

INDEX OF SHEETS

SEE SHEET 2 FOR INDEX OF SHEETS

STATE OF TEXAS
DEPARTMENT OF TRANSPORTATION

PLANS OF PROPOSED
STATE HIGHWAY IMPROVEMENT

FEDERAL AID PROJECT NO.
STP 2021(537)HES

NET LENGTH OF PROJECT = 98,608.70 FT. = 18.676 MI.

FM 38
LAMAR COUNTY

LIMITS: FROM US 82 TO US 82

FOR HAZARD ELIMINATION AND SAFETY

CONSISTING OF SAFETY TREATING FIXED OBJECTS

CONT	SECT	JOB	HIGHWAY
0435	01	080	FM 38
DIST	COUNTY		SHEET NO.
PAR	LAMAR		1

DESIGN SPEED= 40 MPH MAIN LANES
A.D.T.(2019)= 3089
A.D.T.(2039)= 4325

FINAL PLANS

LETTING DATE: _____
DATE CONTRACTOR BEGAN WORK: _____
DATE WORK WAS COMPLETED: _____
DATE WORK WAS ACCEPTED: _____
ORIGINAL CONTRACT WORKING DAYS: _____
USED _____ OF _____ WORKING DAYS
NO. OF CHANGE ORDERS: _____
FINAL CONTRACT COST: _____
PERCENT OVER/UNDER RUN: _____
CONTRACTOR: _____

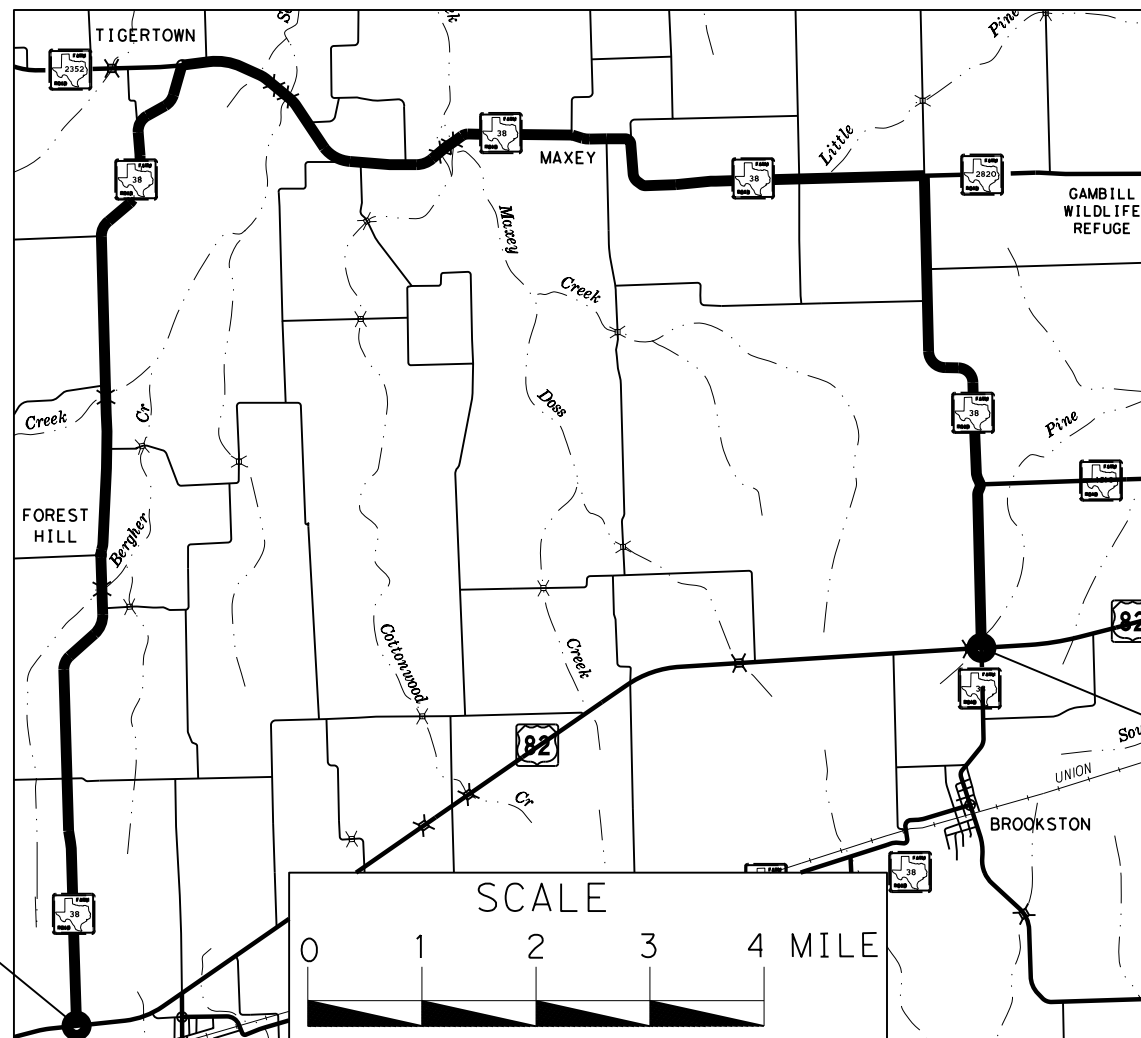
I CERTIFY THAT THIS PROJECT WAS BUILT IN ACCORDANCE WITH PLANS AND SPECIFICATIONS.

AREA ENGINEER _____ DATE _____

REQUIRED SIGNS SHALL BE IN ACCORDANCE WITH BC (1) - 14 THRU BC (12) - 14 AND THE "TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES".

BEGIN PROJECT:
STA. 0+00.00
LAT: 33.6424533
LON: -95.6973561
TRM: 224 +0.684

END PROJECT:
STA. 986+08.70
LAT: 33.6026436
LON: -95.8246001
TRM: 206 -0.061



EXCEPTIONS: N/A
EQUATIONS: N/A
RAILROAD CROSSINGS: N/A

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SPECIFICATIONS ADOPTED BY THE TEXAS DEPARTMENT OF TRANSPORTATION, NOVEMBER 1, 2014 AND SPECIFICATION ITEMS LISTED AND DATED AS FOLLOWS, SHALL GOVERN ON THIS PROJECT: REQUIRED CONTRACT PROVISIONS FOR ALL FEDERAL-AID CONSTRUCTION CONTRACTS (FORM FHWA 1273, MAY 2012)



SUBMITTED FOR LETTING: Mar. 03.21

Monte R. Pate P.E.
DESIGN ENGINEER

RECOMMENDED FOR LETTING: 3/4/2021

DocuSigned by:
Daniel H. Taylor, P.E.
AREA ENGINEER

APPROVED FOR LETTING: 3/4/2021

DocuSigned by:
Noel Paramanathan
DISTRICT ENGINEER

DATE: 2/28/2021 8:44:58 PM
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SHEET NO. DESCRIPTION

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THE STANDARD SHEETS SPECIFICALLY IDENTIFIED WITH A " # " HAVE BEEN ISSUED BY ME AND ARE APPLICABLE TO THIS PROJECT.

Katie J. Vick, P.E.

NAME _____ DATE 03/05/2021

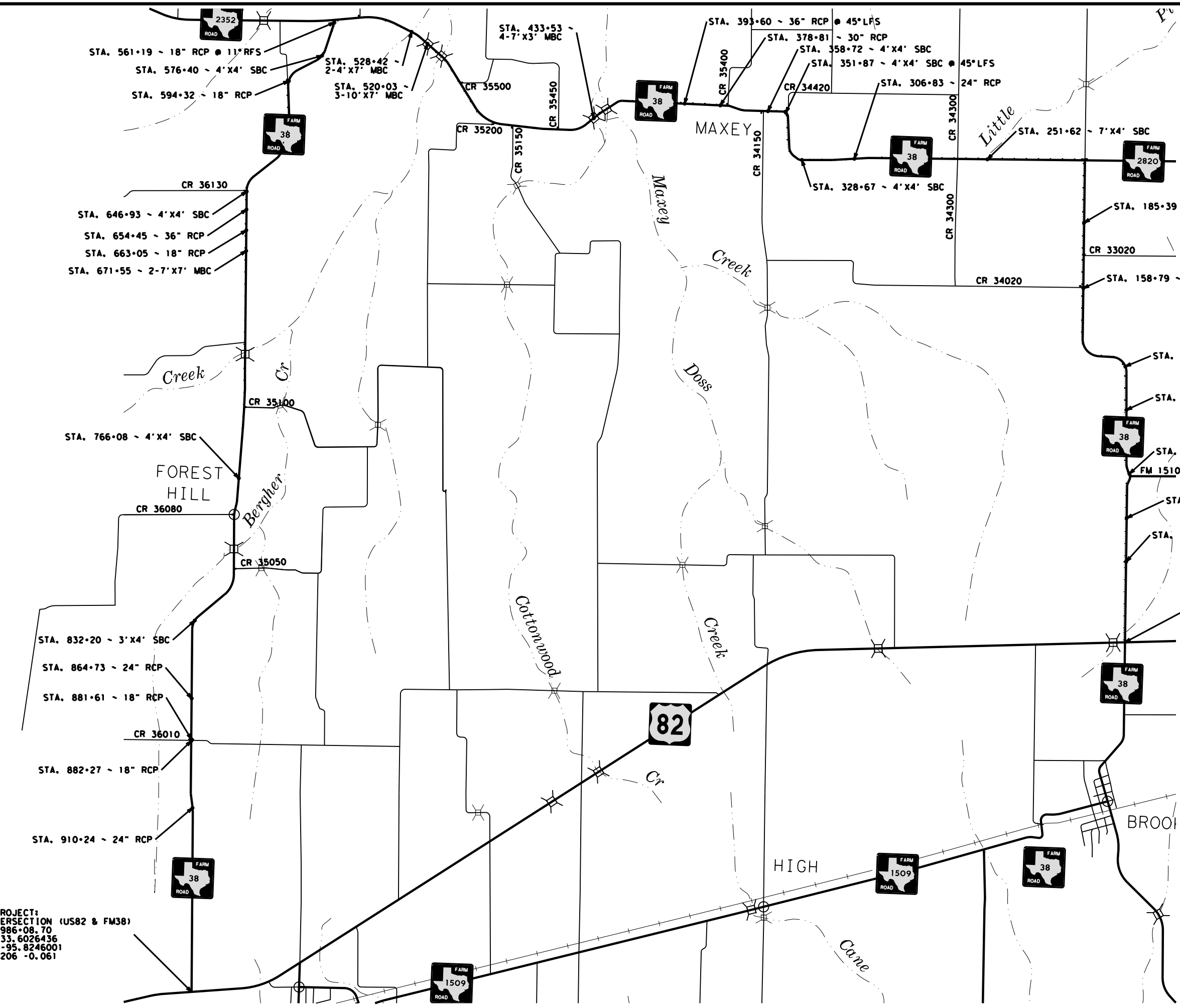
INDEX OF SHEETS

© 2021			
CONT	SECT	JOB	HIGHWAY
0435	01	080	FM 38
DIST	COUNTY		SHEET NO.
PAR	LAMAR		2

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DATE: 2/28/2021 8:45:05 PM
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STA. 561+19 ~ 18" RCP @ 11° RFS
 STA. 576+40 ~ 4'x4' SBC
 STA. 594+32 ~ 18" RCP

STA. 528+42 ~ 2-4'x7' MBC
 STA. 520+03 ~ 3-10'x7' MBC

STA. 433+53 ~ 4-7'x3' MBC

STA. 393+60 ~ 36" RCP @ 45° LFS
 STA. 378+81 ~ 30" RCP
 STA. 358+72 ~ 4'x4' SBC
 STA. 351+87 ~ 4'x4' SBC @ 45° LFS

STA. 306+83 ~ 24" RCP

STA. 251+62 ~ 7'x4' SBC

CR 36130
 STA. 646+93 ~ 4'x4' SBC
 STA. 654+45 ~ 36" RCP
 STA. 663+05 ~ 18" RCP
 STA. 671+55 ~ 2-7'x7' MBC

STA. 766+08 ~ 4'x4' SBC

STA. 832+20 ~ 3'x4' SBC

STA. 864+73 ~ 24" RCP

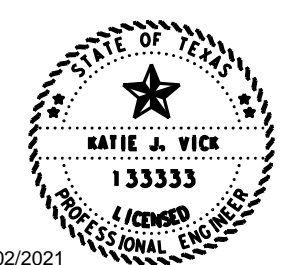
STA. 881+61 ~ 18" RCP

STA. 882+27 ~ 18" RCP

STA. 910+24 ~ 24" RCP

END PROJECT:
 @ INTERSECTION (US82 & FM38)
 STA: 986+08.70
 LAT: 33.6026436
 LON: -95.8246001
 TRM: 206 -0.061

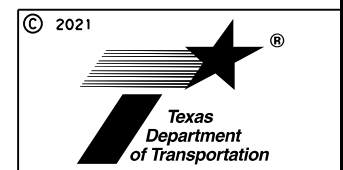
BEGIN PROJECT:
 @ INTERSECTION (US82 & FM38)
 STA: 0+00.00
 LAT: 33.6424533
 LON: -95.6973561
 TRM: 224 +0.684



03/02/2021

Katie J. Vick, P.E.

**FM 38
 PROJECT LAYOUT
 (CROSS CULVERTS)**



CONT	SECT	JOB	HIGHWAY
0435	01	080	FM 38
DIST	COUNTY		SHEET NO.
PAR	LAMAR		3

County: Lamar

Control: 0435-01-080

Highway: FM 38

Sheet:

GENERAL NOTES

General:

This project contains the following modified standard sheets: RAIL RETROFIT T131RC (MOD), T202TR (MOD)

Contractor questions on this project are to be addressed to the following individual(s):

Paris Area Office

Daniel Taylor - Daniel.Taylor@txdot.gov

Ellen Perry - Ellen.Perry@txdot.gov

Contractor questions will be accepted through email, phone, and in person by the above individuals.

All contractor questions will be reviewed by the Engineer. Once a response is developed, it will be posted to TxDOT's Public FTP at the following Address:

<https://ftp.dot.state.tx.us/pub/txdot-info/Pre-Letting%20Responses/>

All questions submitted that generate a response will be posted through this site. The site is organized by District, Project Type (Construction or Maintenance), Letting Date, CCSJ/Project Name.

Dispose of waste materials at an approved site. Furnish written approval from the property owner before disposal of waste materials.

Locate equipment a minimum of 30 feet from roadway when possible. Place signs and barricades as approved.

Stockpile sites for construction materials must be approved. Give at least 48 hours notification prior to stockpiling material.

Item 2 Instructions to Bidders:

View plans on-line or download from the web at:

<http://www.txdot.gov/business/letting-bids/plans-online.html>

Order plans from any of the plan reproduction companies shown on the web at:

<http://www.txdot.gov/business/letting-bids/repro-companies.html>

Item 5 Control of the Work:

The responsibility for the construction surveying on this contract will be in accordance with Section 5.9.3, Method C.

County: Lamar

Control: 0435-01-080

Highway: FM 38

Sheet: 4

Working days will be computed and charged in accordance with Article 8.3.1.4 Standard Work Week.

Right and left are determined based upon the forward direction of stationing in the specific control section.

When a precast or cast-in-place concrete element is included in the plans, a precast concrete alternate may be submitted in accordance with "Standard Operating Procedure for Alternate Precast Proposal Submission" found online at <https://www.txdot.gov/inside-txdot/forms-publications/consultants-contractors/publications/bridge.html#design>. Acceptance or denial of an alternate is at the sole discretion of the Engineer. Impacts to the project schedule and any additional costs resulting from the use of alternates are the sole responsibility of the Contractor.

Item 7 Legal Relations and Responsibilities:

No significant traffic generator events identified.

Item 8 Prosecution and Progress:

Before beginning work on this project submit in writing, for approval, a plan of construction operations outlining in detail a sequence of work to be followed.

Provide a Bar Chart progress schedule for this project.

Item 9 Measurement and Payment:

Items of work for the Monthly Estimate will be cut off on the 25th of each month. Items of work performed after the 25th will be processed and paid on the following month's estimate. Material On Hand (MOH) will cut off on the 20th of each month. Special circumstances will be considered on a case by case basis.

Item 100 Preparing Right of Way:

At cross structures, remove trees to ROW line and within 100' of the structure, parallel to the roadway. Remove underbrush and neatly trim trees and overhanging branches to produce a 60' vertical clear area within the limits of Prep ROW. Remove any trees or underbrush that interferes with any construction operation, including relocation of ditches or other drainage elements. Receive approval of equipment used to trim limbs. A boom axe will not be allowed. Remove all trimmed debris from the ROW or mulch all debris and incorporate into the topsoil on State ROW to the satisfaction of the Engineer.

County: Lamar

Control: 0435-01-080

Highway: FM 38

Sheet:

Item 164 Seeding for Erosion Control, 166 Fertilizer:

Apply fertilizer with a ratio of 3-1-2 (N-P-K) over the areas to be seeded. This work will not be paid for directly, but will be considered subsidiary.

Item 168 Vegetative Watering:

Use water trucks equipped with a sprinkler system adequate to permit coverage of the entire seeded area from the roadbed. This equipment must be available to perform watering throughout the duration of vegetative establishment.

Water all seeded areas the day seed is applied. Thereafter, maintain the seeded areas in a well-watered condition throughout the duration of vegetative establishment.

Item 400 Excavation and Backfill for Structures:

Excavation and backfill for bridge, culvert and Safety End Treatment construction/installation will be subsidiary to Item 462, 464, 466, 467 and 472.

Pavement markings and RPM replacement will be subsidiary to "Cut and Restore Pavement".

Cut and Restore Pavement for cross culverts: Backfill to top of pipe using HES flowable fill. Use an accelerator that produces a minimum strength of 250 psi in 4 hours. Provide rheofill or equivalent to ensure flowability. Anchor pipes to ensure no movement or displacement by the flowable fill. Furnish paper type cylinder test molds. Place flowable fill from the top of the pipe to within 10" of the existing pavement surface. Place Type C HMA from the top of the flowable fill to the existing roadway surface. These items will be subsidiary to this item and will not be paid for directly.

Item 402 Trench Excavation Protection

Submit a Trench Excavation Protection Plan to the Engineer a minimum of three weeks prior to use. The excavation support plan shall address excavation/protection methods, work sequencing, traffic control, backfill operations, etc.

Limits shown on plans are for quantity estimates only. Exact limits to be determined by approved shop drawings.

Item 403 Temporary Special Shoring

Submit a Temporary Special Shoring Plan to the Engineer a minimum of three weeks prior to use. The excavation support plan shall address excavation/protection methods, work sequencing, traffic control, backfill operations, etc.

Limits shown on plans are for quantity estimates only. Exact limits to be determined by approved shop drawings.

County: Lamar

Control: 0435-01-080

Highway: FM 38

Sheet: 4A

Item 420 Concrete Structures:

Do not use membrane curing for structural elements.

Item 429 Concrete Structure Repair:

Excavation related to concrete structure repair shall be considered subsidiary to Item 429 Concrete Structure Repair

Item 432 Riprap:

The Engineer may adjust placement of riprap in the field.

Filter fabric is required for stone riprap.

Item 462 Concrete Box Culverts and Drains

Required excavation and backfill will be subsidiary to this Item.

Item 464 Reinforced Concrete Pipe:

Required excavation and backfill will be subsidiary to this Item. Preserve existing gravel on driveways for surface.

Item 466 Headwalls and Wingwalls:

Riprap apron, between wingwalls, will be subsidiary to this Item.

Required excavation, backfill and pipe saw cutting will be subsidiary to this Item.

Removed headwalls and wingwalls may be broken into riprap size pieces (12" average diameter) for use as stone riprap on the project. Cut protruding steel reinforcement flush with concrete pieces. Broken concrete and riprap must be stored according to the requirements for material stockpiles indicated on the BC standards.

County: Lamar

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Sheet:

Item 467 Safety End Treatment:

Parallel pipe culverts ~ 30" diameter and smaller require precast SET unless directed by the Engineer to use cast-in-place SETs when precast SETs would project over 3" above surrounding ground surface or when otherwise indicated in the plans. Cross pipe culverts ~ 30" diameter and smaller require precast SET unless indicated otherwise in the plans. For cross pipe culverts 36" diameter and larger, the contractor may choose precast or cast-in-place SET's. Additional work to install cast in place SETs will be subsidiary to this Item.

Prior to installing SET's for parallel drainage, ensure the slope from the top of the SET to the top of the grade is not steeper than 6:1. At locations where the slope is steeper than 6:1, additional pipe will be added. This will be paid for with Item 464.

Repair damage culvert ends prior to SET installation. Straighten CMP ends by straightening or cutting off damaged ends. Paint cut off ends with zinc paint. Repair minor damaged RCP ends with epoxy mortar. This work will be subsidiary to this Item.

When necessary to close connection gaps, grout precast SETs to culvert ends. Materials, labor and equipment will be subsidiary to this item.

On existing CMP parallel culverts with mitered metal ends, construct concrete cast in place SETs or remove the mitered ends and install precast or cast-in-place SETs. Replace/remove existing mitered metal ends that are not 6:1 or flatter.

Required excavation, backfill and pipe saw cutting will be subsidiary to this Item.

Unless shown in the plans to obtain backfill from offsite source, obtain SET backfill from the Right-of-Way. This work will be subsidiary to this Item.

Placement of concrete Riprap between multiple SETs on multiple barrel culverts will be subsidiary to this Item.

During SET installation, unless indicated otherwise in the plans, match SET flow line grade with the culvert flow line grade.

Removal and disposal of existing headwalls for parallel culverts will be subsidiary to this Item.

Removed concrete headwalls and wingwalls may be broken into riprap size pieces (12" average diameter) for use as stone riprap. Cut protruding steel reinforcement. Broken concrete and riprap must be stored according to the requirements for material stockpiles indicated on BC(10)-14.

Item 472 Removing and Re-Laying Culvert:

Seal reinforced concrete pipe joints with either the original manufacturers seal or cementitious mortar per DMS-4675.

County: Lamar

Control: 0435-01-080

Highway: FM 38

Sheet: 4B

Required excavation and backfilling will be subsidiary to this Item. Obtain backfill from Right-of-way unless indicated otherwise in the plans.

Item 502 Barricades, Signs and Traffic Handling:

The Contractor Force Account "Safety Contingency" that has been established for this project is intended to be utilized for work zone enhancements, to improve the effectiveness of the Traffic Control Plan, that could not be foreseen in the project planning and design stage. These enhancements will be mutually agreed upon by the Engineer and the Contractor's Responsible Person based on weekly or more frequent traffic management reviews on the project. The Engineer may choose to use existing bid items if it does not slow the implementation of enhancement.

All flaggers are required to wear a white hard hat while performing flagging operations.

The traffic control plan for this contract consists of the installation and maintenance of warning signs and other traffic control devices shown in the plans, specification data which may be included in the general notes, applicable provisions of the Texas Manual on Uniform Traffic Control Devices (TMUTCD), traffic control plan sheets included in the plans, standard BC sheets and Item 502 of the Standard Specifications.

Do not begin Item 502, Barricades, Signs, and Traffic Handling, on the roadway until both of the following conditions are met:

1. The work schedule is approved.
2. No more than 5 workdays will pass between the beginning of Item 502 and the actual commencement of roadway work bid items.

The final estimate will be withheld until all disturbed areas are covered with at least 70% perennial vegetative cover.

Correct all deficiencies within the time frame noted on the Traffic Control Device Inspection Form 599. Failure to make corrections within time frame specified may result in no payment for this Item for the month of the noted deficiency.

Provide shadow vehicles equipped with Truck Mounted Attenuators (TMA) as shown on Traffic Control Plan (TCP) standards.

Ensure that all travel lanes are open at night.

Road closures must be approved by the Engineer. Provide a two-week advance notice to the Engineer prior to desired roadway closure period. Begin display of closure information on PCMBs ten days prior to roadway closure.

County: Lamar

Control: 0435-01-080

Highway: FM 38

Sheet:

Item 506 Temporary Erosion, Sedimentation & Environmental Controls:

The Temporary Erosion Control measures for this project will consist of using the following items, as directed:

1. Temporary Silt Fence
2. Erosion Control Logs

Silt fences will remain the property of the Contractor upon completion of the project. The final estimate will not be released until all silt fences have been properly removed, or as directed and 70% establishment of vegetative cover is obtained.

Acquire approval for any change to the location of temporary sediment fence, as shown in the plans, prior to installation. Placement of erosion protection devices may be altered, as directed, to satisfy the requirements of the SW3P.

Refer to the SW3P sheet for the total disturbed area for the project.

The disturbed area in this project, all project locations in the Contract, and Contractor project specific locations (PSLs) within one mile of the project limits will further establish the authorization requirements for storm water discharges. The Department will obtain an authorization to discharge storm water from the Texas Commission on Environmental Quality (TCEQ) for the construction activities shown on the plans. Obtain any required authorization from the TCEQ for any Contractor PSLs for construction support activities on or off ROW. When the total area disturbed for all projects in the Contract and PSLs within one mile of the project limits exceeds five acres, provide a copy of the Contractors NOI for PSLs on the ROW (to the appropriate MS4 operator when on an off-system route).

Item 512 Portable Traffic Barrier:

PTB stockpiled at the TxDOT Lamar County Maintenance Facility, 3600 NW Loop 286, Paris, TX, shall be used in this project. At project completion, all Portable Traffic Barriers shall be stockpiled at the TxDOT Lamar County Maintenance Facility. All stockpiled Portable Traffic Barriers shall be cleaned to the extent that all loose and foreign material is removed. Any damaged PTB, as determined by the Engineer, and shall become the property of the Contractor.

Inspect PTB before bidding and provide necessary connection hardware as required.

Reflectors shall be placed on all PTB as shown on standard D&OM(2)-15, throughout stage construction. Expense for this work will be subsidiary to this Item.

Item 540 Metal Beam Guard Fence:

Reinstall removed MBGF and SGT's on the same day.

County: Lamar

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Sheet: 4C

MBGF delineation shall be installed within ten (10) working days of the completion of each MBGF section. Concrete mow strip is not considered to be a part of this work. Delineators and object markers will be provided by the department.

Item 542 Removing Metal Beam Guard Fence:

Removed MBGF rail shall be retained by the Contractor.

Item 545 Crash Cushion Attenuators:

Crash cushions shall be provided by the Contractor. At project completion, all crash cushions shall be stockpiled at the TxDOT Lamar County Maintenance Facility, 3600 SW Loop 286, PARIS, TX 75460

Item 662 Work Zone Pavement Markings:

Non-removable markings may be paint and beads.

Item 666 Reflectorized Pavement Markings:

No stripe will be placed unless the inspector is present and at least 24 hours advance notice has been given by the Contractor.

Lay out pilot lines for approval 24 hours prior to all final pavement marking applications.

Use equipment with footage counters capable of measuring the linear footage placed. Calibrate counters prior to the beginning of striping operations.

Reduce truck speed enough to ensure that the beads drop onto the stripe and do not roll in the paint film.

Due to problems in traffic handling, do not place a dash center stripe and edge line at the same time.

Item 6001 Portable Changeable Message Board:

Two (2) portable changeable message boards are required for advance warning.

Item 6185 Truck Mounted Attenuators:

Shadow vehicles with truck mounted attenuator (TMA) are required on the traffic control plan and TCP standards for this project. The contractor will be responsible for determining if one or more of these traffic control operations will be ongoing at the same time to determine the total number of TMAs needed for the project.



CONTROLLING PROJECT ID 0435-01-080

DISTRICT Paris
HIGHWAY FM 38

COUNTY Lamar

QUANTITY SHEET

CONTROL SECTION JOB				0435-01-080		TOTAL EST.	TOTAL FINAL
PROJECT ID				A00127589			
COUNTY				Lamar			
HIGHWAY				FM 38			
ALT	BID CODE	DESCRIPTION	UNIT	EST.	FINAL		
	100-6002	PREPARING ROW	STA	30.000		30.000	
	104-6009	REMOVING CONC (RIPRAP)	SY	6.000		6.000	
	104-6067	REMOVING CONC (SAWCUT)	LF	181.000		181.000	
	110-6002	EXCAVATION (CHANNEL)	CY	149.000		149.000	
	132-6019	EMBANKMENT (VEHICLE)(ORD COMP)(TY B)	CY	395.000		395.000	
	158-6002	SPEC EXCAV WORK (BACKHOE)	HR	6.000		6.000	
	164-6021	CELL FBR MLCH SEED(PERM)(RURAL)(SANDY)	SY	4,374.000		4,374.000	
	400-6006	CUT & RESTORING PAV	SY	4.000		4.000	
	400-6008	CUT & RESTORE ASPH PAVING	SY	53.000		53.000	
	402-6001	TRENCH EXCAVATION PROTECTION	LF	49.000		49.000	
	403-6001	TEMPORARY SPL SHORING	SF	1,835.000		1,835.000	
	420-6071	CL C CONC (COLLAR)	EA	1.000		1.000	
	429-6009	CONC STR REPAIR (STANDARD)	SF	42.000		42.000	
	432-6031	RIPRAP (STONE PROTECTION)(12 IN)	CY	358.000		358.000	
	432-6045	RIPRAP (MOW STRIP)(4 IN)	CY	449.600		449.600	
	451-6004	RETROFIT RAIL (TY T131RC)	LF	200.000		200.000	
	451-6048	RETROFIT RAIL (ADD HSS)	LF	416.000		416.000	
	462-6048	CONC BOX CULV (4 FT X 3 FT)(EXTEND)	LF	2.000		2.000	
	462-6049	CONC BOX CULV (4 FT X 4 FT)(EXTEND)	LF	107.000		107.000	
	462-6053	CONC BOX CULV (5 FT X 5 FT)(EXTEND)	LF	14.000		14.000	
	462-6058	CONC BOX CULV (7 FT X 3 FT)(EXTEND)	LF	64.000		64.000	
	462-6059	CONC BOX CULV (7 FT X 4 FT)(EXTEND)	LF	10.000		10.000	
	462-6062	CONC BOX CULV (7 FT X 7 FT)(EXTEND)	LF	12.000		12.000	
	462-6075	CONC BOX CULV (10 FT X 7 FT)(EXTEND)	LF	45.000		45.000	
	464-6001	RC PIPE (CL III)(12 IN)	LF	158.000		158.000	
	464-6002	RC PIPE (CL III)(15 IN)	LF	40.000		40.000	
	464-6003	RC PIPE (CL III)(18 IN)	LF	176.000		176.000	
	464-6005	RC PIPE (CL III)(24 IN)	LF	48.000		48.000	
	464-6007	RC PIPE (CL III)(30 IN)	LF	113.000		113.000	
	464-6008	RC PIPE (CL III)(36 IN)	LF	116.000		116.000	
	466-6097	HEADWALL (CH - PW - 0) (DIA= 24 IN)	EA	1.000		1.000	
	466-6132	HEADWALL (CH - PW - S) (DIA= 30 IN)	EA	1.000		1.000	
	466-6152	WINGWALL (FW - 0) (HW=5 FT)	EA	1.000		1.000	
	466-6185	WINGWALL (PW - 2) (HW=10 FT)	EA	2.000		2.000	
	466-6194	WINGWALL (PW - 2) (HW=5 FT)	EA	1.000		1.000	
	466-6195	WINGWALL (PW - 2) (HW=6 FT)	EA	5.000		5.000	
	466-6196	WINGWALL (PW - 2) (HW=7 FT)	EA	1.000		1.000	

ESTIMATE & QUANTITY



DISTRICT	COUNTY	CCSJ	SHEET
Paris	Lamar	0435-01-080	5



CONTROLLING PROJECT ID 0435-01-080

DISTRICT Paris
HIGHWAY FM 38

COUNTY Lamar

QUANTITY SHEET

CONTROL SECTION JOB				0435-01-080		TOTAL EST.	TOTAL FINAL
PROJECT ID				A00127589			
COUNTY				Lamar			
HIGHWAY				FM 38			
ALT	BID CODE	DESCRIPTION	UNIT	EST.	FINAL		
	466-6198	WINGWALL (PW - 2) (HW=9 FT)	EA	2.000		2.000	
	466-6208	WINGWALL (SW - 0) (HW=5 FT)	EA	3.000		3.000	
	467-6147	SET (TY I)(S= 4 FT)(HW= 4 FT)(6:1) (P)	EA	2.000		2.000	
	467-6319	SET (TY II) (12 IN) (CMP) (6: 1) (P)	EA	27.000		27.000	
	467-6326	SET (TY II) (12 IN) (RCP) (6: 1) (P)	EA	91.000		91.000	
	467-6333	SET (TY II) (15 IN) (CMP) (6: 1) (P)	EA	26.000		26.000	
	467-6341	SET (TY II) (15 IN) (RCP) (6: 1) (P)	EA	21.000		21.000	
	467-6348	SET (TY II) (18 IN) (CMP) (6: 1) (P)	EA	57.000		57.000	
	467-6358	SET (TY II) (18 IN) (RCP) (4: 1) (C)	EA	2.000		2.000	
	467-6362	SET (TY II) (18 IN) (RCP) (6: 1) (C)	EA	5.000		5.000	
	467-6363	SET (TY II) (18 IN) (RCP) (6: 1) (P)	EA	69.000		69.000	
	467-6380	SET (TY II) (24 IN) (CMP) (6: 1) (P)	EA	13.000		13.000	
	467-6390	SET (TY II) (24 IN) (RCP) (4: 1) (C)	EA	3.000		3.000	
	467-6395	SET (TY II) (24 IN) (RCP) (6: 1) (P)	EA	18.000		18.000	
	467-6410	SET (TY II) (30 IN) (CMP) (6: 1) (P)	EA	2.000		2.000	
	467-6419	SET (TY II) (30 IN) (RCP) (4: 1) (C)	EA	3.000		3.000	
	467-6423	SET (TY II) (30 IN) (RCP) (6: 1) (P)	EA	3.000		3.000	
	467-6448	SET (TY II) (36 IN) (RCP) (3: 1) (C)	EA	2.000		2.000	
	467-6450	SET (TY II) (36 IN) (RCP) (4: 1) (C)	EA	2.000		2.000	
	467-6454	SET (TY II) (36 IN) (RCP) (6: 1) (P)	EA	3.000		3.000	
	467-6552	SET (TY II) (DES 4) (RCP) (3: 1) (C)	EA	2.000		2.000	
	472-6002	REMOV & RE - LAY PIPE (12 IN)	LF	18.000		18.000	
	472-6003	REMOV & RE - LAY PIPE (15 IN)	LF	18.000		18.000	
	472-6004	REMOV & RE - LAY PIPE (18 IN)	LF	36.000		36.000	
	472-6006	REMOV & RE - LAY PIPE (24 IN)	LF	18.000		18.000	
	480-6001	CLEAN EXIST CULVERTS	EA	24.000		24.000	
	496-6002	REMOV STR (INLET)	EA	2.000		2.000	
	496-6004	REMOV STR (SET)	EA	6.000		6.000	
	496-6005	REMOV STR (WINGWALL)	EA	10.000		10.000	
	496-6006	REMOV STR (HEADWALL)	EA	6.000		6.000	
	496-6007	REMOV STR (PIPE)	LF	537.000		537.000	
	500-6001	MOBILIZATION	LS	100.00%		100.00%	
	502-6001	BARRICADES, SIGNS AND TRAFFIC HANDLING	MO	20.000		20.000	
	506-6038	TEMP SEDMT CONT FENCE (INSTALL)	LF	600.000		600.000	
	506-6039	TEMP SEDMT CONT FENCE (REMOVE)	LF	600.000		600.000	
	506-6041	BIODEG EROSN CONT LOGS (INSTL) (12")	LF	4,290.000		4,290.000	
	506-6043	BIODEG EROSN CONT LOGS (REMOVE)	LF	4,290.000		4,290.000	

ESTIMATE & QUANTITY



DISTRICT	COUNTY	CCSJ	SHEET
Paris	Lamar	0435-01-080	5A



CONTROLLING PROJECT ID 0435-01-080

DISTRICT Paris
HIGHWAY FM 38

COUNTY Lamar

QUANTITY SHEET

CONTROL SECTION JOB				0435-01-080		TOTAL EST.	TOTAL FINAL
PROJECT ID				A00127589			
COUNTY				Lamar			
HIGHWAY				FM 38			
ALT	BID CODE	DESCRIPTION	UNIT	EST.	FINAL		
	510-6003	ONE-WAY TRAF CONT (PORT TRAF SIG)	MO	2.000		2.000	
	512-6017	PORT CTB (DES SOURCE)(F-SHAPE)(TY 1)	LF	700.000		700.000	
	512-6029	PORT CTB (MOVE)(F-SHAPE)(TY 1)	LF	700.000		700.000	
	512-6041	PORT CTB (STKPL)(F-SHAPE)(TY 1)	LF	700.000		700.000	
	540-6002	MTL W-BEAM GD FEN (STEEL POST)	LF	4,346.000		4,346.000	
	540-6006	MTL BEAM GD FEN TRANS (THRIE-BEAM)	EA	8.000		8.000	
	540-6020	MTL W - BEAM GD FEN (LOW FILL CULVERT)	LF	204.000		204.000	
	540-6037	MTL BM GD FEN TRANS (ANCHOR PLATE)	EA	8.000		8.000	
	542-6001	REMOVE METAL BEAM GUARD FENCE	LF	2,400.000		2,400.000	
	542-6004	RM MTL BM GD FENCE TRANS (THRIE-BEAM)	EA	8.000		8.000	
	544-6001	GUARDRAIL END TREATMENT (INSTALL)	EA	28.000		28.000	
	544-6003	GUARDRAIL END TREATMENT (REMOVE)	EA	28.000		28.000	
	545-6003	CRASH CUSH ATTEN (MOVE & RESET)	EA	2.000		2.000	
	545-6005	CRASH CUSH ATTEN (REMOVE)	EA	2.000		2.000	
	545-6019	CRASH CUSH ATTEN (INSTL)(S)(N)(TL3)	EA	2.000		2.000	
	658-6047	INSTL OM ASSM (OM-2Y)(WC)GND	EA	81.000		81.000	
	658-6062	INSTL DEL ASSM (D-SW)SZ 1(BRF)GF2(BI)	EA	72.000		72.000	
	662-6050	WK ZN PAV MRK REMOV (REFL) TY II-A-A	EA	284.000		284.000	
	662-6063	WK ZN PAV MRK REMOV (W)4"(SLD)	LF	3,196.000		3,196.000	
	662-6075	WK ZN PAV MRK REMOV (W)24"(SLD)	LF	44.000		44.000	
	662-6095	WK ZN PAV MRK REMOV (Y)4"(SLD)	LF	11,376.000		11,376.000	
	666-6303	RE PM W/RET REQ TY I (W)4"(SLD)(100MIL)	LF	1,796.000		1,796.000	
	666-6315	RE PM W/RET REQ TY I (Y)4"(SLD)(100MIL)	LF	1,796.000		1,796.000	
	672-6009	REFL PAV MRKR TY II-A-A	EA	90.000		90.000	
	677-6001	ELIM EXT PAV MRK & MRKS (4")	LF	14,572.000		14,572.000	
	6001-6002	PORTABLE CHANGEABLE MESSAGE SIGN	EA	2.000		2.000	
	6185-6002	TMA (STATIONARY)	DAY	304.000		304.000	
	6185-6003	TMA (MOBILE OPERATION)	HR	40.000		40.000	
18		SAFETY CONTINGENCY: CONTRACTOR FORCE ACCOUNT WORK (PARTICIPATING)	LS	1.000		1.000	
		EROSION CONTROL MAINTENANCE: CONTRACTOR FORCE ACCOUNT WORK (PART)	LS	1.000		1.000	

ESTIMATE & QUANTITY



DISTRICT	COUNTY	CCSJ	SHEET
Paris	Lamar	0435-01-080	5B

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SUMMARY OF DRAINAGE ITEMS		100 6002	104 6009	104 6067	110 6002	132 6019	158 6002	400 6008	402 6001	403 6001	420 6071	429 6009
LOCATION (STA.)	DESCRIPTION (EXISTING)	PREPARING ROW	REMOVING CONC (RIPRAP)	REMOVING CONC (SAWCUT)	EXCAVATION (CHANNEL)	EMBANKMENT (VEHICLE) (ORD COMP) (TY B)	SPEC EXCAV WORK (BACKHOE) ①	CUT & RESTORE ASPH PAVING	TRENCH EXCAVATION PROTECTION	TEMPORARY SPL SHORING	CL C CONC (COLLAR)	CONC STR REPAIR (STANDARD)
		STA	SY	LF	CY	CY	HR	SY	LF	SF	EA	SF
32+43.00	37' DES 4 ARCH RCP	1			3	2						
50+53.00	2 - 7' X 9' X 48' MBC	1										42
69+00.00	4' X 4' X 53' SBC	1			9	14				130		
95+97.00	2 - 5' X 5' X 40' MBC	1			33	21				100		
113+80.00	52' DES 4 ARCH CMP	1			1	2		19	13			
158+79.00	30" X 52' CMP	1			1	8		14	36			
185+39.00	40' DES 5 ARCH CMP	1			2	2		20				
251+62.00	7' X 4' X 37' SBC	1		54		8						
306+83.00	24" X 54' RCP	1				4						
328+67.00	4' X 4' X 41' SBC	1		24		35						
358+72.00	4' X 4' X 47' SBC	1			30	36						
378+81.00	30" X 58' RCP	1				4						
393+60.00	36" X 85' RCP @ 45° LFC	1		40		4					** 1	
433+53.00	4 - 7' X 3' MBC	1			13	104				550		
485+91.00	30" X 57' RCP	1					6					
520+03.00	3 - 10' X 7' MBC	1				70				630		
528+42.00	2 - 4' X 7' MBC	1		36								
561+19.00	18" X 67' RCP @ 11° RFS	1				4						
576+40.00	4' X 4' X 45' SBC	1		6		2						
594+32.00	18" X 57' RCP	1			8	5						
646+93.00	4' X 4' X 53' SBC	1			1	15						
654+45.00	36" X 49' RCP	1										
663+05.00	18" X 45' RCP	1			2	3						
671+55.00	2 - 7' X 7' X 38' MBC	1			33	32				425		
766+08.00	4' X 4' X 45' SBC	1				4						
832+20.00	4' X 3' X 56' SBC	1	6	21	2	4						
864+73.00	24" X 63' RCP	1				2						
881+61.00	18" X 68' RCP	1			2	2						
882+27.00	18" X 69' RCP	1			2	1						
910+24.00	24" X 45' RCP	1			7	2						
PROJECT TOTALS		30	6	181	149	390	6	53	49	1835	1	42


① BACKHOE HOURS USED TO PAY FOR DITCH CLEANING AS DIRECTED BY THE ENGINEER.
 ** USE COLLAR FOR DISJOINTED PIPE UPSTREAM JOINT.

SUMMARY OF DRAINAGE ITEMS		432 6031	462 6048	462 6049	462 6053	462 6058	462 6059	462 6062	462 6075	464 6003	464 6005	464 6007
LOCATION (STA.)	DESCRIPTION (EXISTING)	RIPRAP (STONE PROTECTION) (12 IN)	CONC BOX CULV (4 FT X 3 FT) (EXTEND)	CONC BOX CULV (4 FT X 4 FT) (EXTEND)	CONC BOX CULV (5 FT X 5 FT) (EXTEND)	CONC BOX CULV (7 FT X 3 FT) (EXTEND)	CONC BOX CULV (7 FT X 4 FT) (EXTEND)	CONC BOX CULV (7 FT X 7 FT) (EXTEND)	CONC BOX CULV (10 FT X 7 FT) (EXTEND)	RC PIPE (CL 111) (18 IN)	RC PIPE (CL 111) (24 IN)	RC PIPE (CL 111) (30 IN)
		CY	LF	LF	LF	LF	LF	LF	LF	LF	LF	LF
32+43.00	37' DES 4 ARCH RCP											
50+53.00	2 - 7' X 9' X 48' MBC	96										
69+00.00	4' X 4' X 53' SBC			8								
95+97.00	2 - 5' X 5' X 40' MBC				14							
113+80.00	52' DES 4 ARCH CMP											61
158+79.00	30" X 52' CMP											52
185+39.00	40' DES 5 ARCH CMP											
251+62.00	7' X 4' X 37' SBC						10					
306+83.00	24" X 54' RCP											
328+67.00	4' X 4' X 41' SBC			37								
358+72.00	4' X 4' X 47' SBC	19		8								
378+81.00	30" X 58' RCP											
393+60.00	36" X 85' RCP @ 45° LFC											
433+53.00	4 - 7' X 3' MBC	35				64						
485+91.00	30" X 57' RCP											
520+03.00	3 - 10' X 7' MBC	121							45			
528+42.00	2 - 4' X 7' MBC											
561+19.00	18" X 67' RCP @ 11° RFS									31		
576+40.00	4' X 4' X 45' SBC											
594+32.00	18" X 57' RCP									8		
646+93.00	4' X 4' X 53' SBC			13								
654+45.00	36" X 49' RCP	5										
663+05.00	18" X 45' RCP											
671+55.00	2 - 7' X 7' X 38' MBC	55						12				
766+08.00	4' X 4' X 45' SBC											
832+20.00	4' X 3' X 56' SBC		2									
864+73.00	24" X 63' RCP	11										
881+61.00	18" X 68' RCP											
882+27.00	18" X 69' RCP											
910+24.00	24" X 45' RCP	3										
PROJECT TOTALS		345	2	66	14	64	10	12	45	39	8	113

FM 38
QUANTITY SUMMARY

SHEET 1 OF 12

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CONT	SECT	JOB	HIGHWAY
0435	01	080	FM 38
DIST	COUNTY		SHEET NO.
PAR	LAMAR		6


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SUMMARY OF DRAINAGE ITEMS		464 6008	466 6097	466 6132	466 6185	466 6194	466 6195	466 6196	466 6198	466 6208	466 6152	467 6147	467 6358
LOCATION (STA.)	DESCRIPTION (EXISTING)	RC PIPE (CL 111) (36 IN)	HEADWALL (CH - PW - 0) (DIA= 24 IN)	HEADWALL (CH - PW - 5) (DIA= 30 IN)	WINGWALL (PW - 2) (HW=10 FT)	WINGWALL (PW - 2) (HW=5 FT)	WINGWALL (PW - 2) (HW=6 FT)	WINGWALL (PW - 2) (HW=7 FT)	WINGWALL (PW - 2) (HW=9 FT)	WINGWALL (SW - 0) (HW=5 FT)	WINGWALL (FW - 0) (HW=5 FT)	SET (TY I) (S= 4 FT) (HW= 4 FT) (6:1) (P)	SET (TY II) (18 IN) (RCP) (4: 1) (C)
		LF	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA
32+43.00	37' DES 4 ARCH RCP												
50+53.00	2 - 7' X 9' X 48' MBC												
69+00.00	4' X 4' X 53' SBC												
95+97.00	2 - 5' X 5' X 40' MBC												
113+80.00	52' DES 4 ARCH CMP												
158+79.00	30" X 52' CMP			1									
185+39.00	40' DES 5 ARCH CMP	40											
251+62.00	7' X 4' X 37' SBC						2						
306+83.00	24" X 54' RCP												
328+67.00	4' X 4' X 41' SBC							1				1	
358+72.00	4' X 4' X 47' SBC						2						
378+81.00	30" X 58' RCP												
393+60.00	36" X 85' RCP @ 45° LFC												
433+53.00	4 - 7' X 3' MBC									2			
485+91.00	30" X 57' RCP												
520+03.00	3 - 10' X 7' MBC				2								
528+42.00	2 - 4' X 7' MBC												
561+19.00	18" X 67' RCP @ 11° RFS												
576+40.00	4' X 4' X 45' SBC												
594+32.00	18" X 57' RCP												
646+93.00	4' X 4' X 53' SBC	24								1			
654+45.00	36" X 49' RCP												
663+05.00	18" X 45' RCP												
671+55.00	2 - 7' X 7' X 38' MBC								2				
766+08.00	4' X 4' X 45' SBC												
832+20.00	4' X 3' X 56' SBC					1							
864+73.00	24" X 63' RCP		1										
881+61.00	18" X 68' RCP												2
882+27.00	18" X 69' RCP												
910+24.00	24" X 45' RCP												
PROJECT TOTALS		64	1	1	2	1	5	1	2	3	1	1	2

SUMMARY OF DRAINAGE ITEMS		467 6362	467 6363	467 6390	467 6419	467 6448	467 6450	467 6454	467 6552	472 6006	496 6002	496 6004
LOCATION (STA.)	DESCRIPTION (EXISTING)	SET (TY II) (18 IN) (RCP) (6: 1) (C)	SET (TY II) (18 IN) (RCP) (6: 1) (P)	SET (TY II) (24 IN) (RCP) (4: 1) (C)	SET (TY II) (30 IN) (RCP) (4: 1) (C)	SET (TY II) (36 IN) (RCP) (3: 1) (C)	SET (TY II) (36 IN) (RCP) (4: 1) (C)	SET (TY II) (36 IN) (RCP) (6: 1) (P)	SET (TY II) (DES 4) (RCP) (3: 1) (C)	REMOV & RE - LAY PIPE (24 IN)	REMOV STR (INLET)	REMOV STR (SET)
		EA	EA	EA	EA	EA	EA	EA	EA	LF	EA	EA
32+43.00	37' DES 4 ARCH RCP								2			
50+53.00	2 - 7' X 9' X 48' MBC											
69+00.00	4' X 4' X 53' SBC											
95+97.00	2 - 5' X 5' X 40' MBC											
113+80.00	52' DES 4 ARCH CMP				2							
158+79.00	30" X 52' CMP				1							
185+39.00	40' DES 5 ARCH CMP							2				
251+62.00	7' X 4' X 37' SBC											
306+83.00	24" X 54' RCP											
328+67.00	4' X 4' X 41' SBC											
358+72.00	4' X 4' X 47' SBC										1	
378+81.00	30" X 58' RCP											
393+60.00	36" X 85' RCP @ 45° LFC											
433+53.00	4 - 7' X 3' MBC											
485+91.00	30" X 57' RCP											
520+03.00	3 - 10' X 7' MBC											
528+42.00	2 - 4' X 7' MBC											
561+19.00	18" X 67' RCP @ 11° RFS		3									
576+40.00	4' X 4' X 45' SBC											
594+32.00	18" X 57' RCP	1	1									
646+93.00	4' X 4' X 53' SBC							1				
654+45.00	36" X 49' RCP					2						
663+05.00	18" X 45' RCP	2										
671+55.00	2 - 7' X 7' X 38' MBC											
766+08.00	4' X 4' X 45' SBC											
832+20.00	4' X 3' X 56' SBC											
864+73.00	24" X 63' RCP			1						8		
881+61.00	18" X 68' RCP											
882+27.00	18" X 69' RCP	2										
910+24.00	24" X 45' RCP			2								2
PROJECT TOTALS		5	4	3	3	2	2	1	2	8	2	2

FM 38
QUANTITY SUMMARY

SHEET 2 OF 12



CONT	SECT	JOB	HIGHWAY
0435	01	080	FM 38
DIST	COUNTY		SHEET NO.
PAR	LAMAR		7

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SUMMARY OF DRAINAGE ITEMS				
LOCATION (STA.)	DESCRIPTION (EXISTING)	496	496	658
		6005	6007	6047
		REMOV STR (WINGWALL)	REMOV STR (PIPE)	INSTL OM ASSM (OM-2Y) (WC) GND
		EA	LF	EA
32+43.00	37' DES 4 ARCH RCP			2
50+53.00	2 - 7' X 9' X 48' MBC			4
69+00.00	4' X 4' X 53' SBC	1		3
95+97.00	2 - 5' X 5' X 40' MBC			4
113+80.00	52' DES 4 ARCH CMP		74	2
158+79.00	30" X 52' CMP		50	2
185+39.00	40' DES 5 ARCH CMP		40	2
251+62.00	7' X 4' X 37' SBC			2
306+83.00	24" X 54' RCP			2
328+67.00	4' X 4' X 41' SBC	1		4
358+72.00	4' X 4' X 47' SBC	1		4
378+81.00	30" X 58' RCP			2
393+60.00	36" X 85' RCP @ 45° LFC			4
433+53.00	4 - 7' X 3' MBC	2		2
485+91.00	30" X 57' RCP			2
520+03.00	3 - 10' X 7' MBC	2		4
528+42.00	2 - 4' X 7' MBC			4
561+19.00	18" X 67' RCP @ 11° RFS		6	2
576+40.00	4' X 4' X 45' SBC			2
594+32.00	18" X 57' RCP		4	2
646+93.00	4' X 4' X 53' SBC			2
654+45.00	36" X 49' RCP		6	2
663+05.00	18" X 45' RCP			2
671+55.00	2 - 7' X 7' X 38' MBC	2		4
766+08.00	4' X 4' X 45' SBC			2
832+20.00	4' X 3' X 56' SBC	1		2
864+73.00	24" X 63' RCP		8	2
881+61.00	18" X 68' RCP		8	2
882+27.00	18" X 69' RCP		8	2
910+24.00	24" X 45' RCP			2
PROJECT TOTALS		10	204	77


SUMMARY OF MBGF ITEMS												
LOCATION (STA.)	DESCRIPTION (EXISTING)	432	540	540	540	540	542	542	544	544	658	658
		6045	6002	6006	6020	6037	6001	6004	6001	6003	6047	6062
		RIPRAP (MOW STRIP) (4 IN)	MTL W-BEAM GD FEN (STEEL POST)	MTL BEAM GD FEN TRANS (THRIE-BEAM)	MTL W - BEAM GD FEN (LOW FILL CULVERT)	MTL BM GD FEN TRANS (ANCHOR PLATE)	REMOVE METAL BEAM GUARD FENCE	RM MTL BM GD FENCE TRANS (THRIE-BEAM)	GUARDRAIL END TREATMENT (INSTALL)	GUARDRAIL END TREATMENT (REMOVE)	INSTL OM ASSM (OM-2Y) (WC) GND	INSTL DEL ASSM (D-SW) SZ 1 (BRF) GF 2 (BI)
		CY	LF	EA	LF	EA	LF	EA	EA	EA	EA	EA
426+85.00	COTTON WOOD CRK 91'	51.8	600	4		4	350	4	4	4		12
433+53.00	4 - 7' X 3' MBC	94.8	588		62		350	4	4			12
512+38.00	SANDERS CRK 91'	51.8	600	4		4	350	4	4			12
520+03.00	3 - 10' X 7' MBC	94.8	584		66		400	4	4			12
528+26.00	2 - 4' X 7' MBC	50.7	618		32		350	4	4			12
713+31.00	WEST FORK SANDERS CRK 100'	50.7	650				350	4	4	4		12
796+09.00	2 - 10' X 9' SKEWED MBC	55	706		44		250	4	4			12
PROJECT TOTALS		449.6	4346	8	204	8	2400	8	28	28	4	72

SUMMARY OF WORKZONE TRAFFIC CONTROL ITEMS				
LOCATION	510	6001	6185	6185
	6003	6002	6002	6003
	ONE-WAY TRAF CONT (PORT TRAF SIG)	PORTABLE CHANGEABLE MESSAGE SIGN	TMA (STATIONARY)	TMA (MOBILE OPERATION)
	MO	EA	DAY	HR
PROJECT LIMITS	2	2	304	40
PROJECT TOTALS	2	2	304	40

FM 38
QUANTITY SUMMARY

SHEET 3 OF 12

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CONT	SECT	JOB	HIGHWAY
0435	01	080	FM 38
DIST	COUNTY		SHEET NO.
PAR	LAMAR		8


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SUMMARY OF DRIVEWAY PIPE ITEMS				462 6049	464 6001	464 6003	464 6005	467 6147	467 6319	467 6326	467 6333	467 6348
LOCATION (STA.)	LT/RT	DRIVEWAY MATERIAL	DESCRIPTION (EXIST.)	CONC BOX CULV (4 FT X 4 FT) (EXTEND)	RC PIPE (CL III) (12 IN)	RC PIPE (CL III) (18 IN)	RC PIPE (CL III) (24 IN)	SET (TY I) (S= 4 FT) (HW= 4 FT) (6:1) (P)	SET (TY II) (12 IN) (CMP) (6:1) (P)	SET (TY II) (12 IN) (RCP) (6:1) (P)	SET (TY II) (15 IN) (CMP) (6:1) (P)	SET (TY II) (18 IN) (CMP) (6:1) (P)
				LF	LF	LF	LF	EA	EA	EA	EA	EA
26+95.00	LT/RT		NO PIPE									
59+50.00	LT		2 - 18" X 22' RCP			8						
59+80.00	LT		2 - 18" X 22' RCP			8						
59+80.00	RT		NO PIPE									
FM 1510	RT		NO PIPE									
80+06.00	LT		18" X 22' RCP									
80+82.00	RT		NO PIPE									
83+00.00	RT		NO PIPE									
87+21.00	RT		15" X 22' CMP								* 2	
91+92.00	RT		24" X 30' CMP									
104+32.00	RT		12" X 28' RCP							* 2		
104+97.00	RT		12" X 28' RCP							* 2		
108+05.00	RT	GRAVEL	12" X 28' RCP		28					* 2		
123+21.00	RT		24" X 28' RCP									
127+45.00	RT	GRAVEL	24" X 28' STEEL				24					
128+13.00	LT		NO PIPE									
138+60.00	LT		NO WORK									
146+93.00	LT		NO PIPE									
148+97.00	LT		NO WORK									
150+96.00	LT		NO WORK									
155+75.00	LT		NO WORK									
156+31.00	RT		18" X 26' CMP									2
159+30.00	LT		NO PIPE									
172+60.00	RT		NO PIPE									
175+26.00	RT		18" X 28' RCP									
178+98.00	RT		NO WORK									
180+91.00	RT		NO WORK									
183+45.00	RT		NO WORK									
189+41.00	RT		12" X 24' RCP							* 2		
189+92.00	RT		12" X 24' RCP							* 2		
190+73.00	RT		12" X 24' RCP							* 2		
200+68.00	LT		12" X 22' RCP							* 2		
201+53.00	LT		18" X 20' CMP									* 2
202+96.00	LT	GRAVEL	12" X 24' RCP		24					* 2		
202+96.00	RT		15" X 24' CMP								* 2	
204+85.00	RT		12" X 26' RCP							2		
206+44.00	LT		12" X 26' CMP						2			
212+40.00	RT		NO PIPE									
215+15.00	LT		NO WORK									
215+87.00	LT		NO WORK									
216+87.00	RT		NO WORK									
217+44.00	LT		NO WORK									
218+20.00	LT		NO WORK									
221+68.00	LT		NO WORK									
224+33.00	LT		NO WORK									
228+46.00	LT		NO WORK									
230+44.00	LT		NO WORK									
242+06.00	RT		NO WORK									
244+47.00	LT		NO WORK									
249+32.00	RT		NO WORK									
259+13.00	RT		NO WORK									
263+57.00	RT		NO WORK									
265+37.00	LT		30" X 50' RCP									
265+37.00	RT		NO WORK									
276+46.00	RT		NO WORK									
286+44.00	RT		NO WORK									
290+40.00	LT		NO WORK									
291+00.00	LT		NO WORK									
291+00.00	RT		NO WORK									
293+36.00	LT		NO WORK									
298+70.00	RT		NO PIPE									
306+02.00	RT		NO WORK									
312+97.00	RT		NO WORK									
315+77.00	RT		NO WORK									
316+95.00	RT		NO WORK									
319+30.00	RT		NO WORK									
320+18.00	LT		NO WORK									
320+71.00	RT		NO WORK									
327+34.00	RT		54" X 30' RCP	41				* 1				
331+74.00	LT		NO PIPE									
335+91.00	RT		NO WORK									
336+79.00	RT		NO WORK									
342+52.00	LT		NO PIPE									
342+52.00	RT		NO PIPE									
SUB-TOTAL				41	52	16	24	1	2	18	4	4

* CAST IN PLACE

FM 38 QUANTITY SUMMARY

SHEET 4 OF 12



Texas
Department
of Transportation

CONT	SECT	JOB	HIGHWAY
0435	01	080	FM 38
DIST	COUNTY		SHEET NO.
PAR	LAMAR		9


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SUMMARY OF DRIVEWAY PIPE ITEMS				467 6363	467 6380	467 6395	467 6423	472 6002	472 6004	496 6007
LOCATION (STA.)	LT/RT	DRIVEWAY MATERIAL	DESCRIPTION (EXIST.)	SET (TY II) (18 IN) (RCP) (6: 1) (P)	SET (TY II) (24 IN) (CMP) (6: 1) (P)	SET (TY II) (24 IN) (RCP) (6: 1) (P)	SET (TY II) (30 IN) (RCP) (6: 1) (P)	REMOV & RE - LAY PIPE (12 IN)	REMOV & RE - LAY PIPE (18 IN)	REMOV STR (PIPE)
				EA	EA	EA	EA	LF	LF	LF
26+95.00	LT/RT		NO PIPE							
59+50.00	LT		2 - 18" X 22' RCP	1						
59+80.00	LT		2 - 18" X 22' RCP	1						
59+80.00	RT		NO PIPE							
FM 1510	RT		NO PIPE							
80+06.00	LT		18" X 22' RCP	2					6	
80+82.00	RT		NO PIPE							
83+00.00	RT		NO PIPE							
87+21.00	RT		15" X 22' CMP							
91+92.00	RT		24" X 30' CMP		2					
104+32.00	RT		12" X 28' RCP					4		
104+97.00	RT		12" X 28' RCP							
108+05.00	RT	GRAVEL	12" X 28' RCP							28
123+21.00	RT		24" X 28' RCP			* 2				
127+45.00	RT	GRAVEL	24" X 28' STEEL			* 2				28
128+13.00	LT		NO PIPE							
138+60.00	LT		NO WORK							
146+93.00	LT		NO PIPE							
148+97.00	LT		NO WORK							
150+96.00	LT		NO WORK							
155+75.00	LT		NO WORK							
156+31.00	RT		18" X 26' CMP							
159+30.00	LT		NO PIPE							
172+60.00	RT		NO PIPE							
175+26.00	RT		18" X 28' RCP	* 2						
178+98.00	RT		NO WORK							
180+91.00	RT		NO WORK							
183+45.00	RT		NO WORK							
189+41.00	RT		12" X 24' RCP							
189+92.00	RT		12" X 24' RCP							
190+73.00	RT		12" X 24' RCP							
200+68.00	LT		12" X 22' RCP							
201+53.00	LT		18" X 20' CMP							
202+96.00	LT	GRAVEL	12" X 24' RCP							
202+96.00	RT		15" X 24' CMP							
204+85.00	RT		12" X 26' RCP							
206+44.00	LT		12" X 26' CMP							
212+40.00	RT		NO PIPE							
215+15.00	LT		NO WORK							
215+87.00	LT		NO WORK							
216+87.00	RT		NO WORK							
217+44.00	LT		NO WORK							
218+20.00	LT		NO WORK							
221+68.00	LT		NO WORK							
224+33.00	LT		NO WORK							
228+46.00	LT		NO WORK							
230+44.00	LT		NO WORK							
242+06.00	RT		NO WORK							
244+47.00	LT		NO WORK							
249+32.00	RT		NO WORK							
259+13.00	RT		NO WORK							
263+57.00	RT		NO WORK							
265+37.00	LT		30" X 50' RCP				1			
265+37.00	RT		NO WORK							
276+46.00	RT		NO WORK							
286+44.00	RT		NO WORK							
290+40.00	LT		NO WORK							
291+00.00	LT		NO WORK							
291+00.00	RT		NO WORK							
293+36.00	LT		NO WORK							
298+70.00	RT		NO PIPE							
306+02.00	RT		NO WORK							
312+97.00	RT		NO WORK							
315+77.00	RT		NO WORK							
316+95.00	RT		NO WORK							
319+30.00	RT		NO WORK							
320+18.00	LT		NO WORK							
320+71.00	RT		NO WORK							
327+34.00	RT		54" X 30' RCP							30
331+74.00	LT		NO PIPE							
335+91.00	RT		NO WORK							
336+79.00	RT		NO WORK							
342+52.00	LT		NO PIPE							
342+52.00	RT		NO PIPE							
SUB-TOTAL				6	2	4	1	4	6	86

* CAST IN PLACE

FM 38 QUANTITY SUMMARY

SHEET 5 OF 12



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CONT	SECT	JOB	HIGHWAY
0435	01	080	FM 38
DIST	COUNTY		SHEET NO.
PAR	LAMAR		10

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SUMMARY OF DRIVEWAY PIPE ITEMS				132 6019	400 6006	432 6031	464 6001	464 6003	467 6319	467 6326	467 6333	467 6341
LOCATION (STA.)	LT/RT	DRIVEWAY MATERIAL	DESCRIPTION (EXIST.)	EMBANKMENT (VEHICLE) (ORD COMP) (TY B)	CUT & RESTORING PAV	RIPRAP (STONE PROTECTION) (12 IN)	RC PIPE (CL III) (12 IN)	RC PIPE (CL III) (18 IN)	SET (TY II) (12 IN) (CMP) (6: 1) (P)	SET (TY II) (12 IN) (RCP) (6: 1) (P)	SET (TY II) (15 IN) (CMP) (6: 1) (P)	SET (TY II) (15 IN) (RCP) (6: 1) (P)
				CY	SY	CY	LF	LF	EA	EA	EA	EA
345+14.00	RT		NO WORK									
353+21.00	RT		NO PIPE									
354+59.00	RT		NO WORK									
362+28.00	RT		NO WORK									
362+62.00	LT		NO PIPE									
365+04.00	RT		30" X 26' CMP									
366+45.00	LT		12" X 20' RCP							* 2		
368+55.00	RT		24" X 32' RCP									
370+27.00	LT		NO WORK									
372+46.00	RT		15" X 24' CMP								* 2	
374+17.00	RT		NO PIPE									
375+13.00	RT		NO WORK									
376+26.00	RT		12" X 20' RCP						2			
377+08.00	LT		NO WORK									
377+25.00	RT		(15" RCP/24" CMP) X 125'									1
379+05.00	RT		15" X 20' RCP									2
381+91.00	RT		15" X 28 CMP								2	
383+50.00	RT		NO WORK									
384+65.00	RT		12" X 24' RCP							2		
385+54.00	RT		15" X 28' CMP								* 2	
387+14.00	LT		NO PIPE									
387+65.00	RT		NO PIPE									
390+79.00	LT		18" X 40' RCP									
397+22.00	LT		18" X 26' CMP									
397+65.00	RT		NO PIPE									
400+45.00	RT		NO WORK									
401+05.00	LT	ASPHALT	12" X 22' RCP		4		22			* 2		
402+48.00	LT		15" X 28' CMP								2	
402+96.00	RT		18" X 28' RCP									
403+96.00	RT		18" X 28' RCP									
405+61.00	RT		24" X 22' RCP									
408+07.00	LT		12" X 22' RCP							2		
409+66.00	LT		12' X 28' RCP							2		
411+08.00	LT		18" X 60' CMP/RCP									
413+22.00	RT		30" X 36' RCP									
416+35.00	LT		NO WORK									
451+53.00	RT		24" X 42' CMP	5		13						
452+36.00	LT		18" X 44' CMP									
454+97.00	LT		18" X 28' CMP									
456+20.00	LT		18" X 30' CMP									
458+32.00	RT		18" X 24' CMP									
460+22.00	RT		18" X 22' RCP									
461+24.00	RT		18" X 24' RCP									
463+70.00	RT		18" X 28' CMP									
464+46.00	RT		18" X 24' RCP									
466+65.00	RT		12" X 22' RCP							2		
470+28.00	RT		15" X 24' CMP								* 2	
470+72.00	LT		NO PIPE									
471+43.00	RT		24" X 32' CMP									
472+26.00	RT		24" X 32' CMP									
477+19.00	RT		15" X 26' RCP								* 2	
478+00.00	LT		18" X 50' CMP									
484+90.00	LT		NO PIPE									
488+80.00	RT		18" X 40' CMP									
489+93.00	RT		NO PIPE									
490+35.00	LT		NO PIPE									
491+55.00	LT		12" X 22' CMP						2			
500+84.00	RT		18" X 62' CMP									
534+20.00	LT		24" X 28' CMP									
534+78.00	RT		24" X 30' RCP									
538+30.00	LT		24" X 62' RCP									
540+29.00	LT		18" X 60' RCP									
541+05.00	RT		18" X 20' RCP									
542+55.00	LT		18" X 20' CMP									
544+23.00	LT		18" X 30' CMP									
544+96.00	LT		18" X 24' RCP									
550+91.00	LT		18" X 21' CMP									
552+23.00	LT		18" X 40' CMP									
553+40.00	RT		18" X 42' CMP									
554+53.00	RT		12" X 22' RCP							2		
554+61.00	LT		18" X 20' RCP									
555+33.00	LT		18" X 16' RCP									
557+91.00	LT		18" X 22' RCP									
558+22.00	RT		12" X 24' RCP									
SUB-TOTAL				5	4	13	24	16	2	18	12	3

* CAST IN PLACE *** PLACE 4' JOINTS ON BOTH SIDES OF DRIEWAY TO ADDRESS STEEP SLOPES

FM 38
QUANTITY SUMMARY

SHEET 6 OF 12

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CONT	SECT	JOB	HIGHWAY
0435	01	080	FM 38
DIST	COUNTY		SHEET NO.
PAR	LAMAR		11


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SUMMARY OF DRIVEWAY PIPE ITEMS				467 6348	467 6363	467 6380	467 6395	467 6410	467 6423	472 6002	472 6003	472 6004
LOCATION (STA.)	LT/RT	DRIVEWAY MATERIAL	DESCRIPTION (EXIST.)	SET (TY II) (18 IN) (CMP) (6: 1) (P)	SET (TY II) (18 IN) (RCP) (6: 1) (P)	SET (TY II) (24 IN) (CMP) (6: 1) (P)	SET (TY II) (24 IN) (RCP) (6: 1) (P)	SET (TY II) (30 IN) (CMP) (6: 1) (P)	SET (TY II) (30 IN) (RCP) (6: 1) (P)	REMOV & RE - LAY PIPE (12 IN)	REMOV & RE - LAY PIPE (15 IN)	REMOV & RE - LAY PIPE (18 IN)
				EA	EA	EA	EA	EA	EA	LF	LF	LF
345+14.00	RT		NO WORK									
353+21.00	RT		NO PIPE									
354+59.00	RT		NO WORK									
362+28.00	RT		NO WORK									
362+62.00	LT		NO PIPE									
365+04.00	RT		30" X 26' CMP					2				
366+45.00	LT		12" X 20' RCP									
368+55.00	RT		24" X 32' RCP				* 2					
370+27.00	LT		NO WORK									
372+46.00	RT		15" X 24' CMP									
374+17.00	RT		NO PIPE									
375+13.00	RT		NO WORK									
376+26.00	RT		12" X 20' RCP							6		
377+08.00	LT		NO WORK									
377+25.00	RT		(15" RCP/24" CMP) X 125'			1						
379+05.00	RT		15" X 20' RCP									
381+91.00	RT		15" X 28 CMP									
383+50.00	RT		NO WORK									
384+65.00	RT		12" X 24' RCP									
385+54.00	RT		15" X 28' CMP									
387+14.00	LT		NO PIPE									
387+65.00	RT		NO PIPE									
390+79.00	LT		18" X 40' RCP		2							
397+22.00	LT		18" X 26' CMP	* 2								
397+65.00	RT		NO PIPE									
400+45.00	RT		NO WORK									
401+05.00	LT	ASPHALT	12" X 22' RCP									
402+48.00	LT		15" X 28' CMP									
402+96.00	RT		18" X 28' RCP		* 2							4
403+96.00	RT		18" X 28' RCP		* 2							
405+61.00	RT		24" X 22' RCP				2					
408+07.00	LT		12" X 22' RCP									
409+66.00	LT		12' X 28' RCP									
411+08.00	LT		18" X 60' CMP/RCP	1								
413+22.00	RT		30" X 36' RCP		1				2			
416+35.00	LT		NO WORK									
451+53.00	RT		24" X 42' CMP									
452+36.00	LT		18" X 44' CMP	* 2								
454+97.00	LT		18" X 28' CMP	2								
456+20.00	LT		18" X 30' CMP	2								
458+32.00	RT		18" X 24' CMP	2								
460+22.00	RT		18" X 22' RCP		* 2							
461+24.00	RT		18" X 24' RCP		* 2							
463+70.00	RT		18" X 28' CMP	2								4
464+46.00	RT		18" X 24' RCP		2							
466+65.00	RT		12" X 22' RCP									
470+28.00	RT		15" X 24' CMP									
470+72.00	LT		NO PIPE									
471+43.00	RT		24" X 32' CMP			* 2						
472+26.00	RT		24" X 32' CMP			* 2						
477+19.00	RT		15" X 26' RCP								10	
478+00.00	LT		18" X 50' CMP	2								
484+90.00	LT		NO PIPE									
488+80.00	RT		18" X 40' CMP		2							
489+93.00	RT		NO PIPE									
490+35.00	LT		NO PIPE									
491+55.00	LT		12" X 22' CMP									
500+84.00	RT		18" X 62' CMP	2								
534+20.00	LT		24" X 28' CMP			2						
534+78.00	RT		24" X 30' RCP					2				
538+30.00	LT		24" X 62' RCP				2					
540+29.00	LT		18" X 60' RCP		2							
541+05.00	RT		18" X 20' RCP		1							6
542+55.00	LT		18" X 20' CMP	* 2								
544+23.00	LT		18" X 30' CMP	* 2								
544+96.00	LT		18" X 24' RCP		2							
550+91.00	LT		18" X 21' CMP	* 2								
552+23.00	LT		18" X 40' CMP	* 2								
553+40.00	RT		18" X 42' CMP	2								
554+53.00	RT		12" X 22' RCP									
554+61.00	LT		18" X 20' RCP		2					6		4
555+33.00	LT		18" X 16' RCP		2							4
557+91.00	LT		18" X 22' RCP		2							
558+22.00	RT		12" X 24' RCP									
SUB-TOTAL				27	26	7	8	2	2	12	10	22

**FM 38
QUANTITY SUMMARY**

SHEET 7 OF 12

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CONT	SECT	JOB	HIGHWAY
0435	01	080	FM 38
DIST	COUNTY		SHEET NO.
PAR	LAMAR		12

Cks: DWF: Cks: DWF:

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SUMMARY OF DRIVEWAY PIPE ITEMS				472 6006	496 6004	496 6006
LOCATION (STA.)	LT/RT	DRIVEWAY MATERIAL	DESCRIPTION (EXIST.)	REMOV & RE - LAY PIPE (24 IN)	REMOV STR (SET)	REMOV STR (HEADWALL)
				LF	EA	EA
345+14.00	RT		NO WORK			
353+21.00	RT		NO PIPE			
354+59.00	RT		NO WORK			
362+28.00	RT		NO WORK			
362+62.00	LT		NO PIPE			
365+04.00	RT		30" X 26' CMP			
366+45.00	LT		12" X 20' RCP			
368+55.00	RT		24" X 32' RCP			
370+27.00	LT		NO WORK			
372+46.00	RT		15" X 24' CMP			
374+17.00	RT		NO PIPE			
375+13.00	RT		NO WORK			
376+26.00	RT		12" X 20' RCP			
377+08.00	LT		NO WORK			
377+25.00	RT		(15" RCP/24" CMP) X 125'			
379+05.00	RT		15" X 20' RCP			
381+91.00	RT		15" X 28 CMP		2	
383+50.00	RT		NO WORK			
384+65.00	RT		12" X 24' RCP			
385+54.00	RT		15" X 28' CMP			
387+14.00	LT		NO PIPE			
387+65.00	RT		NO PIPE			
390+79.00	LT		18" X 40' RCP			
397+22.00	LT		18" X 26' CMP			
397+65.00	RT		NO PIPE			
400+45.00	RT		NO WORK			
401+05.00	LT	ASPHALT	12" X 22' RCP			
402+48.00	LT		15" X 28' CMP			
402+96.00	RT		18" X 28' RCP			
403+96.00	RT		18" X 28' RCP			
405+61.00	RT		24" X 22' RCP	4		
408+07.00	LT		12" X 22' RCP			
409+66.00	LT		12' X 28' RCP			
411+08.00	LT		18" X 60' CMP/RCP			
413+22.00	RT		30" X 36' RCP			
416+35.00	LT		NO WORK			
451+53.00	RT		24" X 42' CMP			
452+36.00	LT		18" X 44' CMP			
454+97.00	LT		18" X 28' CMP			
456+20.00	LT		18" X 30' CMP			
458+32.00	RT		18" X 24' CMP			
460+22.00	RT		18" X 22' RCP			
461+24.00	RT		18" X 24' RCP			
463+70.00	RT		18" X 28' CMP			
464+46.00	RT		18" X 24' RCP			
466+65.00	RT		12" X 22' RCP			
470+28.00	RT		15" X 24' CMP			2
470+72.00	LT		NO PIPE			
471+43.00	RT		24" X 32' CMP			
472+26.00	RT		24" X 32' CMP			
477+19.00	RT		15" X 26' RCP			
478+00.00	LT		18" X 50' CMP		2	
484+90.00	LT		NO PIPE			
488+80.00	RT		18" X 40' CMP			
489+93.00	RT		NO PIPE			
490+35.00	LT		NO PIPE			
491+55.00	LT		12" X 22' CMP			
500+84.00	RT		18" X 62' CMP			
534+20.00	LT		24" X 28' CMP			
534+78.00	RT		24" X 30' RCP			
538+30.00	LT		24" X 62' RCP			
540+29.00	LT		18" X 60' RCP			
541+05.00	RT		18" X 20' RCP			
542+55.00	LT		18" X 20' CMP			
544+23.00	LT		18" X 30' CMP			
544+96.00	LT		18" X 24' RCP			
550+91.00	LT		18" X 21' CMP			
552+23.00	LT		18" X 40' CMP			
553+40.00	RT		18" X 42' CMP			
554+53.00	RT		12" X 22' RCP			
554+61.00	LT		18" X 20' RCP			
555+33.00	LT		18" X 16' RCP			
557+91.00	LT		18" X 22' RCP			2
558+22.00	RT		12" X 24' RCP			
SUB-TOTAL				4	4	4

* CAST IN PLACE

FM 38
QUANTITY SUMMARY

SHEET 8 OF 12

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CONT	SECT	JOB	HIGHWAY
0435	01	080	FM 38
DIST	COUNTY		SHEET NO.
PAR	LAMAR		13


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SUMMARY OF DRIVEWAY PIPE ITEMS				464 6001	464 6002	464 6003	464 6005	464 6008	467 6319	467 6326	467 6333	467 6341
LOCATION (STA.)	LT/RT	DRIVEWAY MATERIAL	DESCRIPTION (EXIST.)	RC PIPE (CL 111) (12 IN)	RC PIPE (CL 111) (15 IN)	RC PIPE (CL 111) (18 IN)	RC PIPE (CL 111) (24 IN)	RC PIPE (CL 111) (36 IN)	SET (TY 11) (12 IN) (CMP) (6: 1) (P)	SET (TY 11) (12 IN) (RCP) (6: 1) (P)	SET (TY 11) (15 IN) (CMP) (6: 1) (P)	SET (TY 11) (15 IN) (RCP) (6: 1) (P)
				LF	LF	LF	LF	LF	EA	EA	EA	EA
558+91.00	RT		12" X 32' RCP							* 2		
559+34.00	LT		NO WORK									
559+57.00	RT		12" X 28' CMP						* 2			
561+07.00	RT		12" X 16' RCP							2		
562+06.00	LT	GRAVEL	18" X 40' CMP			49						
562+46.00	RT		12" X 30' CMP						* 2			
563+00.00	RT		NO WORK									
563+83.00	LT		NO WORK									
565+33.00	RT		12" X 60' RCP						1	1		
567+10.00	RT		12" X 22' RCP							2		
567+28.00	LT	GRAVEL	12" X 20' CMP	20						* 2		
569+72.00	LT		12" X 24' CMP						* 2			
570+56.00	RT		12" X 24' RCP							2		
570+93.00	LT		15" X 26' CMP									2
575+08.00	LT		18" X 40' RCP									
577+16.00	LT		24" X 30' CMP									
580+98.00	RT		NO WORK									
584+81.00	RT		15" X 36' RCP									2
589+68.00	RT		12" X 24' CMP						2			
596+77.00	RT		15" X 30' RCP									2
604+43.00	LT		15" X 20' RCP									2
610+62.00	RT		18" X 20' RCP									
613+77.00	LT		12" X 24' RCP							2		
623+80.00	LT		18" X 24' CMP									
626+35.00	LT		12" X 24' CMP						* 2			
628+16.00	LT		18" X 30' CMP									
637+99.00	LT		12" X 24' RCP							2		
639+36.00	RT		NO PIPE									
639+51.00	LT		12" X 36" RCP							2		
642+09.00	LT		12" X 40' RCP							2		
646+74.00	RT	GRAVEL	36" X 52' CMP					52				
652+18.00	LT	GRAVEL	15" X 40' RCP		40							2
657+77.00	LT		NO PIPE									
662+13.00	RT	GRAVEL	18" X 36' RCP/CMP			36						
666+28.00	RT		18" X 30' CMP									
668+63.00	RT		12" X 26' RCP							2		
677+76.00	RT		12" X 30' CMP						* 2			
678+45.00	LT		12" X 30' RCP							2		
680+16.00	RT		18" X 40' CMP									
682+58.00	RT	GRAVEL	10" X 40' CMP	40						* 2		
683+82.00	LT		15" X 27' CMP								* 2	
686+33.00	RT		NO WORK									
687+71.00	RT		NO WORK									
689+89.00	LT		18" X 42' CMP									
694+97.00	RT		NO WORK									
694+99.00	LT		18" X 30' CMP									
699+64.00	LT		NO WORK									
702+79.00	RT		NO WORK									
706+06.00	LT		NO WORK									
709+79.00	RT		24" X 56' RCP				**** 16					
724+60.00	LT		18" X 32' RCP									
725+67.00	RT		18" X 30' RCP									
728+53.00	RT		18" X 30' RCP									
732+25.00	LT		12" X 32' RCP							2		
733+03.00	LT		12" X 40' RCP							2		
733+77.00	LT		12" X 20' RCP							2		
736+60.00	LT		NO WORK									
737+38.00	RT		12" X 30' RCP							2		
738+89.00	RT		12" X 18' RCP							2		
741+40.00	LT		18" X 40' CMP									
743+08.00	LT		18" X 50' CMP									
745+06.00	LT		18" X 26' CMP									
751+24.00	RT		12" X 20' RCP							2		
752+22.00	LT		15" X 28' RCP									2
756+82.00	LT		15" X 28' RCP									2
758+78.00	RT		15" X 28' CMP								2	
761+50.00	LT		15" X 30' CMP								* 2	
763+94.00	LT		12" X 28' RCP							2		
772+94.00	RT		12" X 28' RCP							2		
774+53.00	RT		12" X 20' RCP							2		
779+35.00	RT		12" X 30' CMP						* 2			
780+80.00	LT		NO WORK									
781+45.00	RT		24" X 54' RCP									
782+94.00	RT		2 - 18" X 21' RCP									
SUB-TOTAL				60	40	85	16	52	15	43	6	14

* CAST IN PLACE **** RCP TO CONNECT EXISTING PIPES AT CR 36120 (STA. 709+79) AND DRIVEWAY AT STA. 710+24

FM 38 QUANTITY SUMMARY

SHEET 9 OF 12



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CONT	SECT	JOB	HIGHWAY
0435	01	080	FM 38
DIST	COUNTY		SHEET NO.
PAR	LAMAR		14

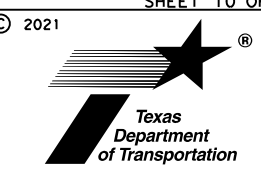
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SUMMARY OF DRIVEWAY PIPE ITEMS				467 6348	467 6363	467 6380	467 6395	467 6454	472 6002	472 6006	480 6001	496 6007
LOCATION (STA.)	LT/RT	DRIVEWAY MATERIAL	DESCRIPTION (EXIST.)	SET (TY II) (18 IN) (CMP) (6: 1) (P)	SET (TY II) (18 IN) (RCP) (6: 1) (P)	SET (TY II) (24 IN) (CMP) (6: 1) (P)	SET (TY II) (24 IN) (RCP) (6: 1) (P)	SET (TY II) (36 IN) (RCP) (6: 1) (P)	REMOV & RE - LAY PIPE (12 IN)	REMOV & RE - LAY PIPE (24 IN)	CLEAN EXIST CULVERTS	REMOV STR (PIPE)
				EA	EA	EA	EA	EA	LF	LF	EA	LF
558+91.00	RT		12" X 32' RCP									
559+34.00	LT		NO WORK									
559+57.00	RT		12" X 28' CMP						2			
561+07.00	RT		12" X 16' RCP									
562+06.00	LT	GRAVEL	18" X 40' CMP		2							40
562+46.00	RT		12" X 30' CMP									
563+00.00	RT		NO WORK									
563+83.00	LT		NO WORK									
565+33.00	RT		12" X 60' RCP									
567+10.00	RT		12" X 22' RCP									
567+28.00	LT	GRAVEL	12" X 20' CMP									20
569+72.00	LT		12" X 24' CMP									
570+56.00	RT		12" X 24' RCP									
570+93.00	LT		15" X 26' CMP									
575+08.00	LT		18" X 40' RCP		2							
577+16.00	LT		24" X 30' CMP			2						
580+98.00	RT		NO WORK									
584+81.00	RT		15" X 36' RCP									
589+68.00	RT		12" X 24' CMP								1	
596+77.00	RT		15" X 30' RCP									
604+43.00	LT		15" X 20' RCP								1	
610+62.00	RT		18" X 20' RCP		2							
613+77.00	LT		12" X 24' RCP									
623+80.00	LT		18" X 24' CMP	* 2								
626+35.00	LT		12" X 24' CMP								1	
628+16.00	LT		18" X 30' CMP	* 2								
637+99.00	LT		12" X 24' RCP									
639+36.00	RT		NO PIPE									
639+51.00	LT		12" X 36" RCP									
642+09.00	LT		12" X 40' RCP									
646+74.00	RT	GRAVEL	36" X 52' CMP					2				52
652+18.00	LT	GRAVEL	15" X 40' RCP									40
657+77.00	LT		NO PIPE									
662+13.00	RT	GRAVEL	18" X 36' RCP/CMP		* 2							36
666+28.00	RT		18" X 30' CMP	* 2								
668+63.00	RT		12" X 26' RCP									
677+76.00	RT		12" X 30' CMP								1	
678+45.00	LT		12" X 30' RCP									
680+16.00	RT		18" X 40' CMP	* 2								
682+58.00	RT	GRAVEL	10" X 40' CMP									40
683+82.00	LT		15" X 27' CMP									
686+33.00	RT		NO WORK									
687+71.00	RT		NO WORK									
689+89.00	LT		18" X 42' CMP	* 2								
694+97.00	RT		NO WORK									
694+99.00	LT		18" X 30' CMP	* 2								
699+64.00	LT		NO WORK									
702+79.00	RT		NO WORK									
706+06.00	LT		NO WORK									
709+79.00	RT		24" X 56' RCP				2					
724+60.00	LT		18" X 32' RCP		2							
725+67.00	RT		18" X 30' RCP		2							
728+53.00	RT		18" X 30' RCP		2							
732+25.00	LT		12" X 32' RCP									
733+03.00	LT		12" X 40' RCP								1	
733+77.00	LT		12" X 20' RCP								1	
736+60.00	LT		NO WORK									
737+38.00	RT		12" X 30' RCP								1	
738+89.00	RT		12" X 18' RCP								1	
741+40.00	LT		18" X 40' CMP	* 2								
743+08.00	LT		18" X 50' CMP	* 2								
745+06.00	LT		18" X 26' CMP	* 2								
751+24.00	RT		12" X 20' RCP								1	
752+22.00	LT		15" X 28' RCP								1	
756+82.00	LT		15" X 28' RCP								1	
758+78.00	RT		15" X 28' CMP									
761+50.00	LT		15" X 30' CMP									
763+94.00	LT		12" X 28' RCP									
772+94.00	RT		12" X 28' RCP									
774+53.00	RT		12" X 20' RCP								1	
779+35.00	RT		12" X 30' CMP								1	
780+80.00	LT		NO WORK									
781+45.00	RT		24" X 54' RCP				2					
782+94.00	RT		2 - 18" X 21' RCP							6		
			SUB-TOTAL	18	18	2	4	2	2	6	15	228

* CAST IN PLACE

FM 38 QUANTITY SUMMARY

SHEET 10 OF 12



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CONT	SECT	JOB	HIGHWAY
0435	01	080	FM 38
DIST	COUNTY		SHEET NO.
PAR	LAMAR		15

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SUMMARY OF DRIVEWAY PIPE ITEMS				464 6003	467 6319	467 6326	467 6333	467 6341	467 6348	467 6363	467 6380	467 6395	472 6003	472 6004
LOCATION (STA.)	LT/RT	DRIVEWAY MATERIAL	DESCRIPTION (EXIST.)	RC PIPE (CL III) (18 IN)	SET (TY II) (12 IN) (CMP) (6: 1) (P)	SET (TY II) (12 IN) (RCP) (6: 1) (P)	SET (TY II) (15 IN) (CMP) (6: 1) (P)	SET (TY II) (15 IN) (RCP) (6: 1) (P)	SET (TY II) (18 IN) (CMP) (6: 1) (P)	SET (TY II) (18 IN) (RCP) (6: 1) (P)	SET (TY II) (24 IN) (CMP) (6: 1) (P)	SET (TY II) (24 IN) (RCP) (6: 1) (P)	REMOV & RE - LAY PIPE (15 IN)	REMOV & RE - LAY PIPE (18 IN)
				LF	EA	EA	EA	EA	EA	EA	EA	EA	LF	LF
782+94.00	LT		15" X 28' CMP					* 2						
784+04.00	LT		NO WORK											
786+09.00	LT		15" X 24' CMP					* 2						
787+08.00	RT		24" X 20' RCP											
789+96.00	LT		18" X 24' RCP											
790+76.00	LT		18" X 20' RCP								2			
793+24.00	RT		24" X 42' CMP								2			
803+94.00	RT		18" X 23' CMP						* 2					
803+94.00	LT		18" X 43' CMP						2					
812+73.00	RT		12" X 36' RCP			2								
814+02.00	RT		12" X 30' CMP			2								
814+57.00	LT		12" X 26' RCP			2								
824+50.00	LT		15" X 20' RCP					2					4	
825+95.00	RT		12" X 19' CMP		2									
831+07.00	LT		18" X 30' RCP											
838+07.00	RT		18" X 21' CMP						* 2					
838+12.00	LT		18" X 21' CMP						* 2					
847+84.00	RT		18" X 28' RCP								2			
847+93.00	LT		12" X 28' RCP			2								
850+03.00	RT		15" X 28' RCP					* 2					4	
857+17.00	LT		NO WORK											
858+19.00	LT		NO WORK											
859+97.00	RT		NO WORK											
861+53.00	LT		NO PIPE											
862+39.00	LT		12" X 19' CMP		* 2									
868+38.00	LT		NO PIPE											
871+18.00	LT		NO WORK											
872+69.00	LT		NO WORK											
875+04.00	RT		12" X 28' RCP			2								
877+56.00	RT		12" X 20' RCP			2								
880+76.00	LT		12" X 24' CMP		* 2									
883+30.00	RT		18" X 27'								2			
883+90.00	LT		18" X 100' RCP								1			
883+90.00	RT		18" X 27' RCP								2			
895+65.00	RT		NO WORK											
896+84.00	RT		12" X 14' CMP		* 2									
898+13.00	RT		NO WORK											
901+07.00	RT		NO WORK											
904+24.00	RT		NO WORK											
913+06.00	LT	GRAVEL	18" X 19' CMP	20							* 2			
916+42.00	LT		NO PIPE											
919+78.00	LT		NO PIPE											
926+41.00	RT		NO WORK											
927+50.00	LT		NO WORK											
938+75.00	LT		NO WORK											
946+15.00	RT		NO WORK											
953+50.00	LT		NO WORK											
962+05.00	RT		NO WORK											
983+27.00	LT		NO WORK											
SUB-TOTAL				20	8	12	4	4	8	15	2	2	8	8

* CAST IN PLACE

FM 38
QUANTITY SUMMARY

SHEET 11 OF 12

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CONT	SECT	JOB	HIGHWAY
0435	01	080	FM 38
DIST	COUNTY		SHEET NO.
PAR	LAMAR		16

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SUMMARY OF DRIVEWAY PIPE ITEMS				480 6001	496 6006	496 6007
LOCATION (STA.)	LT/RT	DRIVEWAY MATERIAL	DESCRIPTION (EXIST.)	CLEAN EXIST CULVERTS	REMOV STR (HEADWALL)	REMOV STR (PIPE)
				EA	EA	LF
782+94.00	LT		15" X 28' CMP			
784+04.00	LT		NO WORK			
786+09.00	LT		15" X 24' CMP			
787+08.00	RT		24" X 20' RCP			
789+96.00	LT		18" X 24' RCP			
790+76.00	LT		18" X 20' RCP			
793+24.00	RT		24" X 42' CMP		2	
803+94.00	RT		18" X 23' CMP			
803+94.00	LT		18" X 43' CMP			
812+73.00	RT		12" X 36' RCP			
814+02.00	RT		12" X 30' CMP			
814+57.00	LT		12" X 26' RCP	1		
824+50.00	LT		15" X 20' RCP			
825+95.00	RT		12" X 19' CMP	1		
831+07.00	LT		18" X 30' RCP			
838+07.00	RT		18" X 21' CMP			
838+12.00	LT		18" X 21' CMP			
847+84.00	RT		18" X 28' RCP	1		
847+93.00	LT		12" X 28' RCP	1		
850+03.00	RT		15" X 28' RCP			
857+17.00	LT		NO WORK			
858+19.00	LT		NO WORK			
859+97.00	RT		NO WORK			
861+53.00	LT		NO PIPE			
862+39.00	LT		12" X 19' CMP			
868+38.00	LT		NO PIPE			
871+18.00	LT		NO WORK			
872+69.00	LT		NO WORK			
875+04.00	RT		12" X 28' RCP	1		
877+56.00	RT		12" X 20' RCP	1		
880+76.00	LT		12" X 24' CMP			
883+30.00	RT		18" X 27'	1		
883+90.00	LT		18" X 100' RCP	1		
883+90.00	RT		18" X 27' RCP	1		
895+65.00	RT		NO WORK			
896+84.00	RT		12" X 14' CMP			
898+13.00	RT		NO WORK			
901+07.00	RT		NO WORK			
904+24.00	RT		NO WORK			
913+06.00	LT	GRAVEL	18" X 19' CMP			19
916+42.00	LT		NO PIPE			
919+78.00	LT		NO PIPE			
926+41.00	RT		NO WORK			
927+50.00	LT		NO WORK			
938+75.00	LT		NO WORK			
946+15.00	RT		NO WORK			
953+50.00	LT		NO WORK			
962+05.00	RT		NO WORK			
983+27.00	LT		NO WORK			
			SUB-TOTAL	9	2	19

SUMMARY OF BRIDGE RAIL RETROFIT ITEMS				
STATION	LOCATION	451 6004	451 6048	512 6017
		RETOFIT RAIL (TY T131RC)	RETOFIT RAIL (ADD HSS)	PORT CTB (DES SOURCE) (F-SHAPE) (TY 1)
		512 6029	512 6041	
		PORT CTB (MOVE) (F-SHAPE) (TY 1)	PORT CTB (STKPL) (F-SHAPE) (TY 1)	
		LF	LF	LF
426+39.50 TO 427+30.50	COTTON WOOD CREEK		208	
511+92.50 TO 512+83.50	SANDERS CREEK		208	
712+81.00 TO 713+81.00	WEST FORK SANDERS CREEK	200		700
	PROJECT TOTALS	200	416	700

SUMMARY OF BRIDGE RAIL RETROFIT ITEMS				
STATION	LOCATION	545 6003	545 6005	545 6019
		CRASH CUSH ATTEN (MOVE & RESET)	CRASH CUSH ATTEN (REMOVE)	CRASH CUSH ATTEN (INSTL) (S) (N) (T) (L3)
		662 6050	662 6063	
		WK ZN PAV MRK REMOV (REFL) TY II-A-A	WK ZN PAV MRK REMOV (W) 4" (SLD)	
		EA	EA	EA
426+39.50 TO 427+30.50	COTTON WOOD CREEK			
511+92.50 TO 512+83.50	SANDERS CREEK			
712+81.00 TO 713+81.00	WEST FORK SANDERS CREEK	2	2	284
	PROJECT TOTALS	2	2	3196

SUMMARY OF BRIDGE RAIL RETROFIT ITEMS				
STATION	LOCATION	662 6075	662 6095	666 6303
		WK ZN PAV MRK REMOV (W) 24" (SLD)	WK ZN PAV MRK REMOV (Y) 4" (SLD)	RE PM W/RET REQ TY I (W) 4" (SLD) (100M IL)
		666 6315	672 6009	
		RE PM W/RET REQ TY I (Y) 4" (SLD) (100M IL)	REFL PAV MRKR TY II-A-A	
		LF	EA	LF
426+39.50 TO 427+30.50	COTTON WOOD CREEK			
511+92.50 TO 512+83.50	SANDERS CREEK			
712+81.00 TO 713+81.00	WEST FORK SANDERS CREEK	44	11376	1796
	PROJECT TOTALS	44	11376	1796

SUMMARY OF BRIDGE RAIL RETROFIT ITEMS		
STATION	LOCATION	677 6001
		ELIM EXT PAV MRK & MRKS (4")
		LF
426+39.50 TO 427+30.50	COTTON WOOD CREEK	
511+92.50 TO 512+83.50	SANDERS CREEK	
712+81.00 TO 713+81.00	WEST FORK SANDERS CREEK	14572
	PROJECT TOTALS	14572


SUMMARY OF EROSION CONTROL ITEMS										
LOCATION (STA.)	DESCRIPTION (EXISTING)	164 6021	506 6038	506 6039	506 6041	506 6043	VEGETATIVE WATERING	FERTILIZER 3-1-2 *	DATE INSTALLED	DATE REMOVED
		CELL FBR MLCH SEED (PERM) (RURAL) (SANDY)	TEMP SEDMT CONT FENCE (INSTALL)	TEMP SEDMT CONT FENCE (REMOVE)	BIODEG EROSN CONT LOGS (INSTL) (12")	BIODEG EROSN CONT LOGS (REMOVE)				
		SY	LF	LF	LF	LF	MG			
426+85.00	COTTON WOOD CREEK BRIDGE 91'	747			630	630	4	74		
433+53.00	4 - 7' X 3' MBC	711			600	600	4	70		
512+38.00	SANDERS CREEK BRIDGE 91'	747			630	630	4	74		
520+03.00	3 - 10' X 7' MBC	711			600	600	4	70		
528+26.00	2 - 4' X 7' MBC									
713+31.00	WEST FORK SANDERS CREEK BRIDGE 100'	747			630	630	4	74		
796+09.00	2 - 10' X 9' SKEWED MBC AS DIRECTED BY ENGINEER	711			600	600	4	70		
	PROJECT TOTALS	4374	600	600	4290	4290	24	432		

* FOR CONTRACTOR'S ONLY: 2 CYCLES AT 50 LBS NITROGEN PER ACRE AT 21-7-14 (NPK) ANALYSIS + 0.0492 LBS/SY/CYCLE WATERING BASED ON 2 APPLICATIONS 0.5" RAINFALL EQUIVALENT + 0.003 MG/SY/CYCLE

FM 38
QUANTITY SUMMARY

SHEET 12 OF 12

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CONT	SECT	JOB	HIGHWAY
0435	01	080	FM 38
DIST	COUNTY		SHEET NO.
PAR	LAMAR		17

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DWG: CKS: DWF: CKS: CJK:

Phase I ~ Initial Traffic Control

Install project limit traffic control devices (TCD) per the BC standard sheets. Utilize the applicable TCP (2-1)-18 or TCP (2-2b)-18 layout for TCD installation.

Phase II ~ Erosion Control

Install erosion control devices utilizing the applicable TCP (2-1)-18 layout or TCP (2-2b)-18.

Phase III ~ West Fork Sanders Creek Bridge Rail Retrofit

Retrofit bridge rail and install MBGF utilizing the Traffic Control Plan for Bridge Rail Retrofit. Bridge rail retrofit must be the first operation worked after TCP and erosion control prep, and shall be fully complete before other operations can begin.

Phase IV ~ Culvert Work (Cross and Parallel Culverts)

Perform off-pavement culvert operations utilizing the applicable TCP (2-1)-18 layout.

Perform on-pavement culvert operations utilizing TCP(2-2b)-18 or TCP(2-8)-20(PAR).

Adhere to the Worksheet for Edge Condition Treatment Types.

Phase V ~ MBGF

Remove existing MBGF and install proposed MBGF utilizing TCP (2-1)-18 or TCP (2-2b)-18 as required.

Phase VI ~ Project Clean Up

Remove erosion control devices, construction debris and waste material utilizing TCP (2-1)-18.

Notes:

Prior to a specific construction operation, the traffic control standard specified for the construction phase in this narrative must be evaluated thoroughly for appropriateness. All traffic control operations must adhere to the Texas Manual on Uniform Traffic Control Devices (TMUTCD) and the applicable Traffic Control Standards. Construction phase order may be varied when approved by the Engineer. Submit a Work and Traffic Control Sequence plan to the Engineer for approval. Ensure that both travel lanes are open at night. Provide access to private property and Public Roads at all times. Provide pilot car during one lane/two way traffic operations. Road closures must be approved by the Engineer.

Limit work area to 2 miles unless approved by the Engineer.

Seeding to be performed within 14 days of structure work utilizing TCP (2-1)-18.



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FM 38

SEQUENCE OF WORK

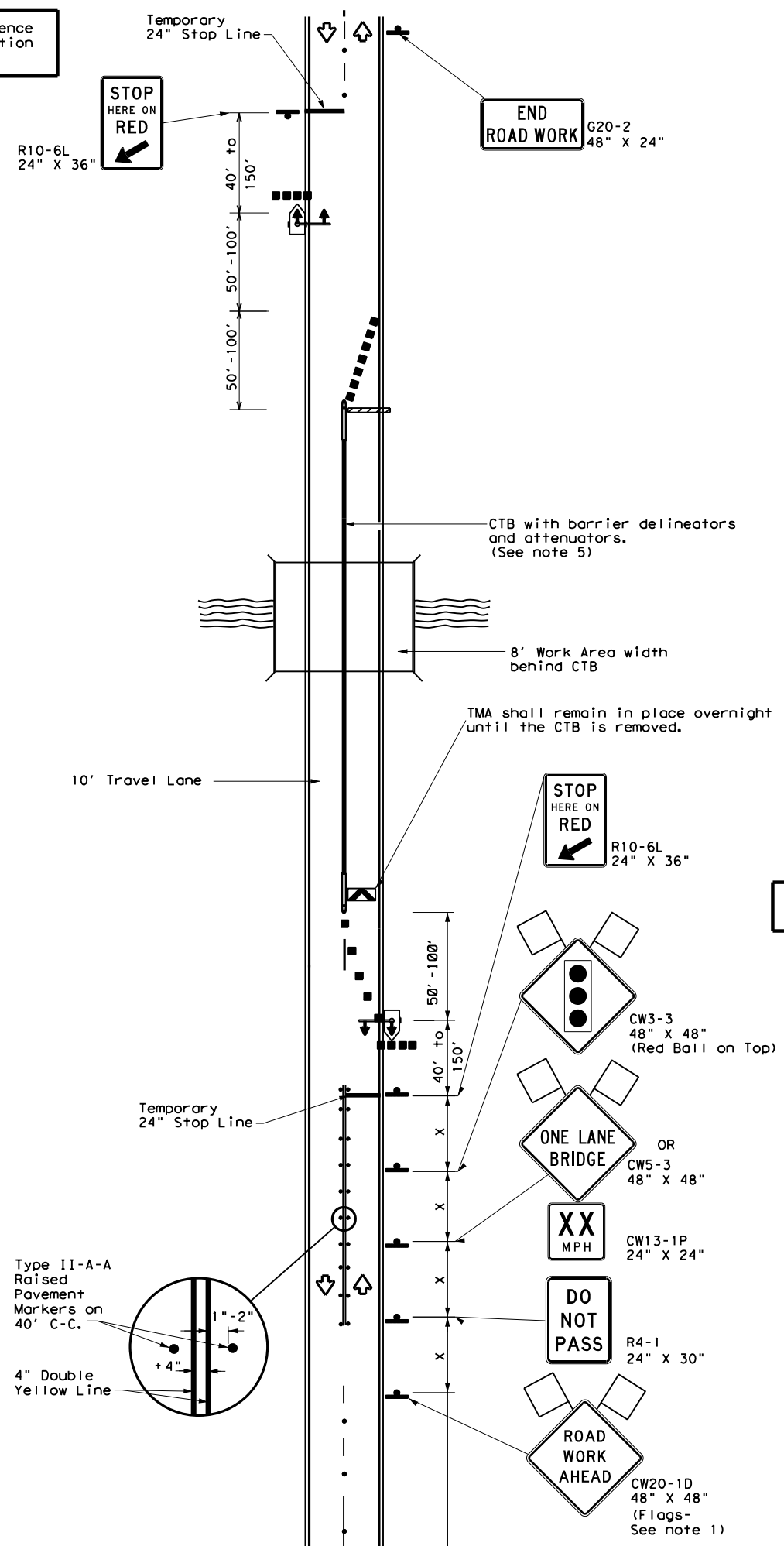
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CONT	SECT	JOB	HIGHWAY
0435	01	080	FM 38
DIST	COUNTY		SHEET NO.
PAR	LAMAR		18

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Warning Sign Sequence in opposite direction same as below



LEGEND			
	Type 3 Barricade		Channelizing Devices
	Heavy Work Vehicle		Truck Mounted Attenuator (TMA)
	Portable Traffic Signal		Raised Pavement Markers Ty II-AA
	Sign		Traffic Flow
	Flag		CTB Attenuator

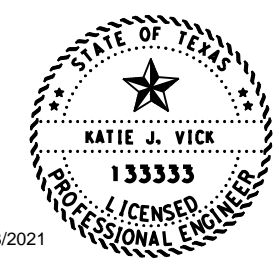
Posted Speed *	Formula	Minimum Desirable Taper Lengths **			Suggested Maximum Spacing of Channelizing Devices		Minimum Sign Spacing "X" Distance	Suggested Longitudinal Buffer Space "B"
		10' Offset	11' Offset	12' Offset	On a Taper	On a Tangent		
30	$L = \frac{WS^2}{60}$	150'	165'	180'	30'	60'	120'	90'
35		205'	225'	245'	35'	70'	160'	120'
40		265'	295'	320'	40'	80'	240'	155'
45	L = WS	450'	495'	540'	45'	90'	320'	195'
50		500'	550'	600'	50'	100'	400'	240'
55		550'	605'	660'	55'	110'	500'	295'
60		600'	660'	720'	60'	120'	600'	350'
65		650'	715'	780'	65'	130'	700'	410'
70		700'	770'	840'	70'	140'	800'	475'
75		750'	825'	900'	75'	150'	900'	540'

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

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.
- When work duration is less than 14 days the 4" Double Yellow Stripe and RPMs at 40' C-C may be substituted with Short Term Pavement Marking Tabs.
- When work duration is less than 14 day the 4" Solid White Edgeline may be omitted.
- CTB length shall encompass bridge rail with attached proposed MBGF length plus 60 feet on both ends of MBGF.
- Install CTB only on one roadway side at a time.
- CTB delineator spacing of 60 feet.

Traffic Control Devices shown for one direction



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**TRAFFIC CONTROL PLAN
 BRIDGE RAIL RETROFIT**

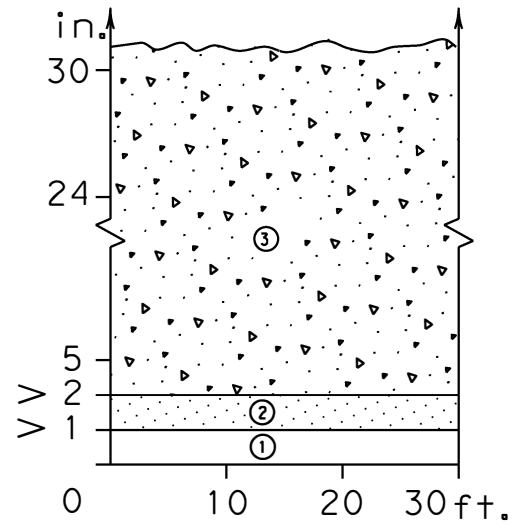
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© TxDOT	CONT	SECT	JOB	HIGHWAY
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	PAR	LAMAR		19

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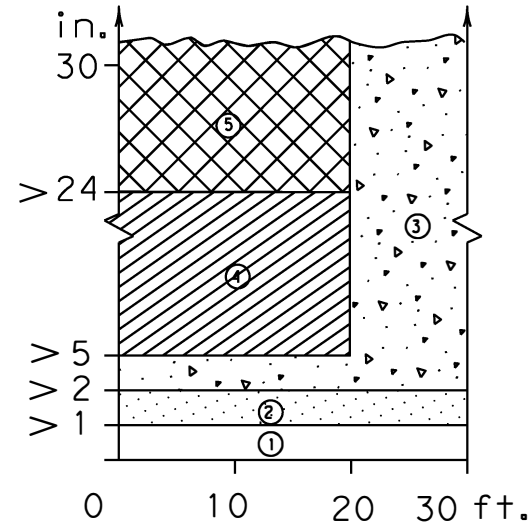
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DEFINITION OF TREATMENT ZONES FOR VARIOUS EDGE CONDITIONS

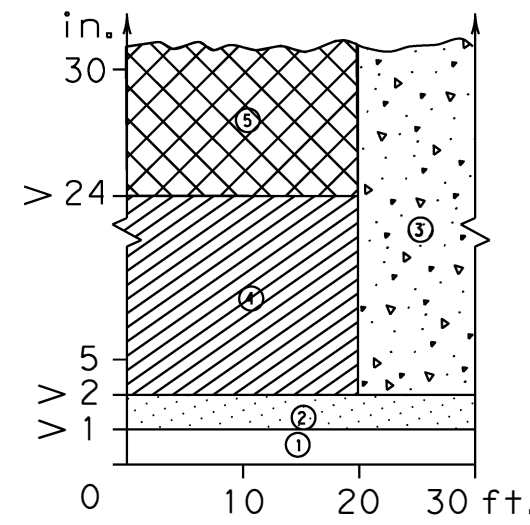
Edge Height (D) in Inches versus Lateral Clearance (Y) in Feet



Edge Condition I
S = (3:1) (or flatter)



Edge Condition II
S = ((2.99):1) to (1:1)



Edge Condition III
S is steeper than (1:1)

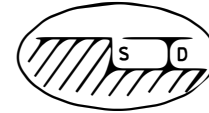
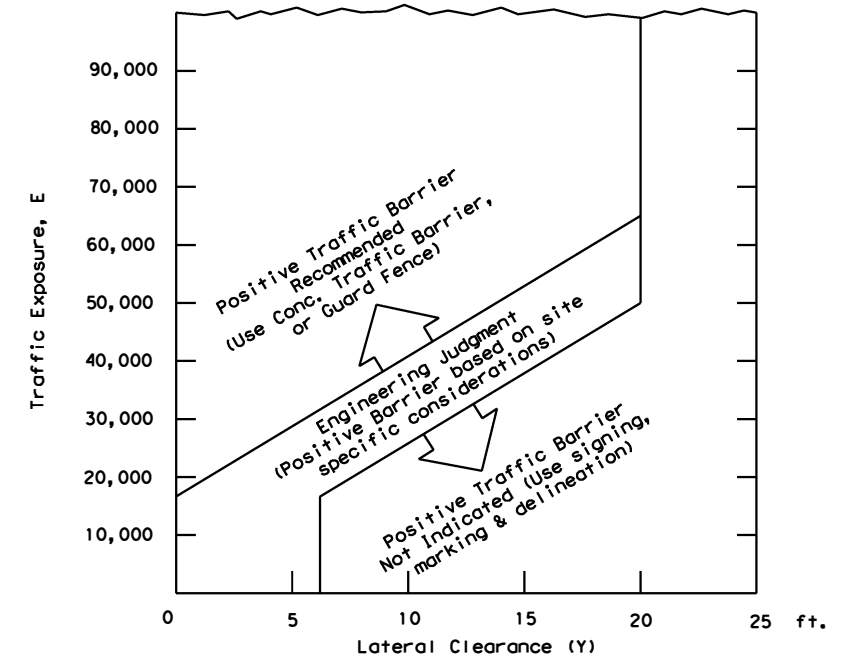


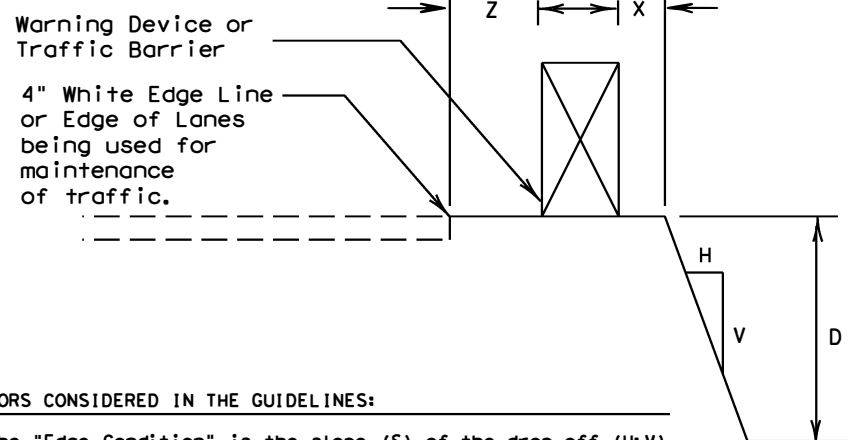
FIGURE-1: CONDITIONS INDICATING USE OF POSITIVE BARRIER FOR ZONE 5 ([Cross-hatched])



- E = ADT x T
Where ADT is that portion of the average daily traffic volume traveling within 20 feet (generally two adjacent lanes) of the edge dropoff condition; and, T is the duration time in years of the dropoff condition.
- Figure-1 provides a practical approach to the use of positive barriers for the protection of vehicles from pavement drop-offs. Other factors, such as the presence of heavy machinery, construction workers, or the mix and volume of traffic may make the use of positive barriers appropriate, even when the edge condition alone may not justify the use of a barrier.
- An approved end treatment should be provided for any positive barrier end located within a lateral offset of 20 feet from the edge of the travel lane.

Zone	Treatment Types Guidelines:
①	No treatment.
②	CW 8-11 "Uneven Lanes" signs.
③	CW 8-9a "Shoulder Drop-Off" or CW 8-11 signs plus vertical panels.
④	CW 8-9a or CW 8-11, signs plus drums. Where restricted space precludes the use of drums, use vertical panels. An edge fill may be provided to change the edge slope to that of the preferable Edge Condition I.
⑤	Check indications (Figure-1) for positive barrier. Where positive barrier is not indicated, the treatment shown above for Zone- 4 may be used after consideration of other applicable factors.

These guidelines apply to temporary traffic control areas or work zones where continuous pavement edges or drop-offs exists parallel and adjacent to a lane used by traffic. The edge conditions may be present between shoulders and travel lanes, between adjacent or opposing travel lanes, or at intermediate points across the width of the paved surface. Due to the variability in construction operations, tolerances in the variables may be allowed by the engineer. These guidelines do not apply to short term operations. These guidelines do not constitute a rigid standard or policy; rather, they are guidance to be used in conjunction with engineering judgement. These guidelines may be updated on the Design Division's on-line manuals.



FACTORS CONSIDERED IN THE GUIDELINES:

- The "Edge Condition" is the slope (S) of the drop-off (H:V). The "Edge Height" is the depth of the drop-off "D".
- Distance "X" is to be the maximum practical under job conditions. Two feet minimum for high speed conditions. Distance "Y" is the lateral clearance from edge of travel lane to edge of dropoff. Distance "Z" does not have a minimum.
- In addition to the factors considered in the guidelines, each construction zone drop-off situation should be analyzed individually, taking into account other variables, such as: traffic mix, posted speed in the construction zone, horizontal curvature, and the practicality of the treatment options.
- The conditions for indicating the use of positive or protective barriers are given by Zone-5 and Figure-1. Traffic barriers are primarily applicable for high speed conditions. Urban areas with speeds of 30 mph or less may have a lesser need for signing, delineation, and barriers. Right-angled edges, however, with "D" greater than 2 inches and located within a lateral offset of 6 feet, may indicate a higher level of treatment.
- If the distance "Y" must be less than 3 feet, the use of a positive barrier may not be feasible. In such a case, consider either: 1) narrowing the lanes to a desired 11 to 12 feet or 10 foot minimum (see CW20-8 sign), or 2) provide an edge slope such as Edge Condition I.

Edge Condition Notes:

- Edge Condition I: Most vehicles are able to traverse an edge condition with a slope rate of (3 to 1) or flatter. The slope must be constructed with a compacted material capable of supporting vehicles.
- Edge Condition II: Most vehicles are able to traverse an edge condition with a slope between (2.99 to 1) and (1 to 1) so long as "D" does not exceed 5 inches. Under-carriage drag on most automobiles will occur when "D" exceeds 6 inches. As "D" exceeds 24 inches, the possibility for rollover is greater in most vehicles.
- Edge Condition III: When slopes are greater than (1 to 1) and where "D" is greater than 2 inches, a more difficult control factor may exist for some vehicles, if not properly treated. For example, where "D" is greater than 2 inches and up to 24 inches different types of vehicles may experience different steering control at different edge heights. Automobiles might experience more steering control differential when "D" is greater than 2 inches and up to 5 inches. Trucks, particularly those with high loads, have more steering control differential when "D" is greater than 5 inches and up to 24 inches. When "D" exceeds 24 inches, the possibility of rollover is greater for most vehicles.
- Milling or overlay operations that result in Edge Condition III should not be in place without appropriate warning treatments, and these conditions should not be left in place for extended periods of time.

Engineer's Seal

Katie J. Vick, P.E.

Date 03/03/2021

Texas Department of Transportation
Traffic Operations Division

TREATMENT FOR VARIOUS EDGE CONDITIONS

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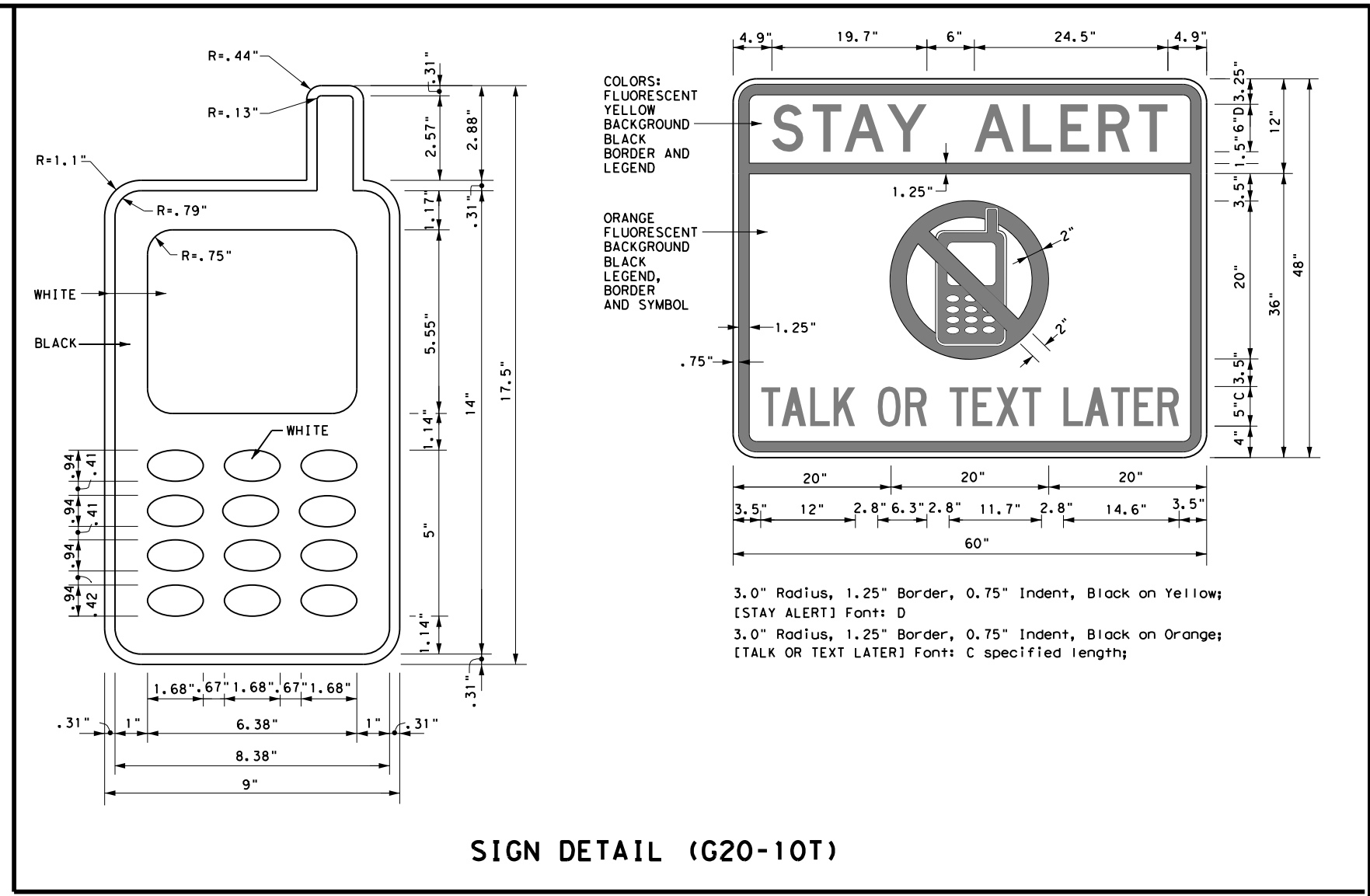
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BARRICADE AND CONSTRUCTION (BC) STANDARD SHEETS GENERAL NOTES:

- 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

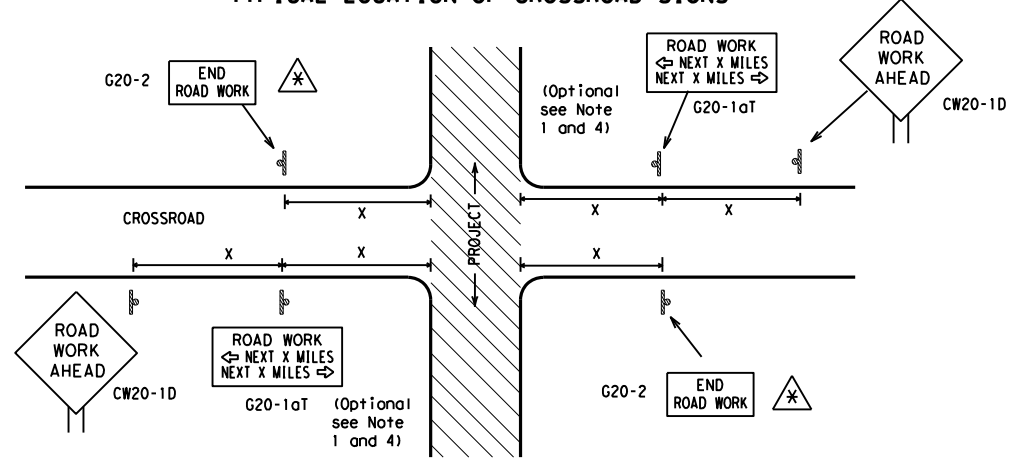
THE DOCUMENTS BELOW CAN BE FOUND ON-LINE AT http://www.txdot.gov	
COMPLIANT WORK ZONE TRAFFIC CONTROL DEVICES LIST (CWZTCD)	
DEPARTMENTAL MATERIAL SPECIFICATIONS (DMS)	
MATERIAL PRODUCER LIST (MPL)	
ROADWAY DESIGN MANUAL - SEE "MANUALS (ONLINE MANUALS)"	
STANDARD HIGHWAY SIGN DESIGNS FOR TEXAS (SHSD)	
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			
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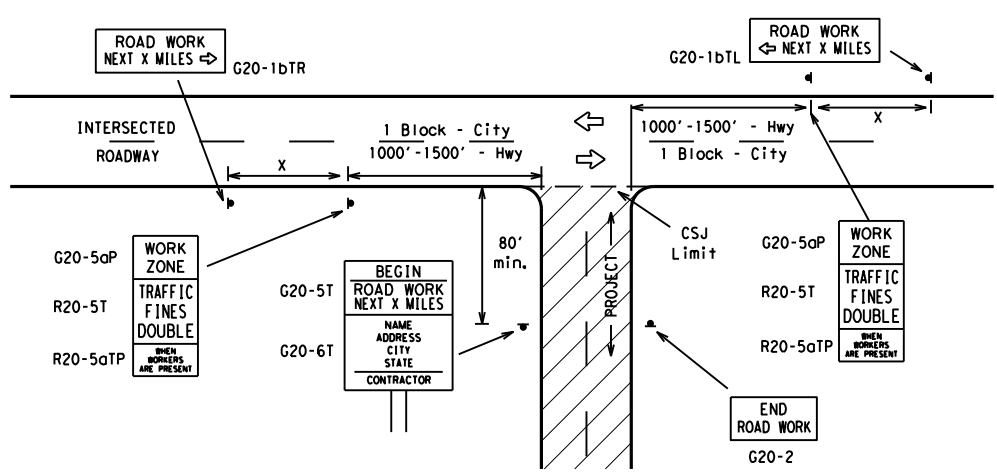
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TYPICAL LOCATION OF CROSSROAD SIGNS



- ⚠ 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" (G20-1aT) sign shall be required at high volume crossroads to advise motorists of the length of construction in either direction from the intersection. The Engineer will determine whether a roadway is considered high volume.
 - 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.

TYPICAL CONSTRUCTION WARNING SIGN SIZE AND SPACING^{1,5,6}

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			50	400
CW1, CW2, CW7, CW8, CW9, CW11, CW14	36" x 36"	48" x 48"	55	500 ²
CW3, CW4, CW5, CW6, CW8-3, CW10, CW12	48" x 48"	48" x 48"	60	600 ²
			65	700 ²
			70	800 ²
			75	900 ²
			80	1000 ²
			*	* ³

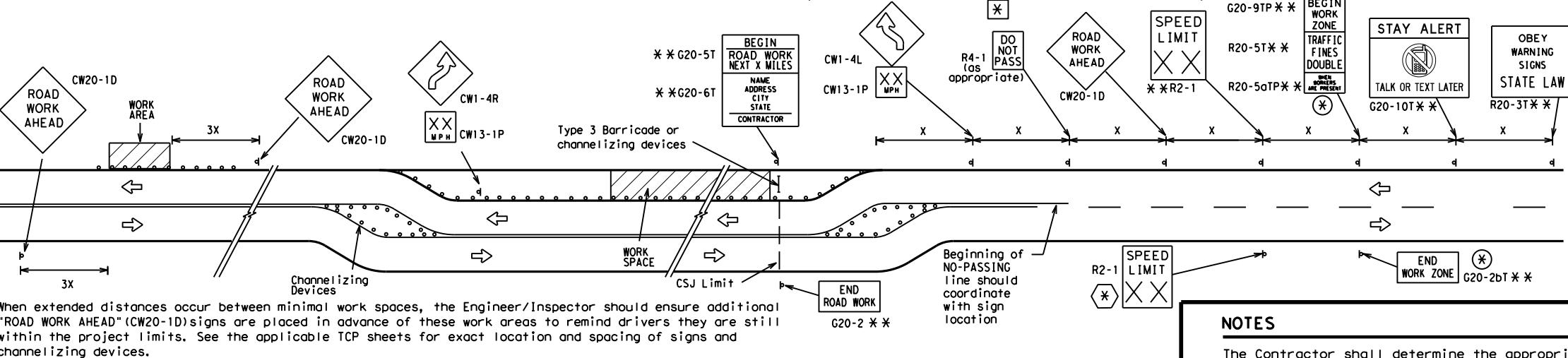
* For typical sign spacings on divided highways, expressways and freeways, see Part 6 of the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD) typical application diagrams or TCP Standard Sheets.

Δ Minimum distance from work area to first Advance Warning sign nearest the work area and/or distance between each additional sign.

GENERAL NOTES

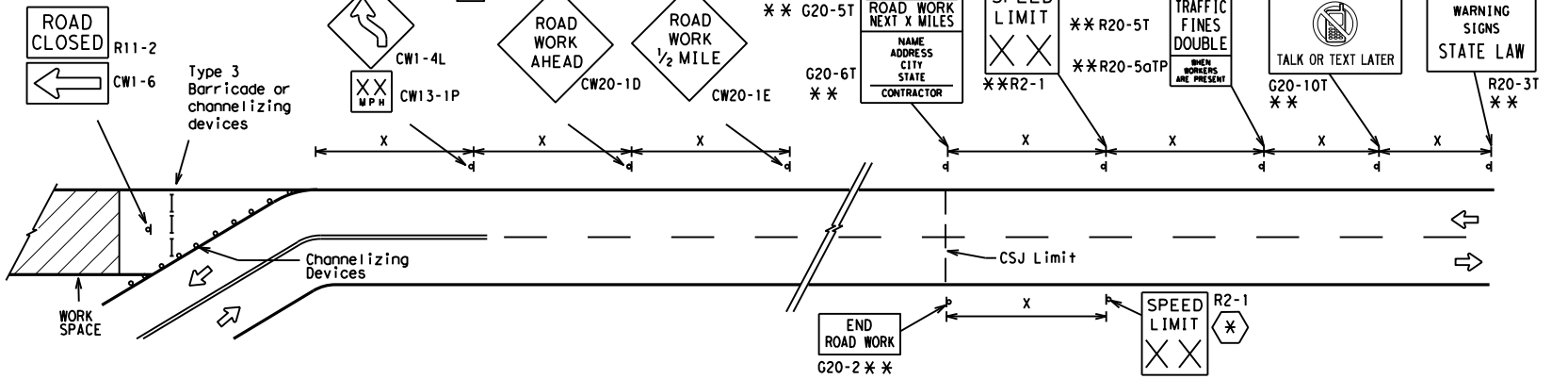
- Special or larger size signs may be used as necessary.
- Distance between signs should be increased as required to have 1500 feet advance warning.
- Distance between signs should be increased as required to have 1/2 mile or more advance warning.
- 36" x 36" "ROAD WORK AHEAD" (CW20-1D) signs may be 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.

WORK AREAS IN MULTIPLE LOCATIONS WITHIN CSJ LIMITS

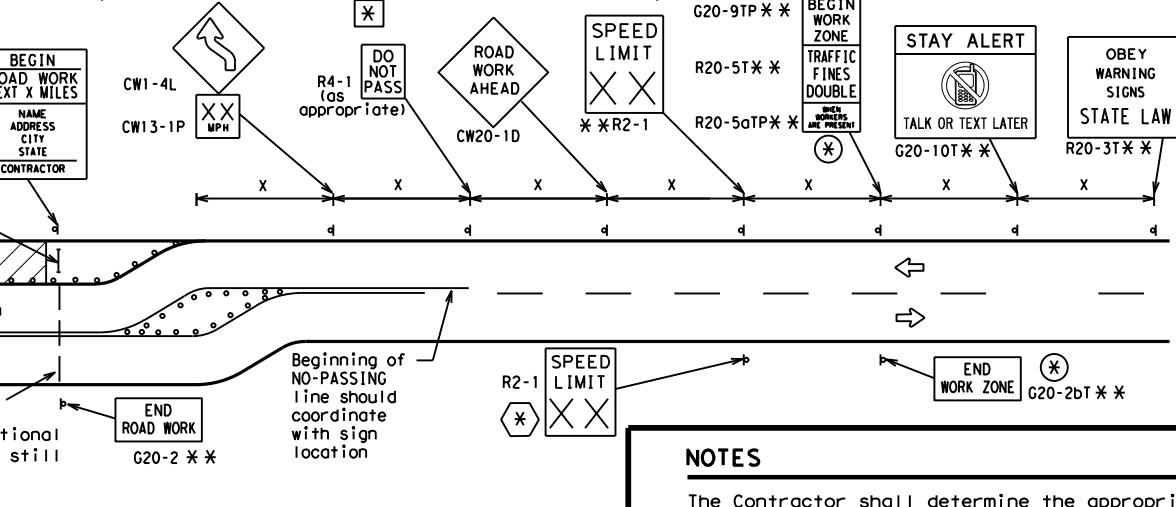


When extended distances occur between minimal work spaces, the Engineer/Inspector should ensure additional "ROAD WORK AHEAD" (CW20-1D) signs are placed in advance of these work areas to remind drivers they are still within the project limits. See the applicable TCP sheets for exact location and spacing of signs and channelizing devices.

SAMPLE LAYOUT OF SIGNING FOR WORK BEGINNING DOWNSTREAM OF THE CSJ LIMITS



SAMPLE LAYOUT OF SIGNING FOR WORK BEGINNING AT THE CSJ LIMITS



NOTES

- The Contractor shall determine the appropriate distance to be placed on the G20-1 series signs and "BEGIN ROAD WORK NEXT X MILES" (G20-5T) sign for each specific project. This distance shall replace the "x" and shall be rounded to the nearest whole mile with the approval of the Engineer. No decimals shall be used.
- ⊗ The "BEGIN WORK ZONE" (G20-9TP) and "END WORK ZONE" (G20-2bT) shall be used as shown on the sample layout when advance signs are required outside the CSJ Limits. They inform the motorist of entering or leaving a part of the work zone lying outside the CSJ Limits where traffic fines may double if workers are present.
- ** Required CSJ Limit signing. See Note 10 on BC(1). TRAFFIC FINES DOUBLE signs will not be required on projects consisting solely of mobile operations work.
- ⊗ Area for placement of "ROAD WORK AHEAD" (CW20-1D) sign and other signs or devices as called for on the Traffic Control Plan.
- ⊗ Contractor will install a regulatory speed limit sign at the end of the work zone.

LEGEND

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

SHEET 2 OF 12

BARRICADE AND CONSTRUCTION PROJECT LIMIT

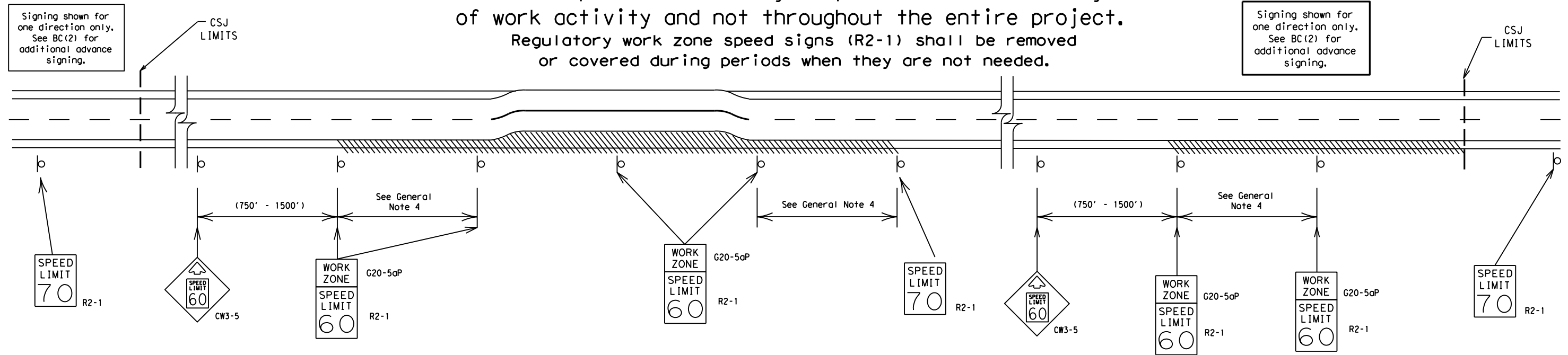
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TYPICAL APPLICATION OF WORK ZONE SPEED LIMIT SIGNS

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 traveled 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 control is 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.

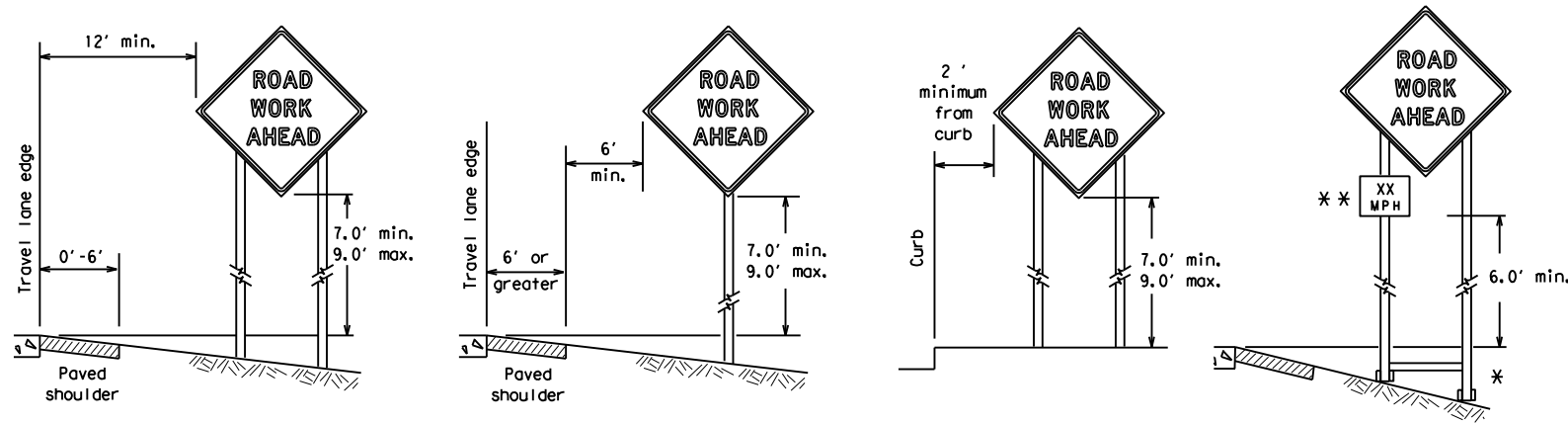
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		Traffic Operations Division Standard	
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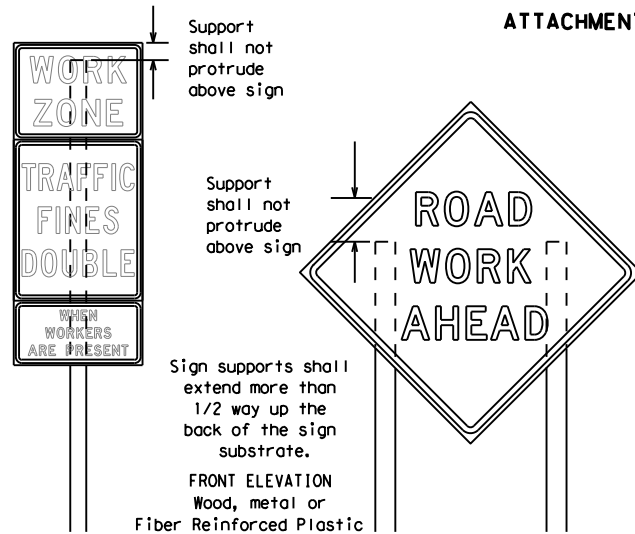
TYPICAL MINIMUM CLEARANCES FOR LONG TERM AND INTERMEDIATE TERM SIGNS



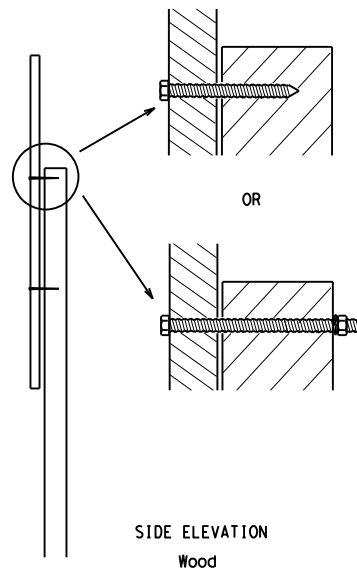
* When placing skid supports on unlevel ground, the leg post lengths must be adjusted so the sign appears straight and plumb. Objects shall NOT be placed under skids as a means of leveling.

** When plaques are placed on dual-leg supports, they should be attached to the upright nearest the travel lane. Supplemental plaques (advisory or distance) should not cover the surface of the parent sign.

ATTACHMENT FOR SIGN SUPPORTS



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

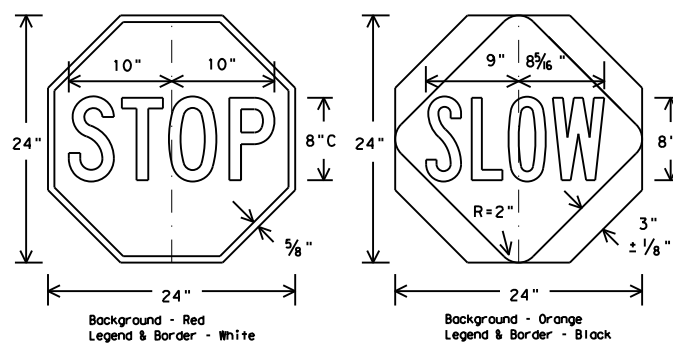


Nails shall NOT be allowed. Each sign shall be attached directly to the sign support. Multiple signs shall not be joined or spliced by any means. Wood supports shall not be extended or repaired by splicing or other means.

Splicing embedded perforated square metal tubing in order to extend post height will only be allowed when the splice is made using four bolts, two above and two below the 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.

STOP/SLOW PADDLES

1. STOP/SLOW paddles are the primary method to control traffic by flaggers. The STOP/SLOW paddle size should be 24" x 24" as detailed below.
2. When used at night, the STOP/SLOW paddle shall be retroreflectORIZED.
3. STOP/SLOW paddles may be attached to a staff with a minimum length of 6' to the bottom of the sign.
4. Any lights incorporated into the STOP or SLOW paddle faces shall only be as specifically described in Section 6E.03 Hand Signaling Devices in the TMUTCD.



CONTRACTOR REQUIREMENTS FOR MAINTAINING PERMANENT SIGNS WITHIN THE PROJECT LIMITS

1. Permanent signs are used to give notice of traffic laws or regulations, call attention to conditions that are potentially hazardous to traffic operations, show route designations, destinations, directions, distances, services, points of interest, and other geographical, recreational, or cultural information. Drivers proceeding through a work zone need the same, if not better route guidance as normally installed on a roadway without construction.
2. When permanent regulatory or warning signs conflict with work zone conditions, remove or cover the permanent signs until the permanent sign message matches the roadway condition.
3. When existing permanent signs are moved and relocated due to construction purposes, they shall be visible to motorists at all times.
4. If existing signs are to be relocated on their original supports, they shall be installed on crashworthy bases as shown on the SMD Standard sheets. The signs shall meet the required mounting heights shown on the BC Sheets or the SMD Standards. This work should be paid for under the appropriate pay item for relocating existing signs.
5. If permanent signs are to be removed and relocated using temporary supports, the Contractor shall use crashworthy supports as shown on the BC sheets or the CWZTCD. The signs shall meet the required mounting heights shown on the BC Sheets or the SMD Standards during construction. This work should be paid for under the appropriate pay item for relocating existing signs.
6. Any sign or traffic control device that is struck or damaged by the Contractor or his/her construction equipment shall be replaced as soon as possible by the Contractor to ensure proper guidance for the motorists. This will be subsidiary to Item 502.

GENERAL NOTES FOR WORK ZONE SIGNS

1. Contractor shall install and maintain signs in a straight and plumb condition and/or as directed by the Engineer.
 2. Wooden sign posts shall be painted white.
 3. Barricades shall NOT be used as sign supports.
 4. All signs shall be installed in accordance with the plans or as directed by the Engineer. Signs shall be used to regulate, warn, and guide the traveling public safely through the work zone.
 5. The Contractor may furnish either the sign design shown in the plans or in the "Standard Highway Sign Designs for Texas" (SHSD). The Engineer/Inspector may require the Contractor to furnish other work zone signs that are shown in the TMUTCD but may have been omitted from the plans. Any variation in the plans shall be documented by written agreement between the Engineer and the Contractor's Responsible Person. All changes must be documented in writing before being implemented. This can include documenting the changes in the Inspector's TxDOT diary and having both the Inspector and Contractor initial and date the agreed upon changes.
 6. The Contractor shall furnish sign supports listed in the "Compliant Work Zone Traffic Control Device List" (CWZTCD). The Contractor shall install the sign support in accordance with the manufacturer's recommendations. If there is a question regarding installation procedures, the Contractor shall furnish the Engineer a copy of the manufacturer's installation recommendations so the Engineer can verify the correct procedures are being followed.
 7. The Contractor is responsible for installing signs on approved supports and replacing signs with damaged or cracked substrates and/or damaged or marred reflective sheeting as directed by the Engineer/Inspector.
 8. Identification markings may be shown only on the back of the sign substrate. The maximum height of letters and/or company logos used for identification shall be 1 inch.
 9. The Contractor shall replace damaged wood posts. New or damaged wood sign posts shall not be spliced.
- DURATION OF WORK (as defined by the "Texas Manual on Uniform Traffic Control Devices" Part 6)**
1. The types of sign supports, sign mounting height, the size of signs, and the type of sign substrates can vary based on the type of work being performed. The Engineer is responsible for selecting the appropriate size sign for the type of work being performed. The Contractor is responsible for ensuring the sign support, sign mounting height and substrate meets manufacturer's recommendations in regard to crashworthiness and duration of work requirements.
 - a. Long-term stationary - work that occupies a location more than 3 days.
 - b. Intermediate-term stationary - work that occupies a location more than one daylight period up to 3 days, or nighttime work lasting more than one hour.
 - c. Short-term stationary - daytime work that occupies a location for more than 1 hour in a single daylight period.
 - d. Short, duration - work that occupies a location up to 1 hour.
 - e. Mobile - work that moves continuously or intermittently (stopping for up to approximately 15 minutes.)

SIGN MOUNTING HEIGHT

1. The bottom of Long-term/Intermediate-term signs shall be at least 7 feet, but not more than 9 feet, above the paved surface, except as shown for supplemental plaques mounted below other signs.
2. The bottom of Short-term/Short Duration signs shall be a minimum of 1 foot above the pavement surface but no more than 2 feet above the ground.
3. Long-term/Intermediate-term Signs may be used in lieu of Short-term/Short Duration signing.
4. Short-term/Short Duration signs shall be used only during daylight and shall be removed at the end of the workday or raised to appropriate Long-term/Intermediate sign height.
5. Regulatory signs shall be mounted at least 7 feet, but not more than 9 feet, above the paved surface regardless of work duration.

SIZE OF SIGNS

1. The Contractor shall furnish the sign sizes shown on BC (2) unless otherwise shown in the plans or as directed by the Engineer.

SIGN SUBSTRATES

1. The Contractor shall ensure the sign substrate is installed in accordance with the manufacturer's recommendations for the type of sign support that is being used. The CWZTCD lists each substrate that can be used on the different types and models of sign supports.
2. "Mesh" type materials are NOT an approved sign substrate, regardless of the tightness of the weave.
3. All wooden individual sign panels fabricated from 2 or more pieces shall have one or more plywood cleat, 1/2" thick by 6" wide, fastened to the back of the sign and extending fully across the sign. The cleat shall be attached to the back of the sign using wood screws that do not penetrate the face of the sign panel. The screws shall be placed on both sides of the splice and spaced at 6" centers. The Engineer may approve other methods of splicing the sign face.

REFLECTIVE SHEETING

1. All signs shall be retroreflective and constructed of sheeting meeting the color and retro-reflectivity requirements of DMS-8300 for rigid signs or DMS-8310 for roll-up signs. The web address for DMS specifications is shown on BC(1).
2. White sheeting, meeting the requirements of DMS-8300 Type A, shall be used for signs with a white background.
3. Orange sheeting, meeting the requirements of DMS-8300 Type B_{FL} or Type C_{FL}, shall be used for rigid signs with orange backgrounds.

SIGN LETTERS

1. All sign letters and numbers shall be clear, and open rounded type uppercase alphabet letters as approved by the Federal Highway Administration (FHWA) and as published in the "Standard Highway Sign Design for Texas" manual. Signs, letters and numbers shall be of first class workmanship in accordance with Department Standards and Specifications.

REMOVING OR COVERING

1. When sign messages may be confusing or do not apply, the signs shall be removed or completely covered.
2. Long-term stationary or intermediate stationary signs installed on square metal tubing may be turned away from traffic 90 degrees when the sign message is not applicable. This technique may not be used for signs installed in the median of divided highways or near any intersections where the sign may be seen from approaching traffic.
3. Signs installed on wooden skids shall not be turned at 90 degree angles to the roadway. These signs should be removed or completely covered when not required.
4. When signs are covered, the material used shall be opaque, such as heavy mil black plastic, or other materials which will cover the entire sign face and maintain their opaque properties under automobile headlights at night, without damaging the sign sheeting.
5. Burlap shall NOT be used to cover signs.
6. Duct tape or other adhesive material shall NOT be affixed to a sign face.
7. Signs and anchor stubs shall be removed and holes backfilled upon completion of work.

SIGN SUPPORT WEIGHTS

1. Where sign supports require the use of weights to keep from turning over, the use of sandbags with dry, cohesionless sand should be used.
2. The sandbags will be tied shut to keep the sand from spilling and to maintain a constant weight.
3. Rock, concrete, iron, steel or other solid objects shall not be permitted for use as sign support weights.
4. Sandbags should weigh a minimum of 35 lbs and a maximum of 50 lbs.
5. Sandbags shall be made of a durable material that tears upon vehicular impact. Rubber (such as tire inner tubes) shall NOT be used.
6. Rubber ballasts designed for channelizing devices should not be used for ballast on portable sign supports. Sign supports designed and manufactured with rubber bases may be used when shown on the CWZTCD list.
7. Sandbags shall only be placed along or laid over the base supports of the traffic control device and shall not be suspended above ground level or hung with rope, wire, chains or other fasteners. Sandbags shall be placed along the length of the skids to weigh down the sign support.
8. Sandbags shall NOT be placed under the skid and shall not be used to level sign supports placed on slopes.

FLAGS ON SIGNS

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

SHEET 4 OF 12



BARRICADE AND CONSTRUCTION TEMPORARY SIGN NOTES

BC (4) - 14

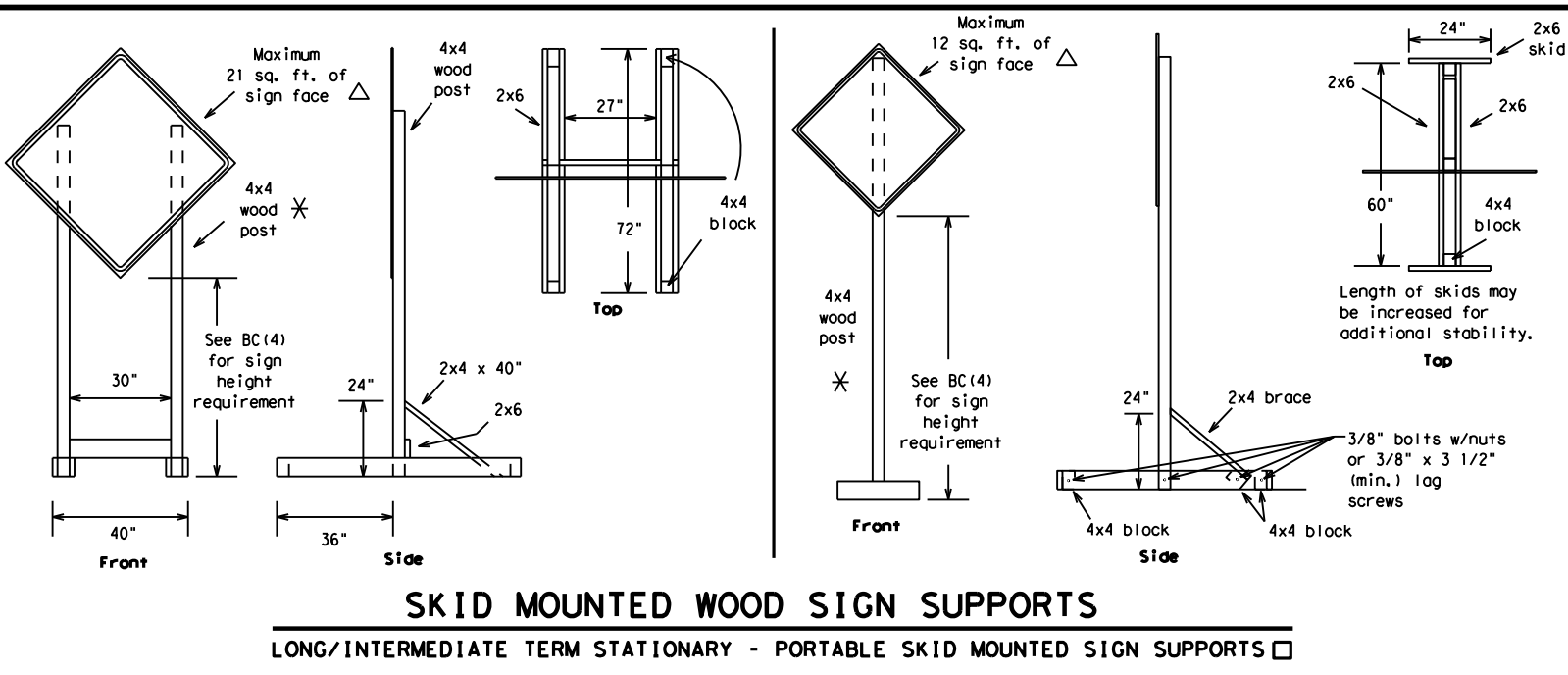
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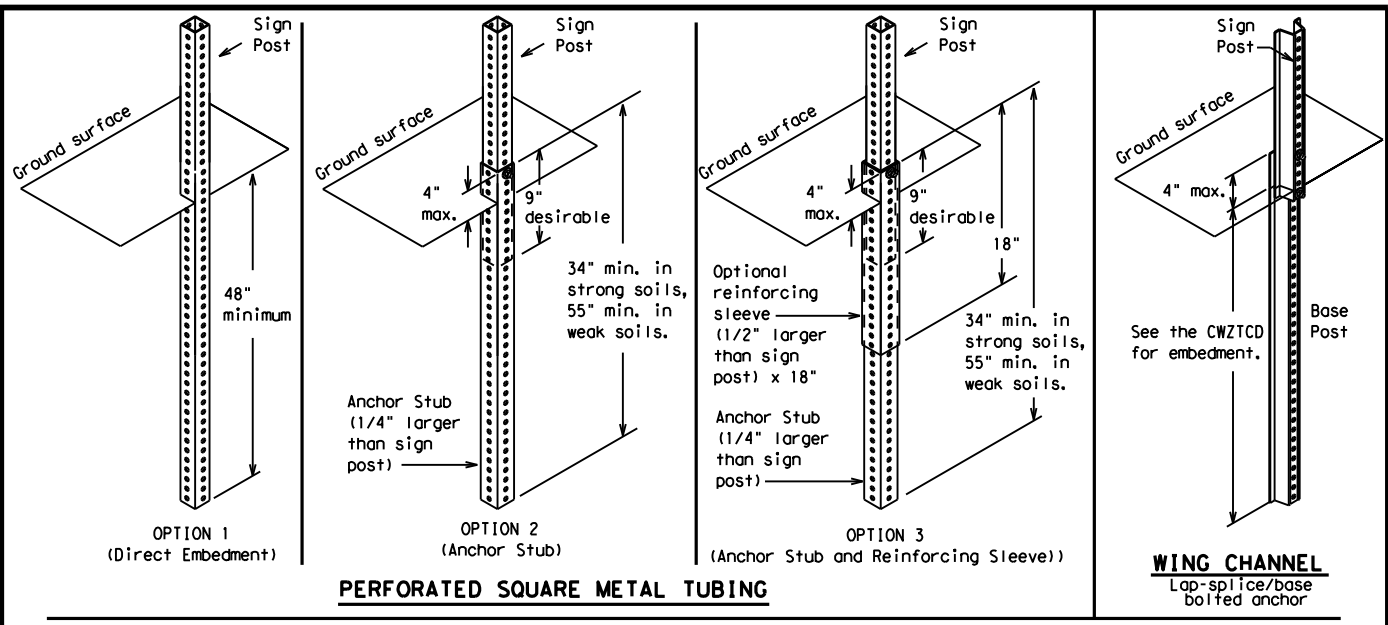
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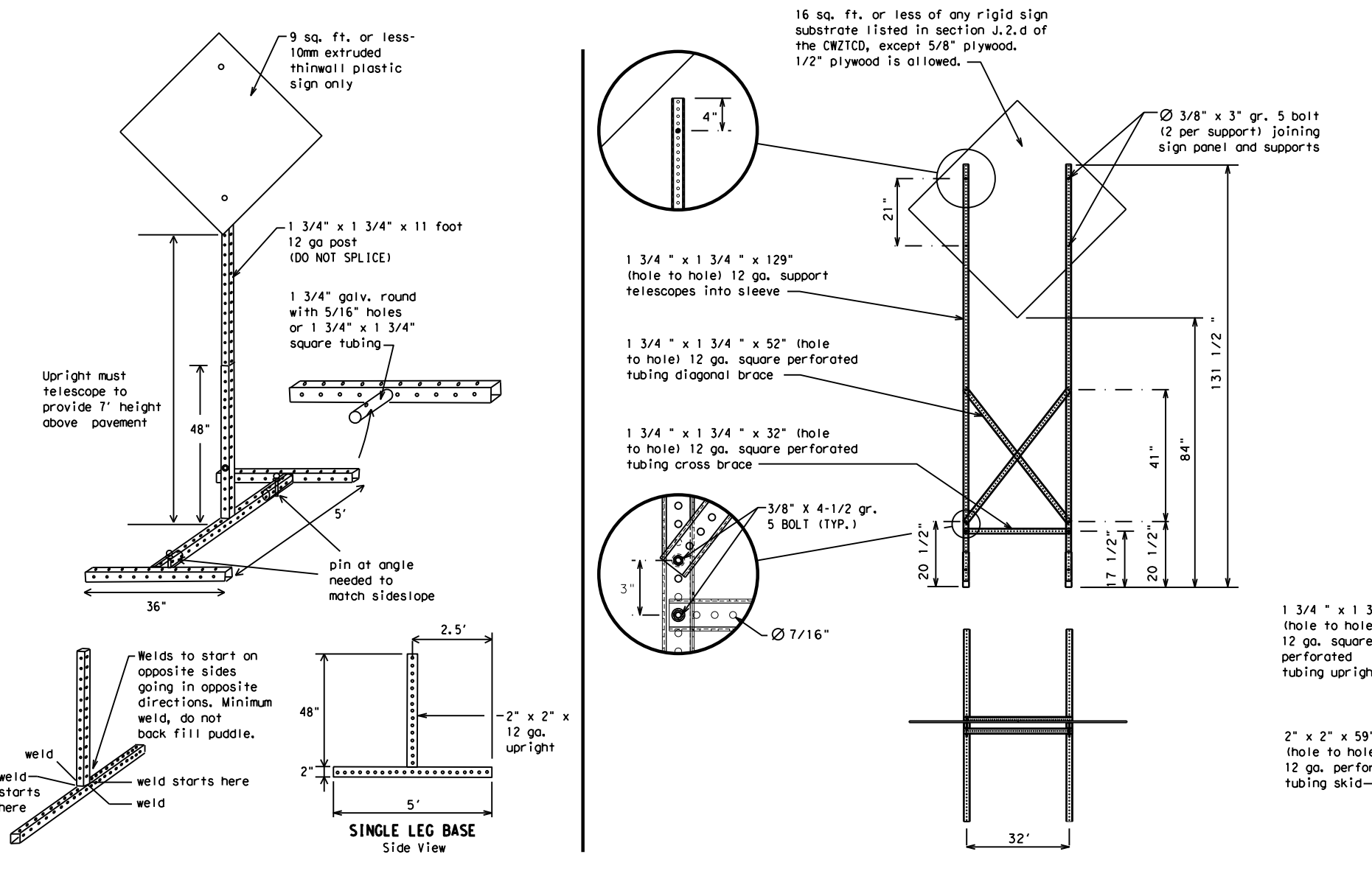
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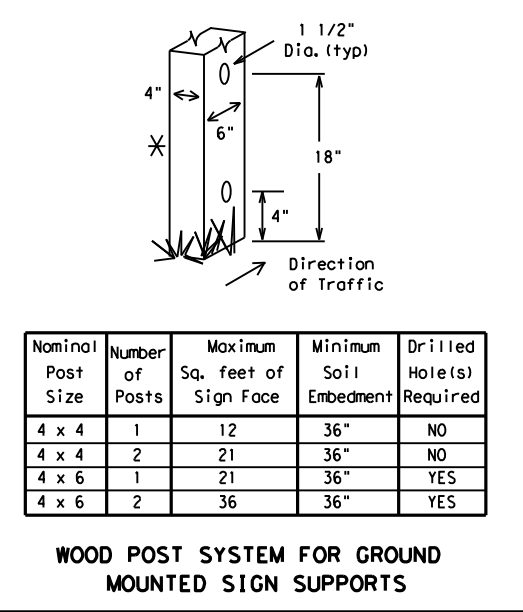
SKID MOUNTED WOOD SIGN SUPPORTS
 LONG/INTERMEDIATE TERM STATIONARY - PORTABLE SKID MOUNTED SIGN SUPPORTS □



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.



SKID MOUNTED PERFORATED SQUARE STEEL TUBING 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

WOOD POST SYSTEM FOR GROUND MOUNTED SIGN SUPPORTS

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

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

- GENERAL NOTES**
- 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.
 - No more than 2 sign posts shall be placed within a 7 ft. circle, except for specific materials noted on the CWZTCD List.
 - 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.

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

RECOMMENDED PHASES AND FORMATS FOR PCMS MESSAGES DURING ROADWORK ACTIVITIES

(The Engineer may approve other messages not specifically covered here.)

PORTABLE CHANGEABLE MESSAGE SIGNS

- The Engineer/Inspector shall approve all messages used on portable changeable message signs (PCMS).
- 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.
- Messages should consist of a single phase, or two phases that alternate. Three-phase messages are not allowed. Each phase of the message should convey a single thought, and must be understood by itself.
- Use the word "EXIT" to refer to an exit ramp on a freeway; i.e., "EXIT CLOSED." Do not use the term "RAMP."
- Always use the route or interstate designation (IH, US, SH, FM) along with the number when referring to a roadway.
- When in use the bottom of a stationary PCMS message panel should be a minimum 7 feet above the roadway, where possible.
- 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.
- 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.
- Do not "flash" messages or words included in a message. The message should be steady burn or continuous while displayed.
- 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.
- Do not use the word "Danger" in message.
- Do not display the message "LANES SHIFT LEFT" or "LANES SHIFT RIGHT" on a PCMS. Drivers do not understand the message.
- Do not display messages that scroll horizontally or vertically across the face of the sign.
- The following table lists abbreviated words and two-word phrases that are acceptable for use on a PCMS. Both words in a phrase must be displayed together. Words or phrases not on this list should not be abbreviated, unless shown in the TMUTCD.
- 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.
- Each line of text should be centered on the message board rather than left or right justified.
- 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.

Phase 1: Condition Lists

Road/Lane/Ramp Closure List

FREEWAY CLOSED X MILE	FRONTAGE ROAD CLOSED
ROAD CLOSED AT SH XXX	SHOULDER CLOSED XXX FT
ROAD CLSD AT FM XXXX	RIGHT LN CLOSED XXX FT
RIGHT X LANES CLOSED	RIGHT X LANES OPEN
CENTER LANE CLOSED	DAYTIME LANE CLOSURES
NIGHT LANE CLOSURES	I-XX SOUTH EXIT CLOSED
VARIOUS LANES CLOSED	EXIT XXX CLOSED X MILE
EXIT CLOSED	RIGHT LN TO BE CLOSED
MALL DRIVEWAY CLOSED	X LANES CLOSED TUE - FRI
XXXXXXXX BLVD CLOSED	

Other Condition List

ROADWORK XXX FT	ROAD REPAIRS XXXX FT
FLAGGER XXXX FT	LANE NARROWS XXXX FT
RIGHT LN NARROWS XXXX FT	TWO-WAY TRAFFIC XX MILE
MERGING TRAFFIC XXXX FT	CONST TRAFFIC XXX FT
LOOSE GRAVEL XXXX FT	UNEVEN LANES XXXX FT
DETOUR X MILE	ROUGH ROAD XXXX FT
ROADWORK PAST SH XXXX	ROADWORK NEXT FRI-SUN
BUMP XXXX FT	US XXX EXIT X MILES
TRAFFIC SIGNAL XXXX FT	LANES SHIFT *

* LANES SHIFT in Phase 1 must be used with STAY IN LANE in Phase 2.

Phase 2: Possible Component Lists

Action to Take/Effect on Travel List

MERGE RIGHT	FORM X LINES RIGHT
DETOUR NEXT X EXITS	USE XXXXX RD EXIT
USE EXIT XXX	USE EXIT I-XX NORTH
STAY ON US XXX SOUTH	USE I-XX E TO I-XX N
TRUCKS USE US XXX N	WATCH FOR TRUCKS
WATCH FOR TRUCKS	EXPECT DELAYS
EXPECT DELAYS	PREPARE TO STOP
REDUCE SPEED XXX FT	END SHOULDER USE
USE OTHER ROUTES	WATCH FOR WORKERS
STAY IN LANE *	

Location List

AT FM XXXX
BEFORE RAILROAD CROSSING
NEXT X MILES
PAST US XXX EXIT
XXXXXXXX TO XXXXXX
US XXX TO FM XXXX

Warning List

SPEED LIMIT XX MPH
MAXIMUM SPEED XX MPH
MINIMUM SPEED XX MPH
ADVISORY SPEED XX MPH
RIGHT LANE EXIT
USE CAUTION
DRIVE SAFELY
DRIVE WITH CARE

** Advance Notice List

TUE-FRI XX AM-X PM
APR XX-XX X PM-X AM
BEGINS MONDAY
BEGINS MAY XX
MAY X-X XX PM - XX AM
NEXT FRI-SUN
XX AM TO XX PM
NEXT TUE AUG XX
TONIGHT XX PM-XX AM

** See Application Guidelines Note 6.

APPLICATION GUIDELINES

- Only 1 or 2 phases are to be used on a PCMS.
- The 1st phase (or both) should be selected from the "Road/Lane/Ramp Closure List" and the "Other Condition List".
- A 2nd phase can be selected from the "Action to Take/Effect on Travel, Location, General Warning, or Advance Notice Phase Lists".
- A Location Phase is necessary only if a distance or location is not included in the first phase selected.
- 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.
- For advance notice, when the current date is within seven days of the actual work date, calendar days should be replaced with days of the week. Advance notification should typically be for no more than one week prior to the work.

WORDING ALTERNATIVES

- The words RIGHT, LEFT and ALL can be interchanged as appropriate.
- Roadway designations IH, US, SH, FM and LP can be interchanged as appropriate.
- EAST, WEST, NORTH and SOUTH (or abbreviations E, W, N and S) can be interchanged as appropriate.
- Highway names and numbers replaced as appropriate.
- ROAD, HIGHWAY and FREEWAY can be interchanged as needed.
- AHEAD may be used instead of distances if necessary.
- FT and MI, MILE and MILES interchanged as appropriate.
- AT, BEFORE and PAST interchanged as needed.
- Distances or AHEAD can be eliminated from the message if a location phase is used.

PCMS SIGNS WITHIN THE R.O.W. SHALL BE BEHIND GUARDRAIL OR CONCRETE BARRIER OR SHALL HAVE A MINIMUM OF FOUR (4) PLASTIC DRUMS PLACED PERPENDICULAR TO TRAFFIC ON THE UPSTREAM SIDE OF THE PCMS, WHEN EXPOSED TO ONE DIRECTION OF TRAFFIC. WHEN EXPOSED TO TWO WAY TRAFFIC, THE FOUR DRUMS SHOULD BE PLACED WITH ONE DRUM AT EACH OF THE FOUR CORNERS OF THE UNIT.

FULL MATRIX PCMS SIGNS

- 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.
- 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.
- 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.
- 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.

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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
Canot	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	FOG AHD	Telephone	PHONE
Freeway	FRWY, FWY	Temporary	TEMP
Freeway Blocked	FWY BLKD	Thursday	THURS
Friday	FRI	To Downtown	TO DWNTN
Hazardous Driving	HAZ DRIVING	Traffic	TRAF
Hazardous Material	HAZMAT	Travelers	TRVLR
High-Occupancy Vehicle	HOV	Tuesday	TUES
Highway	HWY	Time Minutes	TIME MIN
Hour(s)	HR, HRS	Upper Level	UPR LEVEL
Information	INFO	Vehicles (s)	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 # IH-number, US-number, SH-number, FM-number

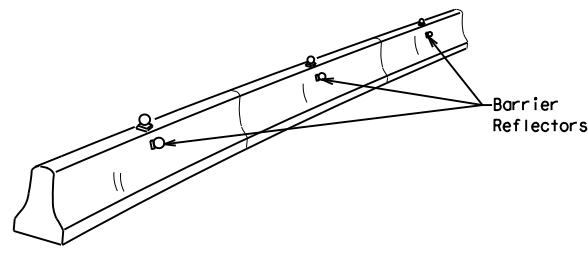
SHEET 6 OF 12

<h3>BARRICADE AND CONSTRUCTION PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)</h3>			
<h2>BC (6) - 14</h2>			
FILE:	bc-14.dgn	DN:	TxDOT
© TxDOT	November 2002	CONT:	SECT:
REVISIONS	0435	01	080
9-07	8-14	DIST:	COUNTY:
7-13		PAR:	LAMAR
		SHEET NO.:	26

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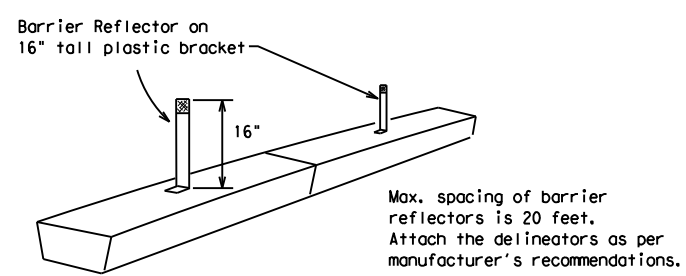
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- Barrier Reflectors shall be pre-qualified, and conform to the color and reflectivity requirements of DMS-8600. A list of prequalified Barrier Reflectors can be found at the Material Producer List web address shown on BC(1).
- Color of Barrier Reflectors shall be as specified in the TMUTCD. The cost of the reflectors shall be considered subsidiary to Item 512.

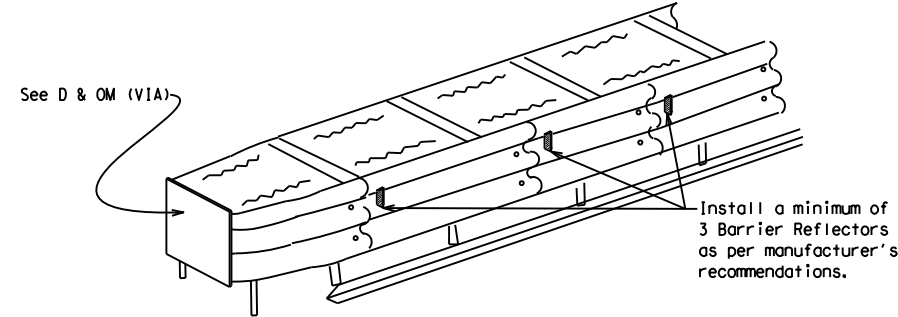


CONCRETE TRAFFIC BARRIER (CTB)

- Where traffic is on one side of the CTB, two (2) Barrier Reflectors shall be mounted in approximately the midsection of each section of CTB. An alternate mounting location is uniformly spaced at one end of each CTB. This will allow for attachment of a barrier grapple without damaging the reflector. The Barrier Reflector mounted on the side of the CTB shall be located directly below the reflector mounted on top of the barrier, as shown in the detail above.
- Where CTB separates two-way traffic, three barrier reflectors shall be mounted on each section of CTB. The reflector unit on top shall have two yellow reflective faces (Bi-Directional) while the reflectors on each side of the barrier shall have one yellow reflective face, as shown in the detail above.
- When CTB separates traffic traveling in the same direction, no barrier reflectors will be required on top of the CTB.
- Barrier Reflector units shall be yellow or white in color to match the edgeline being supplemented.
- Maximum spacing of Barrier Reflectors is forty (40) feet.
- Pavement markers or temporary flexible-reflective roadway marker tabs shall NOT be used as CTB delineation.
- Attachment of Barrier Reflectors to CTB shall be per manufacturer's recommendations.
- Missing or damaged Barrier Reflectors shall be replaced as directed by the Engineer.
- Single slope barriers shall be delineated as shown on the above detail.



LOW PROFILE CONCRETE BARRIER (LPCB)



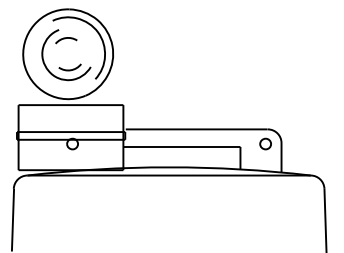
DELINEATION OF END TREATMENTS

END TREATMENTS FOR CTB'S USED IN WORK ZONES
 End treatments used on CTB's in work zones shall meet crashworthy standards as defined in the National Cooperative Highway Research Report 350. Refer to the CWZTCD List for approved end treatments and manufacturers.

BARRIER REFLECTORS FOR CONCRETE TRAFFIC BARRIER AND ATTENUATORS

WARNING LIGHTS

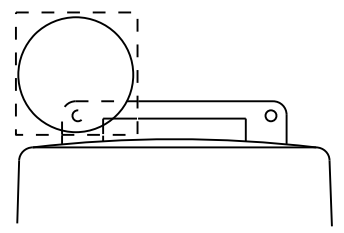
- Warning lights shall meet the requirements of the TMUTCD.
- Warning lights shall NOT be installed on barricades.
- Type A-Low Intensity Flashing Warning Lights are commonly used with drums. They are intended to warn of or mark a potentially hazardous area. Their use shall be as indicated on this sheet 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_{FL} or C_{FL} 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.



Type C Warning Light or approved substitute mounted on a drum adjacent to the travel way.

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.



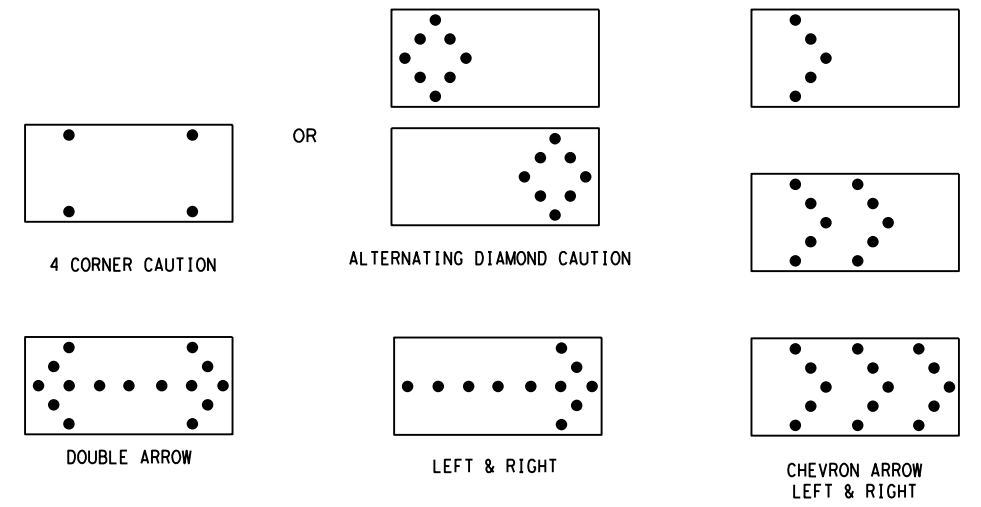
Warning reflector may be round or square. Must have a yellow reflective surface area of at least 30 square inches

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 PCMS may be used to simulate a Flashing Arrow Board provided it meets visibility, flash rate and dimming requirements on this sheet for the same size arrow.
- 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

SHEET 7 OF 12

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.



BARRICADE AND CONSTRUCTION ARROW PANEL, REFLECTORS, WARNING LIGHTS & ATTENUATOR

BC (7) - 14

FILE:	bc-14.dgn	DN:	TxDOT	CR:	TxDOT	DW:	TxDOT	CK:	TxDOT
© TxDOT	November 2002	CONT	SECT	JOB	HIGHWAY				
REVISIONS		0435	01	080	FM 38				
9-07	8-14	DIST	COUNTY	SHEET NO.					
7-13		PAR	LAMAR	27					

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GENERAL NOTES

- For long term stationary work zones on freeways, drums shall be used as the primary channelizing device.
- 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.
- 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.
- Drums and all related items shall comply with the requirements of the current version of the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD) and the "Compliant Work Zone Traffic Control Devices List" (CWZTCD).
- Drums, bases, and related materials shall exhibit good workmanship and shall be free from objectionable marks or defects that would adversely affect their appearance or serviceability.
- The Contractor shall have a maximum of 24 hours to replace any plastic drums identified for replacement by the Engineer/Inspector. The replacement device must be an approved device.

GENERAL DESIGN REQUIREMENTS

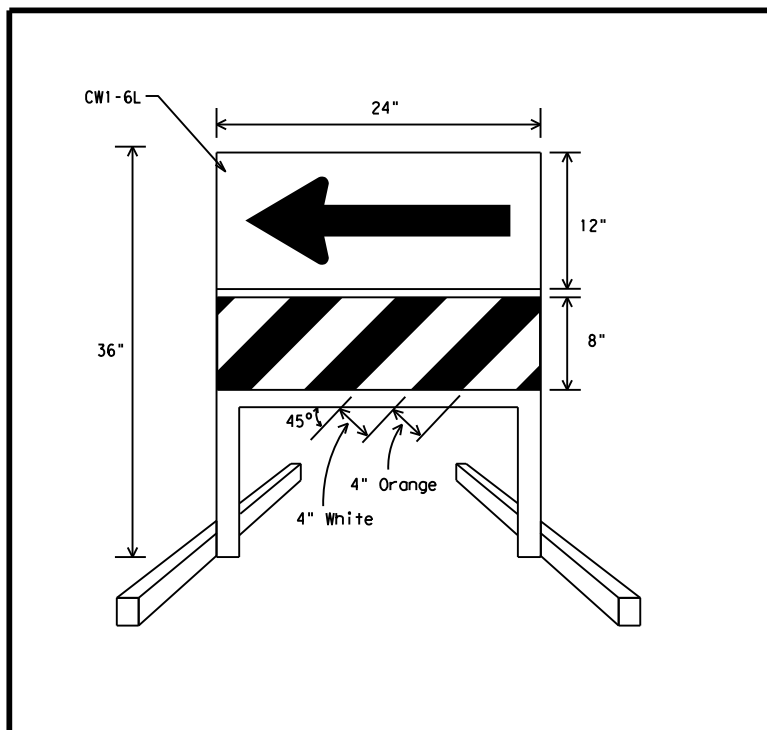
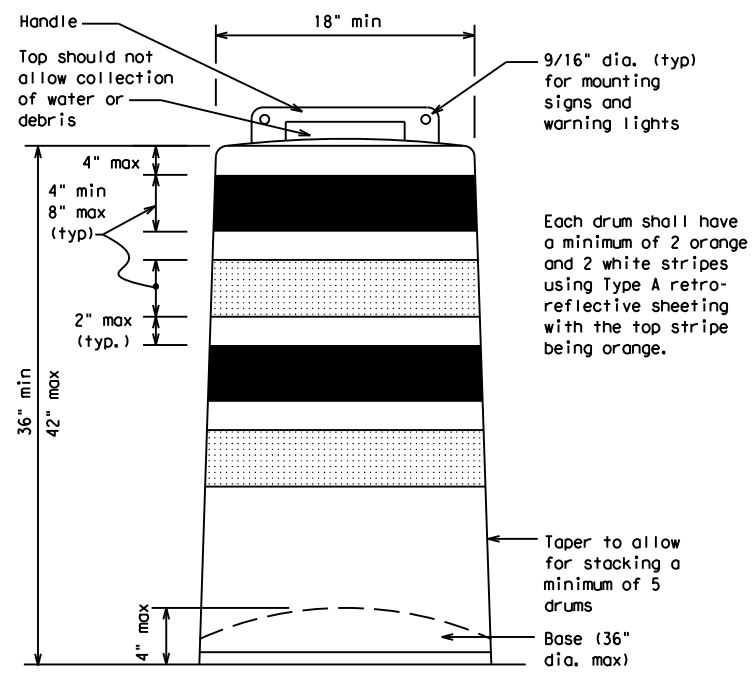
- Pre-qualified plastic drums shall meet the following requirements:
- Plastic drums shall be a two-piece design; the "body" of the drum shall be the top portion and the "base" shall be the bottom.
 - The body and base shall lock together in such a manner that the body separates from the base when impacted by a vehicle traveling at a speed of 20 MPH or greater but prevents accidental separation due to normal handling and/or air turbulence created by passing vehicles.
 - 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.
 - 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.
 - 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.
 - The exterior of the drum body shall have a minimum of four alternating orange and white retroreflective circumferential stripes not less than 4 inches nor greater than 8 inches in width. Any non-reflectORIZED space between any two adjacent stripes shall not exceed 2 inches in width.
 - Bases shall have a maximum width of 36 inches, a maximum height of 4 inches, and a minimum of two footholds of sufficient size to allow base to be held down while separating the drum body from the base.
 - Plastic drums shall be constructed of ultra-violet stabilized, orange, high-density polyethylene (HDPE) or other approved material.
 - Drum body shall have a maximum unballasted weight of 11 lbs.
 - Drum and base shall be marked with manufacturer's name and model number.

RETROREFLECTIVE SHEETING

- 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.
- The sheeting shall be suitable for use on and shall adhere to the drum surface such that, upon vehicular impact, the sheeting shall remain adhered in-place and exhibit no delaminating, cracking, or loss of retroreflectivity other than that loss due to abrasion of the sheeting surface.

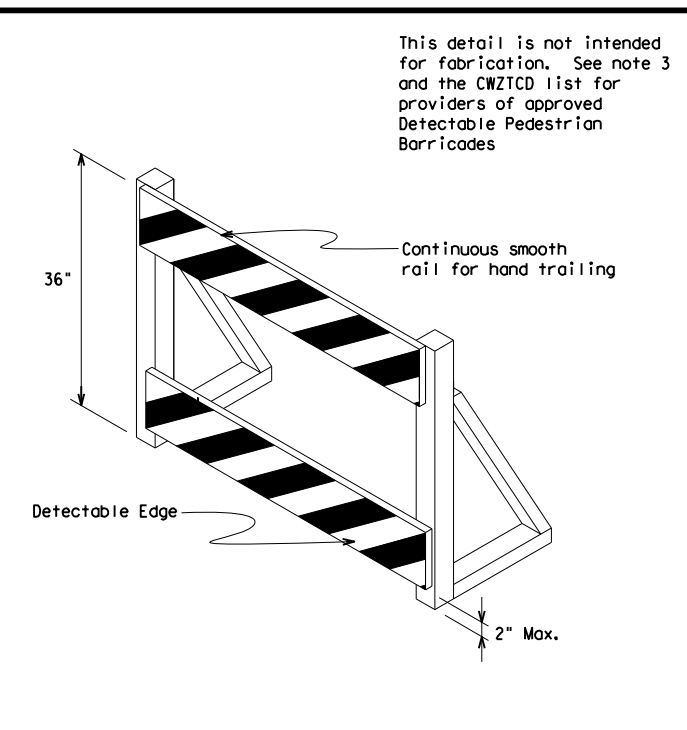
BALLAST

- Unballasted bases shall be large enough to hold up to 50 lbs. of sand. This base, when filled with the ballast material, should weigh between 35 lbs (minimum) and 50 lbs (maximum). The ballast may be sand in one to three sandbags separate from the base, sand in a sand-filled plastic base, or other ballasting devices as approved by the Engineer. Stacking of sandbags will be allowed, however height of sandbags above pavement surface may not exceed 12 inches.
- Bases with built-in ballast shall weigh between 40 lbs. and 50 lbs. Built-in ballast can be constructed of an integral crumb rubber base or a solid rubber base.
- Recycled truck tire sidewalls may be used for ballast on drums approved for this type of ballast on the CWZTCD 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 regions susceptible to freezing, drums shall have drainage holes in the bottoms so that water will not collect and freeze becoming a hazard when struck by a vehicle.
- Ballast shall not be placed on top of drums.
- Adhesives may be used to secure base of drums to pavement.



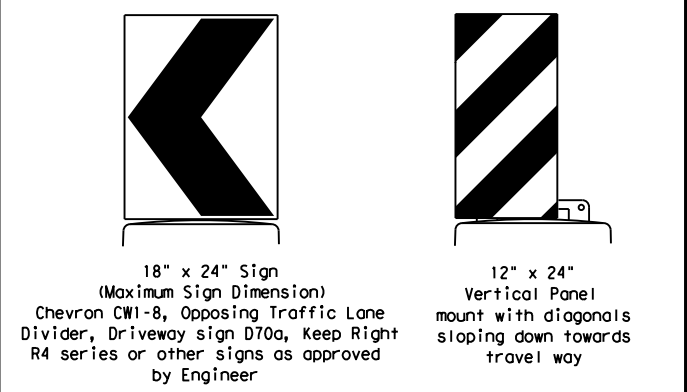
DIRECTION INDICATOR BARRICADE

- The Direction Indicator Barricade may be used in tapers, transitions, and other areas where specific directional guidance to drivers is necessary.
- If used, the Direction Indicator Barricade should be used in series to direct the driver through the transition and into the intended travel lane.
- The Direction Indicator Barricade shall consist of One-Direction Large Arrow (CWI-6) sign in the size shown with a black arrow on a background of Type B_{FL} or Type C_{FL} Orange retroreflective sheeting above a rail with Type A retroreflective sheeting in alternating 4" white and orange stripes sloping downward at an angle of 45 degrees in the direction road users are to pass. Sheeting types shall be as per DMS 8300.
- Double arrows on the Direction Indicator Barricade will not be allowed.
- Approved manufacturers are shown on the CWZTCD List. Ballast shall be as approved by the manufacturer's instructions.



DETECTABLE PEDESTRIAN BARRICADES

- When existing pedestrian facilities are disrupted, closed, or relocated in a TTC zone, the temporary facilities shall be detectable and include accessibility features consistent with the features present in the existing pedestrian facility.
- Where pedestrians with visual disabilities normally use the closed sidewalk, a device that is detectable by a person with a visual disability traveling with the aid of a long cane shall be placed across the full width of the closed sidewalk.
- Detectable pedestrian barricades similar to the one pictured above, longitudinal channelizing devices, some concrete barriers, and wood or chain link fencing with a continuous detectable edging can satisfactorily delineate a pedestrian path.
- Tape, rope, or plastic chain strung between devices are not detectable, do not comply with the design standards in the "Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities (ADAAG)" and should not be used as a control for pedestrian movements.
- Warning lights shall not be attached to detectable pedestrian barricades.
- Detectable pedestrian barricades may use 8" nominal barricade rails as shown on BC(10) provided that the top rail provides a smooth continuous rail suitable for hand trailing with no splinters, burrs, or sharp edges.



Plywood, Aluminum or Metal sign substrates shall NOT be used on plastic drums

SIGNS, CHEVRONS, AND VERTICAL PANELS MOUNTED ON PLASTIC DRUMS

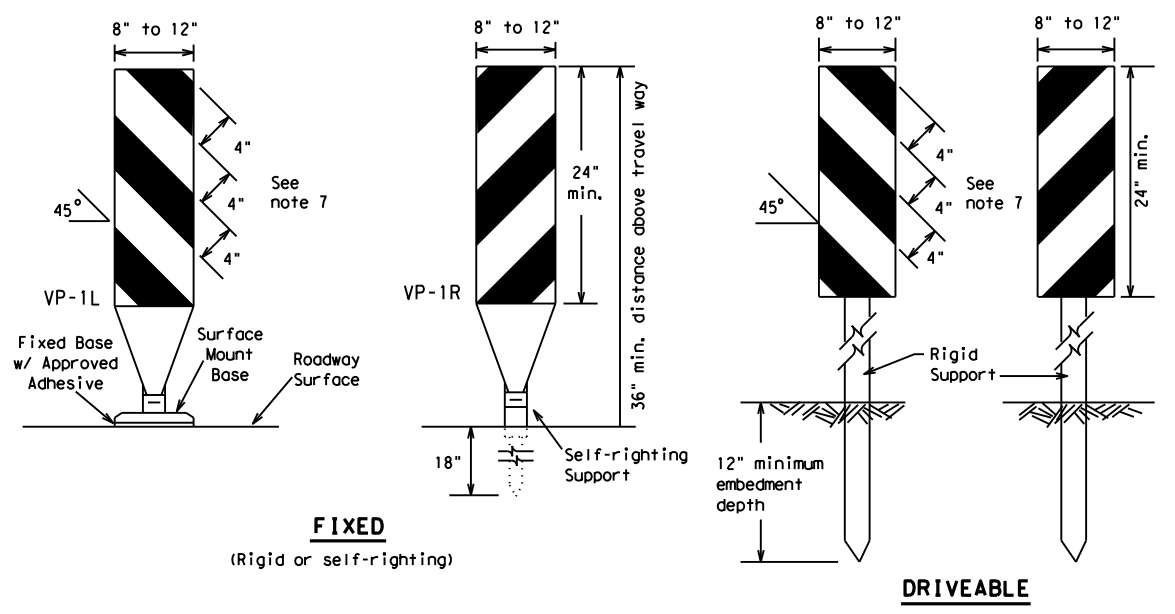
- Signs used on plastic drums shall be manufactured using substrates listed on the CWZTCD.
- Chevrons and other work zone signs with an orange background shall be manufactured with Type B_{FL} or Type C_{FL} Orange sheeting meeting the color and retroreflectivity requirements of DMS-8300, "Sign Face Material," unless otherwise specified in the plans.
- 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.
- Other sign messages (text or symbolic) may be used as approved by the Engineer. Sign dimensions shall not exceed 18 inches in width or 24 inches in height, except for the R9 series signs discussed in note 8 below.
- Signs shall be installed using a 1/2 inch bolt (nominal) and nut, two washers, and one locking washer for each connection.
- Mounting bolts and nuts shall be fully engaged and adequately torqued. Bolts should not extend more than 1/2 inch beyond nuts.
- Chevrons may be placed on drums on the outside of curves, on merging tapers or on shifting tapers. When used in these locations they may be placed on every drum or spaced not more than on every third drum. A minimum of three (3) should be used at each location called for in the plans.
- R9-9, R9-10, R9-11 and R9-11a Sidewalk Closed signs which are 24 inches wide may be mounted on plastic drums, with approval of the Engineer.

SHEET 8 OF 12

		<i>Traffic Operations Division Standard</i>	
BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES			
BC (8) - 14			
FILE:	bc-14.dgn	DWG:	TxDOT
REV:	0435	DATE:	080
DATE:	4-03 7-13	DIST:	COUNTY
DATE:	9-07 8-14	PAR:	LAMAR
		CONTRACT NO.:	FM 38
		SHEET NO.:	28

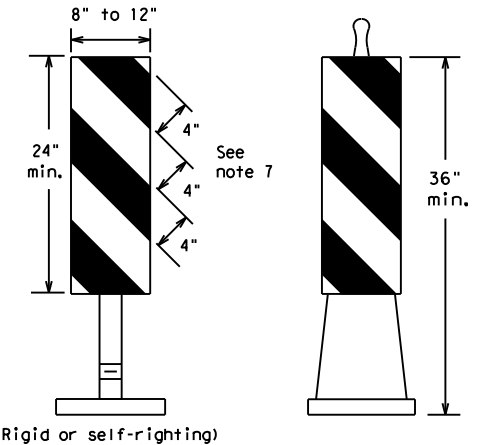
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FIXED
(Rigid or self-righting)

DRIVEABLE

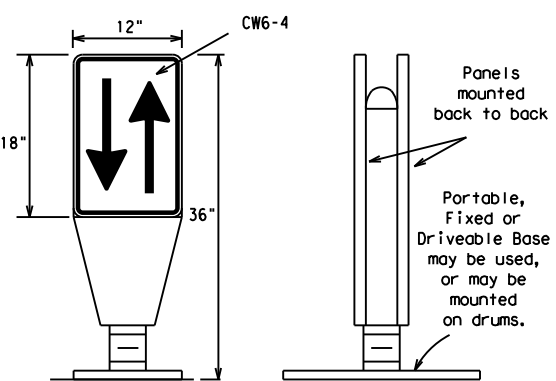


(Rigid or self-righting)

PORTABLE

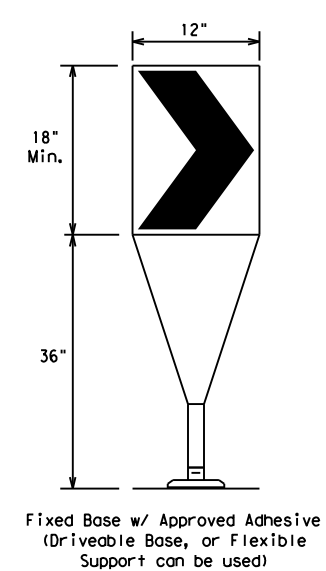
VERTICAL PANELS (VPs)

- 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 panel is 36 inches or greater, a panel stripe of 6 inches shall be used.



OPPOSING TRAFFIC LANE DIVIDERS (OTLD)

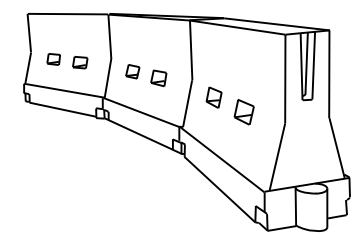
- Opposing Traffic Lane Dividers (OTLD) are delineation devices designed to convert a normal one-way roadway section to two-way operation. OTLD's are used on temporary centerlines. The upward and downward arrows on the sign's face indicate the direction of traffic on either side of the divider. The base 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 VPs.
- Spacing between the OTLD shall not exceed 500 feet. 42" cones or VPs 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_{FL} or Type C_{FL} conforming to Departmental Material Specification DMS-8300, unless noted otherwise. The legend shall meet the requirements of DMS-8300.



Fixed Base w/ Approved Adhesive (Driveable Base, or Flexible Support can be used)

- 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_{FL} or Type C_{FL} 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 canes and the top of the unit shall not be less than 32 inches in height.

HOLLOW OR WATER BALLASTED SYSTEMS USED AS LONGITUDINAL CHANNELIZING DEVICES OR BARRIERS

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 * S	Formula L = WS ² / 60	Minimum Desirable Taper Lengths **			Suggested Maximum Spacing of Channelizing Devices	
		10' Offset	11' Offset	12' Offset	On a Taper	On a Tangent
30	L = WS ² / 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'	

**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

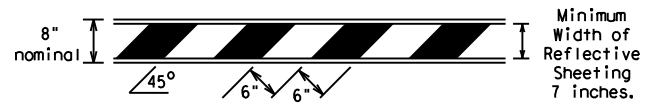
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REVISIONS	0435	01	080	FM 38
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7-13	PAR	LAMAR	29	

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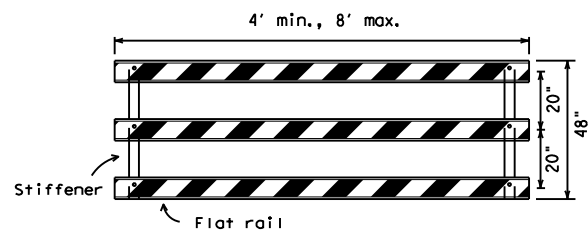
TYPE 3 BARRICADES

1. Refer to the Compliant Work Zone Traffic Control Devices List (CWZTCD) for details of the Type 3 Barricades and a list of all materials used in the construction of Type 3 Barricades.
2. Type 3 Barricades shall be used at each end of construction projects closed to all traffic.
3. Barricades extending across a roadway should have stripes that slope downward in the direction toward which traffic must turn in detouring. When both right and left turns are provided, the chevron striping may slope downward in both directions from the center of the barricade. Where no turns are provided at a closed road striping should slope downward in both directions toward the center of roadway.
4. Striping of rails, for the right side of the roadway, should slope downward to the left. For the left side of the roadway, striping should slope downward to the right.
5. Identification markings may be shown only on the back of the barricade rails. The maximum height of letters and/or company logos used for identification shall be 1".
6. Barricades shall not be placed parallel to traffic unless an adequate clear zone is provided.
7. Warning lights shall NOT be installed on barricades.
8. Where barricades require the use of weights to keep from turning over, the use of sandbags with dry, cohesionless sand is recommended. The sandbags will be tied shut to keep the sand from spilling and to maintain a constant weight. Sand bags shall not be stacked in a manner that covers any portion of a barricade rails reflective sheeting. Rock, concrete, iron, steel or other solid objects will NOT be permitted. Sandbags should weigh a minimum of 35 lbs and a maximum of 50 lbs. Sandbags shall be made of a durable material that tears upon vehicular impact. Rubber (such as tire inner tubes) shall not be used for sandbags. Sandbags shall only be placed along or upon the base supports of the device and shall not be suspended above ground level or hung with rope, wire, chains or other fasteners.
9. Sheeting for barricades shall be retroreflective Type A conforming to Departmental Material Specification DMS-8300 unless otherwise noted.

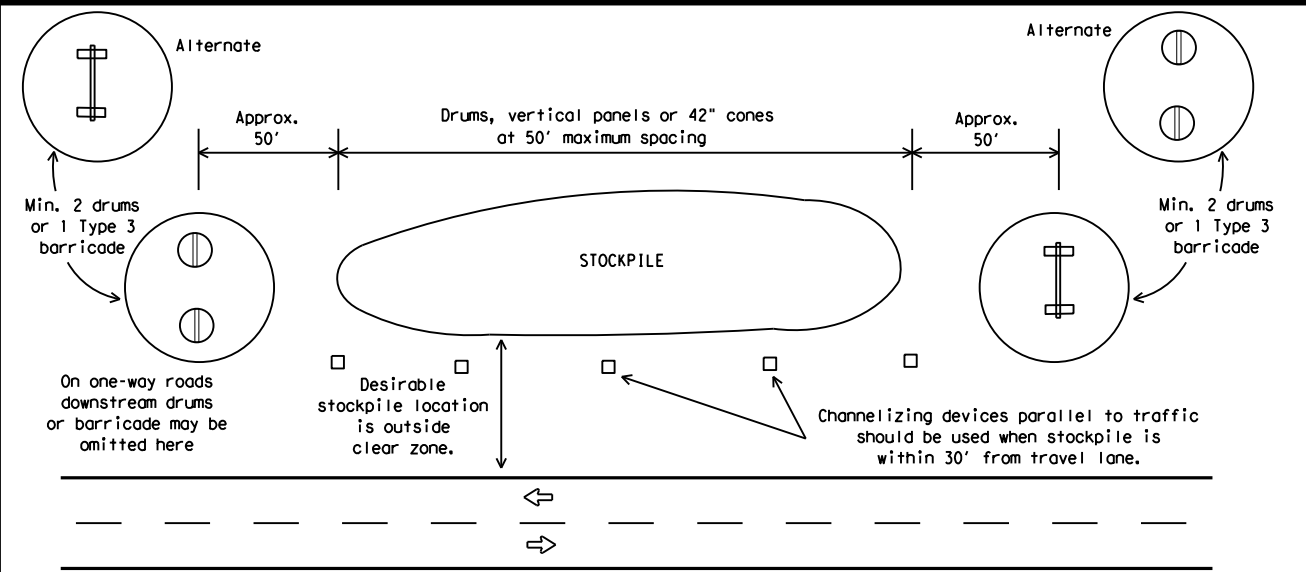
Barricades shall NOT be used as a sign support.



TYPICAL STRIPING DETAIL FOR BARRICADE RAIL

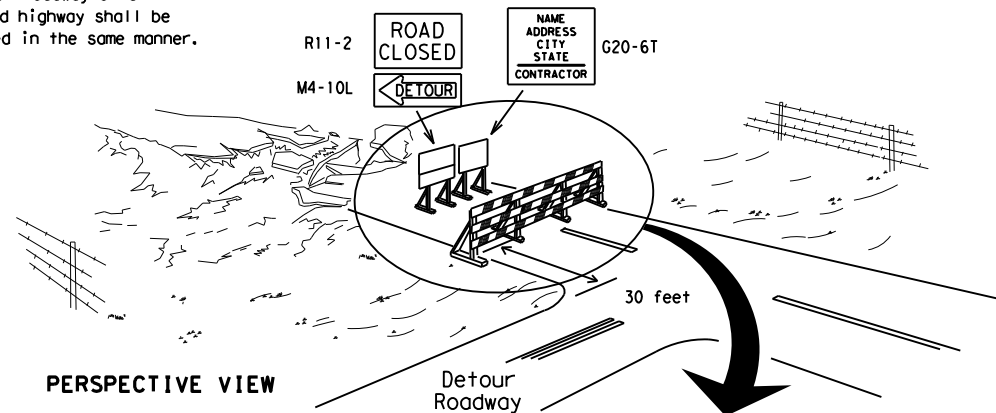


TYPICAL PANEL DETAIL FOR SKID OR POST TYPE BARRICADES



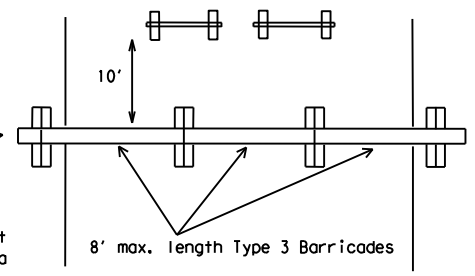
TRAFFIC CONTROL FOR MATERIAL STOCKPILES

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



PERSPECTIVE VIEW

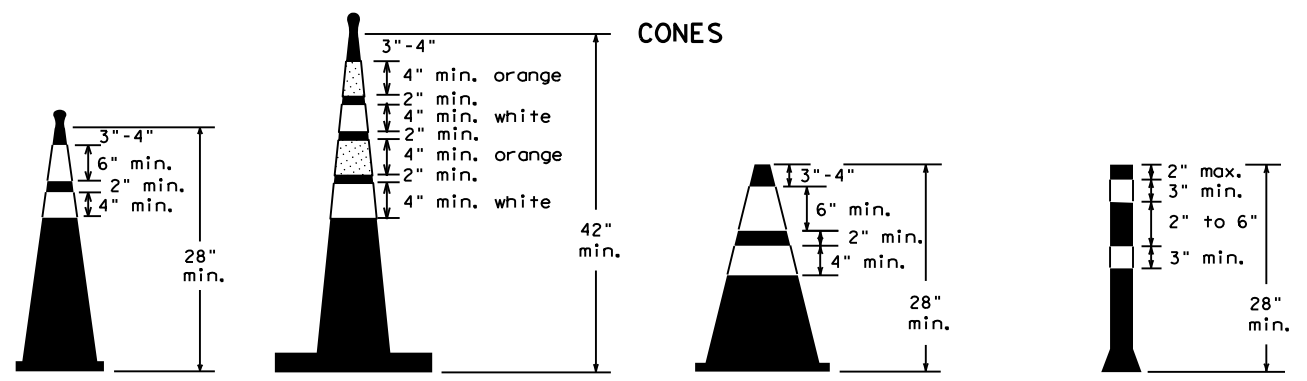
The three rails on Type 3 barricades shall be reflectorized orange and reflective white stripes on one side facing one-way traffic and both sides for two-way traffic. Barricade striping should slant downward in the direction of detour.



PLAN VIEW

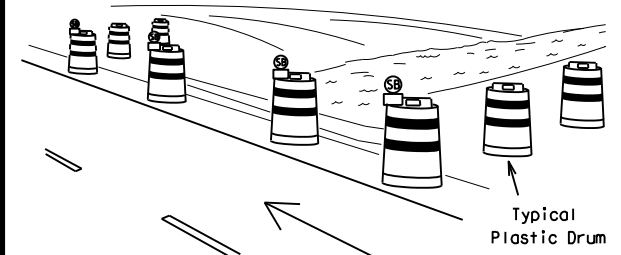
1. Signs should be mounted on independent supports at a 7 foot mounting height in center of roadway. The signs should be a minimum of 10 feet behind Type 3 Barricades.
2. Advance signing shall be as specified elsewhere in the plans.

TYPE 3 BARRICADE (POST AND SKID) TYPICAL APPLICATION

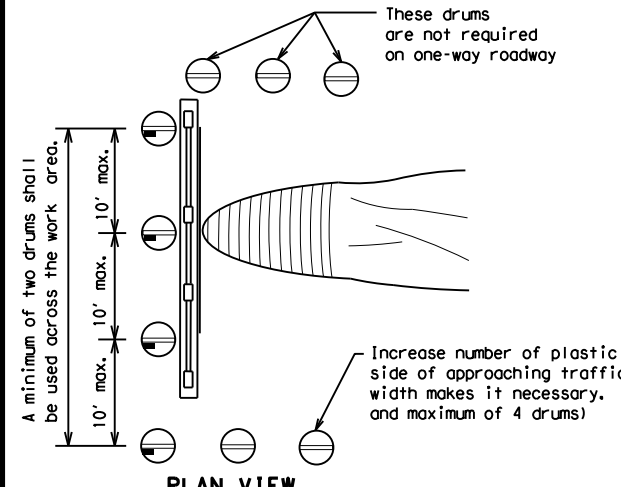


28" Cones shall have a minimum weight of 9 1/2 lbs.
 42" 2-piece cones shall have a minimum weight of 30 lbs. including base.

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



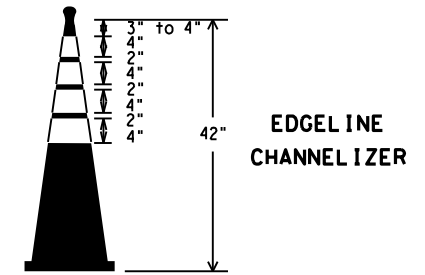
PLAN VIEW

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

CULVERT WIDENING OR OTHER ISOLATED WORK WITHIN THE PROJECT LIMITS

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



EDGE LINE 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.

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC (10) - 14

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WORK ZONE PAVEMENT MARKINGS

GENERAL

- 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.
- Color, patterns and dimensions shall be in conformance with the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD).
- Additional supplemental pavement marking details may be found in the plans or specifications.
- Pavement markings shall be installed in accordance with the TMUTCD and as shown on the plans.
- 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).
- 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.
- All work zone pavement markings shall be installed in accordance with Item 662, "Work Zone Pavement Markings."

RAISED PAVEMENT MARKERS

- Raised pavement markers are to be placed according to the patterns on BC(12).
- 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

- Removable prefabricated pavement markings shall meet the requirements of DMS-8241.
- Non-removable prefabricated pavement markings (foil back) shall meet the requirements of DMS-8240.

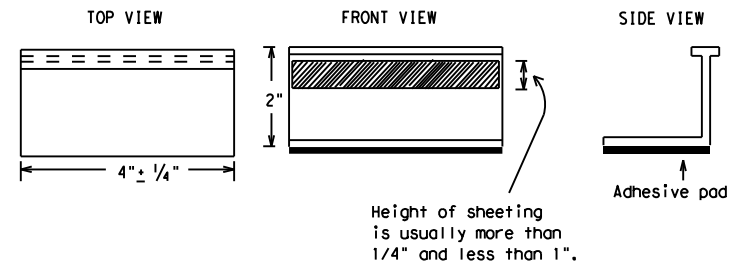
MAINTAINING WORK ZONE PAVEMENT MARKINGS

- The Contractor will be responsible for maintaining work zone pavement markings within the work limits.
- 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.
- 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.
- 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

- 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.
- 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.
- 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".
- The removal of pavement markings may require resurfacing or seal coating portions of the roadway as described in Item 677.
- Subject to the approval of the Engineer, any method that proves to be successful on a particular type pavement may be used.
- Blast cleaning may be used but will not be required unless specifically shown in the plans.
- Over-painting of the markings SHALL NOT BE permitted.
- Removal of raised pavement markers shall be as directed by the Engineer.
- 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.
- 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**

- Temporary flexible-reflective roadway marker tabs used as guidemarks shall meet the requirements of DMS-8242.
- 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.
 - 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.
 - 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.
- Small design variances may be noted between tab manufacturers.
- See Standard Sheet WZ(STPM) for tab placement on new pavements. See Standard Sheet TCP(7-1) for tab placement on seal coat work.

RAISED PAVEMENT MARKERS USED AS GUIDEMARKS

- Raised pavement markers used as guidemarks shall be from the approved product list, and meet the requirements of DMS-4200.
- All temporary construction raised pavement markers provided on a project shall be of the same manufacturer.
- 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



BARRICADE AND CONSTRUCTION PAVEMENT MARKINGS

BC(11) - 14

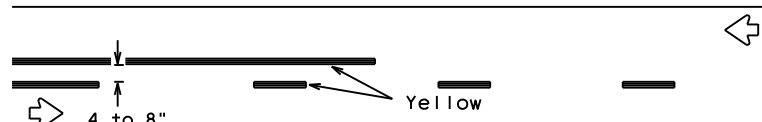
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PAVEMENT MARKING PATTERNS

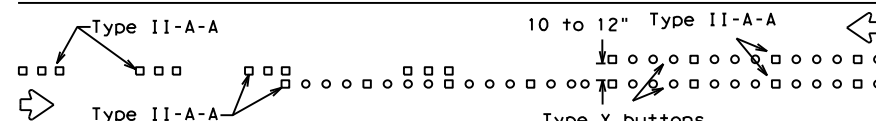


REFLECTORIZED PAVEMENT MARKINGS - PATTERN A

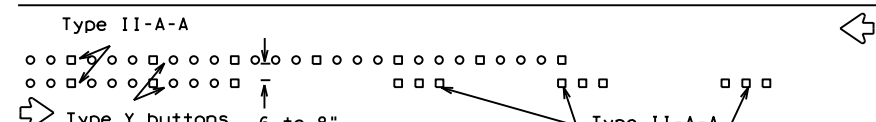


REFLECTORIZED PAVEMENT MARKINGS - PATTERN B

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.

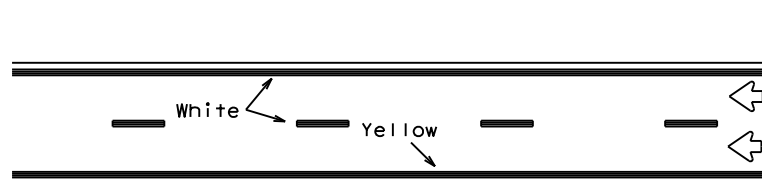


RAISED PAVEMENT MARKERS - PATTERN A



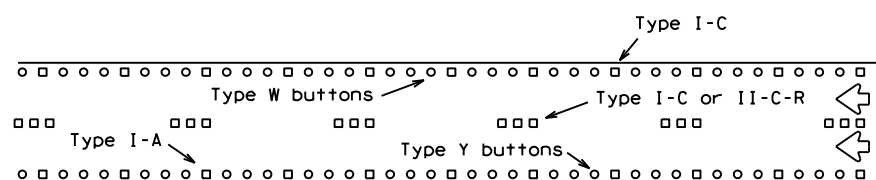
RAISED PAVEMENT MARKERS - PATTERN B

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.



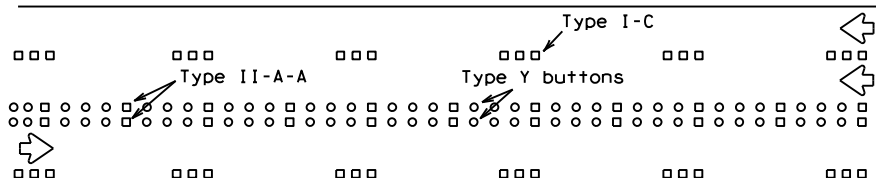
RAISED PAVEMENT MARKERS

EDGE & LANE LINES FOR DIVIDED HIGHWAY



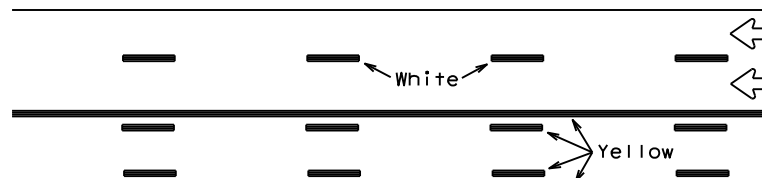
REFLECTORIZED PAVEMENT MARKINGS

Prefabricated markings may be substituted for reflectORIZED pavement markings.



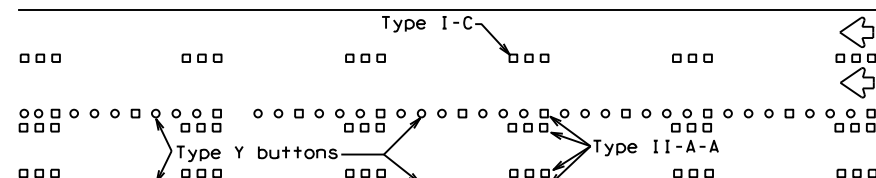
RAISED PAVEMENT MARKERS

LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS



REFLECTORIZED PAVEMENT MARKINGS

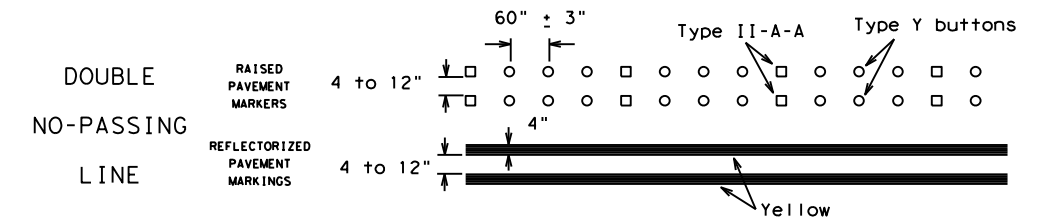
Prefabricated markings may be substituted for reflectORIZED pavement markings.



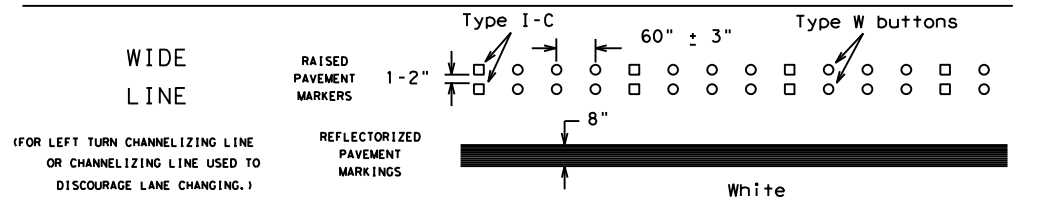
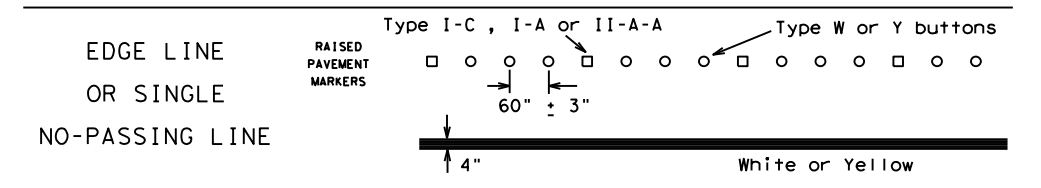
RAISED PAVEMENT MARKERS

TWO-WAY LEFT TURN LANE

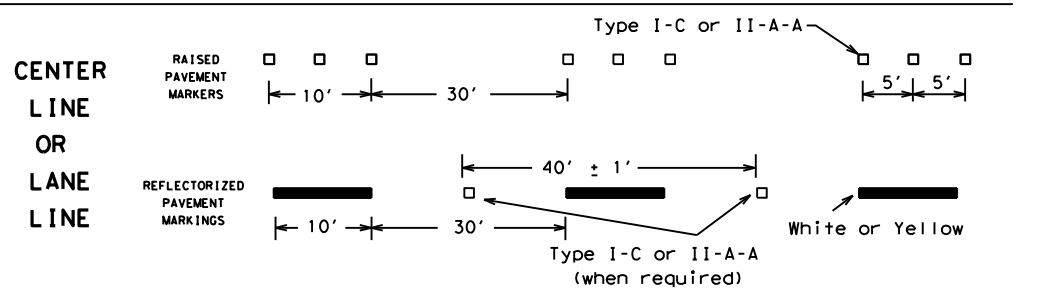
STANDARD WORK ZONE PAVEMENT MARKINGS DETAILS



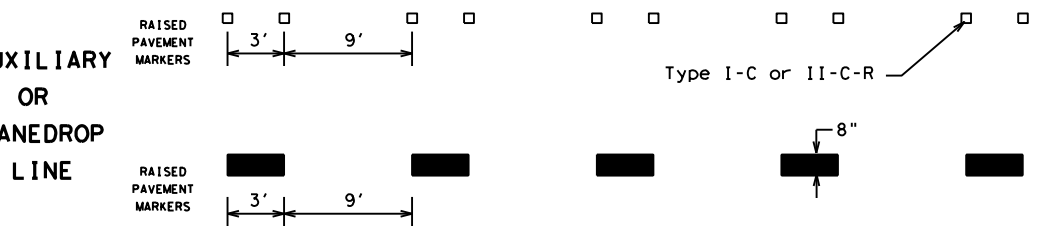
SOLID LINES



BROKEN LINES

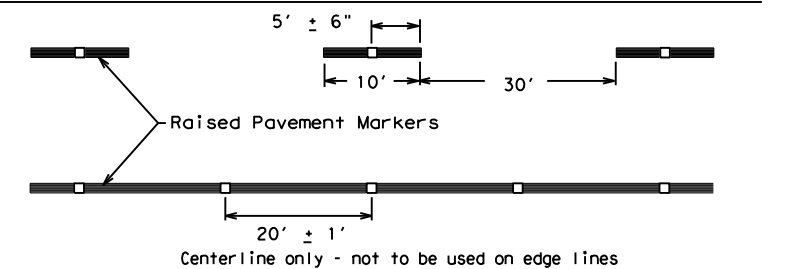


AUXILIARY OR LANEDROP LINE



REMOVABLE MARKINGS WITH RAISED PAVEMENT MARKERS

If raised pavement markers are used to supplement REMOVABLE markings, the markers shall be applied to the top of the tape at the approximate mid length of tape used for broken lines or at 20 foot spacing for solid lines. This allows an easier removal of raised pavement markers and tape.



SHEET 12 OF 12



BARRICADE AND CONSTRUCTION PAVEMENT MARKING PATTERNS

BC(12)-14

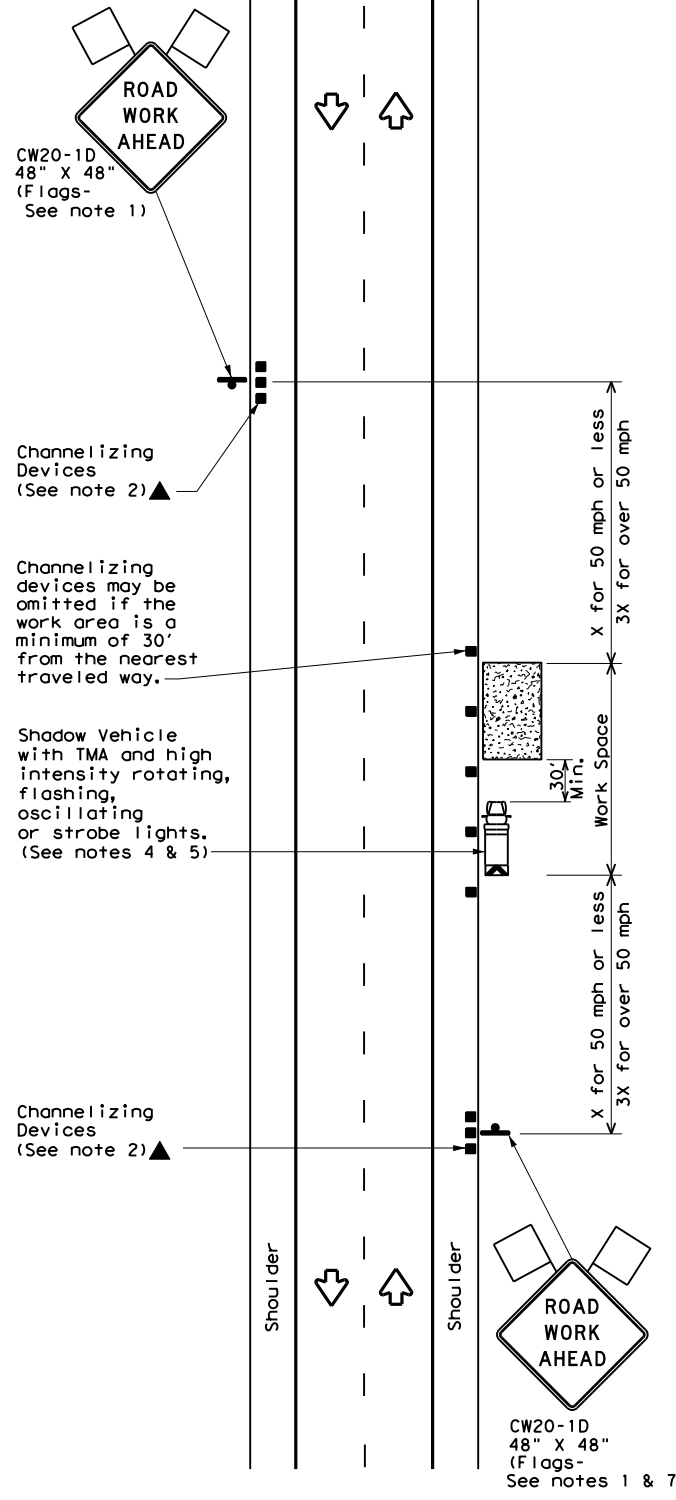
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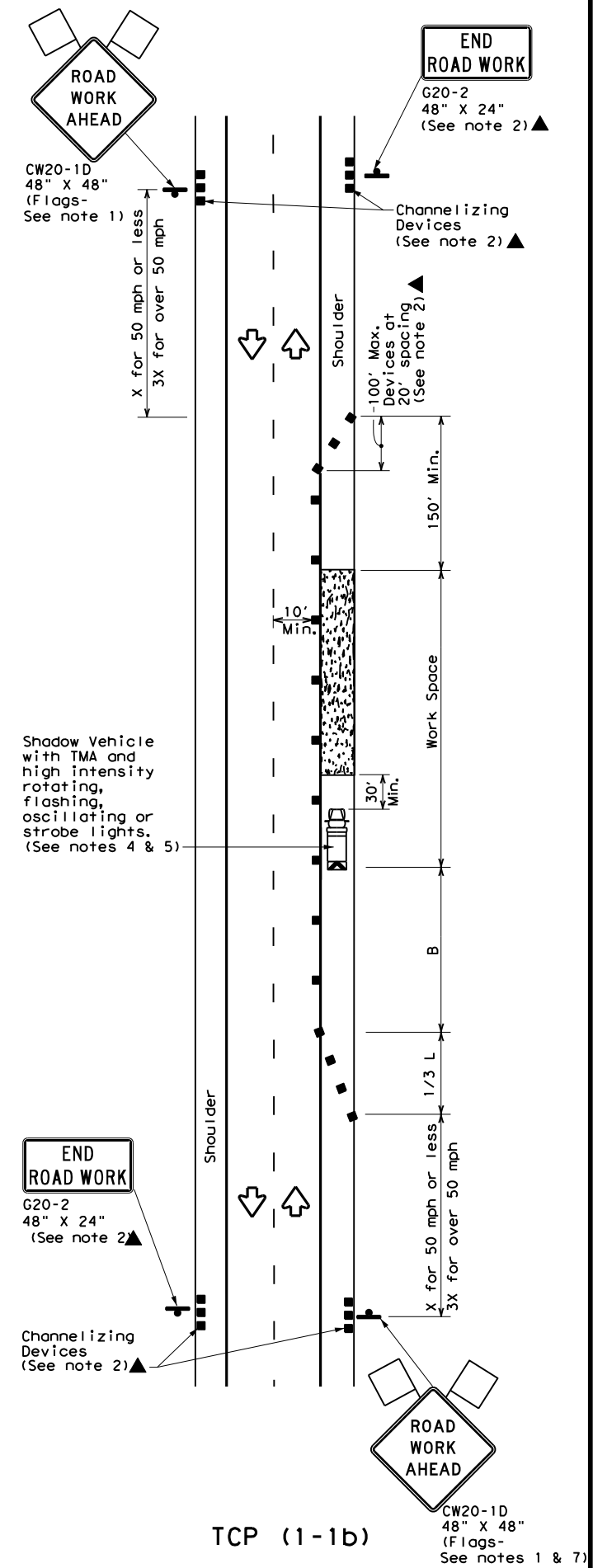
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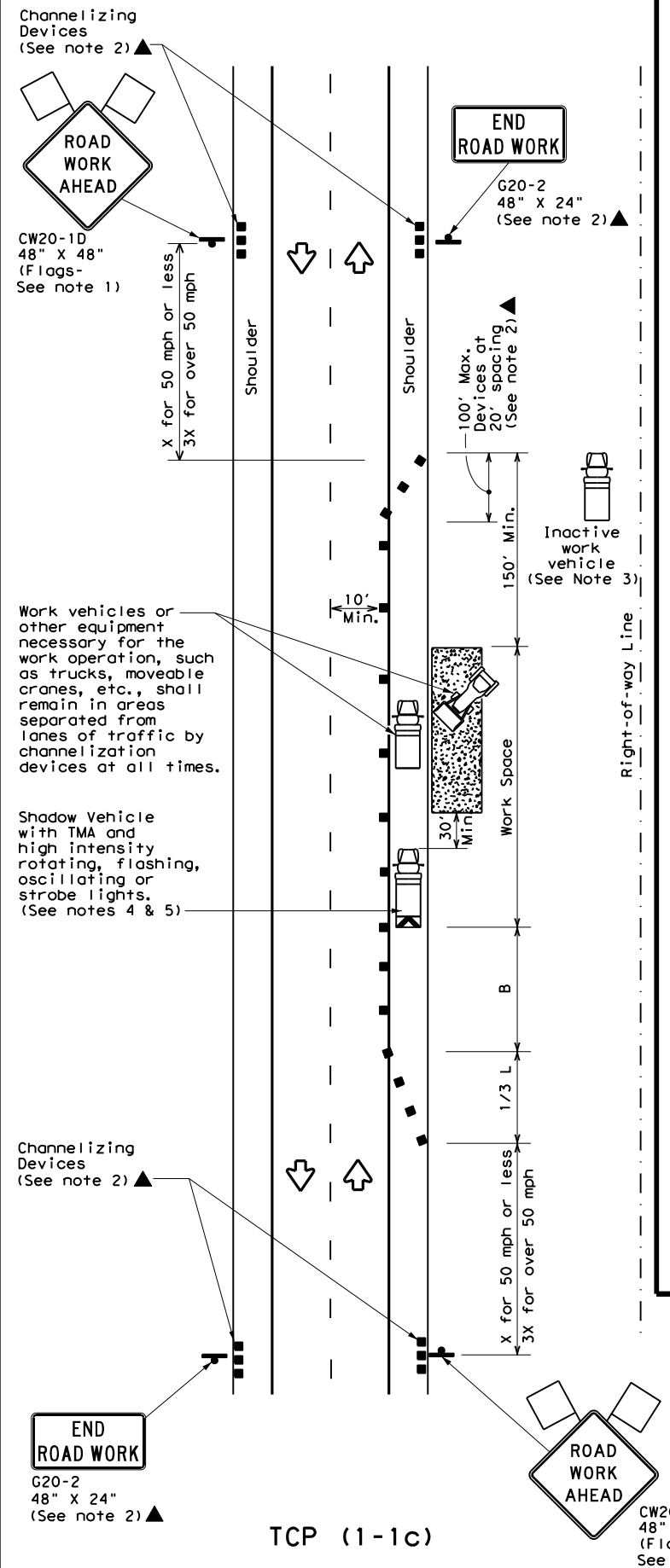
TCP (1-1a)

WORK SPACE NEAR SHOULDER
 Conventional Roads



TCP (1-1b)

WORK SPACE ON SHOULDER
 Conventional Roads



TCP (1-1c)

WORK VEHICLES ON SHOULDER
 Conventional Roads

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

Posted Speed *	Formula	Minimum Desirable Taper Lengths **			Suggested Maximum Spacing of Channelizing Devices		Minimum Sign Spacing "X" Distance	Suggested Longitudinal Buffer Space "B"
		10' Offset	11' Offset	12' Offset	On a Taper	On a Tangent		
30	$L = \frac{WS^2}{60}$	150'	165'	180'	30'	60'	120'	90'
35		205'	225'	245'	35'	70'	160'	120'
40		265'	295'	320'	40'	80'	240'	155'
45	L = WS	450'	495'	540'	45'	90'	320'	195'
50		500'	550'	600'	50'	100'	400'	240'
55		550'	605'	660'	55'	110'	500'	295'
60		600'	660'	720'	60'	120'	600'	350'
65		650'	715'	780'	65'	130'	700'	410'
70		700'	770'	840'	70'	140'	800'	475'
75		750'	825'	900'	75'	150'	900'	540'

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

TYPICAL USAGE				
MOBILE	SHORT DURATION	SHORT TERM STATIONARY	INTERMEDIATE TERM STATIONARY	LONG TERM STATIONARY
	✓	✓		

- GENERAL NOTES**
- 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.
 - Inactive work vehicles or other equipment should be parked near the right-of-way line and not parked on the paved shoulder.
 - 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 off the paved surface, next to those shown in order to protect wider work spaces.
 - See TCP(5-1) for shoulder work on divided highways, expressways and freeways.
 - CW21-5 "SHOULDER WORK" signs may be used in place of CW20-1D "ROAD WORK AHEAD" signs for shoulder work on conventional roadways.

TRAFFIC CONTROL PLAN
CONVENTIONAL ROAD
SHOULDER WORK

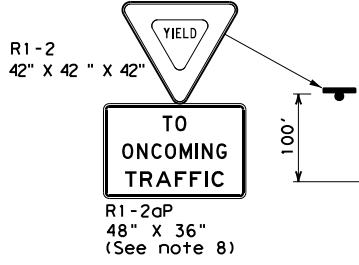
TCP (1-1) - 18

FILE: tcp1-1-18.dgn	DN:	CK:	DW:	CK:
© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS	0435	01	080	FM 38
2-94 4-98	DIST	COUNTY	SHEET NO.	
8-95 2-12	PAR	LAMAR	33	
1-97 2-18				

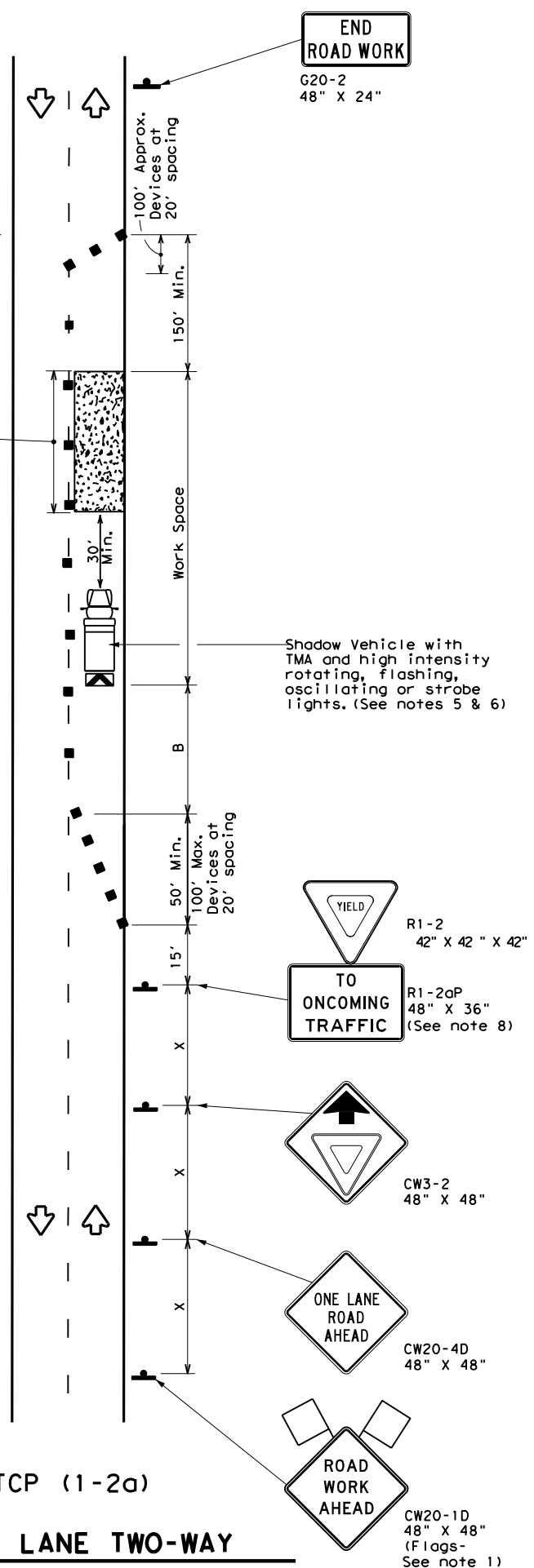
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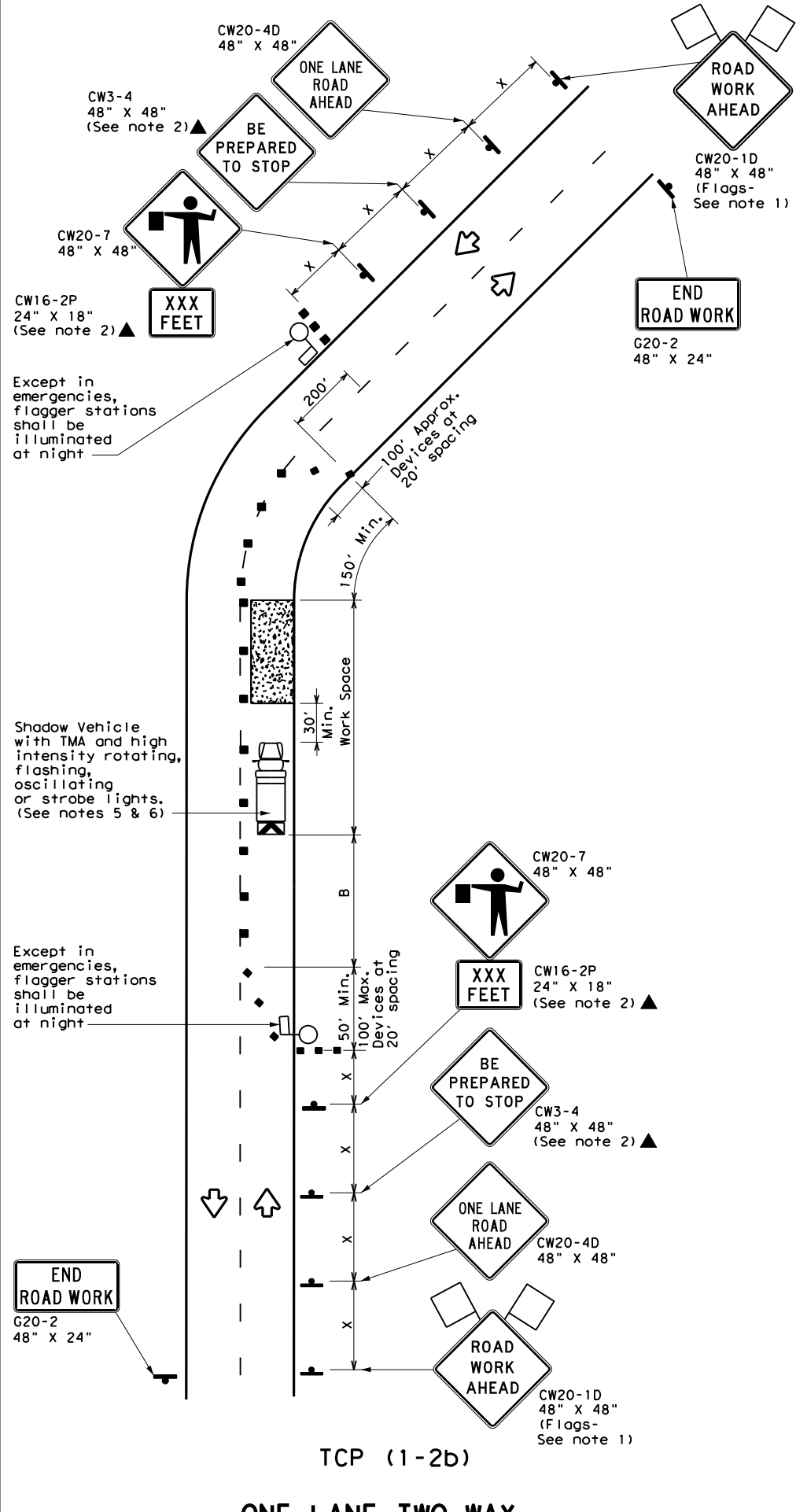
Warning Sign Sequence in Opposite Direction Same as Below



Channelizing devices separate work space from traveled way



TCP (1-2a)
ONE LANE TWO-WAY CONTROL WITH YIELD SIGNS
 (Less than 2000 ADT - See note 7)



TCP (1-2b)
ONE LANE TWO-WAY CONTROL WITH FLAGGERS

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

Posted Speed * X	Formula L = WS ² / 60	Minimum Desirable Taper Lengths **			Suggested Maximum Spacing of Channelizing Devices		Minimum Sign Spacing "X" Distance	Suggested Longitudinal Buffer Space "B"	Stopping Sight Distance
		10' Offset	11' Offset	12' Offset	On a Taper	On a Tangent			
30		150'	165'	180'	30'	60'	120'	90'	200'
35		205'	225'	245'	35'	70'	160'	120'	250'
40		265'	295'	320'	40'	80'	240'	155'	305'
45		450'	495'	540'	45'	90'	320'	195'	360'
50		500'	550'	600'	50'	100'	400'	240'	425'
55		550'	605'	660'	55'	110'	500'	295'	495'
60		600'	660'	720'	60'	120'	600'	350'	570'
65		650'	715'	780'	65'	130'	700'	410'	645'
70		700'	770'	840'	70'	140'	800'	475'	730'
75		750'	825'	900'	75'	150'	900'	540'	820'

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

TYPICAL USAGE				
MOBILE	SHORT DURATION	SHORT TERM STATIONARY	INTERMEDIATE TERM STATIONARY	LONG TERM STATIONARY
	✓	✓		

GENERAL NOTES

- 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.
- The CW3-4 "BE PREPARED TO STOP" sign may be installed after the CW20-4D "ONE LANE ROAD AHEAD" sign, but proper sign spacing shall be maintained.
- Sign spacing may be increased or an additional CW20-1D "ROAD WORK AHEAD" sign may be used if advance warning ahead of the flagger or R1-2 "YIELD" sign is less than 1500 feet.
- 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 off the paved surface, next to those shown in order to protect wider work spaces.

TCP (1-2a)

- R1-2 "YIELD" sign traffic control may be used on projects with approaches that have adequate sight distance. For projects in urban areas, work spaces should be no longer than one half city block. In rural areas on roadways with less than 2000 ADT, work spaces should be no longer than 400 feet.
- R1-2 "YIELD" sign with R1-2aP "TO ONCOMING TRAFFIC" plaque shall be placed on a support at a 7 foot minimum mounting height.

TCP (1-2b)

- Flaggers should use two-way radios or other methods of communication to control traffic.
- Length of work space should be based on the ability of flaggers to communicate.
- If the work space is located near a horizontal or vertical curve, the buffer distances should be increased in order to maintain adequate stopping sight distance to the flagger and a queue of stopped vehicles (see table above).
- Channelizing devices on the center-line may be omitted when a pilot car is leading traffic and approved by the Engineer.
- Flaggers should use 24" STOP/SLOW paddles to control traffic. Flags should be limited to emergency situations.

Texas Department of Transportation

Traffic Operations Division Standard

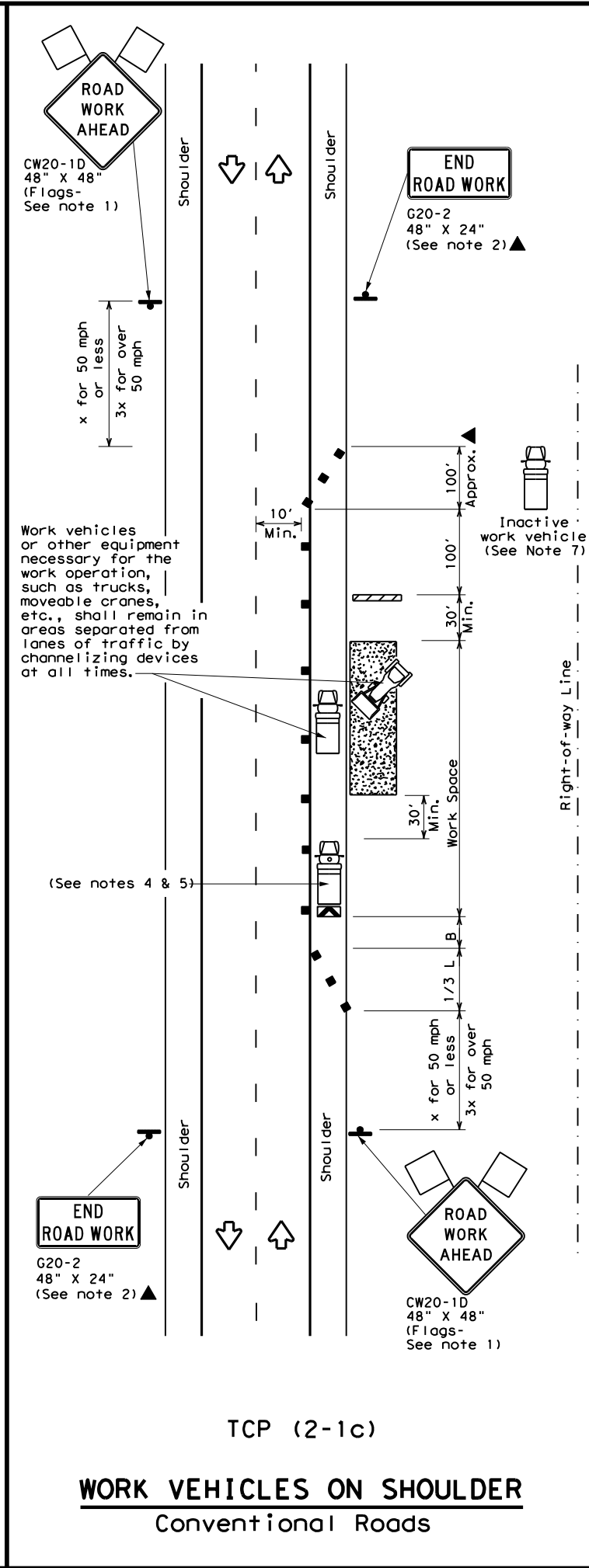
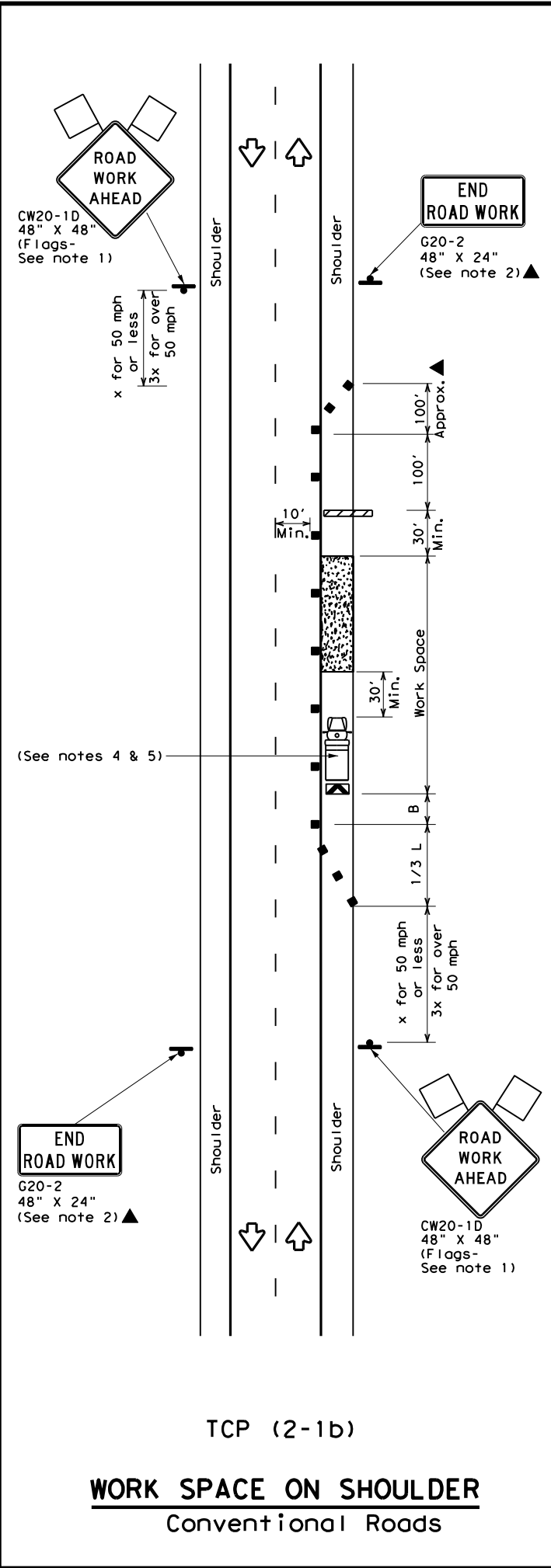
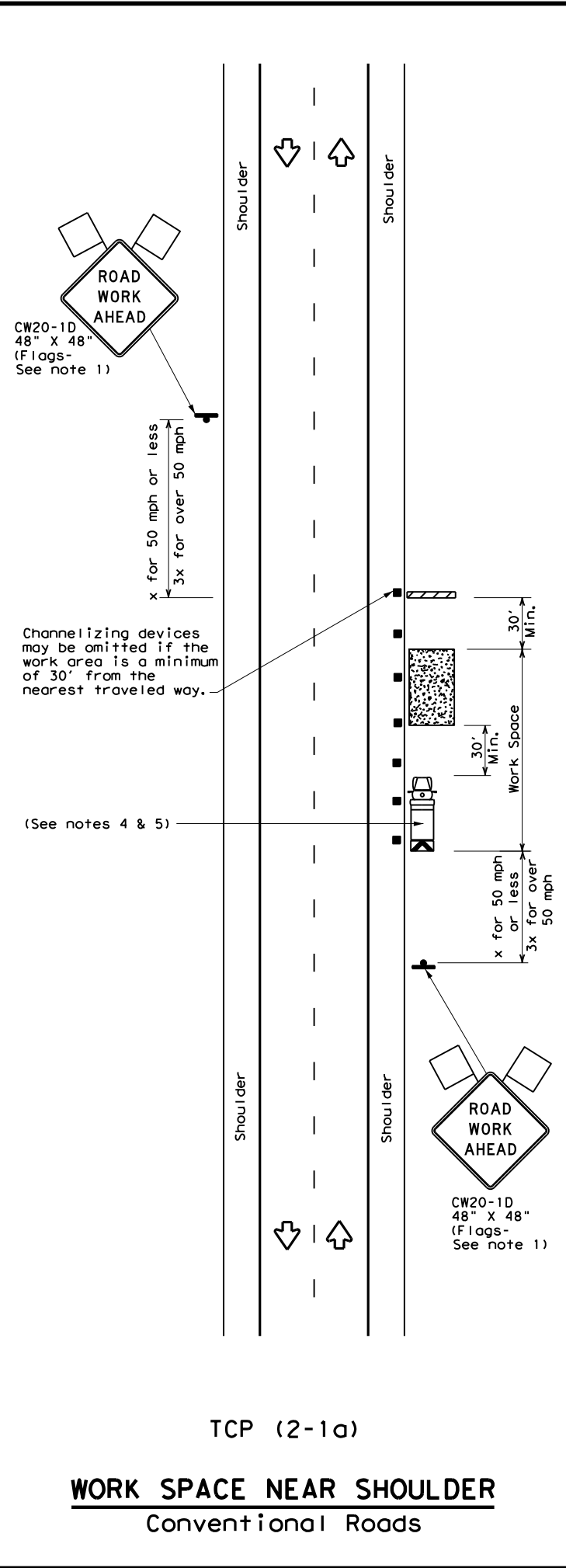
TRAFFIC CONTROL PLAN ONE-LANE TWO-WAY TRAFFIC CONTROL

TCP (1-2) - 18

FILE: tcp1-2-18.dgn	DN:	CK:	DW:	CK:
© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS	0435	01	080	FM 38
4-90 4-98	DIST	COUNTY	SHEET NO.	
2-94 2-12	PAR	LAMAR	34	
1-97 2-18				

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

Posted Speed *	Formula	Minimum Desirable Taper Lengths **			Suggested Maximum Spacing of Channelizing Devices		Minimum Sign Spacing "X" Distance	Suggested Longitudinal Buffer Space "B"
		10' Offset	11' Offset	12' Offset	On a Taper	On a Tangent		
30	$L = \frac{WS^2}{60}$	150'	165'	180'	30'	60'	120'	90'
35		205'	225'	245'	35'	70'	160'	120'
40		265'	295'	320'	40'	80'	240'	155'
45	L = WS	450'	495'	540'	45'	90'	320'	195'
50		500'	550'	600'	50'	100'	400'	240'
55		550'	605'	660'	55'	110'	500'	295'
60		600'	660'	720'	60'	120'	600'	350'
65		650'	715'	780'	65'	130'	700'	410'
70		700'	770'	840'	70'	140'	800'	475'
75		750'	825'	900'	75'	150'	900'	540'

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

TYPICAL USAGE				
MOBILE	SHORT DURATION	SHORT TERM STATIONARY	INTERMEDIATE TERM STATIONARY	LONG TERM STATIONARY
	✓	✓	✓	✓

- GENERAL NOTES**
- 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 in the plans, or for routine maintenance work, when approved by the Engineer.
 - Stockpiled material should be placed a minimum of 30 feet from nearest traveled way.
 - 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 off the paved surface, next to those shown in order to protect a wider work space.
 - See TCP(5-1) for shoulder work on divided highways, expressways and freeways.
 - Additional work vehicles or other equipment should be parked near the right-of-way line and not parked on the paved shoulder.
 - CW21-5 "SHOULDER WORK" signs may be used in place of CW20-1D "ROAD WORK AHEAD" signs for shoulder work on conventional roadways.

Texas Department of Transportation
 Traffic Operations Division Standard

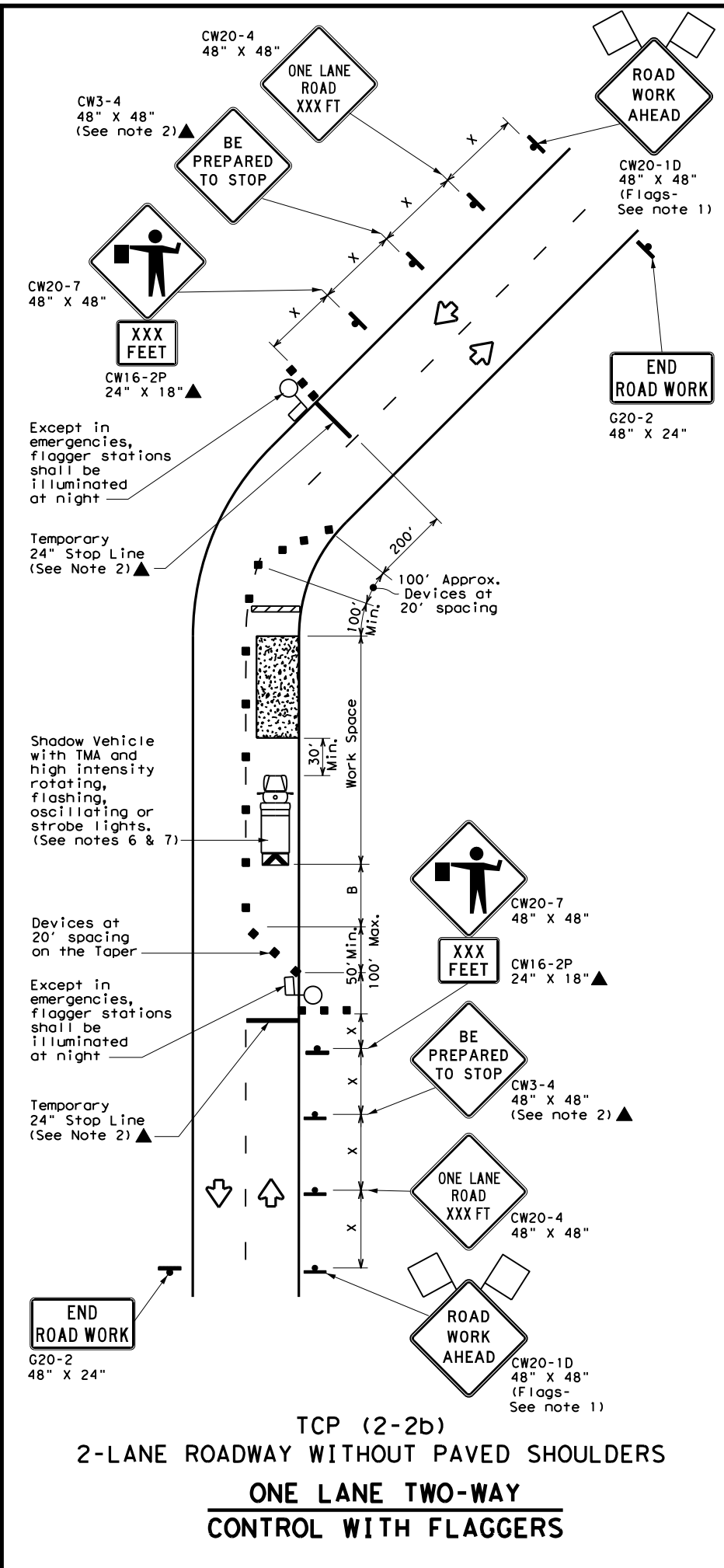
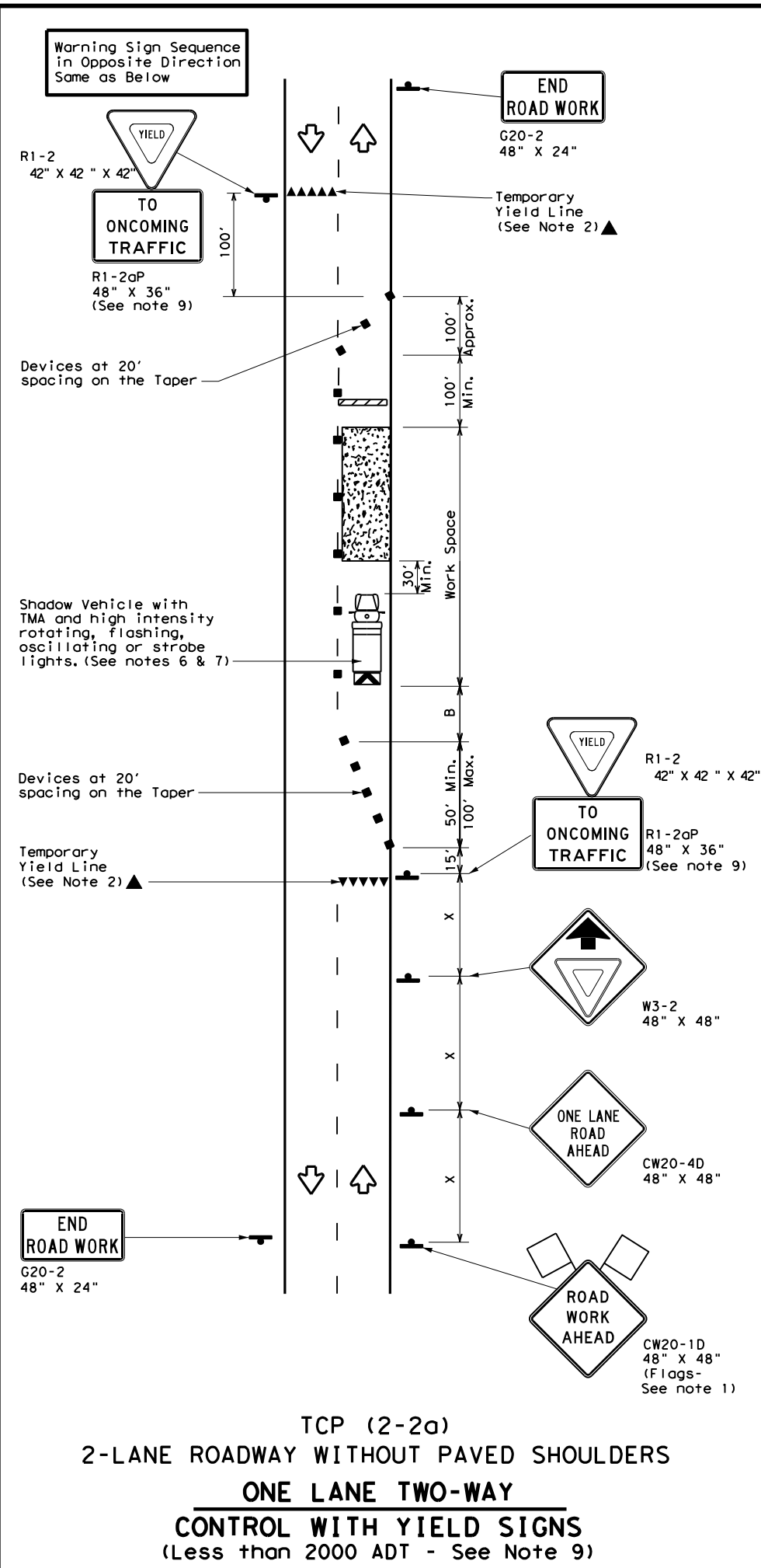
TRAFFIC CONTROL PLAN
CONVENTIONAL ROAD
SHOULDER WORK

TCP (2-1) - 18

FILE: tcp2-1-18.dgn	DN:	CK:	DW:	CK:
© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS	0435	01	080	FM 38
2-94 4-98	DIST	COUNTY	SHEET NO.	
8-95 2-12	PAR	LAMAR	35	
1-97 2-18				

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LEGEND

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

Posted Speed *	Formula	Minimum Desirable Taper Lengths **			Suggested Maximum Spacing of Channelizing Devices		Minimum Sign Spacing "X" Distance	Suggested Longitudinal Buffer Space "B"	Stopping Sight Distance
		10' Offset	11' Offset	12' Offset	On a Taper	On a Tangent			
30	L = WS ² / 60	150'	165'	180'	30'	60'	120'	90'	200'
35		205'	225'	245'	35'	70'	160'	120'	250'
40		265'	295'	320'	40'	80'	240'	155'	305'
45	L = WS	450'	495'	540'	45'	90'	320'	195'	360'
50		500'	550'	600'	50'	100'	400'	240'	425'
55		550'	605'	660'	55'	110'	500'	295'	495'
60		600'	660'	720'	60'	120'	600'	350'	570'
65		650'	715'	780'	65'	130'	700'	410'	645'
70		700'	770'	840'	70'	140'	800'	475'	730'
75		750'	825'	900'	75'	150'	900'	540'	820'

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

TYPICAL USAGE

MOBILE	SHORT DURATION	SHORT TERM STATIONARY	INTERMEDIATE TERM STATIONARY	LONG TERM STATIONARY
	✓	✓	✓	

- GENERAL NOTES**
- 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.
 - The CW3-4 "BE PREPARED TO STOP" sign may be installed after the CW20-4 "ONE LANE ROAD XXX FT" sign, but proper sign spacing shall be maintained.
 - Flaggers should use two-way radios or other methods of communication to control traffic.
 - Length of work space should be based on the ability of flaggers to communicate.
 - 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 off the paved surface, next to those shown in order to protect a wider work space.
- TCP (2-2a)**
- The R1-2 "YIELD" sign traffic control may be used on projects with approaches that have adequate sight distance. For projects in urban areas, work space should be no longer than one half city block. In rural areas, roadways with less than 2000 ADT, work space should be no longer than 400 feet.
 - The R1-2aP "YIELD TO ONCOMING TRAFFIC" sign shall be placed on a support at a 7 foot minimum mounting height.
- TCP (2-2b)**
- Channelizing devices on the center line may be omitted when a pilot car is leading traffic and approved by the Engineer.
 - If the work space is located near a horizontal or vertical curve, the buffer distances should be increased in order to maintain stopping sight distance to the flagger and a queue of stopped vehicles. (See table above).
 - Flaggers should use 24" STOP/SLOW paddles to control traffic. Flags should be limited to emergency situations.

Texas Department of Transportation Traffic Operations Division Standard

TRAFFIC CONTROL PLAN
ONE-LANE TWO-WAY
TRAFFIC CONTROL

TCP (2-2) - 18

FILE: tcp2-2-18.dgn	DN:	CK:	DW:	CK:
© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS	0435	01	080	FM 38
8-95 3-03	DIST	COUNTY	SHEET NO.	
1-97 2-12	PAR	LAMAR	36	
4-98 2-18				

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Traffic Control Devices shown for one direction

New pavement surface should extend to this point. (See note 2)

CW1-6
48" X 24"
(See note 2) ▲

OM-3
Object
Markers

4" Solid
White
Edgeline

Type II-A-A
Raised
Pavement
Markers on
40' C-C.

4" Double
Yellow Line

New pavement
surface should
extend to
this point.
(See note 5)

END
ROAD WORK
G20-2
48" X 24"

CW1-6
48" X 24"
(See note 2) ▲

Warning Reflectors may be added on top of channelizing devices for additional conspicuity at night. Warning Reflectors, chevrons or steady-burn warning lights may be added if drums or longitudinal channelizing devices are used. (Both directions)

Barricades may be offset to permit workers and equipment to enter and exit work space.

CW1-4R
48" X 48"

XX
MPH
CW13-1P
24" X 24"

ROAD
CLOSED
R11-2
48" X 30"

CW1-6
48" X 24"

CW1-4L
48" X 48"

XX
MPH
CW13-1P
24" X 24"
(See note 2) ▲

ROAD
WORK
XXX FT
CW20-1A, B or C
48" X 48"

ROAD
WORK
AHEAD
CW20-1D
48" X 48"
(Flags -
See note 1)

TCP (2-7a)

ROADWAY DIVERSION

Traffic Control Devices shown for one direction

END
ROAD WORK
G20-2
48" X 24"

PASS
WITH
CARE
R4-2
24" X 30"
If applicable

CTB with safety end treatment, or other barrier system as detailed elsewhere in the plans.

4" Solid
White
Edgeline

4" Double
Yellow Line
1"-2"
Type II-A-A
Raised
Pavement
Markers on
40' C-C.
+4"

NARROW
BRIDGE
CW5-2
48" X 48"
(See note 6)

DO
NOT
PASS
R4-1
24" X 30"

ROAD
WORK
AHEAD
CW20-1D
48" X 48"
(Flags -
See note 1)

TCP (2-7b)

BRIDGE WIDENING

LEGEND			
	Type 3 Barricade		Channelizing Devices
	Heavy Work Vehicle		Truck Mounted Attenuator (TMA)
	Trailer Mounted Flashing Arrow Board		Raised Pavement Markers Ty II-AA
	Sign		Traffic Flow
	Flag		Flagger

Posted Speed *	Formula	Minimum Desirable Taper Lengths **			Suggested Maximum Spacing of Channelizing Devices		Minimum Sign Spacing "X" Distance	Suggested Longitudinal Buffer Space "B"
		10' Offset	11' Offset	12' Offset	On a Taper	On a Tangent		
30	L = WS ² / 60	150'	165'	180'	30'	60'	120'	90'
35		205'	225'	245'	35'	70'	160'	120'
40		265'	295'	320'	40'	80'	240'	155'
45	L = WS	450'	495'	540'	45'	90'	320'	195'
50		500'	550'	600'	50'	100'	400'	240'
55		550'	605'	660'	55'	110'	500'	295'
60		600'	660'	720'	60'	120'	600'	350'
65		650'	715'	780'	65'	130'	700'	410'
70		700'	770'	840'	70'	140'	800'	475'
75		750'	825'	900'	75'	150'	900'	540'

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

TYPICAL USAGE				
MOBILE	SHORT DURATION	SHORT TERM STATIONARY	INTERMEDIATE TERM STATIONARY	LONG TERM STATIONARY
			✓	✓

- GENERAL NOTES**
- 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.

- TCP (2-7a)**
- Raised pavement markers shall be placed 40 feet c-c on centerline throughout project.
 - Roadway diversion design requirements should be based on posted speed limit or prevailing speed.
 - New pavement surface should be extended across existing roadway edge to a point where existing pavement markings left in place during project do not conflict with construction area pavement marking.

- TCP (2-7b)**
- The CW5-2 "Narrow Bridge" sign may be omitted if lane and shoulder widths are maintained.

**TRAFFIC CONTROL PLAN
 DIVERSIONS AND
 NARROW BRIDGES**

TCP (2-7) - 18

FILE: tcp2-7-18.dgn	DN:	CK:	DW:	CK:
© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS	0435	01	080	FM 38
8-95 3-03	DIST	COUNTY	SHEET NO.	
1-97 2-12	PAR	LAMAR	37	
4-98 2-18				

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 DATE: 3/3/2021 1:49:19 PM
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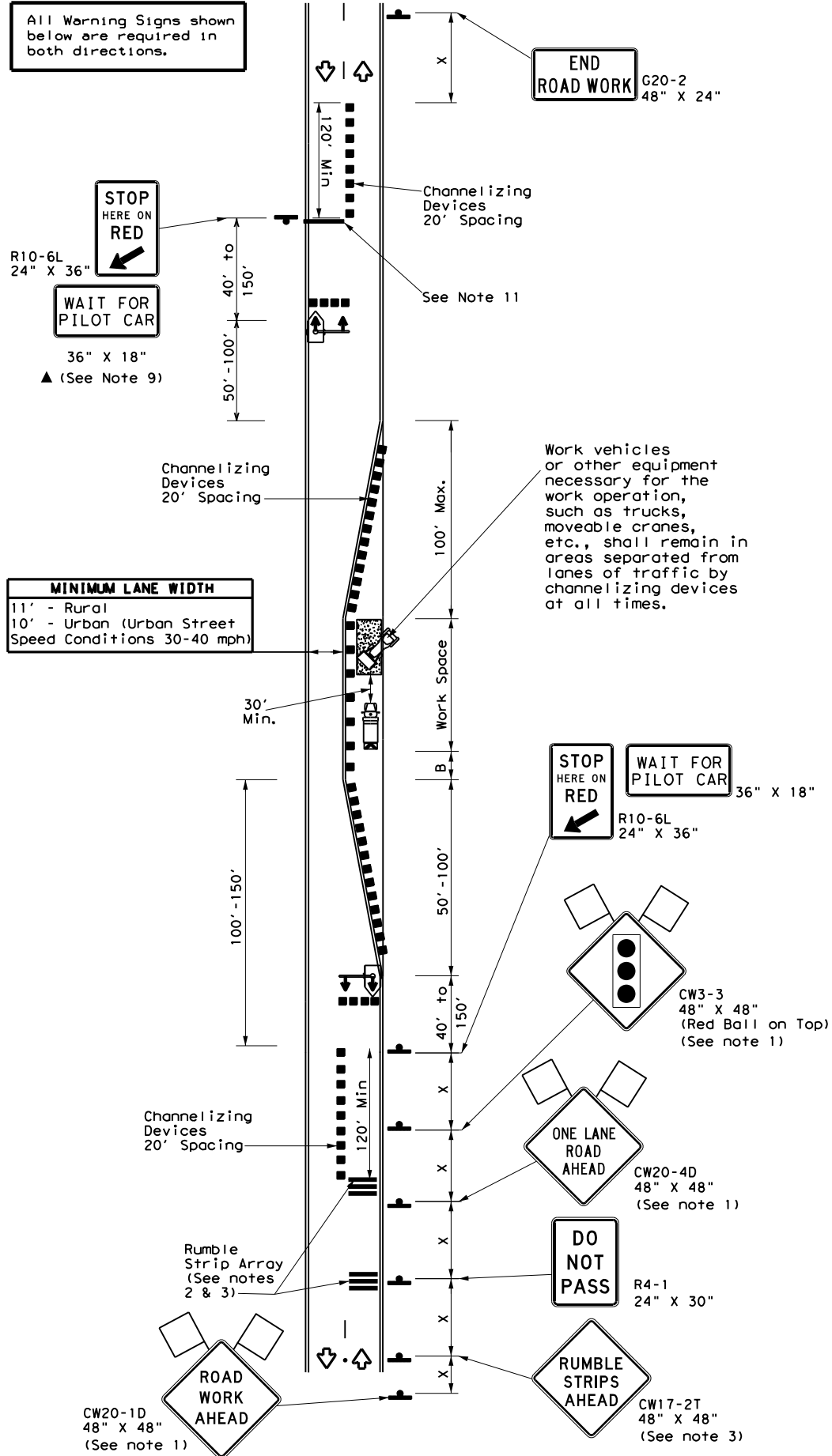
LEGEND			
	Type 3 Barricade		Channelizing Devices
	Sign		Traffic Flow
	Flag		Flagger
	Raised Pavement Markers Ty II-AA		Temporary or Portable Traffic Signal
	Heavy Work Vehicle		Truck Mounted Attenuator

Posted Speed *	Formula	Minimum Desirable Taper Lengths **			Suggested Maximum Spacing of Channelizing Devices		Minimum Sign Spacing "x" Distance	Suggested Longitudinal Buffer Space "B"	Stopping Sight Distance
		10' Offset	11' Offset	12' Offset	On a Taper	On a Tangent			
30	$L = \frac{WS^2}{60}$	150'	165'	180'	30'	60'	120'	90'	200'
35		205'	225'	245'	35'	70'	160'	120'	250'
40		265'	295'	320'	40'	80'	240'	155'	305'
45	L = WS	450'	495'	540'	45'	90'	320'	195'	360'
50		500'	550'	600'	50'	100'	400'	240'	425'
55		550'	605'	660'	55'	110'	500'	295'	495'
60		600'	660'	720'	60'	120'	600'	350'	570'
65		650'	715'	780'	65'	130'	700'	410'	645'
70		700'	770'	840'	70'	140'	800'	475'	730'
75		750'	825'	900'	75'	150'	900'	540'	820'

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

TYPICAL USAGE				
MOBILE	SHORT DURATION	SHORT TERM STATIONARY	INTERMEDIATE TERM STATIONARY	LONG TERM STATIONARY
		✓		

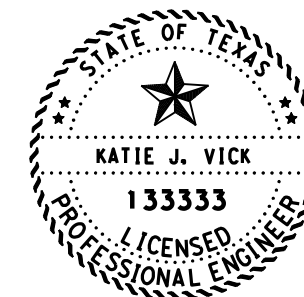
TABLE 2	
Speed	Approximate distance between strips in an Array
≤ 40 MPH	10'
> 40 MPH & ≤ 55 MPH	15'
> 55 MPH	20'



ONE LANE TWO-WAY (WITH NO SHOULDERS)
TRAFFIC CONTROL WITH TRAFFIC SIGNAL

GENERAL NOTES

- Flags attached to signs, where shown, are REQUIRED.
- Each Rumble Strip Array should consist of three rumble strips spaced center to center at the spacing shown in Table 2, placed transverse across the lane at locations shown.
- The CW17-2T "RUMBLE STRIPS AHEAD" sign should be located after the CW20-1D "ROAD WORK AHEAD" sign and spaced as shown. If traffic is observed to be queuing, or is expected to queue beyond the Rumble Strips, the CW17-2T sign and the first Rumble Strip Array may be located upstream of the CW20-1D sign as necessary to provide needed warning.
- Temporary Rumble Strips will be considered subsidiary to Item 502, and shall be a product listed on the Compliant Work Zone Traffic Control Devices.
- Removal of the Temporary Rumble Strips should be accomplished before removing the advance warning signs.
- Temporary Rumble Strips should not be used on horizontal curves, loose gravel, soft or bleeding asphalt, heavily rutted pavements or unpaved surfaces.
- Temporary Rumble Strips shall be installed as per manufacturer's recommendations.
- This standard sheet shall be used in conjunction with other appropriate TCP standard, TMUTCD typical application or project specific detail for the project.
- A list of approved Portable Traffic Signals can be found in the "Compliant Work Zone Traffic Control Devices" list.
- Portable traffic signals should be located to provide adequate stopping sight distance for approaching motorist (See table on left).
- 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.
- Channelizing devices on the center line may be omitted when approved by the Engineer.



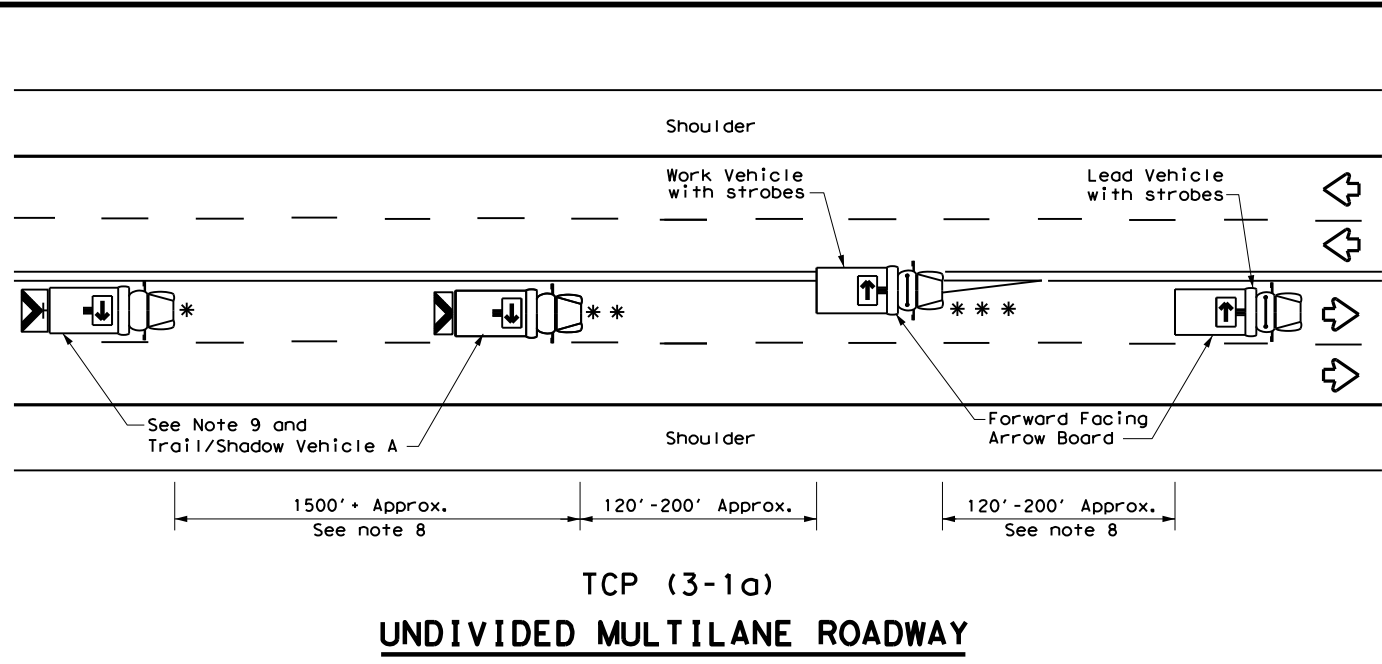
Texas Department of Transportation
 PARIS DISTRICT STANDARD

TRAFFIC CONTROL PLAN
SHORT TERM ONE-LANE
TWO-WAY CONTROL
TCP (2-8)-20 (PAR)

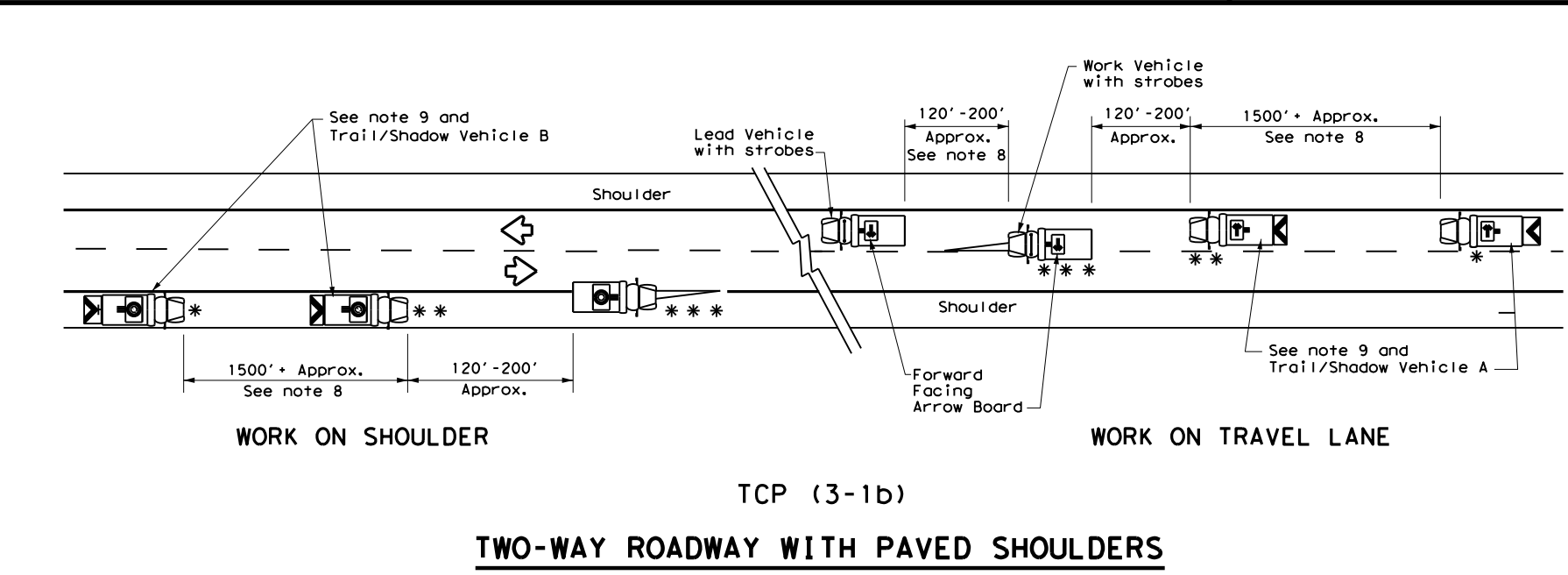
For construction or maintenance contract work, specific project requirements for shadow vehicles can be found in the project GENERAL NOTES for Item 502, Barricades, Signs and Traffic Handling.

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PAR		LAMAR		38	

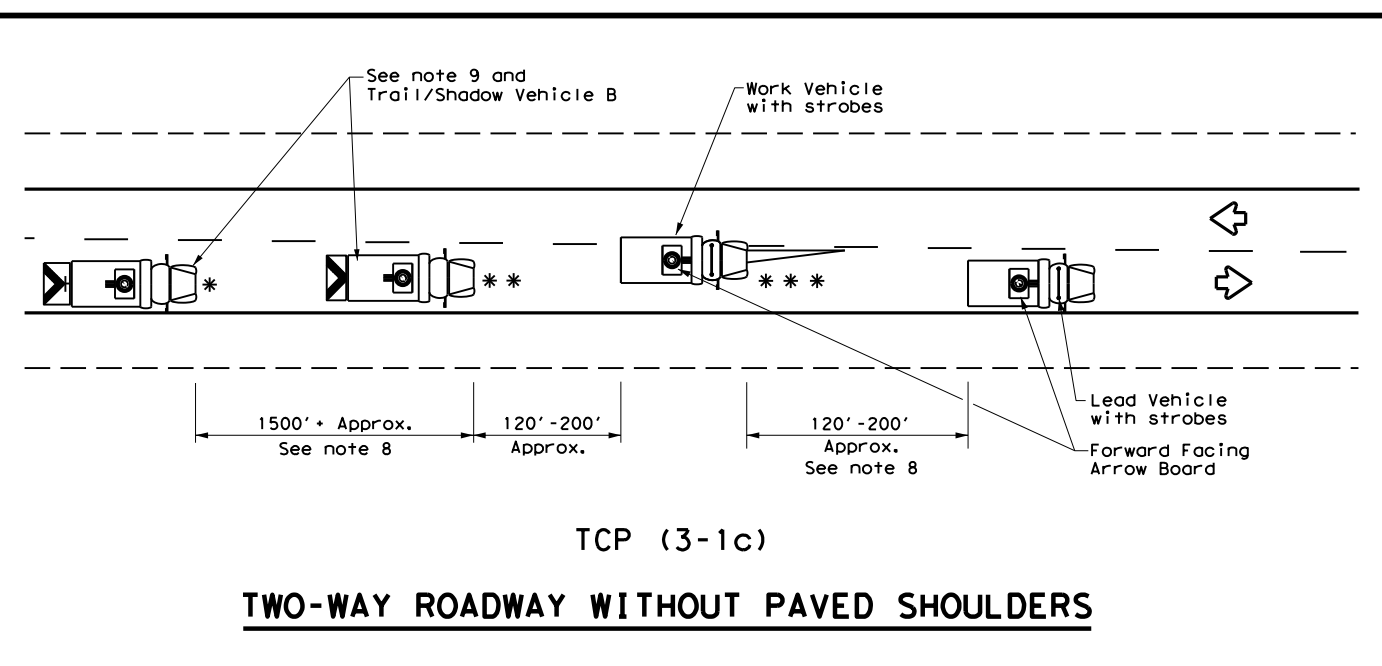
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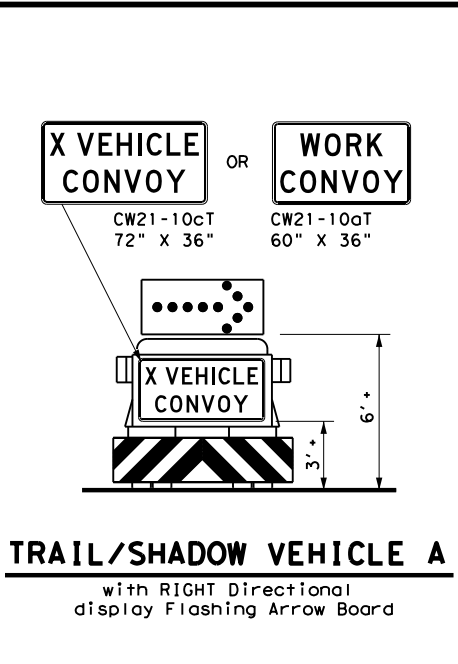
TCP (3-1a)
UNDIVIDED MULTILANE ROADWAY



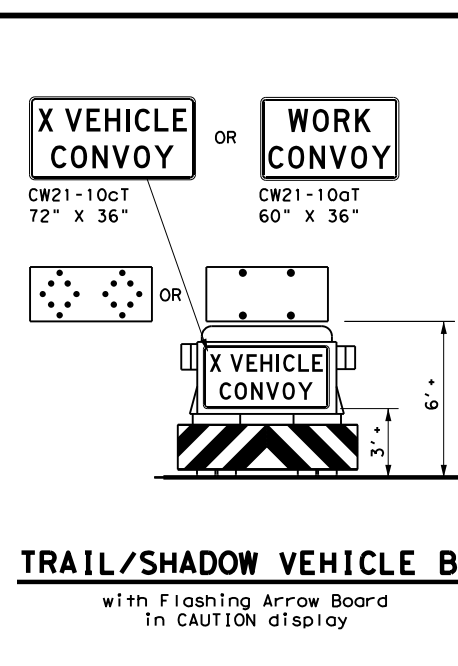
TCP (3-1b)
TWO-WAY ROADWAY WITH PAVED SHOULDERS



TCP (3-1c)
TWO-WAY ROADWAY WITHOUT PAVED SHOULDERS



TRAIL/SHADOW VEHICLE A
with RIGHT Directional display Flashing Arrow Board



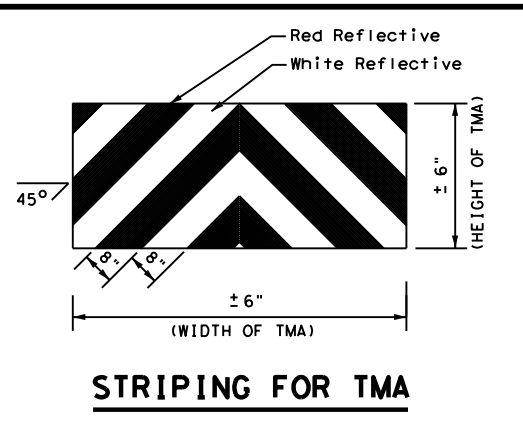
TRAIL/SHADOW VEHICLE B
with Flashing Arrow Board in CAUTION display

LEGEND			
*	Trail Vehicle	ARROW BOARD DISPLAY	
**	Shadow Vehicle		
***	Work Vehicle		RIGHT Directional
	Heavy Work Vehicle		LEFT Directional
	Truck Mounted Attenuator (TMA)		Double Arrow
	Traffic Flow		CAUTION (Alternating Diamond or 4 Corner Flash)

TYPICAL USAGE				
MOBILE	SHORT DURATION	SHORT TERM STATIONARY	INTERMEDIATE TERM STATIONARY	LONG TERM STATIONARY
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GENERAL NOTES

- TRAIL, SHADOW, and LEAD vehicles shall be equipped with arrow boards as illustrated. When a LEAD vehicle is not used the WORK vehicle must be equipped with an arrow board. The Engineer will determine if the LEAD VEHICLE and/or TRAIL VEHICLE are required based on prevailing roadway conditions, traffic volume, and sight distance restrictions.
- The use of amber high intensity rotating, flashing, oscillating, or strobe lights on vehicles are required. Blue high intensity rotating, flashing, oscillating or strobe lights when mounted on the driver's side of the vehicle may be operated simultaneously with the amber beacons or strobe lights.
- The use of truck mounted attenuators (TMA) on the SHADOW VEHICLE and TRAIL VEHICLE are required.
- Reflective sheeting on the rear of the TMA shall meet or exceed the reflectivity and color requirements of DEPARTMENTAL MATERIAL SPECIFICATION DMS 8300, Type A.
- Flashing arrow boards shall be Type B or Type C as per the Barricade and Construction (BC) standards. The board shall be controlled from inside the vehicle.
- Each vehicle shall have two-way radio communication capability.
- When work convoys must change lanes, the TRAIL VEHICLE should change lanes first to shadow the other convoy vehicles.
- Vehicle spacing between the TRAIL VEHICLE and the SHADOW VEHICLE will vary depending on sight distance restrictions. Motorists approaching the work convoy should be able to see the TRAIL VEHICLE in time to slow down and/or change lanes as they approach the TRAIL VEHICLE. Vehicle spacing between the WORK VEHICLE and SHADOW VEHICLE and vehicle spacing between WORK VEHICLE and LEAD VEHICLE may vary according to terrain, work activity and other factors.
- "X VEHICLE CONVOY" (CW21-10cT) or "WORK CONVOY" (CW21-10aT) signs shall be used on TRAIL VEHICLES and SHADOW VEHICLES as shown. As an option 48" X 48" diamond shaped "WORK CONVOY" (CW21-10T) or "X VEHICLE CONVOY" (CW21-10bT) signs may be used where adequate mounting space exists. When used, the X VEHICLE CONVOY sign shall have the number of the convoy vehicles displayed on the sign in the number designation "X" location. The "X VEHICLE CONVOY" sign shall not be used on the SHADOW VEHICLE if a TRAIL VEHICLE is used.
- On two-lane two-way roadways, the work and protection vehicles should pull over periodically to allow motor vehicle traffic to pass. If motorists are not allowed to pass the work convoy, a "DO NOT PASS" (R4-1) sign should be placed on the back of the rearmost protection vehicle.



STRIPING FOR TMA

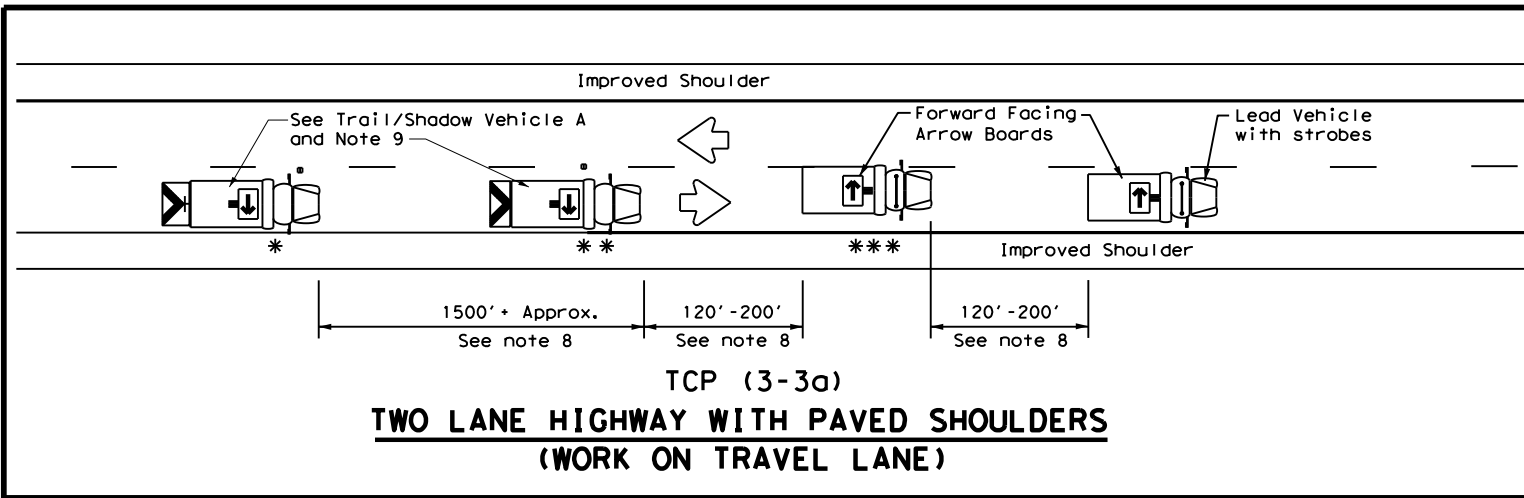
Traffic Operations Division Standard

**TRAFFIC CONTROL PLAN
MOBILE OPERATIONS
UNDIVIDED HIGHWAYS**

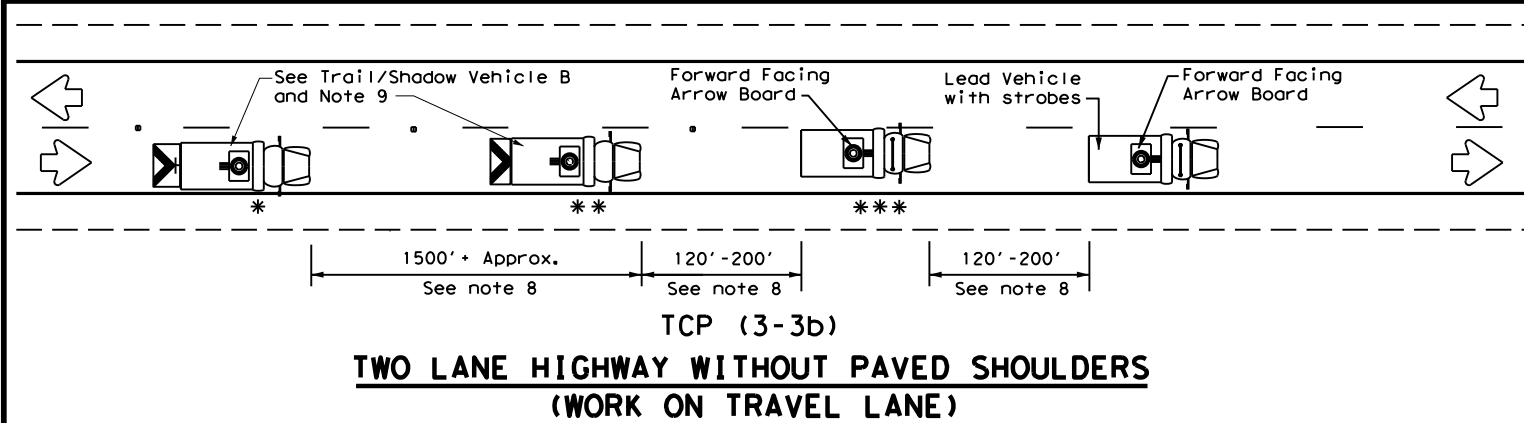
TCP (3-1) - 13

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© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
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8-95 7-13	PAR	LAMAR		39
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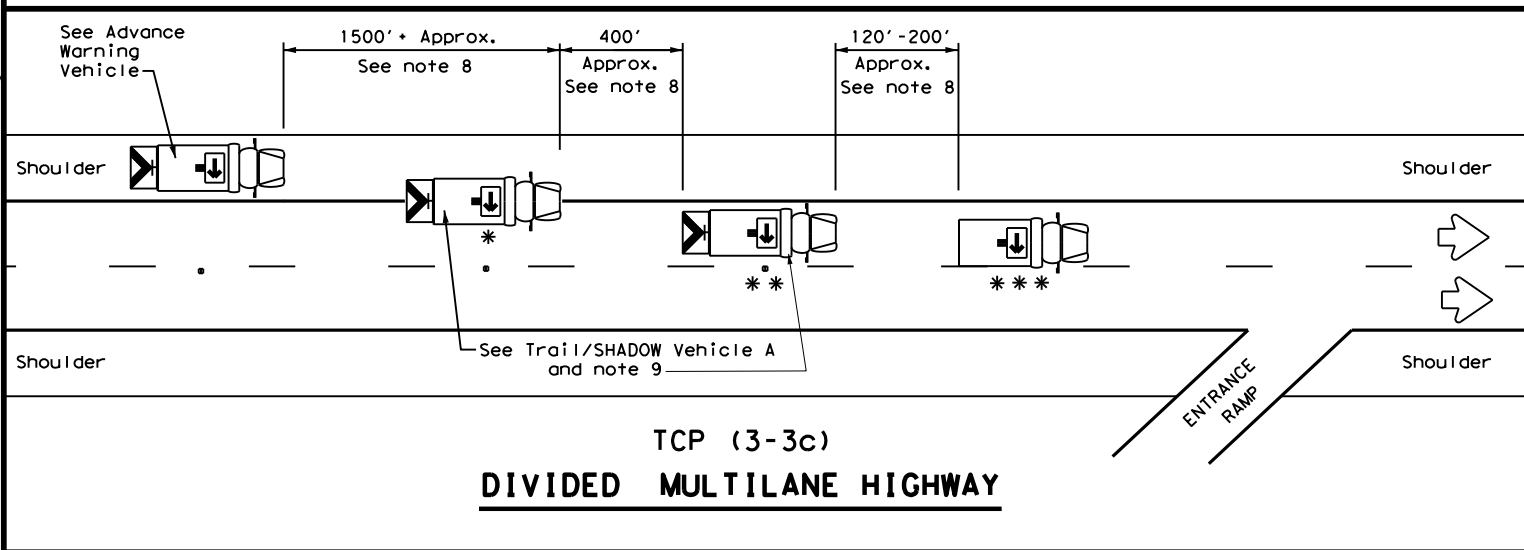
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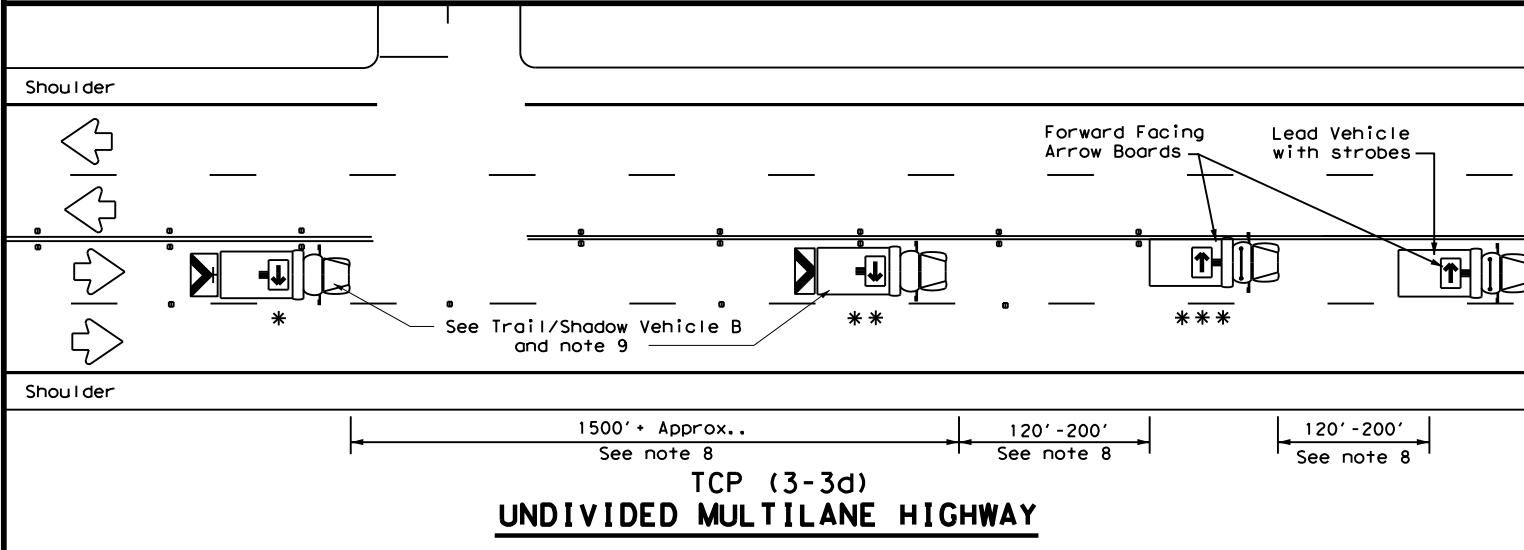
TCP (3-3a)
TWO LANE HIGHWAY WITH PAVED SHOULDERS
(WORK ON TRAVEL LANE)



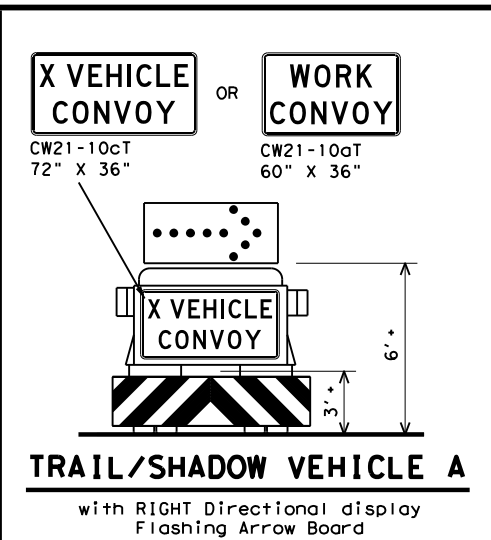
TCP (3-3b)
TWO LANE HIGHWAY WITHOUT PAVED SHOULDERS
(WORK ON TRAVEL LANE)



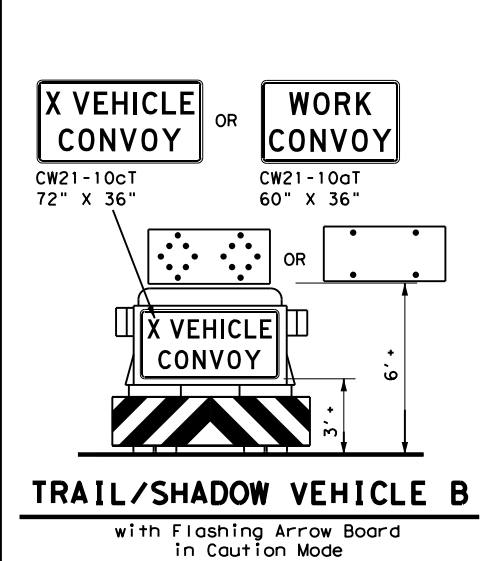
TCP (3-3c)
DIVIDED MULTILANE HIGHWAY



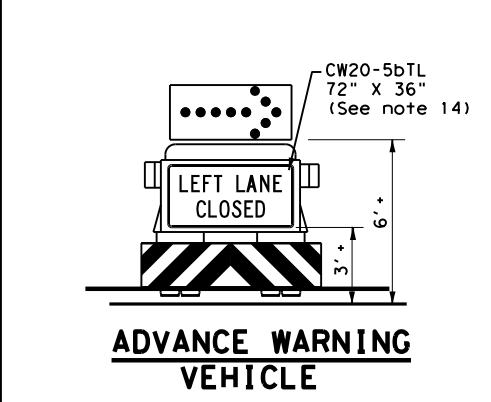
TCP (3-3d)
UNDIVIDED MULTILANE HIGHWAY



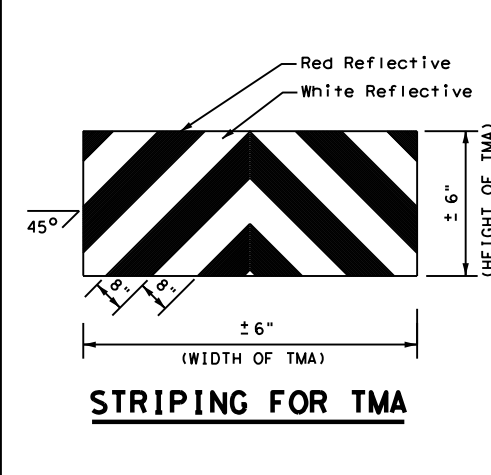
TRAIL/SHADOW VEHICLE A
 with RIGHT Directional display
 Flashing Arrow Board



TRAIL/SHADOW VEHICLE B
 with Flashing Arrow Board
 in Caution Mode



ADVANCE WARNING VEHICLE



STRIPING FOR TMA

LEGEND		
* Trail Vehicle	ARROW BOARD DISPLAY	
** Shadow Vehicle		
*** Work Vehicle		RIGHT Directional
		LEFT Directional
		Double Arrow
		CAUTION (Alternating Diamond or 4 Corner Flash)

TYPICAL USAGE				
MOBILE	SHORT DURATION	SHORT TERM STATIONARY	INTERMEDIATE TERM STATIONARY	LONG TERM STATIONARY
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

GENERAL NOTES

1. TRAIL, SHADOW, and LEAD vehicles shall be equipped with arrow boards as illustrated. When a LEAD vehicle is not used on two way roads the WORK vehicle must have an arrow board. For divided roadways, the arrow board on the WORK vehicle is optional based on the type of work being performed. The Engineer will determine if the LEAD vehicle and/or TRAIL vehicle are required based on prevailing roadway conditions, traffic volume, and sight distance restrictions.
2. The use of amber high intensity rotating, flashing, oscillating, or strobe lights on vehicles are required. Blue high intensity rotating, flashing, oscillating, or strobe lights when mounted on the driver's side of the vehicle may be operated simultaneously with the amber beacons or strobe lights.
3. The use of truck mounted attenuators (TMA) on the SHADOW VEHICLE, ADVANCE WARNING and TRAIL VEHICLE are required.
4. Reflective sheeting on the rear of the TMA shall meet or exceed the reflectivity and color requirements of DEPARTMENTAL MATERIAL SPECIFICATION DMS 8300, Type A.
5. Flashing arrow boards shall be Type B or Type C as per the Barricade and Construction (BC) standards. The board shall be controlled from inside the vehicle.
6. Each vehicle shall have two-way radio communication capability.
7. When work convoys must change lanes, the TRAIL VEHICLE should change lanes first to shadow the other convoy vehicles.
8. Vehicle spacing between the TRAIL VEHICLE and the SHADOW VEHICLE will vary depending on sight distance restrictions. Motorists approaching the convoy should be able to see the TRAIL VEHICLE in time to slow down and/or change lanes as they approach the TRAIL VEHICLE. Vehicle spacing between the WORK VEHICLE and SHADOW VEHICLE and vehicle spacing between WORK VEHICLE and LEAD VEHICLE may vary according to terrain, work activity and other factors.
9. X VEHICLE CONVOY (CW21-10cT) or WORK CONVOY (CW21-10aT) signs shall be used on TRAIL VEHICLES and SHADOW VEHICLES as shown. As an option 48" x 48" diamond shaped WORK CONVOY (CW21-10T) or X VEHICLE CONVOY (CW21-10bT) signs may be used where adequate mounting space exists. When used, the X VEHICLE CONVOY sign shall have the number of the convoy vehicles displayed on the sign in the number designation "X" location. The X VEHICLE CONVOY sign shall not be used on the SHADOW VEHICLE if a TRAIL VEHICLE is used.
10. For divided highways with two or three lanes in one direction, the appropriate LEFT LANE CLOSED (CW20-5bTL), RIGHT LANE CLOSED (CW20-5bTR), or CENTER LANE CLOSED (CW20-5dT) sign should be used on the Advance Warning Vehicle. As an option, a portable changeable message sign (PCMS) or truck mounted changeable message sign (TMCMS) with a minimum character height of 12", and displaying the same legend may be substituted for these signs. An appropriate directional arrow display, simulating the size and legibility of the flashing arrow board may be used in the second phase of the PCMS/TMCMS message. When this is done, the arrow board will not be required on the Advance Warning Vehicle.
11. A double arrow shall not be displayed on the arrow board on the Advance Warning Vehicle.
12. For divided highways with three or four lanes in each direction, use TCP(3-2).
13. Standard diamond shape versions of the CW20-5 series signs may be used as an option if the rectangular signs shown are not available.
14. The Advance Warning Vehicle may straddle the edgeline when Shoulder width makes it necessary.
15. On two-lane two-way roadways, the work and protection vehicles should pull over periodically to allow motor vehicle traffic to pass. If motorists are not allowed to pass the work convoy, a DO NOT PASS (R4-1) sign should be placed on the back of the rearmost protection vehicle.

Texas Department of Transportation
 Traffic Operations Division Standard

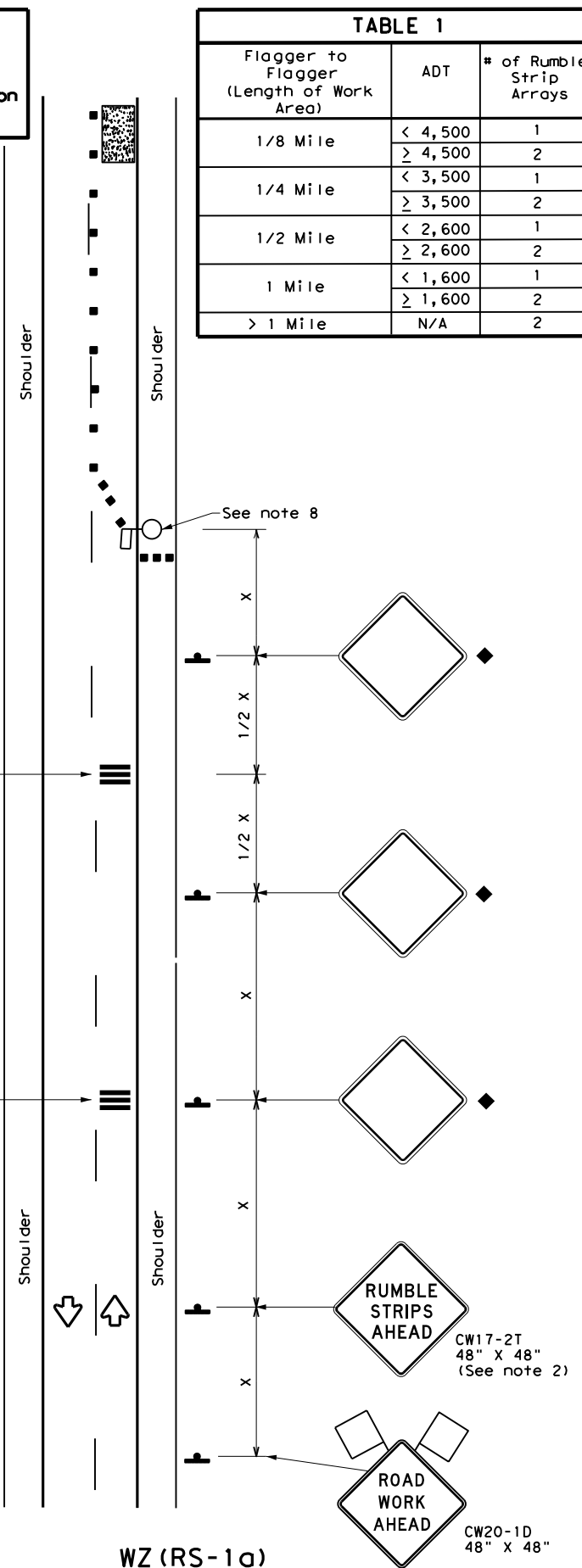
TRAFFIC CONTROL PLAN
MOBILE OPERATIONS
RAISED PAVEMENT
MARKER INSTALLATION/
REMOVAL
TCP (3-3) - 14

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© TxDOT September 1987	CONT	SECT	JOB	HIGHWAY
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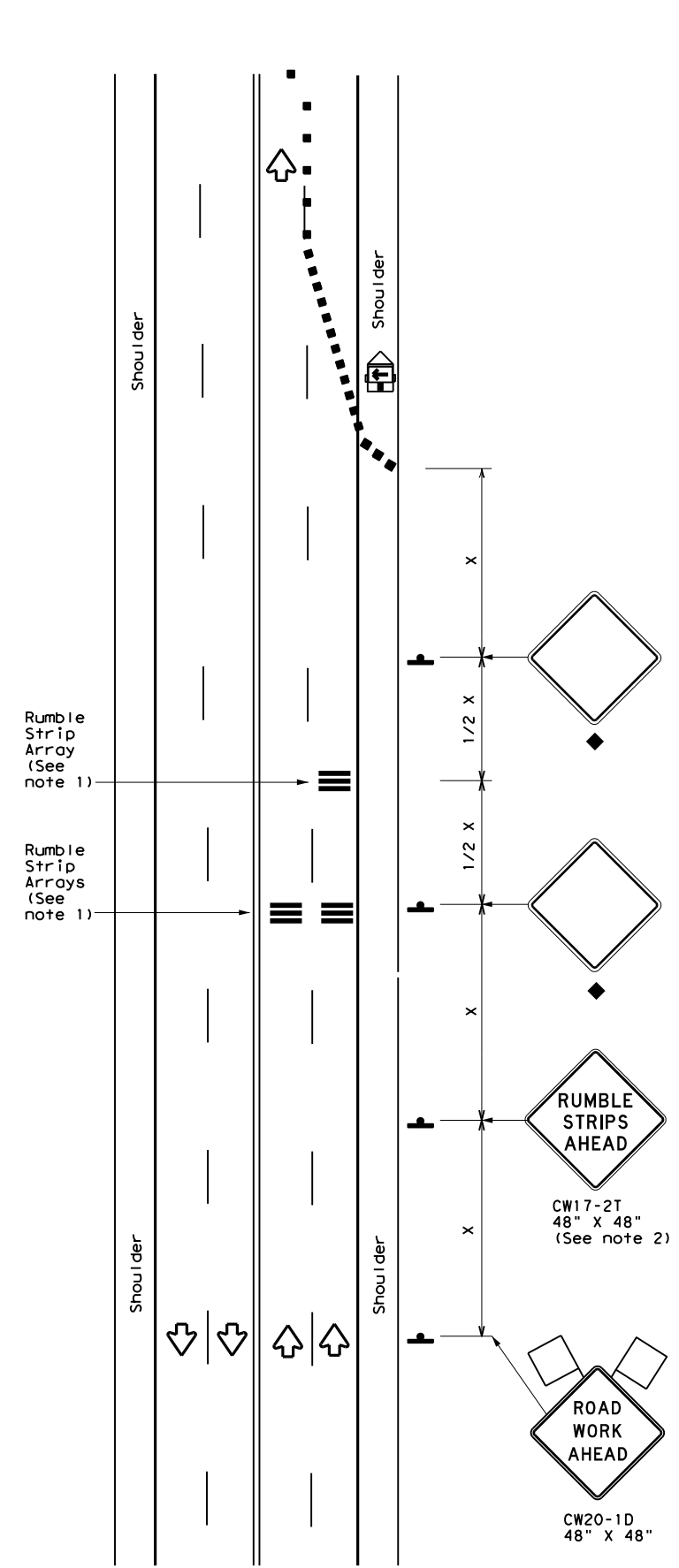
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Warning sign and rumble strip sequence in opposite direction is same as below

Flagger to Flagger (Length of Work Area)	ADT	# of Rumble Strip Arrays
1/8 Mile	< 4,500	1
	≥ 4,500	2
1/4 Mile	< 3,500	1
	≥ 3,500	2
1/2 Mile	< 2,600	1
	≥ 2,600	2
1 Mile	< 1,600	1
	≥ 1,600	2
> 1 Mile	N/A	2



WZ (RS-1a)
 75 mph or Less
RUMBLE STRIPS ON ONE-LANE TWO-WAY APPLICATION



WZ (RS-1b)
 75 mph or Less
RUMBLE STRIPS FOR LANE CLOSURE ON CONVENTIONAL ROADWAY

GENERAL NOTES

- Each Rumble Strip Array should consist of three rumble strips spaced center to center at the spacing shown in Table 2, placed transverse across the lane at locations shown.
- The CW17-2T "RUMBLE STRIPS AHEAD" sign should be located after the CW20-1D "ROAD WORK AHEAD" sign and spaced as shown. If traffic is observed to be queuing, or is expected to queue beyond the Rumble Strips, the CW17-2T sign and the first Rumble Strip Array may be located upstream of the CW20-1D sign as necessary to provide needed warning.
- Temporary Rumble Strips will be considered subsidiary to Item 502, and shall be a product listed on the Compliant Work Zone Traffic Control Devices.
- Removal of the Temporary Rumble Strips should be accomplished before removing the advance warning signs.
- Temporary Rumble Strips should not be used on horizontal curves, loose gravel, soft or bleeding asphalt, heavily rutted pavements or unpaved surfaces.
- Temporary Rumble Strips shall be installed and maintained as per manufacturer's recommendations.
- This standard sheet shall be used in conjunction with other appropriate TCP standard, TMUTCD typical application or project specific detail for the project.
- The one-lane two-way application may utilize a flagger, an AFAD or a portable traffic signal.
- Temporary Rumble Strips may be used on freeways or expressways based on engineering judgment.

Speed	Approximate distance between strips in an Array
≤ 40 MPH	10'
> 40 MPH & ≤ 55 MPH	15'
> 55 MPH	20'

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

Posted Speed *	Formula	Minimum Desirable Taper Lengths **			Suggested Maximum Spacing of Channelizing Devices		Minimum Sign Spacing "x" Distance	Suggested Longitudinal Buffer Space "B"
		10' Offset	11' Offset	12' Offset	On a Taper	On a Tangent		
30	L = WS ² / 60	150'	165'	180'	30'	60'	120'	90'
35		205'	225'	245'	35'	70'	160'	120'
40	L = WS	265'	295'	320'	40'	80'	240'	155'
45		450'	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	L = WS	600'	660'	720'	60'	120'	600'	350'
65		650'	715'	780'	65'	130'	700'	410'
70	L = WS	700'	770'	840'	70'	140'	800'	475'
75		750'	825'	900'	75'	150'	900'	540'

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

MOBILE	SHORT DURATION	SHORT TERM STATIONARY	INTERMEDIATE TERM STATIONARY	LONG TERM STATIONARY
	✓	✓		

◆ Signs are for illustrative purposes only. Signs required may vary depending on the TCP, TMUTCD Typical Application, or project specific details for the project.

Texas Department of Transportation
 Traffic Operations Division Standard

TEMPORARY RUMBLE STRIPS

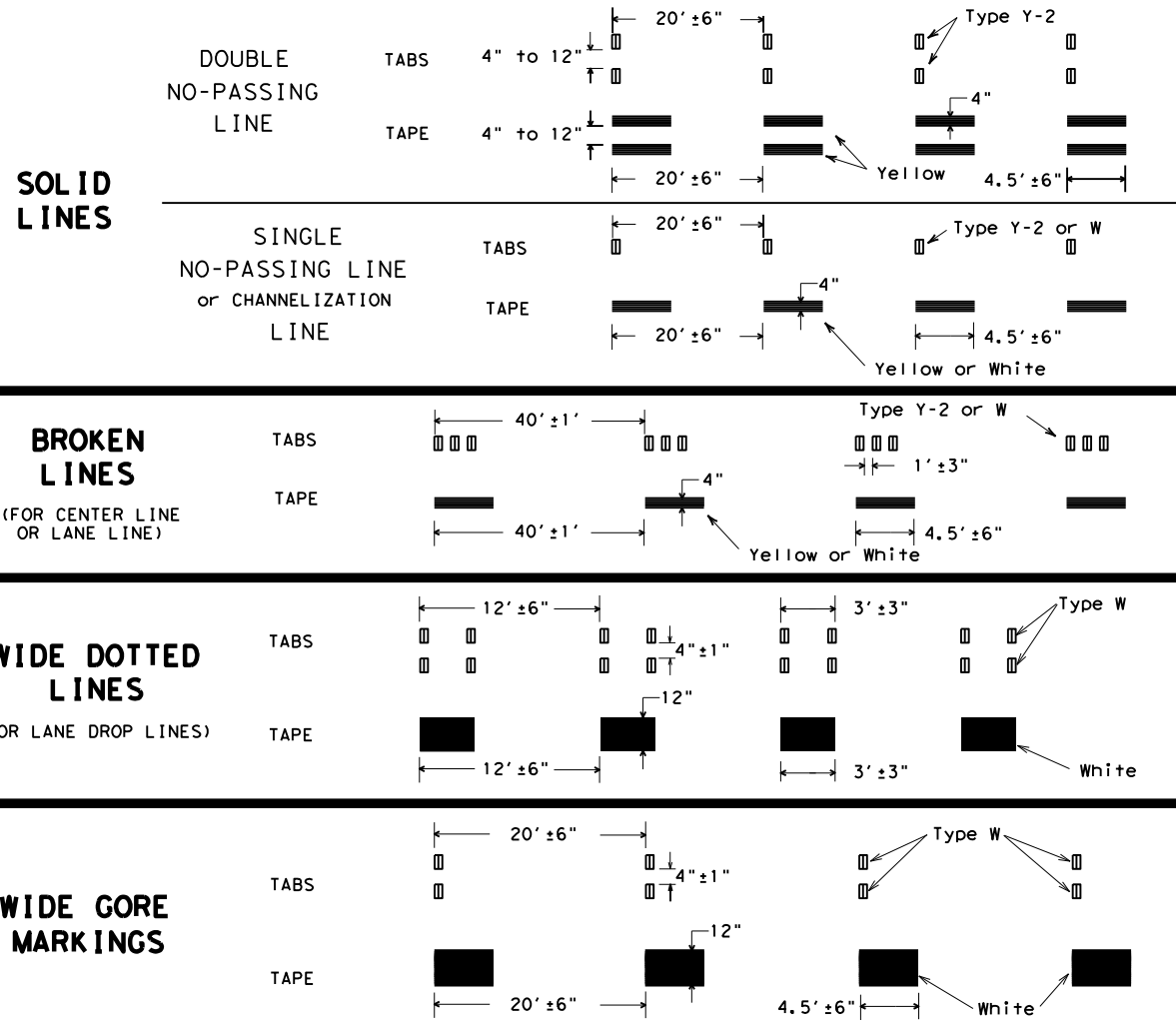
WZ (RS) - 16

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WORK ZONE SHORT TERM PAVEMENT MARKINGS DETAILS



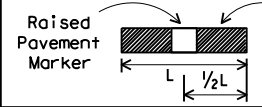
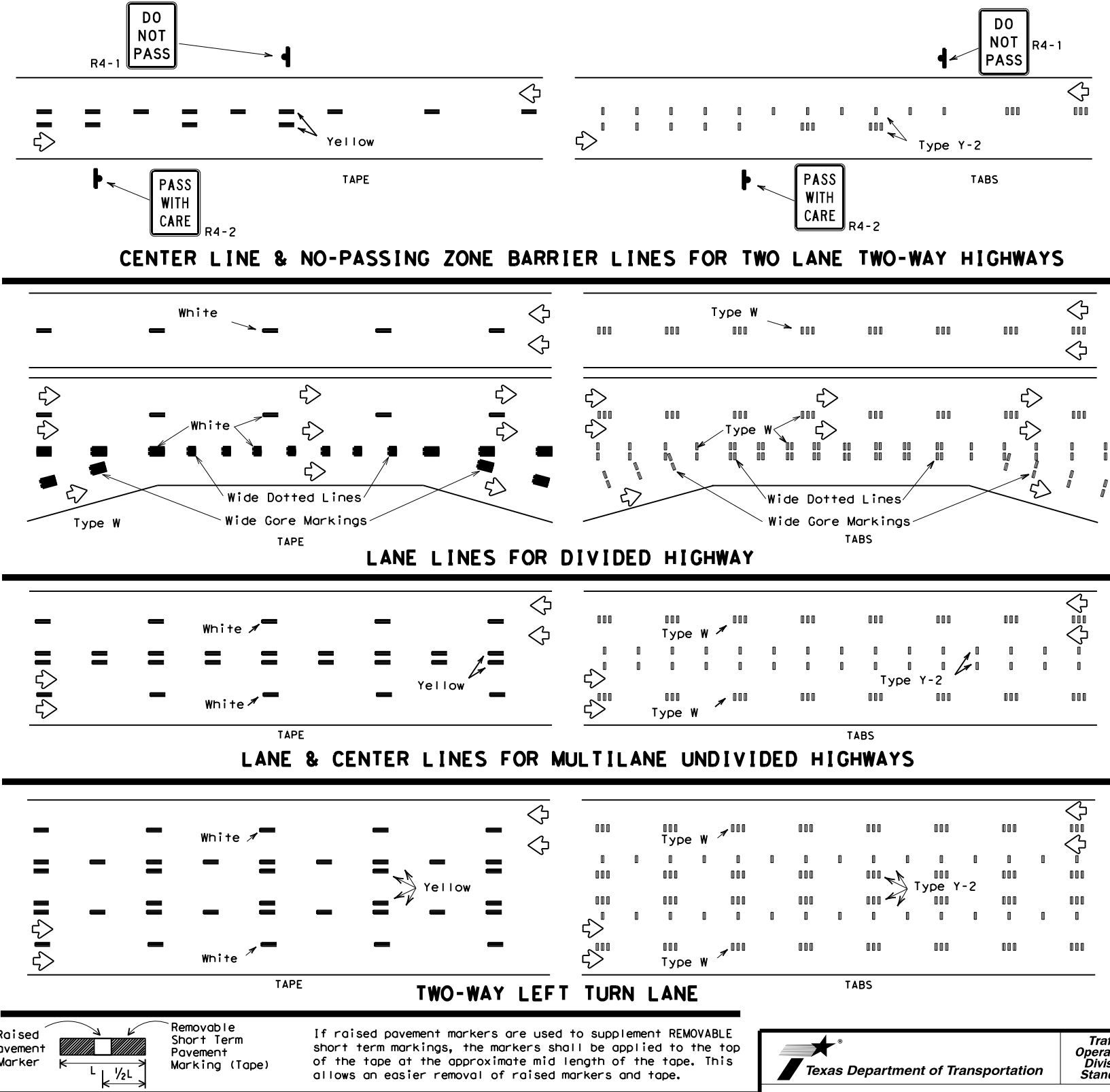
NOTES:

- Short term pavement markings may be prefabricated markings (stick down tape) or temporary flexible-reflective roadway marker tabs unless otherwise specified elsewhere in plans.
- Short term pavement markings shall NOT be used to simulate edge lines.
- Dimensions indicated on this sheet are typical and approximate. Variations in size and height may occur between markers or devices made by manufacturers, by as much as 1/4 inch, unless otherwise noted.
- Temporary flexible-reflective roadway marker tabs will require normal maintenance replacement when used on roadways with an ADT per lane of up to 7500 vehicles with no more than 10% truck mix. When roadways exceed these values, additional maintenance replacement of devices should be planned.
- No segment of roadway open to traffic shall remain without permanent pavement markings for a period greater than 14 calendar days. The Contractor will be responsible for maintaining short term pavement markings until permanent pavement markings are in place. When the Contractor is responsible for placement of permanent pavement markings, no segment of roadway shall remain without permanent pavement markings for a period greater than 14 calendar days unless weather conditions prohibit placement. Permanent pavement markings shall be placed as soon as weather permits.
- For two lane, two-way roadways, DO NOT PASS signs shall be erected to mark the beginning of sections where passing is prohibited and PASS WITH CARE signs shall be erected to mark the beginning of sections where passing is permitted. Signs shall be in accordance with the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD) and may be used to indicate the limits of no-passing zones for up to 14 calendar days. Permanent pavement markings should then be placed.
- For low volume two lane, two-way roadways of 4000 ADT or less, no-passing lines may be omitted when approved by the Engineer. DO NOT PASS and PASS WITH CARE signs shall be erected (see note 6).
- For exit gores where a lane is being dropped place wide gore markings or retroreflective channelizing devices to guide motorist through the exit. If channelizing devices are to be used it should be noted elsewhere in the plans. One piece cones are not allowed for this purpose.

TEMPORARY FLEXIBLE, REFLECTIVE ROADWAY MARKER TABS (TABS)

- Temporary flexible-reflective roadway marker tabs detailed on this sheet will be designated Type Y-2 (two amber reflective surfaces with yellow body); Type Y (one amber reflective surface with yellow body); and Type W (one white or silver reflective surface with white body). Additional details may be found on BC(11).
- Tabs shall meet requirements of Departmental Material Specification DMS-8242.
- When dry, tabs shall be visible for a minimum distance of 200 feet during normal daylight hours and when illuminated by automobile low-beam head light at night, unless sight distance is restricted by roadway geometrics.
- No two consecutive tabs nor four tabs per 1000 feet of line shall be missing or fail to meet the visual performance requirements of Note 3.

WORK ZONE SHORT TERM PAVEMENT MARKINGS PATTERNS



If raised pavement markers are used to supplement REMOVABLE short term markings, the markers shall be applied to the top of the tape at the approximate mid length of the tape. This allows an easier removal of raised markers and tape.

PREFABRICATED PAVEMENT MARKINGS

- Temporary Removable Prefabricated Pavement Markings shall meet the requirements of DMS-8241.
- Non-removable Prefabricated Pavement Markings shall meet the requirements of either DMS-8240 "Permanent Prefabricated Pavement Markings" or DMS-8243 "Temporary Construction-Grade Prefabricated Pavement Markings."

RAISED PAVEMENT MARKERS

- All raised pavement markers used for work zone markings shall meet the requirements of Item 672, "RAISED PAVEMENT MARKERS" and DMS-4200.

DEPARTMENTAL MATERIAL SPECIFICATIONS (DMS) & MATERIAL PRODUCER LISTS (MPL)

- DMSs referenced above can be found along with embedded links to their respective MPLs at the following website:
http://www.txdot.gov/business/contractors_consultants/material_specifications/default.htm

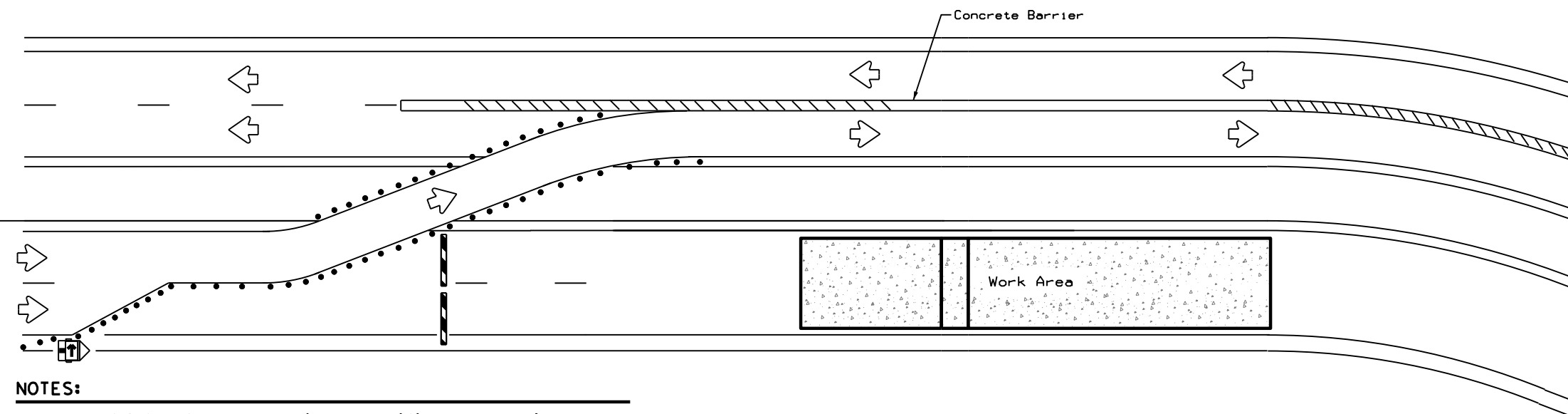


WORK ZONE SHORT TERM PAVEMENT MARKINGS

WZ (STPM) - 13

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1-97		PAR:	LAMAR						42
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LEGEND	
	Type 3 Barricade
	Channelizing Devices
	Trailer Mounted Flashing Arrow Board
	Sign
	Safety glare screen

DEPARTMENTAL MATERIAL SPECIFICATIONS	
SIGN FACE MATERIALS	DMS-8300
DELINEATORS AND OBJECT MARKERS	DMS-8600
MODULAR GLARE SCREENS FOR HEADLIGHT BARRIER	DMS-8610

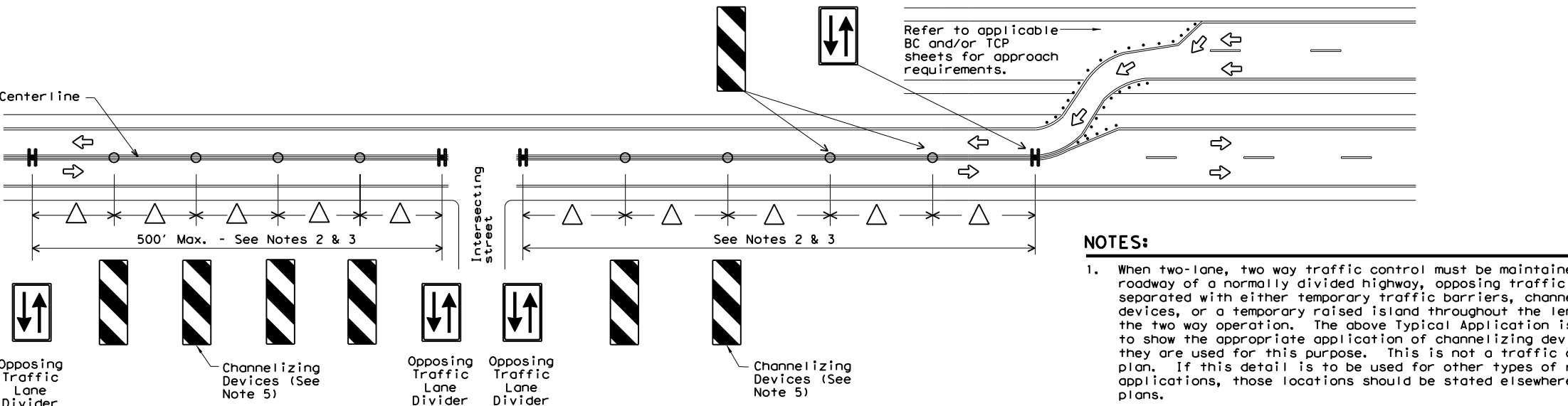
Only pre-qualified products shall be used. A copy of the Compliant Work Zone Traffic Control Devices List (CWZTCD) describes pre-qualified products and their sources and may be found at the following web address:

<http://www.txdot.gov/business/resources/producer-list.html>

NOTES:

- Length of Safety Glare screen will be specified elsewhere in the plans.
- The cumulative nominal length of the modular safety glare screen units shall equal the length of the individual sections of temporary concrete traffic barrier on which they are installed so the joint between barrier sections will not be spanned by any one safety glare screen unit.
- Screen Panel/blades will be designed such that reflective sheeting conforming with Departmental Material Specification DMS-8300, Sign Face Materials, Type B or C Yellow, minimum size of 2 inches by 12 inches can be attached to the edge of the panel/blade. The sheeting shall be attached to one glare screen panel/blade per section of concrete barrier not to exceed a spacing of 30 feet. Barrier reflectors are not necessary when panel/blades are installed with reflective sheeting as described.
- Payment for these devices will be under statewide Special Specification "Modular Glare Screens for Headlight Barrier."
- This detail is only intended to show types of locations where Glare Screens would be appropriate. Required signing and other devices shall be as shown elsewhere in the plans.

BARRIER DELINEATION WITH MODULAR GLARE SCREENS



NOTES:

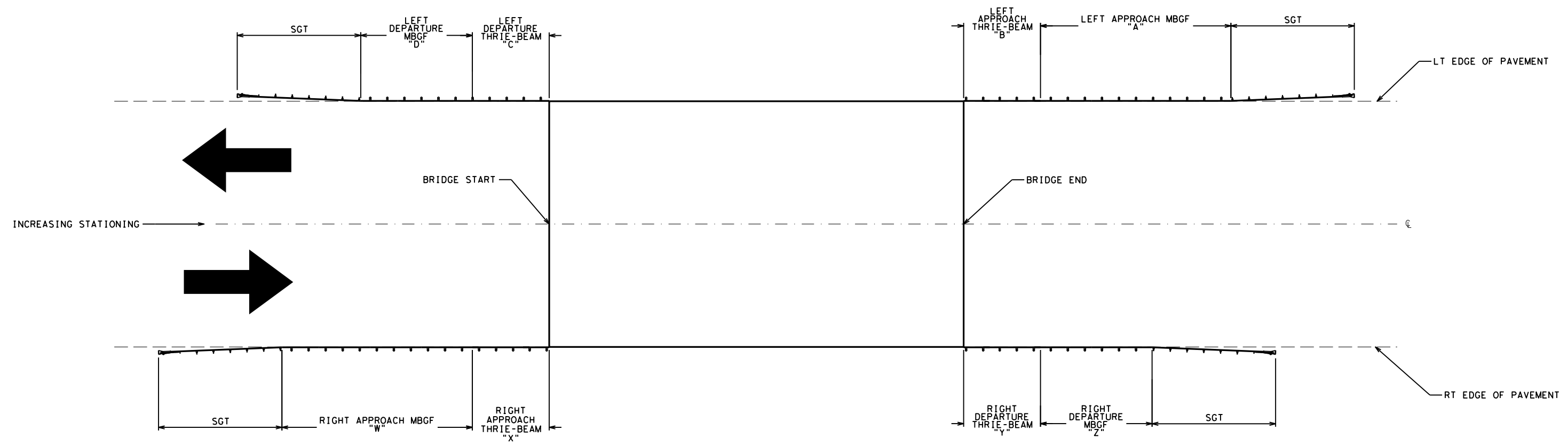
- When two-lane, two way traffic control must be maintained on one roadway of a normally divided highway, opposing traffic shall be separated with either temporary traffic barriers, channelizing devices, or a temporary raised island throughout the length of the two way operation. The above Typical Application is intended to show the appropriate application of channelizing devices when they are used for this purpose. This is not a traffic control plan. If this detail is to be used for other types of roads or applications, those locations should be stated elsewhere in the plans.
- Space devices according to the Tangent Spacing shown on the Device Spacing table on BC(9) but not exceeding 100'.
- Every fifth device should be an OTLD except when spaced closer to accommodate an intersection. An OTLD should be the first device on each side of intersecting streets or roads.
- Locations where surface mount bases with adhesives or self-righting devices will be required in order to maintain them in their proper position should be noted elsewhere in the plans.
- Channelizing devices are to be vertical panels, 42" cones or tubular markers that are at least 36" tall. Tubular markers used to separate traffic should have a rubber base weighing at least 30 pounds. Tubular markers that are 42" tall or more shall have four bands of reflective material as detailed for 42" cones on BC(10). Tubular markers less than 42" but at least 36" tall shall have three bands of 3" wide white reflective material spaced 2" apart. Reflective material shall meet DMS-8300, Type A.

VERTICAL PANELS & OPPOSING TRAFFIC LANE DIVIDERS (OTLD) SEPARATING TWO-WAY TRAFFIC ON NORMALLY DIVIDED HIGHWAYS

		Traffic Operations Division Standard	
TRAFFIC CONTROL PLAN TYPICAL DETAILS			
WZ(TD) - 17			
FILE:	wz1d-17.dgn	DN:	TxDOT
© TxDOT	February 1998	CK:	TxDOT
REVISIONS		OW:	TxDOT
4-98	2-17	CONT	SECT
3-03		0435	01
7-13		JOB	080
		HIGHWAY	FM 38
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		PAR	LAMAR
		SHEET NO.	43

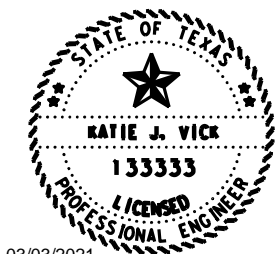
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BRIDGE CROSSING	NBI #	BRIDGE START	BRIDGE END	A	B	C	D	W	X	Y	Z
COTTON WOOD CREEK	01-139-0-0435-01-024	426+39.50	427+30.50	200	18.75	18.75	100	200	18.75	18.75	100
SANDERS CREEK	01-139-0-0435-01-023	511+92.50	512+83.50	200	18.75	18.75	100	200	18.75	18.75	100
WEST FOR SANDERS CREEK	01-139-0-0435-01-007	712+81.00	713+81.00	200	18.75	18.75	125	200	18.75	18.75	125

NOTE: PAO ENGINEER WILL NOTIFY THE DISTRICT BRIDGE INSPECTION COORDINATOR WHEN THE BRIDGE IMPROVEMENTS ARE COMPLETE.



03/03/2021

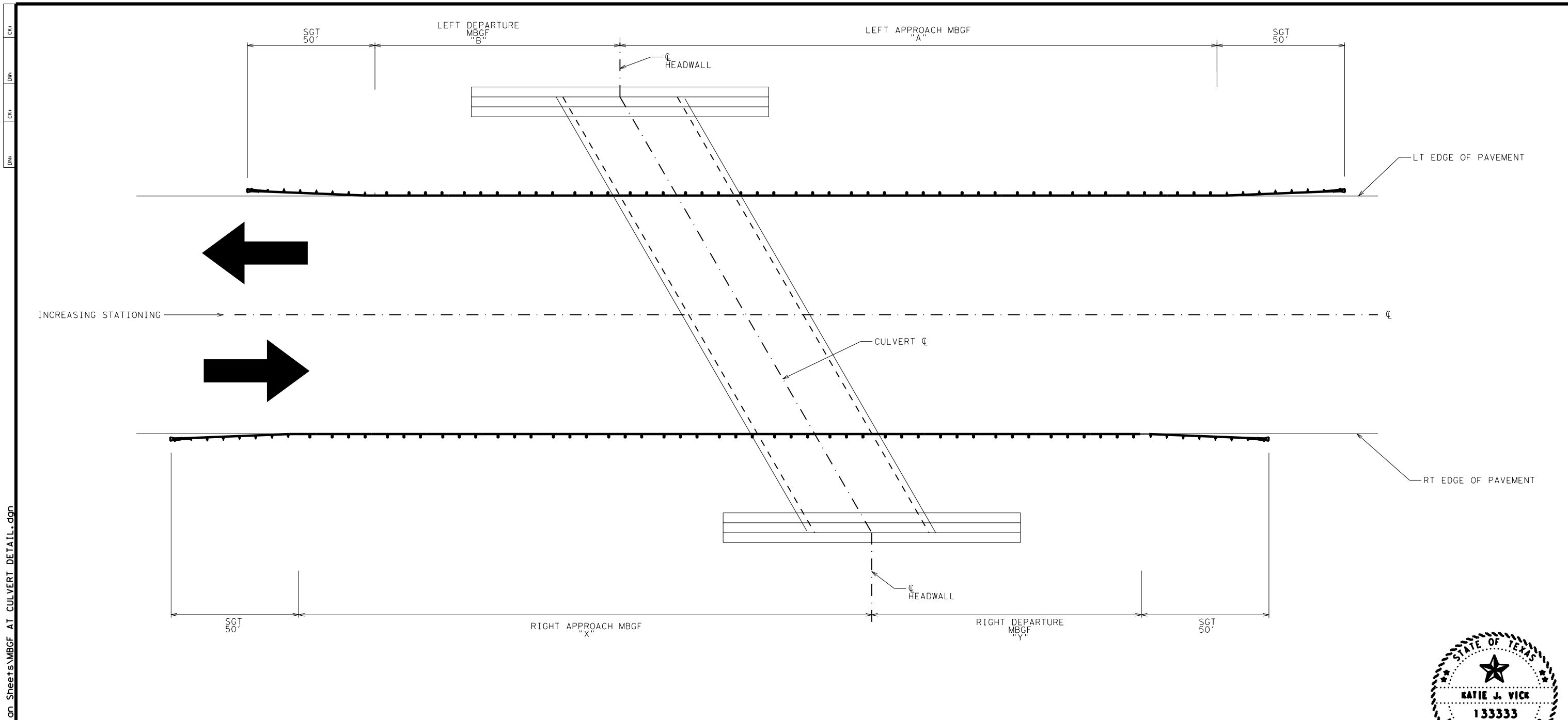
Katie J. Vick, P.E.

FM 38
MBGF DETAIL
FOR BRIDGES



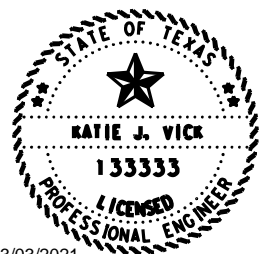
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PAR	LAMAR		44

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BRIDGE CULVERT	NBI #	CULVERT START	CULVERT END	A	B	X	Y
* COTTON WOOD CREEK RELIEF	01-139-0-0435-01-016	433+37.00	433+69.00	200	125	200	125
* SANDERS CREEK RELIEF	01-139-0-0435-01-015	519+89.50	520+19.50	200	125	200	125
BERGER CREEK	01-139-0-0435-01-010	795+98.00	796+20.00	237.5	137.5	237.5	137.5

* MBGF OFFSET 5' FROM EDGE OF PAVEMENT.
 NOTE: PAO ENGINEER WILL NOTIFY THE DISTRICT BRIDGE INSPECTION COORDINATOR WHEN THE BRIDGE IMPROVEMENTS ARE COMPLETE.



03/03/2021
 Katie J. Vick, P.E.

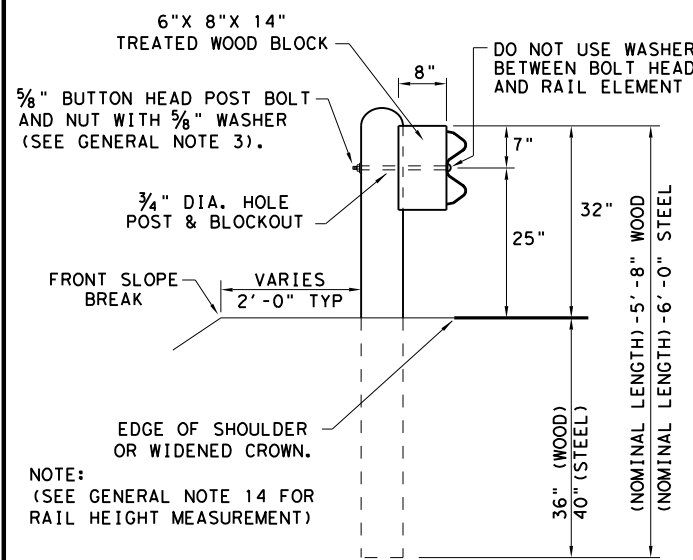
FM 38
MBGF DETAIL
FOR CULVERTS

NOT TO SCALE
 SHEET 2 OF 2

CONT	SECT	JOB	HIGHWAY
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DIST	COUNTY		SHEET NO.
PAR	LAMAR		45

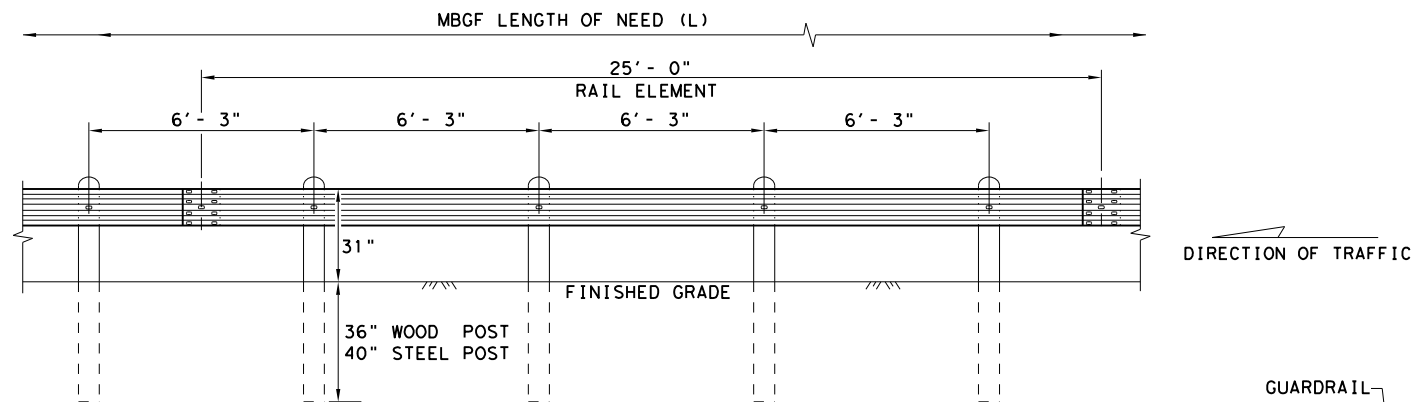
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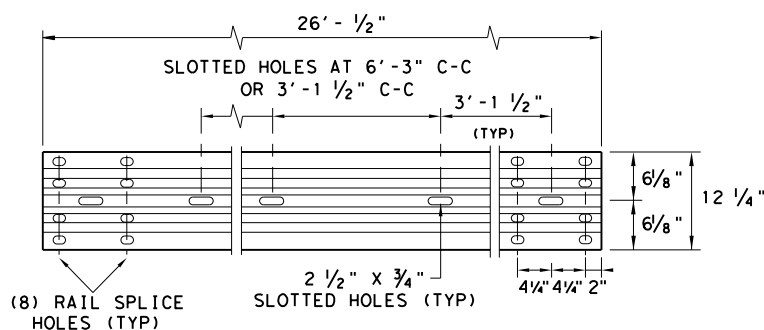
TYPICAL POST PLACEMENT

NOTE: ** "WOOD" INDICATES DIMENSIONS FOR BOTH ROUND AND RECTANGULAR WOOD POST SYSTEMS.



ELEVATION MID-SPAN RAIL SPLICE

SHOWING A 25'-0" SECTION OF W-BEAM RAIL. (SEE GENERAL NOTE 2)



ELEVATION 25'-0" (NOM.) W-BEAM SECTION

NOTES: SEE GENERAL NOTE 2 FOR ALLOWABLE RAIL TYPES. SEE RAIL SPLICE DETAIL FOR REQUIRED HARDWARE.

NOTE: FOUR TYPES OF BUTTON-HEAD GUARD RAIL BOLTS COME WITH A RECESSED NUT.

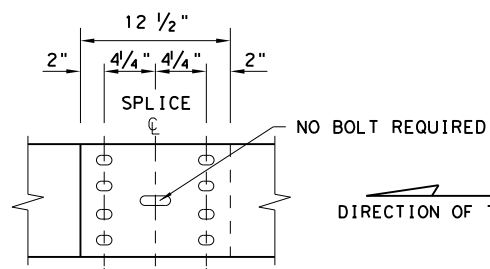
SPLICE BOLT LENGTH VARIES

FBB01 = 1 1/4"
FBB02 = 2"

POST & BLOCK LENGTH
FBB03 = 10"
FBB04 = 18"

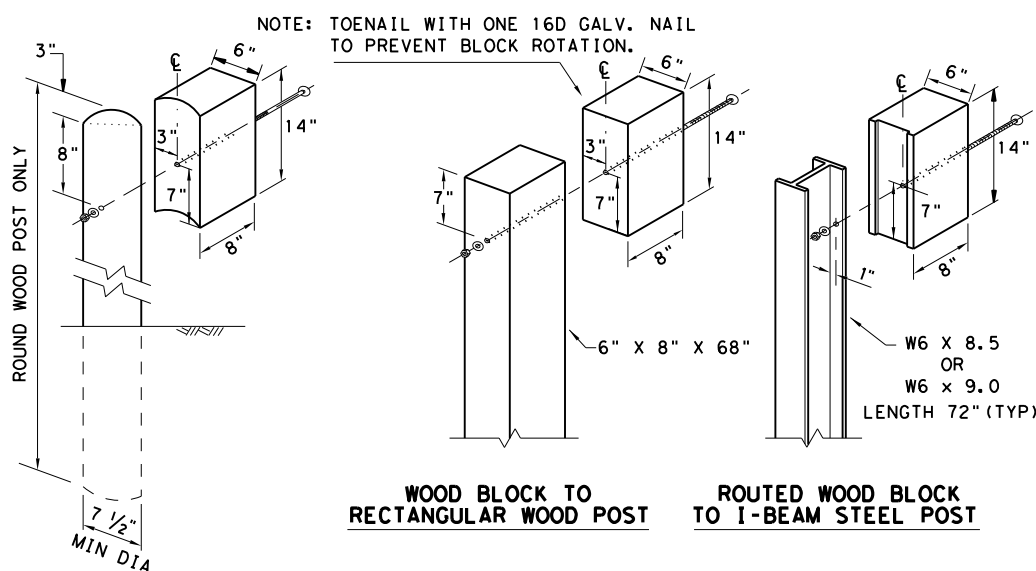
BUTTON HEAD BOLT

NOTE: SEE GENERAL NOTE 3 FOR SPLICE & POST BOLT DETAILS.



MID-SPAN RAIL SPLICE DETAIL

NOTE: GF(31), MID-SPAN RAIL SPLICES ARE REQUIRED WITH 6'-3" POST SPACINGS.



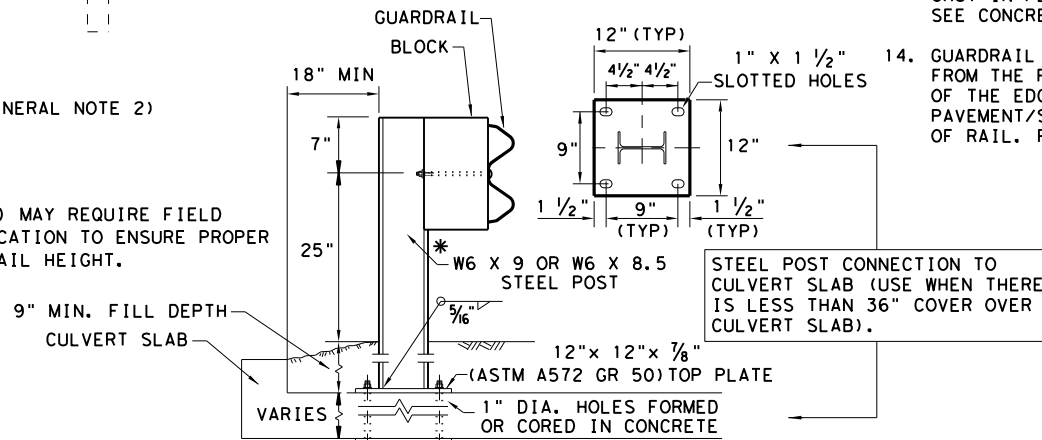
WOOD BLOCK TO RECTANGULAR WOOD POST

ROUTED WOOD BLOCK TO I-BEAM STEEL POST

WOOD BLOCK TO ROUND WOOD POST

- GENERAL NOTES**
1. THE TYPE OF POST (ROUND WOOD POST, RECTANGULAR WOOD POST, OR STEEL POST) WILL BE AS SHOWN IN THE PLANS. THE EXACT POSITION OF MBGF SHALL BE SHOWN IN THE PLANS OR AS DIRECTED BY THE ENGINEER. STEEL POSTS TO BE GALVANIZED IN ACCORDANCE WITH ITEM 445, "GALVANIZING."
 2. RAIL ELEMENTS SHALL MEET THE REQUIREMENTS OF ITEM 540, "METAL BEAM GUARD FENCE" EXCEPT AS MODIFIED IN THE PLANS. THE CONTRACTOR MAY FURNISH RAIL ELEMENTS OF 25'-0", OR 12'-6" (NOM.) LENGTHS. RAIL ELEMENTS MAY HAVE SLOTTED HOLES AT 3'-1 1/2" C-C OR 6'-3" C-C. A SPECIAL LENGTH OF RAIL MAY BE MANUFACTURED TO ACCOMMODATE THE DOWNSTREAM ANCHOR TERMINAL (DAT) AND THE TRANSITION SECTIONS OF GUARDRAIL.
 3. BUTTON HEAD "POST BOLTS & NUTS" SHALL MEET THE REQUIREMENTS OF (ASTM A307), AND SHALL BE OF SUFFICIENT LENGTH TO EXTEND THROUGH THE FULL THICKNESS OF THE NUT AND 3/8" WASHER (FWC16G) AND NOT MORE THAN 1" BEYOND IT. TRIM REMAINING BOLT LENGTH TO MEET REQUIRED LENGTH.
 4. FITTINGS (BOLTS, NUTS, AND WASHERS) SHALL BE GALVANIZED IN ACCORDANCE WITH ITEM 445, "GALVANIZING." FITTINGS SHALL BE SUBSIDIARY TO THE BID ITEM.
 5. CROWN SHALL BE WIDENED TO ACCOMMODATE THE METAL BEAM GUARD FENCE.
 6. THE LATERAL APPROACH TO THE GUARD FENCE, SHALL HAVE A MAXIMUM SLOPE OF 1V:10H.
 7. IF SHOWN ELSEWHERE IN THE PLANS OR AS DIRECTED BY THE ENGINEER, THE GUARD FENCE MAY BE FLARED AT A RATE OF 25:1 OR FLATTER.
 8. UNLESS OTHERWISE SHOWN IN THE PLANS, GUARD FENCE PLACED IN THE VICINITY OF CURBS SHALL BE POSITIONED SO THAT THE FACE OF CURB IS LOCATED DIRECTLY BELOW OR BEHIND THE FACE OF THE RAIL. RAIL PLACED OVER CURBS SHALL BE INSTALLED SO THAT THE POST BOLT IS LOCATED APPROXIMATELY 25 INCHES ABOVE THE GUTTER PAN OR EDGE OF SHOULDER.
 9. APPLICATIONS IN SOLID ROCK ARE ONLY ALLOWED WITH STEEL POSTS. IF SOLID ROCK IS ENCOUNTERED WITHIN 0 TO 18" OF THE FINISHED GRADE, DRILL A 24" DIA. HOLE, 24" INTO THE ROCK. IF SOLID ROCK IS ENCOUNTERED BELOW 18", DRILL A 12" DIA. HOLE, 12" INTO THE ROCK OR TO THE STANDARD EMBEDMENT DEPTH, WHICHEVER MAYBE LESS. ANY EXCESS POST LENGTH, AFTER MEETING THESE DEPTHS, MAY BE FIELD CUT TO ENSURE PROPER GUARDRAIL MOUNTING HEIGHT. BACKFILL WITH COARSE AGGREGATE MATERIAL.
 10. POSTS SHALL NOT BE SET IN CONCRETE, OF ANY DEPTH.
 11. SPECIAL FABRICATION WILL BE REQUIRED AT INSTALLATION LOCATIONS HAVING A CURVATURE OF LESS THAN 150 FT. RADIUS.
 12. UNLESS OTHERWISE SHOWN IN THE PLANS, A COMPOSITE MATERIAL BLOCK THAT MEETS THE REQUIREMENTS OF DMS-7210, "COMPOSITE MATERIAL POSTS AND BLOCKS FOR METAL BEAM GUARD FENCE" MAY BE SUBSTITUTED FOR BLOCKS OF SIMILAR DIMENSIONS. THE CONSTRUCTION DIVISION, TXDOT MAINTAINS A MATERIAL PRODUCER LIST (MPL) FOR PRODUCERS OF MATERIALS CONFORMING TO DMS-7210 ONLY PRODUCERS ON THE MPL MAY FURNISH COMPOSITE MATERIAL BLOCKS.
 13. FOR THE LOW FILL CULVERT OPTION, POSTS LOCATED PARTIALLY OR WHOLLY BETWEEN PRECAST BOX CULVERT UNITS, THE USE OF A CAST-IN-PLACE CONCRETE CLOSURE BETWEEN BOXES IS REQUIRED. THE LENGTH OF THE CAST-IN-PLACE CONCRETE CLOSURE SHALL ACCOMMODATE THE PLACEMENT OF THE LOW FILL CULVERT OPTION. SEE CONCRETE CLOSURE DETAILS ON BRIDGE STANDARD SCP-MD.
 14. GUARDRAIL HEIGHT MEASUREMENT: WHEN THE GUARDRAIL IS LOCATED ABOVE PAVEMENT, MEASURE THE HEIGHT FROM THE PAVEMENT TO THE TOP OF THE W-BEAM RAIL. WHEN THE GUARDRAIL IS LOCATED UP TO 2 FT. OFF OF THE EDGE OF PAVEMENT OR FOR A PAVEMENT OVERLAY, USE A 10-FOOT STRAIGHTEDGE TO EXTEND THE PAVEMENT/SHOULDER SLOPE TO THE BACK OF RAIL, MEASURE FROM THE BOTTOM OF STRAIGHTEDGE TO THE TOP OF RAIL. FOR GUARDRAIL LOCATED DOWN A 10:1 SLOPE, MEASURE FROM THE NOMINAL TERRAIN.

* POST(S) MAY REQUIRE FIELD MODIFICATION TO ENSURE PROPER GUARDRAIL HEIGHT.



LOW FILL CULVERT POST

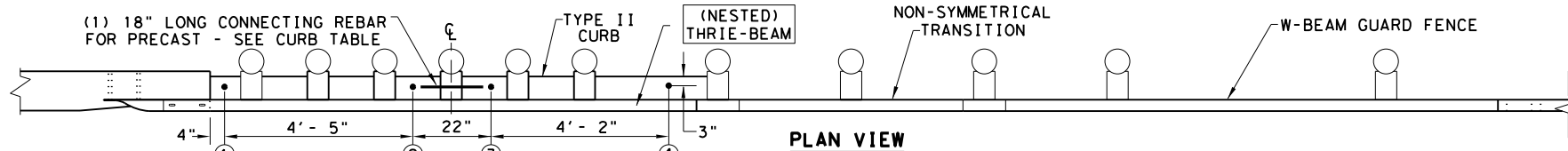
NOTE: TWO INSTALLATION OPTIONS.

1. **BOLT-THROUGH OPTION:** REQUIRES A 6" MIN. SLAB THICKNESS. 3/8" DIA (ASTM A449) HEAVY HEX BOLTS WITH TWO HARDENED WASHER EACH AND HEAVY HEX NUTS. NOTE: BOLT LENGTH = SLAB PLUS 2 1/4" MIN.
2. **EPOXY ANCHOR OPTION:** THIS OPTION MAY ONLY BE USED IF THE CULVERT SLAB IS 9" MIN. THICK. THREADED ANCHOR RODS MUST BE 3/8" DIA. ASTM A449 OR A193 GRADE B7 WITH HEAVY HEX NUT, AND ONE HARDENED WASHER EACH. EMBED ANCHOR RODS 6" WITH HILTI HIT RE 500 EPOXY ADHESIVE. OTHER TYPE III CLASS C EPOXY ADHESIVES MEETING THE REQUIREMENTS OF DMS-6100, "EPOXIES AND ADHESIVES", MAY BE USED IF IT CAN BE DEMONSTRATED THAT THEY MEET OR EXCEED THE STRENGTH OF HILTI HIT RE 500 WITH THE SAME EMBEDMENT DEPTH AND THREADED ROD DIA. FOLLOW THE MANUFACTURER'S REQUIREMENTS FOR INSTALLING EPOXIED THREADED RODS. EXTEND RODS 1/4" MIN. BEYOND NUT.

NOTE: CULVERTS OF 25 FT. OR LESS, SEE GF(31)LS STANDARD FOR "LONG SPAN" OPTION.

				Design Division Standard
METAL BEAM GUARD FENCE TL-3 MASH COMPLIANT GF(31)-19				
FILE: gf3119.dgn	DN: TxDOT	CK: KM	DW: VP	CK: CGL/AG
© TXDOT: NOVEMBER 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0435	01	080	FM 38
	DIST	COUNTY		SHEET NO.
	PAR	LAMAR		46

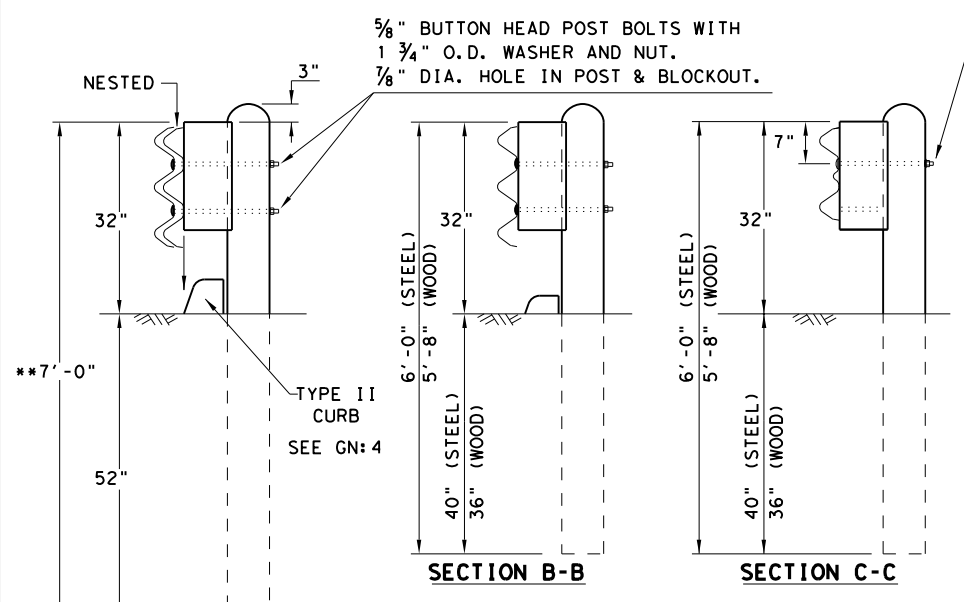
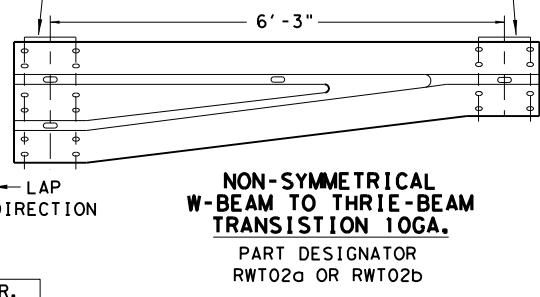
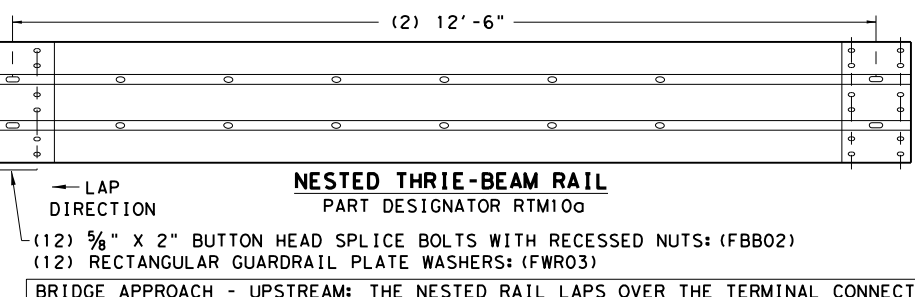
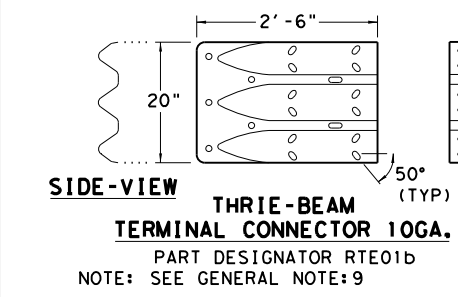
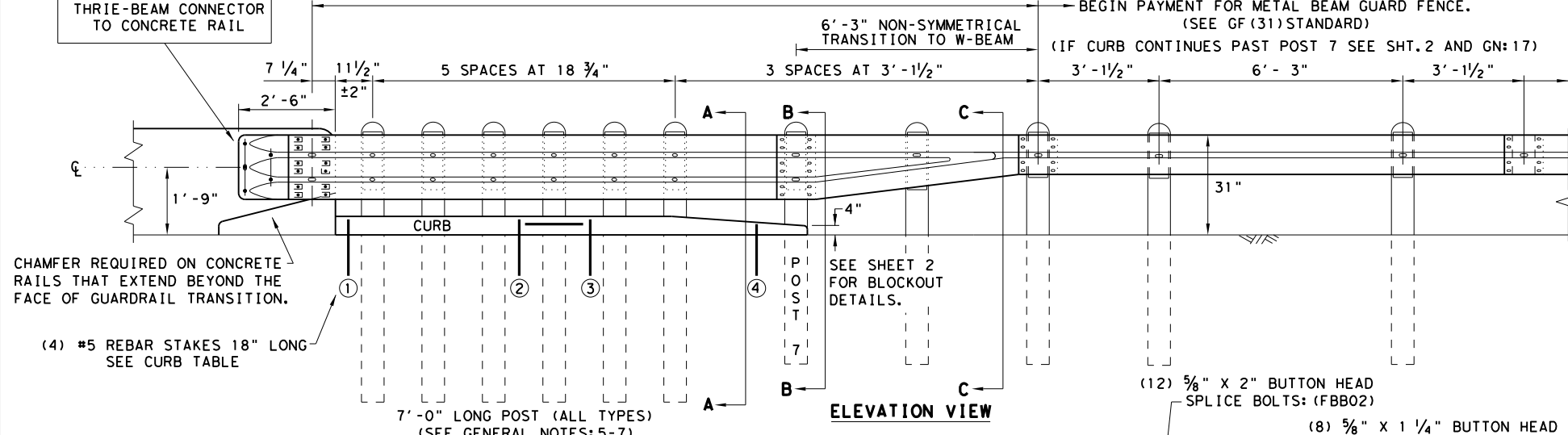
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- (5) 1" DIA. HOLES.
- (5) 7/8" DIA. HEAVY HEX HEAD BOLTS (FACING TRAFFIC SIDE) (ASTM F3125 GR A325 OR A449).
- (10) 1 3/4" O.D. WASHER UNDER EACH HEX BOLT HEAD AND NUT.
- (5) 7/8" DIA. HEAVY HEX NUTS (ASTM A194 OR A563).

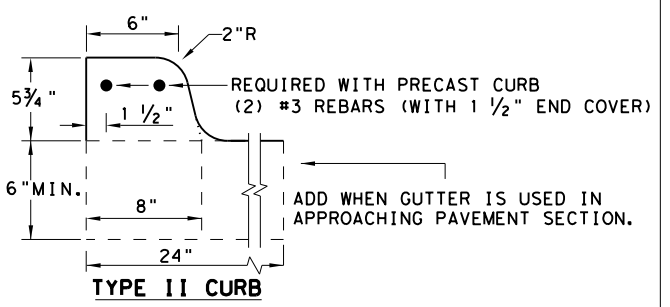
NOTE:
HEAVY HEX BOLT LENGTH WILL VARY DEPENDING ON WIDTH CONCRETE RAIL, LEAVE 1" OF BOLT LENGTH PAST THE 7/8" HEX NUT. TRIM AS REQUIRED.

NOTE:
CURB IS A REQUIRED COMPONENT FOR THE TRANSITION TO FUNCTION PROPERLY. SEE GENERAL NOTES: 2-4 AND 16-17.



THRIE-BEAM TERMINAL - CURB TABLE	
PRECAST CURB FULL LENGTH EQUALS 12'- 2"	
THE PRECAST CURB MAY BE FORMED INTO TWO SECTIONS.	
CURB (1) LENGTH	5'- 8"
CURB (2) LENGTH	6'- 6"
TAPER CURB (2) TO A HEIGHT OF 4" AT POST 7	
CONNECTING PRECAST CURB SECTIONS (1) & (2):	
FORM OR CORE	1" DIA. HOLE 9" LONG INTO EACH CURB END.
USE	(1) #5 GR.60 REBAR 18" LONG TO CONNECT BOTH CURBS.
SECURING PRECAST OR CAST-IN-PLACE TO FINISHED GRADE *:	
FORM OR CORE	(4) 1" DIA. HOLES, SEE PLAN AND ELEVATION VIEWS FOR HOLE LOCATIONS. DRIVE (4) #5 GR.60 REBAR STAKES 18" LONG INTO THE GROUND AND 1/2" BELOW TOP OF CURB.
	FILL HOLES WITH APPROVED GROUT MIXTURE.

* NOTES: NOT NEEDED FOR CAST-IN-PLACE. SEE TYPE II CURB DETAIL FOR REBAR AND COVER REQUIREMENTS. PERCUSSION DRILLING IS NOT PERMITTED WITH: TYPE II CURB, BRIDGE RAIL OR CONCRETE TRAFFIC RAIL.



NOTE: OPTIONS FOR TYPE II CURB:
1. PRECAST
2. CAST-IN-PLACE

GENERAL NOTES

1. CONTACT THE DESIGN DIVISION FOR DRAINAGE CUT OUT OPTIONS NEEDED WITHIN THE CURB SECTION OF THE THRIE-BEAM TRANSITION. (512) 416-2678
2. CONCRETE CURB MAY BE CAST-IN-PLACE OR PRECAST AS SHOWN ON THIS SHEET. WHEN USED IN CONJUNCTION WITH THE THRIE-BEAM TRANSITIONS, CURB SHALL BE TYPE II (5- 3/4" HEIGHT); SEE CURRENT CCGG STANDARD SHEET FOR FURTHER DETAILS. IF OTHER CURB HEIGHTS ARE SHOWN IN THE PLANS IN CONJUNCTION WITH THE TRANSITION, THE CURB HEIGHT MAY BE FROM 4" TO 8" WITH A RELATIVELY VERTICAL FACE. CONCRETE CURB SHALL BE CONTINUOUS TO THE SEVENTH POST UNLESS OTHERWISE SHOWN IN THE PLANS. SEE GENERAL NOTE:17 FOR CIRCUMSTANCES WHERE CURB CONTINUES PAST POST 7.
3. CONCRETE CURB TYPE II SUBSIDIARY TO "METAL BEAM GUARD FENCE TRANSITION". IF NO ADDITIONAL CURB IS INDICATED BEYOND THE TRANSITION, THEN ANY CURB HEIGHT GREATER THAN 4" WILL BE TAPERED DOWN BEGINNING AT THE LAST 7 FT. POST TO A MAXIMUM HEIGHT OF 4" AT POST 7. IF SHOWN ELSEWHERE IN THE PLANS, ADDITIONAL CURB UNDERNEATH GUARDRAIL WILL BE PAID FOR BY THE LINEAR FOOT.
4. UNLESS OTHERWISE SHOWN IN THE PLANS, TRANSITIONS SHALL BE PLACED WITH THE BLOCKOUT FACE IN FRONT OF OR DIRECTLY ABOVE THE CURB FACE. SEE SECTION A-A.
5. FOR ROUND WOOD POST SYSTEMS, ALL ROUND WOOD POSTS SHALL BE 7 1/2" DIA. MINIMUM THROUGHOUT THE THRIE-BEAM TRANSITION.
6. THE TYPE OF POST (ROUND WOOD POST, RECTANGULAR WOOD POST OR STEEL POST) WILL BE AS SHOWN IN THE PLANS. REFER TO GF (31) STANDARD SHEET.
7. THE POST LENGTH SHALL BE MARKED ON ALL 7'- 0" LONG POSTS BY THE MANUFACTURER. THE MARK SHALL BE LOCATED WITHIN THE TOP 1 FT. REGION OF THE POST, AT LEAST 5/8" IN HEIGHT, AND VISIBLE AFTER INSTALLATION. WOODEN POSTS SHALL BE MARKED WITH A BRAND, AND STEEL POSTS WITH A STENCIL BEFORE GALVANIZING.
8. POSTS SHALL NOT BE SET IN CONCRETE, OF ANY DEPTH.
9. RAIL ELEMENTS SHALL MEET THE REQUIREMENTS OF ITEM 540, "METAL BEAM GUARD FENCE" EXCEPT AS MODIFIED ON THE PLANS. THE THRIE-BEAM TERMINAL CONNECTOR AND THE THRIE-BEAM TRANSITION TO W-BEAM SHALL BE OF THE SAME MATERIAL, BUT SHALL NOT BE LESS THAN 10 GAUGE. CONTRACTOR SHALL VERIFY THAT THE LOCATIONS OF BOLT HOLES MATCH THOSE IN THE THRIE-BEAM TERMINAL CONNECTOR PRIOR TO ORDERING MATERIALS.
10. BUTTON HEAD "POST BOLTS & NUTS" SHALL MEET THE REQUIREMENTS OF (ASTM A307), AND SHALL BE OF SUFFICIENT LENGTH TO EXTEND THROUGH THE FULL THICKNESS OF THE NUT AND 5/8" WASHER (FWC16G) AND NOT MORE THAN 1" BEYOND IT. TRIM REMAINING BOLT LENGTH TO MEET REQUIRED LENGTH.
11. FITTINGS (BOLTS, NUTS, AND WASHERS) SHALL BE GALVANIZED IN ACCORDANCE WITH ITEM 445, "GALVANIZING". FITTINGS SHALL BE SUBSIDIARY TO THE BID ITEM.
12. CROWN SHALL BE WIDENED TO ACCOMMODATE TRANSITIONS.
13. WHERE SOLID ROCK IS ENCOUNTERED, CONTACT THE DESIGN DIVISION FOR ADDITIONAL GUIDANCE. (512) 416-2678
14. UNLESS OTHERWISE SHOWN IN THE PLANS, A COMPOSITE MATERIAL BLOCK THAT MEETS THE REQUIREMENTS OF DMS-7210, "COMPOSITE MATERIAL POSTS AND BLOCKS FOR METAL BEAM GUARD FENCE" MAY BE SUBSTITUTED FOR BLOCKS OF SIMILAR DIMENSIONS. TXDOT'S MATERIALS AND TESTS DIVISION MAINTAINS A MATERIAL PRODUCER LIST (MPL) FOR PRODUCERS OF MATERIALS CONFORMING TO DMS-7210. ONLY PRODUCERS ON THE MPL CAN FURNISH COMPOSITE MATERIAL BLOCKS.
15. REFER TO GF (31) STANDARD SHEET & BRIDGE RAILING DETAILS FOR ADDITIONAL DETAILS.
16. THE INSTALLATION OF THE TYPE II CURB IS CRITICAL FOR THE PERFORMANCE OF THE THRIE-BEAM TRANSITION SYSTEM. THE CURB PREVENTS (VEHICLE WHEEL SNAGGING) AT THE CONCRETE RAIL AND IS REQUIRED TO MEET MASH CRASH TEST CRITERIA.
17. IF CURB EXTENDS BEYOND POST 7, 25' OF NESTED W-BEAM GUARDRAIL SHALL BE INSTALLED BEYOND THE PAY LIMITS OF THRIE-BEAM TRANSITION SECTION, (SEE SHT.2). PAYMENT FOR THIS 25' SECTION WILL BE BY LINEAR FOOT, PAY ITEM "0540 6XXX MTL W-BEAM GD FEN (NESTED) (TIM POST)" OR "540 6XXX MTL W-BEAM GD FEN (NESTED) (STEEL POST)" AS APPLICABLE FOR POST TYPE. SEE SHT.2 FOR ADDITIONAL INFORMATION.

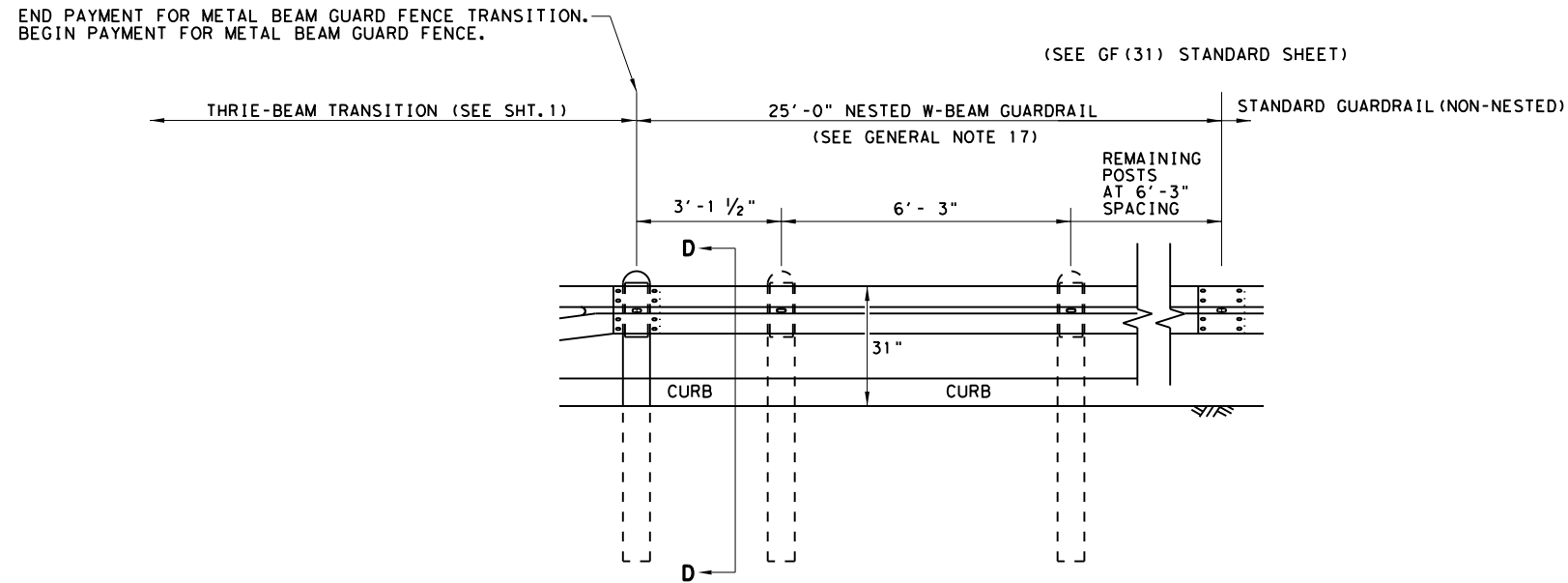
**HIGH-SPEED TRANSITION
SHEET 1 OF 2**

		Design Division Standard	
METAL BEAM GUARD FENCE THRIE-BEAM TRANSITION TL-3 MASH COMPLIANT			
GF (31) TR TL3-20			
FILE: g31tr+1320.dgn	DN: TxDOT	CK: KM	DW: VP
© TXDOT: NOVEMBER 2020	CONT	SECT	JOB
REVISIONS	0435	01	080
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			47

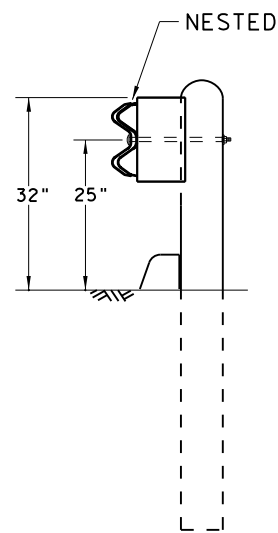
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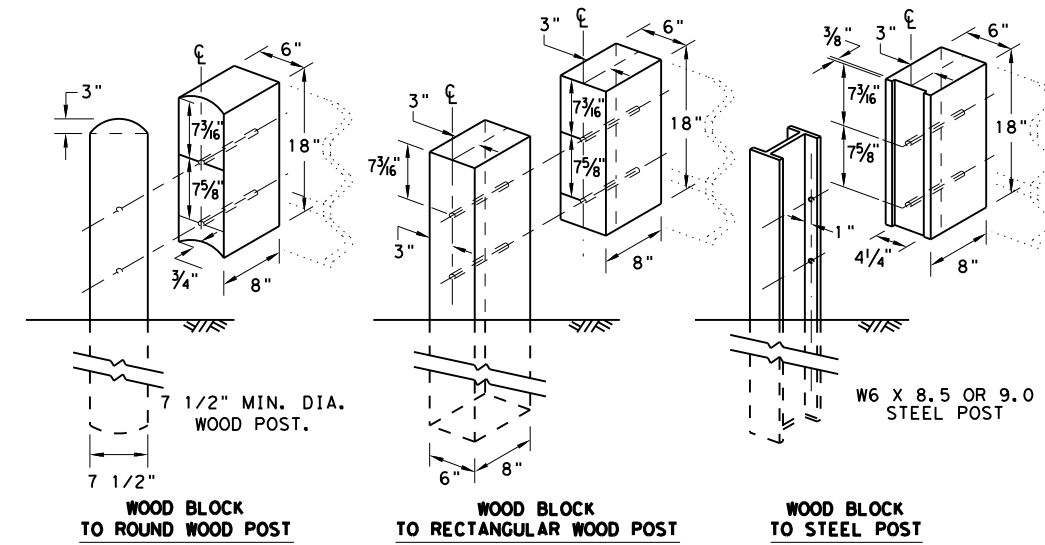
REQUIRED ALTERNATIVE FOR CONTINUOUS CURB EXTENDING PAST POST 7 (SEE SHT. 1 GENERAL NOTE 17)



ELEVATION VIEW



SECTION D-D



THREE BEAM TRANSITION BLOCKOUT DETAILS

HIGH-SPEED TRANSITION

SHEET 2 OF 2

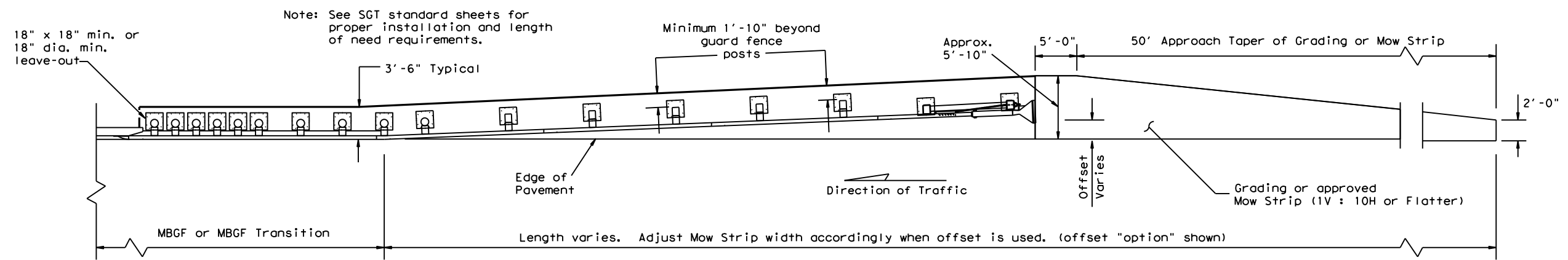


METAL BEAM GUARD FENCE
 THREE-BEAM TRANSITION
 TL-3 MASH COMPLIANT
 GF (31) TR TL3-20

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©TXDOT: NOVEMBER 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0435	01	080	FM 38
	DIST	COUNTY	SHEET NO.	
	PAR	LAMAR	48	

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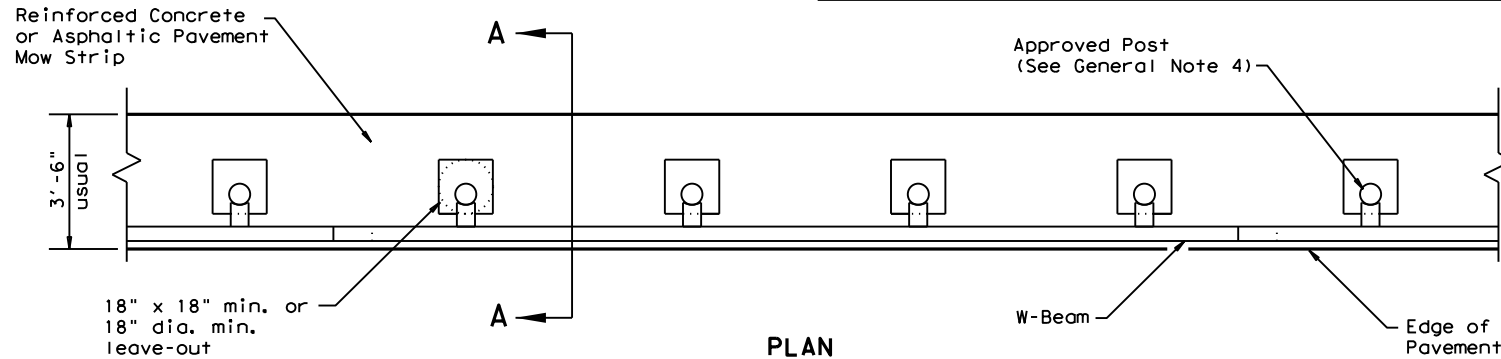
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Note: See SGT standard sheets for proper installation and length of need requirements.

GRADING AND MOW STRIP AT GUARDRAIL END TREATMENTS

Note: Site Condition(s)
 Site conditions may exist where grading is required for the proper installation of metal guard fence and end treatments.
 Approach grading or mow strip may be decreased or eliminated, as directed by the Engineer.

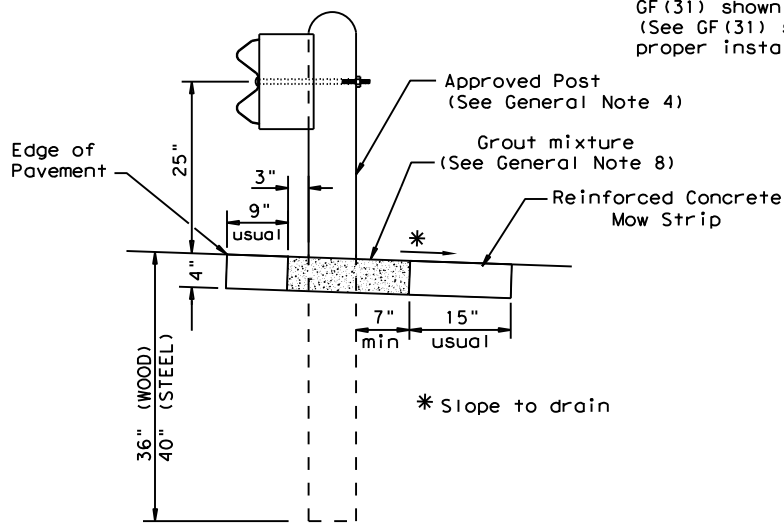


PLAN

GF(31) shown with Mow Strip
 (See GF(31) standard sheet for proper installation)

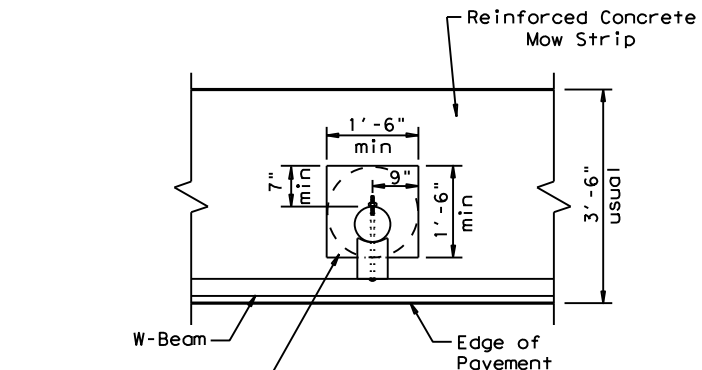
GENERAL NOTES

1. This mow strip design is for use with metal beam guard fence, guard fence transitions, and guard fence end treatments. See applicable GF(31) MBGF or GF(31) Transition Standard sheet for additional information.
2. Mow strips shall be reinforced concrete with (wire mesh or synthetic fiber), as shown on the plans and will be paid for under the pertinent bid item. Reinforced concrete shall be placed in accordance with Item 432, "Riprap." The use of the synthetic fiber in lieu of steel reinforcing is acceptable, provided the fiber producer is on the Department Material Producer List (MPL), maintained by TxDOT, Construction Division.
3. The leave-out behind the post shall be a minimum of 7".
4. Only steel (W6 x 8.5 or W6 x 9.0), or 7 1/2" Dia. round wood posts are acceptable for use in the mow strip. See GF(31) Standard for additional details.
5. Other curb placement options may be used. Curbs are not considered part of the mow strip and will be paid for under other pertinent bid item.
6. Thickness of the mow strip will be 4".
7. The limits of payment for reinforced concrete will include leave-outs for the posts.
8. The leave-outs shall be filled with a Grout mixture consisting of: 2719 pounds sand, 188 pounds Type I or II cement, and 550 pounds of water per cubic yard, with a 28-day compressive strength of approximately 230 psi or less. Provide grout with a consistency that will flow into and completely fill all voids. Due to auger size, larger leave-out dimensions are acceptable from both an impact performance and maintenance repair standpoint (Suggested Maximum leave-out of 20"). Payment for furnishing and placing the grout mixture will be subsidiary to the pay item of riprap mow strip.



SECTION A-A

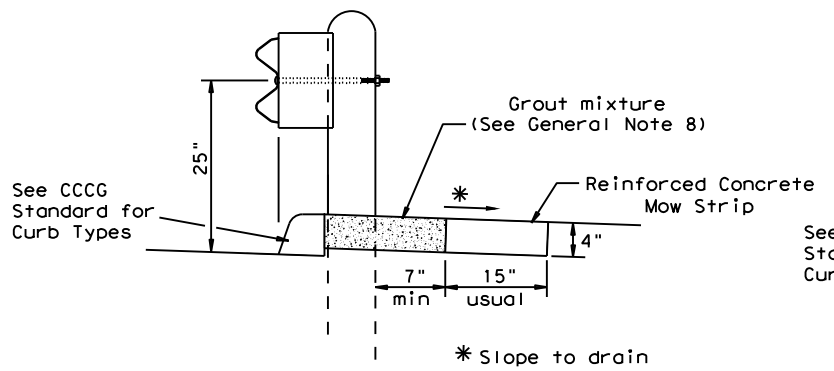
Typical



MOW STRIP DETAIL

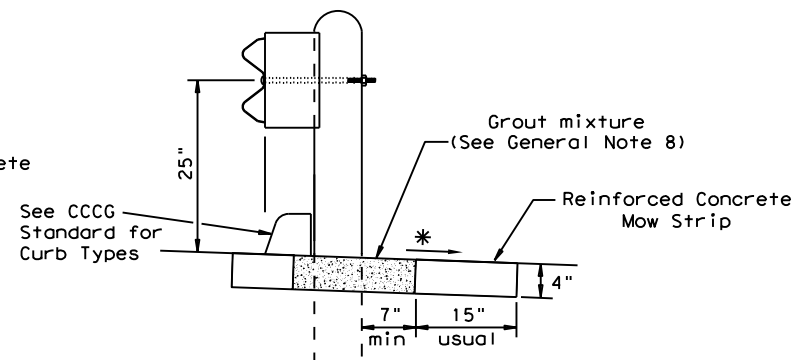
Reinforced Concrete Mow Strip with 18" x 18" Square or 18" Dia. minimum leave-out.

Fill leave-out with Grout mixture (See General Note 8)



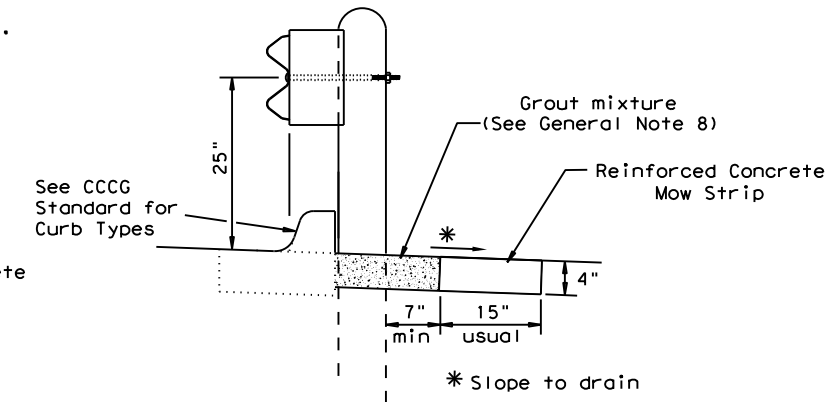
CURB OPTION (1)

This option will increase the post embedment throughout the system.



CURB OPTION (2)

Curb shown on top of mow strip

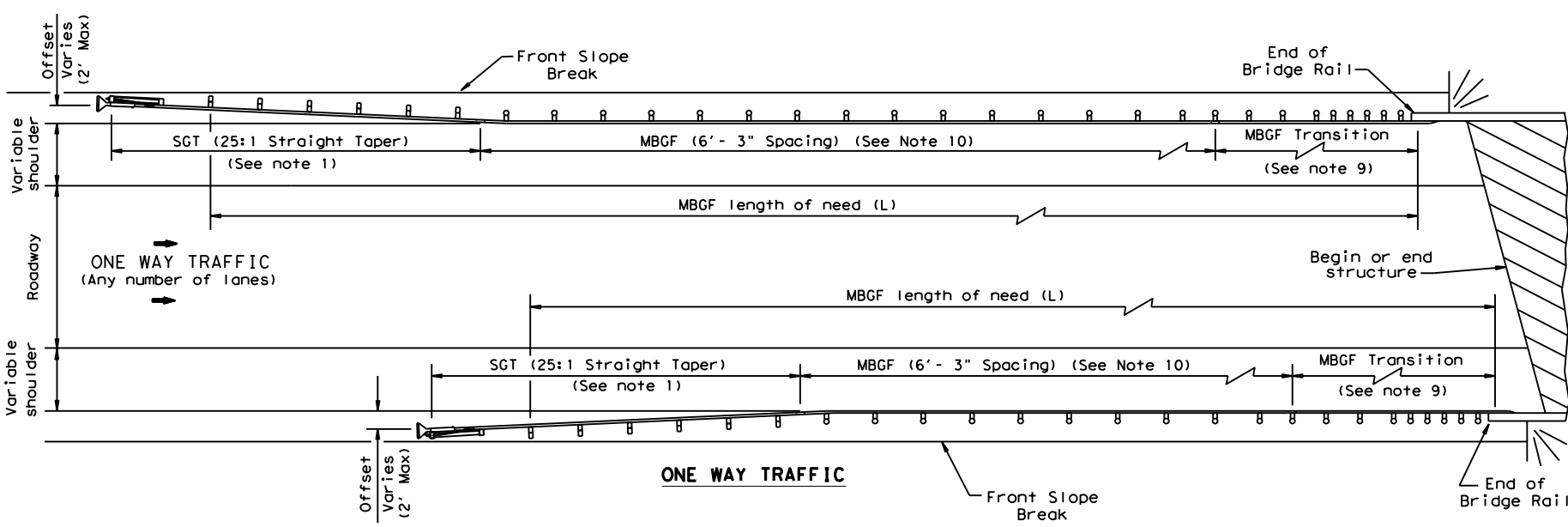
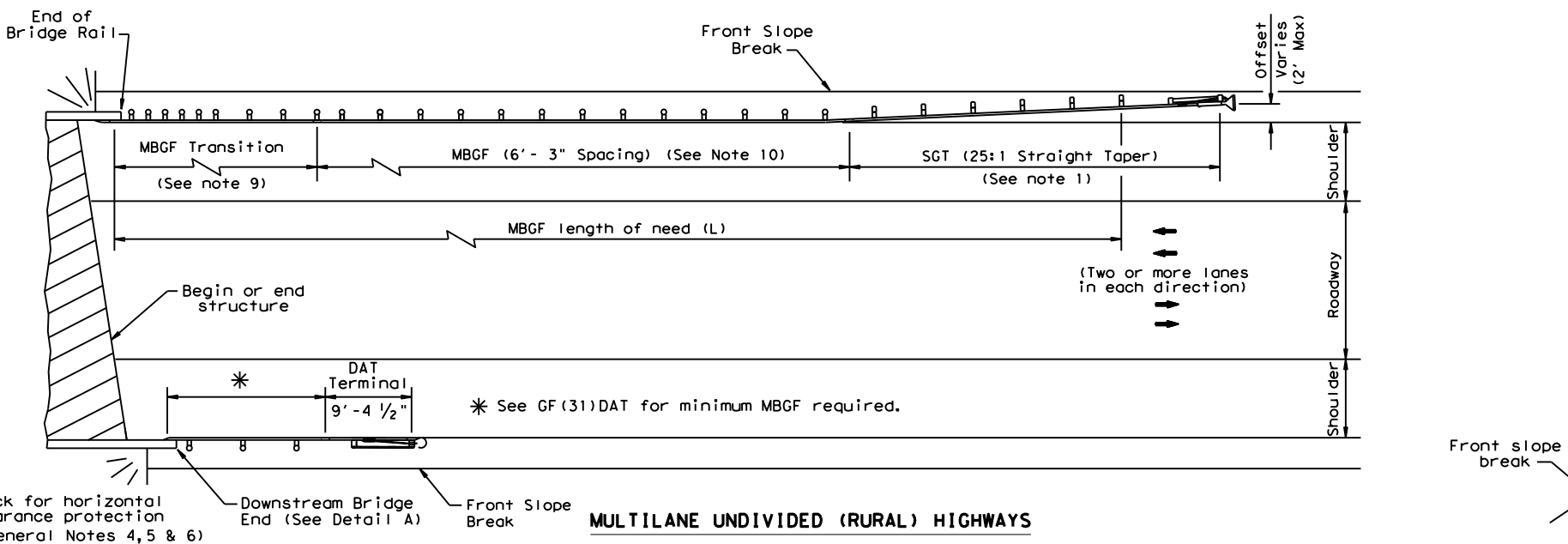
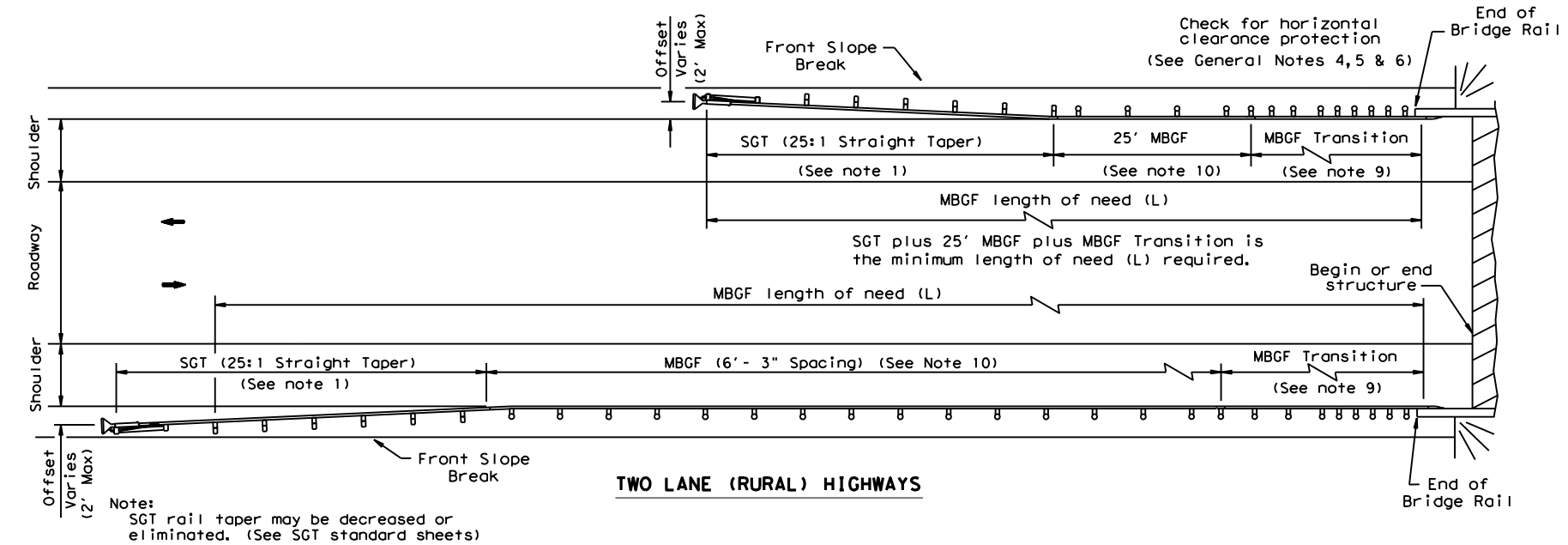


CURB OPTION (3)

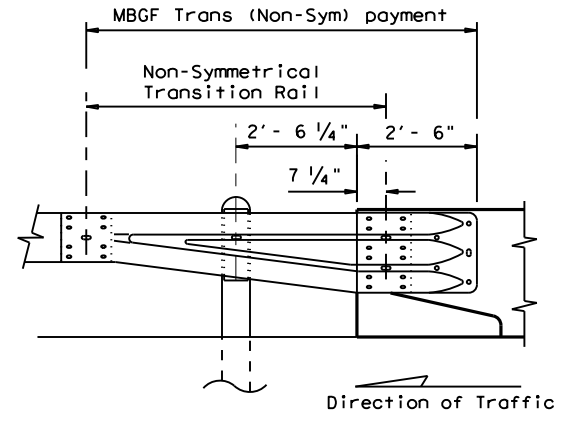
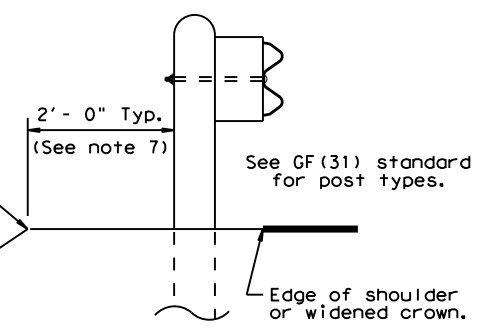
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METAL BEAM GUARD FENCE (MOW STRIP) TL-3 MASH COMPLIANT GF(31)MS-19			
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©TXDOT: NOVEMBER 2019	CONT	SECT	JOB
REVISIONS	0435 01	080	FM 38
	DIST	COUNTY	SHEET NO.
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- GENERAL NOTES**
- For more detail: See GF(31), SGT()31, GF(31)TR, and GF(31)TL2 standard sheets.
 - Quantities of metal beam guard fence (MBSG) at individual bridge ends are as shown in the plans.
 - Use average daily traffic (ADT) for the current year to determine MBSG length of need in accordance with the Roadway Design Manual unless otherwise specified. Where significant traffic volume growth is anticipated on low volume (0-750 ADT) highways, use length determinations for the higher volume category.
 - MBSG may not be required to shield departure end of bridge unless other obstacles within the horizontal clearance limits or opposing traffic indicate a MBSG consideration.
 - Downstream anchor terminals (DAT) are only for downstream end anchorage use, outside the horizontal clearance area of opposing traffic.
 - Direct connection of MBSG to concrete rails are only for downstream rail connections outside the horizontal clearance area of opposing traffic. (This requires a minimum of three standard line posts plus the DAT terminal, See Detail A)
 - The crown shall be widened to accommodate MBSG. Typically the "front slope" break should be 2'-0" from the back of the MBSG post. This applies to new construction on new alignment or where existing roadway cross section is to be widened to increase roadway width. This does not apply to rehabilitation work where existing roadway crown width is to be retained (See Typical Cross Section at MBSG).
 - For restrictive bridge widths: The MBSG should be properly transitioned from the existing bridge rail to the adjoining MBSG (See MBSG Transition Standards). Metal beam guard fence at these bridge location(s) shall be flared at the rate of 25:1 or flatter, and be of the length necessary to locate the terminal end at the 2 ft. "maximum" offset from the shoulder edge in the approach direction.
 - Transition length and post spacing will vary depending on the transition type. Transition type will be shown elsewhere in the plans.
 - A minimum 25' length of MBSG will be required.



Note: All rail elements shall be lapped in the direction of adjacent traffic.

Texas Department of Transportation

BRIDGE END DETAILS
(METAL BEAM GUARD FENCE APPLICATIONS TO RIGID RAILS)

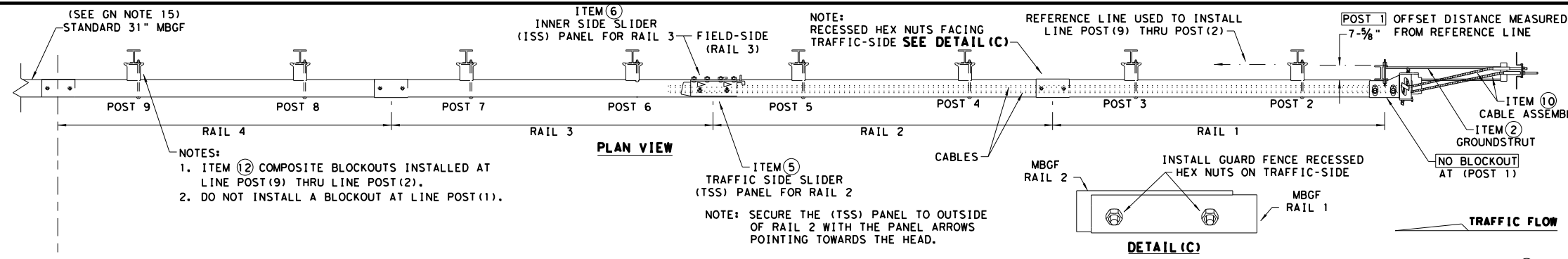
BED-14

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REVISED APRIL 2014 SEE (MEMO 0414)	DIST	COUNTY	SHEET NO.	
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Design Division Standard

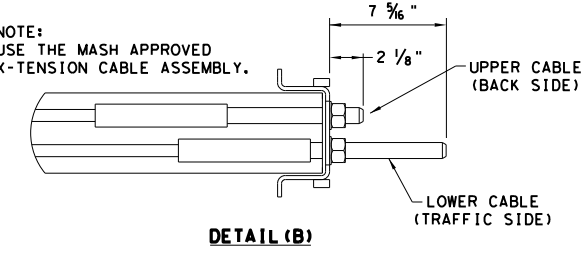
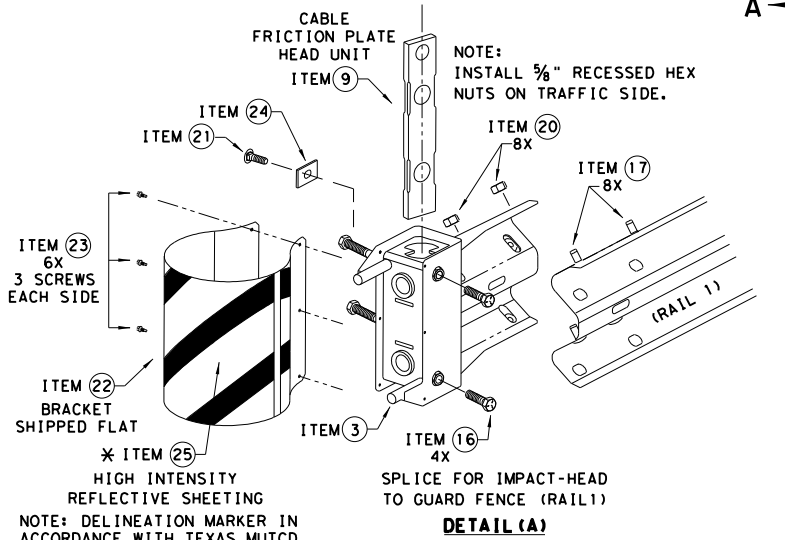
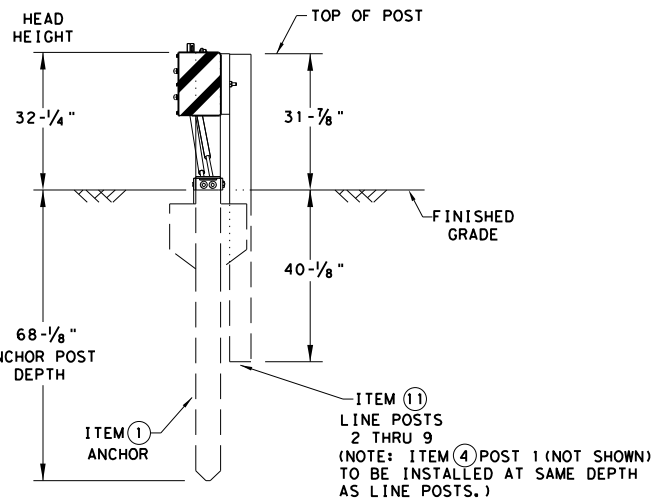
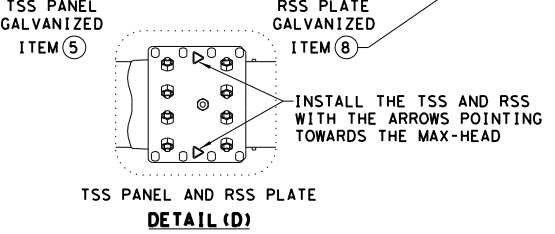
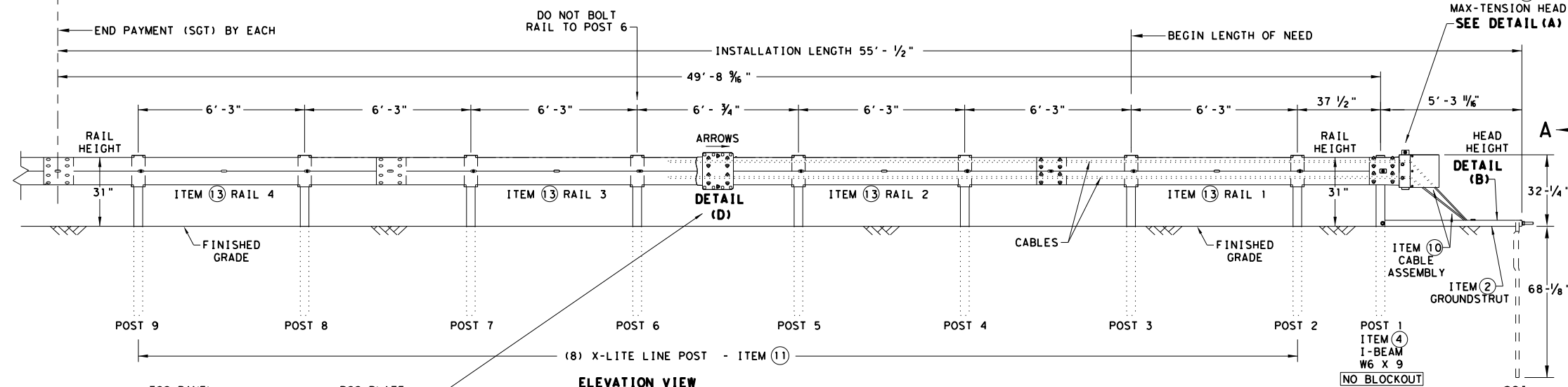
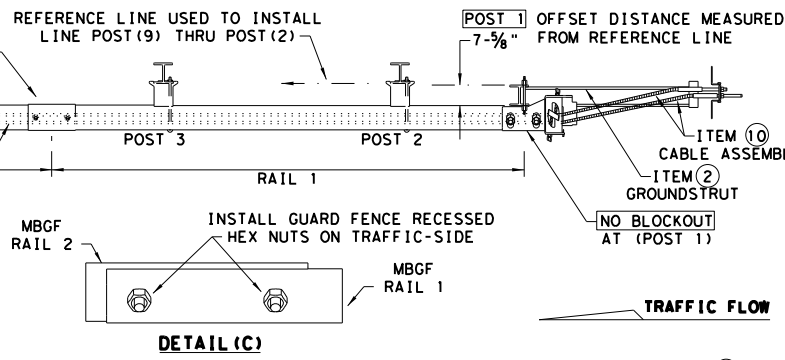
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NOTES:
 1. ITEM 2 COMPOSITE BLOCKOUTS INSTALLED AT LINE POST (9) THRU LINE POST (2).
 2. DO NOT INSTALL A BLOCKOUT AT LINE POST (1).

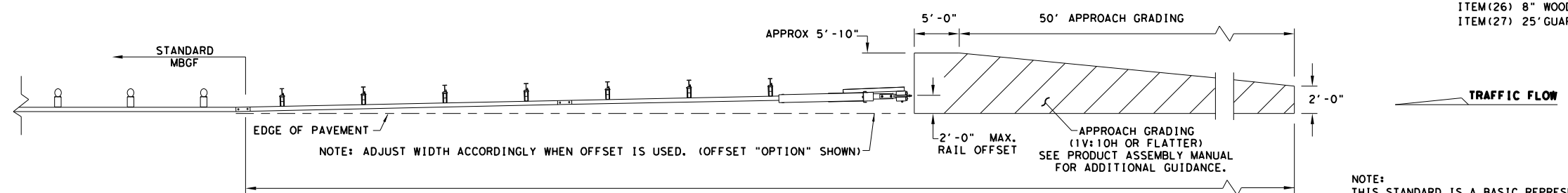
NOTE: SECURE THE (TSS) PANEL TO OUTSIDE OF RAIL 2 WITH THE PANEL ARROWS POINTING TOWARDS THE HEAD.



- GENERAL NOTES**
- FOR SPECIFIC INFORMATION REGARDING INSTALLATION AND TECHNICAL GUIDANCE OF THE SYSTEM, CONTACT: LINDSAY TRANSPORTATION SOLUTIONS (LTS) - BARRIER SYSTEMS, INC. AT (707) 374-6800
 - FOR INSTALLATION, REPAIR, & MAINTENANCE REFER TO THE MAX-TENSION INSTALLATION INSTRUCTION MANUAL, P/N MANMAX REV D (ECN 3516).
 - APPLY HIGH INTENSITY REFLECTIVE SHEETING, "OBJECT MARKER" ON THE FRONT FACE OF THE DEVICE PER MANUFACTURER'S RECOMMENDATIONS. OBJECT MARKER SHALL CONFORM TO THE STANDARDS REQUIRED IN TEXAS MUTCD.
 - FOR POST (LEAVE-OUT) INSTALLATION AND GUIDANCE SEE TxDOT'S LATEST ROADWAY MOW STRIP STANDARD.
 - ALL STEEL COMPONENTS ARE GALVANIZED PER ASTM A123 OR EQUIVALENT UNLESS OTHERWISE STATED.
 - SYSTEM SHOWN USING STEEL WIDE FLANGE POST WITH COMPOSITE BLOCKOUTS.
 - COMPOSITE MATERIAL BLOCKOUT THAT MEETS THE REQUIREMENTS OF DMS-7210, MAY BE SUBSTITUTED FOR BLOCKOUTS SIMILAR DIMENSIONS. SEE CONSTRUCTION DIVISION MATERIAL PRODUCER LIST (MPL) FOR CERTIFIED PRODUCERS.
 - REFER TO INSTALLATION MANUAL FOR SPECIFIC PANEL LAPPING GUIDANCE.
 - IF SOLID ROCK IS ENCOUNTERED SEE THE MANUFACTURER'S INSTALLATION MANUAL FOR INSTALLATION GUIDANCE.
 - POSTS SHALL NOT BE SET IN CONCRETE.
 - A DRIVING CAP WITH A TIMBER OR PLASTIC INSERT SHALL BE USED WHEN DRIVING POST TO PREVENT DAMAGE TO THE GALVANIZING ON TOP OF THE POST.
 - MAX-TENSION SYSTEM SHALL NEVER BE INSTALLED WITHIN A CURVED SECTION OF GUARDRAIL.
 - IF A DELINEATION MARKER IS REQUIRED, MARKER SHALL BE IN ACCORDANCE WITH TEXAS MUTCD.
 - THE SYSTEM IS SHOWN WITH 12'-6" MBGF PANELS, 25'-0" MBGF PANELS ARE ALSO ALLOWED.
 - A MINIMUM OF 12'-6" OF 12GA. MBGF IS REQUIRED IMMEDIATELY DOWNSTREAM OF THE MAX-TENSION SYSTEM.

ITEM #	PART NUMBER	DESCRIPTION	QTY
1	BSI-1610060-00	SOIL ANCHOR - GALVANIZED	1
2	BSI-1610061-00	GROUND STRUT - GALVANIZED	1
3	BSI-1610062-00	MAX-TENSION IMPACT HEAD	1
4	BSI-1610063-00	W6x9 I-BEAM POST 6FT.-GALVANIZED	1
5	BSI-1610064-00	TSS PANEL - TRAFFIC SIDE SLIDER	1
6	BSI-1610065-00	ISS PANEL - INNER SIDE SLIDER	1
7	BSI-1610066-00	TOOTH - GEOMET	1
8	BSI-1610067-00	RSS PLATE - REAR SIDE SLIDER	1
9	B061058	CABLE FRICTION PLATE - HEAD UNIT	1
10	BSI-1610069-00	CABLE ASSEMBLY - MASH X-TENSION	2
11	BSI-1012078-00	X-LITE LINE POST-GALVANIZED	8
12	B090534	8" W-BEAM COMPOSITE-BLOCKOUT XT110	8
13	BSI-4004386	12'-6" W-BEAM GUARD FENCE PANELS 12GA.	4
14	BSI-1102027-00	X-LITE SQUARE WASHER	1
15	BSI-2001886	5/8" X 7" THREAD BOLT HH (GR.5)GEOMET	1
16	BSI-2001885	3/4" X 3" ALL-THREAD BOLT HH (GR.5)GEOMET	4
17	4001115	5/8" X 1 1/4" GUARD FENCE BOLTS (GR.2)MGAL	48
18	2001840	5/8" X 10" GUARD FENCE BOLTS MGAL	8
19	2001636	5/8" WASHER F436 STRUCTURAL MGAL	2
20	4001116	5/8" RECESSED GUARD FENCE NUT (GR.2)MGAL	59
21	BSI-2001888	5/8" X 2" ALL THREAD BOLT (GR.5)GEOMET	1
22	BSI-1701063-00	DELINEATION MOUNTING (BRACKET)	1
23	BSI-2001887	1/4" X 3/4" SCREW SD HH 410SS	7
24	4002051	GUARDRAIL WASHER RECT AASHTO FWRO3	1
25	SEE NOTE BELOW	HIGH INTENSITY REFLECTIVE SHEETING	1
26	4002337	8" W-BEAM TIMBER-BLOCKOUT, PDB01B	8
27	BSI-4004431	25' W-BEAM GUARDRAIL PANEL, 8-SPACE, 12GA.	2
28	MANMAX Rev-(D)	MAX-TENSION INSTALLATION INSTRUCTIONS	1

* TO BE PROVIDED BY DISTRIBUTOR OR CONTRACTOR.
 ** ALTERNATIVE ITEMS NOT SHOWN.
 ITEM (26) 8" WOOD-BLOCKOUTS
 ITEM (27) 25' GUARD FENCE PANELS



NOTE: TxDOT GENERIC APPROACH GRADING LAYOUT USED FOR ALL TANGENT TYPE END TREATMENTS.

APPROACH GRADING AT GUARDRAIL END TREATMENTS

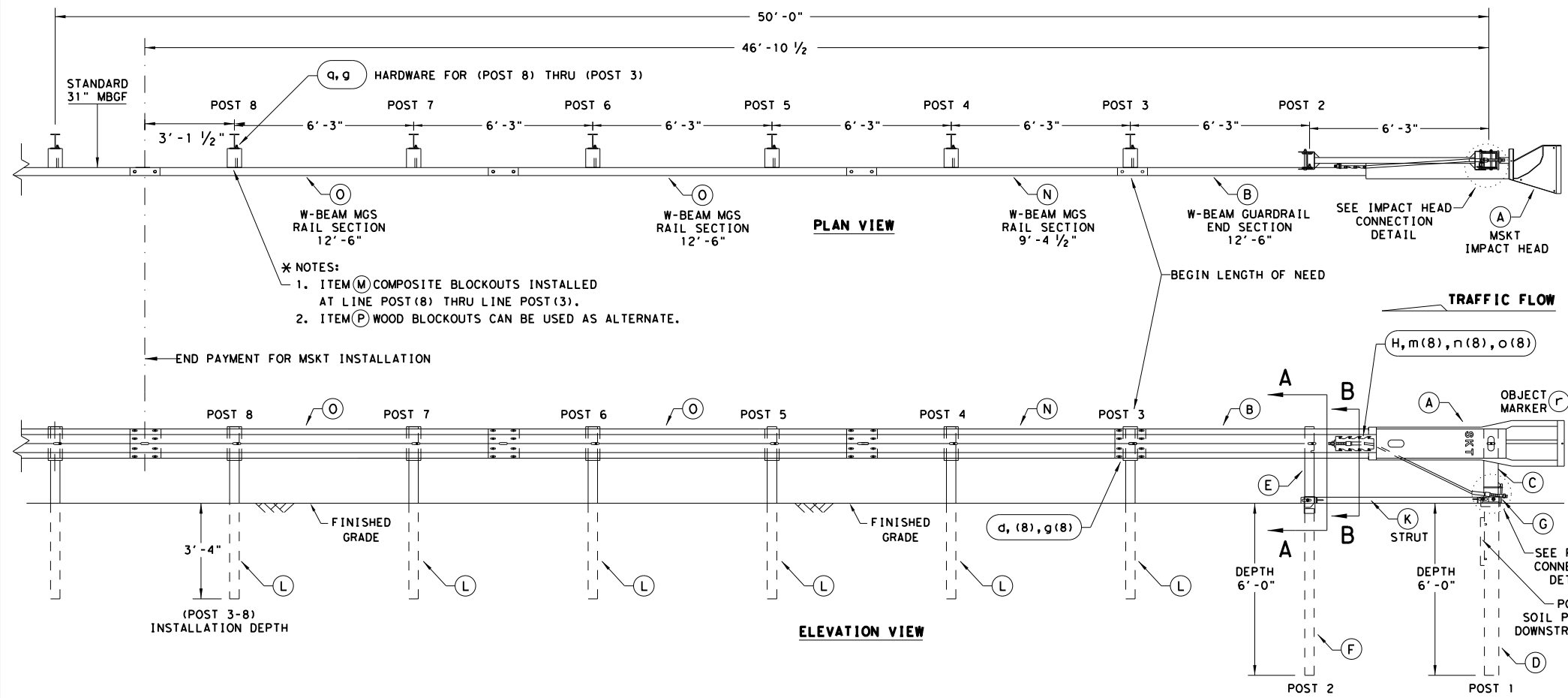
NOTE: THIS STANDARD IS A BASIC REPRESENTATION OF THE MAX-TENSION END TERMINAL, IT IS NOT INTENDED TO REPLACE THE PRODUCT DESCRIPTION ASSEMBLY MANUAL.

Texas Department of Transportation
 Design Division Standard

MAX-TENSION END TERMINAL
MASH - TL-3
SGT (11S) 31-18

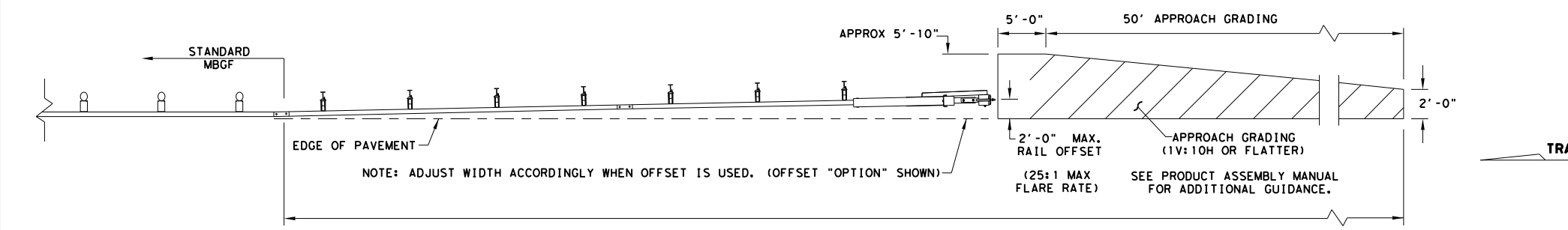
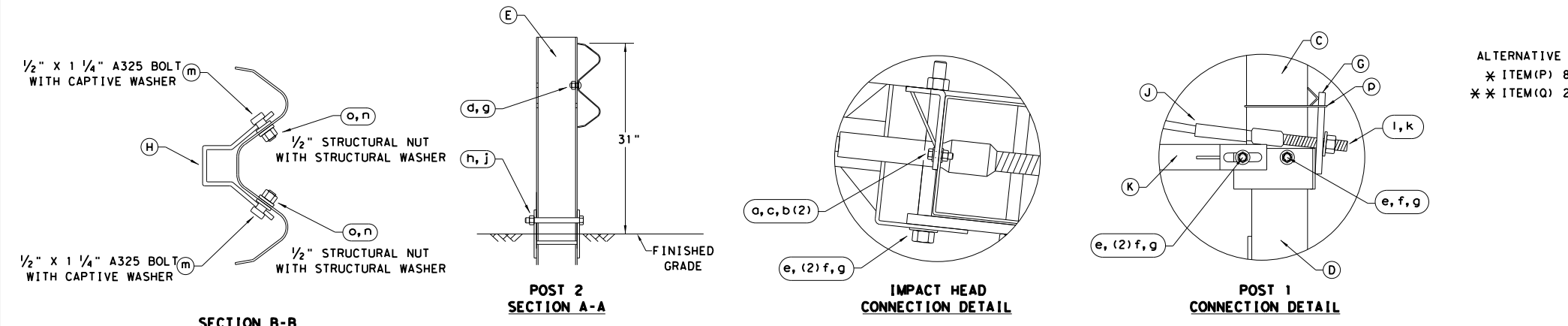
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- GENERAL NOTES**
- FOR SPECIFIC INFORMATION REGARDING INSTALLATION AND TECHNICAL GUIDANCE OF THE SYSTEM, CONTACT: ROAD SYSTEMS, INC. (432)263-2435. 3616 OLD HOWARD COUNTY AIRPORT, BIG SPRING, TX 79720
 - FOR INSTALLATION, REPAIR AND MAINTENANCE REFER TO THE: MSKT END TERMINAL, PRODUCT DESCRIPTION ASSEMBLY MANUAL (PUBLICATION-062717).
 - APPLY HIGH INTENSITY REFLECTIVE SHEETING, "OBJECT MARKER" ON THE FRONT FACE OF THE DEVICE PER MANUFACTURER'S RECOMMENDATIONS. OBJECT MARKER SHALL CONFORM TO THE STANDARDS REQUIRED IN TEXAS MUTCD.
 - FOR POST (LEAVE-OUT) INSTALLATION AND GUIDANCE SEE TXDOT'S LATEST ROADWAY MOW STRIP STANDARD.
 - HARDWARE (BOLTS, NUTS, & WASHERS) SHALL BE GALVANIZED IN ACCORDANCE WITH ITEM 445, "GALVANIZING". FITTINGS SHALL BE SUBSIDIARY TO THE BID ITEM.
 - SYSTEM SHOWN USING STEEL WIDE FLANGE POSTS WITH COMPOSITE BLOCKOUTS.
 - A COMPOSITE MATERIAL BLOCKOUTS THAT MEETS THE REQUIREMENTS OF DMS-7210, MAY BE SUBSTITUTED FOR BLOCKOUTS OF SIMILAR DIMENSIONS. SEE CONSTRUCTION DIVISION MATERIAL PRODUCER LIST (MPL) FOR CERTIFIED PRODUCERS.
 - IF SOLID ROCK IS ENCOUNTERED IN THE AREA OF (POST 1) AND / OR (POST 2) CONTACT THE MANUFACTURER, & REFER TO THE LATEST ROADWAY MBSG STANDARD FOR INSTALLATION GUIDANCE.
 - POSTS SHALL NOT BE SET IN CONCRETE.
 - SYSTEM MUST BE ATTACHED TO STANDARD 31" MBSG.
 - UNDER NO CIRCUMSTANCES SHALL THE GUARDRAIL WITHIN THE MSKT SYSTEM BE CURVED.
 - A FLARE RATE OF UP TO 25:1 MAY BE USED TO PREVENT THE TERMINAL HEAD FROM ENCRANCHING ON THE SHOULDER. THE FLARE MAY BE DECREASED OR ELIMINATED FOR SPECIFIC INSTALLATIONS, IF DIRECTED BY THE ENGINEER.
 - THE SYSTEM IS SHOWN WITH TWO 12'-6" MBSG PANELS, ONE 25'-0" MBSG PANEL IS ALSO ALLOWED IN ITS PLACE.
 - A DRIVING CAP WITH A TIMBER OR PLASTIC INSERT SHALL BE USED WHEN DRIVING POSTS 3-8 TO PREVENT DAMAGE TO THE GALVANIZING ON TOP OF THE POST. SPECIAL DRIVING CAP TO BE USED ON LOWER POSTS 1 & 2 TO PREVENT DAMAGE TO THE WELDED PLATES.

ITEM	QTY	MAIN SYSTEM COMPONENTS	ITEM NUMBERS
A	1	MSKT IMPACT HEAD	MS3000
B	1	W-BEAM GUARDRAIL END SECTION, 12 Go.	SF1303
C	1	POST 1 - TOP (6" X 6" X 1/8" TUBE)	MTPHP1A
D	1	POST 1 - BOTTOM (6' W6X15)	MTPHP1B
E	1	POST 2 - ASSEMBLY TOP	UHP2A
F	1	POST 2 - ASSEMBLY BOTTOM (6' W6X9)	HP2B
G	1	BEARING PLATE	E750
H	1	CABLE ANCHOR BOX	S760
J	1	BCT CABLE ANCHOR ASSEMBLY	E770
K	1	GROUND STRUT	MS785
L	6	W6X9 OR W6X8.5 STEEL POST	P621
M	6	COMPOSITE BLOCKOUTS	CBSP-14
N	1	W-BEAM MGS RAIL SECTION (9'-4 1/2")	G12025
O	2	W-BEAM MGS RAIL SECTION (12'-6")	G1203A
P	6	WOOD BLOCKOUT 6" X 8" X 14"	P675
Q	1	W-BEAM MGS RAIL SECTION (25'-0")	G1209
SMALL HARDWARE			
o	2	5/8" x 1" HEX BOLT (GRD 5)	B5160104A
b	4	5/8" WASHER	W0516
c	2	5/8" HEX NUT	N0516
d	25	5/8" Dia. x 1 1/4" SPLICE BOLT (POST 2)	B580122
e	2	5/8" Dia. x 9" HEX BOLT (GRD A449)	B580904A
f	3	5/8" WASHER	W050
g	33	5/8" Dia. H.G.R NUT	N050
h	1	3/4" Dia. x 8 1/2" HEX BOLT (GRD A449)	B340854A
j	1	3/4" Dia. HEX NUT	N030
k	2	1 ANCHOR CABLE HEX NUT	N100
l	2	1 ANCHOR CABLE WASHER	W100
m	8	1/2" x 1 1/4" A325 BOLT WITH CAPTIVE WASHER	SB12A
n	8	1/2" STRUCTURAL NUTS	N012A
o	8	1 1/8" O.D. x 3/8" I.D. STRUCTURAL WASHERS	W012A
p	1	BEARING PLATE RETAINER TIE	CT-100ST
q	6	5/8" x 10" H.G.R. BOLT	B581002
r	1	OBJECT MARKER 18" X 18"	E3151



NOTE: TXDOT GENERIC APPROACH GRADING LAYOUT USED FOR ALL TANGENT TYPE END TREATMENTS.

NOTE: THIS STANDARD IS A BASIC REPRESENTATION OF THE MSKT END TERMINAL, IT IS NOT INTENDED TO REPLACE THE PRODUCT DESCRIPTION ASSEMBLY MANUAL.

Design Division Standard

SINGLE GUARDRAIL TERMINAL

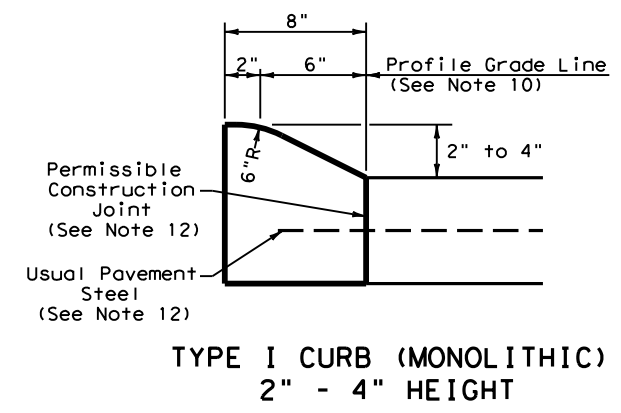
MSKT-MASH-TL-3

SGT (12S) 31-18

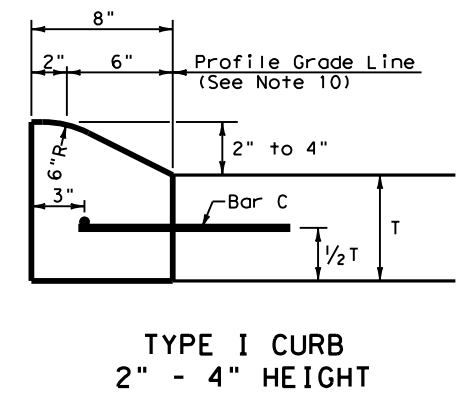
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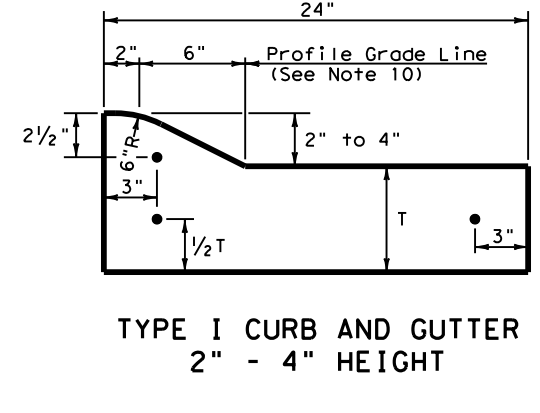
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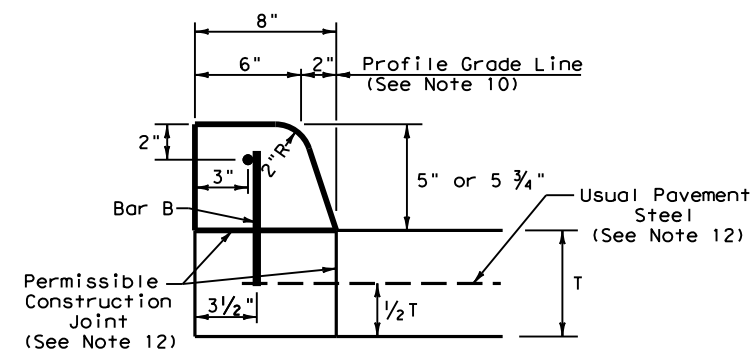
**TYPE I CURB (MONOLITHIC)
2" - 4" HEIGHT**



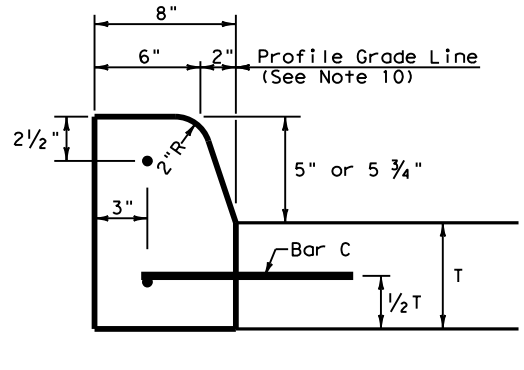
**TYPE I CURB AND GUTTER
2" - 4" HEIGHT**



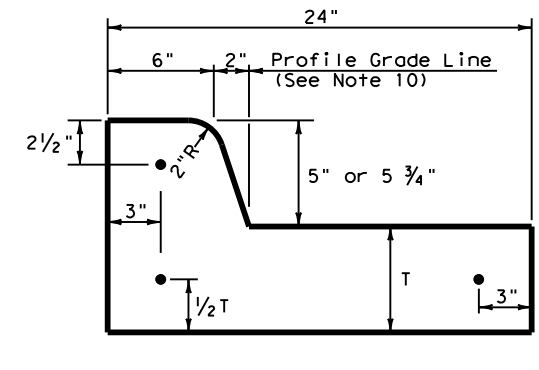
**TYPE I CURB AND GUTTER
2" - 4" HEIGHT**



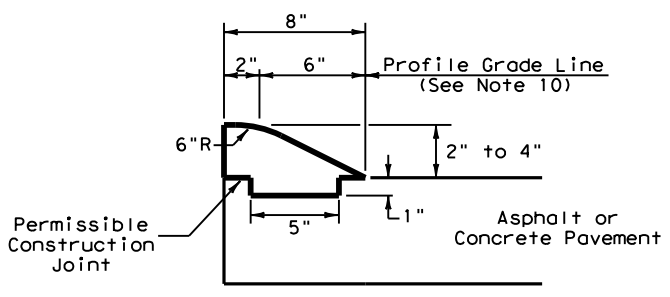
**TYPE II CURB (MONOLITHIC)
5" - 5 3/4" HEIGHT**



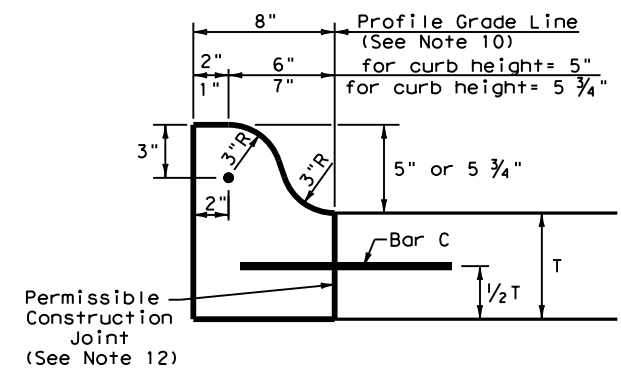
**TYPE II CURB AND GUTTER
5" - 5 3/4" HEIGHT**



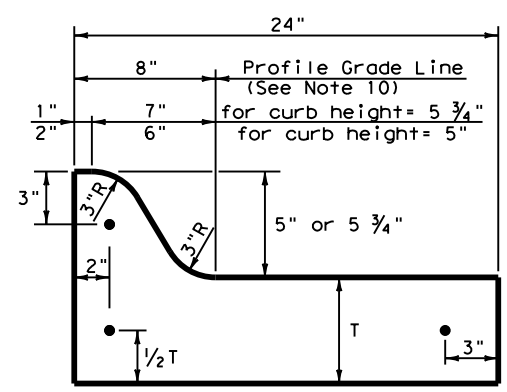
**TYPE II CURB AND GUTTER
5" - 5 3/4" HEIGHT**



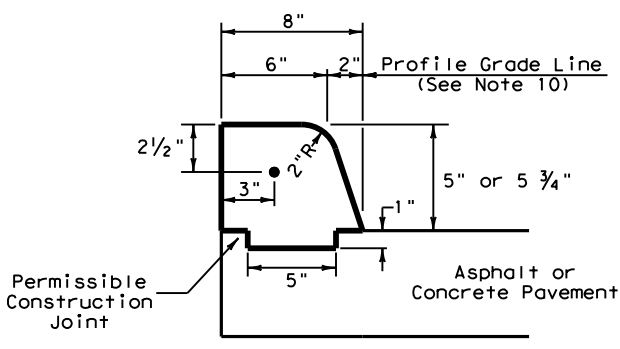
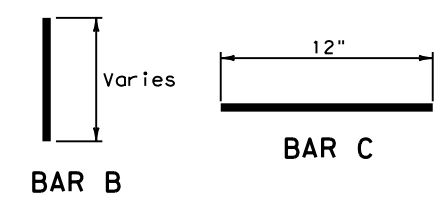
**TYPE III CURB (KEYED)
2" - 4" HEIGHT**



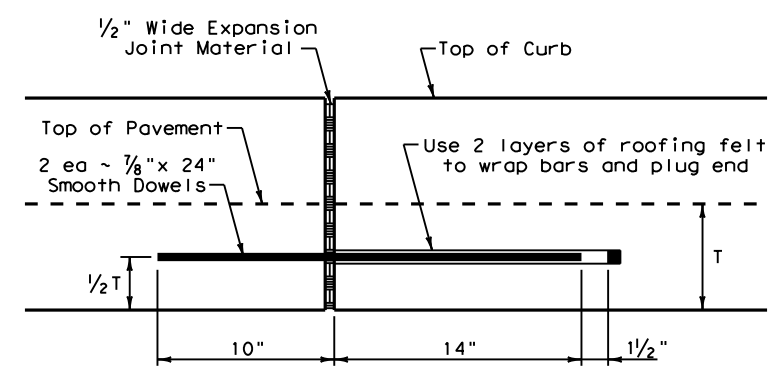
**TYPE IIa CURB
5" - 5 3/4" HEIGHT**



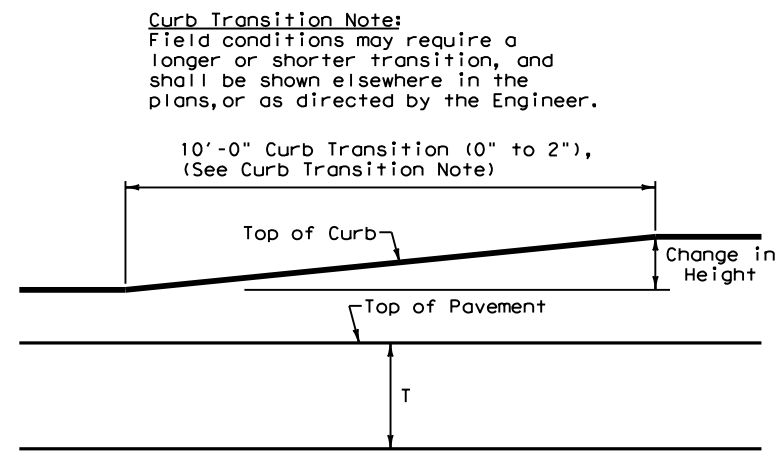
**TYPE IIa CURB AND GUTTER
5" - 5 3/4" HEIGHT**



**TYPE IV CURB (KEYED)
5" - 5 3/4" HEIGHT**



EXPANSION JOINT DETAIL



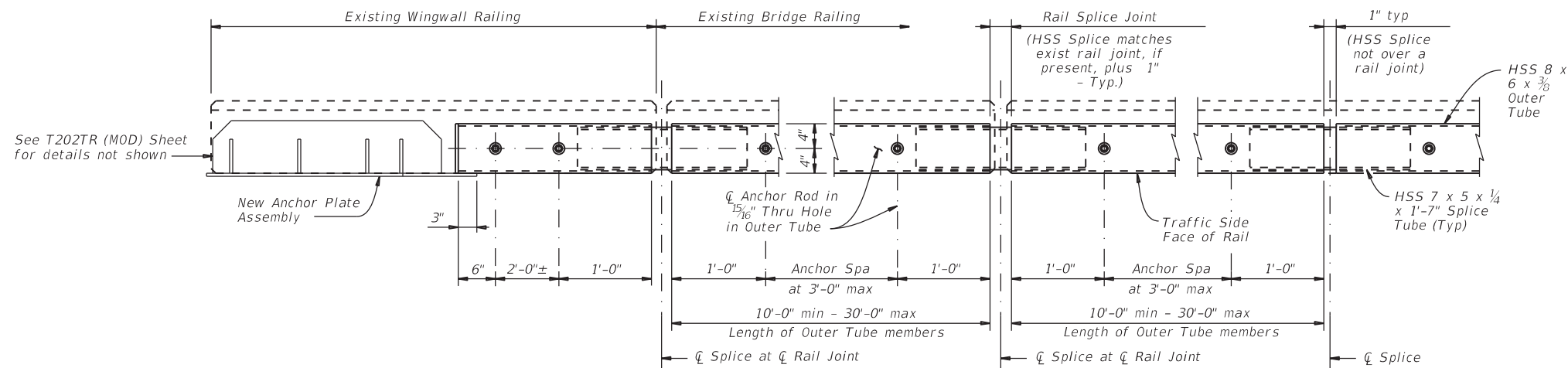
CURB TRANSITION

Note: To be paid for as Highest Curb

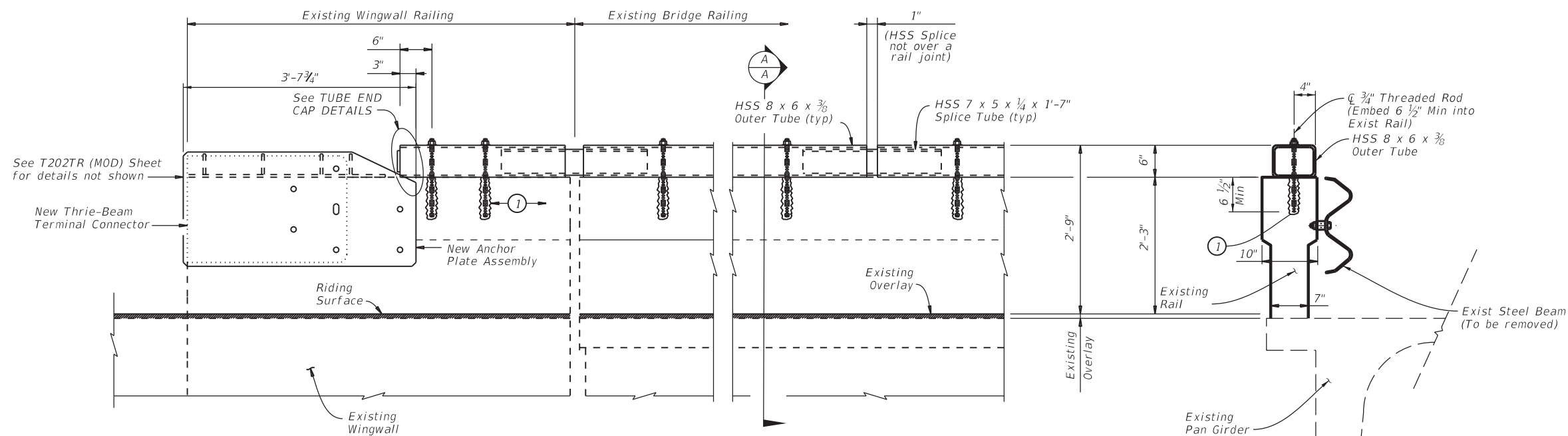
General Notes

- All materials and construction shall be in accordance with Item 529, "Concrete Curb, Gutter, and Combined Curb and Gutter."
- Concrete shall be Class A.
- When reinforcing bars are used, they shall be No.4 unless otherwise shown. The use of synthetic fiber in lieu of steel reinforcing is acceptable, provided the fiber producer is on the Department Producer List (MPL), maintained by TxDOT, Construction Division.
- Round exposed sharp edges with a rounding tool, to a minimum radius of 1/4 inch.
- All existing curbs and driveways to be removed shall be sawed or removed at existing joints.
- Where concrete curb is placed on existing concrete pavement, the pavement shall be drilled and the reinforcing bars grouted in place.
- Expansion and contraction joints shall be constructed to match pavement joints in all curbs and curb and gutter adjacent to jointed concrete pavement. Where placement of curb or curb and gutter is not adjacent to concrete pavement, expansion joints shall be provided at structures, curb returns at streets, and at locations directed by The Engineer.
- Vertical and horizontal dowel bars and transverse reinforcing bars shall be placed at four feet C-C.
- Dimension 'T' shown is the thickness of concrete pavement. When curb is installed adjacent to flexible pavement dimension 'T' is 8" maximum.
- Usual profile grade line. Refer to typical sections and plan-profile sheets for exact locations.
- One-half inch expansion joint material shall be provided where curb or curb and gutter is adjacent to sidewalk or riprap.
- When vertical permissible construction joints are used, resulting in a longitudinal construction joint in the pavement, the longitudinal pavement steel shall be placed in accordance with pavement details shown elsewhere in the plans for longitudinal construction joints. Reinforcing steel for curb section shall then conform to that required for concrete curb.

		Design Division Standard	
<h2>CONCRETE CURB AND GUTTER</h2> <h3>CCCCG-12</h3>			
FILE: cccg12.dgn	DN: TxDOT	CK: AM	DW: VP
© TxDOT: 1995	CONT: 0435	SECT: 01	JOB: 080
REVISIONS	0435	01	080
UPDATED 2012 - VP	DIST: PAR	COUNTY: LAMAR	SHEET NO.: 53



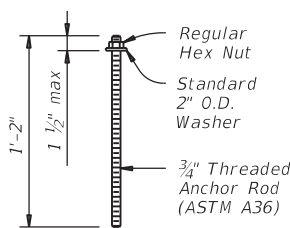
RAIL PLAN



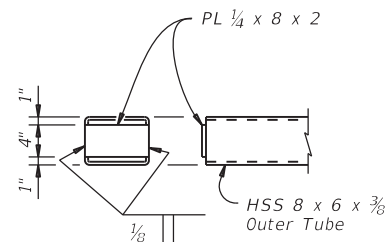
RAIL TRAFFIC SIDE ELEVATION

SECTION A-A

Add Hollow Structural Steel Section on top of rail to increase rail height.



ANCHOR RODS ①



TUBE END CAP DETAILS

GENERAL NOTES:

Remove MBGF (W-shape) fascia and attachment hardware from the existing T202 rail prior to the installation of new HSS steel tube (subsidiary to the bid item). Dispose of the removed materials as directed by the Engineer. If newly exposed bolt holes are in conflict with the structural tubing anchors, plug holes with epoxy grout prior to the coring of new anchor holes. Existing bolt holes not in conflict do not need to be plugged.

Provide ASTM A500 Gr B steel for beam member and ASTM A36 steel for end cap. Provide structural steel conforming to Item 441, "Steel Structures", free of burrs, sharp edges, and weld splatter. Grind exposed edges and corners to 1/16" flat or radius.

Galvanize all steel components in accordance with Item 445, "Galvanizing". Provide anchor bolts, rods, and nuts with Class 2A and 2B fit tolerances. Tap the nuts after galvanizing. Install nuts snug tight. Burr threads after installation to prevent back turn of the nut.

All steel components are Galvanize (including HSS 8 x 6 x 3/8) in accordance with Item 445, "Galvanizing", except otherwise stated.

Verify all dimensions in the field prior to commencement of work. Shop drawings are not required for this rail.

Execute rail retrofit in accordance with Item 451 "Retrofit Railing". Payment for rail retrofit is per Item 451-6048 "Retrofit Rail (Add HSS)".

NBI #: 01-139-0-0435-01-024

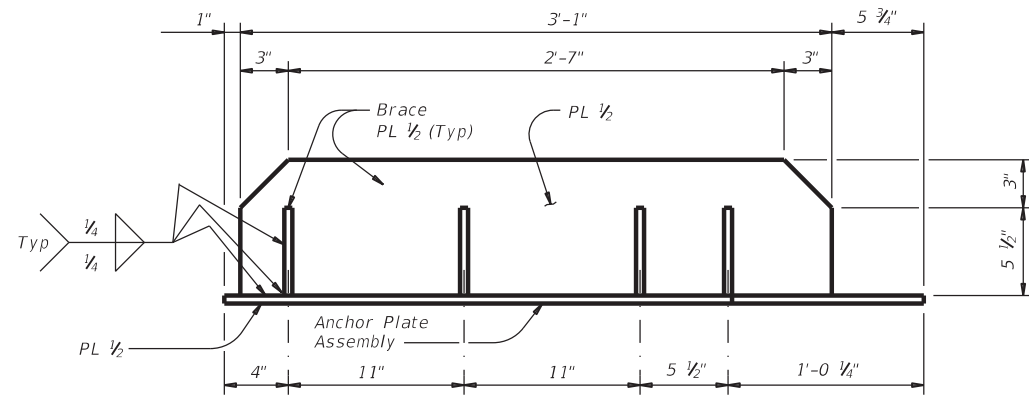


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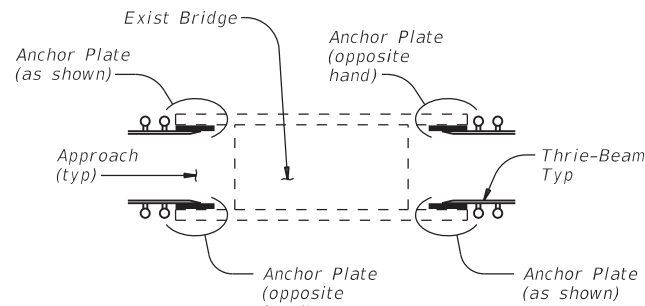
		Bridge Division Standard	
<h2>TYPE T202 RETROFIT</h2> <h3>COTTONWOOD CREEK BRIDGE</h3>			
FILE:	DN: RY	CK: OA	DW: RY
01xDOT February 2021	CONT	SECT	JOB
REVISIONS	0435	01	080
	DIST	COUNTY	SHEET NO.
	PAR	LAMAR	54

① Provide 3/4" Dia. ASTM-A36 threaded rods with one regular hex nut and one standard 2" O.D. washer each. Embed threaded rods 6 1/2" Min into concrete rail using a Type III, Class C epoxy adhesive anchor system capable of obtaining an ultimate load of 20 kips in tension per threaded rod. Follow manufacturer's instructions for Anchor Installation including: hole size, drilling, and clean-out.

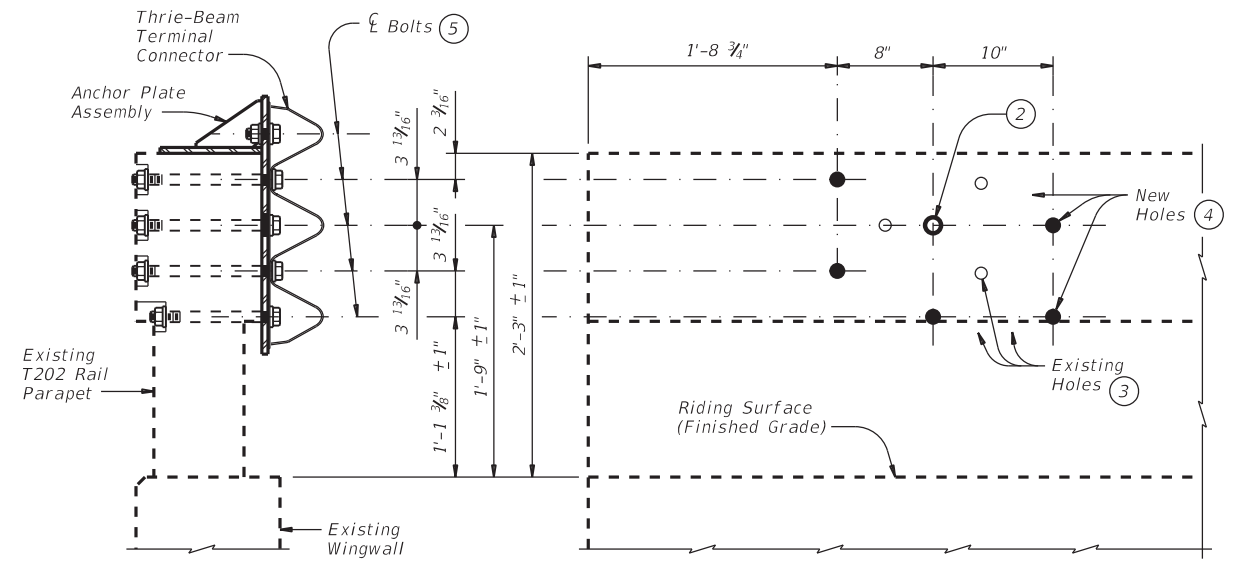
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PLAN



LOCATION DETAILS



SECTION
Showing completed installation

ROADSIDE ELEVATION
Anchor Plate assembly and Thrie-Beam Terminal Connector not shown for clarity

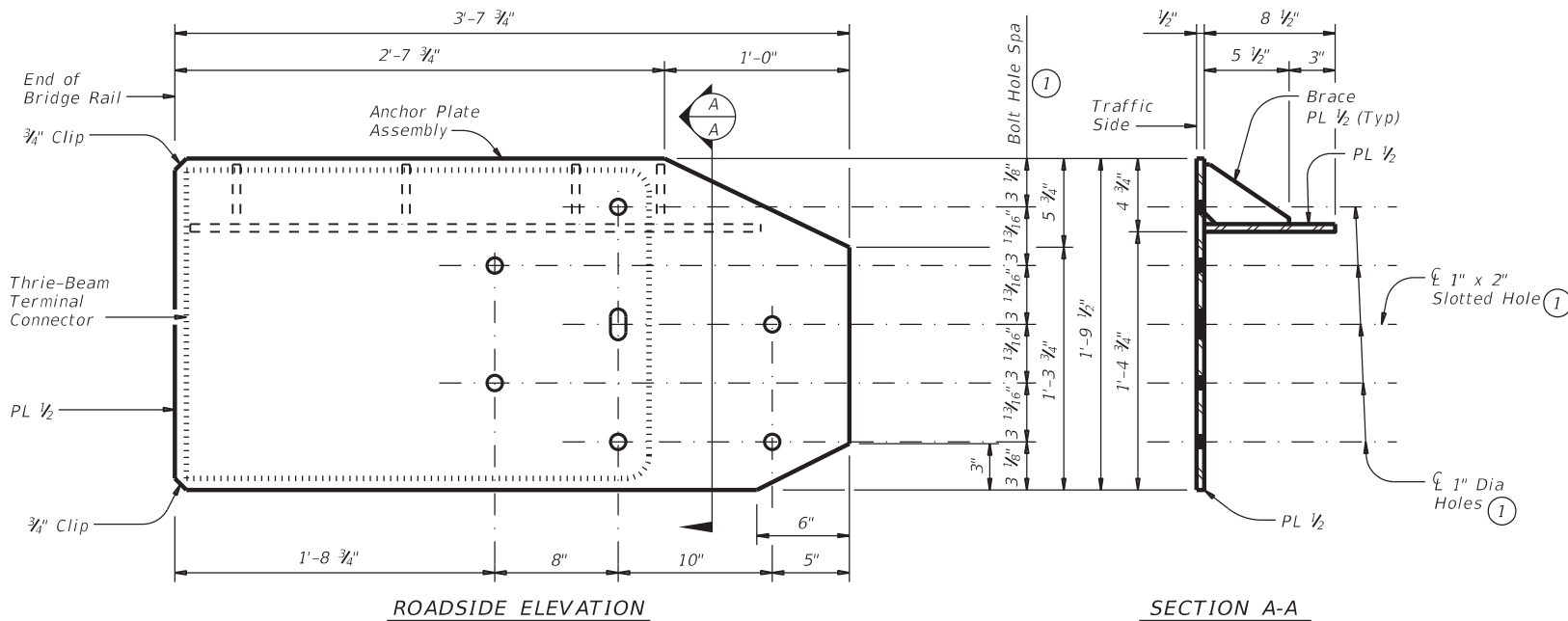
DETAILS OF BOLTS AND HOLES ①

CONSTRUCTION NOTES:
Field verify dimensions before commencing work and ordering materials. Plugging of newly exposed existing bolt holes is not necessary except as stated here in or otherwise indicated on the plans. This work is considered subsidiary to the pertinent bid items.

Attach the MBGF Transition to the existing parapet using the Anchor Plate assembly and the Thrie-Beam Terminal Connection. Splice the Thrie-Beam Terminal Connection to the Thrie-Beam with the normal 12 connection bolts. Refer to Metal Beam Guard Fence Transition and Metal Beam Guard Fence detail sheets for additional details and information not shown herein.

MATERIAL NOTES:
Fabricate Anchor Plate assembly with steel conforming to either ASTM A36 or A572 Gr 50. Anchor Plate assembly must be free of burrs, sharp edges and weld splatter. Grind edges and corners to a 1/16" flat or radius. Hot-dip galvanize Anchor Plate assembly in accordance with Item 445, "Galvanizing". Anchor bolts, nuts, and washers must conform to Item 449, "Anchor Bolts".

GENERAL NOTES:
These details are for retrofitting existing rails only, not new construction, with a Thrie-Beam Terminal Connection. Shop drawings are not required for this installation. Payment for materials, fabrication, and installation of this assembly are to be included in unit price bid in accordance with Item 540 "Mtl Bm Gd Fen Trans (Anchor Plate)". Estimated weight of a single Anchor Plate assembly, including bolts, nuts, and washers, but not including the Thrie-Beam Terminal Connector = 190 lbs.

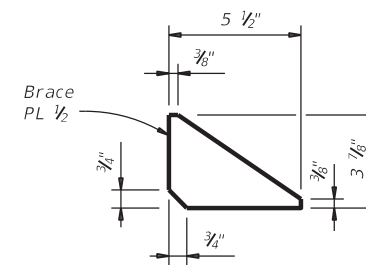


ROADSIDE ELEVATION

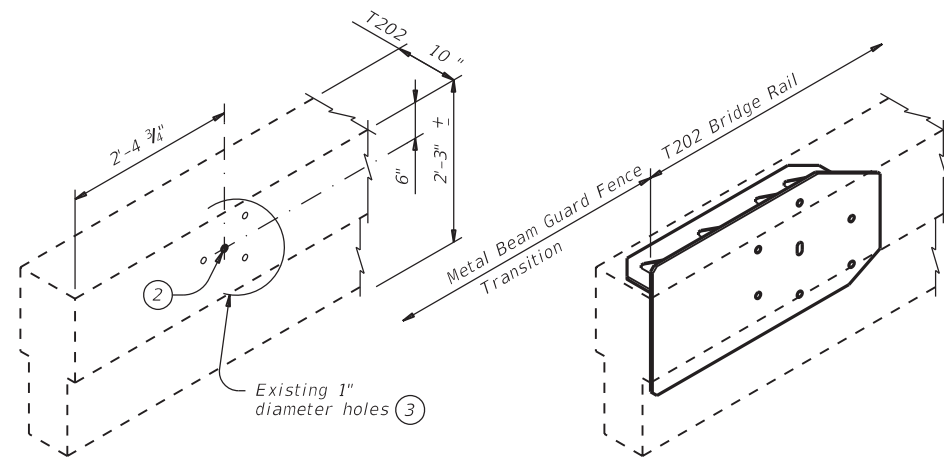
SECTION A-A

ANCHOR PLATE DETAILS

Anchor Plate shown is detailed for one end of one side of rail only. For other side, Anchor Plate must be built opposite hand.



BRACE PLATE DETAILS



EXISTING PARAPET
Shown after removal of existing MBGF Transition connector and prior to coring new bolt holes

ANCHOR PLATE PLACEMENT

INSTALLATION DETAILS

- ① The Contractor must verify that locations of bolt holes match those in the Thrie-Beam Terminal Connector to be installed in that location prior to fabrication of the Anchor Plate assembly and prior to coring bolt holes in the existing T202 parapet.
- ② If the existing holes are aligned as expected, use the indicated existing 1" diameter hole in the installation of the Anchor Plate assembly and the Thrie-Beam Terminal Connector.
- ③ If the existing holes are not aligned as expected, holes that cannot be utilized in the installation and are within 3" of a new bolt hole must be filled with epoxy grout prior to coring new holes.
- ④ Drill new 1" diameter holes, each with a 2 1/2" diameter x 1" deep recess, through existing railing parapet. Recesses are only required when pedestrian sidewalks are adjacent to back of rail unless directed otherwise by the Engineer. Holes should be perpendicular to the roadside face of the parapet. Drill holes and recesses with coring type equipment. Percussion drilling is not allowed. Patch spalls, when directed by the Engineer, in accordance with Item 429, "Concrete Structure Repair", at the contractor's expense.
- ⑤ 7 ~ 7/8" diameter ASTM F3125 Gr A325 Hex Head Anchor Bolts each with 2 ~ 1 3/4" O.D. washers. Place washer under each head and nut. Provide bolts of sufficient length to extend a minimum of 1/2" beyond nut. Cut excess bolt length and paint cut surface with zinc-rich paint if directed by the Engineer.

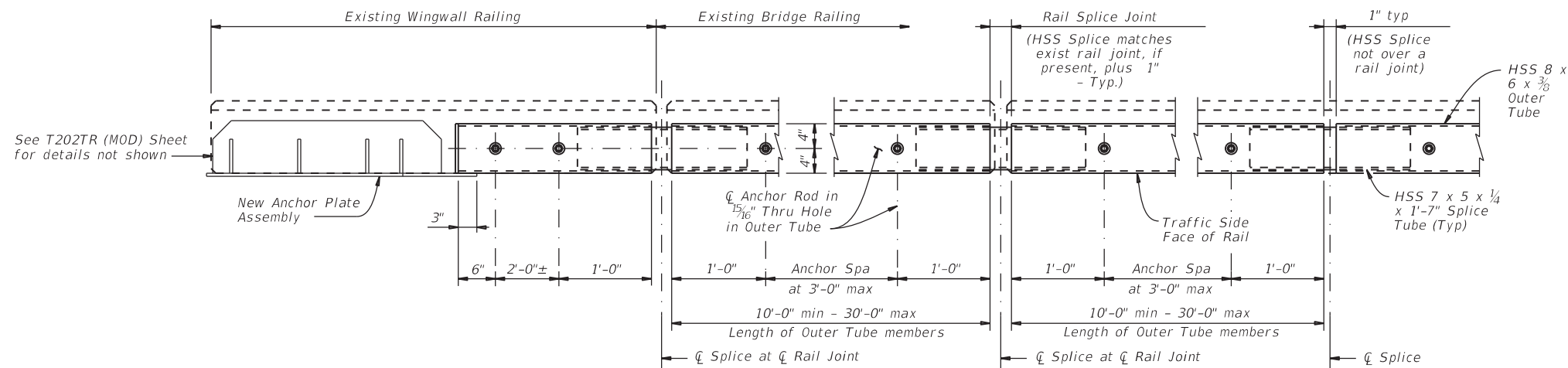


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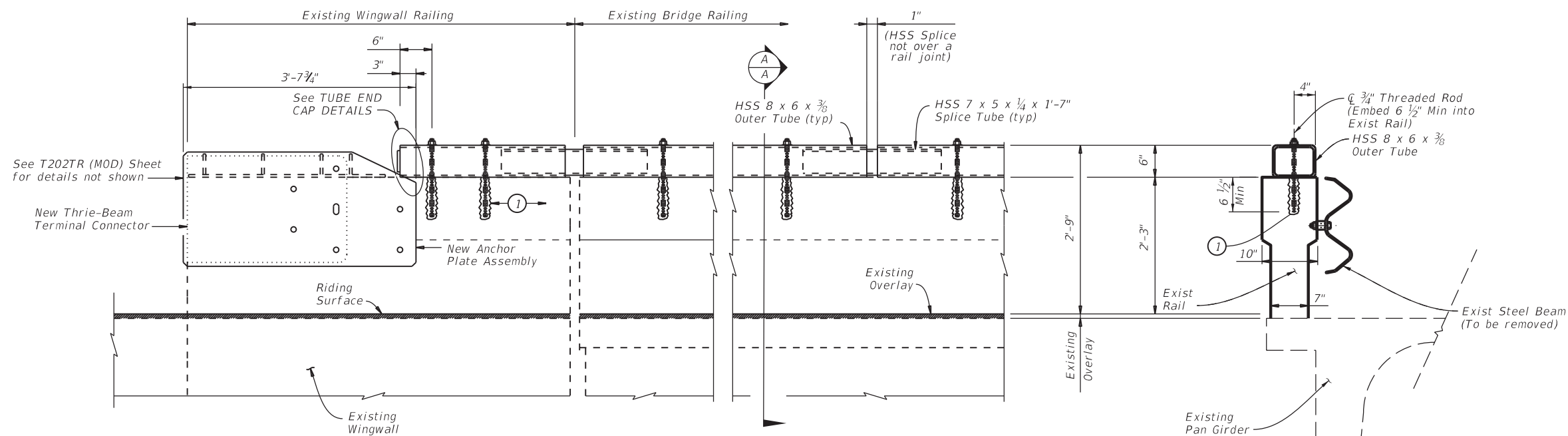
NBI #: 01-139-0-0435-01-024

Texas Department of Transportation		Bridge Division Standard	
T202 TRANSITION RETROFIT			
T202TR (MOD)			
COTTONWOOD CREEK BRIDGE			
FILE: r1std026-19.dgn	DN: RY	CK: OA	DW: RY
CONTRACT: 0435	SECTION: 01	JOB: 080	HIGHWAY: FM 38
DIST: PAR	COUNTY: LAMAR	SHEET NO: 55	

DATE: FILE:



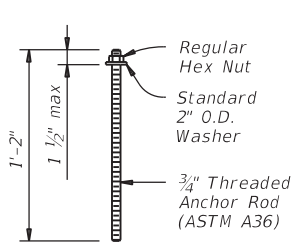
RAIL PLAN



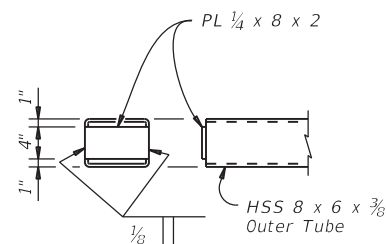
RAIL TRAFFIC SIDE ELEVATION

SECTION A-A

Add Hollow Structural Steel Section on top of rail to increase rail height.



ANCHOR RODS ①



TUBE END CAP DETAILS

GENERAL NOTES:

Remove MBGF (W-shape) fascia and attachment hardware from the existing T202 rail prior to the installation of new HSS steel tube (subsidiary to the bid item). Dispose of the removed materials as directed by the Engineer. If newly exposed bolt holes are in conflict with the structural tubing anchors, plug holes with epoxy grout prior to the coring of new anchor holes. Existing bolt holes not in conflict do not need to be plugged.

Provide ASTM A500 Gr B steel for beam member and ASTM A36 steel for end cap. Provide structural steel conforming to Item 441, "Steel Structures", free of burrs, sharp edges, and weld splatter. Grind exposed edges and corners to 1/16" flat or radius.

Galvanize all steel components in accordance with Item 445, "Galvanizing". Provide anchor bolts, rods, and nuts with Class 2A and 2B fit tolerances. Tap the nuts after galvanizing. Install nuts snug tight. Burr threads after installation to prevent back turn of the nut.

All steel components are Galvanize (including HSS 8 x 6 x 3/8) in accordance with Item 445, "Galvanizing", except otherwise stated.

Verify all dimensions in the field prior to commencement of work. Shop drawings are not required for this rail.

Execute rail retrofit in accordance with Item 451 "Retrofit Railing". Payment for rail retrofit is per Item 451-6048 "Retrofit Rail (Add HSS)".

NBI #: 01-139-0-0435-01-023



TYPE T202 RETROFIT

SANDERS CREEK BRIDGE



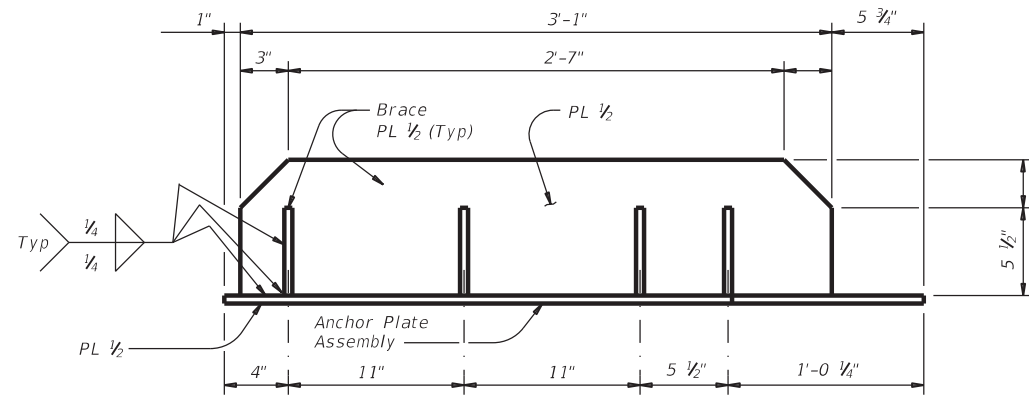
R. D. Owens

03/19/2021

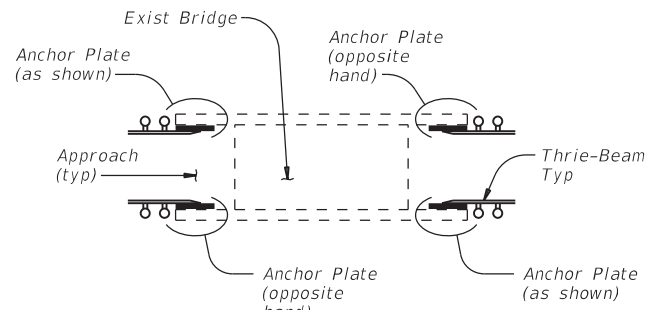
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©TxDOT February 2021	CONT	SECT	JOB	HIGHWAY
REVISIONS	0435	01	080	FM 38
	DIST	COUNTY	SHEET NO.	
	PAR	LAMAR	56	

① Provide 3/4" Dia. ASTM-A36 threaded rods with one regular hex nut and one standard 2" O.D. washer each. Embed threaded rods 6 1/2" Min into concrete rail using a Type III, Class C epoxy adhesive anchor system capable of obtaining an ultimate load of 20 kips in tension per threaded rod. Follow manufacturer's instructions for Anchor Installation including: hole size, drilling, and clean-out.

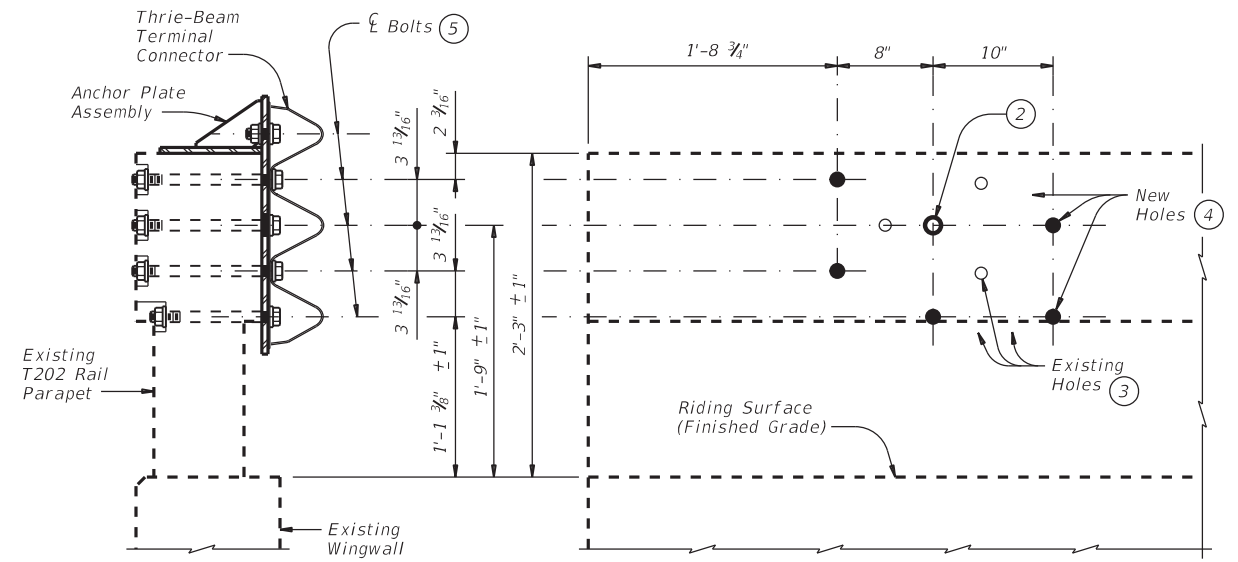
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PLAN



LOCATION DETAILS



SECTION

Showing completed installation

ROADSIDE ELEVATION

Anchor Plate assembly and Thrie-Beam Terminal Connector not shown for clarity

DETAILS OF BOLTS AND HOLES (1)

CONSTRUCTION NOTES:

Field verify dimensions before commencing work and ordering materials. Plugging of newly exposed existing bolt holes is not necessary except as stated here in or otherwise indicated on the plans. This work is considered subsidiary to the pertinent bid items.

Attach the MGBF Transition to the existing parapet using the Anchor Plate assembly and the Thrie-Beam Terminal Connection. Splice the Thrie-Beam Terminal Connection to the Thrie-Beam with the normal 12 connection bolts. Refer to Metal Beam Guard Fence Transition and Metal Beam Guard Fence detail sheets for additional details and information not shown herein.

MATERIAL NOTES:

Fabricate Anchor Plate assembly with steel conforming to either ASTM A36 or A572 Gr 50. Anchor Plate assembly must be free of burrs, sharp edges and weld splatter. Grind edges and corners to a 1/16" flat or radius. Hot-dip galvanize Anchor Plate assembly in accordance with Item 445, "Galvanizing". Anchor bolts, nuts, and washers must conform to Item 449, "Anchor Bolts".

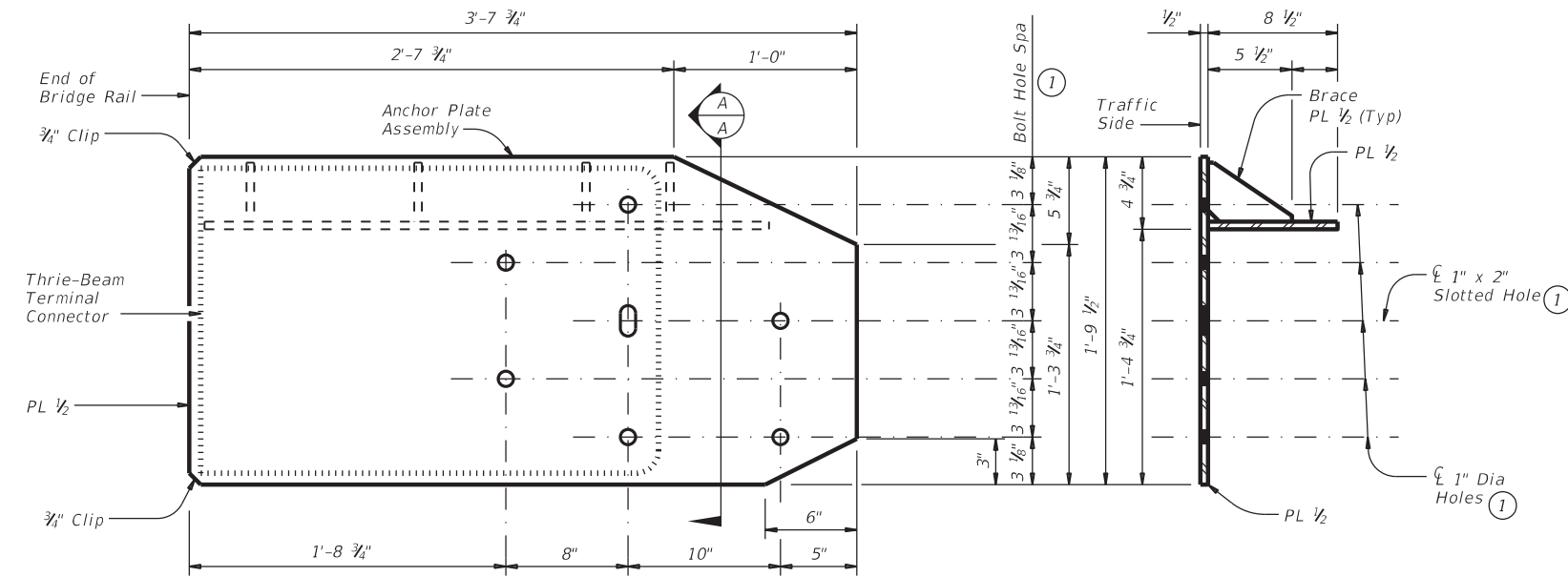
GENERAL NOTES:

These details are for retrofitting existing rails only, not new construction, with a Thrie-Beam Terminal Connection.

Shop drawings are not required for this installation.

Payment for materials, fabrication, and installation of this assembly are to be included in unit price bid in accordance with Item 540 "Mtl Bm Gd Fen Trans (Anchor Plate)".

Estimated weight of a single Anchor Plate assembly, including bolts, nuts, and washers, but not including the Thrie-Beam Terminal Connector = 190 lbs.

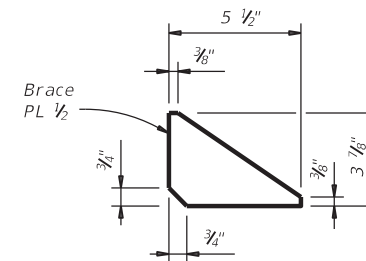


ROADSIDE ELEVATION

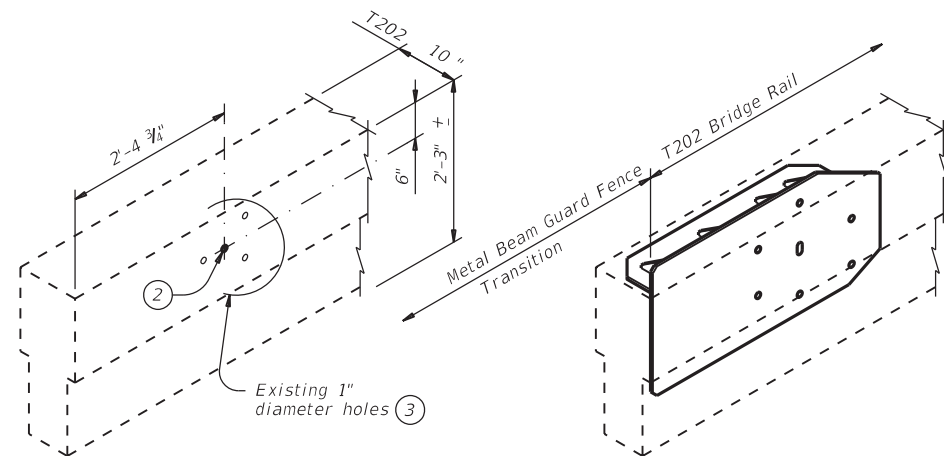
SECTION A-A

ANCHOR PLATE DETAILS

Anchor Plate shown is detailed for one end of one side of rail only. For other side, Anchor Plate must be built opposite hand.



BRACE PLATE DETAILS



EXISTING PARAPET

Shown after removal of existing MGBF Transition connector and prior to coring new bolt holes

ANCHOR PLATE PLACEMENT

INSTALLATION DETAILS

- 1 The Contractor must verify that locations of bolt holes match those in the Thrie-Beam Terminal Connector to be installed in that location prior to fabrication of the Anchor Plate assembly and prior to coring bolt holes in the existing T202 parapet.
- 2 If the existing holes are aligned as expected, use the indicated existing 1" diameter hole in the installation of the Anchor Plate assembly and the Thrie-Beam Terminal Connector.
- 3 If the existing holes are not aligned as expected, holes that cannot be utilized in the installation and are within 3" of a new bolt hole must be filled with epoxy grout prior to coring new holes.
- 4 Drill new 1" diameter holes, each with a 2 1/2" diameter x 1" deep recess, through existing railing parapet. Recesses are only required when pedestrian sidewalks are adjacent to back of rail unless directed otherwise by the Engineer. Holes should be perpendicular to the roadside face of the parapet. Drill holes and recesses with coring type equipment. Percussion drilling is not allowed. Patch spalls, when directed by the Engineer, in accordance with Item 429, "Concrete Structure Repair", at the contractor's expense.
- 5 7 ~ 7/8" diameter ASTM F3125 Gr A325 Hex Head Anchor Bolts each with 2 ~ 1 3/4" O.D. washers. Place washer under each head and nut. Provide bolts of sufficient length to extend a minimum of 1/2" beyond nut. Cut excess bolt length and paint cut surface with zinc-rich paint if directed by the Engineer.

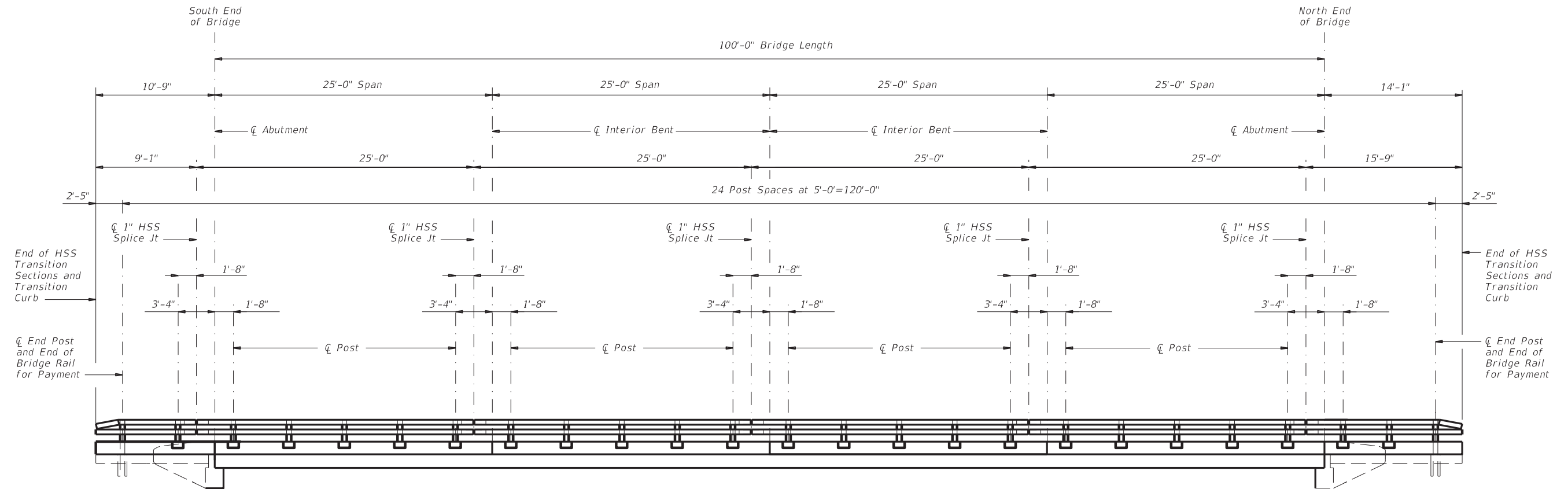


03/19/2021

NBI #: 01-139-0-0435-01-023

		Bridge Division Standard	
T202 TRANSITION RETROFIT			
T202TR (MOD) SANDERS CREEK BRIDGE			
FILE: r1std026-19.dgn	DN: RY	CK: OA	DW: RY
CONTRACT: 0435	SECTION: 01	JOB: 080	HIGHWAY: FM 38
DIST: PAR	COUNTY: LAMAR	SHEET NO: 56A	

DATE: FILE:



ELEVATION OF BRIDGE RAIL RETROFIT

DATE: 1/25/2021 3:44:12 PM
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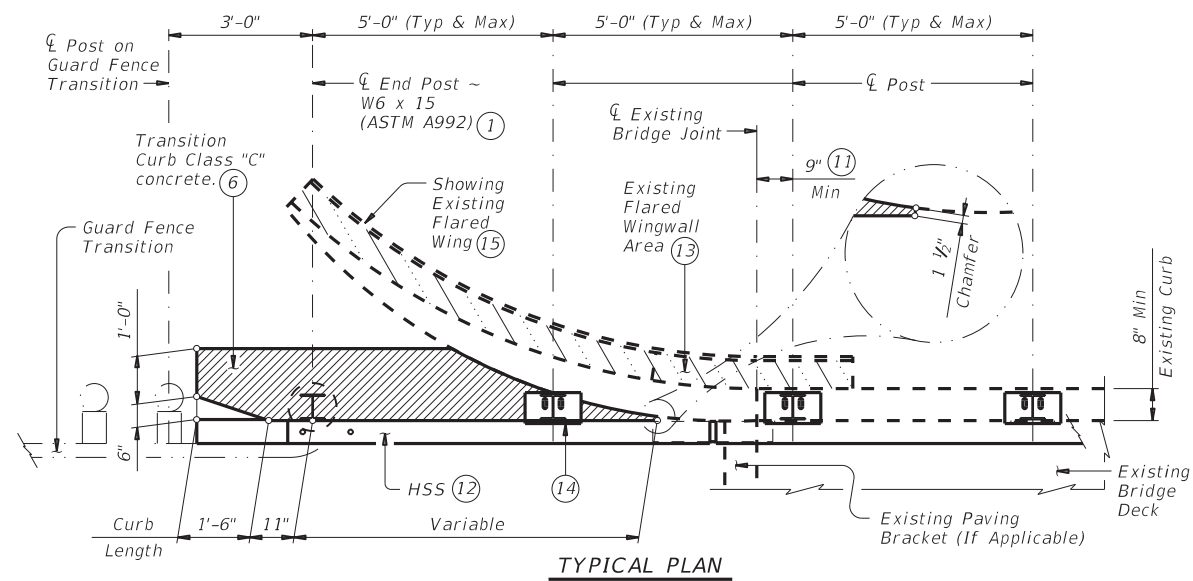
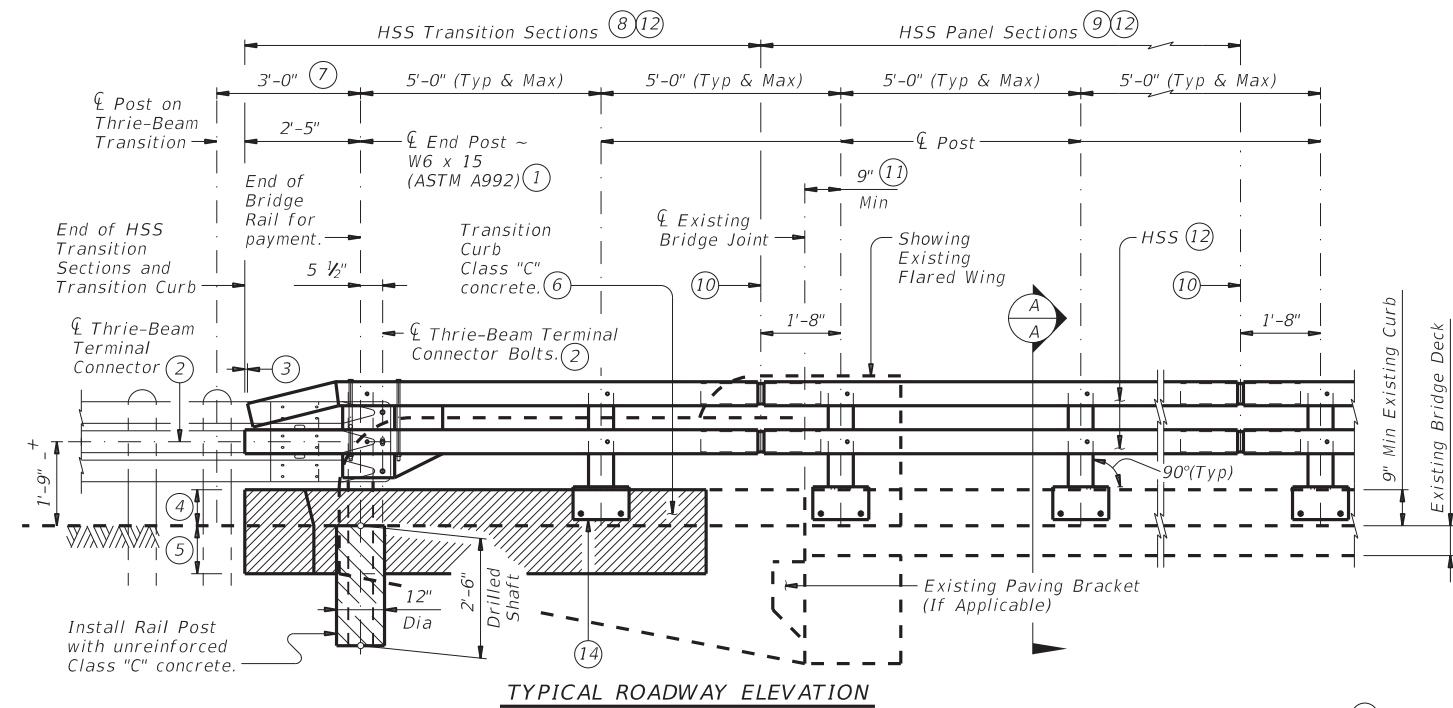
SHEET 1 OF 4



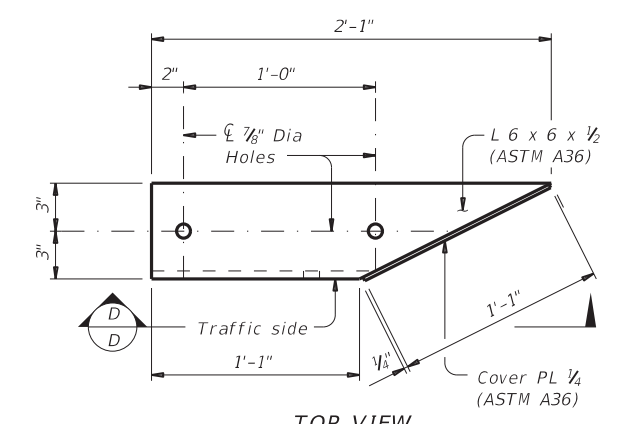
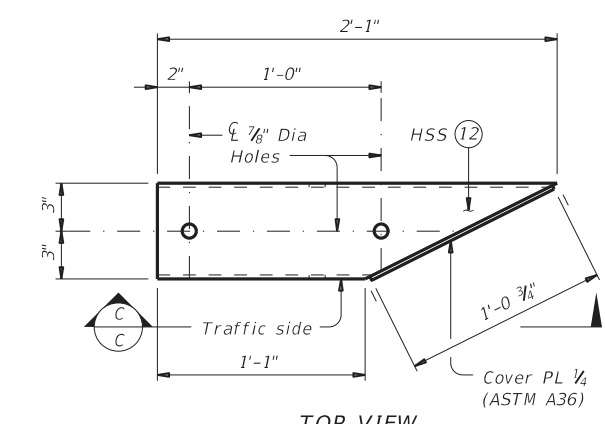
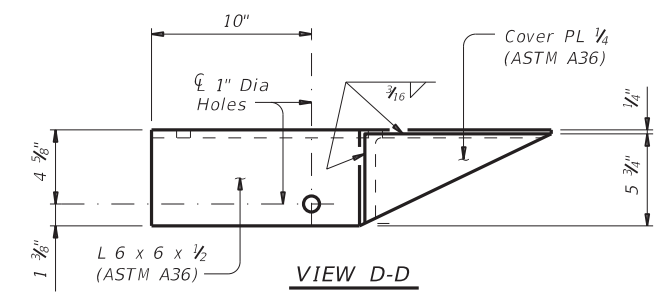
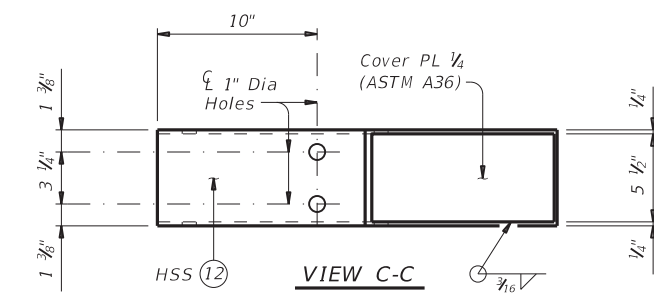
03/19/2021

		Bridge Division	
RAIL RETROFIT T131RC (MOD)			
FM 38 AT WEST FORK SANDERS CREEK			
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©TxDOT	January 2021	CONT: 0435	SECT: 01
REVISIONS		JOB: 080	HIGHWAY: FM 38
DIST: PAR	COUNTY: LAMAR	SHEET NO.: 57	

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RETROFIT WITH FLARED WING



ANGLE SHOE DETAILS

Angle Shoe shown is detailed for one side only, other side similar. For other side shoe must be built for opposite hand.

- ① Post length = Top of rail elevation minus bottom of drilled shaft elevation.
- ② Terminal Connectors and associated hardware are to be paid for under the Item "Metal Beam Guard Fence". The appropriate Metal Beam Guard Fence Transitions or Downstream Anchor Terminal must be attached to the bridge rail and extended along the embankment.
- ③ Top HSS can be shorter than bottom HSS 1/8" plus or minus.
- ④ Match existing bridge curb height.
- ⑤ Cast transition curb 1'-0" into soil or top of concrete approach slab. Remove any asphaltic concrete or mow strip if present.
- ⑥ Match existing bridge curb face on traffic side of transition curb. Transition curb 6" x 1'-6" taper will remain vertical.
- ⑦ Showing first post for a TL-3 rated guard fence transition. First post for a TL-2 rated guard fence transition or a guard fence downstream anchor terminal is 4'-4 3/4".
- ⑧ HSS Transition Sections must have one soil mounted end post embedded in an unreinforced, Class "C" concrete drilled shaft as shown, and a minimum of one curb mounted post per transition section.
- ⑨ HSS Panel Sections must have a minimum of three posts and a maximum of eight posts per panel section.
- ⑩ HSS Expansion Joint or HSS Splice Joint as required.
- ⑪ Use 9" minimum for both expansion joints and construction/controlled joints.
- ⑫ HSS 6 x 6 x 1/4 (ASTM A1085 or A500 Gr C).
- ⑬ Remove all existing structure area from top of existing curb. Cut and grind flush all existing reinforcing extending from top of existing curb and paint ends with two coats of zinc-rich paint conforming to the Item "Galvanizing".
- ⑭ When post is mounted to the transition curb on flared wings as shown, transition curb must be supported laterally by the existing wingwall/curb.
- ⑮ Field verify Existing flared wingwall dimensions and match with transition curb accordingly.

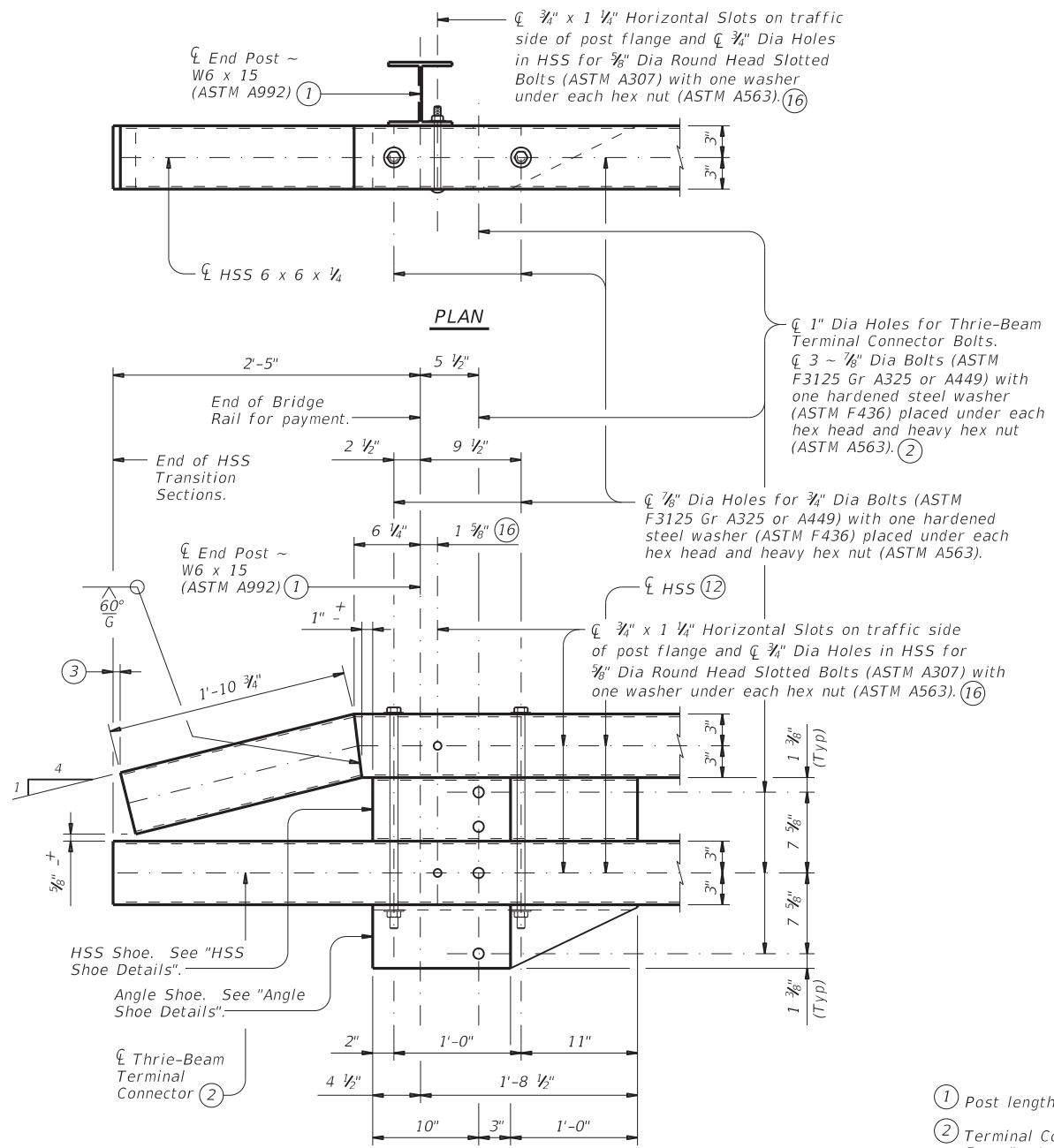


R. D. Owens

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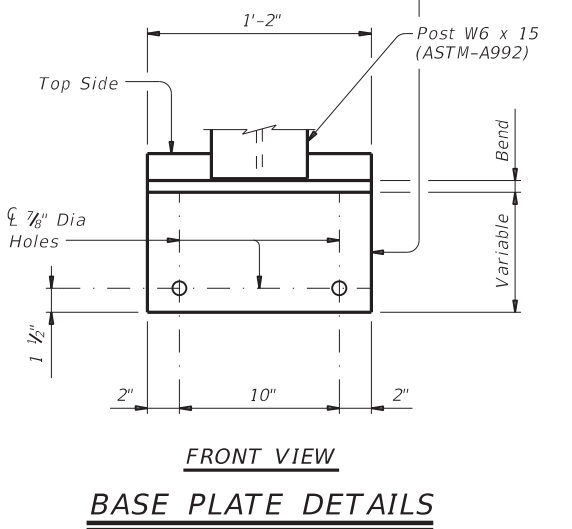
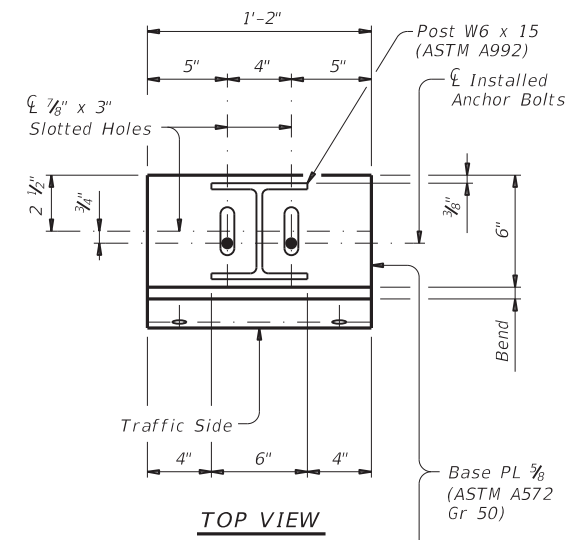
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RAIL RETROFIT T131RC (MOD)			
FM 38 AT WEST FORK SANDERS CREEK			
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©TxDOT	January 2021	CONT SECT	JOB HIGHWAY
REVISIONS	0435 01	080	FM 38
DIST	COUNTY	SHEET NO.	
PAR	LAMAR	58	

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ROADWAY ELEVATION
HSS TRANSITION SECTION END DETAILS
 Thrie-Beam Terminal Connector not shown for clarity.

- (1) Post length = Top of rail elevation minus bottom of drilled shaft elevation.
- (2) Terminal Connectors and associated hardware are to be paid for under the Item "Metal Beam Guard Fence". Attach the appropriate Metal Beam Guard Fence Transitions or Downstream Anchor Terminal to the bridge rail using 3 bolts as shown, and extend along the embankment.
- (3) Top HSS can be shorter than bottom HSS $5/8$ " plus or minus.
- (12) HSS 6 x 6 x $1/4$ (ASTM A1085 or A500 Gr C).
- (16) May be placed on either side of W6 x 15 web.



CONSTRUCTION NOTES:
 Field verify dimensions before commencing work and ordering materials.
 Provide Type VIII epoxy mortar under post base plates if gaps larger than $1/8$ " exist.
 One shop splice per rail member section is permitted with minimum 85 percent penetration.
 The weld may be square groove or single vee groove.
 Round or chamfer exposed edges of HSS rail, rail post and plate to approximately $1/8$ " by grinding.
 Test adhesive anchors in accordance with Item 450.3.3, "Tests". Test 3 anchors per 100 anchors installed. Perform corrective measures to provide adequate capacity if any of the tests do not meet the required test load. Repair damage from testing as directed.
 Submit erection drawings showing panel lengths, splice locations, post placement, anchor bolt locations and adhesive anchor test data to demonstrate pullout strength to the Engineer for approval. Shop drawings are not required.

MATERIAL NOTES:
 Galvanize all metal components of steel rail system.
 Provide Grade 60 reinforcing steel.
 Provide Class "C" concrete. As an alternate, provide Class "K" concrete, or a Type A-2 or Type C concrete repair material per DMS-4655 "Concrete Repair Materials". Do not use Type "B" (Ultra-Rapid) concrete repair materials.
 Anchor bolts must be $3/4$ " Dia ASTM A193 Gr B7 or ASTM A449 fully threaded rods with one heavy hex nut and one hardened steel washer (ASTM F436) each. Nuts must conform to ASTM A563 requirements. Embed fully threaded rods into concrete curb using a Type III, Class C, D, E, or F anchor adhesive. Minimum adhesive anchor embedment depth is 6 $3/4$ ". Anchor adhesive chosen must be able to achieve a basic bond strength in tension, Nba, of 30 kips. Submit signed and sealed calculations or the manufacturer's published literature showing the proposed anchor adhesive's ability to develop this load to the Engineer for approval prior to use. Anchor installation, including hole size, drilling, and clean out, must be in accordance with Item 450, "Railing".

GENERAL NOTES:
 This retrofit railing has been successfully evaluated by full-scale crash test to meet MASH TL-3 criteria. This retrofit railing can be used for speeds of 50 mph and greater when a TL-3 rated guard fence transition is used. When a TL-2 rated guard fence transition is used, this rail can only be used for speeds of 45 mph and less.
 Rail anchorage details shown on this guide may require modification for select structure types.
 See "Section A-A" for limits on existing overlay/seal coats thickness based on existing curb height.
 This rail is to be paid for as "Retrofit Rail (Ty T131RC)" under Item 451 "Retrofit Railing".
 Average weight with no overlay: 53 plf (18" Curbs)

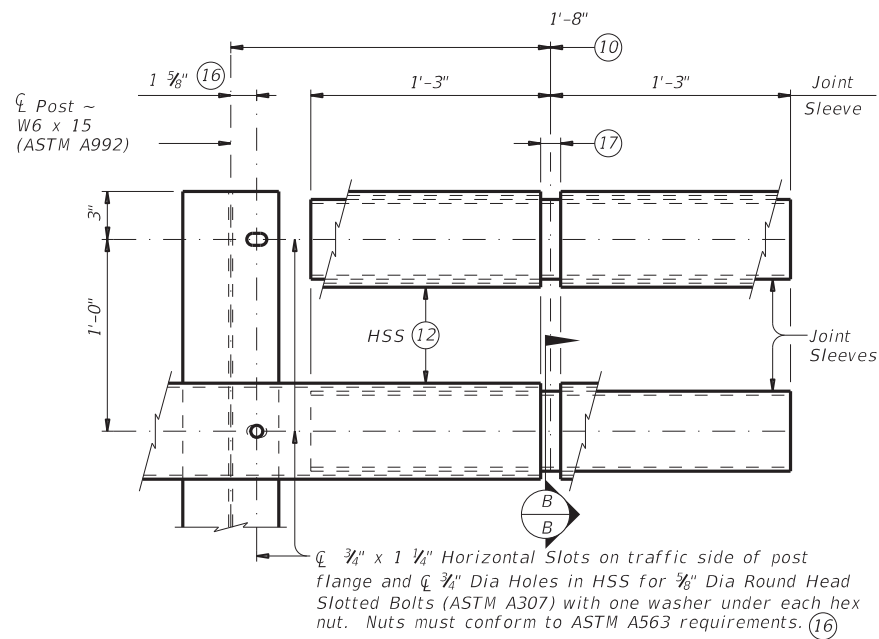
Cover dimensions are clear dimensions, unless noted otherwise.



03/19/2021

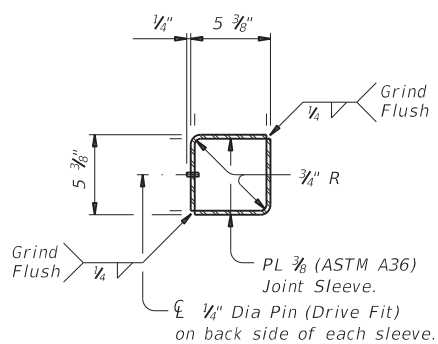
SHEET 3 OF 4

		Bridge Division
RAIL RETROFIT T131RC (MOD)		
FM 38 AT WEST FORK SANDERS CREEK		
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		SHEET NO: 59



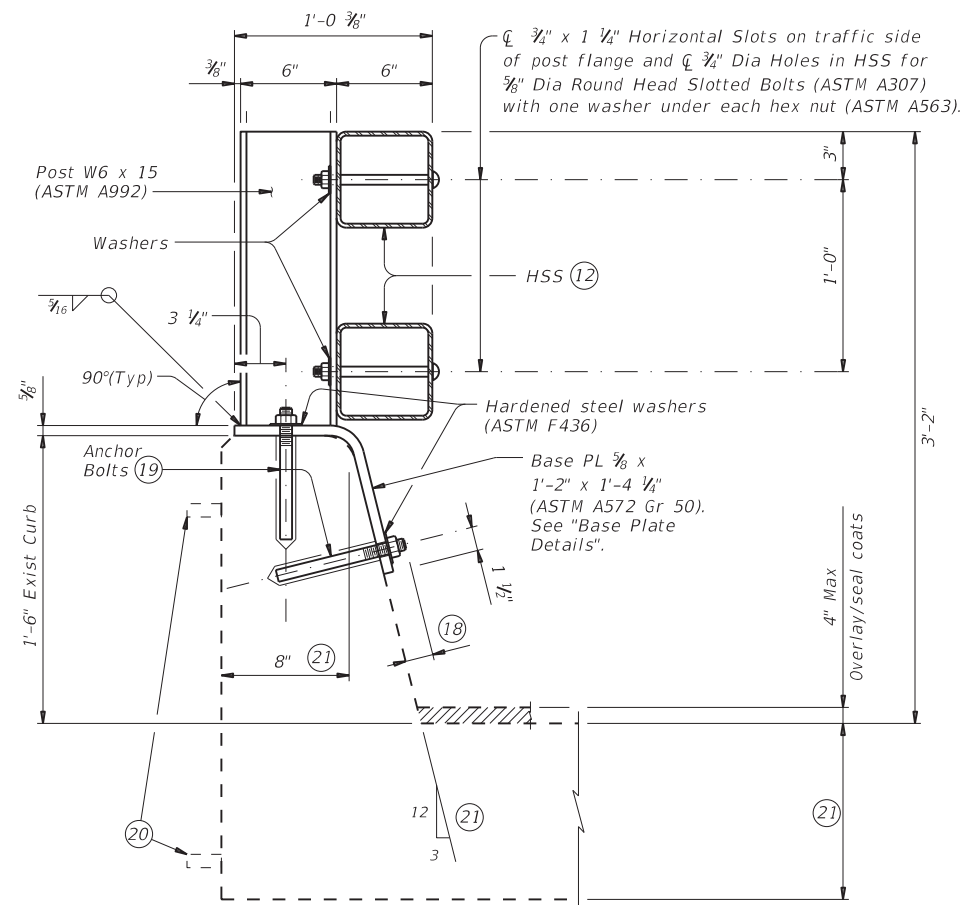
TYPICAL POST CONNECTION AND SPLICE DETAIL FOR HSS

Showing post with HSS and HSS splice.

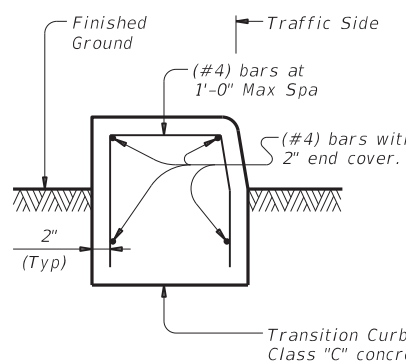


SECTION B-B

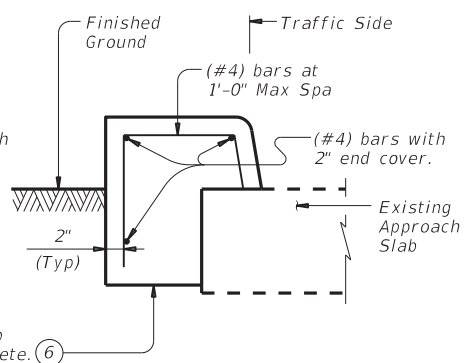
Showing typical joint sleeve.



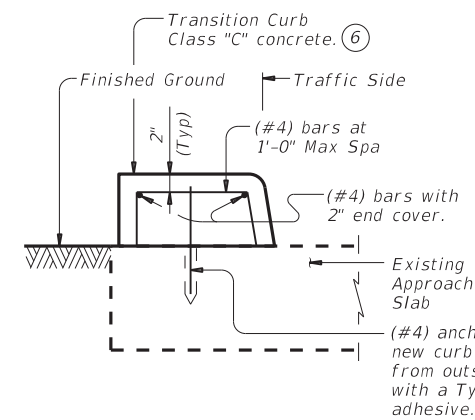
SECTION A-A OF 18" HIGH CURBS



WITH NO APPROACH SLAB

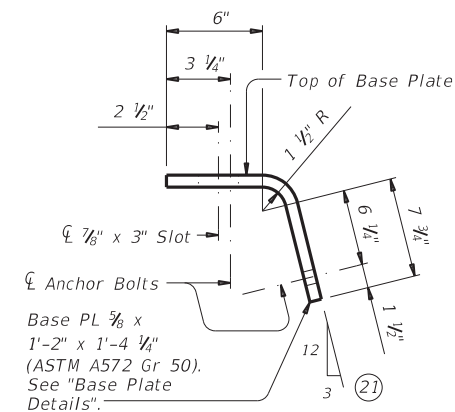


WITH PARTIAL WIDTH APPROACH SLAB



WITH FULL OR ALMOST FULL WIDTH APPROACH SLAB

EXAMPLES OF TRANSITION CURB SECTIONS



CURB BASE PLATE DETAIL

- ⑥ Match existing bridge curb face on traffic side of transition curb. Transition curb 6" x 1'-6" taper will remain vertical.
- ⑩ \bar{C} HSS Expansion Joint or \bar{C} HSS Splice Joint as required.
- ⑫ HSS 6 x 6 x 1/4 (ASTM A1085 or A500 Gr C).
- ⑯ May be placed on either side of W6 x 15 web.
- ⑰ Place HSS Expansion Joints in rail at every slab Expansion Joint. For Expansion and Splice Joints openings, use the greater of 1" or (slab opening plus 1/2").
- ⑱ 1 3/4" Bolt Projection (Typ).
- ⑲ See "Material Notes" for anchor Bolt information.
- ⑳ Remove existing railing (including posts), cut and grind anchor bolts flush and paint ends with two coats of zinc-rich paint conforming to the Item "Galvanizing".
- ㉑ See elsewhere in plans for dimensions (curb width and height, slab and overlay thickness). Slope of curb may differ from what is shown. Adjust base plate as necessary to conform to curb face geometry.

SHEET 4 OF 4

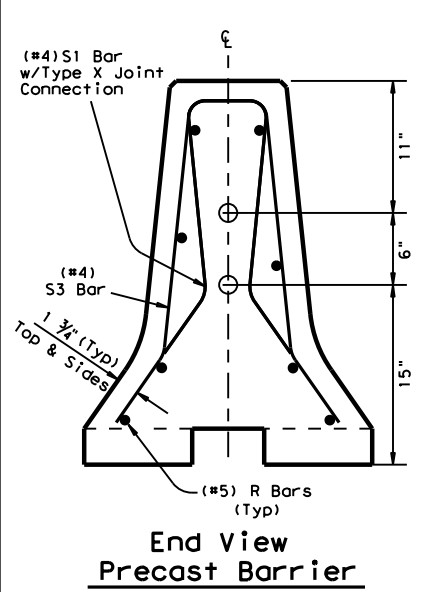
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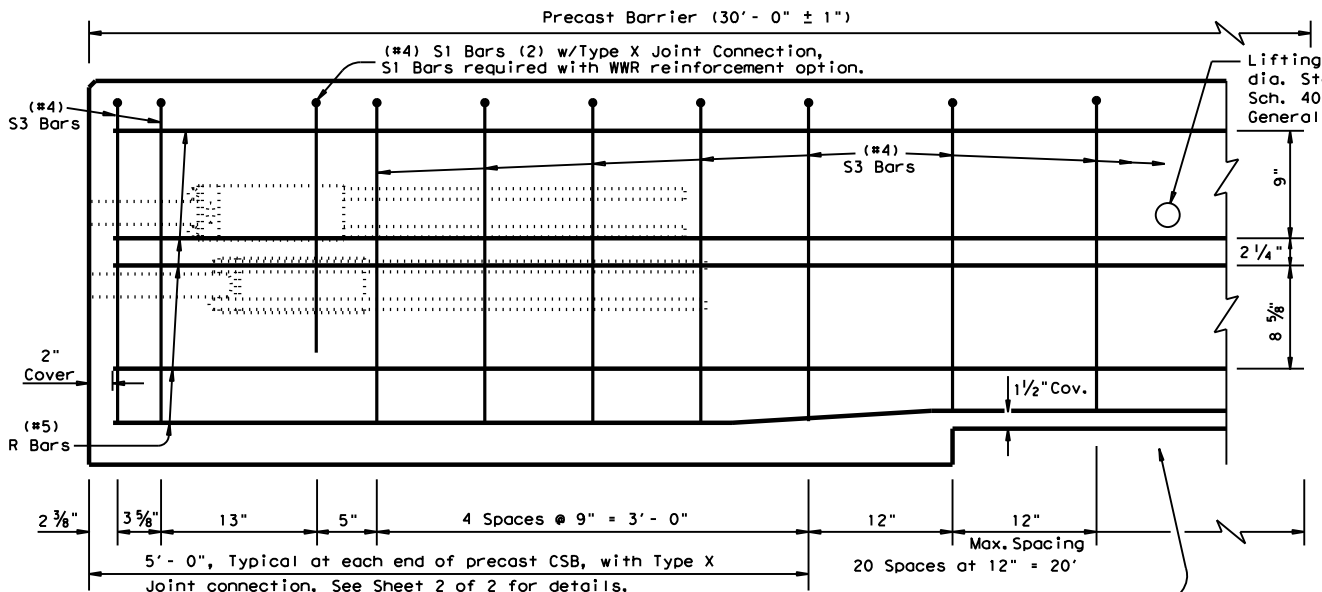
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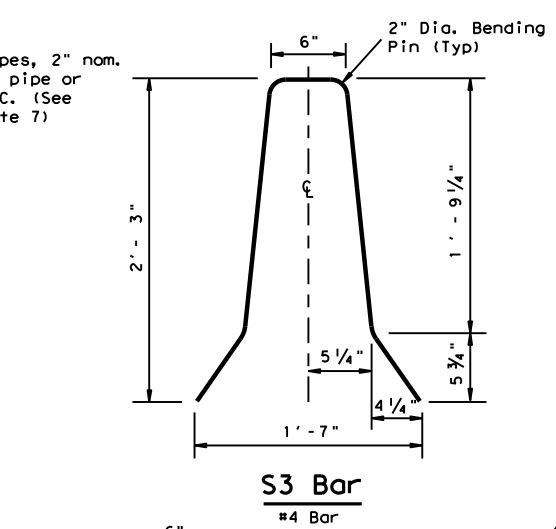
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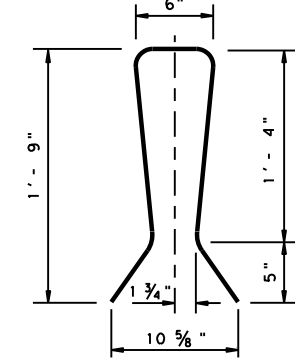
End View Precast Barrier
See sheet 2 of 3 for Joint connection Type X



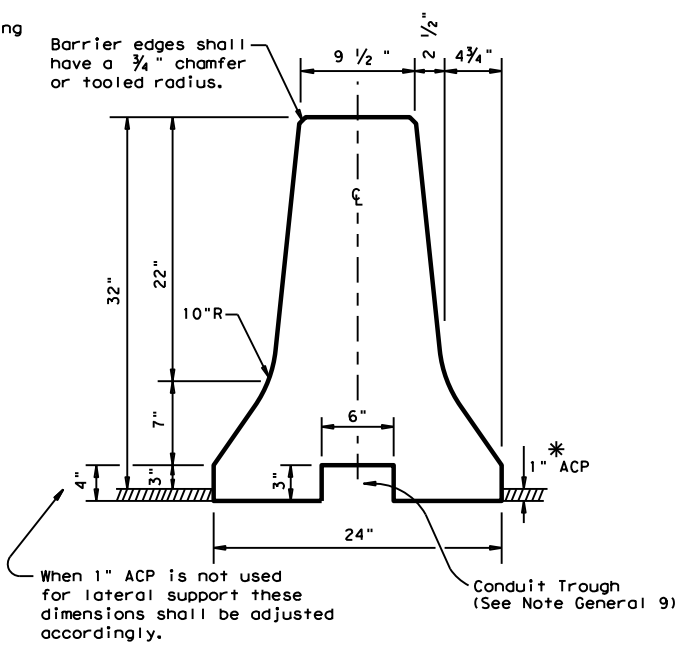
Reinforcement for Precast (CSB) Concrete Safety Barrier (Type 1)
Showing reinforcement for Joint Type X



S3 Bar
#4 Bar

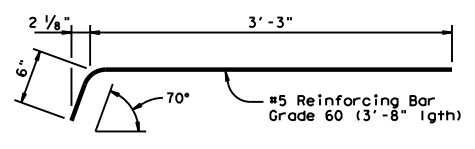


S1 Bar
#4 Bar (2)
(Joint Type X)

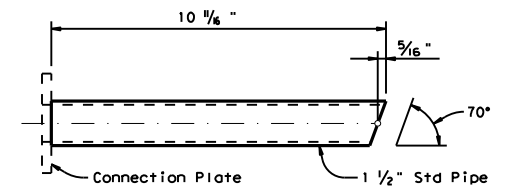


Concrete Safety Barrier

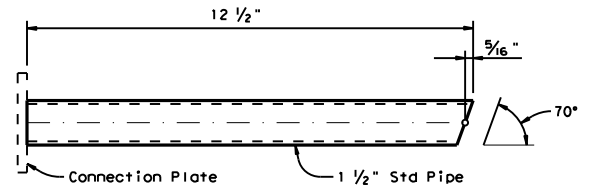
* When 1" ACP is "not" used as lateral support for permanent barrier placement. A permissible method of attaining the equivalent lateral support may be used, See CSB(6) sheet.



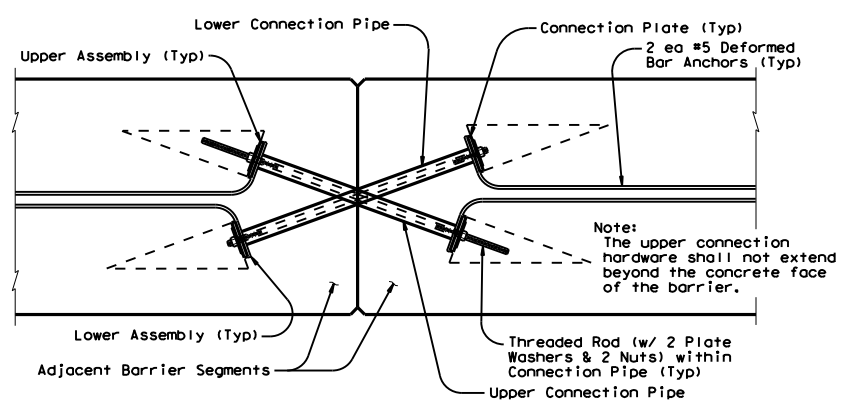
DEFORMED BAR ANCHOR DETAILS
Two (2) Bars required per assembly. Eight (8) required per joint.



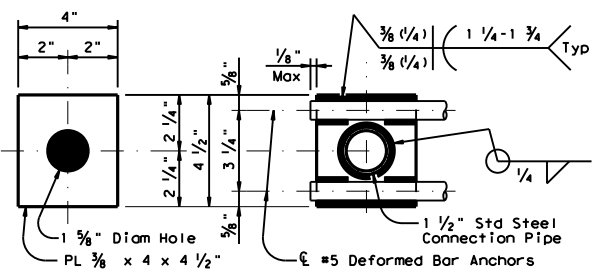
UPPER CONNECTION PIPE DETAILS
One (1) Steel Pipe required per Upper Assembly. Two (2) required per joint.



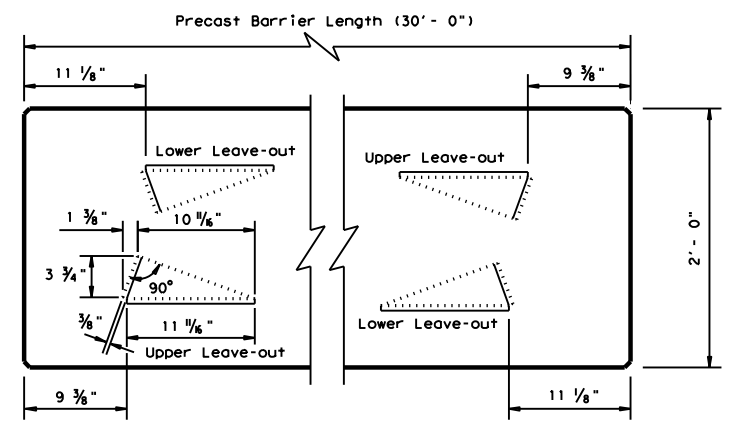
LOWER CONNECTION PIPE DETAILS
One (1) Steel Pipe required per Lower Assembly. Two (2) required per joint.



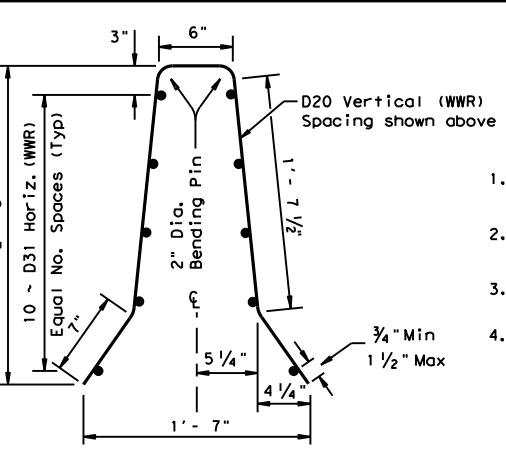
TYPE X JOINT INSTALLATION DETAIL
Barrier reinforcing and Type X Joint Leave-Out dimensions not shown for clarity.



CONNECTION PLATE DETAILS
One (1) Plate required per assembly. Four (4) required per joint. All steel fittings for joint Type X shall be galvanized after fabrication in accordance with Item 445.

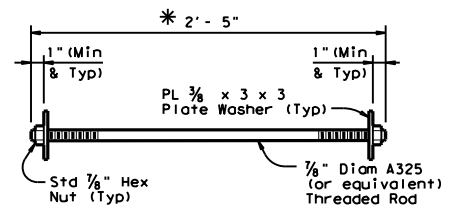


BARRIER PLAN AT END JOINTS

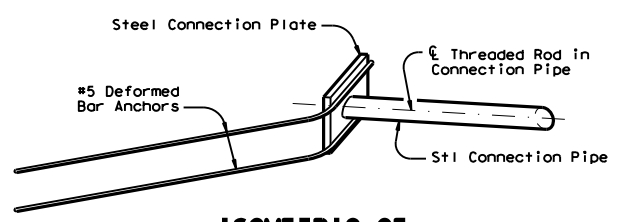


Welded Wire Reinforcement (WWR) Option for Bars R and S3
(WWR) General Notes

1. Deformed Welded Wire Reinforcement (WWR) shall conform to ASTM A497.
2. Welded wire cage may be cut or bent to accommodate the Type X joint connection and drainage slots, as directed by the Engineer.
3. All reinforcement shall comply with Item 440, "Reinforcing Steel."
4. Combinations of reinforcing steel and WWR will be permitted, as directed by the Engineer. The dimension from the end of the barrier section to the first wire shall not exceed 3".



CONNECTION BOLT OR THREADED ROD DETAIL
Two (2) Threaded Rods (or Equivalent Hex Hd. Bolts) (w/ Two (2) PL 3/8 x 3 x 3 Plate Washers & Two (2) Std Hex Nuts) required per joint.
* The connection hardware shall not extend beyond the concrete face of the barrier. Hex head bolts may be provided. The proper length of all hardware should be verified.



ISOMETRIC OF TYPICAL WELDED ASSEMBLY
Four (4) [2 Upper & 2 Lower] Assemblies required per joint.

Weight of one Precast 30 ft. (CSB) segment = Approx. 6.5 Tons or 440 lbs per ft.

GENERAL NOTES

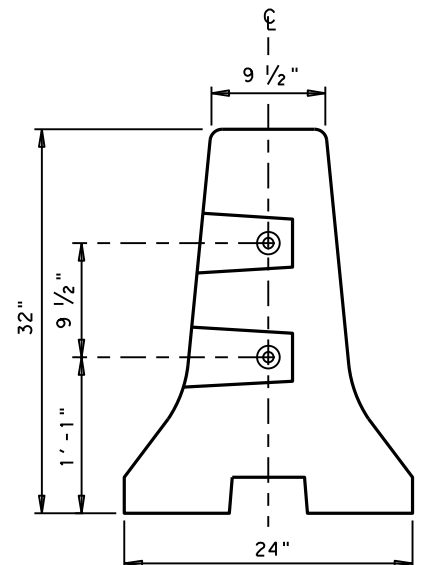
1. Concrete shall be Class H with a minimum compressive strength of 3,600 psi.
2. Where used, rebar reinforcement shall be Grade 60 and conform to ASTM A615.
3. Precast barrier length shall be 30 ft. unless otherwise specified on the plans.
4. All precast barrier edges shall have a 3/4 inch chamfer or tooled radius.
5. All concrete, reinforcement, joint connection systems, grout etc. as shown, are considered as part of the barrier payment.
6. All steel assemblies for joint shall be galvanized after fabrication in accordance with Item 445, "Galvanizing."
7. Regardless of the method of handling, barrier lifting points shall be approx. 7.5 feet from the ends of the barrier. Lifting devices and attachments to barrier sections shall be approved by the Engineer.
8. Surface finishing and grouting (where required) shall be two parts sand one part cement with enough water to make the mixture plastic. Grouting shall be done in a manner that will assure a smooth surface. Surface finishing shall be considered subsidiary to the various bid items involved.
9. Conduit trough when required shall be shown elsewhere on the plans, or as directed by the Engineer.

SHEET 1 OF 2

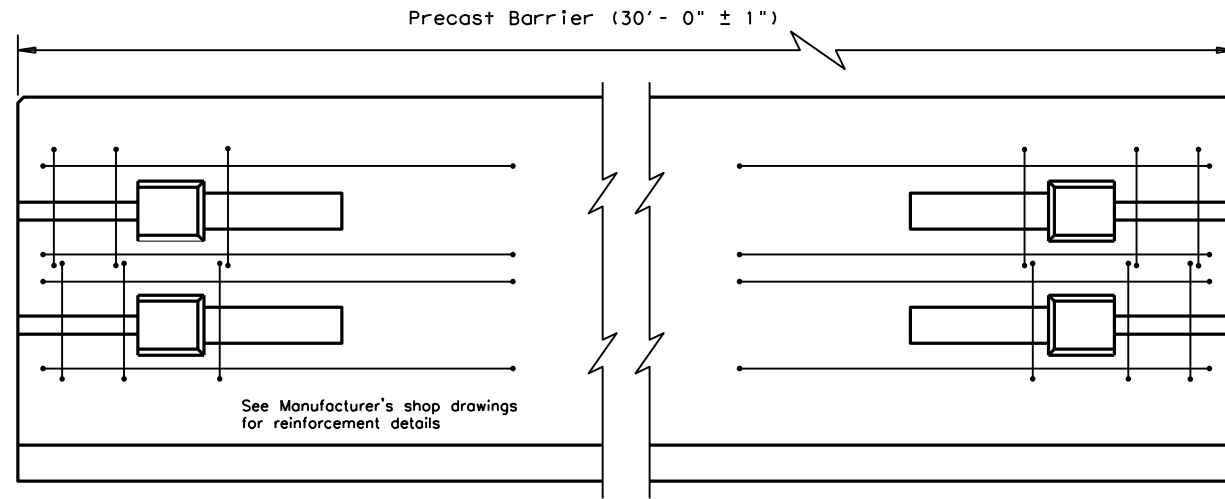
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PRECAST BARRIER (TYPE 1)			
CSB(1)-10			
FILE: csb110.dgn	DN: TxDOT	CK: AM	DW: BD
© TxDOT December 2010	CONT: 0435	SECT: 01	JOB: O80
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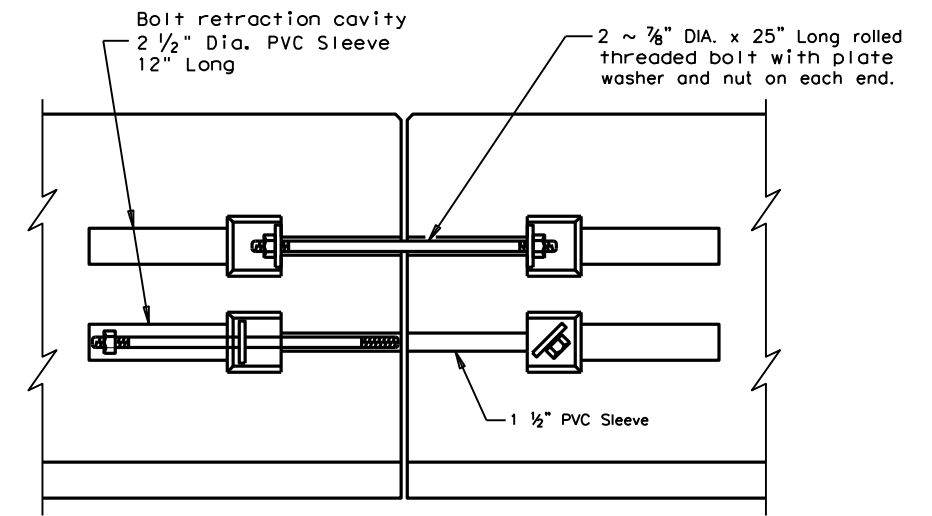
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END VIEW (CSB) QUICK-BOLT
 QUICK-BOLT POCKET LOCATIONS

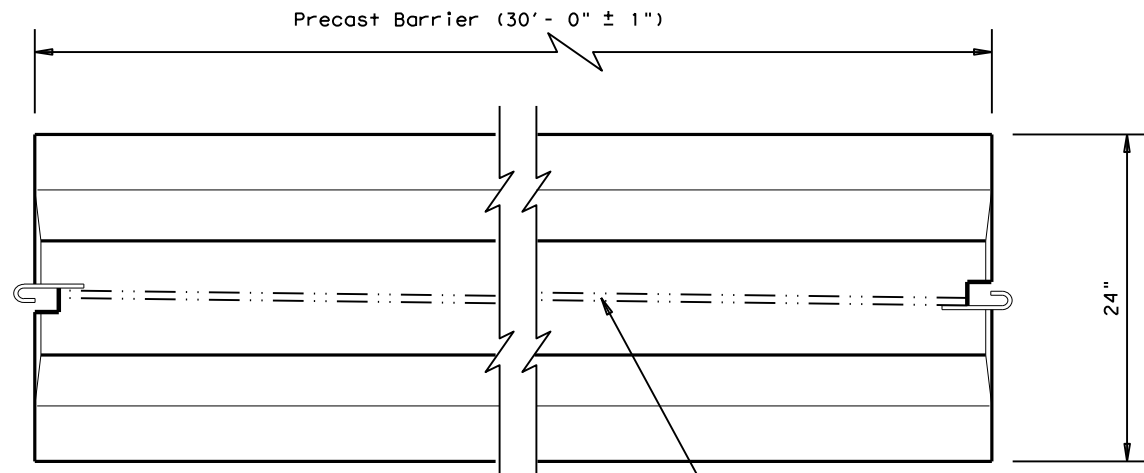


ELEVATION (CSB) QUICK-BOLT
 See Manufacturer's shop drawing for additional details

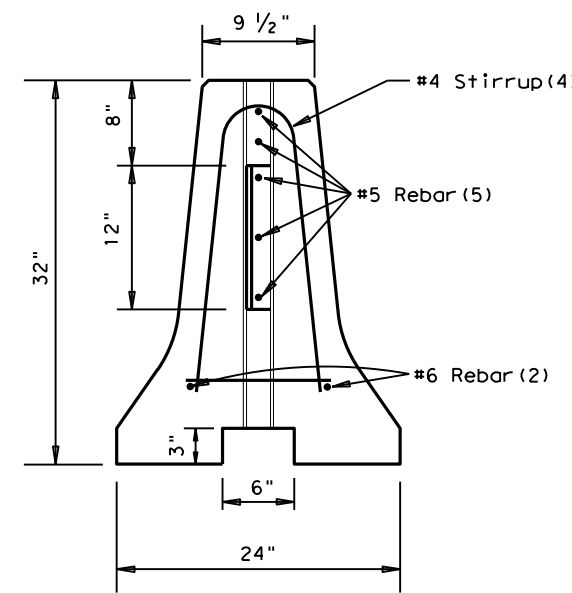


ELEVATION VIEW SHOWING JOINT CONNECTION
"QUICK-BOLT"

Joint Connection (Type Q)

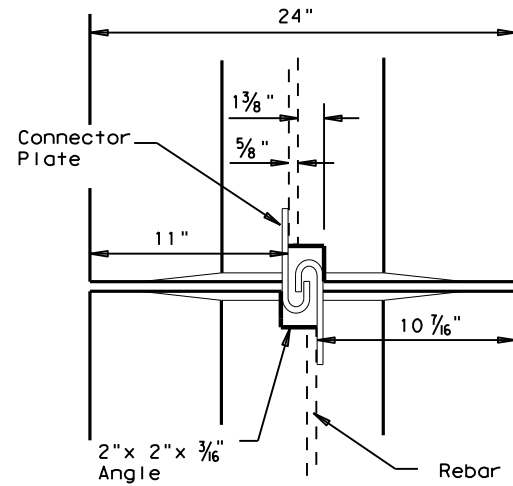


TOP VIEW
PRECAST (CSB) WITH J-J HOOKS
 See Manufacturer's shop drawing for additional details



END VIEW
J-J HOOK CONNECTION

Joint Connection (Type J)



VIEW FROM ABOVE
J-J HOOK CONNECTION

Proprietary Joint Connections (CSB)

Two proprietary joint connections are acceptable as alternates to the (Type X) connection shown, here on. These joint connections types are:

J-J Hooks by Easi-Set Industries, (800)547-4045
 Quick-Bolt by Bexar Concrete, (210)497-3773

If one of these connection systems are exclusively specified in the plans, prior approval for sole source use must be obtained. Details of the connection components and barrier reinforcement for these systems, will be shown on the manufacturer's shop drawing(s) furnished to the Engineer.

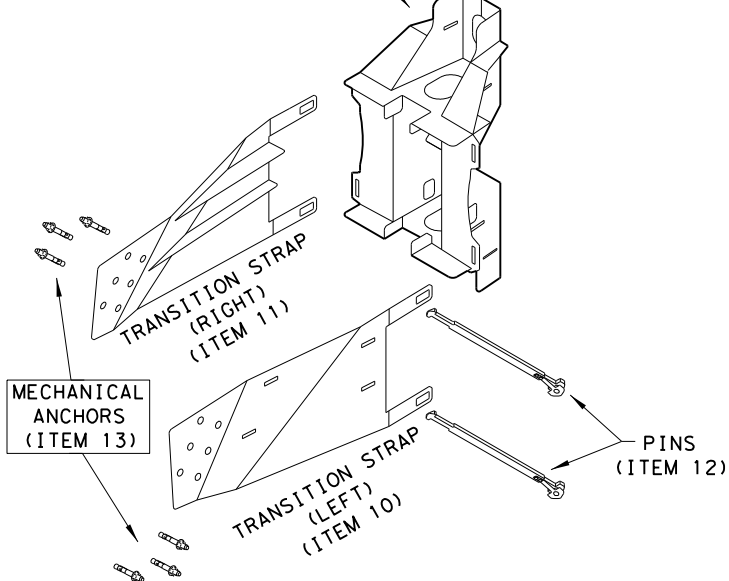
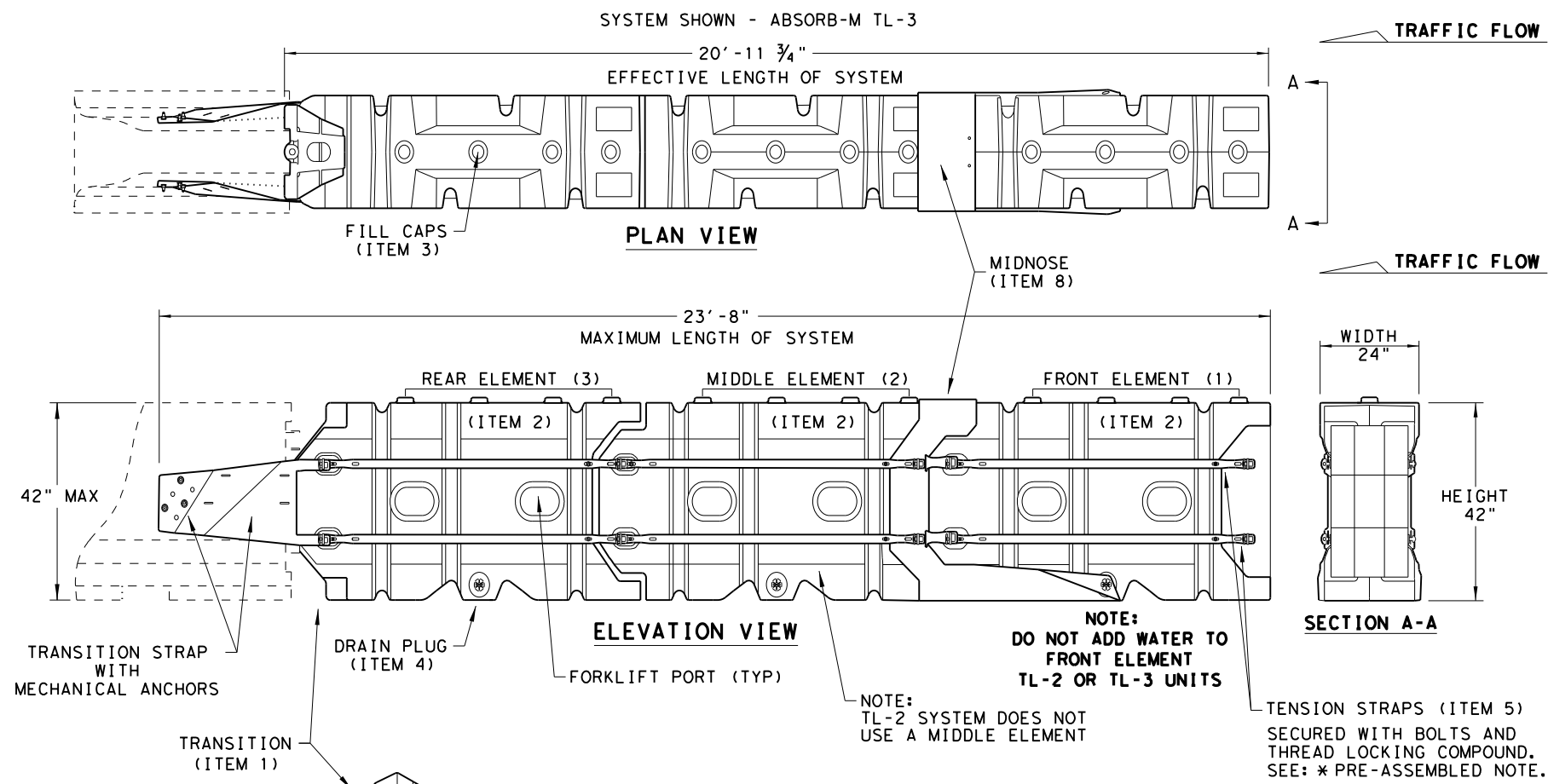
SHEET 2 OF 2

		Design Division Standard	
CONCRETE SAFETY BARRIER (F-SHAPE) PRECAST BARRIER (TYPE 1) CSB(1)-10			
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© TxDOT December 2010	CONT SECT	JOB	HIGHWAY
REVISIONS	0435 01	080	FM 38
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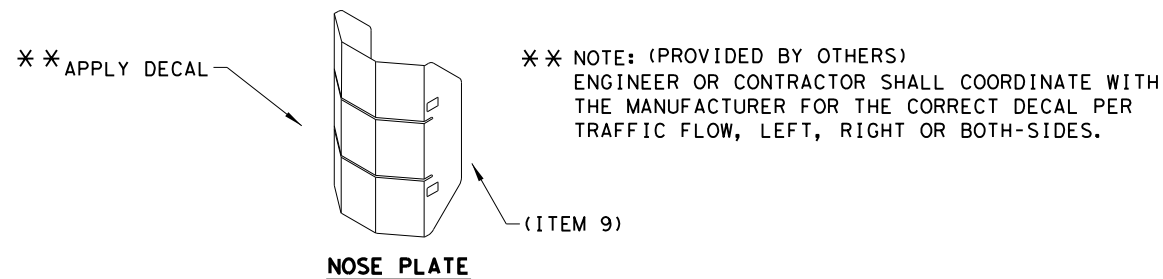


THE ABSORB-M IS A NON-REDIRECTIVE, GATING, CRASH CUSHION DESIGNED TO MEET THE LATEST TL-3 & TL-2 MASH REQUIREMENTS.

THE SYSTEM IS DESIGNED TO ACCOMMODATE A VARIETY OF F-SHAPE AND SINGLE SLOPE CONCRETE BARRIERS. CONTACT THE MANUFACTURER FOR GUIDANCE REGARDING OTHER ALLOWABLE SHAPES.

TEST LEVEL	NUMBER OF ELEMENTS	EFFECTIVE LENGTH	MAXIMUM LENGTH
TL-2	2	14' - 7 3/4"	17' - 4"
TL-3	3	20' - 11 3/4"	23' - 8"

NOTE: CROSS SLOPES OF UP TO 8% (OR 1:12 SLOPE) CAN BE ACCOMMODATED WITH STANDARD HARDWARE SHOWN WITHIN THE INSTRUCTIONS MANUAL. FOR SLOPES WITH EXCESS OF 8% (OR 1:12) CONTACT, LINDSAY TRANSPORTATION SOLUTIONS.



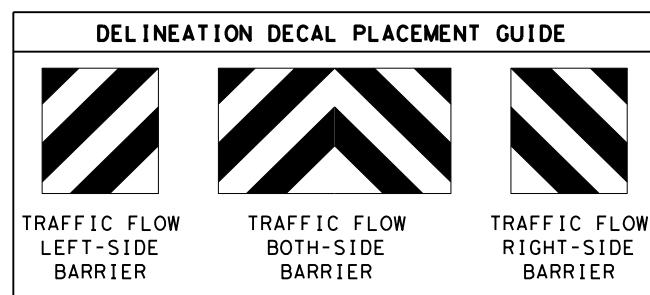
NOTE: APPLY A HIGH REFLECTIVE DECAL TO THE NOSE PLATE. DELINEATION DECAL ORIENTATION IS SHOWN ON THE CONSTRUCTION PLAN SET AND SHALL BE IN ACCORDANCE WITH THE TEXAS MUTCD FOR (TRAFFIC CONTROL DEVICES). DECALS ARE AVAILABLE FOR TRAFFIC FLOW ON THE LEFT-SIDE, BOTH -SIDES AND RIGHT-SIDE.

GENERAL NOTES

- FOR SPECIFIC INFORMATION REGARDING THE INSTALLATION AND TECHNICAL GUIDANCE, CONTACT: LINDSAY TRANSPORTATION SOLUTIONS (LTS) - BARRIER SYSTEMS, INC. AT (707) 374-6800. 180 RIVER ROAD, RIO VISTA, CA 94571
- THE ABSORB-M SYSTEM IS ONLY APPROVED FOR USE IN (TEMPORARY WORK ZONE) LOCATIONS.
- THE ABSORB-M IS A WATER FILLED NON-REDIRECTIVE, GATING CRASH CUSHION THAT DOES NOT NEED TO BE ATTACHED TO A FOUNDATION AND CAN BE INSTALLED ON TOP OF CONCRETE, ASPHALT, OR ANY SURFACE CAPABLE OF BEARING THE WEIGHT OF THE SYSTEM.
- MAXIMUM PERMISSIBLE CROSS-SLOPE IS 8%.
- THE INSTALLATION AREA SHOULD BE FREE FROM CURBS, ELEVATED OBJECTS, OR DEPRESSIONS.
- THE ABSORB-M SHOULD BE LOCATED APPROXIMATELY PARALLEL WITH THE BARRIER.
- THE USE OF THE ABSORB-M IS RESTRICTED TO A BARRIER HEIGHT OF UP TO 42 INCHES.
- DO NOT ADD WATER TO FRONT ELEMENT (TL-2 OR TL-3 UNIT).

BILL OF MATERIALS (BOM) ABSORB-M TL-3 & TL-2 SYSTEMS			QTY	QTY
ITEM #	PART NUMBER	PART DESCRIPTION	TL-2 SYSTEM	TL-3 SYSTEM
1	BSI-1809036-00	TRANSITION-(GALV)	1	1
2	BSI-1808002-00	PRE-ASSEMBLED ABSORBING (ELEMENTS)	2	3
3	BSI-4004598	FILL CAPS	8	12
4	BSI-4004599	DRAIN PLUGS	2	3
5	BSI-1809053-00	TENSION STRAP-(GALV)	8	12
6	BSI-2001998	C-SCR FH 3/8-16 X 1 1/2 GR5 PLT	8	12
7	BSI-2001999	C-SCR FH 3/8-16 X 1 GR5 PLT	8	12
8	BSI-1809035-00	MIDNOSE-(GALV)	1	1
9	BSI-1808014-00	NOSE PLATE	1	1
10	BSI-1809037-00	TRANSITION STRAP (LEFT-HAND)-(GALV)	1	1
11	BSI-1809038-00	TRANSITION STRAP (RIGHT-HAND)-(GALV)	1	1
12	BSI-1808005-00	PIN ASSEMBLY	8	10
13	BSI-2002001	ANC MECH 5/8-11X5 (GALV)	6	6
14	ABSORB-M	INSTALLATION AND INSTRUCTIONS MANUAL	1	1

* COMPONENTS PRE-ASSEMBLED WITH ELEMENT ASSEMBLY

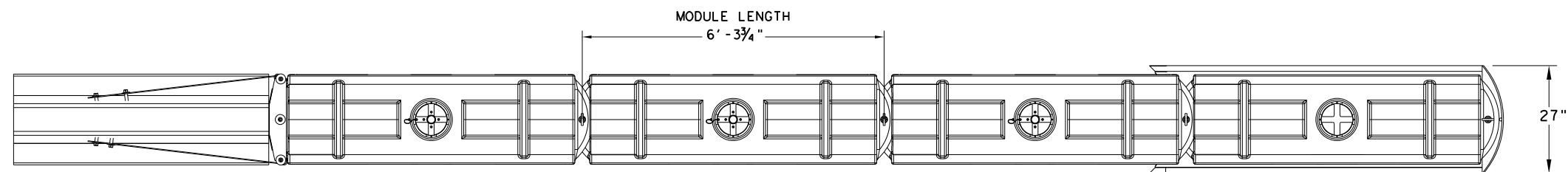


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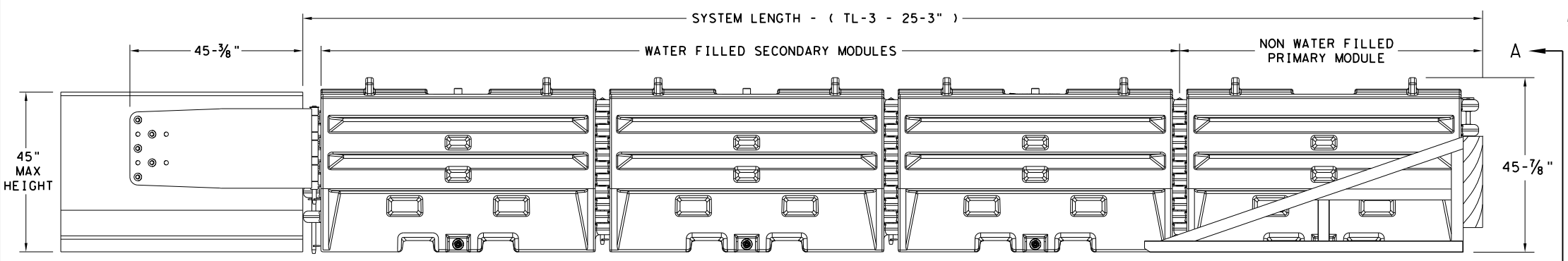
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© TXDOT: JULY 2019	CONT SECT	JOB	HIGHWAY
REVISIONS	0435 01	080	FM 38
DIST	COUNTY	SHEET NO.	
PAR	LAMAR	63	

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DATE: 2/28/2021
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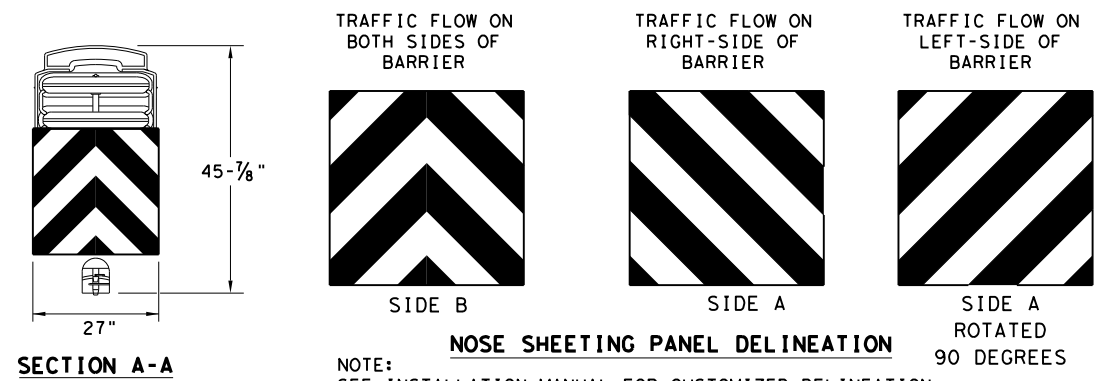
PLAN VIEW



ELEVATION VIEW

GENERAL NOTES

1. REFER TO THE INSTALLATION MANUAL FOR SPECIFIC SYSTEM ASSEMBLY AND MODULE ORIENTATION. FOR ADDITIONAL INFORMATION, CONTACT TRAFFIX, INC. AT (949) 361-5663.
2. THE SLED SYSTEM IS A MASH APPROVED TEST LEVEL 3 (TL-3) CRASH CUSHION APPROVED FOR USE IN TEMPORARY WORK ZONES. THE SLED SYSTEM IS A NON-REDIRECTIVE, GATING CRASH CUSHION THAT DOES NOT NEED TO BE ATTACHED TO THE GROUND AND CAN BE INSTALLED ON CONCRETE, ASPHALT, GRAVEL OR COMPACTED SOIL.
3. MAXIMUM PERMISSIBLE CROSS SLOPE IS 8° (DEGREES) (14%).
4. THE INSTALLATION AREA SHOULD BE FREE FROM CURBS, ELEVATED OBJECTS, OR DEPRESSIONS.
5. THE SLED SYSTEM CAN BE ATTACHED TO:
 - CONCRETE BARRIER, TEMPORARY OR PERMANENT, 45" MAXIMUM HEIGHT
 - STEEL BARRIER
 - PLASTIC BARRIER
 - CONCRETE BRIDGE ABUTMENTS
 - W-BEAM GUARD RAIL
 - THRIE BEAM GUARD RAIL

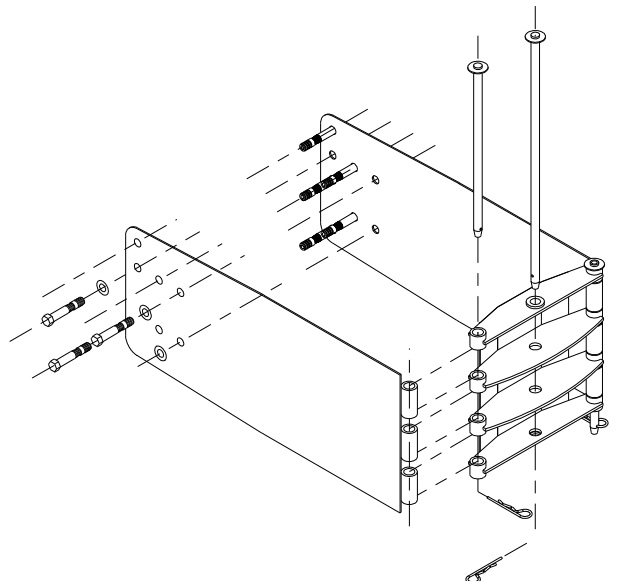


NOSE SHEETING PANEL DELINEATION

NOTE:
SEE INSTALLATION MANUAL FOR CUSTOMIZED DELINEATION NOSE SHEETING FOR DECAL PLACEMENT.

TEST LEVEL	NUMBER OF SECONDARY MODULES	SYSTEM LENGTH
TL-3	3	25' 3"

BILL OF MATERIAL		
PART NUMBER	DESCRIPTION	QTY: TL-3
45131	TRANSITION FRAME, GALVANIZED	1
45150	TRANSITION PANEL, GALVANIZED	2
45147-CP	TRANSITION SHORT DROP PIN W/ KEEPER PIN, GALVANIZED	2
45148-CP	TRANSITION LONG DROP PIN W/ KEEPER PIN, GALVANIZED	1
45050	ANCHOR BOLTS	9
12060	WASHER, 3/4" ID X 2" OD	9
45044-Y	SLED YELLOW WATER FILLED MODULE	3
45044-YH	SLED YELLOW "NO FILL" MODULE	1
45044-S	CIS (CONTAINMENT IMPACT SLED), GALVANIZED	1
45043-CP	T-PIN W/ KEEPER PIN	4
18009-B-I	FILL CAP W/ "DRIVE BY" FLOAT INDICATOR	3
45033-RC-B	DRAIN PLUG	3
45032-DPT	DRAIN PLUG REMOVAL TOOL	1



SLED TRANSITION COMPONENTS FOR ATTACHMENT TO CMB

NOTE:
SEE MANUFACTURER'S INSTALLATION MANUAL FOR FURTHER DETAILS.

TRANSITION OPTIONS
SLED TRANSITION TO CONCRETE TRAFFIC BARRIER (TEMPORARY OR PERMANENT)
SLED TRANSITION TO STEEL TRAFFIC BARRIER (CONTACT MFG FOR PROPER TRANSITION)
SLED TRANSITION TO PLASTIC TRAFFIC BARRIER (CONTACT MFG FOR PROPER TRANSITION)
SLED TRANSITION TO W-BEAM OR THRIE BEAM GUARD RAIL (CONTACT MFG FOR PROPER TRANSITION)
SLED TRANSITION TO CONCRETE BRIDGE ABUTMENT

NOTE:
THIS STANDARD IS A BASIC REPRESENTATION OF THE SLED, IT IS NOT INTENDED TO REPLACE THE INSTALLATION INSTRUCTIONS MANUAL.

SACRIFICIAL

Design Division Standard

SLED
 CRASH CUSHION
 TL-3 MASH COMPLIANT
 (TEMPORARY, WORK ZONE)
 SLED-19

FILE: sled19.dgn	DN: TxDOT	CK: KM	DW: VP	CK:
© TxDOT: DECEMBER 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0435	01	080	FM 38
DIST	COUNTY	SHEET NO.		
PAR	LAMAR			64

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LOC NO.	TCP PHASE	PLAN SHEET NUMBER	LOCATION	STA	TEST LEVEL	DIRECTION OF TRAFFIC (UNI/BI)	FOUNDATION PAD		BACKUP SUPPORT			AVAILABLE SITE LENGTH	CRASH CUSHION														
							PROPOSED MATERIAL	PROPOSED THICKNESS	DESCRIPTION	WIDTH	HEIGHT		INSTALL	REMOVE	MOVE / RESET		L	L	R	R	S	S					
															MOVE/RESET	FROM LOC. #	N	W	N	W	N	W					
1	III	N/A	WEST FORK SANDERS CREEK (SB)	709+52.00	TL-3	BI	N/A	N/A	ATTACH TO CTB	*	*	100+	X												X		
2	III	N/A	WEST FORK SANDERS CREEK (NB)	717+10.00	TL-3	BI	N/A	N/A	ATTACH TO CTB	*	*	100+		X	X	1										X	
												TOTALS															

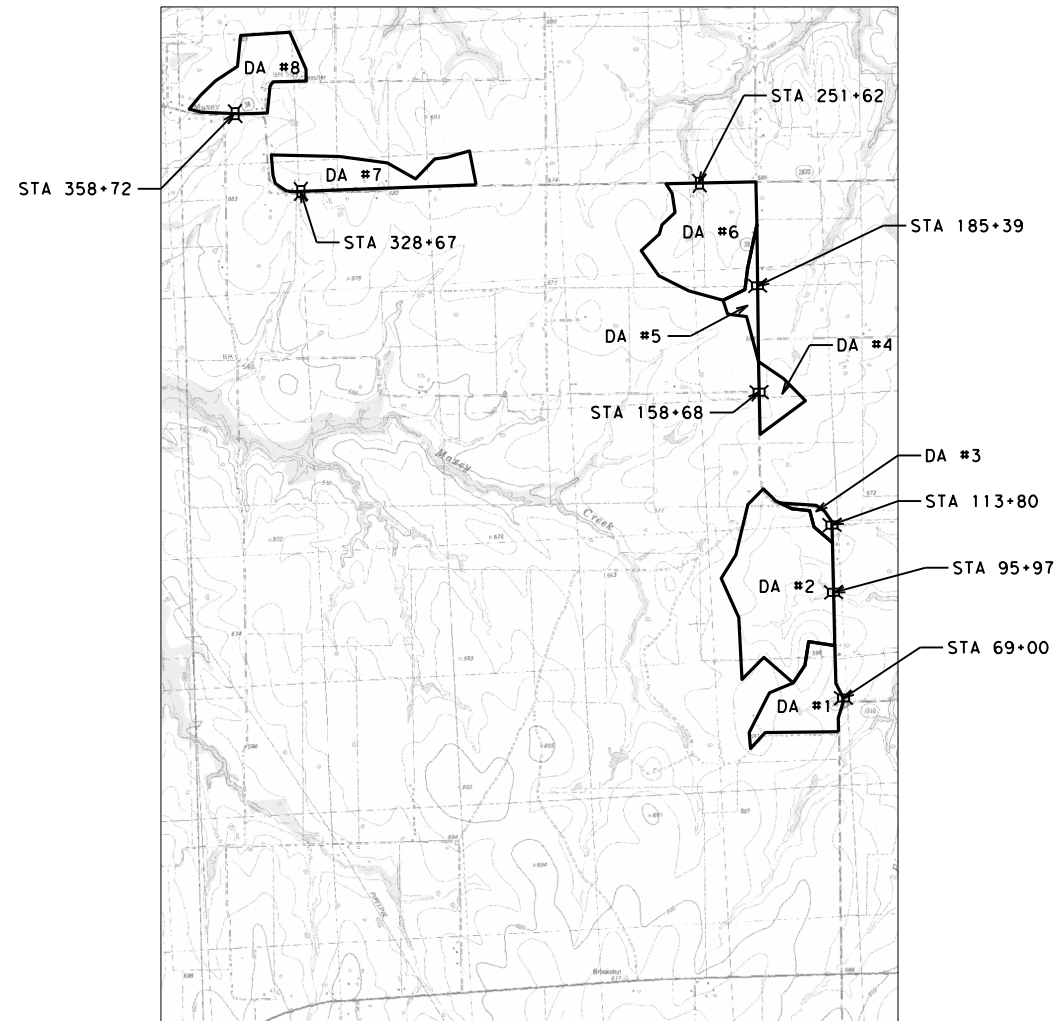
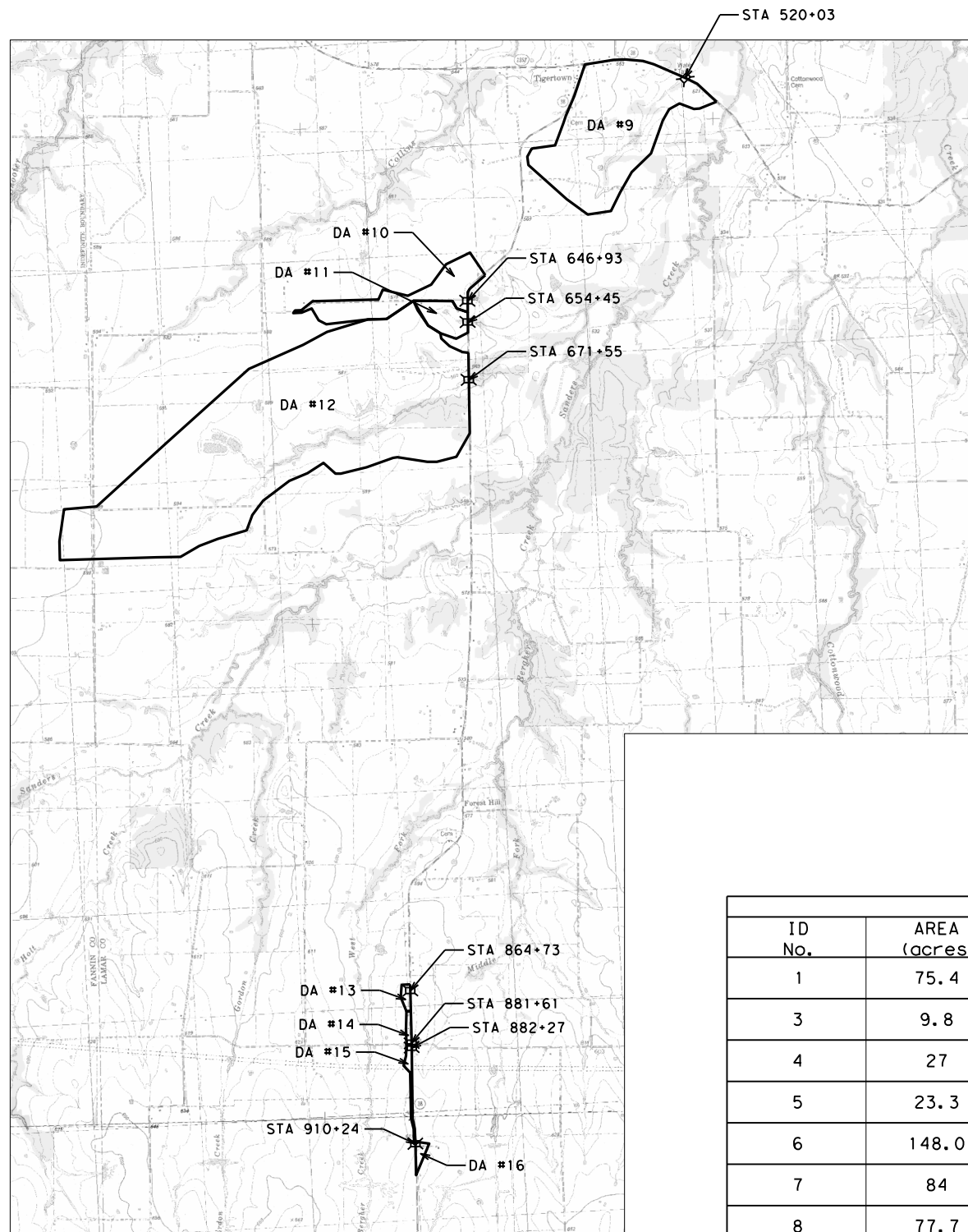
LEGEND:
 L=LOW MAINTENANCE
 R=REUSABLE
 S=SACRIFICIAL
 N=NARROW
 W=WIDE

FOR DEFINITIONS SEE THE "CRASH CUSHION CATEGORIZATION CHART.PDF" AT THE DESIGN DIVISION (ROADWAY STANDARDS) WEBSITE. USE QUICK LINKS TO ACCESS ATTENUATORS / CRASH CUSHIONS SECTION.
<http://www.dot.state.tx.us/insdot/orgchart/cmd/cserve/standard/rdwylse.htm>

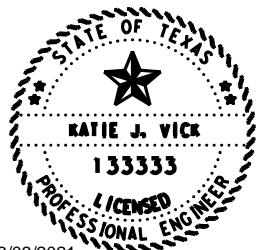
CRASH CUSHION SUMMARY SHEET

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© TxDOT	CONT	SECT	JOB
REVISIONS	0435	01	080
	DIST	COUNTY	
	PAR	LAMAR	
	FEDERAL AID PROJECT		SHEET NO.
			65

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DETERMINATION OF PEAK DISCHARGES								
ID No.	AREA (acres)	COEFFICIENT C	Tc (Min)		5-year	10-year	25-year	100-year
1	75.4	0.29	75.9	Intensity (in/hr)	1.89	2.20	2.61	3.22
				Discharges (cfs)	41.3	48.1	57.1	70.4
3	9.8	0.31	16.8	Intensity (in/hr)	4.56	5.27	6.19	7.53
				Discharges (cfs)	13.9	16.1	18.9	23.0
4	27	0.29	50.3	Intensity (in/hr)	2.47	2.87	3.40	4.19
				Discharges (cfs)	19.3	22.5	26.6	32.8
5	23.3	0.3	13.8	Intensity (in/hr)	4.99	5.76	6.75	8.20
				Discharges (cfs)	34.9	40.3	47.2	57.3
6	148.0	0.3	80.5	Intensity (in/hr)	1.82	2.11	2.51	3.10
				Discharges (cfs)	81.0	94.0	112	138
7	84	0.3	67.7	Intensity (in/hr)	2.04	2.37	2.81	3.47
				Discharges (cfs)	51.5	59.8	70.9	87.5
8	77.7	0.3	79.1	Intensity (in/hr)	1.84	2.14	2.54	3.14
				Discharges (cfs)	42.9	49.9	59.2	73.2
10	85.70	0.3	34.5	Intensity (in/hr)	3.11	3.61	4.26	5.22
				Discharges (cfs)	79.9	92.8	110	134
11	29.60	0.28	44.5	Intensity (in/hr)	2.67	3.10	3.66	4.51
				Discharges (cfs)	22.1	25.7	30.3	37.4
13	4.7	0.3	52.7	Intensity (in/hr)	2.40	2.79	3.30	4.06
				Discharges (cfs)	3.36	3.91	4.62	5.69
14	3.5	0.3	55	Intensity (in/hr)	2.34	2.72	3.21	3.96
				Discharges (cfs)	2.45	2.85	3.36	4.15
15	6.1	0.3	16.1	Intensity (in/hr)	4.67	5.39	6.32	7.69
				Discharges (cfs)	8.57	9.90	11.6	14.1
16	4.3	0.3	23.1	Intensity (in/hr)	3.90	4.51	5.30	6.48
				Discharges (cfs)	5.01	5.79	6.81	8.32
ID No.	AREA (acres)	CN	Tc (Min)		5-year	10-year	25-year	100-year
2	215	80.3	60.7	Discharges (cfs)	297	366	467	609
9	309	78.4	69.6		413	519	659	865
12	1030	79.7	202		674	853	1092	1457

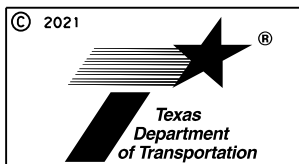
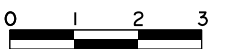


03/03/2021

Katie J. Vick, P.E.

**FM 38
DRAINAGE
AREA MAP**

SCALE (MILE):



CONT	SECT	JOB	HIGHWAY
0435	01	080	FM 38
DIST	COUNTY	SHEET NO.	
PAR	LAMAR	66	

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CROSS CULVERT HYDROLOGIC AND HYDRAULIC DATA (RATIONAL METHOD)

STRUCTURE INLET STA.	DRAINAGE AREA IDENTIFIER	AREA (AC)	CHANNEL SLOPE (FT/FT)	n	CHANNEL TYPE	HYDRAULIC CONDITION	STRUCTURE DESCRIPTION	STRUCTURE MANNINGS n	STRUCTURE SLOPE (FT/FT)	ENTRANCE / EXIT TYPE	RUNOFF COEFFICIENT	Tc (MIN)	FLOOD FREQUENCY	FLOW (Q) (CFS)	HEADWATER ELEV (FT)	TAILWATER ELEV (FT)	TAILWATER VELOCITY	DEPTH OVER ROADWAY (FT)	ROADWAY ELEV OVERTOP (FT)
69+00	1	75.4	0.0112	0.035	TRAPEZOIDAL	EXISTING	4' x 4' x 53' BOX CULVERT	0.012	0.0030	LEFT -- PW RIGHT -- FW	0.29	75.9	10 YEAR	48	569.17	568.21	4.57	-	572.81
						PROPOSED	4' x 4' x 61' BOX CULVERT	0.012	0.0030	LEFT -- PW RIGHT -- SET	0.29	75.9	10 YEAR	48	569.15	568.18	4.57	-	572.81
113+80	3	9.84	0.0200	0.030	TRAPEZOIDAL	EXISTING	2' x 2.5' x 74' ARCH PIPE	0.024	0.0093	LEFT -- PROJ RIGHT -- PROJ	0.31	16.8	10 YEAR	16	570.87	569.05	4.64	-	573.05
						PROPOSED	30" x 74' RCP	0.012	0.0093	LEFT -- SET RIGHT -- SET	0.31	16.8	10 YEAR	16	570.95	569.05	4.64	-	573.05
158+68	4	27	0.0030	0.030	TRAPEZOIDAL	EXISTING	30" x 50' CMP	0.024	0.0172	LEFT -- PROJ RIGHT -- PROJ	0.29	50.3	10 YEAR	22	591.76	590.05	2.77	-	594.32
						PROPOSED	30" x 52' RCP	0.012	0.0172	LEFT -- SET RIGHT -- SET	0.29	50.3	10 YEAR	22	591.52	590.05	2.77	-	594.32
185+39	5	23.3	0.0011	0.030	TRAPEZOIDAL	EXISTING	2.5' x 3.5' x 40' ARCH PIPE	0.024	0.0271	LEFT -- PROJ RIGHT -- PROJ	0.3	13.8	10 YEAR	40	588.44	586.15	1.71	-	588.79
						PROPOSED	36" x 40' RCP	0.012	0.0271	LEFT -- SET RIGHT -- SET	0.3	13.8	10 YEAR	40	588.61	586.12	1.71	-	588.79
251+62	6	148	0.0063	0.030	TRAPEZOIDAL	EXISTING	7' x 4' x 37' BOX CULVERT	0.012	0.0065	LEFT -- PW RIGHT -- PW	0.3	80.5	10 YEAR	94	573.91	573.65	5.24	-	576.98
						PROPOSED	7' x 4' x 47' BOX CULVERT	0.012	0.0065	LEFT -- PW RIGHT -- PW	0.3	80.5	10 YEAR	94	573.88	573.62	5.24	-	576.98
328+67	7	84.1	0.0024	0.025	TRAPEZOIDAL	EXISTING	4' x 4' x 41' BOX CULVERT	0.012	0.0063	LEFT -- SW RIGHT -- PW	0.3	67.7	10 YEAR	60	578.19	577.01	3.06	-	582.85
						PROPOSED	4' x 4' x 56' BOX CULVERT	0.012	0.0063	LEFT -- PW RIGHT -- SET	0.3	67.7	10 YEAR	60	578.41	576.96	3.06	-	582.85
358+72	8	77.7	0.0151	0.030	TRAPEZOIDAL	EXISTING	4' x 4' x 47' BOX CULVERT	0.012	0.0066	LEFT -- SW RIGHT -- DROP INLET	0.3	79.1	10 YEAR	50	559.32	557.56	5.27	-	565.58
						PROPOSED	4' x 4' x 56' BOX CULVERT	0.012	0.0066	LEFT -- PW RIGHT -- PW	0.3	79.1	10 YEAR	50	559.32	557.48	5.27	-	565.58
646+93	10	85.7	0.0096	0.030	TRAPEZOIDAL	EXISTING	4' x 4' x 53' BOX CULVERT	0.012	0.0357	LEFT -- SW RIGHT -- SW	0.3	34.5	10 YEAR	93	565.53	561.31	5.00	-	567.13
						PROPOSED	4' x 4' x 66' BOX CULVERT	0.012	0.0357	LEFT -- SW RIGHT -- SW	0.3	34.5	10 YEAR	93	565.83	561.31	5.00	-	567.13
654+45	11	29.6	0.0157	0.035	TRAPEZOIDAL	EXISTING	36" x 55' RCP	0.012	0.0074	LEFT -- PROJ RIGHT -- PROJ	0.28	44.5	10 YEAR	26	555.77	554.30	4.70	-	558.80
						PROPOSED	36" x 49' RCP	0.012	0.0074	LEFT -- SET RIGHT -- SET	0.28	44.5	10 YEAR	26	555.77	554.34	4.70	-	558.80
864+73	13	4.67	0.0145	0.030	TRAPEZOIDAL	EXISTING	24" x 63' RCP	0.012	0.0323	LEFT -- PROJ RIGHT -- PROJ	0.3	52.7	10 YEAR	4	614.29	611.81	2.64	-	618.90
						PROPOSED	24" x 55' RCP	0.012	0.0323	LEFT -- SET RIGHT -- SET	0.3	52.7	10 YEAR	4	614.29	612.07	2.64	-	618.90
881+61	14	3.49	0.0063	0.030	TRAPEZOIDAL	EXISTING	18" x 68' RCP	0.012	0.0269	LEFT -- PROJ RIGHT -- PROJ	0.3	55	10 YEAR	3	617.95	615.77	1.80	-	620.61
						PROPOSED	18" x 60' RCP	0.012	0.0269	LEFT -- SET RIGHT -- SET	0.3	55	10 YEAR	3	618.03	616.00	1.80	-	620.61
882+27	15	6.12	0.0066	0.030	TRAPEZOIDAL	EXISTING	18" x 69' RCP	0.012	0.0230	LEFT -- PROJ RIGHT -- PROJ	0.3	16.1	10 YEAR	10	618.84	616.11	2.48	-	620.73
						PROPOSED	18" x 61' RCP	0.012	0.0230	LEFT -- SET RIGHT -- SET	0.3	16.1	10 YEAR	10	619.37	616.30	2.48	-	620.73
910+24	16	4.28	0.0263	0.030	TRAPEZOIDAL	EXISTING	24" x 45' RCP	0.012	0.0136	LEFT -- SET RIGHT -- SET	0.3	23.1	10 YEAR	6	631.51	630.19	4.01	-	635.30
						PROPOSED	24" x 53' RCP	0.012	0.0136	LEFT -- SET RIGHT -- SET	0.3	23.1	10 YEAR	6	631.73	630.27	4.36	-	635.30

DESIGN OF DRAINAGE FACILITIES BASED UPON THE TXDOT HYDRAULIC DESIGN MANUAL, SEPTEMBER 2019.
 PEAK FLOWS WERE DETERMINED USING THE RATIONAL METHOD.
 CULVERTS ANALYZED FOR NO PONDING ON ROADWAY PAVEMENT DURING A 10 YEAR FLOOD EVENT.
 SOFTWARE EMPLOYED FOR HYDROLOGIC ANALYSIS: HY-8 (VER. 7.50 FHWA).
 PER CUSTOMARY TXDOT ENGINEERING PROCEDURE, CULVERTS EXTENDED LESS THAN TEN PERCENT ARE NOT ANALYZED WHEN CULVERT HISTORY INDICATES ADEQUATE STORM FLOW CAPACITY AND FLOOD RISKS HAVE NOT CHANGED.

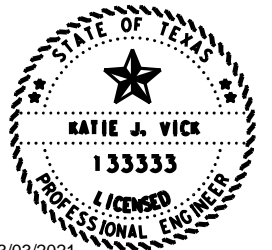
PROJ = PROJECTING END
 FW = FLARED WING
 SW = STRAIGHT WINGS
 PW = PARALLEL WING
 SET = SAFETY END TREATMENT

CROSS-CULVERT HYDROLOGIC AND HYDRAULIC DATA (NRCS UNIT HYDROGRAPH)

STRUCTURE INLET STA.	DRAINAGE AREA IDENTIFIER	AREA (AC)	CHANNEL SLOPE (FT/FT)	n	CHANNEL TYPE	HYDRAULIC CONDITION	STRUCTURE DESCRIPTION	STRUCTURE MANNINGS n	STRUCTURE SLOPE (FT/FT)	ENTRANCE / EXIT TYPE	NRCS RUNOFF CURVE NUMBER	LAG (MIN)	INTERVAL (MIN)	FLOOD FREQUENCY	FLOW (Q) (CFS)	HEADWATER ELEV (FT)	TAILWATER ELEV (FT)	TAILWATER VELOCITY	DEPTH OVER ROADWAY (FT)	ROADWAY ELEV OVERTOP (FT)
95+97	2	215	0.0049	0.035	TRAPEZOIDAL	EXISTING	2 - 5' x 5' x 40' BOX CULVERT	0.012	0.0085	LEFT -- DROP INLET RIGHT -- PW	80.3	43	5	10 YEAR	366	563.80	562.28	5.91	-	563.80
						PROPOSED	2 - 5' x 5' x 47' BOX CULVERT	0.012	0.0085	LEFT -- PW RIGHT -- PW	80.3	43	5	10 YEAR	366	563.40	562.28	5.91	-	563.80
433+53			0.0050	0.060	TRAPEZOIDAL	EXISTING	4 - 7' x 3' x 28' BOX CULVERT	0.012	0.0018	LEFT -- PW RIGHT -- PW				10 YEAR	0	517.53	517.53	0.00	-	523.52
						PROPOSED	4 - 7' x 3' x 44' BOX CULVERT	0.012	0.0018	LEFT -- SW RIGHT -- SW				10 YEAR	0	517.53	517.53	0.00	-	523.52
520+03	9	309	0.0077	0.035	TRAPEZOIDAL	EXISTING	3 - 10' x 7' x 29' BOX CULVERT	0.012	0.0069	LEFT -- PW RIGHT -- PW	78.4	42	6	10 YEAR	519	517.66	517.31	7.69	-	522.87
						PROPOSED	3 - 10' x 7' x 44' BOX CULVERT	0.012	0.0069	LEFT -- SW RIGHT -- SW	78.4	42	6	10 YEAR	519	517.50	517.26	7.69	-	522.87
671+55	12	1030	0.0047	0.035	TRAPEZOIDAL	EXISTING	2 - 7' x 7' x 38' BOX CULVERT	0.012	0.0179	LEFT -- SW RIGHT -- SW	79.7	121	20	10 YEAR	853	544.74	542.49	7.30	-	545.01
						PROPOSED	2 - 7' x 7' x 50' BOX CULVERT	0.012	0.0179	LEFT -- PW RIGHT -- PW	79.7	121	20	10 YEAR	1457	546.27	544.72	8.37	1.26	545.01

DESIGN OF DRAINAGE FACILITIES BASED UPON THE TXDOT HYDRAULIC DESIGN MANUAL, SEPTEMBER 2019.
 NRCS CURVE NUMBER LOSS MODEL EMPLOYED IN HYDROLOGIC ANALYSIS.
 PEAK FLOWS WERE DETERMINED USING A NRCS DIMENSIONLESS UNIT HYDROGRAPH MODELLED IN HEC-HMS.
 PEAK FLOWS FOR STA 433+53 WERE DETERMINED FROM AS-BUILT PLANS 0435-01-036.
 CULVERTS ANALYZED FOR NO PONDING ON ROADWAY PAVEMENT DURING A 10 YEAR FLOOD EVENT.
 SOFTWARE EMPLOYED FOR HYDROLOGIC ANALYSIS: HEC-HMS (VER. 4.2, USACE), HY-8 (VER. 7.50 FHWA).
 PER CUSTOMARY TXDOT ENGINEERING PROCEDURE, CULVERTS EXTENDED LESS THAN TEN PERCENT ARE NOT ANALYZED WHEN CULVERT HISTORY INDICATES ADEQUATE STORM FLOW CAPACITY AND FLOOD RISKS HAVE NOT CHANGED.

SW = STRAIGHT WINGS
 PW = PARALLEL WING



03/03/2021

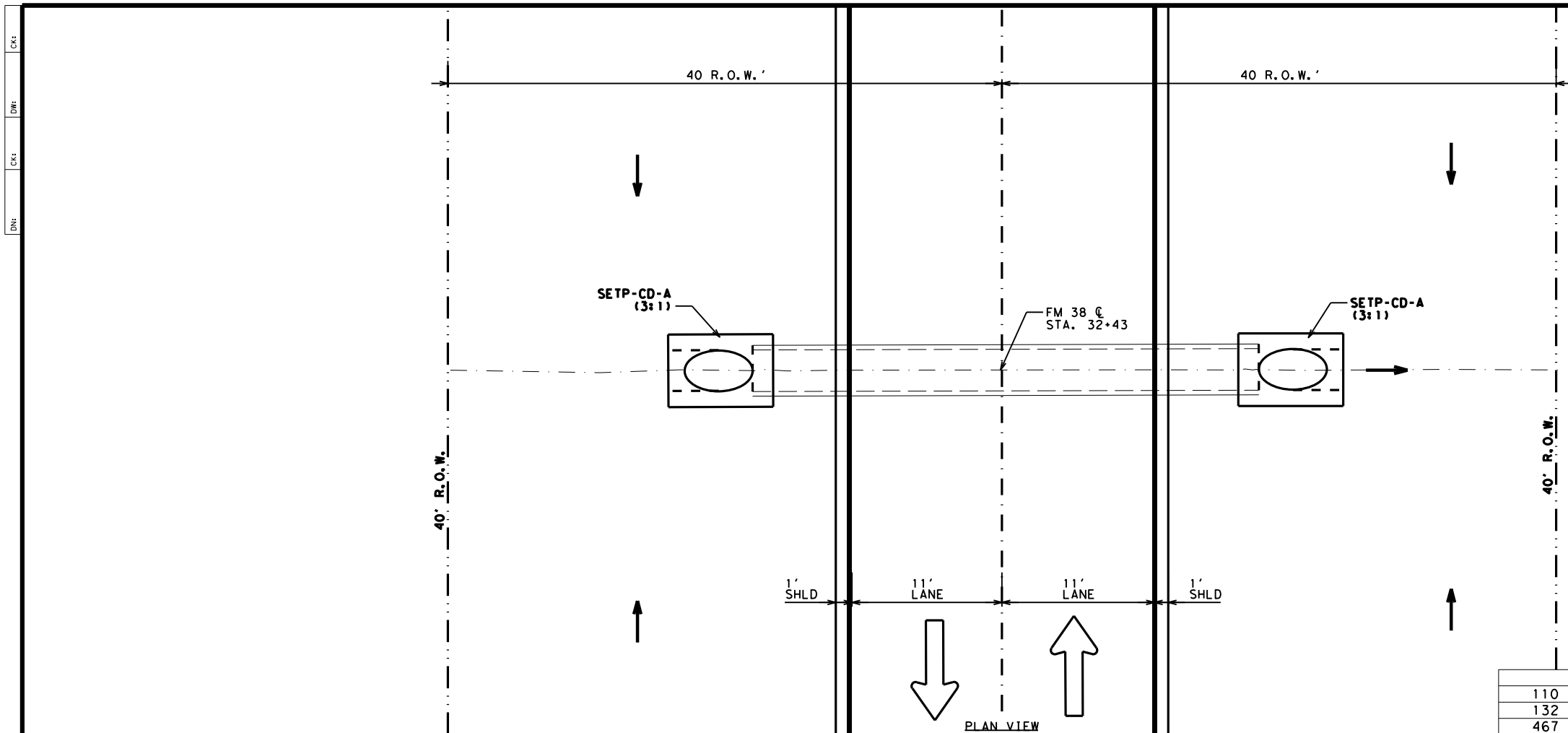
Katie J. Vick, P.E.

**FM 38
HYDRAULIC DATA**

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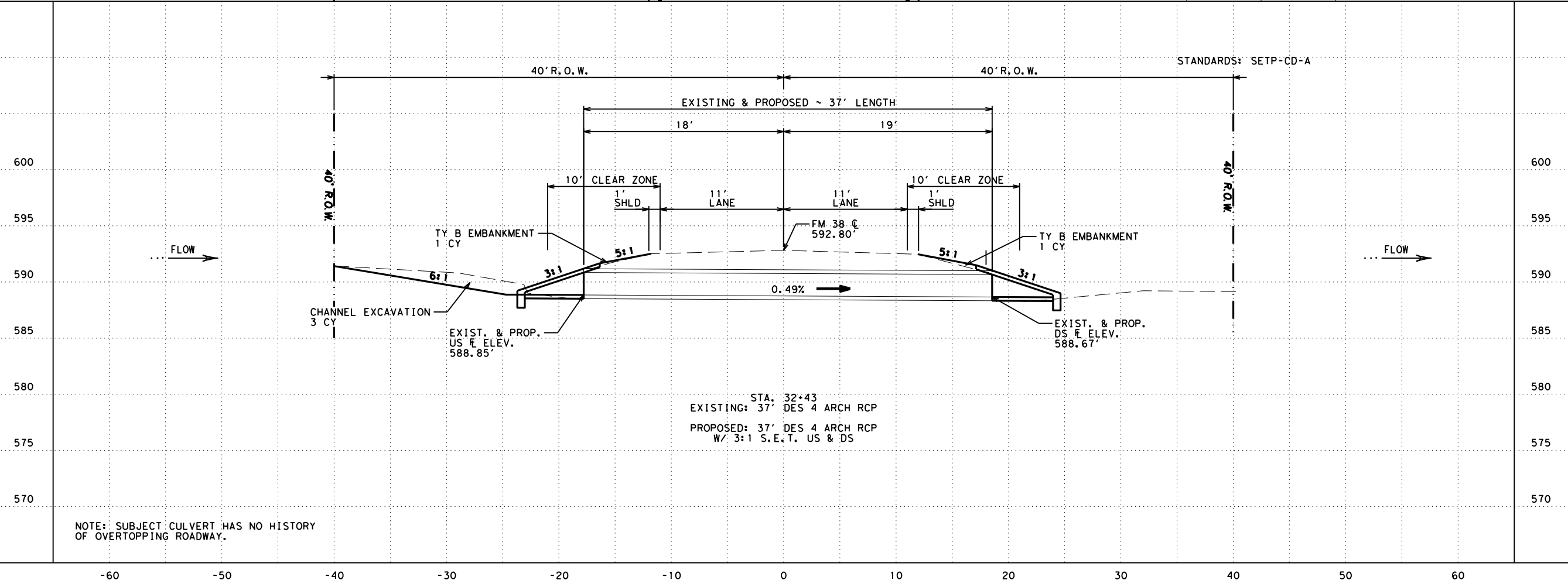
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DIST	COUNTY	SHEET NO.	
PAR	LAMAR	67	

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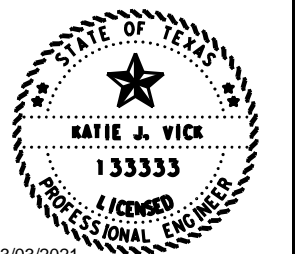
STA. 32+43.00 ESTIMATED QUANTITIES

110	6002	EXCAVATION (CHANNEL)	3	CY
132	6019	EMBANKMENT (VEHICLE) (ORD COMP) (TY B)	2	CY
467	6552	SET (TY II) (DES 4) (RCP) (3:1) (C)	2	EA



NOTE: SUBJECT CULVERT HAS NO HISTORY OF OVERTOPPING ROADWAY.

BENCHMARK
 STA. 32+84.01
 36' LT OF C
 CAPPED 1/2" STEEL ROD
 N: 7295120.104
 E: 2821264.665
 ELEV: 590.97



03/03/2021
 Katie J. Vick, P.E.

FM 38
CULVERT LAYOUT
STA. 32+43

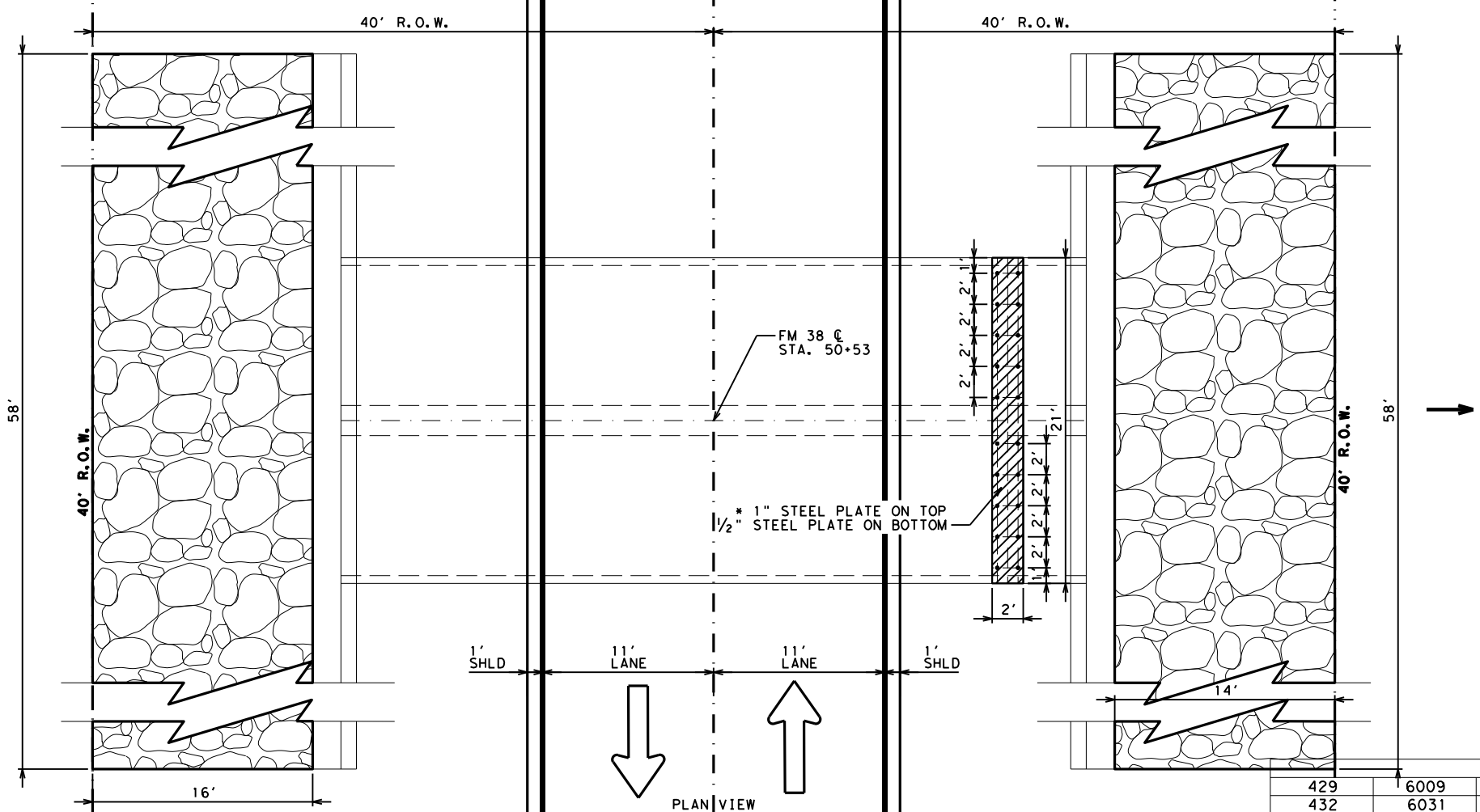
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SHEET 1 OF 23

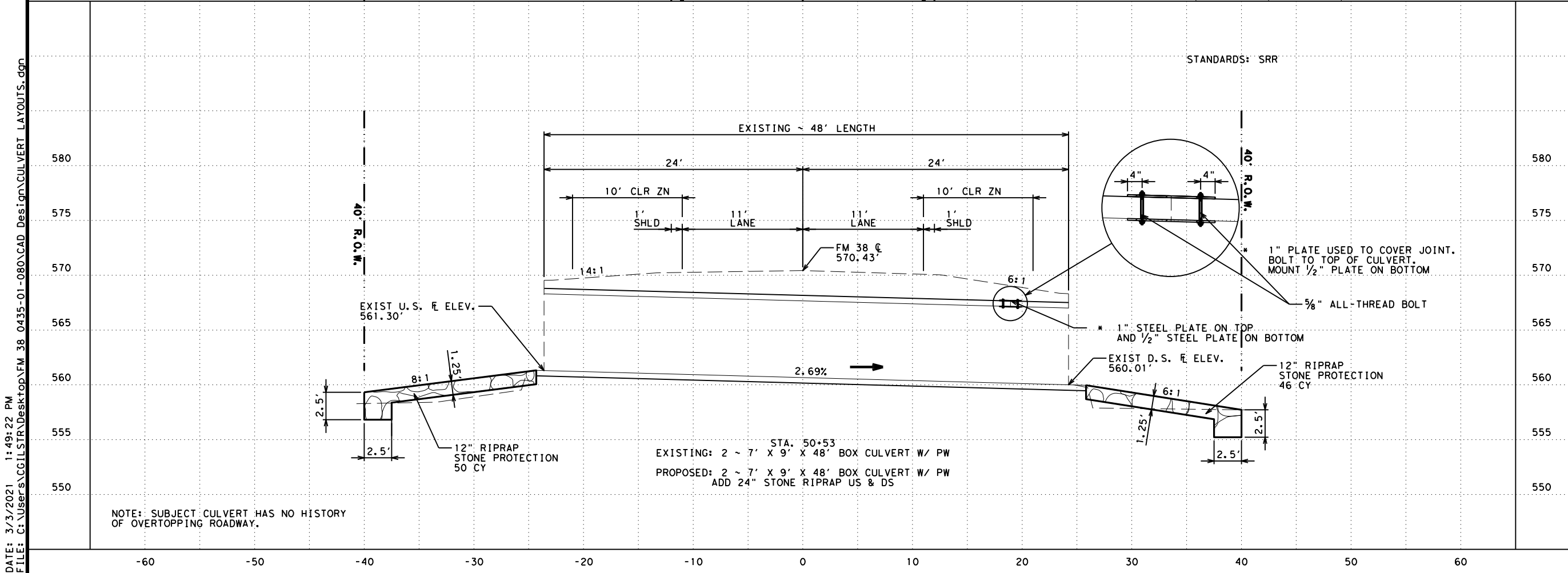


CONT	SECT	JOB	HIGHWAY
0435	01	080	FM 38
DIST	COUNTY	SHEET NO.	
PAR	LAMAR	68	

DATE: 3/3/2021 1:49:22 PM
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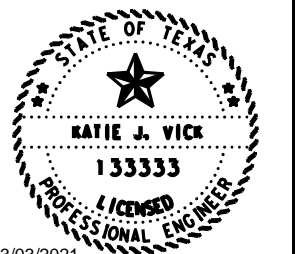


STA. 50+53.00 ESTIMATED QUANTITIES			
429	6009	42	SF
432	6031	96	CY
CONC STR REPAIR (STANDARD)			
RIPRAP (STONE PROTECTION) (12 IN)			



STANDARDS: SRR

BENCHMARK
 STA. 51+77.65
 37' LT OF C
 SPIKE IN POWER POLE
 N: 7297013.769
 E: 2821247.746
 ELEV: 566.39'



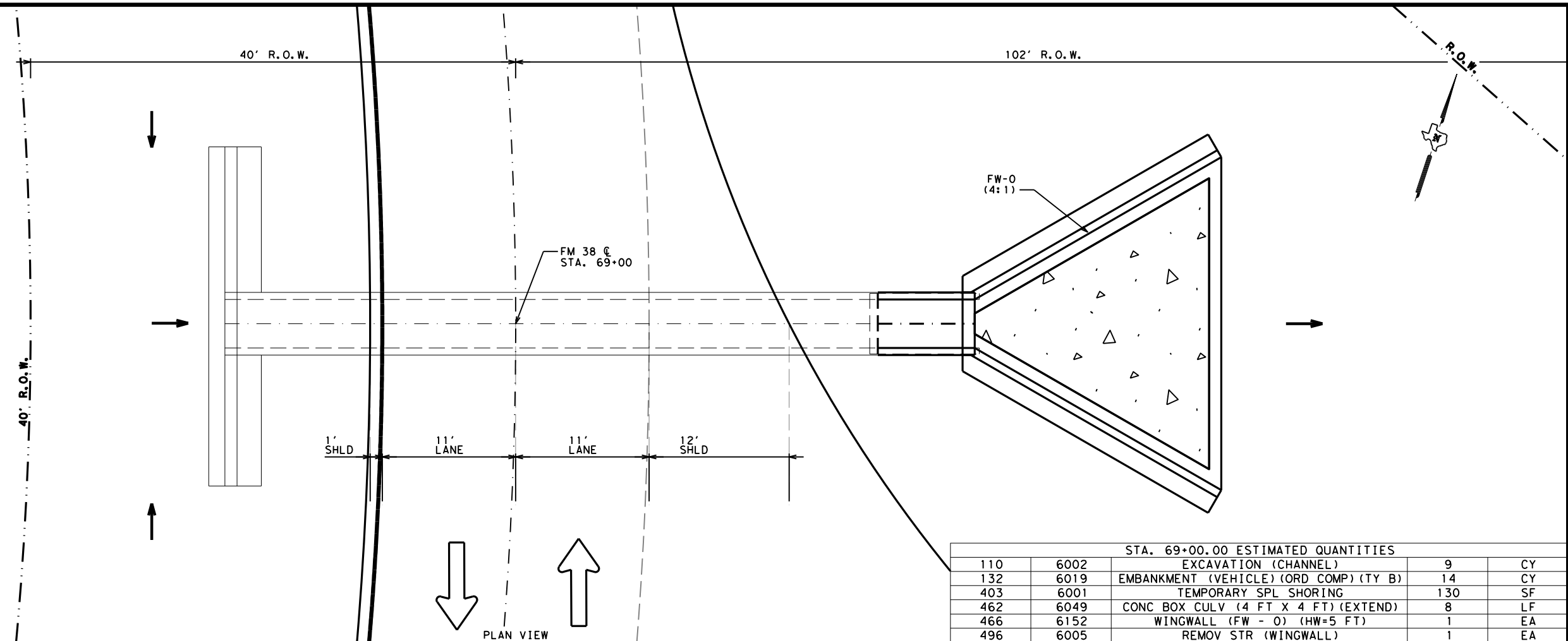
03/03/2021
 Katie J. Vick, P.E.

FM 38
CULVERT LAYOUT
STA. 50+53
 0 5 10
 SCALE IN FEET
 HORZ. & VERT.
 SHEET 2 OF 23

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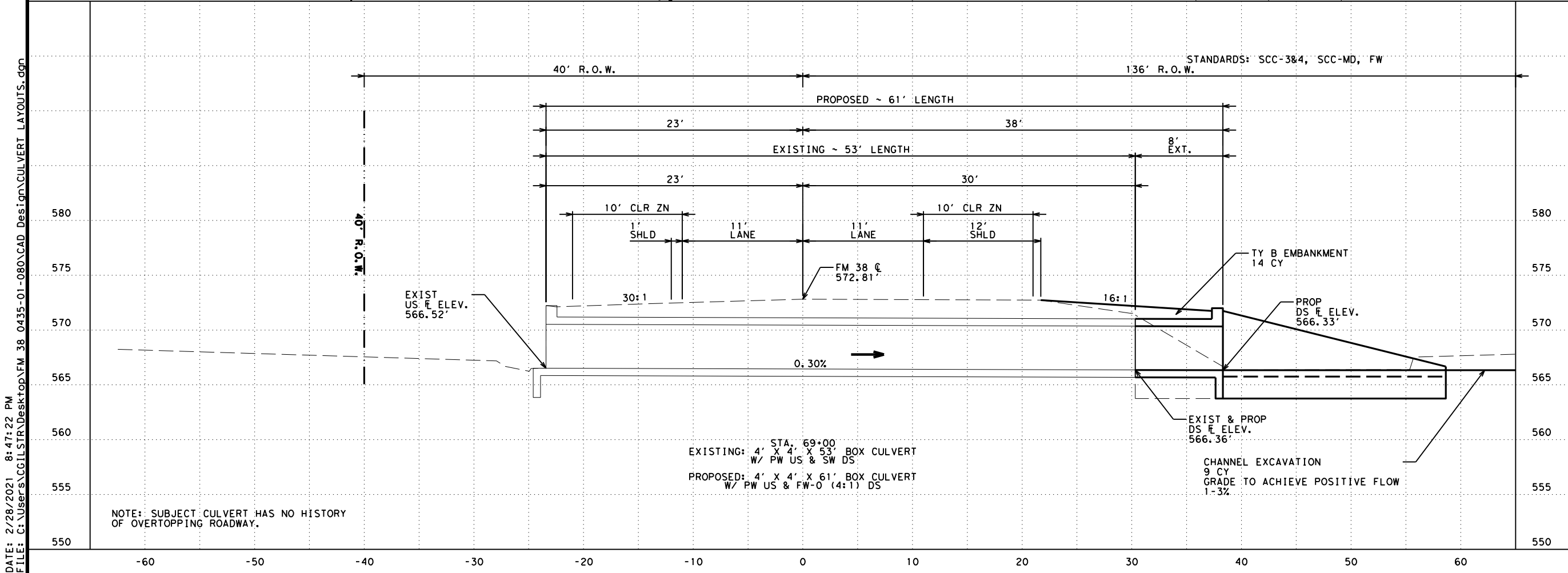
CONT	SECT	JOB	HIGHWAY
0435	01	080	FM 38
DIST	COUNTY	SHEET NO.	
PAR	LAMAR	69	

DATE: 2/28/2021 8:47:22 PM
 FILE: C:\Users\CGILS\OneDrive\Documents\Design\CULVERT_LAYOUTS.dgn

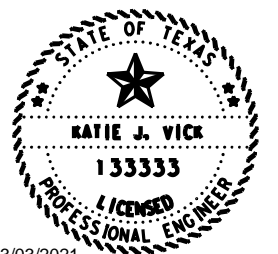


STA. 69+00.00 ESTIMATED QUANTITIES

110	6002	EXCAVATION (CHANNEL)	9	CY
132	6019	EMBANKMENT (VEHICLE) (ORD COMP) (TY B)	14	CY
403	6001	TEMPORARY SPL SHORING	130	SF
462	6049	CONC BOX CULV (4 FT X 4 FT) (EXTEND)	8	LF
466	6152	WINGWALL (FW - 0) (HW=5 FT)	1	EA
496	6005	REMOV STR (WINGWALL)	1	EA

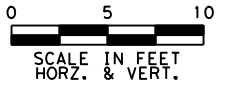


BENCHMARK
 STA. 68+40.22
 49' LT OF C
 CAPPED 1/2" STEEL ROD
 N: 7298655.079
 E: 2821339.800
 ELEV: 570.14



03/03/2021
 Katie J. Vick, P.E.

FM 38
CULVERT LAYOUT
STA. 69+00



SHEET 3 OF 23



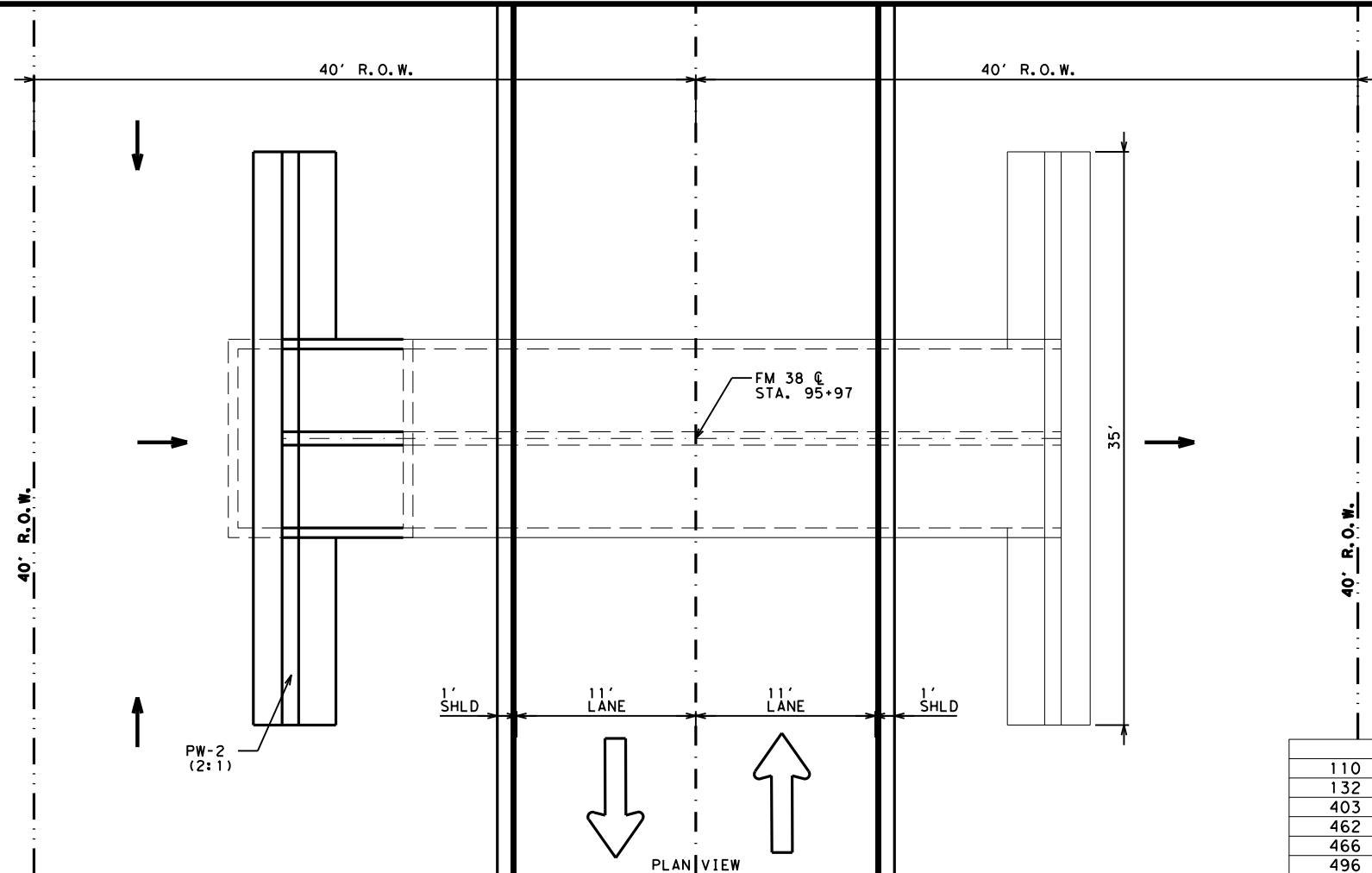
CONT	SECT	JOB	HIGHWAY
0435	01	080	FM 38
DIST	COUNTY	SHEET NO.	
PAR	LAMAR	70	

NOTE: SUBJECT CULVERT HAS NO HISTORY OF OVERTOPPING ROADWAY.

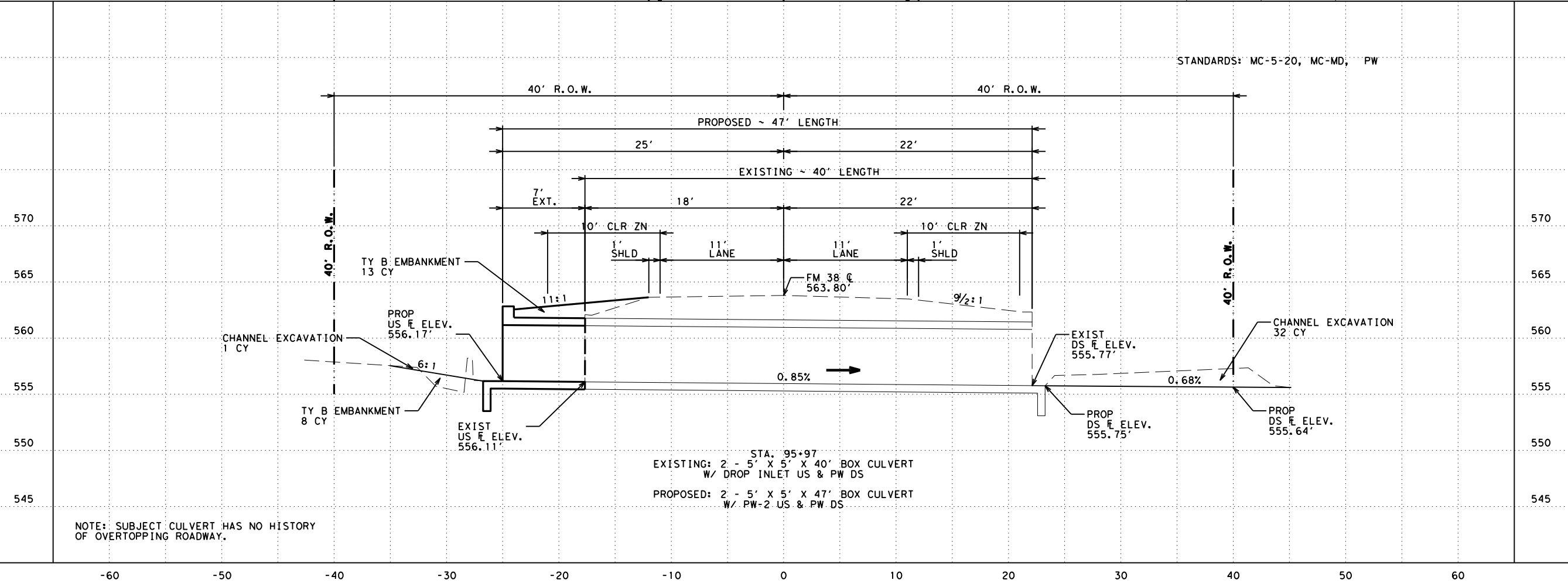
EXISTING: 4' X 4' X 53' BOX CULVERT
 W/ PW US & SW DS
 PROPOSED: 4' X 4' X 61' BOX CULVERT
 W/ PW US & FW-0 (4:1) DS

EXIST & PROP DS ELEV. 566.36'
 CHANNEL EXCAVATION 9 CY
 GRADE TO ACHIEVE POSITIVE FLOW 1-3%

DATE: 2/28/2021 8:47:23 PM
 FILE: C:\Users\CGILS\OneDrive\Documents\01-080\CAD Design\CULVERT LAYOUTS.dgn

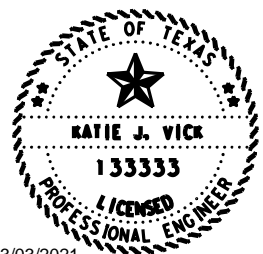


STA. 95+97.00 ESTIMATED QUANTITIES				
110	6002	EXCAVATION (CHANNEL)	33	CY
132	6019	EMBANKMENT (VEHICLE) (ORD COMP) (TY B)	21	CY
403	6001	TEMPORARY SPL SHORING	100	SF
462	6053	CONC BOX CULV (5 FT X 5 FT) (EXTEND)	14	LF
466	6196	WINGWALL (PW - 2) (HW=7 FT)	1	EA
496	6002	REMOV STR (INLET)	1	EA



STANDARDS: MC-5-20, MC-MD, PW

BENCHMARK
 STA. 96+95.08
 42' RT OF C
 CAPPED 1/2" STEEL ROD
 N: 7301483.510
 E: 2821194.633
 ELEV: 562.79



03/03/2021
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FM 38
CULVERT LAYOUT
STA. 95+97



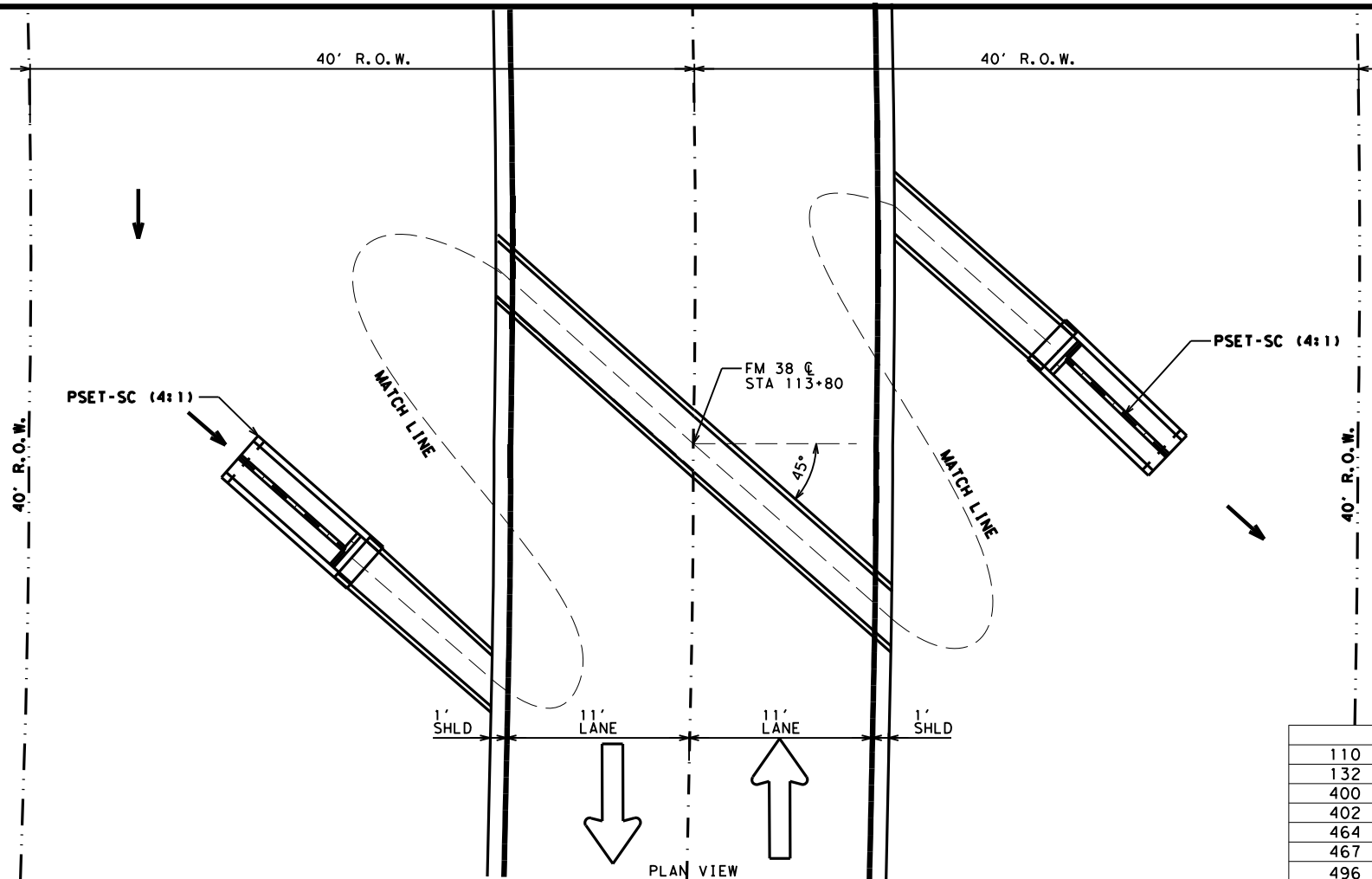
SHEET 4 OF 23



CONT	SECT	JOB	HIGHWAY
0435	01	080	FM 38
DIST	COUNTY	SHEET NO.	
PAR	LAMAR	71	

NOTE: SUBJECT CULVERT HAS NO HISTORY OF OVERTOPPING ROADWAY.

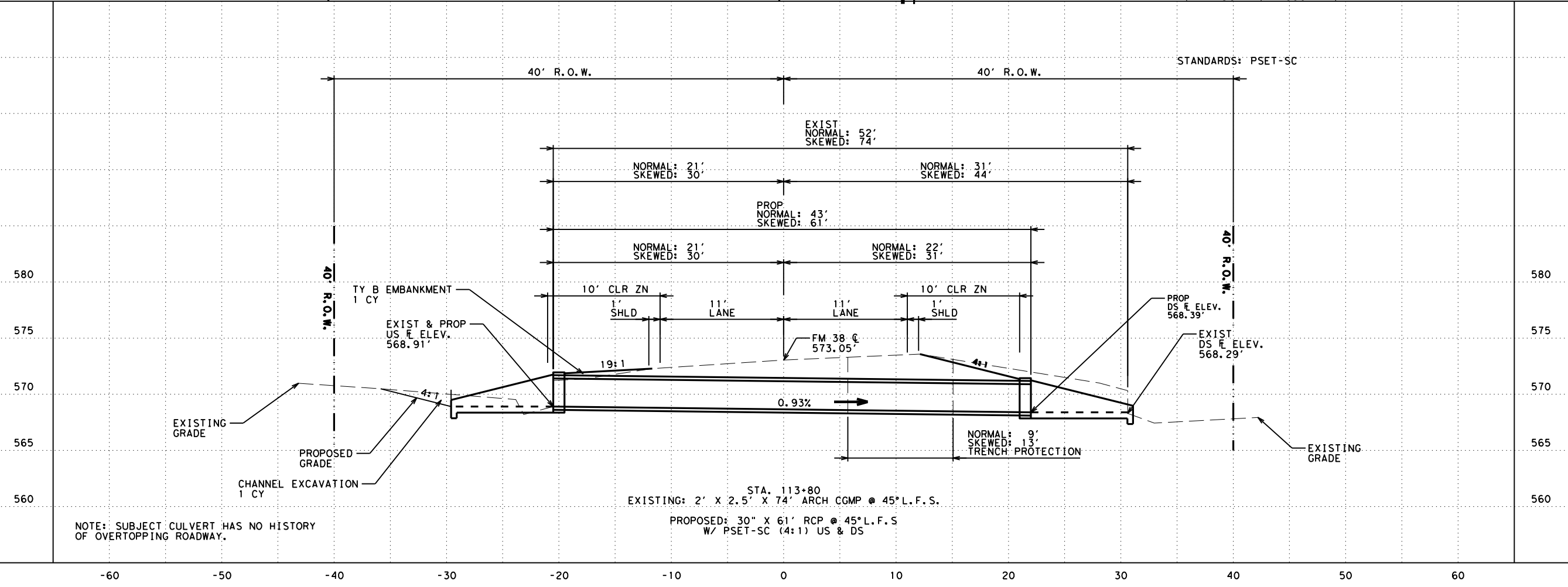
STA. 95+97
 EXISTING: 2 - 5' X 5' X 40' BOX CULVERT W/ DROP INLET US & PW DS
 PROPOSED: 2 - 5' X 5' X 47' BOX CULVERT W/ PW-2 US & PW DS



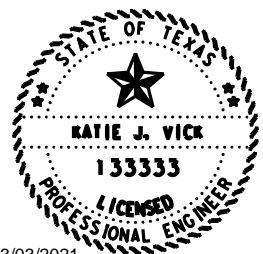
STA. 113+80.00 ESTIMATED QUANTITIES

110	6002	EXCAVATION (CHANNEL)	1	CY
132	6019	EMBANKMENT (VEHICLE) (ORD COMP) (TY B)	2	CY
400	6008	CUT & RESTORE ASPH PAVING	19	SY
402	6001	TRENCH EXCAVATION PROTECTION	13	LF
464	6007	RC PIPE (CL III) (30 IN)	61	LF
467	6419	SET (TY II) (30 IN) (RCP) (4: 1) (C)	2	EA
496	6007	REMOV STR (PIPE)	74	LF

DATE: 2/28/2021 8:47:25 PM
FILE: C:\Users\CGILS\OneDrive\Desktop\FM 38 0435-01-080\CAD Design\CULVERT LAYOUTS.dgn



BENCHMARK
STA. 114+43.10
47' RT OF C
CAPPED 1/2" STEEL ROD
N: 7303240.519
E: 2821087.825
ELEV: 570.98



03/03/2021
Katie J. Vick, P.E.

**FM 38
CULVERT LAYOUT
STA. 113+80**

0 5 10
SCALE IN FEET
HORZ. & VERT.

SHEET 5 OF 23

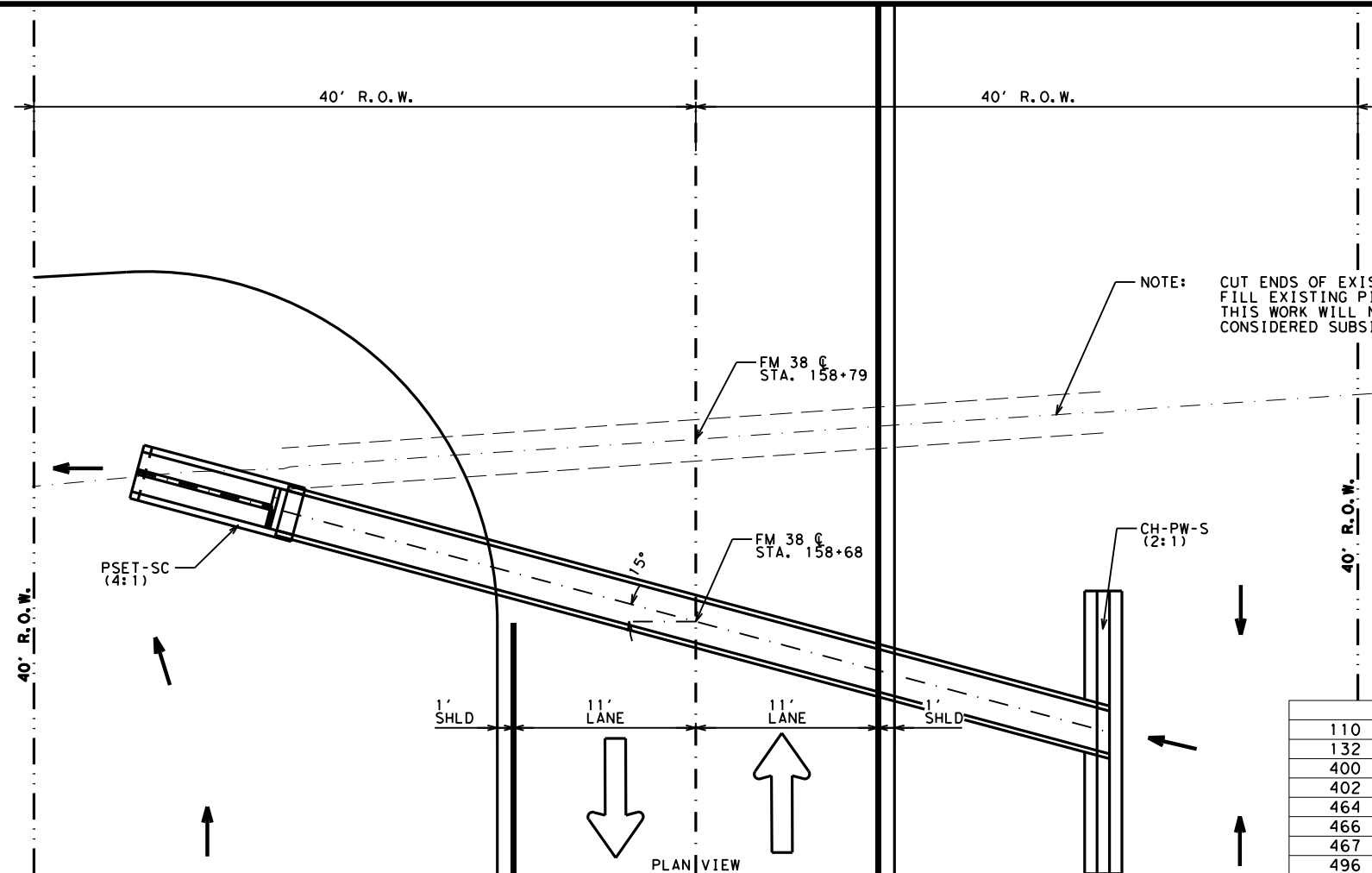
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CONT	SECT	JOB	HIGHWAY
0435	01	080	FM 38
DIST	COUNTY	SHEET NO.	
PAR	LAMAR	72	

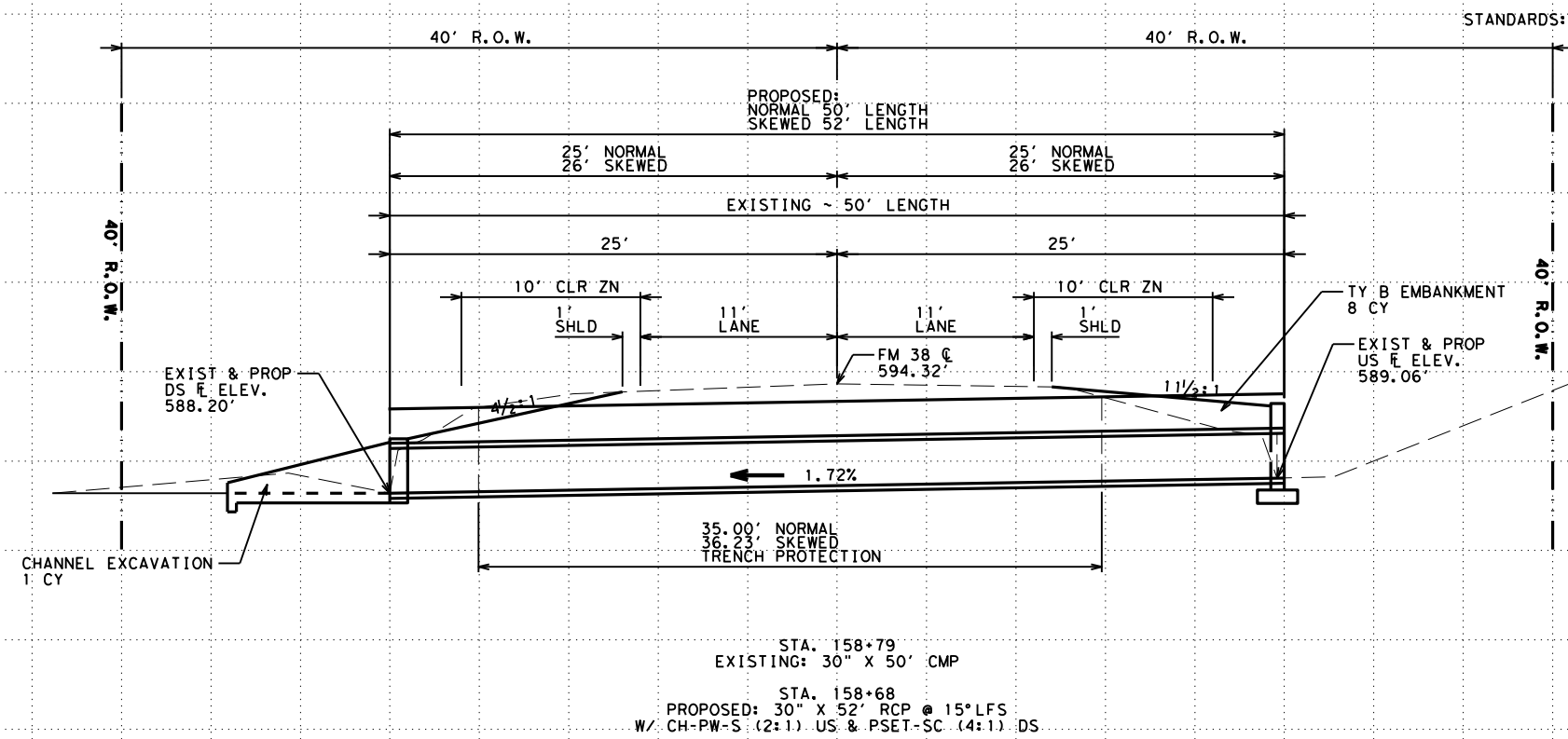
NOTE: SUBJECT CULVERT HAS NO HISTORY OF OVERTOPPING ROADWAY.

DATE: 3/3/2021 1:49:24 PM
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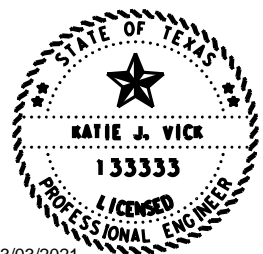


STA. 158+79.00 ESTIMATED QUANTITIES

110	6002	EXCAVATION (CHANNEL)	1	CY
132	6019	EMBANKMENT (VEHICLE) (ORD COMP) (TY B)	8	CY
400	6008	CUT & RESTORE ASPH PAVING	14	SY
402	6001	TRENCH EXCAVATION PROTECTION	36	LF
464	6007	RC PIPE (CL III) (30 IN)	52	LF
466	6132	HEADWALL (CH - PW - S) (DIA= 30 IN)	1	EA
467	6419	SET (TY II) (30 IN) (RCP) (4: 1) (C)	1	EA
496	6007	REMOV STR (PIPE)	50	LF



BENCHMARK
 STA. 159+30.63
 39' LT OF 6"
 CAPPED 1/2" STEEL ROD
 N: 7306504.134
 E: 2819219.460
 ELEV: 592.70



03/03/2021
 Katie J. Vick, P.E.

FM 38
CULVERT LAYOUT
STA. 158+79

0 5 10
 SCALE IN FEET
 HORZ. & VERT.

SHEET 6 OF 23

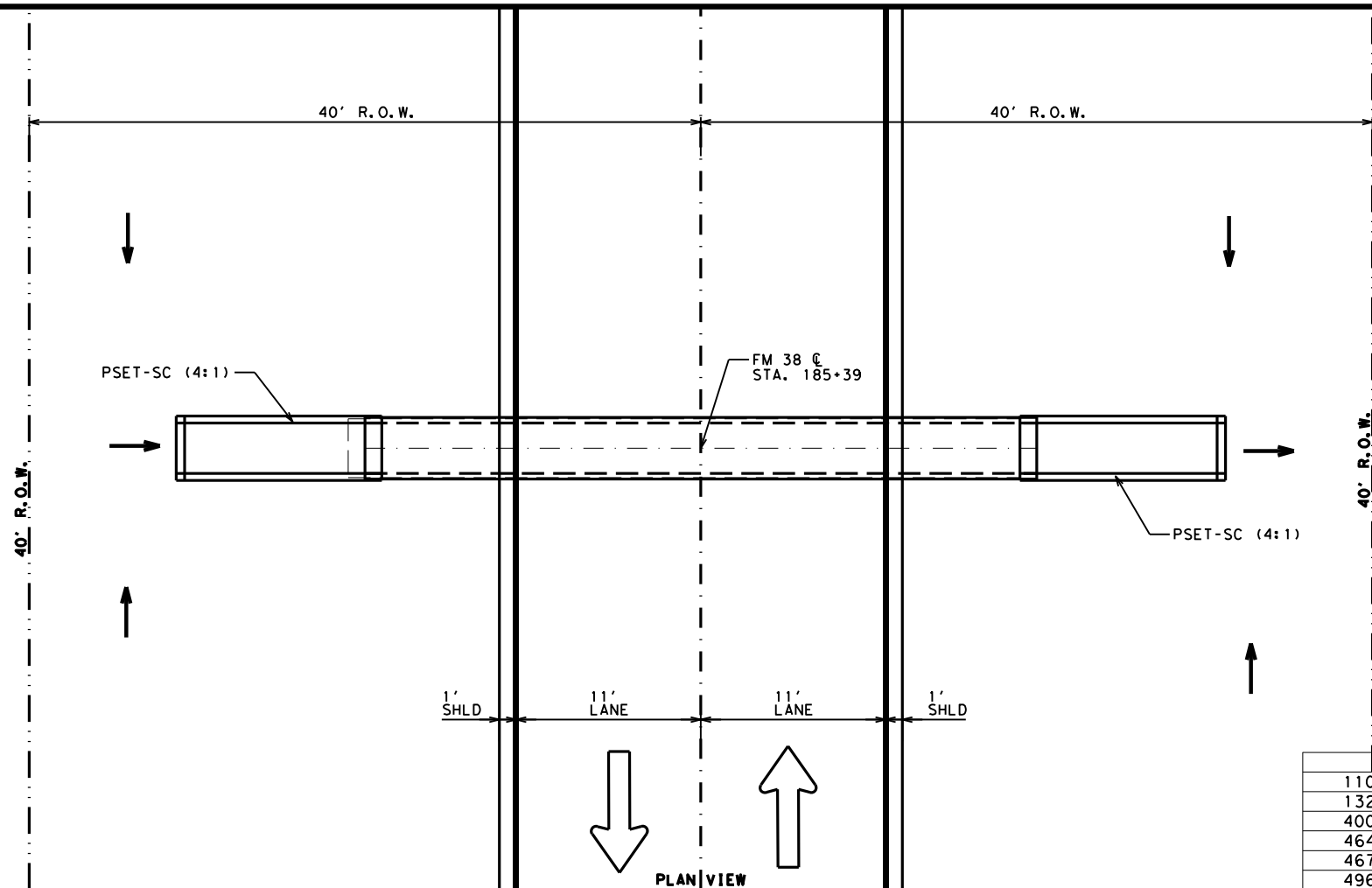


CONT	SECT	JOB	HIGHWAY
0435	01	080	FM 38
DIST	COUNTY	SHEET NO.	
PAR	LAMAR	73	

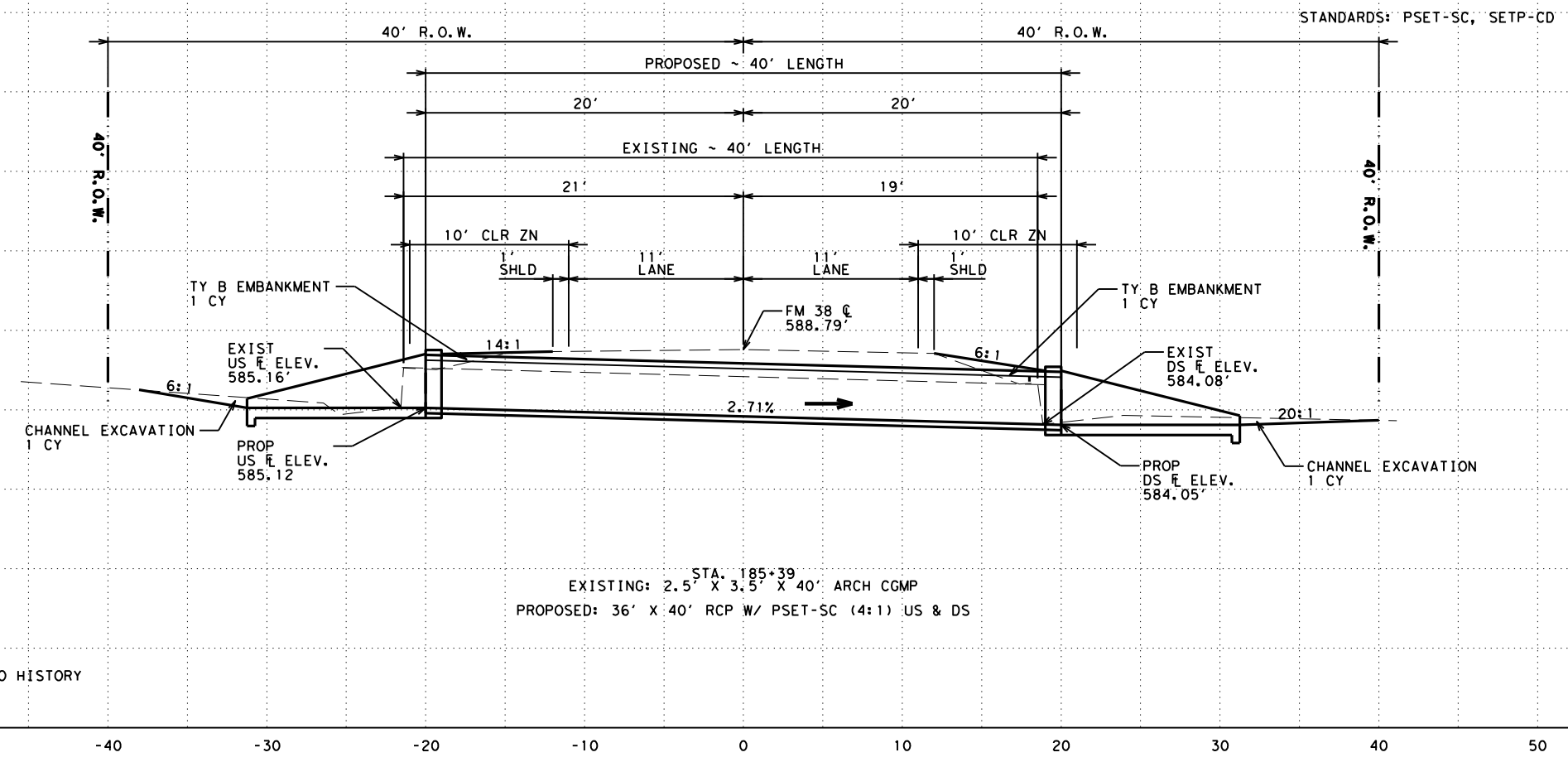
NOTE: SUBJECT CULVERT HAS NO HISTORY OF OVERTOPPING ROADWAY.

-60 -50 -40 -30 -20 -10 0 10 20 30 40 50 60

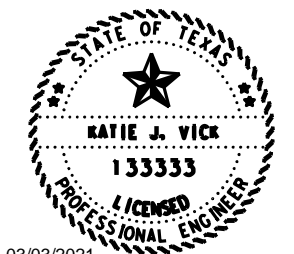
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STA. 185+39.00 ESTIMATED QUANTITIES				
110	6002	EXCAVATION (CHANNEL)	2	CY
132	6019	EMBANKMENT (VEHICLE) (ORD COMP) (TY B)	2	CY
400	6008	CUT & RESTORE ASPH PAVING	20	SY
464	6008	RC PIPE (CL III) (36 IN)	40	LF
467	6450	SET (TY II) (36 IN) (RCP) (4: 1) (C)	2	EA
496	6007	REMOV STR (PIPE)	40	LF



BENCHMARK
 STA. 186+10.56
 43' RT OF @
 CAPPED 1/2" STEEL ROD
 N: 7309184.935
 E: 2819268.208
 ELEV: 585.63



03/03/2021
Katie J. Vick, P.E.

FM 38
CULVERT LAYOUT
STA. 185+39
 0 5 10
 SCALE IN FEET
 HORZ. & VERT.
 SHEET 7 OF 23

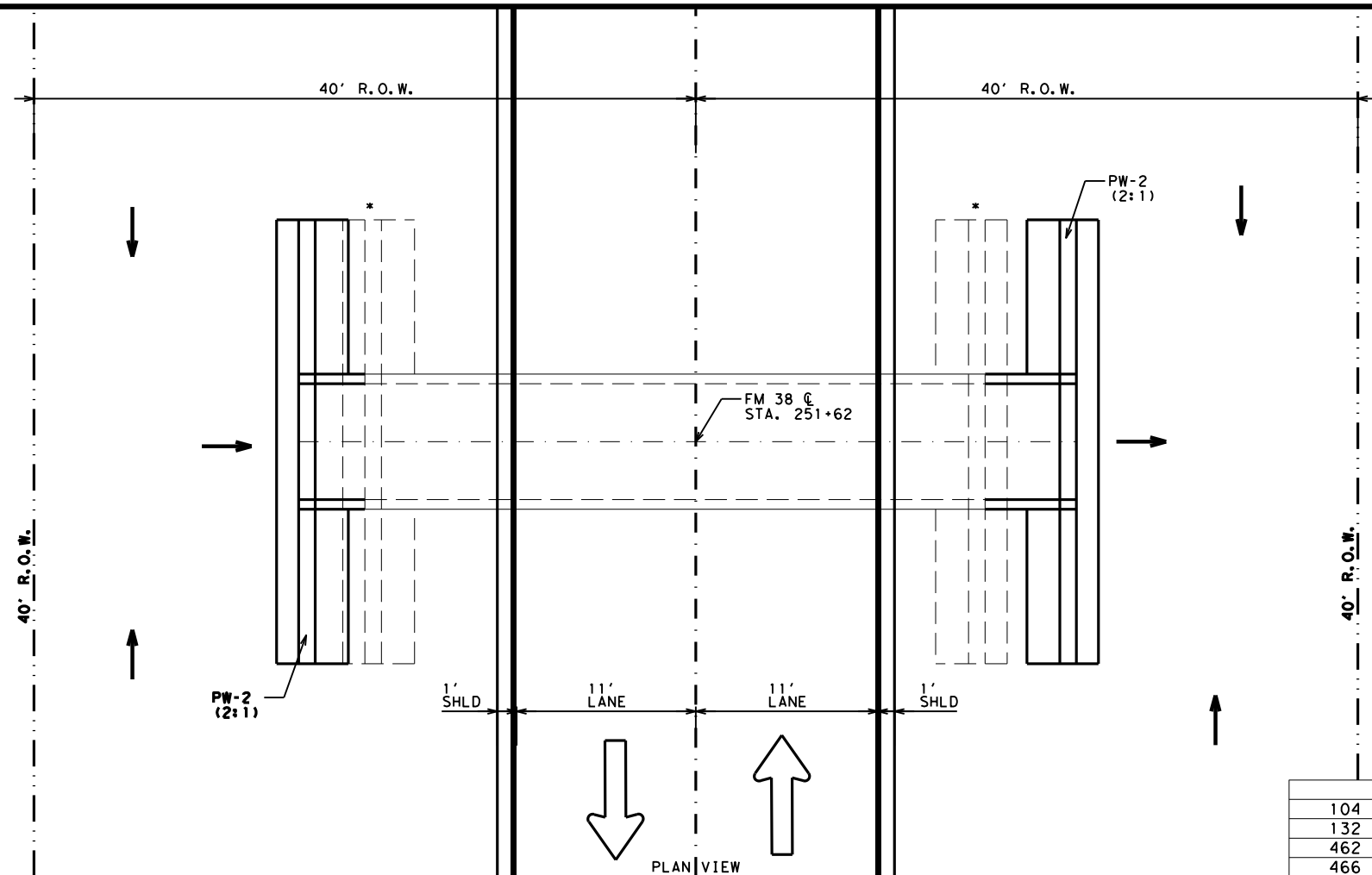


CONT	SECT	JOB	HIGHWAY
0435	01	080	FM 38
DIST	COUNTY	SHEET NO.	
PAR	LAMAR	74	

NOTE: SUBJECT CULVERT HAS NO HISTORY OF OVERTOPPING ROADWAY.

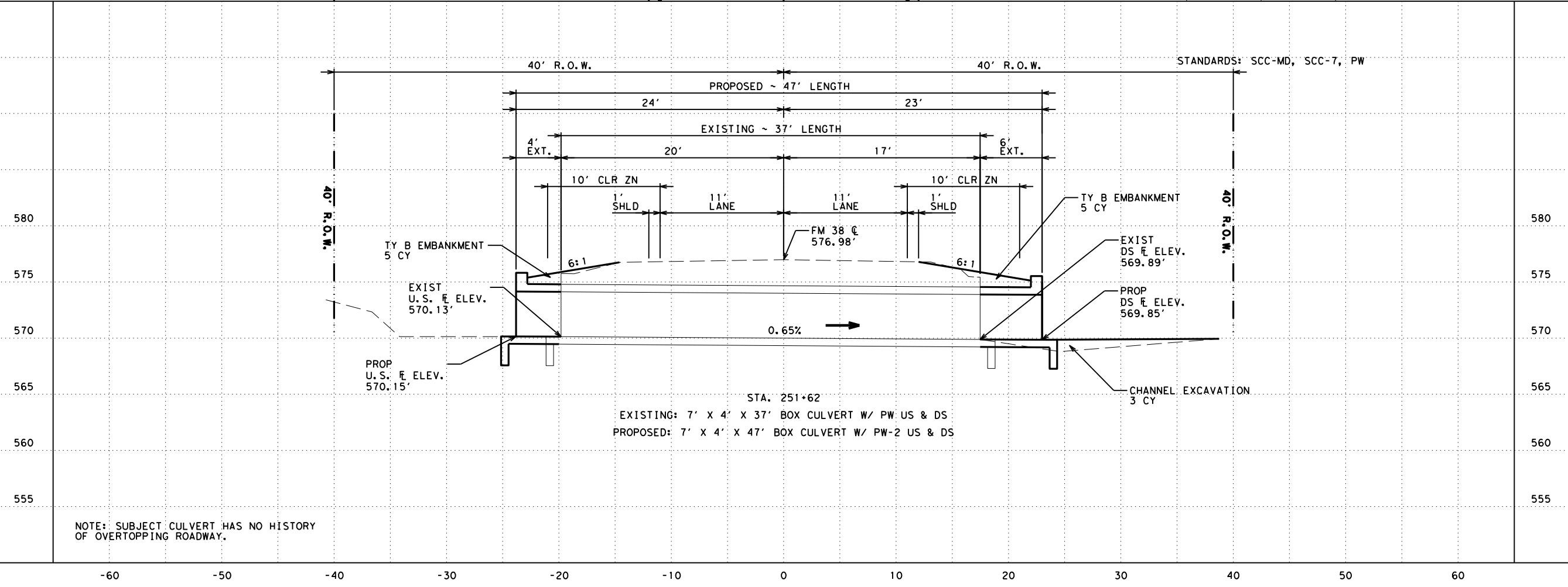
STA. 185+39
 EXISTING: 2.5' X 3.5' X 40' ARCH CGMP
 PROPOSED: 36' X 40' RCP W/ PSET-SC (4:1) US & DS

DATE: 3/3/2021 1:49:25 PM
 FILE: C:\Users\CGIL\STR\Desktop\FM 38 0435-01-080\CAD Design\CULVERT LAYOUTS.dgn



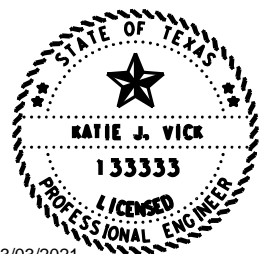
* LEAVE EXISTING HEADWALLS WHILE EXTENDING AND INSTALLING NEW HEADWALLS. CUT CURB FLUSH TO TOP OF BOX BEFORE BACKFILLING.

STA. 251+62.00 ESTIMATED QUANTITIES				
104	6067	REMOVING CONC (SAWCUT)	54	LF
132	6019	EMBANKMENT (VEHICLE) (ORD COMP) (TY B)	8	CY
462	6059	CONC BOX CULV (7 FT X 4 FT) (EXTEND)	10	LF
466	6195	WINGWALL (PW - 2) (HW=6 FT)	2	EA



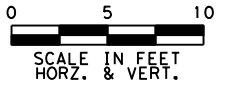
NOTE: SUBJECT CULVERT HAS NO HISTORY OF OVERTOPPING ROADWAY.

BENCHMARK
 STA. 225+62.54
 42" I.D. OF
 CAPPED 1/2" STEEL ROD
 N: 7311649.725
 E: 2815293.121
 ELEV: 574.36



03/03/2021
 Katie J. Vick, P.E.

FM 38
CULVERT LAYOUT
STA. 251+62

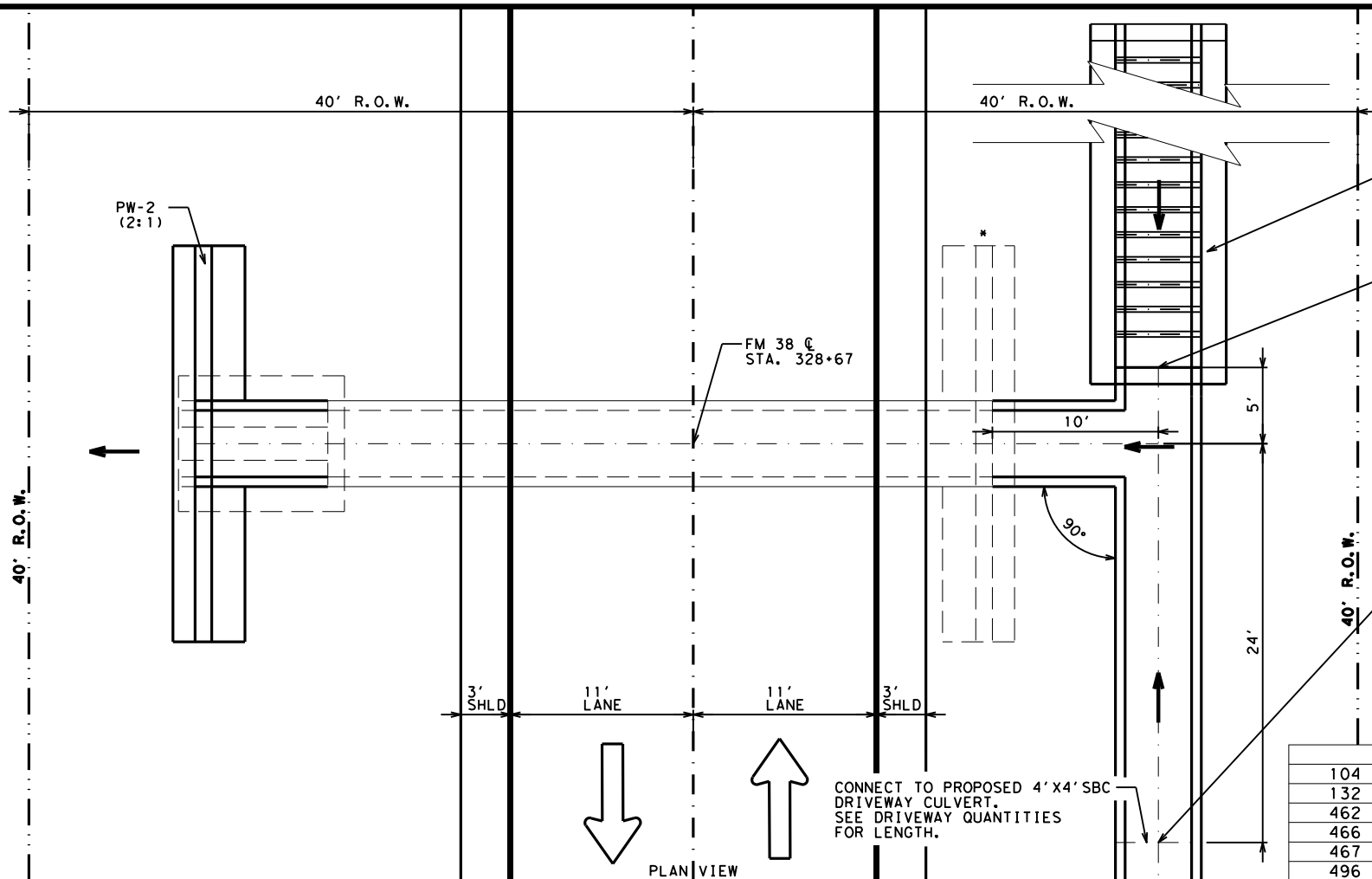


SHEET 8 OF 23

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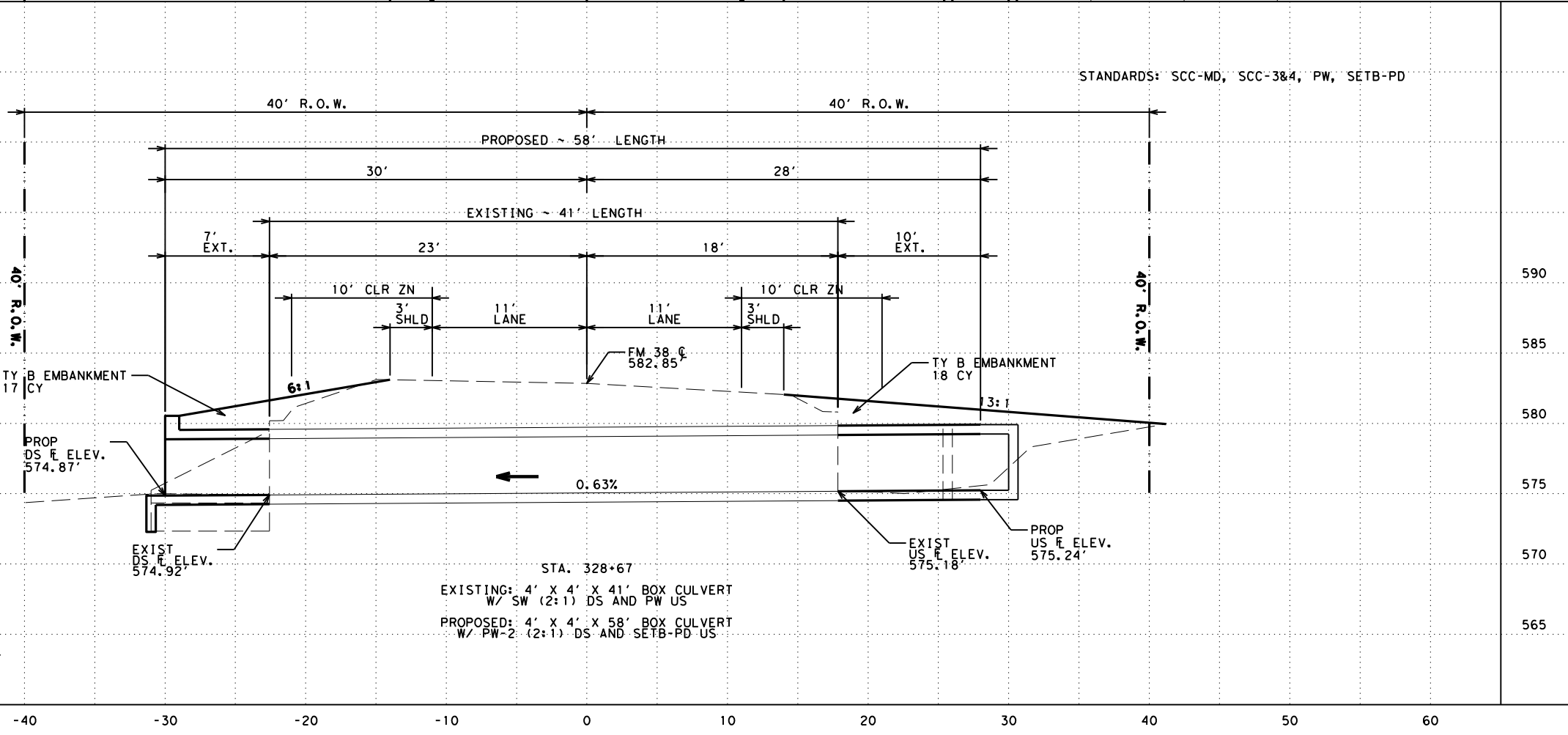
Texas Department of Transportation	
CONT	SECT
0435	01
JOB	
080	
HIGHWAY	
FM 38	
DIST	COUNTY
PAR	LAMAR
SHEET NO.	
75	

DATE: 2/28/2021 8:47:31 PM
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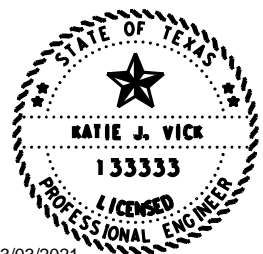


STA. 328+67.00 ESTIMATED QUANTITIES

QTY	ITEM	UNIT	DESCRIPTION
104	6067	24	REMOVING CONC (SAWCUT) LF
132	6019	35	EMBANKMENT (VEHICLE) (ORD COMP) (TY B) CY
462	6049	37	CONC BOX CULV (4 FT X 4 FT) (EXTEND) LF
466	6195	1	WINGWALL (PW - 2) (HW=6 FT) EA
467	6147	1	SET (TY I) (S= 4 FT) (HW= 4 FT) (6:1) EA
496	6005	1	REMOV STR (WINGWALL) EA

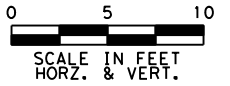


BENCHMARK
 STA. 327+69.07
 38' RT OF C
 CAPPED 1/2" STEEL ROD
 N: 7311489.268
 E: 2807609.319
 ELEV: 579.35



03/03/2021
 Katie J. Vick, P.E.

FM 38
CULVERT LAYOUT
STA. 328+67



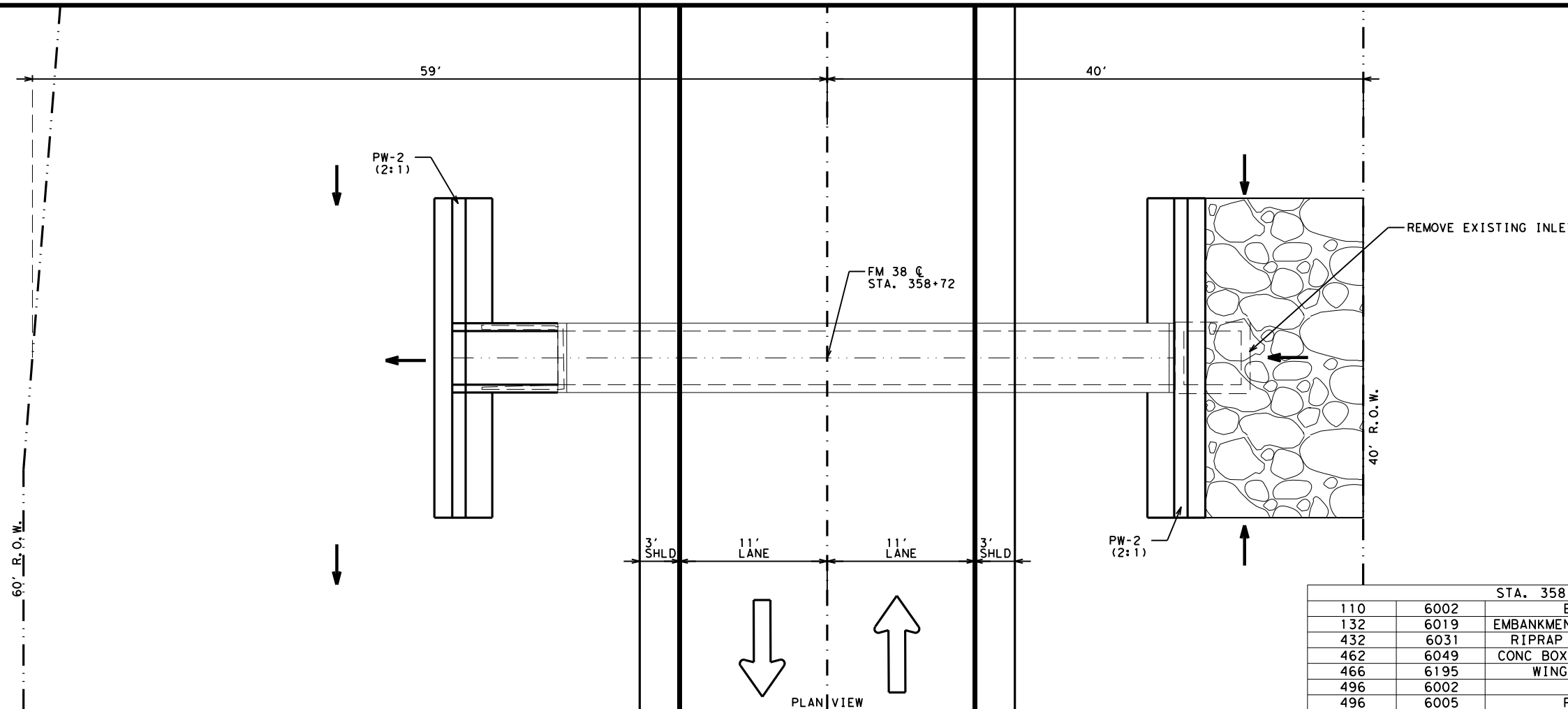
SHEET 9 OF 23

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CONT	SECT	JOB	HIGHWAY
0435	01	080	FM 38
DIST	COUNTY	SHEET NO.	
PAR	LAMAR	76	

NOTE: SUBJECT CULVERT HAS NO HISTORY OF OVERTOPPING ROADWAY.

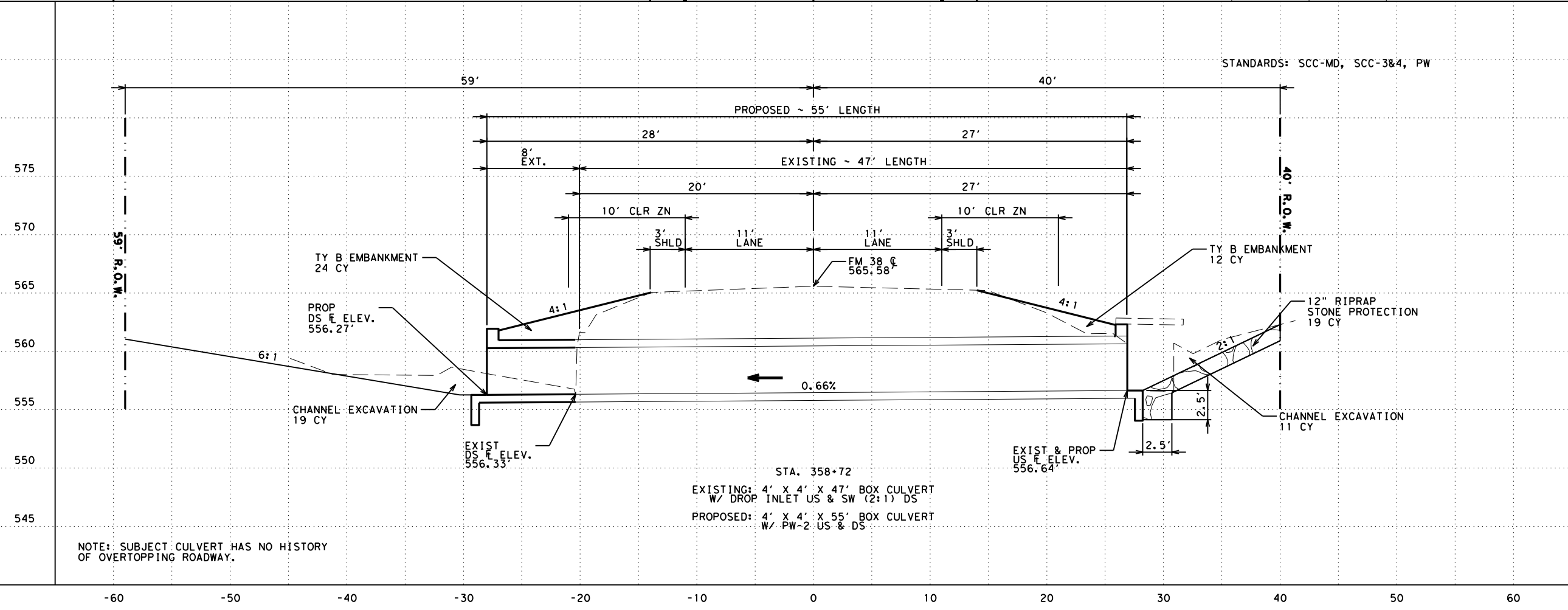
STA. 328+67
 EXISTING: 4' X 4' X 41' BOX CULVERT W/ SW (2:1) DS AND PW US
 PROPOSED: 4' X 4' X 58' BOX CULVERT W/ PW-2 (2:1) DS AND SETB-PD US



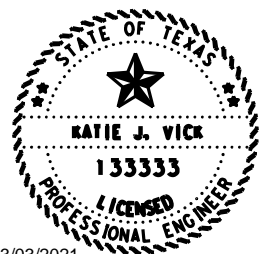
STA. 358+72.00 ESTIMATED QUANTITIES

110	6002	EXCAVATION (CHANNEL)	30	CY
132	6019	EMBANKMENT (VEHICLE) (ORD COMP) (TY B)	36	CY
432	6031	RIPRAP (STONE PROTECTION) (12 IN)	19	CY
462	6049	CONC BOX CULV (4 FT X 4 FT) (EXTEND)	8	LF
466	6195	WINGWALL (PW - 2) (HW=6 FT)	2	EA
496	6002	REMOV STR (INLET)	1	EA
496	6005	REMOV STR (WINGWALL)	1	EA

DATE: 2/28/2021 8:47:33 PM
FILE: C:\Users\CGIL\OneDrive\Documents\FM 38 0435-01-080\CAD Design\CULVERT LAYOUTS.dgn

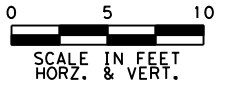


BENCHMARK
STA. 358+72.43
CAPPED 1/2" STEEL ROD
N: 7313469.103
E: 2806051.913
ELEV: 562.67



03/03/2021
Katie J. Vick, P.E.

**FM 38
CULVERT LAYOUT
STA. 358+72**



SHEET 10 OF 23

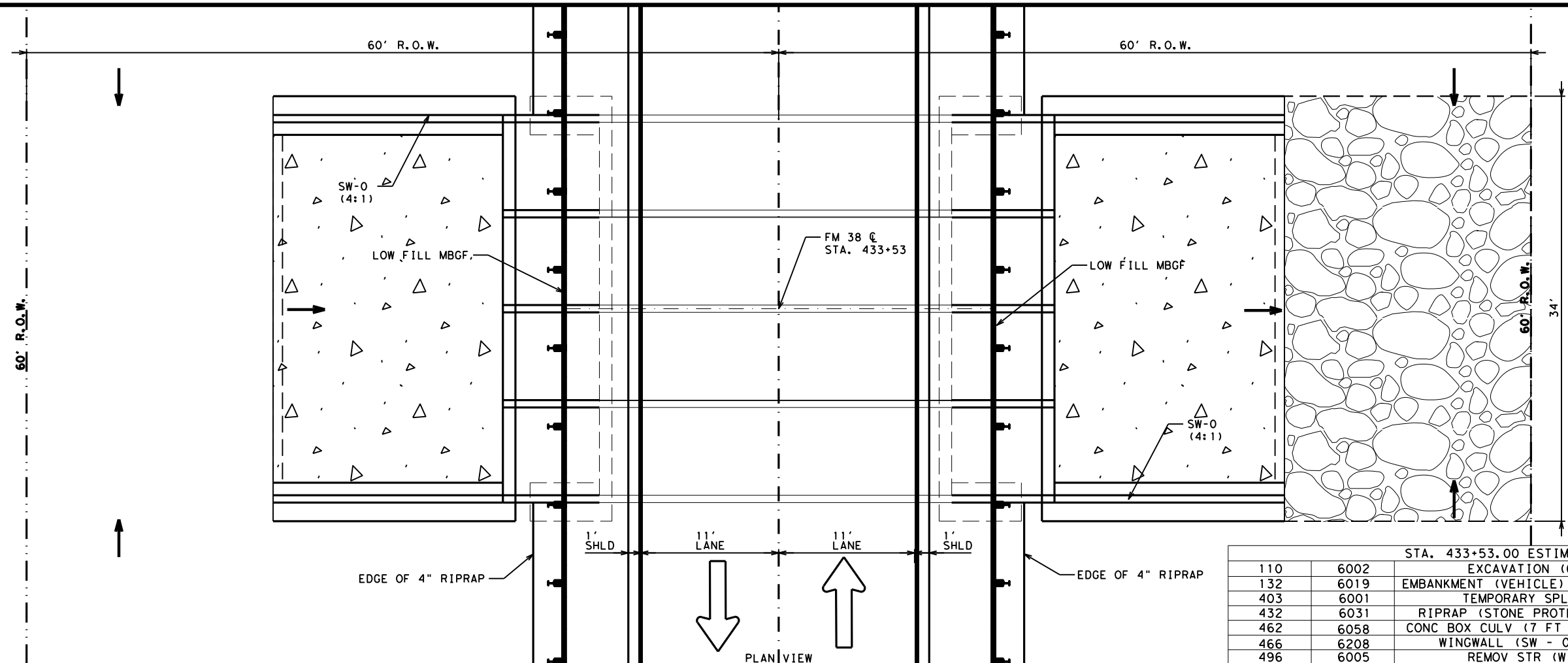


CONT	SECT	JOB	HIGHWAY
0435	01	080	FM 38
DIST	COUNTY	SHEET NO.	
PAR	LAMAR	77	

NOTE: SUBJECT CULVERT HAS NO HISTORY OF OVERTOPPING ROADWAY.

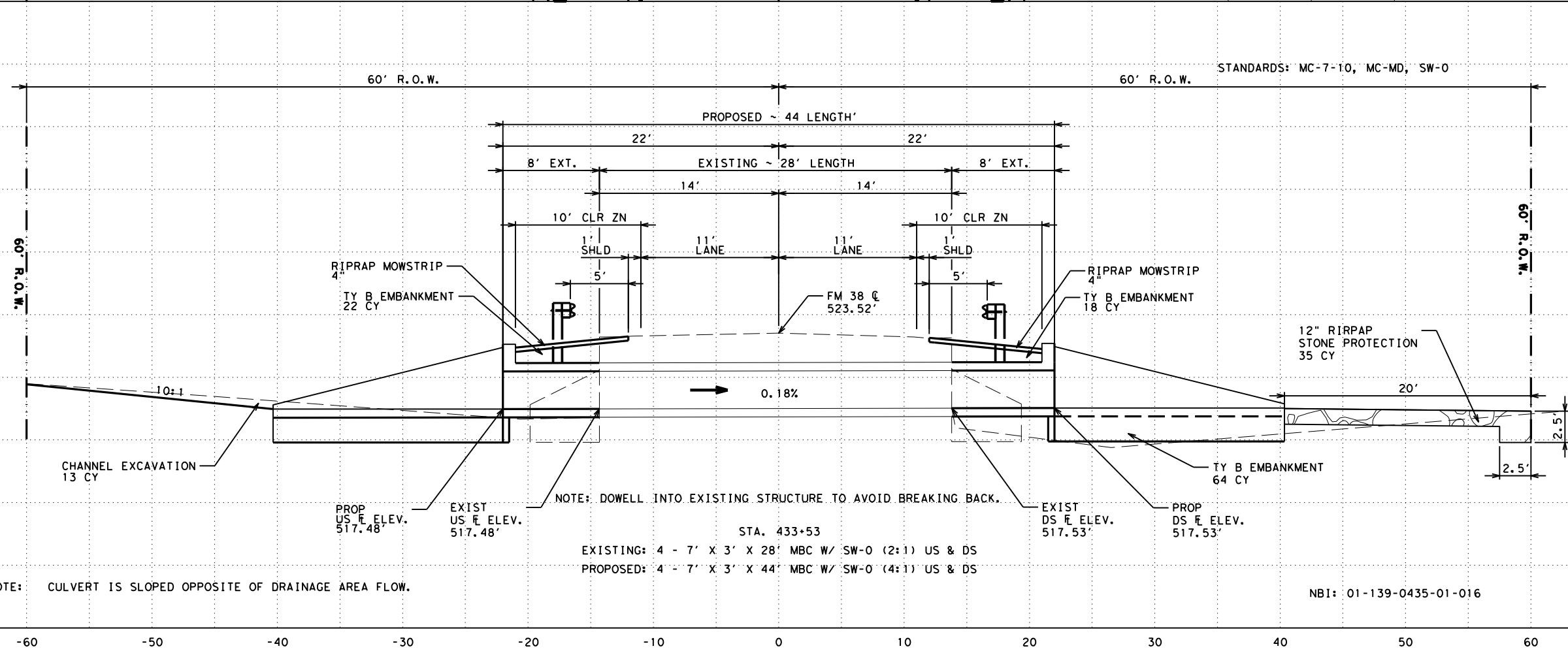
STA. 358+72
EXISTING: 4' X 4' X 47' BOX CULVERT
W/ DROP INLET US & SW (2:1) DS
PROPOSED: 4' X 4' X 55' BOX CULVERT
W/ PW-2 US & DS

DATE: 3/3/2021 1:49:26 PM
 FILE: C:\Users\CGILS\OneDrive\Desktop\FM 38 0435-01-080\CAD Design\CULVERT LAYOUTS.dgn

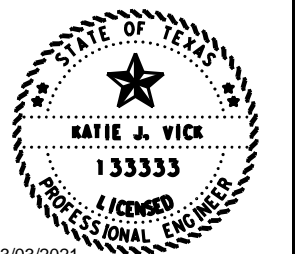


STA. 433+53.00 ESTIMATED QUANTITIES

110	6002	EXCAVATION (CHANNEL)	13	CY
132	6019	EMBANKMENT (VEHICLE) (ORD COMP) (TY B)	104	CY
403	6001	TEMPORARY SPL SHORING	550	SF
432	6031	RIPRAP (STONE PROTECTION) (12 IN)	35	CY
462	6058	CONC BOX CULV (7 FT X 3 FT) (EXTEND)	64	LF
466	6208	WINGWALL (SW - 0) (HW=5 FT)	2	EA
496	6005	REMOVE STR (WINGWALL)	2	EA

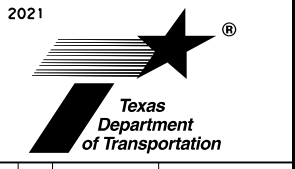


BENCHMARK
 STA. 432+91.78
 4" I.D. OF
 CAPPED 1/2" STEEL ROD
 N: 7312986.505
 E: 2798891.570
 ELEV: 520.26



03/03/2021
Katie J. Vick, P.E.

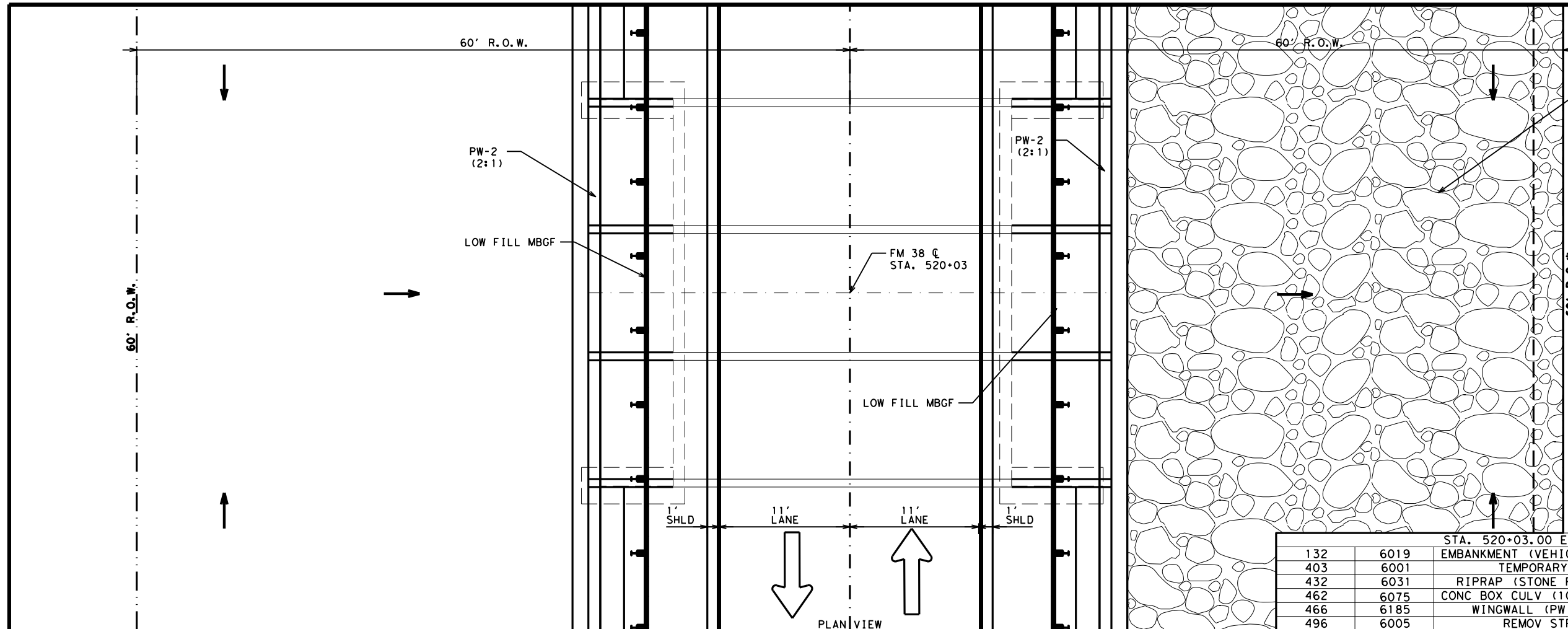
FM 38
CULVERT LAYOUT
STA. 433+53
 0 5 10
 SCALE IN FEET
 HORZ. & VERT.
 SHEET 11 OF 23



CONT	SECT	JOB	HIGHWAY
0435	01	080	FM 38
DIST	COUNTY	SHEET NO.	
PAR	LAMAR	78	

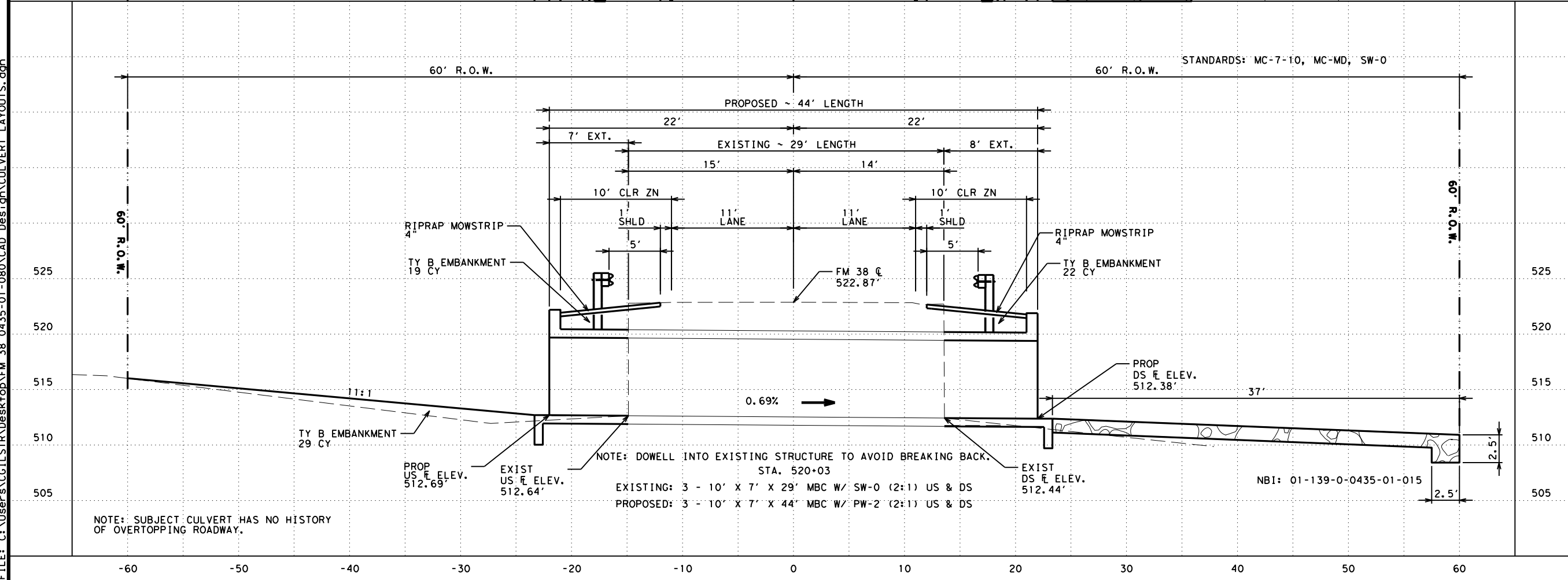
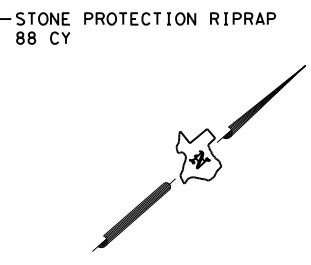
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DATE: 2/28/2021 8:47:36 PM
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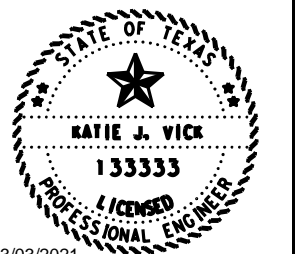


STA. 520+03.00 ESTIMATED QUANTITIES

132	6019	EMBANKMENT (VEHICLE) (ORD COMP) (TY B)	70	CY
403	6001	TEMPORARY SPL SHORING	630	SF
432	6031	RIPRAP (STONE PROTECTION) (12 IN)	121	CY
462	6075	CONC BOX CULV (10 FT X 7 FT) (EXTEND)	45	LF
466	6185	WINGWALL (PW - 2) (HW=10 FT)	2	EA
496	6005	REMOV STR (WINGWALL)	2	EA



BENCHMARK
 STA. 518+52.35
 1" = 10' OF
 CAPPED 1/2" STEEL ROD
 N: 7315.13, 670
 E: 2791922.583
 Elev: 517.21



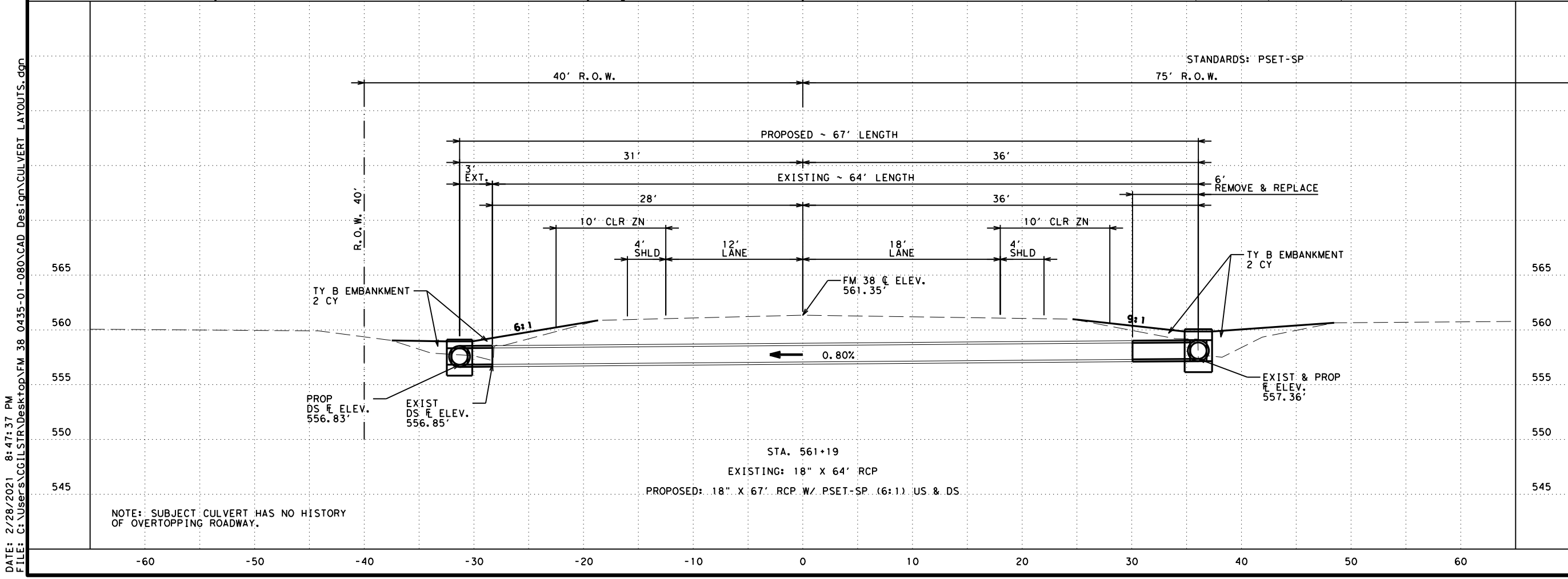
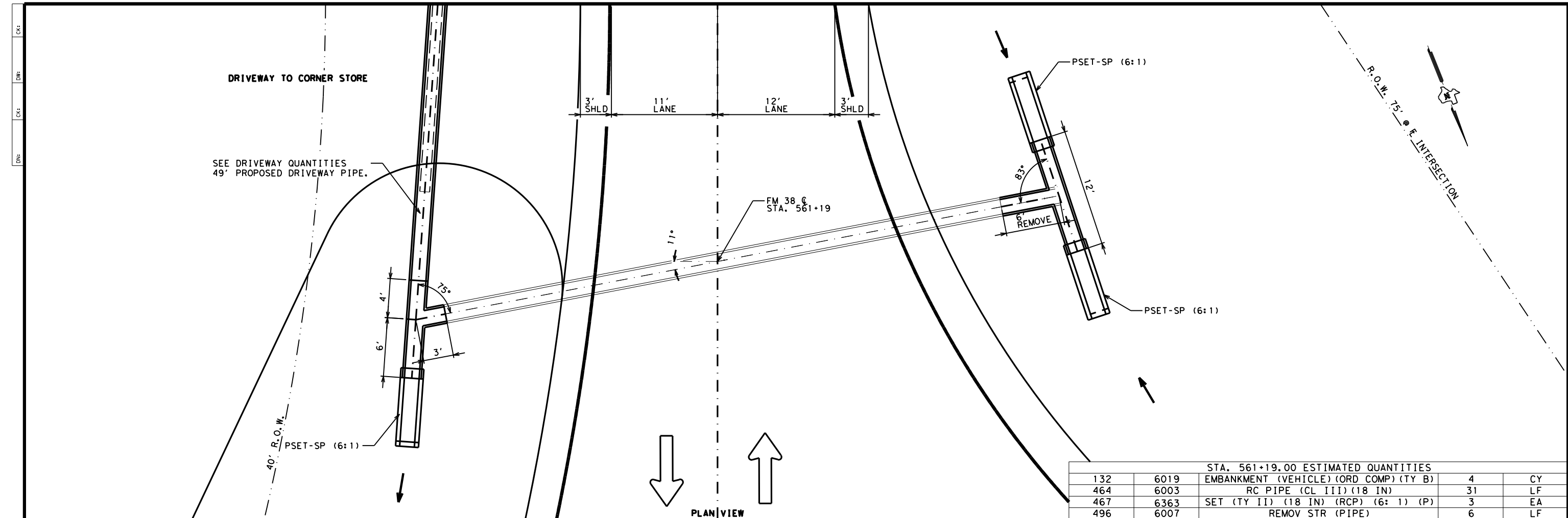
03/03/2021
 Katie J. Vick, P.E.

FM 38
CULVERT LAYOUT
STA. 520+03
 0 5 10
 SCALE IN FEET
 HORZ. & VERT.
 SHEET 12 OF 23

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Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0435	01	080	FM 38
DIST	COUNTY	SHEET NO.	
PAR	LAMAR	79	



BENCHMARK:
STA. 561+00.83
44' L OF C
CAPPED 1/2" STEEL ROD
N: 7316705.067
E: 2788121.538
Elev: 559.49

STATE OF TEXAS
KATIE J. VICK
13333
LICENSED
PROFESSIONAL ENGINEER

03/03/2021
Katie J. Vick, P.E.

FM 38
CULVERT LAYOUT
STA. 561+19

0 5 10
SCALE IN FEET
HORZ. & VERT.

SHEET 13 OF 23

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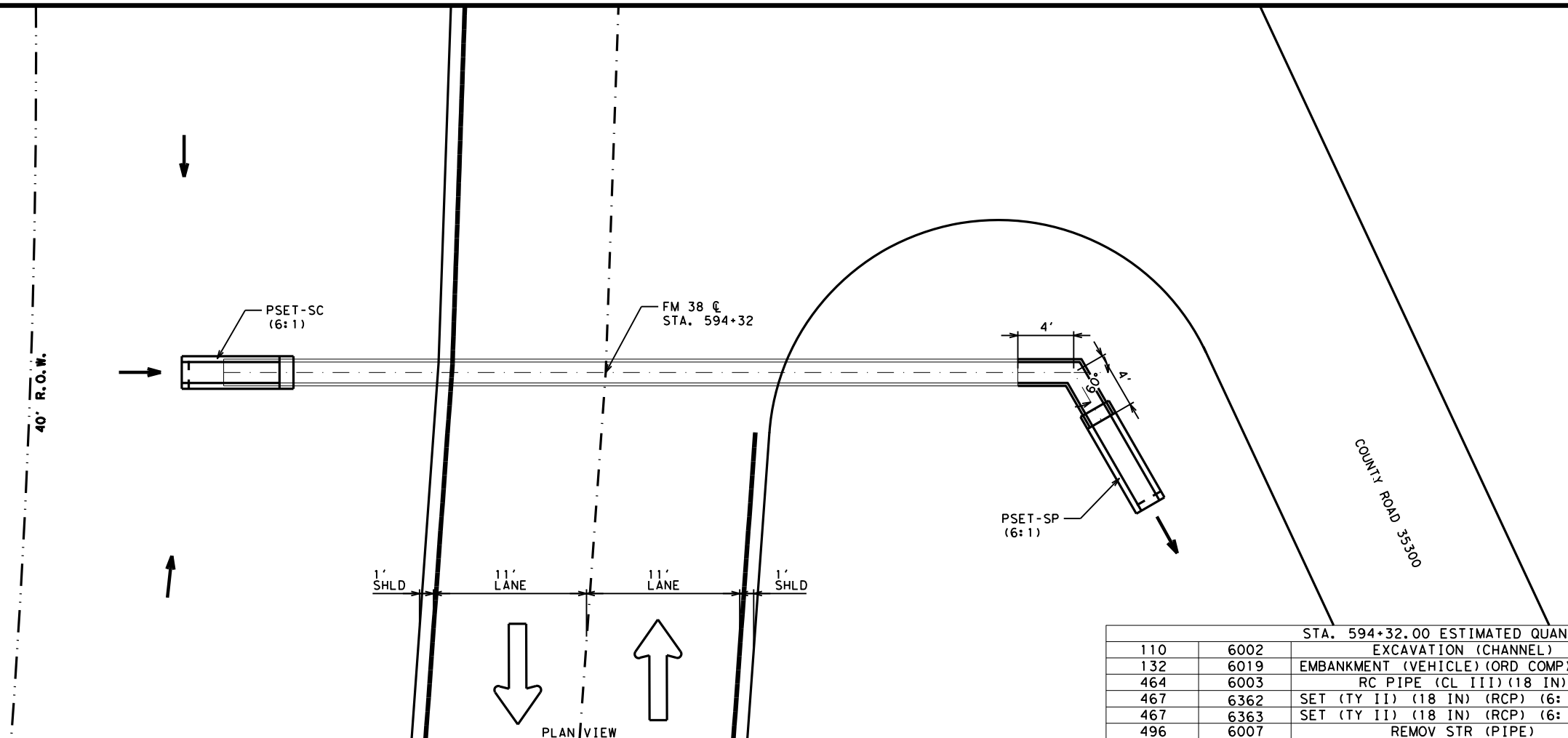
Texas
Department
of Transportation

CONT	SECT	JOB	HIGHWAY
0435	01	080	FM 38
DIST	COUNTY	SHEET NO.	
PAR	LAMAR	80	

DATE: 2/28/2021 8:47:37 PM
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NOTE: SUBJECT CULVERT HAS NO HISTORY OF OVERTOPPING ROADWAY.

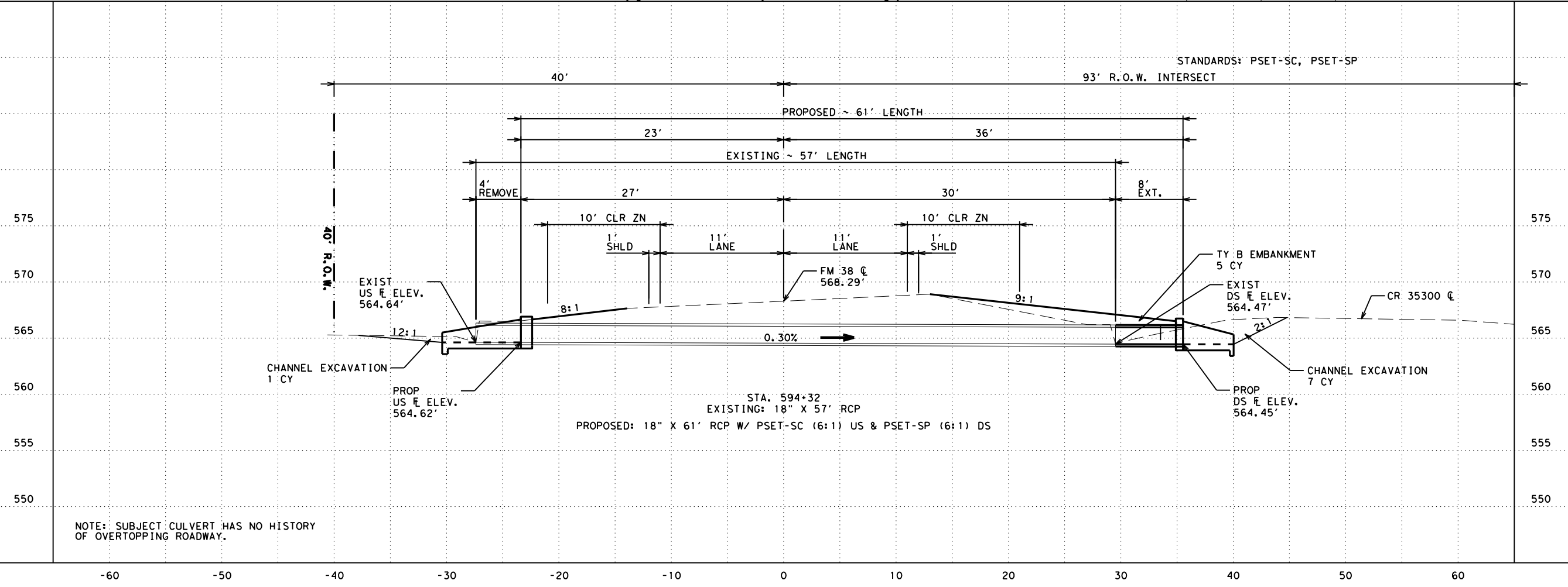
40' R.O.W.



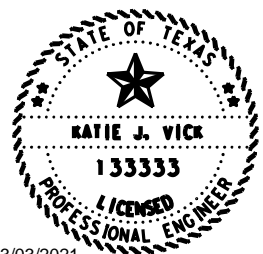
STA. 594+32.00 ESTIMATED QUANTITIES

110	6002	EXCAVATION (CHANNEL)	8	CY
132	6019	EMBANKMENT (VEHICLE) (ORD COMP) (TY B)	5	CY
464	6003	RC PIPE (CL III) (18 IN)	8	LF
467	6362	SET (TY II) (18 IN) (RCP) (6:1) (C)	1	EA
467	6363	SET (TY II) (18 IN) (RCP) (6:1) (P)	1	EA
496	6007	REMOV STR (PIPE)	4	LF

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BENCHMARK
 STA. 593+41.13
 1 OF @
 CAPPED 1/2" STEEL ROD
 N: 7314322.611
 E: 2786097.261
 ELEV: 565.86



03/03/2021
 Katie J. Vick, P.E.

FM 38
CULVERT LAYOUT
STA. 594+32

0 5 10
 SCALE IN FEET
 HORZ. & VERT.

SHEET 14 OF 23

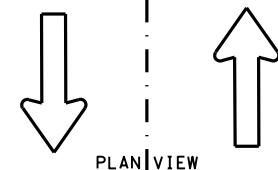
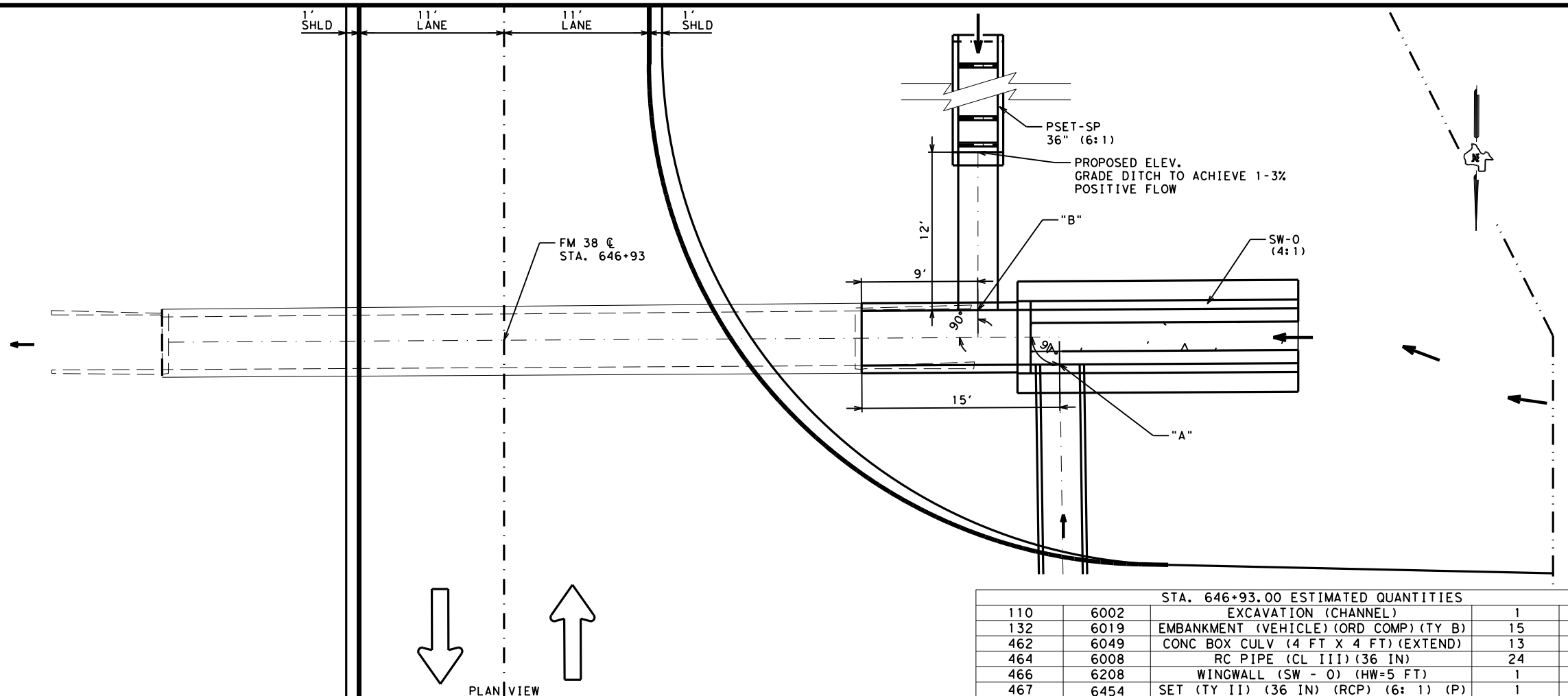
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CONT	SECT	JOB	HIGHWAY
0435	01	080	FM 38
DIST	COUNTY	SHEET NO.	
PAR	LAMAR	81	

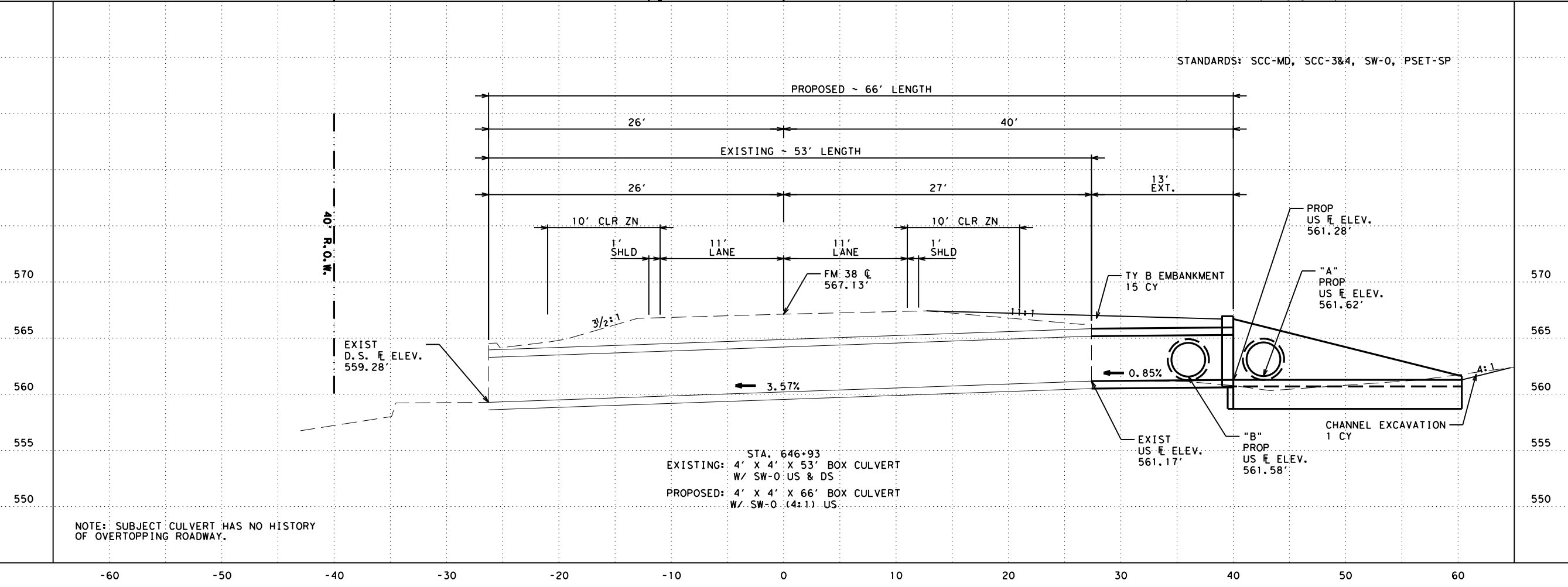
NOTE: SUBJECT CULVERT HAS NO HISTORY OF OVERTOPPING ROADWAY.

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 FILE: C:\Users\CGIL\STR\Desktop\FM 38 0435-01-080\CAD Design\CULVERT LAYOUTS.dgn

40' R.O.W.



STA. 646+93.00 ESTIMATED QUANTITIES				
110	6002	EXCAVATION (CHANNEL)	1	CY
132	6019	EMBANKMENT (VEHICLE) (ORD COMP) (TY B)	15	CY
462	6049	CONC BOX CULV (4 FT X 4 FT) (EXTEND)	13	LF
464	6008	RC PIPE (CL III) (36 IN)	24	LF
466	6208	WINGWALL (SW - 0) (HW=5 FT)	1	EA
467	6454	SET (TY II) (36 IN) (RCP) (6: 1) (P)	1	EA



STANDARDS: SCC-MD, SCC-3&4, SW-0, PSET-SP

EXIST D.S. ELEV. 559.28'

STA. 646+93
 EXISTING: 4' X 4' X 53' BOX CULVERT
 W/ SW-0 US & DS
 PROPOSED: 4' X 4' X 66' BOX CULVERT
 W/ SW-0 (4:1) US

EXIST US ELEV. 561.17'

"B" PROP US ELEV. 561.58'

PROP US ELEV. 561.28'

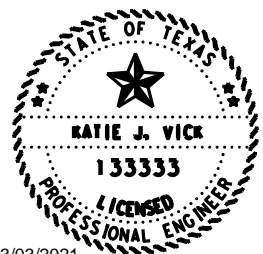
"A" PROP US ELEV. 561.62'

CHANNEL EXCAVATION 1 CY

TY B EMBANKMENT 15 CY

NOTE: SUBJECT CULVERT HAS NO HISTORY OF OVERTOPPING ROADWAY.

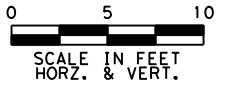
BENCHMARK STA. 646+10.87
 0.7' RT OF CAPPED 1/2" STEEL ROD
 N: 7309673.570
 E: 2784410.215
 ELEV: 567.07



03/03/2021

Katie J. Vick, P.E.

FM 38
 CULVERT LAYOUT
 STA. 646+93



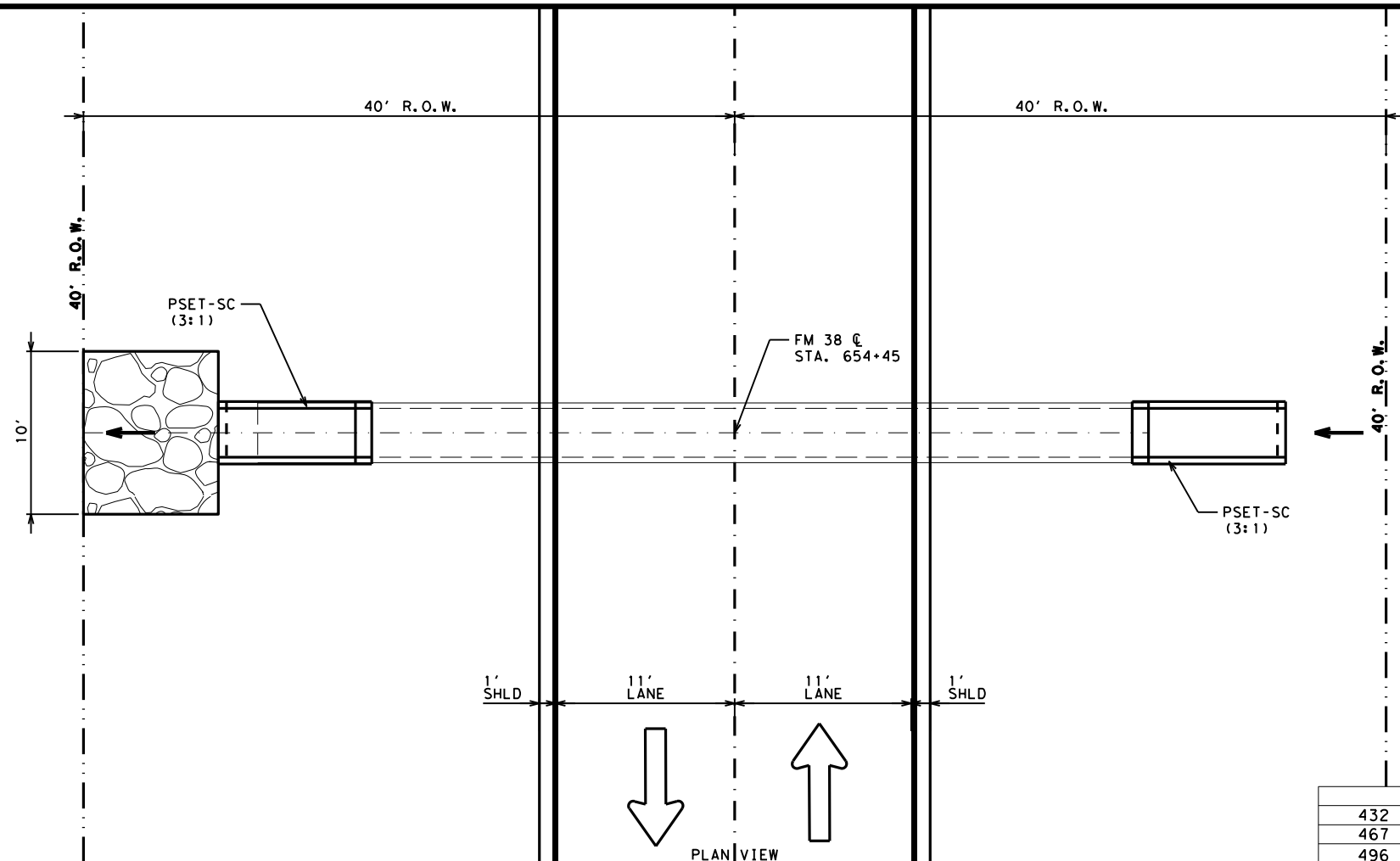
SHEET 15 OF 23

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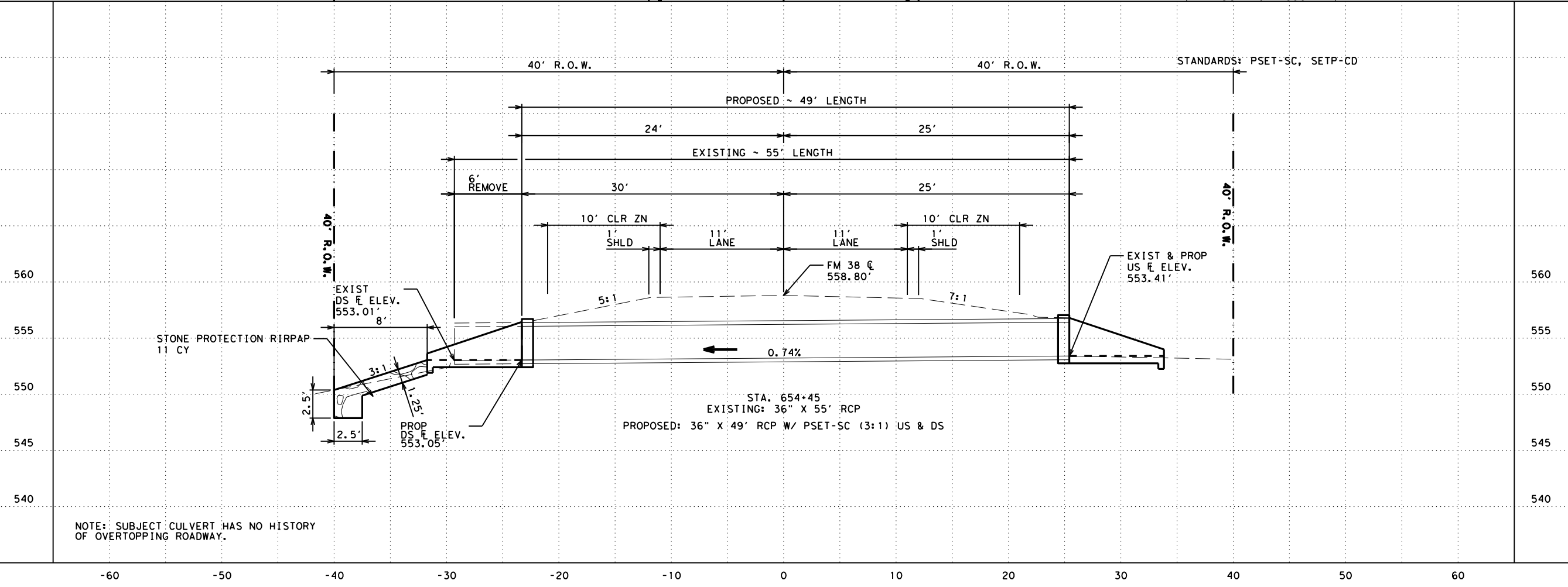
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0435	01	080	FM 38
DIST	COUNTY	SHEET NO.	
PAR	LAMAR	82	

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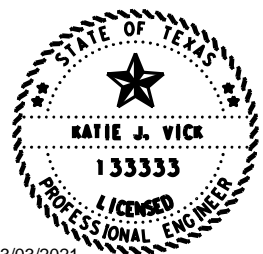
STA. 654+45.00 ESTIMATED QUANTITIES

432	6031	RIPRAP (STONE PROTECTION) (12 IN)	5	CY
467	6448	SET (TY II) (36 IN) (RCP) (3: 1) (C)	2	EA
496	6007	REMOV STR (PIPE)	6	LF



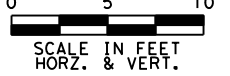
NOTE: SUBJECT CULVERT HAS NO HISTORY OF OVERTOPPING ROADWAY.

BENCHMARK
 STA. 655+02.97
 44' 1" OF
 CAPPED 1/2" STEEL ROD
 N: 7308774.315
 E: 2784516.808
 ELEV: 556.01



03/03/2021
 Katie J. Vick, P.E.

FM 38
CULVERT LAYOUT
STA. 654+45

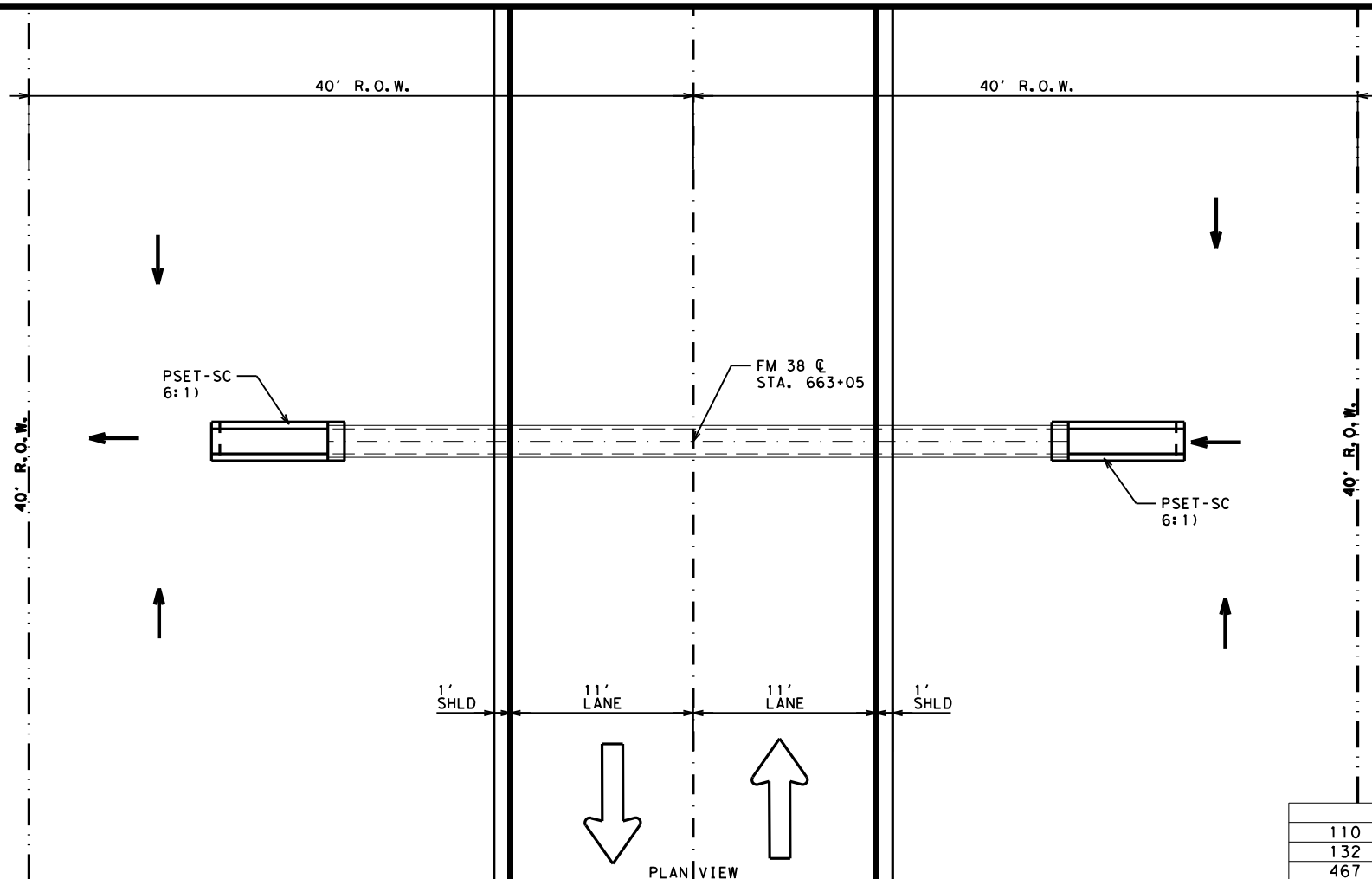


SHEET 16 OF 23

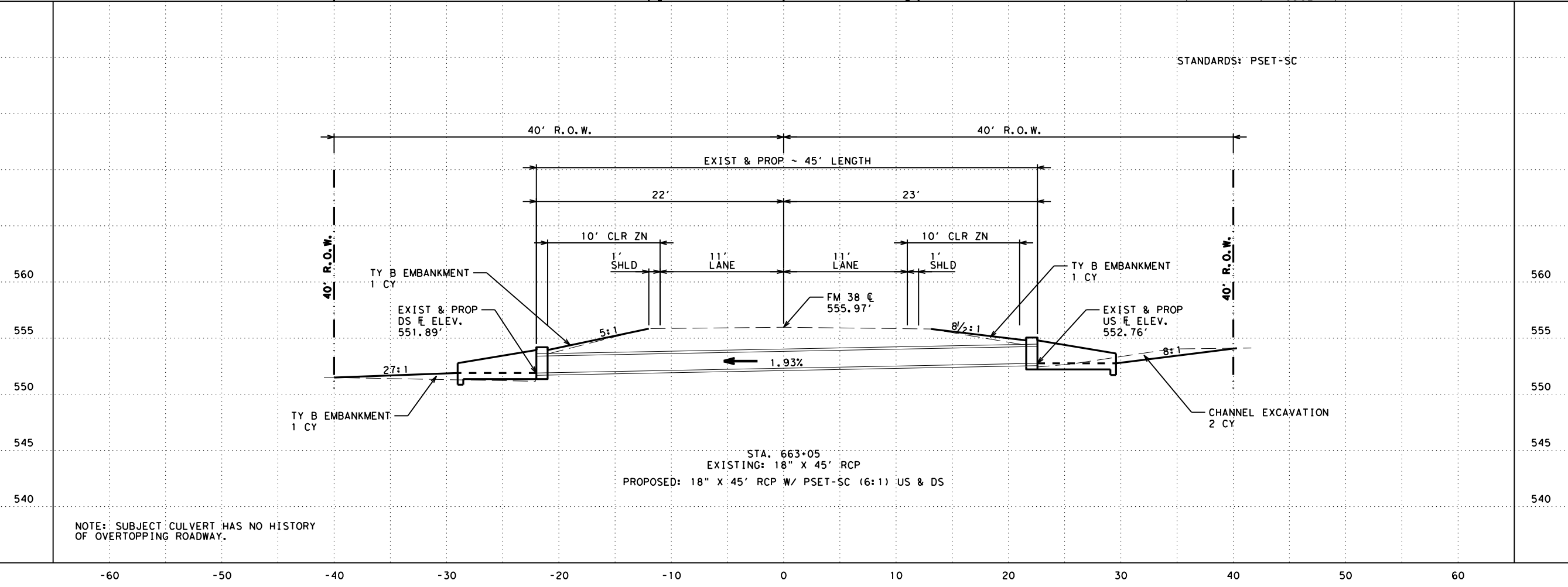
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CONT	SECT	JOB	HIGHWAY
0435	01	080	FM 38
DIST	COUNTY	SHEET NO.	
PAR	LAMAR	83	

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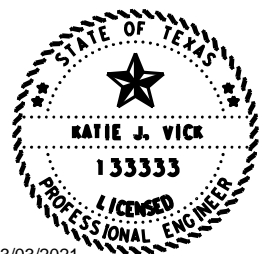


STA. 663+05.00 ESTIMATED QUANTITIES				
110	6002	EXCAVATION (CHANNEL)	2	CY
132	6019	EMBANKMENT (VEHICLE) (ORD COMP) (TY B)	3	CY
467	6362	SET (TY II) (18 IN) (RCP) (6:1) (C)	2	EA



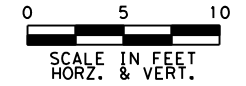
NOTE: SUBJECT CULVERT HAS NO HISTORY OF OVERTOPPING ROADWAY.

BENCHMARK
 STA. 662+64.90
 38' RT OF C
 CAPPED 2" STEEL ROD
 N: 7308774.315
 E: 2784516.808
 ELEV: 556.01



03/03/2021
 Katie J. Vick, P.E.

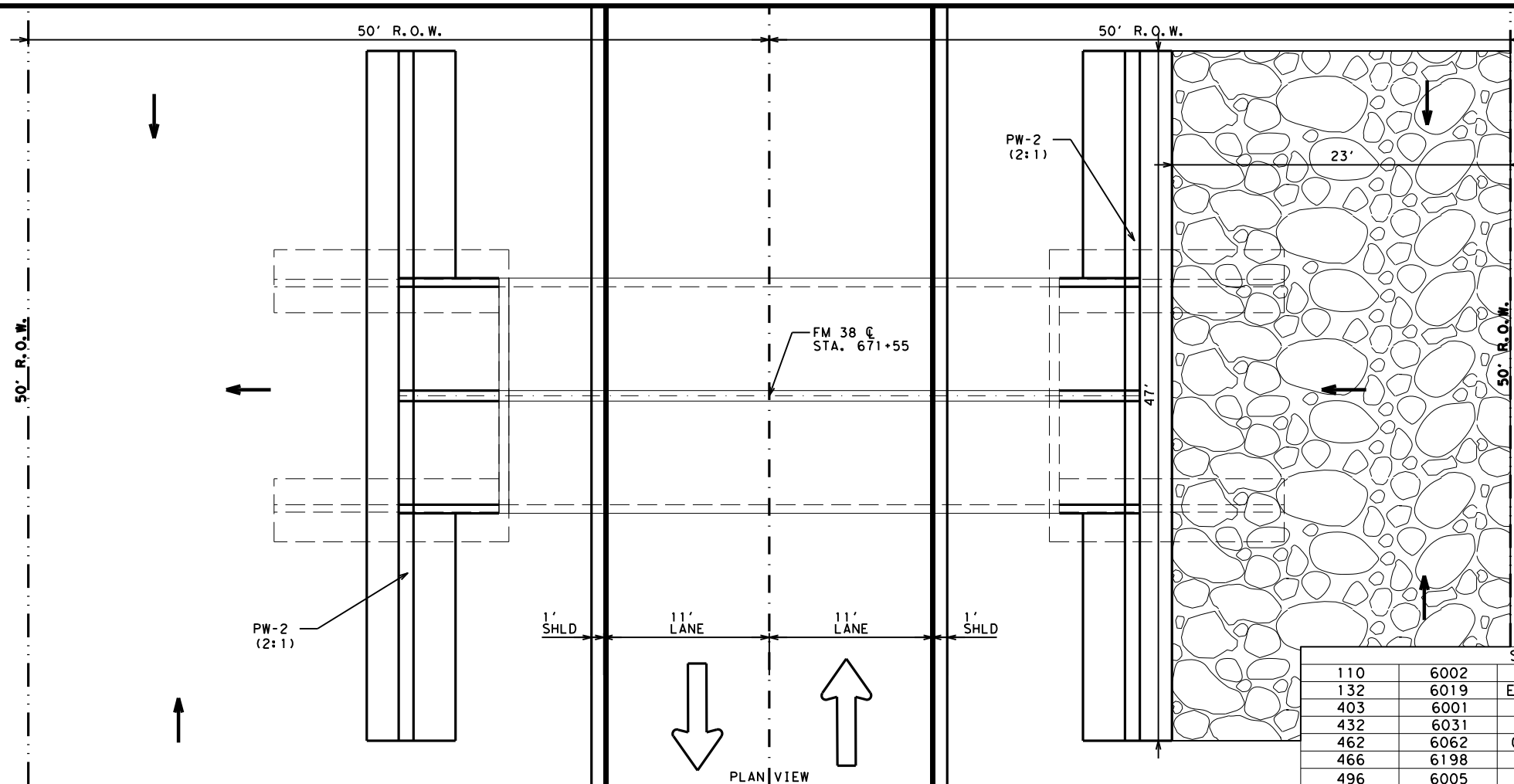
FM 38
CULVERT LAYOUT
STA. 663+05



SHEET 17 OF 23



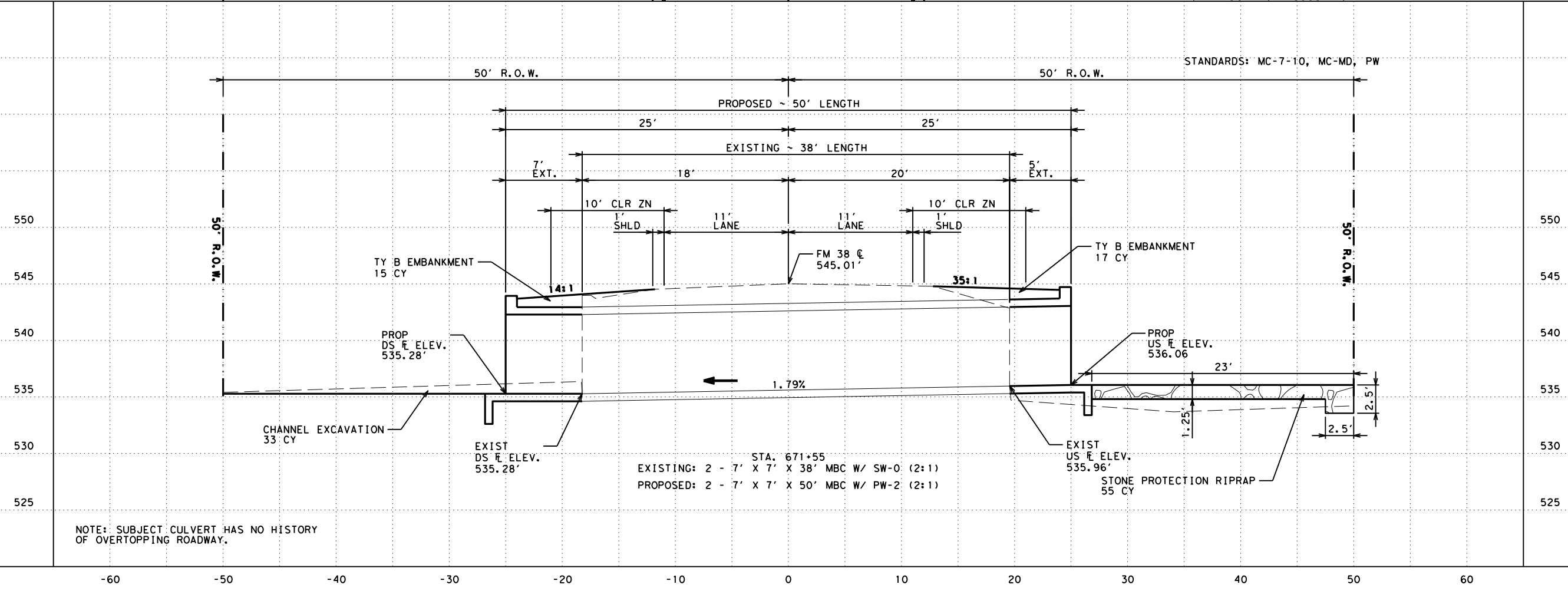
CONT	SECT	JOB	HIGHWAY
0435	01	080	FM 38
DIST	COUNTY	SHEET NO.	
PAR	LAMAR	84	



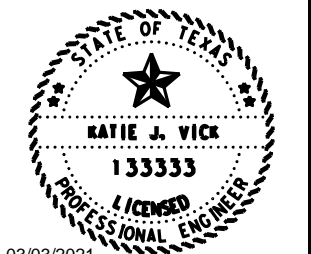
STA. 671+55.00 ESTIMATED QUANTITIES

110	6002	EXCAVATION (CHANNEL)	33	CY
132	6019	EMBANKMENT (VEHICLE) (ORD COMP) (TY B)	32	CY
403	6001	TEMPORARY SPL SHORING	425	SF
432	6031	RIPRAP (STONE PROTECTION) (12 IN)	55	CY
462	6062	CONC BOX CULV (7 FT X 7 FT) (EXTEND)	12	LF
466	6198	WINGWALL (PW - 2) (HW=9 FT)	2	EA
496	6005	REMOV STR (WINGWALL)	2	EA

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BENCHMARK
STA. 672+16.76
46' RT OF C
CAPPED 1/2" STEEL ROD
N: 7307059.563
E: 2784445.343
ELEV: 541.19



03/03/2021
Katie J. Vick, P.E.

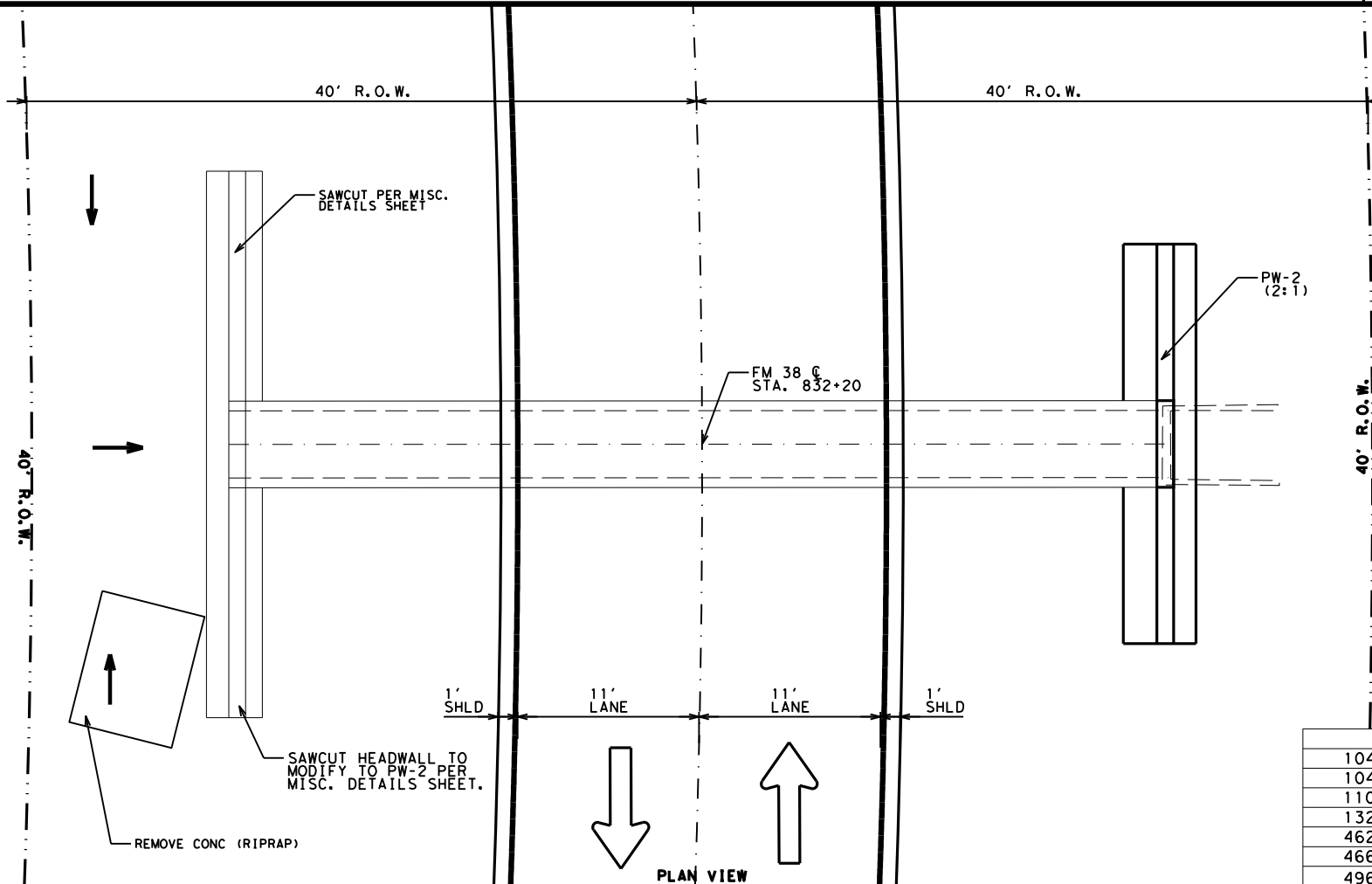
FM 38
CULVERT LAYOUT
STA. 671+55
0 5 10
SCALE IN FEET
HORZ. & VERT.
SHEET 18 OF 23



CONT	SECT	JOB	HIGHWAY
0435	01	080	FM 38
DIST	COUNTY	SHEET NO.	
PAR	LAMAR	85	

NOTE: SUBJECT CULVERT HAS NO HISTORY OF OVERTOPPING ROADWAY.

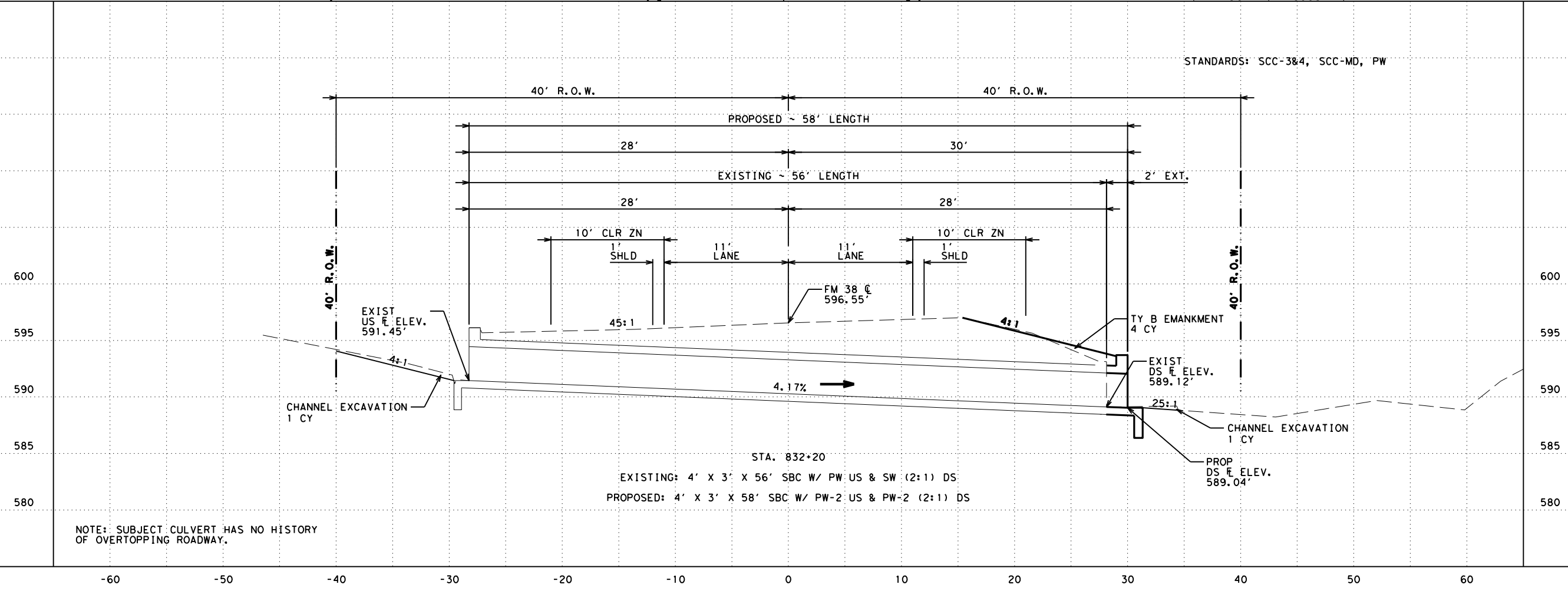
STA. 671+55
EXISTING: 2 - 7' X 7' X 38' MBC W/ SW-0 (2:1)
PROPOSED: 2 - 7' X 7' X 50' MBC W/ PW-2 (2:1)



STA. 832+20.00 ESTIMATED QUANTITIES

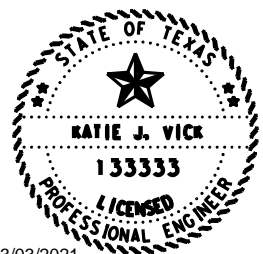
104	6009	REMOVING CONC (RIPRAP)	6	SY
104	6067	REMOVING CONC (SAWCUT)	21	LF
110	6002	EXCAVATION (CHANNEL)	2	CY
132	6019	EMBANKMENT (VEHICLE) (ORD COMP) (TY B)	4	CY
462	6048	CONC BOX CULV (4 FT X 3 FT) (EXTEND)	2	LF
466	6194	WINGWALL (PW - 2) (HW=5 FT)	1	EA
496	6005	REMOV STR (WINGWALL)	1	EA

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FILE: C:\Users\CGILS\OneDrive\Documents\FM 38 0435-01-080\CAD Design\CULVERT LAYOUTS.dgn



NOTE: SUBJECT CULVERT HAS NO HISTORY OF OVERTOPPING ROADWAY.

BENCHMARK
STA. 831+96.87
1" OF
CAPPED 1/2" STEEL ROD
N: 7291719.873
E: 2782804.703
ELEV: 595.50



03/03/2021
Katie J. Vick, P.E.

FM 38
CULVERT LAYOUT
STA. 832+20



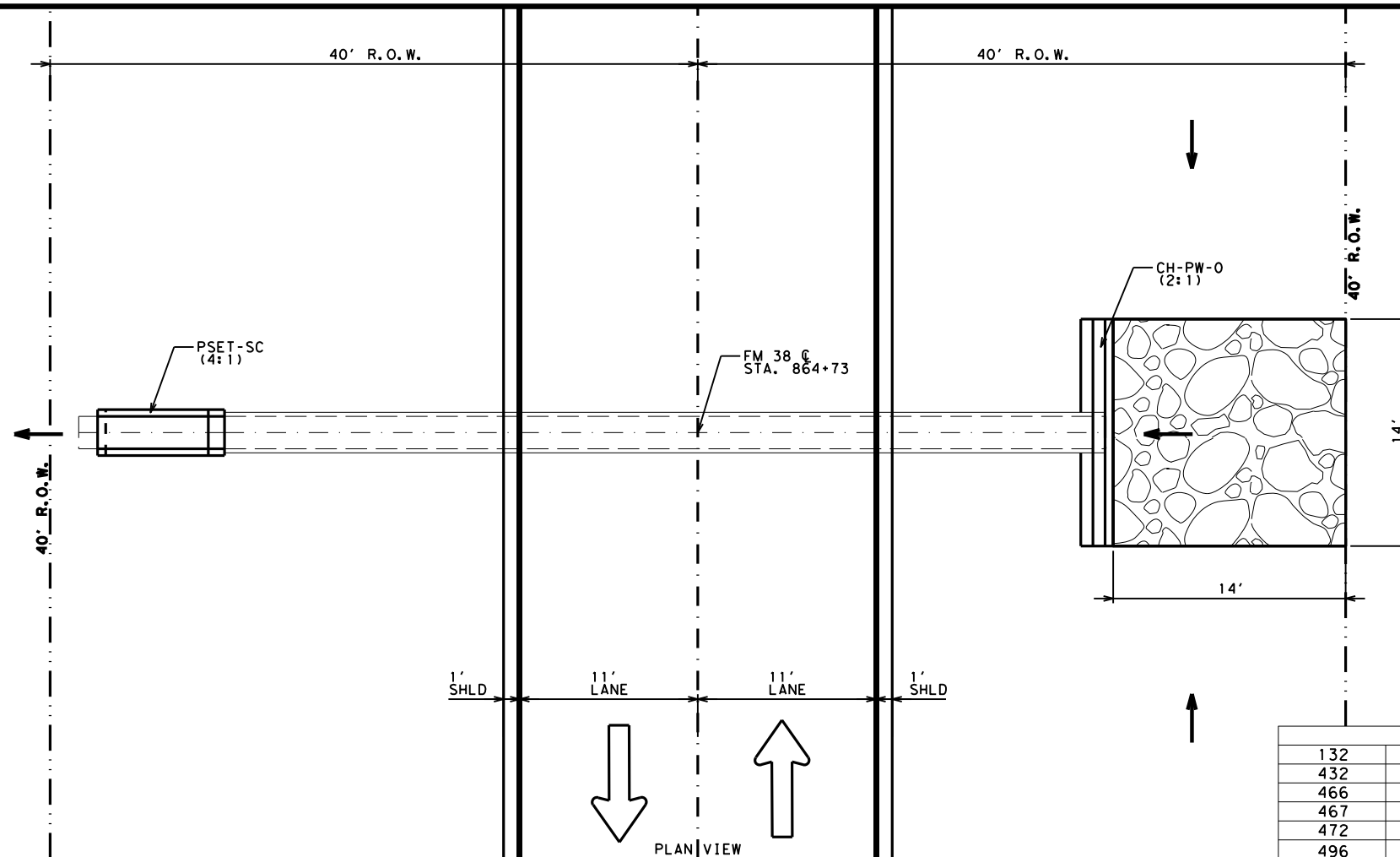
SCALE IN FEET
HORZ. & VERT.

SHEET 19 OF 23

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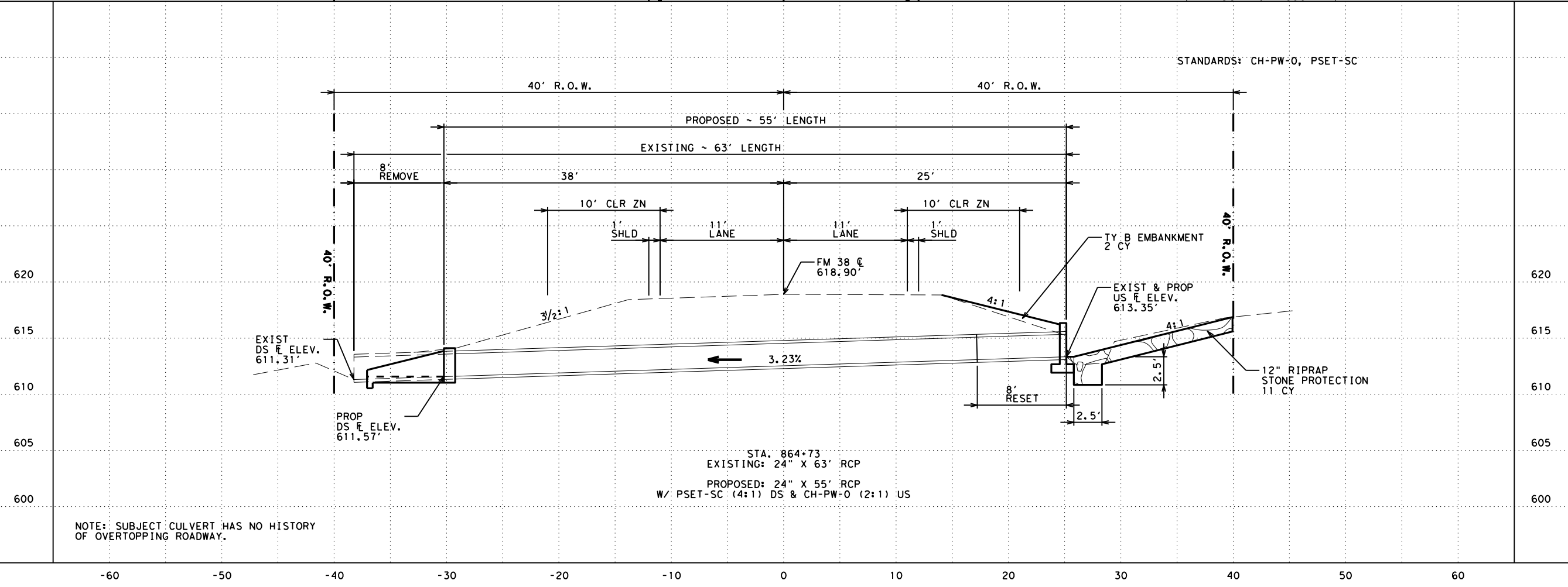


CONT	SECT	JOB	HIGHWAY
0435	01	080	FM 38
DIST	COUNTY	SHEET NO.	
PAR	LAMAR	86	



STA. 864+73.00 ESTIMATED QUANTITIES				
132	6019	EMBANKMENT (VEHICLE) (ORD COMP) (TY B)	2	CY
432	6031	RIPRAP (STONE PROTECTION) (12 IN)	11	CY
466	6097	HEADWALL (CH - PW - 0) (DIA= 24 IN)	1	EA
467	6390	SET (TY II) (24 IN) (RCP) (4: 1) (C)	1	EA
472	6006	REMOV & RE - LAY PIPE (24 IN)	8	LF
496	6007	REMOV STR (PIPE)	8	LF

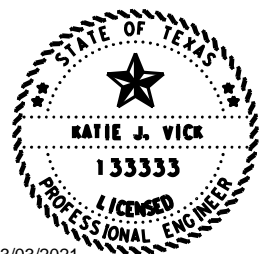
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NOTE: SUBJECT CULVERT HAS NO HISTORY OF OVERTOPPING ROADWAY.

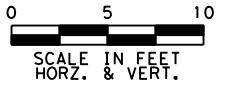
STA. 864+73
EXISTING: 24" X 63' RCP
PROPOSED: 24" X 55' RCP
W/ PSET-SC (4:1) DS & CH-PW-0 (2:1) US

BENCHMARK
STA. 863+74.87
8" RT OF C
CAPPED 1/2" STEEL ROD
N: 7288582.777
E: 2782676.010
ELEV: 617.54



03/03/2021
Katie J. Vick, P.E.

FM 38
CULVERT LAYOUT
STA. 864+73



SHEET 20 OF 23



CONT	SECT	JOB	HIGHWAY
0435	01	080	FM 38
DIST	COUNTY	SHEET NO.	
PAR	LAMAR	87	

CO RD 36010

CO RD 36010

40' - 80' R.O.W.

40' - 80' R.O.W.

80' R.O.W.

PSET-SC (4:1)

FM 38 C
STA. 881+61

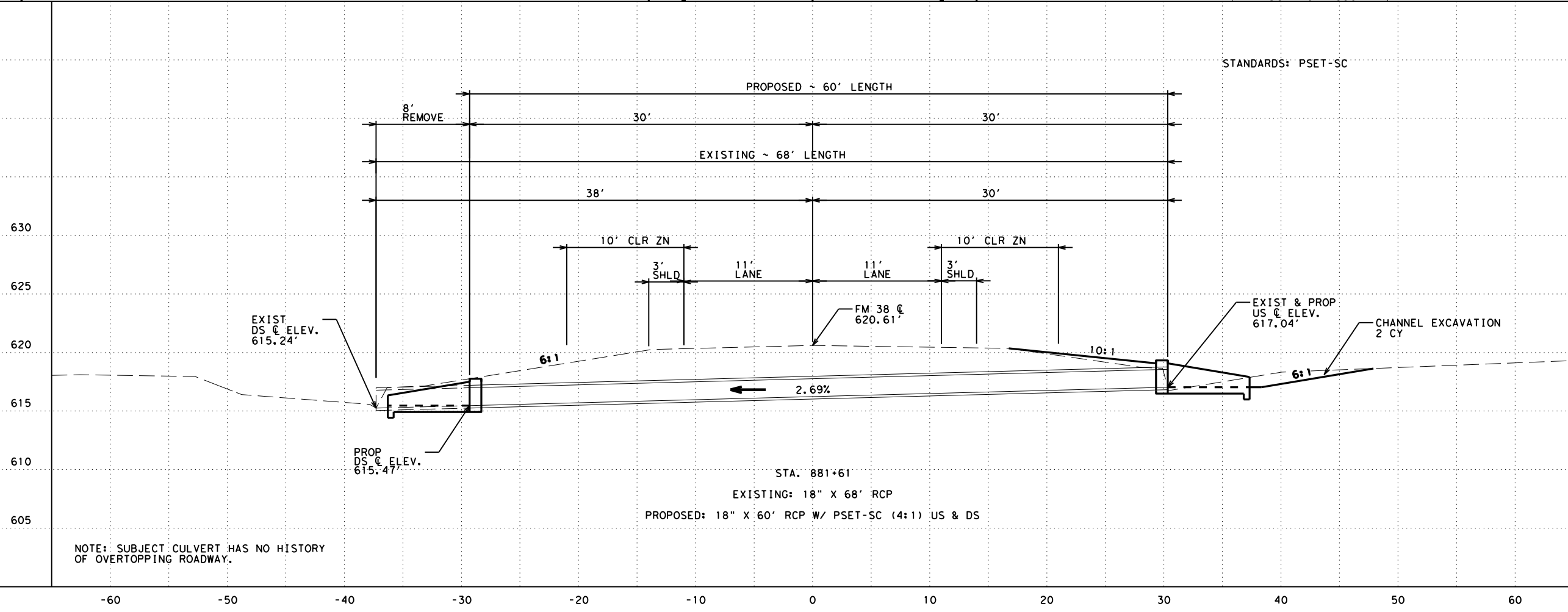
PSET-SC (4:1)

3' SHLD 11' LANE 11' LANE 3' SHLD

PLAN VIEW

STA. 881+61.00 ESTIMATED QUANTITIES				
110	6002	EXCAVATION (CHANNEL)	2	CY
132	6019	EMBANKMENT (VEHICLE) (ORD COMP) (TY B)	2	CY
467	6358	SET (TY II) (18 IN) (RCP) (4:1) (C)	2	EA
496	6007	REMOV STR (PIPE)	8	LF

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STANDARDS: PSET-SC

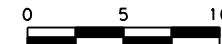
BENCHMARK
STA. 880+98.08
30' RT OF C
CAPPED 1/2" STEEL RO
N: 7286860.348
E: 2782699.644
ELEV: 620.11



03/03/2021

Katie J. Vick, P.E.

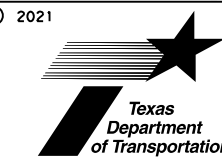
FM 38
CULVERT LAYOUT
STA. 881+61



SCALE IN FEET
HORZ. & VERT.

SHEET 21 OF 23

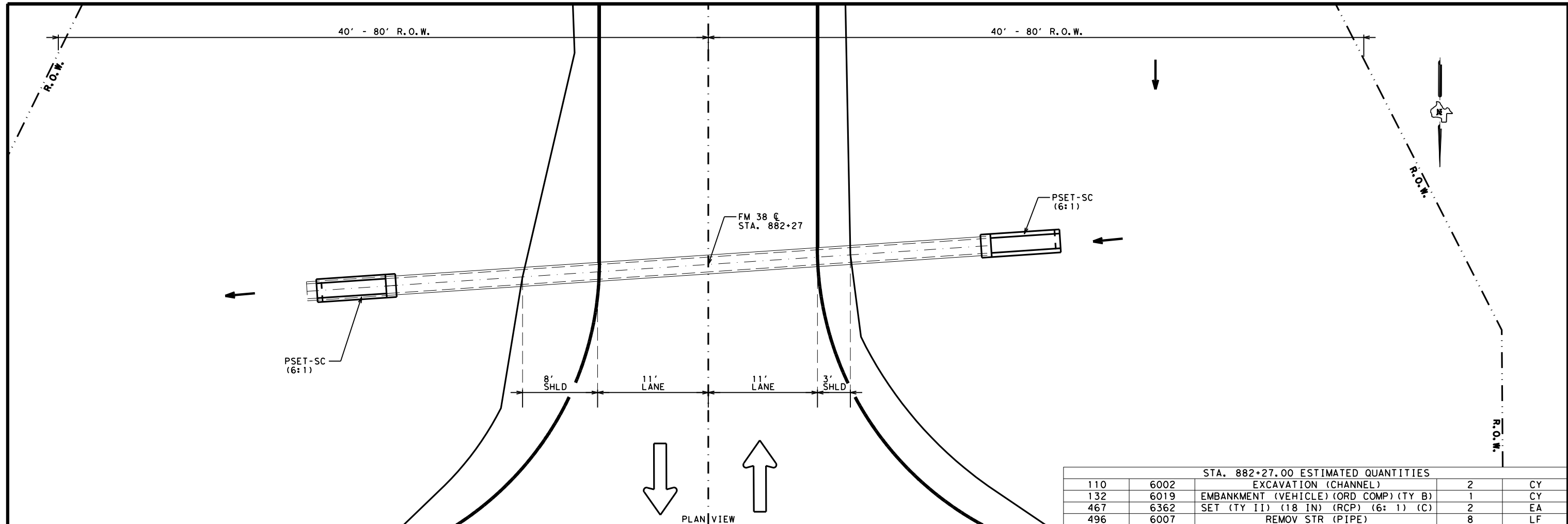
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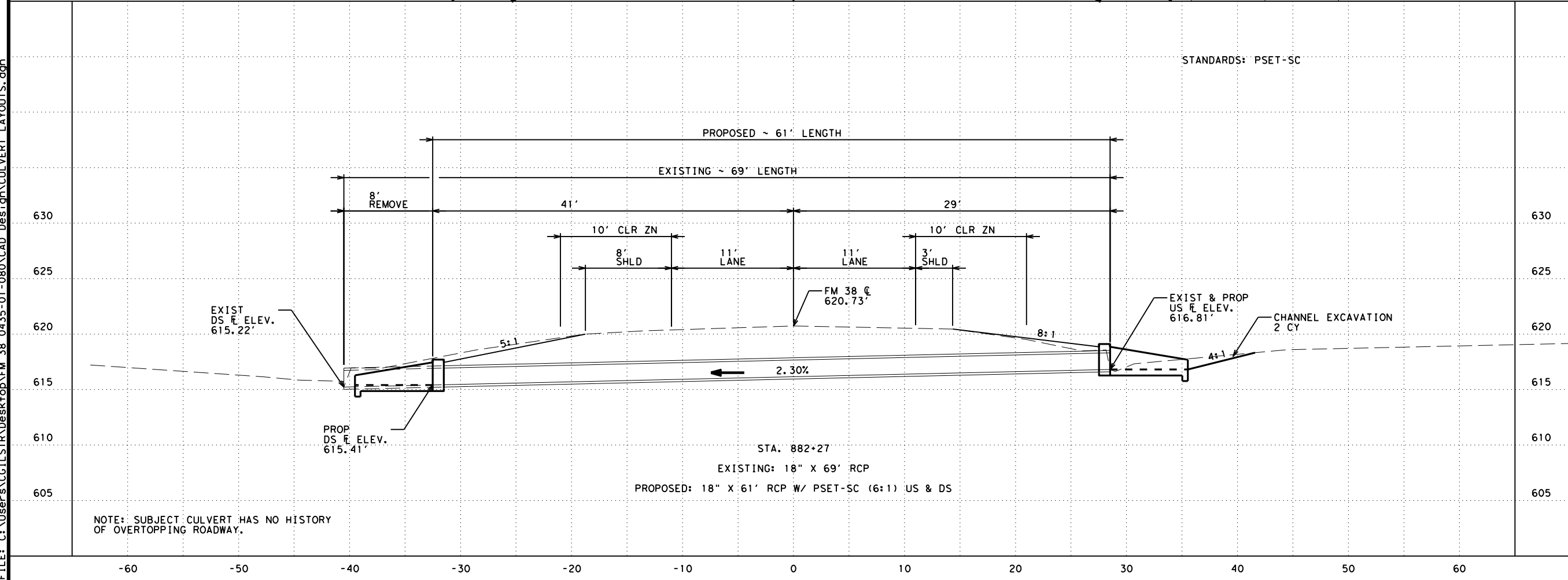
CONT	SECT	JOB	HIGHWAY
0435	01	080	FM 38
DIST	COUNTY	SHEET NO.	
PAR	LAMAR	88	

NOTE: SUBJECT CULVERT HAS NO HISTORY OF OVERTOPPING ROADWAY.

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STA. 882+27.00 ESTIMATED QUANTITIES				
110	6002	EXCAVATION (CHANNEL)	2	CY
132	6019	EMBANKMENT (VEHICLE) (ORD COMP) (TY B)	1	CY
467	6362	SET (TY II) (18 IN) (RCP) (6:1) (C)	2	EA
496	6007	REMOV STR (PIPE)	8	LF



BENCHMARK
 STA. 880+98.08
 50' RT OF C
 CAPPED 1/2" STEEL ROD
 N: 7286860.348
 E: 2782699.644
 ELEV: 620.11

STATE OF TEXAS
 KATIE J. VICK
 13333
 LICENSED PROFESSIONAL ENGINEER

03/03/2021
 Katie J. Vick, P.E.

FM 38
 CULVERT LAYOUT
 STA. 882+27

0 5 10
 SCALE IN FEET
 HORZ. & VERT.

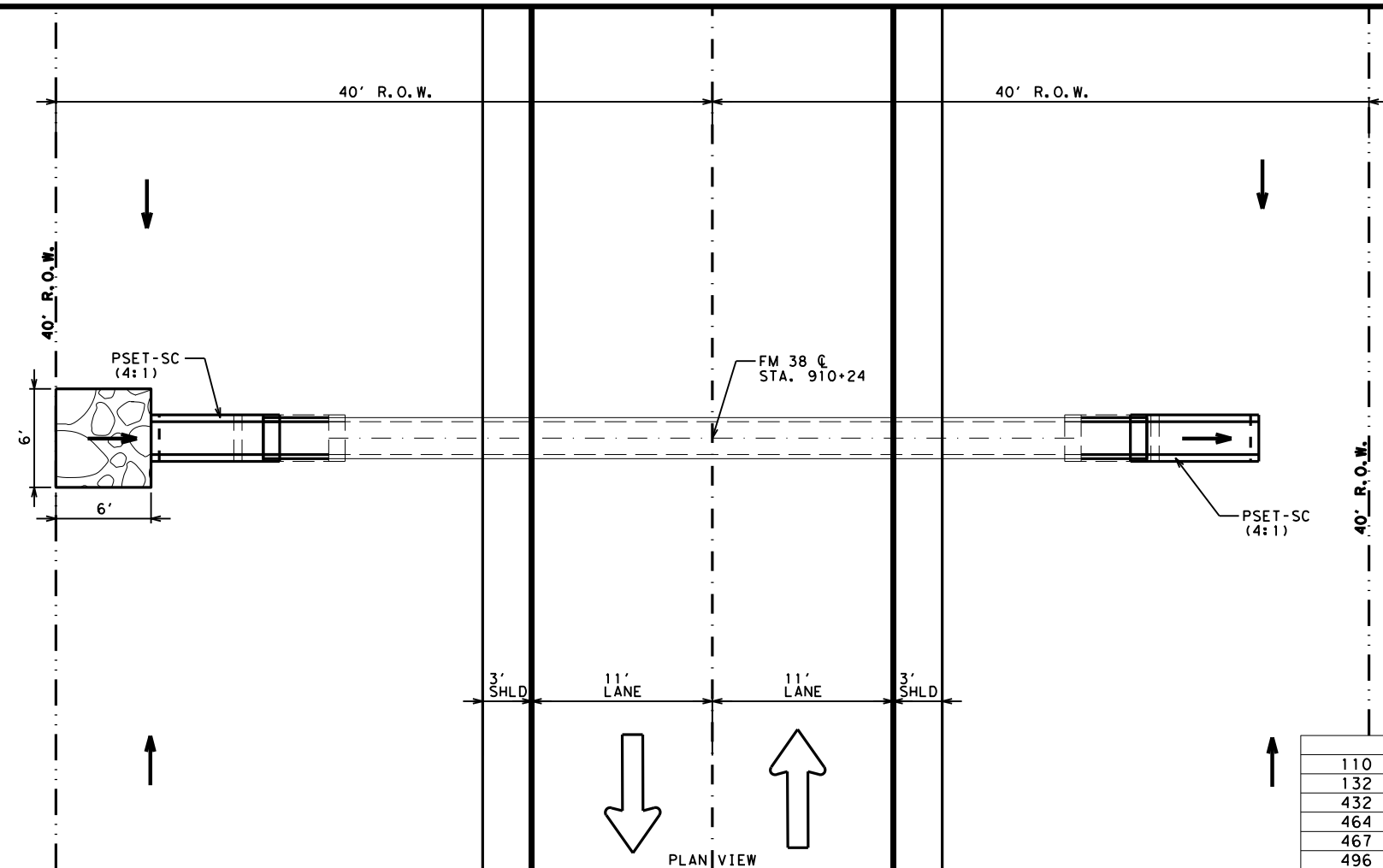
SHEET 22 OF 23

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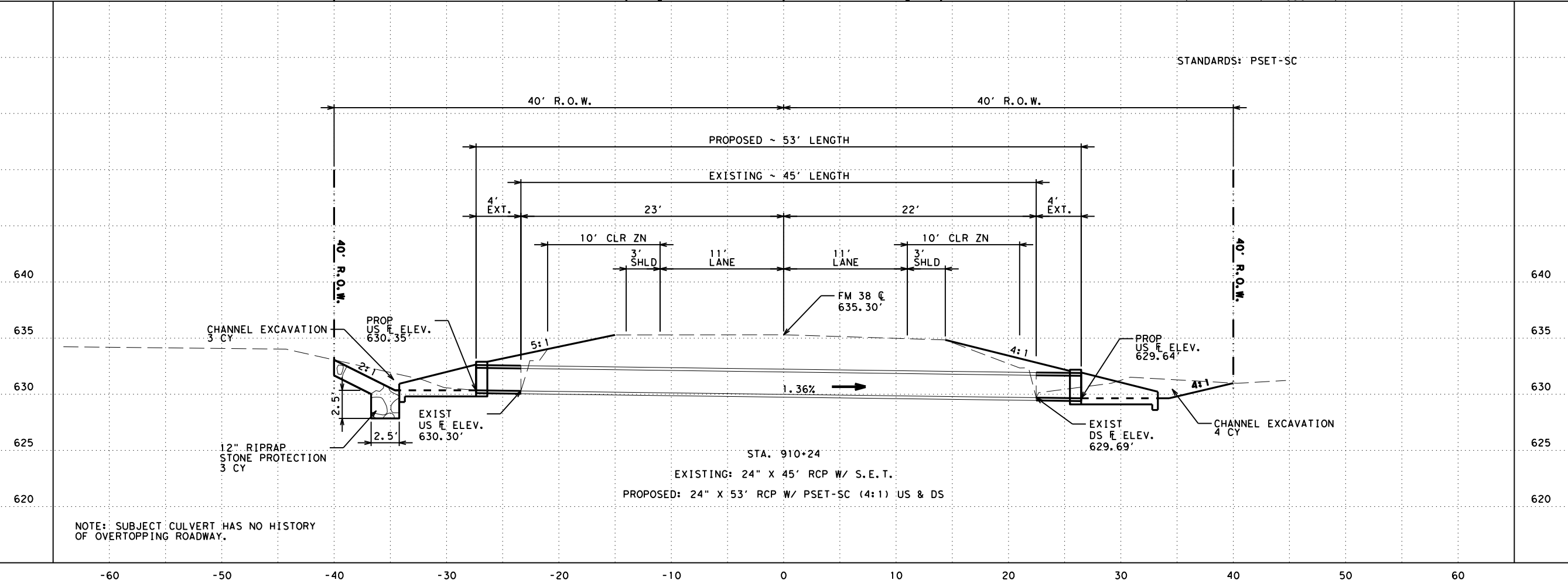
Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0435	01	080	FM 38
DIST	COUNTY	SHEET NO.	
PAR	LAMAR	89	

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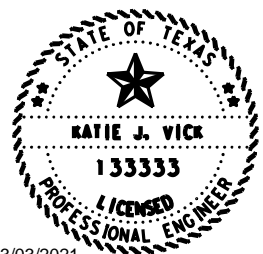
STA. 910+24.00 ESTIMATED QUANTITIES				
110	6002	EXCAVATION (CHANNEL)	7	CY
132	6019	EMBANKMENT (VEHICLE) (ORD COMP) (TY B)	2	CY
432	6031	RIPRAP (STONE PROTECTION) (12 IN)	3	CY
464	6005	RC PIPE (CL III) (24 IN)	8	LF
467	6390	SET (TY II) (24 IN) (RCP) (4: 1) (C)	2	EA
496	6004	REMOV STR (SET)	2	EA



NOTE: SUBJECT CULVERT HAS NO HISTORY OF OVERTOPPING ROADWAY.

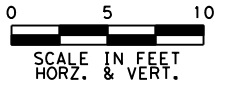
STANDARDS: PSET-SC

BENCHMARK
 STA. 909+41.48
 38' RT OF C
 CAPPED 1/2" STEEL ROD
 N: 7284016.871
 E: 2782806.400
 ELEV: 632.47



03/03/2021
 Katie J. Vick, P.E.

FM 38
CULVERT LAYOUT
STA. 910+24



SHEET 23 OF 23

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Texas Department of Transportation	
CONT	SECT
0435	01
JOB	
080	
HIGHWAY	
FM 38	
DIST	COUNTY
PAR	LAMAR
SHEET NO.	
90	

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DATE: 2/28/2021 8:47:54 PM
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Culvert Station and/or Creek Name followed by applicable end (Lt, Rt or Both)	Description of Box Culvert No. Spans ~ Span X Height	Max Fill Height (Ft)	Applicable Box Culvert Standard (4)	Applicable Wingwall or End Treatment Standard	Skew Angle (0°, 15°, 30° or 45°)	Side Slope or Channel Slope Ratio (SL:1)	T Culvert Top Slab Thickness (In)	U Culvert Wall Thickness (In)	C Estimated Curb Height (Ft)	Hw (1) Height of Wingwall (Ft)	A Curb to End of Wingwall (Ft)	B Offset of End of Wingwall (Ft)	Lw Length of Longest Wingwall (Ft)	Ltw Culvert Toewall Length (Ft)	Atw Anchor Toewall Length (Ft)	Riprap Apron (CY)	Class "C" Conc (Curb) (CY) (2)	Class "C" Conc (Wingwall) (CY) (3)	Total Wingwall Area (SF)
STA. 69+00 (Rt)	1 ~ 4' x 4'	2'	SCC-3&4	FW-0	0°	4:1	8"	7"	1.000'	5.417'	20.333'	11.739'	23.479'	N/A	N/A	4.7	0.2	8.3	135
STA. 95+97 (Lt)	2 ~ 5' x 5'	2.6'	MC-5-20	PW-2	0°	2:1	8"	7"	1.000'	6.667'	N/A	N/A	11.333'	11.750'	N/A	0.0	0.4	10.7	145
STA. 251+62 (Both)	1 ~ 7' x 4'	1.6'	SCC-7	PW-2	0°	2:1	8"	7"	1.000'	5.667'	N/A	N/A	9.333'	8.167'	N/A	0.0	0.6	14.4	200
STA. 327+34 DRIVEWAY (Both)	1 ~ 4' x 4'	2'	SCC-3&4	SETB-PD	0°	6:1	8"	7"	0.500'	4.917'	N/A	N/A	28.000'	N/A	5.167'	0.0	0.2	12.8	N/A
STA. 328+67 (Lt)	1 ~ 4' x 4'	1.6'	SCC-3&4	PW-2	0°	2:1	8"	7"	1.000'	5.667'	N/A	N/A	9.333'	5.167'	N/A	0.0	0.2	7.0	100
STA. 358+72 (Both)	1 ~ 4' x 4'	1'	SCC-3&4	PW-2	0°	2:1	8"	7"	1.000'	5.667'	N/A	N/A	9.333'	5.167'	N/A	0.0	0.4	14.0	200
STA. 433+53 (COTTON WOOD CRK) (Both)	4 ~ 7' x 3'	2'	MC-7-10	SW-0	0°	4:1	8"	7"	1.500'	4.917'	N/A	N/A	18.333'	N/A	N/A	16.8	3.4	12.6	192
STA. 520+03 (SANDERS CRK) (Both)	3 ~ 10' x 7'	2'	MC-10-7	PW-2	0°	2:1	9"	7"	1.750'	9.500'	N/A	N/A	17.000'	32.333'	N/A	0.0	4.2	45.2	634
STA. 646+93 (Rt)	1 ~ 4' x 4'	1'	SCC-3&4	SW-0	0°	4:1	8"	7"	1.000'	5.417'	N/A	N/A	20.333'	N/A	N/A	0.7	0.2	7.2	117
STA. 671+55 (Both)	2 ~ 7' x 7'	2.5'	MC-7-10	PW-2	0°	2:1	8"	7"	1.000'	8.667'	N/A	N/A	15.333'	15.750'	N/A	0.0	1.2	37.8	520
STA. 832+20 (Rt)	1 ~ 4' x 3'	2'	SCC-3&4	PW-2	0°	2:1	8"	7"	1.000'	4.667'	N/A	N/A	7.333'	5.167'	N/A	0.0	0.2	4.8	62

NOTES:

Skew = 0° on SW-0, FW-0, SETB-CD, SETB-SW-0, and SETB-FW-0 standard sheets;
 30° maximum for safety end treatment

SL:1 = Horizontal : 1 Vertical

- Side slope at culvert for flared or straight wingwalls.
- Channel slope for parallel wingwalls.
- Slope must be 3:1 or flatter for safety end treatments.

T = Box culvert top slab thickness. Dimension can be found on the applicable box culvert standard sheet.

U = Box culvert wall thickness. Dimension can be found on the applicable box culvert standard sheet.

C = Curb height

See applicable wing or end treatment standard sheets for calculations of Hw, A, B, Lw, Ltw, Atw, and Total Wingwall Area.

Hw = Height of wingwall

A = Distance from face of curb to end of wingwall (not applicable to parallel or straight wingwalls)

B = Offset of end of wingwall (not applicable to parallel or straight wingwalls)

Lw = Length of longest wingwall.

Ltw = Length of culvert toewall (not applicable when using riprap apron)

Atw = Length of anchor toewall (applicable to safety end treatment only)

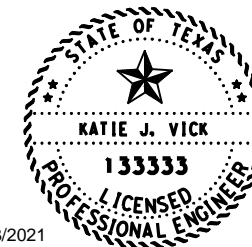
Total Wingwall Area = Wingwall area in sq. ft. for two wingwalls (one structure end) if Lt or Rt.
 Area for four wingwalls (two structure ends) if Both.

① Round the wall heights shown to the nearest foot for bidding purposes.

② Concrete volume shown is for box culvert curb only. For curbs using the Box Culvert Rail Mounting Details (RAC) standard sheet quantities shown must be increased by a factor of 2.25. If Class S concrete is required for the top slab of the culvert, also provide Class S concrete for the curb. Curb concrete is considered part of the Box Culvert for payment.

③ Concrete volume shown is total of wings, footings, culvert toewall (if any), anchor toewalls (if any) and wingwall toewalls. Riprap aprons, culverts, and curb quantities are not included.

④ Regardless of the type of culvert shown on this sheet, the Contractor has the option of furnishing cast-in-place or precast culverts unless otherwise shown elsewhere on the plans. If the Contractor elects to provide culverts of a different type than those shown on this sheet, it is the Contractor's responsibility to make the necessary adjustments to the dimensions and quantities shown.

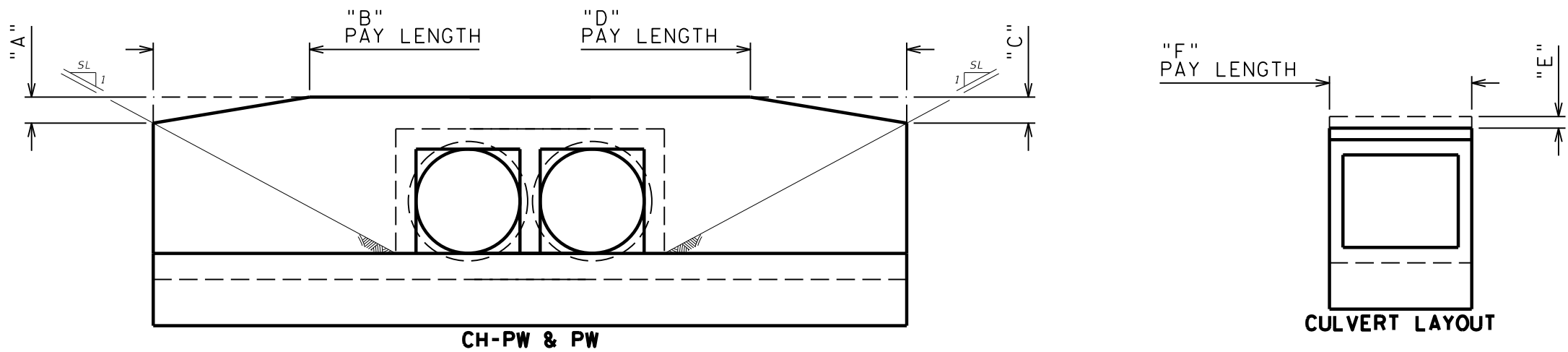


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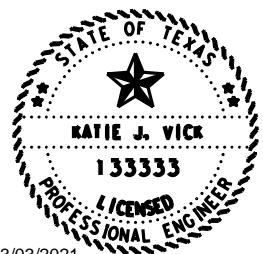
Katie J. Vick, P.E.

				Bridge Division Standard	
BOX CULVERT SUPPLEMENT WINGS AND END TREATMENTS					
BCS					
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©TxDOT	February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0435 01	080		FM 38	
	DIST	COUNTY		SHEET NO.	
	PAR	LAMAR		91	

DN: CK: DW: CK:



ITEM 104 6067 REMOVING CONCRETE (SAWCUT)								
STA.	DESCRIPTION	US/DS	A	B	C	D	E	F
			INCHES	LF	INCHES	LF	INCHES	LF
393+60	30" RCP	US/DS	20	10	20	10		
528+42	2 - 7' X 4' MBC	US/DS	18	9	18	9		
576+40	4' X 4' SBC	DS					6	6
832+20	4' X 3' SBC	US	21	10.5	21	10.5		



03/03/2021

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FM 38
MISCELLANEOUS
DETAILS

NOT TO SCALE

SHEET 1 OF 3

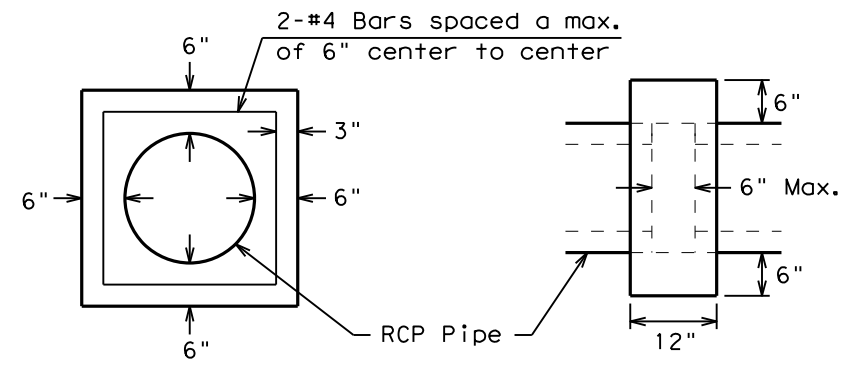


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0435	01	080	FM 38
DIST	COUNTY		SHEET NO.
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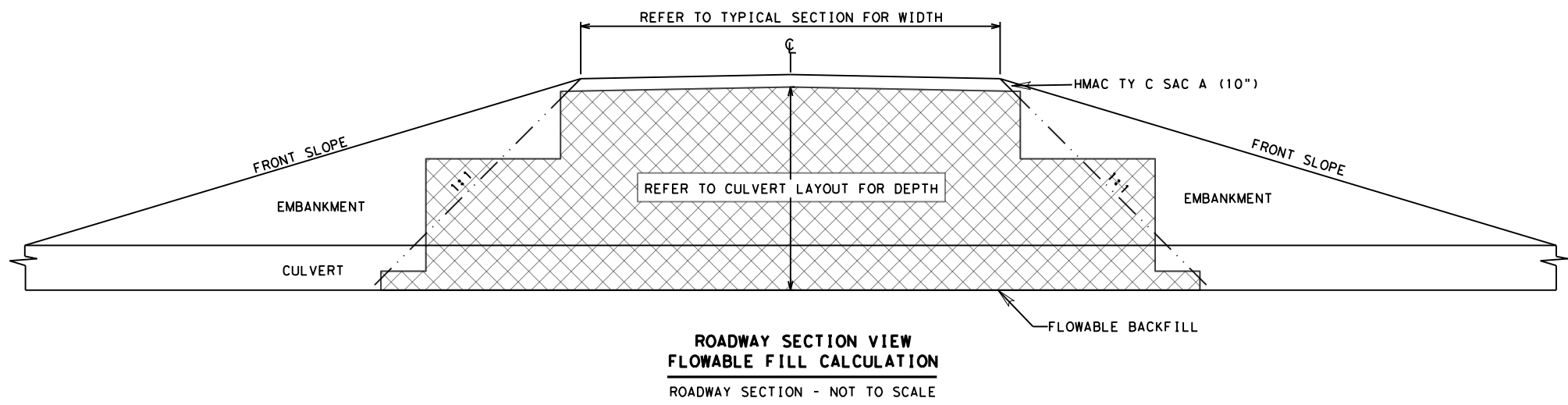
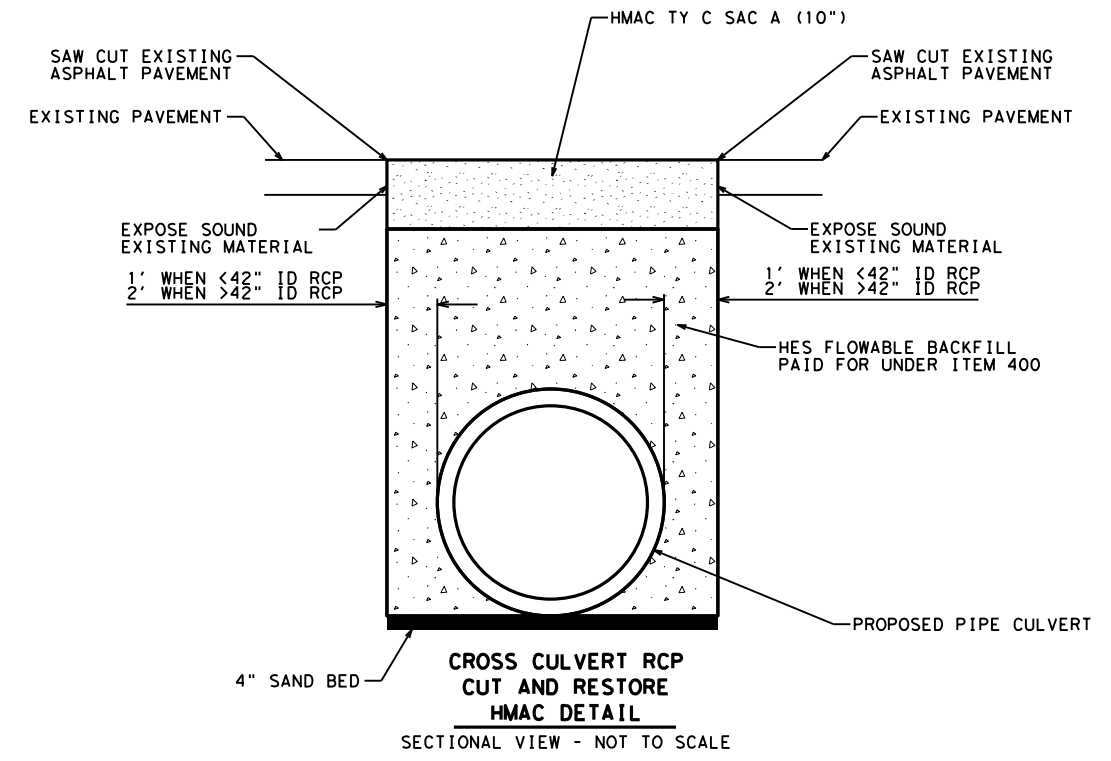
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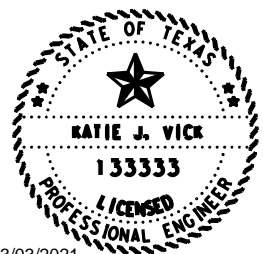
DWG: []
 CHK: []
 DWF: []
 CDS: []



CONCRETE PIPE COLLAR DETAIL
 Concrete for collar shall be Class A
 Pipe collars will be subsidiary to Item 464
 COLLAR DETAIL - NOT TO SCALE



ROADWAY SECTION VIEW
FLOWABLE FILL CALCULATION
 ROADWAY SECTION - NOT TO SCALE



03/03/2021
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FM 38
MISCELLANEOUS
DETAILS

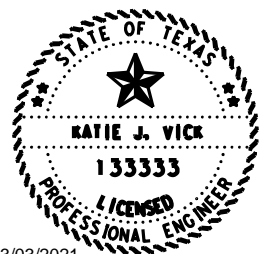
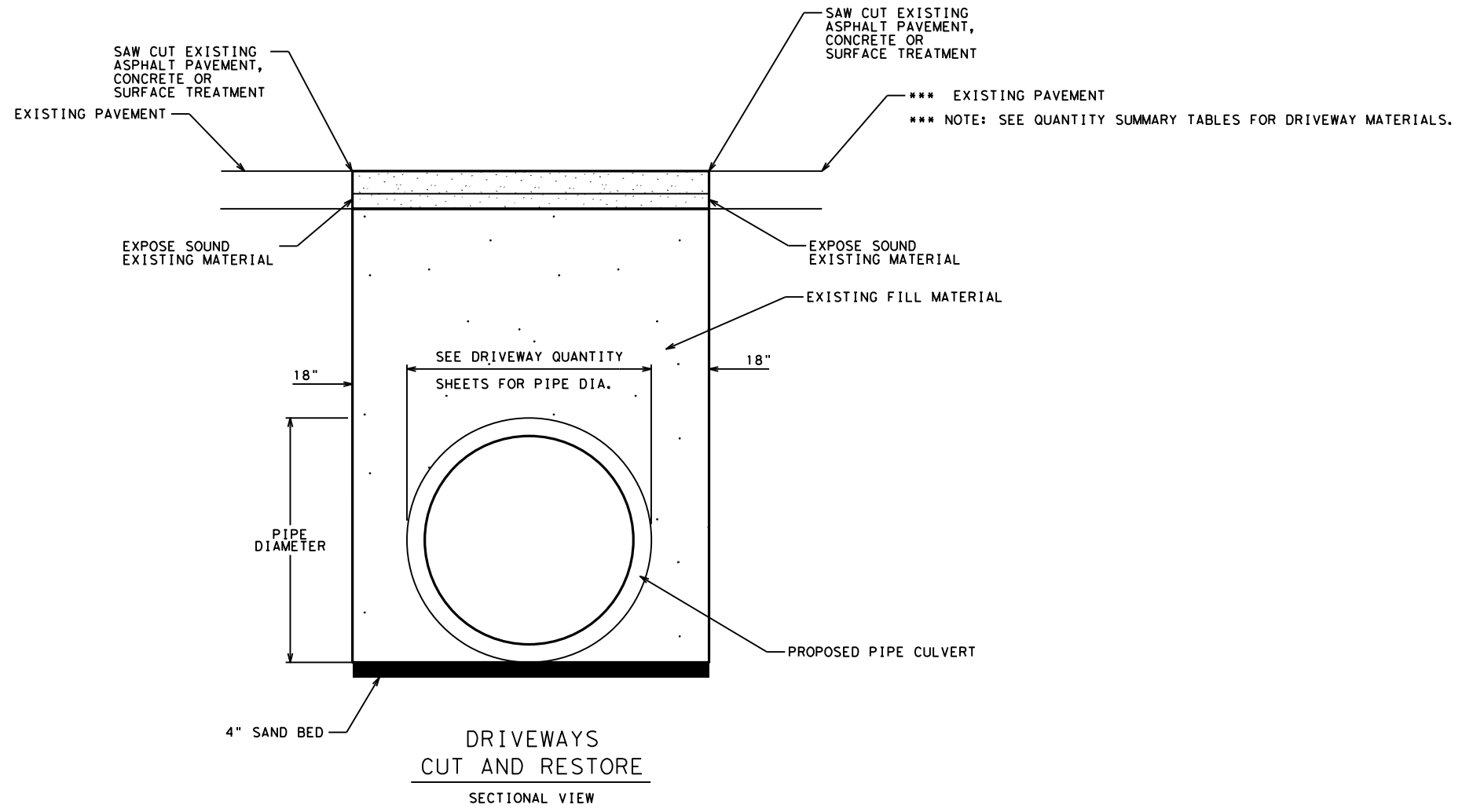
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 SHEET 2 OF 3

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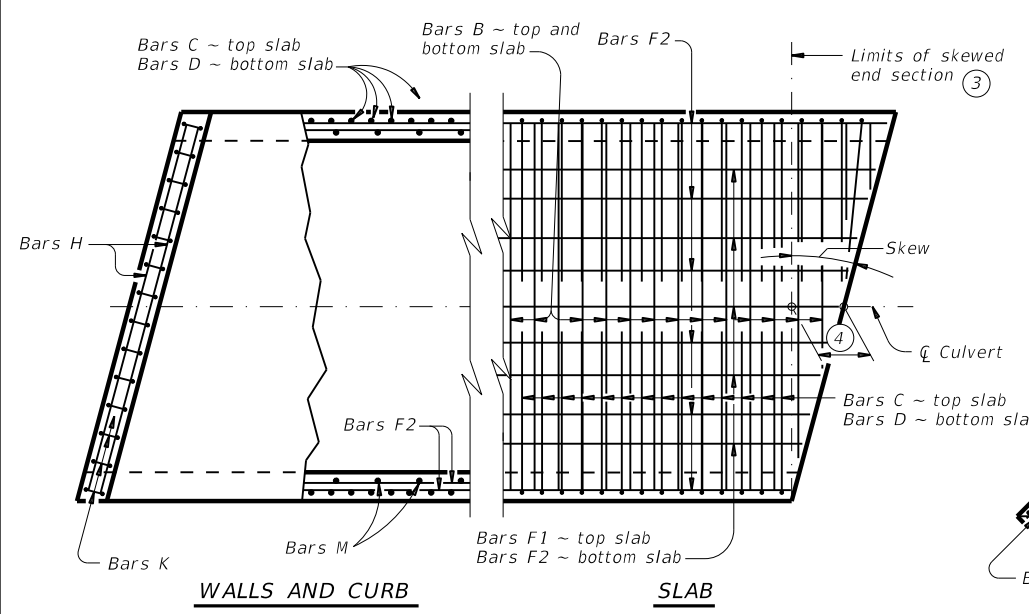
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MISCELLANEOUS
DETAILS

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 SHEET 3 OF 3

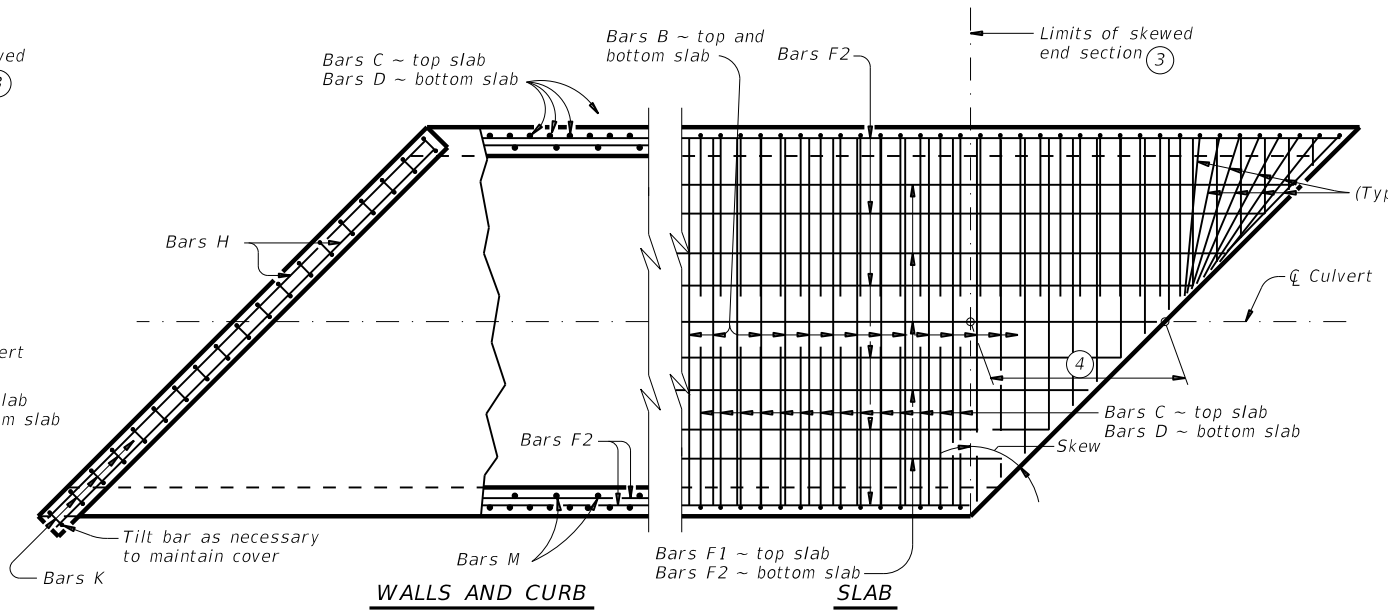
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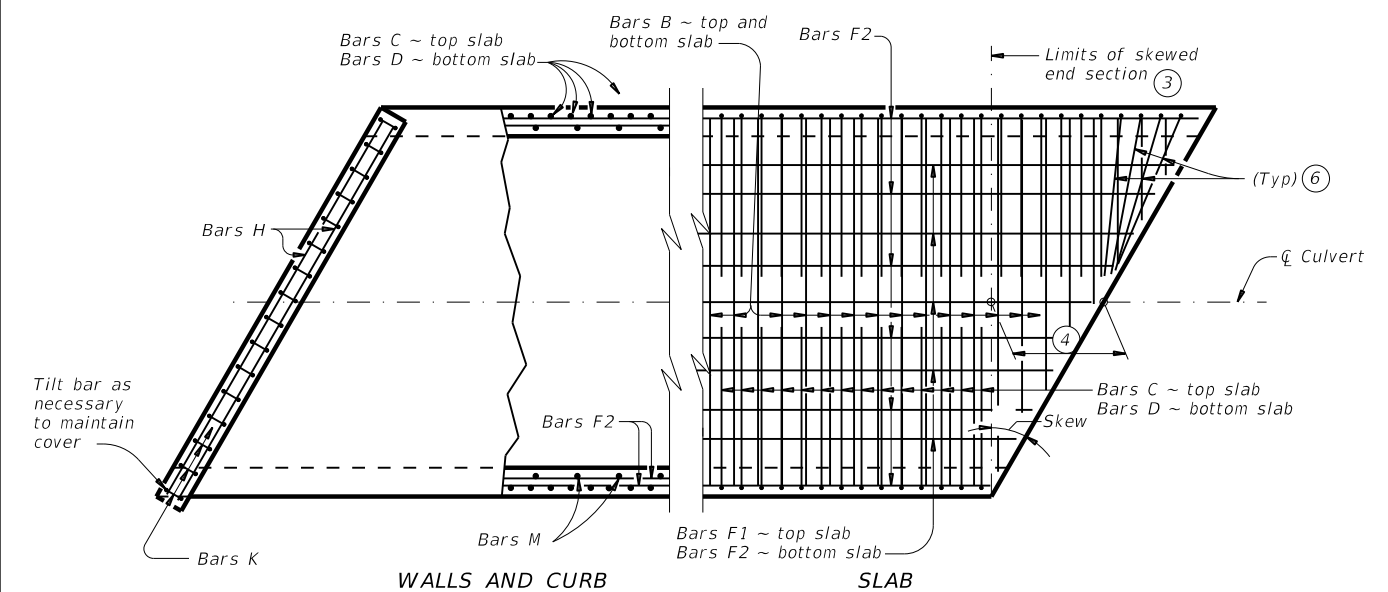
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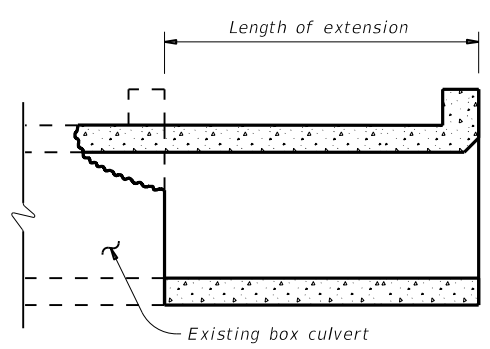
PLAN OF SKEWED ENDS ~ FROM 0° TO 15°



PLAN OF SKEWED ENDS ~ OVER 30° TO 45°



PLAN OF SKEWED ENDS ~ OVER 15° TO 30°



LENGTHENING DETAIL

1 For skewed box culverts with less than 2'-0" of fill, break back the top slab to provide a 1'-10" minimum lap of the existing longitudinal bars with the longitudinal bars in the extension.
 For non-skewed box culverts with less than 2'-0" of fill and for skewed or non-skewed culverts with a fill depth of 2'-0" or greater, break back the top slab to provide a 1'-10" minimum lap of the existing longitudinal bars with the longitudinal bars in the extension. Alternatively, if the box is non-skewed, embed #6 anchor bars with a Type III, C, D, E, or F anchor adhesive into the existing walls, top and bottom slab at 1'-6" center-to-center spacing. Minimum embedment depth is 8". Anchor adhesive chosen must be able to achieve a basic bond strength in tension, Nba, of 26.4 kips. Submit signed and sealed calculations or the manufacturer's published literature showing the proposed anchor adhesive's ability to develop this load to the Engineer for approval prior to use. Anchor installation, including hole size, drilling, and clean out, must be in accordance with Item 450, "Railing." Test adhesive anchors in accordance with Item 450.3.3, "Tests." Test 3 anchors per 100 anchors installed.
 Break back wings and apron as necessary to install the extension. Clean and extend the exposed wingwall and apron reinforcing into the extension. When lengthening existing box culverts with dimensions different than current standard dimensions, form horizontal and vertical transitions as directed by the Engineer. Match bottom slabs to maintain an uninterrupted flow line. Field bend existing and new reinforcing into transitions and maintain specified cover requirements. For top slabs of culverts with overlay, with 1-to-2 course surface treatment, or with the top slab as the final riding surface, adjust the "H" dimension to provide a smooth riding surface.

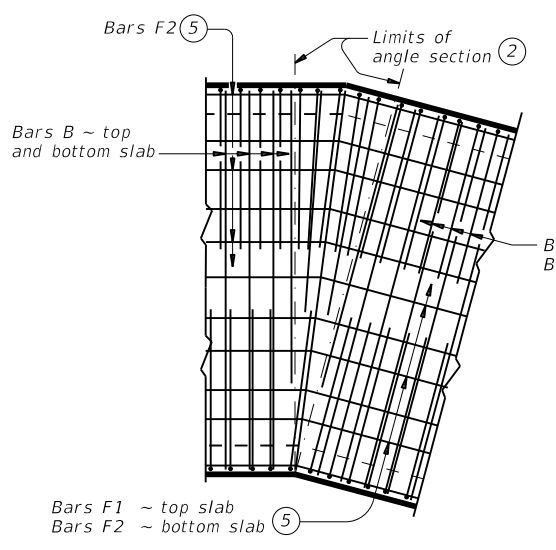
- 2 When the spacing between Bars B becomes less than half of the normal spacing, cut bars to avoid conflict.
- 3 The length of Bars B vary in the skewed end sections.
- 4 $[One\ half\ of\ overall\ width] \times [tangent\ of\ the\ skew\ angle]$
- 5 Place Bars F1 and F2 continuously through the angle section. Bend Bars F1 and F2 to remain parallel to the walls of the box culvert.
- 6 When necessary to avoid conflict in acute corners, shorten the slab extension leg of Bars C and Bars D to a minimum of 1'-6" for skews of 30° thru 45°.
- 7 At the Contractor's option, for skews of 15° or less, place Bars B, C, and D parallel to the skewed end while maintaining spacing along centerline of box. Increase lengths of Bars B shown on the Single Box Culverts Cast-In-Place (SCC) standards sheets to accommodate the skew.

CONSTRUCTION NOTES:
 Do not use permanent forms.
 When required, lap Bars H 1'-8" for uncoated or galvanized bars.
 Provide a minimum of 1 1/2" clear cover.

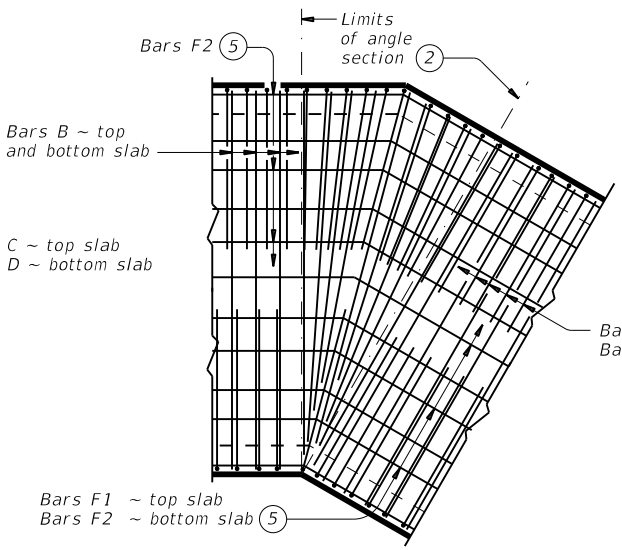
MATERIAL NOTES:
 Provide Grade 60 reinforcing steel.
 Provide galvanized reinforcing steel, if required elsewhere in the plans.
 Provide Class C concrete (f'c = 3,600 psi) with these exceptions:
 provide Class S concrete (f'c = 4,000 psi) for top slabs of culverts with overlay, with 1-to-2 course surface treatment, or with the top slab as the final riding surface.

GENERAL NOTES:
 Designed according to AASHTO LRFD Bridge Design Specifications.
 Refer to Single Box Culverts Cast-in-Place (SCC) standard sheets for details of straight sections of culvert.
 For skewed sections and angle sections, refer to Single Box Culverts Cast-in-Place (SCC) standard sheets for slab and wall dimensions, bar sizes, maximum bar spacing, and any other details not shown.
 For skewed ends with curbs, adjust length of Bars H, number of Bars K, curb concrete volume, and reinforcing steel weight by dividing the values shown on the culvert Single Box Culverts Cast-In-Place (SCC) standard sheets by the cosine of the skew angle.

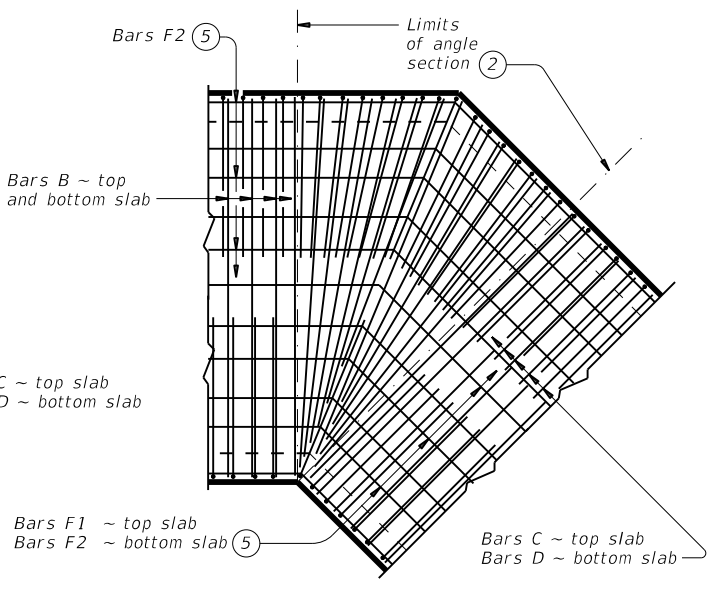
Cover dimensions are clear dimensions, unless noted otherwise.



PLAN OF ANGLE SECTION ~ FROM 0° TO 15°



PLAN OF ANGLE SECTION ~ OVER 15° TO 30°



PLAN OF ANGLE SECTION ~ OVER 30° TO 45°

HL93 LOADING

Texas Department of Transportation
 Bridge Division Standard

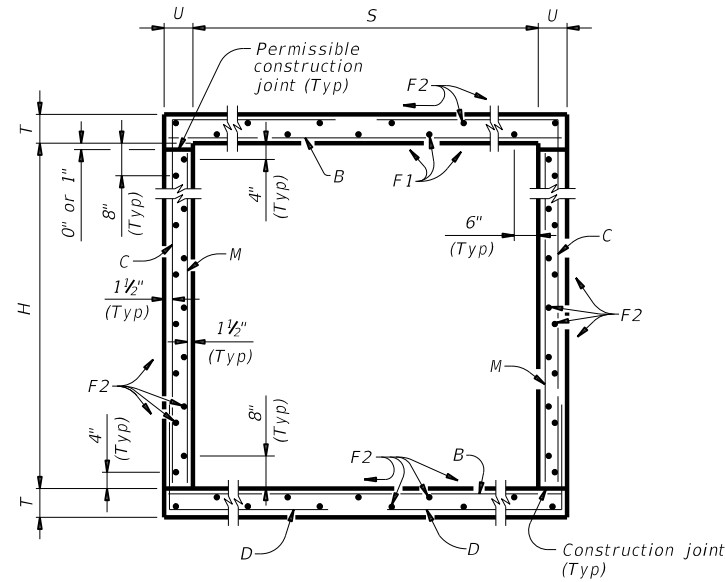
SINGLE BOX CULVERTS
 CAST-IN-PLACE
 MISCELLANEOUS DETAILS

SCC-MD

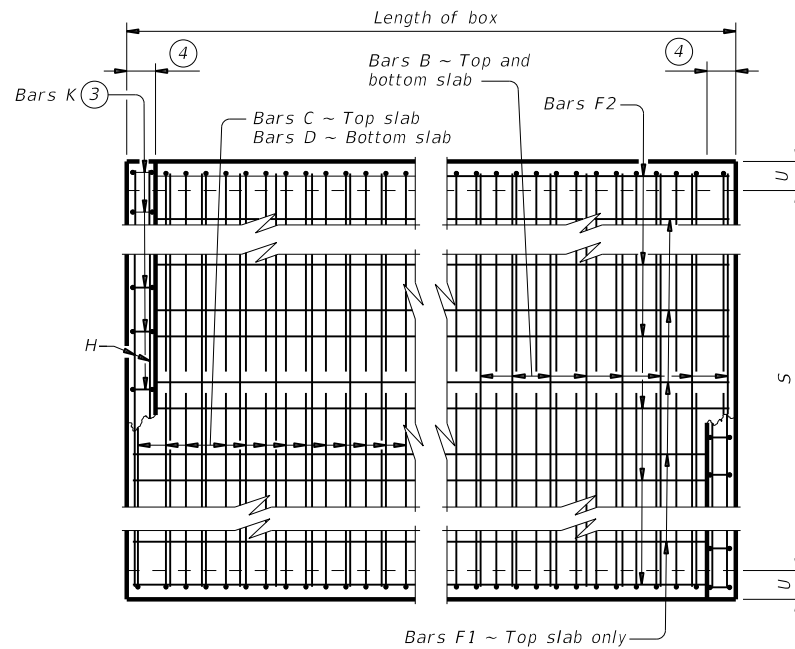
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	LAMAR			

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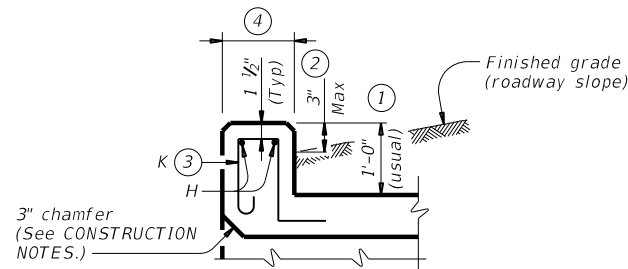
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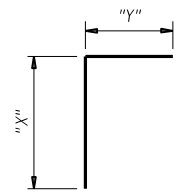
TYPICAL SECTION



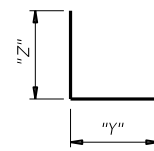
PLAN OF REINF STEEL



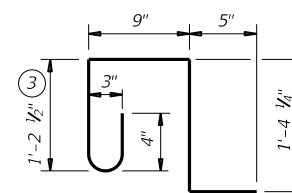
SECTION THRU CURB



BARS C



BARS D



BARS K (#4)
 (Spa = 1'-0" Max)
 (Length = 4'-2")

- ① 0" Min to 5'-0" Max. Estimated curb heights are shown elsewhere in the plans. For structures with pedestrian rail or curbs taller than 1'-0", refer to the Extended Curb Details (ECD) standard sheet. For structures with T631 or T631LS bridge rail, refer to the Mounting Details for T631 & T631LS Rails (T631-CM) standard sheet. Refer to the Rail Anchorage Curb (RAC) standard sheet for structures with bridge rail other than T631 or T631LS.
- ② For vehicle safety, the following requirements must be met:
 - For structures without bridge rail, construct curbs no more than 3" above finished grade.
 - For structures with bridge rail, construct curbs flush with finished grade. Reduce curb heights, if necessary, to meet the above requirements. No changes will be made in quantities and no additional compensation will be allowed for this work.
- ③ For curbs less than 1'-0" high, tilt Bars K or reduce bar height as necessary to maintain cover. For curbs less than 3" high, Bars K may be omitted.
- ④ 1'-0" typical. 2'-3" when the Rail Anchorage Curb (RAC) standard sheet is referred to elsewhere in the plans.

The Contractor may replace Bars B, C, D, E, F1, F2, M, Y, and/or Z with deformed welded wire reinforcement (WWR) meeting the requirements of ASTM A1064. The area of required reinforcement may be reduced by the ratio of 60 ksi / 70 ksi. Spacing of WWR is limited to 4" Min and 18" Max. When required, provide lap splices in the WWR of the same length required for the equivalent bar size, rounded up for wire sizes between conventional bar sizes. The lap length required for WWR is never less than the lap length required for uncoated #4 bars.

Example conversion: Replacing No. 6 Gr 60 at 6" Spacing with WWR.
 Required WWR = (0.44 sq. in. per 0.5 ft.) x (60 ksi / 70 ksi) = 0.755 sq. in. per ft.
 If D30.6 wire is used to meet the 0.755 sq. in. per ft. requirement in this example, the required spacing = (0.306 sq. in.) / (0.755 sq. in. per ft.) x (12 in. per ft.) = 4.86" Max spacing. Required lap length for the provided D30.6 wire is 2'-1" (the same minimum lap length required for uncoated #5 bars, as listed under MATERIAL NOTES).

CONSTRUCTION NOTES:

- Do not use permanent forms.
- Chamfer the bottom edge of the top slab 3" at the entrance.
- Optionally, raise construction joints shown at the flow line by a maximum of 6". If this option is taken, Bars M may be cut off or raised, Bars C and D may be reversed.

MATERIAL NOTES:

- Provide Grade 60 reinforcing steel.
- Provide galvanized reinforcing steel if required elsewhere in the plans.
- Provide Class C concrete (f'c = 3,600 psi) for culvert barrel and curb, with the following exceptions: provide Class S concrete (f'c = 4,000 psi) for top slabs of:
 - culverts with overlay,
 - culverts with 1-to-2 course surface treatment, or
 - culverts with the top slab as the final riding surface.
- Provide bar laps, where required, as follows:
 - Uncoated or galvanized ~ #4 = 1'-8" Min
 - Uncoated or galvanized ~ #5 = 2'-1" Min

GENERAL NOTES:

- Designed according to AASHTO LRFD Bridge Design Specifications for the range of fill heights shown.
- See the Single Box Culverts Cast-In-Place Miscellaneous Detail (SCC-MD) standard sheet for details pertaining to skewed ends, angle sections, and lengthening.

Cover dimensions are clear dimensions, unless noted otherwise.
 Reinforcing bar dimensions shown are out-to-out of bar.

HL93 LOADING SHEET 1 OF 2

		Bridge Division Standard	
SINGLE BOX CULVERTS CAST-IN-PLACE 0' TO 30' FILL			
SCC-3 & 4			
FILE: scc34ste-20.dgn	DN: TBE	CK: BMP	DW: TxDOT
©TxDOT February 2020	CONT	SECT	HIGHWAY
REVISIONS	0435 01	080	FM 38
DIST	COUNTY	SHEET NO.	
PAR	LAMAR	96	

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SECTION DIMENSIONS				FILL HEIGHT ⁵	BILLS OF REINFORCING STEEL (For Box Length = 40 feet)																								QUANTITIES														
					Bars B				Bars C				Bars D				Bars M ~ #4			Bars F1 ~ #4 at 18" Spa			Bars F2 ~ #4 at 18" Spa			Bars H 4 ~ #4		Bars K		Per Foot of Barrel		Curb		Total									
					S	H	T	U	No.	Size	Spa	Length	Weight	No.	Size	Spa	Length	Weight	" X "	" Y "	No.	Size	Spa	Length	Weight	" Y "	" Z "	No.	Spa	Length	Weight	No.	Length	Wt	No.	Length	Weight	Length	Wt	No.	Wt	Conc (CY)	Reinf (Lb)
3'-0"	2'-0"	8"	7"	30'	108	#5	9"	3'-11"	441	108	#4	9"	5'-5"	391	2'-7"	2'-10"	108	#4	9"	5'-1"	367	2'-10"	2'-3"	108	9"	2'-0"	144	3	39'-9"	80	19	39'-9"	505	3'-11"	10	10	28	0.292	48.2	0.3	38	12.0	1,966
3'-0"	3'-0"	8"	7"	30'	108	#5	9"	3'-11"	441	108	#4	9"	6'-5"	463	3'-7"	2'-10"	108	#4	9"	5'-1"	367	2'-10"	2'-3"	108	9"	3'-0"	216	3	39'-9"	80	23	39'-9"	611	3'-11"	10	10	28	0.335	54.5	0.3	38	13.7	2,216
4'-0"	2'-0"	8"	7"	30'	108	#5	9"	4'-11"	554	162	#4	6"	5'-9"	622	2'-7"	3'-2"	162	#4	6"	5'-5"	586	3'-2"	2'-3"	108	9"	2'-0"	144	3	39'-9"	80	21	39'-9"	558	4'-11"	13	12	33	0.342	63.6	0.4	46	14.1	2,590
4'-0"	3'-0"	8"	7"	30'	108	#5	9"	4'-11"	554	162	#4	6"	6'-9"	730	3'-7"	3'-2"	162	#4	6"	5'-5"	586	3'-2"	2'-3"	108	9"	3'-0"	216	3	39'-9"	80	25	39'-9"	664	4'-11"	13	12	33	0.385	70.8	0.4	46	15.8	2,876
4'-0"	4'-0"	8"	7"	30'	108	#5	9"	4'-11"	554	162	#4	6"	7'-9"	839	4'-7"	3'-2"	162	#4	6"	5'-5"	586	3'-2"	2'-3"	108	9"	4'-0"	289	3	39'-9"	80	25	39'-9"	664	4'-11"	13	12	33	0.428	75.3	0.4	46	17.5	3,058

⁵ For direct traffic culverts (fill height ≤ 2 ft.), identify the required box size and select the option with the minimum fill height.



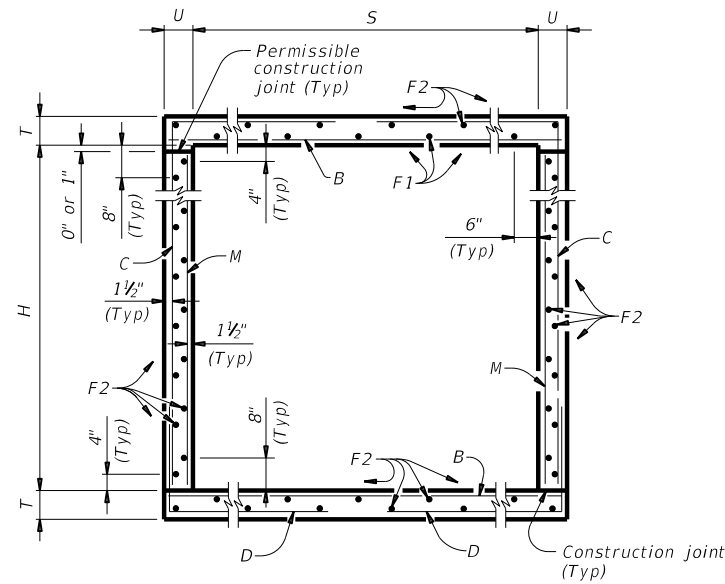
**SINGLE BOX CULVERTS
CAST-IN-PLACE
0' TO 30' FILL**

SCC-3 & 4

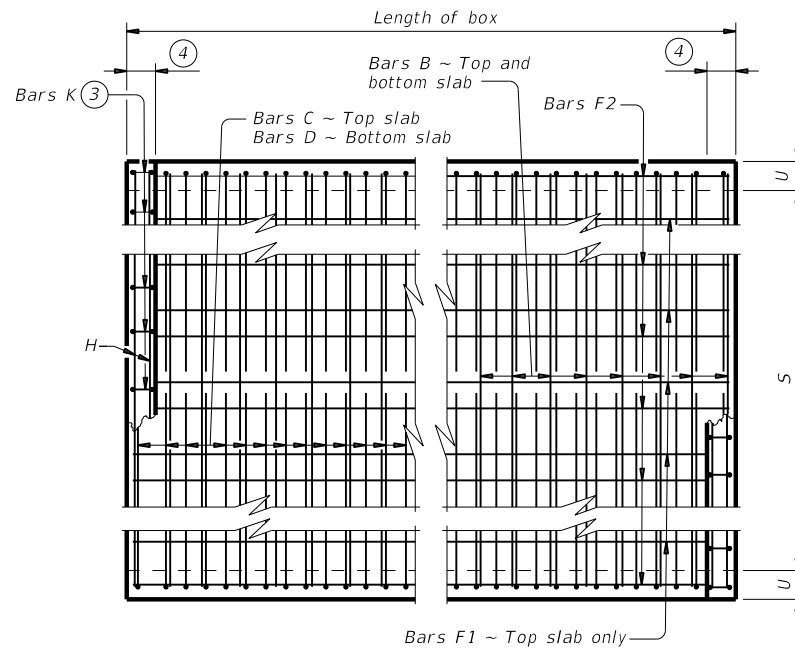
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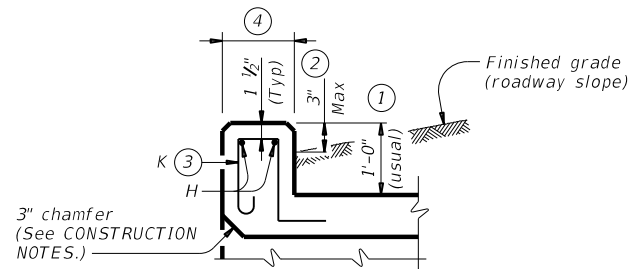
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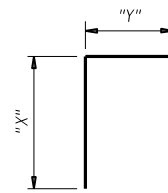
TYPICAL SECTION



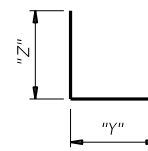
PLAN OF REINF STEEL



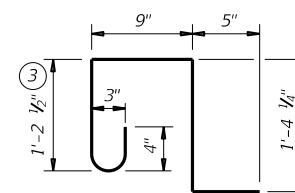
SECTION THRU CURB



BARS C



BARS D



BARS K (#4)
 (Spa = 1'-0" Max)
 (Length = 4'-2")

- ① 0" Min to 5'-0" Max. Estimated curb heights are shown elsewhere in the plans. For structures with pedestrian rail or curbs taller than 1'-0", refer to the Extended Curb Details (ECD) standard sheet. For structures with T631 or T631LS bridge rail, refer to the Mounting Details for T631 & T631LS Rails (T631-CM) standard sheet. Refer to the Rail Anchorage Curb (RAC) standard sheet for structures with bridge rail other than T631 or T631LS.
- ② For vehicle safety, the following requirements must be met:
 - For structures without bridge rail, construct curbs no more than 3" above finished grade.
 - For structures with bridge rail, construct curbs flush with finished grade. Reduce curb heights, if necessary, to meet the above requirements. No changes will be made in quantities and no additional compensation will be allowed for this work.
- ③ For curbs less than 1'-0" high, tilt Bars K or reduce bar height as necessary to maintain cover. For curbs less than 3" high, Bars K may be omitted.
- ④ 1'-0" typical. 2'-3" when the Rail Anchorage Curb (RAC) standard sheet is referred to elsewhere in the plans.

The Contractor may replace Bars B, C, D, E, F1, F2, M, Y, and/or Z with deformed welded wire reinforcement (WWR) meeting the requirements of ASTM A1064. The area of required reinforcement may be reduced by the ratio of 60 ksi / 70 ksi. Spacing of WWR is limited to 4" Min and 18" Max. When required, provide lap splices in the WWR of the same length required for the equivalent bar size, rounded up for wire sizes between conventional bar sizes. The lap length required for WWR is never less than the lap length required for uncoated #4 bars.

Example conversion: Replacing No. 6 Gr 60 at 6" Spacing with WWR.
 Required WWR = (0.44 sq. in. per 0.5 ft.) x (60 ksi / 70 ksi) = 0.755 sq. in. per ft.
 If D30.6 wire is used to meet the 0.755 sq. in. per ft. requirement in this example, the required spacing = (0.306 sq. in.) / (0.755 sq. in. per ft.) x (12 in. per ft.) = 4.86"
 Max spacing. Required lap length for the provided D30.6 wire is 2'-1" (the same minimum lap length required for uncoated #5 bars, as listed under MATERIAL NOTES).

CONSTRUCTION NOTES:

- Do not use permanent forms.
- Chamfer the bottom edge of the top slab 3" at the entrance.
- Optionally, raise construction joints shown at the flow line by a maximum of 6". If this option is taken, Bars M may be cut off or raised, Bars C and D may be reversed.

MATERIAL NOTES:

- Provide Grade 60 reinforcing steel.
- Provide galvanized reinforcing steel if required elsewhere in the plans.
- Provide Class C concrete ($f'_c = 3,600$ psi) for culvert barrel and curb, with the following exceptions: provide Class S concrete ($f'_c = 4,000$ psi) for top slabs of:
 - culverts with overlay,
 - culverts with 1-to-2 course surface treatment, or
 - culverts with the top slab as the final riding surface.
- Provide bar laps, where required, as follows:
 - Uncoated or galvanized ~ #4 = 1'-8" Min
 - Uncoated or galvanized ~ #5 = 2'-1" Min
 - Uncoated or galvanized ~ #6 = 2'-6" Min

GENERAL NOTES:

- Designed according to AASHTO LRFD Bridge Design Specifications for the range of fill heights shown.
- See the Single Box Culverts Cast-In-Place Miscellaneous Detail (SCC-MD) standard sheet for details pertaining to skewed ends, angle sections, and lengthening.

Cover dimensions are clear dimensions, unless noted otherwise.
 Reinforcing bar dimensions shown are out-to-out of bar.

HL93 LOADING

SHEET 1 OF 2



**SINGLE BOX CULVERTS
 CAST-IN-PLACE
 0' TO 30' FILL**

SCC-7

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SECTION DIMENSIONS				FILL HEIGHT ⑤	BILLS OF REINFORCING STEEL (For Box Length = 40 feet)																												QUANTITIES										
					Bars B				Bars C				Bars D				Bars M ~ #4				Bars F1 ~ #4 at 18" Spa			Bars F2 ~ #4 at 18" Spa			Bars H 4 ~ #4		Bars K		Per Foot of Barrel		Curb		Total								
					S	H	T	U	No.	Size	Spa	Length	Weight	No.	Size	Spa	Length	Weight	" X "	" Y "	No.	Size	Spa	Length	Weight	" Y "	" Z "	No.	Spa	Length	Weight	No.	Length	Wt	No.	Length	Weight	Length	Wt	No.	Wt	Conc (CY)	Reinf (Lb)
7'-0"	3'-0"	8"	7"	16'	108	#6	9"	7'-11"	1,284	162	#5	6"	8'-0"	1,352	3'-7"	4'-5"	162	#5	6"	7'-1"	1,197	4'-5"	2'-8"	108	9"	3'-0"	216	5	39'-9"	133	31	39'-9"	823	7'-11"	21	18	50	0.533	125.1	0.6	71	21.9	5,076
7'-0"	3'-0"	9"	7"	20'	108	#6	9"	7'-11"	1,284	162	#5	6"	8'-1"	1,366	3'-8"	4'-5"	162	#5	6"	7'-2"	1,211	4'-5"	2'-9"	108	9"	3'-0"	216	5	39'-9"	133	31	39'-9"	823	7'-11"	21	18	50	0.583	125.8	0.6	71	23.9	5,104
7'-0"	3'-0"	10"	8"	23'	108	#6	9"	8'-1"	1,311	162	#5	6"	8'-3"	1,394	3'-9"	4'-6"	162	#5	6"	7'-4"	1,239	4'-6"	2'-10"	82	12"	3'-0"	164	5	39'-9"	133	31	39'-9"	823	8'-1"	22	20	56	0.663	126.6	0.6	78	27.1	5,142
7'-0"	3'-0"	11"	8"	30'	108	#6	9"	8'-1"	1,311	162	#5	6"	8'-4"	1,408	3'-10"	4'-6"	162	#5	6"	7'-5"	1,253	4'-6"	2'-11"	82	12"	3'-0"	164	5	39'-9"	133	31	39'-9"	823	8'-1"	22	20	56	0.714	127.3	0.6	78	29.2	5,170
7'-0"	4'-0"	8"	7"	16'	108	#6	9"	7'-11"	1,284	162	#5	6"	9'-0"	1,521	4'-7"	4'-5"	162	#5	6"	7'-1"	1,197	4'-5"	2'-8"	108	9"	4'-0"	289	5	39'-9"	133	31	39'-9"	823	7'-11"	21	18	50	0.576	131.2	0.6	71	23.6	5,318
7'-0"	4'-0"	9"	7"	20'	108	#6	9"	7'-11"	1,284	162	#5	6"	9'-1"	1,535	4'-8"	4'-5"	162	#5	6"	7'-2"	1,211	4'-5"	2'-9"	108	9"	4'-0"	289	5	39'-9"	133	31	39'-9"	823	7'-11"	21	18	50	0.627	131.9	0.6	71	25.7	5,346
7'-0"	4'-0"	10"	8"	23'	108	#6	9"	8'-1"	1,311	162	#5	6"	9'-3"	1,563	4'-9"	4'-6"	162	#5	6"	7'-4"	1,239	4'-6"	2'-10"	82	12"	4'-0"	219	5	39'-9"	133	31	39'-9"	823	8'-1"	22	20	56	0.712	132.2	0.6	78	29.1	5,366
7'-0"	4'-0"	11"	8"	30'	162	#6	6"	8'-1"	1,967	162	#5	6"	9'-4"	1,577	4'-10"	4'-6"	162	#5	6"	7'-5"	1,253	4'-6"	2'-11"	82	12"	4'-0"	219	5	39'-9"	133	31	39'-9"	823	8'-1"	22	20	56	0.763	149.3	0.6	78	31.1	6,050
7'-0"	5'-0"	8"	7"	16'	108	#6	9"	7'-11"	1,284	162	#5	6"	10'-0"	1,690	5'-7"	4'-5"	162	#5	6"	7'-1"	1,197	4'-5"	2'-8"	108	9"	5'-0"	361	5	39'-9"	133	35	39'-9"	929	7'-11"	21	18	50	0.619	139.9	0.6	71	25.4	5,665
7'-0"	5'-0"	9"	7"	20'	108	#6	9"	7'-11"	1,284	162	#5	6"	10'-1"	1,704	5'-8"	4'-5"	162	#5	6"	7'-2"	1,211	4'-5"	2'-9"	108	9"	5'-0"	361	5	39'-9"	133	35	39'-9"	929	7'-11"	21	18	50	0.670	140.6	0.6	71	27.4	5,693
7'-0"	5'-0"	10"	8"	23'	108	#6	9"	8'-1"	1,311	162	#5	6"	10'-3"	1,732	5'-9"	4'-6"	162	#5	6"	7'-4"	1,239	4'-6"	2'-10"	82	12"	5'-0"	274	5	39'-9"	133	35	39'-9"	929	8'-1"	22	20	56	0.761	140.5	0.6	78	31.1	5,696
7'-0"	5'-0"	11"	8"	30'	162	#6	6"	8'-1"	1,967	162	#5	6"	10'-4"	1,746	5'-10"	4'-6"	162	#5	6"	7'-5"	1,253	4'-6"	2'-11"	82	12"	5'-0"	274	5	39'-9"	133	35	39'-9"	929	8'-1"	22	20	56	0.813	157.6	0.6	78	33.1	6,380
7'-0"	6'-0"	8"	7"	16'	108	#6	9"	7'-11"	1,284	162	#5	6"	11'-0"	1,859	6'-7"	4'-5"	162	#5	6"	7'-1"	1,197	4'-5"	2'-8"	108	9"	6'-0"	433	5	39'-9"	133	39	39'-9"	1,036	7'-11"	21	18	50	0.663	148.6	0.6	71	27.1	6,013
7'-0"	6'-0"	9"	7"	20'	108	#6	9"	7'-11"	1,284	162	#5	6"	11'-1"	1,873	6'-8"	4'-5"	162	#5	6"	7'-2"	1,211	4'-5"	2'-9"	108	9"	6'-0"	433	5	39'-9"	133	39	39'-9"	1,036	7'-11"	21	18	50	0.713	149.3	0.6	71	29.1	6,041
7'-0"	6'-0"	10"	8"	23'	108	#6	9"	8'-1"	1,311	162	#5	6"	11'-3"	1,901	6'-9"	4'-6"	162	#5	6"	7'-4"	1,239	4'-6"	2'-10"	82	12"	6'-0"	329	5	39'-9"	133	39	39'-9"	1,036	8'-1"	22	20	56	0.811	148.7	0.6	78	33.1	6,027
7'-0"	6'-0"	11"	8"	30'	162	#6	6"	8'-1"	1,967	162	#5	6"	11'-4"	1,915	6'-10"	4'-6"	162	#5	6"	7'-5"	1,253	4'-6"	2'-11"	82	12"	6'-0"	329	5	39'-9"	133	39	39'-9"	1,036	8'-1"	22	20	56	0.862	165.8	0.6	78	35.1	6,711
7'-0"	7'-0"	8"	7"	16'	108	#6	9"	7'-11"	1,284	162	#5	6"	12'-0"	2,028	7'-7"	4'-5"	162	#5	6"	7'-1"	1,197	4'-5"	2'-8"	108	9"	7'-0"	505	5	39'-9"	133	39	39'-9"	1,036	7'-11"	21	18	50	0.706	154.6	0.6	71	28.8	6,254
7'-0"	7'-0"	9"	7"	20'	108	#6	9"	7'-11"	1,284	162	#5	6"	12'-1"	2,042	7'-8"	4'-5"	162	#5	6"	7'-2"	1,211	4'-5"	2'-9"	108	9"	7'-0"	505	5	39'-9"	133	39	39'-9"	1,036	7'-11"	21	18	50	0.756	155.3	0.6	71	30.8	6,282
7'-0"	7'-0"	10"	8"	23'	108	#6	9"	8'-1"	1,311	162	#5	6"	12'-3"	2,070	7'-9"	4'-6"	162	#5	6"	7'-4"	1,239	4'-6"	2'-10"	108	9"	7'-0"	505	5	39'-9"	133	39	39'-9"	1,036	8'-1"	22	20	56	0.860	157.4	0.6	78	35.0	6,372
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⑤ For direct traffic culverts (fill height ≤ 2 ft.), identify the required box size and select the option with the minimum fill height.



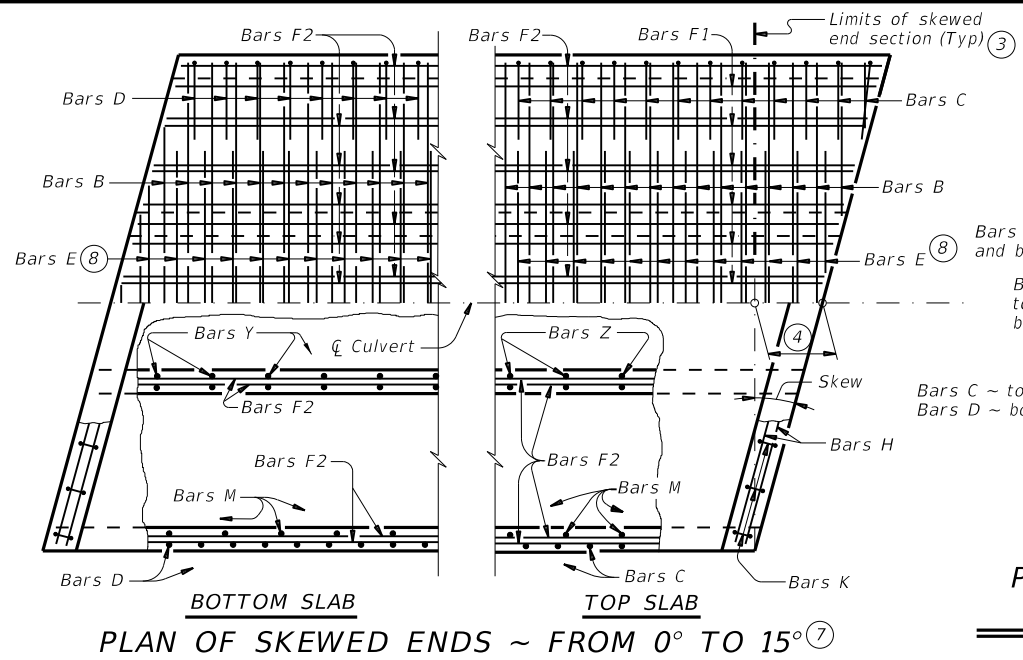
**SINGLE BOX CULVERTS
 CAST-IN-PLACE
 0' TO 30' FILL**

SCC-7

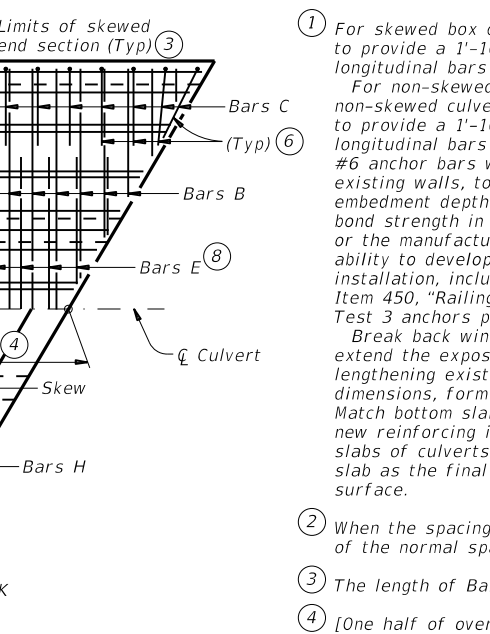
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	PAR	LAMAR	99	

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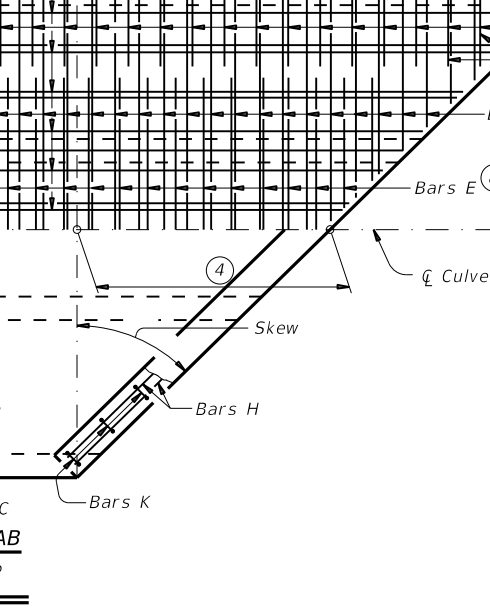
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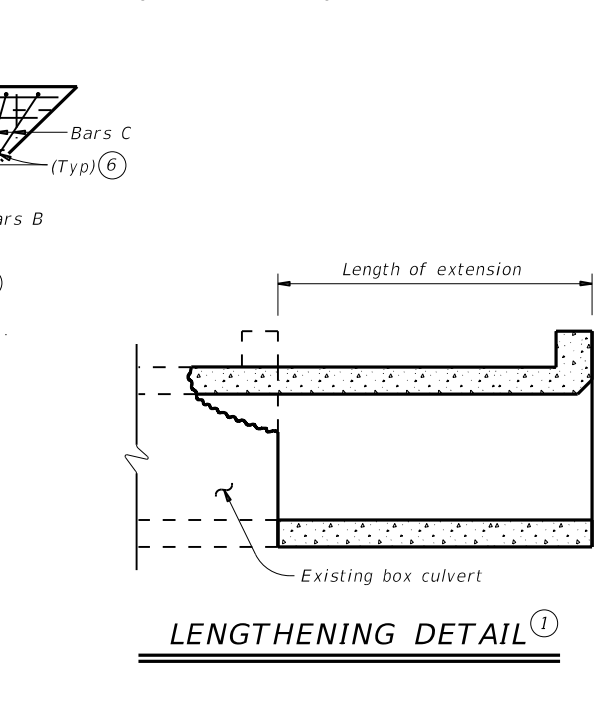
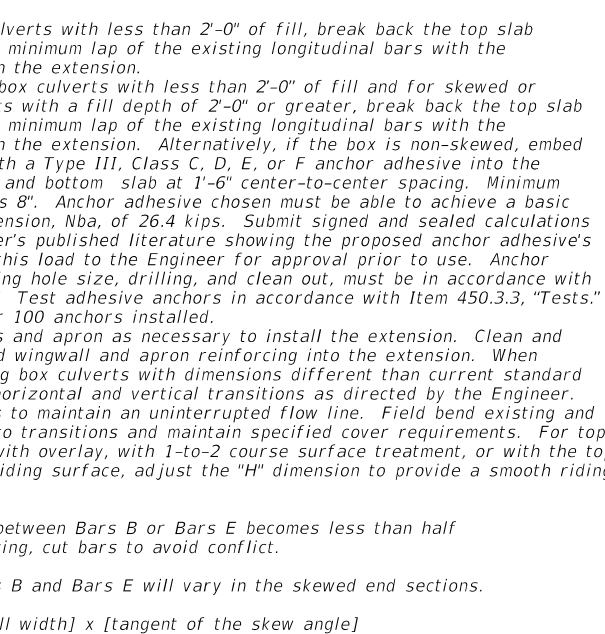
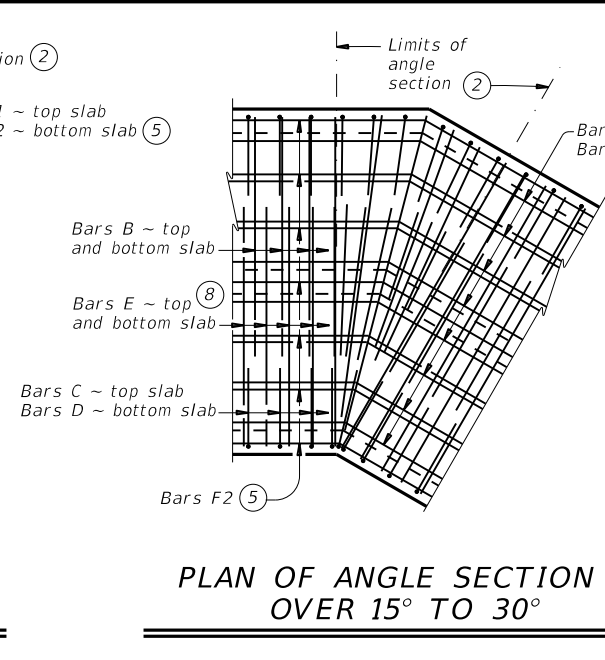
PLAN OF ANGLE SECTION ~ FROM 0° TO 15°



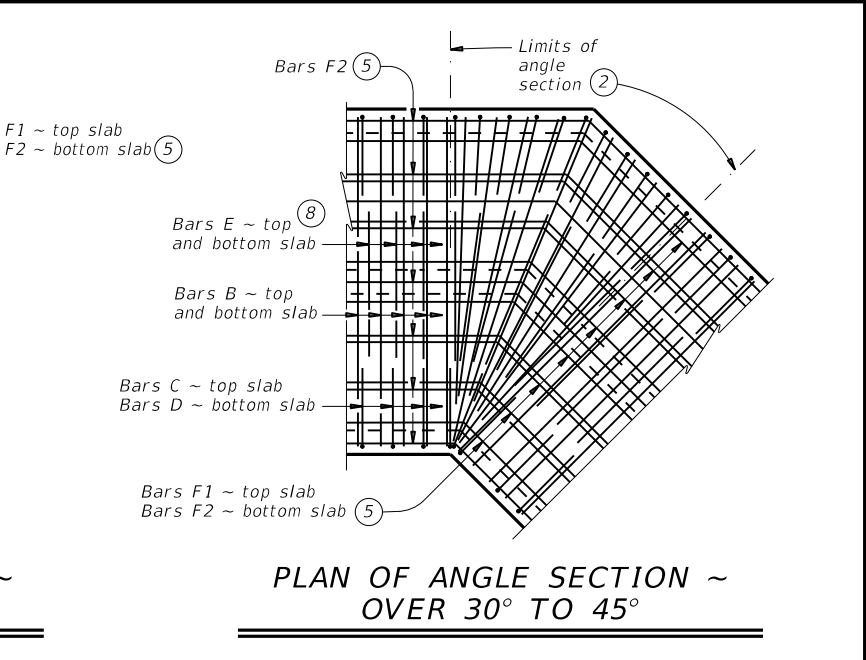
PLAN OF ANGLE SECTION ~ OVER 15° TO 30°



PLAN OF ANGLE SECTION ~ OVER 30° TO 45°



LENGTHENING DETAIL



- ① For skewed box culverts with less than 2'-0" of fill, break back the top slab to provide a 1'-10" minimum lap of the existing longitudinal bars with the longitudinal bars in the extension.
 For non-skewed box culverts with less than 2'-0" of fill and for skewed or non-skewed culverts with a fill depth of 2'-0" or greater, break back the top slab to provide a 1'-10" minimum lap of the existing longitudinal bars with the longitudinal bars in the extension. Alternatively, if the box is non-skewed, embed #6 anchor bars with a Type III, Class C, D, E, or F anchor adhesive into the existing walls, top and bottom slab at 1'-6" center-to-center spacing. Minimum embedment depth is 8". Anchor adhesive chosen must be able to achieve a basic bond strength in tension, N_{ba} , of 26.4 kips. Submit signed and sealed calculations or the manufacturer's published literature showing the proposed anchor adhesive's ability to develop this load to the Engineer for approval prior to use. Anchor installation, including hole size, drilling, and clean out, must be in accordance with Item 450, "Railing." Test adhesive anchors in accordance with Item 450.3.3, "Tests." Test 3 anchors per 100 anchors installed.
 Break back wings and apron as necessary to install the extension. Clean and extend the exposed wingwall and apron reinforcing into the extension. When lengthening existing box culverts with dimensions different than current standard dimensions, form horizontal and vertical transitions as directed by the Engineer. Match bottom slabs to maintain an uninterrupted flow line. Field bend existing and new reinforcing into transitions and maintain specified cover requirements. For top slabs of culverts with overlay, with 1-to-2 course surface treatment, or with the top slab as the final riding surface, adjust the "H" dimension to provide a smooth riding surface.
- ② When the spacing between Bars B or Bars E becomes less than half of the normal spacing, cut bars to avoid conflict.
- ③ The length of Bars B and Bars E will vary in the skewed end sections.
- ④ $[0.5 \times \text{overall width}] \times [\text{tangent of the skew angle}]$
- ⑤ Place Bars F1 and F2 continuously through the angle section. Bend Bars F1 and F2 to remain parallel to the walls of the box culvert.
- ⑥ When necessary to avoid conflict in acute corners, shorten the slab extension leg of Bars C and Bars D to a minimum of 1'-6" for skews of 30° thru 45°.
- ⑦ At the Contractor's option, for skews of 15° or less, place Bars B, C, D, and E parallel to the skewed end while maintaining spacing along centerline of box. Increase lengths of Bars B and Bars E shown on the Multiple Box Culverts Cast-In-Place (MC) standard sheets to accommodate the skew.
- ⑧ Extend Bars E as shown on the MC standard sheet for direct traffic culverts.

CONSTRUCTION NOTES:
 Do not use permanent forms.
 When required, lap Bars H 1'-8" for uncoated or galvanized bars.
 Provide a minimum of 1 1/2" clear cover.

MATERIAL NOTES:
 Provide Grade 60 reinforcing steel.
 Provide galvanized reinforcing steel, if required elsewhere in the plans.
 Provide Class C concrete ($f'_c = 3,600$ psi) with these exceptions:
 provide Class S concrete ($f'_c = 4,000$ psi) for top slabs of culverts with overlay, with 1-to-2 course surface treatment, or with the top slab as the final riding surface.

GENERAL NOTES:
 Designed according to AASHTO LRFD Bridge Design Specifications.
 Refer to Multiple Box Culverts Cast-in-Place (MC) standard sheets for details of straight sections of culvert.
 For skewed sections and angle sections, refer to Multiple Box Culverts Cast-in-Place (MC) standard sheets for slab and wall dimensions, bar sizes, maximum bar spacing, and any other details not shown.
 For skewed ends with curbs, adjust length of Bars H, number of Bars K, curb concrete volume, and reinforcing steel weight by dividing the values shown on the Multiple Box Culverts Cast-In-Place (MC) standard sheets by the cosine of the skew angle.

Cover dimensions are clear dimensions, unless noted otherwise.

HL93 LOADING

Texas Department of Transportation
 Bridge Division Standard

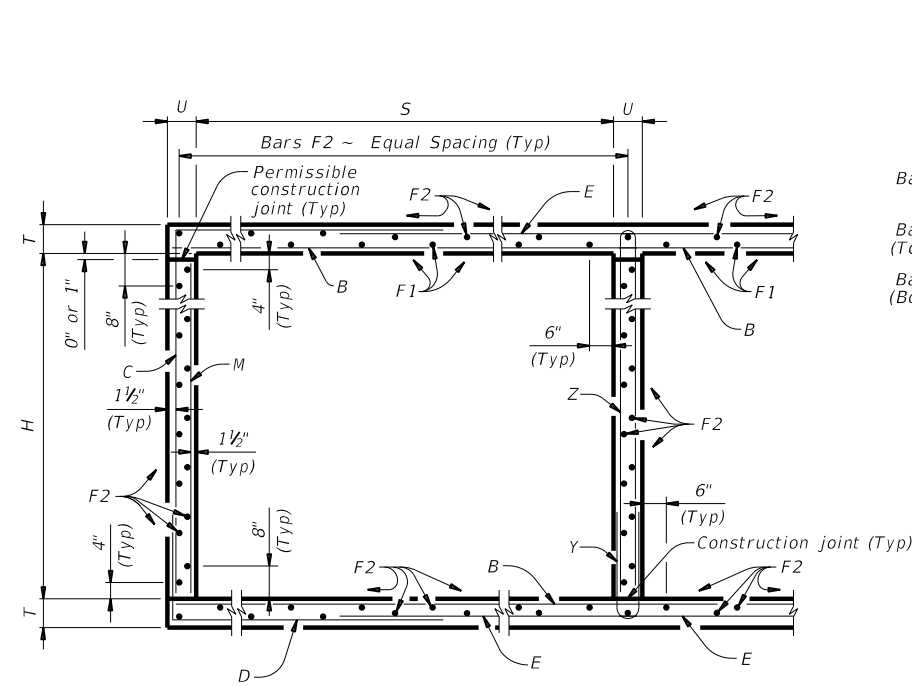
MULTIPLE BOX CULVERTS CAST-IN-PLACE MISCELLANEOUS DETAILS

MC-MD

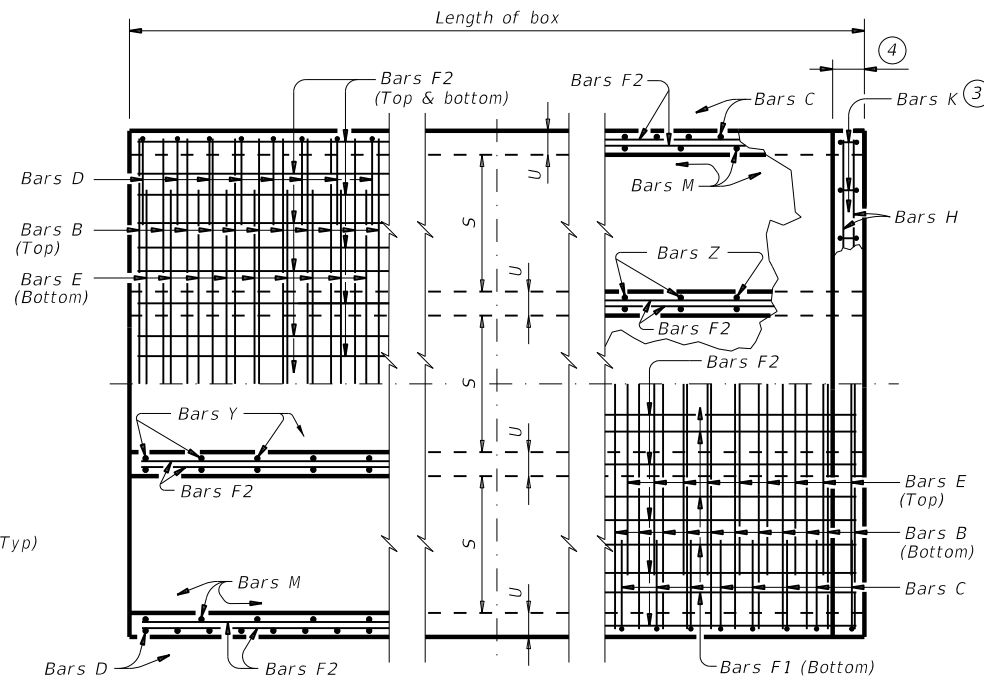
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©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0435	01	080	FM 38
	DIST	COUNTY	SHEET NO.	
	PAR	LAMAR	100	

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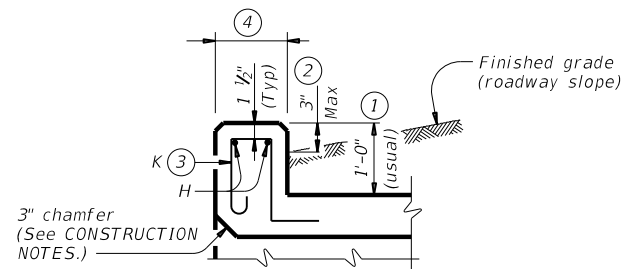
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TYPICAL SECTION

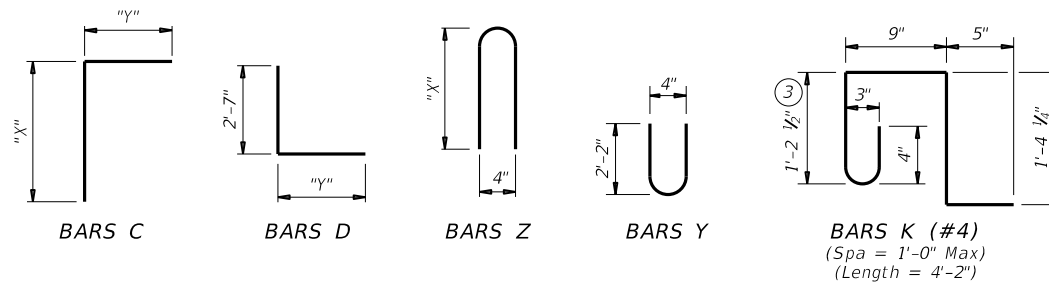


BOTTOM SLAB **TOP SLAB**
PART PLANS



SECTION THRU CURB

TABLE OF BAR DIMENSIONS		
H	"X"	"Y"
2'-0"	2'-6 1/2"	3'-8 1/2"
3'-0"	3'-6 1/2"	3'-8 1/2"
4'-0"	4'-6 1/2"	3'-8 1/2"
5'-0"	5'-6 1/2"	3'-8 1/2"



- 0" Min to 5'-0" Max. Estimated curb heights are shown elsewhere in the plans. For structures with pedestrian rail or curbs taller than 1'-0", refer to the Extended Curb Details (ECD) standard sheet. For structures with T631 or T631LS bridge rail, refer to the Mounting Details for T631 & T631LS Rails (T631-CM) standard sheet. Refer to the Rail Anchorage Curb (RAC) standard sheet for structures with bridge rail other than T631 or T631LS.
- For vehicle safety, the following requirements must be met:
 - For structures without bridge rail, construct curbs no more than 3" above finished grade.
 - For structures with bridge rail, construct curbs flush with finished grade. Reduce curb heights, if necessary, to meet the above requirements. No changes will be made in quantities and no additional compensation will be allowed for this work.
- For curbs less than 1'-0" high, tilt Bars K or reduce bar height as necessary to maintain cover. For curbs less than 3" high, Bars K may be omitted.
- 1'-0" typical. 2'-3" when the Rail Anchorage Curb (RAC) standard sheet is referred to elsewhere in the plans.

The Contractor may replace Bars B, C, D, E, F1, F2, M, Y, and/or Z with deformed welded wire reinforcement (WWR) meeting the requirements of ASTM A1064. The area of required reinforcement may be reduced by the ratio of 60 ksi / 70 ksi. Spacing of WWR is limited to 4" Min and 18" Max. When required, provide lap splices in the WWR of the same length required for the equivalent bar size, rounded up for wire sizes between conventional bar sizes. The lap length required for WWR is never less than the lap length required for uncoated #4 bars.

Example conversion: Replacing No. 6 Gr 60 at 6" Spacing with WWR
 Required WWR = (0.44 sq. in. per 0.5 ft.) x (60 ksi / 70 ksi) = 0.755 sq. in. per ft.
 If D30.6 wire is used to meet the 0.755 sq. in. per ft. requirement in this example, the required spacing = (0.306 sq. in.) / (0.755 sq. in. per ft.) x (12 in. per ft.) = 4.86" Max spacing. Required lap length for the provided D30.6 wire is 2'-1" (the same minimum lap length required for uncoated #5 bars, as listed under MATERIAL NOTES).

CONSTRUCTION NOTES:

- Do not use permanent forms.
- Chamfer the bottom edge of the top slab 3" at the entrance.
- Optionally, raise construction joints shown at the flow line by a maximum of 6". If this option is taken, Bars M may be cut off or raised, Bars C and D may be reversed, and Bars Y and Z may be reversed.

MATERIAL NOTES:

- Provide Grade 60 reinforcing steel.
- Provide galvanized reinforcing steel if required elsewhere in the plans.
- Provide Class C concrete (f'c = 3,600 psi) for culvert barrel and curb, with the following exceptions: provide Class S concrete (f'c = 4,000 psi) for top slabs of:
 - culverts with overlay,
 - culverts with 1-to-2 course surface treatment, or
 - culverts with the top slab as the final riding surface.
- Provide bar laps, where required, as follows:
 - Uncoated or galvanized ~ #4 = 1'-8" Min
 - Uncoated or galvanized ~ #5 = 2'-1" Min
 - Uncoated or galvanized ~ #6 = 2'-6" Min

GENERAL NOTES:

- Designed according to AASHTO LRFD Bridge Design Specifications for the range of fill heights shown.
- See the Multiple Box Culverts Cast-In-Place Miscellaneous Detail (MC-MD) standard sheet for details pertaining to skewed ends, angle sections, and lengthening.

Cover dimensions are clear dimensions, unless noted otherwise. Reinforcing bar dimensions shown are out-to-out of bar.



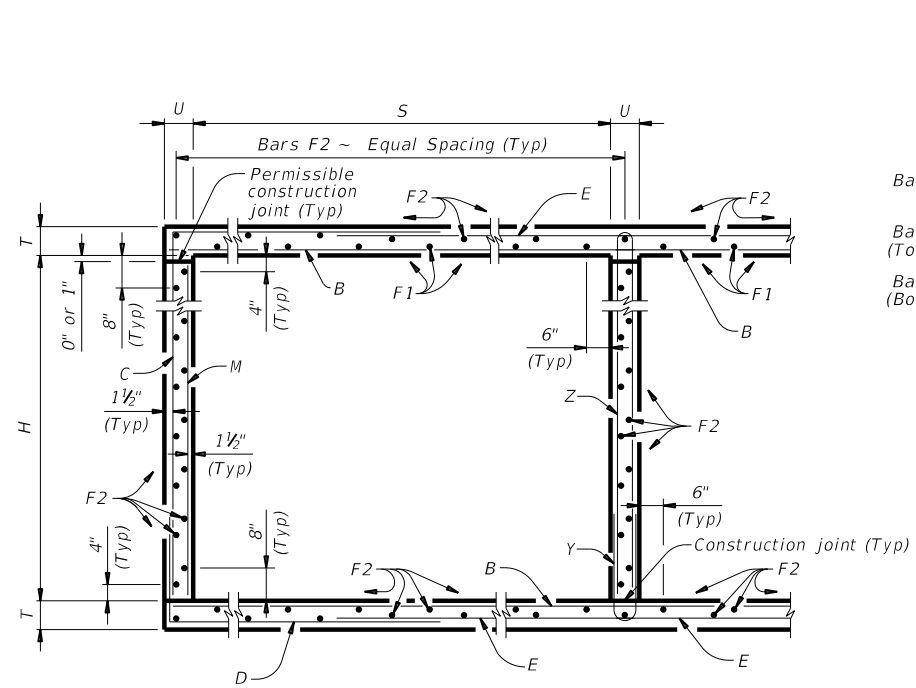
MULTIPLE BOX CULVERTS CAST-IN-PLACE
5'-0" SPAN
0' TO 20' FILL

MC-5-20

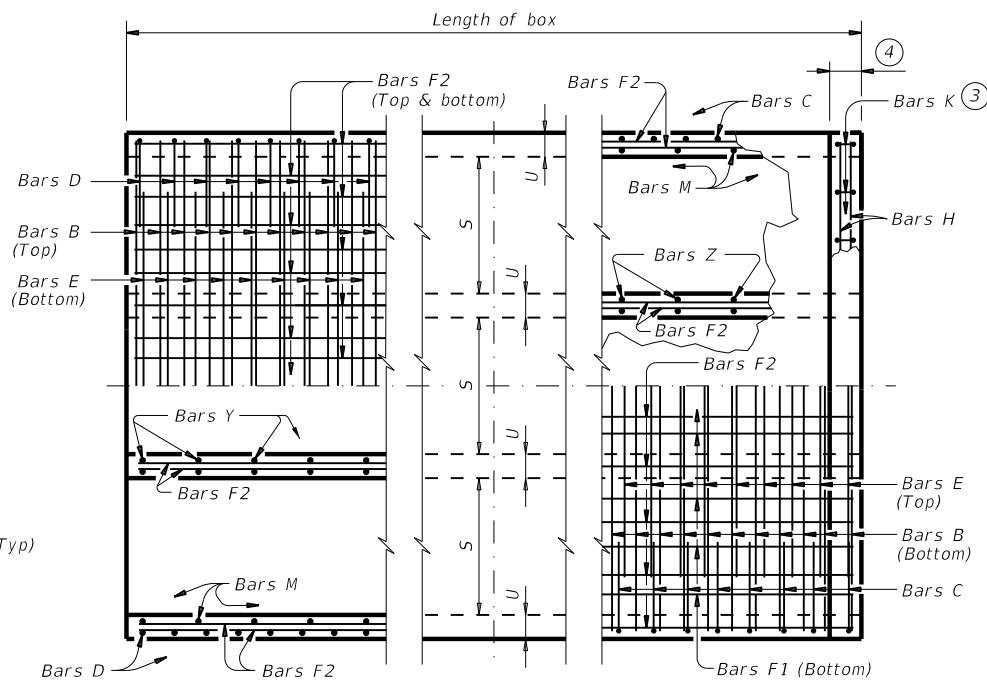
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DIST	COUNTY	SHEET NO.		
PAR	LAMAR	101		

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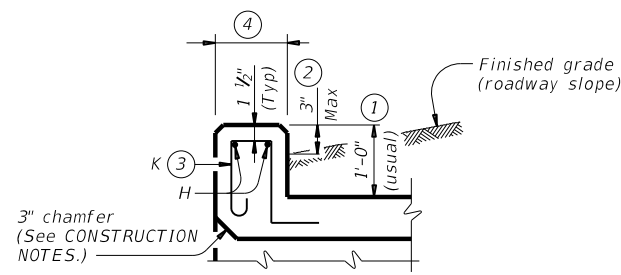
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TYPICAL SECTION

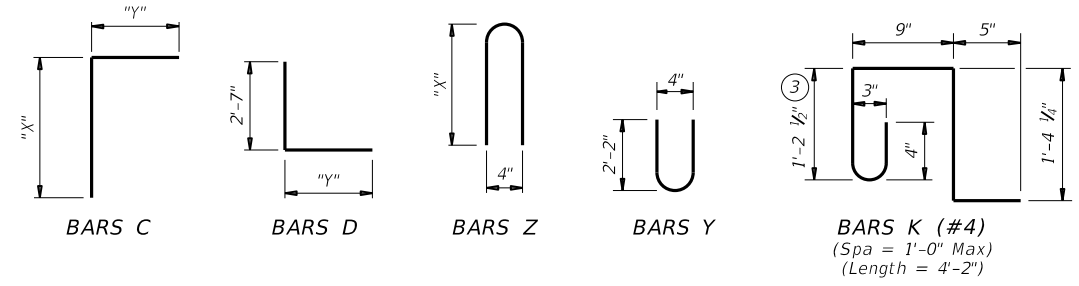


BOTTOM SLAB **TOP SLAB**



SECTION THRU CURB

TABLE OF BAR DIMENSIONS		
H	"X"	"Y"
3'-0"	3'-6 1/2"	4'-5"
4'-0"	4'-6 1/2"	4'-5"
5'-0"	5'-6 1/2"	4'-5"
6'-0"	6'-6 1/2"	4'-5"
7'-0"	7'-6 1/2"	4'-5"



- 0" Min to 5'-0" Max. Estimated curb heights are shown elsewhere in the plans. For structures with pedestrian rail or curbs taller than 1'-0", refer to the Extended Curb Details (ECD) standard sheet. For structures with T631 or T631LS bridge rail, refer to the Mounting Details for T631 & T631LS Rails (T631-CM) standard sheet. Refer to the Rail Anchorage Curb (RAC) standard sheet for structures with bridge rail other than T631 or T631LS.
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 - For structures without bridge rail, construct curbs no more than 3" above finished grade.
 - For structures with bridge rail, construct curbs flush with finished grade. Reduce curb heights, if necessary, to meet the above requirements. No changes will be made in quantities and no additional compensation will be allowed for this work.
- For curbs less than 1'-0" high, tilt Bars K or reduce bar height as necessary to maintain cover. For curbs less than 3" high, Bars K may be omitted.
- 1'-0" typical. 2'-3" when the Rail Anchorage Curb (RAC) standard sheet is referred to elsewhere in the plans.

The Contractor may replace Bars B, C, D, E, F1, F2, M, Y, and/or Z with deformed welded wire reinforcement (WWR) meeting the requirements of ASTM A1064. The area of required reinforcement may be reduced by the ratio of 60 ksi / 70 ksi. Spacing of WWR is limited to 4" Min and 18" Max. When required, provide lap splices in the WWR of the same length required for the equivalent bar size, rounded up for wire sizes between conventional bar sizes. The lap length required for WWR is never less than the lap length required for uncoated #4 bars.

Example conversion: Replacing No. 6 Gr 60 at 6" Spacing with WWR
 Required WWR = (0.44 sq. in. per 0.5 ft.) x (60 ksi / 70 ksi) = 0.755 sq. in. per ft.
 If D30.6 wire is used to meet the 0.755 sq. in. per ft. requirement in this example, the required spacing = (0.306 sq. in.) / (0.755 sq. in. per ft.) x (12 in. per ft.) = 4.86"
 Max spacing. Required lap length for the provided D30.6 wire is 2'-1" (the same minimum lap length required for uncoated #5 bars, as listed under MATERIAL NOTES).

CONSTRUCTION NOTES:
 Do not use permanent forms.
 Chamfer the bottom edge of the top slab 3" at the entrance.
 Optionally, raise construction joints shown at the flow line by a maximum of 6". If this option is taken, Bars M may be cut off or raised, Bars C and D may be reversed, and Bars Y and Z may be reversed.

MATERIAL NOTES:
 Provide Grade 60 reinforcing steel.
 Provide galvanized reinforcing steel if required elsewhere in the plans.
 Provide Class C concrete (f'c = 3,600 psi) for culvert barrel and curb, with the following exceptions: provide Class S concrete (f'c = 4,000 psi) for top slabs of:
 • culverts with overlay,
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 • Uncoated or galvanized ~ #4 = 1'-8" Min
 • Uncoated or galvanized ~ #5 = 2'-1" Min
 • Uncoated or galvanized ~ #6 = 2'-6" Min

GENERAL NOTES:
 Designed according to AASHTO LRFD Bridge Design Specifications for the range of fill heights shown.
 See the Multiple Box Culverts Cast-In-Place Miscellaneous Detail (MC-MD) standard sheet for details pertaining to skewed ends, angle sections, and lengthening.

Cover dimensions are clear dimensions, unless noted otherwise.
 Reinforcing bar dimensions shown are out-to-out of bar.

HL93 LOADING SHEET 1 OF 2

Texas Department of Transportation Bridge Division Standard

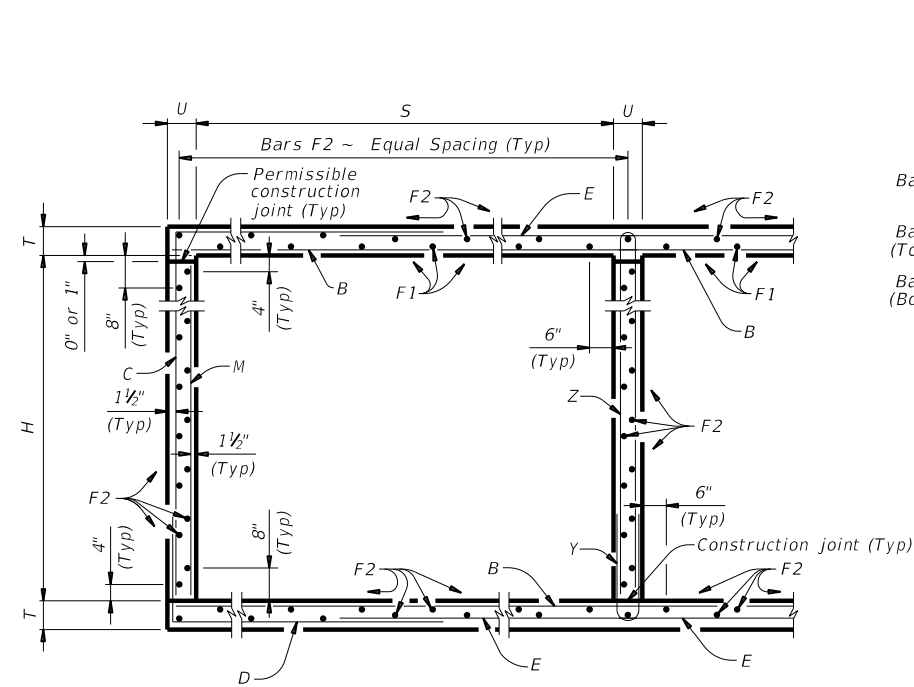
MULTIPLE BOX CULVERTS CAST-IN-PLACE
 7'-0" SPAN
 0' TO 10' FILL

MC-7-10

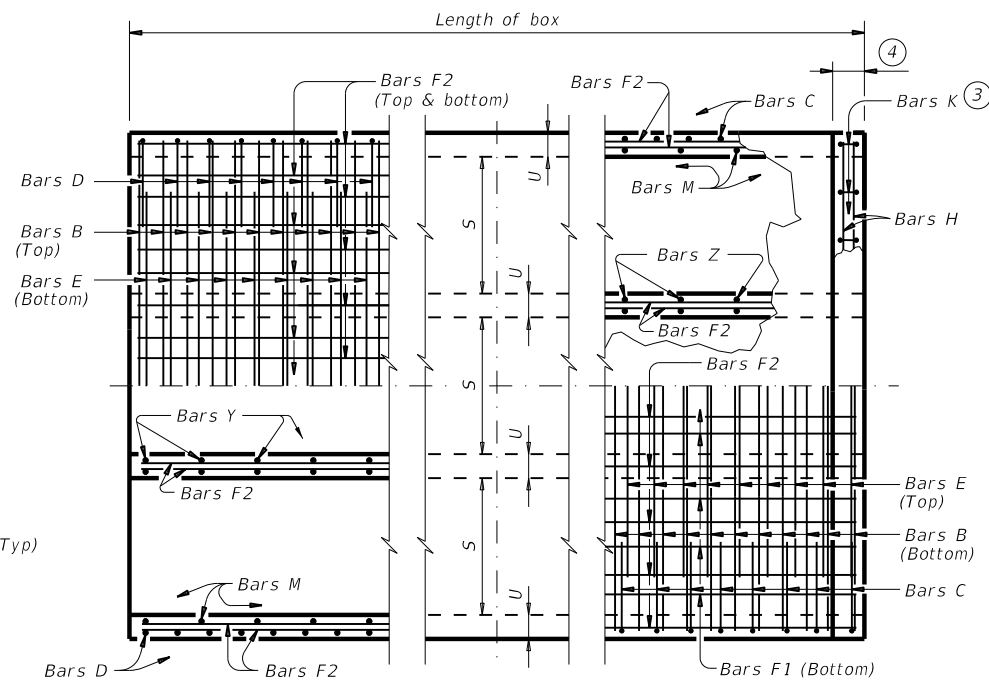
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	DIST	COUNTY	SHEET NO.	
	PAR	LAMAR	103	

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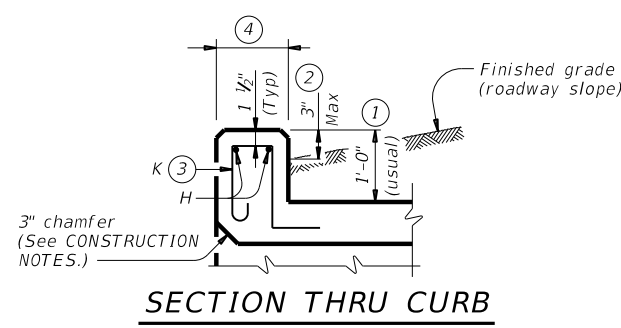
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TYPICAL SECTION

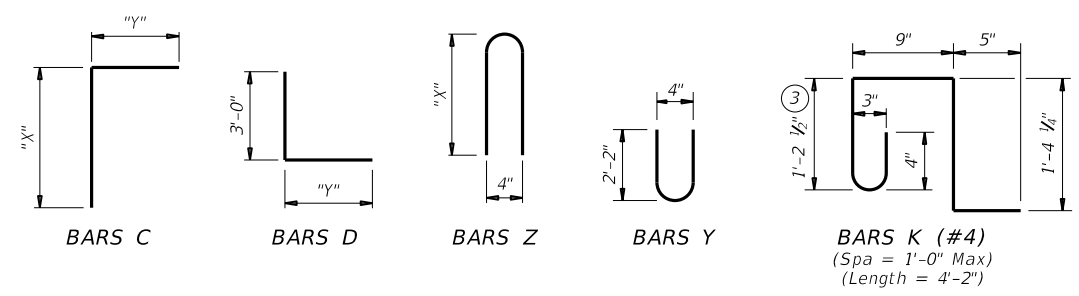


BOTTOM SLAB **PART PLANS** **TOP SLAB**



SECTION THRU CURB

TABLE OF BAR DIMENSIONS		
H	"X"	"Y"
4'-0"	4'-6 1/2"	5'-9"
5'-0"	5'-6 1/2"	5'-9"
6'-0"	6'-6 1/2"	5'-9"
7'-0"	7'-6 1/2"	5'-9"
8'-0"	8'-6 1/2"	5'-9"
9'-0"	9'-6 1/2"	5'-9"
10'-0"	10'-6 1/2"	5'-9"



- 0" Min to 5'-0" Max. Estimated curb heights are shown elsewhere in the plans. For structures with pedestrian rail or curbs taller than 1'-0", refer to the Extended Curb Details (ECD) standard sheet. For structures with T631 or T631LS bridge rail, refer to the Mounting Details for T631 & T631LS Rails (T631-CM) standard sheet. Refer to the Rail Anchorage Curb (RAC) standard sheet for structures with bridge rail other than T631 or T631LS.
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- 1'-0" typical. 2'-3" when the Rail Anchorage Curb (RAC) standard sheet is referred to elsewhere in the plans.

The Contractor may replace Bars B, C, D, E, F1, F2, M, Y, and/or Z with deformed welded wire reinforcement (WWR) meeting the requirements of ASTM A1064. The area of required reinforcement may be reduced by the ratio of 60 ksi / 70 ksi. Spacing of WWR is limited to 4" Min and 18" Max. When required, provide lap splices in the WWR of the same length required for the equivalent bar size, rounded up for wire sizes between conventional bar sizes. The lap length required for WWR is never less than the lap length required for uncoated #4 bars.

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 • culverts with overlay,
 • culverts with 1-to-2 course surface treatment, or
 • culverts with the top slab as the final riding surface.
 Provide bar laps, where required, as follows:
 • Uncoated or galvanized ~ #4 = 1'-8" Min
 • Uncoated or galvanized ~ #5 = 2'-1" Min
 • Uncoated or galvanized ~ #6 = 2'-6" Min

GENERAL NOTES:
 Designed according to AASHTO LRFD Bridge Design Specifications for the range of fill heights shown.
 See the Multiple Box Culverts Cast-In-Place Miscellaneous Detail (MC-MD) standard sheet for details pertaining to skewed ends, angle sections, and lengthening.

Cover dimensions are clear dimensions, unless noted otherwise.
 Reinforcing bar dimensions shown are out-to-out of bar.

HL93 LOADING SHEET 1 OF 2

Texas Department of Transportation
 Bridge Division Standard

**MULTIPLE BOX CULVERTS
 CAST-IN-PLACE
 10'-0" SPAN
 0' TO 7' FILL**

MC-10-7

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DIST	COUNTY	SHEET NO.		
PAR	LAMAR	105		

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TABLE OF DIMENSIONS AND REINFORCING STEEL
(Wings for one structure end)

Maximum Wingwall Height Hw	Dimensions				Variable Reinforcing				Estimated Quantities per ft of wing length (2-wings)	
	W	X	Y	Z	Bars J1		Bars J2		Reinf (Lb/Ft)	Conc (CY/Ft)
					Size	Spa	Size	Spa		
2'-6"	2'-5"	1'-0"	9"	7"	#4	1'-0"	#4	1'-0"	33.73	0.248
3'-0"	2'-5"	1'-0"	9"	7"	#4	1'-0"	#4	1'-0"	37.07	0.261
3'-6"	2'-5"	1'-0"	9"	7"	#4	1'-0"	#4	1'-0"	37.74	0.273
4'-0"	2'-5"	1'-0"	9"	7"	#4	1'-0"	#4	1'-0"	38.41	0.285
4'-6"	3'-2"	1'-6"	1'-0"	7"	#4	1'-0"	#4	1'-0"	41.75	0.330
5'-0"	3'-2"	1'-6"	1'-0"	7"	#4	1'-0"	#4	1'-0"	45.09	0.343
5'-6"	3'-2"	1'-6"	1'-0"	7"	#4	1'-0"	#4	1'-0"	45.75	0.355
6'-0"	3'-2"	1'-6"	1'-0"	7"	#4	1'-0"	#4	1'-0"	46.42	0.367
7'-0"	3'-8"	1'-9"	1'-3"	7"	#4	1'-0"	#4	1'-0"	52.77	0.414
8'-0"	4'-2"	2'-0"	1'-6"	8"	#5	1'-0"	#4	1'-0"	60.19	0.486
9'-0"	4'-8"	2'-3"	1'-9"	8"	#4	6"	#4	6"	81.49	0.535
10'-0"	5'-2"	2'-6"	2'-0"	8"	#5	6"	#4	6"	97.25	0.584
11'-0"	5'-8"	2'-9"	2'-3"	8"	#6	6"	#5	6"	133.65	0.634
12'-0"	6'-2"	3'-0"	2'-6"	9"	#7	6"	#5	6"	162.29	0.721
13'-0"	6'-8"	3'-3"	2'-9"	11"	#7	6"	#5	6"	178.80	0.856
14'-0"	7'-2"	3'-6"	3'-0"	1'-0"	#8	6"	#5	6"	216.78	0.959
15'-0"	7'-8"	4'-0"	3'-0"	1'-1"	#9	6"	#6	6"	283.06	1.068
16'-0"	8'-2"	4'-6"	3'-0"	1'-3"	#9	6"	#6	6"	297.02	1.234

TABLE OF WINGWALL REINFORCING
(2-wings)

Bar	Size	No.	Spa
D	#5	~	1'-0"
E	#4	~	1'-0"
F	#4	~	1'-0"
G	#6	4	~
M	#4	4	~
P	#4	~	1'-0"
R	#5	6	~
V	#4	~	1'-0"

TABLE OF ESTIMATED CULVERT TOEWALL QUANTITIES

Bar	Size	No.	Spa
L	#4	~	1'-6"
Q	#4	1	~
Reinf (Lb/Ft)			2.45
Conc (CY/Ft)			0.037

WING DIMENSION FORMULAS:

(All values are in feet.)

$$\begin{aligned}
 Hw &= H + T + C - 0.250' \\
 A &= (Hw - 0.333') (SL) \\
 B &= (A) \text{ tangent } (30^\circ) \\
 Lw &= (A) \div \text{cosine } (30^\circ)
 \end{aligned}$$

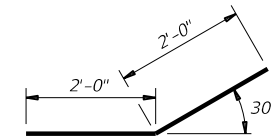
For cast-in-place culverts:
 $Ltw = (N) (S) + (N + 1) (U)$

For precast culverts:
 $Ltw = (N) (2U + S) + (N - 1) (0.5')$

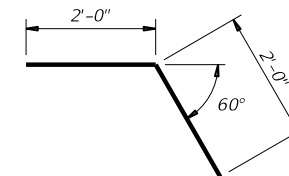
Total wingwall area (two wings ~ SF) = $(Hw + 0.333') (Lw)$

Hw = Height of wingwall
 $SL:1$ = Side slope ratio (horizontal:1 vertical)
 Lw = Length of wingwall
 Ltw = Culvert toewall length
 N = Number of culvert spans

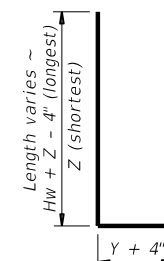
See applicable box culvert standard sheet for H, S, T, and U values.



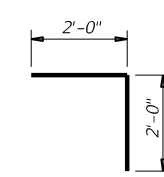
BARS D



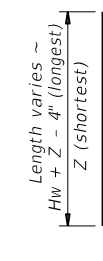
BARS R



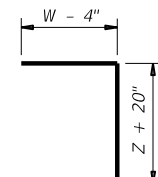
BARS J1



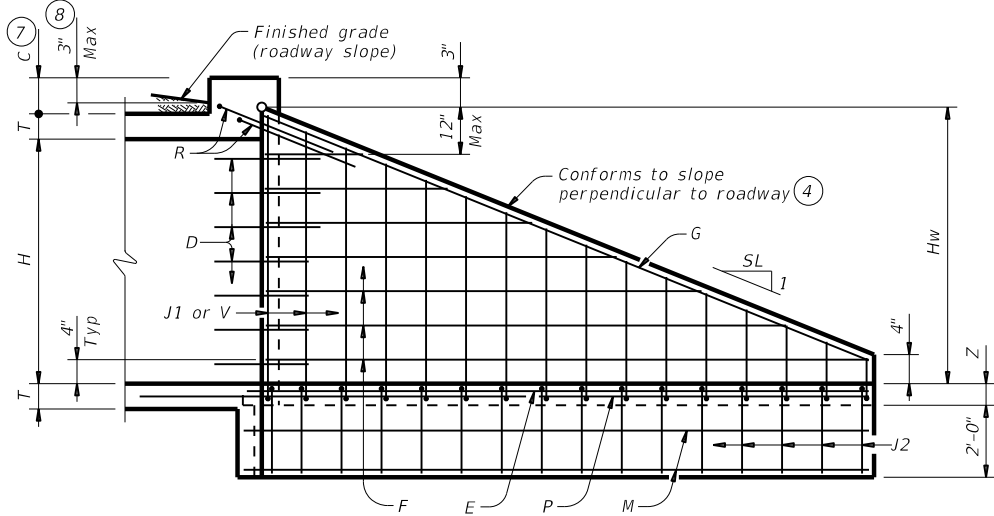
BARS L



BARS V

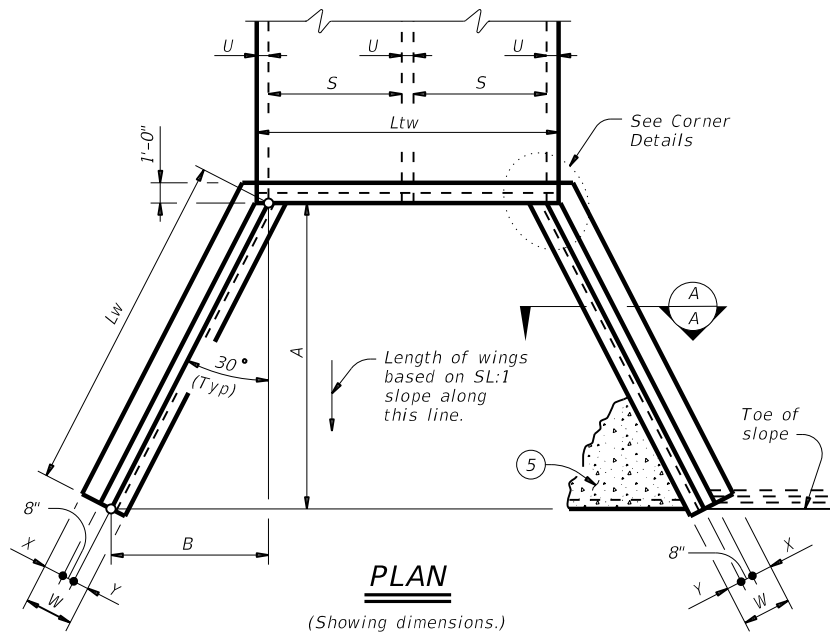


BARS J2



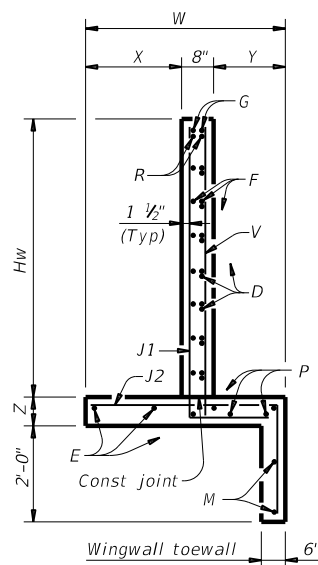
INSIDE ELEVATION

(Showing reinforcing. Culvert and culvert toewall reinforcing not shown for clarity.)

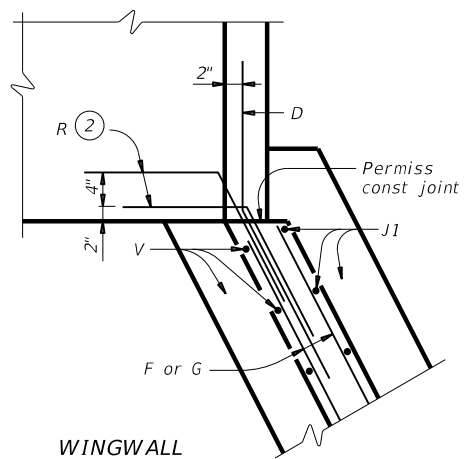


PLAN

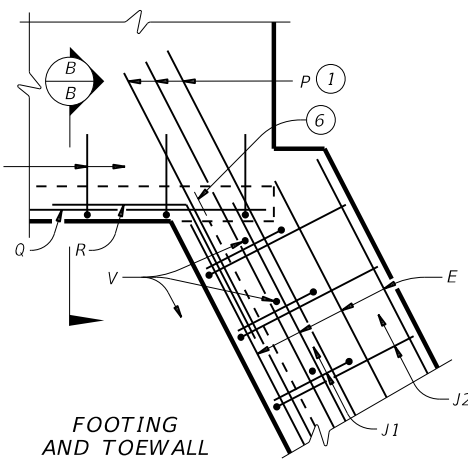
(Showing dimensions.)



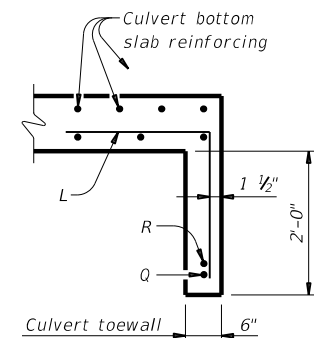
SECTION A-A



WINGWALL



FOOTING AND TOEWALL



SECTION B-B

- Extend Bars P 3'-0" minimum into bottom slab of box culvert.
- Adjust as necessary to maintain 1 #2" clear cover and 4" minimum between bars.
- Quantities shown are based on an average wing height for two wings (one structure end). To determine total quantities for two wings, multiply the tabulated values by Lw.
- Recommended values of side slope are: 2:1, 3:1, 4:1, and 6:1.
- When shown elsewhere on the plans, construct 5" deep concrete riprap. Payment for riprap is as required by Item 432, "Riprap". Unless otherwise shown on the plans or directed by the Engineer, provide a 6" wide by 1'-6" deep reinforced concrete toewall along all edges of the riprap adjacent to natural ground; reinforce the toewall by extending typical riprap reinforcing into the toewall; and extend construction joints or grooved joints oriented in the direction of flow across the full distance of the riprap at intervals of approximately 20'. When such riprap is provided, the culvert toewall shown in SECTION B-B will not be required.
- At Contractor's option, culvert toewall may be ended flush with wingwall toewall. Adjust reinforcing as needed.
- 0" Min to 5'-0" Max. Estimated curb heights are shown elsewhere in the plans. For structures with pedestrian rail or curbs taller than 1'-0", refer to the Extended Curb Details (ECD) standard sheet. For structures with T631 or T631LS bridge rail, refer to the Mounting Details for T631 & T631LS Rails (T631-CM) standard sheet. Refer to the Box Culvert Rail Mounting Details (RAC) standard sheet for structures with bridge rail other than T631 or T631LS.
- For vehicle safety, the following requirements must be met:
 - For structures without bridge rail, construct curbs no more than 3" above finished grade.
 - For structures with bridge rail, construct curbs flush with finished grade.
 Reduce curb heights, if necessary, to meet the above requirements. No changes will be made in quantities and no additional compensation will be allowed for this work.

MATERIAL NOTES:

Provide Class C concrete (f'c=3,600 psi).
 Provide Grade 60 reinforcing steel.
 Provide galvanized reinforcing steel if required elsewhere in the plans.
 In riprap concrete synthetic fibers listed on the "Fibers for Concrete" Material Producer List (MPL) may be used in lieu of steel reinforcing unless noted otherwise.

GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications.
 When structure is founded on solid rock, depth of toewalls for culverts and wingwalls may be reduced or eliminated as directed by the Engineer.
 See Box Culvert Supplement (BCS) standard sheet for additional dimensions and information.
 The quantities for concrete and reinforcing steel resulting from the formulas given on this sheet are for Contractor's information only.

Cover dimensions are clear dimensions, unless noted otherwise. Reinforcing dimensions are out-to-out of bars.

		Bridge Division Standard	
CONCRETE WINGWALLS WITH FLARED WINGS FOR 0° SKEW BOX CULVERTS			
FW-0			
FILE: fw-0std-20.dgn	DN: GAF	CK: CAT	DW: TxDOT
©TxDOT February 2020	CONT SECT	JOB	HIGHWAY
REVISIONS	0435 01	080	FM 38
	DIST	COUNTY	SHEET NO.
	PAR	LAMAR	107

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 STANDARDS: 0435-01-080

TABLE OF DIMENSIONS AND REINFORCING STEEL
(Wings for one structure end)

Maximum Wingwall Height Hw	Dimensions				Variable Reinforcing				Estimated Quantities per ft of wing length (2-wings)	
	W	X	Y	Z	Bars J1		Bars J2		Reinf (Lb/Ft)	Conc (CY/Ft)
					Size	Spa	Size	Spa		
2'-6"	2'-5"	1'-0"	9"	7"	#4	1'-0"	#4	1'-0"	33.73	0.248
3'-0"	2'-5"	1'-0"	9"	7"	#4	1'-0"	#4	1'-0"	37.07	0.261
3'-6"	2'-5"	1'-0"	9"	7"	#4	1'-0"	#4	1'-0"	37.74	0.273
4'-0"	2'-5"	1'-0"	9"	7"	#4	1'-0"	#4	1'-0"	38.41	0.285
4'-6"	3'-2"	1'-6"	1'-0"	7"	#4	1'-0"	#4	1'-0"	41.75	0.330
5'-0"	3'-2"	1'-6"	1'-0"	7"	#4	1'-0"	#4	1'-0"	45.09	0.343
5'-6"	3'-2"	1'-6"	1'-0"	7"	#4	1'-0"	#4	1'-0"	45.75	0.355
6'-0"	3'-2"	1'-6"	1'-0"	7"	#4	1'-0"	#4	1'-0"	46.42	0.367
7'-0"	3'-8"	1'-9"	1'-3"	7"	#4	1'-0"	#4	1'-0"	52.77	0.414
8'-0"	4'-2"	2'-0"	1'-6"	8"	#5	1'-0"	#4	1'-0"	60.19	0.486
9'-0"	4'-8"	2'-3"	1'-9"	8"	#4	6"	#4	6"	81.49	0.535
10'-0"	5'-2"	2'-6"	2'-0"	8"	#5	6"	#4	6"	97.25	0.584
11'-0"	5'-8"	2'-9"	2'-3"	8"	#6	6"	#5	6"	133.65	0.634
12'-0"	6'-2"	3'-0"	2'-6"	9"	#7	6"	#5	6"	162.29	0.721
13'-0"	6'-8"	3'-3"	2'-9"	11"	#7	6"	#5	6"	178.80	0.856
14'-0"	7'-2"	3'-6"	3'-0"	1'-0"	#8	6"	#5	6"	216.78	0.959
15'-0"	7'-8"	4'-0"	3'-0"	1'-1"	#9	6"	#6	6"	283.06	1.068
16'-0"	8'-2"	4'-6"	3'-0"	1'-3"	#9	6"	#6	6"	297.02	1.234

TABLE OF WINGWALL REINFORCING
(2-wings)

Bar	Size	No.	Spa
D	#5	~	1'-0"
E	#4	~	1'-0"
F	#4	~	1'-0"
G	#6	4	~
M	#4	4	~
P	#4	~	1'-0"
R	#5	6	~
V	#4	~	1'-0"

TABLE OF ESTIMATED CULVERT TOEWALL QUANTITIES

Bar	Size	No.	Spa
L	#4	~	1'-6"
Q	#4	1	~
Reinf (Lb/Ft)			2.45
Conc (CY/Ft)			0.037

WING DIMENSION FORMULAS:

(All values are in feet.)

$Hw = H + T + C - 0.250'$
 $A = (Hw - 0.333') (SL)$
 $B = (A) \text{ tangent } (30^\circ)$
 $Lw = (A) \div \text{cosine } (30^\circ)$

For cast-in-place culverts:
 $Ltw = (N) (S) + (N + 1) (U)$

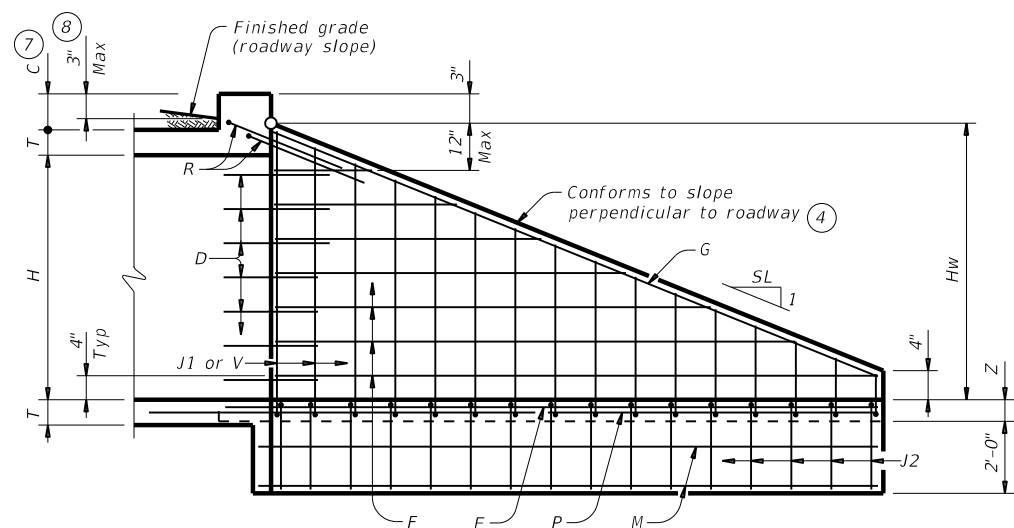
For precast culverts:
 $Ltw = (N) (2U + S) + (N - 1) (0.5')$

Total Wingwall Area (two wings ~ SF) = $(Hw + 0.333') (Lw)$

Hw = Height of wingwall
 SL:1 = Side slope ratio (horizontal:1 vertical)
 Lw = Length of wingwall
 Ltw = Culvert toewall length
 N = Number of culvert spans

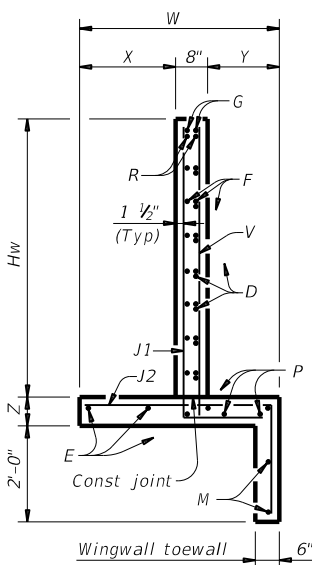
See applicable box culvert standard sheet for H, S, T, and U values.

- Extend Bars P 3'-0" minimum into bottom slab of box culvert.
- Adjust as necessary to maintain 1 #2" clear cover and 4" minimum between bars.
- Quantities shown are based on an average wing height for two wings (one structure end). To determine total quantities for two wings, multiply the tabulated values by Lw.
- Recommended values of side slope are: 2:1, 3:1, 4:1, and 6:1.
- When shown elsewhere on the plans, construct 5" deep concrete riprap. Payment for riprap is as required by Item 432, "Riprap". Unless otherwise shown on the plans or directed by the Engineer, provide a 6" wide by 1'-6" deep reinforced concrete toewall along all edges of the riprap adjacent to natural ground; reinforce the toewall by extending typical riprap reinforcing into the toewall; and extend construction joints or grooved joints oriented in the direction of flow across the full distance of the riprap at intervals of approximately 20'. When such riprap is provided, the culvert toewall shown in SECTION B-B will not be required.
- At Contractor's option, culvert toewall may be ended flush with wingwall toewall. Adjust reinforcing as needed.
- 0" Min to 5'-0" Max. Estimated curb heights are shown elsewhere in the plans. For structures with pedestrian rail or curbs taller than 1'-0", refer to the Extended Curb Details (ECD) standard sheet. For structures with T631 or T631LS bridge rail, refer to the Mounting Details for T631 & T631LS Rails (T631-CM) standard sheet. Refer to the Box Culvert Rail Mounting Details (RAC) standard sheet for structures with bridge rail other than T631 or T631LS.
- For vehicle safety, the following requirements must be met:
 - For structures without bridge rail, construct curbs no more than 3" above finished grade.
 - For structures with bridge rail, construct curbs flush with finished grade.
 Reduce curb heights, if necessary, to meet the above requirements. No changes will be made in quantities and no additional compensation will be allowed for this work.

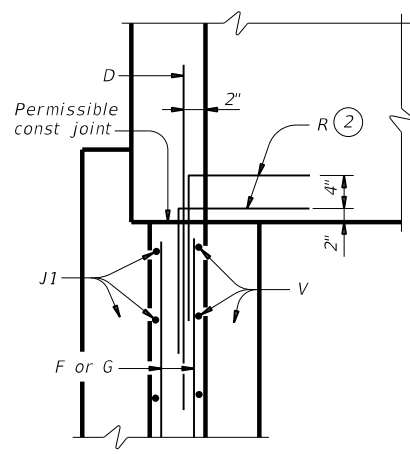


INSIDE ELEVATION

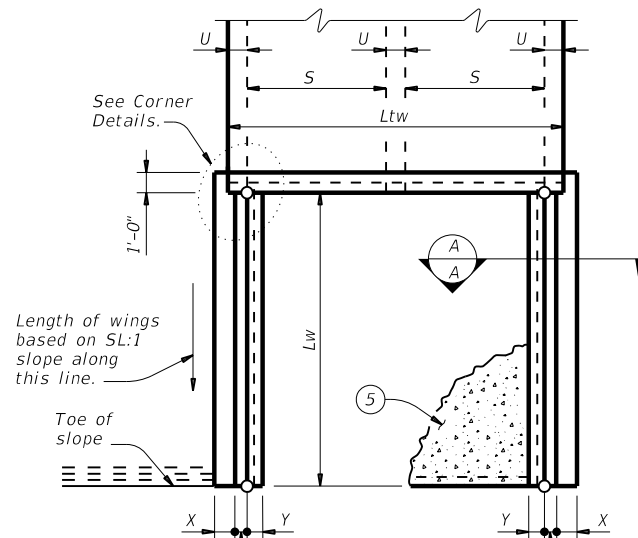
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SECTION A-A

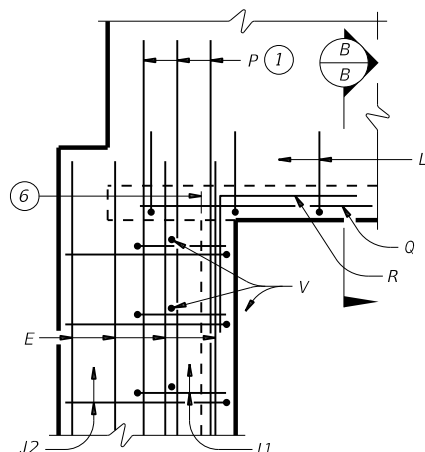
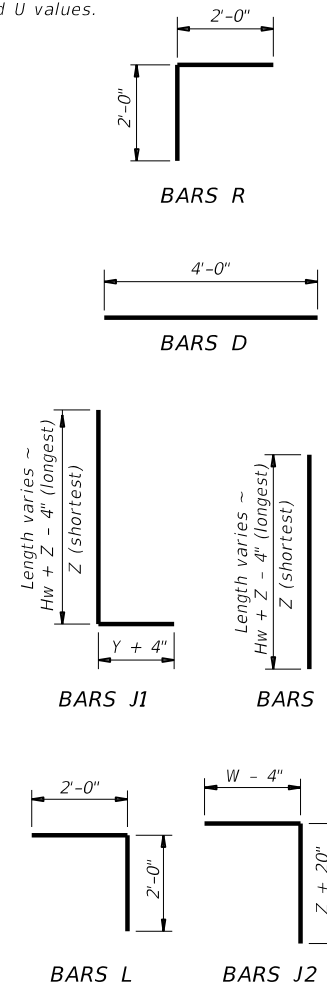


CORNER DETAILS

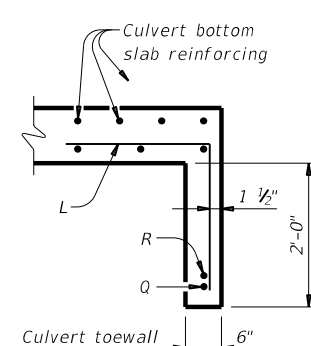


PLAN

(Showing dimensions.)



FOOTING AND TOEWALL



SECTION B-B

MATERIAL NOTES:

- Provide Class C concrete (f'c=3,600 psi).
- Provide Grade 60 reinforcing steel.
- Provide galvanized reinforcing steel if required elsewhere in the plans.
- In riprap concrete, synthetic fibers listed on the "Fibers for Concrete" Material Producer List (MPL) may be used in lieu of steel reinforcing unless noted otherwise.

GENERAL NOTES:

- Designed according to AASHTO LRFD Bridge Design Specifications.
- When structure is founded on solid rock, depth of toewalls for culverts and wingwalls may be reduced or eliminated as directed by the Engineer.
- See Box Culvert Supplement (BCS) standard sheet for additional dimensions and information.
- The quantities for concrete and reinforcing steel resulting from the formulas given on this sheet are for Contractor's information only.

Cover dimensions are clear dimensions, unless noted otherwise. Reinforcing dimensions are out-to-out of bars.

Bridge Division Standard

CONCRETE WINGWALLS WITH STRAIGHT WINGS FOR 0° SKEW BOX CULVERTS

SW-0

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©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0435	01	080	FM 38
	DIST	COUNTY	SHEET NO.	
	PAR	LAMAR	108	

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TABLE OF DIMENSIONS AND REINFORCING STEEL
(Wings for one structure end)

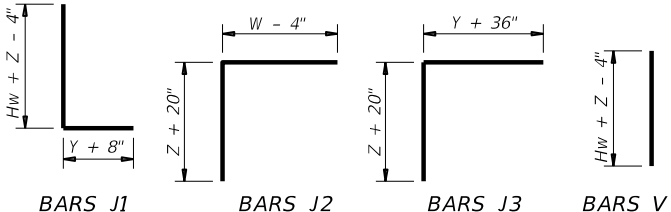
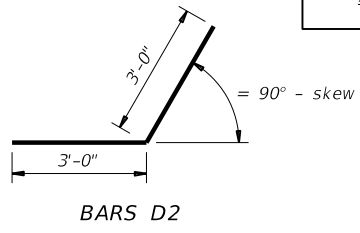
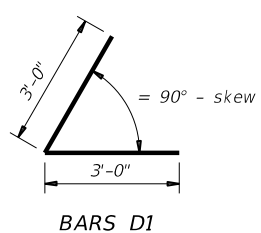
Maximum Wingwall Height Hw	Dimensions				Variable Reinforcing				Estimated Quantities per ft of wing (2-wings) ④		Estimated Quantities per ft of Toewall (1-toewall)	
	W	X	Y	Z	Bars J1		Bars J2		Reinf (Lb/Ft)	Conc (CY/Ft)	Reinf (Lb/Ft)	Conc (CY/Ft)
					Size	Spa	Size	Spa				
2'-6"	2'-10"	10"	1'-0"	7"	#4	1'-0"	#4	1'-0"	48.64	0.406	6.85	0.071
2'-9"	2'-10"	10"	1'-0"	7"	#4	1'-0"	#4	1'-0"	49.31	0.424	6.85	0.071
3'-0"	2'-10"	10"	1'-0"	7"	#4	1'-0"	#4	1'-0"	49.98	0.444	6.85	0.071
3'-3"	2'-10"	10"	1'-0"	7"	#4	1'-0"	#4	1'-0"	53.32	0.462	6.85	0.071
3'-6"	2'-10"	10"	1'-0"	7"	#4	1'-0"	#4	1'-0"	53.98	0.480	6.85	0.071
4'-0"	3'-2"	1'-2"	1'-0"	7"	#4	1'-0"	#4	1'-0"	55.77	0.532	6.85	0.071
4'-6"	3'-2"	1'-2"	1'-0"	7"	#4	1'-0"	#4	1'-0"	59.77	0.568	6.85	0.071
5'-0"	3'-9"	1'-7"	1'-2"	7"	#4	1'-0"	#4	1'-0"	63.45	0.632	6.96	0.075
5'-6"	3'-9"	1'-7"	1'-2"	7"	#4	1'-0"	#4	1'-0"	67.46	0.668	6.96	0.075
6'-0"	4'-4"	2'-0"	1'-4"	7"	#5	1'-0"	#5	1'-0"	80.67	0.730	7.07	0.078
6'-6"	4'-4"	2'-0"	1'-4"	7"	#5	1'-0"	#5	1'-0"	85.05	0.768	7.07	0.078
7'-0"	5'-0"	2'-3"	1'-9"	8"	#5	1'-0"	#5	1'-0"	92.15	0.864	8.07	0.093
7'-6"	5'-0"	2'-3"	1'-9"	8"	#5	1'-0"	#5	1'-0"	96.54	0.902	8.07	0.093
8'-0"	5'-6"	2'-8"	1'-10"	8"	#5	6"	#5	6"	139.04	0.962	8.13	0.095
8'-6"	5'-6"	2'-8"	1'-10"	8"	#5	6"	#5	6"	144.47	1.000	8.13	0.095
9'-6"	6'-0"	2'-10"	2'-2"	9"	#5	6"	#5	6"	156.93	1.136	8.41	0.110
10'-6"	6'-5"	3'-0"	2'-5"	9"	#6	6"	#5	6"	196.27	1.234	8.57	0.117
11'-6"	7'-2"	3'-6"	2'-8"	11"	#6	6"	#6	6"	230.13	1.438	9.52	0.140
12'-6"	7'-8"	3'-9"	2'-11"	1'-0"	#7	6"	#6	6"	283.41	1.592	9.74	0.157
13'-6"	8'-2"	4'-0"	3'-2"	1'-2"	#8	6"	#6	6"	348.72	1.804	10.02	0.186
14'-6"	8'-10"	4'-5"	3'-5"	1'-4"	#9	6"	#6	6"	432.94	2.046	10.30	0.218
15'-6"	9'-6"	4'-10"	3'-8"	1'-6"	#9	6"	#7	6"	489.52	2.302	11.24	0.253
16'-0"	9'-11"	5'-0"	3'-11"	1'-7"	#9	6"	#7	6"	505.72	2.448	11.47	0.279

TABLE OF WINGWALL REINFORCING
(2-wings)

Bar	Size	No.	Spa
D1	#6	~	1'-0"
D2	#6	~	1'-0"
E1	#4	~	1'-0"
F	#4	~	1'-0"
G	#6	~	8"
M1	#4	4	~
P	#4	~	1'-0"
V	#4	~	1'-0"

TABLE OF TOEWALL REINFORCING

Bar	Size	No.	Spa
J3	#4	~	1'-0"
M2	#4	2	~
E2	#4	~	1'-0"



WING DIMENSION FORMULAS:
(All values are in feet.)

$Hw = H + T + C$
 $Lw = (Hw)(SL) \div \cosine(\theta)$ for Type PW-1
 $= (Hw - 1')(SL) \div \cosine(\theta)$ for Type PW-2 and $Hw \geq 4'$
 $= (Hw - 0.5')(SL) \div \cosine(\theta)$ for Type PW-2 and $Hw < 4'$

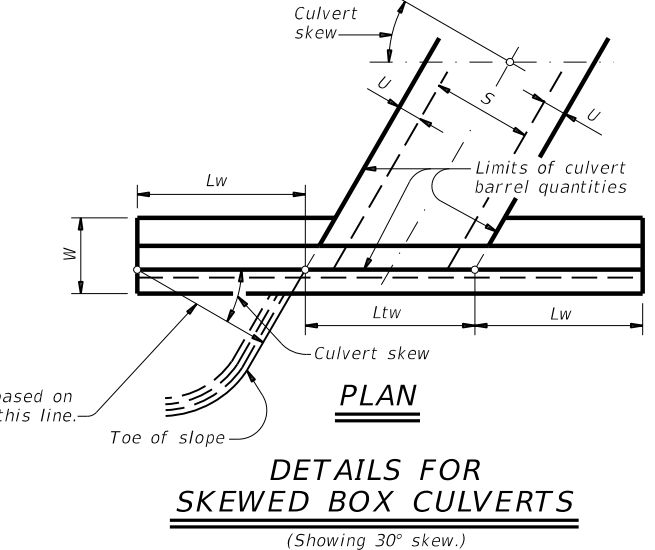
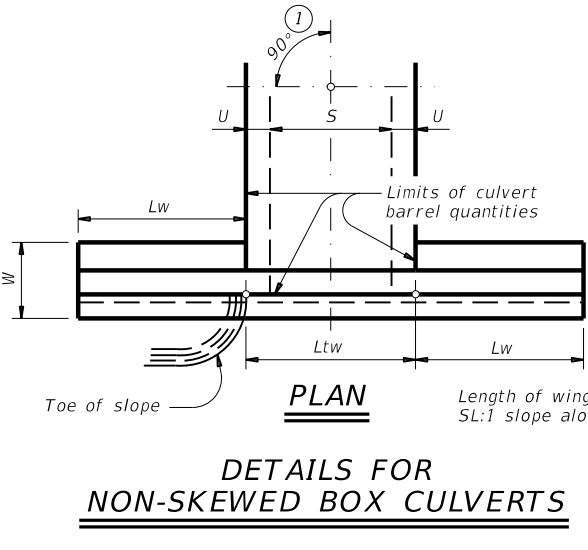
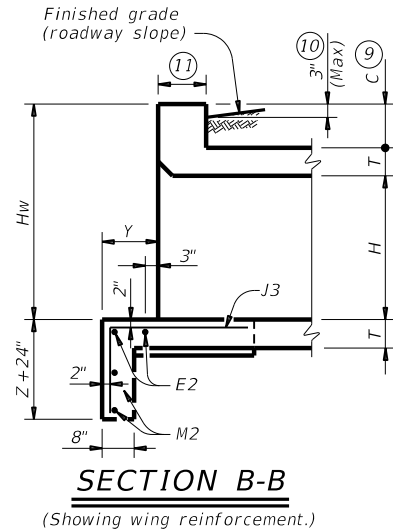
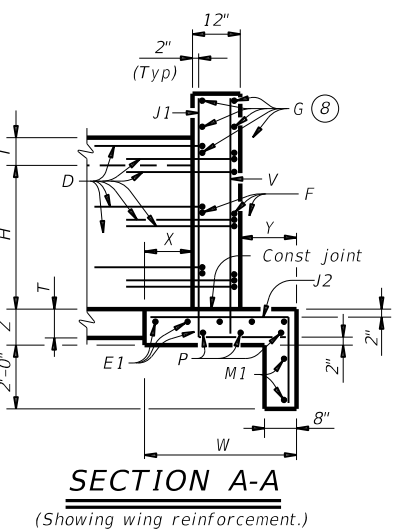
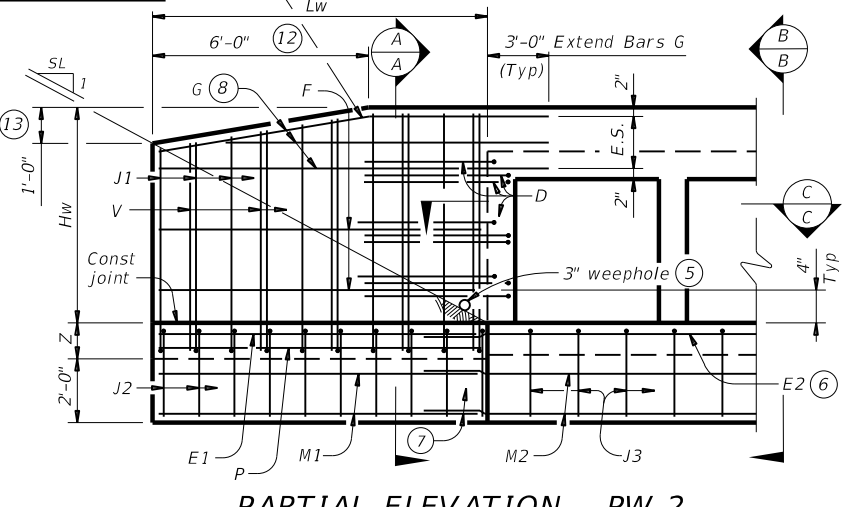
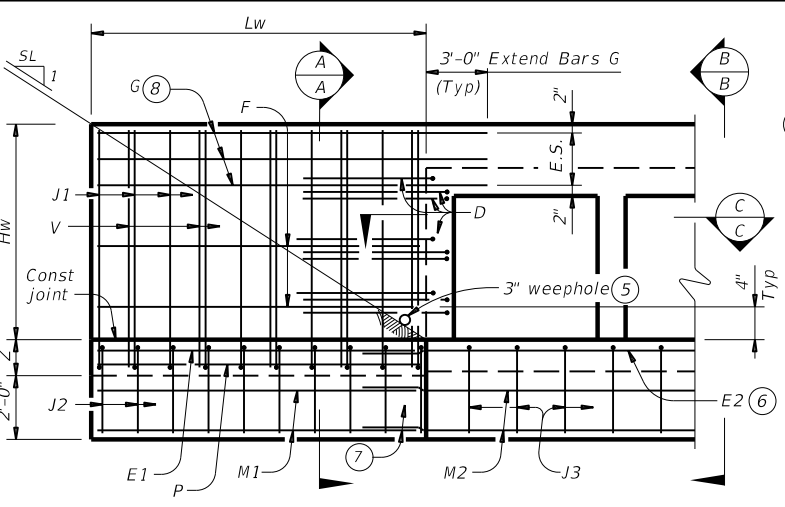
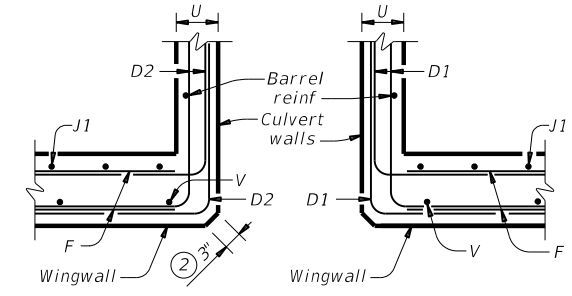
For cast-in-place culverts:
 $Ltw = [(N)(S) + (N + 1)(U)] \div \cosine(\theta)$

For precast culverts:
 $Ltw = [(N)(2U + S) + (N - 1)(0.5')] \div \cosine(\theta)$
 Total Wingwall Area (two wings ~ SF)
 $= (2)(Hw)(Lw)$ for Type PW-1
 $= (2)(Hw)(Lw) - 6 SF$ for Type PW-2 and $Hw \geq 4'$
 $= (2)(Hw)(Lw) - 1.5 SF$ for Type PW-2 and $Hw < 4'$

Hw = Height of wingwall
 Lw = Length of wingwall
 Ltw = Culvert toewall length
 N = Number of culvert spans
 $SL:1$ = Channel slope ratio, (horizontal: 1 vertical, usual value is 2:1)
 θ = Culvert skew

See applicable box culvert standard sheet for S, H, T, and U values.

- Skew = 0°
- At discharge end, chamfer may be 3/4" minimum.
- For 15° skew ~ 1"
For 30° skew ~ 2"
For 45° skew ~ 3"
- Quantities shown are for two Type PW-1 wings. Adjust concrete volume for Type PW-2 wings. To determine estimated quantities for two wings, multiply the tabulated values by Lw. Quantities shown do not include weight of Bars D.
- Provide weepholes for Hw = 5'-0" and greater. Fill around weepholes with coarse gravel.
- Extend Bars E2 1'-6" minimum into the wingwall footing.
- Lap Bars M1 1'-6" minimum with Bars M2.
- Place Bars G as shown, equally spaced at 8" maximum. Provide at least two pairs of Bars G per wing.
- 0" Min to 5'-0" Max. Estimated curb heights are shown elsewhere in the plans. For structures with pedestrian rail or curbs taller than 1'-0, refer to the Extended Curb Details (ECD) standard sheet. For structures with T631 or T631LS bridge rail, refer to the Mounting Details for T631 & T631LS Rails (T631-CM) standard sheet. Refer to the Box Culvert Rail Mounting Details (RAC) standard sheet for structures with bridge rail other than T631 or T631LS.
- For vehicle safety, the following requirements must be met:
 - For structures without bridge rail, construct curbs no more than 3" above finished grade.
 - For structures with bridge rail, construct curbs flush with finished grade.
 Reduce curb heights, if necessary, to meet the above requirements. No changes will be made in quantities and no additional compensation will be allowed for this work.
- 1'-0" typical. 2'-3" when the Box Culvert Rail Mounting Details (RAC) standard sheet is referred to elsewhere in the plans.
- 3'-0" for Hw < 4'.
- 6" for Hw < 4'.



DESIGNER NOTES:
 Type PW-1 can be used for all applications and must be used if railing is to be mounted to the wingwall.
 Type PW-2 can only be used for applications without a railing mounted to the wingwall.

MATERIAL NOTES:
 Provide Class C concrete (f'c=3,600 psi).
 Provide Grade 60 reinforcing steel.
 Provide galvanized reinforcing steel if required elsewhere in the plans.

GENERAL NOTES:
 Designed in accordance with AASHTO LRFD Bridge Design Specifications.
 Depth of toewalls for wingwalls and culverts may be reduced or eliminated when founded on solid rock, when directed by the Engineer.
 See Box Culvert Supplement (BCS) standard sheet for wingwall type and additional dimensions and information.
 Quantities for concrete and reinforcing steel resulting from the formulas given on this sheet are for the Contractor's information only.

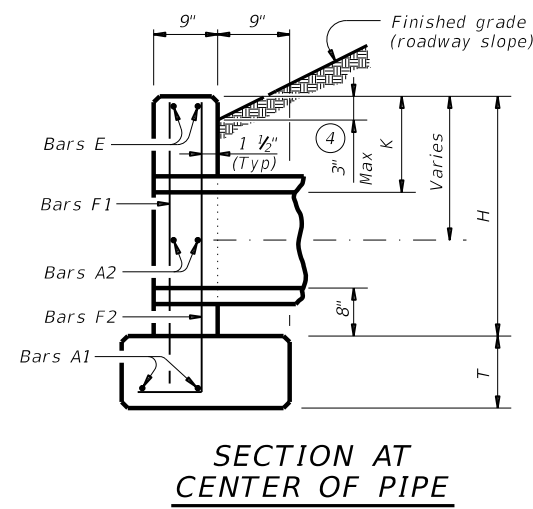
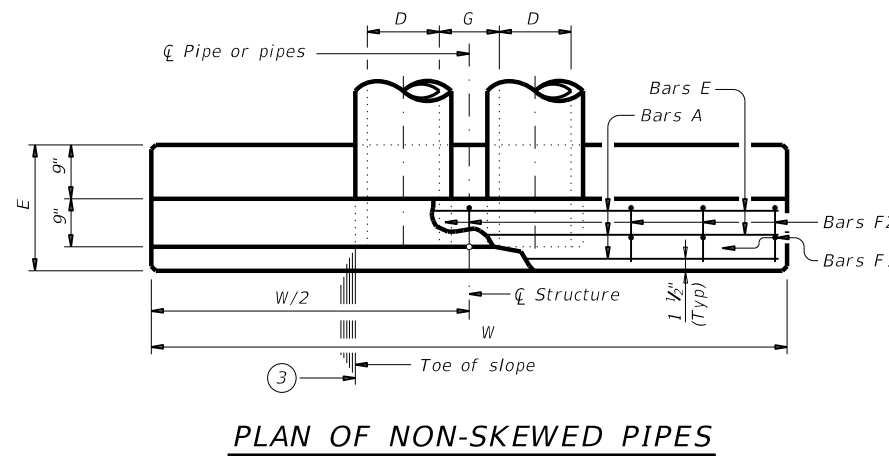
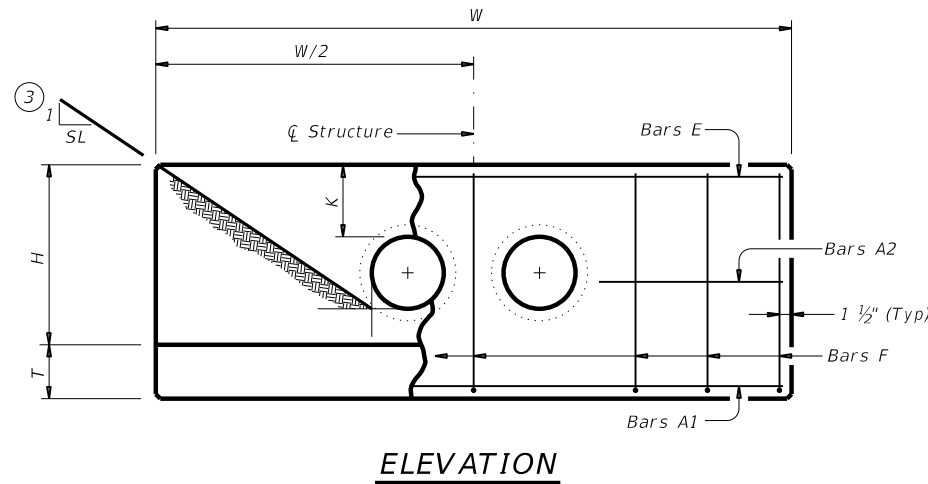
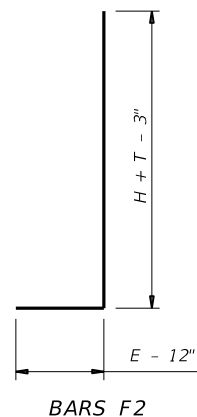
Cover dimensions are clear dimensions, unless noted otherwise. Reinforcing dimensions are out-to-out of bars.

		Bridge Division Standard	
CONCRETE WINGWALLS WITH PARALLEL WINGS FOR BOX CULVERTS TYPES PW-1 AND PW-2			
PW			
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**TABLE OF VARIABLE DIMENSIONS (5)
AND QUANTITIES FOR ONE HEADWALL**

Slope	Dia of Pipe (D)	Values for One Pipe		Values To Be Added for Each Add'l Pipe			
		W	Reinf (Lbs) (1)	Conc (CY) (2)	W	Reinf (Lbs) (1)	Conc (CY) (2)
2:1	12"	9'-0"	122	1.1	1'-9"	15	0.2
	15"	10'-3"	136	1.3	2'-2"	16	0.2
	18"	11'-6"	163	1.5	2'-8"	19	0.3
	21"	12'-9"	200	1.8	3'-1"	31	0.4
	24"	14'-0"	217	2.1	3'-7"	34	0.4
	27"	15'-3"	254	2.4	3'-11"	37	0.5
	30"	16'-6"	272	2.7	4'-4"	40	0.6
	33"	17'-9"	314	3.1	4'-8"	43	0.6
	36"	19'-0"	371	3.9	5'-1"	46	0.8
	42"	21'-6"	442	4.9	5'-10"	52	1.0
	48"	25'-0"	569	6.4	6'-7"	59	1.3
	54"	27'-6"	701	7.5	7'-6"	82	1.6
60"	30'-0"	794	8.8	8'-3"	90	1.8	
66"	32'-6"	894	10.2	8'-9"	96	2.0	
72"	35'-0"	1,055	11.7	9'-4"	103	2.3	
3:1	12"	13'-0"	175	1.6	1'-9"	14	0.2
	15"	14'-9"	193	1.9	2'-2"	17	0.2
	18"	16'-6"	228	2.2	2'-8"	19	0.3
	21"	18'-3"	299	2.6	3'-1"	31	0.4
	24"	20'-0"	323	3.0	3'-7"	33	0.4
	27"	21'-9"	371	3.5	3'-11"	37	0.5
	30"	23'-6"	415	4.0	4'-4"	40	0.5
	33"	25'-3"	469	4.6	4'-8"	43	0.6
	36"	27'-0"	556	5.7	5'-1"	46	0.8
	42"	30'-6"	675	7.1	5'-10"	52	1.0
	48"	35'-6"	837	9.2	6'-7"	59	1.3
	54"	39'-0"	1,015	11.0	7'-6"	84	1.6
60"	42'-6"	1,171	12.9	8'-3"	91	1.8	
66"	46'-0"	1,298	14.9	8'-9"	98	2.0	
72"	49'-6"	1,561	17.1	9'-4"	103	2.3	
4:1	12"	17'-0"	229	2.0	1'-9"	15	0.2
	15"	19'-3"	266	2.4	2'-2"	17	0.2
	18"	21'-6"	308	2.9	2'-8"	19	0.3
	21"	23'-9"	382	3.5	3'-1"	31	0.3
	24"	26'-0"	430	3.9	3'-7"	34	0.4
	27"	28'-3"	486	4.7	3'-11"	37	0.5
	30"	30'-6"	539	5.2	4'-4"	40	0.6
	33"	32'-9"	603	6.0	4'-8"	42	0.6
	36"	35'-0"	738	7.5	5'-1"	47	0.8
	42"	39'-6"	881	9.3	5'-10"	52	1.0
	48"	46'-0"	1,102	12.1	6'-7"	61	1.3
	54"	50'-6"	1,364	14.4	7'-6"	84	1.6
60"	55'-0"	1,547	16.9	8'-3"	91	1.8	
66"	59'-6"	1,741	19.5	8'-9"	98	2.0	
72"	64'-0"	2,077	22.4	9'-4"	102	2.3	
6:1	12"	25'-0"	336	3.0	1'-9"	14	0.2
	15"	28'-3"	384	3.6	2'-2"	17	0.2
	18"	31'-6"	452	4.2	2'-8"	19	0.3
	21"	34'-9"	581	5.1	3'-1"	31	0.4
	24"	38'-0"	644	5.8	3'-7"	34	0.4
	27"	41'-3"	737	6.9	3'-11"	37	0.5
	30"	44'-6"	807	7.7	4'-4"	39	0.6
	33"	47'-9"	912	8.9	4'-8"	44	0.6
	36"	51'-0"	1,108	11.0	5'-1"	48	0.8
	42"	57'-6"	1,318	13.7	5'-10"	54	1.0
	48"	67'-0"	1,682	17.9	6'-7"	59	1.3
	54"	73'-6"	2,072	21.3	7'-6"	83	1.6
60"	80'-0"	2,351	24.9	8'-3"	89	1.8	
66"	86'-6"	2,643	28.9	8'-9"	96	2.0	
72"	93'-0"	3,121	33.1	9'-4"	101	2.3	



- ① Total quantities include one 3'-1" lap for bars over 60' in length.
- ② Quantities shown are for concrete pipe and will increase slightly for metal pipe installations.
- ③ Indicated slope is perpendicular to centerline pipe or pipes.
- ④ For vehicle safety, construct curbs no more than 3" above finished grade. Reduce curb heights, if necessary, to meet these requirements. No changes will be made in quantities and no additional compensation will be allowed for this work.
- ⑤ Dimensions shown are usual and maximum.
- ⑥ Quantities shown are for one structure end only (one headwall).

TABLE OF CONSTANT DIMENSIONS

Dia of Pipe (D)	G	K (5)	H	T	E
12"	0'-9"	1'-0"	2'-8"	0'-9"	1'-9"
15"	0'-11"	1'-0"	2'-11"	0'-9"	1'-9"
18"	1'-2"	1'-0"	3'-2"	0'-9"	1'-9"
21"	1'-4"	1'-0"	3'-5"	0'-9"	2'-0"
24"	1'-7"	1'-0"	3'-8"	0'-9"	2'-0"
27"	1'-8"	1'-0"	3'-11"	0'-9"	2'-3"
30"	1'-10"	1'-0"	4'-2"	0'-9"	2'-3"
33"	1'-11"	1'-0"	4'-5"	0'-9"	2'-6"
36"	2'-1"	1'-0"	4'-8"	1'-0"	2'-6"
42"	2'-4"	1'-0"	5'-2"	1'-0"	2'-9"
48"	2'-7"	1'-3"	5'-11"	1'-0"	3'-0"
54"	3'-0"	1'-3"	6'-5"	1'-0"	3'-3"
60"	3'-3"	1'-3"	6'-11"	1'-0"	3'-6"
66"	3'-3"	1'-3"	7'-5"	1'-0"	3'-9"
72"	3'-4"	1'-3"	7'-11"	1'-0"	4'-0"

TABLE OF REINFORCING STEEL (6)

Bar	Size	Spa	No.
A1	#5	~	2
A2	#5	1'-6"	~
E	#5	~	2
F	#5	1'-0"	~

MATERIAL NOTES:
 Provide Grade 60 reinforcing steel.
 Provide Class C concrete (f'c = 3,600 psi).

GENERAL NOTES:
 Designed according to AASHTO LRFD Bridge Design Specifications.
 Do not mount bridge rails of any type directly to these culvert headwalls.
 This standard may not be used for wall heights, H, exceeding the values shown.

Cover dimensions are clear dimensions, unless noted otherwise.
 Reinforcing dimensions are out-to-out of bars.

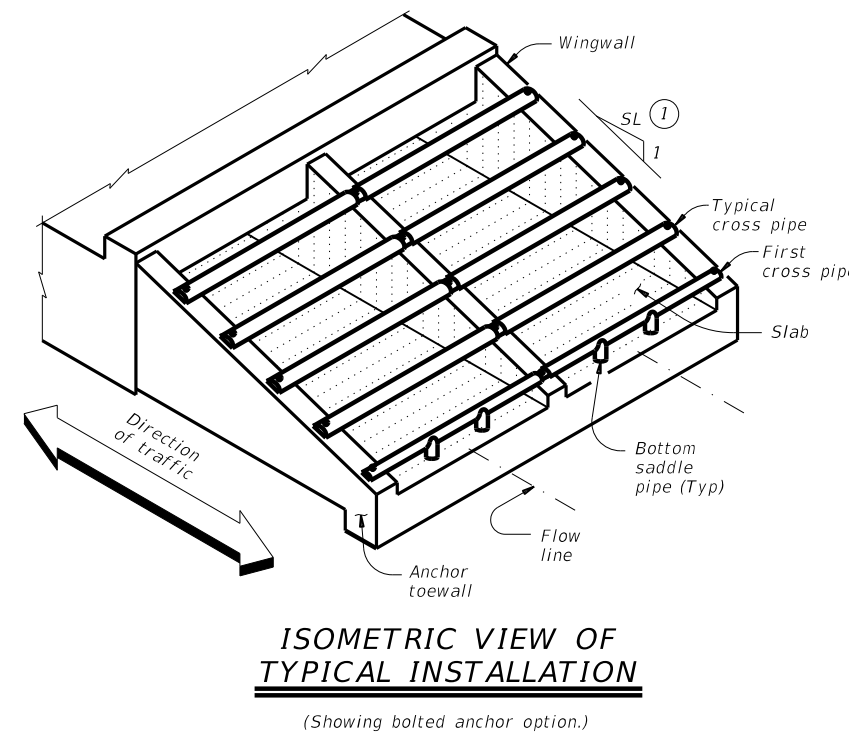
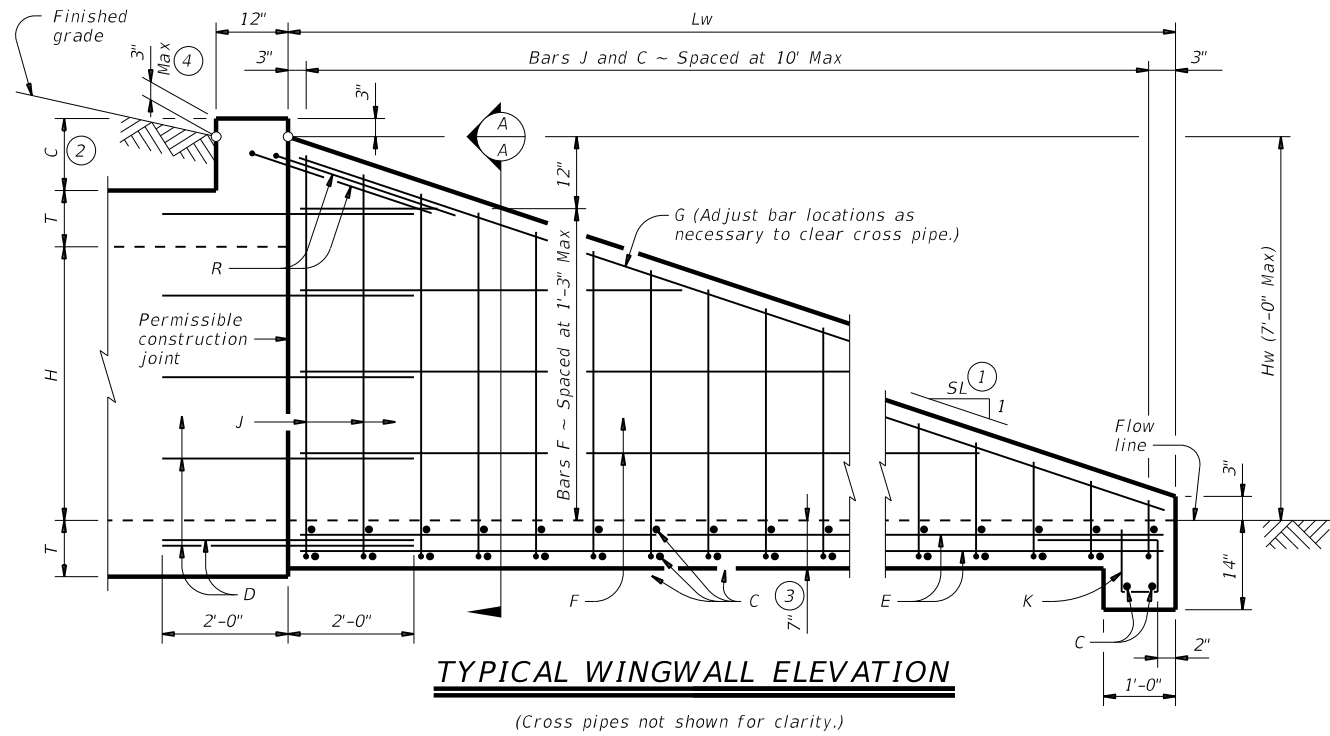
Bridge Division Standard

CONCRETE HEADWALLS
WITH PARALLEL WINGS FOR
NON-SKEWED PIPE CULVERTS

CH-PW-0

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©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
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	DIST	COUNTY	SHEET NO.	
	PAR	LAMAR	110	

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WING DIMENSION CALCULATIONS:

$$Hw = H + T + C - 0.250'$$

$$Lw = (Hw - 0.333') (SL)$$

For cast-in-place culverts:
 $Atw = (N) (S) + (N + 1) (U)$

For precast culverts:
 $Atw = (N) (2U + S) + (N - 1) (0.500')$

$$\text{Total Wingwall Area (SF)} = (0.5) (Hw + 0.333') (Lw) (N - 1)$$

$$\text{Total Concrete Volume (CY)} = [(Wingwall Area) (0.583') + (Lw) (Atw) (0.583') + (Atw) (1.167') (1.167' - 0.583')] \div (27)$$

PIPE RUNNER DIMENSION CALCULATIONS:

$$\text{Pipe Runner Length (feet)} = (Lw) (K1) = (1.917')$$

$$\text{Total Reinforcing (Lb)} = (1.55) (Lw) (Atw) + (4.43) (Atw) + (K2) (Hw) (N + 1) (\sqrt{Lw})$$

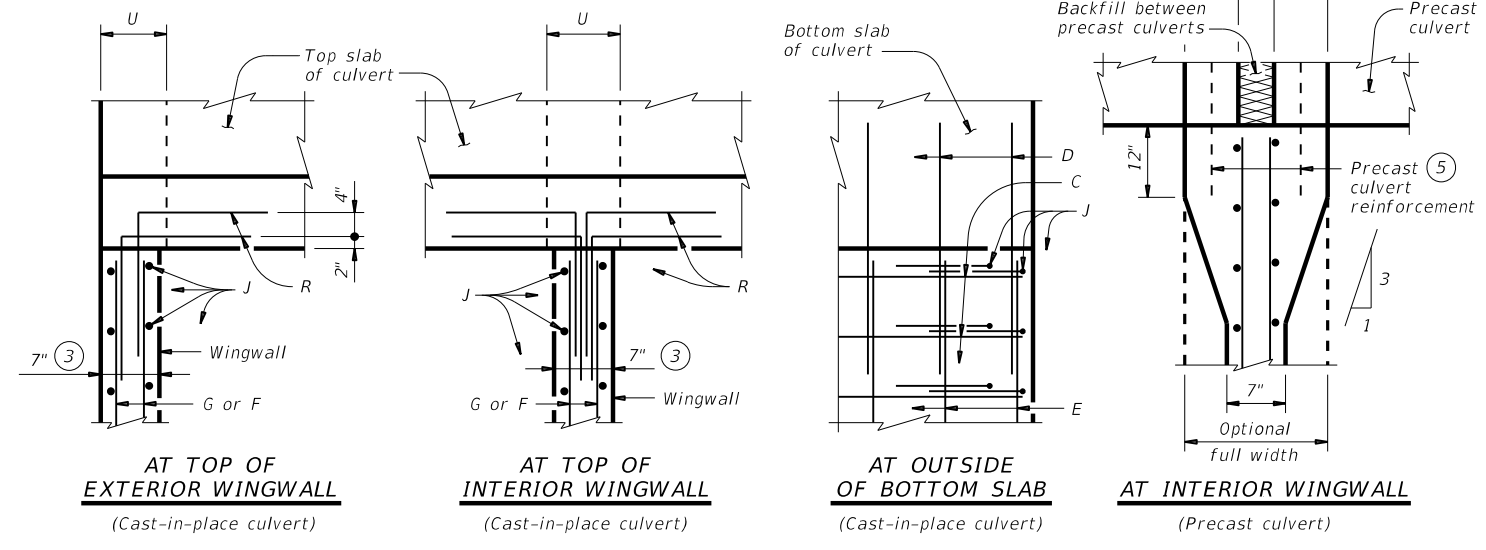
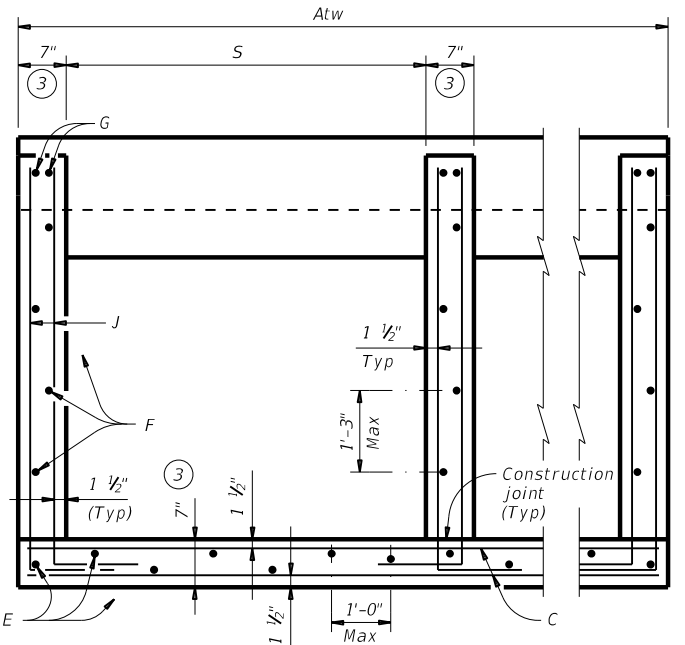
C = Height of curb above top of top slab (feet)
 Hw = Height of wingwall (feet)
 K = Constant value for use in formulas
 Slope SL:1 K1 K2
 3:1 ~ 1.054 ~ 7.45
 4:1 ~ 1.031 ~ 8.49
 6:1 ~ 1.014 ~ 10.30
 Atw = Anchor toewall length (feet)
 Lw = Length of wingwall (feet)
 N = Number of culvert barrels
 SL:1 = Side slope ratio (horizontal : 1 vertical)
 See applicable box culvert standard for H, S, T, and U values.

MATERIAL NOTES:

Provide Grade 60 reinforcing steel.
 Provide galvanized reinforcing steel if required elsewhere in the plans. Adjust reinforcing as necessary to provide a minimum clear cover of 1 1/2".
 Provide Class "C" concrete (f'c = 3,600 psi).
 Provide pipe runners, cross pipes, and anchor pipes meeting the requirements of ASTM A53 (Type E or S, Gr B), ASTM A500 Gr B, or API 5LX52.
 Provide ASTM A307 bolts.
 Galvanize all steel components, except the concrete reinforcing, unless required elsewhere in the plans, after fabrication.
 Repair galvanizing damaged during transport or construction in accordance with Item 445, "Galvanizing."

GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications.
 The safety end treatments shown herein are intended for use in those installations where out of control vehicles are likely to traverse the openings approximately perpendicular to the cross pipes.
 Cross pipes are designed for a traversing load of 10,000 pounds at yield as recommended by Research Report 280-2F, "Safety Treatment of Roadside Parallel-Drainage Structures", Texas Transportation Institute, March 1981.
 The quantities for concrete, reinforcing steel, and cross pipes resulting from the formulas given herein are for Contractor's information only.
 See the Box Culvert Supplement (BCS) standard sheet for additional dimensions and information.
 Alternate design drawings bearing the seal of a professional engineer will be acceptable for precast construction of the safety end treatments.



PLAN VIEWS OF CORNER DETAILS

- Provide 6:1 or flatter slope.
- 0" Min to 5'-0" Max. Estimated curb heights are shown elsewhere in the plans. For structures without railing and curbs taller than 1'-0", refer to Extended Curb Details the Extended Curb Details (ECD) standard sheet.
- Wingwall and slab thicknesses may be the same as the adjacent culvert wall and slab thicknesses (7" Minimum). If thicknesses greater than the minimum (7") are used, no changes will be made in quantities and no additional compensation will be allowed.
- For vehicle safety, reduce height, if necessary, to provide a maximum 3" projection above finished grade. No changes will be made in quantities and no additional compensation will be allowed for this work.
- For culverts with C = 0", the precast culvert reinforcing may extend 1'-0" minimum into wingwall. Wingwall bars D and R may be omitted. Otherwise, refer to the Wingwall Connection detail on the Box Culvert Precast Miscellaneous Details (SCP-MD) standard sheet.

Cover dimensions are clear dimensions, unless noted otherwise. Reinforcing dimensions are out-to-out of bars.

SECTION A-A
(Showing typical wingwall and wing slab reinforcing. Pipe runners not shown for clarity.)

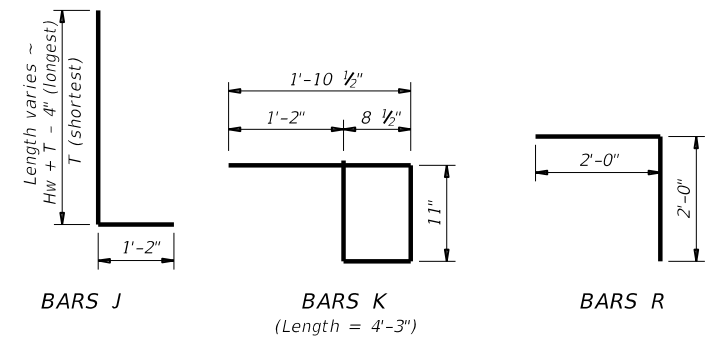


TABLE OF REINFORCING BAR SIZES AND SPACING		
Bar	Size	Spacing
C	#4	10" Max
D	#4	Match F and E
E	#4	1'- 0" Max
F	#4	1'- 3" Max
G	#6	As shown
J	#4	10" Max
K	#4	1'- 0" Max
R	#4	As shown

SHEET 1 OF 2

Bridge Division Standard

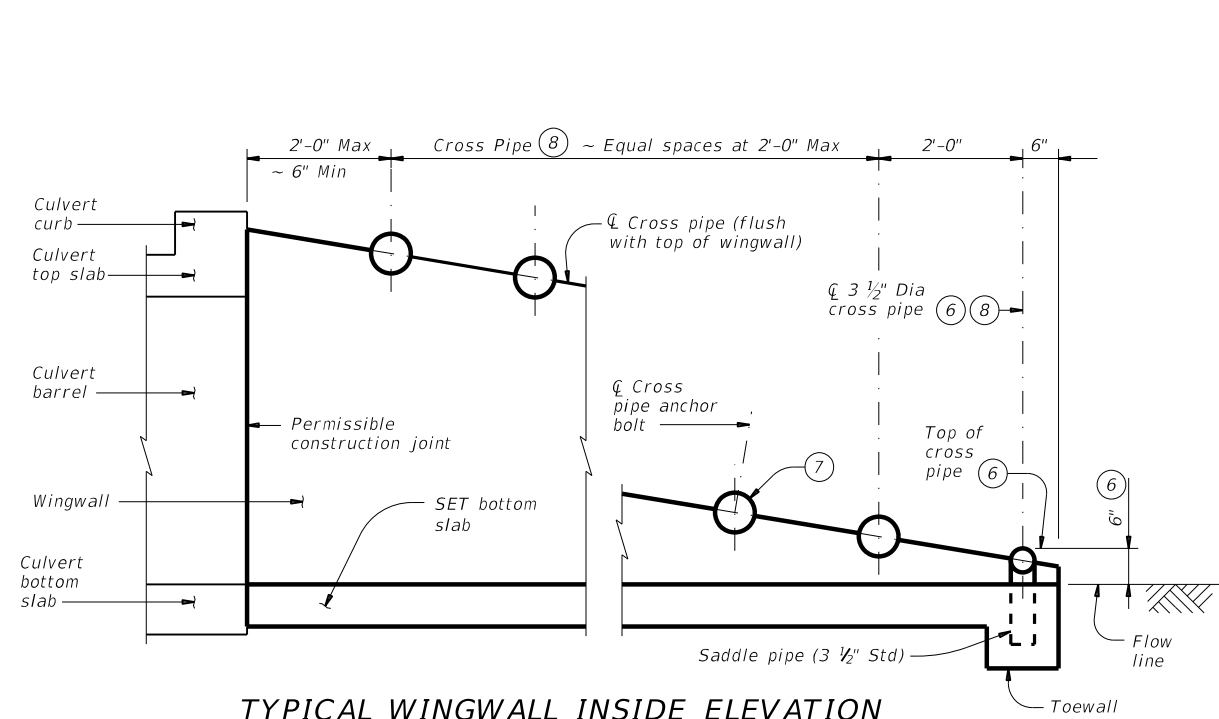
SAFETY END TREATMENT
 FOR BOX CULVERTS
 (MAXIMUM Hw = 7'-0")
 TYPE I ~ PARALLEL DRAINAGE

SETB-PD

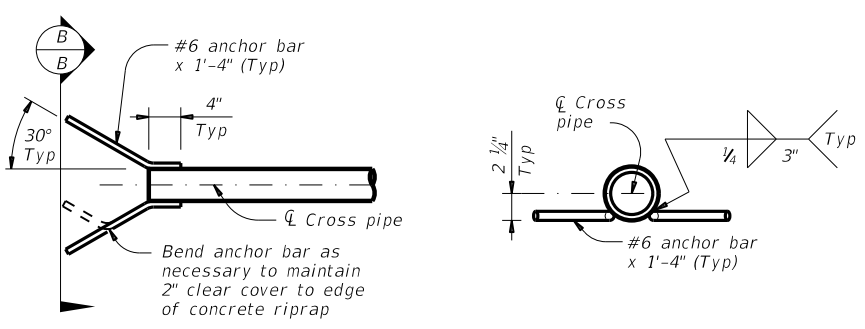
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	DIST	COUNTY	SHEET NO.	
	PAR	LAMAR	112	

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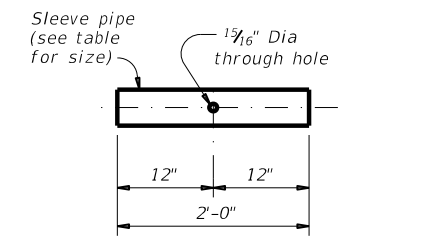
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TYPICAL WINGWALL INSIDE ELEVATION
 (Showing installation of cross pipes.)



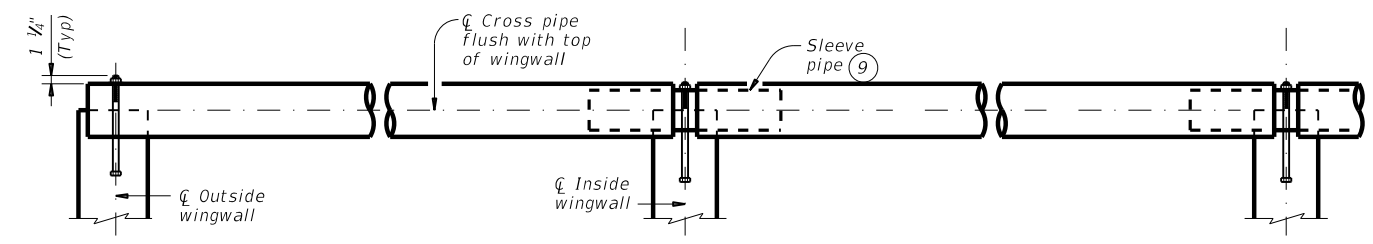
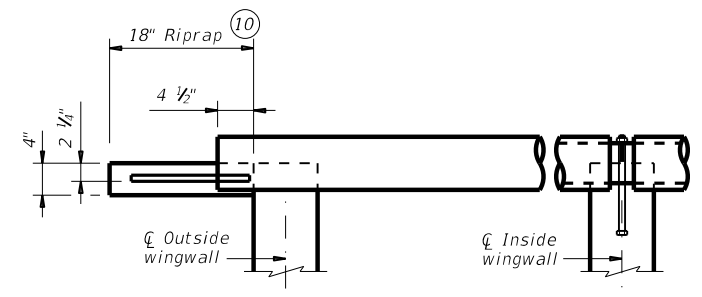
OPTIONAL ANCHOR BAR DETAILS



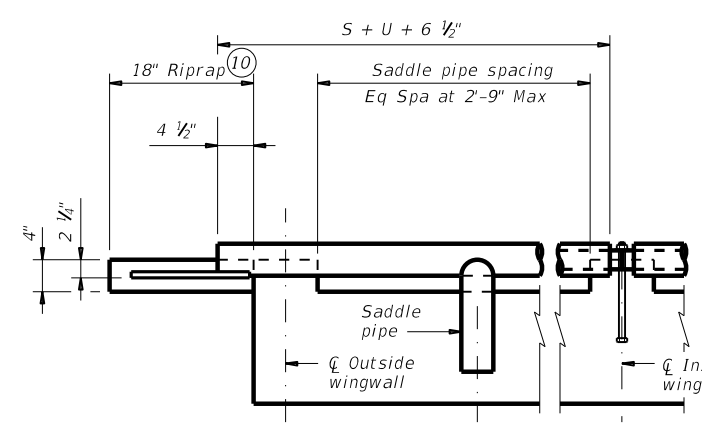
SLEEVE PIPE DETAILS (9)

REQUIRED PIPE SIZES (8)			STANDARD PIPE SIZES		
Culvert Span Sizes	Cross Pipe Size	Sleeve Pipe Size (9)	Pipe Size	Pipe O.D.	Pipe I.D.
First Pipe	3 1/2" STD	2 1/2" STD	2 1/2" STD	2.875"	2.469"
30" to 42"	4" STD	3" STD	3" STD	3.500"	3.068"
48" to 72"	5" STD	4" STD	3 1/2" STD	4.000"	3.548"
78" to 120"	6" STD	5" STD	4" STD	4.500"	4.026"
			5" STD	5.563"	5.047"
			6" STD	6.625"	6.065"

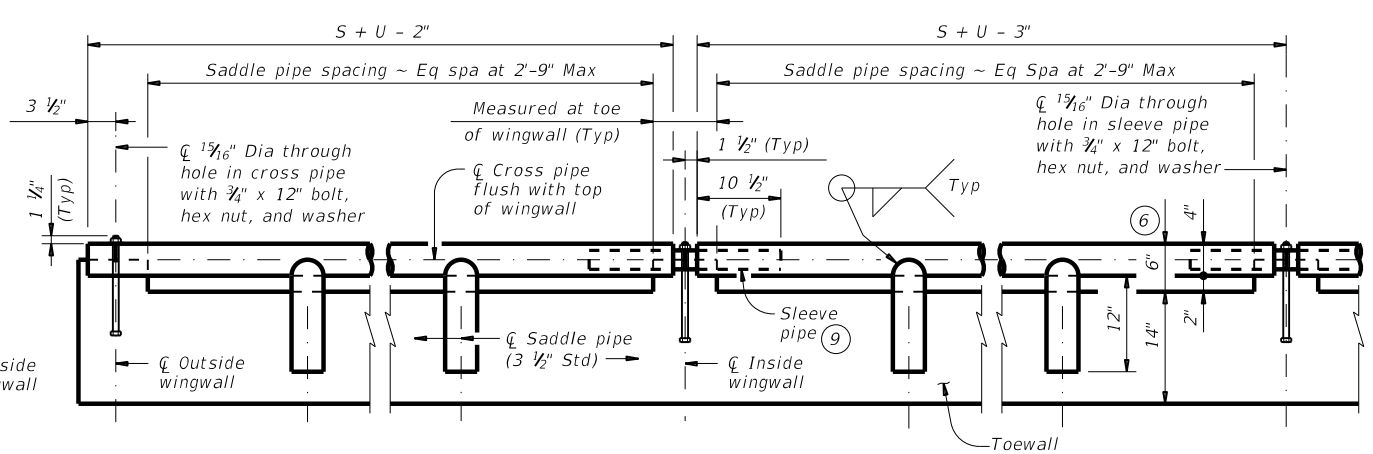
- (6) The proper installation of the first cross pipe is critical for vehicle safety. Place the top of the first cross pipe at no more than 6" above the flow line.
- (7) Always install the third cross pipe from the bottom of the culvert using a bolted connection. Take care to ensure that concrete does not flow into this cross pipe so as to permit disassembly of the bolted connection to allow cleanout access.
- (8) Provide cross pipes and sleeve pipes (if required) as shown in the Required Pipe Sizes table. Provide 3 1#2" saddle pipes for the 3 1#2" first cross pipe.
- (9) At Contractor's option, make the cross pipe continuous across the inside wingwalls. If this option is selected, omit the sleeve pipe and make a 15#16" diameter throughhole in the cross pipe to accept the anchor bolt at the centerline of each interior wingwall.
- (10) Provide riprap when using the Optional Anchor Bar details. Riprap is included in the bid price for Safety End Treatment. Provide riprap in accordance with Item 432, "Riprap".



SECTION THROUGH INSTALLATION OF TYPICAL FULL CROSS PIPE
 (Anchor details and dimensions are similar to those shown below in Section Through Installation of 3 1/2" First Cross Pipe detail.)



OUTSIDE CULVERT BARREL WITH OPTIONAL ANCHOR BARS & RIPRAP



SECTION THROUGH INSTALLATION OF 3 1/2" FIRST CROSS PIPE

OUTSIDE CULVERT BARREL WITH BOLTED ANCHOR

INSIDE CULVERT BARREL

CROSS PIPE INSTALLATION DETAILS

SHEET 2 OF 2

			Bridge Division Standard		
SAFETY END TREATMENT FOR BOX CULVERTS (MAXIMUM Hw = 7'-0") TYPE I ~ PARALLEL DRAINAGE					
SETB-PD					
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©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY	
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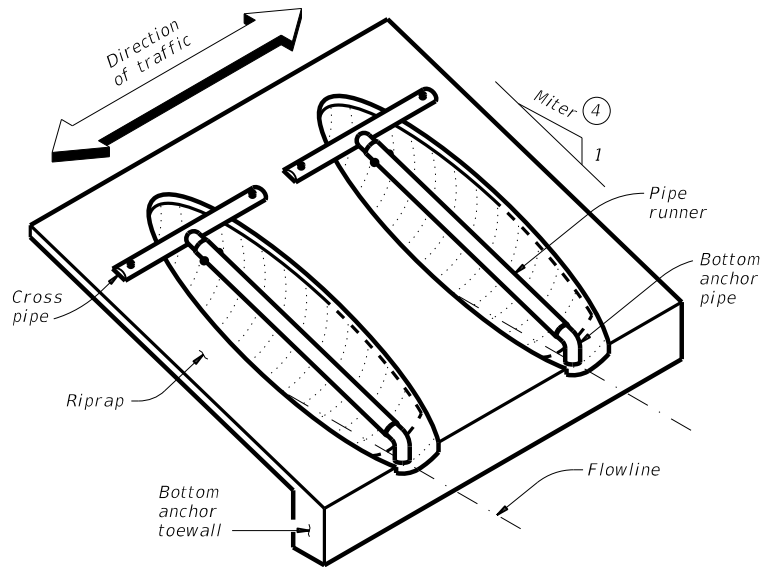
CROSS PIPE LENGTHS AND PIPE RUNNER LENGTHS ① ③

Corrugated Metal Pipe (CMP) Culverts

Design	Pipe Culvert Span	Pipe Culvert Rise	Pipe Culvert Spa ~ G	Cross Pipe Length	Pipe Runner Length												
					3:1 Side Slope				4:1 Side Slope				6:1 Side Slope				
					0° Skew	15° Skew	30° Skew	45° Skew	0° Skew	15° Skew	30° Skew	45° Skew	0° Skew	15° Skew	30° Skew	45° Skew	
1	17"	13"	1' - 0"	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2	21"	15"	1' - 2"	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
3	28"	20"	1' - 5"	3' - 9"	N/A	N/A	3' - 5"	4' - 7"	N/A	N/A	4' - 11"	6' - 5"	N/A	N/A	7' - 11"	10' - 2"	N/A
4	35"	24"	1' - 8"	4' - 4"	3' - 10"	4' - 0"	4' - 7"	6' - 0"	5' - 5"	5' - 8"	6' - 6"	8' - 4"	8' - 8"	9' - 1"	10' - 3"	12' - 11"	N/A
5	42"	29"	1' - 11"	4' - 11"	5' - 1"	5' - 4"	6' - 1"	7' - 10"	7' - 2"	7' - 5"	8' - 6"	10' - 9"	11' - 2"	11' - 8"	13' - 2"	16' - 6"	N/A
6	49"	33"	2' - 2"	5' - 6"	6' - 2"	6' - 5"	7' - 4"	N/A	8' - 6"	8' - 10"	10' - 0"	N/A	N/A	13' - 3"	13' - 9"	15' - 6"	N/A
7	57"	38"	2' - 5"	6' - 2"	7' - 6"	7' - 9"	N/A	N/A	10' - 2"	10' - 7"	N/A	N/A	N/A	15' - 9"	16' - 4"	N/A	N/A

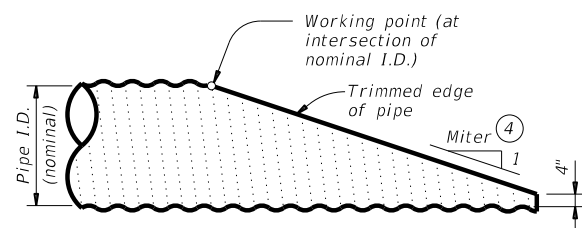
Reinforced Concrete Pipe (RCP) Culverts

Design	Pipe Culvert Span	Pipe Culvert Rise	Pipe Culvert Spa ~ G	Cross Pipe Length	Pipe Runner Length												
					3:1 Side Slope				4:1 Side Slope				6:1 Side Slope				
					0° Skew	15° Skew	30° Skew	45° Skew	0° Skew	15° Skew	30° Skew	45° Skew	0° Skew	15° Skew	30° Skew	45° Skew	
1	22"	13 1/2"	1' - 0"	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2	26"	15 1/2"	1' - 2"	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
3	28 1/2"	18"	1' - 5"	3' - 9 1/2"	N/A	N/A	2' - 10"	3' - 10"	N/A	N/A	4' - 2"	5' - 5"	N/A	N/A	6' - 9"	8' - 9"	N/A
4	36 1/4"	22 1/2"	1' - 8"	4' - 5 1/4"	3' - 5"	3' - 7"	4' - 2"	5' - 6"	4' - 11"	5' - 1"	5' - 11"	7' - 7"	7' - 11"	8' - 3"	9' - 5"	11' - 11"	N/A
5	43 3/4"	26 5/8"	1' - 11"	4' - 0 3/4"	4' - 6"	4' - 8"	5' - 5"	6' - 11"	6' - 4"	6' - 7"	7' - 6"	9' - 7"	10' - 0"	10' - 5"	11' - 9"	14' - 10"	N/A
6	51 1/8"	31 5/16"	2' - 2"	5' - 8"	5' - 9"	6' - 0"	6' - 10"	N/A	7' - 11"	8' - 3"	9' - 4"	N/A	N/A	12' - 4"	12' - 10"	14' - 6"	N/A
7	58 1/2"	36"	2' - 5"	6' - 3 1/2"	6' - 11"	7' - 3"	N/A	N/A	9' - 6"	9' - 11"	N/A	N/A	N/A	14' - 9"	15' - 4"	N/A	N/A



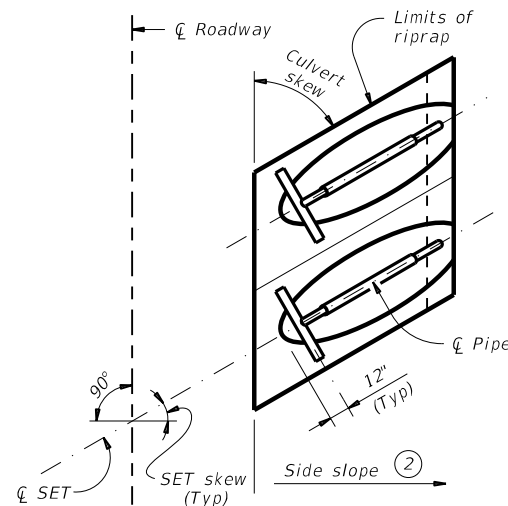
ISOMETRIC VIEW OF TYPICAL INSTALLATION

(Showing installation with no skew.)



SIDE ELEVATION OF TYPICAL PIPE CULVERT MITER

(Showing corrugated metal pipe (CMP) culvert. Details of reinforced concrete pipe (RCP) culvert are similar.)



PLAN OF SKEWED INSTALLATION

TYPICAL PIPE CULVERT MITERS ④

Side Slope	0° Skew	15° Skew	30° Skew	45° Skew
3:1	3:1	3.106:1	3.464:1	4.243:1
4:1	4:1	4.141:1	4.619:1	5.657:1
6:1	6:1	6.212:1	6.928:1	8.485:1

STANDARD PIPE SIZES AND MAX PIPE RUNNER LENGTHS ①

Side Slope	0° Skew	15° Skew	30° Skew	45° Skew	Pipe Size	Pipe O.D.	Pipe I.D.	Max Pipe Runner Length
3:1	3:1	3.106:1	3.464:1	4.243:1	2" STD	2.375"	2.067"	N/A
4:1	4:1	4.141:1	4.619:1	5.657:1	3" STD	3.500"	3.068"	10' - 0"
6:1	6:1	6.212:1	6.928:1	8.485:1	4" STD	4.500"	4.026"	19' - 8"
					5" STD	5.563"	5.047"	34' - 2"

CONDITIONS WHERE PIPE RUNNERS ARE NOT REQUIRED ③

Design	Single Pipe Culvert	Multiple Pipe Culverts
1 and 2	Skews thru 45°	Skews thru 45°
3	Skews thru 35°	Skews thru 10°
4	Normal (no skew)	Always required
5 thru 7	Always required	Always required

MATERIAL NOTES:

Synthetic fibers listed on the "Fibers for Concrete" Material Producer List (MPL) may be used in lieu of steel reinforcing in riprap concrete unless noted otherwise. Provide pipe runners, cross pipes, and anchor pipes that meet the requirements of ASTM A53 (Type E or S, Gr B), ASTM A500 Gr B, or API 5LX52. Provide ASTM A307 bolts and nuts. Galvanize all steel components, except concrete reinforcing, after fabrication. Repair galvanizing damaged during transport or construction in accordance with the specifications.

GENERAL NOTES:

Pipe runners are designed for a traversing load of 1,800 pounds at yield as recommended by Research Report 280-1, "Safety Treatment of Roadside Cross-Drainage Structures", Texas Transportation Institute, March 1981. Safety end treatments (SET) shown herein are intended for use in those installations where out of control vehicles are likely to traverse the openings approximately perpendicular to the Pipe Runners. Construct concrete riprap and all necessary inverts in accordance with the requirements of Item 432, "Riprap". Payment for riprap and toewall is included in the price bid for each safety end treatment.

- ① Provide pipe runner of the size shown in the tables. Provide cross pipe of the same size as the pipe runner. Provide cross pipe stub out and bottom anchor pipe of the next smaller size pipe as shown in the Standard Pipe Sizes and Max Pipe Runners Lengths table.
- ② Recommended values of slope are 3:1, 4:1, and 6:1. All quantities, calculations, and dimensions shown herein are based on these recommended values. Slope of 3:1 or flatter is required for vehicle safety.
- ③ This standard allows for the placement of only one pipe runner across each culvert pipe opening. In order to limit the clear opening to be traversed by an errant vehicle, the following conditions must be met:
 - For Design 1 through 5 culvert pipe sizes, the skew must not exceed 45°.
 - For Design 6 culvert pipes, the skew must not exceed 30°.
 - For Design 7 culvert pipes, the skew must not exceed 15°.

If the above conditions cannot be met, the designer should consider using a safety end treatment with flared wings. For further information, refer to the TxDOT "Roadway Design Manual".

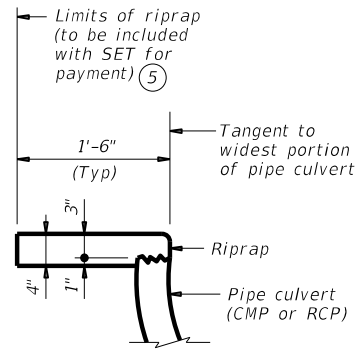
- ④ Miter = slope of mitered end of pipe culvert.

SHEET 1 OF 3

		Bridge Division Standard	
<h2 style="margin: 0;">SAFETY END TREATMENT</h2> <h3 style="margin: 0;">FOR DESIGN 1 TO 7</h3> <h3 style="margin: 0;">ARCH PIPE CULVERTS</h3> <h3 style="margin: 0;">TYPE II ~ CROSS DRAINAGE</h3>			
<h2 style="margin: 0;">SETP-CD-A</h2>			
FILE: setp-case-20.dgn	DN: GAF	CK: CAT	DW: JRP
©TxDOT February 2020	CONT SECT	JOB	HIGHWAY
REVISIONS	0435 01	080	FM 38
DIST	COUNTY	SHEET NO.	
PAR	LAMAR	114	

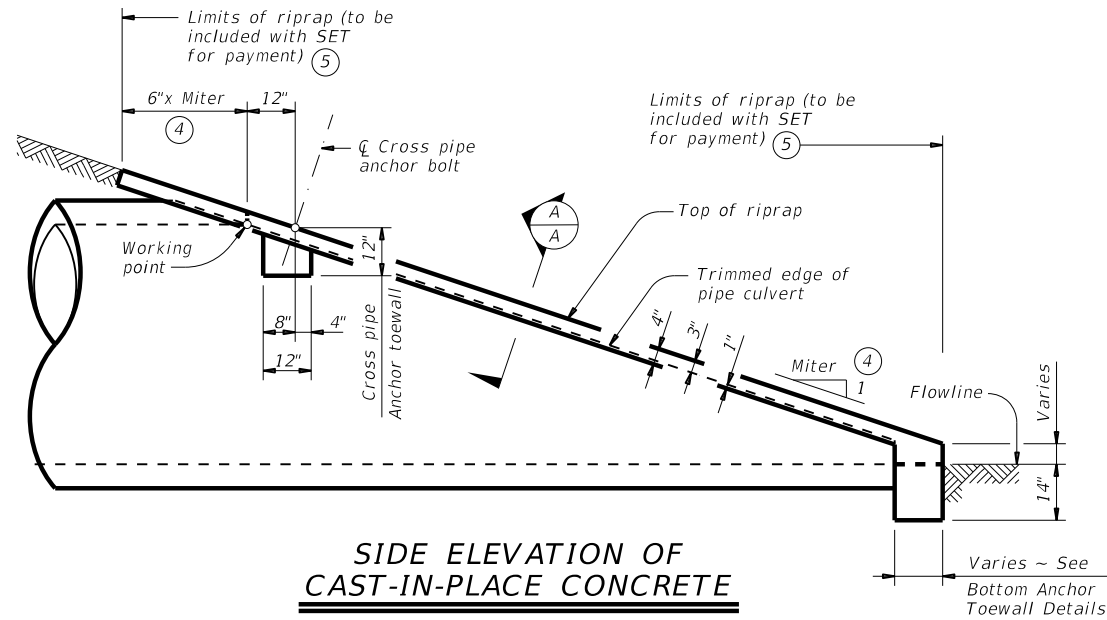
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SHOWING TYPICAL PIPE CULVERT AND RIPRAP

SECTION A-A



SIDE ELEVATION OF CAST-IN-PLACE CONCRETE

(Showing reinforced concrete pipe (RCP) culvert. Details of corrugated metal pipe (CMP) culvert are similar. Pipe runners not shown for clarity.)

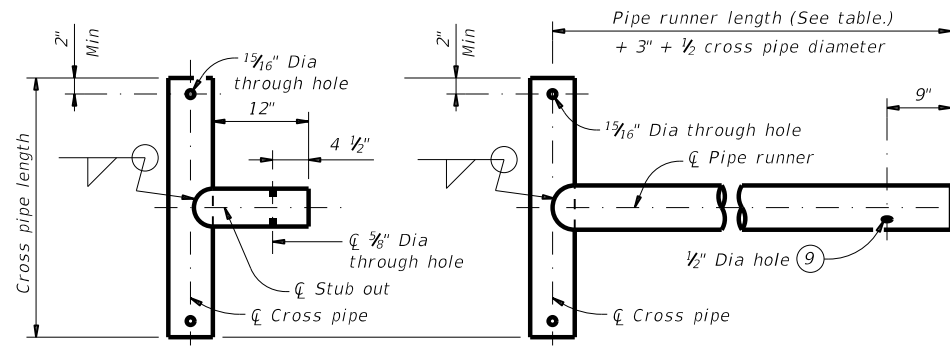
ESTIMATED CONCRETE RIPRAP QUANTITIES (CY) ⑥												
FOR BOTH CORRUGATED METAL PIPE CULVERTS AND CONCRETE PIPE CULVERTS												
Design	3:1 Side Slope				4:1 Side Slope				6:1 Side Slope			
	0° Skew	15° Skew	30° Skew	45° Skew	0° Skew	15° Skew	30° Skew	45° Skew	0° Skew	15° Skew	30° Skew	45° Skew
1	0.5	0.5	0.5	0.6	0.6	0.6	0.6	0.7	0.7	0.7	0.8	0.9
2	0.5	0.5	0.6	0.6	0.6	0.6	0.6	0.7	0.7	0.8	0.8	1.0
3	0.6	0.6	0.7	0.8	0.7	0.7	0.8	0.9	0.9	1.0	1.0	1.2
4	0.7	0.7	0.8	0.9	0.8	0.9	0.9	1.0	1.1	1.1	1.2	1.4
5	0.8	0.8	0.9	1.0	1.0	1.0	1.1	1.2	1.3	1.3	1.4	1.7
6	0.9	1.0	1.0	N/A	1.1	1.1	1.2	N/A	1.4	1.5	1.6	N/A
7	1.0	1.1	N/A	N/A	1.3	1.3	N/A	N/A	1.7	1.7	N/A	N/A

- ④ Miter = slope of mitered end of pipe culvert.
- ⑤ Riprap placed beyond the limits shown will be paid for as concrete riprap in accordance with Item 432, "Riprap".
- ⑥ Quantities shown are for one end of one pipe culvert. For multiple pipe culverts, quantities will need to be adjusted. Riprap quantities are for Contractor's information only.

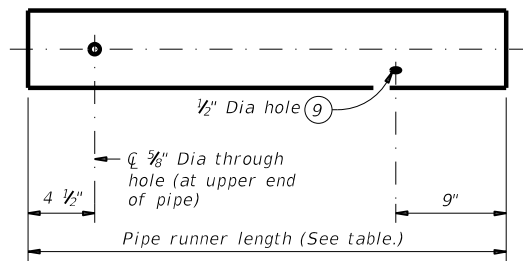
					Bridge Division Standard				
SAFETY END TREATMENT FOR DESIGN 1 TO 7 ARCH PIPE CULVERTS TYPE II ~ CROSS DRAINAGE									
SETP-CD-A									
FILE:	setpcae-20.dgn	DN:	GAF	CK:	CAT	DW:	JRP	CK:	GAF
©TxDOT	February 2020	CONT	SECT	JOB	HIGHWAY				
REVISIONS		0435	01	080	FM 38				
		DIST	COUNTY		SHEET NO.				
		PAR	LAMAR		115				

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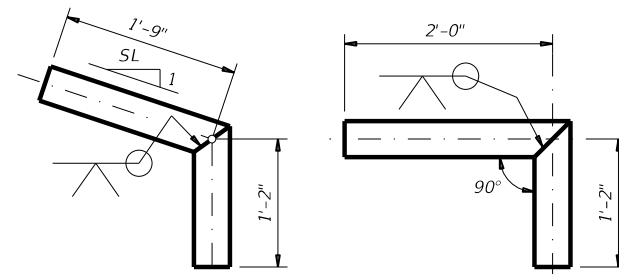


CROSS PIPE AND CONNECTIONS DETAILS

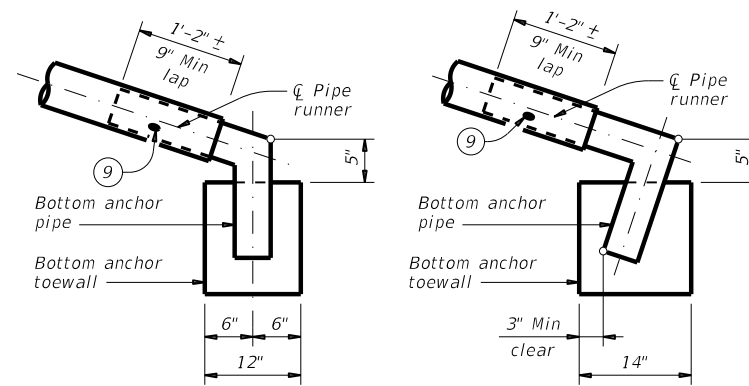


NOTE: The separate pipe runner shown is required when Cross Pipe Connection Option A1 is used.

PIPE RUNNER DETAILS

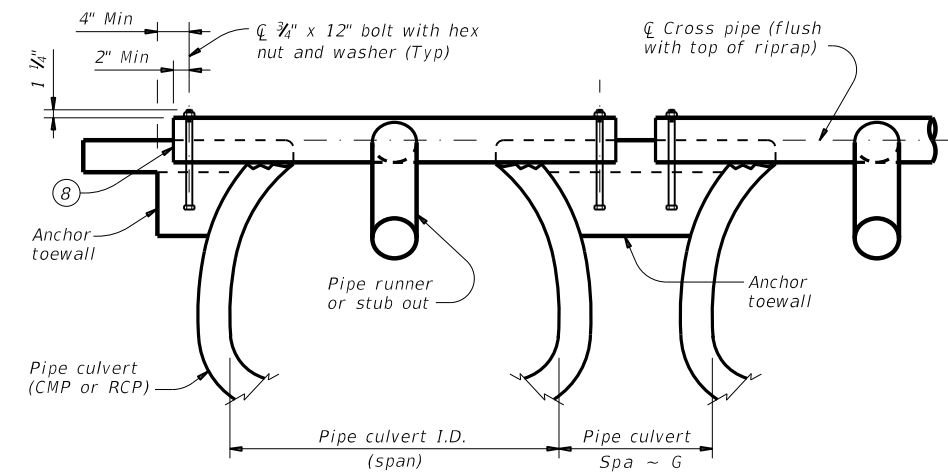


BOTTOM ANCHOR PIPE DETAILS

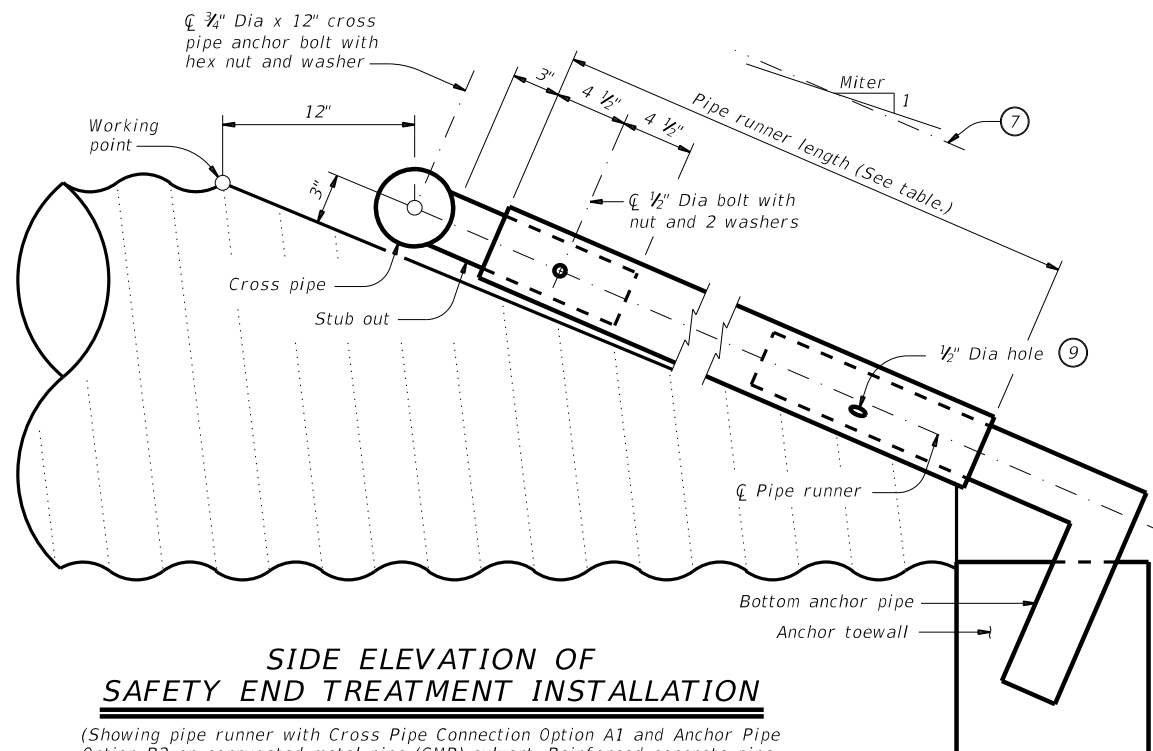


BOTTOM ANCHOR TOEWALL DETAILS

(Culvert and riprap not shown for clarity.)



SECTION A-A



SIDE ELEVATION OF SAFETY END TREATMENT INSTALLATION

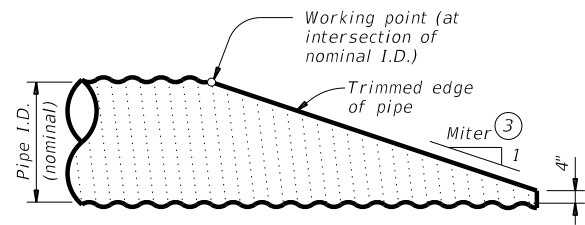
(Showing pipe runner with Cross Pipe Connection Option A1 and Anchor Pipe Option B2 on corrugated metal pipe (CMP) culvert. Reinforced concrete pipe (RCP) culvert details are similar. Riprap not shown for clarity.)

- ⑦ Note that actual slope of pipe runner may vary slightly from side slope of riprap and trimmed culvert pipe edge.
- ⑧ Ensure that riprap concrete does not flow into the cross pipe so as to permit disassembly of the bolted connection to allow cleanout access.
- ⑨ After installation, inspect the 1#2" hole to ensure that the lap of the pipe runner with the bottom anchor pipe is adequate.
- ⑩ At fabricator's option, a heat bend to a smooth 5" radius or a manufactured elbow (of the same material as the runner) may be substituted for the mitered and welded joint in the bottom anchor pipe.

SHEET 3 OF 3

		Bridge Division Standard	
SAFETY END TREATMENT FOR DESIGN 1 TO 7 ARCH PIPE CULVERTS TYPE II ~ CROSS DRAINAGE			
SETP-CD-A			
FILE: setpcae-20.dgn	DN: GAF	CK: CAT	DW: JRP
©TxDOT February 2020	CONT SECT	JOB	HIGHWAY
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PAR	LAMAR	116	

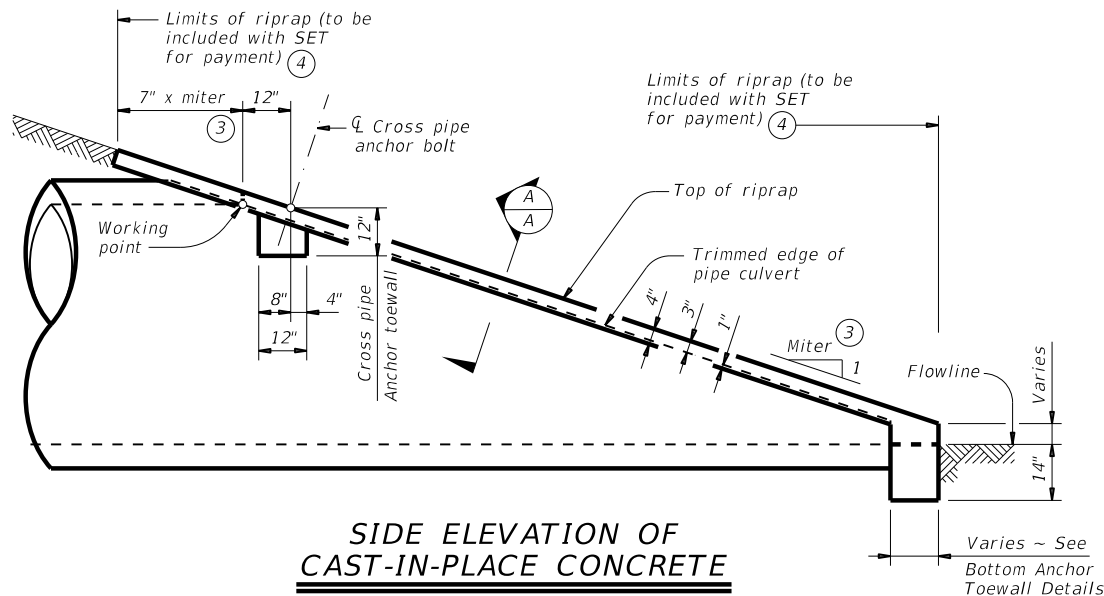
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NOTE: All pipe runners, calculations, and dimensions are based on the pipe culverts mitered as shown in this detail. Alternate styles of mitered ends will require that appropriate adjustments be made to the values presented on this standard.

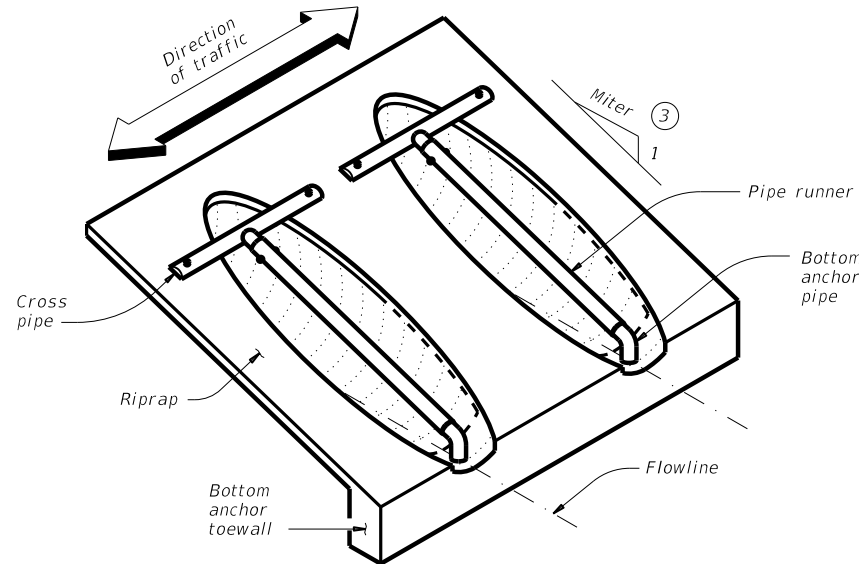
SIDE ELEVATION OF TYPICAL PIPE CULVERT MITER

(Showing corrugated metal pipe (CMP) culvert. Details of reinforced concrete pipe (RCP) culvert are similar.)



SIDE ELEVATION OF CAST-IN-PLACE CONCRETE

(Showing reinforced concrete pipe (RCP) culvert. Details of corrugated metal pipe (CMP) culvert are similar. Pipe runners not shown for clarity)



ISOMETRIC VIEW OF TYPICAL INSTALLATION

(Showing installation with no skew.)

CROSS PIPE LENGTHS AND PIPE RUNNER LENGTHS (1)(2)

Nominal Culvert I.D.	Pipe Culvert Spa ~ G	Cross Pipe Length	Pipe Runner Length											
			3:1 Side Slope				4:1 Side Slope				6:1 Side Slope			
			0° Skew	15° Skew	30° Skew	45° Skew	0° Skew	15° Skew	30° Skew	45° Skew	0° Skew	15° Skew	30° Skew	45° Skew
24"	1' - 7"	3' - 5"	N/A	N/A	N/A	5' - 10"	N/A	N/A	N/A	8' - 1"	N/A	N/A	N/A	12' - 9"
27"	1' - 8"	3' - 8"	N/A	N/A	5' - 5"	6' - 11"	N/A	N/A	7' - 7"	9' - 7"	N/A	N/A	11' - 11"	14' - 11"
30"	1' - 10"	3' - 11"	N/A	N/A	6' - 4"	8' - 0"	N/A	N/A	8' - 9"	11' - 0"	N/A	N/A	13' - 8"	17' - 0"
33"	1' - 11"	4' - 2"	6' - 2"	6' - 5"	7' - 3"	9' - 1"	8' - 6"	8' - 10"	10' - 0"	12' - 5"	13' - 3"	13' - 9"	15' - 5"	19' - 2"
36"	2' - 1"	4' - 5"	6' - 11"	7' - 3"	8' - 2"	10' - 2"	9' - 6"	9' - 11"	11' - 2"	13' - 10"	14' - 9"	15' - 3"	17' - 2"	21' - 3"
42"	2' - 4"	4' - 11"	8' - 6"	8' - 10"	9' - 11"	12' - 4"	11' - 7"	12' - 0"	13' - 6"	16' - 8"	17' - 9"	18' - 5"	20' - 8"	25' - 7"
48"	2' - 7"	5' - 5"	10' - 1"	10' - 5"	11' - 9"	N/A	13' - 7"	14' - 2"	15' - 10"	N/A	20' - 9"	21' - 6"	24' - 2"	N/A
54"	3' - 0"	5' - 11"	11' - 8"	12' - 1"	N/A	N/A	15' - 8"	16' - 3"	N/A	N/A	23' - 10"	24' - 8"	N/A	N/A
60"	3' - 3"	6' - 5"	13' - 3"	N/A	N/A	N/A	17' - 9"	N/A	N/A	N/A	26' - 10"	N/A	N/A	N/A

TYPICAL PIPE CULVERT MITERS (3)

Side Slope	0° Skew	15° Skew	30° Skew	45° Skew
3:1	3:1	3.106:1	3.464:1	4.243:1
4:1	4:1	4.141:1	4.619:1	5.657:1
6:1	6:1	6.212:1	6.928:1	8.485:1

CONDITIONS WHERE PIPE RUNNERS ARE NOT REQUIRED (2)

Nominal Culvert I.D.	Single Pipe Culvert	Multiple Pipe Culverts
12" thru 21"	Skews thru 45°	Skews thru 45°
24"	Skews thru 45°	Skews thru 30°
27"	Skews thru 30°	Skews thru 15°
30"	Skews thru 15°	Skews thru 15°
33"	Skews thru 15°	Always required
36"	Normal (no skew)	Always required
42" thru 60"	Always required	Always required

STANDARD PIPE SIZES AND MAX PIPE RUNNER LENGTHS (1)

Pipe Size	Pipe O.D.	Pipe I.D.	Max Pipe Runner Length
2" STD	2.375"	2.067"	N/A
3" STD	3.500"	3.068"	10' - 0"
4" STD	4.500"	4.026"	19' - 8"
5" STD	5.563"	5.047"	34' - 2"

ESTIMATED CONCRETE RIPRAP QUANTITIES (CY) (5)

Nominal Culvert I.D.	3:1 Side Slope				4:1 Side Slope				6:1 Side Slope			
	0° Skew	15° Skew	30° Skew	45° Skew	0° Skew	15° Skew	30° Skew	45° Skew	0° Skew	15° Skew	30° Skew	45° Skew
12"	0.4	0.4	0.5	0.5	0.5	0.5	0.5	0.6	0.7	0.7	0.7	0.8
15"	0.5	0.5	0.5	0.6	0.6	0.6	0.6	0.7	0.7	0.7	0.8	0.9
18"	0.5	0.5	0.6	0.6	0.6	0.7	0.7	0.8	0.8	0.8	0.9	1.0
21"	0.6	0.6	0.6	0.7	0.7	0.7	0.8	0.9	0.9	0.9	1.0	1.2
24"	0.6	0.7	0.7	0.8	0.8	0.8	0.8	1.0	1.0	1.0	1.1	1.3
27"	0.7	0.7	0.8	0.9	0.8	0.9	0.9	1.1	1.1	1.1	1.2	1.4
30"	0.8	0.8	0.8	0.9	0.9	0.9	1.0	1.2	1.2	1.2	1.3	1.6
33"	0.8	0.8	0.9	1.0	1.0	1.0	1.1	1.3	1.3	1.4	1.5	1.7
36"	0.9	0.9	0.9	1.1	1.1	1.1	1.2	1.4	1.4	1.5	1.6	1.8
42"	1.0	1.0	1.1	1.3	1.2	1.3	1.3	1.6	1.6	1.7	1.8	2.1
48"	1.1	1.1	1.2	N/A	1.4	1.4	1.5	N/A	1.9	1.9	2.1	N/A
54"	1.3	1.3	N/A	N/A	1.6	1.6	N/A	N/A	2.1	2.1	N/A	N/A
60"	1.4	N/A	N/A	N/A	1.7	N/A	N/A	N/A	2.3	N/A	N/A	N/A

(1) Provide pipe runner of the size shown in the tables. Provide cross pipe of the same size as the pipe runner. Provide cross pipe stub out and bottom anchor pipe of the next smaller size pipe as shown in the Standard Pipe Sizes and Max Pipe Runner Lengths table.

(2) This standard allows for the placement of only one pipe runner across each culvert pipe opening. In order to limit the clear opening to be traversed by an errant vehicle, the following conditions must be met:

For 60" culvert pipes, the skew must not exceed 0°.
 For 54" culvert pipes, the skew must not exceed 15°.
 For 48" culvert pipes, the skew must not exceed 30°.
 For all culvert pipe sizes 42" and less, the skew must not exceed 45°.

If the above conditions cannot be met, the designer should consider using a safety end treatment with flared wings. For further information, refer to the TxDOT Roadway Design Manual.

(3) Miter = slope of mitered end of pipe culvert.

(4) Riprap placed beyond the limits shown will be paid for as concrete riprap in accordance with Item 432, "Riprap".

(5) Quantities shown are for one end of one reinforced concrete pipe (RCP) culvert. For multiple pipe culverts or for corrugated metal pipe (CMP) culverts, quantities will need to be adjusted. Riprap quantities are for Contractor's information only.

SHEET 1 OF 2

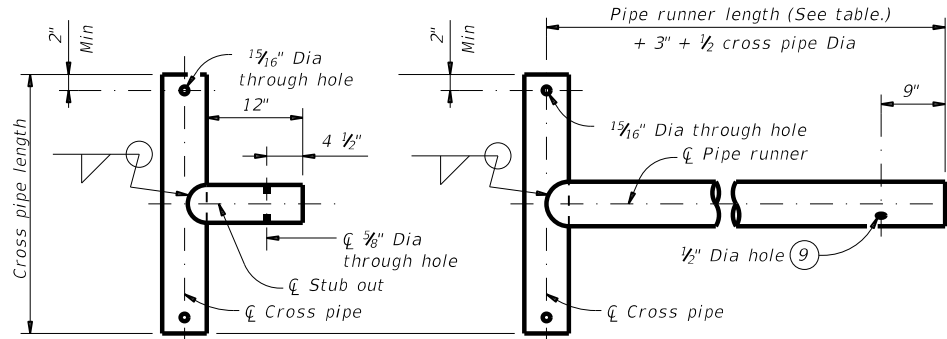


SAFETY END TREATMENT FOR 12" DIA TO 60" DIA PIPE CULVERTS TYPE II ~ CROSS DRAINAGE

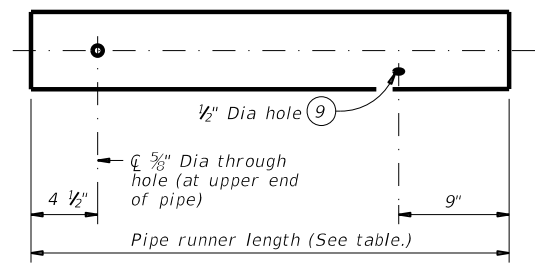
SETP-CD

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	PAR	LAMAR	117	

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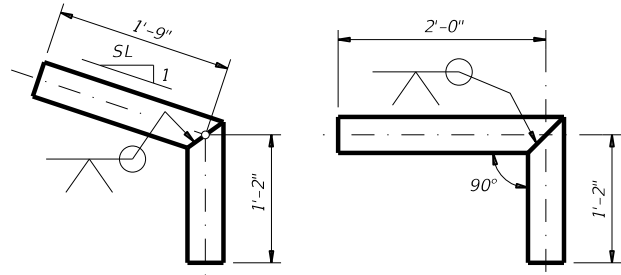


OPTION A1 **OPTION A2**
CROSS PIPE AND CONNECTIONS DETAILS

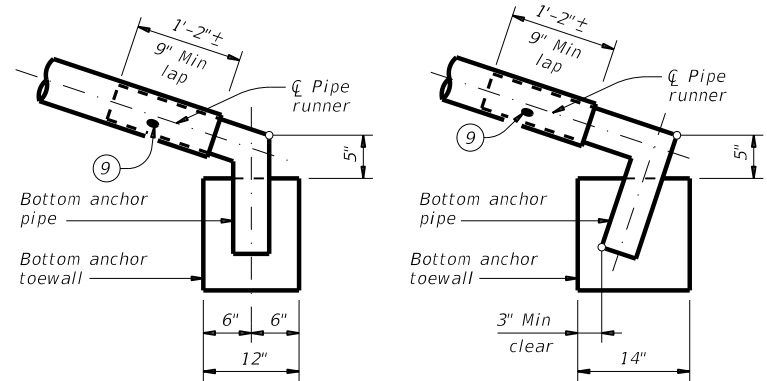


NOTE: The separate pipe runner shown is required when Cross Pipe Connection Option A1 is used.

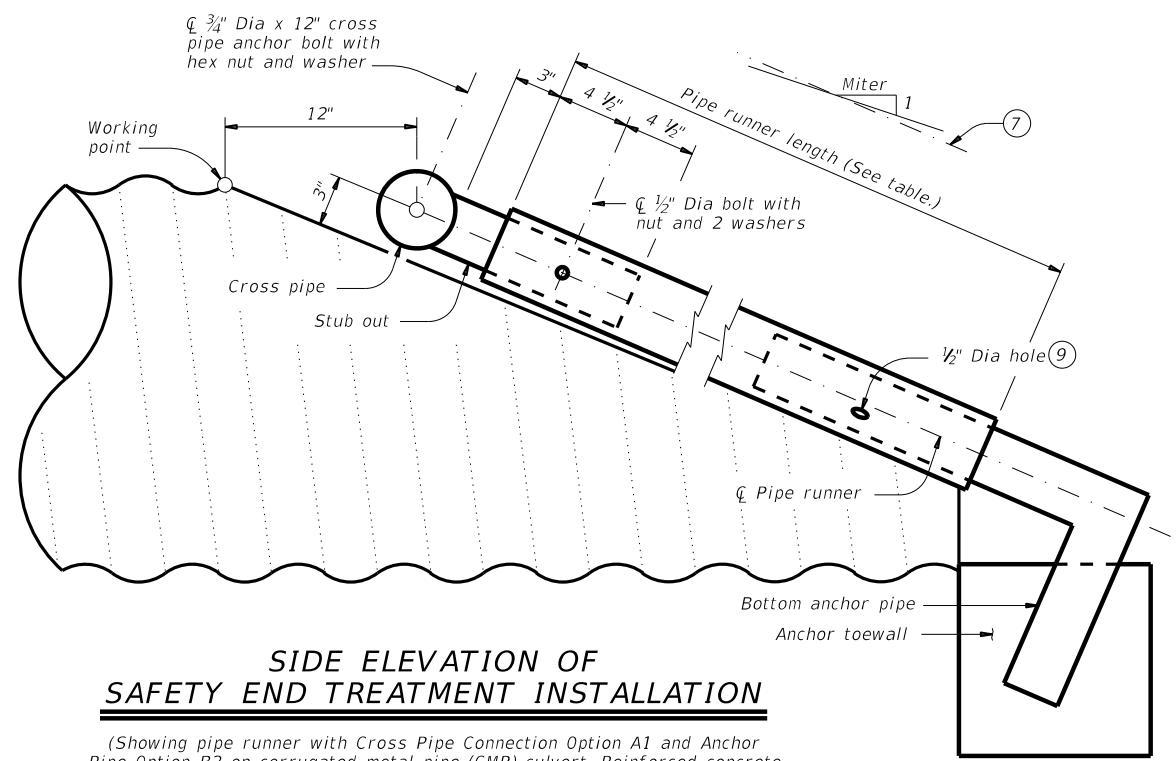
PIPE RUNNER DETAILS



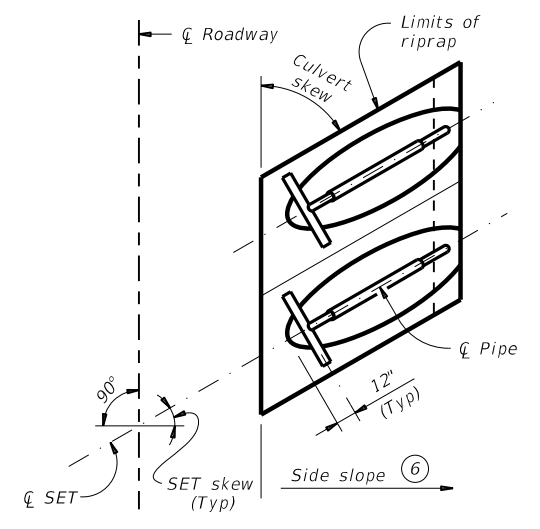
OPTION B1 **OPTION B2**
BOTTOM ANCHOR PIPE DETAILS ⑩



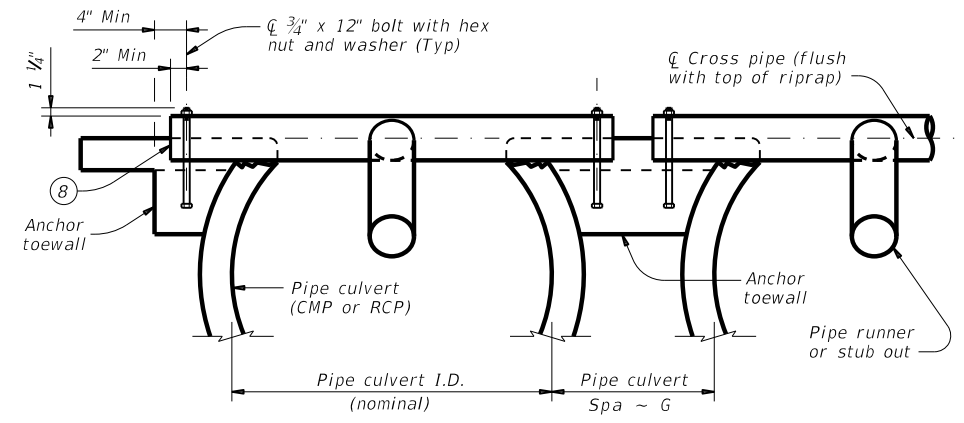
OPTION B1 **OPTION B2**
BOTTOM ANCHOR TOEWALL DETAILS
 (Culvert and riprap not shown for clarity.)



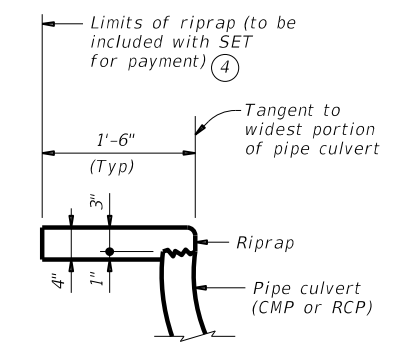
SIDE ELEVATION OF SAFETY END TREATMENT INSTALLATION
 (Showing pipe runner with Cross Pipe Connection Option A1 and Anchor Pipe Option B2 on corrugated metal pipe (CMP) culvert. Reinforced concrete pipe culvert (RCP) details are similar. Riprap not shown for clarity.)



PLAN OF SKEWED INSTALLATION



SHOWING CROSS PIPE AND ANCHOR TOEWALL



SHOWING TYPICAL PIPE CULVERT AND RIPRAP

SECTION A-A

- ④ Riprap placed beyond the limits shown will be paid for as concrete riprap in accordance with Item 432, "Riprap".
- ⑥ Recommended values of side slope are 3:1, 4:1, and 6:1. All quantities, calculations, and dimensions shown herein are based on these recommended values. Slope of 3:1 or flatter is required for vehicle safety.
- ⑦ Note that actual slope of pipe runner may vary slightly from side slope of riprap and trimmed culvert pipe edge.
- ⑧ Ensure that riprap concrete does not flow into the cross pipe so as to permit disassembly of the bolted connection to allow cleanout access.
- ⑨ After installation, inspect the 1/2" hole to ensure that the lap of the pipe runner with the bottom anchor pipe is adequate.
- ⑩ At fabricator's option, a heat bend to a smooth 5" radius or a manufactured elbow (of the same material as the runner) may be substituted for the mitered and welded joint in the bottom anchor pipe.

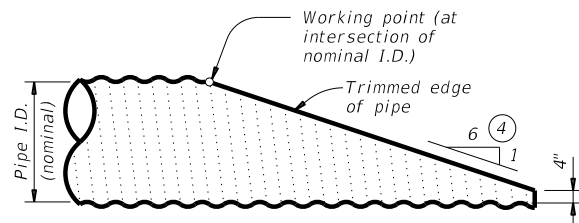
MATERIAL NOTES:
 Synthetic fibers listed on the "Fibers for Concrete" Material Producer List (MPL) may be used in lieu of steel reinforcing in riprap concrete unless noted otherwise.
 Provide pipe runners, cross pipes, and anchor pipes conforming to the requirements of ASTM A53 (Type E or S, Gr B), ASTM A500 Gr B, or API 5LX52.
 Provide ASTM A307 bolts and nuts.
 Galvanize all steel components, except concrete reinforcing, after fabrication.
 Repair galvanizing damaged during transport or construction in accordance with the specifications.

GENERAL NOTES:
 Pipe runners are designed for a traversing load of 1,800 pounds at yield as recommended by Research Report 280-1, "Safety Treatment of Roadside Cross-Drainage Structures", Texas Transportation Institute, March 1981.
 Safety end treatments (SET) shown herein are intended for use in those installations where out of control vehicles are likely to traverse the openings approximately perpendicular to the pipe runners.
 Payment for riprap and toewall is included in the price bid for each safety end treatment.
 Construct concrete riprap and all necessary inverts in accordance with the requirements of Item 432, "Riprap".

SHEET 2 OF 2

		Bridge Division Standard	
SAFETY END TREATMENT FOR 12" DIA TO 60" DIA PIPE CULVERTS TYPE II ~ CROSS DRAINAGE			
SETP-CD			
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REVISIONS	0435 01	080	FM 38
	DIST	COUNTY	SHEET NO.
	PAR	LAMAR	118

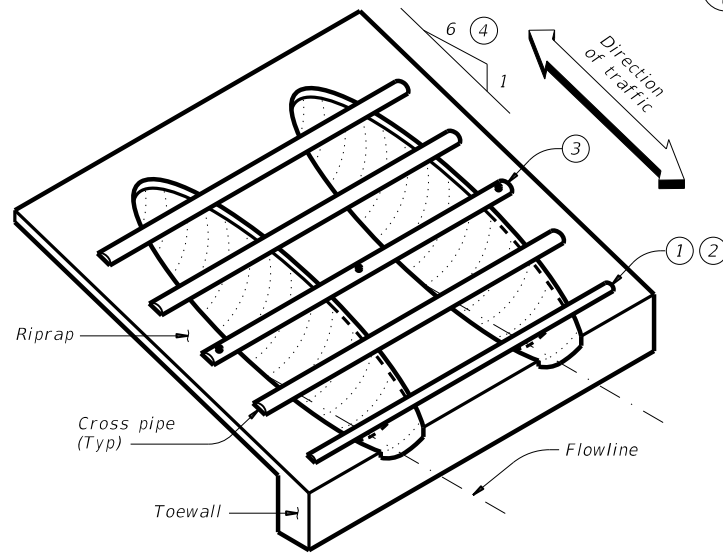
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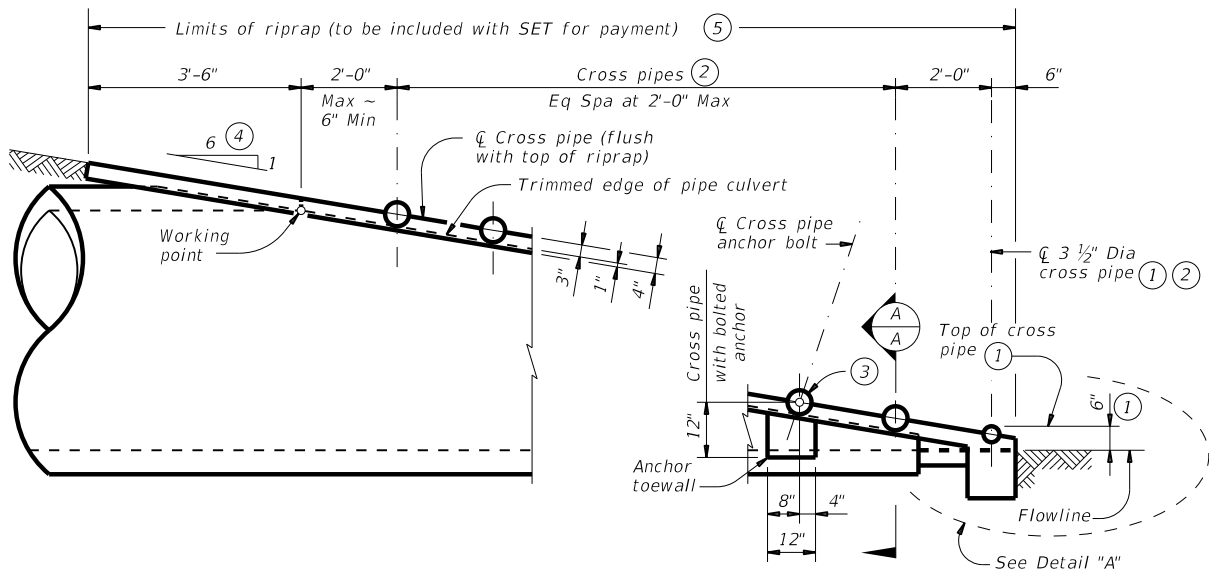
NOTE: All cross pipes, calculations, and dimensions are based on the pipe culverts mitered as shown in this detail. Alternate styles of mitered ends will require that appropriate adjustments be made to the values presented on this standard.

SIDE ELEVATION OF TYPICAL PIPE CULVERT MITER

(Showing corrugated metal pipe (CMP) culvert. Details at reinforced concrete pipe (RCP) culvert are similar.)

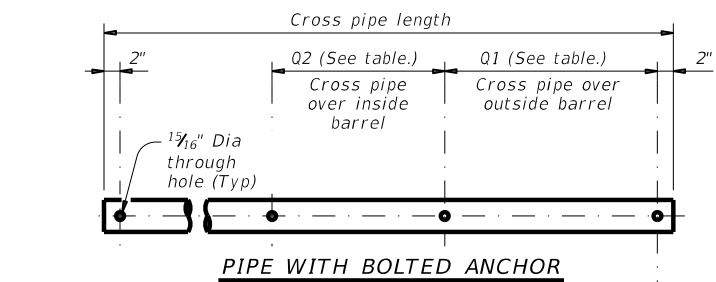


ISOMETRIC VIEW OF TYPICAL INSTALLATION

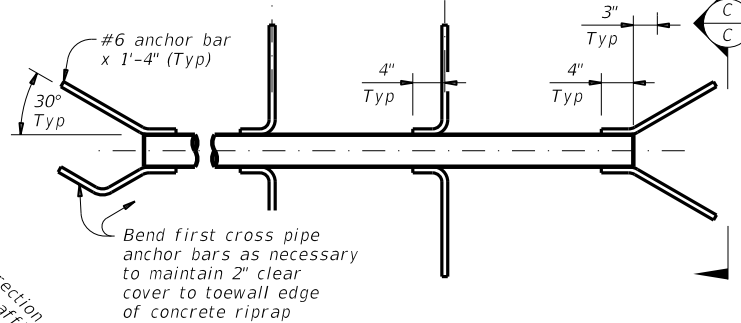


SIDE ELEVATION OF CAST-IN-PLACE CONCRETE

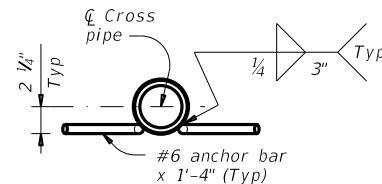
(Showing reinforced concrete pipe (RCP) culvert. Details at corrugated metal pipe (CMP) culvert are similar.)



PIPE WITH BOLTED ANCHOR

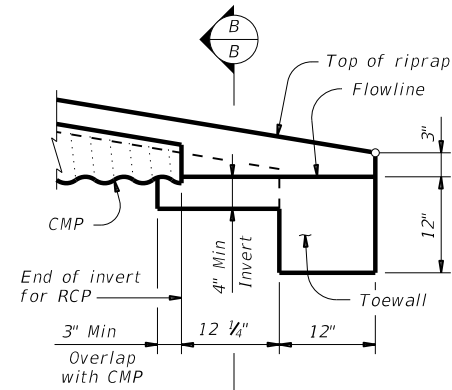


PIPE WITH ANCHOR BARS



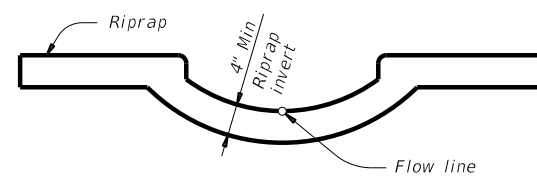
SECTION C-C

CROSS PIPE DETAILS



DETAIL "A"

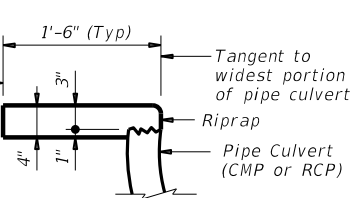
(Showing invert with corrugated metal pipe (CMP) culvert. Reinforced concrete pipe (RCP) culvert details are similar. Cross pipes not shown for clarity.)



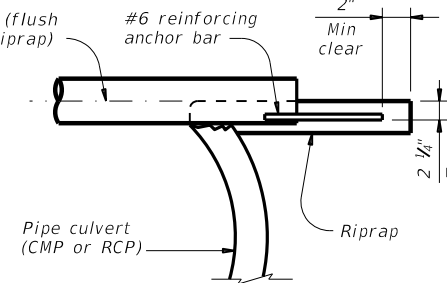
SECTION B-B

(Cross pipes not shown for clarity.)

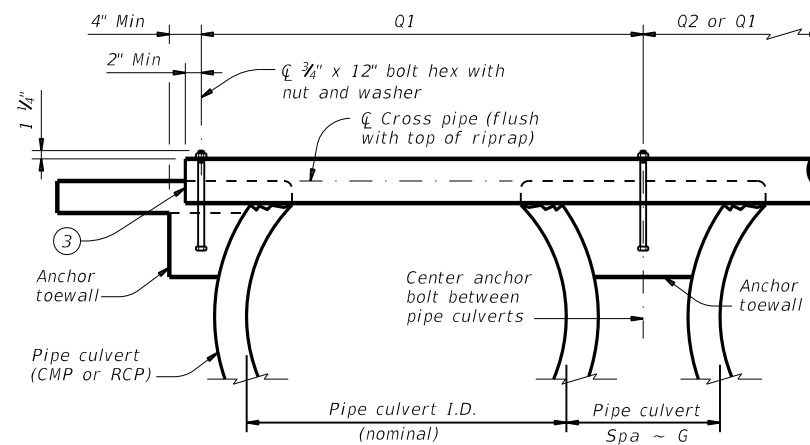
Limits of riprap (to be included with SET for payment) ⑤



SHOWING TYPICAL PIPE CULVERT AND RIPRAP



SHOWING CROSS PIPE WITH ANCHOR BAR



SHOWING CROSS PIPE WITH BOLTED ANCHOR

SECTION A-A

CROSS PIPE LENGTHS, REQUIRED PIPE SIZES, AND RIPRAP QUANTITIES

Nominal Culvert I.D.	Conc Riprap (CY) ⑥	Pipe Culvert Spa ~ G	Single Barrel ~ Q1	Multi-Barrel ~ Q1	Q2	Conditions for Use of Cross Pipes	Cross Pipe Sizes
12"	0.6	0' - 9"	N/A	2' - 1"	1' - 9"	3 or more pipe culverts	3" Std (3.500" O.D.)
15"	0.7	0' - 11"	N/A	2' - 5"	2' - 2"		
18"	0.8	1' - 2"	N/A	2' - 10"	2' - 8"		
21"	0.9	1' - 4"	N/A	3' - 2"	3' - 1"		
24"	0.9	1' - 7"	N/A	3' - 6"	3' - 7"	3 or more pipe culverts	3 1/2" Std (4.000" O.D.)
27"	1.0	1' - 8"	N/A	3' - 10"	3' - 11"	2 or more pipe culverts	
30"	1.1	1' - 10"	N/A	4' - 2"	4' - 4"	All pipe culverts	
33"	1.2	1' - 11"	4' - 2"	4' - 5"	4' - 8"	All pipe culverts	4" Std (4.500" O.D.)
36"	1.3	2' - 1"	4' - 5"	4' - 9"	5' - 1"		
42"	1.5	2' - 4"	4' - 11"	5' - 5"	5' - 10"	All pipe culverts	5" Std (5.563" O.D.)
48"	1.7	2' - 7"	5' - 5"	6' - 0"	6' - 7"		
54"	2.0	3' - 0"	5' - 11"	6' - 9"	7' - 6"		
60"	2.2	3' - 3"	6' - 5"	7' - 4"	8' - 3"	All pipe culverts	5" Std (5.563" O.D.)
66"	2.4	3' - 3"	6' - 11"	7' - 10"	8' - 9"		
72"	2.7	3' - 4"	7' - 5"	8' - 5"	9' - 4"		

- The proper installation of the first cross pipe is critical for vehicle safety. Place the top of the first cross pipe no more than 6" above the flowline.
- Provide cross pipes, except the first bottom pipe, of the size shown in the table. Provide a 3 1/2" standard pipe (4" O.D.) for the first bottom pipe.
- Install the third cross pipe from the bottom of the culvert using a bolted connection. Ensure that riprap concrete does not flow into the cross pipe so as to permit disassembly of the bolted connection to allow cleanout access. At the Contractor's option, install all other cross pipes using the bolted connection details.
- Match cross slope as shown elsewhere in the plans. Cross slope of 6:1 or flatter is required for vehicle safety.
- Riprap placed beyond the limits shown will be paid for as concrete riprap in accordance with Item 432, "Riprap".
- Quantities shown are for one end of one reinforced concrete pipe (RCP) culvert. For multiple pipe culverts or for corrugated metal pipe (CMP) culverts, quantities will need to be adjusted. Riprap quantities are for contractor's information only.

MATERIAL NOTES:

Synthetic fibers listed on the "Fibers for Concrete" Material Producer List (MPL) may be used in lieu of steel reinforcing in riprap concrete unless noted otherwise. Provide cross pipes that meet the requirements of ASTM A53 (Type E or S, Gr B), ASTM A500 (Gr B), or API 5LX52. Provide ASTM A307 bolts and nuts. Galvanize all steel components, except concrete reinforcing, after fabrication. Repair galvanizing damaged during transport or construction in accordance with the specifications.

GENERAL NOTES:

Cross pipes are designed for a traversing load of 10,000 pounds at yield as recommended by Research Report 280-2F, "Safety Treatment of Roadside Parallel-Drainage Structures", Texas Transportation Institute, March 1981. Safety end treatments (SET) shown herein are intended for use in those installations where out of control vehicles are likely to traverse the openings approximately perpendicular to the cross pipes. Construct concrete riprap and all necessary inverts in accordance with the requirements of Item 432, "Riprap". Payment for riprap and toewall is included in the Price Bid for each Safety End Treatment.

Bridge Division Standard

SAFETY END TREATMENT
 FOR 12" DIA TO 72" DIA
 PIPE CULVERTS
 TYPE II ~ PARALLEL DRAINAGE

SETP-PD

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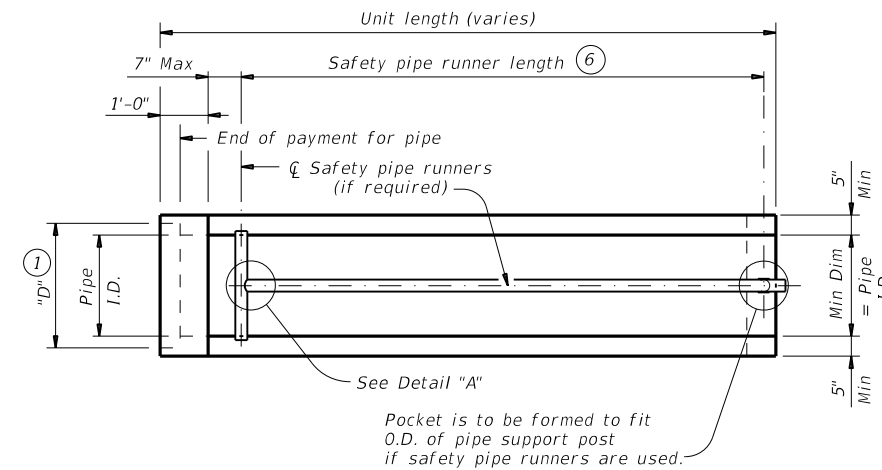
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REQUIREMENTS FOR CULVERT PIPES AND SAFETY PIPE RUNNERS

Pipe I.D.	RCP Wall "B" Thickness	TP Wall Thickness (8)	"D" (1)	Slope	Min Length of Unit	Single Pipe		Multiple Pipes	
						Skew	Pipe Runners Required	Skew	Pipe Runners Required
12"	2"	1.15"	17.00"	3:1	2' - 11"	≤ 45°	No	≤ 45°	No
				4:1	3' - 6"				
				6:1	4' - 9"				
15"	2 1/4"	1.30"	20.50"	3:1	3' - 8"	≤ 45°	No	≤ 45°	No
				4:1	4' - 7"				
				6:1	6' - 5"				
18"	2 1/2"	1.60"	24.00"	3:1	4' - 6"	≤ 45°	No	≤ 45°	No
				4:1	5' - 8"				
				6:1	8' - 0"				
24"	3"	1.95"	31.00"	3:1	6' - 2"	≤ 45°	No	= 30°	No
				4:1	7' - 10"				
				6:1	11' - 3"				
30"	3 1/2"	2.65"	38.50"	3:1	7' - 10"	= 15°	No	= 15°	No
				4:1	10' - 1"				
				6:1	14' - 8"				
36"	4"	2.75"	45.50"	3:1	9' - 5"	= 0°	No	≥ 0°	Yes
				4:1	12' - 3"				
				6:1	17' - 11"				
42"	4 1/2"	N/A	52.50"	3:1	11' - 1"	≥ 0°	Yes	≥ 0°	Yes
				4:1	14' - 5"				
				6:1	21' - 2"				

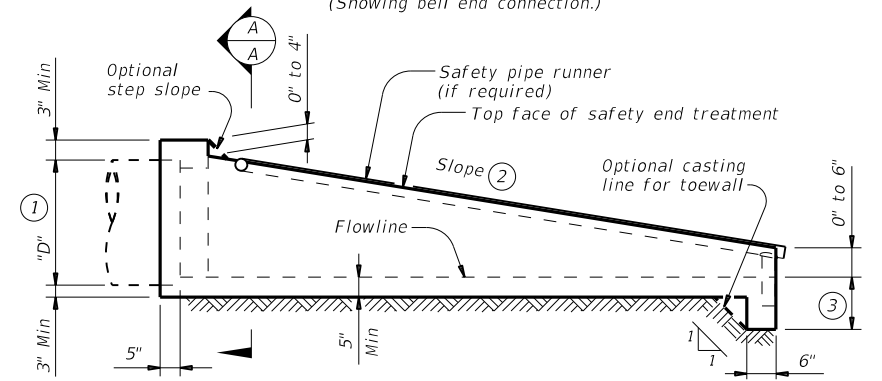
SAFETY PIPE RUNNER DIMENSIONS

Max Safety Pipe Runner Length	Required Pipe Runner Size		
	Pipe Size	Pipe O.D.	Pipe I.D.
11' - 2"	3" STD	3.500"	3.068"
15' - 6"	3 1/2" STD	4.000"	3.548"
20' - 10"	4" STD	4.500"	4.026"
35' - 4"	5" STD	5.563"	5.047"



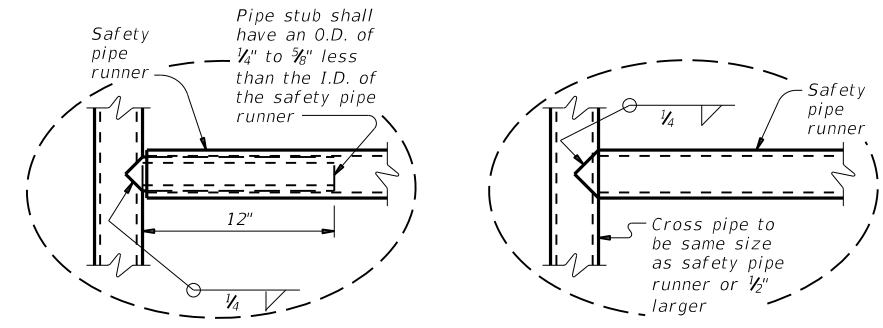
PLAN

(Showing bell end connection.)

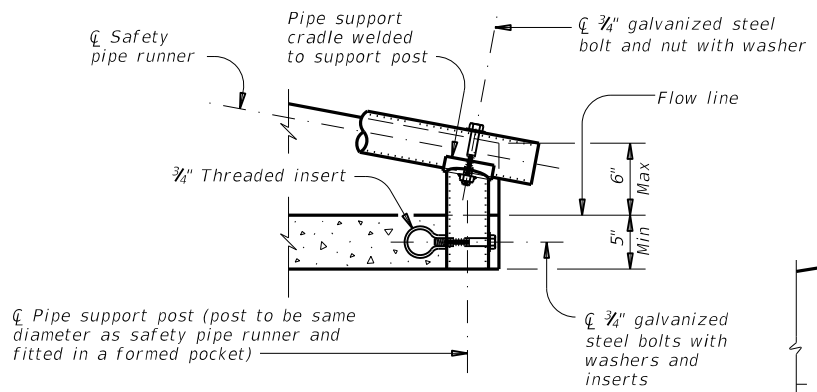


LONGITUDINAL ELEVATION

(Showing bell end connection.)

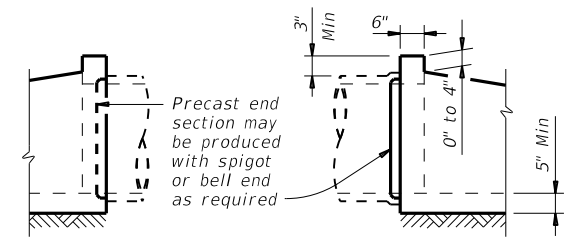


OPTION A **DETAIL A** **OPTION B**
 (If required)



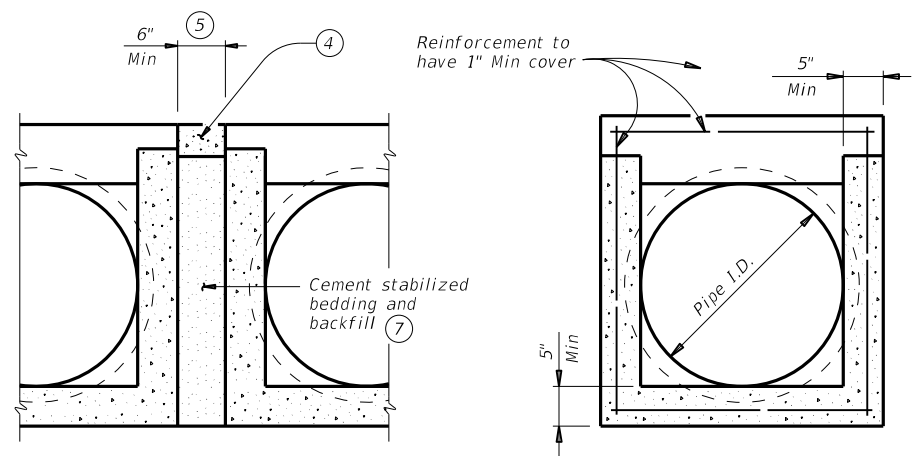
END DETAIL FOR INSTALLATION OF SAFETY PIPE RUNNERS

(If required)



OPTIONAL JOINT FOR RCP

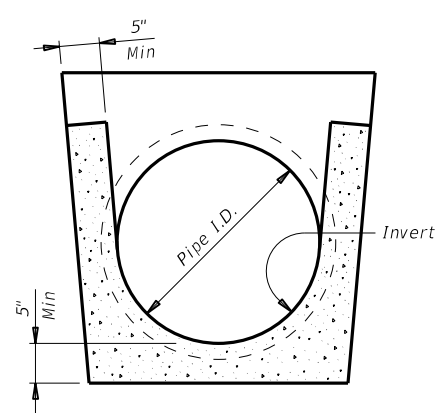
(Showing joint between RCP and precast safety end treatment)



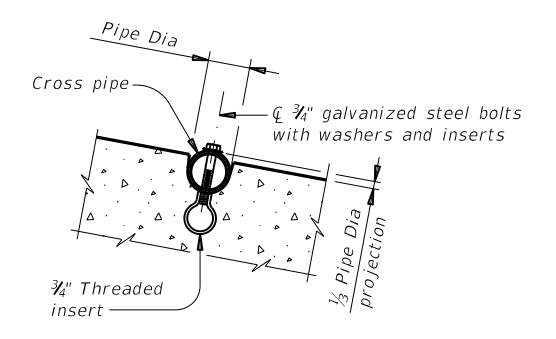
MULTIPLE PIPE INSTALLATION

OPTION WITH SQUARE BOTTOM

SECTION A-A



OPTION WITH INVERT BOTTOM



INSTALLATION DETAIL FOR SAFETY PIPE RUNNERS

(If required)

- ① Dimension "D" is based on reinforced concrete pipe (RCP) meeting the requirements of ASTM C-76, Class III, (RCP Wall "B" thickness). Adjust "D" for any other wall thickness used. For thermoplastic pipe (TP) take into account the annular space requirements for grouted connections.
- ② Slope as shown elsewhere in plans. Slope of 3:1 or flatter is required for vehicle safety.
- ③ Toewall to be used only when dimension is shown elsewhere in the plans.
- ④ Fill the top 4" of void between precast end treatments with concrete riprap. Concrete riprap is considered subsidiary to the Item 467, "Safety End Treatment".
- ⑤ Adjust clear distance between pipes to provide for the minimum distance between safety end treatments.
- ⑥ Measured along slope.
- ⑦ Provide cement stabilized bedding and backfill in accordance with the Item 400, "Excavation and Backfill for Structures". Bedding and backfill is considered subsidiary to the Item 467, "Safety End Treatment". When concrete riprap is specified around the safety end treatment, backfill as directed by Engineer.
- ⑧ Thermoplastic pipe wall thickness may vary. Adjust accordingly. Thermoplastic pipe requires the safety end treatments to have a bell end for grouted connections.

GENERAL NOTES:

Precast safety end treatment for reinforced concrete pipe (RCP), and thermoplastic pipe (TP) may be used for TYPE II end treatment as specified in Item "Safety End Treatment".

When precast safety end treatment is used as a Contractor's alternate to mitered RCP, riprap will not be required unless noted otherwise on the plans.

Synthetic fibers listed on the "Fibers for Concrete" Material Producer List (MPL) may be used in lieu of steel reinforcing in riprap concrete unless noted otherwise.

Manufacture this product in accordance with Item 467, "Safety End Treatment" except as noted below:

- A. Provide minimum reinforcing of #4 at 6" (Grade 40) or #4 at 9" (Grade 60) each way or 6"x6" - D12 x D12 or 5"x5" - D10 x D10 welded wire reinforcement (WWR).
- B. For precast (steel formed) sections, provide Class "C" concrete (f'c = 3,600 psi).

At the option and expense of the Contractor, the next larger size of safety end treatment may be furnished as long as the "D" dimension cast is that of the required size of pipe.

Pipe runners are designed for a traversing load of 1,800 Lbs at yield as recommended by Research Report 280-1, "Safety Treatment of Roadside Cross-Drainage Structures", Texas Transportation Institute, March 1981.

Provide safety pipe runners, cross pipes, pipe support posts, and pipe stubs meeting the requirements of ASTM A53 (Type E or S, Grade B), ASTM A500 (Grade B), or API 5LX52.

Galvanize all steel components except reinforcing steel after fabrication. Repair galvanizing damaged during transport or construction in accordance with the specifications.

Connect RCP using the Optional Joint for RCP detail shown or in accordance with Item 464 "Reinforced Concrete Pipe". Connect TP by grouting. See PBGC standard for grouted connections with TP and precast safety end treatment.

Texas Department of Transportation
Bridge Division Standard

PRECAST SAFETY END TREATMENT

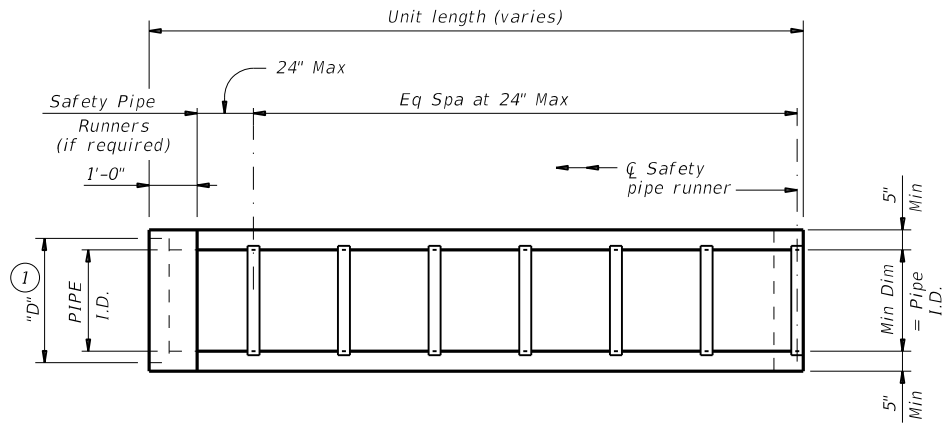
TYPE II ~ CROSS DRAINAGE

PSET-SC

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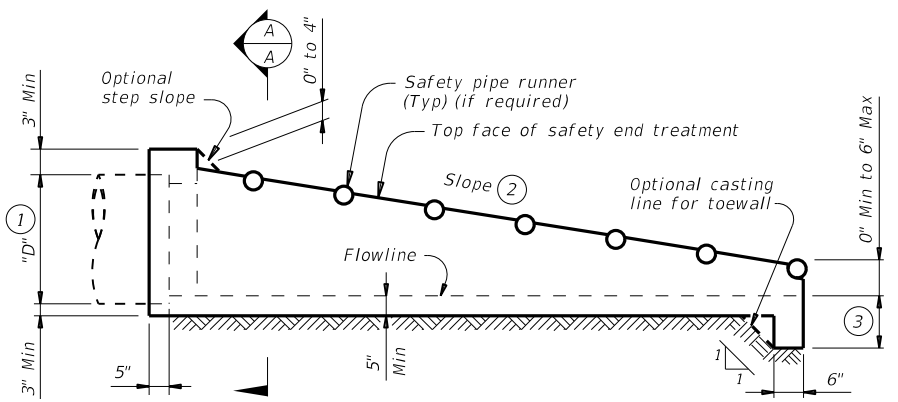
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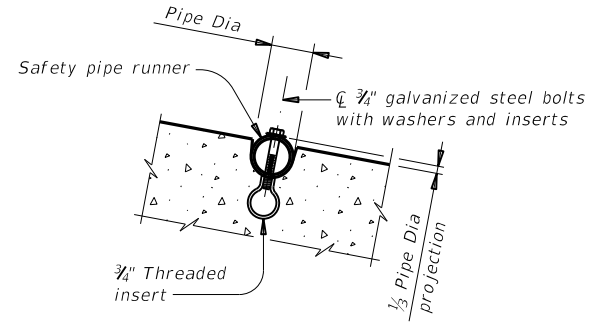
PLAN

(Showing bell end connection.)



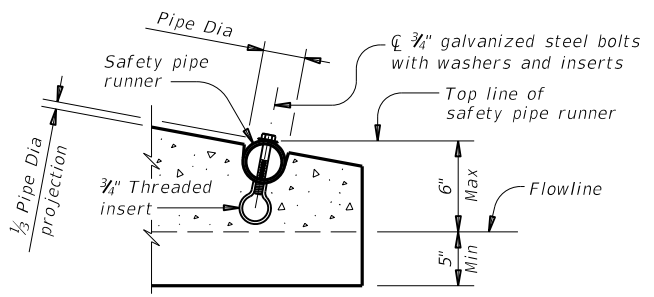
LONGITUDINAL ELEVATION

(Showing bell end connection.)

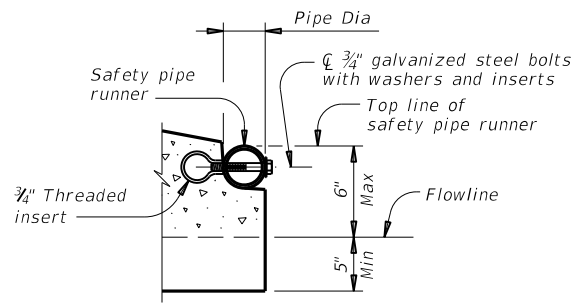


INSTALLATION DETAIL FOR SAFETY PIPE RUNNERS

(If required)



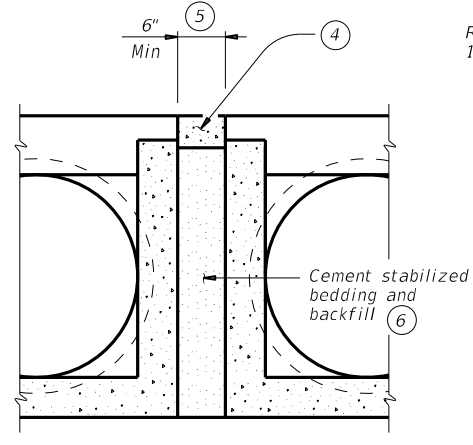
OPTION A



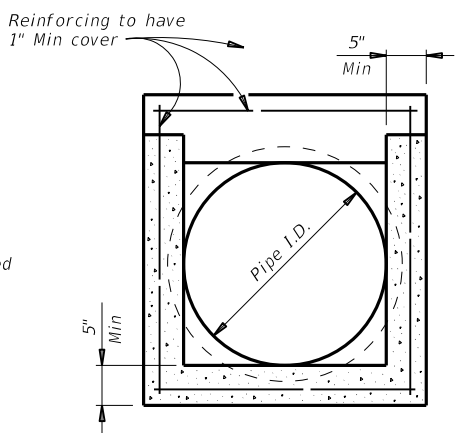
OPTION B

END DETAILS FOR INSTALLATION OF SAFETY PIPE RUNNERS

(If required)

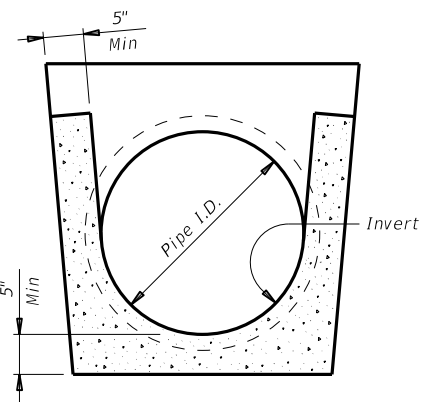


MULTIPLE PIPE INSTALLATION

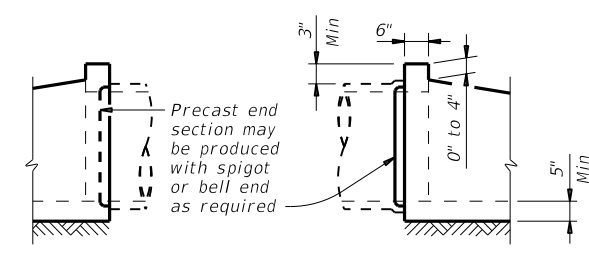


OPTION WITH SQUARE BOTTOM

SECTION A-A



OPTION WITH INVERT BOTTOM



OPTIONAL JOINT FOR RCP

(Showing joint between RCP and precast safety end treatment.)

REQUIREMENTS FOR CULVERT PIPES AND SAFETY PIPE RUNNERS

Pipe I.D.	RCP Wall "B" Thickness	TP Wall Thickness (7)	"D" (1)	Slope	Min Length	Pipe Runners Required		Required Pipe Runner Size		
						Single Pipe	Multiple Pipe	Nominal Dia.	O.D.	I.D.
12"	2"	1.15"	17.00"	6:1	4' - 9"	No	Yes, for > 2 pipes	3" STD	3.500"	3.068"
15"	2 1/4"	1.30"	20.50"	6:1	6' - 5"	No	Yes, for > 2 pipes	3" STD	3.500"	3.068"
18"	2 1/2"	1.60"	24.00"	6:1	8' - 0"	No	Yes, for > 2 pipes	3" STD	3.500"	3.068"
24"	3"	1.95"	31.00"	6:1	11' - 3"	No	Yes, for > 2 pipes	3" STD	3.500"	3.068"
30"	3 1/2"	2.65"	38.50"	6:1	14' - 8"	No	Yes	4" STD	4.500"	4.026"
36"	4"	2.75"	45.50"	6:1	17' - 11"	Yes	Yes	4" STD	4.500"	4.026"
42"	4 1/2"	N/A	52.50"	6:1	21' - 2"	Yes	Yes	4" STD	4.500"	4.026"

- (1) Dimension "D" is based on reinforced concrete pipe (RCP) meeting the requirements of ASTM C-76, Class III, (RCP Wall "B" thickness). Adjust "D" for any other wall thickness used. For thermoplastic pipe (TP) take into account the annular space requirements for grouted connections.
- (2) Slope as shown elsewhere in the plans. Slope of 6:1 or flatter is required for vehicle safety.
- (3) Toewall to be used only when dimension is shown elsewhere in the plans.
- (4) Fill the top 4" of void between precast end treatments with concrete riprap. Concrete riprap is considered subsidiary to the Item 467, "Safety End Treatment".
- (5) Adjust clear distance between pipes to provide for the minimum distance between safety end treatments.
- (6) Provide cement stabilized bedding and backfill in accordance with the Item 400, "Excavation and Backfill for Structures". Bedding and backfill is considered subsidiary to the Item 467, "Safety End Treatment". When concrete riprap is specified around the safety end treatment, backfill as directed by Engineer.
- (7) Thermoplastic pipe wall thickness may vary. Adjust accordingly. Thermoplastic pipe requires the safety end treatments to have a bell end for grouted connections.

GENERAL NOTES:

Precast safety end treatment for reinforced concrete pipe (RCP), and thermoplastic pipe (TP) may be used for TYPE II end treatment as specified in Item "Safety End Treatment".
 When precast safety end treatment is used as a Contractor's alternate to mitered RCP, riprap will not be required unless noted otherwise on the plans.
 Synthetic fibers listed on the "Fibers for Concrete" Material Producer List (MPL) may be used in lieu of steel reinforcing in riprap concrete unless noted otherwise.
 Manufacture this product in accordance with Item 467, "Safety End Treatment" except as noted below:
 A. Provide minimum reinforcing of #4 at 6" (Grade 40) or #4 at 9" (Grade 60) each way or 6"x6" - D12 x D12 or 5"x5" - D10 x D10 welded wire reinforcement (WWR).
 B. For precast (steel formed) sections, provide Class "C" concrete (f'c = 3,600 psi).
 At the option and expense of the Contractor the next larger size of safety end treatment may be furnished; as long as the "D" dimension cast is that of the required size of pipe.
 Pipe runners are designed for a traversing load of 10,000 Lbs at yield as recommended by Research Report 280-2F, "Safety Treatment of Roadside Parallel-Drainage Structures", Texas Transportation Institute, March 1981.
 Provide pipe runners meeting the requirements of ASTM A53 (Type E or S, Grade B), ASTM A500 (Grade B), or API 5LX52.
 Galvanize all steel components except reinforcing steel after fabrication. Repair galvanizing damaged during transport or construction in accordance with the specifications.
 Connect RCP using the Optional Joint for RCP detail shown or in accordance with Item 464, "Reinforced Concrete Pipe". Connect TP by grouting. See PBGC standard for grouted connections with TP and precast safety end treatment.

Bridge Division Standard

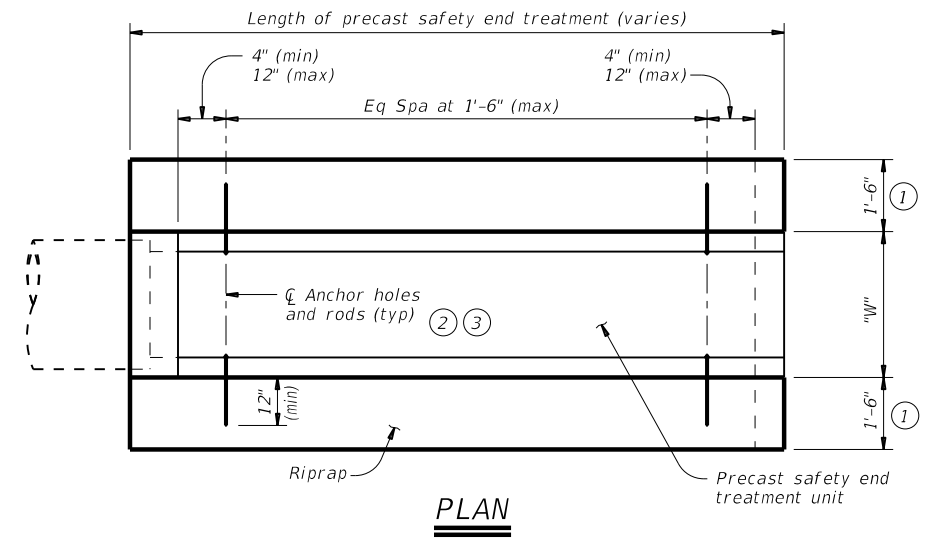
PRECAST SAFETY END TREATMENT
TYPE II ~ PARALLEL DRAINAGE

PSET-SP

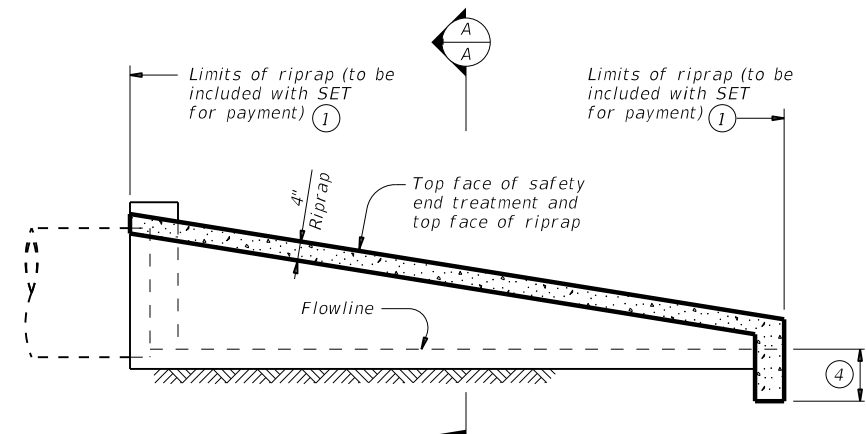
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	PAR	LAMAR	121	

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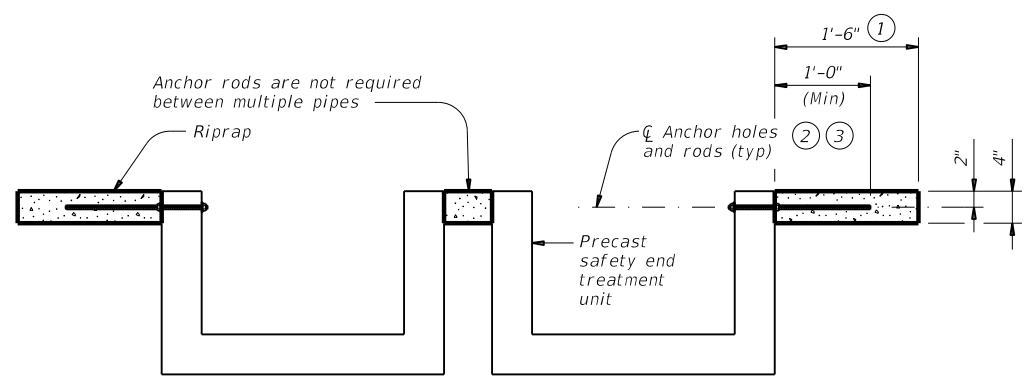
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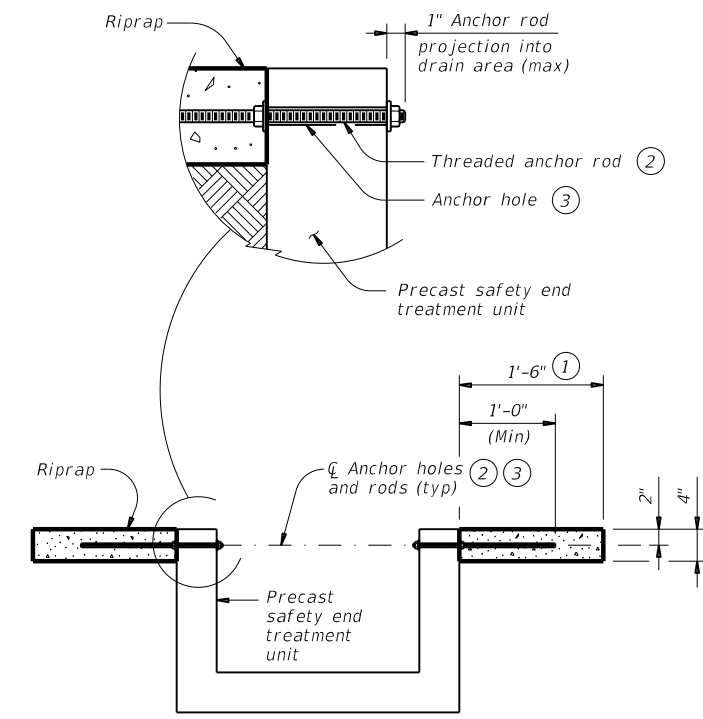
PLAN



LONGITUDINAL ELEVATION



MULTIPLE PIPE INSTALLATION



SINGLE PIPE INSTALLATION

SECTION A-A

ESTIMATED CONCRETE RIPRAP QUANTITIES (CY)

Nominal Culvert (Pipe) I.D.	PSET-SC and PSET-SP Standards					PSET-RC and PSET-RP Standards		
	Unit Width "W"	Side Slope			Unit Width "W"	Side Slope		
		3:1	4:1	6:1		3:1	4:1	6:1
12"	23.0"	0.1	0.2	0.2	16.0"	0.1	0.1	0.2
15"	26.5"	0.2	0.2	0.3	19.5"	0.1	0.2	0.2
18"	30.0"	0.2	0.2	0.3	23.0"	0.2	0.2	0.3
24"	37.0"	0.3	0.3	0.5	30.0"	0.2	0.3	0.4
30"	44.5"	0.3	0.4	0.6	37.0"	0.3	0.3	0.5
36"	51.5"	0.4	0.5	0.7	44.0"	0.3	0.4	0.6
42"	58.5"	0.5	0.6	0.8	51.0"	0.4	0.5	0.7

- ① Riprap placed beyond the limits shown will be paid as concrete riprap in accordance with Item 432, "Riprap". When riprap is cast integrally with the precast safety end treatment, this dimension is 1'-0" minimum.
- ② 1#2" Dia ASTM A307 Gr A threaded anchor rod with 2 nuts and 2 washers. Galvanize all components in accordance with Item 445, "Galvanizing". Repair galvanizing that is damaged during transport or construction in accordance with the specifications.
- ③ 3#4" through holes in walls of safety end treatment for riprap anchor rods may be drilled with rotary (coring or masonry) type drilling equipment or may be formed. Do not use percussive (star) type drilling equipment. If holes are drilled, patch spalls in the inside face of the wall exceeding 1#2" from the holes.
- ④ Provide riprap toe wall when dimension is shown elsewhere in the plans or when field conditions require a toe wall.
- ⑤ Quantities shown are for one end of one reinforced concrete pipe culvert. For multiple pipe culverts, quantities will need to be adjusted. Riprap quantities are for Contractor's information only. Quantities are based on the minimum unit lengths shown on the Precast Safety End Treatment (SET) standard sheets.

MATERIAL NOTES:

Provide Class "B" riprap in accordance with Item 432, "Riprap". Synthetic fibers listed on the "Fibers for Concrete" Material Producer List (MPL) may be used in lieu of steel reinforcing in riprap concrete unless noted otherwise. The anchor rods shown are always required.

GENERAL NOTES:

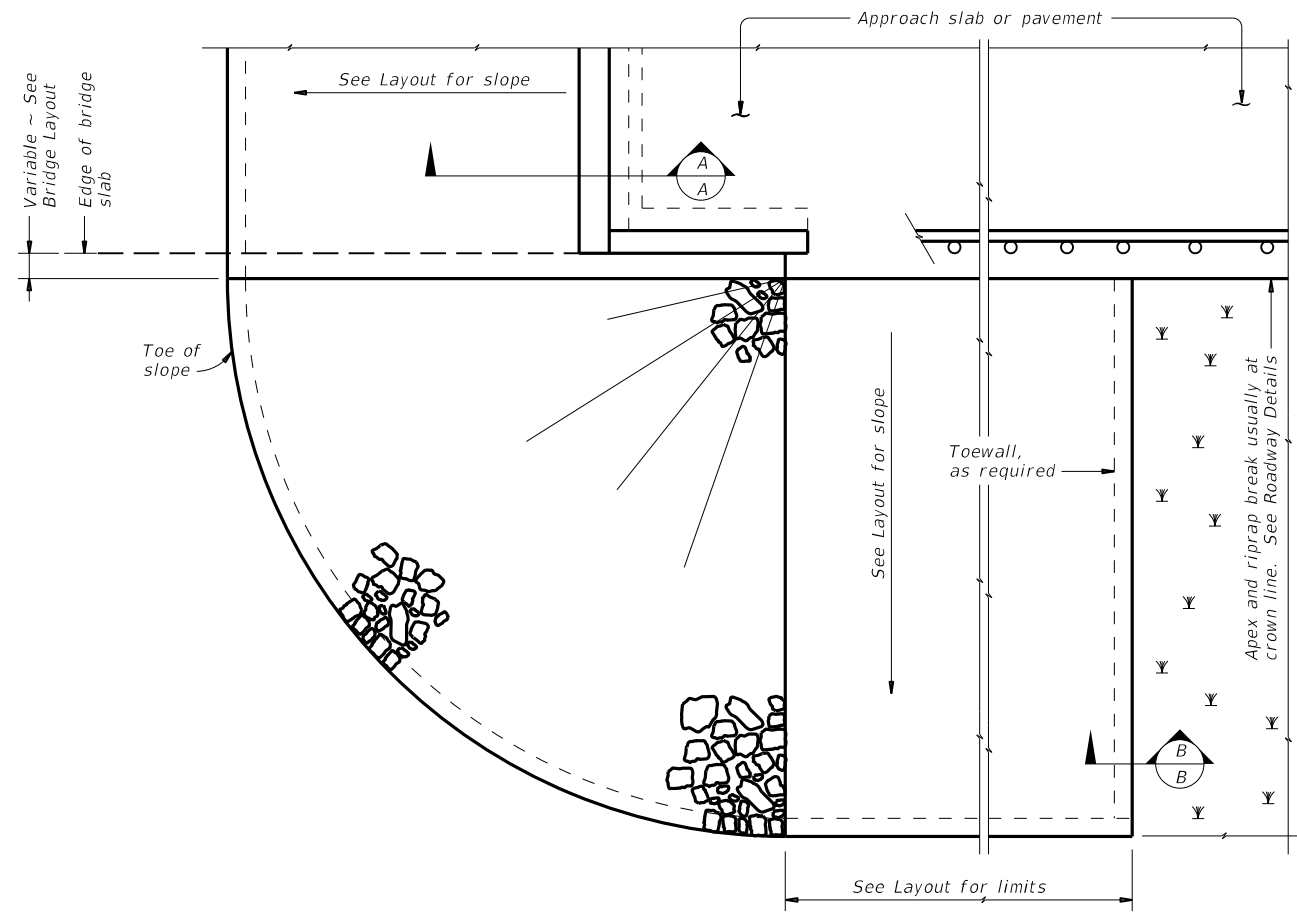
Precast safety end treatment for reinforced concrete pipe may be used for TYPE II end treatment as specified in Item 467, "Safety End Treatment". Refer to PSET-SC or PSET-SP standard sheets for details of square safety end treatments not shown. Refer to PSET-RC or PSET-RP standard sheets for details of round safety end treatments not shown. For precast units with integrally cast riprap, substitute reinforcing steel in the amount on 0.26 in./ft. minimum for the threaded anchor rods shown. When requested, submit sealed engineering drawings for approval prior to construction. Shop drawings will not be required. Note that a proprietary precast unit with integral riprap is available from L&R Precast Concrete Works, Inc. (956) 583-6293 or www.lrpccast.com. Payment for riprap and toewalls is included in the price bid for each safety end treatment.

These riprap details are only applicable when notes that require placement of riprap with precast safety end treatments are shown elsewhere in the plans.
 Precast units with integrally cast riprap are permitted unless noted otherwise on the plans.

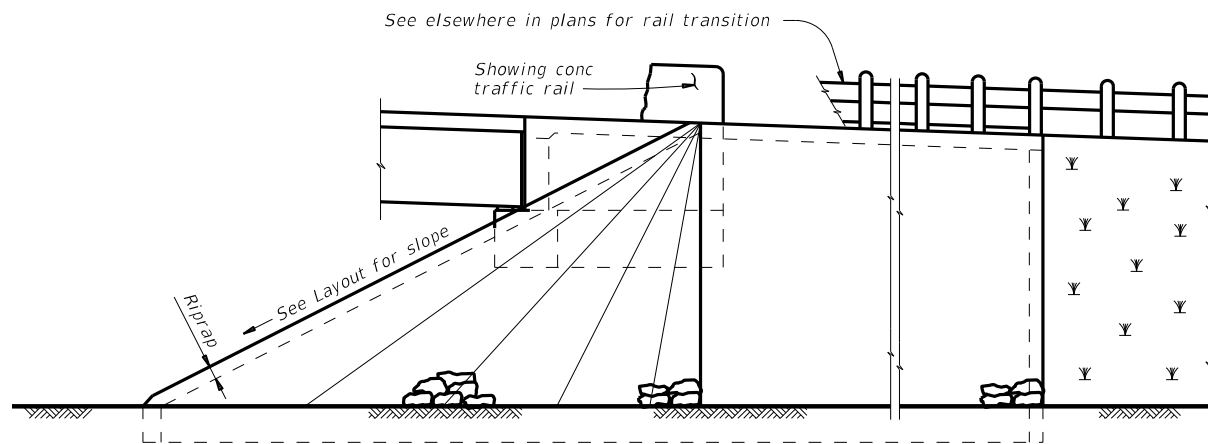
				Bridge Division Standard	
PRECAST SAFETY END TREATMENT TYPE II RIPRAP DETAILS PSET-RR					
FILE: psetrrse-20.dgn	DN: GAF	CK: TxDOT	DW: JRP	CK: GAF	
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY	
REVISIONS	0435	01	080	FM 38	
	DIST	COUNTY	SHEET NO.		
	PAR	LAMAR	122		

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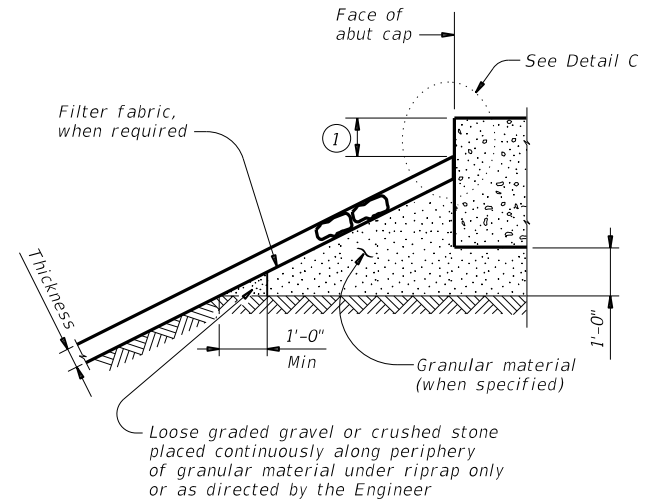
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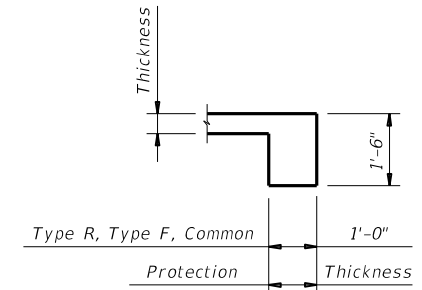
PLAN



ELEVATION

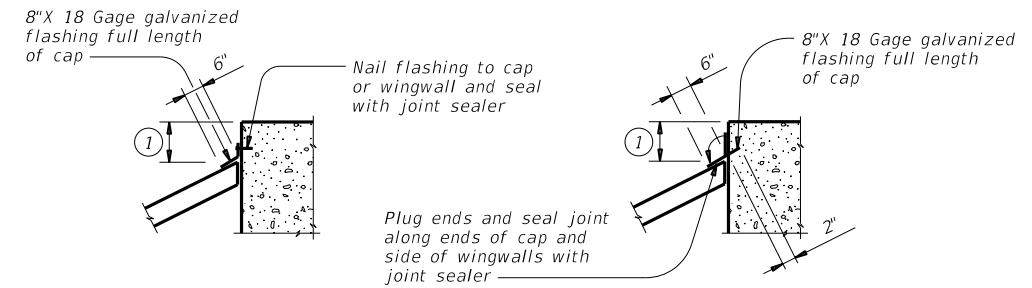


SECTION A-A AT CAP



SECTION B-B

Provide toewall when shoulder drain is located adjacent to limits of stone riprap. Omit toewall when thickness of protection riprap is greater than 18".



CAP OPTION A

CAP OPTION B

DETAIL C

① Top of cap to top of riprap dimension varies as directed by the Engineer. Provide 9" Min for beam/slab type bridges and 1'-6" for slab span, box beam, or slab beam bridges.

GENERAL NOTES:

Refer to Item 432, "Riprap" for stone size and gradation, and construction details. See Layout for limits and thickness of riprap specified.
 See elsewhere in plans for locations and details of shoulder drains.

SHEET 1 OF 2

					Bridge Division Standard
<h1>STONE RIPRAP</h1>					
<h2>SRR</h2>					
FILE: srrstd1-19.dgn	DN: AES	CK: JGD	DW: BWH	CK: AES	
©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY	
REVISIONS	0435	01	080	FM 38	
	DIST	COUNTY	SHEET NO.		
	PAR	LAMAR	123		

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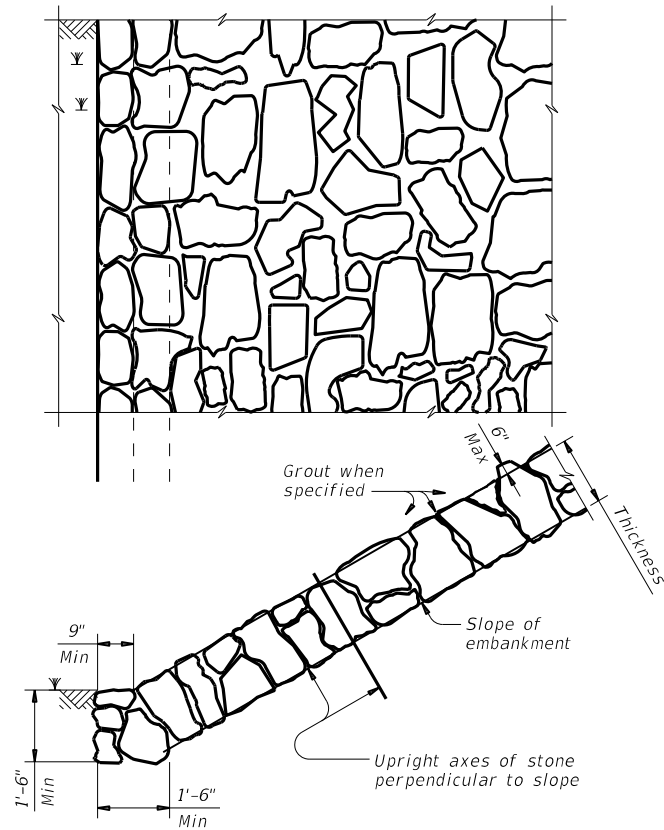


FIGURE 1 ~ TYPE R STONE RIPRAP
dry or grouted

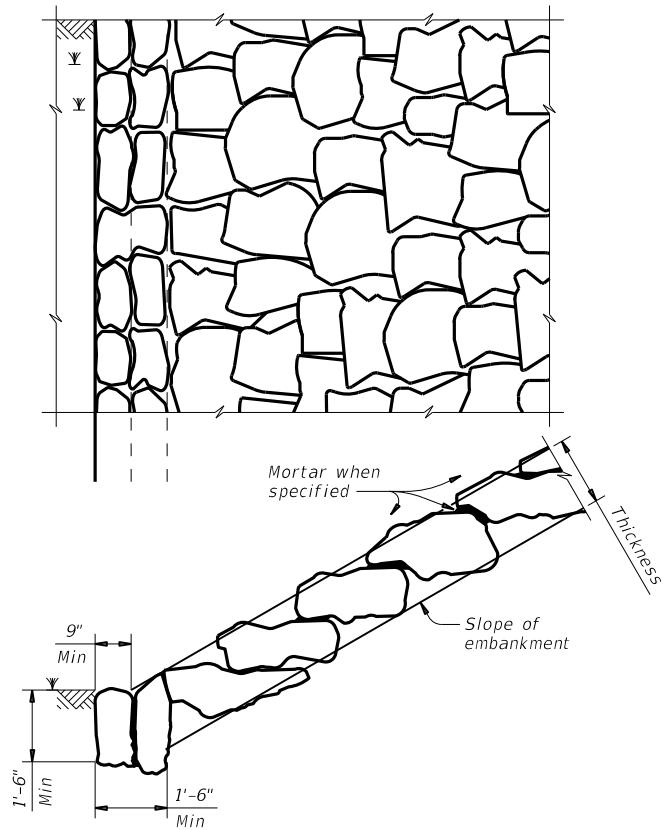


FIGURE 2 ~ TYPE F STONE RIPRAP
dry or mortared

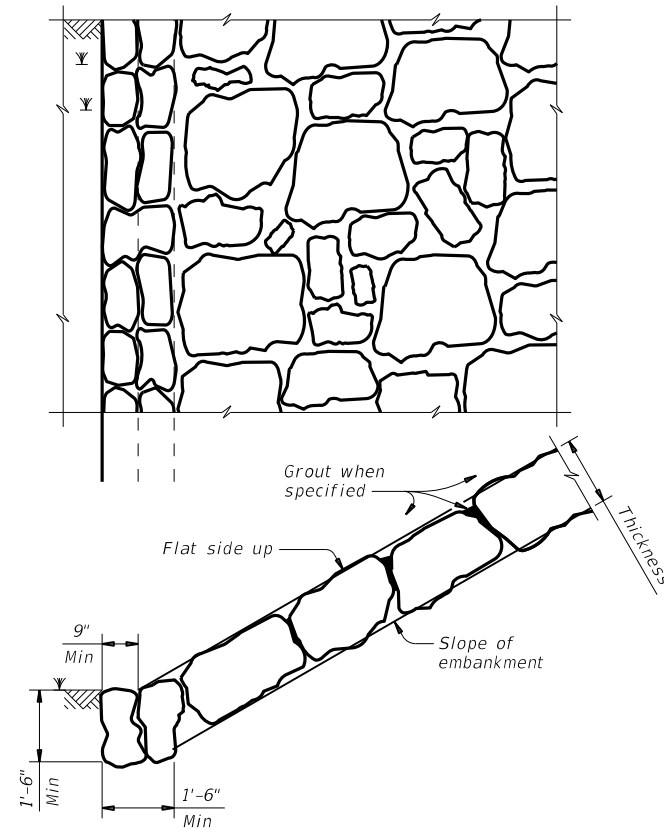
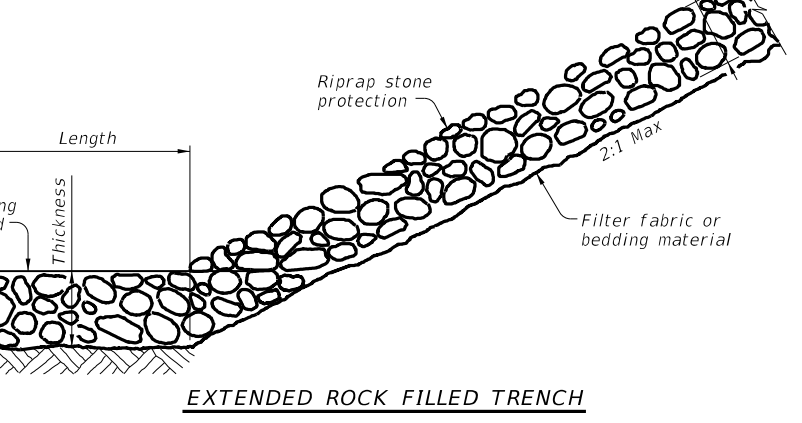
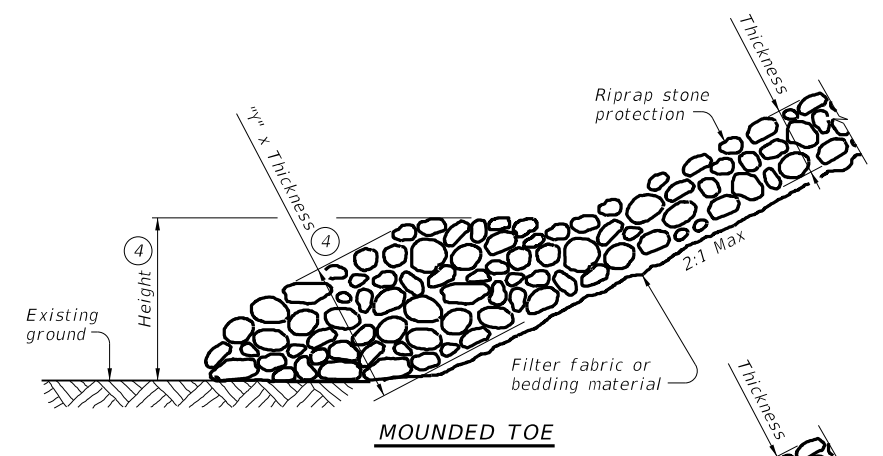


FIGURE 3 ~ TYPE F STONE RIPRAP
grouted

- ② Provide bedding material instead of filter fabric if shown elsewhere in plans. See Layout for thickness of bedding material.
- ③ Minimum toe depth is the larger of the maximum scour depth or 2 times the riprap thickness.
- ④ "Y" and Height need to be defined. See layout or detail sheet for values if this option is used.
- ⑤ List Stone Protection as size (XX inch) and thickness (YY inch) on the layout.
Example: Riprap (Stone Protection) XX inch, Thickness = YY inch.



PROTECTION STONE RIPRAP TOE OPTIONS ⑤

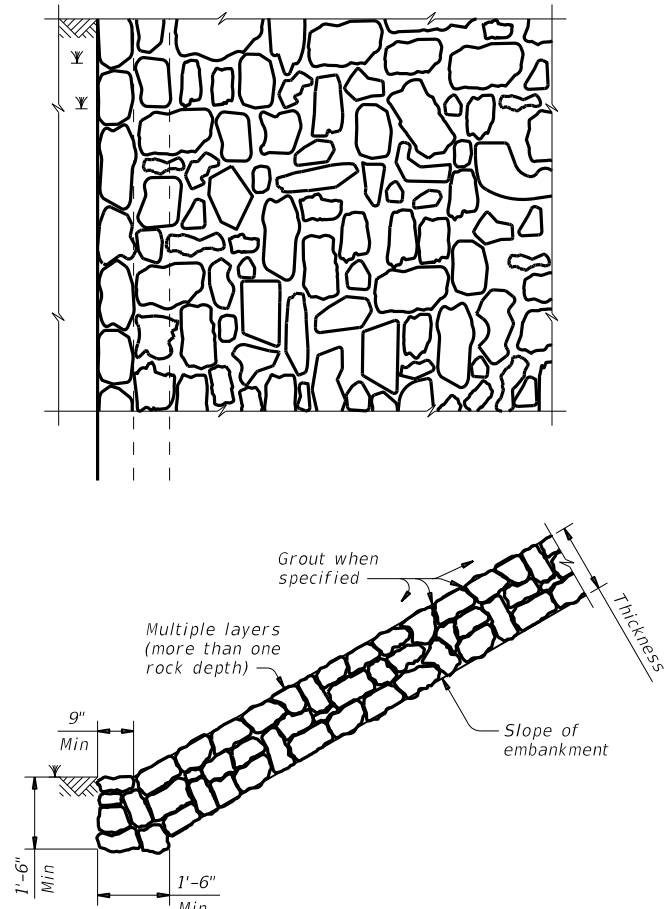


FIGURE 4 ~ COMMON STONE RIPRAP
dry or grouted

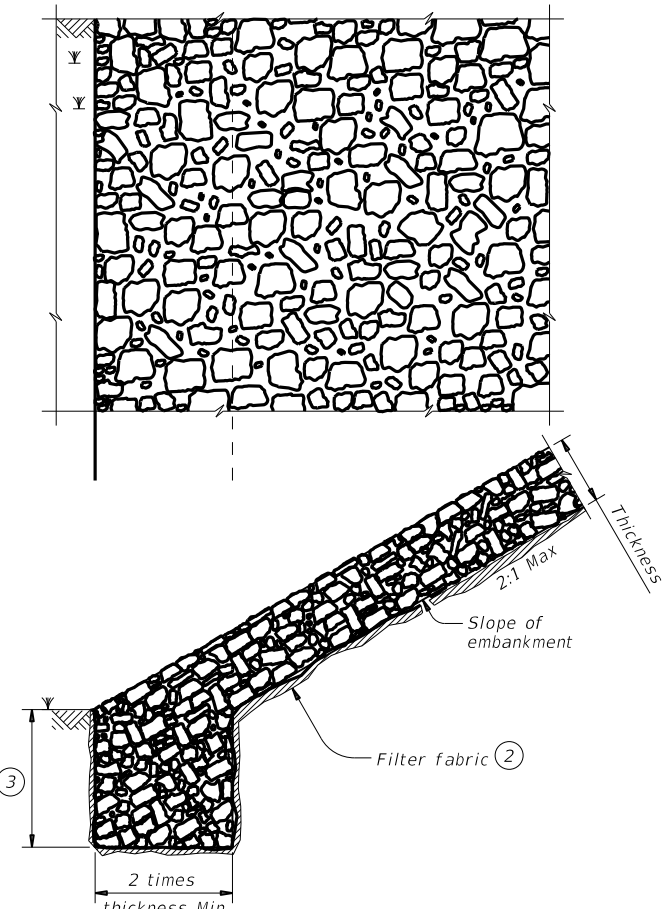


FIGURE 5 ~ PROTECTION STONE RIPRAP ⑤

SHEET 2 OF 2



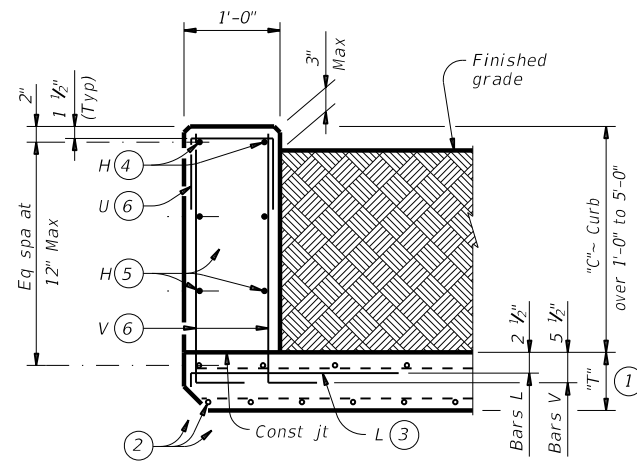
STONE RIPRAP

SRR

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©TxDOT April 2019	CONT SECT	JOB	HIGHWAY	
REVISIONS	0435 01	080	FM 38	
	DIST	COUNTY	SHEET NO.	
	PAR	LAMAR	124	

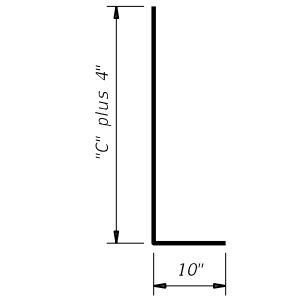
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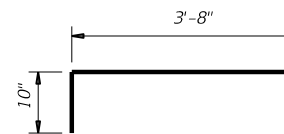


TYPICAL SECTION

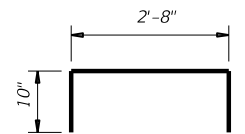
Used for curbs over 1'-0" to 5'-0"



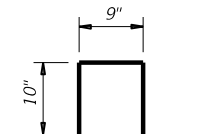
BARS V (#5)
Spaced at 12" Max



BARS L (#5)
Spaced at 12" Max



OPTIONAL BARS L (#5)
Spaced at 12" Max



BARS U (#4)
Spaced at 12" Max

- ① "T" is equal to the culvert top slab thickness. For precast boxes with slabs less than 8" thick, see SCP-MD standard for additional details.
- ② Adjust normal culvert slab bars as necessary to clear obstructions.
- ③ Place bars L as shown. Tilt hook as necessary to maintain cover.
- ④ Place normal culvert curb bars H(#4) as shown. Adjust as necessary to clear obstructions.
- ⑤ Additional bars H(#4) as required to maintain 12" Max spacing.
- ⑥ Replace normal culvert curb bars K with one bar U and two bars V as shown spaced at 12" Max. Adjust length of bars V as necessary to maintain clear cover.
- ⑦ Optional bars L are to be used only for precast box culverts with 3'-0" closure pour.
- ⑧ Quantities shown are for Contractor's information only. Quantities are per linear foot of curb length. The value in table can be interpolated for intermediate values of curb height, "C". Quantity includes bars K (when applicable).

TABLE OF ESTIMATED CURB QUANTITIES ^⑧		
Curb Height "C"	Conc (CY/LF)	Reinf Steel (Lb/LF)
1'-0"	0.037	10.4
1'-6"	0.056	14.5
2'-0"	0.074	15.6
2'-6"	0.093	18.0
3'-0"	0.111	19.0
3'-6"	0.130	21.3
4'-0"	0.148	22.4
4'-6"	0.167	24.8
5'-0"	0.185	25.9

CONSTRUCTION NOTES:
 Adjust reinforcing steel as necessary to provide 1 1/2" cover.
 For vehicle safety, top of the curb must not project more than 3" above the finished grade.

MATERIAL NOTES:
 Provide Grade 60 reinforcing steel.
 Provide galvanized reinforcing steel if required elsewhere in the plans.
 Provide Class "C" concrete (f'c = 3,600 psi) minimum for curbs.
 Provide bar laps, where required, as follows:
 • Uncoated or galvanized ~ #4 = 1'-8" Min

GENERAL NOTES:
 Designed according to AASHTO LRFD Bridge Design Specifications.
 These extended curb details have sufficient strength to allow for future retrofit of Type T631 or T631LS railing. These details are suitable for use with PR11, PR22 and PR3 type rails. These details are not suitable for the mounting of other rail types. For new construction using T631 or T631LS railing, use the T631-CM standard.
 This Curb is considered as part of the Box Culvert for payment.

Cover dimensions are clear dimensions, unless noted otherwise.
 Reinforcing bar dimensions shown are out-to-out of bar.

		Bridge Division Standard	
EXTENDED CURB DETAILS FOR BOX CULVERTS WITH CURBS OVER 1'-0" TO 5'-0" TALL			
ECD			
FILE: ecdstd1-20.dgn	DN: GAF	CK: TxDOT	DW: TxDOT
©TxDOT February 2020	CONT SECT	JOB	HIGHWAY
REVISIONS	0435 01	080	FM 38
DIST	COUNTY	SHEET NO.	
PAR	LAMAR	125	

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REFLECTOR UNIT SIZES FOR DELINEATORS AND OBJECT MARKERS				DELINEATORS				D & OM DESCRIPTIVE CODES		
DEVICE	SIZE 1	SIZE 2	SIZE 3	SIZE 4	SINGLE		DOUBLE		INSTL DEL ASSM (D-XX)SZ X (XXXX)XXX(XX) NUMBER OF REFLECTORS S = Single D = Double COLOR OF REFLECTORS W = White Y = Yellow R = Red REFLECTOR UNIT SIZE 1 or 2 TYPE OF POST OR DELINEATOR WC = Wing Channel Post YFLX = Yellow Flexible Post WFLX = White Flexible Post BRFL = Barrier Reflector TYPE OF MOUNT GND = Embedded (drivable or set in concrete) CTB = Concrete Barrier Mount GF1 or GF2 = Guard Fence Attachment SRF = Surface Mount DIRECTION If Required BI = Bi-Directional BR = Bi-Directional with red on back	
SHEETING	Yellow, White or Red Type B or C reflective sheeting				Yellow, White or Red Type B or C Reflective Sheeting					
NOTE	1. Size 1 and 4 - Direct applied reflective sheeting for use on flexible post (fix). 2. Size 2 and 3 - For use on wing channel (wc) post only. Use approved metal, plastic or fiberglass backplate with 17/64" mounting holes.				POST TYPE	WC	YFLX, WFLX	WC	YFLX, WFLX	
					MOUNT TYPE	GND	GND, SRF	GND	GND, SRF	

OBJECT MARKERS								D & OM DESCRIPTIVE CODES	
DEVICE	Type 1 (OM-1)	Type 2 (OM-2)			Type 3 (OM-3)			Type 4 (OM-4)	INSTL OM ASSM (OM-XX) (XXXX)XXX(XX) TYPE OF OBJECT MARKER 1, 2, 3, or 4 NUMBER OF REFLECTORS OR DIRECTION X = 3-Size 2 reflector unit (Type 2 only) Y = 1-Size 3 reflector unit (Type 2 only) Z = 3-Size 1 or 1-Size 4 reflector unit(s) (Type 2 only) L = Left Side (Type 3 Object Marker only) R = Right Side (Type 3 Object Marker only) C = Center (Type 3 Object Marker only) TYPE OF POST WC = Wing Channel Post WFLX = White Flexible Post TWT = Thin Walled Tubing TYPE OF MOUNT GND = Embedded (drivable) SRF = Surface Mount WAS = Wedge Anchor Steel WAP = Wedge Anchor Plastic DIRECTION If Required BI = Bi-Directional
SHEETING	Yellow-Type B _{FL} or C _{FL} Sheeting	Yellow - Type B or C Sheeting			Alternating acrylic black and retroreflective yellow - Type B _{FL} or C _{FL} Sheeting			Red -Type B _{FL} or C _{FL} Sheeting	
POST TYPE	TWT	WC	WC	WFLX	TWT			TWT	
MOUNT TYPE	WAS, WAP	GND	GND	GND, SRF	WAS, WAP			WAS, WAP	

DEPARTMENTAL MATERIAL SPECIFICATIONS	
FLEXIBLE DELINEATOR & OBJECT MARKER POSTS (EMBEDDED & SURFACE MOUNT TYPES)	DMS-4400
SIGN FACE MATERIALS	DMS-8300
DELINEATORS, OBJECT MARKERS AND BARRIER REFLECTORS	DMS-8600

BARRIER REFLECTORS (BRF)			CHEVRONS				ONE DIRECTION LARGE ARROW		NOTE: Delineator and object marker substrates and sign substrates shall be 0.080" Aluminum sign blank to conform to ASTM B-209 Alloy 6061-T6 or approved alternative.		
GF1 GF2 CTB 											
1. Barrier reflectors shall meet the requirements of DMS 8600. 2. Approved Barrier Reflectors are listed on the "Barrier Reflectors" Material Producer List at: www.txdot.gov.			SIZE (W x L)	18" x 24" (Conventional)	24" x 30" (Conventional Oversize)	30" x 36" (Expressway)	36" x 48" (Freeway)	SIZE (W x L)	48" x 24" (Conventional)	60" x 30" (Expressway & Freeway)	
			MOUNTING HEIGHT	4'-0" or 7'-0"		7'-0" Only		MOUNTING HEIGHT	7'-0"		
			NOTE	1. CHEVRON (W1-8) signs and ONE DIRECTION LARGE ARROW (W1-6) Signs shall be installed per Sign Mounting Details (SMD) Standard Sheets and paid under Item 644 (Small Roadside Sign Assemblies). 2. When there is a need to increase conspicuity, the Texas version of the ONE DIRECTION LARGE ARROW sign (W1-9T) may be used instead of the ONE DIRECTION LARGE ARROW (W1-6).							
SHEETING	Yellow, White, Red										
NOTE	1. Reflective sheeting shall have a minimum dimension of 3 inches and minimum surface area of 9 square inches.										

Texas Department of Transportation
 Traffic Safety Division Standard

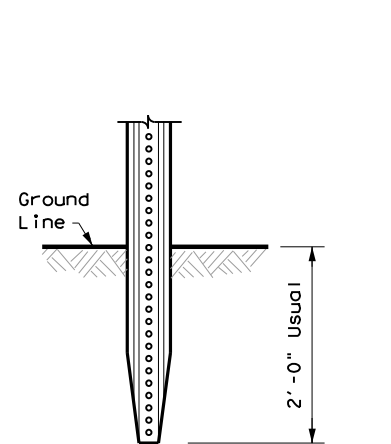
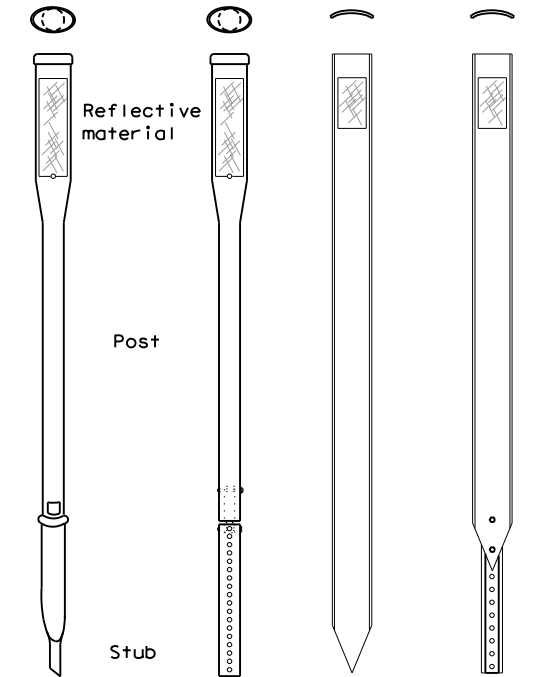
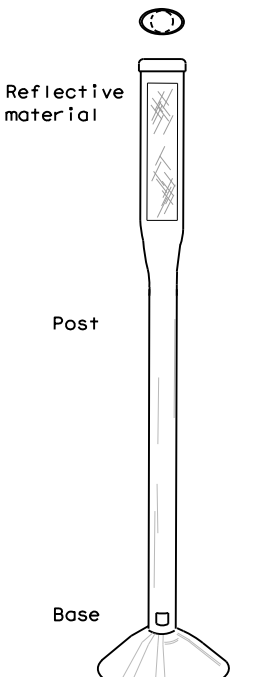
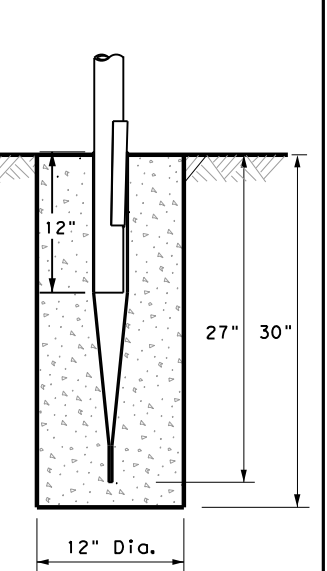
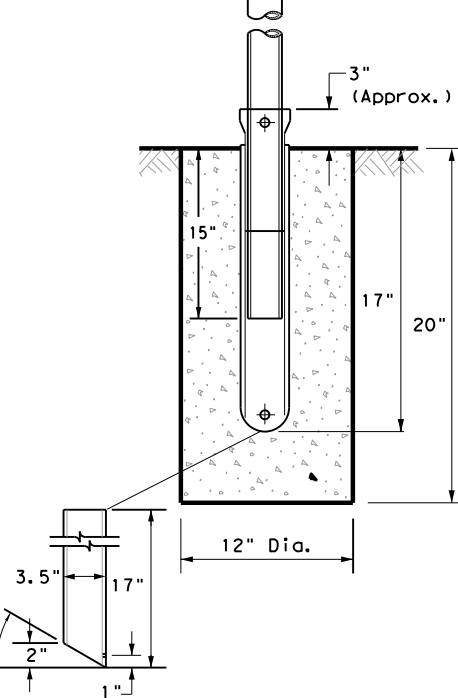
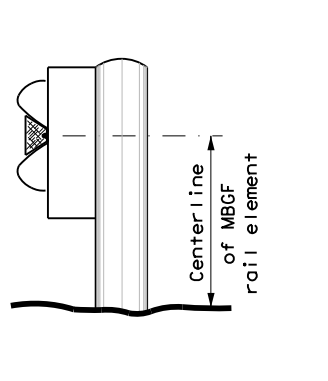
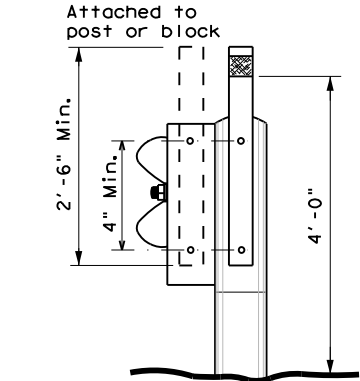
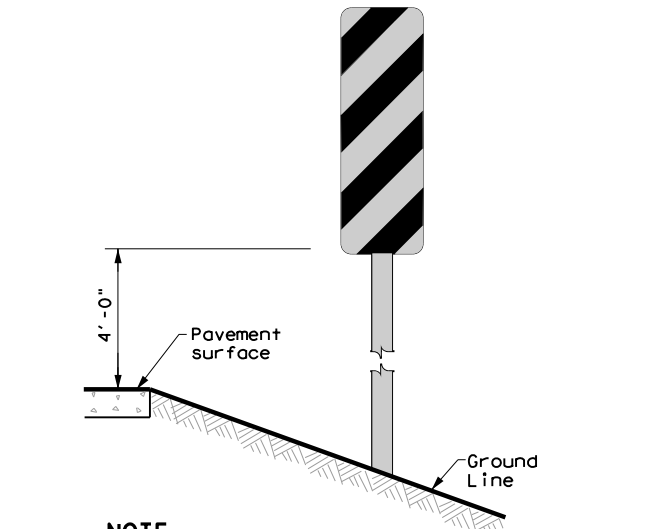
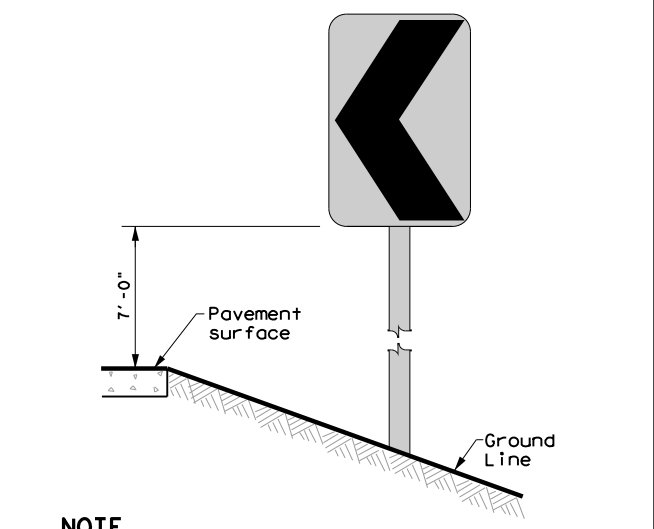
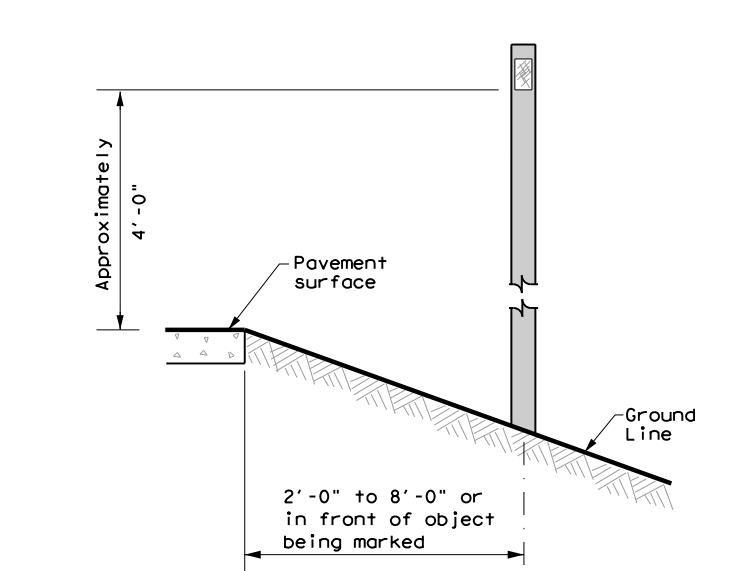

DELINEATOR & OBJECT MARKER MATERIAL DESCRIPTION

D & OM(1)-20

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© TxDOT August 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS	0435	01	080	FM 38
10-09 3-15	DIST	COUNTY	SHEET NO.	
4-10 7-20	PAR	LAMAR	126	

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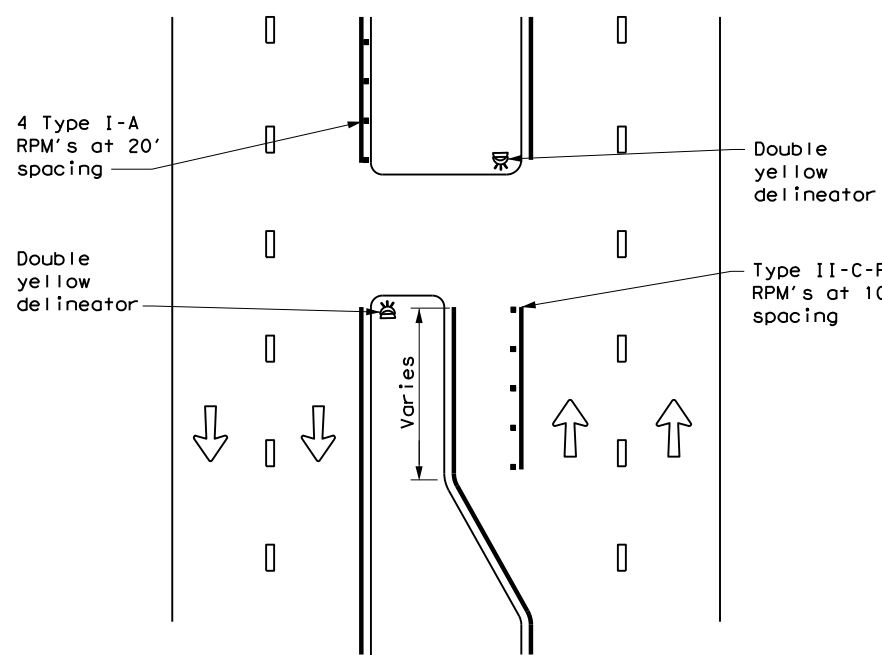
DATE: 2/28/2021 8:49:22 PM
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POST TYPE AND SUPPORT FOUNDATION DETAILS				TYPE OF BARRIER MOUNTS																										
WING CHANNEL (WC)	FLEXIBLE POSTS (YFLX, WFLX)		WEDGE ANCHOR SYSTEMS		GUARD FENCE ATTACHMENT																									
GND	GND	SRF	WAS	WAP	GF 1																									
 <p style="text-align: center;">2'-0" Usual</p>																														
	EMBEDDED	SURFACE MOUNT	STEEL	PLASTIC	CONCRETE TRAFFIC BARRIER (CTB)																									
NOTES 1. Embedded Wing Channel (WC) post option may be used for Type 2 Object Markers and Delineators only. 2. 1.12 lbs/ft steel per ASTM A 1011 SS Gr. 50, or ASTM A499.		NOTES 1. See "Flexible Delineator and Object Marker Posts" Material Producer List for approved devices. 2. Install per manufacturer's recommendations. 3. Post length may vary to meet field conditions. 4. When using yellow delineators with flexible posts to separate opposing direction of travel, such as centerline or median use, the flexible posts shall be yellow.		NOTE 1. Install per manufacturer's recommendations.																										
TYPES 1,3, AND 4 OBJECT MARKERS AND CHEVRONS		CHEVRONS AND ONE DIRECTION LARGE ARROW SIGN		DELINEATORS AND TYPE 2 OBJECT MARKERS																										
																														
NOTE Mounting at 4 feet to the bottom of the chevron is permitted for chevrons that will not exceed a height of 6'-6" to the top of the chevron (sizes 24" x 30" and smaller)		NOTE Chevrons 30" x 36" and larger shall be mounted at a height of 7' to the bottom of the chevron. Chevron sign and ONE DIRECTION LARGE ARROW sign (W1-9T) shall be installed per SMD standard sheets and paid under item 644.		See general notes 1, 2 and 3.																										
GENERAL NOTES 1. Place delineators on a section of roadway at a consistent distance from the edge of pavement. 2. Where a restriction prevents consistent placement from the pavement edge, place the affected object markers in line with the innermost edge of the obstruction. 3. When Type 2 object markers and delineators are more than 8'-0" from the edge of the pavement, it may not be possible to maintain a height of approximately 4'-0". If this is the case, place the object marker or delineator as close to the desired height as possible. 4. Install all delineators, object markers and barrier reflectors in accordance with the manufacturer's recommendation. 5. Barrier reflectors should be installed a minimum of 18 inches above the edge of the pavement surface. 6. Diagonal stripes on Type 3 object markers shall slope down toward the intended travel lane.																														
 Traffic Safety Division Standard																														
<h2 style="margin: 0;">DELINEATOR & OBJECT MARKER INSTALLATION</h2> <h3 style="margin: 0;">D & OM(2)-20</h3>																														
<table border="1" style="width: 100%; border-collapse: collapse; font-size: small;"> <tr> <td>FILE: dom2-20.dgn</td> <td>DN: TxDOT</td> <td>CK: TxDOT</td> <td>DW: TxDOT</td> <td>CK: TxDOT</td> </tr> <tr> <td>© TxDOT August 2004</td> <td>CONT</td> <td>SECT</td> <td>JOB</td> <td>HIGHWAY</td> </tr> <tr> <td>REVISIONS</td> <td>0435</td> <td>01</td> <td>080</td> <td>FM 38</td> </tr> <tr> <td>10-09 3-15</td> <td>DIST</td> <td>COUNTY</td> <td>SHEET NO.</td> <td></td> </tr> <tr> <td>4-10 7-20</td> <td>PAR</td> <td>LAMAR</td> <td>127</td> <td></td> </tr> </table>						FILE: dom2-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT	© TxDOT August 2004	CONT	SECT	JOB	HIGHWAY	REVISIONS	0435	01	080	FM 38	10-09 3-15	DIST	COUNTY	SHEET NO.		4-10 7-20	PAR	LAMAR	127	
FILE: dom2-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT																										
© TxDOT August 2004	CONT	SECT	JOB	HIGHWAY																										
REVISIONS	0435	01	080	FM 38																										
10-09 3-15	DIST	COUNTY	SHEET NO.																											
4-10 7-20	PAR	LAMAR	127																											

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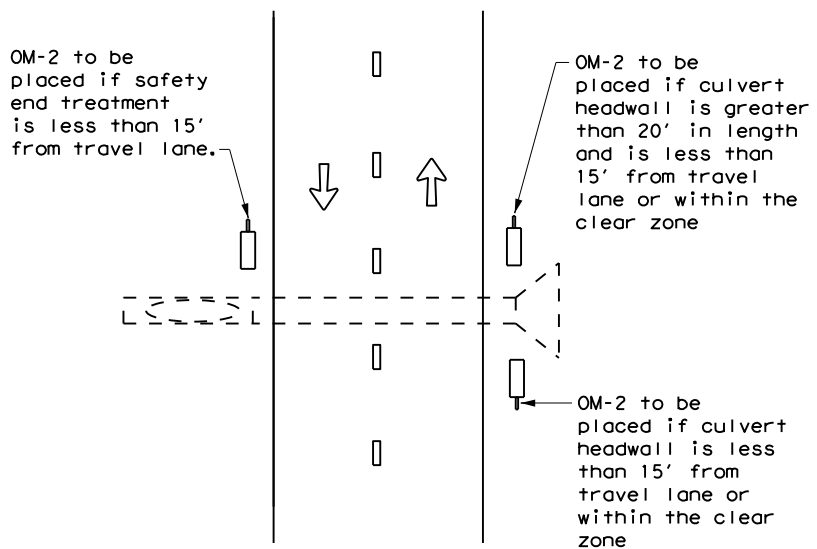
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CROSSOVERS



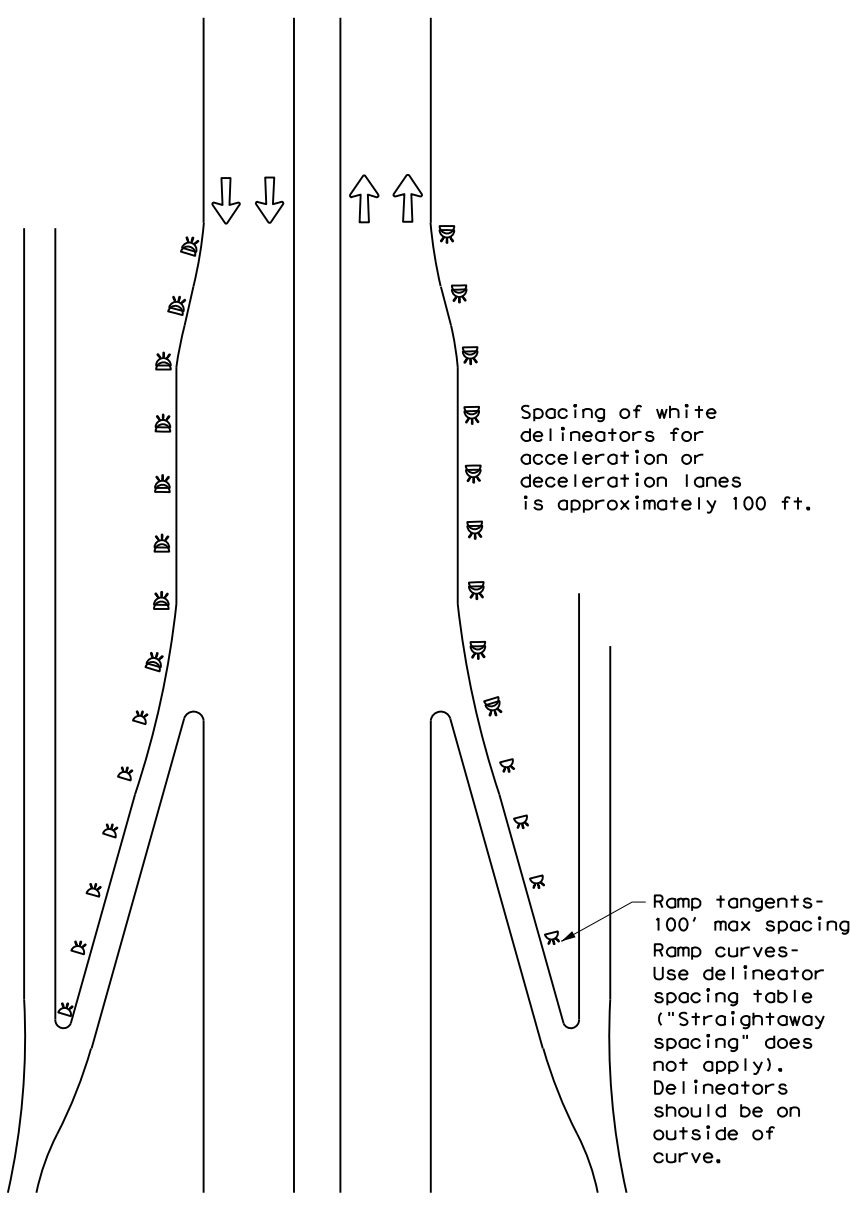
DETAIL 1

FOR CULVERTS WITHOUT MBGF



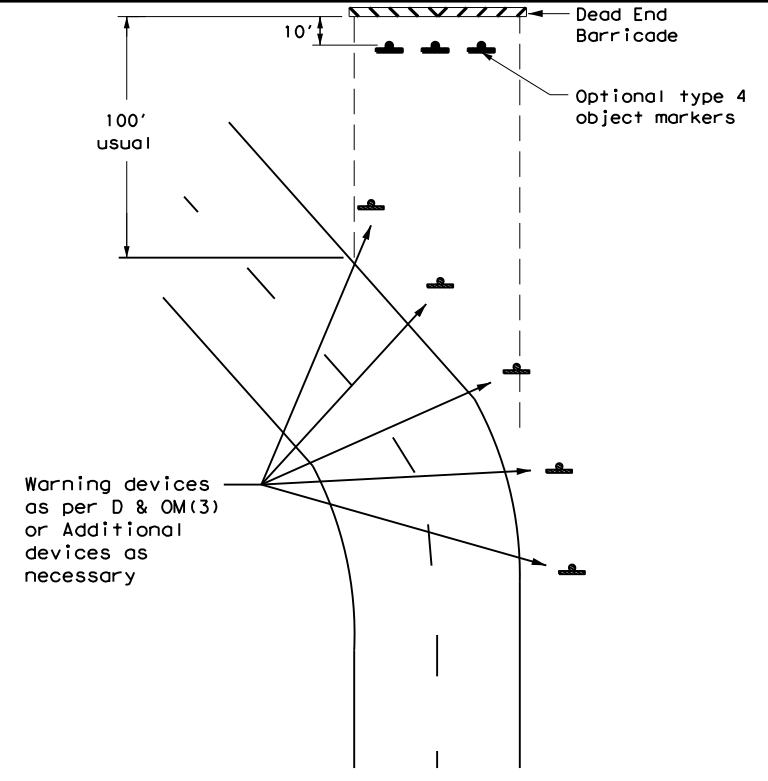
DETAIL 2

FREEWAY DELINEATION FOR RAMPS AND ACCELERATION/DECELERATION LANES



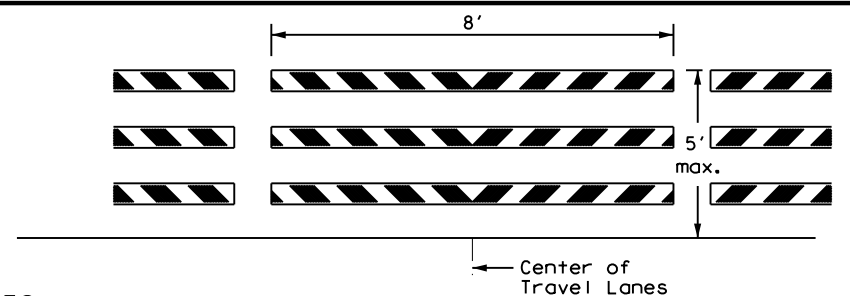
DETAIL 3

TYPICAL APPLICATION OF DEAD END BARRICADE



DETAIL 4

TYPICAL DEAD END BARRICADE INSTALLATION



NOTES

1. Barricade striping shall be red and white reflective sheeting for all permanent road closures.
2. Barricade striping is red and white sloping toward the center of the roadway.
3. Type 3 Barricade Supports should be anchored to soil or pavement as described in compliant Work Zone Traffic Control Devices List, section D.2.f and D.2.g.

DETAIL 5

LEGEND	
	Bidirectional Delineator
	Delineator
	OM-3
	Barricade
	Sign
	OM-2
	Double Delineator

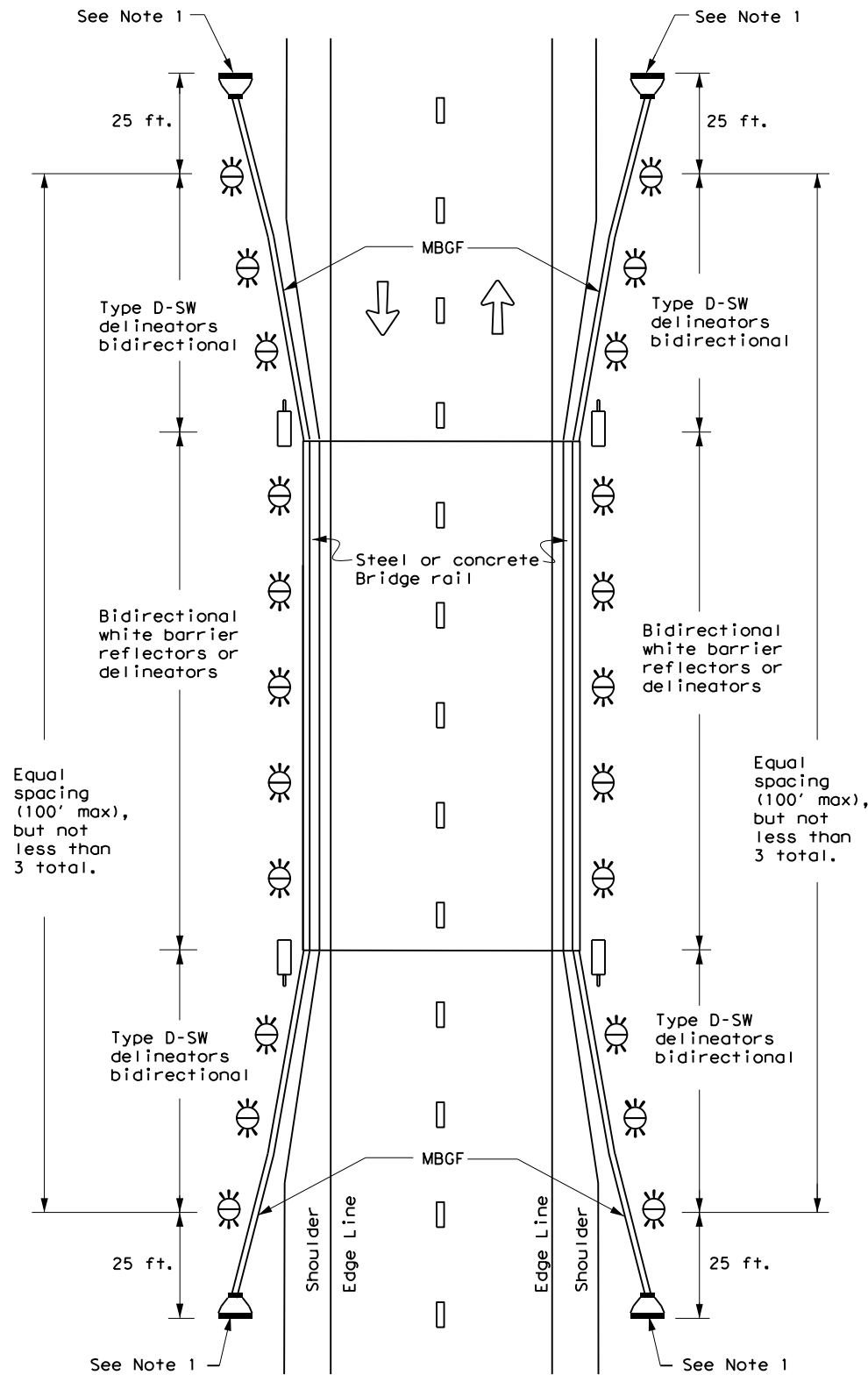


DELINEATOR & OBJECT MARKER PLACEMENT DETAILS

D & OM(4) -20

FILE: dom4-20.dgn	DN: TXDOT	CK: TXDOT	OW: TXDOT	CK: TXDOT
© TXDOT August 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS	0435	01	080	FM 38
3-15	DIST	COUNTY	SHEET NO.	
7-20	PAR	LAMAR	128	

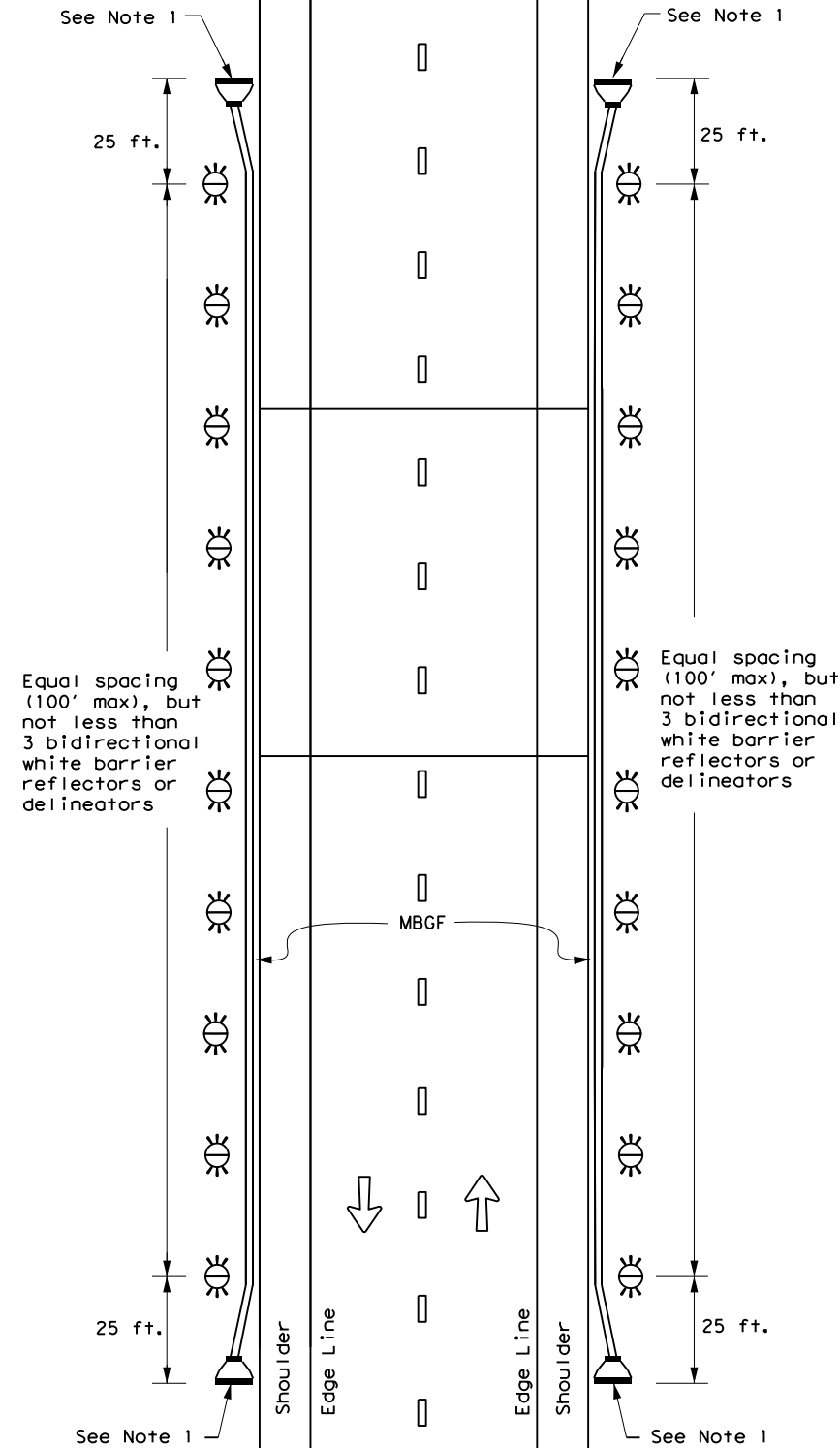
**TWO-WAY, TWO LANE ROADWAY
WITH REDUCED WIDTH APPROACH RAIL**



NOTE:

1. Terminal ends require reflective sheeting provided by manufacturer per D & OM (VIA) or a Type 3 Object Marker (OM-3) in front of the terminal end.

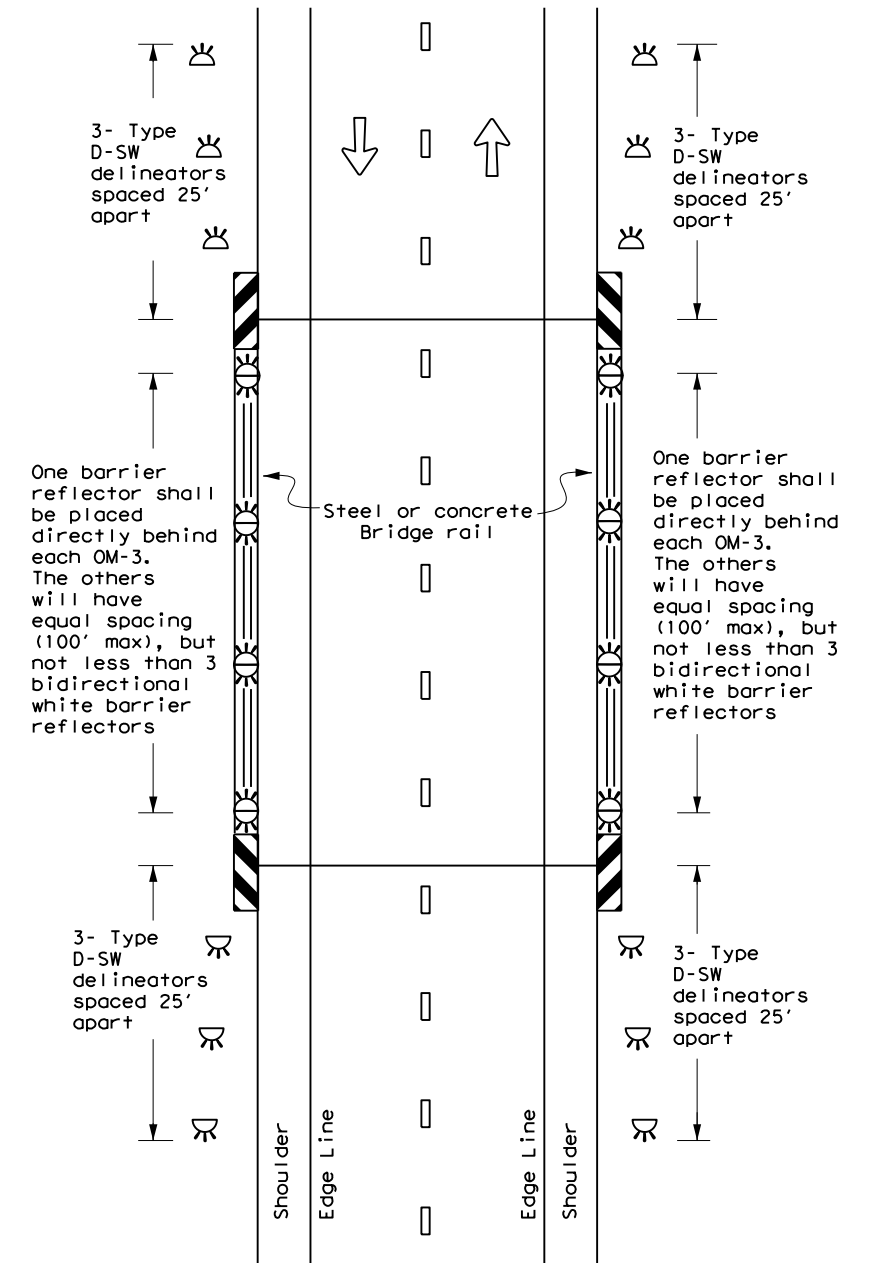
**TWO-WAY, TWO LANE ROADWAY
WITH METAL BEAM GUARD FENCE (MBGF)**



NOTE:

1. Terminal ends require reflective sheeting provided by manufacturer per D & OM (VIA) or a Type 3 Object Marker (OM-3) in front of the terminal end.

**TWO-WAY, TWO LANE ROADWAY
BRIDGE WITH NO APPROACH RAIL**



LEGEND

	Bidirectional Delineator
	Delineator
	OM-3
	OM-2
	Terminal End
	Traffic Flow



**DELINEATOR &
OBJECT MARKER
PLACEMENT DETAILS**

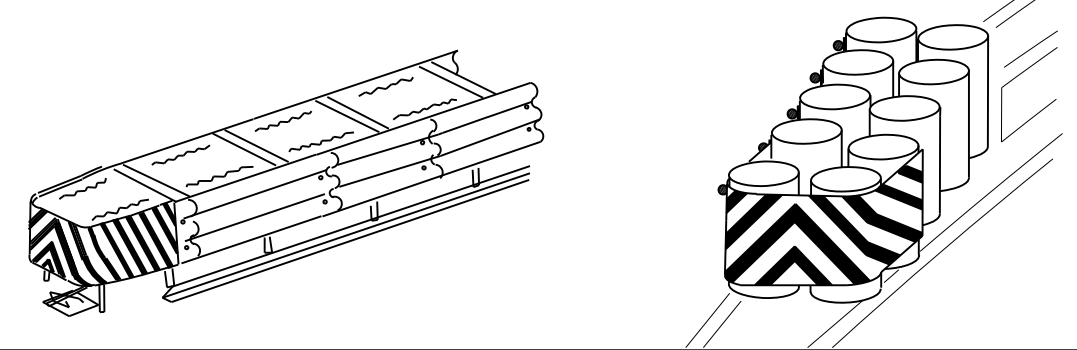
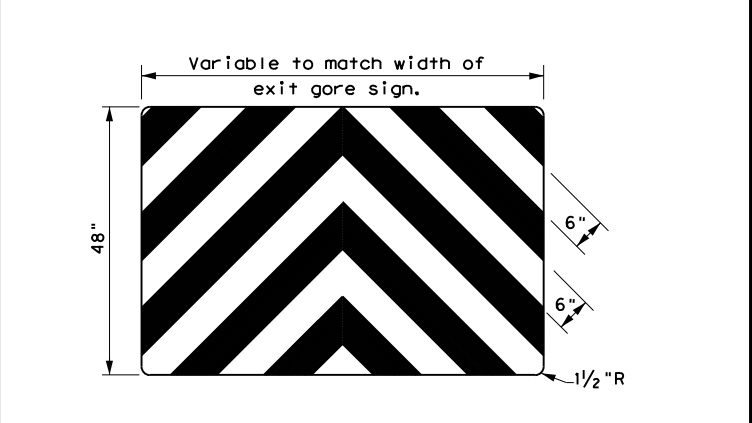
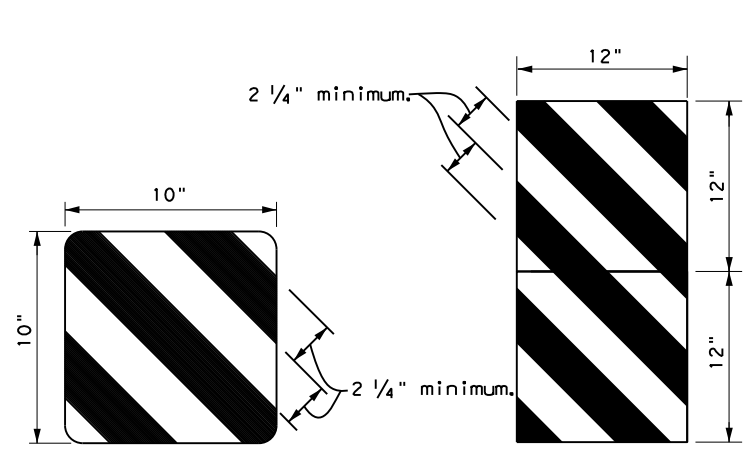
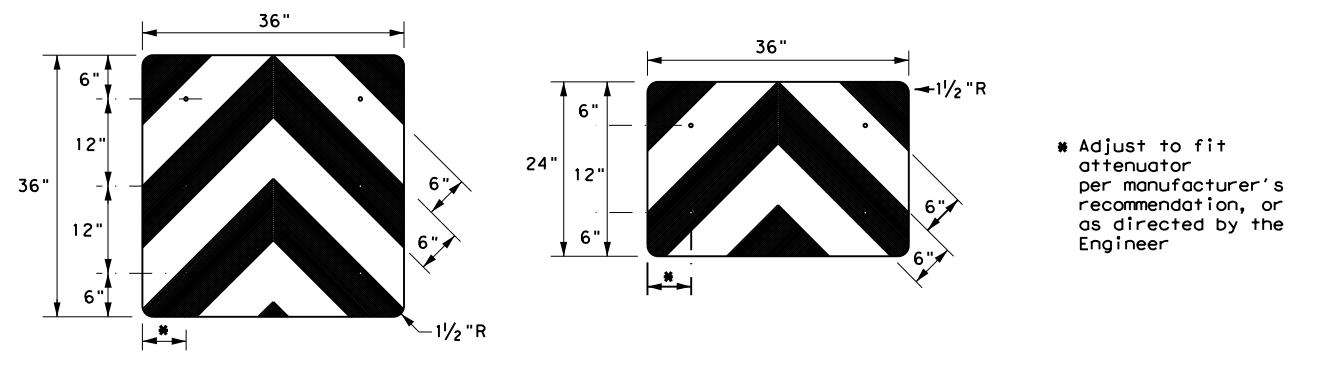
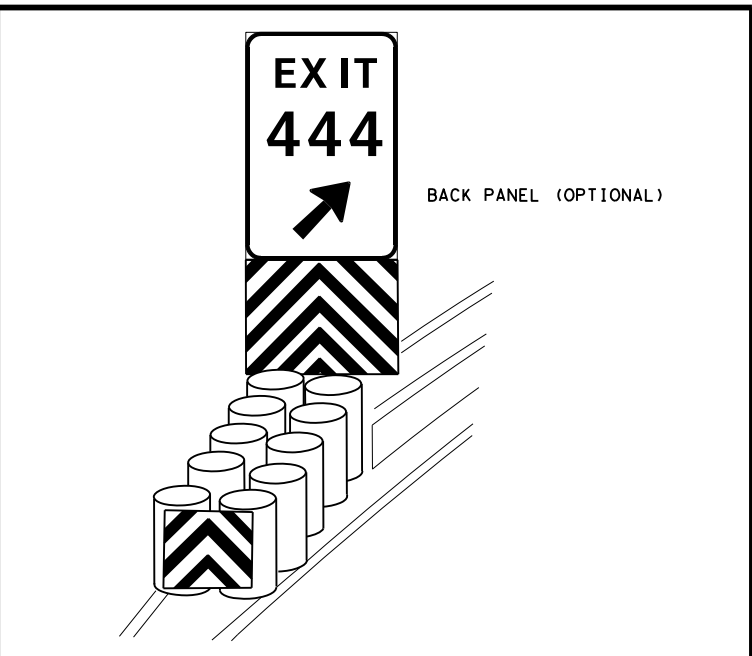
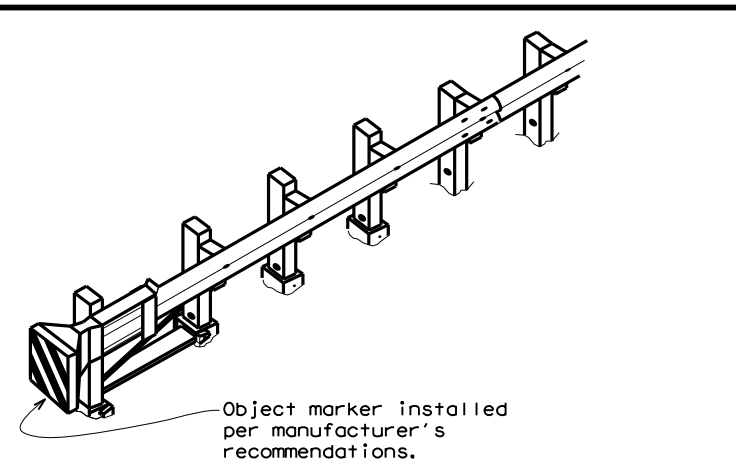
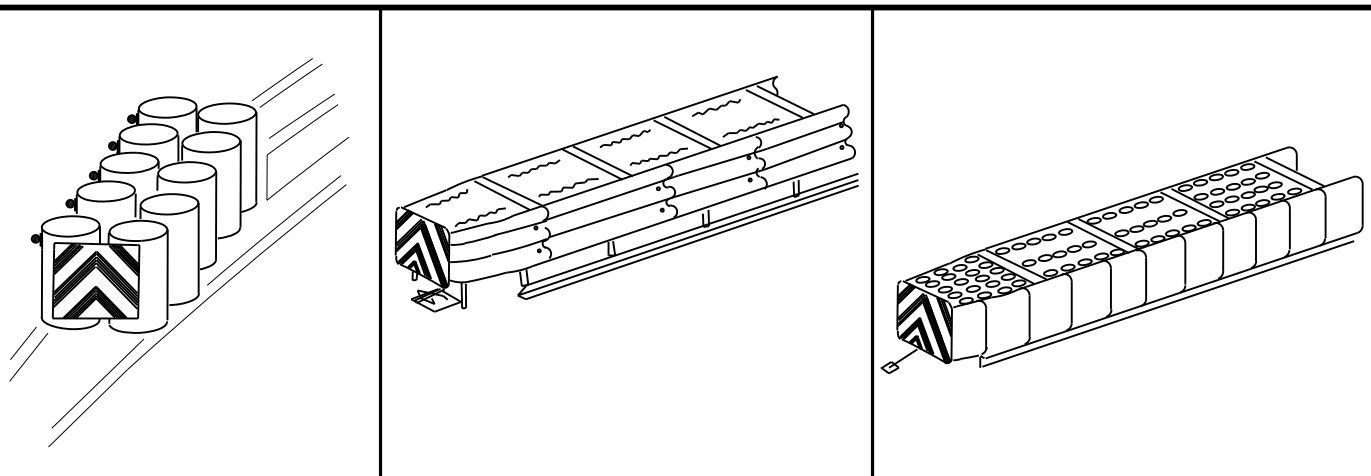
D & OM(5)-20

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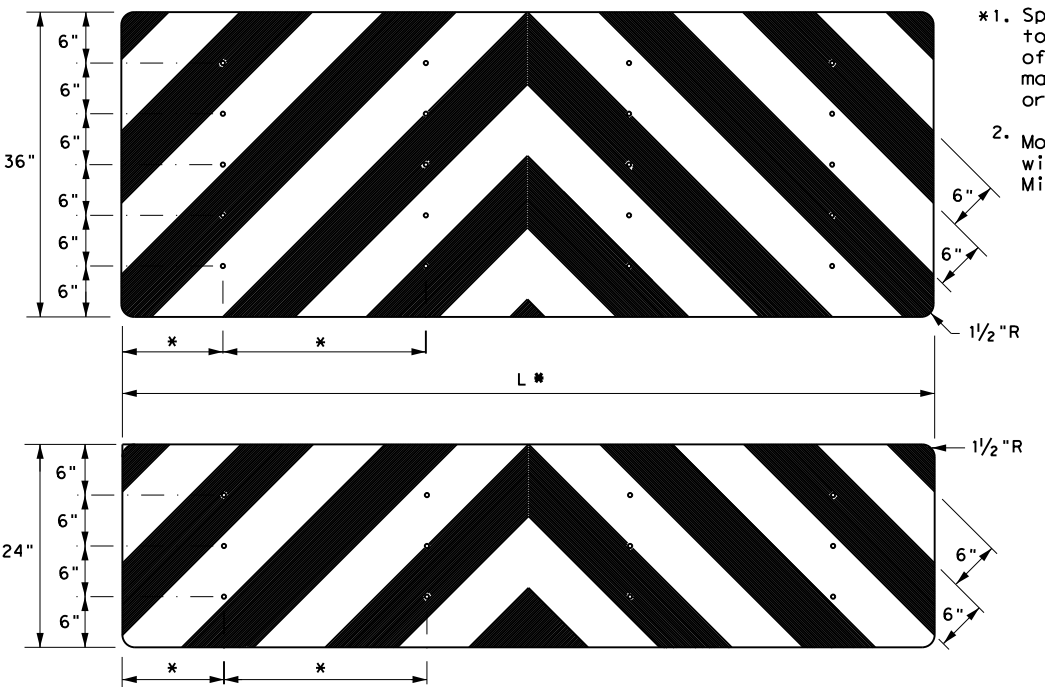
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OBJECT MARKERS SMALLER THAN 3 FT²

- NOTES**
- Spacing should be adjusted to attach through centerline of drum, per attenuator manufacturer's recommendation, or as directed by the Engineer.
 - Mounting should be flush with top of attenuator. Minimum size 96" x 24".

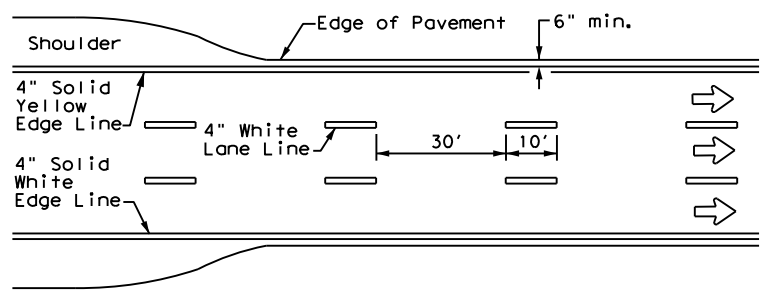


- NOTES**
- Object Markers shall conform to the Texas MUTCD and meet the color and reflectivity requirement of Department Material Specification DMS 8300. Background shall be yellow reflective sheeting (Type B or C) and Chevron shall be black.
 - Object Markers may be fabricated from adhesive backed reflective sheeting applied directly to guardrail end treatment, or applied directly to an "end cap" as per the manufacturer's recommendation. Direct applied sheeting shall provide a smooth surface and have no wrinkles, air bubbles, cuts or tears. A radius at the corners is not required for direct applied sheeting.
 - Object Marker size may be reduced to fit smaller devices. Width of alternating black and yellow stripes are typically 6". Object Markers smaller than 3ft may have reduced width stripes of a minimum of 2 1/4".
 - Pop rivets, screws, or nuts and bolts may be used to attach object markers and reflectors. Holes, slots or other openings may be cut or drilled through object markers to allow cable or other attachments.
 - Object Marker at nose of attenuator is subsidiary to the attenuator.
 - See D & OM (1-4) for required barrier reflectors.

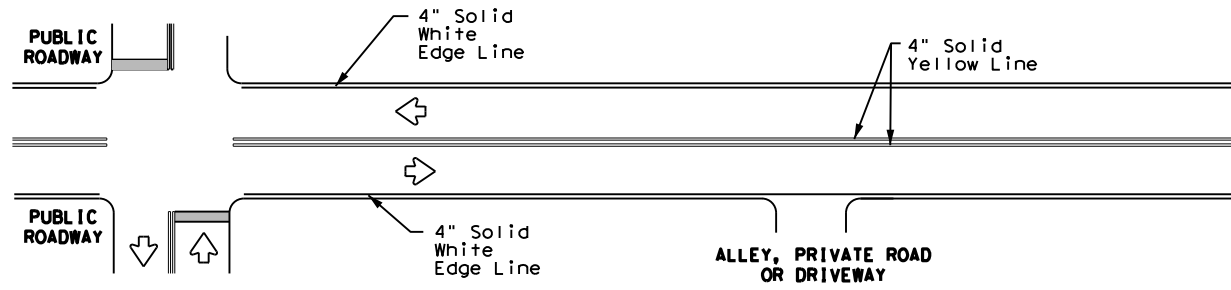
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DELINEATOR & OBJECT MARKER FOR VEHICLE IMPACT ATTENUATORS D & OM(VIA) -20			
FILE: domvia20.dgn	DN: TxDOT	CK: TxDOT	OW: TxDOT
© TxDOT December 1989	CONT	SECT	HIGHWAY
REVISIONS	0435	01	080 FM 38
4-92 8-04	DIST	COUNTY	SHEET NO.
8-95 3-15	PAR	LAMAR	130
4-98 7-20			
20G			

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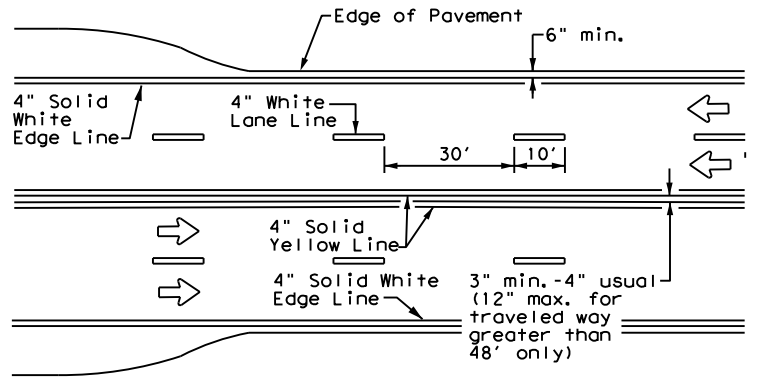
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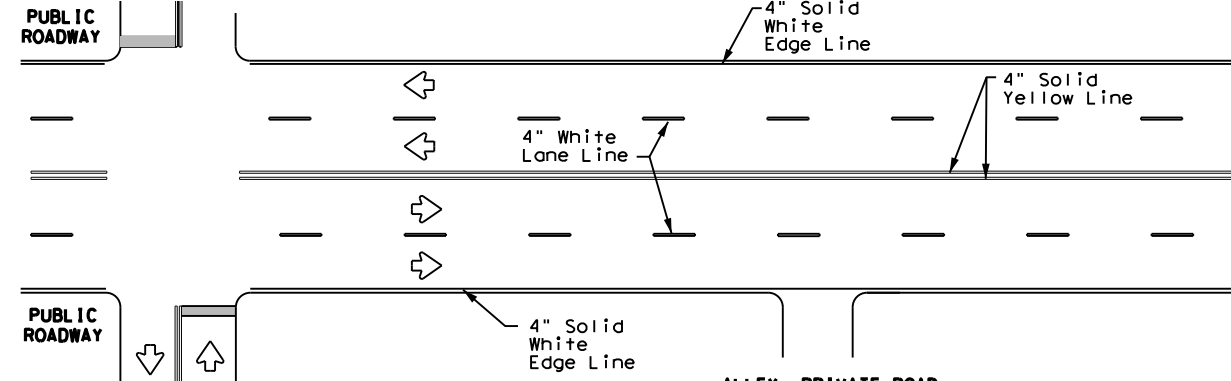
**EDGE LINE AND LANE LINES
ONE-WAY ROADWAY
WITH OR WITHOUT SHOULDERS**



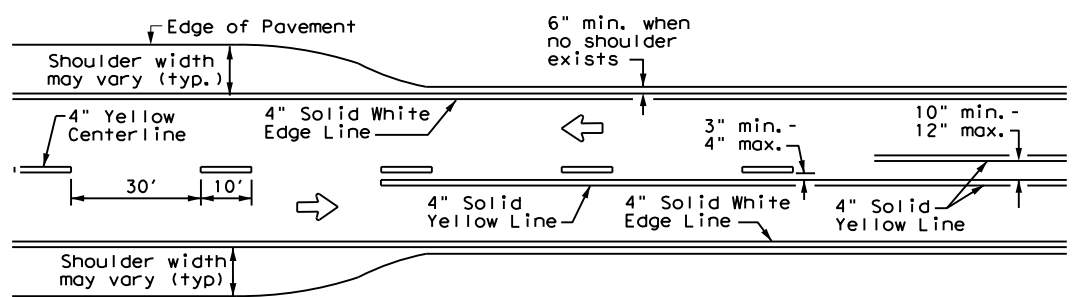
**TYPICAL TWO-LANE, TWO-WAY PAVEMENT
MARKINGS THROUGH INTERSECTIONS**



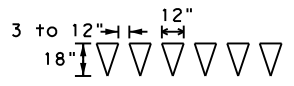
**CENTERLINE AND LANE LINES
FOUR LANE TWO-WAY ROADWAY
WITH OR WITHOUT SHOULDERS**



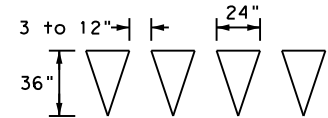
**TYPICAL MULTI-LANE, TWO-WAY PAVEMENT
MARKINGS THROUGH INTERSECTIONS**



**TWO LANE TWO-WAY ROADWAY
WITH OR WITHOUT SHOULDERS**

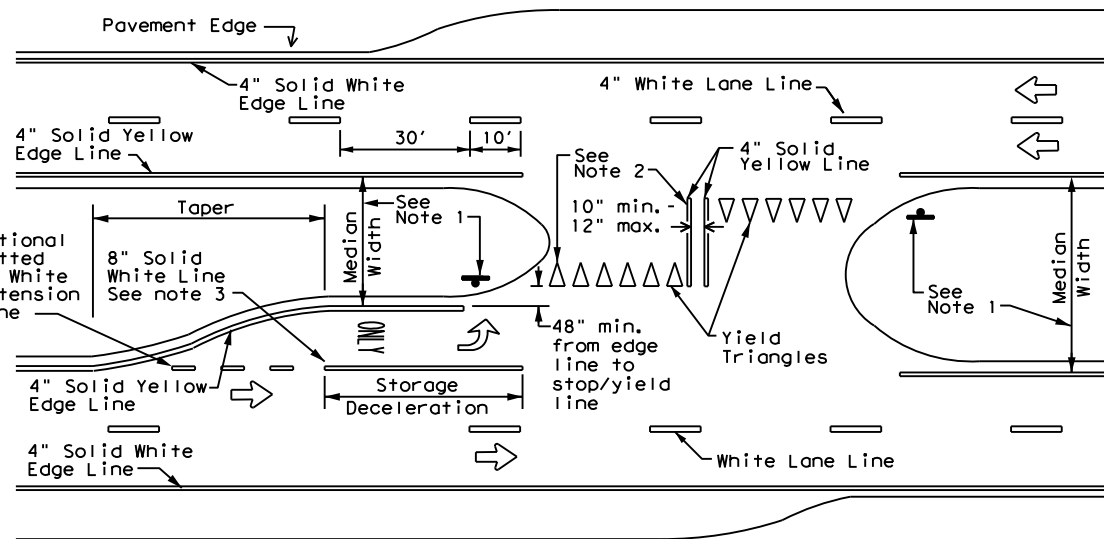


For posted speed on road being marked equal to or less than 40 MPH.



For posted speed on road being marked equal to or greater than 45 MPH.

YIELD LINES



FOUR LANE DIVIDED ROADWAY CROSSOVERS

NOTES

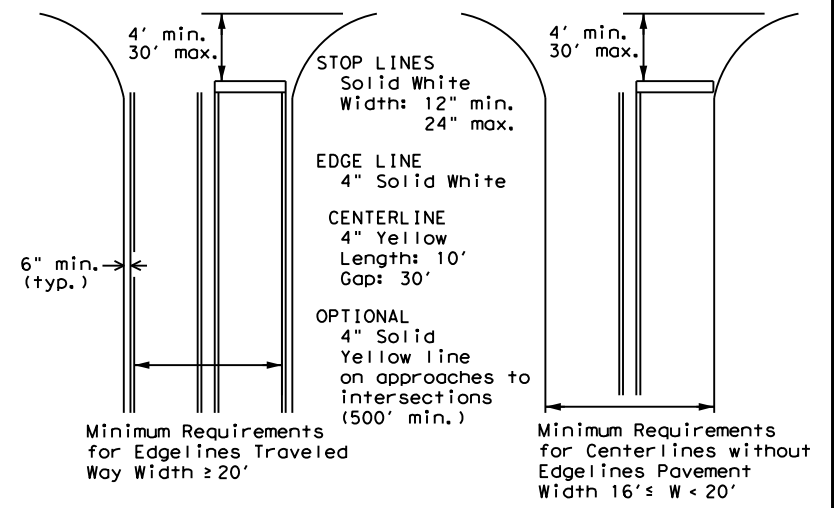
- Where divided highways are separated by median widths at the median opening itself of 30 feet or more, median openings shall be signed as two separate intersections. Each median opening has two width measurements, with one measurement for each approach. The narrow median width will be the controlling width to determine if signs are required. Yield signs are the typical intersection control. Stop signs are optional as determined by the Engineer.
- Install median striping (double yellow centerlines and stop bars/yield triangles) when a 50' or greater median centerline can be placed. Stop bars shall only be used with stop signs. Yield triangles shall only be used with yield signs.
- Length of turn bays, including taper, deceleration, and storage lengths shall be as shown on the plans or as directed by the Engineer.

GENERAL NOTES

- Edgeline striping shall be as shown in the plans or as directed by the Engineer. The edgeline should not be placed less than 6 inches from the edge of pavement. This distance may vary due to pavement raveling or other conditions. Edgelines are not required in curb and gutter sections of roadways.
- The traveled way includes only that portion of the roadway used for vehicular travel. It does not include the parking lanes, sidewalks, berms and shoulders. The traveled ways shall be measured from the inside of edgeline to the inside of edgeline of a two lane roadway.

MATERIAL SPECIFICATIONS	
PAVEMENT MARKERS (REFLECTORIZED)	DMS-4200
EPOXY AND ADHESIVES	DMS-6100
BITUMINOUS ADHESIVE FOR PAVEMENT MARKERS	DMS-6130
TRAFFIC PAINT	DMS-8200
HOT APPLIED THERMOPLASTIC	DMS-8220
PERMANENT PREFABRICATED PAVEMENT MARKINGS	DMS-8240

All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.



**GUIDE FOR PLACEMENT OF STOP LINES,
EDGE LINE & CENTERLINE**

Based on Traveled Way and Pavement Widths for Undivided Highways



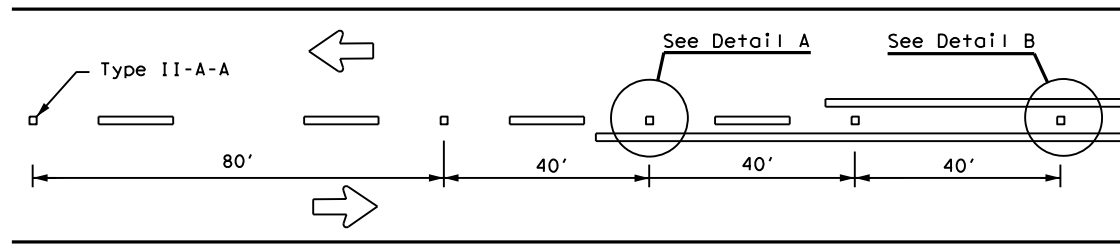
**TYPICAL STANDARD
PAVEMENT MARKINGS**

PM(1) - 20

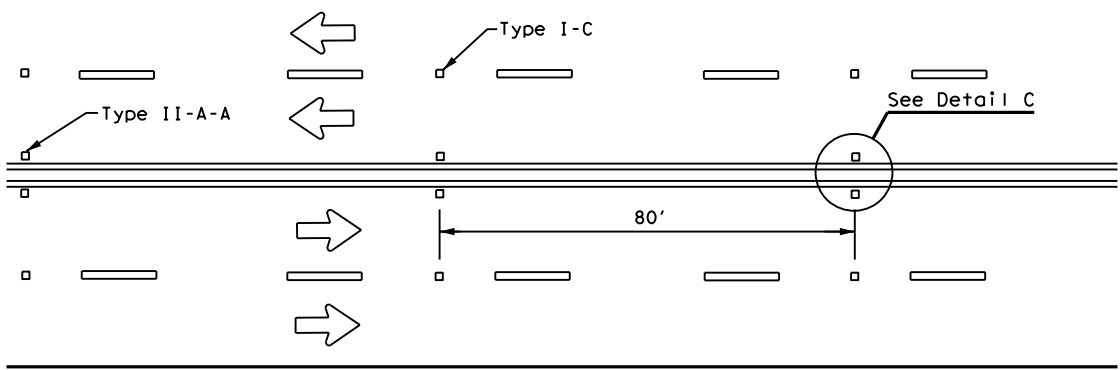
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© TxDOT November 1978	CONT	SECT	JOB	HIGHWAY
8-95 3-03 REVISIONS	0435	01	080	FM 38
5-00 2-12	DIST	COUNTY	SHEET NO.	
8-00 6-20	PAR	LAMAR	131	

REFLECTIVE RAISED PAVEMENT MARKERS FOR VEHICLE POSITIONING GUIDANCE

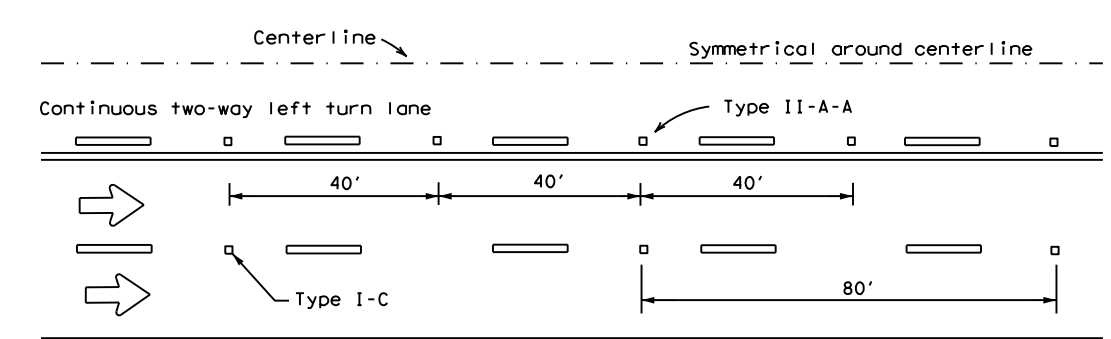
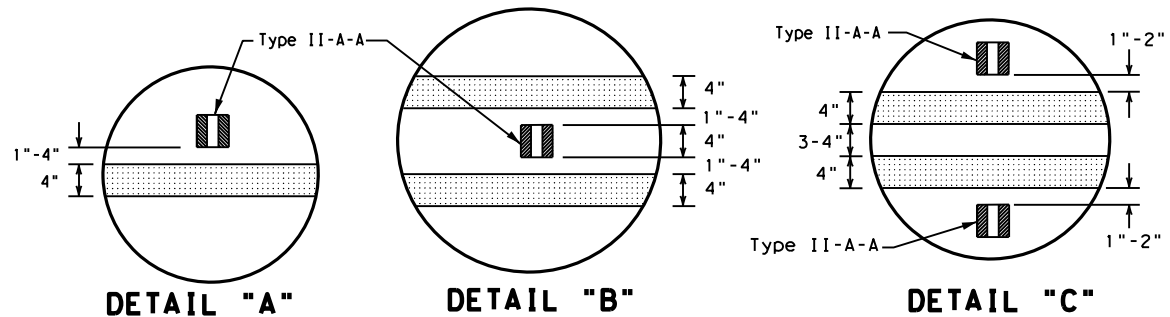
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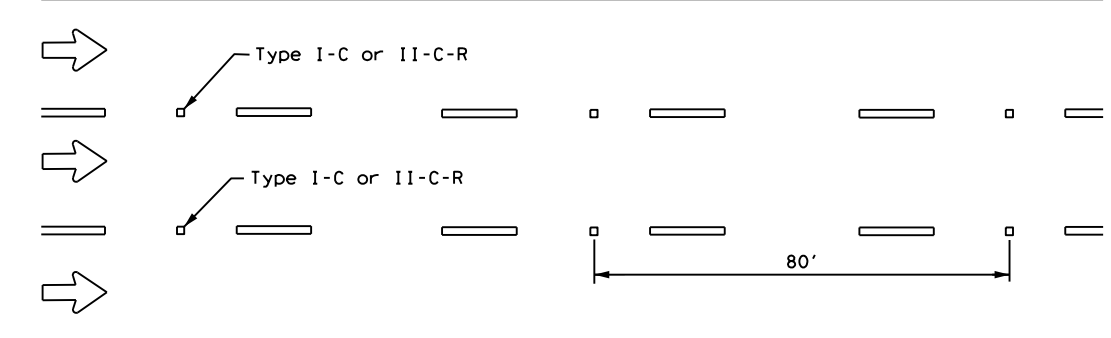
CENTERLINE FOR ALL TWO LANE ROADWAYS



**CENTERLINE & LANE LINES
FOR FOUR LANE TWO-WAY HIGHWAYS**



CENTERLINE AND LANE LINES FOR TWO-WAY LEFT TURN LANE

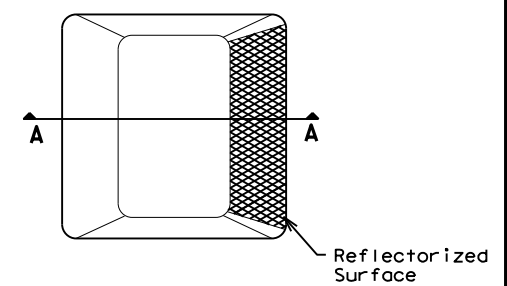


LANE LINES FOR ONE-WAY ROADWAY (NON-FREEWAY FACILITIES)

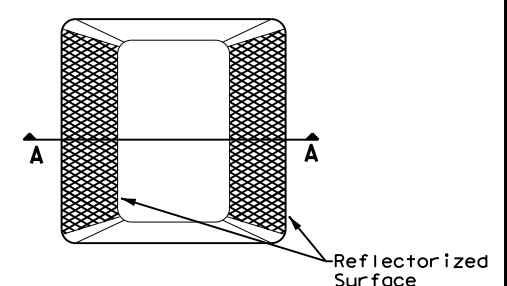
Raised pavement markers Type II-C-R shall have clear face toward normal traffic and red face toward wrong-way traffic.

MATERIAL SPECIFICATIONS	
PAVEMENT MARKERS (REFLECTORIZED)	DMS-4200
EPOXY AND ADHESIVES	DMS-6100
BITUMINOUS ADHESIVE FOR PAVEMENT MARKERS	DMS-6130
TRAFFIC PAINT	DMS-8200
HOT APPLIED THERMOPLASTIC	DMS-8220
PERMANENT PREFABRICATED PAVEMENT MARKINGS	DMS-8240

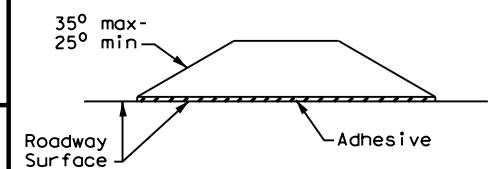
All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.



Type I (Top View)



Type II (Top View)

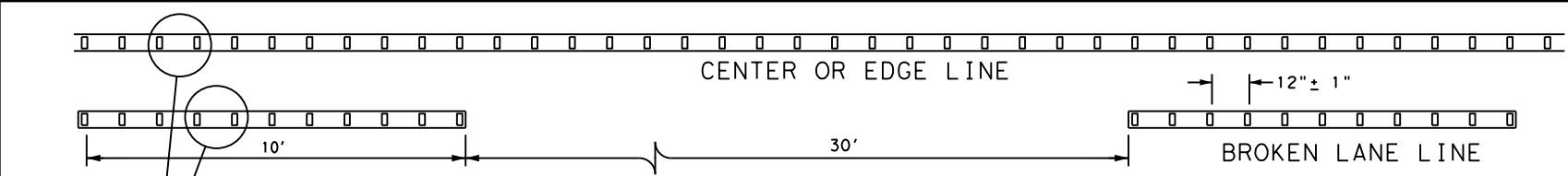


SECTION A

RAISED PAVEMENT MARKERS

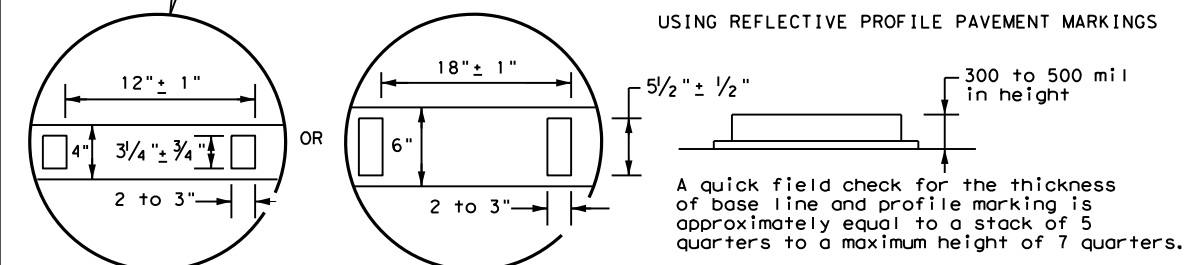
GENERAL NOTES

- All raised pavement markers placed in broken lines shall be placed in line with and midway between the stripes.
- On concrete pavements the raised pavement markers should be placed to one side of the longitudinal joints.



**REFLECTORIZED PROFILE
PATTERN DETAIL**

USING REFLECTIVE PROFILE PAVEMENT MARKINGS



NOTE

Profile markings shall not be placed on roadways with a posted speed limit of 45 MPH or less.

Texas Department of Transportation

POSITION GUIDANCE USING RAISED MARKERS REFLECTORIZED PROFILE MARKINGS PM(2) - 20

FILE: pm2-20.dgn	DN:	CK:	DW:	CK:
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4-92 2-10 REVISIONS	0435	01	080	FM 38
5-00 2-12	DIST	COUNTY	SHEET NO.	
8-00 6-20	PAR	LAMAR	132	

SITE DESCRIPTION

PROJECT LIMITS: THIS PROJECT IS IN NORTHWEST LAMAR COUNTY FROM THE US 82 TO US 82.

PROJECT DESCRIPTION: SAFETY TREAT FIXED OBJECTS

MAJOR SOIL DISTURBING ACTIVITIES:

INCLUDES PREP ROW, EMBANKMENT FOR FILL, DITCH GRADING, EROSION AND SEDIMENTARY CONTROLS, AND TOPSOIL WORK FOR FINAL SEEDING.

TOTAL PROJECT AREA: 181.10 ACRES

TOTAL AREA TO BE DISTURBED: 0.10 AC (0.055%)

EXISTING CONDITION OF SOIL & VEGETATIVE COVER AND % OF EXISTING VEGETATIVE COVER:
The existing soil consists of Lassiter silt loam, frequently flooded. Slopes range from 0 to 1 percent. Native grasses, brush, and trees cover the existing soil.

NAME OF RECEIVING WATERS:

Cotton Wood Creek flows approximately 9.4 miles and empties into Sanders Creek. Sanders Creek flows approximately 10 miles from Cotton Creek and empties into Pat Mayse Lake, Segment 0209, of the Red River Basin.

EROSION AND SEDIMENT CONTROLS

SOIL STABILIZATION PRACTICES & STRUCTURAL PRACTICES:

EROSION CONTROL:

- TEMPORARY SEEDING
- PERMANENT PLANTING, SODDING, OR SEEDING
- MULCHING
- SOIL RETENTION BLANKET
- BUFFER ZONES
- PRESERVATION OF NATURAL RESOURCES

OTHER:

DISTURBED AREAS ON WHICH CONSTRUCTION ACTIVITY HAS CEASED (TEMPORARILY OR PERMANENTLY) SHALL BE STABILIZED WITHIN 14 DAYS UNLESS ACTIVITIES ARE SCHEDULED TO RESUME AND DO WITHIN 21 DAYS.

SEDIMENTATION CONTROL:

- SILT FENCES
- HAY BALES
- ROCK BERMS
- DIVERSION, INTERCEPTOR, OR PERIMETER DIKES
- DIVERSION, INTERCEPTOR, OR PERIMETER SWALES
- DIVERSION DIKE AND SWALE COMBINATIONS
- PIPE SLOPE DRAINS
- PAVED FLUMES
- ROCK BEDDING AT CONSTRUCTION EXIT
- TIMBER MATTING AT CONSTRUCTION EXIT
- CHANNEL LINERS
- SEDIMENT TRAPS
- SEDIMENT BASINS
- STORM INLET SEDIMENT TRAP
- STONE OUTLET STRUCTURES
- CURBS AND GUTTERS
- STORM SEWERS
- VELOCITY CONTROL DEVICES

POST-CONSTRUCTION CONTROLS:

- RETENTION / IRRIGATION
- EXTENDED DETENTION BASIN (ie: ROCK BERMS)
- VEGETATIVE FILTER STRIPS
- GRASSY SWALES
- VEGETATIVE LINED DRAINAGE DITCHES
- CONSTRUCTED WET LANDS
- WET BASINS
- SAND FILTER SYSTEMS

NARRATIVE - SEQUENCE OF CONSTRUCTION (STORM WATER MANAGEMENT) ACTIVITIES:

THE ORDER OF ACTIVITIES WILL BE AS FOLLOWS:

MAJOR SOIL DISTURBING ACTIVITIES SHALL NOT BE PERFORMED UNTIL EMBANKMENT PLACEMENT IS SCHEDULED TO BEGIN WITHIN FIVE (5) WORKING DAYS.

INSTALL EROSION AND SEDIMENTATION CONTROLS PRIOR TO SOIL DISTURBANCE WHENEVER POSSIBLE.

ONCE BEGUN, EARTHWORK ACTIVITIES SHALL BE PROGRESSED WITHOUT DELAY, UNLESS APPROVED BY THE ENGINEER, UNTIL FINAL GRADING IS ACCOMPLISHED.

EROSION CONTROL MEASURES SHALL BE APPLIED IMMEDIATELY UPON COMPLETION OF THE EMBANKMENT PLACEMENT TO MINIMIZE POTENTIAL WATER QUALITY IMPACTS.

REMARKS: Disposal areas, stockpiles, and haul roads shall be constructed in a manner that will minimize and control the amount of sediment that may enter receiving waters. Disposal areas shall not be located in any wetland, waterbody or streambed. The Contractor shall designate a location for, construct, and maintain an area for concrete mixing, handling and delivery equipment to wash out. Construction staging areas and vehicle maintenance areas shall be constructed by the Contractor in a manner to minimize the runoff of pollutants. All waterways shall be cleared as soon as practicable of temporary embankment, temporary bridges, matting, falsework, piling, debris or other obstructions placed during construction operations that are not a part of the finished work.

MAINTENANCE: All erosion and sediment controls will be maintained in good working order. If a repair is necessary, it will be done at the earliest date possible, but no later than 7 calendar days after the surrounding exposed ground has dried sufficiently to prevent further damage from heavy equipment. The areas adjacent to creeks and drainageways shall have priority followed by devices protecting storm sewer inlets.

INSPECTION: An inspection will be performed by a TxDOT Inspector at least once every seven (7) calendar days. An inspection and maintenance report will be made per each inspection. Stormwater controls will be modified as directed by the Engineer based on these reports.

OTHER EROSION AND SEDIMENT CONTROLS:

WASTE MATERIALS: All trash and construction debris from the job site will be disposed of by the Contractor at a local dump. No construction materials will be buried on site.

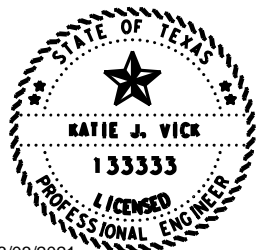
HAZARDOUS WASTE (INCLUDING SPILL REPORTING): Any hazardous waste spills shall be reported to the TxDOT Safety Officer in Paris. It shall be the responsibility of the waste owner to provide for the required clean-up. If the owner cannot be determined, the district laboratory shall direct in the clean-up operation.

SANITARY WASTE: Any sanitary waste shall be collected from portable units as necessary or as required by local regulation by a licensed sanitary waste management contractor. All sanitary waste from permanent sites will be collected by local sanitary sewer systems.

OFFSITE VEHICLE TRACKING:

- HAUL ROADS DAMPENED FOR DUST CONTROL
- LOADED HAUL TRUCKS TO BE COVERED WITH TARPAULIN
- EXCESS DIRT ON ROAD REMOVED DAILY
- STABILIZED CONSTRUCTION ENTRANCE

THE CONTRACTOR IS RESPONSIBLE FOR ENSURING THAT ALL SUBCONTRACTORS ARE AWARE OF AND COMPLY WITH ALL COMPONENTS OF THE SW3P.



03/03/2021

Katie J. Vick, P.E.

FM 38 SWPPP

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CONT	SECT	JOB	HIGHWAY
0435	01	080	FM 38
DIST	COUNTY	SHEET NO.	
PAR	LAMAR	133	

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I. STORMWATER POLLUTION PREVENTION-CLEAN WATER ACT SECTION 402

TPDES TXR 150000: Stormwater Discharge Permit or Construction General Permit required for projects with 1 or more acres disturbed soil. Projects with any disturbed soil must protect for erosion and sedimentation in accordance with Item 506.

List MS4 Operator(s) that may receive discharges from this project. They may need to be notified prior to construction activities.

-
- No Action Required Required Action

Action No.

- Prevent stormwater pollution by controlling erosion and sedimentation in accordance with TPDES Permit TXR 150000
- Comply with the SW3P and revise when necessary to control pollution or required by the Engineer.
- Post Construction Site Notice (CSN) with SW3P information on or near the site, accessible to the public and TCEQ, EPA or other inspectors.
- When Contractor project specific locations (PSL's) increase disturbed soil area to 5 acres or more, submit NOI to TCEQ and the Engineer.

II. WORK IN OR NEAR STREAMS, WATERBODIES AND WETLANDS CLEAN WATER ACT SECTIONS 401 AND 404

USACE Permit required for filling, dredging, excavating or other work in any water bodies, rivers, creeks, streams, wetlands or wet areas.

The Contractor must adhere to all of the terms and conditions associated with the following permit(s):

- No Permit Required
- Nationwide Permit 14 - PCN not Required (less than 1/10th acre waters or wetlands affected)
- Nationwide Permit 14 - PCN Required (1/10 to <1/2 acre, 1/3 in tidal waters)
- Individual 404 Permit Required
- Other Nationwide Permit Required: NWP# _____

Required Actions: List waters of the US permit applies to, location in project and check Best Management Practices planned to control erosion, sedimentation and post-project TSS.

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The elevation of the ordinary high water marks of any areas requiring work to be performed in the waters of the US requiring the use of a nationwide permit can be found on the Bridge Layouts.

Best Management Practices:

Erosion	Sedimentation	Post-Construction TSS
<input type="checkbox"/> Temporary Vegetation	<input checked="" type="checkbox"/> Silt Fence	<input type="checkbox"/> Vegetative Filter Strips
<input type="checkbox"/> Blankets/Matting	<input type="checkbox"/> Rock Berm	<input type="checkbox"/> Retention/Irrigation Systems
<input type="checkbox"/> Mulch	<input type="checkbox"/> Triangular Filter Dike	<input type="checkbox"/> Extended Detention Basin
<input type="checkbox"/> Sodding	<input type="checkbox"/> Sand Bag Berm	<input type="checkbox"/> Constructed Wetlands
<input type="checkbox"/> Interceptor Swale	<input type="checkbox"/> Straw Bale Dike	<input type="checkbox"/> Wet Basin
<input type="checkbox"/> Diversion Dike	<input type="checkbox"/> Brush Berms	<input type="checkbox"/> Erosion Control Compost
<input type="checkbox"/> Erosion Control Compost	<input type="checkbox"/> Erosion Control Compost	<input type="checkbox"/> Mulch Filter Berm and Socks
<input type="checkbox"/> Mulch Filter Berm and Socks	<input type="checkbox"/> Mulch Filter Berm and Socks	<input type="checkbox"/> Compost Filter Berm and Socks
<input checked="" type="checkbox"/> Compost Filter Berm and Socks	<input type="checkbox"/> Compost Filter Berm and Socks	<input checked="" type="checkbox"/> Vegetation Lined Ditches
	<input type="checkbox"/> Stone Outlet Sediment Traps	<input type="checkbox"/> Sand Filter Systems
	<input type="checkbox"/> Sediment Basins	<input type="checkbox"/> Grassy Swales

III. CULTURAL RESOURCES

Refer to TxDOT Standard Specifications in the event historical issues or archeological artifacts are found during construction. Upon discovery of archeological artifacts (bones, burnt rock, flint, pottery, etc.) cease work in the immediate area and contact the Engineer immediately.

- No Action Required Required Action

Action No.

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IV. VEGETATION RESOURCES

Preserve native vegetation to the extent practical. Contractor must adhere to Construction Specification Requirements Specs 162, 164, 192, 193, 506, 730, 751, 752 in order to comply with requirements for invasive species, beneficial landscaping, and tree/brush removal commitments.

- No Action Required Required Action

Action No.

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V. FEDERAL LISTED, PROPOSED THREATENED, ENDANGERED SPECIES, CRITICAL HABITAT, STATE LISTED SPECIES, CANDIDATE SPECIES AND MIGRATORY BIRDS.

- No Action Required Required Action

Action No.

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If any of the listed species are observed, cease work in the immediate area, do not disturb species or habitat and contact the Engineer immediately. The work may not remove active nests from bridges and other structures during nesting season of the birds associated with the nests. If caves or sinkholes are discovered, cease work in the immediate area, and contact the Engineer immediately.

LIST OF ABBREVIATIONS

BMP: Best Management Practice	SPCC: Spill Prevention Control and Countermeasure
CGP: Construction General Permit	SW3P: Storm Water Pollution Prevention Plan
DSHS: Texas Department of State Health Services	PCN: Pre-Construction Notification
FHWA: Federal Highway Administration	PSL: Project Specific Location
MOA: Memorandum of Agreement	TCEQ: Texas Commission on Environmental Quality
MOU: Memorandum of Understanding	TPDES: Texas Pollutant Discharge Elimination System
MS4: Municipal Separate Stormwater Sewer System	TPWD: Texas Parks and Wildlife Department
MBTA: Migratory Bird Treaty Act	TxDOT: Texas Department of Transportation
NOT: Notice of Termination	T&E: Threatened and Endangered Species
NWP: Nationwide Permit	USACE: U.S. Army Corps of Engineers
NOI: Notice of Intent	USFWS: U.S. Fish and Wildlife Service

VI. HAZARDOUS MATERIALS OR CONTAMINATION ISSUES

General (applies to all projects):

Comply with the Hazard Communication Act (the Act) for personnel who will be working with hazardous materials by conducting safety meetings prior to beginning construction and making workers aware of potential hazards in the workplace. Ensure that all workers are provided with personal protective equipment appropriate for any hazardous materials used. Obtain and keep on-site Material Safety Data Sheets (MSDS) for all hazardous products used on the project, which may include, but are not limited to the following categories: Paints, acids, solvents, asphalt products, chemical additives, fuels and concrete curing compounds or additives. Provide protected storage, off bare ground and covered, for products which may be hazardous. Maintain product labelling as required by the Act. Maintain an adequate supply of on-site spill response materials, as indicated in the MSDS. In the event of a spill, take actions to mitigate the spill as indicated in the MSDS, in accordance with safe work practices, and contact the District Spill Coordinator immediately. The Contractor shall be responsible for the proper containment and cleanup of all product spills.

Contact the Engineer if any of the following are detected:

- * Dead or distressed vegetation (not identified as normal)
- * Trash piles, drums, canister, barrels, etc.
- * Undesirable smells or odors
- * Evidence of leaching or seepage of substances

Does the project involve any bridge class structure rehabilitation or replacements (bridge class structures not including box culverts)?

- Yes No

If "No", then no further action is required.

If "Yes", then TxDOT is responsible for completing asbestos assessment/inspection.

Are the results of the asbestos inspection positive (is asbestos present)?

- Yes No

If "Yes", then TxDOT must retain a DSHS licensed asbestos consultant to assist with the notification, develop abatement/mitigation procedures, and perform management activities as necessary. The notification form to DSHS must be postmarked at least 15 working days prior to scheduled demolition.

If "No", then TxDOT is still required to notify DSHS 15 working days prior to any scheduled demolition.

In either case, the Contractor is responsible for providing the date(s) for abatement activities and/or demolition with careful coordination between the Engineer and asbestos consultant in order to minimize construction delays and subsequent claims.

Any other evidence indicating possible hazardous materials or contamination discovered on site. Hazardous Materials or Contamination Issues Specific to this Project:

- No Action Required Required Action

Action No.

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VII. OTHER ENVIRONMENTAL ISSUES

(includes regional issues such as Edwards Aquifer District, etc.)

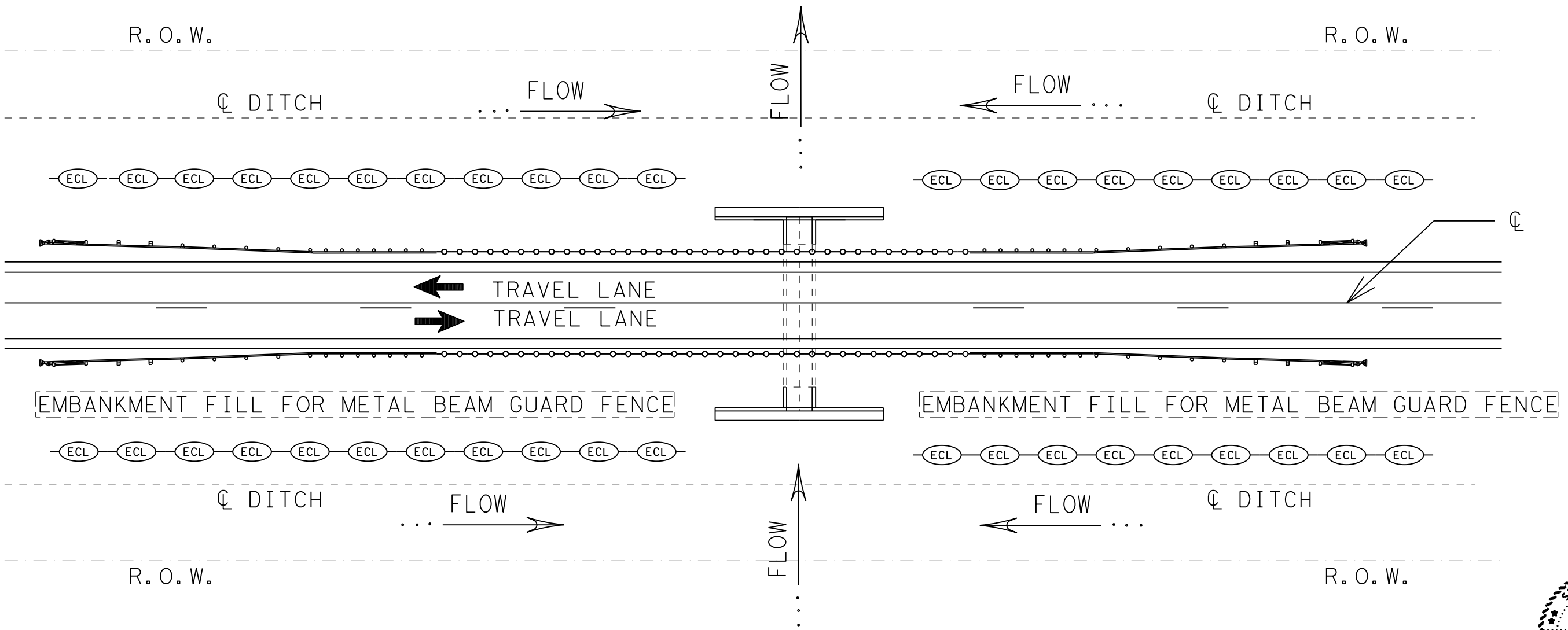
- No Action Required Required Action

Action No.

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 Texas Department of Transportation		Design Division Standard		
ENVIRONMENTAL PERMITS, ISSUES AND COMMITMENTS EPIC				
FILE: epic.dgn	DN: TxDOT	CK: RG	DW: VP	CK: AR
©TxDOT: February 2015	CONT	SECT	JOB	HIGHWAY
12-12-2011 (DS) REVISIONS	0435	01	080	FM 38
05-07-14 ADDED NOTE SECTION IV.	DIST	COUNTY	SHEET NO.	
01-23-2015 SECTION I (CHANGED ITEM 1122 TO ITEM 506, ADDED GRASSY SWALES.	PAR	LAMAR	134	

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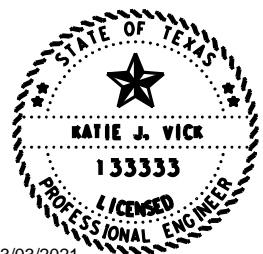


EROSION CONTROL AT MBGF

SEE SUMMARY OF EROSION CONTROL ITEMS QUANTITY SUMMARY TABLE FOR STATION LOCATIONS WHERE ECL WILL BE PLACED

LEGEND

- EROSION CONTROL LOG
- WATER FLOW DIRECTION
- CULVERT



03/03/2021
Katie J. Vick, P.E.

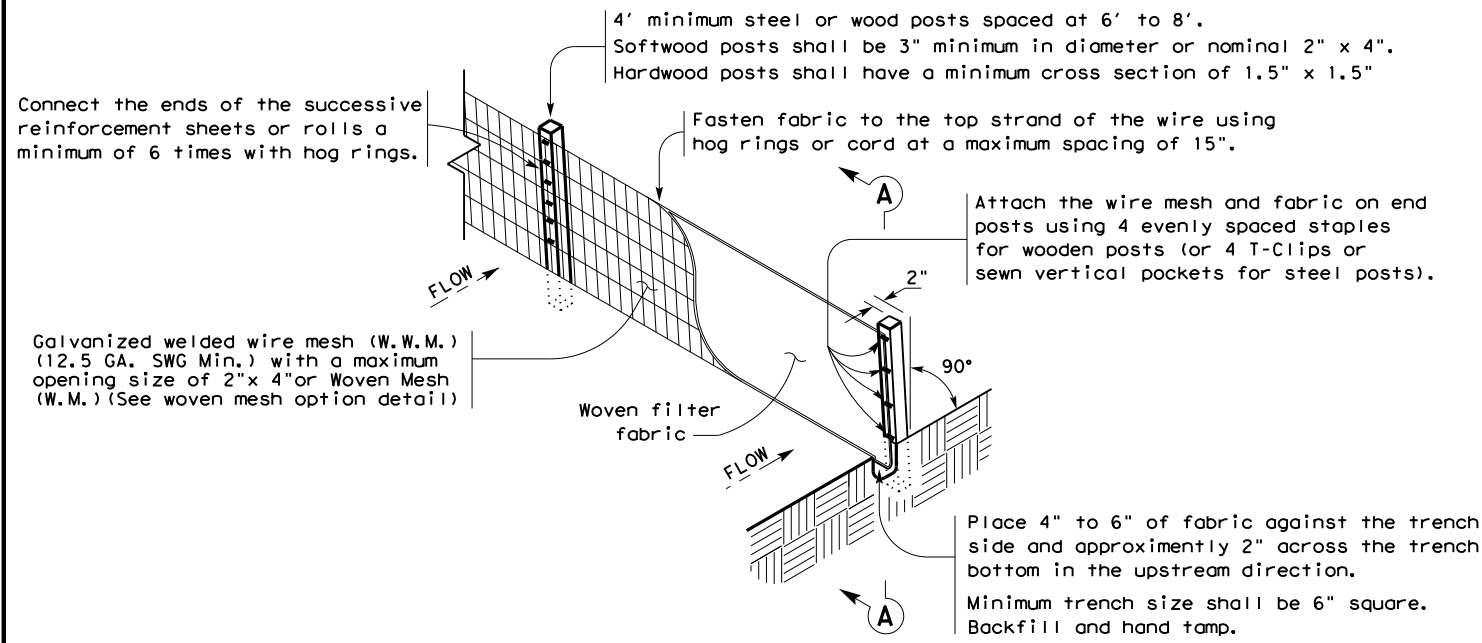
FM 38
 EROSION CONTROL
 LAYOUT DETAIL

SHEET 1 OF 1

CONT	SECT	JOB	HIGHWAY
0435	01	080	FM 38
DIST	COUNTY		SHEET NO.
PAR	LAMAR		135

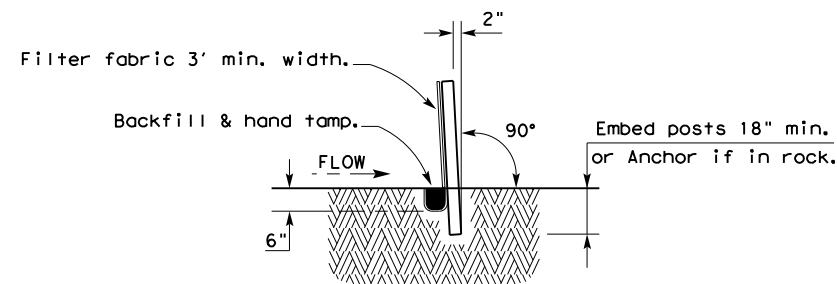
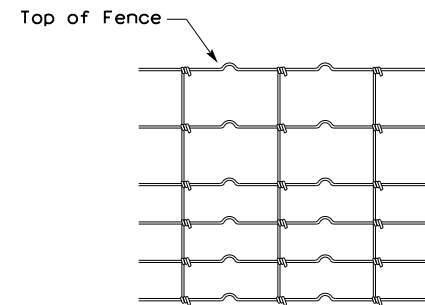
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TEMPORARY SEDIMENT CONTROL FENCE

SCF



SECTION A-A

HINGE JOINT KNOT WOVEN MESH (OPTION) DETAIL

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

SEDIMENT CONTROL FENCE USAGE GUIDELINES

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

Sediment control fence should be sized to filter a maximum flow through rate of 100 GPM/FT². Sediment control fence is not recommended to control erosion from a drainage area larger than 2 acres.

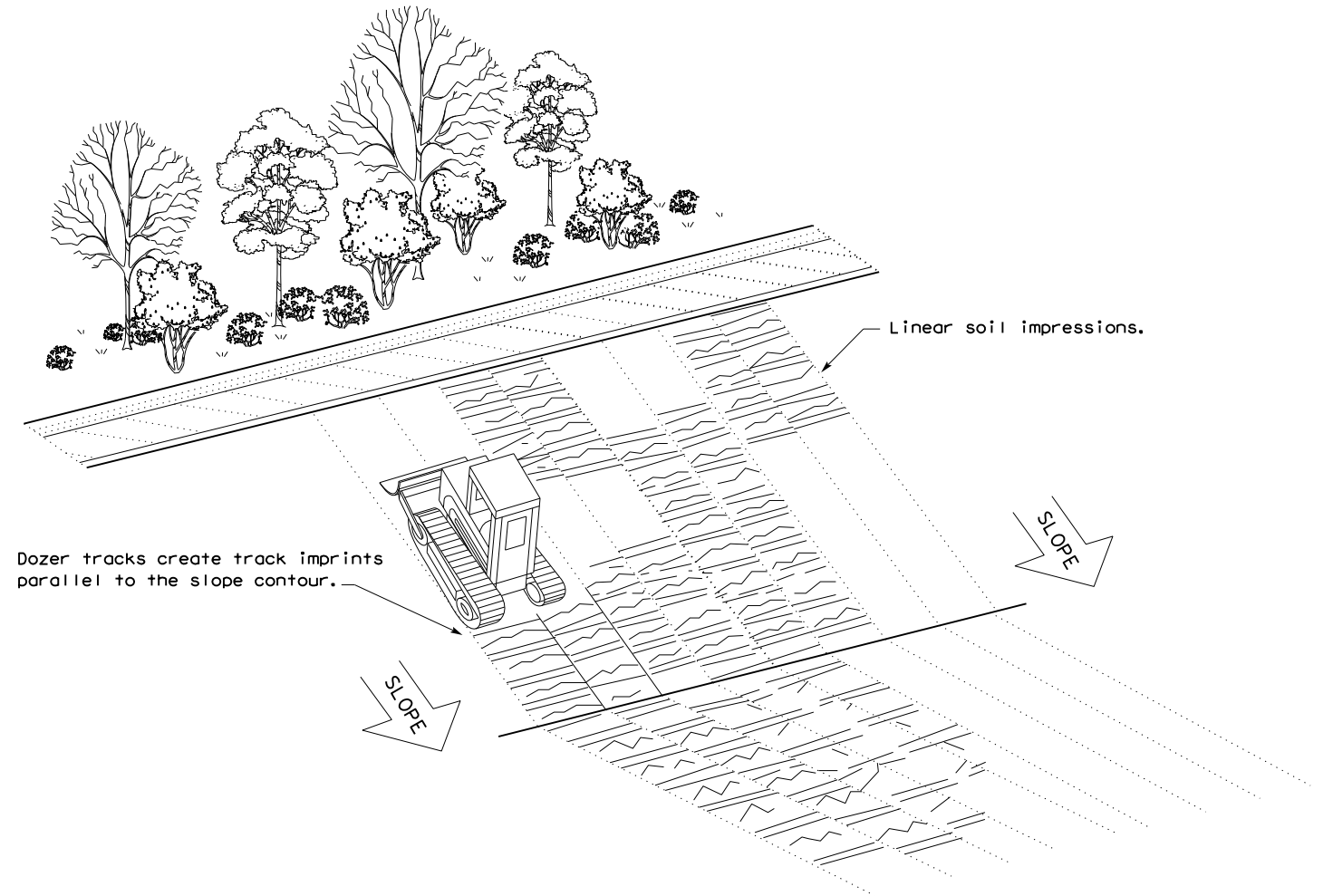
LEGEND

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.

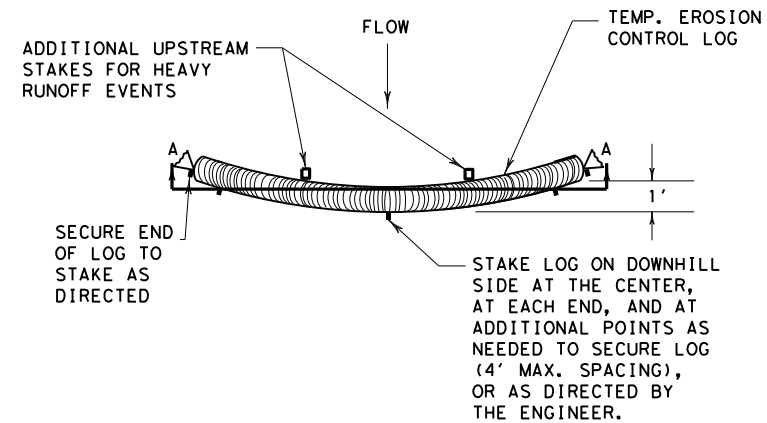


VERTICAL TRACKING

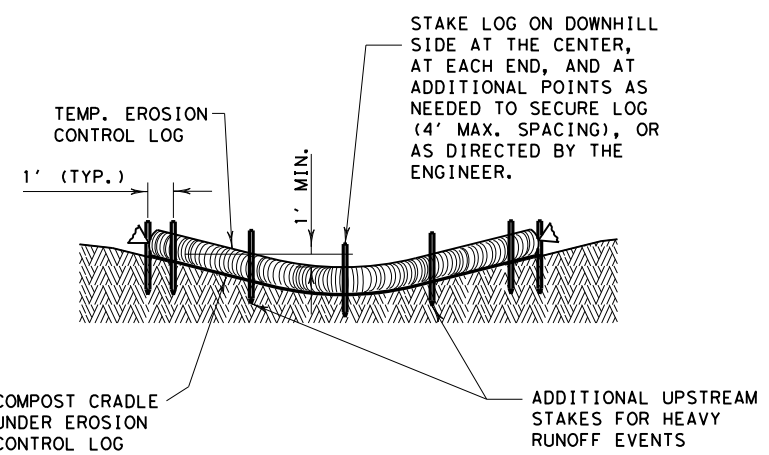
				Design Division Standard	
TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES FENCE & VERTICAL TRACKING					
EC(1)-16					
FILE: ec116	DN: TxDOT	CK: KM	DW: VP	DN/CK: LS	
© TxDOT: JULY 2016	CONT	SECT	JOB	HIGHWAY	
REVISIONS	0435	01	080	FM 38	
	DIST	COUNTY		SHEET NO.	
	PAR	LAMAR		136	

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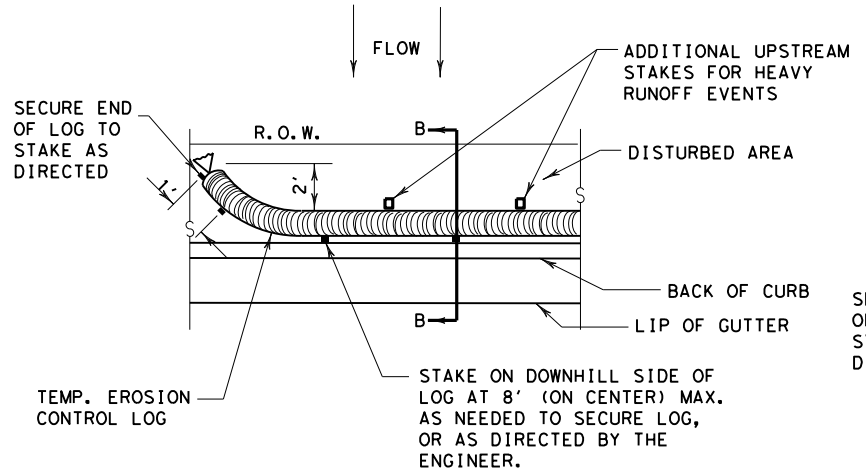
PLAN VIEW



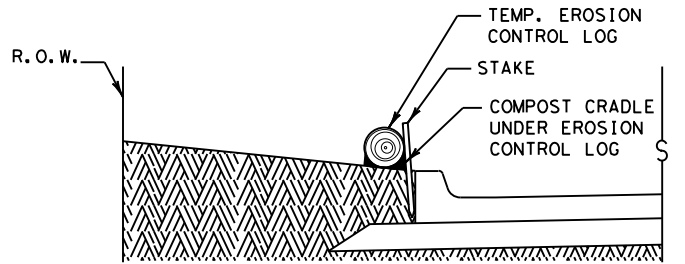
SECTION A-A

EROSION CONTROL LOG DAM

CL-D



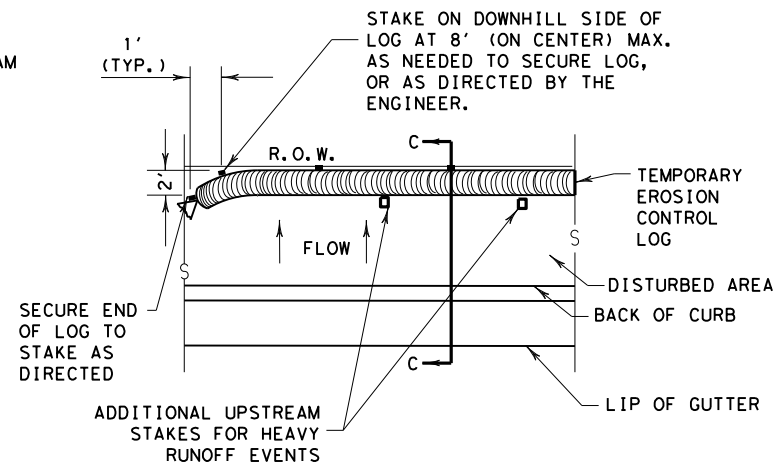
PLAN VIEW



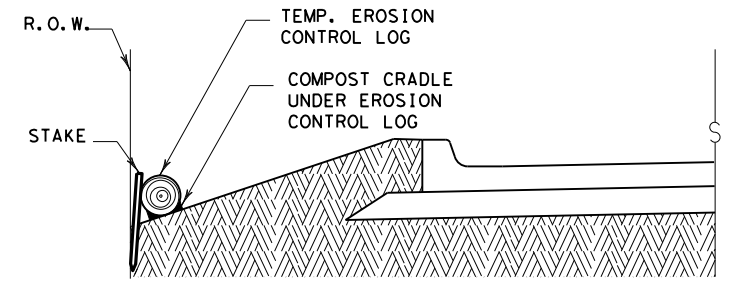
SECTION B-B

EROSION CONTROL LOG AT BACK OF CURB

CL-BOC



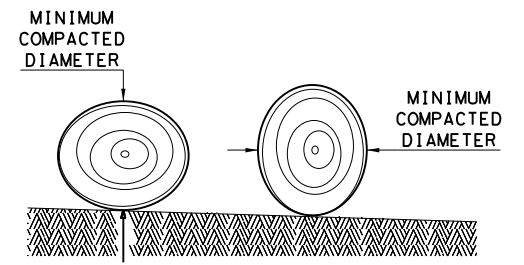
PLAN VIEW



SECTION C-C

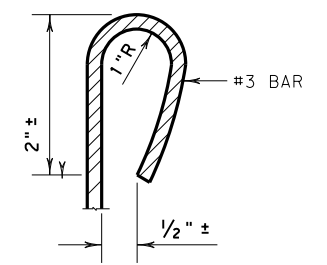
EROSION CONTROL LOG AT EDGE OF RIGHT-OF-WAY

CL-ROW



DIAMETER MEASUREMENTS OF EROSION CONTROL LOGS SPECIFIED IN PLANS

- LEGEND**
- CL-D EROSION CONTROL LOG DAM
 - CL-BOC EROSION CONTROL LOG AT BACK OF CURB
 - CL-ROW EROSION CONTROL LOG AT EDGE OF RIGHT-OF-WAY
 - CL-SST EROSION CONTROL LOGS ON SLOPES STAKE AND TRENCHING ANCHORING
 - CL-SSL EROSION CONTROL LOGS ON SLOPES STAKE AND LASHING ANCHORING
 - CL-DI EROSION CONTROL LOG AT DROP INLET
 - CL-CI EROSION CONTROL LOG AT CURB INLET
 - CL-GI EROSION CONTROL LOG AT CURB & GRATE INLET



REBAR STAKE DETAIL

SEDIMENT BASIN & TRAP USAGE GUIDELINES

An erosion control log sediment trap may be used to filter sediment out of runoff draining from an unstabilized area.

Log 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).

Control logs should be placed in the following locations:

1. Within drainage ditches spaced as needed or min. 500' on center
2. Immediately preceding ditch inlets or drain inlets
3. Just before the drainage enters a water course
4. Just before the drainage leaves the right of way
5. Just before the drainage leaves the construction limits where drainage flows away from the project.

The logs should be cleaned when the sediment has accumulated to a depth of 1/2 the log diameter.

Cleaning and removal of accumulated sediment deposits is incidental and will not be paid for separately.

GENERAL NOTES:

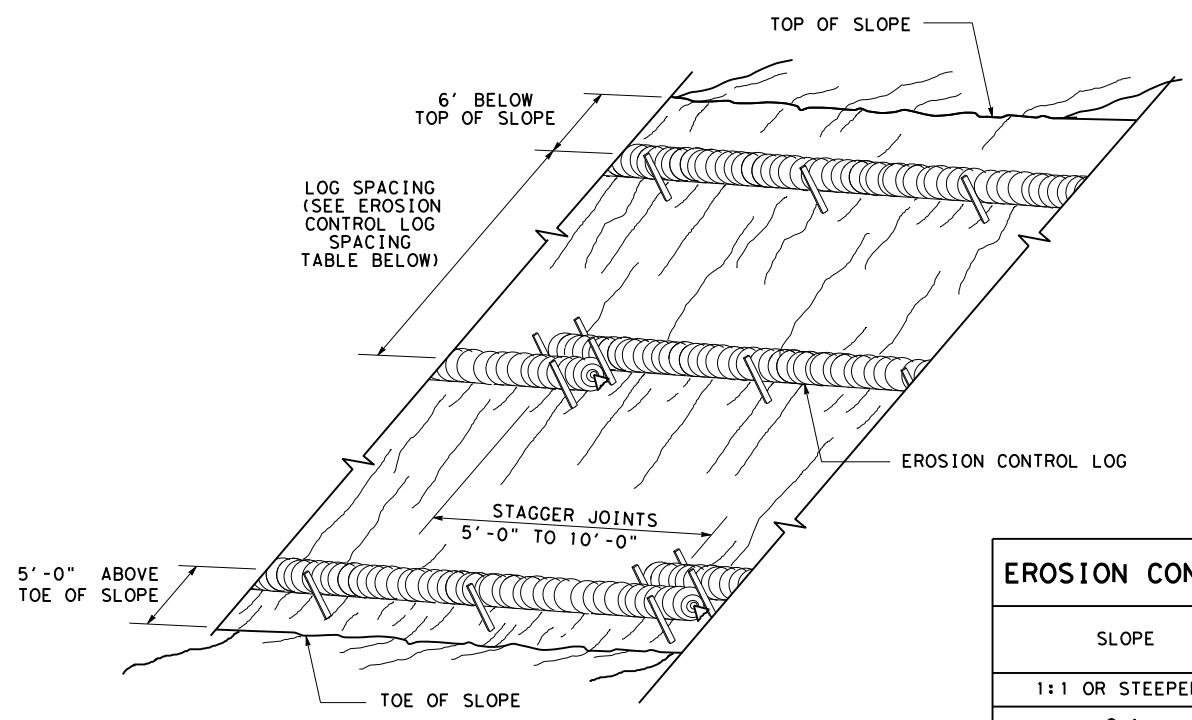
1. EROSION CONTROL LOGS SHALL BE INSTALLED IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS, OR AS DIRECTED BY THE ENGINEER.
2. LENGTHS OF EROSION CONTROL LOGS SHALL BE IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS AND AS REQUIRED FOR THE PURPOSE INTENDED.
3. UNLESS OTHERWISE DIRECTED, USE BIODEGRADABLE OR PHOTODEGRADABLE CONTAINMENT MESH ONLY WHERE LOG WILL REMAIN IN PLACE AS PART OF A VEGETATIVE SYSTEM. FOR TEMPORARY INSTALLATIONS, USE RECYCLABLE CONTAINMENT MESH.
4. FILL LOGS WITH SUFFICIENT FILTER MATERIAL TO ACHIEVE THE MINIMUM COMPACTED DIAMETER SPECIFIED IN THE PLANS WITHOUT EXCESSIVE DEFORMATION.
5. STAKES SHALL BE 2" X 2" WOOD OR #3 REBAR, 2'-4' LONG, EMBEDDED SUCH THAT 2" PROTRUDES ABOVE LOG, OR AS DIRECTED BY THE ENGINEER.
6. DO NOT PLACE STAKES THROUGH CONTAINMENT MESH.
7. COMPOST CRADLE MATERIAL IS INCIDENTAL & WILL NOT BE PAID FOR SEPARATELY.
8. SANDBAGS USED AS ANCHORS SHALL BE PLACED ON TOP OF LOGS & SHALL BE OF SUFFICIENT SIZE TO HOLD LOGS IN PLACE.
9. TURN THE ENDS OF EACH ROW OF LOGS UPSLOPE TO PREVENT RUNOFF FROM FLOWING AROUND THE LOG.
10. FOR HEAVY RUNOFF EVENTS, ADDITIONAL UPSTREAM STAKES MAY BE NECESSARY TO KEEP LOG FROM FOLDING IN ON ITSELF.

SHEET 1 OF 3

		Design Division Standard	
TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES EROSION CONTROL LOG EC (9) - 16			
FILE: ec916	DN: TxDOT	CK: KM	DW: LS/PT
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REVISIONS	0435	01	080
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	PAR	LAMAR	137

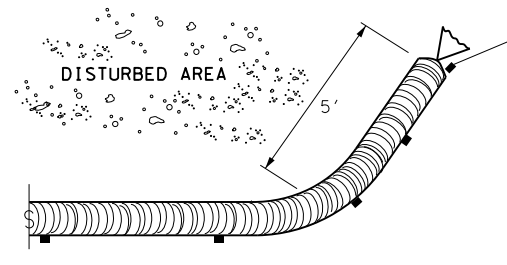
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**EROSION CONTROL LOGS ON SLOPES
 STAKE AND TRENCHING ANCHORING**

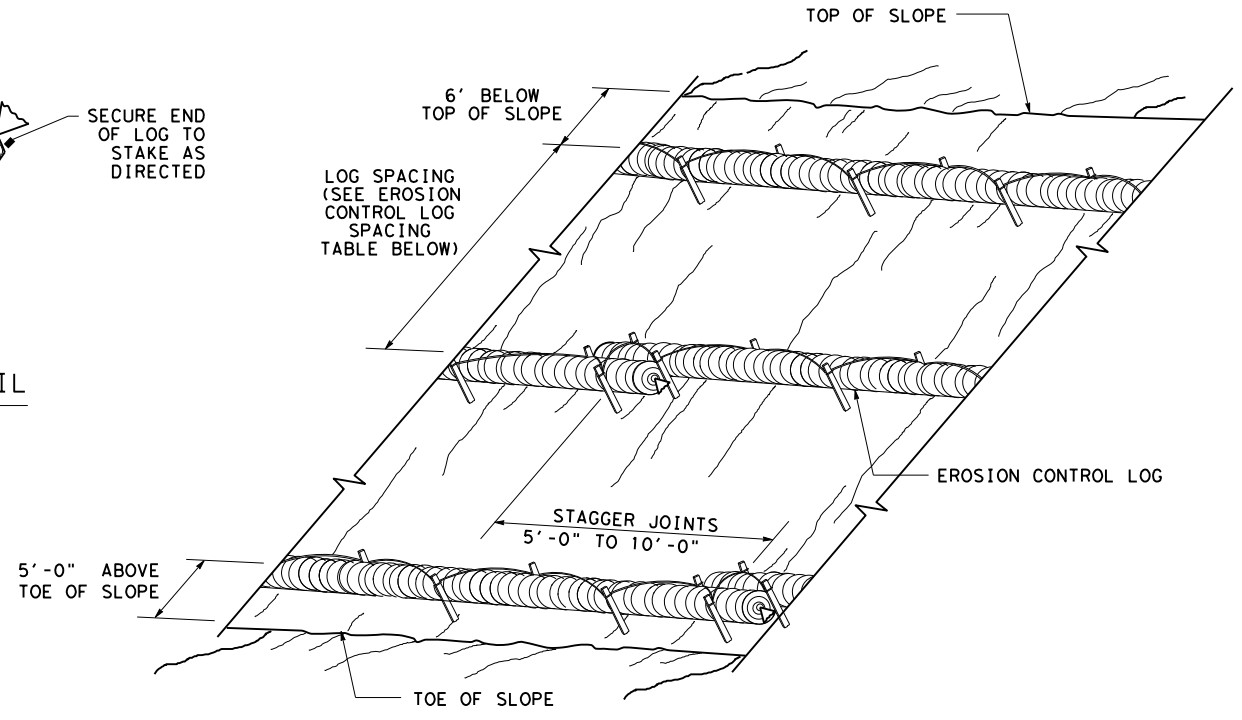
CL-SST



END SECTION RAP DETAIL

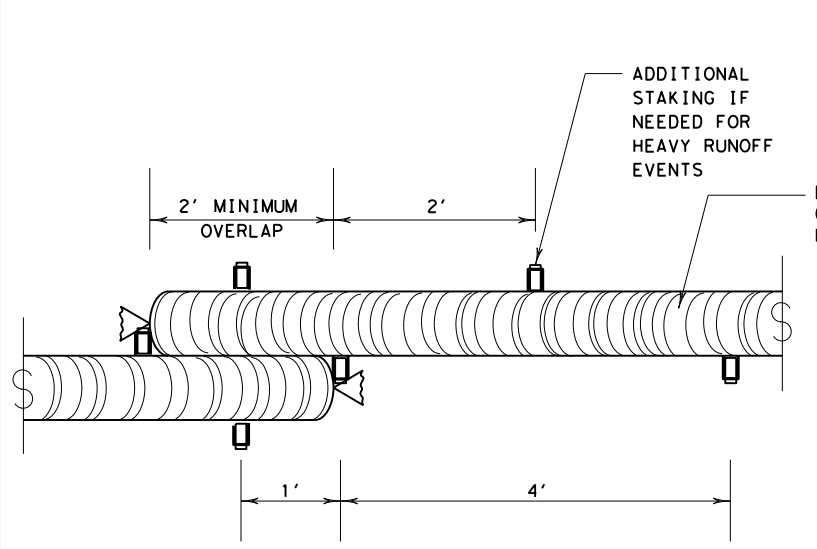
SLOPE	LOG DIAMETER			
	6"	8"	12"	18"
1:1 OR STEEPER	5'	10'	15'	20'
2:1	10'	20'	30'	40'
3:1	15'	30'	45'	60'
4:1 OR FLATTER	20'	40'	60'	80'

* ADJUSTMENTS CAN BE MADE FOR SOIL TYPE:
 SOFT, LOAMY SOILS-ADJUST ROWS CLOSER TOGETHER;
 HARD, ROCKY SOILS- ADJUST ROWS FARTHER APART



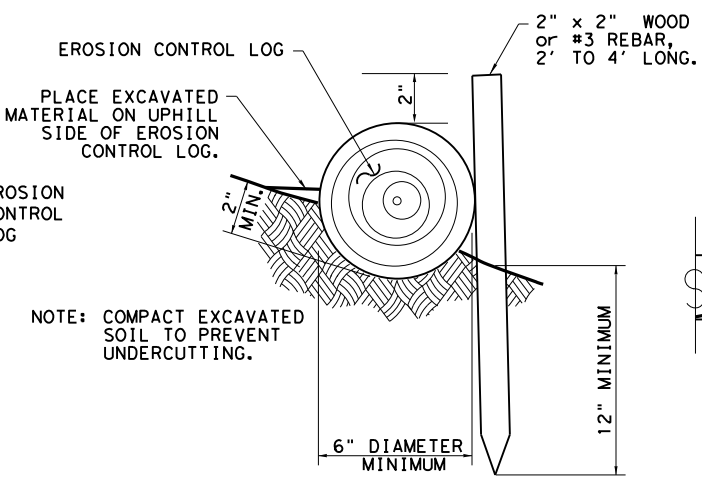
**EROSION CONTROL LOGS ON SLOPES
 STAKE AND LASHING ANCHORING**

CL-SSL



STAKE AND TRENCHING ANCHORING DETAIL

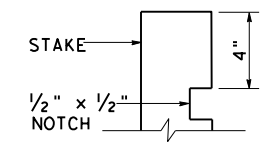
CL-SST



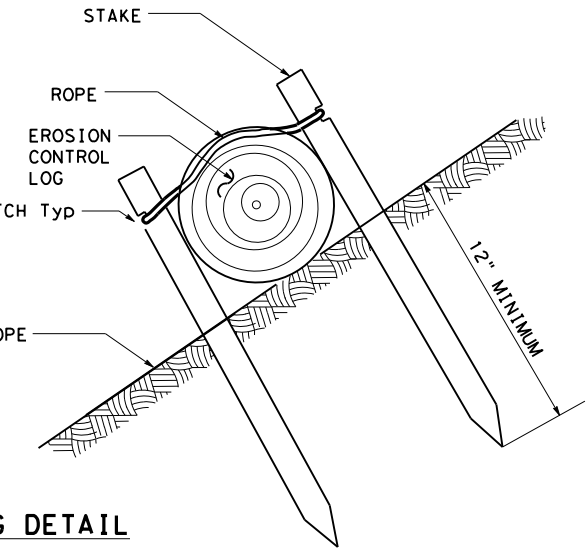
STAKE AND LASHING ANCHORING DETAIL

CL-SSL

LOG DIAMETER	DEPTH
6"	2"
8"	3"
12"	4"
18"	5"



STAKE NOTCH DETAIL



SHEET 2 OF 3

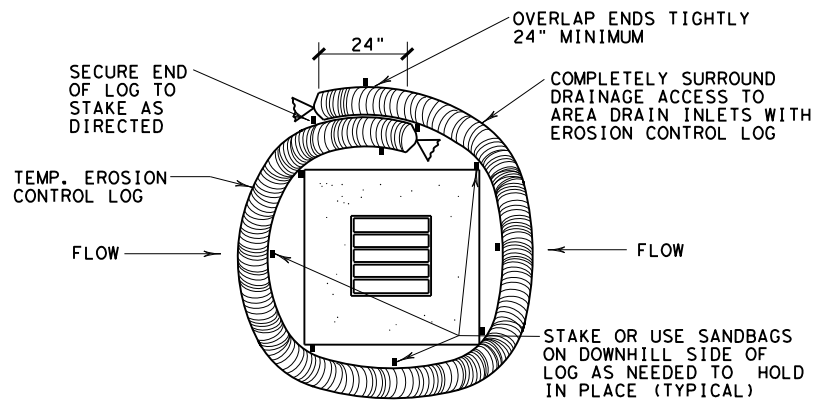
Texas Department of Transportation
 Design Division Standard

**TEMPORARY EROSION,
 SEDIMENT AND WATER
 POLLUTION CONTROL MEASURES**
EROSION CONTROL LOG
EC (9) - 16

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REVISIONS	0435	01	080	FM 38
DIST	COUNTY	SHEET NO.		
PAR	LAMAR	138		

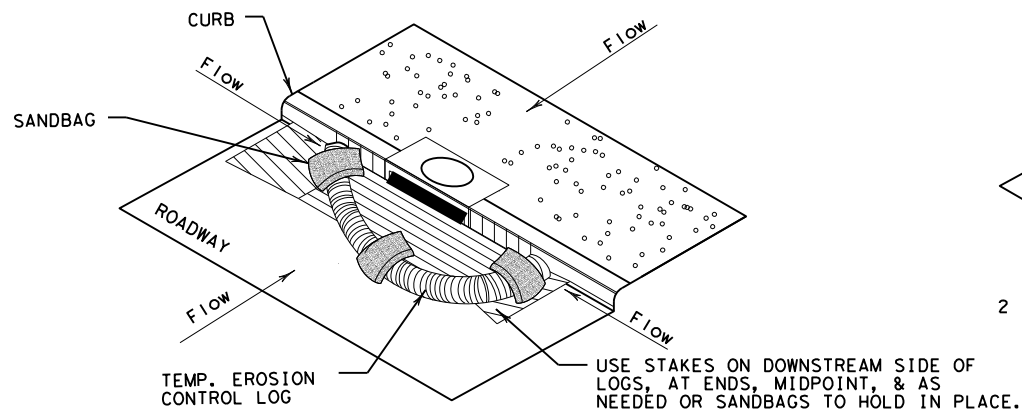
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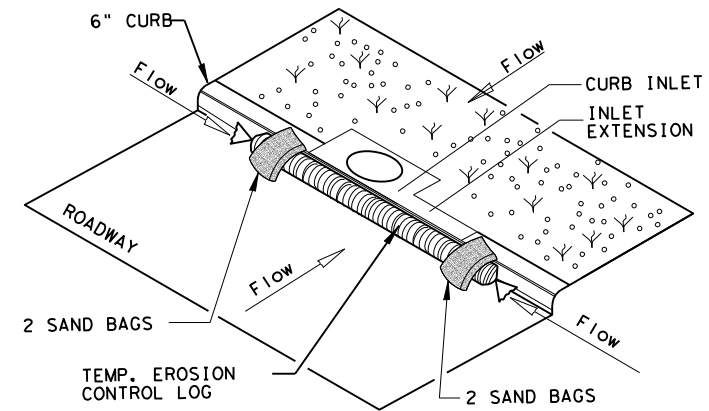
EROSION CONTROL LOG AT DROP INLET

CL-DI



EROSION CONTROL LOG AT CURB INLET

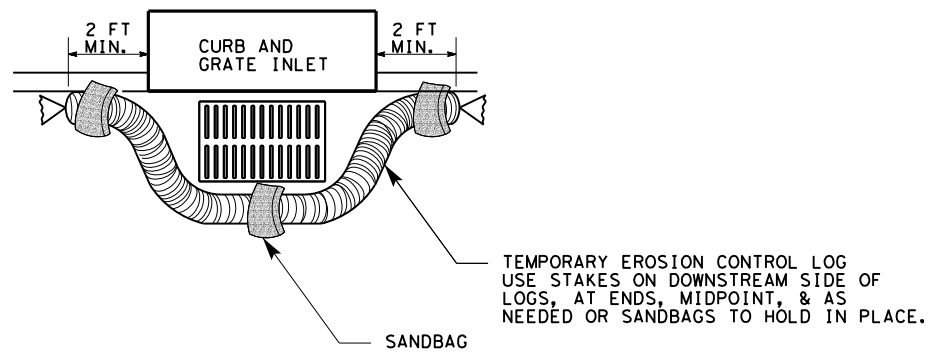
CL-CI



EROSION CONTROL LOG AT CURB INLET

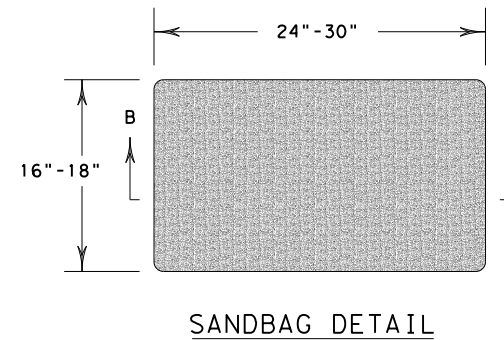
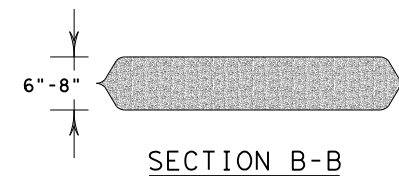
CL-CI

NOTE:
 EROSION CONTROL LOGS USED AT CURB INLETS SHOULD ONLY BE USED IF THEY WILL NOT IMPEDE TRAFFIC OR FLOOD THE ROADWAY OR WHEN THE STORM SEWER SYSTEM IS NOT FULLY FUNCTIONAL.



EROSION CONTROL LOG AT CURB & GRADE INLET

CL-GI



SHEET 3 OF 3

		<i>Design Division Standard</i>	
TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES EROSION CONTROL LOG EC (9) - 16			
FILE: ec916	DN: TxDOT	CK: KM	DW: LS/PT
© TxDOT: JULY 2016	CONT SECT	JOB	HIGHWAY
REVISIONS	0435 01	080	FM 38
DIST	COUNTY	SHEET NO.	
PAR	LAMAR	139	