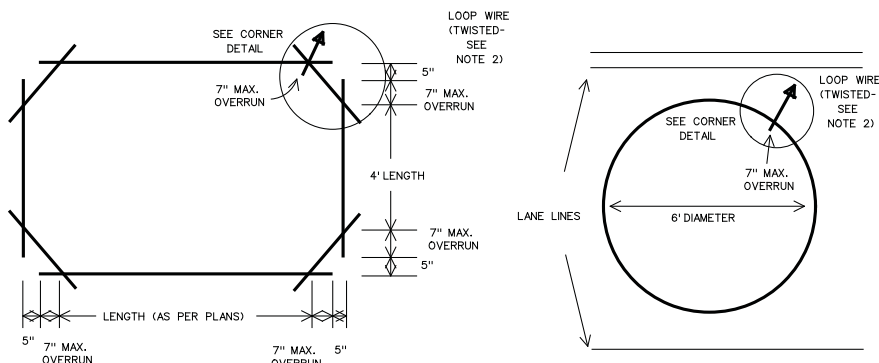
TYPICAL LEAD IN CONFIGURATION (WITHOUT CURBING)



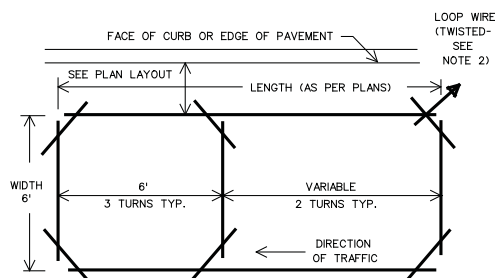
TYPICAL LEAD IN CONFIGURATION (WITH CURBING)

TYPICAL LOOP DETECTOR LAYOUTS

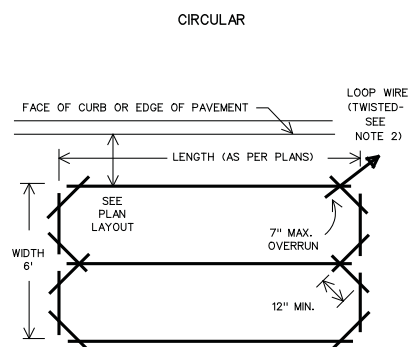
(AS SPECIFIED IN PLANS)



RECTANGULAR



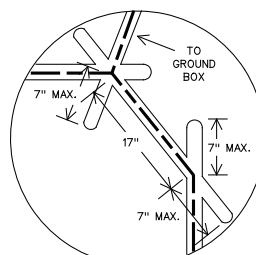
POWER HEADER



CIRCULAR

QUADRAPOLE

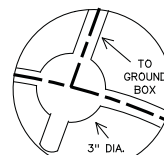
TYPICAL CORNER DETAILS



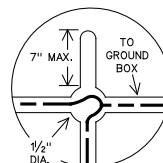
RECTANGULAR & HEXIGON LOOP

SAWCUT CORNER DETAIL

7" OVERRUN BASED ON
24" DIAMETER SAW BLADE

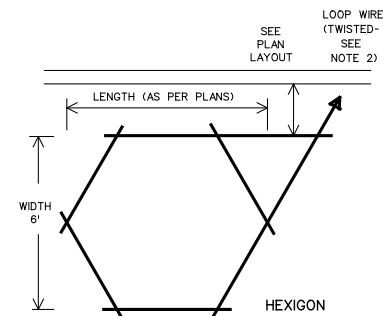


CIRCULAR LOOP
DRILLED CORNER DETAIL



RECTANGULAR & HEXIGON LOOP (ALT.)

DRILLED CORNER DETAIL



GENERAL NOTES:

1. The pavement cut is to be made with a concrete saw to neat lines and loose material removed. The cut shall be clean and dry when the wire and sealing compound is placed.
 2. Loop wire shall be 14 AWG Stranded Type XHHW. Wire from the loop to the ground box shall be twisted a minimum of 5 turns per foot. No splices shall be permitted in the loop or in the run to the ground box.
 3. The home run cable from the pullbox to the controller shall be MS4-50-2 shielded cable and shall be sealed at the terminal ends. The home run cable shall be sealed with Scotchcast or other method acceptable to the Engineer. The shield shall be grounded only at the controller end. Home run cable shall be two conductor 14 AWG shielded, Type XHHW.
 4. All wire placed in the saw cut shall be sealed by fully encapsulating it in a sealant acceptable to the Engineer. Sealing compound shall be in accordance with DMS 6340.
5. The location, configuration and number of turns shall be as indicated on the plans or as directed by the Engineer.

Recommended Number of Turns for Loop Detectors

LOOP PERIMETER SIZE (FT.)	NUMBER OF TURNS	APPROXIMATE LOOP SIZES INCLUDED
24' or Less	3 or 4	5' x 5', 6' x 6'
25' - 110'	2 or 3	6' x 10', 6' x 45'
110' or More	1 or 2	6' x 50' or Longer

6. A separate saw cut shall be made from each loop to the edge of pavement or as specified by the Engineer.
7. Splices between the loop lead-in cable and loop detector shall be made only in the ground box near the loop it is serving.
8. Circular loops may use prepoured loops encased in continuous pvc tubing. Sawcut width may be adjusted to accommodate tubing.
9. The lead-in wire in the circular loop shall be coiled at the 3 inch drilled corner to reduce bending stress.
10. Loop duct may be used as specified by Engineer.

For additional information refer to "Texas Traffic Signal Detector" manual, TTI Report 1163-1.



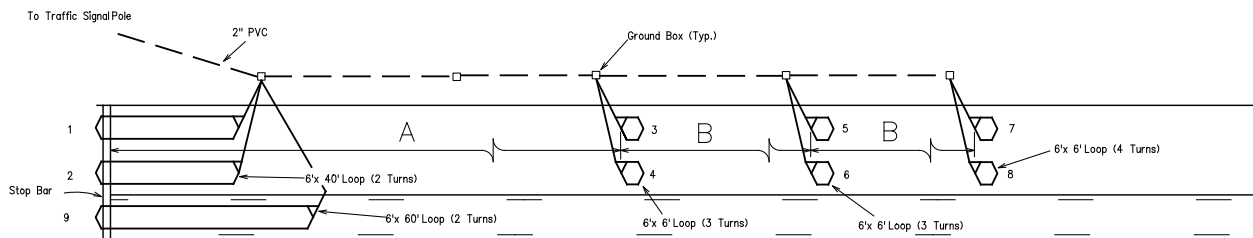
Texas Department of Transportation
Traffic Operations Division

LOOP DETECTOR INSTALLATION DETAILS

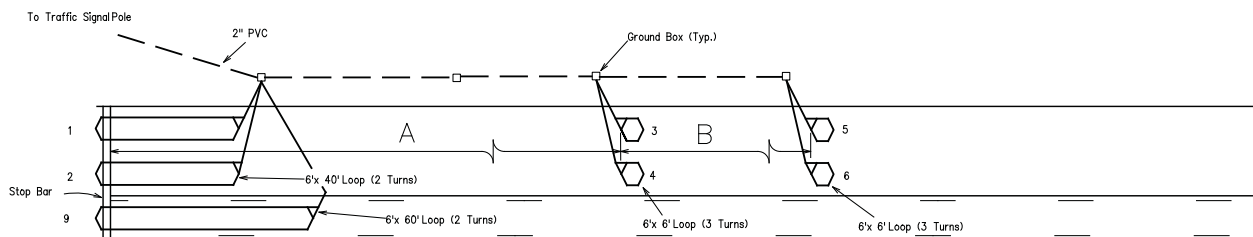
LD(1)-03

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		DIST		COUNTY		SHEET NO.
						85

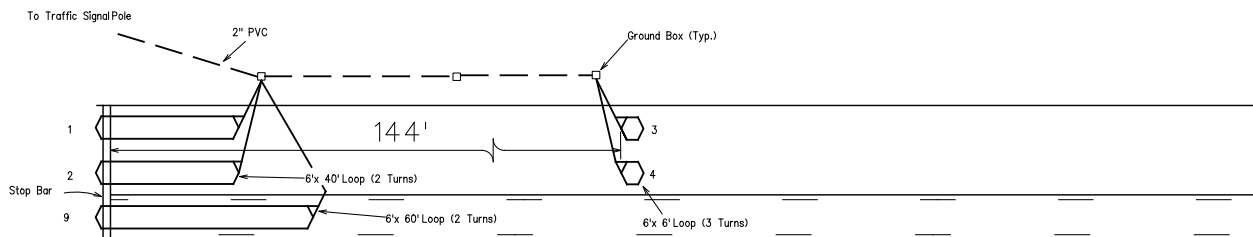
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55 MPH (A=225', B=95') 60 MPH (A=275', B=100')
65 MPH (A=320', B=110') 70 MPH (A=350', B=125')

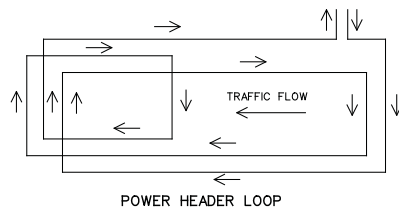
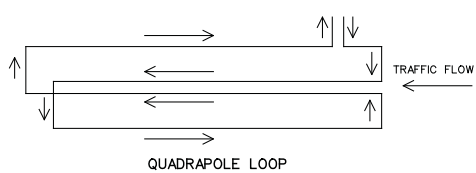


35 MPH (A=90', B=100') 40 MPH (A=110', B=130')
45 MPH (A=175', B=115') 50 MPH (A=220', B=130')



30 MPH

LOOP WINDING DETAILS



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 DETECTOR PLACEMENT DETAILS

LD(2)-03

© TxDOT January 2003	DNV TxDOT	OK TxDOT	DNV TxDOT	OK TxDOT
REVISIONS	CONT	SECT	JOB	HIGHWAY
	DIST		COUNTY	
				SHEET NO.

86

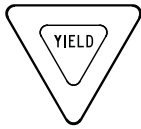
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DATE:
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DATE:
FILE:

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

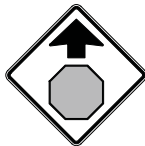
REQUIREMENTS FOR WHITE BACKGROUND REGULATORY SIGNS (EXCLUDING STOP, YIELD, DO NOT ENTER AND WRONG WAY SIGNS)



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	FLUORESCENT 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	FLUORESCENT 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

- 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).
- Sign legend shall use the Federal Highway Administration (FHWA) Standard Highway Alphabets (B, C, D, E, Emod or F).
- 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.
- Black legend and borders shall be applied by screening process or cut-out acrylic non-reflective black film to background sheeting, or combination thereof.
- 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.
- 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.
- Sign substrate shall be any material that meets the Departmental Material Specification requirements of DMS-7110 or approved alternative.
- 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/>

		Traffic Operations Division Standard	
TYPICAL SIGN REQUIREMENTS			
TSR(4)-13			
FILED	tsr4-13.dgn	DW	TxDOT
©TxDOT	October 2003	CONT	SECT
REVISIONS		JOB	HIGHWAY
12-03	7-13	DIST	COUNTY
9-08			SHEET NO.
			88

DATE: _____
FILE: _____

(Descriptive Codes correspond to project estimate and quantities sheets)

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
TEXT 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))
XAL = Extruded Aluminum Sian Panels (see SMD(SLIP-3))

Non-breakaway portion of support (e.g., stub).

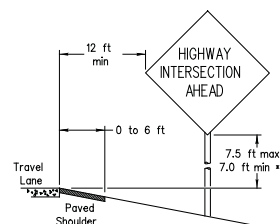
4" max.

60"

Ground Surface

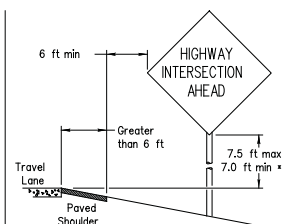
To avoid vehicle undercarriage snagging, any substantial remains of a breakaway support, when it is broken away, should not project more than 4 inches above a 60-inch chord (i.e., typical space between wheel paths).

PAVED SHOULDERS



LESS THAN 6 FT. WIDE

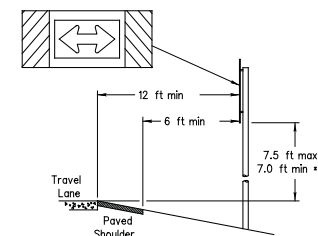
When the shoulder is 6 ft. or less in width, the sign must be placed at least 12 ft. from the edge of the travel lane.



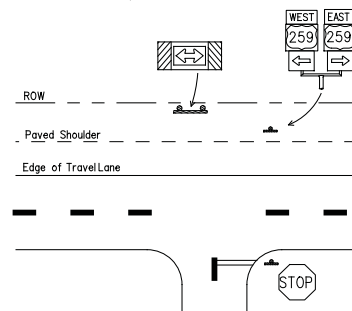
GREATER THAN 6 FT. WIDE

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.



* 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>

The diagrams illustrate two methods for mounting sign panels to a sign post:

- Single Signs:** This method uses a U-bolt to secure the sign panel to the sign post. The components shown are the U-bolt, Sign Post, Sign Clamp, Sign Panel, Nut, lock washer, and Nylon washer, flat washer, lock washer, nut.
- Back-to-Back Signs:** This method uses four sign clamps to secure the sign panel to the sign post. The components shown are the Sign Panel, Sign Post, Sign Clamp, Sign Bolt, Nylon washer, flat washer, lock washer, nut, and Sign Bolt.

Additional details include a dimension of 7.5 ft max / 7.0 ft min for the travel lane and a note about the sign post being 16-18 UNC galvanized square head with nut, lock washer, flat washer and lock washer. The sign post length is 1 inch for aluminum.

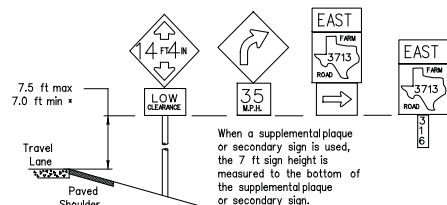
Bolts used to mount sign panels to the clamp are 5/16-18 UNC galvanized square head with nut, nylon washer, flat washer and lock washer. The bolt length is 1 inch for aluminum.

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.

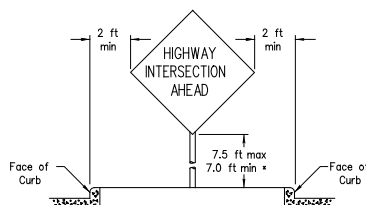
Sign clamps may be either the specific size clamp or the universal clamp.

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"

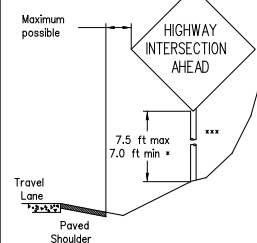
SIGNS WITH PLAQUES



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.

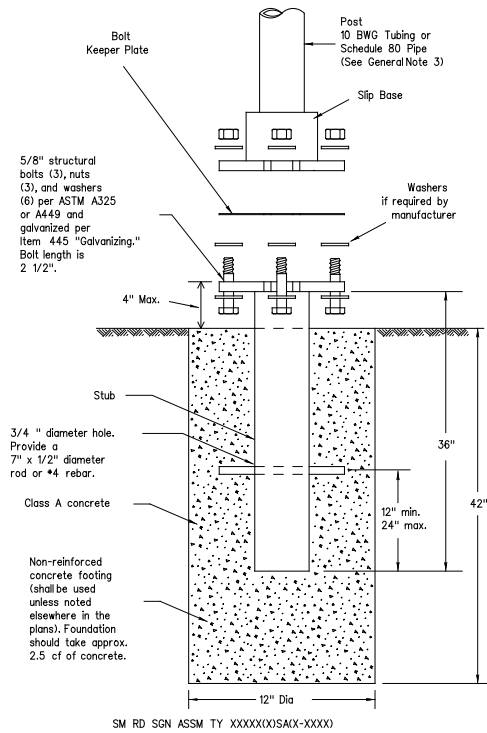


SIGN MOUNTING DETAILS
SMALL ROADSIDE SIGNS
GENERAL NOTES & DETAILS

SMD(GEN)-08

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		DIST			COUNTY	SHEET NO.
						89

TRIANGULAR SLIPBASE INSTALLATION GENERAL REQUIREMENTS



SM RD SGN ASSM TY XXXXX(X)SAX-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:

- 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.
- 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 pre-coated 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
- 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>
- Sign supports shall not be spliced except where shown. Sign support posts shall not be spliced.

ASSEMBLY PROCEDURE

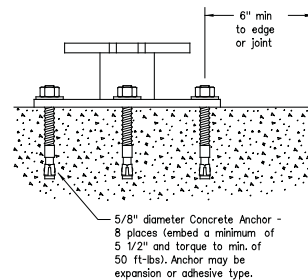
Foundation

- 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.
- 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.
- 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.
- Plumb the stub. Allow a minimum of 4 days to set, unless otherwise directed by the Engineer.
- The triangular slipbase system is multidirectional and is designed to release when struck from any direction.

Support

- 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.
- 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, "Epoxy 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.



SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS TRIANGULAR SLIPBASE SYSTEM

SMD(SLIP-1)-08

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9-08 REVISIONS		CONT	SECT	JOB	HIGHWAY
		DIST		COUNTY	
				SHEET NO.	
				90	

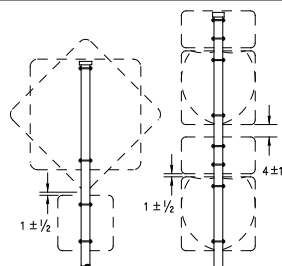
26B

DISCLAIMER: The use of this standard is governed by the Texas Engineering Practice Act. No warranty of any kind is made by TxDOT for any purpose whatsoever. TxDOT assumes no responsibility for the conversion of this standard to other formats or for incorrect results or damages resulting from its use.

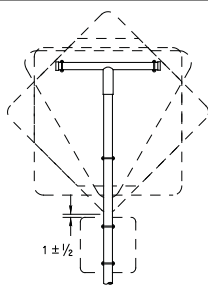
DATE:
FILE:

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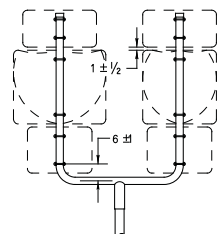
DATE:
FILE:



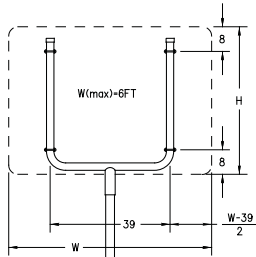
SM RD SGN ASSM TY XXXXX(1)XX(P)



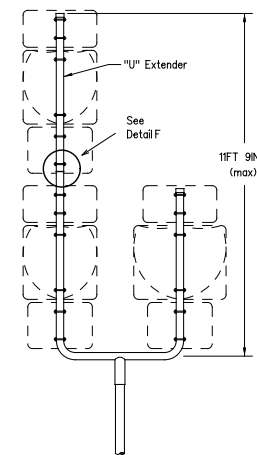
SM RD SGN ASSM TY XXXXX(1)XX(T)



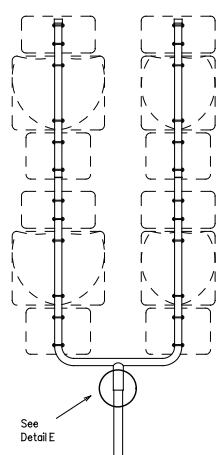
SM RD SGN ASSM TY XXXXX(1)XX(U)



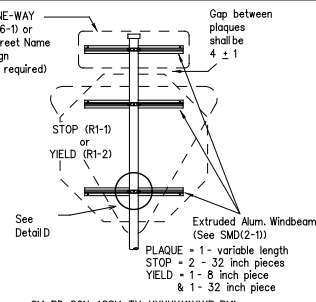
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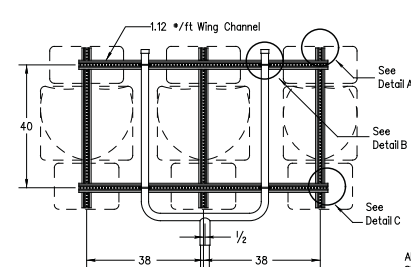
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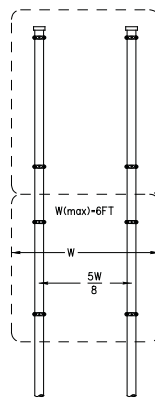
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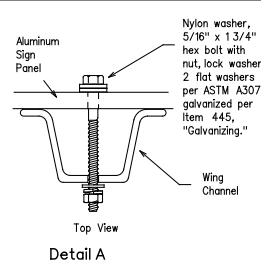
SM RD SGN ASSM TY XXXXX(1)XX(P-BM)



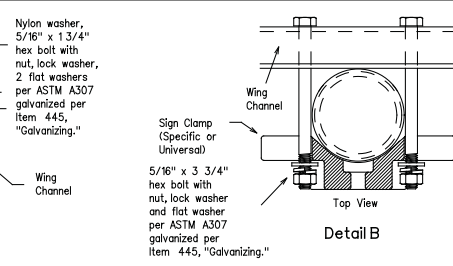
SM RD SGN ASSM TY XXXXX(1)XX(U-WC)
(See Note 11)



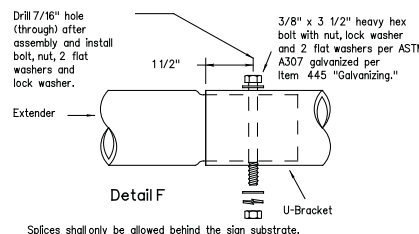
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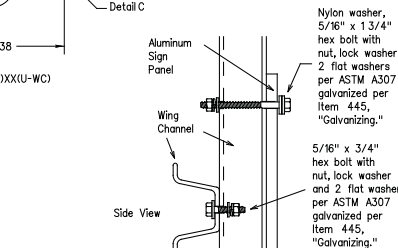
Detail A



Detail B

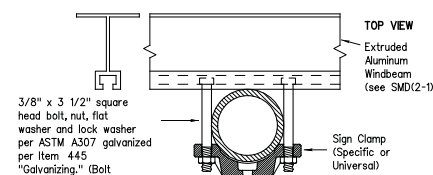


Detail F



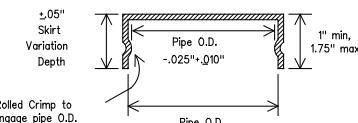
Detail C

SIDE VIEW



Detail D

FRICION CAP DETAIL



Friction caps may be manufactured from hot rolled or cold rolled steelsheets. 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.

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 |
- 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.
- Sign support posts shall not be spliced except where shown. Sign support posts shall not be spliced.
- 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.
- Signs that require specific supports due to reasons in addition to windloading are indicated on the "REQUIRED SUPPORT" table on this sheet.
- 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.
- 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.
- Wing channel shall meet ASTM A 1011 SS Gr 50 and be galvanized per ASTM A 123.
- 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."
- Additional route markers may be added vertically, provided the total sign area does not exceed the maximum allowable amount per Note 1.
- 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.
- Post open ends shall be fitted with Friction Caps.
- Sign blanks shall be the sizes and shapes shown on the plans.

REQUIRED SUPPORT

Regulatory	SIGN DESCRIPTION	SUPPORT
Regulatory	48-inch STOP sign (R1-1)	TY 10BWG(1)XX(T)
	60-inch YIELD sign (R1-2)	TY 10BWG(1)XX(P-BM)
	48x16-inch ONE-WAY sign (R6-1)	TY 10BWG(1)XX(T)
	36x48, 48x36, and 48x48-inch signs	TY 10BWG(1)XX(P-BM)
Warning	48x60-inch signs	TY 10BWG(1)XX(T)
	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)
Warning	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-2)-08

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9-08 REVISIONS	CONT	RECT	JOB	HIGHWAY
DIST	COUNTY			SHEET NO.

DATE: _____
FILE: _____

SUMMARY OF SMALL SIGNS

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

[illegible]

Less than 7.5	0.080"
7.5 to 15	0.100"
Greater than 15	0.125"

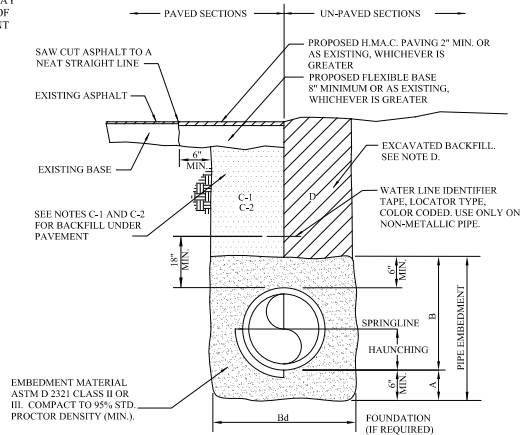
Sign supports shall be located as shown on the plans, except that the Engineer may shift the sign supports, within design guidelines, where necessary to secure a more desirable location or to avoid conflict with utilities. Unless otherwise shown on the plans, the Contractor shall stake and the Engineer will verify all sign support locations.

SUMMARY OF
SMALL SIGNS
SOSS

C:\TxDOT May 1987			
DRW: TxDOT	REVISIONS		
CHK: TxDOT	11-93	7-02	
DRW: TxDOT	8-95	2-07	
CHK: TxDOT	1-02	9-08	
CONT	SECT	JOB	HIGHWAY
DIST	COUNTY		SHEET NO.
			93

NOTES (CUT AND RESTORE):

1. CONSIDER ANY WORK PERFORMED TO REPAIR DAMAGE TO THE EXISTING PAVEMENT LIMITS, AS SHOWN IN THE PLANS, TO BE SUBSIDIARY TO THE PERTINENT ITEMS.
2. REPLACEMENT MATERIAL WILL BE AN ASPHALTIC STABILIZED PAVING MATERIAL AS REQUIRED BY EXISTING CONDITIONS. ENSURE THAT THE THICKNESS OF REPLACEMENT MATERIAL IS 2 INCHES MINIMUM OR EQUIVALENT TO THE THICKNESS OF EXISTING PAVEMENT STRUCTURE, WHICHEVER IS GREATER. ENSURE THAT THE THICKNESS OF REPLACEMENT FLEXIBLE BASE IS 8 INCHES MINIMUM OR EQUIVALENT TO THE THICKNESS OF EXISTING PAVEMENT STRUCTURE, WHICHEVER IS GREATER.
3. PAYMENT FOR CUTTING AND RESTORING PAVEMENT AS SHOWN IN THE PLANS SHALL BE MADE AT THE UNIT PRICE BID FOR "CUTTING AND RESTORING PAVEMENT".



NOTES:

- A. BEDDING SHALL BE PLACED, HAND LEVELED, AND COMPACTED BEFORE PIPE IS LAID, UP TO BOTTOM OF PIPE (MIN. THICKNESS = 6").
- B. BACKFILL PLACED AND COMPACTED AFTER PIPE IS LAID, FROM BOTTOM OF PIPE TO 6" ABOVE THE TOP OF PIPE. WORK IN UNDER PIPE HAUNCHES AND COMPACT BY HAND TO SPRING LINE. USE VIBRATORY-TYPE COMPACTORS FOR LIFTS ABOVE THE SPRING LINE. MAXIMUM 6" LIFTS.
- Bd. MINIMUM TRENCH WIDTH: PIPE O.D. + 16" OR PIPE O.D. X 1.25 + 12", WHICHEVER IS GREATER.
- C-1 (CITY STREETS, PARKING AREA, AND DRIVEWAYS) SELECT EXCAVATED BACKFILL MECHANICALLY COMPACTED TO 95% STANDARD PROCTOR DENSITY IN 8" MAX. LIFTS.
- C-2 (STATE MAINTAINED ROADWAY) SAND/CEMENT STABILIZED BACKFILL WITH 7% PORTLAND CEMENT COMPACTED TO 95% STANDARD PROCTOR DENSITY.
- D. EXCAVATED EARTH BACKFILL MECHANICALLY COMPACTED IN 12" MAX. LIFTS. MINIMUM STANDARD PROCTOR DENSITY: 90% OUTSIDE RIGHT OF WAY; 95% INSIDE RIGHT OF WAY.

EMBEDMENT MATERIAL SHALL BE IN ACCORDANCE WITH THE REQUIREMENTS OF ASTM D 2321. EMBEDMENT MATERIAL SHALL BE CLASS II OR III WITH < 50% PASSING A No. 200 SIEVE AND PLASTICITY INDEX < 7.

WHERE THIS STANDARD CONFLICTS WITH THE RECOMMENDATION OF ANY GEOTECHNICAL REPORT, OBTAIN WRITTEN CLARIFICATION FROM THE UTILITY ENGINEER PRIOR TO CONSTRUCTION.

FOUNDATION PREPARATION USING COBBLES, GRAVEL, CEMENT STABILIZATION, OR OTHER METHODS AS DIRECTED BY THE ENGINEER SHALL BE REQUIRED WHEN TRENCH BOTTOM IS UNSTABLE.

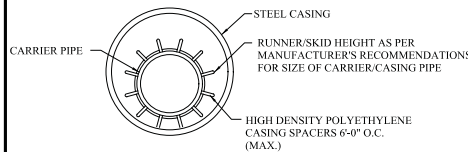
BACKFILLING AT STRUCTURES SHALL BE PLACED IN UNIFORM LAYERS, AND COMPACTED TO 95% STANDARD PROCTOR DENSITY IN 6" MAXIMUM LIFTS. STRUCTURE BACKFILL MATERIAL SHALL BE SAND.

PAY ITEM FOR INSTALLATION OF THE VARIOUS DIAM PIPES BY TRENCHING INCLUDES INSTALLATION OF A, B, C-1 OR C-E, D AND FOUNDATION PREPARATION IF NEEDED. PAYMENT SHALL BE MADE PER LINEAR FT AT THE UNIT PRICE BID FOR "VARIOUS PIPE DIAMETER PVC (TRENCH)".

WATER LINE BEDDING DETAIL & CUT AND RESTORE

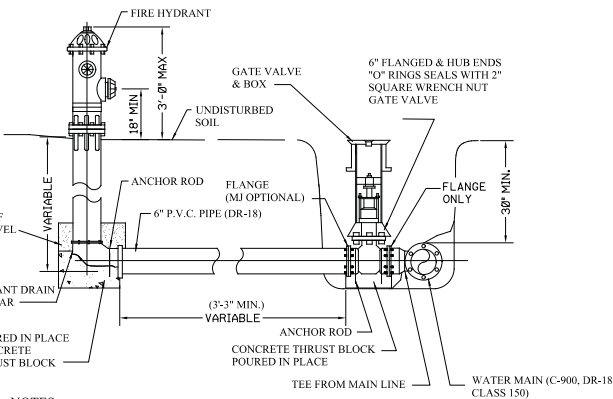
GENERAL NOTES:

1. ALL STEEL CASING SHALL BE WELDED.
2. STEEL CASING SHALL BE CLOSED AT EACH END USING USING SYNTHETIC RUBBER END SEALS.
3. CASING SPACERS SHALL BE USED TO INSTALL THE CARRIER PIPE INSIDE THE ENCASMENT PIPE. CASING SPACERS SHALL FASTEN TIGHTLY ON THE CARRIER PIPE TO PREVENT RELATIVE MOVEMENT ON PIPE DURING INSTALLATION. CASING SPACERS SHALL BE DOUBLED ON EACH END OF THE ENCASMENT.
4. PROJECTION TYPE CASING SPACERS SHALL BE CONSTRUCTED SECTIONS OF HIGH DENSITY POLYETHYLENE.
5. INSTALLATION AND SIZE OF SPACERS SHALL BE PER MANUFACTURER'S RECOMMENDATIONS.



BORING INSTALLATION		
CARRIER PIPE SIZE	PIPE CASING SIZE	MIN. WALL THICKNESS
6"	14"	0.3125"
8"	16"	0.3125"
10"	18"	0.3125"
12"	24"	0.4375"
16"	26"	0.4375"
18"	30"	0.5000"
24"	36"	0.5625"
36"	48"	0.6250"

UTILITY LINE BORE DETAIL

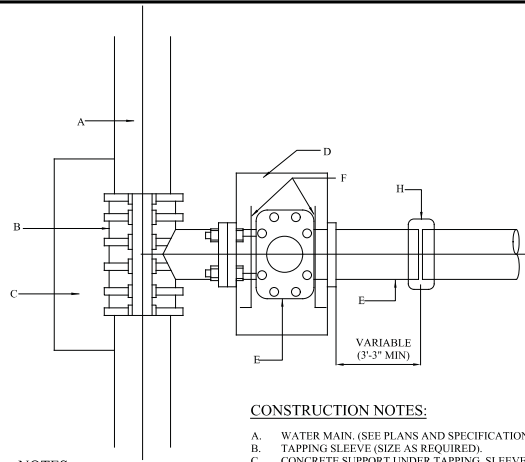


NOTES:

1. FIRE HYDRANT ELEVATIONS WILL BE SET BY THE ENGINEER.
2. FLANGE MUST BE AT FINISHED GRADE OR 3" TO 6" ABOVE NATURAL GROUND OR TOP OF CURB.
3. FLANGED GATE VALVE INSTALLATION TO BE USED WITH 10" WATER LINES OR GREATER.
4. BBF TEES TO BE USED WITH 10" WATER LINE OR GREATER BBF TEES TO BE USED WITH SMALLER DIA. PIPES.
5. ACCEPTABLE HYDRANT BRANDS ARE MUELLER, AMERICAN DARLING AND KENNEDY.

TYPICAL FIRE HYDRANT INSTALLATION

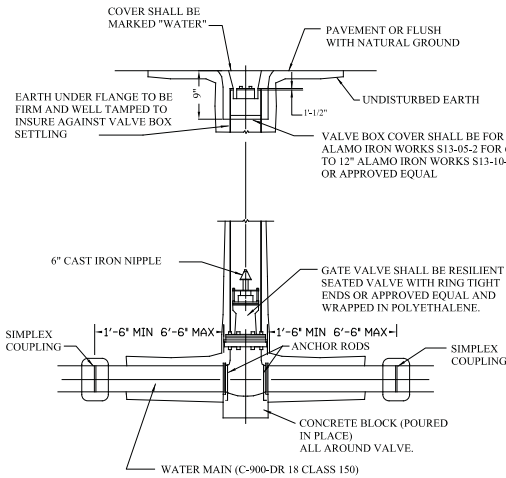
NO.	DATE	REVISION	APP.
 AUTHORIZED 11-21-2019			
 CITY OF McALLEN TEDSI INFRASTRUCTURE GROUP Consulting Engineers 1201 E. Expressway 83 Mission, Texas 78572 (956) 424-7000			
23rd STREET/DICKER ROAD WATER LINE PROJECT			
WATERLINE DETAILS			
SHEET 1 OF 5			
FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
6			99
STATE	DIST.	COUNTY	
TEXAS	PHR	HIDALGO	
CONT.	SECT.	JOB	HIGHWAY NO.



NOTES:

- ALL CONCRETE TO HAVE A MINIMUM OF 28 DAYS COMPRESSIVE STRENGTH OF 3,000 P.S.I.
- PAY ITEM INCLUDES ALL ELEMENTS SHOWN IN DETAIL.

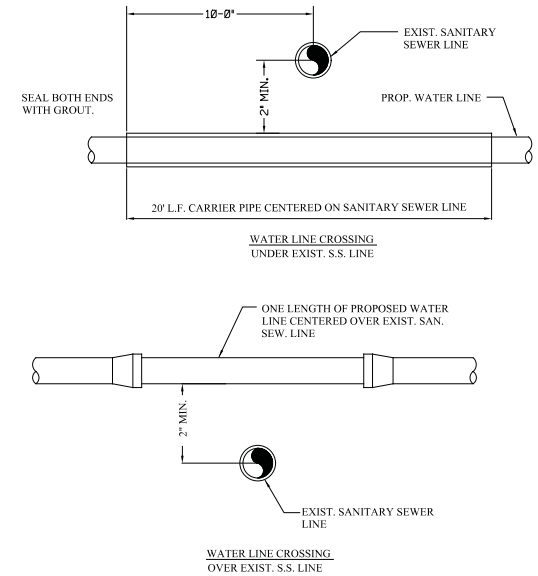
WATER TAPPING SLEEVE & VALVE INSTALLATION



NOTES:

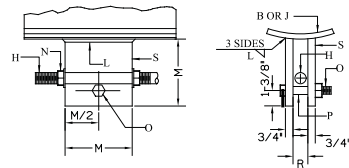
- CAST IRON BOOT TO BE USED IN HEAVY TRAFFIC AREAS CONCRETE BLOCK (POURED IN PLACE)
- PAY ITEM INCLUDES ALL ELEMENTS SHOWN IN DETAIL.

TYPICAL VALVE & VALVE BOX

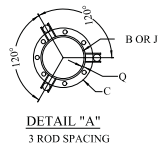


WATER LINE CROSSING DETAIL

NO.	DATE	REVISION	APP.

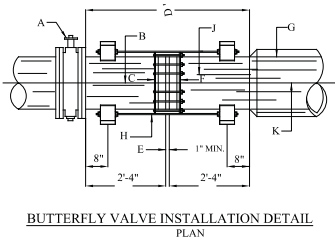


THRUST RESTRAINT DETAILS



DETAIL "A" 3 ROD SPACING

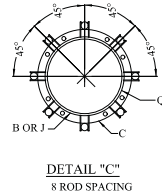
DETAIL "B" 6 ROD SPACING



BUTTERFLY VALVE INSTALLATION DETAIL PLAN

NOTES:

- PAY ITEM INCLUDES ALL ELEMENTS SHOWN IN DETAIL.



DETAIL "C" 8 ROD SPACING

BUTTERFLY VALVE DETAIL

CONSTRUCTION NOTES:

- FLANGED BUTTERFLY VALVE.
- PIPE SPOOL, FLANGE TO PLAIN END.
- DRESSER COUPLING, LONG BODY SEE SPECS.
- SURFACE TO BE TAR PAPER, WRAPPED AS PER AWWA SPECS' C 209.
- JOINT GAP, 1" MIN. SEE SPECS.
- APPLY COAL-TAR ENAMEL.
- GROUT.
- ROD, TO BE A-36 STEEL, SEE CHART BELOW.
- PIPE SPOOL, PLAIN END.
- CONCRETE CYLINDER PIPE.
- WELD, SEE CHART BELOW.
- PLATE LENGTH, SEE CHART BELOW.
- NUT AND WASHER, EACH END.
- BOLT 1/2" DIA.
- PIPE SPACER, 1/2" I.D.
- SPOOL, PLAIN END.
- ROD DIA. DIA PLUS 1/8".
- 3/4" STEEL PLATE.

GENERAL NOTES:

PIPE DIA.	ROD DIA. (H)	WELD (L)	PLATE LGTH. (M)	MIN. SPOOL THICKNESS (Q)	ROD SPACING DETAILS
16"	7/8"	1/4"	6"	1/4"	"A"
18"	1"	1/4"	6"	1/4"	"A"
20"	1 1/8"	1/4"	8"	1/4"	"A"
24"	1 3/8"	1/4"	8"	1/4"	"A"
30"	1 3/8"	1/4"	8"	1/4"	"B"
36"	1 1/2"	5/16"	8"	5/16"	"B"
42"	1 1/2"	5/16"	8"	5/16"	"C"



AUTHORIZED 11-21-2019

**CITY OF
McALLEN**

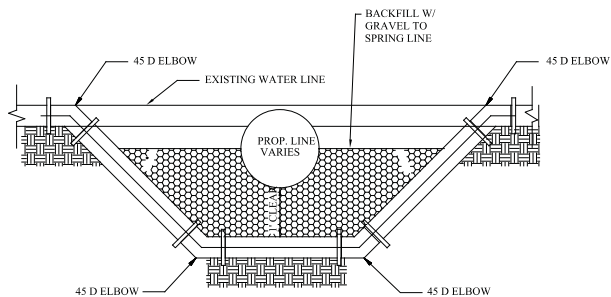
TEDSI INFRASTRUCTURE GROUP
Consulting Engineers
1201 E. Expressway 83
Mission, Texas 78572
(956) 424-7998

**23rd STREET/DICKER ROAD
WATER LINE PROJECT**

**WATERLINE
DETAILS**

FED. RD. DIV. NO.	PROJECT NO.	SHEET NO.
6		100
STATE	DIST.	COUNTY
TEXAS	PHR	HIDALGO
CONT.	SECT.	JOB
		HIGHWAY NO.

SHEET 2 OF 5

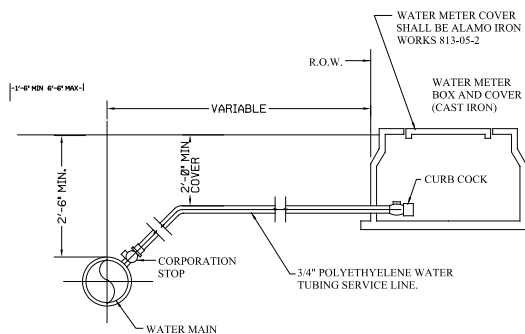


WATER LINE ADJUSTMENT PVC

NOTE:

ALL BENDS AND JOINTS MUST BE SUPPORTED BY A CONC. THRUST BLOCK, APPROVED EQUAL OR AS DIRECTED BY ENGINEER

**WATER LINE ADJUSTMENT
DETAIL**



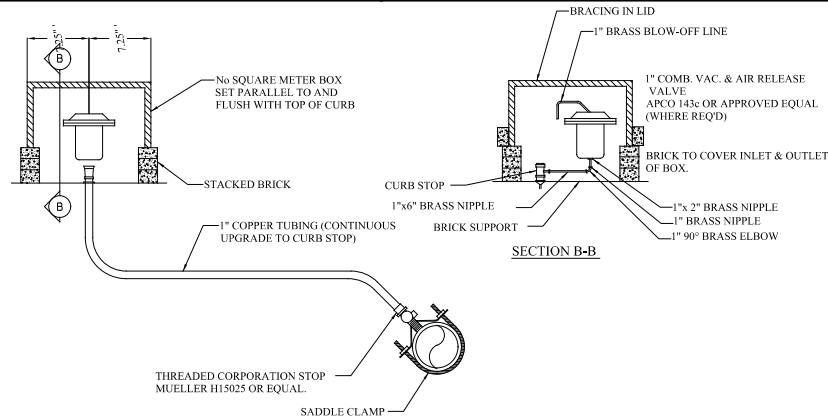
**TYPICAL SERVICE
CONNECTION
WITH METER BOX**

NOTES:

1. ALL SERVICE CONNECTIONS NEED TO HAVE A MIN. 2'-0" COVER FROM FINISHED GRADE.
2. WATER METER COVER SHALL BE ALAMO IRON WORKS 813-05-2.
3. ALL WATER MAINS HAVE 30 INCHES OF COVER FROM FINISHED GRADE.
4. METER BOX SHALL BE CAST IRON.
5. ALL CONCRETE TO HAVE A MIN. 28 DAYS COMPRESSIVE STRENGTH OF 3,000 P.S.I.
6. 2" GATE VALVE ONLY REQUIRED FOR 2" SERVICE.
7. POLYETHYLENE TUBING ACCEPTABLE FOR LINE SIZES 1" OR LESS, SCHEDULE 40 PVC REQUIRED FOR LINE SERVICES GREATER THAN 1".

CONSTRUCTION NOTES:

- A. WATER VALVE COVER
- B. CURB COCK
- C. METER BOX & METER PROVIDED
- D. WATER TUBING SERVICE LINE
- E. CORPORATION STOP
- F. WATER MAIN



**TYPICAL 1" AIR RELEASE
VALVE**

NO.	DATE	REVISION	APP.

JOSE A. SANCHEZ
87890
PROFESSIONAL ENGINEER
STATE OF TEXAS

AUTHORIZED 11-21-2019

**CITY OF
McALLEN**

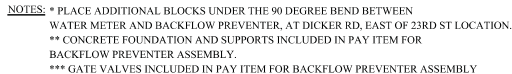
TEDSI INFRASTRUCTURE GROUP
Consulting Engineers
1201 E. Expressway 83
Mission, Texas 78572
(956) 424-7900

**23rd STREET/DICKER ROAD
WATER LINE PROJECT**

**WATERLINE
DETAILS**

SHEET 3 OF 5

FED. RD. DIV. NO.	PROJECT NO.	SHEET NO.
6		101
STATE	DIST.	COUNTY
TEXAS	PHR	HIDALGO
CONT.	SECT.	JOB
		HIGHWAY NO.



REFER TO CITY OF MCALLEN
STANDARD DESIGN GUIDE
DETAIL 223.1 223.2



NOTES:

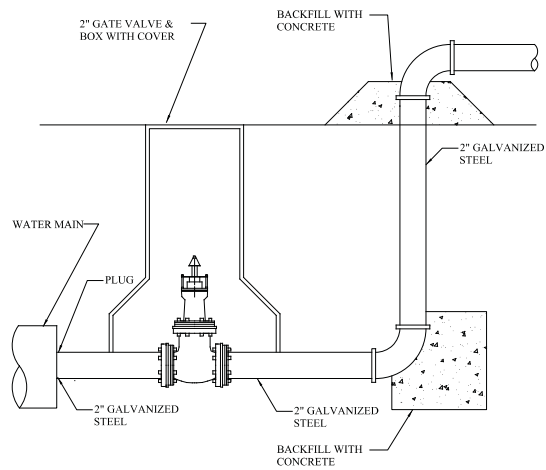
1. THRUST BLOCKING TO BE PLACED AT ALL DEAD ENDS, TEES, BENDS, WYES, AND REDUCERS AND OTHER AREAS THAT REQUIRE THRUST RESISTANCE.
2. MINIMUM AREAS SHOWN ARE IN SQUARE FEET, BLOCK WEIGHTS FOR VERTICAL BENDS ARE IN POUNDS.
3. THRUST BLOCKING AREAS SHOWN ARE BASED ON A TEST PRESSURE OF 150 P.S.I., SOIL BEARING PRESSURE OF 2000 PSF, AND MINIMUM 30% COVER. IF REQUIRED TEST PRESSURE IS LESS OR THE SOIL BEARING CAPACITY IS GREATER, THE CONTRACTOR MAY, AFTER APPROVAL BY THE ENGINEER, REDUCE THE THRUST BLOCK AREA SHOWN. THRUST BLOCKING AREA SHALL BE INCREASED IF SOIL BEARING CAPACITY IS LESS THAN 2000 PSF.
4. AT DOWNWARD VERTICAL BENDS, PIPING SHALL BE RESTRAINED BY THRUST BLOCK AS SHOWN WITH WEIGHT INDICATED IN THE TABLE. ANCHOR RODS OR FLAT BARS SHALL BE STAINLESS STEEL.
5. BEARING MUST BE ON UNDISTURBED EARTH.
6. USE 3000 PSI CONCRETE.
7. RESTRAINING JOINTS MAY BE REQUIRED AS SHOWN ON THE PLANS OR DIRECTED BY THE ENGINEER.
8. THRUST BLOCK SHALL BEAR ON FULL 180° OF CIRCUMFERENCE OF PIPE.
9. THRUST BLOCKS WILL NOT BE PAID FOR DIRECTLY BUT WILL BE SUBSIDIARY TO THE VARIOUS BID ITEMS.



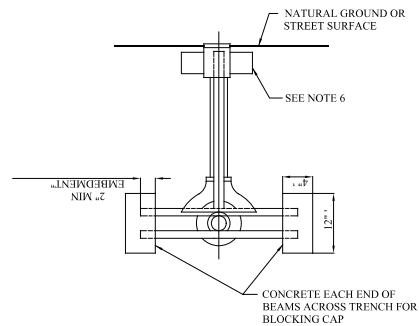
STATIONARY BOLLARD
SPACING DETAIL FOR
WATER METER/BACKFLOW
PREVENTER PROTECTION



NO. DATE	REVISION	APP.	
  AUTHORIZED 11-21-2019			
 CITY OF McALLEN			
TESDI <i>Consulting Engineer</i> 1201 E. Expressway 8 Mission, Texas 78572 956.426-790			
23rd STREET/DICKER ROAD WATER LINE PROJECT			
WATERLINE DETAILS			
SHEET 4 OF 5			
FED. RD. DIV. NO. 6	PROJECT NO.		SHEET NO. 102
STATE TEXAS	DIST. PHR	COUNTY HIDALGO	
CONT.	SECT.	JOB	HIGHWAY NO.



TYPICAL 2" BLOW-OFF VALVE



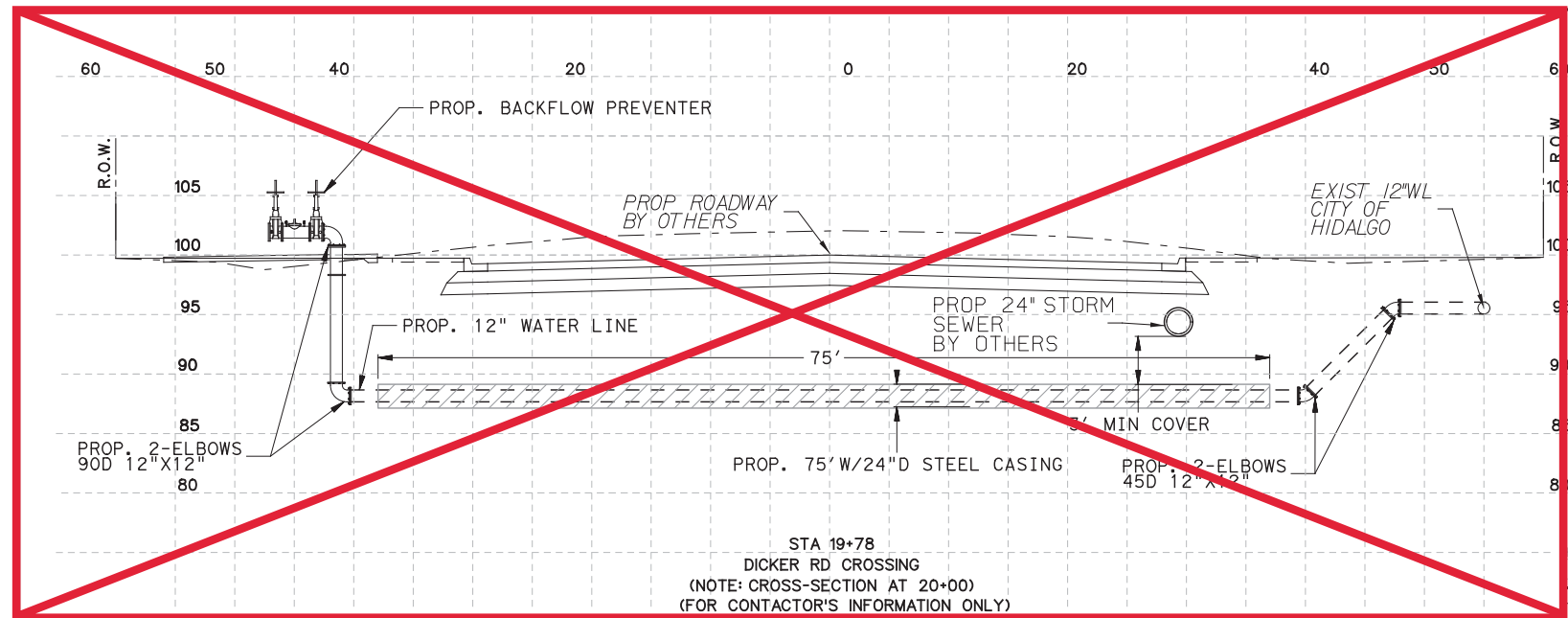
BLOW-OFF VALVE INSTALLATION

BEAM SCHEDULE		
SIZE MAIN	SIZE AND TYPE BEAM	No. OF BEAMS
2"	2" STEEL PIPE	2
8"	3" STEEL PIPE	2
12"	5" I 10.0#	2
16"	6" I 17.25#	2
20"	8" I 18.4#	2
24"	10" I 25.4#	2
30"	12" I 35.0#	2
36"	15" I 50.0#	2

NOTES:

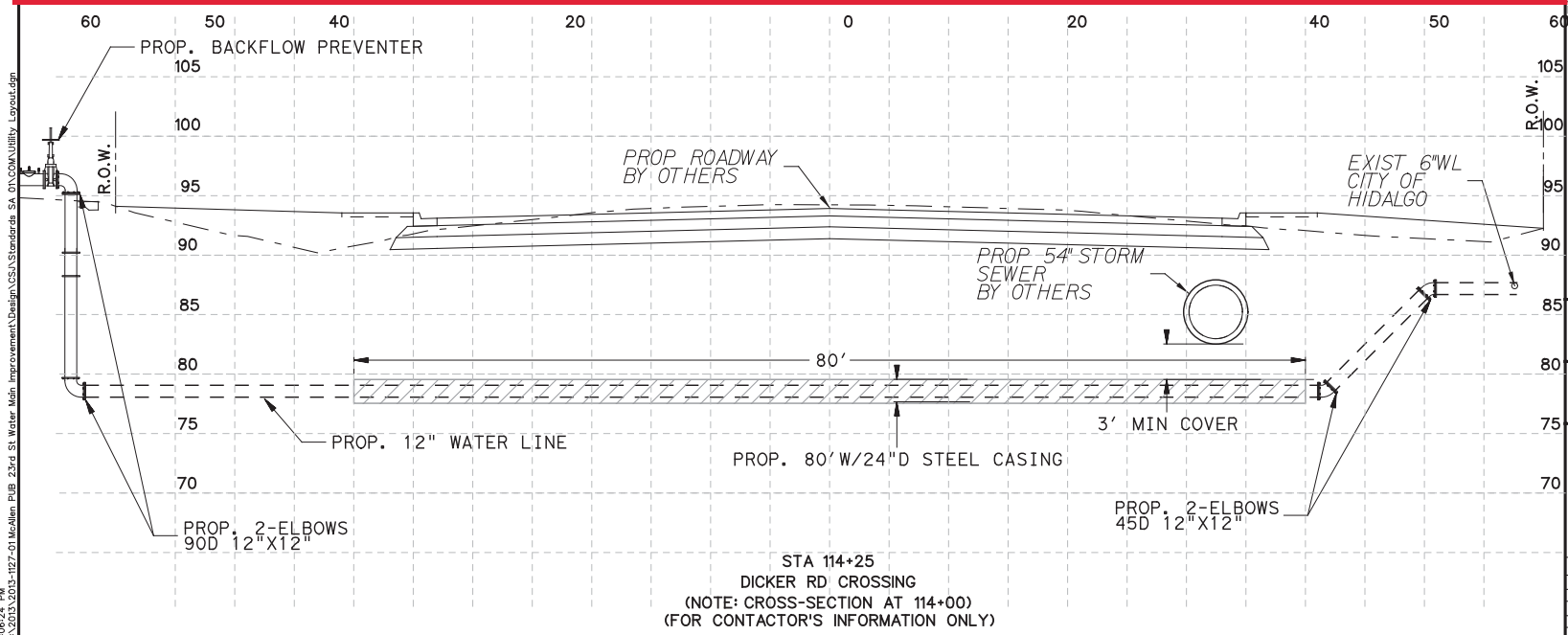
1. ALL DEAD-ENDS ON NEW WATER LINES SHALL BE EQUIPPED WITH A SUITABLE BLOW-OFF FACILITY, OR AS DIRECTED BY THE ENGINEER.
2. EMBED ALL C.I. FITTINGS IN SAND.
3. BEAM SCHEDULE SHALL BE USED FOR END CAPS AND PLUGS, OMITTING BLOW-OFF FITTINGS.
4. BEAMS SHALL EXTEND BEYOND TRENCH WALLS.
5. ALL CONCRETE TO HAVE A MIN. 28 DAYS COMPRESSIVE STRENGTH 3,000 P.S.I.
6. MIN. OF 9 SY. COMPACTION AROUND INSTALLATION.

NO.	DATE	REVISION	APP.
JOSE A. SANCHEZ 87890 PROFESSIONAL ENGINEER AUTHORIZED 11-21-2019			
CITY OF McALLEN TEDSI INFRASTRUCTURE GROUP Consulting Engineers 1201 E. Expressway 83 Mission, Texas 78572 (956) 424-7800			
23rd STREET/DICKER ROAD WATER LINE PROJECT WATERLINE DETAILS			
FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
6			102A
STATE	DIST.	COUNTY	
TEXAS	PHR	HIDALGO	
CONT.	SECT.	JOB	HIGHWAY NO.



HORIZONTAL & VERTICAL SCALE APPROXIMATELY 1" = 10'

NO.	DATE	REVISION	APP.



JOSE A. SANCHEZ
87890
PROFESSIONAL ENGINEER

AUTHORIZED 05-30-2018

CITY OF McALLEN

TEDSI INFRASTRUCTURE GROUP
Consulting Engineers
1201 E. Expressway 83
Mission, Texas 78572
(956) 424-7000

23rd STREET/DICKER ROAD WATER LINE PROJECT 12" LINE UTILITY CROSSING DETAIL				SHEET 1 OF 1
FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.	
6			103	
STATE	DIST.	COUNTY		
TEXAS	PHR	HIDALGO		
CONT.	SECT.	JOB	HIGHWAY NO.	

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HIDALGO COUNTY
IRRIGATION DISTRICT
No. 2

PROPOSED WATER LINE CITY OF MCALLEN
24" STEEL CASING
12" PVC WATER LINE C-900

SPACING OF PROPOSED CONCRETE PIPE SUPPORTS/PILES

PROPOSED CONCRETE PIPE SUPPORT
(REFER TO STRUCTURAL SHEETS)

ACCESS RD

DICKER RD

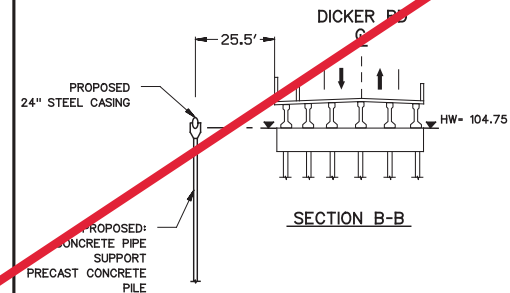
CENTERLINE (CL)

EXISTING BRIDGE

ACCESS RD

ACCESS RD

NOTE: FOR CONTRACTOR'S
INFORMATION ONLY



HORIZONTAL SCALE
APPROXIMATELY 1" = 40'

0 10 20 30 40

VERTICAL SCALE
APPROXIMATELY 1" = 20'

0 5 10 15 20

NO.	DATE	REVISION	APP.



AUTHORIZED 03-18-2015

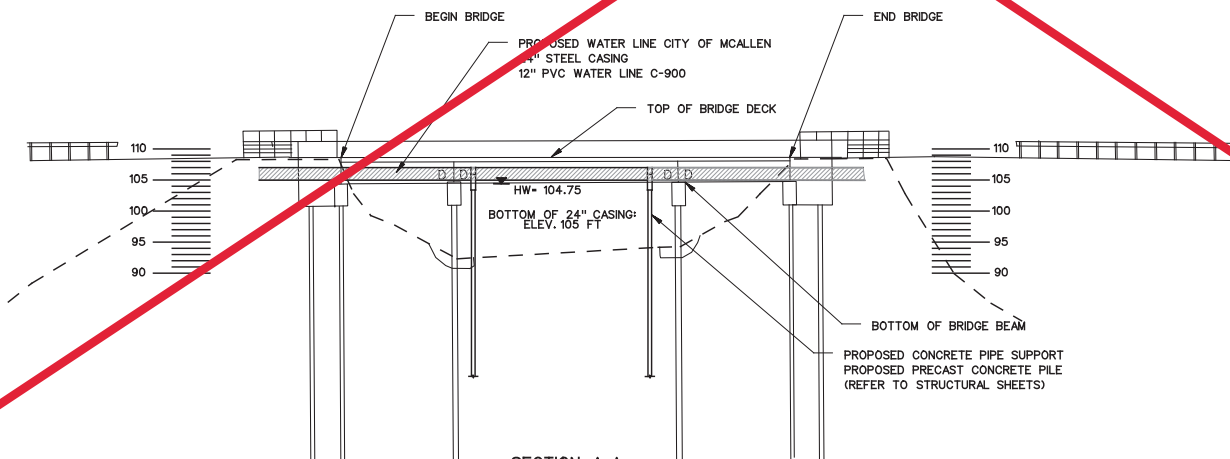
**CITY OF
McALLEN**

TEDSI INFRASTRUCTURE GROUP
Consulting Engineers
1201 E. Expressway 83
Mission, Texas 78572
(956) 424-7800
TBPE F-1640

**23rd STREET/DICKER ROAD
WATER LINE PROJECT
16" LINE
HIDALGO COUNTY IRRIGATION
DISTRICT No. 2
BRIDGE LAYOUT**

FED. RD. DIV. NO.	PROJECT NO.	SHEET NO.
6		104
STATE	DIST.	COUNTY
TEXAS	PHR	HIDALGO
CONT.	SECT.	JOB
		HIGHWAY NO.

NOTE: FOR CONTRACTOR'S
INFORMATION ONLY



SECTION A-A

NOTE: FOR CONTRACTOR'S
INFORMATION ONLY

GENERAL NOTES:

- CRUSHED ROCK BEDDING PLACED, HAND LEVELED, AND COMPACTED BEFORE PIPE IS LAID, UP TO BOTTOM OF PIPE (MIN. THICKNESS = 6").
- CRUSHED ROCK BACKFILL PLACED AND COMPACTED AFTER PIPE IS LAID, FROM BOTTOM OF PIPE TO 12" ABOVE THE TOP OF PIPE. WORK IN UNDER PIPE HAUNCHES AND COMPACT BY HAND TO SPRING LINE. USE VIBRATORY-TYPE COMPACTORS FOR LIFTS ABOVE THE SPRING LINE. MAXIMUM 6" LIFTS.
- MINIMUM TRENCH WIDTH: PIPE O.D. + 6" (FOR 16" PIPE AND SMALLER); PIPE O.D. X 1.25 + 12" (FOR 18" PIPE AND LARGER)
- (CITY STREETS, PARKING AREA, AND DRIVEWAYS) SELECT EXCAVATED BACKFILL MECHANICALLY COMPACTED TO 95% STANDARD PROCTOR DENSITY IN 8" MAX. LIFTS.
- (STATE MAINTAINED ROADWAY) SAND/CEMENT STABILIZED BACKFILL WITH 7% PORTLAND CEMENT COMPACTED TO 95% STANDARD PROCTOR DENSITY.
- EXCAVATED EARTH BACKFILL MECHANICALLY COMPACTED IN 12" MAX. LIFTS. MINIMUM STANDARD PROCTOR DENSITY: 90% OUTSIDE RIGHT OF WAY, 95% INSIDE RIGHT OF WAY

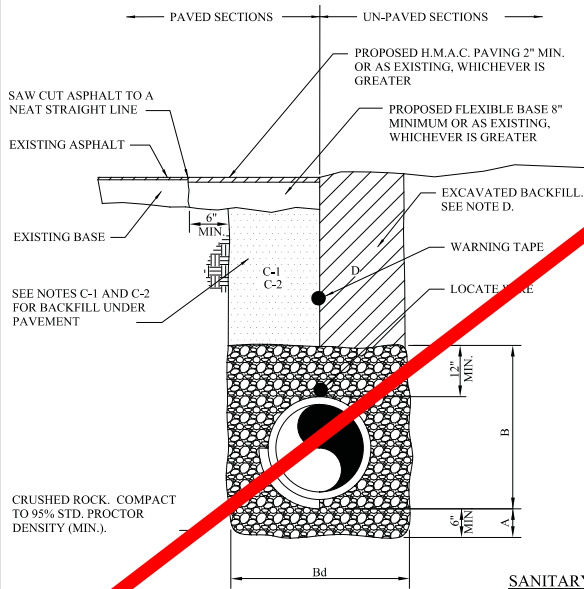
EMBEDMENT SHALL BE IN ACCORDANCE WITH THE REQUIREMENTS OF ASTM D 2321. EMBEDMENT MATERIAL SHALL BE CLASS 1A (CRUSHED ROCK) OR 1B (CRUSHED ROCK-SAND MIXTURE) WITH LESS THAN 50% PASSING A No. 4 SIEVE. MAXIMUM $\frac{3}{4}$ " SIZE FOR PIPE SIZE ≤ 15 ". GREATER THAN 90% OF CRUSHED ROCK SHALL HAVE AT LEAST THREE BROKEN FACES. NO MORE THAN 2% UNBROKEN FRACTION ALLOWED.

IN SATURATED OR UNSTABLE SOILS, EMBEDMENT SHALL BE CLASS 1B ONLY (SEE SPECIFICATIONS FOR GRADATION REQUIREMENTS).

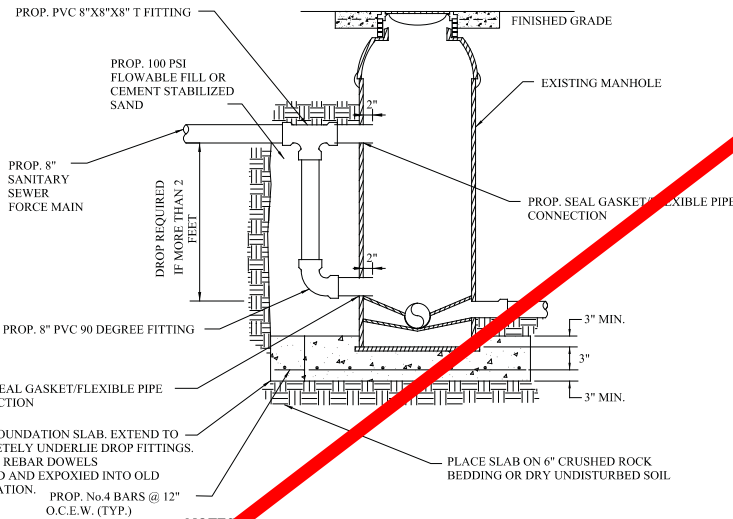
WHERE THIS STANDARD CONFLICTS WITH THE RECOMMENDATION OF ANY GEOTECHNICAL REPORT, OBTAIN WRITTEN CLARIFICATION FROM THE UTILITY ENGINEER PRIOR TO CONSTRUCTION.

FOUNDATION PREPARATION USING COBBLES, GRAVEL, CEMENT STABILIZATION, OR OTHER METHODS AS APPROVED BY THE ENGINEER SHALL BE REQUIRED WHEN TRENCH BOTTOM IS UNSTABLE.

BACKFILLING AT STRUCTURES SHALL BE PLACED IN UNIFORM LAYERS, AND COMPACTED TO 95% STANDARD PROCTOR DENSITY IN 6" MAXIMUM LIFTS. STRUCTURE BACKFILL MATERIAL SHALL BE SAND.



SANITARY SEWER
PIPE BEDDING DETAIL



NOTES:

- INSTALL DROP CONNECTION INTO EXISTING MANHOLE.
- BACKFILL SHALL BE SAND COMPACTED TO 95% STANDARD PROCTOR.
- DROP CONNECTION INTO EXISTING MANHOLE SHALL BE AIR TIGHT, WATER TIGHT AND SEAL GASKET/FLEXIBLE PIPE CONNECTION BE INSTALLED IN STRICT ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS.
- FOUNDATION SLAB, BACKFILL, SEAL GASKET/FLEXIBLE PIPE CONNECTION SUBSIDIARY TO SANITARY SEWER MANHOLE DROP CONNECTION.

8" DROP CONNECTION
EXISTING SANITARY SEWER
MANHOLE

GENERAL NOTES (CONT):

A METALLIC CORE OR METALLIC FACED, ACID AND ALKALI RESISTANT, POLYETHYLENE PLASTIC WARNING TAPE MANUFACTURED SPECIFICALLY FOR WARNING AND IDENTIFICATION OF BURIED UTILITY LINES TO BE PLACED ALONG THE ENTIRE LENGTH OF THE FORCE MAIN. METALLIC AND NON-METALLIC. THE TAPE SHALL HAVE A 3 INCH MINIMUM WIDTH, COLOR CODED FOR THE INTENDED UTILITY WITH WARNING AND IDENTIFICATION IMPRINTED IN BOLD BLACK LETTERS CONTINUOUSLY OVER THE ENTIRE TAPE LENGTH. WARNING AND IDENTIFICATION TO READ "CAUTION, BURIED FORCE MAIN BELOW" OR SIMILAR WORDING. COLOR AND PRINTING SHALL BE PERMANENT, UNAFFECTED BY MOISTURE OR SOIL.

THE TAPE SHALL HAVE A MINIMUM STRENGTH OF 1500 PSI LENGTHWISE AND 150 PSI CROSSWISE, WITH A MAXIMUM 350 PERCENT ELONGATION. THE TAPE SHALL BE ABLE TO BE DETECTED WITH A METAL DETECTOR WHEN THE TAPE IS BURIED UP TO 3 FEET DEEP.

FOR SANITARY FORCE MAIN, LOCATOR WIRE SHALL BE INSTALLED ALONG THE TOP AND TAPED TO THE PIPE. ACCESS POINTS FOR THE LOCATOR WIRE SHALL BE PLACED EVERY 400 FEET. ACCESS POINTS SHALL BE 4-INCH DIAMETER PVC WITH THREADED METALLIC CAPS PAINTED GREEN. PIPE SHALL BE FLUSH WITH GRADE. WIRE SHALL BE PULLED TO WITHIN 6-INCHES OF THE TOP OF THE PIPE. FOR TRENCH INSTALLATIONS ONE (1) LOCATE WIRE IS ACCEPTABLE. FOR TRENCHLESS INSTALATIONS TWO (2) LOCATE WIRES ARE REQUIRED FOR REDUNDANCY.

NO.	DATE	REVISION	APP.
 AUTHORIZED 05-30-2018			
 CITY OF McALLEN			
 TEDSI INFRASTRUCTURE GROUP Consulting Engineers 1201 E. Expressway 83 Mission, Texas 78572 (956) 424-7000			
23rd STREET/DICKER ROAD WATER LINE PROJECT			
SANITARY SEWER DETAILS			
SHEET 1 OF 1			
FED. HIGHWAY DIST. NO.	PROJECT NO.		SHEET NO.
6			107
STATE	DIST.	COUNTY	
TEXAS	PHR	HIDALGO	
CONT.	SECT.	HIGHWAY NO.	

01030 SPECIAL PROCEDURES

1.00 GENERAL

- A. Consider the sequences, duration limitations, and governing factors outlined in this Section to prepare the schedule for the work.
- B. Perform the work not specifically described in this Section as required to complete the entire project within the contract time.

1.01 WATERLINE CONNECTIONS

- A. Submit sequence of construction that demonstrates continuous water service to all existing customers for City of Hidalgo and City of McAllen for review and approval by affected parties.
- B. Contractor is responsible for all required testing including line flushing, disinfection and hydro-static pressure testing.

1.02 SPECIAL PAY INSTRUCTIONS FOR LINE ITEM 22 (ALLOWANCE FOR EXTRA WORK)

- A. Line item may be used to fund the following:
 - 1 Backflow Preventer Assembly equipment
 - 2 City of Hidalgo/McAllen Inter-connection Meter Assembly Equipment
 - 3 Other items not explicitly included as a Pay items in Bid Proposal
- B. Procedure for funding thru allowance:
 - 1. Contractor and/or owner shall submit RFI initiating request to utilize allowance funding.
 - 2. Contractor shall provide a Scope of Work and corresponding Cost Proposal for Owner Review.
 - 3. Contractor shall not proceed until receipt of formal written authorization by owner

01300 SUBMITTALS

1.00 GENERAL

1.01 WORK INCLUDED

- A. Submit documentation as required by the Contract Documents and as reasonably requested by the Owner and Engineer to:
 - 1. Record the products incorporated into the Project for the Owner.
 - 2. Provide information for operation and maintenance of the Project.
 - 3. Provide information for the administration of the Contract.
 - 4. Allow the Engineer to advise the Owner if products proposed for the project by the Contractor conform, in general, with the design concepts of the Contract Documents.
- B. Contractor's responsibility for full compliance with the Contract Documents is not relieved by the Engineer's review of submittals. Contract modifications may only be approved by Change Order or Field Order.

1.02 CONTRACTOR'S RESPONSIBILITIES

- A. Review all submittals prior to submission.
- B. Determine and verify:
 - 1. Field measurements.
 - 2. Field construction requirements.
 - 3. Location of all existing structures, utilities and equipment related to the submittals.
 - 4. Submittals are complete for their intended purpose.
 - 5. Conflicts between the submittals related to the various subcontractors and suppliers have been resolved.
 - 6. Quantities and dimensions shown on the submittals.
- C. Submit information per the procedures described in this section and the detailed specifications.
- D. Furnish the following submittals:
 - 1. As specified in the attached Submittal Schedule.
 - 2. Schedules, data and other documentation as described in detail in this section or referenced in the General Conditions.
 - 3. Documentation required for the administration of the Contract per Section 01040, PROJECT ADMINISTRATION.
 - 4. Shop drawings required for consideration of a contract modification per Paragraph 1.08.
 - 5. Submittals as required in the detailed specifications.
 - 6. Submittals not required will be returned without Engineer's review.

- E. Submit a schedule indicating the date submittals will be sent to the Engineer and proposed dates that the product will be incorporated into the project. Make submittals promptly in accordance with the schedule so as to cause no delay in the project.
 - 1. Submittals shall be sent to Engineer allowing a reasonable time for delivery, review and marking submittals. Time for review is to include time for resubmission if necessary and to allow adequate time for the ordering, fabrication, and delivery of the product.
 - 2. Schedule submittal to provide all information for interrelated work at one time. No review will be performed on submittals requiring coordination with other submittals. Engineer will return submittals for resubmission as a complete package.
- F. Submittals for systems and related equipment shall include information for all of the components required for a complete and operational system.
 - 1. Include electrical, mechanical, and other information required to indicate how the various components of the system function.
 - 2. Where certifications, warranties, and written guarantees are required, they will be provided with the submittal package for review.
- G. Fabrication or installation of any products prior to the approval of shop drawings is done at the Contractor's risk. Products not meeting the requirements of Contract Documents are defective and may be rejected at the Owner's option.
- H. Payment will not be made for products for which submittals are required until the submittals have been received. Payment will not be made for products for which shop drawings or samples are required until these are approved by the Engineer.

1.03 QUALITY ASSURANCE

- A. Submit legible, accurate, complete documents presented in a clear, easily understood manner. Submittals not meeting this criteria will be returned without review.
- B. Demonstrate that the proposed products are in full and complete compliance with the design criteria and requirements of the Contract Documents including drawings and specifications as modified by Addenda, Field Orders, and Change Orders.
- C. Furnish and install products that fully comply with the information included in the submittal.
- D. Review and approve submittals prior to submitting them to the Engineer for review. Submittals will not be accepted from subcontractors, suppliers, or anyone other than the Contractor.

1.04 SUBMITTAL PROCEDURES

- A. Deliver submittals to the Engineer.
- B. Transmit all submittals, with a properly completed Submittal Transmittal Form as indicated in Section 01800, FORMS.
 - 1. A separate transmittal form shall be used for each specific product, class of material, and equipment system.
 - 2. Items specified in different sections of the specifications are to be submitted separately unless integrally related.
- C. Assign a number to the documents originated to allow tracking of the submittal during the review process.

1. Assign a number consisting of a prefix, a sequence number, and a letter suffix. Prefixes shall be as follows:

Prefix	Description	Originator
CO	Change Order	Engineer
CMR	Contractor's Modification Request	Contractor
CTR	Certified Test Report	Contractor
EIR	Equipment Installation Report	Contractor
FO	Field Order	Engineer
NBC	Notification by Contractor	Contractor
O&M	Operation & Maintenance Manuals	Contractor
PCM	Proposed Contract Modification	Engineer
PR	Payment Request	Contractor
PP	Project Photographs	Contractor
RD	Record Data	Contractor
RFI	Request for Information	Contractor
SAM	Sample	Contractor
SD	Shop Drawing	Contractor
SCH	Schedule of Progress	Contractor

2. Issue sequence numbers in chronological order for each type of submittal.
 3. Issue numbers for re-submittals that have the same number as the original submittal followed by an alphabetical suffix indicating the number of times the same submittal has been sent to the Engineer for processing. For example: SD-025-A represents a shop drawing that is the twenty-fifth submittal of this type and is the second time this submittal has been sent for review.
 4. Clearly note the submittal number on each page or sheet of the submittal.
 5. Correct assignment of numbers is essential since different submittal types are processed in different ways.
- D. Submit documents with uniform markings and page sizes.
1. Paper size shall allow for ease of reproduction.
 - a. Submit documents on 8-1/2" X 11" paper where practical.
 - b. Use 11" X 17" paper for larger drawings and schematics.
 - c. Use full size blue-line sheets for fabrications and layout drawings. Reproducible drawings may be submitted in lieu of blue-lines.
 2. Mark submittals to:
 - a. Indicate Contractor's corrections in green.
 - b. Highlight items pertinent to the products being furnished in yellow and delete items that are not when the Manufacturer's standard drawings or information sheets are provided.
 - c. Cloud items and highlight in yellow where selections by the Engineer or Owner are required.

- d. Mark dimensions with the prefix FD to indicate field verified dimensions on the drawings.
 - e. Provide a blank space 8" x 3" for Contractor's and Engineer's stamp.
3. Define abbreviations and symbols used in shop drawings.
 - a. Use terms and symbols in shop drawings consistent with the Contract Drawings.
 - b. Provide a list of abbreviations and their meaning as used in the shop drawings.
 - c. Provide a legend for symbols used on shop drawings.
- E. Mark submittals to reference the drawing number and/or section of the specifications, detail designation, schedule or location that corresponds with the data submitted. Other identification may also be required, such as layout drawings or schedules to allow the reviewer to determine where a particular product is to be used.
- F. The number of copies of each submittal to be sent by the Contractor and the number of copies of each submittal to be returned are:

Prefix	Description	No. of Copies Sent	No. of Copies Returned
CMR	Contractor's Modification Request	4	1
CTR	Certified Test Report	3	0
EIR	Equipment Installation Report	3	0
NBC	Notification by Contractor	3	1
O&M	Preliminary O&M Manuals	4	1
O&M	Final O&M Manuals	4	0
PR	Payment Request	5	1
PP	Project Photographs	2	0
RD	Record Data	3	0
RFI	Request for Information	3	1
SAM	Sample	2	0
SD	Shop Drawings	4	1
SCH	Schedule of Progress	3	0

1.05 REVIEW PROCEDURES

- A. Shop drawings shall be reviewed in the order received.
1. The Contractor may mark submittals as "Priority" for review. Contractor should use discretion in the use of "Priority" submittals as this may delay the review of submittals previously submitted.
 2. Priority submittals will be reviewed before other submittals for this project which have been received but not reviewed.

1.06 REQUIREMENTS

- A. Shop drawings are required for those products that cannot adequately be described in the Contract Documents to allow fabrication, erection or installation of the product without additional detailed information from the product's manufacturer.
1. Shop drawings are requested so that the Engineer can:
 - a. Assist the Owner in selecting colors, textures or other aesthetic features.
 - b. Compare the proposed features of the product with the specified features so as to advise the Owner that the product does, in general, conform to the Contract Documents.
 - c. Compare the performance features of the proposed product with those specified so as to advise the Owner that it appears that the product will meet the designed performance criteria.
 - d. Review required certifications, guarantees, warranties, and service agreements for compliance with the Contract Documents.
 2. Contractor shall certify that he has reviewed the shop drawings and made all necessary corrections such that the products, when installed, will be in full compliance with the Contract Documents. Shop drawings submitted without this certification will be returned without review.
 3. Submit shop drawings for:
 - a. Products indicated in the submittal schedule following this section.
 - b. When a substitution or equal product is proposed in accordance with Paragraph 1.08 of this Section.
 4. Include a complete description of the material or equipment to be furnished. Information is to include:
 - a. Type, dimensions, size, arrangement, model number, and operational parameters of the components.
 - b. Weights, gauges, materials of construction, external connections, anchors, and supports required.
 - c. Performance characteristics, capacities, engineering data, motor curves, and other information necessary to allow a complete evaluation of mechanical components.
 - d. All applicable standards such as ASTM or Federal specification numbers.
 - e. Fabrication and installation drawings, setting diagrams, manufacturing instructions, templates, patterns, and coordination drawings.
 - f. Wiring and piping diagrams and related controls.
 - g. Mix designs for concrete, asphalt, or other materials proportioned for the project.
 - h. Complete and accurate field measurements for products which must fit existing conditions. Indicate on the submittal that the measurements represent actual dimensions obtained at the site.
 5. All required statements of certification, guarantees, extended service agreements, and other related documents are to be provided with the shop drawing. The effective date of these documents shall be the date of acceptance of the work by the Owner.
 6. Comments will be made on items called to the attention of the Engineer for review and comment. Any marks made by the Engineer do not constitute a blanket review of the submittal or relieve the Contractor from responsibility for errors or deviations from the Contract requirements.
 - a. Submittals that are reviewed shall be returned with one or more of the following designations:
 - 1) No Exceptions Taken – No changes or further information are required.
 - 2) Make Corrections Indicated – Only minor changes are required. Resubmittal is not required for changes confirmed by the Contractor by FAX or letter.
 - 3) Conditional to Remarks – The shop drawing potentially complies with Contract Documents requirements, contingent upon satisfactory resolution of review comments.
 - 4) Revise and Resubmit - Submittal does not comply with the Contract Document requirements as submitted, but may with changes indicated and/or submission of additional information. Entire shop drawing package must be revised and resubmitted with review comments completely addressed for subsequent review.
 - 4) Rejected – shop drawing does not comply with the Contract Document requirements and is unacceptable.
 - b. Drawings with a significant or substantial number of markings by the Contractor may be marked "Conditional to Remarks" and "Revise and Resubmit". These drawings are to be revised to provide a clean record of the submittal.

- B. Certifications, Warranties and Service Agreements include documents as specified in the detailed specifications, as shown in the submittal schedule or as follows:
1. Certified Test Reports (CTR) - A report prepared by an approved testing agency giving results of tests performed on products to indicate their compliance with the specifications. (Refer to Section 01400, QUALITY CONTROL.)
 2. Certification of Local Field Service (CLS) - A certified letter stating that field service is available from a factory or supplier approved service organization located within a 300 mile radius of the project site. List names, addresses, and telephone numbers of approved service organizations on or attach to the certificate.
 3. Extended Warranty (EW) - A guarantee of performance for the product or system beyond the normal one (1) year warranty described in the General Conditions. Issue the warranty certificate in the name of the Owner.
 4. Extended Service Agreement (ESA) - A contract to provide maintenance beyond that required to fulfill requirements for warranty repairs, or to perform routine maintenance for a definite period of time beyond the warranty period. Issue the service agreement in the name of the Owner.
 5. Certification of Adequacy of Design (CAD) - A certified letter from the manufacturer of the equipment stating that they have designed the equipment to be structurally stable and to withstand all imposed loads without deformation, failure, or adverse effects to the performance and operational requirements of the unit. The letter shall state that mechanical and electrical equipment is adequately sized to be fully operational for the conditions specified or normally encountered by the product's intended use.
 6. Certification of Applicator/Subcontractor (CSQ) - A certified letter stating that the Applicator or Subcontractor proposed to perform a specified function is duly designated as factory authorized and trained for the application of the specified product.
- C. Submit record data to provide information to allow the Owner to adequately identify the products incorporated into the project and allow replacement or repair at some future date. Also refer to Section 01040 PROJECT ADMINISTRATION.
1. Provide record data for all products. Record data is not required for items for which shop drawings and/or operations and maintenance manuals are required.
 2. Provide information only on the specified products. Submit a Contractor's Modification Request for approval of deviations or substitutions and obtain approval by Field Order or Change Order prior to submitting Record Data.
 3. Provide the same information required for shop drawings.
 4. Record data will be received by the Engineer, logged, and provided to Owner for his record.
 - a. Record data may be reviewed to see that the information provided is adequate for the purpose intended. Inadequate drawings may be returned as unacceptable.
 - b. Record data is not reviewed for compliance with the Contract Documents. Comments may be returned if deviations from the Contract Documents are noted during the cursory review performed to see that the information is adequate.
- D. Submit Operation and Maintenance manuals (O&M) for all equipment, mechanical devices, or components described in the Contract Documents per Section 01730, OPERATION AND MAINTENANCE MANUALS. Include copies of approved shop drawings in the manual.

1.07 REQUESTS FOR DEVIATION

- A. Submit requests for deviation from the Contract Documents for any product that does not fully comply with the specifications.

- B. Submit request by Contractor's Modification Request (CMR) per Section 01040, PROJECT ADMINISTRATION. Identify the deviations and the reason the change is requested.
- C. Deviations that result in a reduction in cost shall also include the amount of the reduction to the Owner.
- D. A Change Order or Field Order will be issued by the Engineer for deviations approved by the Owner. Deviations from the Contract Documents may only be approved by Change Order or Field Order.

1.08 SUBMITTALS FOR SUBSTITUTIONS

- A. Substitutions are defined as any product that the Contractor proposes to provide for the Project in lieu of the specified product.
- B. If the Contractor desires to submit a manufacturer or product which is not specified or does not strictly comply with the Contract Documents, the Contractor must submit the following for consideration of approval of the substitution:
 - 1. Contractor's Modification Request for deviation from the Contract Documents per Paragraph 1.07.
 - 2. Prove that the product is acceptable as a substitute. It is not the Engineer's responsibility to prove the product is not acceptable as a substitute.
 - a. Indicate on a point by point basis for each specified feature that the product is acceptable to meet the intent of the Contract Documents requirements.
 - b. Make a direct comparison with the specified manufacturer's published data sheets and available information. Provide this printed material with the submittal.
 - c. The decision of the Engineer regarding the acceptability of the proposed substituted product is final.
 - 3. Provide a typewritten certification that, in making the substitution request, the Contractor:
 - a. Has determined that the substituted product will perform in substantially the same manner and result in the same ability to meet the specified performance as the specified product.
 - b. Will provide the same warranties and/or bonds for the substituted product as specified or as would be provided by the Manufacturer of the specified product.
 - c. Will assume all responsibility to coordinate any modifications that may be necessary to incorporate the substituted product into the project and will waive all claims for additional work which may be necessary to incorporate the substituted product into the project which may subsequently become apparent.
 - d. Will maintain the same time schedule as for the specified product.
- C. Engineering cost for review of substitutions will be paid by the Contractor.
 - 1. Cost for additional review time will be billed to the Owner by the Engineer for the actual hours required for the review and marking of shop drawings by Engineer and in accordance with the following rates:

<i>Principal-in-Charge</i>	<i>\$130.00</i>
<i>Project Manager</i>	<i>\$ 85.00</i>
<i>Design Engineer</i>	<i>\$ 65.00</i>
<i>Engineering Technician</i>	<i>\$ 45.00</i>
<i>Clerk</i>	<i>\$ 35.00</i>

- 2. Cost for the additional review shall be paid to the Owner by the Contractor on a monthly basis.

1.09 GUARANTEES

- A. Warranties and guarantees shall be submitted as required by the Contract Documents and submitted with the shop drawings or record data.
- B. Additional copies will be provided for equipment and will be included in the Operation and Maintenance Manuals. Refer to Section 01730, OPERATION AND MAINTENANCE MANUALS.

1.10 RESUBMISSION REQUIREMENTS

- A. Make all corrections or changes in the submittals required by the Engineer and resubmit until approved.
- B. For shop drawings:
 - 1. Revise initial drawings or data and resubmit as specified for the original submittal.
 - 2. Highlight in yellow those revisions, which have been made in response to the first review by the Engineer.
 - 3. Highlight in blue any new revisions which have been made or additional details of information that has been added since the previous review by the Engineer.
- C. Engineering cost for excessive review of shop drawings will be paid by the Contractor.
 - 1. Excessive review of shop drawings is defined as any review required after the original review has been made and the first resubmittal has been checked to see that corrections have been made.
 - 2. Cost for additional review time will be billed to the Owner by the Engineer for the actual hours required for the review and marking of shop drawings by Engineer and in accordance with the following rates:

<i>Principal-in-Charge</i>	<i>\$130.00</i>
<i>Project Manager</i>	<i>\$ 85.00</i>
<i>Design Engineer</i>	<i>\$ 65.00</i>
<i>Engineering Technician</i>	<i>\$ 45.00</i>
<i>Clerk</i>	<i>\$ 35.00</i>
 - 3. Pay cost for the additional review to the Owner on a monthly basis as billed by the Owner.
- D. Need for more than one resubmission or any other delay of obtaining Engineer's review of submittals, will not entitle the Contractor to an extension of Contract Time. All costs associated with such delays shall be at the Contractor's expense.

1.11 ENGINEER'S DUTIES

- A. Review the submittals and return with reasonable promptness.
- B. Affix stamp, indicate approval, rejection, and the need for re-submittal.
- C. Distribute documents.

SUBMITTAL SCHEDULE

Spec. No.	Description	S D	S A M	C T R	C L S	E W	E S A	C A D	C S Q	R D	O M	E I R	P P B
00310	Prime Coat												
00340	Hot Mix Asphaltic Concrete Pavements, Prime Coat & Tack Coat												
02105	Clearing and Grubbing												
02221	Trench Excavation, Backfill and Compaction												
02224	Pipe Boring, Drilling and Jacking									X			
02556	Water Transmission Lines and/or Pressure Sewer Lines	X								X			
02558	Water Valves									X			
02570	Sanitary Sewers	X											
02575	Paving Repair and Resurfacing									X			
02590	Polyurthane Protective Coating									X			
02831	Chain Link Fence and Gates									X			
03300	Cast-in-Place Concrete												
09100	Construction Traffic Control												
14000	Street, Alley and Driveway's Repairs												
19000	Trench Protection System									X			

SD - Shop Drawing

SAM - Sample

CTR - Certified Test Report

CLS - Certification of Local Field Service

EW - Extended Warranty

ESA - Extended Service Agreement

CAD - Certificate of Adequacy of Design

CSQ - Certification of Applicator/
Subcontractor Qualifications

RD - Record Data

OM - Operation and Maintenance Manuals

EIR - Equipment Installation Report

PPB - Process Performance Bond

END OF SECTION

01400 QUALITY CONTROL

1.00 GENERAL

1.01 CONTRACTOR'S RESPONSIBILITIES

- A. Control the quality of work produced and verify that the work performed meets the standards of quality established in the Contract Documents.
 - 1. Inspect the work performed by the Contractor, subcontractors and suppliers. Correct defective work.
 - 2. Inspect products to be incorporated into the project. Provide only those products that comply with the Contract Documents.
 - 3. Verify conformance of the work and products with the Contract Documents before notifying the Owner of need for testing.
 - 4. Provide consumable construction materials of adequate quality to provide a finished product that complies with the Contract Documents.
 - 5. Provide and pay for the services of an approved professional materials testing laboratory to insure that products proposed for use fully comply with the Contract Documents.
 - 6. Perform tests as indicated in this and other sections of the specifications. Schedule the time and sequence of testing with the Owner and Engineer. Testing is to be observed by the Owner, Engineer, or designated representative.
 - 7. Provide labor, materials, tools, equipment, and related items for testing by the Owner including, but not limited to temporary construction required for testing and operation of new and existing utilities.
- B. Provide Certified Test Reports on products or constructed works to be incorporated into the project as required by Section 01300 SUBMITTALS. Reports are to indicate that products or constructed works are in compliance with the Contract Documents.
- C. Assist the Engineer, Owner, and Owner's testing organization to perform quality assurance activities.
 - 1. Provide access to the work and to the Manufacturer's operations at all times work is in progress.
 - 2. Cooperate fully in the performance of sampling, inspection, and testing.
 - 3. Furnish labor and facilities to:
 - a. Provide access to the work to be tested.
 - b. Obtain and handle samples for testing at the project site or at the source of the product to be tested.
 - c. Facilitate inspections and tests.
 - d. Store and cure test samples.
 - 4. Furnish copies of the tests performed on products.
 - 5. Provide adequate quantities of representative product to be tested to the laboratory at the designated location.
 - 6. Give the Owner adequate notice before proceeding with work that would interfere with testing.

7. Notify the Engineer and the testing laboratory prior to the time that testing is required. Lead time is to be adequate to allow arrangements to be made for testing. Minimum notice shall be 24 hours.
8. Do not proceed with any work until testing services have been performed and results of tests indicate that the work is acceptable.
9. Provide complete access to the site and make Contract Documents available.
10. Provide personnel and equipment needed to perform sampling or to assist in making the field tests.
11. Testing performed by the Owner will be paid for by the Owner.

1.02 QUALITY ASSURANCE ACTIVITIES BY THE OWNER

Quality assurance activities of the Owner and Engineer through their own forces or through contracts with materials testing laboratories and survey crews are for the purpose of monitoring the results of the Contractor's work to see that it is in compliance with the requirements of the Contract Documents.

1. Quality assurance activities of the Owner and Engineer in no way relieves the Contractor of the obligation to perform work and furnish products and constructed work conforming to the Contract Documents.
2. Failure on the part of the Owner or Engineer to perform or test products or constructed works in no way relieves the Contractor of the obligation to perform work and furnish materials conforming to the Contract Documents.

1.03 SUBMITTALS

Submittals shall be in accordance with Section 01300, SUBMITTALS, and shall include:

1. The name of the proposed testing laboratory along with documentation of qualifications, a list of tests that can be performed, and a list of recent projects for which testing has been performed with references from those projects.
2. Test reports per Paragraph 1.07, TEST REPORTS of this specification.

1.04 STANDARDS

- A. Provide a testing laboratory that complies with the ACIL (American Council of Independent Laboratories) "Recommended Requirements for Independent Laboratory Qualifications".
- B. Perform testing per recognized test procedures as listed in the various sections of the specifications, standards of the State Department of Highways and Public Transportation, American Society of Testing Materials (ASTM), or other testing associations. Perform tests in accordance with published procedures for testing issued by these organizations.

1.05 DELIVERY AND STORAGE

Handle and protect test specimens of products and construction materials at the construction site in accordance with recognized test procedures.

1.06 VERIFICATION TESTING

- A. Provide verification testing when tests performed by the Owner indicate that materials or the results of construction activities are not in conformance with Contract Documents.
- B. Verification testing is to be provided at the Contractor's expense to verify products or constructed works are in compliance after corrections have been made.

- C. Tests must comply with recognized methods or with methods recommended by the Owner's testing laboratory and approved by the Engineer.

1.07 TEST REPORTS

- A. Test reports are to be prepared for all tests.

1. Tests performed by testing laboratories may be submitted on their standard test report forms. These reports must include the following:
 - a. Name of the Owner, project title and number, equipment installer and general contractor.
 - b. Name of the laboratory, address, and telephone number.
 - c. Name and signature of the laboratory personnel performing the test.
 - d. Description of the product being sampled or tested.
 - e. Date and time of sampling, inspection, and testing.
 - f. Date the report was issued.
 - g. Description of the test performed.
 - h. Weather conditions and temperature at time of test or sampling.
 - i. Location at the site or structure where the test was taken.
 - j. Standard or test procedure used in making the test.
 - k. A description of the results of the test.
 - l. Statement of compliance or non-compliance with the Contract Documents.
 - m. Interpretations of test results, if appropriate.
2. Submit reports on tests performed by Contractor or his suppliers or vendors on the forms provided in Section 01800, FORMS.

- B. Distribute copies of the test reports to:

	No. of Copies
Owner	1
Resident Project Representative	1
Engineer	1
Contractor	1

1.08 NON-CONFORMING WORK

- A. Immediately correct any work that is not in compliance with the Contract Documents or submit a written explanation of why the work is not to be corrected immediately and when the corrective work will be performed.
- B. Payment for non-conforming work shall be withheld until work is brought into compliance with the Contract Documents.

1.09 LIMITATION OF AUTHORITY OF THE TESTING LABORATORY

- A. The testing laboratory representatives are limited to providing consultation on the test performed and in an advisory capacity.
- B. The testing laboratory is not authorized to:
 1. Alter the requirements of the contract documents.
 2. Accept or reject any portion of the work.
 3. Perform any of the duties of the Contractor.
 4. Stop the work.

2.00 PRODUCTS

2.01 TESTING APPARATUS

Furnish testing apparatus and related accessories necessary to perform the tests.

3.00 EXECUTION

3.01 PROTECTIVE COATINGS [NOT USED]

3.02 LEAKAGE TEST FOR STRUCTURES

- A. Testing requirements specified in Sections specific to the work performed shall supersede the testing specified in this Section.
- B. Test structures that will contain water on a full time or intermittent basis for leaks. Perform tests prior to installing equipment or materials within the basins. In the event that the basins fail to pass the test, drain the basin, repair the leaks, re-fill, and re-test the basin. Repeat tests until the basin passes the test. The Owner may repeat the test at any time during the one (1) year guarantee period.
- C. Test the basin for leakage using the following procedure:
 - 1. Determine the evaporation allowance for loss of water.
 - a. Use a standard circular pan procedure established by the U.S. Weather Bureau to measure evaporation rate.
 - b. Calculate evaporation allowance by multiplying the evaporation rate in gallons per 24 hours per square foot of surface area by the open surface area of the water in the basin.
 - 2. Calculate the allowable leakage for the basin. Allowable leakage is calculated as 0.03 gallons per square foot of concrete area in contact with the water per 24 hours.
 - 3. Fill the basin to the overflow level with water at a rate not to exceed 2 feet per hour.
 - 4. Allow the basins to set for three (3) days.
 - 5. Observe the perimeter of the basins and identify all leaks.
 - 6. Repair basin walls and floors where leaks have been identified.
 - 7. Mark the water level at the basin wall. Measure the fall in water level over a 24-hour period to the nearest 1/8" at least twice a day to determine the quantity of water lost. Provide a stilling well for measurement if required to allow accurate measurement.
 - 8. Calculate the amount of water lost during this time period.
 - 9. Compare the amount of water lost to the allowable loss.
- D. Drain the basin, determine the sources of leakage and repair if the amount of water lost exceeds the allowable leakage plus the evaporation allowance.

3.03 LEAKAGE TESTS FOR PIPING SYSTEMS AND MANHOLES

- A. Testing requirements specified in Sections specific to the work performed shall supersede the testing specified in this section.
- B. General Test Requirements
 - 1. Perform test on piping systems including piping installed between or connected to existing pipe.

2. Conduct tests on buried pipe to be hydrostatically tested after the trench is completely backfilled. If field conditions permit and if approved by the Engineer, partially backfill the trench and leave the joints open for inspection and for conducting the initial service leak test. Do not conduct the acceptance test until backfilling is complete.
 3. Conduct the test on exposed, non-buried piping after the piping is completely installed, including supports, hangers, and anchors, but prior to insulation.
 4. Do not perform testing on pipe with concrete thrust blocking until the concrete has cured at least five (5) days.
 5. Determine and remedy the cause of the excessive leakage for any pipe failing to meet the specified requirements for water or air tightness.
 6. Tests must be successfully completed and reports filed before piping is accepted. File test reports on forms per Section 01800, FORMS.
 7. Submit the plan for testing to the Engineer for review at least 10 days before starting the test.
 8. Remove and dispose of temporary blocking material and equipment after completion and acceptance of the piping test.
 9. Repair any damage to the pipe coating.
 10. Clean pipelines so they are totally free flowing prior to final acceptance.
 11. Test piping independently from tests on structures.
 12. Test method and test pressure depend upon the application of the piping.
 - a. Pressure pipe is defined as piping that is part of a pumped or pressurized system. Perform test for pressure pipe in accordance with Section 02556 WATER TRANSMISSION AND/OR PRESSURE SEWER LINES.
 - b. Gravity pipe is defined as piping not flowing full under normal design conditions and depends upon the force of gravity for flow through the pipe. Perform test for gravity pipe in accordance with Section 02570 SANITARY SEWERS.
 - c. Chemical processing lines are to be tested as pressure pipe regardless of the operating conditions. The test pressure is to be 1.5 times the pressure rating of the pipe.
 - d. Process piping between hydraulic structures subject to hydrostatic head (i.e. full pipe) is considered pressure pipe and shall require a hydrostatic leak test. The test pressure shall be the maximum hydrostatic head plus 10 feet. The maximum hydrostatic head is the difference in elevation of the pipe at its lowest point and the maximum top-of-wall elevation of the hydraulic structure on the piping system.
- B. Pressure and Leakage Tests of Pressure Piping - Refer to requirements in Section 02556.
- C. Low Pressure Air Test - Refer to requirements in Section 02570
- E. Hydrostatic Leak Test
1. Perform hydrostatic leak tests after backfilling.
 2. The length of the pipe to be tested shall be such that the head over the crown of the upstream end is not less than 2 feet or 2 feet above the ground water level whichever is higher and the head over the downstream crown is not more than 6 feet.
 3. Plug the pipe by pneumatic bags or mechanical plugs so that the air can be released from the pipe while it is being filled with water.

4. Continue the test for one (1) hour and make provisions for measuring the amount of water required to maintain the water at a constant level during this period.
 5. Remove the jointing material, and remake the joint if any joint shows any visible leakage or infiltration.
 6. Remove and replace any defective or broken pipes.
 7. Maximum Allowable Leakage Rates:
 - a. Total exfiltration or infiltration shall not exceed 50 gallons per inch diameter, per mile of pipe, per 24 hours at a minimum test head of two feet above the crown of the pipe at the upstream manhole.
 - b. For construction within the 25 year flood plain, total exfiltration or infiltration shall not exceed 10 gallons per inch diameter, per mile of pipe, per 24 hours at a minimum test head of two feet above the crown of the pipe at the upstream manhole.
 - c. When pipes are installed below the groundwater level, an infiltration test shall be used in lieu of the exfiltration test. The total infiltration, as determined by a hydrostatic head test, shall not exceed 50 gallons per inch diameter per mile of pipe per 24 hours at a minimum test head of two feet above the crown of the pipe at the upstream manhole, or at least two feet above existing groundwater level, whichever is greater.
 9. Determine the rates of infiltration by means of V-Notch weirs, pipe spigot, or plugs in the end of the pipe. Methods, times, and locations are subject to the Engineer's approval.
 10. Pipe with visible leaks or infiltration or exceeds the maximum allowable leakage or infiltration is considered defective and must be corrected.
- F. Deflection Testing for Pipe - Refer to requirements in Section 02570.
- G. Manhole Testing - Refer to vacuum testing requirements in Section 02570.
- H. Tests for Plumbing Drainage and Vent Systems
1. Plug openings as necessary.
 2. Test drainage and venting systems by filling piping with water to the level of the highest vent stack for 30 minutes.
 3. Make the examination for leakage at joints and connections.
 4. There shall be no drop in water level.

3.04 ELECTRICAL TESTING

Refer to Division 16 for electrical testing requirements.

END OF SECTION

02221 TRENCH EXCAVATION, BACKFILL AND COMPACTION

PART 1 - GENERAL

1.01 GENERAL DESCRIPTION OF WORK

- A. Excavation, shoring, dewatering, pipe bedding, trench backfill, compaction, grading and cleanup of all pipeline trenching.
- B. All work must be performed in accordance with these specifications and the safety requirements of the State and OSHA standards.

1.02 JOB CONDITIONS

- A. Site Acceptance
 - 1. Contractor shall accept the site conditions existing during the Contract Time.
 - 2. Ground water and surface water are conditions of the contract and the responsibility of Contractor.
- B. Adverse Weather
 - 1. Place no backfill that is wet or frozen.
 - 2. Place no backfill in wet or frozen trenches.

PART 2 - PRODUCTS

2.01 PIPE BEDDING AND BACKFILL

The types of material to be used for bedding and backfill are identified on the Drawings or in the Special Provisions of the contract documents. Material types are defined either by class in accordance with ASTM D2321, or by product description. Contractor is responsible for determination of source of materials and shall submit characterization analysis and physical sample of proposed bedding material for approval prior to construction.

- A. Class Designations Based on Laboratory Testing (ASTM D2321 and by reference ASTM D2487 and D653).
 - 1. Class IA: Manufactured aggregates (angular crushed rock/gravel), open-graded*, clean.
 - a. Plasticity Index: Non-plastic.
 - b. Gradation: 100% passing 1½" sieve, ≤ 10% passing No. 4 sieve, and < 5% passing No. 200 sieve.
 - 2. Class IB: Mixture of manufactured aggregates (Class 1A) and sand, dense-graded*, clean.
 - a. Plasticity Index: Non-plastic.
 - b. Gradation: 100% passing 1½" sieve, ≤ 50% passing No. 4 sieve, and < 5% passing No. 200 sieve.
 - 3. Class II: Open and dense graded gravels and sands, clean or with little to moderate fines (silt and clay).
 - a. Plasticity Index: Non-plastic.
 - b. Gravel: 100% passing 1½" sieve, < 5% passing No. 200 sieve (i.e. <5% fines), and < 50% of the non-fines passing a No. 4 sieve.
 - c. Sand: 100% passing 1½" sieve, < 5% passing No. 200 sieve (i.e. <5% fines), and > 50% of the non-fines passing a No. 4 sieve.
 - d. Gravel, Sand with Fines: 100% passing 1½" sieve, and 5% to 12% passing No. 200 sieve (i.e. 5% to 12% fines).
 - 4. Class III: Silty/clayey gravels and sands, gravel-sand-silt/clay mixtures.
 - a. Plasticity Index: (Refer to ASTM D2321)
 - b. Gradation: 100% passing 1½" sieve, 12% to 50% passing No. 200 sieve.

* Note: Dense-graded (i.e. well graded) and open-graded (i.e. poorly graded) materials are defined on the basis of the coefficient of uniformity, $C_u = D_{60}/D_{10}$, and the coefficient of curvature, $C_c = (D_{30})^2/(D_{10} \times D_{60})$, where D_{60} , D_{30} , and D_{10} represent the sieve opening dimensions through which 60%, 30%, and 10% of the material would pass, respectively:

Dense-graded: $1 \leq C_c \leq 3$ for both gravel and sand, plus $C_u \geq 4$ for gravel; $C_u \geq 6$ for sand.
Open-graded: Either C_c or C_u criteria for dense gradation are not met.

B. Designations Based on Product Descriptions:

1. Excavated Material Backfill: Excavated material may be used in the trench backfill, provided that all hard rock and stones having any dimensions greater than 6" and frozen earth, debris and roots larger than 2" are removed for the initial backfill. Plasticity Index shall be less than 30. Excavated backfill material must be approved by Engineer.
2. Select Backfill: Select Backfill shall be gravel, fine rock cuttings, sand, sandy loam or loam free from excessive clay. Rock cuttings shall have no dimensions greater than 2 inches. Plasticity Index shall be between 7 and 22. Select backfill must be approved by Engineer.
3. Sand Backfill: Sand backfill shall be clean, hard, durable, uncoated grains, free from lumps and organic material. All materials must pass a No. 8 sieve with less than 5% passing a No. 200 sieve (equivalent to ASTM 2321 Class II Sand Gradation excluding material captured on No. 8 sieve).
4. Granular Backfill: Granular backfill shall be free flowing, such as sand or hydraulically graded stone fines, or mixed sand and gravel, or sandy loam. The material shall be free from lumps, stones over 2 inches in diameter, clay and organic matter.
5. Controlled Low Strength Material (CLSM): Use high slump mixture of portland cement, fly ash and fine aggregate formulated, licensed and marketed as K-Krete or equal. Provide mixture having 28-day compressive strength of 80 psi minimum and 150 psi maximum with no measurable shrinkage or surface settlement.

2.02 CRADLING ROCK

- A. Use crushed rock or stone with 70-100% passing 1½ inch sieve and no more than 50% passing 1 inch sieve.

2.03 GEOTEXTILE MATERIAL FOR UNSTABLE TRENCHES

- A. Where unstable wall or trench bottom conditions are present as determined by the Engineer, a geotextile material shall be installed.
- B. The geotextile shall be designed to prevent loss of trench support caused by migration of sand and fines into the embedment matrix and secure the embedment around the pipe.
- C. The geotextile shall be a nonwoven, needle point construction and shall consist of long-chain polyethylene or polyamide. The fibers shall be oriented into a stable network whereby they retain their positions with each other. The textile shall be free of any chemical treatment commonly found in soil. The geotextile shall conform to the following properties:

Tensile Strength: ASTM D 4632	130 LBS.
Elongation: ASTM D 4632	50%
Mullen Burst Strength: ASTM D 3786	250 psi
Coefficient of Permeability: K-cm/sec. (20 CFMC-GET-2, Constant Head) ASTM D 4491	0.10cm/sec.
Puncture Strength:	80 LBS.

- D. The geotextile shall be furnished in protective wrapping to protect the material from ultraviolet radiation, contamination from other substances, and abrasion or shipping damage. Any material received damaged, shall be rejected.

PART 3 - EXECUTION

3.01 GENERAL

- A. Dewatering
 - 1. Execute work "dry". No pipe or conduits shall be laid or concrete poured on wet soil.
 - 2. Prevent surface water from flowing into excavation.
 - 3. Provide equipment for handling water encountered as required. Obtain Engineer's prior approval of proposed method of dewatering.
 - 4. No sanitary sewer shall be used for disposal of trench water.
- B. Protection of Existing Utilities
 - 1. Notify all utility companies of location and schedule of work.
 - 2. Locations and elevations of utilities shown on plans are to be considered approximate only. Notify utility companies and Engineer of conflicts between existing and proposed facilities.
 - 3. Repair, relay or replace existing utilities damaged, destroyed or disrupted during work. Unless specified otherwise, replacement will be at the Contractor's expense.
- C. Sheet piling, Shoring and Bracing
 - 1. All sheet piling, shoring, and bracing shall be in accordance with the Contractor's Excavation Safety System Plan and the safety requirements of the State and OSHA Standards.
 - 2. Provide as necessary to hold walls of excavation, prevent damage to adjacent structures, and to protect workmen and property.
 - 3. Leave Sheet piling and shoring in place where removal might cause personal injury or damage to the work.
 - 4. When movable trench shield is used below spring line of pipe, it shall be lifted prior to any forward movement to avoid pipe displacement.
- D. Changes in Grade
 - 1. Grades may be adjusted by written field order from the Engineer to suit unforeseen construction conflicts or conditions. Where the bid includes a single bid price for all depths, no additional compensation will be made for adjustments within 1.5 feet of the plan grades.

3.02 EXCAVATION AND TRENCHING

- A. General
 - 1. Method of excavation is Contractor's option.
 - 2. Allow no more than 300 feet of trench to be open at one time.
 - 3. Excavate by hand under and around structures, utilities, and roots of trees required to be left in place.
 - 4. Stockpile and replace topsoil to a minimum of 8 inches for surface restoration in grassed or agricultural areas.
- B. Trench Characteristics
 - 1. Depth: As indicated for pipe installation to lines and grades required with proper allowance for thickness of pipe and type of bedding specified.
 - 2. Width: Trench width shall be no less than pipe O.D. plus 16 inches or pipe O.D. $\times 1.25 + 12$ inches, whichever is greater.
 - 3. Trench walls must be vertical below top of pipe and may be vertical or sloped above pipe to conform to excavation codes.
 - 4. Trench boxes and shoring shall not be set below the top of the embedment zone.
 - 5. Provide bell holes for each pipe joint where pipe bears on undisturbed earth.
 - 6. Trench bottom shall be free of large stones and other foreign material.

3.03 SOFT, SPONGY OR UNSTABLE MATERIALS (e.g. peat, muck, and highly expansive soils)

- A. Stop work and notify Engineer.
- B. Perform remedial work as directed.
- C. If material is judged unsuitable and removal is authorized, remove and replace with trench stabilizing material as directed by Engineer.

3.04 ROCK EXCAVATION

- A. Excavate any rock to maintain minimum 6-inch clearance around pipe.
- B. Dispose of rock material not suitable for backfill as directed by Engineer.
- C. Use of explosives not permitted without prior written authorization from Owner and Engineer.
- D. Provide Special Hazard Insurance covering liability for blasting operations.

3.05 PIPE EMBEDMENT

Pipe embedment includes materials placed in the zone surrounding the pipe including bedding, haunching, and initial backfill over the top of pipe. Refer to the pipe bedding details on the Drawings for material types to be used in the pipe embedment zone.

- A. Bedding
 - 1. Place after bottom of trench has been excavated to proper depth and grade.
 - 2. Place, compact and shape bedding material to conform to barrel of pipe and bell to insure continuous firm bedding for full length of pipe. Compact to minimum 95% of relative density per ASTM D4253.
- B. Haunching (bottom of pipe to springline)
 - 1. Place after pipe has been bedded and checked for alignment, grade and internal obstructions.
 - 2. Do not backfill until any required concrete or mortar has sufficiently cured.
 - 3. Work bedding material under pipe haunches and compact by hand to springline of pipe in 6-inch lifts to minimum 95% of relative density per ASTM D4253.
- C. Initial Backfill
 - 1. From springline to not less than 12 inches above top of pipe, place backfill and compact in 6-inch layers using vibratory compactors to minimum 95% of relative density per ASTM D4253.
 - 2. Backfill simultaneously on both sides of pipe to prevent displacement.
 - 3. Record location of connections and appurtenances before backfilling.
- D. Embedment in Saturated, Silty, or Unstable Soils
 - 1. Soils containing >50% fines (passing No. 200 sieve) shall be considered silty.
 - 2. Where the Engineer determines that the trench bottom or wall is unstable at the bedding zone, special pipe embedment material stabilization shall be required.
 - a. Unstable bedding zone conditions shall be determined immediately after trench excavation by checking soil bearing strength capacities at the bedding zone using a Standard Pocket Penetrometer or other appropriate means. A minimum of three readings shall be obtained and averaged. The soil to be tested in the bedding zone shall not be allowed to dry, and shall be tested under "in-situ" conditions. If, in the Engineer's opinion, the soil has dried, the Penetrometer Test shall be taken after removing a sufficient amount of soil from the wall or bottom surface in order to obtain a representative sample.
 - b. If the average reading is less than 8 blows per foot, then the pipe bed shall be prepared as follows:
 - 1) The trench shall be dewatered to the greatest extent possible and rock shall be placed and

- compacted to form a firm trench bottom. No pipe shall be laid until stabilization is to the satisfaction of the Engineer.
- 2) A geotextile material shall be placed in the trench and the embedment material and pipe installed as indicated on the Drawings. Overlap geotextile around the top of the pipe envelope the width of the trench.
 - 3) The geotextile shall be installed in accordance with the manufacturer's recommendations. Prior to installation, the geotextile shall be stretched, aligned, and placed without any wrinkles. If the material is damaged or punctured, the damaged area shall be patched by overlapping and stitching.
3. Where the trench wall is unable to support trench boxes at a level above the top of the embedment zone, sheeting shall be used for trench wall stabilization to enable such use of trench boxes or as stand-alone trench protection in lieu of trench boxes.
 - a. Sheeting installed below the top of the embedment zone shall be extracted vertically in increments of 12 inches or less.
 - b. Embedment material shall be placed before each extraction increment and thoroughly compacted immediately after each extraction increment to ensure that no compacted lift is disturbed by subsequent extraction.
 - c. Contractor shall ensure the soils of the trench walls on both sides of the embedment zone remain as dense as the original unexcavated condition so that the pipe embedment remains firmly supported.
 - d. In no case shall a trench box be permitted to rest below the top of the embedment zone (i.e. 12" above top of pipe).

E. Embedment materials

1. In unsaturated, consolidated soils, pipe embedment may be installed using least restrictive, open-graded material.
2. In saturated, unstable, or silty soils:
 - a. Dense-graded material shall be used to prevent loss of trench support caused by migration of soil into the embedment matrix.
 - b. Open-graded or close graded embedment may be used in combination with geotextile fabric.
3. In any soil, controlled low strength material (CLSM), or 2-sack cement stabilized sand may be used for embedment.

3.06 TRENCH BACKFILL

A. Final Backfill

1. Place backfill into trench at an angle so that impact on installed pipe is minimized.
2. Compaction of all backfill material shall be performed in a manner that shall not crack, crush, or cause the installed pipe to be moved from the established grade and alignment.
3. Place minimum cushion of 3 feet of compacted backfill above pipe envelope before using heavy compacting equipment.
4. Use excavated material for final backfill subject to the requirements for Excavated Backfill unless otherwise specified.
5. Areas under or within 5 feet of pavement, and under or within 2 feet of utilities, buildings, or walks shall be backfilled with sand and mechanically compacted to the top of the subgrade in 8-inch lifts to a minimum of 95% Standard Proctor Density.
6. Areas not subject to vehicular traffic shall be backfilled in layers not more than 12 inches.
7. Structural and non-structural backfill shall be mechanically compacted. Compaction method is at discretion of Contractor with following exceptions:
 - a. If in Owner's opinion compaction method presents potential damage to pipe, it will not be allowed.
 - b. Flooding or water jetting may be permitted only if a geotechnical report justifying the use of water jetting is submitted to the City Engineer and approval is granted.
8. Mound excavated materials no greater than 6 inches in open areas only.
9. Fill upper portion of trench with topsoil as specified above.

- B. Controlled Low Strength Material (CLSM) Fill
 - 1. Use where shown on plans.
 - 2. Provide suitable forms to limit volume of control density fill material.
 - 3. Prevent flow of material into existing drain lines.
 - 4. Protect exposed utility lines during placement.
 - 5. Place material in accordance with suppliers' written recommendations unless directed otherwise by Engineer.

3.07 EXCESS MATERIAL

- A. Disposal of excess excavated material shall be the responsibility of the Contractor.

3.08 TESTING

- A. Unless specified elsewhere, testing will be responsibility of Owner.
- B. Standard Proctor Density
 - 1. ASTM D698.
 - 2. One (1) required for each type of material encountered.
- C. In Place Density
 - 1. ASTM D1556 (Sand Cone)
 - 2. ASTM D2167 (Balloon)
 - 3. ASTM D3017 (Nuclear)
- D. One (1) test per 250 linear feet of trench on alternating lifts, with a minimum of three tests per visit, for non-structural areas. One (1) test per 100 linear feet of trench on alternating lifts, with a minimum of three tests per visit, for structural areas.
- E. Contractor will be responsible for any costs associated with testing performed as a result of failed tests

PART 4 - MEASUREMENT AND PAYMENT

4.01 TRENCH EXCAVATION

- A. Trench excavation shall be considered incidental to pipeline installation.
- B. Payment shall be made at the contract unit price per cubic yard only if a bid item is established in the contract.

4.02 BACKFILL

- A. Backfill shall be considered incidental to pipeline installation.
- B. Payment for backfill shall be made at the contract unit price per cubic yard only if a separate bid item is established in the contract.
- C. No allowance for waste shall be made.
- D. If Engineer orders a bedding backfill material other than that specified in contract, it shall be paid for as an extra in price per cubic yard as compacted in place, EXCEPT if a higher class embedment is ordered by Engineer because the Contractor has over-excavated the trench.
- E. If the Engineer orders the excavated material to be removed and disposed of and replaced with another material and a separate bid item for that material has not been established, the material shall be paid as an extra.

- F. If the Contractor fails to compact the backfill to the density requirements, the Engineer may order the material removed and replaced at no cost to the Owner.
- G. The disposal of rejected material shall be at no cost to the Owner.
- H. Payment for geotextile envelopment in unstable trench soils shall be made at the bid price for “Trench Stabilization in Unstable Soils” in the bid form.

END OF SECTION

PART 1 - GENERAL**1.01 RELATED REQUIREMENTS SPECIFIED ELSEWHERE**

- A. Trenching, Backfilling and Compacting: Section 02221.
- B. Pipe Boring and Jacking: Section 02224.
- C. Valves and Appurtenances: Section 15100.

1.02 SUBMITTALS

- A. Conform to requirements of Section 01300 - Submittals.
- B. Manufacturer's Literature: Manufacturer's descriptive literature and recommended method of installation.
- C. Certificates: Manufacturer's certification that products meet specification requirements.

1.03 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials on manufacturer's original skids or in original unopened protective packaging. OWNER reserves the right to reject surplus material from a different project/jobsite.
- B. Protect materials during transportation, storage, and installation to avoid physical damage.
- C. All pipe shall be stored at least 6 inches above ground.

1.04 GENERAL DESCRIPTION OF WORK COVERED

- A. Furnish and install all pipe, fittings, structures and accessories required for water transmission line and/or pressure sewer lines.

1.05 QUALITY ASSURANCE

- A. Comply with the latest published edition of American Water Works Association (AWWA) Standards:
 - 1. AWWA C104 - Cement-Mortar Lining for Ductile Iron Pipe and Fittings for Water.
 - 2. AWWA C105 - Polyethylene Encasement for Ductile Iron Pipe Systems
 - 3. AWWA C110 & C110a - Gray Iron and Ductile-Iron Fittings, 2-inch through 48-inch for Water and Other Liquids.
 - 4. AWWA C111 - Rubber Gasket Joints for Cast Iron Pressure Pipe and Fittings.
 - 5. AWWA C115 - Flanged Ductile Iron Pipe with Ductile-Iron or Gray-Iron Threaded Flanges
 - 6. AWWA C150 - Thickness Design of Ductile-Iron Pipe.
 - 7. AWWA C151 - Ductile-Iron Pipe, Centrifugally Cast, for Water or Other Liquids.
 - 8. AWWA C153 - Ductile-Iron Compact Fittings, 3-inch through 24-inch, and 54-inch through 64-inch for Water and Other Liquids.
 - 9. AWWA C600 - Standard for Installation of Ductile Iron Water Mains and Their Appurtenances.
 - 10. AWWA C900 - Polyvinyl Chloride (PVC) Pressure Pipe 4-inch through 12-inch for water.
 - 11. AWWA C907 - Polyvinyl Chloride (PVC) Pressure Fittings for Water, 4-inch through 8-inch.
 - 12. AWWA C909 - Polyvinyl Chloride (PVC) Pressure Pipe 6-inch through 12-inch for water.
 - 13. AWWA C905 - Polyvinyl Chloride (PVC) Pressure Pipe 14-inch through 36-inch for water.
- B. Comply with the latest published editions of the American Society for Testing and Materials (ASTM) Standards:
 - 1. D 1248 - Polyethylene Plastics Molding and Extrusion Materials.
 - 2. D 2241 - Polyvinyl Chloride (PVC) Plastic Pipe (SDR-PR).

3. D 3139 - Joints for PVC Pressure Pipes using Flexible Elastomeric Seals.
 4. G 62 - Test Methods for Holiday Detection in Pipeline Coatings.
- C. Comply with the latest published editions of Plastics Pipe Institute (PPI) Standards:
1. TR2 - PPI PVC Range Composition, Listing of Qualified Ingredients.
- D. Comply with the latest published editions of Canadian Standards Association (CSA) Standards:
1. CSA B137.3 - Rigid Polyvinyl Chloride (PVC) Pipe for Pressure Applications.
- E. Comply with the latest published editions the Steel Structures Painting Council (SSPC) Standards, for Commercial Blast Cleaning.

PART 2 - PRODUCTS

2.01 GENERAL REQUIREMENTS

- A. Water Pipe: Pipe furnished shall be Polyvinyl Chloride (PVC). Ductile Iron (DI) pipe shall be provided only where specifically identified on the Drawings or in the Specifications.
- B. Wastewater Pipe: Pipe shall be Polyvinyl Chloride (PVC) for buried service, and flanged Ductile Iron (DI) for non-buried service unless shown otherwise on the Drawings or Specifications.
- C. Pipe for Reuse/Reclaimed Water shall be as specified for water pipe unless exceptions are noted.
- D. All pipe and fittings shall be marked in accordance with the applicable standard specification under which the pipe is manufactured unless otherwise specified.
- E. The quality of materials, the process of manufacture, and the finished pipe shall be subject to inspection and approval by the ENGINEER at the pipe manufacturing plant and at the project site prior to and during installation. All water distribution pipe and fittings shall be listed in the Fire Protection Equipment Directory published by the Underwriter's Laboratories, Inc. or shall be Factory Mutual approved for fire service.

2.02 POLYVINYL CHLORIDE (PVC) PIPE

- A. Water Pipelines:
 1. Pipe shall be blue in color.
 2. All water lines shall be constructed of PVC water pipe, Pressure Class 235, in accordance with AWWA C900 (DR18) or AWWA C909.
 3. Water lines 30-inch and larger shall not be constructed of PVC.
- B. Wastewater Pipelines:
 1. Pipe shall be green in color.
 2. Force mains 12-inch and smaller may be constructed of PVC pipe in accordance with AWWA C900 - Pressure Class 165, DR25; AWWA C909 - Pressure Class 150; or ASTM 2241 - Pressure Rated 160 psi, SDR 26.
 3. Force mains 14-inch and larger may be constructed of PVC pipe in accordance with AWWA C905 - Pressure Rated 165 psi, DR 25; or ASTM 2241 - Pressure Rated 160 psi, SDR 26.
- C. Reuse/Reclaimed Water Pipelines shall be as specified for water pipe except that the color of pipe shall be purple.
- D. Where PVC pipeline is installed using non-encased, trenchless methods, the pipe shall conform to all preceding requirements for PVC pipe and may be one of the following having minimum wall thickness corresponding to DR 18:
 1. Jointless PVC. Pipe shall conform to the requirements of AWWA C900/C905 and PPI TR2. The pipe shall be extruded with plain ends square to the pipe and free of any bevel or chamfer. Pipe shall be Fusible C900™ or Fusible C905™ as manufactured by Underground Solutions, Sarver,

- PA.
- 2. Restrained Joint PVC. Couplings shall be non-metallic and incorporate high-strength, flexible thermoplastic splines which shall be inserted in to mating, precision-machined grooves in the pipe and coupling to provide full 360° restraint with evenly distributed loading. Couplings shall be designed for use at or above the pressure class/rating of the pipe on which they are installed, and shall incorporate twin elastomeric sealing gaskets meeting the requirements of ASTM F 477. Pipe shall be C900/RJ™ or C905/RJ™ as manufactured by CertainTeed Corporation, Valley Forge, PA.
- E. Provide push-on joints with bell integrally cast into pipe or with coupling of same material as pipe.
- F. Use elastomeric gaskets, as provided in AWWA C900 or ASTM D3139.
- G. Provide sleeve type or restraint follower glands where indicated or required to join pipe or provide restraint to offset internal or hydrostatic test pressures.
- H. All pipe shall be designed and installed with a minimum of four foot cover.
- I. PVC pipe shall be marked to indicate the following:
 - 1. Nominal Pipe Size.
 - 2. Material Code Designation.
 - 3. Standard Dimension Ratio.
 - 4. Pressure Rating.
 - 5. Manufacturer's name or trademark.
 - 6. National Sanitation Foundation Seal.
 - 7. Appropriate AWWA or ASTM designation number.

2.03 FITTINGS FOR PVC PIPE

- A. On PVC pipelines, provide compatible fittings meeting or exceeding all requirements and ratings for the pipe on which they are installed. Use long radius fittings where possible.
 - 1. For water lines, provide either AWWA C907 PVC or ductile iron fittings as indicated on the Drawings.
 - 2. For wastewater forcemains, fittings shall be one of the following:
 - a. AWWA C907 PVC or 200 psi Pressure Rated PVC for 8-inch and smaller sizes.
 - b. Fabricated PVC for 10-inch through 24-inch sizes. Fittings shall be made from segments of AWWA C900, C905, or ASTM 2241 PVC pipe bonded together and over-wrapped with fiberglass-reinforced polyester.
 - c. Ductile iron on 14-inch and larger lines conforming to AWWA C905. Ductile iron fittings for wastewater service shall be coated as specified for Ductile Iron Pipe.

2.04 DUCTILE IRON PIPE (DIP)

- A. Ductile iron push-on and mechanical joint pipe for buried service shall meet all requirements of standard AWWA C151, Class 350. Provide push-on joints unless otherwise indicated on the Drawings.
- B. Ductile iron flanged pipe for non-buried service shall meet all requirements AWWA C115. All flanged ductile iron pipe for wastewater service shall be Thickness Class 53. Flanges shall be fabricated and attached to the pipe barrels by U.S. fabricators using flanges and pipe barrels of U.S. manufacture. If fabrication is to be by other than the pipe barrel manufacturer, a complete product submittal and approval by the Utility will be required. Additionally, such fabricator shall submit certification that each fabricated joint has been satisfactorily tested hydrostatically at a minimum pressure of 250 psi
- C. Joints shall meet all requirements of AWWA C111 for push-on, mechanical, and flanged pipe. Threaded- or grooved-type joints which reduce pipe wall thickness below minimum required are not acceptable.

- D. Provide manufacturer's certifications that all ductile iron pipe and fittings meet provisions of this Section and have been hydrostatically tested at the factory.
- E. Joint Materials:
1. Gaskets for ductile iron pipe shall conform to AWWA C111.
 2. Joining of slipjoint iron pipe shall be accomplished with the natural or synthetic rubber gaskets of the manufacturer of that particular pipe being used. Pipe to be installed in areas potentially contaminated by petroleum shall have nitrile rubber gaskets. Where other contaminants are present, gaskets shall be as recommended by the pipe manufacturer.
 3. Gaskets for flanged joints shall be continuous full face gaskets, of 1/8 inch minimum thickness of natural or synthetic rubber, cloth reinforced rubber or neoprene material, preferably of deformed cross section design and shall meet all applicable requirements of AWWA C111 for gaskets. Flange gaskets shall be manufactured by, or satisfy all recommendations of, the manufacturer of the pipe/fittings being used.
 4. Tee-head bolts, nuts, and washers for mechanical joints shall be high strength, low alloy, corrosion resistant steel stock equal to "COR-TEN A" having UNC Class 2 rolled threads or alloyed ductile-iron conforming to ASTM A 536; either shall be fabricated in accordance with ASTM B18.2 with UNC Class 2 rolled threads.
 5. Hex-head bolts and nuts shall satisfy the chemical and mechanical requirements of ASTM A449 SAE Grade 5 plain, and shall be fabricated in accordance with ASTM B 18.2 with UNC Class 2 rolled threads.
 6. Bolts, washers and nuts on flanged fittings shall be Grade B, ASTM A-307, 304 stainless steel. In corrosive environments such as wastewater lift station wetwells, bolts, nuts, and washers shall be 316 stainless steel and shall be coated after assembly in the same manner specified above for piping.
 7. All threaded fasteners shall be marked with a readily visible symbol cast, forged or stamped on each nut and bolt, which will identify the fastener material and grade. The producer and the supplier shall provide adequate literature to facilitate such identification; painted markings are not acceptable.
- F. Polyethylene Film Wrap:
1. All iron pipe, fittings, and accessories including polyurethane coated pipe shall be wrapped with standard 8-mil (minimum) low density polyethylene film or r-fill (minimum) cross laminated high-density polyethylene conforming to AWWA C105, with all edges overlapped and taped securely with duct tape to provide a continuous wrap to prevent contact between the piping and the surrounding backfill. Repair all punctures of the polyethylene, including those caused in the placement of bedding aggregates, with duct tape to restore the continuous protective wrap before backfilling.
 2. For flanged joints in buried service, provide petrolatum wrapping system, Denso, or equal, for the complete joint and alloy steel fasteners. Alternatively, provide bolts made of Type 304 stainless steel.
- G. Markings: Each ductile iron pipe joint and fitting shall be marked as required by the applicable AWWA specification including the following:
1. Manufacturer's identification.
 2. Country where cast.
 3. Year of casting.
 4. "DUCTILE" or "DI".
 5. Barrels of flanged pipe shall show thickness class; others shall show pressure class.
 6. The flanges of pipe sections shall be stamped with the fabricators identification.
 7. Fittings shall show pressure rating and the nominal diameter of openings and the number of degrees for bends.
 8. Painted markings are not acceptable.
- H. Linings and Coatings:
1. Interior:
 - a. Pipe and fittings for water pipelines shall be cement-mortar lined and seal coated as required by AWWA C104. The type and brand of interior lining shall be clearly marked on the outside

- of the pipe and fittings. Except as authorized by the ENGINEER, only one type and brand of pipe lining shall be used on a given project.
- b. Pipe and fittings for wastewater pipelines shall be coated to a minimum 40 mils dry film thickness with an amine cured novalac epoxy containing at least 20% by volume of ceramic quartz pigment. Coating shall be "Protecto 401" ceramic epoxy, as manufactured by Induron Protective Coatings.
2. Exterior:
- a. Buried ductile iron piping and fittings shall have a prime coat and outside asphaltic coating conforming to the applicable AWWA standard for the pipe or fitting being installed. Pipe to be installed in potentially contaminated areas shall have coatings and linings recommended by the manufacturer and approved by the ENGINEER as resistant to the contaminants identified.
 - b. Above-ground ductile iron piping shall have a shop prime with one coat of Koppers No. 621 Rust Inhibitive Primer or equal, and a finish coat of Tnemec 75 Endura-Shield or equal.
 - c. Ductile iron piping and fittings in non-buried, corrosive environments such as wastewater lift station wetwells shall be coated as follows:
 - i) Minimum 25 mils DFT with "Ceramawrap" ceramic epoxy as manufactured by Induron Protective Coatings.
 - ii) Minimum 40 mils DFT with "Corropipe II TX-15 (AM)" as manufactured by Madison Chemical.
 - iii) Or equal.
 - d. Non-buried pipe with specified coating shall be provided with touch-up kit for field repair of damaged coating.
 - e. Pipe and fittings to receive external coating shall be shop primed or delivered to the coating applicator bear as recommended by the manufacturer of the finish coat. Pipe and fittings for non-buried service receiving asphaltic coating at any point prior to application of the specified coating are not acceptable.

2.05 DUCTILE IRON PIPE FITTINGS

- A. Fittings shall be flanged for above-ground service or mechanical joint for buried service unless otherwise indicated or approved, and shall meet all requirements of the following standards:
 - 1. AWWA C110 or AWWA C153 (buried service only).
 - 2. AWWA C111.
- B. Use fittings of same size as pipe. Reducers are not permitted to facilitate an off-size fitting. Reducing bushings are also prohibited. Make reductions in piping size by reducing fittings.
- C. Where long radius bends are indicated, fittings shall have center-to-face and radius dimensions according to the ANSI B16.1 Class 125 standard for long radius bends, and shall conform to all other applicable requirements of AWWA C110 including pressure rating.
- D. Shall be compatible with joint type of adjacent pipe.
- E. Provide all specials, taps, plugs, flanges and wall fittings as required.
- F. Linings and coatings for ductile iron fittings shall be as specified for ductile iron pipe.
- G. Submit certification that all testing requirements of AWWA C110 and C153 have been met. Submittal shall indicate foundry or foundries of manufacture for all fittings.

2.06 VALVES, HYDRANTS, METERS AND APPURTENANCES

- A. For valve requirements refer to Section 15100.
- B. Valve Boxes:
 - 1. Provide for all buried valves.
 - 2. Use nominal 6 inch cast-iron sliding type pipe shaft with cover and base casting.
 - 3. Set box top at finished grade.

4. Furnish drop cover appropriately marked "WATER".
- C. Corporation Stops:
 1. Conform to AWWA C800.
 2. Use 1 inch unless indicated otherwise.
- D. Hydrants:
 1. Design: latest edition of AWWA C502, traffic model with break flange.
 - a. Mueller Centurion - A423
 - b. American-Darling - B-84-B
 - c. Kennedy Guardian - K-81A
 2. Provide 6 inch inlet, 2 – 2 1/2 inch hose nozzles, 1 - 5 inch pumper.
 3. Provide compression type main valve, minimum size 5 inches.
 4. Pentagon operating nut.
 5. Design to open counterclockwise.
 6. Provide mechanical joint bell on footpiece.
 7. Furnish depth as noted on plans.
 8. Furnish National (American) Standard Fire Hose Coupling Screw Thread (NH).
- E. Polyethylene Wrapping:
 1. Material: AWWA C105.
 2. Thickness: 8 mils.
- F. Polyethylene Plastic Pipe (PE):
 1. Material: ASTM D2737.
 2. Fittings: ASTM D2683.
 3. Size: 1 inch unless shown otherwise on plans.

PART 3 - EXECUTION

3.01 GENERAL

- A. Provide all labor, equipment and materials, and install all pipe fittings, specials and appurtenances as indicated or specified.

3.02 PIPE INSTALLATION

- A. Handling:
 1. Handle in a manner to insure installation in sound and undamaged condition.
 - a. Do not drop or bump.
 - b. Use slings, lifting lugs, hooks and other devices designed to protect pipe, joint elements, and coatings.
 2. Ship, move and store with provisions to prevent movement or shock contact with adjacent units.
 3. Handle with equipment capable of work with adequate factor of safety against overturning or other unsafe procedures.
- B. Installation:
 1. Install pipe with orientation of labeling point upward.
 2. Utilize equipment, methods, and materials insuring installation to lines and grades as indicated.
 3. Do not lay piping on blocks unless pipe is to receive total concrete encasement.
 4. Accomplish horizontal and vertical alignment adjustments with fittings or deflection of joints.
 - a. Limit joint deflection:
 - (1) Conform to AWWA C600 for ductile iron pipe.
 - (2) Not more than 80% of pipe manufacturer's recommended maximum for PVC pipe.
 - b. Use short specials preceding curves as required.
 - c. Obtain approval of ENGINEER of method proposed or transfer of line and grade from control to the work.
 5. Install pipe of size, material, strength class, and joint type with embedment as shown on the Drawings or specified herein.

6. Clean interior of all pipe, fittings, and joints prior to installation. Exclude entrance of foreign matter during discontinuance of installation.
 - a. Close open ends of pipe with snug fitting closures.
 - b. Do not let water fill trench. Prevent flotation of pipe where potential for trench flooding is present.
 - c. Remove water, sand, mud and undesirable materials from trench before removal of end cap.
7. Inspect pipe prior to installation to determine if any pipe defects are present.
8. Brace or anchor as required to prevent displacement after establishing final position.
9. Perform only when weather and trench conditions are suitable. Do not lay pipe in water.
10. Observe extra precaution when hazardous atmospheres might be encountered.
11. Sanitary sewer separation distance from water lines:
 - a. Conform to all TCEQ requirements for separation.
 - b. Reuse/Reclaimed water lines shall be treated as sewer lines with regard to separation distance requirements.
 - c. Maintain 9-foot horizontal separation whenever possible.
 - d. When conditions prevent a lateral separation of 9 feet, water line may be installed closer to a sewer subject to the following conditions:
 - (1) Crossings: Sewer shall be constructed of PVC pipe meeting the requirements specified above for pressure sewer lines and have a minimum working pressure rating of 150 psi or greater for pipe and fittings. The water line may be placed no closer than 6 inches from the sewer. The separation distance shall be measured between the nearest outside pipe diameters. The water line shall be located at a higher elevation than the sewer line whenever possible and one length of the sewer pipe must be centered on the water line;
 - (2) Parallel Alignment: the water line shall be separated by a minimum vertical distance of 2-feet (water above sewer) and a minimum horizontal distance of 4-feet, measured between the nearest outside diameters of the pipes.
12. Separation of water lines from sewer manholes:
 - a. No water pipe shall pass through or come in contact with any part of a sewer manhole.
 - b. A minimum horizontal separation of 9 feet shall be maintained.
13. Construct service lines where shown on plans in accordance with Standard Detail Drawing. Use pipe material specified on plans or in contract documents.
14. Wrap ferrous pipe, fittings and tie rods with polyethylene where shown on plans in accordance with AWWA C105.

D. Jointing:

1. General requirements:
 - a. Locate joint to provide for differential movement at changes in type of pipe embedment, at changes from rock to soil trench bottom, and within 18 inches of structure walls.
 - b. Perform in accordance with manufacturer's recommendations.
 - c. Clean and lubricate all joint and gasket surfaces with lubricant recommended.
 - d. Utilize methods and equipment capable of fully homing or making up joints without damage.
 - e. Check joint opening and deflection for specification limits.
2. Special provisions for jointing ductile iron pipe:
 - a. Conform to AWWA C600.
 - b. Visually examine while suspended and before lowering into trench.
 - (1) Paint bell, spigot, or other suspected portions with turpentine and dust with cement to check for cracks invisible to the eye.
 - (2) Remove turpentine and cement by washing when test is satisfactorily completed.
 - (3) Reject all defective pipe.
3. Special provisions for jointing and laying PVC pipe:
 - a. Conform to AWWA C600 and ASTM D2321.
 - b. Allow pipe to reach trench soil temperature prior to installation in ditch.

E. Cutting:

1. Cut in neat workmanlike manner without damage to pipe.
2. Cut cast-iron with Carborundum saw or other approved method.
 - a. Smooth cut by power grinding to remove burrs and sharp edges.
 - b. Repair lining as required and approved by Engineer.

F. Closure Pieces:

1. Connect two segments of pipelines or a pipeline segment and existing structure with short sections of pipe fabricated for the purpose.
2. Observe specifications regarding location of joints, type of joints and pipe materials and strength classifications.
3. May be accomplished with sleeve coupling of rating equal to or greater than that of pipe:
 - a. Of length such that gaskets are not less than 3 inches from pipe ends.
 - b. Include spacer ring identical to pipe end such that clear space does not exceed 1/4 inch.

G. Temporary Plugs:

1. Install whenever installed pipe is left unattended.
2. Use water-tight plug rated for 150 psi or greater.

H. Joint Restraint:

1. Thrust Blocks:

- a. Provide for all horizontal or vertical bends.
- b. Use on all dead-ends, tee fittings, and changes in pipe diameter.
- c. Install as indicated on Standard Detail Drawing.
- d. Construct to undisturbed edge of trench for bearing.
- e. Mechanical joints shall be protected by felt roofing paper prior to placing concrete. Concrete shall not cover joints, bolts or nuts, or interfere with the removal of any joint. Wooden side forms or sand bags shall be provided for thrust blocks.
- f. Provide minimum bearing area in square feet. based on 150 psi test pressure and 2000 psf soil bearing capacity listed in the following table:

Pipe/Tee Size	Tee/Dead Ends	11¼° Bend	22¼° Bend	45° Bend	90° Bend
4"	1.4	0.3	0.5	1.0	1.9
6"	2.8	0.5	1.1	2.1	4.0
8"	4.8	0.9	1.9	3.7	6.8
10"	7.3	1.4	2.8	5.6	10.3
12"	10.3	2.0	4.0	7.9	14.5
14"	13.8	2.7	5.4	10.6	19.5
16"	17.8	3.5	7.0	13.6	25.2

- g. Adjust thrust block areas accordingly if pressures and/or soil bearing capacity varies

3. Restraint follower glands for use with mechanical joint fittings shall be used in addition to thrust blocks where indicated on the Drawings. Restraint gland shall have torque limiting twist-off nuts and shall meet the requirements of ASTM 1674-96 for use with PVC pipe and be equal to "MEGALUG®" as manufactured by EBAA Iron, Eastland, TX.

- I. After installation, non-buried pipe shall be visually inspected for damage to protective coating and repaired using coating manufacturer's repair kit.

3.03 VALVE AND APPURTENANCE INSTALLATION

A. Valves:

1. Install with stems vertical when installation is horizontal.
2. Set valves on concrete thrust block having four (4) square feet of bearing area on undisturbed earth.

B. Valve Boxes:

1. Center on valves.
2. Carefully tamp earth around each valve box to a distance of 4 feet on all sides of box or to undisturbed trench face, if less than 4 feet.

C. Hydrants:

1. Set hydrants where shown on plans in accordance with Standard Detail Drawing.

2. Install gravel, blocks and anchors in accordance with Standard Detail Drawing.
3. Set reference elevation 3 inches above existing grade or to elevation established by ENGINEER (not to exceed 6 inches).
4. Break-a-way flange to be either ground level where applicable or between 3 inches and 6 inches above curb as established by Engineer.

3.04 ACCEPTANCE TESTS FOR PRESSURE MAINS

- A. Perform hydrostatic pressure and leakage test.
 1. Conform to AWWA C600 procedures.
 - a. As modified herein.
 - b. Shall apply to all pipe materials specified.
 2. Perform after backfilling.
- B. Test separately in segments between sectionalizing valves, between a sectionalizing valve and a test plug, or between test plugs.
 1. Contractor to furnish and install test plugs, including all anchors, braces and other temporary or permanent devices to withstand hydrostatic pressure on plugs, at no additional cost to the Owner.
 2. Contractor responsible for any damage to public or private property caused by failure of plugs.
- C. Limit fill rate of line to available venting capacity. Fill rate shall be regulated to limit velocity in lines when flowing full to not more than 1 fps.
- D. OWNER will make water for testing available to contractor at nearest source. **Valves of existing water system will at all times be operated by City personnel only.**
- E. Pressure test:
 1. Conduct at pressure at least 1.5 times the normal working pressure (not less than 150 psi test pressure).
 2. Maintain pressure for a minimum of two (2) hours.
 3. Test pressure shall not vary by more than +5 psi
- F. Leakage Test:
 1. Conduct concurrently with the pressure test.
 2. Maintain pressure for a minimum of two (2) hours.
 3. Acceptable when leakage does not exceed that determined by the following formula:

$$L = \frac{N \cdot D \cdot P^{0.5}}{7400}$$

L = Maximum permissible leakage in gallons per hour.

N = Number of pipe joints in segment under test.

D = Nominal internal diameter of pipe being tested in inches.

P = Average actual leakage test pressure, psig.

4. Repeat leakage test as necessary:
 - a. After location of leaks and repair or replacement of defective joints, pipe or fittings.
 - b. Until satisfactory performance of test.
 - c. At no increase in cost to the OWNER.
- G. Refit and replace all pipe not meeting the leakage or pressure requirements. Repair clamp is not permitted.
- H. Repair all visible leaks regardless of the amount of leakage.
- I. OWNER or ENGINEER will observe all tests.

3.05 DISINFECTION OF PIPELINES FOR CONVEYING POTABLE WATER

- A. CONTRACTOR to provide all equipment and materials and perform in accordance with AWWA C601.
 - 1. As modified herein.
 - 2. Include chlorination and final flushing.
- B. Add chlorine to attain an initial concentration of 50 mg/l chlorine with 10 mg/l remaining after 24 hours.
- C. Flush main until concentration is 2 mg/l or current disinfectant levels of treatment or less prior to placing main in service.
- D. Obtain approval of materials and methods proposed for use.
- E. May be conducted in conjunction with acceptance tests.
- F. Dispose of flushing water without damage to public or private property.
- G. Repeat disinfection procedure should initial treatment fail to yield satisfactory results.
 - 1. At no additional cost to the OWNER.
 - 2. OWNER will provide water under terms specified for acceptance tests.
- H. Do not exceed 500 gpm rate in flushing.
- I. Provide safe bacterial sample results before requesting main to be placed into service.
- J. No valves separating city potable water from newly installed mains shall be operated by anyone other than TCEQ certified water operators as authorized by the Department Manager in charge of maintenance of the distribution system.

PART 4 - MEASUREMENT AND PAYMENT

4.01 PRESSURE LINES

- A. Line shall be measured along the center of the pipe without considering fittings or other pipe connections. The line will be paid at the contract bid price per linear foot.
- B. Compensation will be for furnishing all materials, labor, equipment, tools and incidental work required by the construction of the pressure line, all in accordance with the plans and these specifications.
- C. If pressure line fails any test procedure, trouble spot is to be corrected all as incidental to the construction of the pressure line.

END OF SECTION

SECTION 02558 - VALVES AND APPURTENANCES

1.00 GENERAL

1.01 WORK INCLUDED

- A. Furnish all labor, materials, equipment and incidentals required and install complete and ready for operation all valves and appurtenances as shown on the Drawings and as specified herein.
- B. All valves and appurtenances shall be of the size shown on the Drawings and as far as possible all equipment of the same type shall be from one manufacturer.
- C. All valves and appurtenances shall have the name of the maker and the working pressure for which they are designed cast in raised letters upon some appropriate part of the body.
- D. All exposed valves, where applicable, shall have "open-closed" position indicators. The position indicators shall be conveniently located for easy visibility.

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Piping is specified in Division 2.

1.03 DESCRIPTION OF SYSTEMS

All of the equipment and materials specified herein are intended to be standard for use in controlling the flow of potable water and domestic wastewater.

1.04 QUALITY ASSURANCE

All of the types of valves and appurtenances shall be products of well established reputable firms who are fully experienced and qualified in the manufacture of the particular equipment to be furnished. The equipment shall be designed, constructed and installed in accordance with the best practices and methods and shall comply with these specifications as applicable.

1.05 SUBMITTALS

Complete shop drawings of all valves and appurtenances shall be submitted to the Engineer for approval in accordance with the requirements of the General Conditions.

1.06 TOOLS

Special tools, if required for normal operation and maintenance, shall be supplied with the equipment.

2.00 PRODUCTS

2.01 RESILIENT SEATED GATE VALVES

- A. Gate valves shall be resilient seated, manufactured to meet or exceed the requirements of AWWA C509 (valves 12-inch and smaller) or AWWA C515 (valves larger than 12-inch) or latest revision and be UL listed and FM approved. All valves shall be rated for 250 psi working pressure and be tested in strict accordance with AWWA C509/C515. The valves shall be tested and certified to ANSI/NSF 61. Valve shall have an unobstructed waterway equal to or greater than the full nominal diameter of the valve.
- B. The valve body, bonnet, stuffing box and disc shall be ASTM A-126, Class B grey iron or ASTM A395 or A536 ductile iron. Flanges shall conform to ANSI B16.1 Class 125.
- C. All ferrous surfaces inside and outside shall have a fusion-bonded epoxy coating, 10 mils minimum.
- D. The valves are to be non-rising stem (NRS) with the stem made of cast, forged, or rolled bronze per AWWA C509/C515. The stem shall have at least one "anti-friction" thrust washer above and below the stem collar to reduce operating torque. The design of the NRS valve stem shall be such that if excessive input torque is applied, stem failure shall occur above the stuffing box at such a point as to

enable the operation of the valve with a pipe wrench or other readily available tool. Valves with two-piece stem collars do not meet the requirements of AWWA C509/C515 and are unacceptable.

- E. The valves shall have bolts and nuts for the stuffing box and bonnet fabricated of ASTM A-307, Grade B zinc plated steel or type 316 stainless steel. Refer to Paragraph 3.01.
- F. The NRS valves shall have a stuffing box that is o-ring sealed. Two o-rings shall be placed above and one o-ring below the stem thrust collar. The thrust collar shall be factory lubricated. The thrust collar and its lubrication shall be isolated by the o-rings from the waterway and from outside contamination providing permanent lubrication for long term ease of operation. Valves without a stuffing box are unacceptable. Valves without at least three stem o-rings are also unacceptable.
- G. The sealing mechanism shall consist of disc and guide lugs completely encapsulated in SBR ASTM D2000 rubber material. The peel strength shall not be less than 75 pounds per inch. Guide caps of an Acetal bearing material shall be placed over solid guide lugs to prevent abrasion and to reduce the operating torque. Guide lugs placed over bare metal are not acceptable. The resilient sealing mechanism shall provide zero leakage at the water working pressure when installed with the line flow in either direction.
- H. Non-buried valves shall have an arrow cast on the handwheel showing opening direction. Buried valves shall be provided with a 2" square operating nut, and the bolt that attaches the operating nut to the stem shall be recessed into the operating nut so as not to interfere with valve wrench operation. All valves shall turn counter-clockwise to open, and clockwise to close.
- I. Tapping valves where indicated on the drawings shall have an inlet flange conforming to ANSI B16.1 Class 125 for attachment to a tapping sleeve or cross. In addition, the valve inlet flange shall have a machined projection or raised face complying with MSS SP-60 for accurate alignment to the mating recess in the tapping sleeve flange. The seat opening of the tapping valves shall be at least .30" larger than the nominal pipe size to permit full size shell cutters.
- J. The valves shall be warranted by the manufacturer against defects in materials or workmanship for a period of ten (10) years from the date of manufacture.
- K. Valves shall be Mueller A2360 or A2361 Series or approved equal.

2.02 VALVE STEM EXTENSIONS (AS REQUESTED ONLY)

- A. Extension stems shall be provided as necessary to situate the operating nut no greater than 18 inches below the valve cover.
- B. Extension stems shall be equipped with stem guides affixed to the valve box at intervals not to exceed ten feet.
- C. Stem guides shall be considered a part of the extension. Extension stems and stem guide shall be manufactured items or approved equal.

2.03 VALVE BOXES

- A. All buried valves shall have cast-iron three piece valve boxes.
- B. Valve boxes shall be provided with suitable heavy bonnets and be set to finished grade.
- C. The barrel shall be two-piece, sliding type, having 5-inch shaft. The upper section shall have a flange at the bottom having sufficient bearing area to prevent settling and shall be complete with cast iron covers.
- D. Covers shall have "WATER" cast into the top for all water mains and "SEWER" cast into the top of all wastewater lines.
- E. All valves shall have actuating nuts extended to top of valve boxes.
- F. Valve boxes shall be provided with concrete base.

2.04 CHECK VALVES

- A. Check valves for PVC and ductile iron pipelines shall be resilient disc swing type suitable for cold working pressures of 250 psig in water and wastewater and shall conform to ANSI/AWWA C508 standards. Valve shall be hydrostatically tested at 1.5 times the rated cold working pressure.
- B. The valves shall be ductile iron body conforming to ASTM A536 Grade 65-45-12. Body shall have full flow area equal to the nominal pipe diameter. The seating surface shall be on a 45 degree angle to minimize disc travel. Valves shall be so constructed that disc and body seat may easily be removed and replaced without removing the valve from the line.
- C. Top access shall be full size, allowing removal of the disc without removing the valve from the line. The cover shall be domed in shape to provide flushing action over the disc for operation in lines containing high solids content.
- D. Resilient disc shall be one-piece construction of precision molded Buna-N (NBR), conforming to ASTM D2000-BG, with an integral o-ring type sealing surface. Disc shall have steel and nylon reinforcement in the hinge. Non-slam closing characteristics shall be provided through a short 35 degree disc stroke and a disc accelerator. The flex portion of the disc shall be warranted for twenty-five (25) years.
- E. Disc accelerator shall be one-piece, stainless steel construction and provide rapid closure of the valve in high head applications. The disc accelerator shall be enclosed within the valve and shall be field adjustable and replaceable without removal of the valve from the line. The disc accelerator shall be securely held in place by being captured between the cover and disc. It shall be formed with a large radius to allow smooth movement over the disc surface.
- F. Valve shall be cycle tested 1,000,000 times with no signs of wear, cracking, or distortion to the valve disc or seat and shall remain drop tight at both high and low pressures. Manufacturer shall have 5 years minimum experience in the manufacture of resilient disc check valves.
- G. Ends shall have Class 125 ANSI B16.1 flanges.
- H. Valve shall have mechanical disc position indicator remaining in continuous contact with the disc under all operating conditions.
- I. Provide screw-type backflow actuator of rising-stem design with a stainless steel T-handle to allow opening of valve during no-flow conditions. Buna-N seals shall be used to seal the stainless steel stem in a bronze bushing.
- J. Exterior and interior of the valve shall be coated with an NSF 61 approved fusion bonded epoxy shop coating.
- K. Valve shall be Surgebuster™ Series #7200 as manufactured by Val-Matic Valve & Manufacturing Corporation, Elmhurst, IL, or approved equal.

2.05 COMBINATION AIR/VACUUM VALVES FOR SANITARY SEWER SERVICE

- A. The air-vacuum release valves for use in sanitary sewer force mains shall be installed as shown on the drawings.
- B. Air Release/Vacuum Relief Valves shall have a minimum seating pressure of 0 psi through a maximum operating pressure of 250psi.
- C. The operating mechanism shall be non-metallic and corrosion resistant. The valve body, floats, float guide, and stem shall be of stainless steel Type 316ti.
- D. The valves shall have an internal debris shield and debris screen or an alternative mechanism to prevent clogging of the orifice.
- E. Valve shall have standard NPT inlets and outlet ports. Provisions shall be made for back-flushing the valve with clean water via cam lock attachment.
- F. The air release valve for sanitary sewer service shall come with a five year warranty.
- G. Valve shall be as manufactured by H-Tec or approved equal, Model 986 for above ground service.
- H. H-Tec Model 985 Manhole Free Set for below-ground installations, or approved equal.

2.06 COMBINATION AIR/VACUUM VALVES FOR WATER SERVICE

- A. The valve shall be a combination air/vacuum – double orifice automatic and infinitely air release valve.
- B. One 2” orifice and one 1” orifice for allow air to escape and enter in the event of a vacuum condition.
- C. The valve shall be of three-piece body design.
- D. The valve shall be of corrosion free materials.
- E. Body shall be anodized aluminum. Float shall be expanded PP.
- F. The valve sealing is rubber made of EPDM.
- G. The valve shall have an outlet elbow of PE with insect protection screen of stainless steel.
- H. Automatic and Infinitely Variable Air Valve
- I. Valve shall be as manufactured by H-Tec or approved equal, Model 993 for above ground service.
- J. H-Tec Model 992 Manhole Free Set for below-ground installations, or approved equal.

2.07 SLEEVE TYPE COUPLINGS

- A. Coupling shall have stainless steel middle ring without pipe stops. Provide epoxy coated steel follower rings with ribbed construction and two wedge-section gaskets of material suitable for wastewater service.
- B. Nuts and bolts shall conform to AWWA C-111 and be provided in sufficient quantity to compress the gaskets.
- C. Couplings shall be Dresser Style 38 or equal.

2.08 SHOP PAINTING

Ferrous surfaces of valves and appurtenances shall receive a coating of rust inhibitive primer as specified in Section 02556 for ductile iron. All pipe connection openings shall be capped to prevent the entry of foreign matter prior to installation.

3.00 EXECUTION

3.01 INSTALLATION

- A. All valves and appurtenances shall be installed in the locations shown, true to alignment and rigidly supported. Any damage to the above items shall be repaired to the satisfaction of the Engineer before they are installed.
- B. Pipe for use with flexible couplings shall have plain ends.
- C. Flanged joints shall be made with 316 stainless steel bolts, nuts and washers. Mechanical joints shall be made with mild corrosion resistant alloy steel bolts and nuts. All exposed bolts shall be painted the same color as the pipe. All buried bolts and nuts shall be heavily coated with two (2) coats of bituminous paint comparable to Inertol No. 66 Special Heavy.
- D. Prior to assembly of split couplings, the grooves as well as other parts shall be thoroughly cleaned. The ends of the pipes and out-side of the gaskets shall be moderately coated with petroleum jelly, cup grease, soft soap or graphite paste, and the gasket shall be slipped over one pipe end. After the other pipe has been brought to the correct position, the gasket shall be centered properly over the pipe ends with the lips against the pipes. The housing sections then shall be placed. After the bolts have been inserted, the nuts shall be tightened until the housing sections are firmly in contact, metal-to-metal, without excessive bolt tension.
- E. Prior to the installation of sleeve-type couplings, the pipe ends shall be cleaned thoroughly for a distance of 8 inches. Soapy water may be used as a gasket lubricant. A follower and gasket, in that order, shall be slipped over each pipe to a distance of about 6 inches from the end, and the middle ring shall be placed on the already laid pipe end until it is properly centered over the joint. The other pipe end shall be inserted into the middle ring and brought to proper position in relation to the pipe already laid. The gaskets and followers shall then be pressed evenly and firmly into the middle ring flares. After the bolts have been inserted and all nuts have been made up finger tight, diametrically opposite nuts shall be progressively and uniformly tightened all around the joint, preferably by use of a torque wrench of the appropriate size and torque for the bolts.
- F. Air Valve Locations: After the mains have been installed the Contractor shall install the air release valves. The connection to the main shall be by a stainless steel tapping saddle, or as shown on the Drawings. These connections to the main shall be at high points and other locations as determined by the Engineer. In order for the Engineer to determine these locations, the Contractor shall submit the as-built elevations of the top of the pipe to the Engineer as soon as possible after the pipe has been installed. Elevations shall be determined at intervals not to exceed 100 feet and at defined breaks in the pipe profile grade. Should re-excavation of the main be necessary to install the air release valve connection, cost for this work and subsequent backfill/restoration work cost shall be included in the appropriate lump sum price bid for air release valves.
- G. Valve boxes with concrete bases shall be installed as shown on the Drawings. Mechanical joints shall be made in the standard manner. Valve stems shall be vertical in all cases. Place cast iron box over each stem with base bearing on compacted fill and top flush with final grade. Boxes shall have sufficient bracing to maintain alignment during backfilling. Knobs on cover shall be parallel to pipe. Remove any sand or undesirable fill from valve box.

END OF SECTION

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PART 1 - GENERAL

1.01 GENERAL DESCRIPTION OF WORK

- A. This work shall consist of shoring, bracing, bank stabilization, bank sloping, providing trench boxes or trench shields or other equivalent means to protect employees from the effects of moving ground or cave-ins for all trenches 5-feet or more in depth.
- B. All work shall be done in conformance with OSHA Safety and Health Standards (29 CFR 1926/1010 Chapter XVII Subpart P-Excavations, Trenching and Shoring).
- C. Trench safety plan shall be submitted by a Texas Registered Professional Engineer 30 days prior to commencement of any trenching operation in accordance with the Special Provisions of the specifications.

1.02 DEFINITIONS APPLICABLE TO THIS SPECIFICATION

- A. "Accepted engineering requirements (or practices)" - Those requirements or practices which are compatible with standards required a Registered Professional Engineer, or other duly licensed or recognized authority.
- B. "Angle of repose" - The greatest angle above the horizontal plane at which a material will lie without sliding.
- C. "Bank" - A mass of soil rising above a digging level.
- D. "Belled excavation" - A part of shaft or footing excavation, usually near the bottom and bell-shaped; i.e., an enlargement of the cross section above.
- E. "Braces (trench)" - The horizontal members of the shoring system whose ends bear against the uprights or stringers.
- F. "Excavation" - Any manmade cavity or depression in the earth's surface, including its sides, walls, or faces, formed by earth removal and producing unsupported earth conditions by reasons of the excavation. If installed forms or similar structures reduce the depth-to-width relationship, an excavation may become a trench.
- G. "Faces" - See paragraph (k) of this section.
- H. "Hard compact soil" - All earth materials not classified as running or unstable.
- I. "Kickouts" - Accidental release or failure of a shore or brace.
- J. "Sheet pile" - A pile, or sheeting, that may form one of the continuous interlocking line, or a row of timber, concrete, or steel piles, driven in close contact to provide a tight wall to resist the lateral pressure of water, adjacent earth, or other materials.
- K. "Sides", "Walls", or "Faces" - The vertical or inclined earth surfaces formed as a result of excavation work.
- L. "Slope" - The angle with the horizontal at which a particular earth material will stand indefinitely without movement.
- M. "Stringers" (wales) - The horizontal members of a shoring system whose sides bear against the uprights or earth.
- N. "Trench" - A narrow excavation made below the surface of the ground. In general, the depth is greater than the width, but the width of a trench is not greater than 15-feet.
- O. "Trench shield" - A shoring system composed of steel plates and bracing, welded or bolted together, which support the walls of a trench from the ground level to the trench bottom and which can be moved along as work progresses.
- P. "Unstable soil" - Earth material, other than running, that because of its nature of the influence of related conditions,

cannot be depended upon to remain in place without extra support, such as would be furnished by a system of shoring.

- Q. "Uprights" - the vertical members of a shoring system.
- R. "Wales" - See paragraph M of this section.
- S. "Walls" - See paragraph K of this section.

PART 2 - PRODUCTS

No information for this section

PART 3 - EXECUTION

3.01 GENERAL PROTECTION REQUIREMENTS

- A. Walkways, runways, and sidewalks shall be kept clear of excavated material or other obstructions and no sidewalks shall be undermined unless shored to carry a minimum live load of one hundred and twenty-five (125) pounds per square foot.
- B. If planks are used for raised walkways, runways, or sidewalks they shall be laid parallel to the length of the walk and fastened together against displacement.
- C. Planks shall be uniform in thickness and all exposed ends shall be provided with beveled cleats to prevent tripping.
- D. Raised walkways, runways, and sidewalks shall be provided with plank steps on string stringers. Ramps, used in lieu of steps, shall be provided with cleats to insure a safe walking surface.
- E. All employees shall be protected with personal protective equipment for the protection of the head, eyes, respiratory organs, hands, feet and other parts of the body as set forth in OSHA Standards.
- F. Employees exposed to vehicular traffic shall be provided with and shall be instructed to wear warning vests marked with or made or reflectorized with high visibility material.
- G. Employees subjected to hazardous dusts, gases, fumes, mists, or atmospheres deficient in oxygen, shall be protected with approved respiratory protection as set forth in OSHA Standards.
- H. No person shall be permitted under loads handled by power shovels, derricks, or hoists. To avoid any spillage, employees shall be required to stand away from any vehicle being loaded.
- I. Daily inspections of excavations shall be made by a competent person. If evidence of possible cave-ins or slides is apparent, all work in the excavation shall cease until the necessary precautions have been taken to safeguard employees.

3.02 SPECIFIC EXCAVATION REQUIREMENTS

- A. Prior to opening an excavation, effort shall be made to determine whether underground installations, i.e., sewer, telephone, water, fuel, electric lines, etc., will be encountered, and if so, where such underground installations are located. When the excavation approaches the estimated location of such an installation, the exact location shall be determined and when it is uncovered, proper supports shall be provided for the existing installation. Utility companies shall be contacted and advised of proposed work prior to the start of actual excavation.
- B. Trees, boulders, and other surface encumbrances, located so as to create a hazard to employees involved in excavation work or in the vicinity thereof at any time during operations, shall be removed or made safe before excavating is begun.
- C. The walls and faces of all excavations in which employees are exposed to danger from moving ground shall be

guarded by a shoring system, sloping of the ground or some other equivalent means.

- D. Excavations shall be inspected by a competent person after every rainstorm or other hazard-increasing occurrence, and the protection against slides and cave-ins shall be increased if necessary.
- E. The determination of the angle of repose and design of the supporting system shall be based on careful evaluation of pertinent factors such as: Depth of cut; possible variation in water content of the material while the excavation is open; anticipated changes in materials from exposure to air, sun, water, or freezing; loading imposed by structures, equipment, overlying materials, or stored material; and vibration from equipment, blasting, traffic, or other sources.
- F. Supporting systems, i.e., piling, cribbing, shoring, etc., shall be designed by a qualified person and meet accepted engineering requirements. When tie rods are used to restrain the top of sheeting or other retaining systems, the rods shall be securely anchored well back of the angle of repose. When tight sheeting or sheet piling is used, full loading due to ground water table shall be assumed, unless prevented by weep holes or drains or other means. Additional stringers, ties, and bracing shall be provided to allow for any necessary temporary removal of individual supports.
- G. All slopes shall be excavated to at least the angle of repose except for areas where solid rock allows for line drilling or presplitting.
- H. The angle of repose shall be flattened when an excavation has water conditions, silty materials, loose boulders, and areas where erosion, deep frost action and slide planes appear.
- I. Clearances:
 - 1. In excavations which employees may be required to enter, excavated or other material shall be effectively stored and retained at least 2-feet or more from the edge of the excavation.
 - 2. An alternative to the clearance prescribed in subparagraph 1, the Contractor may use effective barriers or other effective retaining devices in lieu thereof in order to prevent excavated or other materials from falling into the excavation.
- J. Sides, slopes, and faces of all excavations shall meet accepted engineering requirements by scaling, benching, barricading, rock bolting, wire meshing, or other equally effective means. Special attention shall be given to slopes which may be adversely affected by weather or moisture content.
- K. Support systems shall be planned and designed by a qualified person when excavation is in excess of 20-feet in depth, adjacent to structures or improvements, or subject to vibration or ground water.
- L. Materials used for sheeting, sheet piling, cribbing, bracing, shoring and underpinning shall be in good serviceable condition, and timbers shall be sound, free from large or loose knots, and of proper dimensions.
- M. Special precautions shall be taken in sloping or shoring the sides of excavations adjacent to previously backfilled excavation for a fill, particularly when the separation is less than the depth of the excavation. Particular attention also shall be paid to joints and seams of material comprising a face and the slope of such seams and joints.
- N. Except in hard rock, excavations below the level of the base of footing of any foundation or retaining wall shall not be permitted, unless the wall is underpinned and all other precautions taken to insure the stability of the adjacent walls for the protection of employees involved in excavation work or in the vicinity thereof.
- O. If the stability of adjoining building or walls is endangered by excavations, shoring, bracing or underpinning shall be provided as necessary to insure their safety. Such shoring, bracing or underpinning shall be inspected daily or more often, as conditions warrant, by a competent person so that the protection is effectively maintained.
- P. Diversion ditches, dikes, or other suitable means shall be used to prevent surface water from entering an excavation and to provide adequate drainage of the area adjacent to the excavation. Water shall not be allowed to accumulate in an excavation.
- Q. If it is necessary to place or operate power shovels, derricks, trucks, materials, or other heavy objects on a level above and near an excavation, the side of the excavation shall be sheet-piled, shored, and braced as necessary to resist the extra pressure due to such superimposed loads.

- R. Blasting and the use of explosives are not allowed unless authorized in other portions of the specifications.
- S. When mobile equipment is utilized or allowed adjacent to excavations, substantial stop logs or barricades shall be installed. If possible, the grade should be away from the excavation.
- T. Adequate barrier physical protection shall be provided at all remotely located excavations. All wells, pits shafts, etc., shall be barricaded or covered. Upon completion of exploration and similar operations, temporary wells, pits, shafts, etc. shall be backfilled.
- U. If possible, dust conditions shall be kept to a minimum by the use of water, salt, calcium chloride, oil, or other means.
- V. In locations where oxygen deficiency or gaseous conditions are possible, air in the excavation shall be tested. Controls, as set forth in OSHA Standards shall be established to assure acceptable atmospheric conditions. When flammable gases are present, adequate ventilation shall be provided or sources of ignition shall be eliminated. Attended emergency rescue equipment, such as breathing apparatus, a safety harness and line, basket stretcher, etc. shall be readily available where adverse atmospheric conditions may exist or develop in an excavation.
- W. Where employees or equipment are required or permitted to cross over excavations, walkways or bridges with standard guardrails shall be provided.
- X. Where ramps are used for employees or equipment, they shall be designed and constructed by qualified persons in accordance with accepted engineering requirements.
- Y. All ladders used on excavation operations shall be in accordance with requirements of OSHA Standards.

3.03 SPECIFIC TRENCHING REQUIREMENTS

- A. Banks more than 5-feet shall be shored, laid back to a stable slope or some other equivalent means of protection shall be provided where employees may be exposed to moving ground or cave-ins. Trenches less than 5-feet in depth shall also be effectively protected when examination of the ground indicates hazardous ground movement may be expected.
- B. Sides of trenches in unstable or soft material, 5-feet or more in depth, shall be shored, sheeted, braced, sloped, or otherwise supported by means of sufficient strength to protect the employees working within them.
- C. Sides of trenches in hard or compact soil, including embankments, shall be shored or otherwise supported when the trench is more than 5-feet in depth and 8-feet or more in length. In lieu of shoring, the sides of the trench above the 5-foot level may be sloped to preclude collapse, but shall not be steeper than a 1-foot rise to each 1/2-foot horizontal. When the outside diameter of a pipe is greater than 6-feet, a bench of 4-foot minimum shall be provided at the toe of the sloped portion.
- D. Materials used for sheeting and sheet piling, bracing, shoring, and underpinning, shall be in good serviceable condition, and timbers used shall be sound and free from large or loose knots, and shall be designed and installed so as to be effective to the bottom of the excavation.
- E. Additional precautions by way of shoring and bracing shall be taken to prevent slides or cave-ins when excavations or trenches are made in locations adjacent to backfilled excavations, or where excavations are subjected to vibrations from railroad or highway traffic, the operation of machinery, or any other source.
- F. Employees entering bell-bottom pier holes shall be protected by the installation of a removable-type casing of sufficient strength to resist shifting of the surrounding earth. Such temporary protection shall be provided for the full depth of that part of each pier and securely fastened to shoulder harness, shall be worn by each employee entering the shafts. This lifeline shall be individually manned and separate from any line used to remove materials excavated from the bell footing.
- G. Minimum requirements for trench timbering shall be in accordance with Table 19000-1. Braces and diagonal shores

in a wood shoring system shall not be subjected to compressive stresses in excess of values given by the following formula:

$$S + 1300 - 20 \frac{L}{D}$$

Maximum Ratio: $\frac{L}{D} = 50$

Where:

L = Length, unsupported, inches

D = Least side of the timber in inches

S = Allowable stress in pounds per square inch of cross-section.

- H. When employees are required to be in trenches 4-feet deep or more, an adequate means of exit, such as a ladder or steps shall be provided and located so as to require no more than 25-feet of lateral travel.
- I. Bracing or shoring of trenches shall be carried along with the excavation.
- J. Cross braces or trench jacks shall be placed in true horizontal position, be spaced vertically, and be secured to prevent sliding, falling, or kickouts.
- K. Portable trench boxes or sliding trench shields may be used for the protection of personnel in lieu of a shoring system or sloping. Where such trench boxes or shields are used, they shall be designed, constructed, and maintained in a manner which will provide protection equal to or greater than the sheeting or shoring required for the trench. The Contractor shall provide a statement certified by a Registered Professional Engineer of the adequacy of trench boxes or shields.
- L. Backfilling and removal of trench supports shall progress together from the bottom of the trench. Jacks or braces shall be released slowly and, in unstable soil, ropes shall be used to pull out the jacks or braces from above after employees have cleared the trench.

3.05 CONSTRUCTION REQUIREMENTS

- A. The Contractor, unless otherwise provided for in the plans, shall provide the minimum shoring shown in Table 19000-1 for the soil class noted in the plans.
- B. Should the soil conditions differ from those specified or should ground water be encountered in the excavation, the contractor shall notify the Engineer immediately. The Contractor shall refrain from operating in that portion of the trench where changed conditions are noted until such time as an inspection of conditions takes place and the contractor is notified of measures necessary for continued operation.
- C. The Contractor shall prepare and submit a plan of operation. This plan of operation shall identify material, equipment, methods and installation and shall be inspected by a Registered Professional Engineer. The Contractor's Engineer shall certify the adequacy of the trench protection system and its adherence of OSHA Standards.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

- A. *Providing shoring in trenches or other alternate means in accordance with this specification shall be measured by the linear foot of trench of specified sizes or sizes of pipe in ranges of depth to the invert elevation of the pipe or structure. Additional depth for foundations, etc. shall be considered incidental to the price bid for the protection.*
- B. The Contractor shall provide shoring systems for construction of structures 5-feet or greater in depth. There will be no direct payment for these systems but it shall be considered incidental to the price bid for the structure.

4.02 PAYMENT

- A. *The unit price bid for trench protection shall be full compensation for providing acceptable shoring or other alternate means, installing, inspecting, certifying and maintaining the shoring and for all manipulations, labor, tools, equipment and incidentals necessary to complete the work.*

SEE ATTACHED TABLE

END OF SECTION

TABLE 19000-1
TRENCH SHORING, MINIMUM REQUIREMENTS

Depth Of Trench Feet	Kind or Condition of Earth	Size and Spacing of Members										
		Uprights		Stringers		Cross Braces		Width of Trench		Maximum Spacing		
		Minimum Dimension Inches	Maximum Spacing Feet	Minimum Dimension Inches	Maximum Spacing Feet	Up to 3 Feet Inches	3-6 Feet Inches	6-9 Feet Inches	9-12 Feet Inches	12-15 Feet Inches	Vertical Feet	Horizontal Feet
5 to 10	Hard, Compact	3 x 4 or 2 x 6	6	---	---	2 x 6	4 x 4	4 x 6	6 x 6	6 x 8	4	6
	Likely to Crack	3 x 4 or 2 x 6	3	4 x 6	4	2 x 6	4 x 4	4 x 6	6 x 6	6 x 8	4	6
	Soft, Sandy or Filled	3 x 4 or 2 x 6	Close Sheeting	4 x 6	4	4 x 4	4 x 6	6 x 6	6 x 8	8 x 8	4	6
	Hydrostatic Pressure	3 x 4 or 2 x 6	Close Sheeting	6 x 8	4	4 x 4	4 x 6	6 x 6	6 x 8	8 x 8	4	6
10-15	Hard, Compact	3 x 4 or 2 x 6	4	4 x 6	4	4 x 4	4 x 6	6 x 6	6 x 8	8 x 8	4	6
	Likely to Crack	3 x 4 or 2 x 6	2	4 x 6	4	4 x 4	4 x 6	6 x 6	6 x 8	8 x 8	---	6
	Soft, Sandy or Filled	3 x 4 or 2 x 6	Close Sheeting	4 x 6	4	4 x 6	6 x 6	6 x 8	8 x 8	8 x 10	4	6
	Hydrostatic Pressure	3 x 6	Close Sheeting	8 x 10	4	4 x 6	6 x 6	6 x 8	8 x 8	8 x 10	4	6
15-20	All Kinds of Conditions	3 x 6	Close Sheeting	4 x 12	4	4 x 12	6 x 8	8 x 8	8 x 10	10 x 10	4	6
Over 20	All Kinds of Conditions	3 x 6	Close Sheeting	6 x 8	4	4 x 12	8 x 8	8 x 10	10 x 12	10 x 12	4	6

Trench jacks may be used in lieu of, or in combination with cross braces

Shoring is not required in solid rock, hard shale or hard slag.

Where desirable, steel sheet piling and bracing of equal strength may be substituted for wood.