FED. RD. DIV. NO.	PROJECT NUMBER		HIGHWAY NUMBER
6	STP 2021(271)HES		FM696,Etc.
STATE	DISTRICT	COUNTY	
TEXAS	BRY	BURLESON	
CONTROL	SECTION	JOB	SHEET NO.
1507	02	016,Etc.	1

DESIGN SPEED: N/A

STATE OF TEXAS
DEPARTMENT OF TRANSPORTATION

SEE SHEET 2
FOR INDEX OF SHEETS
AND SHEET 3 FOR
PROJECT LOCATION MAP

PLANS OF PROPOSED
STATE HIGHWAY IMPROVEMENT

PROJECT NUMBER: STP 2021(271)HES

FM 696, Etc.
BURLESON COUNTY

TOTAL LENGTH OF PROJECT = 30851.04 FT= 5.843 MILES, Etc.

FINAL PLANS

CONTRACTOR:

LETTING DATE:

DATE CONTRACTOR BEGAN WORK:

DATE WORK WAS COMPLETED:

DATE WORK WAS ACCEPTED:

FINAL CONTRACT COST: $

FOR THE CONSTRUCTION OF
SAFETY TREAT FIXED OBJECTS

LOCATION NO.	HIGHWAY	CONTROL NO.	LIMITS	2021/2041 ADT	REFERENCE MARKERS		RDWY LENGTH (FT)	BRIDGE LENGTH (FT)	TOTAL LENGTH (FT)
					BEGIN	END			
1	FM 2000	1129-02-019	FROM: FM 1362 TO: SH 21	N/A	RM 408+0.000 MI MP 7.745 MI	RM 420+0.946 MI MP 20.667 MI	68,078.16	150	68,228.16
2	FM 2000	1129-02-020	FROM: FM 1362 TO: SH 21	N/A	RM 408+0.000 MI MP 7.745 MI	RM 420+0.946 MI MP 20.667 MI	68,078.16	150	68,228.16
3	FM 696	1507-02-016	FROM: LEE COUNTY LINE TO: SH 21	N/A	RM 594+1.381 MI MP 9.944 MI	RM 602+0.011 MI MP 15.787 MI	30,164.04	687	30,851.04

NO EXCEPTIONS
NO EQUATIONS
NO RAILROAD CROSSINGS

TEXAS DEPARTMENT OF TRANSPORTATION®

SUBMITTED FOR LETTING: 12/14/2020
DocuSigned by: Ben A. Ovalle, P.E.
59B67CE6AA5C433... DESIGN MANAGER

RECOMMENDED FOR LETTING: 12/14/2020
DocuSigned by: Doug McTaine, P.E.
DAA3B0624EE3415... DIRECTOR OF TRANSPORTATION PLANNING AND DEVELOPMENT

APPROVED FOR LETTING: 12/14/2020
DocuSigned by: Lance M. Simmons
7A1E426988DE4A2... DISTRICT ENGINEER

SPECIFICATIONS ADOPTED BY THE TEXAS DEPARTMENT OF TRANSPORTATION, NOVEMBER 1, 2014, AND SPECIFICATION ITEMS LISTED AS FOLLOWS, SHALL GOVERN ON THIS PROJECT:

REQUIRED CONTRACT PROVISIONS FOR ALL FEDERAL-AID CONSTRUCTION CONTRACTS (FORM FHWA 1273, MAY, 2012)

REV DATE: 2-12-2015
CSJ: 1507-02-016, Etc. FILENAME: g:\150702\016\sheets\General\Title Sheet.dgn

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2			INDEX OF SHEETS
3			PROJECT LOCATION MAP
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5A-5C			ESTIMATE AND QUANTITY SHEET
6-9,9A	GENERAL		SUMMARY OF DRAINAGE ITEMS
10-12			SUMMARY OF DRIVEWAYS
13			SUMMARY OF MBGF
14			SUMMARY OF TCP ITEMS AND PAVEMENT MARKINGS
15			SUMMARY OF SW3P ITEMS
16			CRASH CUSHION SUMMARY SHEET
17			TRAFFIC CONTROL PLAN (FM 696) (EAST YEGUA CREEK BRIDGE)
18			SEQUENCE OF WORK (CULVERT)
19			TCP DETOUR PLAN (FM 2000 CLOSURE)
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32		~	TCP(1-2)-18
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37A		~	TCP(3-1)-13
37B	TRAFFIC CONTROL	~	TCP(3-3)-14
38		~	TCP(S-1)-08A
39		~	TCP(S-2)-08A
40		~	TCP(S-2c)-10
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71			KEY OF REPAIRS
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79-80			TRAFFIC RAIL RETROFIT
81-82			DRAINAGE AREA MAP (FM 2000)
83-84			HYDROLOGIC DATA (FM 2000)
85			CULVERT HYDRAULIC COMPUTATIONS (FM 2000)
86			DRAINAGE AREA MAP AND HYDROLOGIC & HYDRAULIC DATA (FM 696)
87-110	DRAINAGE		STRUCTURE LAYOUT (FM 2000)
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SHEET NO.			DESCRIPTION
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126		~	PSET-SP
127		~	PSET-RC
128		~	PSET-RP
129		~	PSET-RR
130		~	CH-PW-0
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133-134		~	SCC-3 & 4
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153-155		~	SETB-FW-S
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158		~	PW
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161			TxDOT STORM WATER POLLUTION PREVENTION PLAN (SW3P)
162-165			SW3P LAYOUT
166	ENVIRONMENTAL		SW3P DETAILS
167		~	AREF-21
168-169		~	EC(1)-16 THRU EC(2)-16
170			ENVIRONMENTAL PERMITS, ISSUES AND COMMITMENTS (EPIC)

THE STANDARD SHEETS SPECIFICALLY IDENTIFIED ABOVE WITH A TILDE (~), AND STANDARD SHEET *T5/T501/T502 TRANSITION RETROFIT GUIDE (MOD) WHICH HAVE BEEN MODIFIED, HAVE BEEN SELECTED BY ME, OR UNDER MY RESPONSIBLE SUPERVISION, AS BEING APPLICABLE TO THIS PROJECT.

STATE OF TEXAS
JEAN J. FENG
102035
LICENSED
PROFESSIONAL ENGINEER

01/22/2021

PRINT DATE	REVISION DATE
1/22/2021	

Texas Department of Transportation
Bryan District

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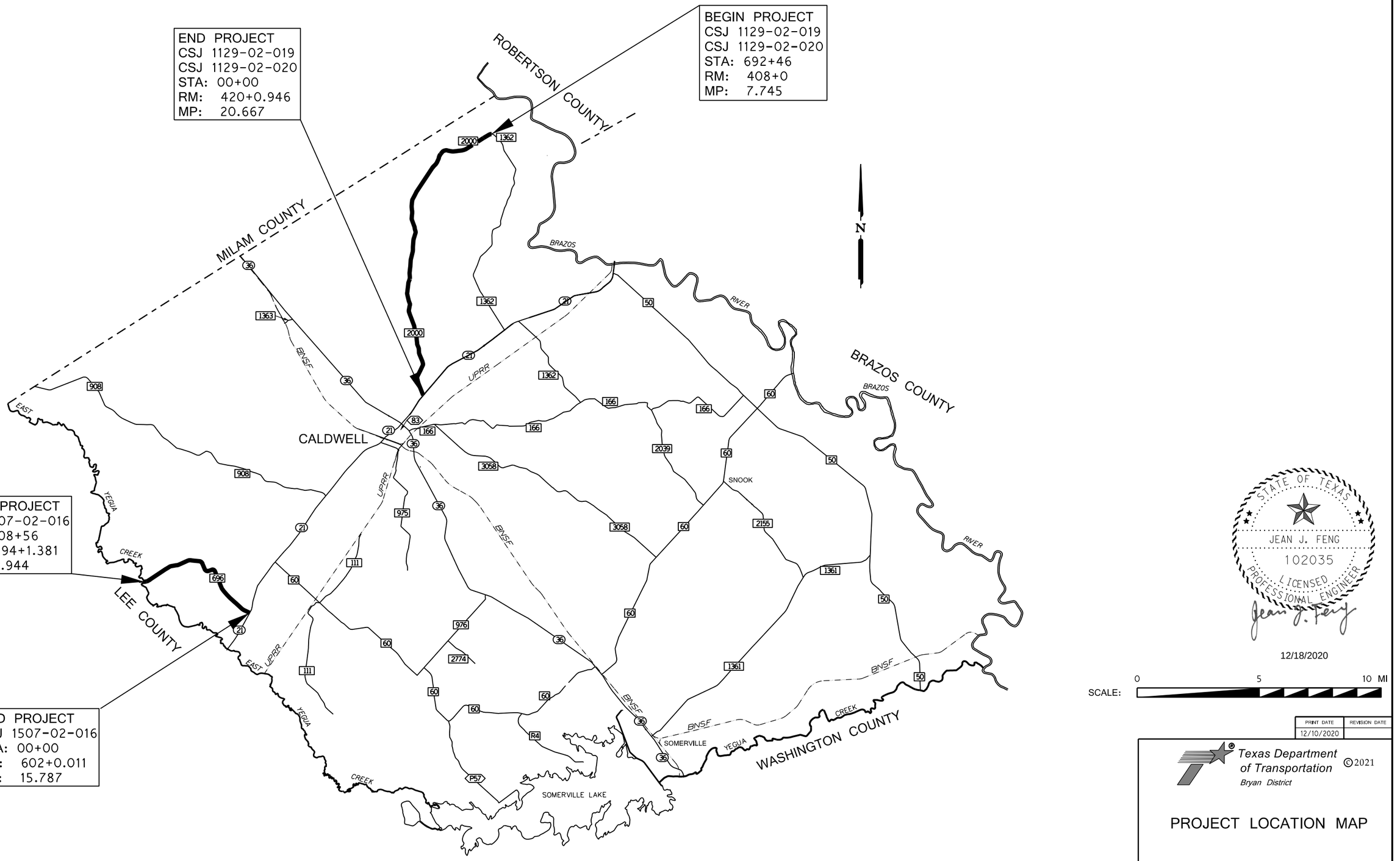
6			FM 696, ETC.
STATE	DISTRICT	COUNTY	
TEXAS	BRYAN	BURLESON	
CONTROL	SECTION	JOB	SHEET NO.
1507	02	016, ETC.	2

REV DATE: 2-12-2015
CSJ: 1507-02-016, Etc. FILENAME: g:\150702\016\sheets\General\Index of Sheets.dgn



REV DATE: 2-12-2015
CSJ: 1507-02-016, Etc. FILENAME: g:\150702\016\sheets\General\Project Location Map.dgn

STATE OF TEXAS
JEAN J. FENG
102035
LICENSED
PROFESSIONAL ENGINEER

12/18/2020

SCALE: 0 5 10 MI

PRINT DATE	REVISION DATE
12/10/2020	

Texas Department of Transportation
Bryan District

PROJECT LOCATION MAP

FED. RD. DIV. NO.	PROJECT NUMBER		HIGHWAY NUMBER
6			FM 696, ETC.
STATE	DISTRICT	COUNTY	
TEXAS	BRYAN	BURLESON	
CONTROL	SECTION	JOB	SHEET NO.
1507	02	016, ETC.	3

BASIS OF ESTIMATE					
ITEM	**DESCRIPTION**	**COURSE**	**RATE**	**AMOUNT**	**QUANTITY**
168	Vegetative Watering CSJ 1129-02-020 CSJ 1507-02-016		10 GAL/SY	11,899 SY 3,010 SY	119 MG 30 MG

BASIS OF ESTIMATE * for contractor's information only					
ITEM	**DESCRIPTION**	**COURSE**	**RATE**	**AMOUNT**	**QUANTITY**
CSJ 1129-02-020					
166*	FERTILIZER **		60 LB/AC	0.44 AC	0.0132 TON
CSJ 1507-02-016					
166*	FERTILIZER **		60 LB/AC	0.07 AC	0.002 TON

Note: Rates are for estimating purposes only. Actual Rates will be determined in the field.
** Tonnage represents Nitrogen content only.

GENERAL:

Contractor questions on this project are to be addressed to the following individuals:
Norman Bennett, P.E., A.E., Eric.Bennett@txdot.gov
James Kreamer, P.E., A.A.E., James.Kreamer@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.

For non-bridge items, send eligible shop plan submittals with PDF attachments directly to the reviewing office. Submit bridge, retaining wall, and structural item shop drawings following the directions described at:
http://www.txdot.gov/business/resources/specifications/shop-drawings.html

United States Fish & Wildlife Voluntary Conservation Measures:

Sheet: 4A

Highway: FM 696, Etc. **Control:** 1507-02-016, Etc.

County: Burleson

Measures to Be Implemented Prior to Project Construction

1. Contractor training will be provided with an emphasis on the potential for Houston toad occurrence in and adjacent to the project area, and to avoid harming the species if encountered. A Houston toad information sheet will be provided and discussed with the contractor during the pre-construction meeting.

Measures to Be Implemented During Project Construction

1. Exclusion Zones - Toad Exclusion Fencing (TEF): Adhere to the SW3P which includes the locations of TEF. Please contact the District Environmental Office if you have any questions.
2. Prior to the installation of TEF, a search for Houston toads within each Exclusion Zone will be conducted by a 10(a)1(A) permitted biologist (Provided by TxDOT) who will document and remove any toads from within the Exclusion Zones at the time of their finding. TEF would be installed during the non-breeding season for the Houston toad (July 1 to December 31) and would remain in place through the duration of construction activities.
3. The construction duration will be six months for the FM 2000/ FM 696 project (install TEF, complete construction activities, and remove TEF) during the non-breeding season (July 1 – December 31).
4. After a rain event of two or more inches within a 48-hour period, work would cease in areas adjacent to Houston toad habitat until a search is conducted in the construction area to confirm that no toads had moved into the project area. Rainfall totals reported by the National Oceanic and Atmospheric Administration (NOAA) would be used as available. Rain gage(s) located on-site at area(s) of construction could also be used to determine rainfall amounts, and to confirm two inches of rainfall within 48 hours as available. (NOAA; https://water.weather.gov/precip/)
5. If a breach in the TEF is discovered, construction work in the area would be suspended until the construction area is inspected for the presence of toads and the TEF is repaired. TEF would be repaired by sundown of the day it occurred or if not repairable within that day, construction would be halted until repairs can be made. TEF would be inspected weekly by the contractor and inspections will clear the TEF of sediment, vegetation, and debris.
6. The contractor will submit proposed locations for staging areas and fill material borrow sites approved by district environmental staff before moving into the selected site. No staging areas or fill material borrow sites would be allowed within 200 feet of an Exclusion Zone or located within the Critical Habitat Unit on FM 2000 from STA164+00 - STA 280+00.
7. Vegetation removal within the project area, particularly in Exclusion Zones, would be minimized to the maximum extent possible. Woody vegetation clearing would be limited to limb trimming of overhanging vegetation where necessary for heavy equipment operation. All woody debris that is cut will be removed from the project area by the end of each day to remove potential refugia that may attract Houston toads.

8. If any species of toad is found in the project area during construction, construction activities would be immediately suspended, a photograph would be taken and sent to TxDOT environmental staff, and construction activities would remain suspended until identification can be confirmed. The toad location would be monitored until identification is received. If the toad leaves the project area on its own accord, work may proceed prior to identification. If the species is confirmed to be a Houston toad, work would remain suspended until the animal is removed from the project area by a 10(a)1(A) permitted biologist or leaves the project area on its own.

Measures Initiated Prior to Construction and to Continue Implementing Following Construction

1. TxDOT initiated three years of acoustic monitoring along FM 2000/ FM 696 following the 2020 Interim Protocol prepared for TxDOT by the USFWS in February 2020 and will continue until April 30, 2022. In total, 11 Wildlife Acoustic Mini Bat Ultrasonic recorders fitted with an acoustic microphone have been deployed across the project area. The sites were selected based on habitat suitability and were coordinated with the Service early 2020. The results of the multi-year survey will be coordinated annually with the Service.
2. If Houston toads are identified during any of the annual monitoring events along FM 2000/ FM 696 prior to completion of construction, TxDOT will reinitiate consultation with the Service.

Post-project Site Restoration

1. All disturbed areas will be re-vegetated according to TxDOT's standard practices and the TCEQ Construction General Permit to the extent practicable, in compliance with Executive Order 13112 on Invasive Species and the Executive Memorandum on Beneficial Landscaping. Re-vegetation efforts would provide appropriate and sustainable cover to prevent erosion and siltation.
2. Following the completion of construction activities, all areas where ground disturbance occurred will be reseeded with native rural sandy soil seed mix developed for the TxDOT Austin District. The planting of native bunchgrasses and forbs (as opposed to sod-forming non-native grasses) will provide a vegetative community conducive to Houston toad dispersal across the project area.
3. Post-construction revegetation would be done using seed drilling, hydroseeding or hydromulch. If erosion blankets are used to help secure seed, blankets of natural fiber netting that are wildlife friendly would be used; blankets with nylon netting would not be used.

ITEM 7 "LEGAL RELATIONS AND RESPONSIBILITIES"

State contract mowers will mow the right of way during the growing season. The Contractor will be notified by the Engineer one week in advance of the anticipated time when mowers will be in

Sheet: 4B
Highway: FM 696, Etc. Control: 1507-02-016, Etc.
County: Burleson

the limits of the project. Clean the right of way to such a condition that allows the mowing contractors to safely mow.

In the event of the declaration of a hurricane watch, warning, other severe weather warning or national or state emergency that requires the roadways in the vicinity be used as evacuation routes, cease all work that requires the Contractor's, sub-contractors' or material suppliers' vehicles to enter the stream of traffic on these primary or secondary evacuation routes. This work includes material hauling and delivery, and mobilization or demobilization of equipment.

The following roadways are recognized evacuation routes in the Bryan District:
Primary Evacuation Routes: IH 45, US 290, SH 6, SH 36.
Secondary Evacuation Routes: US 79, US 84, SH 7, SH 30, SH 21, SH 105.

Other routes may be designated.

No significant traffic generator events identified.

PROPOSED BMPS

Amphibians and Aquatic Reptile BMPs

Contractor will be advised of the potential occurrence in the project area and to avoid harming the species if encountered. Minimize impacts to wetland, temporary and permanent open water features, including depression, and river habitats. Maintain hydrologic regime and connections between wetlands and other aquatic features. Use barrier fencing to direct animal movements away from construction activities and area of potential wildlife-vehicle collisions in construction areas directly adjacent, or that may directly impact, potential habitat for the target species.

Stream Crossing BMPs

Riprap will be placed so not to impede the movement of aquatic and terrestrial wildlife under the bridges.

Timber/canebrake rattlesnake BMPs

Contractor will be advised of the potential occurrence in the project area and to avoid harming the species if encountered. This information will be presented at the preconstruction meeting.

Vegetation BMPs

Vegetation removal will be minimized to the greatest extent practicable. Only approved seed mixes will be used for the revegetation and stabilization of disturbed areas.

Water Quality BMPs

Once construction activities are completed and disturbed areas have been stabilized and revegetated, silt fences and accumulated sediment will be removed. The use of construction equipment will be minimized in stream channels. Once they are no longer needed, temporary fills will be removed in their entirety and the stream banks will be stabilized.

Bird BMPs

In addition to complying with the Migratory Bird Treaty Act (MBTA), contractor prior to construction will perform daytime surveys for nests including under bridges and in culverts to determine if they are active before removal. Nests that are active should be left alone. Do not disturb, destroy, or remove active nests, including nesting birds, during the nesting season. Avoid the removal of unoccupied, inactive nests. Prevent the establishment of active nests during nesting season on TxDOT owned and operated facilities and structures proposed for replacement or repair. Please do not collect, capture, relocate, or transport birds, eggs, young, or active nests without a permit.

ITEM 8 "PROSECUTION AND PROGRESS"

The roadway start work date is July 1, 2021, and the latest roadway end work date is December 31, 2021. Two or more crews are needed to complete work by the end work date.

The following standard detail sheet has been modified:
T5/T501/T502 TRANSITION RETROFIT GUIDE

By noon of each Wednesday, provide the Engineer a written outline of the daily work schedule for the following week. Include in the outline the times and places for proposed traffic control changes, lane and shoulder closures, and moving operations or other operations that affect traffic on the roadway. Unless otherwise authorized by the Engineer, prosecute the work on this project in accordance with the following sequence of work:
1) Set advance signing and barricades.
2) Follow TCP detour plan and SEQUENCE OF WORK for culvert replacement.
3) Safety treat cross drainage structures.
4) Safety treat driveway pipes.
4) Final cleanup.

Some of these operations may be performed simultaneously.

Prepare Progress Schedule Bar Chart or Critical Path Method(CPM).

Equipment and material may be pre-staged at approved locations.

Sheet: 4C
Highway: FM 696, Etc. Control: 1507-02-016, Etc.
County: Burleson

ITEM 132 "EMBANKMENT"

Provide Embankment material for areas within the limits of the Pavement Structure that meet one of the following requirements:
- Sources outside the ROW provide material with a plasticity index between 10 and 25 and with less than 10% silt.
- Sources within the ROW provide material with a plasticity index between 10 and 25 and with less than 10% silt.

Provide Embankment material for areas outside the limits of the Pavement Structure with a plasticity index between 10 and 35.

ITEM 160 "TOPSOIL"

All slopes requiring topsoil will be tracked immediately upon final grading to prevent erosion per standard sheet EC(1)-16. Tracking slopes to prevent erosion will not be measured or paid for directly, but will be subsidiary to pertinent Items.

Topsoil may be obtained from the right of way at sites of proposed excavation and embankment.

ITEM 162 "SODDING FOR EROSION CONTROL"

Furnish and place block sod (Bermuda).

ITEM 164 "SEEDING FOR EROSION CONTROL"

Using the Austin rural seed mix.

ITEM 166 "FERTILIZER"

Fertilize all areas of project that are being seeded or sodded.

ITEM 168 "VEGETATIVE WATERING"

Vegetative watering is required for all areas of the project that are being seeded or sodded.

ITEM 432 “RIPRAP”

The fifty-foot (50’) approach taper to the MBGF end treatment will be concrete Mow Strip unless otherwise shown in the plans or otherwise directed by the Engineer.

ITEM 464 “REINFORCED CONCRETE PIPE”

Seal joints using cold applied plastic asphalt sewer compound or cold applied preformed plastic gaskets. When cohesionless material is used for backfill, wrap the joints prior to backfilling with sand proof tape following the manufacturer's recommendations or with an equivalent material and method.

ITEM 465 “JUNCTION BOXES, MANHOLES AND INLETS”

When furnishing precast Inlets, Manholes and Extensions, cast elements for specific project locations.

ITEM 467 “SAFETY END TREATMENTS”

All Type II SET’s shall have riprap aprons as shown on the plans. Riprap aprons are considered subsidiary to Type II SET’s.

ITEM 502 “BARRICADES, SIGNS AND TRAFFIC HANDLING”

Where shown on applicable TCP standards, channelizing devices on the centerline are required at all times; including when a pilot vehicle is used to lead traffic. Mount a G20-4 sign at a conspicuous location on the rear of the vehicle. Traffic delays caused by one-lane, two-way traffic control, will not be allowed to exceed 5 minutes unless approved by the Engineer.

One way traffic control operations are required when placing centerline profile markings on all two-lane roadways, unless otherwise approved by the Engineer. Work area is limited to a maximum of 2 miles for this work.

During one-way operations, station flaggers at all county roads and any other locations, such as private businesses, that may have traffic entering the work area.

Prior to beginning pulverization operations, place an approved channelizing device along both sides of the travelway the entire length of the operation in accordance with the BC standards. Do not remove the channelizing devices until permanent edge striping is placed.

Sheet: 4D

Highway: FM 696, Etc. **Control:** 1507-02-016, Etc.

County: Burleson

Place "Pavement Ends" (CW8-3), "Slow Down On Wet Road" (CW8-5a), “No Centerline Stripe”, and “Loose Gravel” signs before pulverization of the existing pavement.

Removal of ground mounted temporary signs and supports as specified on standard sheet BC(5), shall include the immediate backfilling of support holes with Type B embankment material and the compaction of the backfill material.

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.

ITEM 512 “PORTABLE TRAFFIC BARRIER”

Do not pin PTB on bridge decks.

ITEM 540 “METAL BEAM GUARD FENCE”

Furnish and Install only one type of timber post.

ITEM 544 “GUARDRAIL END TREATMENTS”

Furnish and install only MASH compliant guardrail end treatments.

ITEM 662 “WORK ZONE PAVEMENT MARKINGS”

Paint and beads may be used for non-removable work zone pavement markings.

All striping limits must be approved by the Engineer before striping operations may begin.

ITEM 666 “REFLECTORIZED PAVEMENT MARKINGS”

Unless authorized by the Engineer, the Contractor will not place the pavement markings on the resurfaced roadway until it has cured for 3 days.

All striping limits must be approved by the Engineer before striping operations may begin.

ITEM 672 "RAISED PAVEMENT MARKERS"

Use flexible bituminous adhesive for applications on all pavement types.

ITEM 6001 "PORTABLE CHANGEABLE MESSAGE SIGN"

Furnish, install, and operate up to four (4) Portable Changeable Message Signs (PCMS) for this project. The signs can be used both on the project and within a ten (10) mile radius of the project. Locations, messages, and durations of use will be specified by the Engineer. The primary uses will be to inform the public of special events, lane and road closures, and changes in traffic control. Signs will be paid for only when used as directed by the Engineer.

ITEM 6185 "TRUCK MOUNTED ATTENUATOR (TMA) AND TRAILER ATTENUATOR (TA)"

In addition to the shadow vehicles with truck mounted attenuator (TMA) that are specified as being required on the traffic control plan for this project,

provide one (1) shadow vehicle with TMA for TCP(1-2)-18 as detailed on General Note 5 of this standard sheet,

provide one (1) shadow vehicle with TMA for TCP(1-3)-18 as detailed on General Note 6 of this standard sheet,

provide one (1) shadow vehicle with TMA for TCP(2-1)-18 as detailed on General Note 4 of this standard sheet,

provide one (1) shadow vehicle with TMA for TCP(2-2)-18 as detailed on General Note 6 of this standard sheet,

provide one (1) shadow vehicle with TMA for TCP(2-3)-18 as detailed on General Note 7 of this standard sheet,

provide two (2) (shadow and trail) vehicles with TMA for TCP(3-1)-13 as detailed on General Note 3 of this standard sheet,

provide two (2) (shadow and trail) vehicles with TMA for TCP(3-3)-14 as detailed on General Note 3 of this standard sheet.

Therefore, nine (9) total shadow vehicles with TMA will be required for this type of work. The contractor will be responsible for determining if one or more of these operations will be ongoing at the same time to determine the total number of TMAs needed for the project.

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Highway: FM 696, Etc. Control: 1507-02-016, Etc.
County: Burleson

One hundred fourteen (114) TMA days are provided in the project estimate for stationary operations.

Thirty (30) TMA days are provided in the project estimate for mobile operations.

QUANTITY SHEET

CONTROLLING PROJECT ID 1507-02-016 **DISTRICT** Bryan **COUNTY** Burleson
HIGHWAY FM 2000, FM 696

		CONTROL SECTION JOB		**1129-02-019**		**1129-02-020**		**1507-02-016**		TOTAL EST.	TOTAL FINAL
		PROJECT ID		**A00128557**		**A00128556**		**A00126502**			
		COUNTY		**Burleson**		**Burleson**		**Burleson**			
		HIGHWAY		**FM 2000**		**FM 2000**		**FM 696**			
ALT	**BID CODE**	**DESCRIPTION**	**UNIT**	EST.	FINAL	EST.	FINAL	EST.	FINAL		
	104-6054	REMOVING CONCRETE(MOW STRIP)	LF			290.000				290.000	
	132-6022	EMBANKMENT (VEHICLE)(DENS CONT)(TY C)	CY			1,775.000		630.000		2,405.000	
	160-6003	FURNISHING AND PLACING TOPSOIL (4")	SY			11,870.000		3,010.000		14,880.000	
	162-6002	BLOCK SODDING	SY			29.000				29.000	
	164-6023	CELL FBR MLCH SEED(PERM)(RURAL)(CLAY)	SY			11,870.000		3,010.000		14,880.000	
	164-6029	CELL FBR MLCH SEED(TEMP)(WARM)	SY			5,935.000		1,505.000		7,440.000	
	164-6031	CELL FBR MLCH SEED(TEMP)(COOL)	SY			5,935.000		1,505.000		7,440.000	
	168-6001	VEGETATIVE WATERING	MG			119.000		30.000		149.000	
	400-6005	CEM STABIL BKFL	CY			865.000		213.000		1,078.000	
	400-6006	CUT & RESTORING PAV	SY			612.000		171.000		783.000	
	401-6001	FLOWABLE BACKFILL	CY			8.400				8.400	
	402-6001	TRENCH EXCAVATION PROTECTION	LF			643.000		118.000		761.000	
	403-6001	TEMPORARY SPL SHORING	SF			1,440.000				1,440.000	
	420-6009	CL A CONC (COLLAR)	EA			2.000				2.000	
	432-6001	RIPRAP (CONC)(4 IN)	CY			22.000				22.000	
	432-6033	RIPRAP (STONE PROTECTION)(18 IN)	CY			60.000		297.000		357.000	
	432-6045	RIPRAP (MOW STRIP)(4 IN)	CY			74.000		75.200		149.200	
	451-6019	RETROFIT RAIL (TY T631)	LF					1,057.300		1,057.300	
	460-6002	CMP (GAL STL 18 IN)	LF			266.000		22.000		288.000	
	460-6003	CMP (GAL STL 24 IN)	LF			35.000				35.000	
	460-6004	CMP (GAL STL 30 IN)	LF			24.000				24.000	
	462-6001	CONC BOX CULV (3 FT X 2 FT)	LF					98.000		98.000	
	462-6007	CONC BOX CULV (5 FT X 3 FT)	LF			82.000				82.000	
	462-6010	CONC BOX CULV (6 FT X 3 FT)	LF			62.000				62.000	
	462-6011	CONC BOX CULV (6 FT X 4 FT)	LF					39.000		39.000	
	462-6020	CONC BOX CULV (8 FT X 5 FT)	LF			60.000				60.000	
	462-6063	CONC BOX CULV (8 FT X 4 FT)(EXTEND)	LF			60.000				60.000	
	462-6112	CONC BOX CULVERT (5 FT X 7 FT) (EXTEND)	LF			36.000				36.000	
	464-6002	RC PIPE (CL III)(15 IN)	LF			8.000				8.000	
	464-6003	RC PIPE (CL III)(18 IN)	LF			18.000		24.000		42.000	
	464-6005	RC PIPE (CL III)(24 IN)	LF			364.000		174.000		538.000	
	464-6007	RC PIPE (CL III)(30 IN)	LF			554.000		42.000		596.000	
	464-6008	RC PIPE (CL III)(36 IN)	LF			466.000		84.000		550.000	
	464-6009	RC PIPE (CL III)(42 IN)	LF			320.000				320.000	
	464-6010	RC PIPE (CL III)(48 IN)	LF			18.000				18.000	
	465-6128	INLET (COMPL)(PSL)(FG)(4FTX4FT-4FTX4FT)	EA			1.000				1.000	
	466-6099	HEADWALL (CH - PW - 0) (DIA= 30 IN)	EA			2.000				2.000	

QUANTITY SHEET

CONTROLLING PROJECT ID 1507-02-016 **DISTRICT** Bryan **COUNTY** Burleson
HIGHWAY FM 2000, FM 696

			CONTROL SECTION JOB	**1129-02-019**		**1129-02-020**		**1507-02-016**		TOTAL EST.	TOTAL FINAL
			PROJECT ID	**A00128557**		**A00128556**		**A00126502**			
			COUNTY	**Burleson**		**Burleson**		**Burleson**			
			HIGHWAY	**FM 2000**		**FM 2000**		**FM 696**			
ALT	**BID CODE**	**DESCRIPTION**	**UNIT**	EST.	FINAL	EST.	FINAL	EST.	FINAL		
	466-6102	HEADWALL (CH - PW - 0) (DIA= 42 IN)	EA			2.000				2.000	
	466-6104	HEADWALL (CH - PW - 0) (DIA= 54 IN)	EA			2.000		1.000		3.000	
	466-6106	HEADWALL (CH - PW - 0) (DIA= 66 IN)	EA			1.000		1.000		2.000	
	466-6135	HEADWALL (CH - PW - S) (DIA= 42 IN)	EA			2.000				2.000	
	466-6136	HEADWALL (CH - PW - S) (DIA= 48 IN)	EA			2.000				2.000	
	466-6179	WINGWALL (PW - 1) (HW=4 FT)	EA			2.000				2.000	
	466-6180	WINGWALL (PW - 1) (HW=5 FT)	EA			2.000				2.000	
	466-6181	WINGWALL (PW - 1) (HW=6 FT)	EA			2.000				2.000	
	466-6184	WINGWALL (PW - 1) (HW=9 FT)	EA			2.000				2.000	
	467-6106	SET (TY I)(S=3 FT)(HW=3FT)(4:1)(C)	EA					6.000		6.000	
	467-6212	SET (TY I)(S= 6 FT)(HW= 4 FT)(4:1) (C)	EA			4.000				4.000	
	467-6217	SET (TY I)(S= 6 FT)(HW= 5 FT)(3:1) (C)	EA					2.000		2.000	
	467-6333	SET (TY II) (15 IN) (CMP) (6: 1) (P)	EA					2.000		2.000	
	467-6341	SET (TY II) (15 IN) (RCP) (6: 1) (P)	EA			8.000				8.000	
	467-6348	SET (TY II) (18 IN) (CMP) (6: 1) (P)	EA			164.000		28.000		192.000	
	467-6363	SET (TY II) (18 IN) (RCP) (6: 1) (P)	EA			8.000		2.000		10.000	
	467-6380	SET (TY II) (24 IN) (CMP) (6: 1) (P)	EA			18.000		8.000		26.000	
	467-6388	SET (TY II) (24 IN) (RCP) (3: 1) (C)	EA			11.000		4.000		15.000	
	467-6390	SET (TY II) (24 IN) (RCP) (4: 1) (C)	EA			14.000		4.000		18.000	
	467-6395	SET (TY II) (24 IN) (RCP) (6: 1) (P)	EA			4.000		2.000		6.000	
	467-6410	SET (TY II) (30 IN) (CMP) (6: 1) (P)	EA			6.000				6.000	
	467-6417	SET (TY II) (30 IN) (RCP) (3: 1) (C)	EA			12.000		2.000		14.000	
	467-6419	SET (TY II) (30 IN) (RCP) (4: 1) (C)	EA			10.000				10.000	
	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			15.000				15.000	
	496-6005	REMOV STR (WINGWALL)	EA			15.000				15.000	
	496-6007	REMOV STR (PIPE)	LF			90.000				90.000	
	496-6016	REMOV STR (PIPE)	EA			31.000		12.000		43.000	
	496-6018	REMOVE STR (CONC)	EA			3.000				3.000	
	496-6072	REMOVING ROCK RIPRAP	LF			6.000				6.000	
	500-6001	MOBILIZATION	LS	3.00%		66.00%		31.00%		100.00%	
	502-6001	BARRICADES, SIGNS AND TRAFFIC HANDLING	MO			6.000				6.000	
	506-6001	ROCK FILTER DAMS (INSTALL) (TY 1)	LF			65.000		80.000		145.000	
	506-6011	ROCK FILTER DAMS (REMOVE)	LF			65.000		80.000		145.000	
	506-6038	TEMP SEDMT CONT FENCE (INSTALL)	LF			2,235.000		1,995.000		4,230.000	
	506-6039	TEMP SEDMT CONT FENCE (REMOVE)	LF			2,235.000		1,995.000		4,230.000	
	512-6005	PORT CTB (FUR & INST)(F-SHAPE)(TY 1)	LF					900.000		900.000	

QUANTITY SHEET

CONTROLLING PROJECT ID 1507-02-016 **DISTRICT** Bryan **COUNTY** Burleson
HIGHWAY FM 2000, FM 696

		CONTROL SECTION JOB		**1129-02-019**		**1129-02-020**		**1507-02-016**		TOTAL EST.	TOTAL FINAL
		PROJECT ID		**A00128557**		**A00128556**		**A00126502**			
		COUNTY		**Burleson**		**Burleson**		**Burleson**			
		HIGHWAY		**FM 2000**		**FM 2000**		**FM 696**			
ALT	**BID CODE**	**DESCRIPTION**	**UNIT**	EST.	FINAL	EST.	FINAL	EST.	FINAL		
	512-6029	PORT CTB (MOVE)(F-SHAPE)(TY 1)	LF					900.000		900.000	
	512-6053	PORT CTB (REMOVE)(F-SHAPE)(TY 1)	LF					900.000		900.000	
	540-6001	MTL W-BEAM GD FEN (TIM POST)	LF			1,900.000		1,300.000		3,200.000	
	540-6006	MTL BEAM GD FEN TRANS (THRIE-BEAM)	EA					8.000		8.000	
	540-6009	MTL BEAM GD FEN TRANS (T6)	EA			4.000				4.000	
	540-6020	MTL W - BEAM GD FEN (LOW FILL CULVERT)	LF			60.000				60.000	
	542-6001	REMOVE METAL BEAM GUARD FENCE	LF			400.000		1,650.000		2,050.000	
	542-6002	REMOVE TERMINAL ANCHOR SECTION	EA					8.000		8.000	
	544-6001	GUARDRAIL END TREATMENT (INSTALL)	EA			12.000		12.000		24.000	
	544-6003	GUARDRAIL END TREATMENT (REMOVE)	EA			4.000		4.000		8.000	
	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	
	658-6048	INSTL OM ASSM (OM-2Z)(FLX)GND	EA			68.000		20.000		88.000	
	658-6060	REMOVE DELIN & OBJECT MARKER ASSMS	EA			68.000		20.000		88.000	
	658-6062	INSTL DEL ASSM (D-SW)SZ 1(BRF)GF2(BI)	EA			40.000		36.000		76.000	
	662-6004	WK ZN PAV MRK NON-REMOV (W)4"(SLD)	LF					400.000		400.000	
	662-6016	WK ZN PAV MRK NON-REMOV (W)24"(SLD)	LF					48.000		48.000	
	662-6034	WK ZN PAV MRK NON-REMOV (Y)4"(SLD)	LF					8,720.000		8,720.000	
	662-6050	WK ZN PAV MRK REMOV (REFL) TY II-A-A	EA					222.000		222.000	
	666-6342	REF PROF PAV MRK TY I(W)4"(SLD)(100MIL)	LF	200.000				100.000		300.000	
	666-6344	REF PROF PAV MRK TY I(Y)4"(BRK)(100MIL)	LF	8,846.000				244.000		9,090.000	
	666-6345	REF PROF PAV MRK TY I(Y)4"(SLD)(100MIL)	LF	89,965.000				7,905.000		97,870.000	
	672-6009	REFL PAV MRKR TY II-A-A	EA	1,252.000				108.000		1,360.000	
	677-6001	ELIM EXT PAV MRK & MRKS (4")	LF					8,019.000		8,019.000	
	681-6001	TEMP TRAF SIGNALS	EA					1.000		1.000	
	5116-6001	AMPHIBIAN/REPTILE EXCLUSION FENCE INST	LF			9,600.000		4,000.000		13,600.000	
	5116-6002	AMPHIBIAN/REPTILE EXCLUSION FENCE REM	LF			9,600.000		4,000.000		13,600.000	
	6001-6002	PORTABLE CHANGEABLE MESSAGE SIGN	EA			2.000		2.000		4.000	
	6056-6002	PREFORMED CENTERLINE RUMBLE STRIP	LF	1,321.000						1,321.000	
	6185-6002	TMA (STATIONARY)	DAY			87.000		27.000		114.000	
	6185-6005	TMA (MOBILE OPERATION)	DAY	24.000				6.000		30.000	
	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	
		LAW ENFORCEMENT: CONTRACTOR FORCE ACCOUNT WORK (PARTICIPATING)	LS			1.000				1.000	

SUMMARY OF DRAINAGE ITEMS

LOCATION	132	160	162	164	164	164	168	400	400	401	402
	6022	6003	6002	6023	6029	6031	6001	6005	6006	6001	6001
	EMBANKMENT (VEHICLE) (DENS CONT) (TY C)	FURNISHING AND PLACING TOPSOIL (4")	BLOCK SODDING	CELL FBR MLCH SEED (PERM) (RURAL) (CLAY)	CELL FBR MLCH SEED (TEMP) (WARM)	CELL FBR MLCH SEED (TEMP) (COOL)	VEGETATIVE WATERING	CEM STABIL BKFL	CUT & RESTORING PAV	FLOWABLE BACKFILL	TRENCH EXCAVATION PROTECTION
	CY	SY	SY	SY	SY	SY	SY	CY	SY	CY	LF
STA 29+15	150	240		240	120	120	240				
STA 47+44	10	200		200	100	100	200				
STA 57+38		200		200	100	100	200				
STA 70+29	60	350		350	175	175	350				
STA 89+94	10	200		200	100	100	200	36	29		26
STA 117+49	55	280		280	140	140	280	50	15		43
STA 129+04	20	240		240	120	120	240	30	12		45
STA 145+42	20	240		240	120	120	240				
STA 169+30		220		220	110	110	220				
STA 198+42	20	250		250	125	125	250				
STA 210+49	40	230		230	115	115	230				
STA 216+69	10	220		220	110	110	220	17	17		
STA 240+98		260		260	130	130	260	17	14		17
STA 326+77		220		220	110	110	220	14	12		28
STA 351+32		250		250	125	125	250	17	14		35
STA 364+04	40	260		260	130	130	260				
STA 377+62	10	200		200	100	100	200	46	30		60
STA 387+09	25	200		200	100	100	200	67	25		45
STA 401+93		300		300	150	150	300	34	29		35
STA 407+79		250		250	125	125	250	30	25		26
STA 421+82		200		200	100	100	200	14	24		29
STA 432+39		160		160	80	80	160				
STA 450+44		300	29	300	150	150	329	26	21	8.4	46
STA 469+20		200		200	100	100	200	14	12		
STA 483+27		180		180	90	90	180	15	12		19
STA 499+50	10	150		150	75	75	150	11	12		
STA 516+72		150		150	75	75	150	16	22		
STA 533+22		200		200	100	100	200	46	29		38
STA 541+29		220		220	110	110	220	23	27		
STA 593+66	40	230		230	115	115	230	37	25		31
STA 614+85	120	380		380	190	190	380	143	89		47
STA 638+18	100	350		350	175	175	350	90	52		43
STA 645+95	35	240		240	120	120	240	39	28		30
STA 680+40		200		200	100	100	200	33	37		
AT MBGF	1,000	3,900		3900	1950	1950	3900				
CSJ 1129-02-020	**1,775**	**11,870**	**29**	**11,870**	**5,935**	**5,935**	**11,899**	**865**	**612**	**8.4**	**643**
STA 30+15		170		170	85	85	170	19	17		
STA 45+38		140		140	70	70	140	14	12		
STA 67+37		200		200	100	100	200	14	15		
STA 124+25		170		170	85	85	170	13	15		19
STA 153+75		120		120	60	60	120	9	15		
STA 171+40		200		200	100	100	200	14	15		
STA 179+90		280		280	140	140	280	22	32		38
STA 195+45	40	250		250	125	125	250	83	21		61
STA 205+25	20	180		180	90	90	180	14	14		
STA 241+30	20	200		200	100	100	200	11	15		
AT MBGF	550	1,100		1100	550	550	1100				
CSJ 1507-02-016	**630**	**3,010**	**0**	**3,010**	**1,505**	**1,505**	**3,010**	**213**	**171**	**0**	**118**
PROJECT TOTALS	**2,405**	**14,880**	**29**	**14,880**	**7,440**	**7,440**	**14,909**	**1,078**	**783**	**8.4**	**761**

REV DATE: 2-12-2015
CSJ: 1507-02-016, Etc. FILENAME: g:\150702\016\sheets\Summary\SUMMARY OF DRAINAGE ITEMS_FM696_2000.dgn

PRINT DATE	REVISION DATE
12/18/2020	

Texas Department of Transportation *Bryan District*

SUMMARY OF DRAINAGE ITEMS

SHEET 1 OF 5 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 696, ETC.

STATE	DISTRICT	COUNTY	
TEXAS	BRYAN	BURLESON	
CONTROL	SECTION	JOB	SHEET NO.
1507	02	016, ETC.	6

SUMMARY OF DRAINAGE ITEMS (CONT'D)

LOCATION	403	420	432	462	462	462	462	462	462	462	464
	6001	6009	6033	6001	6007	6010	6011	6020	6063	6112	6005
	TEMPORARY SPL SHORING	CL A CONC (COLLAR)	RIPRAP (STONE PROTECTION) (18 IN)	CONC BOX CULV (3 FT X 2 FT)	CONC BOX CULV (5 FT X 3 FT)	CONC BOX CULV (6 FT X 3 FT)	CONC BOX CULV (6 FT X 4 FT)	CONC BOX CULV (8 FT X 5 FT)	CONC BOX CULV (8 FT X 4 FT)(EXTEND)	CONC BOX CULVERT (5 FT X 7 FT) (EXTEND)	RC PIPE (CL III)(24 IN)
	SF	EA	CY	LF	LF	LF	LF	LF	LF	LF	LF
STA 29+15	560		26						60		
STA 47+44											4
STA 57+38											
STA 70+29											
STA 89+94											
STA 117+49											
STA 129+04											52
STA 145+42											4
STA 169+30											
STA 198+42											6
STA 210+49											
STA 216+69											54
STA 240+98			9								
STA 326+77											40
STA 351+32											
STA 364+04	880									36	
STA 377+62					82						
STA 387+09											
STA 401+93			13								
STA 407+79			12								
STA 421+82						31					
STA 432+39						31					
STA 450+44		2									
STA 469+20											40
STA 483+27											40
STA 499+50											36
STA 516+72											76
STA 533+22											
STA 541+29											
STA 593+66											
STA 614+85											
STA 638+18								60			
STA 645+95											
STA 680+40											
AT MBGF											
CSJ 1129-02-020	**1,440**	**2**	**60**	**0**	**82**	**62**	**0**	**60**	**60**	**36**	**352**
STA 30+15											52
STA 45+38											40
STA 67+37				34							
STA 124+25				34							
STA 153+75				30							
STA 171+40											
STA 179+90							39				
STA 195+45											
STA 205+25			7								42
STA 241+30											40
AT MBGF											
CSJ 1507-02-016	**0**	**0**	**7**	**98**	**0**	**0**	**39**	**0**	**0**	**0**	**174**
PROJECT TOTALS	**1,440**	**2**	**67**	**98**	**82**	**62**	**39**	**60**	**60**	**36**	**526**

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PRINT DATE	REVISION DATE
12/18/2020	

Texas Department of Transportation
Bryan District

SUMMARY OF DRAINAGE ITEMS

SHEET 2 OF 5 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 696, ETC.

STATE	DISTRICT	COUNTY	
TEXAS	BRYAN	BURLESON	
CONTROL	SECTION	JOB	SHEET NO.
1507	02	016, ETC.	7

SUMMARY OF DRAINAGE ITEMS (CONT'D)

LOCATION	464	464	464	464	465	466	466	466	466	466	466
	6007	6008	6009	6010	6128	6099	6102	6104	6106	6135	6136
	RC PIPE (CL III)(30 IN)	RC PIPE (CL III)(36 IN)	RC PIPE (CL III)(42 IN)	RC PIPE (CL III)(48 IN)	INLET (COMPL)(PSL)(FG)(4FTX4FT-4FTX4FT)	HEADWALL (CH - PW - 0) (DIA= 30 IN)	HEADWALL (CH - PW - 0) (DIA= 42 IN)	HEADWALL (CH - PW - 0) (DIA= 54 IN)	HEADWALL (CH - PW - 0) (DIA= 66 IN)	HEADWALL (CH - PW - S) (DIA= 42 IN)	HEADWALL (CH - PW - S) (DIA= 48 IN)
	LF	LF	LF	LF	EA	EA	EA	EA	EA	EA	EA
STA 29+15											
STA 47+44											
STA 57+38											
STA 70+29		4					1		1		
STA 89+94		80									
STA 117+49		58						2			
STA 129+04							1				
STA 145+42											
STA 169+30											
STA 198+42											
STA 210+49				18							2
STA 216+69											
STA 240+98	40										
STA 326+77											
STA 351+32	44										
STA 364+04											
STA 377+62											
STA 387+09	124					2					
STA 401+93		88									
STA 407+79	76										
STA 421+82											
STA 432+39											
STA 450+44		52			1						
STA 469+20											
STA 483+27											
STA 499+50											
STA 516+72											
STA 533+22		96									
STA 541+29	72										
STA 593+66	96										
STA 614+85			320							2	
STA 638+18											
STA 645+95		88									
STA 680+40	102										
AT MBGF											
CSJ 1129-02-020	**554**	**466**	**320**	**18**	1	2	2	2	1	2	2
STA 30+15											
STA 45+38											
STA 67+37											
STA 124+25											
STA 153+75											
STA 171+40	42										
STA 179+90											
STA 195+45		84						1	1		
STA 205+25											
STA 241+30											
AT MBGF											
CSJ 1507-02-016	**42**	**84**	0	0	0	0	0	1	1	0	0
PROJECT TOTALS	**596**	**550**	**320**	**18**	1	2	2	3	2	2	2

REV DATE: 2-12-2015
CSJ: 1507-02-016, Etc. FILENAME: g:\150702\016\sheets\Summary\SUMMARY OF DRAINAGE ITEMS_FM696_2000.dgn

PRINT DATE	REVISION DATE
12/18/2020	

Texas Department of Transportation
Bryan District

SUMMARY OF DRAINAGE ITEMS

SHEET 3 OF 5 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 696, ETC.

STATE	DISTRICT	COUNTY	
TEXAS	BRYAN	BURLESON	
CONTROL	SECTION	JOB	SHEET NO.
1507	02	016, ETC.	8

SUMMARY OF DRAINAGE ITEMS (CONT'D)

LOCATION	466	466	466	466	467	467	467	467	467	467	467
	6179	6180	6181	6184	6106	6212	6217	6388	6390	6417	6419
	WINGWALL (PW - 1) (HW=4 FT)	WINGWALL (PW - 1) (HW=5 FT)	WINGWALL (PW - 1) (HW=6 FT)	WINGWALL (PW - 1) (HW=9 FT)	SET (TY I)(S=3 FT)(HW=3FT)(4:1)(C)	SET (TY I)(S= 6 FT)(HW= 4 FT)(4:1) (C)	SET (TY I)(S= 6 FT)(HW= 5 FT)(3:1) (C)	SET (TY II) (24 IN) (RCP) (3: 1) (C)	SET (TY II) (24 IN) (RCP) (4: 1) (C)	SET (TY II) (30 IN) (RCP) (3: 1) (C)	SET (TY II) (30 IN) (RCP) (4: 1) (C)
	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA
STA 29+15		2									
STA 47+44								2			
STA 57+38								2			
STA 70+29											
STA 89+94											
STA 117+49											
STA 129+04								1			
STA 145+42								2			
STA 169+30								2			
STA 198+42								1	1		
STA 210+49											
STA 216+69								1	1		
STA 240+98											2
STA 326+77									2		
STA 351+32											2
STA 364+04				2							
STA 377+62	2										
STA 387+09											
STA 401+93											
STA 407+79										2	2
STA 421+82						2					
STA 432+39						2					
STA 450+44											
STA 469+20									2		
STA 483+27									2		
STA 499+50									2		
STA 516+72									4		
STA 533+22											
STA 541+29										4	
STA 593+66											4
STA 614+85											
STA 638+18			2								
STA 645+95											
STA 680+40										6	
AT MBGF											
CSJ 1129-02-020	2	2	2	2	0	4	0	11	14	12	10
STA 30+15								1	1		
STA 45+38									2		
STA 67+37					2						
STA 124+25					2						
STA 153+75					2						
STA 171+40										2	
STA 179+90							2				
STA 195+45											
STA 205+25								2			
STA 241+30								1	1		
AT MBGF											
CSJ 1507-02-016	0	0	0	0	6	0	2	4	4	2	0
PROJECT TOTALS	2	2	2	2	6	4	2	15	18	14	10

REV DATE: 2-12-2015
CSJ: 1507-02-016, Etc. FILENAME: g:\150702\016\sheets\Summary\SUMMARY OF DRAINAGE ITEMS_FM696_2000.dgn

PRINT DATE	REVISION DATE
12/18/2020	

Texas Department of Transportation
Bryan District

SUMMARY OF DRAINAGE ITEMS

SHEET 4 OF 5 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 696, ETC.

STATE	DISTRICT	COUNTY	
TEXAS	BRYAN	BURLESON	
CONTROL	SECTION	JOB	SHEET NO.
1507	02	016, ETC.	9

SUMMARY OF DRAINAGE ITEMS (CONT'D)

LOCATION	467	467	496	496	496	496	658	658
	6448	6450	6005	6007	6016	6018	6048	6060
	SET (TY II) (36 IN) (RCP) (3: 1) (C)	SET (TY II) (36 IN) (RCP) (4: 1) (C)	REMOV STR (WINGWALL)	REMOV STR (PIPE)	REMOV STR (PIPE)	REMOVE STR (CONC)	INSTL OM ASSM (OM-2Z)(FLX)GND	REMOVE DELIN & OBJECT MARKER ASSMS
		EA	EA	LF	EA	EA	EA	EA
STA 29+15			2				2	2
STA 47+44				4			2	2
STA 57+38				8			2	2
STA 70+29							2	2
STA 89+94		4			1		2	2
STA 117+49					1		2	2
STA 129+04					1		2	2
STA 145+42							2	2
STA 169+30				3			2	2
STA 198+42							2	2
STA 210+49							2	2
STA 216+69					1	1	2	2
STA 240+98					1		2	2
STA 326+77					1	1	2	2
STA 351+32					1		2	2
STA 364+04			2				2	2
STA 377+62			2		1		2	2
STA 387+09					1		2	2
STA 401+93		4			1		2	2
STA 407+79					1		2	2
STA 421+82					1		2	2
STA 432+39					1		2	2
STA 450+44		1	1	26			2	2
STA 469+20					1	1	2	2
STA 483+27					1		2	2
STA 499+50					1		2	2
STA 516+72					1		2	2
STA 533+22		4			1		2	2
STA 541+29					1		2	2
STA 593+66			2		2		2	2
STA 614+85			2		4		2	2
STA 638+18			2		3		2	2
STA 645+95	2	2	2		2		2	2
STA 680+40					1		2	2
AT MBGF								
CSJ 1129-02-020	**2**	**15**	**15**	**41**	**31**	**3**	**68**	**68**
STA 30+15					1		2	2
STA 45+38					1		2	2
STA 67+37					1		2	2
STA 124+25					1		2	2
STA 153+75					1		2	2
STA 171+40					1		2	2
STA 179+90					2		2	2
STA 195+45					2		2	2
STA 205+25					1		2	2
STA 241+30					1		2	2
AT MBGF								
CSJ 1507-02-016	**0**	**0**	**0**	**0**	**12**	**0**	**20**	**20**
PROJECT TOTALS	**2**	**15**	**15**	**41**	**43**	**3**	**88**	**88**

REV DATE: 2-12-2015
CSJ: 1507-02-016, Etc. FILENAME: g:\150702\016\sheets\Summary\SUMMARY OF DRAINAGE ITEMS_FM696_2000.dgn

PRINT DATE	REVISION DATE
12/18/2020	

Texas Department of Transportation
Bryan District

SUMMARY OF DRAINAGE ITEMS

SHEET 5 OF 5 SHEETS

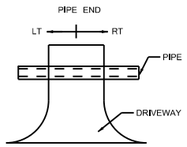
FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 696, ETC.

STATE	DISTRICT	COUNTY	
TEXAS	BRYAN	BURLESON	
CONTROL	SECTION	JOB	SHEET NO.
1507	02	016, ETC.	9A

HIGHWAY:	FM 696
CSJ:	1507-02-016
COUNTY:	Burleson
LIMITS:	FROM Lee Co. Line TO SH 21
START STA (0+00):	Sh 21

SUMMARY OF DRIVEWAYS

STATION	**LT / RT**	**EXISTING STRUCTURE**				**PROPOSED MODIFICATIONS** (Example: Add 4' LT, Add 6' RT, Add SET LT & RT)	**OFFSET** (From Edgeline to Center of Pipe) (ft.)	**COVER DEPTH** (in)	Item 467 SET (TY II) (PIPE SIZE) (CMP) (6: 1) (P)			Item 467 SET (TY II) (PIPE SIZE) (RCP) (6: 1) (P)		Item 460 CMP (GAL STL PIPE SIZE)	Item 464 RC PIPE (CL III)(PIPE SIZE)		**Comments**
		QTY	LENGTH (ft)	SIZE (in)	TYPE				6333	6348	6380	6363	6395	6002	6003	6005	
									15"	**18"**	**24"**	**18"**	**24"**	**18"**	**18"**	**24"**	
									EA	EA	EA	EA	EA	LF	LF	LF	
2+55	LT	1	46	24	CMP	Add SET each side	12.0	12			2						
4+85	LT	1	44	18	CMP	Add SET each side	11.0	0		2							
32+95	LT	1	32	24	CMP	Add SET each side	10.0	0			2						
79+95	RT	1	22	18	CMP	LT: Add 4' & SET, RT: Add 2' & SET	10.0	6		2				6			
80+75	RT	1	25	18	CMP	Add SET each side	14.0	0		2							
137+05	LT	1	36	18	CMP	Add 4' and SET each side	16.0	18		2				8			
148+15	RT	1	24	18	CMP	Add SET each side	11.0	0		2							
151+95	RT	1	46	18	CMP	Add SET each side	12.0	18		2							
156+15	LT	1	24	18	CMP	Add SET each side	11.0	12		2							
164+85	RT	1	70	18	CMP	Add SET each side	12.0	24		2							
167+15	RT	1	38	18	CMP	LT: Add 2' & SET, RT: Add SET	12.0	6		2				2			
188+35	RT	1	32	18	CMP	Add SET each side	20.0	18		2							
219+10	LT	1	26	18	CMP	LT: Add 2' & SET, RT: Add SET	13.0	12		2				2			
221+80	RT	1	30	18	RCP	Add 12' and SET each side	16.0	30				2			24		CR 318
229+50	RT	1	26	18	CMP	Add SET each side	14.0	0		2							
241+20	LT	1	26	18	CMP	Add SET each side	16.0	6		2							
256+60	LT	1	26	15	CMP	Add SET each side	28.0	0	2								
262+10	LT	1	22	18	CMP	LT: Add 4' And SET, RT: Add SET	23.0	12		2				4			
270+80	LT	1	24	24	CMP	Add SET each side	24.0	0			2						
283+20	RT	1	44	24	CMP	Add SET each side	34.0	0			2						
290+80	RT	1	25	24	RCP	LT: Add SET, RT: Add 2' and SET	23.0	12					2			2	
							CSJ 1507-02-016		2	28	8	2	2	22	24	2	



PRINT DATE	REVISION DATE
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Bryan District

SUMMARY OF DRIVEWAYS (FM 696)

SHEET 1 OF 3 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 696, ETC.

STATE	DISTRICT	COUNTY	
TEXAS	BRYAN	BURLESON	
CONTROL	SECTION	JOB	SHEET NO.
1507	02	016, ETC.	10

REV DATE: 2-12-2015
CSJ: 1507-02-016, Etc. FILENAME: g:\150702\016\sheets\Summary\SUMMARY OF DRIVEWAYS_FM696.dgn

HIGHWAY:	FM 2000
CSJ:	1129-02-020
COUNTY:	Burleson
LIMITS:	FM 1362 to SH 21
START STA (0+00):	SH 21

SUMMARY OF DRIVEWAYS (SHEET 1 OF 2)

STATION	LT / RT	EXISTING STRUCTURE				PROPOSED MODIFICATIONS (Example: Add 4' LT, Add 6' RT, Add SET LT & RT)	OFFSET (From Edgeline to Center of Pipe) (ft.)	COVER DEPTH (in)	Item 467 SET (TY II) (PIPE SIZE) (CMP) (☒ 1) (P)			Item 467 SET (TY II) (PIPE SIZE) (RCP) (☒ 1) (P)			Item 460 CMP (GAL STL PIPE SIZE)			Item 464 RC PIPE (CL III)(PIPE SIZE)			Item 496 REMOV STR (PIPE)		Item 496 REMOV ROCK RIPRAP	Comments
		QTY	LENGTH (ft)	SIZE (in)	TYPE				6348	6380	6410	6341	6363	6395	6002	6003	6004	6002	6003	6005	6007	6016	6072	
									18"	24"	30"	15"	18"	24"	18"	24"	30"	15"	18"	24"				
									EA	EA	EA	EA	EA	EA	LF	LF	LF	LF	LF	LF	LF	EA	LF	
0+90	RT	1	28	18	CMP	Add SETs	14.0	6	2															
5+00	RT	1	17	24	CMP	LT: add 4' and SET RT: Add 6' and SET	15.0	16		2						10								
8+25	RT	1	45	24	CMP	RT: add 5' and SET LT: add SET	13.0	18		2						5								
32+65	RT	1	23	18	RCP	Add 4' and SET each side	12.0	12					2											
82+50	RT	1	19	18	RCP	RT: add 2' and SET LT: add 4' and SET	13.0	12					2						6					
99+70	LT	1	20	18		Add 6' and SET each side	13.0	18											12					
102+40	RT	1	48	18	CMP	Add SETs	13.0	12	2															
124+20	LT	1	46	18	CMP	Add SETs	14.0	12	2															
137+20	RT	1	22	24	CMP	RT: add 2' and SET LT: Add SET	16.0	6		2						2								
140+00	RT	1	26	18	CMP	RT: add 3' and SET LT: Add SET	16.0	RT: 9" LT: 3"	2						3									
145+50	RT	1	22	24	CMP	Add 4' and SET each side	18.0	12		2						8								
147+60	LT	1	48	18	CMP	Add SET each slde	13.0	6	2															
177+90	LT	1	22	18	CMP	Add 4' and SET each side	19.0	12	2						8									
208+10	LT	1	28	18	CMP	Remove Existing Rock Riprap Add 4' and SET each slde	19.0	12	2						8								6	Lake Woodrow
213+60	RT	1	27	18	CMP	RT: Remove 2' add 2' add SET LT: Remove 2' add 2' add SET	12.0	6	2						4						4			
219+30	RT	1	32	30	CMP	Add SET each side	14.0	8			2													
221+60	RT	1	26	18	CMP	RT: Add 4' and SET LT: Add SET	16.0	12	2						4									
226+50	RT	1	26	18	CMP	RT: Add 4' and SET LT: Add SET	14.0	12	2						4									
228+30	RT	1	26	18	CMP	Add SET each side	16.0	6	2															
229+30	RT	1	24	18	CMP	RT: Add 4' and SET LT: Add SET	13.0	6	2						4									
239+00	RT	1	26	18	CMP	RT: Add 4' and SET LT: Add SET	12.0	12	2						4									
239+00	LT	1	72	18	CMP	Add SET each slde	12.0	12	2															
269+80	LT	1	44	18	CMP	Add SETs	13.0	8	2															
272+30	LT	1	32	18	CMP	Add SET each side	14.0	8	2															
294+50	RT	1	66	18	CMP	RT: Add 2' and SET LT: Add SET	15.0	18	2						2									
298+10	LT	1	50	18	CMP	Add SET each side	18.0	12	2															
304+20	RT	1	22	18	CMP	Add 4' and SET each side	12.0	18	2						8									
325+40	LT	1	20	18	CMP	Remove 2' add 4' add SET each slde	14.0	12	2						8						4			
328+50	LT	1	28	18	CMP	Add SET each slde	12.0	12	2															
329+30	LT	1	24	18	CMP	Add SET each side	12.0	6	2															
342+50	LT	1	25	18	CMP	RT: Add 4' and SET LT: Add SET	14.0	12	2						4									
357+00	RT	1	20	18	CMP	RT: Add 4' and SET LT: Add 2' and SET	13.0	24	2						6									
357+80	LT	1	33	18	CMP	RT: Remove 2' add 2' add SET LT: Add SET	16.0	12	2						2						2			
358+50	RT	1	25	18	CMP	RT: Add 7' and SET LT: Add 2' and SET	12.0	24	2						9									
364+80	RT	1	32	18	CMP	Add SET each side	17.0	18	2															
369+20	LT	1	26	18	CMP	Add SET each slde	19.0	12	2															
372+90	RT	1	46	24	CMP	RT: Rem 2' Add 2' Add SET LT: Add SET	18.0	6		2						2					2			
381+50	LT	1	24	18	RCP	Add SET each slde	12.0	6					2											
384+50	RT	1	22	18	CMP	Add SET each slde	12.0	0	2															
385+70	LT	1	22	18	CMP	RT: Add SET LT: Add 2' and SET	16.0	12	2						2									
393+20	RT	1	23	18	CMP	Add 5' and SET each slde	14.0	12	2						10									
397+80	RT	1	22	18	CMP	Add SET each slde	17.0	0	2															
398+70	LT	1	23	18	CMP	Add 5' and SET each side	14.0	18	2						10									
399+40	LT	1	42	18	CMP	Add SET each side	14.0	12	2															
400+90	LT	1	24	18	CMP	Add 2' and SET each slde	13.0	12	2						4									
401+30	LT	1	26	18	CMP	Add SET each slde	13.0	12	2															
Sheet 1 Totals									72	10	2	0	6	0	104	27	0	0	18	0	12	0	6	

REV DATE: 2-12-2015
CSJ: 1507-02-016, Etc. FILENAME: g:\150702\016\sheets\Summary\SUMMARY OF DRIVEWAYS_FM2000.dgn

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Texas Department of Transportation
Bryan District

DRIVEWAY SUMMARY (FM 2000)

SHEET 2 OF 3 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 696, ETC.

STATE	DISTRICT	COUNTY	
TEXAS	BRYAN	BURLESON	
CONTROL	SECTION	JOB	SHEET NO.
1507	02	016, ETC.	11

HIGHWAY:	FM 2000
CSJ:	1129-02-020
COUNTY:	Burleson
LIMITS:	FM 1362 to SH 21
START STA (0+00):	SH 21

SUMMARY OF DRIVEWAYS (SHEET 2 OF 2)

STATION	LT / RT	EXISTING STRUCTURE				PROPOSED MODIFICATIONS (Example: Add 4' LT, Add 6' RT, Add SET LT & RT)	OFFSET (From Edgeline to Center of Pipe) (ft.)	COVER DEPTH (in)	Item 467				Item 467			Item 460			Item 464			Item 496		Item 496	Comments
		QTY	LENGTH (ft)	SIZE (in.)	TYPE				SET (TY II) (PIPE SIZE) (CMP) (6: 1) (P)				SET (TY II) (PIPE SIZE) (RCP) (6: 1) (P)			CMP (GAL STL PIPE SIZE)			RC PIPE (CL III)(PIPE SIZE)			REMOV STR (PIPE)		REMOV ROCK RIPRAP	
									6333	6348	6380	6410	6341	6363	6395	6002	6003	6004	6002	6003	6005	6007	6016	6072	
									15"	18"	24"	30"	15"	18"	24"	18"	24"	30"	15"	18"	24"				
										EA	EA	EA	EA	EA	EA	LF	LF	LF	LF	LF	LF	LF	EA	LF	
403+40	LT	1	25	18	CMP	RT: Add SET	13.0	12		2						4									
408+90	RT	1	26	24	CMP	RT: Add SET LT: Rem 2' add 2' add SET	16.0	12			2						2								
416+80	LT	1	31	15	RCP	RT: Rem 2' add 2' add SET both pipes LT: add SET both pipes	17.0	12					2						2						
417+40	LT	2	33	15	RCP	RT: Rem 2' add 2' add SET both pipes	16.0	12					4						4			2			
422+00	LT	1	19	18	CMP	Remove 1' add 2' add SET each side	14.0	6		2						4						2			
422+00	RT	1	25	15	RCP	RT: Add 2' and SET LT: Add SET	13.0	12					2						2						
438+40	LT	1	26	18	CMP	Add 5' and SET each side	20.0	18		2						10									
442+60	LT	1	23	18	CMP	Add 6' and SET each side	15.0	24		2						12									
446+30	LT	1	26	18	CMP	Add SET each side	13.0	6		2															
447+00	RT	1	46	18	CMP	RT: Add 2' and SET LT: Add SET	13.0	6		2						2									
450+20	RT	1	57	18	CMP	Rem 2' add 2' and SET each side	13.0	0		2						4						4			
463+10	LT	1	20	18	CMP	Rem 4' add 4' and SET each side	11.0	12		2						8						8			
463+70	LT	1	24	18	CMP	Rem 2' add 4' and SET each side	11.0	6		2						8						4			
475+60	RT	1	29	24	CMP	Rem 2' add 2' and SET each side	13.0	12			2						4					4			
487+80	RT	1	26	18	CMP	Add SET each side	18.0	12		2															
491+10	LT	1	26	18	CMP	RT: Add 3' and SET	16.0	12		2						3									
492+90	LT	1	25	18	CMP	Add SET each side	15.0	6		2															
493+60	LT	1	47	18	CMP	Add SET each side	15.0	6		2															
499+40	LT	1	24	18	CMP	Add SET each side	18.0	12		2															
501+30	LT	1	26	18	CMP	RT: Add 2' and SET LT: Add SET	19.0	12		2						2									
507+00	LT	1	24	24	RCP	Add 5' and SET each side	23.0	8							2						10				
509+60	LT	1	49	24	CMP	RT: Add SET	24.0	24			2						2								
511+30	RT	1	32	24	RCP	RT: Add SET	17.0	12							2						2				
514+20	LT	1	27	18	CMP	Add 2' and SET each side	16.0	12		2						4									
516+40	LT	1	20	18	CMP	RT: Add SET LT: Add 3' and SET	33.0	12		2						3									
528+90	LT	1	26	18	CMP	RT: Add 3' and SET	13.0	18		2						3									
530+00	RT	1	24	18	CMP	RT: Rem 2' add 8' and SET	14.0	18		2						12						4			
532+30	LT	1	47	18	CMP	Add 4' and SET each side	14.0	6		2						8									
533+90	RT	1	24	18	RCP	Add SET each side	17.0	6						2											
536+40	LT	1	26	18	CMP	Add SET each side	15.0	6		2															
546+60	RT	1	16	18	CMP	RT: Add 16' and SET LT: Add 8' and SET	17.0	36		2						24									
555+40	RT	1	30	18	CMP	Add SET each side	11.0	12		2															
556+50	RT	1	40	18	CMP	Add SET each side	11.0	24		2															
557+70	LT	1	30	18	CMP	RT: Rem 5' add SET LT: Add SET	26.0	12		2												5			CEMETARY
558+10	RT	1	32	18	CMP	Add SET each side	12.0	12		2															
558+20	LT	1	26	18	CMP	RT: Add SET	18.0	12		2												4			CEMETARY
559+90	RT	1	25	18	CMP	Add SET each side	11.0	12		2															
560+30	RT	1	25	18	CMP	Add SET each side	13.0	12		2															
560+50	LT	1	44	18	CMP	RT: Add 4' and SET	12.0	12		2						6									
564+50	LT	1	24	18	CMP	Add SET each side	15.0	6		2															
574+00	RT	1	24	18	CMP	RT: add 5' and SET	15.0	18		2						8									
575+70	RT	1	24	18	CMP	Add 6' and SET each side	13.0	24		2						12									
582+30	LT	1	24	18	CMP	Add 5' and SET each side	13.0	18		2						10									
601+20	RT	1	24	18	CMP	Add 2' and SET each side	15.0	12		2						4									
604+20	RT	1	26	18	CMP	Add 2' and SET each side	22.0	12		2						4									
610+00	RT	1	28	18	CMP	Add SET each side	13.0	12		2															
622+10	RT	1	29	18	CMP	RT: Add 5' and SET LT: Add SET	16.0	18		2						5									
636+10	LT	1	42	18	CMP	Add SET each side	15.0	18		2															
636+70	RT	1	25	18	CMP	Add SET each side	12.0	6		2															
639+80	RT	1	25	18	CMP	Add SET each side	13.0	0		2															
641+50	RT	1	40	18	CMP	Add SET each side	13.0	6		2															
644+30	LT	1	26	24	CMP	Add SET each side	14.0	12			2														
644+30	RT	1	26	18	CMP	Add SET each side	12.0	12		2															
651+60	RT	1	24	18	CMP	Add SET each side	14.0	12		2															
652+30	LT	2	24	30	CMP	Add 6' and SET each side	12.0	24				2						12							
656+90	RT	1	26	18	CMP	Add SET each side	14.0	12		2															
660+80	RT	1	28	18	CMP	RT: Add SET	11.0	12		2						2									
661+40	LT	2	26	30	CMP	Add 6' and SET each side	14.0	24				2						12							

Sheet 2 Totals		92	8	4	8	2	4	162	8	24	8	0	12	37	0	0				
Sheet 1 Totals		72	10	2	0	6	0	104	27	0	0	18	0	12	0	6				
CSJ 1129-02-020		164	18	6	8	8	4	266	35	24	8	18	12	49	0	6				
PROJECT TOTALS	2	192	26	6	8	10	6	288	35	24	8	42	14	49	0	6				

REV DATE: 2-12-2015
CSJ: 1507-02-016, Etc. FILENAME: g:\150702\016\sheets\Summary\SUMMARY OF DRIVEWAYS_FM2000.dgn

PRINT DATE	REVISION DATE
12/5/2020	

Texas Department of Transportation
Bryan District

DRIVEWAY SUMMARY (FM 2000)

SHEET 3 OF 3 SHEETS

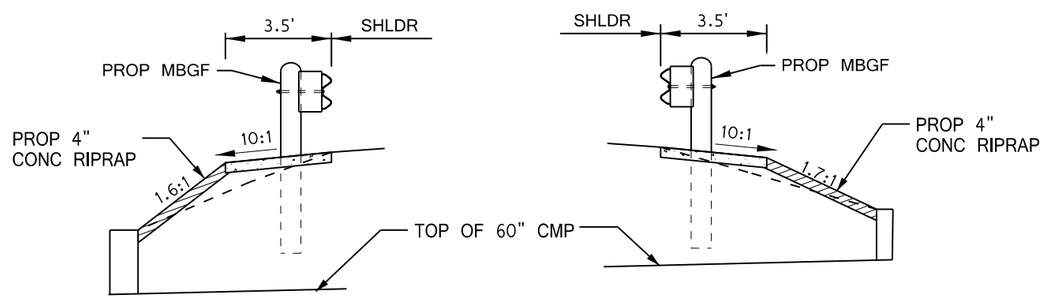
FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 696, ETC.

STATE	DISTRICT	COUNTY	
TEXAS	BRYAN	BURLESON	
CONTROL	SECTION	JOB	SHEET NO.
1507	02	016, ETC.	12

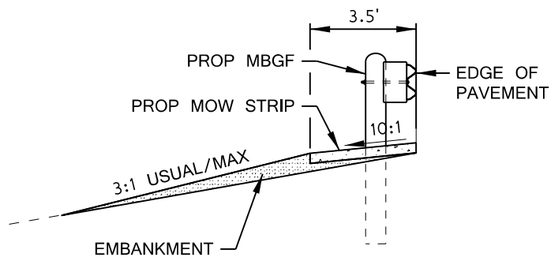
SUMMARY OF MBGF

LOCATION		104 6054 REMOVING CONCRETE(MOW STRIP) LF	432 6001 RIPRAP (CONC)(4 IN) CY	432 6045 RIPRAP (MOW STRIP)(4 IN) CY	540 6001 MTL W-BEAM GD FEN (TIM POST) LF	540 6006 MTL BEAM GD FEN TRANS (THRIE-BEAM) EA	540 6009 MTL BEAM GD FEN TRANS (T6) EA	540 6020 MTL W - BEAM GD FEN (LOW FILL CULVERT) LF	542 6001 REMOVE METAL BEAM GUARD FENCE LF	542 6002 REMOVE TERMINAL ANCHOR SECTION EA	544 6001 GUARDRAIL END TREATMENT (INSTALL) EA	544 6003 GUARDRAIL END TREATMENT (REMOVE) EA	658 6062 INSTL DEL ASSM (D-SW)SZ 1(BRF)GF2(BI) EA	132 ① 6022 EMBANKMENT (VEHICLE)(DENS CONT)(TY C) CY	160 ① 6003 FURNISHING AND PLACING TOPSOIL (4") SY
STA 183+50 2 - 9' X 8' MBC	APPROACH, RT			5.8	225			30			1		4	300	1000
	DEPARTURE, RT			5.8	125						1		3		
	APPROACH, LT			5.8	225			30			1		4		
	DEPARTURE, LT			5.8	125						1		3		
STA 289+25 TO 290+46	CEDAR CR (RT, APPROACH)	200		6.9	175		1		150		1	1	3	200	400
	CEDAR CR (RT, DEPARTURE)			6.9	75		1		50		1	1	3		
	CEDAR CR (LT, APPROACH)			6.9	175		1		150		1	1	3		
	CEDAR CR (LT, DEPARTURE)	90		6.9	75		1		50		1	1	3		
STA 567+60 60" CMP	APPROACH, RT		22	5.8	225						1		4	500	2,500
	DEPARTURE, RT			5.8	125						1		3		
	APPROACH, LT			5.8	225						1		4		
	DEPARTURE, LT			5.8	125						1		3		
	CSJ 1129-02-020	290	22	74.0	1,900	0	4	60	400	0	12	4	40	1,000	3,900
STA 38+76 TO 39+56	BUFFALO CR (RT, APPROACH)			6.5	125	1			175	1	1		3	150	300
	BUFFALO CR (RT, DEPARTURE)			6.5	50	1			62.5	1	1		3		
	BUFFALO CR (LT, APPROACH)			6.5	125	1			175	1	1		3		
	BUFFALO CR (LT, DEPARTURE)			6.5	50	1			62.5	1	1		3		
STA 183+69 TO 184+60	HOOKERS CR (RT, APPROACH)			6.5	125	1			175	1	1		3	150	300
	HOOKERS CR (RT, DEPARTURE)			6.5	50	1			100	1	1		3		
	HOOKERS CR (LT, APPROACH)			6.5	125	1			175	1	1		3		
	HOOKERS CR (LT, DEPARTURE)			6.5	50	1			100	1	1		3		
STA 302+34 TO 307+50	EAST YEGUA CR (RT, APPROACH)			5.7	200				200		1	1	3	250	500
	EAST YEGUA CR (RT, DEPARTURE)			5.7	100				112.5		1	1	3		
	EAST YEGUA CR (LT, APPROACH)			5.7	200				200		1	1	3		
	EAST YEGUA CR (LT, DEPARTURE)			5.7	100				112.5		1	1	3		
	CSJ 1507-02-016	0	0	75.2	1,300	8	0	0	1,650	8	12	4	36	550	1,100
	PROJECT TOTALS	**290**	**22**	**149.2**	**3,200**	**8**	**4**	**60**	**2,050**	**8**	**24**	**8**	**76**	**1,550**	**5,000**

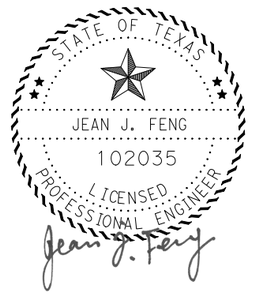
① FOR CONTRACTOR'S INFORMATION ONLY. QUANTITY INCLUDED IN SHEET "SUMMARY OF DRAINAGE ITEMS".



MBGF DETAIL N.T.S
AT STRUCTURE STA 567+60



TYPICAL MBGF DETAIL N.T.S



12/18/2020

PRINT DATE	REVISION DATE
12/18/2020	

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Bryan District
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SUMMARY OF MBGF

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 696, ETC.
STATE	DISTRICT	COUNTY
TEXAS	BRYAN	BURLESON
CONTROL	SECTION	JOB / SHEET NO.
1507	02	016, ETC. / 13

REV DATE: 2-12-2015
CSJ: 1507-02-016, Etc. FILENAME: g:\150702\016\sheets\Summary\SUMMARY OF MBGF_150702016.dgn

SUMMARY OF TCP ITEMS

REMARKS	ITEM 512			ITEM 545			ITEM 662				ITEM 677	ITEM 681	ITEM 666 ①		ITEM 672 ①
	6005	6029	6053	6019	6003	6005	6004	6016	6034	6050	6001	6001	6344	6345	6009
	PORT CTB			CRASH CUSH ATTEN			WK ZN PAV MRK NON-REMOV				ELIM EXT PAV MRK & MRKS (4")	TEMP TRAF SIGNALS	REF PROF PAV MRK TY I		REFL PAV MRKR TY II-A-A
	(FUR & INST) (F-SHAPE) (TY 1)	(MOVE) (F-SHAPE) (TY 1)	(REMOVE) (F-SHAPE) (TY 1)	(INSTL) (S)(N) (TL3)	(MOVE & RESET)	(REMOVE)	(W) 4" (SLD)	(W) 24" (SLD)	(Y) 4" (SLD)	TY II-A-A			(Y) 4" (BRK) (100 MIL)	(Y) 4" (SLD) (100 MIL)	
	LF	LF	LF	EA	EA	EA		LF	LF	EA	LF	EA	LF	LF	EA
EAST YEGUA CR															
PHASE I	900			2			200	24	4,360	111	3,719	0.5			
PHASE II		900	900		2	2	200	24	4,360	111	4,300	0.5			
													214	7,805	108
CSJ 1507-02-016	900	900	900	2	2	2	400	48	8,720	222	8,019	1	214	7,805	108
PROJECT TOTALS	900	900	900	2	2	2	400	48	8,720	222	8,019	1	214	7,805	108

① FOR CONTRACTOR'S INFORMATION ONLY. QUANTITIES ARE INCLUDED IN "SUMMARY OF PAVEMENT MARKINGS" BELOW.

SUMMARY OF PAVEMENT MARKINGS

STATION	SHEET	LENGTH	ITEM 666 REF PROF PAV MRK TY I			ITEM 672	ITEM 6056	TYPE OF SHOULDER RUMBLE STRIPS	TYPE OF CENTERLINE RUMBLE STRIPS
			6342	6344	6345	6009	6002		
			(W)4"(SLD) (100MIL)	(Y)4"(BRK) (100MIL)	(Y)4"(SLD) (100MIL)	REFL PAV MRKR TY II-A-A	PREFORMED CENTERLINE RUMBLE STRIP		
		FT	LF	LF	LF	EA	LF		
STA 0+00 TO STA 281+12	1	28,112		3,944	34,240	503	776	OPTION 6	OPTION 4
STA 281+12 TO STA 676+19	2	39,507		4,782	55,525	749	545	OPTION 6	OPTION 4
①			200	120	200				
CSJ 1129-02-019			200	8,846	89,965	1,252	1,321		
FM 696 ②			100	30	100				
FM 696 ③				214	7,805	108			
CSJ 1507-02-016			100	244	7,905	108			
PROJECT TOTALS:			300	9,090	97,870	1,360	1,321		

① AT CROSS DRAINAGE STRUCTURES FOR CUT & RESTORE PAVEMENT OF FM 2000.
② AT CROSS DRAINAGE STRUCTURES FOR CUT & RESTORE PAVEMENT OF FM 696.
③ FROM "SUMMARY OF TCP ITEMS" ABOVE.

PRINT DATE	REVISION DATE
12/30/2020	

Texas Department of Transportation
Bryan District

SUMMARY OF TCP ITEMS AND PAVEMENT MARKINGS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 696, ETC.

STATE	DISTRICT	COUNTY	
TEXAS	BRYAN	BURLESON	
CONTROL	SECTION	JOB	SHEET NO.
1507	02	016, ETC.	14

REV DATE: 2-12-2015
CSJ: 1507-02-016, Etc. FILENAME: g:\150702\016\sheets\Summary\Summary OF TCP_striping ITEMS.dgn

SUMMARY OF SW3P ITEMS

ID #	STATION	ITEM 606	ITEM 606	ITEM 606	ITEM 606	ITEM 5116	ITEM 5116
		6038	6039	6001	6011	6001	6002
		TEMP SEDMT CONT FENCE (INSTALL)	TEMP SEDMT CONT FENCE (REMOVE)	ROCK FILTER DAM (INSTALL) (TY 1)	ROCK FILTER DAM (REMOVE)	AMPHIBIAN/REPTILE EXCLUSION FENCE INST	AMPHIBIAN/REPTILE EXCLUSION FENCE REM
FM 2000		(LF)	(LF)	(LF)	(LF)	(LF)	(LF)
1	29+15	60	60	10	10		
2	47+44	60	60				
3	57+38	60	60				
4	70+29	60	60				
5	89+94	60	60				
6	117+49	60	60			400	400
7	129+04	60	60			400	400
8	145+42	60	60			800	800
9	169+30	60	60			800	800
10	198+42	60	60			800	800
11	210+49	90	90	10	10		
12	216+69	60	60			400	400
13	240+98	60	60			800	800
14	326+77	60	60				
15	351+32	60	60			400	400
16	364+04	60	60			800	800
17	377+62	75	75	10	10	800	800
18	387+09	60	60				
19	401+93	60	60				
20	407+79	60	60				
21	421+82	60	60				
22	432+39	60	60				
23	460+44	90	90				
24	469+20	60	60				
25	483+27	60	60			400	400
26	499+60	60	60			800	800
27	516+72	60	60			400	400
28	533+22	60	60			400	400
29	541+29	60	60				
30	593+66	60	60			400	400
31	614+85	150	150	25	25		
32	638+18	90	90	10	10	400	400
33	645+95	60	60				
34	680+40	60	60			400	400
CSJ 1129-02-020		2235	2235	65	65	9600	9600

SUMMARY OF SW3P ITEMS (CONT'D)

ID #	STATION	ITEM 506	ITEM 506	ITEM 506	ITEM 506	ITEM 5116	ITEM 5116
		6038	6039	6001	6011	6001	6002
		TEMP SEDMT CONT FENCE (INSTALL)	TEMP SEDMT CONT FENCE (REMOVE)	ROCK FILTER DAM (INSTALL) (TY 1)	ROCK FILTER DAM (REMOVE)	AMPHIBIAN/REPTILE EXCLUSION FENCE INST	AMPHIBIAN/REPTILE EXCLUSION FENCE REM
FM 696		(LF)	(LF)	(LF)	(LF)	(LF)	(LF)
1	30+15	75	75			400	400
2	Buffalo Cr Bridge	390	390				
3	45+38	60	60	10	10	800	800
4	67+37	90	90	10	10		
5	124+25	90	90	10	10		
6	153+75	60	60	10	10		
7	171+40	75	75	10	10	400	400
8	179+90	90	90	10	10	800	800
9	Hookers Cr Bridge	390	390				
10	195+45	150	150			800	800
11	205+25	75	75	10	10	800	800
12	241+30	60	60	10	10		
13	E Yegua Cr Bridge	390	390				
CSJ 1507-02-016		1995	1995	80	80	4000	4000
CSJ 1129-02-020		2235	2235	65	65	9600	9600
Project Totals		4230	4230	145	145	13600	13600

PRINT DATE	REVISION DATE
12/21/2020	

Texas Department of Transportation
Bryan District

SUMMARY OF SW3P ITEMS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 696, ETC.

STATE	DISTRICT	COUNTY	
TEXAS	BRYAN	BURLESON	
CONTROL	SECTION	JOB	SHEET NO.
1507	02	016, ETC.	15

REV DATE: 2-12-2015
CSJ: 1507-02-016, Etc. FILENAME: g:\150702\016\sheets\Summary\SUMMARY OF SW3P Combined.dgn

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									
															MOVE / RESET		L	L	R	R	S	S
							PROPOSED MATERIAL	PROPOSED THICKNESS	DESCRIPTION	WIDTH	HEIGHT		INSTALL	REMOVE	MOVE/ RESET	FROM LOC.#	N	W	N	W	N	W
1	PHASE I (FM 696)		EAST YEGUA CREEK	299+94	TL-3	BI			CTB	24"	32"	40'+	1								1	
1	PHASE I (FM 696)		EAST YEGUA CREEK	308+94	TL-3	BI			CTB	24"	32"	40'+	1								1	
1	PHASE II (FM 696)		EAST YEGUA CREEK	300+90	TL-3	BI			CTB	24"	32"	40'+		1	1	1					1	
1	PHASE II (FM 696)		EAST YEGUA CREEK	309+90	TL-3	BI			CTB	24"	32"	40'+		1	1	1					1	
												TOTALS	2	2	2							

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

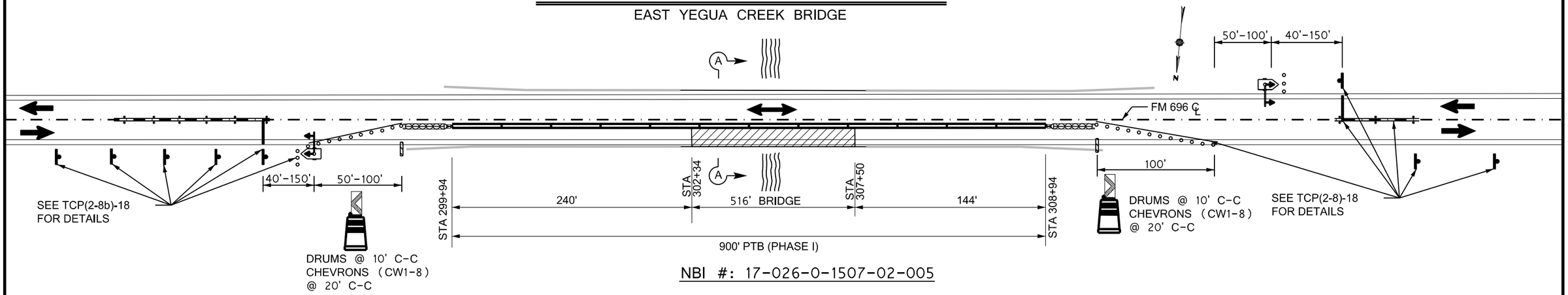
FOR DEFINITIONS SEE THE "CRASH CUSHION CATEGORIZATION CHART.PDF" AT THE DESIGN DIVISION (ROADWAY STANDARDS) WEBSITE. USE QUICK LINKS TO ACCESS ATTENUATORS / CRASH CUSHIONS SECTION.
http://www.dot.state.tx.us/insdtdot/orgchart/cmd/cserve/standard/rdwylse.htm

CRASH CUSHION SUMMARY SHEET

FILE: ccss.dgn	DN: TxDOT	CK:		CK:
© TxDOT	CONT	SECT	JOB	HIGHWAY
REVISIONS	1507	02	016, Etc.	FM696, Etc.
	DIST	COUNTY		
	BRY	BURLESON		
	FEDERAL AID PROJECT			SHEET NO.
				16

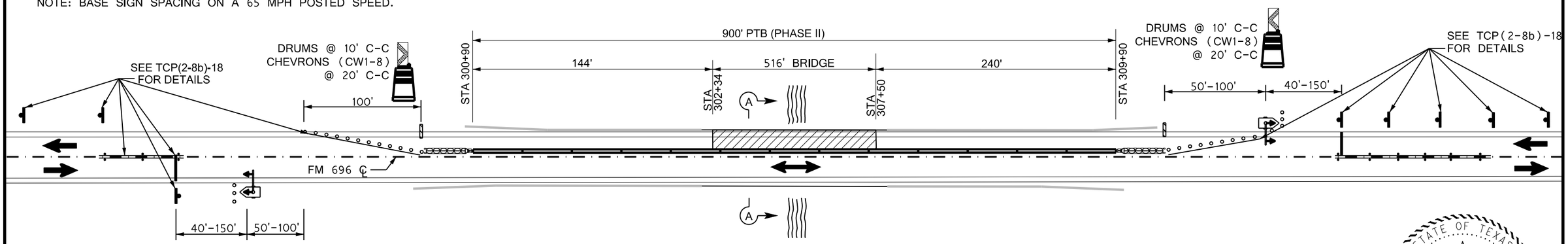
PTB LAYOUT - PHASE I AND PHASE II

EAST YEGUA CREEK BRIDGE



NBI #: 17-026-0-1507-02-005

NOTE: BASE SIGN SPACING ON A 65 MPH POSTED SPEED.



PHASE 1 SEQUENCE OF WORK

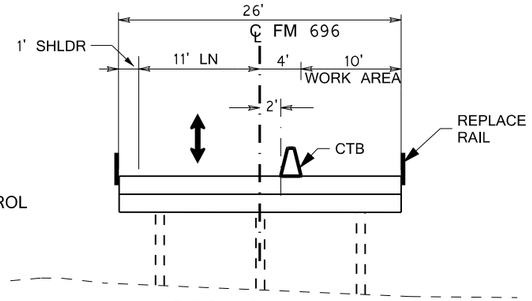
1) PLACE PCTB FROM STA STA 299+94 TO STA 309+94 (900') WITH CRASH CUSHIONS AND ONE LANE TWO-WAY TRAFFIC CONTROL WITH TRAFFIC SIGNAL, PER TCP(2-8)-18.
2) REMOVE EXIST MBGF ON ROADWAY AND BRIDGE RAIL ON RIGHT SIDE.
3) PLACE NEW RAILING ON BRIDGE AND MBGF WITH SGTS ON ROADWAY ON RIGHT SIDE.

PHASE 2 SEQUENCE OF WORK

1) MOVE AND RESET PCTB'S ON THE OTHER SIDE FOR ONE LANE TWO-WAY TRAFFIC CONTROL WITH TRAFFIC SIGNAL, PER TCP(2-8)-18.
2) REPEAT WORK OF PHASE 1 FOR THE LEFT SIDE.
3) REMOVE PCTB'S AND RESTORE TRAFFIC LANES TO TWO WAY TRAFFIC.

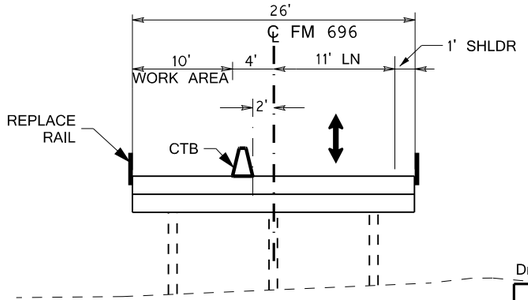
LEGEND

- CRASH CUSHION ATTENUATOR
- PORTABLE TRAFFIC BARRIER (PTB)
- DIRECTIONAL TRAFFIC
- WORKING ZONE
- CHANNELIZING DEVICES (BARREL)
- SIGN POST
- TYPE III BARRICADE
- TEMPORARY OR PORTABLE TRAFFIC SIGNAL



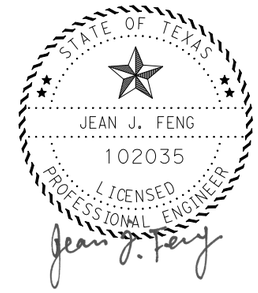
SECTION A-A

PHASE I



SECTION A-A

PHASE II



12/30/2020

Drawings Not To Scale

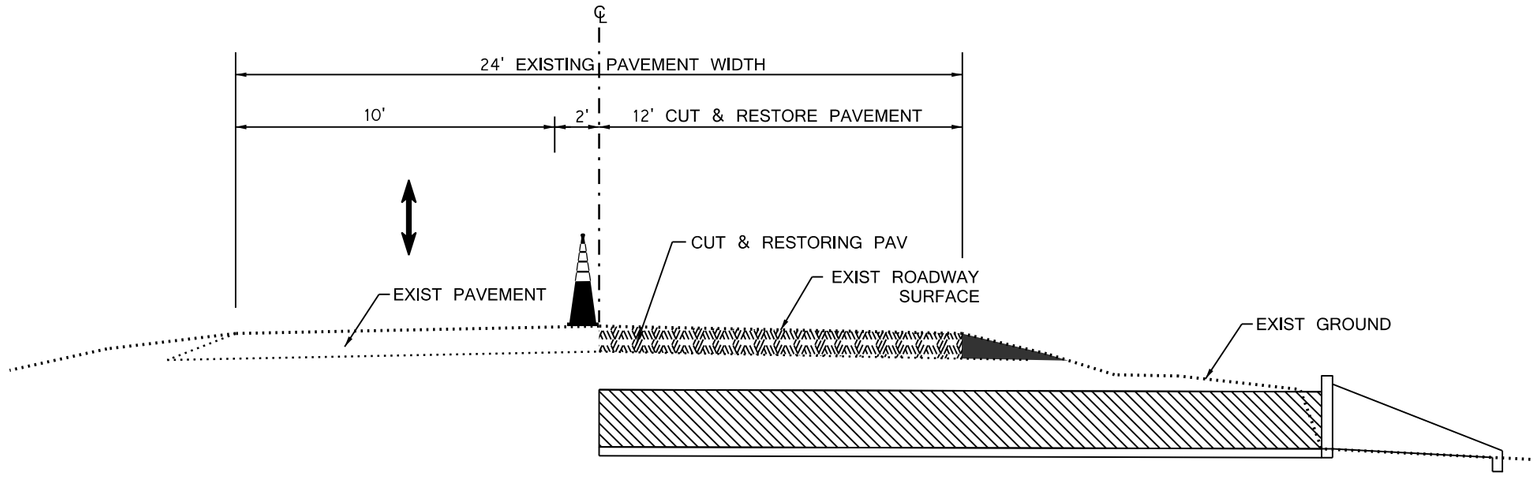
PRINT DATE	REVISION DATE
12/30/2020	

Texas Department of Transportation
Bryan District

TRAFFIC CONTROL PLAN (FM 696) (EAST YEGUA CREEK BRIDGE)

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 696, ETC.
STATE	DISTRICT	COUNTY
TEXAS	BRYAN	BURLESON
CONTROL	SECTION	JOB / SHEET NO.
1507	02	016, ETC. / 17

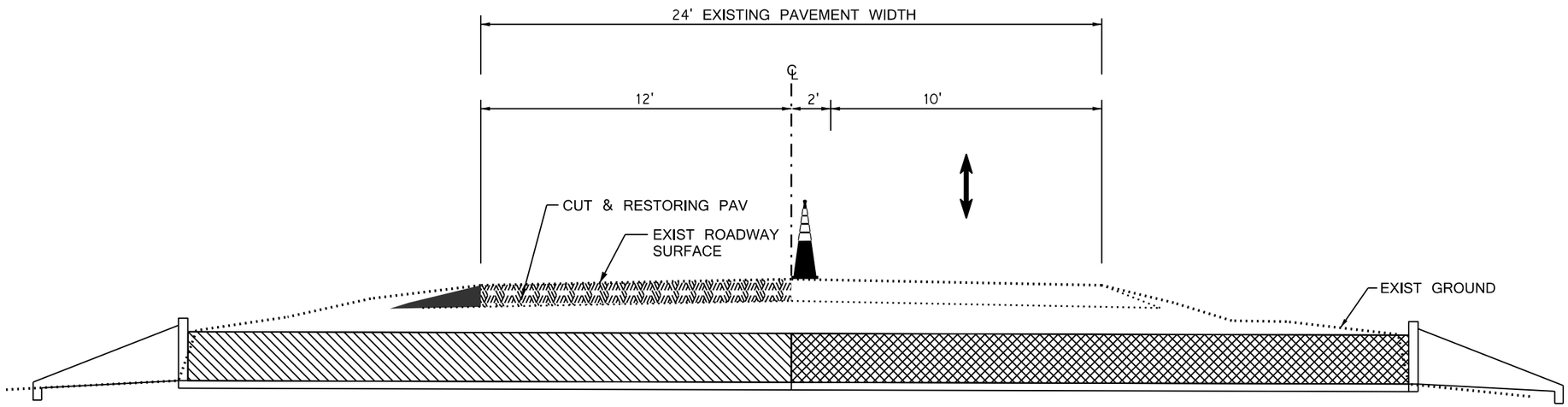
REV DATE: 2-12-2015
CSJ: 1507-02-016, Etc. FILENAME: g:\150702\016\sheets\Traf_Cntl\BRG_TCP_FM 696.dgn



LEGEND

- CUT & RESTORING PAV
- CURRENT PHASE CONSTRUCTION
- PREVIOUS PHASE CONSTRUCTION

PHASE I
CULVERT REPLACEMENT AND/OR EXTENSIONS (RIGHT SIDE)



PHASE II
CULVERT REPLACEMENT AND/OR EXTENSIONS (LEFT SIDE)

STATE OF TEXAS
JEAN J. FENG
102035
LICENSED
PROFESSIONAL ENGINEER

12/18/2020

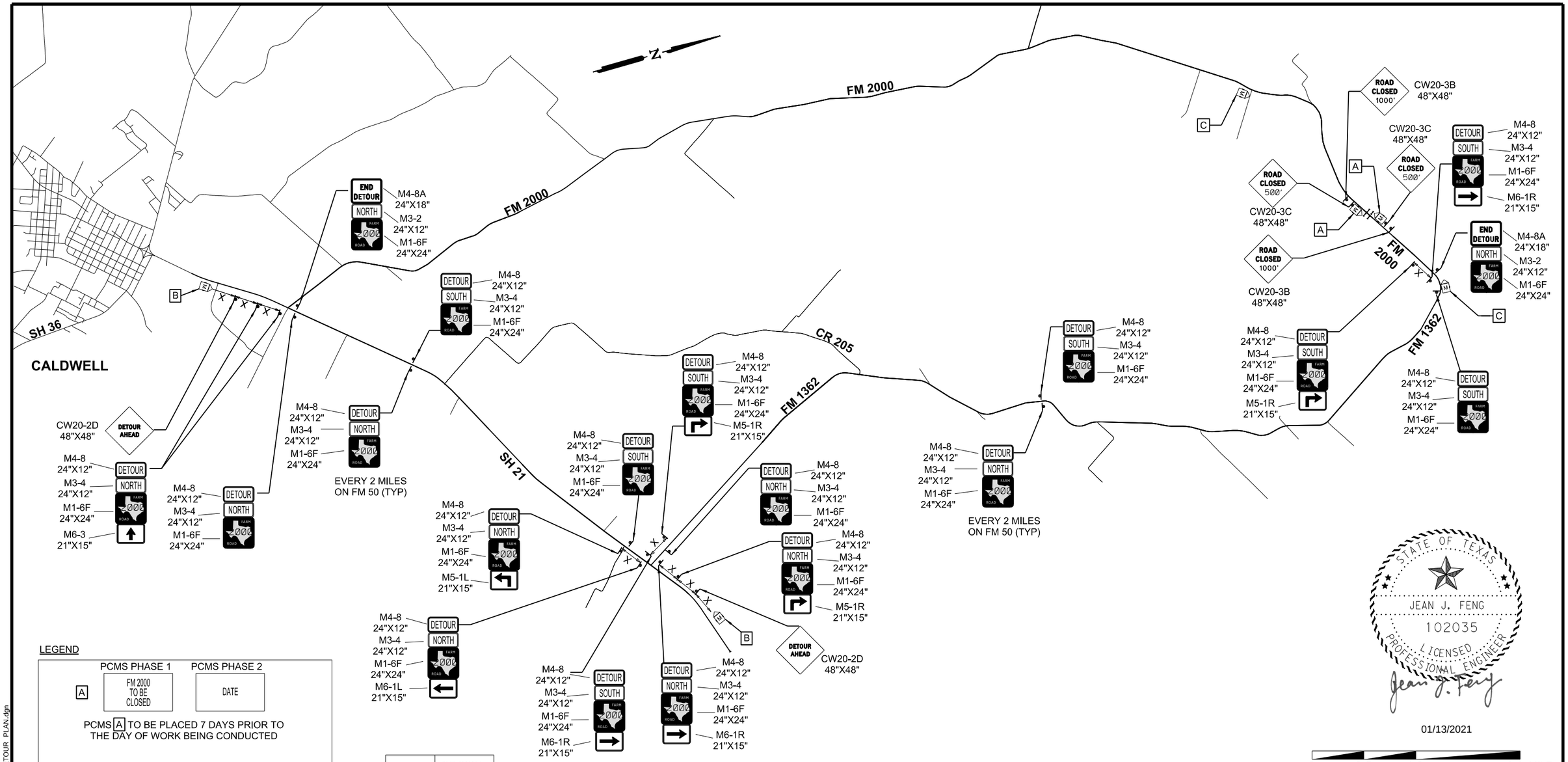
PRINT DATE	REVISION DATE
9/25/2020	

Texas Department of Transportation
Bryan District

SEQUENCE OF WORK (CULVERT)

FED. RD. DIV. NO.	PROJECT NUMBER		HIGHWAY NUMBER
6			FM 696, ETC.
STATE	DISTRICT	COUNTY	
TEXAS	BRYAN	BURLESON	
CONTROL	SECTION	JOB	SHEET NO.
1507	02	016, ETC.	18

REV DATE: 2-12-2015
CSJ: 1507-02-016, Etc. FILENAME: g:\150702\016\sheets\Traf_Cnf\TCP_CULV.dgn



LEGEND

	PCMS PHASE 1	PCMS PHASE 2
A	FM 2000 TO BE CLOSED	DATE

PCMS A TO BE PLACED 7 DAYS PRIOR TO THE DAY OF WORK BEING CONDUCTED

	PCMS PHASE 1	PCMS PHASE 2
B	FM 2000 CLOSED 12 MI	FOLLOW DETOUR
C	FM 2000 CLOSED AHEAD	

PCMS B C TO BE PLACED DURING THE DAY OF WORK BEING CONDUCTED

POSTED SPEED	"X" SIGN SPACING FEET
25	100'
30	120'
35	160'
40	240'
45	320'
50	400'
# 55	500'
# 60	600'
# 65	700'
# 70	800'
# 75	900'
# 80	1000'

DISTANCE BETWEEN SIGNS SHOULD BE INCREASED TO 1500 FEET ADVANCE WARNING (SEE SECTION 6C.04.07)

STATE OF TEXAS
JEAN J. FENG
102035
LICENSED PROFESSIONAL ENGINEER

01/13/2021

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1/13/2021	

Texas Department of Transportation
Bryan District

TCP DETOUR PLAN (FM 2000 CLOSURE) (STA 638+18)

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 696, ETC.

STATE	DISTRICT	COUNTY
TEXAS	BRYAN	BURLESON

CONTROL	SECTION	JOB	SHEET NO.
1507	02	016, ETC.	19

REV DATE: 2-12-2015
CSJ: 1507-02-016, Etc. FILENAME: g:\150702\016\sheets\Traf_Cntl\TCP DETOUR PLAN.dgn

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BARRICADE AND CONSTRUCTION (BC) STANDARD SHEETS GENERAL NOTES:

1. The Barricade and Construction Standard Sheets (BC sheets) are intended to show typical examples for placement of temporary traffic control devices, construction pavement markings, and typical work zone signs. The information contained in these sheets meet or exceed the requirements shown in the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD).

2. The development and design of the Traffic Control Plan (TCP)is the responsibility of the Engineer.

3. The Contractor may propose changes to the TCP that are signed and sealed by a licensed professional engineer for approval. The Engineer may develop, sign and seal Contractor proposed changes.

4. The Contractor is responsible for installing and maintaining the traffic control devices as shown in the plans. The Contractor may not move or change the approximate location of any device without the approval of the Engineer.

5. Geometric design of lane shifts and detours should, when possible, meet the applicable design criteria contained in manuals such as the American Association of State Highway and Transportation Officials (AASHTO), "A Policy on Geometric Design of Highways and Streets," the TxDOT "Roadway Design Manual" or engineering judgment.

6. When projects abut, the Engineer(s) may omit the END ROAD WORK, TRAFFIC FINES DOUBLE, and other advance warning signs if the signing would be redundant and the work areas appear continuous to the motorists. If the adjacent project is completed first, the Contractor shall erect the necessary warning signs as shown on these sheets, the TCP sheets or as directed by the Engineer. The BEGIN ROAD WORK NEXT X MILES sign shall be revised to show appropriate work zone distance.

7. The Engineer may require duplicate warning signs on the median side of divided highways where median width will permit and traffic volumes justify the signing.

8. All signs shall be constructed in accordance with the details found in the "Standard Highway Sign Designs for Texas," latest edition. Sign details not shown in this manual shall be shown in the plans or the Engineer shall provide a detail to the Contractor before the sign is manufactured.

9. The temporary traffic control devices shown in the illustrations of the BC sheets are examples. As necessary, the Engineer will determine the most appropriate traffic control devices to be used.

10. As shown on BC(2), the OBEY WARNING SIGNS STATE LAW sign, STAY ALERT TALK OR TEXT LATER (see Sign Detail G20-10T) and the WORK ZONE TRAFFIC FINES DOUBLE sign with plaque shall be erected in advance of the CSJ limits. However, the TRAFFIC FINES DOUBLE sign will not be required on projects consisting solely of mobile operation work, such as striping or milling edgeline rumble strips. The BEGIN ROAD WORK NEXT X MILES, CONTRACTOR and END ROAD WORK signs shall be erected at or near the CSJ limits.

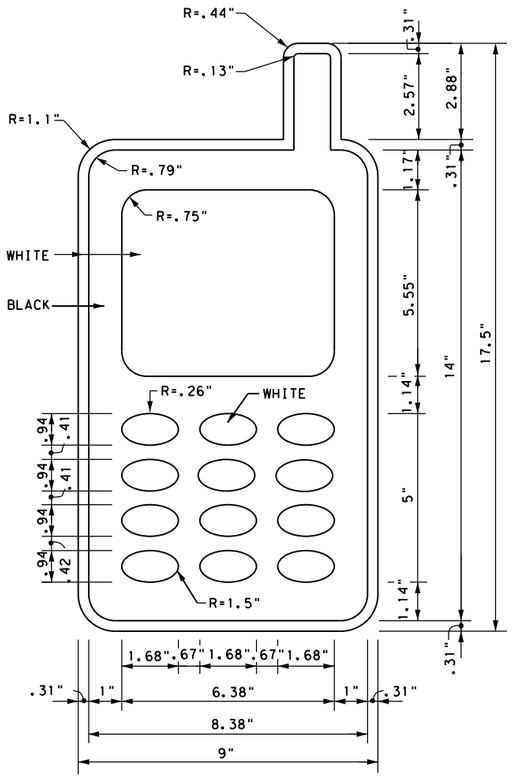
11. Except for devices required by Note 10, traffic control devices should be in place only while work is actually in progress or a definite need exists.

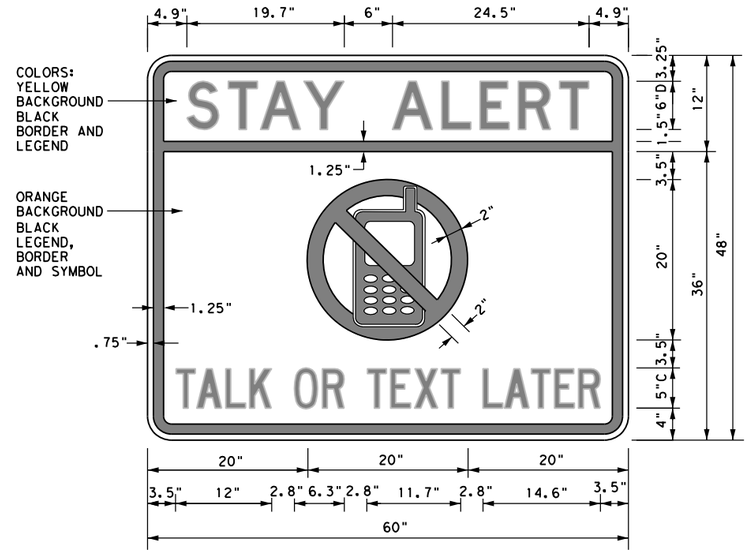
12. The Engineer has the final decision on the location of all traffic control devices.

13. Inactive equipment and work vehicles, including workers' private vehicles must be parked away from travel lanes. They should be as close to the right-of-way line as possible, or located behind a barrier or guardrail, or as approved by the Engineer.

WORKER SAFETY APPAREL NOTES:

1. Workers on foot who are exposed to traffic or to construction equipment within the right-of-way shall wear high-visibility safety apparel meeting the requirements of ISEA "American National Standard for High-Visibility Apparel," or equivalent revisions, and labeled as ANSI 107-2004 standard performance for Class 2 or 3 risk exposure. Class 3 garments should be considered for high traffic volume work areas or night time work.





3.0" Radius, 1.25" Border, 0.75" Indent, Black on Yellow;
[STAY ALERT] Font: D
3.0" Radius, 1.25" Border, 0.75" Indent, Black on Orange;
[TALK OR TEXT LATER] Font: C specified length;

SIGN DETAIL (G20-10T)

Only pre-qualified products shall be used. The "Compliant Work Zone Traffic Control Devices List" (CWZTCD) describes pre-qualified products and their sources and may be found on-line at the web address given below or by contacting:

Texas Department of Transportation
Traffic Operations Division - TE
Phone (512) 416-3118

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

Texas Department of Transportation — Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION GENERAL NOTES AND REQUIREMENTS

BC(1)-14

FILE: bc-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	1507	02	016, Etc.	FM 696, Etc.
4-03 5-10 8-14	DIST	COUNTY		SHEET NO.
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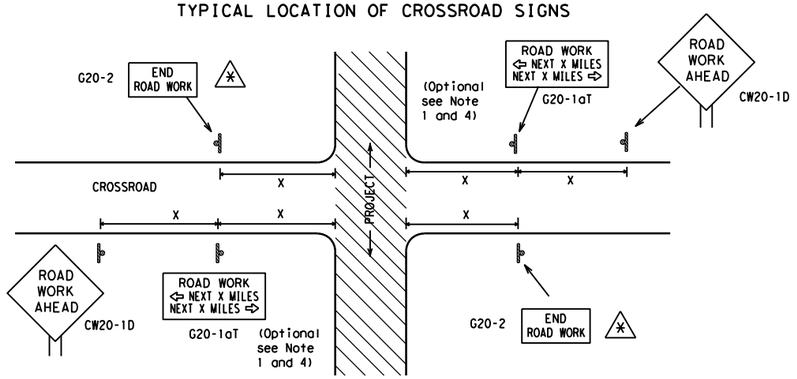
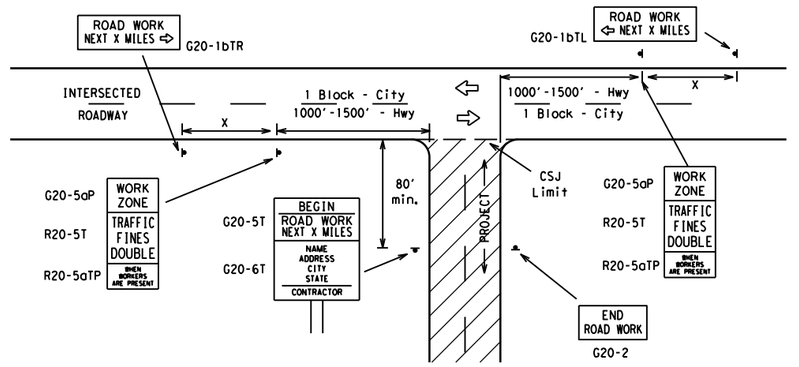
TYPICAL LOCATION OF CROSSROAD SIGNS



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

1. The typical minimum signing on a crossroad approach should be a "ROAD WORK AHEAD" (CW20-1D)sign and a (G20-2) "END ROAD WORK" sign, unless noted otherwise in plans.
2. The Engineer may use the reduced size 36" x 36" ROAD WORK AHEAD (CW20-1D) sign mounted back to back with the reduced size 36" x 18" "END ROAD WORK"(G20-2) sign on low volume crossroads (see Note 4 under "Typical Construction Warning Sign Size and Spacing"). See the "Standard Highway Sign Designs for Texas" manual for sign details. The Engineer may omit the advance warning signs on low volume crossroads. The Engineer will determine whether a road is low volume. This information shall be shown in the plans.
3. Based on existing field conditions, the Engineer/Inspector may require additional signs such as FLAGGER AHEAD, LOOSE GRAVEL, or other appropriate signs. When additional signs are required, these signs will be considered part of the minimum requirements. The Engineer/Inspector will determine the proper location and spacing of any sign not shown on the BC sheets, Traffic Control Plan sheets or the Work Zone Standard Sheets.
4. The "ROAD WORK NEXT X MILES"(G20-1aT)sign shall be required at high volume crossroads to advise motorists of the length of construction in either direction from the intersection. The Engineer will determine whether a roadway is considered high volume.
5. Additional traffic control devices may be shown elsewhere in the plans for higher volume crossroads.
6. When work occurs in the intersection area, appropriate traffic control devices, as shown elsewhere in the plans or as determined by the Engineer/Inspector, shall be in place.

T-INTERSECTION



CSJ LIMITS AT T-INTERSECTION

1. The Engineer will determine the types and location of any additional traffic control devices, such as a flagger and accompanying signs, or other signs, that should be used when work is being performed at or near an intersection.
2. If construction closes the road at a T-intersection the Contractor shall place the "CONTRACTOR NAME"(G20-6T) sign behind the Type 3 Barricades for the road closure (see BC(10) also). The "ROAD WORK NEXT X MILES" left arrow(G20-1bTL) and "ROAD WORK NEXT X MILES" right arrow (G20-1bTR)" signs shall be replaced by the detour signing called for in the plans.

TYPICAL CONSTRUCTION WARNING SIGN SIZE AND SPACING[1,5,6]

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

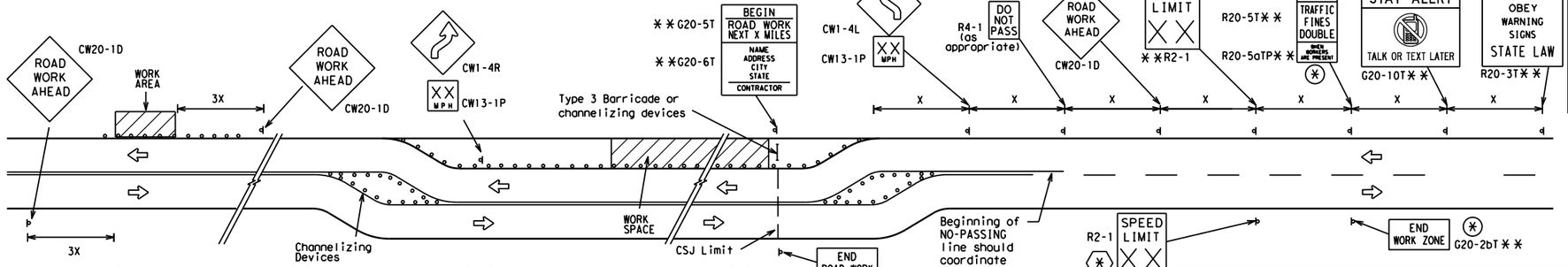
✱ For typical sign spacings on divided highways, expressways and freeways, see Part 6 of the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD) typical application diagrams or TCP Standard Sheets.

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

GENERAL NOTES

1. Special or larger size signs may be used as necessary.
2. Distance between signs should be increased as required to have 1500 feet advance warning.
3. Distance between signs should be increased as required to have 1/2 mile or more advance warning.
4. 36" x 36" "ROAD WORK AHEAD" (CW20-1D)signs may be used on low volume crossroads at the discretion of the Engineer. See Note 2 under "Typical Location of Crossroad Signs".
5. Only diamond shaped warning sign sizes are indicated.
6. See sign size listing in "TMUTCD", Sign Appendix or the "Standard Highway Sign Designs for Texas" manual for complete list of available sign design sizes.

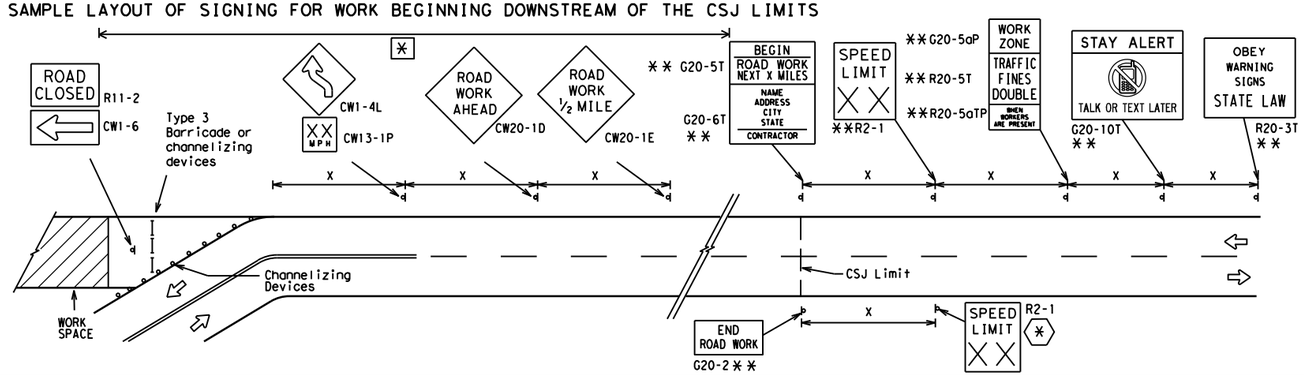
WORK AREAS IN MULTIPLE LOCATIONS WITHIN CSJ LIMITS



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

SAMPLE LAYOUT OF SIGNING FOR WORK BEGINNING AT THE CSJ LIMITS

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



NOTES

The Contractor shall determine the appropriate distance to be placed on the G20-1 series signs and "BEGIN ROAD WORK NEXT X MILES"(G20-5T)sign for each specific project. This distance shall replace the "X" and shall be rounded to the nearest whole mile with the approval of the Engineer. No decimals shall be used.

(✱) The "BEGIN WORK ZONE"(G20-9TP) and "END WORK ZONE" (G20-2bT) shall be used as shown on the sample layout when advance signs are required outside the CSJ Limits. They inform the motorist of entering or leaving a part of the work zone lying outside the CSJ Limits where traffic fines may double if workers are present.

✱✱ Required CSJ Limit signing. See Note 10 on BC(1). TRAFFIC FINES DOUBLE signs will not be required on projects consisting solely of mobile operations work.

[✱] Area for placement of "ROAD WORK AHEAD" (CW20-1D)sign and other signs or devices as called for on the Traffic Control Plan.

(✱) Contractor will install a regulatory speed limit sign at the end of the work zone.

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

Texas Department of Transportation

Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION PROJECT LIMIT

BC(2)-14

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REVISIONS	1507	02	016, Etc.	FM 696, Etc.
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13	BRY	BURLESON		21

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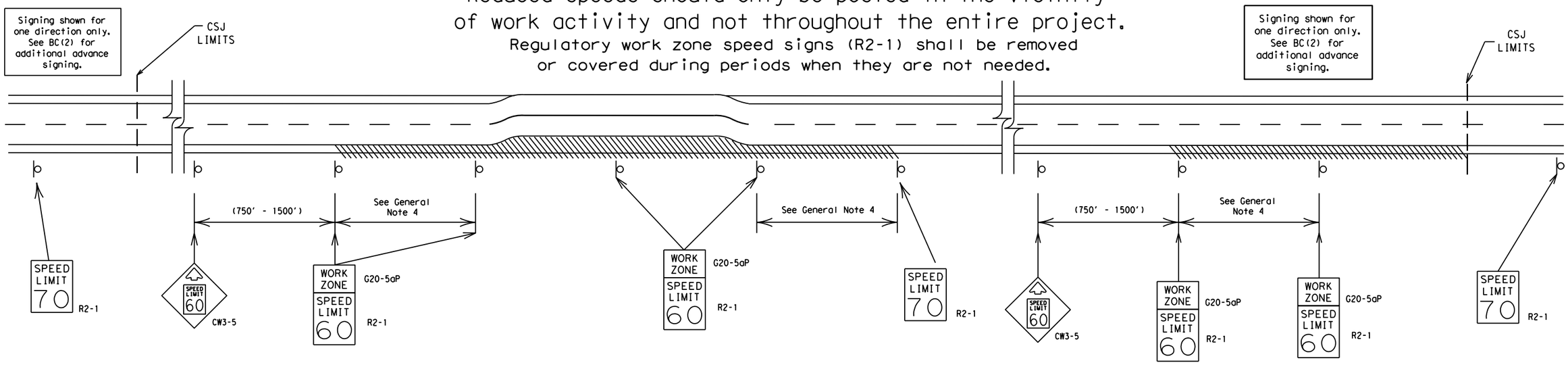
TYPICAL APPLICATION OF WORK ZONE SPEED LIMIT SIGNS

Work zone speed limits shall be regulatory, established in accordance with the "Procedures for Establishing Speed Zones," and approved by the Texas Transportation Commission, or by City Ordinance when within Incorporated City Limits.

Reduced speeds should only be posted in the vicinity of work activity and not throughout the entire project.

Regulatory work zone speed signs (R2-1) shall be removed or covered during periods when they are not needed.



GUIDANCE FOR USE:

LONG/INTERMEDIATE TERM WORK ZONE SPEED LIMITS

This type of work zone speed limit should be included on the design of the traffic control plans when restricted geometrics with a lower design speed are present in the work zone and modification of the geometrics to a higher design speed is not feasible.

Long/Intermediate Term Work Zone Speed Limit signs, when approved as described above, should be posted and visible to the motorist when work activity is present. Work activity may also be defined as a change in the roadway that requires a reduced speed for motorists to safely negotiate the work area, including:

a) rough road or damaged pavement surface
b) substantial alteration of roadway geometrics (diversions)
c) construction detours
d) grade
e) width
f) other conditions readily apparent to the driver

As long as any of these conditions exist, the work zone speed limit signs should remain in place.

SHORT TERM WORK ZONE SPEED LIMITS

This type of work zone speed limit may be included on the design of the traffic control plans when workers or equipment are not behind concrete barrier, when work activity is within 10 feet of the traveled way or actually in the travelled way.

Short Term Work Zone Speed Limit signs should be posted and visible to the motorists only when work activity is present. When work activity is not present, signs shall be removed or covered.
(See Removing or Covering on BC(4)).

GENERAL NOTES

1. Regulatory work zone speed limits should be used only for sections of construction projects where speed control is of major importance.
2. Regulatory work zone speed limit signs shall be placed on supports at a 7 foot minimum mounting height.
3. Speed zone signs are illustrated for one direction of travel and are normally posted for each direction of travel.
4. Frequency of work zone speed limit signs should be:
   40 mph and greater 0.2 to 2 miles
   35 mph and less 0.2 to 1 mile
5. Regulatory speed limit signs shall have black legend and border on a white reflective background (See "Reflective Sheeting" on BC(4)).
6. Fabrication, erection and maintenance of the"ADVANCE SPEED LIMIT"(CW3-5)sign, "WORK ZONE"(G20-5aP) plaque and the "SPEED LIMIT"(R2-1)signs shall not be paid for directly, but shall be considered subsidiary to Item 502.
7. Turning signs from view, laying signs over or down will not be allowed, unless as otherwise noted under "REMOVING OR COVERING" on BC(4).
8. Techniques that may help reduce traffic speeds include but are not limited to:
   A. Law enforcement.
   B. Flagger stationed next to sign.
   C. Portable changeable message sign (PCMS).
   D. Low-power (drone) radar transmitter.
   E. Speed monitor trailers or signs.
9. Speeds shown on details above are for illustration only. Work Zone Speed Limits should only be posted as approved for each project.
10. For more specific guidance concerning the type of work, work zone conditions and factors impacting allowable regulatory construction speed zone reduction see TxDOT form #1204 in the TxDOT e-form system.

Texas Department of Transportation

Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION WORK ZONE SPEED LIMIT

BC(3)-14

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REVISIONS 9-07 8-14 7-13	1507	02	016, Etc.	FM 696, Etc.
	DIST	COUNTY		SHEET NO.
	BRY	BURLESON		22

DATE:
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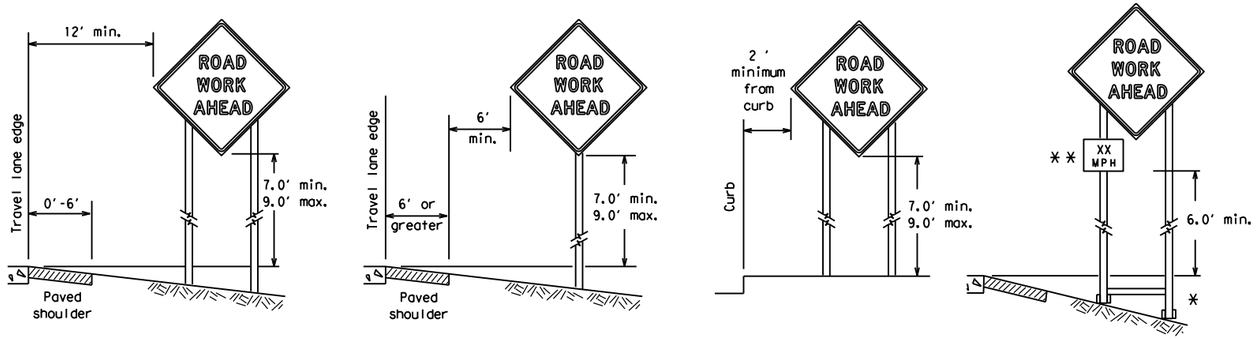
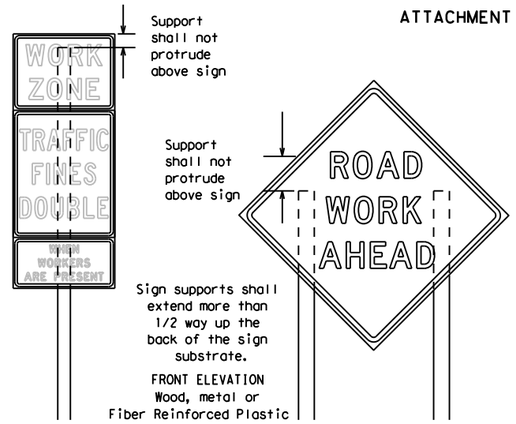
TYPICAL MINIMUM CLEARANCES FOR LONG TERM AND INTERMEDIATE TERM SIGNS



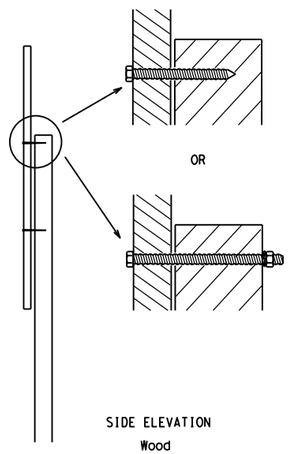
* When placing skid supports on unlevel ground, the leg post lengths must be adjusted so the sign appears straight and plumb. Objects shall NOT be placed under skids as a means of leveling.

* * 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



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

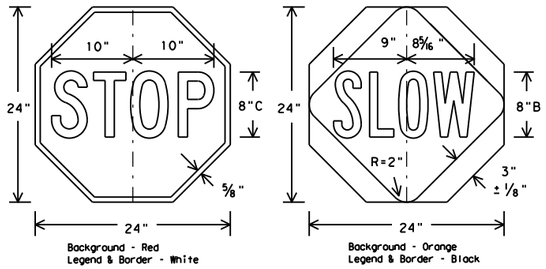


Attachment to wooden supports will be by bolts and nuts or screws. Use TxDOT's or manufacturer's recommended procedures for attaching sign substrates to other types of sign supports

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

STOP/SLOW PADDLES

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



CONTRACTOR REQUIREMENTS FOR MAINTAINING PERMANENT SIGNS WITHIN THE PROJECT LIMITS

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

GENERAL NOTES FOR WORK ZONE SIGNS

1. Contractor shall install and maintain signs in a straight and plumb condition and/or as directed by the Engineer.
2. Wooden sign posts shall be painted white.
3. Barricades shall NOT be used as sign supports.
4. All signs shall be installed in accordance with the plans or as directed by the Engineer. Signs shall be used to regulate, warn, and guide the traveling public safely through the work zone.
5. The Contractor may furnish either the sign design shown in the plans or in the "Standard Highway Sign Designs for Texas" (SHSD). The Engineer/Inspector may require the Contractor to furnish other work zone signs that are shown in the TMUTCD but may have been omitted from the plans. Any variation in the plans shall be documented by written agreement between the Engineer and the Contractor's Responsible Person. All changes must be documented in writing before being implemented. This can include documenting the changes in the Inspector's TxDOT diary and having both the Inspector and Contractor initial and date the agreed upon changes.
6. The Contractor shall furnish sign supports listed in the "Compliant Work Zone Traffic Control Device List" (CWZTCD). The Contractor shall install the sign support in accordance with the manufacturer's recommendations. If there is a question regarding installation procedures, the Contractor shall furnish the Engineer a copy of the manufacturer's installation recommendations so the Engineer can verify the correct procedures are being followed.
7. The Contractor is responsible for installing signs on approved supports and replacing signs with damaged or cracked substrates and/or damaged or marred reflective sheeting as directed by the Engineer/Inspector.
8. Identification markings may be shown only on the back of the sign substrate. The maximum height of letters and/or company logos used for identification shall be 1 inch.
9. The Contractor shall replace damaged wood posts. New or damaged wood sign posts shall not be spliced.

DURATION OF WORK (as defined by the "Texas Manual on Uniform Traffic Control Devices" Part 6)

1. The types of sign supports, sign mounting height, the size of signs, and the type of sign substrates can vary based on the type of work being performed. The Engineer is responsible for selecting the appropriate size sign for the type of work being performed. The Contractor is responsible for ensuring the sign support, sign mounting height and substrate meets manufacturer's recommendations in regard to crashworthiness and duration of work requirements.
   a. Long-term stationary - work that occupies a location more than 3 days.
   b. Intermediate-term stationary - work that occupies a location more than one daylight period up to 3 days, or nighttime work lasting more than one hour.
   c. Short-term stationary - daytime work that occupies a location for more than 1 hour in a single daylight period.
   d. Short, duration - work that occupies a location up to 1 hour.
   e. Mobile - work that moves continuously or intermittently (stopping for up to approximately 15 minutes.)

SIGN MOUNTING HEIGHT

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

SIZE OF SIGNS

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

SIGN SUBSTRATES

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

REFLECTIVE SHEETING

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

SIGN LETTERS

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

REMOVING OR COVERING

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

SIGN SUPPORT WEIGHTS

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

FLAGS ON SIGNS

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

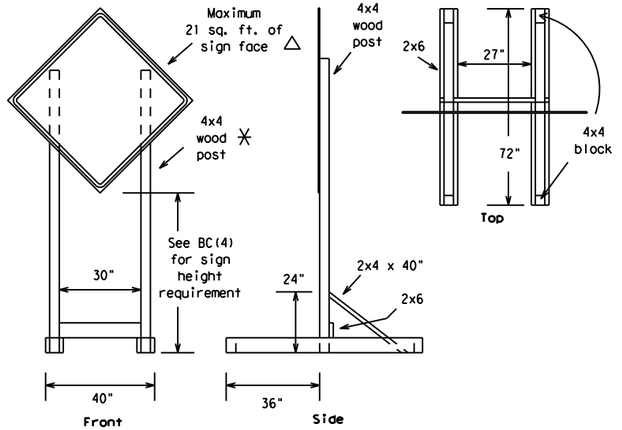
Texas Department of Transportation

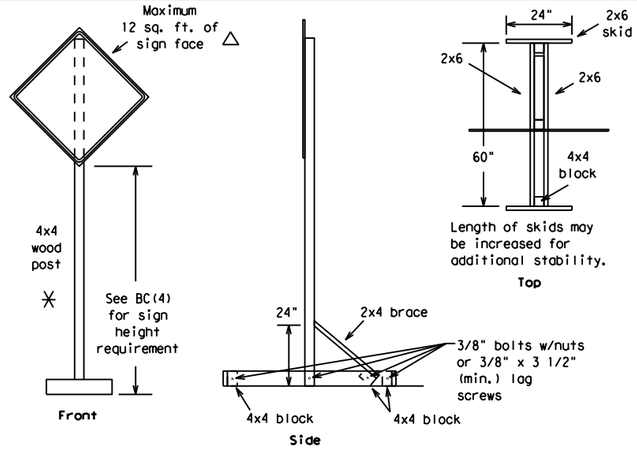
Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION TEMPORARY SIGN NOTES

BC(4)-14

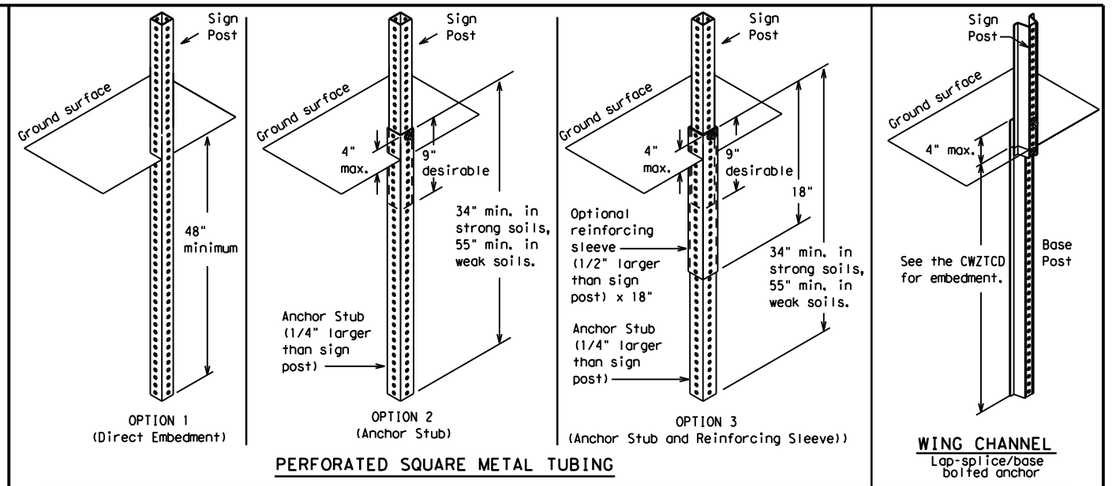
FILE: bc-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS 9-07 8-14 7-13	1507	02	016, Etc.	FM 696, Etc.
	DIST	COUNTY		SHEET NO.
	BRY	BURLESON		23





SKID MOUNTED WOOD SIGN SUPPORTS

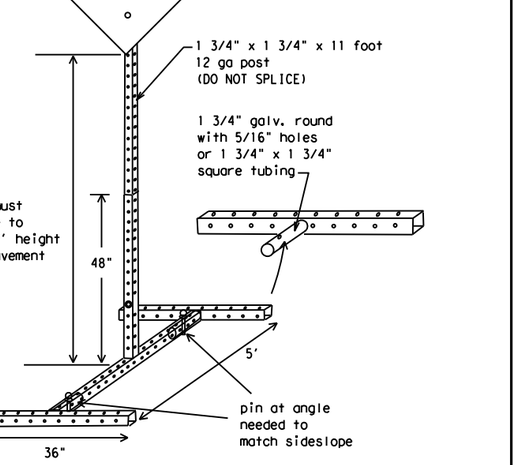
LONG/INTERMEDIATE TERM STATIONARY - PORTABLE SKID MOUNTED SIGN SUPPORTS □

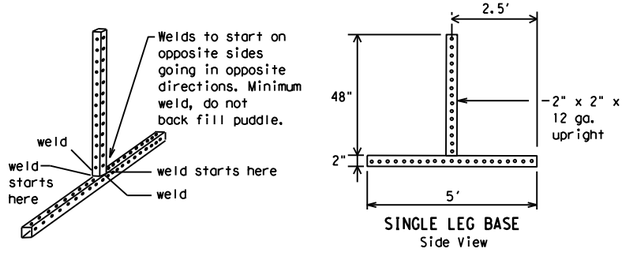


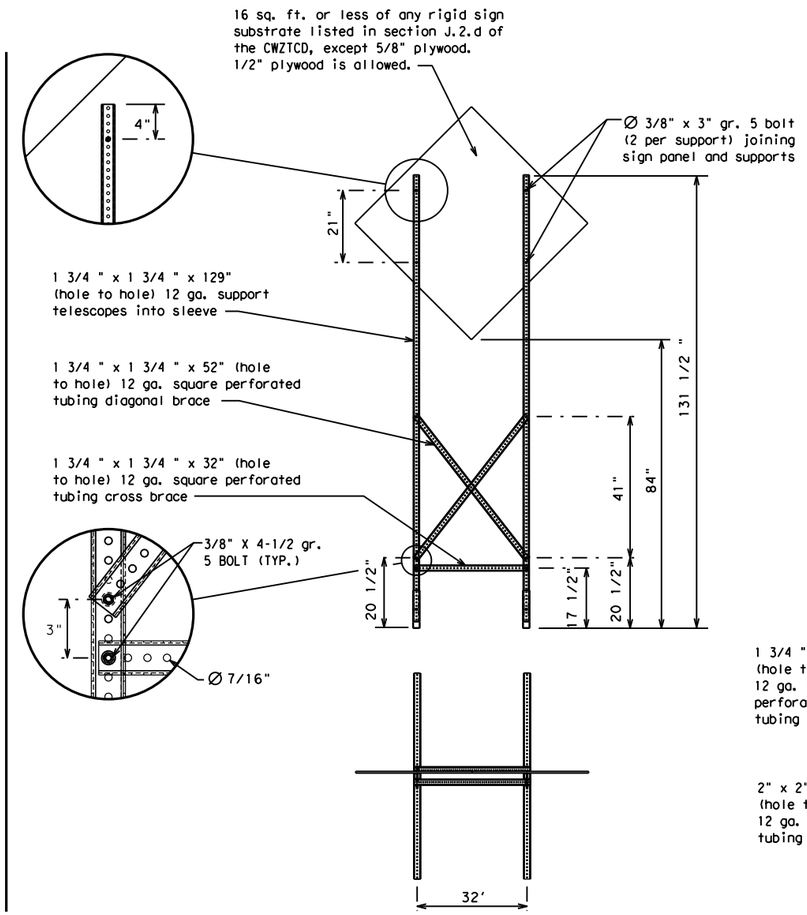
PERFORATED SQUARE METAL TUBING

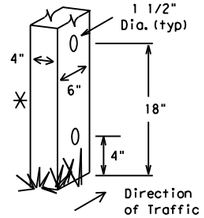
GROUND MOUNTED SIGN SUPPORTS

Refer to the CWZTCD and the manufacturer's installation procedure for each type sign support.
The maximum sign square footage shall adhere to the manufacturer's recommendation.
Two post installations can be used for larger signs.



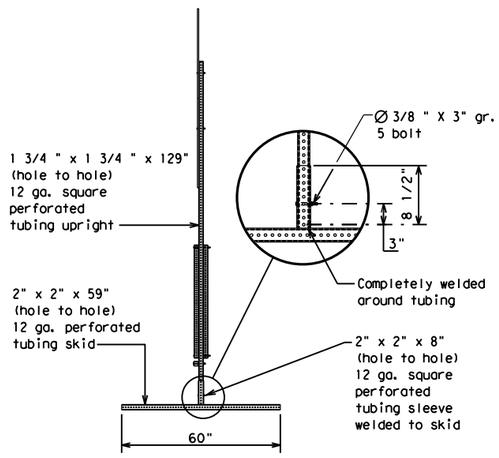






Nominal Post Size	Number of Posts	Maximum Sq. feet of Sign Face	Minimum Soil Embedment	Drilled Hole(s) Required
4 x 4	1	12	36"	NO
4 x 4	2	21	36"	NO
4 x 6	1	21	36"	YES
4 x 6	2	36	36"	YES

WOOD POST SYSTEM FOR GROUND MOUNTED SIGN SUPPORTS



WEDGE ANCHORS

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

OTHER DESIGNS

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

GENERAL NOTES

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

□ See BC(4) for definition of "Work Duration."

✳ Wood sign posts MUST be one piece. Splicing will NOT be allowed. Posts shall be painted white.

△ See the CWZTCD for the type of sign substrate that can be used for each approved sign support.

Texas Department of Transportation

Traffic Operations Division Standard

SKID MOUNTED PERFORATED SQUARE STEEL TUBING SIGN SUPPORTS

BARRICADE AND CONSTRUCTION TYPICAL SIGN SUPPORT

BC(5)-14

FILE: bc-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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7-13	BRY	BURLESON		24

DATE:
FILE:

DATE:
FILE:

WHEN NOT IN USE, REMOVE THE PCMS FROM THE RIGHT-OF-WAY OR PLACE THE PCMS BEHIND BARRIER OR GUARDRAIL WITH SIGN PANEL TURNED PARALLEL TO TRAFFIC

PORTABLE CHANGEABLE MESSAGE SIGNS

1. The Engineer/Inspector shall approve all messages used on portable changeable message signs (PCMS).
2. Messages on PCMS should contain no more than 8 words (about four to eight characters per word), not including simple words such as "TO," "FOR," "AT," etc.
3. Messages should consist of a single phase, or two phases that alternate. Three-phase messages are not allowed. Each phase of the message should convey a single thought, and must be understood by itself.
4. Use the word "EXIT" to refer to an exit ramp on a freeway; i.e., "EXIT CLOSED." Do not use the term "RAMP."
5. Always use the route or interstate designation (IH, US, SH, FM) along with the number when referring to a roadway.
6. When in use the bottom of a stationary PCMS message panel should be a minimum 7 feet above the roadway, where possible.
7. The message term "WEEKEND" should be used only if the work is to start on Saturday morning and end by Sunday evening at midnight. Actual days and hours of work should be displayed on the PCMS if work is to begin on Friday evening and/or continue into Monday morning.
8. The Engineer/Inspector may select one of two options which are available for displaying a two-phase message on a PCMS. Each phase may be displayed for either four seconds each or for three seconds each.
9. Do not "flash" messages or words included in a message. The message should be steady burn or continuous while displayed.
10. Do not present redundant information on a two-phase message; i.e., keeping two lines of the message the same and changing the third line.
11. Do not use the word "Danger" in message.
12. Do not display the message "LANES SHIFT LEFT" or "LANES SHIFT RIGHT" on a PCMS. Drivers do not understand the message.
13. Do not display messages that scroll horizontally or vertically across the face of the sign.
14. The following table lists abbreviated words and two-word phrases that are acceptable for use on a PCMS. Both words in a phrase must be displayed together. Words or phrases not on this list should not be abbreviated, unless shown in the TMUTCD.
15. PCMS character height should be at least 18 inches for trailer mounted units. They should be visible from at least 1/2 (.5) mile and the text should be legible from at least 600 feet at night and 800 feet in daylight. Truck mounted units must have a character height of 10 inches and must be legible from at least 400 feet.
16. Each line of text should be centered on the message board rather than left or right justified.
17. If disabled, the PCMS should default to an illegible display that will not alarm motorists and will only be used to alert workers that the PCMS has malfunctioned. A pattern such as a series of horizontal solid bars is appropriate.

WORD OR PHRASE	ABBREVIATION
Access Road	ACCS RD
Alternate	ALT
Avenue	AVE
Best Route	BEST RTE
Boulevard	BLVD
Bridge	BRDG
Cannot	CANT
Center	CTR
Construction Ahead	CONST AHD
CROSSING	XING
Detour Route	DETOUR RTE
Do Not	DONT
East	E
Eastbound	(route) E
Emergency	EMER
Emergency Vehicle	EMER VEH
Entrance, Enter	ENT
Express Lane	EXP LN
Expressway	EXPWY
XXXX Feet	XXXX FT
Fog Ahead	FOG AHD
Freeway	FRWY, FWY
Freeway Blocked	FWY BLKD
Friday	FRI
Hazardous Driving	HAZ DRIVING
Hazardous Material	HAZMAT
High-Occupancy	HOV
Vehicle Highway	HWY
Hour(s)	HR, HRS
Information	INFO
It Is	ITS
Junction	JCT
Left	LFT
Left Lane	LFT LN
Lane Closed	LN CLOSED
Lower Level	LWR LEVEL
Maintenance	MAINT

WORD OR PHRASE	ABBREVIATION
Major	MAJ
Miles	MI
Miles Per Hour	MPH
Minor	MNR
Monday	MON
Normal	NORM
North	N
Northbound	(route) N
Parking	PKING
Road	RD
Right Lane	RT LN
Saturday	SAT
Service Road	SERV RD
Shoulder	SHLDR
Slippery	SLIP
South	S
Southbound	(route) S
Speed	SPD
Street	ST
Sunday	SUN
Telephone	PHONE
Temporary	TEMP
Thursday	THURS
To Downtown	TO DWNTN
Traffic	TRAF
Travelers	TRVLRS
Tuesday	TUES
Time Minutes	TIME MIN
Upper Level	UPR LEVEL
Vehicles (s)	VEH, VEHS
Warning	WARN
Wednesday	WED
Weight Limit	WT LIMIT
West	W
Westbound	(route) W
Wet Pavement	WET PVMT
Will Not	WONT

Roadway designation * IH-number, US-number, SH-number, FM-number

RECOMMENDED PHASES AND FORMATS FOR PCMS MESSAGES DURING ROADWORK ACTIVITIES

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

Phase 1: Condition Lists

Road/Lane/Ramp Closure List

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

Other Condition List

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

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

Phase 2: Possible Component Lists

Action to Take/Effect on Travel List

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

Location List

- AT FM XXXX
- BEFORE RAILROAD CROSSING
- NEXT X MILES
- PAST US XXX EXIT
- XXXXXXX TO XXXXXXX
- US XXX TO FM XXXX

Warning List

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

** Advance Notice List

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

* * See Application Guidelines Note 6.

APPLICATION GUIDELINES

1. Only 1 or 2 phases are to be used on a PCMS.
2. The 1st phase (or both) should be selected from the "Road/Lane/Ramp Closure List" and the "Other Condition List".
3. A 2nd phase can be selected from the "Action to Take/Effect on Travel, Location, General Warning, or Advance Notice Phase Lists".
4. A Location Phase is necessary only if a distance or location is not included in the first phase selected.
5. If two PCMS are used in sequence, they must be separated by a minimum of 1000 ft. Each PCMS shall be limited to two phases, and should be understandable by themselves.
6. For advance notice, when the current date is within seven days of the actual work date, calendar days should be replaced with days of the week. Advance notification should typically be for no more than one week prior to the work.

WORDING ALTERNATIVES

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

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

FULL MATRIX PCMS SIGNS

1. When Full Matrix PCMS signs are used, the character height and legibility/visibility requirements shall be maintained as listed in Note 15 under "PORTABLE CHANGEABLE MESSAGE SIGNS" above.
2. When symbol signs, such as the "Flagger Symbol"(CW20-7) are represented graphically on the Full Matrix PCMS sign and, with the approval of the Engineer, it shall maintain the legibility/visibility requirement listed above.
3. When symbol signs are represented graphically on the Full Matrix PCMS, they shall only supplement the use of the static sign represented, and shall not substitute for, or replace that sign.
4. A full matrix PCMS may be used to simulate a flashing arrow board provided it meets the visibility, flash rate and dimming requirements on BC(7), for the same size arrow.

Texas Department of Transportation

Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)

BC(6)-14

FILE: bc-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	1507	02	016, Etc.	FM 696, Etc.
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13	BRY	BURLESON		25

100

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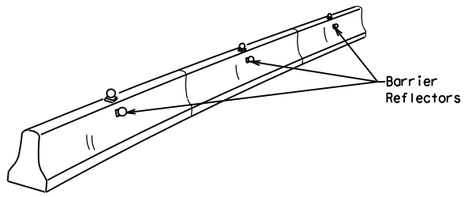
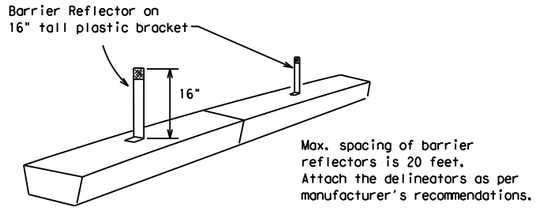
1. Barrier Reflectors shall be pre-qualified, and conform to the color and reflectivity requirements of DMS-8600. A list of prequalified Barrier Reflectors can be found at the Material Producer List web address shown on BC(1).
2. Color of Barrier Reflectors shall be as specified in the TMUTCD. The cost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

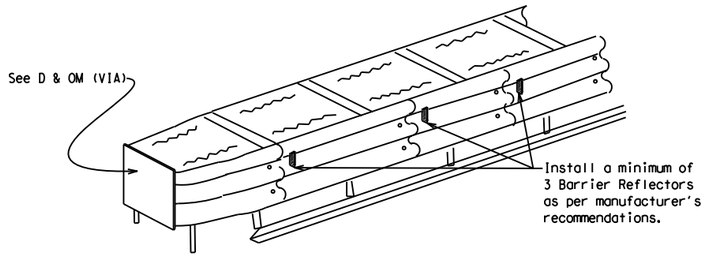


CONCRETE TRAFFIC BARRIER (CTB)

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



LOW PROFILE CONCRETE BARRIER (LPCB)



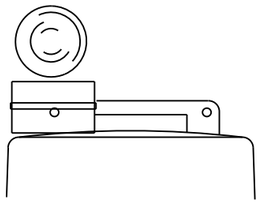
DELINEATION OF END TREATMENTS

END TREATMENTS FOR
CTB'S USED
IN WORK ZONES

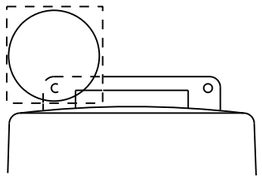
End treatments used on CTB's in work zones shall meet crashworthy standards as defined in the National Cooperative Highway Research Report 350. Refer to the CWZTCD List for approved end treatments and manufacturers.

BARRIER REFLECTORS FOR CONCRETE TRAFFIC BARRIER AND ATTENUATORS

WARNING LIGHTS



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



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

1. Warning lights shall meet the requirements of the TMUTCD.
2. Warning lights shall NOT be installed on barricades.
3. Type A-Low Intensity Flashing Warning Lights are commonly used with drums. They are intended to warn of or mark a potentially hazardous area. Their use shall be as indicated on this sheet and/or other sheets of the plans by the designation "FL". The Type A Warning Lights shall not be used with signs manufactured with Type B_{FL} or C_{FL} Sheeting meeting the requirements of Departmental Material Specification DMS-8300.
4. Type-C and Type D 360 degree Steady Burn Lights are intended to be used in a series for delineation to supplement other traffic control devices. Their use shall be as indicated on this sheet and/or other sheets of the plans by the designation "SB".
5. The Engineer/Inspector or the plans shall specify the location and type of warning lights to be installed on the traffic control devices.
6. When required by the Engineer, the Contractor shall furnish a copy of the warning lights certification. The warning light manufacturer will certify the warning lights meet the requirements of the latest ITE Purchase Specifications for Flashing and Steady-Burn Warning Lights.
7. When used to delineate curves, Type-C and Type D Steady Burn Lights should only be placed on the outside of the curve, not the inside.
8. The location of warning lights and warning reflectors on drums shall be as shown elsewhere in the plans.

WARNING LIGHTS MOUNTED ON PLASTIC DRUMS

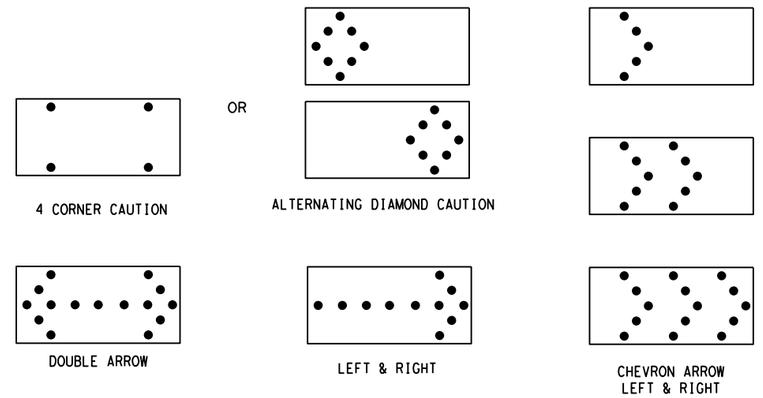
1. Type A flashing warning lights are intended to warn drivers that they are approaching or are in a potentially hazardous area.
2. Type A random flashing warning lights are not intended for delineation and shall not be used in a series.
3. A series of sequential flashing warning lights placed on channelizing devices to form a merging taper may be used for delineation. If used, the successive flashing of the sequential warning lights should occur from the beginning of the taper to the end of the merging taper in order to identify the desired vehicle path. The rate of flashing for each light shall be 65 flashes per minute, plus or minus 10 flashes.
4. Type C and D steady-burn warning lights are intended to be used in a series to delineate the edge of the travel lane on detours, on lane changes, on lane closures, and on other similar conditions.
5. Type A, Type C and Type D warning lights shall be installed at locations as detailed on other sheets in the plans.
6. Warning lights shall not be installed on a drum that has a sign, chevron or vertical panel.
7. The maximum spacing for warning lights on drums should be identical to the channelizing device spacing.

WARNING REFLECTORS MOUNTED ON PLASTIC DRUMS AS A SUBSTITUTE FOR TYPE C (STEADY BURN) WARNING LIGHTS

1. A warning reflector or approved substitute may be mounted on a plastic drum as a substitute for a Type C, steady burn warning light at the discretion of the Contractor unless otherwise noted in the plans.
2. The warning reflector shall be yellow in color and shall be manufactured using a sign substrate approved for use with plastic drums listed on the CWZTCD.
3. The warning reflector shall have a minimum retroreflective surface area (one-side) of 30 square inches.
4. Round reflectors shall be fully reflectorized, including the area where attached to the drum.
5. Square substrates must have a minimum of 30 square inches of reflectorized sheeting. They do not have to be reflectorized where it attaches to the drum.
6. The side of the warning reflector facing approaching traffic shall have sheeting meeting the color and retroreflectivity requirements for DMS 8300-Type B or Type C.
7. When used near two-way traffic, both sides of the warning reflector shall be reflectorized.
8. The warning reflector should be mounted on the side of the handle nearest approaching traffic.
9. The maximum spacing for warning reflectors should be identical to the channelizing device spacing requirements.

Arrow Boards may be located behind channelizing devices in place for a shoulder taper or merging taper, otherwise they shall be delineated with four (4) channelizing devices placed perpendicular to traffic on the upstream side of traffic.

1. The Flashing Arrow Board should be used for all lane closures on multi-lane roadways, or slow moving maintenance or construction activities on the travel lanes.
2. Flashing Arrow Boards should not be used on two-lane, two-way roadways, detours, diversions or work on shoulders unless the "CAUTION" display (see detail below) is used.
3. The Engineer/Inspector shall choose all appropriate signs, barricades and/or other traffic control devices that should be used in conjunction with the Flashing Arrow Board.
4. The Flashing Arrow Board should be able to display the following symbols:



5. The "CAUTION" display consists of four corner lamps flashing simultaneously, or the Alternating Diamond Caution mode as shown.
6. The straight line caution display is NOT ALLOWED.
7. The Flashing Arrow Board shall be capable of minimum 50 percent dimming from rated lamp voltage. The flashing rate of the lamps shall not be less than 25 nor more than 40 flashes per minute.
8. Minimum lamp "on time" shall be approximately 50 percent for the flashing arrow and equal intervals of 25 percent for each sequential phase of the flashing chevron.
9. The sequential arrow display is NOT ALLOWED.
10. The flashing arrow display is the TxDOT standard; however, the sequential Chevron display may be used during daylight operations.
11. The Flashing Arrow Board shall be mounted on a vehicle, trailer or other suitable support.
12. A Flashing Arrow Board SHALL NOT BE USED to laterally shift traffic.
13. A full matrix PCMS may be used to simulate a Flashing Arrow Board provided it meets visibility, flash rate and dimming requirements on this sheet for the same size arrow.
14. Minimum mounting height of trailer mounted Arrow Boards should be 7 feet from roadway to bottom of panel.

REQUIREMENTS			
TYPE	MINIMUM SIZE	MINIMUM NUMBER OF PANEL LAMPS	MINIMUM VISIBILITY DISTANCE
B	30 x 60	13	3/4 mile
C	48 x 96	15	1 mile

ATTENTION
Flashing Arrow Boards shall be equipped with automatic dimming devices.

WHEN NOT IN USE, REMOVE THE ARROW BOARD FROM THE RIGHT-OF-WAY OR PLACE THE ARROW BOARD BEHIND CONCRETE TRAFFIC BARRIER OR GUARDRAIL.

FLASHING ARROW BOARDS

TRUCK-MOUNTED ATTENUATORS

1. Truck-mounted attenuators (TMA) used on TxDOT facilities must meet the requirements outlined in the National Cooperative Highway Research Report No. 350 (NCHRP 350) or the Manual for Assessing Safety Hardware (MASH).
2. Refer to the CWZTCD for the requirements of Level 2 or Level 3 TMAs.
3. Refer to the CWZTCD for a list of approved TMAs.
4. TMAs are required on freeways unless otherwise noted in the plans.
5. A TMA should be used anytime that it can be positioned 30 to 100 feet in advance of the area of crew exposure without adversely affecting the work performance.
6. The only reason a TMA should not be required is when a work area is spread down the roadway and the work crew is an extended distance from the TMA.

Texas Department of Transportation

Traffic Operations Division Standard

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

BC(7)-14

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GENERAL NOTES

1. For long term stationary work zones on freeways, drums shall be used as the primary channelizing device.
2. For intermediate term stationary work zones on freeways, drums should be used as the primary channelizing device but may be replaced in tangent sections by vertical panels, or 42" two-piece cones. In tangent sections one-piece cones may be used with the approval of the Engineer but only if personnel are present on the project at all times to maintain the cones in proper position and location.
3. For short term stationary work zones on freeways, drums are the preferred channelizing device but may be replaced in tapers, transitions and tangent sections by vertical panels, two-piece cones or one-piece cones as approved by the Engineer.
4. Drums and all related items shall comply with the requirements of the current version of the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD) and the "Compliant Work Zone Traffic Control Devices List" (CWZTCD).
5. Drums, bases, and related materials shall exhibit good workmanship and shall be free from objectionable marks or defects that would adversely affect their appearance or serviceability.
6. The Contractor shall have a maximum of 24 hours to replace any plastic drums identified for replacement by the Engineer/Inspector. The replacement device must be an approved device.

GENERAL DESIGN REQUIREMENTS

Pre-qualified plastic drums shall meet the following requirements:

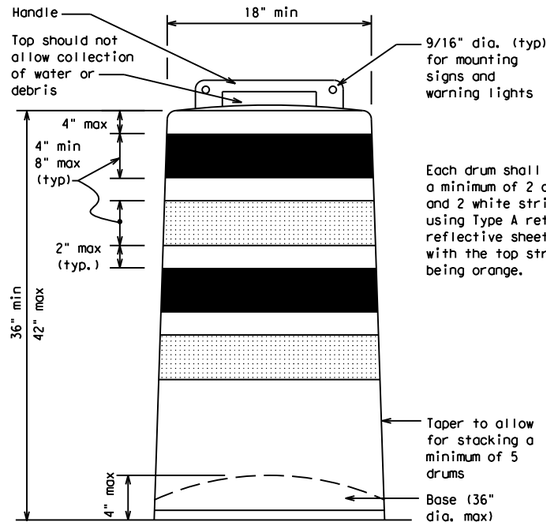
1. Plastic drums shall be a two-piece design; the "body" of the drum shall be the top portion and the "base" shall be the bottom.
2. The body and base shall lock together in such a manner that the body separates from the base when impacted by a vehicle traveling at a speed of 20 MPH or greater but prevents accidental separation due to normal handling and/or air turbulence created by passing vehicles.
3. Plastic drums shall be constructed of lightweight flexible, and deformable materials. The Contractor shall NOT use metal drums or single piece plastic drums as channelization devices or sign supports.
4. Drums shall present a profile that is a minimum of 18 inches in width at the 36 inch height when viewed from any direction. The height of drum unit (body installed on base) shall be a minimum of 36 inches and a maximum of 42 inches.
5. The top of the drum shall have a built-in handle for easy pickup and shall be designed to drain water and not collect debris. The handle shall have a minimum of two widely spaced 9/16 inch diameter holes to allow attachment of a warning light, warning reflector unit or approved compliant sign.
6. The exterior of the drum body shall have a minimum of four alternating orange and white retroreflective circumferential stripes not less than 4 inches nor greater than 8 inches in width. Any non-reflectorized space between any two adjacent stripes shall not exceed 2 inches in width.
7. Bases shall have a maximum width of 36 inches, a maximum height of 4 inches, and a minimum of two footholds of sufficient size to allow base to be held down while separating the drum body from the base.
8. Plastic drums shall be constructed of ultra-violet stabilized, orange, high-density polyethylene (HDPE) or other approved material.
9. Drum body shall have a maximum unballasted weight of 11 lbs.
10. Drum and base shall be marked with manufacturer's name and model number.

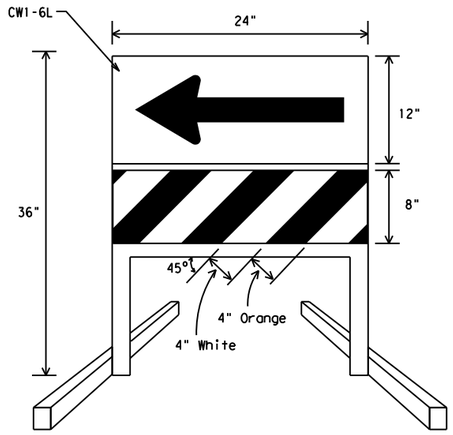
RETROREFLECTIVE SHEETING

1. The stripes used on drums shall be constructed of sheeting meeting the color and retroreflectivity requirements of Departmental Materials Specification DMS-8300, "Sign Face Materials." Type A reflective sheeting shall be supplied unless otherwise specified in the plans.
2. The sheeting shall be suitable for use on and shall adhere to the drum surface such that, upon vehicular impact, the sheeting shall remain adhered in-place and exhibit no delaminating, cracking, or loss of retroreflectivity other than that loss due to abrasion of the sheeting surface.

BALLAST

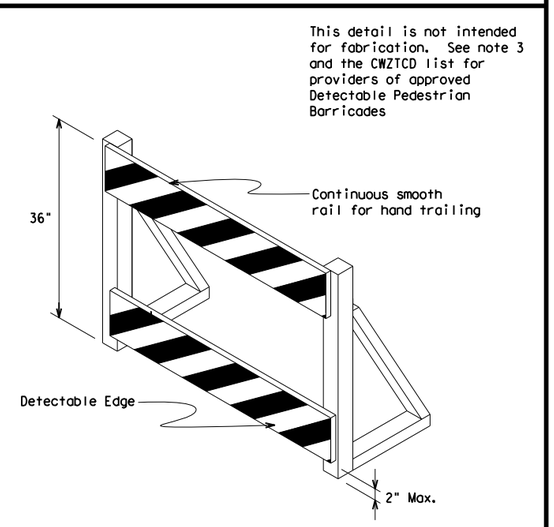
1. Unballasted bases shall be large enough to hold up to 50 lbs. of sand. This base, when filled with the ballast material, should weigh between 35 lbs (minimum) and 50 lbs (maximum). The ballast may be sand in one to three sandbags separate from the base, sand in a sand-filled plastic base, or other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





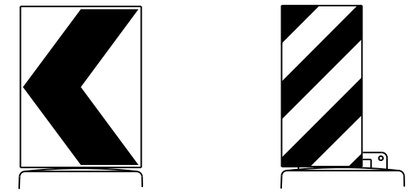
DIRECTION INDICATOR BARRICADE

1. The Direction Indicator Barricade may be used in tapers, transitions, and other areas where specific directional guidance to drivers is necessary.
2. If used, the Direction Indicator Barricade should be used in series to direct the driver through the transition and into the intended travel lane.
3. The Direction Indicator Barricade shall consist of One-Direction Large Arrow (CW1-6) sign in the size shown with a black arrow on a background of Type B_{FL} or Type C_{FL} Orange retroreflective sheeting above a rail with Type A retroreflective sheeting in alternating 4" white and orange stripes sloping downward at an angle of 45 degrees in the direction road users are to pass. Sheeting types shall be as per DMS 8300.
4. Double arrows on the Direction Indicator Barricade will not be allowed.
5. Approved manufacturers are shown on the CWZTCD List. Ballast shall be as approved by the manufacturers instructions.



DETECTABLE PEDESTRIAN BARRICADES

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



18" x 24" Sign
(Maximum Sign Dimension)
Chevron CW1-8, Opposing Traffic Lane Divider, Driveway sign D70a, Keep Right R4 series or other signs as approved by Engineer

12" x 24"
Vertical Panel
mount with diagonals sloping down towards travel way

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

SIGNS, CHEVRONS, AND VERTICAL PANELS MOUNTED ON PLASTIC DRUMS

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

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BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(8)-14

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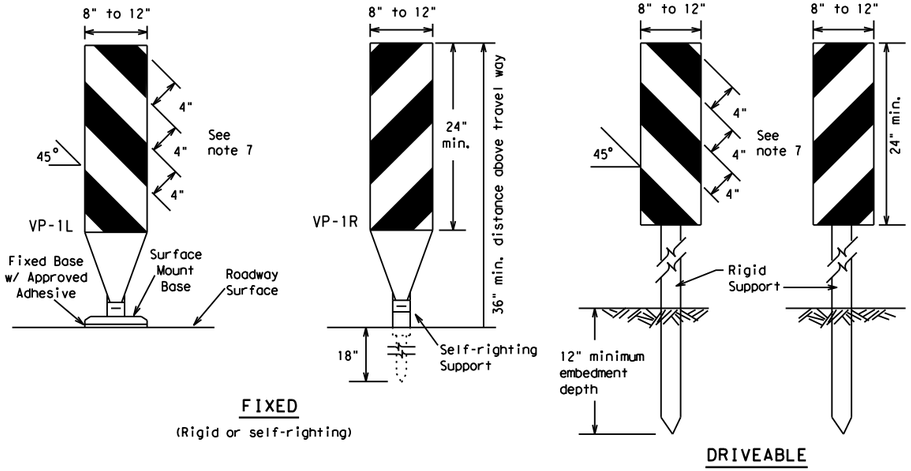
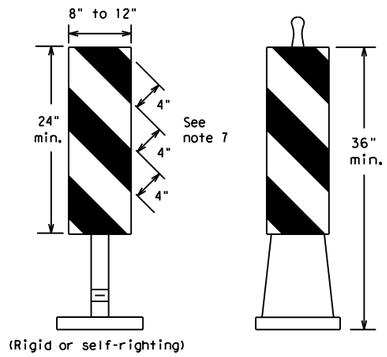


FIXED

(Rigid or self-righting)

DRIVEABLE

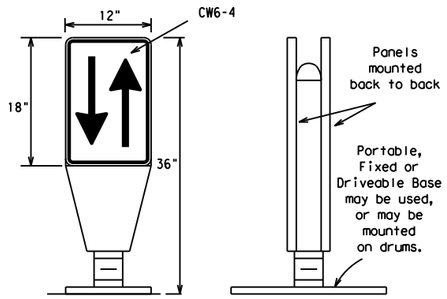


(Rigid or self-righting)

PORTABLE

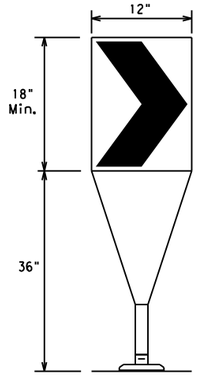
1. Vertical Panels (VP's) are normally used to channelize traffic or divide opposing lanes of traffic.
2. VP's may be used in daytime or nighttime situations. They may be used at the edge of shoulder drop-offs and other areas such as lane transitions where positive daytime and nighttime delineation is required. The Engineer/Inspector shall refer to the Roadway Design Manual Appendix B "Treatment of Pavement Drop-offs in Work Zones" for additional guidelines on the use of VP's for drop-offs.
3. VP's should be mounted back to back if used at the edge of cuts adjacent to two-way two lane roadways. Stripes are to be reflective orange and reflective white and should always slope downward toward the travel lane.
4. VP's used on expressways and freeways or other high speed roadways, may have more than 270 square inches of retroreflective area facing traffic.
5. Self-righting supports are available with portable base. See "Compliant Work Zone Traffic Control Devices List" (CWZTCD).
6. Sheeting for the VP's shall be retroreflective Type A conforming to Departmental Material Specification DMS-8300, unless noted otherwise.
7. Where the height of reflective material on the vertical panel is 36 inches or greater, a panel stripe of 6 inches shall be used.

VERTICAL PANELS (VPs)



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

OPPOSING TRAFFIC LANE DIVIDERS (OTLD)



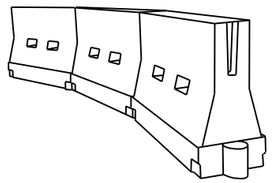
Fixed Base w/ Approved Adhesive (Driveable Base, or Flexible Support can be used)

1. The chevron shall be a vertical rectangle with a minimum size of 12 by 18 inches.
2. Chevrons are intended to give notice of a sharp change of alignment with the direction of travel and provide additional emphasis and guidance for vehicle operators with regard to changes in horizontal alignment of the roadway.
3. Chevrons, when used, shall be erected on the outside of a sharp curve or turn, or on the far side of an intersection. They shall be in line with and at right angles to approaching traffic. Spacing should be such that the motorist always has three in view, until the change in alignment eliminates its need.
4. To be effective, the chevron should be visible for at least 500 feet.
5. Chevrons shall be orange with a black nonreflective legend. Sheeting for the chevron shall be retroreflective Type B_{FL} or Type C_{FL} conforming to Departmental Material Specification DMS-8300, unless noted otherwise. The legend shall meet the requirements of DMS-8300.
6. For Long Term Stationary use on tapers or transitions on freeways and divided highways self-righting chevrons may be used to supplement plastic drums but not to replace plastic drums.

CHEVRONS

GENERAL NOTES

1. Work Zone channelizing devices illustrated on this sheet may be installed in close proximity to traffic and are suitable for use on high or low speed roadways. The Engineer/Inspector shall ensure that spacing and placement is uniform and in accordance with the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD).
2. Channelizing devices shown on this sheet may have a driveable, fixed or portable base. The requirement for self-righting channelizing devices must be specified in the General Notes or other plan sheets.
3. Channelizing devices on self-righting supports should be used in work zone areas where channelizing devices are frequently impacted by errant vehicles or vehicle related wind gusts making alignment of the channelizing devices difficult to maintain. Locations of these devices shall be detailed elsewhere in the plans. These devices shall conform to the TMUTCD and the "Compliant Work Zone Traffic Control Devices List" (CWZTCD).
4. The Contractor shall maintain devices in a clean condition and replace damaged, nonreflective, faded, or broken devices and bases as required by the Engineer/Inspector. The Contractor shall be required to maintain proper device spacing and alignment.
5. Portable bases shall be fabricated from virgin and/or recycled rubber. The portable bases shall weigh a minimum of 30 lbs.
6. Pavement surfaces shall be prepared in a manner that ensures proper bonding between the adhesives, the fixed mount bases and the pavement surface. Adhesives shall be prepared and applied according to the manufacturer's recommendations.
7. The installation and removal of channelizing devices shall not cause detrimental effects to the final pavement surfaces, including pavement surface discoloration or surface integrity. Driveable bases shall not be permitted on final pavement surfaces. The Engineer/Inspector shall approve all application and removal procedures of fixed bases.



LONGITUDINAL CHANNELIZING DEVICES (LCD)

1. LCDs are crashworthy, lightweight, deformable devices that are highly visible, have good target value and can be connected together. They are not designed to contain or redirect a vehicle on impact.
2. LCDs may be used instead of a line of cones or drums.
3. LCDs shall be placed in accordance to application and installation requirements specific to the device, and used only when shown on the CWZTCD list.
4. LCDs should not be used to provide positive protection for obstacles, pedestrians or workers.
5. LCDs shall be supplemented with retroreflective delineation as required for temporary barriers on BC(7) when placed roughly parallel to the travel lanes.
6. LCDs used as barricades placed perpendicular to traffic should have at least one row of reflective sheeting meeting the requirements for barricade rails as shown on BC(10) placed near the top of the LCD along the full length of the device.

WATER BALLASTED SYSTEMS USED AS BARRIERS

1. Water ballasted systems used as barriers shall not be used solely to channelize road users, but also to protect the work space per the appropriate NCHRP 350 crashworthiness requirements based on roadway speed and barrier application.
2. Water ballasted systems used to channelize vehicular traffic shall be supplemented with retroreflective delineation or channelizing devices to improve daytime/nighttime visibility. They may also be supplemented with pavement markings.
3. Water ballasted systems used as barriers shall be placed in accordance to application and installation requirements specific to the device, and used only when shown on the CWZTCD list.
4. Water ballasted systems used as barriers should not be used for a merging taper except in low speed (less than 45 MPH) urban areas. When used on a taper in a low speed urban area, the taper shall be delineated and the taper length should be designed to optimize road user operations considering the available geometric conditions.
5. When water ballasted systems used as barriers have blunt ends exposed to traffic, they should be attenuated as per manufacturer recommendations or flared to a point outside the clear zone.

If used to channelize pedestrians, longitudinal channelizing devices or water ballasted systems must have a continuous detectable bottom for users of long canes and the top of the unit shall not be less than 32 inches in height.

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

Posted Speed *	Formula	Minimum Desirable Taper Lengths ** 10' Offset	11' Offset	12' Offset	Suggested Maximum Spacing of Channelizing Devices On a Taper	On a Tangent
30	$L=\frac{WS^2}{60}$	150'	165'	180'	30'	60'
35		205'	225'	245'	35'	70'
40		265'	295'	320'	40'	80'
45	L = WS	450'	495'	540'	45'	90'
50		500'	550'	600'	50'	100'
55		550'	605'	660'	55'	110'
60		600'	660'	720'	60'	120'
65		650'	715'	780'	65'	130'
70		700'	770'	840'	70'	140'
75		750'	825'	900'	75'	150'
80		800'	880'	960'	80'	160'

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

SUGGESTED MAXIMUM SPACING OF CHANNELIZING DEVICES AND MINIMUM DESIRABLE TAPER LENGTHS

Texas Department of Transportation

Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(9)-14

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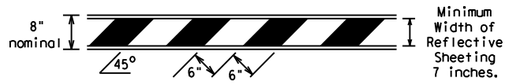
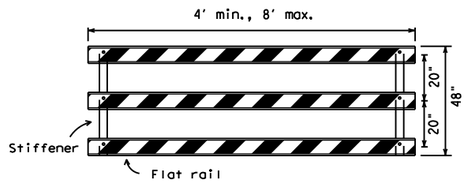
TYPE 3 BARRICADES

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

Barricades shall NOT be used as a sign support.



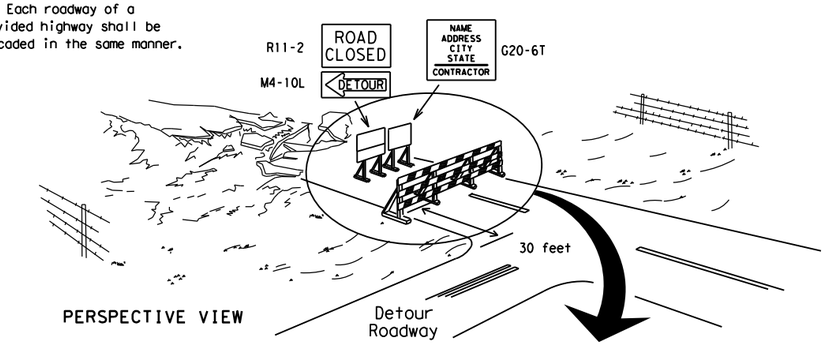
TYPICAL STRIPING DETAIL FOR BARRICADE RAIL



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

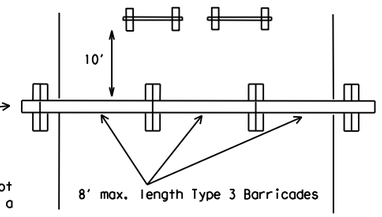
TYPICAL PANEL DETAIL FOR SKID OR POST TYPE BARRICADES

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



PERSPECTIVE VIEW

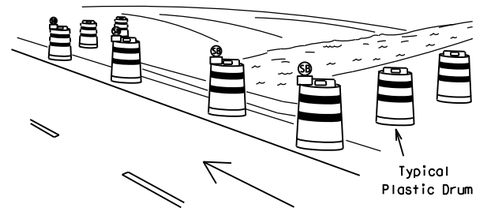
The three rails on Type 3 barricades shall be reflectorized orange and reflective white stripes on one side facing one-way traffic and both sides for two-way traffic.
Barricade striping should slant downward in the direction of detour.



PLAN VIEW

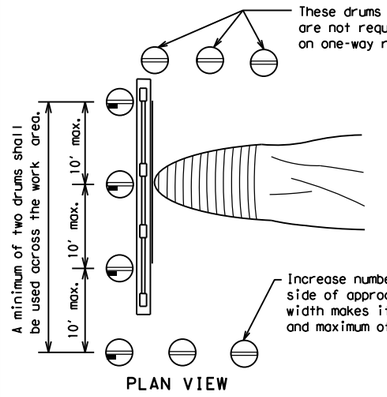
1. Signs should be mounted on independent supports at a 7 foot mounting height in center of roadway. The signs should be a minimum of 10 feet behind Type 3 Barricades.
2. Advance signing shall be as specified elsewhere in the plans.

TYPE 3 BARRICADE (POST AND SKID) TYPICAL APPLICATION



PERSPECTIVE VIEW

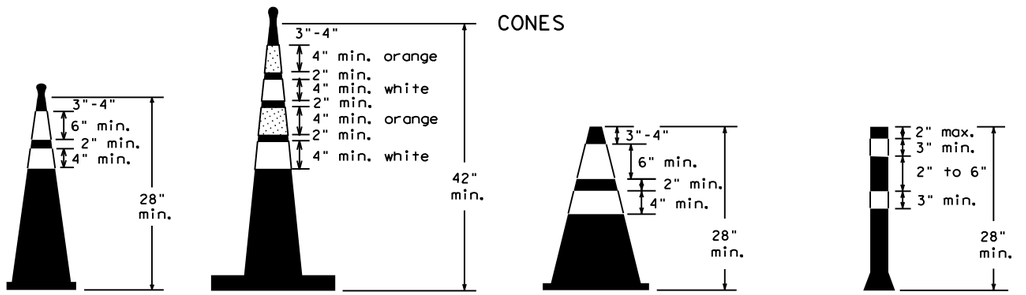
1. Where positive redirectional capability is provided, drums may be omitted.
2. Plastic construction fencing may be used with drums for safety as required in the plans.
3. Vertical Panels on flexible support may be substituted for drums when the shoulder width is less than 4 feet.
4. When the shoulder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



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

PLAN VIEW

CULVERT WIDENING OR OTHER ISOLATED WORK WITHIN THE PROJECT LIMITS

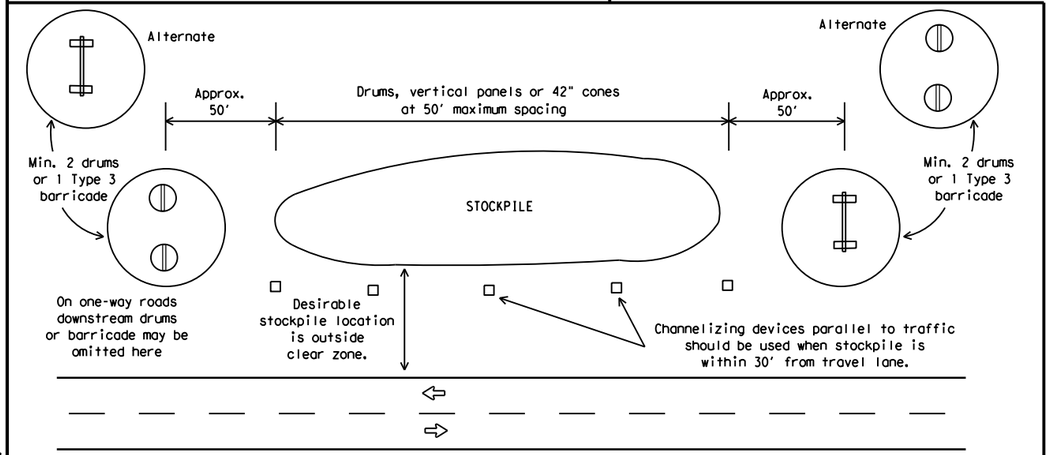


Two-Piece cones | One-Piece cones | Tubular Marker

28" Cones shall have a minimum weight of 9 1/2 lbs.

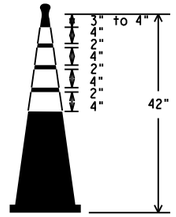
42" 2-piece cones shall have a minimum weight of 30 lbs. including base.

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



TRAFFIC CONTROL FOR MATERIAL STOCKPILES

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



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

Texas Department of Transportation

Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(10)-14

FILE: bc-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS 9-07 8-14 7-13	1507	02	016, Etc.	FM 696, Etc.
	DIST	COUNTY		SHEET NO.
	BRY	BURLESON		29

DATE:
FILE:

DATE:
FILE:

WORK ZONE PAVEMENT MARKINGS

GENERAL

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

RAISED PAVEMENT MARKERS

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

PREFABRICATED PAVEMENT MARKINGS

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

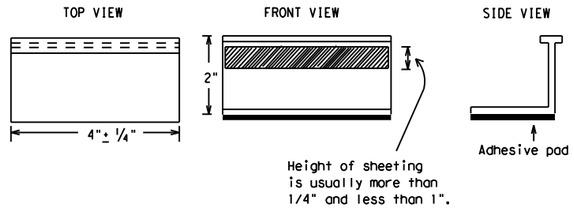
MAINTAINING WORK ZONE PAVEMENT MARKINGS

1. The Contractor will be responsible for maintaining work zone pavement markings within the work limits.
2. Work zone pavement markings shall be inspected in accordance with the frequency and reporting requirements of work zone traffic control device inspections as required by Form 599.
3. The markings should provide a visible reference for a minimum distance of 300 feet during normal daylight hours and 160 feet when illuminated by automobile low-beam headlights at night, unless sight distance is restricted by roadway geometrics.
4. Markings failing to meet this criteria within the first 30 days after placement shall be replaced at the expense of the Contractor as per Specification Item 662.

REMOVAL OF PAVEMENT MARKINGS

1. Pavement markings that are no longer applicable, could create confusion or direct a motorist toward or into the closed portion of the roadway shall be removed or obliterated before the roadway is opened to traffic.
2. The above shall not apply to detours in place for less than three days, where flaggers and/or sufficient channelizing devices are used in lieu of markings to outline the detour route.
3. Pavement markings shall be removed to the fullest extent possible, so as not to leave a discernable marking. This shall be by any method approved by TxDOT Specification Item 677 for "Eliminating Existing Pavement Markings and Markers".
4. The removal of pavement markings may require resurfacing or seal coating portions of the roadway as described in Item 677.
5. Subject to the approval of the Engineer, any method that proves to be successful on a particular type pavement may be used.
6. Blast cleaning may be used but will not be required unless specifically shown in the plans.
7. Over-painting of the markings SHALL NOT BE permitted.
8. Removal of raised pavement markers shall be as directed by the Engineer.
9. Removal of existing pavement markings and markers will be paid for directly in accordance with Item 677, "ELIMINATING EXISTING PAVEMENT MARKINGS AND MARKERS," unless otherwise stated in the plans.
10. Black-out marking tape may be used to cover conflicting existing markings for periods less than two weeks when approved by the Engineer.

Temporary Flexible-Reflective Roadway Marker Tabs



STAPLES OR NAILS SHALL NOT BE USED TO SECURE TEMPORARY FLEXIBLE-REFLECTIVE ROADWAY MARKER TABS TO THE PAVEMENT SURFACE

1. Temporary flexible-reflective roadway marker tabs used as guidemarks shall meet the requirements of DMS-8242.
2. Tabs detailed on this sheet are to be inspected and accepted by the Engineer or designated representative. Sampling and testing is not normally required, however at the option of the Engineer, either "A" or "B" below may be imposed to assure quality before placement on the roadway.
   A. Select five (5) or more tabs at random from each lot or shipment and submit to the Construction Division, Materials and Pavement Section to determine specification compliance.
   B. Select five (5) tabs and perform the following test. Affix five (5) tabs at 24 inch intervals on an asphaltic pavement in a straight line. Using a medium size passenger vehicle or pickup, run over the markers with the front and rear tires at a speed of 35 to 40 miles per hour, four (4) times in each direction. No more than one (1) out of the five (5) reflective surfaces shall be lost or displaced as a result of this test.
3. Small design variances may be noted between tab manufacturers.
4. See Standard Sheet WZ(STPM) for tab placement on new pavements. See Standard Sheet TCP(7-1) for tab placement on seal coat work.

RAISED PAVEMENT MARKERS USED AS GUIDEMARKS

1. Raised pavement markers used as guidemarks shall be from the approved product list, and meet the requirements of DMS-4200.
2. All temporary construction raised pavement markers provided on a project shall be of the same manufacturer.
3. Adhesive for guidemarks shall be bituminous material hot applied or butyl rubber pad for all surfaces, or thermoplastic for concrete surfaces.

Guidemarks shall be designated as:
YELLOW - (two amber reflective surfaces with yellow body).
WHITE - (one silver reflective surface with white body).

DEPARTMENTAL MATERIAL SPECIFICATIONS	
PAVEMENT MARKERS (REFLECTORIZED)	DMS-4200
TRAFFIC BUTTONS	DMS-4300
EPOXY AND ADHESIVES	DMS-6100
BITUMINOUS ADHESIVE FOR PAVEMENT MARKERS	DMS-6130
PERMANENT PREFABRICATED PAVEMENT MARKINGS	DMS-8240
TEMPORARY REMOVABLE, PREFABRICATED PAVEMENT MARKINGS	DMS-8241
TEMPORARY FLEXIBLE, REFLECTIVE ROADWAY MARKER TABS	DMS-8242

A list of prequalified reflective raised pavement markers, non-reflective traffic buttons, roadway marker tabs and other pavement markings can be found at the Material Producer List web address shown on BC(1).

Texas Department of Transportation

Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION PAVEMENT MARKINGS

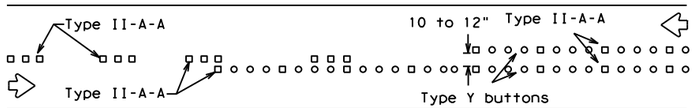
BC(11)-14

FILE: bc-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT February 1998	CONT	SECT	JOB	HIGHWAY
REVISIONS	1507	02	016, Etc.	FM 696, Etc.
2-98 9-07	DIST	COUNTY		SHEET NO.
1-02 7-13	BRY	BURLESON		30
11-02 8-14				

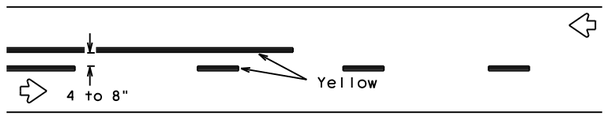
DATE:
FILE:

PAVEMENT MARKING PATTERNS

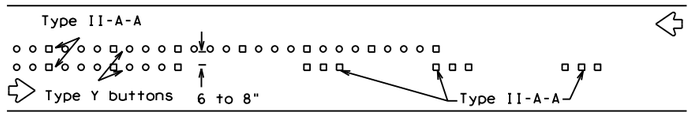
REFLECTORIZED PAVEMENT MARKINGS - PATTERN A



RAISED PAVEMENT MARKERS - PATTERN A



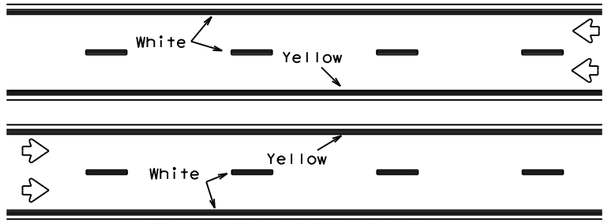
REFLECTORIZED PAVEMENT MARKINGS - PATTERN B



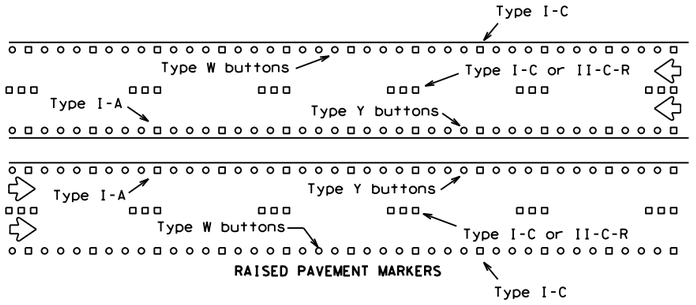
RAISED PAVEMENT MARKERS - PATTERN B

Pattern A is the TXDOT Standard, however Pattern B may be used if approved by the Engineer.
Prefabricated markings may be substituted for reflectorized pavement markings.

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



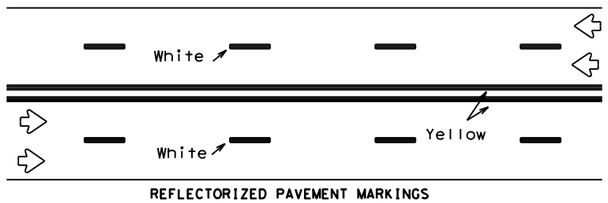
REFLECTORIZED PAVEMENT MARKINGS



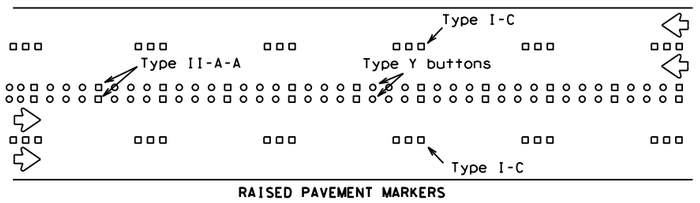
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

EDGE & LANE LINES FOR DIVIDED HIGHWAY



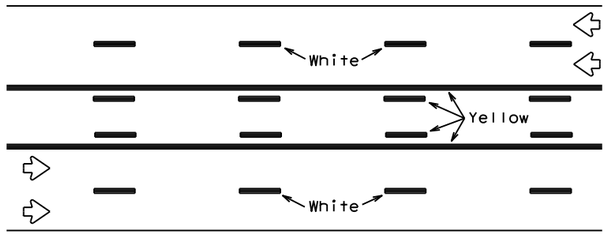
REFLECTORIZED PAVEMENT MARKINGS



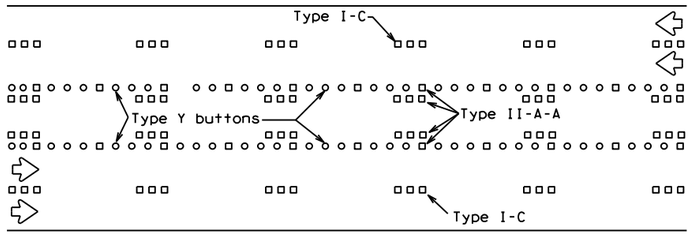
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS



REFLECTORIZED PAVEMENT MARKINGS



RAISED PAVEMENT MARKERS

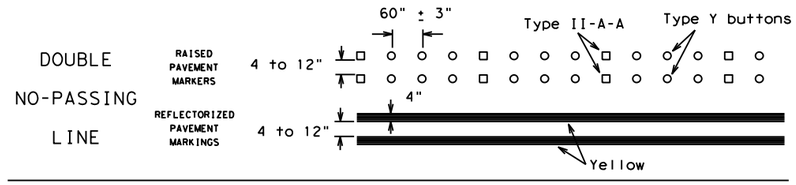
Prefabricated markings may be substituted for reflectorized pavement markings.

TWO-WAY LEFT TURN LANE

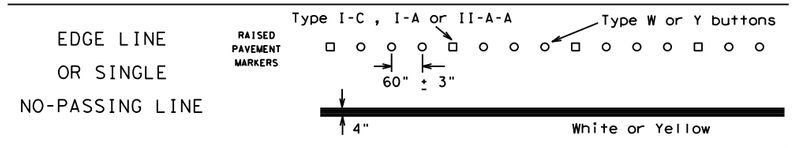
STANDARD WORK ZONE PAVEMENT MARKINGS DETAILS

SOLID LINES

DOUBLE NO-PASSING LINE

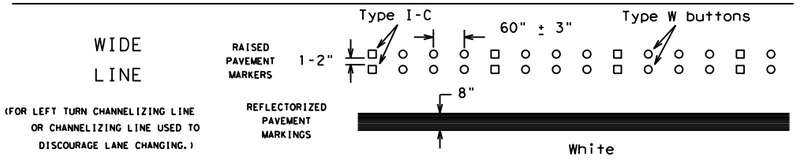


EDGE LINE OR SINGLE NO-PASSING LINE



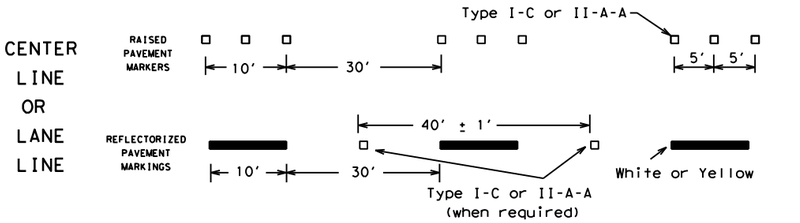
WIDE LINE

(FOR LEFT TURN CHANNELIZING LINE OR CHANNELIZING LINE USED TO DISCOURAGE LANE CHANGING.)

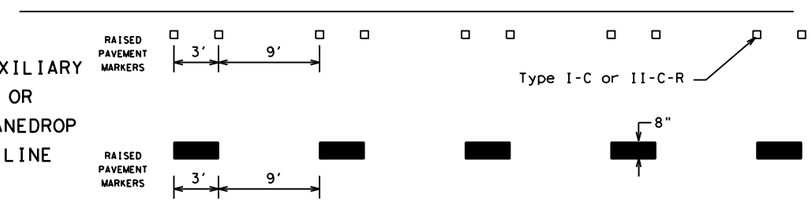


BROKEN LINES

CENTER LINE OR LANE LINE

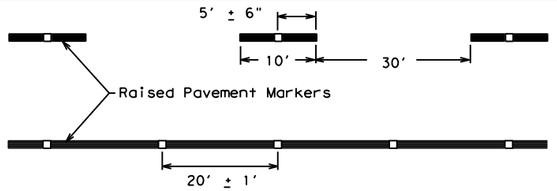


AUXILIARY OR LANEDROP LINE



REMOVABLE MARKINGS WITH RAISED PAVEMENT MARKERS

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



Centerline only - not to be used on edge lines

Raised pavement markers used as standard pavement markings shall be from the approved products list and meet the requirements of Item 672 "RAISED PAVEMENT MARKERS."

Texas Department of Transportation

Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION PAVEMENT MARKING PATTERNS

BC(12)-14

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© TxDOT February 1998	CONT	SECT	JOB	HIGHWAY
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1-97 9-07	DIST	COUNTY		SHEET NO.
2-98 7-13	BRY	BURLESON		31
11-02 8-14				

106

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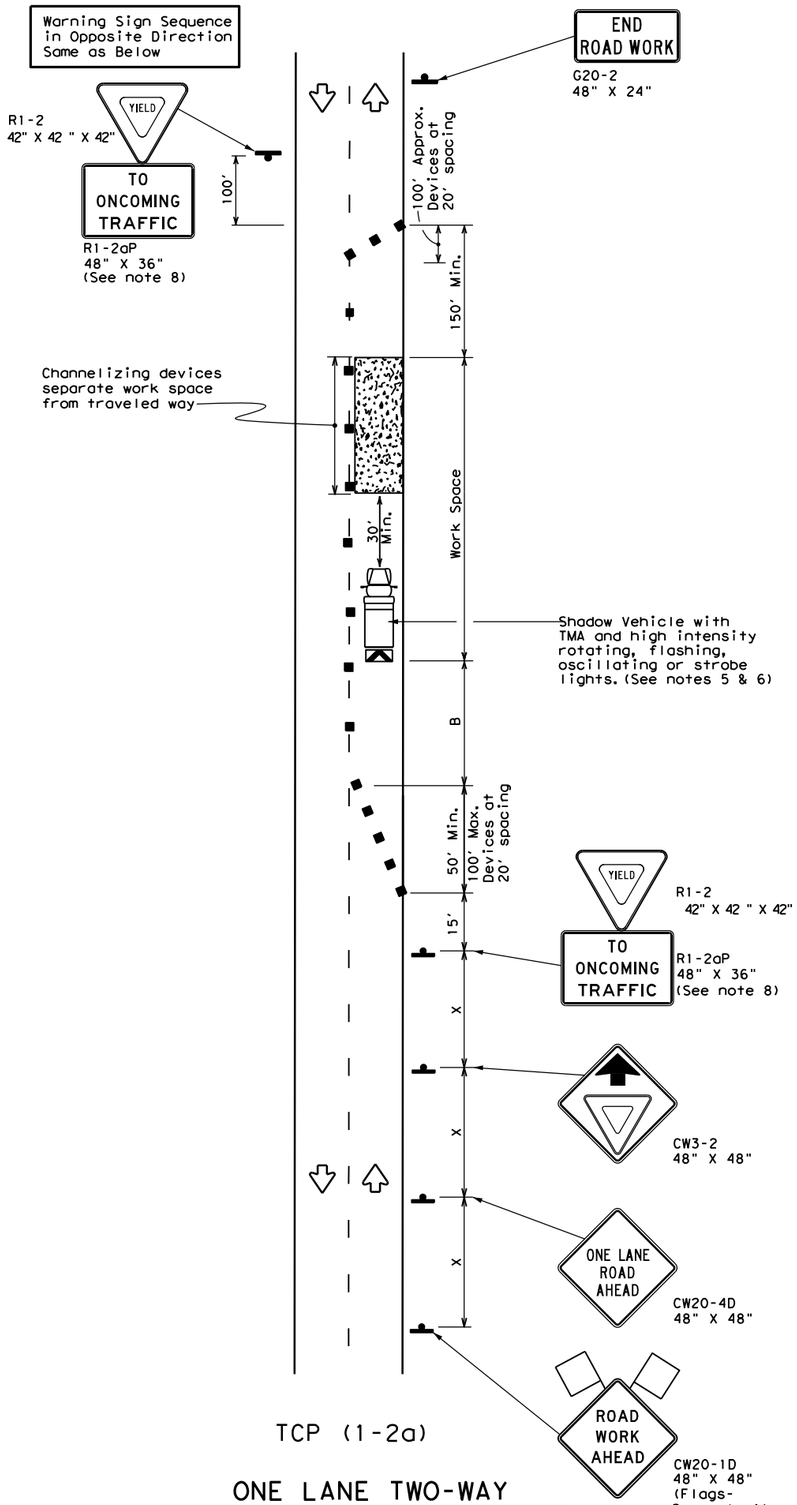
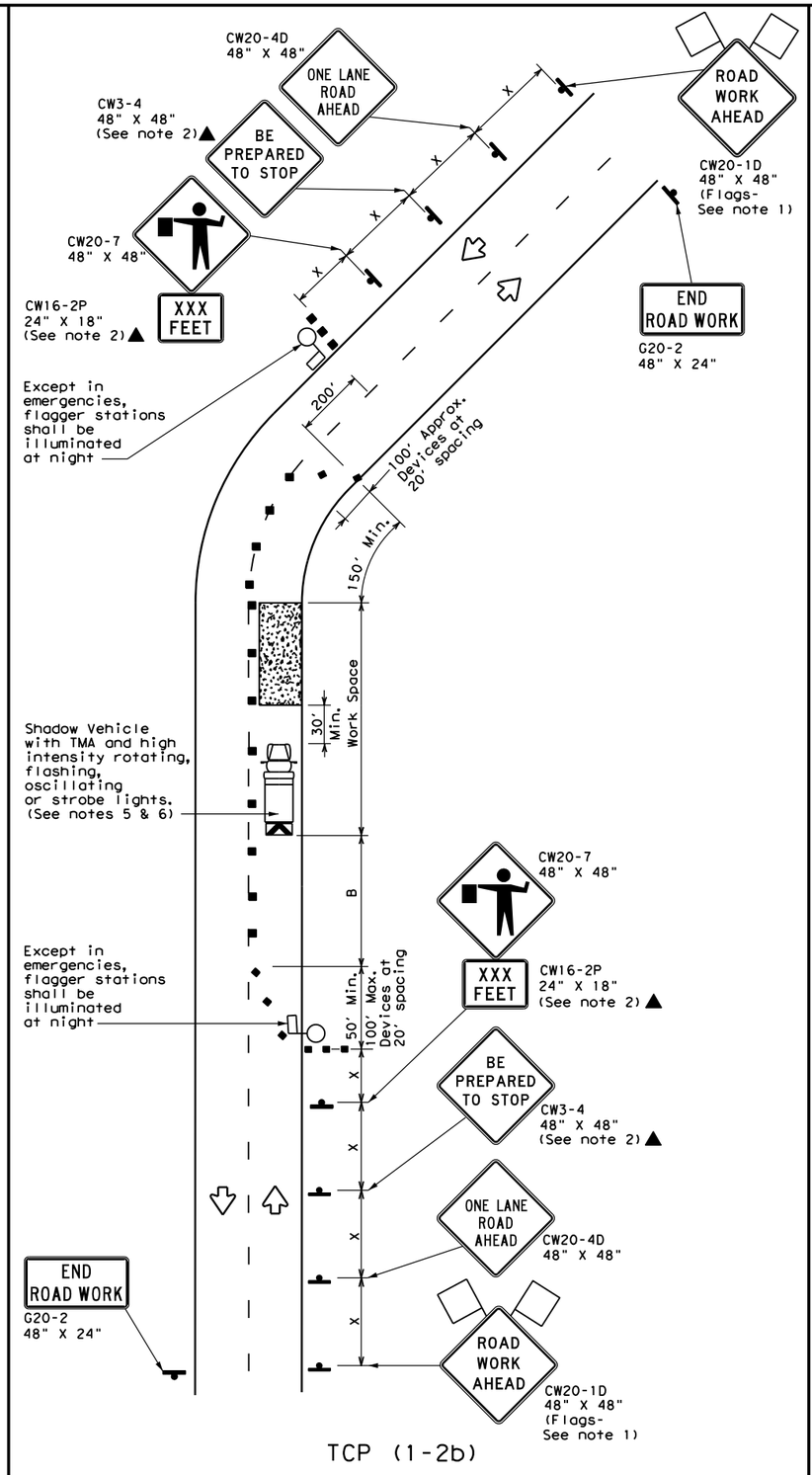


TCP (1-2a)

ONE LANE TWO-WAY CONTROL WITH YIELD SIGNS

(Less than 2000 ADT - See note 7)



TCP (1-2b)

ONE LANE TWO-WAY CONTROL WITH FLAGGERS

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

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

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

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

GENERAL NOTES

1. Flags attached to signs where shown are REQUIRED.
2. All traffic control devices illustrated are REQUIRED, except those denoted with the triangle symbol may be omitted when stated elsewhere in the plans, or for routine maintenance work, when approved by the Engineer.
3. The CW3-4 "BE PREPARED TO STOP" sign may be installed after the CW20-4D "ONE LANE ROAD AHEAD" sign, but proper sign spacing shall be maintained.
4. Sign spacing may be increased or an additional CW20-1D "ROAD WORK AHEAD" sign may be used if advance warning ahead of the flagger or R1-2 "YIELD" sign is less than 1500 feet.
5. A Shadow Vehicle with a TMA should be used anytime it can be positioned 30 to 100 feet in advance of the area of crew exposure without adversely affecting the performance or quality of the work. If workers are no longer present but road or work conditions require the traffic control to remain in place, Type 3 Barricades or other channelizing devices may be substituted for the Shadow Vehicle and TMA.
6. Additional Shadow Vehicles with TMAs may be positioned off the paved surface, next to those shown in order to protect wider work spaces.

TCP (1-2a)

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

TCP (1-2b)

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

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 4-90 4-98 2-94 2-12 1-97 2-18	1507	02	016, Etc.	FM696, Etc.
	DIST	COUNTY		SHEET NO.
	BRY	BURLESON		32

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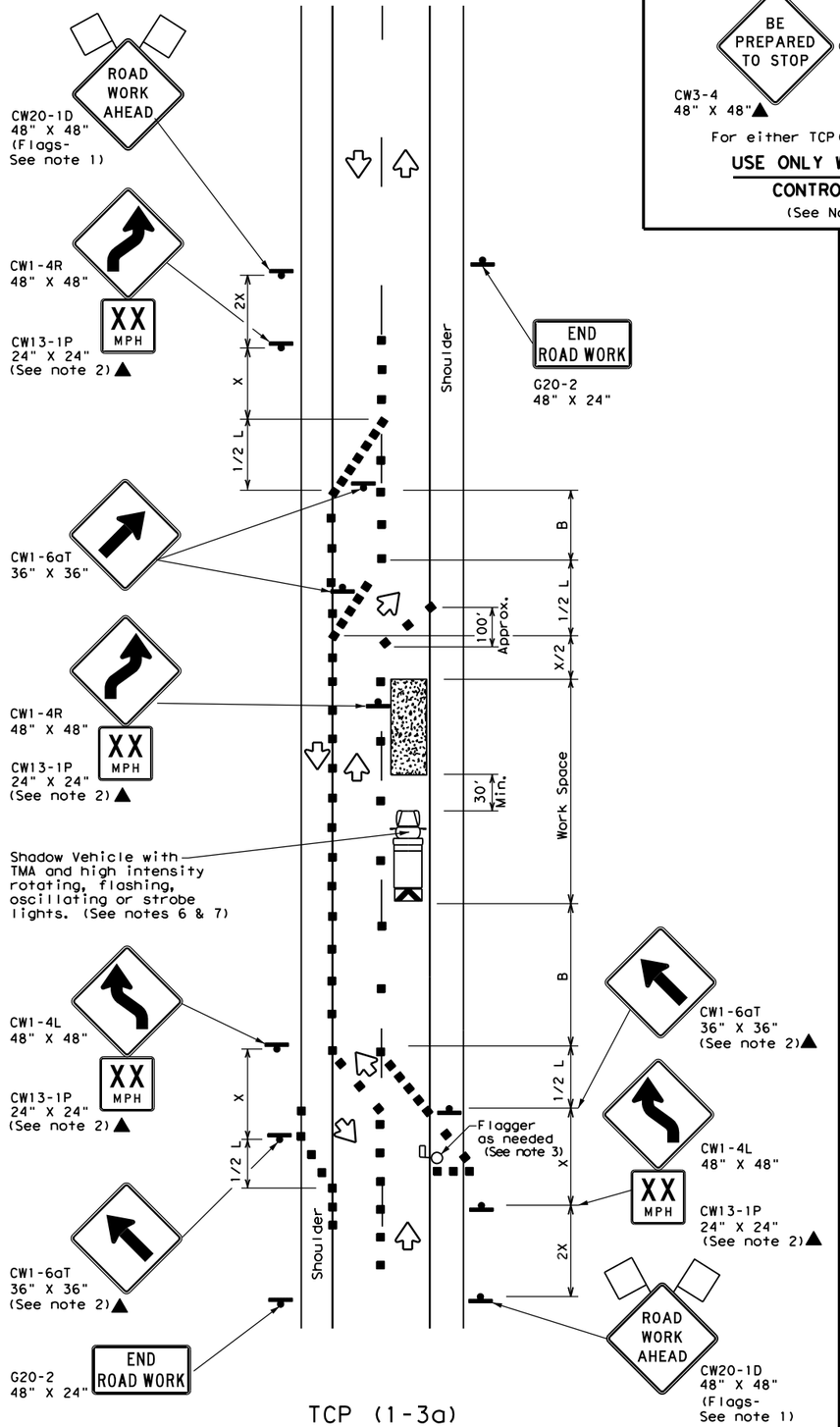
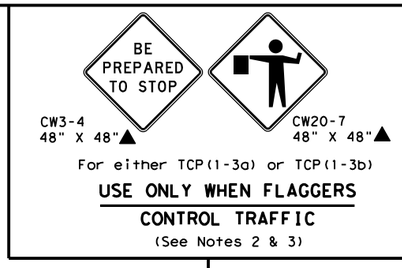


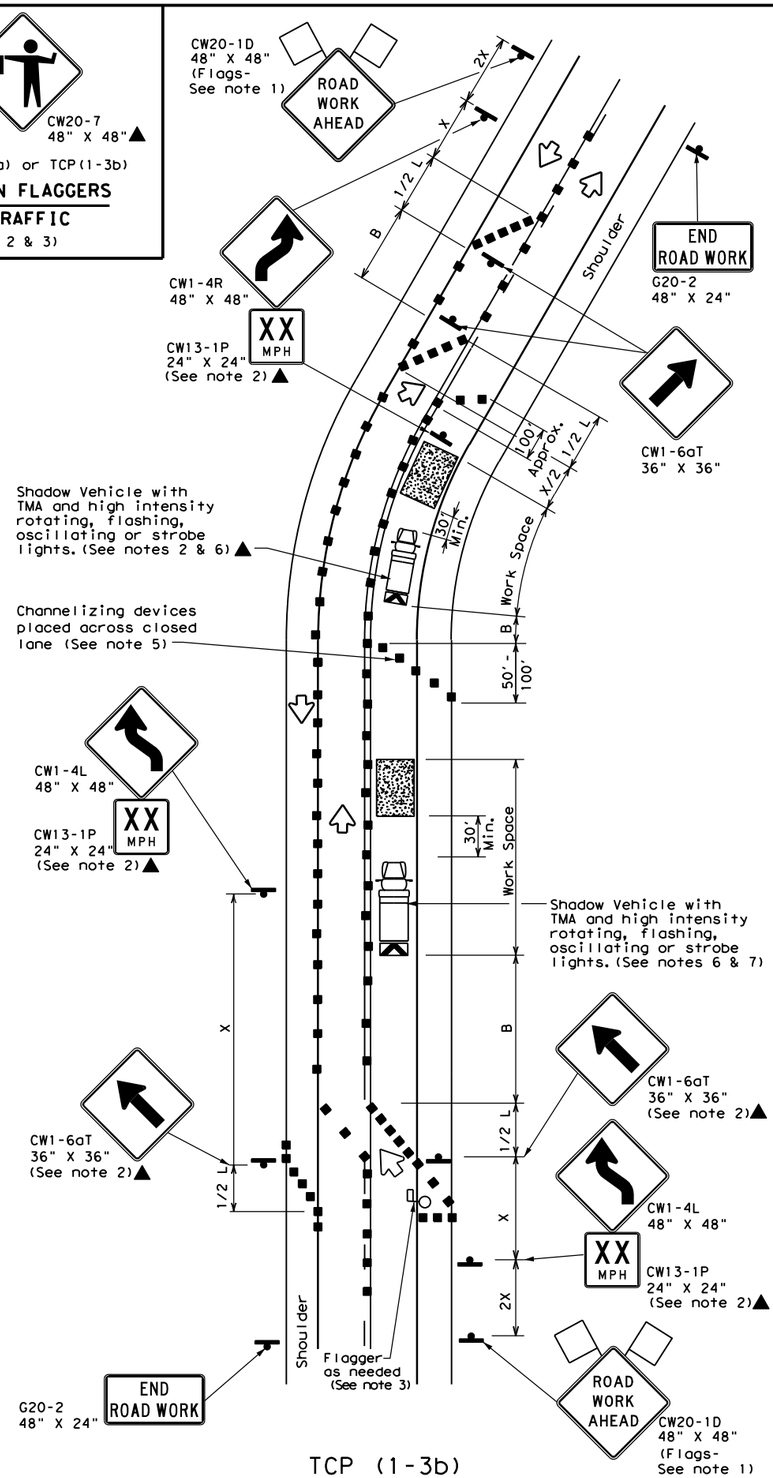
TCP (1-3a)
2-LANE ROADWAY WITH PAVED SHOULDERS

ONE LANE CLOSED
ADEQUATE FIELD OF VIEW



For either TCP(1-3a) or TCP(1-3b)

USE ONLY WHEN FLAGGERS CONTROL TRAFFIC
(See Notes 2 & 3)



TCP (1-3b)
2-LANE ROADWAY WITH PAVED SHOULDERS

ONE LANE CLOSED
INADEQUATE FIELD OF VIEW

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

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

* Conventional Roads Only

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

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

GENERAL NOTES

1. Flags attached to signs where shown are REQUIRED.
2. All traffic control devices illustrated are REQUIRED, except those denoted with the triangle symbol may be omitted when stated elsewhere in the plans, or for routine maintenance work, when approved by the Engineer.
3. Flagger control should NOT be used unless roadway conditions or heavy traffic volume require additional emphasis to safely control traffic. Additional flaggers may be positioned in advance of traffic queues to alert traffic to reduce speed.
4. DO NOT PASS, PASS WITH CARE and construction regulatory speed zone signs may be installed downstream of the ROAD WORK AHEAD signs.
5. When the work zone is made up of several work spaces, channelizing devices should be placed laterally across the closed lane to re-emphasize closure. Laterally placed channelizing devices should be repeated every 500 to 1000 feet in urban areas and every 1/4 to 1/2 mile in rural areas.
6. A Shadow Vehicle with a TMA should be used anytime it can be positioned 30 to 100 feet in advance of the area of crew exposure without adversely affecting the performance or quality of the work. If workers are no longer present but road or work conditions require the traffic control to remain in place, Type 3 Barricades or other channelizing devices may be substituted for the Shadow Vehicle and TMA.
7. Additional Shadow Vehicles with TMAs may be positioned off the paved surface, next to those shown in order to protect wider work spaces.
8. Where traffic is directed over a yellow centerline, channelizing devices which separate two-way traffic should be spaced on tapers at 20', or 15' if posted speed are 35 mph or slower, and for tangent sections, at 1/2S where S is the speed in mph. This tighter device spacing is intended for the area of conflicting markings not the entire work zone.

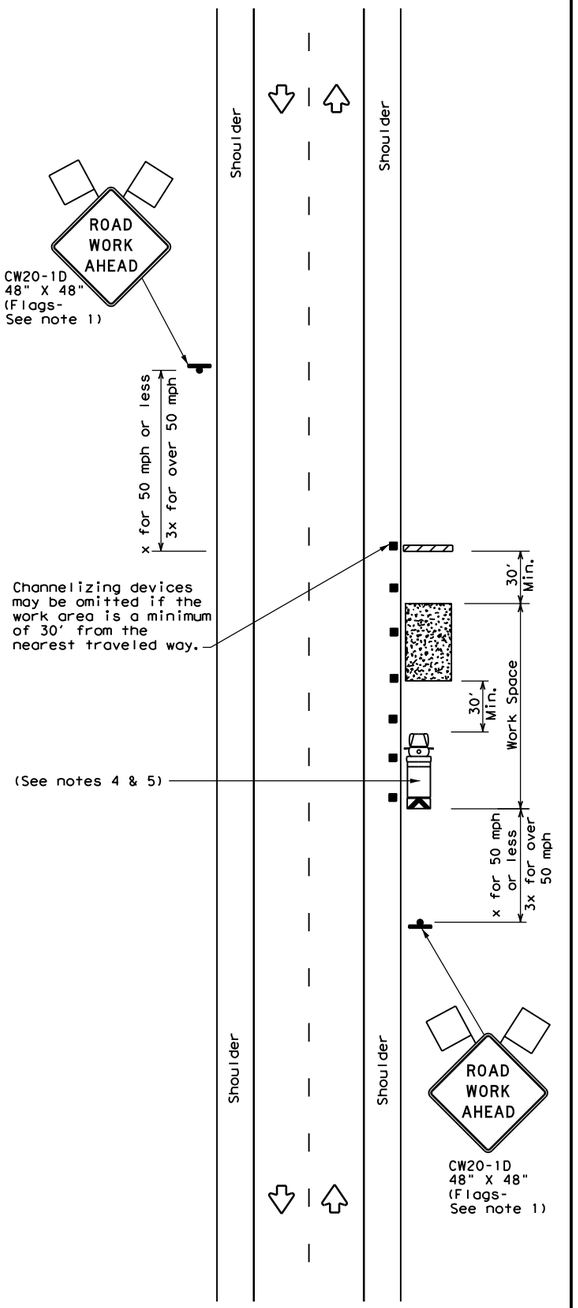
Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN
TRAFFIC SHIFTS ON TWO LANE ROADS
TCP(1-3)-18

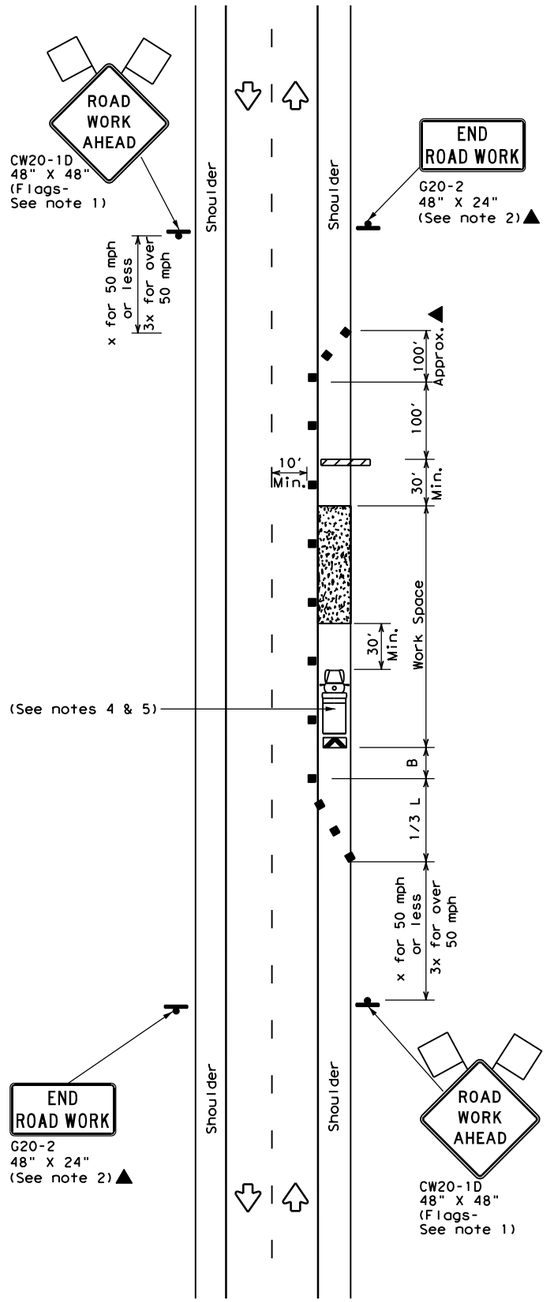
FILE: tcp1-3-18.dgn	DN:	CK:	DW:	CK:
© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS 2-94 4-98 8-95 2-12 1-97 2-18	1507	02	016, Etc.	FM696, Etc.
	DIST	COUNTY		SHEET NO.
	BRY	BURLESON		33

DATE:
FILE:



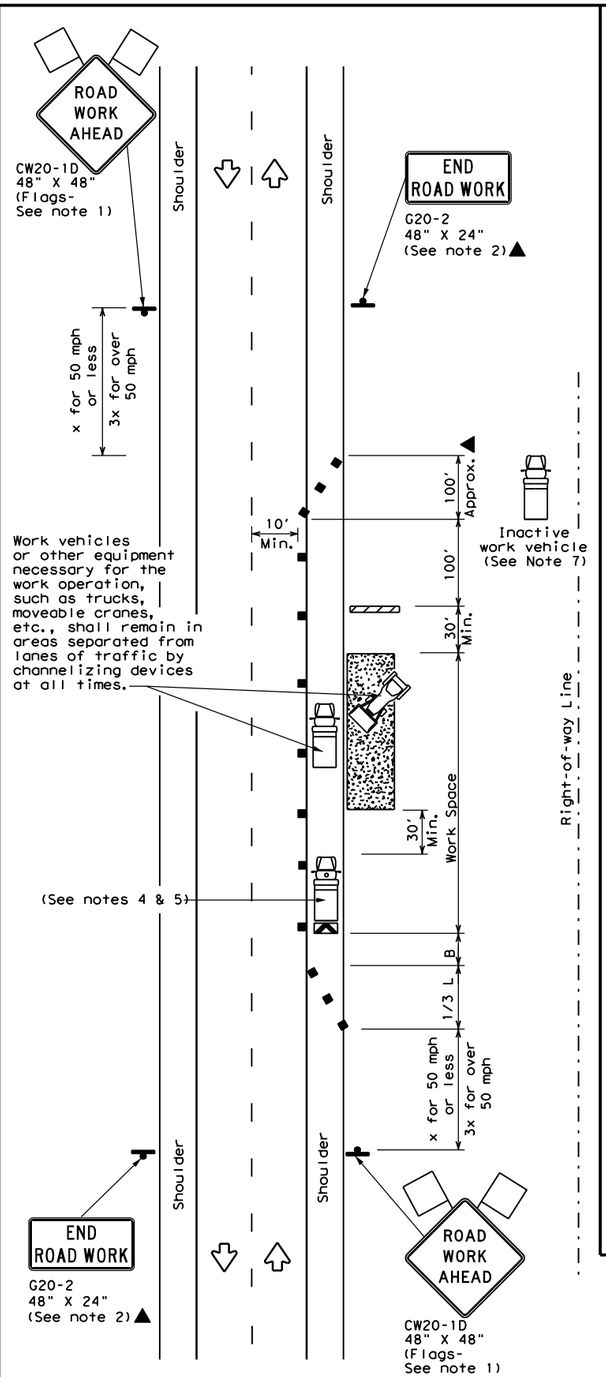
TCP (2-1a)

WORK SPACE NEAR SHOULDER
Conventional Roads



TCP (2-1b)

WORK SPACE ON SHOULDER
Conventional Roads



TCP (2-1c)

WORK VEHICLES ON SHOULDER
Conventional Roads

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

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

* Conventional Roads Only

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

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

GENERAL NOTES

1. Flags attached to signs where shown, are REQUIRED.
2. All traffic control devices illustrated are REQUIRED, except those denoted with the triangle symbol may be omitted when stated in the plans, or for routine maintenance work, when approved by the Engineer.
3. Stockpiled material should be placed a minimum of 30 feet from nearest traveled way.
4. Shadow Vehicle with TMA and high intensity rotating, flashing, oscillating or strobe lights. A Shadow Vehicle with a TMA should be used anytime it can be positioned 30 to 100 feet in advance of the area of crew exposure without adversely affecting the performance or quality of the work. If workers are no longer present but road or work conditions require the traffic control to remain in place, Type 3 Barricades or other channelizing devices may be substituted for the Shadow Vehicle and TMA.
5. Additional Shadow Vehicles with TMAs may be positioned off the paved surface, next to those shown in order to protect a wider work space.
6. See TCP(5-1) for shoulder work on divided highways, expressways and freeways.
7. Inactive work vehicles or other equipment should be parked near the right-of-way line and not parked on the paved shoulder.
8. CW21-5 "SHOULDER WORK" signs may be used in place of CW21-1D "ROAD WORK AHEAD" signs for shoulder work on conventional roadways.

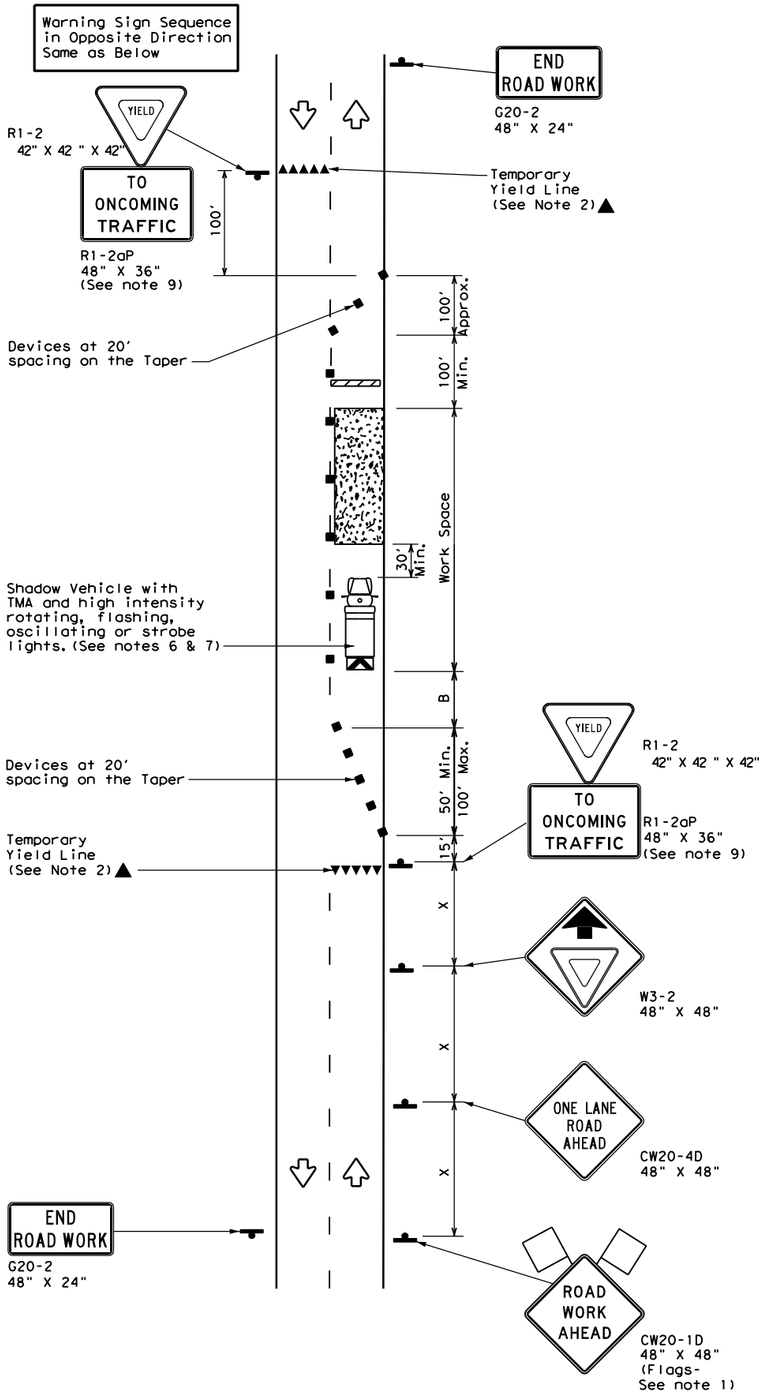
Texas Department of Transportation

Traffic Operations Division Standard

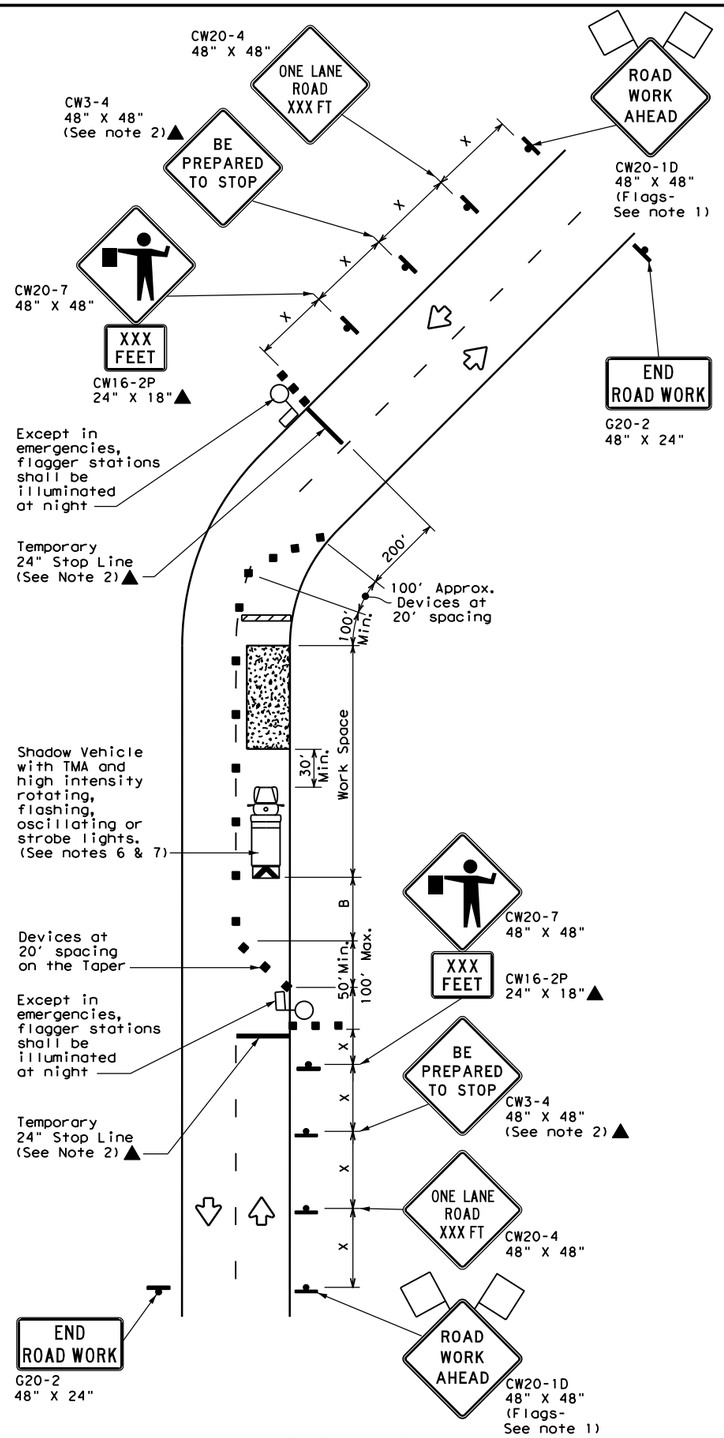
TRAFFIC CONTROL PLAN CONVENTIONAL ROAD SHOULDER WORK

TCP(2-1)-18

FILE: tcp2-1-18.dgn	DN:	CK:	DW:	CK:
© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS	1507	02	016	FM 696, Etc.
2-94 4-98	DIST	COUNTY		SHEET NO.
8-95 2-12	BRY	BURLESON		34
1-97 2-18				



TCP (2-2a)
2-LANE ROADWAY WITHOUT PAVED SHOULDERS
ONE LANE TWO-WAY
CONTROL WITH YIELD SIGNS
(Less than 2000 ADT - See Note 9)



TCP (2-2b)
2-LANE ROADWAY WITHOUT PAVED SHOULDERS
ONE LANE TWO-WAY
CONTROL WITH FLAGGERS

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

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

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

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

GENERAL NOTES

1. Flags attached to signs where shown, are REQUIRED.
2. All traffic control devices illustrated are REQUIRED, except those denoted with the triangle symbol may be omitted when stated elsewhere in the plans, or for routine maintenance work, when approved by the Engineer.
3. The CW3-4 "BE PREPARED TO STOP" sign may be installed after the CW20-4 "ONE LANE ROAD XXX FT" sign, but proper sign spacing shall be maintained.
4. Flaggers should use two-way radios or other methods of communication to control traffic.
5. Length of work space should be based on the ability of flaggers to communicate.
6. A Shadow Vehicle with a TMA should be used anytime it can be positioned 30 to 100 feet in advance of the area of crew exposure without adversely affecting the performance or quality of the work. If workers are no longer present but road or work conditions require the traffic control to remain in place, Type 3 Barricades or other channelizing devices may be substituted for the Shadow Vehicle and TMA.
7. Additional Shadow Vehicles with TMAs may be positioned off the paved surface, next to those shown in order to protect a wider work space.

TCP (2-2a)

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

TCP (2-2b)

10. Channelizing devices on the center line may be omitted when a pilot car is leading traffic and approved by the Engineer.
11. If the work space is located near a horizontal or vertical curve, the buffer distances should be increased in order to maintain stopping sight distance to the flagger and a queue of stopped vehicles. (See table above).
12. Flaggers should use 24" STOP/SLOW paddles to control traffic. Flags should be limited to emergency situtations.

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 8-95 3-03 1-97 2-12 4-98 2-18	1507	02	016, Etc.	FM696, Etc.
	DIST	COUNTY		SHEET NO.
	BRY	BURLESON		35

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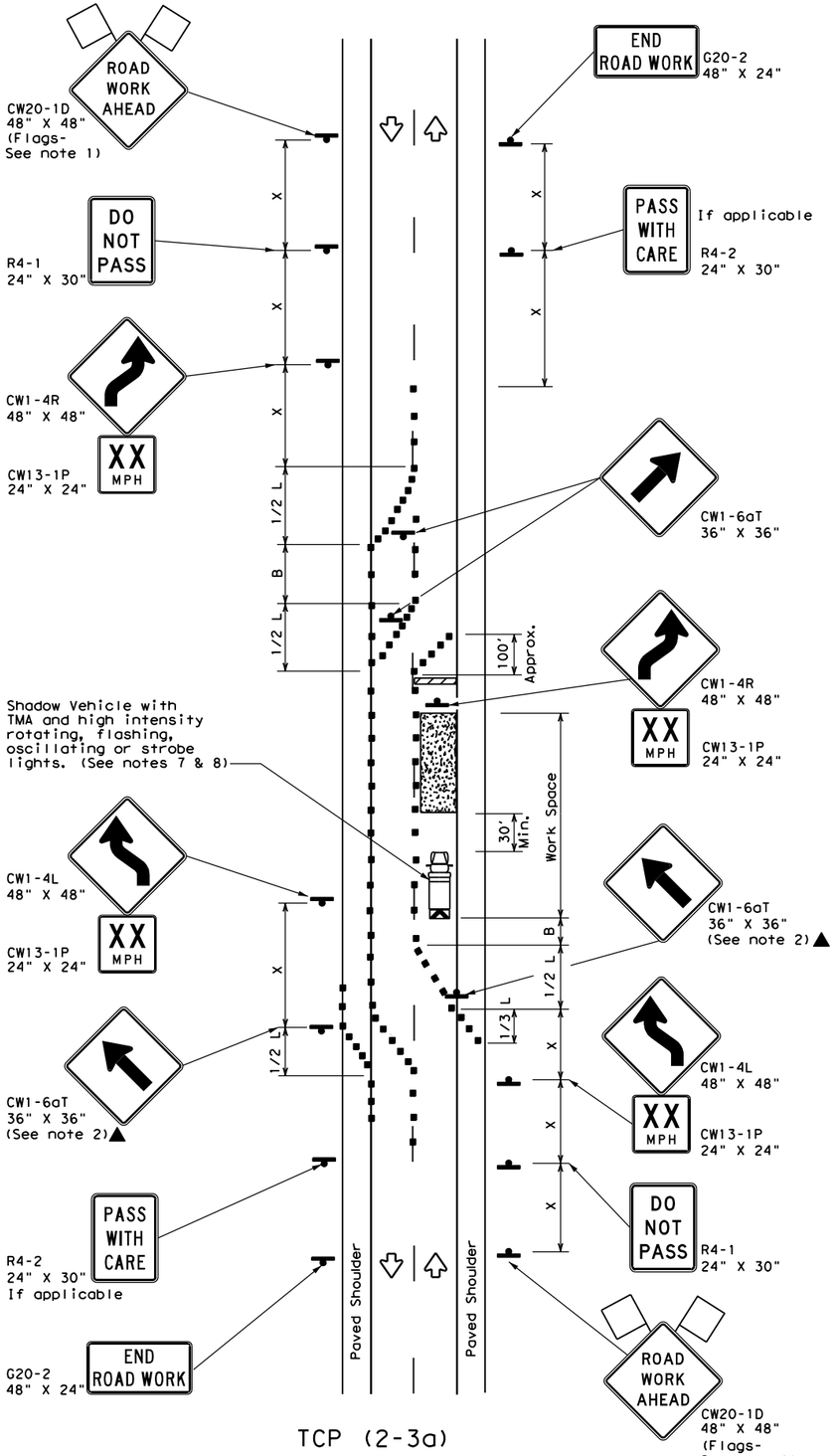
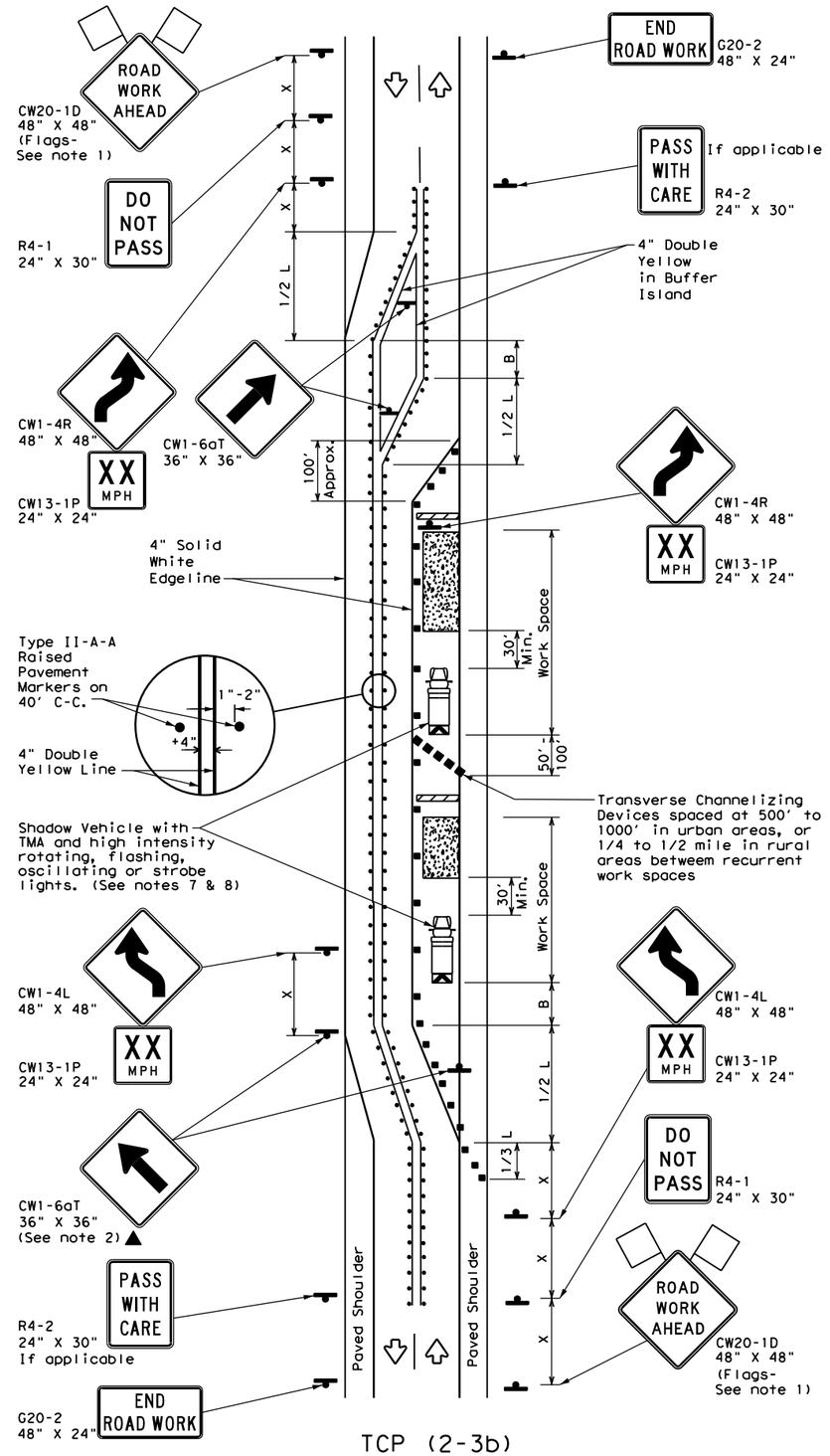


TCP (2-3a)
2-LANE ROADWAY WITH PAVED SHOULDERS

ONE LANE CLOSED
ADEQUATE FIELD OF VIEW



TCP (2-3b)
2-LANE ROADWAY WITH PAVED SHOULDERS

ONE LANE CLOSED
INADEQUATE FIELD OF VIEW

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

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

* Conventional Roads Only

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

TYPICAL USAGE				
MOBILE	SHORT DURATION	SHORT TERM STATIONARY	INTERMEDIATE TERM STATIONARY	LONG TERM STATIONARY
				TCP(2-3b)ONLY
			✓	✓

GENERAL NOTES

1. Flags attached to signs where shown, are REQUIRED.
2. All traffic control devices illustrated are REQUIRED, except those denoted with the triangle symbol may be omitted when stated elsewhere in the plans, or for routine maintenance work, when approved by the Engineer.
3. When work space will be in place less than three days existing pavement markings may remain in place. Channelizing devices shall be used to separate traffic.
4. Flagger control should NOT be used unless roadway conditions or heavy traffic volume require additional emphasis to safely control traffic. Flagger should be positioned at end of traffic queue.
5. The R4-1 "DO NOT PASS," R4-2 " PASS WITH CARE" and construction regulatory speed zone signs may be installed within CW20-1D "ROAD WORK AHEAD" signs. Proper spacing of signs shall be maintained.
6. Conflicting pavement marking shall be removed for long term projects.
7. A Shadow Vehicle with a TMA should be used anytime it can be positioned 30 to 100 feet in advance of the area of crew exposure without adversely affecting the performance or quality of the work. If workers are no longer present but road or work conditions require the traffic control to remain in place, Type 3 Barricades or other channelizing devices may be substituted.
8. Additional Shadow Vehicles with TMAs may be positioned off the paved surface, next to those shown in order to protect a wider work space.

TCP (2-3a)

9. Conflicting pavement markings shall be removed for long-term projects. For shorter durations where traffic is directed over a yellow centerline, channelizing devices which separate two-way traffic should be spaced on tapers at 20' or 15' if posted speeds are 35 mph or slower, and for tangent sections, at 1/2(S) where S is the speed in mph. This tighter device spacing is intended for the area of the conflicting markings, not the entire work zone.

Texas Department of Transportation — Traffic Operations Division Standard

TRAFFIC CONTROL PLAN TRAFFIC SHIFTS ON TWO-LANE ROADS

TCP(2-3)-18

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© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS	1507	02	016, Etc.	FM696, Etc.
8-95 3-03	DIST	COUNTY		SHEET NO.
1-97 2-12	BRY	BURLESON		36
4-98 2-18				

163

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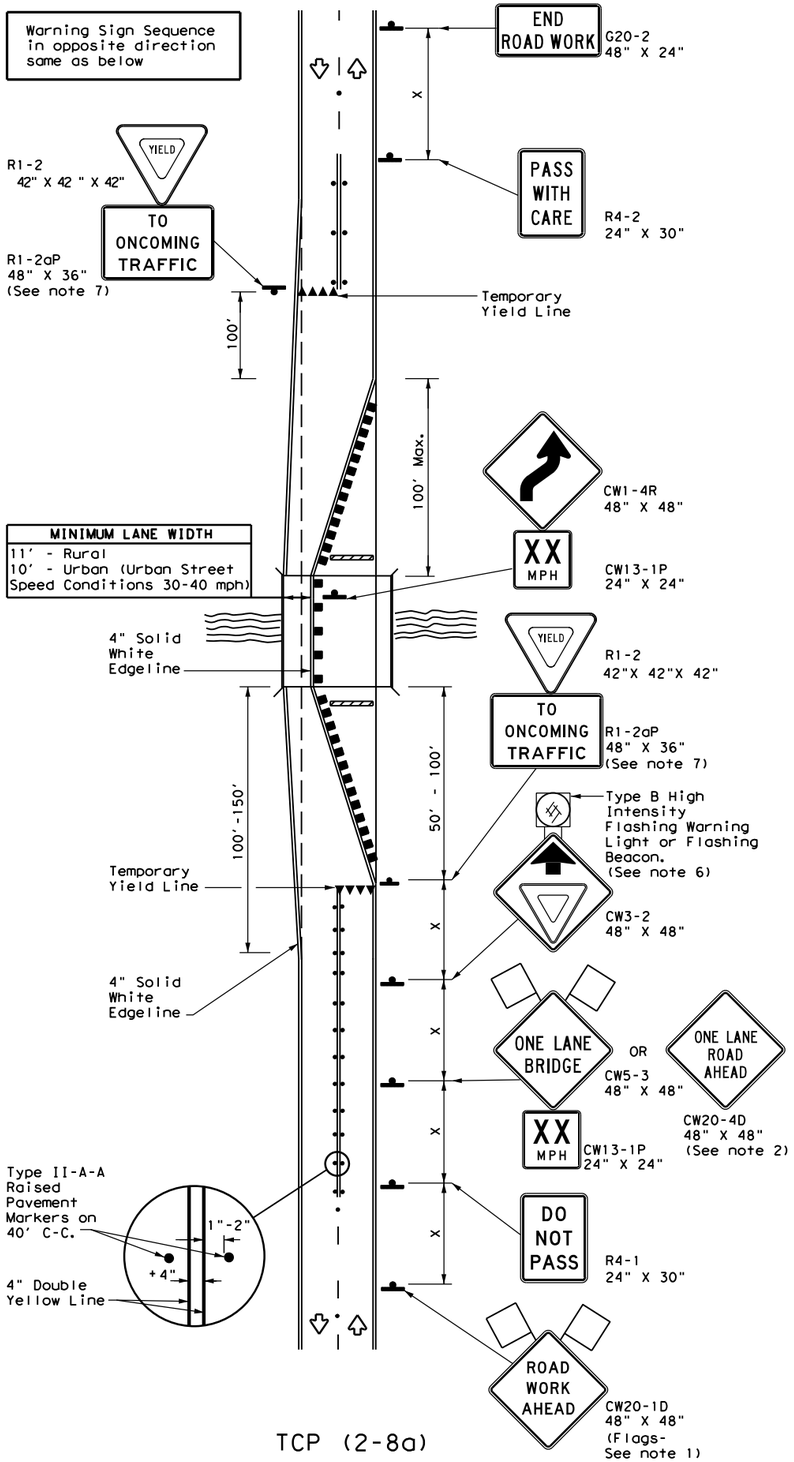
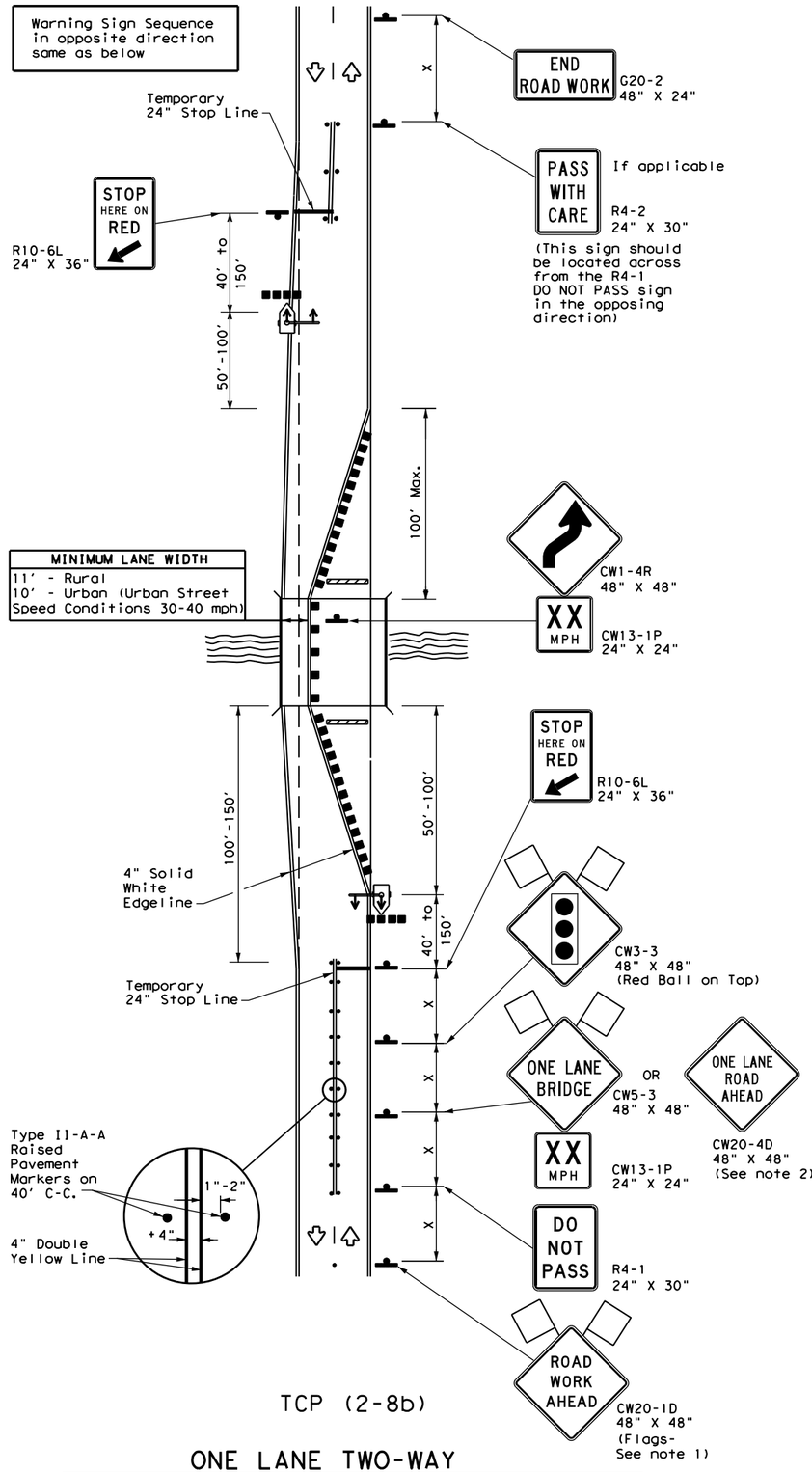


TCP (2-8a)

ONE LANE TWO-WAY
TRAFFIC CONTROL WITH YIELD SIGNS
(Less Than 2000 ADT-See Note 5)



TCP (2-8b)

ONE LANE TWO-WAY
TRAFFIC CONTROL WITH TRAFFIC SIGNAL

LEGEND			
	Type 3 Barricade		Channelizing Devices
	Sign		Traffic Flow
	Flag		Flagger
	Raised Pavement Markers Ty II-AA		Temporary or Portable Traffic Signal

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

* Conventional Roads Only

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

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

GENERAL NOTES

1. Flags attached to signs where shown are REQUIRED.
2. When this TCP is used at a location which does not involve a bridge, a 48" x 48" CW20-4D "ONE LANE ROAD AHEAD" signs should be used in lieu of the CW5-3 "ONE LANE BRIDGE" signs. The CW13-1P Advisory Speed Plaque is required with either warning sign.
3. Raised pavement markers shall be placed 40 feet c-c on centerline between DO NOT PASS signs and stop or yield lines.
4. For intermediate term situations, when it is not feasible to remove and restore pavement markings, the channelization must be made dominant by using a very close spacing. This is especially important in locations of conflicting information, such as where traffic is directed over a double yellow centerline. In such locations a maximum channelizing device spacing of 20 feet is recommended. The 20 foot channelizing device spacing recommendation is intended for the area of conflicting information and not the entire work zone.

TCP (2-8a)

5. Traffic control by CW3-2 "YIELD AHEAD" symbol signs for one lane two-way traffic control operations should be limited to work spaces less than 400 feet long and roadways with less than 2000 ADT. Otherwise, portable traffic signals should be used.
6. If power is available, a flashing beacon should be attached to the CW3-2 "YIELD AHEAD" symbol sign for emphasis.
7. The R1-2 "YIELD" and R1-2aP "TO ONCOMING TRAFFIC" signs and other regulatory signs shall be installed at 7 foot minimum mounting height.

TCP (2-8b)

8. A list of approved Portable Traffic Signals can be found in the "Compliant Work Zone Traffic Control Devices" list.
9. Portable traffic signals should be located to provide adequate stopping sight distance for approaching motorist (See table above).

Texas Department of Transportation | Traffic Operations Division Standard

TRAFFIC CONTROL PLAN
LONG TERM ONE-LANE TWO-WAY CONTROL

TCP(2-8)-18

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© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS	1507	02	016,Etc.	FM696,Etc.
8-95 3-03	DIST	COUNTY		SHEET NO.
1-97 2-12	BRY	BURLESON		37
4-98 2-18				

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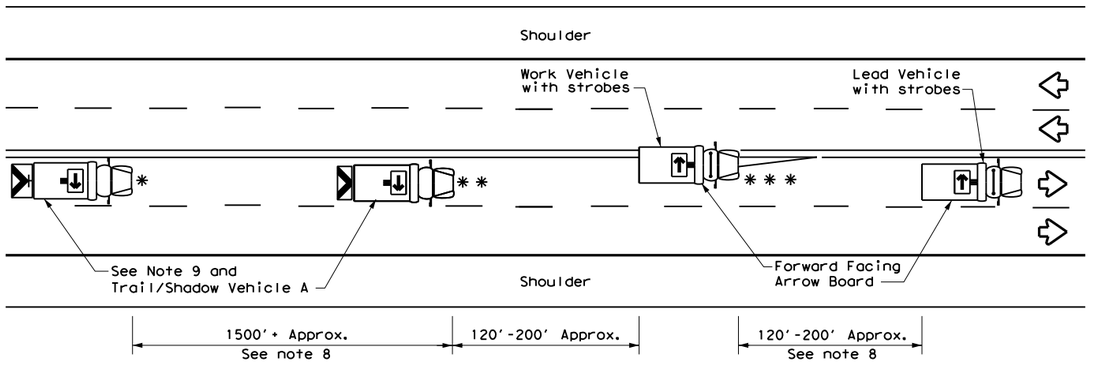
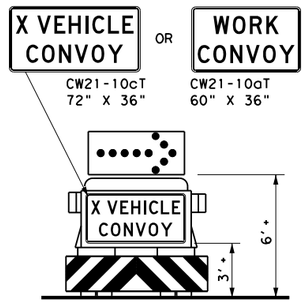


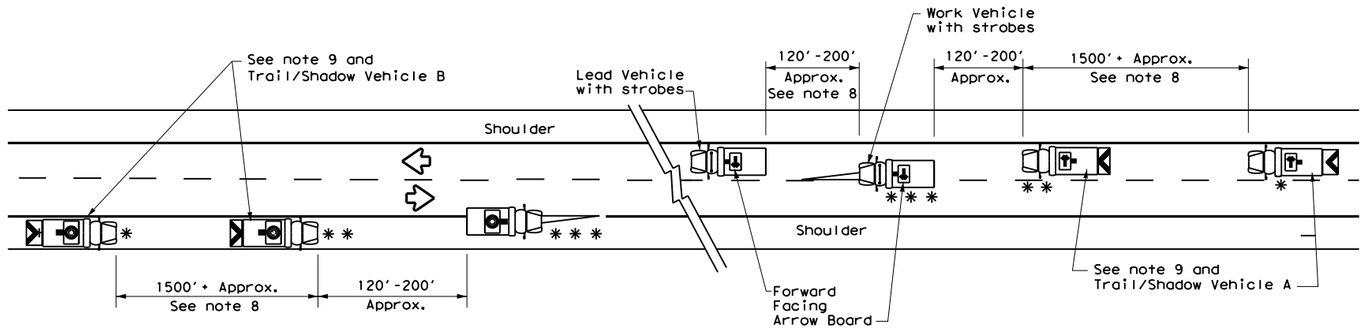
TCP (3-1a)

UNDIVIDED MULTILANE ROADWAY



TRAIL/SHADOW VEHICLE A

with RIGHT Directional display Flashing Arrow Board

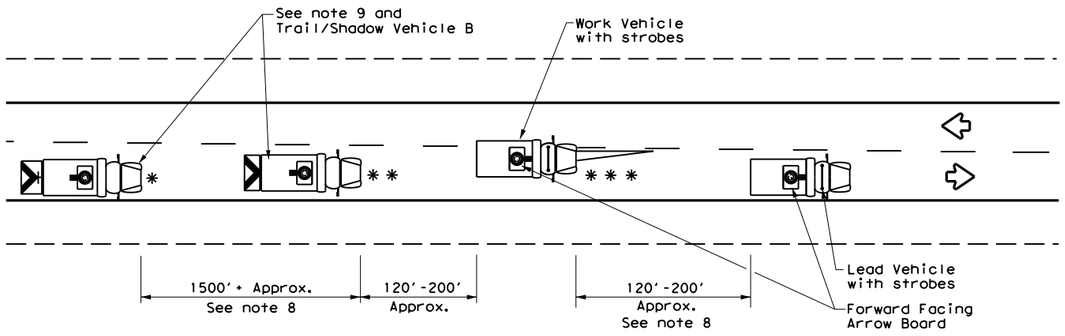


WORK ON SHOULDER

WORK ON TRAVEL LANE

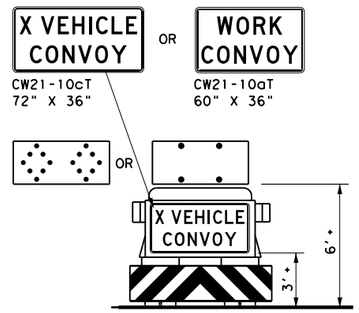
TCP (3-1b)

TWO-WAY ROADWAY WITH PAVED SHOULDERS



TCP (3-1c)

TWO-WAY ROADWAY WITHOUT PAVED SHOULDERS



TRAIL/SHADOW VEHICLE B

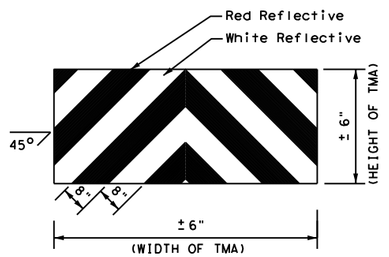
with Flashing Arrow Board in CAUTION display

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

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

GENERAL NOTES

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



STRIPING FOR TMA

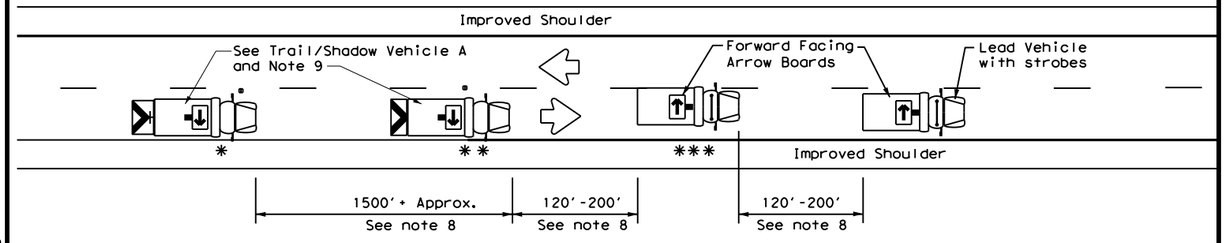
Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN MOBILE OPERATIONS UNDIVIDED HIGHWAYS

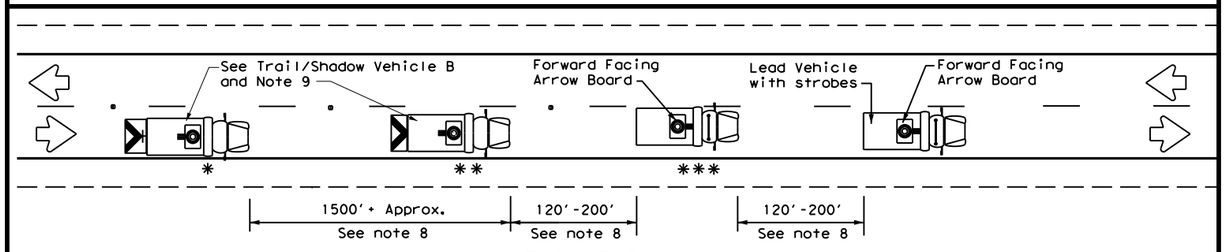
TCP(3-1)-13

FILE: tcp3-1.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS 2-94 4-98 8-95 7-13 1-97	1507	02	016, Etc.	FM 696, Etc.
	DIST	COUNTY		SHEET NO.
	BRY	BURLESON		37A



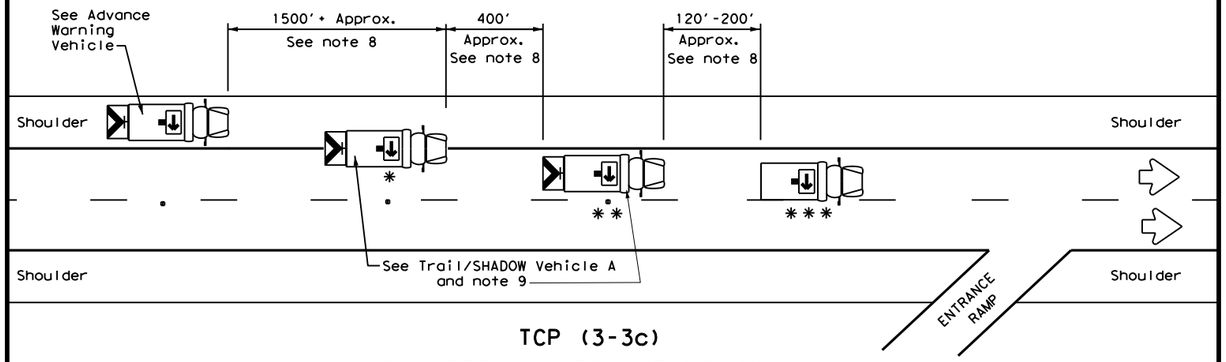
TCP (3-3a)

TWO LANE HIGHWAY WITH PAVED SHOULDERS
(WORK ON TRAVEL LANE)



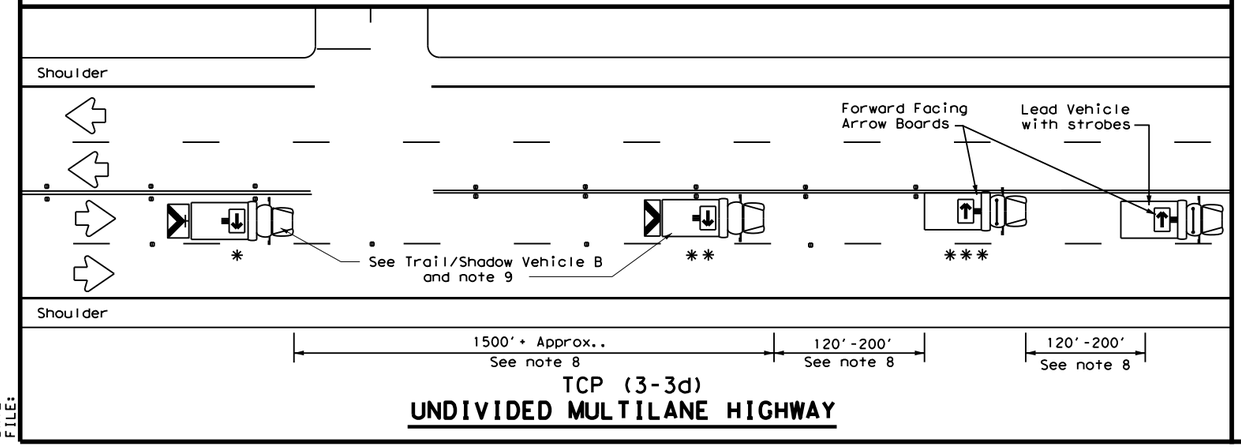
TCP (3-3b)

TWO LANE HIGHWAY WITHOUT PAVED SHOULDERS
(WORK ON TRAVEL LANE)



TCP (3-3c)

DIVIDED MULTILANE HIGHWAY



TCP (3-3d)

UNDIVIDED MULTILANE HIGHWAY

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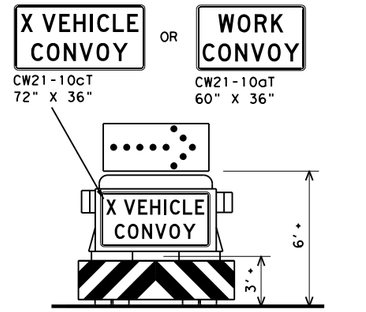
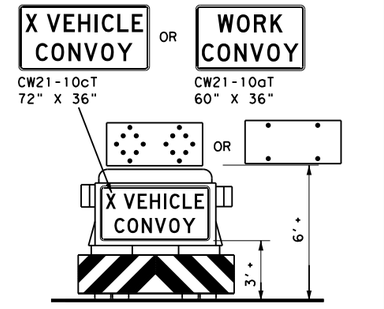
FILE:



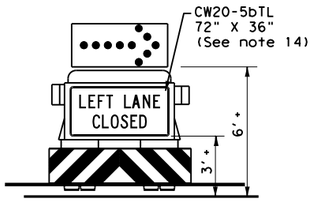
TRAIL/SHADOW VEHICLE A

with RIGHT Directional display
Flashing Arrow Board

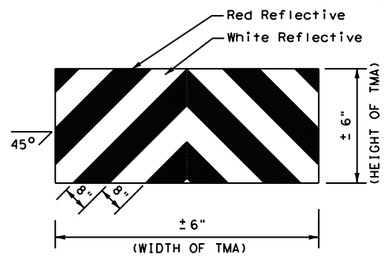


TRAIL/SHADOW VEHICLE B

with Flashing Arrow Board
in Caution Mode



ADVANCE WARNING VEHICLE



STRIPING FOR TMA

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

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

GENERAL NOTES

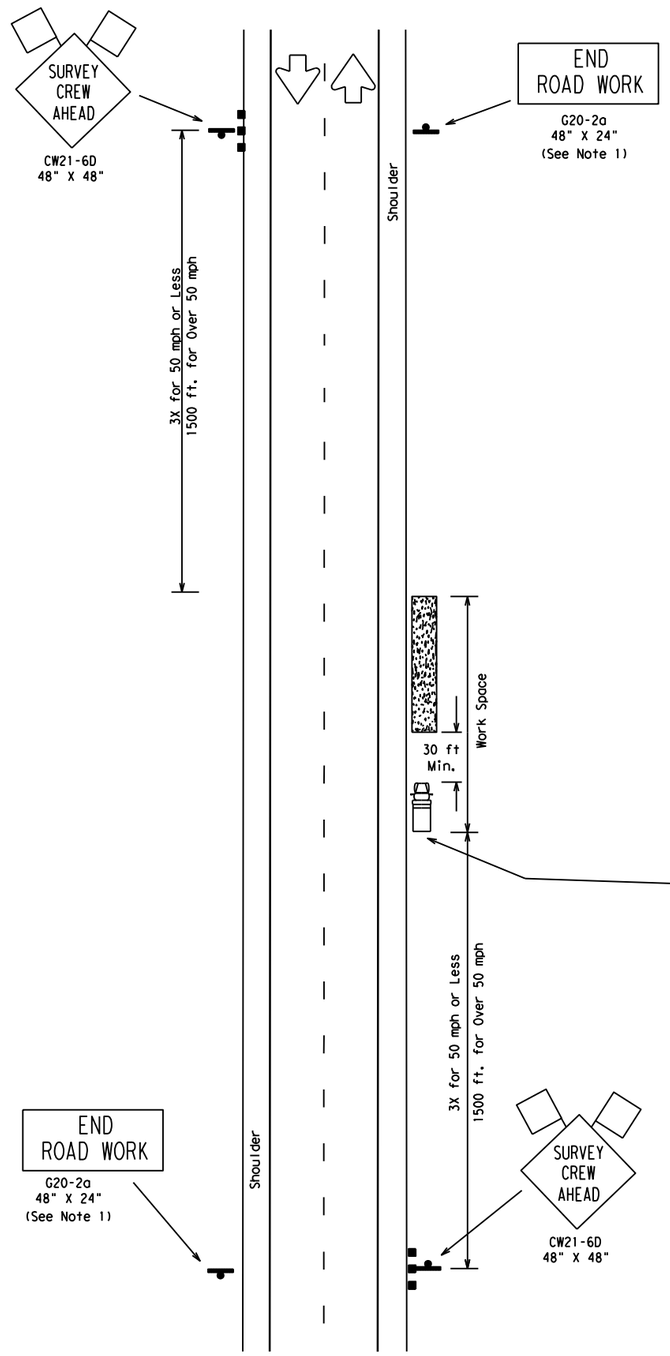
1. TRAIL, SHADOW, and LEAD vehicles shall be equipped with arrow boards as illustrated. When a LEAD vehicle is not used on two way roads the WORK vehicle must have an arrow board. For divided roadways, the arrow board on the WORK vehicle is optional based on the type of work being performed. The Engineer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

Texas Department of Transportation

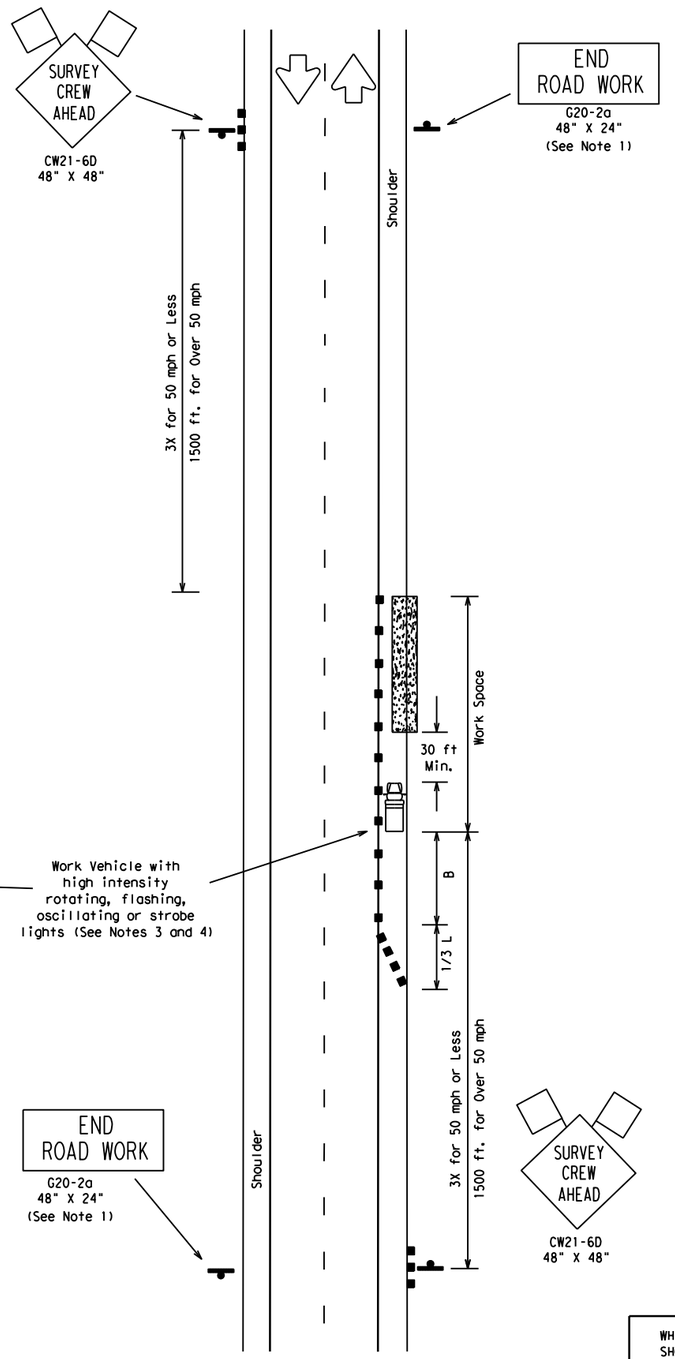
Traffic Operations Division Standard

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

FILE: tcp3-3.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT September 1987	CONT	SECT	JOB	HIGHWAY
REVISIONS	1507	02	016, Etc.	FM 696, Etc.
2-94 4-98	DIST	COUNTY		SHEET NO.
8-95 7-13				
1-97 7-14	BRY	BURLESON		37B



TCP (S-1a)
WORK OFF SHOULDER
OR PAVED SURFACE



TCP (S-1b)
WORK ON SHOULDER

Posted Speed ✳	Formula	Minimum Desirable Taper Lengths ✳✳ 10' Offset	11' Offset	12' Offset	Suggested Maximum Spacing of Device On a Taper	On a Tangent	Min. Sign Spacing "X" Distance	Longitudinal Buffer Space "B"
30	$L=\frac{WS^2}{60}$	150'	165'	180'	30'	60'-75'	120'	90'
35		205'	225'	245'	35'	70'-90'	160'	120'
40		265'	295'	320'	40'	80'-100'	240'	155'
45	L=WS	450'	495'	540'	45'	90'-110'	320'	195'
50		500'	550'	600'	50'	100'-125'	400'	240'
55		550'	605'	660'	55'	110'-140'	500'	295'
60		600'	660'	720'	60'	120'-150'	600'	350'
65		650'	715'	780'	65'	130'-165'	700'	410'
70		700'	770'	840'	70'	140'-175'	800'	475'
75		750'	825'	900'	75'	150'-185'	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
	✓	✓		

DEFINITIONS:
SHORT DURATION - work that occupies a location up to 1 hour.
SHORT TERM STATIONARY - daytime work that occupies a location for more than 1 hour within a single daylight period.

GENERAL NOTES:

1. The G20-2a "END ROAD WORK" sign may be placed on the back of the CW21-6D "SURVEY CREW AHEAD" sign or may be omitted for short duration (less than 1 hour) work.
2. Channelizing devices on the shoulder taper and tangent section may be omitted for short duration (less than 1 hour) work.
3. If line-of-sight requirements for surveying operations will preclude the placement of the Work Vehicle to protect workers, the channelizing devices mentioned in Note 2 are required.
4. ⚠ A Shadow Vehicle with a Truck Mounted Attenuator and flashing warning lights/arrow panel in caution mode may be used in lieu of the Work Vehicle to protect the work space.
5. The CW20-1D "ROAD WORK AHEAD" sign may be substituted for the CW21-6D "SURVEY CREW AHEAD" sign.
6. This plan may also be used for shoulder work or off shoulder work for multilane undivided roadways.
7. The CW21-6D "SURVEY CREW AHEAD" sign for low volume intersecting side roads is desirable, but is not required when working less than 15 minutes in area of the side road, as determined by the Engineer.

TCP(S-1a)

8. Cones may be placed at edge of pavement adjacent to the work space to enhance safety.

WHENEVER POSSIBLE, SURVEY PARTIES SHOULD AVOID, BY THE USE OF OFFSET LINES, ANY UNNECCESSARY PERIODS OF TIME ON THE ROAD SURFACE.

8-18-08 Revision
⚠ Corrected misspelling.

Texas Department of Transportation
Traffic Operations Division

TRAFFIC CONTROL PLAN FOR SURVEYING OPERATIONS

TCP(S-1)-08A

DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT

REVISIONS
8-08

CONT	SECT	JOB	HIGHWAY
1507	02	016,Etc.	FM696,Etc.

DIST	COUNTY	SHEET NO.
BRY	BURLESON	38

DATE: 9/25/2020 5:16:56 AM
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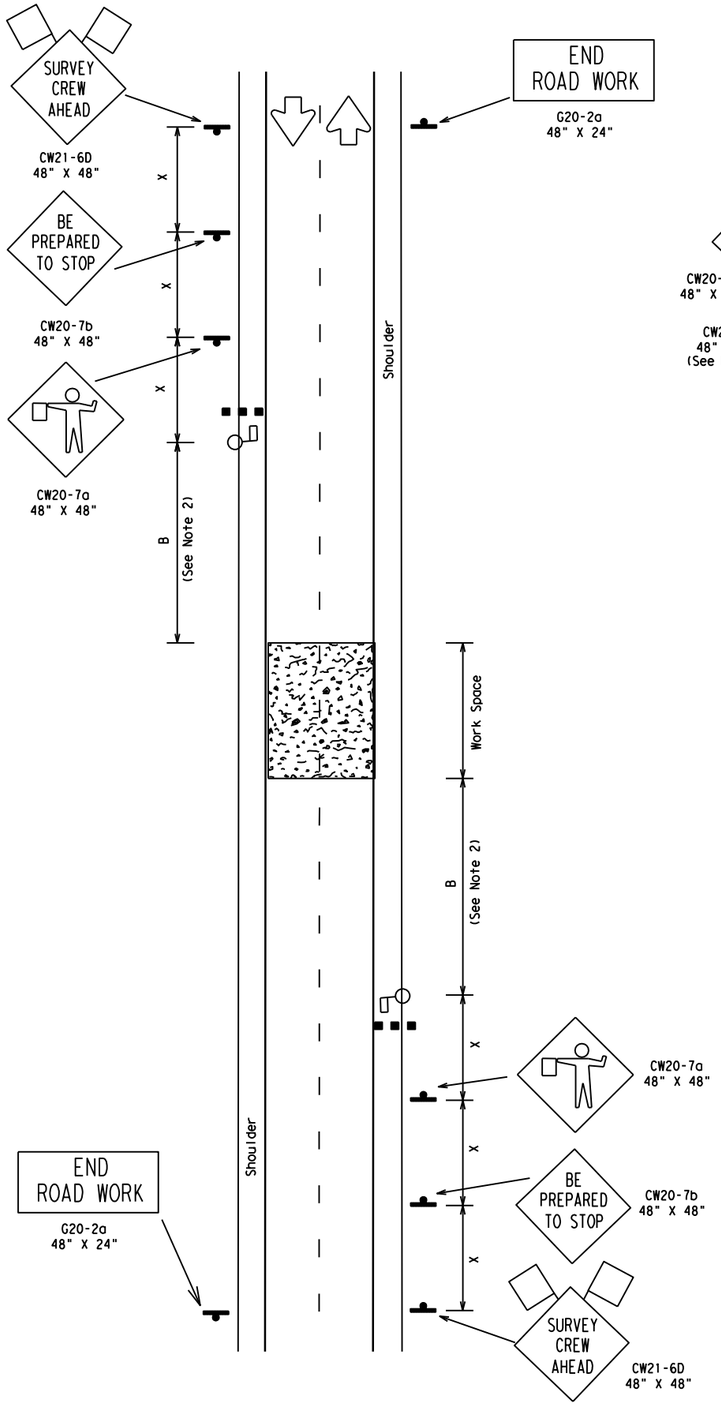
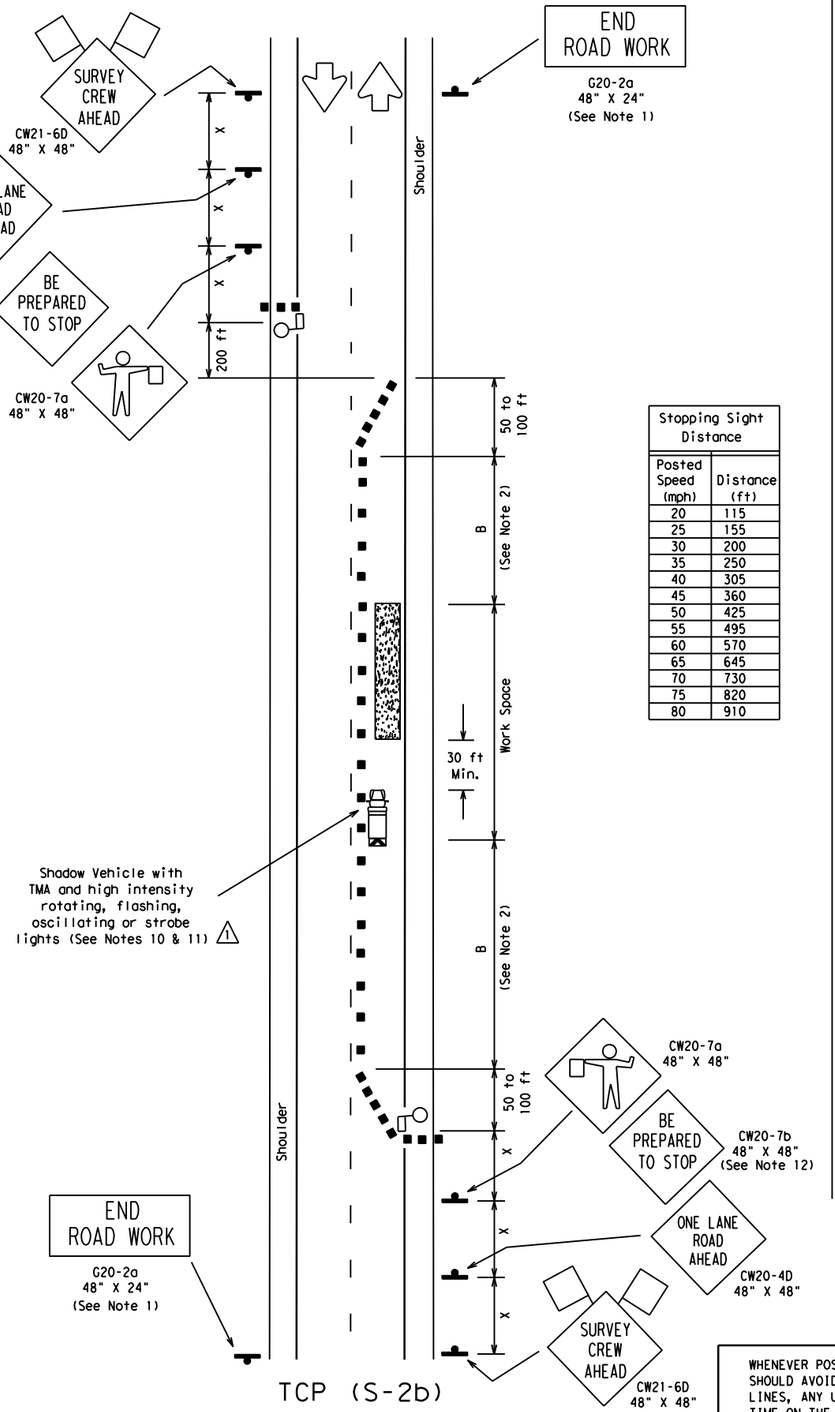


TCP (S-2a)
ROAD CLOSED FOR LESS THAN 20 MINUTES -
OFF PEAK TRAFFIC HOURS
WITH OR WITHOUT SHOULDERS



TCP (S-2b)
WORK IN ROADWAY
OFF PEAK TRAFFIC HOURS
WITH OR WITHOUT SHOULDERS

Stopping Sight Distance	
Posted Speed (mph)	Distance (ft)
20	115
25	155
30	200
35	250
40	305
45	360
50	425
55	495
60	570
65	645
70	730
75	820
80	910

Posted Speed ✳	Formula	Minimum Desirable Taper Lengths ✳✳ 10' Offset	11' Offset	12' Offset	Suggested Maximum Spacing of Device On a Taper	On a Tangent	Min. Sign Spacing "X" Distance	Longitudinal Buffer Space "B"
30	$L = \frac{WS^2}{60}$	150'	165'	180'	30'	60'-75'	120'	90'
35		205'	225'	245'	35'	70'-90'	160'	120'
40		265'	295'	320'	40'	80'-100'	240'	155'
45	L=WS	450'	495'	540'	45'	90'-110'	320'	195'
50		500'	550'	600'	50'	100'-125'	400'	240'
55		550'	605'	660'	55'	110'-140'	500'	295'
60		600'	660'	720'	60'	120'-150'	600'	350'
65		650'	715'	780'	65'	130'-165'	700'	410'
70		700'	770'	840'	70'	140'-175'	800'	475'
75		750'	825'	900'	75'	150'-185'	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
	✓	✓		

DEFINITIONS:
SHORT DURATION - work that occupies a location up to 1 hour.
SHORT TERM STATIONARY - daytime work that occupies a location for more than 1 hour within a single daylight period.

GENERAL NOTES:
1. The G20-2a "END ROAD WORK" sign may be placed on the back of the CW21-6D "SURVEY CREW AHEAD" sign or may be omitted for short duration (less than 1 hour) work.
2. Adequate Stopping Sight Distance (see Stopping Sight Distance table) should be maintained from approaching traffic to the flagger or a queue of stopped vehicles. The Buffer Space "B" should be extended around curves or other obstacles, when necessary, to have adequate Stopping Sight Distance to the flagger station.
3. Flaggers should use two-way radios or other means of communication while flagging.
4. The length of the work space should be based on the ability of the flaggers to communicate.
5. CW20-1D "ROAD WORK AHEAD" signs may be substituted for CW21-6D "SURVEY CREW AHEAD" signs.
6. The CW21-6D "SURVEY CREW AHEAD" sign for low volume intersecting side roads is desirable, but is not required when working less than 15 minutes in area of the side road, as determined by the Engineer.

TCP(S-2a)

7. Road closures shall be less than 20 minutes. Closures less than 5 minutes are desirable.
8. Sign spacing should be increased if traffic repeatedly queues past the CW20-7b "BE PREPARED TO STOP" sign.
9. The surveying instrument should not be located on the paved surface.

TCP (S-2B)

10. For short duration work the Shadow Vehicle with a TMA may be replaced by another Work Vehicle with high intensity rotating, flashing or strobe lights.
11. Shadow Vehicles with a TMA are desirable when workers or equipment are in the work space. When approved by the engineer, Type III barricades or other channelizing devices may be substituted for the Shadow Vehicle.
12. The CW20-7b "BE PREPARED TO STOP" sign is optional. When used, it should be installed after the CW20-4D "ONE LANE ROAD AHEAD" sign.

WHENEVER POSSIBLE, SURVEY PARTIES SHOULD AVOID, BY THE USE OF OFFSET LINES, ANY UNNECCESSARY PERIODS OF TIME ON THE ROAD SURFACE.

8-18-08 Revision
1 Corrected referrence to notes.

Texas Department of Transportation
Traffic Operations Division

TRAFFIC CONTROL PLAN FOR SURVEYING OPERATIONS

TCP(S-2)-08A

REVISIONS	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
8-08	CONT	SECT	JOB	HIGHWAY
	1507	02	016,Etc.	FM696,Etc.
	DIST	COUNTY		SHEET NO.
	BRY	BURLESON		39

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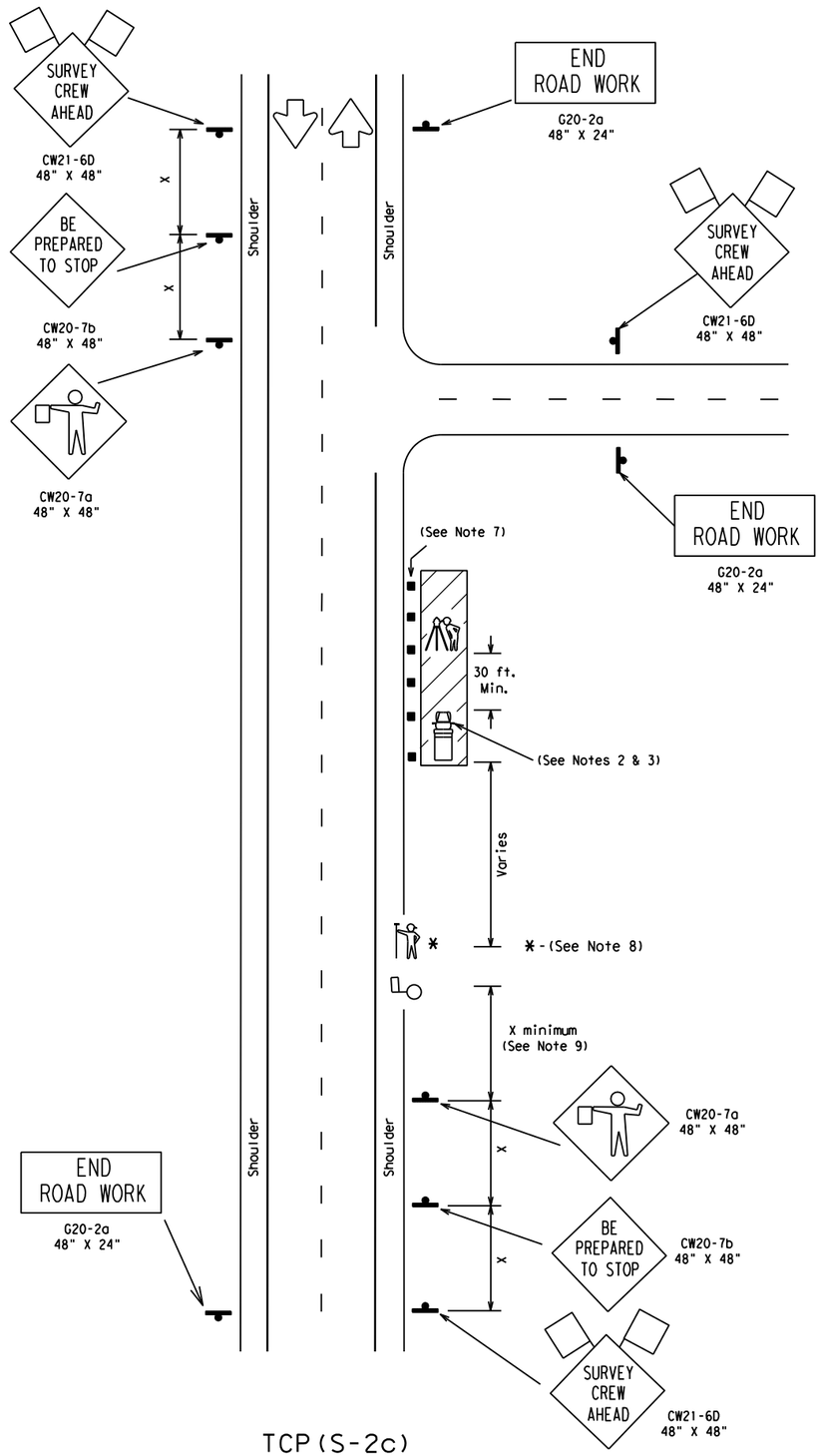

TCP(S-2c)

Stopping Sight Distance	
Posted Speed (mph)	Distance (ft)
20	115
25	155
30	200
35	250
40	305
45	360
50	425
55	495
60	570
65	645
70	730
75	820
80	910

Posted Speed ⁎	Formula	Minimum Desirable Taper Lengths ⁎⁎ 10' Offset	11' Offset	12' Offset	Suggested Maximum Spacing of Device On a Taper	On a Tangent	Min. Sign Spacing "X" Distance	Longitudinal Buffer Space "B"
30	$L = \frac{WS^2}{60}$	150'	165'	180'	30'	60'-75'	120'	90'
35		205'	225'	245'	35'	70'-90'	160'	120'
40		265'	295'	320'	40'	80'-100'	240'	155'
45	L=WS	450'	495'	540'	45'	90'-110'	320'	195'
50		500'	550'	600'	50'	100'-125'	400'	240'
55		550'	605'	660'	55'	110'-140'	500'	295'
60		600'	660'	720'	60'	120'-150'	600'	350'
65		650'	715'	780'	65'	130'-165'	700'	410'
70		700'	770'	840'	70'	140'-175'	800'	475'
75		750'	825'	900'	75'	150'-185'	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
	✓	✓		

DEFINITIONS:

MOBILE - work that moves continously or intermittently (stopping up to approximately 15 minutes).

SHORT DURATION - work that occupies a location up to 1 hour.

SHORT TERM STATIONARY - daytime work that occupies a location for more than 1 hour within a single daylight period.

GENERAL NOTES:

1. The G20-2a "END ROAD WORK" sign may be placed on the back of the CW21-6D "SURVEY CREW AHEAD" sign or may be omitted for short duration (less than 1 hour) work.
2. Work Vehicle with high intensity rotating, flashing, oscillating or strobe lights should be used to protect work space.
3. When approved by the engineer, Type III barricades or other channelizing devices may be substituted for the Heavy Work Vehicle.
4. CW20-1D "ROAD WORK AHEAD" signs may be substituted for CW21-6D "SURVEY CREW AHEAD" SIGNS.
5. The CW21-6D "SURVEY CREW AHEAD" sign for low volume intersecting side roads may be omitted when approved by the Engineer.
6. The Surveying Instrument shall not be located on the paved surface.
7. Cones at edge of pavement adjacent to instrument person may be omitted when approved by the Engineer.
8. Rodman may only enter roadway when accompanied by flagger and as traffic allows.
9. The distance between the advance warning signs and the work should not exceed a two mile maximum.
10. Flaggers and Survey Crew should use two-way radios or other means of communication.
11. Survey Crew and Flaggers shall wear high-visibility apparel meeting the ANSI 107-2007 standard performance for Class 2 or Class 3 risk exposure.
12. Additional traffic control devices may be required to address local site conditions.
13. Stopping Sight Distance shall be maintained from approaching traffic to the flagger. See "Stopping Sight Distance" table.

SURVEY PARTIES SHOULD AVOID ANY UNNECCESSARY PERIODS OF TIME ON THE ROAD SURFACE.

This TCP is to cover two lane rural type roadways as determined by the Engineer. All other type roadways will be covered by other established Survey TCP'S.

Texas Department of Transportation
Traffic Operations Division

TRAFFIC CONTROL PLAN FOR SURVEYING OPERATIONS

TCP(S-2c)-10

REVISIONS

DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT

CONT	SECT	JOB	HIGHWAY
1507	02	016, Etc.	FM696, Etc.

DIST	COUNTY	SHEET NO.
BRY	BURLESON	40

212A

DATE: 9/25/2020 5:17:09 AM
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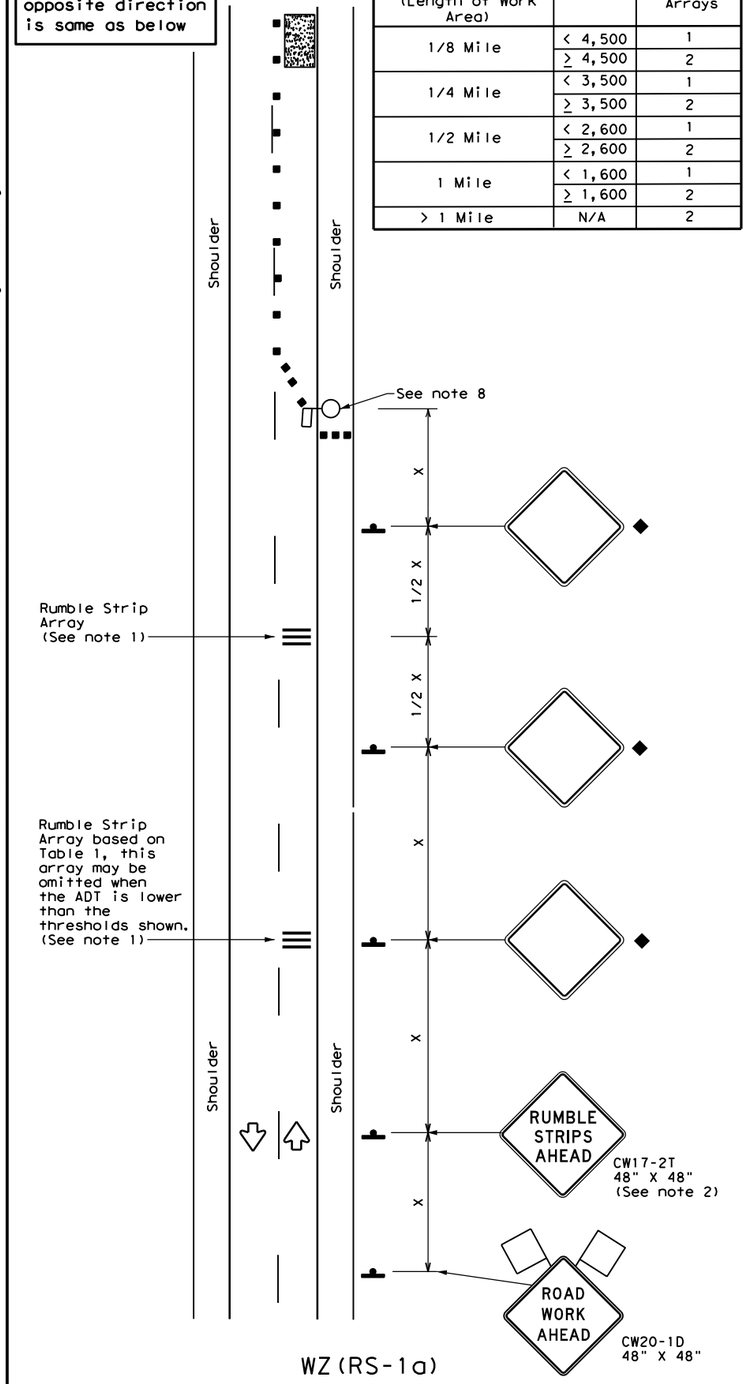
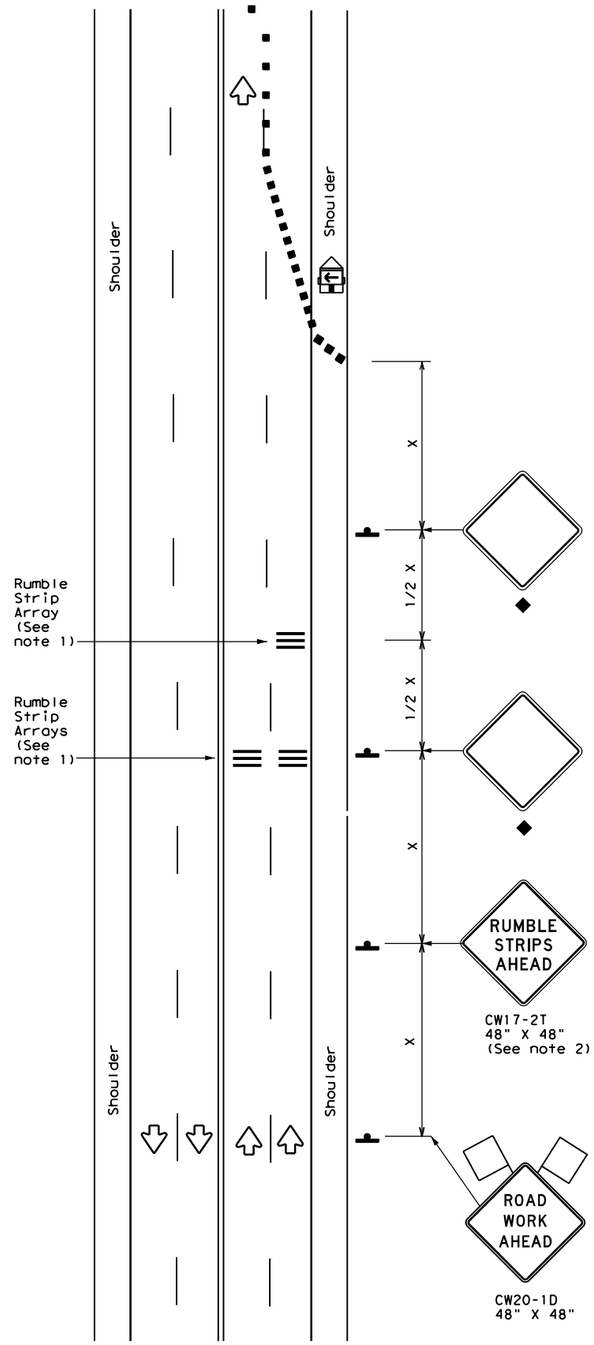
Warning sign and rumble strip sequence in opposite direction is same as below



WZ(RS-1a)
75 mph or Less

RUMBLE STRIPS ON ONE-LANE TWO-WAY APPLICATION

TABLE 1		
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-1b)
75 mph or Less

RUMBLE STRIPS FOR LANE CLOSURE ON CONVENTIONAL ROADWAY

GENERAL NOTES

1. 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.
2. 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.
3. Temporary Rumble Strips will be considered subsidiary to Item 502, and shall be a product listed on the Compliant Work Zone Traffic Control Devices.
4. Removal of the Temporary Rumble Strips should be accomplished before removing the advance warning signs.
5. Temporary Rumble Strips should not be used on horizontal curves, loose gravel, soft or bleeding asphalt, heavily rutted pavements or unpaved surfaces.
6. Temporary Rumble Strips shall be installed and maintained as per manufacturer's recommendations.
7. This standard sheet shall be used in conjunction with other appropriate TCP standard, TMUTCD typical application or project specific detail for the project.
8. The one-lane two-way application may utilize a flagger, an AFAD or a portable traffic signal.
9. Temporary Rumble Strips may be used on freeways or expressways based on engineering judgment.

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

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

* Conventional Roads Only

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

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

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

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

Texas Department of Transportation

Traffic Operations Division Standard

TEMPORARY RUMBLE STRIPS

WZ(RS)-16

FILE: wzrs16.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2012	CONT	SECT	JOB	HIGHWAY
REVISIONS	1507	02	016, ETC.	FM 696, Etc.
2-14	DIST	COUNTY		SHEET NO.
4-16	BRY	BURLESON		41

DATE:
FILE:

DATE: 9/25/2020 5:17:28 AM
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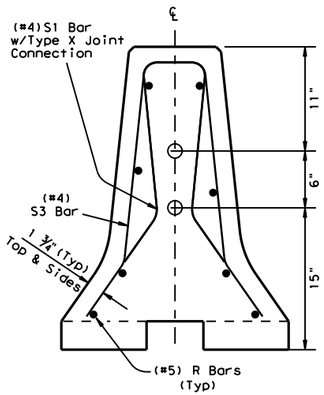
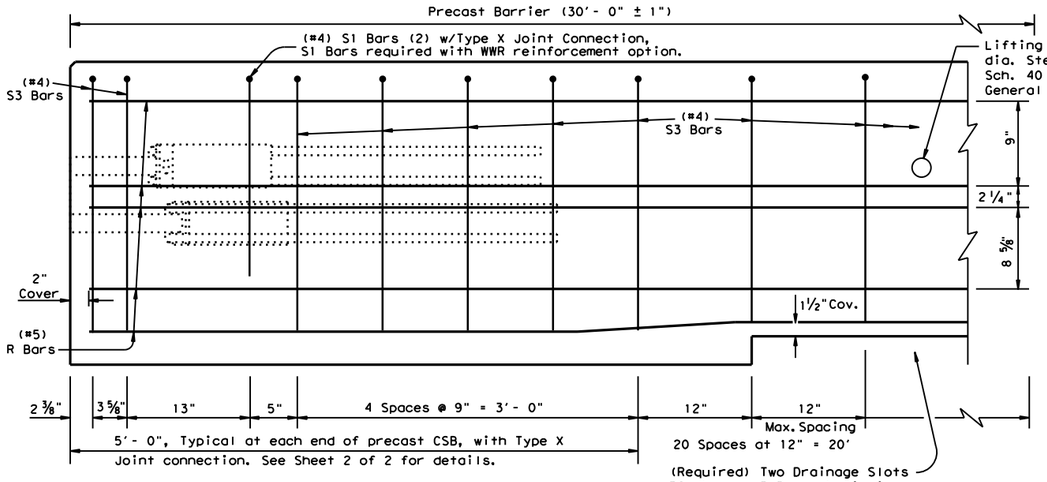


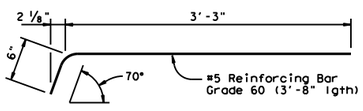
End View
Precast Barrier

See sheet 2 of 3 for Joint connection Type X



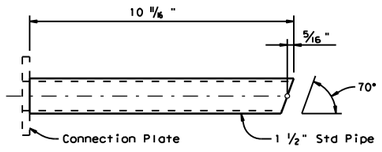
Reinforcement for Precast (CSB)
Concrete Safety Barrier (Type 1)

Showing reinforcement for Joint Type X



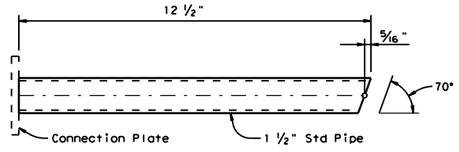
DEFORMED BAR ANCHOR DETAILS

Two (2) Bars required per assembly.
Eight (8) required per Joint.



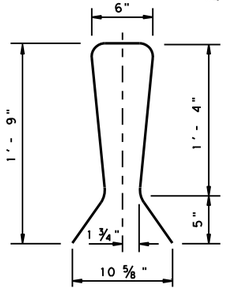
UPPER CONNECTION PIPE DETAILS

One (1) Steel Pipe required per Upper Assembly.
Two (2) required per Joint.

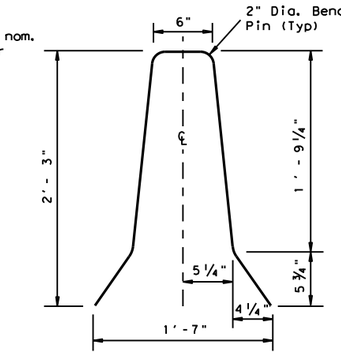


LOWER CONNECTION PIPE DETAILS

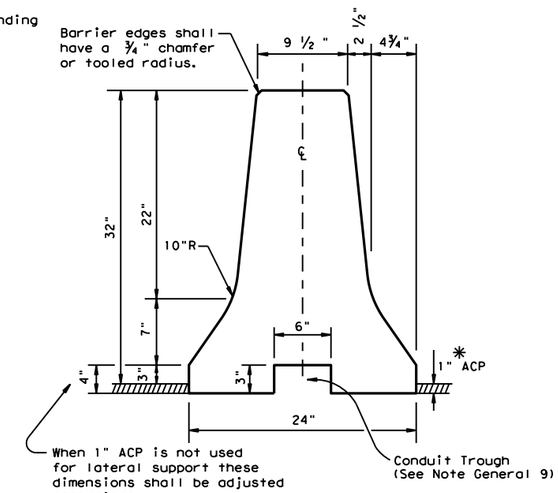
One (1) Steel Pipe required per Lower Assembly.
Two (2) required per Joint.



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



S3 Bar
#4 Bar

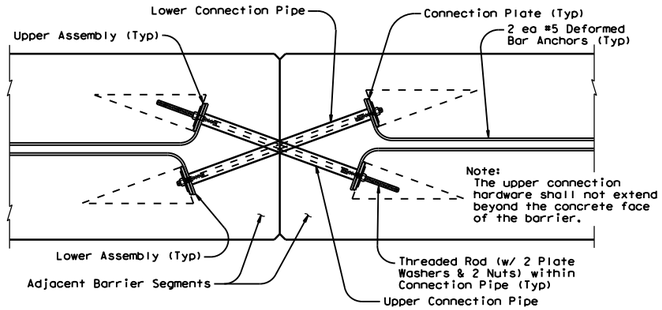


Concrete Safety Barrier

✱ 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.

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 ¾" 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.



TYPE X JOINT INSTALLATION DETAIL

Barrier reinforcing and Type X Joint Leave-Out dimensions not shown for clarity.

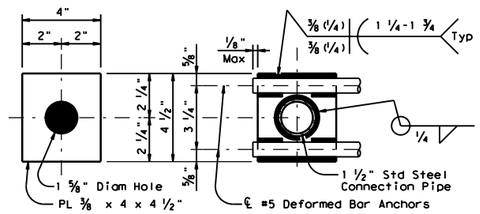
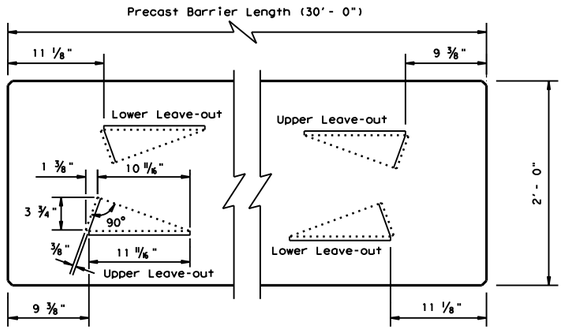


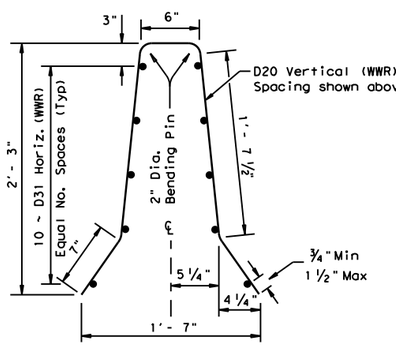
PLATE DIMENSIONS WELDING DETAILS

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.



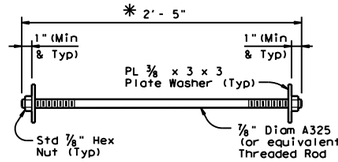
BARRIER PLAN AT END JOINTS



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

(WWR) General Notes

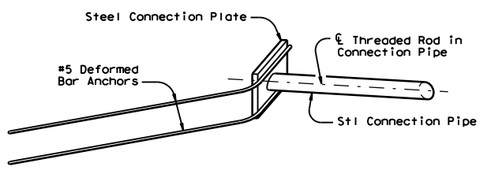
1. Deformed Welded Wire Reinforcement (WWR) shall conform to ASTM A497.
2. Welded wire cage may be cut or bent to accommodate the Type X joint connection and drainage slots, as directed by the Engineer.
3. All reinforcement shall comply with Item 440, "Reinforcing Steel."
4. Combinations of reinforcing 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.

SHEET 1 OF 2

Texas Department of Transportation

Design Division Standard

CONCRETE SAFETY BARRIER (F-SHAPE)

PRECAST BARRIER
(TYPE 1)

CSB(1)-10

FILE: csb110.dgn	DN: TxDOT	CK: AM	DW: BD	CK: VP
©TxDOT December 2010	CONT	SECT	JOB	HIGHWAY
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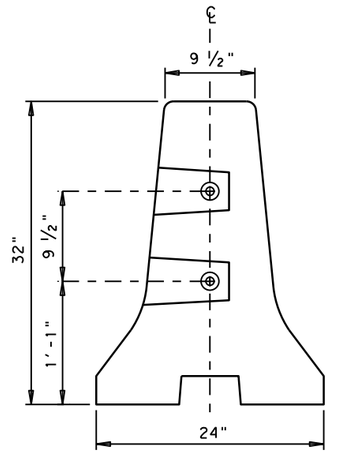
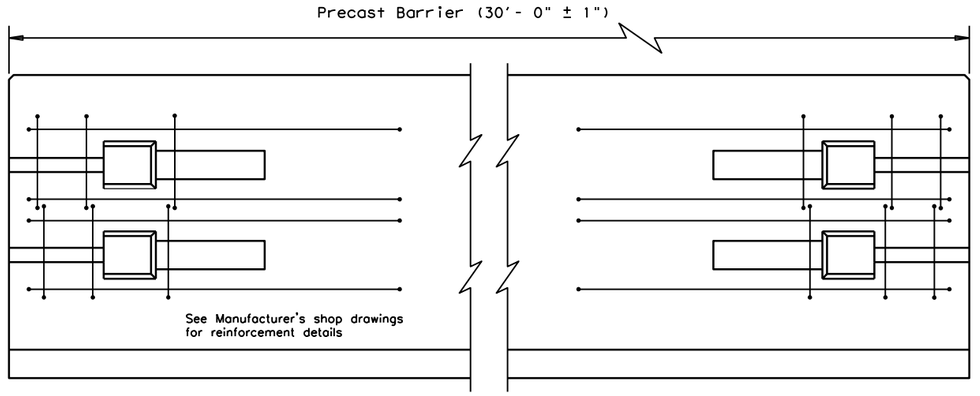
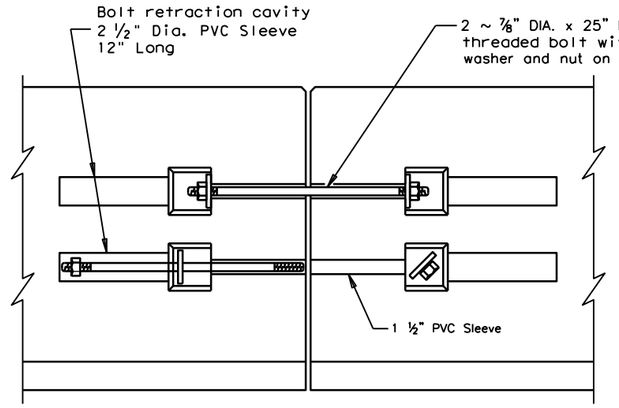


END VIEW (CSB) QUICK-BOLT
QUICK-BOLT POCKET LOCATIONS

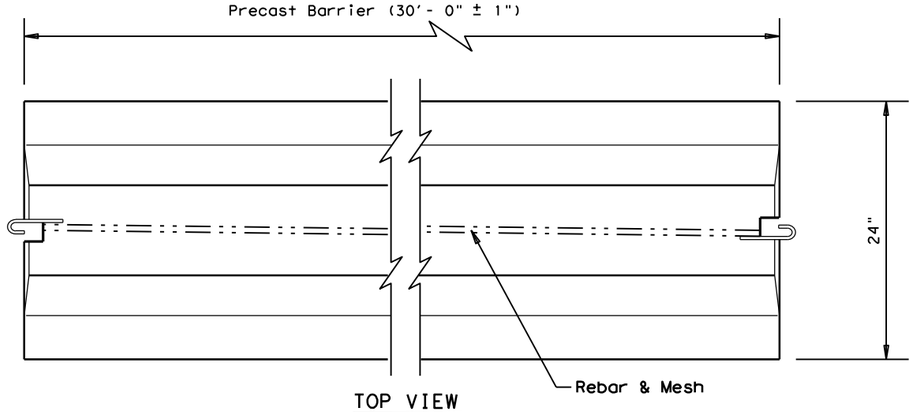


ELEVATION (CSB) QUICK-BOLT
See Manufacturer's shop drawing for additional details

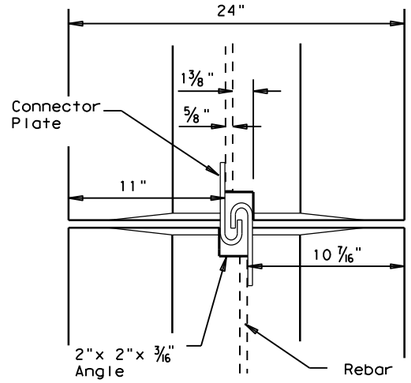


ELEVATION VIEW SHOWING JOINT CONNECTION
"QUICK-BOLT"

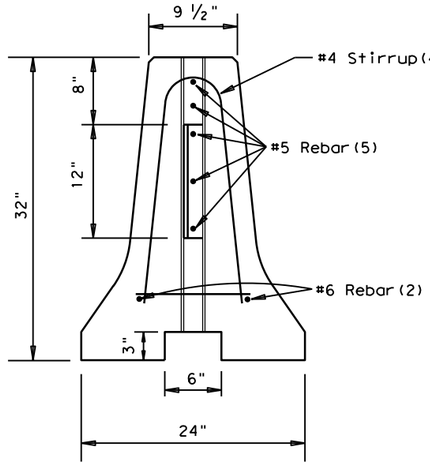
Joint Connection (Type Q)



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



VIEW FROM ABOVE
J-J HOOK CONNECTION



END VIEW
J-J HOOK CONNECTION

Joint Connection (Type J)

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.

Texas Department of Transportation
Design Division Standard

CONCRETE SAFETY BARRIER (F-SHAPE)

PRECAST BARRIER
(TYPE 1)

CSB(1)-10

FILE: csb110.dgn	DN: TxDOT	CK: AM	DW: BD	CK: VP
© TxDOT December 2010	CONT	SECT	JOB	HIGHWAY
REVISIONS	1507	02	016, Etc.	FM696, Etc.
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	BRY	BURLESON		43

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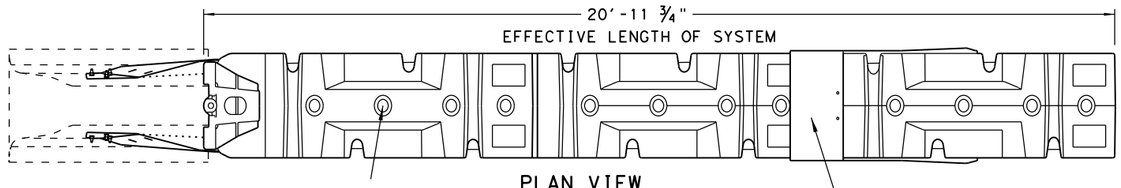
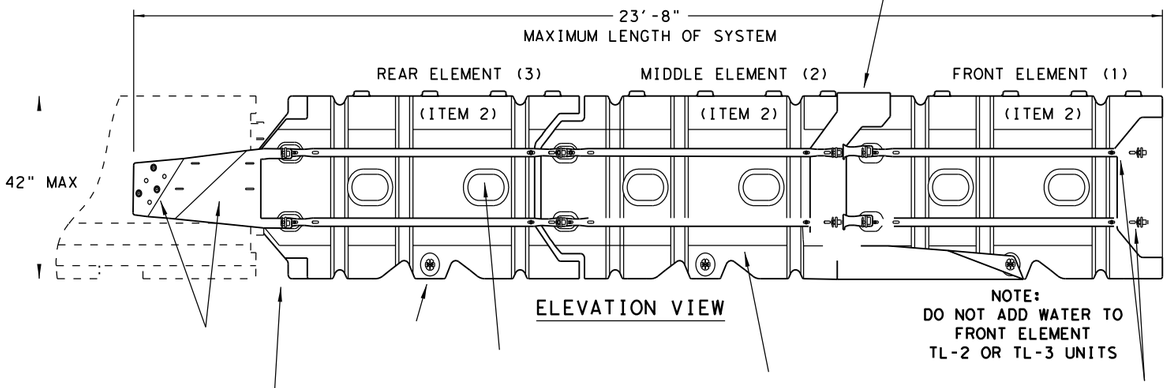
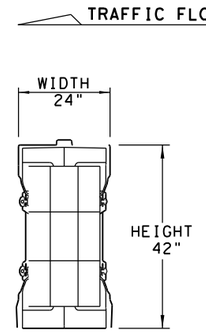
SYSTEM SHOWN - ABSORB-M TL-3



PLAN VIEW



ELEVATION VIEW



SECTION A-A

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"

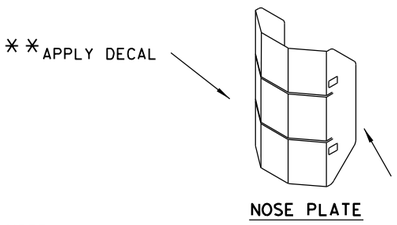
GENERAL NOTES

1. 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
2. THE ABSORB-M SYSTEM IS ONLY APPROVED FOR USE IN (TEMPORARY WORK ZONE) LOCATIONS.
3. 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.
4. MAXIMUM PERMISSIBLE CROSS-SLOPE IS 8%.
5. THE INSTALLATION AREA SHOULD BE FREE FROM CURBS, ELEVATED OBJECTS, OR DEPRESSIONS.
6. THE ABSORB-M SHOULD BE LOCATED APPROXIMATELY PARALLEL WITH THE BARRIER.
7. THE USE OF THE ABSORB-M IS RESTRICTED TO A BARRIER HEIGHT OF UP TO 42 INCHES.
8. 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

DELINEATION DECAL PLACEMENT GUIDE



NOSE PLATE

** NOTE: (PROVIDED BY OTHERS)
ENGINEER OR CONTRACTOR SHALL COORDINATE WITH THE MANUFACTURER FOR THE CORRECT DECAL PER TRAFFIC FLOW, LEFT, RIGHT OR BOTH-SIDES.

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.

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

SACRIFICIAL

Texas Department of Transportation — Design Division Standard

LINDSAY TRANSPORTATION SOLUTIONS
CRASH CUSHION
(MASH TL-3 & TL-2)
TEMPORARY - WORK ZONE
ABSORB(M)-19

FILE: absorbm19	DN: TxDOT	CK: KM	DW: VP	CK:
© TxDOT: JULY 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	1507	02	016, Etc.	FM696, Etc.
	DIST	COUNTY		SHEET NO.
	BRY	BURLESON		45

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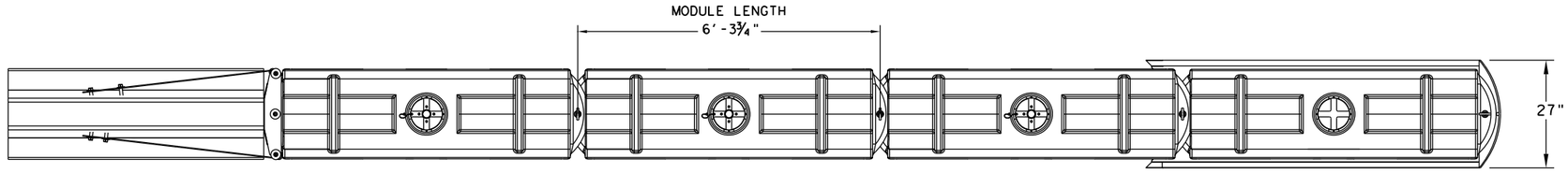
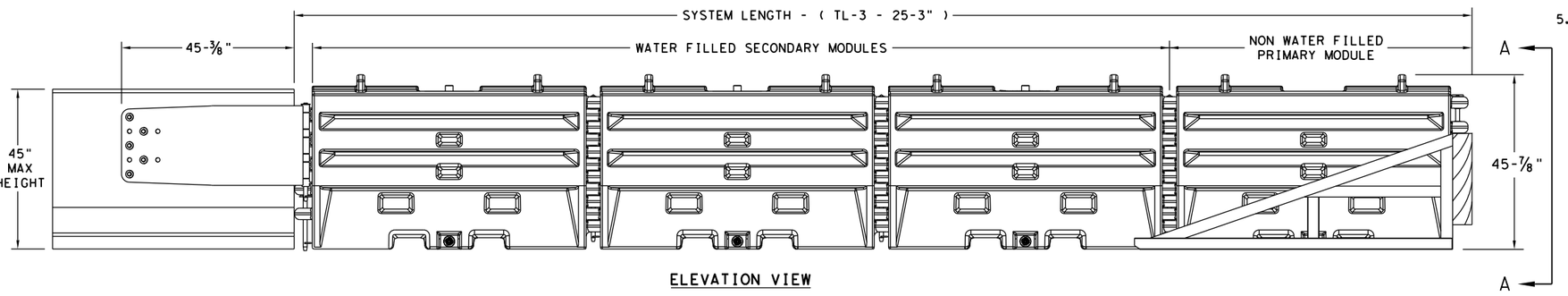


PLAN VIEW



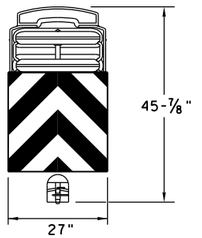
ELEVATION VIEW

GENERAL NOTES

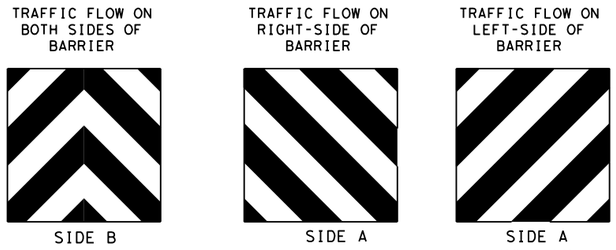
1. REFER TO THE INSTALLATION MANUAL FOR SPECIFIC SYSTEM ASSEMBLY AND MODULE ORIENTATION. FOR ADDITIONAL INFORMATION, CONTACT TRAFFIX, INC. AT (949) 361-5663.
2. THE SLED SYSTEM IS A MASH APPROVED TEST LEVEL 3 (TL-3) CRASH CUSHION APPROVED FOR USE IN TEMPORARY WORK ZONES. THE SLED SYSTEM IS A NON-REDIRECTIVE, 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

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

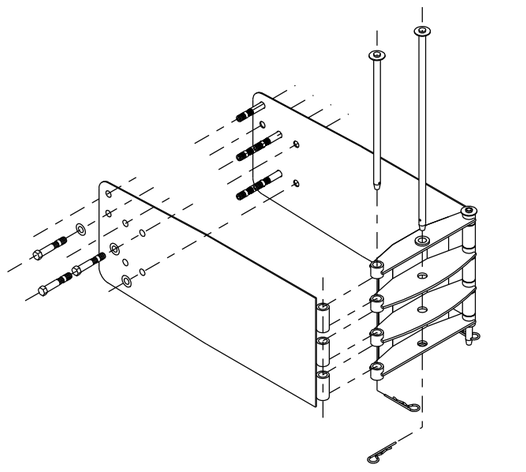


SECTION A-A



NOSE SHEETING PANEL DELINEATION

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



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 MFGR FOR PROPER TRANSITION)
SLED TRANSITION TO PLASTIC TRAFFIC BARRIER (CONTACT MFGR FOR PROPER TRANSITION)
SLED TRANSITION TO W-BEAM OR THRIE BEAM GUARD RAIL (CONTACT MFGR 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

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

Texas Department of Transportation

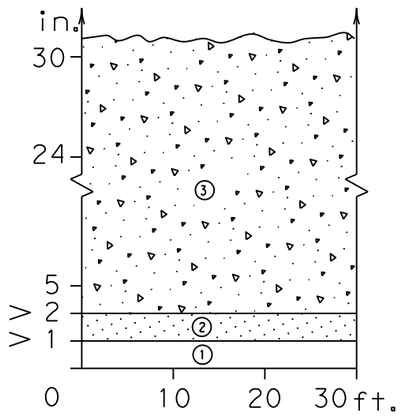
Design Division Standard

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

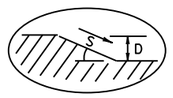
FILE: sled19.dgn	DN: TxDOT	CK: KM	DW: VP	CK:
©TxDOT: DECEMBER 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	1507	02	016, Etc.	FM696, Etc.
	DIST	COUNTY		SHEET NO.
	BRY	BURLESON		46

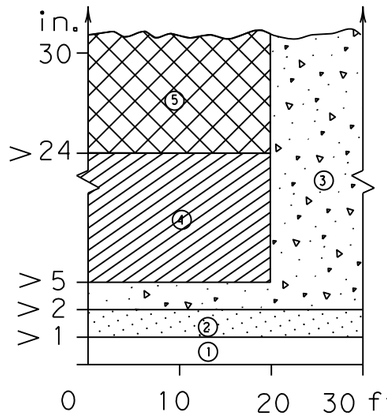
DEFINITION OF TREATMENT ZONES FOR VARIOUS EDGE CONDITIONS

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

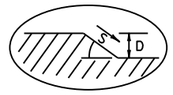


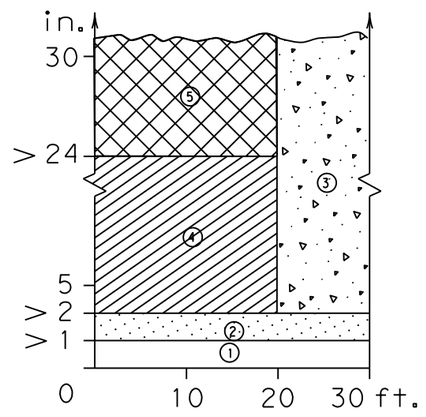
Edge Condition I
S = (3:1) (or flatter)



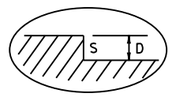


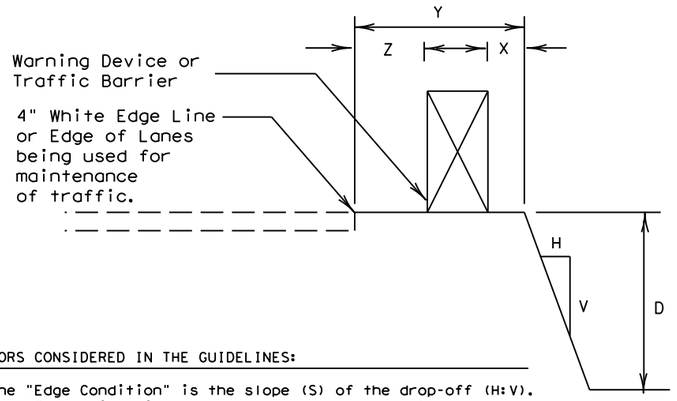
Edge Condition II
S = ((2.99):1) to (1:1)





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





FACTORS CONSIDERED IN THE GUIDELINES:

1. The "Edge Condition" is the slope (S) of the drop-off (H:V). The "Edge Height is the depth of the drop-off "D".

2. Distance "X" is to be the maximum practical under job conditions. Two feet minimum for high speed conditions. Distance "Y" is the lateral clearance from edge of travel lane to edge of dropoff. Distance "Z" does not have a minimum.

3. In addition to the factors considered in the guidelines, each construction zone drop-off situation should be analyzed individually, taking into account other variables, such as: traffic mix, posted speed in the construction zone, horizontal curvature, and the practicality of the treatment options.

4. The conditions for indicating the use of positive or protective barriers are given by Zone-5 and Figure-1. Traffic barriers are primarily applicable for high speed conditions. Urban areas with speeds of 30 mph or less may have a lesser need for signing, delineation, and barriers. Right-angled edges, however, with "D" greater than 2 inches and located within a lateral offset of 6 feet, may indicate a higher level of treatment.

5. If the distance "Y" must be less than 3 feet, the use of a positive barrier may not be feasible. In such a case, consider either: 1) narrowing the lanes to a desired 11 to 12 feet or 10 foot minimum (see CW20-8 sign), or 2) provide an edge slope such as Edge Condition I.

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

Edge Condition Notes:

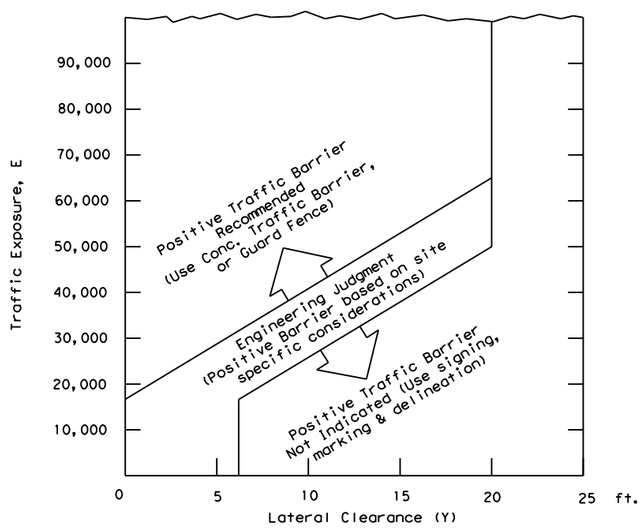
1. Edge Condition I: Most vehicles are able to traverse an edge condition with a slope rate of (3 to 1) or flatter. The slope must be constructed with a compacted material capable of supporting vehicles.

2. Edge Condition II: Most vehicles are able to traverse an edge condition with a slope between (2.99 to 1) and (1to 1) so long as "D" does not exceed 5 inches. Under-carriage drag on most automobiles will occur when "D" exceeds 6 inches. As "D" exeeds 24 inches, the possibility for rollover is greater in most vehicles.

3. Edge Condition III: When slopes are greater than (1 to 1) and where "D" is greater than 2 inches, a more difficult control factor may exist for some vehicles, if not properly treated. For example, where "D" is greater than 2 inches and up to 24 inches different types of vehicles may experience different steering control at different edge heights. Automobiles might experience more steering control differential when "D" is greater than 2 inches and up to 5 inches. Trucks, particularly those with high loads, have more steering control differential when "D" is greater than 5 inches and up to 24 inches. When "D" exceeds 24 inches, the possibility of rollover is greater for most vehicles.

4. Milling or overlay operations that result in Edge Condition III should not be in place without appropriate warning treatments, and these conditions should not be left in place for extended periods of time.

FIGURE-1: CONDITIONS INDICATING USE OF POSITIVE BARRIER FOR ZONE 5 (▨)



1 E = ADT x T
Where ADT is that portion of the average daily traffic volume traveling within 20 feet (generally two adjacent lanes) of the edge dropoff condition; and, T is the duration time in years of the dropoff condition.

2 Figure-1 provides a practical approach to the use of positive barriers for the protection of vehicles from pavement drop-offs. Other factors, such as the presence of heavy machinery, construction workers, or the mix and volume of traffic may make the use of positive barriers appropriate, even when the edge condition alone may not justify the use of a barrier.

3 An approved end treatment should be provided for any positive barrier end located within a lateral offset of 20 feet from the edge of the travel lane.

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

Engineer's Seal

12/18/2020

Texas Department of Transportation

WORKSHEET FOR EDGE CONDITION TREATMENT TYPES

©TxDOT August 2000	DN: GRB	CK: JEB	DW: BGD	CK: CAL
REVISIONS 03-01 08-01 correct typos	STATE DISTRICT: BRY	FEDERAL REGION: 6	FEDERAL AID PROJECT	SHEET: 47
COUNTY: BURLESON	CONTROL: 1507	SECTION: 02	JOB: 016, Etc.	HIGHWAY: FM696, Etc.

LEVELS DISPLAYED
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63

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DATE: 9/25/2020
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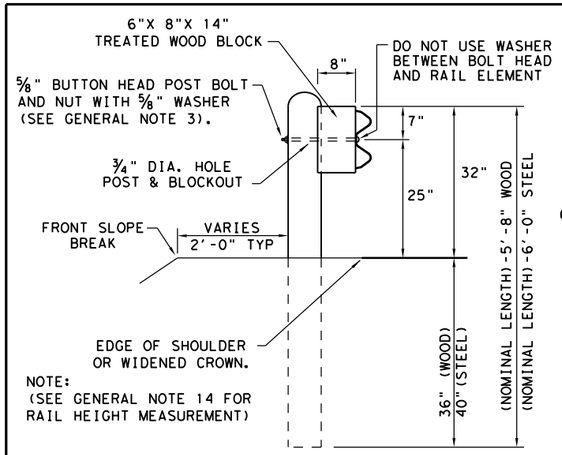
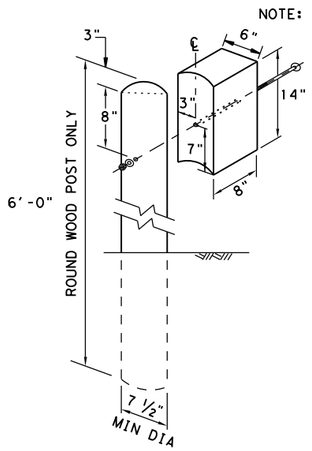
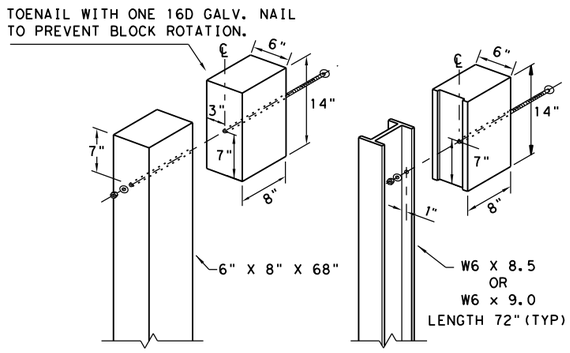


TYPICAL POST PLACEMENT



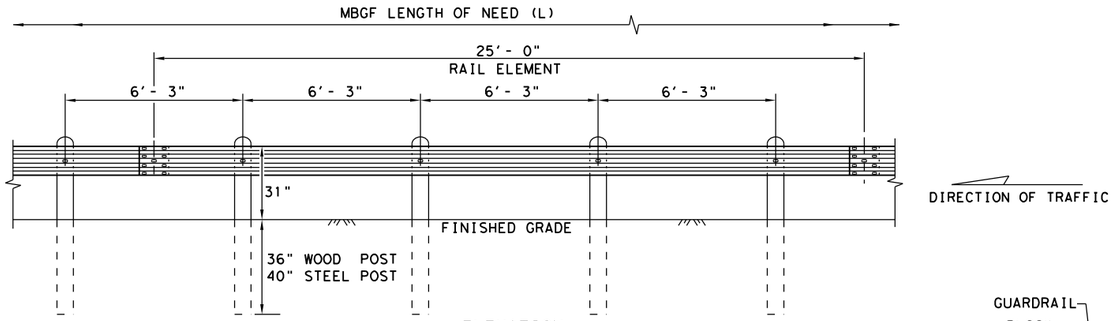
WOOD BLOCK TO
ROUND WOOD POST



WOOD BLOCK TO
RECTANGULAR WOOD POST

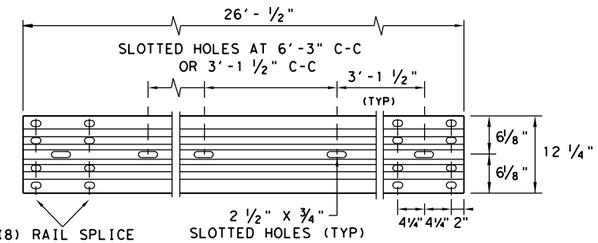
ROUTED WOOD BLOCK
TO I-BEAM STEEL POST

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



ELEVATION
MID-SPAN RAIL SPLICE

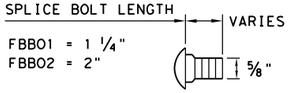
SHOWING A 25'- 0" SECTION OF W-BEAM RAIL. (SEE GENERAL NOTE 2)



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

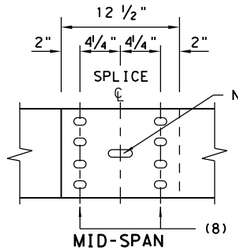
NOTES: SEE GENERAL NOTE 2 FOR ALLOWABLE RAIL TYPES.
SEE RAIL SPLICE DETAIL FOR REQUIRED HARDWARE.

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



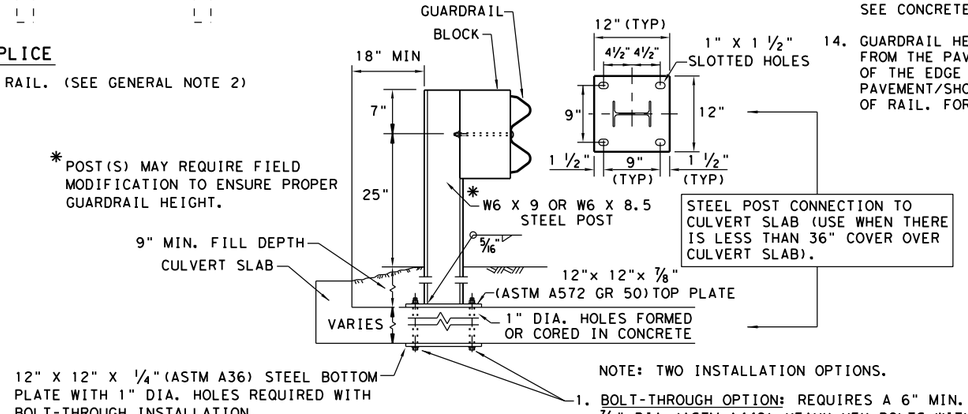
BUTTON HEAD BOLT

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.



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

12" X 12" X ¼"(ASTM A36) STEEL BOTTOM PLATE WITH 1" DIA. HOLES REQUIRED WITH BOLT-THROUGH INSTALLATION.

LOW FILL CULVERT POST

NOTE: TWO INSTALLATION OPTIONS.

1. BOLT-THROUGH OPTION: REQUIRES A 6" MIN. SLAB THICKNESS. ⅞" DIA (ASTM A449) HEAVY HEX BOLTS WITH TWO HARDENED WASHER EACH AND HEAVY HEX NUTS.
   NOTE: BOLT LENGTH = SLAB PLUS 2 ¼" MIN.

2. EPOXY ANCHOR OPTION: THIS OPTION MAY ONLY BE USED IF THE CULVERT SLAB IS 9" MIN. THICK. THREADED ANCHOR RODS MUST BE ⅞" DIA. ASTM A449 OR A193 GRADE B7 WITH HEAVY HEX NUT, AND ONE HARDENED WASHER EACH. EMBED ANCHOR RODS 6" WITH HILTI HIT RE 500 EPOXY ADHESIVE. OTHER TYPE III CLASS C EPOXY ADHESIVES MEETING THE REQUIREMENTS OF DMS-6100, "EPOXIES AND ADHESIVES", MAY BE USED IF IT CAN BE DEMONSTRATED THAT THEY MEET OR EXCEED THE STRENGTH OF HILTI HIT RE 500 WITH THE SAME EMBEDMENT DEPTH AND THREADED ROD DIA. FOLLOW THE MANUFACTURER'S REQUIREMENTS FOR INSTALLING EPOXIED THREADED RODS. EXTEND RODS ¼" MIN. BEYOND NUT.

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

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 ½" 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 ⅝" WASHER (FWC16a) 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.

NOTE: TRANSISTIONS TO BRIDGE RAILS OR TRAFFIC BARRIERS.
SEE GF(31)TL3 TR STANDARD FOR HIGH-SPEED TL-3 TRANSITIONS.
SEE GF(31)TL2 TR STANDARD FOR LOW-SPEED TL-2 TRANSITIONS.

Texas Department of Transportation — Design Division Standard

METAL BEAM GUARD FENCE
TL-3 MASH COMPLIANT
GF(31)-19

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©TxDOT: NOVEMBER 2019	CONT	SECT	JOB	HIGHWAY	
REVISIONS	1507	02	016,Etc.	FM696,Etc.	
	DIST	COUNTY		SHEET NO.	
	BRY	BURLESON		49	

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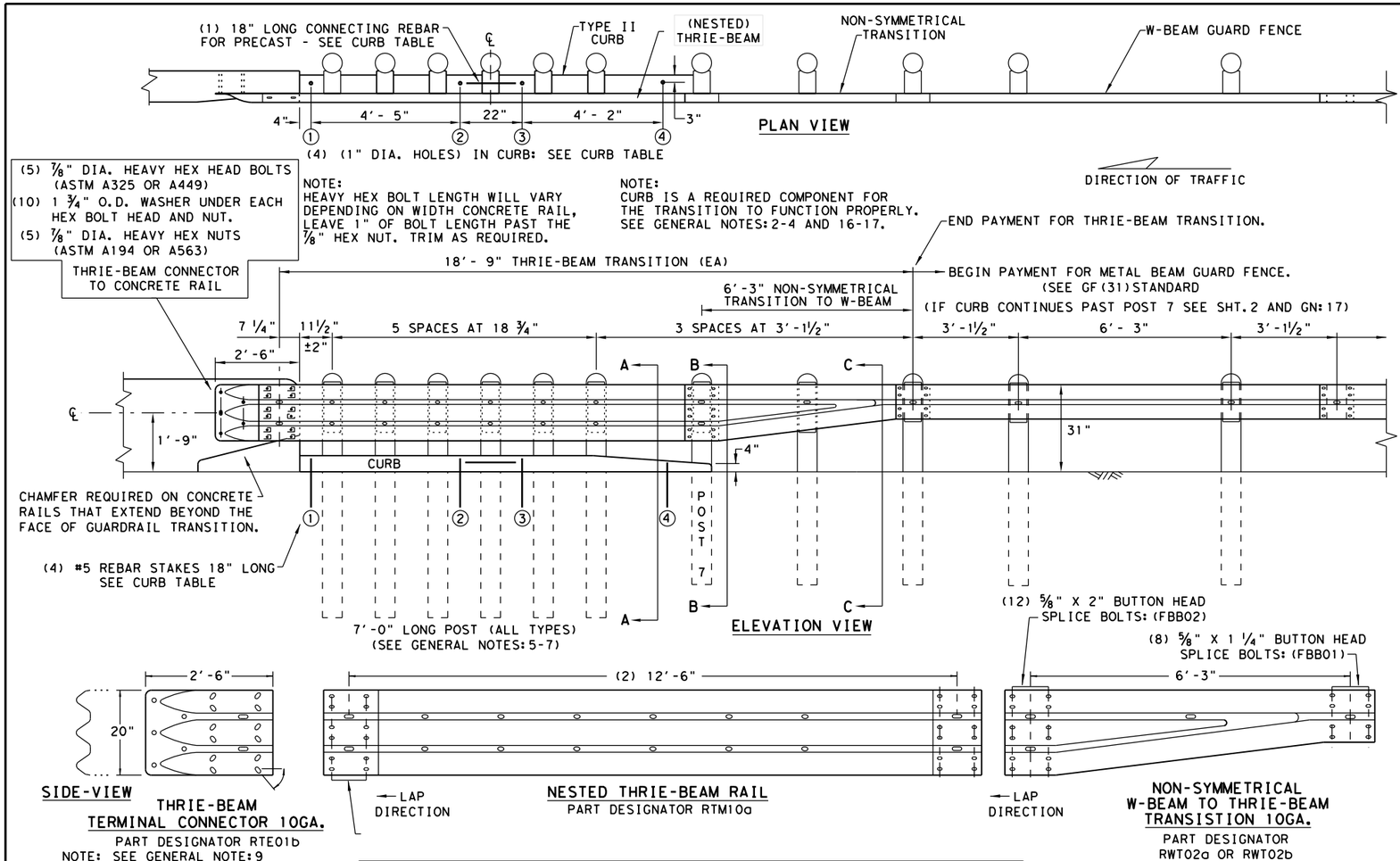
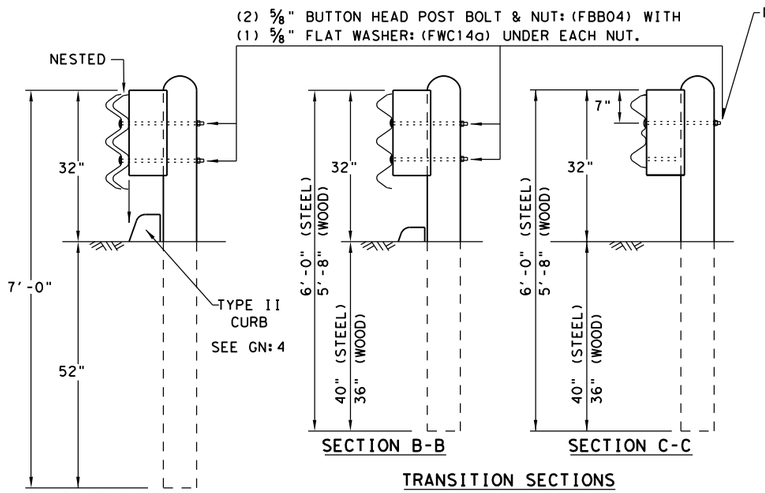


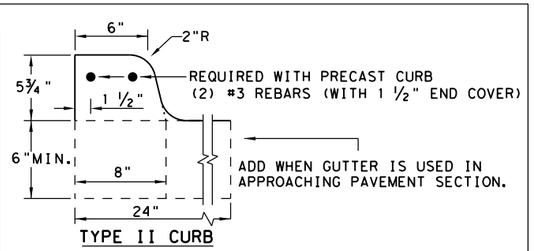
PLATE WASHER INSTRUCTIONS

BRIDGE APPROACH - UPSTREAM: THE NESTED RAIL LAPS OVER THE TERMINAL CONNECTOR. PLATE WASHERS ARE INSTALLED UNDER THE SPLICE NUTS AGAINST INSIDE OF CONNECTOR.
BRIDGE EXIT - DOWNSTREAM: THE TERMINAL CONNECTOR LAPS OVER THE NESTED RAIL. PLATE WASHERS ARE INSTALLED UNDER THE BOLT HEAD AGAINST OUTSIDE OF CONNECTOR.



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

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 FOUR (1" DIA. HOLES), SEE BOTH VIEWS FOR HOLE LOCATIONS. DRIVE (4) #5 GR.60 REBAR STAKES 18" LONG INTO THE GROUND AND ½" BELOW TOP OF CURB. FILL HOLES WITH APPROVED GROUT MIXTURE.



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

* 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.

TYPE II CURB DETAILS

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- ¾") HEIGHT; SEE CURRENT CCCG 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 ½" 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 ⅝" 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 ⅝" WASHER (FWC16a) 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 CONSTRUCTION DIVISION MAINTAINS A MATERIAL PRODUCER LIST (MPL) FOR PRODUCERS OF MATERIALS CONFORMING TO DMS-7210. ONLY PRODUCERS ON THE MPL CAN FURNISH COMPOSITE MATERIAL 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

Texas Department of Transportation — Design Division Standard

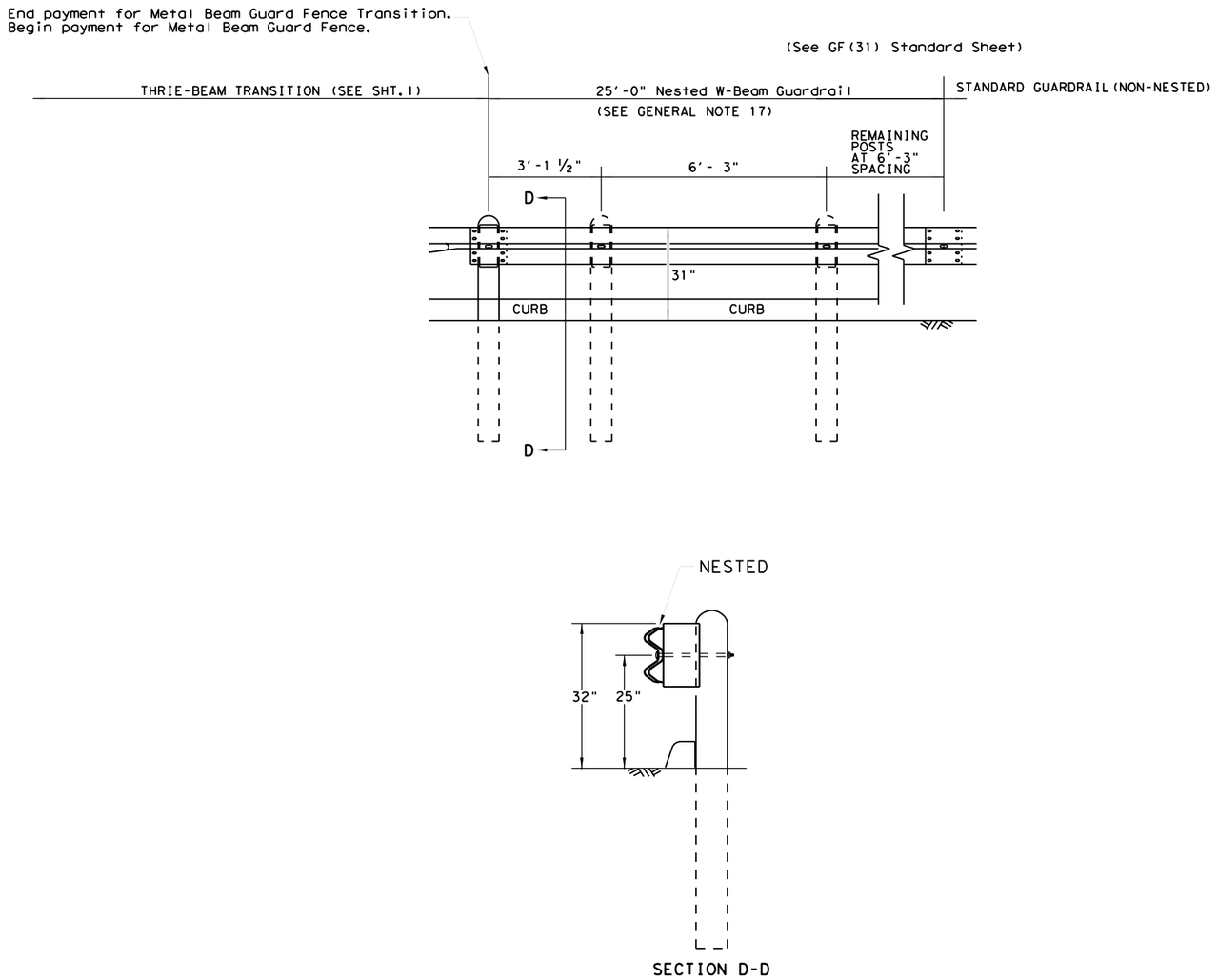
METAL BEAM GUARD FENCE THRIE-BEAM TRANSITION TL-3 MASH COMPLIANT

GF(31)TR TL3-19

FILE: gf31trt1319.dgn	DN: TxDOT	CK: KM	DW: VP	CK: CGL/AG
©TxDOT: NOVEMBER 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	1507	02	016, Etc.	FM696, Etc.
	DIST	COUNTY		SHEET NO.
	BRY	BURLESON		50

DATE: 9/25/2020
FILE: g:\150702\016\sheets\Standards\Design\GF(31)TRTL3-19.dgn

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



HIGH-SPEED TRANSITION

SHEET 2 OF 2

Texas Department of Transportation | Design Division Standard

METAL BEAM GUARD FENCE THRIE-BEAM TRANSITION TL-3 MASH COMPLIANT

GF(31)TR TL3-19

FILE: gf31trtl319.dgn	DN: TxDOT	CK: KM	DW: KM	CK: CGL/AG		
©TxDOT: NOVEMBER 2019	CONT	SECT	JOB		HIGHWAY	
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	BRY	BURLESON			51	

DATE: 9/25/2020
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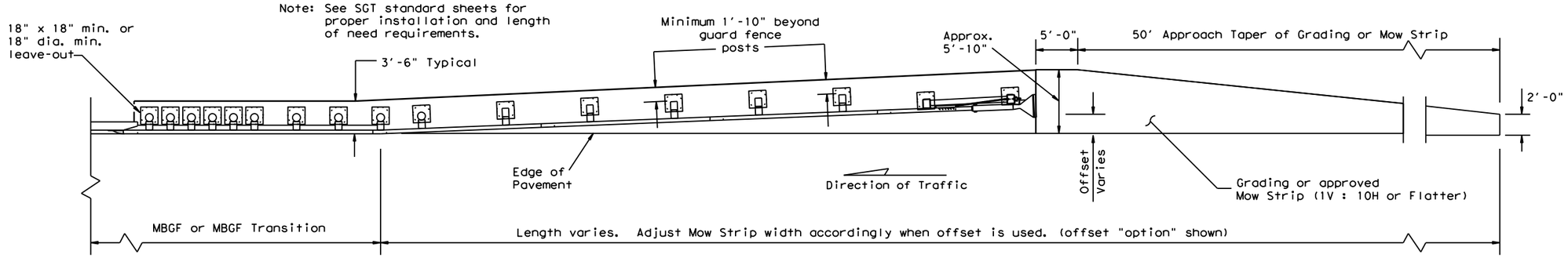
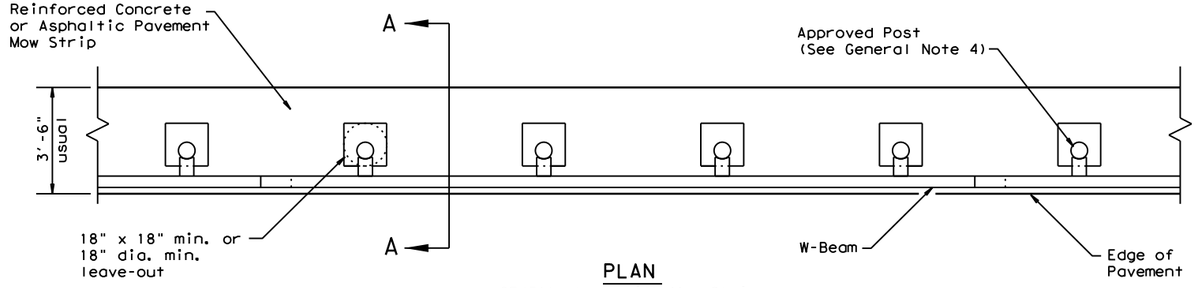
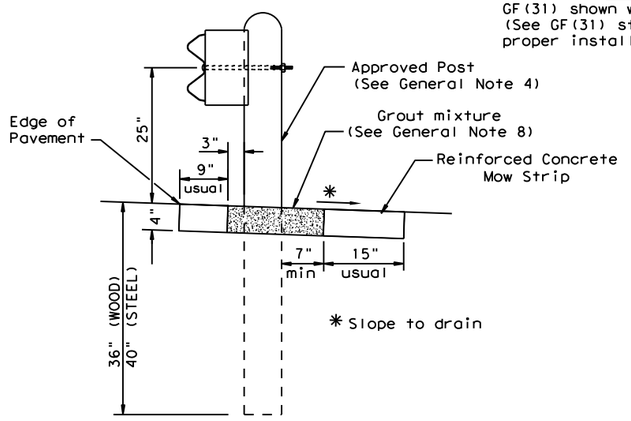


GRADING AND MOW STRIP AT GUARDRAIL END TREATMENTS



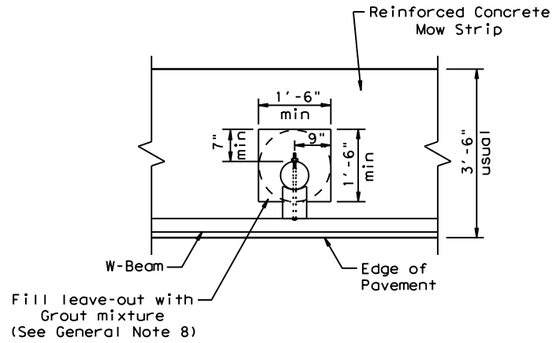
PLAN

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



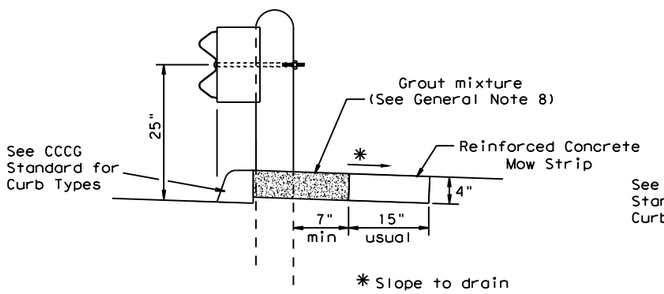
SECTION A-A

Typical



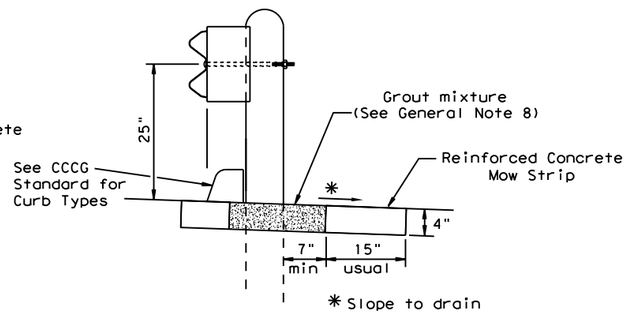
MOW STRIP DETAIL

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



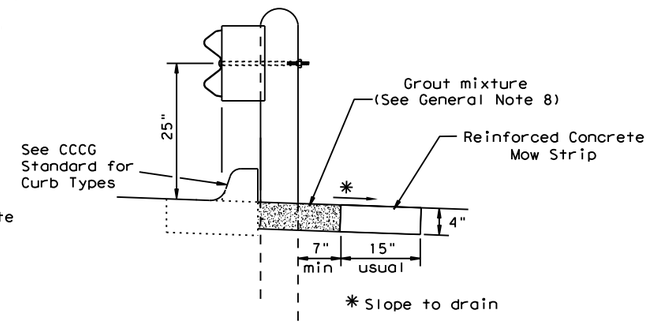
CURB OPTION (1)

This option will increase the post embedment throughout the system.



CURB OPTION (2)

Curb shown on top of mow strip



CURB OPTION (3)

Note: Site Condition(s)

Site conditions may exist where grading is required for the proper installation of metal guard fence and end treatments.

Approach grading or mow strip may be decreased or eliminated, as directed by the Engineer.

GENERAL NOTES

1. This mow strip design is for use with metal beam guard fence, guard fence transitions, and guard fence end treatments. See 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 ½" 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 1 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.

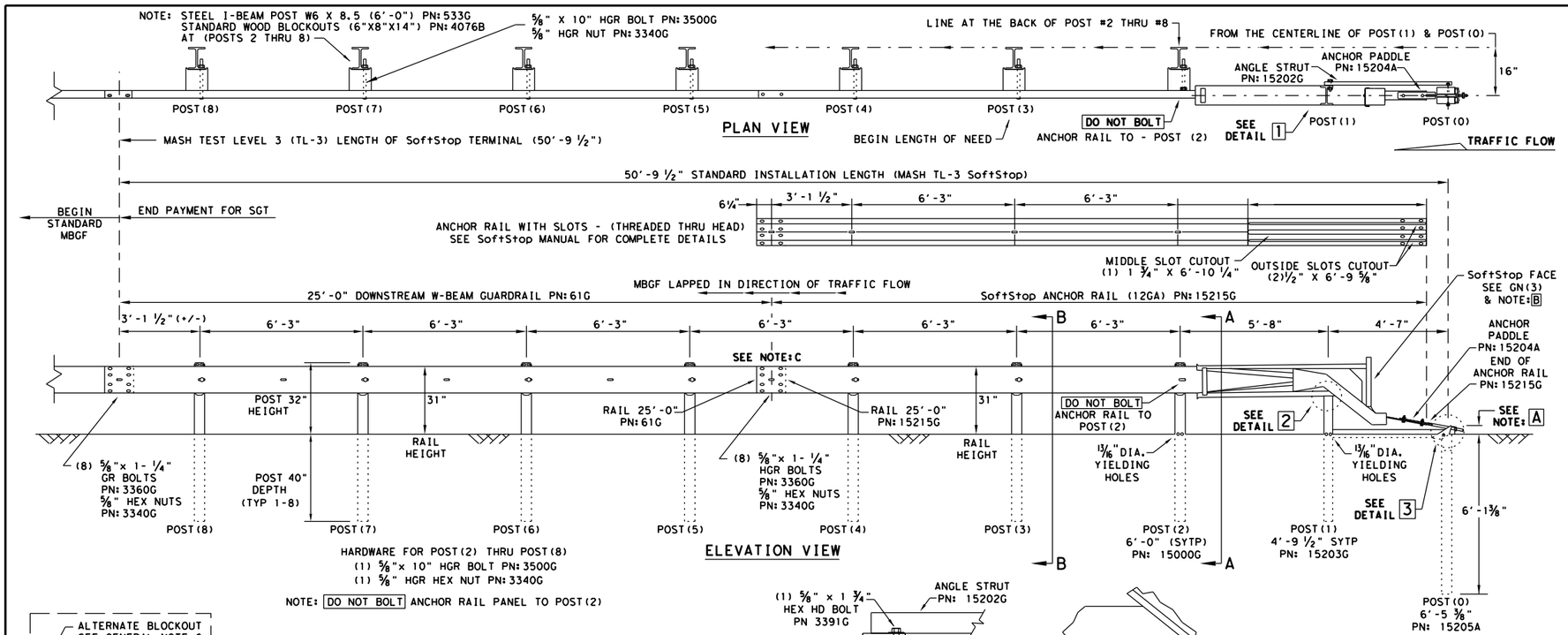
Texas Department of Transportation

Design Division Standard

METAL BEAM GUARD FENCE (MOW STRIP) TL-3 MASH COMPLIANT

GF(31)MS-19

FILE: gf31ms19.dgn	DN: TxDOT	CK: KM	DW: VP	CK: CGL/AG	
©TxDOT: NOVEMBER 2019	CONT	SECT	JOB	HIGHWAY	
REVISIONS	1507	02	016, Etc.	FM696, Etc.	
	DIST	COUNTY		SHEET NO.	
	BRY	BURLESON		52	



GENERAL NOTES

1. FOR SPECIFIC INFORMATION REGARDING INSTALLATION AND TECHNICAL GUIDANCE OF THE SYSTEM, CONTACT: TRINITY HIGHWAY AT 1(888)323-6374. 2525 N. STEMMONS FREEWAY, DALLAS, TX 75207
2. FOR INSTALLATION, REPAIR AND MAINTENANCE REFER TO THE; SoftStop END TERMINAL, PRODUCT DESCRIPTION ASSEMBLY MANUAL. PN: 620237B
3. 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.
4. FOR POST (LEAVE-OUT) INSTALLATION AND GUIDANCE SEE TXDOT'S LATEST ROADWAY MOW STRIP STANDARD.
5. HARDWARE (BOLTS, NUTS, & WASHERS) SHALL BE GALVANIZED IN ACCORDANCE WITH ITEM 445, "GALVANIZING". FITTINGS SHALL BE SUBSIDIARY TO THE BID ITEM.
6. A COMPOSITE MATERIAL BLOCKOUT 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.
7. IF SOLID ROCK IS ENCOUNTERED SEE THE MANUFACTURER'S INSTALLATION MANUAL AND REFER TO THE LATEST ROADWAY MBGF STANDARD FOR INSTALLATION GUIDANCE.
8. POSTS SHALL NOT BE SET IN CONCRETE.
9. IT IS ACCEPTABLE TO INSTALL THE SoftStop IMPACT HEAD PARALLEL TO THE GRADE LINE OR WITH AN UPWARD TILT.
10. DO NOT ATTACH THE SoftStop SYSTEM DIRECTLY TO A RIGID BARRIER.
11. UNDER NO CIRCUMSTANCES SHALL THE GUARDRAIL WITHIN THE SoftStop SYSTEM BE CURVED.
12. A FLARE RATE OF UP TO 25:1 MAY BE USED TO PREVENT THE TERMINAL HEAD FROM ENCROACHING ON THE SHOULDER. THE FLARE MAY BE DECREASED OR ELIMINATED FOR SPECIFIC INSTALLATIONS, IF DIRECTED BY THE ENGINEER.

NOTE: A	THE INSTALLATION HEIGHT OF FULLY ASSEMBLED ANCHOR POST WILL VARY FROM 3-¾" MIN. TO 4" MAX. ABOVE FINISHED GRADE.
NOTE: B	PART PN: 5852B RIGHT-SIDE (HIGH INTENSITY REFLECTIVE SHEETING) PART PN: 5851B LEFT-SIDE (HIGH INTENSITY REFLECTIVE SHEETING)
NOTE: C	W-BEAM SPLICE LOCATED BETWEEN LINE POST(4) AND LINE POST(5) GUARDRAIL PANEL 25'-0" PN: 61G ANCHOR RAIL 25'-0" PN: 15215G LAP GUARDRAIL IN DIRECTION OF TRAFFIC FLOW.

PART	QTY	MAIN SYSTEM COMPONENTS
620237B	1	PRODUCT DESCRIPTION ASSEMBLY MANUAL (LATEST REV.)
15208A	1	SoftStop HEAD (SEE MANUAL FOR RIGHT-LEFT APPROACH)
15215G	1	SoftStop ANCHOR RAIL (12GA) WITH CUTOUT SLOTS
61G	1	SoftStop DOWNSTREAM W-BEAM RAIL (12GA) (25'- 0")
15205A	1	POST #0 - ANCHOR POST (6'- 5 ⅞")
15203G	1	POST #1 - (SYTP) (4'- 9 ½")
15000G	1	POST #2 - (SYTP) (6'- 0")
533G	6	POST #3 THRU #8 - I-BEAM (W6 x 8.5) (6'- 0")
4076B	7	BLOCKOUT - WOOD (ROUTED) (6" x 8" x 14")
6777B	7	BLOCKOUT - COMPOSITE (4" x 7 ½" x 14")
15204A	1	ANCHOR PADDLE
15207G	1	ANCHOR KEEPER PLATE (24 GA)
15206G	1	ANCHOR PLATE WASHER (½" THICK)
15201G	2	ANCHOR POST ANGLE (10" LONG)
15202G	1	ANGLE STRUT
		HARDWARE
4902G	1	1" ROUND WASHER F436
3908G	1	1" HEAVY HEX NUT A563 GR.DH
3717G	2	¾" x 2 ½" HEX BOLT A325
3701G	4	¾" ROUND WASHER F436
3704G	2	¾" HEAVY HEX NUT A563 GR.DH
3360G	16	⅝" x 1 ¼" W-BEAM RAIL SPLICE BOLTS HGR
3340G	25	⅝" W-BEAM RAIL SPLICE NUTS HGR
3500G	7	⅝" x 10" HGR POST BOLT A307
3391G	1	⅝" x 1 ¾" HEX HD BOLT A325
4489G	1	⅝" x 9" HEX HD BOLT A325
4372G	4	⅝" WASHER F436
105285G	2	⅝" x 2 ½" HEX HD BOLT GR-5
105286G	1	⅝" x 1 ½" HEX HD BOLT GR-5
3240G	6	⅝" ROUND WASHER (WIDE)
3245G	3	⅝" HEX NUT A563 GR.DH
5852B	1	HIGH INTENSITY REFLECTIVE SHEETING - SEE NOTE:B

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

Texas Department of Transportation

Design Division Standard

TRINITY HIGHWAY
SOFTSTOP END TERMINAL
MASH - TL-3
SGT(10S)31-16

FILE: sgt10s3116	DN: TxDOT	CK: KM	DW: VP	CK: MB/VP		
©TxDOT: JULY 2016	CONT	SECT	JOB		HIGHWAY	
REVISIONS	1507	02	016, ETC.		FM 696, ETC.	
	DIST	COUNTY			SHEET NO.	
	BRYAN	BURLESON			53	

DATE:
FILE:

DATE: 9/25/2020
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(SEE GN NOTE 15)
STANDARD 31" MBGF

ITEM (6) INNER SIDE SLIDER (ISS) PANEL FOR RAIL 3

FIELD-SIDE (RAIL 3)

NOTE: RECESSED HEX NUTS FACING TRAFFIC-SIDE SEE DETAIL (C)

REFERENCE LINE USED TO INSTALL LINE POST(9) THRU POST(2)

POST 1 OFFSET DISTANCE MEASURED 7-⅝" FROM REFERENCE LINE

ITEM (10) CABLE ASSEMBLY

ITEM (2) GROUNDSTRUT

NO BLOCKOUT AT (POST 1)

POST 9 POST 8 POST 7 POST 6 POST 5 POST 4 POST 3 POST 2

RAIL 4 RAIL 3 RAIL 2 RAIL 1

CABLES

NOTES:
1. ITEM (12) COMPOSITE BLOCKOUTS INSTALLED AT LINE POST(9) THRU LINE POST(2).
2. DO NOT INSTALL A BLOCKOUT AT LINE POST(1).

ITEM (5) TRAFFIC SIDE SLIDER (TSS) PANEL FOR RAIL 2

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

PLAN VIEW

INSTALL GUARD FENCE RECESSED HEX NUTS ON TRAFFIC-SIDE

MBGF RAIL 2

MBGF RAIL 1

DETAIL (C)

TRAFFIC FLOW

END PAYMENT (SGT) BY EACH

DO NOT BOLT RAIL TO POST 6

BEGIN LENGTH OF NEED

INSTALLATION LENGTH 55'- ½"

49'-8 5/16"

ITEM (25) MAX-TENSION HEAD SEE DETAIL (A)

6'-3" 6'-3" 6'-3" 6'- ¾" 6'-3" 6'-3" 6'-3" 37 ½" 5'-3 11/16"

RAIL HEIGHT 31"

ARROWS

DETAIL (D)

RAIL HEIGHT 31"

HEAD HEIGHT

DETAIL (B)

32-¼"

ITEM (13) RAIL 4 ITEM (13) RAIL 3 ITEM (13) RAIL 2 ITEM (13) RAIL 1

FINISHED GRADE

CABLES

FINISHED GRADE

ITEM (10) CABLE ASSEMBLY

ITEM (2) GROUNDSTRUT

68-⅛"

POST 9 POST 8 POST 7 POST 6 POST 5 POST 4 POST 3 POST 2 POST 1

ITEM (4) I-BEAM W6 X 9

NO BLOCKOUT AT (POST 1)

SOIL ANCHOR POST ITEM (1)

(8) X-LITE LINE POST - ITEM (11)

ELEVATION VIEW

A

A

TSS PANEL GALVANIZED ITEM (5)

RSS PLATE GALVANIZED ITEM (8)

INSTALL THE TSS AND RSS WITH THE ARROWS POINTING TOWARDS THE MAX-HEAD

TSS PANEL AND RSS PLATE

DETAIL (D)

HEAD HEIGHT 32-¼"

TOP OF POST

31-⅞"

FINISHED GRADE

40-⅛"

68-⅛" ANCHOR POST DEPTH

ITEM (1) ANCHOR

ITEM (11) LINE POSTS 2 THRU 9

(NOTE: ITEM (4) POST 1 (NOT SHOWN), TO BE INSTALLED AT SAME DEPTH AS LINE POSTS.)

SOIL ANCHOR, POST 1 & LINE POST 2 THRU 9

SECTION VIEW A-A

NOTE:
USE THE MASH APPROVED X-TENSION CABLE ASSEMBLY.

7 5/16"

2 ⅛"

UPPER CABLE (BACK SIDE)

LOWER CABLE (TRAFFIC SIDE)

DETAIL (B)

CABLE FRICTION PLATE HEAD UNIT ITEM (9)

NOTE:
INSTALL ⅝" RECESSED HEX NUTS ON TRAFFIC SIDE.

ITEM (24)

ITEM (21)

ITEM (20) 8X

ITEM (17) 8X

ITEM (23) 6X 3 SCREWS EACH SIDE

(RAIL 1)

ITEM (22) BRACKET SHIPPED FLAT

ITEM (3)

ITEM (16) 4X

* ITEM (25) HIGH INTENSITY REFLECTIVE SHEETING

NOTE: DELINEATION MARKER IN ACCORDANCE WITH TEXAS MUTCD.

SPLICE FOR IMPACT-HEAD TO GUARD FENCE (RAIL1)

DETAIL (A)

* TO BE PROVIDED BY DISTRIBUTOR OR CONTRACTOR.

** ALTERNATIVE ITEMS NOT SHOWN.
ITEM(26) 8" WOOD-BLOCKOUTS
ITEM(27) 25'GUARD FENCE PANELS

STANDARD MBGF

APPROX 5'-10"

5'-0"

50' APPROACH GRADING

2'-0"

EDGE OF PAVEMENT

NOTE: ADJUST WIDTH ACCORDINGLY WHEN OFFSET IS USED. (OFFSET "OPTION" SHOWN)

2'-0" MAX. RAIL OFFSET

APPROACH GRADING (1V:10H OR FLATTER) SEE PRODUCT ASSEMBLY MANUAL FOR ADDITIONAL GUIDANCE.

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

APPROACH GRADING AT GUARDRAIL END TREATMENTS

TRAFFIC FLOW

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

GENERAL NOTES

1. FOR SPECIFIC INFORMATION REGARDING INSTALLATION AND TECHNICAL GUIDANCE OF THE SYSTEM, CONTACT: LINDSAY TRANSPORTATION SOLUTIONS (LTS) - BARRIER SYSTEMS, INC. AT (707) 374-6800
2. FOR INSTALLATION, REPAIR, & MAINTENANCE REFER TO THE; MAX-TENSION INSTALLATION INSTRUCTION MANUAL. P/N MANMAX REV D (ECN 3516).
3. APPLY HIGH INTENSITY REFLECTIVE SHEETING, "OBJECT MARKER" ON THE FRONT FACE OF THE DEVICE PER MANUFACTURE'S RECOMMENDATIONS. OBJECT MARKER SHALL CONFORM TO THE STANDARDS REQUIRED IN TEXAS MUTCD.
4. FOR POST (LEAVE-OUT) INSTALLATION AND GUIDANCE SEE TXDOT'S LATEST ROADWAY MOW STRIP STANDARD.
5. ALL STEEL COMPONENTS ARE GALVANIZED PER ASTM A123 OR EQUIVALENT UNLESS OTHERWISE STATED.
6. SYSTEM SHOWN USING STEEL WIDE FLANGE POST WITH COMPOSITE BLOCKOUTS.
7. 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.
8. REFER TO INSTALLATION MANUAL FOR SPECIFIC PANEL LAPPING GUIDANCE.
9. IF SOLID ROCK IS ENCOUNTERED SEE THE MANUFACTURER'S INSTALLATION MANUAL FOR INSTALLATION GUIDANCE.
10. POSTS SHALL NOT BE SET IN CONCRETE.
11. 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.
12. MAX-TENSION SYSTEM SHALL NEVER BE INSTALLED WITHIN A CURVED SECTION OF GUARDRAIL.
13. IF A DELINEATION MARKER IS REQUIRED, MARKER SHALL BE IN ACCORDANCE WITH TEXAS MUTCD.
14. THE SYSTEM IS SHOWN WITH 12'-6" MBGF PANELS, 25'-0" MBGF PANELS ARE ALSO ALLOWED.
15. 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	⅝" X 7" THREAD BOLT HH (GR.5)GEOMET	1
16	BSI-2001885	¾" X 3" ALL-THREAD BOLT HH (GR.5)GEOMET	4
17	4001115	⅝" X 1 ¼" GUARD FENCE BOLTS (GR.2)MGAL	48
18	2001840	⅝" X 10" GUARD FENCE BOLTS MGAL	8
19	2001636	⅝" WASHER F436 STRUCTURAL MGAL	2
20	4001116	⅝" RECESSED GUARD FENCE NUT (GR.2)MGAL	59
21	BSI-2001888	⅝" X 2" ALL THREAD BOLT (GR.5)GEOMET	1
22	BSI-1701063-00	DELINEATION MOUNTING (BRACKET)	1
23	BSI-2001887	¼" X ¾" SCREW SD HH 410SS	7
24	4002051	GUARDRAIL WASHER RECT AASHTO FWR03	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

Texas Department of Transportation

Design Division Standard

MAX-TENSION END TERMINAL MASH - TL-3

SGT(11S)31-18

FILE: sgt11s3118.dgn	DN: TxDOT	CK: KM	DW: TxDOT	CK: CL
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REVISIONS	1507	02	016, Etc.	FM696, Etc.
	DIST	COUNTY		SHEET NO.
	BRY	BURLESON		54

DATE:
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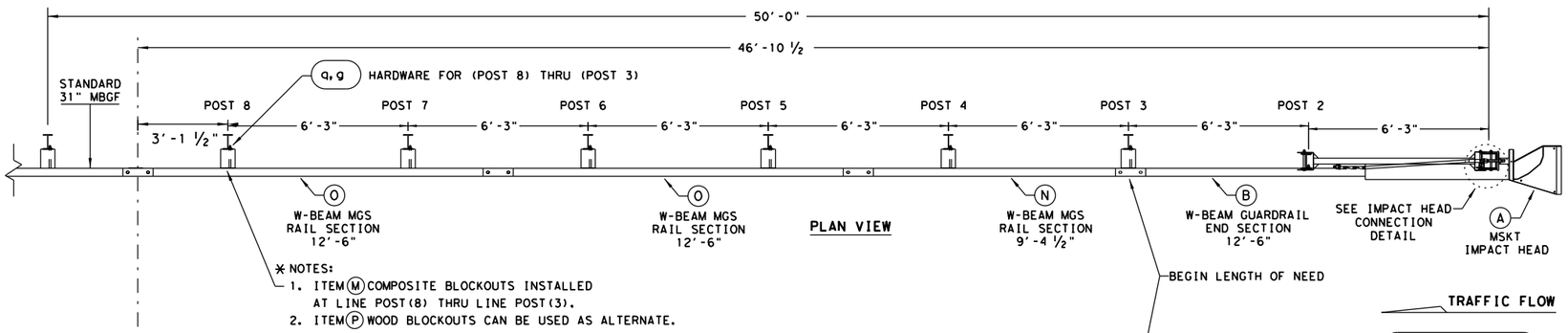
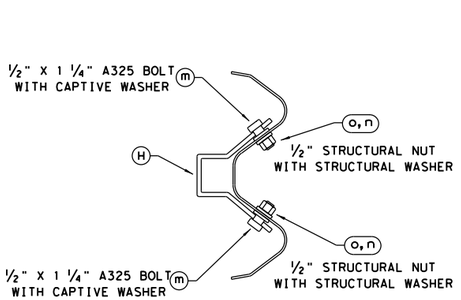
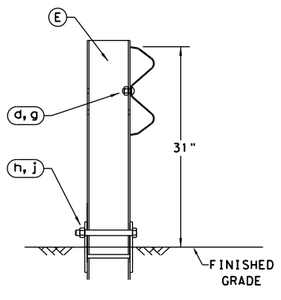


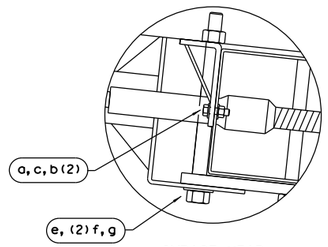
NOTE: SEE (GENERAL NOTE 14) FOR DRIVING CAP INFORMATION.



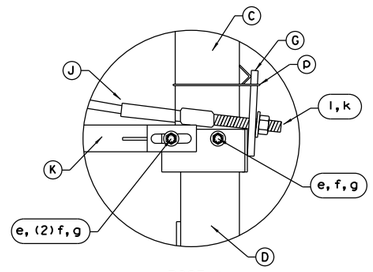
SECTION B-B
ANCHOR BRACKET



POST 2
SECTION A-A



IMPACT HEAD
CONNECTION DETAIL



POST 1
CONNECTION DETAIL

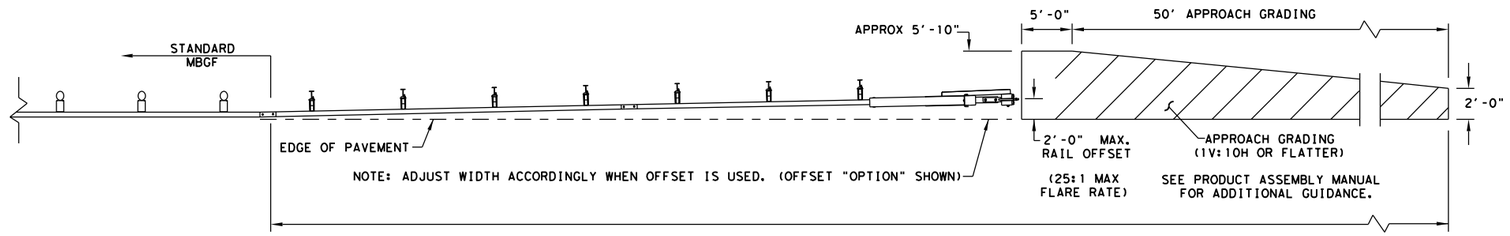
GENERAL NOTES

1. 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
2. FOR INSTALLATION, REPAIR AND MAINTENANCE REFER TO THE; MSKT END TERMINAL, PRODUCT DESCRIPTION ASSEMBLY MANUAL (PUBLICATION~062717).
3. 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.
4. FOR POST (LEAVE-OUT) INSTALLATION AND GUIDANCE SEE TXDOT'S LATEST ROADWAY MOW STRIP STANDARD.
5. HARDWARE (BOLTS, NUTS, & WASHERS) SHALL BE GALVANIZED IN ACCORDANCE WITH ITEM 445, "GALVANIZING". FITTINGS SHALL BE SUBSIDIARY TO THE BID ITEM.
6. SYSTEM SHOWN USING STEEL WIDE FLANGE POSTS WITH COMPOSITE BLOCKOUTS.
7. 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.
8. IF SOLID ROCK IS ENCOUNTERED IN THE AREA OF (POST 1) AND / OR (POST 2) CONTACT THE MANUFACTURER, & REFER TO THE LATEST ROADWAY MBGF STANDARD FOR INSTALLATION GUIDANCE.
9. POSTS SHALL NOT BE SET IN CONCRETE.
10. SYSTEM MUST BE ATTACHED TO STANDARD 31" MBGF.
11. UNDER NO CIRCUMSTANCES SHALL THE GUARDRAIL WITHIN THE MSKT SYSTEM BE CURVED.
12. A FLARE RATE OF UP TO 25:1 MAY BE USED TO PREVENT THE TERMINAL HEAD FROM ENCROACHING ON THE SHOULDER. THE FLARE MAY BE DECREASED OR ELIMINATED FOR SPECIFIC INSTALLATIONS, IF DIRECTED BY THE ENGINEER.
13. THE SYSTEM IS SHOWN WITH TWO 12'-6" MBGF PANELS, ONE 25'-0" MBGF PANEL IS ALSO ALLOWED IN THEIR PLACE.
14. 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.

SEE NOTES: *

ALTERNATIVE ITEMS NOT SHOWN. **
* ITEM(P) 8" WOOD-BLOCKOUT
** ITEM(Q) 25'GUARD FENCE PANEL

ITEM	QTY	MAIN SYSTEM COMPONENTS	ITEM NUMBERS
A	1	MSKT IMPACT HEAD	MS3000
B	1	W-BEAM GUARDRAIL END SECTION, 12 Ga.	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	
a	2	5/16" x 1" HEX BOLT (GRD 5)	B5160104A
b	4	5/16" WASHER	W0516
c	2	5/16" 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 1/16" O.D. x 9/16" 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: ADJUST WIDTH ACCORDINGLY WHEN OFFSET IS USED. (OFFSET "OPTION" SHOWN)

APPROACH GRADING AT GUARDRAIL END TREATMENTS

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.

Texas Department of Transportation

Design Division Standard

SINGLE GUARDRAIL TERMINAL

MSKT-MASH-TL-3

SGT(12S)31-18

FILE: sgt12s3118.dgn	DN: TxDOT	CK: KM	DW: VP	CK: CL	
© TxDOT: APRIL 2018	CONT	SECT	JOB	HIGHWAY	
REVISIONS	1507	02	016, Etc	FM 696, Etc.	
	DIST	COUNTY		SHEET NO.	
	BRY	BURLESON		55	

DATE:
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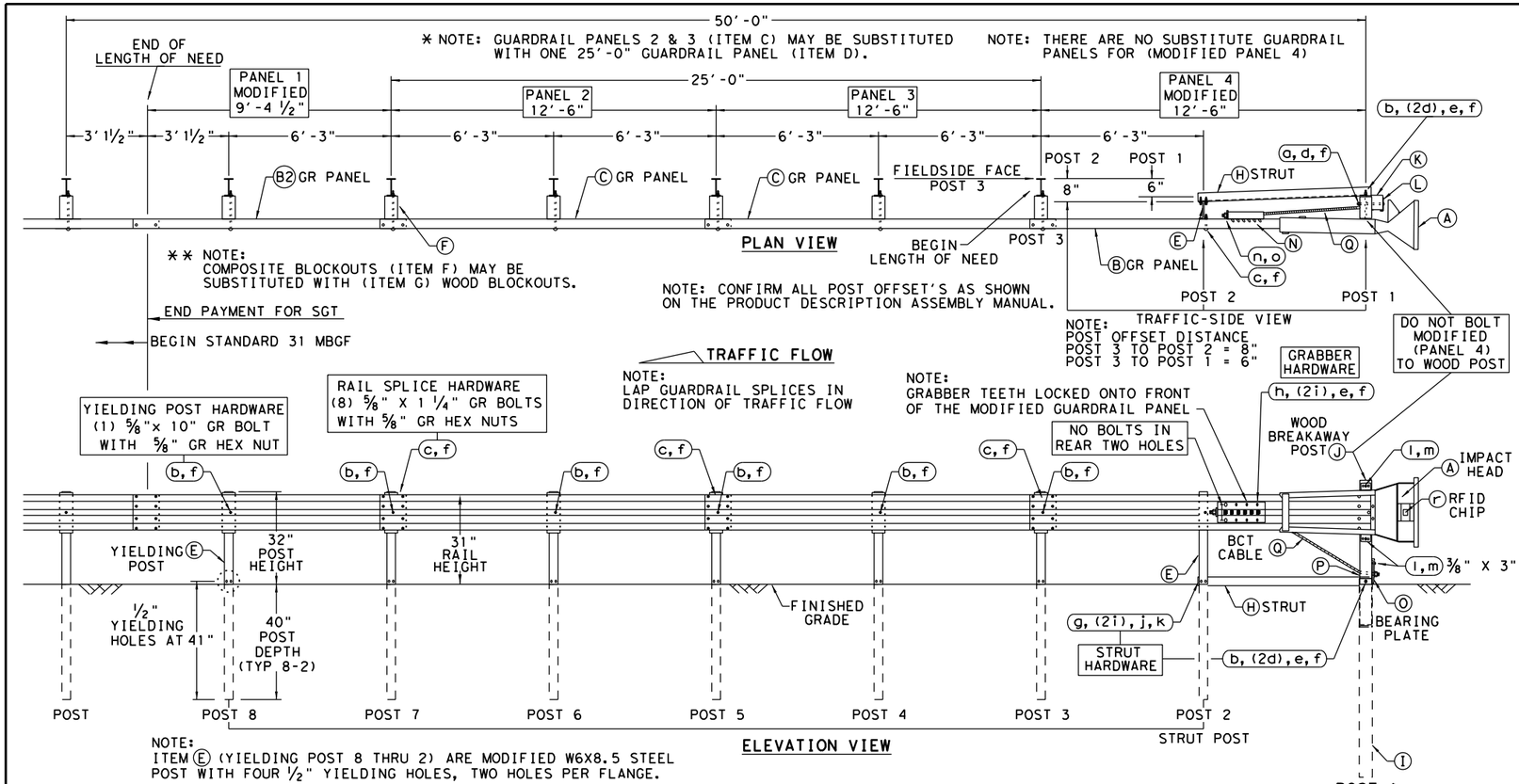
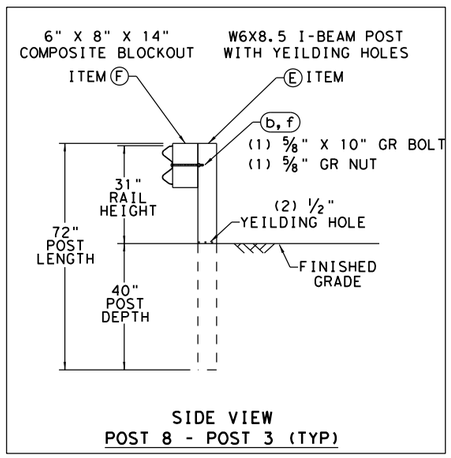


GENERAL NOTES

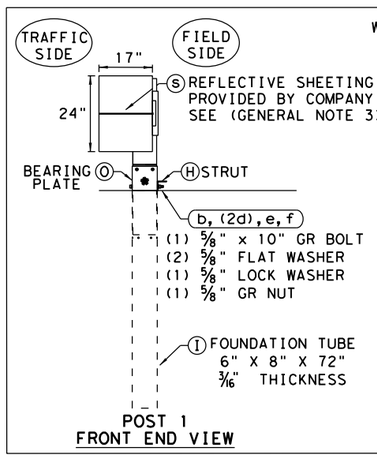
1. FOR SPECIFIC INFORMATION REGARDING INSTALLATION AND TECHNICAL GUIDANCE OF THE SYSTEM, CONTACT: SPIG INDUSTRY, INC. AT 1(267) 644-9510. 14675 INDUSTRIAL PARK RD; BRISTOL, VA 24202
2. FOR INSTALLATION, REPAIR AND MAINTENANCE REFER TO THE MANUFACTURER'S; SGET END TERMINAL, PRODUCT DESCRIPTION ASSEMBLY MANUAL.
3. MANUFACTURER WILL APPLY HIGH INTENSITY REFLECTIVE SHEETING, "OBJECT MARKER" TO THE FACE PLATE OF THE DEVICE PER MANUFACTURER'S RECOMMENDATIONS. THE OBJECT MARKER SHALL CONFORM TO THE STANDARDS REQUIRED IN TEXAS MUTCD.
4. THE NOMINAL HEIGHT OF THE GUARDRAIL BEAM IS 31 INCHES WITH A TOLERANCE OF +/- ONE INCH.
5. FOR POST (LEAVE-OUT) INSTALLATION AND GUIDANCE SEE TXDOT'S LATEST ROADWAY MOW STRIP STANDARD.
6. (POST 2 THROUGH POST 8) ARE MODIFIED STEEL-YIELDING POSTS WITH YIELDING HOLES AT GROUND LEVEL. THERE ARE NO SUBSTITUTE POSTS.
7. POSTS SHALL NOT BE SET IN CONCRETE.
8. IF SOLID ROCK IS ENCOUNTERED FOR ANY OF THE POSTS IN THE SYSTEM, CONTACT THE MANUFACTURER FOR SPECIFIC INSTALLATION GUIDANCE.
9. HARDWARE (BOLTS, NUTS, & WASHERS) SHALL BE GALVANIZED IN ACCORDANCE WITH ITEM 445,"GALVANIZING". FITTINGS SHALL BE SUBSIDIARY TO THE BID ITEM.
10. A COMPOSITE MATERIAL BLOCKOUT THAT MEETS DMS-7210 REQUIREMENTS MAY BE SUBSTITUTED FOR AN APPROVED WOOD BLOCKOUT. SEE CONSTRUCTION DIVISION MATERIAL PRODUCER LIST (MPL) FOR CERTIFIED PRODUCERS.
11. THE ENTIRE SYSTEM MUST BE INSTALLED IN A STRAIGHT LINE WITHOUT ANY CURVE. HOWEVER, THE SYSTEM CAN BE OFFSET BY TWO FEET AS SHOWN ON THE APPROACH GRADING DETAIL TO HELP OFF-SET THE IMPACT HEAD FROM SHOULDER OF THE ROAD.

ITEM	QTY	MAIN SYSTEM COMPONENTS	ITEM #
A	1	SGET IMPACT HEAD	SIH1A
B	1	MODIFIED GUARDRAIL PANEL 12'-6" 12GA	126SPZGP
B2	1	MODIFIED GUARDRAIL PANEL 9'-4 1/2" 12GA	GP94
C	2	STANDARD GUARDRAIL PANEL 12'-6" 12GA	GP126
D *	1	STANDARD GUARDRAIL PANEL 25'-0" 12GA	GP25
E	7	MODIFIED YIELDING I-BEAM POST W6x8.5	YP6MOD
F	6	COMPOSITE BLOCKOUT 6" X 8" X 14"	CBO8
G **	6	WOOD BLOCKOUT 6" X 8" X 14"	WBO8
H	1	STRUT 3" X 3" X 80" x 1/4" A36 ANGLE	STR80
I	1	FOUNDATION TUBE 6" X 8" X 72" x 3/16"	FNDT6
J	1	WOOD BREAKAWAY POST 5 1/2" x 7 1/2" x 50"	WBRK50
K	1	WOOD STRIKE BLOCK	WSBLK14
L	1	STRIKE PLATE 1/4" A36 BENT PLATE	SPLT8
M	1	REINFORCEMENT PLATE 12 GA. GR55	REPLT17
N	1	GUARDRAIL GRABBER 2 1/2" X 2 1/2" X 16 1/2"	GGR17
O	1	BEARING PLATE 8" X 8 5/8" X 5/8" A36	BPLT8
P	1	PIPE SLEEVE 4 1/4" X 2 3/8" O.D. (2 1/8" I.D.)	PSLV4
Q	1	BCT CABLE 3/4" X 81" LENGTH	CBL81
		SMALL HARDWARE	
a	1	5/8" X 12" GUARDRAIL BOLT 307A HDG	12GRBLT
b	7	5/8" X 10" GUARDRAIL BOLT 307A HDG	10GRBLT
c	33	5/8" X 1 1/4" GR SPLICE BOLTS 307A HDG	1GRBLT
d	3	5/8" FLAT WASHER F436 A325 HDG	58FW436
e	1	5/8" LOCK WASHER HDG	58LW
f	39	5/8" GUARDRAIL HEX NUT HDG	58HN563
g	2	1/2" X 2" STRUT BOLT A325 HDG	2BLT
h	6	1/2" X 1 1/4" PLATE BOLT A325 HDG	125BLT
i	16	1/2" FLAT WASHER F436 A325 HDG	12FWF436
j	8	1/2" LOCK WASHER HDG	12LW
k	8	1/2" HEX NUT A563 HDG	12HN563
l	4	3/8" X 3" HEX LAG SCREW GR5 HDG	38LS
m	4	3/8" FLAT WASHER F436 A325 HDG	38FW844
n	2	1" FLAT WASHER F436 A325 HDG	1FWF436
o	2	1" HEX NUT A563DH HDG	1HN563
p	1	18" TO 24" LONG ZIP TIE RATED 175-200LB	ZPT18
q	1	1 1/2" X 4" SCH-40 PVC PIPE	PSPCR4
r	1	RFID CHIP RATED MIL-STD-810F	RFID810F
s	1	IMPACT HEAD REFLECTIVE SHEETING	RS30M

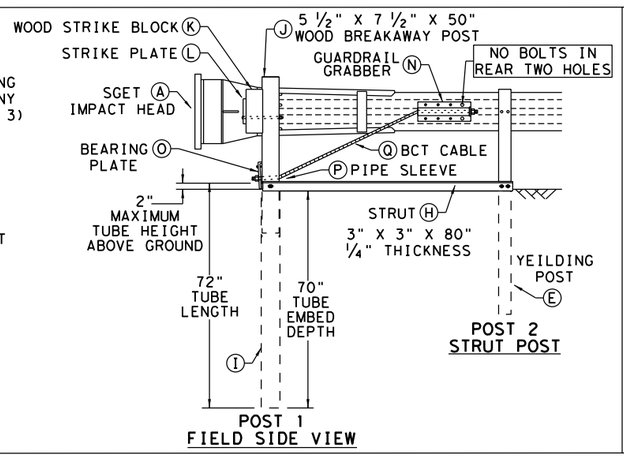
* ALTERNATIVE ITEMS
** NOTE: SEE PLAN VIEW



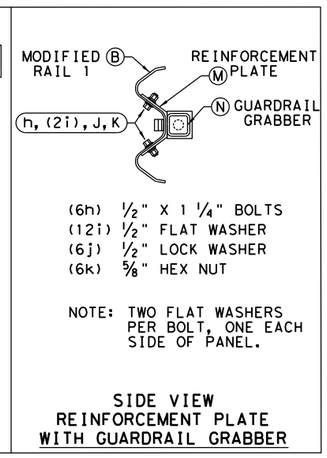
SIDE VIEW
POST 8 - POST 3 (TYP)



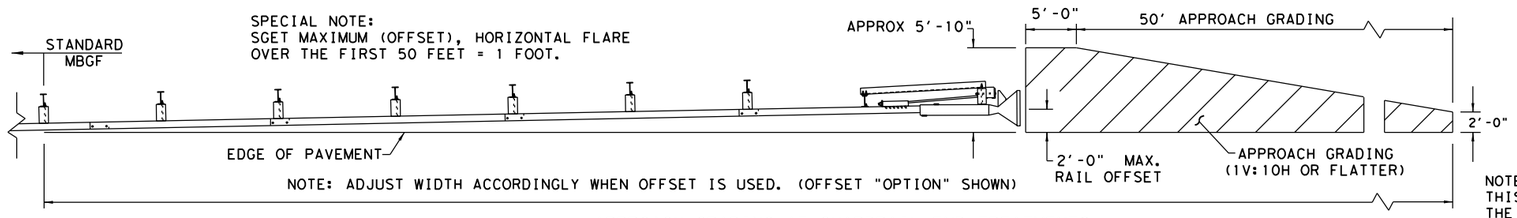
POST 1
FRONT END VIEW



POST 1
FIELD SIDE VIEW



SIDE VIEW
REINFORCEMENT PLATE
WITH GUARDRAIL GRABBER



APPROACH GRADING AT GUARDRAIL END TREATMENTS

NOTE:
THIS STANDARD IS A BASIC REPRESENTATION OF THE SGET TERMINAL SYSTEM AND IS NOT INTENDED TO REPLACE THE MANUFACTURER'S ASSEMBLY MANUAL.

Texas Department of Transportation

Design Division Standard

SPIG INDUSTRY, LLC
SINGLE GUARDRAIL TERMINAL
SGET - TL-3 - MASH
SGT(15)31-20

FILE: sgt153120.dgn	DN: TxDOT	CK: KM	DW: VP	CK: VP
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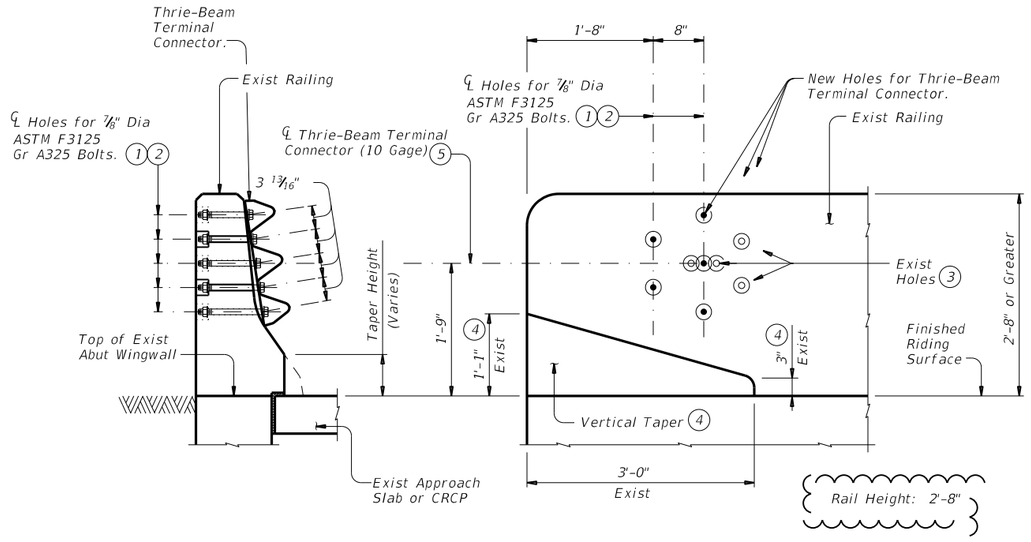
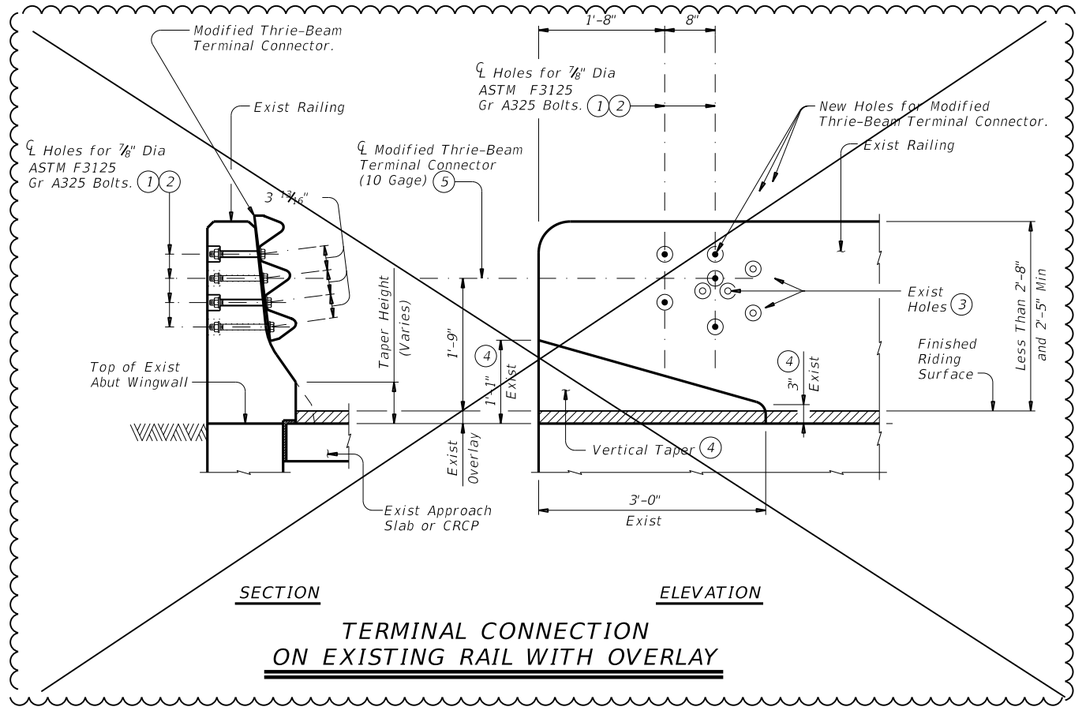
	BRY	BURLESON		56



TERMINAL CONNECTION ON EXISTING RAIL WITHOUT OVERLAY



TERMINAL CONNECTION ON EXISTING RAIL WITH OVERLAY

(MOD)

(1) ℄ 5 ~ 1" Dia holes and 2 ½" Dia x 2" deep recesses. Holes and recesses must be core drilled. Percussion drilling is not permitted. Concrete spalls in rail exceeding ½" from edge of holes will be patched in accordance with Item 429, "Concrete Structure Repair" at the contractor's expense. Bolt recesses are only required when pedestrian sidewalks are adjacent to back of rail.

(2) ℄ 5 ~ ⅞" Dia F3125 Gr A325 Bolts with two 1 ¾" O.D. washers. Place washer under each head and nut. The 5 Terminal Connection Bolts must be tightened in a well distributed pattern so to prevent damage or distortion of the Thrie-Beam Connection and the MBGF Transition. Bolts must be cut off after installation so as to extend no more than ¾" beyond nut. End of cut-off bolt must be painted with two coats of zinc-rich paint conforming to the Item "Galvanizing".

(3) Existing anchor bolt holes in rail that can not be utilized and are within 3" of a new bolt hole must be filled with an epoxy grout prior to coring new holes.

(4) If vertical taper is not present, then a vertical taper must be field cut to limits shown when the existing rail measurement is 2'-8". Rail measurement should be taken from behind rail as to not include overlay if present. If existing rail measurement is 2'-10" and existing rail does not have vertical taper, then add 2" to vertical dimensions and field cut vertical taper. Any exposed reinforcing steel from field cut taper must be ground flush and painted with two coats of zinc-rich paint conforming to the Item "Galvanizing".

(5) 10 Gage Terminal Connectors and associated hardware are to be paid for under the Item "Metal Beam Guard Fence". Metal Beam Guard Fence Transitions must be attached to the bridge rail and extended along the embankment unless otherwise shown in the plans.

(6) Terminal Connector must be modified for the Terminal Connection on Existing Rail with Overlay with two new 1" Dia holes as shown. Top new 1" Dia hole is used in lieu of existing top hole in terminal connector. All other existing holes in terminal connector must be used. Additional hole on bottom of terminal connector is used for other side for opposite hand. Damage to galvanization caused by this modification must be painted with two coats of zinc-rich paint conforming to the Item "Galvanizing".

CONSTRUCTION NOTES:

Field verify dimensions before commencing work and ordering materials.

Remove any MBGF (W-beam) and attachment hardware, from the face of rail if present, prior to installation of new MBGF Transition. Dispose of these materials as directed by the Engineer. Plugging of exposed existing bolt holes is not necessary except as stated herein or otherwise indicated on the plans. This work is considered subsidiary to the pertinent bid items.

If vertical taper is not present, then a vertical taper must be field cut to limits shown and debris removed.

Attach the MBGF Transition to the existing rail and extend along the embankment using the Thrie-Beam Terminal Connection unless shown otherwise on the plans. Splice the Approach Guard Rail and the Terminal Connection with the normal 12 connection bolts. Refer to Metal Beam Guard Fence detail sheets for additional details and information not shown herein.

MATERIAL NOTES:

Galvanize all steel components unless otherwise noted.

GENERAL NOTES:

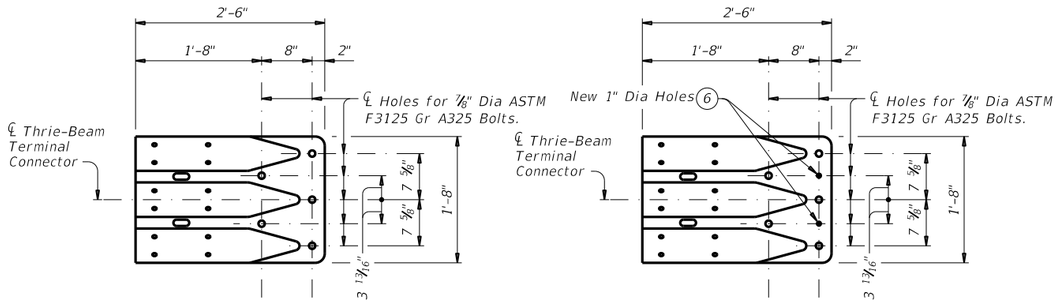
These details are shown for retrofitting MBGF transitions to existing rails only and not used for new construction.

Shop drawings are not required for this installation.

Materials, fabrication and installation of this assembly are to be included in the price bid for "Metal Beam Guard Fence."

STATE OF TEXAS
JEAN J. FENG
102035
LICENSED
PROFESSIONAL ENGINEER
Jean J. Feng

12/28/2020



THRIE-BEAM TERMINAL CONNECTORS (5)

Texas Department of Transportation

Bridge Division Standard

T5/T501/T502 TRANSITION RETROFIT GUIDE (MOD)

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©TxDOT	September 2019	CONT	SECT	JOB	HIGHWAY
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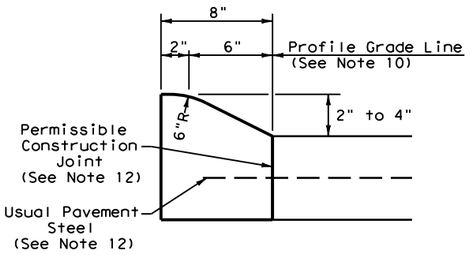

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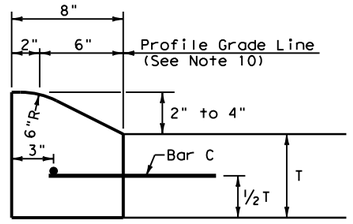
2" - 4" HEIGHT



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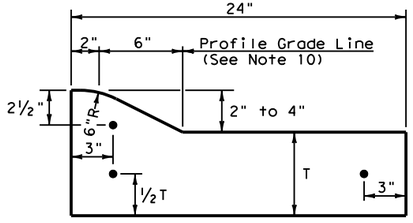
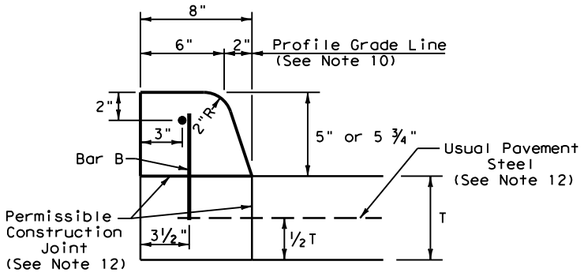
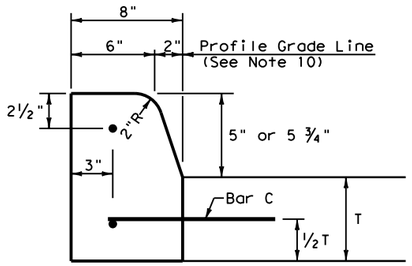


TYPE I CURB AND GUTTER
2" - 4" HEIGHT



TYPE II CURB (MONOLITHIC)
5" - 5 ¾" HEIGHT



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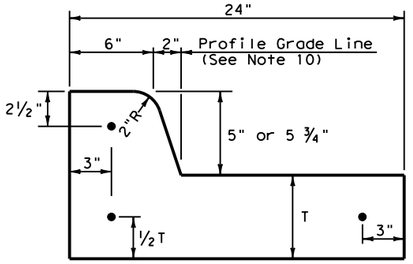
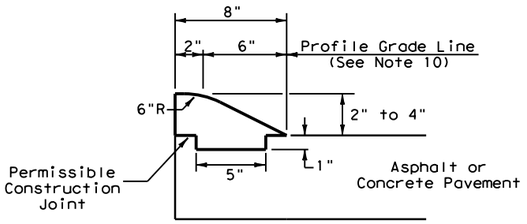
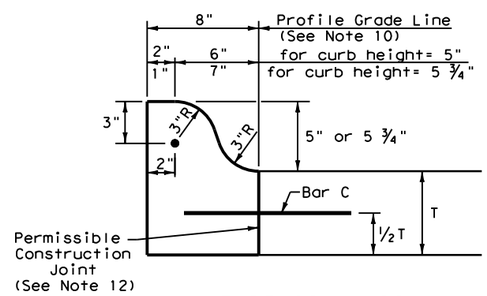


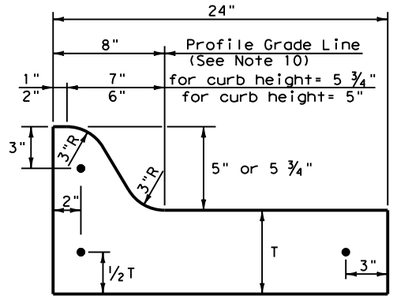
TYPE II CURB AND GUTTER
5" - 5 ¾" HEIGHT



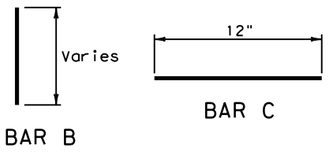
TYPE III CURB (KEYED)
2" - 4" HEIGHT



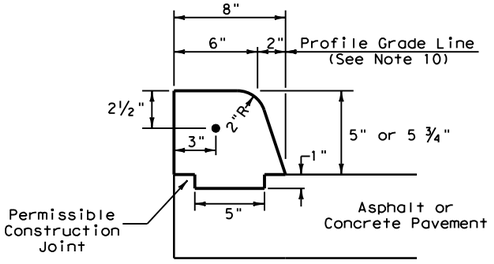
TYPE IIa CURB
5" - 5 ¾" HEIGHT



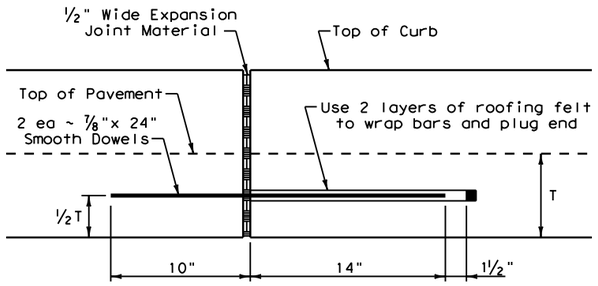
TYPE IIa CURB AND GUTTER
5" - 5 ¾" HEIGHT



BAR B BAR C

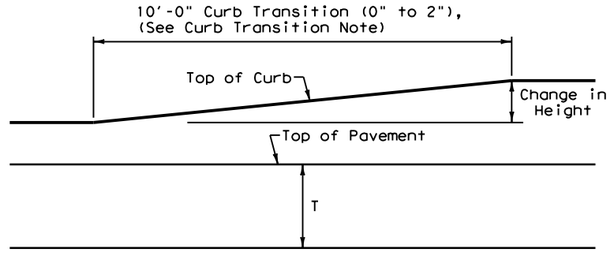


TYPE IV CURB (KEYED)
5" - 5 ¾" HEIGHT



EXPANSION JOINT DETAIL

Curb Transition Note:
Field conditions may require a longer or shorter transition, and shall be shown elsewhere in the plans, or as directed by the Engineer.



CURB TRANSITION
Note: To be paid for as Highest Curb

General Notes

1. All materials and construction shall be in accordance with Item 529, "Concrete Curb, Gutter, and Combined Curb and Gutter."
2. Concrete shall be Class A.
3. When reinforcing bars are used, they shall be No. 4 unless otherwise shown. The use of synthetic fiber in lieu of steel reinforcing is acceptable, provided the fiber producer is on the Department Producer List (MPL), maintained by TxDOT, Construction Division.
4. Round exposed sharp edges with a rounding tool, to a minimum radius of ¼ inch.
5. All existing curbs and driveways to be removed shall be sawed or removed at existing joints.
6. Where concrete curb is placed on existing concrete pavement, the pavement shall be drilled and the reinforcing bars grouted in place.
7. Expansion and contraction joints shall be constructed to match pavement joints in all curbs and curb and gutter adjacent to jointed concrete pavement. Where placement of curb or curb and gutter is not adjacent to concrete pavement, expansion joints shall be provided at structures, curb returns at streets, and at locations directed by The Engineer.
8. Vertical and horizontal dowel bars and transverse reinforcing bars shall be placed at four feet C-C.
9. Dimension 'T' shown is the thickness of concrete pavement. When curb is installed adjacent to flexible pavement dimension 'T' is 8" maximum.
10. Usual profile grade line. Refer to typical sections and plan-profile sheets for exact locations.
11. One-half inch expansion joint material shall be provided where curb or curb and gutter is adjacent to sidewalk or riprap.
12. When vertical permissible construction joints are used, resulting in a longitudinal construction joint in the pavement, the longitudinal pavement steel shall be placed in accordance with pavement details shown elsewhere in the plans for longitudinal construction joints. Reinforcing steel for curb section shall then conform to that required for concrete curb.

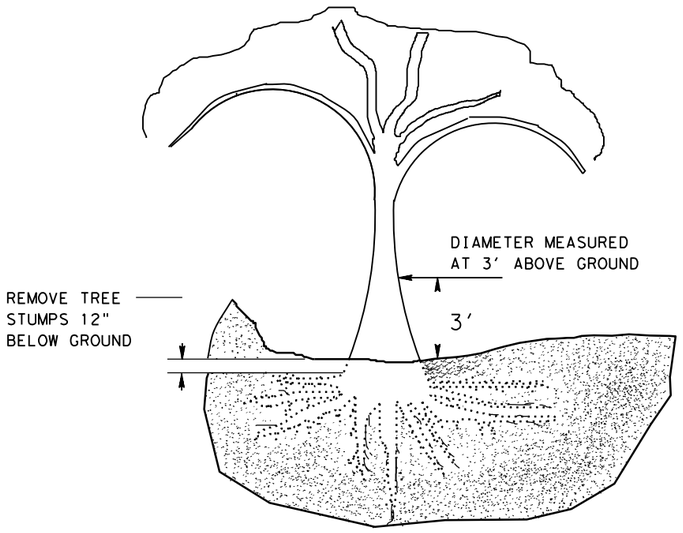
Texas Department of Transportation

Design Division Standard

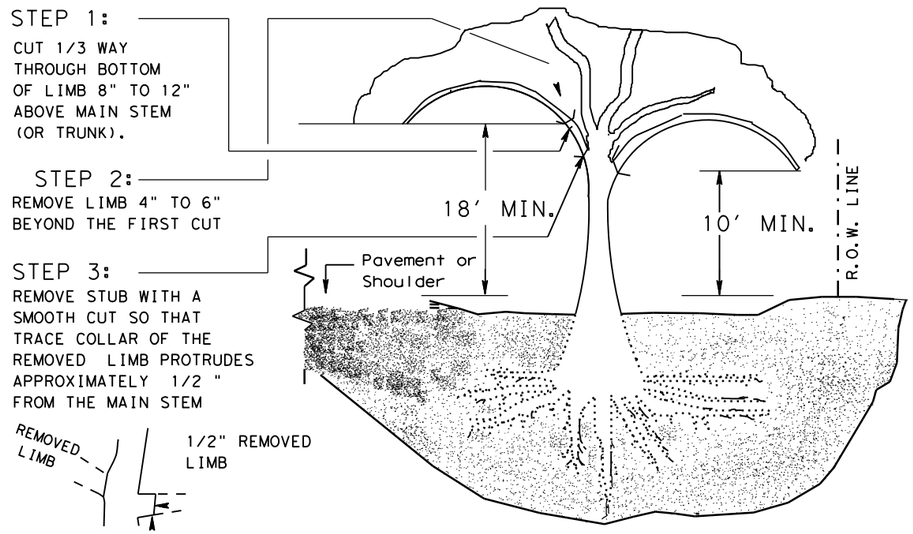
CURB AND GUTTER

CCCG-12

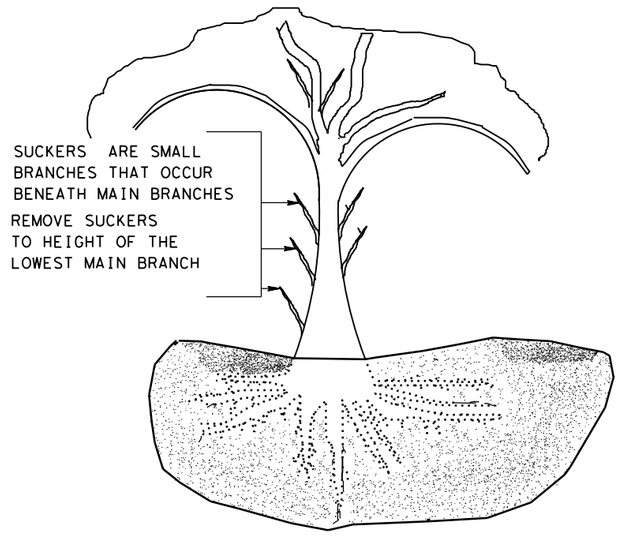
FILE: cccg12.dgn	DN: TxDOT	CK: AM	DW: VP	CK: VP
©TxDOT: 1995	CONT	SECT	JOB	HIGHWAY
REVISIONS UPDATED 2012 - VP	1507	02	016, Etc.	FM696, Etc.
	DIST	COUNTY		SHEET NO.
	BRY	BURLESON		58



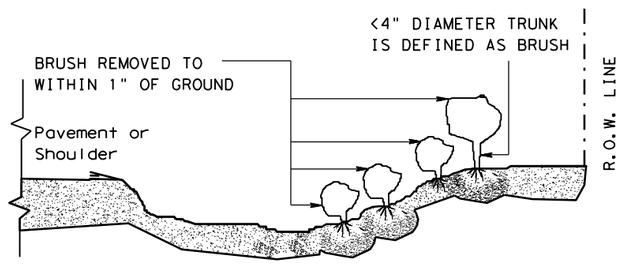
TREE REMOVAL



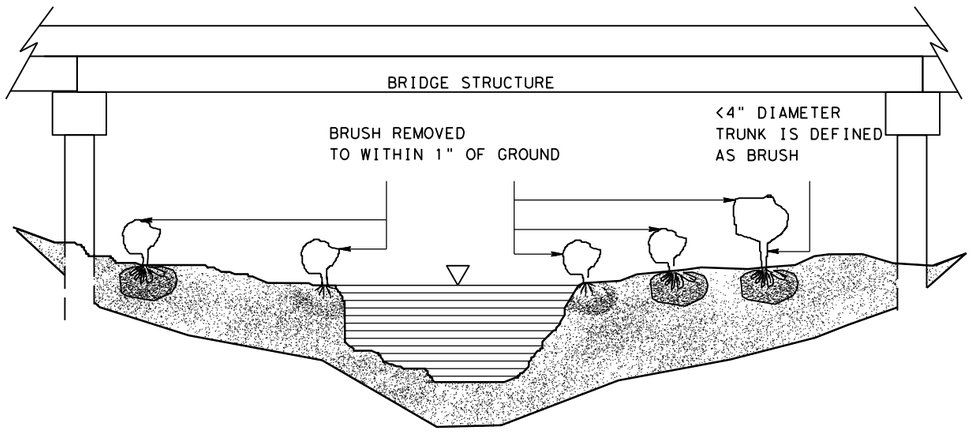
TREE TRIMMING



STEPS 1, 2 AND 3 APPLY WHEN REMOVING LIMBS 2" IN DIAMETER OR LARGER.



BRUSH REMOVAL



BRUSH REMOVAL UNDER BRIDGE AND IN CHANNEL

GENERAL NOTES:

TREE TRIMMING

1. TRIM AND REMOVE ALL TREE LIMBS ON THE PAVEMENT SIDE OF THE TRUNK 18' ABOVE THE PAVEMENT OR BRIDGE DECK ELEVATION, UNLESS OTHERWISE SHOWN ON THE PLANS.

2. TRIM AND REMOVE ALL TREE LIMBS BETWEEN THE TRUNK AND R.O.W. LINE 10' ABOVE NATURAL GROUND, TERRAIN OR OTHER STRUCTURE ELEVATION, UNLESS OTHERWISE SHOWN ON THE PLANS.

TREE REMOVAL

3. FOR TREES MARKED FOR REMOVAL, THE DIAMETER OF TREES ARE DETERMINED BY MEASUREMENT OF THE TRUNK CIRCUMFERENCE 3' ABOVE THE GROUND. TREES WITH TRUNKS OF LESS THAN 4" DIAMETER ARE CONSIDERED TO BE BRUSH. TREES WITH MULTIPLE TRUNKS AT THE POINT OF MEASUREMENT ARE MEASURED AND PAID FOR SEPARATELY.

4. MEASUREMENTS FOR PAYMENT OF TREE DIAMETERS ARE DIVIDED INTO THE RANGES SHOWN IN TABLE 1.

TABLE 1
TREE TRUNK SIZE FOR TREE REMOVAL PAYMENT

PAY ITEM	RANGE FOR PAY ITEMS: TRUNK DIAMETER * — LOWER LIMIT IS GREATER THAN	TRUNK DIAMETER * — UPPER LIMIT IS LESS THAN OR EQUAL TO	TRUNK CIRCUMFERENCE — LOWER LIMIT IS GREATER THAN	TRUNK CIRCUMFERENCE — UPPER LIMIT IS LESS THAN OR EQUAL TO
752 6005	4	12	12 1/2	37 1/2
752 6006	12	18	37 1/2	56 1/2
752 6007	18	24	56 1/2	75 1/2
752 6008	24	30	75 1/2	94
752 6009	30	36	94	113
752 6010	36	42	113	132
752 6011	42	48	132	151
752 6012	48	60	151	188 1/2
752 6013	60	72	188 1/2	226
752 6019	72	84	226	264
	84	GREATER THAN 84	264	NOT APPLICABLE

*SEE GENERAL NOTE #3.

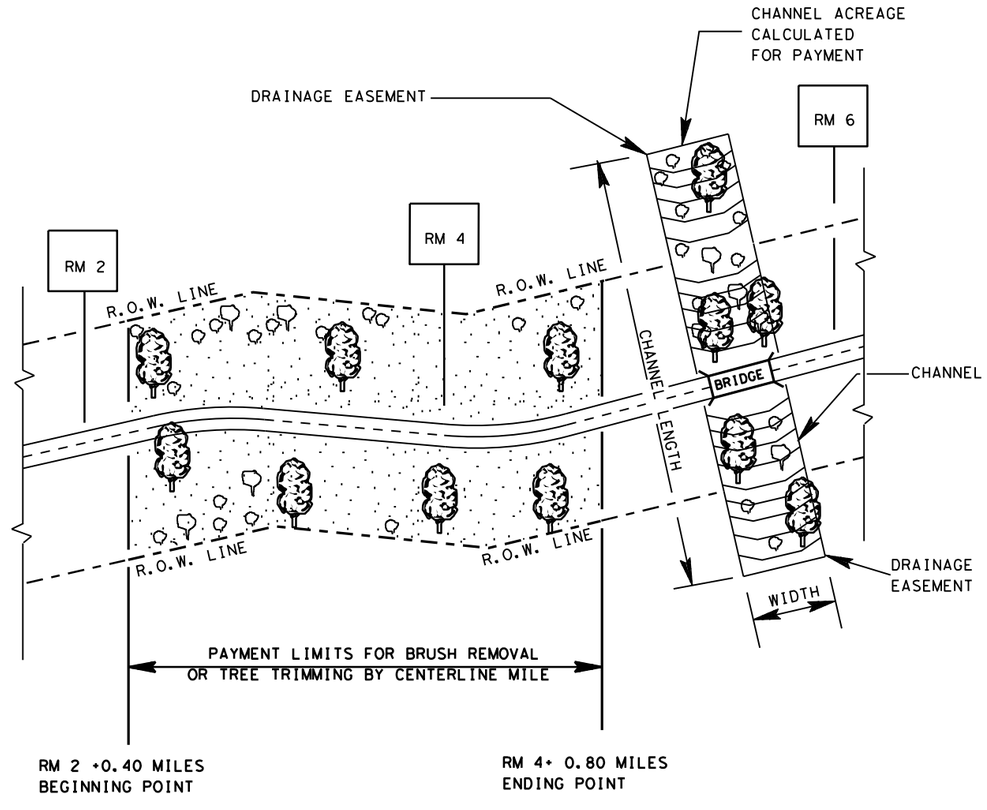
Texas Department of Transportation

Maintenance Division Standard

TREE AND BRUSH REMOVAL

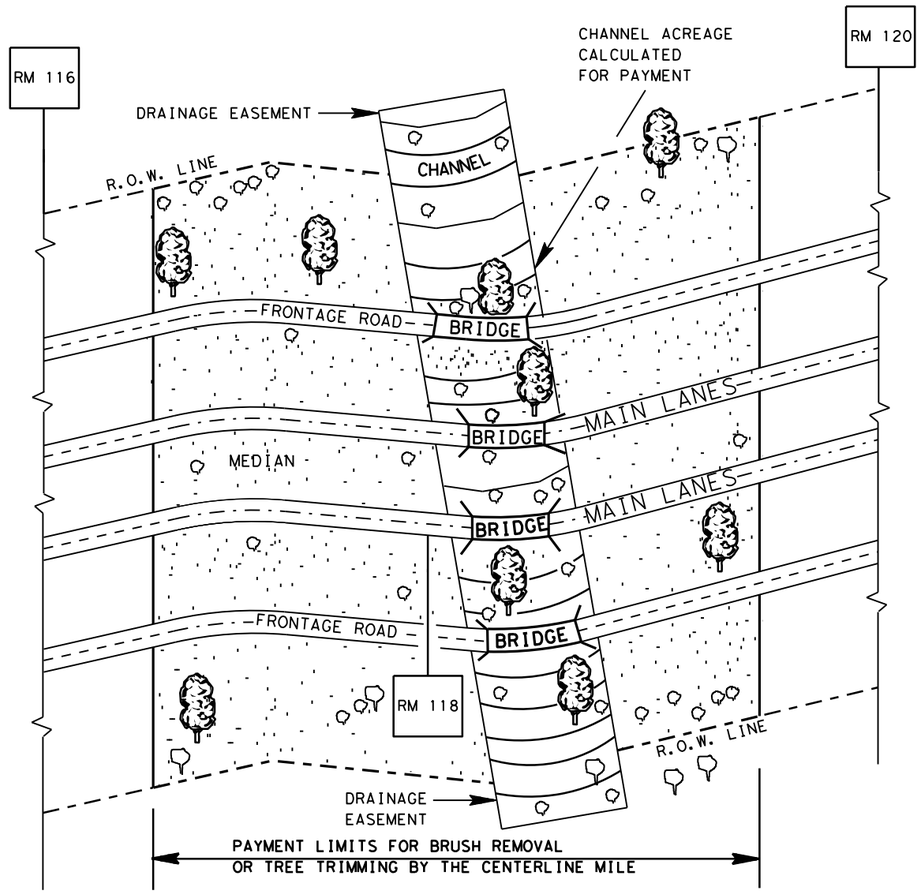
TRB-15(1)

FILE:	DN: JEO	CK: LJB	DW: JEO	CK:
© TxDOT MARCH 2015	CONT	SECT	JOB	HIGHWAY
REVISIONS	1507	02	016, Etc.	FM 696, Etc.
Revised table 1 to 2014 Specification	DIST	COUNTY		SHEET NO.
	BRY	BURLESON		59



BRUSH REMOVED TO
WITHIN 1" OF GROUND
<4" DIAMETER TRUNK
IS DEFINED AS BRUSH
UNLESS OTHERWISE DIRECTED

EXAMPLE: UNDIVIDED HIGHWAY



BRUSH REMOVED TO
WITHIN 1" OF GROUND
<4" DIAMETER TRUNK
IS DEFINED AS BRUSH
UNLESS OTHERWISE DIRECTED

EXAMPLE: DIVIDED HIGHWAY WITH FRONTAGE ROADS

LEVELS DISPLAYED
1

GENERAL NOTES:

TREE TRIMMING AND BRUSH REMOVAL

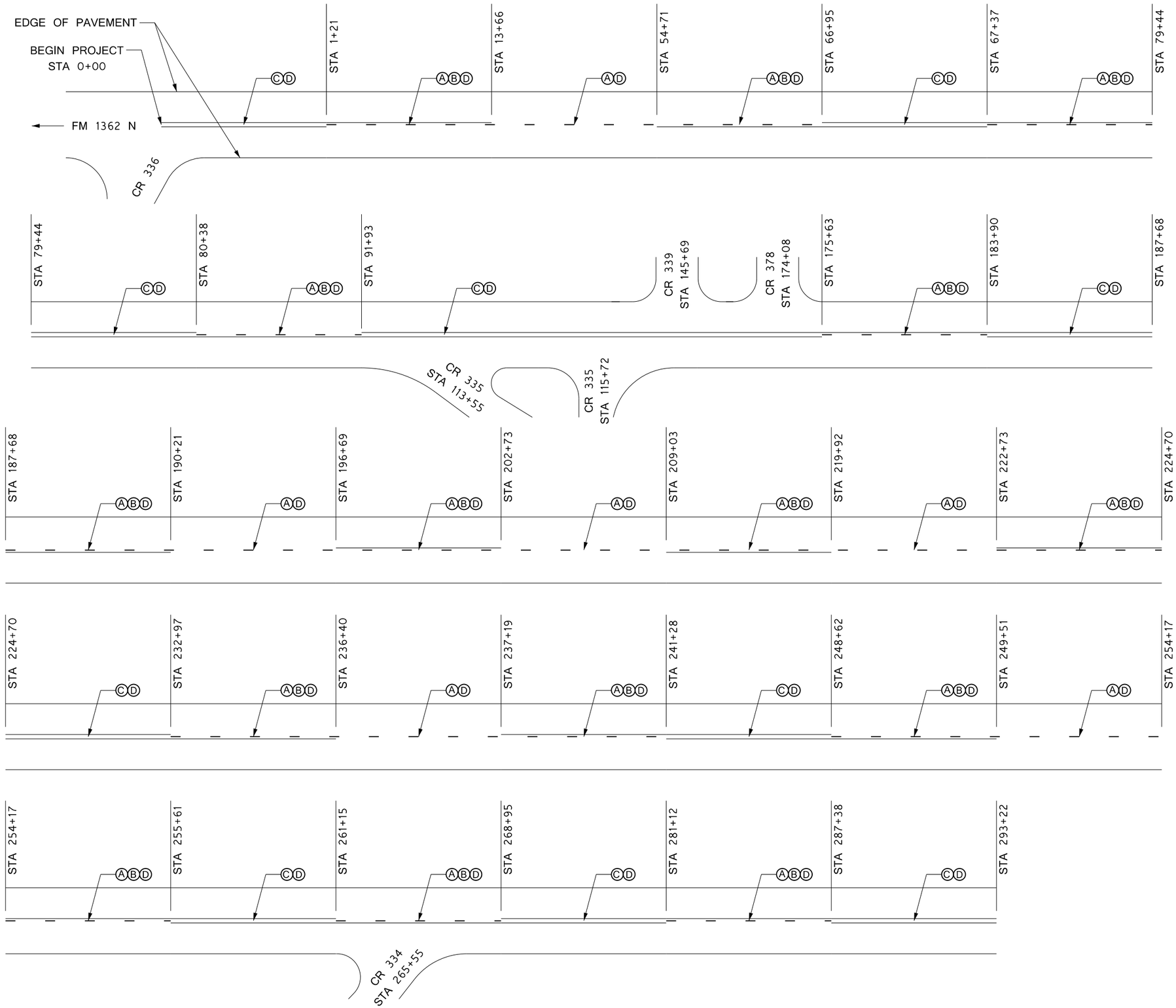
1. PAYMENT BY THE CENTERLINE MILE IS MADE TO THE NEAREST 1/100 (0.01) MILE.
2. LIMITS OF WORK ARE SHOWN AS DISTANCES FROM REFERENCE MARKERS (RM).
3. PAY ITEMS BY THE CENTERLINE MILE INCLUDE ALL TREE TRIMMING OR BRUSH REMOVAL IN THE RIGHT OF WAY ON BOTH SIDES OF THE HIGHWAY. FOR DIVIDED HIGHWAYS, THE MEDIAN IS INCLUDED. FOR HIGHWAYS WITH FRONTAGE ROADS, THE AREAS BETWEEN THE FRONTAGE ROADS AND MAIN LANES, AND THE AREAS OUTSIDE OF THE FRONTAGE ROADS ARE INCLUDED.
4. BRUSH REMOVAL AND TREE TRIMMING UNDER BRIDGES, IN AND ALONG CHANNELS AND EASEMENTS ARE PAID FOR BY THE ACRE FOR AREAS DESIGNATED ON THE PLANS.

Texas Department of Transportation
Maintenance Division
Standard Plans

TREE AND BRUSH REMOVAL

TRB-15(2)

FILE: TRB-15(2).DGN		DRAWN: JEO	CHECKED: DW; LJB	DW: -	CK: -	NEG NO.:	
© TxDOT APRIL 2015		MODIFIED:	STATE DISTRICT	FEDERAL REGION	FEDERAL AID PROJECT #		SHEET
REVISED:	5/13/2004	LJB	BRY				60
REVISED:	9/24/2004	LJB	COUNTY		CONTROL	SECTION	JOB	HIGHWAY
REVISED:	APRIL 2015	JEO	BURLESON		1507	02	016,Etc.	FM696,Etc.



LEGEND	
(A)	PROF PAV MRK (Y) 4" BRK
(B)	PROF PAV MRK (Y) 4" SLD
(C)	PROF PAV MRK (Y) DBL 4" SLD
(D)	REFL PAV MRKR TYPE II-A-A
(E)	PROF PAV MRK (W) 4" SLD

GENERAL NOTES:

STATE OF TEXAS
JEAN J. FENG
102035
LICENSED
PROFESSIONAL ENGINEER

12/21/2020

Drawings Not To Scale

PRINT DATE	REVISION DATE
12/21/2020	

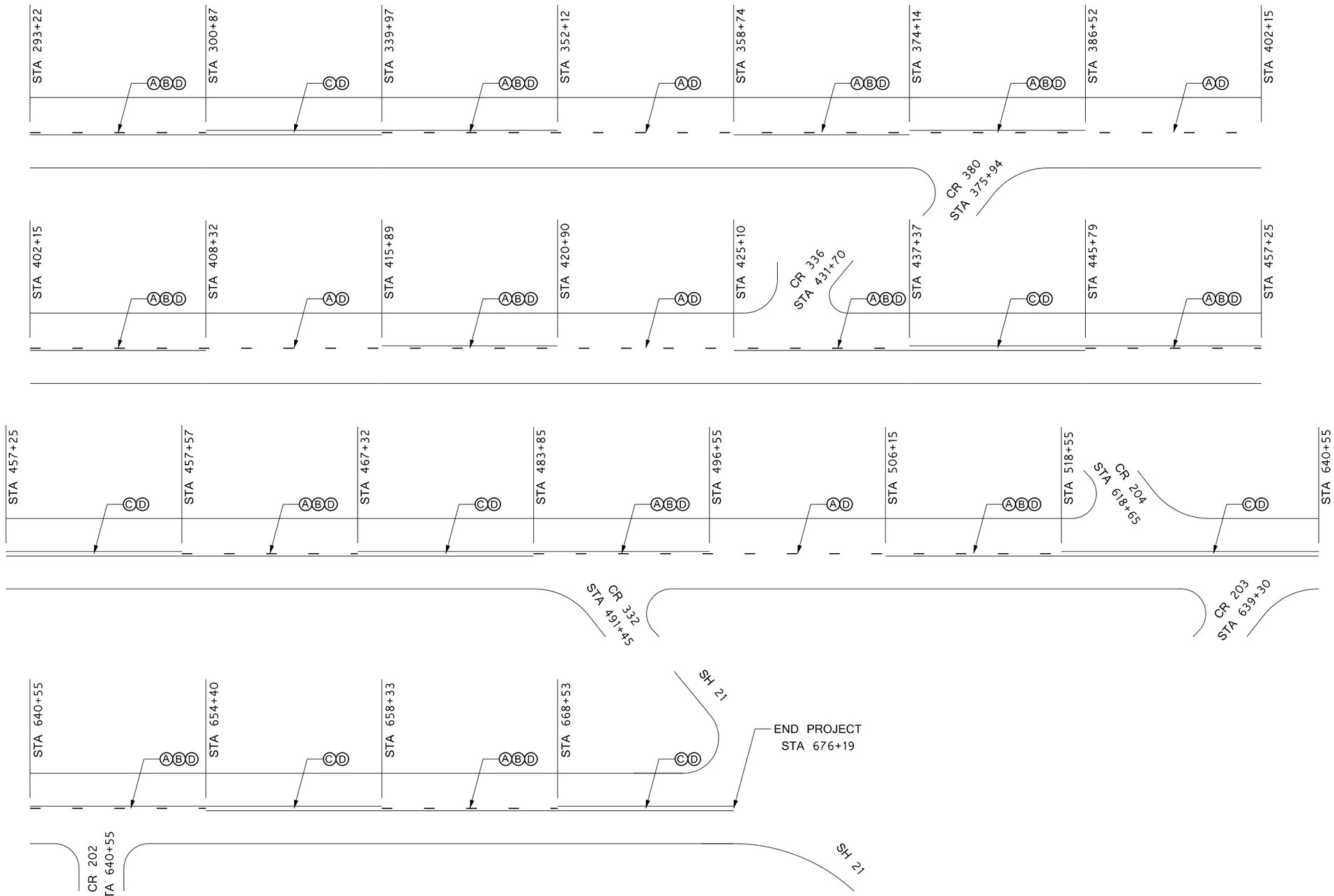
Texas Department of Transportation
Bryan District

STRIPING LAYOUT (FM 2000)

SHEET 1 OF 2

FED. RD. DIV. NO.	PROJECT NUMBER		HIGHWAY NUMBER
6			FM 696, ETC.
STATE	DISTRICT	COUNTY	
TEXAS	BRYAN	BURLESON	
CONTROL	SECTION	JOB	SHEET NO.
1507	02	016, ETC.	61

REV DATE: 2-12-2015
CSJ: 1507-02-016, Etc. FILENAME: g:\150702\016\sheets\Sign_Stripe\1129-02-019 Centerline.dgn



LEGEND

- (A) PROF PAV MRK (Y) 4" BRK
- (B) PROF PAV MRK (Y) 4" SLD
- (C) PROF PAV MRK (Y) DBL 4" SLD
- (D) REFL PAV MRKR TYPE II-A-A
- (E) PROF PAV MRK (W) 4" SLD

GENERAL NOTES:

STATE OF TEXAS
JEAN J. FENG
102035
LICENSED
PROFESSIONAL ENGINEER

12/21/2020

Drawings Not To Scale

PRINT DATE	REVISION DATE
12/21/2020	

Texas Department of Transportation
Bryan District

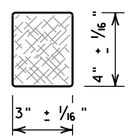
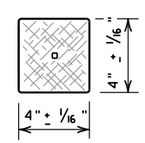
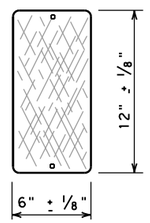
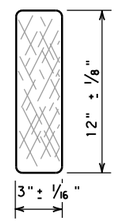
STRIPING LAYOUT (FM 2000)

SHEET 2 OF 2

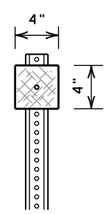
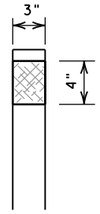
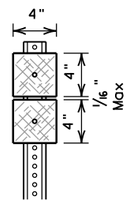
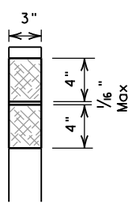
FED. RD. DIV. NO.	PROJECT NUMBER		HIGHWAY NUMBER
6			FM 696, ETC.
STATE	DISTRICT	COUNTY	
TEXAS	BRYAN	BURLESON	
CONTROL	SECTION	JOB	SHEET NO.
1507	02	016, ETC.	62

REV DATE: 2-12-2015
CSJ: 1507-02-016, Etc. FILENAME: g:\150702\016\sheets\Sign_Stripe\1129-02-019 Centerline.dgn

REFLECTOR UNIT SIZES FOR DELINEATORS AND OBJECT MARKERS

	SIZE 1	SIZE 2	SIZE 3	SIZE 4
DEVICE				
SHEETING	Yellow, White or Red Type B or C reflective sheeting			
NOTE	1. Size 1 and 4 - Direct applied reflective sheeting for use on flexible post (flx). 2. Size 2 and 3 - For use on wing channel (wc) post only. Use approved metal, plastic or fiberglass backplate with 17/64" mounting holes.			

DELINEATORS

	SINGLE		DOUBLE	
DEVICE	 1-Size 2 reflector unit	 1-Size 1 reflector unit	 2-Size 2 reflector units	 2-Size 1 reflector units
SHEETING	Yellow, White or Red Type B or C Reflective Sheeting			
POST TYPE	WC	YFLX, WFLX	WC	YFLX, WFLX
MOUNT TYPE	GND	GND, SRF	GND	GND, SRF

D & OM DESCRIPTIVE CODES

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
BRF = Barrier Reflector

TYPE OF MOUNT
GND = Embedded (drivable or set in concrete)
CTB = Concrete Barrier Mount
GF1 or GF2 = Guard Fence Attachment
SRF = Surface Mount

DIRECTION
If Required
BI = Bi-Directional
BR = Bi-Directional with red on back

INSTL OM ASSM (OM-XX) (XXXX)XXX(XX)

TYPE OF OBJECT MARKER
1, 2, 3, or 4

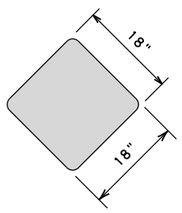
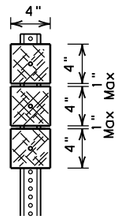
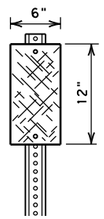
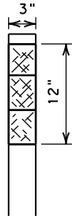
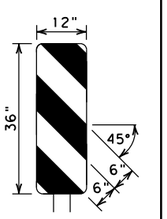
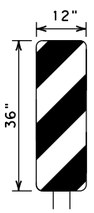
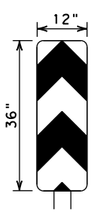
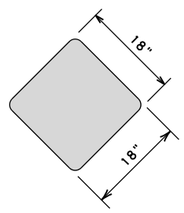
NUMBER OF REFLECTORS OR DIRECTION
X = 3-Size 2 reflector units (Type 2 only)
Y = 1-Size 3 reflector unit (Type 2 only)
Z = 3-Size 1 or 1-Size 4 reflector unit(s) (Type 2 only)
L = Left Side (Type 3 Object Marker only)
R = Right Side (Type 3 Object Marker only)
C = Center (Type 3 Object Marker only)

TYPE OF POST
WC = Wing Channel Post
WFLX = White Flexible Post
TWT = Thin Walled Tubing

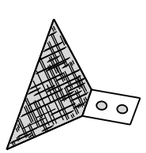
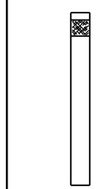
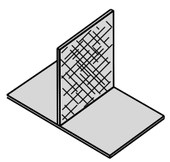
TYPE OF MOUNT
GND = Embedded (drivable)
SRF = Surface Mount
WAS = Wedge Anchor Steel
WAP = Wedge Anchor Plastic

DIRECTION
If Required
BI = Bi-Directional

OBJECT MARKERS

	Type 1 (OM-1)	Type 2 (OM-2)			Type 3 (OM-3)			Type 4 (OM-4)
	OM-1	OM-2X	OM-2Y	OM-2Z	OM-3L	OM-3R	OM-3C	OM-4
DEVICE		 3-Size 2 reflector units	 1-Size 3 reflector unit	 3-Size 1 reflector units or 1-Size 4 reflector unit				
SHEETING	Yellow-Type B_{FL} or C_{FL} Sheeting	Yellow - Type B or C Sheeting			Alternating acrylic black and retroflective yellow - Type B_{FL} or C_{FL} Sheeting			Red -Type B_{FL} or C_{FL} Sheeting
POST TYPE	TWT	WC	WC	WFLX	TWT			TWT
MOUNT TYPE	WAS, WAP	GND	GND	GND, SRF	WAS, WAP			WAS, WAP

BARRIER REFLECTORS (BRF)

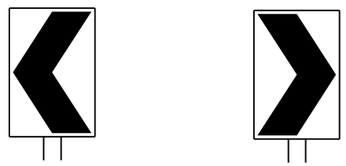
	GF1	GF2	CTB
DEVICE			

1. Barrier reflectors shall meet the requirements of DMS 8600.
2. Approved Barrier Reflectors are listed on the "Barrier Reflectors" Material Producer List at: www.txdot.gov.

SHEETING	Yellow, White, Red
NOTE	1. Reflective sheeting shall have a minimum dimension of 3 inches and minimum surface area of 9 square inches.

CHEVRONS

DEVICE



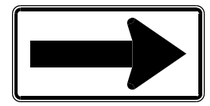
W1-8

SIZE (W x L)	18"x 24" (Conventional)	24"x 30" (Conventional Oversize)	30"x 36" (Expressway)	36" x 48" (Freeway)
MOUNTING HEIGHT	4'-0" or 7'-0"		7'-0" Only	

NOTE
1. CHEVRON (W1-8) signs and ONE DIRECTION LARGE ARROW (W1-6) Signs shall be installed per Sign Mounting Details (SMD) Standard Sheets and paid under Item 644 (Small Roadside Sign Assemblies).
2. 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).

ONE DIRECTION LARGE ARROW

DEVICE



W1-6

SIZE (W x L)	48" x 24" (Conventional)	60" x 30" (Expressway & Freeway)
MOUNTING HEIGHT	7'-0"	

NOTE:

Delineator and object marker substrates and sign substrates shall be 0.080" Aluminum sign blank to conform to ASTM B-209 Alloy 6061-T6 or approved alternative.

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

Texas Department of Transportation

Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER MATERIAL DESCRIPTION

D & OM(1)-20

FILE: dom1-20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
©TxDOT August 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS	1507	02	016, Etc.	FM696, Etc.
10-09 3-15	DIST	COUNTY		SHEET NO.
4-10 7-20	BRY	BURLESON		63

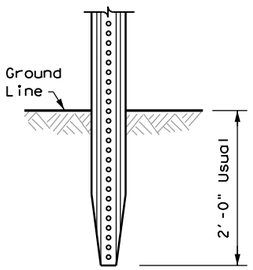
20A

DATE: 9/25/2020 5:20:07 AM
FILE: g:\150702\016\sheets\Standards\Traffic\D&OM(1)-20.dgn

POST TYPE AND SUPPORT FOUNDATION DETAILS

WING CHANNEL (WC)

GND

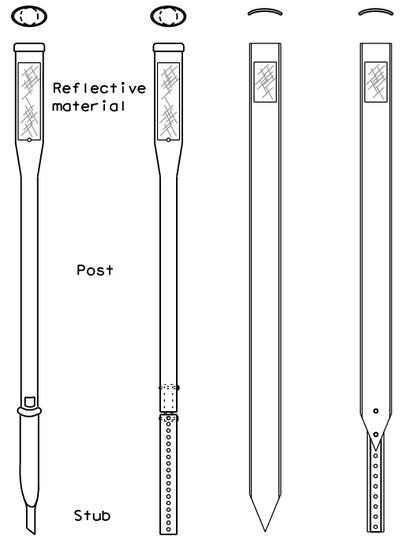


NOTES

1. Embedded Wing Channel (WC) post option may be used for Type 2 Object Markers and Delineators only.
2. 1.12 lbs/ft steel per ASTM A 1011 SS Gr. 50, or ASTM A499.

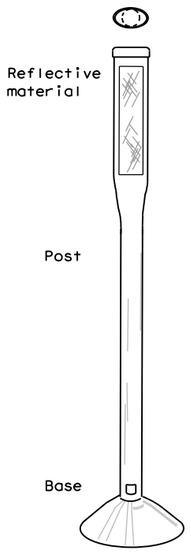
FLEXIBLE POSTS (YFLX, WFLX)

GND



EMBEDDED

SRF



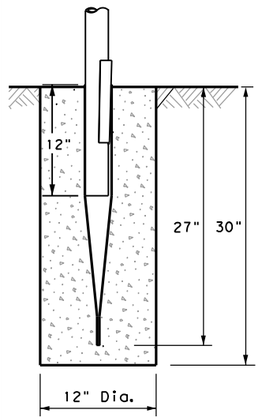
SURFACE MOUNT

NOTES

1. See "Flexible Delineator and Object Marker Posts" Material Producer List for approved devices.
2. Install per manufacturer's recommendations.
3. Post length may vary to meet field conditions.
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.

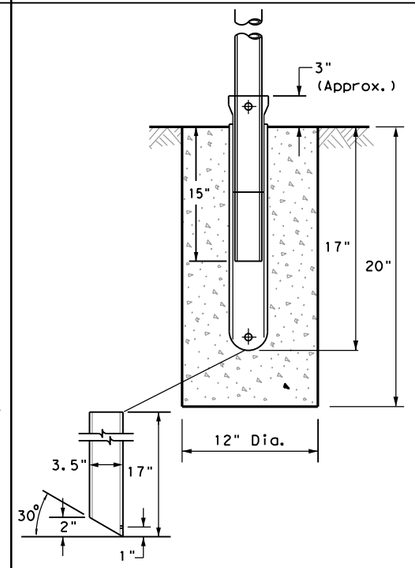
WEDGE ANCHOR SYSTEMS

WAS



STEEL

WAP



PLASTIC

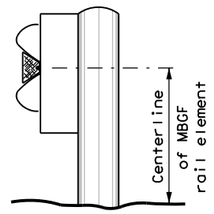
NOTE

1. Install per manufacturer's recommendations.

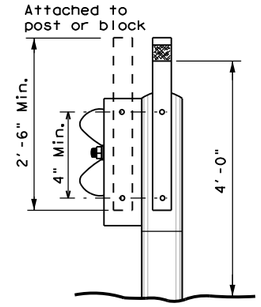
TYPE OF BARRIER MOUNTS

GUARD FENCE ATTACHMENT

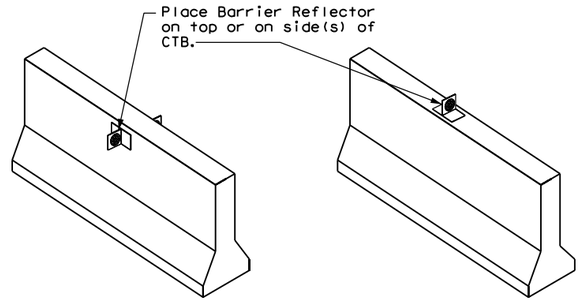
GF1



GF2



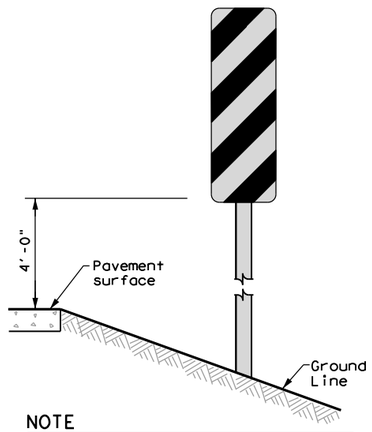
CONCRETE TRAFFIC BARRIER (CTB)



GENERAL NOTES

1. Place delineators on a section of roadway at a consistent distance from the edge of pavement.
2. Where a restriction prevents consistent placement from the pavement edge, place the affected object markers in line with the innermost edge of the obstruction.
3. When Type 2 object markers and delineators are more than 8'-0" from the edge of the pavement, it may not be possible to maintain a height of approximately 4'-0". If this is the case, place the object marker or delineator as close to the desired height as possible.
4. Install all delineators, object markers and barrier reflectors in accordance with the manufacturer's recommendation.
5. Barrier reflectors should be installed a minimum of 18 inches above the edge of the pavement surface.
6. Diagonal stripes on Type 3 object markers shall slope down toward the intended travel lane.

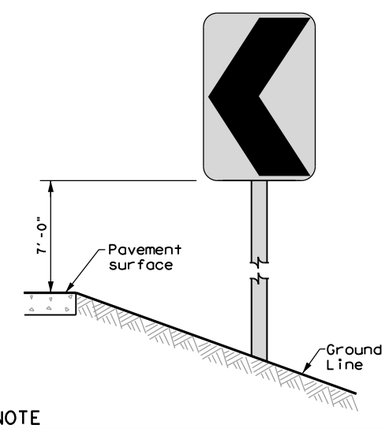
TYPES 1, 3, AND 4 OBJECT MARKERS AND CHEVRONS



NOTE

Mounting at 4 feet to the bottom of the chevron is permitted for chevrons that will not exceed a height of 6'-6" to the top of the chevron (sizes 24" x 30" and smaller)

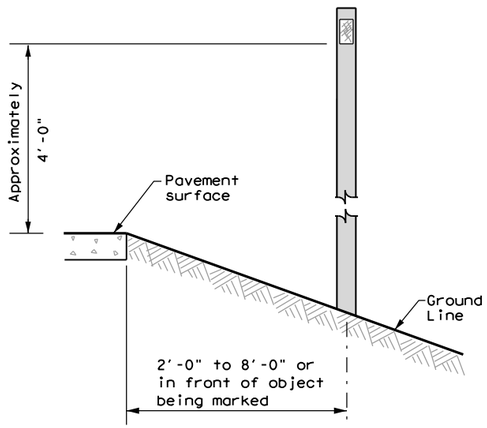
CHEVRONS AND ONE DIRECTION LARGE ARROW SIGN



NOTE

Chevrons 30" x 36" and larger shall be mounted at a height of 7' to the bottom of the chevron. Chevron sign and ONE DIRECTION LARGE ARROW sign (W1-9T) shall be installed per SMD standard sheets and paid under item 644.

DELINEATORS AND TYPE 2 OBJECT MARKERS



See general notes 1, 2 and 3.

Texas Department of Transportation

Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER INSTALLATION

D & OM(2)-20

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10-09 3-15	DIST	COUNTY		SHEET NO.
4-10 7-20	BRY	BURLESON		64

20B

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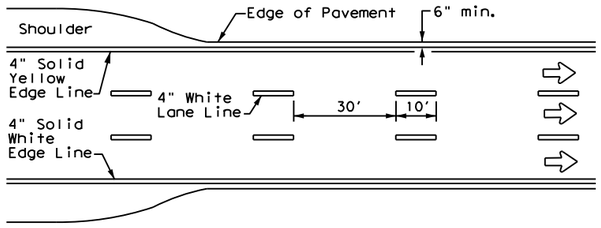
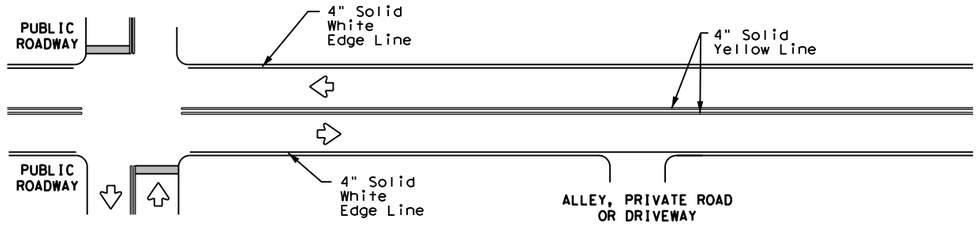
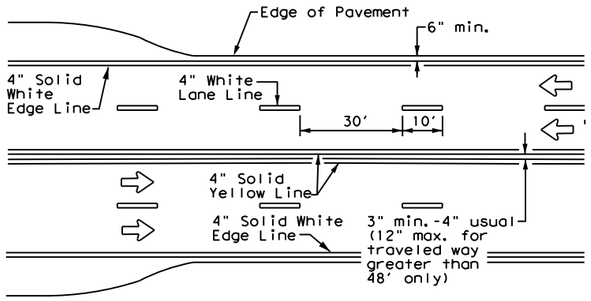


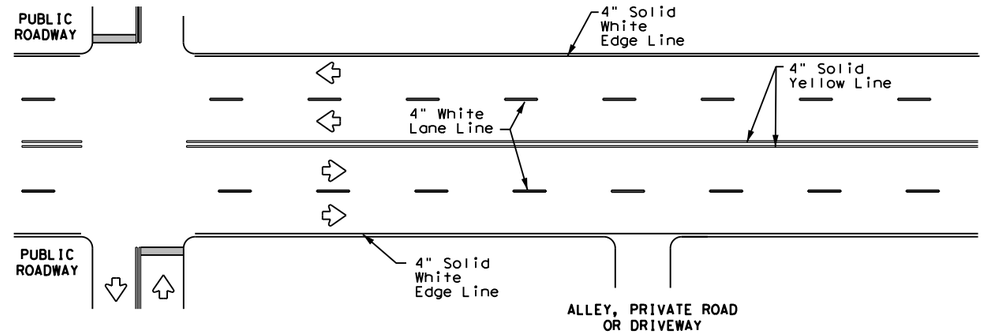
EDGE LINE AND LANE LINES
ONE-WAY ROADWAY
WITH OR WITHOUT SHOULDERS



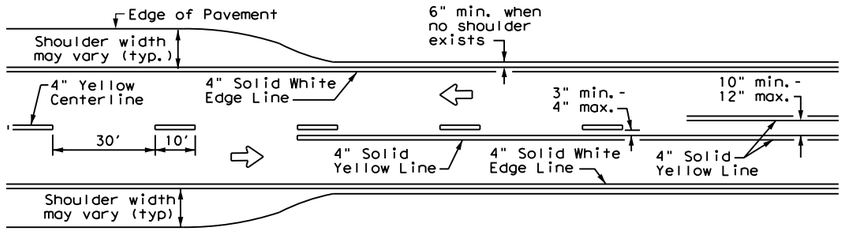
TYPICAL TWO-LANE, TWO-WAY PAVEMENT
MARKINGS THROUGH INTERSECTIONS



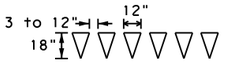
CENTERLINE AND LANE LINES
FOUR LANE TWO-WAY ROADWAY
WITH OR WITHOUT SHOULDERS



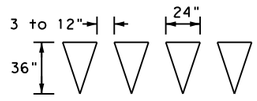
TYPICAL MULTI-LANE, TWO-WAY PAVEMENT
MARKINGS THROUGH INTERSECTIONS



TWO LANE TWO-WAY ROADWAY
WITH OR WITHOUT SHOULDERS

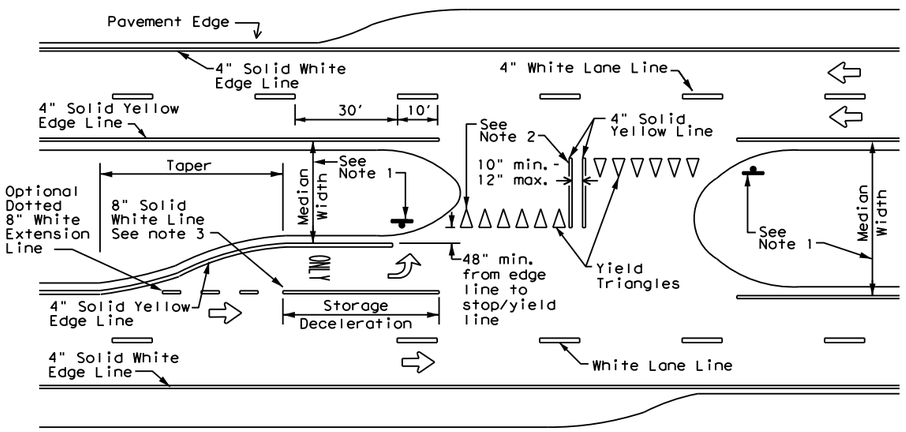


For posted speed on road being marked equal to or less than 40 MPH.



For posted speed on road being marked equal to or greater than 45 MPH.

YIELD LINES



FOUR LANE DIVIDED ROADWAY CROSSOVERS

NOTES

1. 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.

2. 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 traingles shall only be used with yield signs.

3. Length of turn bays, including taper, deceleration, and storage lengths shall be as shown on the plans or as directed by the Engineer.

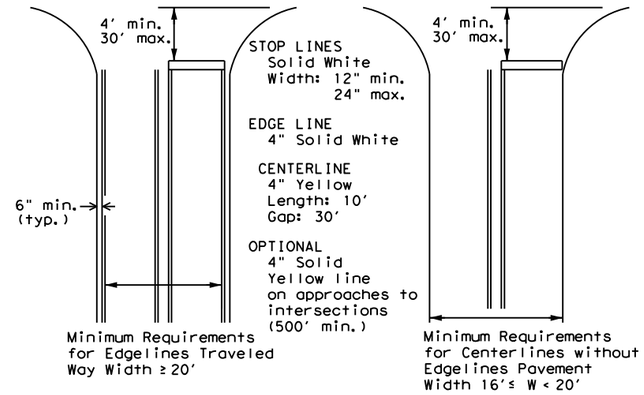
GENERAL NOTES

1. Edgeline striping shall be as shown in the plans or as directed by the Engineer. The edgeline should not be placed less 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.

2. 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

Texas Department of Transportation

Traffic Safety Division Standard

TYPICAL STANDARD PAVEMENT MARKINGS

PM(1)-20

FILE: pm1-20.dgn	DN:	CK:	DW:	CK:
©TxDOT November 1978	CONT	SECT	JOB	HIGHWAY
REVISIONS 8-95 3-03	1507	02	016, Etc.	FM696, Etc.
5-00 2-12	DIST	COUNTY		SHEET NO.
8-00 6-20	BRY	BURLESON		65

22B

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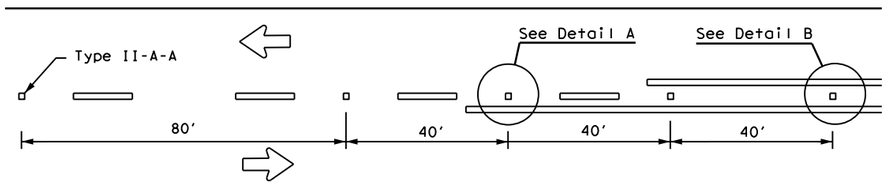
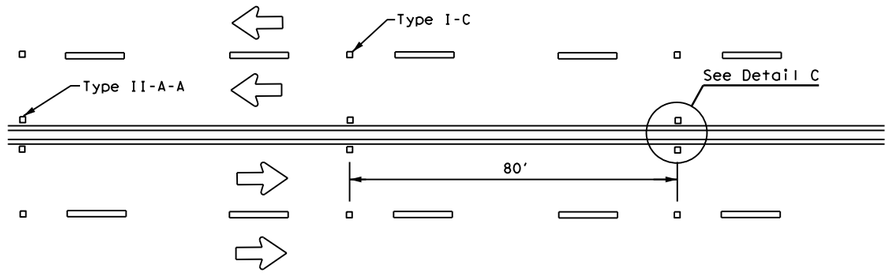
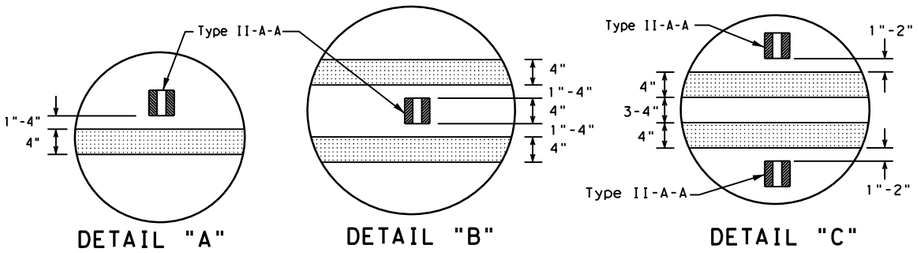
REFLECTIVE RAISED PAVEMENT MARKERS FOR VEHICLE POSITIONING GUIDANCE



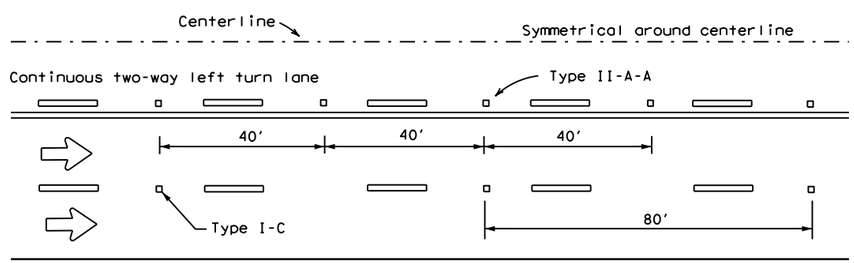
CENTERLINE FOR ALL TWO LANE ROADWAYS



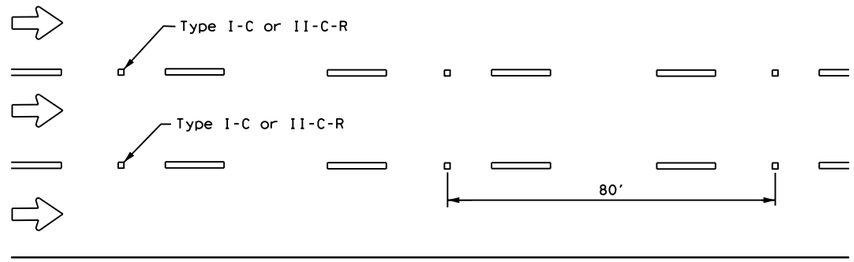
CENTERLINE & LANE LINES FOR FOUR LANE TWO-WAY HIGHWAYS



DETAIL "A" DETAIL "B" DETAIL "C"

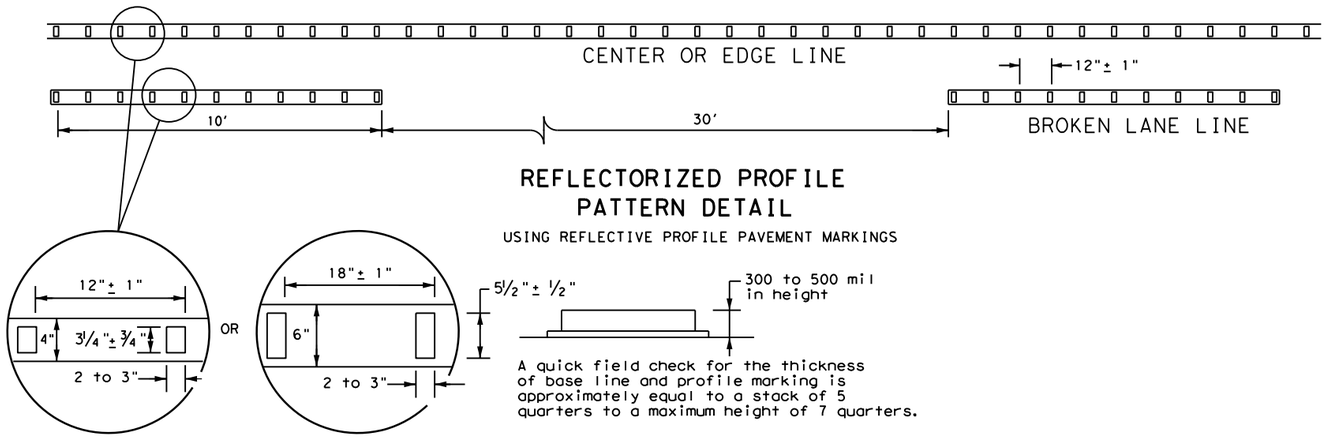


CENTERLINE AND LANE LINES FOR TWO-WAY LEFT TURN LANE



LANE LINES FOR ONE-WAY ROADWAY (NON-FREEWAY FACILITIES)

Raised pavement markers Type II-C-R shall have clear face toward normal traffic and red face toward wrong-way traffic.



REFLECTORIZED PROFILE PATTERN DETAIL

USING REFLECTIVE PROFILE PAVEMENT MARKINGS

A quick field check for the thickness of base line and profile marking is approximately equal to a stack of 5 quarters to a maximum height of 7 quarters.

4" EDGE LINE, CENTER LINE OR LANE LINE

OPTIONAL 6" EDGE LINE, CENTER LINE OR LANE LINE

NOTE

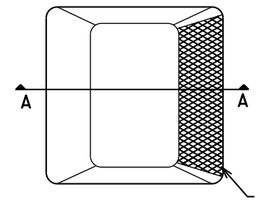
Profile markings shall not be placed on roadways with a posted speed limit of 45 MPH or less.

GENERAL NOTES

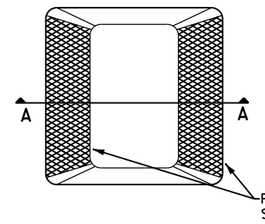
1. All raised pavement markers placed in broken lines shall be placed in line with and midway between the stripes.
2. On concrete pavements the raised pavement markers should be placed to one side of the longitudinal joints.

MATERIAL SPECIFICATIONS	
PAVEMENT MARKERS (REFLECTORIZED)	DMS-4200
EPOXY AND ADHESIVES	DMS-6100
BITUMINOUS ADHESIVE FOR PAVEMENT MARKERS	DMS-6130
TRAFFIC PAINT	DMS-8200
HOT APPLIED THERMOPLASTIC	DMS-8220
PERMANENT PREFABRICATED PAVEMENT MARKINGS	DMS-8240

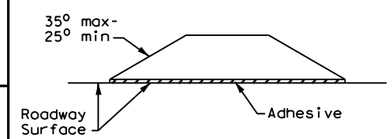
All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.



Type I (Top View)



Type II (Top View)



SECTION A

RAISED PAVEMENT MARKERS

Texas Department of Transportation

Traffic Safety Division Standard

POSITION GUIDANCE USING RAISED MARKERS RELECTORIZED PROFILE MARKINGS PM(2)-20

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©TxDOT April 1977	CONT	SECT	JOB	HIGHWAY
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	DIST	COUNTY		SHEET NO.
	BRY	BURLESON		66

228

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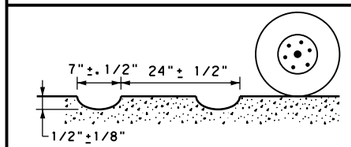
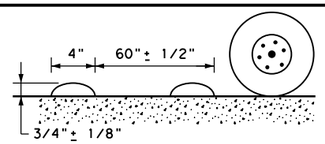
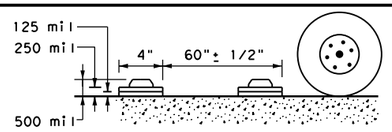
CENTERLINE RUMBLE STRIPS



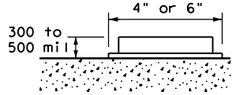
MILLED RUMBLE STRIPS



RAISED TRAFFIC BUTTONS

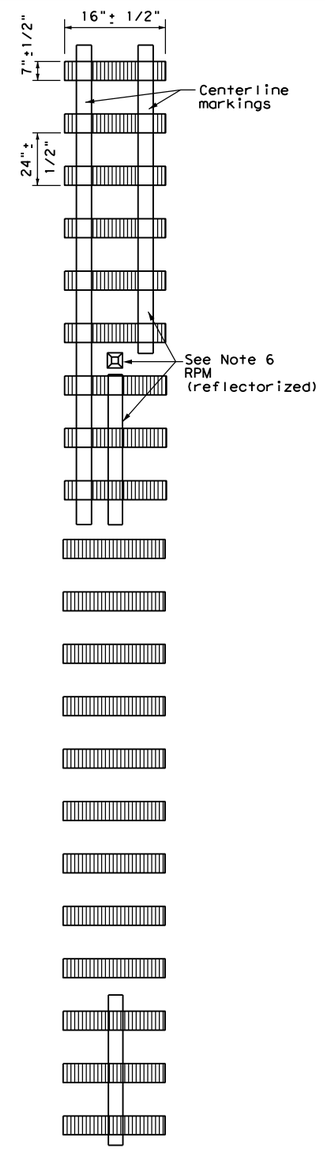


PREFORMED THERMOPLASTIC STRIPS



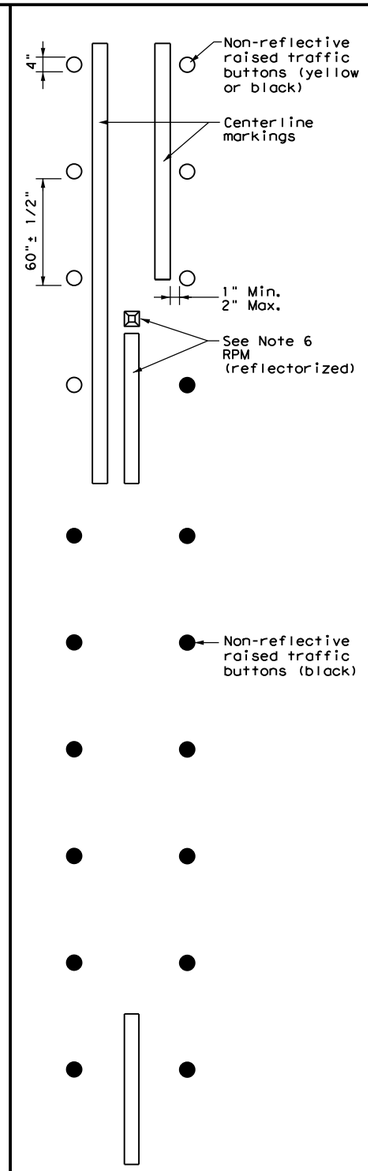
PROFILE MARKINGS

PROFILE VIEW



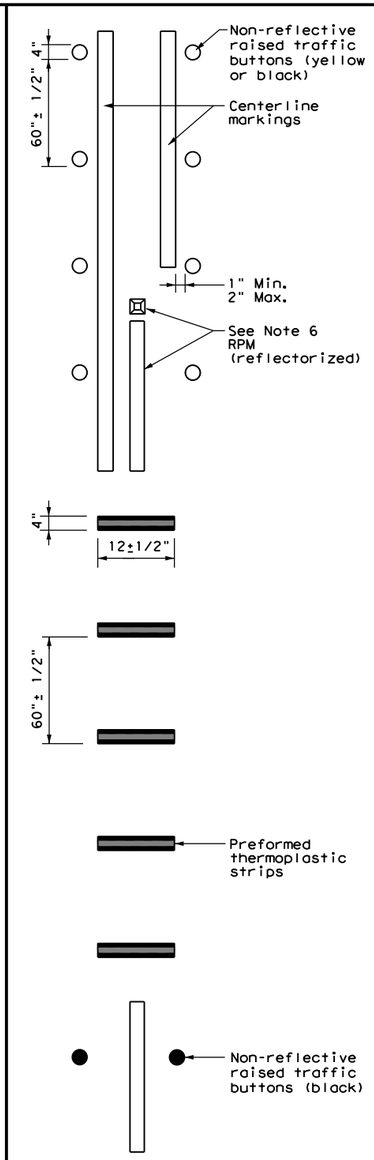
PLAN VIEW
OPTION 1

MILLED CENTERLINE RUMBLE STRIPS



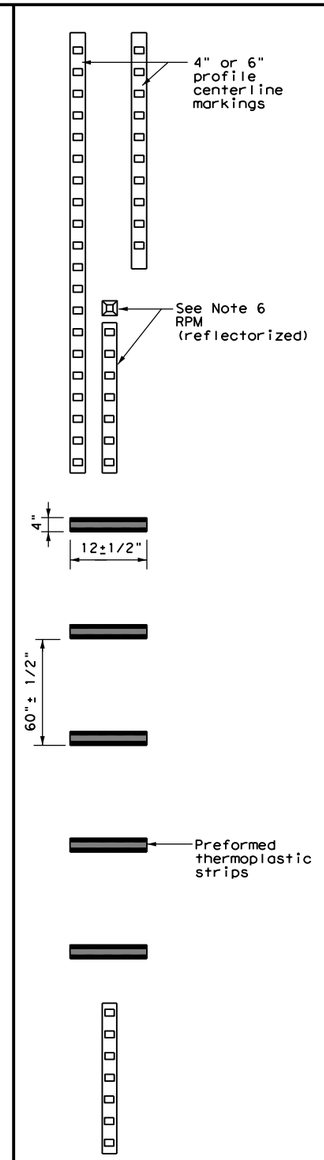
PLAN VIEW
OPTION 2

RAISED CENTERLINE RUMBLE STRIPS



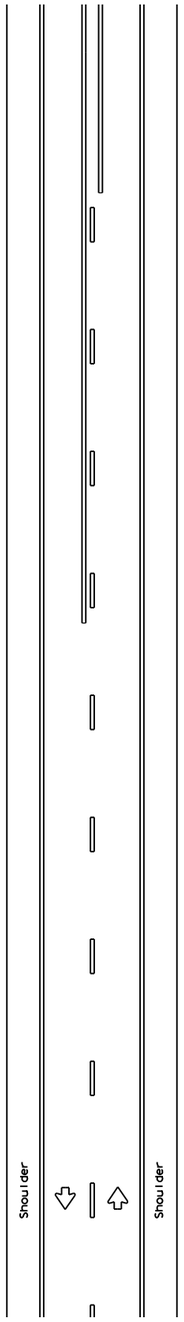
PLAN VIEW
OPTION 3

RAISED CENTERLINE RUMBLE STRIPS AND PREFORMED THERMOPLASTIC STRIPS



PLAN VIEW
OPTION 4

PROFILE CENTERLINE MARKINGS AND PREFORMED THERMOPLASTIC STRIPS



TWO LANE TWO-WAY ROADWAYS

GENERAL NOTES

1. This standard sheet provides guidelines for installing centerline rumble strips on two-lane highways with or without shoulders.
2. Centerline and edgeline rumble strips or profile markings shall not be placed on roadways with a posted speed limit of 45 MPH or less.
3. Milled rumble strips are preferred when adequate pavement depth is available. If pavement thickness is less than 2 inches, milled rumble strips shall not be used. Rumble strips shall not be milled or depressed into bridge decks.
4. See dimensions for milled rumble strips. Other shapes and dimensions may be used if approved by the Traffic Operations Division.
5. Breaks in milled centerline rumble strips shall occur at least 50 feet and no more than 150 feet in advance of bridges, railroad crossings, intersections and driveways with high usage of large trucks.
6. Use Standard Sheet PM(2) for positioning, dimensioning, and spacing of all reflective raised pavement markers, and dimensions pavement markings and profile markings.
7. Consideration should be given to noise levels when centerline rumble strips are installed near residential areas, schools, churches, etc. A minimum of 3/8 inch depth of milled rumble strip may be considered in these areas.
8. Pavement markings must be applied over milled centerline rumble strips.

WHEN INSTALLING CENTERLINE RUMBLE STRIPS:

9. Raised rumble strips consisting of non-reflective raised traffic buttons may be used. Non-reflective raised traffic buttons can be affixed to asphalt or concrete with bitumen or adhesives, as per manufacturer's recommendations.
10. When using non-reflective raised traffic buttons as a centerline rumble strip, the button shall be placed adjacent to the pavement marking delineating the centerline. The buttons will be paid for under Item 672, "Raised Pavement Markers." Non-reflective traffic buttons must meet the requirements of DMS-4300.
11. The color of the button should be yellow for a continuous no passing roadway. Black buttons should be used in areas where passing is allowed.

WHEN INSTALLING EDGELINE RUMBLE STRIPS WITH OR WITHOUT CENTERLINE RUMBLE STRIPS ON UNDIVIDED HIGHWAYS:

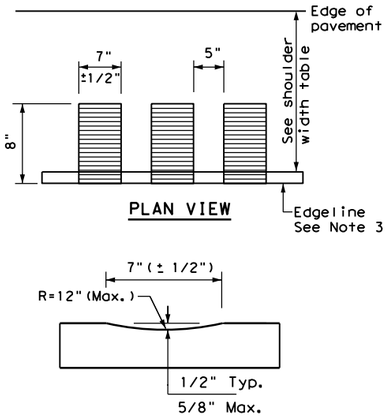
12. See standard sheet RS(4).

Texas Department of Transportation®
Traffic Operations Division Standard

CENTERLINE RUMBLE STRIPS ON TWO LANE TWO-WAY HIGHWAYS

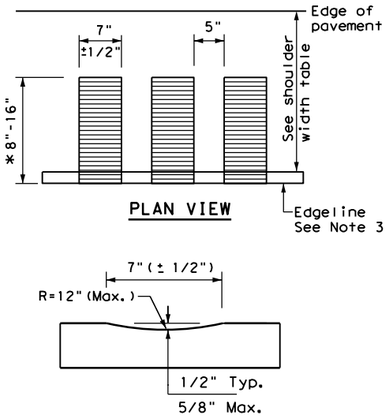
RS(3)-13

FILE: rs(3)-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT October 2013	CONT	SECT	JOB	HIGHWAY
REVISIONS	1507	02	016, Etc.	FM696, Etc.
	DIST	COUNTY		SHEET NO.
	BRY	BURLESON		67



PROFILE VIEW
OPTION 1

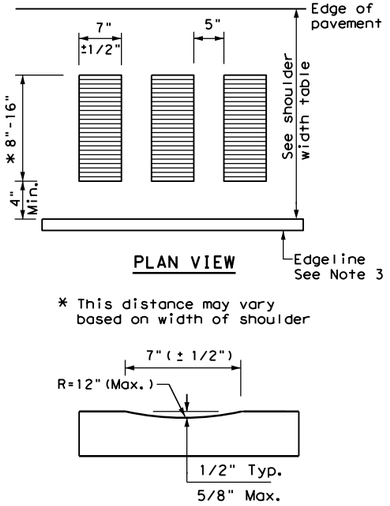
CONTINUOUS MILLED DEPRESSIONS
(Rumble Stripes)



* This distance may vary based on width of shoulder

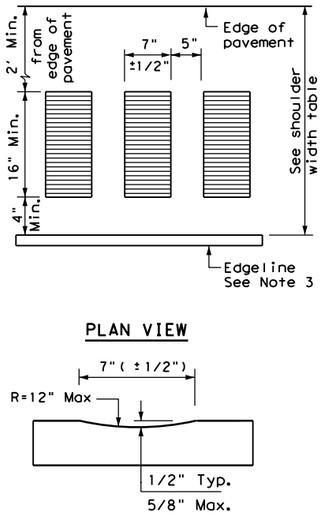
PROFILE VIEW
OPTION 2

CONTINUOUS MILLED DEPRESSIONS
(Rumble Stripes)



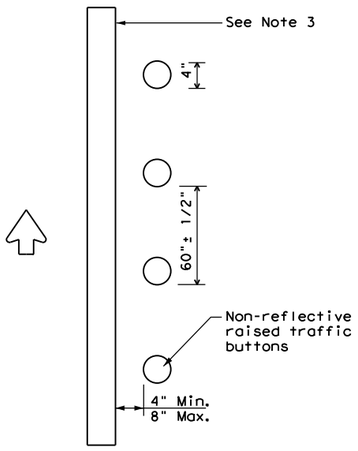
PROFILE VIEW
OPTION 3

CONTINUOUS MILLED DEPRESSIONS
(Rumble Strips)



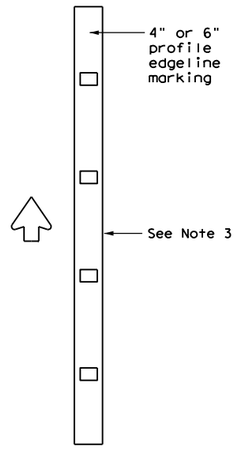
PROFILE VIEW
OPTION 4

CONTINUOUS MILLED DEPRESSIONS
(Rumble Strips)



PLAN VIEW
OPTION 5

RAISED EDGELINE RUMBLE STRIPS



PLAN VIEW
OPTION 6

PROFILE EDGELINE MARKINGS

SHOULDER WIDTH TABLE		
EQUAL TO OR LESS THAN 2 FEET	GREATER THAN 2 FEET LESS THAN 4 FEET	EQUAL TO OR GREATER THAN 4 FEET
Option 1, 5 OR 6	Option 1, 2, 3 5 OR 6	Option 2, 4, 5 OR 6

GENERAL NOTES

1. Rumble strips and profile markings shall not be placed on roadways with a posted speed limit of 45 MPH or less.
2. Milled rumble strips are preferred when adequate pavement depth is available. If pavement thickness is less than 2 inches, milled rumble strips shall not be used. Rumble strips shall not be milled or depressed into bridge decks.
3. Use Standard Sheet PM(2) for positioning, dimensioning, and spacing of all reflective raised pavement markers, pavement markings, and profile markings.
4. See the table below for determining what options may be used for edgeline rumble strips.

WHEN INSTALLING MILLED DEPRESSION EDGELINE RUMBLE STRIPS:

5. See dimensions for milled rumble strips. Other shapes and dimensions may be used if approved by the Traffic Operations Division.
6. Pavement markings can be applied over milled shoulder rumble strips to create an edgeline rumble stripe.
7. Breaks in edgeline rumble strips shall occur at least 50 feet and no more than 150 feet in advance of bridges, railroad crossings, intersections and driveways with high usage of large trucks when installed on conventional highways.
8. Rumble strips shall not be placed across exit or entrance ramps, acceleration and deceleration lanes, crossovers, gore areas or intersections with other roadways.
9. Consideration should be given to noise levels when edgeline rumble strips are installed near residential areas, schools, churches, etc. A minimum of 3/8 inches depth of milled rumble strip may be considered in these areas.
10. On roadways with high bicycle activity, consideration should be given before the installation of edgeline rumble strips. Things to consider include size of rumble strips, rumble strip material and location of rumble strips on the shoulder. If the designer determines that gaps are needed in the rumble strips due to bicycle use of the road, then follow the requirement shown in FHWA Technical Advisory T5040.39, or latest version. A detail of the spacing shall be included in the plans.

WHEN INSTALLING RAISED OR PROFILE EDGELINE RUMBLE STRIPS:

11. Raised rumble strips consisting of non-reflective raised traffic buttons may be used. Non-reflective raised traffic buttons can be affixed to asphalt or concrete with bitumen or adhesives, as per the manufacturer's recommendations.
12. Non-reflective traffic buttons shall be placed adjacent to the pavement marking delineating the edgeline when used as a rumble strip. The color of the button should match the color of the adjacent edgeline marking (white or yellow). The buttons will be paid for under Item 672, "Raised Pavement Markers." Non-reflective traffic buttons must meet the requirements of DMS-4300.
13. Non-reflective traffic buttons shall not be placed across exit or entrance ramps, acceleration and deceleration lanes, crossovers, gore areas or intersections with other roadways.
14. Breaks in edgeline rumble strips using raised traffic buttons shall occur at least 50 feet and no more than 150 feet in advance of bridges, railroad crossing, intersections and driveways with high usage of large trucks when installed on conventional highways.
15. The minimum distance between the edgeline and the buttons should be used if the shoulder is less than 8 feet in width.
16. Raised profile thermoplastic markings used as edgelines may substitute for buttons.

Texas Department of Transportation

Traffic Operations Division Standard

EDGELINE RUMBLE STRIPS ON UNDIVIDED OR TWO LANE HIGHWAYS RS(4)-13

FILE: rs(4)-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT October 2013	CONT	SECT	JOB	HIGHWAY
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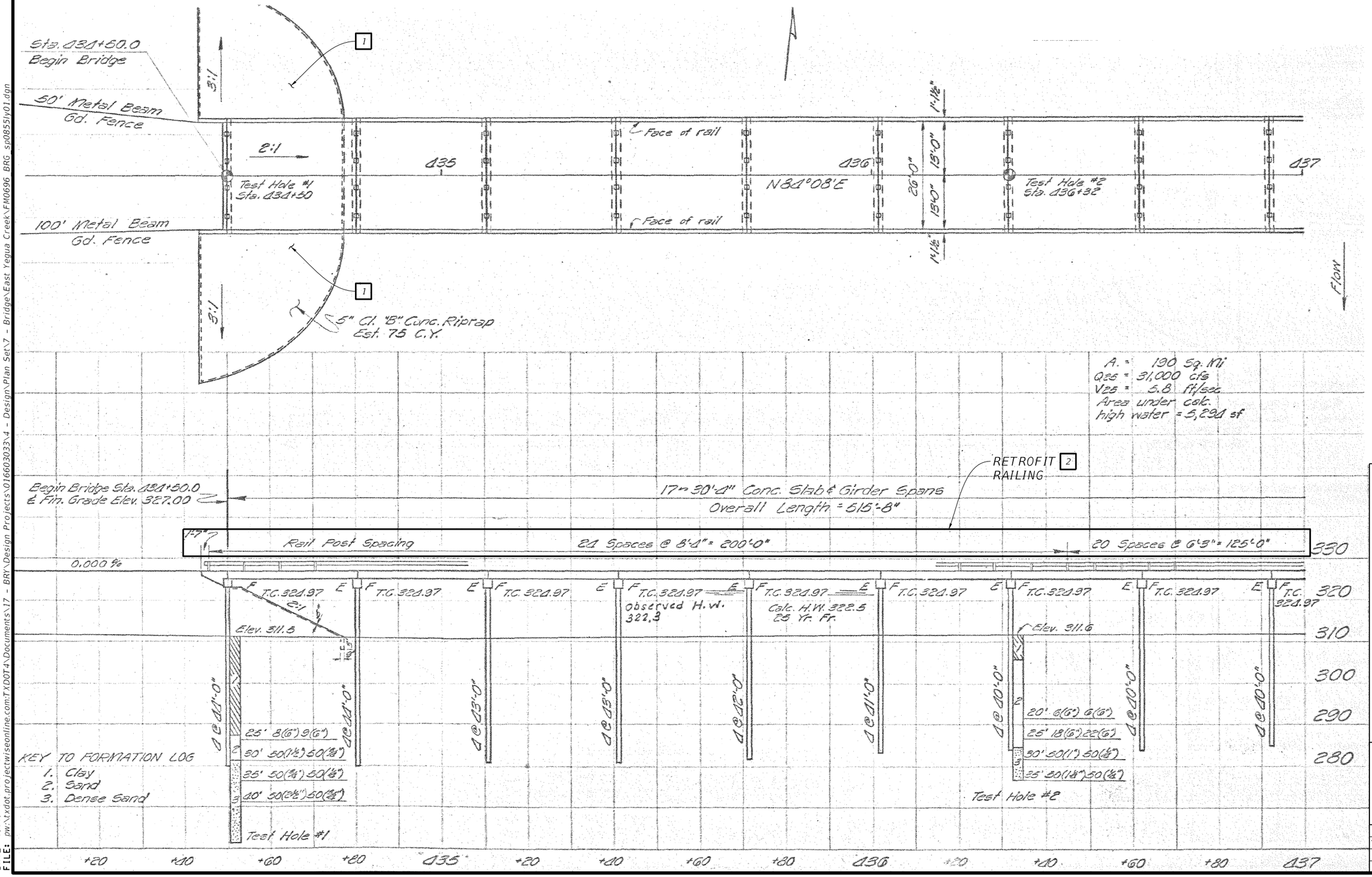

= Repair No.
See Key of
Repairs sheet

NBI# 17-026-0-1507-02-005

STATE OF TEXAS
AL SHAWN
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09/25/2020

FM 696
EAST YEGUA
BRIDGE LAYOUT

SHEET 1 OF 2

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
1507	02	016, Etc.	FM 696, Etc.
DIST	COUNTY		SHEET NO.
BRY	BURLESON		69

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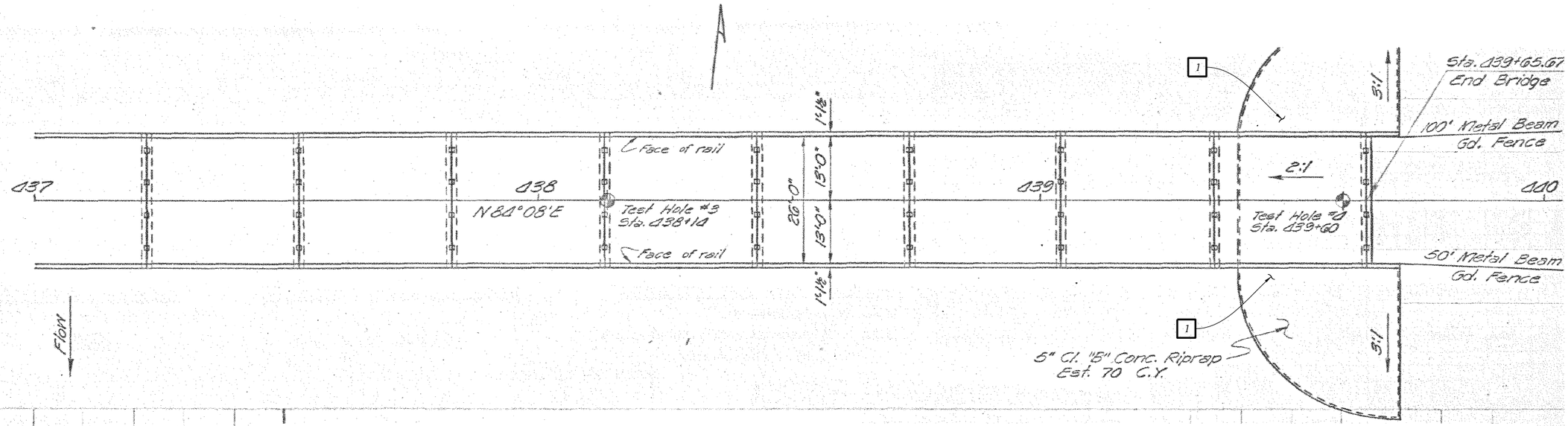

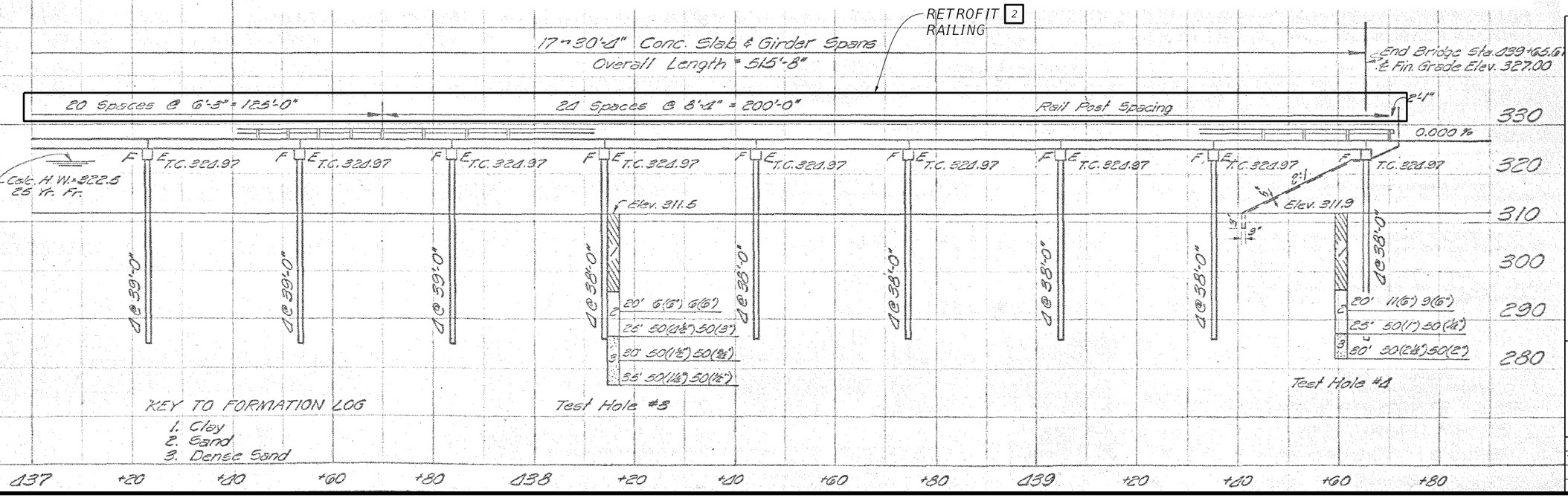

= Repair No. See Key of Repairs sheet

NBI# 17-026-0-1507-02-005

STATE OF TEXAS
AL SHAWN
132389
LICENSED PROFESSIONAL ENGINEER

09/25/2020

FM 696
EAST YEGUA BRIDGE LAYOUT

SHEET 2 OF 2

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
1507	02	016, Etc.	FM 696, Etc.
DIST	COUNTY		SHEET NO.
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TABLE OF REPAIRS

REPAIR NO.	ITEM	BID ITEM DESCRIPTION	UNIT	QUANTITY	TOTAL	REPAIR DESCRIPTION/LOCATOR	DETAILS/NOTES
1	0432 6033	RIPRAP (STONE PROTECTION) (18)	CY	290	290	Replace the current riprap with riprap stone protection	
2	0451 6019	Retrofit Rail (Ty T631)	LF	1057.3	1057.3	Upgrade rail with traffic rail (Ty T631)	

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Texas Department of Transportation — Bridge Division

KEY OF REPAIRS

NBI# 17-026-0-1507-02-005

FM 696 AT
EAST YEGUA CREEK BRIDGE

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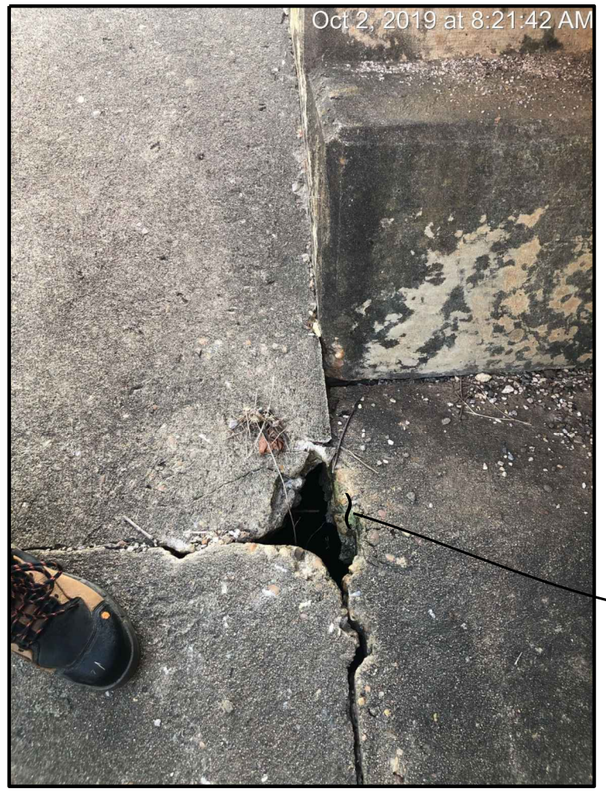
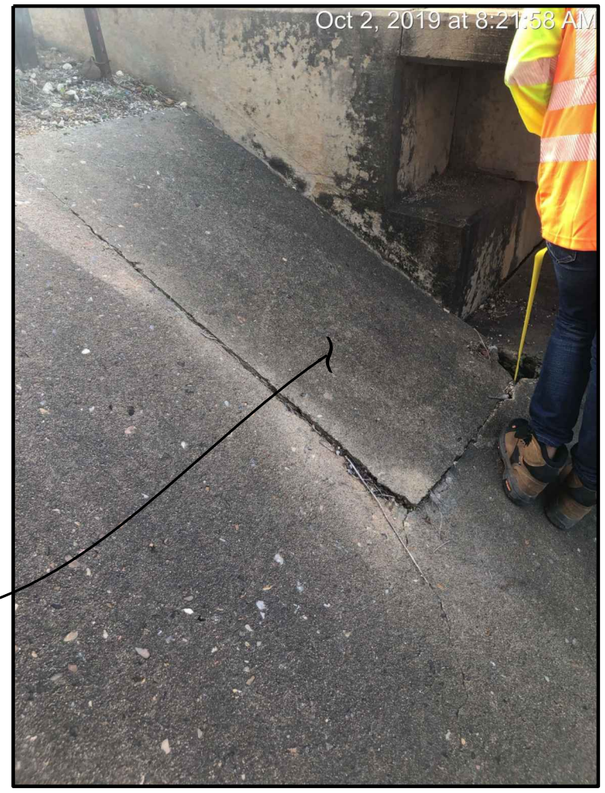


RIPRAP SETTLED AT ABUTMENT NO. 18



RIPRAP SETTLED AT ABUTMENT NO. 18

RIPRAP SETTLED AT ABUTMENT NO. 18 WITH NO FILL UNDERNEATH

(1) Concrete riprap settled. See repair No. 1.

GENERAL NOTES:

Photos were taken 10/2/2019 and are intended to give Contractor a sense of existing conditions and scope of damage. Current conditions may differ. Before beginning work perform a walk-through inspection with the Engineer to verify damage locations and note any potential additional damage locations.

SHEET 1 OF 3

STATE OF TEXAS
AL SHAWN
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09/25/2020

Texas Department of Transportation | Bridge Division

EXISTING STRUCTURE PHOTOS

NBI# 17-026-0-1507-02-005

FM 696 AT EAST YEGUA CREEK BRIDGE

FILE: FM0696_BRG_RL412mi01.dgn	DN: KW	CK: AS	DW: DCY	CK: KW
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BRIDGE DECK SPALL AT SPAN NO. 17

BRIDGE DECK SPALL AT SPAN NO. 17

RIPRAP SETTLEMENT AT ABUTMENT NO. 1

(1) Concrete riprap settled. See repair No. 1.

(2) Upgrade rail. See repair No. 2.

STATE OF TEXAS
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LICENSED PROFESSIONAL ENGINEER

09/25/2020

SHEET 2 OF 3

Texas Department of Transportation | Bridge Division

EXISTING STRUCTURE PHOTOS

NBI# 17-026-0-1507-02-005

FM 696 AT
EAST YEGUA CREEK BRIDGE

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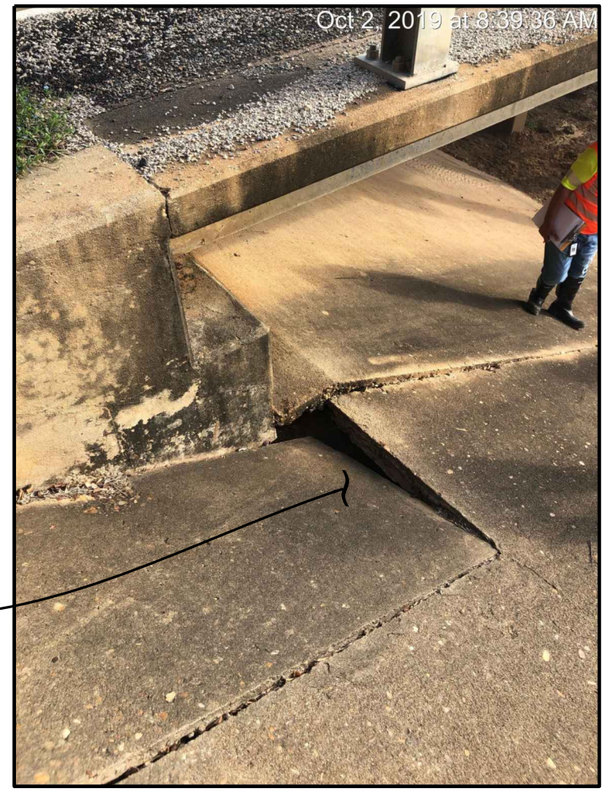
SCOUR UNDERNEATH THE RIPRAP AT ABUTMENT NO. 1



RIPRAP SETTLED AT ABUTMENT NO. 1

SCOUR/UNDERMINING END OF WINGWALL AT ABUTMENT NO. 18

(1) Concrete riprap settled. See repair No. 1.

STATE OF TEXAS
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SHEET 3 OF 3

Texas Department of Transportation | Bridge Division

EXISTING STRUCTURE PHOTOS

NBI# 17-026-0-1507-02-005

FM 696 AT EAST YEGUA CREEK BRIDGE

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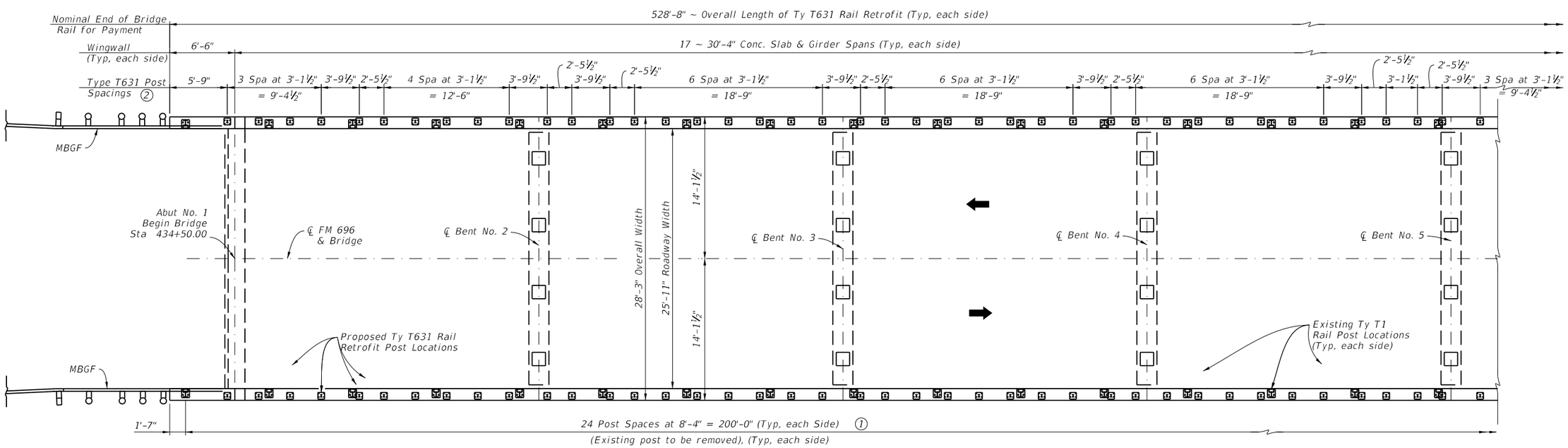

PLAN

(1) Based on measurements provided by existing drawings. Field verify prior to ordering materials.

(2) Post Spacing shown configured to avoid conflicts with existing post anchorages. Field verify and adjust as necessary to avoid conflicts.

Field verify existing dimensions before commencing work and ordering materials.

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09/25/2020

SHEET 1 OF 4

Texas Department of Transportation — Bridge Division

RAIL RETROFIT LAYOUT

NBI# 17-026-0-1507-02-005

FM 696 AT EAST YEGUA CREEK BRIDGE

FILE: FM0696_BRG_RL412lyO1.dgn	DN: KW	CK: AS	DW: LH	CK: KW
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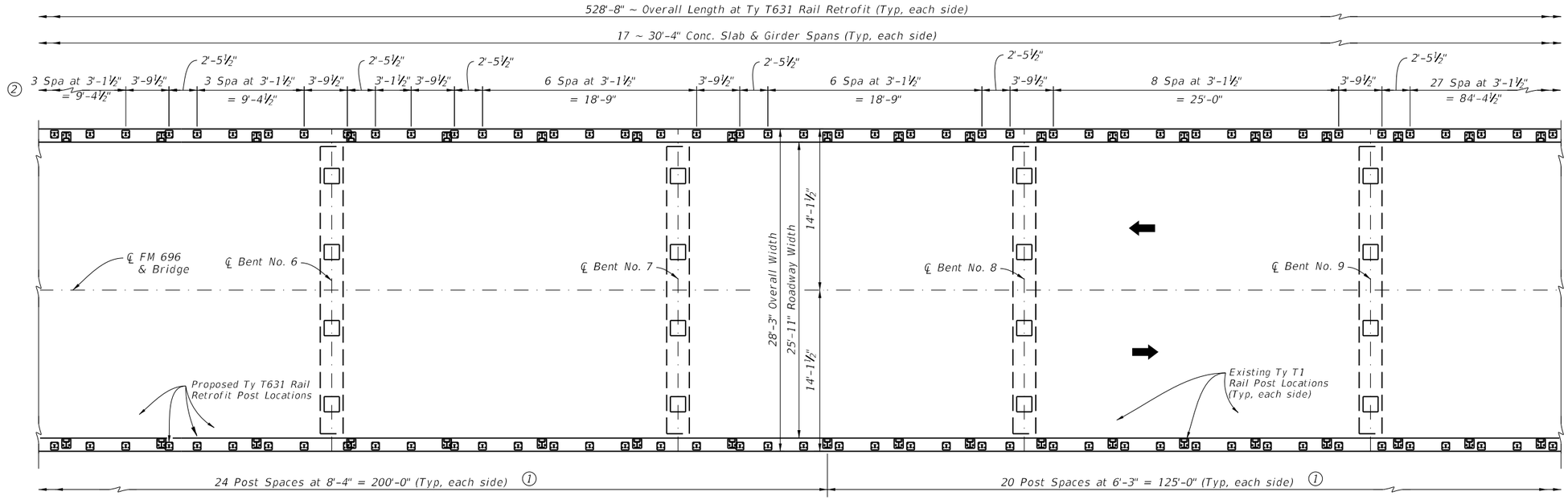

PLAN

1 Based on measurements provided by existing drawings. Field verify prior to ordering materials.

2 Post Spacing shown configured to avoid conflicts with existing post anchorages. Field verify and adjust as necessary to avoid conflicts.

Field verify existing dimensions before commencing work and ordering materials.

STATE OF TEXAS
AL SHAWN
132389
LICENSED PROFESSIONAL ENGINEER

09/25/2020

SHEET 2 OF 4

Texas Department of Transportation | Bridge Division

RAIL RETROFIT LAYOUT

NBI# 17-026-0-1507-02-005

FM 696 AT EAST YEGUA CREEK BRIDGE

FILE: FM0696_BRG_RL412ly01.dgn	DN: KW	CK: AS	DW: LH	CK: KW
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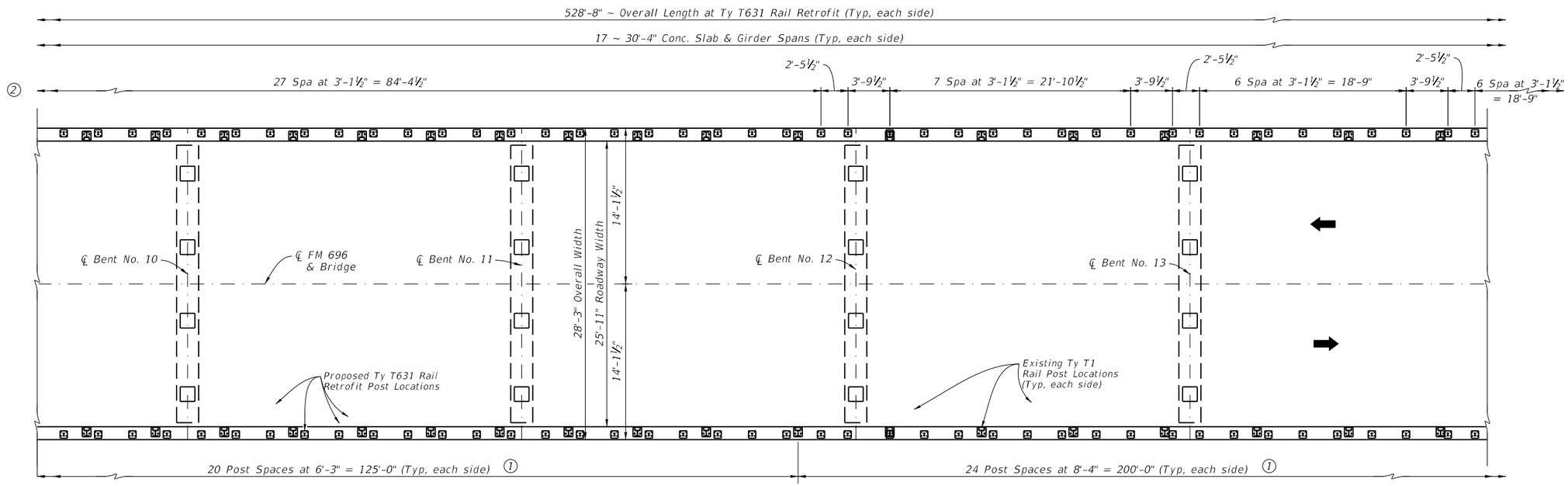

PLAN

① Based on measurements provided by existing drawings. Field verify prior to ordering materials.

② Post Spacing shown configured to avoid conflicts with existing post anchorages. Field verify and adjust as necessary to avoid conflicts.

Field verify existing dimensions before commencing work and ordering materials.

STATE OF TEXAS
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SHEET 3 OF 4

Texas Department of Transportation | Bridge Division

RAIL RETROFIT LAYOUT

NBI# 17-026-0-1507-02-005

FM 696 AT EAST YEGUA CREEK BRIDGE

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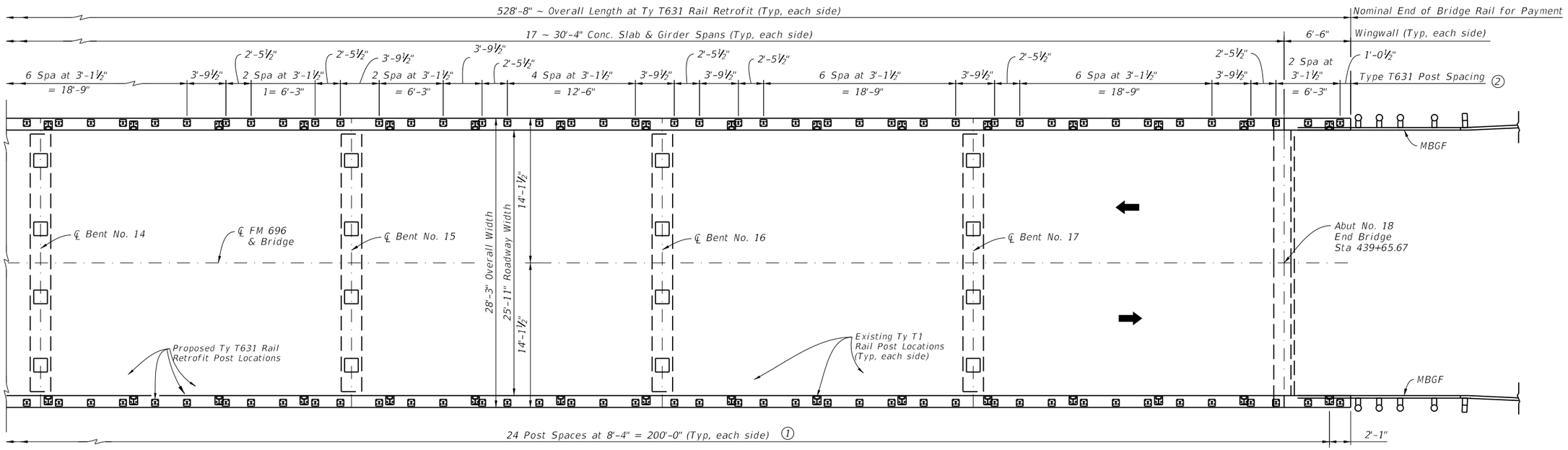

PLAN

① Based on measurements provided by existing drawings. Field verify prior to ordering materials.

② Post Spacing shown configured to avoid conflicts with existing post anchorages. Field verify and adjust as necessary to avoid conflicts.

Field verify existing dimensions before commencing work and ordering materials.

STATE OF TEXAS
AL SHAWN
132389
LICENSED PROFESSIONAL ENGINEER

09/25/2020

SHEET 4 OF 4

Texas Department of Transportation — Bridge Division

RAIL RETROFIT LAYOUT

NBI #17-026-0-1507-02-005

FM 696 AT EAST YEGUA CREEK BRIDGE

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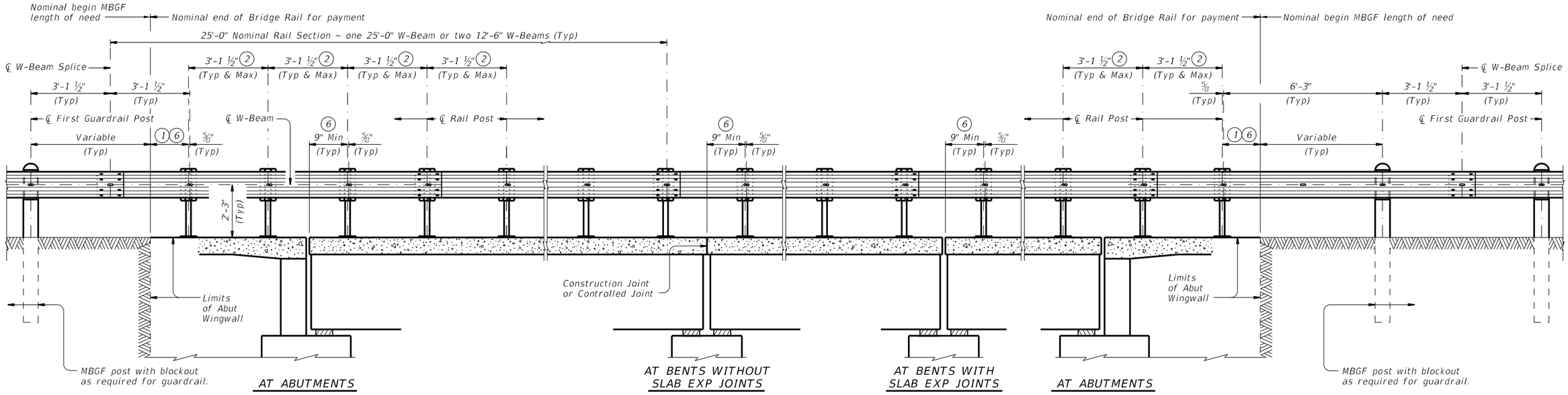
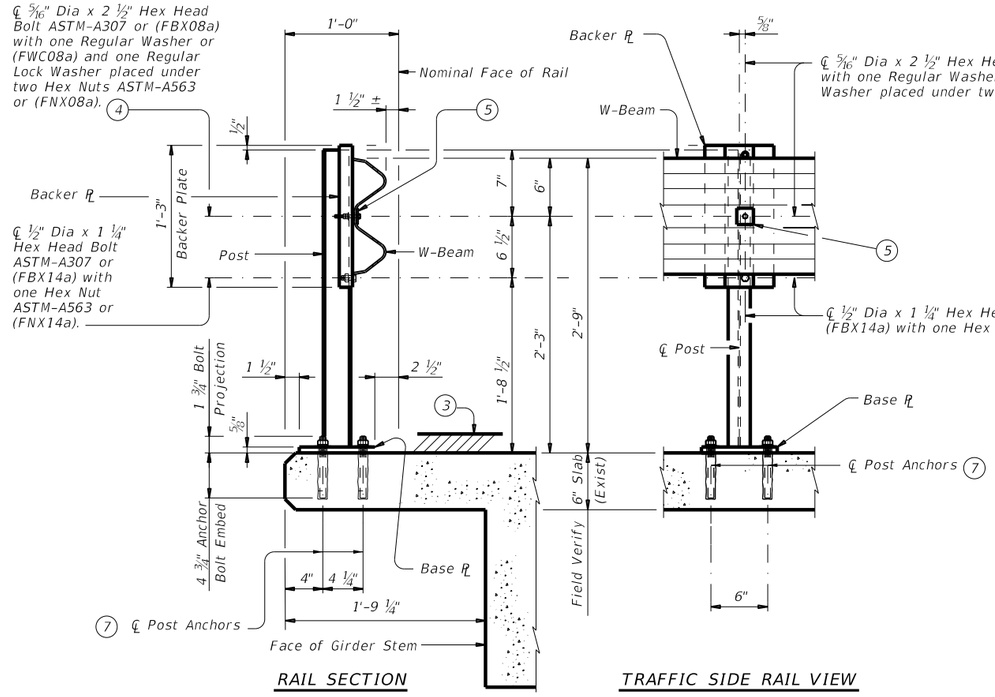
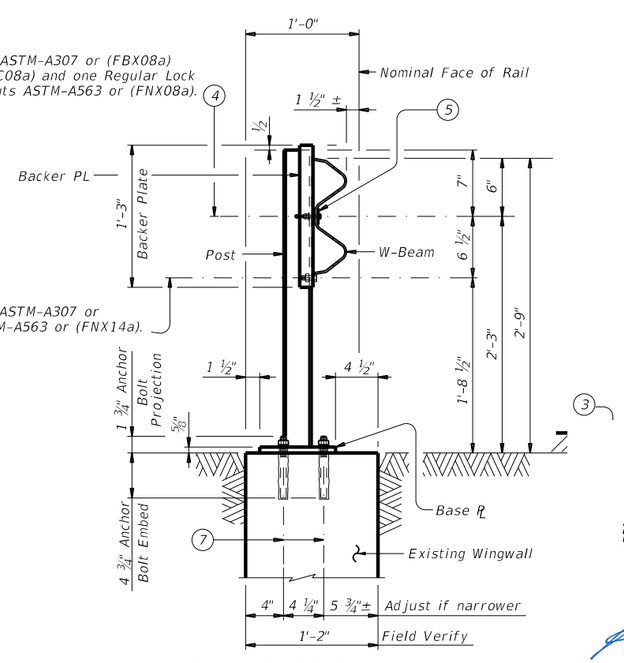


ROADWAY ELEVATION OF RAIL



RAIL DETAILS ON BRIDGE SLAB



RAIL SECTION ON ABUTMENT WINGWALL

1. 9" Min, 5'-9" Max
2. Maintain 3'-1 ½" Rail Post spacing wherever possible for use with nominal 25'-0" or 12'-6" W-Beam sections. Symmetry of post spacing on both sides and along the structure is not necessary. See Rail Layout for post spacing adjustments to avoid existing posts and joints.
3. Existing overlay. If finished driving surface is greater than 2" above top of concrete, it is recommended to taper overlay at a 1:10 or flatter slope over shoulder width to thickness of 2" or less at toe of rail. Do not perform this work unless directed by the Engineer.
4. Tighten the first hex nut by hand until the top and bottom edges of the W-Beam engage the Backer Plate (Backer Plate should be snug against the post). Then tighten hex nut one revolution with wrench and secure with the second hex nut.
5. PL ½ x 1 ¾ x 1¾ with ⅞ Dia Hole centered in PL, ASTM-A36. Square Guardrail Washer (FWR01).
6. The post nearest to a slab joint, end of structure, or existing post anchorage may be shifted up to 9" in order to satisfy the minimum offset dimension. Drill a new ¾" Dia hole on the centerline of W-beam for shifted post. Paint hole with two coats of zinc-rich paint conforming to the Item "Galvanizing". All other posts must remain on the typical spacing.
7. See Material Notes on Sheet 2 of 2 for adhesive anchorage requirements.

STATE OF TEXAS
AL SHAWN
132389
LICENSED PROFESSIONAL ENGINEER

09/25/2020

SHEET 1 OF 2

Texas Department of Transportation | Bridge Division

TRAFFIC RAIL RETROFIT

NBI: 17-026-0-1507-02-005

FM 696 AT EAST YEGUA CREEK BRIDGE

TYPE T631 (MOD)

FILE: FM0696_BRG_RL412md01.dgn	DN: KW	CK: AS	DW: LH	CK: KW
©TxDOT December 2019	CONT.	SECT.	JOB	HIGHWAY
REVISIONS 03-16: Added note for post near joint, additional baker PL material and MBGF end treatment notes. 08-16: Modified for application on pan girder bridge with 6" thick slab as retrofit.	1507	02	016, Etc.	FM 696, Etc.
	DIST.	COUNTY		SHEET NO.
	BRY	BURLESON		79

DATE: 3/31/2020 8:17:32 AM
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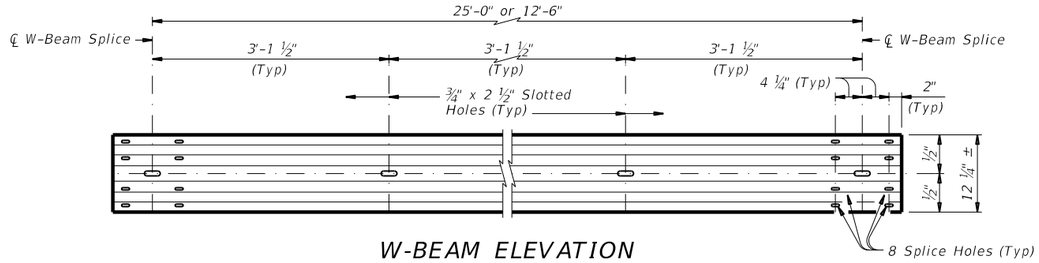
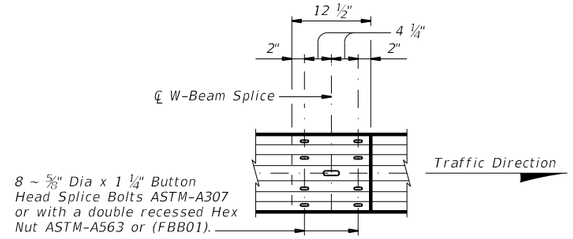
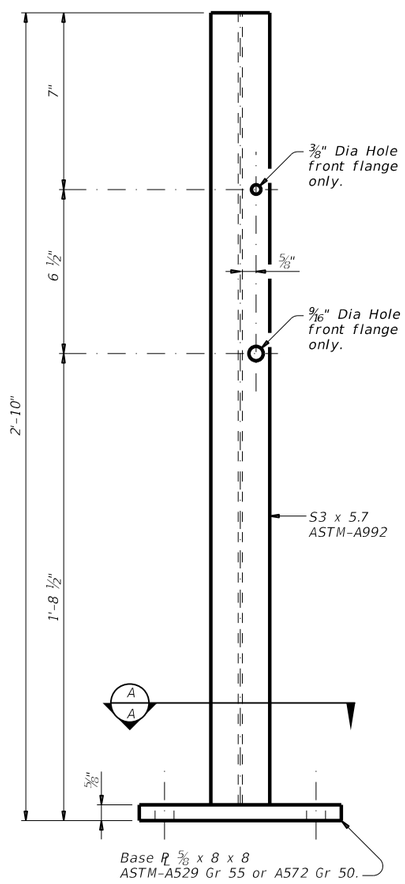


W-BEAM ELEVATION

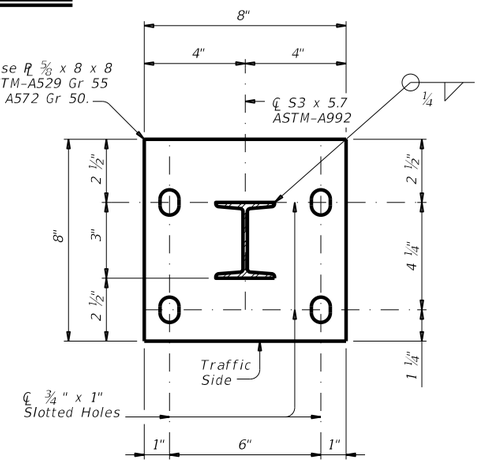
Adjust hole locations as necessary for any spacing adjustments. See RAIL LAYOUT and note 6 from Sheet 1 of 2.



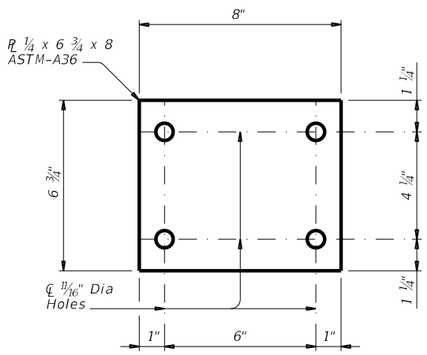
W-BEAM SPLICE ELEVATION



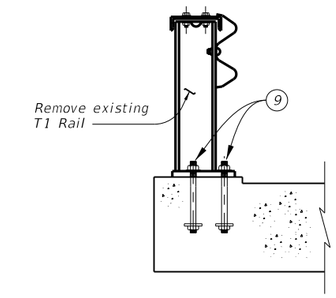
POST ELEVATION



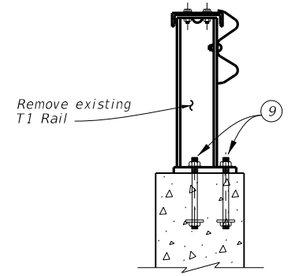
SECTION A-A



WASHER PLATE DETAIL



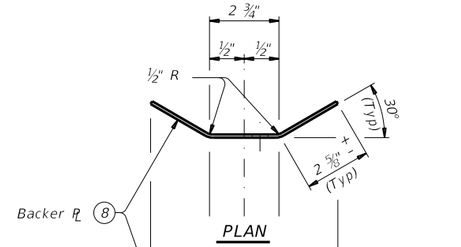
EXISTING SECTION



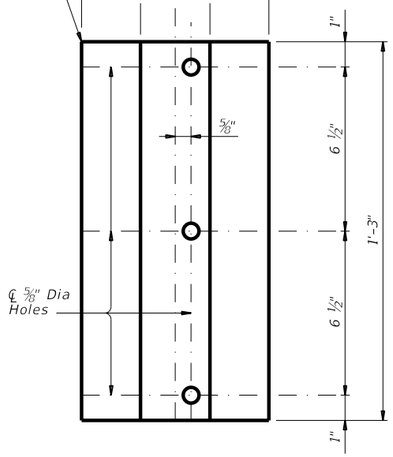
ON ABUT WINGWALL OR CIP RETAINING WALL

(8) Backer PL ½ x 8 x 1'-3" ASTM-A1011 CS or SS Gr 33, or A1008 CS or SS Gr 33 (11 Gage acceptable).

(9) On bridge superstructure, remove existing bolting hardware. Remove any stay-in-place forms (ie. pipe inserts, etc.) for the existing 1 1/4" dia holes. Fill existing holes with a cementitious grout or mortar conforming to DMS-4675. On abutment wingwalls, remove and recess existing projecting anchor rods to a depth of 1/2" into existing wingwall. Repair recess hole with an approved epoxy.



PLAN



ELEVATION

BACKER PLATE

MBGF AND END TREATMENT NOTES:

This traffic railing must be anchored by metal beam guard fence (MBGF) and guard fence end treatments. Determine MBGF length of need in accordance with the Roadway Design Manual, unless otherwise specified. The minimum MBGF length of need required for anchoring the railing is 25' of MBGF plus the appropriate end treatment.

CONSTRUCTION NOTES:

Field verify dimensions before any work starts or ordering of materials.

Face of rail post must be plumb unless otherwise approved by the Engineer. Post must be perpendicular to adjacent roadway grade. Use epoxy mortar under post base plates if gaps larger than 1/16" exist.

Fully anchored guardrail must be attached to each end of rail. A metal beam guard fence transition is not used with this rail.

It is recommended to show a Rail Layout with rail posts and W-beam splices. Fabricator must submit erection drawings to the Engineer for approval.

Round or chamfer exposed edges of rail post and backer plate to approximately 1/16" by grinding.

Shop drawings are not required for this rail.

MATERIAL NOTES:

Adhesive anchorage system must be ⅜" Dia ASTM A193 Gr B7 or F1554 Gr 105 fully threaded rods with one hardened steel washer (ASTM F436) and one regular lock washer placed under each heavy hex nut. Nuts must conform to ASTM A563 requirements. Embed fully threaded rod into slab and/or abutment wingwall using a Type III, Class C, D, E, or F anchor adhesive. Minimum adhesive anchor embedment depth is 4 ¾". Anchor adhesive chosen must be able to achieve a nominal bond strength in tension of a single anchor, Na, of 8 kips (edge distance must be accounted for). 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."

W-beam must 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" (Nominal) lengths. W-Beam must have slotted holes at 3'-1 ½".

Some part numbers from the "Task Force 13" Guide to Standardized Highway Barrier Hardware have been furnished for quick reference.

GENERAL NOTES:

This railing has been successfully evaluated by full-scale crash test to meet MASH TL-3 criteria. This railing can be used for speeds of 50 mph and greater.

This rail is designed to deflect approximately 4' to 4'-6" as it contains and redirects the errant vehicle. This rail may not be installed on top of or behind curbs that project above finished grade, on bridges with expansion joints providing more than 5" movement, on retaining walls, or on grade separations and interchanges.

Repairs to impact-damaged post and base plate unit are not permitted. Replace all impact-damaged posts with a new post and base plate unit.

Average weight of railing with no overlay: 19 plf total.

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Texas Department of Transportation — Bridge Division

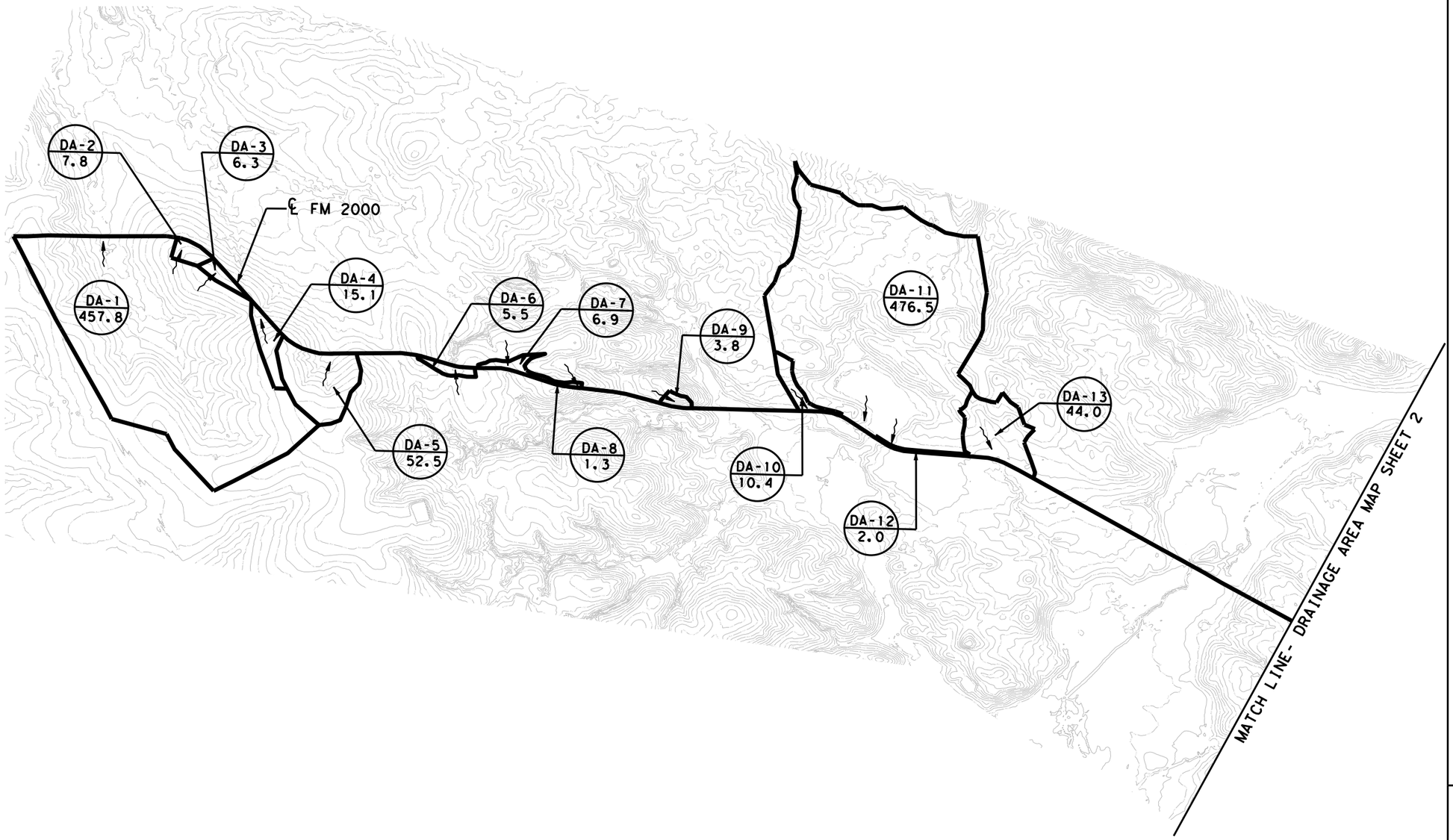
TRAFFIC RAIL RETROFIT

NBI: 17-026-0-1507-02-005

FM 696 AT EAST YEGUA CREEK BRIDGE

TYPE T631 (MOD)

FILE: FM0696_BRG_RL412md01.dgn	DN: KW	CK: AS	DW: LH	CK: KW
©TxDOT December 2019	CONT.	SECT	JOB	HIGHWAY
REVISIONS 03-16: Added note for post near joint, additional baker PL material and MBGF end treatment notes. 08-16: Modified for application on pan girder bridge with 6" thick slab as retrofit.	1507	02	016, Etc.	FM 696, Etc.
	DIST	COUNTY		SHEET NO.
	BRY	BURLESON		80



LEGEND

DA-XX / XXX — DRAINAGE AREA ID / DRAINAGE AREA IN ACRE

FLOW ARROW

STATE OF TEXAS
JANN KEONG KAM
108196
LICENSED
PROFESSIONAL ENGINEER

12/21/2020

HORIZONTAL

0 1250 2500 5000 FT

PRINT DATE	REVISION DATE
12/21/2020	

Texas Department of Transportation
Bryan District

DRAINAGE AREA MAP (FM 2000)

SHEET 1 OF 2 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 696, ETC.

STATE	DISTRICT	COUNTY
TEXAS	BRYAN	BURLESON

CONTROL	SECTION	JOB	SHEET NO.
1507	02	016, ETC.	81

REV DATE: 2-12-2015
CSJ: 1507-02-016, Etc. FILENAME: g:\150702\016\sheets\Hydrology\DRAINAGE AREA MAP_FM2000 SHEET 1 OF 2.dgn

MATCH LINE- DRAINAGE AREA MAP SHEET 1

LEGEND

DA-XX / XXX — DRAINAGE AREA ID / DRAINAGE AREA IN ACRE

FLOW ARROW

STATE OF TEXAS
JANN KEONG KAM
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12/21/2020

HORIZONTAL
0 1250 2500 5000 FT

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Texas Department of Transportation
Bryan District

DRAINAGE AREA MAP (FM 2000)

SHEET 2 OF 2 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER		HIGHWAY NUMBER
6			FM 696, ETC.
STATE	DISTRICT	COUNTY	
TEXAS	BRYAN	BURLESON	
CONTROL	SECTION	JOB	SHEET NO.
1507	02	016, ETC.	82

REV DATE: 2-12-2015
CSJ: 1507-02-016, Etc. FILENAME: g:\150702\016\sheets\Hydrology\DRAINAGE AREA MAP_FM2000 SHEET 2 OF 2.dgn

12/18/2020

NOTES:

1. FLOWS ARE COMPUTED USING NRCS HYDROGRAPH METHOD WITH HEC-HMS(4.2).
2. SOIL TYPE INFORMATION IS TAKEN FROM USDA WEB SOIL SURVEY (WSS).
3. CN VALUE IS COMPUTED BASED ON TxDOT HYDRAULIC DESIGN MANUAL 2019 AND NRCS TR-55.
4. RAINFALL DATA IS TAKEN FROM NOAA ATLAS 14, VOLUME 11, VERSION 2.
5. RATIONAL METHOD PARAMETERS ARE BASED ON TxDOT HYDRAULIC DESIGN MANUAL 2019.

NRCS Method for Time of Concentration, t_c

Drainage Area ID	Structure Station	L_{total} (ft)	Sheet Flow									Shallow Concentrated Flow						Channel Flow							t_c (min)	Remark
			L_{sh}	S_{sh}			A_{total} (ac)	Pavement n_{ol}	Weighted n_{ol}	$P_{2yr, 24hr}$	t_{sh} (hr)	L_{sc}	S_{sc}			K	t_{sc} (hr)	L_{ch}	S_{ch}			R	n	t_{ch} (hr)		
				∆h	∆L	S_{sh}							∆h	∆L	S_{sc}				∆h	∆L	S_{ch}					
FM 2000																										
DA-2	Sta 47+44	696	100	2	100	0.02	7.8	0.011	0.15	3.67	0.15	596	16.5	596	0.03	16.13	0.06								13	
DA-3	Sta 57+38	1045	100	1	100	0.01	6.3	0.011	0.15	3.67	0.20	945	10.8	945	0.01	16.13	0.15								21	
DA-4	Sta 70+29	1941	100	1	100	0.01	15.1	0.011	0.15	3.67	0.20	1841	43.7	1841	0.02	16.13	0.21								24	
DA-5	Sta 89+94	1647	100	1	100	0.01	46.2	0.011	0.15	3.67	0.20	1547	45.0	1547	0.03	16.13	0.16								21	
DA-6	Sta 117+49	849	100	5	100	0.05	8.8	0.011	0.15	3.67	0.11	749	27.9	749	0.04	16.13	0.07								10	
DA-7	Sta 129+02	925	100	0.5	100	0.005	5.8	0.011	0.15	3.67	0.27	825	20.0	825	0.02	16.13	0.09								21	
DA-8	Sta 145+42	585	100	3.5	100	0.035	1.3	0.011	0.15	3.67	0.12	485	19.3	485	0.04	16.13	0.04								10	
DA-9	Sta 169+30	514	100	1	100	0.01	3.8	0.011	0.15	3.67	0.20	414	43.0	414	0.10	16.13	0.02								13	
DA-10	Sta 198+42	1551	100	0.5	100	0.005	10.4	0.011	0.15	3.67	0.27	1451	36.6	1451	0.03	16.13	0.16								25	
DA-12	Sta 216+69	1816	100	1	100	0.01	2.0	0.011	0.08	3.67	0.12	1716	5.0	1716	0.00	16.13	0.55								40	
DA-13	Sta 240+98	1637	100	2	100	0.02	44.0	0.011	0.08	3.67	0.09	1537	32.4	1537	0.02	16.13	0.18								16	
DA-14	Sta 326+77	1685	100	0.5	100	0.005	1.9	0.011	0.15	3.67	0.27	1585	14.5	1585	0.01	16.13	0.29								33	
DA-15	Sta 351+32	1685	100	1	100	0.01	21.0	0.011	0.08	3.67	0.12	1585	9.0	1585	0.01	16.13	0.36								29	
DA-17	Sta 377+62	2081	100	2.5	100	0.025	64.2	0.011	0.08	3.67	0.08	1981	72.5	1981	0.04	16.13	0.18								16	
DA-18	Sta 387+09	2516	100	2.5	100	0.025	40.2	0.011	0.05	3.67	0.05	2416	86.8	2416	0.04	16.13	0.22								16	
DA-19	Sta 401+93	1957	100	4	100	0.04	27.0	0.011	0.08	3.67	0.07	1857	86.0	1857	0.05	16.13	0.15								13	
DA-20	Sta 407+79	1689	100	4.5	100	0.045	26.4	0.011	0.05	3.67	0.04	1589	80.0	1589	0.05	16.13	0.12								10	
DA-21	Sta 421+82	1762	100	3.5	100	0.035	44.2	0.011	0.05	3.67	0.05	1662	67.0	1662	0.04	16.13	0.14								11	
DA-22	Sta 432+39	2307	100	3	100	0.03	52.6	0.011	0.11	3.67	0.10	2207	148.0	2207	0.07	16.13	0.15								15	
DA-23	Sta 450+44	1810	100	2	100	0.02	19.7	0.011	0.08	3.67	0.09	1710	49.0	1710	0.03	16.13	0.17								16	
DA-24	Sta 469+19	856	100	1	100	0.01	2.2	0.011	0.08	3.67	0.12	756	14.0	756	0.02	16.13	0.10								13	
DA-25	Sta 483+27	405	100	2.5	100	0.025	4.0	0.011	0.08	3.67	0.08	305	3.0	305	0.01	16.13	0.05								8	use min. 10 minutes
DA-26	Sta 499+50	1041	100	1.5	100	0.015	8.8	0.011	0.08	3.67	0.10	941	10.1	941	0.01	16.13	0.16								15	
DA-27	Sta 516+72	1268	100	1	100	0.01	18.3	0.011	0.08	3.67	0.12	1168	12.1	1168	0.01	16.13	0.20								19	
DA-28	Sta 533+22	1709	100	1	100	0.01	51.5	0.011	0.08	3.67	0.12	1609	33.5	1609	0.02	16.13	0.19								18	
DA-29	Sta 541+29	1160	100	0.5	100	0.005	18.0	0.011	0.08	3.67	0.15	1060	35.0	1060	0.03	16.13	0.10								15	
DA-30	Sta 593+66	2435	100	2.7	100	0.027	43.6	0.011	0.08	3.67	0.08	1240	7.3	1240	0.01	16.13	0.28	1095	64	1095	0.06	5.4	0.027	0.01	22	SHORT GRASS, FEW WEEDS
DA-31	Sta 614+85	3141	100	3	100	0.03	134.6	0.011	0.05	3.67	0.05	1256	82.0	1256	0.07	16.13	0.08	1785	25.7	1785	0.01	2.2	0.027	0.04	11	SHORT GRASS, FEW WEEDS
DA-32	Sta 638+18	4197	100	2	100	0.02	87.8	0.011	0.08	3.67	0.09	1786	40.0	1786	0.02	16.13	0.21	2311	36.4	2311	0.02	2	0.027	0.06	21	SHORT GRASS, FEW WEEDS
DA-33	Sta 645+95	2201	100	5	100	0.05	46.3	0.011	0.14	3.67	0.10	2101	81.0	2101	0.04	16.13	0.18								17	
DA-34	Sta 680+40	3863	100	5	100	0.05	70.0	0.011	0.08	3.67	0.06	3763	107.0	3763	0.03	16.13	0.38								27	

The Kerby and Kirpich Method for Time of Concentration, t_c

DRAINAGE AREA ID	DRAINAGE OUTFALL STATION	THE KERBY METHOD (Overland Flow)							THE KIRPICH METHOD (Channel Flow)							TIME OF CONCENTRATION	KERBY AND KIRPICH LAG TIME (MINUTES)
		K	L(ft)	N	S (ft/ft)				t^{ov} (minutes)	K	L (ft)	S(ft/ft)				t^{ch} (minutes)	t_c (minutes)	Tranditional (for HEC-HMS) $0.6^X t^C$
					Upstream Elev(ft)	Downstream Elev(ft)	∆h(ft)	S				Upstream Elev(ft)	Downstream Elev(ft)	∆h(ft)	S			
DA-1	Sta 29+15	0.828	1200	0.6	445	427.5	17.5	0.015	48.3	0.0078	5538	427.5	316.3	111.2	0.020	26.8	75.1	45.0
DA-11	Sta 210+49	0.828	1200	0.6	425	395	30	0.025	42.5	0.0078	6193	395	315	80	0.013	34.6	77.1	46.3
DA-16	Sta 364+04	0.828	1200	0.6	435	420	15	0.0125	50.1	0.0078	13672	420	300.5	119.5	0.009	74.0	124.1	74.4

PRINT DATE	REVISION DATE
12/18/2020	

Texas Department of Transportation
Bryan District

HYDROLOGIC DATA (FM 2000)

SHEET 1 OF 2 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 696, ETC.

STATE	DISTRICT	COUNTY	
TEXAS	BRYAN	BURLESON	
CONTROL	SECTION	JOB	SHEET NO.
1507	02	016, ETC.	83

REV DATE: 2-12-2015
CSJ: 1507-02-016, Etc. FILENAME: g:\150702\016\sheets\Hydrology\HYDROLOGIC DATA_FM 2000 SHEET 1 OF 2.dgn

HYDROLOGIC DATA (RATIONAL METHOD)

DRAINAGE AREA ID	Structure Station	Drainage Area A (ac)	Drainage Area A (Sq.Mile)	C	t_c (min)	I2 (in/hr)	I5 (in/hr)	I10 (in/hr)	I10 (in/hr)	I50 (in/hr)	I100 (in/hr)	Q2 (cfs)	Q5 (cfs)	Q_{10} (cfs)	Q25 (cfs)	Q50 (cfs)	Q_{100} (cfs)
DA-2	Sta 47+44	7.8	0.01	0.39	13	4.24	5.43	6.30	7.40	8.19	8.96	12.91	16.51	19.15	22.5	24.9	27.3
DA-3	Sta 57+38	6.3	0.01	0.39	21	3.48	4.44	5.13	6.01	6.63	7.25	8.55	10.91	12.60	14.8	16.3	17.8
DA-4	Sta 70+29	15.1	0.02	0.39	24	3.24	4.13	4.78	5.60	6.17	6.75	19.10	24.35	28.14	33.0	36.3	39.7
DA-5	Sta 89+94	52.5	0.08	0.39	21	3.48	4.44	5.13	6.01	6.63	7.25	71.25	90.91	105.04	123.1	135.7	148.4
DA-6	Sta 117+49	5.5	0.01	0.39	10	4.70	6.01	6.98	8.23	9.13	10.00	10.08	12.89	14.97	17.7	19.6	21.5
DA-7	Sta 129+02	6.9	0.01	0.39	21	3.48	4.44	5.13	6.01	6.63	7.25	9.36	11.95	13.80	16.2	17.8	19.5
DA-8	Sta 145+42	1.3	0.00	0.36	10	4.70	6.01	6.98	8.23	9.13	10.00	2.20	2.81	3.27	3.9	4.3	4.7
DA-9	Sta 169+30	3.8	0.01	0.36	13	4.24	5.43	6.30	7.40	8.19	8.96	5.81	7.43	8.61	10.1	11.2	12.3
DA-10	Sta 198+42	10.4	0.02	0.36	25	3.17	4.03	4.66	5.46	6.01	6.58	11.86	15.10	17.45	20.4	22.5	24.6
DA-12	Sta 216+69	2.0	0.003	0.34	40	2.46	3.13	3.61	4.23	4.66	5.10	1.67	2.13	2.45	2.9	3.2	3.5
DA-13	Sta 240+98	44.0	0.07	0.34	16	3.86	4.94	5.72	6.71	7.41	8.10	57.79	73.89	85.60	100.4	110.8	121.2
DA-14	Sta 326+77	1.9	0.00	0.39	33	2.68	3.41	3.93	4.60	5.07	5.54	1.99	2.53	2.91	3.4	3.8	4.1
DA-15	Sta 351+32	21.0	0.03	0.39	29	2.86	3.63	4.19	4.90	5.39	5.90	23.40	29.74	34.30	40.1	44.2	48.3
DA-17	Sta 377+62	64.2	0.10	0.37	16	3.86	4.94	5.72	6.71	7.41	8.10	91.75	117.33	135.92	159.4	175.9	192.4
DA-18	Sta 387+09	40.2	0.06	0.34	16	3.86	4.94	5.72	6.71	7.41	8.10	52.79	67.51	78.21	91.7	101.2	110.7
DA-19	Sta 401+93	30.4	0.05	0.34	13	4.24	5.43	6.30	7.40	8.19	8.96	43.87	56.10	65.08	76.5	84.6	92.6
DA-20	Sta 407+79	26.4	0.04	0.34	10	4.70	6.01	6.98	8.23	9.13	10.00	42.19	53.95	62.65	73.9	82.0	89.8
DA-21	Sta 421+82	44.2	0.07	0.36	11	4.55	5.82	6.75	7.95	8.82	9.65	72.37	92.54	107.44	126.6	140.3	153.6
DA-22	Sta 432+39	52.6	0.08	0.36	15	3.94	5.04	5.84	6.85	7.56	8.27	74.61	95.44	110.59	129.7	143.2	156.6
DA-23	Sta 450+44	19.7	0.03	0.36	16	3.86	4.94	5.72	6.71	7.41	8.10	27.39	35.03	40.58	47.6	52.5	57.4
DA-24	Sta 469+20	2.2	0.00	0.36	13	4.24	5.43	6.30	7.40	8.19	8.96	3.36	4.30	4.99	5.9	6.5	7.1
DA-25	Sta 483+27	4.0	0.01	0.36	10	4.70	6.01	6.98	8.23	9.13	10.00	6.77	8.65	10.05	11.9	13.1	14.4
DA-26	Sta 499+50	8.8	0.01	0.36	15	3.94	5.04	5.84	6.85	7.56	8.27	12.48	15.97	18.50	21.7	24.0	26.2
DA-27	Sta 516+72	18.3	0.03	0.36	19	3.63	4.64	5.37	6.29	6.94	7.59	23.92	30.55	35.36	41.5	45.7	50.0
DA-28	Sta 533+22	51.5	0.08	0.36	18	3.71	4.74	5.49	6.43	7.10	7.76	68.75	87.84	101.71	119.2	131.6	143.9
DA-29	Sta 541+29	18.0	0.03	0.36	15	3.94	5.04	5.84	6.85	7.56	8.27	25.53	32.66	37.84	44.4	49.0	53.6
DA-30	Sta 593+66	43.6	0.07	0.32	22	3.40	4.34	5.01	5.87	6.48	7.08	47.42	60.49	69.96	82.0	90.4	98.8
DA-31	Sta 614+85	134.6	0.21	0.32	11	4.55	5.82	6.75	7.95	8.82	9.65	195.89	250.51	290.82	342.6	379.7	415.8
DA-32	Sta 638+18	87.8	0.14	0.36	21	3.48	4.44	5.13	6.01	6.63	7.25	109.87	140.21	162.21	190.1	209.6	229.3
DA-33	Sta 645+95	46.3	0.07	0.37	17	3.79	4.84	5.60	6.57	7.25	7.93	64.85	82.89	96.00	112.6	124.2	135.9
DA-34	Sta 680+40	70.0	0.11	0.32	27	3.01	3.83	4.42	5.18	5.70	6.24	67.47	85.84	99.10	116.0	127.8	139.7

NOTES:

1. FLOWS ARE COMPUTED USING NRCS HYDROGRAPH METHOD WITH HEC-HMS(4.2).
2. SOIL TYPE INFORMATION IS TAKEN FROM USDA WEB SOIL SURVEY (WSS).
3. CN VALUE IS COMPUTED BASED ON TxDOT HYDRAULIC DESIGN MANUAL 2019 AND NRCS TR-55.
4. RAINFALL DATA IS TAKEN FROM NOAA ATLAS 14, VOLUME 11, VERSION 2.
5. RATIONAL METHOD PARAMETERS ARE BASED ON TxDOT HYDRAULIC DESIGN MANUAL 2019.

DRAINAGE AREA HYDROLOGIC PARAMETERS AND COMPUTED FLOWS- NRCS HYDROGRAPH METHOD

DRAINAGE AREA ID	DRAINAGE OUTFALL STATION	DRAINAGE AREA (AC)	DRAINAGE AREA (SQ.MI))	LOSS PARAMETERS (HEC-HMS)			TIME OF CONCENTRATION & LAG TIME								COMPUTED FLOW					
							THE KERBY METHOD(OVERLAND FLOW)			THE KIRPICH METHOD(CHANNEL FLOW)			TIME OF CONCENTRATION	KERBY-KIRPICH METHOD LAG TIME	Q2 (CFS)	Q5 (CFS)	Q10 (CFS)	Q25 (CFS)	Q50 (CFS)	Q100 (CFS)
				IMPERV %	CN	INITIAL ABSTR Ia (IN)	L(FT)	S (FT/FT)	t^{ov} (minutes)	L (ft)	S (FT/FT)	t^{ch} (minutes)	tc (minutes)	Tranditional (for HEC-HMS) $0.6^{x}t^{C}$						
DA-1	Sta 29+15	457.8	0.71	0	65	1.08	1200	0.015	48.3	5538	0.020	26.8	75.1	45.1	130.7	287.8	431.5	639.5	805.9	990.6
DA-11	Sta 210+49	476.5	0.75	0	55	1.64	1200	0.025	42.5	6193	0.013	34.6	77.1	46.3	45.7	145.4	253.7	435.3	591.6	768.1
DA-16	Sta 364+04	1573	2.5	0	62	1.23	1200	0.013	50.1	13672	0.009	74.0	124.1	74.5	256.7	608.0	950.4	1482.9	1927.7	2423.6

12/18/2020

PRINT DATE	REVISION DATE
12/18/2020	

Texas Department of Transportation
Bryan District

HYDROLOGIC DATA (FM 2000)

SHEET 2 OF 2 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 696, ETC.

STATE	DISTRICT	COUNTY
TEXAS	BRYAN	BURLESON

CONTROL	SECTION	JOB	SHEET NO.
1507	02	016, ETC.	84

REV DATE: 2-12-2015
CSJ: 1507-02-016, Etc. FILENAME: g:\150702\016\sheets\Hydrology\HYDROLOGIC DATA_FM 2000 SHEET 2 OF 2.dgn

CULVERT HYDRAULIC DATA (HY-8)

STR NO STATION	STRUCTURE DESCRIPTION		ALLOWABLE ELEV	LENGTH	CULV		D.S. CHANNEL		FREQ = 10 YR				FREQ = 100 YR			
					SLOPE	Manning	SLOPE	Manning	Q_{10}	HW	TW	VEL OUTLET	Q_{100}	HW	TW	VEL OUTLET
				(FT)	(%)	"n"	(%)	"n"	(CFS)	(FT)	(FT)	(FT/S)	(CFS)	(FT)	(FT)	(FT/S)
STR 1	EXIST	2-8' X 4' MBC	367.18	30	0.60	0.012	1.0	0.029	431.5	366.42	363.94	9.99	990.60	368.34	365.22	9.88
STA 29+15	PROP	2-8' X 4' MBC		60	0.70	0.012				366.41	363.70	11.47		368.33	364.98	12.64
STR 2	EXIST	24" RCP	406.38	47	2.43	0.012	1.0	0.029	19.2	403.93	401.43	10.68	27.30	405.15	401.59	11.73
STA 47+44	PROP	24" RCP		47	2.43	0.012				404.58	401.43	10.66		406.39	401.59	11.60
STR 3	EXIST	24" RCP	413.09	46	1.50	0.012	1.0	0.029	12.6	410.77	409.22	8.44	17.80	411.30	409.36	9.18
STA 57+38	PROP	24" RCP		46	1.50	0.012				410.96	409.22	8.75		411.77	409.36	9.48
STR 4	EXIST	36" RCP	418.93	54	3.70	0.012	1.0	0.029	28.1	412.51	409.42	12.87	39.70	413.10	409.61	13.69
STA 70+29	PROP	36" RCP		58	3.70	0.012				412.77	410.05	11.61		413.46	410.24	12.50
STR 5	EXIST	30" CMP	413.88	49	2.41	0.024	1.0	0.029	105.0	414.24	410.13	8.73	148.44	414.38	410.44	8.33
STA 89+94	PROP	2-36" RCP		40	2.45	0.012				413.67	410.23	12.42		414.12	410.54	12.68
STR 6	EXIST	36" CMP	401.25	54	1.70	0.024	1.0	0.029	15.0	393.93	391.76	5.99	21.50	394.39	391.89	6.53
STA 117+49	PROP	36" RCP		58	1.70	0.012				393.83	391.72	8.88		394.27	391.85	9.64
STR 7	EXIST	24" RCP	394.72	66	17.00	0.012	10.0	0.029	13.8	392.27	379.50	20.54	19.50	392.89	379.62	22.66
STA 129+02	PROP	24" RCP		52	10.00	0.012				392.23	385.24	16.31		393.21	385.36	17.40
STR 8	EXIST	24" RCP	391.31	51	4.00	0.012	3.0	0.029	3.3	386.50	384.09	8.38	4.70	386.69	384.16	9.38
STA 145+42	PROP	24" RCP		55	4.00	0.012				386.62	383.92	8.41		386.83	383.99	9.45
STR 9	EXIST	24" RCP	341.30	50	3.20	0.012	4.5	0.029	8.6	338.55	335.77	9.85	12.30	338.90	335.83	10.59
STA 169+30	PROP	24" RCP		47	3.19	0.012				338.58	335.77	9.82		339.01	335.83	10.51
STR 10	EXIST	24" RCP	315.93	54	3.07	0.012	5.0	0.029	17.5	314.23	311.07	11.43	24.60	315.19	311.19	12.41
STA 198+42	PROP	24" RCP		60	3.07	0.012				314.72	310.89	11.61		315.96	311.01	12.37
STR 11	EXIST	3-48" RCP	313.59	63	0.33	0.012	0.14	0.029	253.7	310.50	307.87	9.06	768.10	314.51	308.83	13.69
STA 210+49	PROP	3-48" RCP		69	0.33	0.012				310.84	307.86	9.06		314.61	308.82	12.69
STR 12	EXIST	24" CMP	313.03	64	2.20	0.024	1.0	0.029	2.5	310.26	308.30	4.18	3.50	310.42	308.35	4.52
STA 216+69	PROP	24" RCP		54	1.90	0.012				310.22	308.61	6.03		310.39	308.66	6.81
STR 13	EXIST	30" CMP	311.28	53	0.70	0.022	7.0	0.029	85.6	311.58	307.70	8.46	121.20	311.71	307.90	8.56
STA 240+98	PROP	30" RCP		40	0.70	0.012				311.56	307.76	9.01		311.69	307.96	9.12
STR 14	EXIST	24" CMP	329.33	37	0.03	0.024	1.0	0.029	32.2	325.31	324.51	3.74	45.40	325.51	324.56	4.13
STA 326+77	PROP	24" RCP		40	1.20	0.012				325.86	324.77	5.48		326.04	324.82	5.91
STR 15	EXIST	24" CMP	338.30	45	1.53	0.024	1.5	0.029	25.8	338.41	334.05	8.26	36.40	338.49	334.21	8.31
STA 351+32	PROP	30" RCP		44	1.52	0.012				337.82	334.04	10.47		338.41	334.20	10.77
STR 16	EXIST	2-5'X7' MBC	314.15	40	0.32	0.012	0.2	0.029	950.4	313.93	305.68	14.52	2,423.60	316.79	308.09	15.97
STA 364+04	PROP	2-5'X7' MBC		58	0.40	0.012				314.00	305.65	14.52		316.80	308.06	15.92
STR 17	EXIST	48" CMP	336.14	65	0.50	0.024	0.5	0.029	135.9	336.27	330.18	10.93	192.40	336.51	330.50	11.10
STA 377+62	PROP	5' X 5' SBC		82	0.50	0.012				334.48	330.34	10.47		336.32	330.66	11.29
STR 18	EXIST	24" CMP	361.45	60	1.15	0.024	5.0	0.029	78.2	361.74	353.89	10.25	110.70	361.86	354.06	10.32
STA 387+09	PROP	2-30" RCP		62	1.15	0.012				358.39	353.89	10.34		361.46	354.06	11.51
STR 19	EXIST	36" CMP	363.47	61	7.33	0.024	1.0	0.029	65.1	363.65	357.25	12.99	92.60	363.77	357.51	13.12
STA 401+93	PROP	2-36" RCP		44	5.73	0.012				362.51	358.83	14.52		363.51	359.09	15.40
STR 20	EXIST	36" CMP	367.22	51	1.41	0.024	1.0	0.029	62.7	367.36	364.20	8.31	89.80	367.49	364.47	8.42
STA 407+79	PROP	2-30" RCP		38	1.39	0.012				366.27	363.96	9.88		367.34	364.23	10.50
STR 21	EXIST	36" CMP	381.20	55	0.82	0.024	1.0	0.029	107.4	381.54	378.95	7.83	153.60	381.69	379.31	7.00
STA 421+82	PROP	6' X 3' SBC		31	0.74	0.012				380.19	379.05	9.76		381.29	379.41	10.62
STR 22	EXIST	36" CMP	384.70	56	2.43	0.024	1.0	0.029	110.6	385.06	382.18	8.87	156.60	385.21	382.53	6.94
STA 432+39	PROP	6' X 3' SBC		31	1.19	0.012				383.66	382.33	10.64		384.79	382.68	11.50
STR 23	EXIST	36" CMP	407.65	59	0.83	0.024	1.0	0.029	40.6	406.44	403.90	7.79	57.40	407.71	404.14	8.85
STA 450+44	PROP	36" RCP		52	0.60	0.012				406.14	404.06	8.50		407.67	404.30	9.16
STR 24	EXIST	24" CMP	455.72	42	3.00	0.024	11.0	0.029	5.0	453.20	451.33	5.45	7.10	453.48	451.41	6.03
STA 469+20	PROP	24" RCP		40	3.00	0.012				453.22	451.33	8.55		453.47	451.41	9.02
STR 25	EXIST	24" CMP	461.30	43	1.60	0.024	18.0	0.029	10.1	458.22	456.20	5.57	14.40	458.89	456.28	6.31
STA 483+27	PROP	24" RCP		40	1.10	0.012				458.73	457.16	7.24		459.29	457.24	7.91
STR 26	EXIST	24" CMP	458.80	39	1.80	0.024	1.0	0.029	18.5	458.55	455.86	710.00	26.20	458.88	456.02	7.42
STA 499+50	PROP	24" RCP		36	1.80	0.012				458.36	455.86	9.52		458.87	456.02	9.85
STR 27	EXIST	24" CMP	462.84	44	0.68	0.024	1.0	0.029	35.4	462.99	460.82	6.98	50.00	463.07	461.02	6.46
STA 516+72	PROP	2-24" RCP		38	0.71	0.012				462.19	460.56	7.37		462.92	460.76	7.59
STR 28	EXIST	30" CMP	421.30	50	0.92	0.024	1.0	0.029	101.7	421.63	417.20	9.53	143.90	421.78	417.51	8.91
STA 533+22	PROP	2-30" RCP		52	1.38	0.012				419.92	416.91	11.23		421.44	417.22	12.03
STR 29	EXIST	18" CMP	427.00	47	4.15	0.024	1.0	0.029	37.8	427.20	423.66	6.78	53.60	427.27	423.87	6.89
STA 541+29	PROP	2-36" RCP		36	4.08	0.012				426.22	423.91	11.63		426.98	424.12	12.46
STR 30	EXIST	2-30" CMP	401.59	39	0.54	0.024	1.0	0.029	70.0	400.54	397.73	8.28	98.80	401.73	397.99	9.28
STA 593+66	PROP	2-30" RCP		48	0.54	0.012				400.17	397.71	8.28		401.70	397.97	9.61
STR 31	EXIST	4-36" CMP	370.52	56	0.86	0.024	1.0	0.029	290.8	370.92	365.57	10.54	415.80	371.35	365.94	10.90
STA 614+85	PROP	4-36" RCP		80	0.81	0.012				368.87	365.45	10.72		370.92	365.82	11.57
STR 32	EXIST	3-48" CMP	342.13	49	0.90	0.024	1.0	0.029	162.2	337.00	334.43	7.60	229.28	337.86	334.70	8.67
STA 638+18	PROP	8' x 5' SBC		60	1.50	0.012				337.85	334.39	12.42		338.89	334.66	13.50
STR 33	EXIST	2-30" CMP	342.15	40	0.40	0.024	1.0	0.029	96.0	342.27	337.50	9.95	135.87	342.49	337.75	10.15
STA 645+95	PROP	2-36" RCP		46	0.59	0.012				340.52	336.73	8.80		342.25	336.85	9.85
STR 34	EXIST	24" CMP	317.77	43	2.00	0.024	1.0	0.029	99.1	318.16	314.57	8.61	139.73	318.29	314.86	8.25
STA 680+40	PROP	3-30" RCP		34	1.50	0.012				317.65	314.94	10.09		318.00	315.23	10.30

REV DATE: 2-12-2015
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STATE OF TEXAS
JANN KEONG KAM
108196
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PROFESSIONAL ENGINEER

12/18/2020

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12/18/2020	

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CULVERT HYDRAULIC COMPUTATIONS (FM 2000)

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 696, ETC.

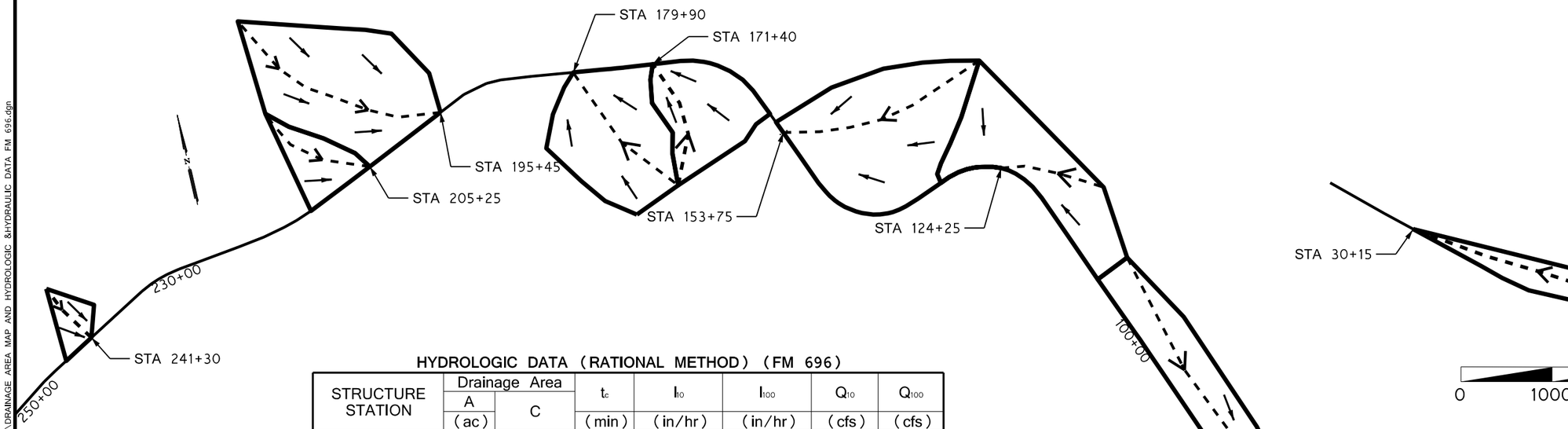
STATE	DISTRICT	COUNTY	
TEXAS	BRYAN	BURLESON	
CONTROL	SECTION	JOB	SHEET NO.
1507	02	016, ETC.	85

HYDRAULIC DATA (HY-8) (FM 696)

	STRUCTURE STATION	STRUCTURE DESCRIPTION	ALLOWABLE ELEV	LENGTH	CULV		D.S. CHANNEL		FREQ = 10 YR						FREQ = 100 YR					
					SLOPE	Manning	SLOPE	Manning	Q_{10}	HW	TW	NORMAL DEPTH	VEL UNIFORM	VEL OUTLET	Q_{100}	HW	TW	NORMAL DEPTH	VEL UNIFORM	VEL OUTLET
				(FT)	(%)	"n"	(%)	"n"	(CFS)	(FT)	(FT)	(FT)	(FT/S)	(FT/S)	(CFS)	(FT)	(FT)	(FT)	(FT/S)	(FT/S)
EXIST	STA 30+15	24" CMP	348.3	61	0.36	0.024	2	0.055	17	347.50	345.30	2.00	5.54	6.40	26	348.35	345.54	2.00	8.41	6.67
PROP		24" RCP		52	0.77	0.012				346.81	345.30	1.31	7.99	7.30		348.30	345.54	2.00	8.41	8.73
EXIST	STA 45+38	24" CMP	349.3	41	0.85	0.024	2.5	0.055	13	347.64	346.58	2.00	4.19	4.73	20	349.04	346.67	2.00	6.33	6.96
PROP		24" RCP		40	0.85	0.012				347.38	346.58	1.06	7.78	4.62		348.57	346.67	1.42	8.34	7.80
EXIST	STA 67+37	24" CMP	374.8	40	1.75	0.024	0.2	0.050	43	375.22	369.78	2.00	7.32	8.08	65	375.33	370.13	2.00	7.48	8.17
PROP		3' X 2' SBC		34	1.74	0.012				374.62	369.78	1.13	12.63	10.43		375.20	370.13	1.24	17.77	10.75
EXIST	STA 124+25	24" CMP	48.0	41	1.34	0.024	1.0	0.055	48	385.02	381.39	2.00	7.64	8.30	72	385.16	381.69	2.00	7.80	8.09
PROP		3' X 2' SBC		34	1.32	0.012				384.12	381.39	1.36	11.74	10.10		384.96	381.69	1.52	15.58	10.60
EXIST	STA 153+75	24" CMP	361.3	40	1.15	0.024	0.6	0.045	36	361.48	359.36	2.00	6.05	6.83	55	361.58	359.36	2.00	6.11	6.83
PROP		3' X 2' SBC		30	1.63	0.012				361.20	358.85	1.02	11.91	9.73		361.43	359.09	1.06	11.95	9.88
EXIST	STA 171+40	30" CMP	343.5	41	2.44	0.024	3.0	0.033	29	343.44	339.25	1.70	8.17	7.92	44	343.50	339.31	1.72	8.33	7.95
PROP		30" RCP		42	2.43	0.012				343.30	339.30	1.10	13.95	10.83		343.50	339.37	1.13	14.39	10.98
EXIST	STA 179+90	36" CMP & 48"	336.3	55	0.27	0.024	0.20	0.06	68	333.58	331.44	3.50	7.05	6.80	103	334.53	331.67	3.50	10.68	7.92
PROP		6' X 4' SBC		39	1.21	0.012				332.99	331.44	0.98	11.53	9.61		333.77	331.67	1.30	13.17	10.70
EXIST	STA 195+45	24" CMP	374.8	81	0.17	0.024	4.0	0.065	69	350.89	342.49	--	--	12.37	105	350.98	342.59	--	--	12.44
PROP		36" RCP		84	0.54	0.012				346.31	343.29	3.00	9.81	9.76		350.78	343.53	3.00	14.29	14.32
EXIST	STA 205+25	24" CMP	380.7	40	3.03	0.024	2.2	0.06	20	380.67	376.95	1.47	8.15	7.70	31	380.73	377.12	1.49	7.97	7.72
PROP		24" RCP		42	2.74	0.012				380.50	377.95	0.96	13.53	10.63		380.57	378.12	0.97	13.24	10.67
EXIST	STA 241+30	18" CMP	396.5	40	1.53	0.012	0.7	0.04	12	396.53	393.91	1.50	6.55	6.30	18	396.56	394.05	1.50	5.66	6.32
PROP		24" RCP		40	1.88	0.012				395.25	393.91	0.80	9.86	8.48		395.98	394.05	1.01	11.05	9.34

LEGEND

- DRAINAGE AREA BOUNDRY
- LONGEST FLOW PATH
- FLOW DIRECTION



HYDROLOGIC DATA (RATIONAL METHOD) (FM 696)

STRUCTURE STATION	Drainage Area A (ac)	Drainage Area C	t_c (min)	I_{10} (in/hr)	I_{100} (in/hr)	Q_{10} (cfs)	Q_{100} (cfs)
STA 30+15	16	0.35	45	3.11	4.72	17	26
STA 45+38	9.9	0.37	34	3.59	5.43	13	20
STA 67+37	40.5	0.35	47	3.02	4.59	43	65
STA 124+25	37.7	0.31	27	4.10	6.20	48	72
STA 153+75	45.0	0.32	41	2.53	3.81	36	55
STA 171+40	24.5	0.33	34	3.59	5.43	29	44
STA 179+90	37.4	0.38	21	4.77	7.23	68	103
STA 195+45	51.9	0.34	26	3.93	5.95	69	105
STA 205+25	11.3	0.35	18	5.10	7.75	20	31
STA 241+30	5.3	0.37	13	5.90	8.96	12	18

STATE OF TEXAS
JEAN J. FENG
102035
LICENSED
PROFESSIONAL ENGINEER
12/21/2020

0 1000 2000 4000 FT

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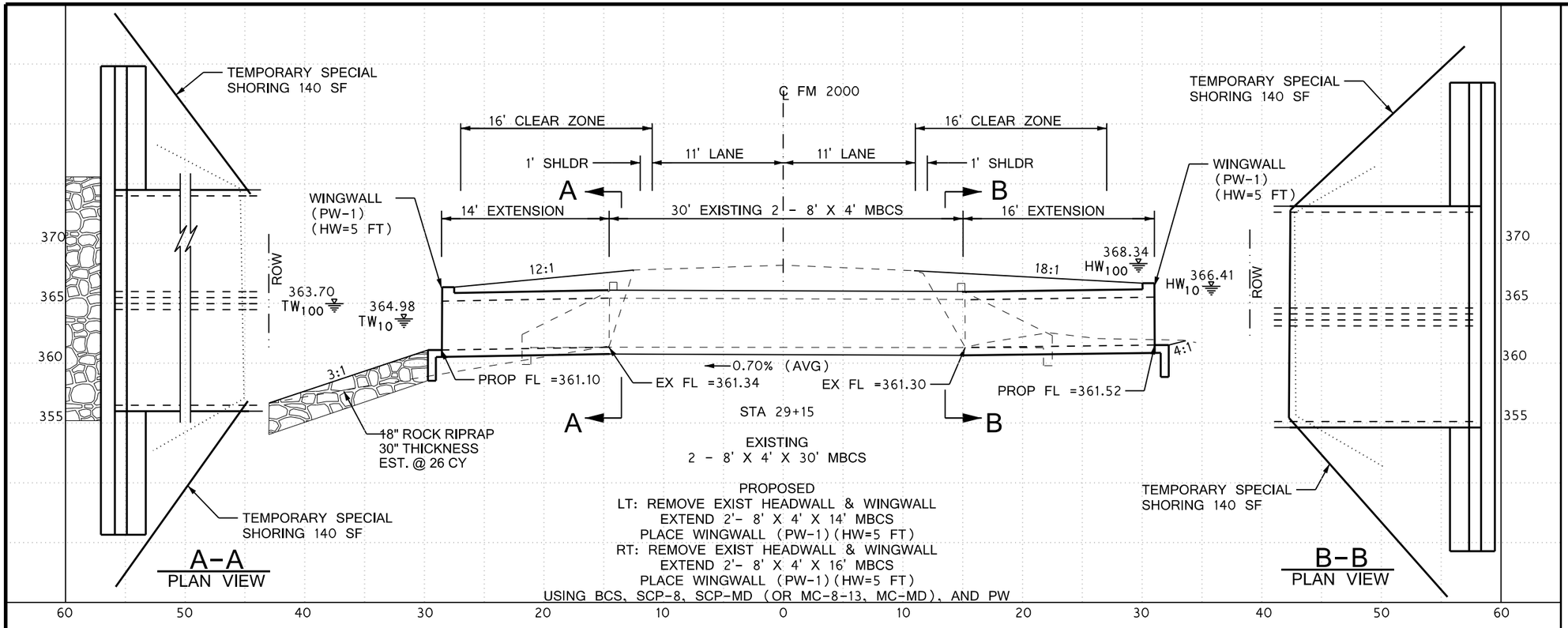
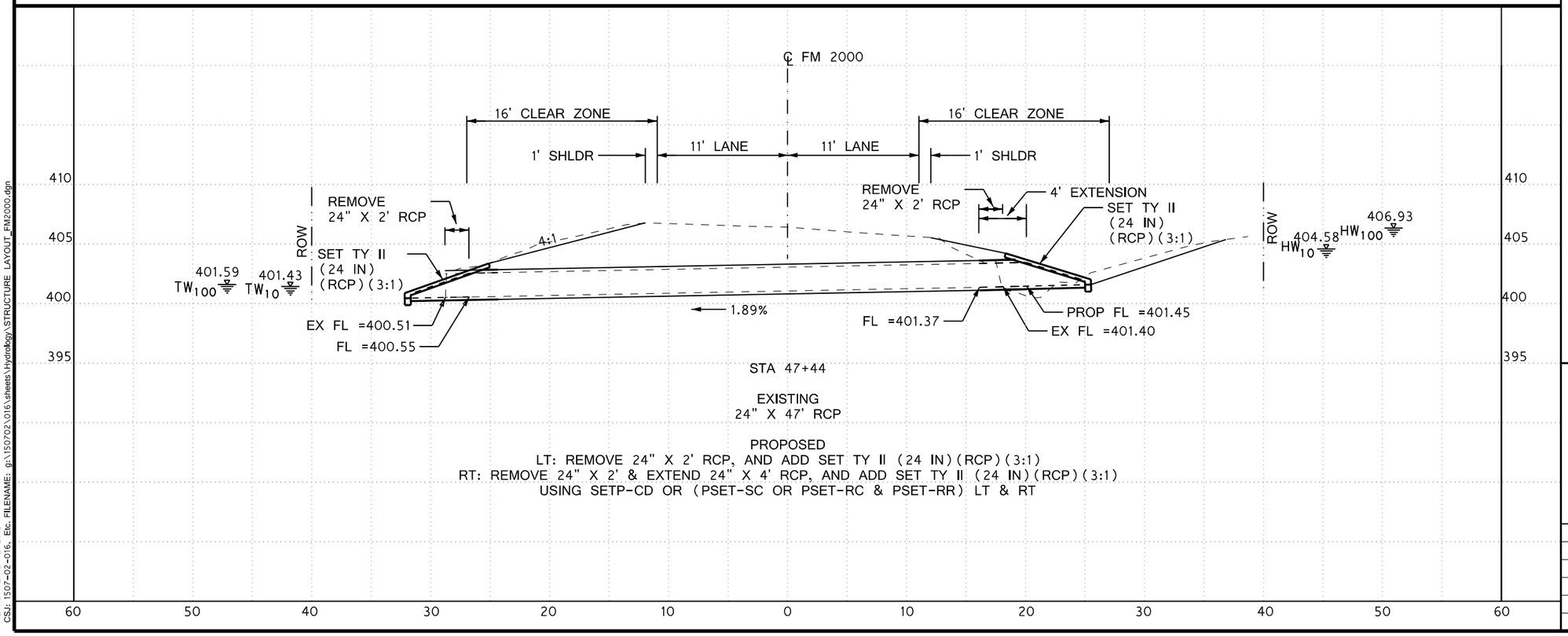
Texas Department of Transportation
Bryan District

DRAINAGE AREA MAP AND HYDROLOGIC & HYDRAULIC DATA (FM 696)

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 696, ETC.
STATE	DISTRICT	COUNTY
TEXAS	BRYAN	BURLESON
CONTROL	SECTION	JOB / SHEET NO.
1507	02	016, ETC. / 86

REV DATE: 2-12-2015
CSJ: 1507-02-016, Etc. FILENAME: g:\150702\016\sheets\Hydrology\DRAINAGE AREA MAP AND HYDROLOGIC &HYDRAULIC DATA FM 696.dgn





GENERAL NOTES:

PROFILES ARE ALONG CENTERLINE OF STRUCTURE.

SEE "MISCELLANEOUS STRUCTURE DETAILS" FOR ADDITIONAL INFORMATION.

THE EXACT QUANTITY OF ROCK RIPRAP WILL BE DETERMINED IN THE FIELD BY THE ENGINEER. REDUCE THE DEPTH IF NECESSARY TO AVOID UTILITY CONFLICT.

PLACE FILTER FABRIC BELOW ALL ROCK RIPRAP PROTECTION.

DIMENSIONS OF PROPOSED CONC RIPRAP ARE TO BE DETERMINED IN THE FIELD BY THE ENGINEER.

WHERE TREE REMOVAL IS REQUIRED, THE PAYMENT IS CONSIDERED SUBSIDIARY TO ITEM 467.

WHERE UTILITY PRESENT, NO GRABING OF TREES OR BRUSHES, FLUSHING CUT ONLY UNLESS APPROVED BY THE ENGINEER.

STATION OF DRAINAGE STRUCTURES ARE APPROXIMATELY 900' AHEAD THAN SHOWN IN AS-BUILT PLANS.

12/21/2020

HORIZONTAL
0 5 10 20 FT
0 5 10 20 FT
VERTICAL

PRINT DATE	REVISION DATE
12/21/2020	

Texas Department of Transportation
Bryan District
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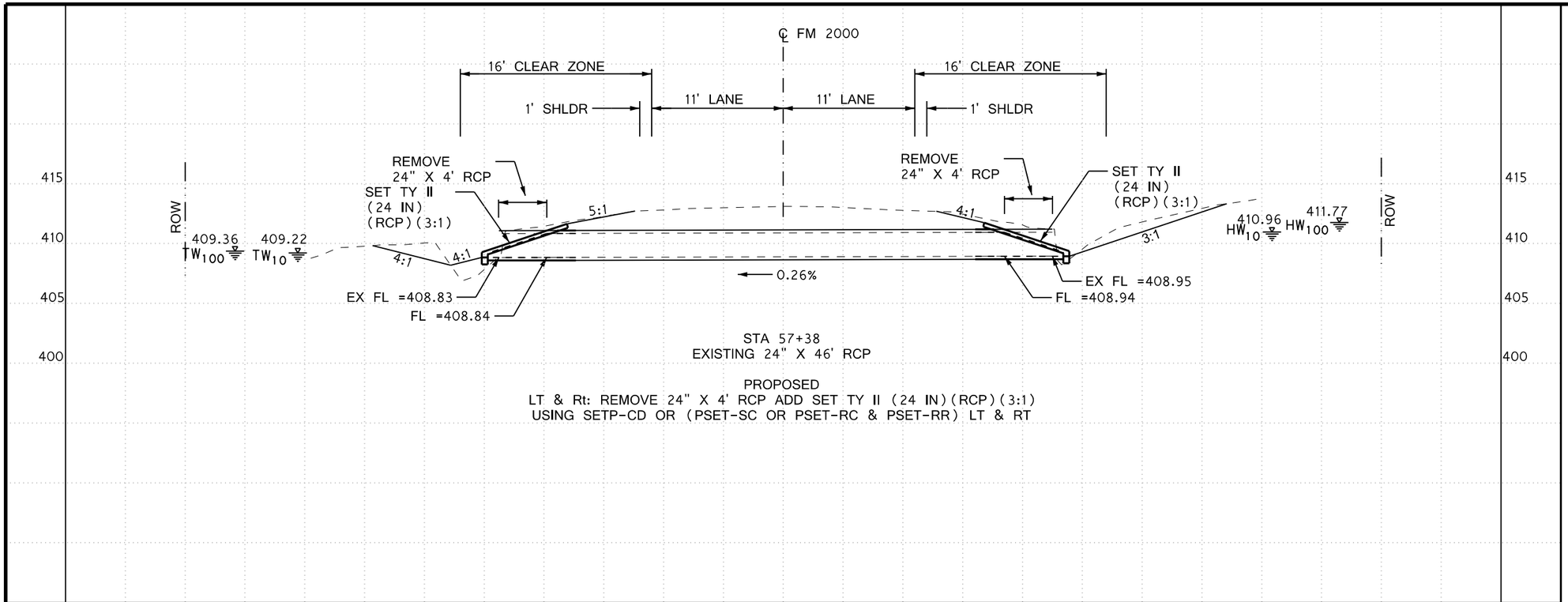
STRUCTURE LAYOUT (FM 2000)

SHEET 1 OF 24 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 696, ETC.

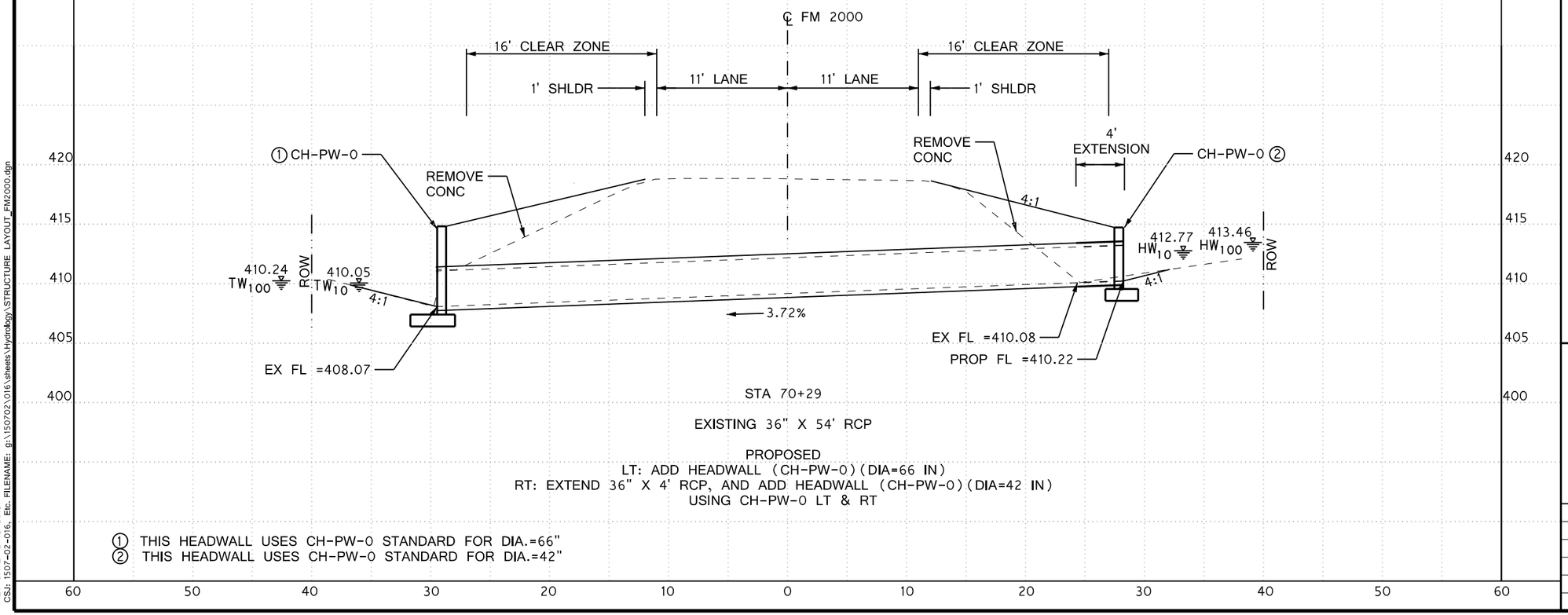
STATE	DISTRICT	COUNTY	
TEXAS	BRYAN	BURLESON	
CONTROL	SECTION	JOB	SHEET NO.
1507	02	016, ETC.	87

REV DATE: 2-12-2015
CSJ: 1507-02-016, Etc. FILENAME: g:\150702\016\sheets\Hydrology\STRUCTURE LAYOUT_FM2000.dgn



STA 57+38
EXISTING 24" X 46' RCP

PROPOSED
LT & Rt: REMOVE 24" X 4' RCP ADD SET TY II (24 IN)(RCP)(3:1)
USING SETP-CD OR (PSET-SC OR PSET-RC & PSET-RR) LT & RT



STA 70+29

EXISTING 36" X 54' RCP

PROPOSED
LT: ADD HEADWALL (CH-PW-0)(DIA=66 IN)
RT: EXTEND 36" X 4' RCP, AND ADD HEADWALL (CH-PW-0)(DIA=42 IN)
USING CH-PW-0 LT & RT

① THIS HEADWALL USES CH-PW-0 STANDARD FOR DIA.=66"
② THIS HEADWALL USES CH-PW-0 STANDARD FOR DIA.=42"

GENERAL NOTES:

PROFILES ARE ALONG CENTERLINE OF STRUCTURE.

SEE "MISCELLANEOUS STRUCTURE DETAILS" FOR ADDITIONAL INFORMATION.

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WHERE UTILITY PRESENT, NO GRABING OF TREES OR BRUSHES, FLUSHING CUT ONLY UNLESS APPROVED BY THE ENGINEER.

STATION OF DRAINAGE STRUCTURES ARE APPROXIMATELY 1000' AHEAD THAN SHOWN IN AS-BUILT PLANS.

STATE OF TEXAS
JEAN J. FENG
102035
LICENSED
PROFESSIONAL ENGINEER

12/21/2020

HORIZONTAL
0 5 10 20 FT
0 5 10 20 FT
VERTICAL

PRINT DATE	REVISION DATE
12/21/2020	

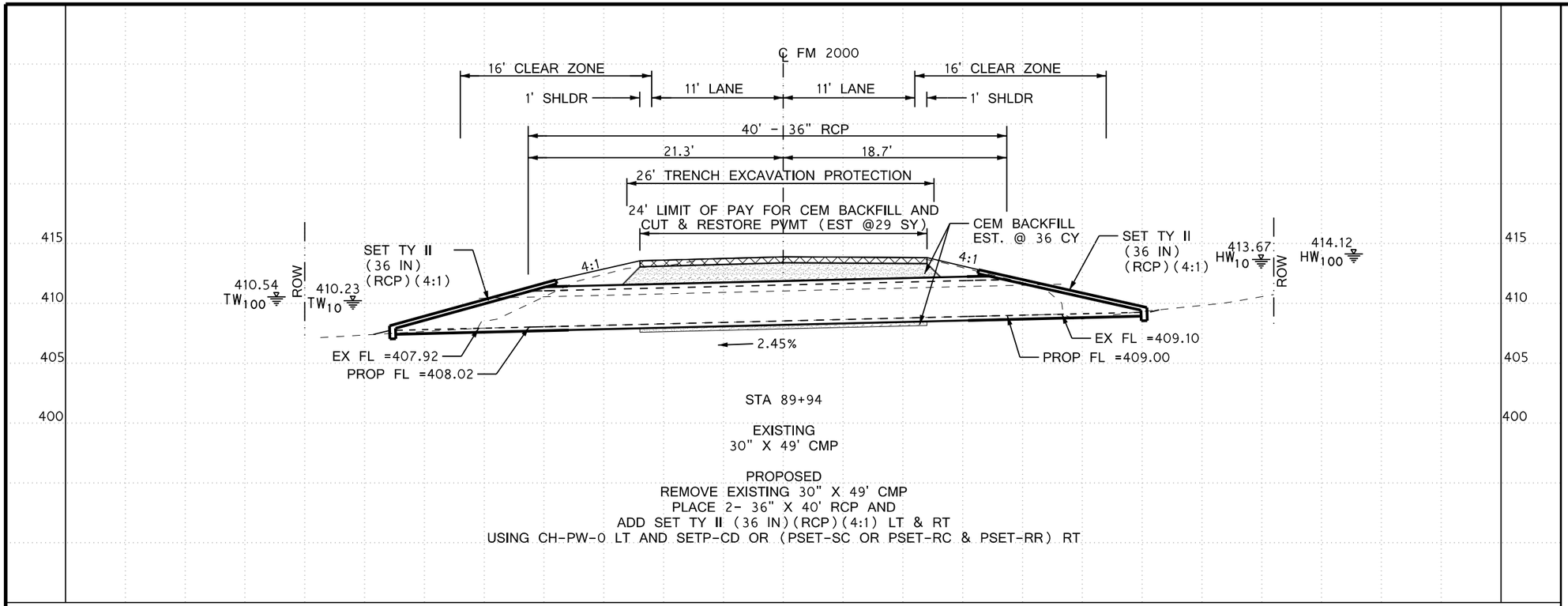
Texas Department of Transportation
Bryan District

STRUCTURE LAYOUT (FM 2000)

SHEET 2 OF 24 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 696, ETC.
STATE	DISTRICT	COUNTY
TEXAS	BRYAN	BURLESON
CONTROL	SECTION	JOB / SHEET NO.
1507	02	016, ETC. / 88

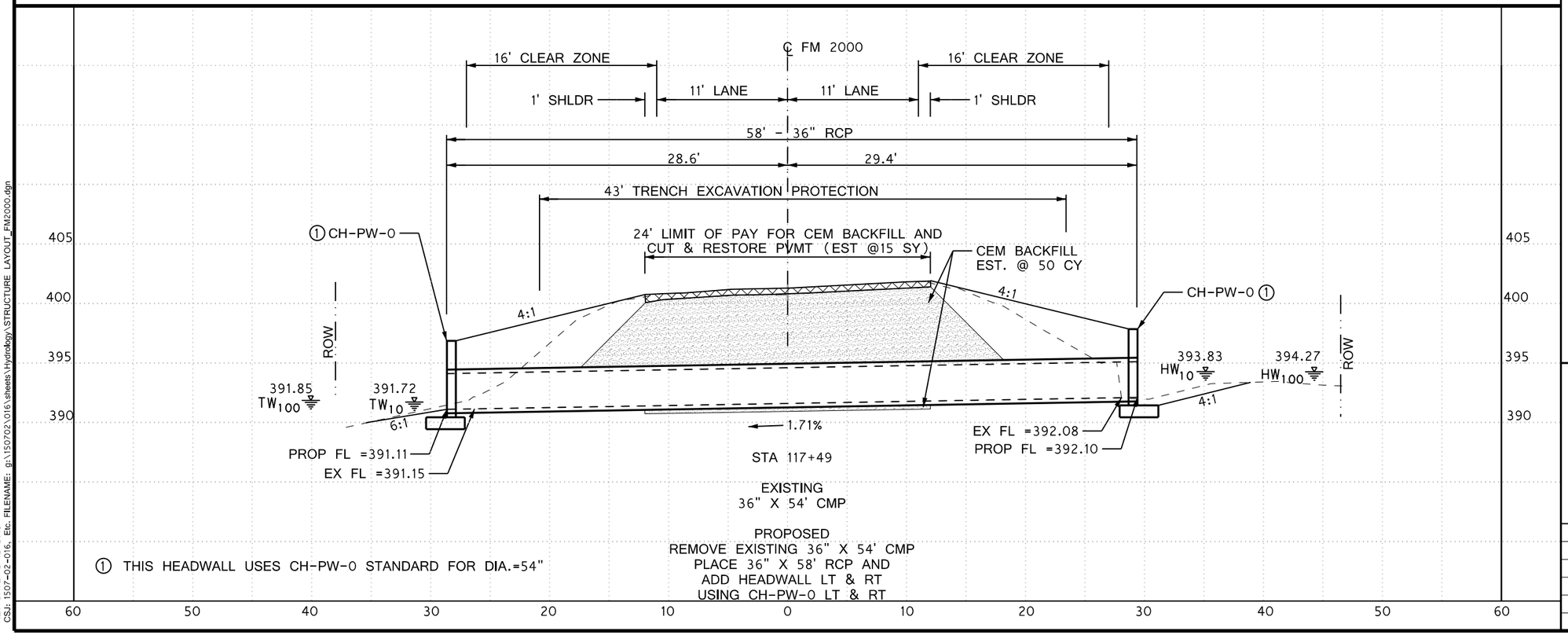
REV DATE: 2-12-2015
CSJ: 1507-02-016, Etc. FILENAME: g:\150702\016\sheets\Hydrology\STRUCTURE LAYOUT_FM2000.dgn



STA 89+94

EXISTING
30" X 49' CMP

PROPOSED
REMOVE EXISTING 30" X 49' CMP
PLACE 2- 36" X 40' RCP AND
ADD SET TY II (36 IN)(RCP)(4:1) LT & RT
USING CH-PW-0 LT AND SETP-CD OR (PSET-SC OR PSET-RC & PSET-RR) RT



STA 117+49

EXISTING
36" X 54' CMP

PROPOSED
REMOVE EXISTING 36" X 54' CMP
PLACE 36" X 58' RCP AND
ADD HEADWALL LT & RT
USING CH-PW-0 LT & RT

① THIS HEADWALL USES CH-PW-0 STANDARD FOR DIA.=54"

GENERAL NOTES:

PROFILES ARE ALONG CENTERLINE OF STRUCTURE.

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PLACE FILTER FABRIC BELOW ALL ROCK RIPRAP PROTECTION.

DIMENSIONS OF PROPOSED CONC RIPRAP ARE TO BE DETERMINED IN THE FIELD BY THE ENGINEER.

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WHERE UTILITY PRESENT, NO GRABING OF TREES OR BRUSHES, FLUSHING CUT ONLY UNLESS APPROVED BY THE ENGINEER.

STATE OF TEXAS
JEAN J. FENG
102035
LICENSED
PROFESSIONAL ENGINEER

12/21/2020

HORIZONTAL
0 5 10 20 FT
0 5 10 20 FT
VERTICAL

PRINT DATE	REVISION DATE
12/21/2020	

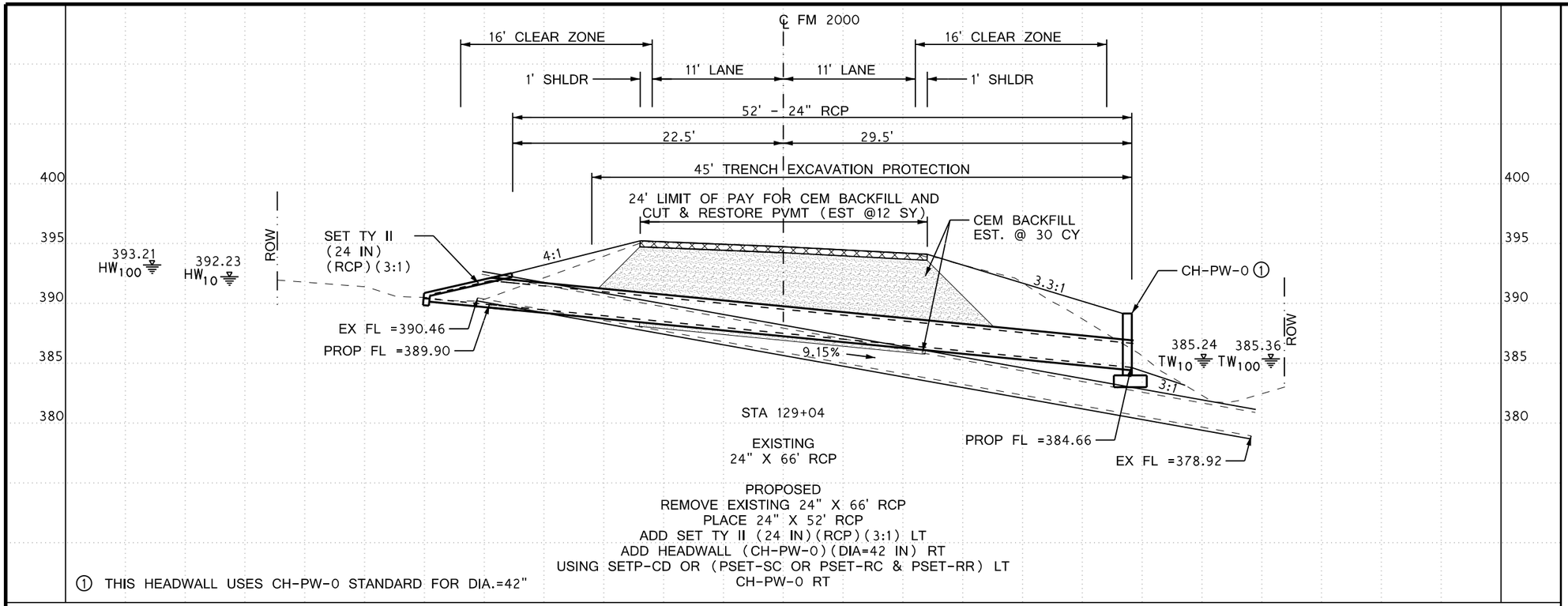
Texas Department of Transportation
Bryan District

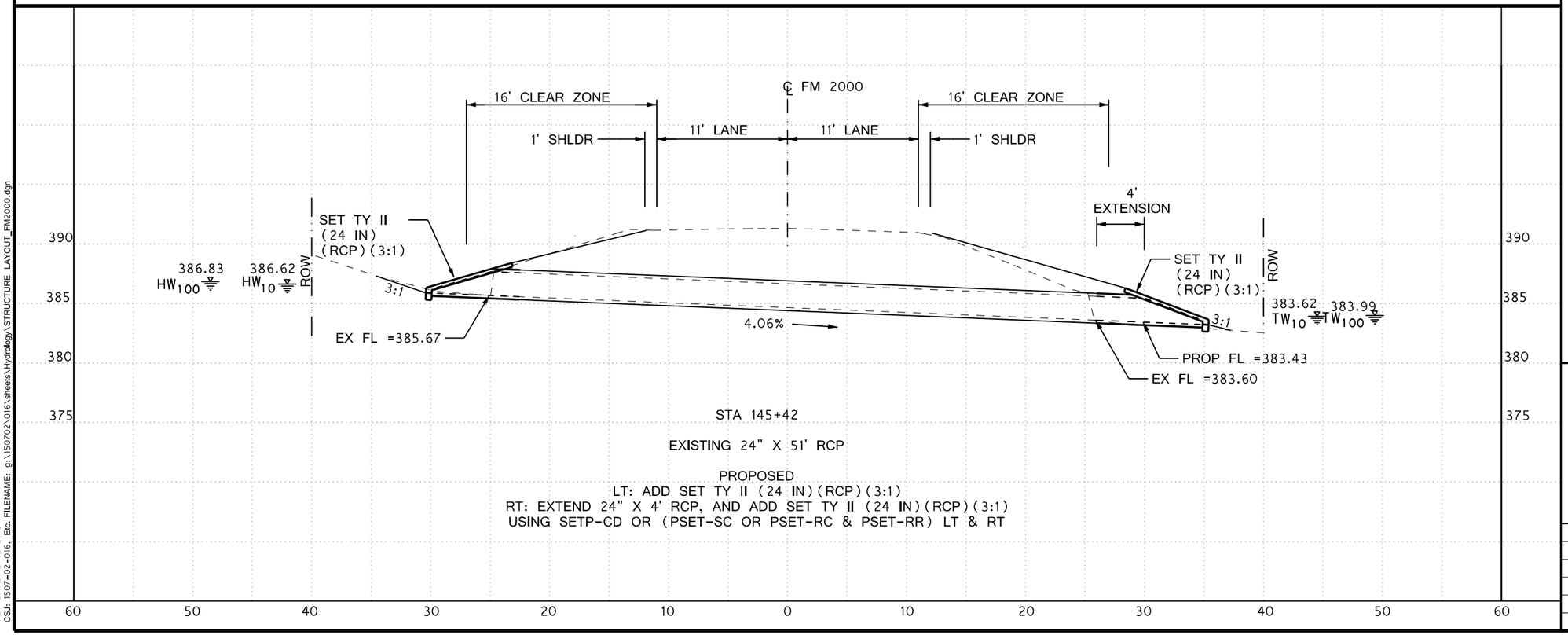
STRUCTURE LAYOUT (FM 2000)

SHEET 3 OF 24 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 696, ETC.
STATE	DISTRICT	COUNTY
TEXAS	BRYAN	BURLESON
CONTROL	SECTION	JOB / SHEET NO.
1507	02	016, ETC. / 89

REV DATE: 2-12-2015
CSJ: 1507-02-016, Etc. FILENAME: g:\150702\016\sheets\Hydrology\STRUCTURE LAYOUT_FM2000.dgn





GENERAL NOTES:

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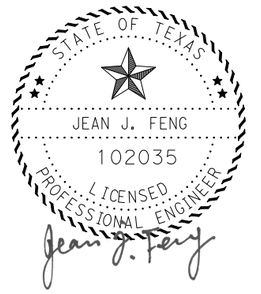


12/21/2020

HORIZONTAL
0 5 10 20 FT
0 5 10 20 FT
VERTICAL

PRINT DATE	REVISION DATE
12/21/2020	

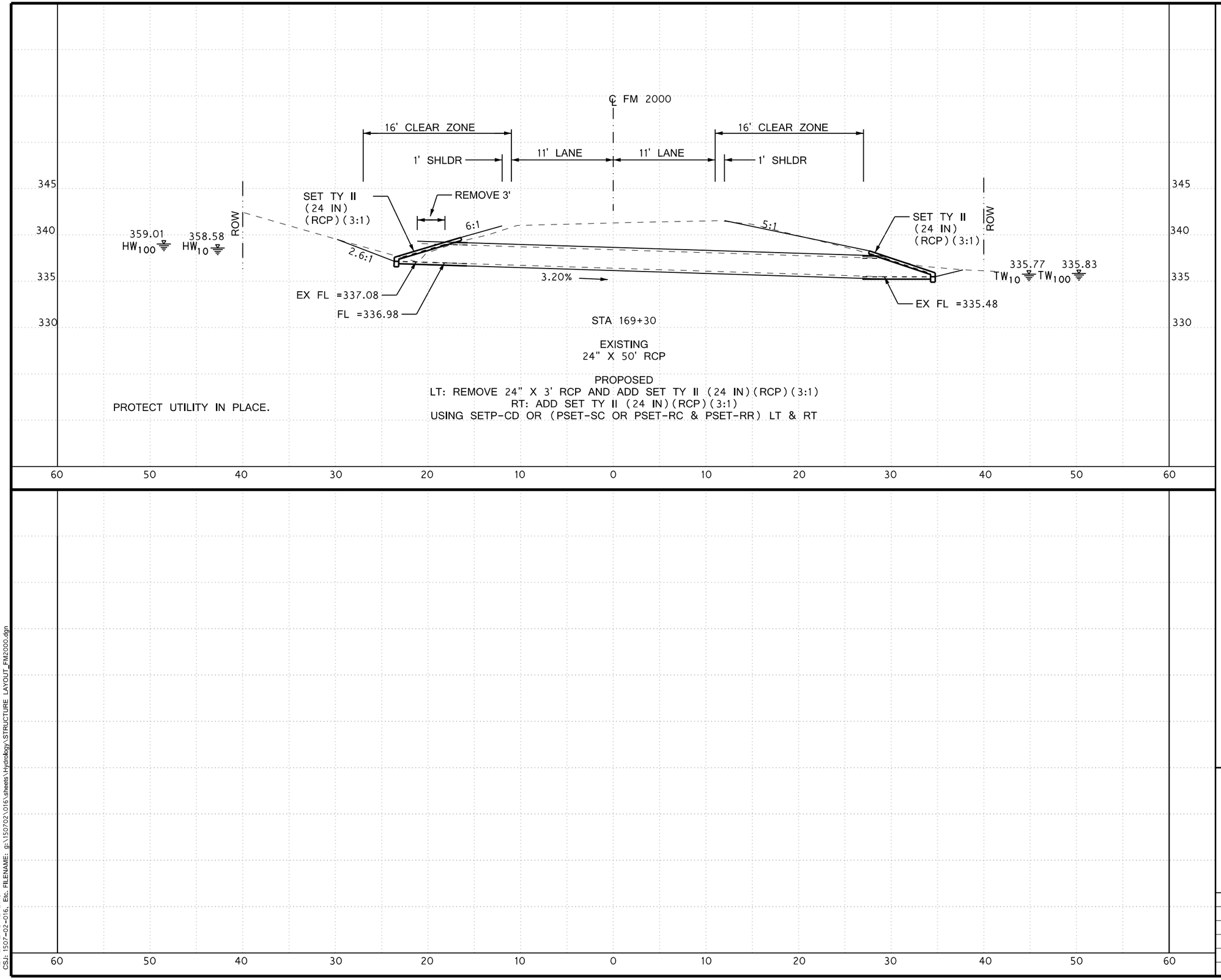
Texas Department of Transportation
Bryan District

STRUCTURE LAYOUT (FM 2000)

SHEET 4 OF 24 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 696, ETC.
STATE	DISTRICT	COUNTY
TEXAS	BRYAN	BURLESON
CONTROL	SECTION	JOB / SHEET NO.
1507	02	016, ETC. / 90

REV DATE: 2-12-2015
CSJ: 1507-02-016, Etc. FILENAME: g:\150702\016\sheets\Hydrology\STRUCTURE LAYOUT_FM2000.dgn



GENERAL NOTES:

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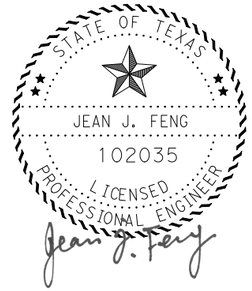


12/21/2020

HORIZONTAL
0 5 10 20 FT
0 5 10 20 FT
VERTICAL

PRINT DATE	REVISION DATE
12/21/2020	

Texas Department of Transportation
Bryan District

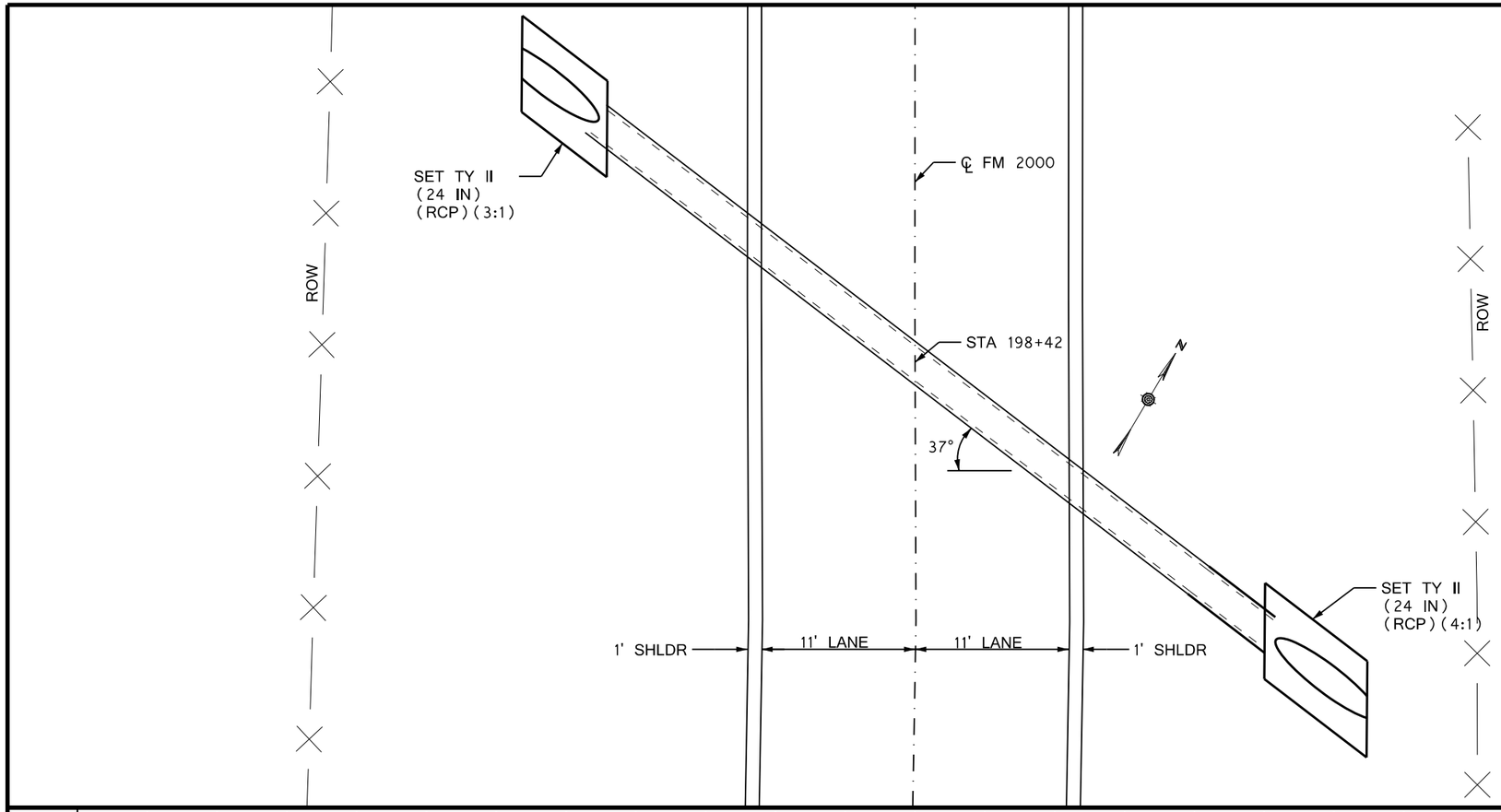
STRUCTURE LAYOUT (FM 2000)

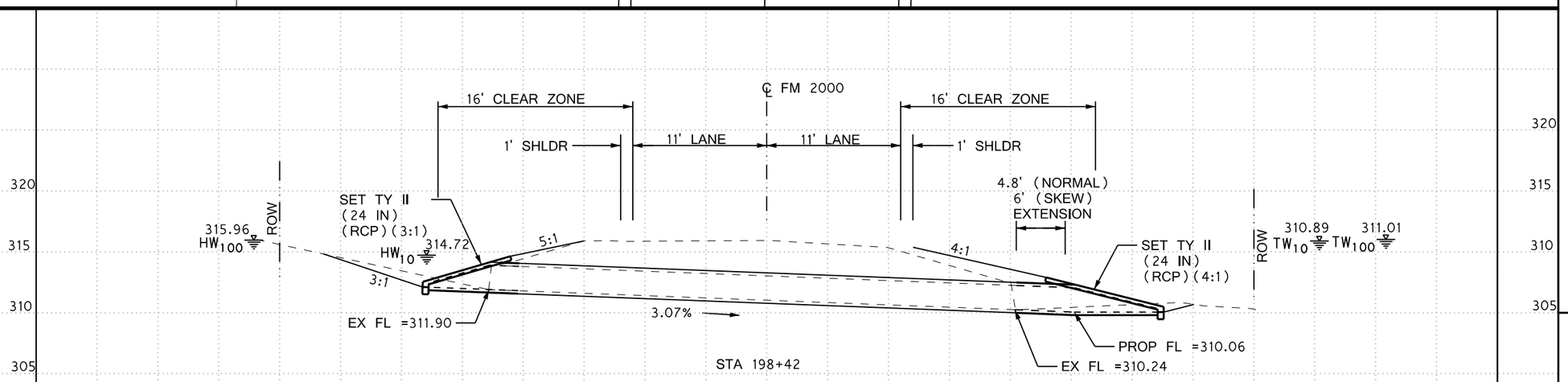
SHEET 5 OF 24 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 696, ETC.

STATE	DISTRICT	COUNTY	
TEXAS	BRYAN	BURLESON	
CONTROL	SECTION	JOB	SHEET NO.
1507	02	016, ETC.	91

REV DATE: 2-12-2015
CSJ: 1507-02-016, Etc. FILENAME: g:\150702\016\sheets\Hydrology\STRUCTURE LAYOUT_FM2000.dgn





EXISTING
24" X 54' RCP 37° LFS

PROPOSED
LT: ADD SET TY II (24 IN)(RCP)(3:1)
RT: EXTEND 24" X 6' RCP, AND ADD SET TY II (24 IN)(RCP)(4:1)
USING SETP-CD OR (PSET-SC OR PSET-RC & PSET-RR) LT & RT

GENERAL NOTES:

PROFILES ARE ALONG CENTERLINE OF STRUCTURE.

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STATION OF DRAINAGE STRUCTURES ARE APPROXIMATELY 1000' AHEAD THAN SHOWN IN AS-BUILT PLANS.

STATE OF TEXAS
JEAN J. FENG
102035
LICENSED
PROFESSIONAL ENGINEER

HORIZONTAL 12/21/2020
0 5 10 20 FT
0 5 10 20 FT
VERTICAL

PRINT DATE	REVISION DATE
12/21/2020	

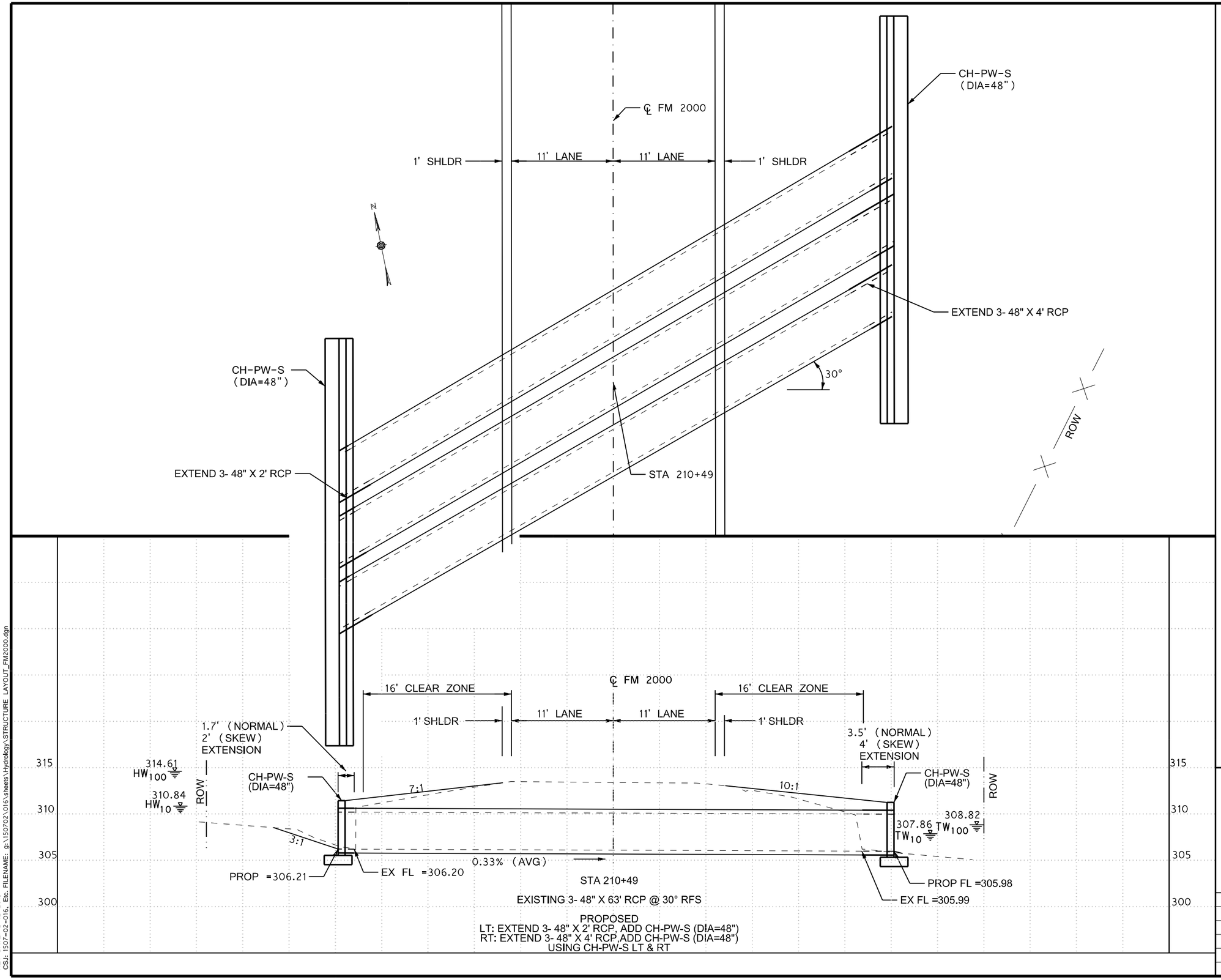
Texas Department of Transportation
Bryan District

STRUCTURE LAYOUT (FM 2000)

SHEET 6 OF 24 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 696, ETC.
STATE	DISTRICT	COUNTY
TEXAS	BRYAN	BURLESON
CONTROL	SECTION	JOB / SHEET NO.
1507	02	016, ETC. / 92

REV DATE: 2-12-2015
CSJs: 1507-02-016, Etc. FILENAME: g:\150702\016\sheets\Hydrology\STRUCTURE LAYOUT_FM2000.dgn



GENERAL NOTES:

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STATE OF TEXAS
JEAN J. FENG
102035
LICENSED
PROFESSIONAL ENGINEER

12/21/2020

HORIZONTAL
0 5 10 20 FT
0 5 10 20 FT
VERTICAL

PRINT DATE	REVISION DATE
12/21/2020	

Texas Department of Transportation
Bryan District

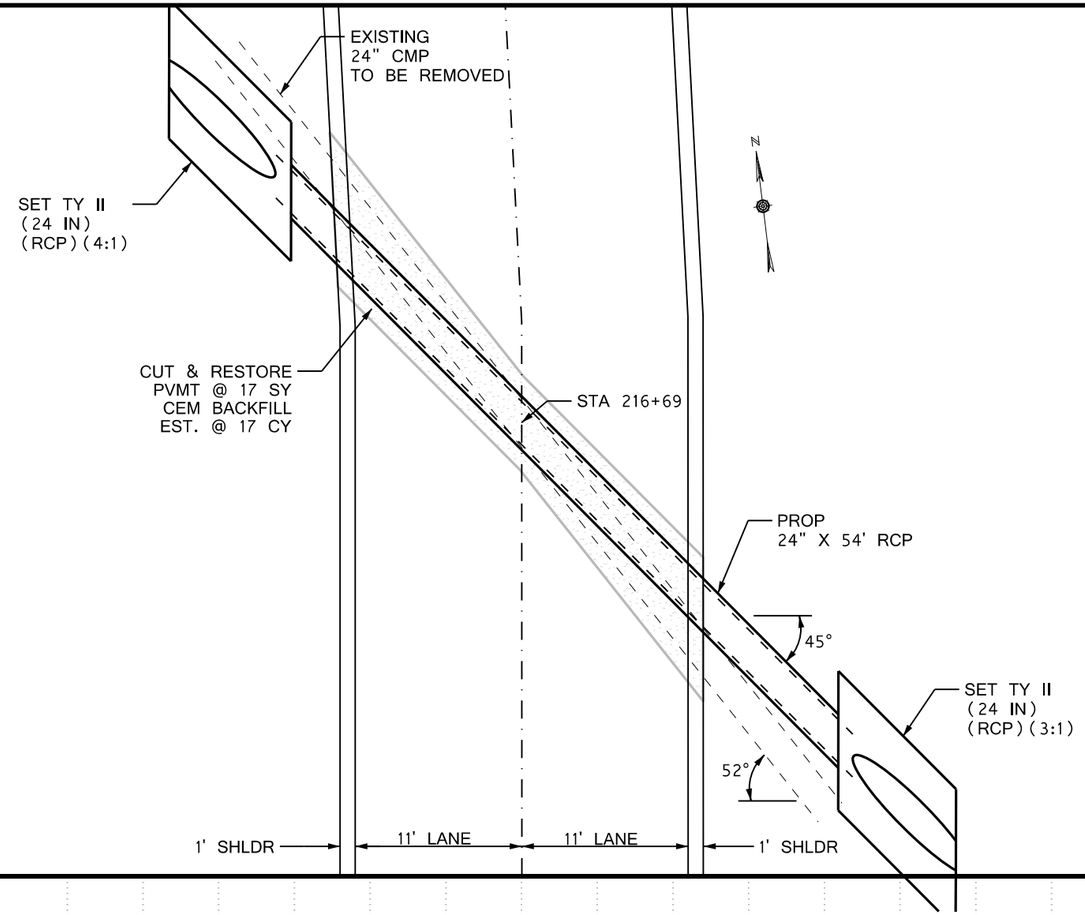
STRUCTURE LAYOUT (FM 2000)

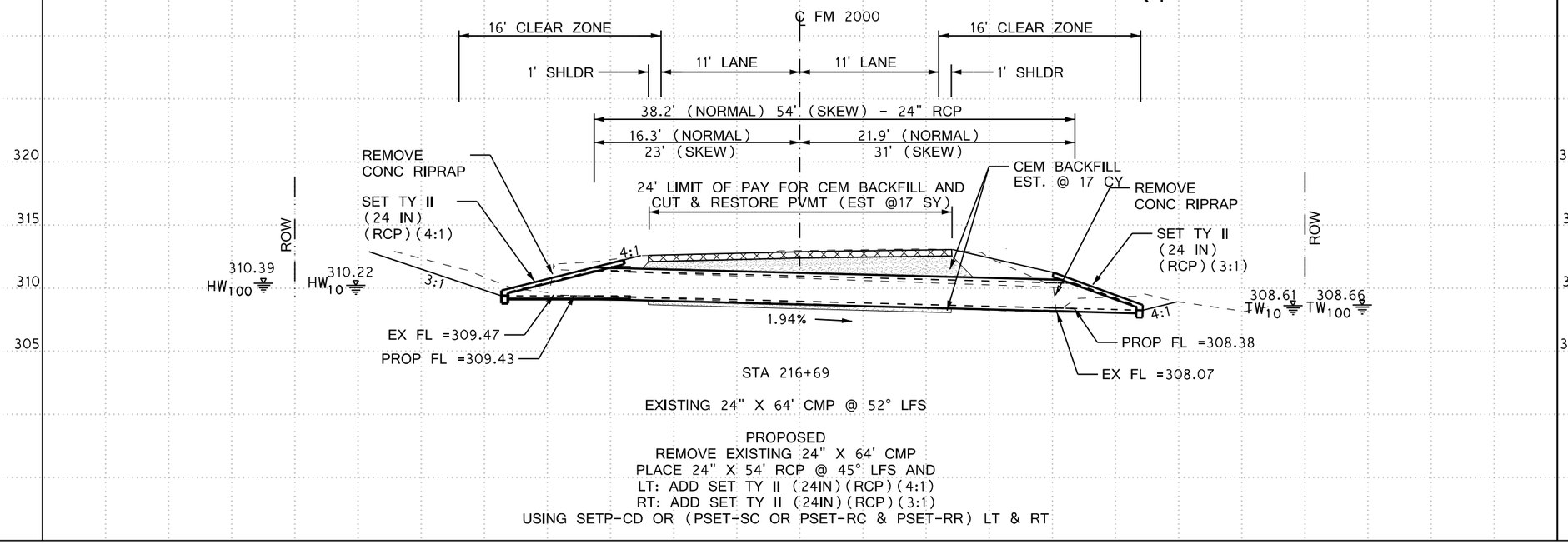
SHEET 7 OF 24 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 696, ETC.

STATE	DISTRICT	COUNTY	
TEXAS	BRYAN	BURLESON	
CONTROL	SECTION	JOB	SHEET NO.
1507	02	016, ETC.	93

REV DATE: 2-12-2015
CSJ: 1507-02-016, Etc. FILENAME: g:\150702\016\sheets\Hydrology\STRUCTURE LAYOUT_FM2000.dgn





GENERAL NOTES:

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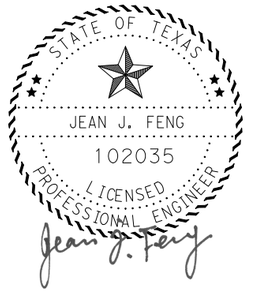


12/21/2020

HORIZONTAL
0 5 10 20 FT
0 5 10 20 FT
VERTICAL

PRINT DATE	REVISION DATE
12/21/2020	

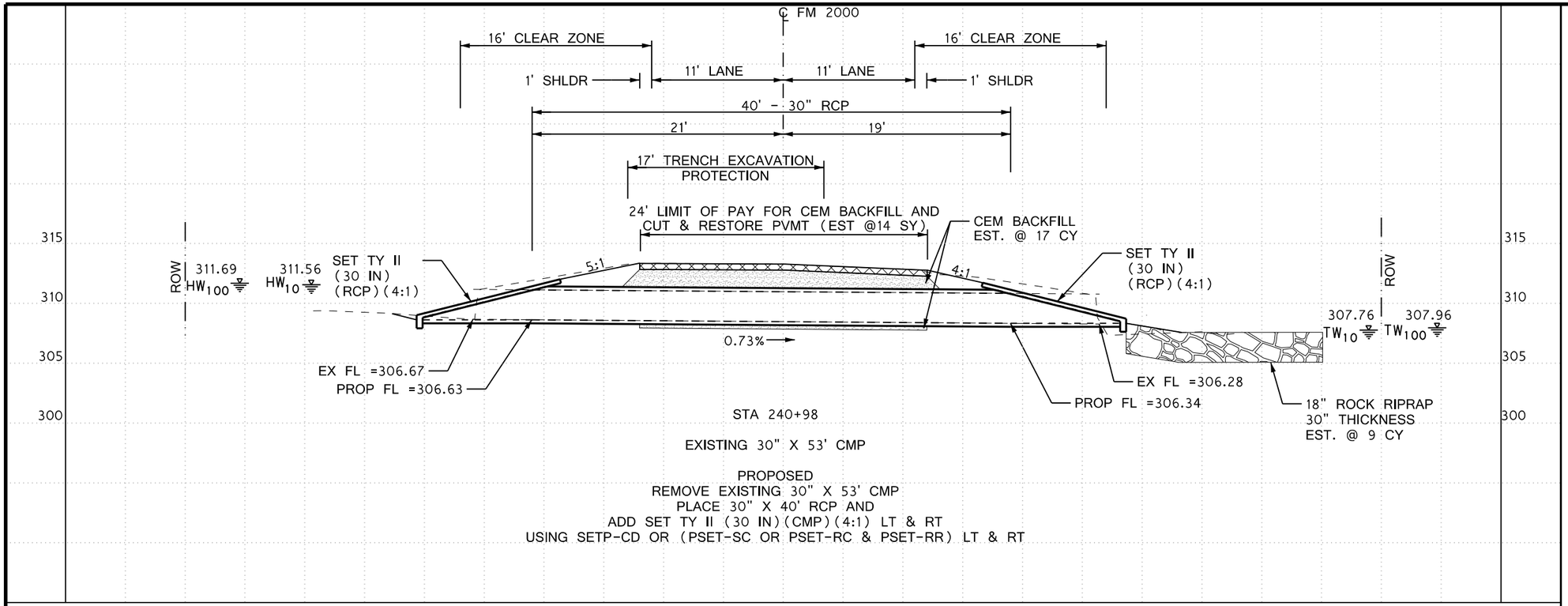
Texas Department of Transportation
Bryan District

STRUCTURE LAYOUT (FM 2000)

SHEET 8 OF 24 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 696, ETC.
STATE	DISTRICT	COUNTY
TEXAS	BRYAN	BURLESON
CONTROL	SECTION	JOB / SHEET NO.
1507	02	016, ETC. / 94

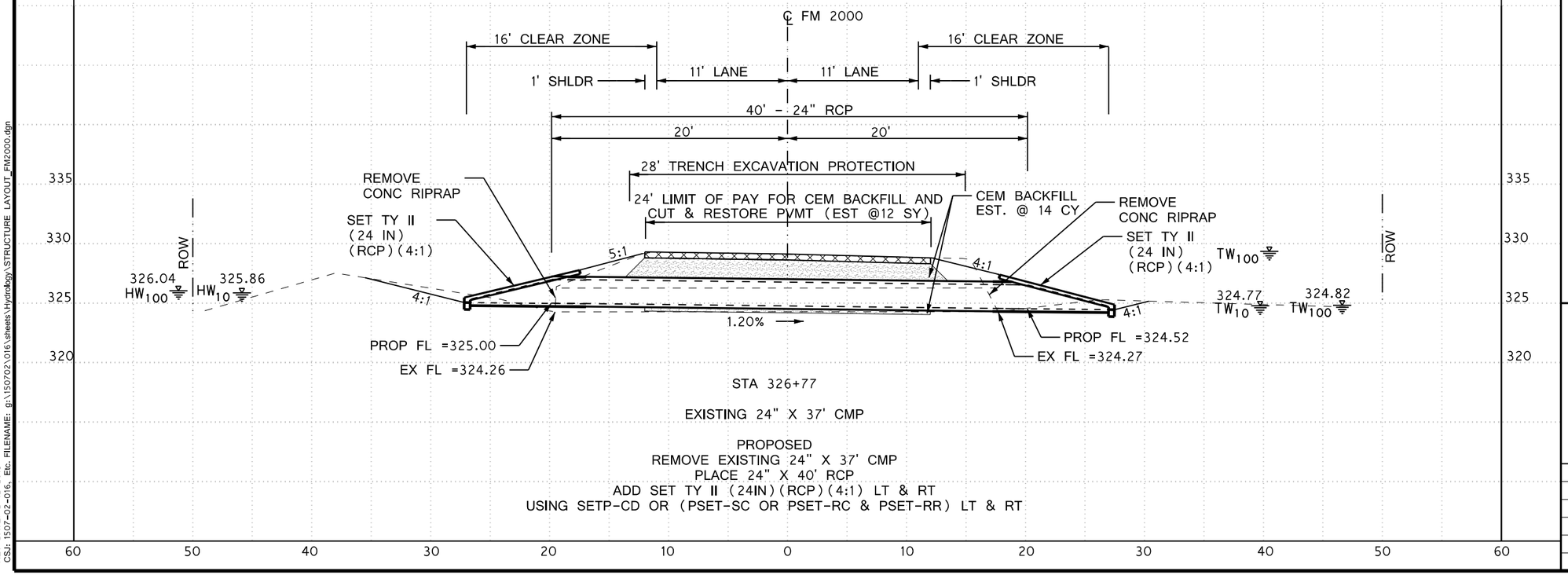
REV DATE: 2-12-2015
CSJ: 1507-02-016, Etc. FILENAME: g:\150702\016\sheets\Hydrology\STRUCTURE LAYOUT_FM2000.dgn



STA 240+98

EXISTING 30" X 53' CMP

PROPOSED
REMOVE EXISTING 30" X 53' CMP
PLACE 30" X 40' RCP AND
ADD SET TY II (30 IN)(CMP)(4:1) LT & RT
USING SETP-CD OR (PSET-SC OR PSET-RC & PSET-RR) LT & RT



STA 326+77

EXISTING 24" X 37' CMP

PROPOSED
REMOVE EXISTING 24" X 37' CMP
PLACE 24" X 40' RCP
ADD SET TY II (24IN)(RCP)(4:1) LT & RT
USING SETP-CD OR (PSET-SC OR PSET-RC & PSET-RR) LT & RT

GENERAL NOTES:

PROFILES ARE ALONG CENTERLINE OF STRUCTURE.

SEE "MISCELLANEOUS STRUCTURE DETAILS" FOR ADDITIONAL INFORMATION.

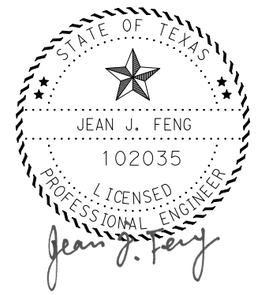
THE EXACT QUANTITY OF ROCK RIPRAP WILL BE DETERMINED IN THE FIELD BY THE ENGINEER. REDUCE THE DEPTH IF NECESSARY TO AVOID UTILITY CONFLICT.

PLACE FILTER FABRIC BELOW ALL ROCK RIPRAP PROTECTION.

DIMENSIONS OF PROPOSED CONC RIPRAP ARE TO BE DETERMINED IN THE FIELD BY THE ENGINEER.

WHERE TREE REMOVAL IS REQUIRED, THE PAYMENT IS CONSIDERED SUBSIDIARY TO ITEM 467.

WHERE UTILITY PRESENT, NO GRABING OF TREES OR BRUSHES, FLUSHING CUT ONLY UNLESS APPROVED BY THE ENGINEER.



12/21/2020

HORIZONTAL
0 5 10 20 FT
0 5 10 20 FT
VERTICAL

PRINT DATE	REVISION DATE
12/21/2020	

Texas Department of Transportation
Bryan District

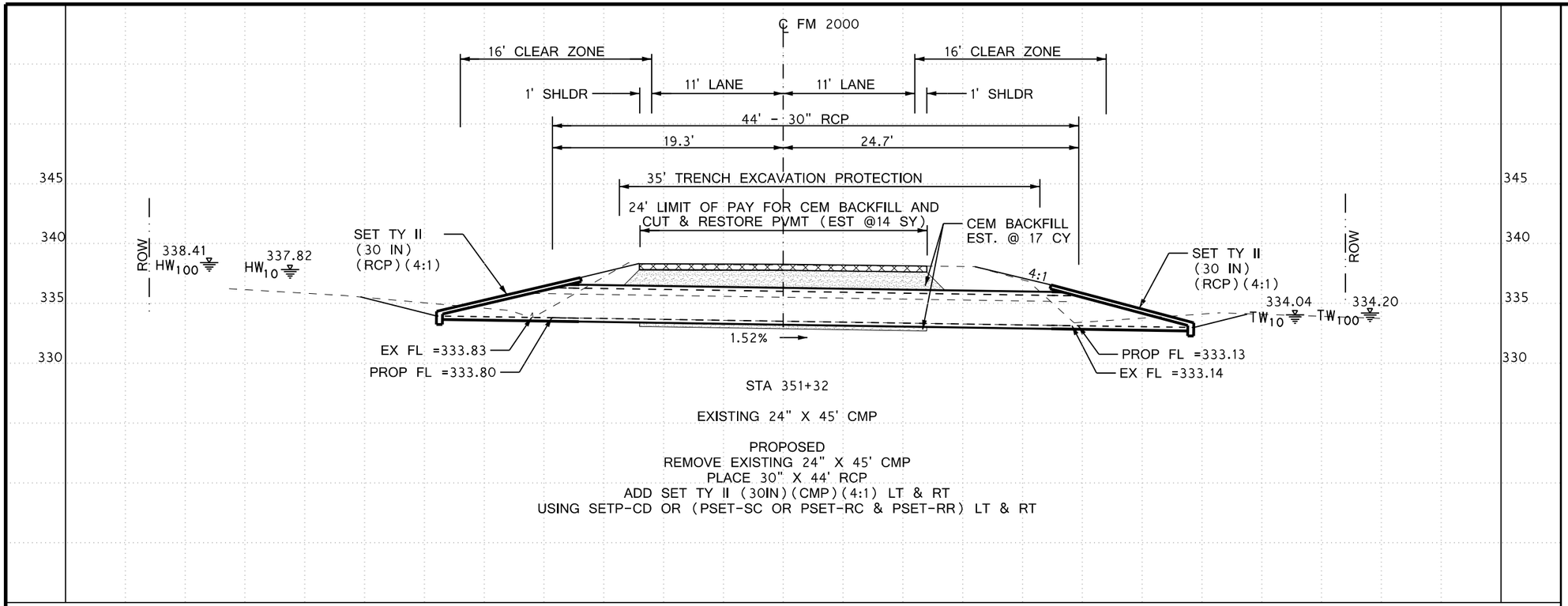
STRUCTURE LAYOUT (FM 2000)

SHEET 9 OF 24 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 696, ETC.

STATE	DISTRICT	COUNTY	
TEXAS	BRYAN	BURLESON	
CONTROL	SECTION	JOB	SHEET NO.
1507	02	016, ETC.	95

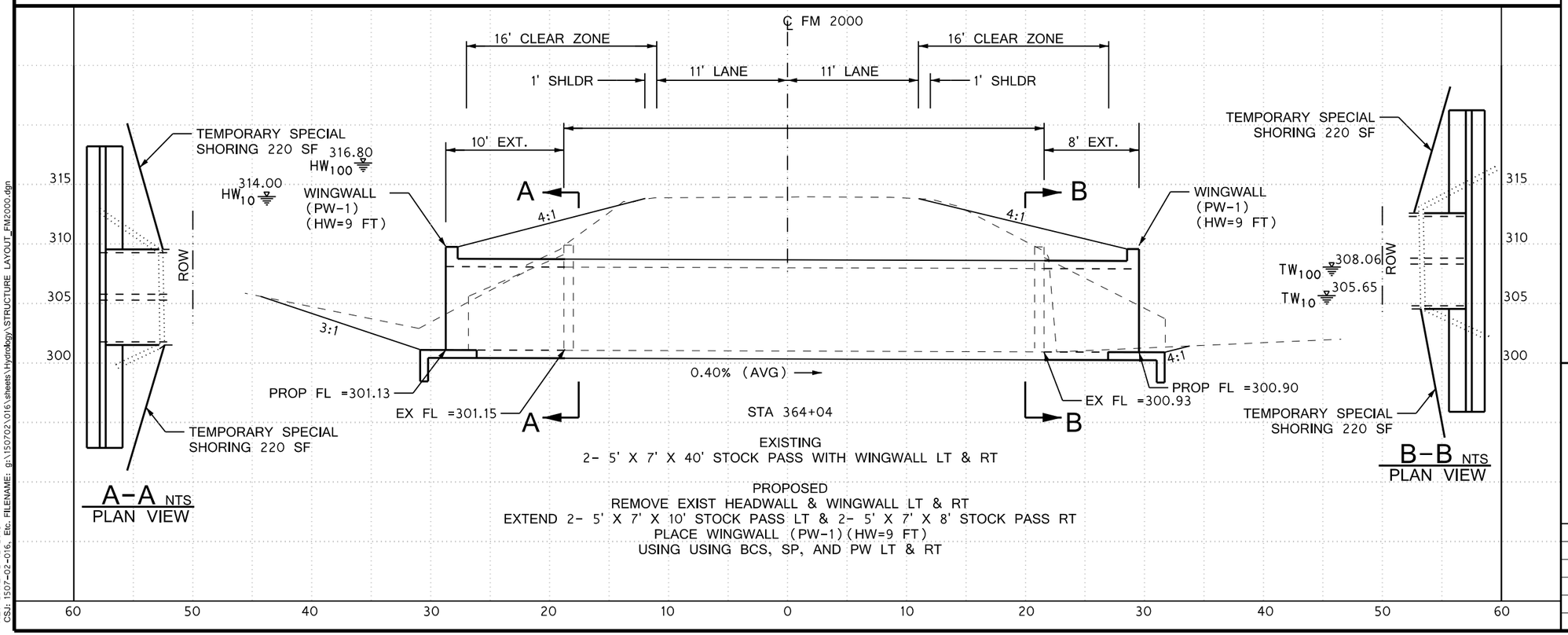
REV DATE: 2-12-2015
CSJ: 1507-02-016, Etc. FILENAME: g:\150702\016\sheets\Hydrology\STRUCTURE LAYOUT_FM2000.dgn



STA 351+32

EXISTING 24" X 45' CMP

PROPOSED
REMOVE EXISTING 24" X 45' CMP
PLACE 30" X 44' RCP
ADD SET TY II (30IN)(CMP)(4:1) LT & RT
USING SETP-CD OR (PSET-SC OR PSET-RC & PSET-RR) LT & RT



A-A NTS
PLAN VIEW

B-B NTS
PLAN VIEW

STA 364+04

EXISTING
2- 5' X 7' X 40' STOCK PASS WITH WINGWALL LT & RT

PROPOSED
REMOVE EXIST HEADWALL & WINGWALL LT & RT
EXTEND 2- 5' X 7' X 10' STOCK PASS LT & 2- 5' X 7' X 8' STOCK PASS RT
PLACE WINGWALL (PW-1)(HW=9 FT)
USING USING BCS, SP, AND PW LT & RT

GENERAL NOTES:

PROFILES ARE ALONG CENTERLINE OF STRUCTURE.

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WHERE UTILITY PRESENT, NO GRABING OF TREES OR BRUSHES, FLUSHING CUT ONLY UNLESS APPROVED BY THE ENGINEER.

STATE OF TEXAS
JEAN J. FENG
102035
LICENSED PROFESSIONAL ENGINEER

12/21/2020

HORIZONTAL
0 5 10 20 FT
0 5 10 20 FT
VERTICAL

PRINT DATE	REVISION DATE
12/21/2020	

Texas Department of Transportation
Bryan District

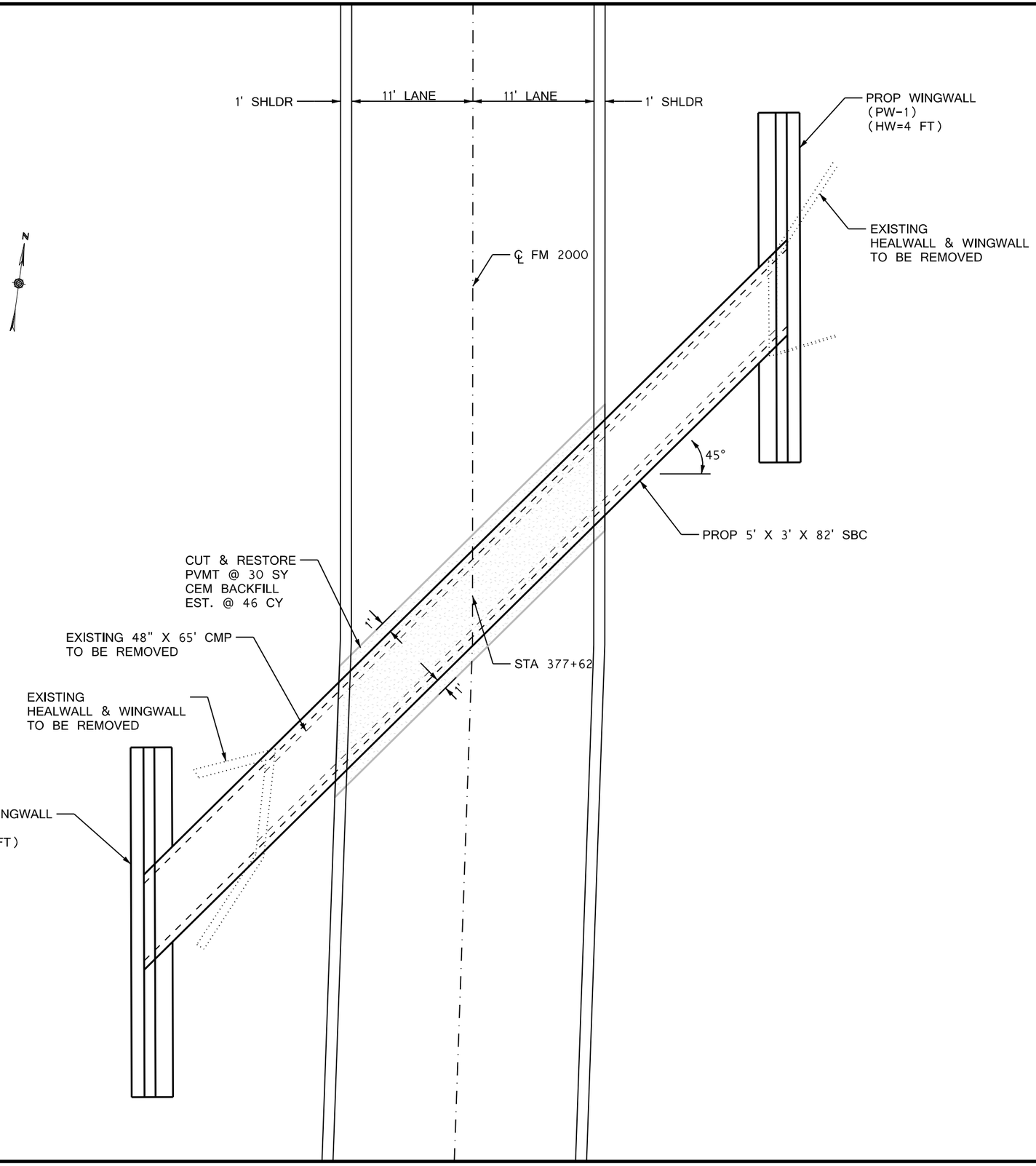
STRUCTURE LAYOUT (FM 2000)

SHEET 10 OF 24 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 696, ETC.

STATE	DISTRICT	COUNTY	
TEXAS	BRYAN	BURLESON	
CONTROL	SECTION	JOB	SHEET NO.
1507	02	016, ETC.	96

REV DATE: 2-12-2015
CSJ: 1507-02-016, Etc. FILENAME: g:\150702\016\sheets\Hydrology\STRUCTURE LAYOUT_FM2000.dgn



STATION OF DRAIANGE STRUCTURES ARE APPROXIMATELY 1000' - 1400' AHEAD THAN SHOWN IN AS-BUILT PLANS.

STATE OF TEXAS
JEAN J. FENG
102035
LICENSED
PROFESSIONAL ENGINEER

12/21/2020

0 5 10 20 FT

PRINT DATE	REVISION DATE
12/21/2020	

Texas Department of Transportation
Bryan District

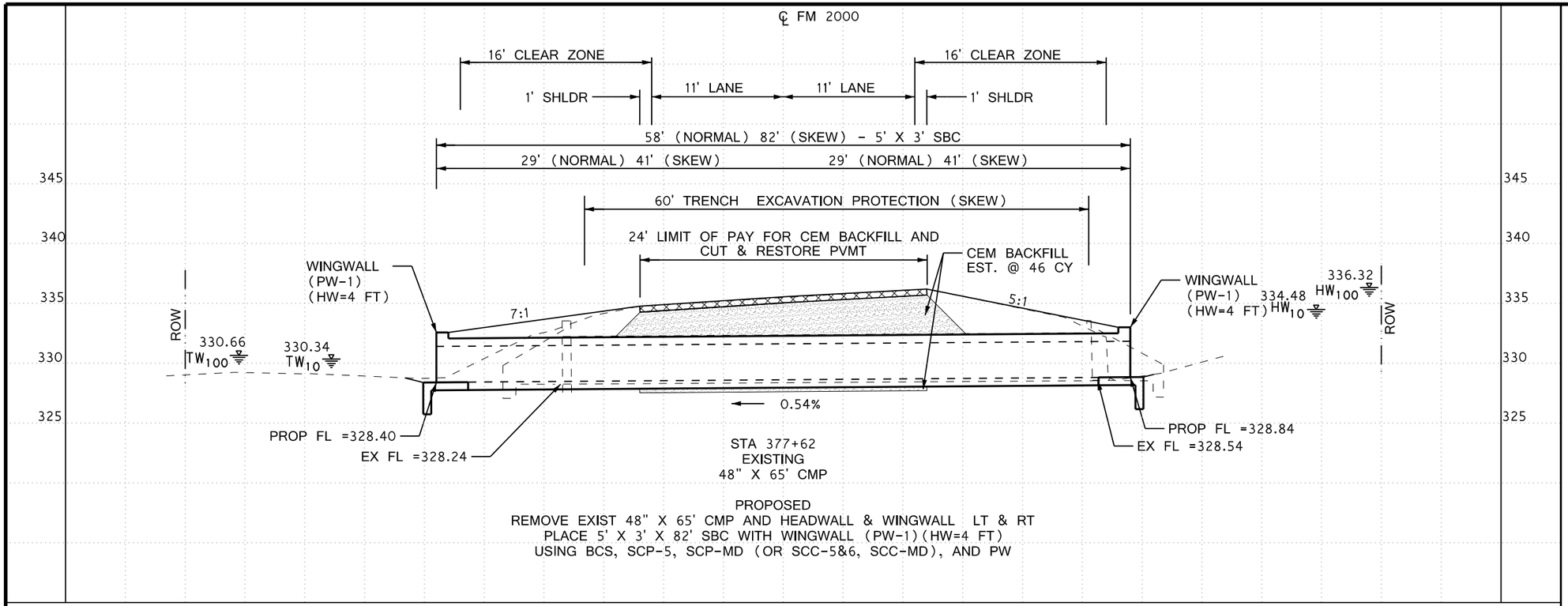
STRUCTURE LAYOUT (FM 2000)

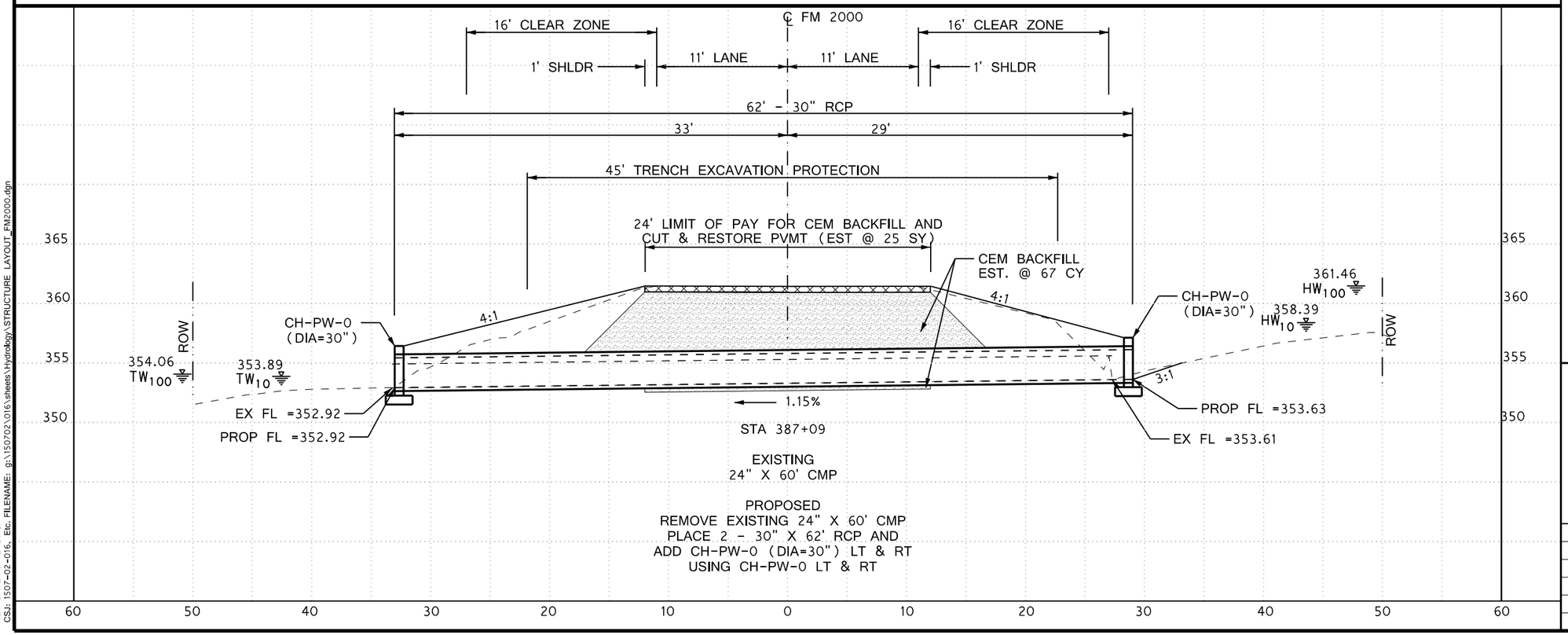
SHEET 11 OF 24 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 696, ETC.

STATE	DISTRICT	COUNTY	
TEXAS	BRYAN	BURLESON	
CONTROL	SECTION	JOB	SHEET NO.
1507	02	016, ETC.	97

REV DATE: 2-12-2015
CSJ: 1507-02-016, Etc. FILENAME: g:\150702\016\sheets\Hydrology\STRUCTURE LAYOUT_FM2000.dgn





GENERAL NOTES:

PROFILES ARE ALONG CENTERLINE OF STRUCTURE.

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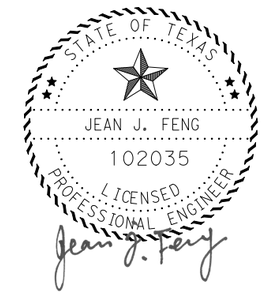

12/21/2020

HORIZONTAL
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VERTICAL

PRINT DATE	REVISION DATE
12/21/2020	

Texas Department of Transportation
Bryan District

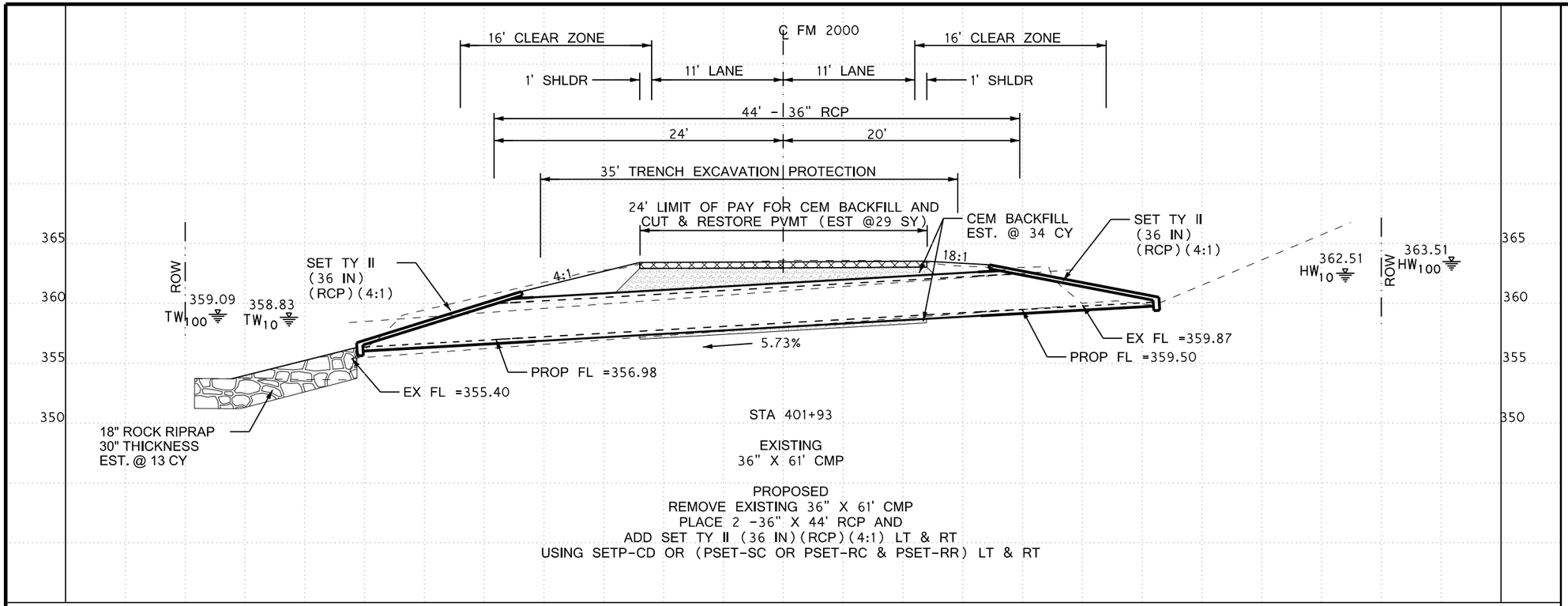
STRUCTURE LAYOUT (FM 2000)

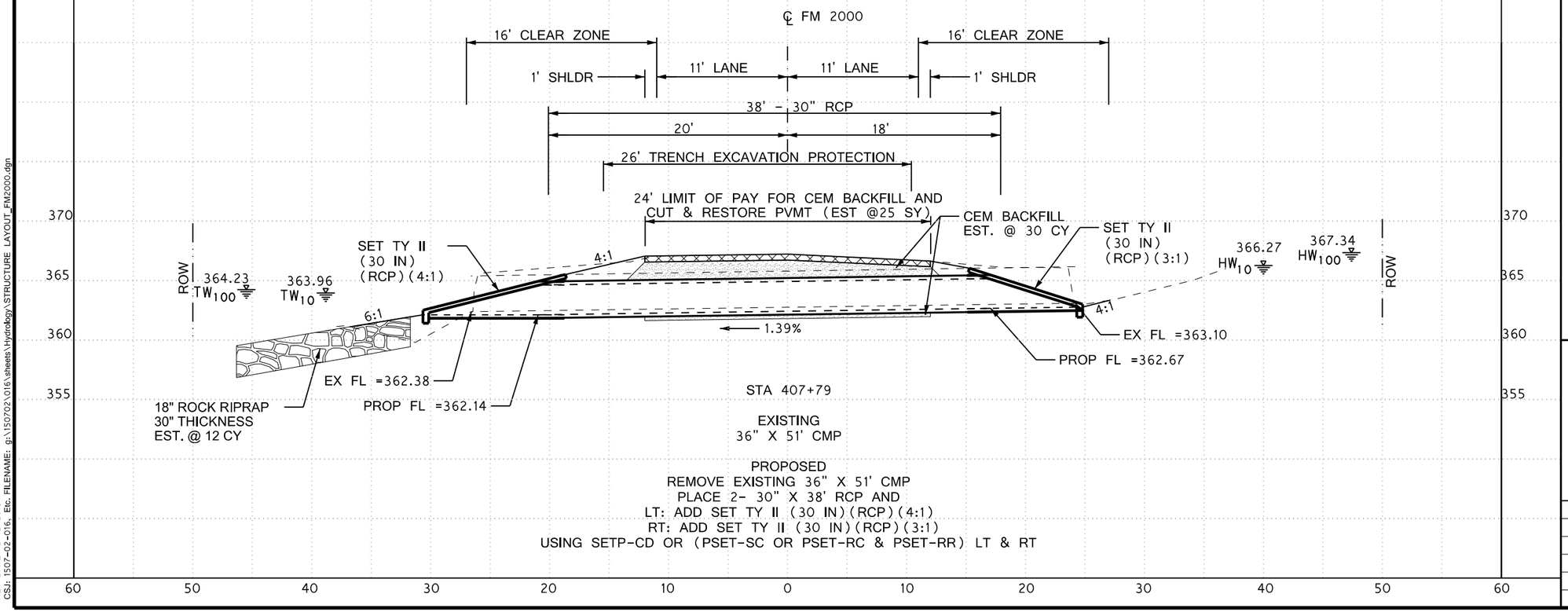
SHEET 12 OF 24 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 696, ETC.

STATE	DISTRICT	COUNTY	
TEXAS	BRYAN	BURLESON	
CONTROL	SECTION	JOB	SHEET NO.
1507	02	016, ETC.	98

REV DATE: 2-12-2015
CSJ: 1507-02-016, Etc. FILENAME: g:\150702\016\sheets\Hydrology\STRUCTURE LAYOUT_FM2000.dgn





GENERAL NOTES:

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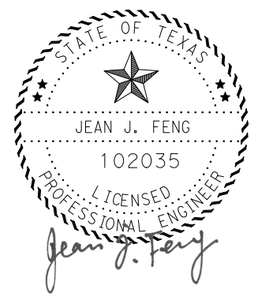

12/21/2020

HORIZONTAL
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VERTICAL

PRINT DATE	REVISION DATE
12/21/2020	

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Bryan District
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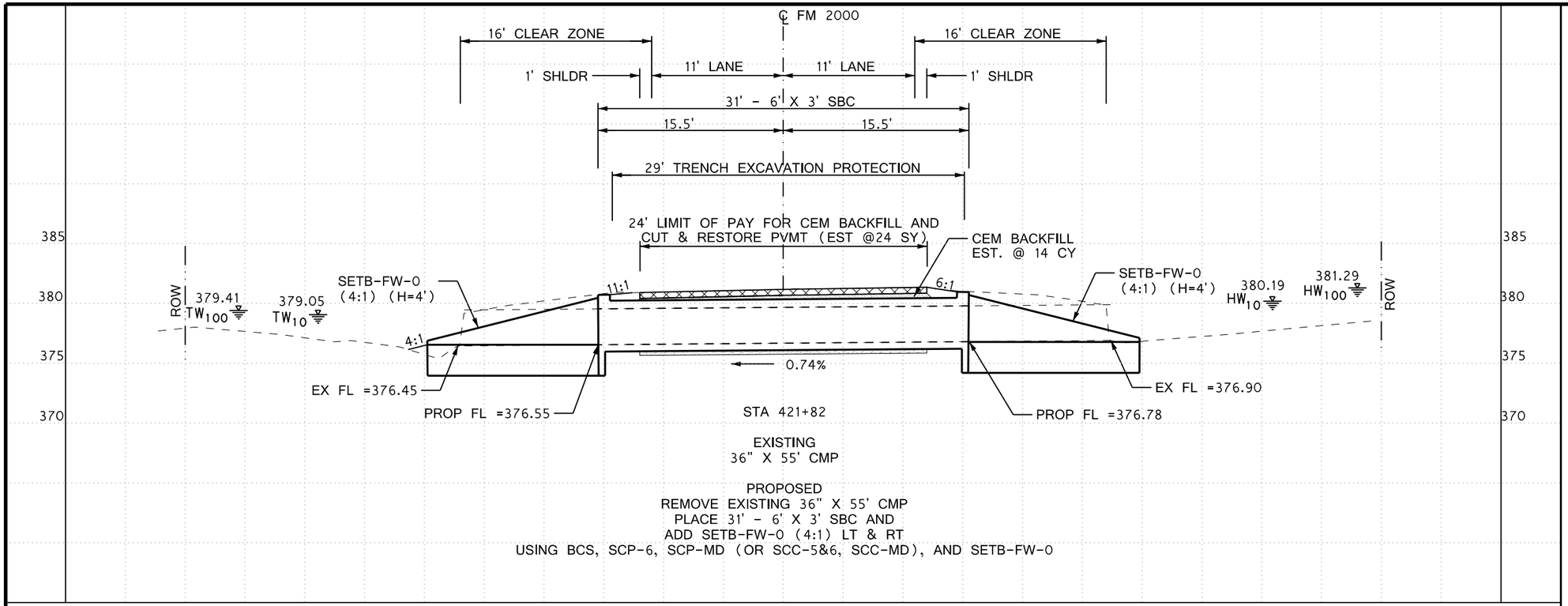
STRUCTURE LAYOUT (FM 2000)

SHEET 13 OF 24 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 696, ETC.

STATE	DISTRICT	COUNTY	
TEXAS	BRYAN	BURLESON	
CONTROL	SECTION	JOB	SHEET NO.
1507	02	016, ETC.	99

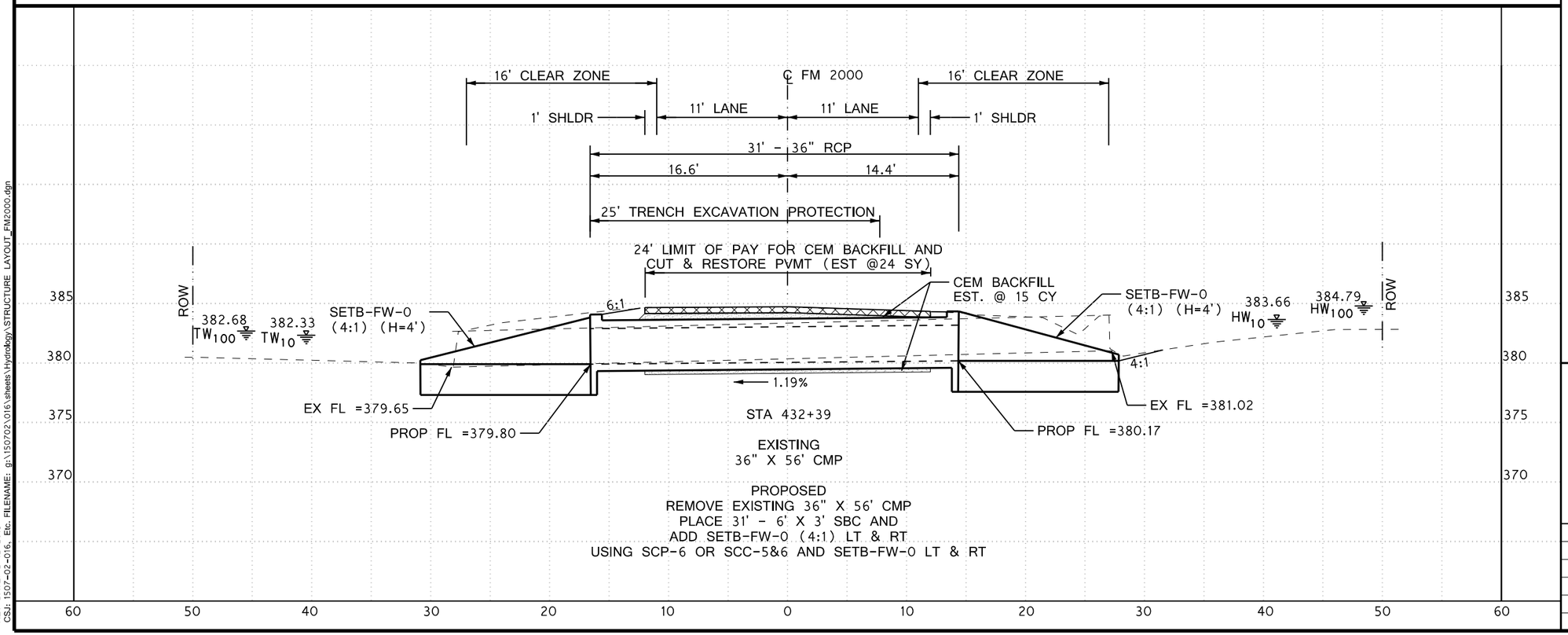
REV DATE: 2-12-2015
CSJ: 1507-02-016, Etc. FILENAME: g:\150702\016\sheets\Hydrology\STRUCTURE LAYOUT_FM2000.dgn



STA 421+82

EXISTING
36" X 55' CMP

PROPOSED
REMOVE EXISTING 36" X 55' CMP
PLACE 31' - 6' X 3' SBC AND
ADD SETB-FW-0 (4:1) LT & RT
USING BCS, SCP-6, SCP-MD (OR SCC-5&6, SCC-MD), AND SETB-FW-0



STA 432+39

EXISTING
36" X 56' CMP

PROPOSED
REMOVE EXISTING 36" X 56' CMP
PLACE 31' - 6' X 3' SBC AND
ADD SETB-FW-0 (4:1) LT & RT
USING SCP-6 OR SCC-5&6 AND SETB-FW-0 LT & RT

GENERAL NOTES:

PROFILES ARE ALONG CENTERLINE OF STRUCTURE.

SEE "MISCELLANEOUS STRUCTURE DETAILS" FOR ADDITIONAL INFORMATION.

THE EXACT QUANTITY OF ROCK RIPRAP WILL BE DETERMINED IN THE FIELD BY THE ENGINEER. REDUCE THE DEPTH IF NECESSARY TO AVOID UTILITY CONFLICT.

PLACE FILTER FABRIC BELOW ALL ROCK RIPRAP PROTECTION.

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WHERE TREE REMOVAL IS REQUIRED, THE PAYMENT IS CONSIDERED SUBSIDIARY TO ITEM 467.

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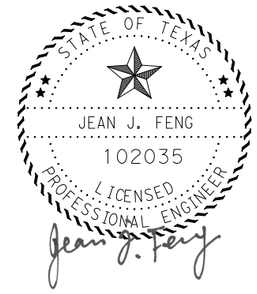
STATION OF DRAIANGE STRUCTURES ARE APPROXIMATELY 1000' - 1400' AHEAD THAN SHOWN IN AS-BUILT PLANS.



12/21/2020

HORIZONTAL
0 5 10 20 FT
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VERTICAL

PRINT DATE	REVISION DATE
12/21/2020	

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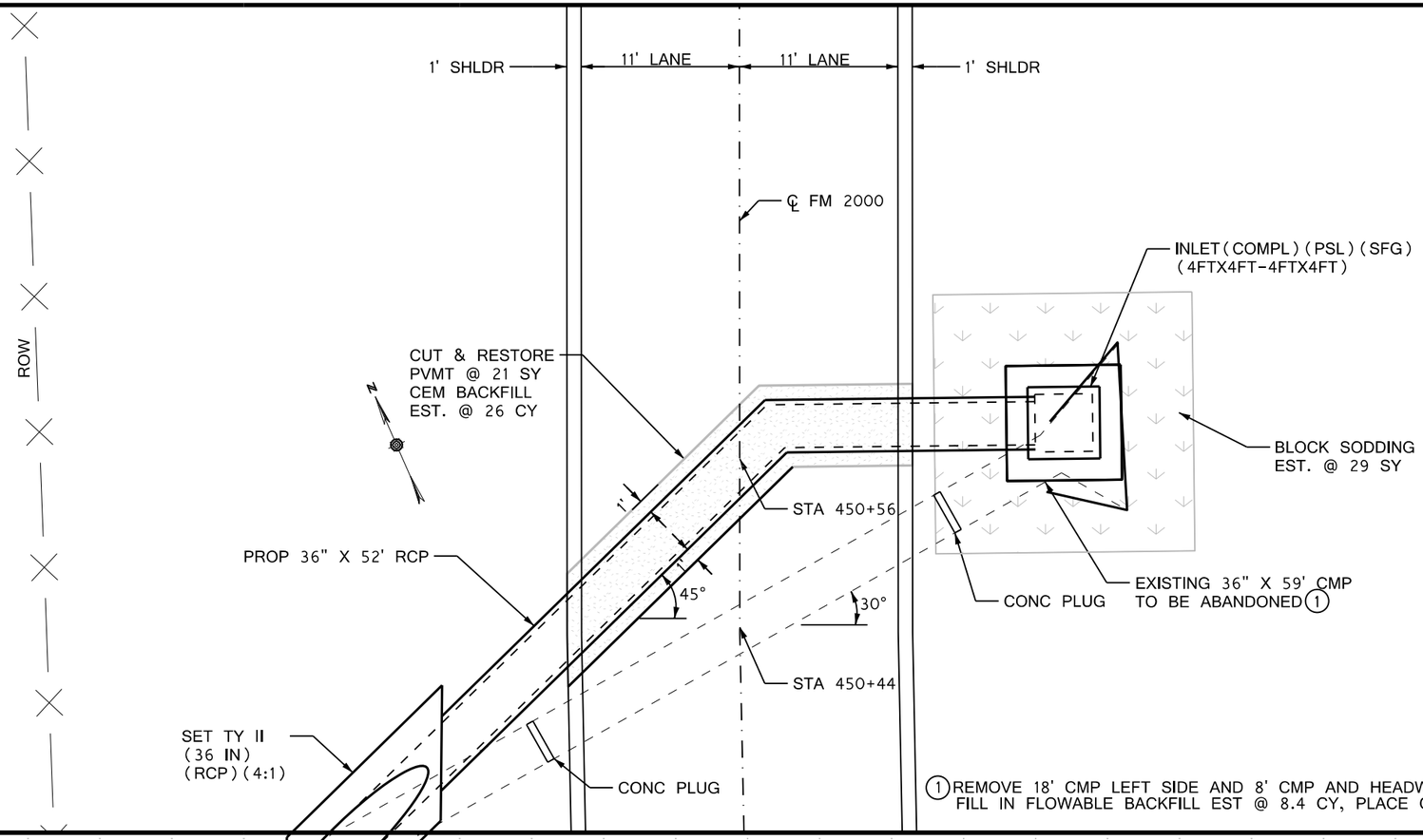
Bryan District

STRUCTURE LAYOUT (FM 2000)

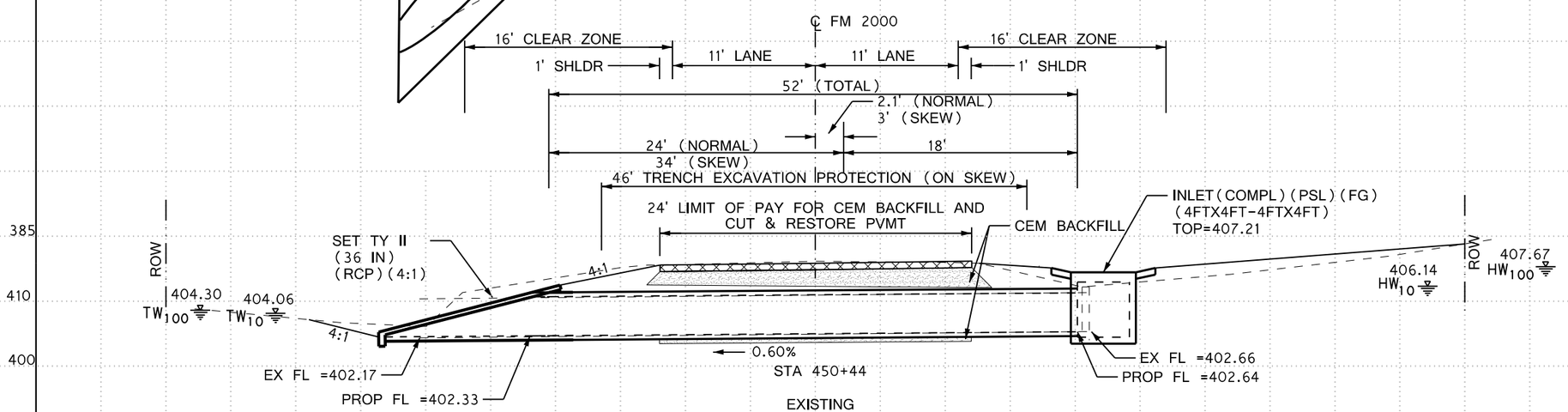
SHEET 14 OF 24 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER		HIGHWAY NUMBER
6			FM 696, ETC.
STATE	DISTRICT	COUNTY	
TEXAS	BRYAN	BURLESON	
CONTROL	SECTION	JOB	SHEET NO.
1507	02	016, ETC.	100

REV DATE: 2-12-2015
CSJ: 1507-02-016, Etc. FILENAME: g:\150702\016\sheets\Hydrology\STRUCTURE LAYOUT_FM2000.dgn



(1) REMOVE 18' CMP LEFT SIDE AND 8' CMP AND HEADWALL/WINGWALLS RIGHT SIDE. FILL IN FLOWABLE BACKFILL EST @ 8.4 CY, PLACE CONC PLUG AT BOTH ENDS.



EXISTING
36" X 59' CMP 30° RFS

PROPOSED
EXISTING 36" X 59' CMP TO BE ABANDONED
PLACE 36" X 52' RCP AND
LT: ADD SET TY II (36 IN) (RCP) (4:1)
RT: ADD INLET (COMPL) (PSL)
USING SETP-CD OR (PSET-SC OR PSET-RC & PSET-RR) LT
PB & PSL RT

GENERAL NOTES:

PROFILES ARE ALONG CENTERLINE OF STRUCTURE.

SEE "MISCELLANEOUS STRUCTURE DETAILS" FOR ADDITIONAL INFORMATION.

THE EXACT QUANTITY OF ROCK RIPRAP WILL BE DETERMINED IN THE FIELD BY THE ENGINEER. REDUCE THE DEPTH IF NECESSARY TO AVOID UTILITY CONFLICT.

PLACE FILTER FABRIC BELOW ALL ROCK RIPRAP PROTECTION.

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STATION OF DRAIANGE STRUCTURES ARE APPROXIMATELY 1000' - 1400' AHEAD THAN SHOWN IN AS-BUILT PLANS.

STATE OF TEXAS
JEAN J. FENG
102035
LICENSED
PROFESSIONAL ENGINEER

12/21/2020

HORIZONTAL
0 5 10 20 FT
0 5 10 20 FT
VERTICAL

PRINT DATE	REVISION DATE
12/21/2020	

Texas Department of Transportation
Bryan District

STRUCTURE LAYOUT (FM 2000)

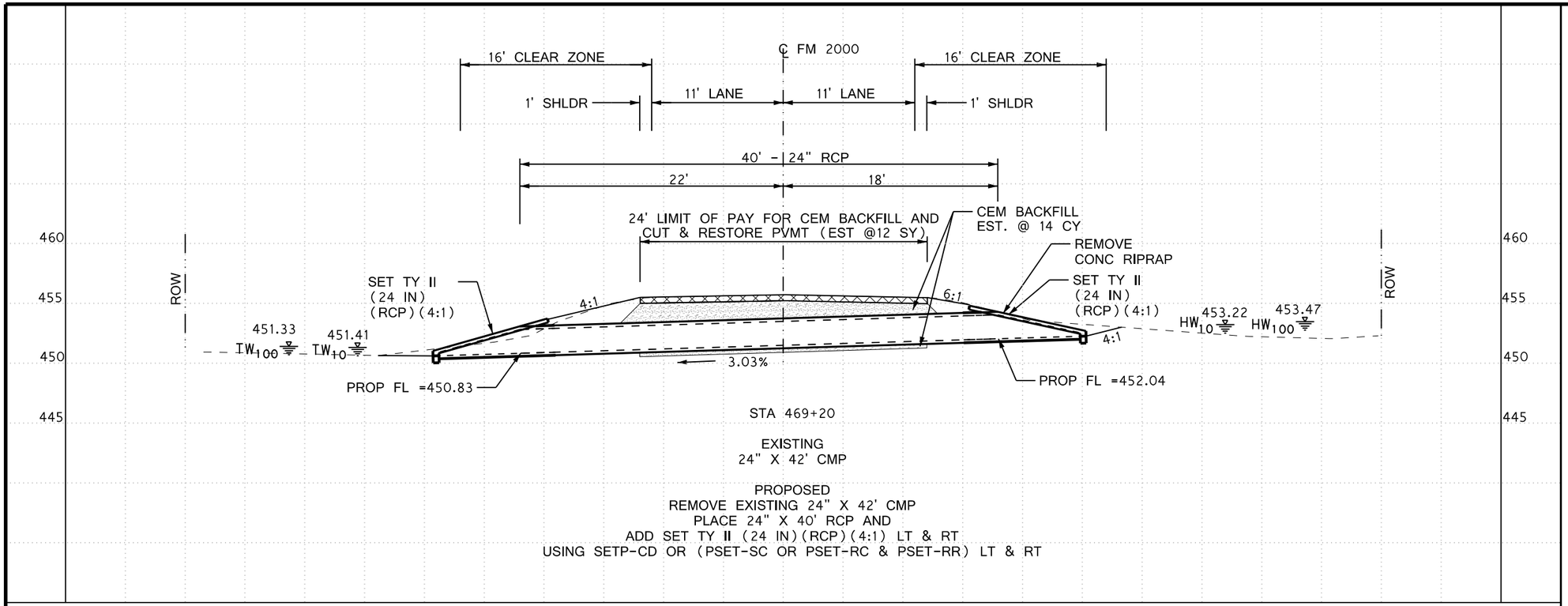
SHEET 15 OF 24 SHEETS

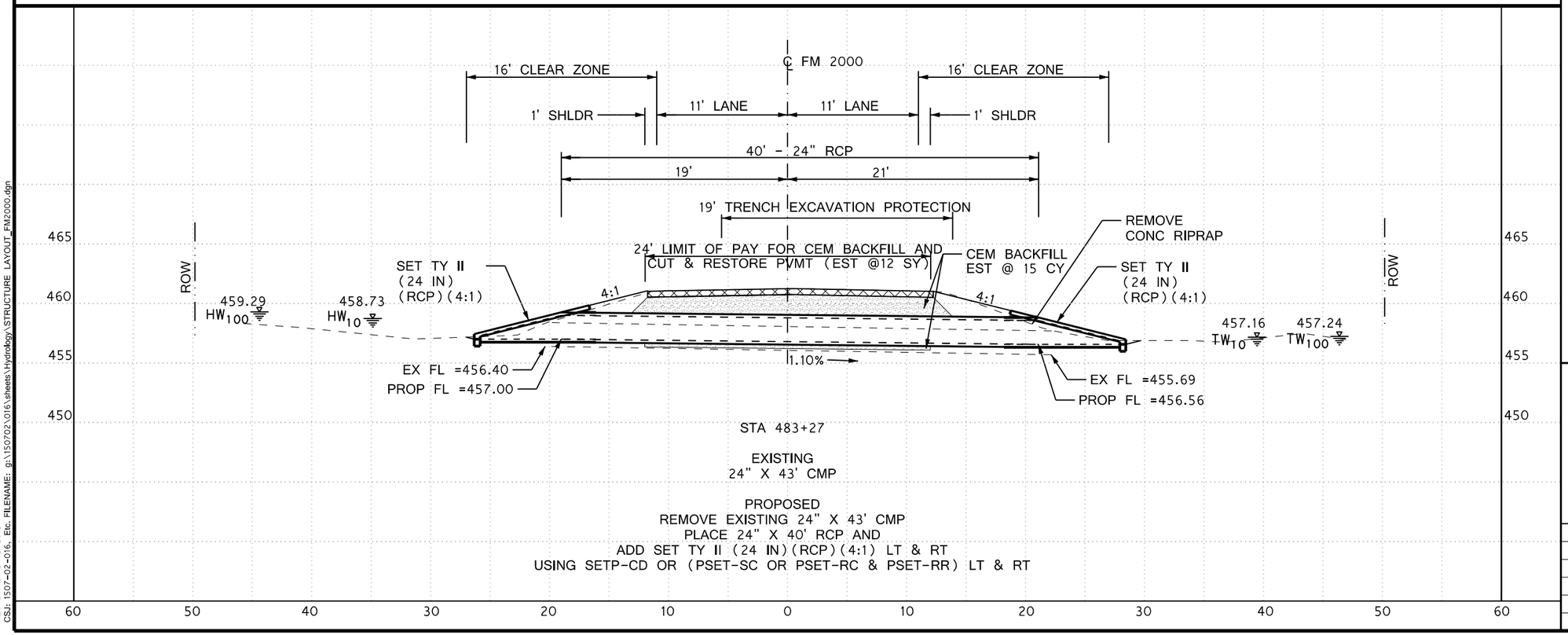
FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 696, ETC.

STATE	DISTRICT	COUNTY
TEXAS	BRYAN	BURLESON

CONTROL	SECTION	JOB	SHEET NO.
1507	02	016, ETC.	101

REV DATE: 2-12-2015
CSJ: 1507-02-016, Etc. FILENAME: g:\150702\016\sheets\Hydrology\STRUCTURE LAYOUT_FM2000.dgn





GENERAL NOTES:

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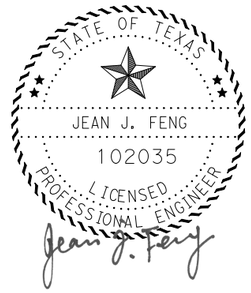

12/21/2020

HORIZONTAL
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VERTICAL

PRINT DATE	REVISION DATE
12/21/2020	

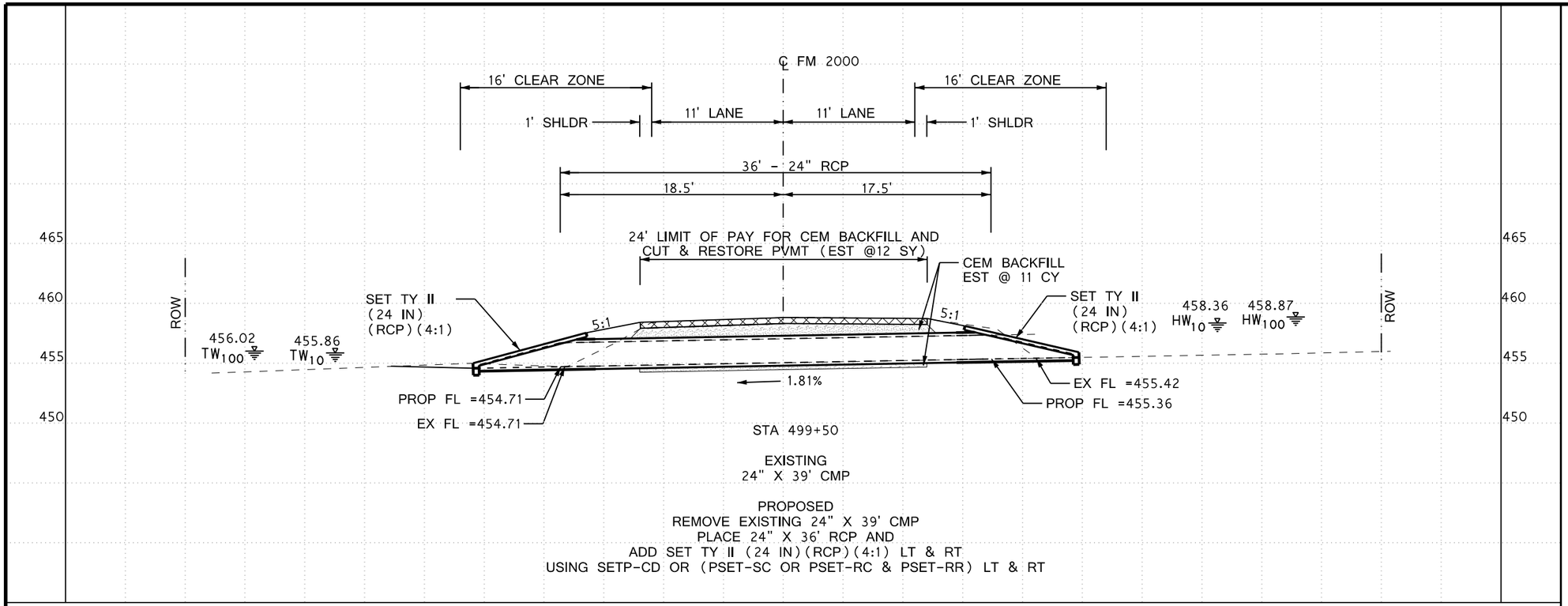
Texas Department of Transportation
Bryan District

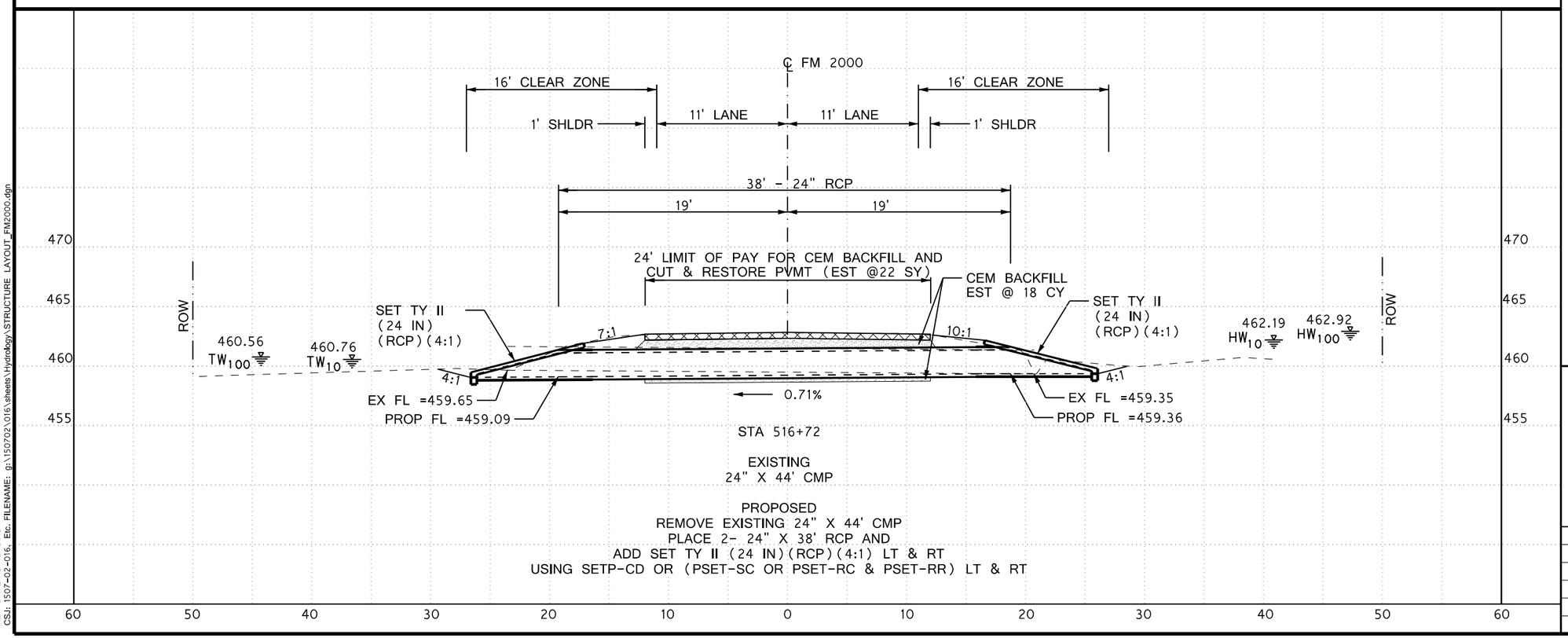
STRUCTURE LAYOUT (FM 2000)

SHEET 16 OF 24 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 696, ETC.
STATE	DISTRICT	COUNTY
TEXAS	BRYAN	BURLESON
CONTROL	SECTION	JOB / SHEET NO.
1507	02	016, ETC. / 102

REV DATE: 2-12-2015
CSJ: 1507-02-016, Etc. FILENAME: g:\150702\016\sheets\Hydrology\STRUCTURE LAYOUT_FM2000.dgn





GENERAL NOTES:

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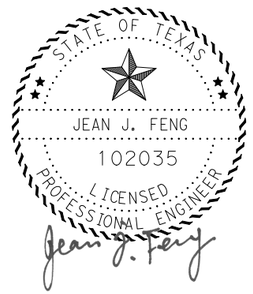

12/21/2020

HORIZONTAL
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VERTICAL

PRINT DATE	REVISION DATE
12/21/2020	

Texas Department of Transportation
Bryan District

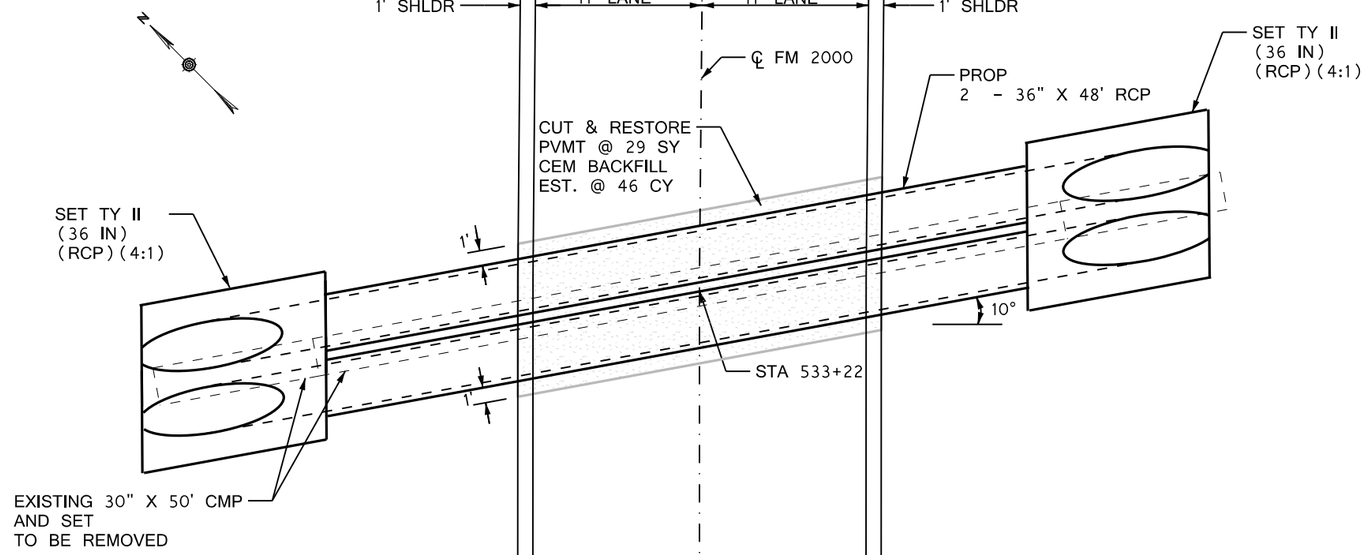
STRUCTURE LAYOUT (FM 2000)

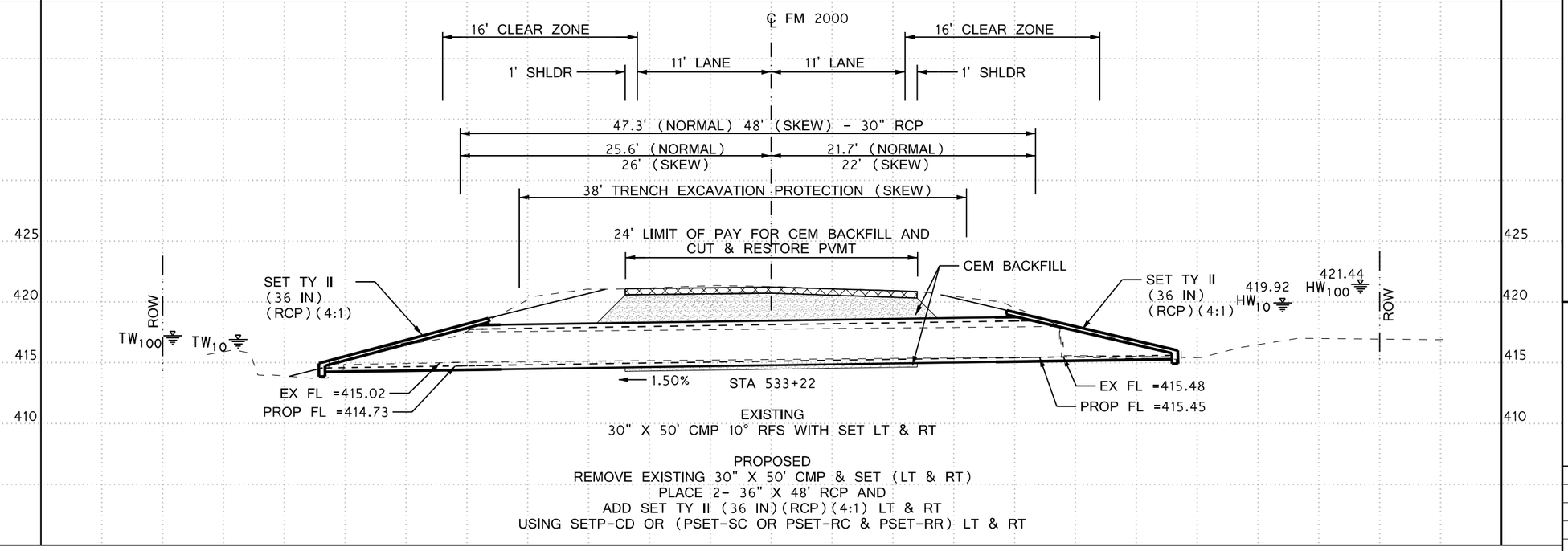
SHEET 17 OF 24 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 696, ETC.

STATE	DISTRICT	COUNTY	
TEXAS	BRYAN	BURLESON	
CONTROL	SECTION	JOB	SHEET NO.
1507	02	016, ETC.	103

REV DATE: 2-12-2015
CSJ: 1507-02-016, Etc. FILENAME: g:\150702\016\sheets\Hydrology\STRUCTURE LAYOUT_FM2000.dgn





GENERAL NOTES:

PROFILES ARE ALONG CENTERLINE OF STRUCTURE.

SEE "MISCELLANEOUS STRUCTURE DETAILS" FOR ADDITIONAL INFORMATION.

THE EXACT QUANTITY OF ROCK RIPRAP WILL BE DETERMINED IN THE FIELD BY THE ENGINEER. REDUCE THE DEPTH IF NECESSARY TO AVOID UTILITY CONFLICT.

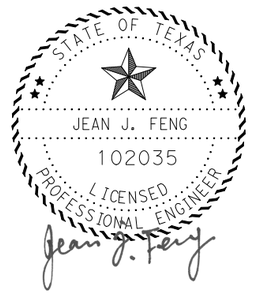
PLACE FILTER FABRIC BELOW ALL ROCK RIPRAP PROTECTION.

DIMENSIONS OF PROPOSED CONC RIPRAP ARE TO BE DETERMINED IN THE FIELD BY THE ENGINEER.

WHERE TREE REMOVAL IS REQUIRED, THE PAYMENT IS CONSIDERED SUBSIDIARY TO ITEM 467.

WHERE UTILITY PRESENT, NO GRABING OF TREES OR BRUSHES, FLUSHING CUT ONLY UNLESS APPROVED BY THE ENGINEER.

STATION OF DRAIANGE STRUCTURES ARE APPROXIMATELY 1000' - 1400' AHEAD THAN SHOWN IN AS-BUILT PLANS.



12/21/2020

HORIZONTAL
0 5 10 20 FT
0 5 10 20 FT
VERTICAL

PRINT DATE	REVISION DATE
12/21/2020	

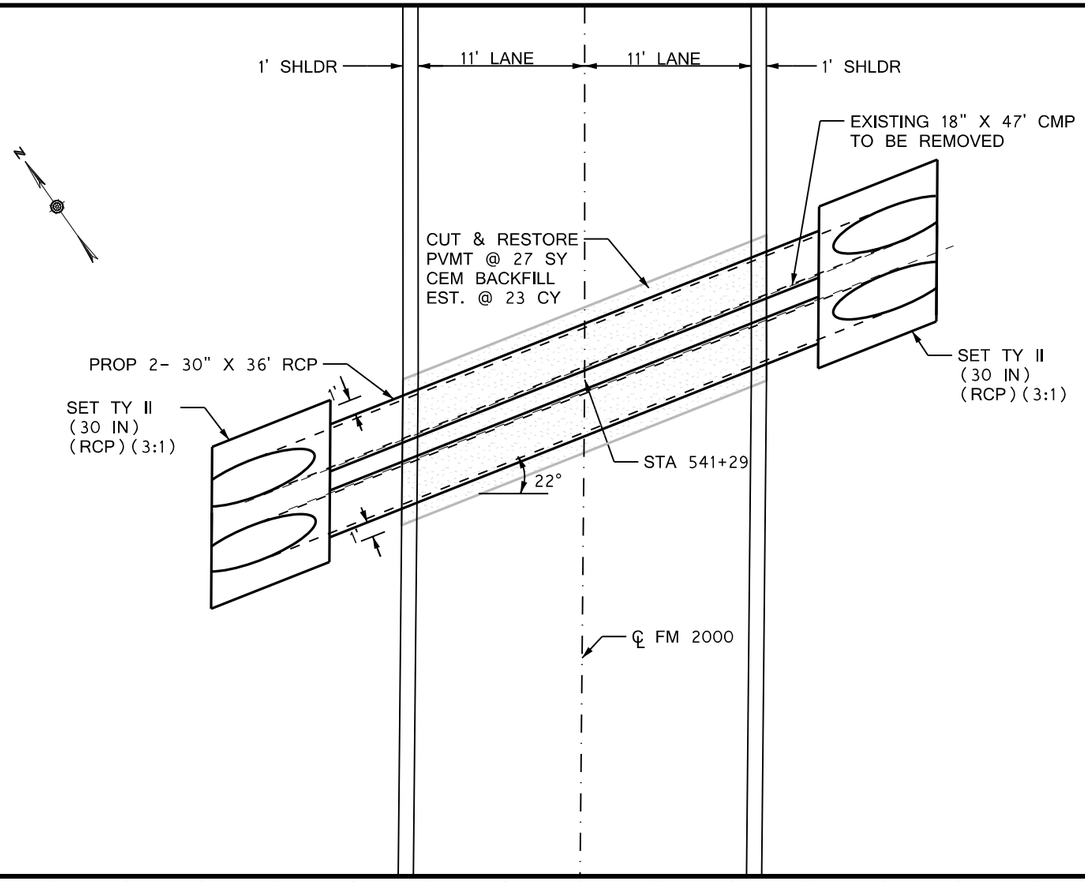
Texas Department of Transportation
Bryan District

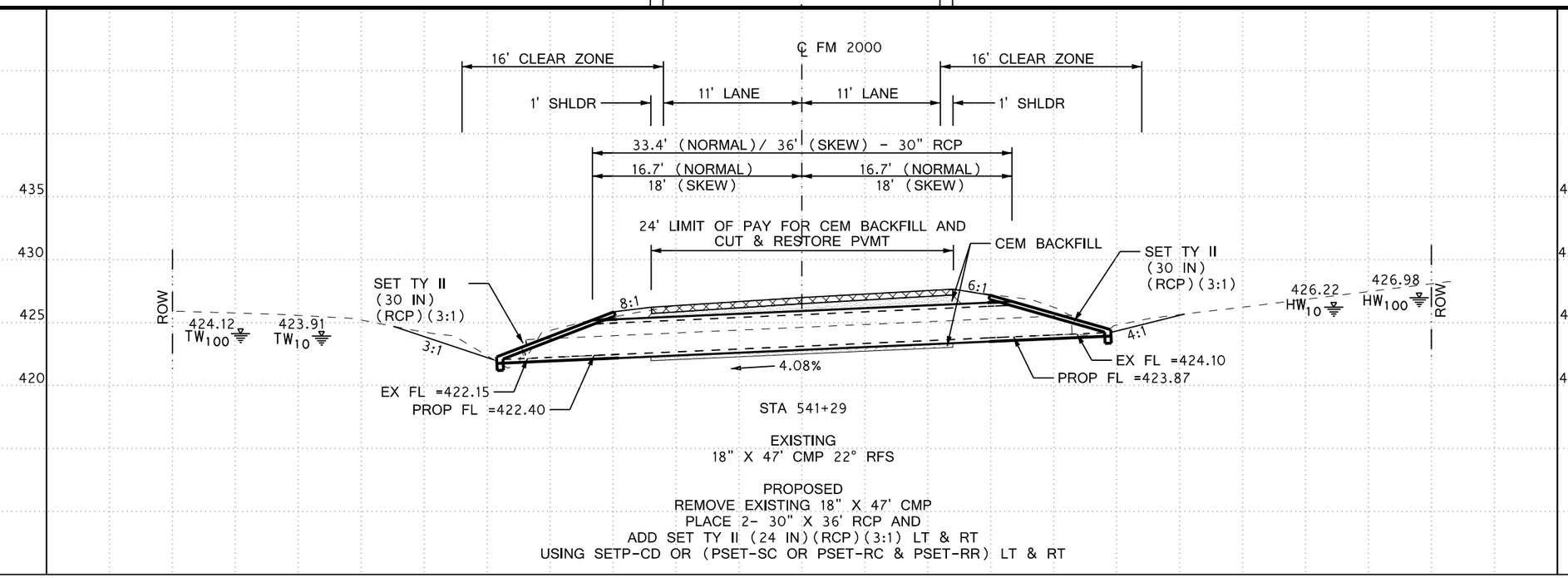
STRUCTURE LAYOUT (FM 2000)

SHEET 18 OF 24 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 696, ETC.
STATE	DISTRICT	COUNTY
TEXAS	BRYAN	BURLESON
CONTROL	SECTION	JOB / SHEET NO.
1507	02	016, ETC. / 104

REV DATE: 2-12-2015
CSJ: 1507-02-016, Etc. FILENAME: g:\150702\016\sheets\Hydrology\STRUCTURE LAYOUT_FM2000.dgn





GENERAL NOTES:

PROFILES ARE ALONG CENTERLINE OF STRUCTURE.

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STATION OF DRAIANGE STRUCTURES ARE APPROXIMATELY 1000' - 1400' AHEAD THAN SHOWN IN AS-BUILT PLANS.

STATE OF TEXAS
JEAN J. FENG
102035
LICENSED
PROFESSIONAL ENGINEER

12/21/2020

HORIZONTAL
0 5 10 20 FT
0 5 10 20 FT
VERTICAL

PRINT DATE	REVISION DATE
12/21/2020	

Texas Department of Transportation
Bryan District
©2021

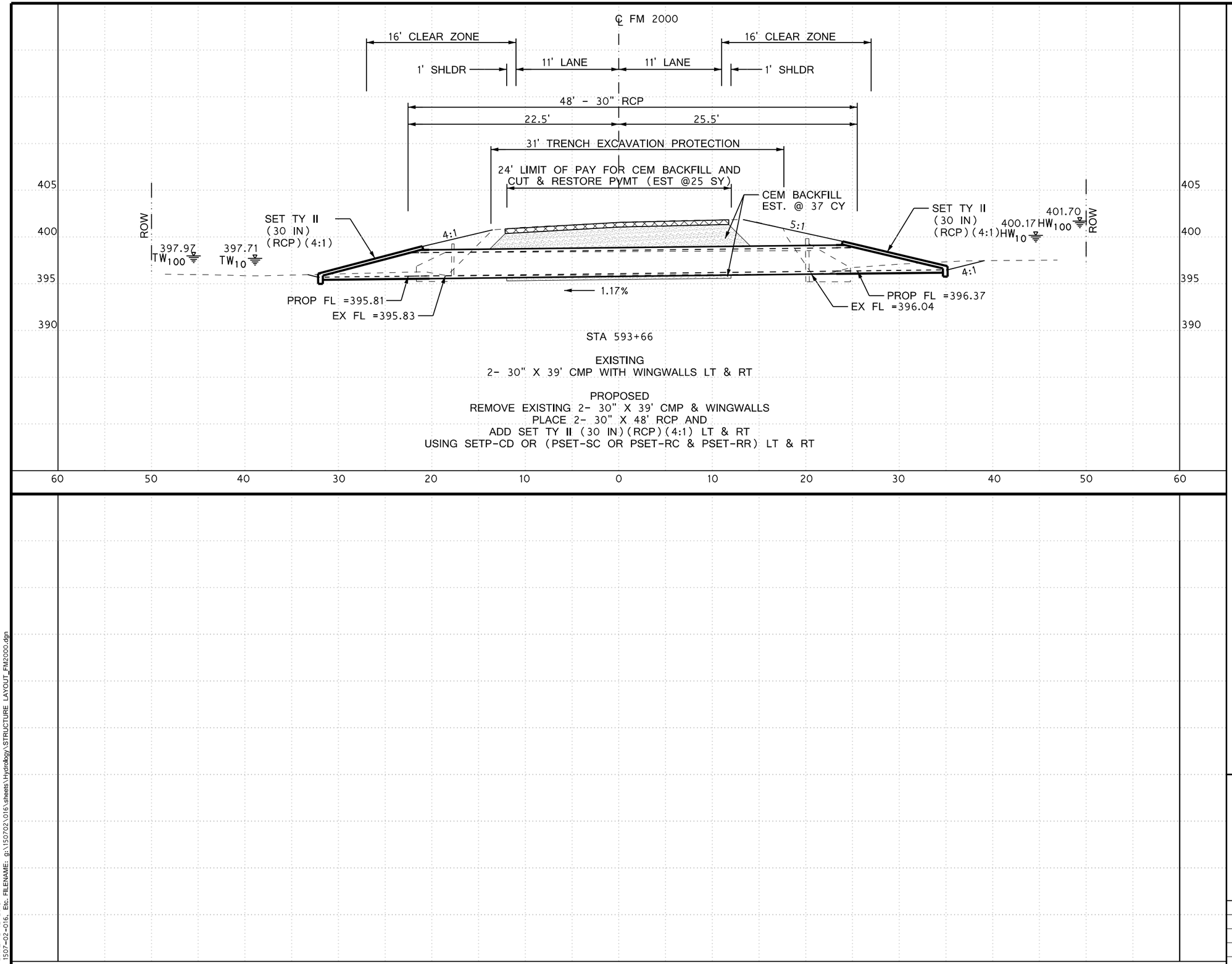
STRUCTURE LAYOUT (FM 2000)

SHEET 19 OF 24 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 696, ETC.

STATE	DISTRICT	COUNTY	
TEXAS	BRYAN	BURLESON	
CONTROL	SECTION	JOB	SHEET NO.
1507	02	016, ETC.	105

REV DATE: 2-12-2015
CSJ: 1507-02-016, Etc. FILENAME: g:\150702\016\sheets\Hydrology\STRUCTURE LAYOUT_FM2000.dgn



STA 593+66

EXISTING
2- 30" X 39' CMP WITH WINGWALLS LT & RT

PROPOSED
REMOVE EXISTING 2- 30" X 39' CMP & WINGWALLS
PLACE 2- 30" X 48' RCP AND
ADD SET TY II (30 IN)(RCP)(4:1) LT & RT
USING SETP-CD OR (PSET-SC OR PSET-RC & PSET-RR) LT & RT

GENERAL NOTES:

PROFILES ARE ALONG CENTERLINE OF STRUCTURE.

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STATE OF TEXAS
JEAN J. FENG
102035
LICENSED
PROFESSIONAL ENGINEER

12/21/2020

HORIZONTAL
0 5 10 20 FT
0 5 10 20 FT
VERTICAL

PRINT DATE	REVISION DATE
12/21/2020	

Texas Department of Transportation
Bryan District

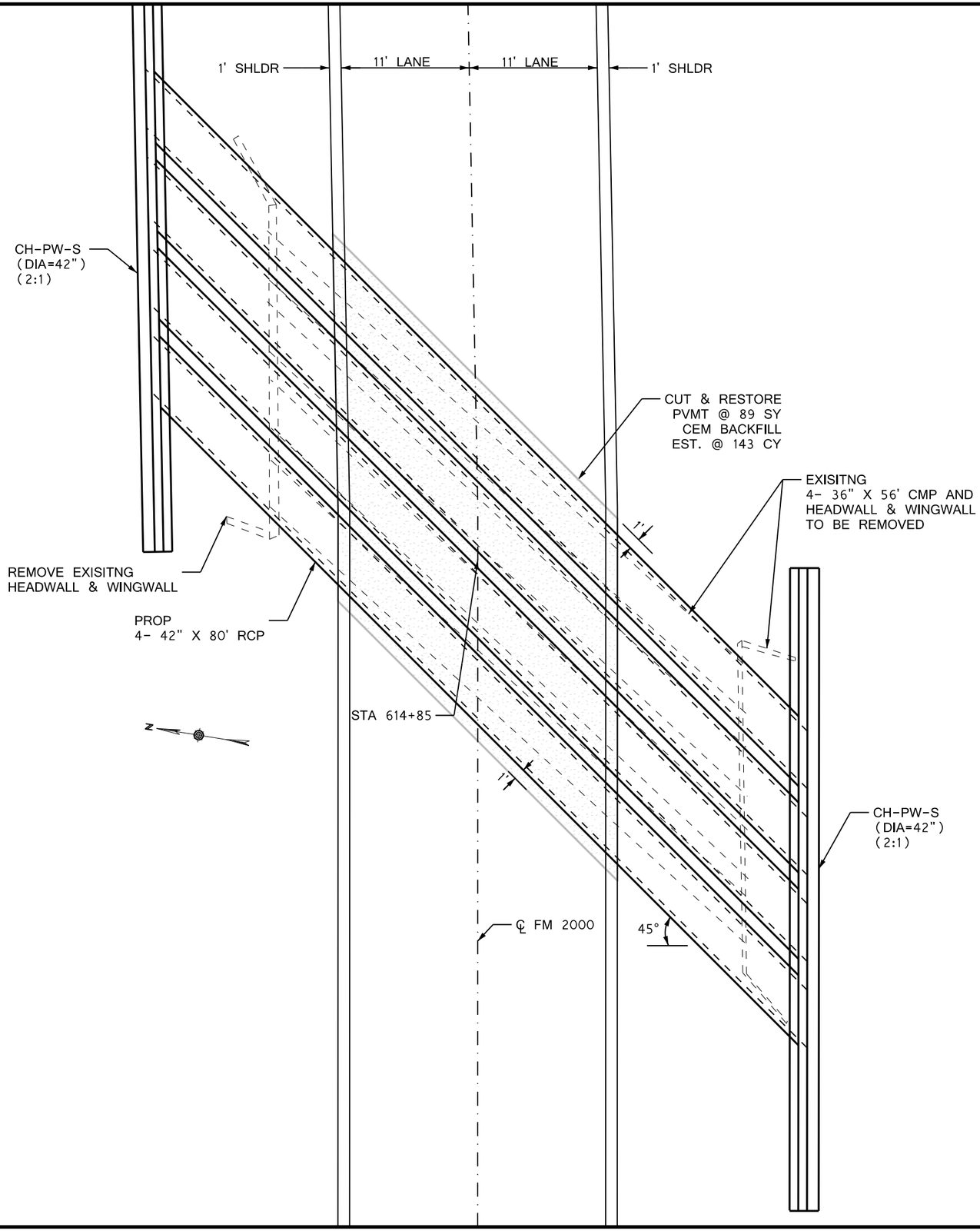
STRUCTURE LAYOUT (FM 2000)

SHEET 20 OF 24 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 696, ETC.

STATE	DISTRICT	COUNTY	
TEXAS	BRYAN	BURLESON	
CONTROL	SECTION	JOB	SHEET NO.
1507	02	016, ETC.	106

REV DATE: 2-12-2015
CSJ: 1507-02-016, Etc. FILENAME: g:\150702\016\sheets\Hydrology\STRUCTURE LAYOUT_FM2000.dgn



GENERAL NOTES:

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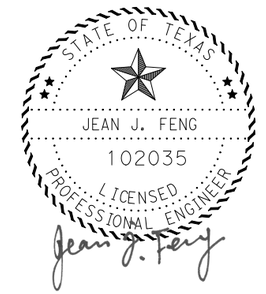


12/21/2020

0 5 10 20 FT

PRINT DATE	REVISION DATE
12/21/2020	

Texas Department of Transportation
Bryan District

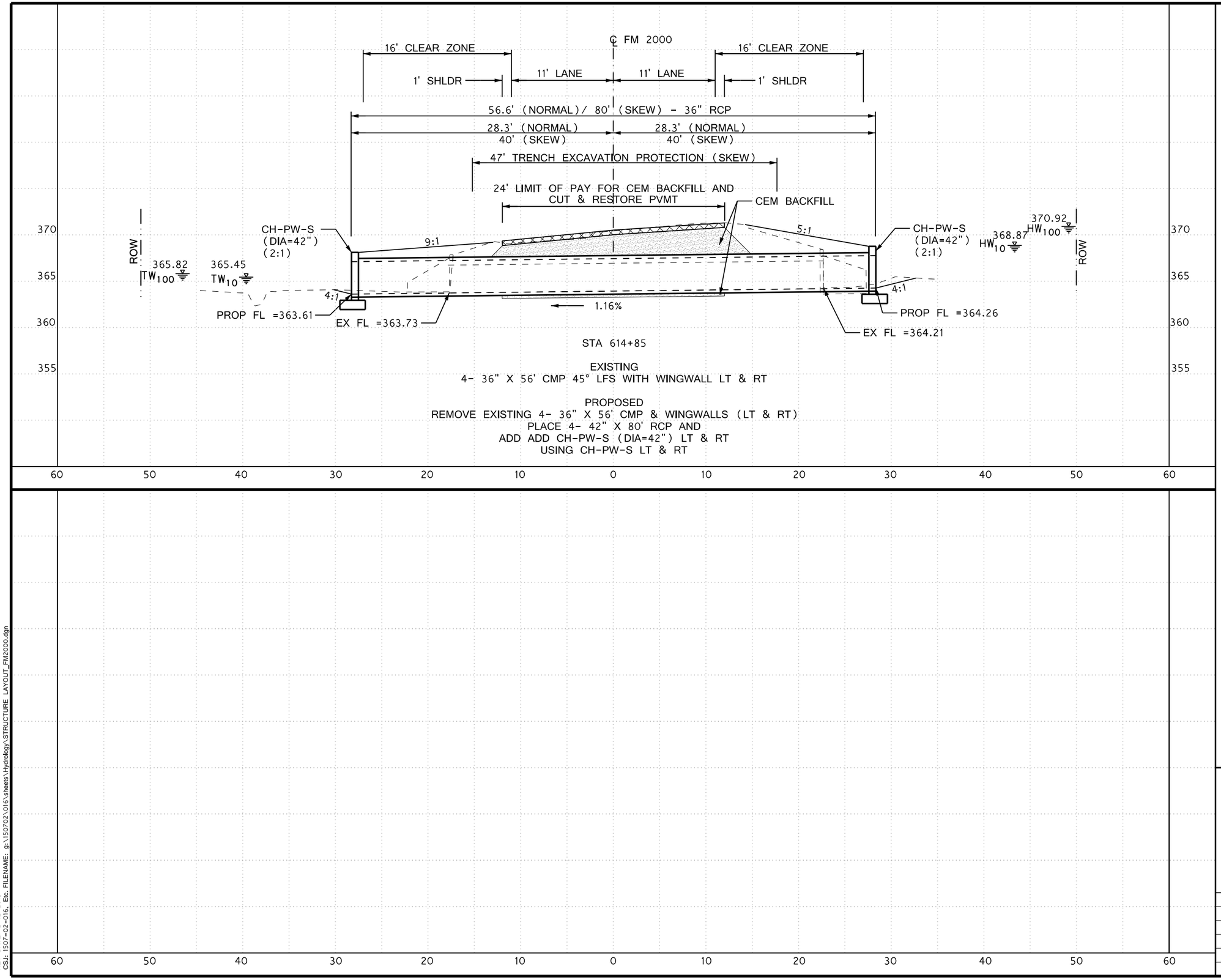
(FM 2000)

SHEET 21 OF 24 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 696, ETC.

STATE	DISTRICT	COUNTY	
TEXAS	BRYAN	BURLESON	
CONTROL	SECTION	JOB	SHEET NO.
1507	02	016, ETC.	107

REV DATE: 2-12-2015
CSJ: 1507-02-016, Etc. FILENAME: g:\150702\016\sheets\Hydrology\STRUCTURE LAYOUT_FM2000.dgn



GENERAL NOTES:

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STATE OF TEXAS
JEAN J. FENG
102035
LICENSED
PROFESSIONAL ENGINEER

12/21/2020

HORIZONTAL
0 5 10 20 FT
0 5 10 20 FT
VERTICAL

PRINT DATE	REVISION DATE
12/21/2020	

Texas Department of Transportation
Bryan District

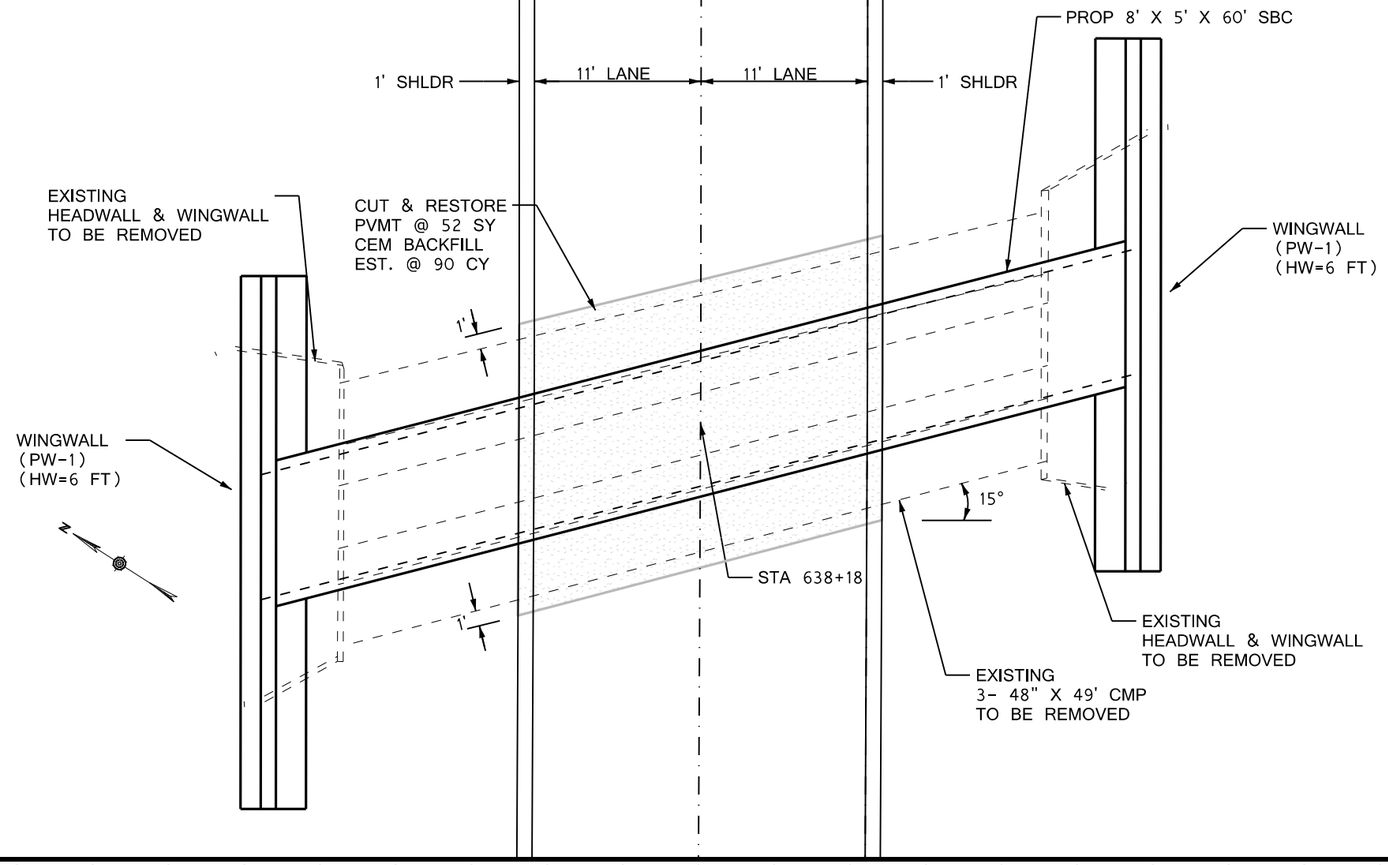
STRUCTURE LAYOUT (FM 2000)

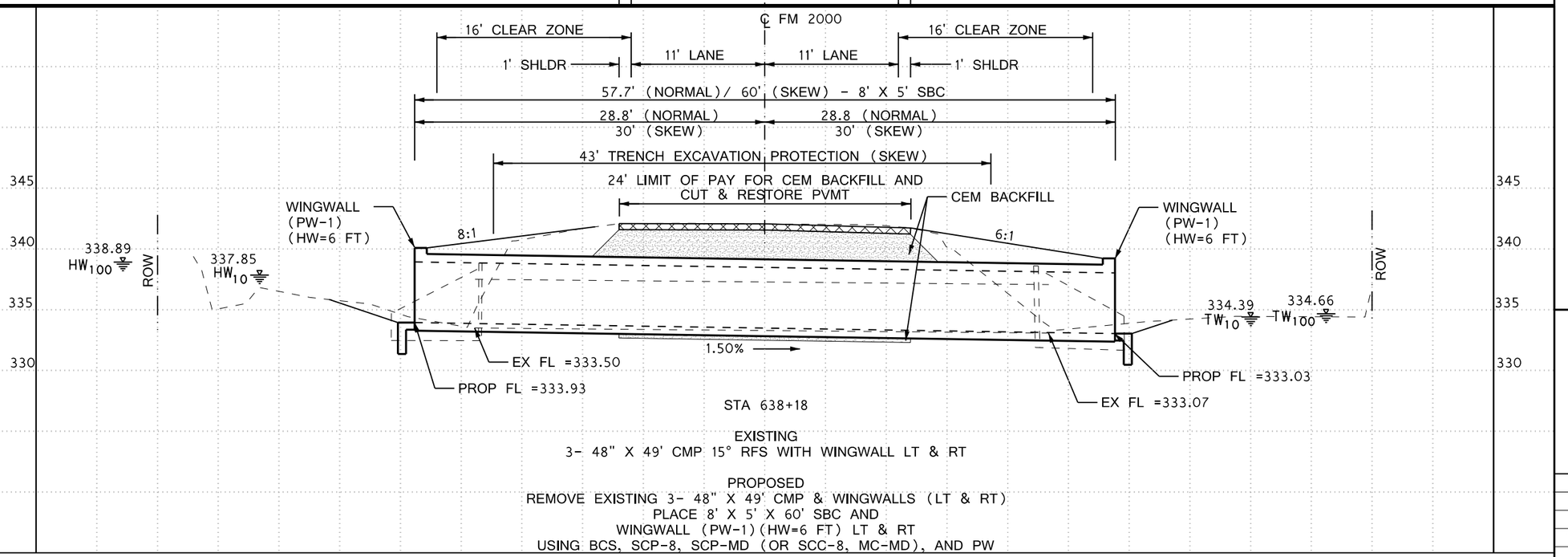
SHEET 22 OF 24 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 696, ETC.

STATE	DISTRICT	COUNTY	
TEXAS	BRYAN	BURLESON	
CONTROL	SECTION	JOB	SHEET NO.
1507	02	016, ETC.	108

REV DATE: 2-12-2015
CSJ: 1507-02-016, Etc. FILENAME: g:\150702\016\sheets\Hydrology\STRUCTURE LAYOUT_FM2000.dgn





STA 638+18

EXISTING
3- 48" X 49' CMP 15° RFS WITH WINGWALL LT & RT

PROPOSED
REMOVE EXISTING 3- 48" X 49' CMP & WINGWALLS (LT & RT)
PLACE 8' X 5' X 60' SBC AND
WINGWALL (PW-1)(HW=6 FT) LT & RT
USING BCS, SCP-8, SCP-MD (OR SCC-8, MC-MD), AND PW

GENERAL NOTES:

PROFILES ARE ALONG CENTERLINE OF STRUCTURE.

SEE "MISCELLANEOUS STRUCTURE DETAILS" FOR ADDITIONAL INFORMATION.

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STATE OF TEXAS
JEAN J. FENG
102035
LICENSED
PROFESSIONAL ENGINEER

12/21/2020

HORIZONTAL
0 5 10 20 FT
0 5 10 20 FT
VERTICAL

PRINT DATE	REVISION DATE
12/21/2020	

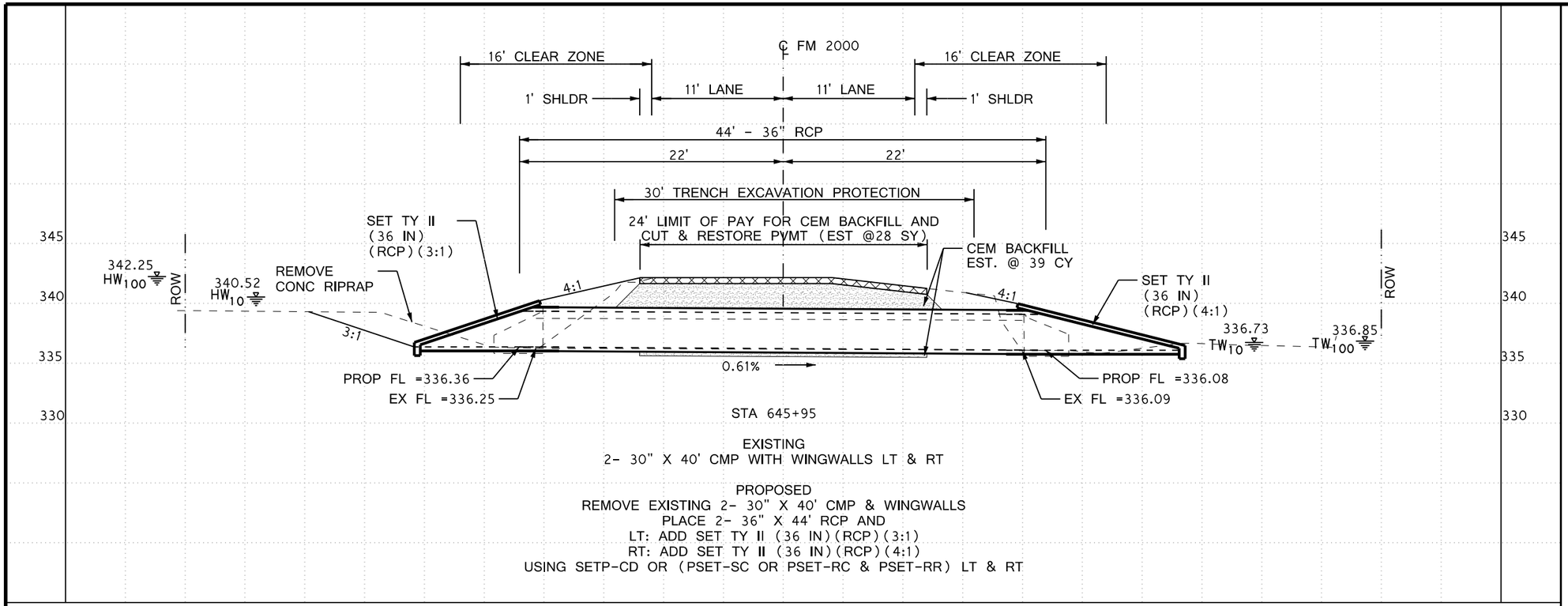
Texas Department of Transportation
Bryan District

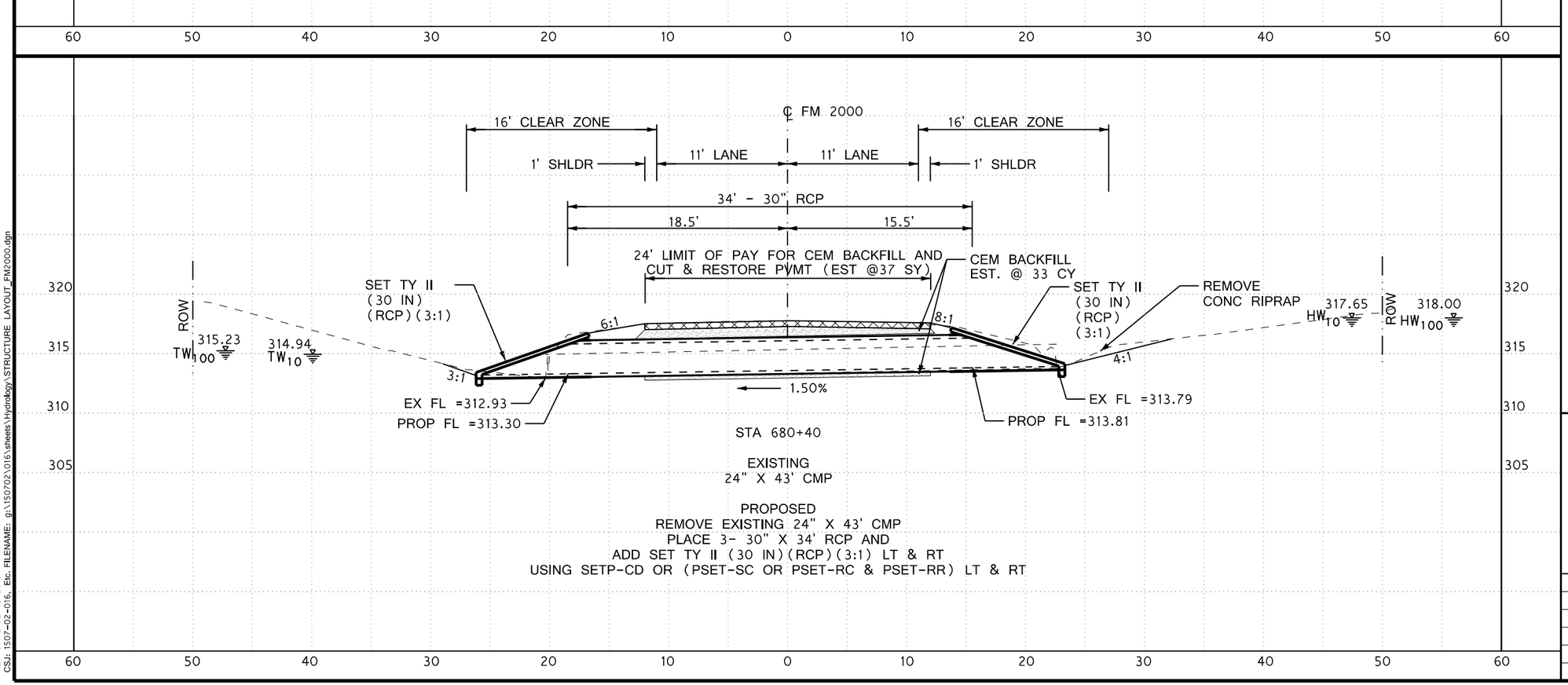
STRUCTURE LAYOUT (FM 2000)

SHEET 23 OF 24 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 696, ETC.
STATE	DISTRICT	COUNTY
TEXAS	BRYAN	BURLESON
CONTROL	SECTION	JOB / SHEET NO.
1507	02	016, ETC. / 109

REV DATE: 2-12-2015
CSJs: 1507-02-016, Etc. FILENAME: g:\150702\016\sheets\Hydrology\STRUCTURE LAYOUT_FM2000.dgn





GENERAL NOTES:

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STATE OF TEXAS
JEAN J. FENG
102035
LICENSED PROFESSIONAL ENGINEER

12/30/2020

HORIZONTAL
0 5 10 20 FT
0 5 10 20 FT
VERTICAL

PRINT DATE	REVISION DATE
12/30/2020	

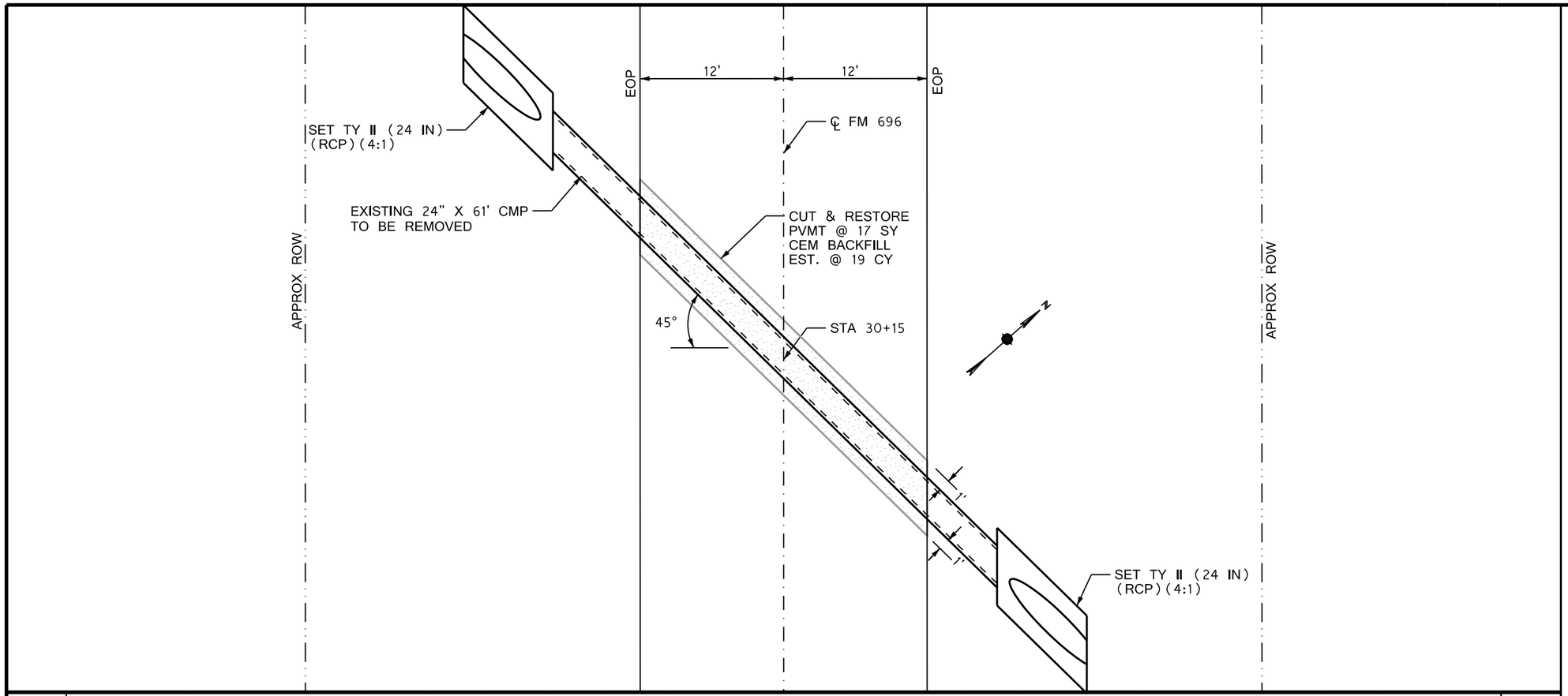
Texas Department of Transportation
Bryan District

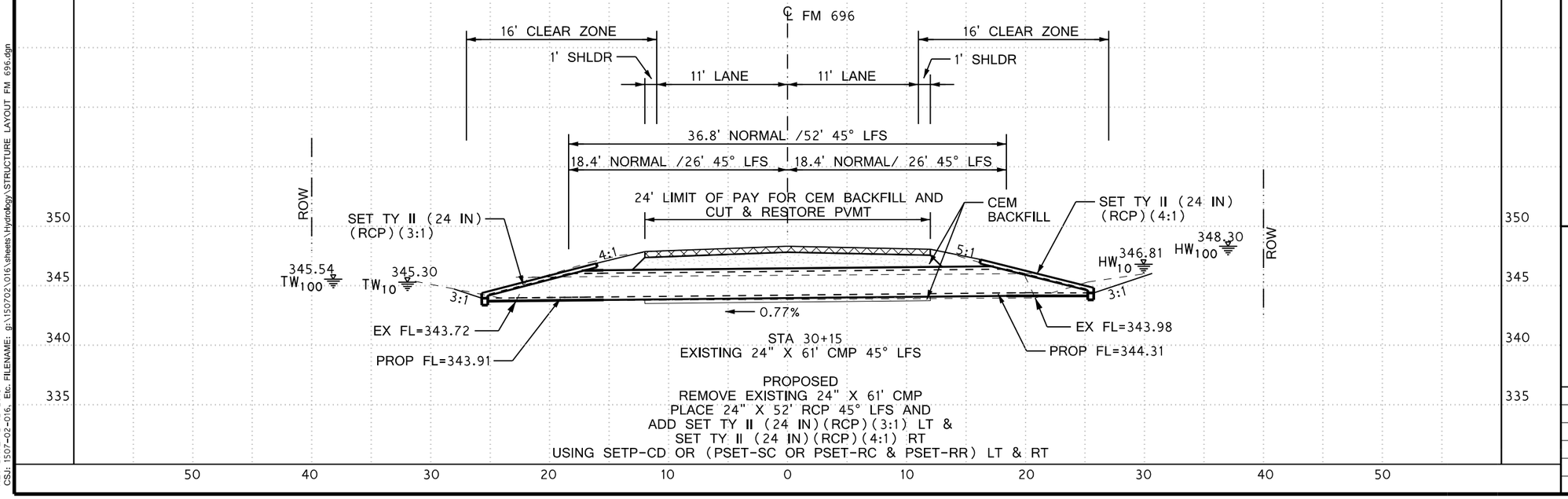
STRUCTURE LAYOUT (FM 2000)

SHEET 24 OF 24 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 696, ETC.
STATE	DISTRICT	COUNTY
TEXAS	BRYAN	BURLESON
CONTROL	SECTION	JOB / SHEET NO.
1507	02	016, ETC. / 110

REV DATE: 2-12-2015
CSJ: 1507-02-016, Etc. FILENAME: g:\150702\016\sheets\Hydrology\STRUCTURE LAYOUT_FM2000.dgn





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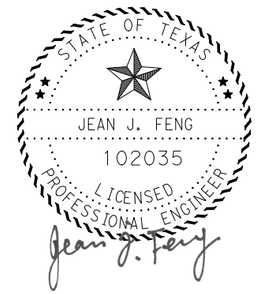


12/21/2020

HORIZONTAL
0 50 100 200 FT
0 5 10 20 FT
VERTICAL

PRINT DATE	REVISION DATE
12/21/2020	

Texas Department of Transportation
Bryan District

STRUCTURE LAYOUT (FM 696)

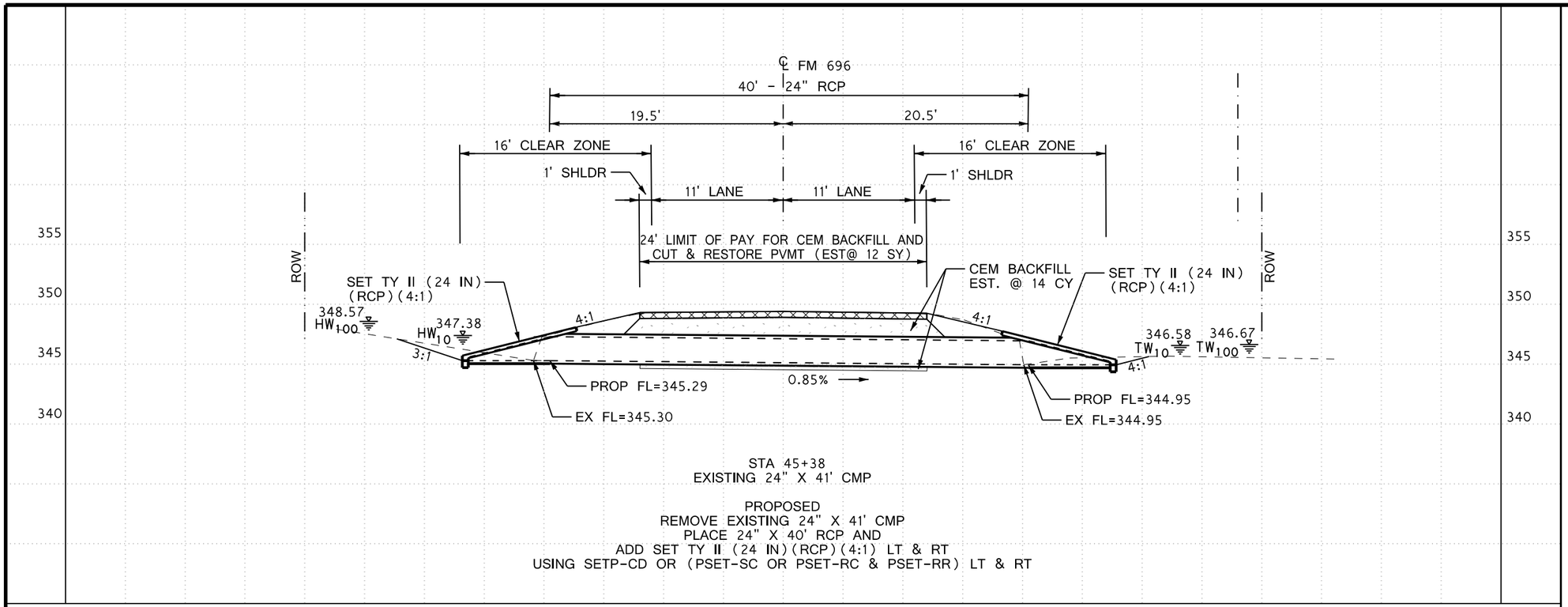
SHEET 1 OF 9 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 696, ETC.

STATE	DISTRICT	COUNTY
TEXAS	BRYAN	BURLESON

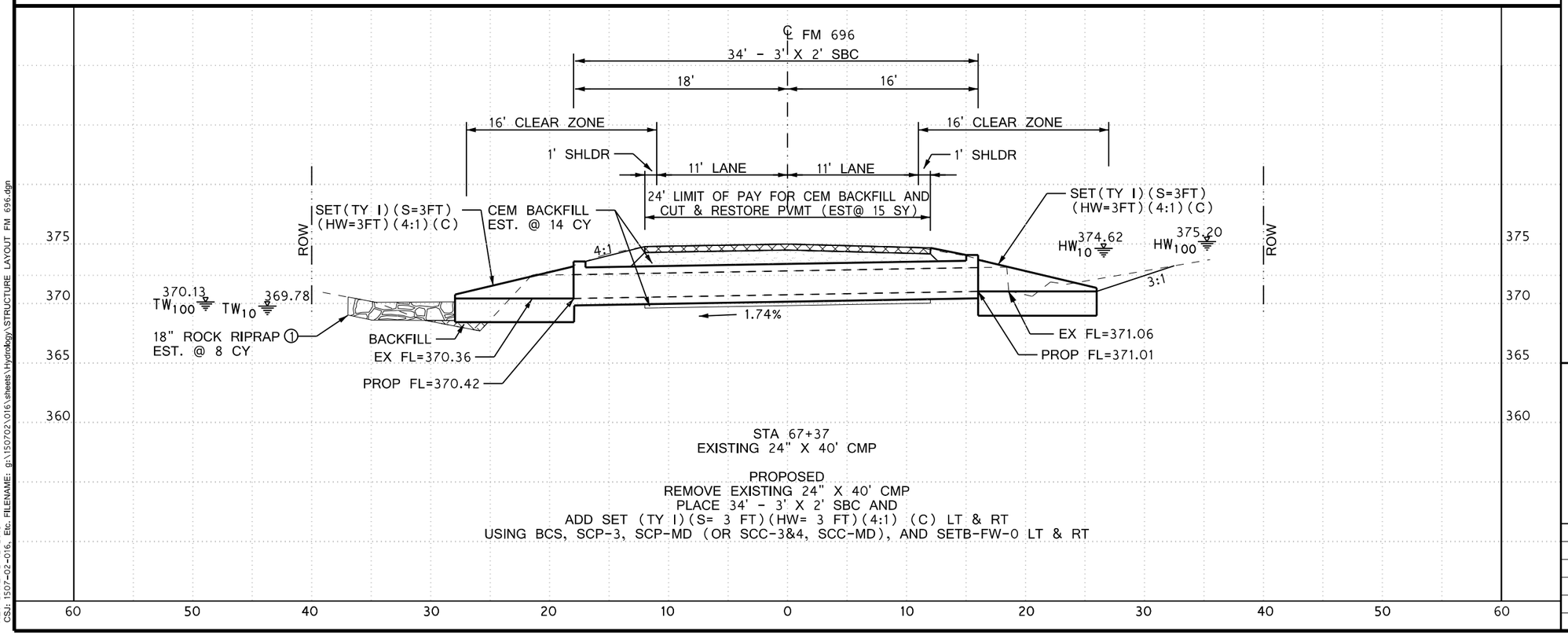
CONTROL	SECTION	JOB	SHEET NO.
1507	02	016, ETC.	111

REV DATE: 2-12-2015
CSJ: 1507-02-016, Etc. FILENAME: g:\150702\016\sheets\Hydrology\STRUCTURE LAYOUT FM 696.dgn



STA 45+38
EXISTING 24" X 41' CMP

PROPOSED
REMOVE EXISTING 24" X 41' CMP
PLACE 24" X 40' RCP AND
ADD SET TY II (24 IN)(RCP)(4:1) LT & RT
USING SETP-CD OR (PSET-SC OR PSET-RC & PSET-RR) LT & RT



STA 67+37
EXISTING 24" X 40' CMP

PROPOSED
REMOVE EXISTING 24" X 40' CMP
PLACE 34' - 3' X 2' SBC AND
ADD SET (TY I)(S= 3 FT)(HW= 3 FT)(4:1) (C) LT & RT
USING BCS, SCP-3, SCP-MD (OR SCC-3&4, SCC-MD), AND SETB-FW-0 LT & RT

GENERAL NOTES:

PROFILES ARE ALONG CENTERLINE OF STRUCTURE.

SEE "MISCELLANEOUS STRUCTURE DETAILS" FOR ADDITIONAL INFORMATION.

THE EXACT QUANTITY OF ROCK RIPRAP WILL BE DETERMINED IN THE FIELD BY THE ENGINEER. REDUCE THE DEPTH IF NECESSARY TO AVOID UTILITY CONFLICT.

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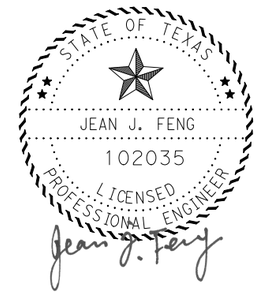


12/21/2020
HORIZONTAL
0 50 100 200 FT
0 5 10 20 FT
VERTICAL

PRINT DATE	REVISION DATE
12/21/2020	

Texas Department of Transportation
Bryan District

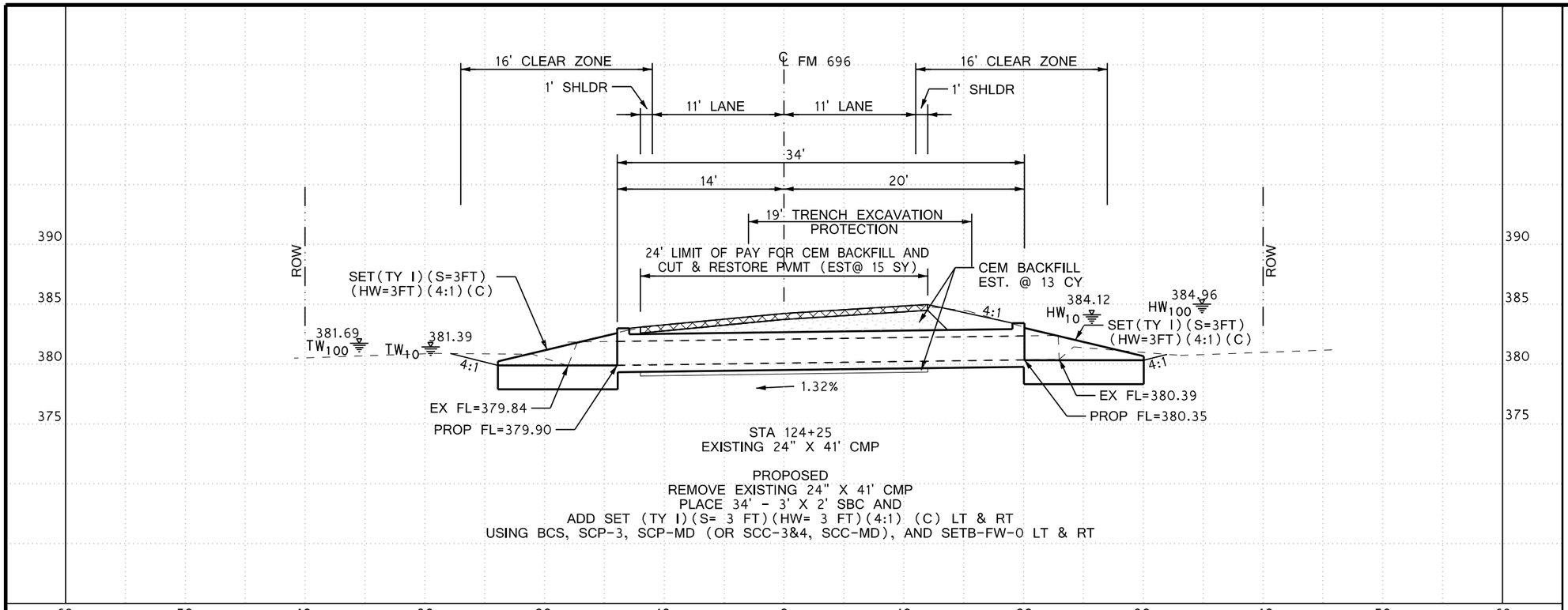
STRUCTURE LAYOUT (FM 696)

SHEET 2 OF 9 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 696, ETC.

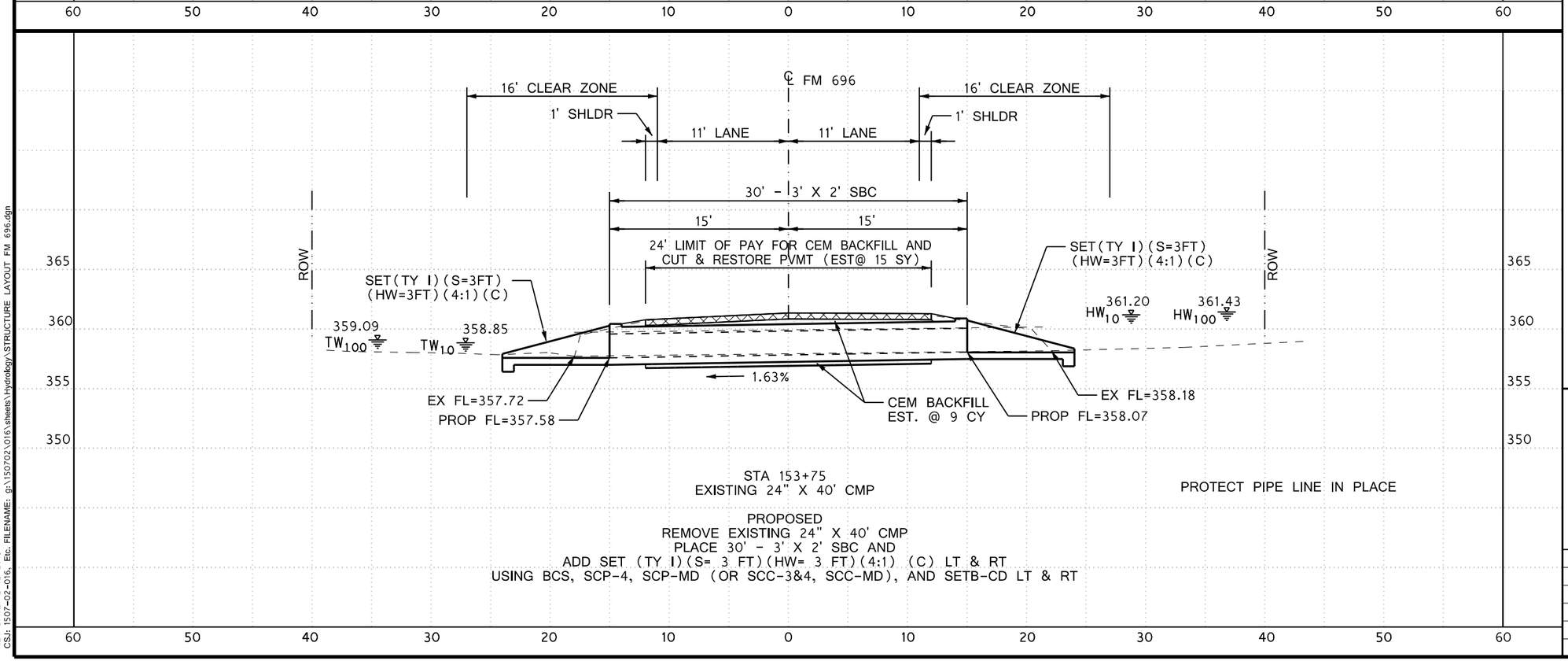
STATE	DISTRICT	COUNTY	
TEXAS	BRYAN	BURLESON	
CONTROL	SECTION	JOB	SHEET NO.
1507	02	016, ETC.	112

REV DATE: 2-12-2015
CSJ: 1507-02-016, Etc. FILENAME: g:\150702\016\sheets\Hydrology\STRUCTURE LAYOUT FM 696.dgn



STA 124+25
EXISTING 24" X 41' CMP

PROPOSED
REMOVE EXISTING 24" X 41' CMP
PLACE 34' - 3' X 2' SBC AND
ADD SET (TY I)(S= 3 FT)(HW= 3 FT)(4:1) (C) LT & RT
USING BCS, SCP-3, SCP-MD (OR SCC-3&4, SCC-MD), AND SETB-FW-0 LT & RT



STA 153+75
EXISTING 24" X 40' CMP

PROTECT PIPE LINE IN PLACE

PROPOSED
REMOVE EXISTING 24" X 40' CMP
PLACE 30' - 3' X 2' SBC AND
ADD SET (TY I)(S= 3 FT)(HW= 3 FT)(4:1) (C) LT & RT
USING BCS, SCP-4, SCP-MD (OR SCC-3&4, SCC-MD), AND SETB-CD LT & RT

GENERAL NOTES:

PROFILES ARE ALONG CENTERLINE OF STRUCTURE.

SEE "MISCELLANEOUS STRUCTURE DETAILS" FOR ADDITIONAL INFORMATION.

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WHERE UTILITY PRESENT, NO GRABING OF TREES OR BRUSHES, FLUSHING CUT ONLY UNLESS APPROVED BY THE ENGINEER.

STATE OF TEXAS
JEAN J. FENG
102035
LICENSED PROFESSIONAL ENGINEER

12/21/2020

HORIZONTAL
0 50 100 200 FT
0 5 10 20 FT
VERTICAL

PRINT DATE	REVISION DATE
12/21/2020	

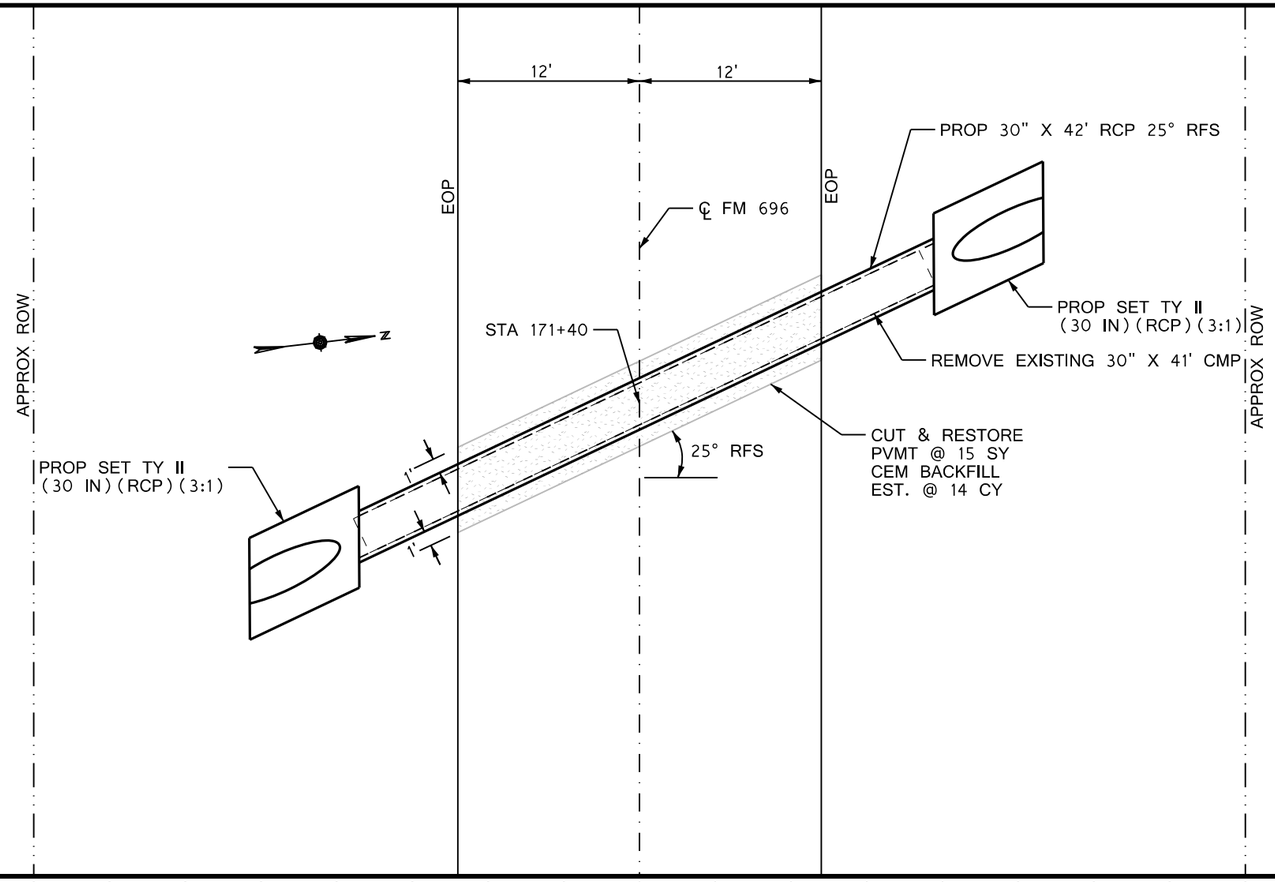
Texas Department of Transportation
Bryan District

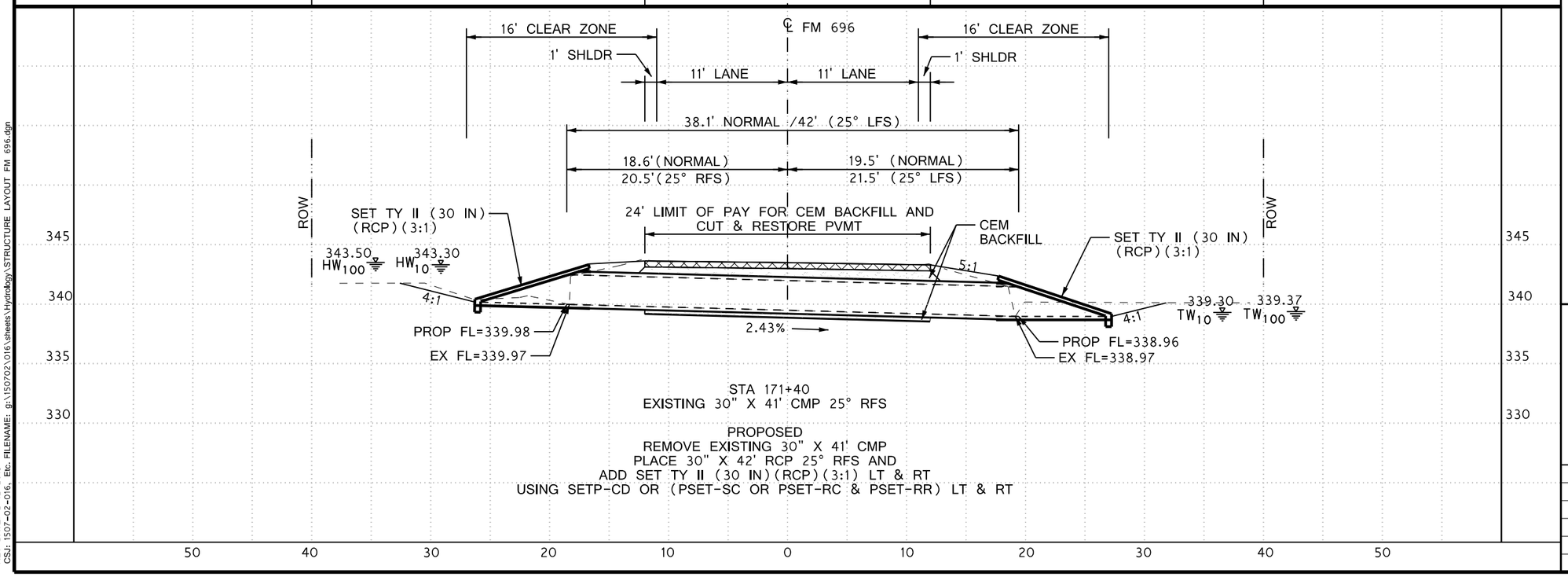
STRUCTURE LAYOUT (FM 696)

SHEET 3 OF 9 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 696, ETC.
STATE	DISTRICT	COUNTY
TEXAS	BRYAN	BURLESON
CONTROL	SECTION	JOB / SHEET NO.
1507	02	016, ETC. / 113

REV DATE: 2-12-2015
CSJ: 1507-02-016, Etc. FILENAME: g:\150702\016\sheets\Hydrology\STRUCTURE LAYOUT FM 696.dgn





STA 171+40
EXISTING 30" X 41' CMP 25° RFS

PROPOSED
REMOVE EXISTING 30" X 41' CMP
PLACE 30" X 42' RCP 25° RFS AND
ADD SET TY II (30 IN)(RCP)(3:1) LT & RT
USING SETP-CD OR (PSET-SC OR PSET-RC & PSET-RR) LT & RT

GENERAL NOTES:

PROFILES ARE ALONG CENTERLINE OF STRUCTURE.

SEE "MISCELLANEOUS STRUCTURE DETAILS" FOR ADDITIONAL INFORMATION.

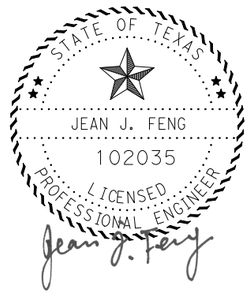
THE EXACT QUANTITY OF ROCK RIPRAP WILL BE DETERMINED IN THE FIELD BY THE ENGINEER. REDUCE THE DEPTH IF NECESSARY TO AVOID UTILITY CONFLICT.

PLACE FILTER FABRIC BELOW ALL ROCK RIPRAP PROTECTION.

DIMENSIONS OF PROPOSED CONC RIPRAP ARE TO BE DETERMINED IN THE FIELD BY THE ENGINEER.

WHERE TREE REMOVAL IS REQUIRED, THE PAYMENT IS CONSIDERED SUBSIDIARY TO ITEM 467.

WHERE UTILITY PRESENT, NO GRABING OF TREES OR BRUSHES, FLUSHING CUT ONLY UNLESS APPROVED BY THE ENGINEER.



12/21/2020

HORIZONTAL
0 50 100 200 FT
0 5 10 20 FT
VERTICAL

PRINT DATE	REVISION DATE
12/21/2020	

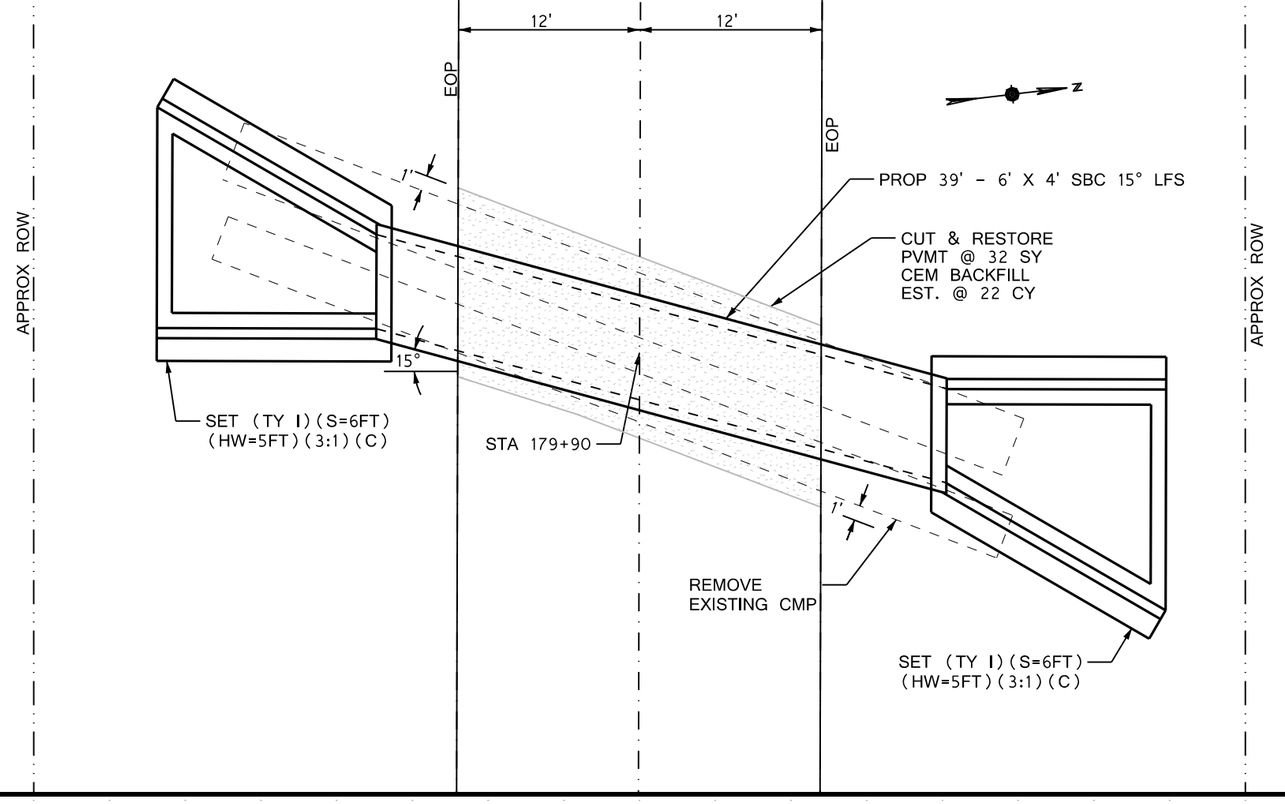
Texas Department of Transportation
Bryan District

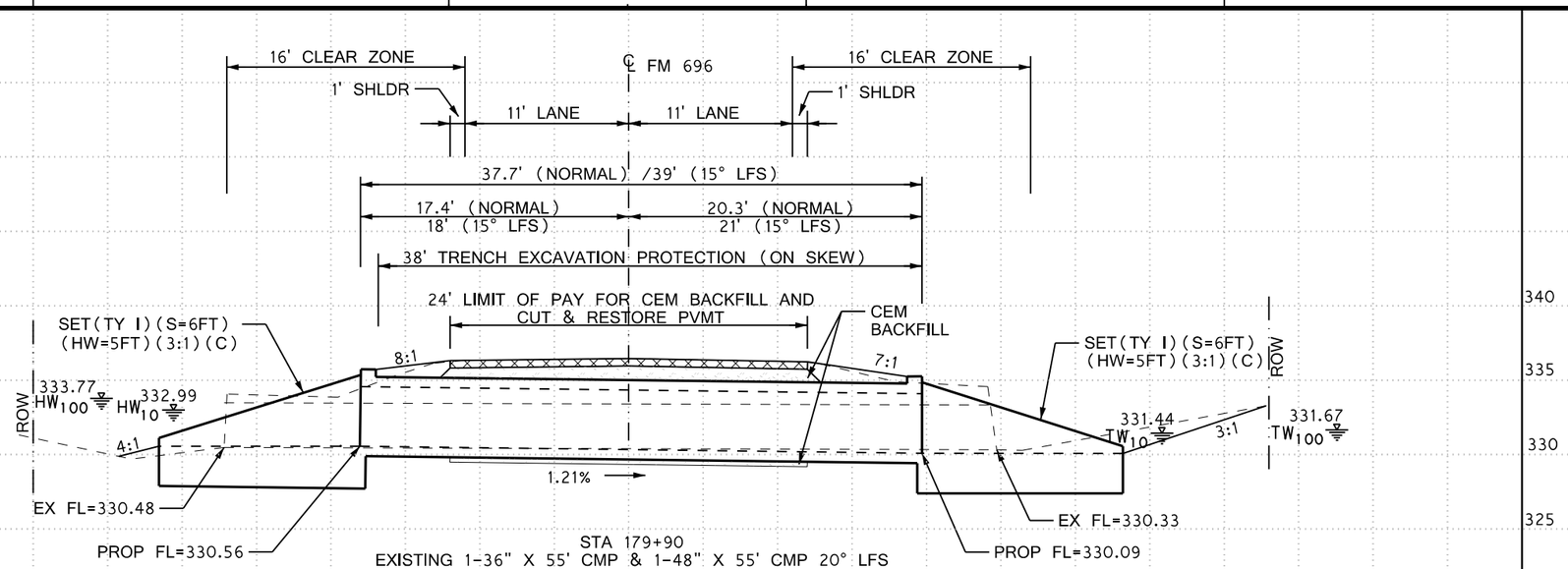
STRUCTURE LAYOUT (FM 696)

SHEET 4 OF 9 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 696, ETC.
STATE	DISTRICT	COUNTY
TEXAS	BRYAN	BURLESON
CONTROL	SECTION	JOB / SHEET NO.
1507	02	016, ETC. / 114

REV DATE: 2-12-2015
CSJ: 1507-02-016, Etc. FILENAME: g:\150702\016\sheets\Hydrology\STRUCTURE LAYOUT FM 696.dgn





STA 179+90
EXISTING 1-36" X 55' CMP & 1-48" X 55' CMP 20° LFS

PROPOSED
REMOVE EXISTING 1-36" X 55' CMP & 1-48" X 55' CMP
PLACE 39' - 6' X 4' SBC 15° LFS AND
ADD SET (TY I)(S= 6 FT)(HW= 5 FT)(3:1) (C) LT & RT
USING BCS, SCP-6, SCP-MD (OR SCC-5&6, MC-MD), AND SETB-FW-S LT & RT

GENERAL NOTES:

PROFILES ARE ALONG CENTERLINE OF STRUCTURE.

SEE "MISCELLANEOUS STRUCTURE DETAILS" FOR ADDITIONAL INFORMATION.

THE EXACT QUANTITY OF ROCK RIPRAP WILL BE DETERMINED IN THE FIELD BY THE ENGINEER. REDUCE THE DEPTH IF NECESSARY TO AVOID UTILITY CONFLICT.

PLACE FILTER FABRIC BELOW ALL ROCK RIPRAP PROTECTION.

DIMENSIONS OF PROPOSED CONC RIPRAP ARE TO BE DETERMINED IN THE FIELD BY THE ENGINEER.

WHERE TREE REMOVAL IS REQUIRED, THE PAYMENT IS CONSIDERED SUBSIDIARY TO ITEM 467.

WHERE UTILITY PRESENT, NO GRABING OF TREES OR BRUSHES, FLUSHING CUT ONLY UNLESS APPROVED BY THE ENGINEER.

STATE OF TEXAS
JEAN J. FENG
102035
LICENSED
PROFESSIONAL ENGINEER

12/21/2020

HORIZONTAL
0 50 100 200 FT
0 5 10 20 FT
VERTICAL

PRINT DATE	REVISION DATE
12/21/2020	

Texas Department of Transportation
Bryan District

STRUCTURE LAYOUT (FM 696)

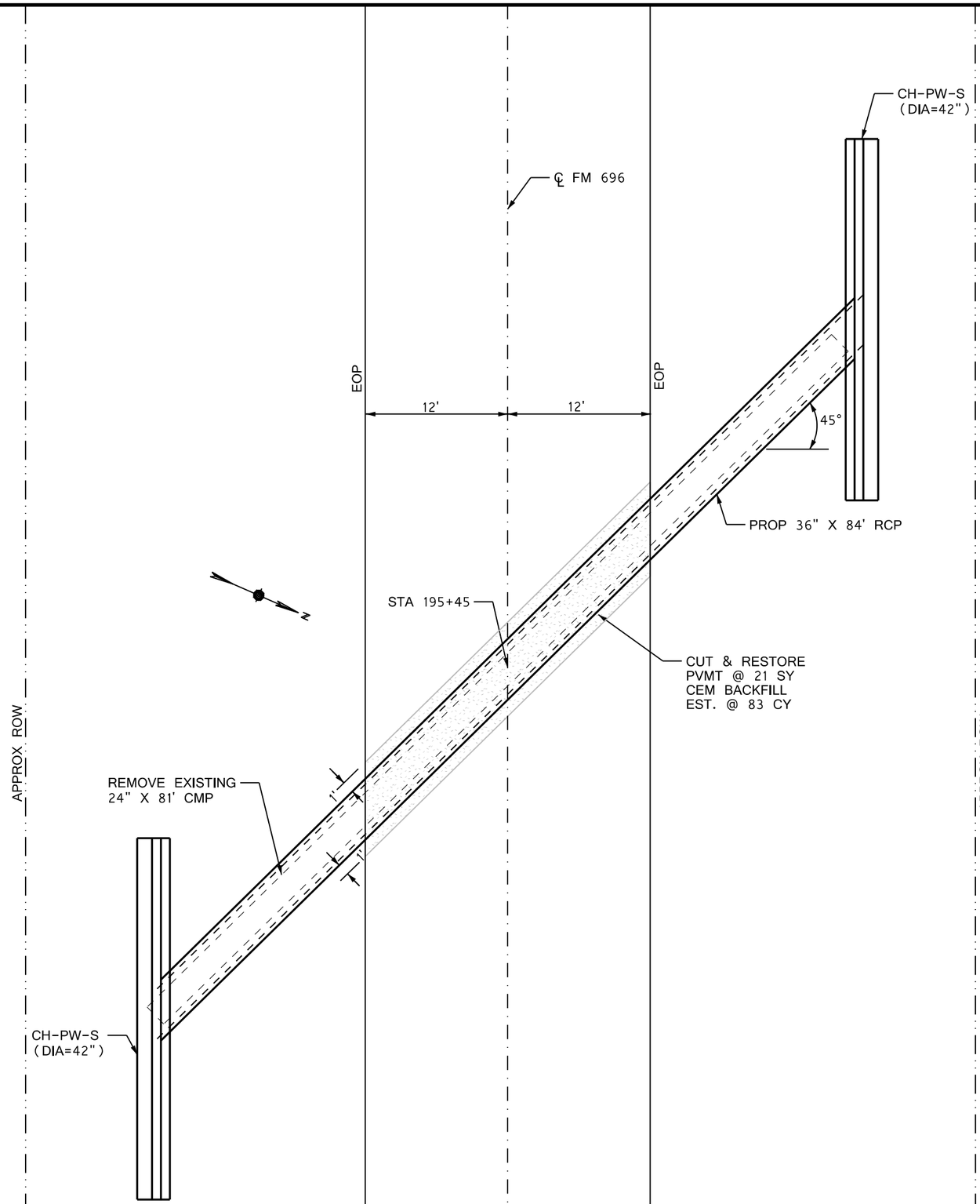
SHEET 5 OF 9 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 696, ETC.

STATE	DISTRICT	COUNTY
TEXAS	BRYAN	BURLESON

CONTROL	SECTION	JOB	SHEET NO.
1507	02	016, ETC.	115

REV DATE: 2-12-2015
CSJ: 1507-02-016, Etc. FILENAME: g:\150702\016\sheets\Hydrology\STRUCTURE LAYOUT FM 696.dgn



REV DATE: 2-12-2015
CSJ: 1507-02-016, Etc. FILENAME: g:\150702\016\sheets\Hydrology\STRUCTURE LAYOUT FM 696.dgn

STATE OF TEXAS
JEAN J. FENG
102035
LICENSED
PROFESSIONAL ENGINEER

12/21/2020

HORIZONTAL
0 50 100 200 FT

PRINT DATE	REVISION DATE
12/21/2020	

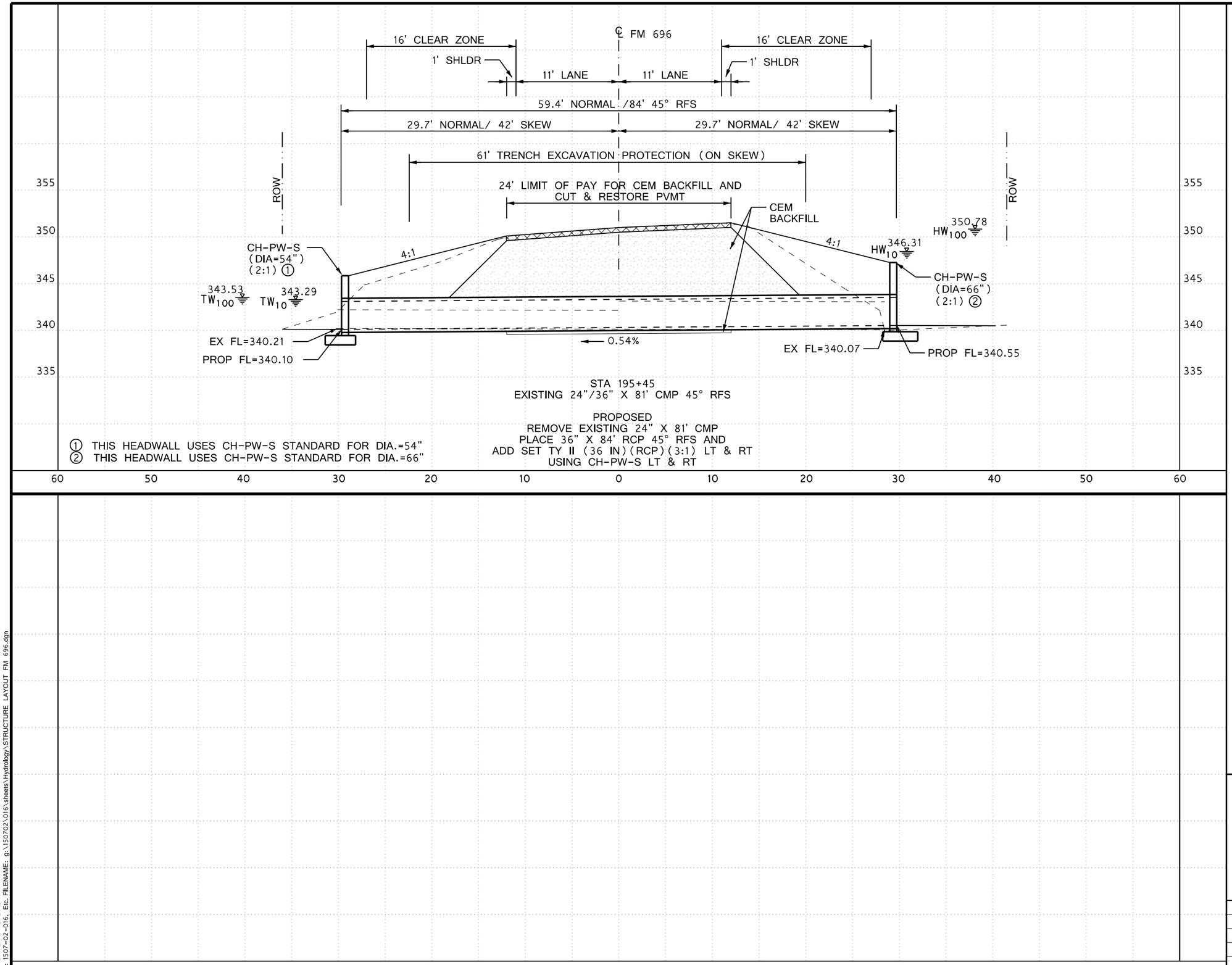
Texas Department of Transportation
Bryan District

STRUCTURE LAYOUT (FM 696)

SHEET 6 OF 9 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 696, ETC.

STATE	DISTRICT	COUNTY	
TEXAS	BRYAN	BURLESON	
CONTROL	SECTION	JOB	SHEET NO.
1507	02	016, ETC.	116



STA 195+45
EXISTING 24"/36" X 81' CMP 45° RFS

PROPOSED
REMOVE EXISTING 24" X 81' CMP
PLACE 36" X 84' RCP 45° RFS AND
ADD SET TY II (36 IN)(RCP)(3:1) LT & RT
USING CH-PW-S LT & RT

① THIS HEADWALL USES CH-PW-S STANDARD FOR DIA.=54"
② THIS HEADWALL USES CH-PW-S STANDARD FOR DIA.=66"

GENERAL NOTES:

PROFILES ARE ALONG CENTERLINE OF STRUCTURE.

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STATE OF TEXAS
JEAN J. FENG
102035
LICENSED
PROFESSIONAL ENGINEER

12/21/2020

HORIZONTAL
0 50 100 200 FT
0 5 10 20 FT
VERTICAL

PRINT DATE	REVISION DATE
12/21/2020	

Texas Department of Transportation
Bryan District

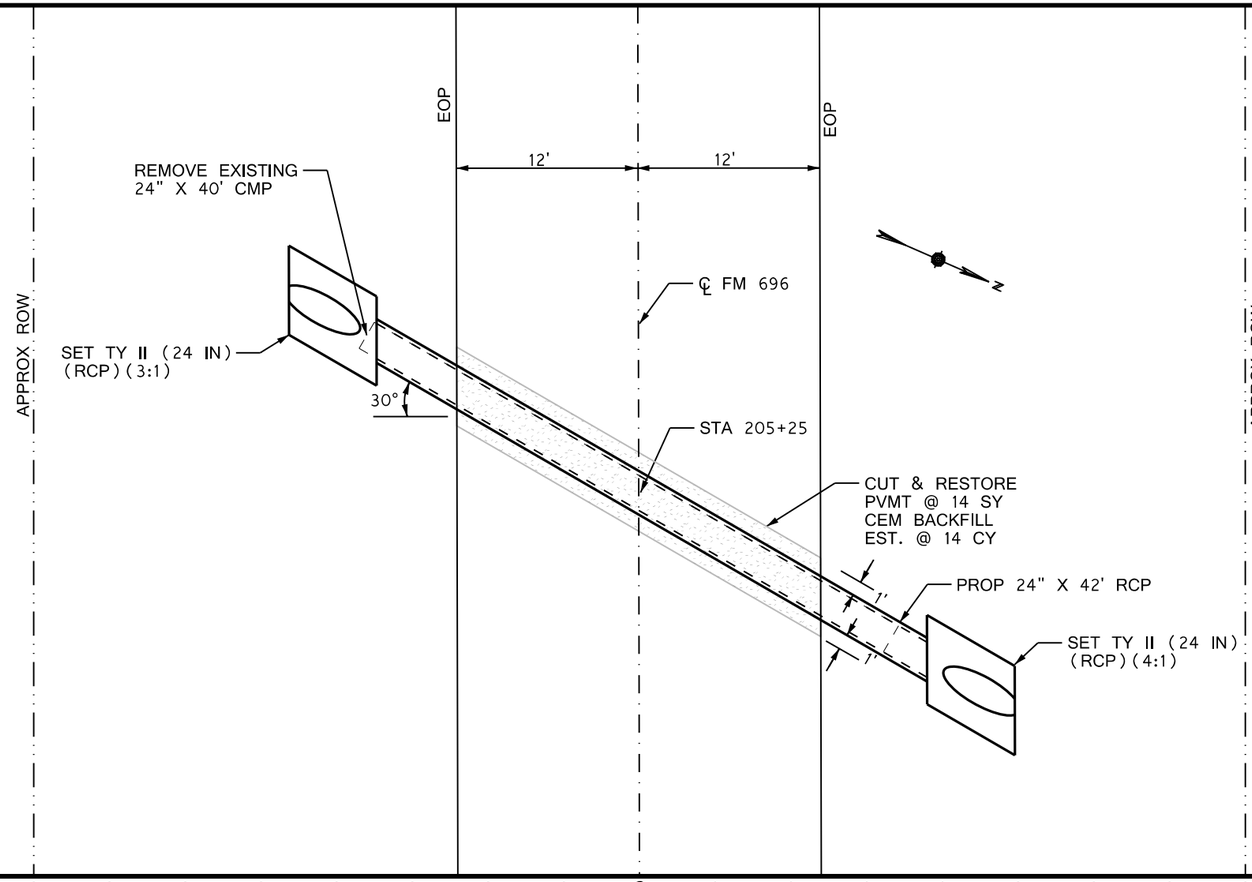
STRUCTURE LAYOUT (FM 696)

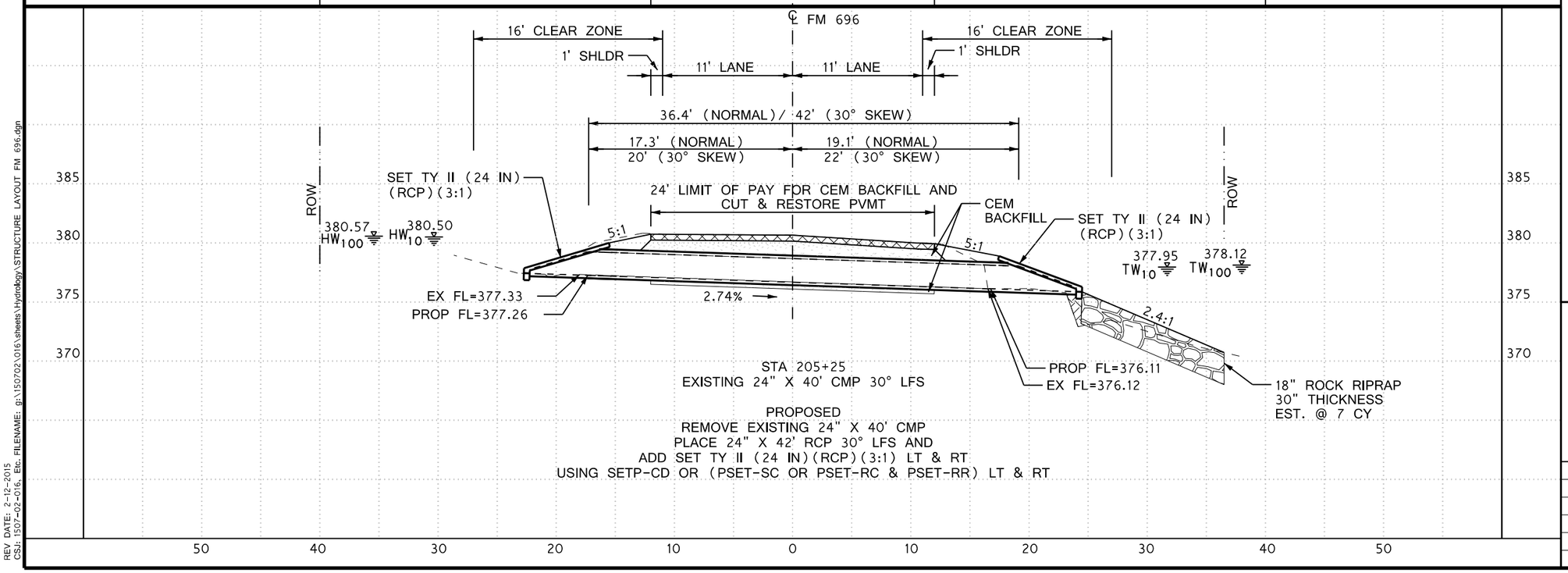
SHEET 7 OF 9 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 696, ETC.

STATE	DISTRICT	COUNTY	
TEXAS	BRYAN	BURLESON	
CONTROL	SECTION	JOB	SHEET NO.
1507	02	016, ETC.	117

REV DATE: 2-12-2015
CSJ: 1507-02-016, Etc. FILENAME: g:\150702\016\sheets\Hydrology\STRUCTURE LAYOUT FM 696.dgn





STA 205+25
EXISTING 24" X 40' CMP 30° LFS

PROPOSED
REMOVE EXISTING 24" X 40' CMP
PLACE 24" X 42' RCP 30° LFS AND
ADD SET TY II (24 IN)(RCP)(3:1) LT & RT
USING SETP-CD OR (PSET-SC OR PSET-RC & PSET-RR) LT & RT

REV DATE: 2-12-2015
CSJ: 1507-02-016, Etc. FILENAME: g:\150702\016\sheets\Hydrology\STRUCTURE LAYOUT FM 696.dgn

GENERAL NOTES:

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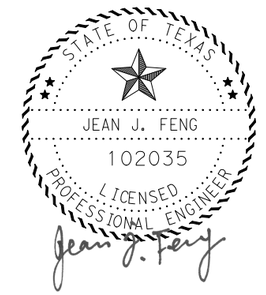


12/21/2020

HORIZONTAL
0 50 100 200 FT
0 5 10 20 FT
VERTICAL

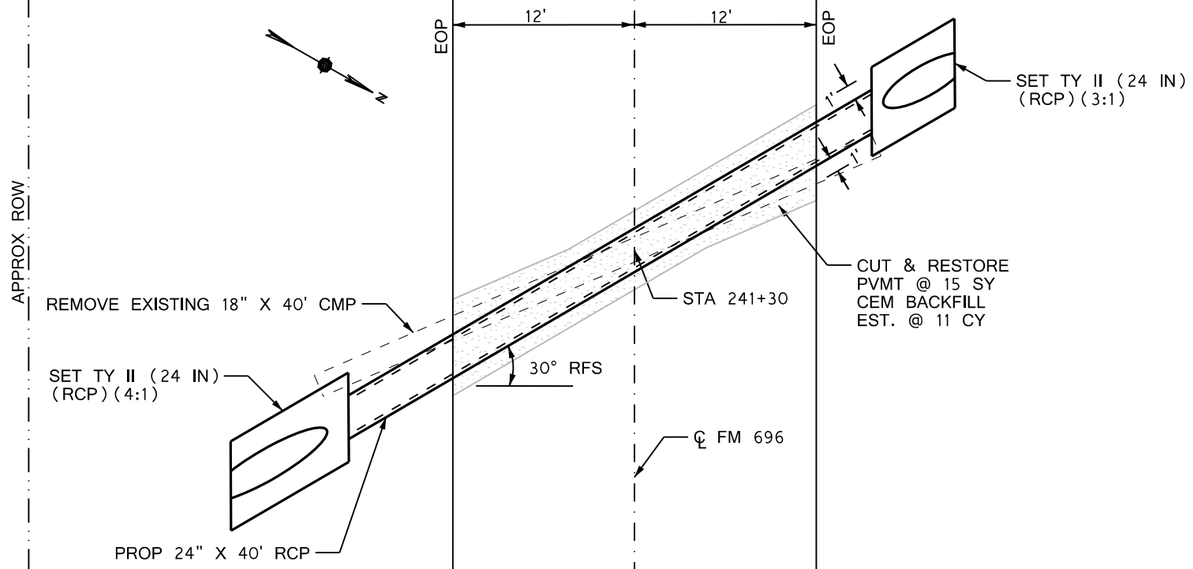
PRINT DATE	REVISION DATE
12/21/2020	

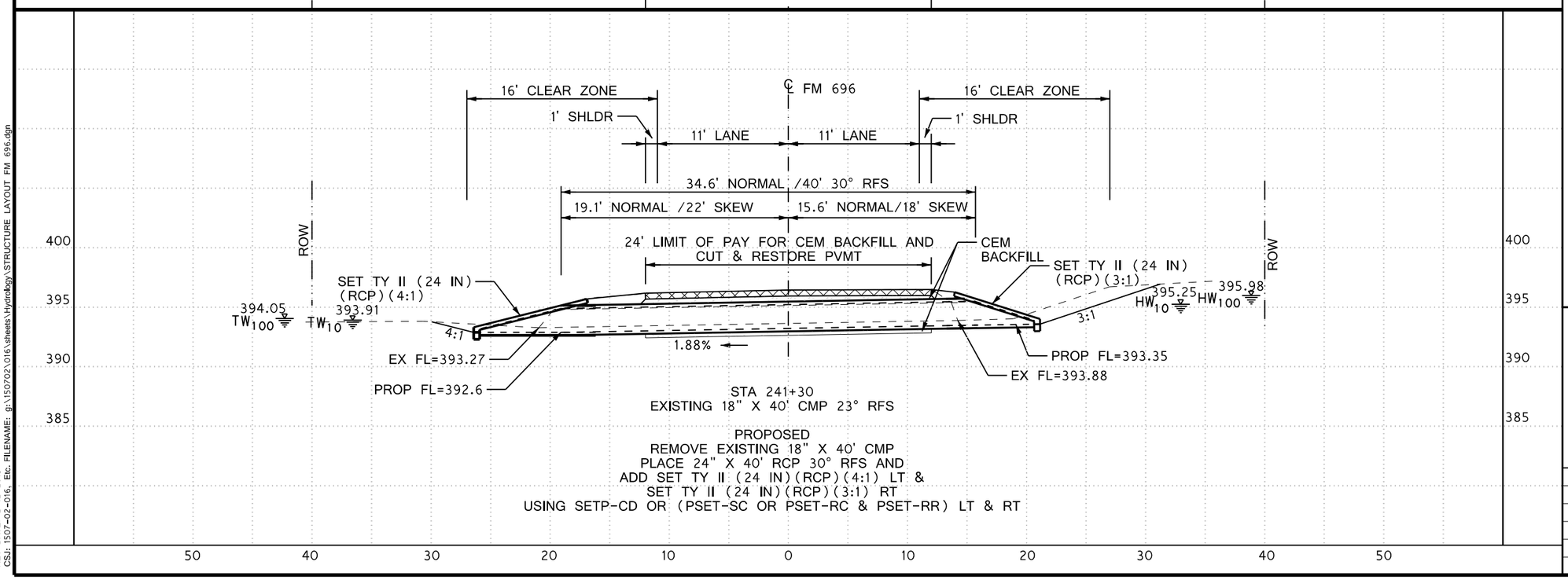
Texas Department of Transportation
Bryan District

STRUCTURE LAYOUT (FM 696)

SHEET 8 OF 9 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 696, ETC.
STATE	DISTRICT	COUNTY
TEXAS	BRYAN	BURLESON
CONTROL	SECTION	JOB / SHEET NO.
1507	02	016, ETC. / 118





GENERAL NOTES:

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STATE OF TEXAS
JEAN J. FENG
102035
LICENSED
PROFESSIONAL ENGINEER

12/21/2020

HORIZONTAL
0 50 100 200 FT
0 5 10 20 FT
VERTICAL

PRINT DATE	REVISION DATE
12/21/2020	

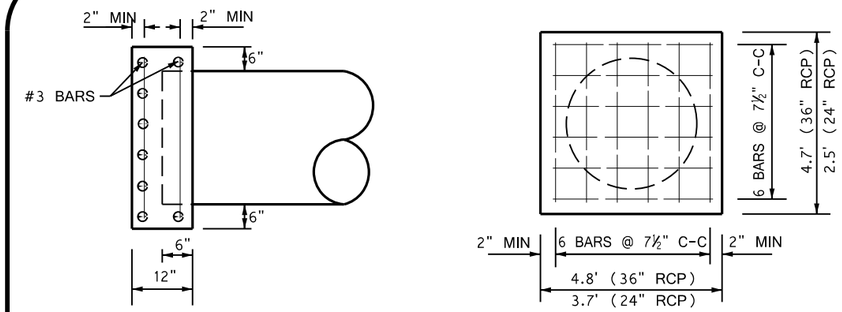
Texas Department of Transportation
Bryan District

STRUCTURE LAYOUT (FM 696)

SHEET 9 OF 9 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 696, ETC.
STATE	DISTRICT	COUNTY
TEXAS	BRYAN	BURLESON
CONTROL	SECTION	JOB / SHEET NO.
1507	02	016, ETC. / 119

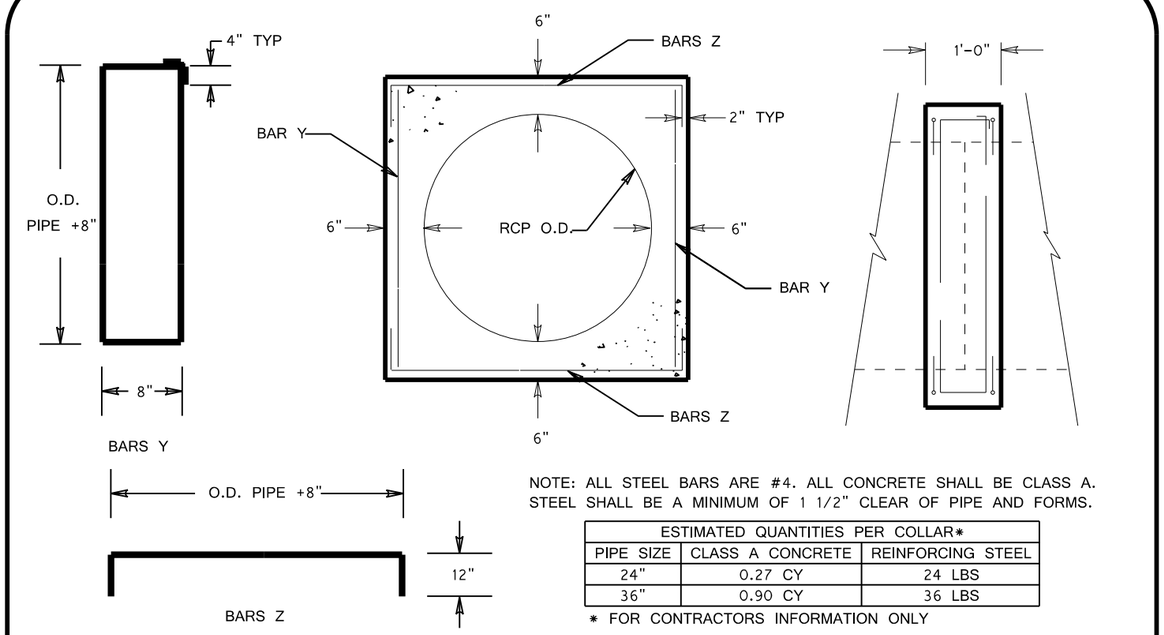
REV DATE: 2-12-2015
CSJ: 1507-02-016, Etc. FILENAME: g:\150702\016\sheets\Hydrology\STRUCTURE LAYOUT FM 696.dgn



ELEVATION SECTION

NOTE: ALL CONC. SHALL BE CL. "A". STEEL SHALL BE BENT IN THE FIELD OR CUT OFF AS NECESSARY TO CLEAR PIPE A MIN. 1½"

PIPE PLUG DETAIL

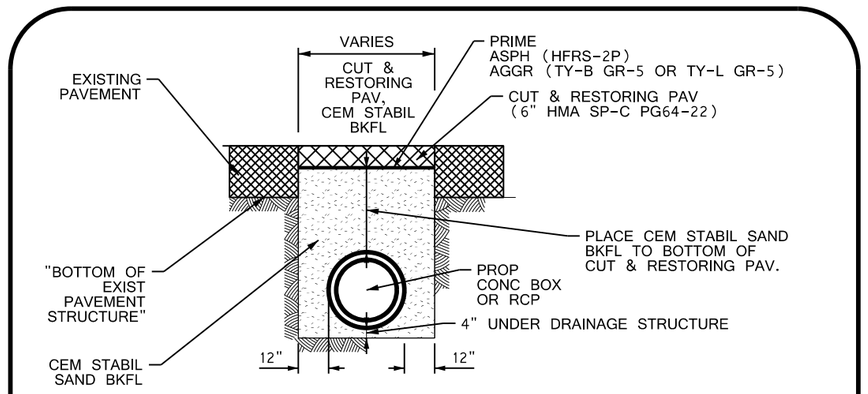


NOTE: ALL STEEL BARS ARE #4. ALL CONCRETE SHALL BE CLASS A. STEEL SHALL BE A MINIMUM OF 1 1/2" CLEAR OF PIPE AND FORMS.

ESTIMATED QUANTITIES PER COLLAR*		
PIPE SIZE	CLASS A CONCRETE	REINFORCING STEEL
24"	0.27 CY	24 LBS
36"	0.90 CY	36 LBS

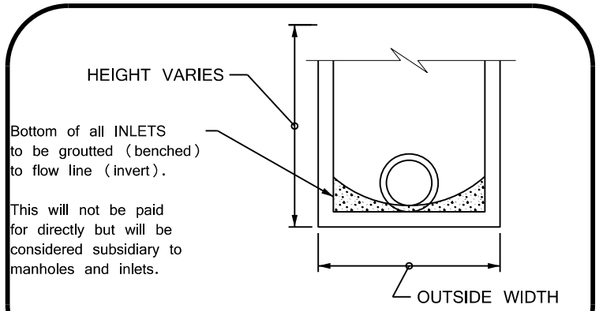
* FOR CONTRACTORS INFORMATION ONLY

PIPE COLLAR DETAIL



CUT & RESTORING PAVEMENT BACKFILL DETAIL

ROADWAYS



GROUT DETAIL

12/18/2020

Drawings Not To Scale

PRINT DATE	REVISION DATE
12/18/2020	

Texas Department of Transportation
Bryan District

MISCELLANEOUS DETAILS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 696, ETC.

STATE	DISTRICT	COUNTY	
TEXAS	BRYAN	BURLESON	
CONTROL	SECTION	JOB	SHEET NO.
1507	02	016, ETC.	120

REV DATE: 2-12-2015
CSJ: 1507-02-016, Etc. FILENAME: g:\150702\016\sheets\Hydrology\MISCELLANEOUS DETAILS.dgn

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" (2) Conc (Curb) (CY)	Class "C" (3) Conc (Wingwall) (CY)	Total Wingwall Area (SF)
STA 29+15 (FM 2000) (Both)	2 ~ 8'x 4'	2'	MC-8-13	PW-1	0°	2:1	8"	7"	0.500'	5.167'	N/A	N/A	10.333'	17.750'	N/A	0.0	0.6	16.4	214
STA 29+15 (FM 2000) (Both)	2 ~ 8'x 4'	2'	SCP-8	PW-1	0°	2:1	8"	8"	0.500'	5.167'	N/A	N/A	10.333'	19.167'	N/A	0.0	0.8	16.6	214
STA 364+04 (FM 2000) (Both)	2 ~ 5'x 7'	5'	Non-Stndrd	PW-1	0°	2:1	7"	7"	1.000'	8.583'	N/A	N/A	17.167'	11.750'	N/A	0.0	0.8	41.6	590
STA 364+04 (FM 2000) (Both)	2 ~ 5'x 7'	5'	Non-Stndrd	PW-1	0°	2:1	7"	7"	1.000'	8.583'	N/A	N/A	17.167'	12.833'	N/A	0.0	1.0	41.8	590
STA 377+62 (FM 2000) (Both)	1 ~ 5'x 3'	2'	SCC-5&6	PW-1	45°	2:1	7"	7"	0.500'	4.083'	N/A	N/A	11.549'	8.721'	N/A	0.0	0.4	14.4	188
STA 377+62 (FM 2000) (Both)	1 ~ 5'x 3'	2'	SCP-5	PW-1	45°	2:1	6"	6"	0.500'	4.000'	N/A	N/A	11.314'	8.485'	N/A	0.0	0.4	13.2	182
STA 421+82 (FM 2000) (Both)	1 ~ 6'x 3'	1'	SCC-5&6	SETB-FW-0	0°	4:1	7"	7"	0.500'	3.833'	14.000'	8.083'	16.166'	N/A	22.166'	4.8	0.2	12.2	N/A
STA 421+82 (FM 2000) (Both)	1 ~ 6'x 3'	1'	SCP-6	SETB-FW-0	0°	4:1	8"	7"	0.500'	3.917'	14.333'	8.275'	16.551'	N/A	22.551'	5.0	0.2	12.6	N/A
STA 432+39 (FM 2000) (Both)	1 ~ 6'x 3'	1'	SCC-5&6	SETB-FW-0	0°	4:1	7"	7"	0.500'	3.833'	14.000'	8.083'	16.166'	N/A	22.166'	4.8	0.2	12.2	N/A
STA 432+39 (FM 2000) (Both)	1 ~ 6'x 3'	1'	SCP-6	SETB-FW-0	0°	4:1	8"	7"	0.500'	3.917'	14.333'	8.275'	16.551'	N/A	22.551'	5.0	0.2	12.6	N/A
STA 638+18 (FM 2000) (Both)	1 ~ 8'x 5'	3'	SCC-8	PW-1	15°	2:1	7"	7"	0.500'	6.083'	N/A	N/A	12.596'	9.490'	N/A	0.0	0.4	20.8	306
STA 638+18 (FM 2000) (Both)	1 ~ 8'x 5'	3'	SCP-8	PW-1	15°	2:1	8"	8"	0.500'	6.167'	N/A	N/A	12.768'	9.663'	N/A	0.0	0.4	21.2	314
STA 67+37 (FM 696) (Both)	1 ~ 3'x 2'	2'	SCC-3&4	SETB-FW-0	0°	4:1	7"	7"	0.500'	2.833'	10.000'	5.774'	11.547'	N/A	14.547'	1.8	0.2	8.0	N/A
STA 67+37 (FM 696) (Both)	1 ~ 3'x 2'	2'	SCP-3	SETB-FW-0	0°	4:1	4"	4"	0.500'	2.583'	9.000'	5.196'	10.392'	N/A	13.392'	1.4	0.2	7.2	N/A
STA 124+25 (FM 696) (Both)	1 ~ 3'x 2'	2'	SCC-3&4	SETB-FW-0	0°	4:1	7"	7"	0.500'	2.833'	10.000'	5.774'	11.547'	N/A	14.547'	1.8	0.2	8.0	N/A
STA 124+25 (FM 696) (Both)	1 ~ 3'x 2'	2'	SCP-3	SETB-FW-0	0°	4:1	4"	4"	0.500'	2.583'	9.000'	5.196'	10.392'	N/A	13.392'	1.4	0.2	7.2	N/A
STA 153+75 (FM 696) (Both)	1 ~ 3'x 2'	2'	SCC-3&4	SETB-CD	0°	4:1	7"	7"	0.250'	2.583'	N/A	N/A	9.000'	N/A	4.167'	0.0	0.0	3.0	N/A
STA 153+75 (FM 696) (Both)	1 ~ 3'x 2'	2'	SCP-3	SETB-CD	0°	4:1	4"	4"	0.250'	2.333'	N/A	N/A	8.000'	N/A	4.167'	0.0	0.0	2.6	N/A
STA 179+90 (FM 696) (Both)	1 ~ 6'x 4'	2'	SCC-5&6	SETB-FW-S	15°	3:1	7"	7"	0.500'	4.833'	13.500'	7.794'	15.588'	N/A	14.006'	3.0	0.2	11.8	N/A
STA 179+90 (FM 696) (Both)	1 ~ 6'x 4'	2'	SCP-6	SETB-FW-S	15°	3:1	7"	7"	0.500'	4.833'	13.500'	7.794'	15.588'	N/A	14.006'	3.0	0.2	11.8	N/A

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.

SPECIAL NOTE:

This sheet is a supplement to the box culvert standards. It is to be filled out by the culvert specifier and provides dimensions for the construction of the box culvert wingwalls and safety end treatments.

An Excel 2010 spreadsheet to assist in completing this table can be downloaded from the Bridge Standards (English) web page on the TxDOT web site. The completed sheet must be signed, sealed, and dated by a licensed Professional Engineer.

STATE OF TEXAS
JEAN J. FENG
102035
LICENSED PROFESSIONAL ENGINEER
12/18/2020

Texas Department of Transportation

Bridge Division Standard

BOX CULVERT SUPPLEMENT
WINGS AND END TREATMENTS

BCS

FILE: bcsstde1-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	DIST	COUNTY		SHEET NO.
				121

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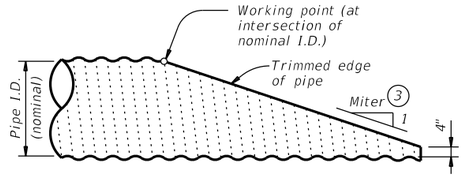
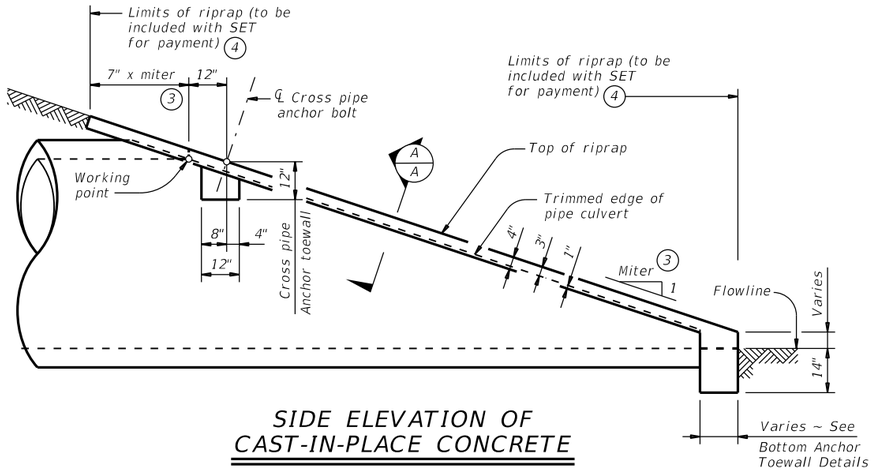


NOTE: All pipe runners, calculations, and dimensions are based on the pipe culverts mitered as shown in this detail. Alternate styles of mitered ends will require that appropriate adjustments be made to the values presented on this standard.

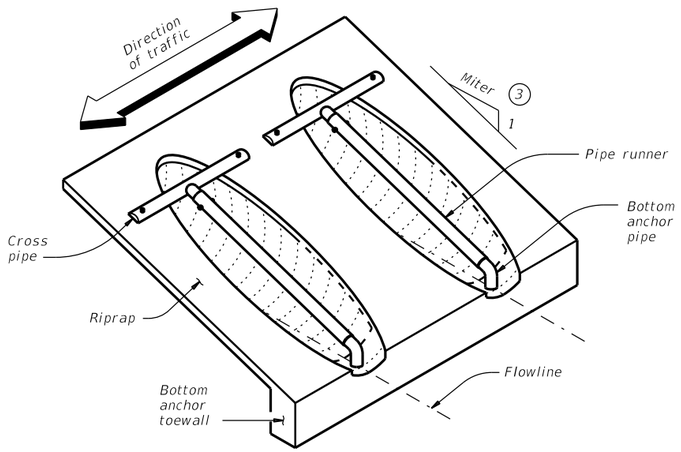
SIDE ELEVATION OF TYPICAL PIPE CULVERT MITER

(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.

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SHEET 1 OF 2

Texas Department of Transportation

Bridge Division Standard

SAFETY END TREATMENT

FOR 12" DIA TO 60" DIA
PIPE CULVERTS
TYPE II ~ CROSS DRAINAGE

SETP-CD

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©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
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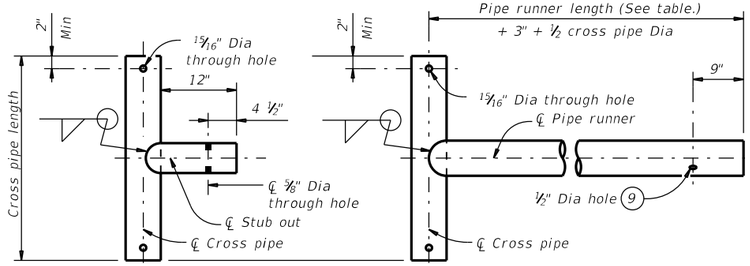
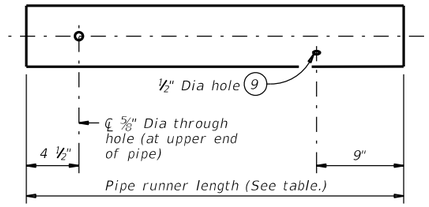


OPTION A1 OPTION A2

CROSS PIPE AND CONNECTIONS DETAILS

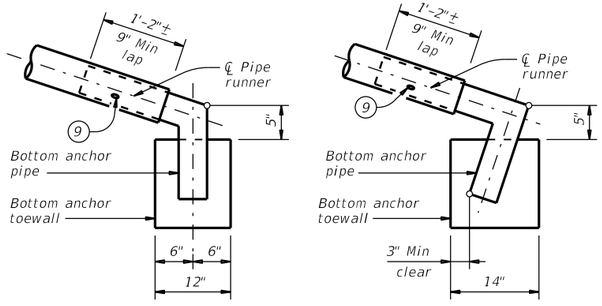


NOTE: The separate pipe runner shown is required when Cross Pipe Connection Option A1 is used.

PIPE RUNNER DETAILS

OPTION B1 OPTION B2

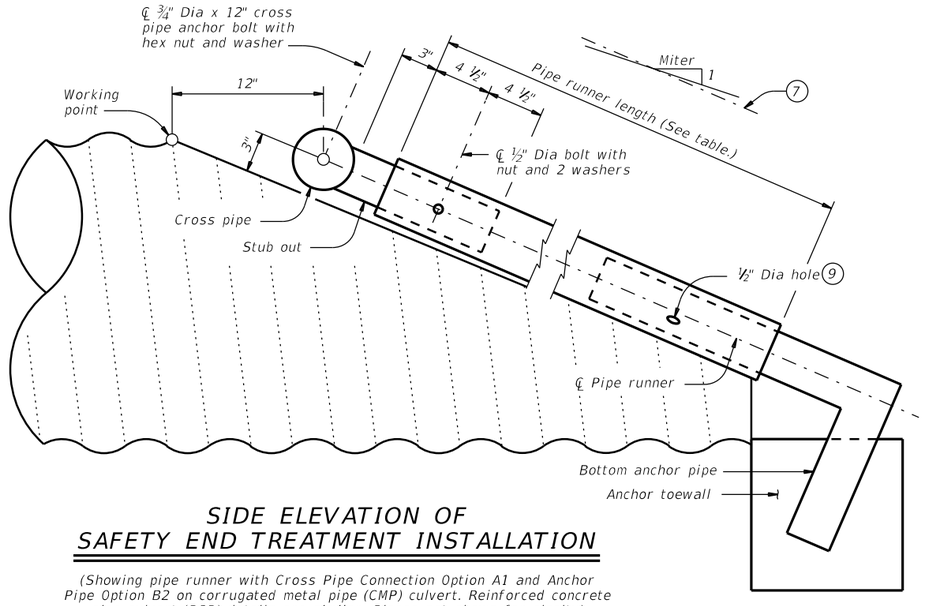
BOTTOM ANCHOR PIPE DETAILS (10)



OPTION B1 OPTION B2

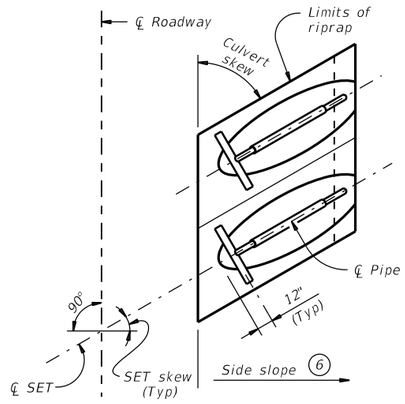
BOTTOM ANCHOR TOEWALL DETAILS

(Culvert and riprap not shown for clarity.)

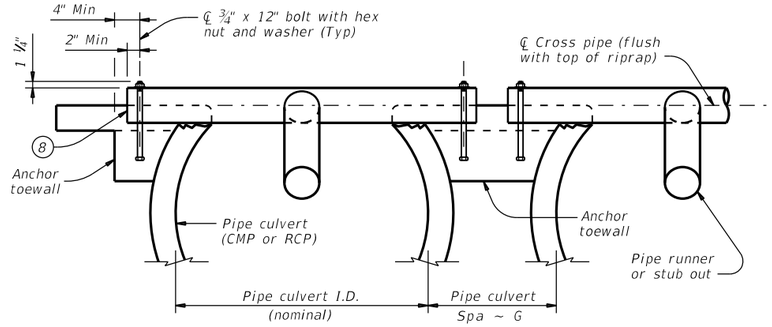


SIDE ELEVATION OF SAFETY END TREATMENT INSTALLATION

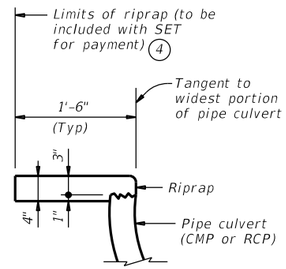
(Showing pipe runner with Cross Pipe Connection Option A1 and Anchor Pipe Option B2 on corrugated metal pipe (CMP) culvert. Reinforced concrete pipe culvert (RCP) details are similar. Riprap not shown for clarity)



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

Texas Department of Transportation

Bridge Division Standard

SAFETY END TREATMENT

FOR 12" DIA TO 60" DIA PIPE CULVERTS
TYPE II ~ CROSS DRAINAGE

SETP-CD

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©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
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	DIST	COUNTY		SHEET NO.
	BRY	BURLESON		123

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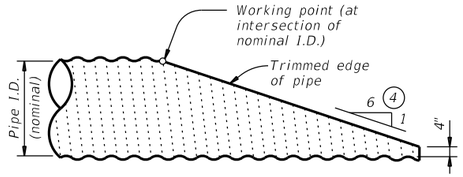
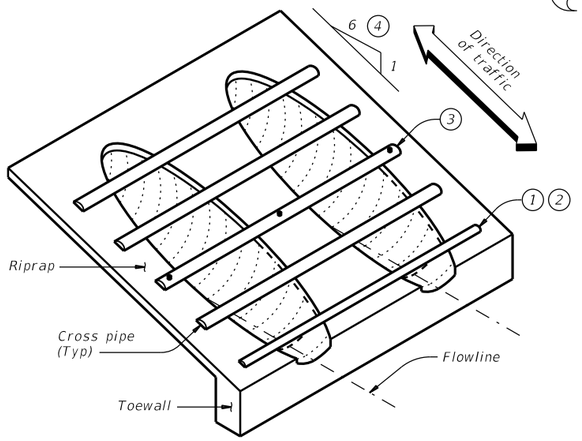


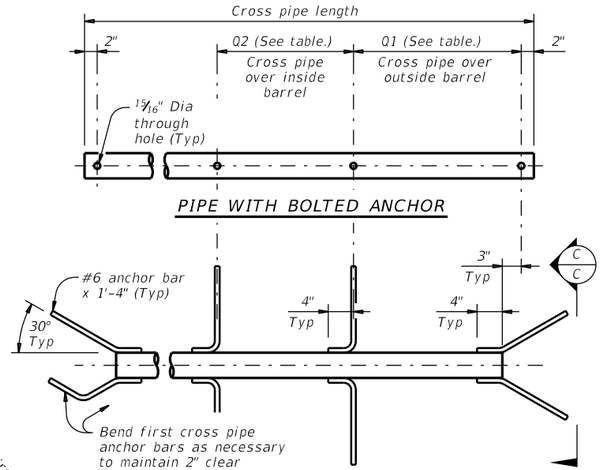
NOTE: All cross pipes, calculations, and dimensions are based on the pipe culverts mitered as shown in this detail. Alternate styles of mitered ends will require that appropriate adjustments be made to the values presented on this standard.

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

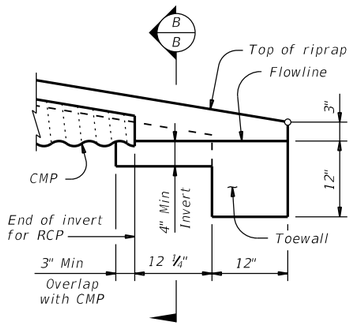


PIPE WITH BOLTED ANCHOR

PIPE WITH ANCHOR BARS

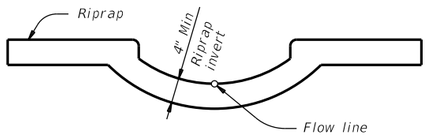
SECTION C-C

CROSS PIPE DETAILS



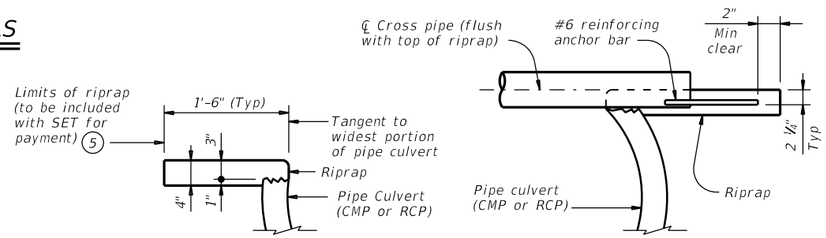
DETAIL "A"

(Showing invert with corrugated metal pipe (CMP) culvert. Reinforced concrete pipe (RCP) culvert details are similar. Cross pipes not shown for clarity.)



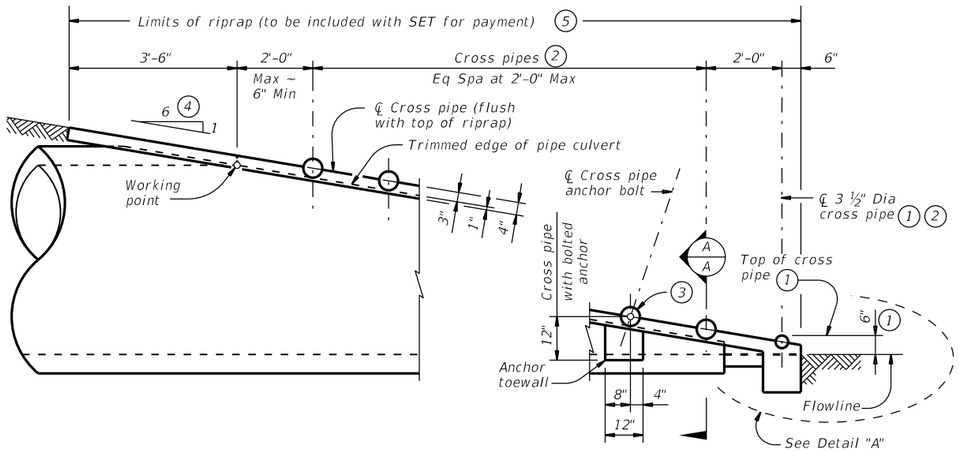
SECTION B-B

(Cross pipes not shown for clarity.)



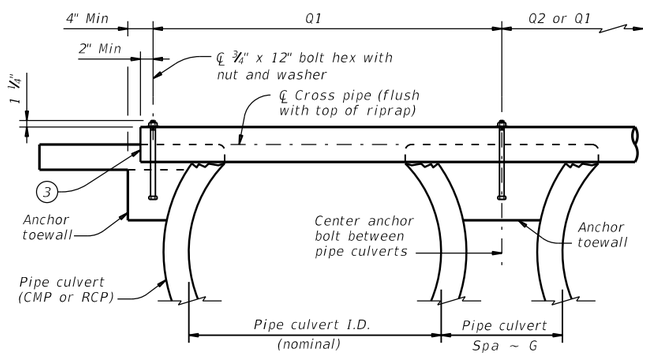
SHOWING TYPICAL PIPE CULVERT AND RIPRAP

SHOWING CROSS PIPE WITH ANCHOR BAR



SIDE ELEVATION OF CAST-IN-PLACE CONCRETE

(Showing reinforced concrete pipe (RCP) culvert. Details at corrugated metal pipe (CMP) culvert are similar.)



SHOWING CROSS PIPE WITH BOLTED ANCHOR

SECTION A-A

CROSS PIPE LENGTHS, REQUIRED PIPE SIZES, AND RIPRAP QUANTITIES (2)

Nominal Culvert I.D.	Conc Riprap (CY) (6)	Pipe Culvert Spa ~ G	Single Barrel ~ Q1	Multi-Barrel ~ Q1	Q2	Conditions for Use of Cross Pipes	Cross Pipe 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"		
27"	1.0	1' - 8"	N/A	3' - 10"	3' - 11"	3 or more pipe culverts	3 ½" Std (4.000" O.D.)
30"	1.1	1' - 10"	N/A	4' - 2"	4' - 4"	2 or more pipe culverts	
33"	1.2	1' - 11"	4' - 2"	4' - 5"	4' - 8"	All pipe culverts	
36"	1.3	2' - 1"	4' - 5"	4' - 9"	5' - 1"	All pipe culverts	4" Std (4.500" O.D.)
42"	1.5	2' - 4"	4' - 11"	5' - 5"	5' - 10"		
48"	1.7	2' - 7"	5' - 5"	6' - 0"	6' - 7"	All pipe culverts	5" Std (5.563" O.D.)
54"	2.0	3' - 0"	5' - 11"	6' - 9"	7' - 6"		
60"	2.2	3' - 3"	6' - 5"	7' - 4"	8' - 3"		
66"	2.4	3' - 3"	6' - 11"	7' - 10"	8' - 9"		
72"	2.7	3' - 4"	7' - 5"	8' - 5"	9' - 4"		

(1) The proper installation of the first cross pipe is critical for vehicle safety. Place the top of the first cross pipe no more than 6" above the flow line.

(2) 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.

(3) 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.

(4) Match cross slope as shown elsewhere in the plans. Cross slope of 6:1 or flatter is required for vehicle safety.

(5) Riprap placed beyond the limits shown will be paid for as concrete riprap in accordance with Item 432, "Riprap".

(6) 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.

Texas Department of Transportation

Bridge Division Standard

SAFETY END TREATMENT

FOR 12" DIA TO 72" DIA
PIPE CULVERTS
TYPE II ~ PARALLEL DRAINAGE

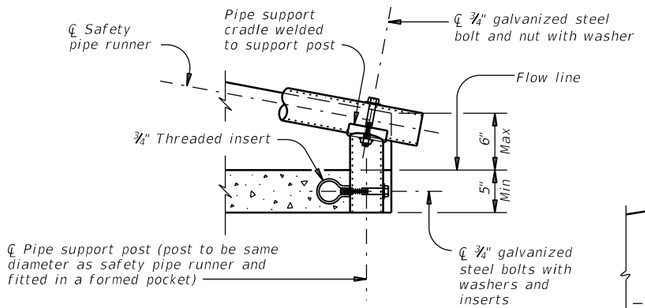
SETP-PD

FILE: setppdse-20.dgn	DN: GAF	CK: CAT	DW: JRP	CK: GAF
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	1507	02	016, Etc.	FM696, Etc.
	DIST	COUNTY		SHEET NO.
	BRY	BURLESON		124

DATE: 9/25/2020 5:30:44 AM
FILE: g:\150702\016\sheets\Standards\Bridge\PSET-SC.DGN

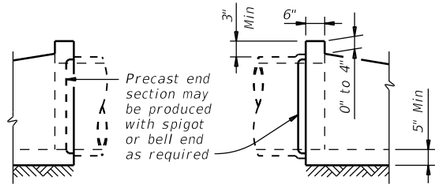
REQUIREMENTS FOR CULVERT PIPES AND SAFETY PIPE RUNNERS

Pipe I.D.	RCP Wall "B" Thickness	TP Wall Thickness (8)	"D" (1)	Slope	Min Length of Unit	Single Pipe Skew	Single Pipe Pipe Runners Required	Multiple Pipes Skew	Multiple Pipes 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 ¼"	1.30"	20.50"	3:1	3' - 8"	≤ 45°	No	≤ 45°	No
				4:1	4' - 7"				
				6:1	6' - 5"				
18"	2 ½"	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"			> 30°	Yes
				6:1	11' - 3"				
30"	3 ½"	2.65"	38.50"	3:1	7' - 10"	= 15°	No	= 15°	No
				4:1	10' - 1"	> 15°	Yes	> 15°	Yes
				6:1	14' - 8"				
36"	4"	2.75"	45.50"	3:1	9' - 5"	= 0°	No	≥ 0°	Yes
				4:1	12' - 3"	> 0°	Yes		
				6:1	17' - 11"				
42"	4 ½"	N/A	52.50"	3:1	11' - 1"	≥ 0°	Yes	≥ 0°	Yes
				4:1	14' - 5"				
				6:1	21' - 2"				



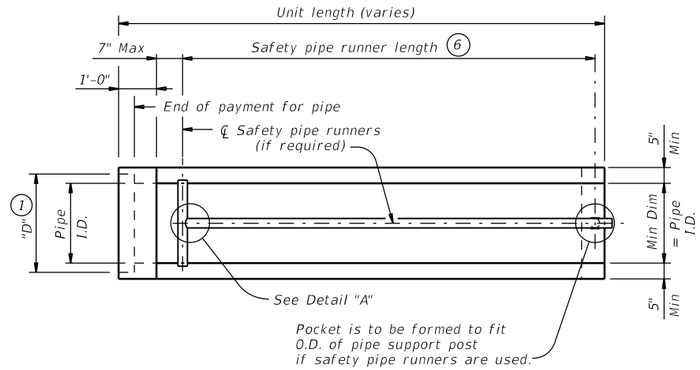
END DETAIL FOR INSTALLATION OF SAFETY PIPE RUNNERS

(If required)



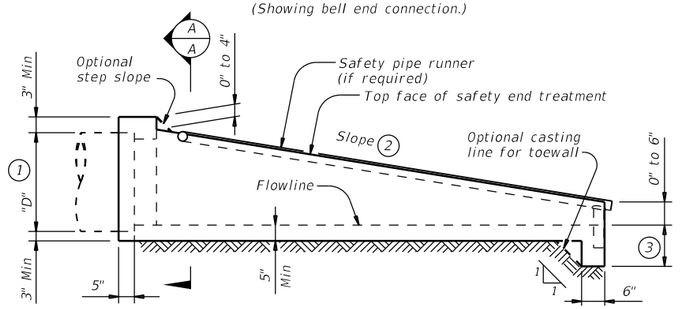
OPTIONAL JOINT FOR RCP

(Showing joint between RCP and precast safety end treatment)



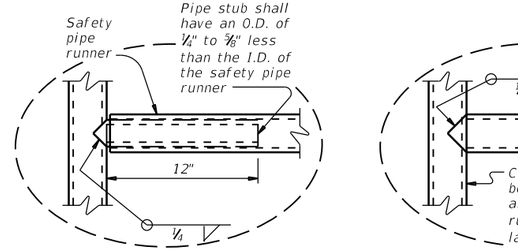
PLAN

(Showing bell end connection.)



LONGITUDINAL ELEVATION

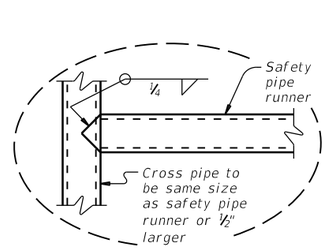
(Showing bell end connection.)



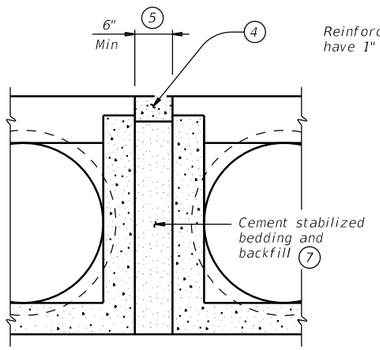
OPTION A

DETAIL A

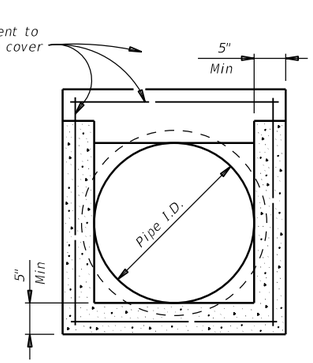
(If required)



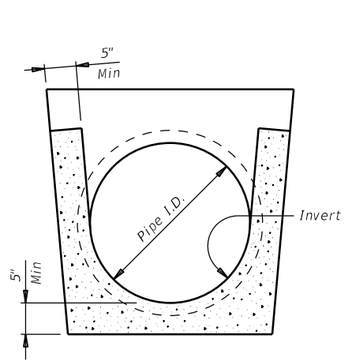
OPTION B



MULTIPLE PIPE INSTALLATION

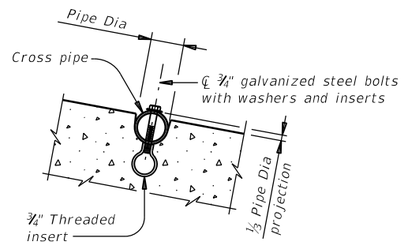


OPTION WITH SQUARE BOTTOM



OPTION WITH INVERT BOTTOM

SECTION A-A



INSTALLATION DETAIL FOR SAFETY PIPE RUNNERS

(If required)

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 ½" STD	4.000"	3.548"
20' - 10"	4" STD	4.500"	4.026"
35' - 4"	5" STD	5.563"	5.047"

(1) Dimension "D" is based on 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

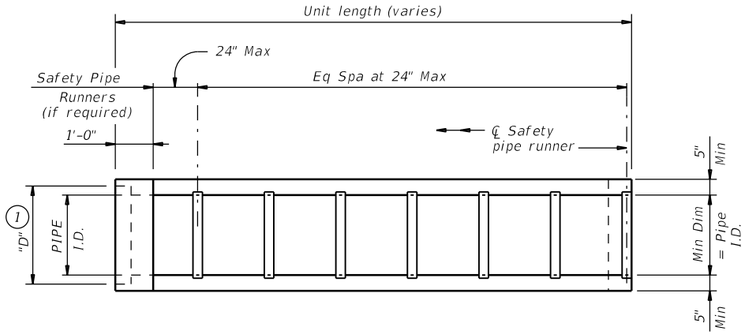
PRECAST SAFETY END TREATMENT

TYPE II ~ CROSS DRAINAGE

PSET-SC

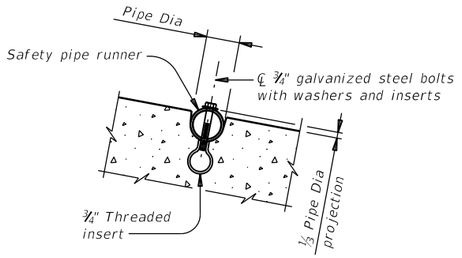
FILE: psetscss-20.dgn	DN: RLW	CK: KLR	DW: JTR	CK: GAF
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	1507	02	016, Etc.	FM696, Etc.
	DIST.	COUNTY		SHEET NO.
	BRY	BURLESON		125

DATE: 9/25/2020 5:30:50 AM
FILE: g:\150702\016\sheets\Standards\Bridge\PSET-SP.DGN



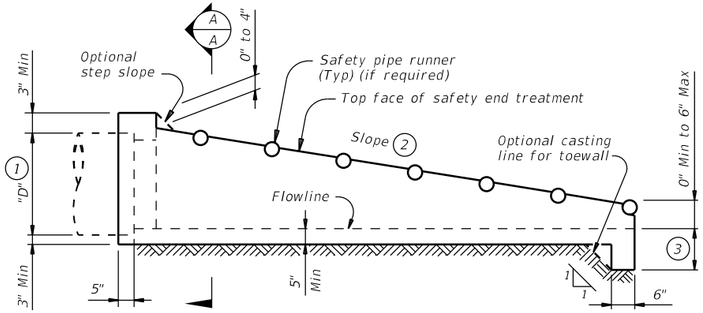
PLAN

(Showing bell end connection.)



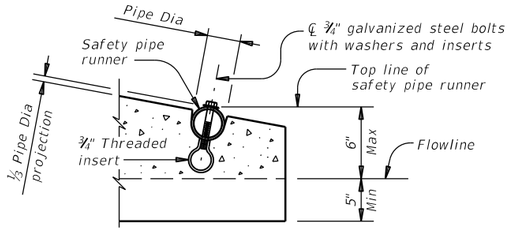
INSTALLATION DETAIL FOR SAFETY PIPE RUNNERS

(If required)



LONGITUDINAL ELEVATION

(Showing bell end connection.)

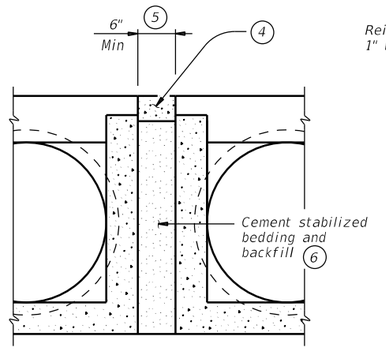


OPTION A

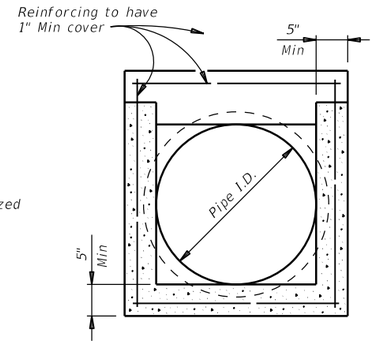
OPTION B

END DETAILS FOR INSTALLATION OF SAFETY PIPE RUNNERS

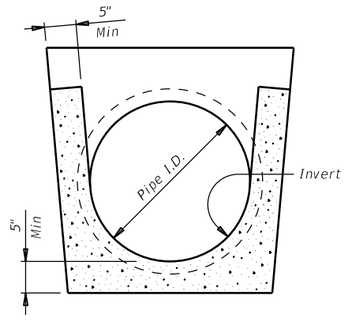
(If required)



MULTIPLE PIPE INSTALLATION

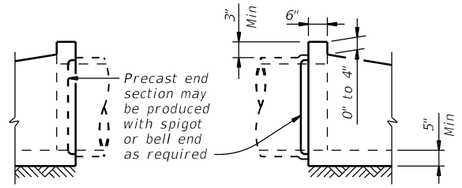


OPTION WITH SQUARE BOTTOM



OPTION WITH INVERT BOTTOM

SECTION A-A



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 ¼"	1.30"	20.50"	6:1	6' – 5"	No	Yes, for > 2 pipes	3" STD	3.500"	3.068"
18"	2 ½"	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 ½"	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 ½"	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.

Texas Department of Transportation

Bridge Division Standard

PRECAST SAFETY END TREATMENT

TYPE II ~ PARALLEL DRAINAGE

PSET-SP

FILE: psetspss-20.dgn	DN: RLW	CK: KLR	DW: JTR	CK: GAF
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	1507	02	016, Etc.	FM696, Etc.
	DIST	COUNTY		SHEET NO.
	BRY	BURLESON		126

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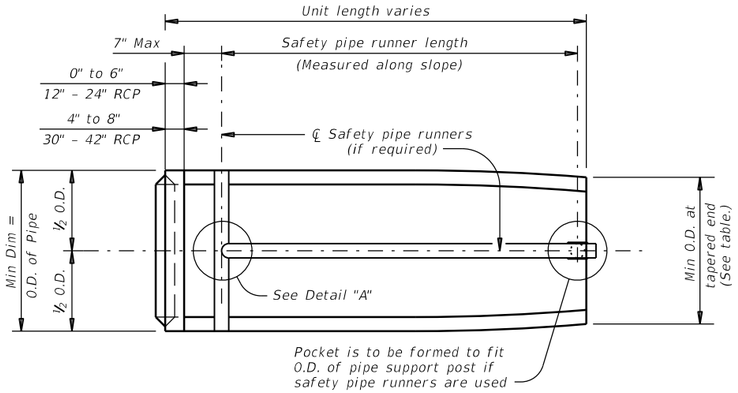
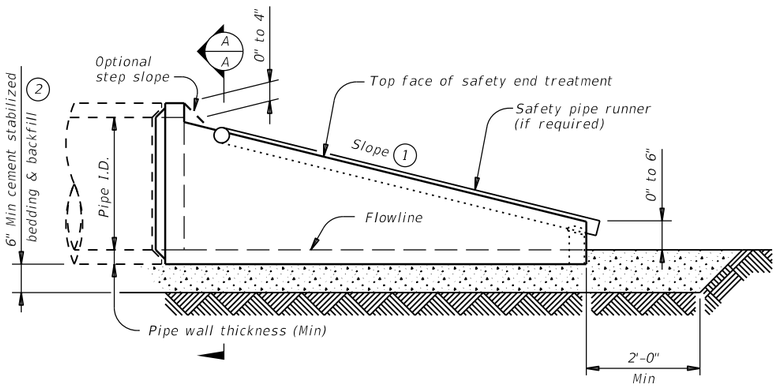


PLAN VIEW

(Showing spigot end connection.)



LONGITUDINAL ELEVATION

(Showing spigot end connection.)

MAX SAFETY PIPE RUNNER LENGTHS AND REQUIRED SAFETY PIPE RUNNER SIZES

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 ½" STD	4.000"	3.548"
20' – 10"	4" STD	4.500"	4.026"
35' – 4"	5" STD	5.563"	5.047"

(1) Slope as shown elsewhere in the plans. Slope of 3:1 or flatter is required for vehicle safety.

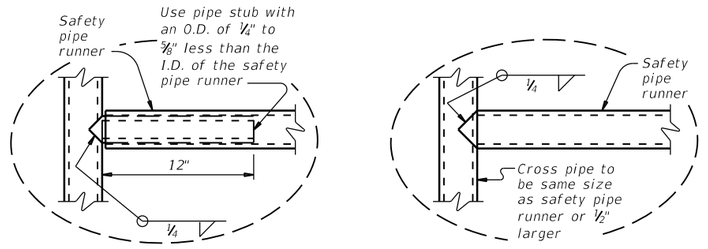
(2) Provide cement stabilized bedding and backfill in accordance with the Item, "Excavation and Backfill for Structures". Bedding and backfill is considered subsidiary to the Item "Safety End Treatment". When concrete riprap is specified around the safety end treatment, backfill as directed by Engineer.

(3) Fill the top 4" of void between precast end treatments with concrete riprap. Concrete riprap be considered subsidiary to the Item "Safety End Treatment".

(4) Adjust clear distance between pipes to provide for the minimum distance between safety end treatments.

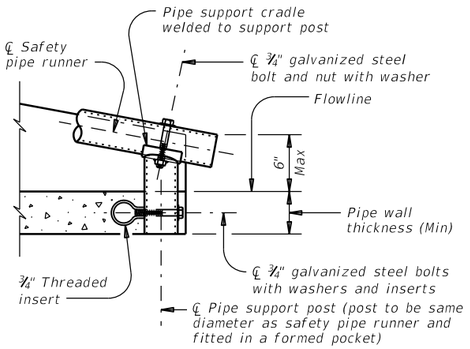
REQUIREMENTS FOR CULVERT PIPES AND SAFETY PIPE RUNNERS

Pipe I.D.	Min Wall Thickness	Min O.D.	Min O.D. at Tapered End	Min Reinf Requirements (sq. in. / ft. of pipe)	Slope	Minimum Length of Unit	Single Pipe		Multiple Pipe	
							Skew	Pipe Runners Required	Skew	Pipe Runners Required
12"	2"	16"	16"	0.07 Circ.	3:1	2' – 0"	≤ 45°	No	≤ 45°	No
					4:1	2' – 8"				
					6:1	4' – 0"				
15"	2 ¼"	19 ½"	19"	0.07 Circ.	3:1	2' – 10"	≤ 45°	No	≤ 45°	No
					4:1	3' – 9"				
					6:1	5' – 8"				
18"	2 ½"	23"	21 ½"	0.07 Circ.	3:1	3' – 8"	≤ 45°	No	≤ 45°	No
					4:1	4' – 10"				
					6:1	7' – 3"				
24"	3"	30"	27"	0.07 Circ.	3:1	5' – 3"	≤ 45°	No	≤ 30°	No
					4:1	7' – 0"			> 30°	Yes
					6:1	10' – 6"				
30"	3 ½"	37"	31"	0.18 Circ.	3:1	6' – 3"	≤ 15°	No	≤ 15°	No
					4:1	8' – 2"				
					6:1	12' – 1"	> 15°	Yes	> 15°	Yes
36"	4"	44"	36"	0.19 Ellip.	3:1	7' – 10"	= 0°	No	≥ 0°	Yes
					4:1	10' – 4"				
					6:1	15' – 4"	> 0°	Yes		
42"	4 ½"	51"	41 ½"	0.23 Ellip.	3:1	9' – 6"	≥ 0°	Yes	≥ 0°	Yes
					4:1	12' – 6"				
					6:1	18' – 7"				



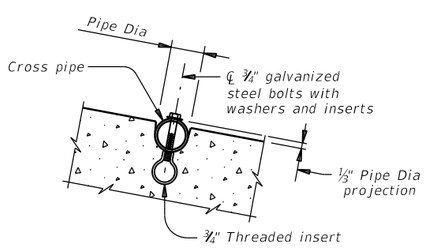
OPTION A OPTION B

DETAIL A



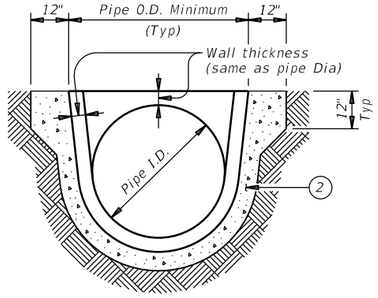
END DETAIL FOR INSTALLATION OF SAFETY PIPE RUNNERS

(If required)

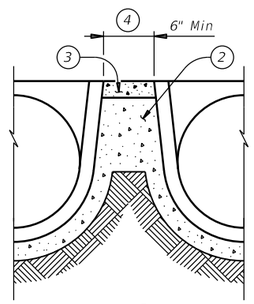


INSTALLATION DETAIL FOR SAFETY PIPE RUNNERS

(If required)



SECTION A-A



MULTIPLE PIPE INSTALLATION

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 safety pipe runners, cross pipes, pipe support posts, and pipe stubs meeting the requirements of ASTM A53 (Type E or S, Gr B), ASTM A500 Gr 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.

GENERAL NOTES:

Precast safety end treatment for reinforced concrete pipe (CRP) may be used for TYPE II end treatment as specified in Item 467, "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.

Manufacture precast concrete end sections in accordance with Item 464, "Reinforced Concrete Pipe" and in accordance with ASTM Specification C-76, Class III, Wall B for circular pipe.

Provide precast concrete end sections with a spigot or bell end for compatibility to upstream or downstream end conditions with sufficient annular space to allow for grout, mortar, cold applied asphalt joint compound or pre-formed plastic gasket material.

Methods of lifting shall be provided by the manufacturer for ease of loading, unloading, and installation.

Pipe runners are designed for a traversing load of 1,800 Lbs at yield as recommended by Research Report 280-1, "Safety Treatment of Roadside Cross-Drainage Structures", Texas Transportation Institute, March 1981.

Texas Department of Transportation

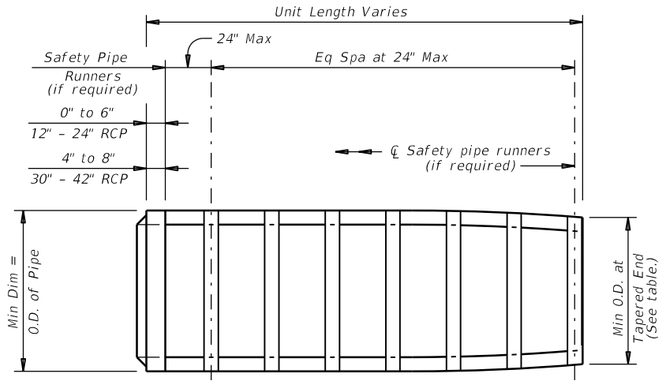
Bridge Division Standard

PRECAST SAFETY END TREATMENT

TYPE II ~ CROSS DRAINAGE

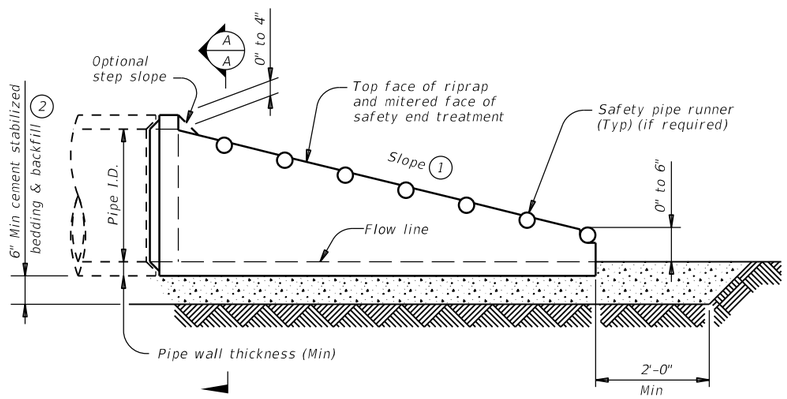
PSET-RC

FILE: psetrcss-20.dgn	DN: RLW	CK: KLR	DW: JTR	CK: GAF
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	1507	02	016,Etc.	FM696,Etc.
	DIST	COUNTY		SHEET NO.
	BRY	BURLESON		127



PLAN VIEW – 12" THRU 24"

(Showing spigot end connection.)



LONGITUDINAL ELEVATION - 12" THRU 24"

(Showing spigot end connection.)

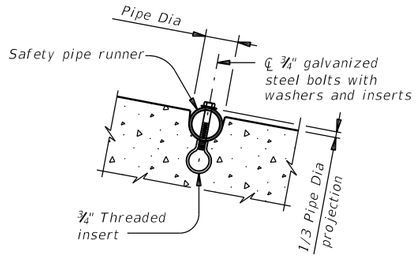
(1) Slope as shown elsewhere in the plans. Slope of 6:1 or flatter is required for vehicle safety.

Provide cement stabilized bedding and backfill in accordance with the Item, "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.

(3) 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".

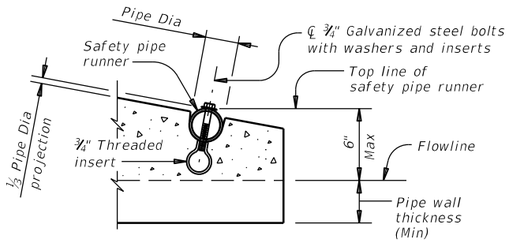
(4) Adjust clear distance between pipes to provide for the minimum distance between safety end treatments.

(5) Safety pipe runners are required for multiple pipe culverts with more than two pipes.

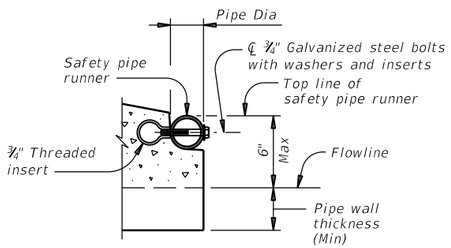


INSTALLATION DETAIL FOR SAFETY PIPE RUNNERS

(If required)



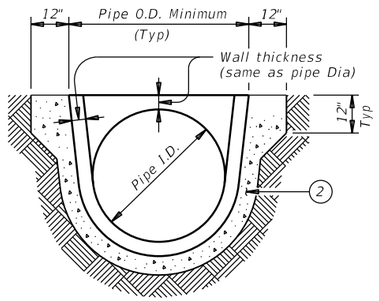
OPTION A



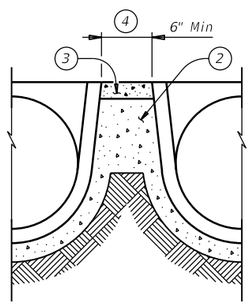
OPTION B

END DETAILS FOR INSTALLATION OF SAFETY PIPE RUNNERS

(If required)



SECTION A-A



MULTIPLE PIPE INSTALLATION

REQUIREMENTS FOR CULVERT PIPES AND SAFETY PIPE RUNNERS

Pipe I.D.	Min Wall Thickness	Min O.D.	Min O.D. at Tapered End	Min Reinf Requirements (sq. in. per ft. of Pipe)	Max Slope	Min Length of Unit	Pipe Runner Requirements		Required Pipe Runner Sizes		
							Single Pipe	Multiple Pipe	Nominal Dia	O.D.	I.D.
12"	2"	16"	16"	0.07 Circ.	6:1	4'–0"	No	(5)	3" STD	3.500"	3.068"
15"	2 ¼"	19 ½"	19"	0.07 Circ.	6:1	5'–8"	No	(5)	3" STD	3.500"	3.068"
18"	2 ½"	23"	21 ½"	0.07 Circ.	6:1	7'–3"	No	(5)	3" STD	3.500"	3.068"
24"	3"	30"	27"	0.07 Circ.	6:1	10'–6"	No	(5)	3" STD	3.500"	3.068"
30"	3 ½"	37"	31"	0.18 Circ.	6:1	12'–1"	No	Yes	4" STD	4.500"	4.026"
36"	4"	44"	36"	0.19 Ellip.	6:1	15'–4"	Yes	Yes	4" STD	4.500"	4.026"
42"	4 ½"	51"	41 ½"	0.23 Ellip.	6:1	18'–7"	Yes	Yes	4" STD	4.500"	4.026"

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 meeting the requirements of ASTM A53 (Type E or S, Gr B), ASTM A500 Gr B, or API 5LX52.

Galvanize steel components except reinforcing steel after fabrication. Repair galvanizing damaged during transport or construction in accordance with the specifications.

GENERAL NOTES:

Precast safety end treatment for reinforced concrete pipe (RCP) may be used for TYPE II end treatment as specified in Item 467, "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.

Manufacture precast concrete end sections in accordance with Item 464, "Reinforced Concrete Pipe" and in accordance with ASTM Specification C-76, Class III, Wall B for circular pipe.

Provide precast concrete end sections with a spigot or bell end for compatibility to upstream or downstream end conditions with sufficient annular space to allow for grout, mortar, cold applied asphalt joint compound or pre-formed plastic gasket material.

Methods of lifting shall be provided by the manufacturer for ease of loading, unloading and installation.

Pipe runners are designed for a traversing load of 10,000 Lbs at yield as recommended by Research Report 280-2F, "Safety Treatment of Roadside Parallel-Drainage Structures", Texas Transportation Institute, March 1981.

Texas Department of Transportation

Bridge Division Standard

PRECAST SAFETY END TREATMENT

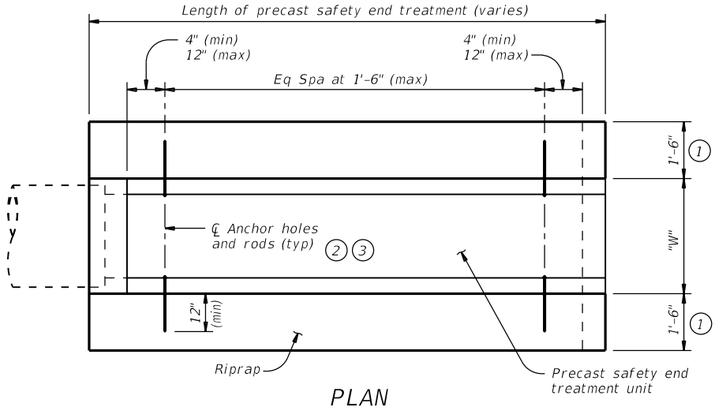
TYPE II ~ PARALLEL DRAINAGE

PSET-RP

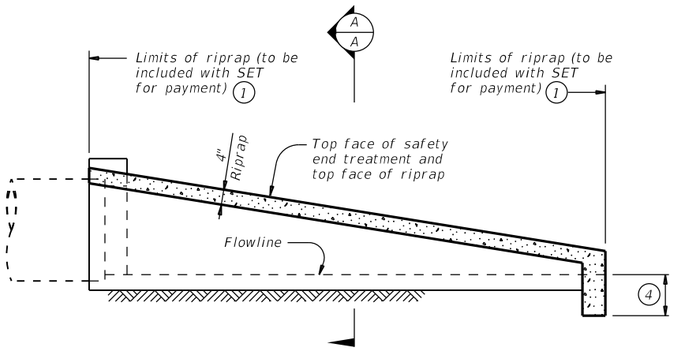
FILE: psetrpss-20.dgn	DN: RLW	CK: KLR	DW: JTR	CK: GAF
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	1507	02	016, Etc.	FM696, Etc.
	DIST	COUNTY		SHEET NO.
	BRY	BURLESON		128

DATE: 9/25/2020 5:31:03 AM
FILE: g:\150702\016\sheets\Standards\Bridge\PSET-RP.DGN

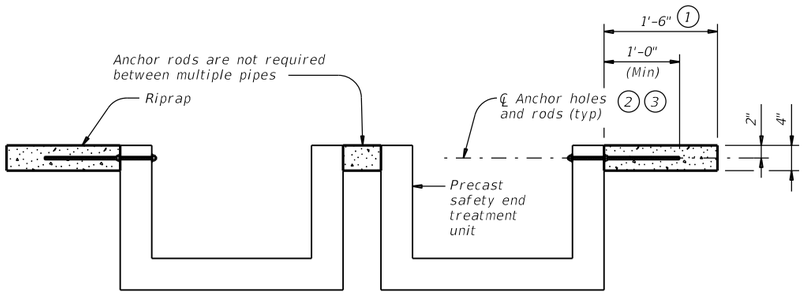
DATE: 9/25/2020 5:31:09 AM
FILE: g:\150702\016\sheets\Standards\Bridge\PSET-RR.dgn



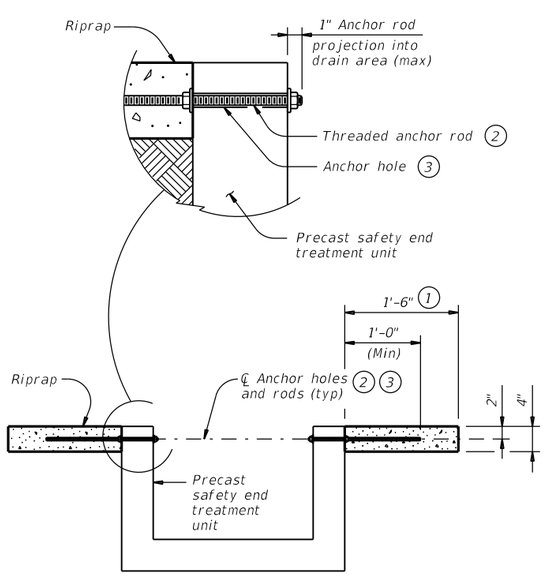
PLAN



LONGITUDINAL ELEVATION



MULTIPLE PIPE INSTALLATION



SINGLE PIPE INSTALLATION

SECTION A-A

ESTIMATED CONCRETE RIPRAP QUANTITIES (CY) 5

Nominal Culvert (Pipe) I.D.	PSET-SC 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 Saftey 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.lrprecast.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.

Texas Department of Transportation

Bridge Division Standard

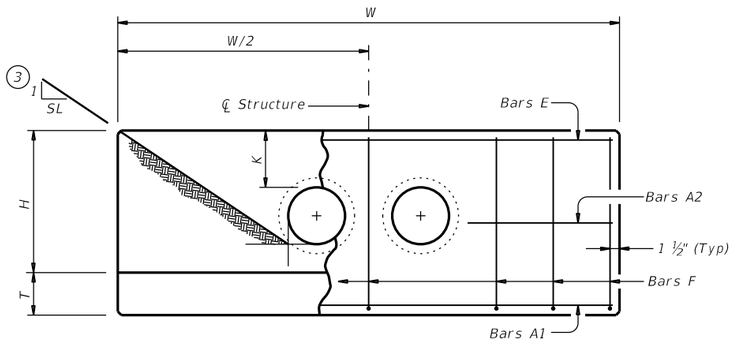
PRECAST SAFETY END TREATMENT
TYPE II
RIPRAP DETAILS

PSET-RR

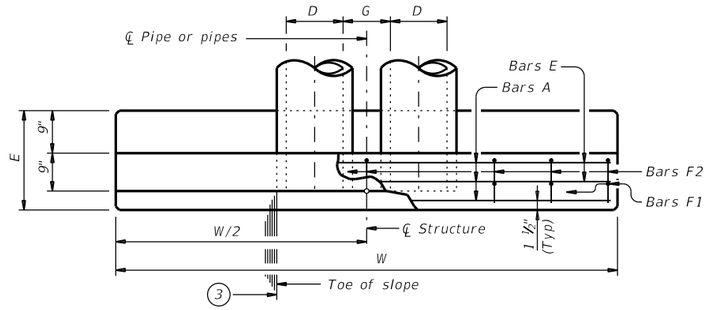
FILE: psetrrse-20.dgn	DN: GAF	CK: TxDOT	DW: JRP	CK: GAF
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	1507	02	016, Etc.	FM696, Etc.
	DIST	COUNTY		SHEET NO.
	BRY	BURLESON		129

TABLE OF VARIABLE DIMENSIONS AND QUANTITIES FOR ONE HEADWALL (5)

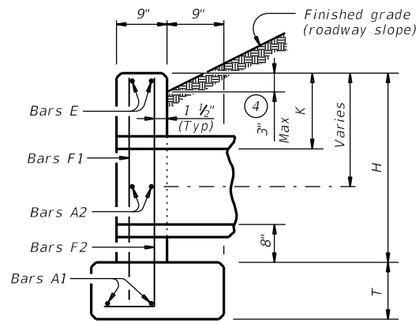
Slope	Dia of Pipe (D)	Values for One Pipe			Values To Be Added for Each Addt'l Pipe		
		W	Reinf (Lbs) (1)	Conc (CY) (2)	W	Reinf (Lbs) (1)	Conc (CY) (2)
2:1	12"	9' – 0"	122	1.1	1' – 9"	15	0.2
	15"	10' – 3"	136	1.3	2' – 2"	16	0.2
	18"	11' – 6"	163	1.5	2' – 8"	19	0.3
	21"	12' – 9"	200	1.8	3' – 1"	31	0.4
	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



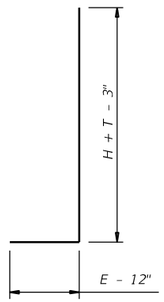
ELEVATION



PLAN OF NON-SKEWED PIPES



SECTION AT CENTER OF PIPE



BARS F2

(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.

Texas Department of Transportation

Bridge Division Standard

CONCRETE HEADWALLS WITH PARALLEL WINGS FOR NON-SKEWED PIPE CULVERTS

CH-PW-0

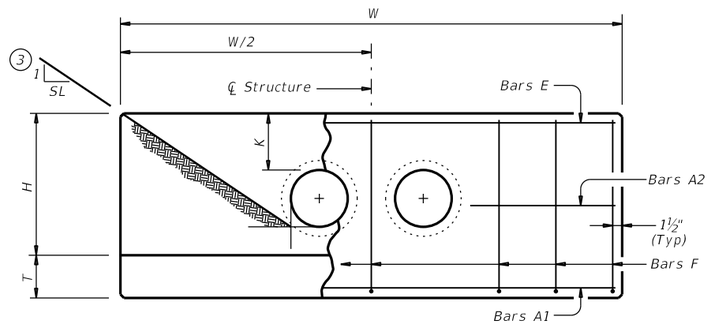
FILE: chpw0ste-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	1507	02	016, Etc.	FM696, Etc.
	DIST	COUNTY		SHEET NO.
	BRY	BURLESON		130

DATE: 9/25/2020 5:31:16 AM
FILE: g:\150702\016\sheets\standards\bridge\CH-PW-0.DGN

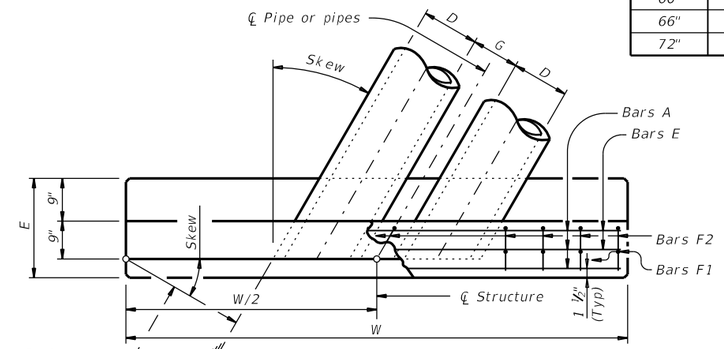
DATE: 9/25/2020 5:31:22 AM
g:\150702\016\sheets\Standards\Bridge\CH-PW-S.DGN

TABLE OF VARIABLE DIMENSIONS AND QUANTITIES FOR ONE HEADWALL (5)

Slope	Dia of Pipe (D)	15° Skew						30° Skew						45° Skew					
		Values for One Pipe			Values To Be Added for Each Addt'l Pipe			Values for One Pipe			Values To Be Added for Each Addt'l Pipe			Values for One Pipe			Values To Be Added for Each Addt'l Pipe		
		W	Reinf (Lbs) (1)	Conc (CY) (2)	W	Reinf (Lbs) (1)	Conc (CY) (2)	W	Reinf (Lbs) (1)	Conc (CY) (2)	W	Reinf (Lbs) (1)	Conc (CY) (2)	W	Reinf (Lbs) (1)	Conc (CY) (2)	W	Reinf (Lbs) (1)	Conc (CY) (2)
2:1	12"	9' – 4"	124	1.1	1' – 9 3/4"	15	0.2	10' – 5"	130	1.2	2' – 0"	16	0.2	12' – 9"	159	1.5	2' – 5 3/4"	17	0.3
	15"	10' – 7"	136	1.3	2' – 3"	17	0.2	11' – 10"	159	1.5	2' – 6"	18	0.2	14' – 6"	191	1.8	3' – 0 3/4"	20	0.3
	18"	11' – 11"	165	1.5	2' – 9"	19	0.3	13' – 3"	174	1.7	3' – 1"	29	0.3	16' – 3"	207	2.1	3' – 9 1/4"	33	0.4
	21"	13' – 2"	203	1.9	3' – 2 1/4"	31	0.4	14' – 9"	233	2.1	3' – 6 3/4"	33	0.4	18' – 0"	276	2.6	4' – 4 1/4"	36	0.5
	24"	14' – 6"	240	2.1	3' – 8 1/4"	34	0.4	16' – 2"	251	2.4	4' – 1 3/4"	36	0.5	19' – 10"	318	2.9	5' – 0 3/4"	39	0.6
	27"	15' – 9"	258	2.5	4' – 0 3/4"	38	0.5	17' – 7"	292	2.8	4' – 6 1/4"	39	0.6	21' – 7"	342	3.4	5' – 6 1/4"	44	0.7
	30"	17' – 1"	297	2.8	4' – 5 3/4"	40	0.6	19' – 1"	311	3.1	5' – 0"	42	0.6	23' – 4"	388	3.8	6' – 1 3/4"	47	0.8
	33"	18' – 5"	320	3.3	4' – 9 3/4"	43	0.6	20' – 6"	358	3.6	5' – 4 3/4"	46	0.7	25' – 1"	439	4.4	6' – 7 1/4"	51	0.9
	36"	19' – 8"	401	4.0	5' – 3"	47	0.9	21' – 11"	422	4.5	5' – 10 3/4"	50	0.9	26' – 10"	517	5.5	7' – 2 1/4"	55	1.2
	42"	22' – 3"	476	5.0	6' – 0 3/4"	53	1.1	24' – 10"	528	5.6	6' – 8 3/4"	56	1.2	30' – 5"	634	6.9	8' – 3"	76	1.4
	48"	25' – 11"	577	6.6	6' – 9 3/4"	60	1.3	28' – 10"	637	7.3	7' – 7 1/4"	79	1.5	35' – 4"	791	9.0	9' – 3 3/4"	88	1.8
	54"	28' – 6"	711	7.8	7' – 9"	83	1.6	31' – 9"	781	8.7	8' – 8"	81	1.8	38' – 11"	958	10.7	10' – 7 1/4"	97	2.2
	60"	31' – 1"	805	9.2	8' – 6 1/4"	91	1.9	34' – 8"	881	10.2	9' – 6 1/4"	97	2.1	42' – 5"	1,113	12.5	11' – 8"	124	2.6
	66"	33' – 8"	907	10.6	9' – 0 3/4"	98	2.1	37' – 6"	1,028	11.8	10' – 1 1/4"	102	2.4	46' – 0"	1,235	14.5	12' – 4 1/4"	132	2.9
	72"	36' – 3"	1,071	12.1	9' – 8"	105	2.4	40' – 5"	1,207	13.5	10' – 9 1/4"	110	2.6	49' – 6"	1,446	16.6	13' – 2 1/4"	141	3.2
3:1	12"	13' – 6"	178	1.6	1' – 9 3/4"	15	0.2	15' – 0"	189	1.8	2' – 0"	15	0.2	18' – 5"	237	2.2	2' – 5 3/4"	17	0.2
	15"	15' – 3"	212	1.9	2' – 3"	17	0.2	17' – 0"	223	2.1	2' – 6"	17	0.3	20' – 10"	276	2.6	3' – 0 3/4"	20	0.3
	18"	17' – 1"	231	2.3	2' – 9"	19	0.3	19' – 1"	259	2.5	3' – 1"	29	0.3	23' – 4"	318	3.1	3' – 9 1/4"	32	0.4
	21"	18' – 11"	306	2.7	3' – 2 1/4"	31	0.4	21' – 1"	339	3.0	3' – 6 3/4"	33	0.4	25' – 10"	413	3.7	4' – 4 1/4"	36	0.5
	24"	20' – 8"	345	3.1	3' – 8 3/4"	35	0.4	23' – 1"	384	3.5	4' – 1 3/4"	36	0.5	28' – 3"	462	4.2	5' – 0 3/4"	40	0.6
	27"	22' – 6"	376	3.7	4' – 0 3/4"	38	0.5	25' – 1"	438	4.1	4' – 6 1/4"	39	0.6	30' – 9"	522	5.0	5' – 6 1/4"	44	0.7
	30"	24' – 4"	422	4.1	4' – 5 3/4"	40	0.6	27' – 2"	466	4.6	5' – 0"	42	0.6	33' – 3"	578	5.6	6' – 1 3/4"	47	0.8
	33"	26' – 2"	476	4.8	4' – 10"	43	0.6	29' – 2"	522	5.3	5' – 4 3/4"	46	0.7	35' – 9"	644	6.5	6' – 7 1/4"	51	0.9
	36"	27' – 11"	590	5.9	5' – 3"	47	0.8	31' – 2"	645	6.6	5' – 10 3/4"	50	0.9	38' – 2"	787	8.0	7' – 2 1/4"	56	1.2
	42"	31' – 7"	684	7.3	6' – 0 1/4"	53	1.1	35' – 3"	776	8.2	6' – 8 3/4"	56	1.2	43' – 2"	933	10.0	8' – 3"	79	1.4
	48"	36' – 9"	880	9.6	6' – 9 3/4"	61	1.3	41' – 0"	953	10.7	7' – 7 1/4"	81	1.5	50' – 2"	1,166	13.1	9' – 3 3/4"	88	1.8
	54"	40' – 5"	1,065	11.4	7' – 9"	85	1.6	45' – 0"	1,185	12.7	8' – 8"	89	1.8	55' – 2"	1,435	15.5	10' – 7 1/4"	97	2.2
	60"	44' – 0"	1,224	13.3	8' – 6 1/4"	93	1.9	49' – 1"	1,356	14.8	9' – 6 1/4"	96	2.1	60' – 1"	1,635	18.2	11' – 8"	124	2.6
	66"	47' – 7"	1,357	15.4	9' – 1"	98	2.1	53' – 1"	1,497	17.2	10' – 1 1/4"	103	2.3	65' – 1"	1,892	21.1	12' – 4 1/4"	130	2.9
	72"	51' – 3"	1,624	17.7	9' – 8"	105	2.3	57' – 2"	1,787	19.7	10' – 9 1/4"	109	2.6	70' – 0"	2,218	24.1	13' – 2 1/4"	139	3.2
4:1	12"	17' – 7"	232	2.1	1' – 9 3/4"	15	0.2	19' – 8"	259	2.4	2' – 0"	16	0.2	24' – 0"	314	2.9	2' – 5 3/4"	18	0.2
	15"	19' – 11"	272	2.5	2' – 3"	17	0.2	22' – 3"	301	2.8	2' – 6"	18	0.3	27' – 3"	361	3.5	3' – 0 3/4"	21	0.3
	18"	22' – 3"	313	3.0	2' – 9"	19	0.3	24' – 10"	344	3.3	3' – 1"	29	0.3	30' – 5"	427	4.0	3' – 9 1/4"	32	0.4
	21"	24' – 7"	407	3.6	3' – 2 1/4"	31	0.4	27' – 5"	446	4.0	3' – 6 3/4"	33	0.4	33' – 7"	549	4.9	4' – 4 1/4"	36	0.5
	24"	26' – 11"	455	4.1	3' – 8 3/4"	35	0.4	30' – 0"	499	4.5	4' – 1 3/4"	36	0.5	36' – 9"	609	5.6	5' – 0 3/4"	40	0.6
	27"	29' – 3"	514	4.8	4' – 0 3/4"	38	0.5	32' – 7"	562	5.4	4' – 6 1/4"	40	0.6	39' – 11"	703	6.6	5' – 6 1/4"	43	0.7
	30"	31' – 7"	568	5.4	4' – 5 3/4"	40	0.6	35' – 3"	620	6.0	5' – 0"	42	0.6	43' – 2"	768	7.4	6' – 1 3/4"	49	0.8
	33"	33' – 11"	634	6.2	4' – 10"	43	0.7	37' – 10"	710	7.0	5' – 4 3/4"	46	0.7	46' – 4"	848	8.5	6' – 7 1/4"	52	0.9
	36"	36' – 3"	776	7.7	5' – 3"	48	0.9	40' – 5"	868	8.6	5' – 10 3/4"	49	0.9	49' – 6"	1,058	10.6	7' – 2 1/4"	56	1.1
	42"	40' – 11"	921	9.6	6' – 0 1/4"	53	1.0	45' – 7"	1,022	10.7	6' – 8 3/4"	57	1.2	55' – 10"	1,262	13.1	8' – 3"	78	1.4
	48"	47' – 7"	1,152	12.6	6' – 10"	61	1.3	53' – 1"	1,268	14.0	7' – 7 1/4"	80	1.5	65' – 1"	1,587	17.2	9' – 3 3/4"	86	1.8
	54"	52' – 3"	1,416	14.9	7' – 9 1/4"	86	1.6	58' – 4"	1,589	16.6	8' – 8"	89	1.8	71' – 5"	1,924	20.4	10' – 7 1/4"	95	2.2
	60"	56' – 11"	1,606	17.5	8' – 6 3/4"	92	1.9	63' – 6"	1,806	19.5	9' – 6 1/4"	95	2.1	77' – 9"	2,192	23.9	11' – 8"	122	2.6
	66"	61' – 7"	1,819	20.2	9' – 0 3/4"	97	2.1	68' – 8"	2,019	22.5	10' – 1 1/4"	101	2.4	84' – 2"	2,472	27.6	12' – 4 1/4"	131	2.9
	72"	66' – 3"	2,150	23.2	9' – 8"	104	2.4	73' – 11"	2,379	25.9	10' – 9 1/4"	108	2.6	90' – 6"	2,937	31.7	13' – 2 1/4"	138	3.2
6:1	12"	25' – 11"	342	3.1	1' – 9 3/4"	15	0.2	28' – 10"	374	3.5	2' – 0"	16	0.2	35' – 4"	456	4.3	2' – 5 3/4"	17	0.2
	15"	29' – 3"	390	3.7	2' – 3"	17	0.2	32' – 7"	442	4.2	2' – 6"	18	0.2	39' – 11"	549	5.1	3' – 0 3/4"	20	0.3
	18"	32' – 7"	459	4.4	2' – 9"	20	0.3	36' – 4"	515	4.9	3' – 1"	29	0.3	44' – 7"	629	6.0	3' – 9 1/4"	33	0.4
	21"	36' – 0"	608	5.3	3' – 2 1/4"	31	0.4	40' – 2"	660	5.9	3' – 6 3/4"	33	0.4	49' – 2"	823	7.2	4' – 4 1/4"	38	0.5
	24"	39' – 4"	672	6.0	3' – 8 3/4"	35	0.4	43' – 11"	748	6.7	4' – 1 3/4"	36	0.5	53' – 9"	920	8.2	5' – 0 3/4"	42	0.6
	27"	42' – 8"	770	7.1	4' – 0 3/4"	38	0.5	47' – 8"	852	8.0	4' – 6 1/4"	41	0.5	58' – 4"	1,039	9.7	5' – 6 1/4"	45	0.7
	30"	46' – 1"	839	8.0	4' – 5 3/4"	40	0.6	51' – 5"	949	8.9	5' – 0"	44	0.6	62' – 11"	1,162	10.9	6' – 1 3/4"	48	0.8
	33"	49' – 5"	947	9.2	4' – 10"	45	0.7	55' – 2"	1,040	10.3	5' – 4 3/4"	48	0.7	67' – 6"	1,292	12.6	6' – 7 1/4"	50	0.9
	36"	52' – 10"	1,151	11.4	5' – 3"	49	0.8	58' – 11"	1,287	12.7	5' – 10 3/4"	51	1.0	72' – 1"	1,583	15.6	7' – 2 1/4"	55	1.1
	42"	59' – 6"	1,365	14.2	6' – 0 1/4"	55	1.0	66' – 5"	1,530	15.8	6' – 8 3/4"	57	1.2	81' – 4"	1,875	19.4	8' – 3"	76	1.4
	48"	69' – 4"	1,737	18.5	6' – 10"	59	1.3	77' – 4"	1,942	20.7	7' – 7 1/4"	79	1.5	94' – 9"	2,368	25.3	9' – 3 3/4"	86	1.8
	54"	76' – 1"	2,138	22.0	7' – 9 1/4"	83	1.6	84' – 10"	2,378	24.6	8' – 8"	87	1.8	103' – 11"	2,912	30.1	10' – 7 1/4"	95	2.2
	60"	82' – 10"	2,426	25.8	8' – 6 3/4"	90	1.9	92' – 5"	2,681	28.8	9' – 6 1/4"	94	2.1	113' – 2"	3,294	35.3	11' – 8"	122	2.6
	66"	89' – 7"	2,730	29.9	9' – 0 3/4"	96	2.1	99' – 11"	3,038	33.3	10' – 1 1/4"	101	2.4	122' – 4"	3,697	40.8	12' – 4 1/4"	130	2.9
	72"	96' – 3"	3,218	34.2	9' – 8"	102	2.4	107' – 5"	3,580	38.2	10' – 9 1/4"	108	2.6	131' – 6"	4,372	46.8	13' – 2 1/4"	139	3.2

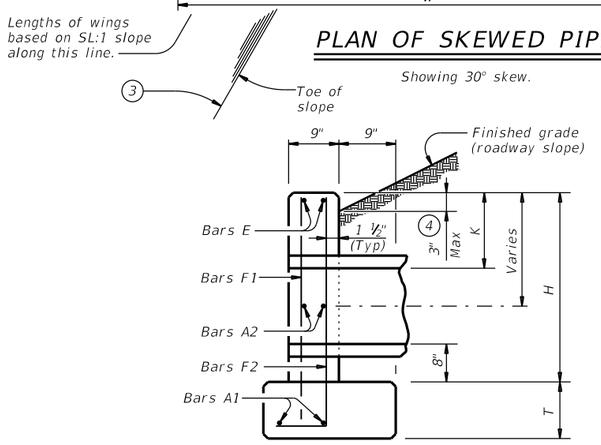


ELEVATION

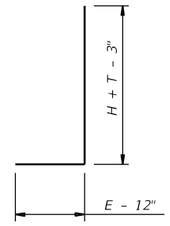


PLAN OF SKEWED PIPES

Showing 30° skew.



SECTION AT CENTER OF PIPE



BARS F2

(1) Total quantites 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 (6) REINFORCING STEEL

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.

Texas Department of Transportation

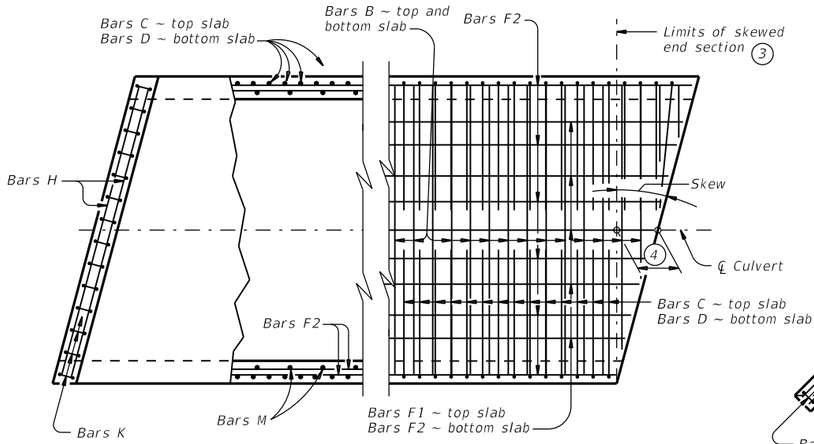
Bridge Division Standard

CONCRETE HEADWALLS WITH PARALLEL WINGS FOR SKEWED PIPE CULVERTS

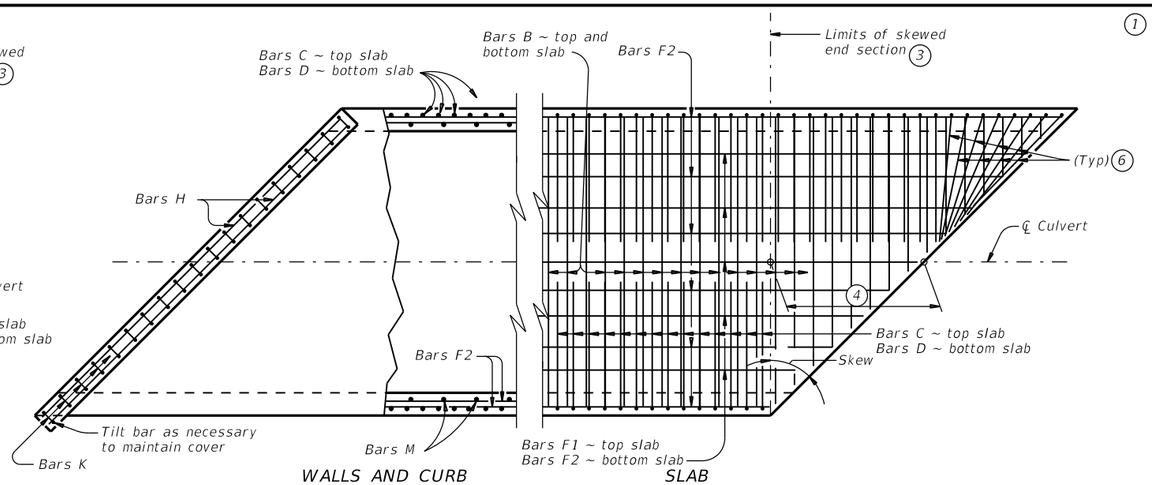
CH-PW-S

FILE: chpwsste-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	1507	02	016, Etc.	FM696, Etc.
	DIST	COUNTY		SHEET NO.
	BRY	BURLESON		131

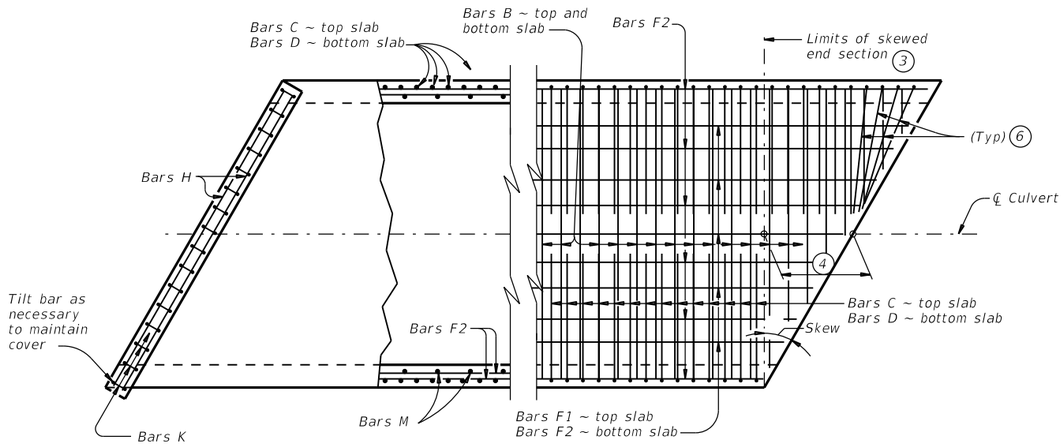
DATE: 9/25/2020 5:31:29 AM
FILE: g:\150702\016\sheets\Standards\Bridge\SCC-MD.DGN



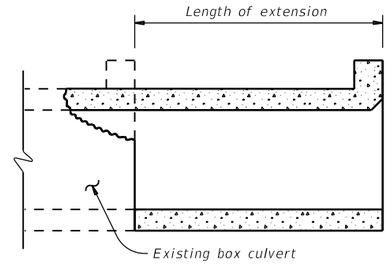
PLAN OF SKEWED ENDS ~ FROM 0° TO 15° (7)



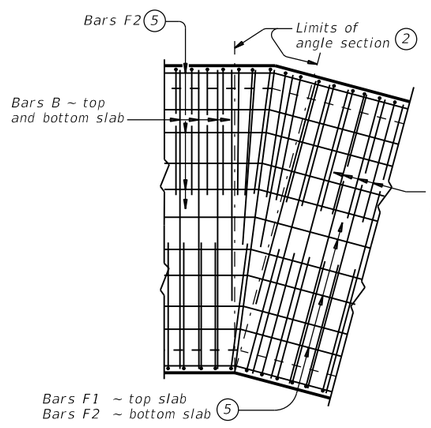
PLAN OF SKEWED ENDS ~ OVER 30° TO 45°



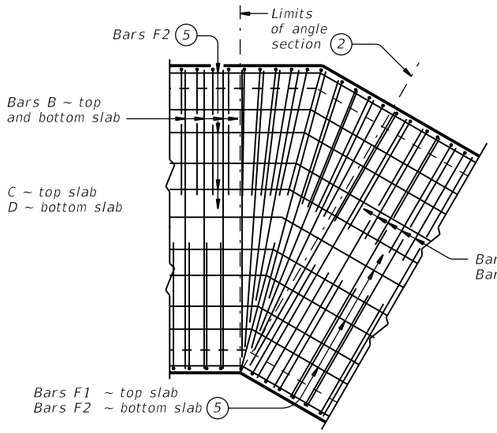
PLAN OF SKEWED ENDS ~ OVER 15° TO 30°



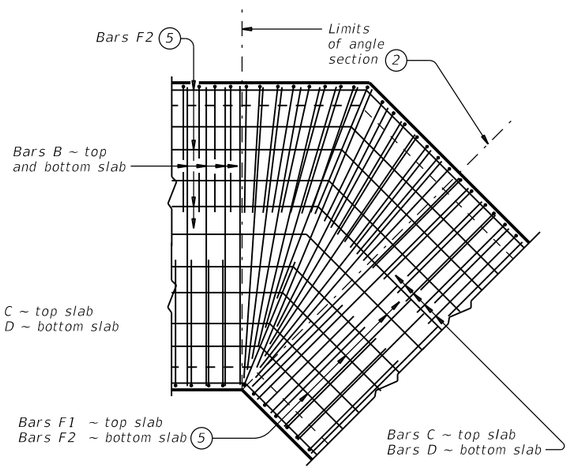
LENGTHENING DETAIL (1)



PLAN OF ANGLE SECTION ~ FROM 0° TO 15°



PLAN OF ANGLE SECTION ~ OVER 15° TO 30°



PLAN OF ANGLE SECTION ~ OVER 30° TO 45°

(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 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 ancher 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] x [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 conflictin 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 ½" 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 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.

HL93 LOADING

Texas Department of Transportation

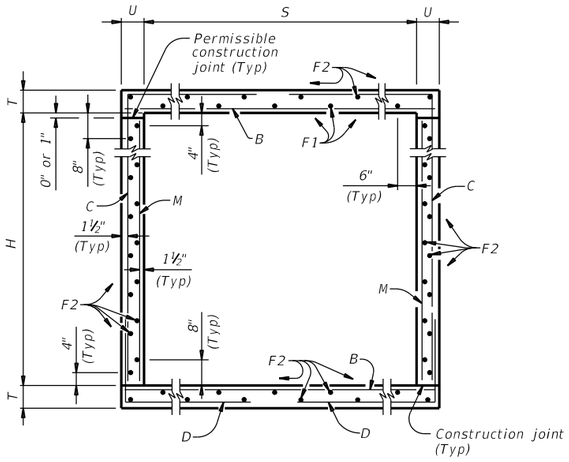
Bridge Division Standard

SINGLE BOX CULVERTS CAST-IN-PLACE MISCELLANEOUS DETAILS

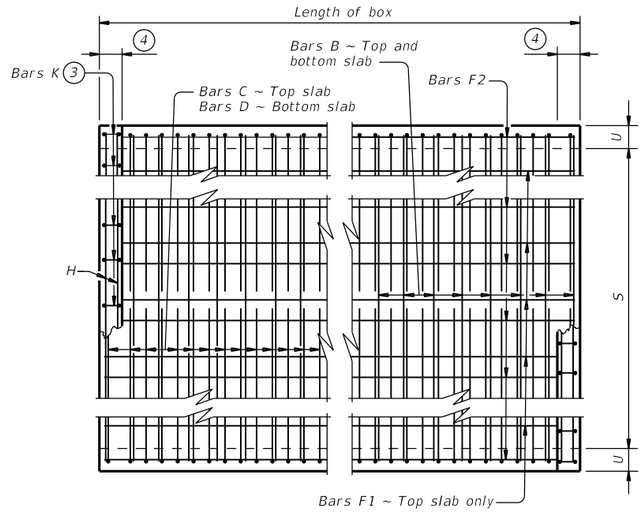
SCC-MD

FILE: sccmdste-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	1507	02	016, Etc.	FM696, Etc.
	DIST	COUNTY		SHEET NO.
	BRY	BURLESON		132

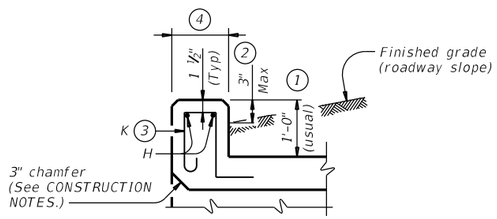
DATE: 9/25/2020 5:31:35 AM
FILE: g:\150702\016\sheets\Standards\Bridge\SCC-3 & 4.dgn



TYPICAL SECTION



PLAN OF REINF STEEL



SECTION THRU CURB

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:

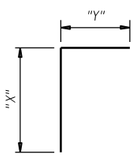
- Uncoated or galvanized ~ #4 = 1'-8" Min
- Uncoated or galvanized ~ #5 = 2'-1" Min

GENERAL NOTES:

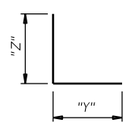
Designed according to AASHTO LRFD Bridge Design Specifications for the range of fill heights shown.

See the Single Box Culverts Cast-In-Place Miscellaneous Detail (SCC-MD) standard sheet for details pertaining to skewed ends, angle sections, and lengthening.

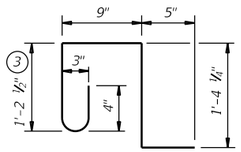
Cover dimensions are clear dimensions, unless noted otherwise.
Reinforcing bar dimensions shown are out-to-out of bar.



BARS C



BARS D



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

HL93 LOADING SHEET 1 OF 2

Texas Department of Transportation

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	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	1507	02	016, Etc.	FM696, Etc.
	DIST	COUNTY		SHEET NO.
	BRY	BURLESON		133

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)	Conc (CY)	Reinf (Lb)	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.

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HL93 LOADING SHEET 2 OF 2

Texas Department of Transportation

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	CK: TxDOT
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REVISIONS	1507	02	016, Etc.	FM696, Etc.
	DIST	COUNTY		SHEET NO.
	BRY	BURLESON		134

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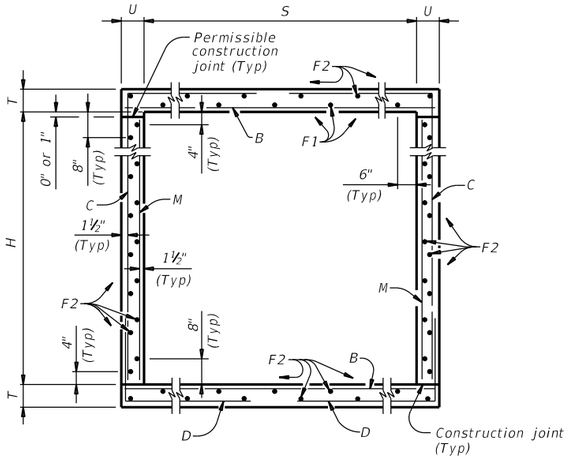
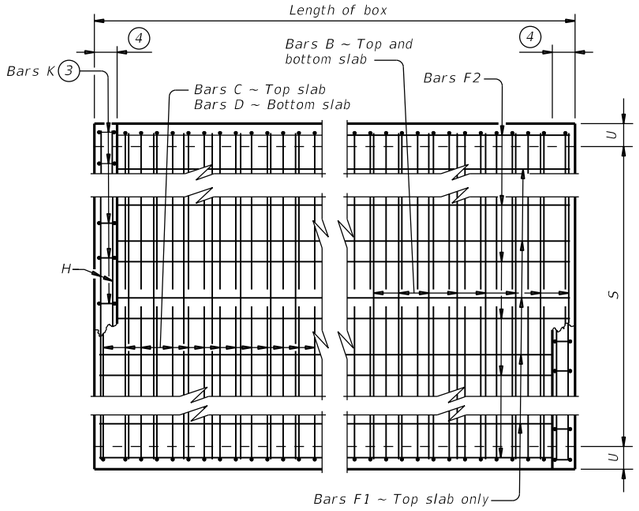
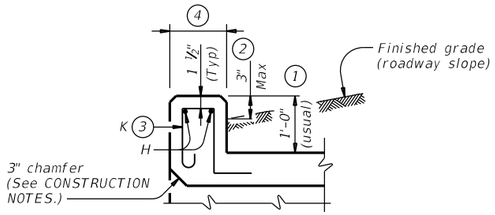


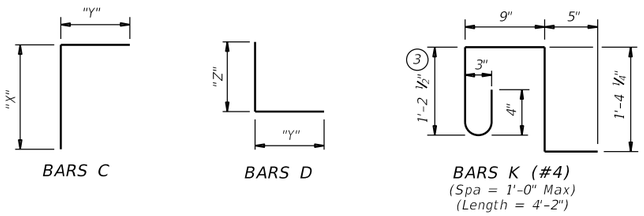
TYPICAL SECTION



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

Texas Department of Transportation

Bridge Division Standard

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

SCC-5 & 6

FILE: scc56ste-20.dgn	DN: TBE	CK: BMP	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	1507	02	016, Etc.	FM696, Etc.
	DIST	COUNTY		SHEET NO.
	BRY	BURLESON		135

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)	Conc (CY)	Reinf (Lb)	Conc (CY)	Reinf (Lb)
5' – 0"	2' – 0"	8"	7"	26'	108	#6	9"	5' – 11"	960	108	#5	9"	6' – 4"	713	2' – 7"	3' – 9"	108	#5	9"	6' – 5"	723	3' – 9"	2' – 8"	108	9"	2' – 0"	144	4	39' – 9"	106	22	39' – 9"	584	5' – 11"	16	14	39	0.391	80.8	0.5	55	16.1	3,285
5' – 0"	2' – 0"	9"	7"	30'	108	#6	9"	5' – 11"	960	108	#5	9"	6' – 5"	723	2' – 8"	3' – 9"	108	#5	9"	6' – 6"	732	3' – 9"	2' – 9"	108	9"	2' – 0"	144	4	39' – 9"	106	22	39' – 9"	584	5' – 11"	16	14	39	0.429	81.2	0.5	55	17.6	3,304
5' – 0"	3' – 0"	8"	7"	26'	108	#6	9"	5' – 11"	960	108	#5	9"	7' – 4"	826	3' – 7"	3' – 9"	108	#5	9"	6' – 5"	723	3' – 9"	2' – 8"	108	9"	3' – 0"	216	4	39' – 9"	106	26	39' – 9"	690	5' – 11"	16	14	39	0.434	88.0	0.5	55	17.8	3,576
5' – 0"	3' – 0"	9"	7"	30'	108	#6	9"	5' – 11"	960	108	#5	9"	7' – 5"	835	3' – 8"	3' – 9"	108	#5	9"	6' – 6"	732	3' – 9"	2' – 9"	108	9"	3' – 0"	216	4	39' – 9"	106	26	39' – 9"	690	5' – 11"	16	14	39	0.472	88.5	0.5	55	19.3	3,594
5' – 0"	4' – 0"	8"	7"	26'	108	#6	9"	5' – 11"	960	108	#5	9"	8' – 4"	939	4' – 7"	3' – 9"	108	#5	9"	6' – 5"	723	3' – 9"	2' – 8"	108	9"	4' – 0"	289	4	39' – 9"	106	26	39' – 9"	690	5' – 11"	16	14	39	0.477	92.7	0.5	55	19.5	3,762
5' – 0"	4' – 0"	9"	7"	30'	108	#6	9"	5' – 11"	960	108	#5	9"	8' – 5"	948	4' – 8"	3' – 9"	108	#5	9"	6' – 6"	732	3' – 9"	2' – 9"	108	9"	4' – 0"	289	4	39' – 9"	106	26	39' – 9"	690	5' – 11"	16	14	39	0.515	93.1	0.5	55	21.1	3,780
5' – 0"	5' – 0"	8"	7"	26'	108	#6	9"	5' – 11"	960	108	#5	9"	9' – 4"	1,051	5' – 7"	3' – 9"	108	#5	9"	6' – 5"	723	3' – 9"	2' – 8"	108	9"	5' – 0"	361	4	39' – 9"	106	30	39' – 9"	797	5' – 11"	16	14	39	0.521	100.0	0.5	55	21.3	4,053
5' – 0"	5' – 0"	9"	7"	30'	108	#6	9"	5' – 11"	960	108	#5	9"	9' – 5"	1,061	5' – 8"	3' – 9"	108	#5	9"	6' – 6"	732	3' – 9"	2' – 9"	108	9"	5' – 0"	361	4	39' – 9"	106	30	39' – 9"	797	5' – 11"	16	14	39	0.559	100.4	0.5	55	22.8	4,072
6' – 0"	2' – 0"	8"	7"	20'	108	#6	9"	6' – 11"	1,122	108	#5	9"	6' – 8"	751	2' – 7"	4' – 1"	108	#5	9"	6' – 9"	760	4' – 1"	2' – 8"	108	9"	2' – 0"	144	5	39' – 9"	133	25	39' – 9"	664	6' – 11"	18	16	45	0.440	89.4	0.5	63	18.1	3,637
6' – 0"	2' – 0"	9"	7"	26'	108	#6	9"	6' – 11"	1,122	162	#5	6"	6' – 9"	1,141	2' – 8"	4' – 1"	162	#5	6"	6' – 10"	1,155	4' – 1"	2' – 9"	108	9"	2' – 0"	144	5	39' – 9"	133	25	39' – 9"	664	6' – 11"	18	16	45	0.485	109.0	0.5	63	19.9	4,422
6' – 0"	2' – 0"	10"	8"	30'	108	#6	9"	7' – 1"	1,149	162	#5	6"	6' – 11"	1,169	2' – 9"	4' – 2"	162	#5	6"	7' – 0"	1,183	4' – 2"	2' – 10"	82	12"	2' – 0"	110	5	39' – 9"	133	25	39' – 9"	664	7' – 1"	19	18	50	0.551	110.2	0.5	69	22.6	4,477
6' – 0"	3' – 0"	8"	7"	20'	108	#6	9"	6' – 11"	1,122	108	#5	9"	7' – 8"	864	3' – 7"	4' – 1"	108	#5	9"	6' – 9"	760	4' – 1"	2' – 8"	108	9"	3' – 0"	216	5	39' – 9"	133	29	39' – 9"	770	6' – 11"	18	16	45	0.484	96.6	0.5	63	19.9	3,928
6' – 0"	3' – 0"	9"	7"	26'	108	#6	9"	6' – 11"	1,122	162	#5	6"	7' – 9"	1,309	3' – 8"	4' – 1"	162	#5	6"	6' – 10"	1,155	4' – 1"	2' – 9"	108	9"	3' – 0"	216	5	39' – 9"	133	29	39' – 9"	770	6' – 11"	18	16	45	0.528	117.6	0.5	63	21.6	4,768
6' – 0"	3' – 0"	10"	8"	30'	108	#6	9"	7' – 1"	1,149	162	#5	6"	7' – 11"	1,338	3' – 9"	4' – 2"	162	#5	6"	7' – 0"	1,183	4' – 2"	2' – 10"	82	12"	3' – 0"	164	5	39' – 9"	133	29	39' – 9"	770	7' – 1"	19	18	50	0.601	118.4	0.5	69	24.6	4,806
6' – 0"	4' – 0"	8"	7"	20'	108	#6	9"	6' – 11"	1,122	108	#5	9"	8' – 8"	976	4' – 7"	4' – 1"	108	#5	9"	6' – 9"	760	4' – 1"	2' – 8"	108	9"	4' – 0"	289	5	39' – 9"	133	29	39' – 9"	770	6' – 11"	18	16	45	0.527	101.3	0.5	63	21.6	4,113
6' – 0"	4' – 0"	9"	7"	26'	108	#6	9"	6' – 11"	1,122	162	#5	6"	8' – 9"	1,478	4' – 8"	4' – 1"	162	#5	6"	6' – 10"	1,155	4' – 1"	2' – 9"	108	9"	4' – 0"	289	5	39' – 9"	133	29	39' – 9"	770	6' – 11"	18	16	45	0.571	123.7	0.5	63	23.4	5,010
6' – 0"	4' – 0"	10"	8"	30'	108	#6	9"	7' – 1"	1,149	162	#5	6"	8' – 11"	1,507	4' – 9"	4' – 2"	162	#5	6"	7' – 0"	1,183	4' – 2"	2' – 10"	82	12"	4' – 0"	219	5	39' – 9"	133	29	39' – 9"	770	7' – 1"	19	18	50	0.650	124.0	0.5	69	26.5	5,030
6' – 0"	5' – 0"	8"	7"	20'	108	#6	9"	6' – 11"	1,122	108	#5	9"	9' – 8"	1,089	5' – 7"	4' – 1"	108	#5	9"	6' – 9"	760	4' – 1"	2' – 8"	108	9"	5' – 0"	361	5	39' – 9"	133	33	39' – 9"	876	6' – 11"	18	16	45	0.570	108.5	0.5	63	23.3	4,404
6' – 0"	5' – 0"	9"	7"	26'	108	#6	9"	6' – 11"	1,122	162	#5	6"	9' – 9"	1,647	5' – 8"	4' – 1"	162	#5	6"	6' – 10"	1,155	4' – 1"	2' – 9"	108	9"	5' – 0"	361	5	39' – 9"	133	33	39' – 9"	876	6' – 11"	18	16	45	0.614	132.4	0.5	63	25.1	5,357
6' – 0"	5' – 0"	10"	8"	30'	108	#6	9"	7' – 1"	1,149	162	#5	6"	9' – 11"	1,676	5' – 9"	4' – 2"	162	#5	6"	7' – 0"	1,183	4' – 2"	2' – 10"	82	12"	5' – 0"	274	5	39' – 9"	133	33	39' – 9"	876	7' – 1"	19	18	50	0.700	132.3	0.5	69	28.5	5,360
6' – 0"	6' – 0"	8"	7"	20'	108	#6	9"	6' – 11"	1,122	108	#5	9"	10' – 8"	1,202	6' – 7"	4' – 1"	108	#5	9"	6' – 9"	760	4' – 1"	2' – 8"	108	9"	6' – 0"	433	5	39' – 9"	133	37	39' – 9"	982	6' – 11"	18	16	45	0.613	115.8	0.5	63	25.0	4,695
6' – 0"	6' – 0"	9"	7"	26'	108	#6	9"	6' – 11"	1,122	162	#5	6"	10' – 9"	1,816	6' – 8"	4' – 1"	162	#5	6"	6' – 10"	1,155	4' – 1"	2' – 9"	108	9"	6' – 0"	433	5	39' – 9"	133	37	39' – 9"	982	6' – 11"	18	16	45	0.657	141.0	0.5	63	26.8	5,704
6' – 0"	6' – 0"	10"	8"	30'	108	#6	9"	7' – 1"	1,149	162	#5	6"	10' – 11"	1,845	6' – 9"	4' – 2"	162	#5	6"	7' – 0"	1,183	4' – 2"	2' – 10"	82	12"	6' – 0"	329	5	39' – 9"	133	37	39' – 9"	982	7' – 1"	19	18	50	0.749	140.5	0.5	69	30.5	5,690

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

DATE: 9/25/2020 5:31:46 AM
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HL93 LOADING SHEET 2 OF 2

Texas Department of Transportation

Bridge Division Standard

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

SCC-5 & 6

FILE: scc56ste-20.dgn	DN: TBE	CK: BMP	DW: TxDOT	CK: TxDOT	
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY	
REVISIONS	1507	02	016, Etc.	FM696, Etc.	
	DIST	COUNTY		SHEET NO.	
	BRY	BURLESON		136	

DATE: 9/25/2020 5:31:52 AM
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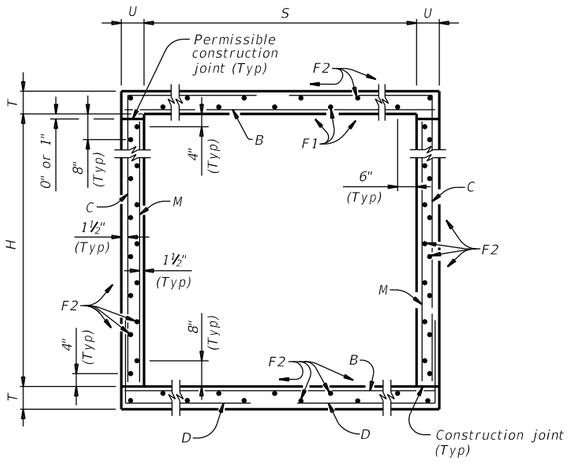
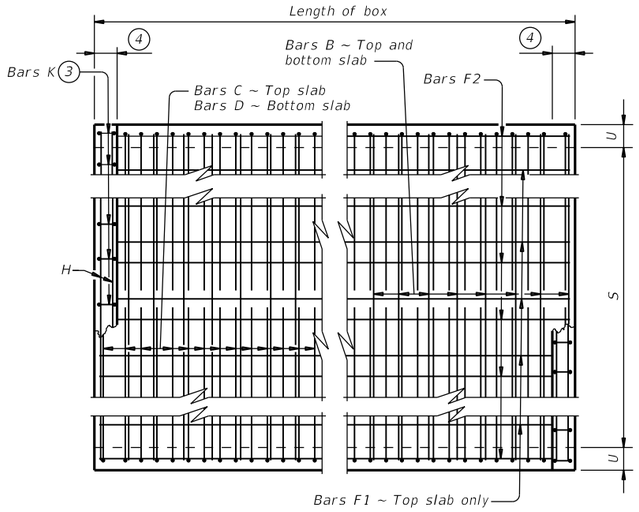
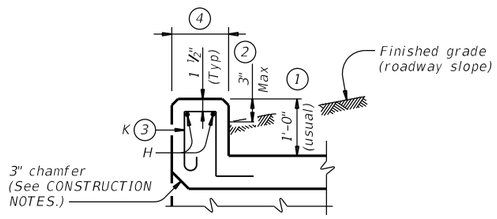


TYPICAL SECTION



PLAN OF REINF STEEL



SECTION THRU CURB

(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:

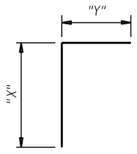
Provide Grade 60 reinforcing steel.
Provide galvanized reinforcing steel if required elsewhere in the plans.
Provide Class C concrete (f'_c = 3,600 psi) for culvert barrel and curb, with the following exceptions: provide Class S concrete (f'_c = 4,000 psi) for top slabs of:
- culverts with overlay,
- 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

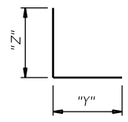
GENERAL NOTES:

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.

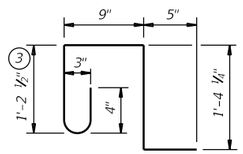
Cover dimensions are clear dimensions, unless noted otherwise.
Reinforcing bar dimensions shown are out-to-out of bar.



BARS C



BARS D



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

HL93 LOADING SHEET 1 OF 2

Texas Department of Transportation

Bridge Division Standard

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

SCC-8

FILE: scc08ste-20.dgn	DN: TBE	CK: BMP	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	1507	02	016, Etc.	FM696, Etc.
	DIST	COUNTY		SHEET NO.
	BRY	BURLESON		137

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)	Conc (CY)	Reinf (Lb)	Conc (CY)	Reinf (Lb)
8' – 0"	3' – 0"	8"	7"	13'	162	#6	6"	8' – 11"	2,170	108	#6	9"	8' – 9"	1,419	3' – 7"	5' – 2"	108	#6	9"	8' – 3"	1,338	5' – 2"	3' – 1"	108	9"	3' – 0"	216	6	39' – 9"	159	32	39' – 9"	850	8' – 11"	24	20	56	0.582	153.8	0.7	80	24.0	6,232
8' – 0"	3' – 0"	8"	7"	16'	162	#6	6"	8' – 11"	2,170	108	#6	9"	8' – 9"	1,419	3' – 7"	5' – 2"	108	#6	9"	8' – 3"	1,338	5' – 2"	3' – 1"	108	9"	3' – 0"	216	6	39' – 9"	159	32	39' – 9"	850	8' – 11"	24	20	56	0.582	153.8	0.7	80	24.0	6,232
8' – 0"	3' – 0"	10"	8"	20'	162	#6	6"	9' – 1"	2,210	108	#6	9"	8' – 11"	1,446	3' – 9"	5' – 2"	108	#6	9"	8' – 5"	1,365	5' – 2"	3' – 3"	82	12"	3' – 0"	164	6	39' – 9"	159	32	39' – 9"	850	9' – 1"	24	22	61	0.724	154.9	0.7	85	29.6	6,279
8' – 0"	3' – 0"	11"	8"	23'	162	#6	6"	9' – 1"	2,210	108	#6	9"	9' – 0"	1,460	3' – 10"	5' – 2"	108	#6	9"	8' – 6"	1,379	5' – 2"	3' – 4"	82	12"	3' – 0"	164	6	39' – 9"	159	32	39' – 9"	850	9' – 1"	24	22	61	0.782	155.6	0.7	85	32.0	6,307
8' – 0"	3' – 0"	13"	9"	30'	162	#6	6"	9' – 3"	2,251	108	#6	9"	9' – 3"	1,500	4' – 0"	5' – 3"	108	#6	9"	8' – 9"	1,419	5' – 3"	3' – 6"	108	9"	3' – 0"	216	6	39' – 9"	159	32	39' – 9"	850	9' – 3"	25	22	61	0.929	159.9	0.7	86	37.9	6,481
8' – 0"	4' – 0"	8"	7"	13'	162	#6	6"	8' – 11"	2,170	108	#6	9"	9' – 9"	1,582	4' – 7"	5' – 2"	108	#6	9"	8' – 3"	1,338	5' – 2"	3' – 1"	108	9"	4' – 0"	289	6	39' – 9"	159	32	39' – 9"	850	8' – 11"	24	20	56	0.626	159.7	0.7	80	25.7	6,468
8' – 0"	4' – 0"	8"	7"	16'	162	#6	6"	8' – 11"	2,170	108	#6	9"	9' – 9"	1,582	4' – 7"	5' – 2"	108	#6	9"	8' – 3"	1,338	5' – 2"	3' – 1"	108	9"	4' – 0"	289	6	39' – 9"	159	32	39' – 9"	850	8' – 11"	24	20	56	0.626	159.7	0.7	80	25.7	6,468
8' – 0"	4' – 0"	10"	8"	20'	162	#6	6"	9' – 1"	2,210	108	#6	9"	9' – 11"	1,609	4' – 9"	5' – 2"	108	#6	9"	8' – 5"	1,365	5' – 2"	3' – 3"	82	12"	4' – 0"	219	6	39' – 9"	159	32	39' – 9"	850	9' – 1"	24	22	61	0.774	160.3	0.7	85	31.6	6,497
8' – 0"	4' – 0"	11"	8"	23'	162	#6	6"	9' – 1"	2,210	108	#6	9"	10' – 0"	1,622	4' – 10"	5' – 2"	108	#6	9"	8' – 6"	1,379	5' – 2"	3' – 4"	82	12"	4' – 0"	219	6	39' – 9"	159	32	39' – 9"	850	9' – 1"	24	22	61	0.831	161.0	0.7	85	33.9	6,524
8' – 0"	4' – 0"	13"	9"	30'	162	#6	6"	9' – 3"	2,251	108	#6	9"	10' – 3"	1,663	5' – 0"	5' – 3"	108	#6	9"	8' – 9"	1,419	5' – 3"	3' – 6"	108	9"	4' – 0"	289	6	39' – 9"	159	32	39' – 9"	850	9' – 3"	25	22	61	0.985	165.8	0.7	86	40.1	6,717
8' – 0"	5' – 0"	8"	7"	13'	162	#6	6"	8' – 11"	2,170	108	#6	9"	10' – 9"	1,744	5' – 7"	5' – 2"	108	#6	9"	8' – 3"	1,338	5' – 2"	3' – 1"	108	9"	5' – 0"	361	6	39' – 9"	159	36	39' – 9"	956	8' – 11"	24	20	56	0.669	168.2	0.7	80	27.4	6,808
8' – 0"	5' – 0"	8"	7"	16'	162	#6	6"	8' – 11"	2,170	108	#6	9"	10' – 9"	1,744	5' – 7"	5' – 2"	108	#6	9"	8' – 3"	1,338	5' – 2"	3' – 1"	108	9"	5' – 0"	361	6	39' – 9"	159	36	39' – 9"	956	8' – 11"	24	20	56	0.669	168.2	0.7	80	27.4	6,808
8' – 0"	5' – 0"	10"	8"	20'	162	#6	6"	9' – 1"	2,210	108	#6	9"	10' – 11"	1,771	5' – 9"	5' – 2"	108	#6	9"	8' – 5"	1,365	5' – 2"	3' – 3"	82	12"	5' – 0"	274	6	39' – 9"	159	36	39' – 9"	956	9' – 1"	24	22	61	0.823	168.4	0.7	85	33.6	6,820
8' – 0"	5' – 0"	11"	8"	23'	162	#6	6"	9' – 1"	2,210	108	#6	9"	11' – 0"	1,784	5' – 10"	5' – 2"	108	#6	9"	8' – 6"	1,379	5' – 2"	3' – 4"	82	12"	5' – 0"	274	6	39' – 9"	159	36	39' – 9"	956	9' – 1"	24	22	61	0.881	169.1	0.7	85	35.9	6,847
8' – 0"	5' – 0"	13"	9"	30'	162	#6	6"	9' – 3"	2,251	108	#6	9"	11' – 3"	1,825	6' – 0"	5' – 3"	108	#6	9"	8' – 9"	1,419	5' – 3"	3' – 6"	108	9"	5' – 0"	361	6	39' – 9"	159	36	39' – 9"	956	9' – 3"	25	22	61	1.040	174.3	0.7	86	42.3	7,057
8' – 0"	6' – 0"	8"	7"	13'	162	#6	6"	8' – 11"	2,170	108	#6	9"	11' – 9"	1,906	6' – 7"	5' – 2"	108	#6	9"	8' – 3"	1,338	5' – 2"	3' – 1"	108	9"	6' – 0"	433	6	39' – 9"	159	40	39' – 9"	1,062	8' – 11"	24	20	56	0.712	176.7	0.7	80	29.2	7,148
8' – 0"	6' – 0"	8"	7"	16'	162	#6	6"	8' – 11"	2,170	108	#6	9"	11' – 9"	1,906	6' – 7"	5' – 2"	108	#6	9"	8' – 3"	1,338	5' – 2"	3' – 1"	108	9"	6' – 0"	433	6	39' – 9"	159	40	39' – 9"	1,062	8' – 11"	24	20	56	0.712	176.7	0.7	80	29.2	7,148
8' – 0"	6' – 0"	10"	8"	20'	162	#6	6"	9' – 1"	2,210	108	#6	9"	11' – 11"	1,933	6' – 9"	5' – 2"	108	#6	9"	8' – 5"	1,365	5' – 2"	3' – 3"	82	12"	6' – 0"	329	6	39' – 9"	159	40	39' – 9"	1,062	9' – 1"	24	22	61	0.872	176.5	0.7	85	35.6	7,143
8' – 0"	6' – 0"	11"	8"	23'	162	#6	6"	9' – 1"	2,210	108	#6	9"	12' – 0"	1,947	6' – 10"	5' – 2"	108	#6	9"	8' – 6"	1,379	5' – 2"	3' – 4"	82	12"	6' – 0"	329	6	39' – 9"	159	40	39' – 9"	1,062	9' – 1"	24	22	61	0.930	177.2	0.7	85	37.9	7,171
8' – 0"	6' – 0"	13"	9"	30'	162	#6	6"	9' – 3"	2,251	108	#6	9"	12' – 3"	1,987	7' – 0"	5' – 3"	108	#6	9"	8' – 9"	1,419	5' – 3"	3' – 6"	108	9"	6' – 0"	433	6	39' – 9"	159	40	39' – 9"	1,062	9' – 3"	25	22	61	1.096	182.8	0.7	86	44.5	7,397
8' – 0"	7' – 0"	8"	7"	13'	162	#6	6"	8' – 11"	2,170	108	#6	9"	12' – 9"	2,068	7' – 7"	5' – 2"	108	#6	9"	8' – 3"	1,338	5' – 2"	3' – 1"	108	9"	7' – 0"	505	6	39' – 9"	159	40	39' – 9"	1,062	8' – 11"	24	20	56	0.755	182.6	0.7	80	30.9	7,382
8' – 0"	7' – 0"	8"	7"	16'	162	#6	6"	8' – 11"	2,170	162	#6	6"	12' – 9"	3,102	7' – 7"	5' – 2"	162	#6	6"	8' – 3"	2,007	5' – 2"	3' – 1"	108	9"	7' – 0"	505	6	39' – 9"	159	40	39' – 9"	1,062	8' – 11"	24	20	56	0.755	225.1	0.7	80	30.9	9,085
8' – 0"	7' – 0"	10"	8"	20'	162	#6	6"	9' – 1"	2,210	162	#6	6"	12' – 11"	3,143	7' – 9"	5' – 2"	162	#6	6"	8' – 5"	2,048	5' – 2"	3' – 3"	82	12"	7' – 0"	383	6	39' – 9"	159	40	39' – 9"	1,062	9' – 1"	24	22	61	0.922	225.1	0.7	85	37.6	9,090
8' – 0"	7' – 0"	11"	8"	23'	162	#6	6"	9' – 1"	2,210	162	#6	6"	13' – 0"	3,163	7' – 10"	5' – 2"	162	#6	6"	8' – 6"	2,068	5' – 2"	3' – 4"	82	12"	7' – 0"	383	6	39' – 9"	159	40	39' – 9"	1,062	9' – 1"	24	22	61	0.979	226.1	0.7	85	39.8	9,130
8' – 0"	7' – 0"	13"	9"	30'	162	#6	6"	9' – 3"	2,251	162	#6	6"	13' – 3"	3,224	8' – 0"	5' – 3"	162	#6	6"	8' – 9"	2,129	5' – 3"	3' – 6"	108	9"	7' – 0"	505	6	39' – 9"	159	40	39' – 9"	1,062	9' – 3"	25	22	61	1.151	233.3	0.7	86	46.7	9,416
8' – 0"	8' – 0"	8"	7"	13'	162	#6	6"	8' – 11"	2,170	108	#6	9"	13' – 9"	2,230	8' – 7"	5' – 2"	108	#6	9"	8' – 3"	1,338	5' – 2"	3' – 1"	108	9"	8' – 0"	577	6	39' – 9"	159	44	39' – 9"	1,168	8' – 11"	24	20	56	0.798	191.1	0.7	80	32.6	7,722
8' – 0"	8' – 0"	8"	7"	16'	162	#6	6"	8' – 11"	2,170	108	#6	9"	13' – 9"	2,230	8' – 7"	5' – 2"	162	#6	6"	8' – 3"	2,007	5' – 2"	3' – 1"	108	9"	8' – 0"	577	6	39' – 9"	159	44	39' – 9"	1,168	8' – 11"	24	20	56	0.798	207.8	0.7	80	32.6	8,391
8' – 0"	8' – 0"	10"	8"	20'	162	#6	6"	9' – 1"	2,210	108	#6	9"	13' – 11"	2,258	8' – 9"	5' – 2"	162	#6	6"	8' – 5"	2,048	5' – 2"	3' – 3"	108	9"	8' – 0"	577	6	39' – 9"	159	44	39' – 9"	1,168	9' – 1"	24	22	61	0.971	210.5	0.7	85	39.5	8,505
8' – 0"	8' – 0"	11"	8"	23'	162	#6	6"	9' – 1"	2,210	108	#6	9"	14' – 0"	2,271	8' – 10"	5' – 2"	162	#6	6"	8' – 6"	2,068	5' – 2"	3' – 4"	162	6"	8' – 0"	866	6	39' – 9"	159	44	39' – 9"	1,168	9' – 1"	24	22	61	1.029	218.6	0.7	85	41.8	8,827
8' – 0"	8' – 0"	13"	9"	30'	162	#6	6"	9' – 3"	2,251	108	#6	9"	14' – 3"	2,312	9' – 0"	5' – 3"	162	#6	6"	8' – 9"	2,129	5' – 3"	3' – 6"	162	6"	8' – 0"	866	6	39' – 9"	159	44	39' – 9"	1,168	9' – 3"	25	22	61	1.207	222.1	0.7	86	49.0	8,971

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

DATE: 9/25/2020 5:31:54 AM
FILE: g:\150702\016\sheets\Standards\Bridge\SCC-8.DGN

HL93 LOADING SHEET 2 OF 2

Texas Department of Transportation — Bridge Division Standard

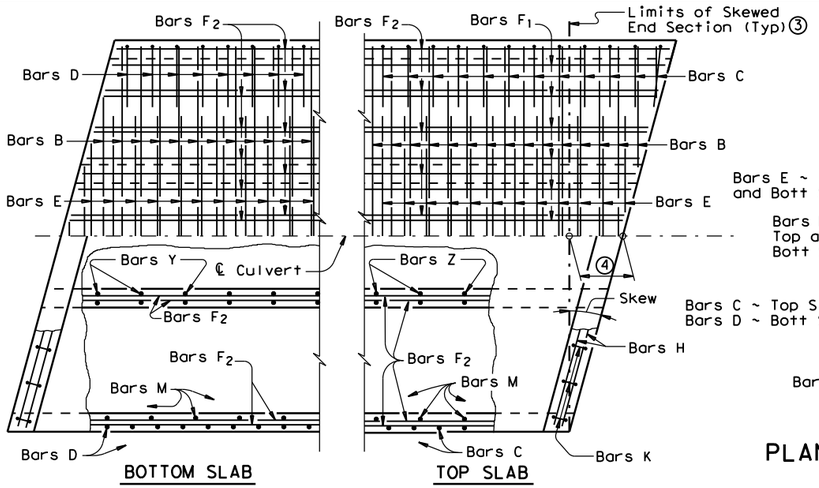
SINGLE BOX CULVERTS CAST-IN-PLACE
0' TO 30' FILL

SCC-8

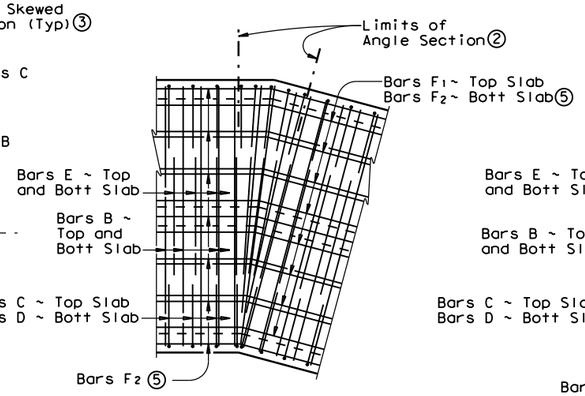
FILE: scc08ste-20.dgn	DN: TBE	CK: BMP	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	1507	02	016, Etc.	FM696, Etc.
	DIST	COUNTY		SHEET NO.
	BRY	BURLESON		138

ACTIVE FILE LEVELS DISPLAYED

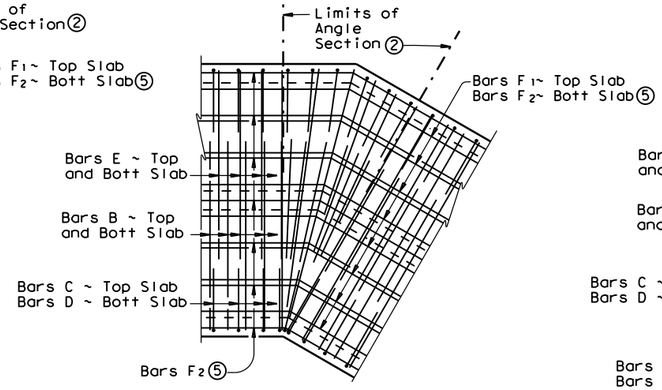
COMMENTS:



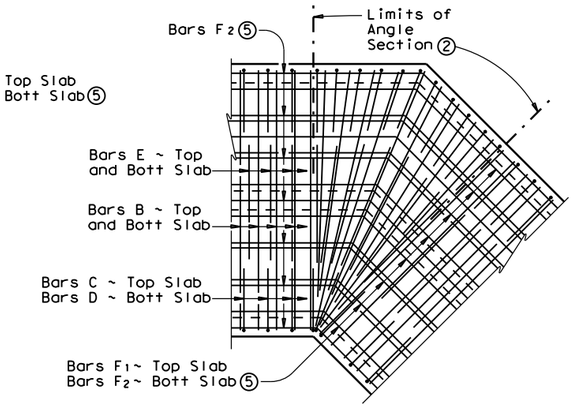
PLAN OF SKEWED ENDS ~ FROM 0° TO 15° ⑦



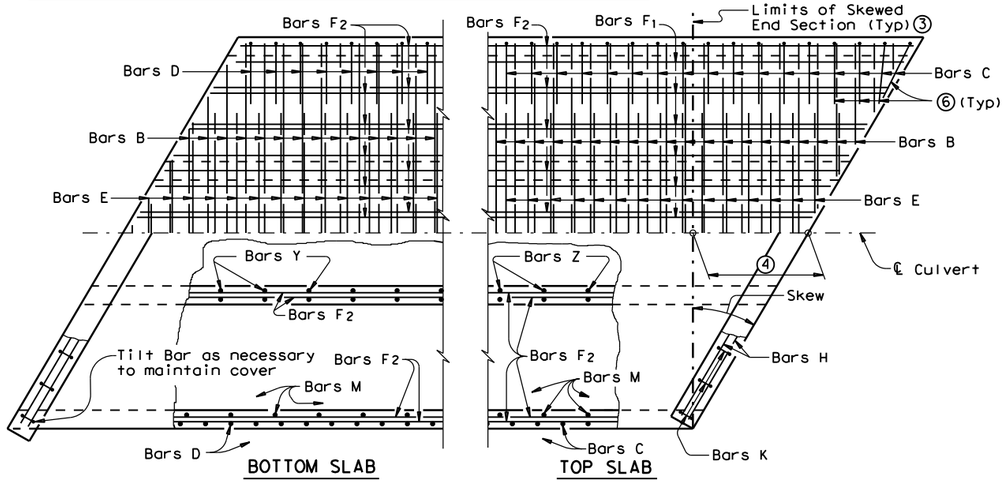
PLAN OF ANGLE SECTION ~ FROM 0° TO 15°



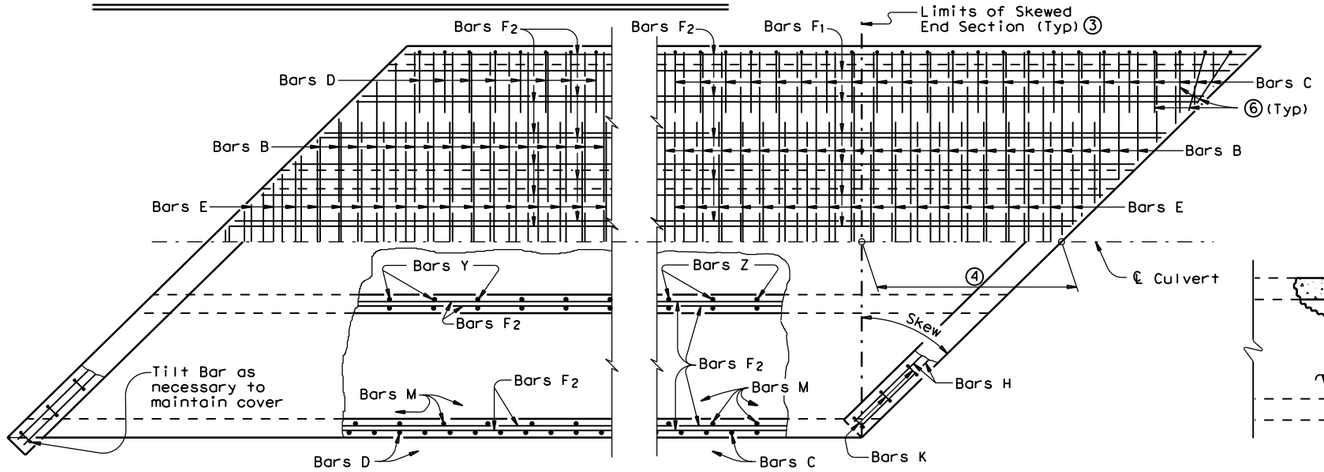
PLAN OF ANGLE SECTION ~ OVER 15° TO 30°



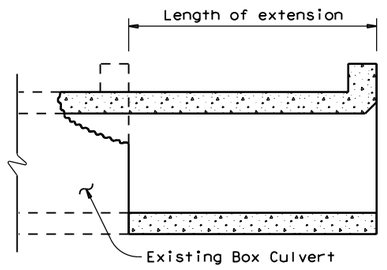
PLAN OF ANGLE SECTION ~ OVER 30° TO 45°



PLAN OF SKEWED ENDS ~ OVER 15° TO 30°



PLAN OF SKEWED ENDS ~ OVER 30° TO 45°



LENGTHENING DETAIL ①

GENERAL NOTES:

Designed according to AASHTO LRFD Specifications.

All reinforcing steel shall be Grade 60.

All concrete shall be Class "C" with these exceptions: use Class "S" for top slabs of culverts with overlay, with 1-to-2 course surface treatment, or with the top slab as the final riding surface.

Class "C" concrete shall have a minimum compressive strength of 3,600 psi. Class "S" concrete shall have a minimum compressive strength of 4,000 psi.

Refer to Multiple Box Culverts Cast-in-Place standard for details of straight sections of culvert. For skewed sections and angle sections refer to Multiple Box Culverts Cast-in-Place standard for slab and wall dimensions, bar sizes, maximum bar spacing, and any other details not shown. For Skewed ends with curbs, adjust length of Bars H, number of Bars K, curb concrete volume and reinforcing steel weight by dividing the values shown on the culvert standards by the cosine of the skew angle.

The use of permanent forms is not allowed.

Laps for Bars H, when required, shall be 1'-9" for uncoated bars and 2'-7" for epoxy coated.

① For box culverts with less than 2'-0" of fill, the top slab shall be broken back to provide a minimum 1'-10" lap of the existing longitudinal bars with the longitudinal bars in the extension. If the depth of fill is 2'-0" or greater, the top slab shall be broken back to provide a 1'-0" minimum embedment of existing longitudinal reinforcing into the extension. Alternatively, if the fill height is greater than 2'-0", the existing curb may be left in place and 2'-0" long #6 bars shall be drilled and grouted 1'-0" into the existing top slab at 1'-6" center to center spacing. Wings and apron shall be broken back as necessary to install the extension. Exposed wingwall and apron reinforcing may be removed or cleaned and included in the extension. When lengthening existing box culverts with dimensions different than current standard dimensions, horizontal and vertical transitions shall be formed as directed by the Engineer. Bottom slabs shall match to maintain an uninterrupted flow line. Existing and new reinforcing shall be field bent into transition maintaining specified cover requirements. For top slabs of culverts with overlay, with 1-to-2 course surface treatment, or with the top slab as the final riding surface, the "H" dimension may be adjusted to provide a smooth riding surface.

② When the spacing between Bars B or Bars E becomes less than half of the normal spacing, bars shall be cut to avoid fouling

③ The length of Bars B and E will vary in the skewed end sections

④ [One half of overall width] x [Tan of the skew angle]

⑤ Bars F1 and F2 shall be continuous through the angle section. They shall be bent to remain parallel to the walls of the Box Culvert.

⑥ When necessary to avoid fouling in acute corners, the slab extension leg of Bars C and Bars D may be shortened to a minimum of 1'-6" for skews of 30° and 45°.

⑦ For skews of 15° or less, the contractor has the option of placing Bars B, C, D and E parallel to the skewed end while maintaining spacing along centerline box. Lengths of Bars B and E shown on the standards shall be increased to accommodate the skew.

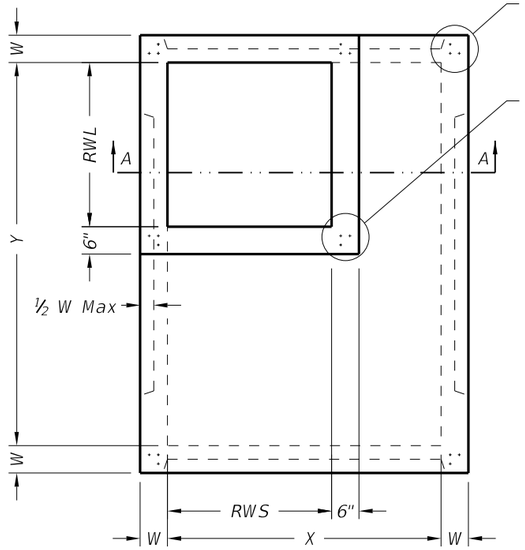
HL93 LOADING

Texas Department of Transportation
Bridge Division

MULTIPLE BOX CULVERTS CAST-IN-PLACE MISCELLANEOUS DETAILS

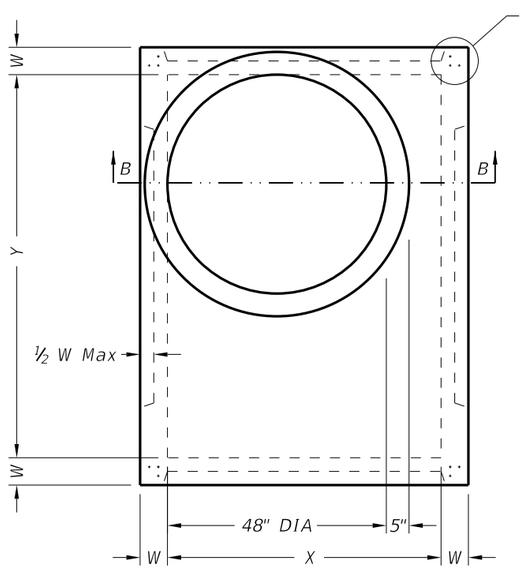
MC-MD

FILE: mc-mdste.dgn	DN: GAF	CK: LMW	DW: BWH/TxDOT	CK: GAF
©TxDOT February 2010	DISTRICT	FEDERAL AID PROJECT		SHEET
REVISIONS	BRY			139
	COUNTY	CONTROL	SECT	JOB	HIGHWAY
	BURLESON	1507	020	6, ETC.



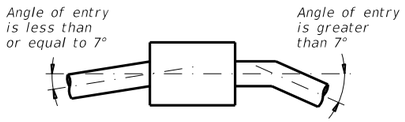
PLAN VIEW "A"

SQUARE REDUCED RISER OPTION



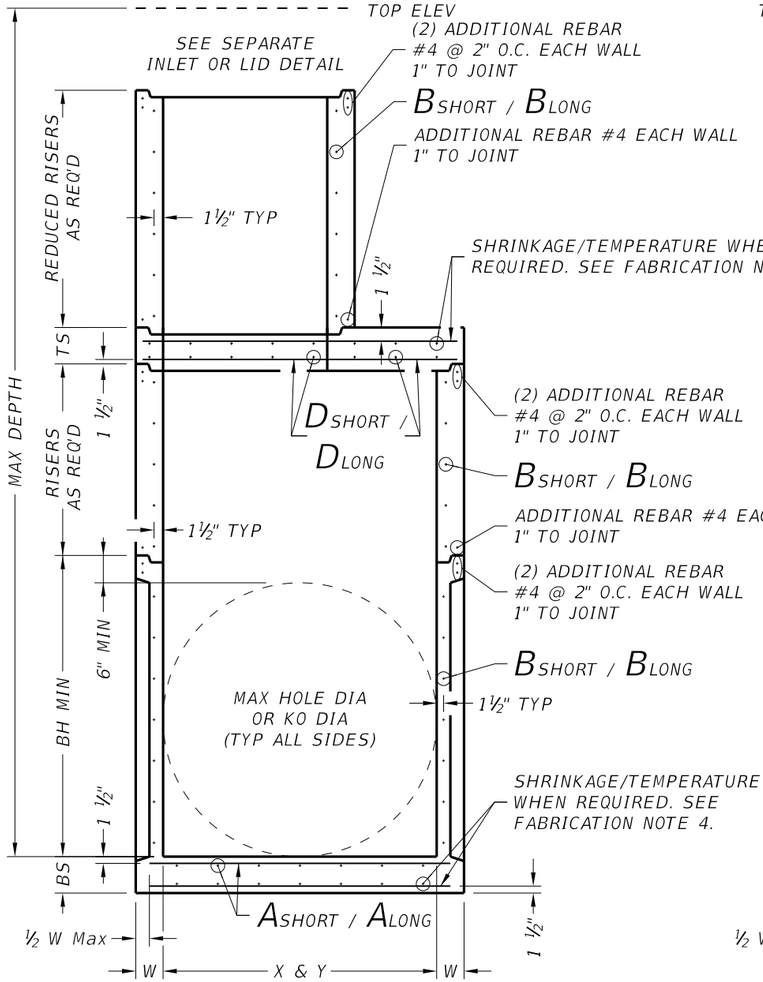
PLAN VIEW "B"

ROUND REDUCED RISER OPTION



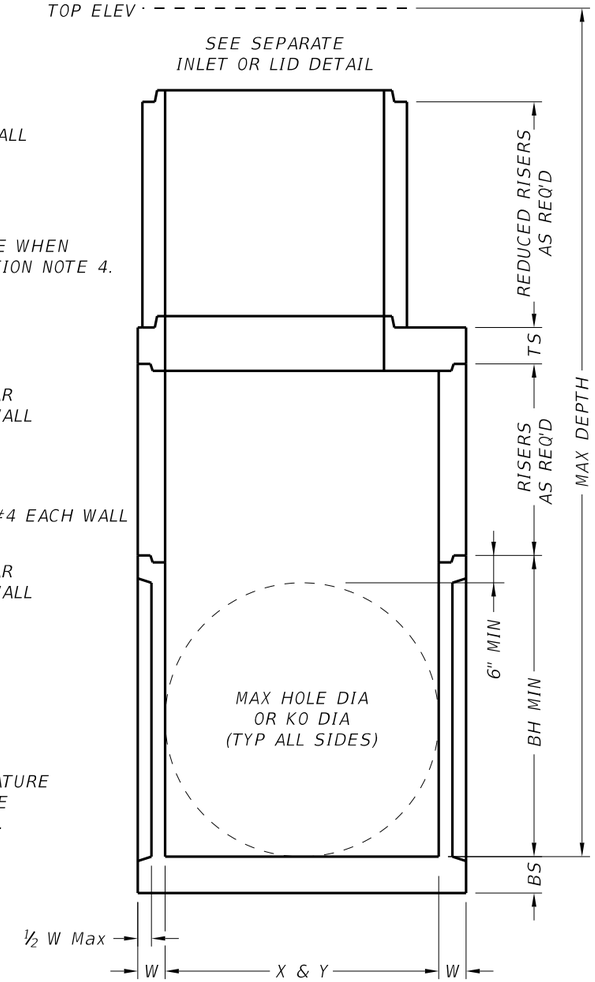
PIPE CONNECTION DETAIL

Connect pipes within 7° of normal to PB wall.
If necessary, use pipe elbow or curved
approach alignment to stay within this limit.



SECTION A-A

SQUARE REDUCED RISER OPTION



SECTION B-B

ROUND REDUCED RISER OPTION

FABRICATION NOTES:

1. Provide Class "H" concrete in accordance with Item 421 and having a minimum compressive strength of 5,000 psi.
2. Provide Grade 60 reinforcing steel or equivalent area of WWR.
3. Provide typical clear cover of 1 ½" to reinforcing steel at interior or exterior walls.
4. Walls or slabs with a thickness of 8" or greater require shrinkage and temperature reinforcing steel. Provide steel area = 0.11 in²/ft each way.
5. No substitution is allowed for vertical and horizontal #4 bars in corners.
6. Manufacture base and risers to nearest 3" increment.
7. Design tongue and groove joints for full closure on both shoulders. Minimum spigot depth is ¾".
8. Provide lifting devices in conformance with Manufacturer's recommendations.
9. See sheet PDD for sizes, dimensions, and reinforcing steel not shown.

Cover dimensions are clear dimensions, unless noted otherwise.

INSTALLATION NOTES:

1. If required elsewhere. Inverts (benching) to be provided by Contractor. Concrete or mortar used for invert is subsidiary to specified inlet or manhole.
2. Seal tongue and groove joints with preformed or bulk mastic in conformance with Manufacturer's recommendations. Tongue and groove joints may be grouted no more than 1" between each section, or ½ the joint depth, whichever is greater.
3. Do not grout rubber gasket joints without Manufacturer's recommendation.
4. For rigid pipe, cut hole in thin wall panel (KO) 4" Max, 2" Min larger than pipe OD.
5. For flexible pipe, consult boot/seal Manufacturer's specification for placement tolerance and hole size. Center pipe in hole and install boot/seal per Manufacturer's specification.

GENERAL NOTES:

1. Precast Base consists of base slab, base unit, risers (as required), reducing slab (as required), and reduced risers (as required). See sheet PDD for sizes.
2. Designed according to ASTM C913.
3. Payment for precast base is subsidiary to the specified inlet, per Item 465, "Junction Boxes, Manholes, and Inlets."

HL93 LOADING

Texas Department of Transportation

Bridge Division Standard

PRECAST BASE

PB

FILE: prestd01-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	1507	02	016, ETC.	FM 696, ETC.
	DIST	COUNTY		SHEET NO.
	BRY	BURLESON		140

DATE: 12/15/2020 10:12:52 PM
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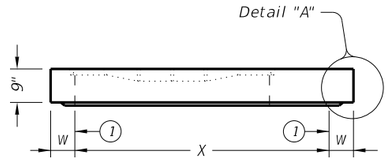
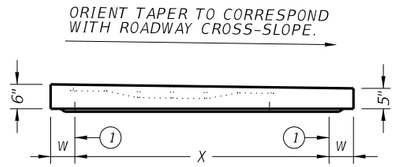
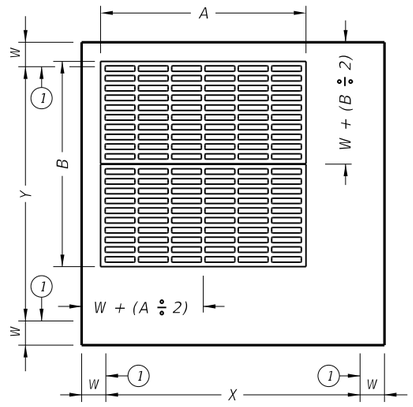


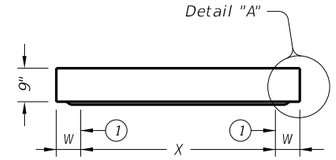
STYLE 'FG'



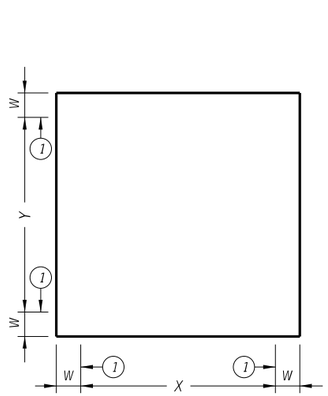
STYLE 'SFG'
ELEVATION VIEW



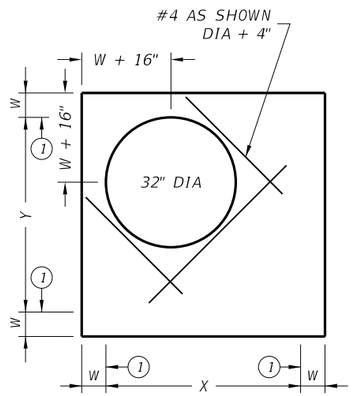
PLAN VIEW
CAST-IN FRAME & GRATE
STYLES 'FG' & 'SFG'



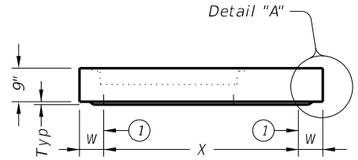
ELEVATION VIEW
ELEVATION VIEW



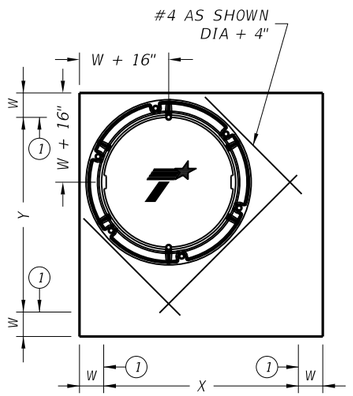
PLAN VIEW
NO OPENINGS
STYLE 'SL'



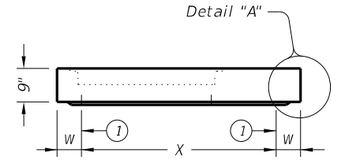
PLAN VIEW
SHIP LOOSE RING & COVER
STYLE 'RH'



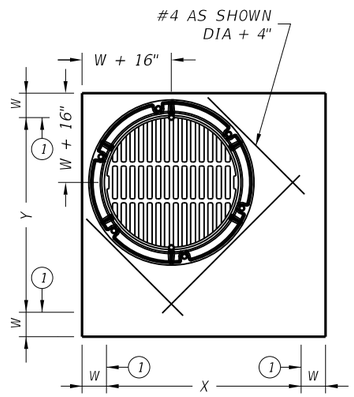
ELEVATION VIEW



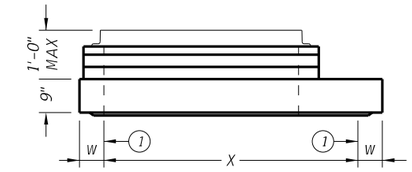
PLAN VIEW
32" DIA CAST-IN RING & COVER
STYLE 'RC'



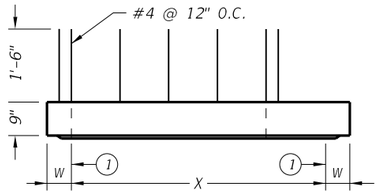
ELEVATION VIEW



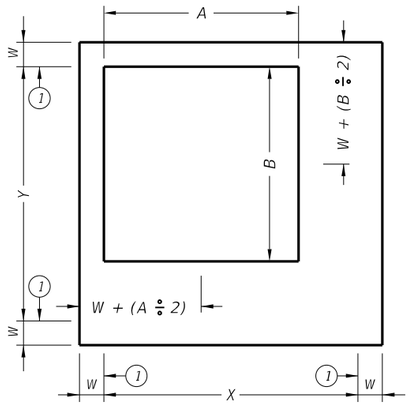
PLAN VIEW
32" DIA CAST-IN RING & GRATE
STYLE 'RG'



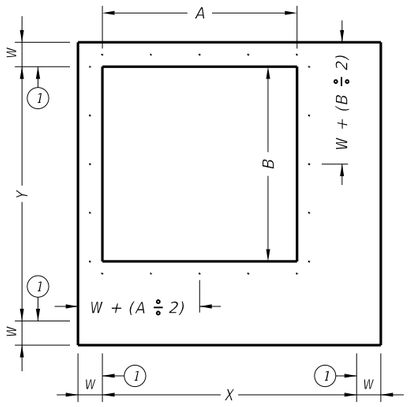
ELEVATION VIEW



ELEVATION VIEW



PLAN VIEW
SHIP LOOSE FRAME & GRATE
STYLE 'SH'



PLAN VIEW
EXPOSED REBAR
STYLE 'S1'

(1) Matches inside face of wall of precast base or riser below inlet.

HL93 LOADING SHEET 1 OF 2

Texas Department of Transportation
Bridge Division Standard

PRECAST SLAB LID

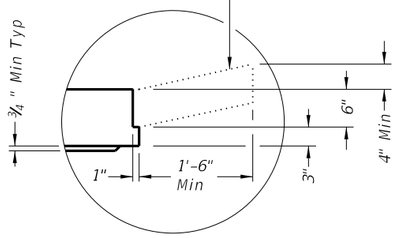
PSL

FILE: prestd05.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT January 2015	CONT	SECT	JOB	HIGHWAY
REVISIONS	1507	02	016, ETC.	FM 696, ETC.
	DIST	COUNTY		SHEET NO.
	BRY	BURLESON		141

Style	Size (X x Y)	W (2)	A x B (nominal)	Short Span Reinf Steel Area	Long Span Reinf Steel Area
SL	3'x3'	6"	n/a	0.37 in²/ft	0.37 in²/ft
RH,RC,RG,SH,S1,FG	3'x3'	6"	3'x3' or 32" Dia	0.37 in²/ft	0.37 in²/ft
SFG	3'x3'	6"	3'x3'	0.32 in²/ft	0.32 in²/ft
SL	4'x4'	6"	n/a	0.34 in²/ft	0.34 in²/ft
RH,RC,RG,SH,S1,FG	4'x4'	6"	3'x3' or 32" Dia	0.41 in²/ft	0.41 in²/ft
SH,S1,FG	4'x4'	6"	4'x4'	0.41 in²/ft	0.41 in²/ft
SFG	4'x4'	6"	4'x4'	0.32 in²/ft	0.32 in²/ft
SL	3'x5'	6"	n/a	0.39 in²/ft	0.39 in²/ft
RH,RC,RG,SH,S1,FG	3'x5'	6"	3'x3' or 32" Dia	0.48 in²/ft	0.48 in²/ft
SH,S1,FG	3'x5'	6"	3'x5'	0.48 in²/ft	0.48 in²/ft
SFG	3'x5'	6"	3'x5'	0.32 in²/ft	0.32 in²/ft
SL	4'x5'	6"	n/a	0.42 in²/ft	0.42 in²/ft
RH,RC,RG,SH,S1,FG	4'x5'	6"	3'x3' or 32" Dia	0.42 in²/ft	0.42 in²/ft
SH,S1,FG	4'x5'	6"	4'x4'	0.63 in²/ft	0.63 in²/ft
SH,S1,FG	4'x5'	6"	3'x5'	0.66 in²/ft	0.66 in²/ft
SL	5'x5'	6"	n/a	0.36 in²/ft	0.36 in²/ft
RH,RC,RG,SH,S1,FG	5'x5'	6"	3'x3' or 32" Dia	0.43 in²/ft	0.43 in²/ft
SH,S1,FG	5'x5'	6"	4'x4'	0.63 in²/ft	0.63 in²/ft
SH,S1,FG	5'x5'	6"	3'x5'	0.63 in²/ft	0.63 in²/ft
SL	5'x6'	6"/8"	n/a	0.48 in²/ft	0.48 in²/ft
RH,RC,RG,SH,S1,FG	5'x6'	6"/8"	3'x3' or 32" Dia	0.48 in²/ft	0.48 in²/ft
SH,S1,FG	5'x6'	6"/8"	4'x4'	0.60 in²/ft	0.60 in²/ft
SH,S1,FG	5'x6'	6"/8"	3'x5'	0.60 in²/ft	0.60 in²/ft
SL	6'x6'	6"/8"	n/a	0.43 in²/ft	0.43 in²/ft
RH,RC,RG,SH,S1,FG	6'x6'	6"/8"	3'x3' or 32" Dia	0.56 in²/ft	0.56 in²/ft
SH,S1,FG	6'x6'	6"/8"	4'x4'	0.56 in²/ft	0.56 in²/ft
SH,S1,FG	6'x6'	6"/8"	3'x5'	0.59 in²/ft	0.59 in²/ft
SL	8'x8'	8"/10"	n/a	0.45 in²/ft	0.45 in²/ft
RH,RC,RG,SH,S1,FG	8'x8'	8"/10"	3'x3' or 32" Dia	0.45 in²/ft	0.45 in²/ft
SH,S1,FG	8'x8'	8"/10"	4'x4'	0.45 in²/ft	0.45 in²/ft
SH,S1,FG	8'x8'	8"/10"	3'x5'	0.45 in²/ft	0.45 in²/ft

(2) See sheet PDD for corresponding wall thickness (W) of base unit or riser.

Construct cast-in-place reinforced concrete apron, when shown elsewhere in plans. Use Class "A" concrete. Apron is subsidiary to PSL. Apron is 1'-6" Min width around precast zone drain.



DETAIL "A"

(Reinforcing not shown for clarity)

When an apron is to be cast around PSL, use detail above to create an apron ledge on all 4 sides.

FABRICATION NOTES:

1. Locate penetration (Style 'RH'), ring and cover (Style 'RC'), ring and grate (Style 'RG'), and frame and grate (Style 'FG') in a corner. Only one penetration is allowed per slab lid.
2. Provide Class "H" concrete in accordance with Item 421 and having a minimum compressive strength of 5,000 psi.
3. Provide Grade 60 reinforcing steel or equivalent area of WWR.
4. Provide clear cover of ¾" to reinforcing from lower outside shoulder of slab for structural reinforcement, and 2" from top of slab for shrinkage and temperature reinforcement. Place short span reinforcing closest to surface.
5. Slabs with a thickness of 8" or greater require shrinkage and temperature reinforcing. Provide steel area = 0.11 in²/ft each way.
6. No substitution is allowed for diagonal #4 bars around openings.
7. Design tongue and groove joints for full closure on both shoulders. Minimum spigot depth is ¾".
8. Provide lifting devices in conformance with Manufacturer's recommendations.

INSTALLATION NOTES:

1. Precast slab lids are intended for direct traffic and may be placed in roadway.
2. Seal tongue and groove joints with preformed or bulk mastic in conformance with Manufacturer's recommendations. Tongue and groove joints may be grouted no more than 1" between each section, or ½ the joint depth, whichever is greater.
3. Do not grout rubber gasket joints without Manufacturer's recommendation.
4. Initial installation of grade adjustment rings for Styles 'RH' and 'SH' is limited to 1'-0" Max as shown.
5. Grade adjustment rings for Styles 'RH' and 'SH' may be increased to 2'-0" Max when future construction affects final grade of structure. Make adjustments greater than 2'-0" with additional risers. Adjustments can be made up to Max depth shown on sheet PDD. Structure must be evaluated if Max depth will be exceeded.
6. Orient long dimension of grate slots perpendicular to traffic, unless noted otherwise on plans

GENERAL NOTES:

1. Designed according to ASTM C913.
2. Payment for lid is per Item 465, "Junction Boxes, Manholes, and Inlets" by type, style, size, and opening size (when applicable).

Cover dimensions are clear dimensions, unless noted otherwise.

Texas Department of Transportation

Bridge Division Standard

PRECAST SLAB LID

PSL

FILE: prestd05.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT January 2015	CONT	SECT	JOB	HIGHWAY
REVISIONS	1507	02	016, ETC.	FM 696, ETC.
	DIST	COUNTY		SHEET NO.
	BRY	BURLESON		141A

DATE: 12/15/2020 10:13:28 PM
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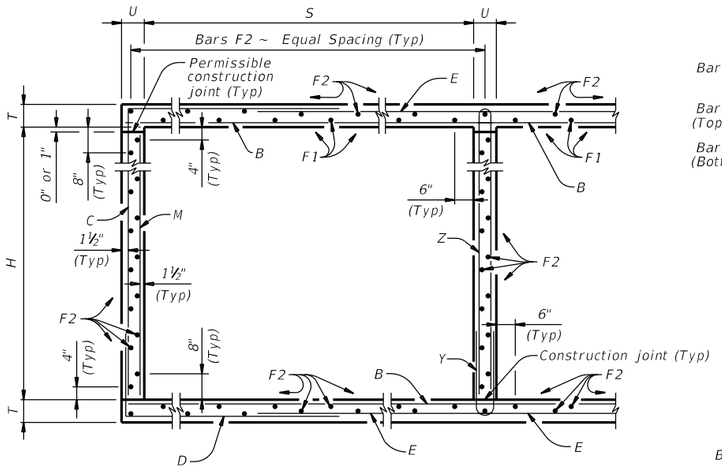
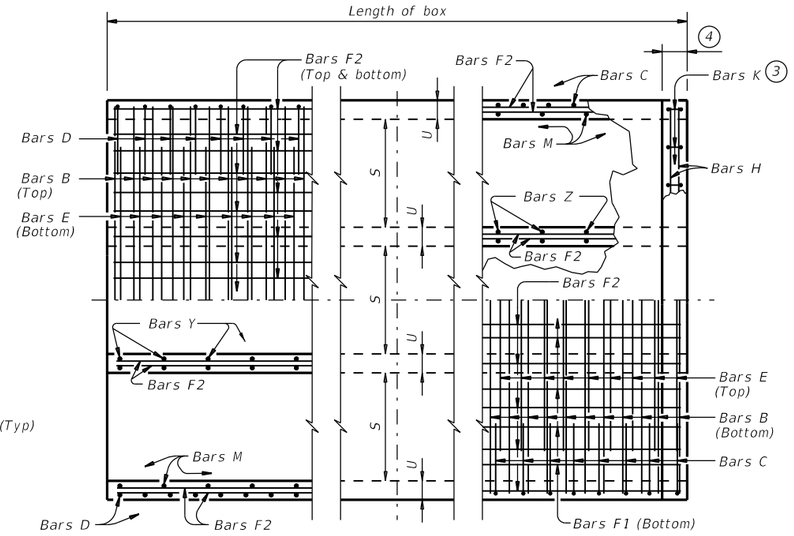
DATE:
FILE:

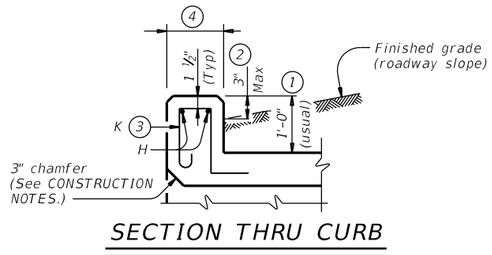


TYPICAL SECTION



BOTTOM SLAB TOP SLAB

PART PLANS



SECTION THRU CURB

TABLE OF BAR DIMENSIONS		
H	"X"	"Y"
3'-0"	3'-6 ½"	5'-1"
4'-0"	4'-6 ½"	5'-1"
5'-0"	5'-6 ½"	5'-1"
6'-0"	6'-6 ½"	5'-1"
7'-0"	7'-6 ½"	5'-1"
8'-0"	8'-6 ½"	5'-1"

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, and Bars Y and Z may be reversed.

MATERIAL NOTES:

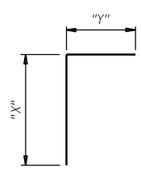
Provide Grade 60 reinforcing steel.
Provide galvanized reinforcing steel if required elsewhere in the plans.
Provide Class C concrete (f'c = 3,600 psi) for culvert barrel and curb, with the following exceptions: provide Class S concrete (f'c = 4,000 psi) for top slabs of:
- culverts with overlay,
- culverts 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

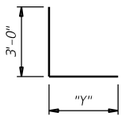
GENERAL NOTES:

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.

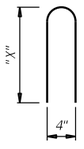
Cover dimensions are clear dimensions, unless noted otherwise.
Reinforcing bar dimensions shown are out-to-out of bar.



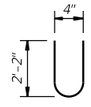
BARS C



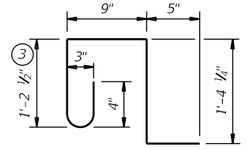
BARS D



BARS Z



BARS Y



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

HL93 LOADING SHEET 1 OF 2

Texas Department of Transportation — Bridge Division Standard

MULTIPLE BOX CULVERTS CAST-IN-PLACE
8'-0" SPAN
0' TO 13' FILL

MC-8-13

FILE: mc813ste-20.dgn	DN: TBE	CK: BMP	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	1507	02	016, Etc.	FM 696, Etc.
	DIST	COUNTY		SHEET NO.
	BRY	BURLESON		142

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DATE:
FILE:

NUMBER OF SPANS	SECTION DIMENSIONS				BILLS OF REINFORCING STEEL (For Box Length = 40 feet)																														QUANTITIES					
					Bars B					Bars C & D							Bars E					Bars F1 ~ #4				Bars F2 ~ #4				Bars M ~ #4				Bars Y & Z ~ #4							Bars H 4 ~ #4		Bars K		Per Foot of Barrel		Curb		Total	
	S	H	T	U	No.	Size	Spa	Length	Wt	No.	Size	Spa	Bars C Length	Bars C Wt	Bars D Length	Bars D Wt	No.	Size	Spa	Length	Wt	No.	Spa	Length	Wt	No.	Spa	Length	Wt	No.	Spa	Length	Wt	No.	Spa	Bars Y Length	Bars Y Wt	Bars Z Length	Bars Z Wt	Length	Wt	No.	Wt	Conc (CY)	Renf (Lb)	Conc (CY)	Renf (Lb)	Conc (CY)	Renf (Lb)
2	8' - 0"	3' - 0"	8"	7"	162	#6	6"	17' - 6"	4,258	108	#6	9"	8' - 8"	1,406	8' - 2"	1,325	162	#6	6"	12' - 9"	3,102	12	18"	39' - 9"	319	56	18"	39' - 9"	1,487	108	9"	3' - 0"	216	54	9"	4' - 7"	165	7' - 3"	262	17' - 6"	47	38	106	1.071	313.5	1.3	153	44.2	12,693
3	8' - 0"	3' - 0"	8"	7"	162	#6	6"	26' - 1"	6,347	108	#6	9"	8' - 8"	1,406	8' - 2"	1,325	162	#6	6"	21' - 4"	5,191	18	18"	39' - 9"	478	80	18"	39' - 9"	2,124	108	9"	3' - 0"	216	108	9"	4' - 7"	331	7' - 3"	523	26' - 1"	70	56	156	1.560	448.5	1.9	226	64.3	18,167
4	8' - 0"	3' - 0"	8"	7"	162	#6	6"	34' - 8"	8,435	108	#6	9"	8' - 8"	1,406	8' - 2"	1,325	162	#6	6"	29' - 11"	7,279	24	18"	39' - 9"	637	104	18"	39' - 9"	2,762	108	9"	3' - 0"	216	162	9"	4' - 7"	496	7' - 3"	785	34' - 8"	93	72	200	2.048	583.5	2.6	293	84.5	23,634
5	8' - 0"	3' - 0"	8"	7"	162	#6	6"	43' - 3"	10,524	108	#6	9"	8' - 8"	1,406	8' - 2"	1,325	162	#6	6"	38' - 6"	9,368	30	18"	39' - 9"	797	128	18"	39' - 9"	3,399	108	9"	3' - 0"	216	216	9"	4' - 7"	661	7' - 3"	1,046	43' - 3"	116	90	251	2.537	718.6	3.2	367	104.7	29,109
6	8' - 0"	3' - 0"	8"	7"	162	#6	6"	51' - 10"	12,612	108	#6	9"	8' - 8"	1,406	8' - 2"	1,325	162	#6	6"	47' - 1"	11,457	36	18"	39' - 9"	956	152	18"	39' - 9"	4,036	108	9"	3' - 0"	216	270	9"	4' - 7"	827	7' - 3"	1,308	51' - 10"	138	106	295	3.026	853.6	3.8	433	124.9	34,576
2	8' - 0"	4' - 0"	8"	7"	162	#6	6"	17' - 6"	4,258	108	#6	9"	9' - 8"	1,568	8' - 2"	1,325	162	#6	6"	12' - 9"	3,102	12	18"	39' - 9"	319	56	18"	39' - 9"	1,487	108	9"	4' - 0"	289	54	9"	4' - 7"	165	9' - 3"	334	17' - 6"	47	38	106	1.136	321.2	1.3	153	46.8	13,000
3	8' - 0"	4' - 0"	8"	7"	162	#6	6"	26' - 1"	6,347	108	#6	9"	9' - 8"	1,568	8' - 2"	1,325	162	#6	6"	21' - 4"	5,191	18	18"	39' - 9"	478	80	18"	39' - 9"	2,124	108	9"	4' - 0"	289	108	9"	4' - 7"	331	9' - 3"	667	26' - 1"	70	56	156	1.646	458.0	1.9	226	67.8	18,546
4	8' - 0"	4' - 0"	8"	7"	162	#6	6"	34' - 8"	8,435	108	#6	9"	9' - 8"	1,568	8' - 2"	1,325	162	#6	6"	29' - 11"	7,279	24	18"	39' - 9"	637	104	18"	39' - 9"	2,762	108	9"	4' - 0"	289	162	9"	4' - 7"	496	9' - 3"	1,001	34' - 8"	93	72	200	2.156	594.8	2.6	293	88.8	24,085
5	8' - 0"	4' - 0"	8"	7"	162	#6	6"	43' - 3"	10,524	108	#6	9"	9' - 8"	1,568	8' - 2"	1,325	162	#6	6"	38' - 6"	9,368	30	18"	39' - 9"	797	128	18"	39' - 9"	3,399	108	9"	4' - 0"	289	216	9"	4' - 7"	661	9' - 3"	1,335	43' - 3"	116	90	251	2.667	731.7	3.2	367	109.9	29,633
6	8' - 0"	4' - 0"	8"	7"	162	#6	6"	51' - 10"	12,612	108	#6	9"	9' - 8"	1,568	8' - 2"	1,325	162	#6	6"	47' - 1"	11,457	36	18"	39' - 9"	956	152	18"	39' - 9"	4,036	108	9"	4' - 0"	289	270	9"	4' - 7"	827	9' - 3"	1,668	51' - 10"	138	106	295	3.177	868.5	3.8	433	130.9	35,171
2	8' - 0"	5' - 0"	8"	7"	162	#6	6"	17' - 6"	4,258	108	#6	9"	10' - 8"	1,730	8' - 2"	1,325	162	#6	6"	12' - 9"	3,102	12	18"	39' - 9"	319	62	18"	39' - 9"	1,646	108	9"	5' - 0"	361	54	9"	4' - 7"	165	11' - 3"	406	17' - 6"	47	38	106	1.201	332.8	1.3	153	49.4	13,465
3	8' - 0"	5' - 0"	8"	7"	162	#6	6"	26' - 1"	6,347	108	#6	9"	10' - 8"	1,730	8' - 2"	1,325	162	#6	6"	21' - 4"	5,191	18	18"	39' - 9"	478	88	18"	39' - 9"	2,337	108	9"	5' - 0"	361	108	9"	4' - 7"	331	11' - 3"	812	26' - 1"	70	56	156	1.733	472.8	1.9	226	71.3	19,138
4	8' - 0"	5' - 0"	8"	7"	162	#6	6"	34' - 8"	8,435	108	#6	9"	10' - 8"	1,730	8' - 2"	1,325	162	#6	6"	29' - 11"	7,279	24	18"	39' - 9"	637	114	18"	39' - 9"	3,027	108	9"	5' - 0"	361	162	9"	4' - 7"	496	11' - 3"	1,217	34' - 8"	93	72	200	2.264	612.7	2.6	293	93.1	24,800
5	8' - 0"	5' - 0"	8"	7"	162	#6	6"	43' - 3"	10,524	108	#6	9"	10' - 8"	1,730	8' - 2"	1,325	162	#6	6"	38' - 6"	9,368	30	18"	39' - 9"	797	140	18"	39' - 9"	3,717	108	9"	5' - 0"	361	216	9"	4' - 7"	661	11' - 3"	1,623	43' - 3"	116	90	251	2.796	752.7	3.2	367	115.1	30,473
6	8' - 0"	5' - 0"	8"	7"	162	#6	6"	51' - 10"	12,612	108	#6	9"	10' - 8"	1,730	8' - 2"	1,325	162	#6	6"	47' - 1"	11,457	36	18"	39' - 9"	956	166	18"	39' - 9"	4,408	108	9"	5' - 0"	361	270	9"	4' - 7"	827	11' - 3"	2,029	51' - 10"	138	106	295	3.328	892.6	3.8	433	137.0	36,138
2	8' - 0"	6' - 0"	8"	7"	162	#6	6"	17' - 6"	4,258	108	#6	9"	11' - 8"	1,893	8' - 2"	1,325	162	#6	6"	12' - 9"	3,102	12	18"	39' - 9"	319	68	18"	39' - 9"	1,806	108	9"	6' - 0"	433	54	9"	4' - 7"	165	13' - 3"	478	17' - 6"	47	38	106	1.265	344.5	1.3	153	51.9	13,932
3	8' - 0"	6' - 0"	8"	7"	162	#6	6"	26' - 1"	6,347	108	#6	9"	11' - 8"	1,893	8' - 2"	1,325	162	#6	6"	21' - 4"	5,191	18	18"	39' - 9"	478	96	18"	39' - 9"	2,549	108	9"	6' - 0"	433	108	9"	4' - 7"	331	13' - 3"	956	26' - 1"	70	56	156	1.819	487.6	1.9	226	74.7	19,729
4	8' - 0"	6' - 0"	8"	7"	162	#6	6"	34' - 8"	8,435	108	#6	9"	11' - 8"	1,893	8' - 2"	1,325	162	#6	6"	29' - 11"	7,279	24	18"	39' - 9"	637	124	18"	39' - 9"	3,293	108	9"	6' - 0"	433	162	9"	4' - 7"	496	13' - 3"	1,434	34' - 8"	93	72	200	2.372	630.6	2.6	293	97.5	25,518
5	8' - 0"	6' - 0"	8"	7"	162	#6	6"	43' - 3"	10,524	108	#6	9"	11' - 8"	1,893	8' - 2"	1,325	162	#6	6"	38' - 6"	9,368	30	18"	39' - 9"	797	152	18"	39' - 9"	4,036	108	9"	6' - 0"	433	216	9"	4' - 7"	661	13' - 3"	1,912	43' - 3"	116	90	251	2.926	773.7	3.2	367	120.3	31,316
6	8' - 0"	6' - 0"	8"	7"	162	#6	6"	51' - 10"	12,612	108	#6	9"	11' - 8"	1,893	8' - 2"	1,325	162	#6	6"	47' - 1"	11,457	36	18"	39' - 9"	956	180	18"	39' - 9"	4,780	108	9"	6' - 0"	433	270	9"	4' - 7"	827	13' - 3"	2,390	51' - 10"	138	106	295	3.479	916.8	3.8	433	143.0	37,106
2	8' - 0"	7' - 0"	8"	7"	162	#6	6"	17' - 6"	4,258	108	#6	9"	12' - 8"	2,055	8' - 2"	1,325	162	#6	6"	12' - 9"	3,102	12	18"	39' - 9"	319	68	18"	39' - 9"	1,806	108	9"	7' - 0"	505	54	9"	4' - 7"	165	15' - 3"	550	17' - 6"	47	38	106	1.330	352.1	1.3	153	54.5	14,238
3	8' - 0"	7' - 0"	8"	7"	162	#6	6"	26' - 1"	6,347	108	#6	9"	12' - 8"	2,055	8' - 2"	1,325	162	#6	6"	21' - 4"	5,191	18	18"	39' - 9"	478	96	18"	39' - 9"	2,549	108	9"	7' - 0"	505	108	9"	4' - 7"	331	15' - 3"	1,100	26' - 1"	70	56	156	1.905	497.0	1.9	226	78.1	20,107
4	8' - 0"	7' - 0"	8"	7"	162	#6	6"	34' - 8"	8,435	108	#6	9"	12' - 8"	2,055	8' - 2"	1,325	162	#6	6"	29' - 11"	7,279	24	18"	39' - 9"	637	124	18"	39' - 9"	3,293	108	9"	7' - 0"	505	162	9"	4' - 7"	496	15' - 3"	1,650	34' - 8"	93	72	200	2.480	641.9	2.6	293	101.8	25,968
5	8' - 0"	7' - 0"	8"	7"	162	#6	6"	43' - 3"	10,524	108	#6	9"	12' - 8"	2,055	8' - 2"	1,325	162	#6	6"	38' - 6"	9,368	30	18"	39' - 9"	797	152	18"	39' - 9"	4,036	108	9"	7' - 0"	505	216	9"	4' - 7"	661	15' - 3"	2,200	43' - 3"	116	90	251	3.056	786.8	3.2	367	125.5	31,838
6	8' - 0"	7' - 0"	8"	7"	162	#6	6"	51' - 10"	12,612	108	#6	9"	12' - 8"	2,055	8' - 2"	1,325	162	#6	6"	47' - 1"	11,457	36	18"	39' - 9"	956	180	18"	39' - 9"	4,780	108	9"	7' - 0"	505	270	9"	4' - 7"	827	15' - 3"	2,750	51' - 10"	138	106	295	3.631	931.7	3.8	433	149.1	37,700
2	8' - 0"	8' - 0"	8"	7"	162	#6	6"	17' - 6"	4,258	108	#6	9"	13' - 8"	2,217	8' - 2"	1,325	162	#6	6"	12' - 9"	3,102	12	18"	39' - 9"	319	74	18"	39' - 9"	1,965	108	9"	8' - 0"	577	54	9"	4' - 7"	165	17' - 3"	622	17' - 6"	47	38	106	1.395	363.8	1.3	153	57.1	14,703
3	8' - 0"	8' - 0"	8"	7"	162	#6	6"	26' - 1"	6,347	108	#6	9"	13' - 8"	2,217	8' - 2"	1,325	162	#6	6"	21' - 4"	5,191	18	18"	39' - 9"	478	104	18"	39' - 9"	2,762	108	9"	8' - 0"	577	108	9"	4' - 7"	331	17' - 3"	1,244	26' - 1"	70	56	156	1.992	511.8	1.9	226	81.6	20,698
4	8' - 0"	8' - 0"	8"	7"	162	#6	6"	34' - 8"	8,435	108	#6	9"	13' - 8"	2,217	8' - 2"	1,325	162	#6	6"	29' - 11"	7,279	24	18"	39' - 9"	637	134	18"	39' - 9"	3,558	108	9"	8' - 0"	577	162	9"	4' - 7"	496	17' - 3"	1,867	34' - 8"	93	72	200	2.588	659.8	2.6	293	106.1	26,684
5	8' - 0"	8' - 0"	8"	7"	162	#6	6"	43' - 3"	10,524	108	#6	9"	13' - 8"	2,217	8' - 2"	1,325	162	#6	6"	38' - 6"	9,368	30	18"	39' - 9"	797	164	18"	39' - 9"	4,355	108	9"	8' - 0"	577	216	9"	4' - 7"	661	17' - 3"	2,489	43' - 3"	116	90	251	3.185	807.8	3.2	367	130.6	32,680
6	8' - 0"	8' - 0"	8"	7"	162	#6	6"	51' - 10"	12,612	108	#6	9"	13' - 8"	2,217	8' - 2"	1,325	162	#6	6"	47' - 1"	11,457	36	18"	39' - 9"	956	194	18"	39' - 9"	5,151	108	9"	8' - 0"	577	270	9"	4' - 7"	827	17' - 3"	3,111	51' - 10"	138	106	295	3.782	955.8	3.8	433	155.1	38,666

HL93 LOADING SHEET 2 OF 2

Texas Department of Transportation

Bridge Division Standard

MULTIPLE BOX CULVERTS CAST-IN-PLACE

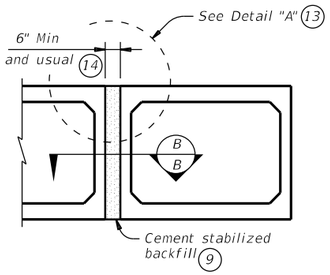
8'-0" SPAN

0' TO 13' FILL

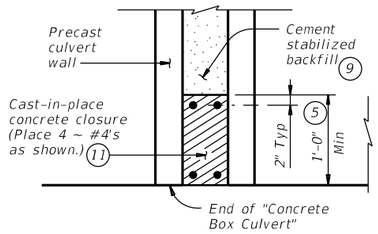
MC-8-13

FILE: mc813ste-20.dgn	DN: TBE	CK: BMP	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	1507	02	016,ETC.	FM 696, Etc.
	DIST	COUNTY		SHEET NO.
	BRY	BURLESON		143

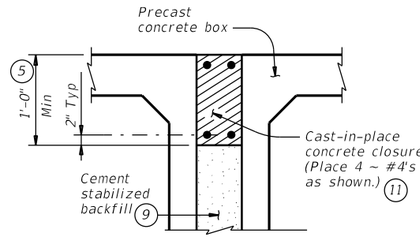
DATE: 9/25/2020 5:32:28 AM
FILE: g:\150702\016\sheets\Standards\Bridge\SCP-MD.DGN



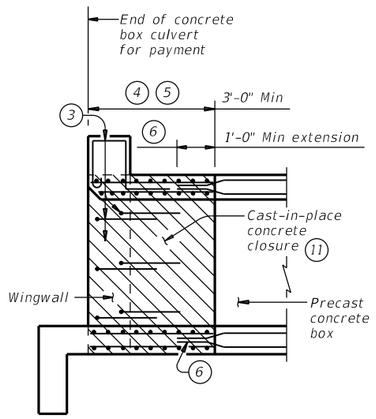
MULTIPLE UNIT PLACEMENT



SECTION B-B

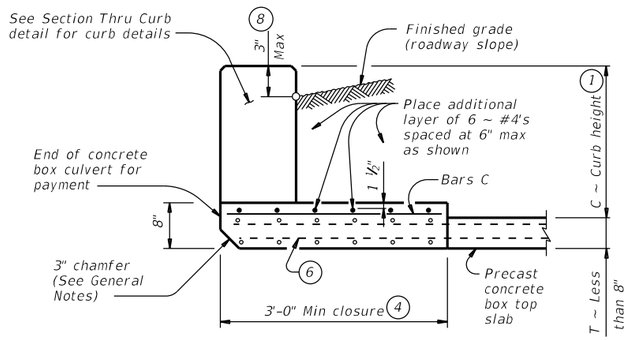


DETAIL "A" (13)

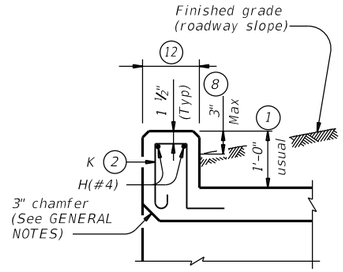


WINGWALL CONNECTION

(Also applies to safety end treatment.)

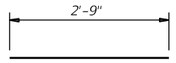


SECTION THRU TOP SLABS LESS THAN 8"

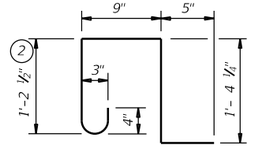


SECTION THRU CURB

QUANTITIES PER FOOT OF CURB (10)	
Reinforcing Steel	4.12 Lb
Concrete	0.037 CY



BARS C (#4)
(Spa = 1'–0" Max)



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, bicycle 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.

2 For curbs less than 1'–0" high, tilt Bars K or reduce bar height as necessary to maintain cover. For curbs less than 3" high, Bars K may be omitted.

3 Extend curb, wingwall, or safety end treatment reinforcing into concrete closure. Bend or trim, as necessary, any reinforcing that does not fit into closure area.

4 Provide a 3'–0" Min cast–in–place concrete closure. Break back boxes in the field or cast boxes short. Provide bands of reinforcing in the closure that are the same size and spacing as in the precast box section. Provide #4 longitudinal reinforcement spaced at 12 inches Max within the closure. Except where shown otherwise, construct the cast–in–place closure flush with the inside and outside faces of the precast box section.

5 For multiple unit placements, adjust the length of the closure for the interior walls as necessary. Provide a 3'–0" Min cast–in–place closure in the top slab, bottom slab, and exterior wall. See Section B–B detail when interior walls are cast full length.

6 Extend precast box reinforcing a minimum of 1'-0" into concrete closure (Typ).

7 Place bands of reinforcing matching the inside and outside face reinforcing in the gaps of the top and bottom slabs. Place a band matching the outside face reinforcing of the wall in the gaps of the walls (placed in the outside face only). Tack weld the bands to the exposed reinforcing at each point of contact.

8 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.

9 Cement stabilized backfill between boxes is considered part of the box culvert for payment.

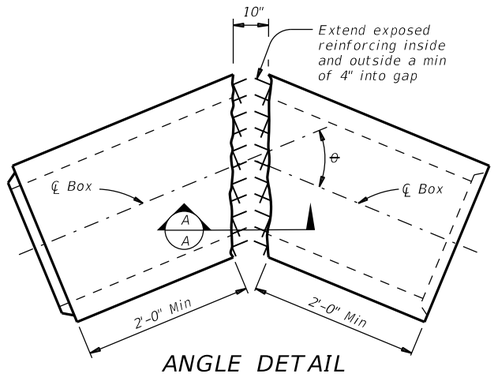
10 All curb concrete and reinforcing is considered part of the box culvert for payment.

11 Any additional concrete and reinforcing required for the closures will be considered subsidiary to the box culvert for payment.

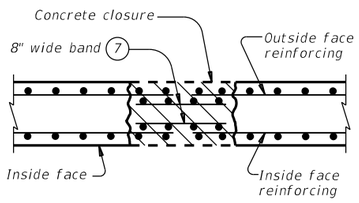
12 1'-0" typical. 2'-3" when the Box Culvert Rail Mounting Details (RAC) standard sheet is referred to elsewhere in the plans.

13 For multiple unit placement with overlay, with 1 to 2 course surface treatment, or with the top slab as the final riding surface, provide wall closure as shown in Detail "A".

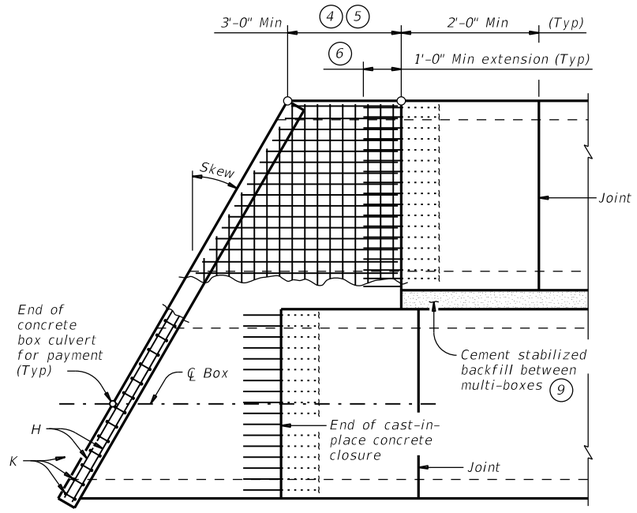
14 This dimension may be increased with approval of the Engineer to allow the precast boxes to be tunneled or jacked in accordance with Item 476, "Jacking, Boring, or Tunneling Pipe or Box". No payment will be made for any additional material in the gap between adjacent boxes.



ANGLE DETAIL



SECTION A-A



PLAN OF SKEWED ENDS

(Showing multi–box placement.)

MATERIAL NOTES:
Provide Grade 60 reinforcing steel.
Provide ASTM A1064 welded wire reinforcement.
Provide Class C concrete (f'c = 3,600 psi) for the closures.
Provide cement stabilized backfill meeting the requirements of Item 400, "Excavation and Backfill for Structures."
Any additional concrete required for the closures will be considered subsidiary to the box culvert.

GENERAL NOTES:
Designed according to AASHTO LRFD Bridge Design Specifications.
Refer to the Single Box Culverts Precast (SCP) standard sheets for details and notes not shown.
Chamfer the bottom edge of the top slab closure 3 inches at culvert closure ends.

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

HL93 LOADING

Texas Department of Transportation

Bridge Division Standard

BOX CULVERTS PRECAST MISCELLANEOUS DETAILS

SCP-MD

FILE: scpmdsts-20.dgn	DN: GAF	CK: LMW	DW: BWH/TxDOT	CK: GAF
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	1507	02	016, Etc.	FM696, Etc.
	DIST	COUNTY		SHEET NO.
	BRY	BURLESON		144

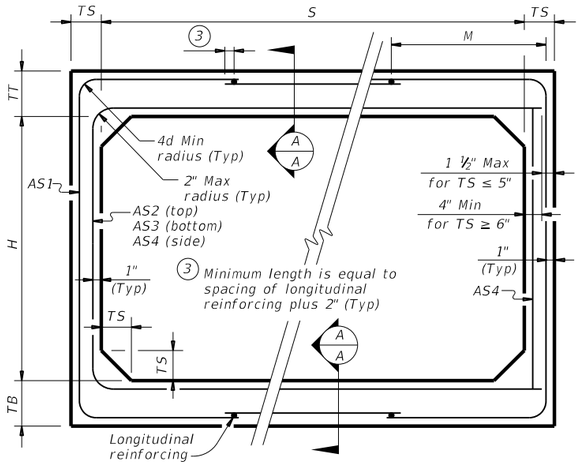
DATE:
FILE:

BOX DATA

SECTION DIMENSIONS					Fill Height	M (Min)	REINFORCING (sq. in. / ft.) (2)							(1) Lift Weight
S (ft.)	H (ft.)	TT (in.)	TB (in.)	TS (in.)	(ft.)	(in.)	AS1	AS2	AS3	AS4	AS5	AS7	AS8	(tons)
3	2	7	6	4	< 2	–	0.17	0.25	0.16	0.10	0.17	0.17	0.14	3.3
3	2	4	4	4	2 < 3	31	0.13	0.19	0.18	0.10	–	–	–	2.4
3	2	4	4	4	3 – 5	31	0.10	0.11	0.12	0.10	–	–	–	2.4
3	2	4	4	4	10	31	0.10	0.10	0.10	0.10	–	–	–	2.4
3	2	4	4	4	15	31	0.10	0.13	0.13	0.10	–	–	–	2.4
3	2	4	4	4	20	31	0.11	0.17	0.17	0.10	–	–	–	2.4
3	2	4	4	4	25	31	0.14	0.21	0.21	0.10	–	–	–	2.4
3	2	4	4	4	30	31	0.17	0.25	0.25	0.10	–	–	–	2.4
3	2	4	4	4	35	31	0.20	0.29	0.30	0.10	–	–	–	2.4
3	3	7	6	4	< 2	–	0.17	0.27	0.17	0.10	0.17	0.17	0.14	3.7
3	3	4	4	4	2 < 3	31	0.10	0.22	0.21	0.10	–	–	–	2.8
3	3	4	4	4	3 – 5	31	0.10	0.14	0.14	0.10	–	–	–	2.8
3	3	4	4	4	10	31	0.10	0.11	0.11	0.10	–	–	–	2.8
3	3	4	4	4	15	31	0.10	0.14	0.15	0.10	–	–	–	2.8
3	3	4	4	4	20	31	0.10	0.18	0.19	0.10	–	–	–	2.8
3	3	4	4	4	25	31	0.10	0.23	0.23	0.10	–	–	–	2.8
3	3	4	4	4	30	31	0.12	0.27	0.28	0.10	–	–	–	2.8
3	3	4	4	4	35	31	0.14	0.32	0.32	0.10	–	–	–	2.8

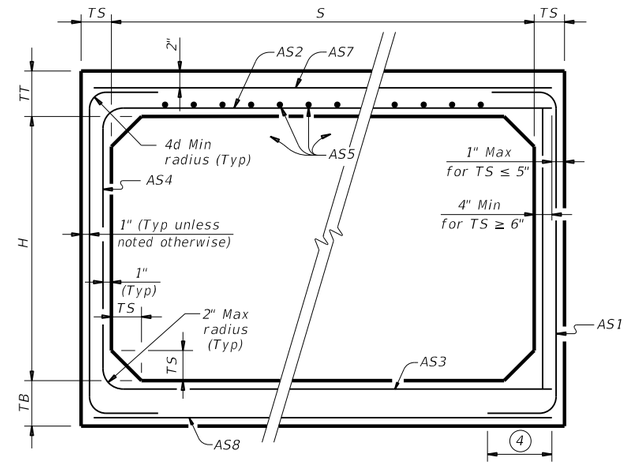
(1) For box length = 8'-0"

(2) AS1 thru AS4, AS7 and AS8 are minimum required areas of reinforcement per linear foot of box length. AS5 is minimum required area of reinforcement per linear foot of box width.



CORNER OPTION "A" CORNER OPTION "B"

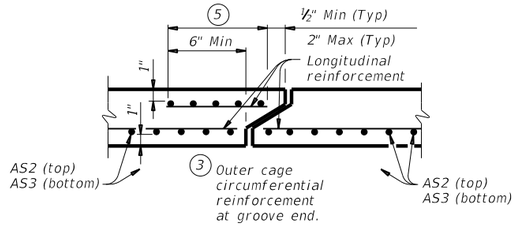
FILL HEIGHT 2 FT AND GREATER



CORNER OPTION "A" CORNER OPTION "B"

FILL HEIGHT LESS THAN 2 FT

(4) Length is equal to spacing of longitudinal reinforcing plus 2". (10" Min) (Typ)



SECTION A-A

(Showing top and bottom slab joint reinforcement.)

MATERIAL NOTES:

Provide 0.03 sq. in./ft. minimum longitudinal reinforcement at each face in slabs and walls. This minimum requirement may be met by the transverse wires when wire mesh reinforcement is used.

Provide Class H concrete (f`c = 5,000 psi).

GENERAL NOTES:

Designs shown conform to ASTM C1577. Refer to ASTM C1577 for information or details not shown.

See Box Culverts Precast Miscellaneous Details (SCP-MD) standard sheet for details and notes not shown.

In lieu of furnishing the designs shown on this sheet, the contractor may furnish an alternate design that is equal to or exceeds the box design for the design fill height in the table. Submit shop plans for alternate designs in accordance with Item "Precast Concrete Structural Members (Fabrication)".

HL93 LOADING

Texas Department of Transportation

Bridge Division Standard

SINGLE BOX CULVERTS PRECAST

3'-0" SPAN

SCP-3

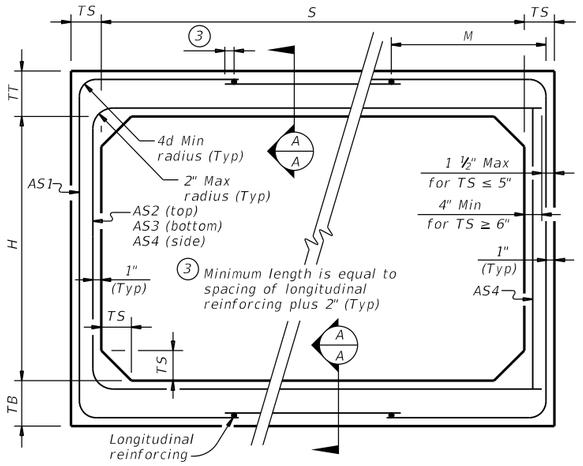
FILE: scp03sts-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	1507	02	016, Etc.	FM 696, Etc.
	DIST	COUNTY		SHEET NO.
	BRY	BURLESON		145

BOX DATA

SECTION DIMENSIONS					Fill Height	M (Min)	REINFORCING (sq. in. / ft.) ②							① Lift Weight
S (ft.)	H (ft.)	TT (in.)	TB (in.)	TS (in.)	(ft.)	(in.)	AS1	AS2	AS3	AS4	AS5	AS7	AS8	(tons)
5	2	8	7	6	< 2	–	0.19	0.27	0.18	0.14	0.19	0.19	0.17	6.0
5	2	6	6	6	2 < 3	44	0.22	0.20	0.16	0.14	–	–	–	5.1
5	2	6	6	6	3 – 5	44	0.16	0.14	0.14	0.14	–	–	–	5.1
5	2	6	6	6	10	36	0.15	0.14	0.14	0.14	–	–	–	5.1
5	2	6	6	6	15	36	0.20	0.18	0.18	0.14	–	–	–	5.1
5	2	6	6	6	20	36	0.26	0.23	0.24	0.14	–	–	–	5.1
5	2	6	6	6	25	36	0.33	0.29	0.29	0.14	–	–	–	5.1
5	2	6	6	6	30	36	0.39	0.34	0.35	0.14	–	–	–	5.1
5	3	8	7	6	< 2	–	0.19	0.31	0.21	0.14	0.19	0.19	0.17	6.6
5	3	6	6	6	2 < 3	45	0.18	0.24	0.19	0.14	–	–	–	5.7
5	3	6	6	6	3 – 5	36	0.14	0.17	0.16	0.14	–	–	–	5.7
5	3	6	6	6	10	36	0.14	0.16	0.17	0.14	–	–	–	5.7
5	3	6	6	6	15	35	0.16	0.21	0.22	0.14	–	–	–	5.7
5	3	6	6	6	20	35	0.21	0.27	0.28	0.14	–	–	–	5.7
5	3	6	6	6	25	35	0.26	0.34	0.34	0.14	–	–	–	5.7
5	3	6	6	6	30	35	0.31	0.41	0.41	0.14	–	–	–	5.7
5	4	8	7	6	< 2	–	0.19	0.33	0.24	0.14	0.19	0.19	0.17	7.2
5	4	6	6	6	2 < 3	45	0.16	0.27	0.22	0.14	–	–	–	6.3
5	4	6	6	6	3 – 5	45	0.14	0.19	0.18	0.14	–	–	–	6.3
5	4	6	6	6	10	36	0.14	0.18	0.18	0.14	–	–	–	6.3
5	4	6	6	6	15	35	0.14	0.23	0.24	0.14	–	–	–	6.3
5	4	6	6	6	20	35	0.17	0.30	0.31	0.14	–	–	–	6.3
5	4	6	6	6	25	35	0.21	0.37	0.38	0.14	–	–	–	6.3
5	4	6	6	6	30	35	0.25	0.44	0.45	0.14	–	–	–	6.3
5	5	8	7	6	< 2	–	0.19	0.35	0.26	0.14	0.19	0.19	0.17	7.8
5	5	6	6	6	2 < 3	45	0.14	0.29	0.24	0.14	–	–	–	6.9
5	5	6	6	6	3 – 5	45	0.14	0.21	0.20	0.14	–	–	–	6.9
5	5	6	6	6	10	45	0.14	0.19	0.20	0.14	–	–	–	6.9
5	5	6	6	6	15	36	0.14	0.24	0.25	0.14	–	–	–	6.9
5	5	6	6	6	20	35	0.15	0.31	0.32	0.14	–	–	–	6.9
5	5	6	6	6	25	35	0.18	0.38	0.39	0.14	–	–	–	6.9
5	5	6	6	6	30	35	0.21	0.46	0.47	0.14	–	–	–	6.9

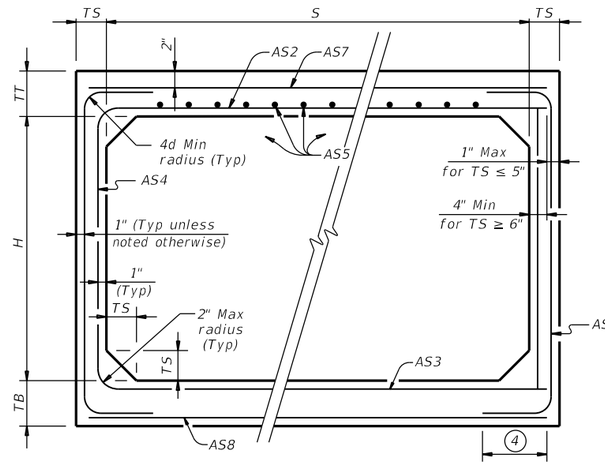
① For box length = 8'-0"

② AS1 thru AS4, AS7 and AS8 are minimum required areas of reinforcement per linear foot of box length. AS5 is minimum required area of reinforcement per linear foot of box width.



CORNER OPTION "A" CORNER OPTION "B"

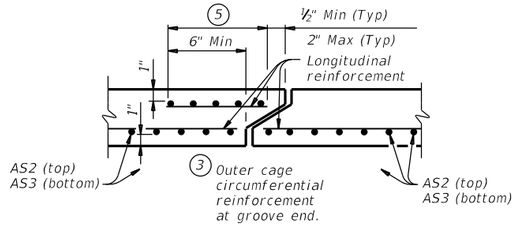
FILL HEIGHT 2 FT AND GREATER



CORNER OPTION "A" CORNER OPTION "B"

FILL HEIGHT LESS THAN 2 FT

④ Length is equal to spacing of longitudinal reinforcing plus 2". (10" Min) (Typ)



SECTION A-A

(Showing top and bottom slab joint reinforcement.)

MATERIAL NOTES:

Provide 0.03 sq. in./ft. minimum longitudinal reinforcement at each face in slabs and walls. This minimum requirement may be met by the transverse wires when wire mesh reinforcement is used.

Provide Class H concrete (f`c = 5,000 psi).

GENERAL NOTES:

Designs shown conform to ASTM C1577. Refer to ASTM C1577 for information or details not shown.

See Box Culverts Precast Miscellaneous Details (SCP-MD) standard sheet for details and notes not shown.

In lieu of furnishing the designs shown on this sheet, the contractor may furnish an alternate design that is equal to or exceeds the box design for the design fill height in the table. Submit shop plans for alternate designs in accordance with Item "Precast Concrete Structural Members (Fabrication)".

HL93 LOADING

Texas Department of Transportation

Bridge Division Standard

SINGLE BOX CULVERTS PRECAST

5'-0" SPAN

SCP-5

FILE: scp05sts-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	1507	02	016, Etc.	FM696, Etc.
	DIST	COUNTY		SHEET NO.
	BRY	BURLESON		146

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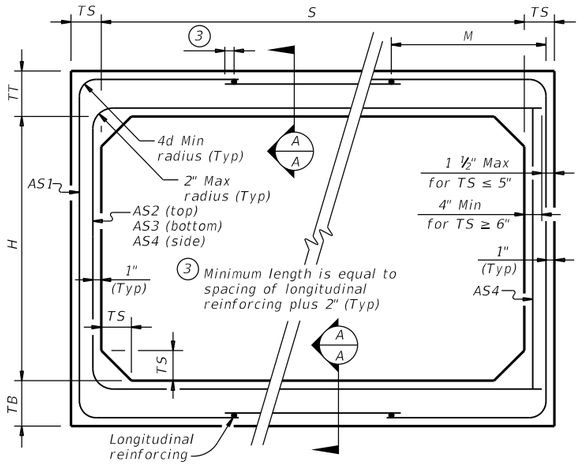
BOX DATA

SECTION DIMENSIONS					Fill Height	M (Min)	REINFORCING (sq. in. / ft.) (2)							(1) Lift Weight
S (ft.)	H (ft.)	TT (in.)	TB (in.)	TS (in.)	(ft.)	(in.)	AS1	AS2	AS3	AS4	AS5	AS7	AS8	(tons)
6	2	8	7	7	< 2	–	0.23	0.27	0.19	0.17	0.19	0.19	0.17	7.2
6	2	7	7	7	2 < 3	43	0.25	0.21	0.17	0.17	–	–	–	6.8
6	2	7	7	7	3 – 5	43	0.20	0.17	0.17	0.17	–	–	–	6.8
6	2	7	7	7	10	39	0.20	0.17	0.17	0.17	–	–	–	6.8
6	2	7	7	7	15	39	0.26	0.20	0.20	0.17	–	–	–	6.8
6	2	7	7	7	20	39	0.34	0.26	0.26	0.17	–	–	–	6.8
6	2	7	7	7	25	39	0.43	0.32	0.32	0.17	–	–	–	6.8
6	2	7	7	7	30	39	0.52	0.38	0.39	0.17	–	–	–	6.8
6	3	8	7	7	< 2	–	0.20	0.31	0.22	0.17	0.19	0.19	0.17	7.9
6	3	7	7	7	2 < 3	43	0.21	0.24	0.19	0.17	–	–	–	7.5
6	3	7	7	7	3 – 5	39	0.17	0.18	0.17	0.17	–	–	–	7.5
6	3	7	7	7	10	39	0.17	0.18	0.19	0.17	–	–	–	7.5
6	3	7	7	7	15	38	0.22	0.24	0.24	0.17	–	–	–	7.5
6	3	7	7	7	20	38	0.28	0.31	0.31	0.17	–	–	–	7.5
6	3	7	7	7	25	38	0.35	0.38	0.39	0.17	–	–	–	7.5
6	3	7	7	7	30	38	0.42	0.46	0.46	0.17	–	–	–	7.5
6	4	8	7	7	< 2	–	0.19	0.34	0.25	0.17	0.19	0.19	0.17	8.6
6	4	7	7	7	2 < 3	43	0.19	0.27	0.21	0.17	–	–	–	8.2
6	4	7	7	7	3 – 5	39	0.17	0.21	0.19	0.17	–	–	–	8.2
6	4	7	7	7	10	39	0.17	0.20	0.21	0.17	–	–	–	8.2
6	4	7	7	7	15	38	0.18	0.27	0.27	0.17	–	–	–	8.2
6	4	7	7	7	20	38	0.24	0.34	0.35	0.17	–	–	–	8.2
6	4	7	7	7	25	38	0.29	0.43	0.42	0.17	–	–	–	8.2
6	4	7	7	7	30	38	0.35	0.51	0.52	0.17	–	–	–	8.2
6	5	8	7	7	< 2	–	0.19	0.37	0.28	0.17	0.19	0.19	0.17	9.3
6	5	7	7	7	2 < 3	43	0.17	0.30	0.24	0.17	–	–	–	8.9
6	5	7	7	7	3 – 5	43	0.17	0.23	0.21	0.17	–	–	–	8.9
6	5	7	7	7	10	39	0.17	0.22	0.23	0.17	–	–	–	8.9
6	5	7	7	7	15	38	0.17	0.28	0.29	0.17	–	–	–	8.9
6	5	7	7	7	20	38	0.20	0.37	0.38	0.17	–	–	–	8.9
6	5	7	7	7	25	38	0.25	0.45	0.46	0.17	–	–	–	8.9
6	5	7	7	7	30	38	0.30	0.54	0.55	0.17	–	–	–	8.9
6	6	8	7	7	< 2	–	0.19	0.38	0.30	0.17	0.19	0.19	0.17	10
6	6	7	7	7	2 < 3	52	0.17	0.32	0.26	0.17	–	–	–	9.6
6	6	7	7	7	3 – 5	52	0.17	0.24	0.22	0.17	–	–	–	9.6
6	6	7	7	7	10	43	0.17	0.23	0.24	0.17	–	–	–	9.6
6	6	7	7	7	15	39	0.17	0.29	0.31	0.17	–	–	–	9.6
6	6	7	7	7	20	39	0.18	0.38	0.39	0.17	–	–	–	9.6
6	6	7	7	7	25	38	0.23	0.46	0.48	0.17	–	–	–	9.6
6	6	7	7	7	30	38	0.27	0.55	0.57	0.17	–	–	–	9.6

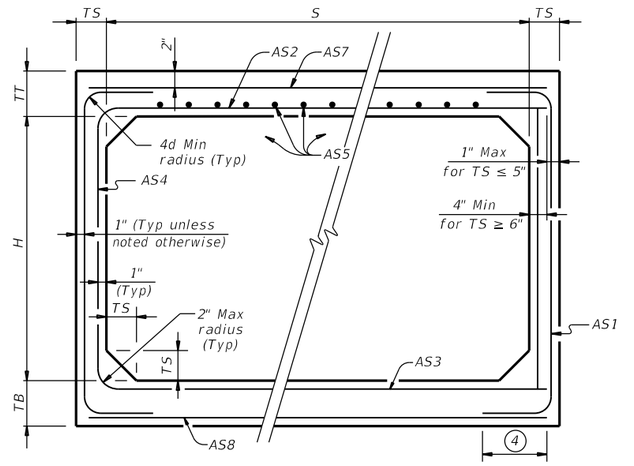
(1) For box length = 8'-0"

(2) AS1 thru AS4, AS7 and AS8 are minimum required areas of reinforcement per linear foot of box length. AS5 is minimum required area of reinforcement per linear foot of box width.



CORNER OPTION "A" CORNER OPTION "B"

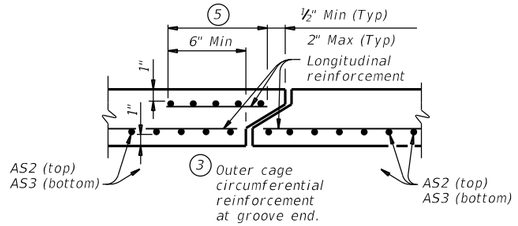
FILL HEIGHT 2 FT AND GREATER



CORNER OPTION "A" CORNER OPTION "B"

FILL HEIGHT LESS THAN 2 FT

(4) Length is equal to spacing of longitudinal reinforcing plus 2". (10" Min) (Typ)



SECTION A-A

(Showing top and bottom slab joint reinforcement.)

MATERIAL NOTES:

Provide 0.03 sq. in./ft. minimum longitudinal reinforcement at each face in slabs and walls. This minimum requirement may be met by the transverse wires when wire mesh reinforcement is used.

Provide Class H concrete (f`c = 5,000 psi).

GENERAL NOTES:

Designs shown conform to ASTM C1577. Refer to ASTM C1577 for information or details not shown.

See Box Culverts Precast Miscellaneous Details (SCP-MD) standard sheet for details and notes not shown.

In lieu of furnishing the designs shown on this sheet, the contractor may furnish an alternate design that is equal to or exceeds the box design for the design fill height in the table. Submit shop plans for alternate designs in accordance with Item "Precast Concrete Structural Members (Fabrication)".

HL93 LOADING

Texas Department of Transportation

Bridge Division Standard

SINGLE BOX CULVERTS PRECAST

6'-0" SPAN

SCP-6

FILE: scp06sts-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
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	DIST	COUNTY		SHEET NO.
	BRY	BURLESON		147

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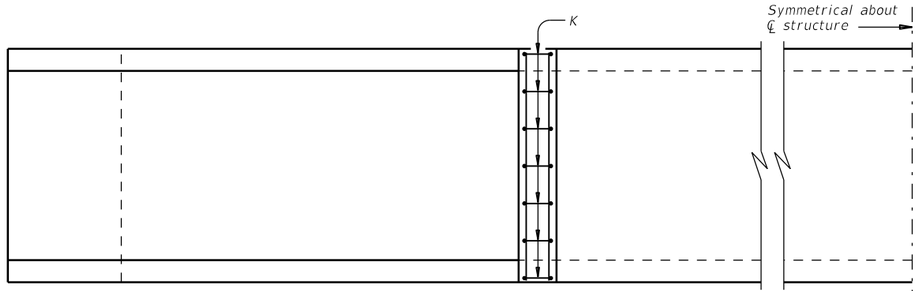
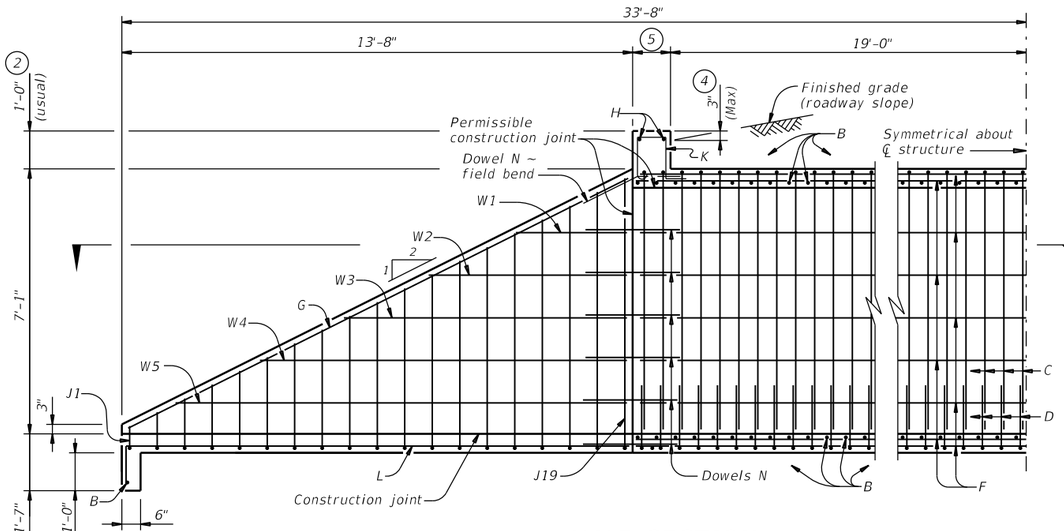
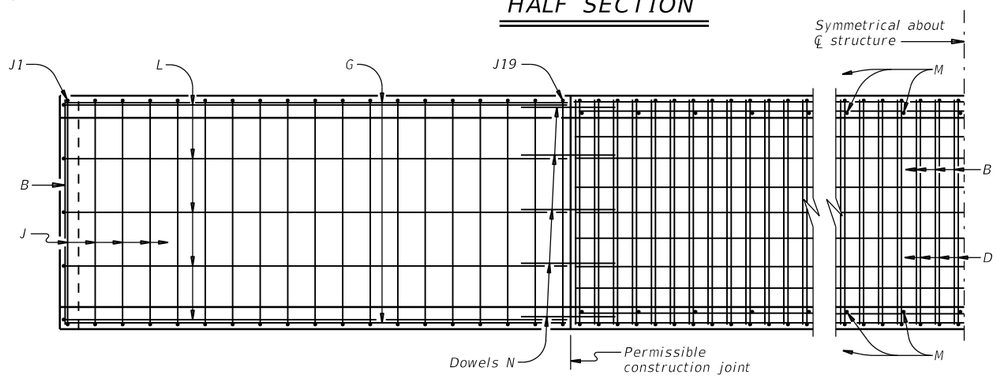


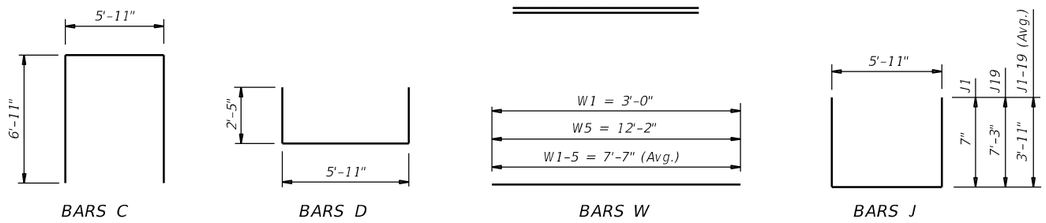
HALF PLAN

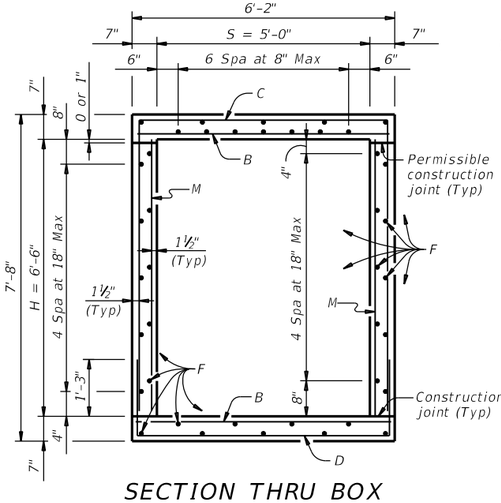


HALF SECTION

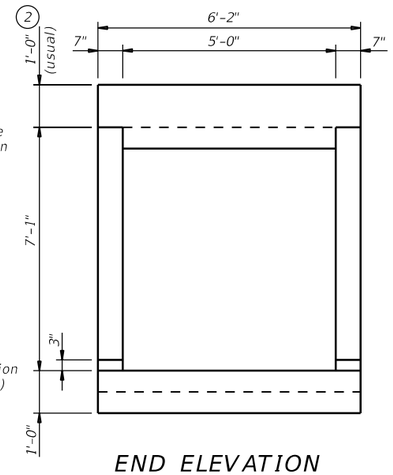


SECTION A-A





SECTION THRU BOX



END ELEVATION

ESTIMATED QUANTITIES FOR ONE STOCK PASS (1)

Bar	No.	Size	Spa	Length	Weight
B	163	#5	6"	5' - 10"	992
C	81	#4	6"	19' - 9"	1,069
D	81	#4	6"	10' - 9"	582
F	41	#4	Shown	39' - 8"	1,086
G	4	#4	~	15' - 0"	40
H	4	#4	~	5' - 10"	16
J1-19	38	#4	9"	13' - 8"Av	347
K	14	#4	12"	4' - 2"	39
L	10	#4	17"±	14' - 4"	96
M	110	#4	9"	6' - 6"	478
N	34	#6	~	3' - 0"	153
W1-5	20	#4	~	7' - 7"Av	101
Reinforcing Steel				Lb	5,002
Concrete				CY	30.6

(1) Quantities shown are for 38'-0" roadway width with two ends (4 wings and 2 aprons). For each 1'-0" variation in roadway width, make the following adjustments:
- reinforcing steel, 104.3 lb.
- concrete, 0.55 CY

For boxes with no wings or with alternate wings, make the following adjustments:
- omit Bars G, J, L, N, and W;
- subtract 730 lb. from reinforcing steel total; and
- subtract 8.3 CY from concrete total.

(2) 0" Min to 1'-0" Max. Estimated curb heights are shown elsewhere in the plans. 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.

(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) 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.

(5) 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, F, or M 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 Gr 60 #4 Bars at 9" Spacing with WWR
Required WWR = (0.20 sq. in. per 0.75 ft.) x (60 ksi / 70 ksi) = 0.229 sq. in. per ft.
If D23 wire is used to meet the 0.229 sq. in. per ft. requirement in this example, the required spacing = (0.230 sq. in.) / (0.229 sq. in. per ft.) x (12 in. per ft.) = 12.05" Max spacing. Required lap length for the provided D19.6 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.
Adjust reinforcing bars to provide a minimum of 1 ½" clear cover.
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 and Bars C and Bars D may be reversed.

MATERIAL NOTES:

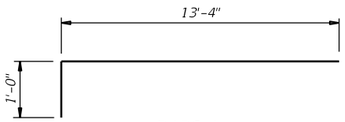
Provide Grade 60 reinforcing steel.
Provide galvanized reinforcing steel if required elsewhere in the plans.
Provide Class C concrete (f'c = 3,600 psi) for culvert barrel and curb, with the following exceptions: provide Class S concrete (f'c = 4,000 psi) for the top slabs of:
- culverts with overlay,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

Provide bar laps, where required, as follows:
- Uncoated or galvanized ~ #4 = 1'-8"
- Uncoated or galvanized ~ #5 = 2'-1"
- Uncoated or galvanized ~ #6 = 2'-6"

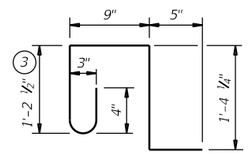
GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications for the range of fill heights shown.
See the Single Box Culverts Cast-In-Place Miscellaneous Details (SCC-MD) standard sheet for lengthening details.
For wingwalls other than those shown here, refer to wingwall standards and details shown elsewhere in the plans.

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



BARS L



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

HL93 LOADING

Texas Department of Transportation

Bridge Division Standard

STOCK PASS

SIZE 5'-0" X 6'-6"
0' TO 14' FILL

SP

FILE: spe01ste-20.dgn	DN: TBE	CK: TAR	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
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	BRY	BURLESON		148

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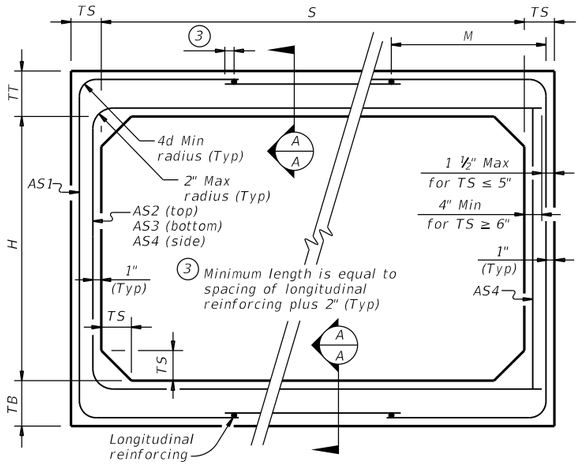
BOX DATA

SECTION DIMENSIONS					Fill Height	M (Min)	REINFORCING (sq. in. / ft.) (2)							(1) Lift Weight
S (ft.)	H (ft.)	TT (in.)	TB (in.)	TS (in.)	(ft.)	(in.)	AS1	AS2	AS3	AS4	AS5	AS7	AS8	(tons)
8	3	8	8	8	< 2	–	0.31	0.35	0.25	0.19	0.19	0.19	0.19	10.4
8	3	8	8	8	2 < 3	55	0.35	0.29	0.28	0.19	–	–	–	10.4
8	3	8	8	8	3 – 5	50	0.28	0.23	0.24	0.19	–	–	–	10.4
8	3	8	8	8	10	45	0.29	0.25	0.26	0.19	–	–	–	10.4
8	3	8	8	8	15	45	0.39	0.33	0.34	0.19	–	–	–	10.4
8	3	8	8	8	20	45	0.51	0.43	0.44	0.19	–	–	–	10.4
8	3	8	8	8	25	45	0.63	0.53	0.54	0.19	–	–	–	10.4
8	4	8	8	8	< 2	–	0.27	0.38	0.29	0.19	0.19	0.19	0.19	11.2
8	4	8	8	8	2 < 3	50	0.31	0.34	0.32	0.19	–	–	–	11.2
8	4	8	8	8	3 – 5	50	0.25	0.27	0.27	0.19	–	–	–	11.2
8	4	8	8	8	10	45	0.26	0.28	0.29	0.19	–	–	–	11.2
8	4	8	8	8	15	41	0.34	0.37	0.38	0.19	–	–	–	11.2
8	4	8	8	8	20	41	0.44	0.48	0.49	0.19	–	–	–	11.2
8	5	8	8	8	< 2	–	0.24	0.40	0.32	0.19	0.19	0.19	0.19	12.0
8	5	8	8	8	2 < 3	50	0.28	0.37	0.35	0.19	–	–	–	12.0
8	5	8	8	8	3 – 5	45	0.23	0.29	0.30	0.19	–	–	–	12.0
8	5	8	8	8	10	45	0.23	0.31	0.32	0.19	–	–	–	12.0
8	5	8	8	8	15	41	0.30	0.41	0.42	0.19	–	–	–	12.0
8	5	8	8	8	20	41	0.39	0.52	0.54	0.19	–	–	–	12.0
8	6	8	8	8	< 2	–	0.22	0.42	0.35	0.19	0.19	0.19	0.19	12.8
8	6	8	8	8	2 < 3	50	0.25	0.40	0.38	0.19	–	–	–	12.8
8	6	8	8	8	3 – 5	50	0.21	0.32	0.33	0.19	–	–	–	12.8
8	6	8	8	8	10	45	0.22	0.33	0.34	0.19	–	–	–	12.8
8	6	8	8	8	15	41	0.28	0.43	0.45	0.19	–	–	–	12.8
8	6	8	8	8	20	41	0.36	0.55	0.57	0.19	–	–	–	12.8
8	7	8	8	8	< 2	–	0.20	0.44	0.37	0.19	0.19	0.19	0.19	13.6
8	7	8	8	8	2 < 3	55	0.23	0.43	0.41	0.19	–	–	–	13.6
8	7	8	8	8	3 – 5	55	0.19	0.34	0.35	0.19	–	–	–	13.6
8	7	8	8	8	10	50	0.20	0.34	0.36	0.19	–	–	–	13.6
8	7	8	8	8	15	41	0.26	0.45	0.47	0.19	–	–	–	13.6
8	7	8	8	8	20	41	0.33	0.57	0.60	0.19	–	–	–	13.6
8	8	8	8	8	< 2	–	0.20	0.45	0.40	0.19	0.19	0.19	0.19	14.4
8	8	8	8	8	2 < 3	65	0.21	0.45	0.44	0.19	–	–	–	14.4
8	8	8	8	8	3 – 5	65	0.19	0.36	0.38	0.19	–	–	–	14.4
8	8	8	8	8	10	55	0.19	0.35	0.38	0.19	–	–	–	14.4
8	8	8	8	8	15	45	0.24	0.46	0.49	0.19	–	–	–	14.4
8	8	8	8	8	20	45	0.31	0.59	0.62	0.19	–	–	–	14.4

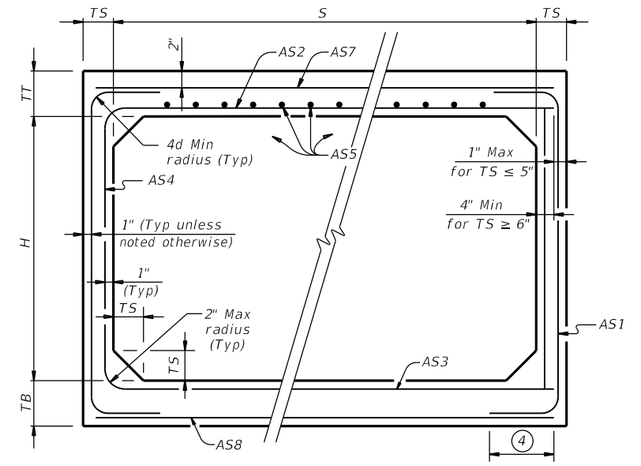
(1) For box length = 8'-0"

(2) AS1 thru AS4, AS7 and AS8 are minimum required areas of reinforcement per linear foot of box length. AS5 is minimum required area of reinforcement per linear foot of box width.



CORNER OPTION "A" CORNER OPTION "B"

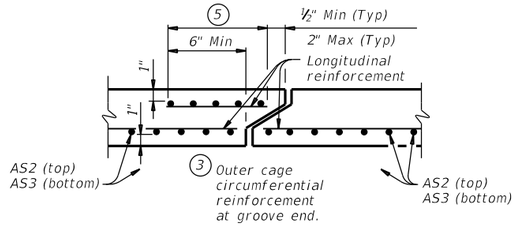
FILL HEIGHT 2 FT AND GREATER



CORNER OPTION "A" CORNER OPTION "B"

FILL HEIGHT LESS THAN 2 FT

(4) Length is equal to spacing of longitudinal reinforcing plus 2". (10" Min) (Typ)



SECTION A-A

(Showing top and bottom slab joint reinforcement.)

MATERIAL NOTES:

Provide 0.03 sq. in./ft. minimum longitudinal reinforcement at each face in slabs and walls. This minimum requirement may be met by the transverse wires when wire mesh reinforcement is used.

Provide Class H concrete (f`c = 5,000 psi).

GENERAL NOTES:

Designs shown conform to ASTM C1577. Refer to ASTM C1577 for information or details not shown.

See Box Culverts Precast Miscellaneous Details (SCP-MD) standard sheet for details and notes not shown.

In lieu of furnishing the designs shown on this sheet, the contractor may furnish an alternate design that is equal to or exceeds the box design for the design fill height in the table. Submit shop plans for alternate designs in accordance with Item "Precast Concrete Structural Members (Fabrication)".

HL93 LOADING

Texas Department of Transportation

Bridge Division Standard

SINGLE BOX CULVERTS PRECAST

8'-0" SPAN

SCP-8

FILE: scp08sts-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	1507	02	016, Etc.	FM696, Etc.
	DIST	COUNTY		SHEET NO.
	BRY	BURLESON		149

TABLE OF DIMENSIONS AND REINFORCING STEEL
(Wings for One Structure End)

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

TABLE OF WING WALL REINFORCING (Two~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

TABLE OF ESTIMATED ANCHOR TOEWALL QUANTITIES

Bar	Size	No.	Spa
K	#4	~	1'-0"
N	#5	6	~
OL	#4	6	~
Reinf (Lb/Ft)			9.82
Conc (CY/Ft)			0.074

(1) Extend Bars P 3'-0" Min into bottom slab of box culvert.

(2) Adjust to fit as necessary to maintain 1 1#2" clear cover and 4" Min between bars.

(3) Quantities shown are based on an average wing height for two wings (one structure end). To determine total quantities for two wings multiply the tabulated values by Lw.

(4) Recommended values of slope are: 3:1, 4:1, and 6:1. Provide 3:1 or flatter slope.

(5) 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, 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 is not required.

(6) At Contractor's option, end the culvert toewall flush with wingwall toewall. Adjust reinforcing as needed.

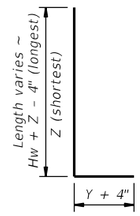
(7) 3" Min to 5'-0" Max. Estimated curb heights are shown elsewhere in the plans. For structures without railing and curbs taller than 1'-0", refer to the Extend Curb Details (ECD) standard sheet.

(8) For vehicle safety, reduce curb heights, 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.

(9) See Table of Maximum Wing Heights for various slopes. Height is limited based on a 33'-6" maximum safety pipe runner length.

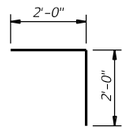
TABLE OF MAXIMUM WING HEIGHTS (9)

Side Slope	Hw Max
3:1	11'- 5"
4:1	8'-10"
6:1	6'- 1"

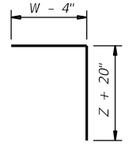


BARS J1

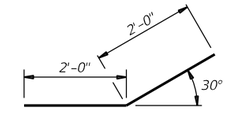
BARS V



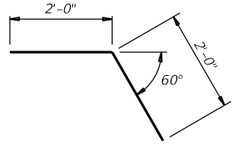
BARS L



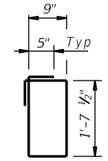
BARS J2



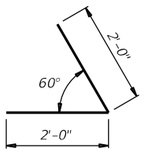
BARS D



BARS R



BARS K
(Length = 5'-5")



BARS OL

WING DIMENSION CALCULATIONS:

Hw = H + T + C - 0.250' (9)
A = (Hw - 0.333') (SL)
B = (A) (tan (30°))
Lw = (A) ÷ cos (30°))

For cast-in-place culverts:
Ltw = (N) (S) + (N + 1) (U)
For precast culverts:
Ltw = (N) (2U + S) + (N - 1) (0.500')

Lc = (Ltw) - (2U)
Atw = (Lc) + (2B)
Total Wingwall Area (two wings ~ SF)
= (Hw + 0.333') (Lw)

Hw = Height of wingwall (feet)
Atw = Anchor toewall length (feet)
Lw = Length of wingwall (feet)
N = Number of culvert barrels
SL:1 = Side slope ratio (horizontal : 1 vertical)
Ltw = Culvert toewall length (feet)
Lc = Culvert curb between wings (feet)

See applicable box culvert standard for H, S, T, and U values.
See Table of Maximum Wall Heights for limits on Hw.

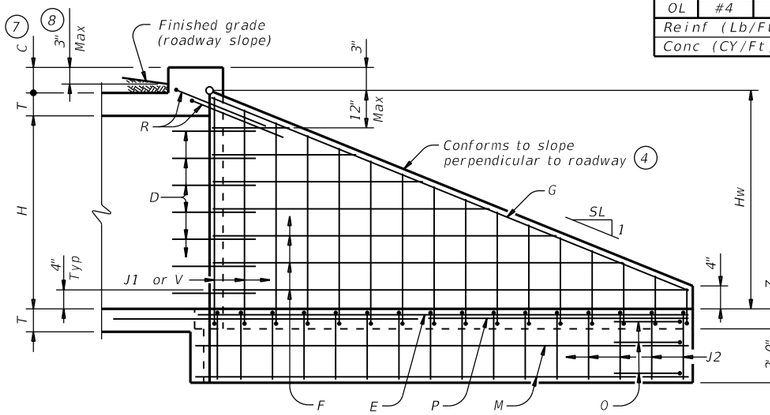
MATERIAL NOTES:

Provide Grade 60 reinforcing steel.
Provide galvanized reinforcing steel if required elsewhere in 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.
Provide Class "C" concrete (f`c = 3,600 psi).
Adjust reinforcing as necessary to provide a minimum clear cover of 1 ½".
Provide pipe runners 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 and nuts.
Provide ASTM A36 steel plates.
Galvanize all steel components, except reinforcing unless required elsewhere in the plans, after fabrication.
Repair galvanizing damaged during transport or construction in accordance with the Item 445, "Galvanizing".
For optional adhesive anchors, install adhesive anchorages in accordance with the manufacturer's instructions including hole size, drilling equipment and method, hole cleaning equipment and method, mixing and dispensing adhesive, and anchor insertion. Do not alter the manufacturer's mixing nozzle or dispenser. Provide anchorage rods that are clean and free of grease, oil, or any other foreign material. Demonstrate hole cleaning method to the Engineer for approval and continue the approved process for all anchorage locations. Test adhesive anchors in accordance with Item 450.3.3, "Tests." Test 3 anchors per 100 anchors installed.

GENERAL NOTES:

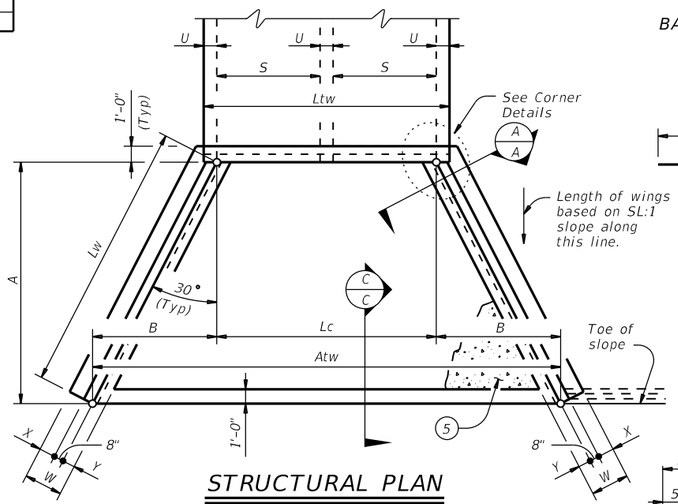
Designed according to AASHTO LRFD Bridge Design Specifications.
The safety end treatments shown herein are intended for use in those installations where out of control vehicles are likely to traverse the openings approximately perpendicular to the pipe runners.
Pipe runners are designed for a traversing load of 1,800 pounds at yield as recommended by Research Report 280-1, "Safety Treatment of Roadside Cross-Drainage Structures", Texas Transportation Institute, March 1981.
When structure is founded on solid rock, depth of toewalls for culverts and wingwalls may be reduced or eliminated as directed by the Engineer.
All bolts, nuts, washers, brackets, angles, and pipe runners are considered parts of the safety end treatment for payment.
The quantities for pipe runners, reinforcing steel, and concrete, 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.

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



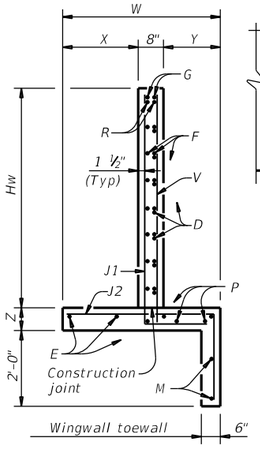
INSIDE ELEVATION OF WINGWALL

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

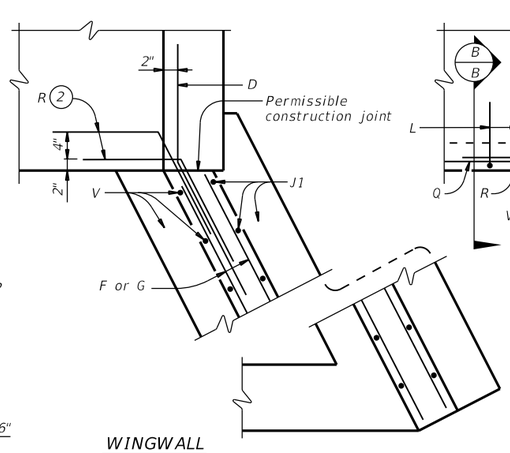


STRUCTURAL PLAN

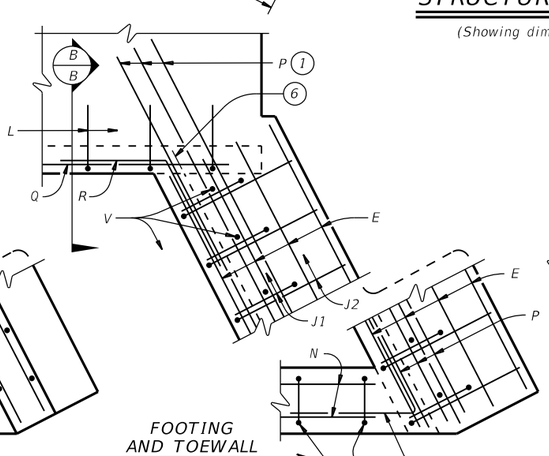
(Showing dimensions.)



SECTION A-A



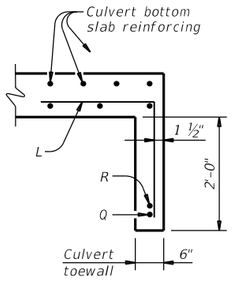
WINGWALL



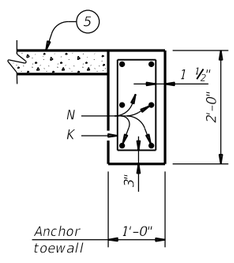
FOOTING AND TOEWALL

CORNER DETAILS

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



SECTION B-B (5)



SECTION C-C

SHEET 1 OF 3

Texas Department of Transportation

Bridge Division Standard

SAFETY END TREATMENT WITH FLARED WINGS

FOR 0° SKEW BOX CULVERTS TYPE I ~ CROSS DRAINAGE

SETB-FW-0

FILE: setbf0se-20.dgn	DN: GAF	CK: CAT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020 REVISIONS	CONT	SECT	JOB	HIGHWAY
	1507	02	016, Etc.	FM696, Etc.
	DIST	COUNTY		SHEET NO.
	BRY	BURLESON		150

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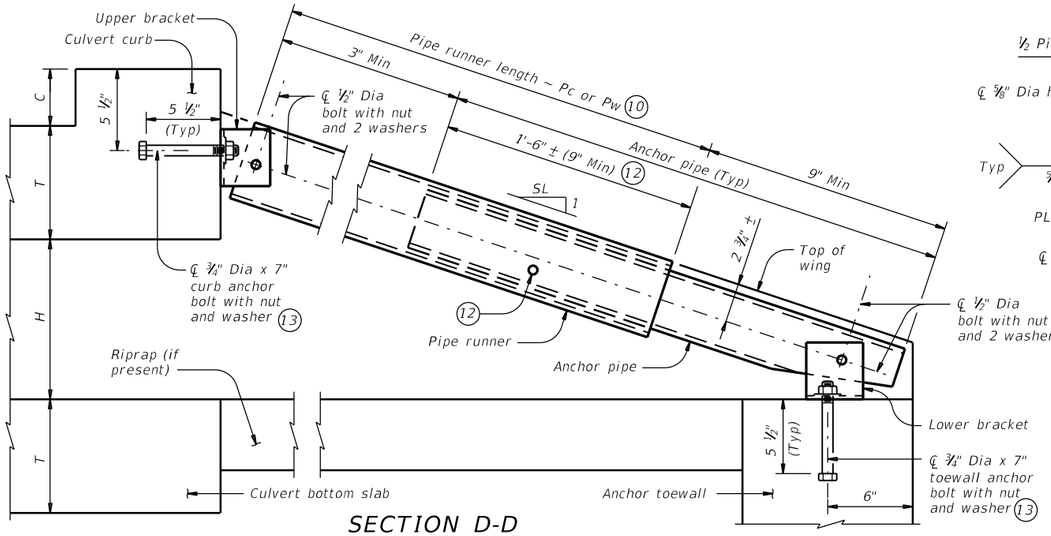
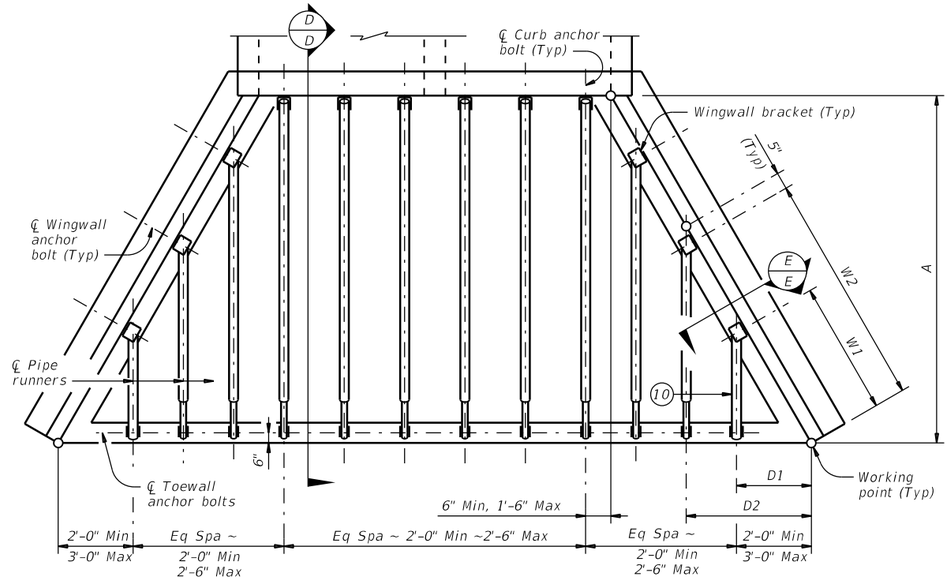
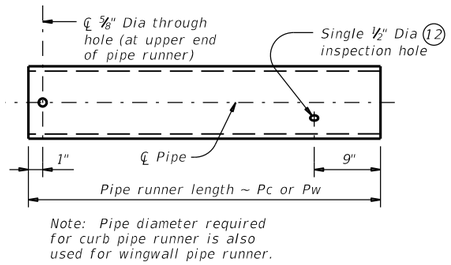


SECTION D-D

(Showing curb pipe runner. Except for upper bracket, wingwall pipe runners are similar.)

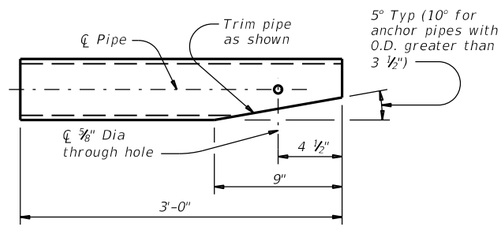


PIPE RUNNER PLAN

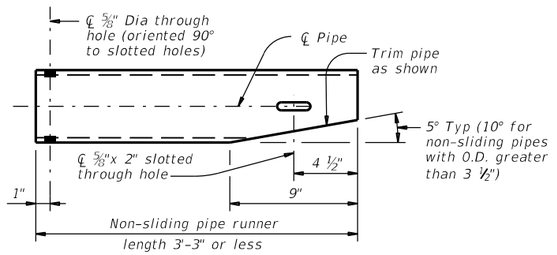


Note: Pipe diameter required for curb pipe runner is also used for wingwall pipe runner.

PIPE RUNNER DETAILS

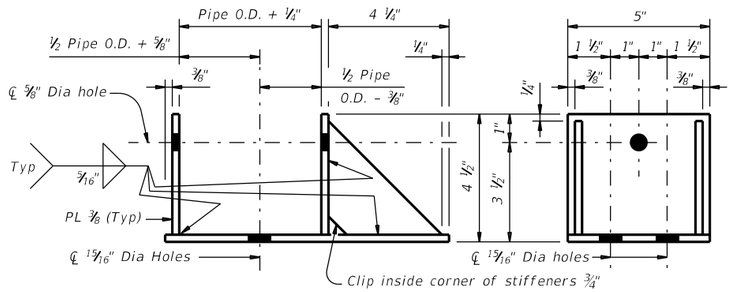


ANCHOR PIPE DETAILS



Note: Pipe size is the same as required for curb pipe runner. Adjust the corresponding lower bracket accordingly.

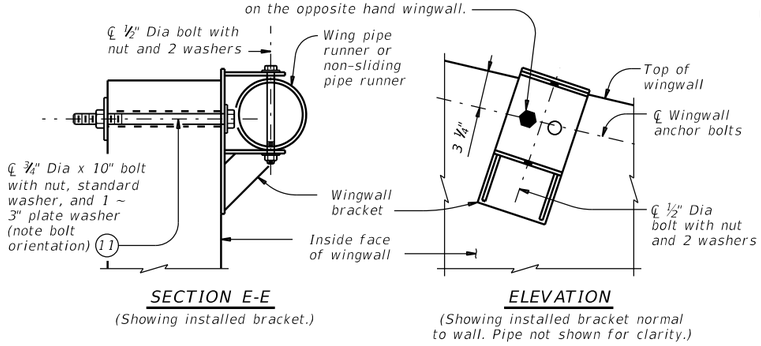
NON-SLIDING PIPE RUNNER DETAILS



ELEVATION

SIDE VIEW

Install ¾" anchor bolt in hole nearest to the culvert curb. Other bolt hole is intended for use on the opposite hand wingwall.



SECTION E-E

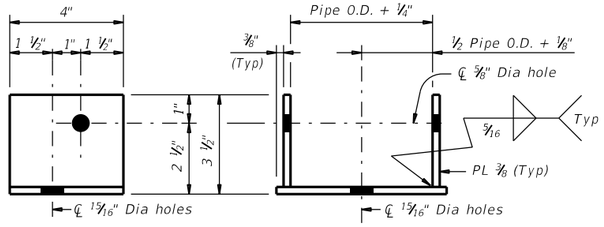
(Showing installed bracket.)

ELEVATION

(Showing installed bracket normal to wall. Pipe not shown for clarity.)

Note: Match wingwall bracket to the upper curb bracket size.

WINGWALL BRACKET DETAILS



SIDE VIEW

ELEVATION

Note: Match upper and lower brackets, except for the brackets used with non-sliding pipe runners, to the required pipe diameters as shown in the table.

UPPER AND LOWER BRACKET DETAILS

MAXIMUM PIPE RUNNER LENGTHS AND REQUIRED PIPE RUNNER SIZES

Maximum Pipe Runner Length (Pc or Pw)	Required Pipe Runner Size			Required Anchor Pipe Size		
	Pipe Size	Pipe O.D.	Pipe I.D.	Pipe Size	Pipe O.D.	Pipe I.D.
9'-4"	3" STD	3.500"	3.068"	2" STD	2.375"	2.067"
19'-0"	4" STD	4.500"	4.026"	3" STD	3.500"	3.068"
33'-6"	5" STD	5.563"	5.047"	4" STD	4.500"	4.026"

(10) If pipe runner length (Pw) is 1'-9" or less replace the normal pipe runner and anchor pipe with a single non-sliding pipe runner. See Non-Sliding Pipe Runner Details for additional information.

(11) At Contractor's option, ⅞" diameter hole may be formed or cored drilled. Percussion drilling is not permitted. Adjust placement of reinforcing steel as necessary to avoid bolt holes.

(12) After installation of pipe runner, use the ½" inspection hole to ensure that the lap of the anchor pipe with the pipe runner is adequate.

(13) At Contractor's option, an adhesive anchor may be used. Provide ¾" Dia adhesive anchors that meet the requirements of ASTM A307 Gr A fully threaded rods. Embed threaded rods into curb, wingwalls, and toewall using a Type III, Class C, D, E, or F anchor adhesive. Minimum embedment depth is 5 ½". Provide anchor adhesive able to achieve a basic bond strength in tension, Nba, of 20 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.

PIPE RUNNER DIMENSION CALCULATIONS:

Wn = (2.000) (Dn) - (0.416')
Pwn = (Dn) (K2) - (2.063')
Pw1 Non-Sliding Pipe Runner (If required) = (D1) (K2) - (0.563')
Pc = (A) (K1) - (1.688')

Wn = Distance from working point to centerline anchor bolt measured along bottom inside face of wing (feet)
Dn = Distance from working point to centerline pipe runner measured along outside face of anchor toewall (feet)
Pw = Wingwall pipe runner length (feet)
Pc = Curb pipe runner length (feet)
K = Constant values for use in formulas

Slope SL:1	K1	K2
3:1	~ 1.054	~ 1.826
4:1	~ 1.031	~ 1.785
6:1	~ 1.014	~ 1.756

n = Wing pipe runner number

Texas Department of Transportation

Bridge Division Standard

SAFETY END TREATMENT WITH FLARED WINGS

FOR 0° SKEW BOX CULVERTS
TYPE I ~ CROSS DRAINAGE

SETB-FW-0

FILE: setbf0se-20.dgn	DN: GAF	CK: CAT	DW: TxDOT	CK: TxDOT
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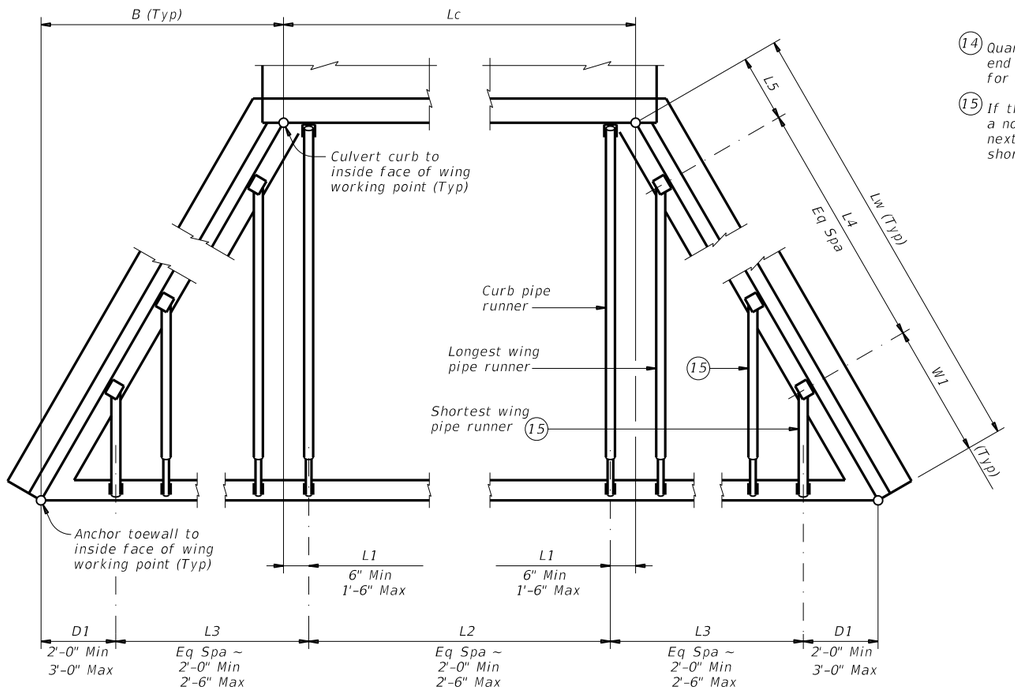
REVISIONS	1507	02	016, Etc.	FM696, Etc.
	DIST	COUNTY		SHEET NO.
	BRY	BURLESON		151

Culvert Station and/or Creek name followed by applicable end (Lt, Rt or Both) (14)	Lc	L1	L2			D1	L3			W1	L4			L5	Curb Pipe Runner (Pc)		Longest Wing Pipe Runner (Pw)	Shortest Wing Pipe Runner (Pw)	Non-Sliding Wing Pipe Runner (if applicable)	Curb, Wing, and/or Non-Sliding Pipe Runners		3'-0" Anchor Pipe	
			No. Spa	Spa at	Overall Length		No. Spa	Spa at	Overall Length		No. Spa	Spa at	Overall Length		No.	Length				Size (3",4" or 5")	Total (14) Length	Size (2",3" or 4")	Total (14) Length
	(Ft)	(Ft)		(Ft)	(Ft)	(Ft)		(Ft)	(Ft)	(Ft)		(Ft)	(Ft)	(Ft)		(Ft)	(Ft)	(Ft)	(Ft)				
STA 421+82 (FM 2000) (Both)	6.000'	1.000'	2	2.000'	4.000'	3.000'	3	2.028'	6.083'	5.583'	2	4.055'	8.111'	2.472'	3	12.750'	10.521'	3.292'	N/A	4"	159.375'	3"	54.000'
STA 421+82 (FM 2000) (Both)	6.000'	1.000'	2	2.000'	4.000'	3.000'	3	2.092'	6.275'	5.583'	2	4.184'	8.367'	2.600'	3	13.083'	10.750'	3.292'	N/A	4"	162.750'	3"	54.000'
STA 432+39 (FM 2000) (Both)	6.000'	1.000'	2	2.000'	4.000'	3.000'	3	2.028'	6.083'	5.583'	2	4.055'	8.111'	2.472'	3	12.750'	10.521'	3.292'	N/A	4"	159.375'	3"	54.000'
STA 432+39 (FM 2000) (Both)	6.000'	1.000'	2	2.000'	4.000'	3.000'	3	2.092'	6.275'	5.583'	2	4.184'	8.367'	2.600'	3	13.083'	10.750'	3.292'	N/A	4"	162.750'	3"	54.000'
STA 67+37 (FM 696) (Both)	3.000'	1.500'	0	0.000'	0.000'	2.500'	2	2.387'	4.774'	4.583'	1	4.774'	4.774'	2.190'	1	8.625'	6.667'	2.396'	N/A	3"	53.500'	2"	30.000'
STA 67+37 (FM 696) (Both)	3.000'	1.500'	0	0.000'	0.000'	2.500'	2	2.098'	4.196'	4.583'	1	4.196'	4.196'	1.613'	1	7.583'	6.146'	2.396'	N/A	3"	49.333'	2"	30.000'
STA 124+25 (FM 696) (Both)	3.000'	1.500'	0	0.000'	0.000'	2.500'	2	2.387'	4.774'	4.583'	1	4.774'	4.774'	2.190'	1	8.625'	6.667'	2.396'	N/A	3"	53.500'	2"	30.000'
STA 124+25 (FM 696) (Both)	3.000'	1.500'	0	0.000'	0.000'	2.500'	2	2.098'	4.196'	4.583'	1	4.196'	4.196'	1.613'	1	7.583'	6.146'	2.396'	N/A	3"	49.333'	2"	30.000'



PIPE RUNNER LAYOUT

(14) Quantities shown are for one structure end if Lt or Rt. Quantities shown are for two structure ends if Both.

(15) If the outermost wing pipe runner is a non-sliding pipe runner, consider the next outermost wing pipe runner as the shortest.

SPECIAL NOTE:

This tabular sheet is to be filled out by the culvert specifier and provides information for the construction details and quantities of pipe runners.

An Excel 2010 spreadsheet to assist in completing this table can be downloaded from the Bridge Standards (English) web page on the TxDOT web site. The completed sheet must be signed, sealed, and dated by a licensed Professional Engineer.

Note that the tabular quantities are given for estimating purposes only. It is likely that these quantities will change due to field conditions. Therefore, all dimensions must be verified by the Contractor in the field prior to fabrication of the safety end treatment components.

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SHEET 3 OF 3

STATE OF TEXAS
JEAN J. FENG
102035
LICENSED
PROFESSIONAL ENGINEER
12/23/2020

Texas Department of Transportation

Bridge Division Standard

SAFETY END TREATMENT WITH FLARED WINGS

FOR 0° SKEW BOX CULVERTS
TYPE I ~ CROSS DRAINAGE

SETB-FW-0

FILE: setbf0se-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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REVISIONS				
	DIST	COUNTY		SHEET NO.
				152

TABLE OF DIMENSIONS AND REINFORCING STEEL
(Wings for One Structure End)

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

TABLE OF WINGWALL REINFORCING (Two~Wings)

Bar	Size	No.	Spa
DL & DS	#5	~	1'-0"
E	#4	~	1'-0"
F	#4	~	1'-0"
G	#6	4	~
M	#4	4	~
P	#4	~	1'-0"
RL	#5	3	~
RS	#5	3	~
V	#4	~	1'-0"

TABLE OF ESTIMATED CULVERT TOEWALL QUANTITIES

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

TABLE OF ESTIMATED ANCHOR TOEWALL QUANTITIES

Bar	Size	No.	Spa
K	#4	~	1'-0"
N	#5	6	~
OL	#4	3	~
OS	#4	3	~
Reinf (Lb/Ft)			9.82
Conc (CY/Ft)			0.074

(1) Extend Bars P 3'-0" Min into bottom slab of box culvert.

(2) Adjust to fit as necessary to maintain 11#2" clearcover and 4" Min between bars.

(3) Quantities shown are based on an average wing height for two wings (one structure end). To determine total quantities for two wings multiply the tabulated values by 0.5 (A+Lw).

(4) Recommended values of slope are: 3:1, 4:1, and 6:1. Provide 3:1 or flatter slope.

(5) 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, 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 is not required.

(6) At Contractor's option, end the culvert toewall flush with wingwall toewall. Adjust reinforcing as needed.

(7) 3" Min to 5'-0" Max. Estimated curb heights are shown elsewhere in the plans. For structures without railing and curbs taller than 1'-0", refer to the Extended Curb Details (ECD) standard sheet.

(8) For vehicle safety, reduce curb heights, 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.

(9) Culvert skew (limit to 15° or 30°)

(10) See Table of Maximum Wing Heights for various slopes. Height is limited based on a 33'-6" maximum safety pipe runner length.

(11) Typical wingwall angle for all skews.

TABLE OF MAXIMUM WING HEIGHTS (10)

Side Slope	Hw Max
3:1	11'- 5"
4:1	8'–10"
6:1	6'– 1"

WING DIMENSION CALCULATIONS:

Formulas:

Hw = H + T + C – 0.250' (10)

A = (Hw – 0.333') (SL)

B = (A) [tan (θ + 15°)]

Lw = (A) ÷ [cos (θ + 15°)]

For cast–in–place culverts:

Ltw = [(N) (S) + (N + 1) (U)] ÷ (cos θ)

For precast culverts:

Ltw = [(N) (2U + S) + (N – 1) (0.500')] ÷ (cos θ)

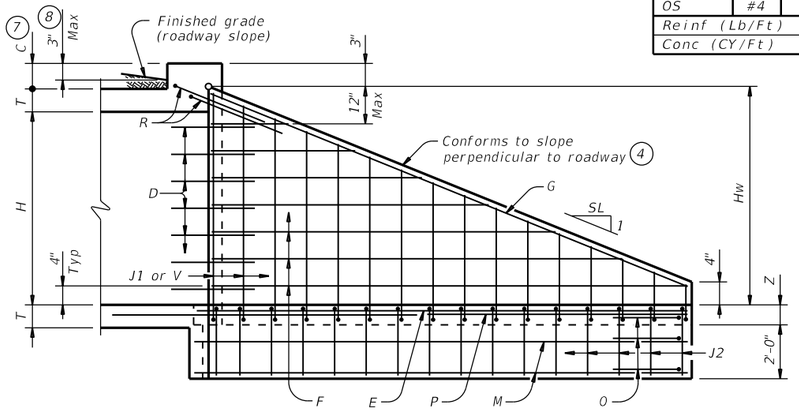
Lc = (Ltw) – (2U) ÷ (cos θ)

Atw = (Lc) + (B)

Total Wingwall Area (two wings ~ S.F.) = (0.5) (Hw + 0.333') (Lw + A)

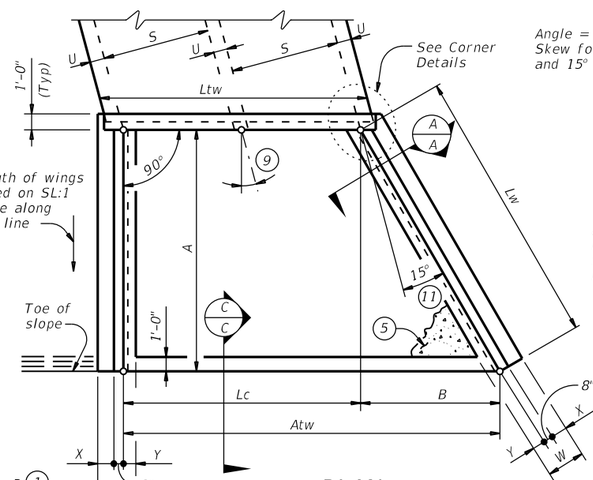
Hw = Height of wingwall (feet)
SL:1 = Side slope ratio (horizontal : 1 vertical)
Lw = Length of wingwall (feet)
Ltw = Culvert toewall length (feet)
Lc = Culvert curb between wings (feet)
Atw = Anchor toewall length (feet)
N = Number of culvert spans
θ = Culvert skew

See applicable box culvert standard for H, S, T, and U values.
See Table of Maximum Wall Heights for limits on Hw.



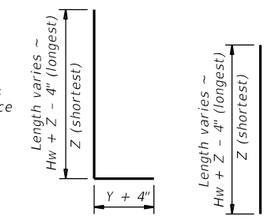
INSIDE ELEVATION OF WINGWALL

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



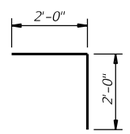
PLAN

(Showing dimensions and 15° skew.)

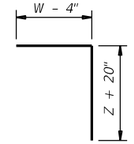


BARS J1

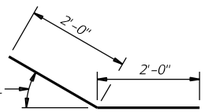
BARS V



BARS L

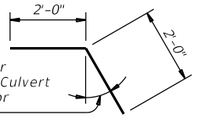


BARS J2



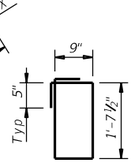
Angle = Culvert Skew for Bars DS and 15° for Bars DL

BARS DS and DL
(DS ~ Short wing and DL ~ Long wing)

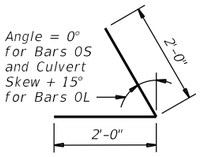


Angle = 0° for Bars RS and Culvert Skew + 15° for Bars RL

BARS RS and RL
(RS ~ Short wing and RL ~ Long wing)



BARS K
(Length = 5'–5")



BARS OS and OL
(OS ~ Short wing and OL ~ Long wing)

MATERIAL NOTES:

Provide Grade 60 reinforcing steel.

Provide galvanized reinforcing steel if required elsewhere in 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.

Provide Class "C" concrete (f`c = 3,600 psi).

Adjust reinforcing as necessary to provide a minimum clear cover of 1 ½".

Provide pipe runners 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 and nuts.

Provide ASTM A36 steel plates.

Galvanize all steel components, except reinforcing unless required elsewherein the plans, after fabrication.

Repair galvanizing damaged during transport or construction in accordance with the Item 445, "Galvanizing".

For optional adhesive anchors, install adhesive anchorages in accordance with the manufacturer's instructions including hole size, drilling equipment and method, hole cleaning equipment and method, mixing and dispensing adhesive, and anchor insertion. Do not alter the manufacturer's mixing nozzle or dispenser. Provide anchorage rods that are clean and free of grease, oil, or any other foreign material. Demonstrate hole cleaning method to the Engineer for approval and continue the approved process for all anchorage locations. Test adhesive anchors in accordance with Item 450.3.3, "Tests." Test 3 anchors per 100 anchors installed.

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 pipe runners.

Pipe runners are designed for a traversing load of 1,800 pounds at yield as recommended by Research Report 280–1, "Safety Treatment of Roadside Cross–Drainage Structures", Texas Transportation Institute, March 1981.

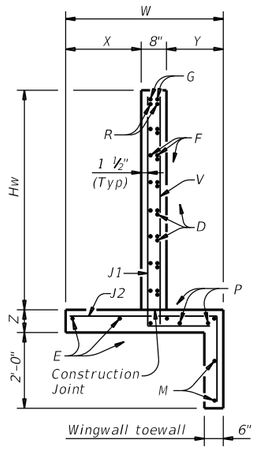
When structure is founded on solid rock, depth of toewalls for culverts and wingwalls may be reduced or eliminated as directed by the Engineer.

All bolts, nuts, washers, brackets, angles, and pipe runners are considered parts of the safety end treatment for payment

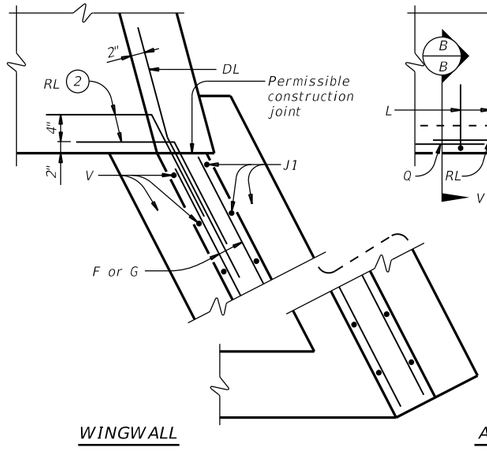
The quantities for pipe runners, reinforcing steel, and concrete, resulting from the formulas given herein are for Contractor's information only.

See Box Culvert Supplement (BCS) standard sheet for additional dimensions and information.

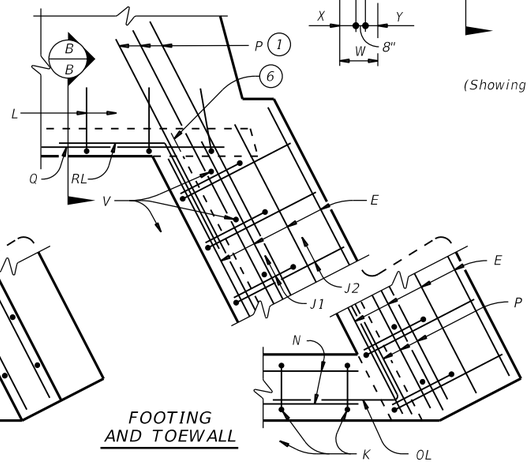
Cover dimensions are clear dimensions, unless noted otherwise. Reinforcing dimensions are out–to–out of bars.



SECTION A-A



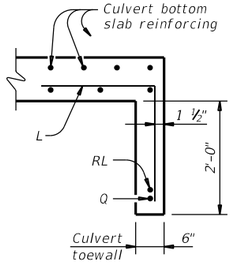
WINGWALL



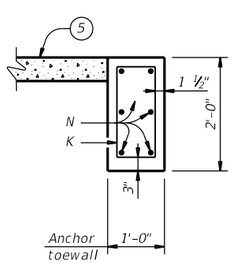
FOOTING AND TOEWALL

CORNER DETAILS

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



SECTION B-B (5)



SECTION C-C

SHEET 1 OF 3

Texas Department of Transportation

Bridge Division Standard

SAFETY END TREATMENT WITH FLARED WINGS

FOR 15° AND 30° SKEW BOX CULVERTS
TYPE I ~ CROSS DRAINAGE

SETB-FW-S

FILE: setbfsse-20.dgn	DN: GAF	CK: CAT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	1507	02	016, Etc.	FM696, Etc.
	DIST	COUNTY		SHEET NO.
	BRY	BURLESON		153

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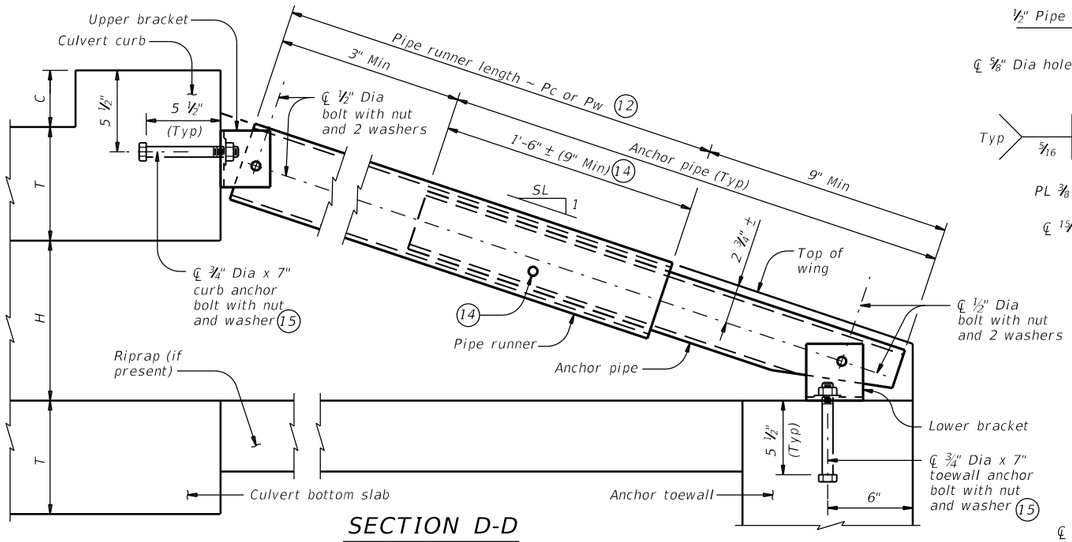
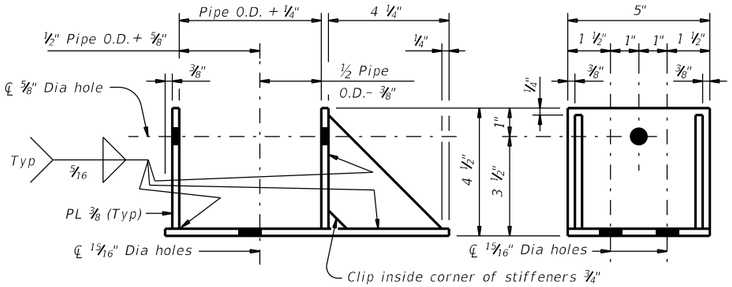
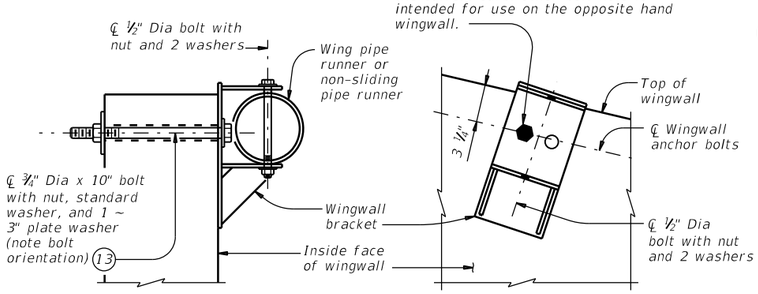


SECTION D-D

(Showing curb pipe runner. Except for upper bracket, wingwall pipe runners are similar.)



ELEVATION — SIDE VIEW

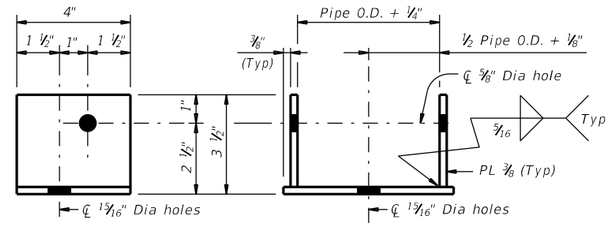


SECTION E-E
(Showing installed bracket.)

ELEVATION
(Showing installed bracket normal to wall. Pipe not shown for clarity.)

Note: Match wingwall bracket to the upper curb bracket size.

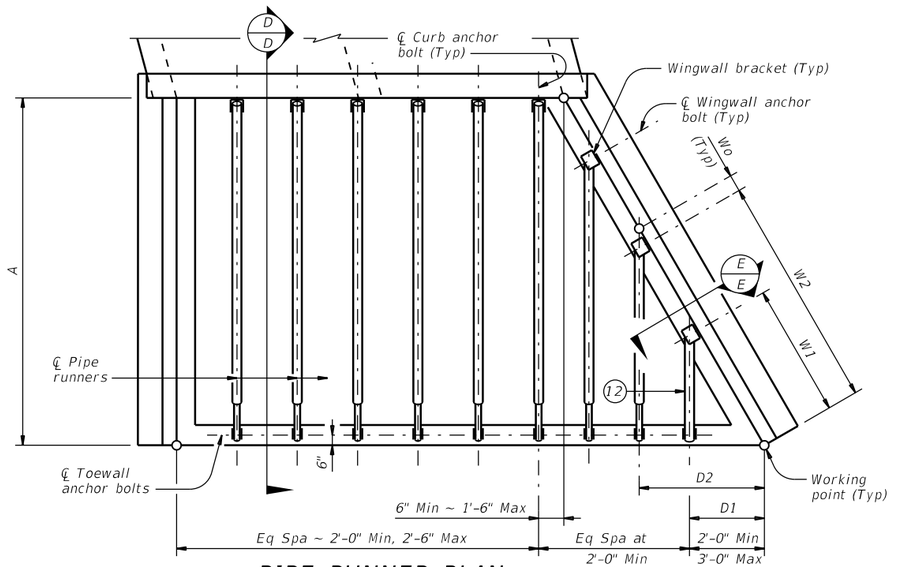
WINGWALL BRACKET DETAILS



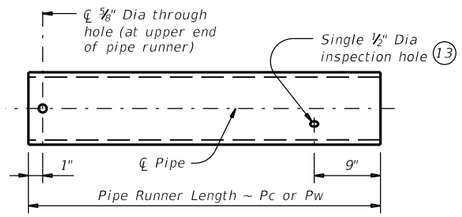
SIDE VIEW — ELEVATION

Note: Match upper and lower brackets, except for the brackets used with non-sliding pipe runners, to the required pipe diameters as shown in the table.

UPPER AND LOWER BRACKET DETAILS

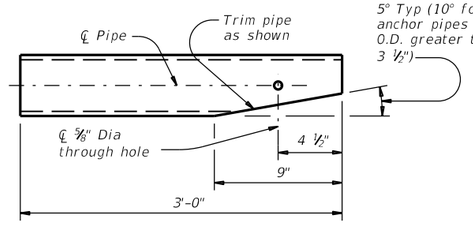


PIPE RUNNER PLAN

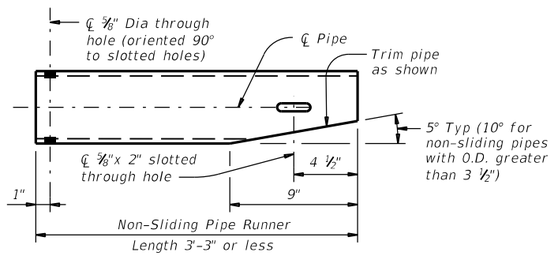


Note: Use pipe diameter required for curb pipe runner for wingwall pipe runner.

PIPE RUNNER DETAILS



ANCHOR PIPE DETAILS



Note: Pipe size is the same as required for curb pipe runner. Adjust the corresponding lower bracket accordingly.

NON-SLIDING PIPE RUNNER DETAILS

MAXIMUM PIPE RUNNER LENGTHS AND REQUIRED PIPE RUNNER AND ANCHOR PIPE SIZES

Maximum Pipe Runner Length (Pc or Pw)	Required Pipe Runner Size			Required Anchor Pipe Size		
	Pipe Size	Pipe O.D.	Pipe I.D.	Pipe Size	Pipe O.D.	Pipe I.D.
9'-4"	3" STD	3.500"	3.068"	2" STD	2.375"	2.067"
19'-0"	4" STD	4.500"	4.026"	3" STD	3.500"	3.068"
33'-6"	5" STD	5.563"	5.047"	4" STD	4.500"	4.026"

(12) If pipe runner length (Pw) is 1'-9" or less, replace the normal pipe runner and anchor pipe with a single non-sliding pipe runner. See Non-Sliding Pipe Runner Details for additional information.

(13) At Contractor's option, ⅞" diameter hole may be formed or cored drilled. Percussion drilling is not permitted. Adjust placement of reinforcing steel as necessary to avoid bolt holes.

(14) After installation of pipe runner, use the ½" inspection hole to ensure that the lap of the anchor pipe with the pipe runner is adequate.

(15) At Contractor's option, an adhesive anchor may be used. Provide ¾" Dia adhesive anchors that meet the requirements of ASTM A307, Gr A fully threaded rods. Embed threaded rods into curb, wingwalls, and toewall using a Type III, Class C, D, E, or F anchor adhesive. Minimum embedment depth is 5 ½". Provide anchor adhesive able to achieve a basic bond strength in tension, Nba, of 20 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.

PIPE RUNNER DIMENSION CALCULATIONS:

Wn = (K3) (Dn) – (Wo)
Pwn = (Dn) (K2) – (2.063')
Pw1 Non-Sliding Pipe Runner (If required) = (D1) (K2) – (0.563')
Pc = (A) (K1) – (1.688')

Wn = Distance from working point to centerline anchor bolt measured along bottom inside face of wing (feet)
Dn = Distance from working point to centerline pipe runner measured along outside face of anchor toewall (feet)
Pw = Wingwall pipe runner length (feet)
Pc = Curb pipe runner length (feet)
K = Constant values for use in formulas

Slope SL:1	K1	K2~15° Skew	K2~30° Skew
3:1	~ 1.054	~ 1.826	~ 1.054
4:1	~ 1.031	~ 1.785	~ 1.031
6:1	~ 1.014	~ 1.756	~ 1.014

K3 = 15° Skew ~ 2.000
30° Skew ~ 1.414
n = Wing pipe runner number
Wo = 15° Skew ~ 5"
30° Skew ~ 2 ½"

Texas Department of Transportation — Bridge Division Standard

SAFETY END TREATMENT WITH FLARED WINGS

FOR 15° AND 30° SKEW BOX CULVERTS
TYPE I ~ CROSS DRAINAGE

SETB-FW-S

FILE: setbfsse-20.dgn	DN: GAF	CK: CAT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	1507	02	016, Etc.	FM696, Etc.
	DIST	COUNTY		SHEET NO.
	BRY	BURLESON		154

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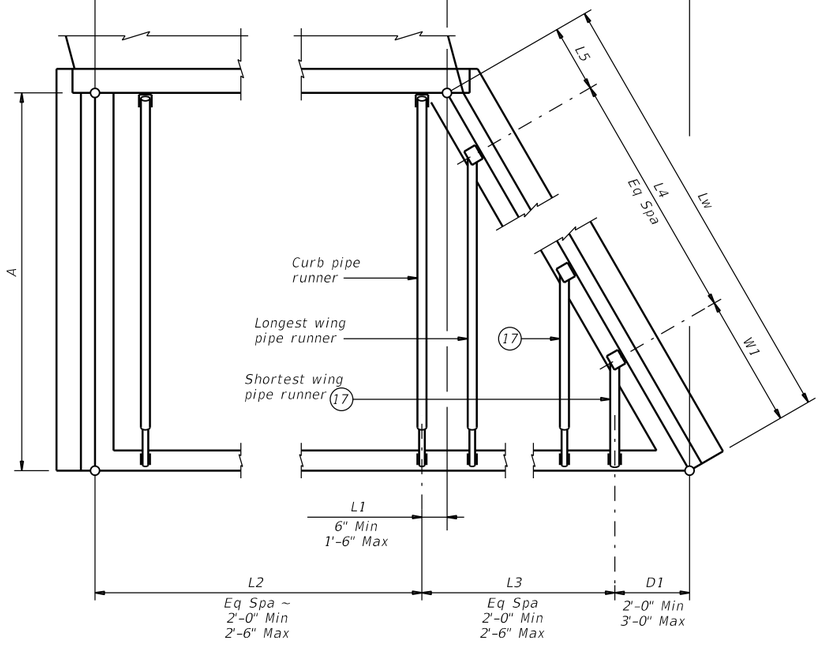
Culvert Station and/or Creek name followed by applicable end (Lt, Rt or Both) (16)	Lc	L1	L2			D1	L3			W1	L4			L5	Curb Pipe Runner (Pc)		Longest Wing Pipe Runner (Pw)	Shortest Wing Pipe Runner (Pw)	Non-Sliding Wing Pipe Runner (if applicable)	Curb, Wing, and/or Non-Sliding Pipe Runners		3'-0" Anchor Pipe	
			No. Spa	Spa at	Overall Length		No. Spa	Spa at	Overall Length		No. Spa	Spa at	Overall Length		No.	Length				Size (3",4" or 5")	Total Length (16)	Size (2",3" or 4")	Total Length (16)
	(Ft)	(Ft)		(Ft)	(Ft)	(Ft)			(Ft)	(Ft)			(Ft)	(Ft)		(Ft)	(Ft)	(Ft)	(Ft)		(Ft)		(Ft)
STA 179+90 (FM 696) (Both)	6.212'	1.500'	2	2.356'	4.712'	3.000'	3	2.098'	6.294'	5.583'	2	4.196'	8.392'	1.613'	2	12.542'	11.083'	3.417'	N/A	4"	93.667'	3"	30.000'
STA 179+90 (FM 696) (Both)	6.212'	1.500'	2	2.356'	4.712'	3.000'	3	2.098'	6.294'	5.583'	2	4.196'	8.392'	1.613'	2	12.542'	11.083'	3.417'	N/A	4"	93.667'	3"	30.000'



PIPE RUNNER LAYOUT

Note: Right forward culvert skew shown, actual culvert skew may be opposite hand.

(16) Quantities shown are for one structure end if Lt or Rt. Quantities shown are for two structure ends if Both.

(17) If the outermost wing pipe runner is a non-sliding pipe runner, consider the next outermost wing pipe runner as the shortest.

SPECIAL NOTE:

This tabular sheet is to be filled out by the culvert specifier and provides information for the construction details and quantities of pipe runners.

An Excel 2010 spreadsheet to assist in completing this table can be downloaded from the Bridge Standards (English) web page on the TxDOT web site. The completed sheet must be signed, sealed, and dated by a licensed Professional Engineer.

Note that the tabular quantities are given for estimating purposes only. It is likely that these quantities will change due to field conditions. Therefore, all dimensions must be verified by the Contractor in the field prior to fabrication of the safety end treatment components.

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SHEET 3 OF 3

STATE OF TEXAS
JEAN J. FENG
102035
LICENSED
PROFESSIONAL ENGINEER

12/23/2020

Texas Department of Transportation

Bridge Division Standard

SAFETY END TREATMENT WITH FLARED WINGS

FOR 15° AND 30° SKEW BOX CULVERTS
TYPE I ~ CROSS DRAINAGE

SETB-FW-S

FILE: setbfsse-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	1507	02	016, Etc.	FM696, Etc.
	DIST	COUNTY		SHEET NO.
	BRY	BURLESON		155

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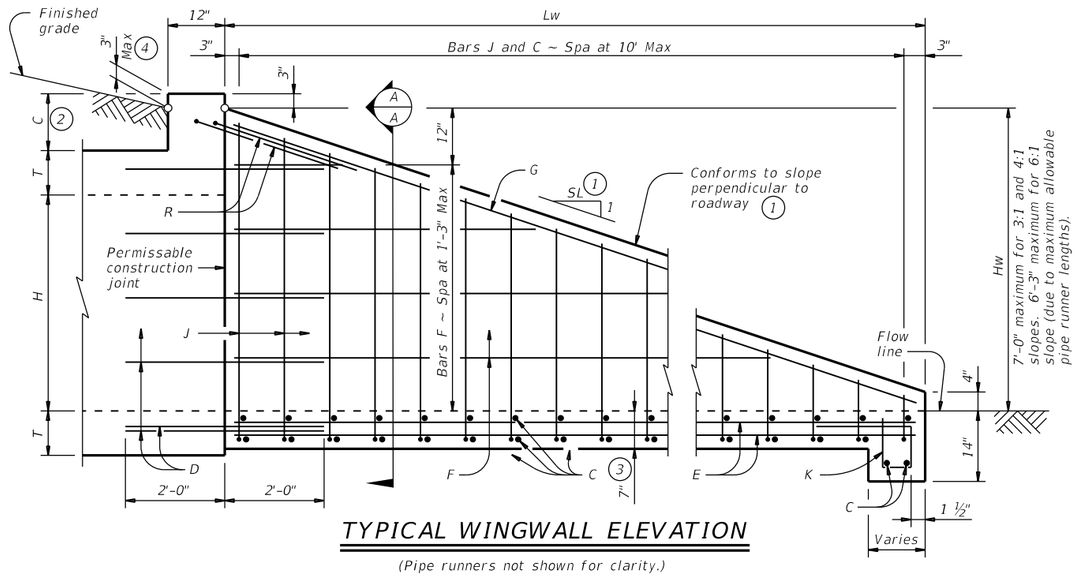
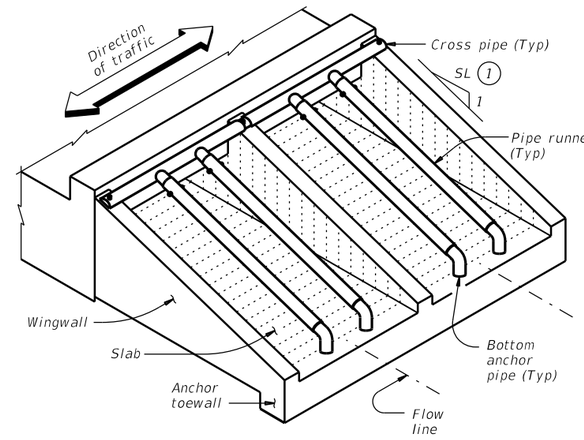


TYPICAL WINGWALL ELEVATION

(Pipe runners not shown for clarity.)



ISOMETRIC VIEW OF TYPICAL INSTALLATION

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:

$Atw = (N) (2U + S) + (N - 1) (0.500')$

Total Wingwall Area (SF)
$= (0.5) (Hw + 0.333') (Lw) (N + 1)$

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

PIPE RUNNER DIMENSION CALCULATIONS:

Pipe Runner Length
$= (Lw) (K1) - (1.917')$

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 ½".

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 the 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 pipe runners.

Pipe runners are designed for a traversing load of 1,800 pounds at yield as recommended by Research Report 280-1, "Safety Treatment of Roadside Cross-Drainage Structures", Texas Transportation Institute, March 1981.

The quantities for pipe runners, reinforcing steel, and concrete 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.

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.)

AT TOP OF EXTERIOR WINGWALL

(Cast-in-place culvert)

AT TOP OF INTERIOR WINGWALL

(Cast-in-place culvert)

AT OUTSIDE OF BOTTOM SLAB

(Cast-in-place culvert)

AT INTERIOR WINGWALL

(Precast culvert)

PLAN VIEWS OF CORNER DETAILS

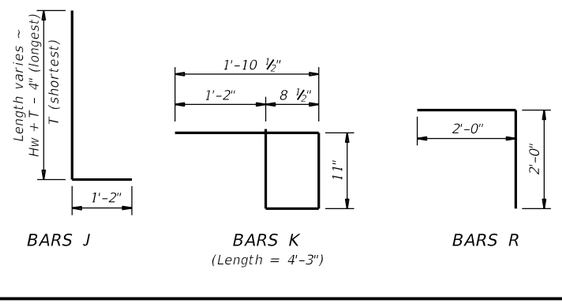


TABLE OF REINFORCING BAR SIZES AND SPACING

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

(1) Recommended values of slope are: 3:1, 4:1, and 6:1. Provide 3:1 or flatter slope.

(2) 0" Min to 5'-0" Max. Estimated curb heights are shown elsewhere in the plans. For structures without railing and curbs taller than 1'-0", refer to the Extended Curb Details (ECD) standard sheet.

(3) Wingwall and slab thicknesses may be the same as the adjacent culvert wall and slab thicknesses (7" minimum). If thicknesses greater than the minimum (7") are used, no changes will be made in quantities and no additional compensation will be allowed.

(4) For vehicle safety, reduce curb height, if necessary, to provide a maximum 3" projection. No changes will be made in quantities and no additional compensation will be allowed for this work.

(5) For culverts with C = 0", the precast culvert reinforcing may extend 1'-0" minimum into wingwall. Wingwall Bars D and R may be omitted. Otherwise, refer to the Wingwall Connection detail on the Box Culvert Precast Miscellaneous Details (SCP-MD) standard sheet.

SHEET 1 OF 2

Texas Department of Transportation

Bridge Division Standard

SAFETY END TREATMENT

FOR 0° SKEW BOX CULVERTS (MAXIMUM Hw = 7'-0") TYPE I ~ CROSS DRAINAGE

SETB-CD

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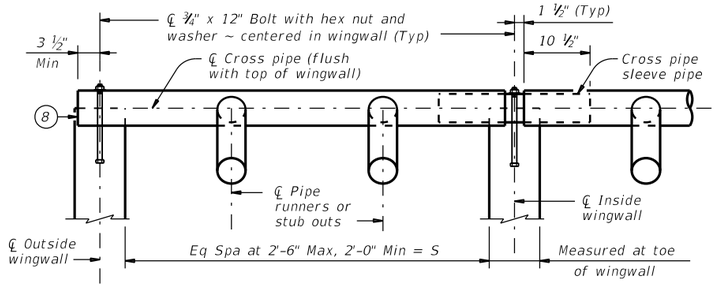
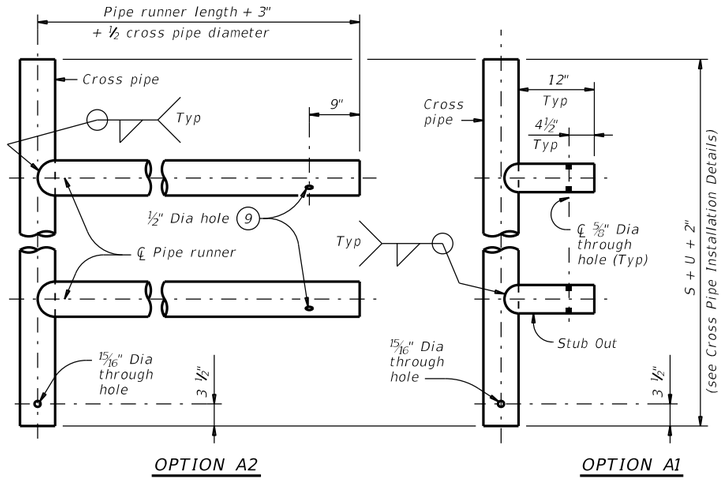
REVISIONS	1507	02	016, Etc.	FM696, Etc.
	DIST	COUNTY		SHEET NO.
	BRY	BURLESON		156



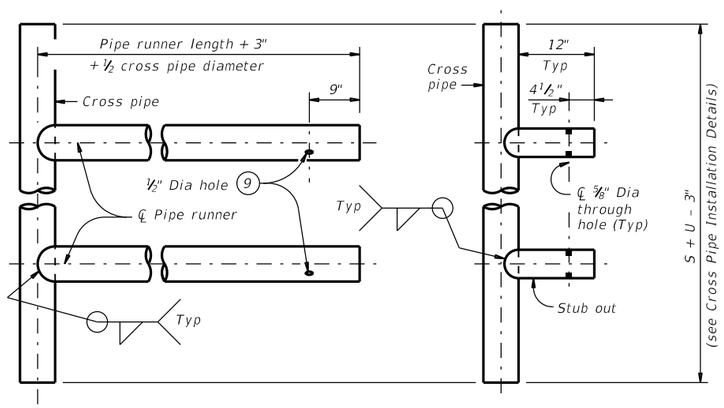
NOTE: At Contractor's option, make the cross pipe continuous across the inside wingwalls. If option is selected, omit the sleeve pipe and make a $^{15}/_{16}$" diameter through hole in the cross pipe to accept the anchor bolt at the centerline of each inside wingwall.

CROSS PIPE INSTALLATION DETAILS



OPTION A2 OPTION A1

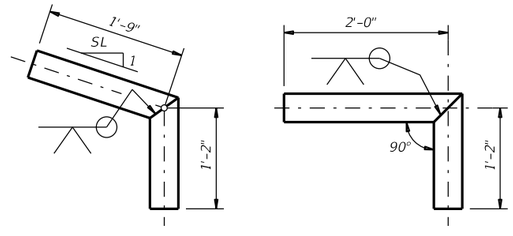
FOR USE IN OUTSIDE CULVERT BAY



OPTION A2 OPTION A1

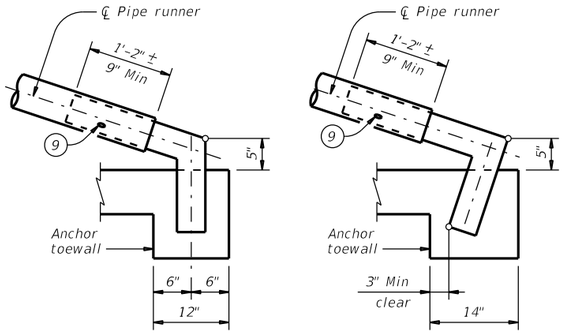
FOR USE IN INSIDE CULVERT BAY

CROSS PIPE AND CONNECTIONS DETAILS



OPTION A OPTION B

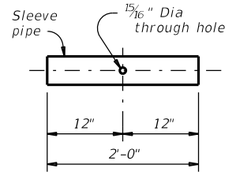
BOTTOM ANCHOR PIPE DETAILS (10)



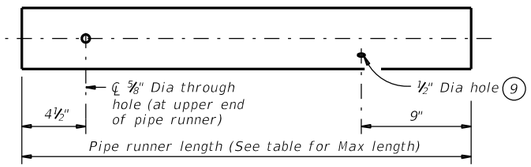
OPTION B1 OPTION B2

BOTTOM ANCHOR TOEWALL DETAILS

(Wingwall not shown for clarity.)

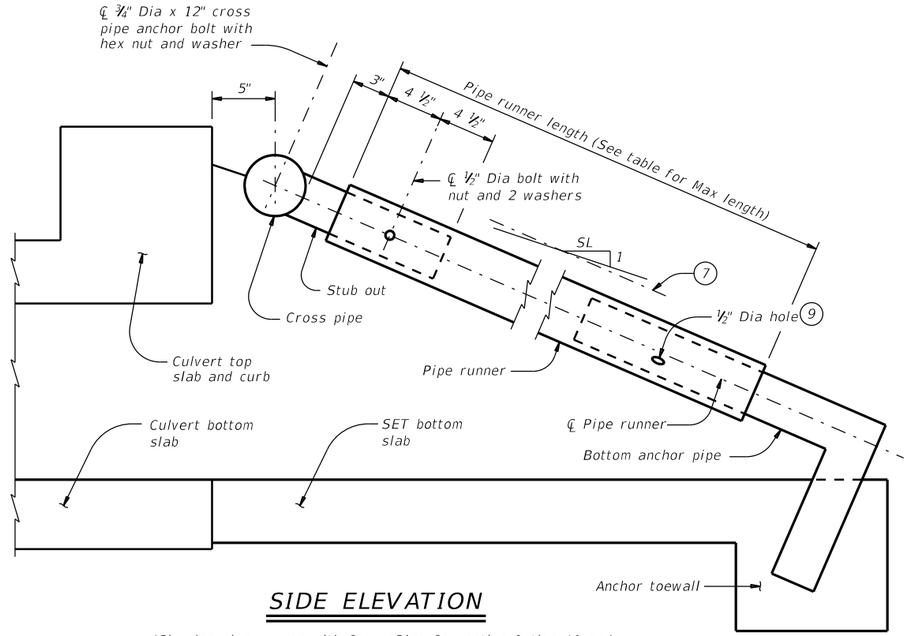


CROSS PIPE SLEEVE PIPE DETAILS



NOTE: The separate pipe runner shown is required when Cross Pipe Connection Option A1 is used.

PIPE RUNNER DETAILS



SIDE ELEVATION

(Showing pipe runner with Cross Pipe Connection Option A1 and Bottom Anchor Toewall Option B2. Wingwall not shown for clarity.)

(6) Cross pipe is the same size as the pipe runner. Cross pipe stub out is the same size as the anchor pipe.

(7) Note that actual slope of safety pipe runner may vary slightly from side slope.

(8) Take care to ensure that riprap concrete does not flow into the cross pipe so as to permit disassembly of the bolted connection to allow cleanout access.

(9) After installation, inspect the 1#2" hole to ensure that the lap of the safety 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.

MAXIMUM PIPE RUNNER LENGTHS AND (6) REQUIRED PIPE RUNNER AND ANCHOR PIPE SIZES

Maximum Pipe Runner Length	Required Pipe Runner Size			Required Anchor Pipe Size		
	Pipe Size	Pipe O.D.	Pipe I.D.	Pipe Size	Pipe O.D.	Pipe I.D.
10'- 0"	3" STD	3.500"	3.068"	2" STD	2.375"	2.067"
19'- 8"	4" STD	4.500"	4.026"	3" STD	3.500"	3.068"
34'- 2"	5" STD	5.563"	5.047"	4" STD	4.500"	4.026"

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SHEET 2 OF 2

Texas Department of Transportation | Bridge Division Standard

SAFETY END TREATMENT

FOR 0° SKEW BOX CULVERTS
(MAXIMUM Hw = 7'-0")
TYPE I ~ CROSS DRAINAGE

SETB-CD

FILE: setbcdse-20.dgn	DN: GAF	CK: CAT	DW: TxDOT	CK: TxDOT
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	DIST	COUNTY		SHEET NO.
	BRY	BURLESON		157

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

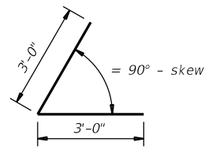
Dimensions					Variable Reinforcing				Estimated Quantities per ft of wing (2~wings) (4)		Estimated Quantities per ft of Toewall (1~toewall)	
					Bars J1		Bars J2					
Maximum Wingwall Height Hw	W	X	Y	Z	Size	Spa	Size	Spa	Reinf (Lb/Ft)	Conc (CY/Ft)	Reinf (Lb/Ft)	Conc (CY/Ft)
2'-6"	2'-10"	10"	1'-0"	7"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

TABLE OF WINGWALL REINFORCING
(2~wings)

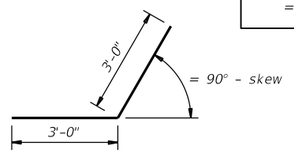
Bar	Size	No.	Spa
D1	#6	~	1'-0"
D2	#6	~	1'-0"
E1	#4	~	1'-0"
F	#4	~	1'-0"
G	#6	~	8"
M1	#4	4	~
P	#4	~	1'-0"
V	#4	~	1'-0"

TABLE OF TOEWALL REINFORCING

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



BARS D1



BARS D2

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

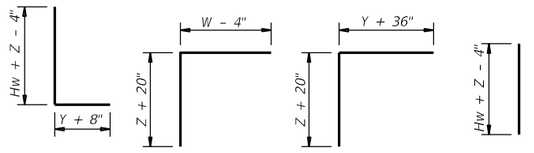
Hw = H + T + C
Lw = (Hw) (SL) ÷ cosine (θ) for Type PW-1
= (Hw - 1') (SL) ÷ cosine (θ) for Type PW-2 and Hw ≥ 4'
= (Hw - 0.5') (SL) ÷ cosine (θ) for Type PW-2 and Hw < 4'

For cast-in-place culverts:
Ltw = [(N) (S) + (N + 1) (U)] ÷ cosine (θ)

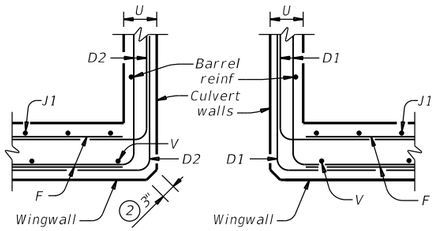
For precast culverts:
Ltw = [(N) (2 U + S) + (N - 1) (0.5')] ÷ cosine (θ)
Total Wingwall Area (two wings ~ SF)
= (2)(Hw)(Lw) for Type PW-1
= (2)(Hw)(Lw) - 6 SF for Type PW-2 and Hw ≥ 4'
= (2)(Hw)(Lw) - 1.5 SF for Type PW-2 and Hw < 4'

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

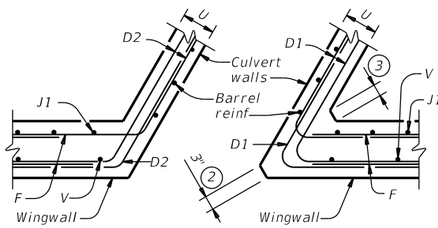
See applicable box culvert standard sheet for S, H, T, and U values.



BARS J1 BARS J2 BARS J3 BARS V



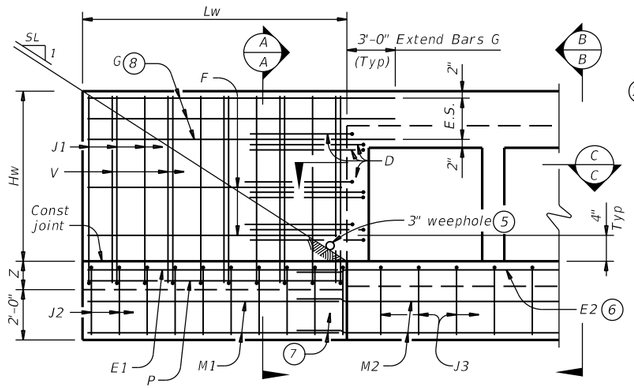
SECTION C-C - PW-1



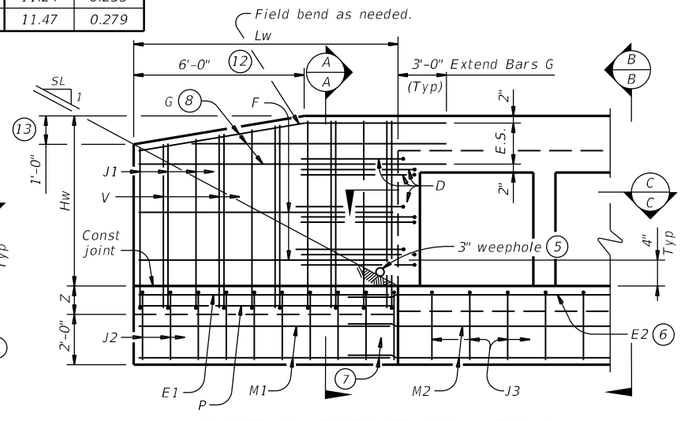
SECTION C-C - PW-2

1. Skew = 0°
2. At discharge end, chamfer may be ¾" minimum.
3. For 15° skew ~ 1"
For 30° skew ~ 2"
For 45° skew ~ 3"
4. Quantities shown are for two Type PW-1 wings. Adjust concrete volume for Type PW-2 wings. To determine estimated quantities for two wings, multiply the tabulated values by Lw. Quantities shown do not include weight of Bars D.
5. Provide weepholes for Hw = 5'-0" and greater. Fill around weepholes with coarse gravel.
6. Extend Bars E2 1'-6" minimum into the wingwall footing.
7. Lap Bars M1 1'-6" minimum with Bars M2.
8. Place Bars G as shown, equally spaced at 8" maximum. Provide at least two pairs of Bars G per wing.
9. 0" Min to 5'-0" Max. Estimated curb heights are shown elsewhere in the plans. For structures with pedestrian rail 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.
10. 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.
11. 1'-0" typical. 2'-3" when the Box Culvert Rail Mounting Details (RAC) standard sheet is referred to elswhere in the plans.
12. 3'-0" for Hw < 4'.
13. 6" for Hw < 4'.



PARTIAL ELEVATION - PW-1



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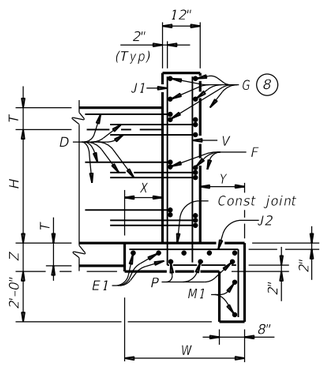
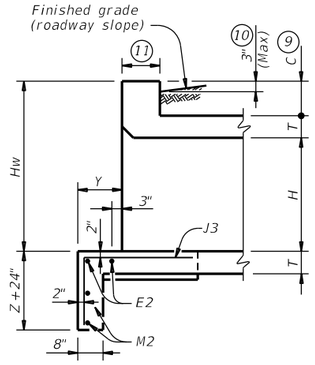
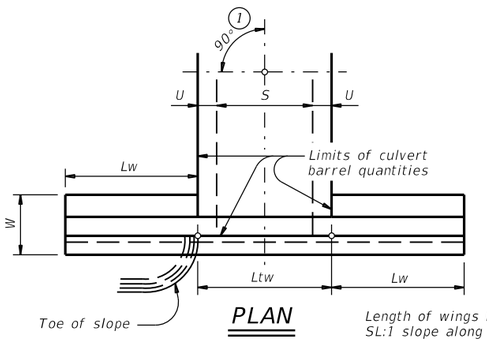


SECTION A-A
(Showing wing reinforcement.)

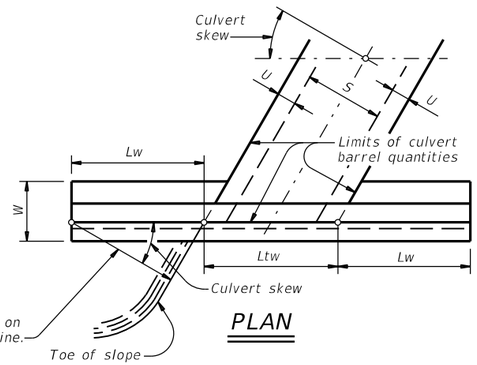


SECTION B-B
(Showing wing reinforcement.)



PLAN

DETAILS FOR NON-SKEWED BOX CULVERTS



PLAN

DETAILS FOR SKEWED BOX CULVERTS
(Showing 30° skew.)

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 reinforing 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.

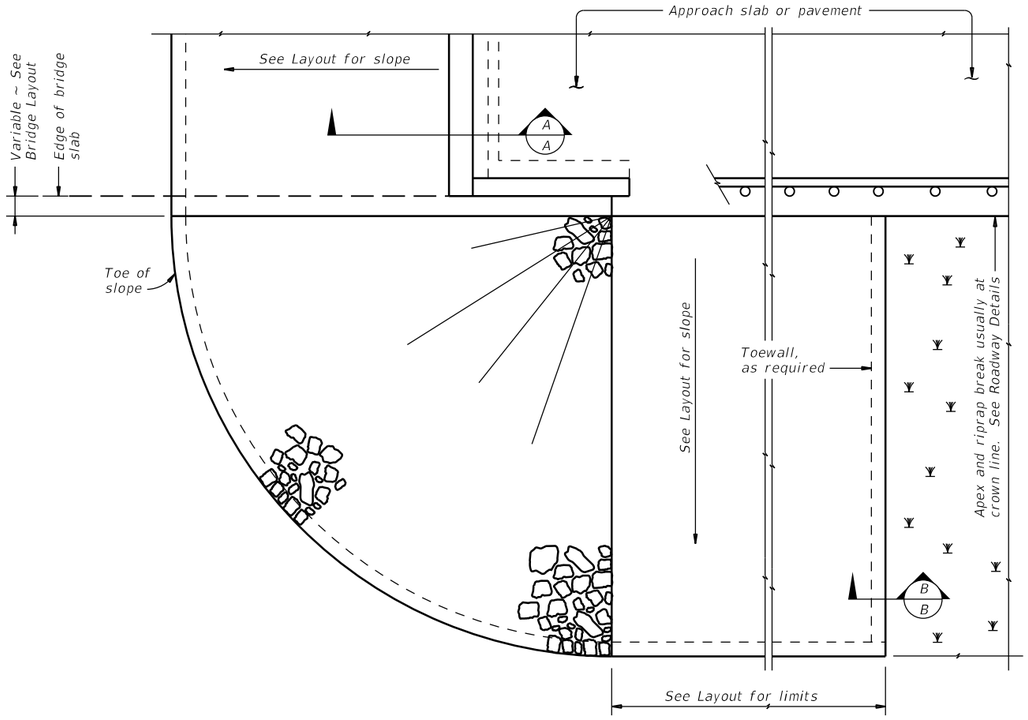
Cover dimensions are clear dimensions, unless noted otherwise. Reinforcing dimensions are out-to-out of bars.

Texas Department of Transportation
Bridge Division Standard

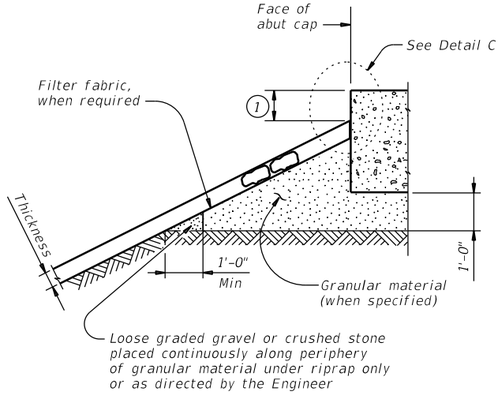
CONCRETE WINGWALLS
WITH PARALLEL WINGS FOR BOX CULVERTS
TYPES PW-1 AND PW-2

PW

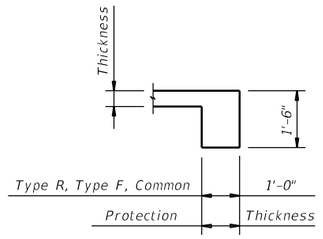
FILE: pwstde01-20.dgn	DN: GAF	CK: CAT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	1507	02	016, Etc.	FM696, Etc.
	DIST	COUNTY		SHEET NO.
	BRY	BURLESON		158



PLAN

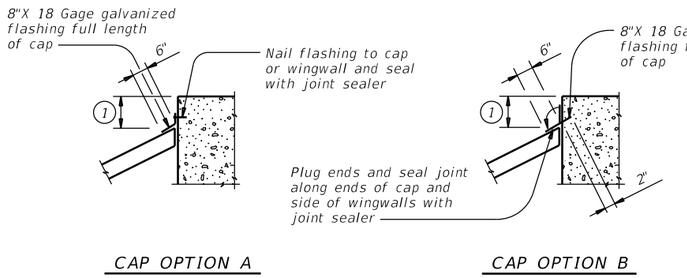


SECTION A-A AT CAP



SECTION B-B

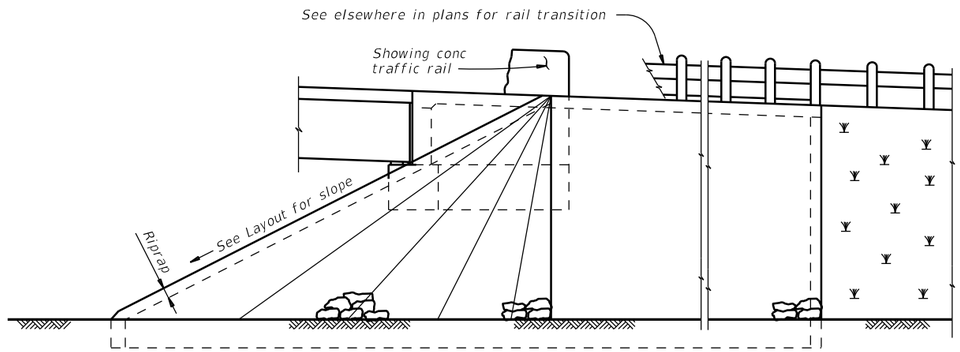
Provide toewall when shoulder drain is located adjacent to limits of stone riprap. Omit toewall when thickness of protection riprap is greater than 18".



CAP OPTION A

CAP OPTION B

DETAIL C



ELEVATION

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.

(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.

Texas Department of Transportation

Bridge Division Standard

STONE RIPRAP

SRR

FILE: srrstde1-19.dgn	DN: AES	CK: JGD	DW: BWH	CK: AES		
©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY		
REVISIONS	1507	02	016, Etc.	FM696, Etc.		
	DIST	COUNTY		SHEET NO.		
	BRY	BURLESON		159		

DATE: 9/25/2020 5:33:53 AM
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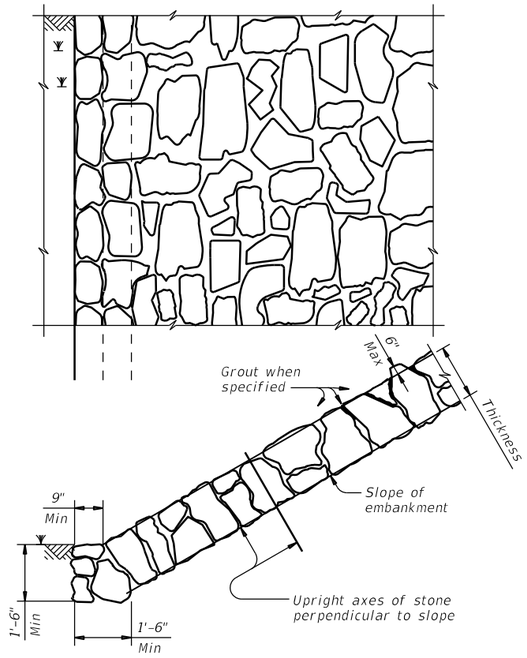


FIGURE 1 ~ TYPE R STONE RIPRAP

dry or grouted

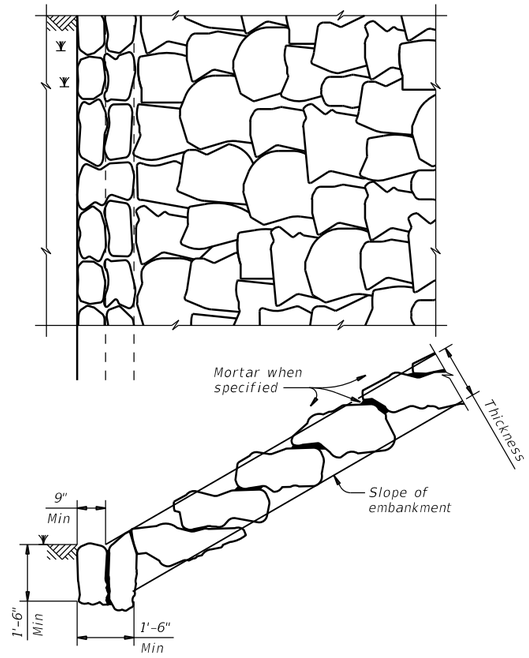


FIGURE 2 ~ TYPE F STONE RIPRAP

dry or mortared

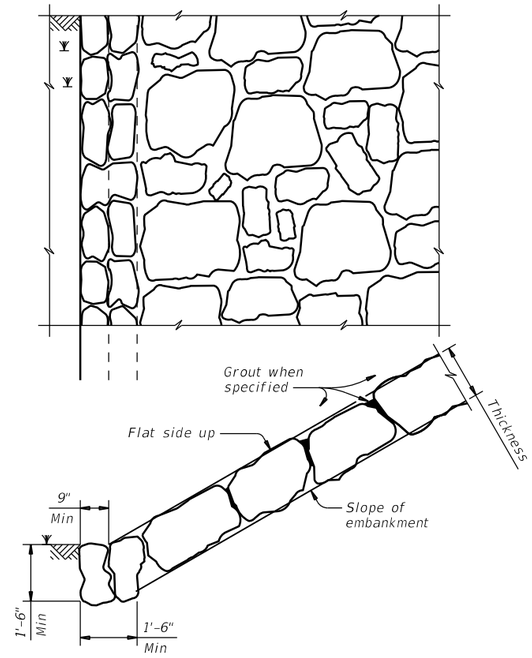


FIGURE 3 ~ TYPE F STONE RIPRAP

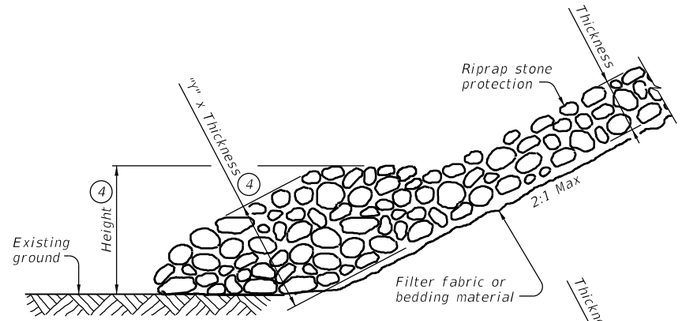
grouted

2 Provide bedding material instead of filter fabric if shown elsewhere in plans. See Layout for thickness of bedding material.

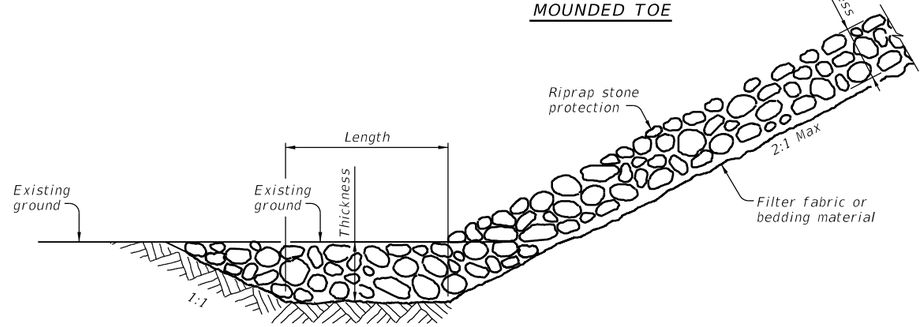
3 Minimum toe depth is the larger of the maximum scour depth or 2 times the riprap thickness.

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.



MOUNDED TOE



EXTENDED ROCK FILLED TRENCH

PROTECTION STONE RIPRAP TOE OPTIONS 5

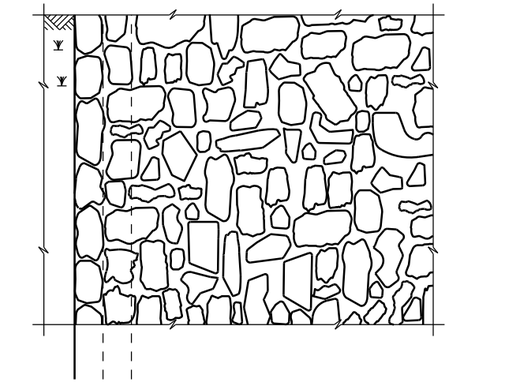


FIGURE 4 ~ COMMON STONE RIPRAP

dry or grouted

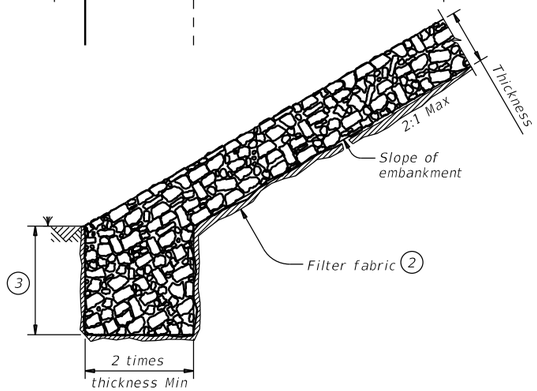


FIGURE 5 ~ PROTECTION STONE RIPRAP 5

SHEET 2 OF 2

Texas Department of Transportation

Bridge Division Standard

STONE RIPRAP

SRR

FILE: srrstde1-19.dgn	DN: AES	CK: JGD	DW: BWH	CK: AES
©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	1507	02	016, Etc.	FM696, Etc.
	DIST	COUNTY		SHEET NO.
	BRY	BURLESON		160

DATE: 9/25/2020 5:33:55 AM
FILE: g:\150702\016\sheets\Standards\Bridge\SRR.dgn

SITE DESCRIPTION

PROJECT LIMITS:

CSJ 1507-02-016 - From: Lee Co. Line (Latitude 30°26'52.76"N, Longitude 96°52'37.98"W)
To: SH 21 (Latitude 30°25'39.33"N, Longitude 96°48'6.79"W)

CSJ 1129-02-020 - From: FM 1362 (Latitude 30°42'28.10"N, Longitude 96°37'28.87"W)
To: SH 21 (Latitude 30°33'13.21"N, Longitude 96°40'39.86"W)

PROJECT DESCRIPTION:

For the construction of safety treat fixed objects

SEQUENCE OF MAJOR SOIL DISTURBING ACTIVITIES:

Soil distrubing activities will include excavation and embankment for the proposed roadway modifications and erosion controls.

TOTAL PROJECT AREA: CSJ 1507-02-016: 89.70 Acres
CSJ 1129-02-020: 125 Acres

TOTAL AREA TO BE DISTURBED: CSJ 1507-02-016: 0.62 Acres (0.69 % of the Total Project Area)
CSJ 1129-02-020: 2.37 Acres (1.89 % of the Total Project Area)

EXISTING CONDITION OF SOIL & VEGETATIVE COVER AND % OF EXISTING VEGETATIVE COVER:

This existing soil types are typically loam and sand
Vegetation covers 90% of this project non-paved area and is in good condition.
Native vegetation includes various grasses and is in good condition.

NAME OF RECEIVING WATERS:

CSJ 1507-02-016: Water drainage flows into various tributaries of the East Yagua Creek (1212B) into Yegua Creek above Somerville Lake in the Brazos River Basin.
CSJ 1129-02-020: Water drainage flows into various tributaries of Cedar Creek and the Brazos River.

ANTICIPATED EFFECT OF STORM WATER ON THREATENED AND ENDANGERED SPECIES AND WILDLIFE HABITAT:

See Environmental Permits, Issues and Commitments (EPIC) sheet.

EROSION AND SEDIMENT CONTROLS AND TCEQ 401 CERTIFICATION

I. SOIL STABILIZATION PRACTICES AND EROSION CONTROL:

- [X] TEMPORARY SEEDING
- [X] PERMANENT PLANTING, SODDING, OR SEEDING
- [ ] MULCHING
- [ ] SOIL RETENTION BLANKET
- [ ] BUFFER ZONES
- [X] PRESERVATION OF NATURAL RESOURCES
- [ ] SUBSURFACE DRAINS

OTHER:

II. STRUCTURAL PRACTICES AND SEDIMENTATION CONTROL: (T/P) *

- [T] SEDIMENT CONTROL FENCES
- [ ] HAY BALES
- [ ] ROCK BERMS
- [ ] STORM SEWERS
- [ ] CURBS AND GUTTERS
- [ ] VELOCITY CONTROL DEVICES
- [ ] PIPE SLOPE DRAINS
- [ ] PAVED FLUMES
- [ ] SAND BAG BERM
- [ ] GRAVEL BAG BERM
- [ ] BRUSH BERMS
- [ ] TRIANGULAR FILTER DIKE
- [ ] STONE OUTLET SEDIMENT TRAPS
- [ ] ROCK BEDDING AT CONSTRUCTION EXIT
- [ ] TIMBER MATTING AT CONSTRUCTION EXIT
- [ ] DIVERSION, INTERCEPTOR, OR PERIMETER DIKES
- [ ] DIVERSION, INTERCEPTOR, OR PERIMETER SWALES
- [ ] DIVERSION DIKE AND SWALE COMBINATIONS
- [T] ROCK FILTER DAMS
- [ ] CHANNEL LINERS
- [ ] SEDIMENT TRAPS
- [ ] SEDIMENT BASINS
- [ ] STORM INLET SEDIMENT TRAP
- [ ] STONE OUTLET STRUCTURES

* T means Temporary - P means Permanent

OTHER:

III. POST CONSTRUCTION: (IF COE PERMIT IS ISSUED)

- [ ] RETENTION/IRRIGATION
- [ ] EXTENDED DETENTION BASINS
- [ ] VEGETATION FILTER STRIPS
- [ ] CONSTRUCTION WETLANDS
- [ ] WET BASINS
- [ ] VEGETATION LINED DRAINAGE DITCHES
- [ ] GRASSY SWALES
- [ ] SAND FILTER SYSTEMS

OTHER:

NARRATIVE - SEQUENCE OF CONSTRUCTION (STORM WATER MANAGEMENT) ACTIVITIES:

All work to be performed by the Contractor. Take care to disturb only the soil necessary to complete the work. Maintain all sedimentation control devices until stabilized.
The order of activities will be as follows:
1) Set advance signing and barricades.
2) Place SW3P as directed before disturbing soil.
3) Complete excavation, embankment and construction. Place topsoil immediately following construction.
4) Backfill pavement edges and place seeding.
5) Place permanent pavement markings and signing.
6) Remove SW3P after areas are stabilized and approved. Remove temporary controls and seed areas distrubed by their removal.
7) Final cleanup.

STORM WATER MANAGEMENT:

OTHER EROSION AND SEDIMENT CONTROLS:

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. Sediment must be removed from sediment traps or sedimentation ponds when design capacity has been reduced by 50%.

INSPECTION:
A TxDOT inspector will perform an inspection every 7 days.

DESCRIPTION OF CONSTRUCTION MATERIALS TO BE STORED ON-SITE AND CONTROLS TO PREVENT THESE FROM ENTERING STORM WATER:
Store all construction materials (wood, flex base, aggregate, etc.) in locations where they will not enter storm water runoff. Structural controls may be required for flex base, aggregate and earth stockpiles.

WASTE MATERIALS:
A TxDOT inspector will perform an inspection every 7 days.

HAZARDOUS WASTE (INCLUDING SPILL REPORTING):
At a minimum, any products in the following categories are considered to be hazardous: paints, acids for cleaning masonry surfaces, cleaning solvents, asphalt products, chemical additives for soil stabilization or concrete curing compounds and additives. In the event of a spill which may be hazardous, the Engineer should be contacted immediately.

SANITARY WASTE:
All sanitary waste will be collected from the portable units as necessary or as required by local regulation by a licensed sanitary waste management director.

OFFSITE VEHICLE TRACKING:

- [ ] HAUL ROADS DAMPENED FOR DUST CONTROL
- [X] LOADED HAUL TRUCKS TO BE COVERED WITH TARPAULIN
- [X] EXCESS DIRT ON ROAD REMOVED DAILY
- [ ] STABILIZED CONSTRUCTION ENTRANCE

REMARKS:

STATE OF TEXAS
TIMOTHY TYLER THOMASON
136933
LICENSED
PROFESSIONAL ENGINEER

12/17/2020

PRINT DATE	REVISION DATE
12/17/2020	1/11/2007

Texas Department of Transportation
Bryan District

TxDOT STORM WATER POLLUTION PREVENTION PLAN (SW3P)

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 696, ETC.

STATE	DISTRICT	COUNTY
TEXAS	BRYAN	BURLESON

CONTROL	SECTION	JOB	SHEET NO.
1507	02	016, ETC.	161

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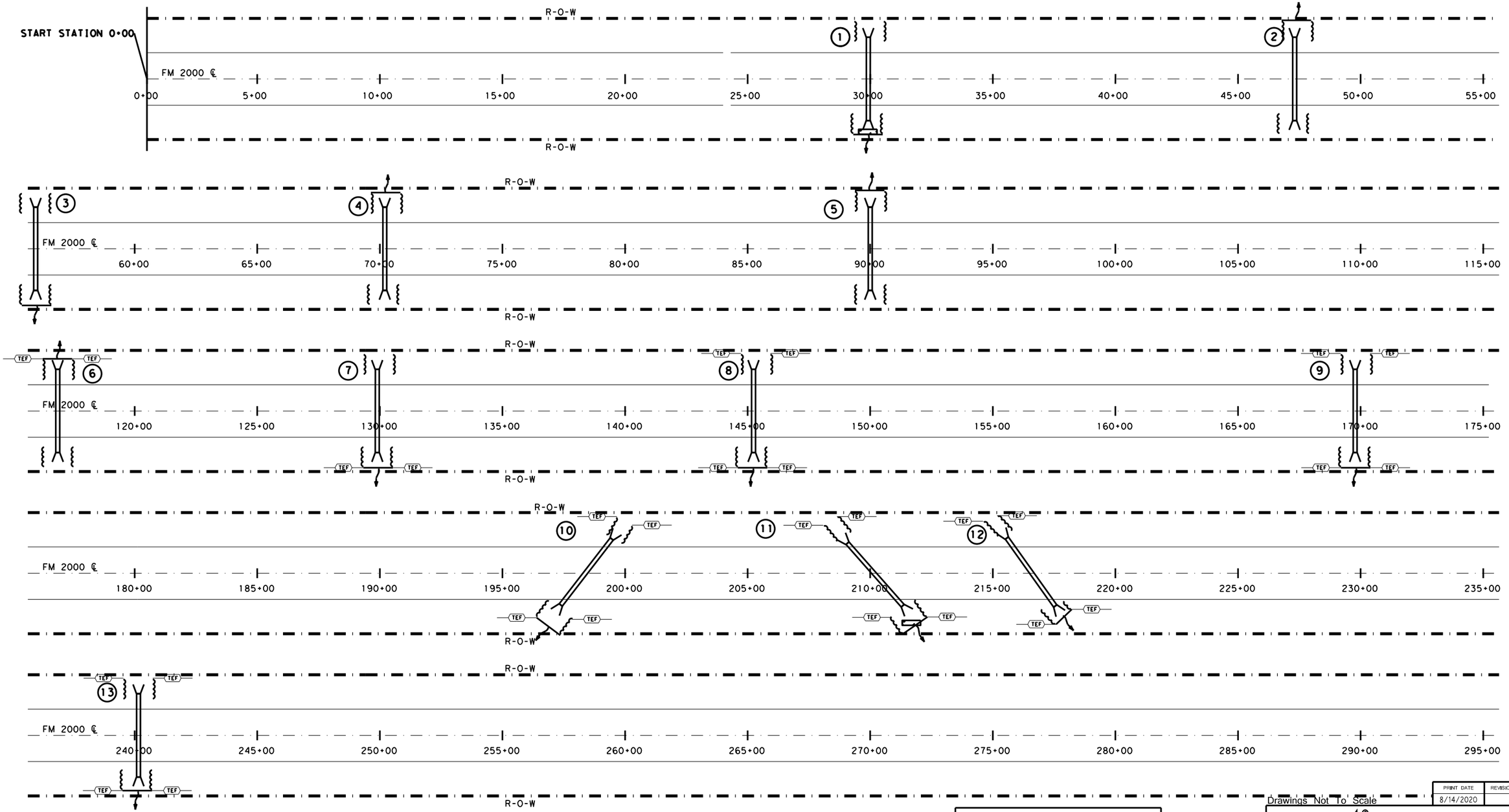

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STATE OF TEXAS
TIMOTHY TYLER THOMASON
136933
LICENSED
PROFESSIONAL ENGINEER

12/17/2020

LEGEND

TEF	TEF (200 ft)
	TOPSOIL WINDROW
	ROCK FILTER DAM
	SILT FENCE
#	ID NUMBER
	DIRECTION OF WATER FLOW
	CULVERT

Drawings Not To Scale

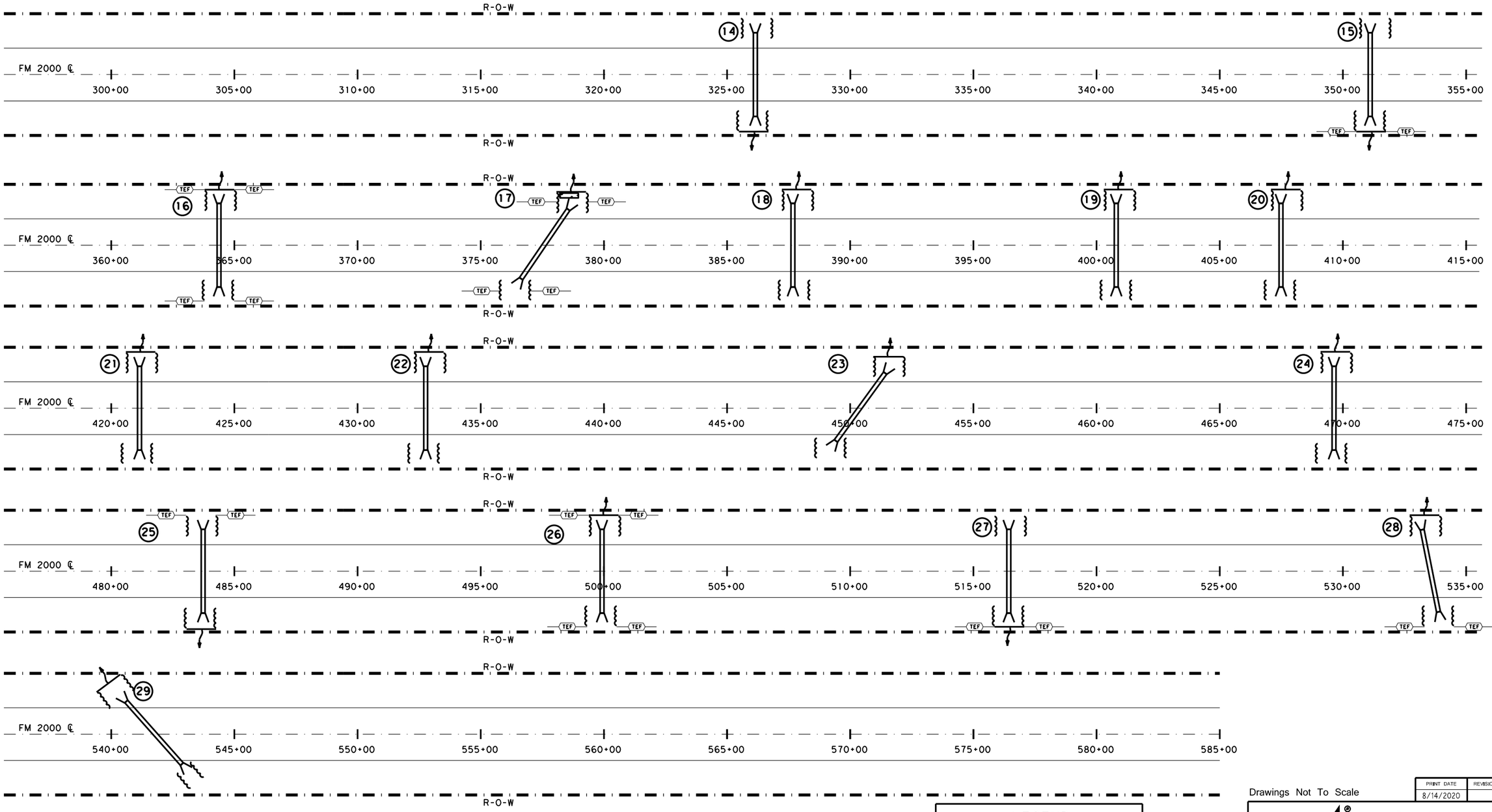
PRINT DATE	REVISION DATE
8/14/2020	

Texas Department of Transportation
Bryan District

SW3P LAYOUT

SHEET 1 OF 4 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 696, ETC.
STATE	DISTRICT	COUNTY
TEXAS	BRYAN	BURLESON
CONTROL	SECTION	JOB / SHEET NO.
1507	02	016, ETC. / 162



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CSJ: 1507-02-016, Etc. FILENAME: g:\150702\016\sheets\ENV\SW3P LAYOUT FM2000_FM696(1507).dgn

STATE OF TEXAS
TIMOTHY TYLER THOMASON
136933
LICENSED
PROFESSIONAL ENGINEER

12/17/2020

LEGEND

TEF	TEF (200 ft)
	TOPSOIL WINDROW
	ROCK FILTER DAM
	SILT FENCE
#	ID NUMBER
	DIRECTION OF WATER FLOW
	CULVERT

Drawings Not To Scale

PRINT DATE	REVISION DATE
8/14/2020	

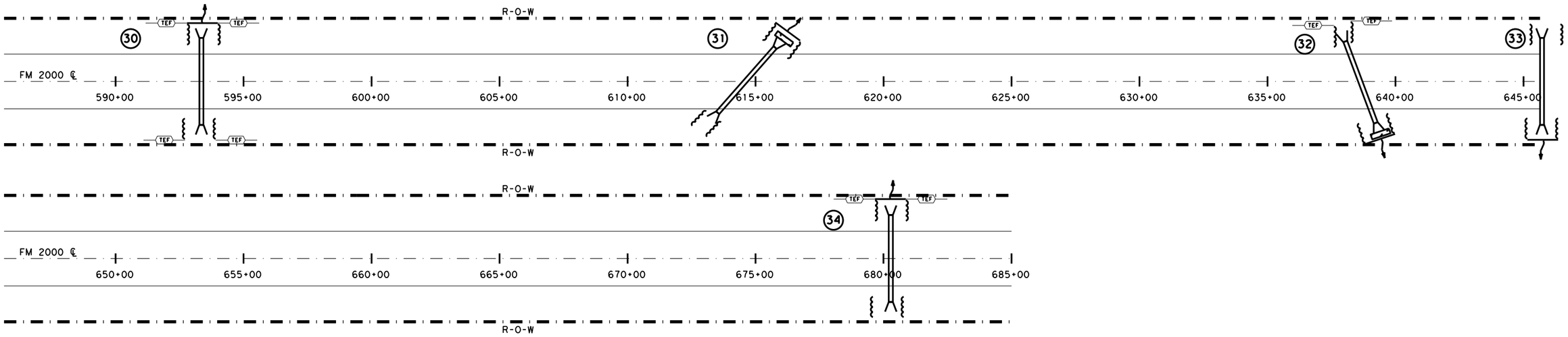
Texas Department of Transportation
Bryan District

SW3P LAYOUT

SHEET 2 OF 4 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 696, ETC.

STATE	DISTRICT	COUNTY	
TEXAS	BRYAN	BURLESON	
CONTROL	SECTION	JOB	SHEET NO.
1507	02	016, ETC.	163



LEGEND

TEF	TEF (200 ft)
	TOPSOIL WINDROW
	ROCK FILTER DAM
	SILT FENCE
#	ID NUMBER
	DIRECTION OF WATER FLOW
	CULVERT

STATE OF TEXAS
TIMOTHY TYLER THOMASON
136933
LICENSED
PROFESSIONAL ENGINEER

12/17/2020

Drawings Not To Scale

PRINT DATE	REVISION DATE
8/14/2020	

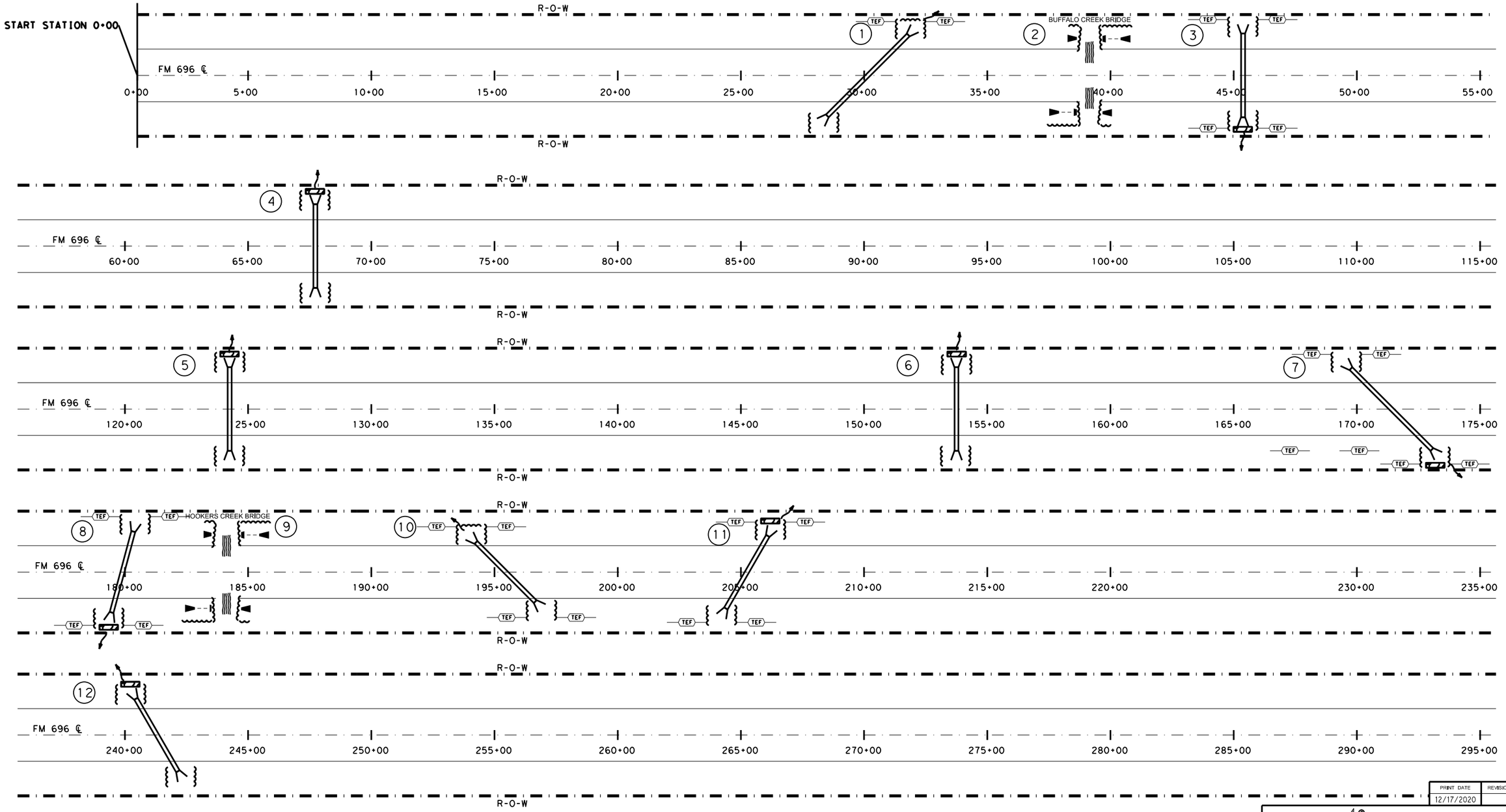
Texas Department of Transportation
Bryan District

SW3P LAYOUT

SHEET 3 OF 4 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER		HIGHWAY NUMBER
6			FM 696, ETC.
STATE	DISTRICT	COUNTY	
TEXAS	BRYAN	BURLESON	
CONTROL	SECTION	JOB	SHEET NO.
1507	02	016, ETC.	164

REV DATE: 2-12-2015
CSJ: 1507-02-016, Etc. FILENAME: g:\150702\016\sheets\ENV\SW3P LAYOUT FM2000_FM696(1507).dgn



END STATION 310+18

STATE OF TEXAS
TIMOTHY TYLER THOMASON
136933
LICENSED
PROFESSIONAL ENGINEER

12/17/2020

LEGEND

- TOPSOIL WINDROW
- ROCK FILTER DAM
- SILT FENCE
- (#) ID NUMBER
- DIRECTION OF WATER FLOW
- CULVERT

PRINT DATE	REVISION DATE
12/17/2020	

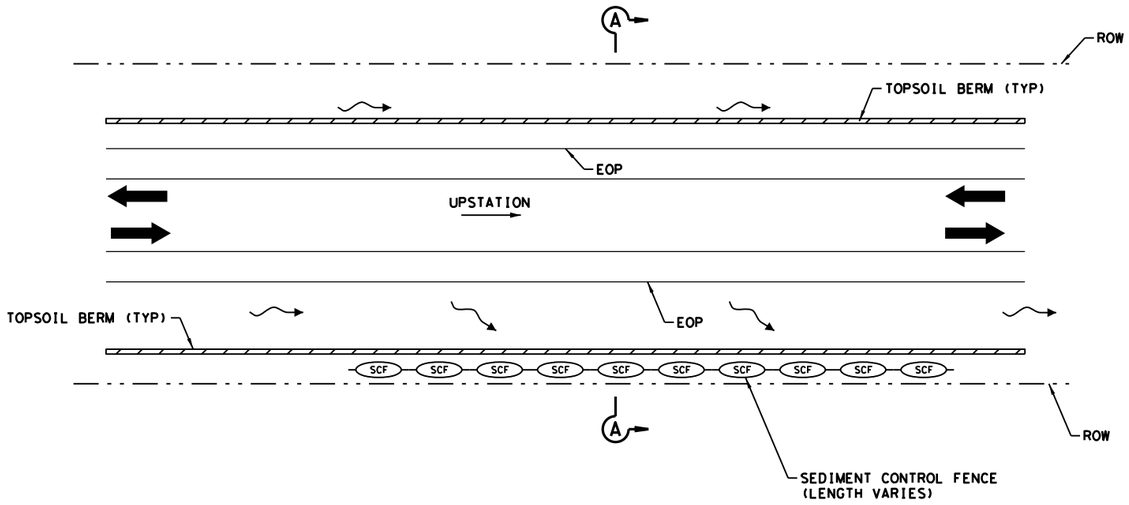
Texas Department of Transportation
Bryan District

SW3P LAYOUT

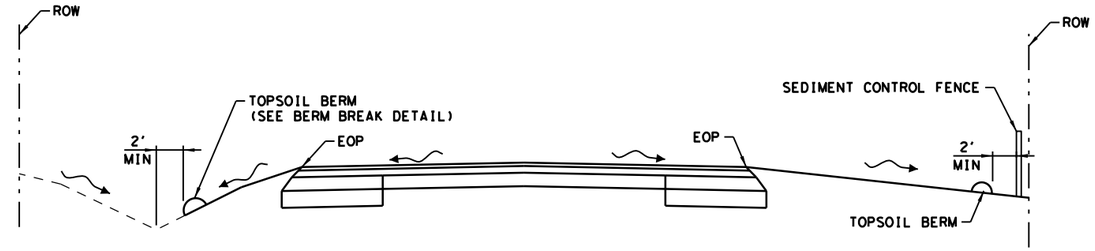
SHEET 4 OF 4 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 696, ETC.
STATE	DISTRICT	COUNTY
TEXAS	BRYAN	BURLESON
CONTROL	SECTION	JOB / SHEET NO.
1507	02	016, ETC. / 165

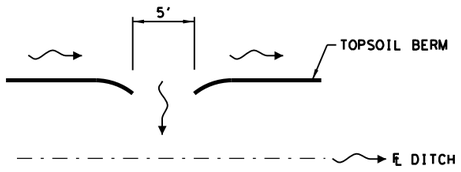
REV DATE: 2-12-2015
CSJs: 1507-02-016, Etc. FILENAME: g:\150702\016\sheets\ENV\SW3P LAYOUT FM2000_FM696(1507).dgn



SEDIMENT CONTROL FENCE AT OFF-SITE FLOW



SECTION A-A



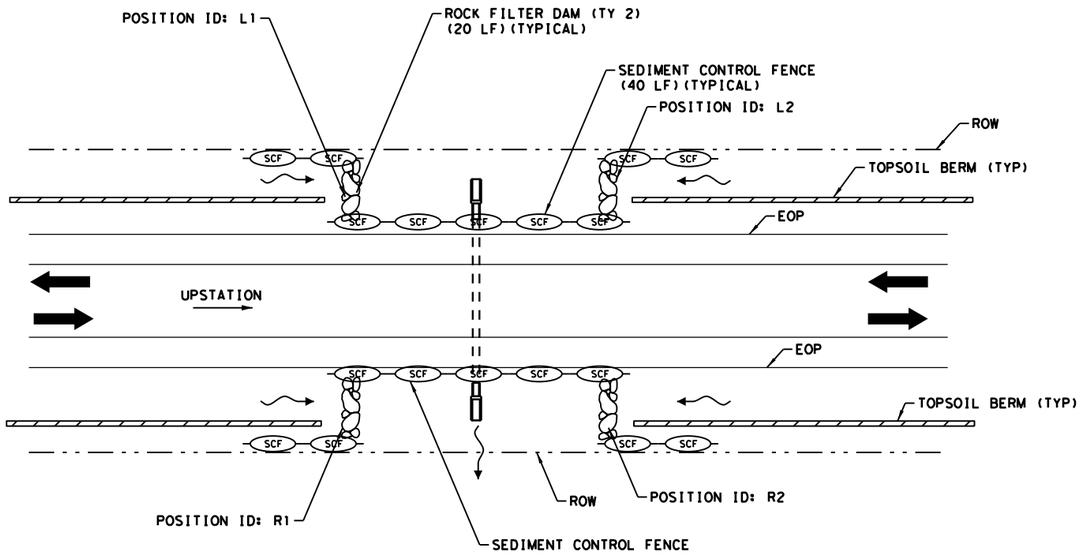
PLAN VIEW

BERM BREAK DETAIL

1. SHAPE THE BERM BREAK TO DIRECT FLOW TO THE ROADSIDE DITCH.
2. BREAK BERM SO THAT MAX FLOW LENGTH ALONG THE BERM IS LESS THAN 1000'.
3. BREAK BERM IN THE LOW AREAS WHERE FLOW MAY OVERTOP THE BERM.
4. DO NOT BREAK BERM ON HILLTOPS OR WHERE RUNOFF AND SEDIMENT FLOW DIRECTLY OFF THE ROW.

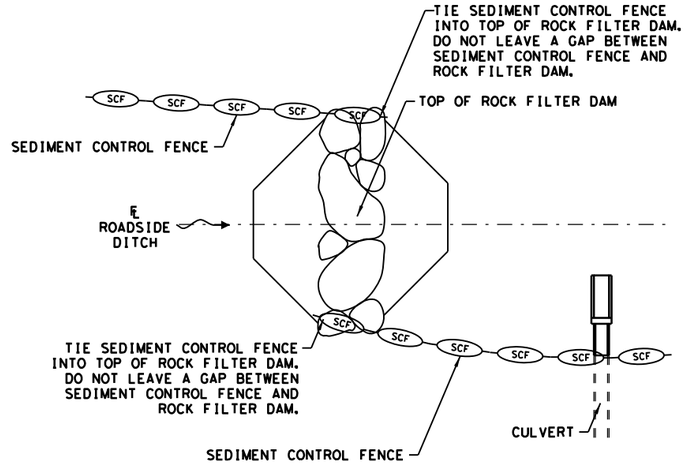
NOTES

1. TOPSOIL BERM SHALL BE LOCATED THE ENTIRE LENGTH OF PROJECT (BOTH SIDES). WHERE THE SOIL DISTURBANCE EXTENDS TO THE ROW, THE TOPSOIL BERM WILL BE PLACED AT THE ROW.
2. LOCATIONS OF SWP3 DEVICES WILL BE APPROVED BY THE ENGINEER.
3. SEE "SWP3 SUMMARY" ON "QUANTITY SUMMARIES" SHEETS FOR LOCATION AND QUANTITIES OF SWP3 DEVICES.



SW3P DEVICES AT CULVERTS

1. PLACE EACH END OF THE ROCK FILTER DAM SUFFICIENTLY HIGH TO PREVENT FLOW AROUND EITHER END OF THE DAM



SEDIMENT CONTROL FENCE - ROCK FILTER DAM TIE-IN

STATE OF TEXAS
JEAN J. FENG
102035
LICENSED
PROFESSIONAL ENGINEER

12/21/2020

PRINT DATE	REVISION DATE
9/25/2020	

Texas Department of Transportation
Bryan District

SW3P DETAILS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 696, ETC.

STATE	DISTRICT	COUNTY	
TEXAS	BRYAN	BURLESON	
CONTROL	SECTION	JOB	SHEET NO.
1507	02	016, ETC.	166

REV DATE: 2-12-2015
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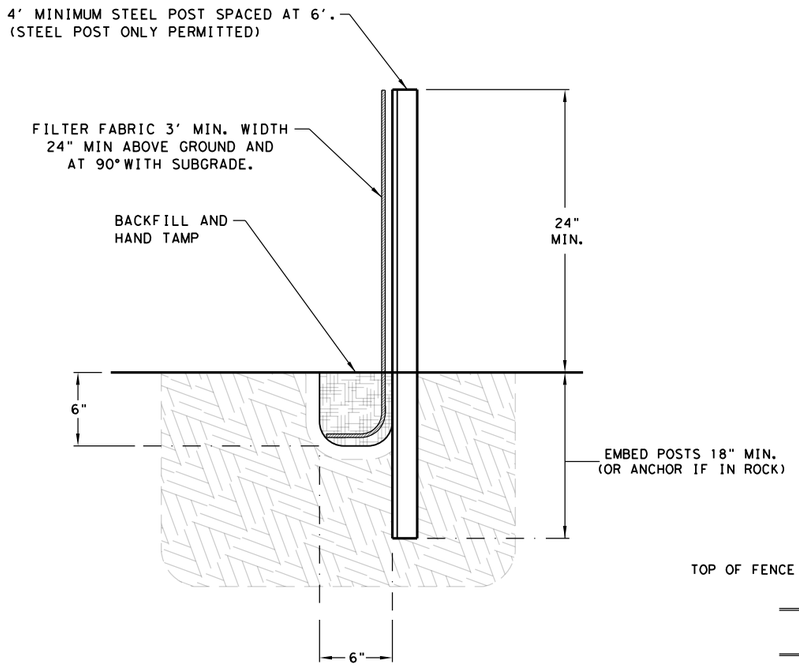
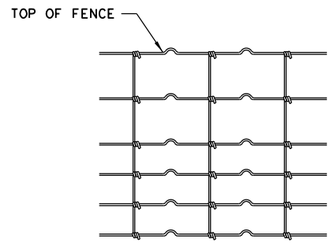
DATE:
FILE:



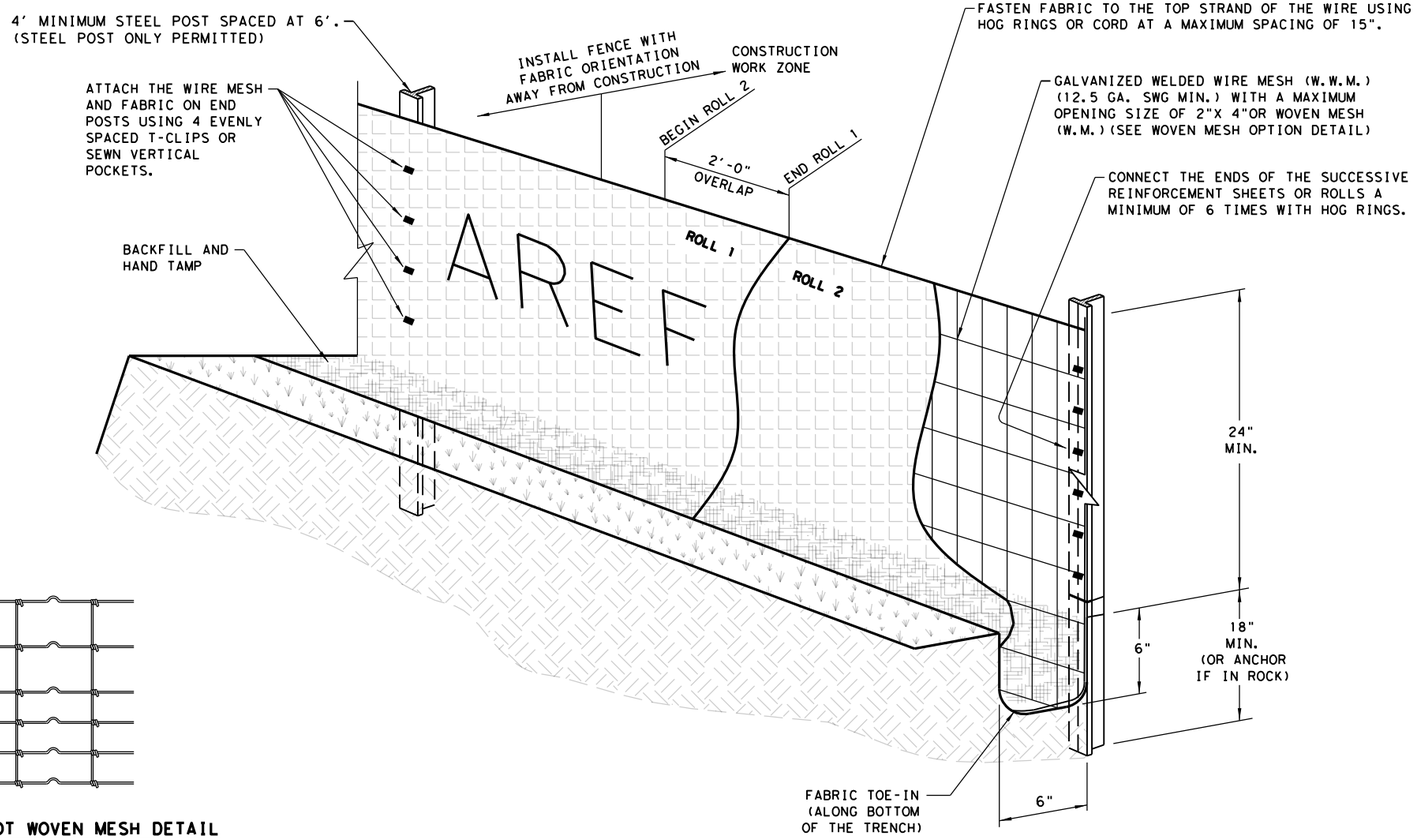
TRENCH SIDE VIEW DETAIL

FABRIC TOE-IN IS TO RUN DOWN THE TRENCH
AND ALONG THE BOTTOM OF THE TRENCH



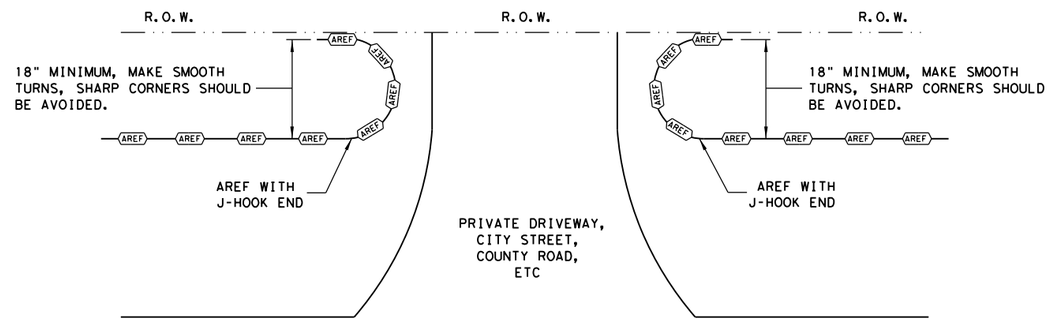
HINGE JOINT KNOT WOVEN MESH DETAIL

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.



GENERAL NOTES

1. REMOVE ALL ROOTS AND OTHER OBSTRUCTIONS FROM THE TRENCH BEFORE FABRIC PLACEMENT.
2. AMPHIBIAN AND REPTILE EXCLUSION FENCE MUST BE CHECKED DAILY, INCLUDING DAYS DURING RAINFALL SHUTDOWN PERIODS.
3. ANY DAMAGE TO FENCE, INCLUDING SMALL HOLES, MUST BE REPAIRED THE DAY IT IS OBSERVED BEFORE DARK.
4. SMALL HOLES (WITH THE ENGINEER'S DISCRETION) MAY BE REPAIRED WITH TAPE AS DIRECTED BY THE ENGINEER.
5. AS DIRECTED BY THE ENGINEER, SECTIONS OF FENCE WHERE THE DAMAGE IS DEEMED DETRIMENTAL TO THE FENCE WILL BE REPLACED RATHER THAN REPAIRED.
6. A MINIMUM OF 2' SHOULD BE OVERLAPPED WHEN JOINING FABRIC SECTIONS.
7. PAINT "AREF" OR "TEF" ON THE FABRIC IN BRIGHT COLOR EVERY 50' AND AT BREAKS.
8. REMOVE SEDIMENT, VEGETATION, OR OTHER DEBRIS TO MAINTAIN THE 24" AREF CLEARANCE.
9. FOR PAYMENT AND ADDITIONAL INFORMATION FOR AREF, SEE SPEC. 5116 (AMPHIBIAN AND REPTILE EXCLUSION FENCE).



J-HOOK END OF FENCE DETAIL (TOP VIEW)

TRENCH IS TO STAY 6 IN DEEP AND 6 IN WIDE WITH
FABRIC TOE-IN TO MATCH TRENCH DETAIL.

J-HOOK APPLIES AT DRIVEWAY BREAKS, ROADWAY
BREAKS, AND AT ANY LOCATION AS DIRECTED BY
THE ENGINEER.

LEGEND

AREF — AMPHIBIAN AND REPTILE EXCLUSION FENCE

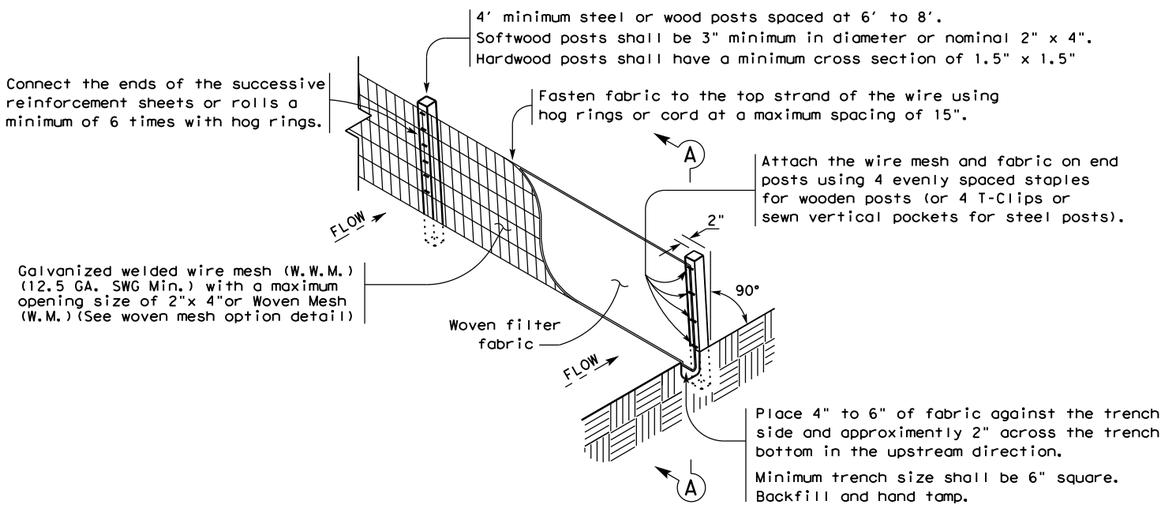
Texas Department of Transportation | Design Division Standard

AMPHIBIAN AND REPTILE EXCLUSION FENCE

AREF-21

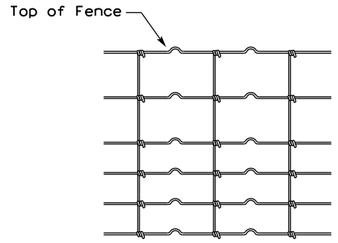
FILE: aref21.dgn	DN: TJ	CK: KM	DW: SS	CK: AG
© TxDOT: JANUARY 2021	CONT	SECT	JOB	HIGHWAY
REVISIONS	1507	02	016, ETC.	FM 696, ETC.
	DIST	COUNTY		SHEET NO.
	BRY	BURLESON		167

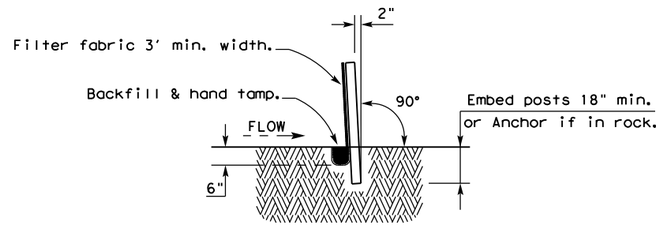
3RD DRAFT [01-21-21] 130PM



TEMPORARY SEDIMENT CONTROL FENCE

SCF





SECTION A-A

HINGE JOINT KNOT WOVEN MESH (OPTION) DETAIL

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

SEDIMENT CONTROL FENCE USAGE GUIDELINES

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

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

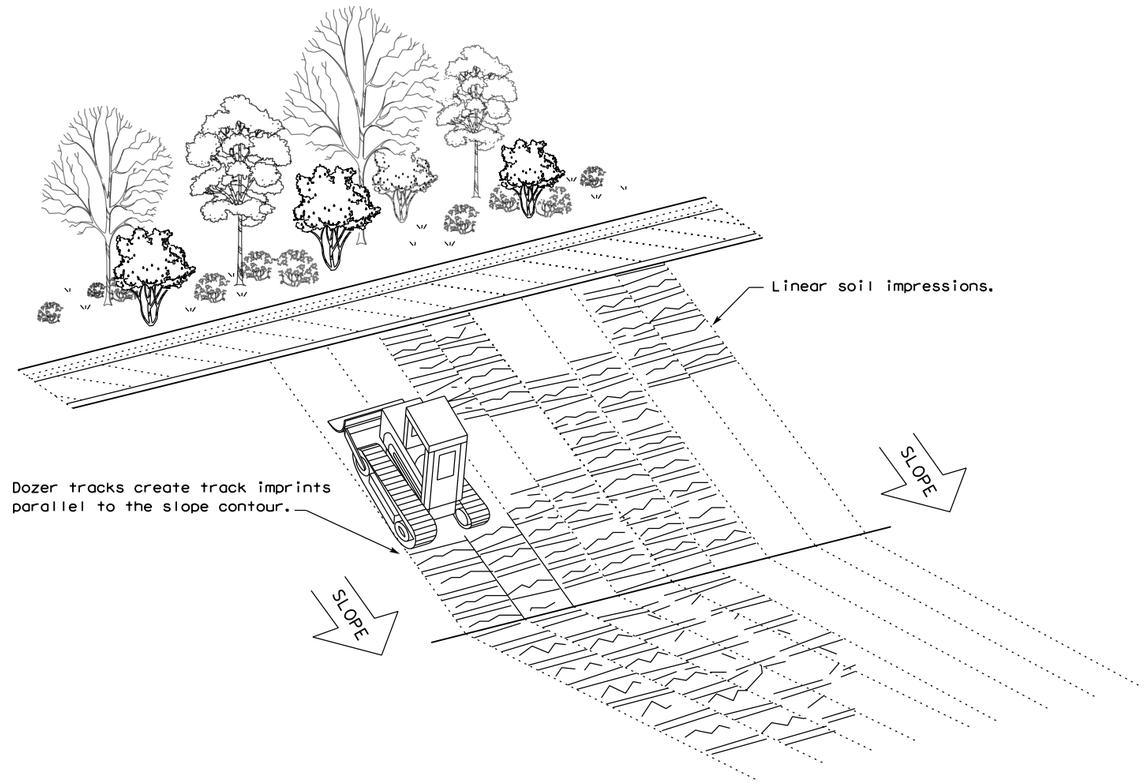
LEGEND

Sediment Control Fence

SCF

GENERAL NOTES

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



VERTICAL TRACKING

Texas Department of Transportation

Design Division Standard

TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

FENCE & VERTICAL TRACKING

EC(1)-16

FILE: ec116	DN: TxDOT		CK: KM		DW: VP	DN/CK: LS
© TxDOT: JULY 2016	CONT	SECT	JOB		HIGHWAY	
REVISIONS	1507	02	016, Etc.		FM696, Etc.	
	DIST	COUNTY			SHEET NO.	
	BRY	BURLESON			168	

9/15/2020
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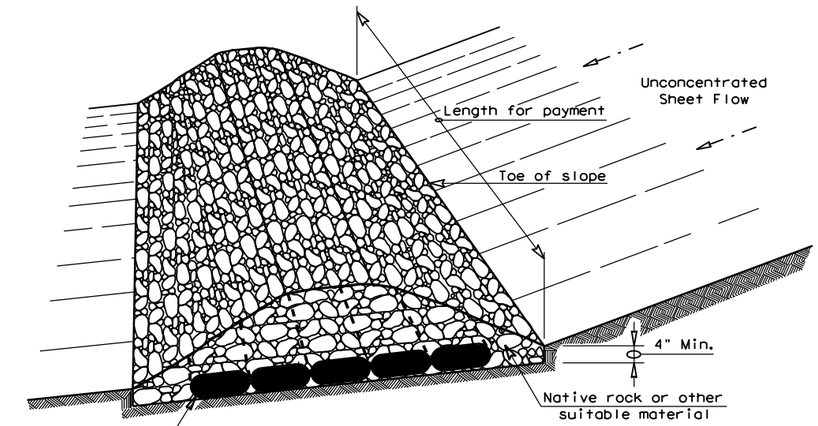
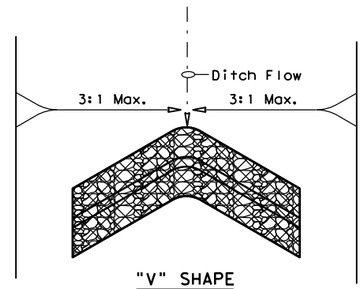


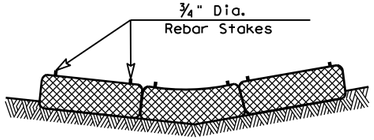
FILTER DAM AT TOE OF SLOPE

RFD1

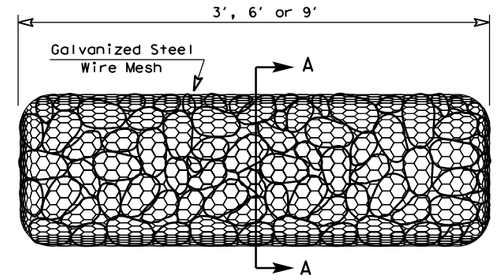


"V" SHAPE
PLAN VIEW

PLAN VIEW

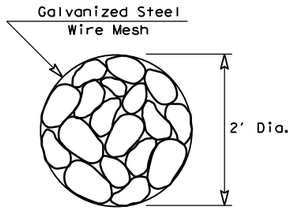


SECTION B-B

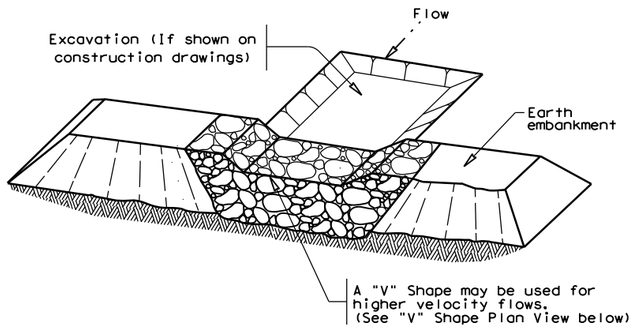


TYPE 4 (SACK GABIONS)

RFD4

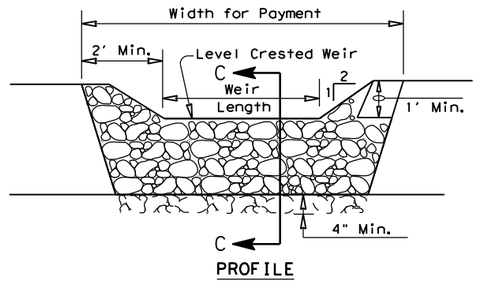


SECTION A-A

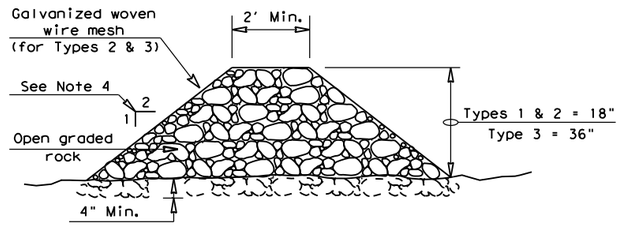


FILTER DAM AT SEDIMENT TRAP

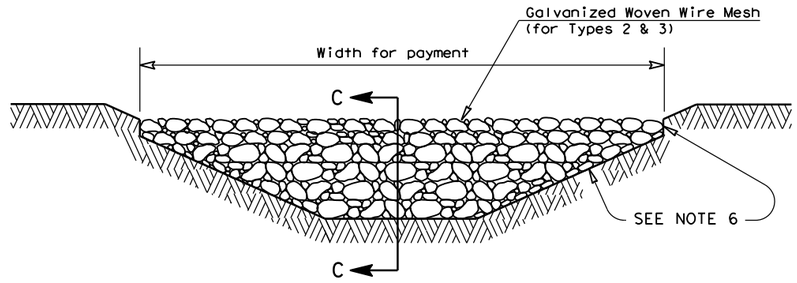
RFD1 OR RFD2



PROFILE



SECTION C-C



FILTER DAM AT CHANNEL SECTIONS

RFD1 OR RFD2 OR RFD3

ROCK FILTER DAM USAGE GUIDELINES

Rock Filter Dams should be constructed downstream from disturbed areas to intercept sediment from overland runoff and/or concentrated flow. The dams should be sized to filter a maximum flow through rate of 60 GPM/FT^2 of cross sectional area. A 2 year storm frequency may be used to calculate the flow rate.

Type 1 (18" high with no wire mesh) (3" to 6" aggregate): Type 1 may be used at the toe of slopes, around inlets, in small ditches, and at dike or swale outlets. This type of dam is recommended to control erosion from a drainage area of 5 acres or less. Type 1 may not be used in concentrated high velocity flows (approximently 8 Ft/Sec or more) in which aggregate wash out may occur. Sandbags may be used at the embedded foundation (4" deep min.) for better filtering efficiency of low flows if called for on the plans or directed by the Engineer.

Type 2 (18" high with wire mesh) (3" to 6" aggregate): Type 2 may be used in ditches and at dike or swale outlets.

Type 3 (36" high with wire mesh) (4" to 8" aggregate): Type 3 may be used in stream flow and should be secured to the stream bed.

Type 4 (Sack gabions) (3" to 6" aggregate): Type 4 May be used in ditches and smaller channels to form an erosion control dam.

Type 5: Provide rock filter dams as shown on plans.

GENERAL NOTES

1. If shown on the plans or directed by the Engineer, filter dams should be placed near the toe of slopes where erosion is anticipated, upstream and/or downstream at drainage structures, and in roadway ditches and channels to collect sediment.
2. Materials (aggregate, wire mesh, sandbags, etc.) shall be as indicated by the specification for "Rock Filter Dams for Erosion and Sedimentation Control".
3. The rock filter dam dimensions shall be as indicated on the SW3P plans.
4. Side slopes should be 2:1 or flatter. Dams within the safety zone shall have sideslopes of 6:1 or flatter.
5. Maintain a minimum of 1' between top of rock filter dam weir and top of embankment for filter dams at sediment traps.
6. Filter dams should be embedded a minimum of 4" into existing ground.
7. The sediment trap for ponding of sediment laden runoff shall be of the dimensions shown on the plans.
8. Rock filter dam types 2 & 3 shall be secured with 20 gauge galvanized woven wire mesh with 1" diameter hexagonal openings. The aggregate shall be placed on the mesh to the height & slopes specified. The mesh shall be folded at the upstream side over the aggregate and tightly secured to itself on the downstream side using wire ties or hog rings. For in stream use, the mesh should be secured or staked to the stream bed prior to aggregate placement.
9. Sack Gabions should be staked down with ¾" dia. rebar stakes, and have a double-twisted hexagonal weave with a nominal mesh opening of 2 ½" x 3 ¼"
10. Flow outlet should be onto a stabilized area (vegetation, rock, etc.).
11. The guidelines shown hereon are suggestions only and may be modified by the Engineer.

PLAN SHEET LEGEND

Type 1 Rock Filter Dam	RFD1
Type 2 Rock Filter Dam	RFD2
Type 3 Rock Filter Dam	RFD3
Type 4 Rock Filter Dam	RFD4

Texas Department of Transportation — Design Division Standard

TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

ROCK FILTER DAMS

EC(2)-16

FILE: ec216	DN: TxDOT	CK: KM	DW: VP	DN/CK: LS
© TxDOT: JULY 2016	CONT	SECT	JOB	HIGHWAY
REVISIONS	1507	02	016, Etc.	FM696, Etc.
	DIST	COUNTY		SHEET NO.
	BRY	BURLESON		169

DATE: 9/25/2020
FILE: g:\150702\016\sheets\Standards\Design\EC(2)-16.dgn

During the planning phase of project development the following environmental permits, issues and commitments have been developed during coordination with resource agencies, local governmental entities and the general public. Any change orders and/or deviations from the final design must be reported to the Engineer prior to the commencement of construction activities. As additional environmental clearances may be required.

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.

☒ Required Action ☐ No Action Required

Action No.

1. Prevent stormwater pollution by controlling erosion and sedimentation in accordance with TPDES Permit TXR 150000
2. Comply with the SW3P and revise when necessary to control pollution or required by the Engineer.
3. Post Construction Site Notice (CSN) with SW3P information on or near the site, accessible to the public and TCEQ, EPA or other inspectors.
4. When Contractor project specific locations (PSL's) increase disturbed soil area to 5 acres or more, submit NOI to TCEQ and the Engineer.

Refer to 2014 TxDOT Standard Specification Items:
7.7.2 Texas Pollutant Discharge Elimination System (TPDES) Permits and Storm Water Pollution Prevention PLans (SWP3)
506 Temporary Erosion, Sedimentation and Environmental Controls
734 Litter Removal
735 Debris Removal
738 Cleaning and Sweeping Highways

II. WORK IN OR NEAR STREAMS, WATER BODIES 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 locations of waters of the US.

1. STATION NUMBERS (FM 696): 179+90, 195+45
2. STATION NUMBERS (FM 2000): 117+49, 145+42, 169+30, 183+52, 387+08, 401+93, 407+79, 432+38, 450+43, 469+19, 483+27, 499+49, 516+72, 533+21, 541+28, and 567+59.

Information regarding the USACE Nationwide Permit Program can be found at:
http://www.swf.usace.army.mil/Missions/Regulatory/Permitting/GeneralPermits.aspx

Refer to 2014 TxDOT Standard Specification Items:
7.7.3 Work in Waters of the United States
7.7.6 Project Specific Locations
496 Removing Structures
506 Temporary Erosion, Sedimentation and Environmental Controls
506.4.3.4 Restricted Activities and Required Precautions

III. CULTURAL RESOURCES

Refer to 2014 TxDOT Standard Specification Item 7.7.1 Cultural Resources, in the event historical issues or archeological artifacts are found during construction. Upon discovery of archeological artifacts (bones, burnt rock, flint, pottery, etc.) immediately cease work in the vicinity and contact the Engineer.

☐ Required Action ☒ No Action Required

IV. VEGETATION RESOURCES

Preserve native vegetation to the extent practical.

☒ Required Action ☐ No Action Required

Action No.

1. Tree removal to be done in accordance with the Migratory Bird Treaty Act (see Section V)

Refer to 2014 TxDOT Standard Specification Items:
160 Topsoil
161 Compost
162 Sodding for Erosion Control
164 Seeding for Erosion Control
166 Fertilizer
168 Vegetative Watering
169 Soil Retention Blankets
170 Irrigation System
180 Wildflower Seeding
192 Landscape Planting
193 Landscape Establishment
506 Temporary Erosion, Sedimentation, and Environmental Controls
730 Roadside Mowing
751 Landscape Maintenance
752 Tree and Brush Removal

V. FEDERAL LISTED, PROPOSED THREATENED, ENDANGERED SPECIES, CRITICAL HABITAT, STATE LISTED SPECIES, CANDIDATE SPECIES AND MIGRATORY BIRDS.

☒ Required Action ☐ No Action Required

Action No.

1. Do not kill snakes or other animals!
2. Do not destroy nests on structures within the project limits.

   Temporarily prevent the building of nests on any structures that require work within the project limits during the construction timeframe.

   This can be accomplished by application of bird repellant gel, netting, or removal by hand every 3-4 days.

   The nesting/breeding season for migratory birds is March 1 - September 1.

Under the Migratory Bird Treaty Act (MBTA), it is unlawful by any means or manner, to pursue, hunt, take, capture, [or] kill any migratory birds except as permitted by regulation (16 U.S.C. 703-704). Neither the statute nor its implementing regulations (Title 50, Code of Federal Regulations, Parts 10, 13, 21) exempt unintentional take of migratory birds. The unauthorized take (e.g. killing, capturing, or collecting) of migratory birds is a strict liability criminal offense that does not require knowledge or specific intent on the part of the offender. Even when engaged in an otherwise lawful activity for which the intent is not the killing of migratory birds, a violation may be committed.

3. If caves or sinkholes are discovered, cease work in the immediate area to verify the presence or absence of wildlife.
4. BMPs for T and E species will be discussed at the preconstruction meeting.

The Bryan District Environmental Section can be contacted at (979) 778-9766 to assist with the removal of wildlife that will not leave on their own with gentle persuasion.

Refer to 2014 TxDOT Standard Specification Item:
7.7.6 Project Specific Locations

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 appropiate 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 Engineerimmediately. The Contractor shall be responsiblefor the proper containment and cleanup of all product spills.

Contact the Engineer if any of the follwing 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 notifiy 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 discoverd on site. Hazardous Materials or Contamination Issues Specific to this Project:

☒ Required Action ☐ No Action Required

Action No.

1. The Clean Water Act, in part, requires that any spill of oil that could enter a waterway, as defined by the Act, and that violates applicable water quality standards or causes a film or sheen on water require reporting to the TCEQ and local authorities.
   Contact the Bryan District Environmental Section at 979-778-9766.

   If potentially hazardous material and/or contaminated media (i.e. soil, groudwater, surface water, sediment, building materials) are unexpectedly encountered during construction, immediately cease work in the vicinity and contact the Engineer.

   Refer to 2014 TxDOT Standard Specification Items:
   6.10 Hazardous Materials
   7.12 Responsibility for Hazardous Materials

VII. OTHER ENVIRONMENTAL ISSUES

☐ Required Action ☒ No Action Required

Refer to 2014 TxDOT Standard Specification Items:
7.7.6 Project Specific Locations
751 Landscape Maintenance

Contacts:

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PRINT DATE	REVISION DATE
1/13/2021	02/12/2015

Texas Department of Transportation
Bryan District

ENVIRONMENTAL PERMITS, ISSUES AND COMMITMENTS (EPIC)

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 696, ETC.
STATE	DISTRICT	COUNTY
TEXAS	BRYAN	BURLESON
CONTROL	SECTION	JOB / SHEET NO.
1507	02	016, ETC. / 170

REV DATE: 2-12-2015
CSJ: 1507-02-016, Etc. FILENAME: g:\150702\016\sheets\ENV\EPIC.DGN