FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6	STP 2B23(029)HES	FM 149, ETC

STATE	DISTRICT	COUNTY
TEXAS	BRYAN	GRIMES

CONTROL	SECTION	JOB	SHEET NO.
0720	01	044, ETC.	1

DESIGN SPEED: 65 MPH (SH 6)
40 MPH (FM 149)

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 2B23(029)HES

FM 149, ETC.
GRIMES COUNTY

TOTAL LENGTH OF PROJECT = 28,638.72 FT= 5.424 MILES, ETC.

FOR THE CONSTRUCTION OF WIDEN PAVED SHOULDERS, ETC.

FINAL PLANS

CONTRACTOR:

LETTING DATE:

DATE CONTRACTOR BEGAN WORK:

DATE WORK WAS COMPLETED:

DATE WORK WAS ACCEPTED:

FINAL CONTRACT COST: $

LOCATION NO.	HIGHWAY	CONTROL NO.	LIMITS	2021/2041 ADT	REFERENCE MARKERS		TOTAL LENGTH (FT)	BRIDGE LENGTH (FT)	RDWY LENGTH (FT)
					BEGIN	END			
1	FM 149	0720-01-044	FROM: SH 90 TO: 0.2 MI E OF FM 2562	1,596/1,947	RM 428-1.440 MI (MP 0.000)	RM 430+1.991 MI (MP 5.424)	28,638.72	96.00	28,542.72
2	SH 6	0050-03-109	FROM: 0.3 MI N OF FM 2988 TO: 0.1 MI S OF FM 2988	26,290/36,806	RM 618+0.506 MI (MP 8.649)	RM 618+0.908 MI (MP 9.051)	2,122.56	0.00	2,122.56

NEBLETTS CREEK BRIDGE
NBI# 17-094-0-0720-01-052
LENGTH = 96'

NO EXCEPTIONS
NO EQUATIONS
NO RAILROAD CROSSINGS

TEXAS DEPARTMENT OF TRANSPORTATION®

SUBMITTED FOR LETTING: 6/1/2023
DocuSigned by: Jeff Miles
589D3E0B31FA414...
DISTRICT DESIGN ENGINEER

RECOMMENDED FOR LETTING: 6/1/2023
DocuSigned by: Doug Maine, P.E.
DAA3B06...
DIRECTOR OF TRANSPORTATION PLANNING AND DEVELOPMENT

APPROVED FOR LETTING: 6/1/2023
DocuSigned by: Chad Bohne
60E5537715D24EA...
DISTRICT ENGINEER

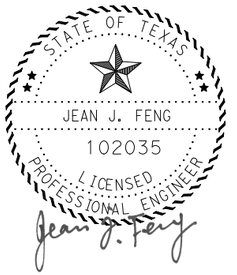
SPECIFICATIONS ADOPTED BY THE TEXAS DEPARTMENT OF TRANSPORTATION, NOVEMBER 1, 2014, AND SPECIFICATION ITEMS LISTED AS FOLLOWS, SHALL GOVERN ON THIS PROJECT:

REQUIRED CONTRACT PROVISIONS FOR ALL FEDERAL-AID CONSTRUCTION CONTRACTS (FORM FHWA 1273, JULY 5, 2022)

REV DATE: 5/31/2023
CSJ: 0720-01-044
FILENAME: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY/Design Projects/0720010044/4 - Design/Plan Ser/1. General/1A. TitleSheet/TITLE SHEET

INDEX OF SHEETS

THE STANDARD SHEETS SPECIFICALLY IDENTIFIED ABOVE WITH (~), STATE STANDARD HAVE BEEN SELECTED BY ME, OR UNDER MY RESPONSIBLE SUPERVISION, AS BEING APPLICABLE TO THIS PROJECT.



04/20/2023

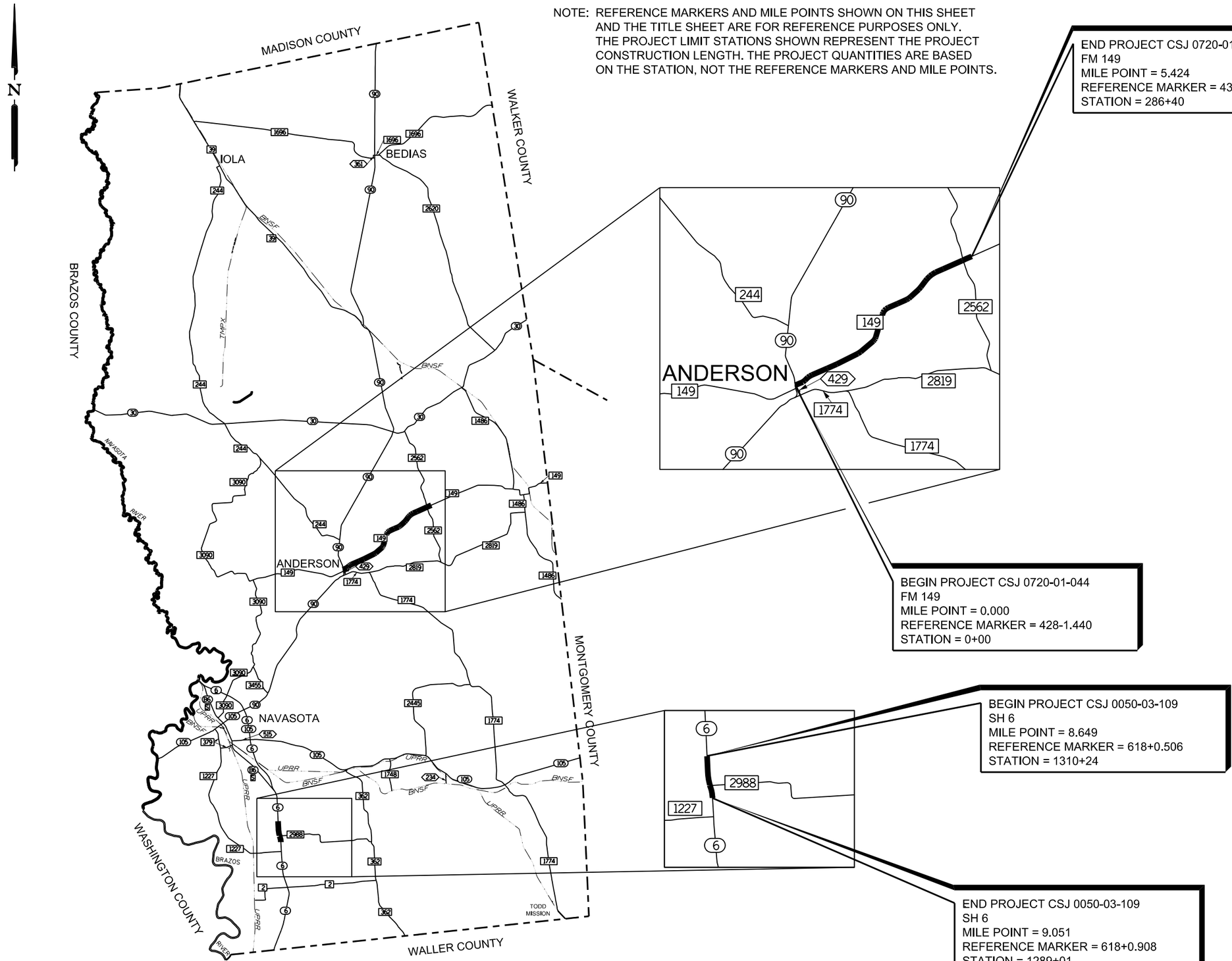
PRINT DATE	REVISION DATE
4/19/2023	

Texas Department of Transportation
Bryan District

INDEX OF SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 149, ETC.
STATE	DISTRICT	COUNTY
TEXAS	BRY	GRIMES
CONTROL	SECTION	JOB / SHEET NO.
0720	01	044, ETC. / 2

NOTE: REFERENCE MARKERS AND MILE POINTS SHOWN ON THIS SHEET AND THE TITLE SHEET ARE FOR REFERENCE PURPOSES ONLY. THE PROJECT LIMIT STATIONS SHOWN REPRESENT THE PROJECT CONSTRUCTION LENGTH. THE PROJECT QUANTITIES ARE BASED ON THE STATION, NOT THE REFERENCE MARKERS AND MILE POINTS.



END PROJECT CSJ 0720-01-044
FM 149
MILE POINT = 5.424
REFERENCE MARKER = 430+1.991
STATION = 286+40

BEGIN PROJECT CSJ 0720-01-044
FM 149
MILE POINT = 0.000
REFERENCE MARKER = 428-1.440
STATION = 0+00

BEGIN PROJECT CSJ 0050-03-109
SH 6
MILE POINT = 8.649
REFERENCE MARKER = 618+0.506
STATION = 1310+24

END PROJECT CSJ 0050-03-109
SH 6
MILE POINT = 9.051
REFERENCE MARKER = 618+0.908
STATION = 1289+01

STATE OF TEXAS
JEAN J. FENG
102035
LICENSED
PROFESSIONAL ENGINEER

04/20/2023

PRINT DATE	REVISION DATE
4/19/2023	

Texas Department of Transportation
Bryan District
© 2023

PROJECT LOCATION MAP

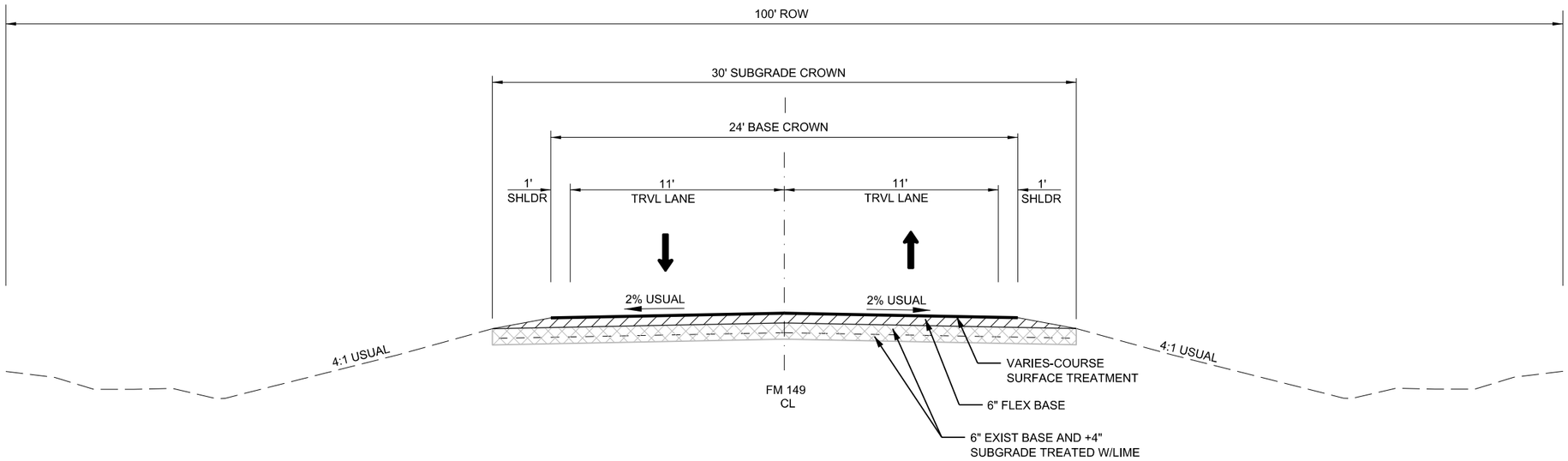
FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 149, ETC.

STATE	DISTRICT	COUNTY
TEXAS	BRY	GRIMES

CONTROL	SECTION	JOB	SHEET NO.
0720	01	044, ETC.	3

REV DATE: 4/18/2023
CSJs: 0720-01-044

FILENAME: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY/Design Projects/0720010444 - Design/Plan Set/1. General/1B. ProjectLayout/PROJECT LOCATION MAP.dgn



EXISTING TYPICAL SECTION

STA 0+00 TO STA 286+40

STATE OF TEXAS
JEAN J. FENG
102035
LICENSED
PROFESSIONAL ENGINEER

04/20/2023

Drawings Not To Scale

PRINT DATE	REVISION DATE
4/19/2023	

Texas Department of Transportation
Bryan District

TYPICAL SECTIONS (FM 149)

SHEET 1 OF 2 SHEETS

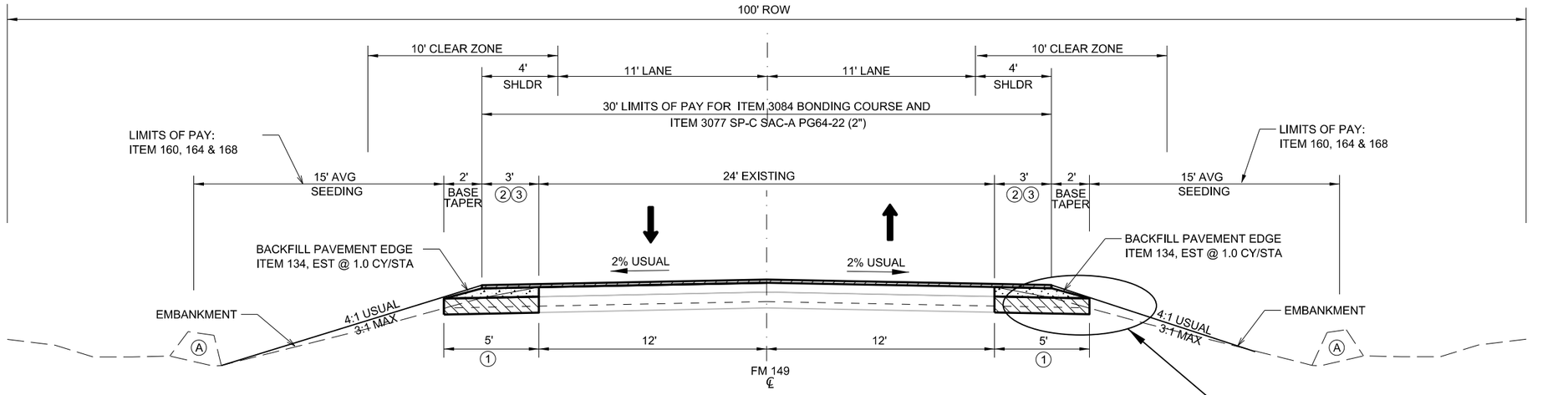
FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 149, ETC.

STATE	DISTRICT	COUNTY
TEXAS	BRY	GRIMES

CONTROL	SECTION	JOB	SHEET NO.
0720	01	044, ETC.	4

REV DATE: 3/28/2023
CSJ: 0720-01-044

FILENAME: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY/Design Projects/0720010444 - DesignPlan Set/1. General/1D. PropTypicalSections/TYPICAL SECTIONS (FM 149).dgn



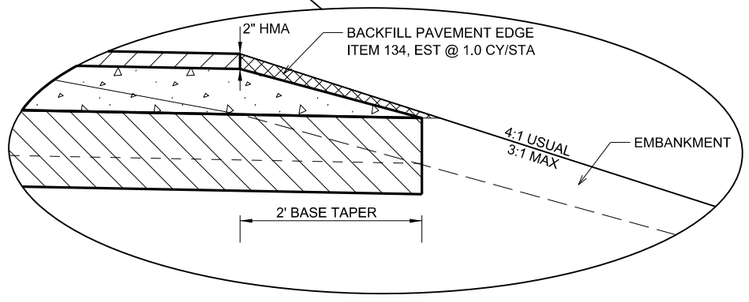
PROPOSED TYPICAL SECTION

STA 0+00 TO STA 54+06
TRANSITION STA 54+06 TO STA 55+06

TRANSITION STA 62+29 TO STA 63+29
STA 63+29 TO STA 274+00

STA 274+00 TO STA 275+00 (FM 2562 INTERSECTION)

STA 275+00 TO STA 286+40



INSET
(LT & RT)

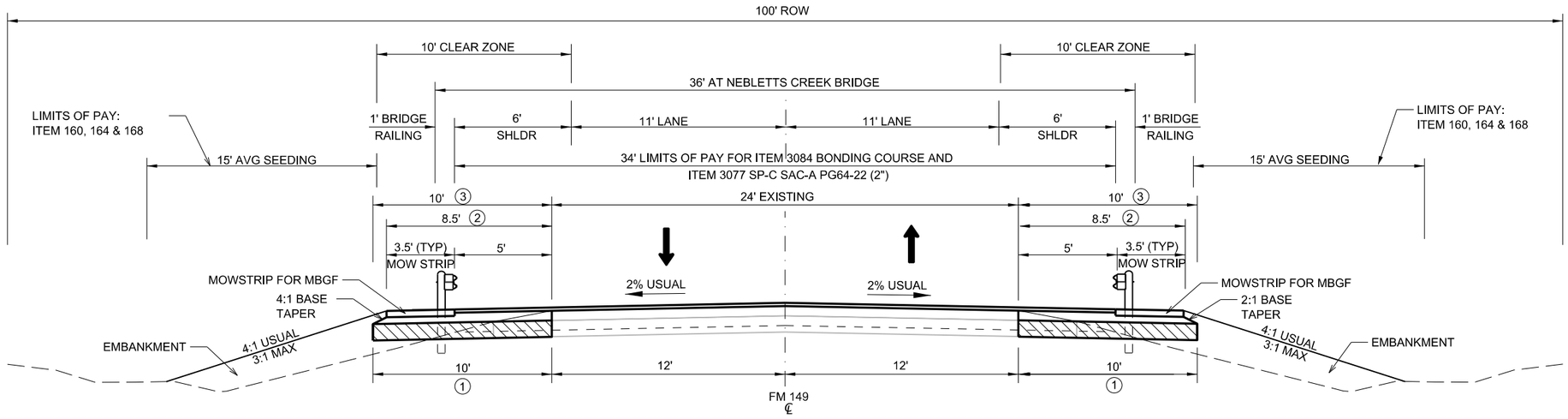
①LIMITS OF PAY - ITEM 112 SUB-GRADE WIDENING (OC)
ITEM 260 - 5" LIME TREAT SUBGRADE @ 3%

②LIMITS OF PAY - ITEM 247 6" FLEX BASE

③LIMITS OF PAY - ITEM 316 - ASPH (RC 250) AND
ITEM 316 - AGGR (TY L OR B GR 5)

Ⓐ ITEM 160: FURNISHING AND PLACING TOPSOIL (4")
EXISTING TOPSOIL SHALL BE REMOVED TO A DEPTH OF 4" AND WINDROWED OUTSIDE OF THE WORK AREA CREATING A BERM, AND THEN RETURNED TO SLOPES UPON COMPLETION OF ROADWAY WIDENING.

NOTE:
SEE TIE-IN DETAILS ON THE ROADWAY LAYOUT SHEETS FOR BEGINNING, END OF PROJECT AND NESBLETT CREEK BRIDGE.



PROPOSED TYPICAL SECTION

STA 55+06 TO STA 58+19

STA 58+19 TO STA 59+15
(NEBLETTS CREEK BRIDGE)

STA 59+15 TO STA 62+29

①LIMITS OF PAY - ITEM 112 SUB-GRADE WIDENING (OC)
ITEM 260 - 10" LIME TREAT SUBGRADE @ 3%

②LIMITS OF PAY - ITEM 247 6" FLEX BASE

③LIMITS OF PAY - ITEM 316 - ASPH (RC 250) AND
ITEM 316 - AGGR (TY L OR B GR 5)

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

04/20/2023

Drawings Not To Scale

PRINT DATE	REVISION DATE
4/19/2023	

Texas Department of Transportation
Bryan District

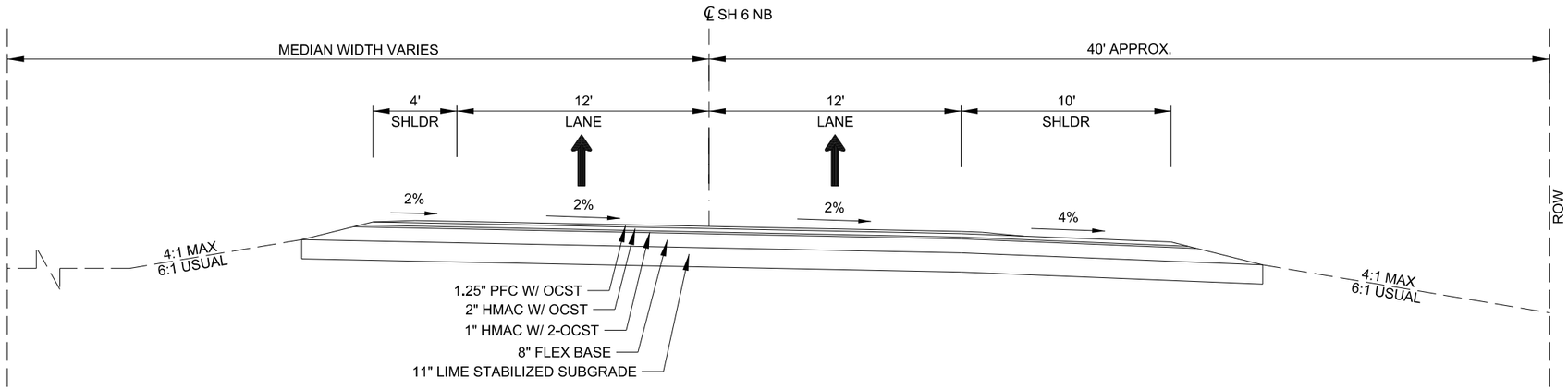
TYPICAL SECTIONS (FM 149)

SHEET 2 OF 2 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 149, ETC.

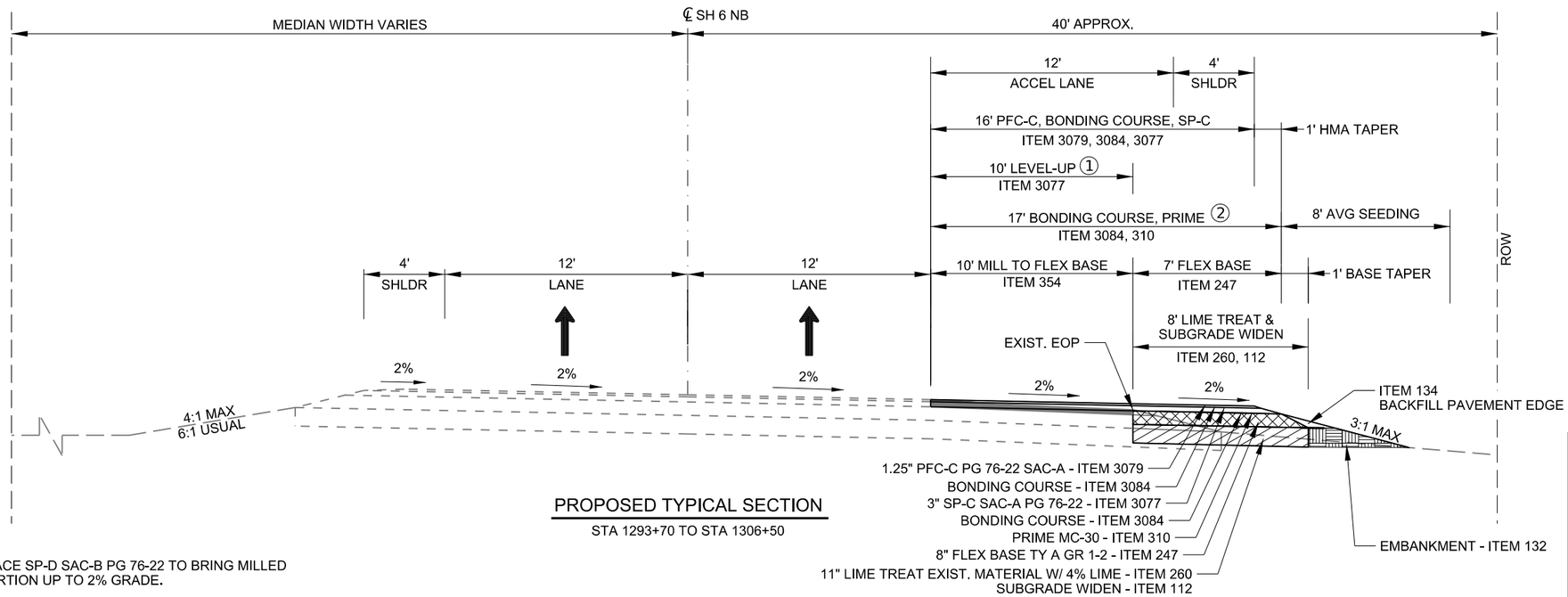
STATE	DISTRICT	COUNTY	
TEXAS	BRY	GRIMES	
CONTROL	SECTION	JOB	SHEET NO.
0720	01	044, ETC.	5

REV DATE: 3/28/2023
CSJ: 0720-01-044
FILENAME: pw:\\txdot.projectwiseonline.com:TxDOT4\Documents\17 - BRY\Design Projects\0720010444 - Design\Plan Set\1. General\1D. PropTypicalSections\TYPICAL SECTIONS (FM 149).dgn



EXISTING TYPICAL SECTION

STA 1293+70 TO STA 1306+50



PROPOSED TYPICAL SECTION

STA 1293+70 TO STA 1306+50

① PLACE SP-D SAC-B PG 76-22 TO BRING MILLED PORTION UP TO 2% GRADE.

② SEE TCP NARRATIVE FOR SEQUENCE OF WORK.

STATE OF TEXAS
JEAN J. FENG
102035
LICENSED
PROFESSIONAL ENGINEER

04/20/2023

Drawings Not To Scale

PRINT DATE	REVISION DATE
4/19/2023	

Texas Department of Transportation
Bryan District

TYPICAL SECTIONS (SH 6)

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 149, ETC.

STATE	DISTRICT	COUNTY
TEXAS	BRY	GRIMES

CONTROL	SECTION	JOB	SHEET NO.
0720	01	044, ETC.	6

REV DATE: 3/28/2023
CSJ#: 0050-03-109

FILENAME: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY/Design Projects/0050031094 - Design/Plan Set/1. General/TC. TypicalSections/TYPICAL SECTIONS (SH 6)

Highway: FM 149, Etc. **Control:** 0720-01-044, Etc.

County: Grimes

BASIS OF ESTIMATE (FM 149, 0720-01-044)					
ITEM	**DESCRIPTION**	**COURSE**	**RATE**	**AMOUNT**	**QUANTITY**
168-6001	Vegetative Watering		10 GAL/SY	47,633 SY	476 MG
260-6012	Lime (HYD, COM OR QK) (SLRY) OR QK(DRY) (10")(3%)		0.0123 TON/SY	32,252 SY	397 TON
316-6029	Asphalt (RC 250)		0.25 GAL/SY	19,851 SY	4,963 GAL
316-6403	AGGREGATE (TY-B GR-5 or TY L GR-5)		1 CY/135 SY	19,851 SY	147 GAL
3077-6012	SP MIXES SP-C SAC-A PG64-22	2"	220 LB/SY	95,470 SY	10,502 TON
3084-6001	Bonding Course		0.10 GAL/SY	95,470 SY	9,547 GAL

BASIS OF ESTIMATE (FM 149, 0720-01-044) * for contractor's information only					
ITEM	**DESCRIPTION**	**COURSE**	**RATE**	**AMOUNT**	**QUANTITY**
166*	FERTILIZER **		60 LBS/AC	1.09 AC	0.0327 TON
FOR DRIVEWAYS AND TURNOUTS					
530*	ASPH (RC-250)	1 ST	0.28 GAL/SY	7,595 SY	2,127 GAL
530*	AGGREGATE (TY-B GR-5 OR TY-L GR-5)	1 ST	1 CY/135 SY	7,595 SY	56 CY
530*	ASPHALT (AC-20-5TR)	2 ND	0.38 GAL/SY	7,595 SY	2,886 GAL
530*	AGGREGATE (TY PB or TY PL GR4) (SAC-A)	2 ND	1 CY/125/SY	7,595 SY	61 CY
530*	SP MIXES SP-C SAC-A PG64-22	2"	220 LB/SY	7,595 SY	835 TON
INTERSECTION AT FM 2562					
530*	SP MIXES SP-C SAC-A PG64-22	2"	220 LB/SY	564 SY	62 TON

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

Sheet:7

Highway: FM 149, Etc. **Control:** 0720-01-044, Etc.

County: Grimes

BASIS OF ESTIMATE (SH 6, 0050-03-109)					
ITEM	**DESCRIPTION**	**COURSE**	**RATE**	**AMOUNT**	**QUANTITY**
168-6001	Vegetative Watering		10 GAL/SY	1,138 SY	11 MG
260-6012	Lime (HYD, COM OR QK) (SLRY) OR QK(DRY) (11")(4%)		0.0182 TON/SY	1,004 SY	19 TON
310-6009	Prime Coat (MC-30)		0.20 GAL/SY	2,318 SY	464 GAL
3084-6001	Bonding Course		.10 GAL SY	4,494 SY	449 GAL
3077-6033	SP Mixes SP-C SAC-A PG 76-22	3"	330 LB/SY	2,176 SY	359 TON
3077-6066	SP Mixes SP-D SAC-B PG 76-22	2.5"	275 LB/SY	1,422 SY	196 TON
3079-6011	PFC PFC-C PG76-22 SAC-A (1)	1-1/4"	116.25 LB/SY	2,176 SY	126 TON

(1) PFC estimated at 93 LB/SY/IN.

BASIS OF ESTIMATE (SH 6, 0050-03-109) * for contractor's information only					
ITEM	**DESCRIPTION**	**COURSE**	**RATE**	**AMOUNT**	**QUANTITY**
166*	FERTILIZER **		60 LBS/AC	0.21 AC	0.007 TON
530*	DRIVEWAY (ACP)	2"	220 LB/SY	212 SY	23 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:
James Robbins, P.E., A.E., James.Robbins@txdot.gov
Joseph Greive, P.E., A.A.E., Joseph.Greive@txdot.gov

Questions may be submitted via the Letting Pre-Bid Q&A web page. This webpage can be accessed from the Notice to Contractors dashboard located at the following Address:
https://tableau.txdot.gov/views/ProjectInformationDashboard/NoticetoContractors

All contractor questions will be reviewed by the Engineer. All questions and any corresponding responses that are generated will be posted through the same Letting Pre-Bid Q&A web page.

The Letting Pre-Bid Q&A web page for each project can be accessed by using the dashboard to navigate to the project you are interested in by scrolling or filtering the dashboard using the controls on the left. Hover over the blue hyperlink for the project you want to view the Q&A for and click on the link in the window that pops up.

Send eligible shop plan submittals with PDF attachments directly to the reviewing office.

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

ITEM 5 "CONTROL OF THE WORK"

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

ITEM 6 "CONTROL OF MATERIALS"

To comply with the latest provisions of Build America, Buy America Act (BABA Act) of the Bipartisan Infrastructure Law, the contractor must submit an original of the TxDOT Construction Material Buy America Certification Form for all items classified as construction materials. This form is not required for materials classified as a manufactured product.

Refer to the Buy America Material Classification Sheet for clarification on material categorization.

The Buy America Material Classification Sheet is located at the below link.

https://www.txdot.gov/business/resources/materials/buy-america-material-classification-sheet.html for clarification on material categorization.

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:7A
Highway: FM 149, Etc. Control: 0720-01-044, Etc.
County: Grimes

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

SH 6 is on a hurricane evacuation route. Furnish at the pre-construction meeting a written plan outlining procedures to suspend work, secure the job site and safely handle traffic through and across the project in the event of a hurricane evacuation.

During the hurricane season (June 1 through November 30), do not close any travel lanes except when the Contractor can demonstrate that he can provide labor, equipment, material, work plan, and quality of work to satisfactorily return all lanes to an open, all-weather travel surface within three days of receiving written or verbal notice but no later than 3 days prior to hurricane landfall. Construction of temporary lanes to an all-weather surface will be paid in accordance with Article 9.7, "Payment for Extra Work and Force Account Method".

In addition to lane closures, cease work 3 days prior to hurricane landfall on or near the roadway that adversely impacts the flow of traffic and reduces the capacity of the highway during an evacuation. Prohibit the Contractor's, sub-contractors' or material suppliers' vehicles from entering or exiting the stream of traffic including material hauling and delivery, and mobilization or demobilization of equipment. When directed, this prohibition will include a reasonable time period for the evacuees to return to their point of origin.

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 for FM 149.

Roadway closures on SH 6 during the following key dates and/or special events are prohibited:

- Day before and day of Texas A&M home football games
- Texas A&M graduation
- Texas A&M Parents Weekend

The Engineer may decide to restrict construction operations or lane closures on these key dates and/or special events.

ITEM 8 "PROSECUTION AND PROGRESS"

No more than 2 miles of non-surfaced roadway will be allowed at any time. The Engineer may consider extending the 2-mile limit or allow alternating 2-mile sections of concurrent work, only if the Contractor can demonstrate adequate workforce, equipment, material deliveries, work plan, and quality of work sufficient to handle the longer work zones. If the 2 miles of non-surfaced roadway are extended by the Engineer in writing, this will not exempt the Contractor from not exceeding the 5 minute delay and any additional signing/traffic control will be considered subsidiary to Item 502, Barricades, Signs, and Traffic Handling.

At the end of each work day, remove all grade differentials transverse to centerline.

At the end of each work day, provide 100 foot minimum grade tapers longitudinal to the centerline to transition differences in the profile grade line or roadway grade.

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:

FM 149 (CSJ 0720-01-044)
1) Set-up Signs and Barricades.
2) Follow SEQUENCE OF WORK, phase 1 through phase 3.
3) Final Cleanup

SH 6 (CSJ 0050-03-109)
1) Set advance signing and barricades.
2) Follow SEQUENCE OF WORK, phase 1 through phase 2.
3) Final cleanup.

Some of these operations may be performed simultaneously.

Prepare Progress Schedule Bar Chart.

Work in the travel lanes (including lane closures) is not allowed from 7:00AM to 8:30AM, Monday through Friday, for both FM 149 and SH 6.

Work is allowed to be performed during the nighttime.

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

The 90 day delayed start allowed after authorization under SP008-003 is for Contractor mobilization.

Sheet:7B
Highway: FM 149, Etc. Control: 0720-01-044, Etc.
County: Grimes

MILESTONE 1:

Milestone 1 is for the construction of SH 6 northbound widening associated with adding right turn lane.

The road-user cost liquidated damages for Milestone 1 is $ 1,400 per day.

Substantially complete Milestone 1 in 97 working days charged in accordance with article 8.3.1.1.

The time for Milestone 1 will begin upon the closure of the outside northbound lane as shown in Phase 2A of the traffic control plans.
The time charges for Milestone 1 will end when, in the opinion of the Engineer, the Contractor has completed the following items of work, which define the term "substantially complete":

1) Complete the SH 6 northbound right turn lane and shoulder paving including placement of the one and a quarter-inch porous friction course, including placing retaining wall and MBGF;
2) Complete backfilling SH 6 northbound outside shoulder so that no shoulder slope is steeper than 3:1 within the thirty-foot clear zone of the outside lane of SH 6;
3) Complete placement of permanent and/or temporary pavement markings along the outside edge of the outside lane of the SH 6 northbound;
4) Place temporary or permanent signs necessary for the outside lane of SH 6 to be re-opened to traffic.

ITEM 100 "PREPARING RIGHT OF WAY"

During burn bans obtain written approval from the Commissioners Court prior to burning brush.

Prevent ashes from burned vegetation to be transported into any stream.

If burning is not allowed, all trees and brush will be disposed of by shredding, logging or other methods approved by the Engineer. Create a windrow, stockpile, or topdress biomass on disturbed areas along the project at locations approved by necessary permits and the Engineer.

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 30% silt.
- Sources within the ROW provide material with a plasticity index between 10 and 25 and with less than 30% silt.

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

ITEM 134 "BACKFILLING PAVEMENT EDGES"

Furnish Type A or B material meeting one of the following requirements:
Item 247, Type D Grade 3;
Reclaimed Asphalt Pavement (RAP) with 95% of the RAP passing the 2 inch sieve.

Place emulsified asphalt (SS-1, CSS-1, or as approved by the Engineer) at an application rate of 0.15 gal/SY.

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 Bermuda sod.

ITEM 166 "FERTILIZER"

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

Sheet:7C
Highway: FM 149, Etc. Control: 0720-01-044, Etc.
County: Grimes

ITEM 168 "VEGETATIVE WATERING"

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

ITEM 247 "FLEXIBLE BASE"

Place flexible base in equal lifts of 4 to 8 in. in depth unless otherwise approved by the Engineer.

ITEM 301 "ASPHALT ANTISTRIPPING AGENT"

When the Contractor adds lime as an anti-stripping agent (or an equivalent anti-stripping agent) the lime or equivalent shall be added to the asphaltic concrete in the methods specified in this item unless otherwise approved by the Engineer. If an alternate method is proposed, the Engineer's approval will be based on test method Tex-242-F performed on the asphaltic concrete produced through the plant.

ITEM 310 "PRIME COAT"

Cure MC 30 for 7 days before placing subsequent surface courses unless otherwise directed by the engineer.

ITEM 316 "SEAL COAT"

Remove vegetation and blade pavement edges.

When placing surface treatment on base material, prepare surface by sweeping or other approved methods. Before applying bituminous material, lightly sprinkle the surface with water. When directed, sweep the surface after sprinkling with water. Do not apply bituminous material when water is puddling on the surface.

Sweep excess aggregate no sooner than 2 hours after rolling or as directed.

Vehicles used to haul aggregate from the stockpile to the chip spreader will not be overloaded. Any damage to the roadway caused by the vehicles will be repaired by the Contractor at his expense and subsequent loads will be reduced so as not to cause further damage.

Transverse variance rates shall be used as directed. The nozzles outside the wheel paths will output up to 20% more asphalt by volume than the nozzles over the wheel paths.

The Contractor may be required to furnish and set string line to insure straight and uniform alignment as directed by the Engineer. The Contractor may use other methods subject to approval of the Engineer.

Surface treat the metal beam guard fence widening areas after placing the MBGF to ensure that the entire widened areas are properly sealed.

If electing to place the MBGF after placing the surface treatment, reseal the widened areas to the satisfaction of the Engineer.

Surface treat driveways before the roadway is surface treated (second course only).

Cure surface treatments placed with a cutback asphalt binder for 21 days before placing subsequent surface courses unless otherwise directed by the engineer.

Cure surface treatments placed with an emulsion asphalt binder for 7 days before placing subsequent surface courses unless otherwise directed by the engineer.

Air and surface temperature for asphalt material application will be in accordance with the specification and the manufacturer's recommendation. However, the engineer may limit the use of an asphalt material due to the time of year.

ITEM 320 "EQUIPMENT FOR ASPHALT CONCRETE PAVEMENT"

Unless otherwise approved by the Engineer, provide a Material Transfer Device with remixing capabilities as specified in Item 320.2.3.3 Placement and Compaction Equipment for all asphaltic concrete pavement.

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.

Sheet:7D
Highway: FM 149, Etc. Control: 0720-01-044, Etc.
County: Grimes

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.

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.

Law enforcement assistance will be required for this project and is expected to be required for major traffic control changes and lane closures. Coordinate with local law enforcement and arrange for law enforcement as directed or agreed by the Engineer. Complete the weekly tracking form provided by the department and submit invoices that agree with the tracking form for payment at the end of each month approved services were provided.

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.

Furnish and install a single type of guardrail end treatments project-wide (either wood post or steel post).

Use TYPE III post and tube option when using wood post guardrail end treatments.

ITEM 560 “MAILBOX ASSEMBLIES”

Notify the postmaster prior to installation for approval of type and temporary and permanent locations.

Retain and re-use newspaper holders removed or relocated during construction for placement on new mailbox assemblies in accordance with mailbox standard sheets.

ITEM 585 “RIDE QUALITY FOR PAVEMENT SURFACES”

Pay adjustment schedule 3 will be used to evaluate ride quality of the travel lanes in accordance with Item 585, “Ride Quality for Pavement Surfaces.”

ITEM 644 “SMALL ROADSIDE SIGN ASSEMBLIES”

Salvage and deliver all aluminum sign faces to the local TxDOT maintenance office.

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.

Sheet:7E
Highway: FM 149, Etc. Control: 0720-01-044, Etc.
County: Grimes

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 678 “PAVEMENT SURFACE PREPARATION FOR MARKINGS”

It is not anticipated that pavement surface preparation for markings will be needed. If the Engineer determines that it is needed, payment for work will be determined in accordance with Article 9.7 “Payment for Extra Work and Force Account Method”.

ITEM 3077 “SUPERPAVE MIXTURES”

Aggregates used on ramps are required to meet SAC requirements.

Hydrated lime, commercial lime slurry or an equivalent anti-stripping agent may be used. If hydrated lime or commercial lime slurry is used up to 1.0 percent may be added. If an equivalent anti-stripping agent is used, add according to manufacturers recommendations. Provide hydrated lime or commercial lime slurry in accordance with DMS-6350, “Lime and Lime Slurry”. Add hydrated lime, commercial lime, commercial lime slurry, or an equivalent anti-stripping agent in accordance with Section 301.4.2.

Apply tack coat through a distributor spray bar in accordance with Section 316.3.1. Distributor. If residual from emulsion tack is not tacky, then the Engineer can require the use of PG binder.

RAS is not permitted in thin level-up courses.

ITEM 3079 "PERMEABLE FRICTION COURSE"

Use aggregate that meets the SAC requirement of class A.

Blending is not allowed.

Apply tack coat through a distributor spray bar in accordance with Article 316.3 Distributor. If residual from emulsion tack is not tacky, then the Engineer can require the use of PG binder.

No RAP or RAS is allowed.

ITEM 6001 "PORTABLE CHANGEABLE MESSAGE SIGN"

Furnish, install, and operate up to (2) Portable Changeable Message Signs (PCMS) for FM 149 and (2) Portable Changeable Message Signs (PCMS) for SH 6. 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 (1-1)-18 as detailed on General Note 4 of this standard sheet.

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 (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 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

Sheet:7F
Highway: FM 149, Etc. Control: 0720-01-044, Etc.
County: Grimes

General Note 3 of this standard sheet.

Provide one (1) shadow vehicles with TMA for TCP (5-1)-18 as detailed on General Note 1 of this standard sheet.

Provide one (1) shadow vehicles with TMA for TCP (S-1)-08 as detailed on General Note 4 of this standard sheet.

Provide one (1) shadow vehicles with TMA for TCP (S-2)-08A as detailed on General Note 10 of this standard sheet.

FM 149
138 (one hundred thirty-eight) TMA days are provided in the project estimate for stationary operations.
2 (two) TMA days are provided in the project estimate for mobile operations.

SH 6
97 (ninety-seven) TMA days are provided in the project estimate for stationary operations.
1 (one) TMA days are provided in the project estimate for mobile operations.

Therefore, eleven (11) 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.

Estimate & Quantity Sheet

CONTROLLING PROJECT ID 0720-01-044 **DISTRICT** Bryan **COUNTY** Grimes
HIGHWAY FM 149, SH 6

			CONTROL SECTION JOB		**0050-03-109**		**0720-01-044**		TOTAL EST.	TOTAL FINAL
			PROJECT ID		**A00178693**		**A00178480**			
			COUNTY		**Grimes**		**Grimes**			
			HIGHWAY		**SH 6**		**FM 149**			
ALT	**BID CODE**	**DESCRIPTION**		**UNIT**	EST.	FINAL	EST.	FINAL		
	100-6002	PREPARING ROW		STA	3.000		8.000		11.000	
	104-6009	REMOVING CONC (RIPRAP)		SY			48.000		48.000	
	104-6017	REMOVING CONC (DRIVEWAYS)		SY			182.000		182.000	
	110-6001	EXCAVATION (ROADWAY)		CY	84.000				84.000	
	112-6001	SUBGRADE WIDENING (ORD COMP)		STA	13.000		286.440		299.440	
	132-6005	EMBANKMENT (FINAL)(ORD COMP)(TY C)		CY			720.000		720.000	
	132-6006	EMBANKMENT (FINAL)(DENS CONT)(TY C)		CY	158.000				158.000	
	134-6004	BACKFILL (TY A OR B)		STA	13.000		286.440		299.440	
	160-6003	FURNISHING AND PLACING TOPSOIL (4")		SY	1,138.000		47,633.000		48,771.000	
	162-6002	BLOCK SODDING		SY			294.000		294.000	
	164-6001	BROADCAST SEED (PERM) (RURAL) (SANDY)		SY	1,138.000		47,633.000		48,771.000	
	164-6071	BROADCAST SEED (TEMP)(WARM OR COOL)		SY	1,138.000		47,633.000		48,771.000	
	168-6001	VEGETATIVE WATERING		MG	11.000		476.000		487.000	
	216-6001	PROOF ROLLING		HR	1.000				1.000	
	247-6061	FL BS (CMP IN PLC)(TYA GR1-2) (6")		SY			19,851.000		19,851.000	
	247-6230	FL BS (CMP IN PLACE)(TY A GR 1-2)(8")		SY	879.000				879.000	
	260-6009	LIME TRT (EXST MATL)(10")		SY			32,252.000		32,252.000	
	260-6012	LIME(HYD,COM OR QK)(SLRY)OR QK(DRY)		TON	19.000		397.000		416.000	
	260-6038	LIME TRT (EXIST MATL)(11")		SY	1,004.000				1,004.000	
	310-6009	PRIME COAT (MC-30)		GAL	464.000				464.000	
	316-6029	ASPH (RC-250)		GAL			4,963.000		4,963.000	
	316-6403	AGGR (TY-B GR-5 OR TY-L GR-5)		CY			147.000		147.000	
	354-6021	PLANE ASPH CONC PAV(0" TO 2")		SY			2,132.000		2,132.000	
	354-6096	PLANE ASPH CONC PAV (3"- 5")		SY	1,422.000				1,422.000	
	400-6005	CEM STABIL BKFL		CY			258.000		258.000	
	400-6006	CUT & RESTORING PAV		SY			149.000		149.000	
	401-6001	FLOWABLE BACKFILL		CY			10.000		10.000	
	402-6001	TRENCH EXCAVATION PROTECTION		LF	12.000		187.000		199.000	
	420-6054	CL C CONC (HEADWALL)		CY			3.600		3.600	
	423-6005	RETAINING WALL (SPREAD FOOTING)		SF	2,100.000				2,100.000	
	432-6001	RIPRAP (CONC)(4 IN)		CY	23.000				23.000	
	432-6031	RIPRAP (STONE PROTECTION)(12 IN)		CY			125.000		125.000	
	432-6045	RIPRAP (MOW STRIP)(4 IN)		CY	6.500		100.000		106.500	
	451-6024	RETROFIT RAIL (TY SSTR)		LF	350.000				350.000	
	462-6007	CONC BOX CULV (5 FT X 3 FT)		LF			48.000		48.000	
	462-6045	CONC BOX CULV (3 FT X 2 FT)(EXTEND)		LF	7.000				7.000	
	464-6003	RC PIPE (CL III)(18 IN)		LF			1,556.000		1,556.000	

Estimate & Quantity Sheet

CONTROLLING PROJECT ID 0720-01-044 **DISTRICT** Bryan **COUNTY** Grimes
HIGHWAY FM 149, SH 6

			CONTROL SECTION JOB		**0050-03-109**		**0720-01-044**		TOTAL EST.	TOTAL FINAL
			PROJECT ID		**A00178693**		**A00178480**			
			COUNTY		**Grimes**		**Grimes**			
			HIGHWAY		**SH 6**		**FM 149**			
ALT	**BID CODE**	**DESCRIPTION**		**UNIT**	EST.	FINAL	EST.	FINAL		
	464-6005	RC PIPE (CL III)(24 IN)		LF	10.000		688.000		698.000	
	464-6007	RC PIPE (CL III)(30 IN)		LF			32.000		32.000	
	464-6008	RC PIPE (CL III)(36 IN)		LF			192.000		192.000	
	464-6018	RC PIPE (CL IV)(24 IN)		LF			172.000		172.000	
	465-6001	INLET (COMPL)(TY S)		EA	1.000				1.000	
	465-6132	INLET (COMPL)(PSL)(FG)(4FTX5FT-4FTX4FT)		EA	1.000				1.000	
	466-6101	HEADWALL (CH - PW - 0) (DIA= 36 IN)		EA			4.000		4.000	
	466-6138	HEADWALL (CH - PW - S) (DIA= 60 IN)		EA			2.000		2.000	
	466-6139	HEADWALL (CH - PW - S) (DIA= 66 IN)		EA			2.000		2.000	
	467-6175	SET (TY I)(S= 5 FT)(HW= 4 FT)(3:1) (C)		EA			1.000		1.000	
	467-6177	SET (TY I)(S= 5 FT)(HW= 4 FT)(4:1) (C)		EA			1.000		1.000	
	467-6363	SET (TY II) (18 IN) (RCP) (6: 1) (P)		EA			90.000		90.000	
	467-6390	SET (TY II) (24 IN) (RCP) (4: 1) (C)		EA			14.000		14.000	
	467-6395	SET (TY II) (24 IN) (RCP) (6: 1) (P)		EA			32.000		32.000	
	467-6423	SET (TY II) (30 IN) (RCP) (6: 1) (P)		EA			2.000		2.000	
	467-6448	SET (TY II) (36 IN) (RCP) (3: 1) (C)		EA			1.000		1.000	
	467-6450	SET (TY II) (36 IN) (RCP) (4: 1) (C)		EA			1.000		1.000	
	496-6002	REMOV STR (INLET)		EA	1.000				1.000	
	496-6004	REMOV STR (SET)		EA			40.000		40.000	
	496-6006	REMOV STR (HEADWALL)		EA			3.000		3.000	
	496-6016	REMOV STR (PIPE)		EA			75.000		75.000	
	500-6001	MOBILIZATION		LS			1.000		1.000	
	502-6001	BARRICADES, SIGNS AND TRAFFIC HANDLING		MO			16.000		16.000	
	506-6002	ROCK FILTER DAMS (INSTALL) (TY 2)		LF	80.000		1,280.000		1,360.000	
	506-6011	ROCK FILTER DAMS (REMOVE)		LF	80.000		1,280.000		1,360.000	
	506-6038	TEMP SEDMT CONT FENCE (INSTALL)		LF	60.000		5,872.000		5,932.000	
	506-6039	TEMP SEDMT CONT FENCE (REMOVE)		LF	60.000		5,872.000		5,932.000	
	506-6040	BIODEG EROSN CONT LOGS (INSTL) (8")		LF			562.000		562.000	
	506-6043	BIODEG EROSN CONT LOGS (REMOVE)		LF			562.000		562.000	
	530-6002	INTERSECTIONS (ACP)		SY	212.000		564.000		776.000	
	530-6004	DRIVEWAYS (CONC)		SY			150.000		150.000	
	530-6006	DRIVEWAYS (SURF TREAT)		SY			6,977.000		6,977.000	
	530-6009	TURNOUTS (SURF TREAT)		SY			480.000		480.000	
	533-6001	RUMBLE STRIPS (SHOULDER)		LF	1,280.000				1,280.000	
	540-6001	MTL W-BEAM GD FEN (TIM POST)		LF	25.000		1,200.000		1,225.000	
	540-6006	MTL BEAM GD FEN TRANS (THRIE-BEAM)		EA	1.000		4.000		5.000	
	542-6001	REMOVE METAL BEAM GUARD FENCE		LF			400.000		400.000	

Estimate & Quantity Sheet

CONTROLLING PROJECT ID 0720-01-044 **DISTRICT** Bryan **COUNTY** Grimes
HIGHWAY FM 149, SH 6

			CONTROL SECTION JOB	**0050-03-109**		**0720-01-044**		TOTAL EST.	TOTAL FINAL
			PROJECT ID	**A00178693**		**A00178480**			
			COUNTY	**Grimes**		**Grimes**			
			HIGHWAY	**SH 6**		**FM 149**			
ALT	**BID CODE**	**DESCRIPTION**	**UNIT**	EST.	FINAL	EST.	FINAL		
	544-6001	GUARDRAIL END TREATMENT (INSTALL)	EA	1.000		4.000		5.000	
	544-6002	GUARDRAIL END TREATMENT (MOVE & RESET)	EA			4.000		4.000	
	560-6014	MAILBOX INSTALL-S (TWG-POST) TY 4	EA			29.000		29.000	
	560-6022	MAILBOX INSTALL-D (TWG-POST) TY 4	EA			5.000		5.000	
	560-6023	MAILBOX INSTALL-M (TWG-POST) TY 4	EA			3.000		3.000	
	644-6001	IN SM RD SN SUP&AM TY10BWG(1)SA(P)	EA	3.000		60.000		63.000	
	644-6004	IN SM RD SN SUP&AM TY10BWG(1)SA(T)	EA			1.000		1.000	
	644-6007	IN SM RD SN SUP&AM TY10BWG(1)SA(U)	EA			1.000		1.000	
	644-6027	IN SM RD SN SUP&AM TYS80(1)SA(P)	EA			6.000		6.000	
	644-6030	IN SM RD SN SUP&AM TYS80(1)SA(T)	EA	1.000				1.000	
	644-6033	IN SM RD SN SUP&AM TYS80(1)SA(U)	EA			1.000		1.000	
	644-6037	IN SM RD SN SUP&AM TYS80(1)SA(U-WC)	EA			1.000		1.000	
	644-6067	IN SM RD SN SUP&AM (INST SIGN ONLY)	EA			1.000		1.000	
	644-6076	REMOVE SM RD SN SUP&AM	EA	4.000		67.000		71.000	
	658-6013	INSTL DEL ASSM (D-SW)SZ (BRF)CTB	EA	6.000				6.000	
	658-6061	INSTL DEL ASSM (D-SW)SZ 1(BRF)GF2	EA			24.000		24.000	
	658-6101	INSTL OM ASSM (OM-2Z)(WFLX)SRF)SRF	EA	2.000		26.000		28.000	
	662-6032	WK ZN PAV MRK NON-REMOV (Y)4"(BRK)	LF			3,967.000		3,967.000	
	662-6034	WK ZN PAV MRK NON-REMOV (Y)4"(SLD)	LF			25,372.000		25,372.000	
	662-6109	WK ZN PAV MRK SHT TERM (TAB)TY W	EA	30.000				30.000	
	662-6110	WK ZN PAV MRK SHT TERM (TAB)TY Y	EA			714.000		714.000	
	662-6111	WK ZN PAV MRK SHT TERM (TAB)TY Y-2	EA	15.000				15.000	
	666-6018	REFL PAV MRK TY I (W)6"(DOT)(100MIL)	LF	219.000				219.000	
	666-6036	REFL PAV MRK TY I (W)8"(SLD)(100MIL)	LF	300.000				300.000	
	666-6048	REFL PAV MRK TY I (W)24"(SLD)(100MIL)	LF	20.000		113.000		133.000	
	666-6285	REF PROF PAV MRK TY I(W)6"(SLD)(090MIL)	LF			57,106.000		57,106.000	
	666-6289	REF PROF PAV MRK TY I(Y)6"(SLD)(090MIL)	LF			25,372.000		25,372.000	
	666-6293	REF PROF PAV MRK TY I(Y)6"(BRK)(090MIL)	LF			3,967.000		3,967.000	
	666-6309	RE PM W/RET REQ TY I (W)6"(SLD)(100MIL)	LF	1,244.000				1,244.000	
	666-6321	RE PM W/RET REQ TY I (Y)6"(SLD)(100MIL)	LF	144.000				144.000	
	668-6083	PREFAB PAV MRK TY C (W) (LNDP ARROW)	EA	2.000				2.000	
	672-6009	REFL PAV MRKR TY II-A-A	EA			698.000		698.000	
	672-6010	REFL PAV MRKR TY II-C-R	EA	15.000				15.000	
	3077-6012	SP MIXESSP-CSAC-A PG64-22	TON			10,502.000		10,502.000	
	3077-6033	SP MIXESSP-CSAC-A PG76-22	TON	359.000				359.000	
	3077-6066	SP MIXESSP-DSAC-B PG76-22	TON	196.000				196.000	
	3079-6011	PFC-C PG76-22 SAC-A	TON	126.000				126.000	

Estimate & Quantity Sheet

CONTROLLING PROJECT ID 0720-01-044 **DISTRICT** Bryan **COUNTY** Grimes
HIGHWAY FM 149, SH 6

			CONTROL SECTION JOB	**0050-03-109**		**0720-01-044**		TOTAL EST.	TOTAL FINAL
			PROJECT ID	**A00178693**		**A00178480**			
			COUNTY	**Grimes**		**Grimes**			
			HIGHWAY	**SH 6**		**FM 149**			
ALT	**BID CODE**	**DESCRIPTION**	**UNIT**	EST.	FINAL	EST.	FINAL		
	3084-6001	BONDING COURSE	GAL	449.000		9,547.000		9,996.000	
	6001-6002	PORTABLE CHANGEABLE MESSAGE SIGN	EA	2.000		2.000		4.000	
	6056-6002	PREFORMED CENTERLINE RUMBLE STRIP	LF			150.000		150.000	
	6185-6002	TMA (STATIONARY)	DAY	97.000		138.000		235.000	
	6185-6005	TMA (MOBILE OPERATION)	DAY	1.000		2.000		3.000	
	18	ENVIRONMENTAL: CONTRACTOR FORCE ACCOUNT WORK (PARTICIPATING)	LS			1.000		1.000	
		SAFETY CONTINGENCY: CONTRACTOR FORCE ACCOUNT WORK (PARTICIPATING)	LS			1.000		1.000	
		LAW ENFORCEMENT: CONTRACTOR FORCE ACCOUNT WORK (PARTICIPATING)	LS			1.000		1.000	

SUMMARY OF ROADWAY QUANTITIES (FM 149)

COMMENTS	STA	STA	LENGTH	ITEM 112	ITEM 134	ITEM 247		ITEM 260		ITEM 316			ITEM 354			ITEM 3084		ITEM 3077
				6001	6004		6061		6009		6029	6403		6021		6001		6012
				SUBGRADE WIDENING (ORD COMP)	BACKFILL (TY A OR B)	WIDTH	FL BS (CMP IN PLC) (TYA GR 1-2) (6")	WIDTH	LIME TRT (EXIST MATL) (10") ①	WIDTH	RC-250 ①	AGGR (TY-B GR-5 OR TY-L GR-5) ①	WIDTH	PLANE ASPH CONC PAV (0" TO 2")	WIDTH	BONDING COURSE	WIDTH	SP MIXES SP-C SAC-A PG 64-22 ①
			FT	STA	STA	FT	SY	FT	SY	FT	SY	SY	FT	SY	FT	SY	FT	SY
200' HMA TIE-IN	0+00	2+00	200										24	533				
TYP SECTION (4' SHLDR)	0+00	54+06	5,406	54.06	54.06	6	3,604	10	6,007	6	3,604	3,604			30	18,020	30	18,020
TRANS (4' - 8.5' SHLDR)	54+06	55+06	100	1.00	1.00	11.5	128	14	156	11.5	128	128			32	356	32	356
TYP SECTION (8.5' SHLDR)	55+06	58+19	313	3.13	3.13	17	591	18	626	17	591	591			34	1,182	34	1,182
200' HMA TIE-IN	56+19	58+19	200										24	533				
BRIDGE																		
200' HMA TIE-IN	59+15	61+15	200										24	533				
TYP SECTION (8.5' SHLDR)	59+15	62+29	314	3.14	3.14	17	593	18	628	17	593	593			34	1,186	34	1,186
TRANS (8.5' - 4' SHLDR)	62+29	63+29	100	1.00	1.00	11.5	128	14	156	11.5	128	128			32	356	32	356
TYP SECTION (4' SHLDR)	63+29	274+00	21,071	210.71	210.71	6	14,047	10	23,412	6	14,047	14,047			30	70,237	30	70,237
FM 2562 INTERSECTION	274+00	275+00	100												30	333	30	333
TYP SECTION (4' SHLDR)	275+00	286+40	1,140	11.40	11.40	6	760	10	1,267	6	760	760			30	3,800	30	3,800
200' HMA TIE-IN	284+40	286+40	200	2.00	2								24	533				
FM 149 PROJECT TOTAL:				286.44	286.44		19,851		32,252		19,851	19,851		2,132		95,470		95,470

①REFER TO "BASIS OF ESTIMATE" FOR APPLICATION RATES AND QUANTITIES.

SUMMARY OF MBGF QUANTITIES (FM 149)

MBGF LAYOUT	BEGIN STA	END STA	LENGTH (FT)	ITEM 542	ITEM 544	ITEM 432	ITEM 540		ITEM 544	ITEM 658
				6001	6002	6045	6001	6006	6001	6061
				REMOVE METAL BEAM GUARD FENCE	GUARDRAIL END TREATMENT (MOVE & RESET)	RIPRAP (MOW STRIP) (4 IN)	MTL W-BEAM GD FEN (TIM POST)	MTL BEAM GD FEN TRANS (THRIE-BEAM)	GUARDRAIL END TREATMENT (INSTALL)	INSTL DEL ASSM (D-SW) SZ 1 (BRF) GF 2
				LF	EA	CY	LF	EA	EA	EA
DICKSON CREEK										
1 OF 2 (LT SIDE)	13+35	17+19	384			26.4	350		2	6
1 OF 2 (RT SIDE)	12+05	17+55	550			26.4	350		2	6
NESBLETT CREEK BRIDGE										
2 OF 2 (LT SIDE)	56+77	61+74	497	200	2	23.5	250	2		6
2 OF 2 (RT SIDE)	55+61	60+58	497	200	2	23.5	250	2		6
TOTAL PROJECT FM 149:				400	4	100	1200	4	4	24

PRINT DATE	REVISION DATE
4/19/2023	

Texas Department of Transportation
Bryan District

SUMMARY OF CONSOLIDATED QUANTITIES (FM 149)

SHEET 1 OF 6 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 149, ETC.

STATE	DISTRICT	COUNTY	
TEXAS	BRY	GRIMES	
CONTROL	SECTION	JOB	SHEET NO.
0720	01	044, ETC.	9

REV DATE: 4/19/2023
CSJ: 0720-01-044
FILENAME: pw://txdot.projectwiseonline.com/TxDOT4/Documents/17 - BRY/Design Projects/0720010044/4 - Design/Plan Set/1. General/1G. Quantity/Summary/Sheets/SUMMARY OF CONSOLIDATED QUANTITIES (FM 149)

SUMMARY OF DRIVEWAYS (FM 149)

DW NO.	STATION	EXIST PIPE	EXISTING MATERIAL	PROPOSED PIPE	D	L (LENGTH) (1)	W (WIDTH) (1)	R1/R2 (RADII) (1)		ITEM 104	ITEM 530			ITEM 464			ITEM 467			ITEM 496		REMARKS
										6017	6004	6006	6002	6003	6005	6007	6363	6395	6423	6004	6016	
					FT	FT	FT	FT		REMOVING CONC (DRIVEWAYS) SY	DRIVEWAYS (CONC) SY	DRIVEWAYS (SURF TREAT) SY	INTERSECTION (ACP) SY	RC PIPE (CL III) (18 IN) LF	RC PIPE (CL III) (24 IN) LF	RC PIPE (CL III) (30 IN) LF	SET (TY II) (18 IN) (RCP) (6: 1)(P) EA	SET (TY II) (24 IN) (RCP) (6: 1)(P) EA	SET (TY II) (30 IN) (RCP) (6: 1)(P) EA	REMOV STR (SET) EA	REMOV STR (PIPE) EA	
1-1	2+26	RT	18"X32' CMP w/SET	GRAVEL	18"X38' RCP	28	35	26	20	20			119		38			2			2	1	RESIDENTIAL
1-2	2+57	LT	15"X25' RCP	GRAVEL	18"X26' RCP	15	21	9	15	15			31		26			2			2	1	RESIDENTIAL
1-3	3+12	LT	15"X26' RCP	GRAVEL	18"X26' RCP	17	22	11	15	15			37		26			2			2	1	RESIDENTIAL
1-4	4+54	RT	NONE	GRAVEL			11	17	25	25			50										COMMERCIAL
1-5	6+40	RT	15"X26' RCP	GRAVEL	18"X26' RCP	20	25	12	25	25			63		26			2			2	1	RESIDENTIAL
1-6	7+04	RT	15"X28' RCP	GRAVEL	18"X28' RCP	18	23	15	25	25			69		28			2			2	1	RESIDENTIAL
1-7	7+82	RT	15"X29' RCP	GRAVEL	18"X30' RCP	18	23	13	20	20			52		30			2			2	1	RESIDENTIAL
1-8	10+59	RT	21"X43' RCP	ASPHALT	24"X44' RCP	26	34	22	50	90			335			44			2			1	CEDAR ST (PUBLIC)
1-9	11+01	LT	18"X34' CMP	GRAVEL	18"X34' RCP	8	13	15	30	30			63		34			2				1	RESIDENTIAL
2-1	25+25	RT	18"X25' CMP	GRAVEL	18"X26' RCP	18	23	13	20	20			53		26			2				1	RESIDENTIAL
2-2	28+59	RT	15"X20' RCP	GRAVEL	18"X24' RCP	12	17	11	20	20			41		24			2				1	RESIDENTIAL
2-3	31+44	RT	NONE	GRAVEL			13	13	20	20			37										RESIDENTIAL
2-4	31+98	LT	NONE	GRAVEL			19	26	30	30			96										RESIDENTIAL
2-5	32+07	RT	18"X43' CMP w/SET	GRAVEL	18"X44' RCP	13	19	15	30	30					44			2			2	1	RESIDENTIAL
2-6	39+20	RT	18"X25' CMP w/SET	CONCRETE	18"X28' RCP	14	18	15	25	25	40	40			28			2			2	1	RESIDENTIAL
2-7	39+64	LT	18"X17' RCP	GRAVEL	18"X18' RCP	19	24	11	25	25			60		18			2				1	RESIDENTIAL
2-8	40+12	LT	18"X40' CMP	GRAVEL	18"X40' RCP	17	22	6	30	30			59		40			1				1	RESIDENTIAL
2-9	47+35	LT	NONE	CONCRETE/GRASS			14	14	25	25			52										RESIDENTIAL
3-1	49+08	LT	NONE	GRAVEL			14	11	25	25			47										RESIDENTIAL
3-2	54+96	LT	18"X33' RCP	ASPHALT	18"X34' RCP	16	21	16	90	20			240		34			1				1	PUBLIC
3-3	65+02	RT	NONE	GRAVEL/ASPHALT			33	19	35	35			125										RESIDENTIAL
3-4	71+14	LT	24"X41' CMP	GRAVEL	24"X42' RCP	21	36	23	30	30			137			42			2			1	CR 277 (PUBLIC)
N/A	72+00	RT	24"X60' STEEL	GRASS																		1	REMOVE PIPE/ NOT A DRIVEWAY
4-1	75+44	RT	24"X45' CMP	GRAVEL	24"X46' RCP	16	21	13	25	25			60			46			2			1	COMMERCIAL
4-2	81+72	RT	18"X80' CMP	ASPHALT	18"X50' RCP	14	19	19	25	25			71		50			2				1	COMMERCIAL
4-3	83+66	LT	NONE	GRAVEL			37	17	55	55			212										PUBLIC
4-4	83+71	RT	18"X39' CMP	ASPHALT	18"X40' RCP	10	15	22	15	15			49		40			2				1	COMMERCIAL
4-5	85+09	RT	NONE	GRAVEL			13	13	20	20			38										RESIDENTIAL
4-6	86+80	RT	NONE	GRAVEL			11	14	25	25			46										RESIDENTIAL
4-7	92+26	RT	18"X33' RCP	GRAVEL	18"X34' RCP	28	36	20	55	25			167		34			2				1	CR 221(PUBLIC)
4-8	95+45	LT	18"X33' STEEL	GRAVEL	18"X34' RCP	20	28	11	45	45			132		34			2				1	PUBLIC
5-1	101+53	LT	NONE	GRASS			11	17	25	25			51										RESIDENTIAL
5-2	106+21	LT	18"X31' CMP	GRAVEL	18"X32' RCP	20	25	12	20	20			53		32			2			2	1	RESIDENTIAL
5-3	111+46	LT	18"X31' CMP w/SET	GRAVEL	18"X32' RCP	20	25	16	30	30			88		32			2			2	2	RESIDENTIAL
5-4	115+77	RT	18"X24' CMP	GRASS	18"X28' RCP	22	27	14	25	25			72		28								RESIDENTIAL
6-1	121+36	LT	18"X37' RCP	GRAVEL	18"X38' RCP	25	30	11	30	30			78		38								RESIDENTIAL
6-2	130+11	RT	18"X42' CMP	GRAVEL	18"X46' RCP	11	34	33	20	30			154		46			2				1	CR 222 (PUBLIC)
6-3	130+94	LT	18"X48' CMP	GRAVEL	18"X48' RCP	14	37	30	55	20			205		48			2				1	CR 222 (PUBLIC)
6-4	137+03	RT	24"X28' RCP w/SET	ASPHALT			35	22	25	25			114										ANDERSON RIDGE LANE (PUBLIC)
7-1	145+53	LT	NONE	GRAVEL			15	9	25	25			45										RESIDENTIAL
7-2	145+59	RT	18"X34' RCP w/SET	CONCRETE			22	20	25	25	90	70											RESIDENTIAL
7-3	151+24	LT	18"X31' CMP w/SET	GRAVEL	18"X32' RCP	16	26	12	30	30			76		32			2			2	1	RESIDENTIAL
7-4	155+20	RT	18"X32' STEEL	GRAVEL	18"X32' RCP	17	22	13	30	30			75		32			2				1	PUBLIC
7-5	156+92	LT	18"X24' CMP	GRASS	18"X26' RCP	21	26	12	30	30			78		26			2				1	RESIDENTIAL
7-6	159+29	LT	18"X21' RCP	ASPHALT	18"X22' RCP	18	22	10	30	30			68		22			2				1	RESIDENTIAL
SHEET 1 OF 2 TOTALS:											**130**	**110**	**3,698**	**0**	**916**	**132**	**0**	**50**	**6**	**0**	**22**	**31**	

(1) SEE SHEET "DRIVEWAY DETAILS".

PRINT DATE	REVISION DATE
4/19/2023	

Texas Department of Transportation
Bryan District

SUMMARY OF CONSOLIDATED QUANTITIES (FM 149)

SHEET 2 OF 6 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 149, ETC.

STATE	DISTRICT	COUNTY	
TEXAS	BRY	GRIMES	
CONTROL	SECTION	JOB	SHEET NO.
0720	01	044, ETC.	10

REV DATE: 4/18/2023
CSJ: 0720-01-044

FILENAME: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY/Design Projects/072001044/4 - Design/Plan Set/1. General/1G. Quantity/Summary/Sheets/SUMMARY OF CONSOLIDATED QUANTITIES (FM 149)

SUMMARY OF DRIVEWAYS (FM 149)

DW NO.	STATION		EXIST PIPE	EXISTING MATERIAL	PROPOSED PIPE	D	L (LENGTH) (1)	W (WIDTH) (1)	R1/R2 (RADII) (1)		ITEM 104 6017 REMOVING CONC (DRIVEWAYS)	ITEM 530 6004 DRIVEWAYS (CONC)	ITEM 530 6006 DRIVEWAYS (SURF TREAT)	ITEM 530 6002 INTERSECTION (ACP)	ITEM 464 6003 RC PIPE (CL III) (18 IN)	ITEM 464 6005 RC PIPE (CL III) (24 IN)	ITEM 464 6007 RC PIPE (CL III) (30 IN)	ITEM 467 6363 SET (TY II) (18 IN) (RCP) (6: 1)(P)	ITEM 467 6395 SET (TY II) (24 IN) (RCP) (6: 1)(P)	ITEM 467 6423 SET (TY II) (30 IN) (RCP) (6: 1)(P)	ITEM 496 6004 REMOV STR (SET)	ITEM 496 6016 REMOV STR (PIPE)	REMARKS
						FT	FT	FT	FT		SY	SY	SY	SY	LF	LF	LF	EA	EA	EA	EA	EA	
7-7	162+86	RT	24"X25' CMP	GRAVEL	24"X26' RCP	20	25	12	25	25			62			26			2			1	RESIDENTIAL
7-8	163+89	LT	24"X25' CMP w/SET	GRAVEL	24"X34' RCP	15	21	22	25	25			80			34			2		2	1	RESIDENTIAL
7-9	164+85	RT	24"X24' CMP	GRAVEL	24"X24' RCP	17	22	12	20	20			47			24			2			1	RESIDENTIAL
7-10	166+64	RT	24"X62' CMP	GRAVEL	24"X62' RCP	19	24	23	35	35			119			62			2			1	RESIDENTIAL
8-1	170+27	LT	18"X20' RCP	GRAVEL	18"X20' RCP	22	33	11	30	30			83		20			2				1	CEDAR HILL LN (PUBLIC)
8-2	175+69	RT	24"X25' CMP w/SET	GRAVEL	24"X32' RCP	16	22	19	50	50			167			32			2		2	1	RESIDENTIAL
8-3	179+87	RT	18"X24' CMP	GRAVEL	18"X26' RCP	17	22	13	30	30			74		26			2				1	RESIDENTIAL
8-4	183+49	LT	18"X29' RCP	GRAVEL	18"X30' RCP	20	14	13	30	30			63		30			2				1	RESIDENTIAL
8-5	183+73	RT	18"X25' CMP	GRAVEL	18"X25' RCP	11	20	11	30	30			69		26			2				1	RESIDENTIAL
8-6	186+27	LT	18"X23' CMP	GRAVEL	18"X24' RCP	18	23	9	25	25			51		24			2				1	RESIDENTIAL
8-7	188+72	RT	NONE	GRASS			20	11	30	30			68										RESIDENTIAL
8-8	190+23	LT	18"X25' RCP	GRAVEL	18"X26' RCP	15	20	11	25	25			54		26			2				1	RESIDENTIAL
8-9	191+66	RT	18"X25' CMP w/SET	GRASS	18"X26' RCP	21	26	13	30	30			80		26			2			2	1	RESIDENTIAL
9-1	192+57	RT	NONE	GRAVEL			15	11	25	25			49										RESIDENTIAL
9-2	192+96	LT	18"X61' CMP	GRAVEL	18"X62' RCP	16	32	9	30	30			74		62			2				1	PUBILIC
9-3	194+06	RT	18"X35' RCP w/SET	GRAVEL			18	26	30	30			94										RESIDENTIAL
9-4	194+58	LT	18"X35' RCP w/SET	GRAVEL			20	27	30	30			103										RESIDENTIAL
9-5	195+54	RT	18"X67' CMP	GRAVEL	18"X68' RCP	20	28	33	60	30			211		68			2				1	COMMERCIAL
9-6	202+26	LT	18"X17' RCP	GRAVEL	18"X18' RCP	17	22	12	20	20			48		18			2				1	RESIDENTIAL
9-7	205+35	LT	18"X21' RCP	GRAVEL	18"X22' RCP	18	23	12	25	25			60		22			2				1	RESIDENTIAL
9-8	211+66	RT	24"X33' CMP	GRAVEL	24"X34' RCP	22	36	14	45	25			117			34			2			1	PUBLIC
9-9	215+39	RT	24"X24' CMP	GRAVEL	24"X26' RCP	17	41	14	45	30			132			26			2			1	PUBLIC
10-1	220+44	LT	NONE	GRAVEL			13	17	30	30			67										RESIDENTIAL
10-2	225+58	RT	18"X27' CMP w/SET	GRAVEL	18"X28' RCP	17	22	13	30	30			73		28			2			2	1	RESIDENTIAL
10-3	231+29	RT	24"X24' CMP	GRAVEL	24"X24' RCP	25	30	10	35	30			84			24			2			1	RESIDENTIAL
10-4	233+27	LT	24"X20' STEEL	GRAVEL	24"x24' RCP	14	19	10	30	30			65			24			2			1	RESIDENTIAL
10-5	238+34	LT	18"X36' CMP	GRAVEL	18"X36' RCP	16	36	22	26	32			126		36			2				1	CR 220 (PUBLIC)
11-1	241+96	RT	2 - 24"X25' CMP w/SET	GRAVEL	2 - 24"X26' RCP	16	23	14	22	43			92			54			4		4	2	RESIDENTIAL
11-2	243+49	LT	30"X31' CMP w/SET	GRAVEL	30"X32' RCP	17	22	15	30	30			79				32			2	2	1	RESIDENTIAL
11-3	246+29	RT	18"X21' RCP 18"X20' CMP	GRAVEL	18"X26' RCP 18"X26' RCP	21	28	10	30	30			74		26 26			4				2	RESIDENTIAL
11-4	248+64	LT	18"X66' CMP	GRAVEL	18"X66' RCP	19	24	31	30	30			125		66			2				1	COMMERCIAL
11-5	252+23	RT	24"X22' CMP	GRAVEL	24"x22' RCP	14	19	10	15	15			31			22			2			1	RESIDENTIAL
11-6	257+06	LT	NONE	CONCRETE			8	17	30	30	22	20											RESIDENTIAL
11-7	258+15	RT	NONE	GRAVEL			36	17	30	50			150										PUBLIC
11-8	258+28	LT	NONE	CONCRETE			8	17	20	20	30	20											RESIDENTIAL
11-9	258+80	RT	15"X25' CMP	GRAVEL	18"X26' RCP	12	17	10	30	30			61		26			2				1	RESIDENTIAL
11-10	261+73	LT	18"X25' CMP w/SET	GRAVEL	18"X26' RCP	11	16	18	25	25			61		30			2			2	1	RESIDENTIAL
12-1	265+56	LT	NONE	GRAVEL			16	31	30	30			97										RESIDENTIAL
12-2	273+79	LT	NONE	GRAVEL			22	19	30	30			90										RESIDENTIAL
12-3	274+41	RT	24"X52' CMP	ASPHALT	24"X52' RCP	29	44	33	40	55				273		52			2			1	FM 2562 INTERSECTION
12-4	274+52	LT	NONE	ASPHALT			26	50	60	50				291									FM 2562 INTERSECTION
12-5	279+32	LT	NONE	ASPHALT			7	19	15	15			26										RESIDENTIAL
12-6	282+02	LT	18"X24' CMP w/SET	GRAVEL	18"X28' RCP	10	15	15	15	15			37		28			2			2	1	RESIDENTIAL
12-7	285+21	LT	15"X25' RCP	GRAVEL	18"X26' RCP	10	15	10	20	20			36		26			2				1	RESIDENTIAL
SHEET 2 OF 2 TOTALS:											**52**	**40**	**3279**	**564**	**640**	**414**	**32**	**40**	**26**	**2**	**18**	**34**	
FM 149 PROJECT TOTALS:											**182**	**150**	**6,977**	**564**	**1,556**	**546**	**32**	**90**	**32**	**2**	**40**	**65**	

(1) SEE SHEET "DRIVEWAY DETAILS".

PRINT DATE	REVISION DATE
4/19/2023	

Texas Department of Transportation
Bryan District

SUMMARY OF CONSOLIDATED QUANTITIES (FM 149)

SHEET 3 OF 6 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 149, ETC.

STATE	DISTRICT	COUNTY	
TEXAS	BRY	GRIMES	
CONTROL	SECTION	JOB	SHEET NO.
0720	01	044, ETC.	11

REV DATE: 4/18/2023
CSJ: 0720-01-044

FILENAME: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY/Design Projects/0720010044/4 - Design/Plan Set/1. General/1G. Quantity/Summary/Sheets/SUMMARY OF CONSOLIDATED QUANTITIES (FM 149)

SUMMARY OF MAILBOX TURNOUTS & INSTALLATIONS (FM 149)

STATION	LT/RT	NUMBER OF MAILBOXES	ITEM 530 TURNOUTS (ACP)			ITEM 560 MAILBOX INSTALL		
			TYPE 1	TYPE 2	6009 SURFACE AREA (1)	6014 MAILBOX INSTALL-S (TWG-POST) TY 4	6022 MAILBOX INSTALL-D (TWG-POST) TY 4	6023 MAILBOX INSTALL-M (TWG-POST) TY 4
			EA	(EA)	SY	EA	EA	EA
1+91	LT	1		1	16	1		
6+44	LT	2		1	16		1	
31+98	LT	2	1		12		1	
39+64	LT	1		1	16	1		
49+08	LT	1	1		12	1		
54+96	LT	2	1		12		1	
64+70	LT	1		1	16	1		
71+14	LT	4	1		12			1
83+66	LT	1	1		12	1		
95+45	LT	1	1		12	1		
151+24	LT	1	1		12	1		
159+29	LT	1	1		12	1		
164+82	LT	1		1	16	1		
179+92	LT	1		1	16	1		
183+49	LT	3	1		12			1
190+23	LT	1	1		12	1		
192+35	LT	1		1	16	1		
202+26	LT	1	1		12	1		
205+35	LT	1	1		12	1		
211+86	LT	1		1	16	1		
215+35	LT	1		1	16	1		
220+44	LT	1	1		12		1	
225+55	LT	1		1	16	1		
231+25	LT	1		1	16	1		
233+27	LT	1	1		12	1		
241+55	LT	1		1	16	1		
243+49	LT	1	1		12	1		
246+57	LT	3		1	16	1	1	
252+36	LT	1		1	16	1		
258+28	LT	5	1		12	1		1
261+73	LT	1	1		12	1		
265+56	LT	1	1		12	1		
273+79	LT	1	1		12	1		
278+73	LT	1		1	16	1		
282+02	LT	1	1		12	1		
FM 149 PROJECT TOTAL:			**20**	**15**	**480**	**29**	**5**	**3**

(1) REFER TO THE "BASIS OF ESTIMATE" FOR QUANTITIES AND APPLICATION RATES
(2) SALVAGE AND REUSE ANY NEWSPAPER DELIVERY BOXES

PRINT DATE	REVISION DATE
4/19/2023	

Texas Department of Transportation
Bryan District

SUMMARY OF CONSOLIDATED QUANTITIES (FM 149)

SHEET 4 OF 6 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 149, ETC.

STATE	DISTRICT	COUNTY	
TEXAS	BRY	GRIMES	
CONTROL	SECTION	JOB	SHEET NO.
0720	01	044, ETC.	12

REV DATE: 4/18/2023
CSJ: 0720-01-044
FILENAME: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY/Design Projects/0720010444 - Design/Plan Set/1. General/1G. Quantity/SummarySheets/SUMMARY OF CONSOLIDATED QUANTITIES (FM 149)

DRAINAGE ITEM SUMMARY (FM 149)

STR. NO.	LOCATION	ITEM 100	ITEM 104	ITEM 132	ITEM 400		ITEM 401	ITEM 402	ITEM 420	ITEM 432	ITEM 462	ITEM 464			ITEM 466			ITEM 467					ITEM 496		ITEM 658
		6002	6009	6005	6005	6006	6001	6001	6054	6031	6007	6005	6008	6018	6101	6138	6139	6390	6448	6450	6175	6177	6006	6016	6101
		PREPARING ROW	REMOVING CONC (RIPRAP)	EMBANKMENT (FINAL) (ORD COMP) (TY C)	CEM STABIL BACKFILL	CUT & RESTORING PAV	FLOWABLE BACKFILL	TRENCH EXCAVATION PROTECTION	CL C CONC (HEADWALL)	RIPRAP (STONE PROTECTION) (12 IN)	CONC BOX CULV (5 FT X 3 FT)	RC PIPE (CL III) (24 IN)	RC PIPE (CL III) (36 IN)	RC PIPE (CL IV) (24 IN)	HEADWALL (CH-PW-0) (DIA=36IN)	HEADWALL (CH-PW-S) (DIA=60IN)	HEADWALL (CH-PW-S) (DIA=66IN)	SET (TY II)			SET (TY I)		REMOV STR (HEAD WALL)	REMOV STR (PIPE)	INSTL OM ASSM (OM-2Z) (WFLX) SURF) SRF
																		(24 IN) (4:1) (C)	(36 IN) (3:1) (C)	(36 IN) (4:1) (C)	SET (TY I) (S= 5 FT) (HW= 4 FT)				
																					(3:1) (C)	(4:1) (C)			
		STA	SY	CY	CY	SY	CY	LF	CY		LF	LF	LF	LF	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA
	STA 14+87 (DICKSON CRK)	1																							
1	STA 44+61 (SHT 1 OF 13)	1							3.60	11															2
	NEBLETTS CREEK BRG	1					10			8															
2	STA 66+07 (SHT 2 OF 13)	1		40	35	22		41		15	48										1	1		1	2
3	STA 90+85 (SHT 3 OF 13)			50	18	12		20				50						2						1	2
4	STA 103+98 (SHT 4 OF 13)			30	9	12								46				2						1	2
5	STA 108+97 (SHT 5 OF 13)			20	16	12						44						2					1	1	2
6	STA 132+32 (SHT 6 OF 13)			35	20	21								84				4						1	2
7	STA 168+30 (SHT 7 OF 13)	1	48	70						46						2									2
8	STA 187+46 (SHT 8 OF 13)			45	9	12								42				2						1	2
9	STA 211+23 (SHT 9 OF 13)	1		60	37	15		42					56						1	1			2	1	2
10	STA 236+72 (SHT 10 OF 13)			40	16	13						48						2						1	2
11	STA 245+52 (SHT 11 OF 13)	1		30						36							2								2
12	STA 264+61 (SHT 12 OF 13)	1		150	47	15		43		5			66		2									1	2
13	STA 270+55 (SHT 13 OF 13)			150	51	15		41		4			70		2									1	2
	FM 149 PROJECT TOTAL:	8	48	720	258	149	10	187	3.60	125	48	142	192	172	4	2	2	14	1	1	1	1	3	10	26

SUMMARY OF SIGN ITEMS (FM 149)

SIGN DESCRIPTION	STA START	STA END	ITEM 644							
			6001	6004	6007	6027	6033	6037	6067	6076
			IN SM RD SN SUP&AM TY 10BWG(1) SA (P)	IN SM RD SN SUP&AM TY 10BWG(1) SA (T)	IN SM RD SN SUP&AM TY 10BWG(1) SA (U)	IN SM RD SN SUP&AM TY S80(1) SA (P)	IN SM RD SN SUP&AM TY S80(1) SA (U)	IN SM RD SN SUP&AM TY S80(1) SA (U-WC)	IN SM RD SN SUP&AM (INST SIGN ONLY)	REMOVE SM RD SN SUP&AM
			EA	EA	EA	EA	EA	EA	EA	EA
SIGNING & STRIPING SHEET 1 OF 12	0+00	24+00	13	1	1		1	1	1	20
SIGNING & STRIPING SHEET 2 OF 12	24+00	48+00	3			1				2
SIGNING & STRIPING SHEET 3 OF 12	48+00	72+00	4							4
SIGNING & STRIPING SHEET 4 OF 12	72+00	96+00	5							5
SIGNING & STRIPING SHEET 5 OF 12	96+00	120+00	6			1				7
SIGNING & STRIPING SHEET 6 OF 12	120+00	144+00	5			1				6
SIGNING & STRIPING SHEET 7 OF 12	144+00	168+00	9			2				11
SIGNING & STRIPING SHEET 8 OF 12	168+00	192+00	1							1
SIGNING & STRIPING SHEET 9 OF 12	192+00	216+00								
SIGNING & STRIPING SHEET 10 OF 12	216+00	240+00	2							3
SIGNING & STRIPING SHEET 11 OF 12	240+00	264+00	2			1				2
SIGNING & STRIPING SHEET 12 OF 12	264+00	288+00	10							6
CSJ 0720-01-044			60	1	1	6	1	1	1	67

PRINT DATE	REVISION DATE
4/19/2023	

Texas Department of Transportation
Bryan District

SUMMARY OF CONSOLIDATED QUANTITIES (FM 149)

SHEET 5 OF 6 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 149, ETC.
STATE	DISTRICT	COUNTY
TEXAS	BRY	GRIMES
CONTROL	SECTION	JOB / SHEET NO.
0720	01	044, ETC. / 13

REV DATE: 4/18/2023
CSJ: 0720-01-044
FILENAME: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY/Design Projects/0720010444 - Design/Plan Set/1. General/1G. Quantity/Summary/Sheets/SUMMARY OF CONSOLIDATED QUANTITIES (FM 149)

SUMMARY OF SW3P QUANTITIES (FM 149)

SW3P LAYOUT NO.	BEGIN STA	END STA	LENGTH (FT)	ITEM 160	ITEM 162	ITEM 164		ITEM 168	ITEM 506						REMARK
				6003	6002	6001	6071	6001	6002	6011	6038	6039	6040	6043	
						BROADCAST SEED									
				FURNISHING AND PLACING TOPSOIL (4")	BLOCK SODDING	(PERM) (RURAL) (SANDY)	(TEMP) (WARM OR COOL)	VEGETATIVE WATERING ①	ROCK FILTER DAMS (INSTALL) (TY 2)	ROCK FILTER DAMS (REMOVE)	TEMP SEDMT CONT FENCE (INSTALL)	TEMP SEDMT CONT FENCE (REMOVE)	BIODEG EROSN CONT LOGS (INSTALL) (8")	BIODEG EROSN CONT LOGS (REMOVE)	
				SY	SY	SY	SY	SY	LF	LF	LF	LF	LF	LF	
1	1+50	24+00	2250	3750	66	3750	3750	3750	100	100	1287	1287			SEEDING WIDTH AVG 15' WIDE
2	24+00	48+00	2400	4000	75	4000	4000	4000	80	80	607	607			SEEDING WIDTH AVG 15' WIDE
3	48+00	72+00	2400	4000		4000	4000	4000	160	160	1119	1119	80	80	SEEDING WIDTH AVG 15' WIDE
4	72+00	96+00	2400	4000		4000	4000	4000	80	80	20	20	66	66	SEEDING WIDTH AVG 15' WIDE
5	96+00	120+00	2400	4000		4000	4000	4000	160	160	400	400	119	119	SEEDING WIDTH AVG 15' WIDE
6	120+00	144+00	2400	4000		4000	4000	4000	100	100	60	60	80	80	SEEDING WIDTH AVG 15' WIDE
7	144+00	168+00	2400	4000		4000	4000	4000	100	100	244	244			SEEDING WIDTH AVG 15' WIDE
8	168+00	192+00	2400	4000	153	4000	4000	4000	100	100	509	509	70	70	SEEDING WIDTH AVG 15' WIDE
9	192+00	216+00	2400	4000		4000	4000	4000	80	80	20	20	79	79	SEEDING WIDTH AVG 15' WIDE
10	216+00	240+00	2400	4000		4000	4000	4000	60	60	20	20	68	68	SEEDING WIDTH AVG 15' WIDE
11	240+00	264+00	2400	4000		4000	4000	4000	80	80	424	424			SEEDING WIDTH AVG 15' WIDE
12	264+00	287+00	2300	3883		3883	3883	3883	180	180	1162	1162			SEEDING WIDTH AVG 15' WIDE
FM 149 PROJECT TOTALS:				**47633**	**294**	**47633**	**47633**	**47633**	**1280**	**1280**	**5872**	**5872**	**562**	**562**	

① FOR CONTRACTORS INFORMATION ONLY. SEE BASIS OF ESTIMATE FOR RATES AND QUANTITIES.

SUMMARY OF PAVEMENT MARKINGS AND MARKERS (FM 149)

DESCRIPTION STATION				LENGTH	ITEM 662			ITEM 666				ITEM 672	ITEM 6056
					6110	6032	6034	6048	6285	6293	6289	6009	6002
					WK ZN PAV MRK			REFL PAV MRK TY I	REF PROF PAV MRK TY I			REFL PAV MRKR	PREFORMED CENTERLINE RUMBLE STRIPS
					SHT TERM (TAB) TY Y	NON-REMOV (Y) 4" (BRK)	NON-REMOV (Y) 4" (SLD)	(W) 24" (SLD) (100 MIL)	(W)6" (SLD) (90 MIL)	(Y)6" (BRK) (90 MIL)	(Y)6" (SLD) (90 MIL)	TY II-A-A	
									OPTION 6	OPTION 4			OPTION 4
				FT	EA	LF	LF	LF	LF	LF	LF	EA	LF
FM 149													
SHEET 1 OF 12	0+27	-	24+00	2373	59		4,746	22	4,746		4,746	59	
SHEET 2 OF 12	24+00	-	48+00	2400	60		4,800		4,800		4,800	60	
SHEET 3 OF 12	48+00	-	72+00	2400	60	600		11	4,800	600		60	130
SHEET 4 OF 12	72+00	-	96+00	2400	60	266	2,670	11	4,800	266	2,670	60	
SHEET 5 OF 12	96+00	-	120+00	2400	60	59	4,326		4,800	59	4,326	60	
SHEET 6 OF 12	120+00	-	144+00	2400	60	600		22	4,800	600		48	
SHEET 7 OF 12	144+00	-	168+00	2400	60	246	2,832		4,800	246	2,832	60	
SHEET 8 OF 12	168+00	-	192+00	2400	60	429	1,368		4,800	429	1,368	56	20
SHEET 9 OF 12	192+00	-	216+00	2400	60	416	1,474		4,800	416	1,474	60	
SHEET 10 OF 12	216+00	-	240+00	2400	60	206	3,156	11	4,800	206	3,156	60	
SHEET 11 OF 12	240+00	-	264+00	2400	60	600			4,800	600		60	
SHEET 12 OF 12	264+00	-	287+00	2300	55	545		36	4,360	545		55	
FM 149 PROJECT TOTAL					714	3,967	25,372	113	57,106	3,967	25,372	698	150

PRINT DATE	REVISION DATE
4/19/2023	

Texas Department of Transportation
Bryan District

SUMMARY OF CONSOLIDATED QUANTITIES (FM 149)

SHEET 6 OF 6 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 149, ETC.
STATE	DISTRICT	COUNTY
TEXAS	BRY	GRIMES
CONTROL	SECTION	JOB / SHEET NO.
0720	01	044, ETC. / 14

REV DATE: 4/18/2023
CSJs: 0720-01-044

FILENAME: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY/Design Projects/0720010444 - Design/Plan Set/1. General/1G. Quantity/Summary/Sheets/SUMMARY OF CONSOLIDATED QUANTITIES (FM 149)

SUMMARY OF PAVEMENT MARKINGS AND MARKERS (SH 6)

SIGNING & STRIPING LAYOUT SHEET NO.	FROM STATION	TO STATION	LENGTH	ITEM 533	ITEM 662		ITEM 666					ITEM 668	ITEM 672
				6001	6109	6111	6018	6036	6048	6309	6321	6083	6010
				RUMBLE STRIPS (SHOULDER)	WK ZN PAV MRK		REFL PAV MRK TY I			REFL PM W/RET REQ TY I		PREFAB PAV MRK TY C	REFL PAV MRKR
					SHT TERM (TAB) TY W	SHT TERM (TAB) TY Y-2	(W) 6" (DOT) (100MIL)	(W) 8" (SLD) (100MIL)	(W) 24" (SLD) (100MIL)	(W) 6" (SLD) (100MIL)	(Y) 6" (SLD) (100MIL)	(W) (LNDP ARROW)	TY II-C-R
			FT	LF	EA	EA	LF	LF	LF	LF	LF	EA	EA
1	1293+70	1299+36	566	566	30	15	40	300	20	530	144	1	15
1	1299+36	1306+50	714	714			179			714		1	
SH 6 PROJECT TOTAL				1280	30	15	219	300	20	1244	144	2	15

SUMMARY OF INTERSECTION QUANTITIES (SH 6)

INTERSECTION	STATION	RT/LT	EXISTING SURFACE	WIDTH (W)	LENGTH (L)	RADIUS (R1)	RADIUS (R2)	ITEM 530
								6002
								INTERSECTIONS (ACP)
				FT	FT	FT	FT	SY
FM 2988	1294+35	RT	ACP	27	48	40	50	212
SH 6 PROJECT TOTAL								212

SUMMARY OF SIGNING QUANTITIES (SH 6)

SIGNING & STRIPING LAYOUT SHEET NO.	FROM STATION	TO STATION	ITEM 644		
			6001	6030	6076
			IN SM RD SN SUP&AM TY10BWG(1) SA(P)	IN SM RD SN SUP&AM TYS80(1) SA(T)	REMOVE SM RD SN SUP&AM
			EA	EA	EA
1	1293+70	1299+36	2	1	3
1	1299+36	1306+50	1		1
SH 6 PROJECT TOTAL			3	1	4

DRAINAGE ITEM SUMMARY (SH 6)

LOCATION	ITEM 402	ITEM 462	ITEM 464	ITEM 465		ITEM 496	ITEM 658
	6001	6045	6005	6001	6132	6002	6101
	TRENCH EXCAVATION PROTECTION	CONC BOX CULV (3 FT X 2 FT) (EXTEND)	RC PIPE (CL III)(24 IN)	INLET (COMPL) (TY S)	INLET (COMPL) (PSL)(FG) (4FTX5FT-4FTX4FT)	REMOV STR (INLET)	INSTL OM ASSM (OM-2Z) (WFLX)SRF)SRF
	LF	LF	LF	EA	EA	EA	EA
STA 1296+50	12	7	10	1	1	1	2
SH 6 PROJECT TOTAL	12	7	10	1	1	1	2

PRINT DATE	REVISION DATE
4/19/2023	

Texas Department of Transportation ©2023
Bryan District

SUMMARY OF CONSOLIDATED QUANTITIES (SH 6)

SHEET 2 OF 2 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 149, ETC.

STATE	DISTRICT	COUNTY
TEXAS	BRY	GRIMES

CONTROL	SECTION	JOB	SHEET NO.
0720	01	044, ETC.	15

REV DATE: 4/19/2023
CSJ: 0050-03-109

FILENAME: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY/Design Projects/0050031094 - Design/Plan Set/1. General/1G. Quantity/Summary/Sheets/SUMMARY OF CONSOLIDATED QUANTITIES (SH 6)

SUMMARY OF PAVEMENT MARKINGS AND MARKERS (SH 6)

SIGNING & STRIPING LAYOUT SHEET NO.	FROM STATION	TO STATION	LENGTH	ITEM 533	ITEM 662		ITEM 666					ITEM 668	ITEM 672
				6001	6109	6111	6018	6036	6048	6309	6321	6083	6010
				RUMBLE STRIPS (SHOULDER)	WK ZN PAV MRK		REFL PAV MRK TY I			REFL PM W/RET REQ TY I		PREFAB PAV MRK TY C	REFL PAV MRKR
					SHT TERM (TAB) TY W	SHT TERM (TAB) TY Y-2	(W) 6" (DOT) (100MIL)	(W) 8" (SLD) (100MIL)	(W) 24" (SLD) (100MIL)	(W) 6" (SLD) (100MIL)	(Y) 6" (SLD) (100MIL)	(W) (LNDP ARROW)	TY II-C-R
			FT	LF	EA	EA	LF	LF	LF	LF	LF	EA	EA
1	1293+70	1299+36	566	566	30	15	40	300	20	530	144	1	15
1	1299+36	1306+50	714	714			179			714		1	
SH 6 PROJECT TOTAL				1280	30	15	219	300	20	1244	144	2	15

SUMMARY OF INTERSECTION QUANTITIES (SH 6)

INTERSECTION	STATION	RT/LT	EXISTING SURFACE	WIDTH (W)	LENGTH (L)	RADIUS (R1)	RADIUS (R2)	ITEM 530
								6002
								INTERSECTIONS (ACP)
				FT	FT	FT	FT	SY
FM 2988	1294+35	RT	ACP	27	48	40	50	212
SH 6 PROJECT TOTAL								212

SUMMARY OF SIGNING QUANTITIES (SH 6)

SIGNING & STRIPING LAYOUT SHEET NO.	FROM STATION	TO STATION	ITEM 644		
			6001	6030	6076
			IN SM RD SN SUP&AM TY10BWG(1) SA(P)	IN SM RD SN SUP&AM TYS80(1) SA(T)	REMOVE SM RD SN SUP&AM
			EA	EA	EA
1	1293+70	1299+36	2	1	3
1	1299+36	1306+50	1		1
SH 6 PROJECT TOTAL			3	1	4

DRAINAGE ITEM SUMMARY (SH 6)

LOCATION	ITEM 402	ITEM 462	ITEM 464	ITEM 465		ITEM 496	ITEM 658
	6001	6045	6005	6001	6132	6002	6101
	TRENCH EXCAVATION PROTECTION	CONC BOX CULV (3 FT X 2 FT) (EXTEND)	RC PIPE (CL III)(24 IN)	INLET (COMPL) (TY S)	INLET (COMPL) (PSL)(FG) (4FTX5FT-4FTX4FT)	REMOV STR (INLET)	INSTL OM ASSM (OM-2Z) (WFLX)SRF)SRF
	LF	LF	LF	EA	EA	EA	EA
STA 1296+50	12	7	10	1	1	1	2
SH 6 PROJECT TOTAL	12	7	10	1	1	1	2

PRINT DATE	REVISION DATE
4/19/2023	

Texas Department of Transportation
Bryan District
© 2023

SUMMARY OF CONSOLIDATED QUANTITIES (SH 6)

SHEET 2 OF 2 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 149, ETC.

STATE	DISTRICT	COUNTY	
TEXAS	BRY	GRIMES	
CONTROL	SECTION	JOB	SHEET NO.
0720	01	044, ETC.	16

REV DATE: 4/17/2023
CSJ: 0050-03-109

FILENAME: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY/Design Projects/0050031094 - Design/Plan Set/1. General/1G. Quantity/Summary/Sheets/SUMMARY OF CONSOLIDATED QUANTITIES (SH 6)

SET UP

STEP 1: SET UP ADVANCE WARNING SIGNS AND BARRICADES IN ACCORDANCE WITH THE PLAN SET AND THE TMUTCD.

STEP 2: INSTALL TEMPORARY SEDIMENT CONTROL DEVICES AS SHOWN ON THE SW3P.

STEP 3: PREP ROW FOR ENTIRE PROJECT.

PHASE 1 - DRAINAGE

USE ONE LANE TWO-WAY OPERATIONS CONTROLLED BY PILOT CAR AND FLAGGER PER TXDOT STANDARDS.

PHASE 1A - DRAINAGE

STEP 1: SAW CUT EXISTING PAVEMENT.

STEP 2: REMOVE AND REPLACE CULVERT AND SET.

STEP 3: PLACE BACKFILL MATERIAL.

STEP 4: RESTORE EXISTING PAVEMENT STRUCTURE.

PHASE 1B - DRAINAGE

STEP 1: SAW CUT EXISTING PAVEMENT.

STEP 2: REMOVE AND REPLACE CULVERT AND SET.

STEP 3: PLACE BACKFILL MATERIAL.

STEP 4: RESTORE EXISTING PAVEMENT STRUCTURE.

PHASE 2 - ROADWAY

USE ONE LANE TWO-WAY OPERATIONS CONTROLLED BY PILOT CAR AND FLAGGER PER TXDOT STANDARDS.

PHASE 2A - ROADWAY

STEP 1: SAW CUT EXISTING PAVEMENT.

STEP 2: WINDROW EXCAVATED MATERIAL TOWARDS ROW LINE.

STEP 3: SUBGRADE WIDENING.

STEP 4: LIME TREAT 10" OF EXISTING MATERIAL.

STEP 5: PLACE TEMPORARY TAPER.

PHASE 2B - ROADWAY

STEP 1: SAW CUT EXISTING PAVEMENT.

STEP 2: WINDROW EXCAVATED MATERIAL TOWARDS ROW LINE.

STEP 3: SUBGRADE WIDENING.

STEP 4: LIME TREAT 10" OF EXISTING MATERIAL.

STEP 5: PLACE TEMPORARY TAPER.

PHASE 3A - ROADWAY

STEP 1: REMOVE TEMPORARY TAPER.

STEP 2: PLACE 6" FLEXBASE .

STEP 3: PLACE PRIME SEAL.

PHASE 3B - ROADWAY

STEP 1: REMOVE TEMPORARY TAPER.

STEP 2: PLACE 6" FLEXBASE.

STEP 3: PLACE PRIME SEAL.

PHASE 4 - ROADWAY

USE ONE LANE TWO-WAY OPERATIONS CONTROLLED BY PILOT CAR AND FLAGGER PER TXDOT STANDARDS.

STEP 1: PLACE BONDING COURSE ON ONE SIDE OF THE ROAD.

STEP 2: USE TCP 2-2B WITH PILOT CAR TO PLACE 2" SP-C ON ONE SIDE OF THE ROADWAY AT A TIME.

STEP 3: PLACE TEMPORARY TABS.

STEP 4: PLACE BACKFILL PAVEMENT EDGE ON ONE SIDE OF THE ROAD.

STEP 5: PLACE BONDING COURSE ON THE REMAINING SIDE.

STEP 6: USE TCP 2-2B WITH PILOT CAR TO PLACE 2" SP-C ON THE REMAINING SIDE.

STEP 7: PLACE BACKFILL PAVEMENT EDGE ON THE REMAINING SIDE.

STEP 8: PLACE TEMPORARY WORK ZONE TABS.

STEP 9: REMOVE/REPLACE MBGF.

PHASE 5 - ROADWAY

STEP 1: INSTALL PROPOSED MAILBOXES.

STEP 2: PLACE PERMANENT PAVEMENT MARKINGS, MARKERS, AND DELINEATION ACCORDING TO SIGNING AND STRIPING LAYOUT.

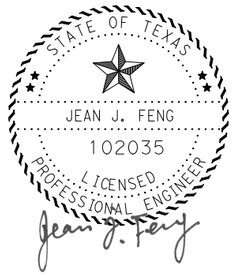
STEP 3: INSTALL SIGNS ACCORDING TO SIGNING AND STRIPING LAYOUT.

STEP 4: PLACE FINAL VEGETATION ACCORDING TO THE PLANS.

STEP 5: FINAL CLEAN UP.

NOTES:

1. *AT THE END OF EACH WORKING DAY, THE CONTRACTOR SHALL OPEN THE ROAD TO TWO LANE TWO-WAY TRAFFIC UNLESS APPROVED BY THE ENGINEER.*



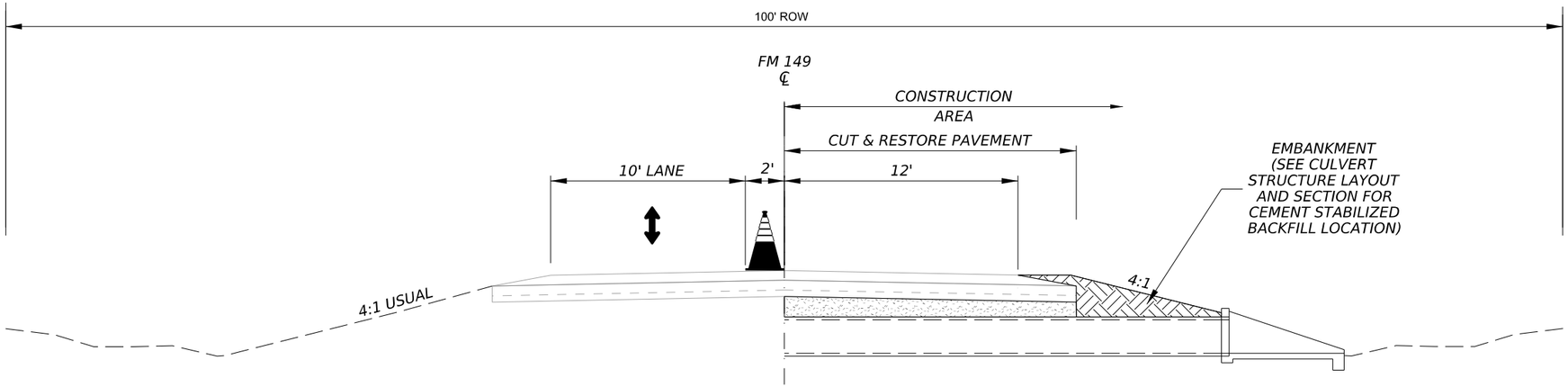
04/20/2023

PRINT DATE	REVISION DATE
4/19/2023	

Texas Department of Transportation
Bryan District

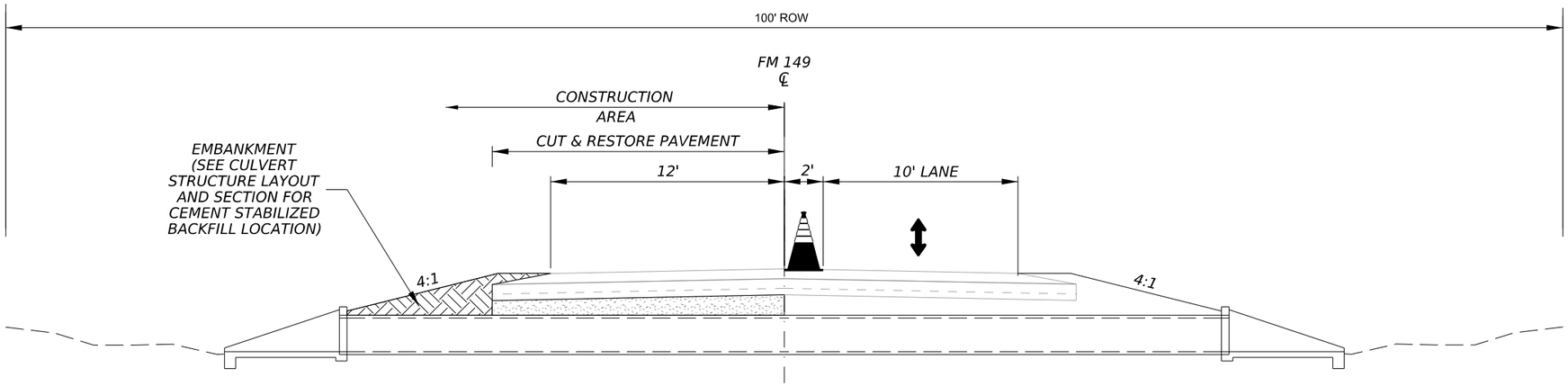
TCP NARRATIVE (FM 149)

FED. RD. DIV. NO.	PROJECT NUMBER		HIGHWAY NUMBER
6			FM 149, ETC.
STATE	DISTRICT	COUNTY	
TEXAS	BRY	GRIMES	
CONTROL	SECTION	JOB	SHEET NO.
0720	01	044, ETC.	17



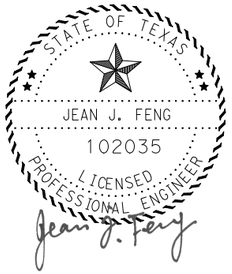
PHASE 1A

STEP 1: SAW CUT EXISTING PAVEMENT
STEP 2: REMOVE AND REPLACE CULVERT AND SET
STEP 3: PLACE BACKFILL MATERIAL
STEP 4: RESTORE EXISTING PAVEMENT STRUCTURE



PHASE 1B

STEP 1: SAW CUT EXISTING PAVEMENT
STEP 2: REMOVE AND REPLACE CULVERT AND SET
STEP 3: PLACE BACKFILL MATERIAL
STEP 4: RESTORE EXISTING PAVEMENT STRUCTURE



04/20/2023

Drawings Not To Scale

PRINT DATE	REVISION DATE
4/19/2023	

Texas Department of Transportation
Bryan District

TCP TYPICAL SECTIONS (FM 149)

SHEET 1 OF 4 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 149, ETC.

STATE	DISTRICT	COUNTY
TEXAS	BRY	GRIMES

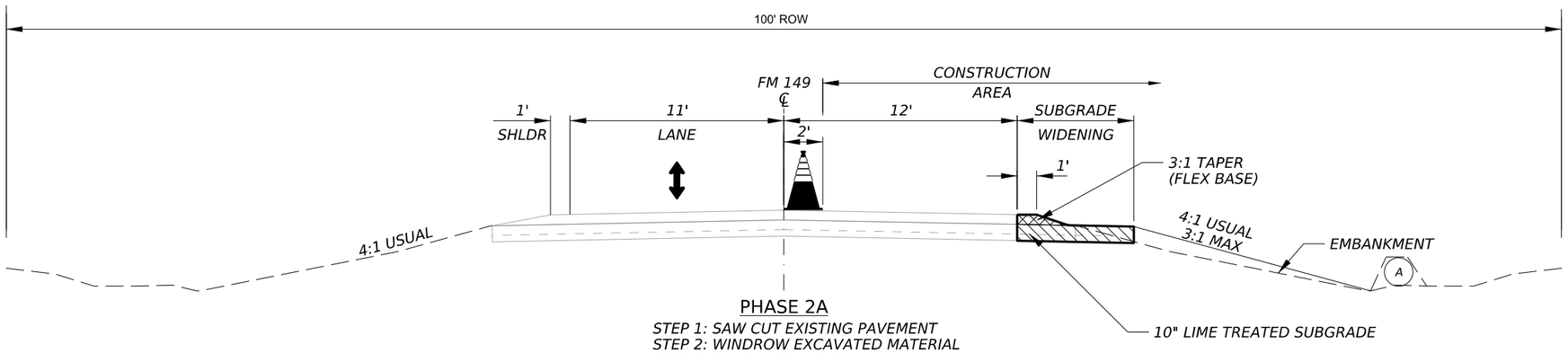
CONTROL	SECTION	JOB	SHEET NO.
0720	01	044, ETC.	18

REV DATE: 3/28/2023
CSJ: 0720-01-044

FILENAME: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY/Design Projects/0720010444 - Design/Plan Set/2. TCP/2A. TCP Sheets/TCP TYPICAL SECTIONS (FM 149)

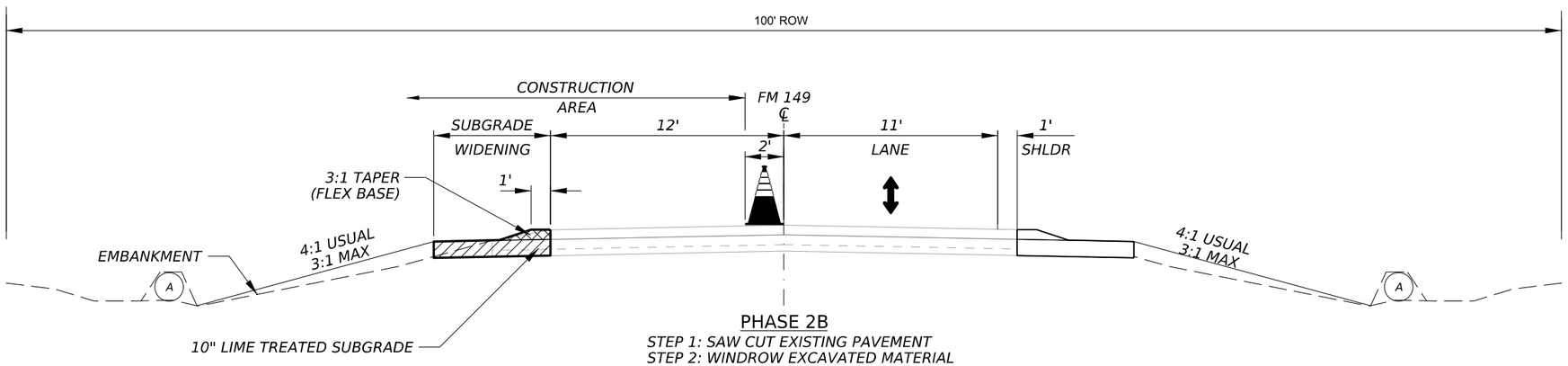
NOTE:

(A) ITEM 160: FURNISHING AND PLACING TOPSOIL (4") EXISTING TOPSOIL SHALL BE REMOVED TO A DEPTH OF 4" AND WINDROWED OUTSIDE OF THE WORK AREA CREATING A BERM, AND THEN RETURN TO SLOPES UPON COMPLETION OF ROADWAY WIDENING.



PHASE 2A

STEP 1: SAW CUT EXISTING PAVEMENT
STEP 2: WINDROW EXCAVATED MATERIAL
STEP 3: SUBGRADE WIDENING
STEP 4: LIME TREAT 10" OF EXISTING MATERIAL
STEP 5: PLACE TEMPORARY TAPER



PHASE 2B

STEP 1: SAW CUT EXISTING PAVEMENT
STEP 2: WINDROW EXCAVATED MATERIAL
STEP 3: SUBGRADE WIDENING
STEP 4: LIME TREAT 10" OF EXISTING MATERIAL
STEP 5: PLACE TEMPORARY TAPER

STATE OF TEXAS
JEAN J. FENG
102035
LICENSED PROFESSIONAL ENGINEER

04/20/2023

Drawings Not To Scale

PRINT DATE	REVISION DATE
4/19/2023	

Texas Department of Transportation
Bryan District

TCP TYPICAL SECTIONS (FM 149)

SHEET 2 OF 4 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 149, ETC.

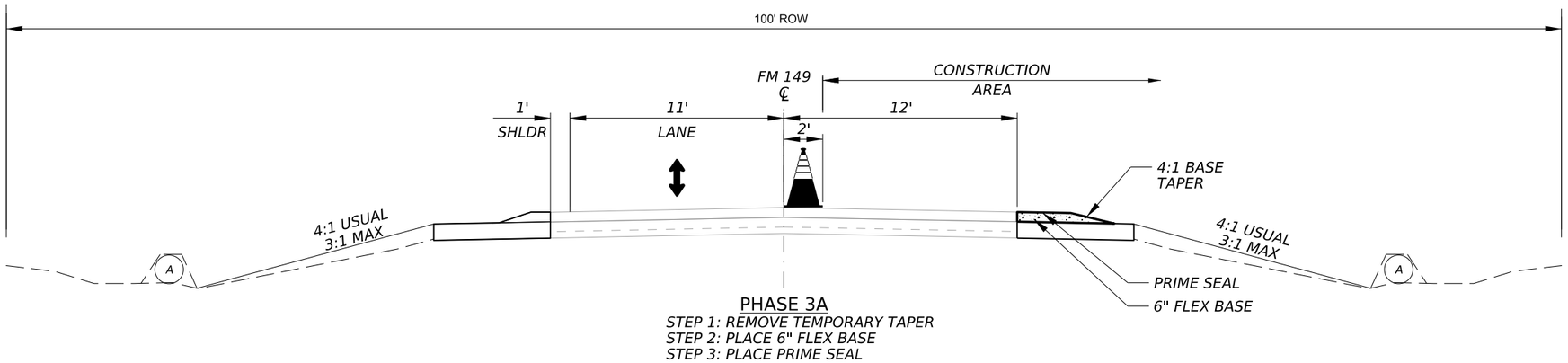
STATE	DISTRICT	COUNTY	
TEXAS	BRY	GRIMES	
CONTROL	SECTION	JOB	SHEET NO.
0720	01	044, ETC.	19

REV DATE: 3/29/2023
CSJ: 0720-01-044

FILENAME: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY/Design Projects/0720010044/4 - Design/Plan Set/2. TCP/2A. TCP Sheets/TCP TYPICAL SECTIONS (FM 149)

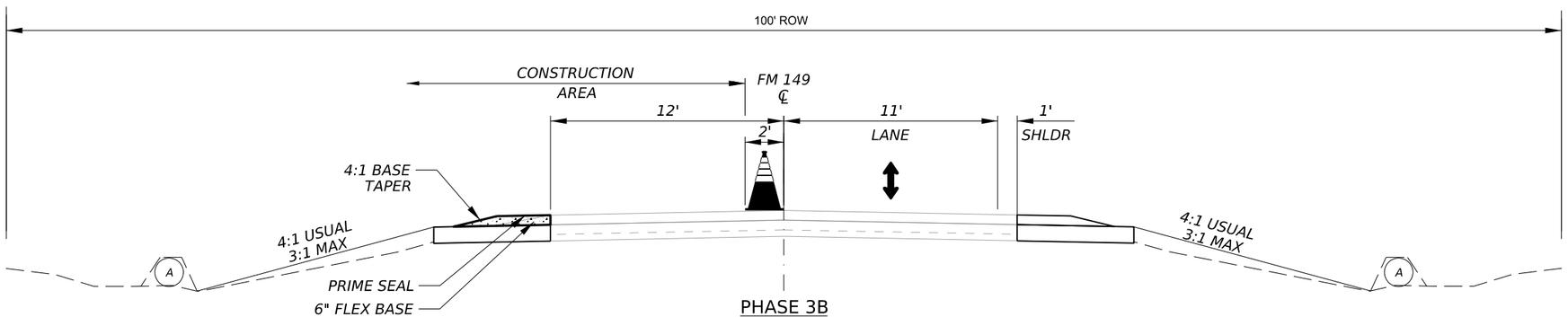
NOTE:

(A) ITEM 160: FURNISHING AND PLACING TOPSOIL (4") EXISTING TOPSOIL SHALL BE REMOVED TO A DEPTH OF 4" AND WINDROWED OUTSIDE OF THE WORK AREA CREATING A BERM, AND THEN RETURN TO SLOPES UPON COMPLETION OF ROADWAY WIDENING.



PHASE 3A

STEP 1: REMOVE TEMPORARY TAPER
STEP 2: PLACE 6" FLEX BASE
STEP 3: PLACE PRIME SEAL



PHASE 3B

STEP 1: REMOVE TEMPORARY TAPER
STEP 2: PLACE 6" FLEX BASE
STEP 3: PLACE PRIME SEAL

STATE OF TEXAS
JEAN J. FENG
102035
LICENSED
PROFESSIONAL ENGINEER

04/20/2023

Drawings Not To Scale

PRINT DATE	REVISION DATE
4/19/2023	

Texas Department of Transportation
Bryan District

TCP TYPICAL SECTIONS (FM 149)

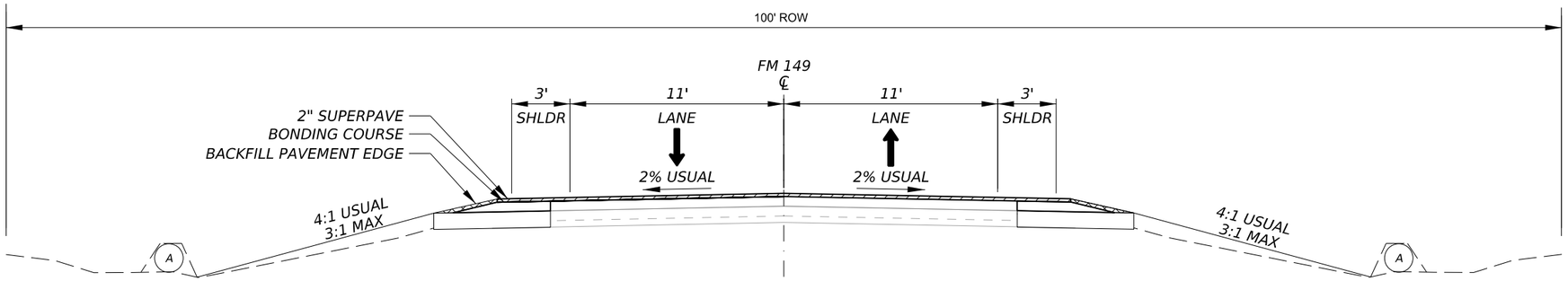
SHEET 3 OF 4 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 149, ETC.

STATE	DISTRICT	COUNTY	
TEXAS	BRY	GRIMES	
CONTROL	SECTION	JOB	SHEET NO.
0720	01	044, ETC.	20

REV DATE: 3/29/2023
CSJ: 0720-01-044

FILENAME: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY/Design Projects/0720010044/4 - Design/Plan Set/2. TCP/2A. TCP Sheets/TCP TYPICAL SECTIONS (FM 149)



PHASE 4

STEP 1: PLACE BONDING COURSE ON ONE SIDE OF THE ROAD
STEP 2: PLACE 2" SUPERPAVE ON ONE SIDE OF THE ROAD AT A TIME
STEP 3: PLACE TEMPORARY TABS.
STEP 4: PLACE BACKFILL PAVEMENT EDGE ON ONE SIDE OF THE ROAD
STEP 5: PLACE BONDING COURSE ON THE REMAINING SIDE OF THE ROAD
STEP 6: PLACE 2" SUPERPAVE ON THE REMAINING SIDE OF THE ROAD
STEP 7: PLACE TEMPORARY WORK ZONE TABS.
STEP 8: PLACE BACKFILL PAVEMENT EDGE ON THE REMAINING SIDE OF THE ROAD

NOTE:

(A) ITEM 160: FURNISHING AND PLACING TOPSOIL (4") EXISTING TOPSOIL SHALL BE REMOVED TO A DEPTH OF 4" AND WINDROWED OUTSIDE OF THE WORK AREA CREATING A BERM, AND THEN RETURN TO SLOPES UPON COMPLETION OF ROADWAY WIDENING.

STATE OF TEXAS
JEAN J. FENG
102035
LICENSED
PROFESSIONAL ENGINEER

04/20/2023

Drawings Not To Scale

PRINT DATE	REVISION DATE
4/19/2023	

Texas Department of Transportation
Bryan District

TCP TYPICAL SECTIONS (FM 149)

SHEET 4 OF 4 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 149, ETC.

STATE	DISTRICT	COUNTY	
TEXAS	BRY	GRIMES	
CONTROL	SECTION	JOB	SHEET NO.
0720	01	044, ETC.	21

REV DATE: 3/29/2023
CSJ: 0720-01-044
FILENAME: pw://txdot.projectwiseonline.com/TxDOT4/Documents/17 - BRY/Design Projects/072001044/4 - Design/Plan Set/2. TCP/2A. TCP Sheets/TCP TYPICAL SECTIONS (FM 149)

SET UP

STEP 1: SET UP ADVANCE WARNING SIGNS AND BARRICADES IN ACCORDANCE WITH THE PLANS AND THE TMUTCD.

STEP 2: INSTALL TEMPORARY SEDIMENT CONTROL DEVICES AS SHOWN ON THE SW3P.

STEP 3: PREP ROW FOR ENTIRE PROJECT.

PHASE 1 - DRAINAGE

USE TCP(5-1) FOR SHOULDER CLOSURE.

STEP 1: EXTEND CULVERT AND REPLACE INLET.

PHASE 2 - ROADWAY

PHASE 2A - ROADWAY

USE TCP(6-1) FOR LANE CLOSURE.

STEP 1: MILL 3"-5" TO EXISTING FLEX BASE LAYER.

STEP 2: PROOF ROLL EXISTING FLEX BASE LAYER.

STEP 3: PLACE PRIME OVER EXISTING FLEX BASE.

STEP 4: PLACE BONDING COURSE ON MILLED PORTION.

STEP 5: PLACE SP-D TO BRING MILLED PORTION UP TO 2% GRADE.

STEP 6: PLACE 3' OF 4" SP-C FOR TEMPORARY EDGE TAPER.

PHASE 2B - ROADWAY

USE TCP(5-1) FOR SHOULDER CLOSURE.

STEP 1: WINDROW EXCAVATED MATERIAL TOWARDS ROW LINE.

STEP 2: PLACE RETAINING WALL AND RIPRAP WHERE APPLICABLE. (SEE TRAFFIC RAIL DETAILS (SH 6))

STEP 3: WIDEN 11" SUBGRADE AND LIME TREAT EXISTING MATERIAL.

STEP 4: PLACE 8" FLEX BASE.

STEP 5: PLACE PRIME.

STEP 6: BACKFILL PAVEMENT EDGE AND PLACE EMBANKMENT.

PHASE 2C - ROADWAY

USE TCP(6-1) FOR LANE CLOSURE.

STEP 1: MILL 3"-5" SP-C TO REMOVE TEMPORARY EDGE TAPER.

STEP 2: PLACE BONDING COURSE ACROSS WIDTH OF MILLED AND WIDENED PORTION.

STEP 3: PLACE 3" SP-C ACROSS WIDTH OF MILLED AND WIDENED PORTION.

STEP 4: PLACE BONDING COURSE.

STEP 5: PLACE 1.25" PFC-C.

STEP 6: PLACE TEMPORARY WORK ZONE TABS.

PHASE 3 - ROADWAY

STEP 1: PLACE TRAFFIC RAIL, MBGF, AND MOW STRIP.

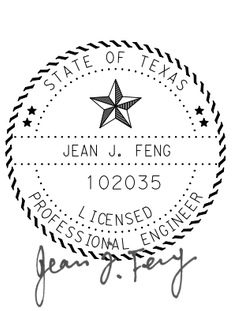
STEP 2: PLACE PERMANENT PAVEMENT MARKINGS, MARKERS, AND DELINEATION ACCORDING TO SIGNING AND STRIPING LAYOUT.

STEP 3: INSTALL SHOULDER RUMBLE STRIPS FOR LENGTH OF PROJECT.

STEP 4: INSTALL SIGNS ACCORDING TO SIGNING AND STRIPING LAYOUT.

STEP 5: PLACE PERMANENT SEEDING ACCORDING TO THE PLANS.

STEP 6: FINAL CLEAN UP.



04/20/2023

PRINT DATE	REVISION DATE
4/19/2023	

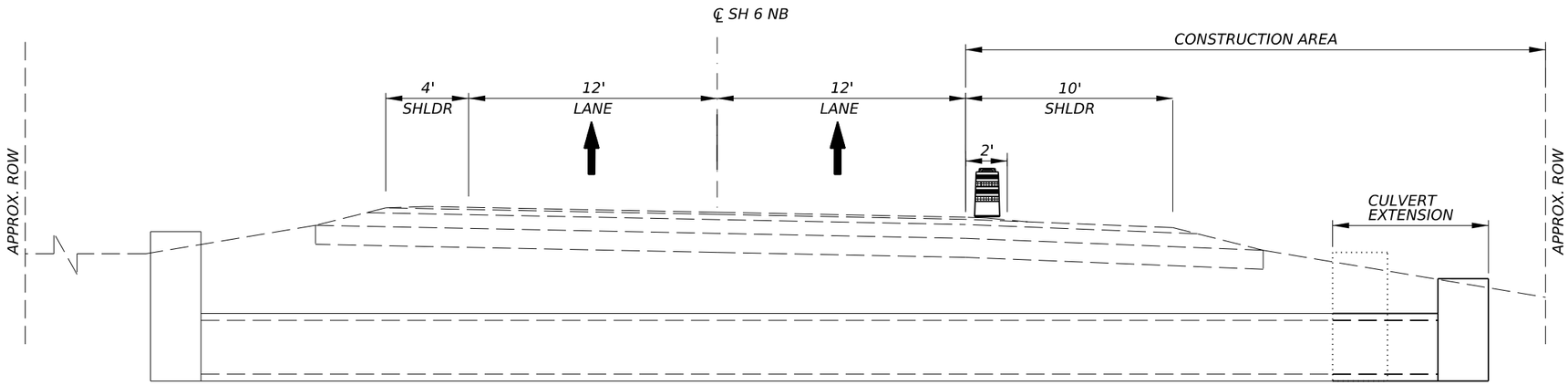
Texas Department of Transportation
Bryan District

TCP NARRATIVE (SH 6)

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 149, ETC.

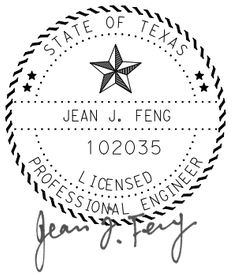
STATE	DISTRICT	COUNTY
TEXAS	BRY	GRIMES

CONTROL	SECTION	JOB	SHEET NO.
0720	01	044, ETC.	22



PHASE 1 - DRAINAGE

STEP 1: EXTEND CULVERT AND REPLACE INLET



04/20/2023

Drawings Not To Scale

PRINT DATE	REVISION DATE
4/19/2023	

Texas Department of Transportation

Bryan District

TCP TYPICAL SECTIONS (SH 6)

SHEET 1 OF 4 SHEETS

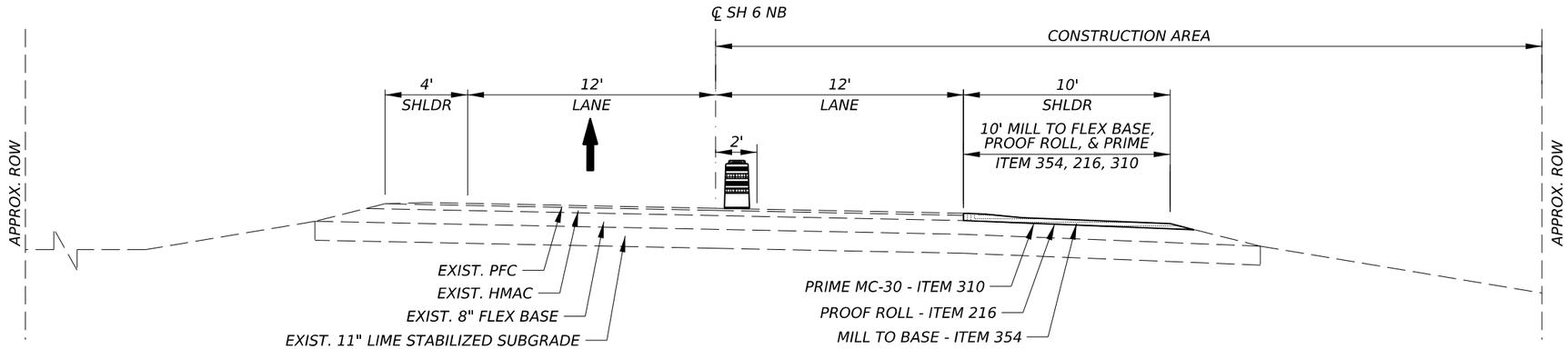
FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 149, ETC.

STATE	DISTRICT	COUNTY
TEXAS	BRY	GRIMES

CONTROL	SECTION	JOB	SHEET NO.
0720	01	044, ETC.	23

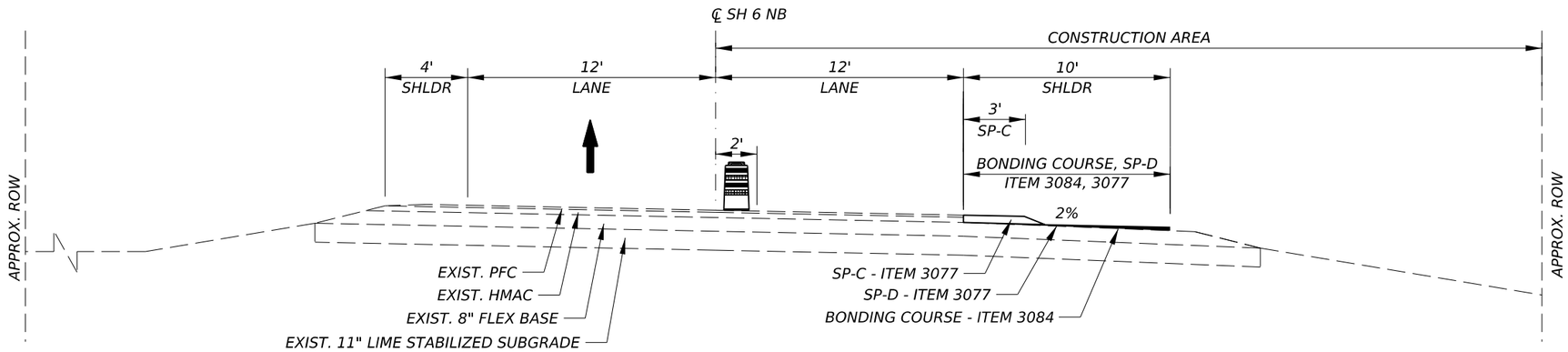
REV DATE: 4/14/2023
CSJ: 0050-03-109

FILENAME: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY/Design Projects/0050031109/4 - Design\Plan Set\2. TCP\2A. TCP Sheets\TCP Sheets\TCP TYPICAL SECTIONS (SH 6).dgn



PHASE 2A

STEP 1: MILL 3"-5" TO EXIST. FLEX BASE
STEP 2: PROOF ROLL EXIST. FLEX BASE
STEP 3: PLACE PRIME OVER EXIST. FLEX BASE



PHASE 2A

STEP 4: PLACE BONDING COURSE ON MILLED PORTION
STEP 5: PLACE SP-D ON MILLED PORTION UP TO 2% GRADE
STEP 6: PLACE 3' OF 4" SP-C FOR TEMPORARY EDGE TAPER

STATE OF TEXAS
JEAN J. FENG
102035
LICENSED
PROFESSIONAL ENGINEER

04/20/2023

Drawings Not To Scale

PRINT DATE	REVISION DATE
4/19/2023	

Texas Department of Transportation
Bryan District

TCP TYPICAL SECTIONS (SH 6)

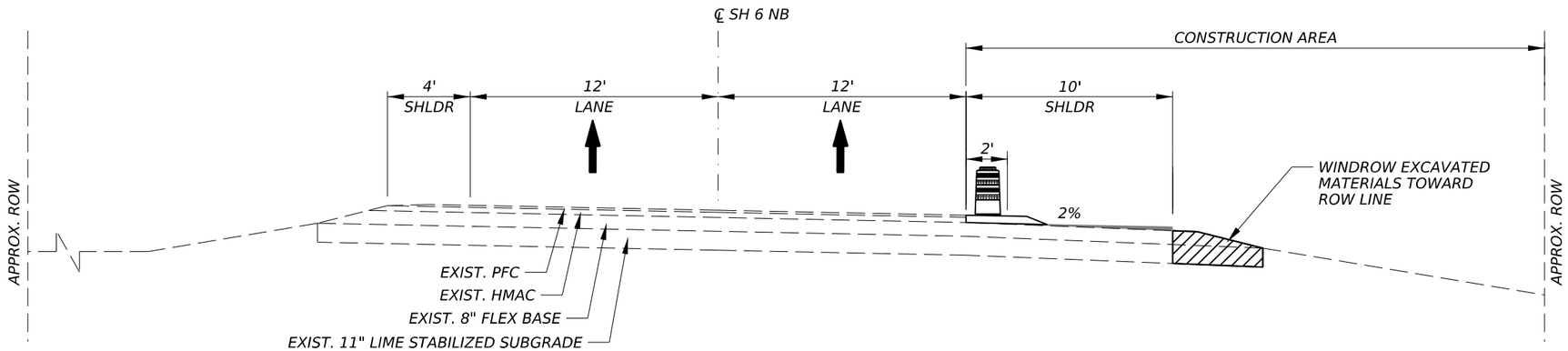
SHEET 2 OF 4 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 149, ETC.

STATE	DISTRICT	COUNTY	
TEXAS	BRY	GRIMES	
CONTROL	SECTION	JOB	SHEET NO.
0720	01	044, ETC.	24

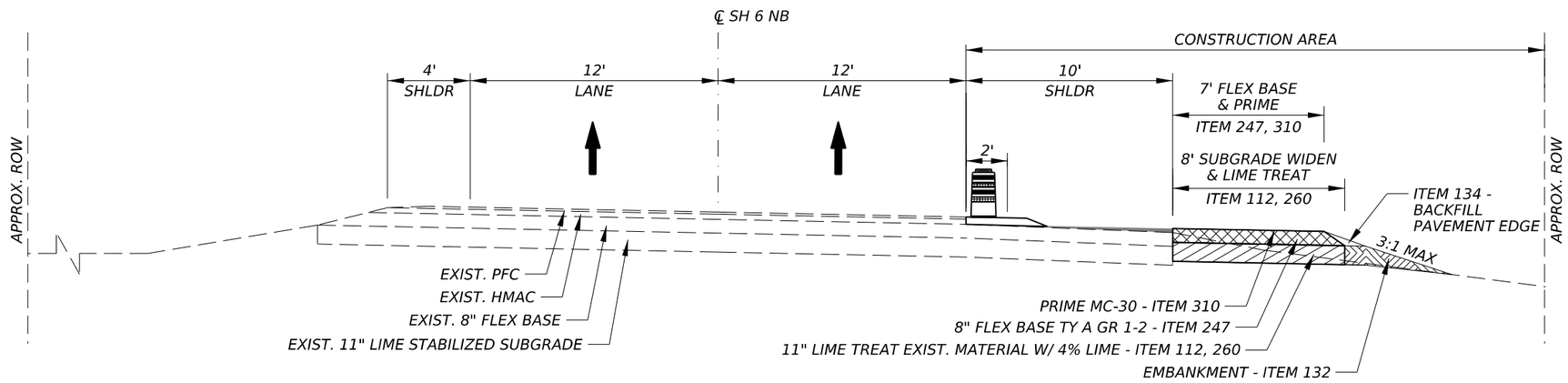
REV DATE: 4/14/2023
CSJ: 0050-03-109

FILENAME: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY/Design Projects/0050031094 - Design/Plan Set/2. TCP/2A. TCP Sheets/TCP TYPICAL SECTIONS (SH 6).dgn



PHASE 2B

STEP 1: WINDROW EXCAVATED MATERIALS TOWARD ROW LINE
STEP 2: PLACE RETAINING WALL AND RIPRAP WHERE APPLICABLE (SEE TRAFFIC RAIL DETAILS (SH 6))



PHASE 2B

STEP 3: WIDEN 11" SUBGRADE AND LIME TREAT EXIST. MATERIAL
STEP 4: PLACE 8" FLEX BASE
STEP 5: PLACE PRIME
STEP 6: BACKFILL PAVEMENT EDGE AND PLACE EMBANKMENT

STATE OF TEXAS
JEAN J. FENG
102035
LICENSED
PROFESSIONAL ENGINEER

04/20/2023

Drawings Not To Scale

PRINT DATE	REVISION DATE
4/19/2023	

Texas Department of Transportation
Bryan District

TCP TYPICAL SECTIONS (SH 6)

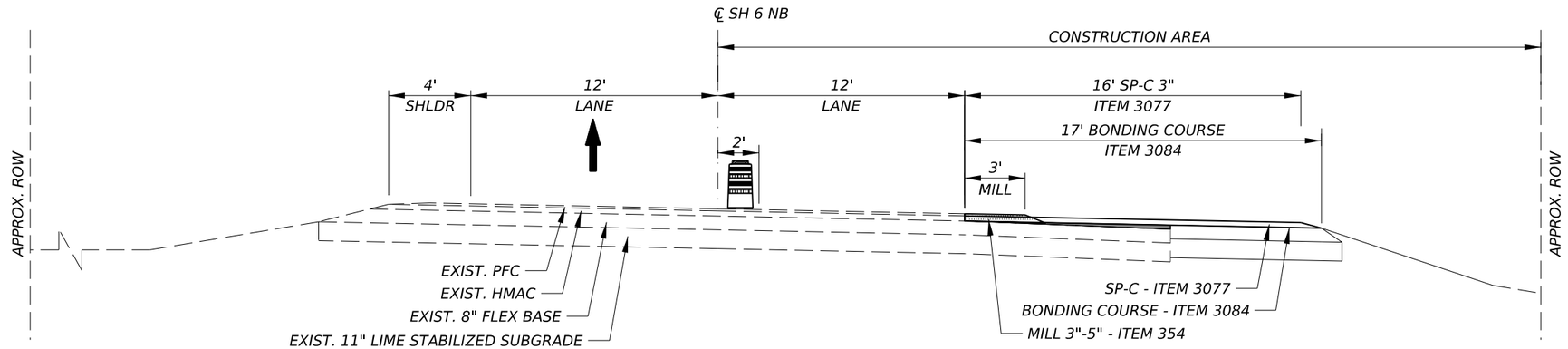
SHEET 3 OF 4 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 149, ETC.

STATE	DISTRICT	COUNTY	
TEXAS	BRY	GRIMES	
CONTROL	SECTION	JOB	SHEET NO.
0720	01	044, ETC.	25

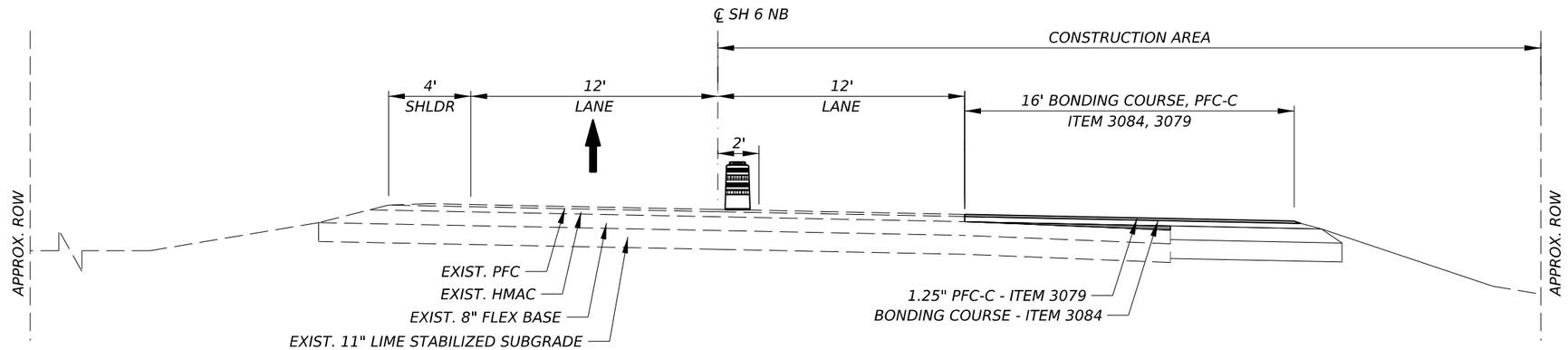
REV DATE: 4/14/2023
CSJ: 0050-03-109

FILENAME: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY/Design Projects/0050031094 - Design/Plan Set/2. TCP/2A. TCP Sheets/TCP TYPICAL SECTIONS (SH 6).dgn



PHASE 2C

STEP 1: MILL 3"-5" SP-C TO REMOVE TEMPORARY EDGE TAPER
STEP 2: PLACE BONDING COURSE ACROSS MILLED AND WIDENED PORTION
STEP 3: PLACE 3" SP-C ACROSS MILLED AND WIDENED PORTION



PHASE 2C

STEP 4: PLACE BONDING COURSE
STEP 5: PLACE 1.25" PFC-C
STEP 6: PLACE TEMPORARY WORK ZONE TABS

STATE OF TEXAS
JEAN J. FENG
102035
LICENSED
PROFESSIONAL ENGINEER

04/20/2023

Drawings Not To Scale

PRINT DATE	REVISION DATE
4/19/2023	

Texas Department of Transportation
Bryan District

TCP TYPICAL SECTIONS (SH 6)

SHEET 4 OF 4 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 149, ETC.

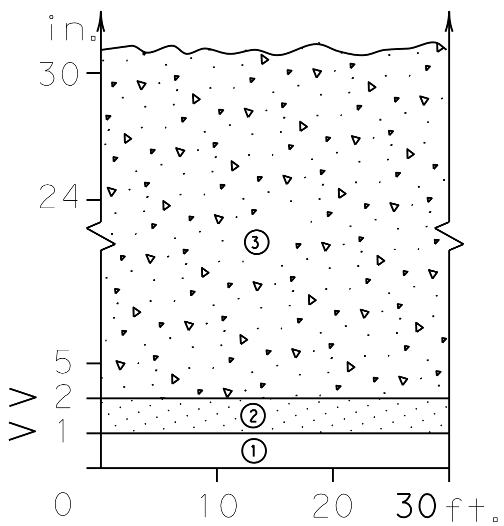
STATE	DISTRICT	COUNTY	
TEXAS	BRY	GRIMES	
CONTROL	SECTION	JOB	SHEET NO.
0720	01	044, ETC.	26

REV DATE: 4/14/2023
CSJ: 0050-03-109

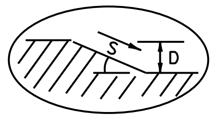
FILENAME: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY/Design Projects/0050031094 - Design/Plan Set/2. TCP/2A. TCP Sheets/TCP TYPICAL SECTIONS (SH 6).dgn

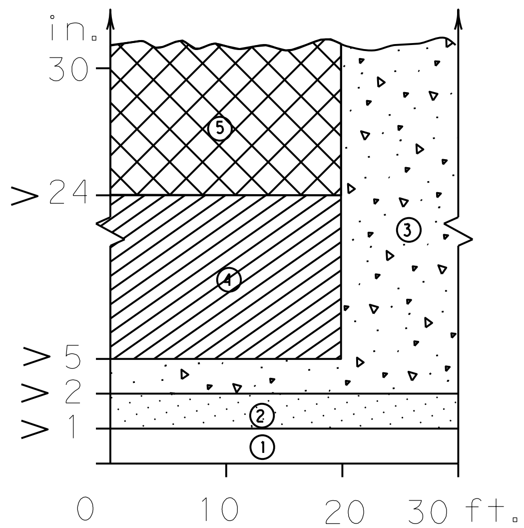
DEFINITION OF TREATMENT ZONES FOR VARIOUS EDGE CONDITIONS

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

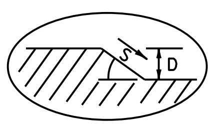


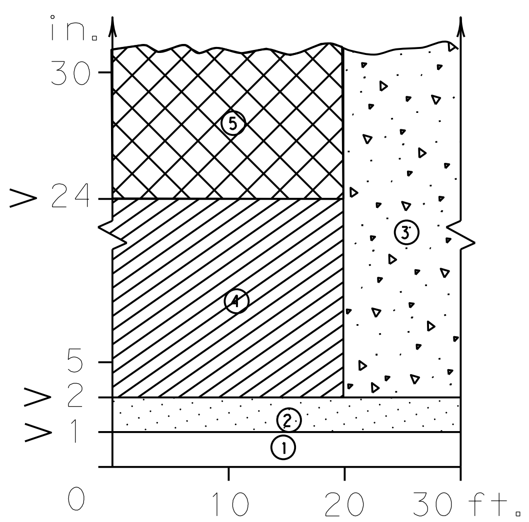
Edge Condition I
S = (3:1) (or flatter)





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





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

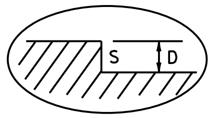
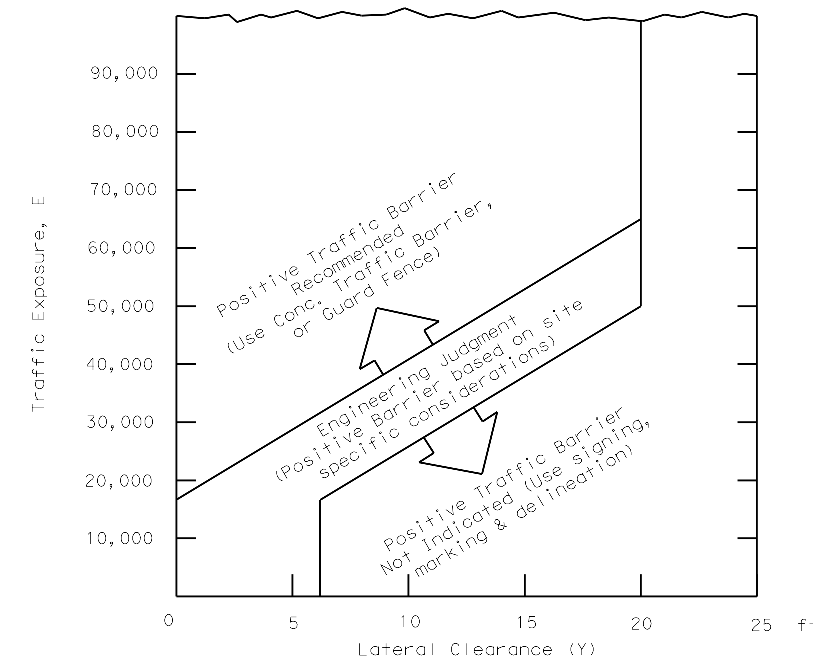


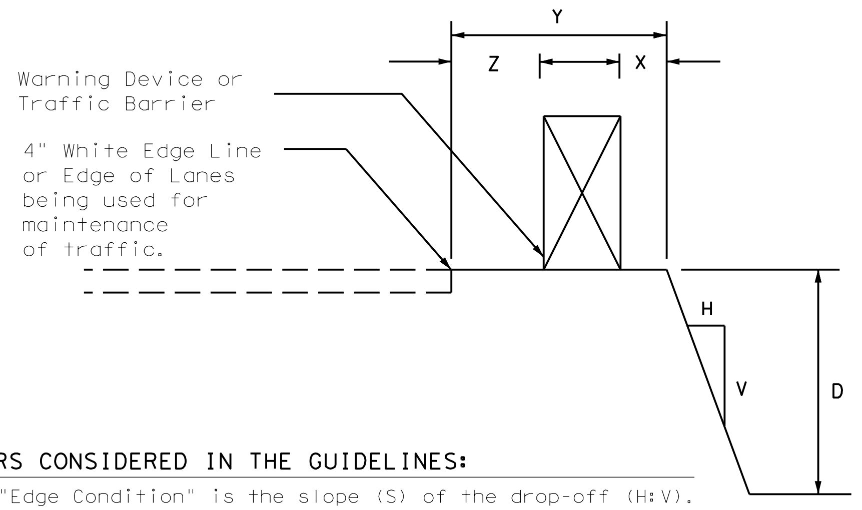
FIGURE-1: CONDITIONS INDICATING USE OF POSITIVE BARRIER FOR ZONE 5 ( )



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 the clear zone.



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	CW8-9a or CW 8-11, signs plus drums. Where restricted space precludes the use of drums, use vertical panels. An edge slope to that of the profered Edge Condition I.
5	Check indications (Figure-1) for possitive barrier. Where positive barrier is not indicated, the treatment shown above for Zone-4 may be used after consideration of other applicable factors.

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

FACTORS CONSIDERED IN THE GUIDELINES:

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.

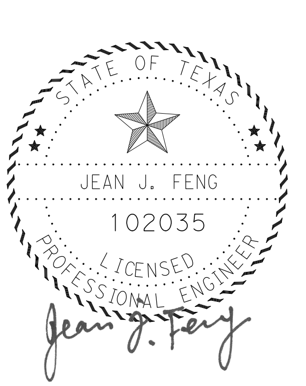
Edge Condition Notes:

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 (1 to 1) so long as "D" does not exceed 5 inches. Under-carriage drag on most automobiles will occur when "D" exceeds 6 inches. As "D" 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.



4/20/2023

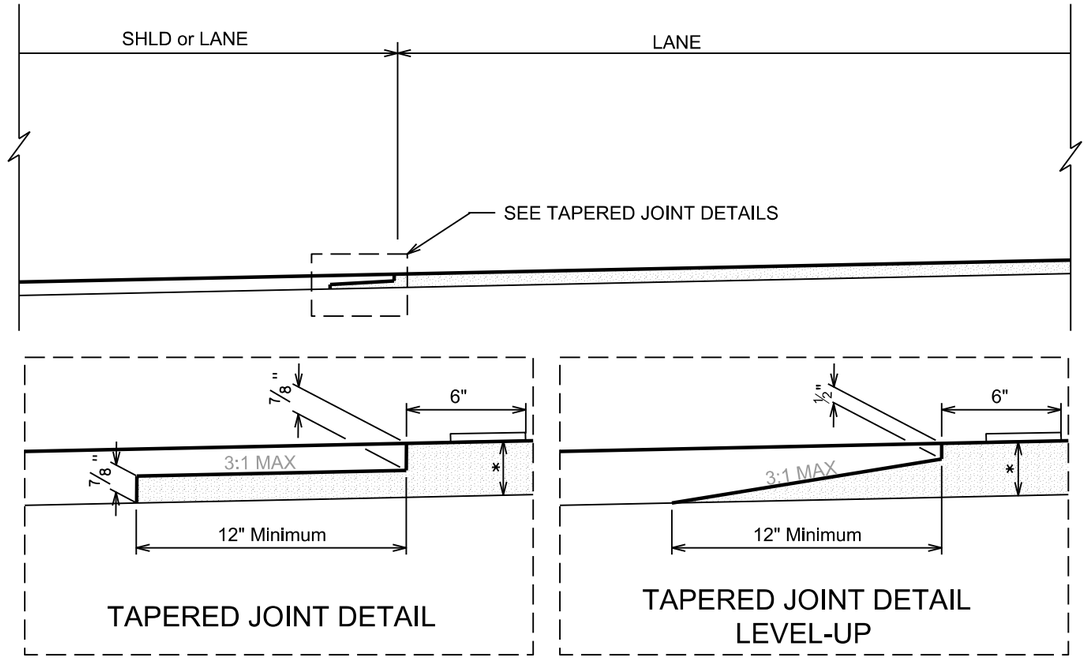
Texas Department of Transportation

Traffic Safety Division Standard

TREATMENT FOR VARIOUS EDGE CONDITIONS

FILE: edgecon.dgn	DN:	CK:	DW:	CK:
©TxDOT August 2000	CONT	SECT	JOB	HIGHWAY
REVISIONS 03-01 08-01 9-21	0720	01	044, ETC.	FM 149, ETC.
	DIST	COUNTY		SHEET NO.
	BRYAN	GRIMES		27

DATE: 4/20/2023 2:03:08 PM
FILE: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY/Design Projects/...



* SEE TYPICAL SECTION FOR DEPTH AND TYPE OF HMA.

NOTES:

LONGITUDINAL JOINTS SHALL BE CONSTRUCTED BY TAPERING THE BITUMINOUS MAT. THE TAPERED PORTION SHALL EXTEND BEYOND THE NORMAL LANE WIDTH. THE TAPERED PORTION OF THE MAT SHALL BE CONSTRUCTED BY THE USE OF AN APPROVED STRIKE-OFF DEVICE THAT WILL PROVIDE A UNIFORM SLOPE AND WILL NOT RESTRICT THE MAIN SCREED. TACK COAT SHALL BE APPLIED TO THE IN-PLACE TAPER BEFORE THE ADJACENT MAT IS PLACED. FINAL DENSITY REQUIREMENTS FOR THE ENTIRE PAVEMENT, INCLUDING THE TAPER AREA, WILL REMAIN UNCHANGED. COMPACTION OF THE INITIAL TAPER SECTION WILL BE REQUIRED AS NEAR TO FINAL DENSITY AS POSSIBLE.

PRINT DATE	REVISION DATE
4/19/2023	

Texas Department of Transportation

Bryan District Standard

HOT MIX LONGITUDINAL JOINT DETAILS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 149, ETC.

STATE	DISTRICT	COUNTY
TEXAS	BRY	GRIMES

CONTROL	SECTION	JOB	SHEET NO.
0720	01	044, ETC.	28

REV DATE: 8/1/2022
CSJ: 0720-01-044

FILENAME: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY/Design Projects/0720010044/4 - Design/Plan Set/3. Roadway/3H. RoadwayStandards/HOT MIX LONG JOINT DETAILS.dgn

DATE: 4/19/2023 7:33:57 AM
FILE: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY/Design Projects/0720044/4 - Design/Plan Set/8. Traffic/8H. Traffic Standards/BC-21.dgn

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. Where highway construction or maintenance work is being undertaken, other than mobile operations as defined by the Texas Manual on Uniform Traffic Control Devices, CSJ limit signs are required. CSJ limit signs are shown on BC(2). The OBEY WARNING SIGNS STATE LAW sign, STAY ALERT TALK OR TEXT LATER and the WORK ZONE TRAFFIC FINES DOUBLE sign with plaque shall be erected in advance of the CSJ limits. The BEGIN ROAD WORK NEXT X MILES, CONTRACTOR and END ROAD WORK signs shall be erected at or near the CSJ limits. For mobile operations, CSJ limit signs are not required.

11. 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 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.

2. Except in emergency situations, flagger stations shall be illuminated when flagging is used at night.

COMPLIANT WORKZONE TRAFFIC CONTROL DEVICES

1. Only pre-qualified products shall be used. The "Compliant Work Zone Traffic Control Devices List" (CWZTCD) describes pre-qualified products and their sources.

2. Work zone traffic control devices shall be compliant with the Manual for Assessing safety Hardware (MASH).

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 Safety Division Standard

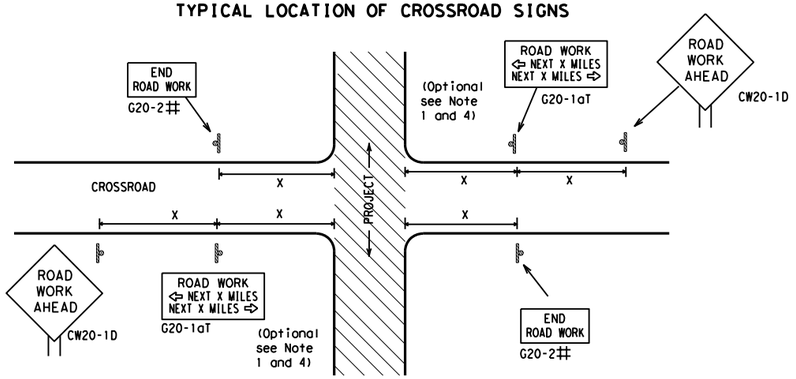
BARRICADE AND CONSTRUCTION GENERAL NOTES AND REQUIREMENTS

BC(1)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0720	01	044, ETC.	FM 149, ETC.
4-03 7-13	DIST	COUNTY		SHEET NO.
9-07 8-14	BRYAN	GRIMES		29
5-10 5-21				

DATE: 4/19/2023 7:33:57 AM
FILE: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY/Design Projects/0720010442/4 - Design/Plan Set/8. Traffic/8H. TrafficStandards/BC-21.dgn

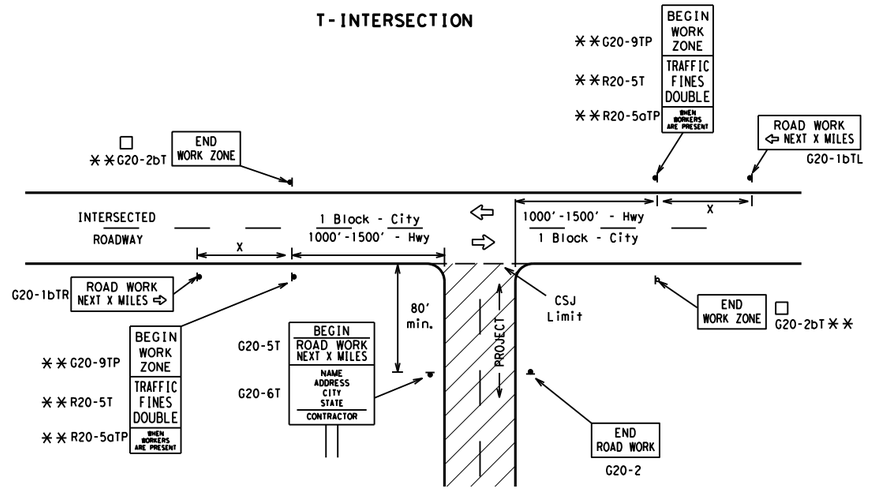
TYPICAL LOCATION OF CROSSROAD SIGNS



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

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

T-INTERSECTION



CSJ LIMITS AT T-INTERSECTION

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

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

SIZE

Sign Number or Series	Conventional Road	Expressway/ Freeway
CW20[4] CW21 CW22 CW23 CW25	48" x 48"	48" x 48"
CW1, CW2, CW7, CW8, CW9, CW11, CW14	36" x 36"	48" x 48"
CW3, CW4, CW5, CW6, CW8-3, CW10, CW12	48" x 48"	48" x 48"

SPACING

Posted Speed	Sign △ Spacing "X"
MPH	Feet (Apprx.)
30	120
35	160
40	240
45	320
50	400
55	500[2]
60	600[2]
65	700[2]
70	800[2]
75	900[2]
80	1000[2]
*	*[3]

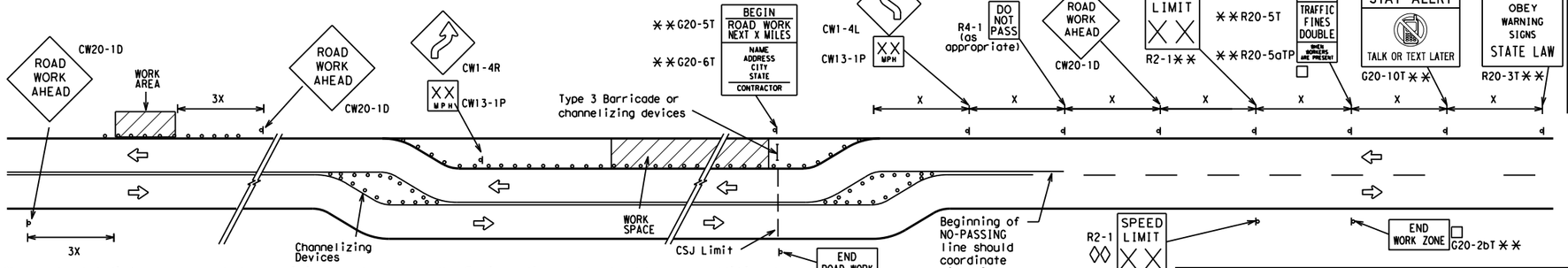
* For typical sign spacings on divided highways, expressways and freeways, see Part 6 of the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD) typical application diagrams or TCP Standard Sheets.

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

GENERAL NOTES

1. Special or larger size signs may be used as necessary.
2. Distance between signs should be increased as required to have 1500 feet advance warning.
3. Distance between signs should be increased as required to have 1/2 mile or more advance warning.
4. 36" x 36" "ROAD WORK AHEAD" (CW20-1D)signs may be used on low volume crossroads at the discretion of the Engineer as per TMUTCD Part 5. 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.

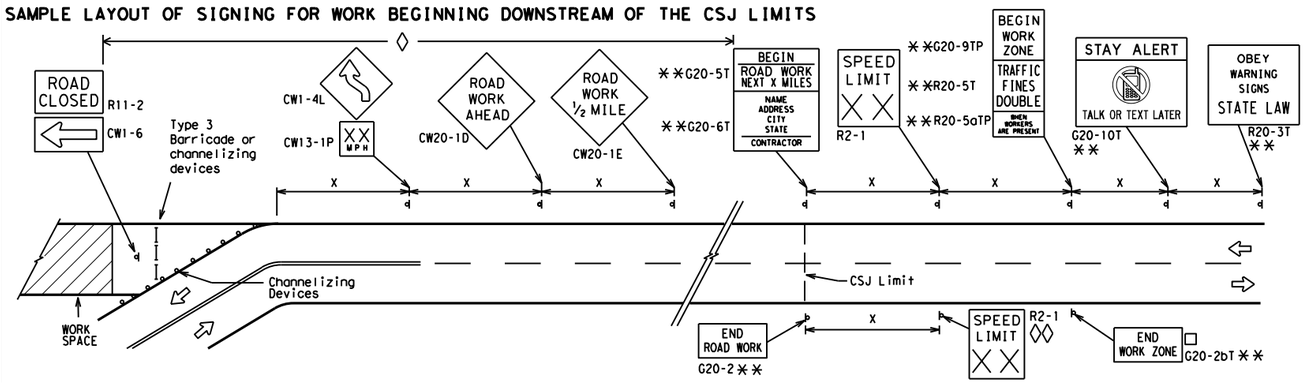
WORK AREAS IN MULTIPLE LOCATIONS WITHIN CSJ LIMITS



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.

** CSJ limit signing is required for highway construction and maintenance work, with the exception of mobile operations.

◊ 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 Safety Division Standard

BARRICADE AND CONSTRUCTION PROJECT LIMIT

BC(2)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0720	01	044, ETC.	FM 149, ETC.
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	BRYAN	GRIMES		30

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.

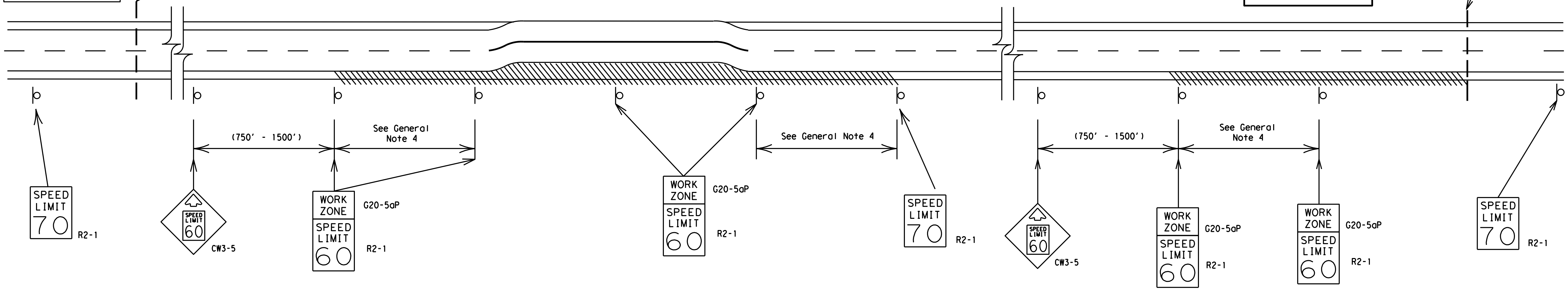
Regulatory work zone speed signs (R2-1) shall be removed or covered during periods when they are not needed.

Signing shown for one direction only. See BC(2) for additional advance signing.

CSJ LIMITS

Signing shown for one direction only. See BC(2) for additional advance signing.

CSJ LIMITS



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 traveled way.

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

GENERAL NOTES

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.

DATE: 4/19/2023 7:33:58 AM
FILE: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY/Design Projects/0720...

Texas Department of Transportation — Traffic Safety Division Standard

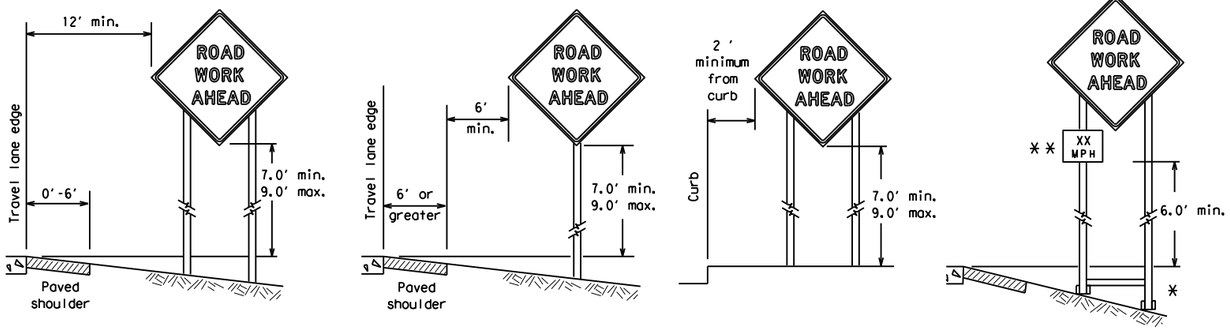
BARRICADE AND CONSTRUCTION WORK ZONE SPEED LIMIT

BC(3)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS 9-07 8-14 7-13 5-21	0720	01	044, ETC.	FM 149, ETC.
	DIST		COUNTY	SHEET NO.
	BRYAN		GRIMES	31

DATE: 4/19/2023 7:33:58 AM
FILE: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY/Design Projects/072001044/4 - Design/Plan Set/8. Traffic/8H. TrafficStandards/BC-21.dgn

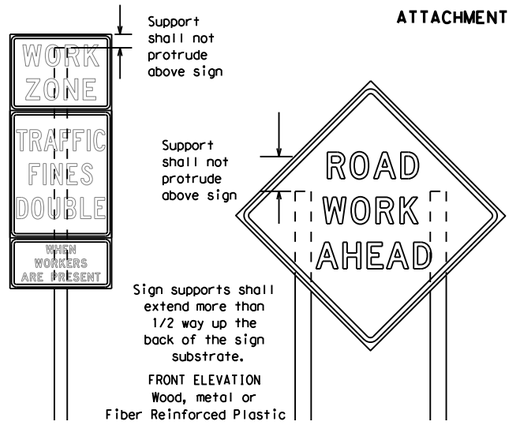
TYPICAL MINIMUM CLEARANCES FOR LONG TERM AND INTERMEDIATE TERM SIGNS

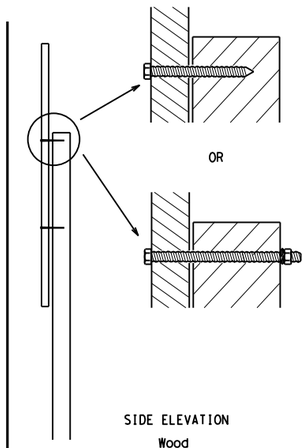


* When placing skid supports on unlevel ground, the leg post lengths must be adjusted so the sign appears straight and plumb. Objects shall NOT be placed under skids as a means of leveling.

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

ATTACHMENT FOR SIGN SUPPORTS





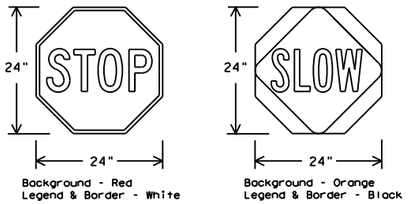
Attachment to wooden supports will be by bolts and nuts or screws. Use TxDOT's or manufacturer's recommended procedures for attaching sign substrates to other types of sign supports

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

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

STOP/SLOW PADDLES

1. STOP/SLOW paddles are the primary method to control traffic by flaggers. The STOP/SLOW paddle size should be 24" x 24".
2. STOP/SLOW paddles shall be retroreflectorized when used at night.
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.



SHEETING REQUIREMENTS (WHEN USED AT NIGHT)		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	RED	TYPE B OR C SHEETING
BACKGROUND	ORANGE	TYPE B_{FL} OR C_{FL} SHEETING
LEGEND & BORDER	WHITE	TYPE B OR C SHEETING
LEGEND & BORDER	BLACK	ACRYLIC NON-REFLECTIVE FILM

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, specific service (LOGO), 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. For details for covering large guide signs see the TS-CD standard.
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 standard sheets, TLRS standard sheets or the CWZTCD list. The signs shall meet the required mounting heights shown on the BC, or the SMD standard sheets 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) for small roadside signs. Supports for temporary large roadside signs shall meet the requirements detailed on the Temporary Large Roadside Signs (TLRS) standard sheets. 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.

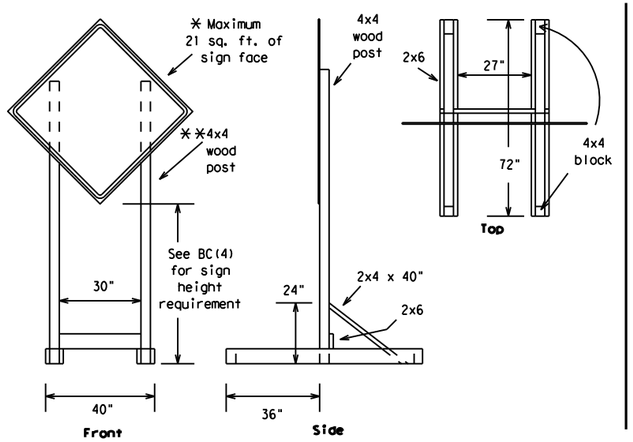
Texas Department of Transportation | Traffic Safety Division Standard

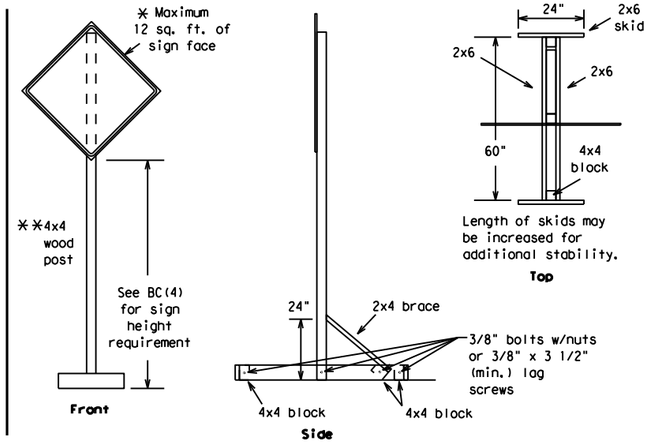
BARRICADE AND CONSTRUCTION TEMPORARY SIGN NOTES

BC(4)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0720	01	044, ETC.	FM 149, ETC.
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	BRYAN	GRIMES		32

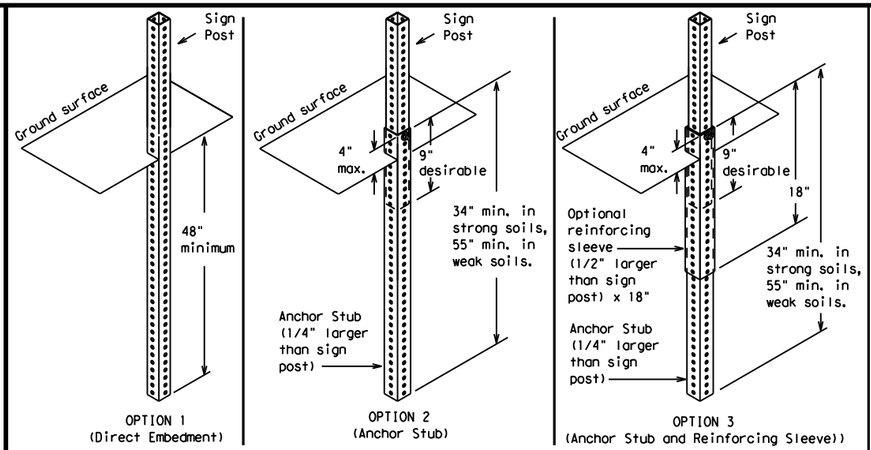
DATE: 4/19/2023 7:33:58 AM
FILE: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY/Design Projects/0720044/4 - Design/Plan Set/8. Traffic/8H. TrafficStandards/BC-21.dgn





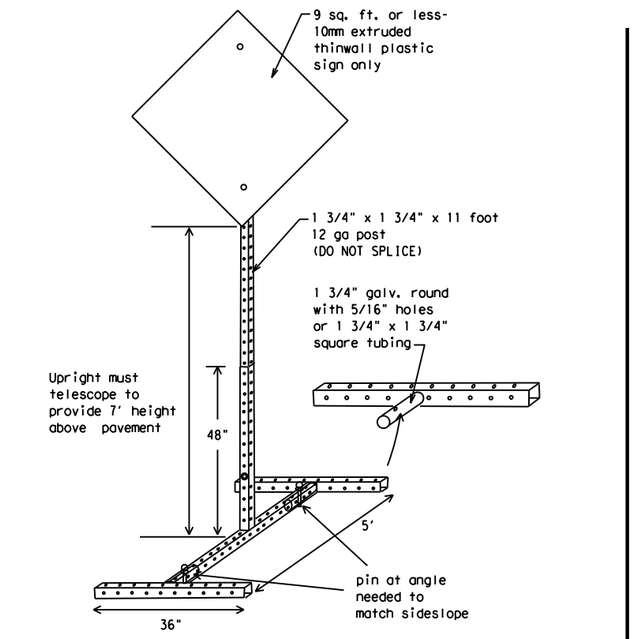
SKID MOUNTED WOOD SIGN SUPPORTS

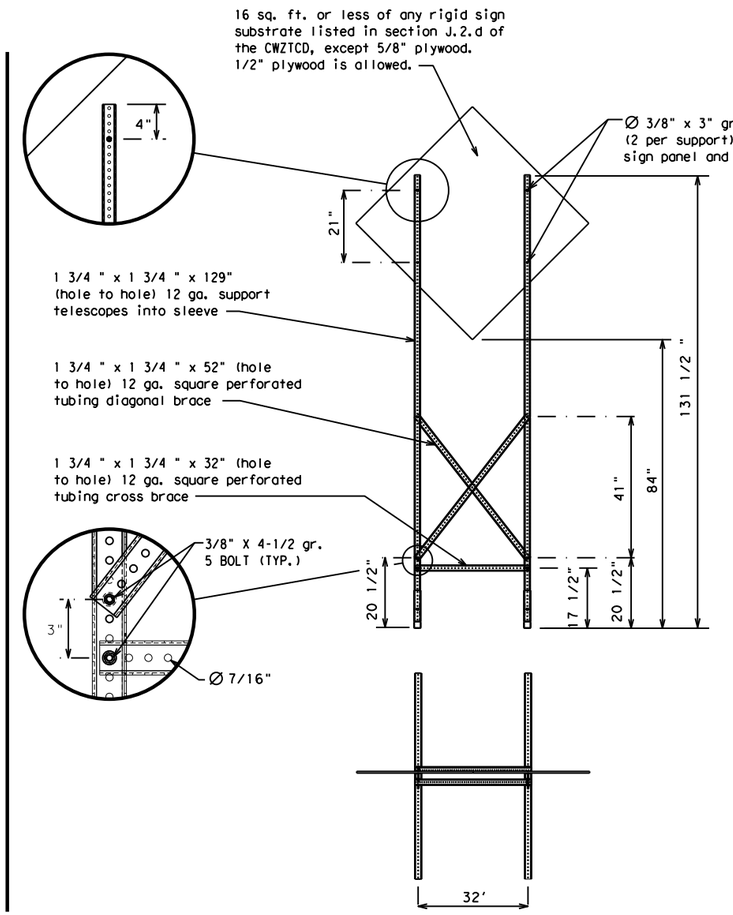
* LONG/INTERMEDIATE TERM STATIONARY - PORTABLE SKID MOUNTED SIGN SUPPORTS

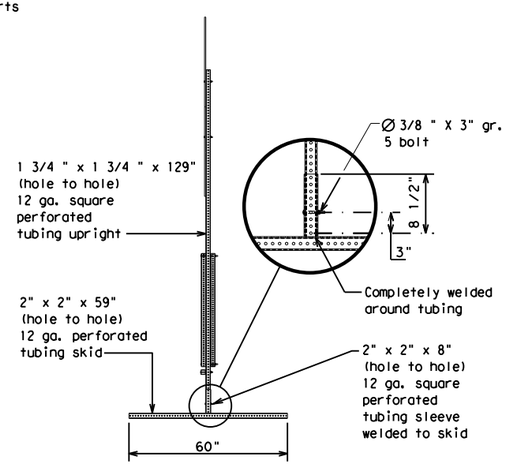


GROUND MOUNTED SIGN SUPPORTS

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







SKID MOUNTED PERFORATED SQUARE STEEL TUBING SIGN SUPPORTS

* LONG/INTERMEDIATE TERM STATIONARY - PORTABLE SKID 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 Safety Division Standard

BARRICADE AND CONSTRUCTION TYPICAL SIGN SUPPORT

BC(5)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0720	01	044, ETC.	FM 149, ETC.
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	BRYAN	GRIMES		33

DATE: 4/19/2023 7:33:59 AM
FILE: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY/Design Projects/0720104/4 - Design/Plan Set/8. Traffic/8H. TrafficStandards/BC-21.dgn

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

PORTABLE CHANGEABLE MESSAGE SIGNS

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

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

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

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

RECOMMENDED PHASES AND FORMATS FOR PCMS MESSAGES DURING ROADWORK ACTIVITIES

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

Phase 1: Condition Lists

Road/Lane/Ramp Closure List		Other Condition List	
FREEWAY CLOSED X MILE	FRONTAGE ROAD CLOSED	ROADWORK XXX FT	ROAD REPAIRS XXXX FT
ROAD CLOSED AT SH XXX	SHOULDER CLOSED XXX FT	FLAGGER XXXX FT	LANE NARROWS XXXX FT
ROAD CLSD AT FM XXXX	RIGHT LN CLOSED XXX FT	RIGHT LN NARROWS XXXX FT	TWO-WAY TRAFFIC XX MILE
RIGHT X LANES CLOSED	RIGHT X LANES OPEN	MERGING TRAFFIC XXXX FT	CONST TRAFFIC XXX FT
CENTER LANE CLOSED	DAYTIME LANE CLOSURES	LOOSE GRAVEL XXXX FT	UNEVEN LANES XXXX FT
NIGHT LANE CLOSURES	I-XX SOUTH EXIT CLOSED	DETOUR X MILE	ROUGH ROAD XXXX FT
VARIOUS LANES CLOSED	EXIT XXX CLOSED X MILE	ROADWORK PAST SH XXXX	ROADWORK NEXT FRI-SUN
EXIT CLOSED	RIGHT LN TO BE CLOSED	BUMP XXXX FT	US XXX EXIT X MILES
MALL DRIVEWAY CLOSED	X LANES CLOSED TUE - FRI	TRAFFIC SIGNAL XXXX FT	LANES SHIFT *
XXXXXXXX BLVD CLOSED			

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

Phase 2: Possible Component Lists

Action to Take/Effect on Travel List		Location List	Warning List	** Advance Notice List
MERGE RIGHT	FORM X LINES RIGHT	AT FM XXXX	SPEED LIMIT XX MPH	TUE-FRI XX AM- X PM
DETOUR NEXT X EXITS	USE XXXXX RD EXIT	BEFORE RAILROAD CROSSING	MAXIMUM SPEED XX MPH	APR XX-XX X PM-X AM
USE EXIT XXX	USE EXIT I-XX NORTH	NEXT X MILES	MINIMUM SPEED XX MPH	BEGINS MONDAY
STAY ON US XXX SOUTH	USE I-XX E TO I-XX N	PAST US XXX EXIT	ADVISORY SPEED XX MPH	BEGINS MAY XX
TRUCKS USE US XXX N	WATCH FOR TRUCKS	XXXXXXX TO XXXXXXX	RIGHT LANE EXIT	MAY X-X XX PM - XX AM
WATCH FOR TRUCKS	EXPECT DELAYS	US XXX TO FM XXXX	USE CAUTION	NEXT FRI-SUN
EXPECT DELAYS	PREPARE TO STOP		DRIVE SAFELY	XX AM TO XX PM
REDUCE SPEED XXX FT	END SHOULDER USE		DRIVE WITH CARE	NEXT TUE AUG XX
USE OTHER ROUTES	WATCH FOR WORKERS			TONIGHT XX PM- XX AM
STAY IN LANE *				

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

** See Application Guidelines Note 6.

APPLICATION GUIDELINES

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

WORDING ALTERNATIVES

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

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

FULL MATRIX PCMS SIGNS

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

Texas Department of Transportation — Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)

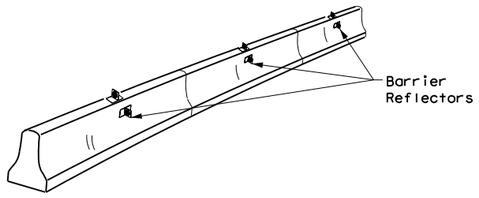
BC(6)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0720	01	044, ETC.	FM 149, ETC.
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	BRYAN	GRIMES		34

100

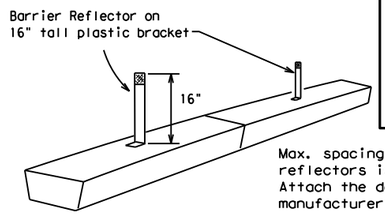
DATE: 4/19/2023 7:33:59 AM
FILE: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY/Design Projects/072001044/4 - Design/Plan Set/8. Traffic/8H. TrafficStandards/BC-21.dgn

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.

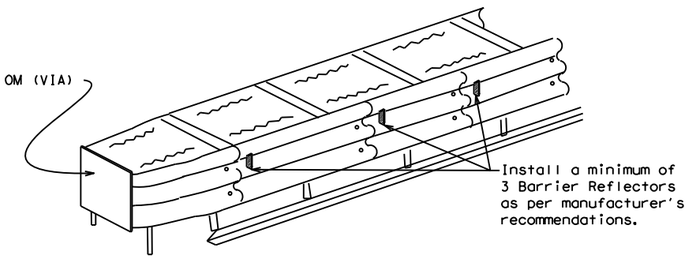


Max. spacing of barrier reflectors is 20 feet. Attach the delineators as per manufacturer's recommendations.

LOW PROFILE CONCRETE BARRIER (LPCB) USED IN WORK ZONES

LPCB is approved for use in work zone locations, where the posted speed is 45mph, or less. See Roadway Standard Sheet LPCB.

LOW PROFILE CONCRETE BARRIER (LPCB)

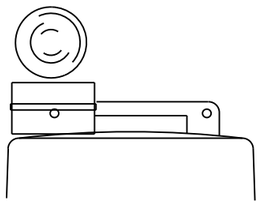


DELINEATION OF END TREATMENTS

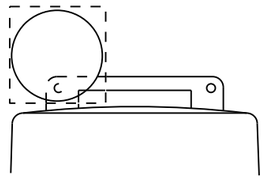
END TREATMENTS FOR CTB'S USED IN WORK ZONES

End treatments used on CTB's in work zones shall meet the apppropriate crashworthy standards as defined in the Manual for Assessing Safety Hardware (MASH). Refer to the CWZTCD List for approved end treatments and manufacturers.

BARRIER REFLECTORS FOR CONCRETE TRAFFIC BARRIER AND ATTENUATORS



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



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

WARNING LIGHTS

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

WARNING LIGHTS MOUNTED ON PLASTIC DRUMS

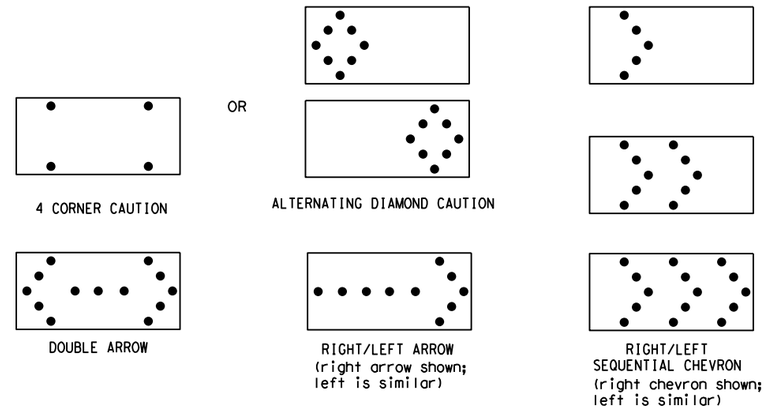
1. Type A flashing warning lights are intended to warn drivers that they are approaching or are in a potentially hazardous area.
2. Type A random flashing warning lights are not intended for delineation and shall not be used in a series.
3. A series of sequential flashing warning lights placed on channelizing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

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

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

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

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



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

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

ATTENTION

Flashing Arrow Boards shall be equipped with automatic dimming devices.

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

FLASHING ARROW BOARDS

TRUCK-MOUNTED ATTENUATORS

1. Truck-mounted attenuators (TMA) used on TxDOT facilities must meet the requirements outlined in the 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 Safety Division Standard

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

BC(7)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0720	01	044, ETC.	FM 149, ETC.
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	BRYAN	GRIMES		35

DATE: 4/19/2023 7:34:00 AM
FILE: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY/Design Projects/0720010044/4 - Design/Plan Set/8. Traffic/8H. TrafficStandards/BC-21.dgn

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:

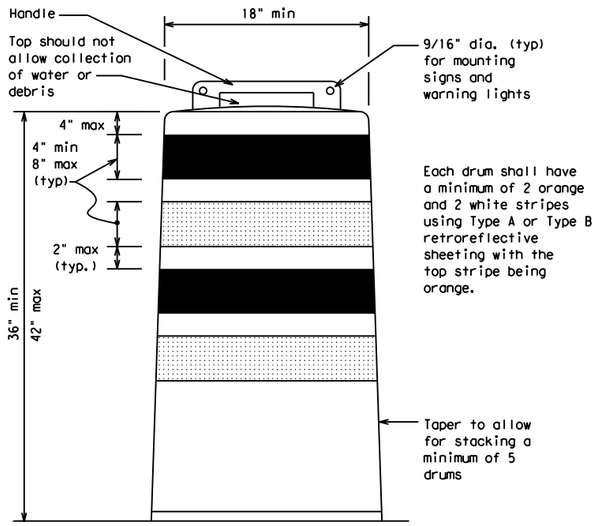
1. Plastic drums shall be a two-piece design; the "body" of the drum shall be the top portion and the "base" shall be the bottom.
2. The body and base shall lock together in such a manner that the body separates from the base when impacted by a vehicle traveling at a speed of 20 MPH or greater but prevents 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.

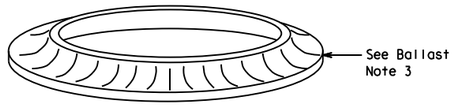
RETROREFLECTIVE SHEETING

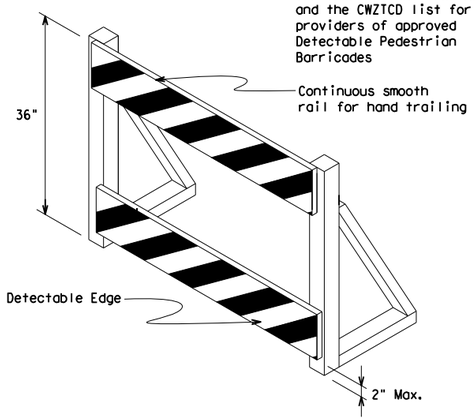
1. The stripes used on drums shall be constructed of sheeting meeting the color and retroreflectivity requirements of Departmental Materials Specification DMS-8300, "Sign Face Materials," Type A or Type B reflective sheeting shall be supplied unless otherwise specified in the plans.
2. The sheeting shall 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.

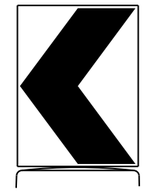




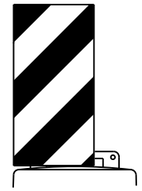


DETECTABLE PEDESTRIAN BARRICADES

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. Refer to WZ(BTS-2) for Pedestrian Control requirements for Sidewalk Diversions, Sidewalk Detours and Crosswalk Closures.
2. Where pedestrians with visual disabilities normally use the closed sidewalk, a Detectable Pedestrian Barricade shall be placed across the full width of the closed sidewalk instead of a Type 3 Barricade.
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 (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 should 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 or Type B. Diagonal stripes on Vertical Panels shall slope down toward the intended traveled lane.
4. Other sign messages (text or symbolic) may be used as approved by the Engineer. Sign dimensions shall not exceed 18 inches in width or 24 inches in height, except for the R9 series signs discussed in note 8 below.
5. Signs shall be installed using a 1/2 inch bolt (nominal) and nut, two washers, and one locking washer for each connection.
6. Mounting bolts and nuts shall be fully engaged and adequately torqued. Bolts should not extend more than 1/2 inch beyond nuts.
7. Chevrons may be placed on drums on the outside of curves, on merging tapers or on shifting tapers. When used in these locations, they may be placed on every drum or spaced not more than on every third drum. A minimum of three (3) should be used at each location called for in the plans.
8. R9-9, R9-10, R9-11 and R9-11a Sidewalk Closed signs which are 24 inches wide may be mounted on plastic drums, with approval of the Engineer.

Texas Department of Transportation | Traffic Safety Division Standard

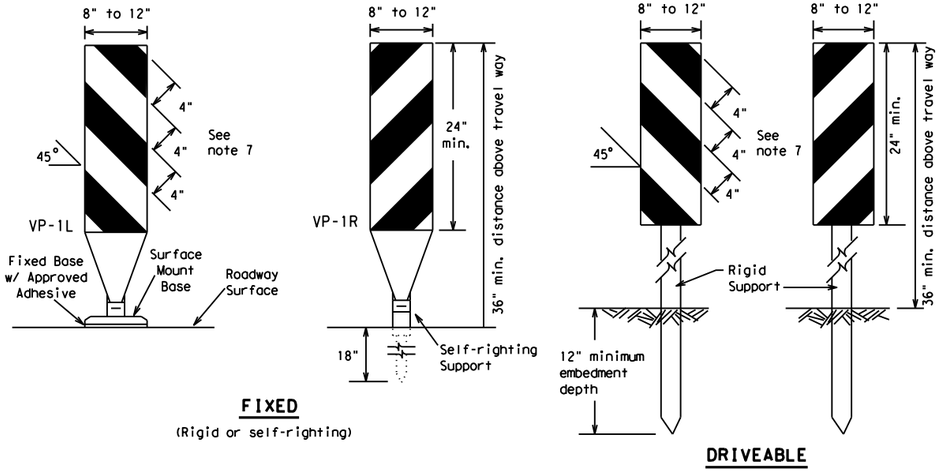
BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(8)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0720	01	044, ETC.	FM 149, ETC.
4-03 8-14	DIST	COUNTY		SHEET NO.
9-07 5-21	BRYAN	GRIMES		36
7-13				

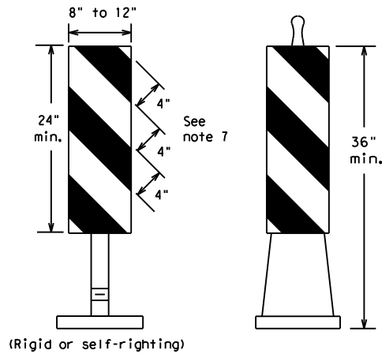
102

DATE: 4/19/2023 7:34:00 AM
FILE: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY/Design Projects/072001044/4 - Design/Plan Set/8. Traffic/8H. TrafficStandards/BC-21.dgn



FIXED
(Rigid or self-righting)

DRIVEABLE

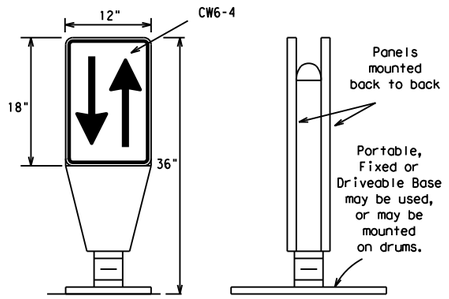


(Rigid or self-righting)

PORTABLE

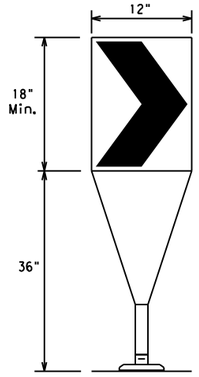
1. Vertical Panels (VP's) are normally used to channelize traffic or divide opposing lanes of traffic.
2. VP's may be used in daytime or nighttime situations. They may be used at the edge of shoulder drop-offs and other areas such as lane transitions where positive daytime and nighttime delineation is required. The Engineer/Inspector shall refer to the Roadway Design Manual for additional requirements on the use 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 or Type B 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)



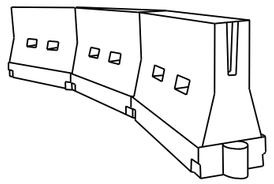
Fixed Base w/ Approved Adhesive (Driveable Base, or Flexible Support can be used)

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

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

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

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

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

SUGGESTED MAXIMUM SPACING OF CHANNELIZING DEVICES AND MINIMUM DESIRABLE TAPER LENGTHS

SHEET 9 OF 12

Texas Department of Transportation | Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(9)-21

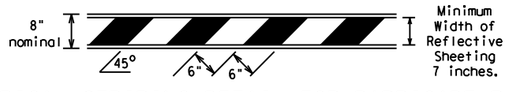
FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0720	01	044, ETC.	FM 149, ETC.
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	BRYAN	GRIMES		37

DATE: 4/19/2023 7:34:00 AM
FILE: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY/Design Projects/0720010441/4 - Design/Plan Set/8. Traffic/8H. TrafficStandards/BC-21.dgn

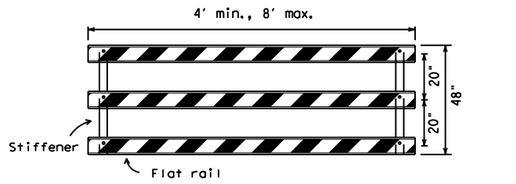
TYPE 3 BARRICADES

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 or Type B conforming to Departmental Material Specification DMS-8300 unless otherwise noted.

Barricades shall NOT be used as a sign support.



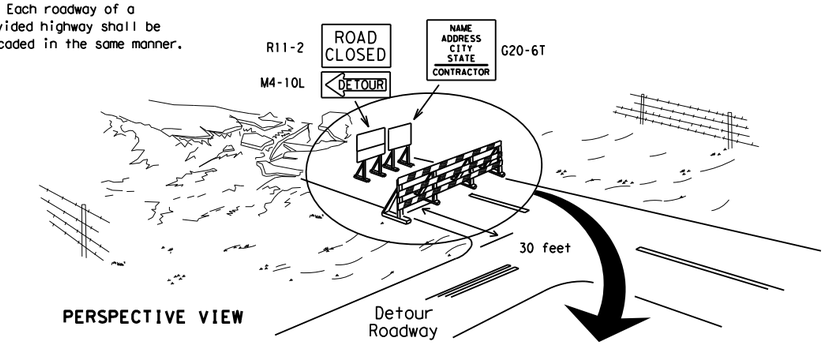
TYPICAL STRIPING DETAIL FOR BARRICADE RAIL



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

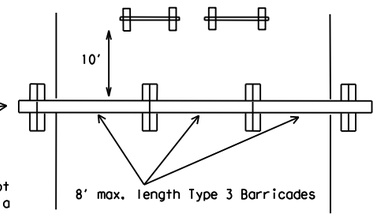
TYPICAL PANEL DETAIL FOR SKID OR POST TYPE BARRICADES

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



PERSPECTIVE VIEW

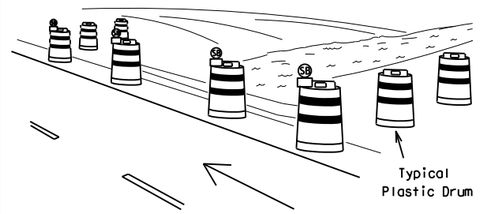
The three rails on Type 3 barricades shall be reflectorized orange and reflective white stripes on one side facing one-way traffic and both sides for two-way traffic.
Barricade striping should slant downward in the direction of detour.



PLAN VIEW

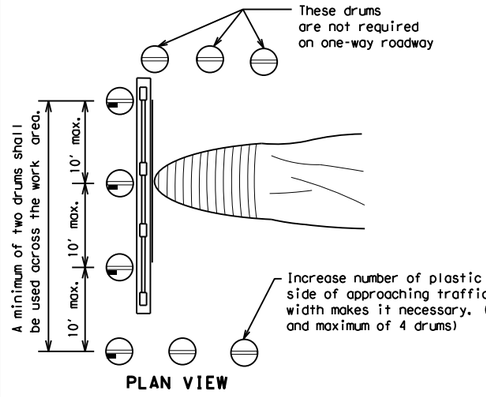
1. Signs should be mounted on independent supports at a 7 foot mounting height in center of roadway. The signs should be a minimum of 10 feet behind Type 3 Barricades.
2. Advance signing shall be as specified elsewhere in the plans.

TYPE 3 BARRICADE (POST AND SKID) TYPICAL APPLICATION



PERSPECTIVE VIEW

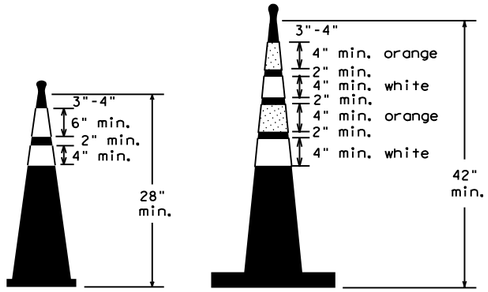
1. Where positive redirectional capability is provided, drums may be omitted.
2. Plastic construction fencing may be used with drums for safety as required in the plans.
3. Vertical Panels on flexible support may be substituted for drums when the shoulder width is less than 4 feet.
4. When the shoulder 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

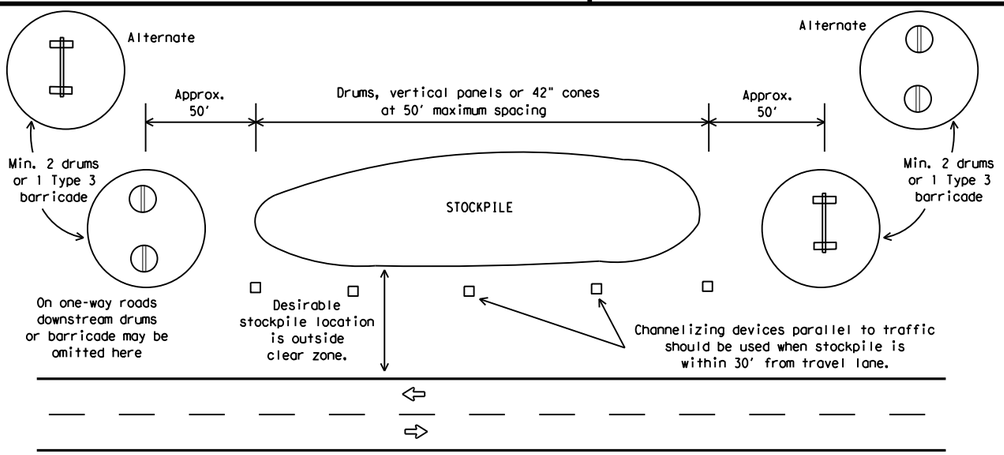
PLAN VIEW

CULVERT WIDENING OR OTHER ISOLATED WORK WITHIN THE PROJECT LIMITS



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 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 or Type B.
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

SHEET 10 OF 12

Texas Department of Transportation | Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(10)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0720	01	044, ETC.	FM 149, ETC.
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	BRYAN	GRIMES		38

104

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.

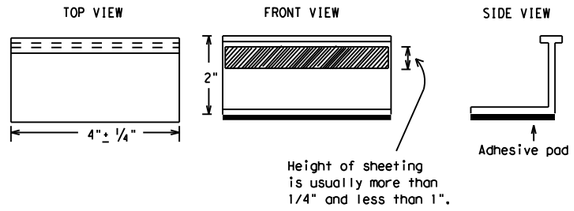
MAINTAINING WORK ZONE PAVEMENT MARKINGS

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 Safety Division Standard

BARRICADE AND CONSTRUCTION PAVEMENT MARKINGS

BC(11)-21

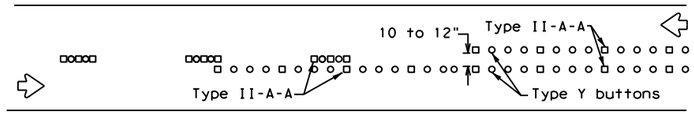
FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 1998	CONT	SECT	JOB	HIGHWAY
REVISIONS	0720	01	044, ETC.	FM 149, ETC.
2-98 9-07 5-21	DIST	COUNTY		SHEET NO.
1-02 7-13	BRYAN	GRIMES		39
11-02 8-14				

105

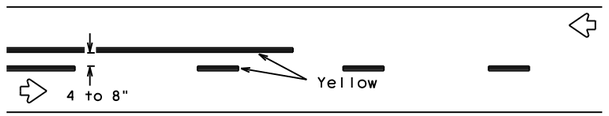
DATE: 4/19/2023 7:34:01 AM
FILE: pw:\\txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY/Design Projects/0720010044/4 - Design/Plan Set/8. Traffic/8H. TrafficStandards/BC-21.dgn

PAVEMENT MARKING PATTERNS

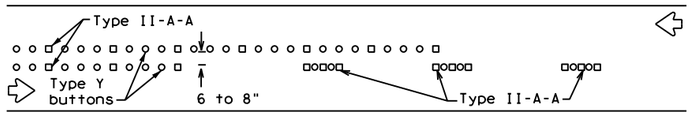
REFLECTORIZED PAVEMENT MARKINGS - PATTERN A



RAISED PAVEMENT MARKERS - PATTERN A



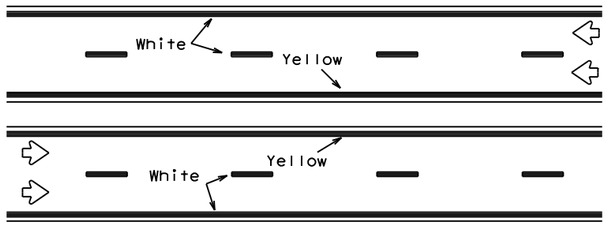
REFLECTORIZED PAVEMENT MARKINGS - PATTERN B



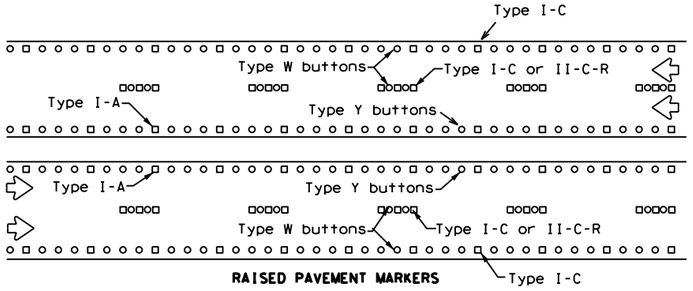
RAISED PAVEMENT MARKERS - PATTERN B

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



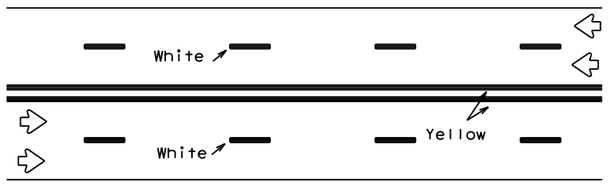
REFLECTORIZED PAVEMENT MARKINGS



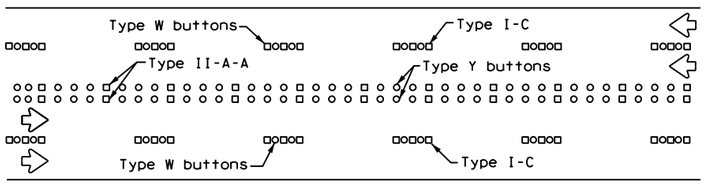
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

EDGE & LANE LINES FOR DIVIDED HIGHWAY



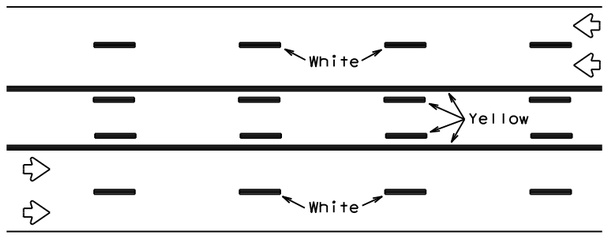
REFLECTORIZED PAVEMENT MARKINGS



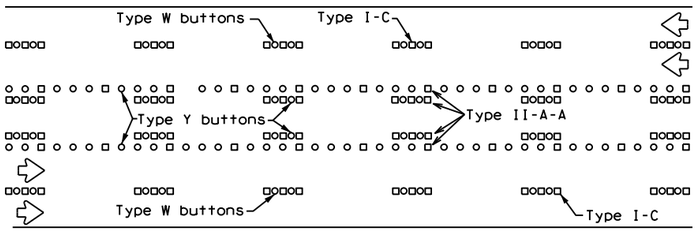
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS



REFLECTORIZED PAVEMENT MARKINGS



RAISED PAVEMENT MARKERS

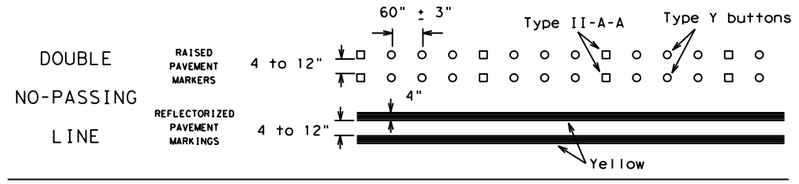
Prefabricated markings may be substituted for reflectorized pavement markings.

TWO-WAY LEFT TURN LANE

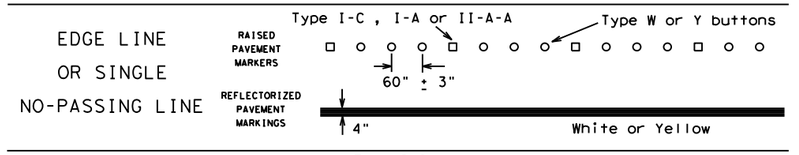
STANDARD WORK ZONE PAVEMENT MARKINGS DETAILS

SOLID LINES

DOUBLE NO-PASSING LINE

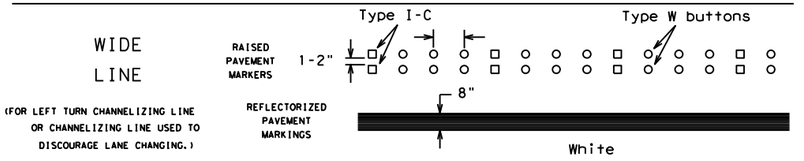


EDGE LINE OR SINGLE NO-PASSING LINE



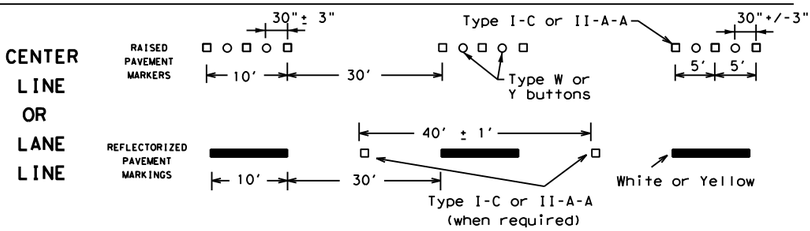
WIDE LINE

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

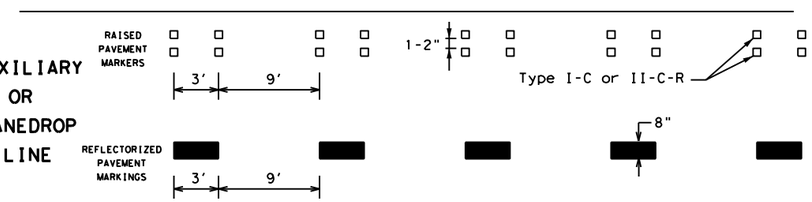


BROKEN LINES

CENTER LINE OR LANE LINE

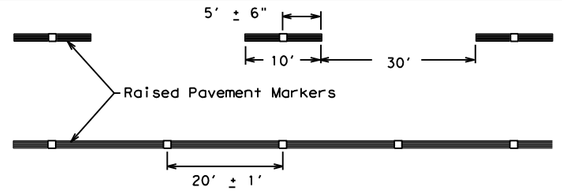


AUXILIARY OR LANEDROP LINE



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

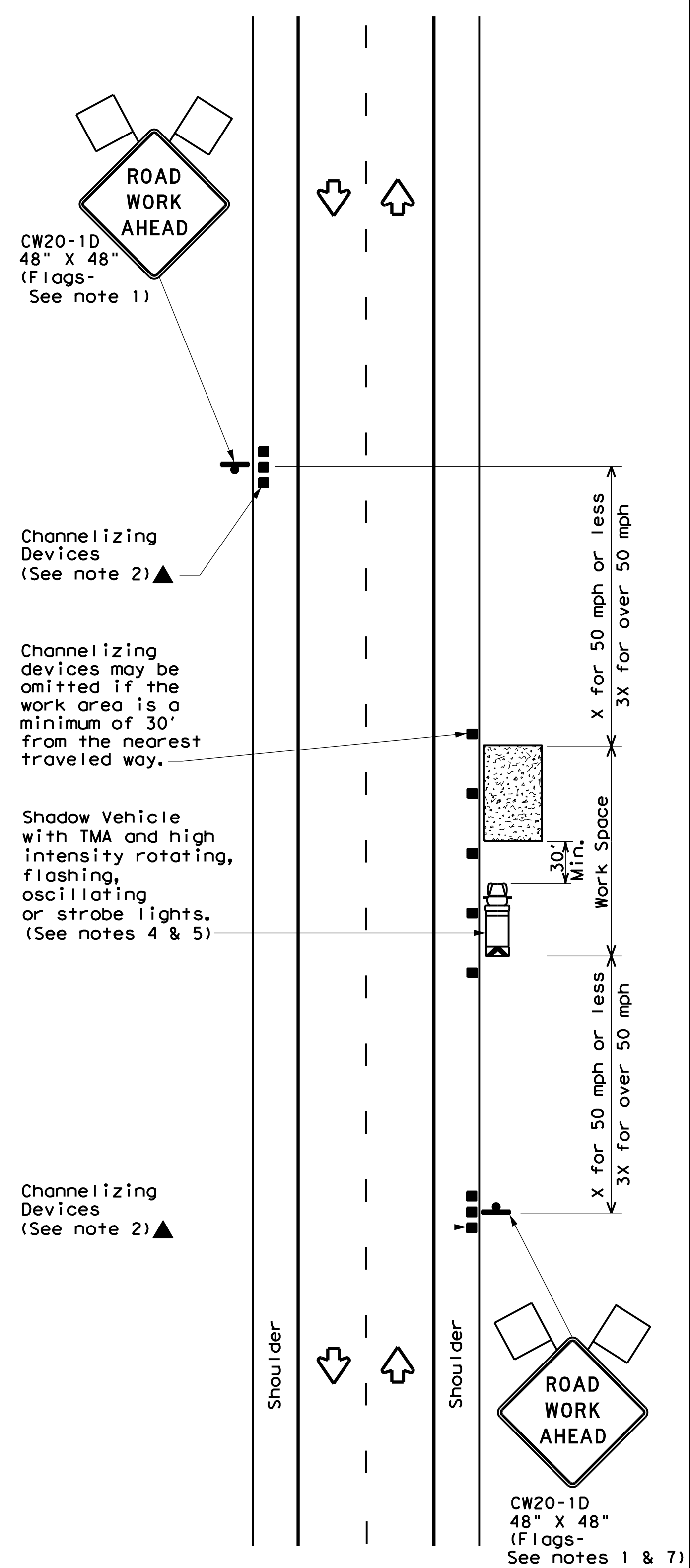
Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION PAVEMENT MARKING PATTERNS

BC(12)-21

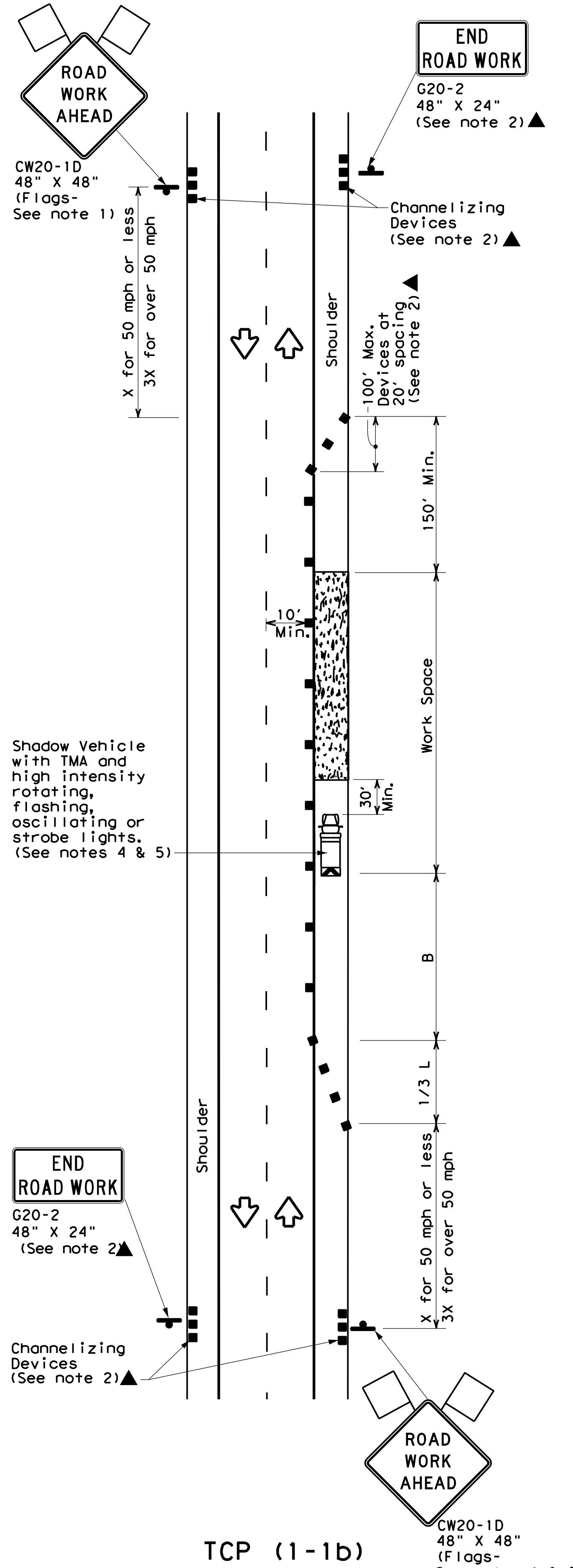
FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT February 1998	CONT	SECT	JOB	HIGHWAY
REVISIONS 1-97 9-07 5-21 2-98 7-13 11-02 8-14	0720	01	044, ETC.	FM 149, ETC.
	DIST	COUNTY		SHEET NO.
	BRYAN	GRIMES		40

106



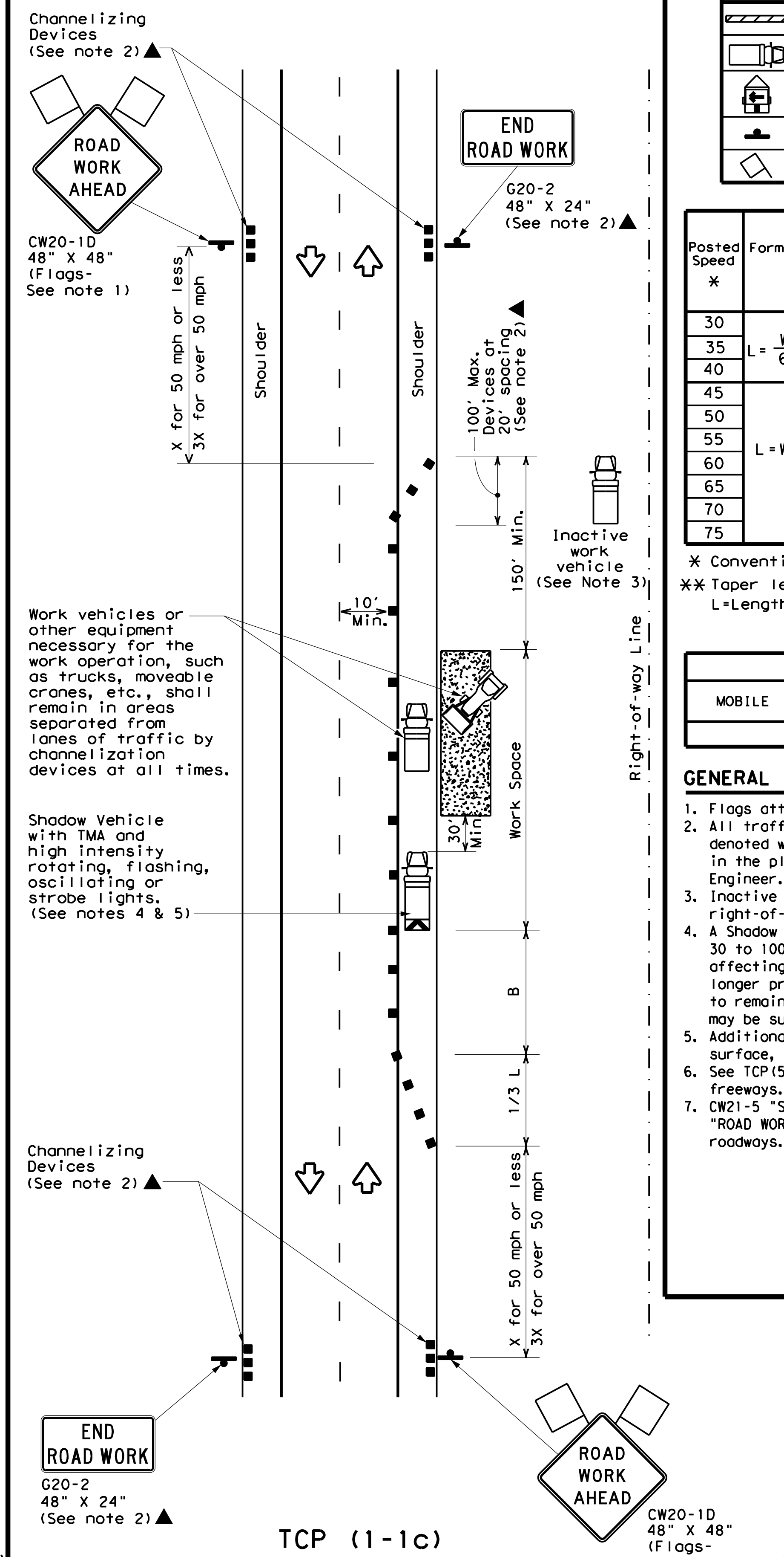
TCP (1-1a)

WORK SPACE NEAR SHOULDER
Conventional Roads



TCP (1-1b)

WORK SPACE ON SHOULDER
Conventional Roads



TCP (1-1c)

WORK VEHICLES ON SHOULDER
Conventional Roads

LEGEND

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

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

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

TYPICAL USAGE

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

GENERAL NOTES

1. Flags attached to signs where shown are REQUIRED.
2. All traffic control devices illustrated are REQUIRED, except those denoted with the triangle symbol may be omitted when stated elsewhere in the plans, or for routine maintenance work, when approved by the Engineer.
3. Inactive work vehicles or other equipment should be parked near the right-of-way line and not parked on the paved shoulder.
4. A Shadow Vehicle with a TMA should be used anytime it can be positioned 30 to 100 feet in advance of the area of crew exposure without adversely affecting the performance or quality of the work. If workers are no longer present but road or work conditions require the traffic control to remain in place, Type 3 Barricades or other channelizing devices may be substituted for the Shadow Vehicle and TMA.
5. Additional Shadow Vehicles with TMAs may be positioned off the paved surface, next to those shown in order to protect wider work spaces.
6. See TCP(5-1)for shoulder work on divided highways, expressways and freeways.
7. CW21-5 "SHOULDER WORK" signs may be used in place of CW20-1D "ROAD WORK AHEAD" signs for shoulder work on conventional roadways.

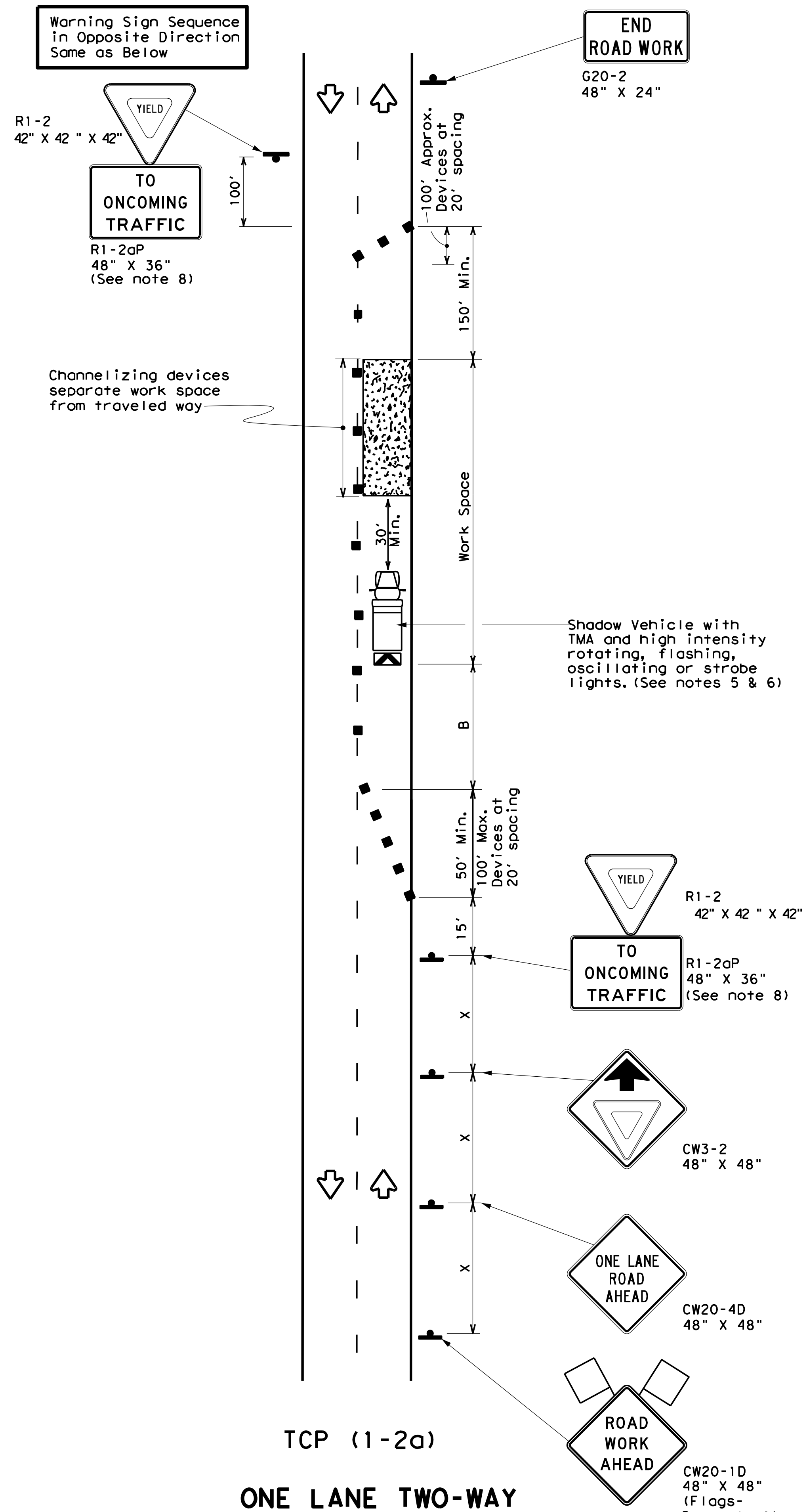
Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN CONVENTIONAL ROAD SHOULDER WORK

TCP(1-1)-18

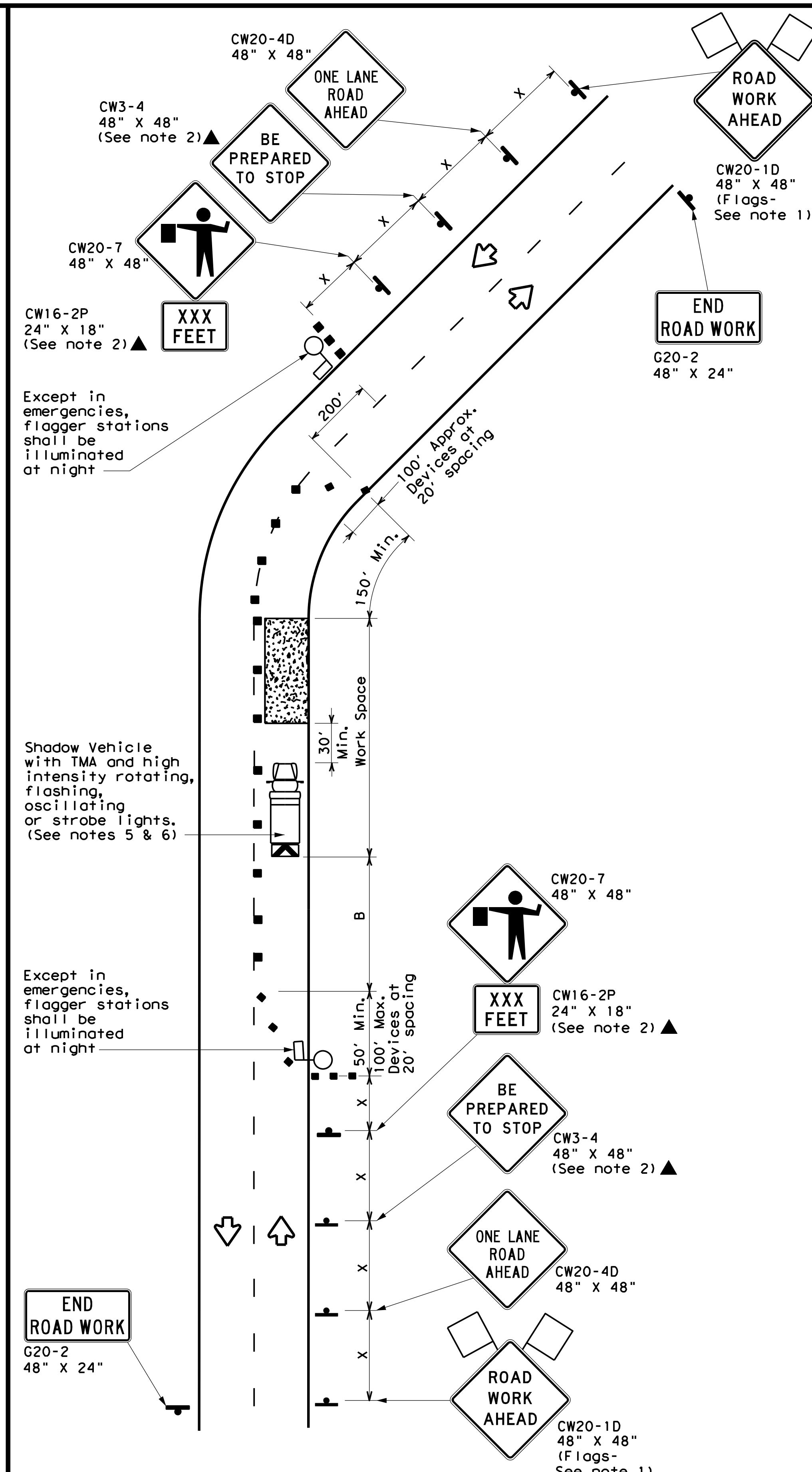
FILE: tcp1-1-18.dgn	DN:	CK:	DW:	CK:
© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS 2-94 4-98 8-95 2-12 1-97 2-18	0720	01	044, ETC.	FM 149, ETC.
	DIST	COUNTY		SHEET NO.
	BRYAN	GRIMES		41



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

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

Posted Speed *	Formula	Minimum Desirable Taper Lengths **			Suggested Maximum Spacing of Channelizing Devices		Minimum Sign Spacing "X" Distance	Suggested Longitudinal Buffer Space "B"	Stopping Sight Distance
		10' Offset	11' Offset	12' Offset	On a Taper	On a Tangent			
30	$L = \frac{WS^2}{60}$	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

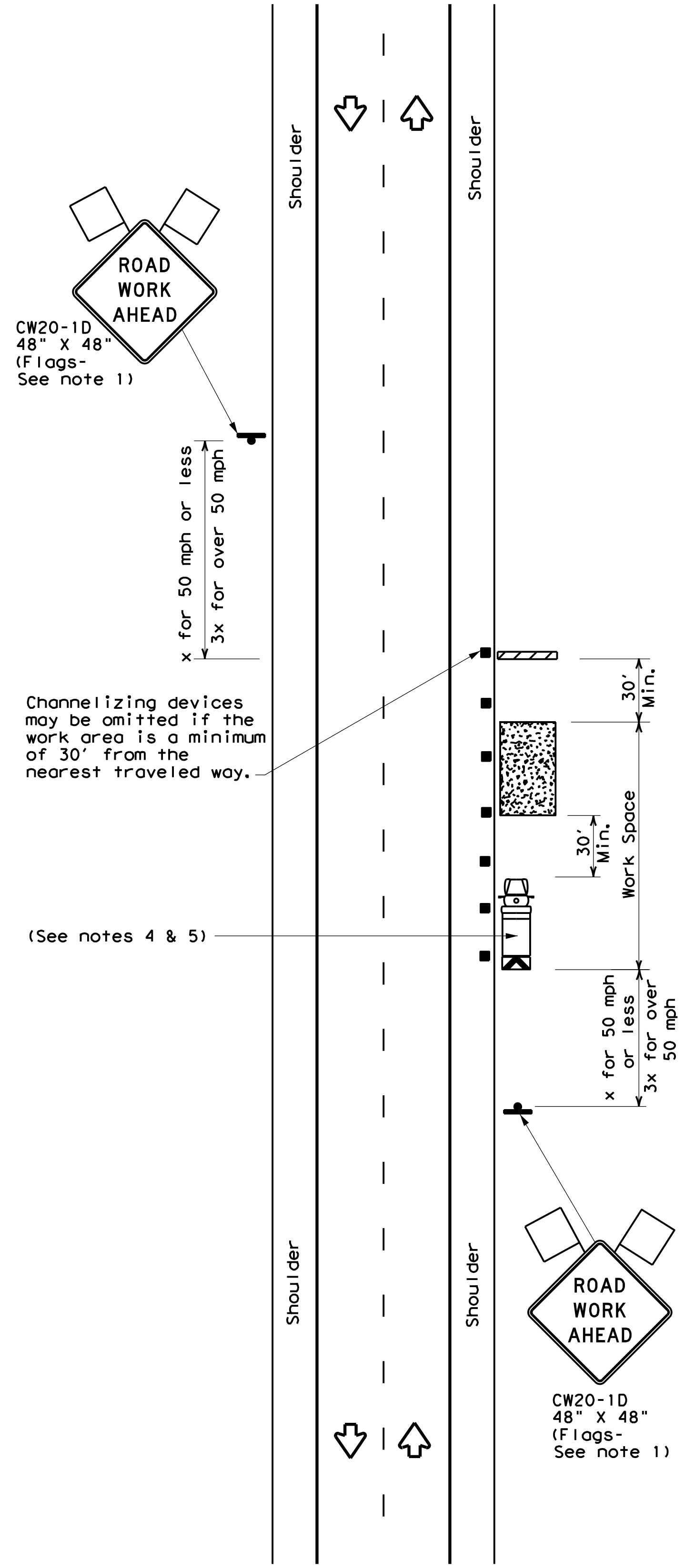
TCP(1-2)-18

FILE: tcp1-2-18.dgn	DN:	CK:	DW:	CK:

CONT	SECT	JOB	HIGHWAY
0720	01	044, ETC.	FM 149, ETC.

DIST	COUNTY	SHEET NO.
BRYAN	GRIMES	42

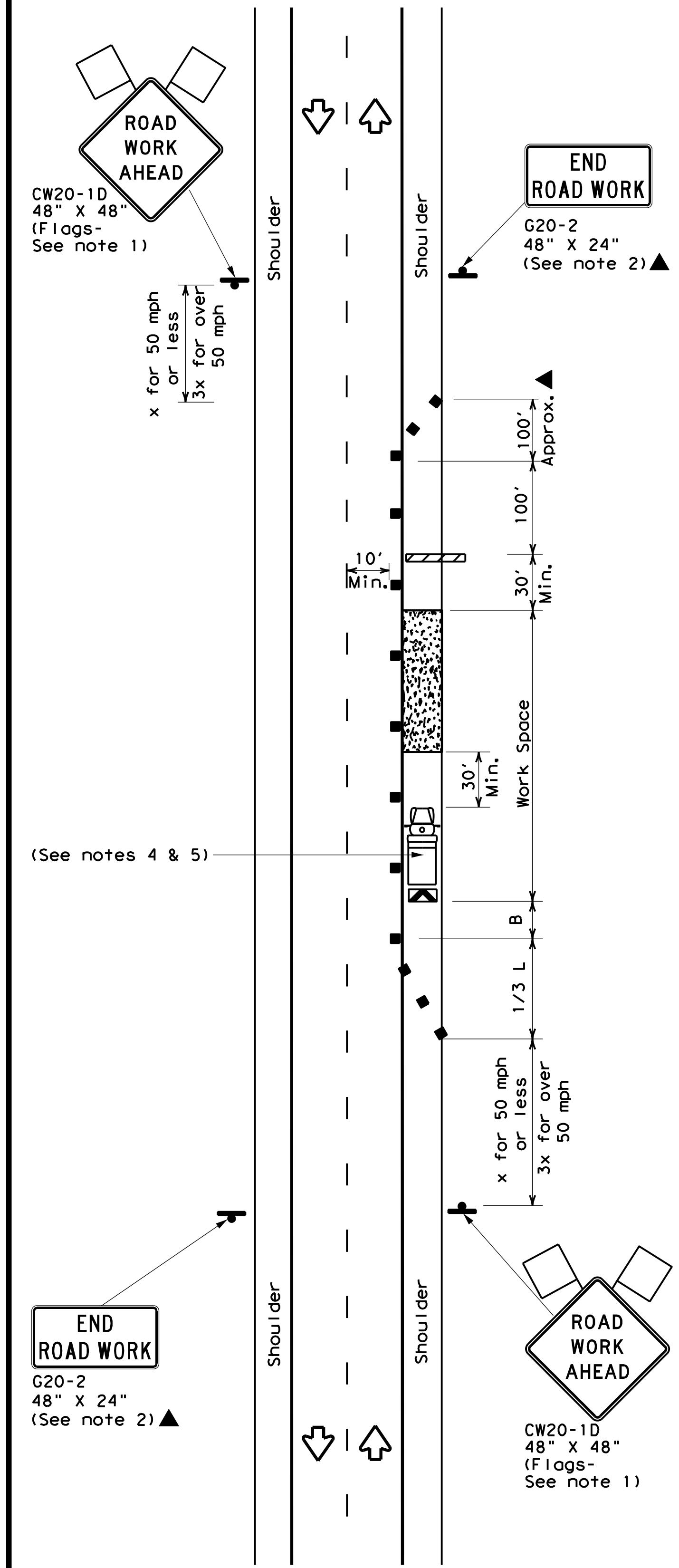
REVISIONS: 4-90, 4-98, 2-94, 2-12, 1-97, 2-18



TCP (2-1a)

WORK SPACE NEAR SHOULDER

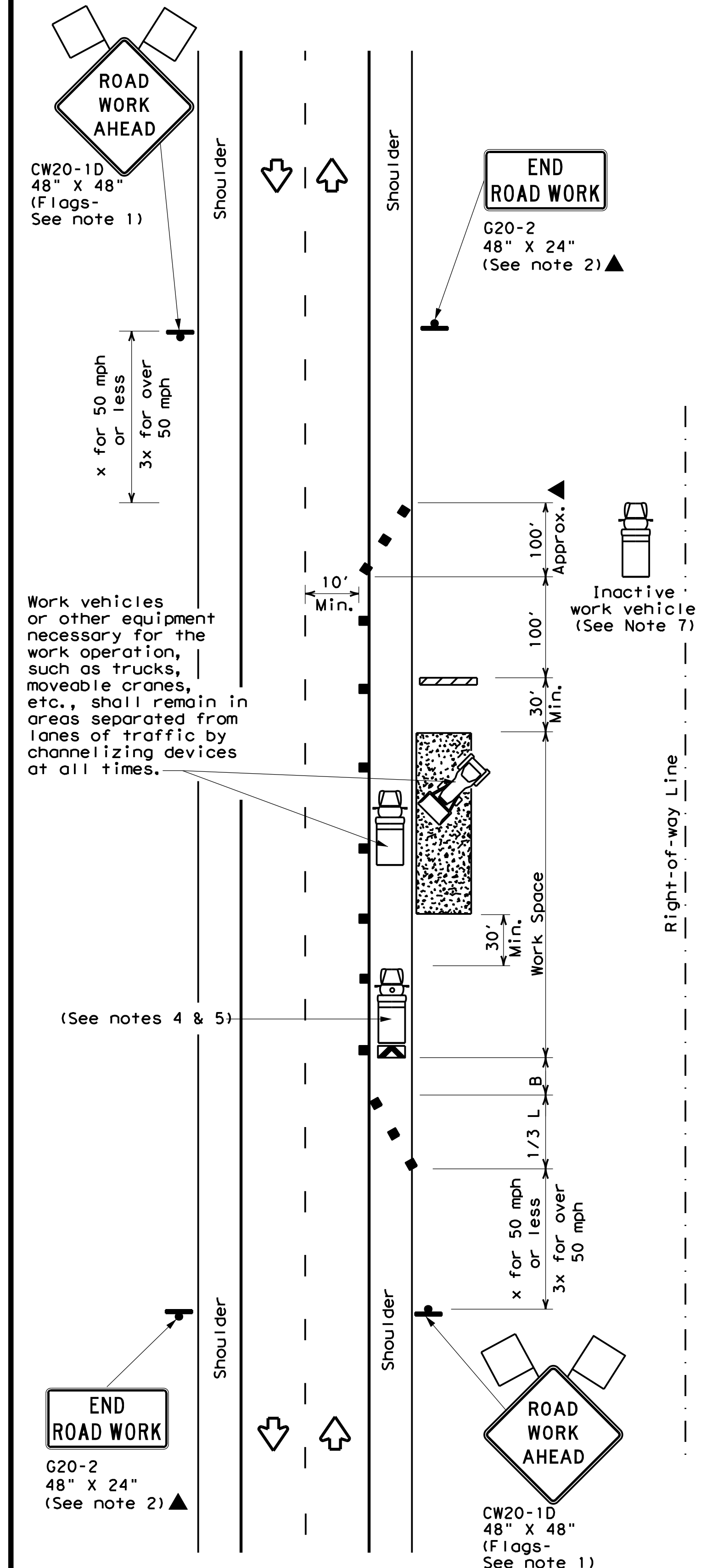
Conventional Roads



TCP (2-1b)

WORK SPACE ON SHOULDER

Conventional Roads



TCP (2-1c)

WORK VEHICLES ON SHOULDER

Conventional Roads

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

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

* Conventional Roads Only

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

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

GENERAL NOTES

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 CW20-1D "ROAD WORK AHEAD" signs for shoulder work on conventional roadways.

Texas Department of Transportation

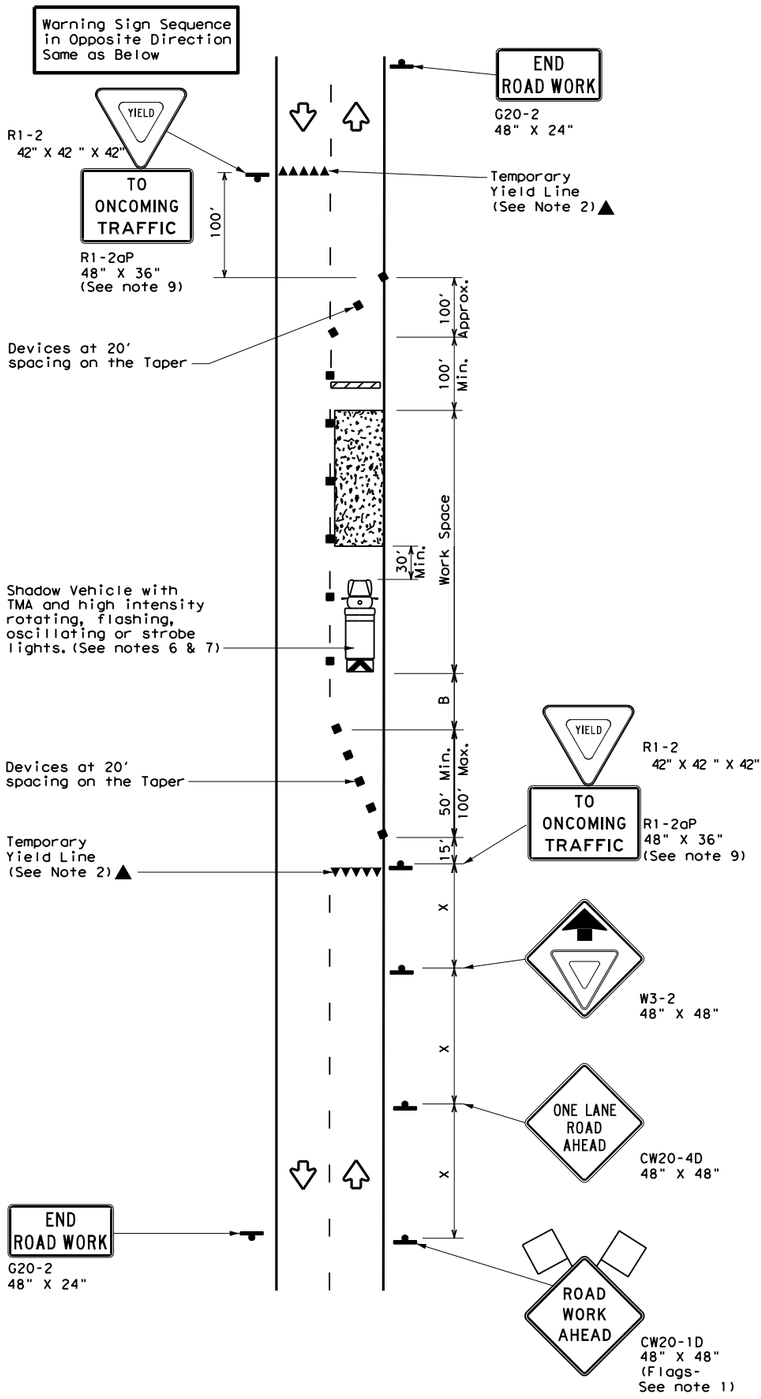
Traffic Operations Division Standard

TRAFFIC CONTROL PLAN CONVENTIONAL ROAD SHOULDER WORK

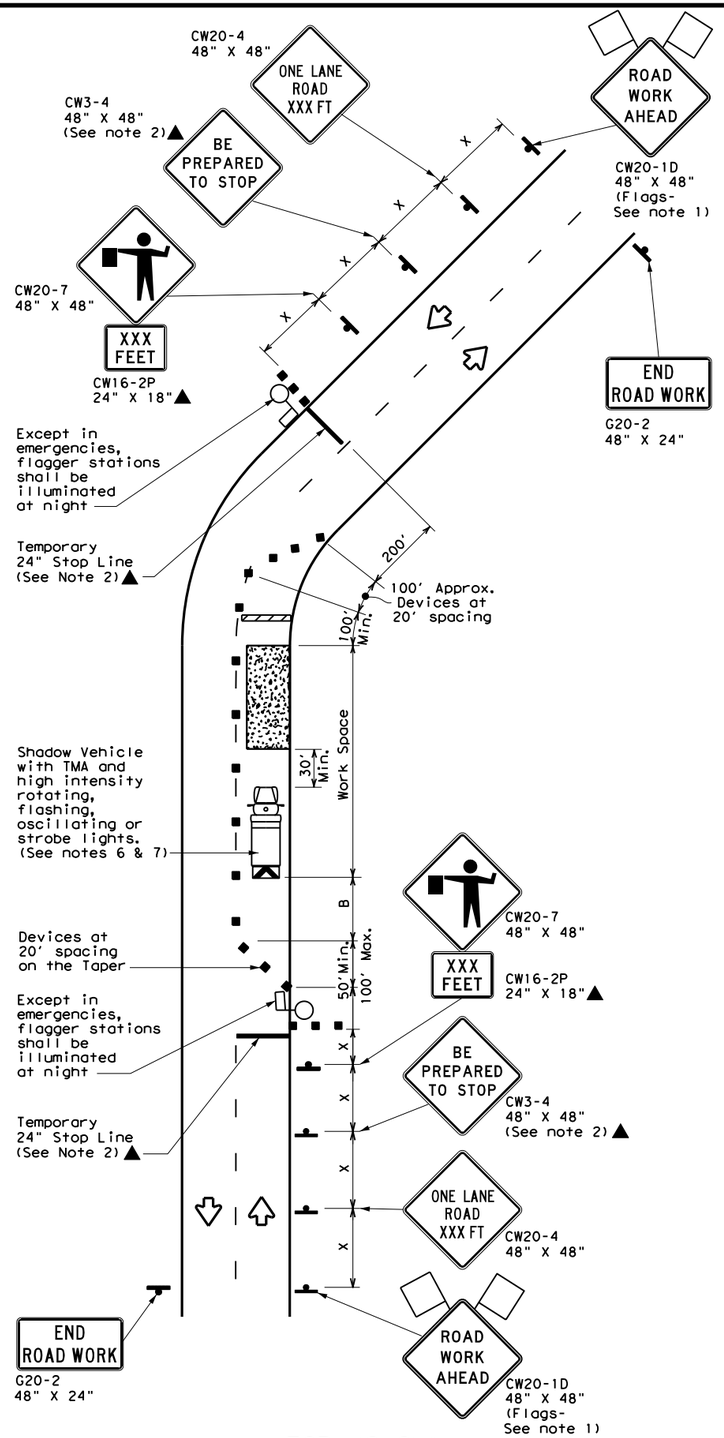
TCP(2-1)-18

FILE: tcp2-1-18.dgn		DN:	CK:	DW:	CK:
© TxDOT December 1985		CONT	SECT	JOB	HIGHWAY
REVISIONS 2-94 4-98 8-95 2-12 1-97 2-18		0720	01	044, ETC.	FM 149, ETC.
		DIST		COUNTY	SHEET NO.
		BRYAN		GRIMES	43

DATE: 4/19/2023 7:35:01 AM
FILE: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY/Design Projects/TCP(2-2)-18.dgn



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.

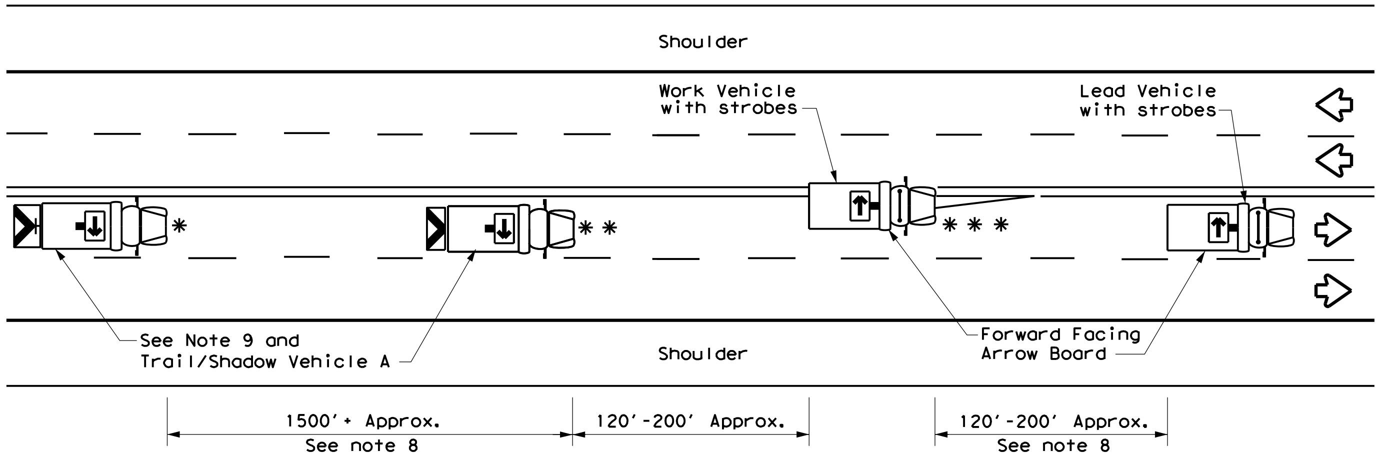
Texas Department of Transportation
Traffic Operations Division Standard

TRAFFIC CONTROL PLAN
ONE-LANE TWO-WAY
TRAFFIC CONTROL

TCP(2-2)-18

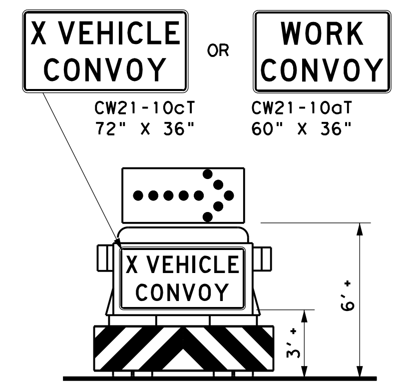
FILE: tcp2-2-18.dgn	DN:	CK:	DW:	CK:
©TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS 8-95 3-03 1-97 2-12 4-98 2-18	0720	01	044, ETC.	FM 149, ETC.
	DIST	COUNTY		SHEET NO.
	BRYAN	GRIMES		44

DATE: 4/19/2023 7:35:16 AM
FILE: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY/Design Projects/...



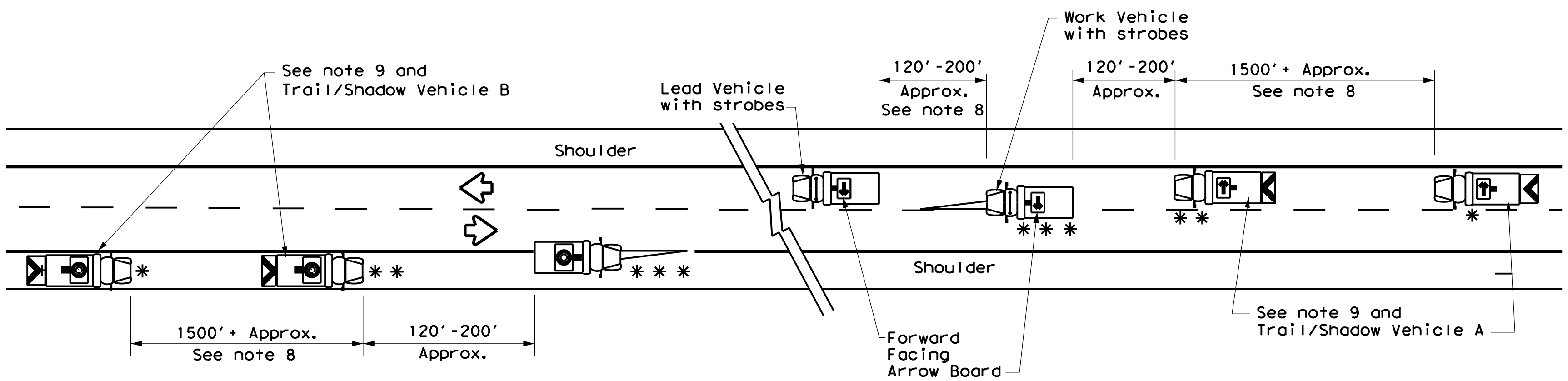
TCP (3-1a)

UNDIVIDED MULTILANE ROADWAY



TRAIL/SHADOW VEHICLE A

with RIGHT Directional display Flashing Arrow Board

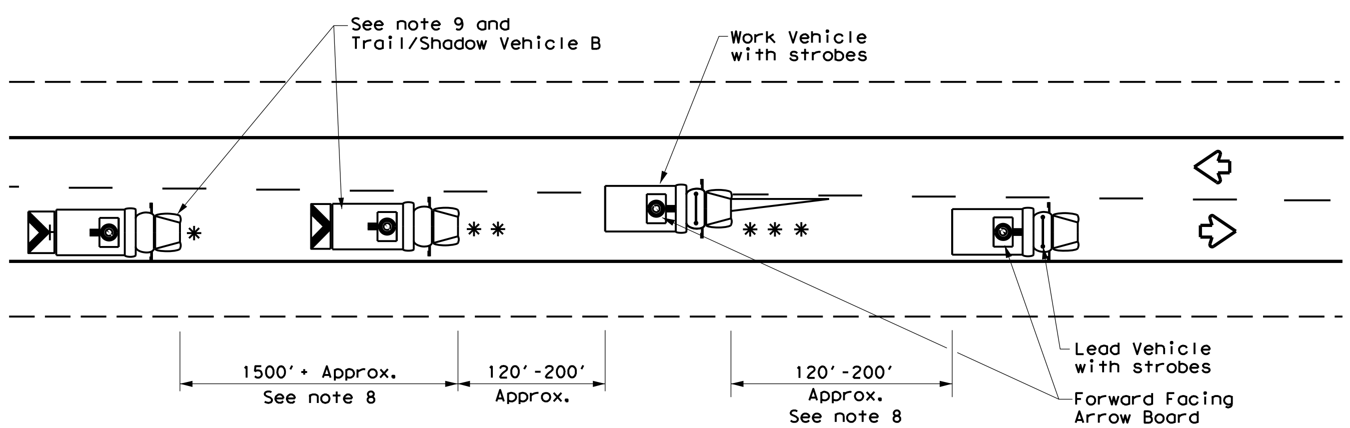


WORK ON SHOULDER

WORK ON TRAVEL LANE

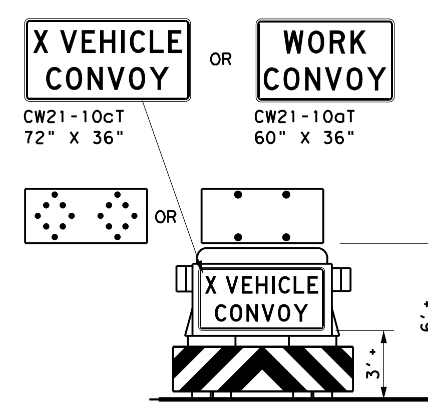
TCP (3-1b)

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

Symbol	Description	Symbol	ARROW BOARD DISPLAY
*	Trail Vehicle		
**	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.

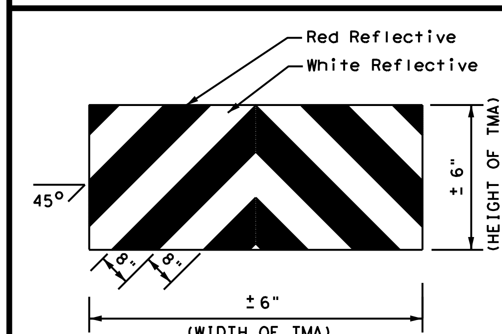
6. Each vehicle shall have two-way radio communication capability.

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

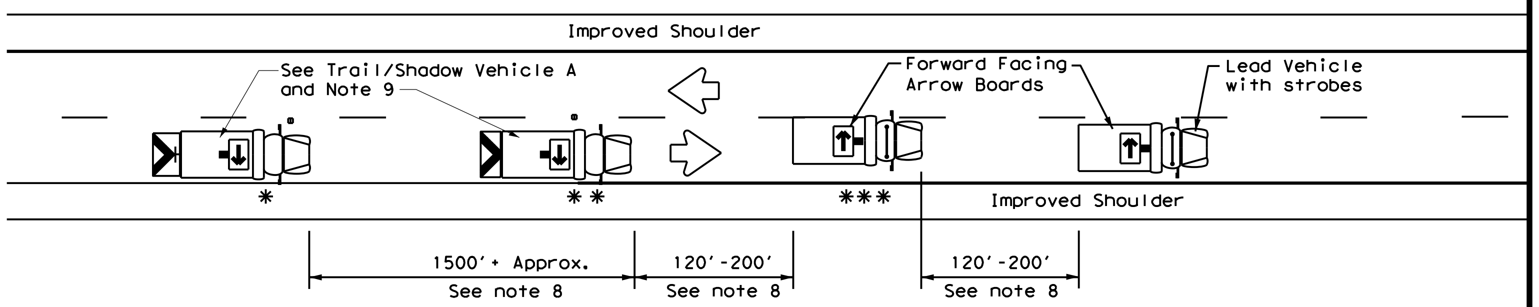
Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN MOBILE OPERATIONS UNDIVIDED HIGHWAYS

TCP(3-1)-13

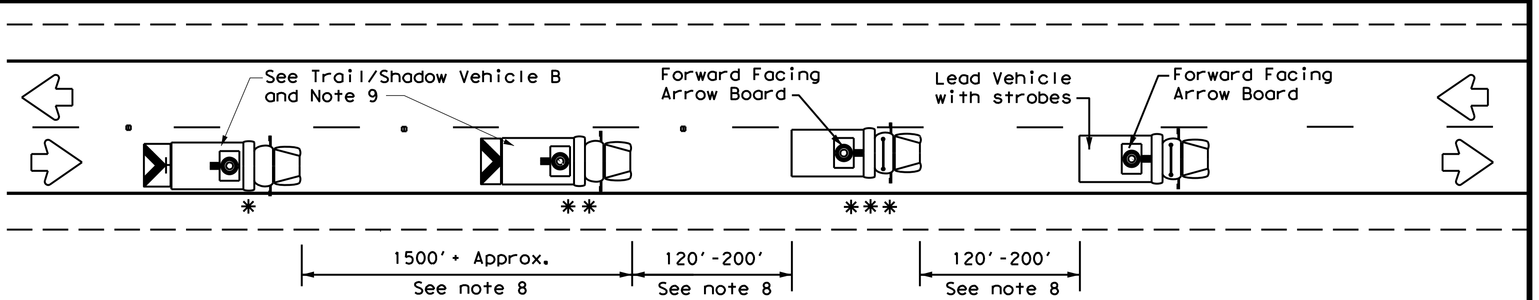
FILE: tcp3-1.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS 2-94 4-98 8-95 7-13 1-97	0720	01	044, ETC.	FM 149, ETC.
	DIST		COUNTY	SHEET NO.
	BRYAN		GRIMES	45



TCP (3-3a)

TWO LANE HIGHWAY WITH PAVED SHOULDERS

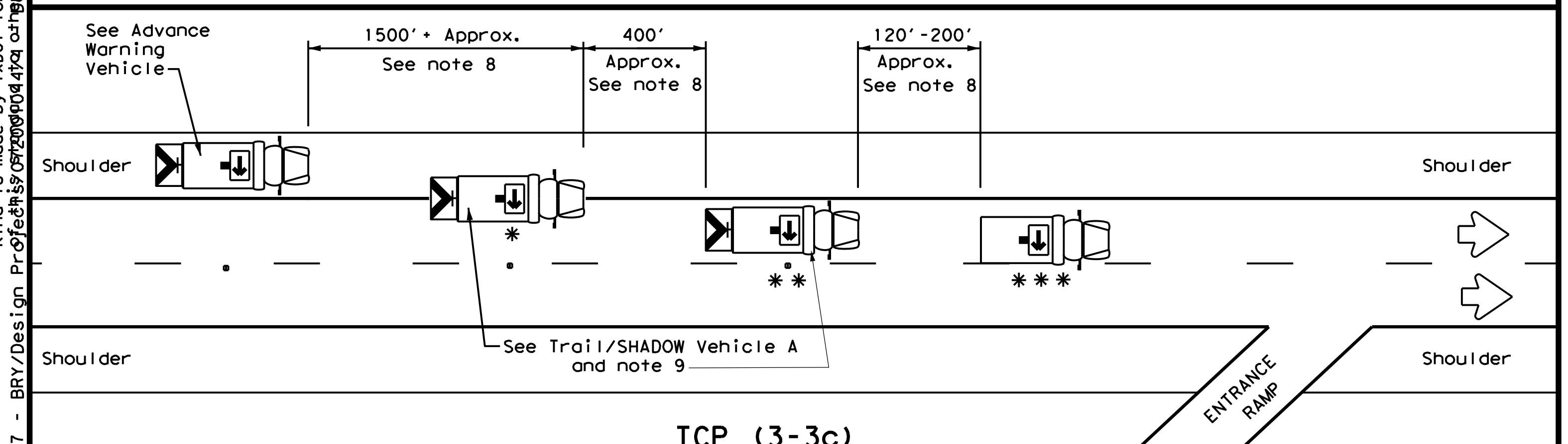
(WORK ON TRAVEL LANE)



TCP (3-3b)

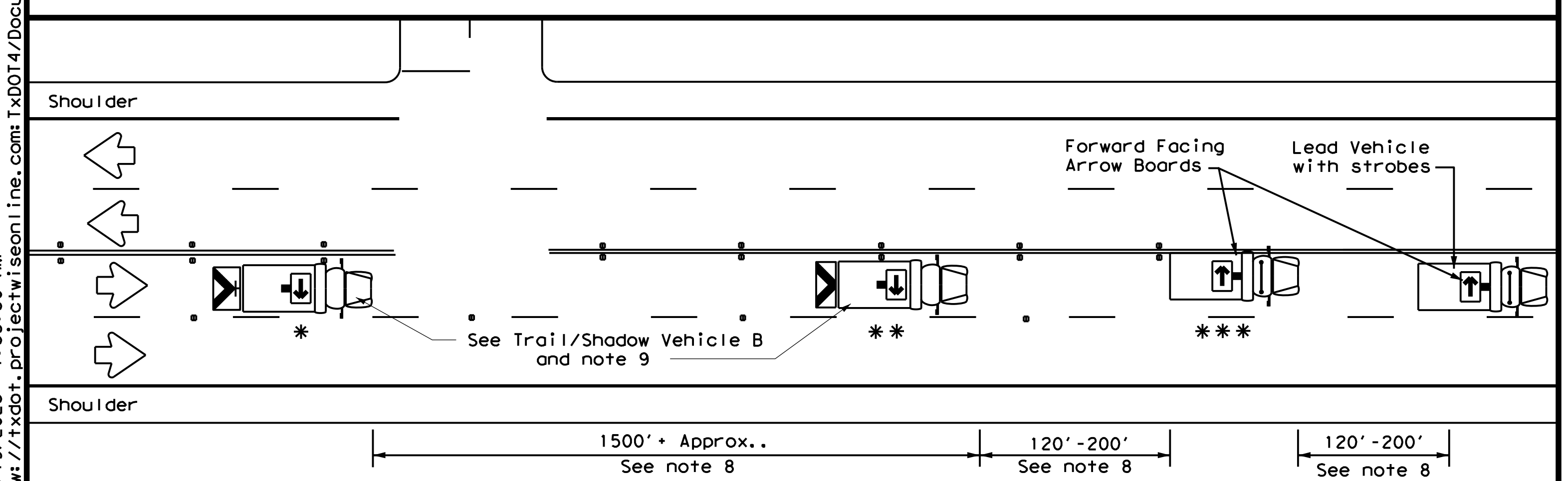
TWO LANE HIGHWAY WITHOUT PAVED SHOULDERS

(WORK ON TRAVEL LANE)



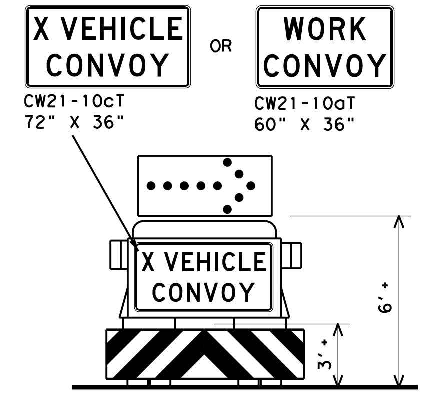
TCP (3-3c)

DIVIDED MULTILANE HIGHWAY



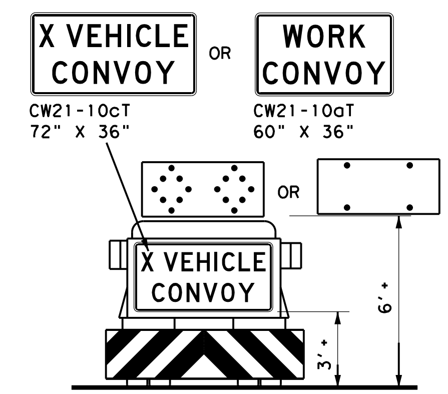
TCP (3-3d)

UNDIVIDED MULTILANE HIGHWAY



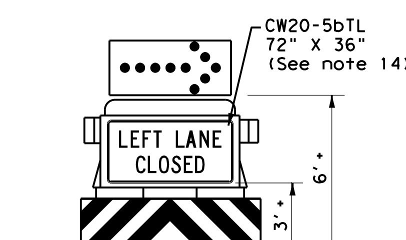
TRAIL/SHADOW VEHICLE A

with RIGHT Directional display Flashing Arrow Board

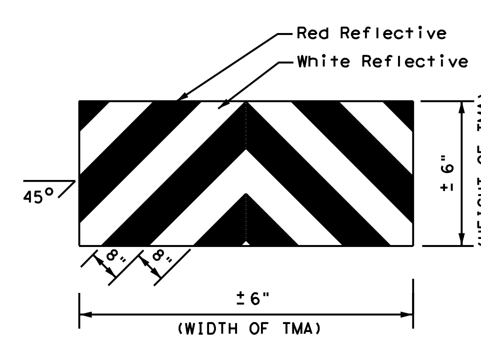


TRAIL/SHADOW VEHICLE B

with Flashing Arrow Board in Caution Mode



ADVANCE WARNING VEHICLE



STRIPING FOR TMA

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

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

GENERAL NOTES

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

Texas Department of Transportation

Traffic Operations Division Standard

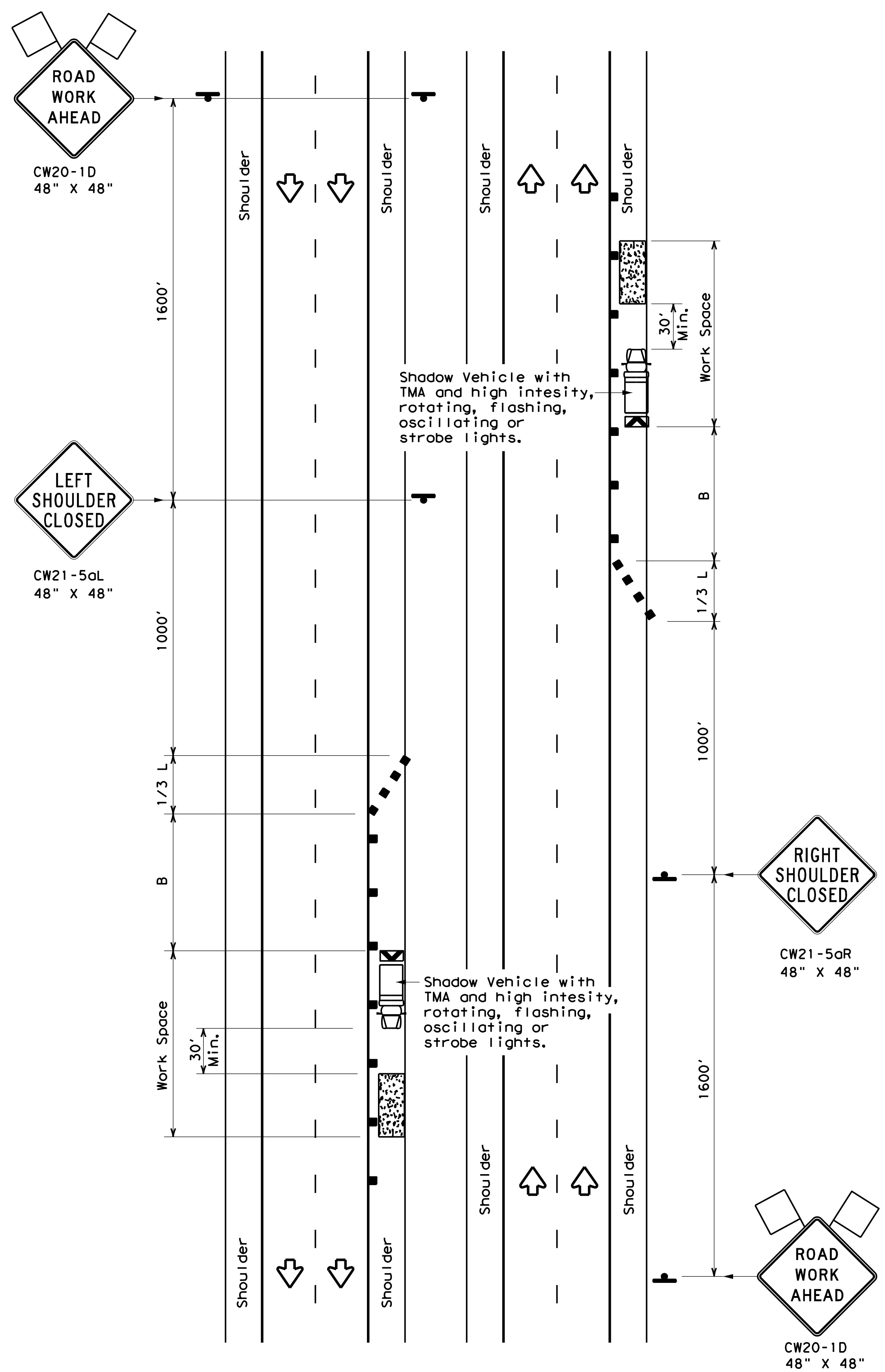
TRAFFIC CONTROL PLAN MOBILE OPERATIONS RAISED PAVEMENT MARKER INSTALLATION/ REMOVAL

TCP(3-3)-14

FILE: tcp3-3.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT September 1987	CONT	SECT	JOB	HIGHWAY
REVISIONS	0720	01	044, ETC.	FM 149, ETC.
2-94 4-98 / 8-95 7-13 / 1-97 7-14	DIST		COUNTY	SHEET NO.
	BRYAN		GRIMES	46

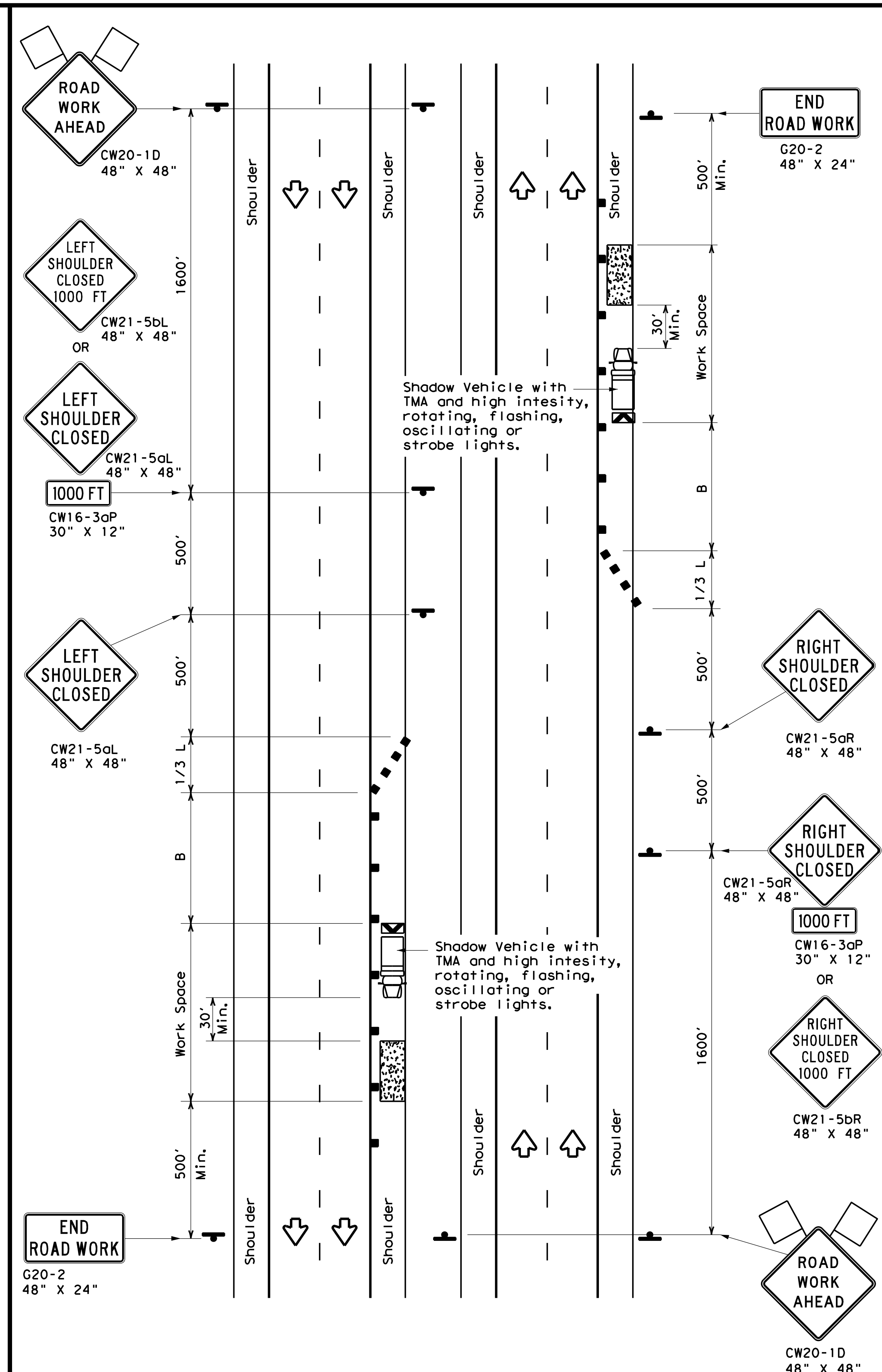
DATE: 4/19/2023 7:35:30 AM
FILE: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY/Design Projects/0720...

DATE: 4/19/2023 7:35:45 AM
FILE: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY/Design Projects/[illegible]



TCP (5-1a)

WORK AREA ON SHOULDER



TCP (5-1b)

WORK AREA ON SHOULDER

LEGEND

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

Posted Speed *	Formula	Minimum Desirable Taper Lengths ** 10' Offset	11' Offset	12' Offset	Suggested Maximum Spacing of Channelizing Devices On a Taper	On a Tangent	Suggested Longitudinal Buffer Space "B"
30	$L = \frac{WS^2}{60}$	150'	165'	180'	30'	60'	90'
35		205'	225'	245'	35'	70'	120'
40		265'	295'	320'	40'	80'	155'
45	L = WS	450'	495'	540'	45'	90'	195'
50		500'	550'	600'	50'	100'	240'
55		550'	605'	660'	55'	110'	295'
60		600'	660'	720'	60'	120'	350'
65		650'	715'	780'	65'	130'	410'
70		700'	770'	840'	70'	140'	475'
75		750'	825'	900'	75'	150'	540'
80		800'	880'	960'	80'	160'	615'

* 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(5-1a)	TCP(5-1b)	TCP(5-1b)	

GENERAL NOTES

1. A Shadow Vehicle with a TMA should be used anytime it can be positioned 30' to 100' in advance of the area of crew exposure without adversely effecting the performance or quality of the work. Type 3 barricades or drums may be substituted when workers on foot are no longer present when approved by the Engineer.

2. 28" tall or taller one-piece cones will be allowed only for Short Duration or Short Term stationary operations when workers are present to maintain the devices upright and in proper location. Intermediate Term stationary work areas should use Drums, Vertical Panels or 42" tall two-piece cones.

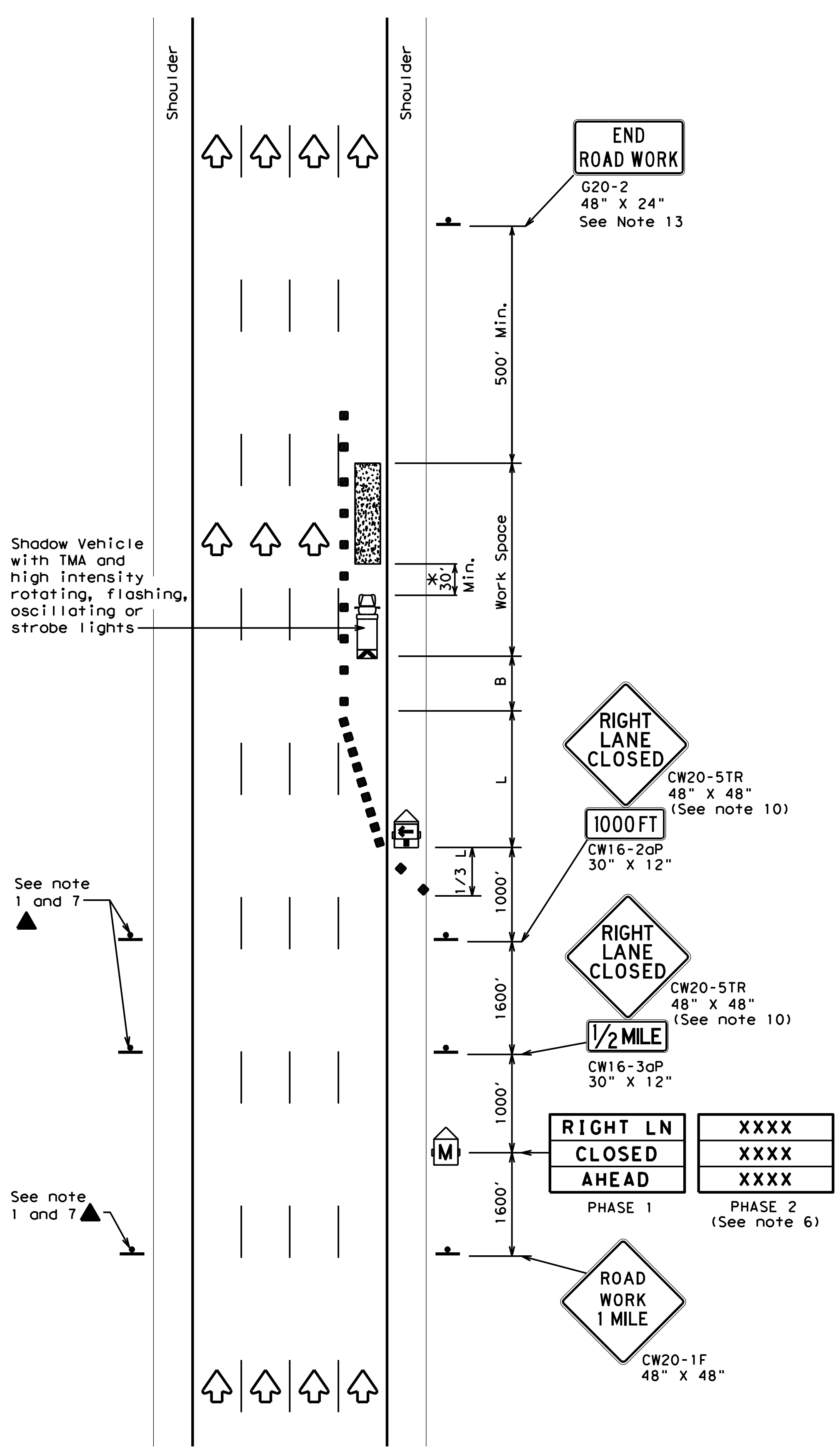
Texas Department of Transportation — Traffic Operations Division Standard

TRAFFIC CONTROL PLAN SHOULDER WORK FOR FREEWAYS / EXPRESSWAYS

TCP(5-1)-18

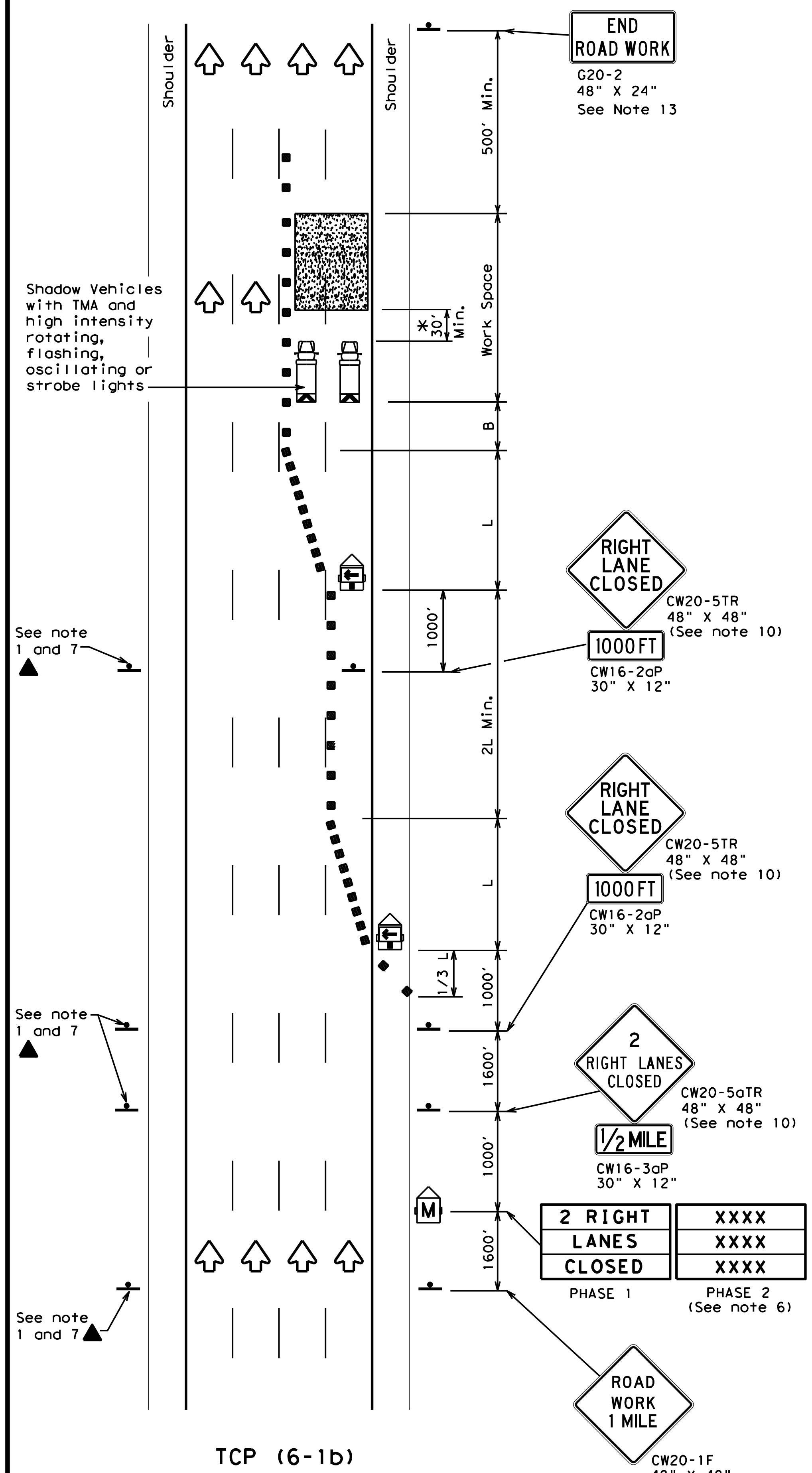
FILE: tcp5-1-18.dgn	DN:	CK:	DW:	CK:
© TxDOT February 2012	CONT	SECT	JOB	HIGHWAY
REVISIONS 2-18	0720	01	044, ETC.	FM 149, ETC.
	DIST		COUNTY	SHEET NO.
	BRYAN		GRIMES	47

DATE: 4/19/2023 7:36:00 AM
FILE: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY/Design Projects/...



TCP (6-1a)

TYPICAL FREEWAY
ONE LANE CLOSURE



TCP (6-1b)

TYPICAL FREEWAY
TWO LANE CLOSURE

LEGEND

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

Posted Speed	Formula	Minimum Desirable Taper Lengths "L" **			Suggested Maximum Spacing of Channelizing Devices		Suggested Longitudinal Buffer Space "B"
		10' Offset	11' Offset	12' Offset	On a Taper	On a Tangent	
45	L=WS	450'	495'	540'	45'	90'	195'
50		500'	550'	600'	50'	100'	240'
55		550'	605'	660'	55'	110'	295'
60		600'	660'	720'	60'	120'	350'
65		650'	715'	780'	65'	130'	410'
70		700'	770'	840'	70'	140'	475'
75		750'	825'	900'	75'	150'	540'
80		800'	880'	960'	80'	160'	615'

** 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. All traffic control devices illustrated are REQUIRED. Devices denoted with the triangle symbol may be omitted when stated elsewhere in the plans.
2. Drums or 42"cones are the typical channelizing devices. For Intermediate Term Stationary work, drums shall be used on tapers with drums or 42" cones used on tangent sections. Other channelizing devices may be used as directed by the Engineer.
3. All construction signs and barricades placed during any phase of work shall remain in place until removal is approved by the Engineer.
4. The Engineer may direct the Contractor to furnish additional signs and barricades as required to maintain traffic flow, detours and motorist safety during construction.
5. Static message boards or changeable message signs stating the date and duration of ramp or freeway lane closures shall be placed a minimum of seven (7) calendar days in advance of the actual closure.
6. Phase 2 of the PCMS message should include appropriate information formatted as shown on BC(6), such as "MERGE LEFT," recommended advisory speed, delay information, or other specific warnings.
7. Duplicate construction warning signs should be erected on the medians side of freeways where median width will permit and traffic volume justifies the signing.
8. The number of closed lanes may be increased provided the spacing of traffic control devices, taper lengths and tangent lengths meet the requirements of the TMUTCD.
9. Warning signs for intermediate term stationary work should be mounted at 7' to the bottom of the sign.
10. Warning signs shown shall be appropriately altered for left lane closures. When signs are mounted at 1' height for short term stationary or short duration work, sign versions shown in the SHSD for Texas with distances on the sign face rather than mounted on a plaque below the sign may be used.
11. When possible, PCMS units should be located in advance of the last available exit ramp prior to the lane closure to allow motorists an alternate route. They may also be relocated to improve advance warning in case of unanticipated queuing or congestion.
12. For Intermediate Term Stationary work at night, floodlights should be used to illuminate the work area and equipment crossings. Floodlights shall not produce a disabling glare condition for road users or workers.
13. The END ROAD WORK (G20-2) sign may be omitted when it conflicts with G20-2 signs already in place on the project.

* A shadow vehicle equipped with a Truck Mounted Attenuator is typically required. A shadow vehicle equipped with a TMA shall be used if it can be positioned 30' to 100' in advance of the area of crew exposure without adversely affecting the work performance.

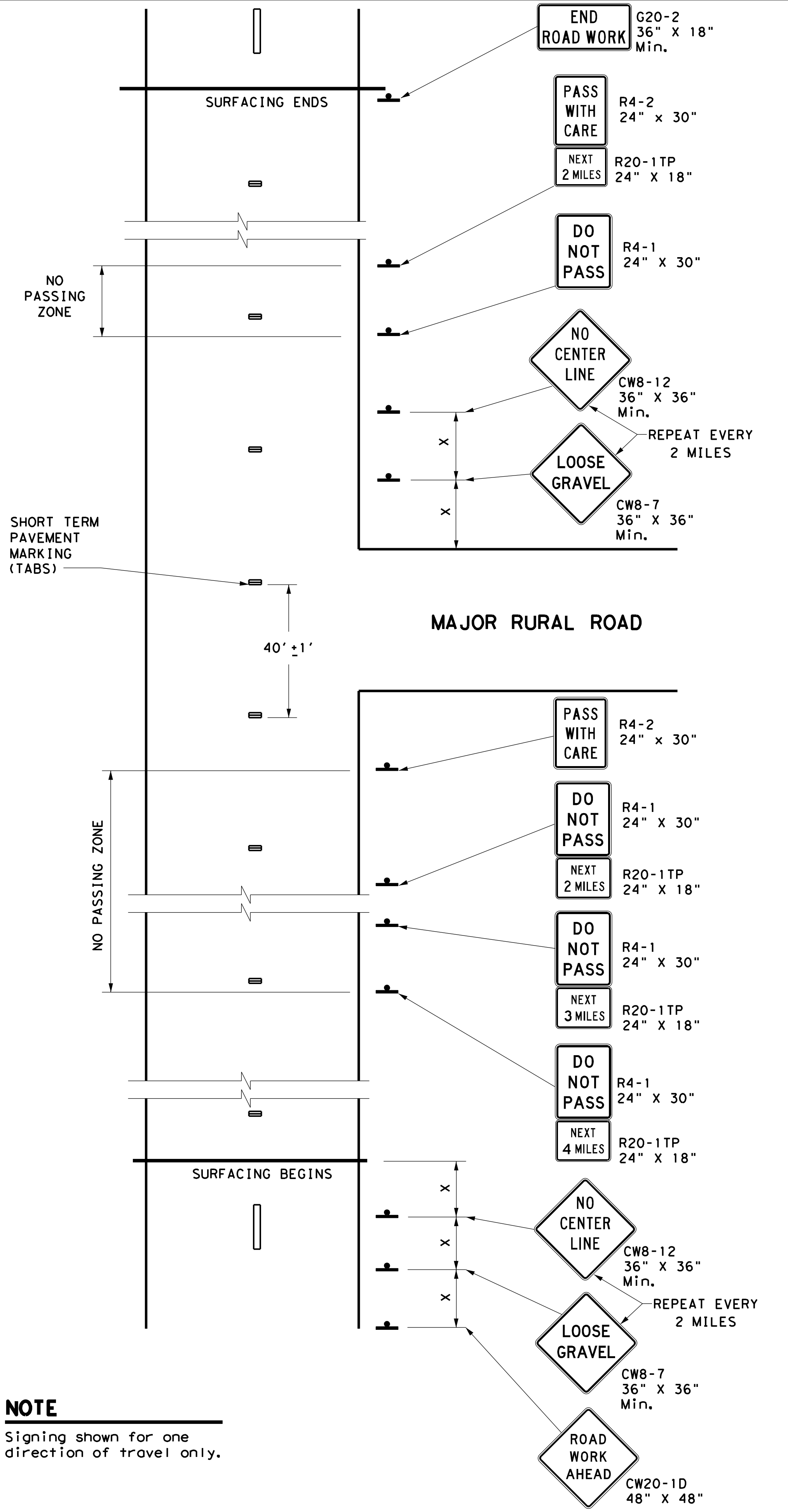
Texas Department of Transportation
Traffic Operations Division Standard

TRAFFIC CONTROL PLAN FREEWAY LANE CLOSURES

TCP(6-1)-12

FILE: tcp6-1.dgn		DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 1998	CONT	SECT	JOB		HIGHWAY
REVISIONS	0720	01	044, ETC.		FM 149,ETC.
8-12	DIST		COUNTY		SHEET NO.
	BRYAN		GRIMES		48

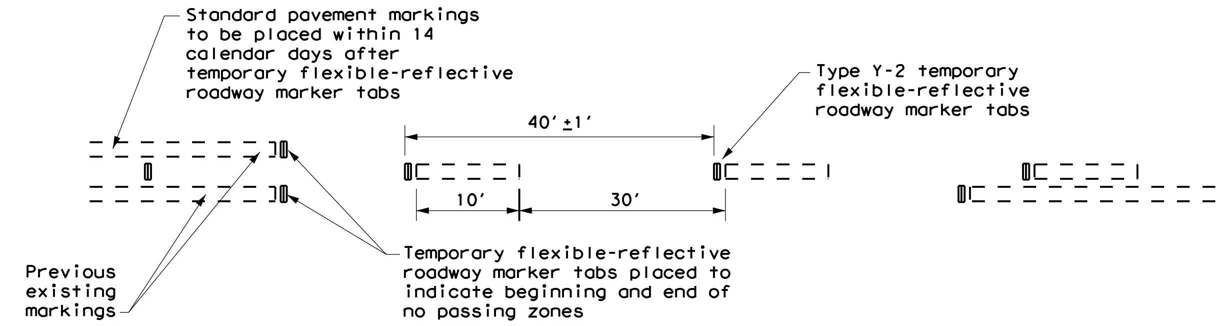
201



NOTE

Signing shown for one direction of travel only.

NO PASSING ZONES ON TWO-LANE TWO-WAY ROADS



TABS ON CENTERLINES OF TWO-LANE TWO-WAY ROADS

For seal coat, micro-surface or similar operations

"DO NOT PASS" SIGN (R4-1) and NO-PASSING ZONES

A. Prior to the beginning of construction, all currently striped no-passing zones shall be signed with the DO NOT PASS (R4-1) signs and PASS WITH CARE (R4-2) signs placed at the beginning and end of each zone for each direction of travel except as otherwise provided herein. Signs marking these individual no-passing zones need not be covered prior to construction if the signs supplement the existing pavement markings.

B. At the discretion of the Engineer, in areas of numerous no-passing zones, several zones may be combined as a single zone. If passing is to be prohibited over one or more lengthy sections, a DO NOT PASS sign and a NEXT XX MILES (R20-1TP) plaque may be used at the beginning of such zones. The DO NOT PASS sign and the NEXT XX MILES plaque should be repeated every mile to the end of the no-passing zone. In areas where there is considerable distance between no-passing zones, the end of the no-passing zone may be signed with a PASS WITH CARE sign and a NEXT XX MILES plaque.

C. Depending on traffic volumes and length of sections, it may be desirable to prohibit passing throughout the project to prevent damage to windshield and lights. The DO NOT PASS sign and NEXT XX MILES plaque should be used and repeated as often as necessary for this purpose. Where several existing zones are to be combined into one individual no-passing zone, the sign at the beginning of the zone should be covered until the surfacing operation has passed this location so as not to have the DO NOT PASS sign conflict with the existing pavement markings. Also, unless one days operation completes the entire length of such combined zones, appropriate DO NOT PASS and PASS WITH CARE signs should be placed at the beginning and end of the no-passing zones where the surfacing operation has stopped for the day.

D. R4-1 and R4-2 are to remain in place until standard pavement markings are installed.

"NO CENTER LINE" SIGN (CW8-12)

A. Center line markings are yellow pavement markings that delineate the separation of travel lanes that have opposite directions of travel on a roadway. Divided highways do not typically have center line markings.

B. At the time construction activity obliterates the existing center line markings(low volume roads may not have an existing centerline), a NO CENTER LINE (CW8-12) sign should be erected at the beginning of the work area, at approximately 2 mile intervals within the work area, beyond major intersections and other locations deemed necessary by the Engineer.

C. The NO CENTER LINE signs are to remain in place until standard pavement markings are installed.

"LOOSE GRAVEL" SIGN (CW8-7)

A. When construction begins, a LOOSE GRAVEL (CW8-7) sign should be erected at each end of the work area and repeated at intervals of approximately 2 miles in rural areas and closer in urban areas.

B. The LOOSE GRAVEL signs are to remain in place until the condition no longer exists.

PAVEMENT MARKINGS

A. Temporary markings for surfacing projects shall be Temporary Flexible-reflective Roadway Marker Tabs unless otherwise approved by the Engineer. Tabs are to be installed to provide true alignment for striping crews or as directed by the Engineer. Tabs will be placed at the spacing indicated. Tabs should be applied to the pavement
no more than two (2) days before the surfacing is applied. After the surfacing is rolled and swept, the cover over the reflective strip shall be removed.

B. Tabs shall not be used to simulate edge lines.

C. Tab placement for overlay/inlay operations shall be as shown on the WZ(STPM) standard sheet.

COORDINATION OF SIGN LOCATIONS

A. The location of warning signs at the beginning and end of a work area are to be coordinated with other signing typically shown on the Barricade and Construction Standards for project limits to ensure adequate sign spacing.

B. Where possible the ROAD WORK AHEAD (CW20-1D), LOOSE GRAVEL (CW8-7), and NO CENTER LINE (CW8-12) signs should be placed in the sequence shown following the OBEY WARNING SIGNS STATE LAW (R20-3T) and the TRAFFIC FINES DOUBLE (R20-5T) sign, and one "X" sign spacing prior to the CONTRACTOR (G20-6T)sign typically located at or near the limits of surfacing. LOOSE GRAVEL and NO CENTER LINE signs will then be repeated as described above.

Posted Speed *	Minimum Sign Spacing "X" Distance
30	120'
35	160'
40	240'
45	320'
50	400'
55	500'
60	600'
65	700'
70	800'
75	900'

* Conventional Roads Only

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

GENERAL NOTES

1. The traffic control devices detailed on this sheet will be furnished and erected as directed by the Engineer on sections of roadway where tabs must be placed prior to the surfacing operation which will cover or obliterate the existing pavement markings.

2. The devices shown on this sheet are to be used to supplement those required by the BC Standards or others required elsewhere in the plans.

3. Signs shall be erected as detailed on the BC Standards or the Compliant Work Zone Traffic Control Devices List (CWZTCD) on supports approved for Long-Term / Intermediate-Term Work Zone Sign Supports.

4. When surfacing operations take place on divided highways, freeways or expressways, the size of diamond shaped construction warning signs shall be 48" x 48".

5. Signs on divided highways, freeways and expressways will be placed on both right and left sides of the roadway based on roadway conditions as directed by the Engineer.

Texas Department of Transportation

Traffic Operations Division Standard

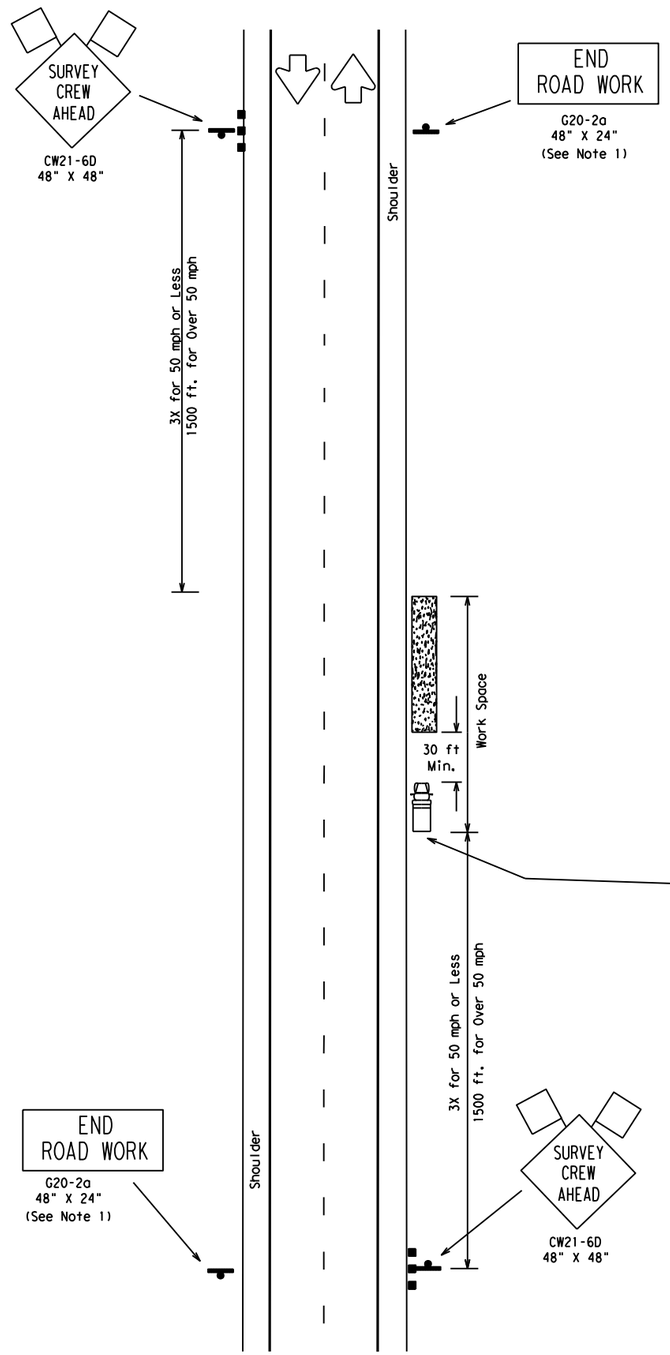
TRAFFIC CONTROL DETAILS FOR SURFACING OPERATIONS

TCP(7-1)-13

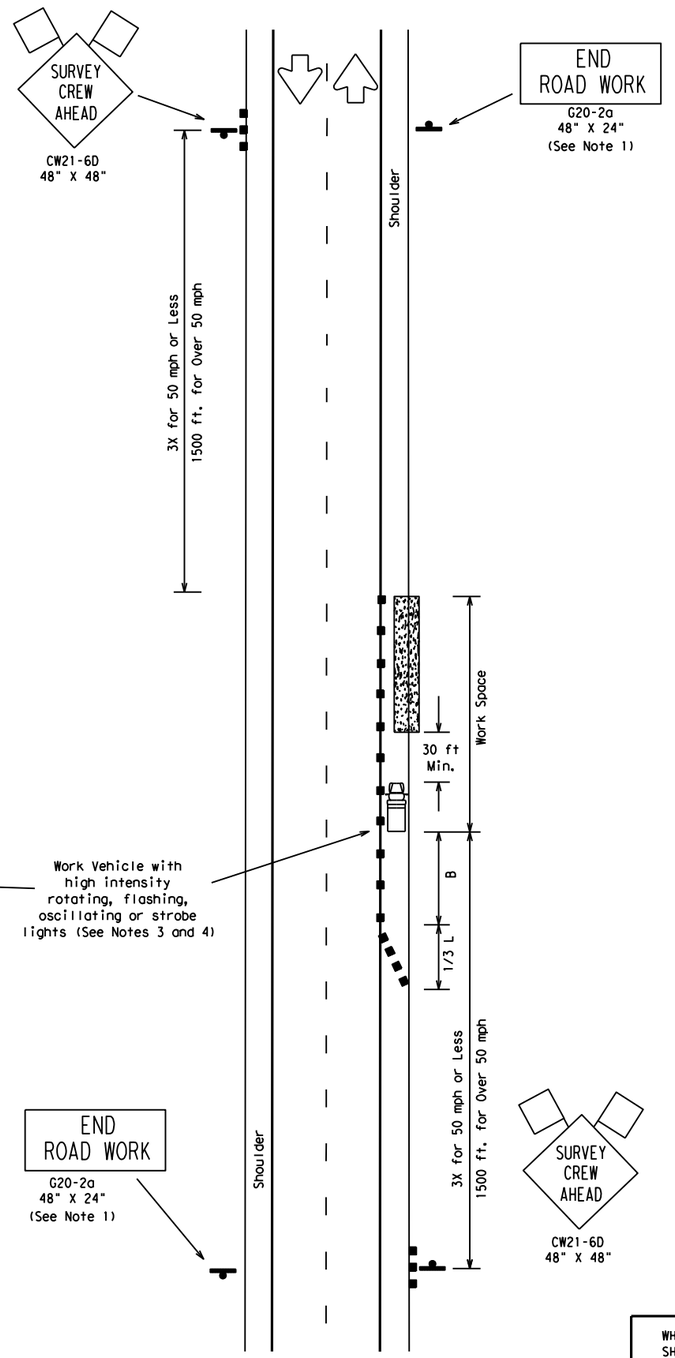
FILE: tcp7-1.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT March 1991	CONT	SECT	JOB	HIGHWAY
REVISIONS 4-92 4-98 1-97 7-13	0720	01	044, ETC.	FM 149, ETC.
	DIST		COUNTY	SHEET NO.
	BRYAN		GRIMES	49

210

DATE: 4/19/2023 7:36:29 AM
FILE: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY/Design Projects/07200104/4 - Design/Plan Set/8. Traffic/8H. TrafficStandards/TCP(S-1)-08A.dgn



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



TCP (S-1b)
WORK ON SHOULDER

LEGEND

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

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. ⚠1 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
⚠1 Corrected misspelling.

Texas Department of Transportation
Traffic Operations Division

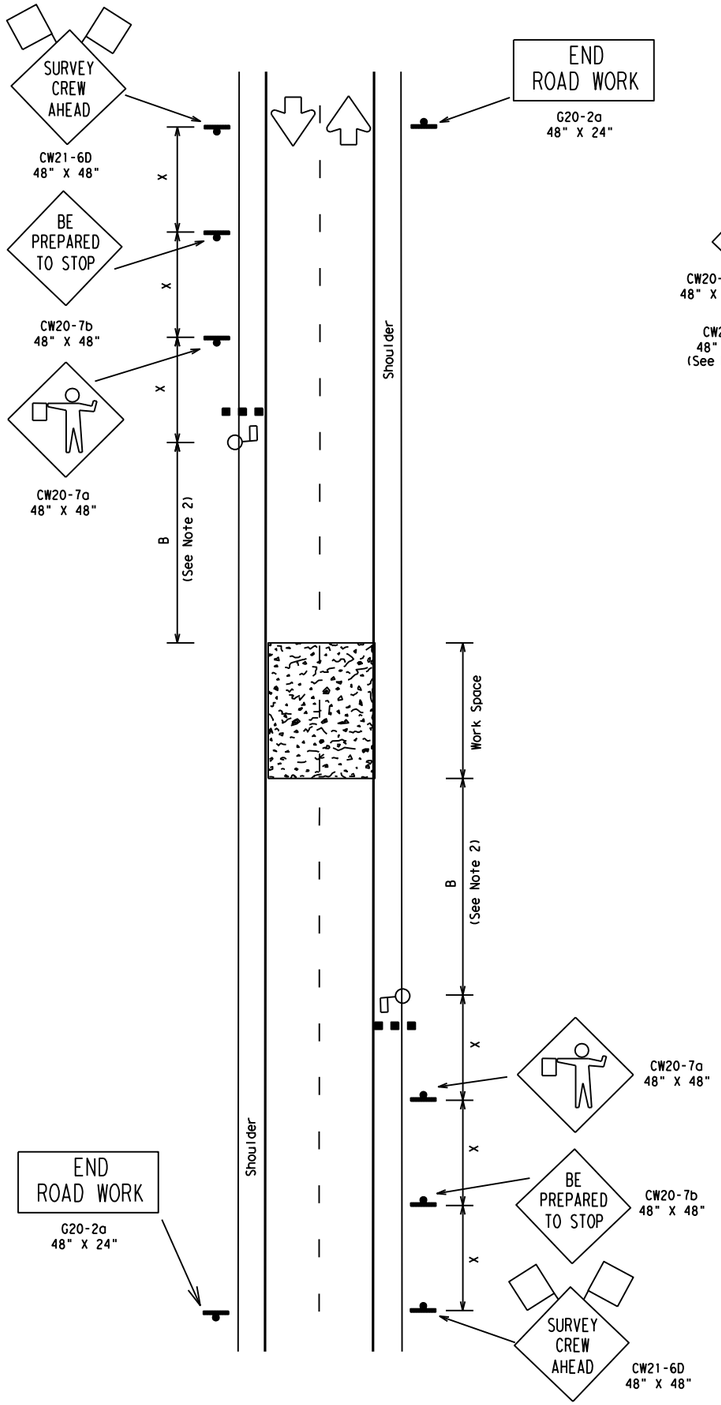
TRAFFIC CONTROL PLAN FOR SURVEYING OPERATIONS

TCP(S-1)-08A

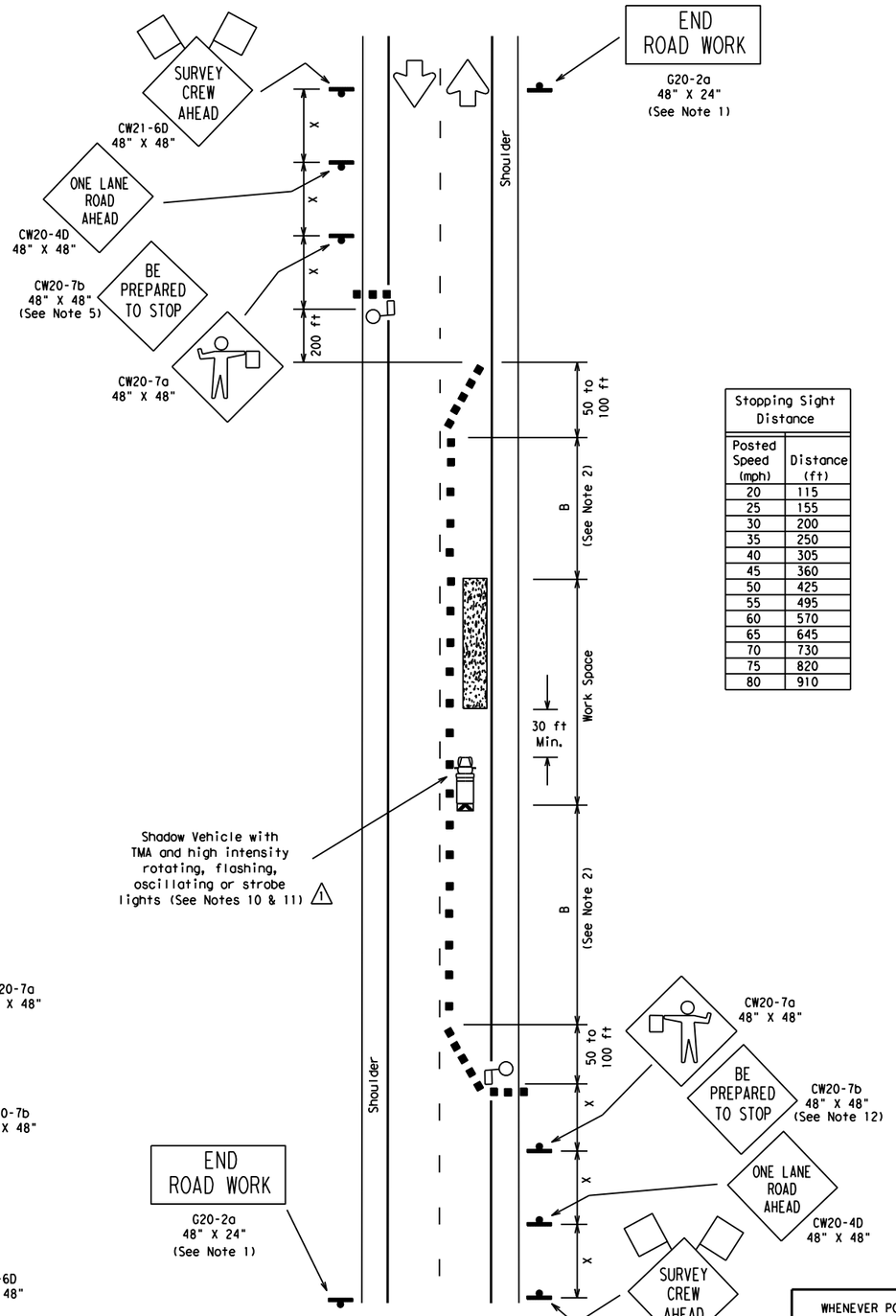
REVISIONS
8-08

DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
CONT	SECT	JOB	HIGHWAY
0720	01	044, ETC.	FM 149, ETC.
DIST	COUNTY		SHEET NO.
BRYAN	GRIMES		50

DATE: 4/19/2023 7:36:45 AM
FILE: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY/Design Projects/0720010044/4 - Design/Plan Set/8. Traffic/8H. TrafficStandards/TCP(S-2)-08A.dgn



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

LEGEND

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

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

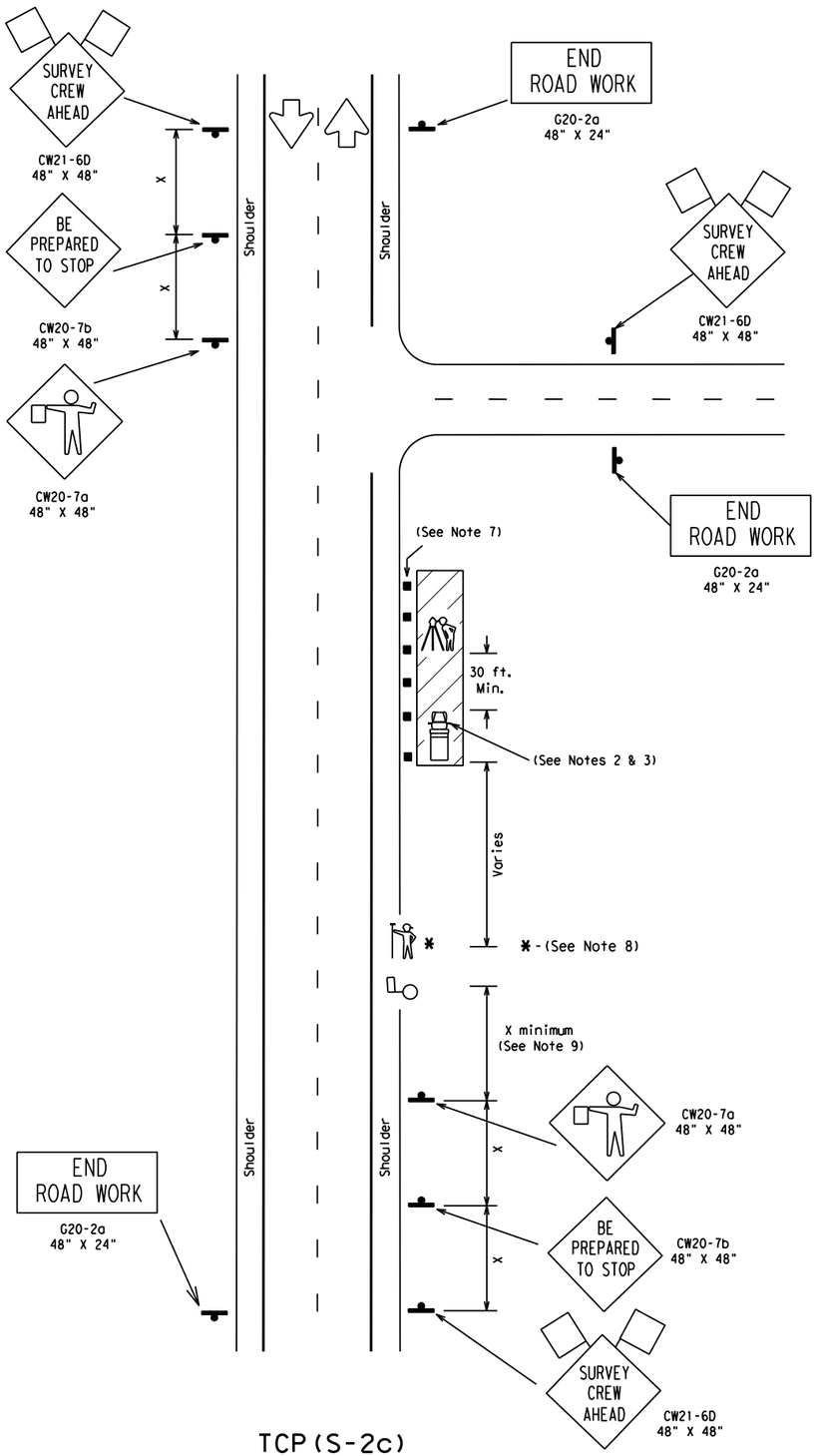
DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT

REVISIONS
8-08

CONT	SECT	JOB	HIGHWAY
0720	01	044, ETC.	FM 149, ETC.

DIST	COUNTY	SHEET NO.
BRYAN	GRIMES	51

DATE: 4/19/2023 7:37:00 AM
FILE: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY/Design Projects/072001044/4 - Design/Plan Set/8. Traffic/8H. TrafficStandards/TCP(S-2c)-10.dgn



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

LEGEND

Type III Barricade ■ ■ Channelizing Devices Flag
Work Vehicle Truck Mounted Attenuator (TMA)
Flagger Sign Post Survey Rodman Instrument Person

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

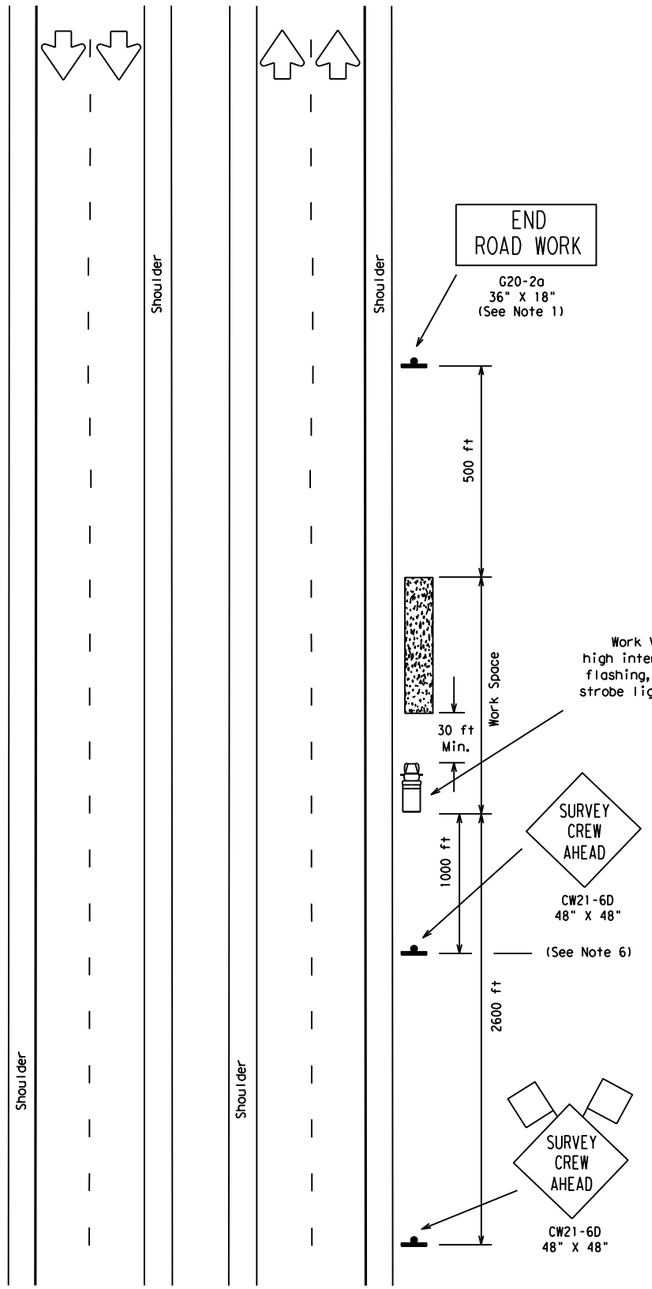
REVISIONS

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

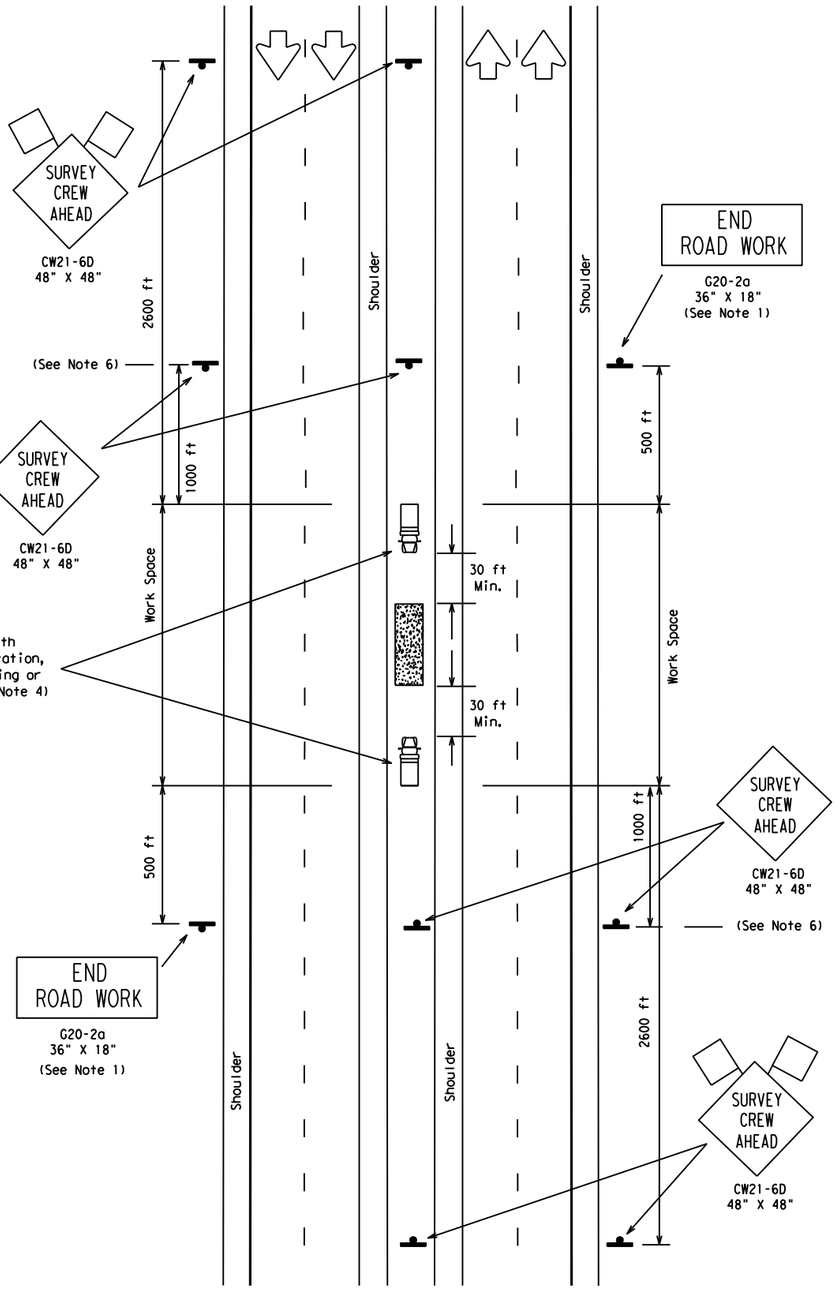
CONT	SECT	JOB	HIGHWAY
0720	01	044, ETC.	FM 149, ETC.

DIST	COUNTY	SHEET NO.
BRYAN	GRIMES	52

DATE: 4/19/2023 7:37:14 AM
FILE: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY/Design Projects/07200104/4 - Design/Plan Set/8. Traffic/8H. TrafficStandards/TCP(S-4).dgn



TCP (S-4a)
WORK OFF RIGHT SHOULDER
OF DIVIDED ROADWAYS



TCP (S-4b)
WORK IN MEDIAN
OF DIVIDED ROADWAYS

LEGEND

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

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 omitted for short duration (less than 1 hour) work.
2. When median work is protected on one side by existing median barriers, signing and protection vehicle may be omitted for the protected direction only.
3. CW20-1D "ROAD WORK AHEAD" signs may be substituted for "SURVEY CREW AHEAD" signs.
1. 4. A Shadow Vehicle with a TMA 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 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.
6. The CW21-6D "SURVEY CREW AHEAD" sign placed at 1000' ahead of the work space is optional, at the discretion of the Engineer. The signs shown at 2600' from the work space are required.
7. 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
1 Corrected misspelling.

Texas Department of Transportation
Traffic Operations Division

TRAFFIC CONTROL PLAN FOR SURVEYING OPERATIONS

TCP(S-4)-08A

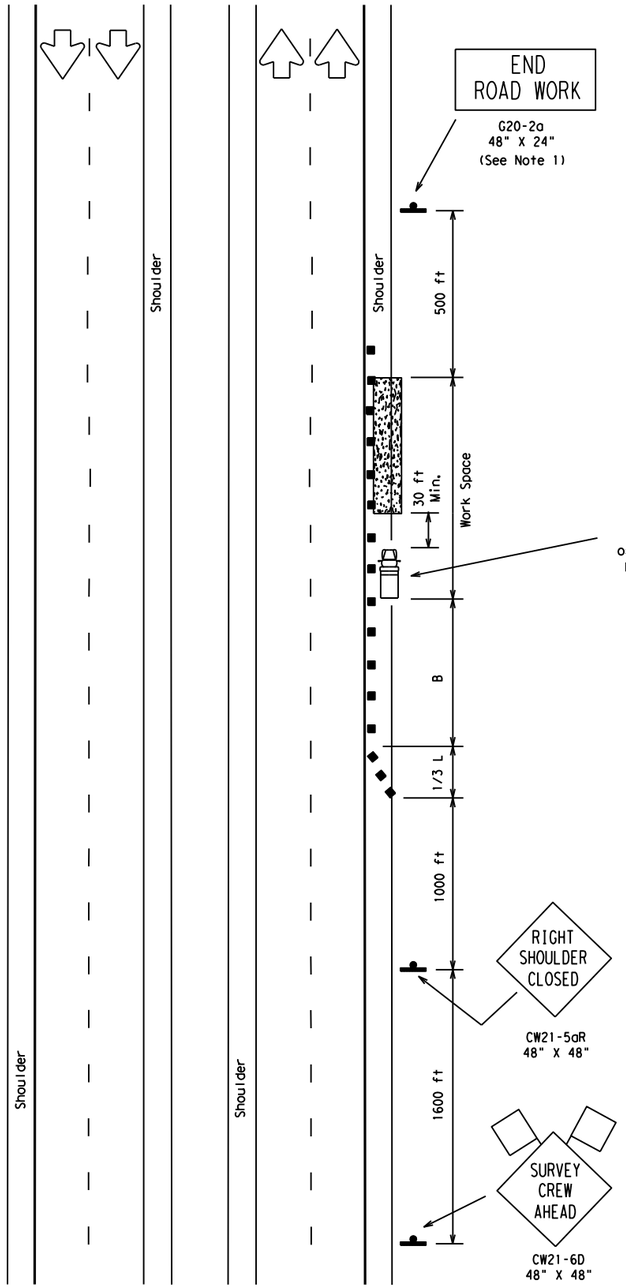
REVISIONS
8-08

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

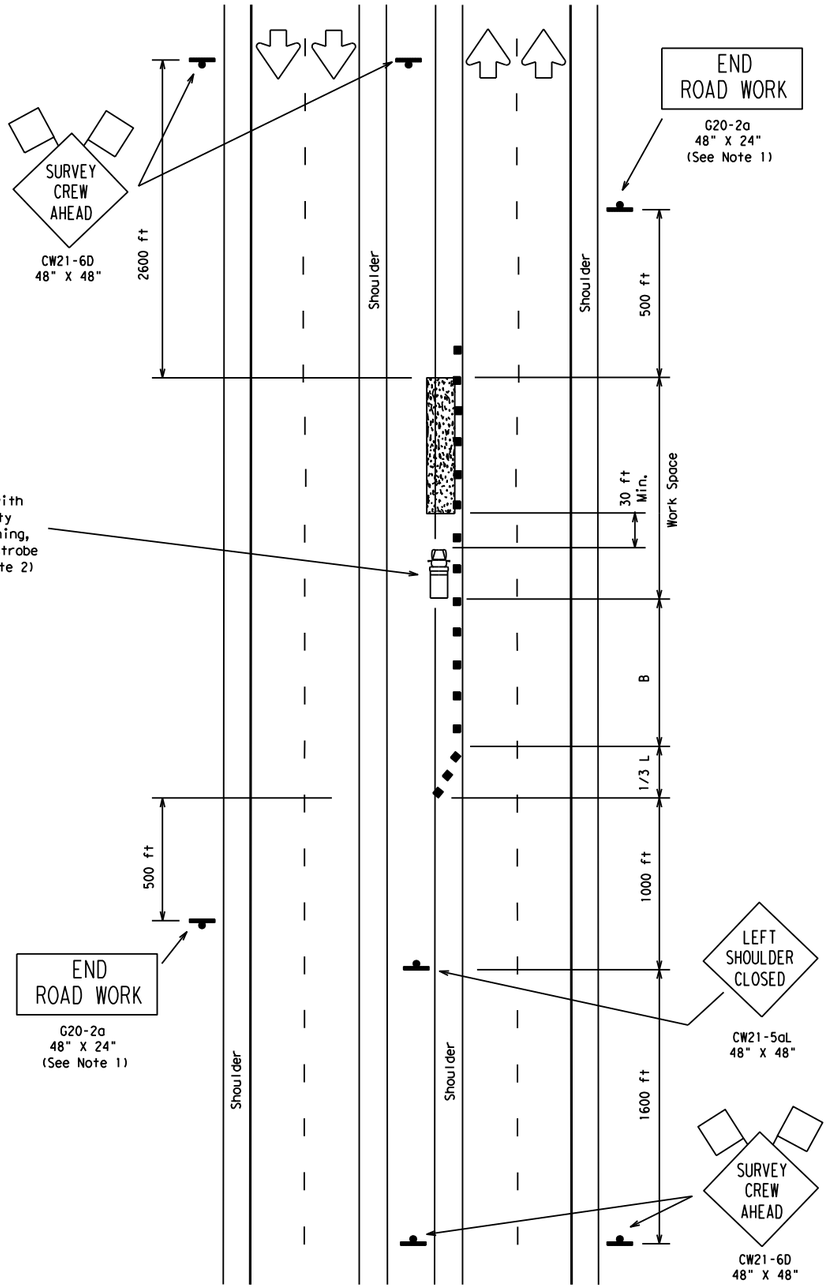
CONT	SECT	JOB	HIGHWAY
0720	01	044, ETC.	FM 149, ETC.

DIST	COUNTY	SHEET NO.
BRYAN	GRIMES	53

DATE: 4/19/2023 7:37:28 AM
FILE: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY/Design Projects/0720010044/4 - Design/Plan Set/8. Traffic/8H. TrafficStandards/TCP(S-5).dgn



TCP (S-5a)
WORK ON RIGHT SHOULDER
OF DIVIDED ROADWAYS



TCP (S-5b)
WORK ON MEDIAN SHOULDER
OF DIVIDED ROADWAYS

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

LEGEND

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

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 omitted for short duration (less than 1 hour) work.
2. For short duration work, the Shadow Vehicle with TMA may be replaced by another Work Vehicle with high intensity rotating, flashing or strobe lights.
3. 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.
4. If shoulders are not present, the 1/3L shoulder taper is to be omitted and four channelizing devices shall be placed in front of the arrow panel, perpendicular to traffic.
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.

Texas Department of Transportation
Traffic Operations Division

TRAFFIC CONTROL PLAN FOR SURVEYING OPERATIONS

TCP(S-5)-08

REVISIONS

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

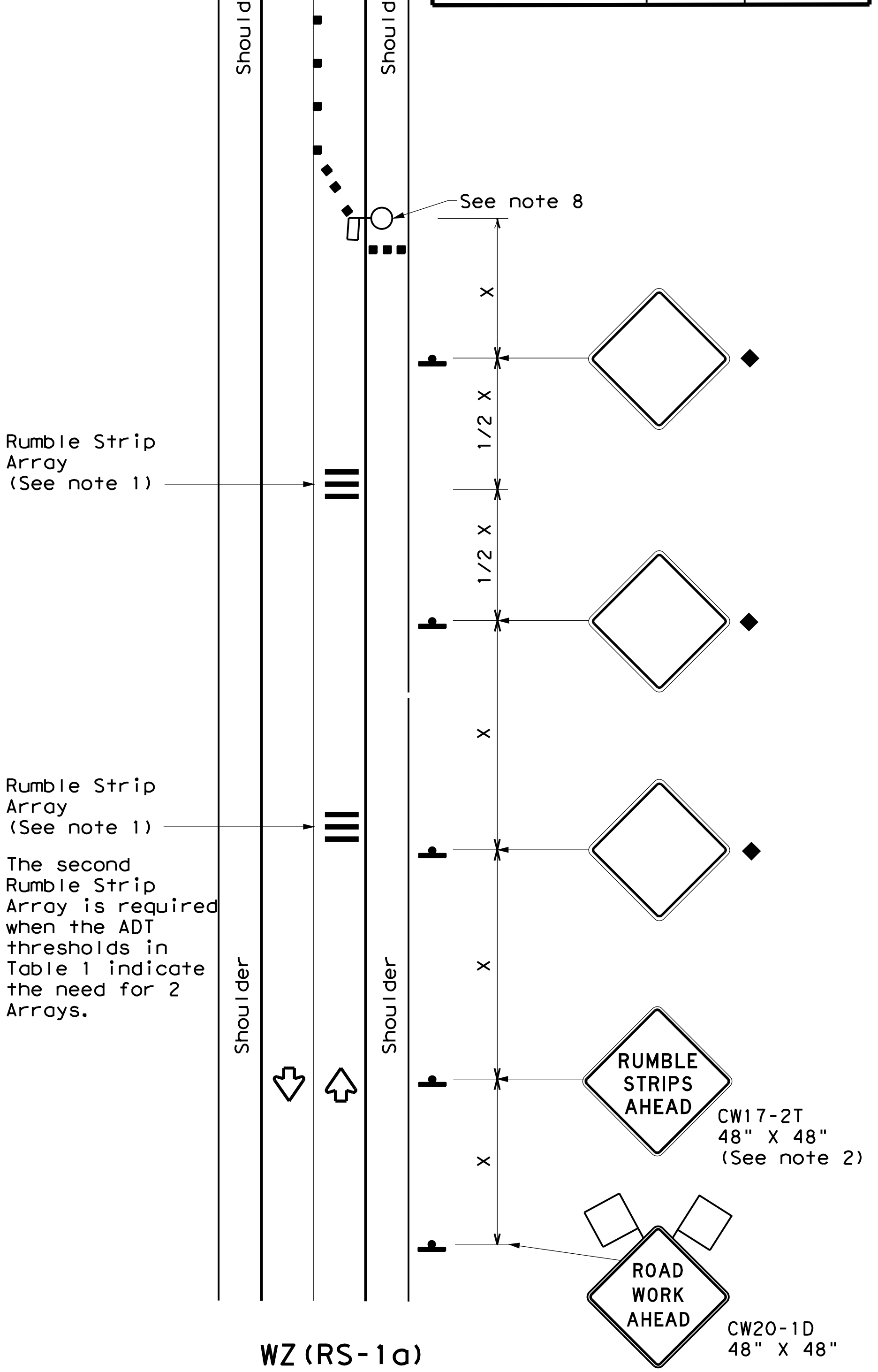
CONT	SECT	JOB	HIGHWAY
0720	01	044, ETC.	FM 149, ETC.

DIST	COUNTY	SHEET NO.
BRYAN	GRIMES	54

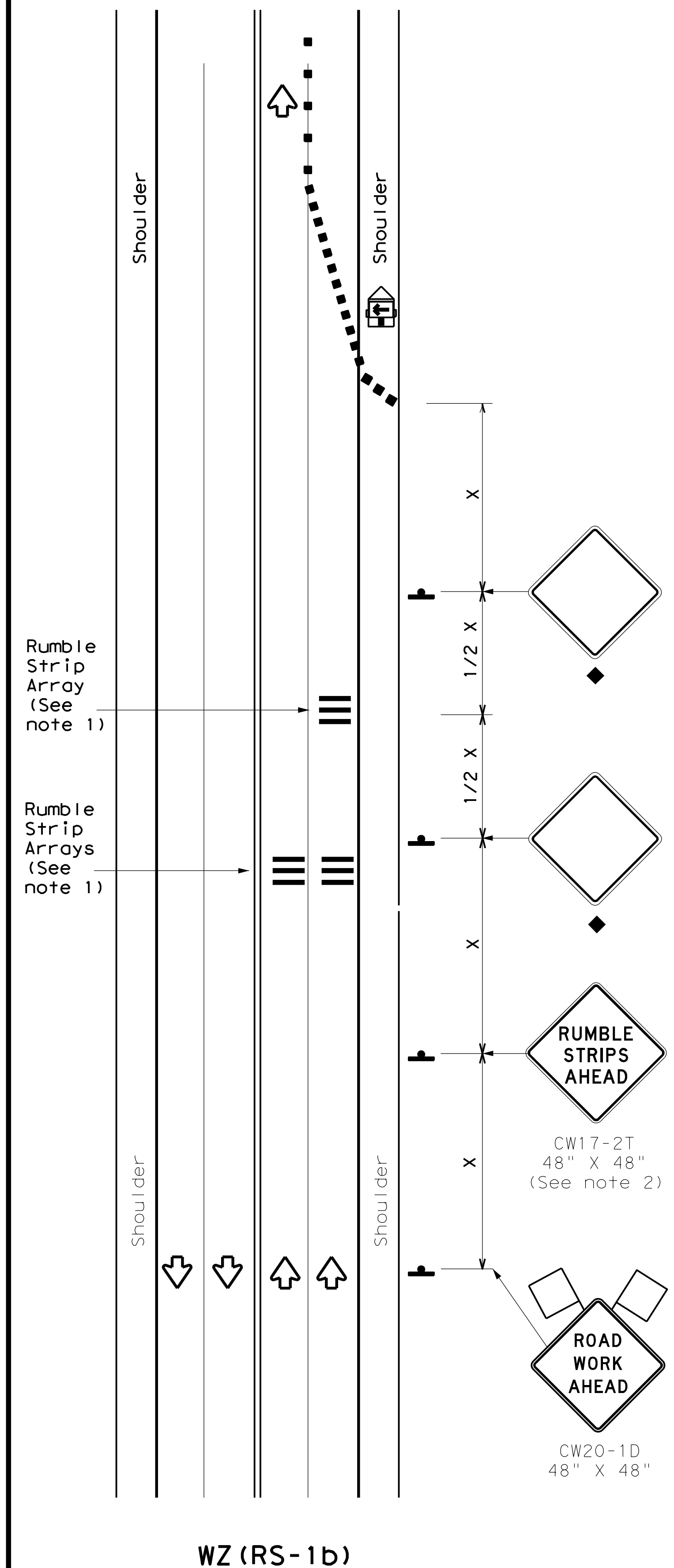
DATE: 4/19/2023 7:37:44 AM
FILE: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY/Design Pro...

Warning sign and rumble strip sequence in opposite direction is same as below.

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



RUMBLE STRIPS ON ONE-LANE TWO-WAY APPLICATION



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. Remove Temporary Rumble Strips before removing the advanced 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 Automated Flagger Assistance Device (AFAD) or a Portable Traffic Signal (PTS).
9. Replace defective Temporary Rumble Strips as directed by the Engineer.
10. Temporary Rumble Strips may be used on freeways or expressways based on engineering judgment and written direction from the Engineer.

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

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

* Conventional Roads Only

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

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

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

* **For posted speeds in excess of 65 MPH, it is recommended that spacing is increased as speed limits increase. Increasing space between rumble strips will improve effectiveness.**

TABLE 2	
Speed	Approximate distance between strips in an array
≤ 40 MPH	10'
> 40 MPH & ≤ 55 MPH	15'
= 60 MPH	20'
≥ 65 MPH	* 35'+

Texas Department of Transportation

Traffic Safety Division Standard

TEMPORARY RUMBLE STRIPS

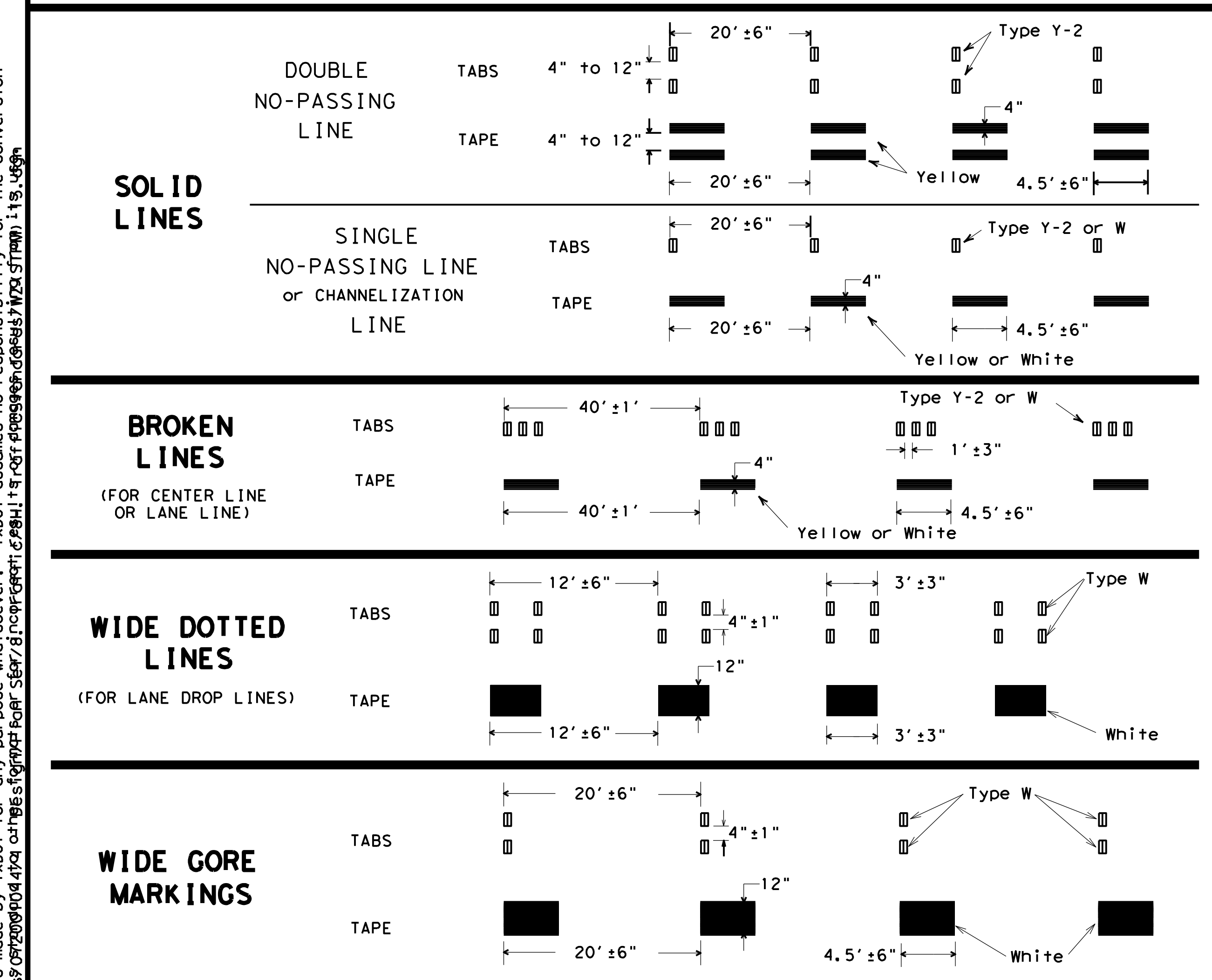
WZ(RS)-22

FILE: wzrs22.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT November 2012	CONT	SECT	JOB	HIGHWAY
REVISIONS 2-14 1-22 4-16	0720	01	044, ETC.	FM 149, ETC.
	DIST		COUNTY	SHEET NO.
	BRYAN		GRIMES	55

117

DATE: 4/19/2023 7:37:59 AM
FILE: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY/Design Projects/0720-01-044/...

WORK ZONE SHORT TERM PAVEMENT MARKINGS DETAILS



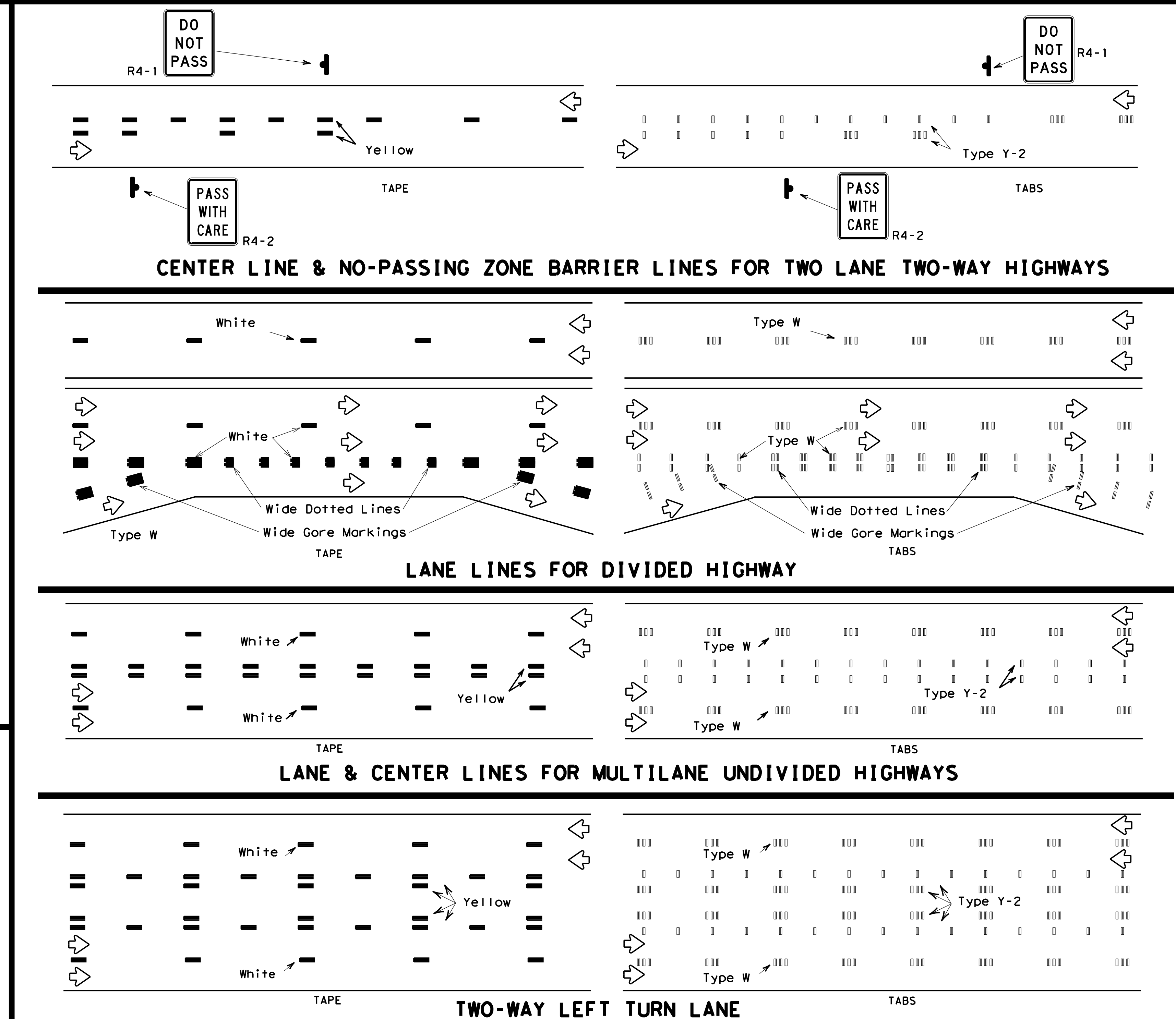
NOTES:

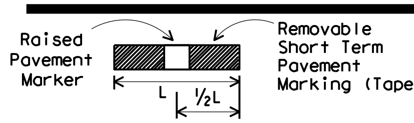
1. Short term pavement markings may be prefabricated markings (stick down tape) or temporary flexible-reflective roadway marker tabs unless otherwise specified elsewhere in plans.
2. Short term pavement markings shall NOT be used to simulate edge lines.
3. Dimensions indicated on this sheet are typical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

TEMPORARY FLEXIBLE, REFLECTIVE ROADWAY MARKER TABS (TABS)

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

WORK ZONE SHORT TERM PAVEMENT MARKINGS PATTERNS





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

PREFABRICATED PAVEMENT MARKINGS

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

RAISED PAVEMENT MARKERS

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

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

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

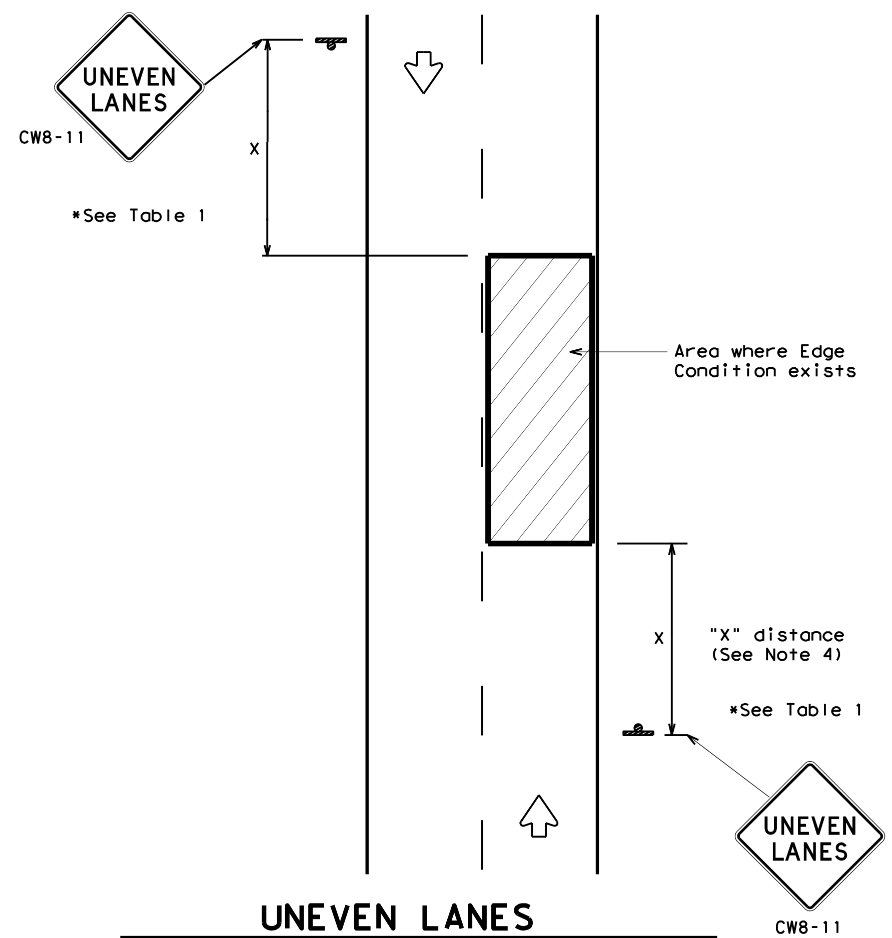
Texas Department of Transportation | Traffic Operations Division Standard

WORK ZONE SHORT TERM PAVEMENT MARKINGS

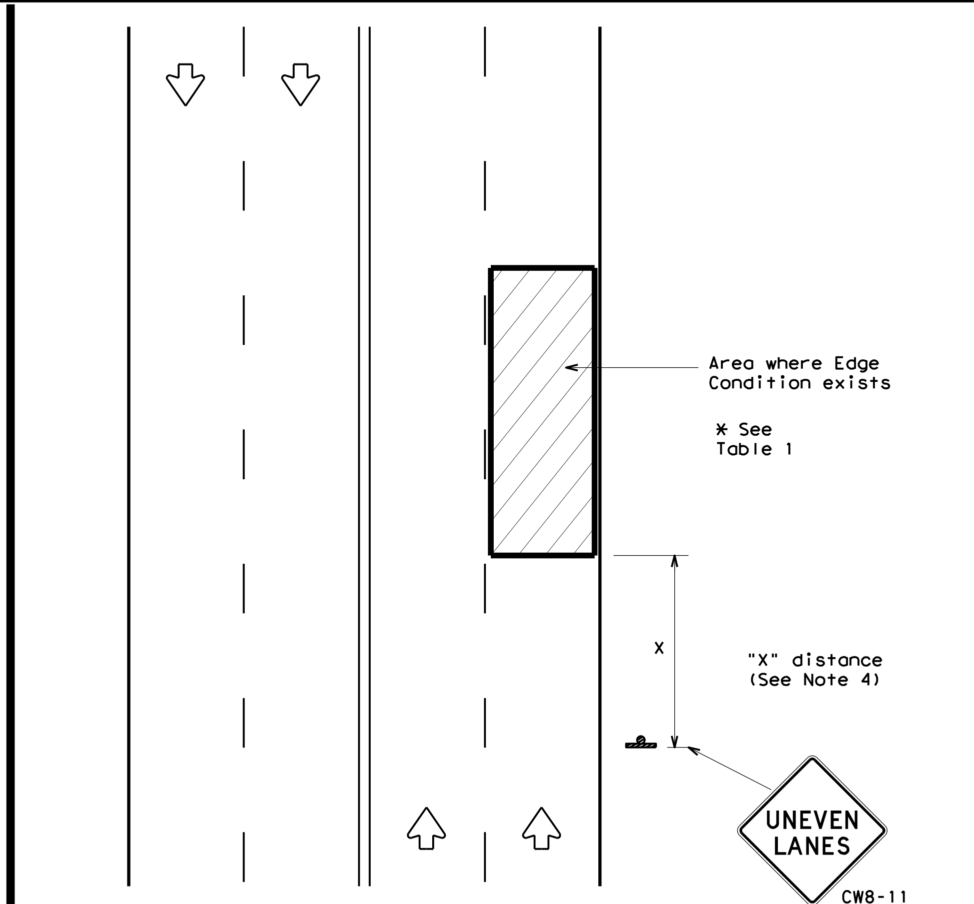
WZ(STPM)-13

FILE: wzstpm-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT April 1992	CONT	SECT	JOB	HIGHWAY
REVISIONS	0720	01	044, ETC.	FM 149, ETC.
1-97	DIST		COUNTY	SHEET NO.
3-03 7-13	BRYAN		GRIMES	56

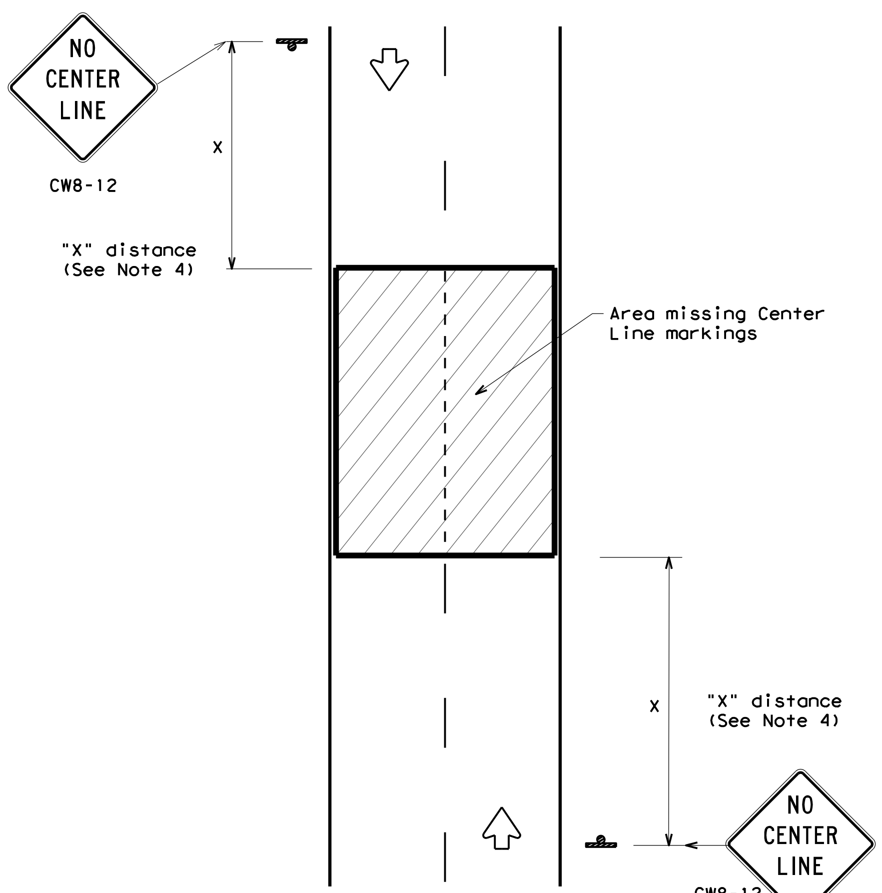
111



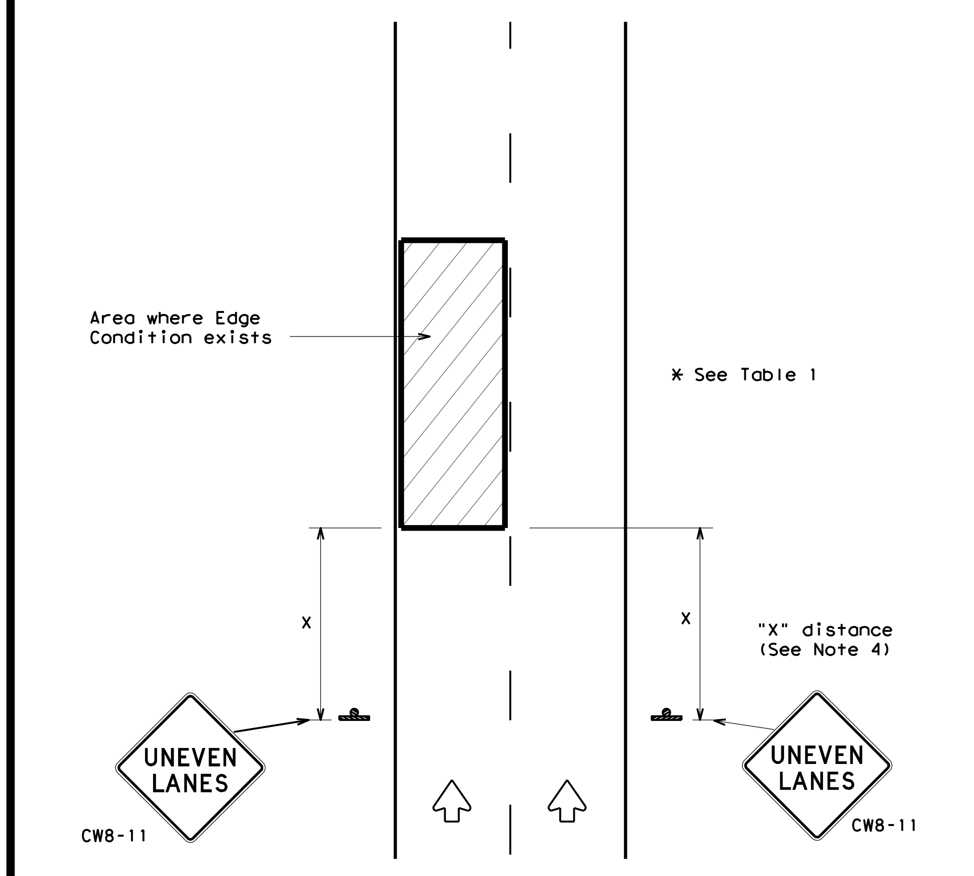
UNEVEN LANES
TWO LANE CONVENTIONAL ROAD



UNEVEN LANES
FOUR LANE CONVENTIONAL ROAD



NO CENTER LINE
TWO LANE CONVENTIONAL ROAD



UNEVEN LANES
DIVIDED ROADWAY

DEPARTMENTAL MATERIAL SPECIFICATIONS	
PERMANENT PREFABRICATED PAVEMENT MARKINGS	DMS-8240
TEMPORARY (REMOVABLE) PREFABRICATED PAVEMENT MARKINGS	DMS-8241
SIGN FACE MATERIALS	DMS-8300

COLOR	USAGE	SHEETING MATERIAL
ORANGE	BACKGROUND	TYPE B_{FL} OR TYPE C_{FL} SHEETING
BLACK	LEGEND & BORDERS	ACRYLIC NON-REFLECTIVE SHEETING

GENERAL NOTES

1. If spalling or holes occur, ROUGH ROAD (CW8-8) signs should be placed in advance of the condition and be repeated every two miles where the condition persists.
2. UNEVEN LANES (CW8-11) signs shall be installed in advance of the condition and repeated every mile. Signs installed along the uneven lane condition may be supplemented with the NEXT XX MILES (CW7-3aP) plaque or Advisory Speed (CW13-1P) plaque.
3. NO CENTER LINE (CW8-12) signs and temporary pavement markings as per the WZ(STPM) standard shall be installed if yellow centerlines separating two way traffic are obscured or obliterated. Repeat NO CENTER LINE signs every two miles where the center line markings are not in place. The signs and markings shall remain in place until permanent pavement markings are installed.
4. Signs shall be spaced at the distances recommended as per BC standards.
5. Additional signs may be required as directed by the Engineer. Signs shall remain in place until final surface is applied. Signs shall be considered subsidiary to Item 502 "BARRICADES, SIGNS AND TRAFFIC HANDLING."
6. Signs shall be fabricated and mounted on supports as shown on the BC standards and/or listed on the "Compliant Work Zone Traffic Control Devices" list.
7. Short term markings shall not be used to simulate edge lines.
8. All signs shall be constructed in accordance with the details found in the "Standard Highway Sign Designs for Texas," latest edition.

TABLE 1

Edge Condition	Edge Height (D)	* Warning Devices
① (D)	Less than or equal to: 1¼" (maximum-planing) 1½" (typical-overlay)	Sign: CW8-11
	Distance "D" may be a maximum of 1 1/4 " for planing operations and 2" for overlay operations if uneven lanes with edge condition 1 are open to traffic after work operations cease.	
② (>3, 1, D)	Less than or equal to 3"	Sign: CW8-11
③ (0" to 3/4", D, 12") Notched Wedge Joint	Distance "D" may be a maximum of 3" if uneven lanes with edge condition 2 or 3 are open to traffic after work operations cease. Uneven lanes should not be open to traffic when "D" is greater than 3".	

TRAFFIC CONTROL DURING PLANING, OVERLAY AND LEVELING OPERATIONS ARE SHOWN ELSEWHERE IN THE PLANS.

MINIMUM WARNING SIGN SIZE	
Conventional roads	36" x 36"
Freeways/expressways, divided roadways	48" x 48"

Texas Department of Transportation

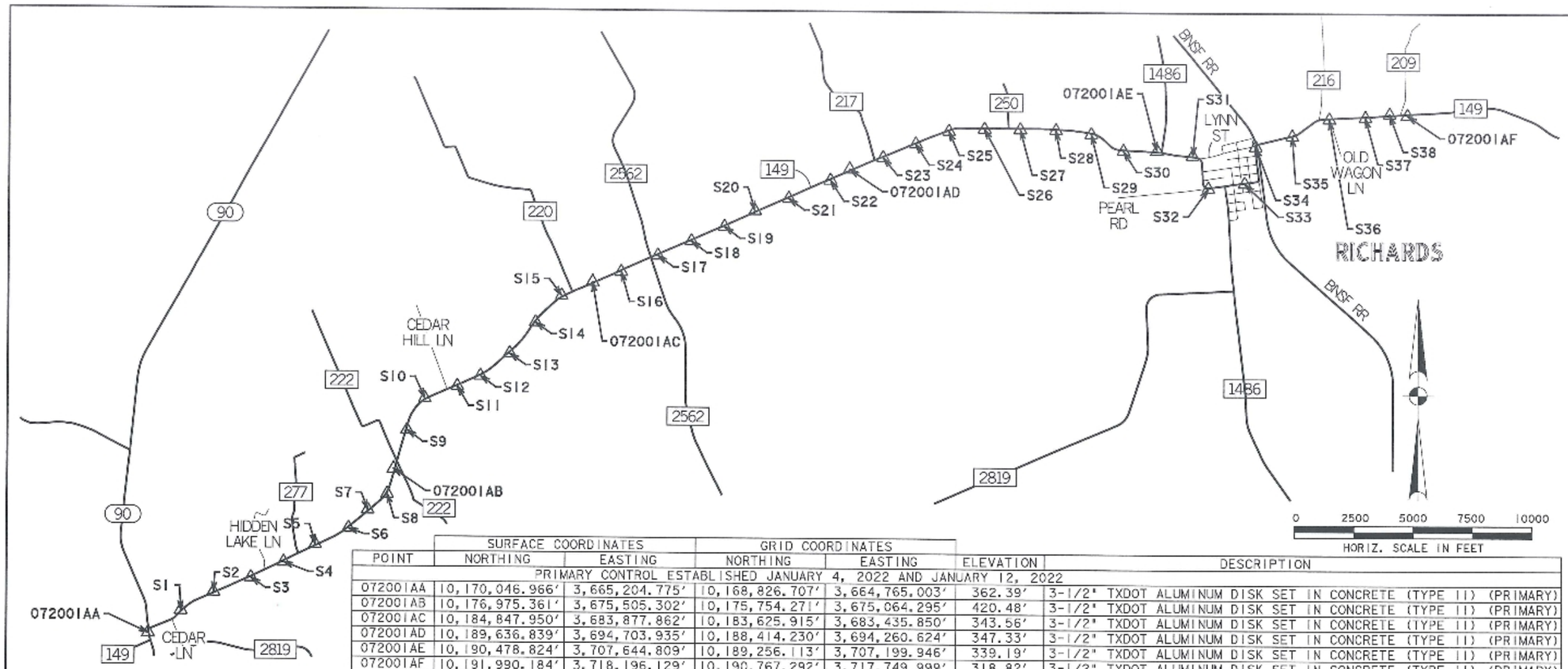
Traffic Operations Division Standard

SIGNING FOR UNEVEN LANES

WZ(UL)-13

FILE: wzul-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT April 1992	CONT	SECT	JOB	HIGHWAY
REVISIONS 8-95 2-98 7-13 1-97 3-03	0720	01	044, ETC.	FM 149, ETC.
	DIST BRYAN		COUNTY GRIMES	SHEET NO. 57

112



ANDERSON

POINT	SURFACE COORDINATES NORTHING	SURFACE COORDINATES EASTING	GRID COORDINATES NORTHING	GRID COORDINATES EASTING	ELEVATION	DESCRIPTION
PRIMARY CONTROL ESTABLISHED JANUARY 4, 2022 AND JANUARY 12, 2022						
072001AA	10,170,046.966'	3,665,204.775'	10,168,826.707'	3,664,765.003'	362.39'	3-1/2" TXDOT ALUMINUM DISK SET IN CONCRETE (TYPE II) (PRIMARY)
072001AB	10,176,975.361'	3,675,505.302'	10,175,754.271'	3,675,064.295'	420.48'	3-1/2" TXDOT ALUMINUM DISK SET IN CONCRETE (TYPE II) (PRIMARY)
072001AC	10,184,847.950'	3,683,877.862'	10,183,625.915'	3,683,435.850'	343.56'	3-1/2" TXDOT ALUMINUM DISK SET IN CONCRETE (TYPE II) (PRIMARY)
072001AD	10,189,636.839'	3,694,703.935'	10,188,414.230'	3,694,260.624'	347.33'	3-1/2" TXDOT ALUMINUM DISK SET IN CONCRETE (TYPE II) (PRIMARY)
072001AE	10,190,478.824'	3,707,644.809'	10,189,256.113'	3,707,199.946'	339.19'	3-1/2" TXDOT ALUMINUM DISK SET IN CONCRETE (TYPE II) (PRIMARY)
072001AF	10,191,990.184'	3,718,196.129'	10,190,767.292'	3,717,749.999'	318.82'	3-1/2" TXDOT ALUMINUM DISK SET IN CONCRETE (TYPE II) (PRIMARY)
S1	10,170,992.527'	3,666,551.330'	10,169,772.154'	3,666,111.397'	304.61'	SET 5/8" REBAR W/RED TRAVERSE CAP (SECONDARY)
S2	10,171,776.516'	3,667,927.029'	10,170,556.049'	3,667,486.931'	383.19'	SET 5/8" REBAR W/RED TRAVERSE CAP (SECONDARY)
S3	10,172,381.687'	3,669,513.460'	10,171,161.147'	3,669,073.171'	333.20'	SET 5/8" REBAR W/RED TRAVERSE CAP (SECONDARY)
S4	10,173,042.174'	3,670,893.707'	10,171,821.555'	3,670,453.253'	319.66'	SET 5/8" REBAR W/RED TRAVERSE CAP (SECONDARY)
S5	10,173,790.402'	3,672,224.102'	10,172,569.694'	3,671,783.488'	381.99'	SET 5/8" REBAR W/RED TRAVERSE CAP (SECONDARY)
S6	10,174,470.975'	3,673,618.830'	10,173,250.185'	3,673,178.048'	408.64'	SET 5/8" REBAR W/RED TRAVERSE CAP (SECONDARY)
S7	10,175,249.275'	3,674,416.275'	10,174,028.392'	3,673,975.398'	414.93'	SET 5/8" REBAR W/RED TRAVERSE CAP (SECONDARY)
S8	10,175,918.569'	3,675,238.561'	10,174,697.605'	3,674,797.586'	425.89'	SET 5/8" REBAR W/RED TRAVERSE CAP (SECONDARY)
S9	10,178,599.512'	3,676,070.057'	10,177,378.227'	3,675,628.981'	434.97'	SET 5/8" REBAR W/RED TRAVERSE CAP (SECONDARY)
S10	10,179,935.662'	3,676,818.415'	10,178,714.216'	3,676,377.250'	399.83'	SET 5/8" REBAR W/RED TRAVERSE CAP (SECONDARY)
S11	10,180,449.191'	3,678,200.095'	10,179,227.684'	3,677,758.764'	391.90'	SET 5/8" REBAR W/RED TRAVERSE CAP (SECONDARY)
S12	10,180,889.419'	3,679,186.997'	10,179,667.859'	3,678,745.547'	419.63'	SET 5/8" REBAR W/RED TRAVERSE CAP (SECONDARY)
S13	10,181,836.634'	3,680,418.214'	10,180,614.960'	3,679,976.617'	406.76'	SET 5/8" REBAR W/RED TRAVERSE CAP (SECONDARY)
S14	10,183,142.473'	3,681,492.347'	10,181,920.643'	3,681,050.621'	397.22'	SET 5/8" REBAR W/RED TRAVERSE CAP (SECONDARY)
S15	10,184,266.719'	3,682,580.180'	10,183,044.754'	3,682,138.324'	375.00'	SET 5/8" REBAR W/RED TRAVERSE CAP (SECONDARY)
S16	10,185,280.463'	3,685,086.902'	10,184,058.376'	3,684,644.745'	365.14'	SET 5/8" REBAR W/RED TRAVERSE CAP (SECONDARY)
S17	10,185,975.315'	3,686,629.859'	10,184,753.145'	3,686,187.516'	362.49'	SET 5/8" REBAR W/RED TRAVERSE CAP (SECONDARY)
S18	10,186,583.335'	3,688,023.933'	10,185,361.092'	3,687,581.424'	329.93'	SET 5/8" REBAR W/RED TRAVERSE CAP (SECONDARY)
S19	10,187,200.858'	3,689,426.528'	10,185,978.541'	3,688,983.850'	305.58'	SET 5/8" REBAR W/RED TRAVERSE CAP (SECONDARY)
S20	10,187,871.570'	3,690,719.561'	10,186,649.173'	3,690,276.728'	310.59'	SET 5/8" REBAR W/RED TRAVERSE CAP (SECONDARY)
S21	10,188,397.671'	3,692,139.774'	10,187,175.210'	3,691,696.770'	325.45'	SET 5/8" REBAR W/RED TRAVERSE CAP (SECONDARY)
S22	10,189,166.107'	3,693,900.048'	10,187,943.554'	3,693,456.833'	316.72'	SET 5/8" REBAR W/RED TRAVERSE CAP (SECONDARY)
S23	10,190,128.318'	3,696,104.601'	10,188,905.649'	3,695,661.122'	349.29'	SET 5/8" REBAR W/RED TRAVERSE CAP (SECONDARY)
S24	10,190,710.016'	3,697,487.611'	10,189,487.278'	3,697,043.966'	340.67'	SET 5/8" REBAR W/RED TRAVERSE CAP (SECONDARY)
S25	10,191,255.768'	3,698,883.178'	10,190,032.964'	3,698,439.366'	353.10'	SET 5/8" REBAR W/RED TRAVERSE CAP (SECONDARY)
S26	10,191,347.817'	3,700,384.224'	10,190,125.002'	3,699,940.232'	331.63'	SET 5/8" REBAR W/RED TRAVERSE CAP (SECONDARY)
S27	10,191,340.179'	3,701,873.671'	10,190,117.365'	3,701,429.500'	351.55'	SET 5/8" REBAR W/RED TRAVERSE CAP (SECONDARY)
S28	10,191,309.918'	3,703,372.929'	10,190,087.108'	3,702,928.578'	372.86'	SET 5/8" REBAR W/RED TRAVERSE CAP (SECONDARY)
S29	10,191,155.453'	3,704,864.021'	10,189,932.662'	3,704,419.491'	376.15'	SET 5/8" REBAR W/RED TRAVERSE CAP (SECONDARY)
S30	10,190,465.376'	3,706,220.517'	10,189,242.667'	3,705,775.824'	355.21'	SET 5/8" REBAR W/RED TRAVERSE CAP (SECONDARY)
S31	10,190,271.962'	3,709,132.829'	10,189,049.277'	3,708,687.787'	325.09'	SET 5/8" REBAR W/RED TRAVERSE CAP (SECONDARY)
S32	10,188,895.542'	3,709,790.309'	10,187,673.022'	3,709,345.188'	309.51'	SET 5/8" REBAR W/RED TRAVERSE CAP (SECONDARY)
S33	10,189,109.630'	3,711,335.739'	10,187,887.084'	3,710,890.432'	306.15'	SET 5/8" REBAR W/RED TRAVERSE CAP (SECONDARY)
S34	10,190,651.397'	3,711,791.636'	10,189,428.666'	3,711,346.275'	277.07'	SET 5/8" REBAR W/RED TRAVERSE CAP (SECONDARY)
S35	10,191,096.380'	3,713,336.690'	10,189,873.596'	3,712,891.143'	270.90'	SET 5/8" REBAR W/RED TRAVERSE CAP (SECONDARY)
S36	10,191,823.908'	3,714,897.068'	10,190,601.036'	3,714,451.334'	291.44'	SET 5/8" REBAR W/RED TRAVERSE CAP (SECONDARY)
S37	10,191,889.245'	3,716,421.497'	10,190,666.365'	3,715,975.580'	304.76'	SET 5/8" REBAR W/RED TRAVERSE CAP (SECONDARY)
S38	10,192,035.621'	3,717,446.999'	10,190,812.723'	3,717,000.959'	329.54'	SET 5/8" REBAR W/RED TRAVERSE CAP (SECONDARY)

NOTES:

HORIZONTAL COORDINATES ARE IN U.S. SURVEY FEET BASED ON THE TEXAS COORDINATE SYSTEM OF 1983, CENTRAL ZONE 4203, NORTH AMERICAN DATUM OF 1983 (NAD83) (2011 ADJ.), EPOCH 2010.00, GEOID 12B MODEL, WITH A GRID TO SURFACE ADJUSTMENT FACTOR OF 1.000120 (GRIMES COUNTY). ELEVATIONS ARE IN U.S. SURVEY FEET BASED ON THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88). PRIMARY CONTROL VALUES ARE DERIVED FROM STATIC GPS OBSERVATIONS (LEVEL 2 TXDOT GPS POSITIONING SPECIFICATIONS) AND SECONDARY CONTROL VALUES ARE DERIVED FROM RTK BASE GPS OBSERVATIONS (LEVEL 3 TXDOT GPS POSITIONING SPECIFICATIONS).

THE SURVEY CONTROL INFORMATION HAS BEEN ACCEPTED AND INCORPORATED INTO THIS PS&E.

I, THE UNDERSIGNED, A REGISTERED PROFESSIONAL LAND SURVEYOR IN THE STATE OF TEXAS, DO HEREBY CERTIFY THAT THE COORDINATE AND ELEVATION INFORMATION SHOWN WERE DERIVED FROM A SURVEY MADE ON THE GROUND UNDER MY SUPERVISION.

STATE OF TEXAS REGISTERED HEATH W. BROWN 6189 PROFESSIONAL LAND SURVEYOR

Heath W. B 1-27-2023

HEATH W. BROWN
RPLS NO. 6189

DATE

NO.	REVISIONS	BY	DATE

ARREDONDO, ZEPEDA & BRUNZ, LLC
11363 McCree Road - Dallas, Texas 75238
(214) 341-0900
FIRM REGISTRATION No. T-10065
TBPLS REGISTRATION No. 10065700

Texas Department of Transportation

SURVEY CONTROL INDEX SHEET

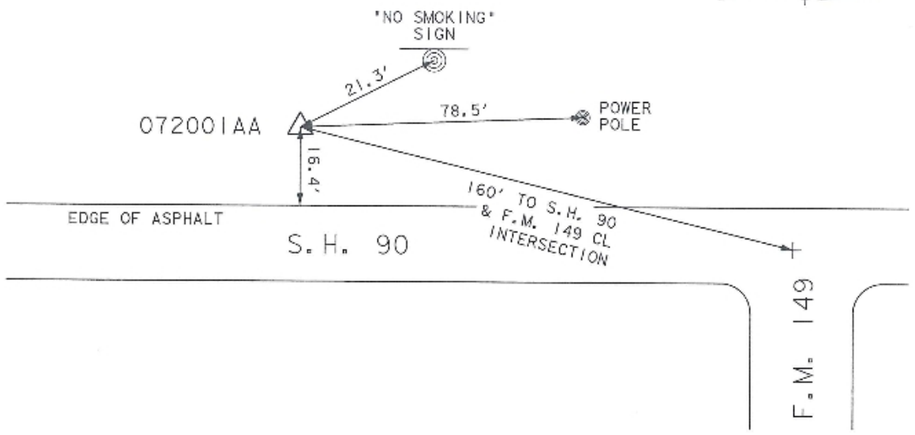
FED. RD. DIV. NO.	PROJECT NO.	HIGHWAY NO.
6		FM 149, ETC.
STATE	DISTRICT	COUNTY
TEXAS	BRYAN	GRIMES
CONTROL	SECTION	JOB / SHEET NO.
0720	01	044, ETC. / 58

CONTROL POINT 072001AA

APPROXIMATE LOCATION:

A 3-1/2" TXDOT ALUMINUM DISK SET IN CONCRETE (TYPE II) LOCATED APPROXIMATELY 160' SOUTHWEST OF THE CENTERLINE INTERSECTION OF S.H. 90 AND F.M. 149, 16.4' WEST OF AN EDGE OF ASPHALT, 78.5' SOUTH OF A POWER POLE AND 21.3' SOUTHEAST OF A "NO SMOKING" SIGN.

SKETCH
(NOT TO SCALE)



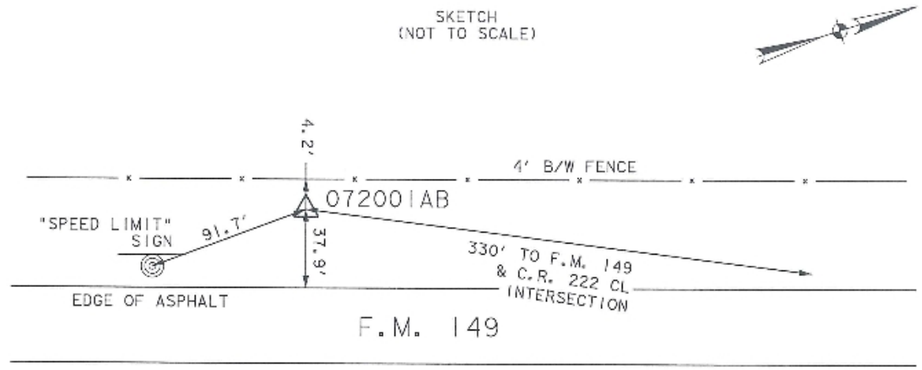
GRID NORTHING:	10,168,826.707'	SURFACE NORTHING:	10,170,046.966'
GRID EASTING:	3,664,765.003'	SURFACE EASTING:	3,665,204.775'
NAVD88 ELEVATION:	362.39'	NAVD88 ELEVATION:	362.39'

CONTROL POINT 072001AB

APPROXIMATE LOCATION:

A 3-1/2" TXDOT ALUMINUM DISK SET IN CONCRETE (TYPE II) LOCATED APPROXIMATELY 330' SOUTHWEST OF THE CENTERLINE INTERSECTION OF F.M. 149 AND CO RD 222, 91.7' NORTHWEST OF A "SPEED LIMIT" SIGN, 37.9' NORTHWEST OF AN EDGE OF ASPHALT AND 4.2' SOUTHEAST OF A 4' BARBED WIRE FENCE.

SKETCH
(NOT TO SCALE)



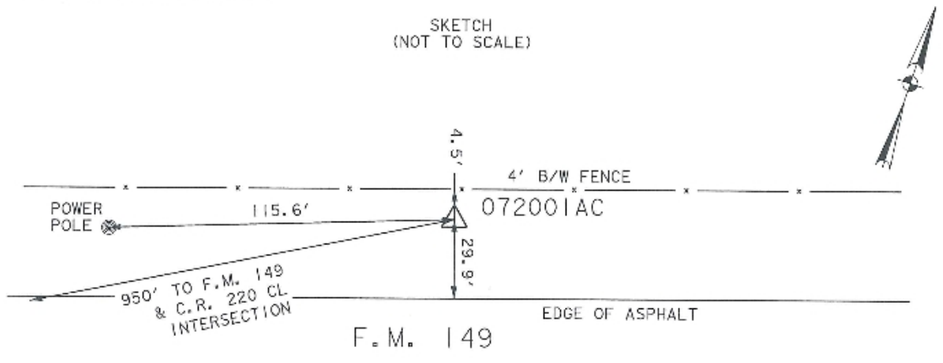
GRID NORTHING:	10,175,754.271'	SURFACE NORTHING:	10,176,975.361'
GRID EASTING:	3,675,064.295'	SURFACE EASTING:	3,675,505.302'
NAVD88 ELEVATION:	420.48'	NAVD88 ELEVATION:	420.48'

CONTROL POINT 072001AC

APPROXIMATE LOCATION:

A 3-1/2" TXDOT ALUMINUM DISK SET IN CONCRETE (TYPE II) LOCATED APPROXIMATELY 950' NORTHEAST OF THE CENTERLINE INTERSECTION OF F.M. 149 AND CO RD 220, 115.6' NORTHEAST OF A POWER POLE, 29.9' NORTHWEST OF AN EDGE OF ASPHALT AND 4.5' SOUTHEAST OF A 4' BARBED WIRE FENCE.

SKETCH
(NOT TO SCALE)



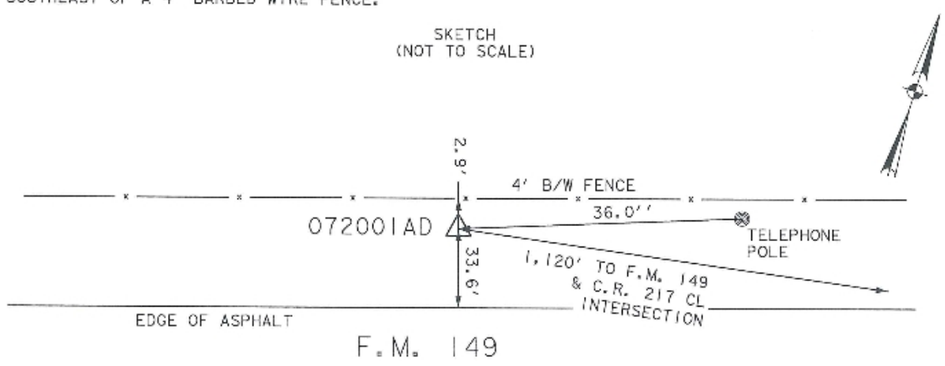
GRID NORTHING:	10,183,625.915'	SURFACE NORTHING:	10,184,847.950'
GRID EASTING:	3,683,435.850'	SURFACE EASTING:	3,683,877.862'
NAVD88 ELEVATION:	343.56'	NAVD88 ELEVATION:	343.56'

CONTROL POINT 072001AD

APPROXIMATE LOCATION:

A 3-1/2" TXDOT ALUMINUM DISK SET IN CONCRETE (TYPE II) LOCATED APPROXIMATELY 1,120' SOUTHWEST OF THE CENTERLINE INTERSECTION OF F.M. 149 AND CO RD 217, 36.0' SOUTHWEST OF A TELEPHONE POLE, 33.6' NORTHWEST OF AN EDGE OF ASPHALT AND 2.9' SOUTHEAST OF A 4' BARBED WIRE FENCE.

SKETCH
(NOT TO SCALE)



GRID NORTHING:	10,188,414.230'	SURFACE NORTHING:	10,189,636.839'
GRID EASTING:	3,694,260.624'	SURFACE EASTING:	3,694,703.935'
NAVD88 ELEVATION:	347.33'	NAVD88 ELEVATION:	347.33'

NOTES:

HORIZONTAL COORDINATES ARE IN U.S. SURVEY FEET BASED ON THE TEXAS COORDINATE SYSTEM OF 1983, CENTRAL ZONE 4203, NORTH AMERICAN DATUM OF 1983 (NAD83) (2011 ADJ.), EPOCH 2010.00, GEOID 12B MODEL, WITH A GRID TO SURFACE ADJUSTMENT FACTOR OF 1.000120 (GRIMES COUNTY). ELEVATIONS ARE IN U.S. SURVEY FEET BASED ON THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88). PRIMARY CONTROL VALUES ARE DERIVED FROM STATIC GPS OBSERVATIONS (LEVEL 2 TXDOT GPS POSITIONING SPECIFICATIONS) AND SECONDARY CONTROL VALUES ARE DERIVED FROM RTK BASE GPS OBSERVATIONS (LEVEL 3 TXDOT GPS POSITIONING SPECIFICATIONS).

THE SURVEY CONTROL INFORMATION HAS BEEN ACCEPTED AND INCORPORATED INTO THIS PS&E.

I, THE UNDERSIGNED, A REGISTERED PROFESSIONAL LAND SURVEYOR IN THE STATE OF TEXAS, DO HEREBY CERTIFY THAT THE COORDINATE AND ELEVATION INFORMATION SHOWN WERE DERIVED FROM A SURVEY MADE ON THE GROUND UNDER MY SUPERVISION.

Heath W. Brown 1-27-2023

HEATH W. BROWN
RPLS NO. 6189

DATE

NO.	REVISIONS	BY	DATE

ARREDONDO, ZEPEDA & BRUNZ, LLC
11255 McCree Road - Dallas, Texas 75238
(214) 341-0900
FIRM REGISTRATION No. F-10085
TBPLS REGISTRATION No. 10085400

Texas Department of Transportation

HORIZONTAL AND VERTICAL CONTROL SHEET

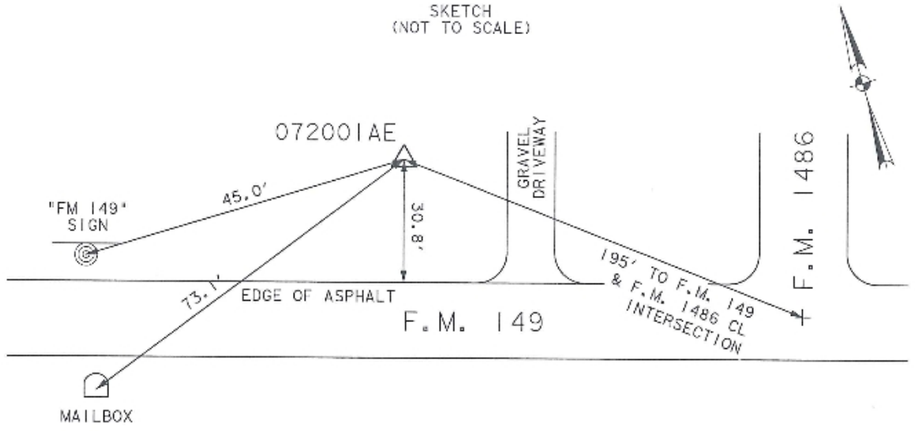
FED. RD. DIV. NO.	PROJECT NO.	HIGHWAY NO.
6		FM 149, ETC.
STATE	DISTRICT	COUNTY
TEXAS	BRYAN	GRIMES
CONTROL	SECTION	JOB / SHEET NO.
0720	01	044, ETC. / 59

CONTROL POINT 072001AE

APPROXIMATE LOCATION:

A 3-1/2" TXDOT ALUMINUM DISK SET IN CONCRETE (TYPE II) LOCATED APPROXIMATELY 195' NORTHWEST OF THE CENTERLINE INTERSECTION OF F.M. 149 AND F.M. 1486, 45.0' NORTHEAST OF A "FM 149" SIGN, 30.8' NORTH OF AN EDGE OF ASPHALT AND 73.1' NORTHEAST OF A MAILBOX.

SKETCH
(NOT TO SCALE)



GRID NORTHING: 10,189,256.113'
GRID EASTING: 3,707,199.946'
NAVD88 ELEVATION: 339.19'

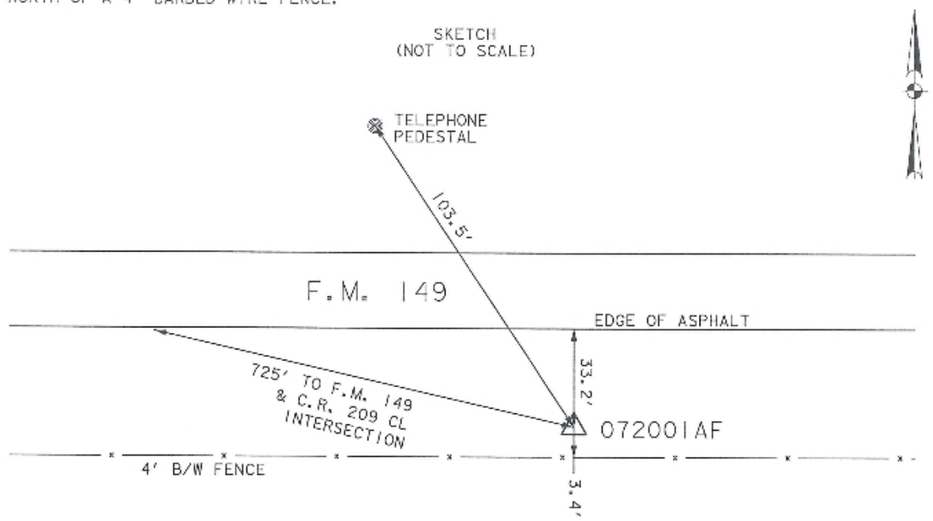
SURFACE NORTHING: 10,190,478.824'
SURFACE EASTING: 3,707,644.809'
NAVD88 ELEVATION: 339.19'

CONTROL POINT 072001AF

APPROXIMATE LOCATION:

A 3-1/2" TXDOT ALUMINUM DISK SET IN CONCRETE (TYPE II) LOCATED APPROXIMATELY 725' SOUTHEAST OF THE CENTERLINE INTERSECTION OF F.M. 149 AND CO RD 209, 103.5' SOUTHEAST OF A TELEPHONE PEDESTAL, 33.2' SOUTH OF AN EDGE OF ASPHALT AND 3.4' NORTH OF A 4' BARBED WIRE FENCE.

SKETCH
(NOT TO SCALE)



GRID NORTHING: 10,190,767.292'
GRID EASTING: 3,717,749.999'
NAVD88 ELEVATION: 318.82'

SURFACE NORTHING: 10,191,990.184'
SURFACE EASTING: 3,718,196.129'
NAVD88 ELEVATION: 318.82'

NOTES:

HORIZONTAL COORDINATES ARE IN U.S. SURVEY FEET BASED ON THE TEXAS COORDINATE SYSTEM OF 1983, CENTRAL ZONE 4203, NORTH AMERICAN DATUM OF 1983 (NAD83) (2011 ADJ.), EPOCH 2010.00, GEOID 12B MODEL, WITH A GRID TO SURFACE ADJUSTMENT FACTOR OF 1.000120 (GRIMES COUNTY). ELEVATIONS ARE IN U.S. SURVEY FEET BASED ON THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88). PRIMARY CONTROL VALUES ARE DERIVED FROM STATIC GPS OBSERVATIONS (LEVEL 2 TXDOT GPS POSITIONING SPECIFICATIONS) AND SECONDARY CONTROL VALUES ARE DERIVED FROM RTK BASE GPS OBSERVATIONS (LEVEL 3 TXDOT GPS POSITIONING SPECIFICATIONS).

THE SURVEY CONTROL INFORMATION HAS BEEN ACCEPTED AND INCORPORATED INTO THIS PS&E.

I, THE UNDERSIGNED, A REGISTERED PROFESSIONAL LAND SURVEYOR IN THE STATE OF TEXAS, DO HEREBY CERTIFY THAT THE COORDINATE AND ELEVATION INFORMATION SHOWN WERE DERIVED FROM A SURVEY MADE ON THE GROUND UNDER MY SUPERVISION.

STATE OF TEXAS
REGISTERED
HEATH W. BROWN
6189
PROFESSIONAL
LAND SURVEYOR

Heath W. Brown 1-27-2023

HEATH W. BROWN DATE
RPLS NO. 6189

NO.	REVISIONS	BY	DATE

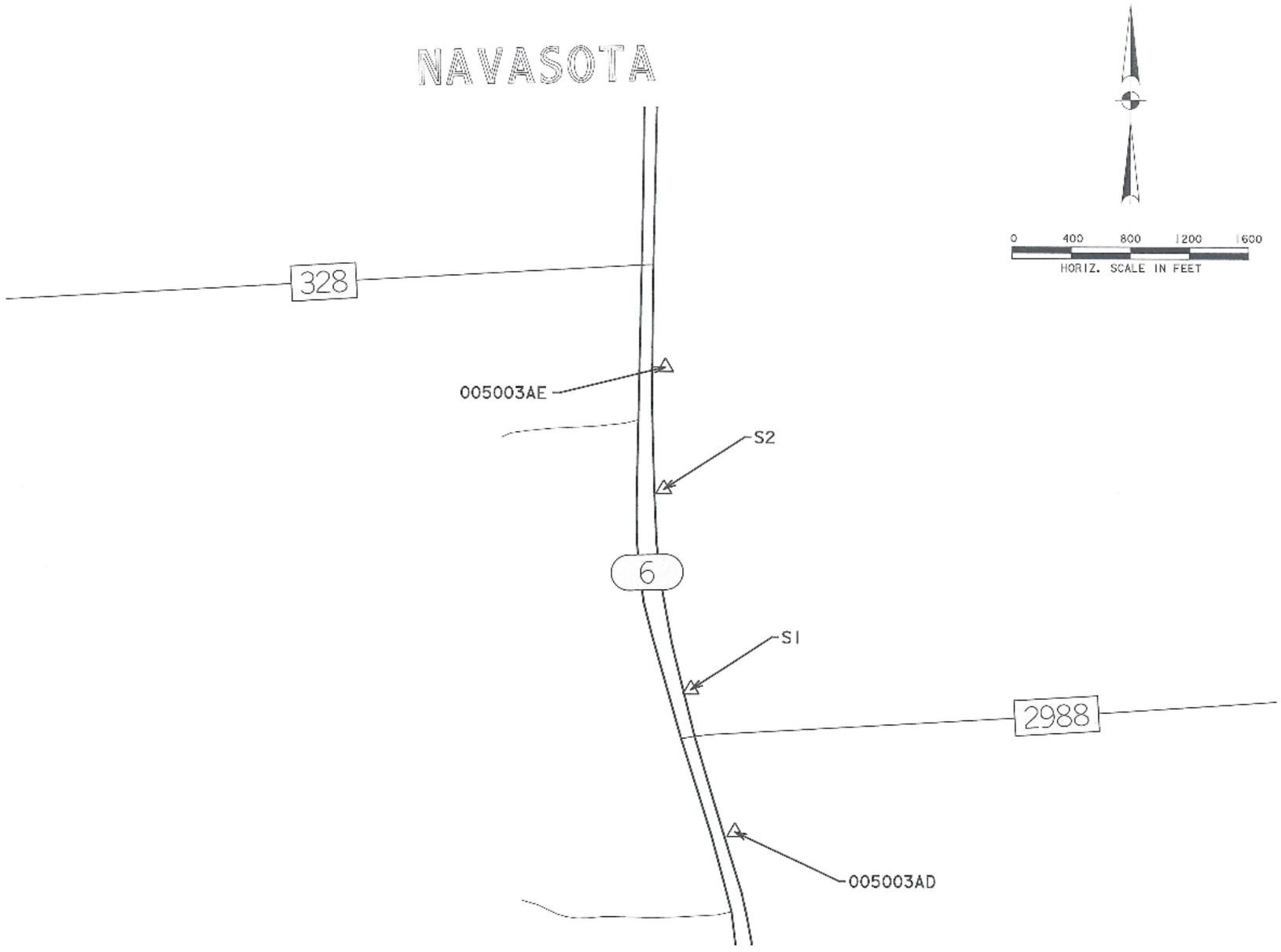
ARREDONDO, ZEPEDA & BRUNZ, LLC
11355 McCree Road - Dallas, Texas 75238
(214) 341 9900
FIRM REGISTRATION No. F-10036
TBPLS REGISTRATION No. 10058700

Texas Department of Transportation

HORIZONTAL AND VERTICAL CONTROL SHEET

FED. RD. DIV. NO.	PROJECT NO.	HIGHWAY NO.
6		FM 149, ETC.

STATE	DISTRICT	COUNTY	
TEXAS	BRYAN	GRIMES	
CONTROL	SECTION	JOB	SHEET NO.
0720	01	044, ETC.	60



POINT	SURFACE COORDINATES NORTHING	SURFACE COORDINATES EASTING	GRID COORDINATES NORTHING	GRID COORDINATES EASTING	ELEVATION	DESCRIPTION
PRIMARY CONTROL ESTABLISHED JANUARY 12, 2022						
005003AD	10,102,800.251'	3,649,600.041'	10,101,588.061'	3,649,162.142'	319.88'	3-1/2" TXDOT ALUMINUM DISK SET IN CONCRETE (TYPE II) (PRIMARY)
005003AE	10,105,924.321'	3,649,124.073'	10,104,711.756'	3,648,686.231'	308.72'	3-1/2" TXDOT ALUMINUM DISK SET IN CONCRETE (TYPE II) (PRIMARY)
S1	10,103,754.988'	3,649,301.909'	10,102,542.683'	3,648,864.046'	279.08'	SET 5/8" REBAR W/RED TRAVERSE CAP (SECONDARY)
S2	10,105,100.933'	3,649,115.130'	10,103,888.467'	3,648,677.289'	278.06'	SET 5/8" REBAR W/RED TRAVERSE CAP (SECONDARY)

NOTES:

HORIZONTAL COORDINATES ARE IN U.S. SURVEY FEET BASED ON THE TEXAS COORDINATE SYSTEM OF 1983, CENTRAL ZONE 4203, NORTH AMERICAN DATUM OF 1983 (NAD83) (2011 ADJ.), EPOCH 2010.00, GEOID 12B MODEL, WITH A GRID TO SURFACE ADJUSTMENT FACTOR OF 1.000120 (GRIMES COUNTY). ELEVATIONS ARE IN U.S. SURVEY FEET BASED ON THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88). PRIMARY CONTROL VALUES ARE DERIVED FROM STATIC GPS OBSERVATIONS (LEVEL 2 TXDOT GPS POSITIONING SPECIFICATIONS) AND SECONDARY CONTROL VALUES ARE DERIVED FROM RTK BASE GPS OBSERVATIONS (LEVEL 3 TXDOT GPS POSITIONING SPECIFICATIONS).

THE SURVEY CONTROL INFORMATION HAS BEEN ACCEPTED AND INCORPORATED INTO THIS PS&E.

I, THE UNDERSIGNED, A REGISTERED PROFESSIONAL LAND SURVEYOR IN THE STATE OF TEXAS, DO HEREBY CERTIFY THAT THE COORDINATE AND ELEVATION INFORMATION SHOWN WERE DERIVED FROM A SURVEY MADE ON THE GROUND UNDER MY SUPERVISION.

Heath W. B 1-27-2023

HEATH W. BROWN
RPLS NO. 6189
DATE

NO.	REVISIONS	BY	DATE

ARREDONDO, ZEPEDA & BRUNZ, LLC
11355 McCree Road - Dallas, Texas 75238
(214) 341-9930
FIRM REGISTRATION No. F-10095
TBPLS REGISTRATION No. 10088700

Texas Department of Transportation

SURVEY CONTROL INDEX SHEET

FED. RD. DIV. NO.	PROJECT NO.	HIGHWAY NO.
6		FM 149, ETC.

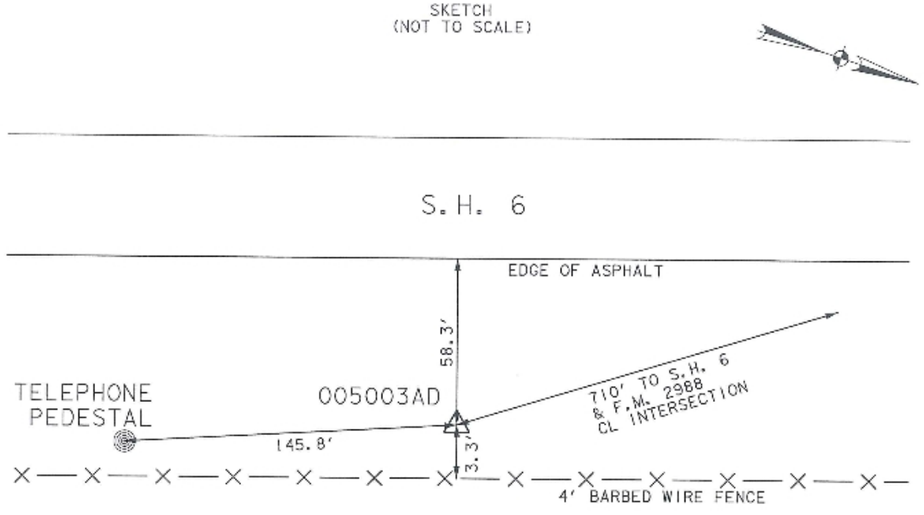
STATE	DISTRICT	COUNTY	
TEXAS	BRYAN	GRIMES	
CONTROL	SECTION	JOB	SHEET NO.
0720	01	044, ETC.	61

CONTROL POINT 005003AD

APPROXIMATE LOCATION:

A 3-1/2" TXDOT ALUMINUM DISK SET IN CONCRETE (TYPE II) LOCATED APPROXIMATELY 710' SOUTHEAST OF THE CENTERLINE INTERSECTION OF S.H. 6 AND F.M. 2988, 3.3' WEST OF A 4' BARBED WIRE FENCE, 58.3' EAST OF THE EDGE OF ASPHALT AND 145.8' NORTHWEST OF A TELEPHONE PEDESTAL.

SKETCH
(NOT TO SCALE)



GRID NORTHING: 10,101,588.061'
GRID EASTING: 3,649,162.142'
NAVD88 ELEVATION: 319.88'

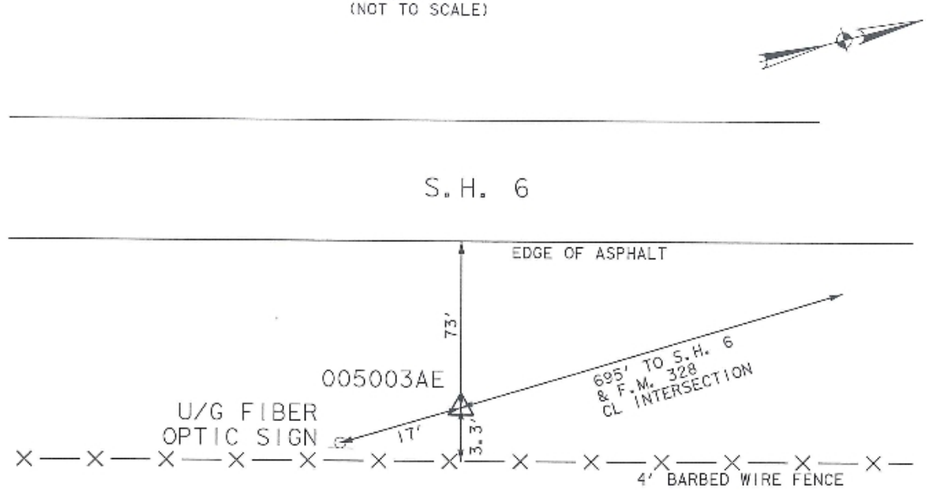
SURFACE NORTHING: 10,102,800.251'
SURFACE EASTING: 3,649,600.041'
NAVD88 ELEVATION: 319.88'

CONTROL POINT 005003AE

APPROXIMATE LOCATION:

A 3-1/2" TXDOT ALUMINUM DISK SET IN CONCRETE (TYPE II) LOCATED APPROXIMATELY 695' SOUTHEAST OF THE CENTERLINE INTERSECTION OF S.H. 6 AND F.M. 328, 3.3' WEST OF A 4' BARBED WIRE FENCE, 73' EAST OF THE EDGE OF ASPHALT AND 17' NORTHWEST OF AN UNDERGROUND FIBER OPTIC SIGN.

SKETCH
(NOT TO SCALE)



GRID NORTHING: 10,104,711.756'
GRID EASTING: 3,648,686.231'
NAVD88 ELEVATION: 308.72'

SURFACE NORTHING: 10,105,924.321'
SURFACE EASTING: 3,649,124.073'
NAVD88 ELEVATION: 308.72'

NOTES:

HORIZONTAL COORDINATES ARE IN U.S. SURVEY FEET BASED ON THE TEXAS COORDINATE SYSTEM OF 1983, CENTRAL ZONE 4203, NORTH AMERICAN DATUM OF 1983 (NAD83) (2011 ADJ.), EPOCH 2010.00, GEOID 12B MODEL, WITH A GRID TO SURFACE ADJUSTMENT FACTOR OF 1.000120 (GRIMES COUNTY). ELEVATIONS ARE IN U.S. SURVEY FEET BASED ON THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88). PRIMARY CONTROL VALUES ARE DERIVED FROM STATIC GPS OBSERVATIONS (LEVEL 2 TXDOT GPS POSITIONING SPECIFICATIONS) AND SECONDARY CONTROL VALUES ARE DERIVED FROM RTK BASE GPS OBSERVATIONS (LEVEL 3 TXDOT GPS POSITIONING SPECIFICATIONS).

THE SURVEY CONTROL INFORMATION HAS BEEN ACCEPTED AND INCORPORATED INTO THIS PS&E.

I, THE UNDERSIGNED, A REGISTERED PROFESSIONAL LAND SURVEYOR IN THE STATE OF TEXAS, DO HEREBY CERTIFY THAT THE COORDINATE AND ELEVATION INFORMATION SHOWN WERE DERIVED FROM A SURVEY MADE ON THE GROUND UNDER MY SUPERVISION.

STATE OF TEXAS
REGISTERED
HEATH W. BROWN
6189
PROFESSIONAL
LAND SURVEYOR

Heath W. B 1-27-2023

HEATH W. BROWN
RPLS NO. 6189

DATE

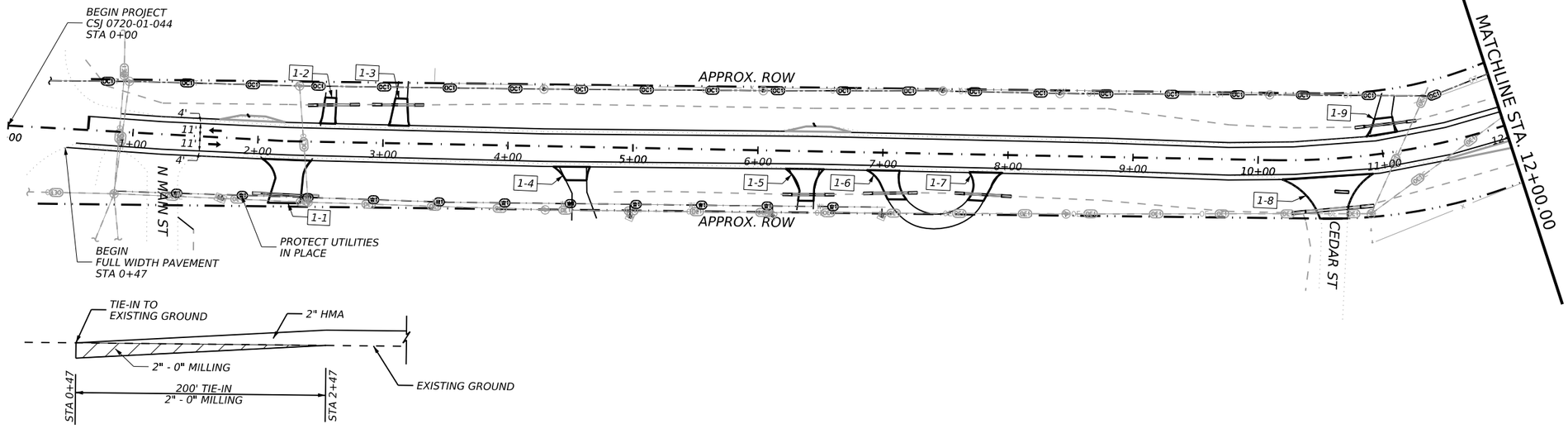
NO.	REVISIONS	BY	DATE

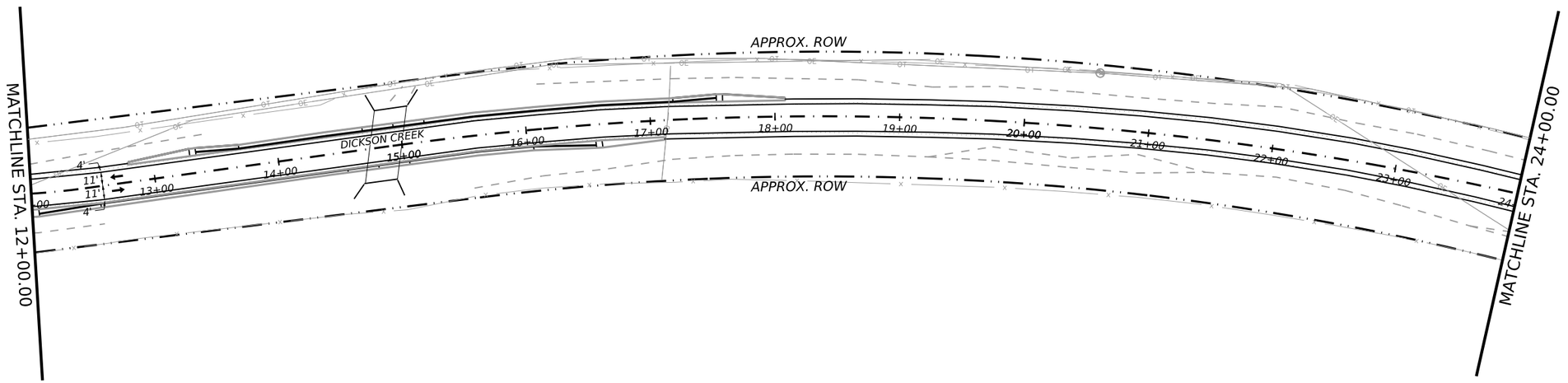
ARREDONDO, ZEPEDA & BRUNZ, LLC
11355 McCree Road - Dallas, Texas 75238
(214) 341-9900
FIRM REGISTRATION No. F-10908
TBPLS REGISTRATION No. 10088700

Texas Department of Transportation

HORIZONTAL AND VERTICAL CONTROL SHEET

FED. RD. DIV. NO.	PROJECT NO.	HIGHWAY NO.	
6		FM149, ETC.	
STATE	DISTRICT	COUNTY	
TEXAS	BRYAN	GRIMES	
CONTROL	SECTION	JOB	SHEET NO.
0720	01	044, ETC.	62





LEGEND	
# - #	DRIVEWAY NUMBER
#	CULVERT NUMBER
	DITCH FLOW LINE
x	FENCE LINE
OE	OVERHEAD ELECTRIC LINE
OT	OVERHEAD TELECOM LINE
T1	UNDERGROUND TELECOM LINE
GL	GAS LINE
WL	WATER LINE

NOTES:
REFER TO "STRUCTURE LAYOUT (FM 149)" FOR DRAINAGE STRUCTURE INFORMATION

REFER TO "MBGF LAYOUT (DICKSON CREEK)" FOR MBGF FROM STA 12+05 TO STA 17+55.

STATE OF TEXAS
JEAN J. FENG
102035
LICENSED
PROFESSIONAL ENGINEER

04/20/2023

HORIZONTAL
0 50 100 200 FT

PRINT DATE	REVISION DATE
4/20/2023	

Texas Department of Transportation
Bryan District

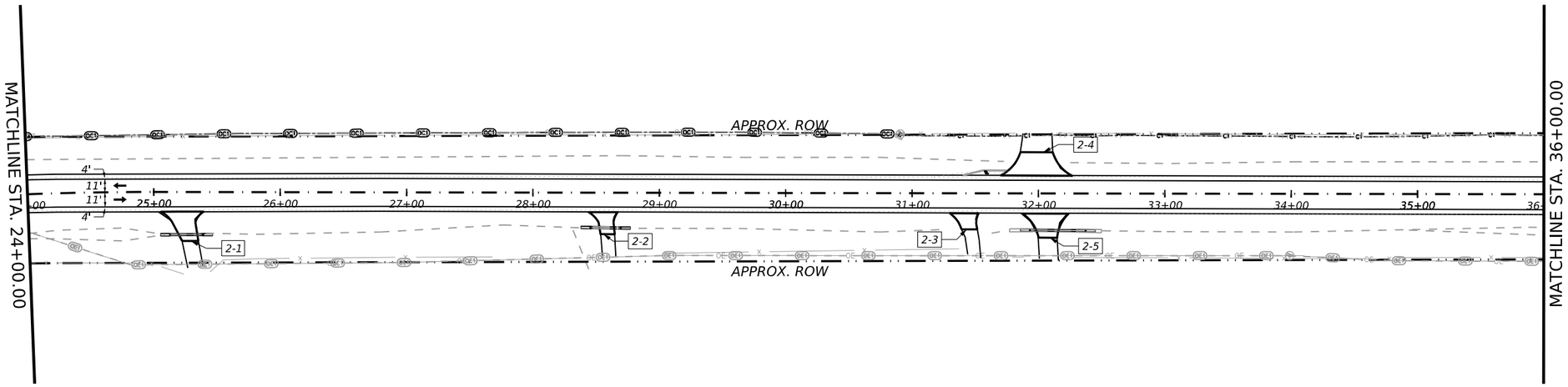
ROADWAY LAYOUT (FM 149)

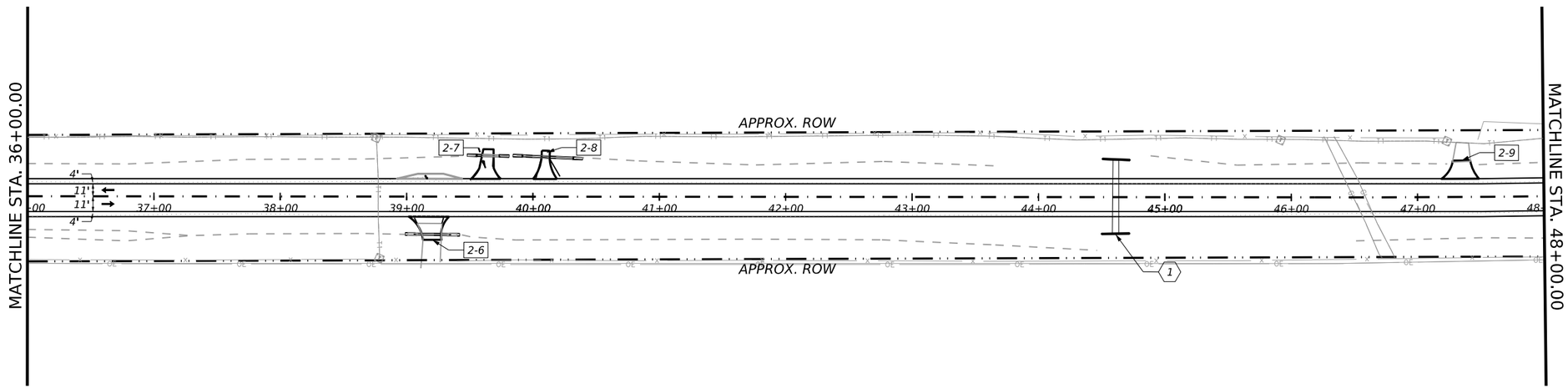
SHEET 1 OF 12 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 149, ETC.

STATE	DISTRICT	COUNTY	
TEXAS	BRY	GRIMES	
CONTROL	SECTION	JOB	SHEET NO.
0720	01	044, ETC.	63

REV DATE: 4/20/2023
CSJ: 0720-01-044
FILENAME: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY/Design Projects/072001044/4 - Design/Plan Set/3. Roadway/3D. Roadway Plan And Profile Sheets/ROADWAY LAYOUT (FM 149)





LEGEND	
# - #	DRIVEWAY NUMBER
#	CULVERT NUMBER
	DITCH FLOW LINE
x	FENCE LINE
OE	OVERHEAD ELECTRIC LINE
OT	OVERHEAD TELECOM LINE
T1	UNDERGROUND TELECOM LINE
GL	GAS LINE
WL	WATER LINE

NOTES:
REFER TO "STRUCTURE LAYOUT (FM 149)" FOR DRAINAGE STRUCTURE INFORMATION

STATE OF TEXAS
JEAN J. FENG
102035
LICENSED
PROFESSIONAL ENGINEER

04/20/2023

HORIZONTAL
0 50 100 200 FT

PRINT DATE	REVISION DATE
4/19/2023	

Texas Department of Transportation
Bryan District
©2023

ROADWAY LAYOUT (FM 149)

SHEET 2 OF 12 SHEETS

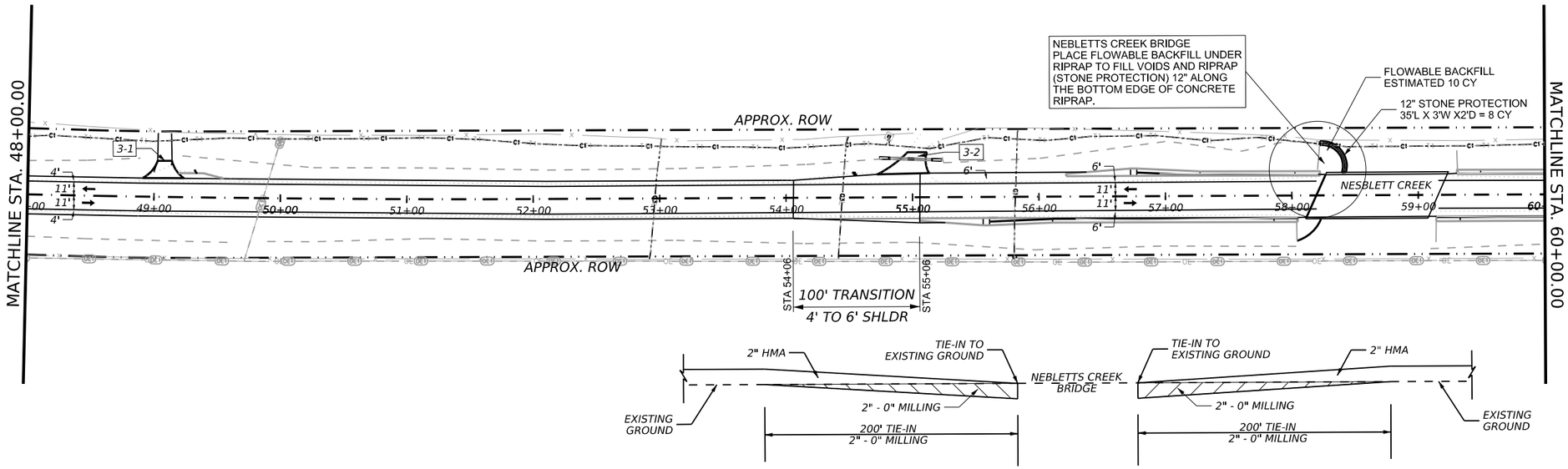
FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 149, ETC.

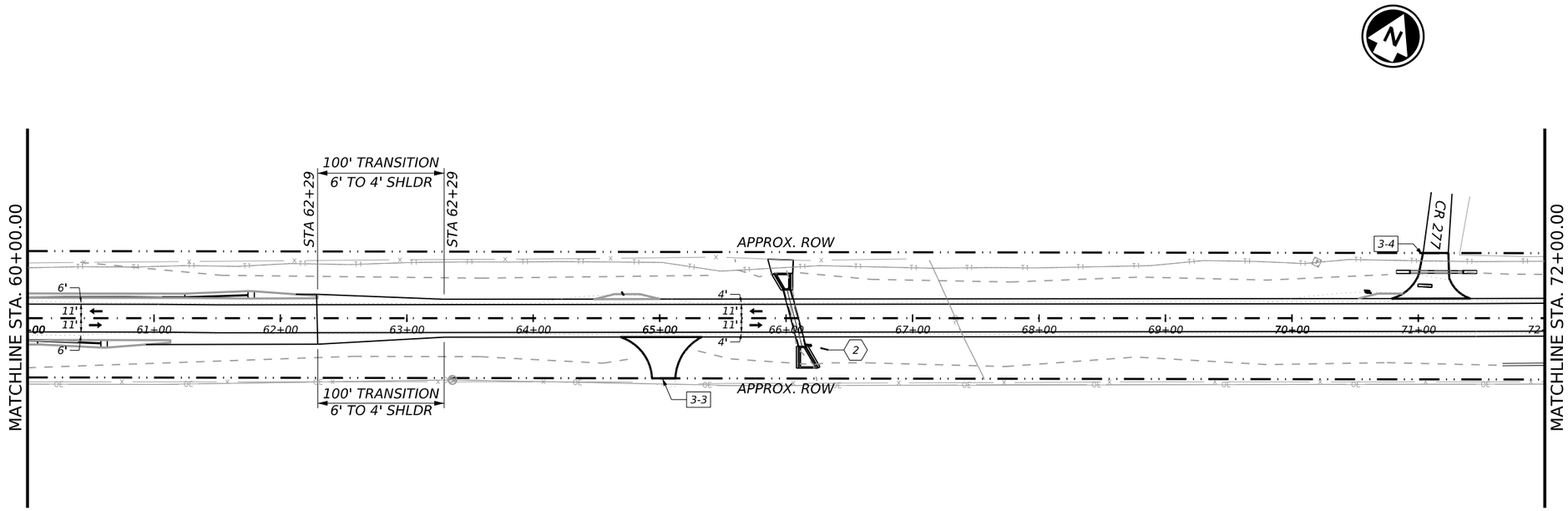
STATE	DISTRICT	COUNTY
TEXAS	BRY	GRIMES

CONTROL	SECTION	JOB	SHEET NO.
0720	01	044, ETC.	64

REV DATE: 4/18/2023
CSJ: 0720-01-044

FILENAME: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY/Design Projects/0720010444 - Design/Plan Set/3. Roadway/3D. Roadway/PlanAndProfileSheets/ROADWAY LAYOUT (FM 149)





LEGEND	
# - #	DRIVEWAY NUMBER
#	CULVERT NUMBER
	DITCH FLOW LINE
x	FENCE LINE
OE	OVERHEAD ELECTRIC LINE
OT	OVERHEAD TELECOM LINE
T1	UNDERGROUND TELECOM LINE
GL	GAS LINE
WL	WATER LINE

NOTES:
REFER TO "STRUCTURE LAYOUT (FM 149)" FOR DRAINAGE STRUCTURE INFORMATION

REFER TO "MBGF LAYOUT (NESBLETT CREEK BRIDGE)" FOR MBGF FROM STA 55+61 TO STA 61+74.

STATE OF TEXAS
JEAN J. FENG
102035
LICENSED
PROFESSIONAL ENGINEER

04/20/2023

HORIZONTAL
0 50 100 200 FT

PRINT DATE	REVISION DATE
4/19/2023	

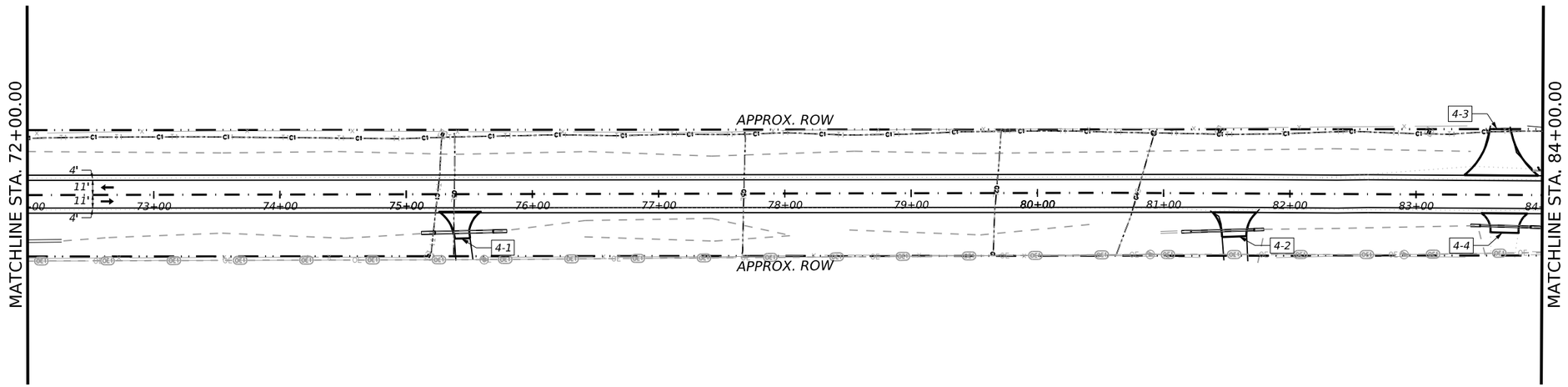
Texas Department of Transportation
Bryan District

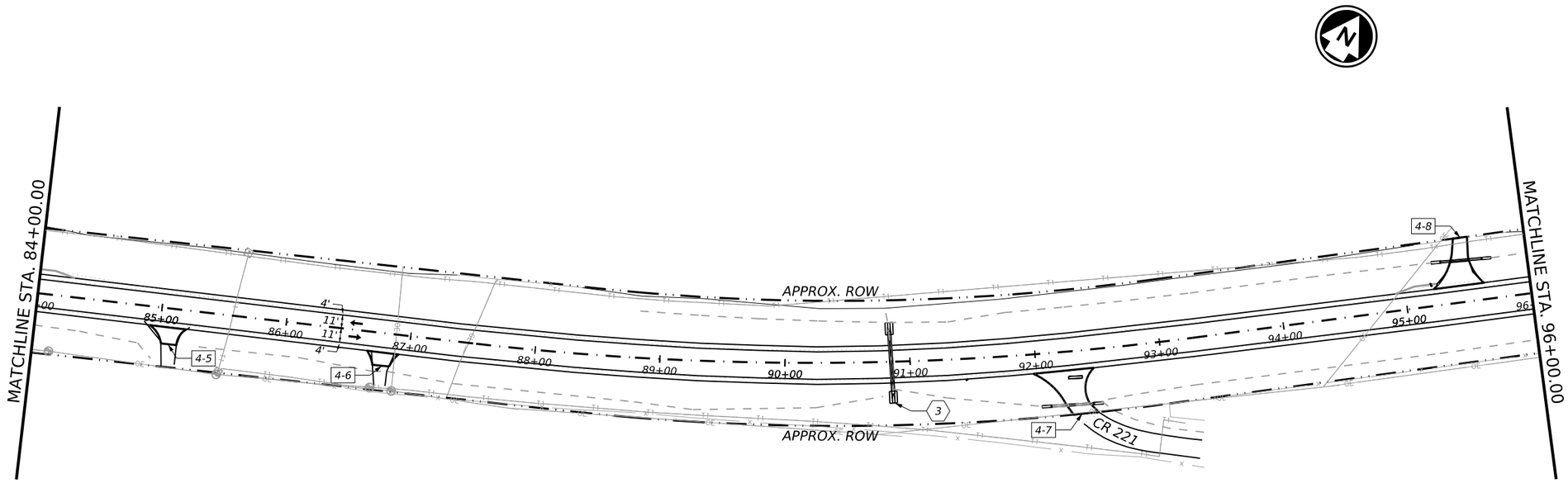
ROADWAY LAYOUT (FM 149)

SHEET 3 OF 12 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 149, ETC.
STATE	DISTRICT	COUNTY
TEXAS	BRY	GRIMES
CONTROL	SECTION	JOB / SHEET NO.
0720	01	044, ETC. / 65

REV DATE: 4/18/2023
CSJs: 0720-01-044
FILENAME: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY\Design Projects\0720010444 - Design\Plan Set\3. Roadway\3D. Roadway\PlanAndProfileSheets\ROADWAY LAYOUT (FM 149)





LEGEND	
# - #	DRIVEWAY NUMBER
#	CULVERT NUMBER
	DITCH FLOW LINE
FENCE	FENCE LINE
OE	OVERHEAD ELECTRIC LINE
OT	OVERHEAD TELECOM LINE
T1	UNDERGROUND TELECOM LINE
GL	GAS LINE
WL	WATER LINE

NOTES:
REFER TO "STRUCTURE LAYOUT (FM 149)" FOR DRAINAGE STRUCTURE INFORMATION

STATE OF TEXAS
JEAN J. FENG
102035
LICENSED
PROFESSIONAL ENGINEER

04/20/2023

HORIZONTAL
0 50 100 200 FT

PRINT DATE	REVISION DATE
4/19/2023	

Texas Department of Transportation
Bryan District
©2023

ROADWAY LAYOUT (FM 149)

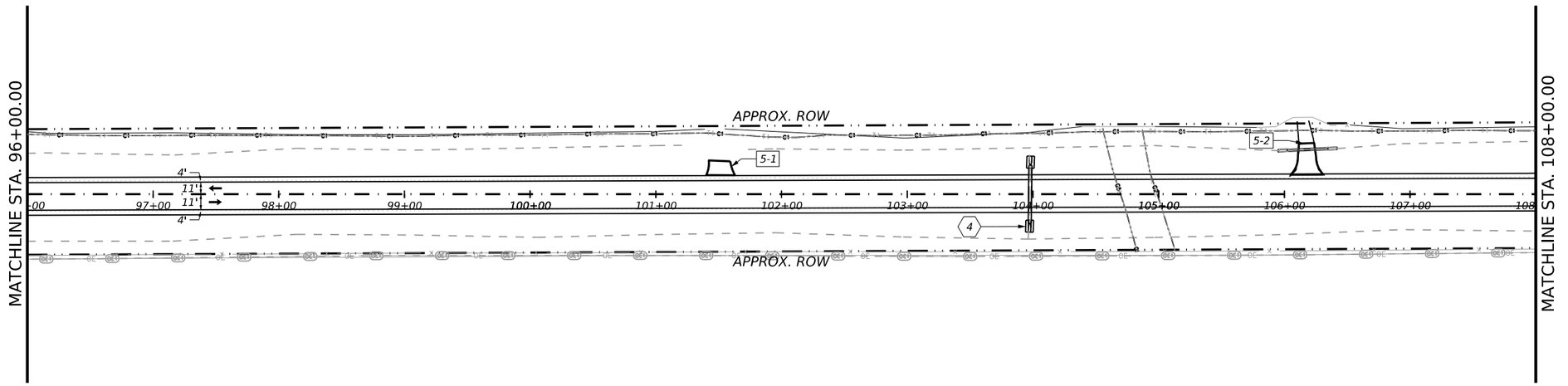
SHEET 4 OF 12 SHEETS

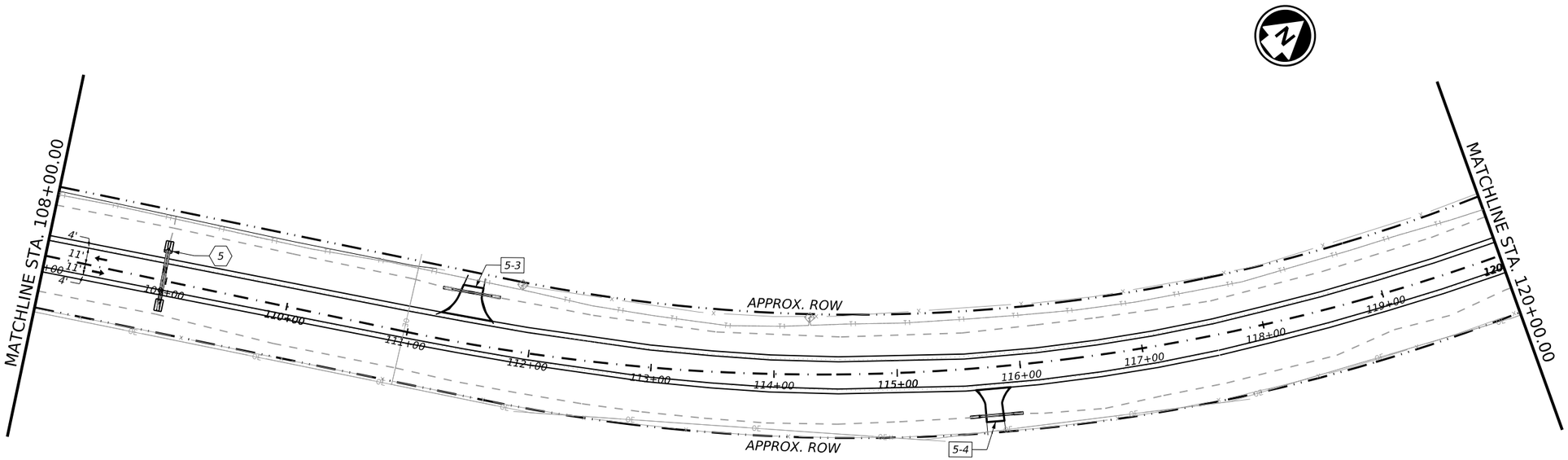
FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 149, ETC.

STATE	DISTRICT	COUNTY
TEXAS	BRY	GRIMES

CONTROL	SECTION	JOB	SHEET NO.
0720	01	044, ETC.	66

REV DATE: 4/18/2023
CSJ: 0720-01-044
FILENAME: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY\Design Projects\0720010444 - Design\Plan Set\3. Roadway\3D. Roadway\PlanAndProfileSheets\ROADWAY LAYOUT (FM 149)





LEGEND	
# - #	DRIVEWAY NUMBER
#	CULVERT NUMBER
	DITCH FLOW LINE
x	FENCE LINE
OE	OVERHEAD ELECTRIC LINE
OT	OVERHEAD TELECOM LINE
T1	UNDERGROUND TELECOM LINE
GL	GAS LINE
WL	WATER LINE

NOTES:
REFER TO "STRUCTURE LAYOUT (FM 149)" FOR DRAINAGE STRUCTURE INFORMATION

STATE OF TEXAS
JEAN J. FENG
102035
LICENSED
PROFESSIONAL ENGINEER

04/20/2023

HORIZONTAL
0 50 100 200 FT

PRINT DATE	REVISION DATE
4/19/2023	

Texas Department of Transportation
Bryan District
© 2023

ROADWAY LAYOUT (FM 149)

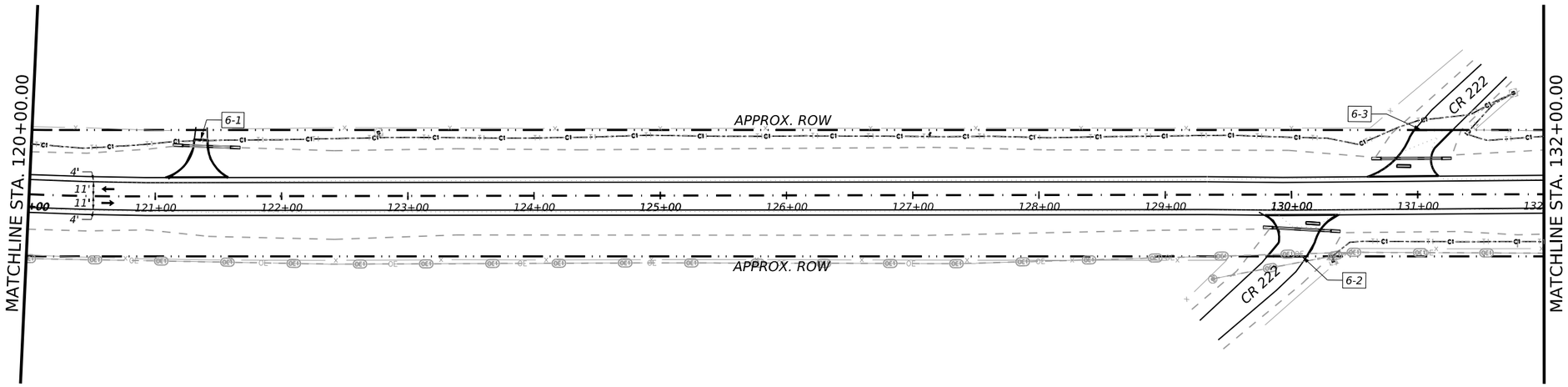
SHEET 5 OF 12 SHEETS

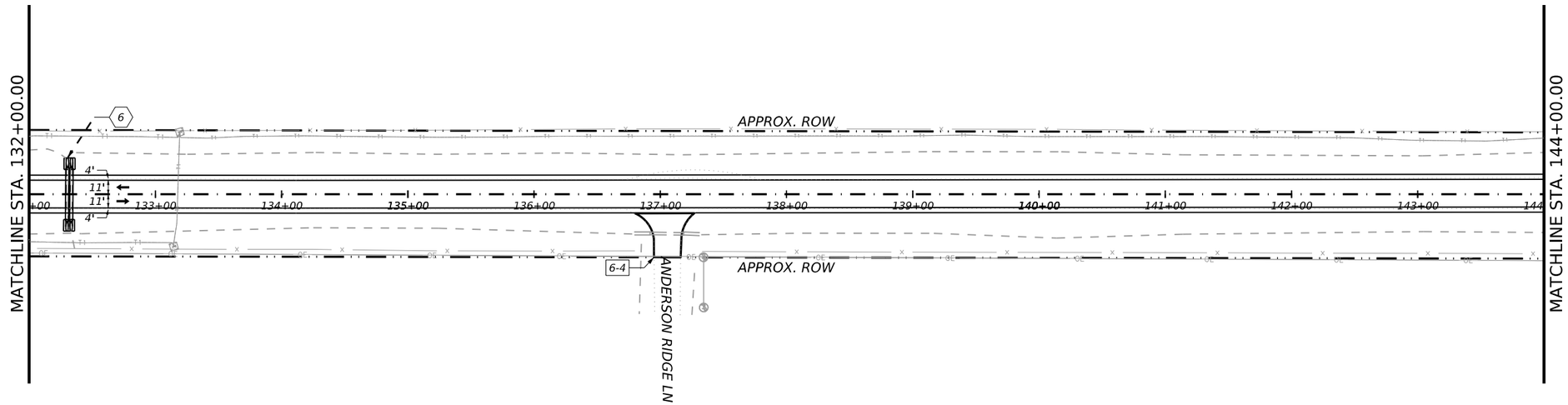
FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 149, ETC.

STATE	DISTRICT	COUNTY
TEXAS	BRY	GRIMES

CONTROL	SECTION	JOB	SHEET NO.
0720	01	044, ETC.	67

REV DATE: 4/18/2023
CSJ: 0720-01-044
FILENAME: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY\Design Projects\0720010444 - Design\Plan Set\3. Roadway\3D. Roadway\Plan\And\Profile\Sheets\ROADWAY LAYOUT (FM 149)





LEGEND	
# - #	DRIVEWAY NUMBER
#	CULVERT NUMBER
	DITCH FLOW LINE
x	FENCE LINE
OE	OVERHEAD ELECTRIC LINE
OT	OVERHEAD TELECOM LINE
T1	UNDERGROUND TELECOM LINE
GL	GAS LINE
WL	WATER LINE

NOTES:
REFER TO "STRUCTURE LAYOUT (FM 149)" FOR DRAINAGE STRUCTURE INFORMATION

STATE OF TEXAS
JEAN J. FENG
102035
LICENSED
PROFESSIONAL ENGINEER

04/20/2023

HORIZONTAL
0 50 100 200 FT

PRINT DATE	REVISION DATE
4/19/2023	

Texas Department of Transportation
Bryan District
©2023

ROADWAY LAYOUT (FM 149)

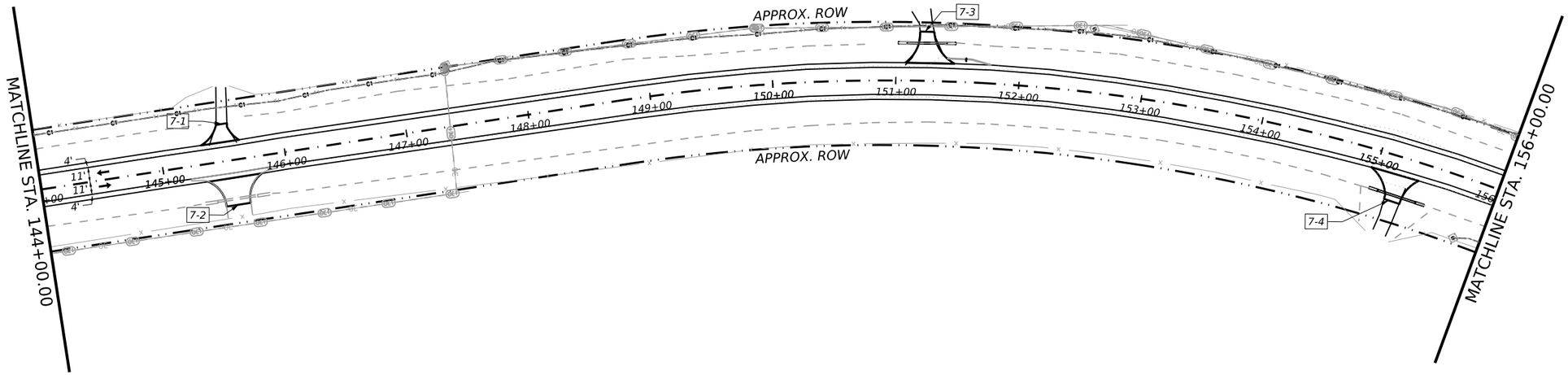
SHEET 6 OF 12 SHEETS

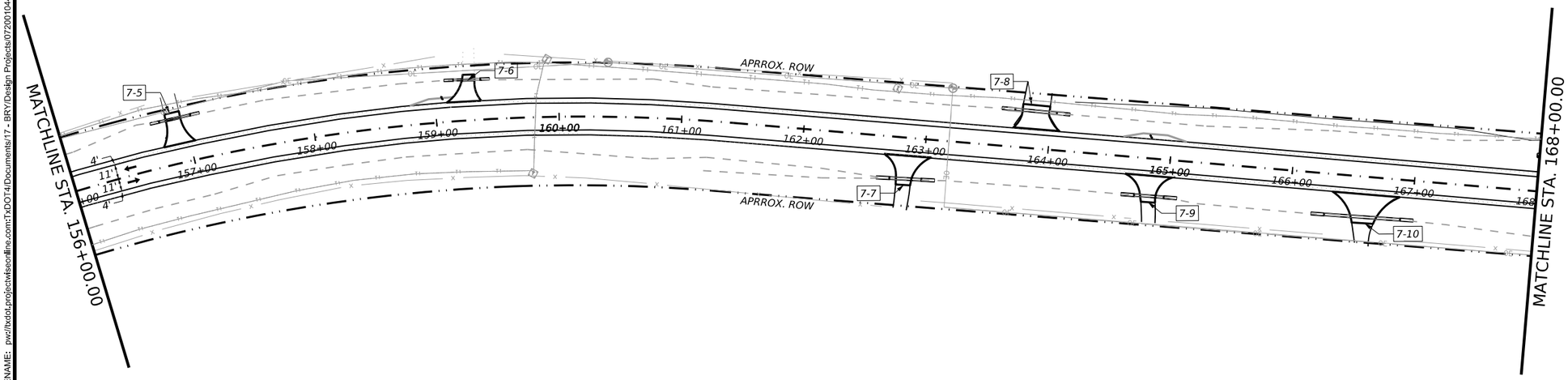
FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 149, ETC.

STATE	DISTRICT	COUNTY
TEXAS	BRY	GRIMES

CONTROL	SECTION	JOB	SHEET NO.
0720	01	044, ETC.	68

REV DATE: 4/18/2023
CSJ#: 0720-01-044
FILENAME: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY\Design Projects\0720010444 - Design\Plan Set\3. Roadway\3D. Roadway\PlanAndProfileSheets\ROADWAY LAYOUT (FM 149)





LEGEND	
# - #	DRIVEWAY NUMBER
#	CULVERT NUMBER
	DITCH FLOW LINE
x	FENCE LINE
OE	OVERHEAD ELECTRIC LINE
OT	OVERHEAD TELECOM LINE
T1	UNDERGROUND TELECOM LINE
GL	GAS LINE
WL	WATER LINE

NOTES:
REFER TO "STRUCTURE LAYOUT (FM 149)" FOR DRAINAGE STRUCTURE INFORMATION

STATE OF TEXAS
JEAN J. FENG
102035
LICENSED
PROFESSIONAL ENGINEER

04/20/2023

HORIZONTAL
0 50 100 200 FT

PRINT DATE	REVISION DATE
4/19/2023	

Texas Department of Transportation
Bryan District
©2023

ROADWAY LAYOUT (FM 149)

SHEET 7 OF 12 SHEETS

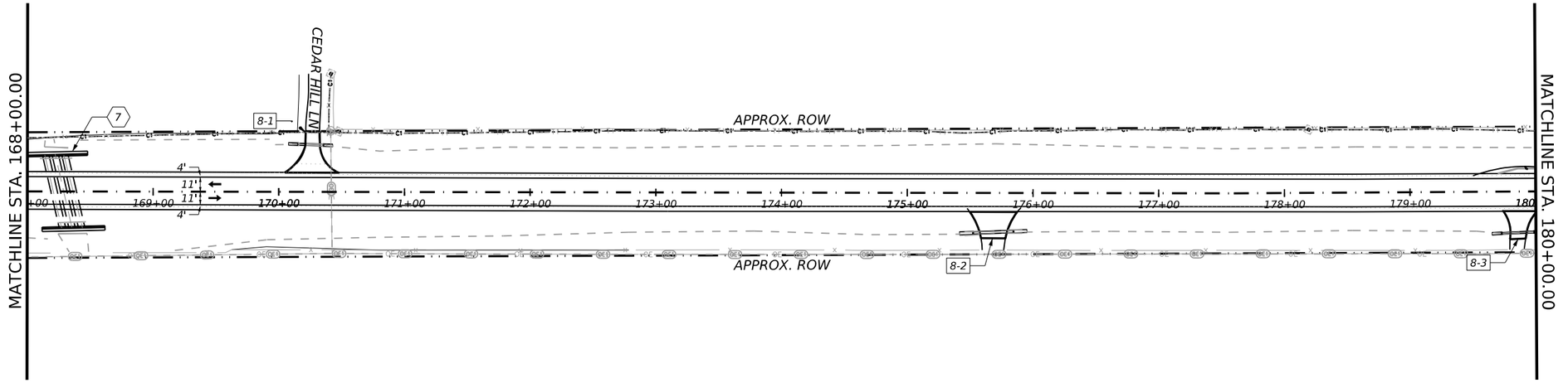
FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 149, ETC.

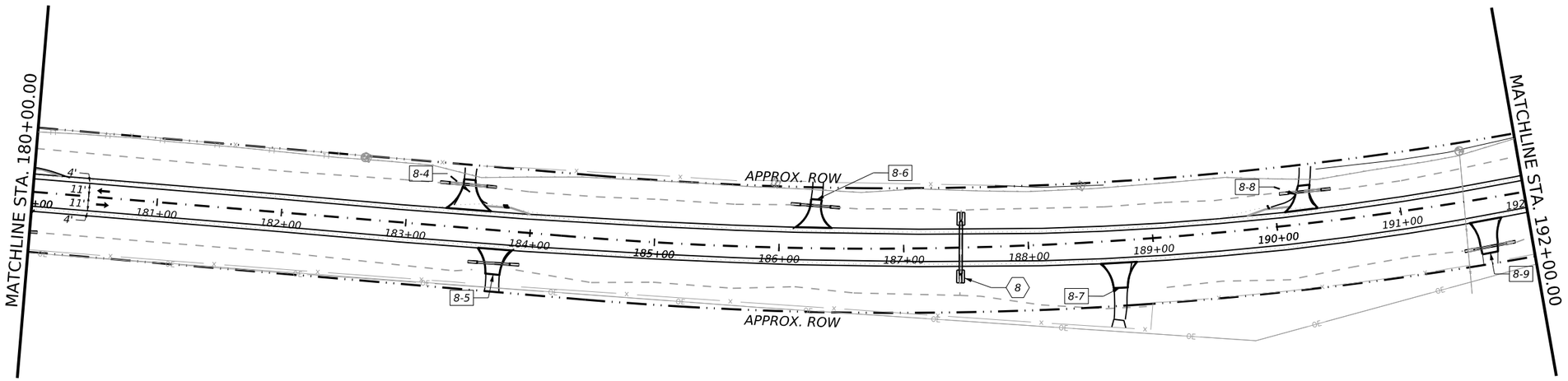
STATE	DISTRICT	COUNTY
TEXAS	BRY	GRIMES

CONTROL	SECTION	JOB	SHEET NO.
0720	01	044, ETC.	69

REV DATE: 4/18/2023
CSJ: 0720-01-044

FILENAME: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY\Design Projects\0720010444 - Design\Plan Set\3. Roadway\3D. Roadway\Plan And Profile Sheets\ROADWAY LAYOUT (FM 149)





LEGEND	
# - #	DRIVEWAY NUMBER
#	CULVERT NUMBER
	DITCH FLOW LINE
x	FENCE LINE
OE	OVERHEAD ELECTRIC LINE
OT	OVERHEAD TELECOM LINE
T1	UNDERGROUND TELECOM LINE
GL	GAS LINE
WL	WATER LINE

NOTES:
REFER TO "STRUCTURE LAYOUT (FM 149)" FOR DRAINAGE STRUCTURE INFORMATION

STATE OF TEXAS
JEAN J. FENG
102035
LICENSED
PROFESSIONAL ENGINEER

04/20/2023

HORIZONTAL
0 50 100 200 FT

PRINT DATE	REVISION DATE
4/19/2023	

Texas Department of Transportation
Bryan District
©2023

ROADWAY LAYOUT (FM 149)

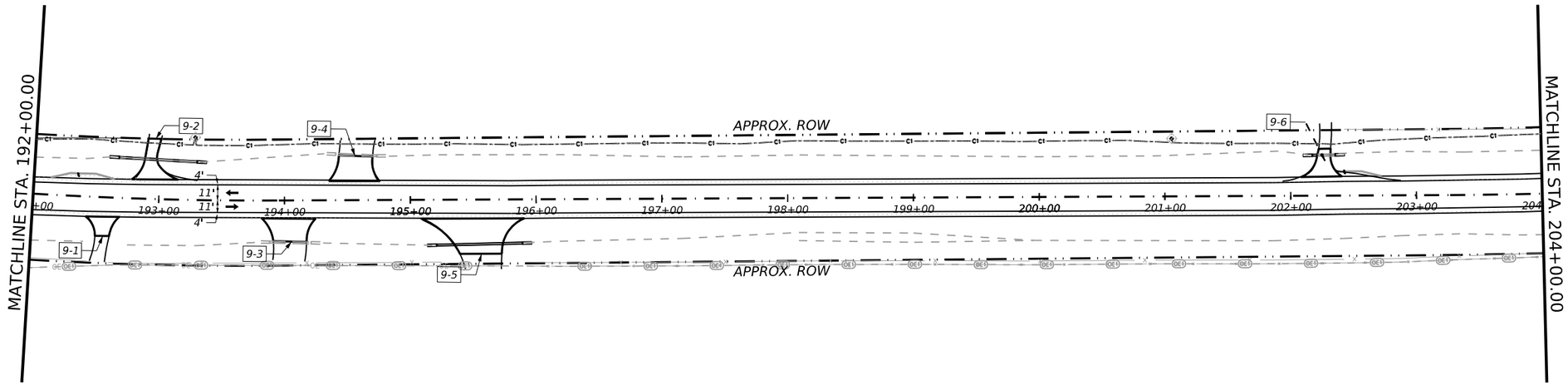
SHEET 8 OF 12 SHEETS

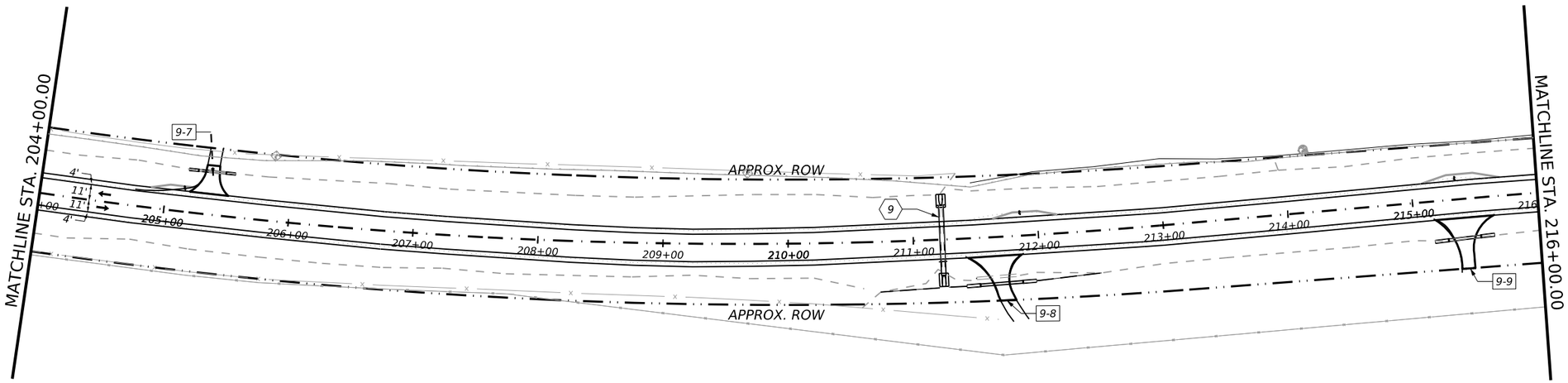
FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 149, ETC.

STATE	DISTRICT	COUNTY
TEXAS	BRY	GRIMES

CONTROL	SECTION	JOB	SHEET NO.
0720	01	044, ETC.	70

REV DATE: 4/18/2023
CSJ: 0720-01-044
FILENAME: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY\Design Projects\0720010444 - Design\Plan Set\3. Roadway\3D. Roadway\Plan\And\Profile\Sheets\ROADWAY LAYOUT (FM 149)





LEGEND	
# - #	DRIVEWAY NUMBER
#	CULVERT NUMBER
	DITCH FLOW LINE
x	FENCE LINE
OE	OVERHEAD ELECTRIC LINE
OT	OVERHEAD TELECOM LINE
T1	UNDERGROUND TELECOM LINE
GL	GAS LINE
WL	WATER LINE

NOTES:
REFER TO "STRUCTURE LAYOUT (FM 149)" FOR DRAINAGE STRUCTURE INFORMATION

STATE OF TEXAS
JEAN J. FENG
102035
LICENSED
PROFESSIONAL ENGINEER

04/20/2023

HORIZONTAL
0 50 100 200 FT

PRINT DATE	REVISION DATE
4/19/2023	

Texas Department of Transportation
Bryan District

ROADWAY LAYOUT (FM 149)

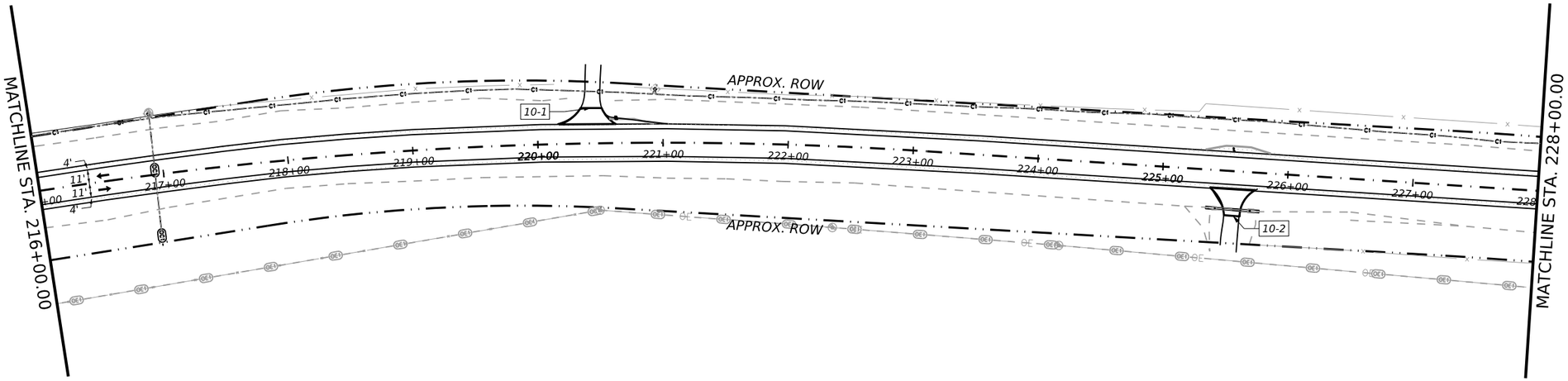
SHEET 9 OF 12 SHEETS

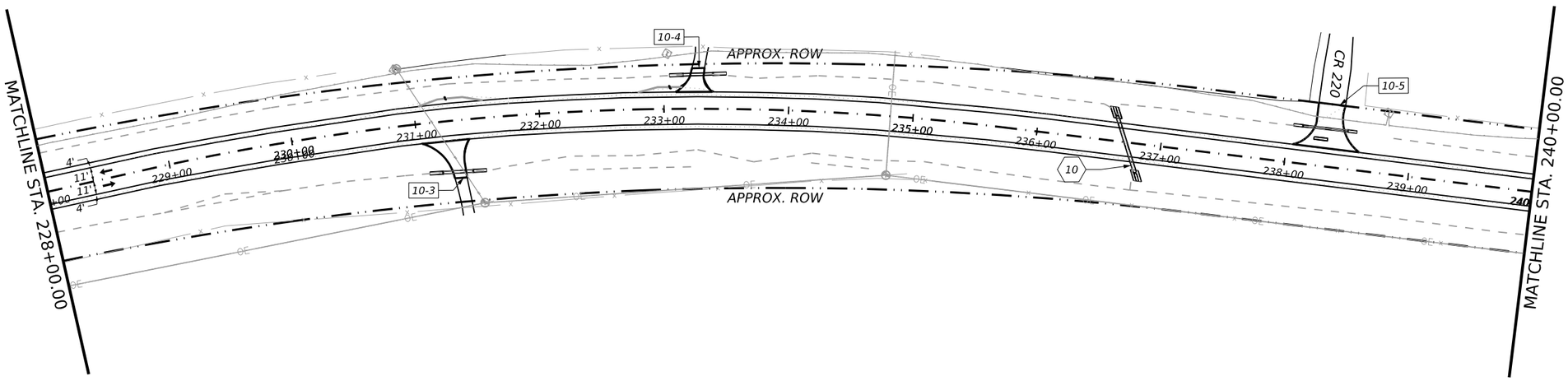
FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 149, ETC.

STATE	DISTRICT	COUNTY
TEXAS	BRY	GRIMES

CONTROL	SECTION	JOB	SHEET NO.
0720	01	044, ETC.	71

REV DATE: 4/18/2023
CS#: 0720-01-044
FILENAME: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY\Design Projects\0720010444 - Design\Plan Set\3. Roadway\3D. Roadway\PlanAndProfileSheets\ROADWAY LAYOUT (FM 149)





LEGEND	
# - #	DRIVEWAY NUMBER
#	CULVERT NUMBER
	DITCH FLOW LINE
x	FENCE LINE
OE	OVERHEAD ELECTRIC LINE
OT	OVERHEAD TELECOM LINE
T1	UNDERGROUND TELECOM LINE
GL	GAS LINE
WL	WATER LINE

NOTES:
REFER TO "STRUCTURE LAYOUT (FM 149)" FOR DRAINAGE STRUCTURE INFORMATION

STATE OF TEXAS
JEAN J. FENG
102035
LICENSED
PROFESSIONAL ENGINEER

04/20/2023

HORIZONTAL
0 50 100 200 FT

PRINT DATE	REVISION DATE
4/19/2023	

Texas Department of Transportation
Bryan District
©2023

ROADWAY LAYOUT (FM 149)

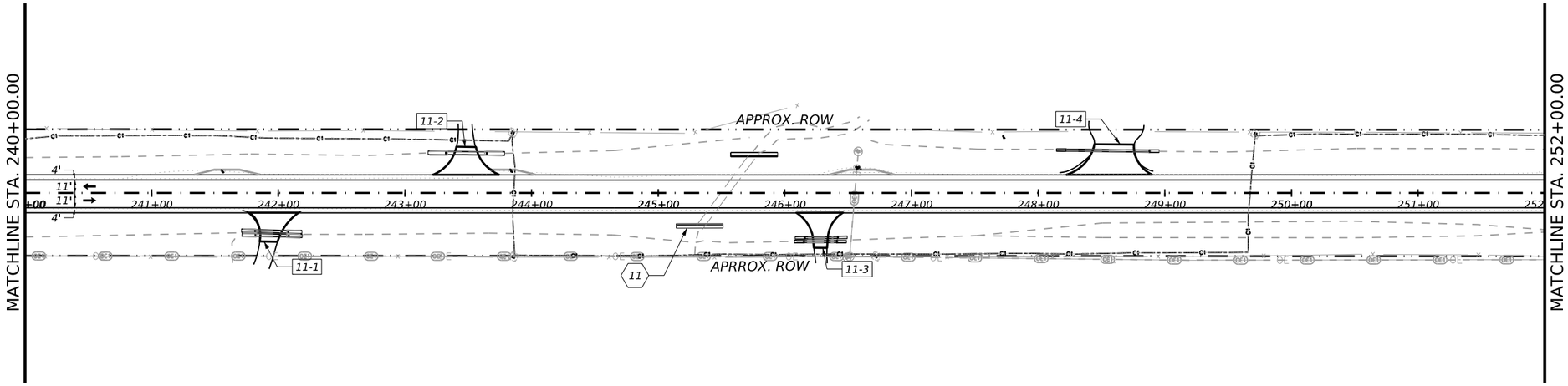
SHEET 10 OF 12 SHEETS

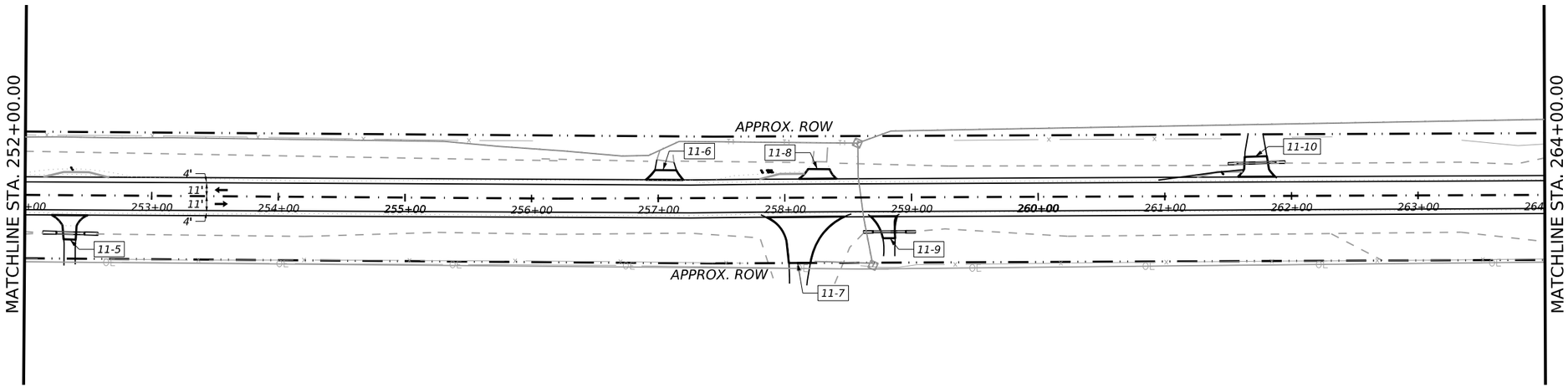
FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 149, ETC.

STATE	DISTRICT	COUNTY
TEXAS	BRY	GRIMES

CONTROL	SECTION	JOB	SHEET NO.
0720	01	044, ETC.	72

REV DATE: 4/18/2023
CS#: 0720-01-044
FILENAME: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY\Design Projects\0720010444 - Design\Plan Set\3. Roadway\3D. Roadway\PlanAndProfileSheets\ROADWAY LAYOUT (FM 149)





LEGEND	
# - #	DRIVEWAY NUMBER
#	CULVERT NUMBER
	DITCH FLOW LINE
x	FENCE LINE
OE	OVERHEAD ELECTRIC LINE
OT	OVERHEAD TELECOM LINE
T1	UNDERGROUND TELECOM LINE
GL	GAS LINE
WL	WATER LINE

NOTES:
REFER TO "STRUCTURE LAYOUT (FM 149)" FOR DRAINAGE STRUCTURE INFORMATION

STATE OF TEXAS
JEAN J. FENG
102035
LICENSED
PROFESSIONAL ENGINEER

05/16/2023

HORIZONTAL
0 50 100 200 FT

PRINT DATE	REVISION DATE
5/16/2023	

Texas Department of Transportation
Bryan District
©2023

ROADWAY LAYOUT (FM 149)

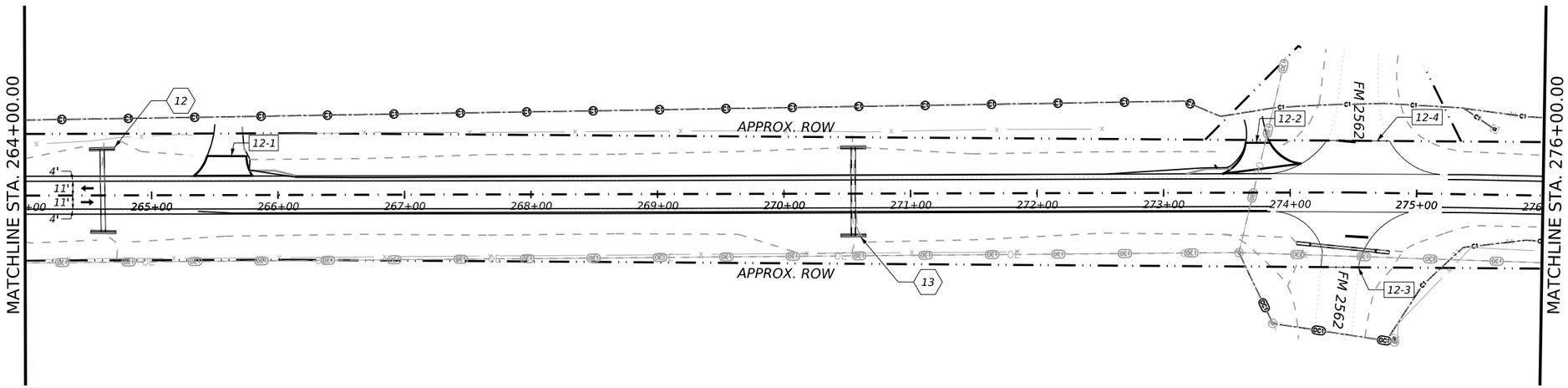
SHEET 11 OF 12 SHEETS

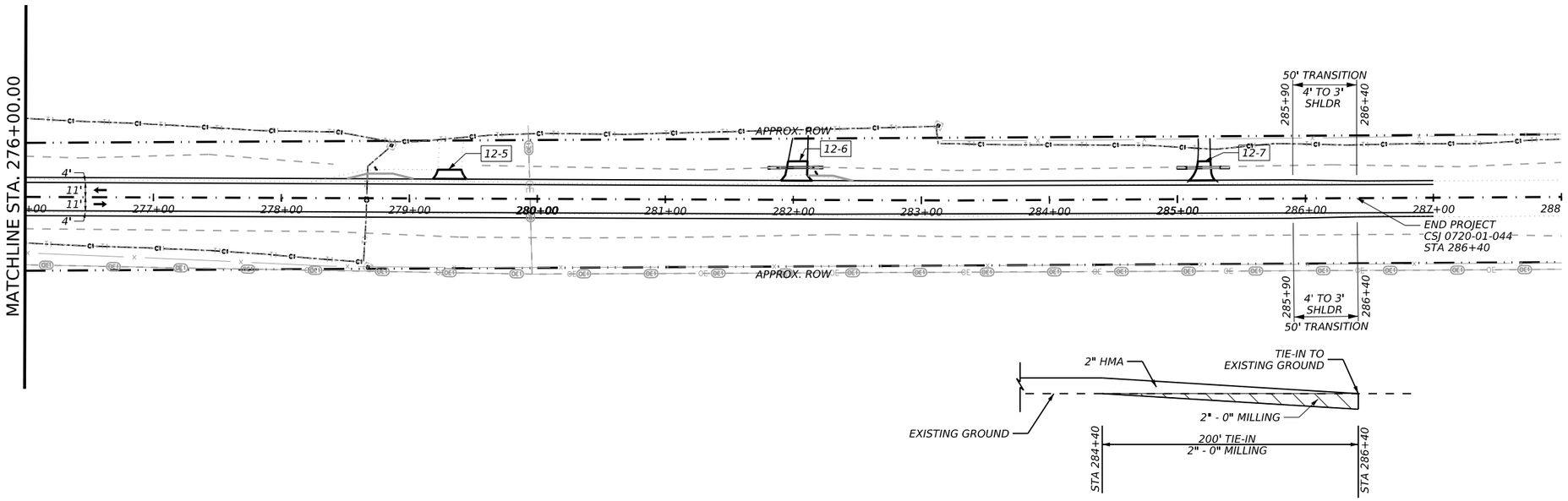
FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 149, ETC.

STATE	DISTRICT	COUNTY
TEXAS	BRY	GRIMES

CONTROL	SECTION	JOB	SHEET NO.
0720	01	044, ETC.	73

REV DATE: 5/16/2023
CSJ: 0720-01-044
FILENAME: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY/Design Projects/072001044/4 - Design/Plan Set/3. Roadway/3D. Roadway Plan And Profile Sheets/ROADWAY LAYOUT (FM 149)





LEGEND	
# - #	DRIVEWAY NUMBER
#	CULVERT NUMBER
	DITCH FLOW LINE
	FENCE LINE
OE	OVERHEAD ELECTRIC LINE
OT	OVERHEAD TELECOM LINE
T1	UNDERGROUND TELECOM LINE
GL	GAS LINE
WL	WATER LINE

NOTES:
REFER TO "STRUCTURE LAYOUT (FM 149)" FOR DRAINAGE STRUCTURE INFORMATION

STATE OF TEXAS
JEAN J. FENG
102035
LICENSED
PROFESSIONAL ENGINEER

04/20/2023

HORIZONTAL
0 50 100 200 FT

PRINT DATE	REVISION DATE
4/19/2023	

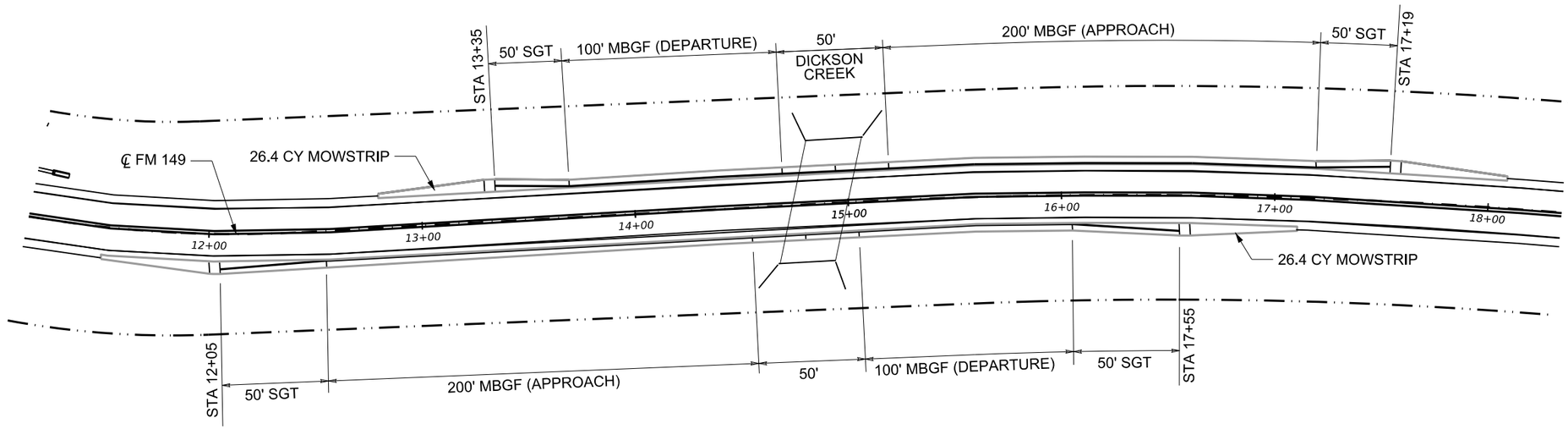
Texas Department of Transportation
Bryan District

ROADWAY LAYOUT (FM 149)

SHEET 12 OF 12 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 149, ETC.
STATE	DISTRICT	COUNTY
TEXAS	BRY	GRIMES
CONTROL	SECTION	JOB / SHEET NO.
0720	01	044, ETC. / 74

REV DATE: 4/18/2023
CSJ: 0720-01-044
FILENAME: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY\Design Projects\0720010444 - Design\Plan Set\3. Roadway\3D. Roadway\Plan\And\Profile\Sheets\ROADWAY LAYOUT (FM 149)



NOTE:
THE REQUIRED DEPTH FOR WOOD POSTS IS 36". THE CALCULATED DEPTH FOR THE TOP OF THE MOW STRIP TO THE TOP OF THE BOX STRUCTURE IS 43". THIS IS INCLUDING THE 2" HMA OVERLAY.

STATE OF TEXAS
JEAN J. FENG
102035
LICENSED
PROFESSIONAL ENGINEER

04/20/2023

PRINT DATE	REVISION DATE
4/19/2023	

Texas Department of Transportation
Bryan District

MBGF LAYOUT (DICKSON CREEK)

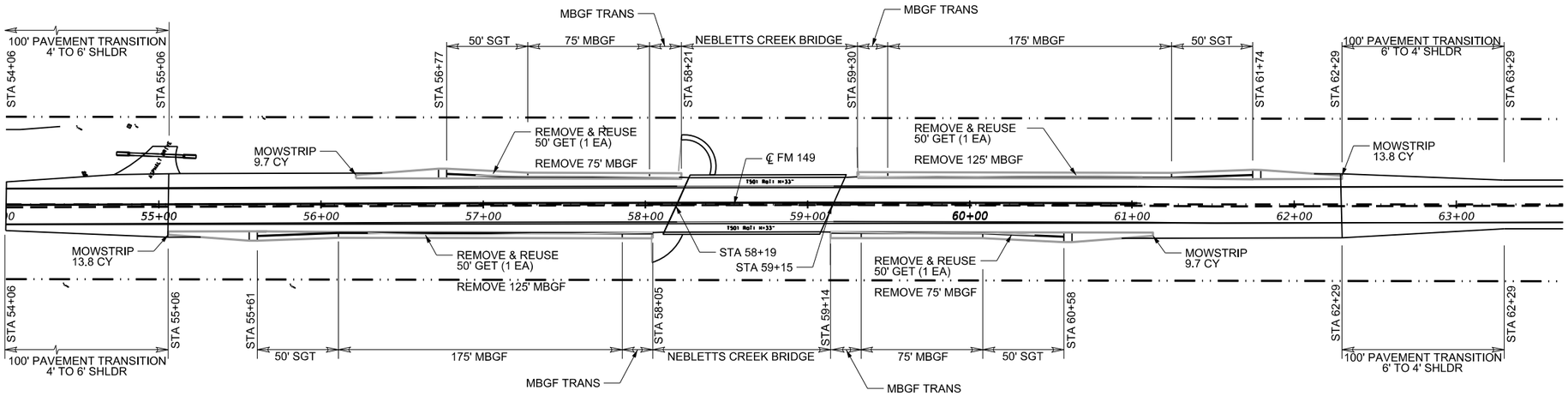
SHEET 1 OF 2 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 149, ETC.

STATE	DISTRICT	COUNTY	
TEXAS	BRY	GRIMES	
CONTROL	SECTION	JOB	SHEET NO.
0720	01	044, ETC.	75

REV DATE: 3/8/2023
CSJ: 0720-01-044

FILENAME: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY/Design Projects/0720010044/4 - Design/Plan Set/3. Roadway/3L Mbgf/Details/MBGF LAYOUTS.dgn



STATE OF TEXAS
JEAN J. FENG
102035
LICENSED
PROFESSIONAL ENGINEER

04/20/2023

PRINT DATE	REVISION DATE
4/19/2023	

Texas Department of Transportation
Bryan District

MBGF LAYOUT (NESBLETT CREEK BRIDGE)

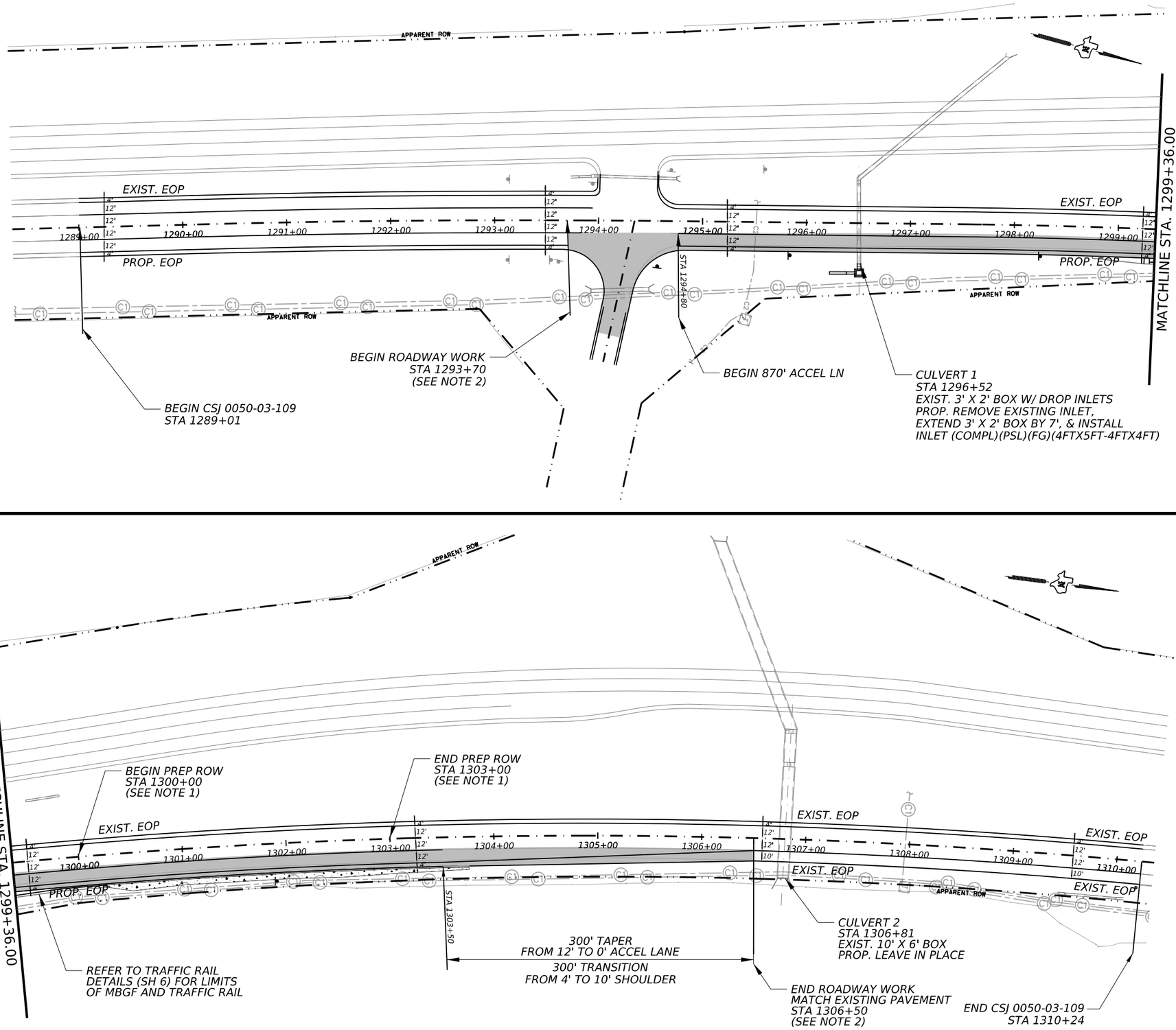
SHEET 2 OF 2 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 149, ETC.

STATE	DISTRICT	COUNTY	
TEXAS	BRY	GRIMES	
CONTROL	SECTION	JOB	SHEET NO.
0720	01	044, ETC.	76

REV DATE: 3/8/2023
CSJ: 0720-01-044

FILENAME: pw://txdot.projectwiseonline.com/TxDOT4/Documents/17 - BRY/Design Projects/0720010044/4 - Design/Plan Set/3. Roadway/3l. Mbgf/Details/MBGF LAYOUTS.dgn



GENERAL NOTES:

1. ITEM 100 - PREP ROW TO BE USED FOR CLEARING THE TREES AND BRUSH WITHIN THE ROW AS NEEDED FROM STA 1300+00 TO STA 1303+00.

2. THE SHADED AREA REPRESENTS THE APPROXIMATE PAVEMENT WORK AREA.

STATE OF TEXAS
JEAN J. FENG
102035
LICENSED
PROFESSIONAL ENGINEER

04/20/2023

HORIZONTAL
0 50 100 200 FT

PRINT DATE	REVISION DATE
4/19/2023	

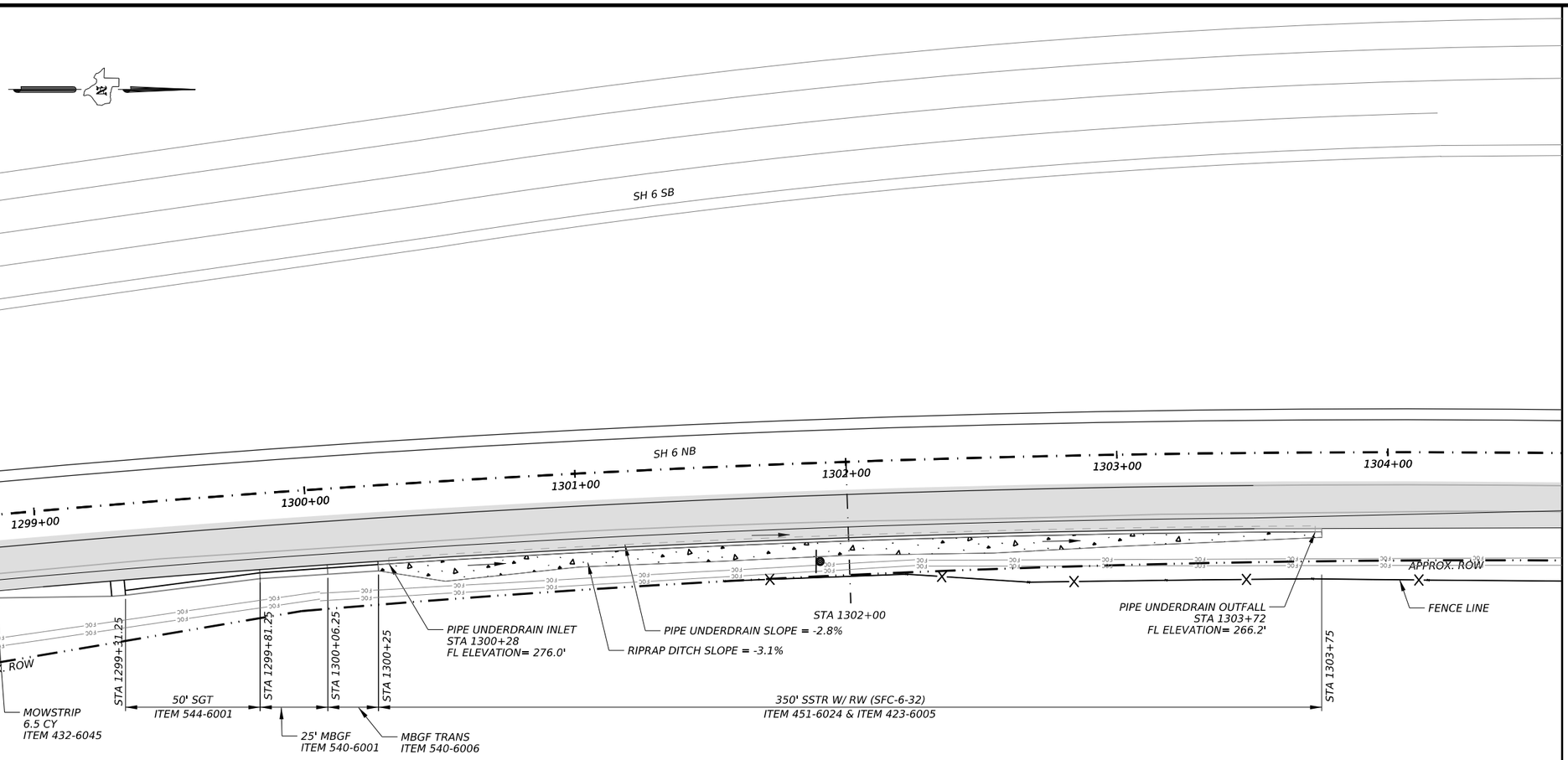
Texas Department of Transportation
Bryan District

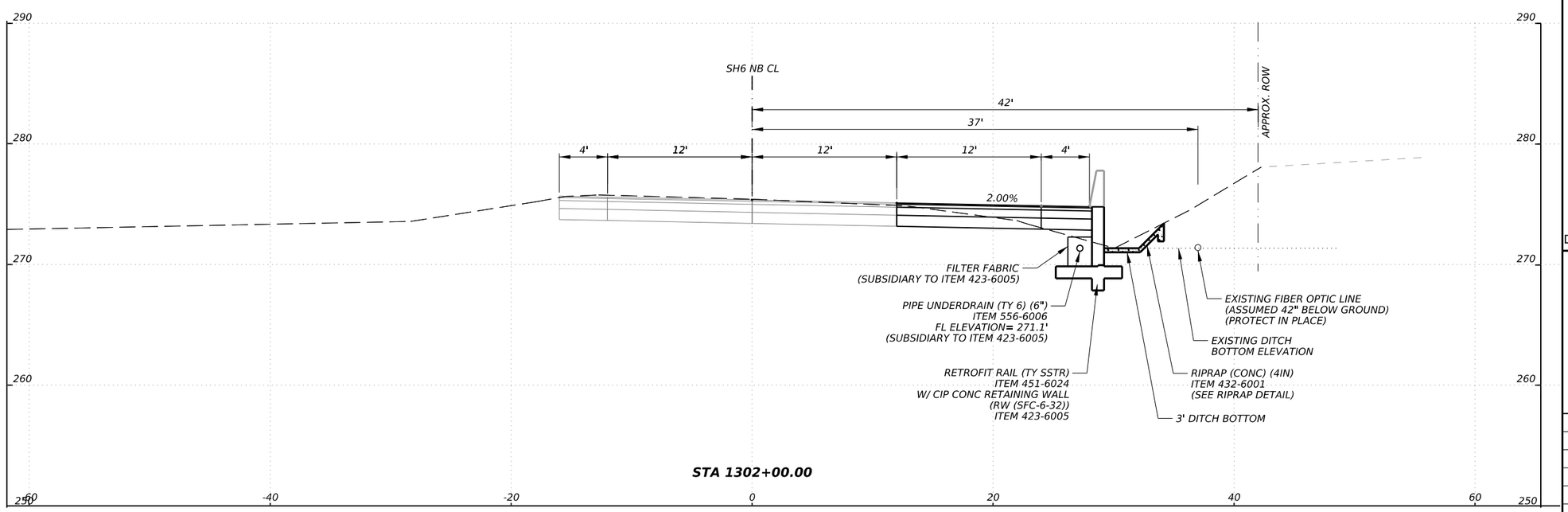
ROADWAY LAYOUT (SH 6)

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 149, ETC.
STATE	DISTRICT	COUNTY
TEXAS	BRY	GRIMES
CONTROL	SECTION	JOB / SHEET NO.
0720	01	044, ETC. / 77

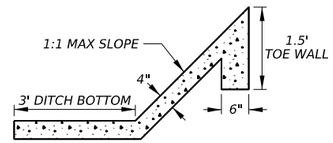
REV DATE: 4/17/2023
CSJ: 0050-03-109

FILENAME: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY/Design Projects/0050031109/4 - Design/Plan Set/3. Roadway/3D. Roadway/PlanAndProfileSheets/ROADWAY LAYOUT (SH 6).dgn





STA 1302+00.00



RIPRAP DETAIL

JEAN J. FENG
102035
LICENSED
PROFESSIONAL ENGINEER

04/20/2023

Drawings Not To Scale

PRINT DATE	REVISION DATE
4/19/2023	

Texas Department of Transportation
Bryan District

TRAFFIC RAIL DETAILS (SH 6)

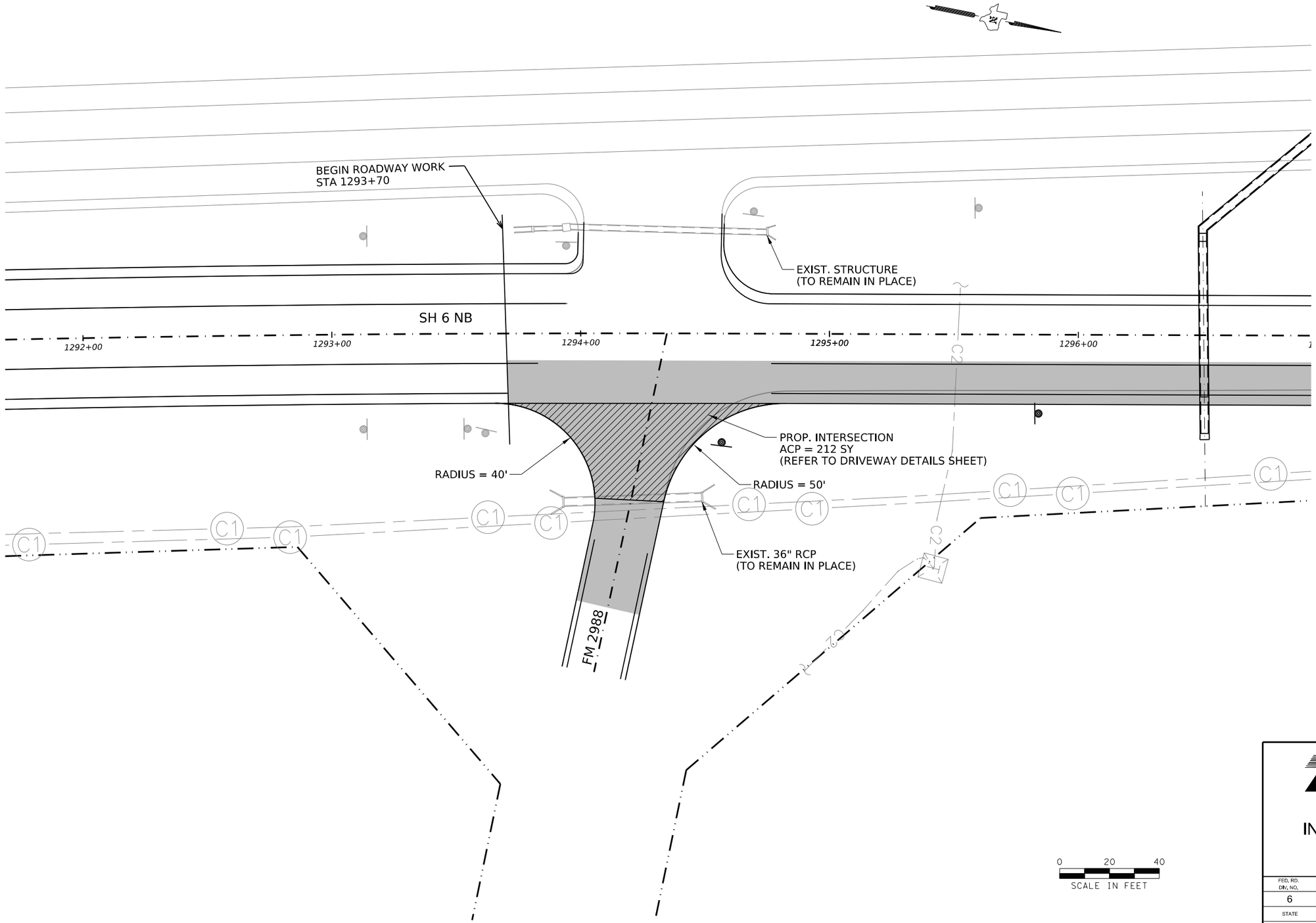
FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 149, ETC.

STATE	DISTRICT	COUNTY
TEXAS	BRY	GRIMES

CONTROL	SECTION	JOB	SHEET NO.
0720	01	044, ETC.	78

REV DATE: 3/28/2023
CSJ: 0050-03-109

FILENAME: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY/Design Projects/0050031094 - Design\Plan Set\3. Roadway\3G. MiscellaneousRoadwayDetails\TRAFFIC RAIL DETAILS (SH 6).dgn



STATE OF TEXAS
JEAN J. FENG
102035
LICENSED
PROFESSIONAL ENGINEER

04/20/2023

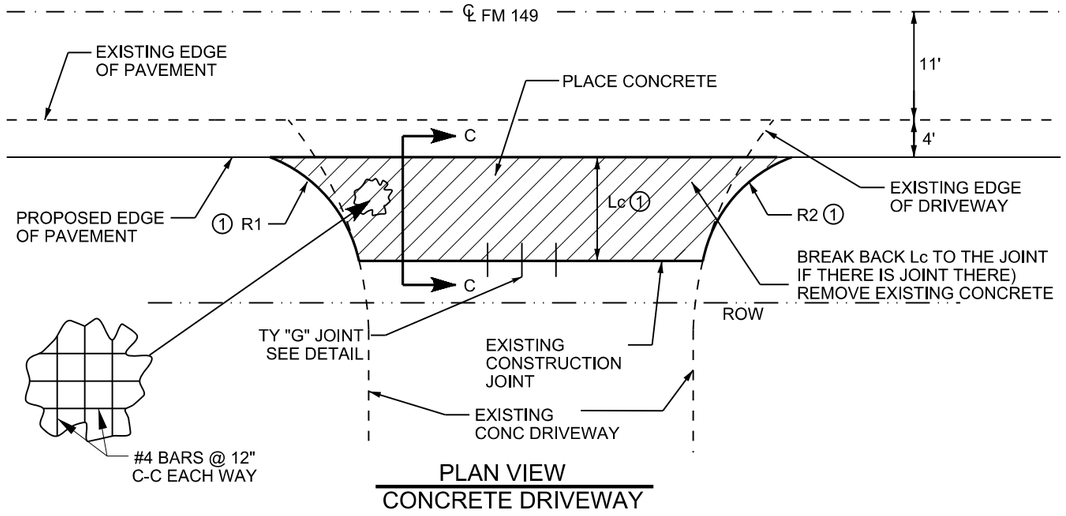
PRINT DATE	REVISION DATE
4/19/2023	

Texas Department of Transportation
Bryan District

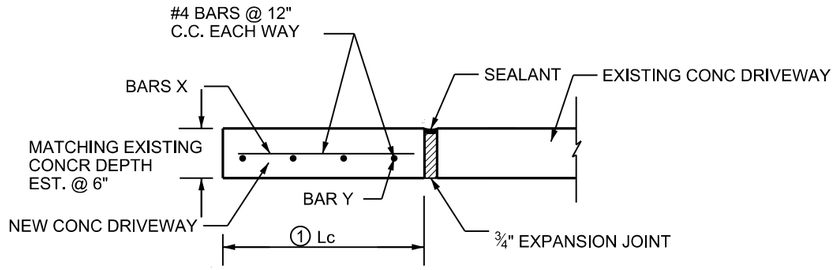
FM 2988
INTERSECTION DETAIL
(SH 6)

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 149, ETC.

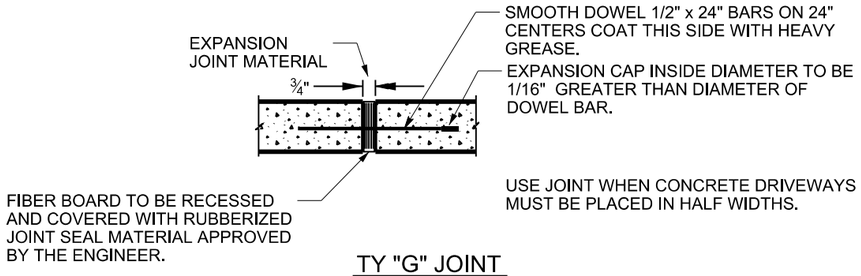
STATE	DISTRICT	COUNTY	
TEXAS	BRY	GRIMES	
CONTROL	SECTION	JOB	SHEET NO.
0720	01	044, ETC.	79



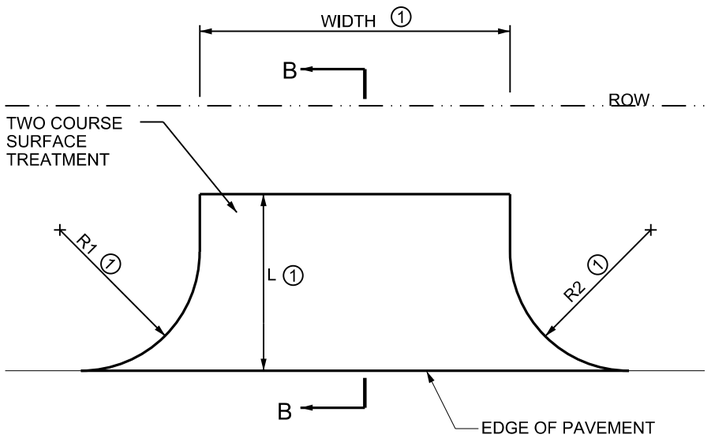
PLAN VIEW
CONCRETE DRIVEWAY



SECTION C-C
CONCRETE DRIVEWAY



TY "G" JOINT



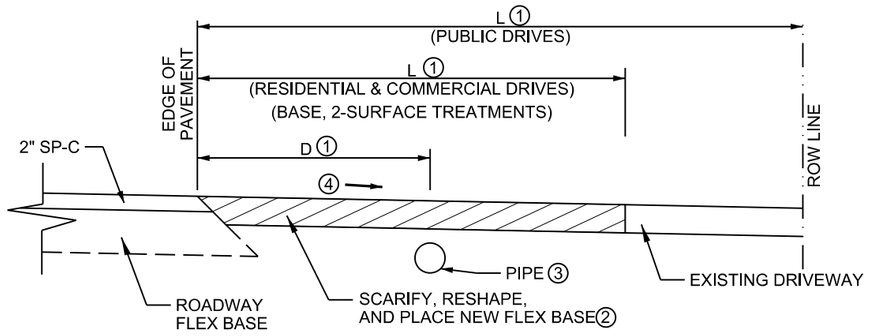
TYPICAL INTERSECTION OR DRIVEWAY DETAILS

① SEE SHEET "SUMMARY OF DRIVEWAYS" FOR DIMENSIONS

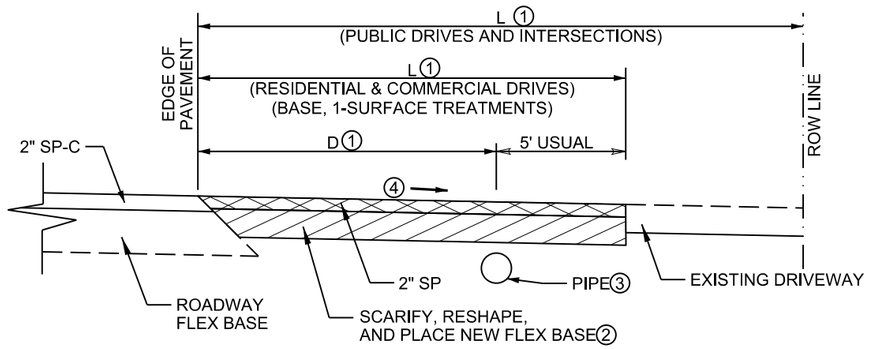
② FLEX BASE IS 6" FOR PRIVATE, 8" FOR PUBLIC STREET

③ MINIMUM 6" COVER ON DRIVEWAY PIPES

④ PRIVATE DRIVE: 12% MAX GRADE
PUBLIC/COMMERCIAL: 8% MAX GRADE

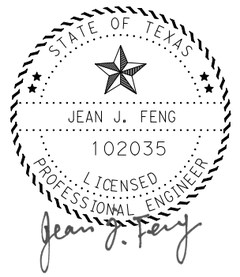


SECTION B-B
SURFACE TREATMENT



NOTE:
AREAS NOT AFFECTED BY WIDENINGS OR PIPE WORK TO GET AN OVERLAY ONLY.

SECTION B-B
ACP



04/20/2023

PRINT DATE	REVISION DATE
4/19/2023	

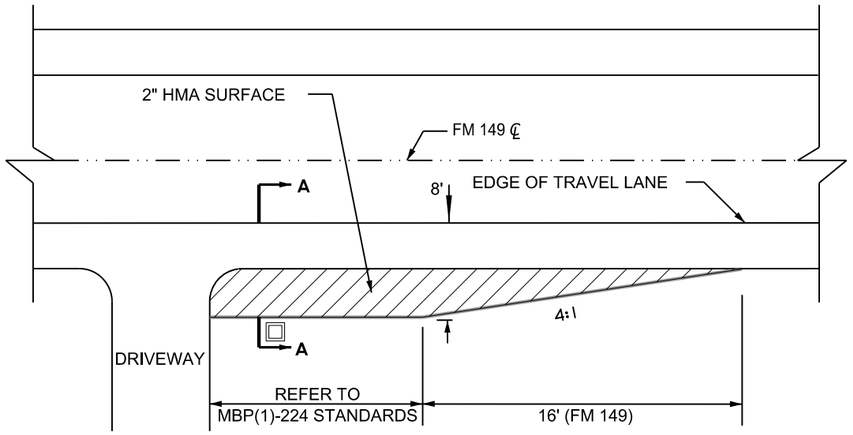
Texas Department of Transportation ©2023
Bryan District

DRIVEWAY DETAILS

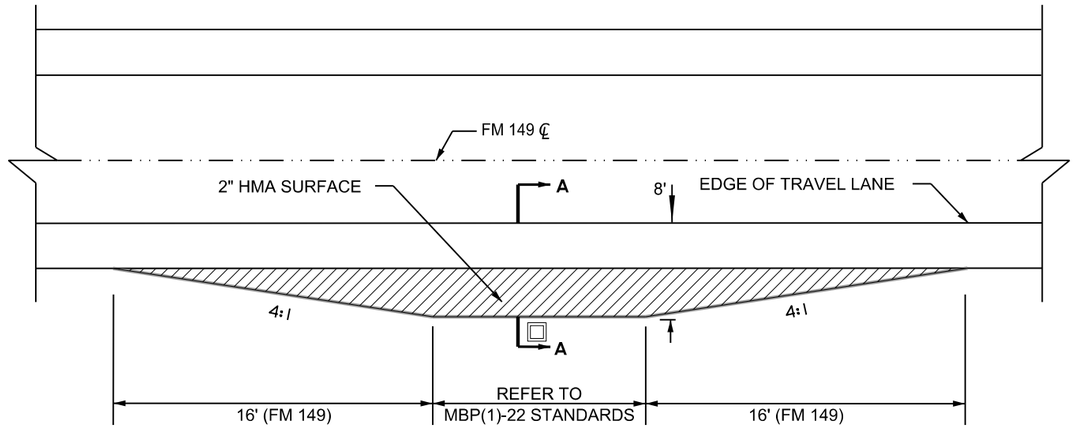
FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 149, ETC.
STATE	DISTRICT	COUNTY
TEXAS	BRY	GRIMES
CONTROL	SECTION	JOB / SHEET NO.
0720	01	044, ETC. / 80

REV DATE: 3/28/2023
CSJ: 0720-01-044

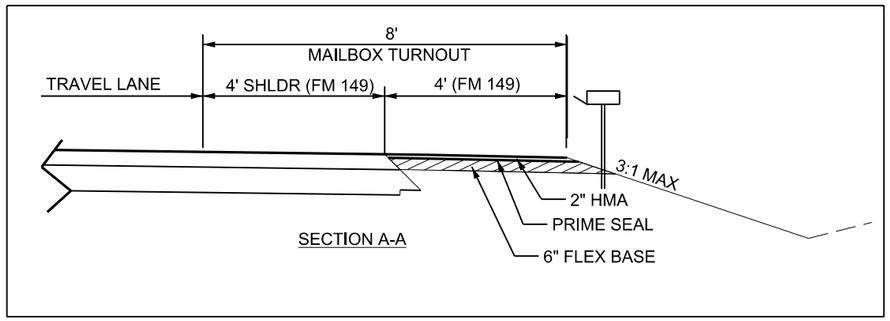
FILENAME: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY/Design Projects/0720010444 - Design/Plan Set/3. Roadway/3F- Driveway/Details/DRIVEWAY & MAILBOX DETAIL



TYPE I MAILBOX TURNOUT
ADDITIONAL SURFACE EST @ 12 SY/EA (FM 149)



TYPE II MAILBOX TURNOUT
ADDITIONAL SURFACE EST @ 16 SY/EA (FM 149)



STATE OF TEXAS
JEAN J. FENG
102035
LICENSED
PROFESSIONAL ENGINEER

04/20/2023

Drawings Not To Scale

PRINT DATE	REVISION DATE
4/19/2023	

Texas Department of Transportation
Bryan District

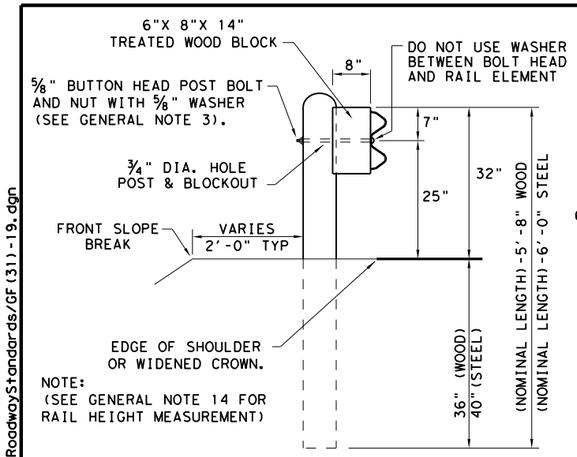
MAILBOX TURNOUT DETAILS (FM 149)

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 149, ETC.

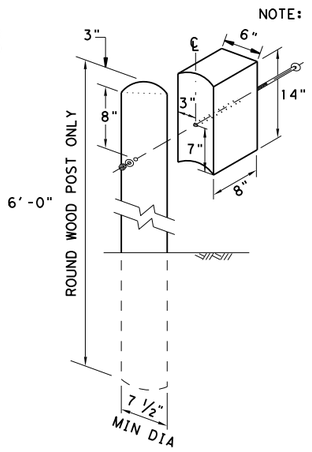
STATE	DISTRICT	COUNTY	
TEXAS	BRY	GRIMES	
CONTROL	SECTION	JOB	SHEET NO.
0720	01	044, ETC.	81

REV DATE: 3/28/2023
CS: 0720-01-044
FILENAME: pw://txdot.projectwiseonline.com/TxDOT4/Documents/17 - BRY/Design Projects/0720010044/4 - Design/Plan Set/3. Roadway/3F. Driveway Details/DRIVEWAY & MAILBOX DETAIL

DATE: 4/19/2023
FILE: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY/Design Projects/0720010044/4 - Design/Plan Set/3. Roadway/3H. RoadwayStandards/GF(31)-19.dgn

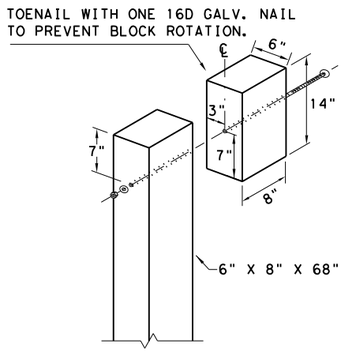


TYPICAL POST PLACEMENT

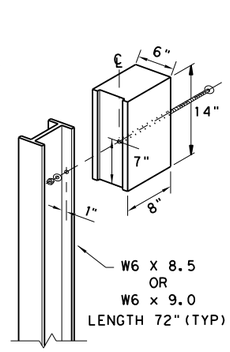


WOOD BLOCK TO ROUND WOOD POST

NOTE: TOENAIL WITH ONE 16D GALV. NAIL TO PREVENT BLOCK ROTATION.

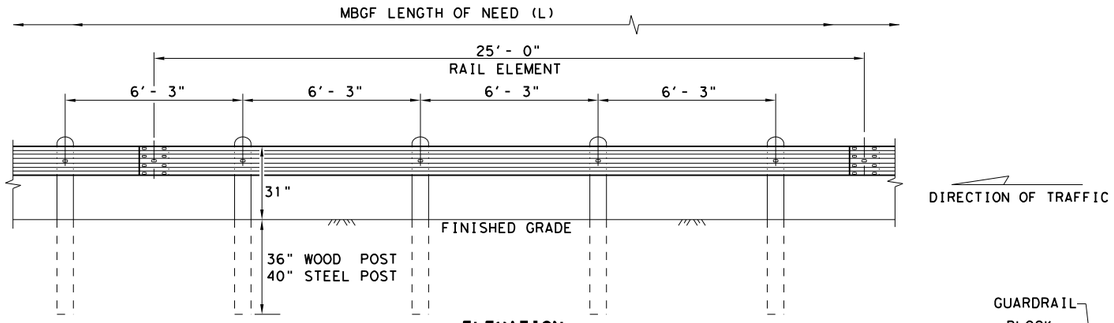


WOOD BLOCK TO RECTANGULAR WOOD POST



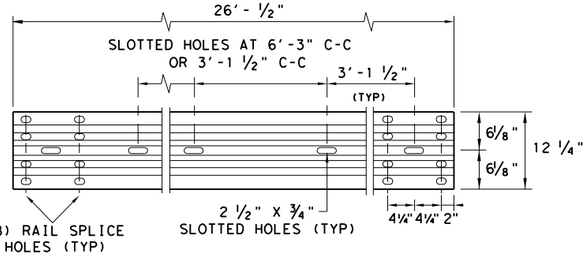
ROUTED WOOD BLOCK TO I-BEAM STEEL POST

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



ELEVATION
MID-SPAN RAIL SPLICE

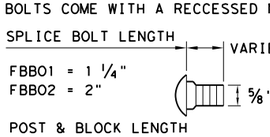
SHOWING A 25'- 0" SECTION OF W-BEAM RAIL. (SEE GENERAL NOTE 2)



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

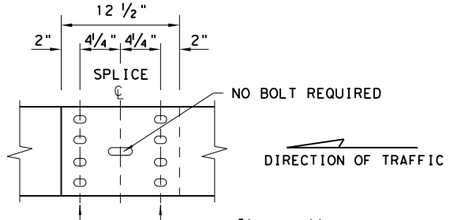
NOTES: SEE GENERAL NOTE 2 FOR ALLOWABLE RAIL TYPES.
SEE RAIL SPLICE DETAIL FOR REQUIRED HARDWARE.

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



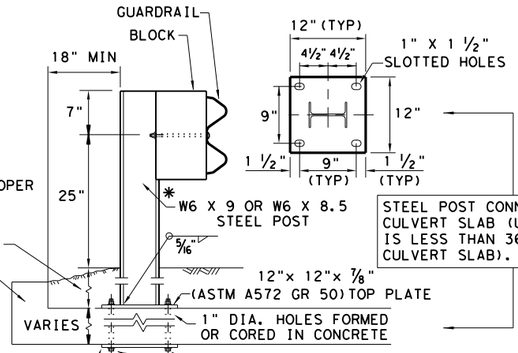
BUTTON HEAD BOLT

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.



LOW FILL CULVERT POST

STEEL POST CONNECTION TO CULVERT SLAB (USE WHEN THERE IS LESS THAN 36" COVER OVER CULVERT SLAB).

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.

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.

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.

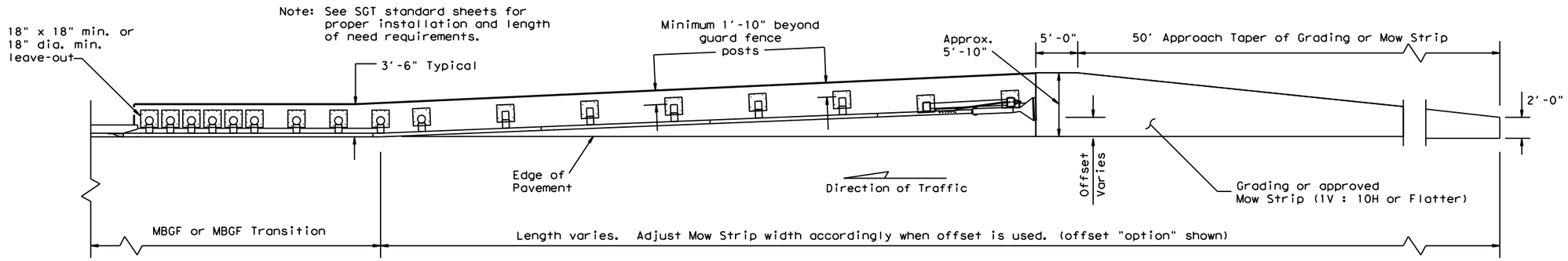
Texas Department of Transportation

Design Division Standard

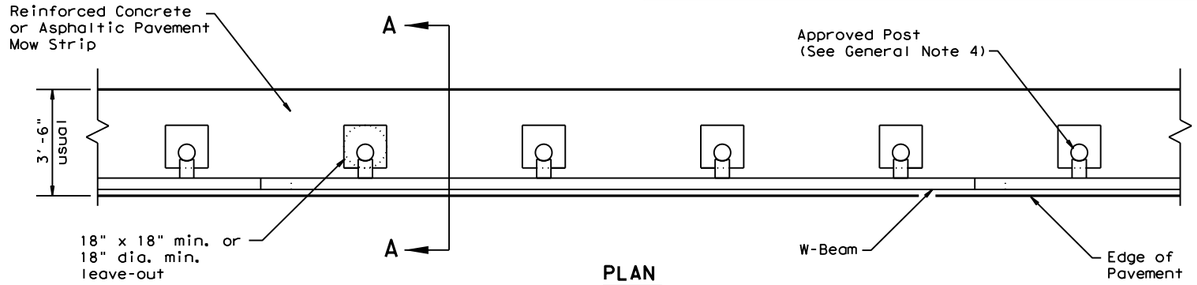
METAL BEAM GUARD FENCE
TL-3 MASH COMPLIANT
GF(31)-19

FILE: gf3119.dgn	DN: TxDOT	CK: KM	DW: VP	CK: CGL/AG
©TxDOT: NOVEMBER 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0720	01	044, ETC.	FM 149, ETC.
	DIST	COUNTY		SHEET NO.
	BRYAN	GRIMES		82

DATE: 4/19/2023
FILE: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY/Design Projects/0720010044/4 - Design/Plan Set/3. Roadway/3H. RoadwayStandards/GF(31)MS-19.dgn

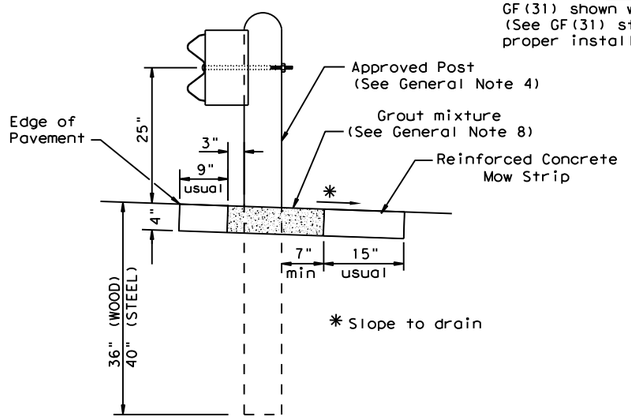


GRADING AND MOW STRIP AT GUARDRAIL END TREATMENTS



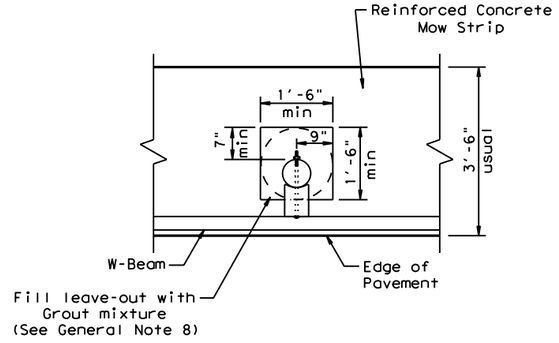
PLAN

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.

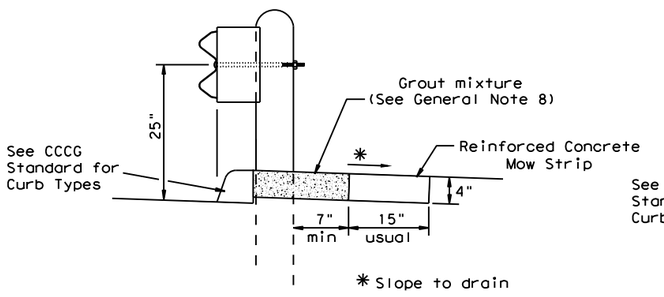
Note: Site Condition(s)

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.

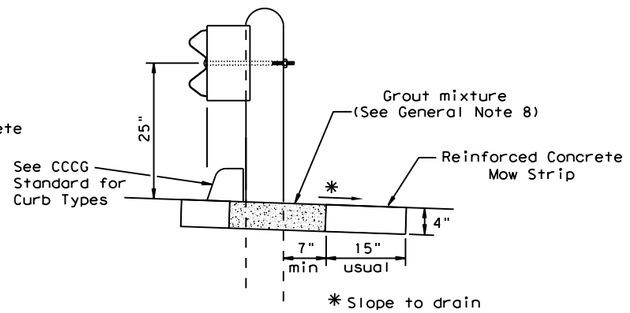
GENERAL NOTES

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.



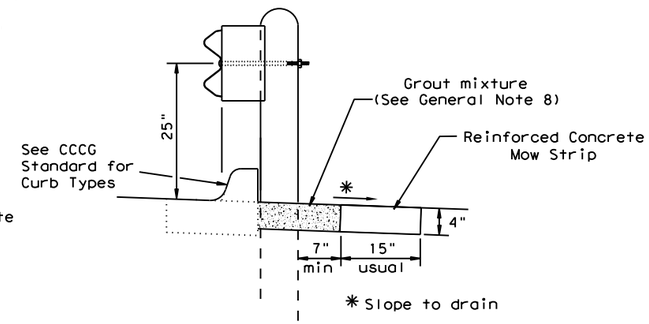
CURB OPTION (1)

This option will increase the post embedment throughout the system.



CURB OPTION (2)

Curb shown on top of mow strip



CURB OPTION (3)

Texas Department of Transportation

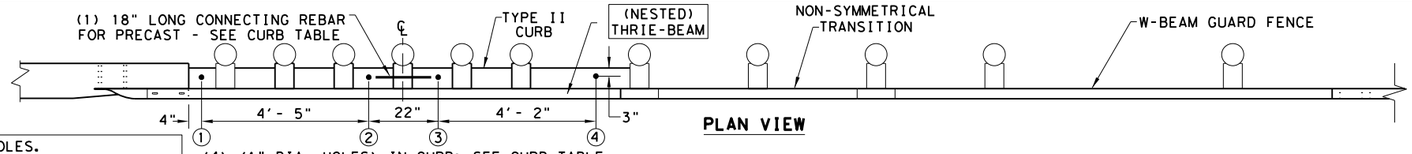
Design Division Standard

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	0720	01	044, ETC.	FM 149, ETC.
	DIST	COUNTY		SHEET NO.
	BRYAN	GRIMES		83

DATE: 4/19/2023
FILE: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY/Design Projects/0720010044/4 - Design/Plan Set/3. Roadway/3H. RoadwayStandards/GF(31)TR TL3-20.dgn



PLAN VIEW

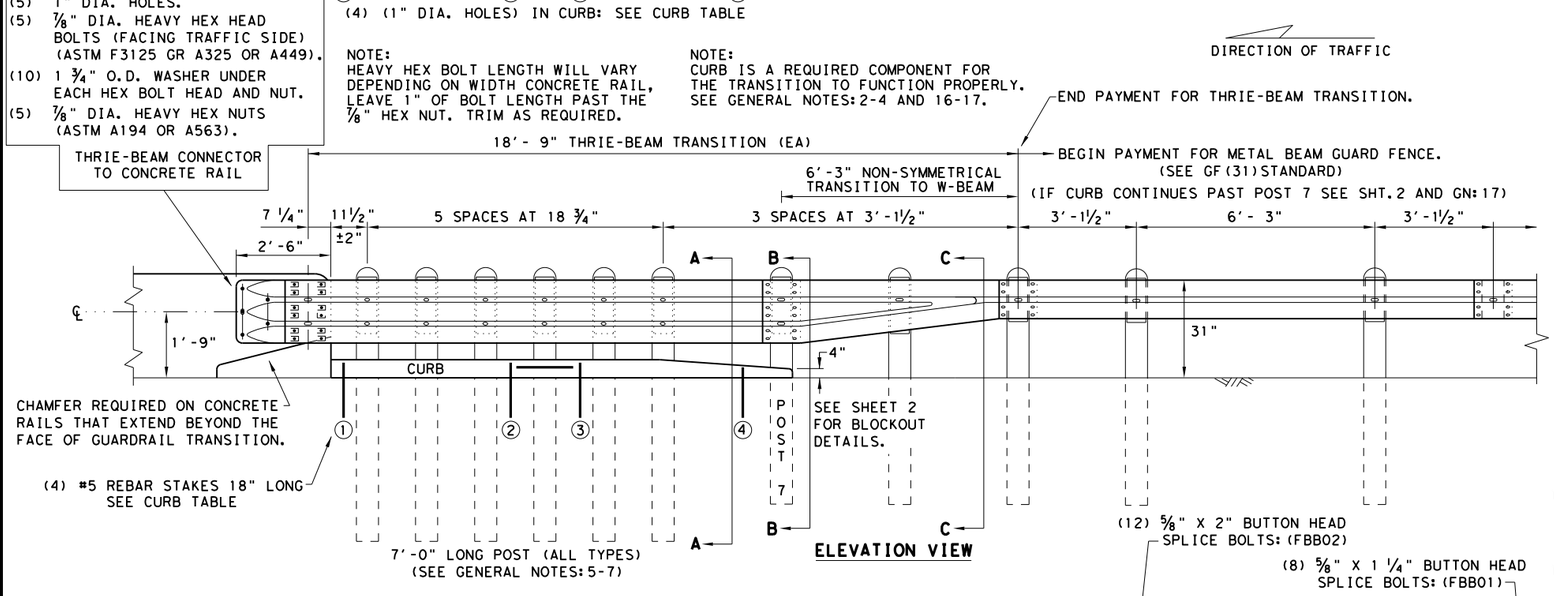
(4) (1" DIA. HOLES) IN CURB: SEE CURB TABLE

(5) 1" DIA. HOLES.
(5) ⅞" DIA. HEAVY HEX HEAD BOLTS (FACING TRAFFIC SIDE) (ASTM F3125 GR A325 OR A449).
(10) 1 ¾" O.D. WASHER UNDER EACH HEX BOLT HEAD AND NUT.
(5) ⅞" DIA. HEAVY HEX NUTS (ASTM A194 OR A563).

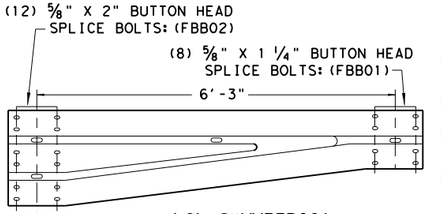
NOTE:
HEAVY HEX BOLT LENGTH WILL VARY DEPENDING ON WIDTH CONCRETE RAIL, LEAVE 1" OF BOLT LENGTH PAST THE ⅞" HEX NUT. TRIM AS REQUIRED.

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

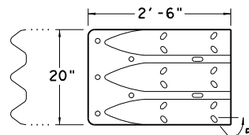
DIRECTION OF TRAFFIC



ELEVATION VIEW

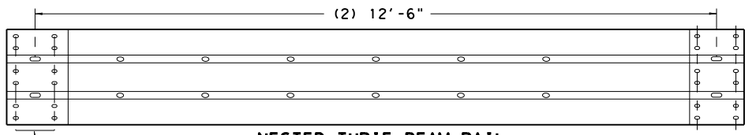


NON-SYMMETRICAL W-BEAM TO THRIE-BEAM TRANSISTION 10GA.
PART DESIGNATOR RWT02a OR RWT02b



SIDE-VIEW

THRIE-BEAM TERMINAL CONNECTOR 10GA.
PART DESIGNATOR RTE01b
NOTE: SEE GENERAL NOTE: 9



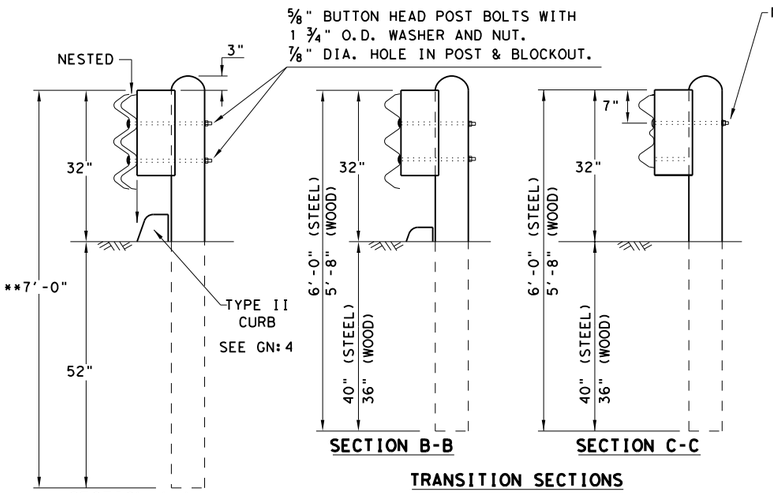
NESTED THRIE-BEAM RAIL
PART DESIGNATOR RTM10a

(12) ⅝" X 2" BUTTON HEAD SPLICE BOLTS WITH RECESSED NUTS: (FBB02)
(12) RECTANGULAR GUARDRAIL PLATE WASHERS: (FWR03)

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.



SECTION A-A

SECTION B-B

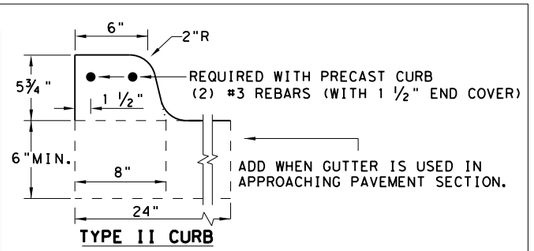
SECTION C-C

TRANSITION SECTIONS

NOTE: ALL POST TYPES, SEE GENERAL NOTE: 5 & 6

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



TYPE II CURB

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 MATERIALS AND TESTS DIVISION MAINTAINS A MATERIAL PRODUCER LIST (MPL) FOR PRODUCERS OF MATERIALS CONFORMING TO DMS-7210. ONLY PRODUCERS ON THE MPL CAN FURNISH COMPOSITE MATERIAL BLOCKS.
15. REFER TO GF(31) STANDARD SHEET & BRIDGE RAILING DETAILS FOR ADDITIONAL DETAILS.
16. THE INSTALLATION OF THE TYPE II CURB IS CRITICAL FOR THE PERFORMANCE OF THE THRIE-BEAM TRANSITION SYSTEM. THE CURB PREVENTS (VEHICLE WHEEL SNAGGING) AT THE CONCRETE RAIL AND IS REQUIRED TO MEET MASH CRASH TEST CRITERIA.
17. IF CURB EXTENDS BEYOND POST 7, 25' OF NESTED W-BEAM GUARDRAIL SHALL BE INSTALLED BEYOND THE PAY LIMITS OF THRIE-BEAM TRANSITION SECTION, (SEE SHT.2). PAYMENT FOR THIS 25' SECTION WILL BE BY LINEAR FOOT, PAY ITEM "0540 6XXX MTL W-BEAM GD FEN (NESTED) (TIM POST)" OR "540 6XXX MTL W-BEAM GD FEN (NESTED) (STEEL POST)" AS APPLICABLE FOR POST TYPE. SEE SHT.2 FOR ADDITIONAL INFORMATION.

HIGH-SPEED TRANSITION

SHEET 1 OF 2

Texas Department of Transportation | Design Division Standard

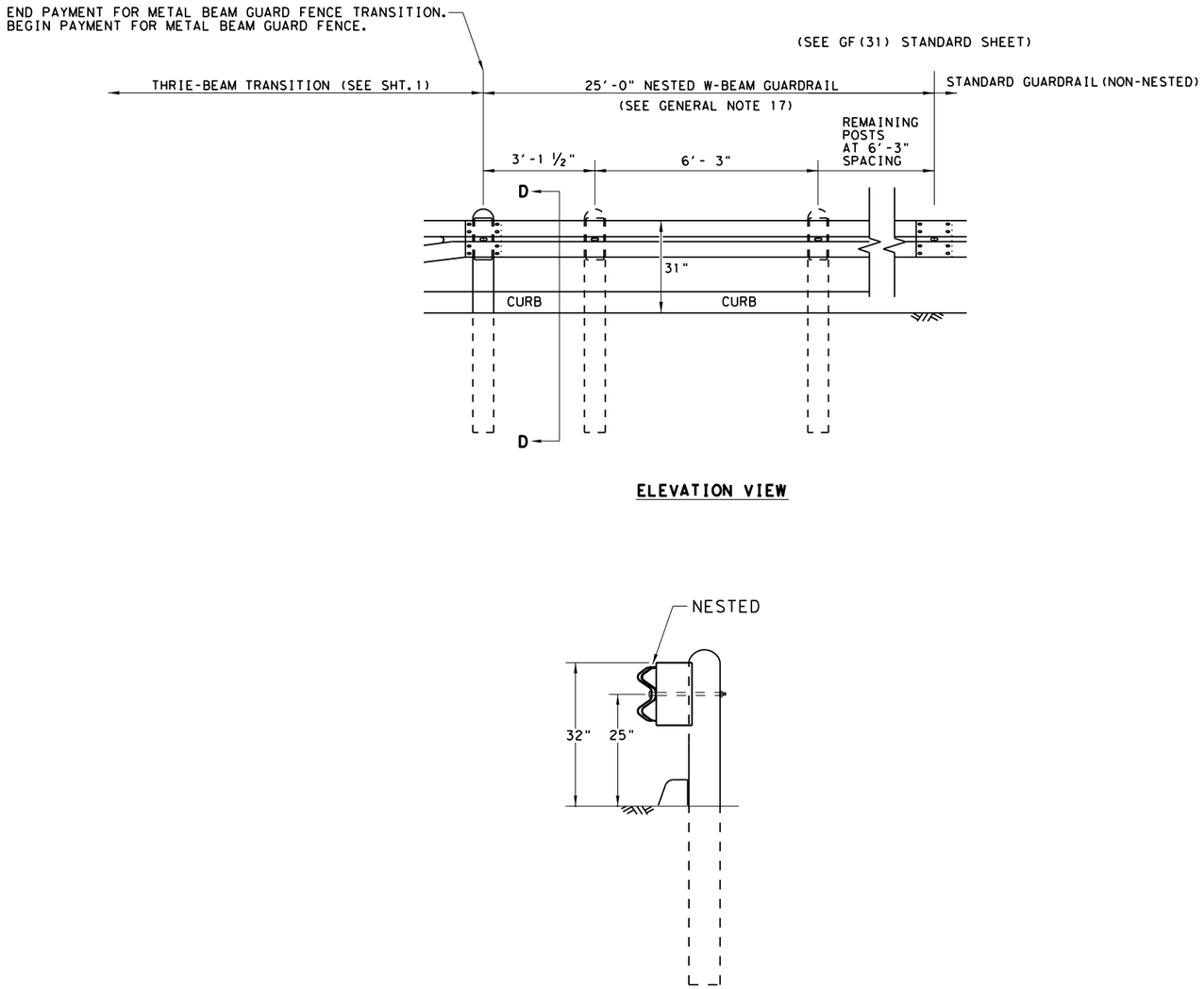
METAL BEAM GUARD FENCE THRIE-BEAM TRANSITION TL-3 MASH COMPLIANT

GF(31)TR TL3-20

FILE: gf31tr1320.dgn	DN: TxDOT	CK: KM	DW: VP	CK: CGL/AG	
©TxDOT: NOVEMBER 2020	CONT	SECT	JOB	HIGHWAY	
REVISIONS	0720	01	044, ETC.	FM 149, ETC.	
	DIST	COUNTY		SHEET NO.	
	BRYAN	GRIMES		84	

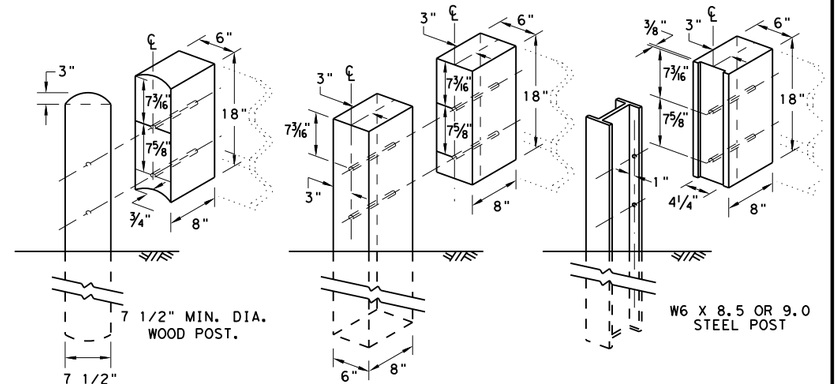
DATE: 4/19/2023
FILE: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY/Design Projects/0720010044/4 - Design/Plan Set/3. Roadway/3H. RoadwayStandards/GF(31)TR TL3-20.dgn

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



ELEVATION VIEW

SECTION D-D



THRIE BEAM TRANSITION BLOCKOUT DETAILS

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 TL3-20

FILE: gf31trt1320.dgn	DN: TxDOT	CK: KM	DW: KM	CK: CGL/AG	
©TxDOT: NOVEMBER 2020	CONT	SECT	JOB	HIGHWAY	
REVISIONS	0720	01	044, ETC.	FM 149, ETC.	
	DIST	COUNTY		SHEET NO.	
	BRYAN	GRIMES		85	

DATE: 4/19/2023
FILE: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY/Design Projects/0720010444 - Design/Plan Set/3. Roadway/3H. RoadwayStandards/SGT(10s)31-16.dgn

NOTE: STEEL I-BEAM POST W6 X 8.5 (6'-0") PN: 533G
STANDARD WOOD BLOCKOUTS (6"X8"X14") PN: 4076B
AT (POSTS 2 THRU 8)

⅝" X 10" HGR BOLT PN: 3500G
⅝" HGR NUT PN: 3340G

LINE AT THE BACK OF POST #2 THRU #8

FROM THE CENTERLINE OF POST(1) & POST(0)

ANCHOR PADDLE PN: 15204A

ANGLE STRUT PN: 15202G

16"

POST(8) POST(7) POST(6) POST(5) POST(4) POST(3) POST(1) POST(0)

DO NOT BOLT ANCHOR RAIL TO - POST (2)

SEE DETAIL 1

TRAFFIC FLOW

PLAN VIEW

MASH TEST LEVEL 3 (TL-3) LENGTH OF SoftStop TERMINAL (50'-9 ½")

BEGIN LENGTH OF NEED

50'-9 ½" STANDARD INSTALLATION LENGTH (MASH TL-3 SoftStop)

BEGIN STANDARD MBGF

END PAYMENT FOR SGT

6¼" 3'-1 ½" 6'-3" 6'-3"

ANCHOR RAIL WITH SLOTS - (THREADED THRU HEAD)
SEE SoftStop MANUAL FOR COMPLETE DETAILS

MIDDLE SLOT CUTOUT
(1) 1 ¾" X 6'-10 ¼"

OUTSIDE SLOTS CUTOUT
(2)½" X 6'-9 ⅝"

MBGF LAPPED IN DIRECTION OF TRAFFIC FLOW

25'-0" DOWNSTREAM W-BEAM GUARDRAIL PN: 61G

SoftStop ANCHOR RAIL (12GA) PN: 15215G

SoftStop FACE SEE GN(3) & NOTE: B

3'-1 ½"(+/-) 6'-3" 6'-3" 6'-3" 6'-3" 6'-3" 6'-3" 5'-8" 4'-7"

ANCHOR PADDLE PN: 15204A

END OF ANCHOR RAIL PN: 15215G

SEE NOTE: A

SEE NOTE: C

POST 32" HEIGHT

31"

RAIL HEIGHT

RAIL 25'-0" PN: 61G

RAIL 25'-0" PN: 15215G

(8) ⅝"× 1- ¼" GR BOLTS PN: 3360G
⅝" HEX NUTS PN: 3340G

POST 40" DEPTH (TYP 1-8)

(8) ⅝"× 1- ¼" HGR BOLTS PN: 3360G
⅝" HEX NUTS PN: 3340G

DO NOT BOLT ANCHOR RAIL TO POST(2)

SEE DETAIL 2

SEE DETAIL 3

13/16" DIA. YIELDING HOLES

13/16" DIA. YIELDING HOLES

6'-1⅜"

POST(8) POST(7) POST(6) POST(5) POST(4) POST(3) POST(2) 6'-0" (SYTP) PN: 15000G POST(1) 4'-9 ½" SYTP PN: 15203G POST(0) 6'-5 ⅜" PN: 15205A

ELEVATION VIEW

HARDWARE FOR POST(2) THRU POST(8)
(1) ⅝"× 10" HGR BOLT PN: 3500G
(1) ⅝" HGR HEX NUT PN: 3340G

NOTE: DO NOT BOLT ANCHOR RAIL PANEL TO POST(2)

ALTERNATE BLOCKOUT SEE GENERAL NOTE: 6

4" X 7 ½" X 14" BLOCKOUT COMPOSITE PN: 6777B

6" X 8" X 14" BLOCKOUT WOOD PN: 4076B

NOTE: DO NOT BOLT ANCHOR RAIL TO POST(2)

8" 6" 14"

⅝" HGR NUT PN: 3340G

⅝" X 10" HGR POST BOLT PN: 3500G

13/16" DIAMETER YIELDING HOLES LOCATED IN FLANGES

FINISHED GRADE

(HOLES APROXIMATELY CENTERED AT FINISHED GRADE)

ISOMETRIC VIEW POST(1 & 2)

W6 X 8.5 I-BEAM POST SHOWING STANDARD WOOD BLOCKOUT

NOTE: NO BLOCKOUT INSTALLED AT POST(1)

(1) ⅝" X 1 ¾" HEX HD BOLT PN 3391G

ANGLE STRUT PN: 15202G

(2) ⅝" WASHERS PN 4372G

(1) ⅝" HGR HEX NUT PN 3340G

DETAIL 1

SHOWN AT POST(1) NEAR GROUND

(1) ⅝" HEX NUT

(1) ⅝" × 1- ½" HEX HD BOLT-GR-5 PN: 105286

(2) ⅝" ROUND WASHERS PN: 3240G

DETAIL 2

SHOWN AT POST(1)

ANCHOR KEEPER PLATE (24 GA) PN: 15207G

ANCHOR PLATE WASHER ½" THICK PN: 15206G

1" ROUND WASHER F463 PN: 4902G

(2) ⅝" × 2 ½" HEX HD BOLT GR-5 PN: 105285G

ALTERNATE BLOCKOUT SEE GENERAL NOTE: 6

(2) ⅝" ROUND WASHER (WIDE) PN: 3240G

1" NUT PN: 3908G SHALL BE SECURELY TIGHTENED AFTER FINAL ASSEMBLY, BUT NOT DEFORMING THE KEEPER PLATE.

ANCHOR PADDLE PN: 15204A

(2) ⅝" HEX NUT A563 GR.DH PN: 3245G

W-BEAM FLATTENED (4 PLIES)

ANGLE STRUT PN: 15202G

SEE NOTE: A

(2) ¾" × 2 ½" HEX BOLT (TYP) PN: 3717G

(4) ¾" FLAT WASHER (TYP) PN: 3701G

(2) ¾" HEX NUT (TYP) PN: 3704G

6'-1 ⅜" POST DEPTH

(2) ANCHOR POST ANGLE PN: 15201G

DETAIL 3 AT POST(0)

6'-5 ⅜" (W6 X 15) I-BEAM POST PN: 15205A

W-BEAM RAIL 25'-0"

6" X 8" X 14" BLOCKOUT WOOD

⅝" X 10" HGR POST BOLT PN: 3500G

⅝" HGR NUT PN: 3340G

POST HEIGHT 32"

31" RAIL HEIGHT

40"

LINE POST (3, 4, 5, 6, 7 & 8)

FINISHED GRADE

SECTION VIEW B-B

6'-0" (W6 X 8.5) I-BEAM POST PN: 533G

SECTION VIEW A-A

6'-0" (W6 X 8.5) (SYTP) I-BEAM POST PN: 15000G

POST(2)

NOTE: DO NOT BOLT ANCHOR RAIL PANEL TO POST(2)

POST 17"- ½" HEIGHT

4'- 9 ½"

13/16" DIA. YIELDING HOLES

40"

POST(1)

FRONT VIEW POST(1)

4'-9 ½" (W6 X 8.5) (SYTP) I-BEAM POST PN: 15203G

NOTE: NO BLOCKOUT INSTALLED AT POST(1)

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.

APPROACH GRADING AT GUARDRAIL END TREATMENTS

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 ⅜")
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" × 2 ½" HEX BOLT A325
3701G	4	¾" ROUND WASHER F436
3704G	2	¾" HEAVY HEX NUT A563 GR.DH
3360G	16	⅝" × 1 ¼" W-BEAM RAIL SPLICE BOLTS HGR
3340G	25	⅝" W-BEAM RAIL SPLICE NUTS HGR
3500G	7	⅝" × 10" HGR POST BOLT A307
3391G	1	⅝" × 1 ¾" HEX HD BOLT A325
4489G	1	⅝" × 9" HEX HD BOLT A325
4372G	4	⅝" WASHER F436
105285G	2	⅝" × 2 ½" HEX HD BOLT GR-5
105286G	1	⅝" × 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

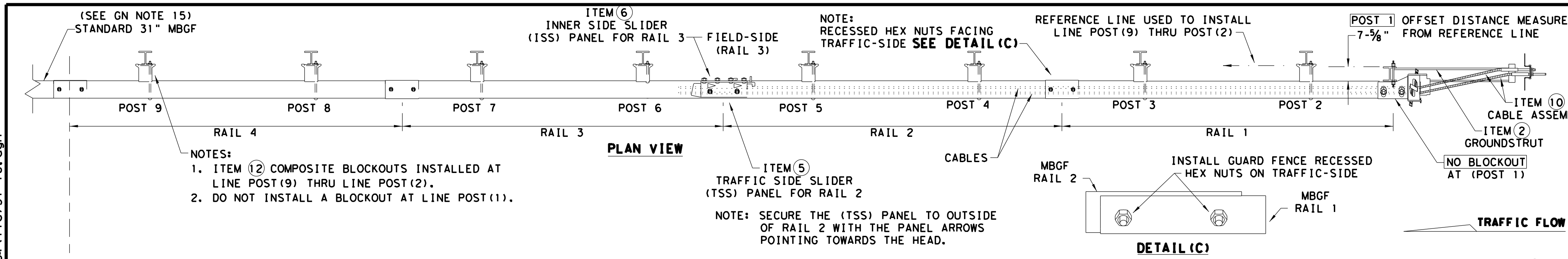
NOTE:
THIS STANDARD IS A BASIC REPRESENTATION OF THE SoftStop END TERMINAL, IT IS NOT INTENDED TO REPLACE THE PRODUCT DESCRIPTION ASSEMBLY MANUAL.

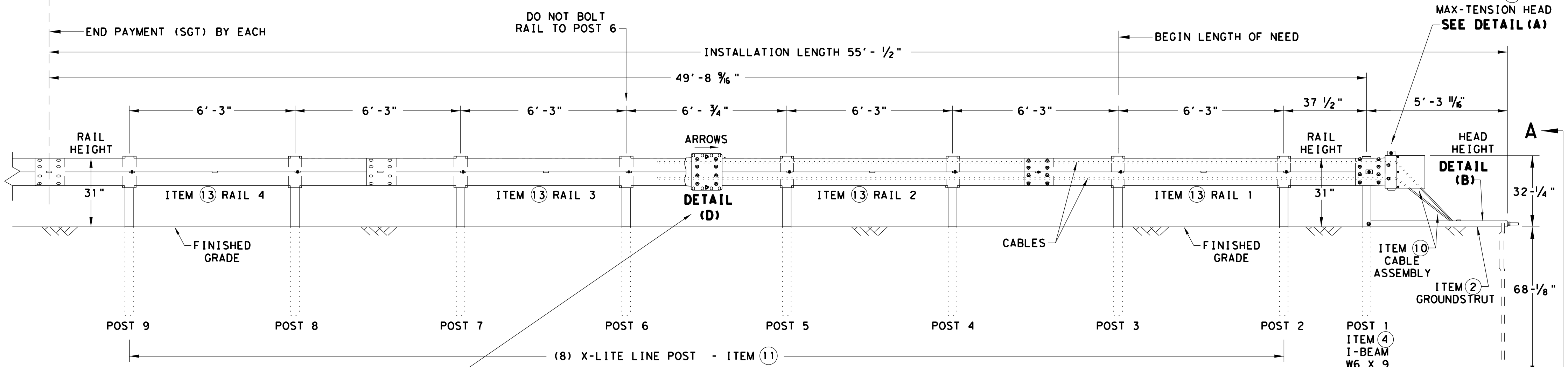
Texas Department of Transportation

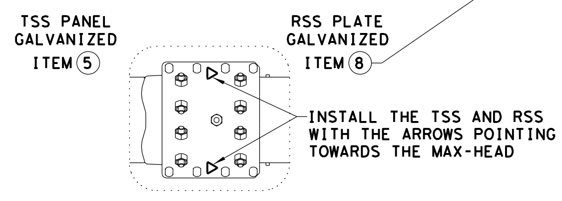
Design Division Standard

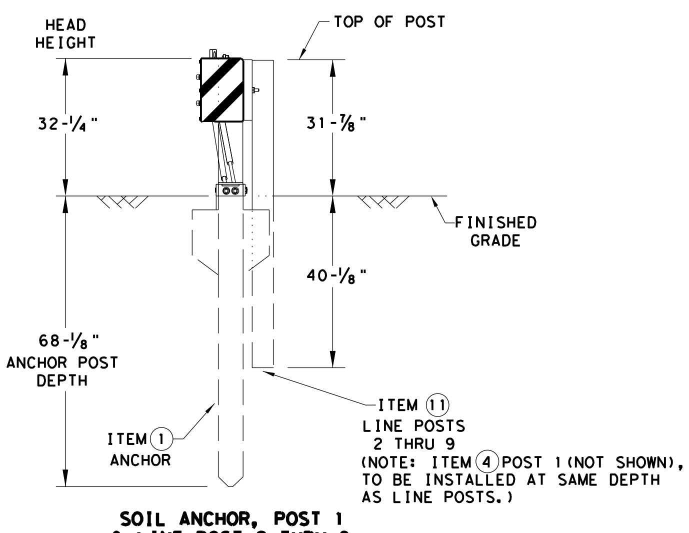
TRINITY HIGHWAY
SOFTSTOP END TERMINAL
MASH - TL-3
SGT(10S)31-16

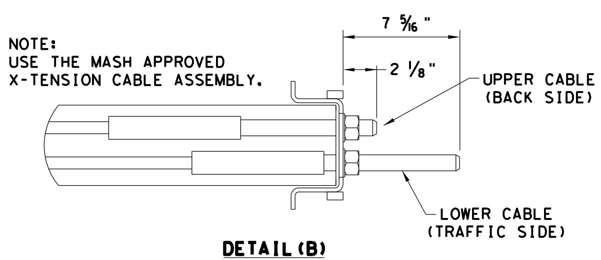
FILE: sgt10s3116	DN: TxDOT	CK: KM	DW: VP	CK: MB/VP	
©TxDOT: JULY 2016	CONT	SECT	JOB	HIGHWAY	
REVISIONS	0720	01	044,ETC.	FM 149, ETC.	
	DIST	COUNTY		SHEET NO.	
	BRYAN	GRIMES		86	

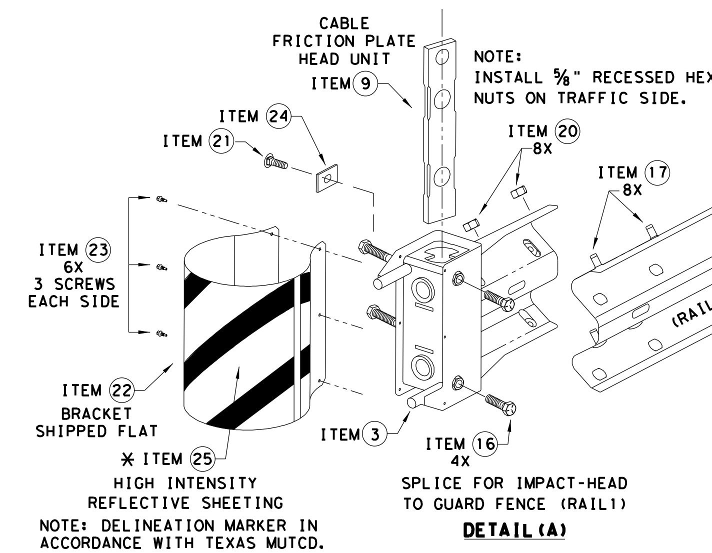


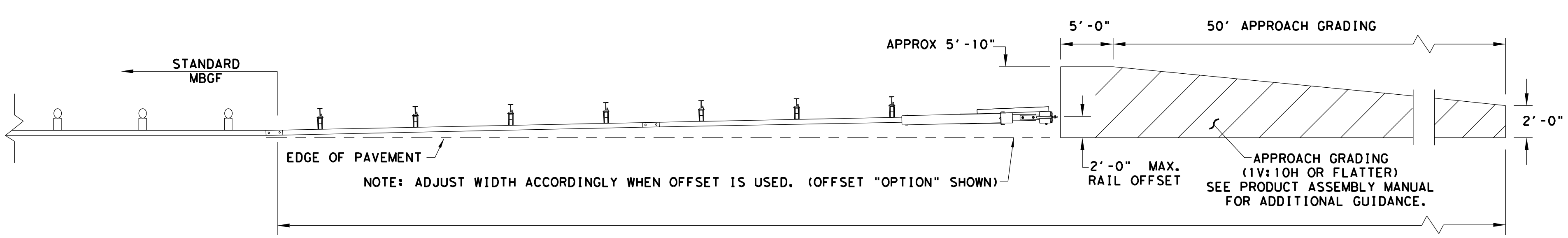












NOTE: TXDOT GENERIC APPROACH GRADING LAYOUT USED FOR ALL TANGENT TYPE END TREATMENTS.

APPROACH GRADING AT GUARDRAIL END TREATMENTS

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 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. 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	5/8" X 7" THREAD BOLT HH (GR.5)GEOMET	1
	16	BSI-2001885	3/4" X 3" ALL-THREAD BOLT HH (GR.5)GEOMET	4
	17	4001115	5/8" X 1 1/4" GUARD FENCE BOLTS (GR.2)MGAL	48
	18	2001840	5/8" X 10" GUARD FENCE BOLTS MGAL	8
	19	2001636	5/8" WASHER F436 STRUCTURAL MGAL	2
	20	4001116	5/8" RECESSED GUARD FENCE NUT (GR.2)MGAL	59
	21	BSI-2001888	5/8" X 2" ALL THREAD BOLT (GR.5)GEOMET	1
	22	BSI-1701063-00	DELINEATION MOUNTING (BRACKET)	1
	23	BSI-2001887	1/4" X 3/4" SCREW SD HH 410SS	7
	24	4002051	GUARDRAIL WASHER RECT AASHTO 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

* TO BE PROVIDED BY DISTRIBUTOR OR CONTRACTOR.

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

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

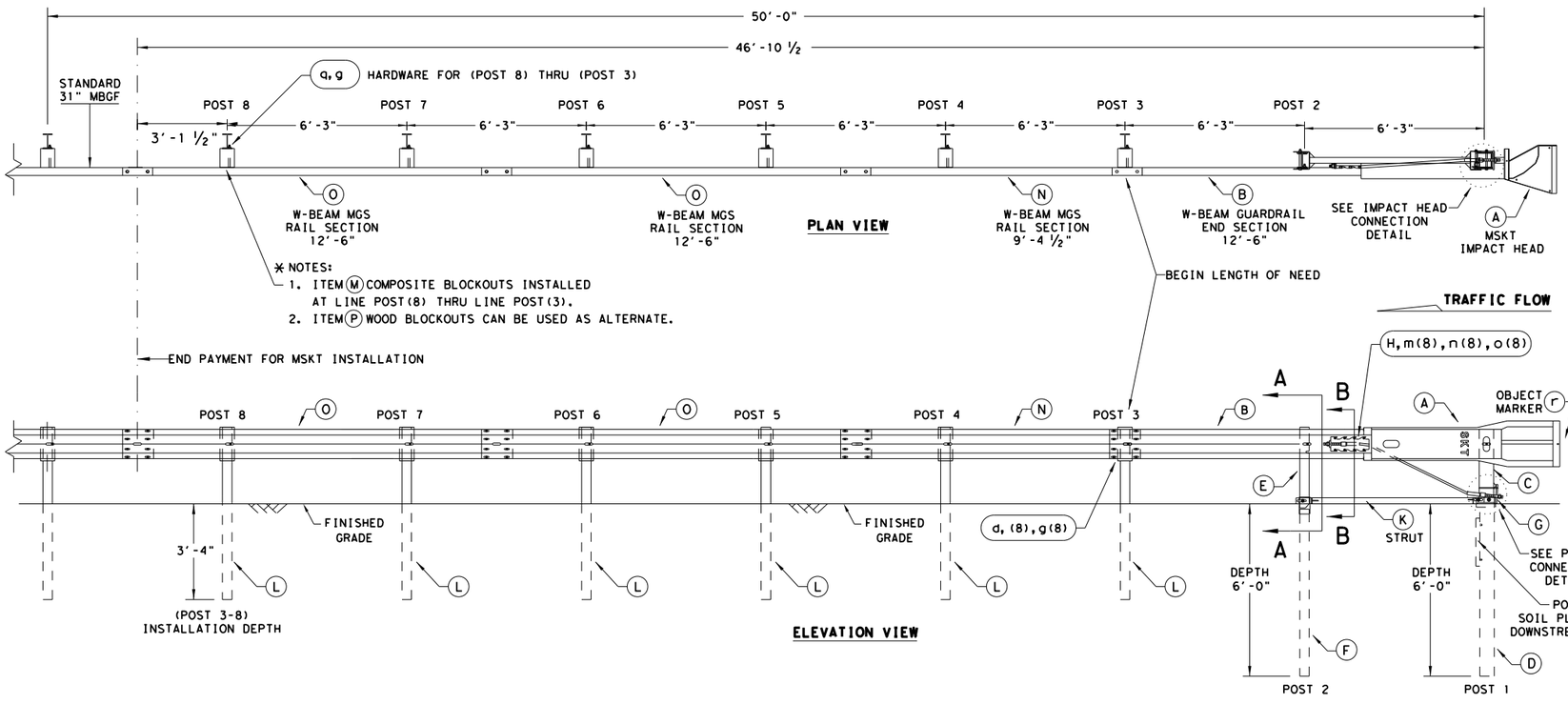
Texas Department of Transportation — Design Division Standard

MAX-TENSION END TERMINAL
MASH - TL-3

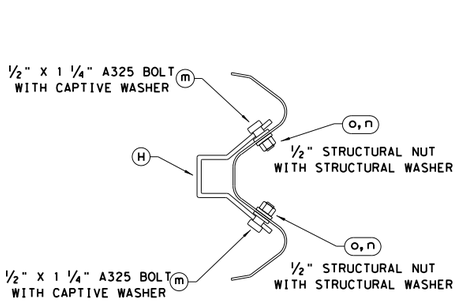
SGT(11S)31-18

FILE: sgt11s3118.dgn	DN: TxDOT	CK: KM	DW: TxDOT	CK: CL
© TxDOT: FEBRUARY 2018	CONT	SECT	JOB	HIGHWAY
REVISIONS	0720	01	044, ETC.	FM 149, ETC.
	DIST		COUNTY	SHEET NO.
	BRYAN		GRIMES	87

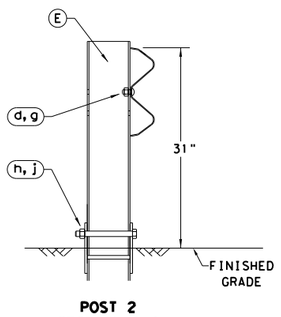
DATE: 4/19/2023
FILE: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY/Design Projects/0720010044/4 - Design/Plan Set/3. Roadway/3H. RoadwayStandards/SGT(12s)31-18.dgn



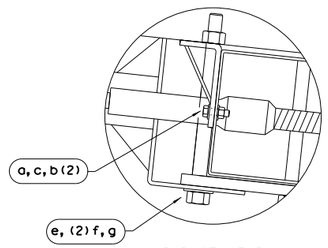
NOTE: SEE (GENERAL NOTE 14) FOR DRIVING CAP INFORMATION.



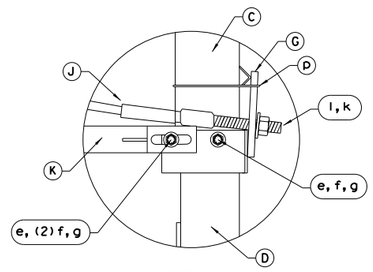
SECTION B-B
ANCHOR BRACKET



POST 2
SECTION A-A



IMPACT HEAD
CONNECTION DETAIL



POST 1
CONNECTION DETAIL

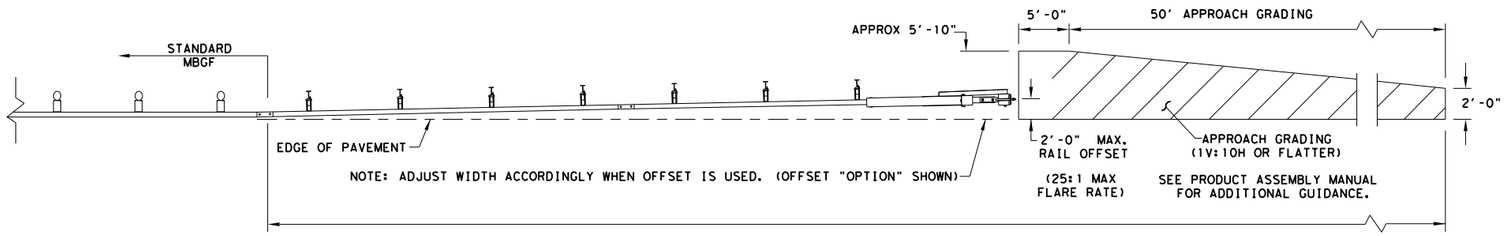
SEE NOTES: *

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

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.

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 5/16" 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



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.

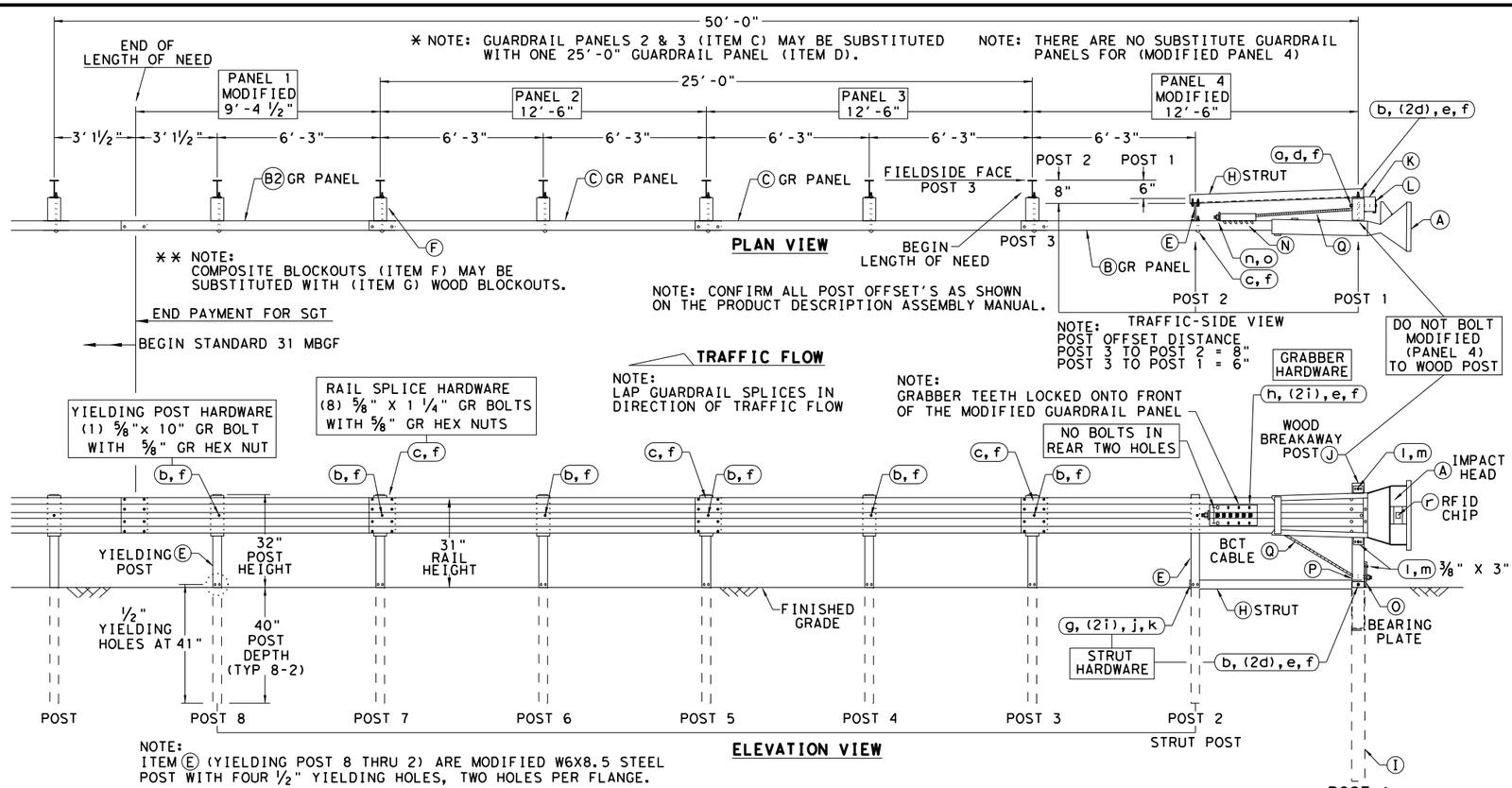
Texas Department of Transportation

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	0720	01	044, ETC.		FM 149, ETC.		
	DIST	COUNTY			SHEET NO.		
	BRYAN	GRIMES			88		

DATE: 4/19/2023
FILE: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY/Design Projects/0720010044/4 - Design/Plan Set/3. Roadway/3H. RoadwayStandards/SGT(15)31-20.dgn

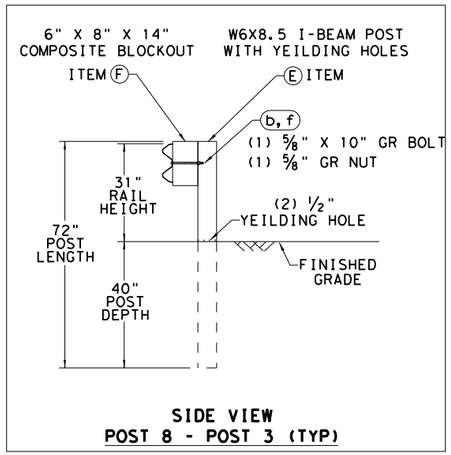


GENERAL NOTES

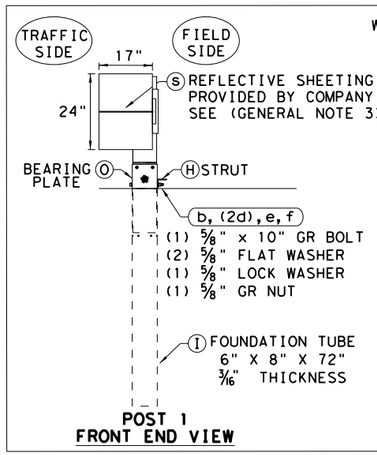
1. FOR SPECIFIC INFORMATION REGARDING INSTALLATION AND TECHNICAL GUIDANCE OF THE SYSTEM, CONTACT: SPIG INDUSTRY, INC. AT 1(267) 644-9510. 14675 INDUSTRIAL PARK RD; BRISTOL, VA 24202
2. FOR INSTALLATION, REPAIR AND MAINTENANCE REFER TO THE MANUFACTURER'S; SGET END TERMINAL, PRODUCT DESCRIPTION ASSEMBLY 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

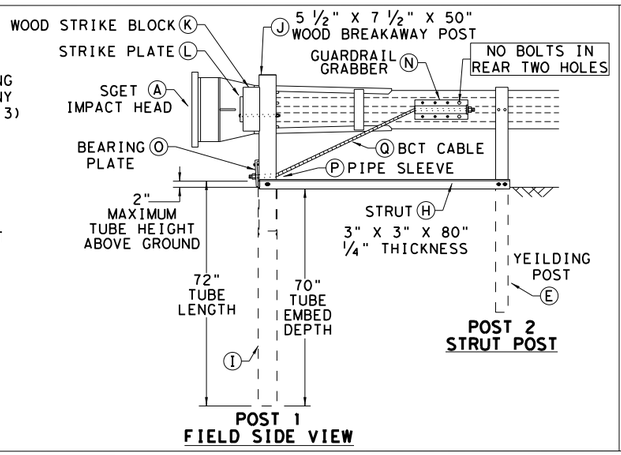
* ALTERNATIVE ITEMS
** NOTE: SEE PLAN VIEW



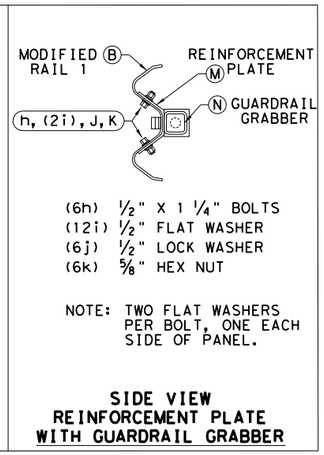
SIDE VIEW
POST 8 - POST 3 (TYP)



POST 1
FRONT END VIEW



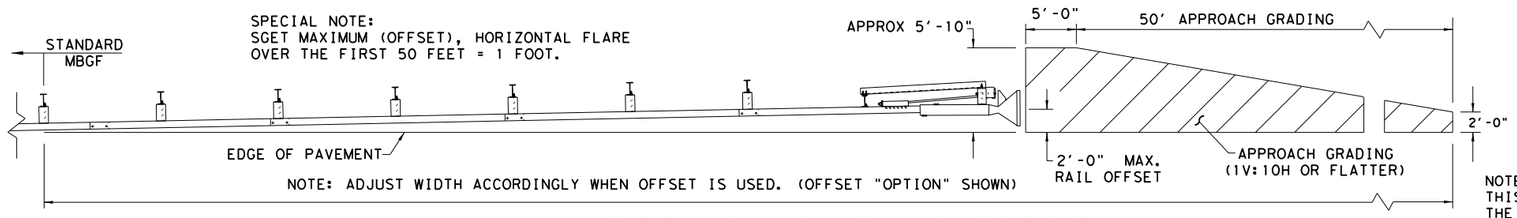
POST 1
FIELD SIDE VIEW



(6h) 1/2" X 1 1/4" BOLTS
(12i) 1/2" FLAT WASHER
(6j) 1/2" LOCK WASHER
(6k) 5/8" HEX NUT

NOTE: TWO FLAT WASHERS PER BOLT, ONE EACH SIDE OF PANEL.

SIDE VIEW
REINFORCEMENT PLATE
WITH GUARDRAIL GRABBER



APPROACH GRADING AT GUARDRAIL END TREATMENTS

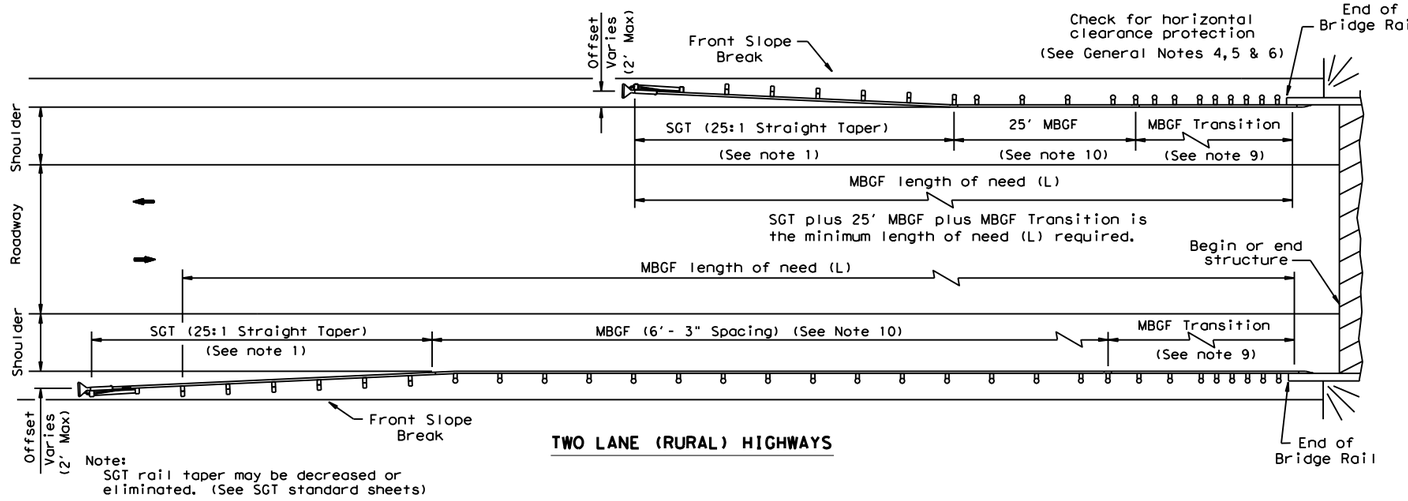
NOTE:
THIS STANDARD IS A BASIC REPRESENTATION OF THE SGET TERMINAL SYSTEM AND IS NOT INTENDED TO REPLACE THE MANUFACTURER'S ASSEMBLY MANUAL.

Texas Department of Transportation
Design Division Standard

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

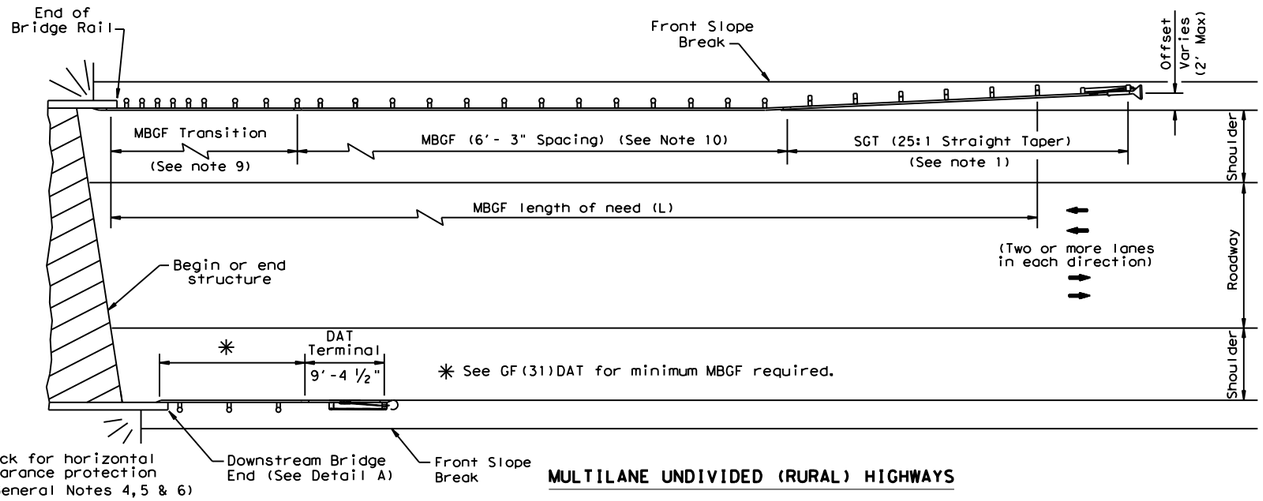
FILE: sgt153120.dgn	DN: TxDOT	CK: KM	DW: VP	CK: VP		
©TxDOT: APRIL 2020	CONT	SECT	JOB	HIGHWAY		
REVISIONS	0720	01	044,ETC.	FM 149, ETC.		
	DIST	COUNTY		SHEET NO.		
	BRYAN	GRIMES		89		

DATE:
FILE:

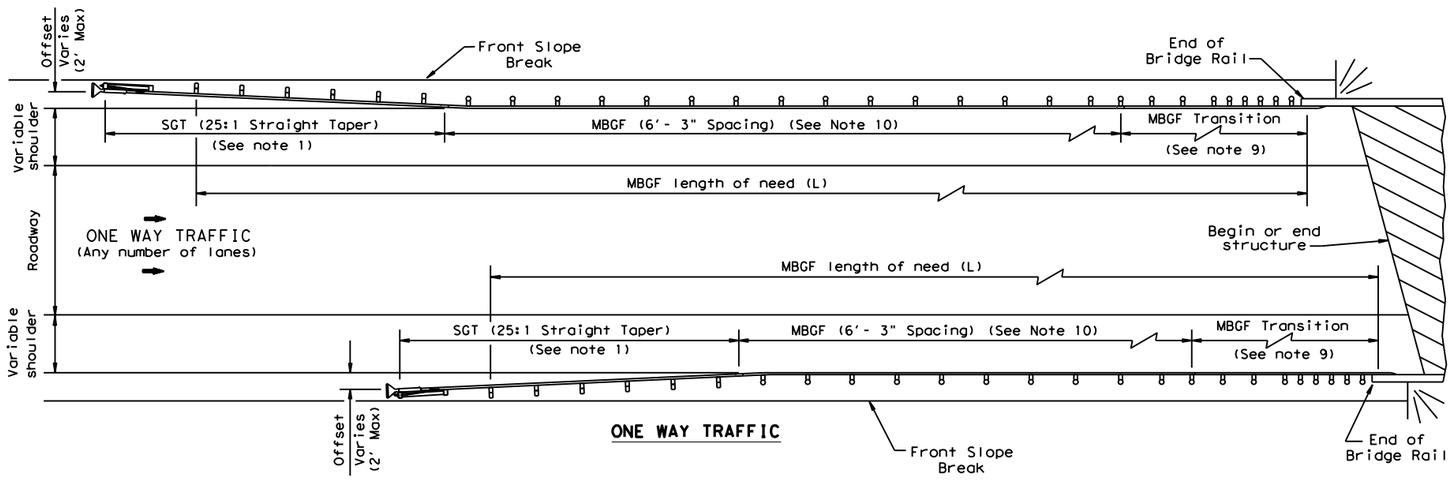


TWO LANE (RURAL) HIGHWAYS

Note:
SGT rail taper may be decreased or eliminated. (See SGT standard sheets)



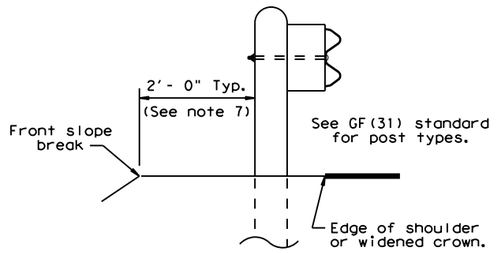
MULTILANE UNDIVIDED (RURAL) HIGHWAYS



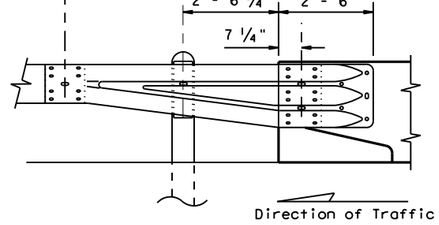
ONE WAY TRAFFIC

GENERAL NOTES

1. For more detail: See GF(31), SGT( )31, GF(31)TR, and GF(31)TL2 standard sheets.
2. Quantities of metal beam guard fence (MBGF) at individual bridge ends are as shown in the plans.
3. Use average daily traffic (ADT) for the current year to determine MBGF length of need in accordance with the Roadway Design Manual unless otherwise specified. Where significant traffic volume growth is anticipated on low volume (0-750 ADT) highways, use length determinations for the higher volume category.
4. MBGF may not be required to shield departure end of bridge unless other obstacles within the horizontal clearance limits or opposing traffic indicate a MBGF consideration.
5. Downstream anchor terminals (DAT) are only for downstream end anchorage use, outside the horizontal clearance area of opposing traffic.
6. Direct connection of MBGF to concrete rails are only for downstream rail connections outside the horizontal clearance area of opposing traffic. (This requires a minimum of three standard line posts plus the DAT terminal, See Detail A)
7. The crown shall be widened to accommodate MBGF. Typically the "front slope" break should be 2'- 0" from the back of the MBGF post. This applies to new construction on new alignment or where existing roadway cross section is to be widened to increase roadway width. This does not apply to rehabilitation work where existing roadway crown width is to be retained (See Typical Cross Section at MBGF).
8. For restrictive bridge widths: The MBGF should be properly transitioned from the existing bridge rail to the adjoining MBGF (See MBGF Transition Standards). Metal beam guard fence at these bridge location(s) shall be flared at the rate of 25:1 or flatter, and be of the length necessary to locate the terminal end at the 2 ft. "maximum" offset from the shoulder edge in the approach direction.
9. Transition length and post spacing will vary depending on the transition type. Transition type will be shown elsewhere in the plans.
10. A minimum 25' length of MBGF will be required.



TYPICAL CROSS SECTION AT MBGF



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

DETAIL A

Showing Downstream Rail Attachment

Texas Department of Transportation

Design Division Standard

BRIDGE END DETAILS

(METAL BEAM GUARD FENCE APPLICATIONS TO RIGID RAILS)

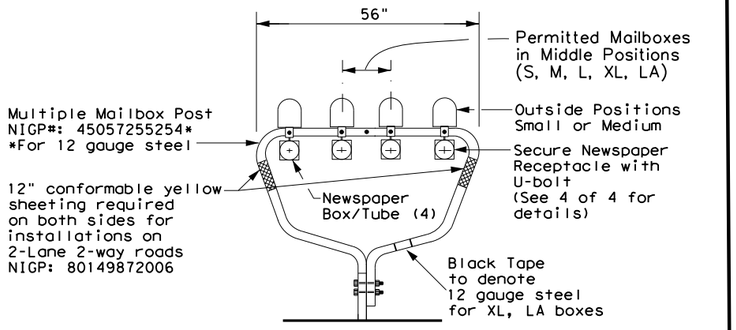
BED-14

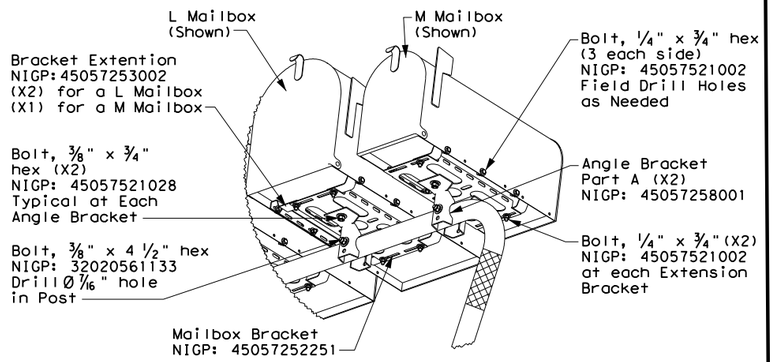
FILE: bed14.dgn	DN: TxDOT	CK: AM	DW: BD/VP	CK: CGL
© TxDOT: December 2011	CONT	SECT	JOB	HIGHWAY
REVISIONS	0720	01	044, ETC,	FM 149, ETC.
REVISED APRIL 2014 SEE (MEMO 0414)	DIST	COUNTY		SHEET NO.
	BRYAN	GRIMES		90

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

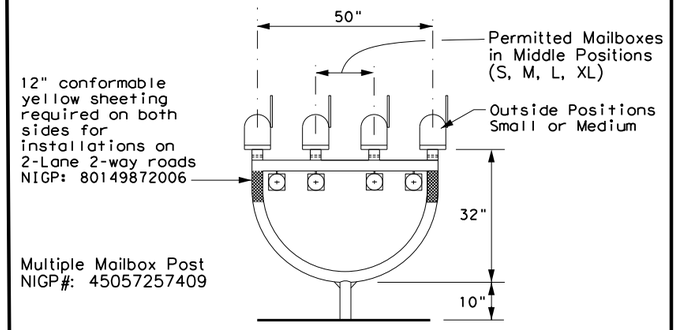
DATE:
FILE:

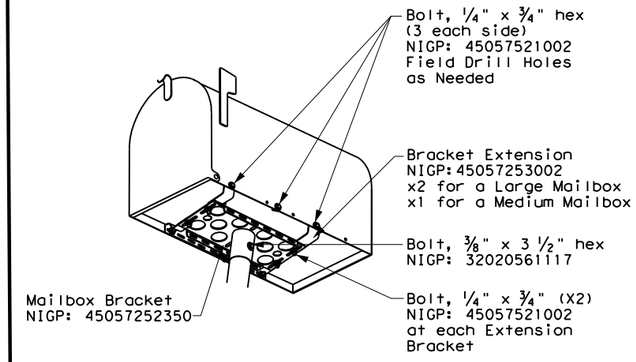
TYPE 1 - MULTIPLE





TYPE 4 - MULTIPLE





MAILBOX SIZES

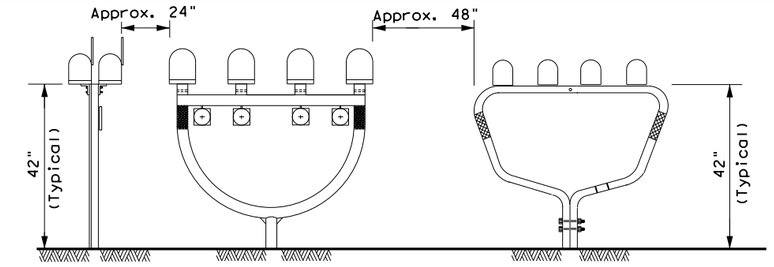
MAILBOX SIZE	TYPICAL DIMENSIONS			MAX **
	LENGTH	WIDTH	HEIGHT	WEIGHT
SMALL	19 1/2"	6"	7"	6 LBS
MEDIUM	22 1/2" *	8" *	11 1/2" *	8 LBS
LARGE	23 1/2"	11 1/2"	13 1/2"	11 LBS
EXTRA LARGE	18"	14"	12"	13 LBS
LOCKABLE	18"	11 1/2"	15"	23 LBS

* See Note 1.
** Excluding Molded Plastic on 4 X 4 Post

GENERAL NOTES:

1. Dimensions shown (length, width, and height) are typical, not maximums. However, anytime a medium size mailbox is mounted on a single/double mount or on the outside position on a multi mount, the dimensions shown are maximums.
2. Mailboxes shall be made of light weight sheet metal or light weight plastic. Heavy steel, cast iron or decorative mailboxes shall not be used on the state highway system.

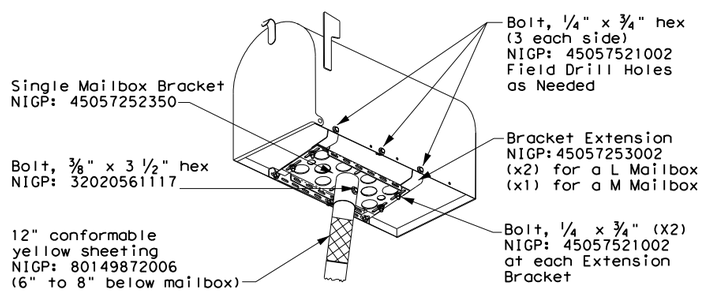
TYPICAL INSTALLATION MEASUREMENTS

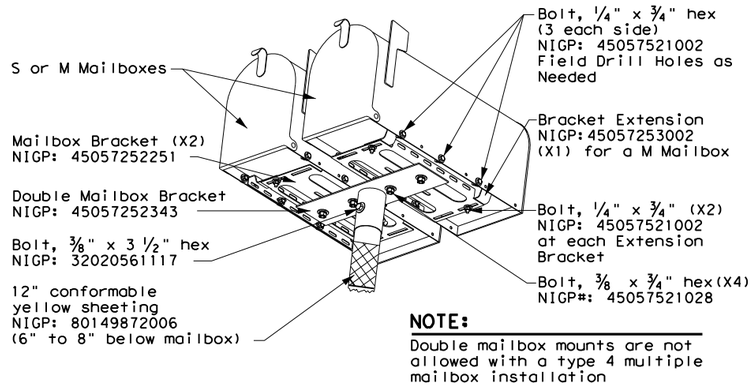


NOTE:

Mailbox installations in sidewalk areas shall be in accordance with the latest TxDOT Design Standard sheets PED-Pedestrian Facilities Curb Ramps.

TYPE 2 and 4 - SINGLE/DOUBLE

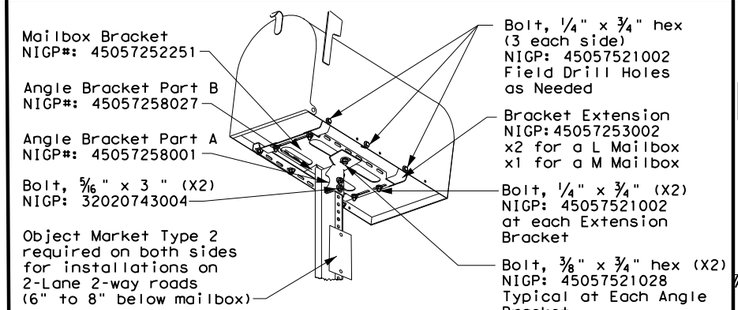


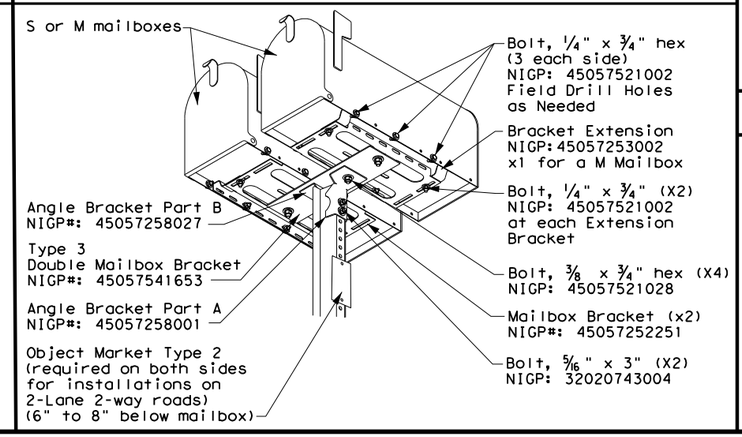


NOTE:

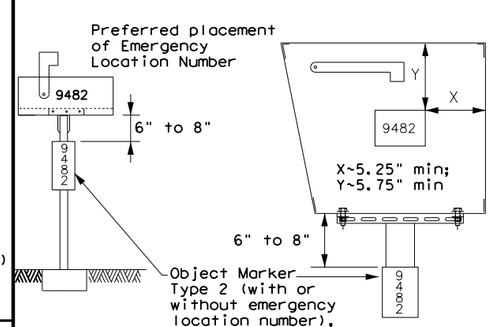
Double mailbox mounts are not allowed with a type 4 multiple mailbox installation

TYPE 3 - SINGLE/DOUBLE





PLACEMENT OF EMERGENCY LOCATION NUMBER

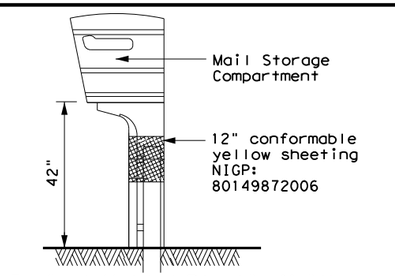


NOTES:

1. Location numbers are provided by homeowner. Minimum size 1" height.
2. Location number is typically placed on the mailbox in a contrasting color.
3. Black numbers may be placed on the Type 2 object marker if the numbers cannot be placed on the mailbox.
4. Alternatively, a green or blue plate with white numbers attached may be mounted below the object marker. Other contrasting color configuration, as approved, may be used.
5. See 3 of 4 for Foundation details.
6. See 4 of 4 for Hardware details.

SHEET 1 OF 4

TYPE 5



Typical Molded Plastic Mailbox

Texas Department of Transportation

Maintenance Division Standard

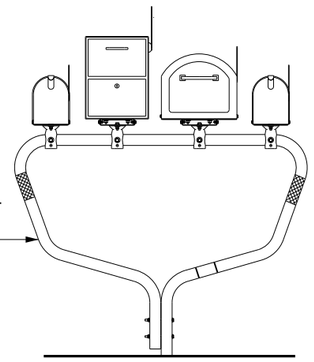
MAILBOX MOUNTING AND ASSEMBLY

MB(1)-21

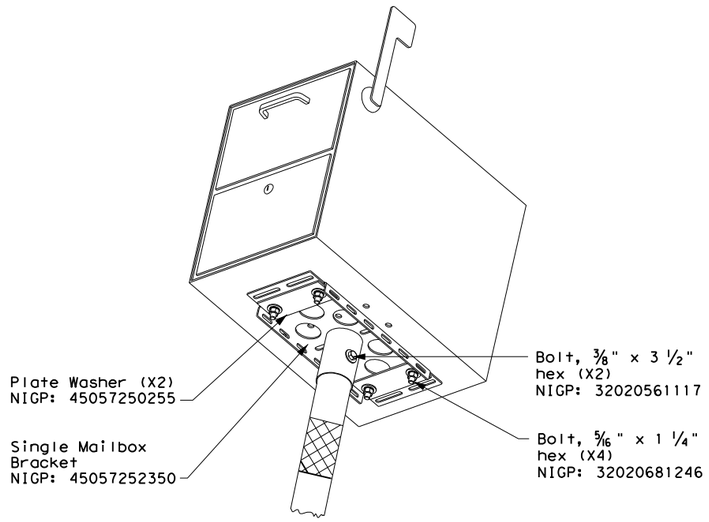
FILE: MB-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT March 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS 2/2005 11/2009 4/2015 6/2005 1/2011 11/2006 7/2014	0720	01	044,ETC.	FM 149, ETC.
	DIST	COUNTY		SHEET NO.
	BRYAN	GRIMES		91

DATE:
FILE:

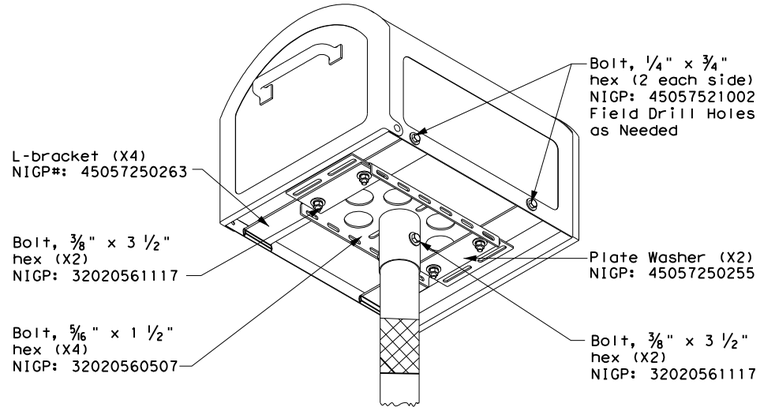
TYPE 1- MULTI LOCKABLE AND XL MAILBOX



TYPE 2/4 - SINGLE LOCKABLE MAILBOX

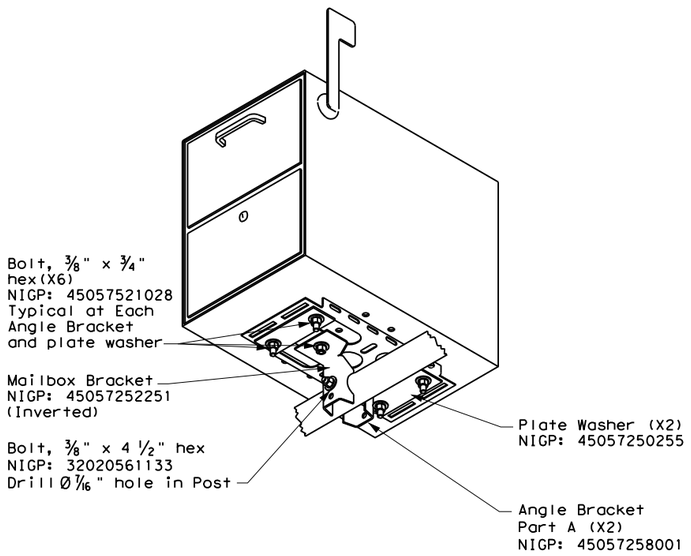


TYPE 2/4 - SINGLE XL MAILBOX

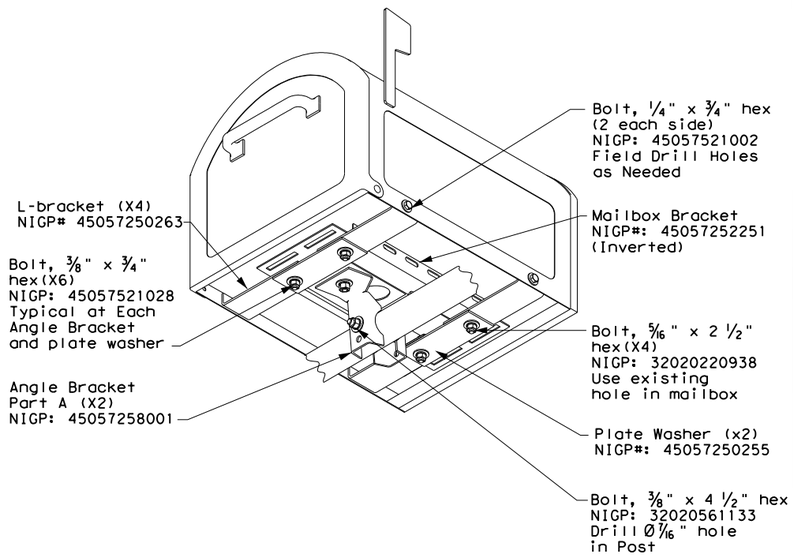


NOTE:
Follow same configuration when mounting an XL mailbox on a Type 4 multi post.

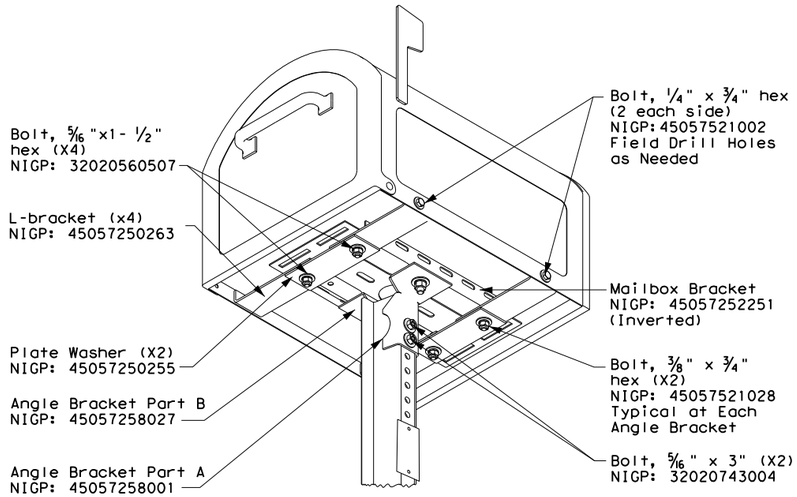
TYPE 1 MULTI – LOCKABLE ARCHITECTURAL (LA)



TYPE 1 MULTI – XL MAILBOX



TYPE 3 - XL MAILBOX MOUNTING



Texas Department of Transportation — Maintenance Division Standard

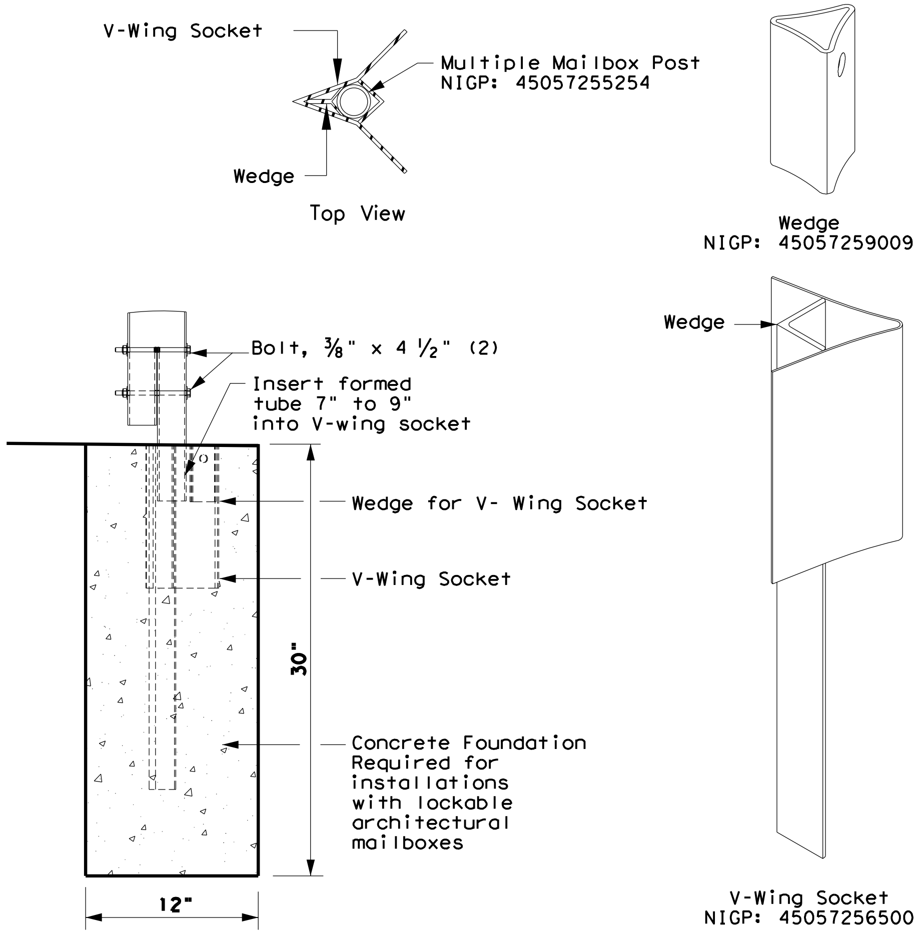
XL AND LOCKABLE ARCHITECTURAL MAILBOX ASSEMBLY

MB(2)-21

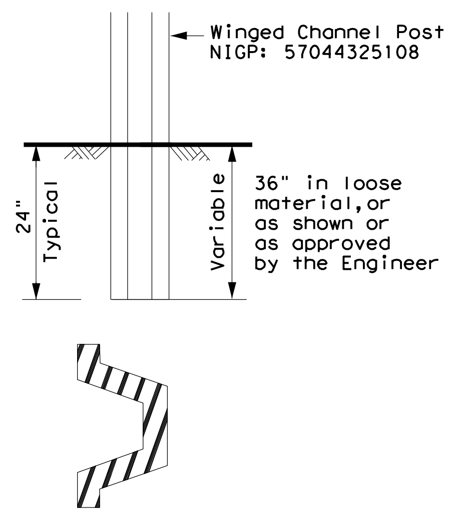
FILE: MB-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT March 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS 2/2005 11/2009 4/2015 6/2005 1/2011 11/2006 7/2014	0720	01	044,ETC.	FM 149, ETC.
	DIST	COUNTY		SHEET NO.
	BRYAN	GRIMES		92

DATE: 4/19/2023 7:43:57 AM
FILE:

TYPE 1 - SUPPORT/FOUNDATION
Thin Wall Tube w/ V-LOC Anchorage



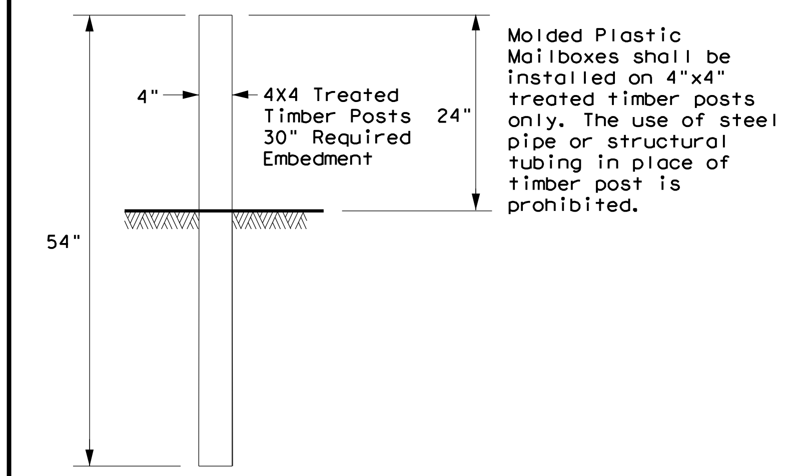
TYPE 3 - SUPPORT/FOUNDATION



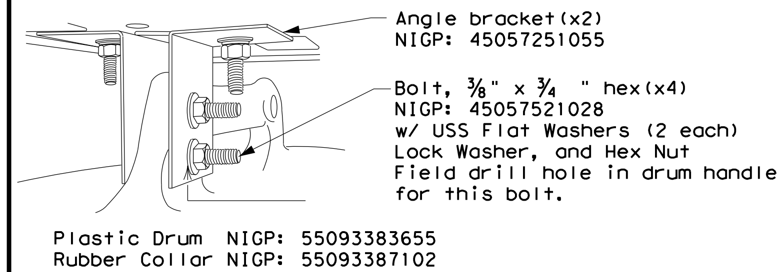
NOTES:

1. Attach Object Marker (OM) facing direction of traffic.
2. OM will also be required on opposite side if installed on a 2-Lane, 2-Way roadway.

TYPE 5 - SUPPORT/FOUNDATION



TYPE 6 - TEMPORARY MAILBOX SUPPORT



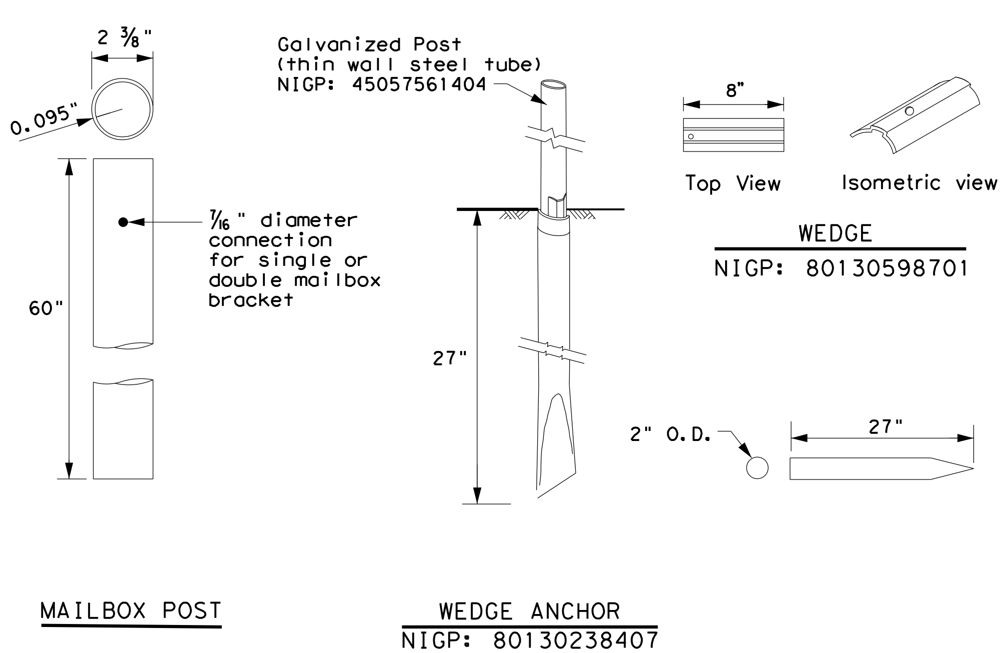
NOTES:

1. Place on approved plastic drum as shown in the Compliant Work Zone Traffic Control Devices (CWZTCD).
2. Existing attachment hardware shall be used unless damaged. Damaged hardware shall be replaced.

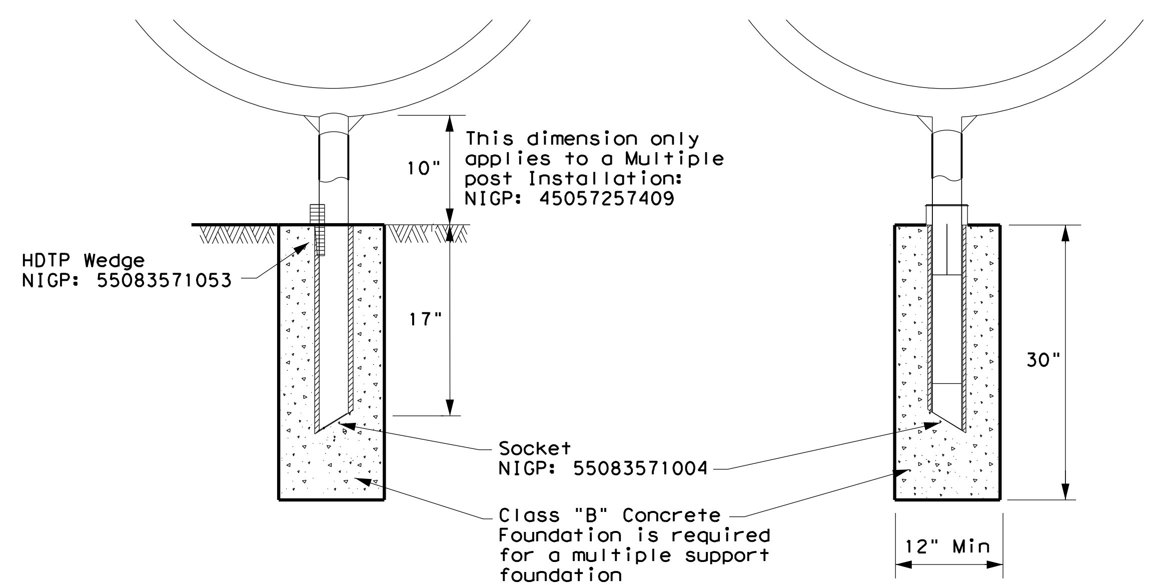
GENERAL NOTES:

1. Erect post plumb or vertical.
2. When galvanized part is required galvanize in accordance with Item 445.
3. Use a concrete footing as shown or when directed. Concrete footing will be required when soils do not hold the support/foundations in a stable condition, only on Type 1, Type 2, and Type 4

TYPE 2 - SUPPORT/FOUNDATION
Thin Wall Steel Tube w/Wedge Anchor System



TYPE 4 - SUPPORT/FOUNDATION
Whitecoated steel post NIGP: 45057561107
Multiple post NIGP: 45057257409
Recycled Rubber post (RR) NIGP: 45057561057



Texas Department of Transportation

Maintenance Division Standard

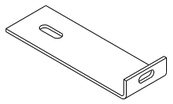
MAILBOX SUPPORT AND FOUNDATION

MB(3)-21

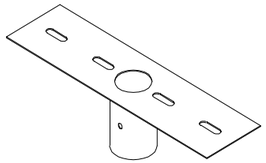
FILE: MB-21.dgn	DN:	CK:	DW:	CK:
© TxDOT March 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS	0720	01	044, ETC.	FM 149, ETC.
2/2005 11/2009 4/2015	DIST		COUNTY	SHEET NO.
6/2005 1/2011 / 11/2006 7/2014	BRYAN		GRIMES	93

DATE: 4/19/2023 7:43:57 AM
FILE: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY/Design Projects/MB(4)-21 dgn

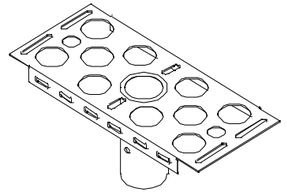
TYPE	TYPE 1	TYPE 2	TYPE 3	TYPE 4			TYPE 5	TYPE 6
Configuration	Multiple	Single or Double	Single or Double	Single	Double	Multiple	Single	Single
Mailbox Size NIGP #	Outside Position: S or M Inside Position: S, M, L, XL, or LA	Single: S, M, L, XL, or LA Double: SS, SM, MM	Single: S, M, L, or XL Double: SS, SM, MM	S, M, L, XL, or LA	SS, SM, or MM	Outside Position: S or M Inside Position: S, M, L, or XL	Molded Plastic	S, or M
Mailbox Post NIGP #	45057255254 (Galvanized Multiple)	45057561404 (Thin Walled Gavanize)	57044325108 (Wing Channel Post)	45057561107 (Thin walled white powder coated) 45057561057 (Recycled Rubber Post: S or M only)	45057561107 (Thin Walled White Powder Coated)	45057257409 (White Powder Coated Multiple)	4x4 Timber	Construction Barrel
Post and Mailbox Hardware NIGP #	45057259009 (Wedge) 45057256500 (V-Wing Socket) 45057253002 (Bracket Extension) 45057252251 (Mailbox Bracket) 45057258001 (Part A Angle Bracket x2) 45057250255 (Plate Washer for XL/LA x2) 45057250263 (L-Bracket for XL x4)	80130598701 (Wedge) 80130238407 (Wedge Anchor) 45057253002 (Bracket Extension) 45057252343 (Double MB Bracket) 45057252350 (S. Mailbox Bracket) 45057252251 (Mailbox Bracket) 45057250255 (Plate Washer for XL/LA x2) 45057250263 (L-Bracket forXL x4)	45057541653 (Type 3 Double Mailbox Bracket) 45057252251 (Mailbox Bracket) 45057253002 (Bracket Extension) 45057258001 (Part A Angle Bracket) 45057258027 (Part B Angle Bracket) 45057250255 (Plate Washer for XL x2) 45057250263 (L-Bracket for XL x4)	55083571053 (Wedge) 55083571004 (Socket) 45057252350 (Single Mailbox Bracket) 45057253002 (Bracket Extension) 45057250255 (Plate Washer for XL/LA x2) 45057250263 (L-Bracket for XL x4)	55083571053 (Wedge) 55083571004 (Socket) 45057253002 (Bracket Extension) 45057252343 (Double Mount Bracket) 45057252251 (Mailbox Bracket x2)	55083571053 (Wedge) 55083571004 (Socket) 45057253002 (Bracket Extension) 45057252350 (Single Mount Bracket) 45057250255 (Plate Washer for XL x2) 45057250263 (L-Bracket for XL x4)	None	45057251055 Angle Bracket (x2)
Foundation Used	Class B Concrete (Required for LA Mailboxes)	Class B Concrete (Required for LA Mailboxes)	None	Class B Concrete (not used with recycled rubber post, required for LA Mailboxes)	Class B Concrete (not required)	Class B Concrete	None	None



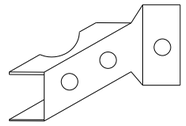
NIGP: 45057250263
L-Bracket x4 for
XL sized mailboxes



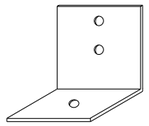
NIGP: 45057252343
Double Mailbox Bracket
For Type 2 and Type 4
double mount



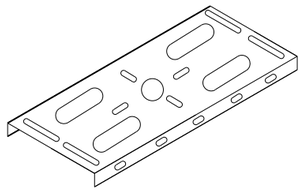
NIGP: 45057252350
Single Mailbox Bracket
For Type 2 single and for
Type 4 single and multi mount



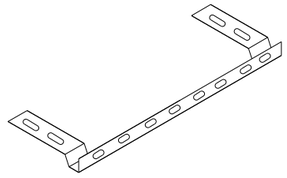
NIGP: 45057258001
Part "A" Angle Bracket
For Type 1 multi (2 per mailbox)
and Type 3 single and double



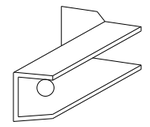
NIGP: 45057251055
Type 6 Angle Bracket
(2 per mailbox)



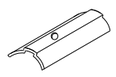
NIGP: 45057252251
Mailbox Bracket
For Type 1 multi and
any double mount (use 2)



NIGP: 45057253002
Bracket Extension
Use 1 for a medium Mailbox
Use 2 for a Large Mailbox



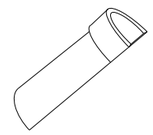
NIGP: 45057258027
Part "B" Angle Bracket
For Type 3 single
and double



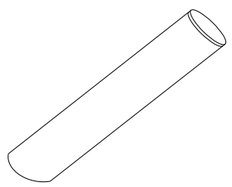
NIGP: 80130598701
Wedge for Type 2

NIGP: 45057250255
Plate Washer for Architecural
and XL Mailboxes

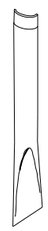
NIGP: 45057541653
Type 3 double mailbox bracket



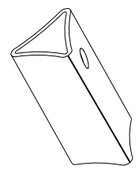
NIGP: 55083571053
Type 4 Mailbox Wedge



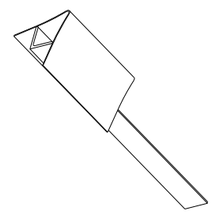
NIGP: 55083571004
Type 4 Mailbox Socket



NIGP: 80130238407
Type 2 Wedge Anchor



NIGP: 45057259009
Wedge for Type 1 V-wing Socket



NIGP: 45057256500
V-wing Socket for
Type 1 Foundation

NIGP #	OBJECT MARKERS AND CONFORMABLE SHEETING
55008311759	Type 2 OM 4"x4" (3 Needed) for Type 3 Wing Channel Post
55008312906	Type 2 OM 6"x12" (1 needed) for Type 3 Wing Channel Post
80149872006	12" Conformable Reflective Yellow Sheeting for Flexible Posts

NOTES:

1. Type 2 object marker in accordance with Traffic Engineering Standard Delineators & Object Markers.
2. A light weight receptacle for newspaper delivery can be attached to mailbox posts if the receptacle does not touch the mailbox, present a hazard to traffic or delivery of the mail, extend beyond the front of the mailbox, or display advertising, except the publication title.

BID CODES FOR CONTRACTS

MB-(X) ASSM TY (XXX) (X)

Type of Mailbox
- S = Single
- D = Double
- M = Multiple
- MP = Molded Plastic

Type of Post
- WC = Winged Channel Post
- RR = Recycled Rubber
- TWW = Thin Walled White Tubing
- TWG = Thin Walled Galvanized Tubing
- TIM = Timber

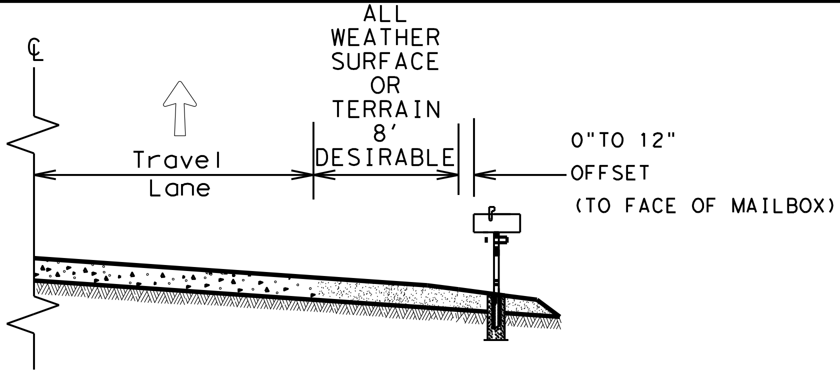
Type of Foundation
- Ty 1 = V-Loc
- Ty 2 = Wedge Anchor Steel System
- Ty 3 = Winged Channel post
- Ty 4 = Wedge Anchor Plastic System
- Ty 5 = 4 X 4 Post

Texas Department of Transportation
Maintenance Division Standard

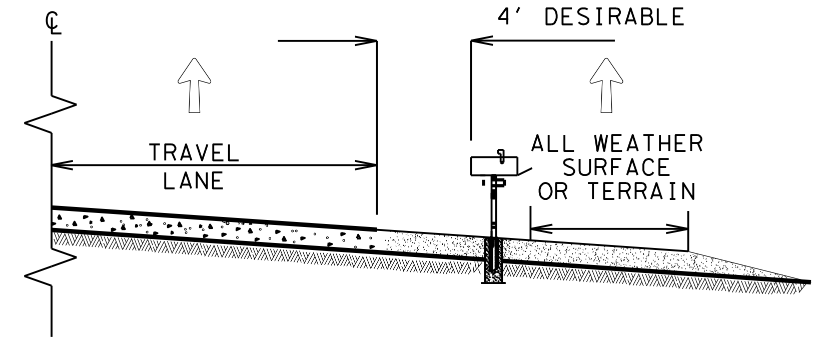
NIGP PARTS LIST AND COMPATIBILITY

MB(4)-21

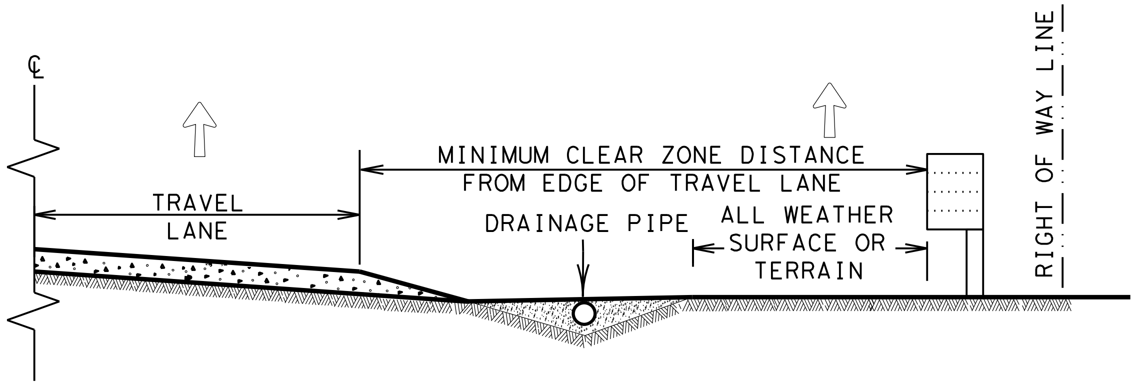
FILE: MB-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT March 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS 2/2005 11/2009 4/2015 6/2005 1/2011 11/2006 7/2014	0720	01	044,ETC.	FM 149, ETC.
	DIST	COUNTY		SHEET NO.
	BRYAN	GRIMES		94



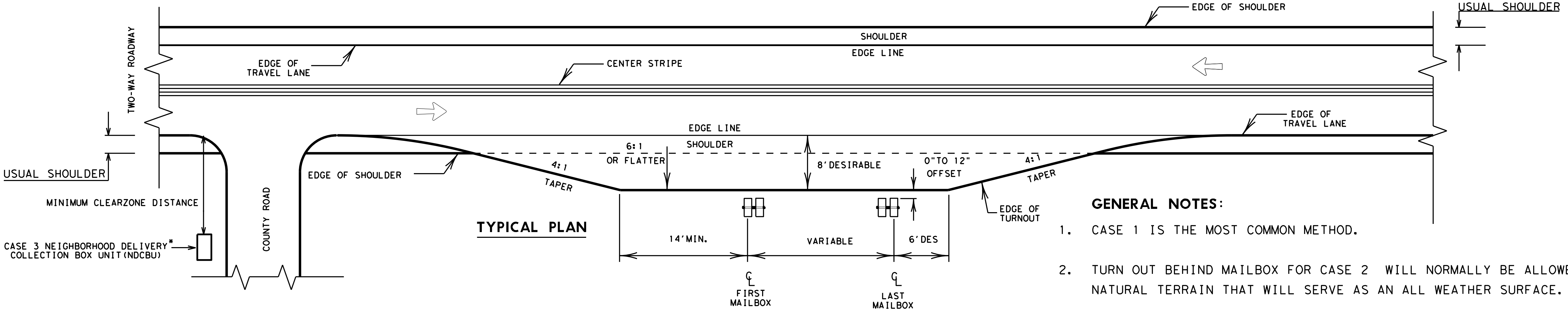
CASE 1. OFF TRAVEL WAY DELIVERY



CASE 2. BACK SIDE DELIVERY



CASE 3. DELIVERY NEAR RIGHT OF WAY LINE



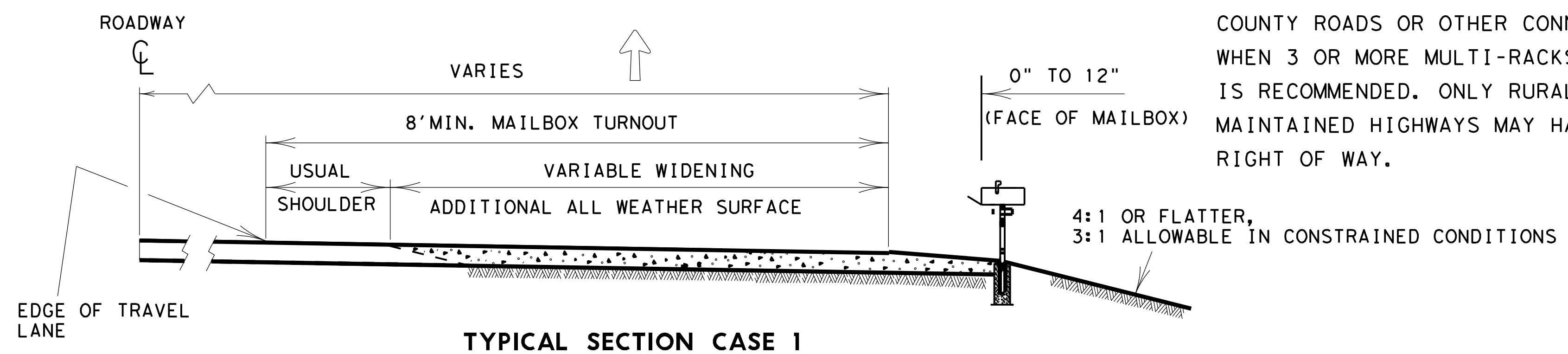
TYPICAL PLAN

GENERAL NOTES:

1. CASE 1 IS THE MOST COMMON METHOD.

2. TURN OUT BEHIND MAILBOX FOR CASE 2 WILL NORMALLY BE ALLOWED FOR NATURAL TERRAIN THAT WILL SERVE AS AN ALL WEATHER SURFACE.

3. ALL WEATHER DRIVEWAYS FOR CASE 3 MAILBOXES LOCATED AT THE RIGHT OF WAY LINE SHOULD NORMALLY BE PLACED IN CONJUNCTION WITH COUNTY ROADS OR OTHER CONNECTING COMMUNITY ROADS OR STREETS. WHEN 3 OR MORE MULTI-RACKS ARE ANTICIPATED, THE USE OF AN NDCBU IS RECOMMENDED. ONLY RURAL PATRONS LOCATED ON STATE MAINTAINED HIGHWAYS MAY HAVE A MAILBOX OR NDCBU SLOT ON TXDOT RIGHT OF WAY.



TYPICAL SECTION CASE 1

* NDCBU MAY BE INSTALLED ON COUNTY ROAD ROW WITH APPROVAL OF COUNTY.

MAIL DELIVERY VEHICLE TRAVEL DIRECTION

SHEET 1 OF 2

Texas Department of Transportation — Maintenance Division Standard

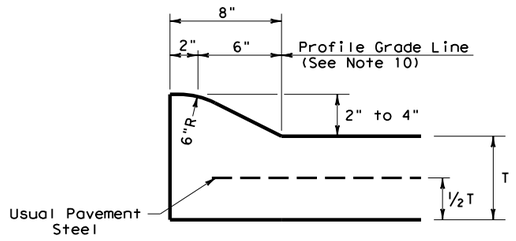
Guideline

MAILBOX SIDE ROAD PLACEMENT AND TURNOUTS

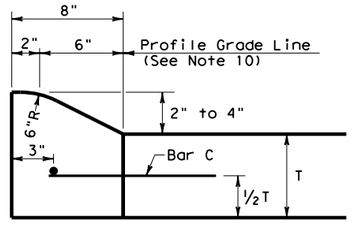
MBP(1)-22

FILE: MBP-22.DGN	DN: VS	CK:	DW: VS	CK:
© TxDOT OCTOBER 2022	CONT 0720	SECT 01	JOB 044, ETC.	HIGHWAY FM 149, ETC.
REVISIONS 12/2012 5/2014	DIST BRYAN	COUNTY GRIMES		SHEET NO. 95

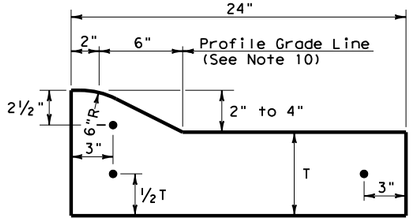
DATE:
FILE:



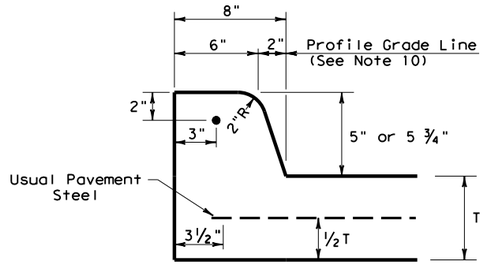
TYPE I CURB (MONOLITHIC)
2" - 4" HEIGHT



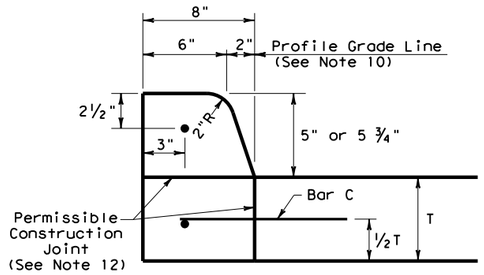
TYPE I CURB
2" - 4" HEIGHT



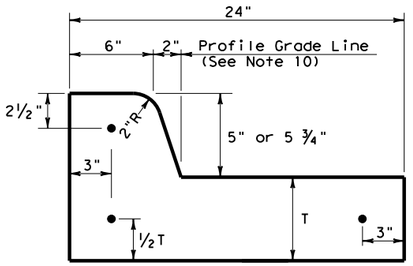
TYPE I CURB AND GUTTER
2" - 4" HEIGHT



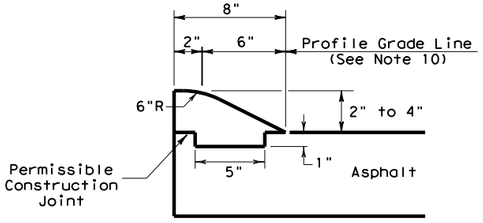
TYPE II CURB (MONOLITHIC)
5" - 5 ¾" HEIGHT



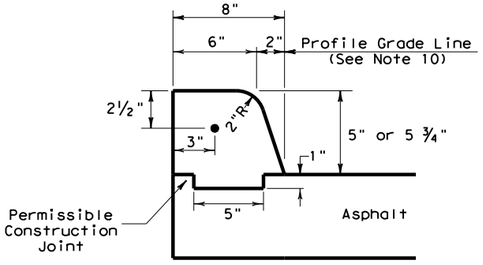
TYPE II CURB
5" - 5 ¾" HEIGHT



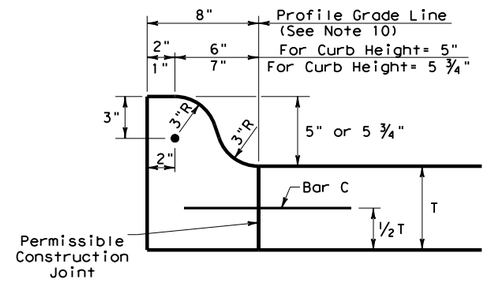
TYPE II CURB AND GUTTER
5" - 5 ¾" HEIGHT



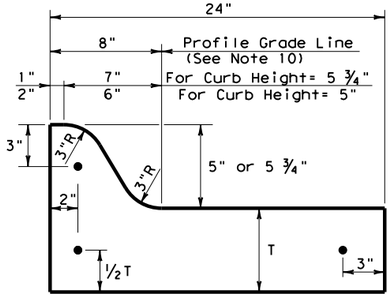
TYPE III CURB (KEYED)
2" - 4" HEIGHT



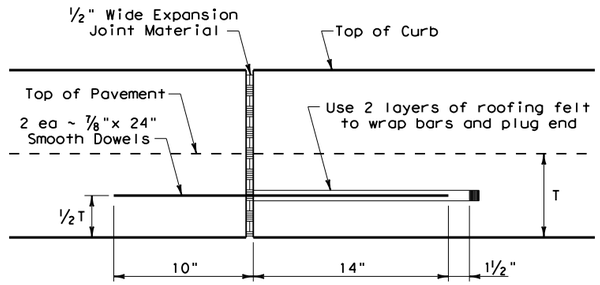
TYPE IV CURB (KEYED)
5" - 5 ¾" HEIGHT



TYPE IIa CURB
5" - 5 ¾" HEIGHT

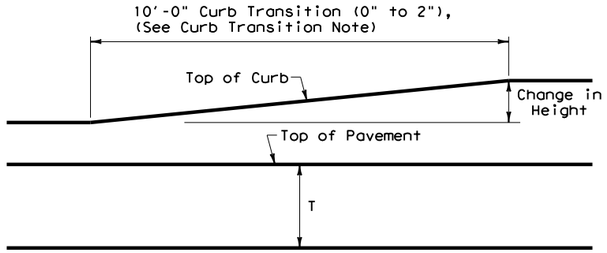


TYPE IIa CURB AND GUTTER
5" - 5 ¾" HEIGHT

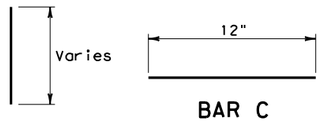


EXPANSION JOINT DETAIL

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



CURB TRANSITION
Note: To be paid for as Highest Curb



BAR B

BAR C

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 fiber reinforced concrete in lieu of reinforcing steel is acceptable. Use fibers meeting the requirements of DMS 4550, "Fibers for Concrete," and dose fibers in accordance with Material Producers List (MPL) "Fibers for Class A and B Concrete Applications."
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 to be placed on existing concrete pavement, Bar B may be drilled and the grouted in place, or may be inserted into fresh concrete.
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 horizontal permissible construction joints are used, the longitudinal pavement steel shall be placed in accordance with pavement details shown elsewhere in the plans. Reinforcing steel for curb section shall then conform to that required for concrete curb.
13. Bar B used as needed to support curb reinforcing steel during concrete placement.

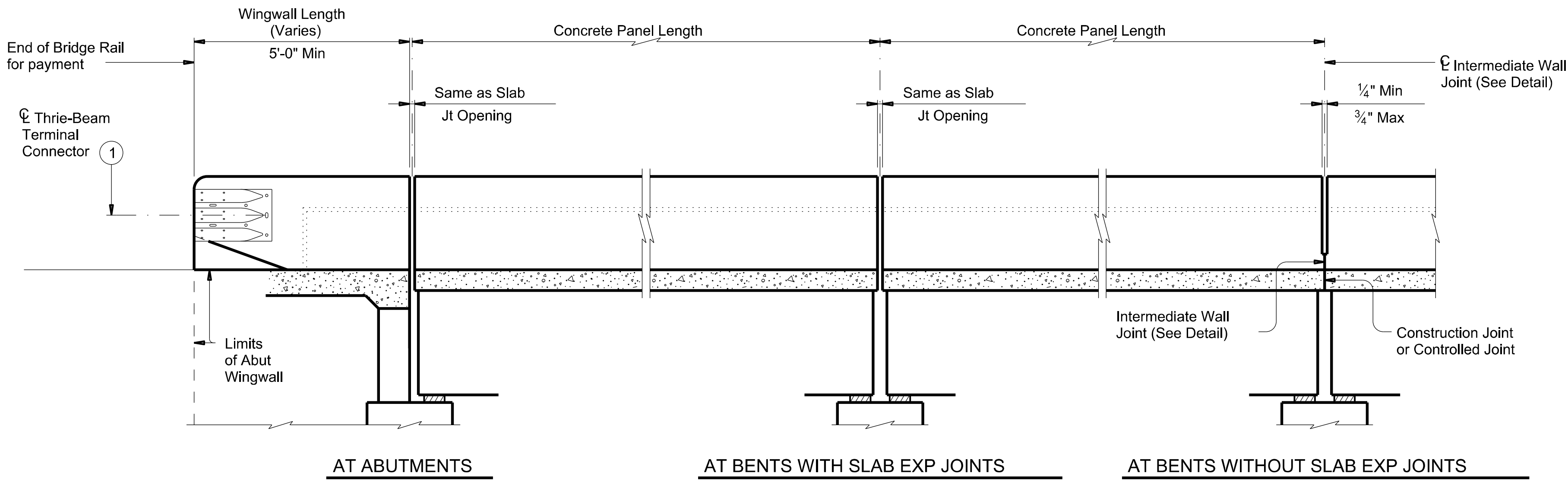
Texas Department of Transportation

Design Division Standard

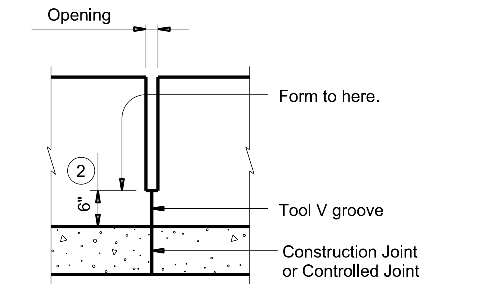
CONCRETE CURB AND CURB AND GUTTER

CCCG-21

FILE: cccg21.dgn	DN: TXDOT	CK: AN	DW: SS	CK: KM
©TxDOT: FEBRUARY 2021 REVISIONS	CONT	SECT	JOB	HIGHWAY
	0720	01	044, ETC.	FM 149, ETC.
	DIST	COUNTY		SHEET NO.
	BRYAN	GRIMES		96

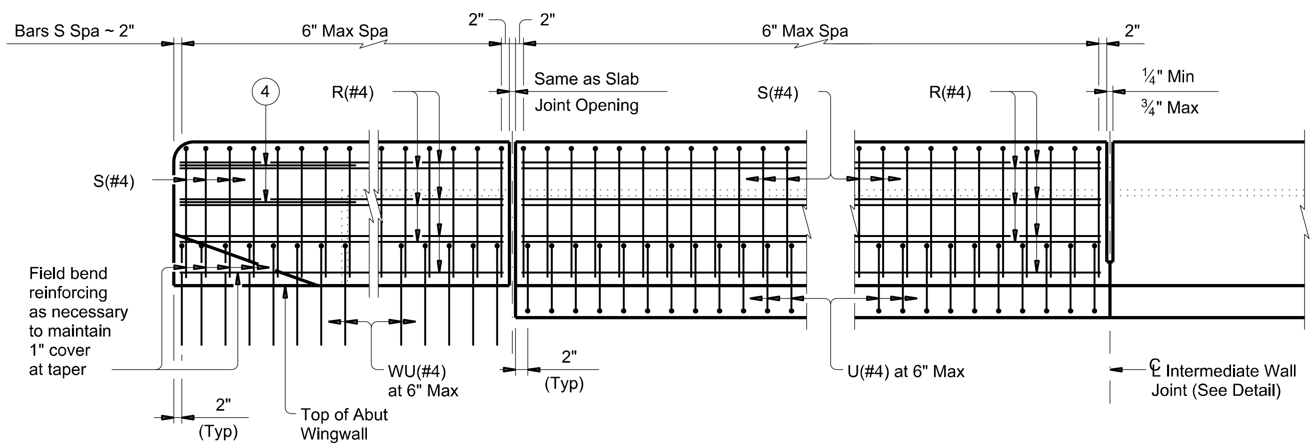


ROADWAY ELEVATION OF RAIL

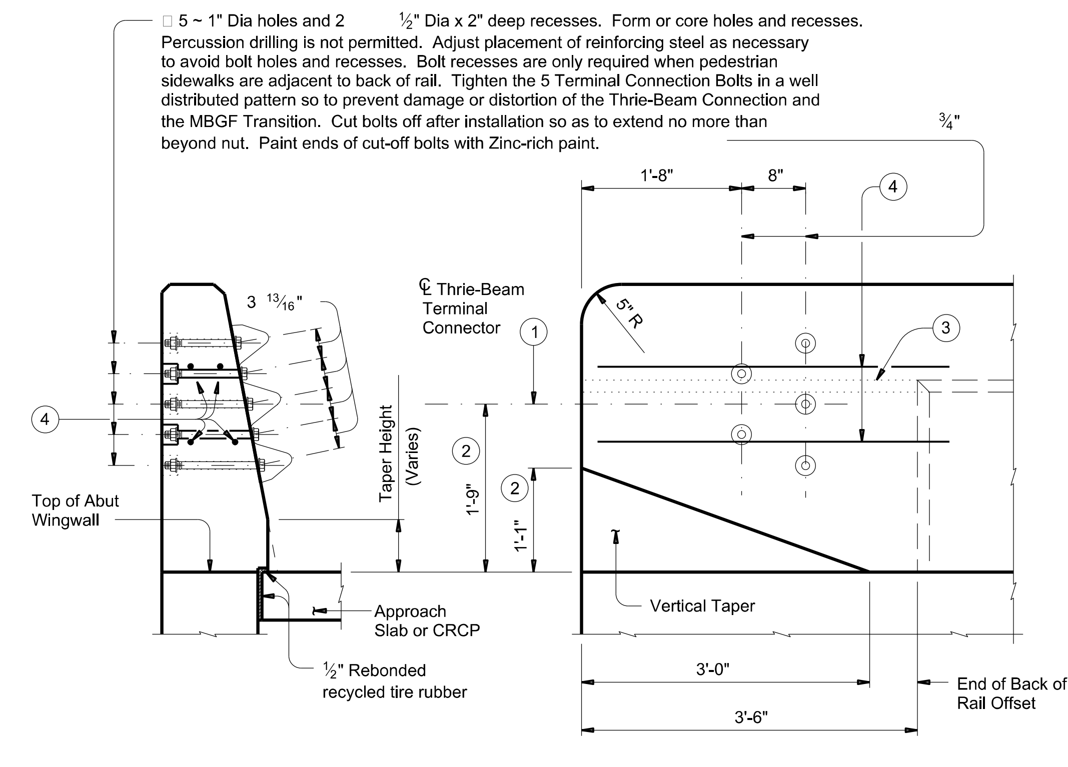


INTERMEDIATE WALL JOINT DETAIL

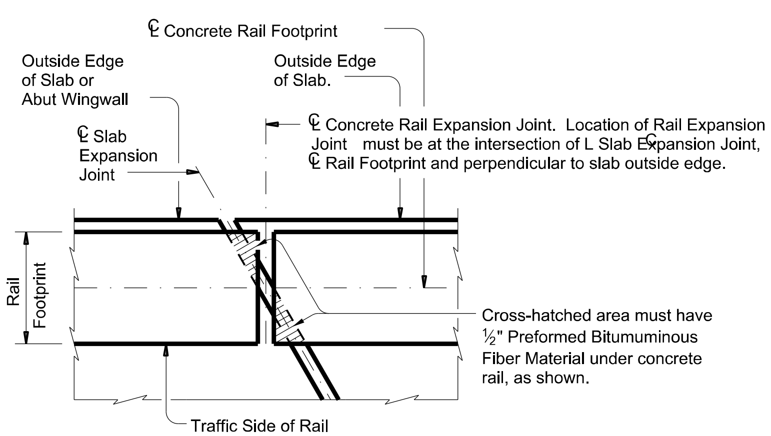
Provide at all interior bents without slab expansion joints.



ELEVATION SHOWING TYPICAL REINFORCING PLACEMENT



TERMINAL CONNECTION DETAILS



PLAN OF RAIL AT EXPANSION JOINTS

Example showing Slab Expansion Joints without breakbacks.

1. Terminal Connectors and associated hardware are to be paid for under the Item "Metal Beam Guard Fence". Attach Metal Beam Guard Fence Transitions to the bridge rail and extend along the embankment unless otherwise shown in the plans.
2. Increase 2" for structures with Overlay.
3. Back of rail offset may, with Engineer's approval, be continued to the end of the railing.
4. Place 4 additional Bars R(#4) 3'-8" in length inside Bars S(#4) and centered 2'-0" from end of rail when Terminal Connections are required.

Texas Department of Transportation — Bridge Division Standard

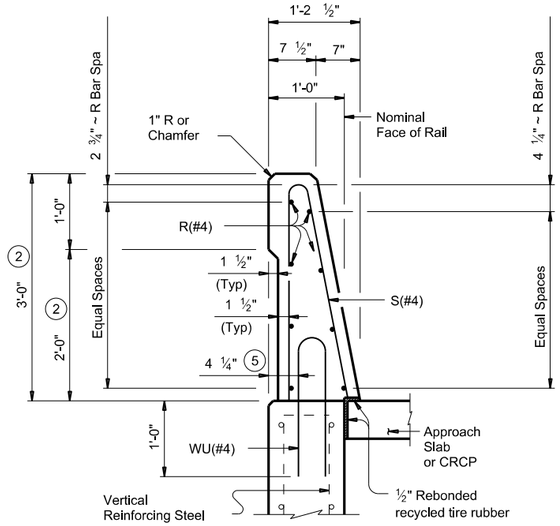
TRAFFIC RAIL SINGLE SLOPE

TYPE SSTR

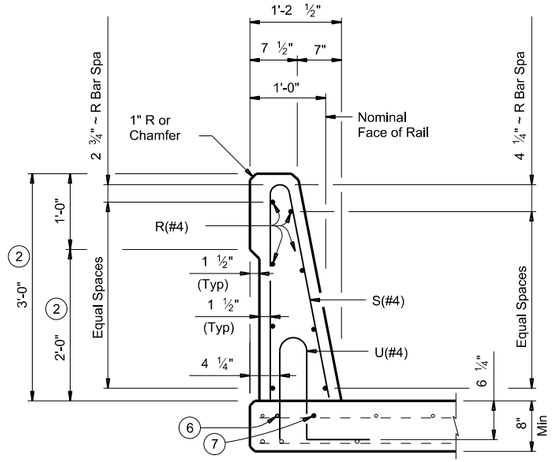
FILE: rlstd014-19.dgn		DN: TxDOT	CK: TxDOT	DW: JTR		CK: TxDOT	
©TxDOT September 2019		CONT	SECT	JOB		HIGHWAY	
REVISIONS		0720	01	044, ETC.		FM 149, ETC.	
		DIST		COUNTY		SHEET NO.	
		BRYAN		GRIMES		97	

DATE: 4/19/2023 7:44:42 AM
FILE: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY/Design Projects/0720-01-044/.../DrainageStandards/SSTR.dgn

DATE: 4/19/2023 7:44:43 AM
FILE: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY/Design Projects/Traffic Rail/SSTR.dgn



ON ABUTMENT WINGWALLS
OR CIP RETAINING WALLS



ON BRIDGE SLAB

SECTIONS THRU RAIL

(2) Increase 2" for structures with Overlay.

(5) 5 ¼" when vertical reinforcing has closer clear cover over horizontal reinforcing in abutment wingwalls or retaining walls on traffic side of wall.

(6) As an aid in supporting reinforcement, additional longitudinal bars may be used in the slab with the approval of the Engineer. Such bars must be furnished at the Contractor's expense.

(7) Top longitudinal slab bar may be adjusted laterally 3" plus or minus to tie reinforcing.

(8) No longitudinal wires may be within upper bend.

(9) Bend or cut as required to clear drain slots.

(10) Space U(#4) bars at 4" Max when end region of panel length is less than 6'-0" to side slot drain. Space U(#4) bars at 6" Max when end region of panel length is 6'-0" and greator to side slot drain.

CONSTRUCTION NOTES:

This railing may be constructed by the slipform process when approved by the Engineer, with equipment approved by the Engineer. Provide sensor control for both line and grade. Tack welding to provide bracing for slipform operations is acceptable. Welding may be performed at a minimum spacing of 3 ft between the cage and the anchorage. It is permissible to weld to bars U, WU and S at any location on the cage. If increased bracing is needed, provide additional anchorage devices and weld in the upper two thirds of the cage. Paint welded areas on epoxy coated and/or galvanized reinforcing with an organic zinc rich paint in accordance with Item 445 "Galvanizing".

If rail is slipformed, apply an heavy epoxy bead 1" behind toe of traffic side of rail to concrete deck just prior to slip forming. Provide a ⅜" width x ¼" tall heavy epoxy bead with Type III, Class C or a Type V epoxy.

The back of railing must be vertical unless otherwise shown in the plans or approved by the Engineer.

MATERIAL NOTES:

Provide Class "C" concrete. Provide Class "C" (HPC) if required elsewhere.

Provide Grade 60 reinforcing steel.

Epoxy coat or galvanize all reinforcing steel if slab bars are epoxy coated or galvanized.

Deformed Welded Wire Reinforcement (WWR) (ASTM A1064) of equal size and spacing may be substituted for Bars U and WU unless noted otherwise. Deformed WWR (ASTM A1064) may be substituted for Bars R and S, as shown. Combinations of reinforcing steel and WWR or configurations of WWR other than shown are permitted if conditions in the table are satisfied. Provide the same laps as required for reinforcing bars.

Provide bar laps, where required, as follows:
Uncoated or galvanized ~ #4 = 1'-7"
Epoxy coated ~ #4 = 2'-5"

GENERAL NOTES:

This rail has been successfully evaluated by full-scale crash test to meet MASH TL-4 criteria. This rail can be used for speeds of 50 mph and greater when a TL-3 rated guard fence transition is used. When a TL-2 rated guard fence transition is used, this rail can only be used for speeds of 45 mph and less.

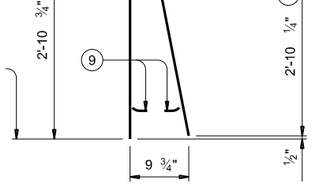
Do not use this railing on bridges with expansion joints providing more than 5" movement.

Rail anchorage details shown on this standard may require modification for select structure types. See appropriate details elsewhere in plans for these modifications.

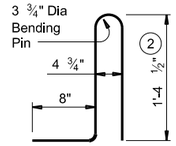
Shop drawings will not be required for this rail.

Average weight of railing with no overlay is 376 plf.

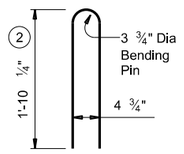
Cover dimensions are clear dimensions, unless noted otherwise.
Reinforcing bar dimensions shown are out-to-out of bar.



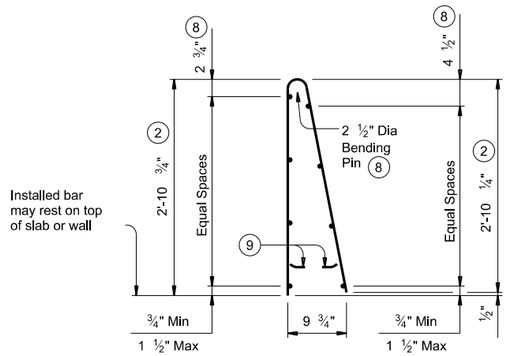
BARS S (#4)



BARS U (#4)

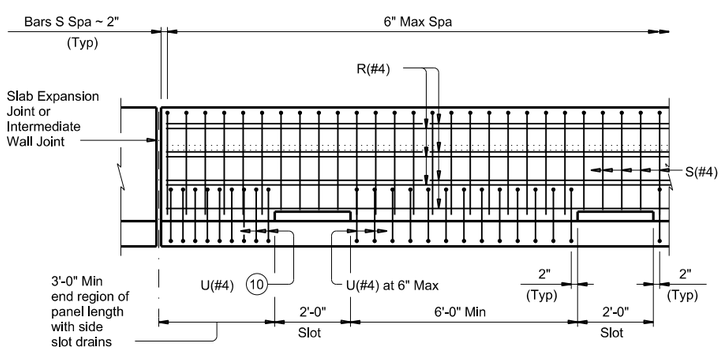


BARS WU (#4)



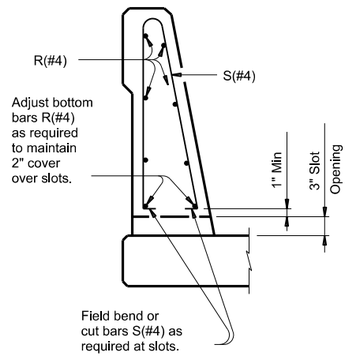
OPTIONAL WELDED WIRE
REINFORCEMENT (WWR)

DESCRIPTION	LONGITUDINAL WIRES	VERTICAL WIRES
Minimum (Cumulative Total) Wire Area	1.067 Sq In.	0.267 Sq In. per Ft
	No. of Wires	Spacing
Minimum	8	4"
Maximum	10	8"
Maximum Wire Size Differential	The smaller wire must have an area of 40% or more of the larger wire.	



OPTIONAL SIDE SLOT DRAIN DETAIL

Note: Side Slot Drains may be used where shown elsewhere on the plans or as directed by the Engineer. Drains should not be placed over railroad tracks, lower roadways, or sidewalks. When this rail is used as a separator between a roadway surface and a sidewalk surface, side drain slots will not be permitted.



SECTION THRU
OPTIONAL SIDE SLOT DRAIN

SHEET 2 OF 2

Texas Department of Transportation

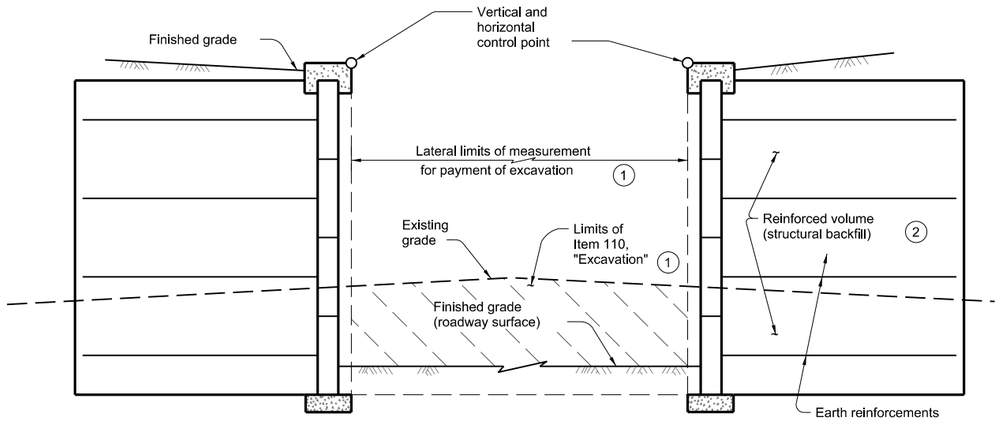
Bridge Division Standard

TRAFFIC RAIL
SINGLE SLOPE

TYPE SSTR

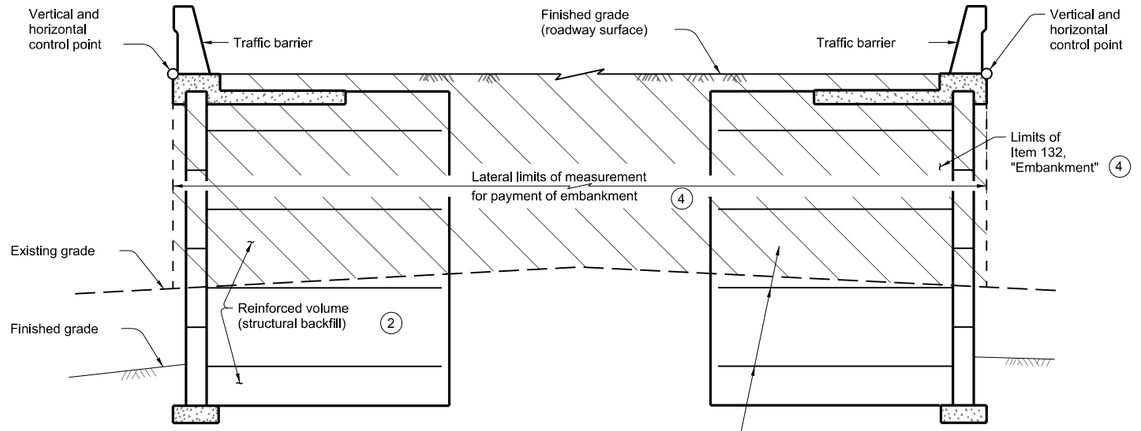
FILE: rlstd014-19.dgn	DN: TxDOT	CK: TxDOT	DW: JTR	CK: TxDOT
©TxDOT September 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0720	01	044, ETC.	FM 149, ETC.
	DIST	COUNTY		SHEET NO.
	BRYAN	GRIMES		98

DATE: 4/19/2023 7:44:58 AM
FILE: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY/Design Projects/072001044/4 - Design/Plan Set/5. Drainage/5c. Drainagestandards/RW-EM-22.dgn



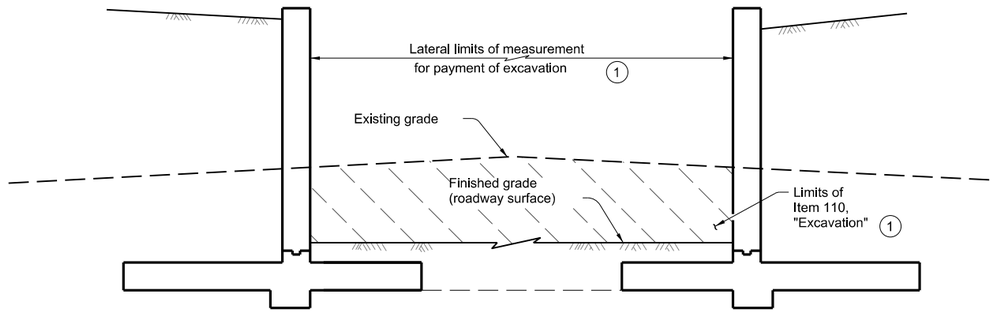
TYPICAL SECTION

(Excavation between MSE retaining walls.) 3



TYPICAL SECTION

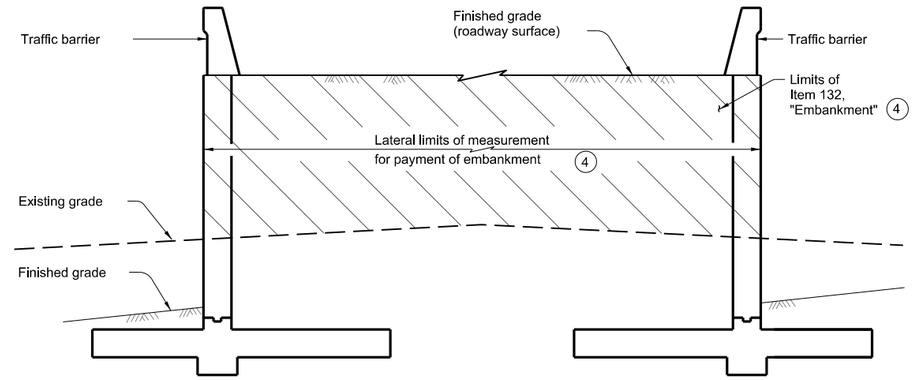
(Embankment between MSE retaining walls.) 3



TYPICAL SECTION

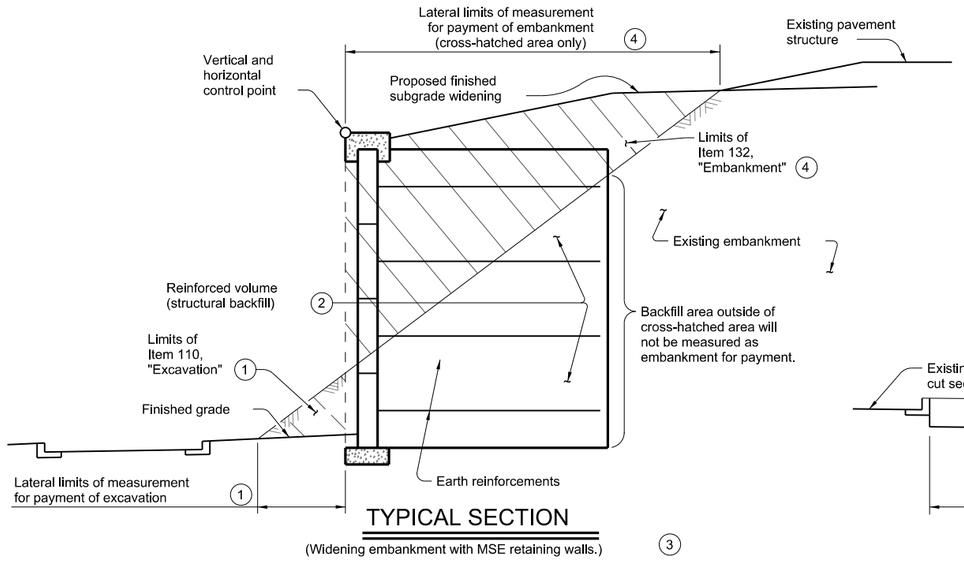
(Excavation between conventional retaining walls.)

1. Only the excavation above the proposed subgrade elevation will be measured for payment.
2. Meeting requirements for Item 423, "Retaining Walls."
3. Earthwork measurement with other retaining wall types will be made to the outside finished face in the same manner.
4. Only the embankment above the existing ground line will be measured for payment.



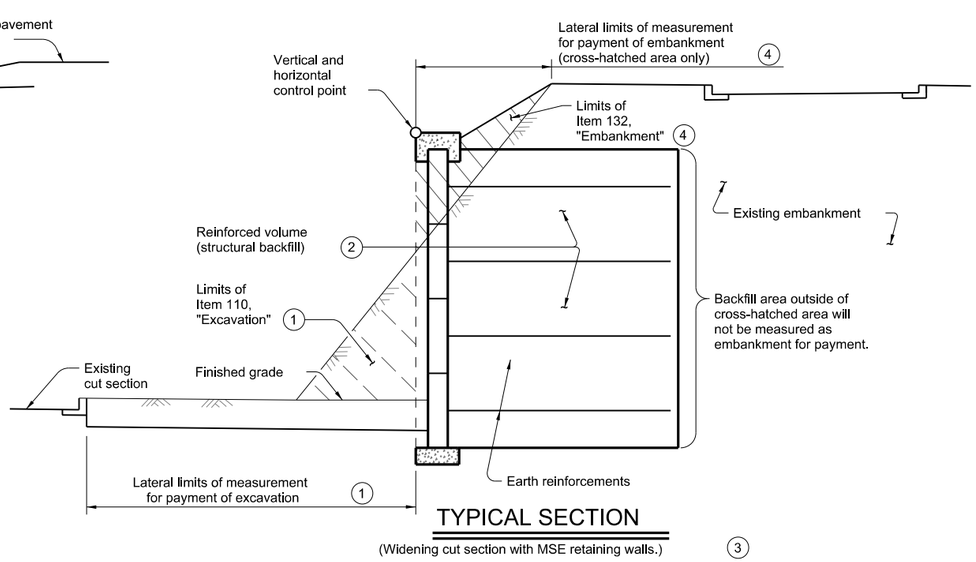
TYPICAL SECTION

(Embankment between conventional retaining walls.)



TYPICAL SECTION

(Widening embankment with MSE retaining walls.) 3



TYPICAL SECTION

(Widening cut section with MSE retaining walls.) 3

Texas Department of Transportation

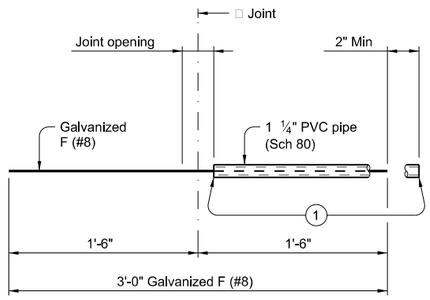
Bridge Division Standard

EARTHWORK MEASUREMENT AT RETAINING WALL

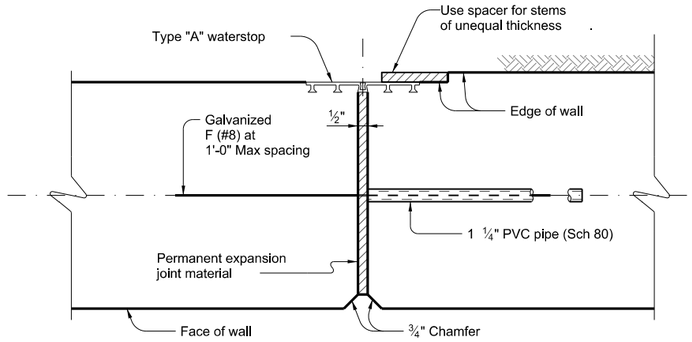
RW(EM)

FILE: RW-EM-22.dgn	DN: TxDOT	CK: TxDOT	DW: JER	CK: RLE
©TxDOT June 2022	CONT	SECT	JOB	HIGHWAY
REVISIONS	0720	01	044, ETC.	FM 149, ETC.
	DIST	COUNTY		SHEET NO.
	BRY	GRIMES		99

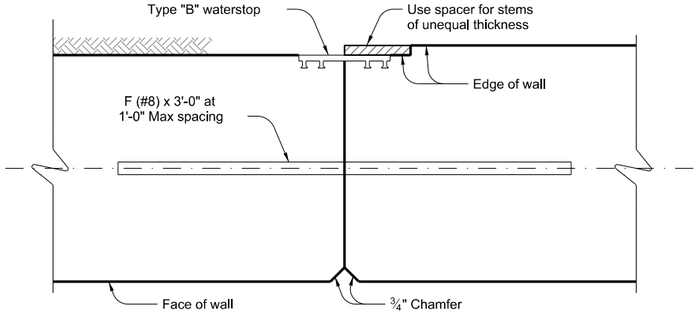
DATE: 4/19/2023 7:45:13 AM
FILE: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY/Design Projects/0720010444 - Design/Plan Set/5. Drainage/5G. Drainage Standards/RW-SF-22.dgn



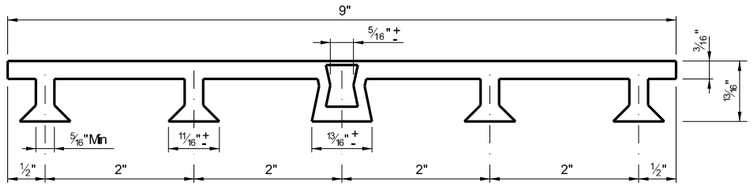
BAR F (#8) ASSEMBLY DETAIL



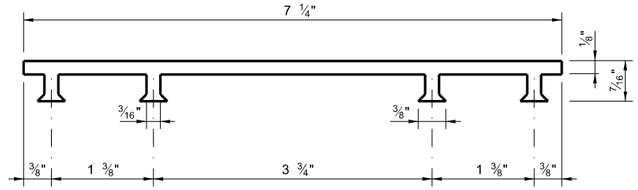
EXPANSION JOINT



CONSTRUCTION JOINT

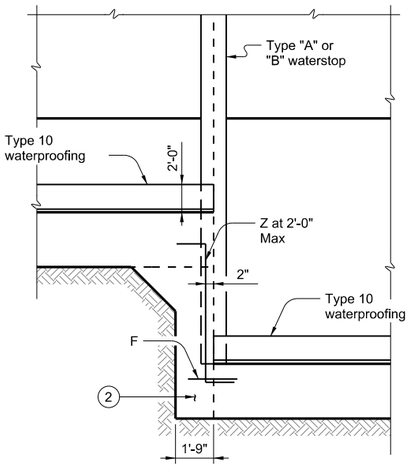


PVC WATERSTOP TYPE "A"

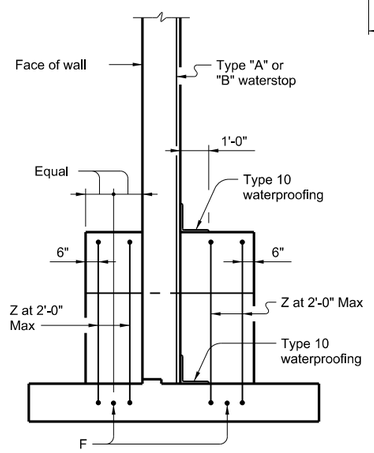


PVC WATERSTOP TYPE "B"

Note: Dimensions and shapes may vary slightly depending on manufacturer.

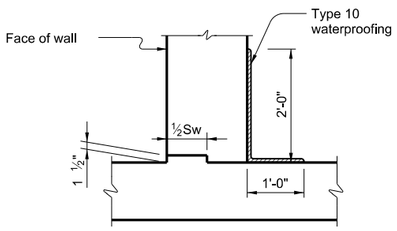


PARTIAL ELEVATION

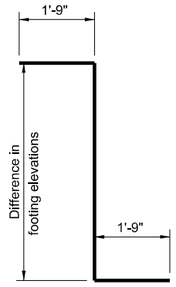


PARTIAL SECTION

SHOWING WATERSTOP AT FOOTING ELEVATION TRANSITION

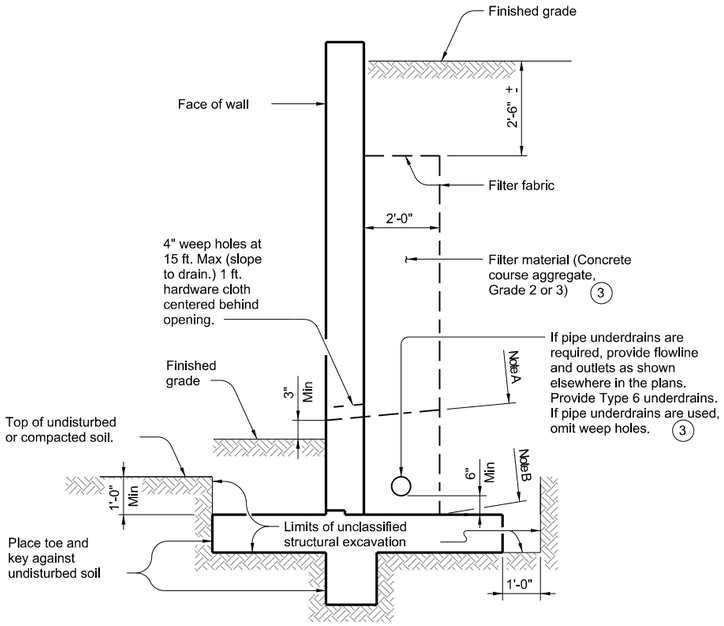


JOINT AND WATERSTOP DETAILS



BARS Z (#5)

(Omit Bars Z when difference in top of footing elevations is less than 2 ft).



DRAINAGE DETAILS AND EXCAVATION DIAGRAM

Note A: Stop coarse aggregate at this level when weep holes are used.

Note B: Use coarse aggregate to here when underdrains are used.

(1) Tape ends of 1 ¼" PVC Schedule 80 to prevent concrete or mortar from seeping in.

(2) Class C unreinforced concrete when difference in top of footing elevations is less than 2 feet. Omit when Dowel Bars F can be placed between adjacent footings with 4-inch cover top and bottom. Footing elevation difference not to exceed 4 feet.

(3) Underdrain pipe to be in accordance with Item 556, "Pipe Underdrains."

MATERIAL NOTES:

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

GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications.

Walls are designed assuming unit weight of soil = 120 pcf and a friction angle = 30 degrees for foundation and retained soil.

The undisturbed or compacted soil depth in front of walls must not measure less than Kd + Ft + 1 foot as measured upwards from bottom of key.

Retaining walls are detailed to be placed on grades up to 10% with level footing, with no changes in reinforcing steel. Steeper grades can be accommodated by shortening Bars A and Bars B and increasing the length of legs of Bars U by the same amount. No change in quantities will be required.

Retaining walls may be placed on horizontal curves by adjusting lengths of Bars T and Bars H in the footing. Minor revisions to concrete quantities may be required as a result.

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

Texas Department of Transportation

Bridge Division Standard

SPREAD FOOTING RETAINING WALL MISCELLANEOUS DETAILS

RW(SF)

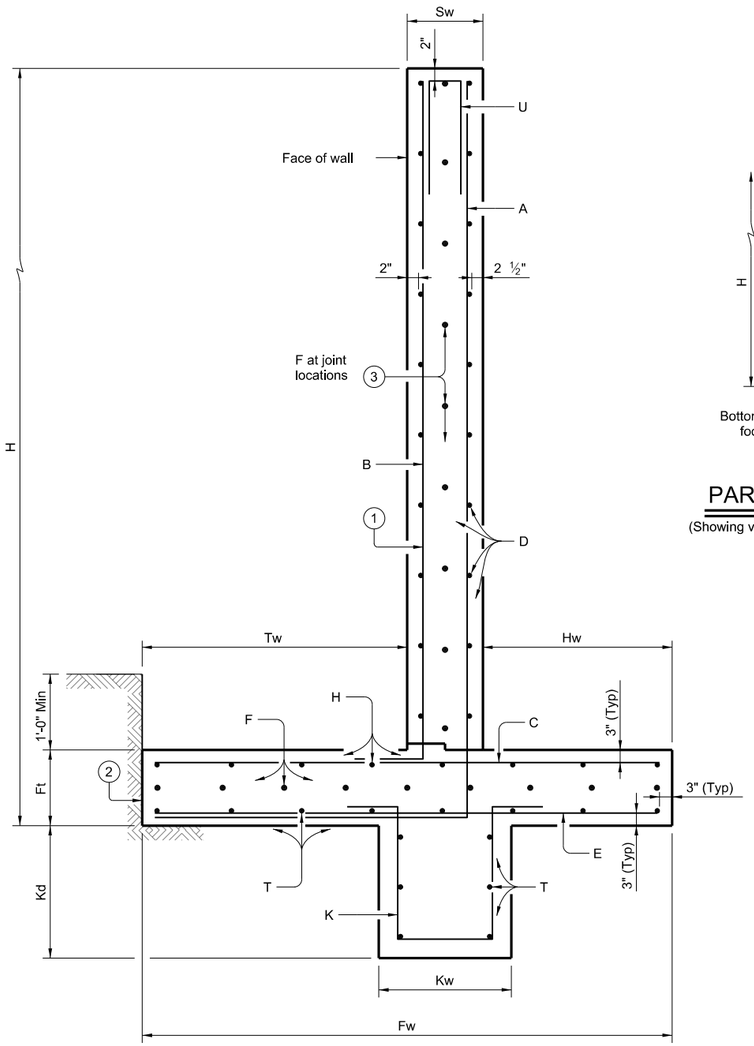
FILE: RW-SF-22.dgn	DN: TAR	CK: RLE	DW: JER	CK: TAR
©TxDOT June 2022	CONT	SECT	JOB	HIGHWAY
REVISIONS	0720	01	044, ETC.	FM 149, ETC.
8-22: Updated underdrain requirements.	DIST	COUNTY		SHEET NO.
	BRY	GRIMES		100

DATE: 4/19/2023 7:45:27 AM
FILE: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY/Design Projects/072001044/4 - Design/Plan Set/5. Drainage/5c. Drainage Standards/RW-SFC-22.dgn

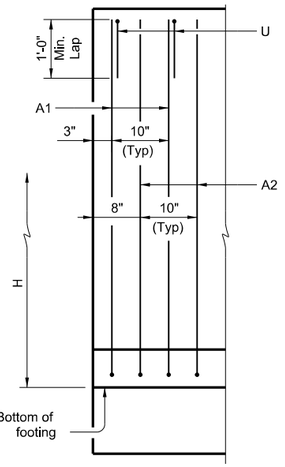
PROPERTIES

REINFORCING STEEL FOR ONE 32' PANEL (DESIGN C)

Wall Height "H"	WALL DIMENSIONS							MAX SOIL PRESS	Bars A1					Bars A2					Bars B					Bars C					Bars E					Bars K					D (#5) at 12" Max.		Dowel F at 12" Max.		H (#5) at 12" Max.		T (#5) at 12" Max.		U ~ 39 #5 at 10" Max		QUANTITY FOR ONE 32' PANEL		Wall Height "H"
									No.	Size	Spa.	Length	Weight	No.	Size	Spa.	Length	Weight	No.	Size	Spa.	Length	Weight	No.	Size	Spa.	Length	Weight	No.	Size	Spa.	Length	Weight	No.	Size	Spa.	Length	Weight	No.	Weight	No.	Weight	No.	Weight	No.	Weight	No.	Weight	Length	Weight	Conc (CY)	REINF (LB)	
(Ft)	Fw	Tw	Sw	Hw	Ft	Kw	Kd	T/SF																																										(Ft)
2	5' - 0"	1' - 0"	1' - 0"	3' - 0"	1' - 0"	1' - 0"	1' - 0"	0.218	39	#4	10"	3' - 2"	83	39	#4	10"	3' - 2"	83	39	#4	10"	1' - 11"	50	39	#4	10"	4' - 6"	118	39	#4	10"	4' - 6"	118	39	#4	10"	3' - 10"	100	4	132	8	65	6	198	6	198	2' - 0"	82	8.3	1227	2
4	5' - 0"	1' - 0"	1' - 0"	3' - 0"	1' - 0"	1' - 0"	1' - 0"	0.321	39	#4	10"	5' - 2"	135	39	#4	10"	5' - 2"	135	39	#4	10"	3' - 11"	103	39	#4	10"	4' - 6"	118	39	#4	10"	4' - 6"	118	39	#4	10"	3' - 10"	100	8	263	10	81	6	198	6	198	6' - 0"	245	10.7	1694	4
6	5' - 6"	1' - 6"	1' - 0"	3' - 0"	1' - 0"	1' - 0"	1' - 0"	0.395	39	#4	10"	7' - 8"	200	39	#4	10"	7' - 8"	200	39	#4	10"	5' - 11"	155	39	#4	10"	5' - 0"	131	39	#4	10"	5' - 0"	131	39	#4	10"	3' - 10"	100	12	395	12	97	6	198	6	198	8' - 5"	343	13.7	2148	6
8	7' - 4"	1' - 9"	1' - 1"	4' - 6"	1' - 0"	1' - 0"	1' - 0"	0.500	39	#4	10"	10' - 0"	261	39	#4	10"	10' - 0"	261	39	#4	10"	7' - 11"	207	39	#4	10"	6' - 10"	179	39	#4	10"	6' - 10"	179	39	#4	10"	3' - 10"	100	16	526	16	129	8	263	8	263	8' - 6"	346	18.9	2714	8
10	8' - 8"	2' - 4"	1' - 1"	5' - 3"	1' - 2"	1' - 6"	1' - 6"	0.590	39	#5	10"	12' - 7"	512	39	#4	10"	12' - 7"	328	39	#4	10"	9' - 9"	255	39	#5	10"	8' - 2"	333	39	#4	10"	8' - 2"	213	39	#4	10"	5' - 4"	139	20	658	20	161	10	329	10	329	8' - 6"	346	26.0	3603	10
12	10' - 4"	2' - 11"	1' - 2"	6' - 3"	1' - 4"	1' - 9"	1' - 9"	0.684	39	#5	10"	15' - 3"	621	39	#4	10"	15' - 3"	398	39	#4	10"	11' - 7"	302	39	#5	10"	9' - 10"	400	39	#4	10"	9' - 10"	257	39	#4	10"	6' - 1"	159	24	789	23	185	11	362	11	362	8' - 7"	350	34.8	4185	12
14	11' - 8"	3' - 6"	1' - 4"	6' - 10"	1' - 7"	2' - 0"	2' - 0"	0.769	39	#5	10"	18' - 0"	733	39	#4	10"	18' - 0"	469	39	#4	10"	13' - 4"	348	39	#5	10"	11' - 2"	455	39	#4	10"	11' - 2"	291	39	#4	10"	6' - 10"	179	28	920	27	217	13	428	13	428	8' - 9"	356	46.3	4824	14
16	13' - 1"	4' - 0"	1' - 6"	7' - 7"	1' - 9"	2' - 0"	2' - 0"	0.853	39	#5	10"	20' - 8"	841	39	#4	10"	20' - 8"	841	39	#4	10"	15' - 2"	396	39	#6	10"	12' - 7"	738	39	#4	10"	12' - 7"	329	39	#4	10"	6' - 10"	179	32	1052	30	241	14	460	14	460	8' - 11"	363	57.3	5900	16
18	14' - 7"	4' - 6"	1' - 8"	8' - 5"	1' - 9"	2' - 0"	2' - 0"	0.937	39	#6	10"	23' - 4"	1367	39	#5	10"	23' - 4"	950	39	#4	10"	17' - 2"	448	39	#7	10"	14' - 1"	1124	39	#4	10"	14' - 1"	368	39	#4	10"	6' - 10"	179	36	1183	34	273	16	526	16	526	9' - 1"	370	67.1	7314	18
20	16' - 5"	5' - 0"	1' - 10"	9' - 7"	2' - 0"	2' - 0"	2' - 0"	1.039	39	#6	10"	26' - 0"	1524	39	#6	10"	26' - 0"	1524	39	#4	10"	18' - 11"	493	39	#7	10"	17' - 11"	1429	39	#4	10"	17' - 11"	467	39	#4	10"	6' - 10"	179	38	1249	36	289	17	559	17	559	9' - 3"	377	82.8	8649	20

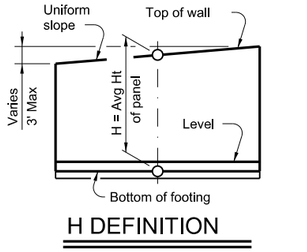


SECTION

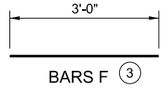


PARTIAL WALL ELEVATION

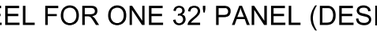
(Showing vertical reinforcing pattern in back face.)



H DEFINITION



BARS F (3)



BARS D, H, and T

1. Place vertical bars inside of horizontal bars (Typical both faces).
2. Place footing toe against undisturbed soil.
3. See Retaining Wall Miscellaneous Details (RW(SF)) standard for size.
4. Optional bars splices not included in above table.

MATERIAL NOTES:

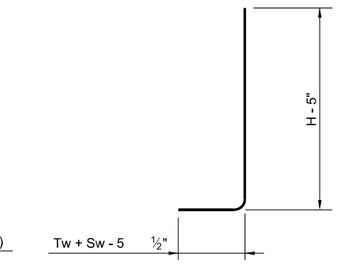
Provide Class C concrete (f'c=3,600 psi.)
Provide Grade 60 reinforcing steel.

GENERAL NOTES:

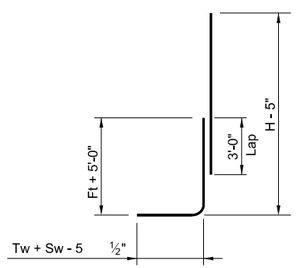
Designed according to AASHTO LRFD Bridge Design Specifications.
Walls are designed assuming unit weight of soil = 120 pcf and a friction angle = 30 degrees for foundation and retained soil.
See Retaining Wall Miscellaneous Details (RW(SF)) standard for details and notes not shown.
These details provide designs for wall heights of 2 to 20 feet. For heights not shown, round up "H" to determine wall dimensions and reinforcing. (For example, a 9-foot high wall would use the 10-foot high dimensions and reinforcing.)
Quantities are based on "H" being average height of panel.
Retaining walls are designed to be coded as follows on Retaining Wall Layout Sheets:

C - 15 - 32 □
- Panel length ~ 32 ft. is standard; 28 ft. requires special quantities.
- Average height (H) of panel.
- Design A = No surcharge or slope above wall.
- Design B = No surcharge; slopes to 3:1.
- Design C = Traffic surcharge; no slope above wall.

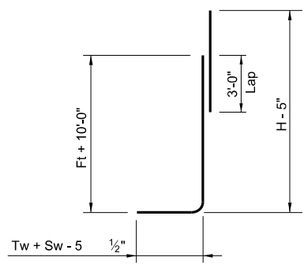
Cover dimensions are clear dimensions, unless noted otherwise.
Reinforcing bar dimensions shown are out-to-out of bar.



BARS A1 & A2

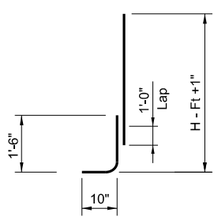


OPTIONAL BARS A1 (4)

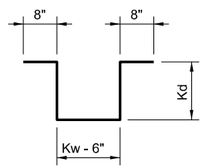


OPTIONAL BARS A2 (4)

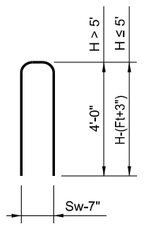
BARS B



OPTIONAL BARS B (4)



BARS K



BARS U

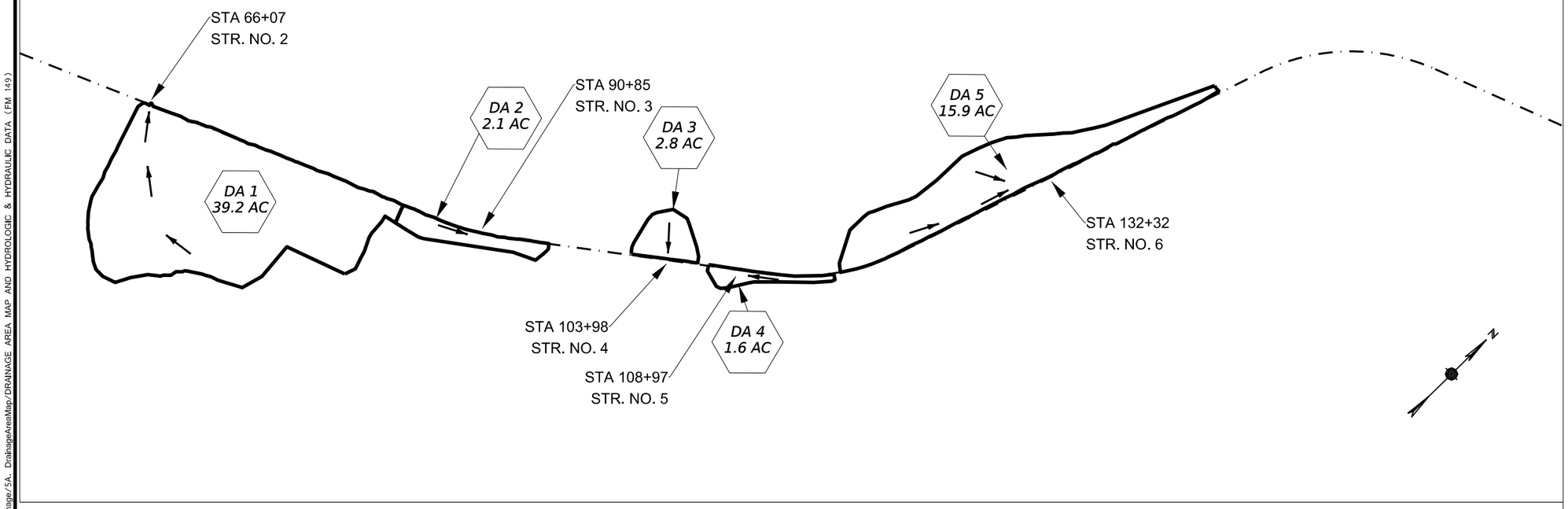
Texas Department of Transportation

Bridge Division Standard

SPREAD FOOTING RETAINING WALL

RW(SFC)

FILE: RW-SFC-22.dgn	DN: TAR	CK: RLE	DW: JER	CK: TAR
©TxDOT June 2022	CONT	SECT	JOB	HIGHWAY
REVISIONS	0720	01	044, ETC.	FM 149, ETC.
8-22: Constructability update.	DIST	COUNTY		SHEET NO.
	BRY	GRIMES		101



04/20/2023

HORIZONTAL
0 500 1000 2000 FT

PRINT DATE	REVISION DATE
4/20/2023	

Texas Department of Transportation
Bryan District

DRAINAGE AREA MAP AND HYDROLOGIC & HYDRAULIC DATA (FM 149)

SHEET 1 OF 2 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 149, ETC.

STATE	DISTRICT	COUNTY	
TEXAS	BRY	GRIMES	
CONTROL	SECTION	JOB	SHEET NO.
0720	01	044, ETC.	102

HYDRAULIC DATA (HY-8)

	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		Q_{100}	HW	TW	NORMAL DEPTH	VEL	
													UNIFORM	OUTLET					UNIFORM	OUTLET
				(FT)	(%)	"n"	(%)	"n"	(CFS)	(FT)	(FT)	(FT)	(FT/S)	(FT/S)	(CFS)	(FT)	(FT)	(FT)	(FT/S)	(FT/S)
EXIST	STA 66+07	48" CMP	324.3	46	3.22	0.024	3.5	0.060	94	324.30	316.41	2.39	12.00	11.64	138	324.46	316.54	2.44	11.58	11.71
PROP		5' X 3' SBC		48	4.13	0.012				322.77	316.41	0.95	19.79	14.91		324.34	316.53	1.21	21.88	15.95
EXIST	STA 90+85	18" CMP	405.5	34	2.27	0.024	7.5	0.060	6	402.74	400.12	0.92	5.28	5.25	8	403.21	400.15	1.15	5.50	5.78
PROP		24" RCP		50	2.86	0.012				402.81	400.12	0.51	9.50	8.83		403.05	400.15	0.59	10.33	9.42
EXIST	STA 103+98	18" CMP	413.8	40	3.68	0.024	5.0	0.060	8	412.70	409.83	0.80	8.35	6.78	12	413.22	409.88	1.01	9.48	7.52
PROP		24" RCP		46	3.67	0.012				412.70	409.83	0.56	4.76	10.04		413.16	409.88	0.69	12.49	10.95
EXIST	STA 108+97	24" CMP	412.9	38	1.24	0.024	4.4	0.05	4	410.04	408.60	0.74	3.79	4.07	7	410.46	408.66	1.01	4.40	4.83
PROP		24" RCP		44	1.23	0.012				409.90	408.60	0.52	2.56	6.00		410.30	408.66	0.69	7.29	6.89
EXIST	STA 132+32	19" X 29" ARCH CMP	415.0	40	1.95	0.024	0.6	0.050	33	415.07	410.58	1.67	8.05	7.92	49	415.12	410.66	1.67	8.12	7.97
PROP		2 -24" RCP		42	1.24	0.012				413.74	410.58	1.12	9.11	8.48		415.00	410.66	1.47	9.90	9.41
EXIST	STA 187+46	18" CMP	422.9	40	1.75	0.024	1.9	0.050	21	422.96	419.15	1.50	6.22	6.99	31	423.00	419.22	1.50	6.22	7.02
PROP		24" RCP		42	1.74	0.012				422.63	419.15	1.17	11.00	9.88		422.92	419.22	1.23	11.35	10.09
EXIST	STA 211+23	36" CMP	390.0	46	2.50	0.024	0.20	0.06	37	385.80	381.69	1.76	8.58	8.61	55	387.52	381.79	2.36	4.61	9.22
PROP		36" RCP		56	1.52	0.012				386.73	381.69	1.35	4.57	10.54		388.42	381.79	1.70	12.49	11.66
EXIST	STA 236+72	18" CMP	367.2	42	3.76	0.024	3.8	0.060	9	366.46	362.38	1.03	6.96	6.97	13	367.22	362.42	1.25	8.26	7.13
PROP		24" RCP		48	3.81	0.012				365.85	362.79	0.59	2.54	10.51		366.33	362.91	0.71	13.01	11.33
EXIST	STA 264+61	36" CMP	353.4	48	3.50	0.024	2.8	0.05	44	349.78	342.26	1.76	10.21	10.09	65	352.19	342.30	2.36	10.90	10.86
PROP		36" RCP		66	4.18	0.012				349.86	342.25	1.09	18.97	13.96		351.64	342.29	1.36	20.87	15.28
EXIST	STA 270+55	36" CMP	348.4	48	2.31	0.012	2.9	0.05	72	347.67	339.54	3.00	10.19	10.79	106	348.56	339.65	3.00	15.00	11.41
PROP		36" RCP		70	1.31	0.012				346.51	339.54	2.16	13.21	12.38		348.50	339.65	2.65	16.04	13.04

HYDROLOGIC DATA (RATIONAL METHOD) (FM 149)

DRAINAGE AREA MAP NUMBER	STRUCTURE STATION	DRAINAGE AREA		tc	I_{10}	I_{100}	Q_{10}	Q_{100}
		A(ac)	C	(min)	(in/hr)	(in/hr)	(cfs)	(cfs)
1	66+04	39.2	0.38	13.8	6.33	9.25	94	138
2	90+85	2.1	0.39	11.8	6.82	10.01	6	8
3	103+98	2.8	0.39	10.0	7.26	10.7	8	12
4	108+97	1.6	0.38	10.0	7.26	10.7	4	7
5	132+32	15.9	0.38	20.2	5.41	8.06	33	49
6	187+34	7.7	0.38	10.4	7.16	10.55	21	31
7	211+23	13.1	0.39	10.0	7.26	10.7	37	55
8	236+72	2.0	0.60	10.0	7.26	10.7	9	13
9	264+61	17.1	0.39	12.5	6.65	9.75	44	65
10	270+55	31.8	0.39	16.8	5.82	8.54	72	106

STATE OF TEXAS
JEAN J. FENG
102035
LICENSED
PROFESSIONAL ENGINEER

04/20/2023

PRINT DATE	REVISION DATE
4/20/2023	

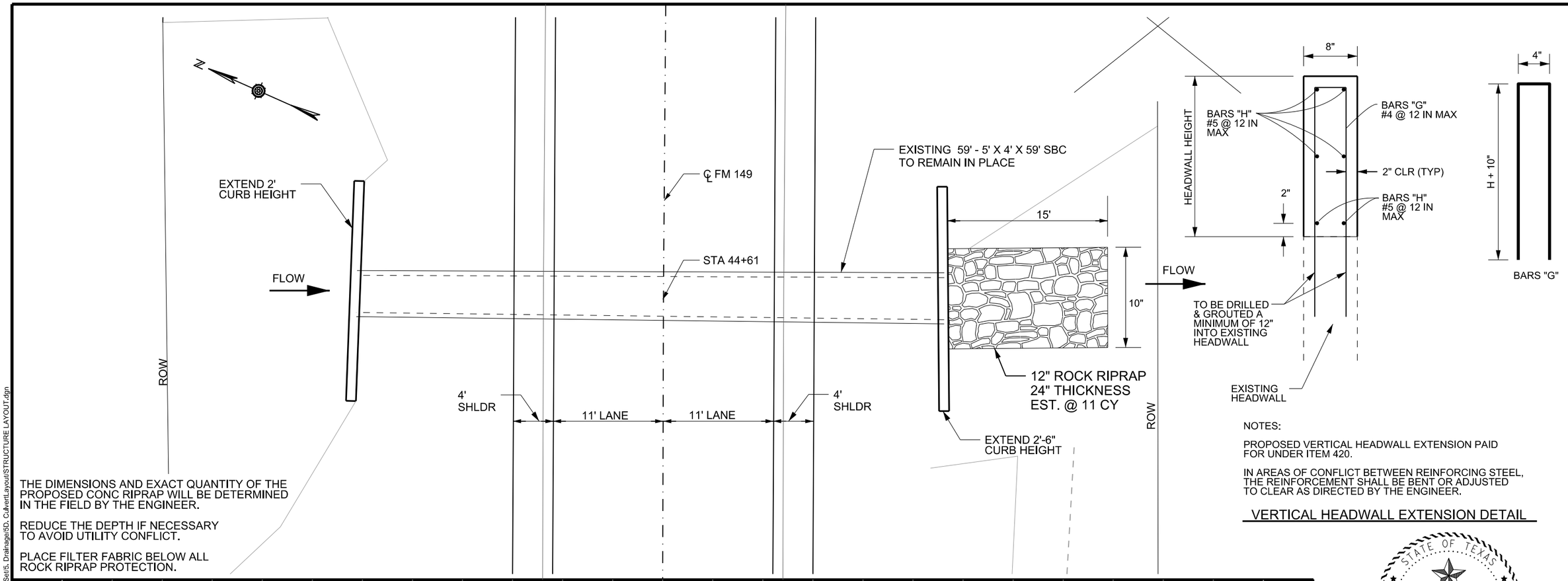
Texas Department of Transportation
Bryan District

DRAINAGE AREA MAP AND HYDROLOGIC & HYDRAULIC DATA (FM 149)

SHEET 2 OF 2 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 149, ETC.

STATE	DISTRICT	COUNTY	
TEXAS	BRY	GRIMES	
CONTROL	SECTION	JOB	SHEET NO.
0720	01	044, ETC.	103



THE DIMENSIONS AND EXACT QUANTITY OF THE PROPOSED CONC RIPRAP WILL BE DETERMINED IN THE FIELD BY THE ENGINEER.

REDUCE THE DEPTH IF NECESSARY TO AVOID UTILITY CONFLICT.

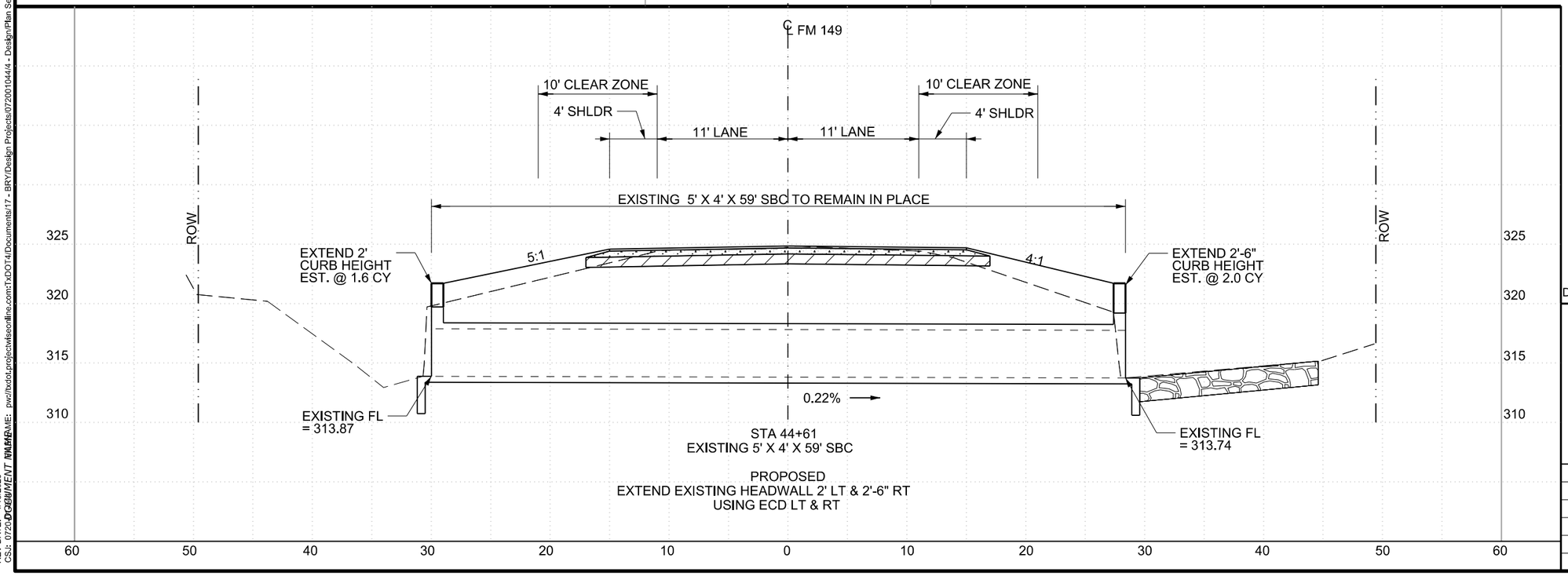
PLACE FILTER FABRIC BELOW ALL ROCK RIPRAP PROTECTION.

NOTES:

PROPOSED VERTICAL HEADWALL EXTENSION PAID FOR UNDER ITEM 420.

IN AREAS OF CONFLICT BETWEEN REINFORCING STEEL, THE REINFORCEMENT SHALL BE BENT OR ADJUSTED TO CLEAR AS DIRECTED BY THE ENGINEER.

VERTICAL HEADWALL EXTENSION DETAIL



STATE OF TEXAS
JEAN J. FENG
102035
LICENSED
PROFESSIONAL ENGINEER

04/20/2023

HORIZONTAL & VERTICAL
0 5 10 20 FT

Drawings Not To Scale

PRINT DATE	REVISION DATE
4/19/2023	

Texas Department of Transportation
Bryan District
© 2023

STRUCTURE LAYOUT
(FM 149)
(STA 44+61, NO. 1)

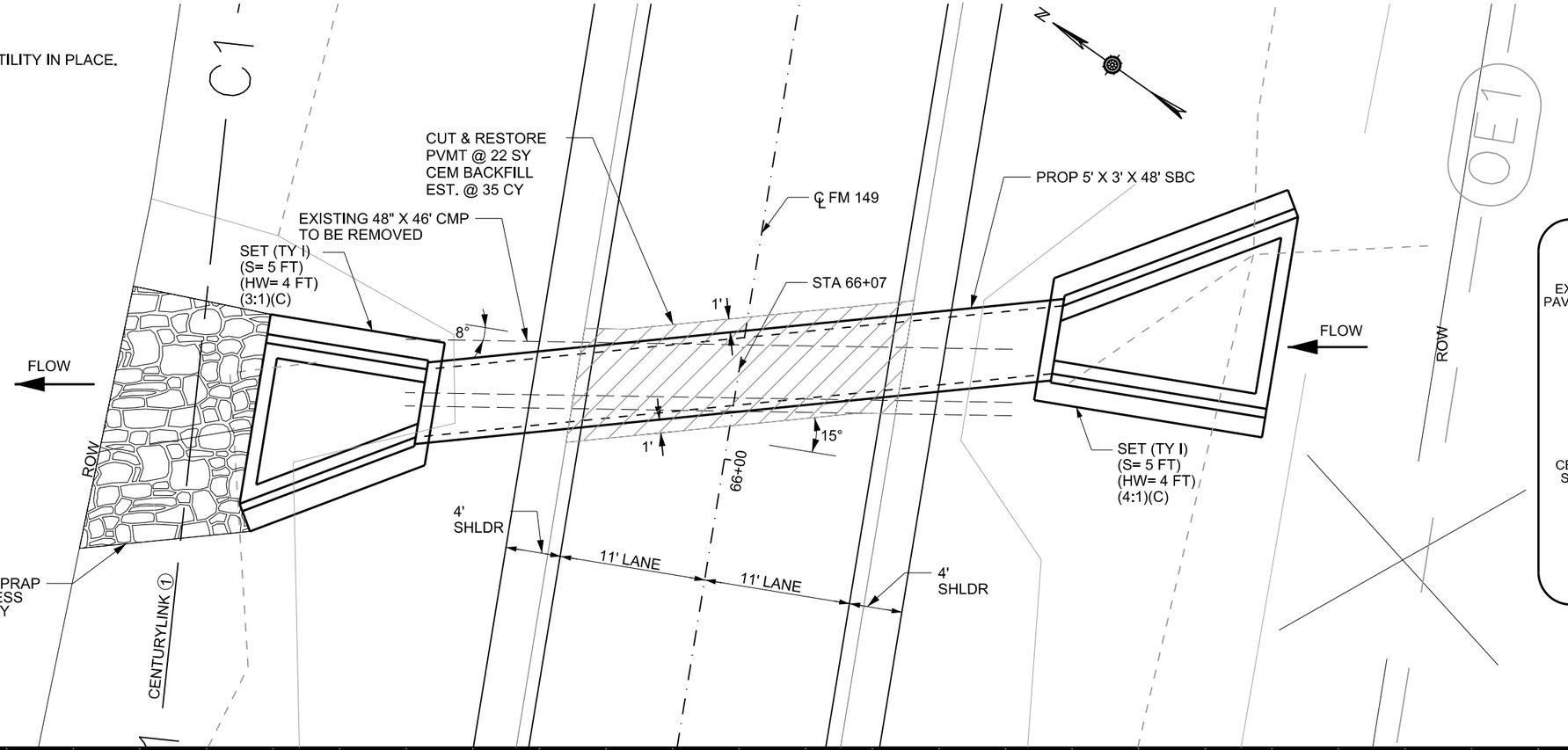
SHEET 1 OF 13 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 149, ETC.

STATE	DISTRICT	COUNTY	
TEXAS	BRY	GRIMES	
CONTROL	SECTION	JOB	SHEET NO.
0720	01	044, ETC.	104

REV DATE: 03/29/2023 10:02 AM
CSJ: 0720-01-044 DGN NAME: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY/Design Projects/0720010044/4 - Design/Plan Set/5. Drainage/5D. CulvertLayout/STRUCTURE LAYOUT.dgn

① PROTECT UTILITY IN PLACE.

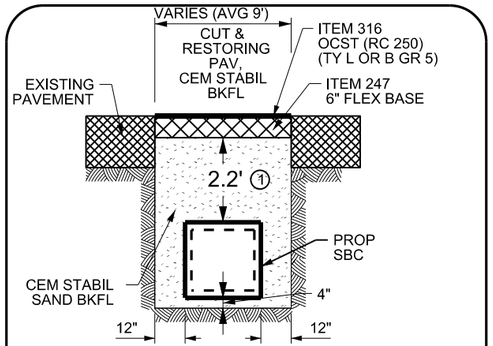


GENERAL NOTES:

THE DIMENSIONS AND EXACT QUANTITY OF THE PROPOSED CONC RIPRAP WILL BE DETERMINED IN THE FIELD BY THE ENGINEER.

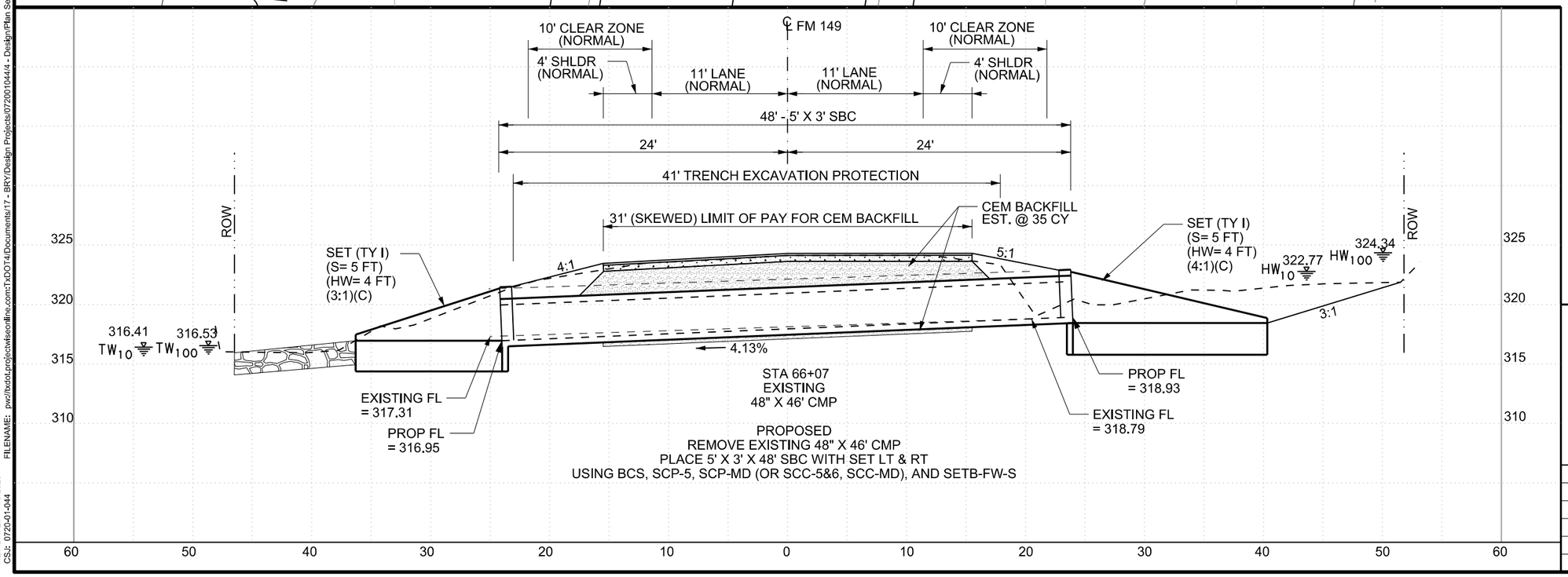
REDUCE THE DEPTH IF NECESSARY TO AVOID UTILITY CONFLICT.

PLACE FILTER FABRIC BELOW ALL ROCK RIPRAP PROTECTION.



CUT & RESTORING PAVEMENT BACKFILL DETAIL (N.T.S.)

①MEASURED AT CENTER OF ROADWAY



PROPOSED
REMOVE EXISTING 48" X 46' CMP
PLACE 5' X 3' X 48' SBC WITH SET LT & RT
USING BCS, SCP-5, SCP-MD (OR SCC-5&6, SCC-MD), AND SETB-FW-S

STATE OF TEXAS
JEAN J. FENG
102035
LICENSED PROFESSIONAL ENGINEER

04/20/2023

HORIZONTAL & VERTICAL
0 5 10 20 FT

PRINT DATE	REVISION DATE
4/19/2023	

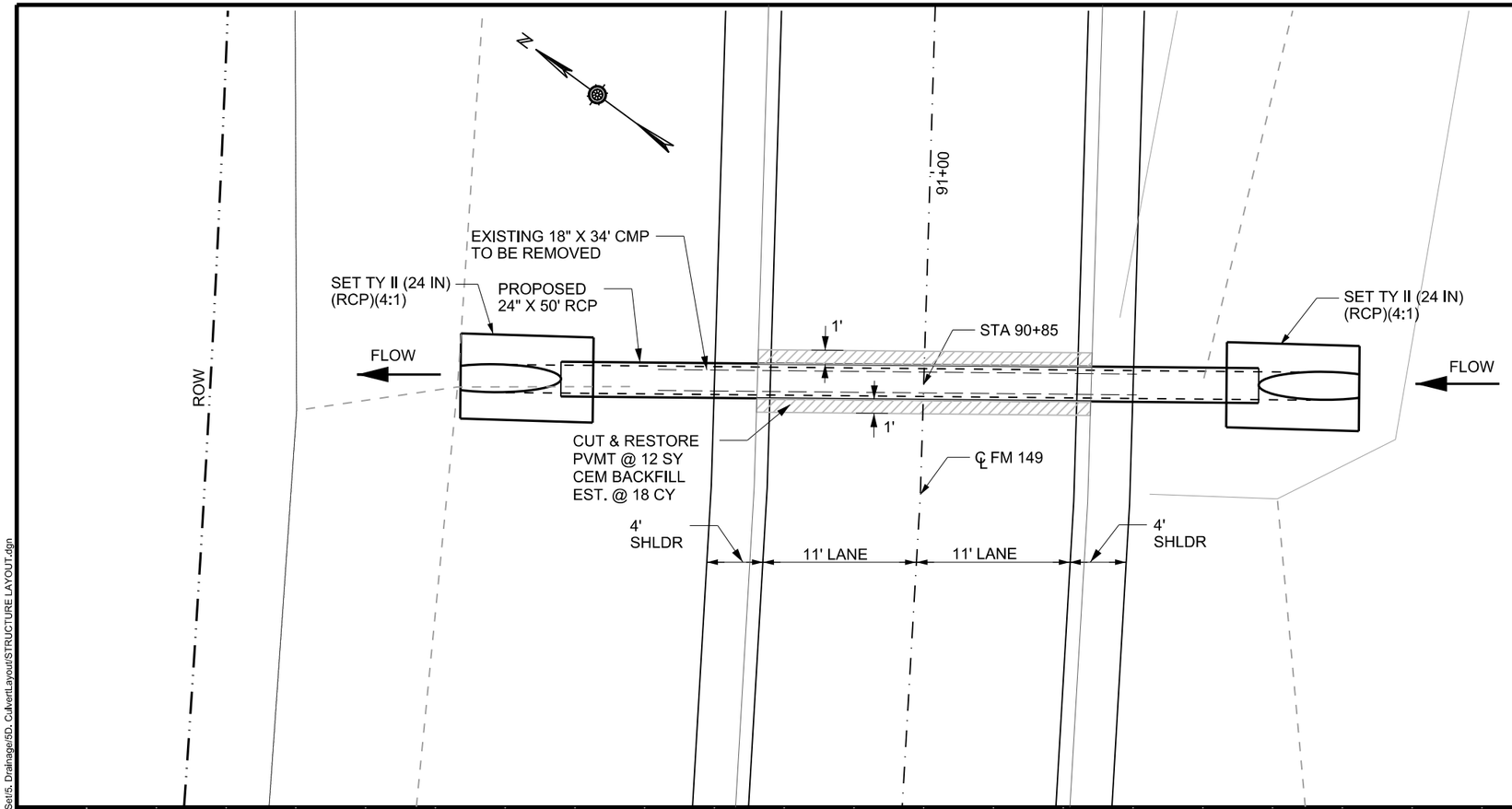
Texas Department of Transportation
Bryan District

STRUCTURE LAYOUT (FM 149) (STA 66+07, NO. 2)

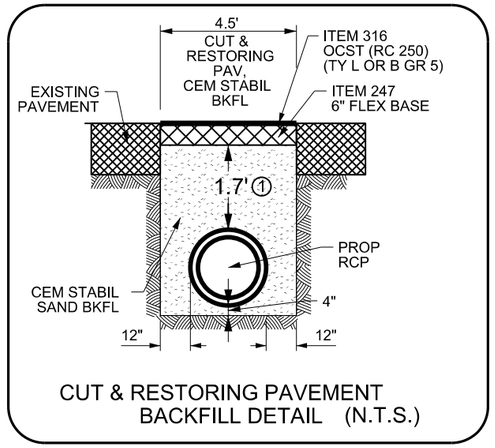
SHEET 2 OF 13 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 149, ETC.
STATE	DISTRICT	COUNTY
TEXAS	BRY	GRIMES
CONTROL	SECTION	JOB / SHEET NO.
0720	01	044, ETC. / 105

REV DATE: 4/18/2023
CSJ: 0720-01-044
FILENAME: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY/Design Projects/0720010044/4 - Design/Plan Set/5. Drainage/5D. CulvertLayout/STRUCTURE LAYOUT.dgn

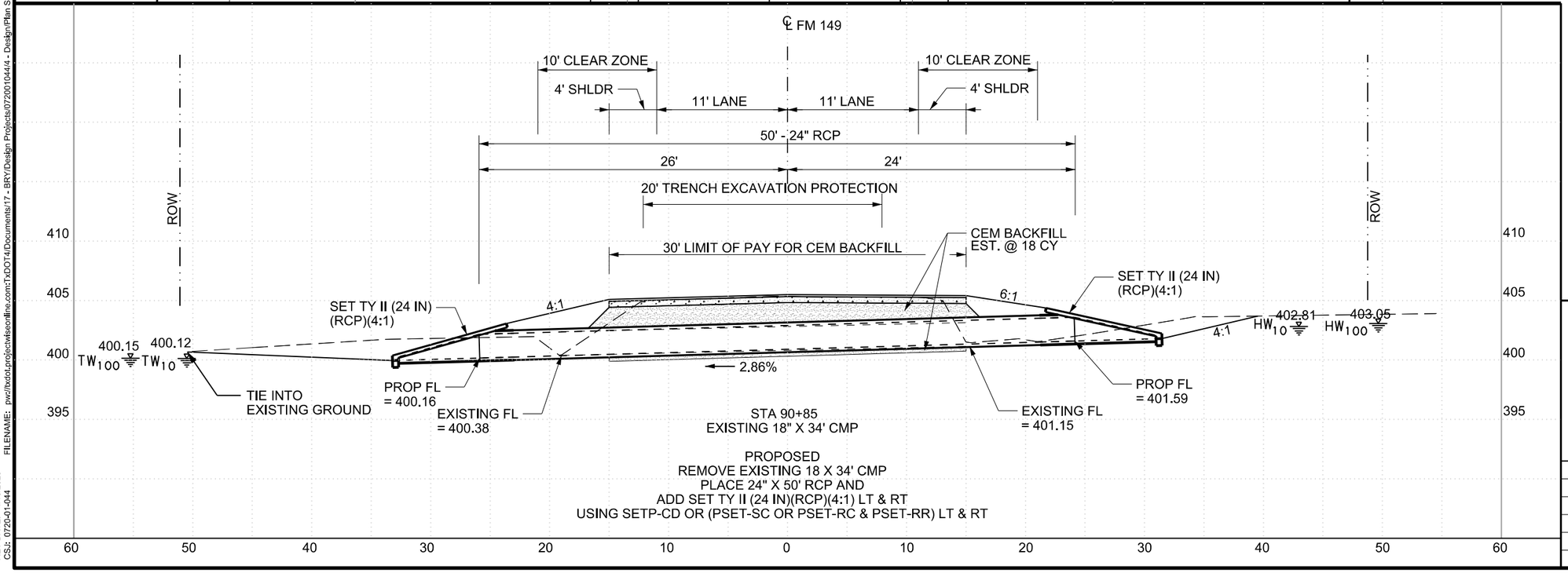


GENERAL NOTES:



CUT & RESTORING PAVEMENT
BACKFILL DETAIL (N.T.S.)

①MEASURED AT CENTER OF ROADWAY



STATE OF TEXAS
JEAN J. FENG
102035
LICENSED
PROFESSIONAL ENGINEER

04/20/2023

HORIZONTAL & VERTICAL

0 5 10 20 FT

PRINT DATE	REVISION DATE
4/19/2023	

Texas Department of Transportation
Bryan District
©2023

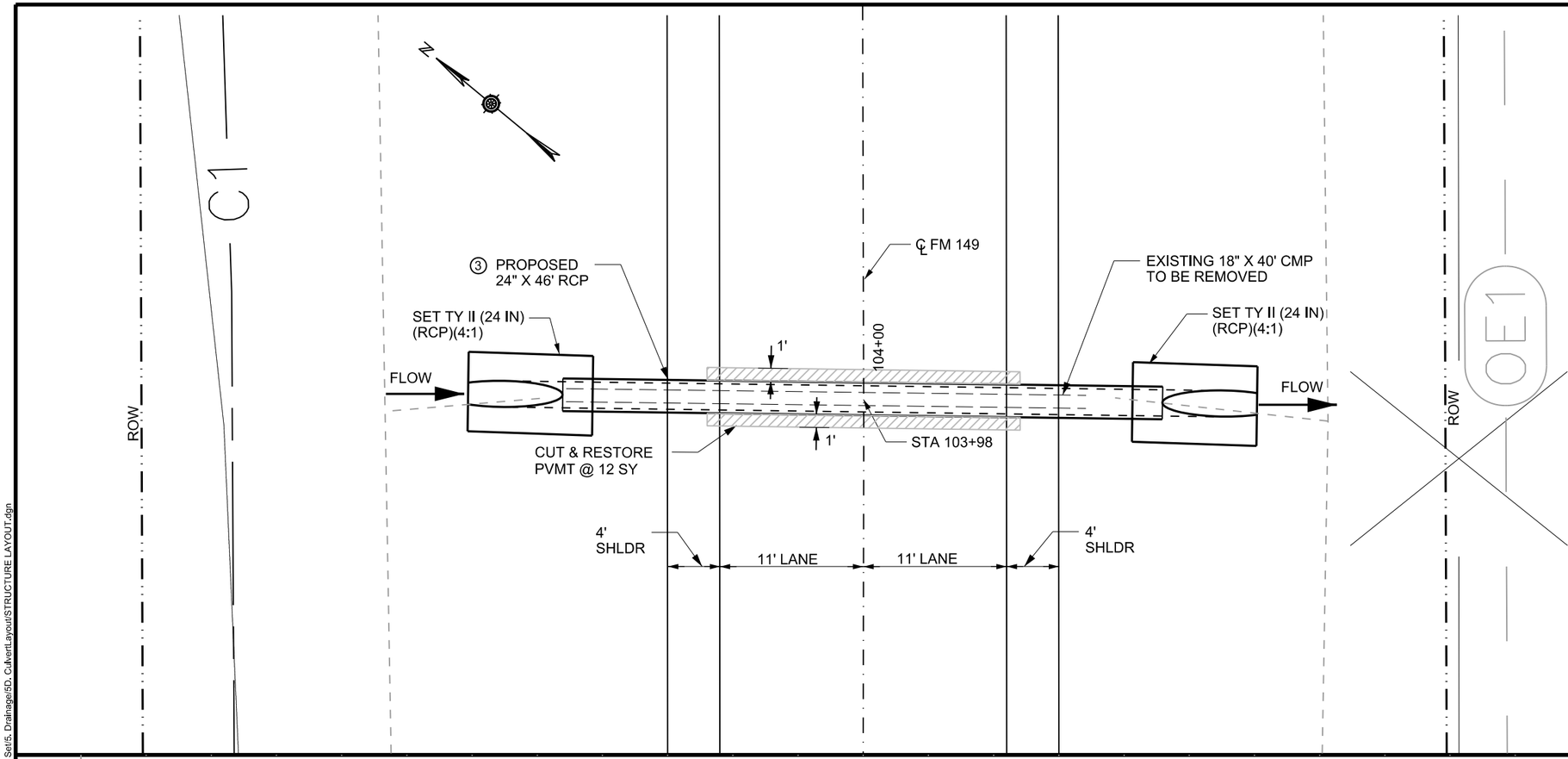
STRUCTURE LAYOUT
(FM 149)
(STA 90+85, NO. 3)

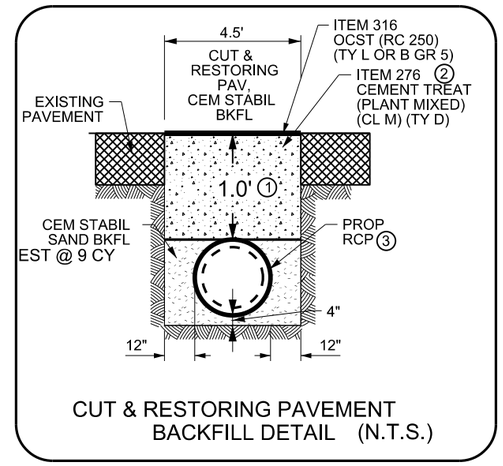
SHEET 3 OF 13 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 149, ETC.

STATE	DISTRICT	COUNTY	
TEXAS	BRY	GRIMES	
CONTROL	SECTION	JOB	SHEET NO.
0720	01	044, ETC.	106

REV DATE: 4/18/2023
CSJ: 0720-01-044
FILENAME: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY/Design Projects/0720010044/4 - Design/Plan Set/5. Drainage/5D. CulvertLayout/STRUCTURE LAYOUT.dgn

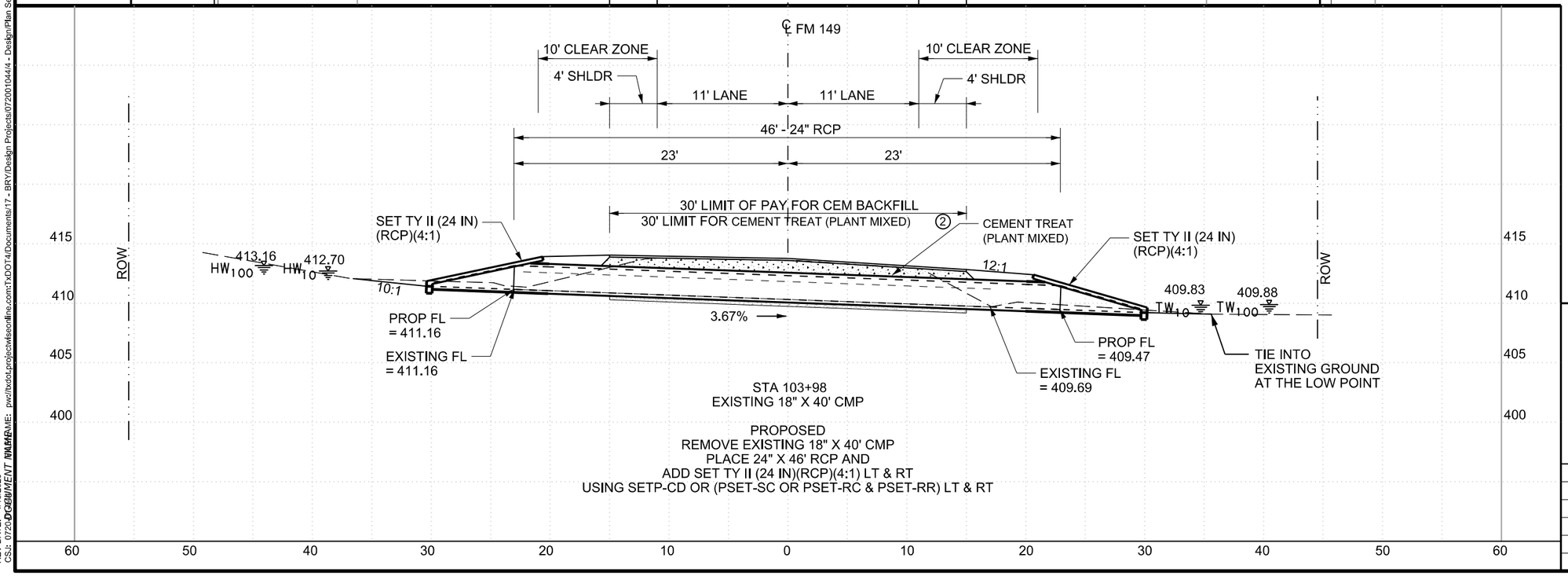




CUT & RESTORING PAVEMENT
BACKFILL DETAIL (N.T.S.)

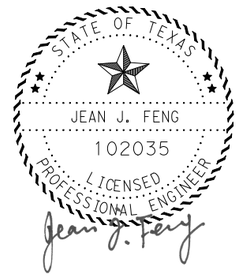
GENERAL NOTES:

① MEASURED AT CENTER OF ROADWAY.
② SUBSIDIARY TO PAYMENT OF "CUT & RESTORING PAV".
③ CLASS IV PIPE DUE TO SHALLOW COVER ON TOP OF PIPE.



STA 103+98
EXISTING 18" X 40' CMP

PROPOSED
REMOVE EXISTING 18" X 40' CMP
PLACE 24" X 46' 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



04/20/2023

HORIZONTAL & VERTICAL
0 5 10 20 FT

PRINT DATE	REVISION DATE
4/19/2023	

Texas Department of Transportation
Bryan District

STRUCTURE LAYOUT
(FM 149)
(STA 103+98, NO. 4)

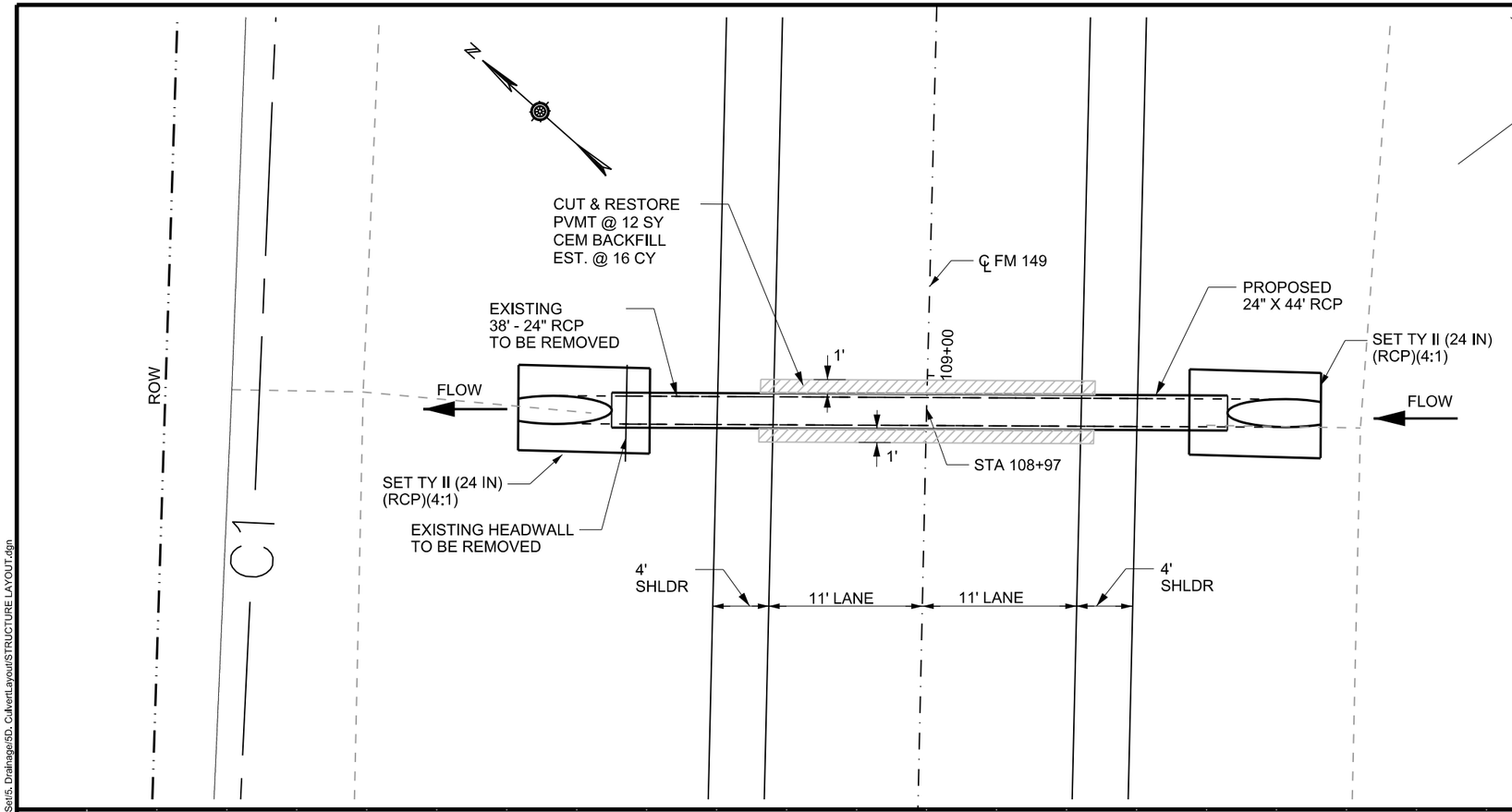
SHEET 4 OF 13 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 149, ETC.

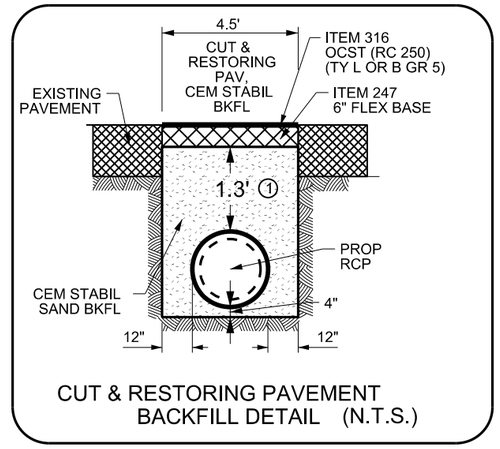
STATE	DISTRICT	COUNTY
TEXAS	BRY	GRIMES

CONTROL	SECTION	JOB	SHEET NO.
0720	01	044, ETC.	107

REV DATE: 03/28/2023 10:02 AM
CS: 0720-01-044 DGN: DOCUMENT NAME: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY/Design Projects/0720010044/4 - Design/Plan Set/5. Drainage/5D. CulvertLayout/STRUCTURE LAYOUT.dgn



GENERAL NOTES:



CUT & RESTORING PAVEMENT
BACKFILL DETAIL (N.T.S.)

①MEASURED AT CENTER OF ROADWAY.

JEAN J. FENG
102035
LICENSED
PROFESSIONAL ENGINEER
STATE OF TEXAS

04/20/2023

HORIZONTAL & VERTICAL
0 5 10 20 FT

PRINT DATE	REVISION DATE
4/19/2023	

Texas Department of Transportation
Bryan District
©2023

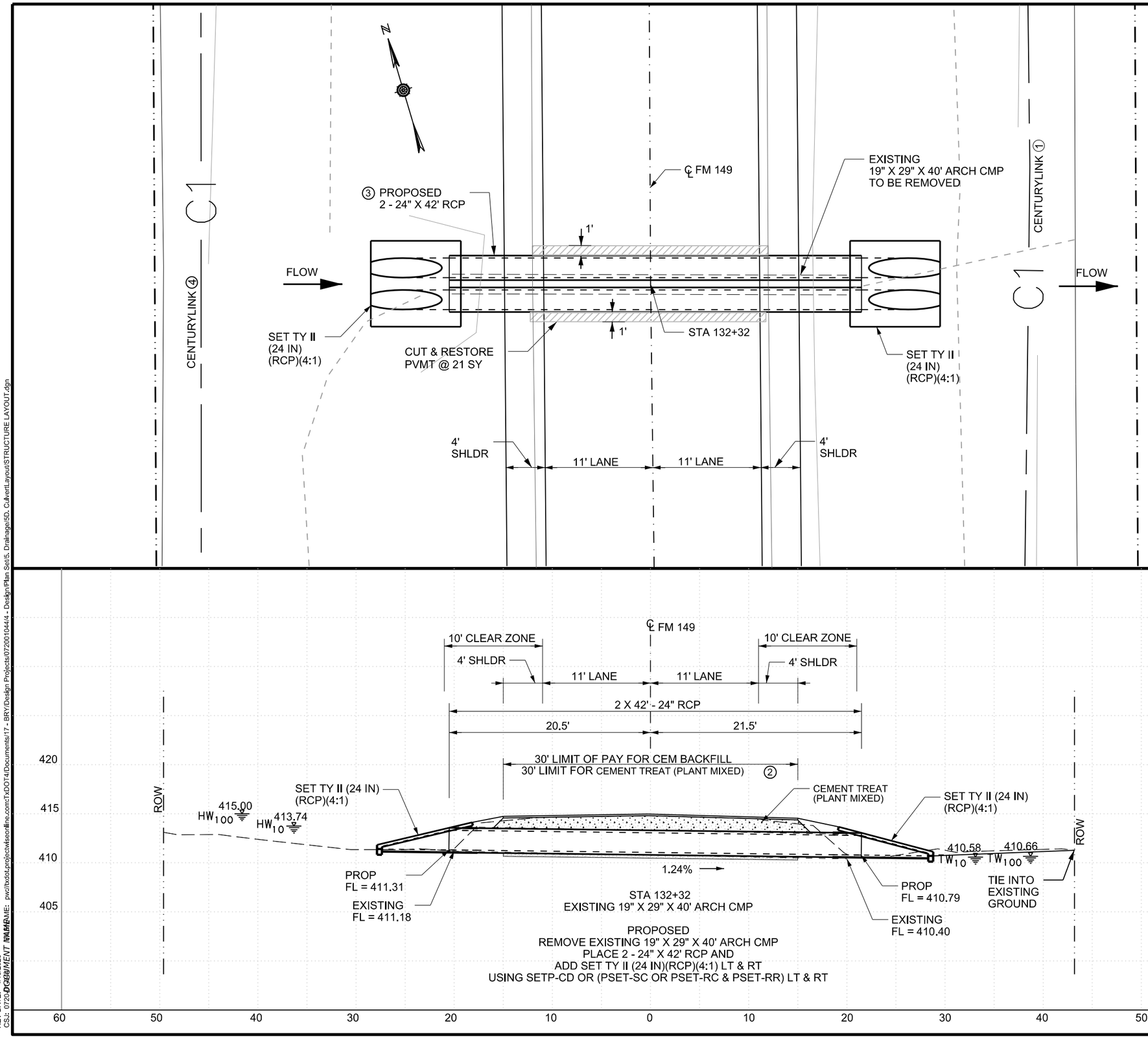
STRUCTURE LAYOUT
(FM 149)
(STA 108+97, NO. 5)

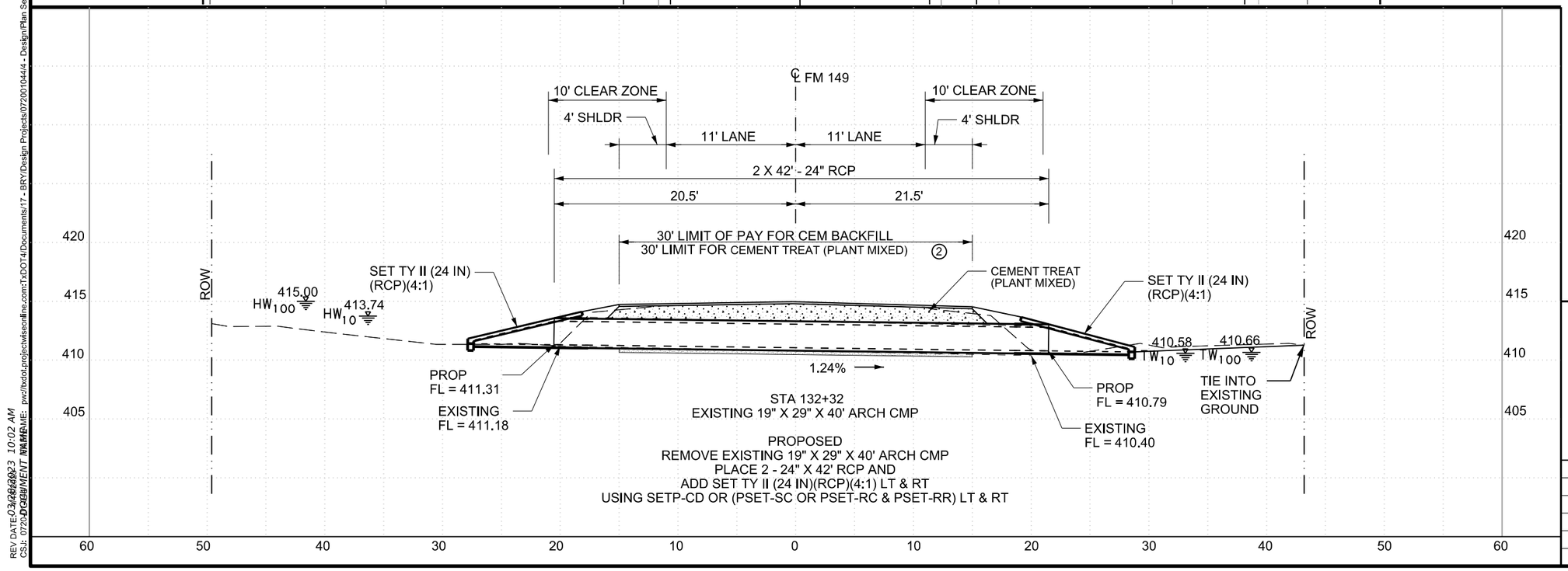
SHEET 5 OF 13 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 149, ETC.
STATE	DISTRICT	COUNTY
TEXAS	BRY	GRIMES
CONTROL	SECTION	JOB / SHEET NO.
0720	01	044, ETC. / 108

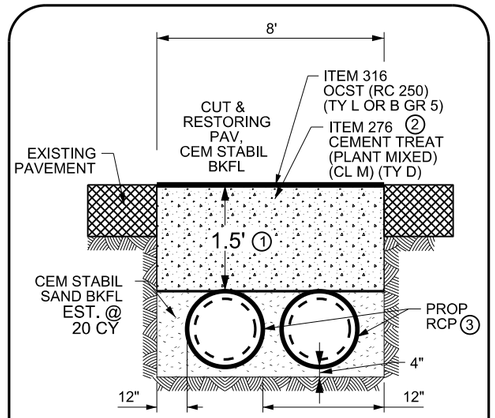
REV DATE: 4/18/2023
CSJs: 0720-01-044

FILENAME: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY/Design Projects/0720010444 - Design/Plan Set/5. Drainage/5D. CulvertLayout/STRUCTURE LAYOUT.dgn





GENERAL NOTES:



CUT & RESTORING PAVEMENT
BACKFILL DETAIL (N.T.S.)

①MEASURED AT CENTER OF ROADWAY.
②SUBSIDIARY TO PAYMENT OF " CUT & RESTORING PAV".
③CLASS IV PIPE DUE TO SHALLOW COVER ON TOP OF PIPE.
④PROTECT UTILITY IN PLACE.

STATE OF TEXAS
JEAN J. FENG
102035
LICENSED
PROFESSIONAL ENGINEER

04/20/2023

HORIZONTAL & VERTICAL
0 5 10 20 FT

PRINT DATE	REVISION DATE
4/19/2023	

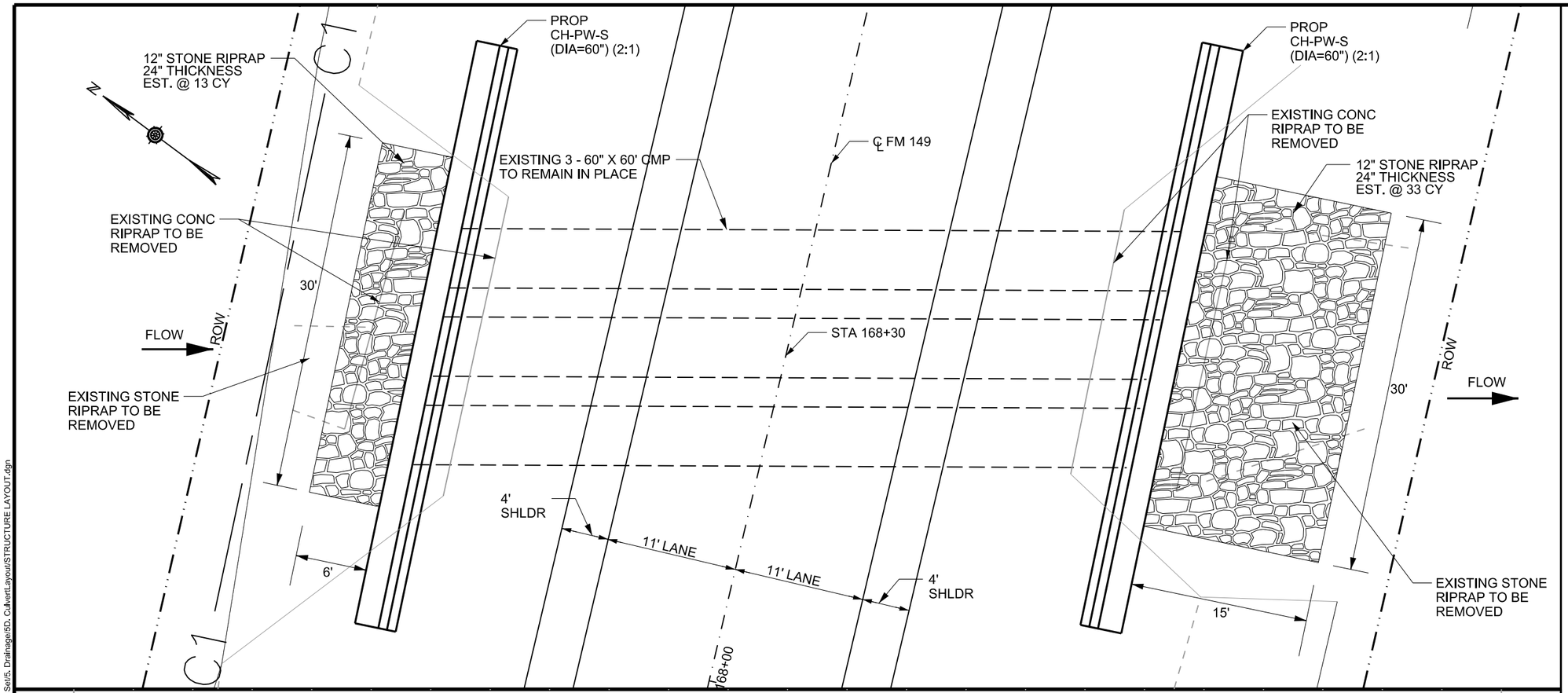
Texas Department of Transportation
Bryan District
©2023

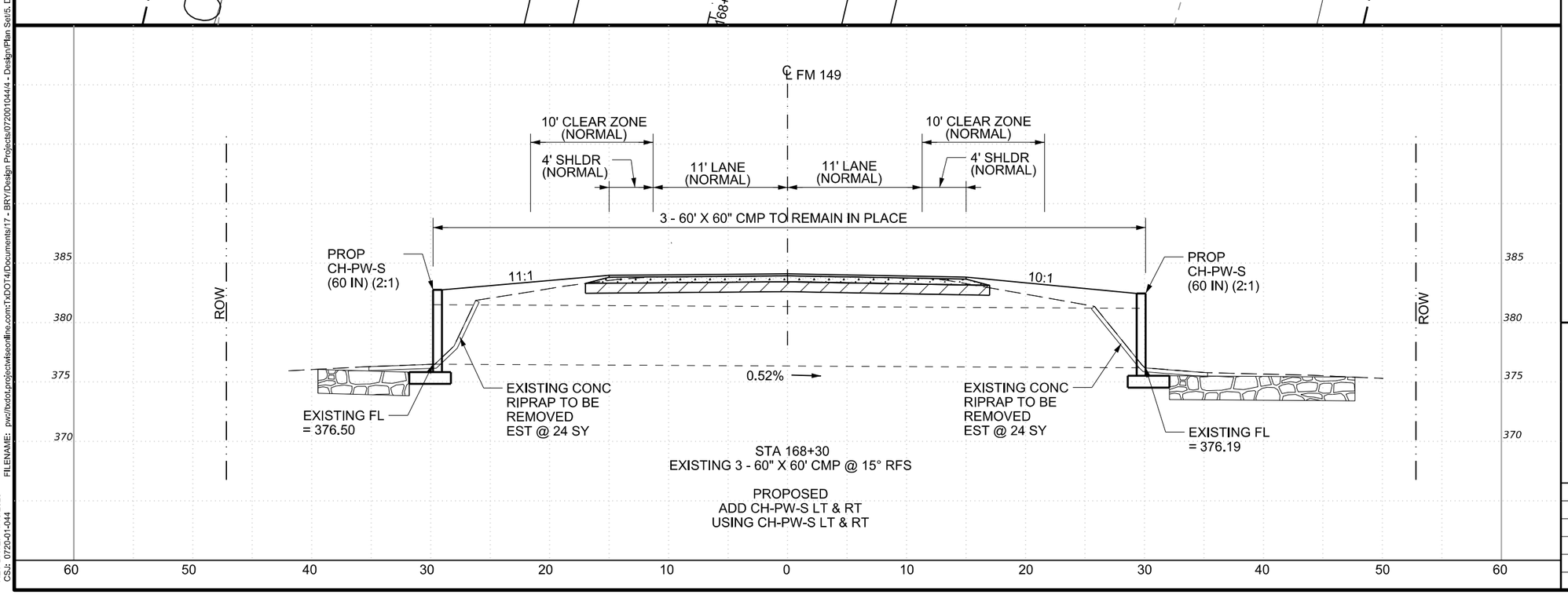
STRUCTURE LAYOUT
(FM 149)
(STA 132+32, NO. 6)

SHEET 6 OF 13 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 149, ETC.
STATE	DISTRICT	COUNTY
TEXAS	BRY	GRIMES
CONTROL	SECTION	JOB / SHEET NO.
0720	01	044, ETC. / 109

REV DATE: 03/28/2023 10:02 AM
CS: 0720-01-044 DGN: DEVELOPMENT NAME: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY/Design Projects/0720010444 - Design/Plan Set/5. Drainage/5D. Culvert Layout/STRUCTURE LAYOUT.dgn





GENERAL NOTES:

EXISTING STONE RIPRAP AT END OF THE DRAINAGE STRUCTURE WILL BE REMOVED. THIS WORK IS SUBSIDIARY TO ITEM 100 PREPARING ROW.

THE DIMENSIONS AND EXACT QUANTITY OF THE PROPOSED CONC 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.

STATE OF TEXAS
JEAN J. FENG
102035
LICENSED
PROFESSIONAL ENGINEER

04/20/2023

HORIZONTAL & VERTICAL
0 5 10 20 FT

PRINT DATE	REVISION DATE
4/19/2023	

Texas Department of Transportation
Bryan District

STRUCTURE LAYOUT
(FM 149)
(STA 168+30, NO. 7)

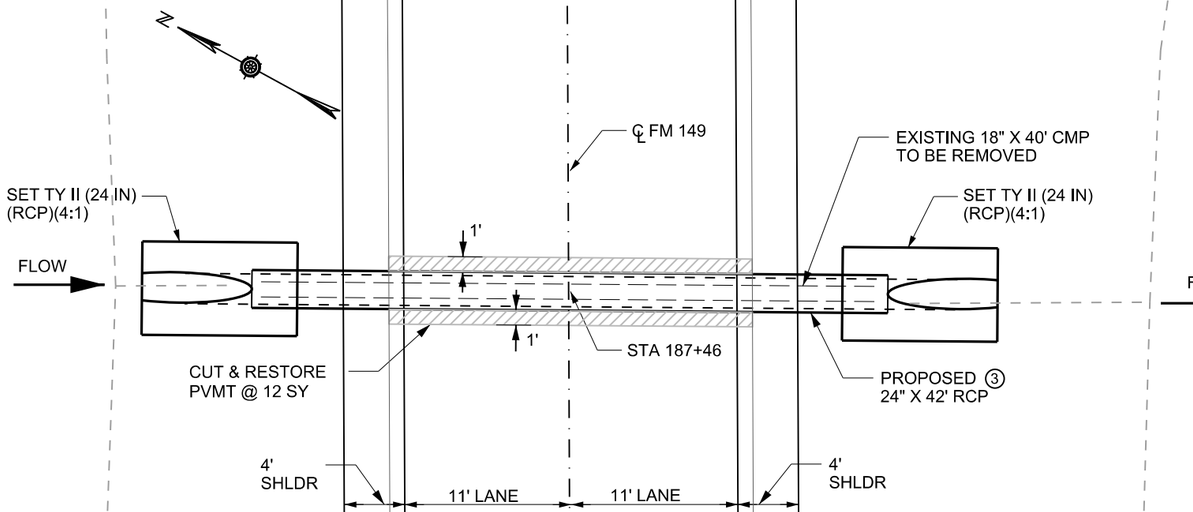
SHEET 7 OF 13 SHEETS

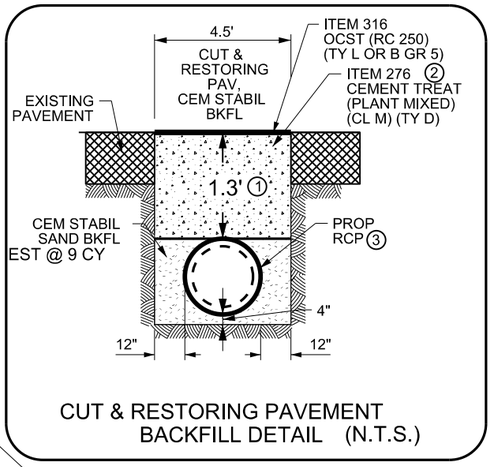
FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 149, ETC.

STATE	DISTRICT	COUNTY	
TEXAS	BRY	GRIMES	
CONTROL	SECTION	JOB	SHEET NO.
0720	01	044, ETC.	110

REV DATE: 4/18/2023
CSJ: 0720-01-044

FILENAME: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY/Design Projects/0720010444 - Design/Plan Set/5. Drainage/5D. Culvert Layout/STRUCTURE LAYOUT.dgn

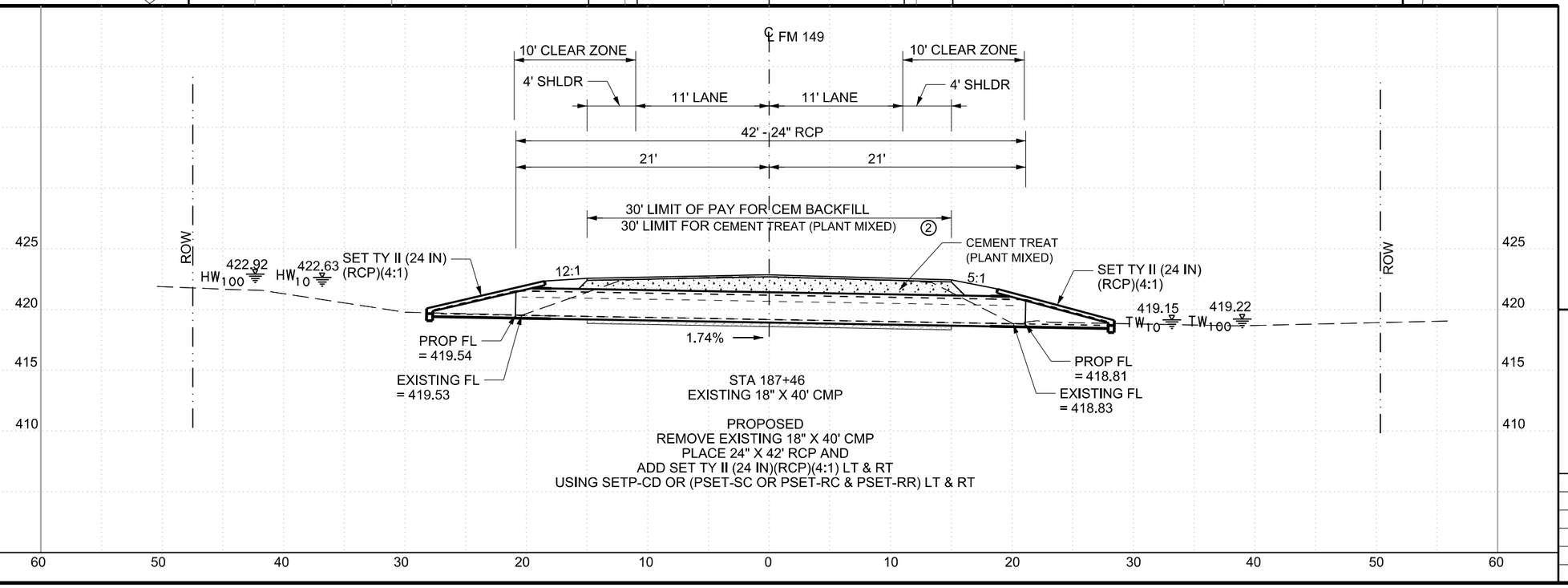




CUT & RESTORING PAVEMENT
BACKFILL DETAIL (N.T.S.)

GENERAL NOTES:

①MEASURED AT CENTER OF ROADWAY.
②SUBSIDIARY TO PAYMENT OF " CUT & RESTORING PAV".
③CLASS IV PIPE DUE TO SHALLOW COVER ON TOP OF PIPE.



04/20/2023

HORIZONTAL & VERTICAL
0 5 10 20 FT

PRINT DATE	REVISION DATE
4/19/2023	

Texas Department of Transportation
Bryan District

STRUCTURE LAYOUT
(FM 149)
(STA 187+46, NO. 8)

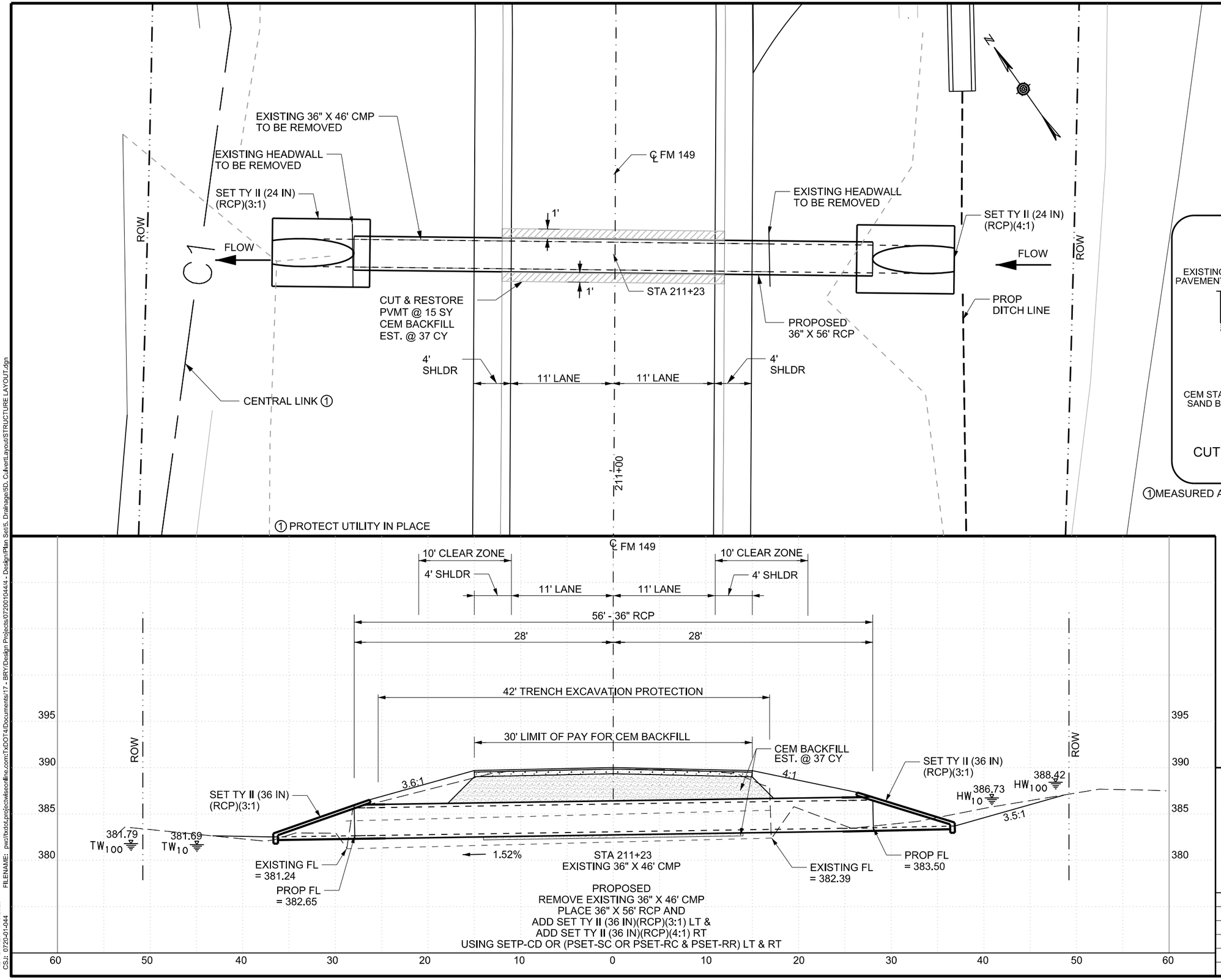
SHEET 8 OF 13 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 149, ETC.

STATE	DISTRICT	COUNTY	
TEXAS	BRY	GRIMES	
CONTROL	SECTION	JOB	SHEET NO.
0720	01	044, ETC.	111

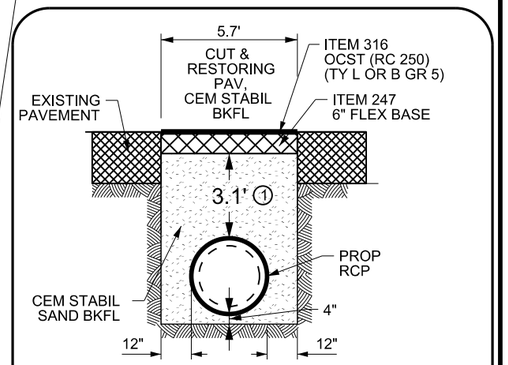
REV DATE: 4/18/2023
CS: 0720-01-044

FILENAME: pw://txdot.projectwiseonline.com/TxDOT4/Documents/17 - BRY/Design Projects/0720010444 - Design/Plan Set/5. Drainage/5D. CulvertLayout/STRUCTURE LAYOUT.dgn



GENERAL NOTES:

TREE REMOVAL IS SUBSIDIARY TO PREPARING ROW.



CUT & RESTORING PAVEMENT BACKFILL DETAIL (N.T.S.)

①MEASURED AT CENTER OF ROADWAY

STATE OF TEXAS
JEAN J. FENG
102035
LICENSED
PROFESSIONAL ENGINEER

04/20/2023

HORIZONTAL & VERTICAL

0 5 10 20 FT

PRINT DATE	REVISION DATE
4/19/2023	

Texas Department of Transportation
Bryan District
©2023

STRUCTURE LAYOUT
(FM 149)
(STA 211+23, NO.9)

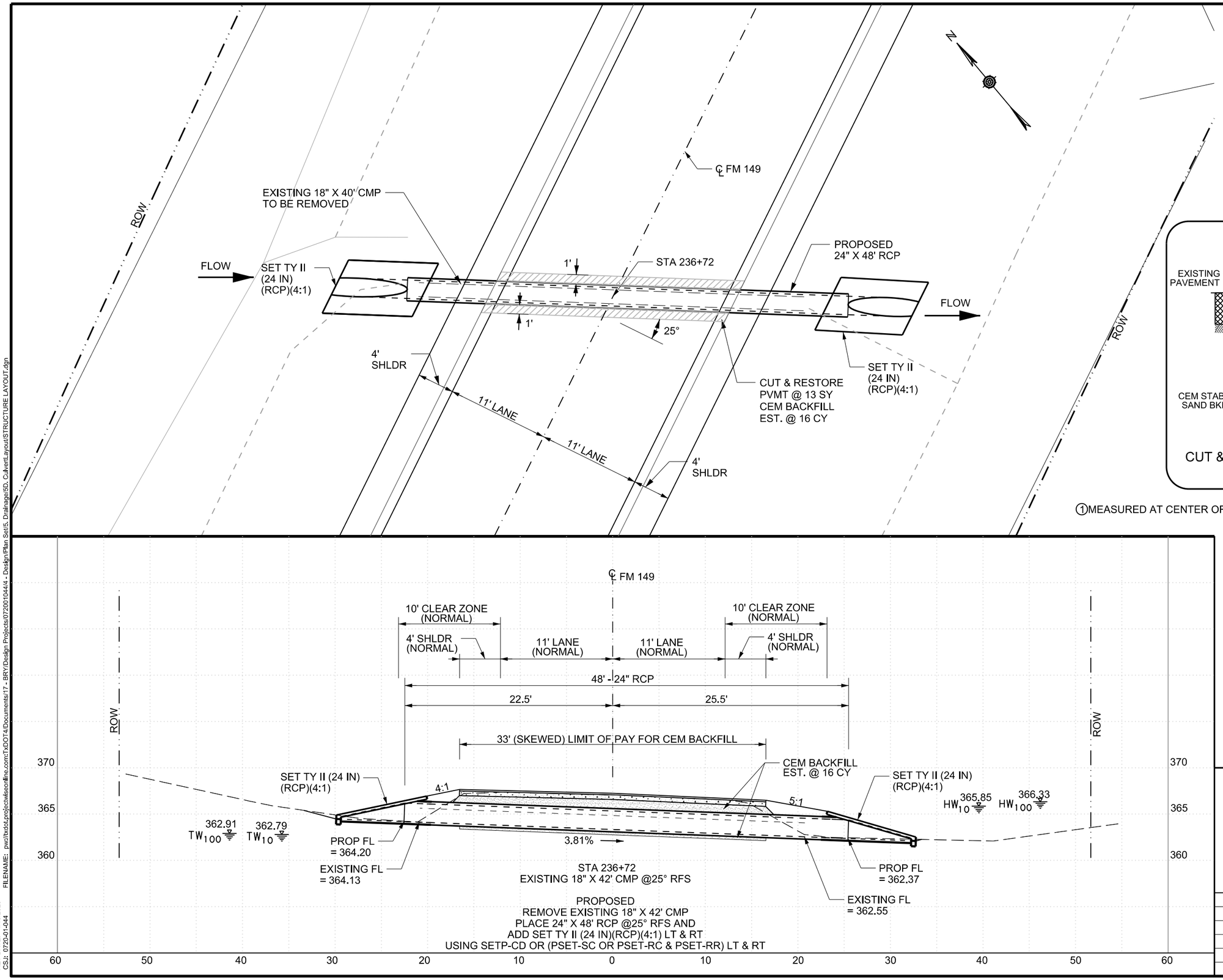
SHEET 9 OF 13 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 149, ETC.

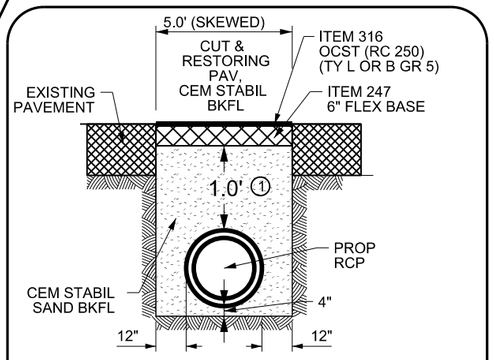
STATE	DISTRICT	COUNTY	
TEXAS	BRY	GRIMES	
CONTROL	SECTION	JOB	SHEET NO.
0720	01	044, ETC.	112

REV DATE: 4/18/2023
CS: 0720-01-044

FILENAME: pw://txdot.projectwiseonline.com/TxDOT4/Documents/17 - BRY/Design Projects/0720010044/4 - Design/Plan Set/5. Drainage/5D. CulvertLayout/STRUCTURE LAYOUT.dgn



GENERAL NOTES:



CUT & RESTORING PAVEMENT
BACKFILL DETAIL (N.T.S.)

①MEASURED AT CENTER OF ROADWAY.

STA 236+72
EXISTING 18" X 42' CMP @25° RFS

PROPOSED
REMOVE EXISTING 18" X 42' CMP
PLACE 24" X 48' RCP @25° RFS 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

STATE OF TEXAS
JEAN J. FENG
102035
LICENSED
PROFESSIONAL ENGINEER

04/20/2023

HORIZONTAL & VERTICAL
0 5 10 20 FT

PRINT DATE	REVISION DATE
4/19/2023	

Texas Department of Transportation
Bryan District
©2023

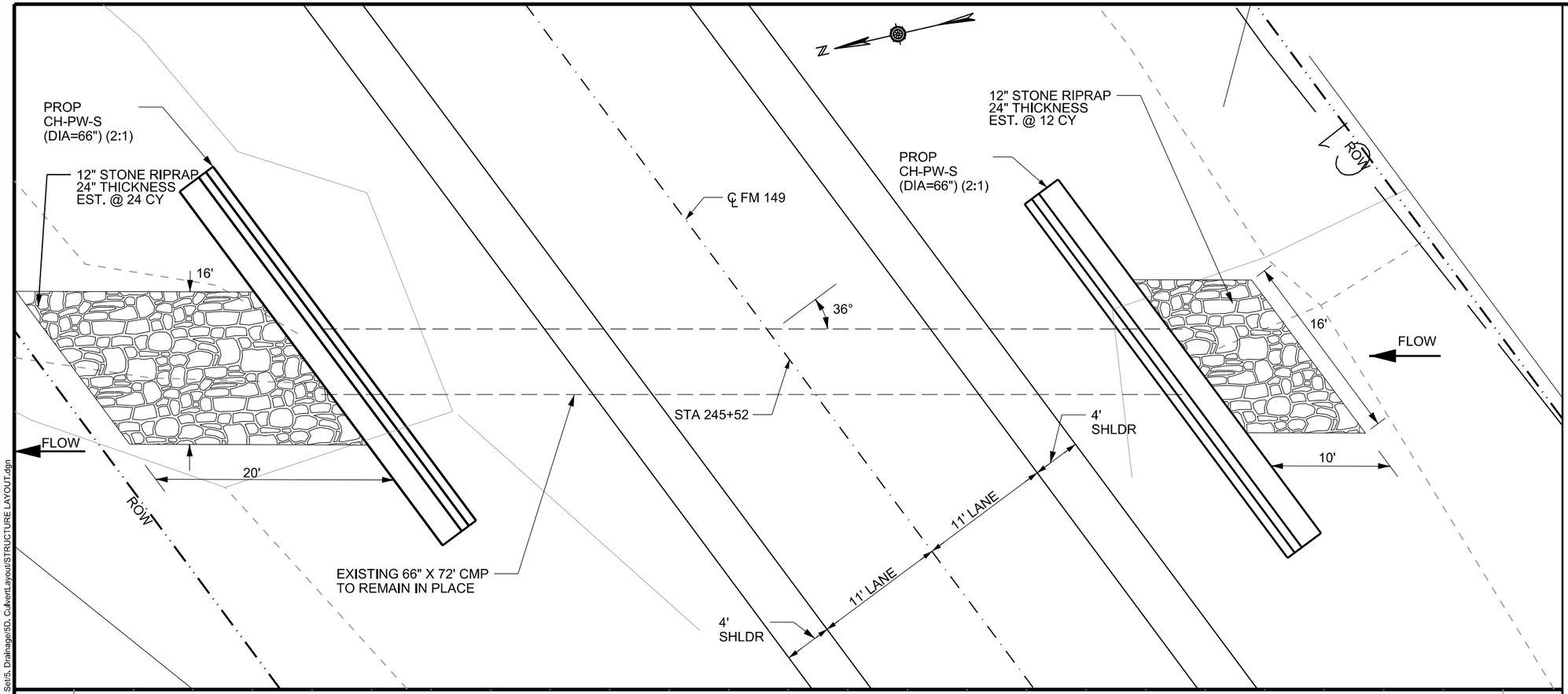
STRUCTURE LAYOUT
(FM 149)
(STA 236+72, NO. 10)

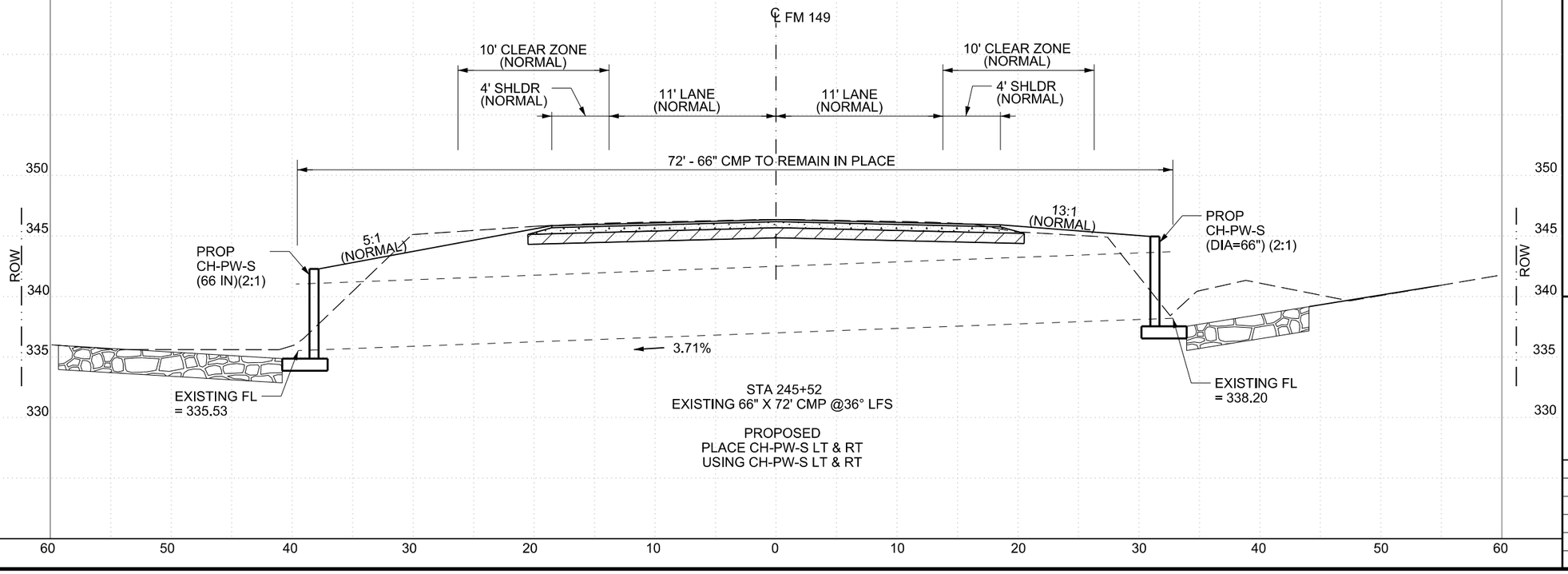
SHEET 10 OF 13 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 149, ETC.
STATE	DISTRICT	COUNTY
TEXAS	BRY	GRIMES
CONTROL	SECTION	JOB / SHEET NO.
0720	01	044, ETC. / 113

REV DATE: 4/18/2023
CSJ: 0720-01-044

FILENAME: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY/Design Projects/0720010044/4 - Design/Plan Set/5. Drainage/5D. CulvertLayout/STRUCTURE LAYOUT.dgn





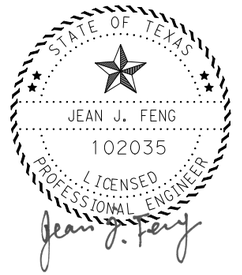
GENERAL NOTES:

EXISTING STONE RIPRAP AT END OF THE DRAINAGE STRUCTURE WILL BE REMOVED. THIS WORK IS SUBSIDIARY TO ITEM 100 PREPARING ROW.

THE DIMENSIONS AND EXACT QUANTITY OF THE PROPOSED CONC 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.



04/20/2023

HORIZONTAL & VERTICAL

0 5 10 20 FT

PRINT DATE	REVISION DATE
4/19/2023	

Texas Department of Transportation
Bryan District

STRUCTURE LAYOUT
(FM 149)
(STA 245+52, NO. 11)

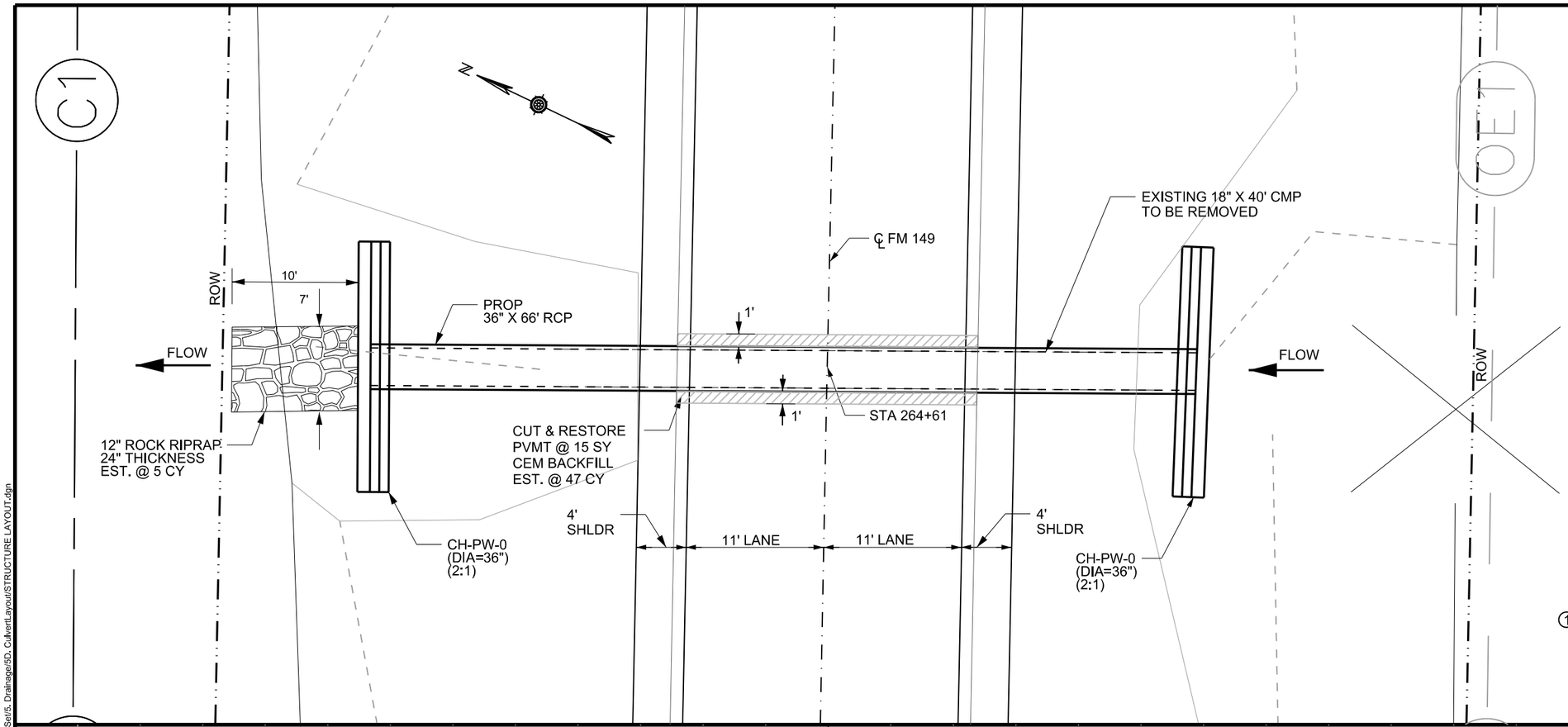
SHEET 11 OF 13 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 149, ETC.

STATE	DISTRICT	COUNTY	
TEXAS	BRY	GRIMES	
CONTROL	SECTION	JOB	SHEET NO.
0720	01	044, ETC.	114

REV DATE: 4/18/2023
CSJ: 0720-01-044

FILENAME: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY/Design Projects/072001044/4 - Design/Plan Set/5. Drainage/5D. CulvertLayout/STRUCTURE LAYOUT.dgn



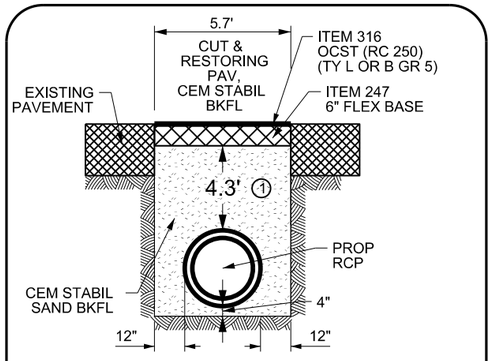
GENERAL NOTES:

REMOVAL OF STONE RIPRAP IS SUBSIDIARY TO PREPARING ROW.

THE DIMENSIONS AND EXACT QUANTITY OF THE PROPOSED CONC RIPRAP WILL BE DETERMINED IN THE FIELD BY THE ENGINEER.

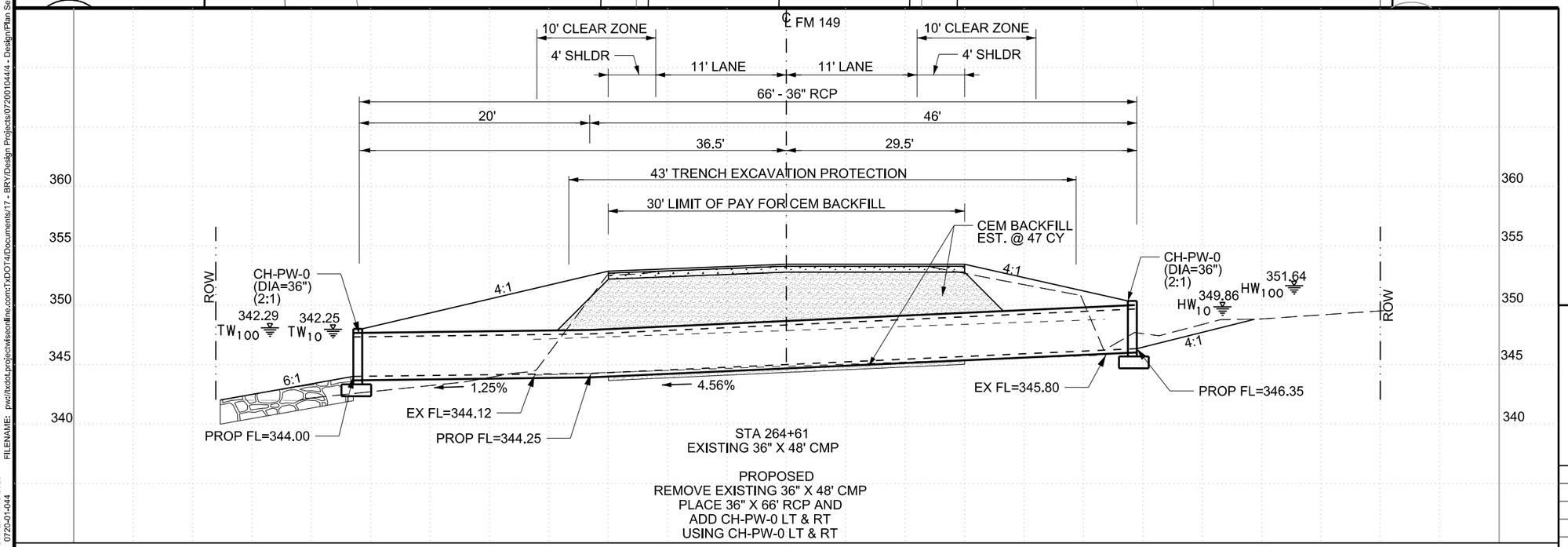
REDUCE THE DEPTH IF NECESSARY TO AVOID UTILITY CONFLICT.

PLACE FILTER FABRIC BELOW ALL ROCK RIPRAP PROTECTION.



CUT & RESTORING PAVEMENT BACKFILL DETAIL (N.T.S.)

①MEASURED AT CENTER OF ROADWAY.



STA 264+61
EXISTING 36" X 48" CMP

PROPOSED
REMOVE EXISTING 36" X 48" CMP
PLACE 36" X 66' RCP AND
ADD CH-PW-0 LT & RT
USING CH-PW-0 LT & RT

STATE OF TEXAS
JEAN J. FENG
102035
LICENSED
PROFESSIONAL ENGINEER

04/20/2023

HORIZONTAL & VERTICAL
0 5 10 20 FT

PRINT DATE	REVISION DATE
4/19/2023	

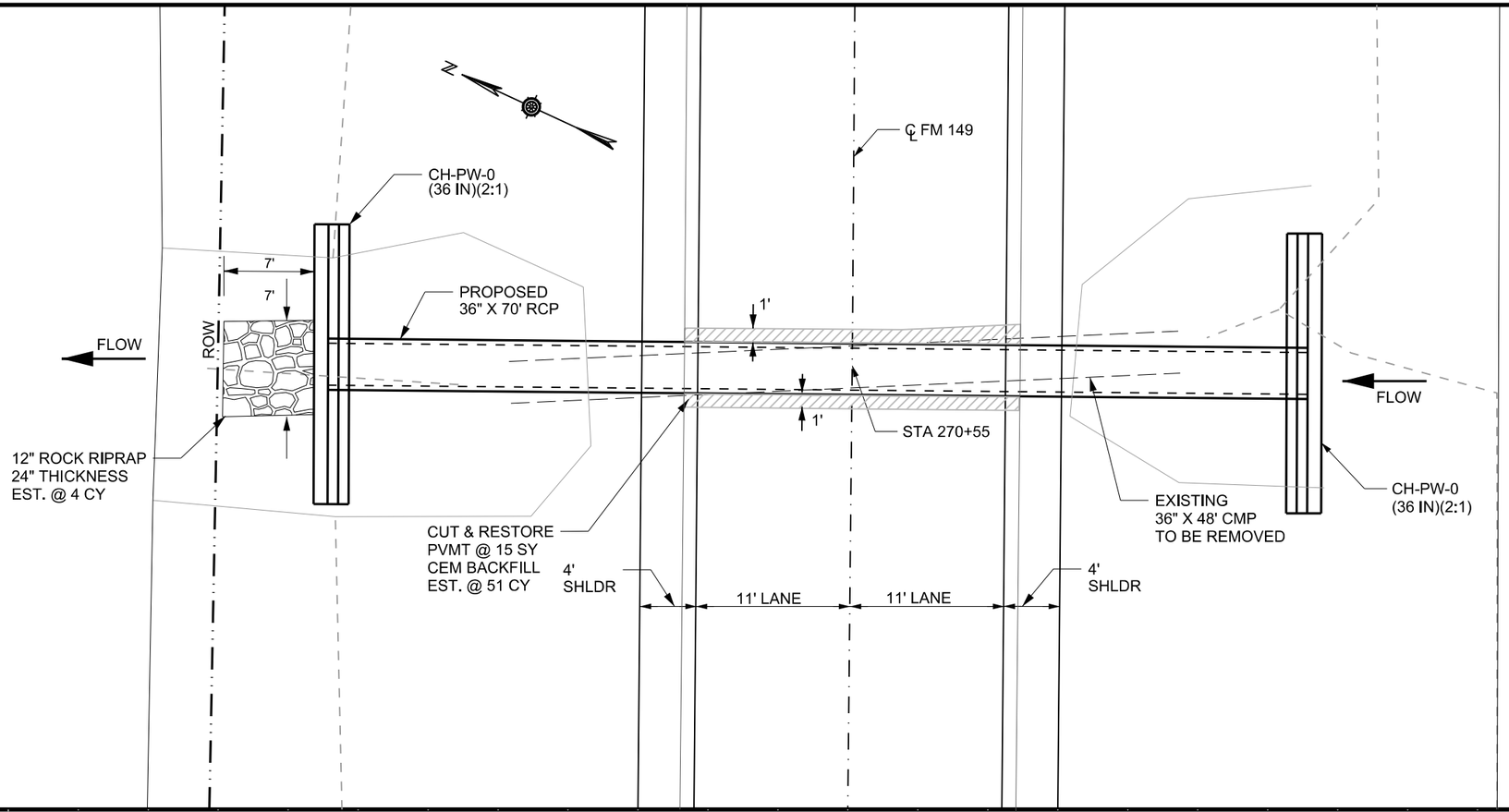
Texas Department of Transportation
Bryan District
©2023

STRUCTURE LAYOUT
(FM 149)
(STA 264+61, NO. 12)

SHEET 12 OF 13 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 149, ETC.
STATE	DISTRICT	COUNTY
TEXAS	BRY	GRIMES
CONTROL	SECTION	JOB / SHEET NO.
0720	01	044, ETC. / 115

REV DATE: 4/18/2023
CSJ: 0720-01-044
FILENAME: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY/Design Projects/0720010444 - Design/Plan Set/5. Drainage/5D. CulvertLayout/STRUCTURE LAYOUT.dgn



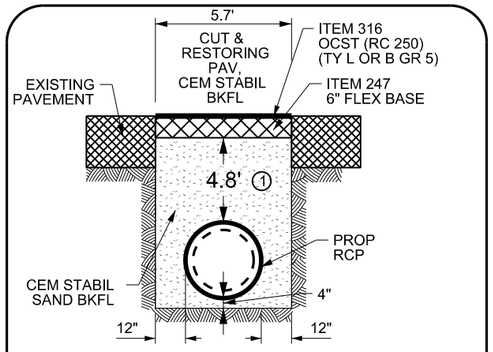
GENERAL NOTES:

REMOVAL OF STONE RIPRAP IS SUBSIDIARY TO PREPARING ROW.

THE DIMENSIONS AND EXACT QUANTITY OF THE PROPOSED CONC RIPRAP WILL BE DETERMINED IN THE FIELD BY THE ENGINEER.

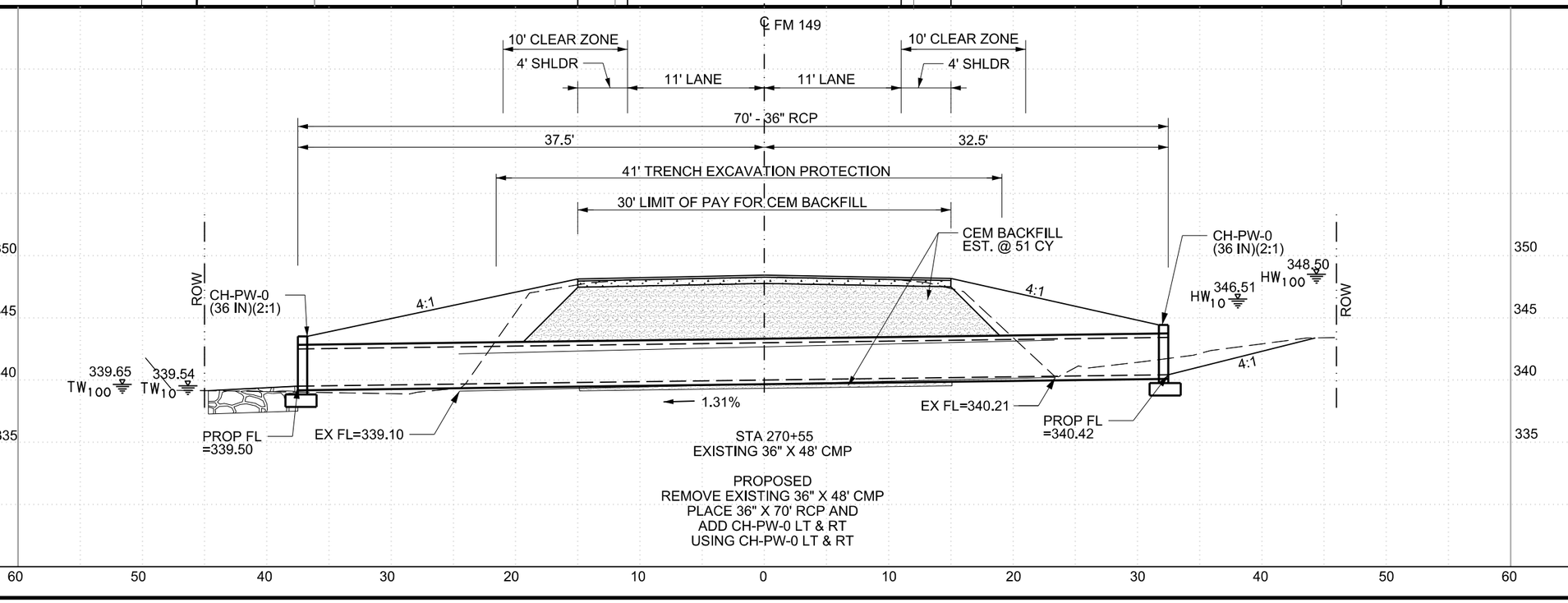
REDUCE THE DEPTH IF NECESSARY TO AVOID UTILITY CONFLICT.

PLACE FILTER FABRIC BELOW ALL ROCK RIPRAP PROTECTION.



CUT & RESTORING PAVEMENT BACKFILL DETAIL (N.T.S.)

①MEASURED AT CENTER OF ROADWAY.



STATE OF TEXAS
JEAN J. FENG
102035
LICENSED
PROFESSIONAL ENGINEER

04/20/2023

HORIZONTAL & VERTICAL
0 5 10 20 FT

PRINT DATE	REVISION DATE
4/19/2023	

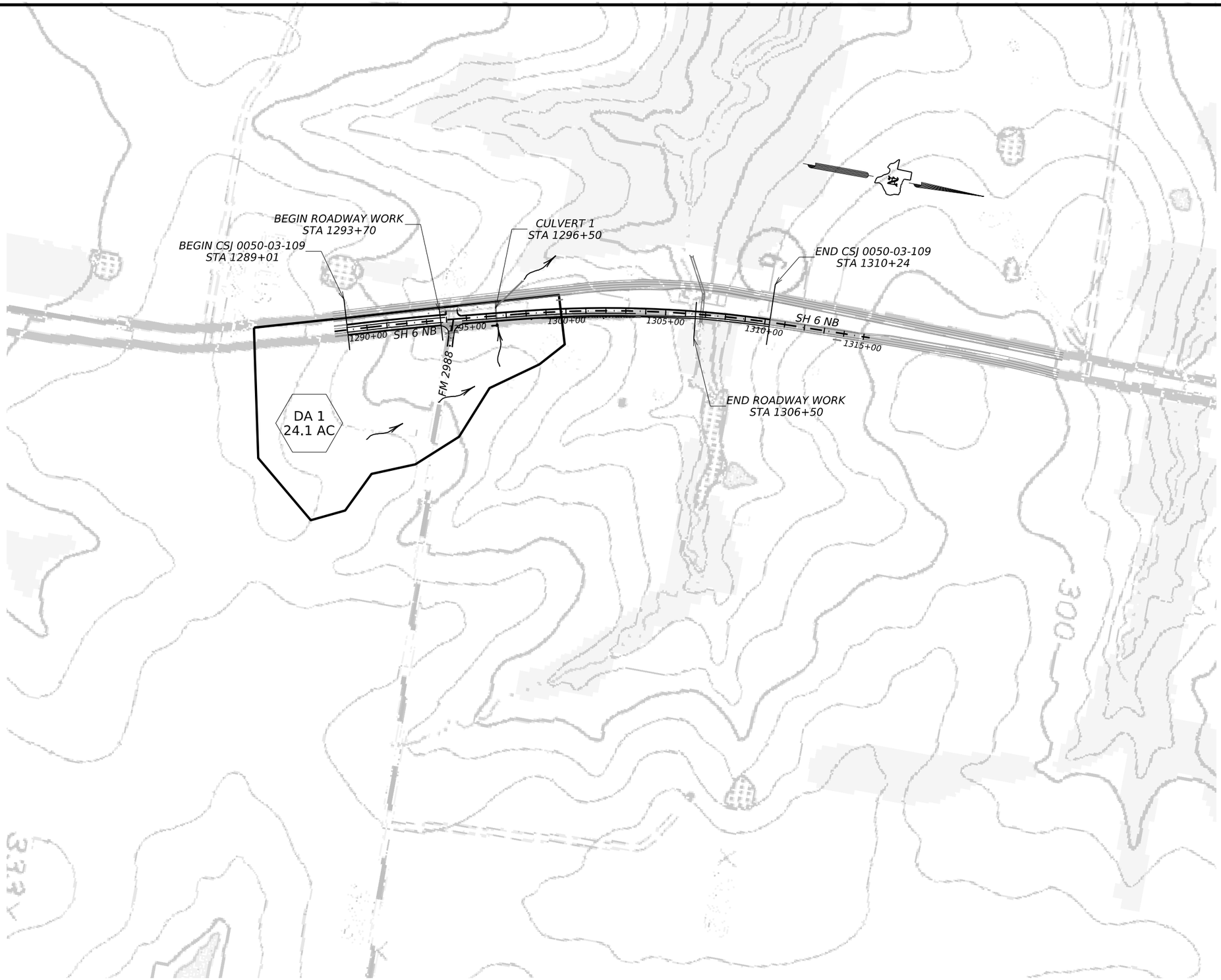
Texas Department of Transportation
Bryan District

STRUCTURE LAYOUT (FM 149) (STA 270+55, NO. 13)

SHEET 13 OF 13 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 149, ETC.
STATE	DISTRICT	COUNTY
TEXAS	BRY	GRIMES
CONTROL	SECTION	JOB / SHEET NO.
0720	01	044, ETC. / 116

REV DATE: 4/18/2023
CSJ: 0720-01-044
FILENAME: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY/Design Projects/0720010044/4 - Design/Plan Set/5. Drainage/5D. CulvertLayout/STRUCTURE LAYOUT.dgn



0 250 500 1000

SCALE IN FEET

STATE OF TEXAS
JEAN J. FENG
102035
LICENSED
PROFESSIONAL ENGINEER

04/20/2023

PRINT DATE	REVISION DATE
4/19/2023	

Texas Department of Transportation
Bryan District

DRAINAGE AREA MAP (SH 6)

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 149, ETC.

STATE	DISTRICT	COUNTY
TEXAS	BRY	GRIMES

CONTROL	SECTION	JOB	SHEET NO.
0720	01	044, ETC.	117

REV DATE: 3/28/2023
CSJ: 0050-03-109

FILENAME: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY/Design Projects/0050031094 - Design/Plan Set/5. Drainage/5A. DrainageAreaMap/DRAINAGE AREA MAP (SH 6)

HYDROLOGY FOR DRAINAGE AREAS																		
DRAINAGE AREA ID	OUTLET STATION	OUTLET PROJECT ID	AREA (AC)	AREA (SQ MILES)	Tc (MIN)	METHOD FOR DISCHARGE FLOW RATES	RATIONAL "C"	INTENSITY (IN/HR)						DISCHARGE (CFS)					
								I2	I5	I10	I25	I50	I100	Q2	Q5	Q10	Q25	Q50	Q100
DA 1	1296+50	CULVERT 1	24.1	0.038	18.63	RATIONAL	0.38	3.74	4.86	5.7	6.81	7.63	8.48	34.25	44.51	52.20	62.37	69.88	77.66

CULVERT HYDRAULIC DATA										
CULVERT NO.	EXISTING DRAINAGE STR TYPE	EXISTING LENGTH (FT)	PROPOSED DRAINAGE STR TYPE	PROPOSED LENGTH (FT)	CULVERT CROSS SECTIONAL AREA (SF)	Q10 (CFS)	V10 (FPS)	Q25 (CFS)	V25 (FPS)	V (MAX ALLOWABLE) (FPS)
1	3′ x 2′ BOX	84′	NO CHANGE	91′	6	52.2	8.7	62.4	10.4	12.0

*INITIAL HYDRAULIC ANALYSIS SUGGESTS CULVERT IS ADEQUATELY SIZED FOR REQUIRED CAPACITY. GIVEN SCOPE OF PROJECT (CULVERT LENGTH IS EXTENDED BY LESS THAN 10%), NO FURTHER ANALYSIS WAS COMPLETED.

STATE OF TEXAS
JEAN J. FENG
102035
LICENSED
PROFESSIONAL ENGINEER

04/20/2023

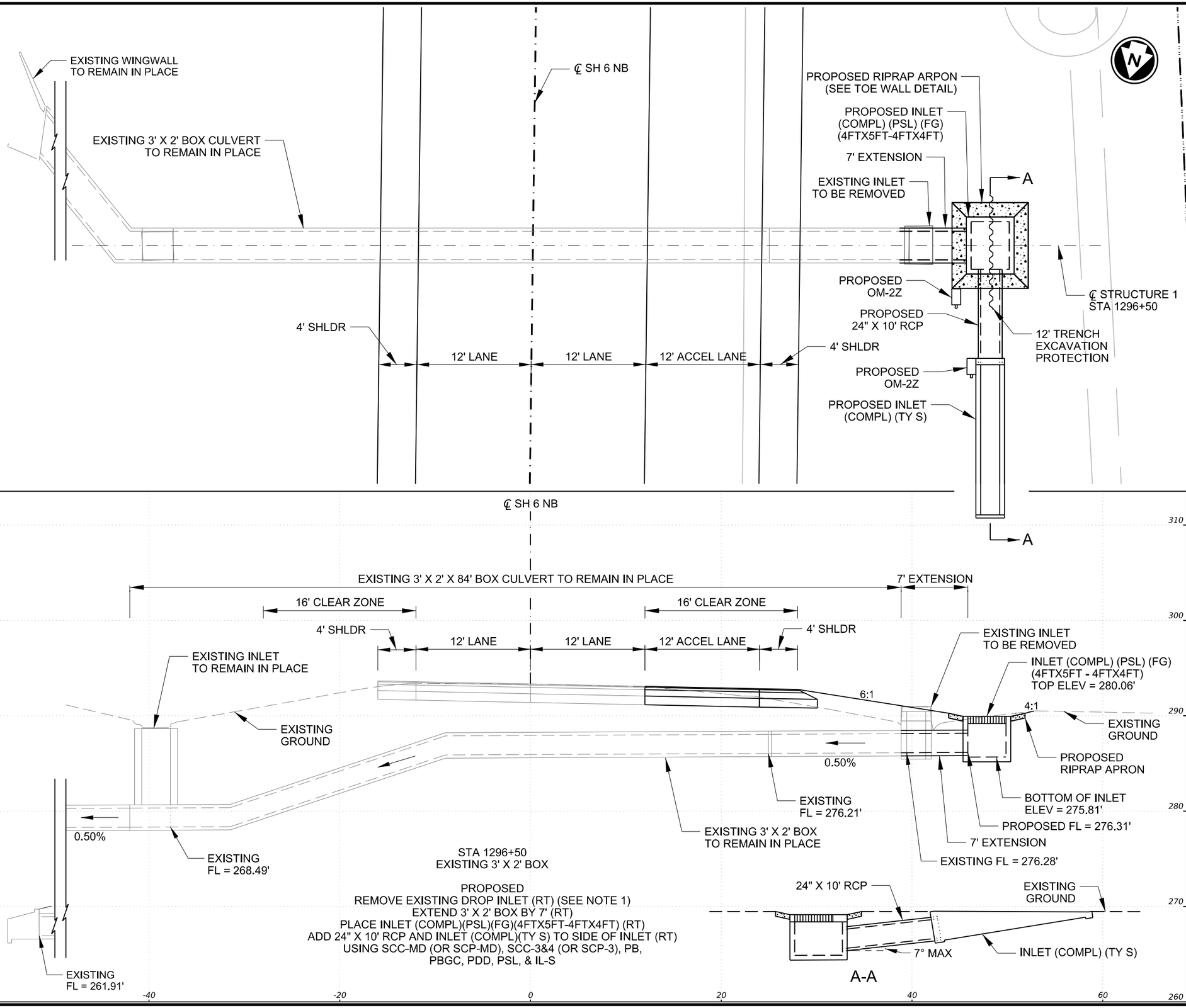
PRINT DATE	REVISION DATE
4/19/2023	

Texas Department of Transportation
Bryan District

HYDROLOGIC & HYDRAULIC DATA (SH 6)

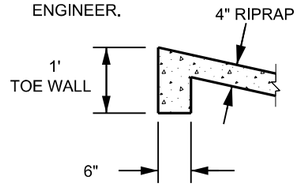
FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 149, ETC.
STATE	DISTRICT	COUNTY
TEXAS	BRY	GRIMES
CONTROL	SECTION	JOB / SHEET NO.
0720	01	044, ETC. / 118

REV DATE: 3/28/2023
CSJ: 0050-03-109
FILENAME: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY/Design Projects/0050031094 - Design/Plan Set/5. Drainage/5B. Hydrologic Calculations/HYDROLOGIC & HYDRAULIC DATA (SH 6)



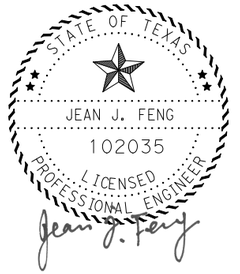
1. ANY DAMAGE TO THE BOX BY THE CONTRACTOR SHALL BE REPORTED TO THE ENGINEER AND REPAIRED AT THE CONTRACTOR'S EXPENSE.

EXACT QUANTITY AND LOCATION WILL BE DECIDED IN THE FIELD BY THE ENGINEER.



RIRPAP TOE WALL DETAIL

PLACE ALONG PERIMETER OF RIPRAP. SUBSIDIARY TO ITEM 465 "INLET (COMPL) (PSL)(FG)(4FTX5FT-4FTX4FT)".



04/20/2023

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

PRINT DATE	REVISION DATE
4/19/2023	

Texas Department of Transportation
Bryan District

STRUCTURE LAYOUT (SH 6) (STA 1296+50)

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 149, ETC.
STATE	DISTRICT	COUNTY
TEXAS	BRY	GRIMES
CONTROL	SECTION	JOB / SHEET NO.
0720	01	044, ETC. / 119

REV DATE: 3/28/2023
CSJ: 0050-03-109
FILENAME: pw://txdot.projectwiseonline.com/TxDOT4/Documents/17 - BRY/Design Projects/0050031094 - Design/Plan Set/5. Drainage/5D. CulvertLayout/STRUCTURE LAYOUT (SH 6) (STA 1296+50)

Culvert Station and/or Creek Name followed by applicable end (Lt, Rt or Both)	Description of Box Culvert No. Spans ~ Span X Height	Max Fill Height (Ft)	Applicable Box Culvert Standard (4)	Applicable Wingwall or End Treatment Standard	Skew Angle (0°,15°, 30° or 45°)	Side Slope or Channel Slope Ratio (SL:1)	T Culvert Top Slab Thickness (In)	U Culvert Wall Thickness (In)	C Estimated Curb Height (Ft)	Hw (1) Height of Wingwall (Ft)	A Curb to End of Wingwall (Ft)	B Offset of End of Wingwall (Ft)	Lw Length of Longest Wingwall (Ft)	Ltw Culvert Toewall Length (Ft)	Atw Anchor Toewall Length (Ft)	Riprap Apron (CY)	Class "C" Conc (Curb) (2) (CY)	Class "C" Conc (Wingwall) (3) (CY)	Total Wingwall Area (SF)
STA 66+07 (Lt)	1 ~ 5'x 3'	2.7'	SCC-5&6	SETB-FW-S	15°	3:1	8"	7"	1.000'	4.417'	12.250'	7.073'	14.145'	N/A	12.249'	1.1	0.2	5.1	N/A
STA 66+07 (Lt)	1 ~ 5'x 3'	2.7'	SCP-5	SETB-FW-S	15°	3:1	6"	6"	1.000'	4.250'	11.750'	6.784'	13.568'	N/A	11.960'	1.0	0.2	4.9	N/A
STA 66+07 (Rt)	1 ~ 5'x 3'	2.7'	SCC-5&6	SETB-FW-S	15°	4:1	8"	7"	1.000'	4.417'	16.333'	9.430'	18.860'	N/A	14.606'	1.8	0.2	6.7	N/A
STA 66+07 (Rt)	1 ~ 5'x 3'	2.7'	SCP-5	SETB-FW-S	15°	4:1	6"	6"	1.000'	4.250'	15.667'	9.045'	18.090'	N/A	14.222'	1.6	0.2	6.5	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
4/20/2023

Texas Department of Transportation | Bridge Division Standard

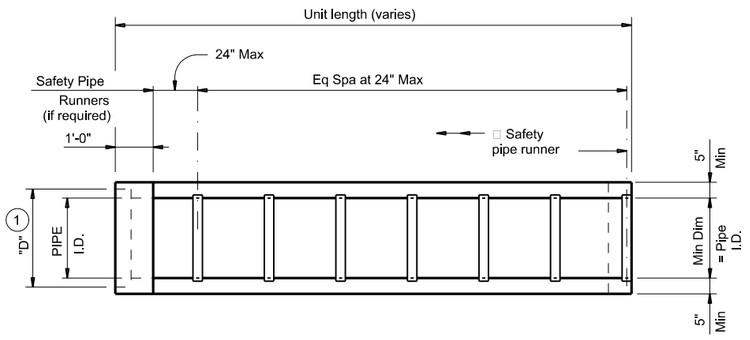
BOX CULVERT SUPPLEMENT
WINGS AND END TREATMENTS

BCS

FILE: bcsstde1-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT 0720	SECT 01	JOB 044, ETC.	HIGHWAY FM 149, ETC.
REVISIONS	DIST BRYAN	COUNTY GRIMES		SHEET NO. 120

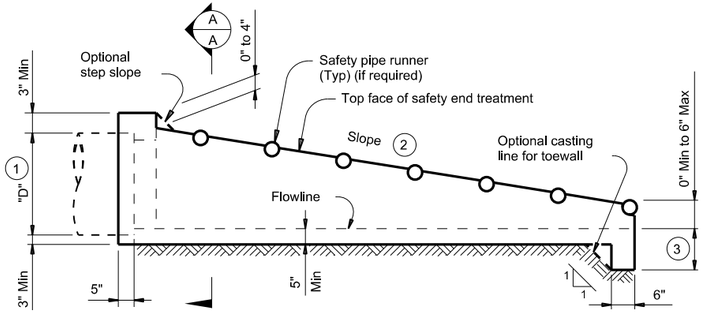
DATE: 4/20/2023 2:03:37 PM
FILE: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY/Design Projects/0720010444/4 Design/Plan Set/5. Drainage/5G. Drainage Standards/BCS.dgn

DATE: 4/19/2023 7:49:35 AM
FILE: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY/Design Projects/Drainage Standards/PSET-SP.dgn



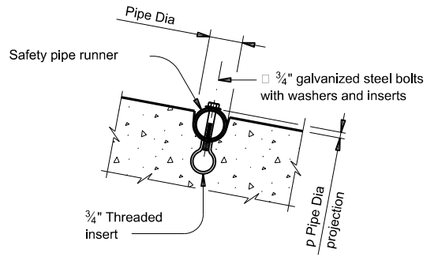
PLAN

(Showing bell end connection.)



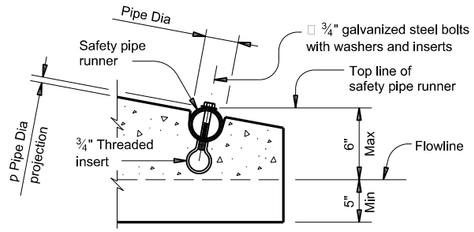
LONGITUDINAL ELEVATION

(Showing bell end connection.)

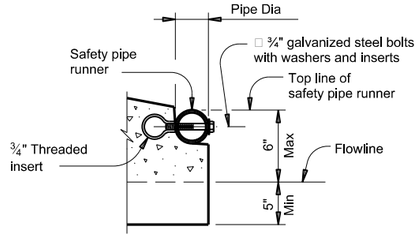


INSTALLATION DETAIL FOR SAFETY PIPE RUNNERS

(If required)



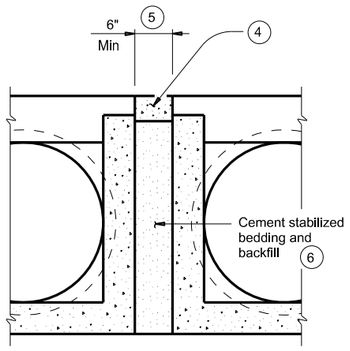
OPTION A



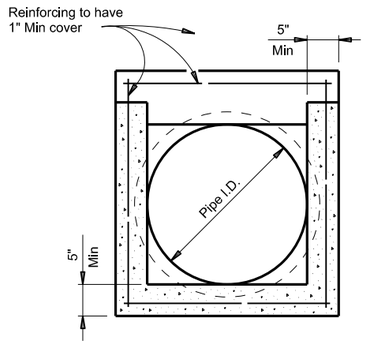
OPTION B

END DETAILS FOR INSTALLATION OF SAFETY PIPE RUNNERS

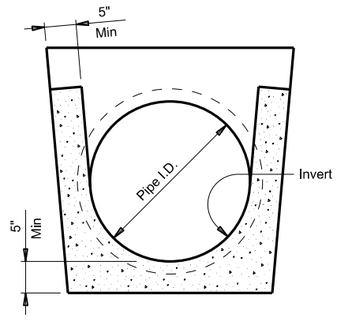
(If required)



MULTIPLE PIPE INSTALLATION

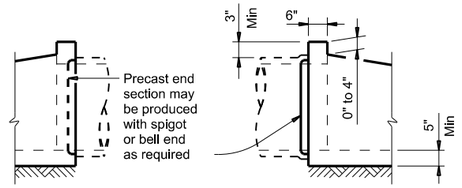


OPTION WITH SQUARE BOTTOM



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"	2.7"	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 Pipe and Box Grouted Connections (PBGC) standard for grouted connections with TP and precast safety end treatment.

Texas Department of Transportation

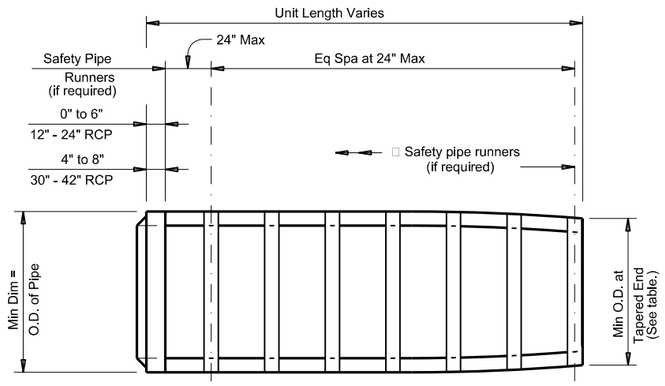
Bridge Division Standard

PRECAST SAFETY END TREATMENT

TYPE II ~ PARALLEL DRAINAGE

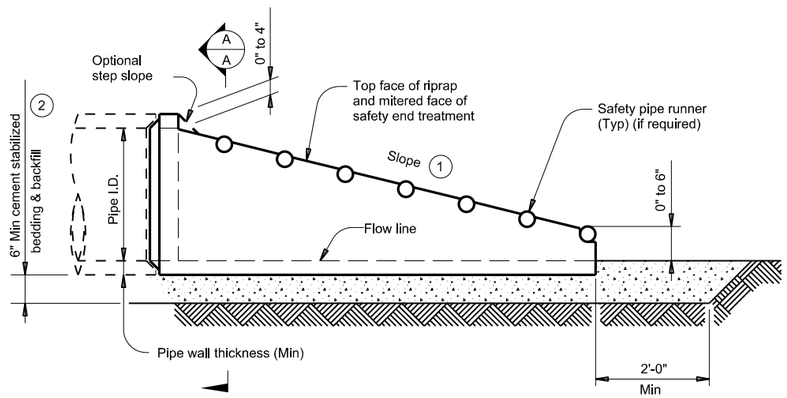
PSET-SP

FILE: psetspss-21.dgn	DN: RLW	CK: KLR	DW: JTR	CK: GAF
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS 12-21: Added 42" TP	0720	01	044, ETC.	FM 149,ETC.
	DIST	COUNTY		SHEET NO.
	BRYAN	GRIMES		121



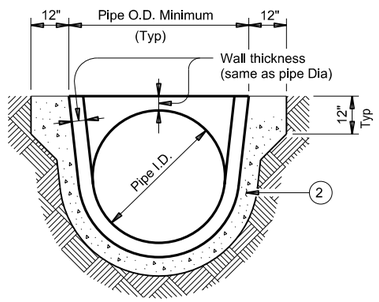
PLAN VIEW - 12" THRU 24"

(Showing spigot end connection.)

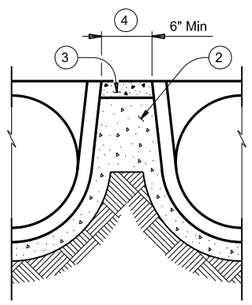


LONGITUDINAL ELEVATION - 12" THRU 24"

(Showing spigot end connection.)

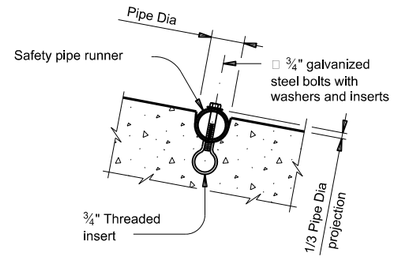


SECTION A-A



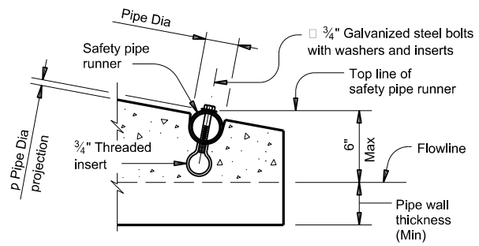
MULTIPLE PIPE INSTALLATION

1. Slope as shown elsewhere in the plans. Slope of 6:1 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 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.

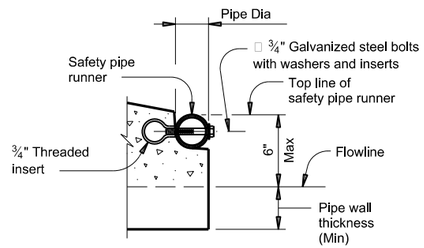


INSTALLATION DETAIL FOR SAFETY PIPE RUNNERS

(If required)



OPTION A



OPTION B

END DETAILS FOR INSTALLATION OF SAFETY PIPE RUNNERS

(If required)

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

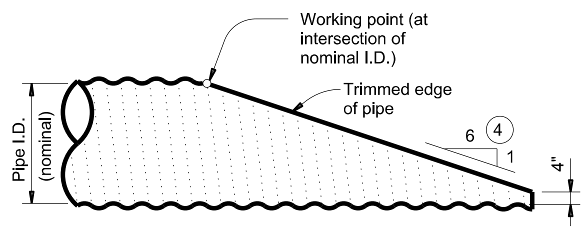
PRECAST SAFETY END TREATMENT

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	0720	01	044, ETC.	FM 149,ETC.
	DIST	COUNTY		SHEET NO.
	BRYAN	GRIMES		122

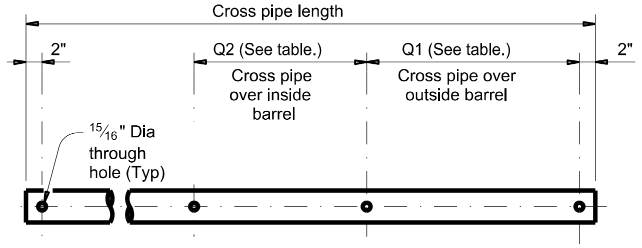
DATE: 4/19/2023 7:49:50 AM
FILE: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY/Design Projects/PSET-RP.dgn



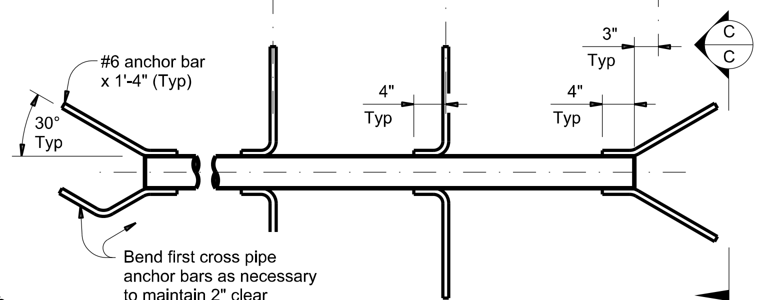
NOTE: All cross pipes, calculations, and dimensions are based on the pipe culverts mitered as shown in this detail. Alternate styles of mitered ends will require that appropriate adjustments be made to the values presented on this standard.

SIDE ELEVATION OF TYPICAL PIPE CULVERT MITER

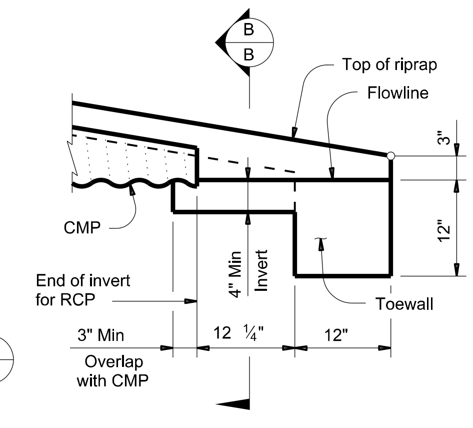
(Showing corrugated metal pipe (CMP) culvert Details at reinforced concrete pipe (RCP) culvert are similar.)



PIPE WITH BOLTED ANCHOR

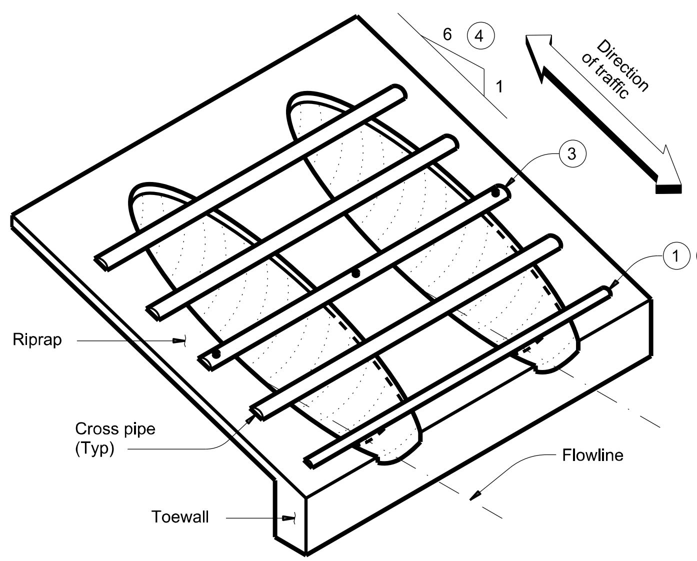


PIPE WITH ANCHOR BARS

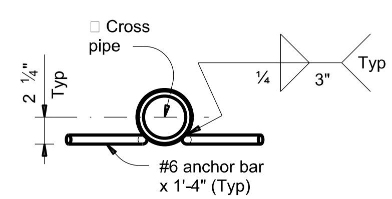


DETAIL "A"

(Showing invert with corrugated metal pipe (CMP) culvert. Reinforced concrete pipe (RCP) culvert details are similar. Cross pipes not shown for clarity.)

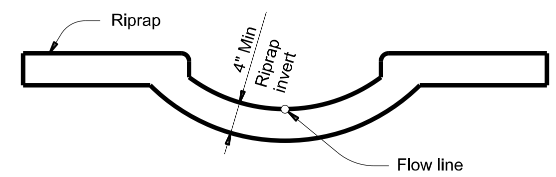


ISOMETRIC VIEW OF TYPICAL INSTALLATION



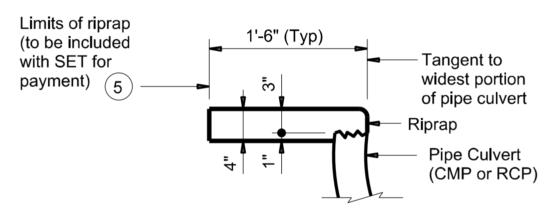
SECTION C-C

CROSS PIPE DETAILS

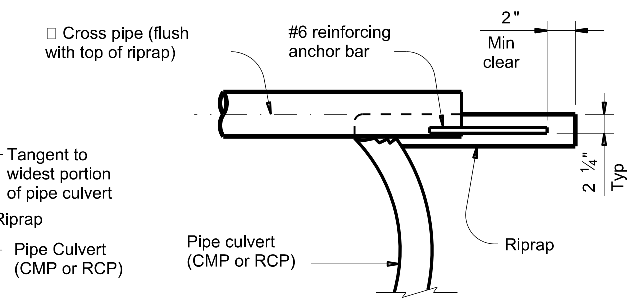


SECTION B-B

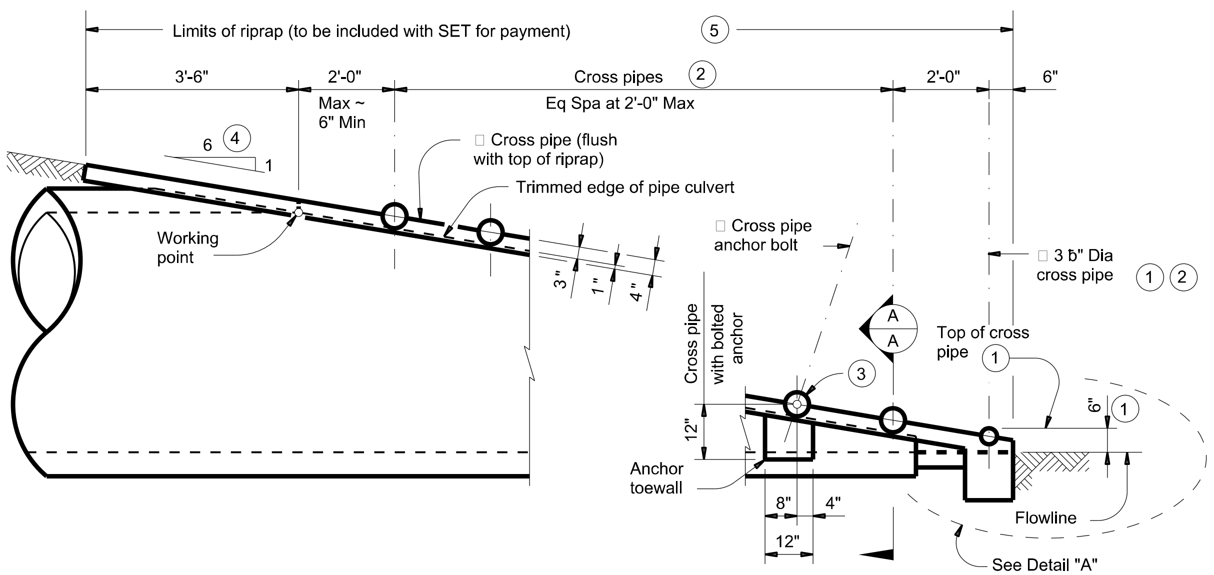
(Cross pipes not shown for clarity.)



SHOWING TYPICAL PIPE CULVERT AND RIPRAP

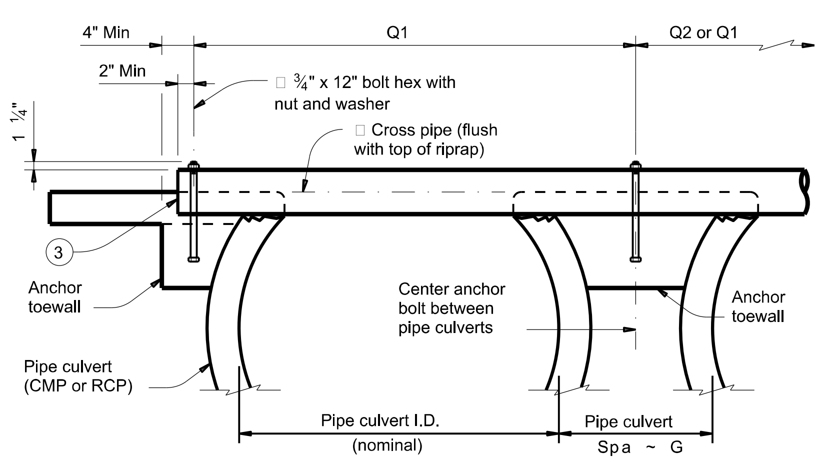


SHOWING CROSS PIPE WITH ANCHOR BAR



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

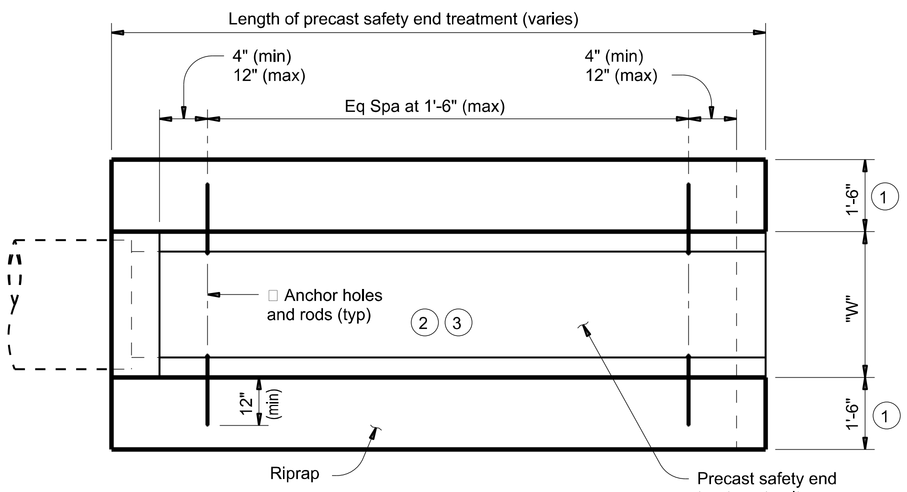
Bridge Division Standard

SAFETY END TREATMENT

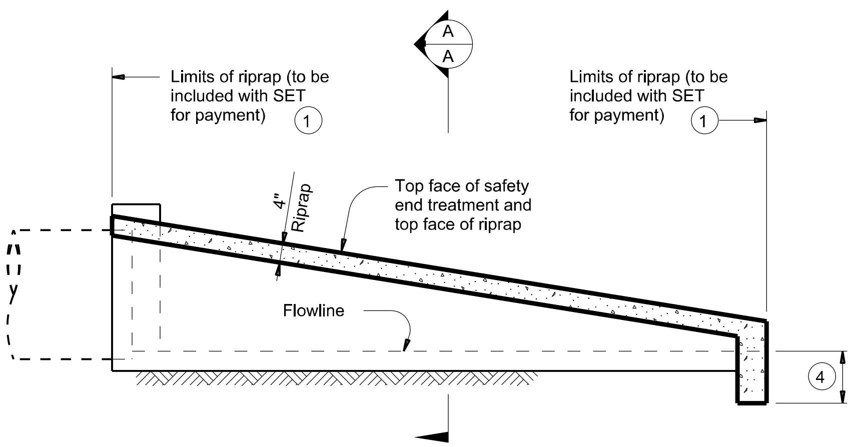
FOR 12" DIA TO 72" DIA PIPE CULVERTS TYPE II ~ PARALLEL DRAINAGE

SETP-PD

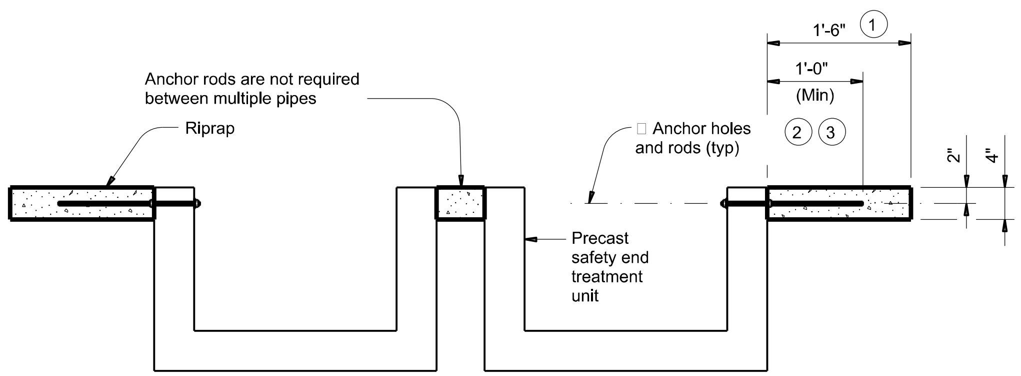
FILE: setppdse-20.dgn	DN: GAF	CK: CAT	DW: JRP	CK: GAF
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0720	01	044	FM 149, ETC.
	DIST	COUNTY		SHEET NO.
	BRYAN	GRIMES		123



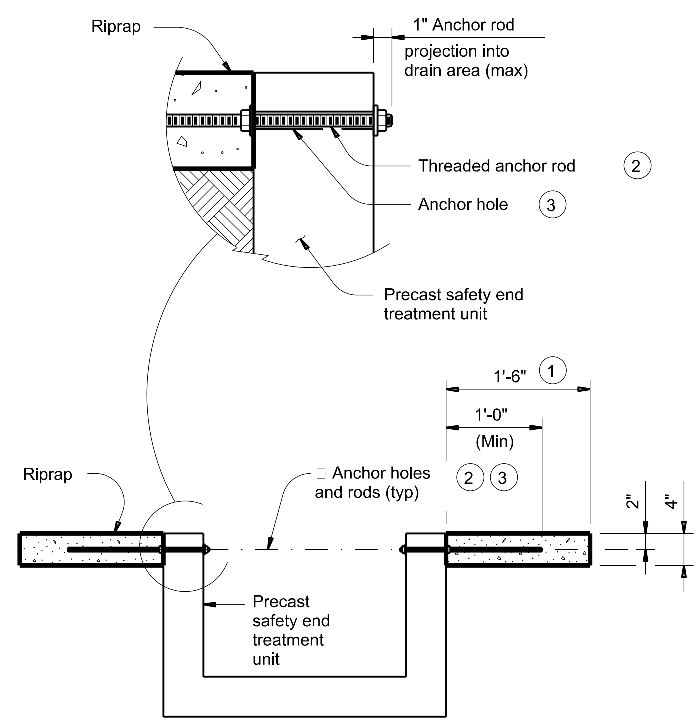
PLAN



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 3:1	Side Slope 4:1	Side Slope 6:1	Unit Width "W"	Side Slope 3:1	Side Slope 4:1	Side Slope 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

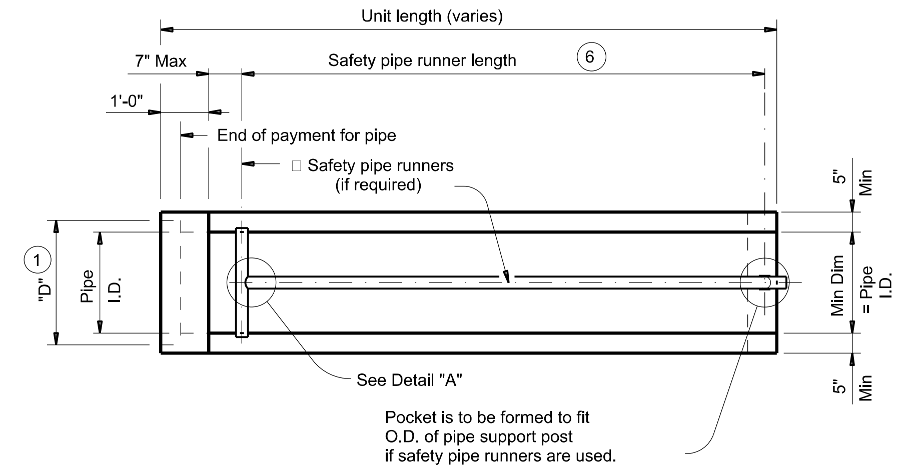
PSET-RR

FILE: psetrrse-20.dgn	DN: GAF	CK: TxDOT	DW: JRP	CK: GAF
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0720	01	044, ETC.	FM 149, ETC.
	DIST		COUNTY	SHEET NO.
	BRYAN		GRIMES	124

DATE: 4/19/2023 7:50:21 AM
FILE: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY/Design Projects/0720-01-044 ... DrainageStandards/PSET-RR.dgn

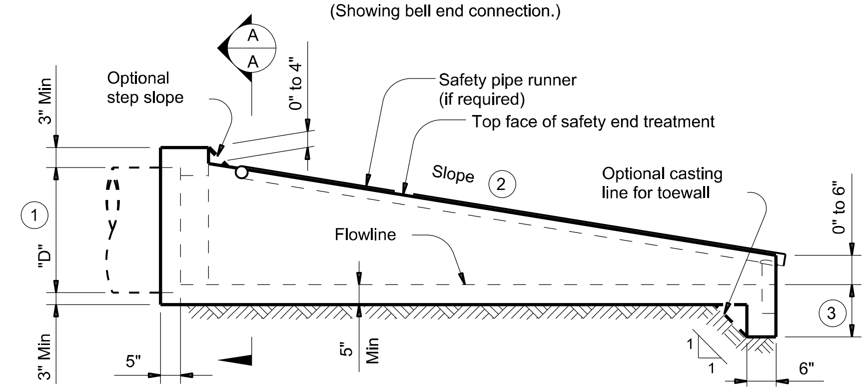
REQUIREMENTS FOR CULVERT PIPES AND SAFETY PIPE RUNNERS

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"	2.7"	52.50"	3:1	11' - 1"	≥ 0°	Yes	≥ 0°	Yes
				4:1	14' - 5"				
				6:1	21' - 2"				



PLAN

(Showing bell end connection.)



LONGITUDINAL ELEVATION

(Showing bell end connection.)

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.

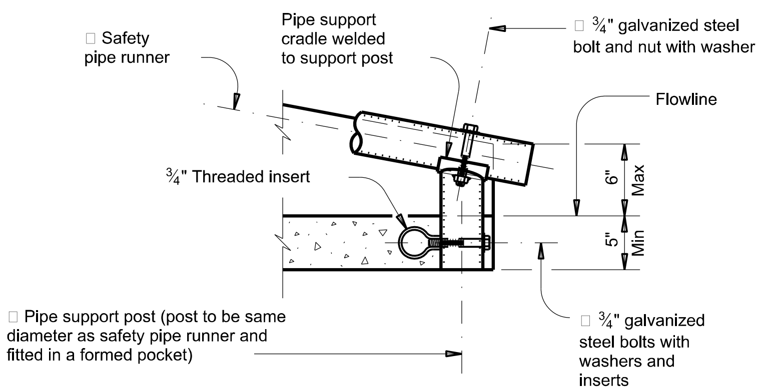
(4) Fill the top 4" of void between precast end treatments with concrete riprap. Concrete riprap is considered subsidiary to the Item 467, "Safety End Treatment".

(5) Adjust clear distance between pipes to provide for the minimum distance between safety end treatments.

(6) Measured along slope.

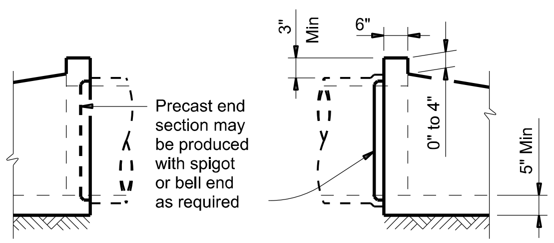
(7) Provide cement stabilized bedding and backfill in accordance with the Item 400, "Excavation and Backfill for Structures". Bedding and backfill is considered subsidiary to the Item 467, "Safety End Treatment". When concrete riprap is specified around the safety end treatment, backfill as directed 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.



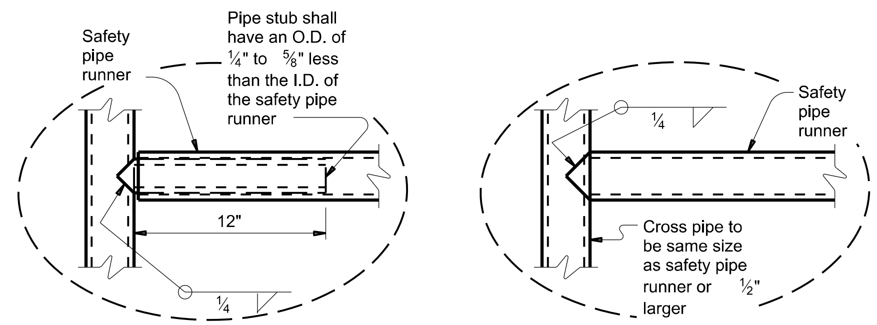
END DETAIL FOR INSTALLATION OF SAFETY PIPE RUNNERS

(If required)



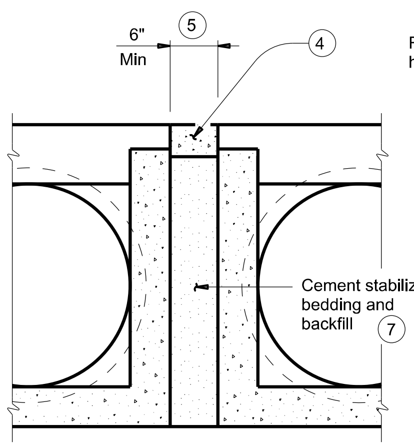
OPTIONAL JOINT FOR RCP

(Showing joint between RCP and precast safety end treatment)

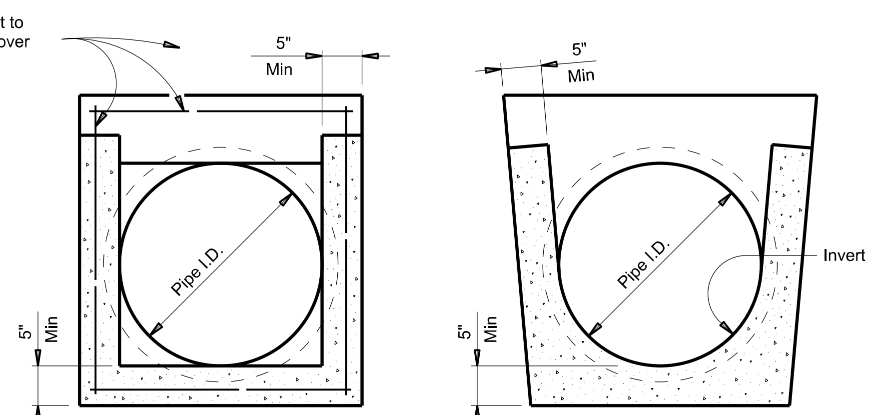


DETAIL A

(If required)



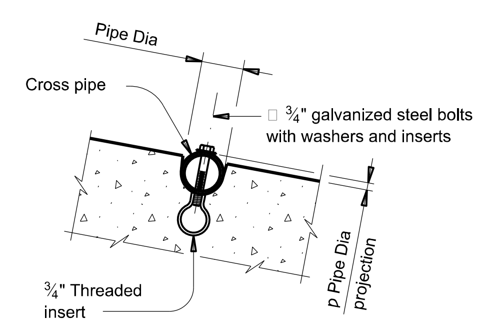
MULTIPLE PIPE INSTALLATION



OPTION WITH SQUARE BOTTOM

OPTION WITH INVERT BOTTOM

SECTION A-A



INSTALLATION DETAIL FOR SAFETY PIPE RUNNERS

(If required)

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 Pipe and Box Grouted Connections (PBGC) standard for grouted connections with TP and precast safety end treatment.

Texas Department of Transportation — Bridge Division Standard

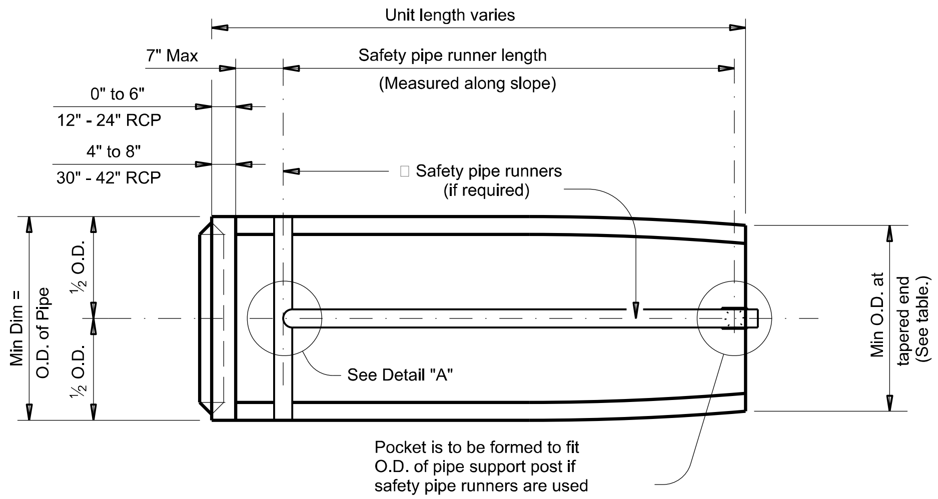
PRECAST SAFETY END TREATMENT

TYPE II ~ CROSS DRAINAGE

PSET-SC

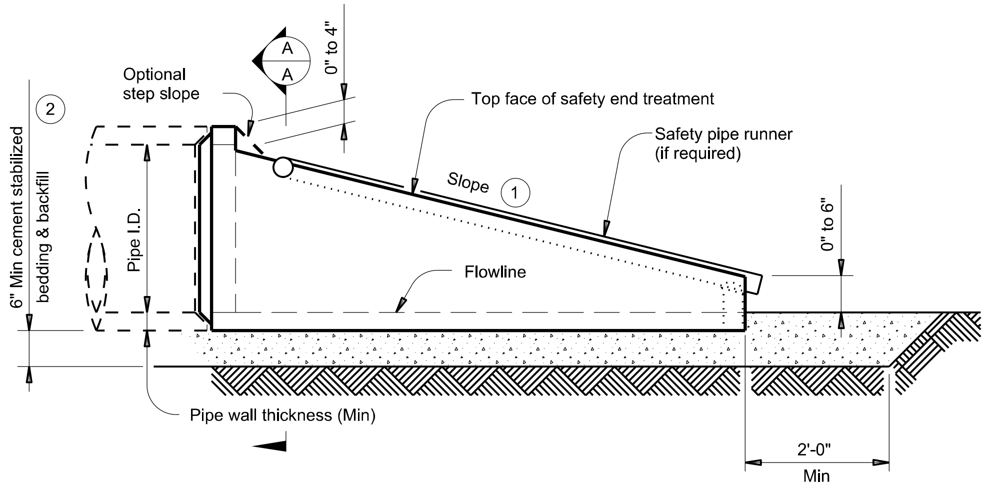
FILE: psetscss-21.dgn	DN: RLW	CK: KLR	DW: JTR	CK: GAF
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS 12-21: Added 42" TP	0720	01	044, ETC.	FM 149, ETC.
	DIST		COUNTY	SHEET NO.
	BRYAN		GRIMES	125

DATE: 4/19/2023 7:50:35 AM
FILE: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY/Design Projects/[illegible] DrainageStandards/PSET-SC.dgn



PLAN VIEW

(Showing spigot end connection.)



LONGITUDINAL ELEVATION

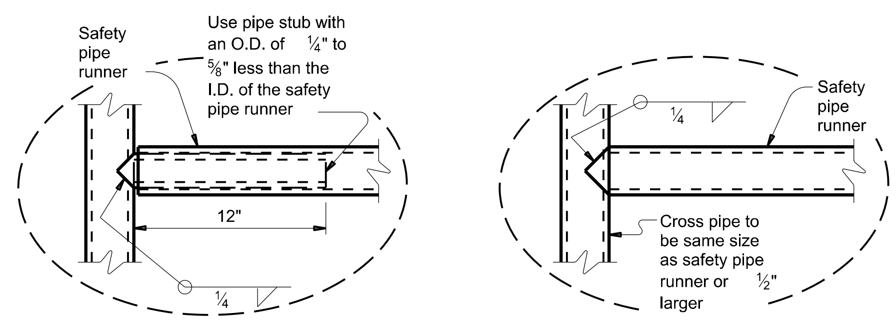
(Showing spigot end connection.)

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: Skew	Single Pipe: Pipe Runners Required	Multiple Pipe: Skew	Multiple Pipe: 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"	> 15°	Yes	> 15°	Yes
					6:1	12' - 1"				
36"	4"	44"	36"	0.19 Ellip.	3:1	7' - 10"	= 0°	No	≥ 0 °	Yes
					4:1	10' - 4"	> 0°	Yes		
					6:1	15' - 4"				
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

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".

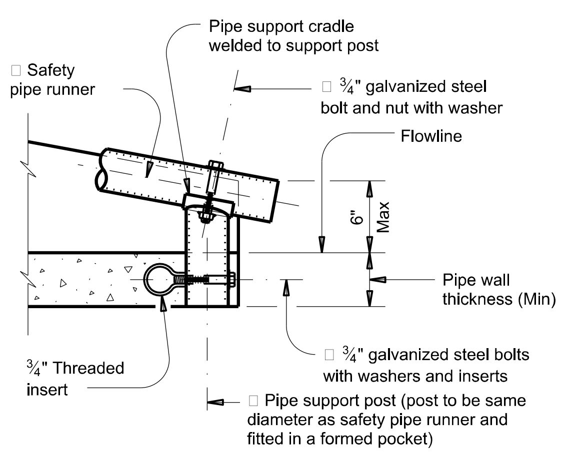
When precast safety end treatment is used as a Contractor's alternate to mitered RCP, riprap will not be required unless noted otherwise on the plans.

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.

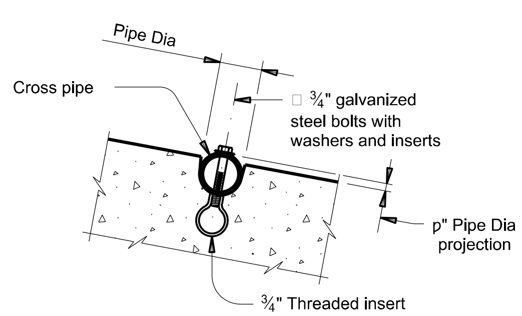
Methods of lifting shall be provided by the manufacturer for ease of loading, unloading, and installation.

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.



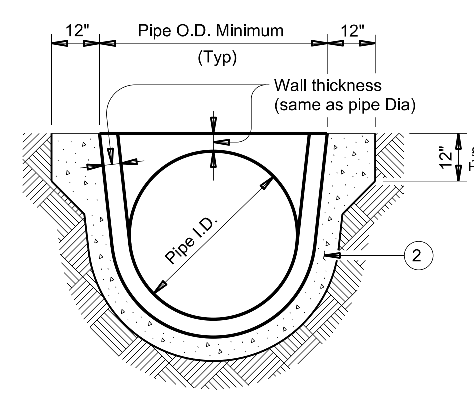
END DETAIL FOR INSTALLATION OF SAFETY PIPE RUNNERS

(If required)

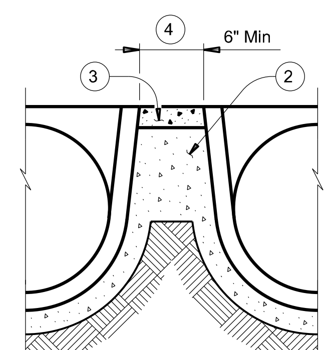


INSTALLATION DETAIL FOR SAFETY PIPE RUNNERS

(If required)



SECTION A-A



MULTIPLE PIPE INSTALLATION

Texas Department of Transportation

Bridge Division Standard

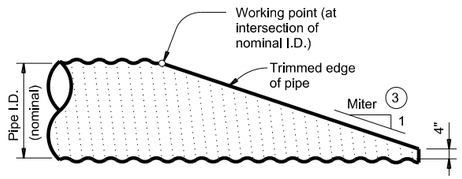
PRECAST SAFETY END TREATMENT

TYPE II ~ CROSS DRAINAGE

PSET-RC

FILE: psetrcss-20.dgn	DN: RLW	CK: KLR	DW: JTR	CK: GAF
©TxDOT February 2020	CONT 0720	SECT 01	JOB 044, ETC.	HIGHWAY FM 149,ETC.
REVISIONS	DIST BRYAN		COUNTY GRIMES	SHEET NO. 126

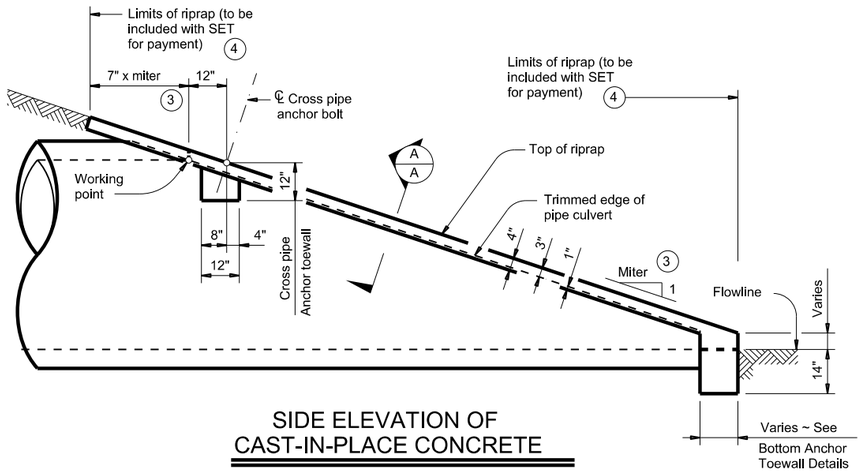
DATE: 4/19/2023 7:50:50 AM
FILE: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY/Design Projects/0720-01-044/... DrainageStandards/PSET-RC.dgn



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.

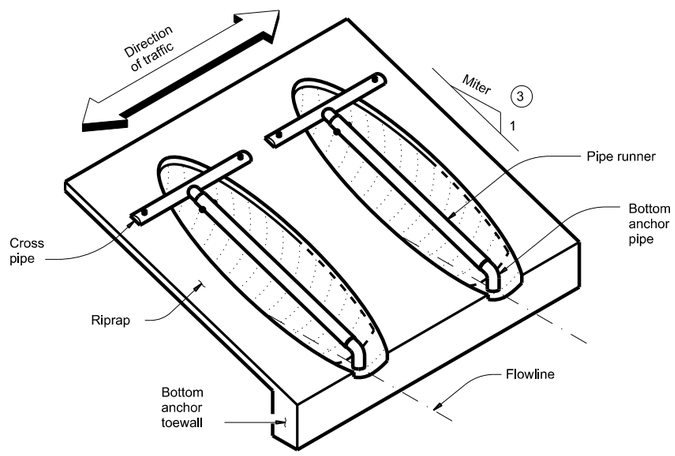
SIDE ELEVATION OF TYPICAL PIPE CULVERT MITER

(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.

Texas Department of Transportation

Bridge Division Standard

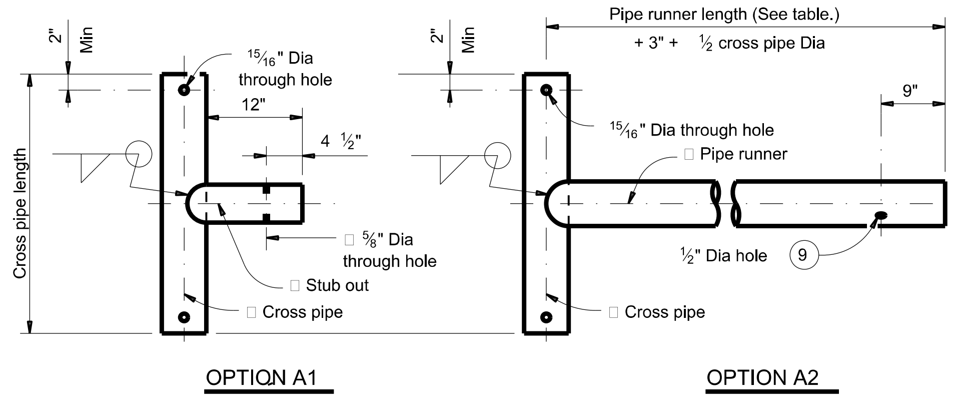
SAFETY END TREATMENT

FOR 12" DIA TO 60" DIA
PIPE CULVERTS
TYPE II ~ CROSS DRAINAGE

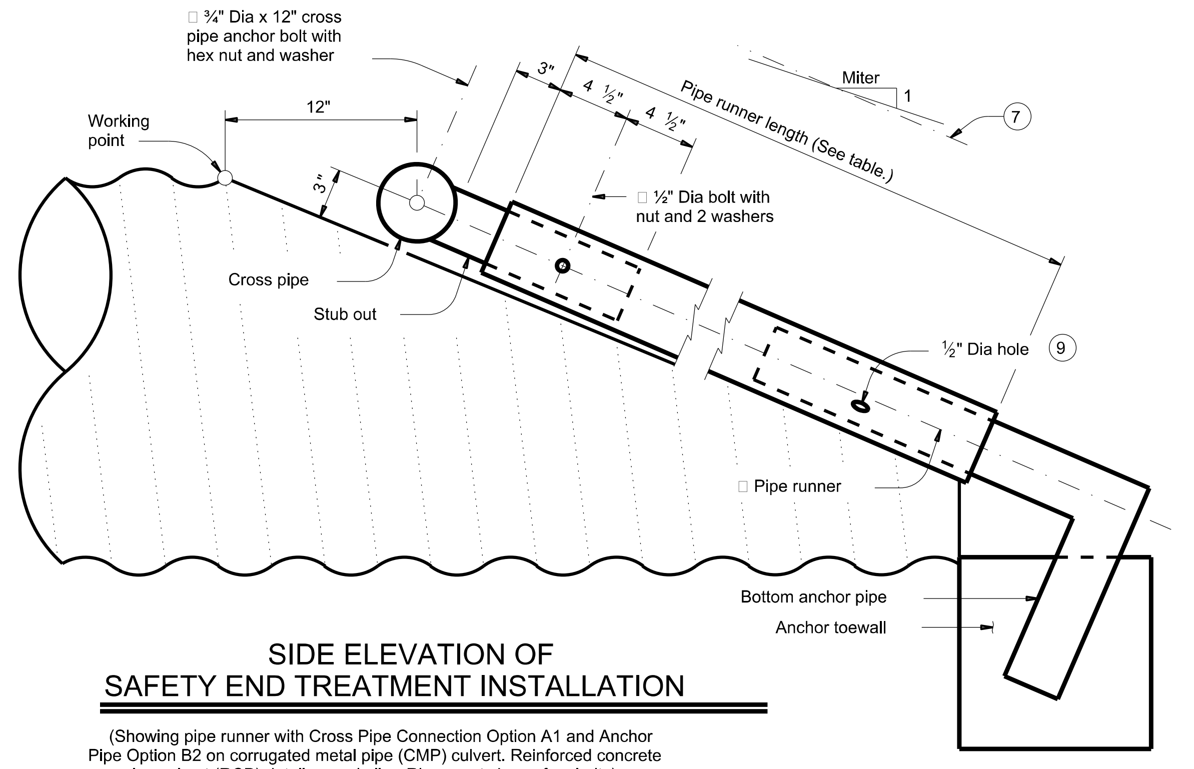
SETP-CD

FILE: setpcdse-20.dgn	DN: GAF	CK: CAT	DW: JRP	CK: GAF
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0720	01	044, ETC.	FM 149,ETC.
	DIST	COUNTY		SHEET NO.
	BRYAN	GRIMES		127

DATE: 4/19/2023 7:51:06 AM
FILE: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY/Design Projects/Drainage Standards/SETP-CD.dgn

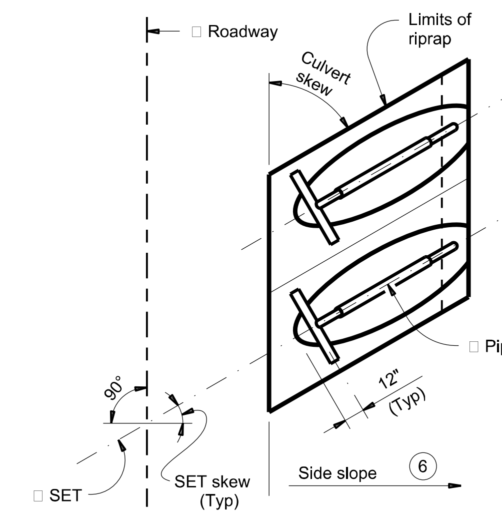


CROSS PIPE AND CONNECTIONS DETAILS

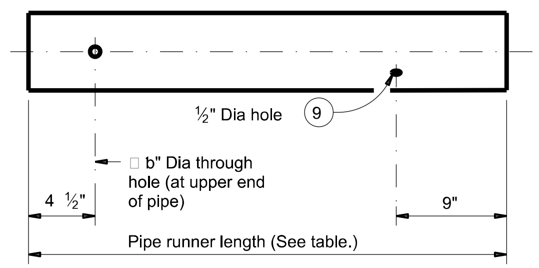


SIDE ELEVATION OF SAFETY END TREATMENT INSTALLATION

(Showing pipe runner with Cross Pipe Connection Option A1 and Anchor Pipe Option B2 on corrugated metal pipe (CMP) culvert. Reinforced concrete pipe culvert (RCP) details are similar. Riprap not shown for clarity)

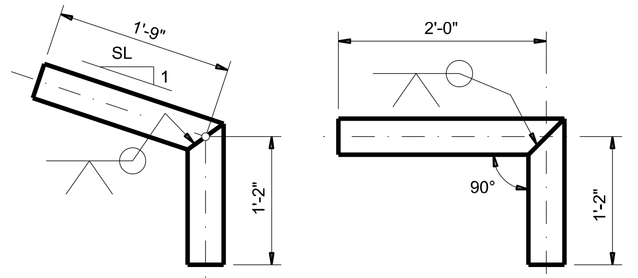


PLAN OF SKEWED INSTALLATION

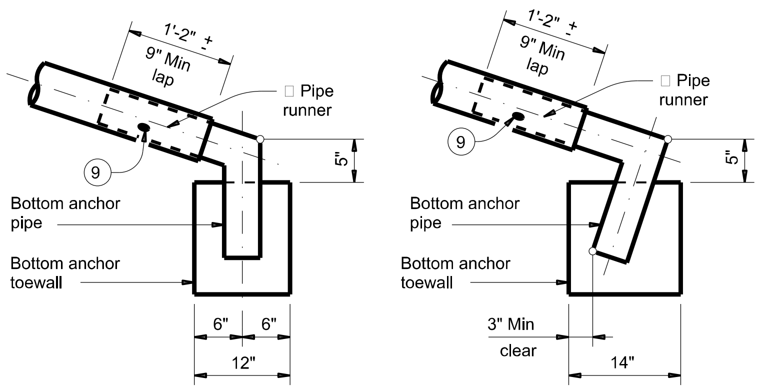


NOTE: The separate pipe runner shown is required when Cross Pipe Connection Option A1 is used.

PIPE RUNNER DETAILS

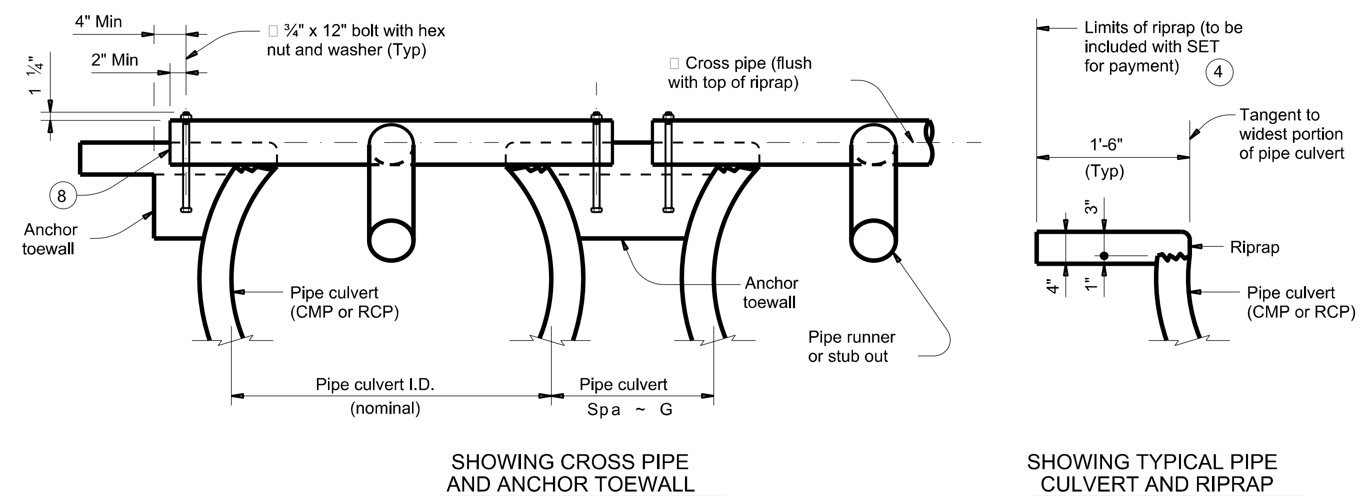


BOTTOM ANCHOR PIPE DETAILS (10)



BOTTOM ANCHOR TOEWALL DETAILS

(Culvert and riprap not shown for clarity.)



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".

DATE: 4/19/2023 7:51:06 AM
FILE: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY/Design Projects/0720-01-044, ETC./Standards/DrainageStandards/SETP-CD.dgn

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

FILE: setpcdse-20.dgn	DN: GAF	CK: CAT	DW: JRP	CK: GAF
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0720	01	044, ETC.	FM 149,ETC.
	DIST		COUNTY	SHEET NO.
	BRYAN		GRIMES	128

TABLE OF DIMENSIONS AND REINFORCING STEEL
(Wings for One Structure End)

Maximum Wingwall Height (10) Hw	W	X	Y	Z	Variable Reinforcing Bars J1 Size	Bars J1 Spa	Bars J2 Size	Bars J2 Spa	Estimated Quantities per ft of wing length (Two~Wings) (3) 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	0.585
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'-0"	
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:

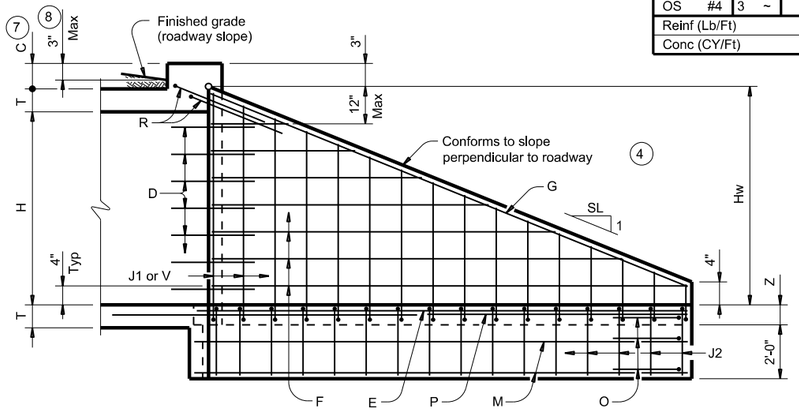
Ltw = [(N) (2U + S) + (N - 1) (0.500')] ÷ (cos θ)

Lc = (Ltw) - (2U) ÷ (cos θ)

Atw = (Lc) + (B)

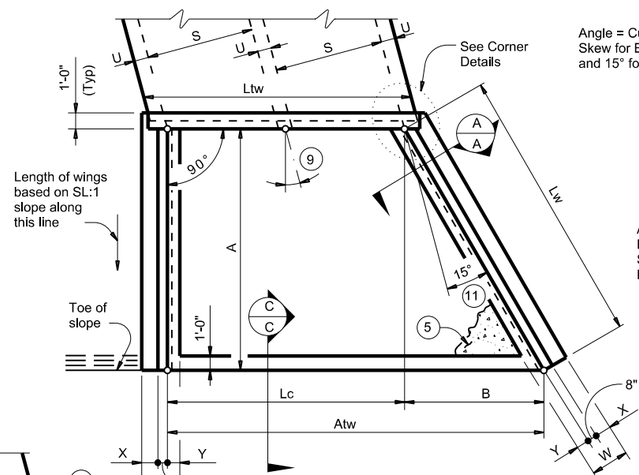
Total Wingwall Area (two wings ~ S.F.)
= (0.5) (Hw 0.333') (Lw + A)

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.



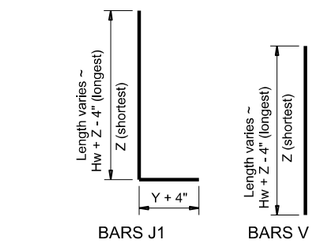
INSIDE ELEVATION OF WINGWALL

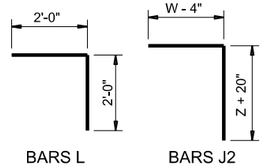
(Showing reinforcing. Culvert and culvert toewall reinforcing not shown for clarity.)

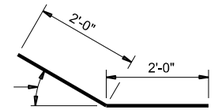


PLAN

(Showing dimensions and 15° skew.)

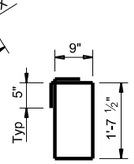


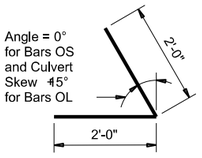




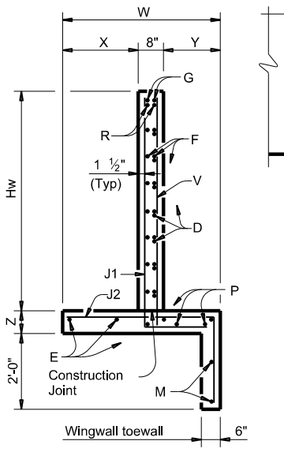
Angle = Culvert Skew for Bars DS and 15° for Bars DL

Angle = 0° for Bars RS and Culvert Skew 15° for Bars RL

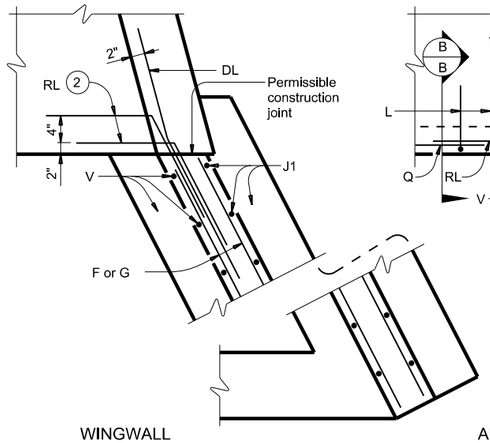




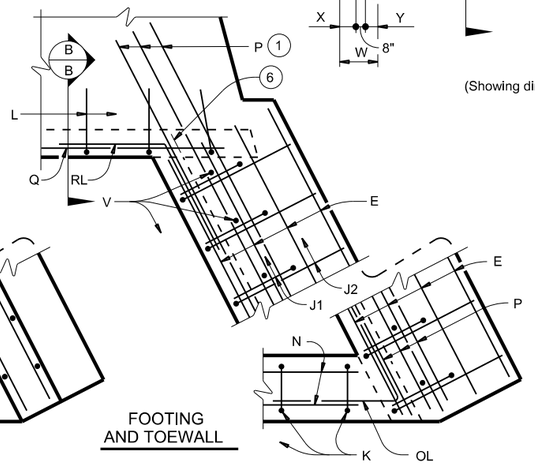
Angle = 0° for Bars OS and Culvert Skew 15° for Bars OL



SECTION A-A



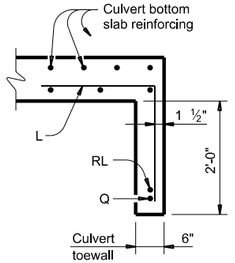
WINGWALL



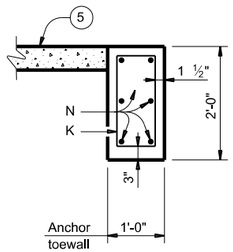
FOOTING AND TOEWALL

CORNER DETAILS

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



SECTION B-B (5)



SECTION C-C

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 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.

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		0720	01	044, ETC.	FM 149, ETC.
		DIST	COUNTY		SHEET NO.
		BRYAN	GRIMES		129

DATE: 4/19/2023 7:51:21 AM
FILE: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY/Design Projects/20070447/setbfsse-20.dgn

MAXIMUM PIPE RUNNER LENGTHS AND REQUIRED PIPE RUNNER AND ANCHOR PIPE SIZES

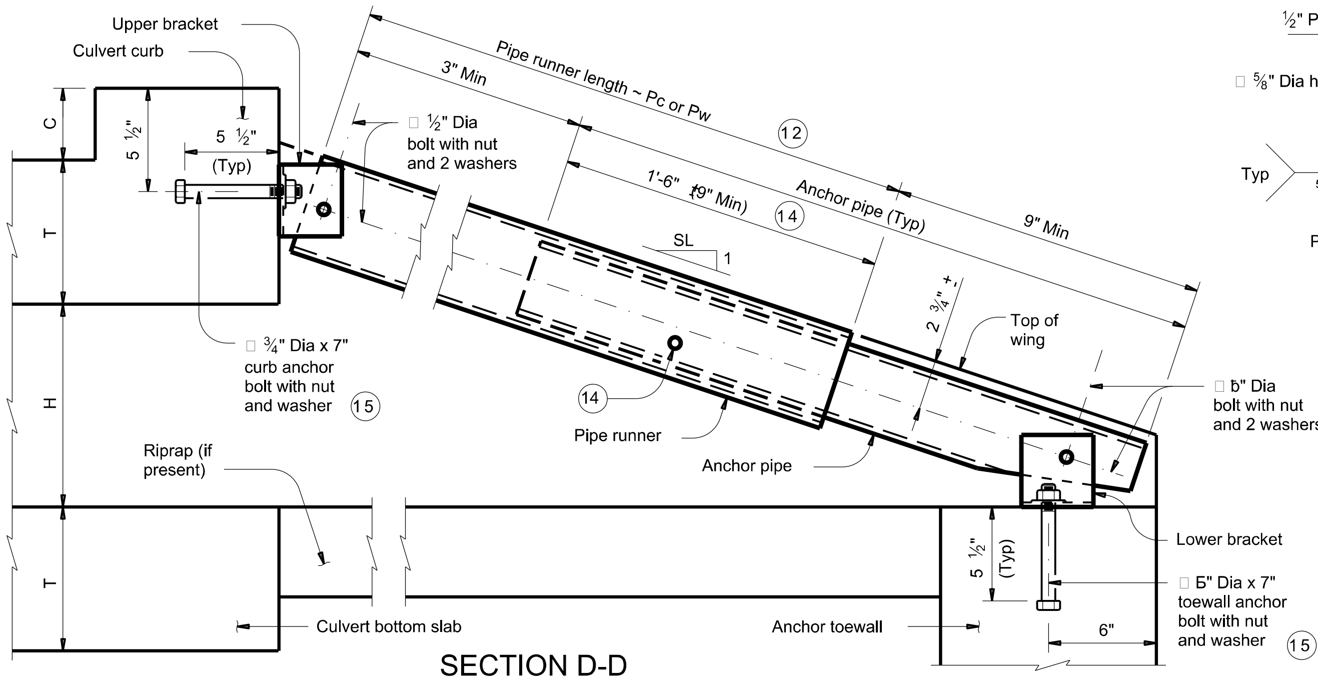
Maximum Pipe Runner Length (Pc or Pw)	Required Pipe Runner Size			Required Anchor Pipe Size		
	Pipe Size	Pipe O.D.	Pipe I.D.	Pipe Size	Pipe O.D.	Pipe I.D.
9'-4"	3" STD	3.500"	3.068"	2" STD	2.375"	2.067"
19'-0"	4" STD	4.500"	4.026"	3" STD	3.500"	3.068"
33'-6"	5" STD	5.563"	5.047"	4" STD	4.500"	4.026"

(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.

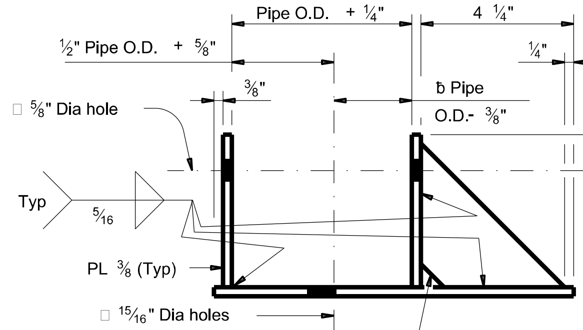
(14) After installation of pipe runner, use the ½" inspection hole to ensure that the lap of the anchor pipe with the pipe runner is adequate.

(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.

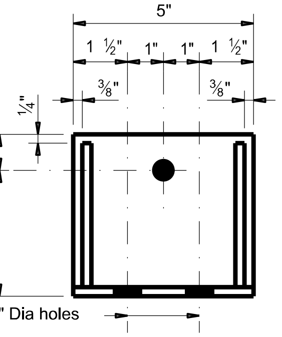


SECTION D-D

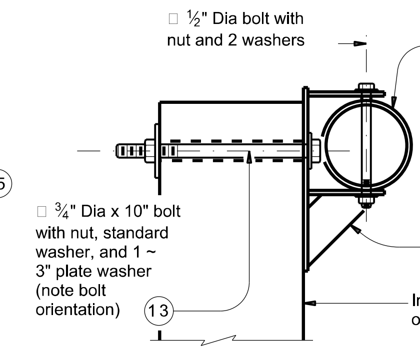
(Showing curb pipe runner. Except for upper bracket, wingwall pipe runners are similar.)



ELEVATION

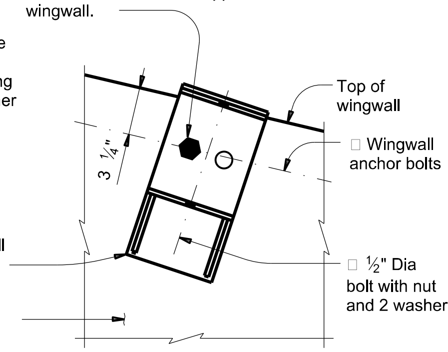


SIDE VIEW



SECTION E-E

(Showing installed bracket.)

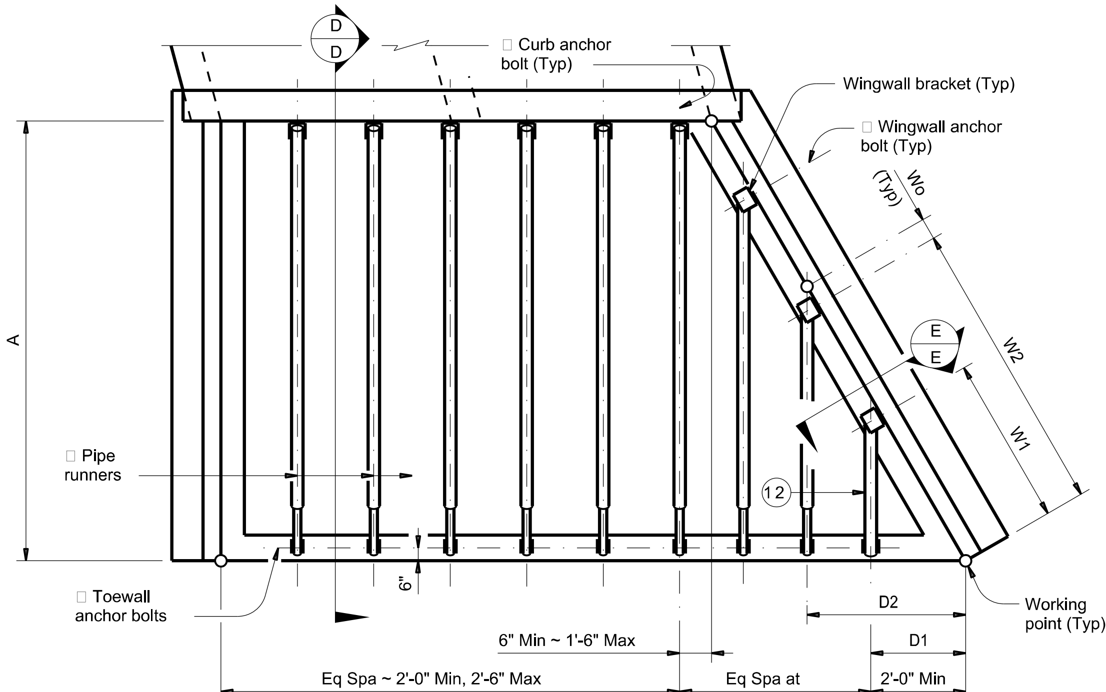


ELEVATION

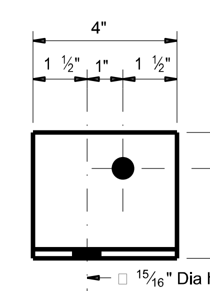
(Showing installed bracket normal to wall. Pipe not shown for clarity.)

Note: Match wingwall bracket to the upper curb bracket size.

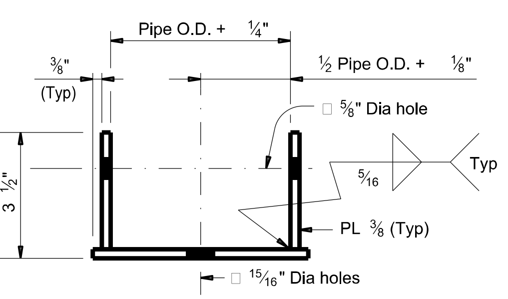
WINGWALL BRACKET DETAILS



PIPE RUNNER PLAN



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

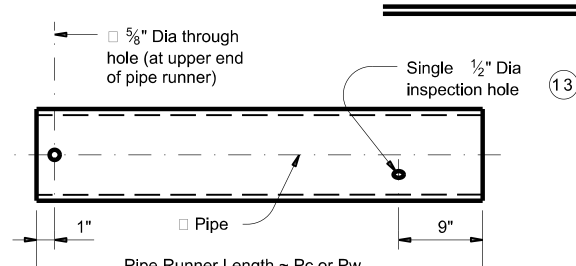
PIPE RUNNER DIMENSION CALCULATIONS:

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

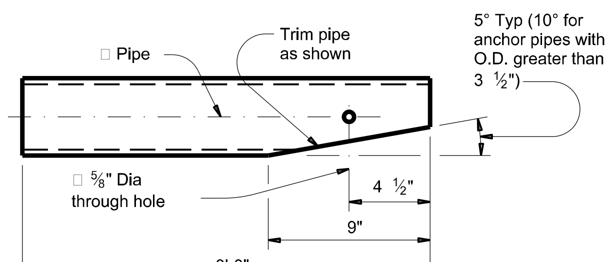
Slope SL:1	K1	K2~15° Skew	K2~30° Skew
3:1	1.054	1.826	1.054
4:1	1.031	1.785	1.031
6:1	1.014	1.756	1.014

K3 = 15° Skew ~ 2.000
30° Skew ~ 1.414
n = Wing pipe runner number
Wo = 15° Skew ~ 5"
30° Skew ~ 2 ½"

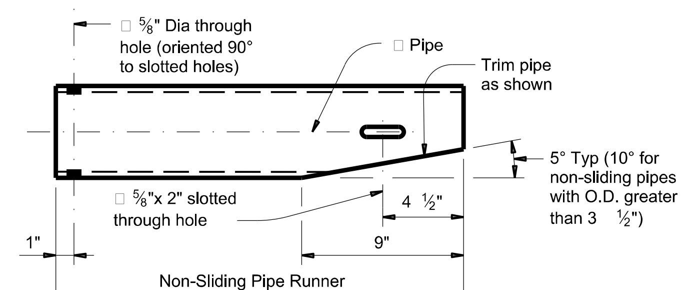


Note: Use pipe diameter required for curb pipe runner for wingwall pipe runner.

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

SHEET 2 OF 3

Texas Department of Transportation | Bridge Division Standard

SAFETY END TREATMENT WITH FLARED WINGS

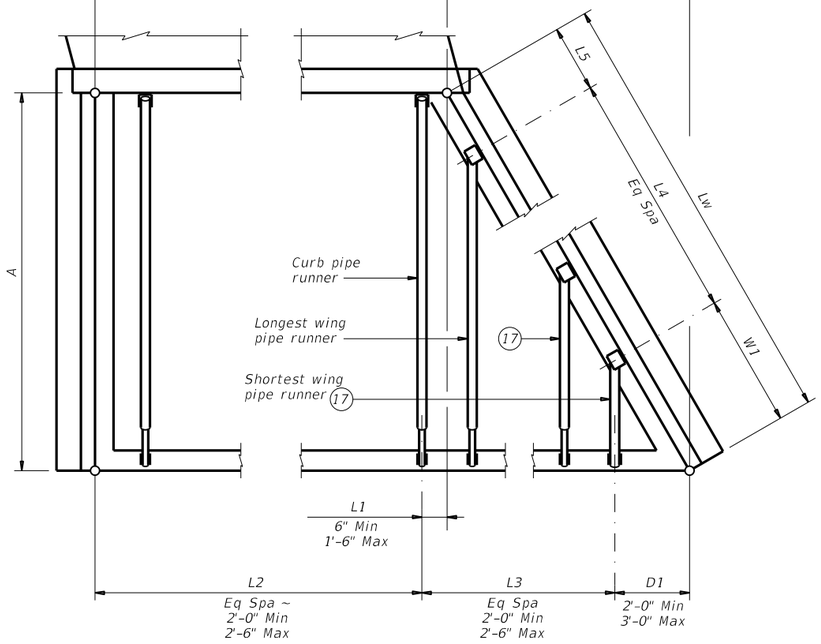
FOR 15° AND 30° SKEW BOX CULVERTS TYPE I ~ CROSS DRAINAGE

SETB-FW-S

FILE: setbfsse-20.dgn	DN: GAF	CK: CAT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0720	01	044, ETC.	FM 149,ETC.
	DIST		COUNTY	SHEET NO.
	BRYAN		GRIMES	130

DATE: 4/19/2023 7:51:22 AM
FILE: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY/Design Projects/.../DrainageStandards/SETB-FW-S.dgn

Culvert Station and/or Creek name followed by applicable end (Lt, Rt or Both) ⑯	Lc (Ft)	L1 (Ft)	L2			D1 (Ft)	L3			W1 (Ft)	L4			L5 (Ft)	Curb Pipe Runner (Pc)		Longest Wing Pipe Runner (Pw) (Ft)	Shortest Wing Pipe Runner (Pw) (Ft)	Non-Sliding Wing Pipe Runner (if applicable) (Ft)	Curb, Wing, and/or Non-Sliding Pipe Runners		3'-0" Anchor Pipe	
			No. Spa	Spa at (Ft)	Overall Length (Ft)		No. Spa	Spa at (Ft)	Overall Length (Ft)		No. Spa	Spa at (Ft)	Overall Length (Ft)		No.	Length (Ft)				Size (3",4" or 5")	Total ⑯ Length (Ft)	Size (2",3" or 4")	Total ⑯ Length (Ft)
STA 66+07 (Lt)	5.176'	0.500'	2	2.338'	4.676'	3.000'	2	2.286'	4.573'	5.583'	1	4.573'	4.573'	3.989'	2	11.229'	7.583'	3.417'	N/A	4"	33.458'	3"	12.000'
STA 66+07 (Lt)	5.176'	0.500'	2	2.338'	4.676'	3.000'	2	2.142'	4.284'	5.583'	1	4.284'	4.284'	3.701'	2	10.688'	7.333'	3.417'	N/A	4"	32.125'	3"	12.000'
STA 66+07 (Rt)	5.176'	0.500'	2	2.338'	4.676'	3.000'	3	2.310'	6.930'	5.583'	2	4.620'	9.240'	4.037'	2	15.146'	11.542'	3.292'	N/A	4"	52.542'	3"	15.000'
STA 66+07 (Rt)	5.176'	0.500'	2	2.338'	4.676'	3.000'	3	2.182'	6.545'	5.583'	2	4.363'	8.727'	3.780'	2	14.458'	11.083'	3.292'	N/A	4"	50.479'	3"	15.000'



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.

JEAN J. FENG
102035
Jean J. Feng
04/20/2023

SHEET 3 OF 3

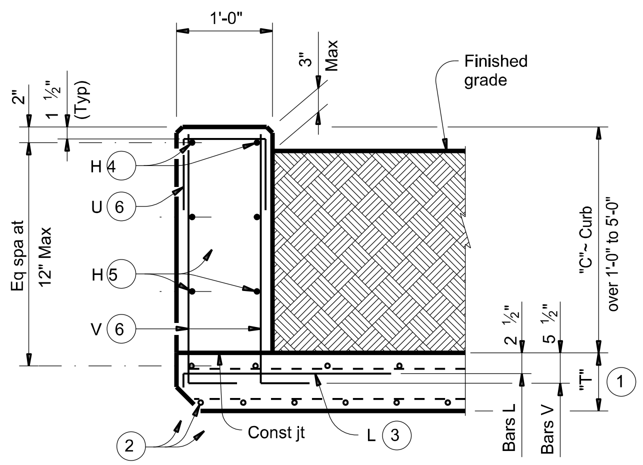
Texas Department of Transportation
Bridge Division Standard

SAFETY END TREATMENT WITH FLARED WINGS

FOR 15° AND 30° SKEW BOX CULVERTS TYPE I ~ CROSS DRAINAGE

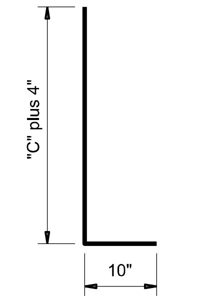
SETB-FW-S

FILE:	setbfsse-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT	February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS		0720	01	044, ETC.	FM 149, ETC.
		DIST		COUNTY	SHEET NO.
		BRYAN		GRIMES	131



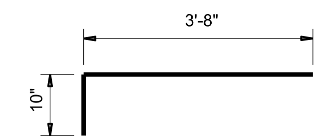
TYPICAL SECTION

Used for curbs over 1'-0" to 5'-0"



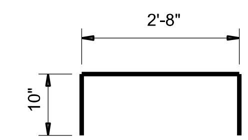
BARS V (#5) 6

Spaced at 12" Max



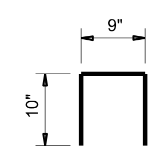
BARS L (#5) 3

Spaced at 12" Max



OPTIONAL BARS L (#5) 3 7

Spaced at 12" Max



BARS U (#4) 6

Spaced at 12" Max

1. "T" is equal to the culvert top slab thickness. For precast boxes with slabs less than 8" thick, see SCP-MD standard for additional details.
2. Adjust normal culvert slab bars as necessary to clear obstructions.
3. Place bars L as shown. Tilt hook as necessary to maintain cover.
4. Place normal culvert curb bars H(#4) as shown. Adjust as necessary to clear obstructions.
5. Additional bars H(#4) as required to maintain 12" Max spacing.
6. Replace normal culvert curb bars K with one bar U and two bars V as shown spaced at 12" Max. Adjust length of bars V as necessary to maintain clear cover.
7. Optional bars L are to be used only for precast box culverts with 3'-0" closure pour.
8. Quantities shown are for Contractor's information only. Quantities are per linear foot of curb length. The value in table can be interpolated for intermediate values of curb height, "C". Quantity includes bars K (when applicable).

TABLE OF ESTIMATED CURB QUANTITIES 8

Curb Height "C"	Conc (CY/LF)	Reinf Steel (Lb/LF)
1'-0"	0.037	10.4
1'-6"	0.056	14.5
2'-0"	0.074	15.6
2'-6"	0.093	18.0
3'-0"	0.111	19.0
3'-6"	0.130	21.3
4'-0"	0.148	22.4
4'-6"	0.167	24.8
5'-0"	0.185	25.9

CONSTRUCTION NOTES:

Adjust reinforcing steel as necessary to provide 1 ¼" cover.
For vehicle safety, top of the curb must not project more than 3" above the finished grade.

MATERIAL NOTES:

Provide Grade 60 reinforcing steel.
Provide galvanized reinforcing steel if required elsewhere in the plans.
Provide Class "C" concrete (f'c = 3,600 psi) minimum for curbs.
Provide bar laps, where required, as follows:
· Uncoated or galvanized ~ #4 = 1'-8" Min

GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications.
These extended curb details have sufficient strength to allow for future retrofit of Type T631 or T631LS railing. These details are suitable for use with PR11, PR22 and PR3 type rails. These details are not suitable for the mounting of other rail types. For new construction using T631 or T631LS railing, use the T631-CM standard.
This Curb is considered as part of the Box Culvert for payment.

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

Texas Department of Transportation — Bridge Division Standard

EXTENDED CURB DETAILS

FOR BOX CULVERTS WITH CURBS OVER 1'-0" TO 5'-0" TALL

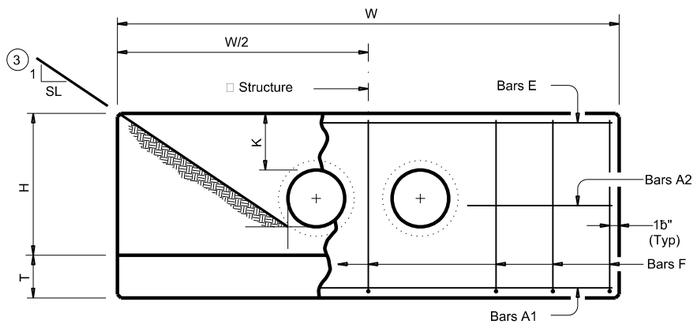
ECD

FILE: ecdstde1-20.dgn	DN: GAF	CK: TxDOT	DW: TxDOT	CK: GAF
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0720	01	044, ETC.	FM 149,ETC.
	DIST	COUNTY		SHEET NO.
	BRYAN	GRIMES		132

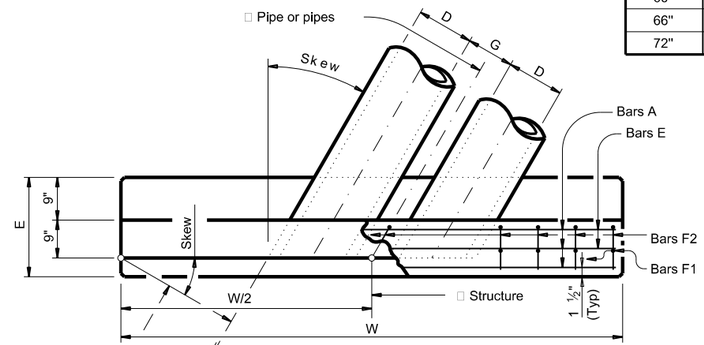
DATE: 4/19/2023 7:51:52 AM
FILE: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY/Design Projects/Drainage Standards/CH-PW-S.dgn

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 ¾"	15	0.2	10' - 5"	130	1.2	2' - 0"	16	0.2	12' - 9"	159	1.5	2' - 5 ¾"	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 ¾"	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 ¼"	33	0.4
	21"	13' - 2"	203	1.9	3' - 2 ¼"	31	0.4	14' - 9"	233	2.1	3' - 6 ¾"	33	0.4	18' - 0"	276	2.6	4' - 4 ¼"	36	0.5
	24"	14' - 6"	240	2.1	3' - 8 ¼"	34	0.4	16' - 2"	251	2.4	4' - 1 ¾"	36	0.5	19' - 10"	318	2.9	5' - 0 ¾"	39	0.6
	27"	15' - 9"	258	2.5	4' - 0 ¾"	38	0.5	17' - 7"	292	2.8	4' - 6 ¼"	39	0.6	21' - 7"	342	3.4	5' - 6 ¼"	44	0.7
	30"	17' - 1"	297	2.8	4' - 5 ¾"	40	0.6	19' - 1"	311	3.1	5' - 0"	42	0.6	23' - 4"	388	3.8	6' - 1 ¾"	47	0.8
	33"	18' - 5"	320	3.3	4' - 9 ¾"	43	0.6	20' - 6"	358	3.6	5' - 4 ¾"	46	0.7	25' - 1"	439	4.4	6' - 7 ¼"	51	0.9
	36"	19' - 8"	401	4.0	5' - 3"	47	0.9	21' - 11"	422	4.5	5' - 10 ¾"	50	0.9	26' - 10"	517	5.5	7' - 2 ¼"	55	1.2
	42"	22' - 3"	476	5.0	6' - 0 ¾"	53	1.1	24' - 10"	528	5.6	6' - 8 ¾"	56	1.2	30' - 5"	634	6.9	8' - 3"	76	1.4
	48"	25' - 11"	577	6.6	6' - 9 ¾"	60	1.3	28' - 10"	637	7.3	7' - 7 ¼"	79	1.5	35' - 4"	791	9.0	9' - 3 ¾"	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 ¼"	97	2.2
	60"	31' - 1"	805	9.2	8' - 6 ¼"	91	1.9	34' - 8"	881	10.2	9' - 6 ¼"	97	2.1	42' - 5"	1,113	12.5	11' - 8"	124	2.6
	66"	33' - 8"	907	10.6	9' - 0 ¾"	98	2.1	37' - 6"	1,028	11.8	10' - 1 ¼"	102	2.4	46' - 0"	1,235	14.5	12' - 4 ¼"	132	2.9
	72"	36' - 3"	1,071	12.1	9' - 8"	105	2.4	40' - 5"	1,207	13.5	10' - 9 ¼"	110	2.6	49' - 6"	1,446	16.6	13' - 2 ¼"	141	3.2
3:1	12"	13' - 6"	178	1.6	1' - 9 ¾"	15	0.2	15' - 0"	189	1.8	2' - 0"	15	0.2	18' - 5"	237	2.2	2' - 5 ¾"	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 ¾"	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 ¼"	32	0.4
	21"	18' - 11"	306	2.7	3' - 2 ¼"	31	0.4	21' - 1"	339	3.0	3' - 6 ¾"	33	0.4	25' - 10"	413	3.7	4' - 4 ¼"	36	0.5
	24"	20' - 8"	345	3.1	3' - 8 ¾"	35	0.4	23' - 1"	384	3.5	4' - 1 ¾"	36	0.5	28' - 3"	462	4.2	5' - 0 ¾"	40	0.6
	27"	22' - 6"	376	3.7	4' - 0 ¾"	38	0.5	25' - 1"	438	4.1	4' - 6 ¼"	39	0.6	30' - 9"	522	5.0	5' - 6 ¼"	44	0.7
	30"	24' - 4"	422	4.1	4' - 5 ¾"	40	0.6	27' - 2"	466	4.6	5' - 0"	42	0.6	33' - 3"	578	5.6	6' - 1 ¾"	47	0.8
	33"	26' - 2"	476	4.8	4' - 10"	43	0.6	29' - 2"	522	5.3	5' - 4 ¾"	46	0.7	35' - 9"	644	6.5	6' - 7 ¼"	51	0.9
	36"	27' - 11"	590	5.9	5' - 3"	47	0.8	31' - 2"	645	6.6	5' - 10 ¾"	50	0.9	38' - 2"	787	8.0	7' - 2 ¼"	56	1.2
	42"	31' - 7"	684	7.3	6' - 0 ¼"	53	1.1	35' - 3"	776	8.2	6' - 8 ¾"	56	1.2	43' - 2"	933	10.0	8' - 3"	79	1.4
	48"	36' - 9"	880	9.6	6' - 9 ¾"	61	1.3	41' - 0"	953	10.7	7' - 7 ¼"	81	1.5	50' - 2"	1,166	13.1	9' - 3 ¾"	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 ¼"	97	2.2
	60"	44' - 0"	1,224	13.3	8' - 6 ¼"	93	1.9	49' - 1"	1,356	14.8	9' - 6 ¼"	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 ¼"	103	2.3	65' - 1"	1,892	21.1	12' - 4 ¼"	130	2.9
	72"	51' - 3"	1,624	17.7	9' - 8"	105	2.3	57' - 2"	1,787	19.7	10' - 9 ¼"	109	2.6	70' - 0"	2,218	24.1	13' - 2 ¼"	139	3.2
4:1	12"	17' - 7"	232	2.1	1' - 9 ¾"	15	0.2	19' - 8"	259	2.4	2' - 0"	16	0.2	24' - 0"	314	2.9	2' - 5 ¾"	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 ¾"	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 ¼"	32	0.4
	21"	24' - 7"	407	3.6	3' - 2 ¼"	31	0.4	27' - 5"	446	4.0	3' - 6 ¾"	33	0.4	33' - 7"	549	4.9	4' - 4 ¼"	36	0.5
	24"	26' - 11"	455	4.1	3' - 8 ¾"	35	0.4	30' - 0"	499	4.5	4' - 1 ¾"	36	0.5	36' - 9"	609	5.6	5' - 0 ¾"	40	0.6
	27"	29' - 3"	514	4.8	4' - 0 ¾"	38	0.5	32' - 7"	562	5.4	4' - 6 ¼"	40	0.6	39' - 11"	703	6.6	5' - 6 ¼"	43	0.7
	30"	31' - 7"	568	5.4	4' - 5 ¾"	40	0.6	35' - 3"	620	6.0	5' - 0"	42	0.6	43' - 2"	768	7.4	6' - 1 ¾"	49	0.8
	33"	33' - 11"	634	6.2	4' - 10"	43	0.7	37' - 10"	710	7.0	5' - 4 ¾"	46	0.7	46' - 4"	848	8.5	6' - 7 ¼"	52	0.9
	36"	36' - 3"	776	7.7	5' - 3"	48	0.9	40' - 5"	868	8.6	5' - 10 ¾"	49	0.9	49' - 6"	1,058	10.6	7' - 2 ¼"	56	1.1
	42"	40' - 11"	921	9.6	6' - 0 ¼"	53	1.0	45' - 7"	1,022	10.7	6' - 8 ¾"	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 ¼"	80	1.5	65' - 1"	1,587	17.2	9' - 3 ¾"	86	1.8
	54"	52' - 3"	1,416	14.9	7' - 9 ¼"	86	1.6	58' - 4"	1,589	16.6	8' - 8"	89	1.8	71' - 5"	1,924	20.4	10' - 7 ¼"	95	2.2
	60"	56' - 11"	1,606	17.5	8' - 6 ¾"	92	1.9	63' - 6"	1,806	19.5	9' - 6 ¼"	95	2.1	77' - 9"	2,192	23.9	11' - 8"	122	2.6
	66"	61' - 7"	1,819	20.2	9' - 0 ¾"	97	2.1	68' - 8"	2,019	22.5	10' - 1 ¼"	101	2.4	84' - 2"	2,472	27.6	12' - 4 ¼"	131	2.9
	72"	66' - 3"	2,150	23.2	9' - 8"	104	2.4	73' - 11"	2,379	25.9	10' - 9 ¼"	108	2.6	90' - 6"	2,937	31.7	13' - 2 ¼"	138	3.2
6:1	12"	25' - 11"	342	3.1	1' - 9 ¾"	15	0.2	28' - 10"	374	3.5	2' - 0"	16	0.2	35' - 4"	456	4.3	2' - 5 ¾"	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 ¾"	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 ¼"	33	0.4
	21"	36' - 0"	608	5.3	3' - 2 ¼"	31	0.4	40' - 2"	660	5.9	3' - 6 ¾"	33	0.4	49' - 2"	823	7.2	4' - 4 ¼"	38	0.5
	24"	39' - 4"	672	6.0	3' - 8 ¾"	35	0.4	43' - 11"	748	6.7	4' - 1 ¾"	36	0.5	53' - 9"	920	8.2	5' - 0 ¾"	42	0.6
	27"	42' - 8"	770	7.1	4' - 0 ¾"	38	0.5	47' - 8"	852	8.0	4' - 6 ¼"	41	0.5	58' - 4"	1,039	9.7	5' - 6 ¼"	45	0.7
	30"	46' - 1"	839	8.0	4' - 5 ¾"	40	0.6	51' - 5"	949	8.9	5' - 0"	44	0.6	62' - 11"	1,162	10.9	6' - 1 ¾"	48	0.8
	33"	49' - 5"	947	9.2	4' - 10"	45	0.7	55' - 2"	1,040	10.3	5' - 4 ¾"	48	0.7	67' - 6"	1,292	12.6	6' - 7 ¼"	50	0.9
	36"	52' - 10"	1,151	11.4	5' - 3"	49	0.8	58' - 11"	1,287	12.7	5' - 10 ¾"	51	1.0	72' - 1"	1,583	15.6	7' - 2 ¼"	55	1.1
	42"	59' - 6"	1,365	14.2	6' - 0 ¼"	55	1.0	66' - 5"	1,530	15.8	6' - 8 ¾"	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 ¼"	79	1.5	94' - 9"	2,368	25.3	9' - 3 ¾"	86	1.8
	54"	76' - 1"	2,138	22.0	7' - 9 ¼"	83	1.6	84' - 10"	2,378	24.6	8' - 8"	87	1.8	103' - 11"	2,912	30.1	10' - 7 ¼"	95	2.2
	60"	82' - 10"	2,426	25.8	8' - 6 ¾"	90	1.9	92' - 5"	2,681	28.8	9' - 6 ¼"	94	2.1	113' - 2"	3,294	35.3	11' - 8"	122	2.6
	66"	89' - 7"	2,730	29.9	9' - 0 ¾"	96	2.1	99' - 11"	3,038	33.3	10' - 1 ¼"	101	2.4	122' - 4"	3,697	40.8	12' - 4 ¼"	130	2.9
	72"	96' - 3"	3,218	34.2	9' - 8"	102	2.4	107' - 5"	3,580	38.2	10' - 9 ¼"	108	2.6	131' - 6"	4,372	46.8	13' - 2 ¼"	139	3.2



ELEVATION

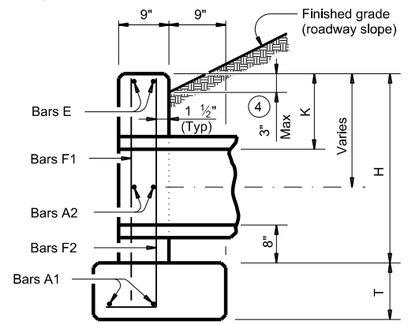


Lengths of wings based on SL:1 slope along this line.

3 Toe of slope

PLAN OF SKEWED PIPES

Showing 30° skew.



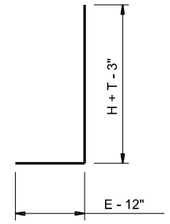
SECTION AT CENTER OF PIPE

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"	~



BARS F2

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.

(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).

Texas Department of Transportation

Bridge Division Standard

CONCRETE HEADWALLS WITH PARALLEL WINGS FOR SKEWED PIPE CULVERTS

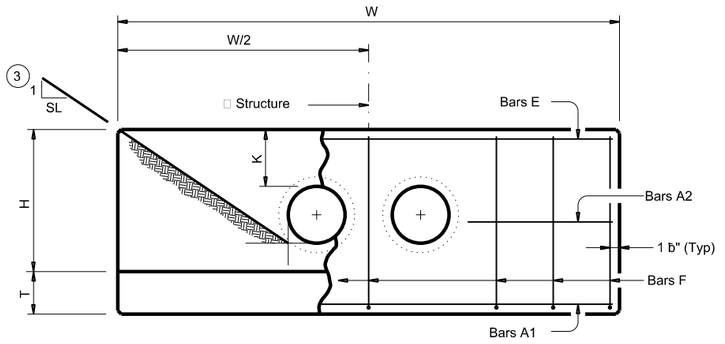
CH-PW-S

FILE: chpwsste-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0720	01	044,ETC.	FM 149,ETC.
	DIST	COUNTY		SHEET NO.
	BRYAN	GRIMES		133

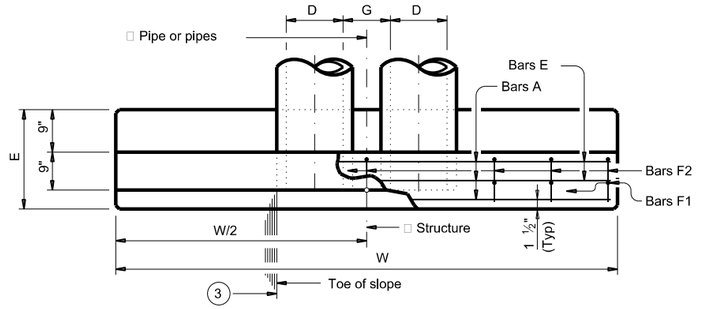
DATE: 4/19/2023 7:52:08 AM
FILE: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY/Design Projects/CH-PW-0.dgn

TABLE OF VARIABLE DIMENSIONS AND QUANTITIES FOR ONE HEADWALL (5)

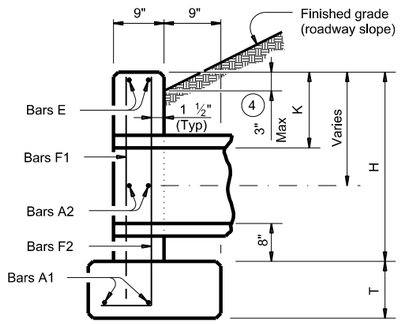
Slope	Dia of Pipe (D)	Values for One Pipe W	Values for One Pipe Reinf (Lbs) (1)	Values for One Pipe Conc (CY) (2)	Values To Be Added for Each Addt'l Pipe W	Values To Be Added for Each Addt'l Pipe Reinf (Lbs) (1)	Values To Be Added for Each Addt'l Pipe Conc (CY) (2)
2:1	12"	9' - 0"	122	1.1	1' - 9"	15	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



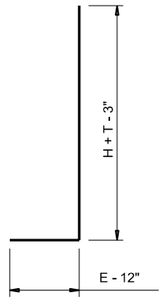
ELEVATION



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.

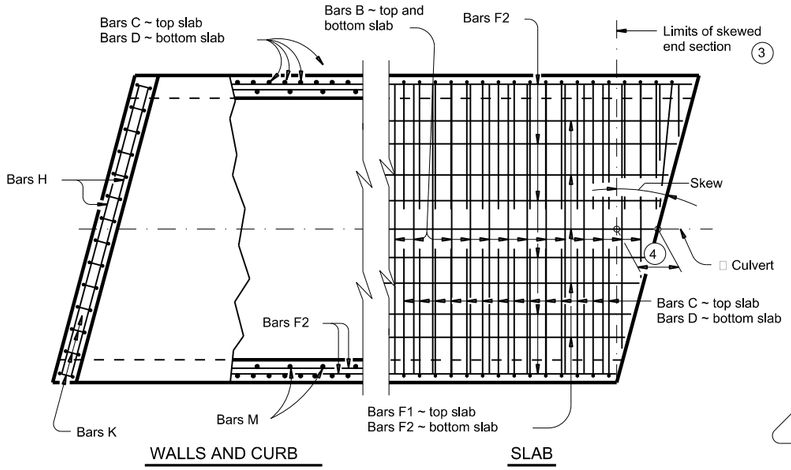
Texas Department of Transportation

Bridge Division Standard

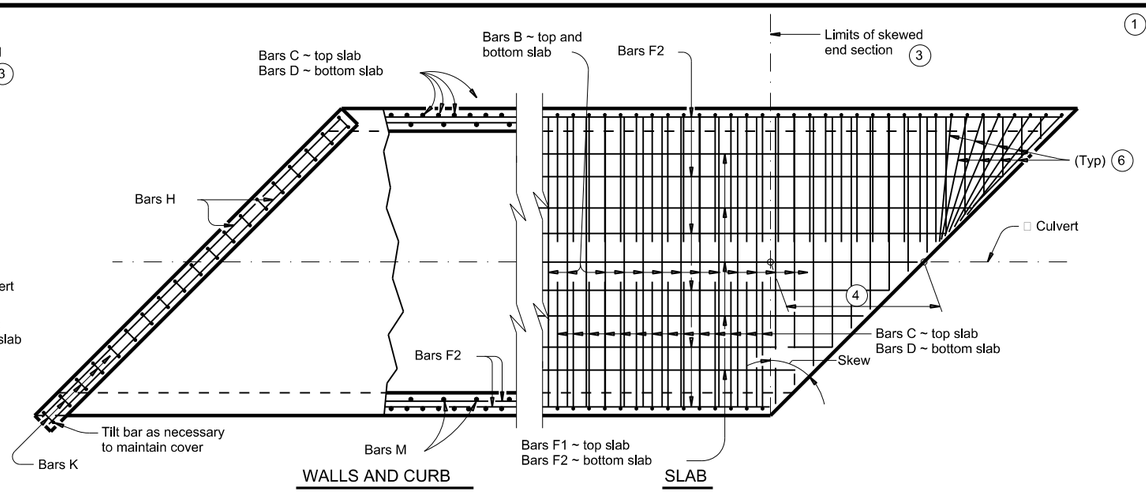
CONCRETE HEADWALLS WITH PARALLEL WINGS FOR NON-SKEWED PIPE CULVERTS

CH-PW-0

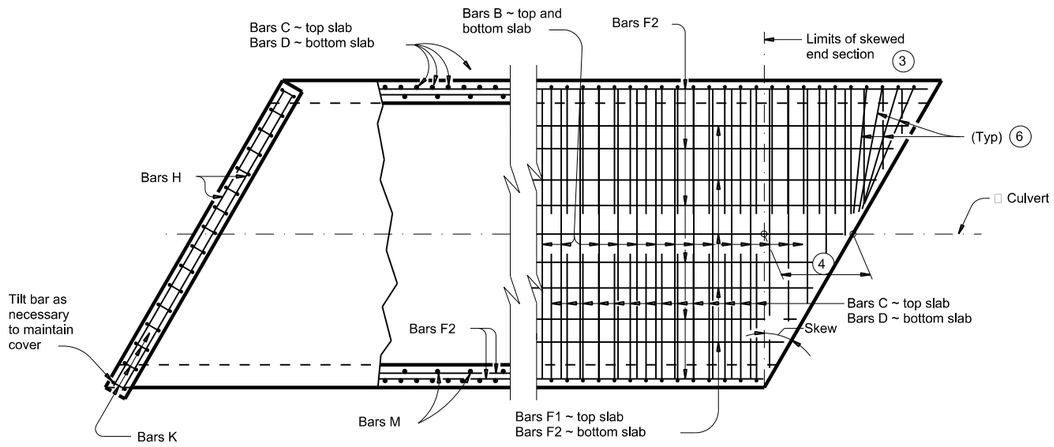
FILE: chpw0ste-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0720	01	044, ETC.	FM 149,ETC,
	DIST	COUNTY		SHEET NO.
	BRYAN	GRIMES		134



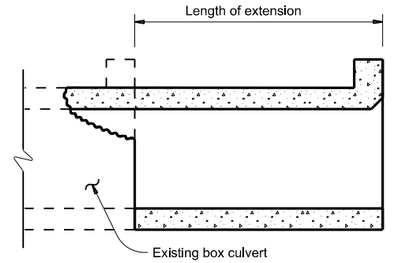
PLAN OF SKEWED ENDS ~ FROM 0° TO 15° (7)



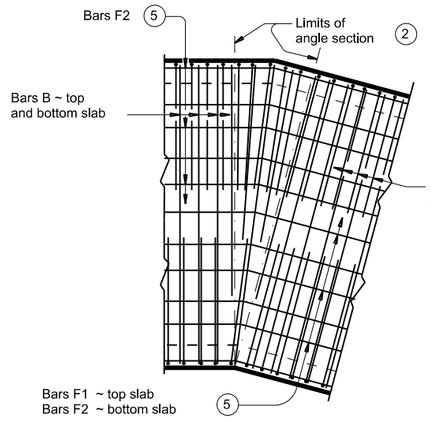
PLAN OF SKEWED ENDS ~ OVER 30° TO 45°



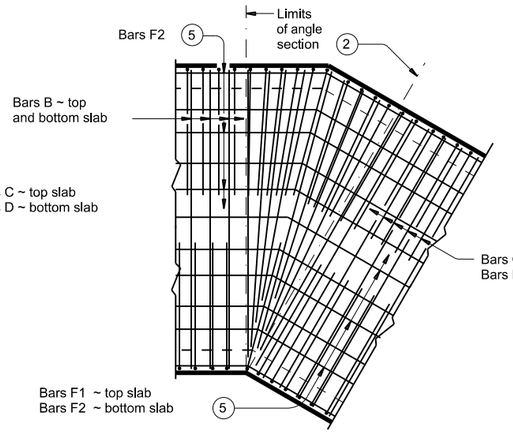
PLAN OF SKEWED ENDS ~ OVER 15° TO 30°



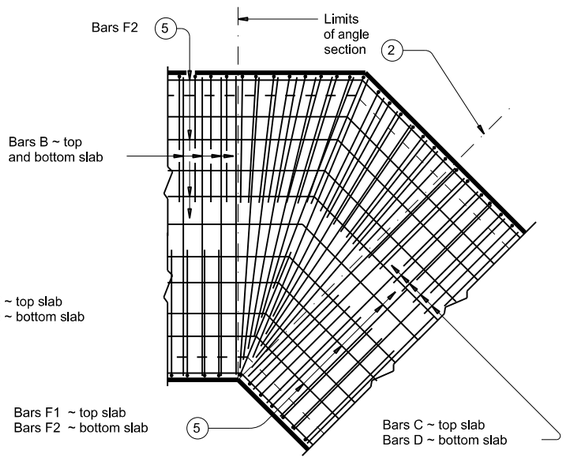
LENGTHENING DETAIL (1)



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 with the longitudinal bars in the extension.

For non-skewed box culverts with less than 2'-0" of fill and for skewed or non-skewed culverts with a fill depth of 2'-0" or greater, break back the top slab to provide a 1'-10" minimum lap of the existing longitudinal bars with the longitudinal bars in the extension. Alternatively, if the box is non-skewed, embed #6 anchor bars with a Type III, C, D , E, or F anchor adhesive into the existing walls, top and bottom slab at 1'-6" center-to-center spacing. Minimum embedment depth is 8". Anchor adhesive chosen must be able to achieve a basic bond strength in tension, Nba, of 26.4 kips. Submit signed and sealed calculations or the manufacturer's published literature showing the proposed anchor adhesive's ability to develop this load to the Engineer for approval prior to use. Anchor installation, including hole size, drilling, and clean out, must be in accordance with Item 450, "Railing." Test adhesive anchors in accordance with Item 450.3.3, "Tests." Test 3 anchors per 100 anchors installed.

Break back wings and apron as necessary to install the extension. Clean and extend the exposed wingwall and apron reinforcing into the extension. When lengthening existing box culverts with dimensions different than current standard dimensions, form horizontal and vertical transitions as directed by the Engineer. Match bottom slabs to maintain an uninterrupted flow line. Field bend existing and new reinforcing into transitions and maintain specified cover requirements. For top slabs of culverts with overlay, with 1-to-2 course surface treatment, or with the top slab as the final riding surface, adjust the "H" dimension to provide a smooth riding surface.

(2) When the spacing between Bars B becomes less than half of the normal spacing, cut bars to avoid conflict.

(3) The length of Bars B vary in the skewed end sections.

(4) [One half of overall width] 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 conflict in acute corners, shorten the slab extension leg of Bars C and Bars D to a minimum of 1'-6" for skews of 30° thru 45°.

(7) At the Contractor's option, for skews of 15° or less, place Bars B, C, and D parallel to the skewed end while maintaining spacing along centerline of box. Increase lengths of Bars B shown on the Single Box Culverts Cast-In-Place (SCC) standards sheets to accommodate the skew.

CONSTRUCTION NOTES:

Do not use permanent forms.
When required, lap Bars H 1'-8" for uncoated or galvanized bars.
Provide a minimum of 1 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 sizes, maximum bar spacing, and any other details not shown.

For skewed ends with curbs, adjust length of Bars H, number of Bars K, curb concrete volume, and reinforcing steel weight by dividing the values shown on the culvert Single Box Culverts Cast-In-Place (SCC) standard sheets by the cosine of the skew angle.

Cover dimensions are clear dimensions, unless noted otherwise.

HL93 LOADING

Texas Department of Transportation

Bridge Division Standard

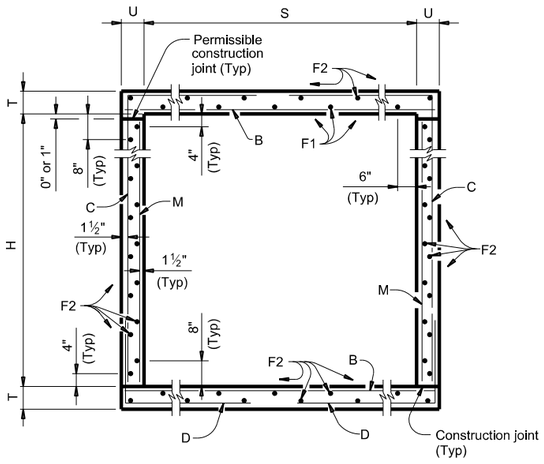
SINGLE BOX CULVERTS CAST-IN-PLACE MISCELLANEOUS DETAILS

SCC-MD

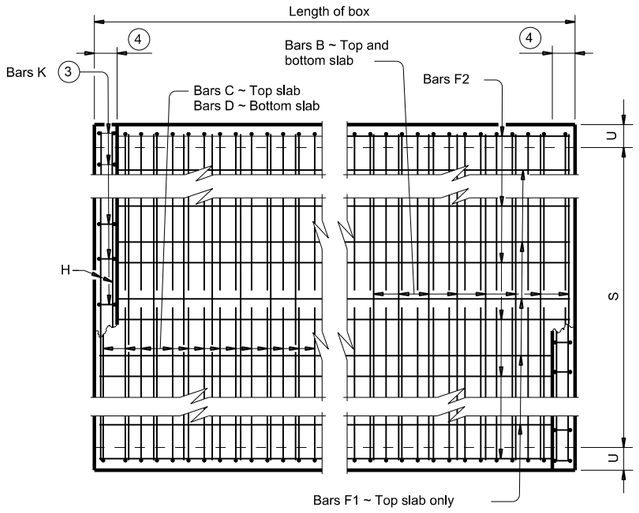
FILE: sccmdste-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0720	01	044, ETC.	FM 149,ETC.
	DIST	COUNTY		SHEET NO.
	BRYAN	GRIMES		135

DATE: 4/19/2023 7:52:22 AM
FILE: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY/Design Projects/SCC-MD/Drawings/Standards/SCC-MD.dgn

DATE: $DATE$ $TIME$
FILE: $FILE$



TYPICAL SECTION



PLAN OF REINF STEEL

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.

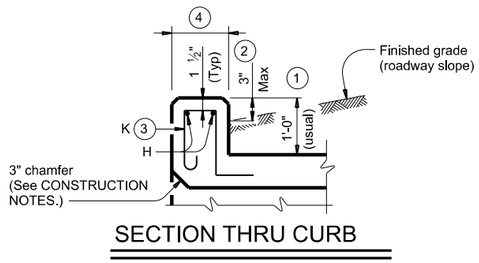
2. For vehicle safety, the following requirements must be met:
   · For structures without bridge rail, construct curbs no more than 3" above finished grade.
   · For structures with bridge rail, construct curbs flush with finished grade.
   Reduce curb heights, if necessary, to meet the above requirements. 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).



SECTION THRU CURB

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.

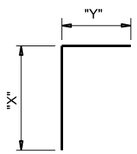
MATERIAL NOTES:

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

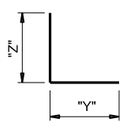
GENERAL NOTES:

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.

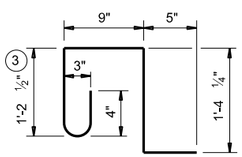
Cover dimensions are clear dimensions, unless noted otherwise.
Reinforcing bar dimensions shown are out-to-out of bar.



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-5 & 6

FILE: scc56ste-21.dgn	DN: TBE	CK: BMP	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0720	01	044,ETC.	FM 149,ETC.
04/2021 Updated X values.	DIST	COUNTY		SHEET NO.
	BRYAN	GRIMES		136

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

DATE: $DATE$ $TIME$
FILE: $FILE$

SECTION DIMENSIONS				⑤ FILL HEIGHT	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' - 3"	704	2' - 6"	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	80.5	0.5	55	16.1	3,276
5' - 0"	2' - 0"	9"	7"	30'	108	#6	9"	5' - 11"	960	108	#5	9"	6' - 4"	713	2' - 7"	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	81.0	0.5	55	17.6	3,294
5' - 0"	3' - 0"	8"	7"	26'	108	#6	9"	5' - 11"	960	108	#5	9"	7' - 3"	817	3' - 6"	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	87.8	0.5	55	17.8	3,567
5' - 0"	3' - 0"	9"	7"	30'	108	#6	9"	5' - 11"	960	108	#5	9"	7' - 4"	826	3' - 7"	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	88.3	0.5	55	19.3	3,585
5' - 0"	4' - 0"	8"	7"	26'	108	#6	9"	5' - 11"	960	108	#5	9"	8' - 3"	929	4' - 6"	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	92.4	0.5	55	19.5	3,752
5' - 0"	4' - 0"	9"	7"	30'	108	#6	9"	5' - 11"	960	108	#5	9"	8' - 4"	939	4' - 7"	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	92.9	0.5	55	21.1	3,771
5' - 0"	5' - 0"	8"	7"	26'	108	#6	9"	5' - 11"	960	108	#5	9"	9' - 3"	1,042	5' - 6"	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	99.7	0.5	55	21.3	4,044
5' - 0"	5' - 0"	9"	7"	30'	108	#6	9"	5' - 11"	960	108	#5	9"	9' - 4"	1,051	5' - 7"	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	100.2	0.5	55	22.8	4,062
6' - 0"	2' - 0"	8"	7"	20'	108	#6	9"	6' - 11"	1,122	108	#5	9"	6' - 7"	742	2' - 6"	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	89.1	0.5	63	18.1	3,628
6' - 0"	2' - 0"	9"	7"	26'	108	#6	9"	6' - 11"	1,122	162	#5	6"	6' - 8"	1,126	2' - 7"	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	108.6	0.5	63	19.9	4,407
6' - 0"	2' - 0"	10"	8"	30'	108	#6	9"	7' - 1"	1,149	162	#5	6"	6' - 10"	1,155	2' - 8"	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	109.9	0.5	69	22.6	4,463
6' - 0"	3' - 0"	8"	7"	20'	108	#6	9"	6' - 11"	1,122	108	#5	9"	7' - 7"	854	3' - 6"	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	96.4	0.5	63	19.9	3,918
6' - 0"	3' - 0"	9"	7"	26'	108	#6	9"	6' - 11"	1,122	162	#5	6"	7' - 8"	1,295	3' - 7"	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	117.3	0.5	63	21.6	4,754
6' - 0"	3' - 0"	10"	8"	30'	108	#6	9"	7' - 1"	1,149	162	#5	6"	7' - 10"	1,324	3' - 8"	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	118.1	0.5	69	24.6	4,792
6' - 0"	4' - 0"	8"	7"	20'	108	#6	9"	6' - 11"	1,122	108	#5	9"	8' - 7"	967	4' - 6"	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	101.0	0.5	63	21.6	4,104
6' - 0"	4' - 0"	9"	7"	26'	108	#6	9"	6' - 11"	1,122	162	#5	6"	8' - 8"	1,464	4' - 7"	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	123.3	0.5	63	23.4	4,996
6' - 0"	4' - 0"	10"	8"	30'	108	#6	9"	7' - 1"	1,149	162	#5	6"	8' - 10"	1,493	4' - 8"	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	123.7	0.5	69	26.5	5,016
6' - 0"	5' - 0"	8"	7"	20'	108	#6	9"	6' - 11"	1,122	108	#5	9"	9' - 7"	1,080	5' - 6"	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	108.3	0.5	63	23.3	4,395
6' - 0"	5' - 0"	9"	7"	26'	108	#6	9"	6' - 11"	1,122	162	#5	6"	9' - 8"	1,633	5' - 7"	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	132.0	0.5	63	25.1	5,343
6' - 0"	5' - 0"	10"	8"	30'	108	#6	9"	7' - 1"	1,149	162	#5	6"	9' - 10"	1,661	5' - 8"	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	131.9	0.5	69	28.5	5,345
6' - 0"	6' - 0"	8"	7"	20'	108	#6	9"	6' - 11"	1,122	108	#5	9"	10' - 7"	1,192	6' - 6"	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	115.6	0.5	63	25.0	4,685
6' - 0"	6' - 0"	9"	7"	26'	108	#6	9"	6' - 11"	1,122	162	#5	6"	10' - 8"	1,802	6' - 7"	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	140.7	0.5	63	26.8	5,690
6' - 0"	6' - 0"	10"	8"	30'	108	#6	9"	7' - 1"	1,149	162	#5	6"	10' - 10"	1,830	6' - 8"	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	140.2	0.5	69	30.5	5,675

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

HL93 LOADING SHEET 2 OF 2

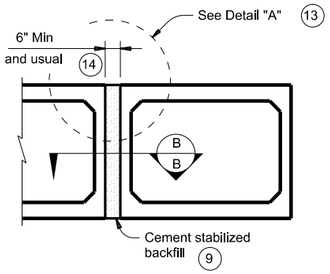
Texas Department of Transportation

Bridge Division Standard

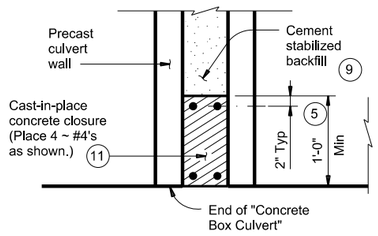
SINGLE BOX CULVERTS CAST-IN-PLACE
0' TO 30' FILL

SCC-5 & 6

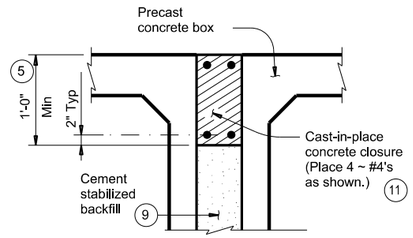
FILE: scc56ste-21.dgn	DN: TBE	CK: BMP	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0720	01	044, ETC.	FM 149, ETC.
04/2021 Updated X values.	DIST	COUNTY		SHEET NO.
	BRYAN	GRIMES		137



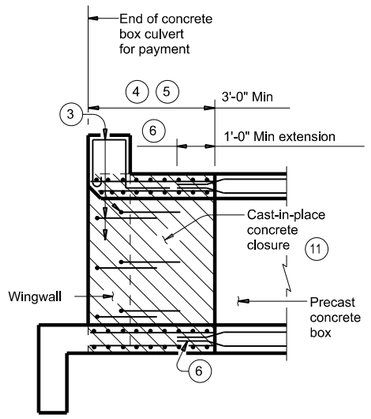
MULTIPLE UNIT PLACEMENT



SECTION B-B

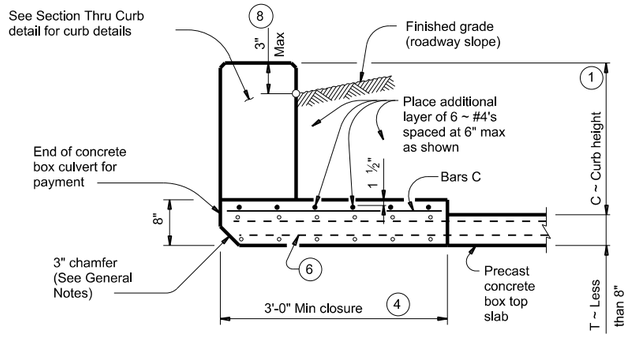


DETAIL "A" (13)

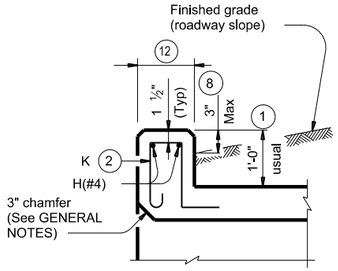


WINGWALL CONNECTION

(Also applies to safety end treatment.)

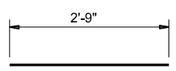


SECTION THRU TOP SLABS LESS THAN 8"

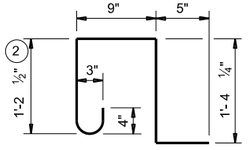


SECTION THRU CURB

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.

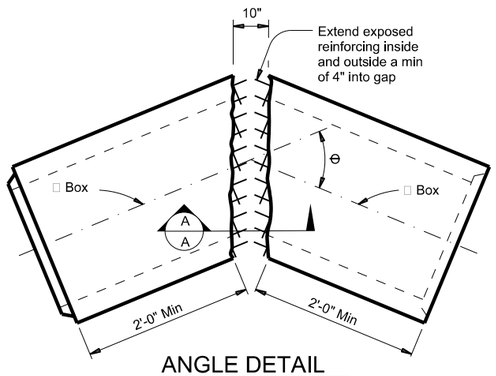
MATERIAL NOTES:

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.

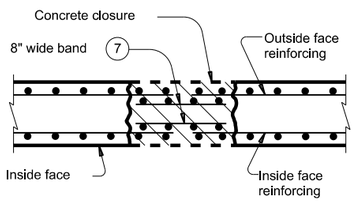
GENERAL NOTES:

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.

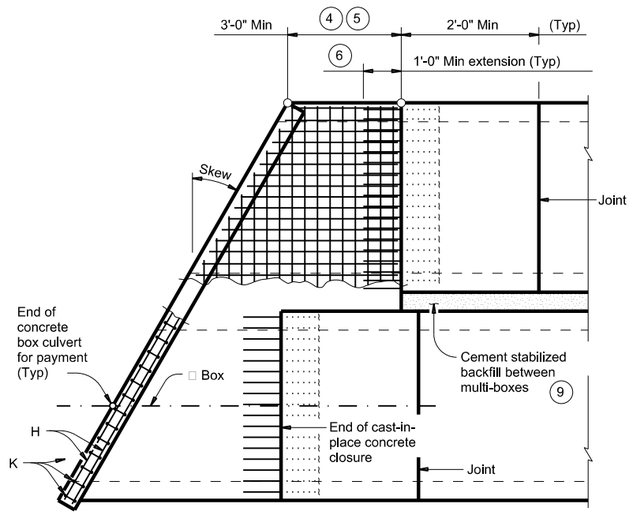
Cover dimensions are clear dimensions, unless noted otherwise.
Reinforcing bars dimensions are out-to-out of bars.



ANGLE DETAIL



SECTION A-A



PLAN OF SKEWED ENDS

(Showing multi-box placement.)

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	0720	01	044, ETC.	FM 149,ETC.
	DIST	COUNTY		SHEET NO.
	BRYAN	GRIMES		138

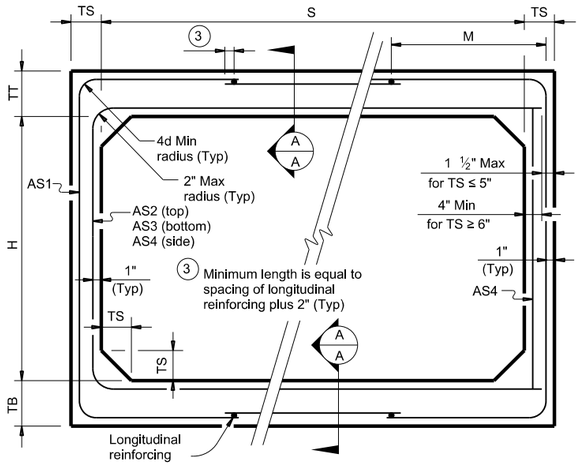
DATE: 4/19/2023 7:52:53 AM
FILE: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY/Design Projects/DrainageStandards/SCP-MD.dgn

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

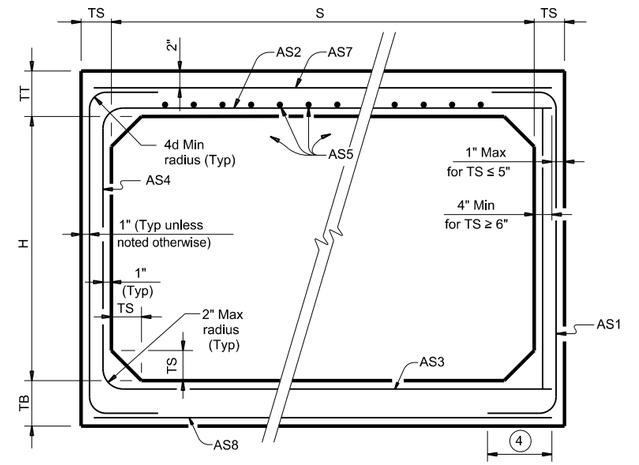
(1) For box length = 8'-0"

(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"

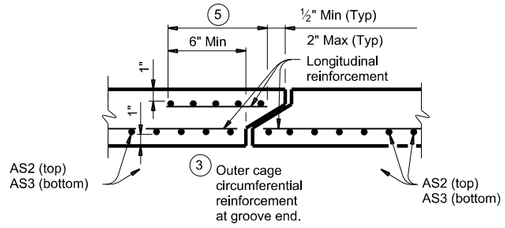
FILL HEIGHT 2 FT AND GREATER



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

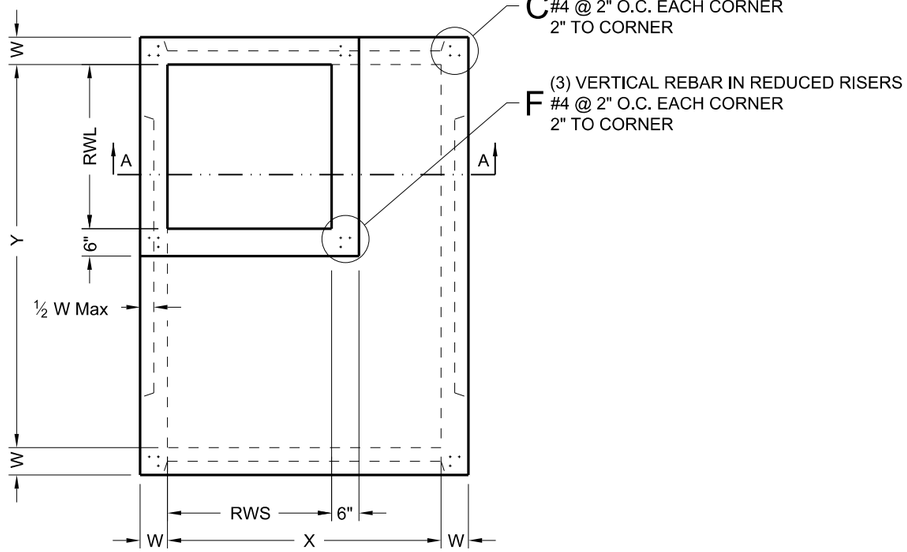
SINGLE BOX CULVERTS PRECAST

5'-0" SPAN

SCP-5

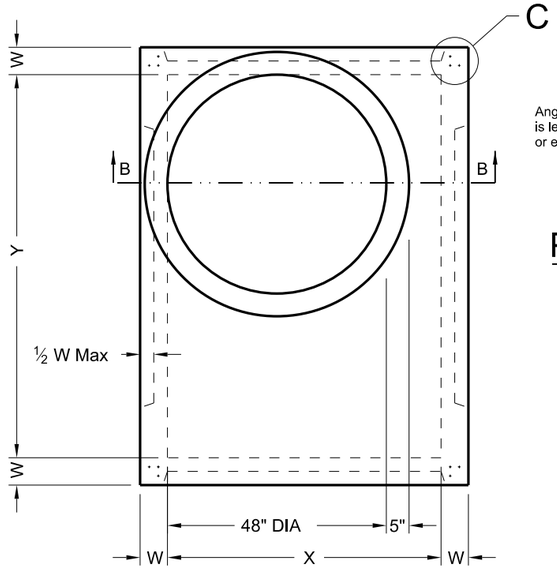
FILE:	scp05sls-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT	February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS		0720	01	044,ETC.	FM 149,ETC.
		DIST	COUNTY		SHEET NO.
		BRYAN	GRIMES		139

DATE: $DATE$ $TIME$
FILE: $FILE$



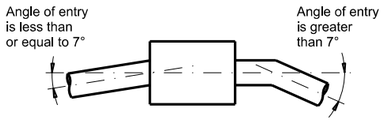
PLAN VIEW "A"

SQUARE REDUCED RISER OPTION



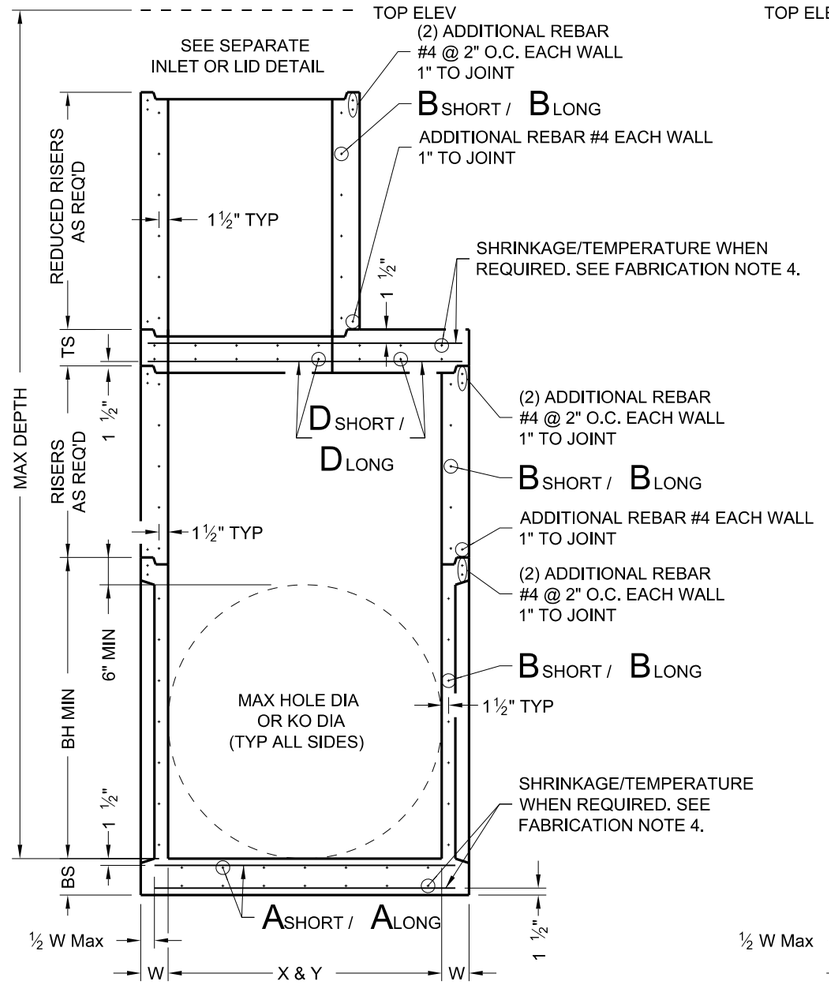
PLAN VIEW "B"

ROUND REDUCED RISER OPTION



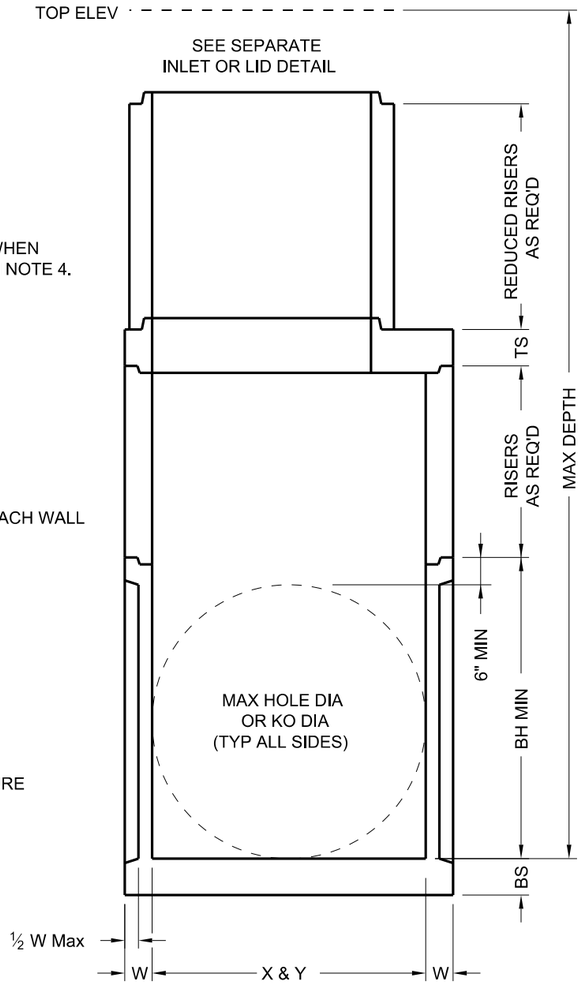
PIPE CONNECTION DETAIL

Connect pipes within 7° of normal to PB wall.
If necessary, use pipe elbow or curved
approach alignment to stay within this limit.



SECTION A-A

SQUARE REDUCED RISER OPTION



SECTION B-B

ROUND REDUCED RISER OPTION

FABRICATION NOTES:

1. Provide Class "H" concrete in accordance with Item 421 and having a minimum compressive strength of 5,000 psi.
2. Provide Grade 60 reinforcing steel or equivalent area of WWR.
3. Provide typical clear cover of 1 ½" to reinforcing steel at interior or exterior walls.
4. Walls or slabs with a thickness of 8" or greater require shrinkage and temperature reinforcing steel. Provide steel area = 0.11 in²/ft each way.
5. No substitution is allowed for vertical and horizontal #4 bars in corners.
6. Manufacture base and risers to nearest 3" increment.
7. Design tongue and groove joints for full closure on both shoulders. Minimum spigot depth is ¾".
8. Provide lifting devices in conformance with Manufacturer's recommendations.
9. See sheet PDD for sizes, dimensions, and reinforcing steel not shown.

INSTALLATION NOTES:

1. 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."

Cover dimensions are clear dimensions, unless noted otherwise.

HL93 LOADING

Texas Department of Transportation

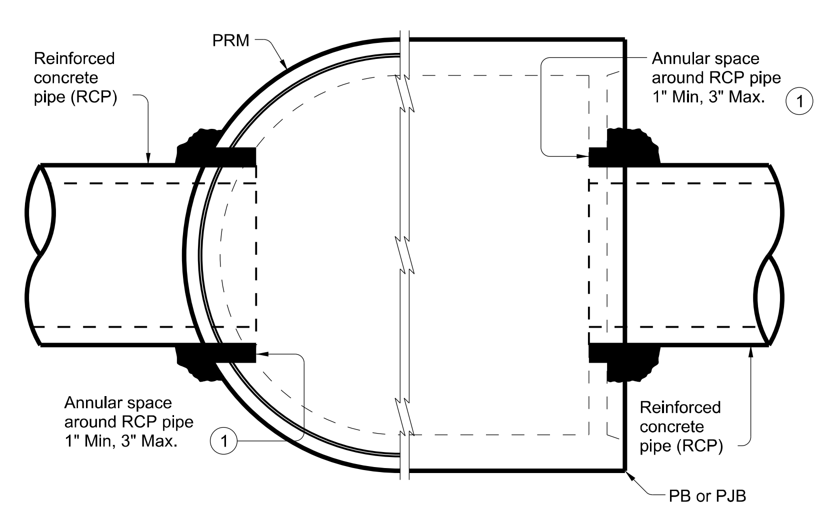
Bridge Division Standard

PRECAST BASE

PB

FILE: prestd01-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0720	01	044, ETC.	FM 149,ETC.
	DIST	COUNTY		SHEET NO.
	BRYAN	GRIMES		140

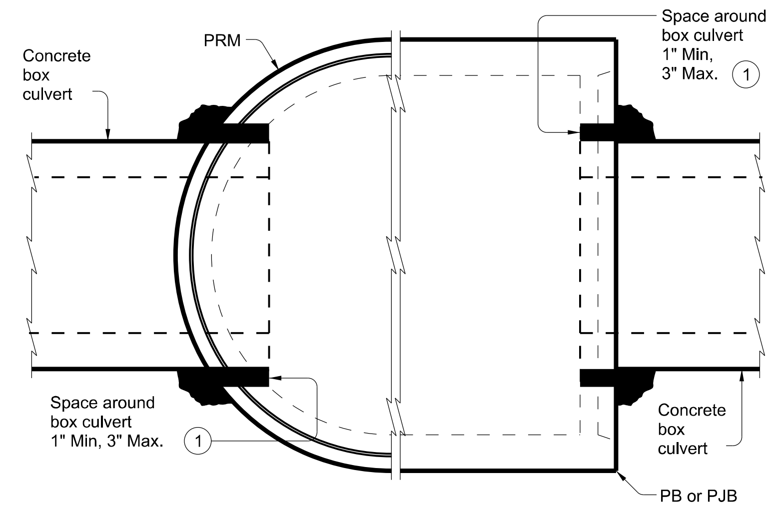
DATE: 4/19/2023 7:53:23 AM
FILE: DW: //txdot.projectwiseonline.com: TxDOT4/Documents/17 - BRY/Design Projects/Drainage Standards/PB.dgn



PRECAST ROUND MANHOLE (PRM) WITH THROUGH-HOLE

PRECAST BASE (PB) OR PRECAST JUNCTION BOX (PJB) WITH THIN-WALL KNOCK-OUT

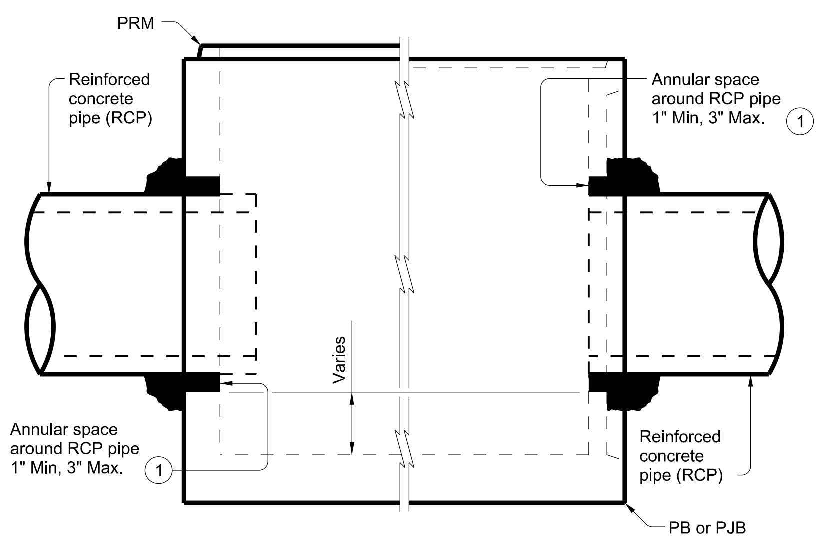
TYPICAL HALF PLAN



PRECAST ROUND MANHOLE (PRM) WITH THROUGH-HOLE

PRECAST BASE (PB) OR PRECAST JUNCTION BOX (PJB) WITH THIN-WALL KNOCK-OUT

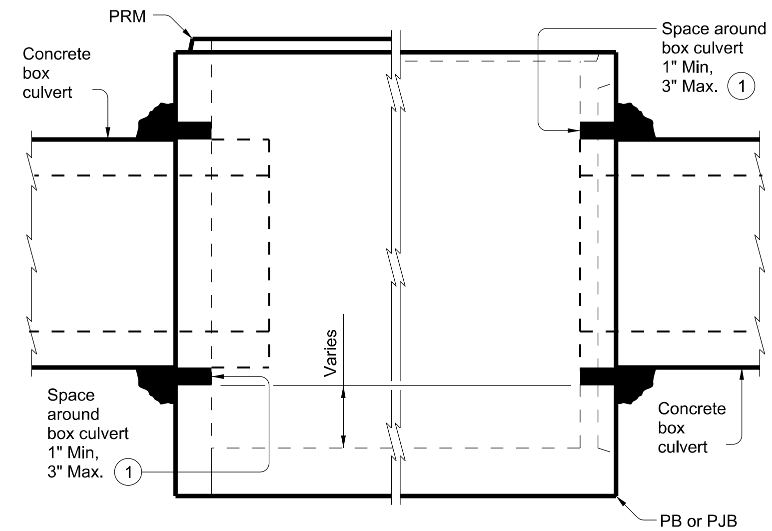
TYPICAL HALF PLAN



PRECAST ROUND MANHOLE (PRM) WITH THROUGH-HOLE

PRECAST BASE (PB) OR PRECAST JUNCTION BOX (PJB) WITH THIN-WALL KNOCK-OUT

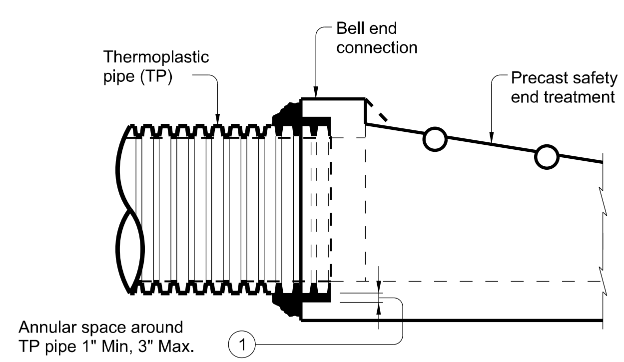
TYPICAL HALF ELEVATION



PRECAST ROUND MANHOLE (PRM) WITH THROUGH-HOLE

PRECAST BASE (PB) OR PRECAST JUNCTION BOX (PJB) WITH THIN-WALL KNOCK-OUT

TYPICAL HALF ELEVATION



TYPICAL PARTIAL ELEVATION OF PRECAST SAFETY END TREATMENTS

Showing square PSET for parallel drainage, cross drainage shown similar.

(1) Completely fill the void between the precast structure and the connecting pipe or box with cementitious grouts and mortars in accordance with DMS-4675 "Cementitious Grouts and Mortars for Miscellaneous Application".

CONSTRUCTION NOTES:

Do not grout rubber gasket joints without Manufacturer's recommendations.

Do not use bricks, masonry blocks, native stone, or similar materials in conjunction with grouted connections when filling void spaces around pipes or box culverts.

MATERIAL NOTES:

Provide grouted connections in accordance with DMS-4675 "Cementitious Grouts and Mortars for Miscellaneous Application".

GENERAL NOTES:

See applicable standards for notes and details not shown:

- Precast Base (PB)
- Precast Junction Box (PJB)
- Precast Round Manhole (PRM)
- Precast Safety End Treatments C/D Square (PSET-SC)
- Precast Safety End Treatments P/D Square (PSET-SP)

Provide Concrete Box Culverts in accordance with Item 462 "Concrete Box Culverts and Drains".

Provide Reinforced Concrete Pipe (RCP) in accordance with Item 464 "Reinforced Concrete Pipe".

Provide Thermoplastic Pipe (TP) in accordance with Special Specification Thermoplastic Pipe.

Payment for grouted connections is considered subsidiary to other bid Items.

Texas Department of Transportation

Bridge Division Standard

PIPE AND BOX GROUTED CONNECTIONS FOR PRECAST STRUCTURES

PBGC

FILE: pbgcstd1-20.dgn		DN: TxDOT	CK: TAR	DW: JTR		CK: TAR	
©TxDOT February 2020		CONT	SECT	JOB		HIGHWAY	
REVISIONS		0720	01	044, ETC.		FM 149,ETC.	
		DIST		COUNTY		SHEET NO.	
		BRYAN		GRIMES		141	

DATE: 4/19/2023 7:53:38 AM
FILE: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY/Design Projects/0720-01-044 ... DrainageStandards/PBGC.dgn

	Size	MAX DEPTH = 15 ft. to top of BASE SLAB										MAX DEPTH = 25 ft. to top of BASE SLAB										Min Height (See Gen Note 3)	Max HOLE DIA (See Fab Note 2)	Max KO DIA (See Fab Note 2)
		Base Slab			Base Unit or Riser Walls			Below Grade Slab (w/PJB) Reducing Slab (w/PB)				Base Slab			Base Unit or Riser Walls			Below Grade Slab (w/PJB) Reducing Slab (w/PB)						
		Short Span Reinf Steel Area	Long Span Reinf Steel Area	Thickness	Short Span Reinf Steel Area	Long Span Reinf Steel Area	Thickness	Reduced Riser Size	Short Span Reinf Steel Area	Long Span Reinf Steel Area	Thickness	Short Span Reinf Steel Area	Long Span Reinf Steel Area	Thickness	Short Span Reinf Steel Area	Long Span Reinf Steel Area	Thickness	Reduced Riser Size	Short Span Reinf Steel Area	Long Span Reinf Steel Area	Thickness			
	X x Y	Ashort	Along	BS	Bshort	Blong	W	RWSxRWL or ID	Dshort	Dlong	TS	Ashort	Along	BS	Bshort	Blong	W	RWSxRWL or ID	Dshort	Dlong	TS	BH MIN	HOLE DIA	KO DIA
	ft.	in^2/ft	in^2/ft	in.	in^2/ft	in^2/ft	in.	ft. **	in^2/ft	in^2/ft	in.	in^2/ft	in^2/ft	in.	in^2/ft	in^2/ft	in.	ft. **	in^2/ft	in^2/ft	in.	ft.	in.	in.
Precast Junction Box (PJB)	3x3	0.23	0.23	6	0.19	0.19	6	N/A	0.37	0.37	9	0.29	0.29	6	0.24	0.24	6	N/A	0.37	0.37	9	3.5	36	36
	4x4	0.29	0.29	6	0.24	0.24	6	N/A	0.41	0.41	9	0.47	0.47	6	0.38	0.38	6	N/A	0.41	0.41	9	4.5	48	48
	3x5	0.29	0.18	6	0.19	0.35	6	N/A	0.48	0.48	9	0.39	0.18	6	0.23	0.59	6	N/A	0.48	0.48	9	3.5	36/60	36/60
	4x5	0.36	0.18	6	0.22	0.34	6	N/A	0.42	0.42	9	0.53	0.26	6	0.39	0.59	6	N/A	0.42	0.42	9	4.5	48/60	48/60
	5x5	0.36	0.36	6	0.34	0.34	6	N/A	0.43	0.43	9	0.62	0.62	6	0.59	0.59	6	N/A	0.43	0.43	9	5.5	60	60
	5x6	0.27	0.27	9	0.34	0.45	6	N/A	0.48	0.48	9	0.47	0.45	9	0.38	0.54	8	N/A	0.48	0.48	9	5.5	60/72	60/72
	6x6	0.27	0.27	9	0.45	0.45	6	N/A	0.56	0.56	9	0.52	0.52	9	0.54	0.54	8	N/A	0.56	0.56	9	6.5	72	72
	8x8	0.46	0.46	9	0.51	0.51	8	N/A	0.45	0.45	12	0.87	0.87	9	0.59	0.59	10	N/A	0.45	0.45	12	8.5	96	72
Precast Base (PB)	3x3	0.23	0.23	6	0.19	0.19	6	N/A	N/A	N/A	N/A	0.29	0.29	6	0.24	0.24	6	N/A	N/A	N/A	N/A	3.5	36	36
	4x4	0.29	0.29	6	0.24	0.24	6	N/A	N/A	N/A	N/A	0.47	0.47	6	0.38	0.38	6	N/A	N/A	N/A	N/A	4.5	48	48
	3x5	0.29	0.18	6	0.19	0.35	6	3x3	0.30	0.34	9	0.39	0.18	6	0.23	0.59	6	3x3	0.40	0.40	9	3.5	36/60	36/60
	4x5	0.36	0.18	6	0.22	0.34	6	3x3	0.30	0.30	9	0.53	0.26	6	0.39	0.59	6	3x3	0.46	0.37	9	4.5	48/60	48/60
	4x5	0.36	0.18	6	0.22	0.34	6	4x4	0.30	0.30	9	0.53	0.26	6	0.39	0.59	6	4x4	0.39	0.39	9	4.5	48/60	48/60
	4x5	0.36	0.18	6	0.22	0.34	6	48"	0.39	0.39	9	0.53	0.26	6	0.39	0.59	6	48"	0.47	0.47	9	4.5	48/60	48/60
	4x5	0.36	0.18	6	0.22	0.34	6	3x5	0.33	0.40	9	0.53	0.26	6	0.39	0.59	6	3x5	0.48	0.48	9	4.5	48/60	48/60
	5x5	0.36	0.36	6	0.34	0.34	6	3x3	0.34	0.34	9	0.62	0.62	6	0.59	0.59	6	3x3	0.53	0.53	9	5.5	60	60
	5x5	0.36	0.36	6	0.34	0.34	6	4x4	0.36	0.36	9	0.62	0.62	6	0.59	0.59	6	4x4	0.64	0.64	9	5.5	60	60
	5x5	0.38	0.38	6	0.34	0.34	6	48"	0.36	0.36	9	0.62	0.62	6	0.59	0.59	6	48"	0.64	0.64	9	5.5	60	60
	5x5	0.36	0.36	6	0.34	0.34	6	3x5	0.34	0.40	9	0.62	0.62	6	0.59	0.59	6	3x5	0.53	0.53	9	5.5	60	60
	5x6	0.31	0.31	9	0.34	0.45	6	3x3	0.34	0.34	9	0.47	0.45	9	0.38	0.54	8	3x3	0.61	0.50	9	5.5	60/72	60/72
	5x6	0.27	0.27	9	0.34	0.45	6	4x4	0.36	0.45	9	0.47	0.45	9	0.38	0.54	8	4x4	0.74	0.57	9	5.5	60/72	60/72
	5x6	0.29	0.29	9	0.34	0.45	6	48"	0.36	0.45	9	0.47	0.45	9	0.38	0.54	8	48"	0.74	0.57	9	5.5	60/72	60/72
	5x6	0.29	0.29	9	0.34	0.45	6	3x5	0.45	0.45	9	0.47	0.45	9	0.38	0.54	8	3x5	0.61	0.61	9	5.5	60/72	60/72
	6x6	0.29	0.29	9	0.45	0.45	6	3x3	0.41	0.41	9	0.52	0.52	9	0.54	0.54	8	3x3	0.74	0.74	9	6.5	72	72
	6x6	0.27	0.27	9	0.45	0.45	6	4x4	0.45	0.45	9	0.52	0.52	9	0.54	0.54	8	4x4	0.87	0.87	9	6.5	72	72
	6x6	0.29	0.29	9	0.45	0.45	6	48"	0.45	0.45	9	0.52	0.52	9	0.54	0.54	8	48"	0.87	0.87	9	6.5	72	72
	6x6	0.29	0.29	9	0.45	0.45	6	3x5	0.45	0.45	9	0.52	0.52	9	0.54	0.54	8	3x5	0.87	0.87	9	6.5	72	72
	8x8	0.52	0.52	9	0.51	0.51	8	3x3	0.61	0.61	12	0.91	0.91	9	0.70	0.70	10	3x3	0.85	0.85	12	8.5	96	72
	8x8	0.52	0.52	9	0.51	0.51	8	4x4	0.70	0.70	12	0.87	0.87	9	0.70	0.70	10	4x4	1.01	1.01	12	8.5	96	72
	8x8	0.52	0.52	9	0.51	0.51	8	48"	0.70	0.70	12	0.87	0.87	9	0.70	0.70	10	48"	1.01	1.01	12	8.5	96	72
	8x8	0.52	0.52	9	0.51	0.51	8	3x5	0.70	0.85	12	0.87	0.87	9	0.70	0.70	10	3x5	1.01	1.01	12	8.5	96	72

** Unless otherwise indicated.

FABRICATION NOTES:
1. Maximum spacing of reinforcement is 8".
2. At manufacturer's option, provide cast or cored holes or thin wall panels (KO) to the maximum diameter shown for each. When no penetration is required, it is acceptable to provide a wall with no sectional reduction.

GENERAL NOTES:
1. Precast Junction Box consists of base slab, base unit, risers (as required), and below grade slab. See sheet PJB for details.
2. Precast Base consists of base slab, base unit, risers (as required), reducing slab (as required), and reduced risers (as required). See sheet PB for details.
3. Min Height shown is for stock base units. Use stock base units whenever practical. Smaller height base units can be used in special installation circumstances, when noted elsewhere in the plans. Absolute minimum height of base units is 2'-6".

HL93 LOADING

Texas Department of Transportation

Bridge Division Standard

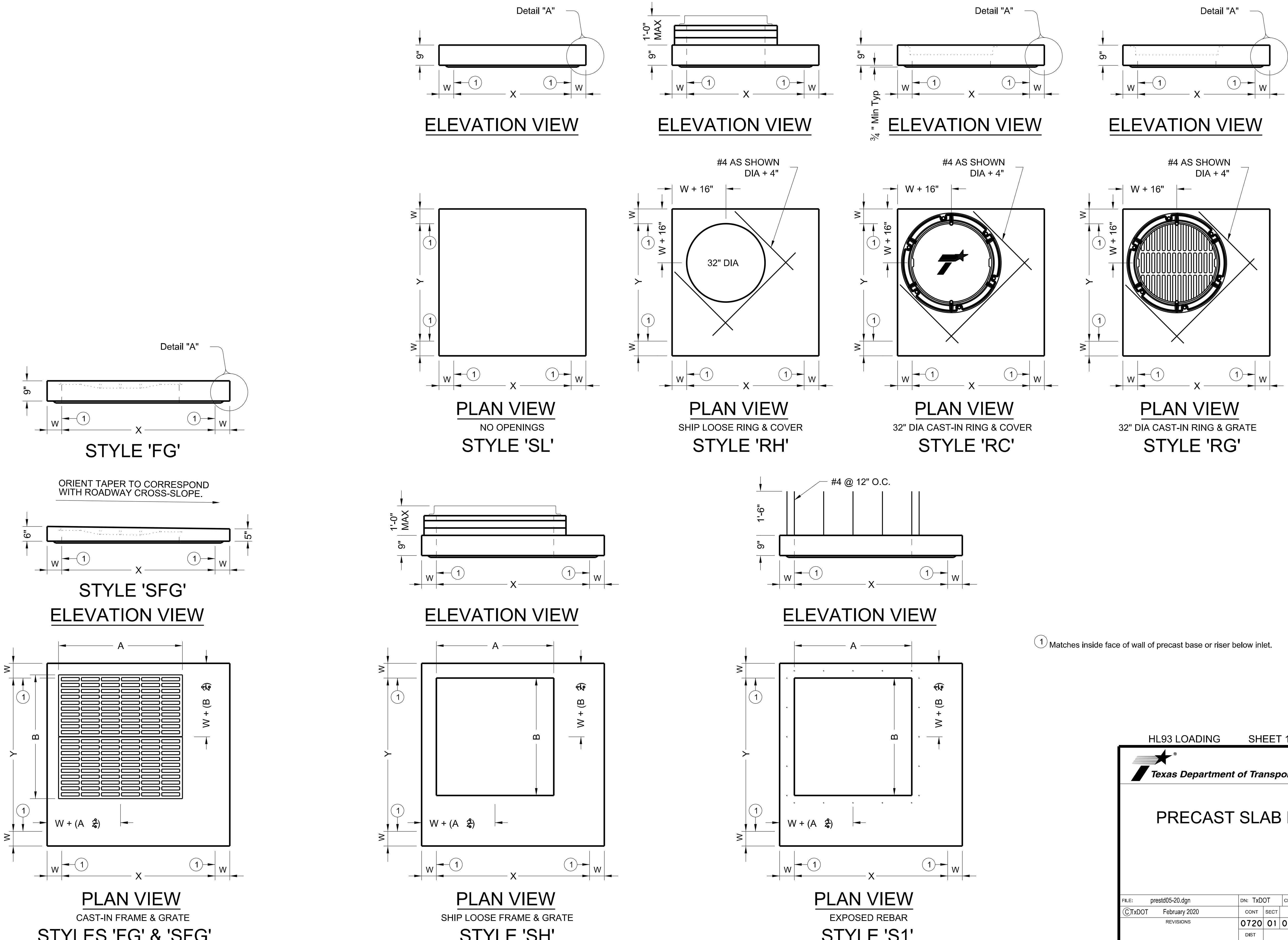
DESIGN DATA FOR PRECAST BASE AND JUNCTION BOX

PDD

FILE: prestd10-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0720	01	044, ETC.	FM 149,ETC.
	DIST	COUNTY		SHEET NO.
	BRYAN	GRIMES		142

DATE: 4/19/2023 7:53:53 AM
FILE: dw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY/Design Projects/PDD Drainage Standards/PDD.dgn

DATE: 4/19/2023 7:54:07 AM
FILE: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY/Design Pro[illegible] DrainageStandards/PSL.dgn



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

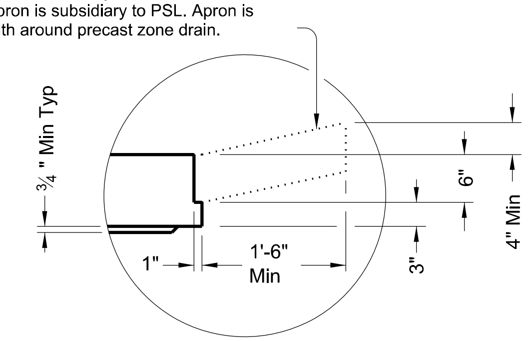
PSL

FILE: prestd05-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0720	01	044, ETC.	FM 149, ETC.
	DIST		COUNTY	SHEET NO.
	BRYAN		GRIMES	143

Style	Size (X x Y)	W (2)	A x B (nominal)	Short Span Reinf Steel Area	Long Span Reinf Steel Area
SL	3'x3'	6"	n/a	0.37 in□/ft	0.37 in□/ft
RH,RC,RG,SH,S1,FG	3'x3'	6"	3'x3' or 32" Dia	0.37 in□/ft	0.37 in□/ft
SFG	3'x3'	6"	3'x3'	0.32 in□/ft	0.32 in□/ft
SL	4'x4'	6"	n/a	0.34 in□/ft	0.34 in□/ft
RH,RC,RG,SH,S1,FG	4'x4'	6"	3'x3' or 32" Dia	0.41 in□/ft	0.41 in□/ft
SH,S1,FG	4'x4'	6"	4'x4'	0.41 in□/ft	0.41 in□/ft
SFG	4'x4'	6"	4'x4'	0.32 in□/ft	0.32 in□/ft
SL	3'x5'	6"	n/a	0.39 in□/ft	0.39 in□/ft
RH,RC,RG,SH,S1,FG	3'x5'	6"	3'x3' or 32" Dia	0.48 in□/ft	0.48 in□/ft
SH,S1,FG	3'x5'	6"	3'x5'	0.48 in□/ft	0.48 in□/ft
SFG	3'x5'	6"	3'x5'	0.32 in□/ft	0.32 in□/ft
SL	4'x5'	6"	n/a	0.42 in□/ft	0.42 in□/ft
RH,RC,RG,SH,S1,FG	4'x5'	6"	3'x3' or 32" Dia	0.42 in□/ft	0.42 in□/ft
SH,S1,FG	4'x5'	6"	4'x4'	0.63 in□/ft	0.63 in□/ft
SH,S1,FG	4'x5'	6"	3'x5'	0.66 in□/ft	0.66 in□/ft
SL	5'x5'	6"	n/a	0.36 in□/ft	0.36 in□/ft
RH,RC,RG,SH,S1,FG	5'x5'	6"	3'x3' or 32" Dia	0.43 in□/ft	0.43 in□/ft
SH,S1,FG	5'x5'	6"	4'x4'	0.63 in□/ft	0.63 in□/ft
SH,S1,FG	5'x5'	6"	3'x5'	0.63 in□/ft	0.63 in□/ft
SL	5'x6'	6"/8"	n/a	0.48 in□/ft	0.48 in□/ft
RH,RC,RG,SH,S1,FG	5'x6'	6"/8"	3'x3' or 32" Dia	0.48 in□/ft	0.48 in□/ft
SH,S1,FG	5'x6'	6"/8"	4'x4'	0.60 in□/ft	0.60 in□/ft
SH,S1,FG	5'x6'	6"/8"	3'x5'	0.60 in□/ft	0.60 in□/ft
SL	6'x6'	6"/8"	n/a	0.43 in□/ft	0.43 in□/ft
RH,RC,RG,SH,S1,FG	6'x6'	6"/8"	3'x3' or 32" Dia	0.56 in□/ft	0.56 in□/ft
SH,S1,FG	6'x6'	6"/8"	4'x4'	0.56 in□/ft	0.56 in□/ft
SH,S1,FG	6'x6'	6"/8"	3'x5'	0.59 in□/ft	0.59 in□/ft
SL	8'x8'	8"/10"	n/a	0.45 in□/ft	0.45 in□/ft
RH,RC,RG,SH,S1,FG	8'x8'	8"/10"	3'x3' or 32" Dia	0.45 in□/ft	0.45 in□/ft
SH,S1,FG	8'x8'	8"/10"	4'x4'	0.45 in□/ft	0.45 in□/ft
SH,S1,FG	8'x8'	8"/10"	3'x5'	0.45 in□/ft	0.45 in□/ft

(2) See sheet PDD for corresponding wall thickness (W) of base unit or riser.

Construct cast-in-place reinforced concrete apron, when shown elsewhere in plans. Use Class "A" concrete. Apron is subsidiary to PSL. Apron is 1'-6" Min width around precast zone drain.



DETAIL "A"

(Reinforcing not shown for clarity)

When an apron is to be cast around PSL, use detail above to create an apron ledge on all 4 sides.

FABRICATION NOTES:

1. Locate penetration (Style 'RH'), ring and cover (Style 'RC'), ring and grate (Style 'RG'), and frame and grate (Style 'FG') in a corner. Only one penetration is allowed per slab lid.
2. Provide Class "H" concrete in accordance with Item 421 and having a minimum compressive strength of 5,000 psi.
3. Provide Grade 60 reinforcing steel or equivalent area of WWR.
4. Provide clear cover of ¾" to reinforcing from lower outside shoulder of slab for structural reinforcement, and 2" from top of slab for shrinkage and temperature reinforcement. Place short span reinforcing closest to surface.
5. Slabs with a thickness of 8" or greater require shrinkage and temperature reinforcing. Provide steel area = 0.11 in²/ft each way.
6. No substitution is allowed for diagonal #4 bars around openings.
7. Design tongue and groove joints for full closure on both shoulders. Minimum spigot depth is ¾".
8. Provide lifting devices in conformance with Manufacturer's recommendations.

INSTALLATION NOTES:

1. Precast slab lids are intended for direct traffic and may be placed in roadway.
2. Seal tongue and groove joints with preformed or bulk mastic in conformance with Manufacturer's recommendations. Tongue and groove joints may be grouted no more than 1" between each section, or ½ the joint depth, whichever is greater.
3. Do not grout rubber gasket joints without Manufacturer's recommendation.
4. Initial installation of grade adjustment rings for Styles 'RH' and 'SH' is limited to 1'-0" Max as shown.
5. Grade adjustment rings for Styles 'RH' and 'SH' may be increased to 2'-0" Max when future construction affects final grade of structure. Make adjustments greater than 2'-0" with additional risers. Adjustments can be made up to Max depth shown on sheet PDD. Structure must be evaluated if Max depth will be exceeded.
6. Orient long dimension of grate slots perpendicular to traffic, unless noted otherwise on plans

GENERAL NOTES:

1. Designed according to ASTM C913.
2. Payment for lid is per Item 465, "Junction Boxes, Manholes, and Inlets" by type, style, size, and opening size (when applicable).

Cover dimensions are clear dimensions, unless noted otherwise.

HL93 LOADING SHEET 2 OF 2

Texas Department of Transportation — Bridge Division Standard

PRECAST SLAB LID

PSL

FILE: prestd05-20.dgn		DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT		
©TxDOT February 2020		CONT	SECT	JOB		HIGHWAY	
REVISIONS		0720	01	044, ETC.		FM 149, ETC.	
		DIST		COUNTY		SHEET NO.	
		BRYAN		GRIMES		144	

DATE: 4/19/2023 7:54:08 AM
FILE: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY/Design Projects/0720-01-044 ... /Drainage Standards/PSL.dgn

BILL OF REINFORCING STEEL

SLOPE	Y	N	DIA OF PIPE = D	TABLE OF DIMENSIONS X	H	L
6:1	4 ½"	2	18"	2'-6"	2'-1 ½"	12'-9"
6:1	5"	2	24"	3'-0"	2'-8"	16'-0"
6:1	5 ½"	3	30"	3'-6"	3'-2 ½"	19'-3"
6:1	6"	3	36"	4'-0"	3'-9"	22'-6"
6:1	6 ½"	3	42"	4'-6"	4'-3 ½"	25'-9"
6:1	4 ½"	4	48"	5'-0"	4'-10"	29'-0"

DIA OF PIPE = D	BARS A				BARS B				BARS C				BARS D			
	No.	Spa	Length	Wgt	No.	Spa	Length	Wgt	No.	Spa	Length	Wgt	No.	Spa	Length	Wgt
18"	2	~	2'- 3"	3	2	~	2'- 5"	3	1	~	2'- 3"	2	3	12" ±	13'- 3"	27
24"	2	~	2'-10"	4	2	~	3'- 0"	4	1	~	2'- 9"	2	4	12" ±	16'- 6"	44
30"	2	~	3'- 5"	5	2	~	3'- 7"	5	1	~	3'- 3"	2	4	12" ±	19'- 9"	53
36"	2	~	4'- 0"	5	2	~	4'- 2"	5	1	~	3'- 9"	3	5	12" ±	23'- 0"	77
42"	2	~	4'- 7"	6	2	~	4'- 9"	6	1	~	4'- 3"	3	5	12" ±	26'- 3"	88
48"	2	~	5'- 2"	7	2	~	5'- 4"	7	1	~	4'- 9"	3	6	12" ±	29'- 6"	118

DIA OF PIPE = D	BARS E				BARS G				BARS H Av			
	No.	Spa	Length	Wgt	No.	Spa	Length	Wgt	No.	Spa	Length	Wgt
18"	6	12" ±	2'- 6"	10	2	~	13'- 5"	18	12	12" ±	4'- 5"	35
24"	8	12" ±	2'- 6"	13	2	~	16'- 9"	22	15	12" ±	5'- 6"	55
30"	8	12" ±	2'- 6"	13	2	~	20'- 0"	27	19	12" ±	6'- 6"	83
36"	10	12" ±	2'- 6"	17	2	~	23'- 3"	31	22	12" ±	7'- 7"	111
42"	10	12" ±	2'- 6"	17	2	~	26'- 8"	36	25	12" ±	8'- 7"	143
48"	12	12" ±	2'- 6"	20	2	~	29'-10"	40	29	12" ±	9'- 7"	186

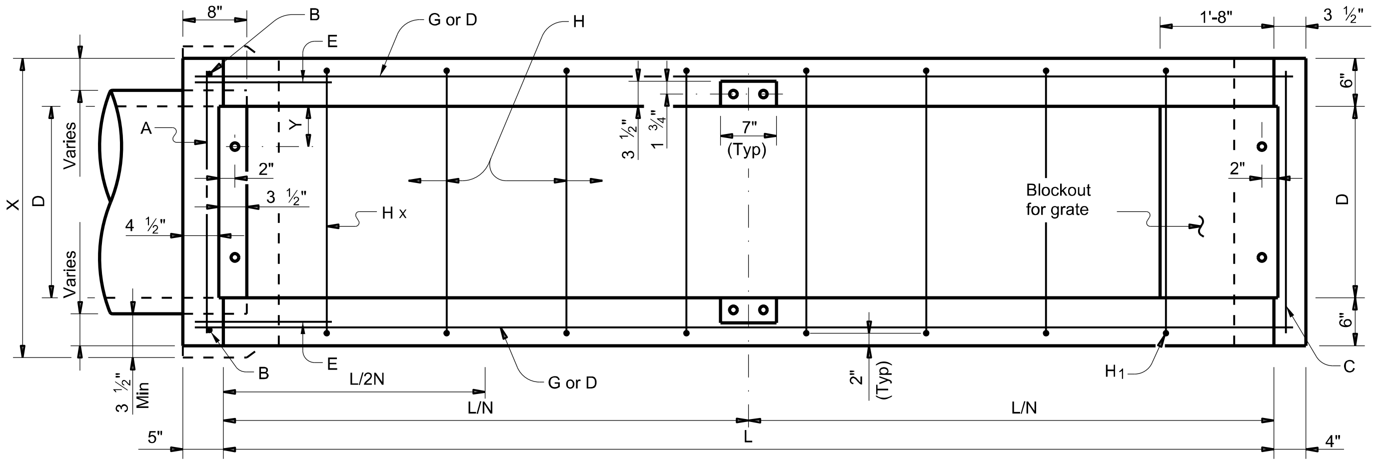
DIA OF PIPE = D	BARS L				BARS L Av				TOTAL QUANTITIES STEEL	CONC
	No.	Spa	Length	Wgt	No.	Spa	Length	Wgt	Lb	CY
18"	2	12" ±	2'- 0"	3	2	12" ±	6'-10"	9	110	1.1
24"	2	12" ±	2'- 0"	3	2	12" ±	9'-10"	13	160	1.7
30"	2	12" ±	2'- 0"	3	4	12" ±	10'- 1"	27	218	2.4
36"	2	12" ±	2'- 0"	3	6	12" ±	13'- 9"	55	307	3.3
42"	2	12" ±	2'- 0"	3	6	12" ±	13'-10"	55	357	4.4
48"	2	12" ±	2'- 0"	3	8	12" ±	14'- 5"	77	461	5.7

GRATE QUANTITIES

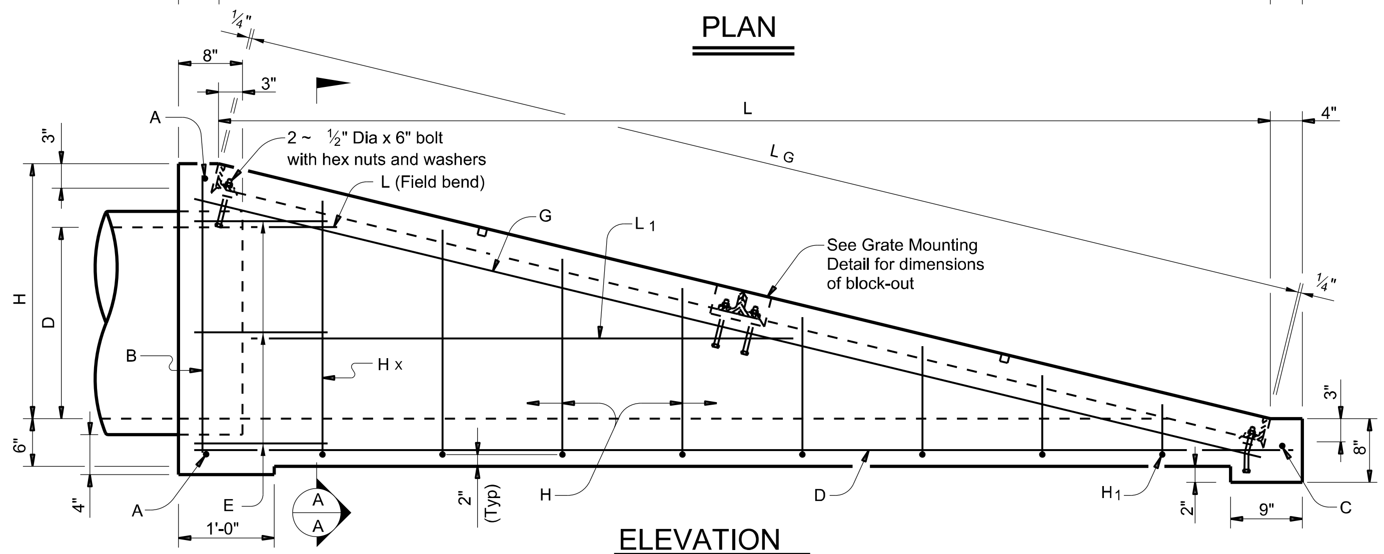
SLOPE	Y	N	DIA OF PIPE = D	BEARING BARS at 5" C-C No.	Size	LG/N	Wgt	INTERIOR ANGLES No.	Size	Length	Wgt
6:1	4 ½"	2	18"	8	2 ½"x ½"	6'-5 ⅝"	220	2	3"x 3"x ½"	2'-0 ½"	38
6:1	5"	2	24"	10	2 ½"x ½"	8'-1 ⅜"	345	2	3"x 3"x ½"	2'-6 ½"	48
6:1	5 ½"	3	30"	18	2 ½"x ½"	6'-6 ⅛"	498	4	3"x 3"x ½"	3'-0 ½"	114
6:1	6"	3	36"	21	2 ½"x ½"	7'-7 ¼"	679	4	3"x 3"x ½"	3'-6 ½"	133
6:1	6 ½"	3	42"	24	2 ½"x ½"	8'-8 ⅜"	888	4	3"x 3"x ½"	4'-0 ½"	152
6:1	4 ½"	4	48"	40	2 ½"x ½"	7'-4 ⅛"	1249	6	3"x 3"x ½"	4'-6 ½"	256

DIA OF PIPE = D	END ANGLES No.	Size	Length	Wgt	1" SQUARE BARS No.	Length	Wgt	TOTAL WEIGHT Lb
18"	2	3"x 3"x ½"	1'- 5"	27	2	1'-4 ½"	9	294
24"	2	3"x 3"x ½"	1'-11"	36	2	1'-9 ½"	12	441
30"	2	3"x 3"x ½"	2'- 5"	45	3	2'-2 ½"	23	680
36"	2	3"x 3"x ½"	2'-11"	55	3	2'-7 ½"	27	894
42"	2	3"x 3"x ½"	3'- 5"	64	3	3'-0 ½"	31	1,135
48"	2	3"x 3"x ½"	3'-11"	74	4	3'-10 ½"	53	1,632

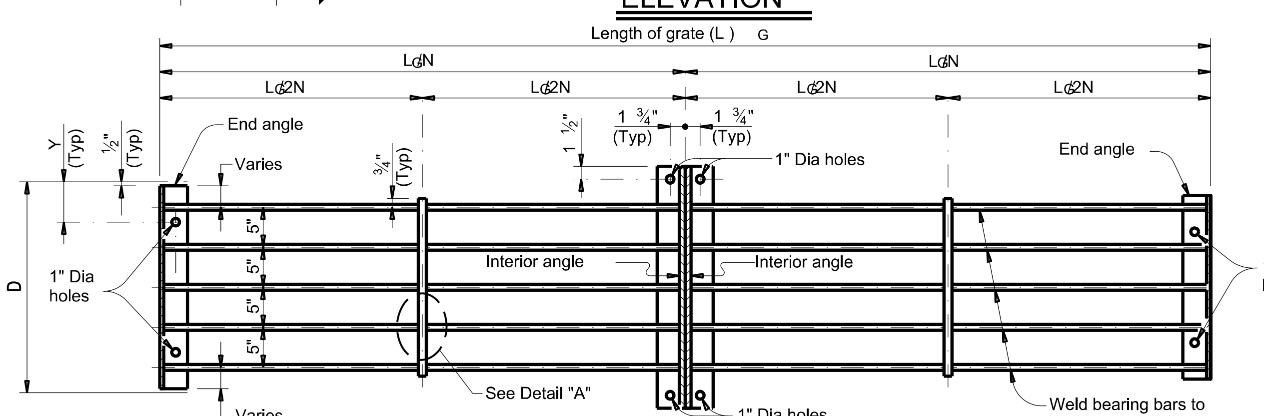
Note: For pipe sizes of 21", 27" and 33" use inlets for pipe sizes 24", 30" and 36", respectively.
N = Number of Grate Units



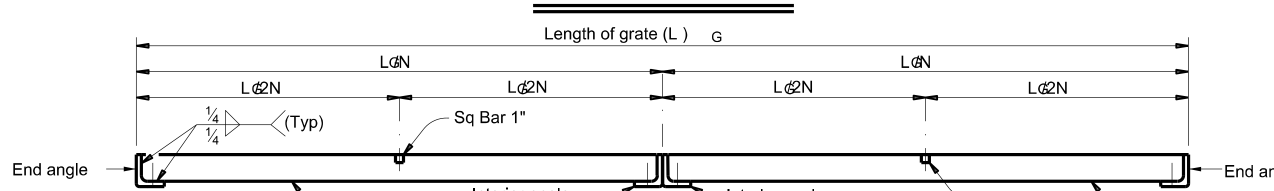
PLAN



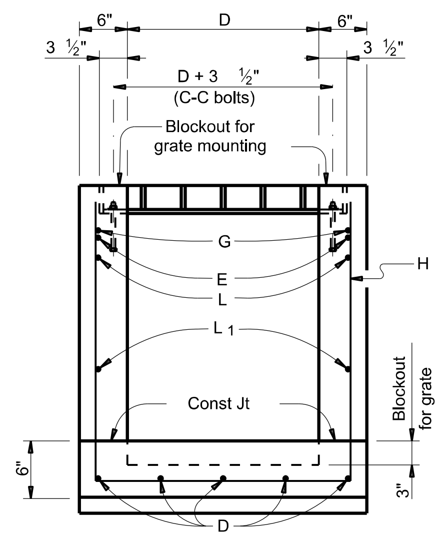
ELEVATION



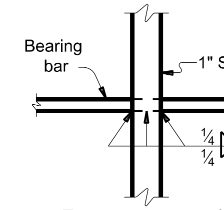
PLAN ~ GRATE



ELEVATION ~ GRATE

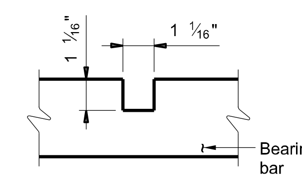


SECTION A-A



Typical connection of bearing bar and 1" square bar

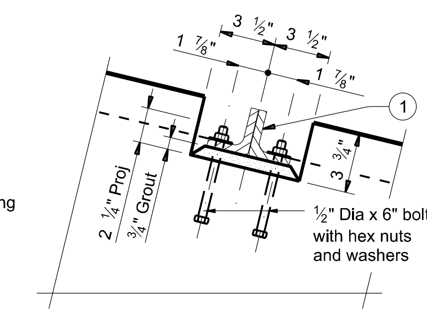
DETAIL "A"



NOTCH FOR 1" SQUARE BAR

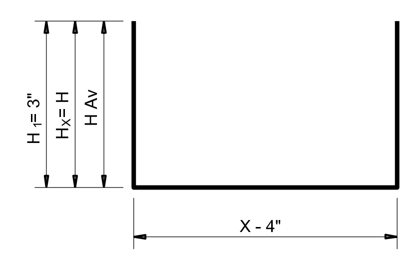
Notch to be punched clean and square

GRATE DETAILS



GRATE MOUNTING DETAIL

(1) Interior angles with 4 ~ ½" dia x 6" bolts, hex nuts, and washers

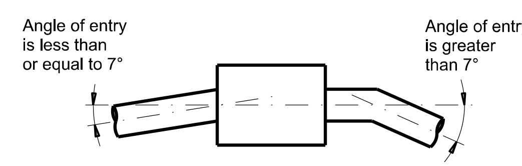


BARS H

GENERAL NOTES:

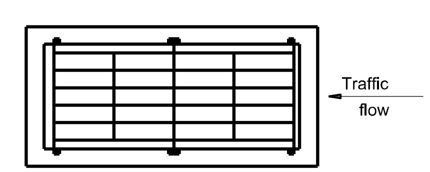
Quantities shown are for one end of one pipe culvert.
Quantities shown are for Contractor's information only. Unless otherwise shown in the plans, payment will be made for each inlet of the type specified.
When approved, precast inlets with equivalent structural capacity may be furnished. Submit sealed engineering calculations and drawings for precast inlets for approval prior to construction.
Shop drawings will not be required.
In areas of conflict between reinforcing steel, blockouts, pipes, anchor bolts or other reinforcing steel, bend or adjust reinforcement to clear as directed by the Engineer.
Provide structural steel for grates conforming to the requirements of ASTM A36.
Provide bolts conforming to the requirements of ASTM A307. Hex nuts must conform to ASTM A563.
Provide (#4) reinforcing steel unless otherwise noted.
Galvanize steel components except reinforcing, after fabrication, in accordance with Item 445 "Galvanizing."
Repair galvanizing damaged during transport or construction in accordance with the specifications.
Provide Class "A" concrete (f'c = 3,000 psi).

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



PIPE CONNECTION DETAIL

Connect pipes within 7° of normal to inlet wall. If necessary, use pipe elbow or curved approach alignment to stay within this limit.



GRATE ORIENTATION DETAIL

If possible, orient horizontal grate inlet such that both traffic and ditch water approach parallel to bars on grate. If this is not possible, orientation must favor traffic flow.

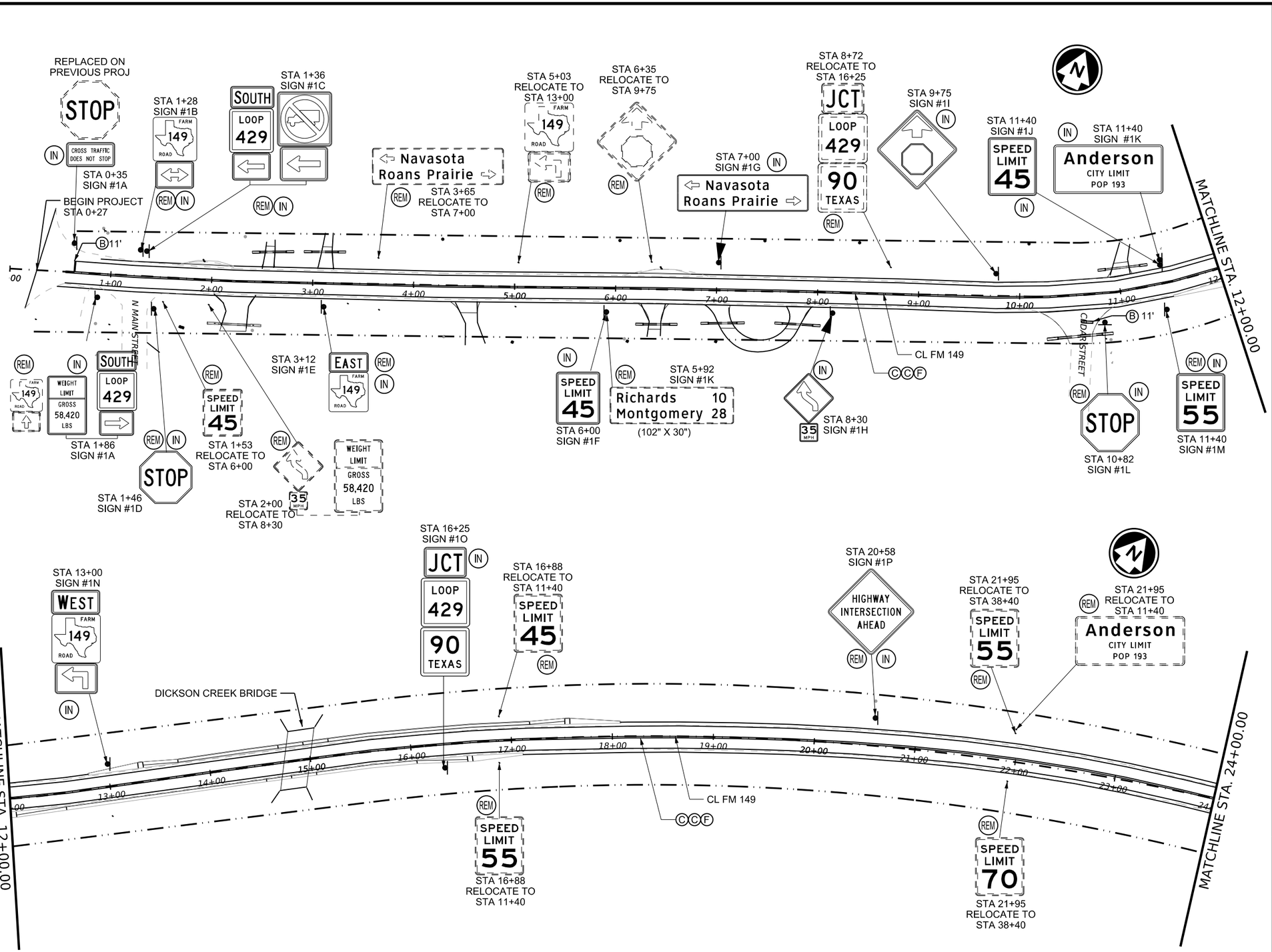
Texas Department of Transportation — Bridge Division Standard

SLOPING INLET TYPE S
(18" to 48" PIPES)

IL-S

FILE: il-sstde-20.dgn	DN: TxDOT	CK: TER	DW: MCB	CK: TER/GAF
©TxDOT February 2020	CONT 0720	SECT 01	JOB 044, ETC.	HIGHWAY FM 149,ETC.
REVISIONS	DIST BRYAN	COUNTY GRIMES		SHEET NO. 145

DATE: 4/19/2023 7:54:23 AM
FILE: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY/Design Projects/0720-01-044 ... DrainageStandards/IL-S.dgn



LEGEND

- (A) (W)(6")(SLD)
- (B) (W)(24")(SLD)
- (C) (Y)(6")(SLD)
- (D) (Y)(6"")(BRK)
- (E) (W)(ARROW)
- (F) REFL PAV MRK TY II-A-A
- SIGN
- (REM) REMOVE EXISTING SM RD SN SUP & AM
- (IN) INSTALL NEW SM RD SN SUP & AM

GENERAL NOTES:

STATE OF TEXAS
JEAN J. FENG
102035
LICENSED PROFESSIONAL ENGINEER

04/20/2023

HORIZONTAL
0 50 100 200 FT

PRINT DATE	REVISION DATE
4/19/2023	

Texas Department of Transportation
Bryan District
© 2023

SIGNING & STRIPING LAYOUT (FM 149)

SHEET 1 OF 12 SHEETS

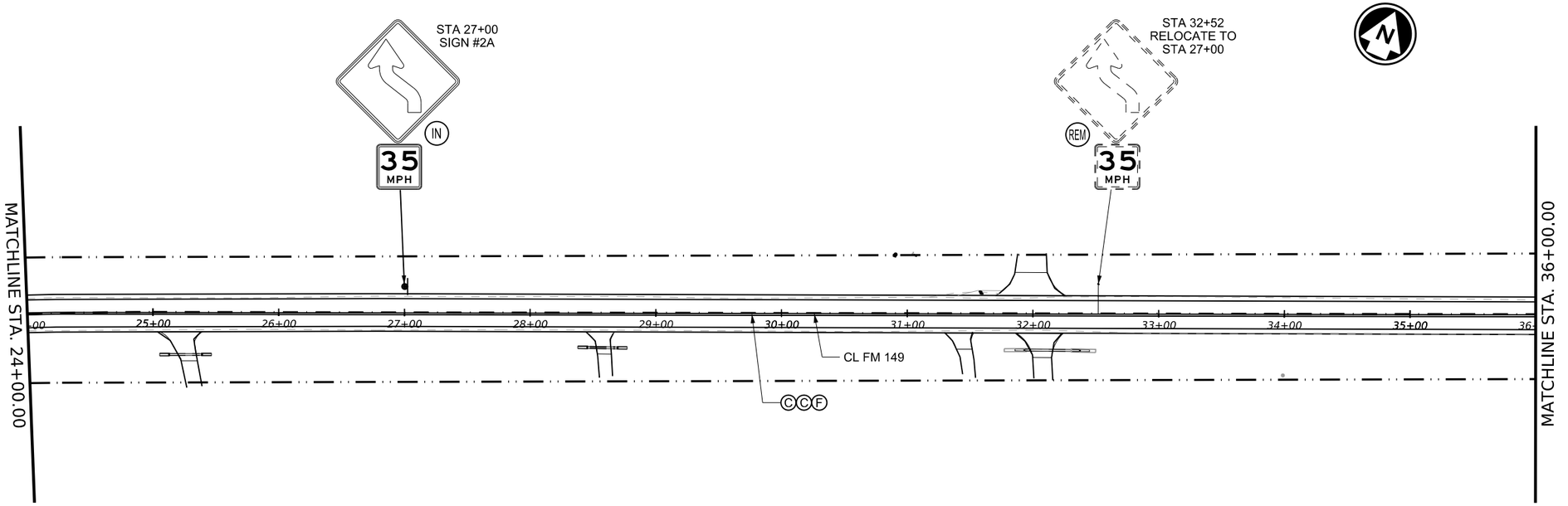
FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 149, ETC.

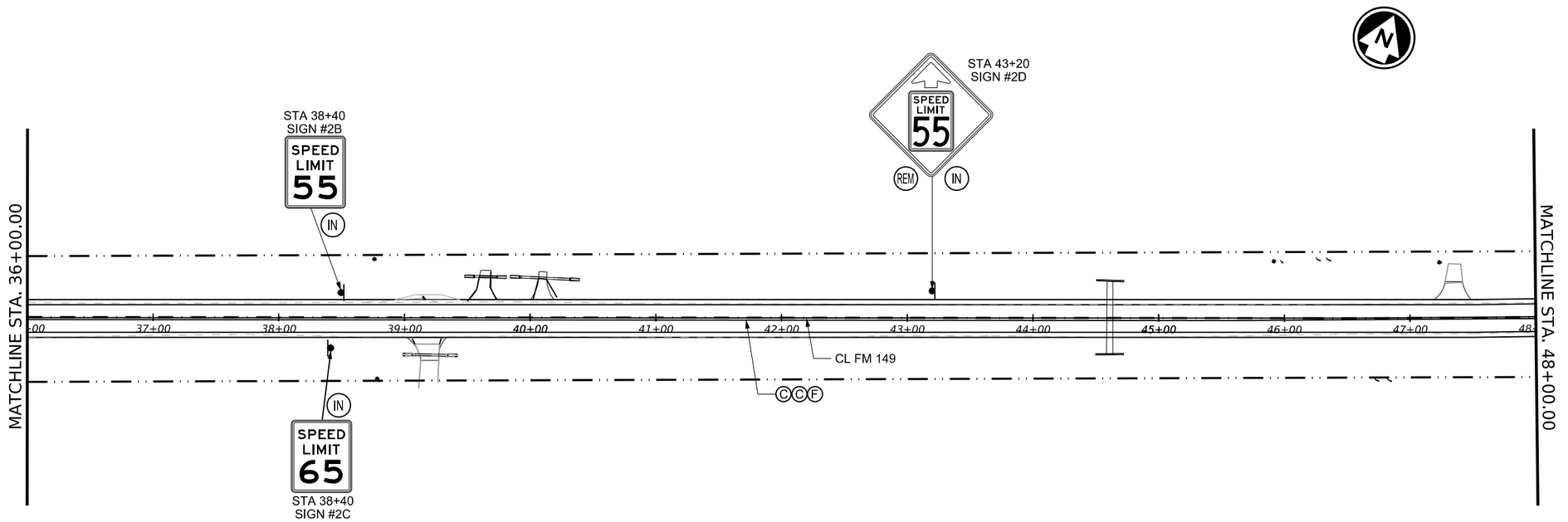
STATE	DISTRICT	COUNTY
TEXAS	BRY	GRIMES

CONTROL	SECTION	JOB	SHEET NO.
0720	01	044, ETC.	146

REV DATE: 3/28/2023
CSJ: 0720-01-044

FILENAME: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY/Design Projects/0720010444 - Design Plan Set/8. Traffic/8D. Signing Layout/SIGNING STRIPING LAYOUT (FM 149)





LEGEND

- (A) (W)(6")(SLD)
- (B) (W)(24")(SLD)
- (C) (Y)(6")(SLD)
- (D) (Y)(6"")(BRK)
- (E) (W)(ARROW)
- (F) REFL PAV MRK TY II-A-A
- SIGN
- (REM) REMOVE EXISTING SM RD SN SUP & AM
- (IN) INSTALL NEW SM RD SN SUP & AM

GENERAL NOTES:

STATE OF TEXAS
JEAN J. FENG
102035
LICENSED
PROFESSIONAL ENGINEER

04/20/2023

HORIZONTAL
0 50 100 200 FT

PRINT DATE	REVISION DATE
4/19/2023	

Texas Department of Transportation
Bryan District

SIGNING & STRIPING LAYOUT (FM 149)

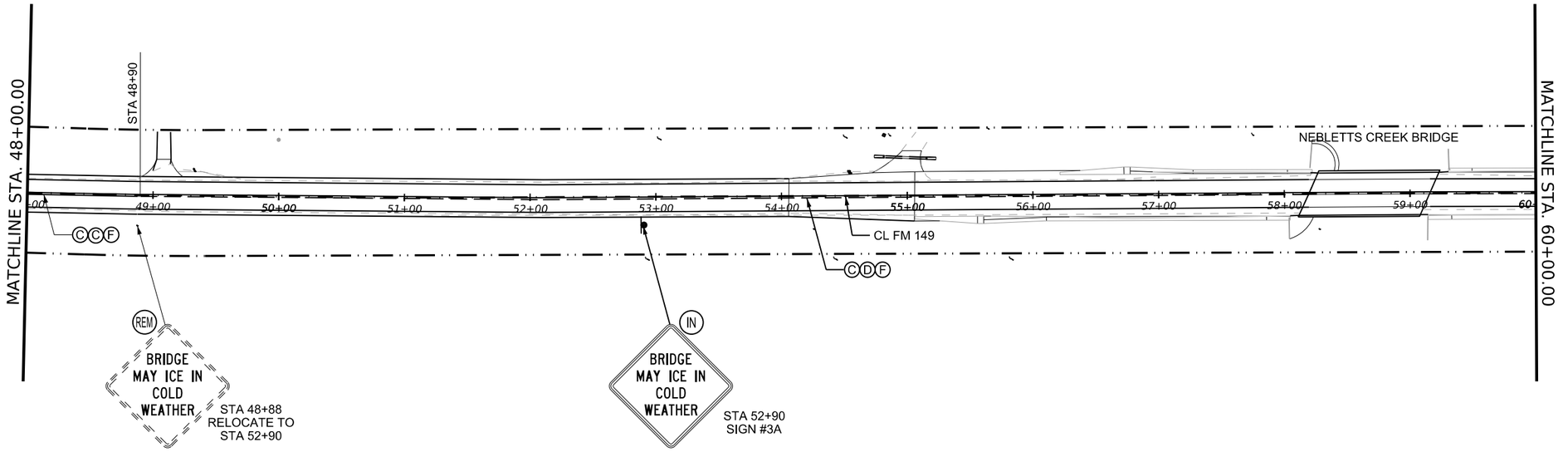
SHEET 2 OF 12 SHEETS

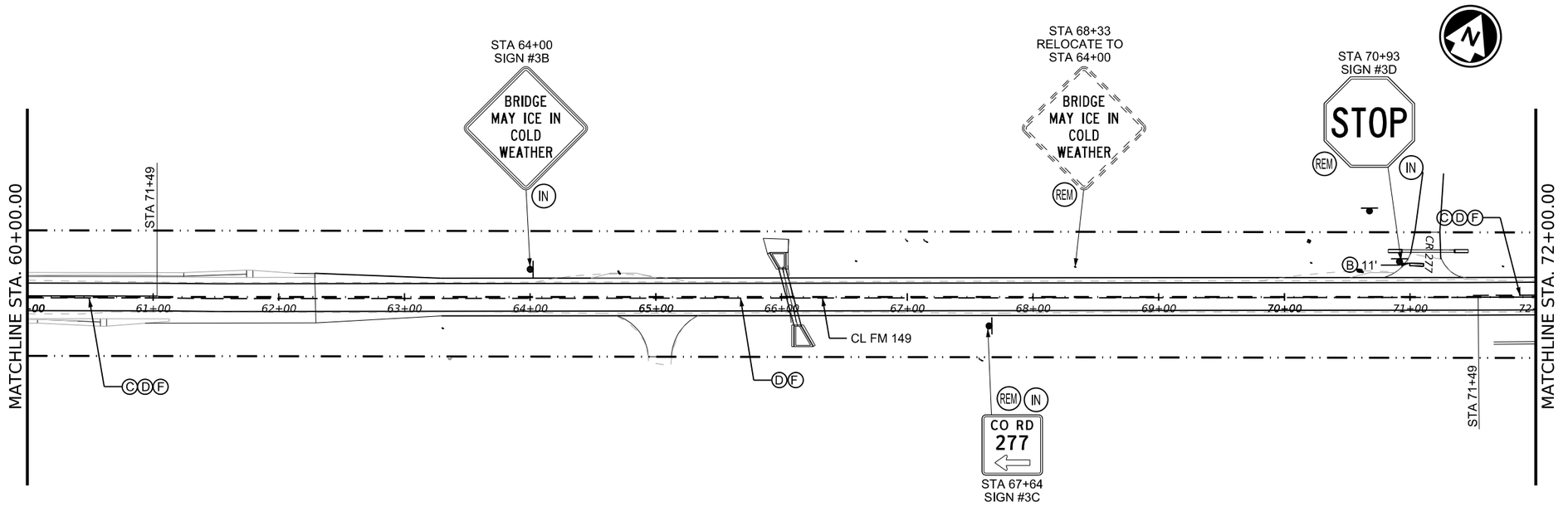
FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 149, ETC.

STATE	DISTRICT	COUNTY	
TEXAS	BRY	GRIMES	
CONTROL	SECTION	JOB	SHEET NO.
0720	01	044, ETC.	147

REV DATE: 3/28/2023
CSJ: 0720-01-044

FILENAME: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY/Design Projects/0720010044/4 - Design/Plan Set/8. Traffic/8D. Signing Layout/SIGNING STRIPING LAYOUT (FM 149)





LEGEND

- (A) (W)(6")(SLD)
- (B) (W)(24")(SLD)
- (C) (Y)(6")(SLD)
- (D) (Y)(6"")(BRK)
- (E) (W)(ARROW)
- (F) REFL PAV MRK TY II-A-A
- SIGN
- (REM) REMOVE EXISTING SM RD SN SUP & AM
- (IN) INSTALL NEW SM RD SN SUP & AM

GENERAL NOTES:

STATE OF TEXAS
JEAN J. FENG
102035
LICENSED PROFESSIONAL ENGINEER

04/20/2023

HORIZONTAL
0 50 100 200 FT

PRINT DATE	REVISION DATE
4/19/2023	

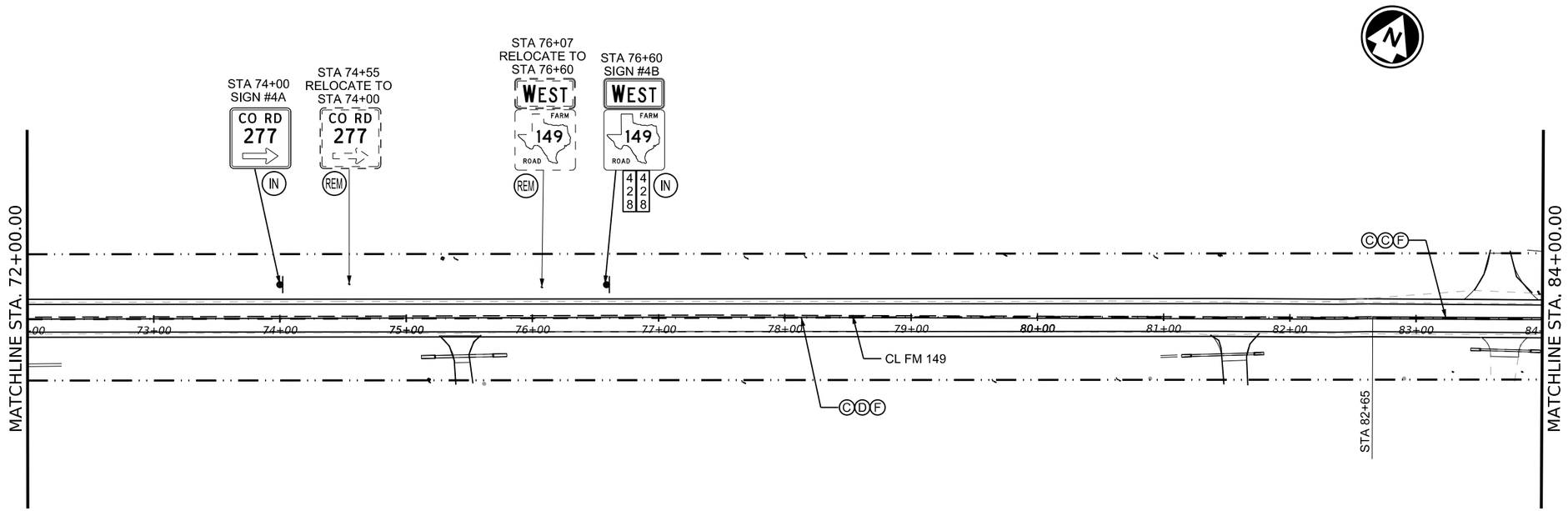
Texas Department of Transportation
Bryan District

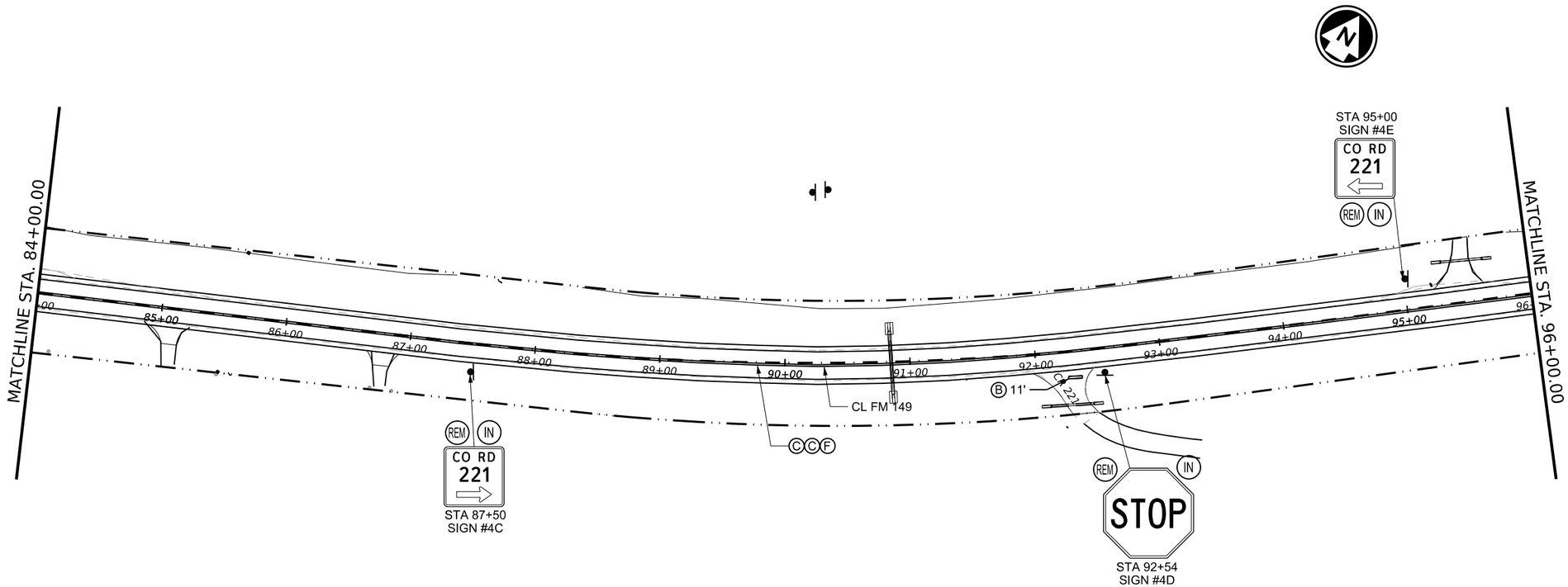
SIGNING & STRIPING LAYOUT (FM 149)

SHEET 3 OF 12 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 149, ETC.
STATE	DISTRICT	COUNTY
TEXAS	BRY	GRIMES
CONTROL	SECTION	JOB / SHEET NO.
0720	01	044, ETC. / 148

REV DATE: 3/28/2023
CSJ: 0720-01-044
FILENAME: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY/Design Projects/0720010044/4 - Design/Plan Set/8. Traffic/8D. Signing Layout/SIGNING STRIPING LAYOUT (FM 149)





LEGEND

- (A) (W)(6")(SLD)
- (B) (W)(24")(SLD)
- (C) (Y)(6")(SLD)
- (D) (Y)(6"")(BRK)
- (E) (W)(ARROW)
- (F) REFL PAV MRK TY II-A-A
- SIGN
- (REM) REMOVE EXISTING SM RD SN SUP & AM
- (IN) INSTALL NEW SM RD SN SUP & AM

GENERAL NOTES:

STATE OF TEXAS
JEAN J. FENG
102035
LICENSED
PROFESSIONAL ENGINEER

04/20/2023

HORIZONTAL
0 50 100 200 FT

PRINT DATE	REVISION DATE
4/19/2023	

Texas Department of Transportation
Bryan District

SIGNING & STRIPING LAYOUT (FM 149)

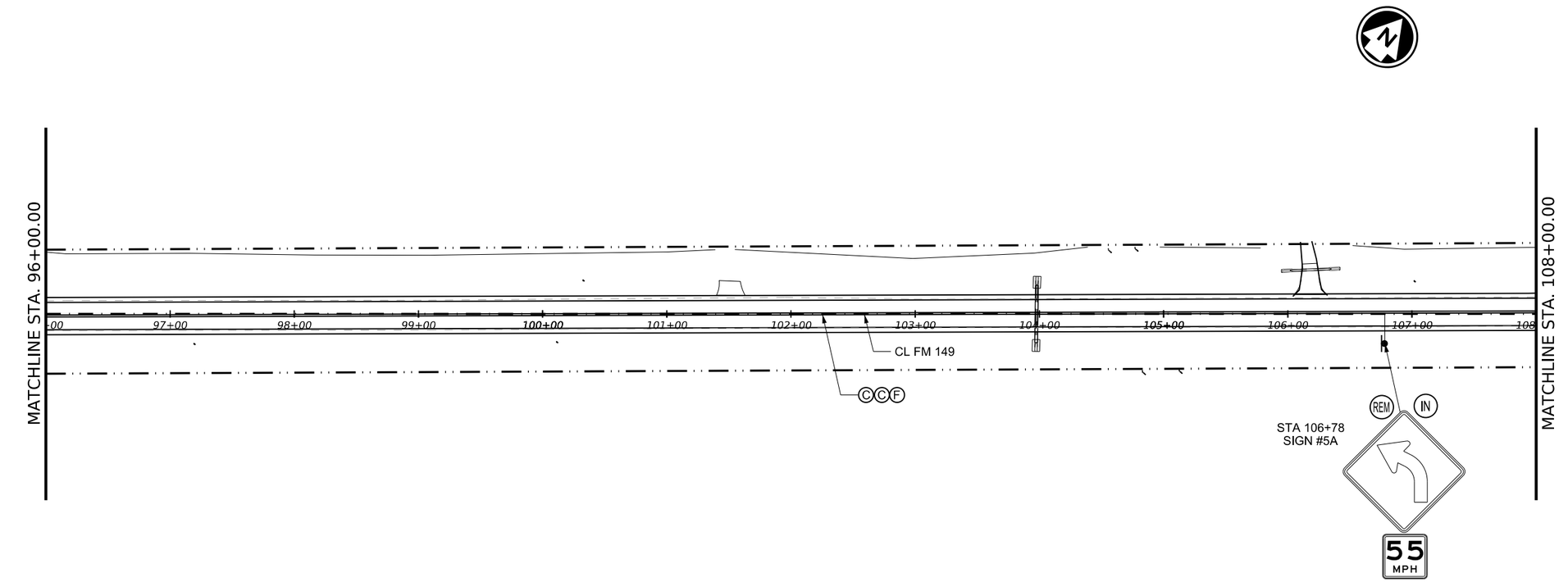
SHEET 4 OF 12 SHEETS

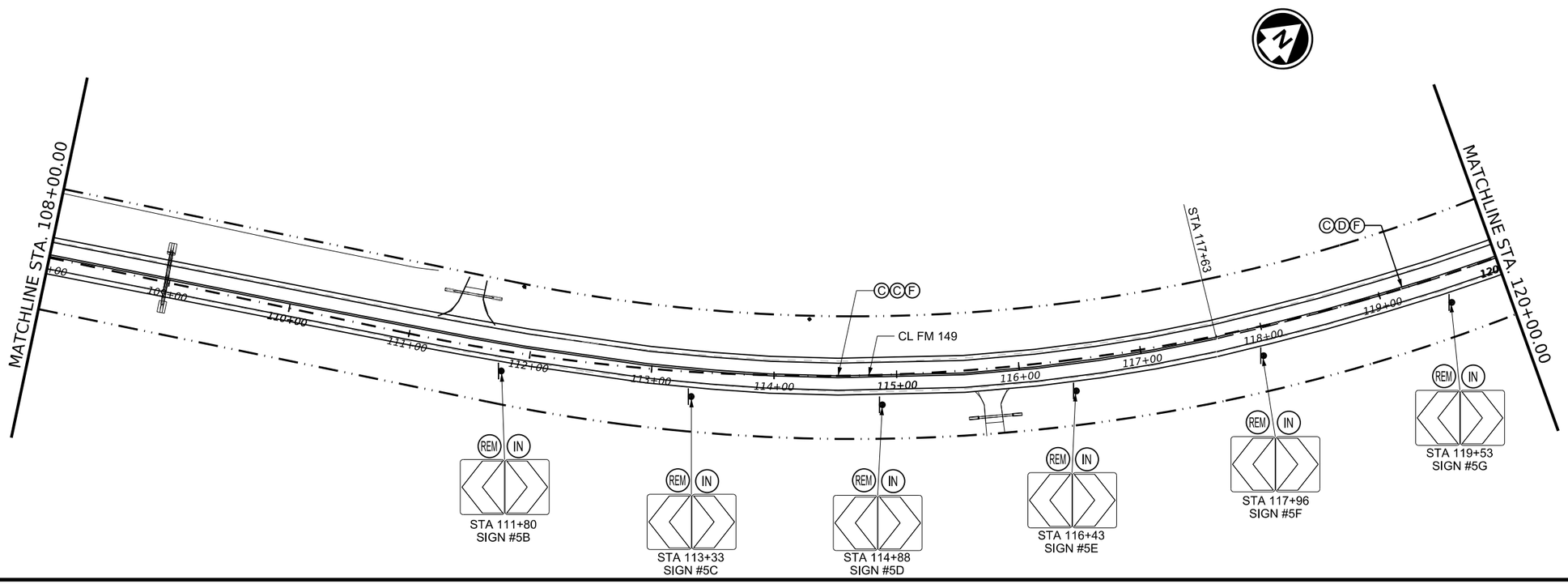
FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 149, ETC.

STATE	DISTRICT	COUNTY	
TEXAS	BRY	GRIMES	
CONTROL	SECTION	JOB	SHEET NO.
0720	01	044, ETC.	149

REV DATE: 3/28/2023
CSJ: 0720-01-044

FILENAME: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY/Design Projects/0720010044/4 - Design/Plan Set/8. Traffic/8D. Signing Layout/SIGNING STRIPING LAYOUT (FM 149)





LEGEND

- (A) (W)(6")(SLD)
- (B) (W)(24")(SLD)
- (C) (Y)(6")(SLD)
- (D) (Y)(6"")(BRK)
- (E) (W)(ARROW)
- (F) REFL PAV MRK TY II-A-A
- SIGN
- (REM) REMOVE EXISTING SM RD SN SUP & AM
- (IN) INSTALL NEW SM RD SN SUP & AM

GENERAL NOTES:

STATE OF TEXAS
JEAN J. FENG
102035
LICENSED
PROFESSIONAL ENGINEER

04/20/2023

HORIZONTAL
0 50 100 200 FT

PRINT DATE	REVISION DATE
4/19/2023	

Texas Department of Transportation
Bryan District

SIGNING & STRIPING LAYOUT (FM 149)

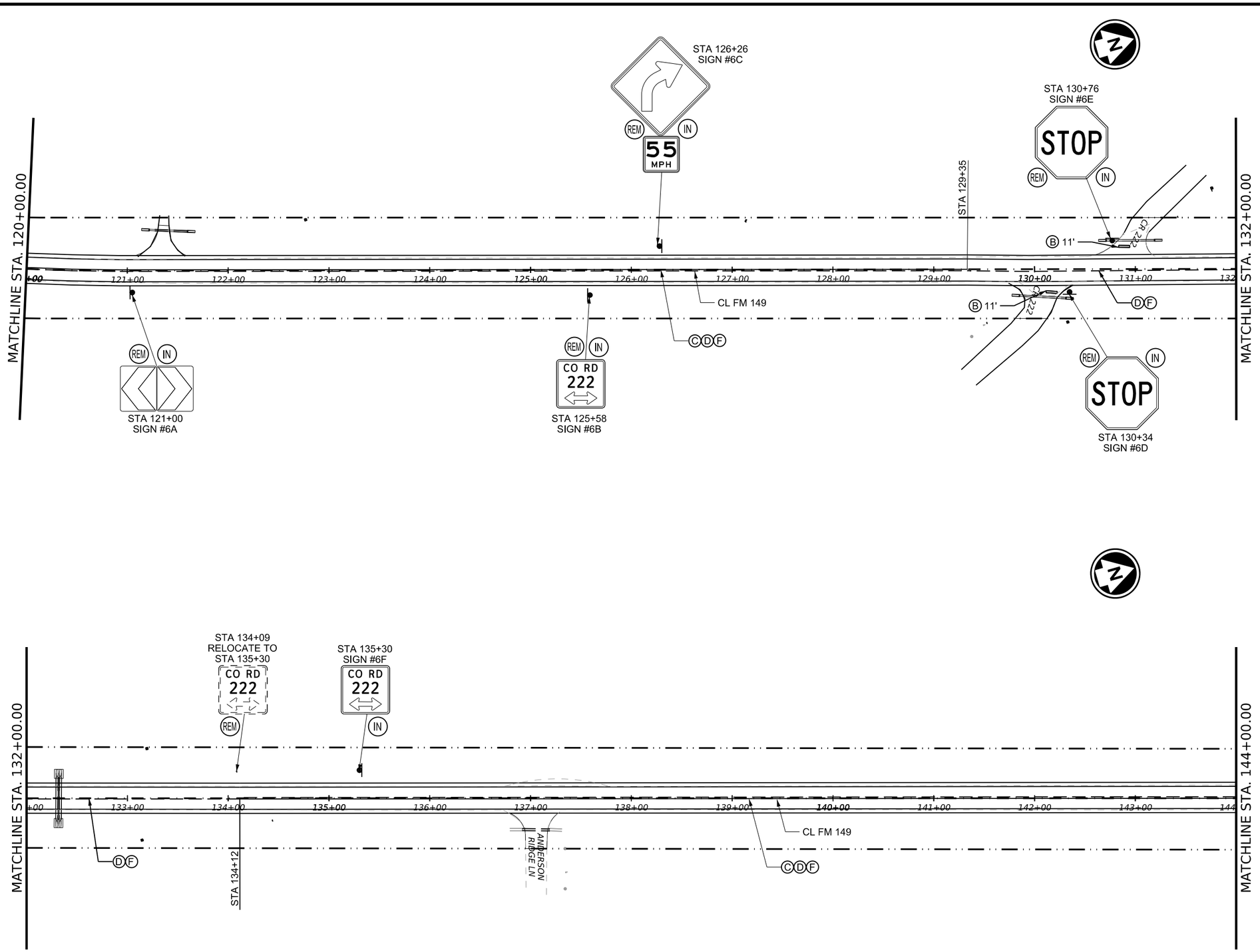
SHEET 5 OF 12 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 149, ETC.

STATE	DISTRICT	COUNTY	
TEXAS	BRY	GRIMES	
CONTROL	SECTION	JOB	SHEET NO.
0720	01	044, ETC.	150

REV DATE: 3/28/2023
CSJ: 0720-01-044

FILENAME: pw://txdot.projectwiseonline.com/TxDOT4/Documents/17 - BRY/Design Projects/0720010044/4 - Design/Plan Set/8. Traffic/8D. Signing/Layout/SIGNING STRIPING LAYOUT (FM 149)



LEGEND
(A) (W)(6")(SLD)
(B) (W)(24")(SLD)
(C) (Y)(6")(SLD)
(D) (Y)(6"")(BRK)
(E) (W)(ARROW)
(F) REFL PAV MRK TY II-A-A
SIGN
(REM) REMOVE EXISTING SM RD SN SUP & AM
(IN) INSTALL NEW SM RD SN SUP & AM

GENERAL NOTES:

STATE OF TEXAS
JEAN J. FENG
102035
LICENSED
PROFESSIONAL ENGINEER

04/20/2023

HORIZONTAL
0 50 100 200 FT

PRINT DATE	REVISION DATE
4/19/2023	

Texas Department of Transportation
Bryan District
© 2023

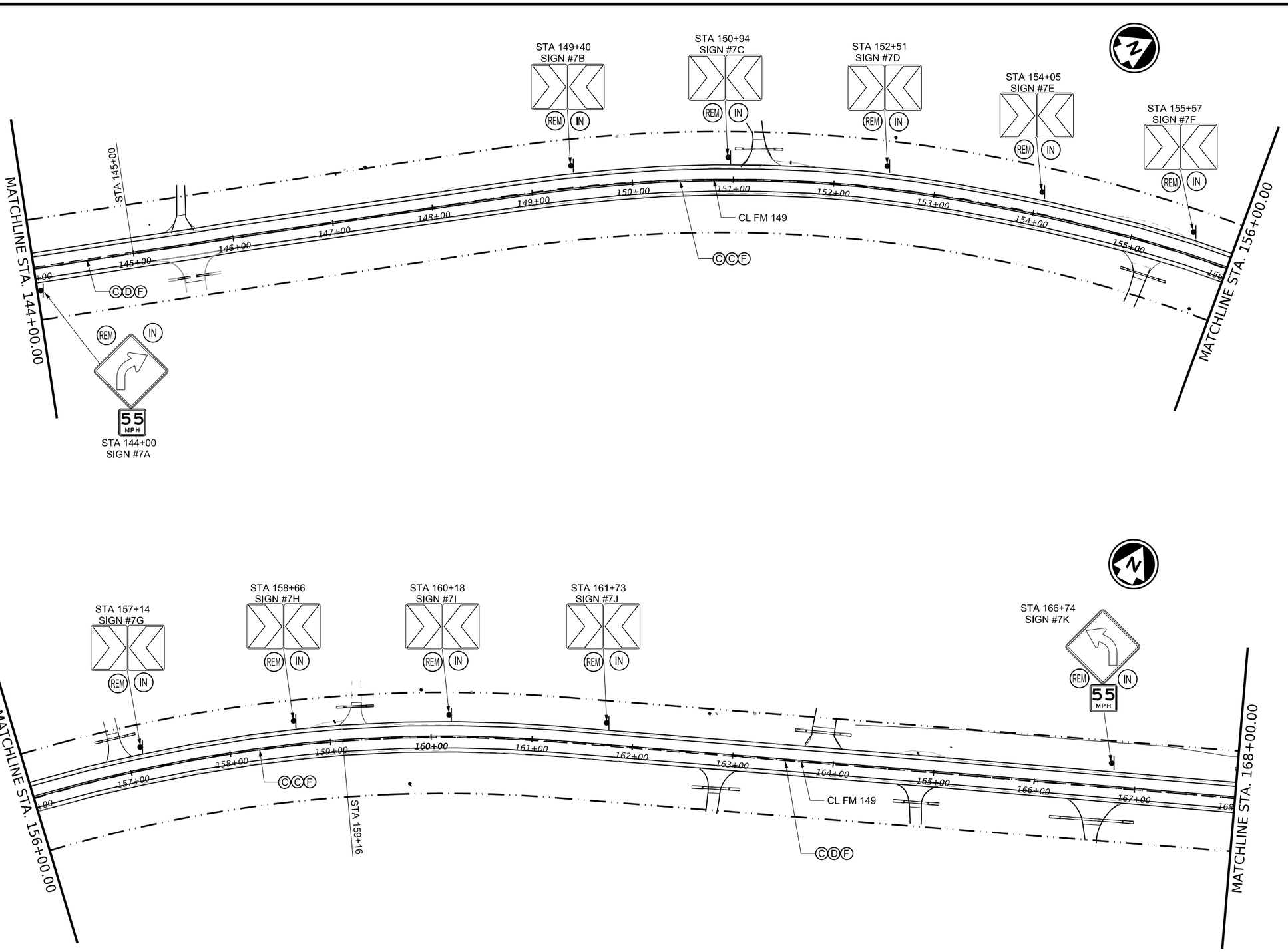
SIGNING & STRIPING LAYOUT (FM 149)

SHEET 6 OF 12 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 149, ETC.
STATE	DISTRICT	COUNTY
TEXAS	BRY	GRIMES
CONTROL	SECTION	JOB / SHEET NO.
0720	01	044, ETC. / 151

REV DATE: 3/28/2023
CSJ: 0720-01-044

FILENAME: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY/Design Projects/0720010044/4 - Design/Plan Set/8. Traffic/8D. Signing Layout/SIGNING STRIPING LAYOUT (FM 149)



LEGEND
(A) (W)(6")(SLD)
(B) (W)(24")(SLD)
(C) (Y)(6")(SLD)
(D) (Y)(6"")(BRK)
(E) (W)(ARROW)
(F) REFL PAV MRK TY II-A-A
SIGN
(REM) REMOVE EXISTING SM RD SN SUP & AM
(IN) INSTALL NEW SM RD SN SUP & AM

GENERAL NOTES:

STATE OF TEXAS
JEAN J. FENG
102035
LICENSED
PROFESSIONAL ENGINEER

04/20/2023

HORIZONTAL
0 50 100 200 FT

PRINT DATE	REVISION DATE
4/19/2023	

Texas Department of Transportation
Bryan District
©2023

SIGNING & STRIPING LAYOUT (FM 149)

SHEET 7 OF 12 SHEETS

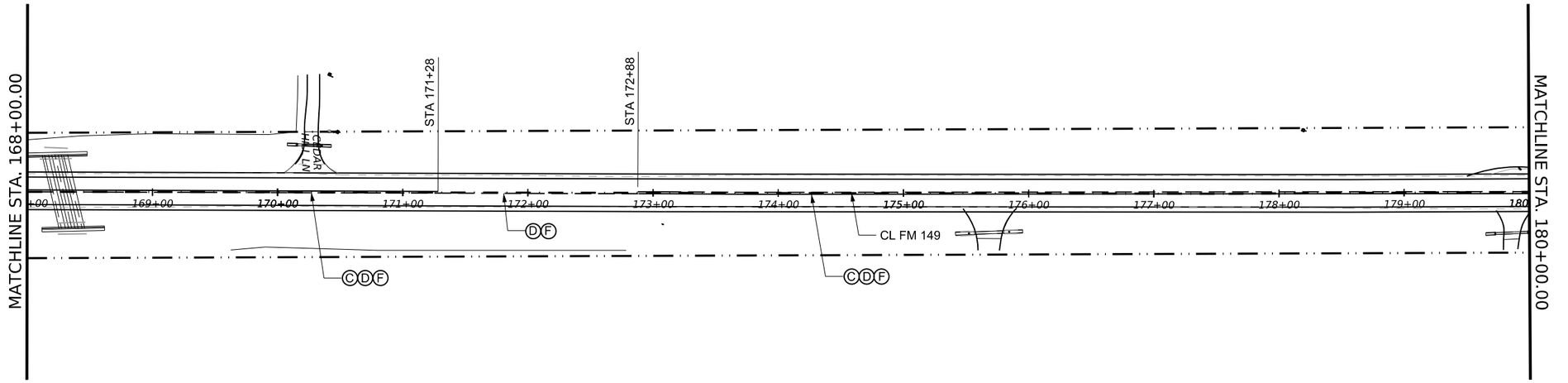
FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 149, ETC.

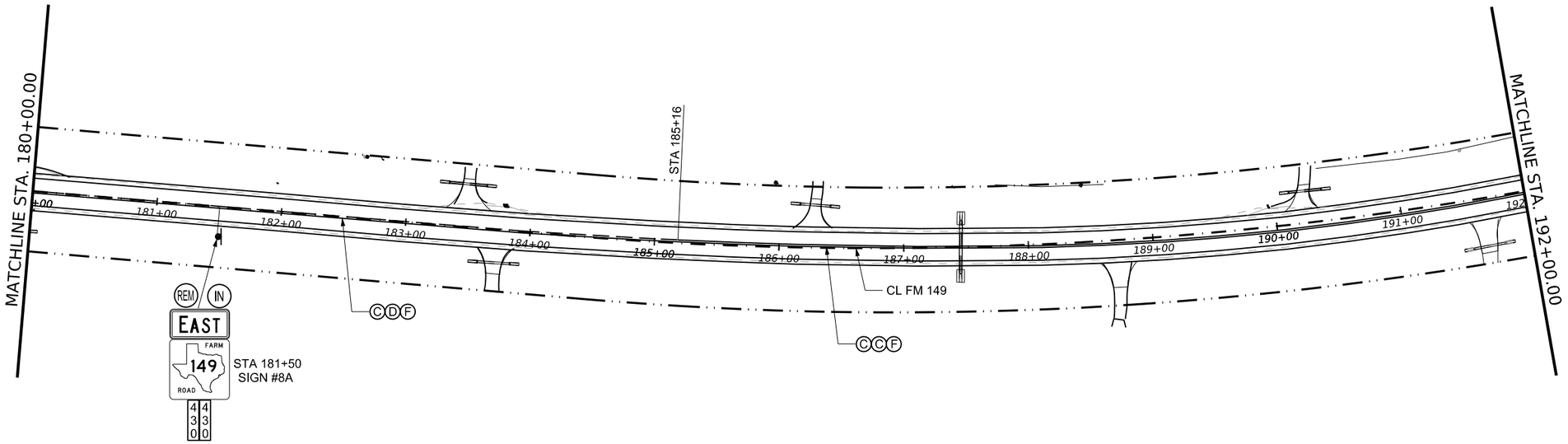
STATE	DISTRICT	COUNTY
TEXAS	BRY	GRIMES

CONTROL	SECTION	JOB	SHEET NO.
0720	01	044, ETC.	152

REV DATE: 3/28/2023
CSJ: 0720-01-044

FILENAME: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY/Design Projects/0720010044/4 - Design/Plan Set/8. Traffic/8D. Signing Layout/SIGNING STRIPING LAYOUT (FM 149)





LEGEND

- (A) (W)(6")(SLD)
- (B) (W)(24")(SLD)
- (C) (Y)(6")(SLD)
- (D) (Y)(6"")(BRK)
- (E) (W)(ARROW)
- (F) REFL PAV MRK TY II-A-A
- SIGN
- (REM) REMOVE EXISTING SM RD SN SUP & AM
- (IN) INSTALL NEW SM RD SN SUP & AM

GENERAL NOTES:

STATE OF TEXAS
JEAN J. FENG
102035
LICENSED
PROFESSIONAL ENGINEER

04/20/2023

HORIZONTAL
0 50 100 200 FT

PRINT DATE	REVISION DATE
4/19/2023	

Texas Department of Transportation
Bryan District

SIGNING & STRIPING LAYOUT (FM 149)

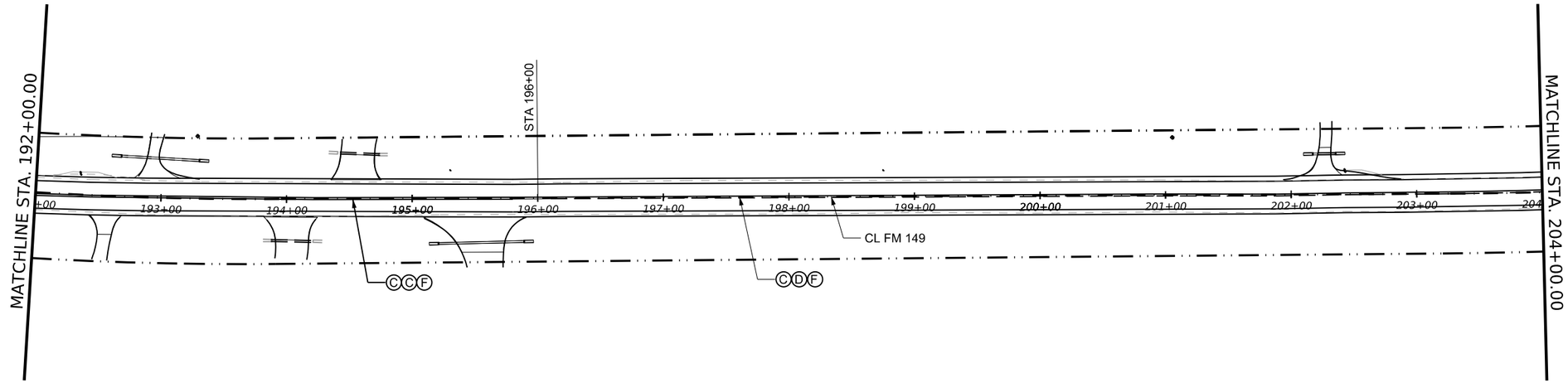
SHEET 8 OF 12 SHEETS

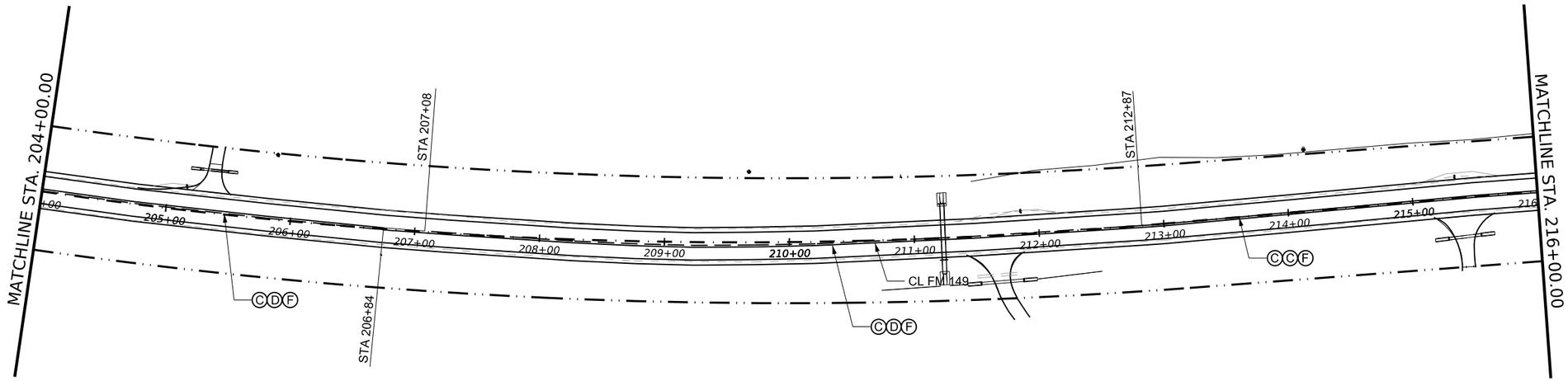
FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 149, ETC.

STATE	DISTRICT	COUNTY	
TEXAS	BRY	GRIMES	
CONTROL	SECTION	JOB	SHEET NO.
0720	01	044, ETC.	153

REV DATE: 3/28/2023
CSJ: 0720-01-044

FILENAME: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY/Design Projects/0720010044/4 - Design/Plan Set/8. Traffic/8D. Signing Layout/SIGNING STRIPING LAYOUT (FM 149)





LEGEND
(A) (W)(6")(SLD)
(B) (W)(24")(SLD)
(C) (Y)(6")(SLD)
(D) (Y)(6"")(BRK)
(E) (W)(ARROW)
(F) REFL PAV MRK TY II-A-A
SIGN
(REM) REMOVE EXISTING SM RD SN SUP & AM
(IN) INSTALL NEW SM RD SN SUP & AM

GENERAL NOTES:

STATE OF TEXAS
JEAN J. FENG
102035
LICENSED
PROFESSIONAL ENGINEER

04/20/2023

HORIZONTAL
0 50 100 200 FT

PRINT DATE	REVISION DATE
4/19/2023	

Texas Department of Transportation
Bryan District
© 2023

SIGNING & STRIPING LAYOUT (FM 149)

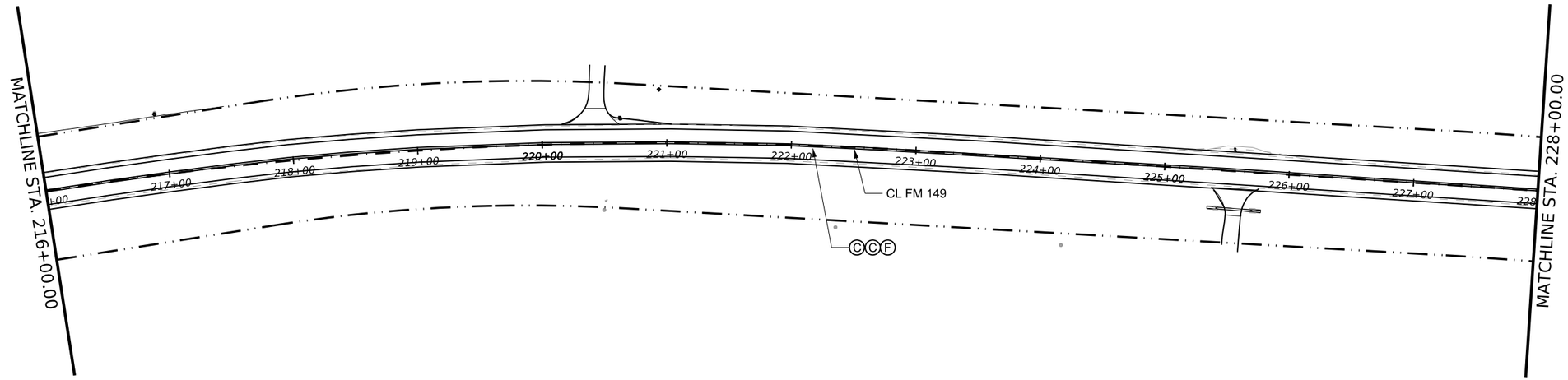
SHEET 9 OF 12 SHEETS

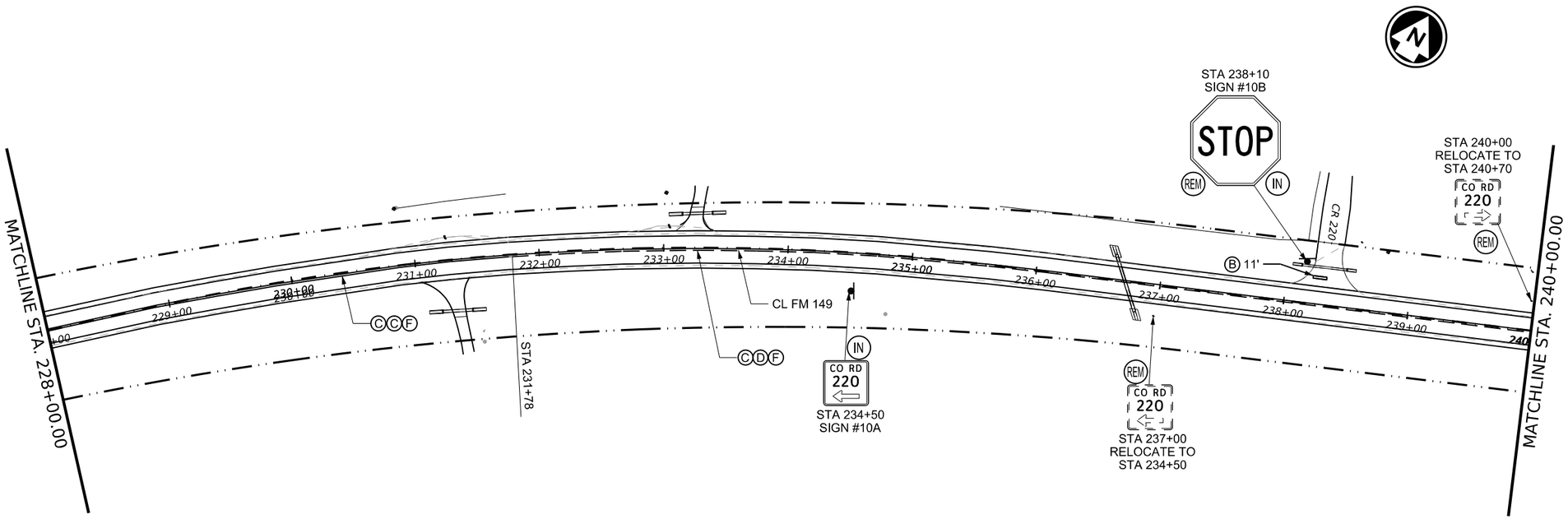
FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 149, ETC.

STATE	DISTRICT	COUNTY	
TEXAS	BRY	GRIMES	
CONTROL	SECTION	JOB	SHEET NO.
0720	01	044, ETC.	154

REV DATE: 3/28/2023
CSJ: 0720-01-044

FILENAME: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY/Design Projects/0720010044/4 - Design/Plan Set/8. Traffic/8D. Signing Layout/SIGNING STRIPING LAYOUT (FM 149)





LEGEND

- (A) (W)(6")(SLD)
- (B) (W)(24")(SLD)
- (C) (Y)(6")(SLD)
- (D) (Y)(6"")(BRK)
- (E) (W)(ARROW)
- (F) REFL PAV MRK TY II-A-A
- SIGN
- (REM) REMOVE EXISTING SM RD SN SUP & AM
- (IN) INSTALL NEW SM RD SN SUP & AM

GENERAL NOTES:

STATE OF TEXAS
JEAN J. FENG
102035
LICENSED
PROFESSIONAL ENGINEER

04/20/2023

HORIZONTAL
0 50 100 200 FT

PRINT DATE	REVISION DATE
4/19/2023	

Texas Department of Transportation
Bryan District

SIGNING & STRIPING LAYOUT (FM 149)

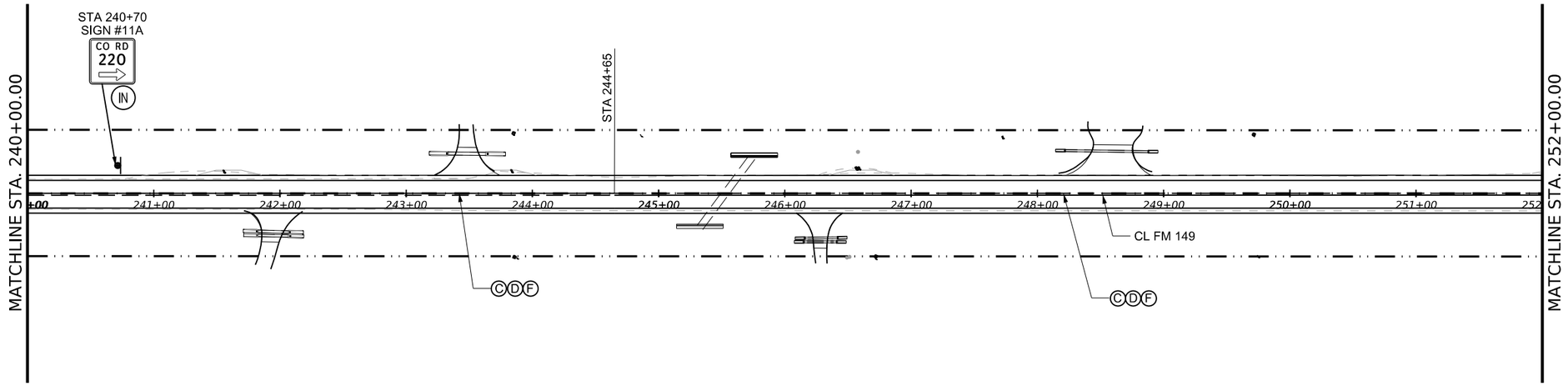
SHEET 10 OF 12 SHEETS

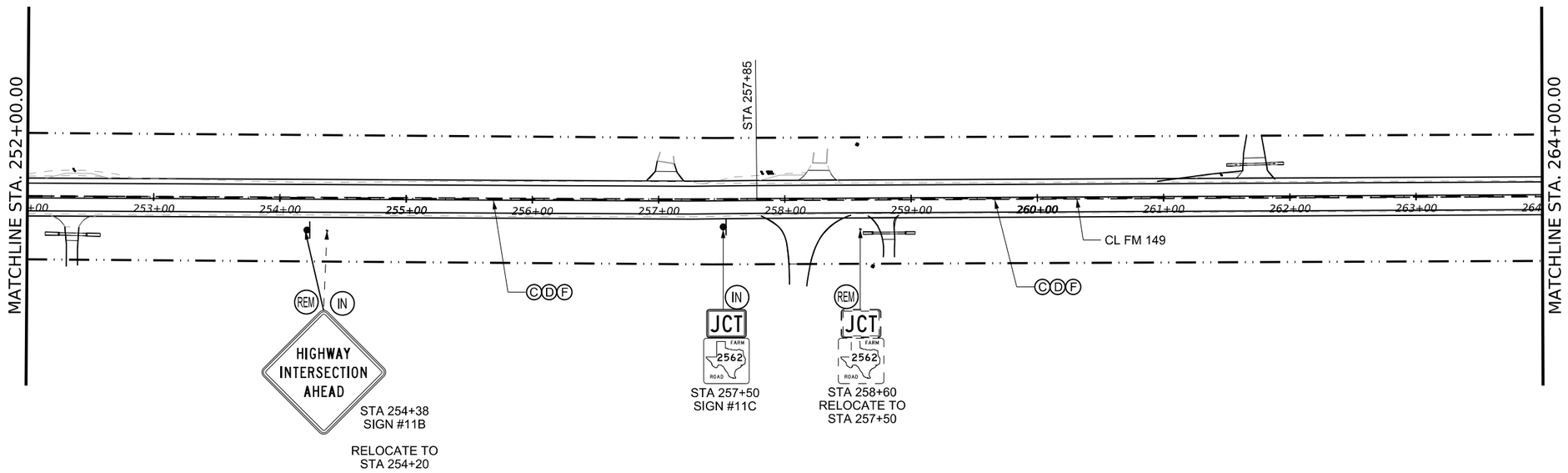
FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 149, ETC.

STATE	DISTRICT	COUNTY	
TEXAS	BRY	GRIMES	
CONTROL	SECTION	JOB	SHEET NO.
0720	01	044, ETC.	155

REV DATE: 3/28/2023
CSJ: 0720-01-044

FILENAME: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY/Design Projects/072001044/4 - Design/Plan Set/8. Traffic/8D. Signing Layout/SIGNING STRIPING LAYOUT (FM 149)





LEGEND

- (A) (W)(6")(SLD)
- (B) (W)(24")(SLD)
- (C) (Y)(6")(SLD)
- (D) (Y)(6"")(BRK)
- (E) (W)(ARROW)
- (F) REFL PAV MRK TY II-A-A
- SIGN
- (REM) REMOVE EXISTING SM RD SN SUP & AM
- (IN) INSTALL NEW SM RD SN SUP & AM

GENERAL NOTES:

STATE OF TEXAS
JEAN J. FENG
102035
LICENSED
PROFESSIONAL ENGINEER

04/20/2023

HORIZONTAL
0 50 100 200 FT

PRINT DATE	REVISION DATE
4/19/2023	

Texas Department of Transportation
Bryan District

SIGNING & STRIPING LAYOUT (FM 149)

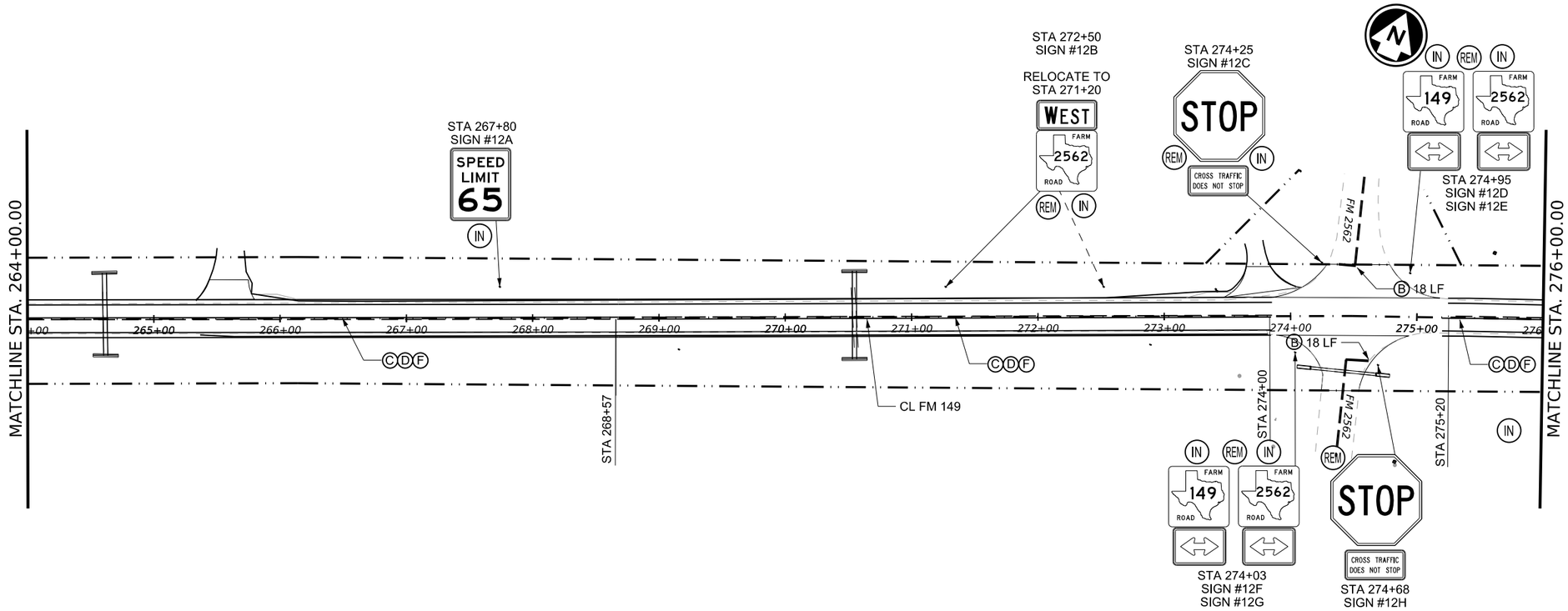
SHEET 11 OF 12 SHEETS

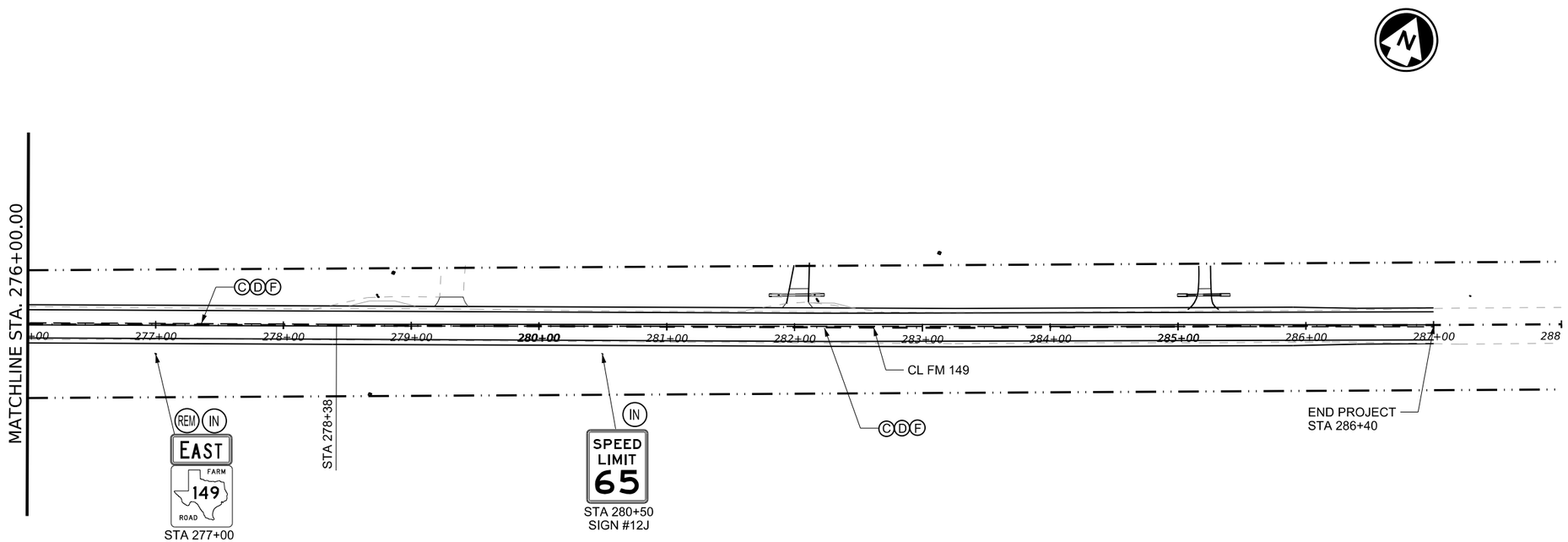
FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 149, ETC.

STATE	DISTRICT	COUNTY	
TEXAS	BRY	GRIMES	
CONTROL	SECTION	JOB	SHEET NO.
0720	01	044, ETC.	156

REV DATE: 3/28/2023
CSJ: 0720-01-044

FILENAME: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY/Design Projects/0720010044/4 - Design/Plan Set/8. Traffic/8D. Signing Layout/SIGNING STRIPING LAYOUT (FM 149)





LEGEND

- (A) (W)(6")(SLD)
- (B) (W)(24")(SLD)
- (C) (Y)(6")(SLD)
- (D) (Y)(6"")(BRK)
- (E) (W)(ARROW)
- (F) REFL PAV MRK TY II-A-A
- SIGN
- (REM) REMOVE EXISTING SM RD SN SUP & AM
- (IN) INSTALL NEW SM RD SN SUP & AM

GENERAL NOTES:

JEAN J. FENG
102035
LICENSED
PROFESSIONAL ENGINEER
STATE OF TEXAS

04/20/2023

HORIZONTAL
0 50 100 200 FT

PRINT DATE	REVISION DATE
4/19/2023	

Texas Department of Transportation
Bryan District
© 2023

SIGNING & STRIPING LAYOUT (FM 149)

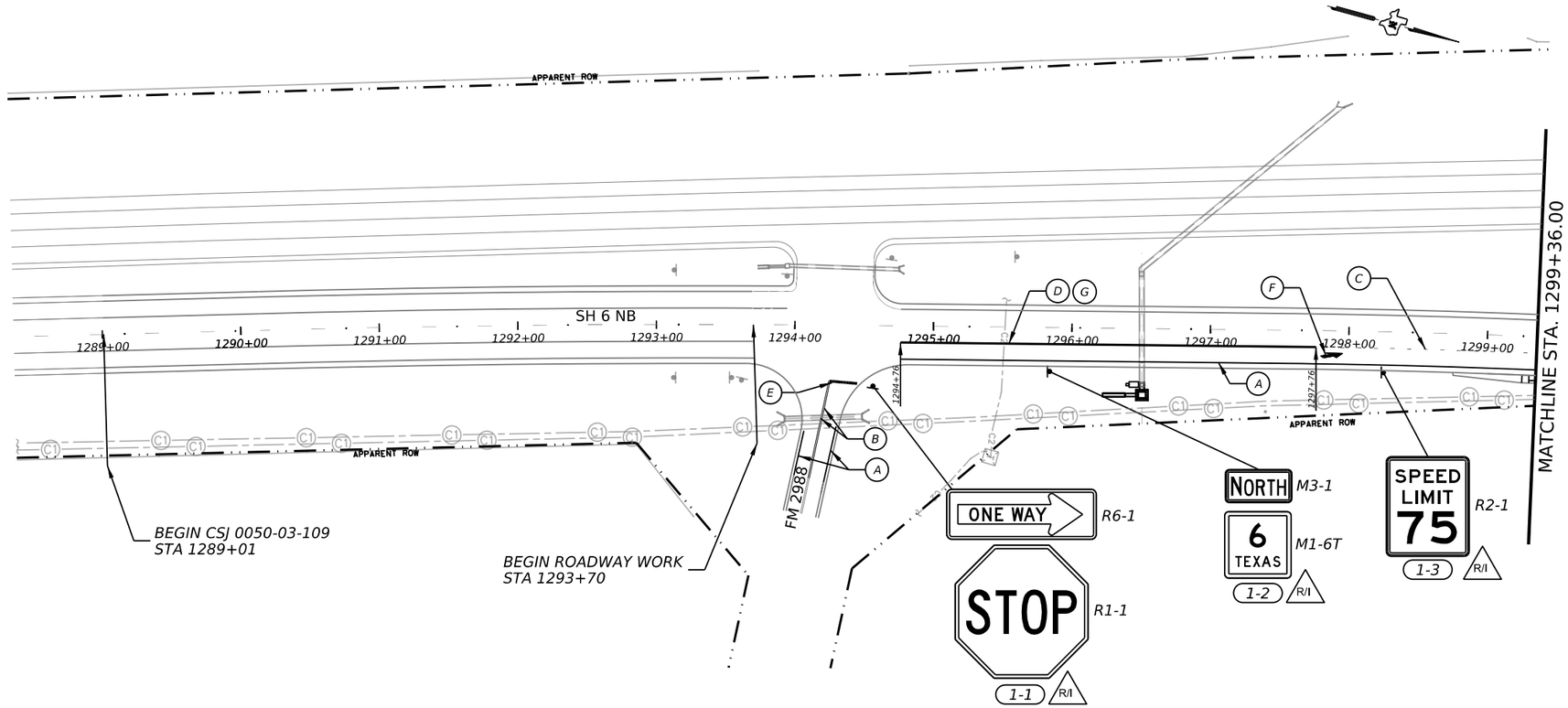
SHEET 12 OF 12 SHEETS

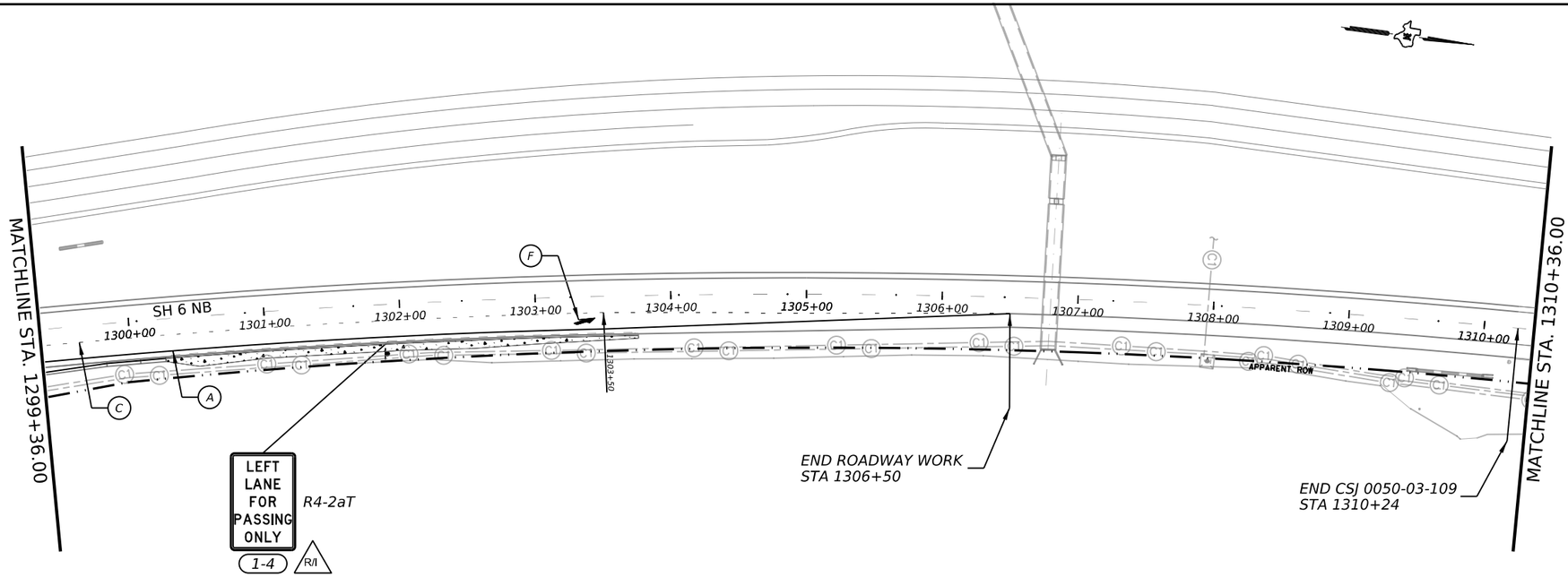
FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 149, ETC.

STATE	DISTRICT	COUNTY	
TEXAS	BRY	GRIMES	
CONTROL	SECTION	JOB	SHEET NO.
0720	01	044, ETC.	157

REV DATE: 3/28/2023
CSJ: 0720-01-044

FILENAME: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY/Design Projects/072001044/4 - Design/Plan Set/8. Traffic/8D. Signing Layout/SIGNING STRIPING LAYOUT (FM 149)





LEGEND

- (A) (W)(6")(SLD)
- (B) (Y)(6")(SLD)
- (C) (W)(6")(DOT)
- (D) (W)(8")(SLD)
- (E) (W)(24")(SLD)
- (F) (W)(LNDP ARW)
- (G) RAISED PAV MRK TY II-C-R
- SIGN
- X-X SIGN NUMBER
- OBJECT MARKER (OM-2)
- R/I REMOVE AND INSTALL SIGN

GENERAL NOTES:

CONTRACTOR TO INCLUDE RED WRAPAROUND REFLECTIVE TAPE ON STOP SIGNS.

STATE OF TEXAS
JEAN J. FENG
102035
LICENSED PROFESSIONAL ENGINEER

04/20/2023

HORIZONTAL
0 50 100 200 FT

PRINT DATE	REVISION DATE
4/19/2023	

Texas Department of Transportation
Bryan District

SIGNING & STRIPING LAYOUT (SH 6)

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 149, ETC.

STATE	DISTRICT	COUNTY
TEXAS	BRY	GRIMES

CONTROL	SECTION	JOB	SHEET NO.
0720	01	044, ETC.	158

SUMMARY OF SMALL SIGNS

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

PLAN SHEET NO.	SIGN NO.	SIGN NOMENCLATURE	SIGN	DIMENSIONS	FLAT ALUMINUM (TYPE A)	EXAL ALUMINUM (TYPE G)	POST TYPE FRP = Fiberglass TWT = Thin-Wall 10BWG = 10 BWG S80 = Sch 80	POSTS 1 or 2	ANCHOR TYPE UA=Universal Conc UB=Universal Bolt SA=Slipbase-Conc SB=Slipbase-Bolt WS=Wedge Steel WP=Wedge Plastic	MOUNTING DESIGNATION PREFABRICATED P = "Plain" T = "T" U = "U"	1EXT or 2EXT = # of Ext BM = Extruded Wind Beam WC = 1.12 #/ft Wing Channel EXAL= Extruded Alum Sign Panels	BRIDGE MOUNT CLEARANCE SIGNS (See Note 2) TY = TYPE TY N TY S
1	1A	W4-4P	CROSS TRAFFIC DOES NOT STOP — PLACE UNDER EXIST STOP SIGN	36 X 18								
		R5-2		30 X 30								
		M6-1R		21 X 15								
1		M3-3	SOUTH	24 X 12								
	1B		SOUTH / LOOP 429		✓		10BWG	1	SA	U		
		M1-6L	SOUTH / LOOP 429	24 X 24								
		M6-1R	SOUTH / LOOP 429	21 X 15								
		M1-6F	FARM 149 ROAD	24 X 24								
1	1C		FARM 149 ROAD		✓		10BWG	1	SA	P		
		M6-4	FARM 149 ROAD	21 X 15								
		M3-3	SOUTH	24 X 12								
		M1-6L	SOUTH / LOOP 429	24 X 24								
		M6-1L	SOUTH / LOOP 429	21 X 15								
1	1D		SOUTH / LOOP 429		✓		S80	1	SA	U		
		R5-2		30 X 30								
		M6-1L		30 X 24								
1	1E	R1-1	STOP	36 X 36	✓		10BWG	1	SA	P		
		M1-6F	WEIGHT LIMIT / GROSS 58,420 LBS	24 X 24								
1	1F	M6-3	WEIGHT LIMIT / GROSS 58,420 LBS	21 X 15			10BWG	1	SA	P		
		M3-2	EAST	24 X 12								
1	1G	M1-6F	EAST / FARM 149 ROAD	24 X 24	✓		10BWG	1	SA	P		
1	1H	R2-1	SPEED LIMIT 45	30 X 36	✓		10BWG	1	SA	P		
1	1I	D1-2	⇦ Navasota / Roans Prairie ⇨	108 X 30	✓		S80	1	SA	U	WC	

ALUMINUM SIGN BLANKS THICKNESS	
Square Feet	Minimum Thickness
Less than 7.5	0.080"
7.5 to 15	0.100"
Greater than 15	0.125"

The Standard Highway Sign Designs for Texas (SHSD) can be found at the following website.

http://www.txdot.gov/

NOTE:

1. Sign supports shall be located as shown on the plans, except that the Engineer may shift the sign supports, within design guidelines, where necessary to secure a more desirable location or to avoid conflict with utilities. Unless otherwise shown on the plans, the Contractor shall stake and the Engineer will verify all sign support locations.
2. For installation of bridge mount clearance signs, see Bridge Mounted Clearance Sign Assembly (BMCS)Standard Sheet.
3. For Sign Support Descriptive Codes, see Sign Mounting Details Small Roadside Signs General Notes & Details SMD(GEN).

Texas Department of Transportation

Traffic Operations Division Standard

SUMMARY OF SMALL SIGNS

(FM 149, 0720-01-044)
SHEET 1 OF 9 SHEETS

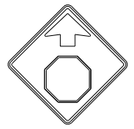
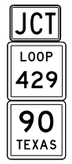
SOSS

FILE:	sums16.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT	May 1987	CONT	SECT	JOB	HIGHWAY
REVISIONS		0720	01	044, ETC.	FM 149,ETC.
4-16		DIST	COUNTY		SHEET NO.
8-16		BRYAN	GRIMES		159

DATE: 4/20/2023 10:59:14 AM
FILE: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY/Design Projects/0720010044/4 - Design/Plan Set/8. Traffic/8D. SigningLayout/SUMMARY OF SMALL SIGNS (FM 149)

SUMMARY OF SMALL SIGNS

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

PLAN SHEET NO.	SIGN NO.	SIGN NOMENCLATURE	SIGN	DIMENSIONS	FLAT ALUMINUM (TYPE A)	EXAL ALUMINUM (TYPE G)	POST TYPE FRP = Fiberglass TWT = Thin-Wall 10BWG = 10 BWG S80 = Sch 80	POSTS 1 or 2	ANCHOR TYPE UA=Universal Conc UB=Universal Bolt SA=Slipbase-Conc SB=Slipbase-Bolt WS=Wedge Steel WP=Wedge Plastic	MOUNTING DESIGNATION PREFABRICATED P = "Plain" T = "T" U = "U"	1EXT or 2EXT = # of Ext BM = Extruded Wind Beam WC = 1.12 #/ft Wing Channel EXAL= Extruded Alum Sign Panels	BRIDGE MOUNT CLEARANCE SIGNS (See Note 2) TY = TYPE TY N TY S
		W1-4L		36 X 36								
1	1J				✓		S80	1	SA	P		
		W13-1P		24 X 24								
1	1K	CW3-1		36 X 36	✓		10BWG	1	SA	P		
1	1L	R2-1		30 X 36	✓		10BWG	1	SA	P		
1	1M	I-2aT		54 X 24 9 SF	✓		10BWG	1	SA	T		
1	1N	R1-1		36 X 36	✓		10BWG	1	SA	P		
1	1O	R2-1		30 X 36	✓		10BWG	1	SA	P		
		M3-4		24 X 12								
1	1P	M1-6F		24 X 24	✓		10BWG	1	SA	P		
		M5-1L		21 X 15								
		M2-1		21 X 15								
1	1Q	M1-6L		24 X 24	✓		10BWG	1	SA	P		
		M1-6T		24 X 24								

ALUMINUM SIGN BLANKS THICKNESS	
Square Feet	Minimum Thickness
Less than 7.5	0.080"
7.5 to 15	0.100"
Greater than 15	0.125"

The Standard Highway Sign Designs for Texas (SHSD) can be found at the following website.

http://www.txdot.gov/

NOTE:

1. Sign supports shall be located as shown on the plans, except that the Engineer may shift the sign supports, within design guidelines, where necessary to secure a more desirable location or to avoid conflict with utilities. Unless otherwise shown on the plans, the Contractor shall stake and the Engineer will verify all sign support locations.
2. For installation of bridge mount clearance signs, see Bridge Mounted Clearance Sign Assembly (BMCS)Standard Sheet.
3. For Sign Support Descriptive Codes, see Sign Mounting Details Small Roadside Signs General Notes & Details SMD(GEN).

Texas Department of Transportation

Traffic Operations Division Standard

SUMMARY OF SMALL SIGNS

(FM 149, 0720-01-044)

SHEET 2 OF 9 SHEETS

SOSS

FILE: sums16.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT May 1987	CONT	SECT	JOB	HIGHWAY
REVISIONS	0720	01	044, ETC.	FM 149,ETC.
4-16 8-16	DIST	COUNTY		SHEET NO.
	BRYAN	GRIMES		160

18

DATE: 4/20/2023 10:59:15 AM
FILE: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY/Design Projects/0720010044/4 - Design/Plan Set/8. Traffic/8D. SigningLayout/SUMMARY OF SMALL SIGNS (FM 149)

SUMMARY OF SMALL SIGNS

PLAN SHEET NO.	SIGN NO.	SIGN NOMENCLATURE	SIGN	DIMENSIONS	FLAT ALUMINUM (TYPE A)	EXAL ALUMINUM (TYPE G)	SM RD SGN ASSM TY XXXXX (X) XX (X-XXXX) POST TYPE FRP = Fiberglass TWT = Thin-Wall 10BWG = 10 BWG S80 = Sch 80	POSTS 1 or 2	ANCHOR TYPE UA=Universal Conc UB=Universal Bolt SA=Slipbase-Conc SB=Slipbase-Bolt WS=Wedge Steel WP=Wedge Plastic	MOUNTING DESIGNATION PREFABRICATED P = "Plain" T = "T" U = "U"	1EXT or 2EXT = # of Ext BM = Extruded Wind Beam WC = 1.12 #/ft Wing Channel EXAL= Extruded Alum Sign Panels	BRIDGE MOUNT CLEARANCE SIGNS (See Note 2) TY = TYPE TY N TY S
1	1R	W2-1aT	HIGHWAY INTERSECTION AHEAD	48 X 48	✓		10BWG	1	SA	P		
2	2A	CW1-4L		36 X 36	✓		S80	1	SA	P		
		CW13-1P	35 MPH	24 X 24								
2	2B	R2-1	SPEED LIMIT 55	30 X 36	✓		10BWG	1	SA	P		
2	2C	R2-1	SPEED LIMIT 65	30 X 36	✓		10BWG	1	SA	P		
2	2D	W3-5	SPEED LIMIT 55	36 X 36	✓		10BWG	1	SA	P		
3	3A	W8-13aT	BRIDGE MAY ICE IN COLD WEATHER	36 X 36	✓		10BWG	1	SA	P		
3	3B	W8-13aT	BRIDGE MAY ICE IN COLD WEATHER	36 X 36	✓		10BWG	1	SA	P		
3	3C	D20-1TL	CO RD 277	24 X 24	✓		10BWG	1	SA	P		

ALUMINUM SIGN BLANKS THICKNESS	
Square Feet	Minimum Thickness
Less than 7.5	0.080"
7.5 to 15	0.100"
Greater than 15	0.125"

The Standard Highway Sign Designs for Texas (SHSD) can be found at the following website.

http://www.txdot.gov/

NOTE:

1. Sign supports shall be located as shown on the plans, except that the Engineer may shift the sign supports, within design guidelines, where necessary to secure a more desirable location or to avoid conflict with utilities. Unless otherwise shown on the plans, the Contractor shall stake and the Engineer will verify all sign support locations.
2. For installation of bridge mount clearance signs, see Bridge Mounted Clearance Sign Assembly (BMCS)Standard Sheet.
3. For Sign Support Descriptive Codes, see Sign Mounting Details Small Roadside Signs General Notes & Details SMD(GEN).

Texas Department of Transportation

Traffic Operations Division Standard

SUMMARY OF SMALL SIGNS

(FM 149, 0720-01-044)
SHEET 3 OF 9 SHEETS

SOSS

FILE: sums16.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT May 1987	CONT	SECT	JOB	HIGHWAY
REVISIONS	0720	01	044, ETC.	FM 149,ETC.
4-16	DIST	COUNTY		SHEET NO.
8-16	BRYAN	GRIMES		161

18

DATE: 4/20/2023 10:59:15 AM
FILE: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY/Design Projects/0720010044/4 - Design/Plan Set/8. Traffic/8D. SigningLayout/SUMMARY OF SMALL SIGNS (FM 149)

SUMMARY OF SMALL SIGNS

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

PLAN SHEET NO.	SIGN NO.	SIGN NOMENCLATURE	SIGN	DIMENSIONS	FLAT ALUMINUM (TYPE A)	EXAL ALUMINUM (TYPE G)	POST TYPE FRP = Fiberglass TWT = Thin-Wall 10BWG = 10 BWG S80 = Sch 80	POSTS 1 or 2	ANCHOR TYPE UA=Universal Conc UB=Universal Bolt SA=Slipbase-Conc SB=Slipbase-Bolt WS=Wedge Steel WP=Wedge Plastic	MOUNTING DESIGNATION PREFABRICATED P = "Plain" T = "T" U = "U"	1EXT or 2EXT = # of Ext BM = Extruded Wind Beam WC = 1.12 #/ft Wing Channel EXAL= Extruded Alum Sign Panels	BRIDGE MOUNT CLEARANCE SIGNS (See Note 2) TY = TYPE TY N TY S
3	3D	R1-1		36 X 36	✓		10BWG	1	SA	P		
4	4A	D20-1TR		24 X 24	✓		10BWG	1	SA	P		
		M3-4		24 X 12								
4	4B	M1-6F		24 X 24	✓		10BWG	1	SA	P		
		D10-7aT		3 X 10								
4	4C	D20-1TR		24 X 24	✓		10BWG	1	SA	P		
4	4D	R1-1		36 X 36	✓		10BWG	1	SA	P		
4	4E	D20-1TL		24 X 24	✓		10BWG	1	SA	P		
		W1-2L		36 X 36								
5	5A				✓		S80	1	SA	P		
		W13-1P		24 X 24								

ALUMINUM SIGN BLANKS THICKNESS	
Square Feet	Minimum Thickness
Less than 7.5	0.080"
7.5 to 15	0.100"
Greater than 15	0.125"

The Standard Highway Sign Designs for Texas (SHSD) can be found at the following website.

http://www.txdot.gov/

NOTE:

1. Sign supports shall be located as shown on the plans, except that the Engineer may shift the sign supports, within design guidelines, where necessary to secure a more desirable location or to avoid conflict with utilities. Unless otherwise shown on the plans, the Contractor shall stake and the Engineer will verify all sign support locations.
2. For installation of bridge mount clearance signs, see Bridge Mounted Clearance Sign Assembly (BMCS)Standard Sheet.
3. For Sign Support Descriptive Codes, see Sign Mounting Details Small Roadside Signs General Notes & Details SMD(GEN).

Texas Department of Transportation

Traffic Operations Division Standard

SUMMARY OF SMALL SIGNS

(FM 149, 0720-01-044)
SHEET 4 OF 9 SHEETS

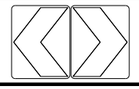
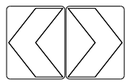
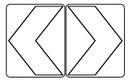
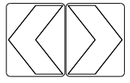
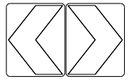
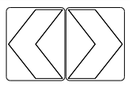
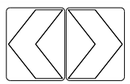
SOSS

FILE:	sums16.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT	May 1987	CONT	SECT	JOB	HIGHWAY
REVISIONS		0720	01	044, ETC.	FM 149,ETC.
4-16		DIST	COUNTY		SHEET NO.
8-16		BRYAN	GRIMES		162

DATE: 4/20/2023 10:59:15 AM
FILE: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY/Design Projects/0720010044/4 - Design/Plan Set/8. Traffic/8D. SignLayout/SUMMARY OF SMALL SIGNS (FM 149)

SUMMARY OF SMALL SIGNS

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

PLAN SHEET NO.	SIGN NO.	SIGN NOMENCLATURE	SIGN	DIMENSIONS	FLAT ALUMINUM (TYPE A)	EXAL ALUMINUM (TYPE G)	POST TYPE FRP = Fiberglass TWT = Thin-Wall 10BWG = 10 BWG S80 = Sch 80	POSTS 1 or 2	ANCHOR TYPE UA=Universal Conc UB=Universal Bolt SA=Slipbase-Conc SB=Slipbase-Bolt WS=Wedge Steel WP=Wedge Plastic	MOUNTING DESIGNATION PREFABRICATED P = "Plain" T = "T" U = "U"	1EXT or 2EXT = # of Ext BM = Extruded Wind Beam WC = 1.12 #/ft Wing Channel EXAL= Extruded Alum Sign Panels	BRIDGE MOUNT CLEARANCE SIGNS (See Note 2) TY = TYPE TY N TY S
5	5B	W1-8L W1-8R		24 X 30 24 X 30	✓		10BWG	1	SA	P		
5	5C	W1-8L W1-8R		24 X 30 24 X 30	✓		10BWG	1	SA	P		
5	5D	W1-8L W1-8R		24 X 30 24 X 30	✓		10BWG	1	SA	P		
5	5E	W1-8L W1-8R		24 X 30 24 X 30	✓		10BWG	1	SA	P		
5	5F	W1-8L W1-8R		24 X 30 24 X 30	✓		10BWG	1	SA	P		
5	5G	W1-8L W1-8R		24 X 30 24 X 30	✓		10BWG	1	SA	P		
6	6A	W1-8L W1-8R		24 X 30 24 X 30	✓		10BWG	1	SA	P		
6	6B	D20-1T		24 X 24	✓		10BWG	1	SA	P		
6	6C	W1-2R W13-1P		36 X 36 24 X 24	✓		S80	1	SA	P		

ALUMINUM SIGN BLANKS THICKNESS	
Square Feet	Minimum Thickness
Less than 7.5	0.080"
7.5 to 15	0.100"
Greater than 15	0.125"

The Standard Highway Sign Designs for Texas (SHSD) can be found at the following website.

http://www.txdot.gov/

NOTE:

1. Sign supports shall be located as shown on the plans, except that the Engineer may shift the sign supports, within design guidelines, where necessary to secure a more desirable location or to avoid conflict with utilities. Unless otherwise shown on the plans, the Contractor shall stake and the Engineer will verify all sign support locations.
2. For installation of bridge mount clearance signs, see Bridge Mounted Clearance Sign Assembly (BMCS)Standard Sheet.
3. For Sign Support Descriptive Codes, see Sign Mounting Details Small Roadside Signs General Notes & Details SMD(GEN).

Texas Department of Transportation

Traffic Operations Division Standard

SUMMARY OF SMALL SIGNS

(FM 149, 0720-01-044)

SHEET 5 OF 9 SHEETS

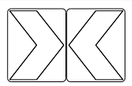
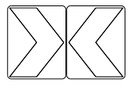
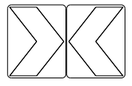
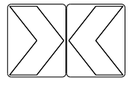
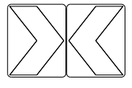
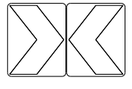
SOSS

FILE: sums16.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT May 1987	CONT	SECT	JOB	HIGHWAY
REVISIONS	0720	01	044, ETC.	FM 149,ETC.
4-16 8-16	DIST	COUNTY		SHEET NO.
	BRYAN	GRIMES		163

DATE: 4/20/2023 10:59:15 AM
FILE: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY/Design Projects/0720044/4 - Design/Plan Set/8. Traffic/8D. SigningLayout/SUMMARY OF SMALL SIGNS (FM 149)

SUMMARY OF SMALL SIGNS

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

PLAN SHEET NO.	SIGN NO.	SIGN NOMENCLATURE	SIGN	DIMENSIONS	FLAT ALUMINUM (TYPE A)	EXAL ALUMINUM (TYPE G)	POST TYPE FRP = Fiberglass TWT = Thin-Wall 10BWG = 10 BWG S80 = Sch 80	POSTS 1 or 2	ANCHOR TYPE UA=Universal Conc UB=Universal Bolt SA=Slipbase-Conc SB=Slipbase-Bolt WS=Wedge Steel WP=Wedge Plastic	MOUNTING DESIGNATION PREFABRICATED P = "Plain" T = "T" U = "U"	1EXT or 2EXT = # of Ext BM = Extruded Wind Beam WC = 1.12 #/ft Wing Channel EXAL= Extruded Alum Sign Panels	BRIDGE MOUNT CLEARANCE SIGNS (See Note 2) TY = TYPE TY N TY S
6	6D	R1-1		36 X 36	✓		10BWG	1	SA	P		
6	6E	R1-1		36 X 36	✓		10BWG	1	SA	P		
6	6F	D20-2T		24 X 24	✓		10BWG	1	SA	P		
7	7A	W1-2R W13-1P		36 X 36 24 X 24	 ✓		S80	1	SA	P		
7	7B	W1-8L W1-8R		24 X 30 24 X 30	✓		10BWG	1	SA	P		
7	7C	W1-8L W1-8R		24 X 30 24 X 30	✓		10BWG	1	SA	P		
7	7D	W1-8L W1-8R		24 X 30 24 X 30	✓		10BWG	1	SA	P		
7	7E	W1-8L W1-8R		24 X 30 24 X 30	✓		10BWG	1	SA	P		
7	7F	W1-8L W1-8R		24 X 30 24 X 30	✓		10BWG	1	SA	P		
7	7G	W1-8L W1-8R		24 X 30 24 X 30	✓		10BWG	1	SA	P		

ALUMINUM SIGN BLANKS THICKNESS	
Square Feet	Minimum Thickness
Less than 7.5	0.080"
7.5 to 15	0.100"
Greater than 15	0.125"

The Standard Highway Sign Designs for Texas (SHSD) can be found at the following website.

http://www.txdot.gov/

NOTE:

1. Sign supports shall be located as shown on the plans, except that the Engineer may shift the sign supports, within design guidelines, where necessary to secure a more desirable location or to avoid conflict with utilities. Unless otherwise shown on the plans, the Contractor shall stake and the Engineer will verify all sign support locations.
2. For installation of bridge mount clearance signs, see Bridge Mounted Clearance Sign Assembly (BMCS)Standard Sheet.
3. For Sign Support Descriptive Codes, see Sign Mounting Details Small Roadside Signs General Notes & Details SMD(GEN).

Texas Department of Transportation

Traffic Operations Division Standard

SUMMARY OF SMALL SIGNS

(FM 149, 0720-01-044)
SHEET 6 OF 9 SHEETS

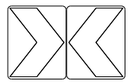
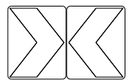
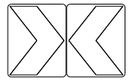
SOSS

FILE:	sums16.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT	May 1987	CONT	SECT	JOB	HIGHWAY
REVISIONS		0720	01	044, ETC.	FM 149,ETC.
4-16		DIST	COUNTY		SHEET NO.
8-16		BRYAN	GRIMES		164

18

DATE: 4/20/2023 10:59:15 AM
FILE: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY/Design Projects/0720010044/4 - Design/Plan Set/8. Traffic/8D. SigningLayout/SUMMARY OF SMALL SIGNS (FM 149)

SUMMARY OF SMALL SIGNS

PLAN SHEET NO.	SIGN NO.	SIGN NOMENCLATURE	SIGN	DIMENSIONS	FLAT ALUMINUM (TYPE A)	EXAL ALUMINUM (TYPE G)	SM RD SGN ASSM TY XXXXX (X) XX (X-XXXX) POST TYPE FRP = Fiberglass TWT = Thin-Wall 10BWG = 10 BWG S80 = Sch 80	POSTS 1 or 2	ANCHOR TYPE UA=Universal Conc UB=Universal Bolt SA=Slipbase-Conc SB=Slipbase-Bolt WS=Wedge Steel WP=Wedge Plastic	MOUNTING DESIGNATION PREFABRICATED P = "Plain" T = "T" U = "U"	1EXT or 2EXT = # of Ext BM = Extruded Wind Beam WC = 1.12 #/ft Wing Channel EXAL= Extruded Alum Sign Panels	BRIDGE MOUNT CLEARANCE SIGNS (See Note 2) TY = TYPE TY N TY S
7	7H	W1-8L W1-8R		24 X 30 24 X 30	✓		10BWG	1	SA	P		
7	7I	W1-8L W1-8R		24 X 30 24 X 30	✓		10BWG	1	SA	P		
7	7J	W1-8L W1-8R		24 X 30 24 X 30	✓		10BWG	1	SA	P		
7	7K	W1-2L W13-1P		36 X 36 24 X 24	✓		S80	1	SA	P		
8	8A	M3-2 M1-6F D10-7aT		24 X 12 24 X 24 3 X 10	✓		10BWG	1	SA	P		
10	10A	D20-1TL		24 X 24	✓		10BWG	1	SA	P		
10	10B	R1-1		36 X 36	✓		10BWG	1	SA	P		
11	11A	D20-1TR		24 X 24	✓		10BWG	1	SA	P		
11	11B	W2-1aT		48 X 48	✓		S80	1	SA	P		

ALUMINUM SIGN BLANKS THICKNESS	
Square Feet	Minimum Thickness
Less than 7.5	0.080"
7.5 to 15	0.100"
Greater than 15	0.125"

The Standard Highway Sign Designs for Texas (SHSD) can be found at the following website.

http://www.txdot.gov/

NOTE:

1. Sign supports shall be located as shown on the plans, except that the Engineer may shift the sign supports, within design guidelines, where necessary to secure a more desirable location or to avoid conflict with utilities. Unless otherwise shown on the plans, the Contractor shall stake and the Engineer will verify all sign support locations.
2. For installation of bridge mount clearance signs, see Bridge Mounted Clearance Sign Assembly (BMCS)Standard Sheet.
3. For Sign Support Descriptive Codes, see Sign Mounting Details Small Roadside Signs General Notes & Details SMD(GEN).

Texas Department of Transportation

Traffic Operations Division Standard

SUMMARY OF SMALL SIGNS

(FM 149, 0720-01-044)
SHEET 7 OF 9 SHEETS

SOSS

FILE:	sums16.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT	May 1987	CONT	SECT	JOB	HIGHWAY
REVISIONS		0720	01	044, ETC.	FM 149,ETC.
4-16		DIST	COUNTY		SHEET NO.
8-16		BRYAN	GRIMES		165

18

DATE: 4/20/2023 10:59:15 AM
FILE: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY/Design Projects/0720010044/4 - Design/Plan Set/8. Traffic/8D. SigningLayout/SUMMARY OF SMALL SIGNS (FM 149)

SUMMARY OF SMALL SIGNS

PLAN SHEET NO.	SIGN NO.	SIGN NOMENCLATURE	SIGN	DIMENSIONS	FLAT ALUMINUM (TYPE A)	EXAL ALUMINUM (TYPE G)	SM RD SGN ASSM TY XXXXX (X) XX (X-XXXX) POST TYPE FRP = Fiberglass TWT = Thin-Wall 10BWG = 10 BWG S80 = Sch 80	POSTS 1 or 2	ANCHOR TYPE UA=Universal Conc UB=Universal Bolt SA=Slipbase-Conc SB=Slipbase-Bolt WS=Wedge Steel WP=Wedge Plastic	MOUNTING DESIGNATION PREFABRICATED P = "Plain" T = "T" U = "U"	1EXT or 2EXT = # of Ext BM = Extruded Wind Beam WC = 1.12 #/ft Wing Channel EXAL= Extruded Alum Sign Panels	BRIDGE MOUNT CLEARANCE SIGNS (See Note 2) TY = TYPE TY N TY S
		M2-1	JCT / FARM 2562 / ROAD	21 X 15								
11	11C	M1-6F		24 X 24	✓		10BWG	1	SA	P		
12	12A	R2-1	SPEED LIMIT 65	30 X 36	✓		10BWG	1	SA	P		
		M3-2	WEST / FARM 149 / ROAD	24 X 12								
12	12B	M1-6F		24 X 24	✓		10BWG	1	SA	P		
12	12C	R1-1	STOP	36 X 36	✓		10BWG	1	SA	P		
12	12D	M1-6F	FARM 149 ROAD	24 X 24	✓		10BWG	1	SA	P		
		M6-4	⇔	21 X 15								
12	12E	M1-6F	FARM 2562 ROAD	24 X 24	✓		10BWG	1	SA	P		
		M6-4	⇔	21 X 15								
12	12F	M1-6F	FARM 149 ROAD	24 X 24	✓		10BWG	1	SA	P		
		M6-4	⇔	21 X 15								
12	12G	M1-6F	FARM 2562 ROAD	24 X 24	✓		10BWG	1	SA	P		
		M6-4	⇔	21 X 15								

ALUMINUM SIGN BLANKS THICKNESS	
Square Feet	Minimum Thickness
Less than 7.5	0.080"
7.5 to 15	0.100"
Greater than 15	0.125"

The Standard Highway Sign Designs for Texas (SHSD) can be found at the following website.

http://www.txdot.gov/

NOTE:

1. Sign supports shall be located as shown on the plans, except that the Engineer may shift the sign supports, within design guidelines, where necessary to secure a more desirable location or to avoid conflict with utilities. Unless otherwise shown on the plans, the Contractor shall stake and the Engineer will verify all sign support locations.
2. For installation of bridge mount clearance signs, see Bridge Mounted Clearance Sign Assembly (BMCS)Standard Sheet.
3. For Sign Support Descriptive Codes, see Sign Mounting Details Small Roadside Signs General Notes & Details SMD(GEN).

Texas Department of Transportation

Traffic Operations Division Standard

SUMMARY OF SMALL SIGNS

(FM 149, 0720-01-044)
SHEET 8 OF 9 SHEETS

SOSS

FILE: sums16.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT May 1987	CONT	SECT	JOB	HIGHWAY
REVISIONS	0720	01	044, ETC.	FM 149,ETC,
4-16 8-16	DIST	COUNTY		SHEET NO.
	BRYAN	GRIMES		166

18

DATE: 4/20/2023 10:59:16 AM
FILE: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY/Design Projects/0720010044/4 - Design/Plan Set/8. Traffic/8D. SigningLayout/SUMMARY OF SMALL SIGNS (FM 149)

SUMMARY OF SMALL SIGNS

PLAN SHEET NO.	SIGN NO.	SIGN NOMENCLATURE	SIGN	DIMENSIONS	FLAT ALUMINUM (TYPE A)	EXAL ALUMINUM (TYPE G)	SM RD SGN ASSM TY XXXXX (X) XX (X-XXXX) POST TYPE	POSTS	ANCHOR TYPE	MOUNTING DESIGNATION PREFABRICATED	MOUNTING DESIGNATION 1EXT or 2EXT = # of Ext BM = Extruded Wind Beam WC = 1.12 #/ft Wing Channel EXAL= Extruded Alum Sign Panels	BRIDGE MOUNT CLEARANCE SIGNS (See Note 2) TY = TYPE
							FRP = Fiberglass TWT = Thin-Wall 10BWG = 10 BWG S80 = Sch 80	1 or 2	UA=Universal Conc UB=Universal Bolt SA=Slipbase-Conc SB=Slipbase-Bolt WS=Wedge Steel WP=Wedge Plastic	P = "Plain" T = "T" U = "U"		TY N TY S
12	12H	R1-1	STOP	36 X 36	✓		10BWG	1	SA	P		
		W4-4P	CROSS TRAFFIC DOES NOT STOP	36 X 18								
		M3-2	EAST	24 X 12								
12	12I	M1-6F	FARM 149 ROAD	24 X 24	✓		10BWG	1	SA	P		
12	12J	R2-1	SPEED LIMIT 65	30 X 36	✓		10BWG	1	SA	P		

ALUMINUM SIGN BLANKS THICKNESS	
Square Feet	Minimum Thickness
Less than 7.5	0.080"
7.5 to 15	0.100"
Greater than 15	0.125"

The Standard Highway Sign Designs for Texas (SHSD) can be found at the following website.

http://www.txdot.gov/

NOTE:

1. Sign supports shall be located as shown on the plans, except that the Engineer may shift the sign supports, within design guidelines, where necessary to secure a more desirable location or to avoid conflict with utilities. Unless otherwise shown on the plans, the Contractor shall stake and the Engineer will verify all sign support locations.
2. For installation of bridge mount clearance signs, see Bridge Mounted Clearance Sign Assembly (BMCS)Standard Sheet.
3. For Sign Support Descriptive Codes, see Sign Mounting Details Small Roadside Signs General Notes & Details SMD(GEN).

Texas Department of Transportation

Traffic Operations Division Standard

SUMMARY OF SMALL SIGNS

(FM 149, 0720-01-044)
SHEET 9 OF 9 SHEETS

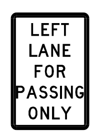
SOSS

FILE: sums16.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT May 1987	CONT	SECT	JOB	HIGHWAY
REVISIONS	0720	01	044, ETC.	FM 149,ETC.
4-16	DIST	COUNTY		SHEET NO.
8-16	BRYAN	GRIMES		167

18

DATE: 4/20/2023 10:59:16 AM
FILE: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY/Design Projects/0720010044/4 - Design/Plan Set/8. Traffic/8D. SigningLayout/SUMMARY OF SMALL SIGNS (FM 149)

SUMMARY OF SMALL SIGNS

PLAN SHEET NO.	SIGN NO.	SIGN NOMENCLATURE	SIGN	DIMENSIONS	FLAT ALUMINUM (TYPE A)	EXAL ALUMINUM (TYPE G)	POST TYPE	POSTS	ANCHOR TYPE	MOUNTING DESIGNATION: PREFABRICATED	MOUNTING DESIGNATION	BRIDGE MOUNT CLEARANCE SIGNS (See Note 2)
							SM RD SGN ASSM TY XXXXX	(X)	XX	(X-XXXX)		
							FRP = Fiberglass TWT = Thin-Wall 10BWG = 10 BWG S80 = Sch 80	1 or 2	UA=Universal Conc UB=Universal Bolt SA=Slipbase-Conc SB=Slipbase-Bolt WS=Wedge Steel WP=Wedge Plastic	P = "Plain" T = "T" U = "U"	1EXT or 2EXT = # of Ext BM = Extruded Wind Beam WC = 1.12 #/ft Wing Channel EXAL= Extruded Alum Sign Panels	TY = TYPE TY N TY S
1	1-1	R6-1 R1-1	 	54 x 18 48 x 48	X		S80	1	SA	T		
1	1-2	M3-1 M1-6T		24 x 12 24 x 24	X		10BWG	1	SA	P		
1	1-3	R2-1		30 x 36	X		10BWG	1	SA	P		
1	1-4	R4-2aT		24 x 36	X		10BWG	1	SA	P		

ALUMINUM SIGN BLANKS THICKNESS

Square Feet	Minimum Thickness
Less than 7.5	0.080"
7.5 to 15	0.100"
Greater than 15	0.125"

The Standard Highway Sign Designs for Texas (SHSD) can be found at the following website.
http://www.txdot.gov/

NOTE:

1. Sign supports shall be located as shown on the plans, except that the Engineer may shift the sign supports, within design guidelines, where necessary to secure a more desirable location or to avoid conflict with utilities. Unless otherwise shown on the plans, the Contractor shall stake and the Engineer will verify all sign support locations.
2. For installation of bridge mount clearance signs, see Bridge Mounted Clearance Sign Assembly (BMCS) Standard Sheet.
3. For Sign Support Descriptive Codes, see Sign Mounting Details Small Roadside Signs General Notes & Details SMD(GEN).

DATE: 4/19/2023 7:57:34 AM
FILE: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY/Design Pro...

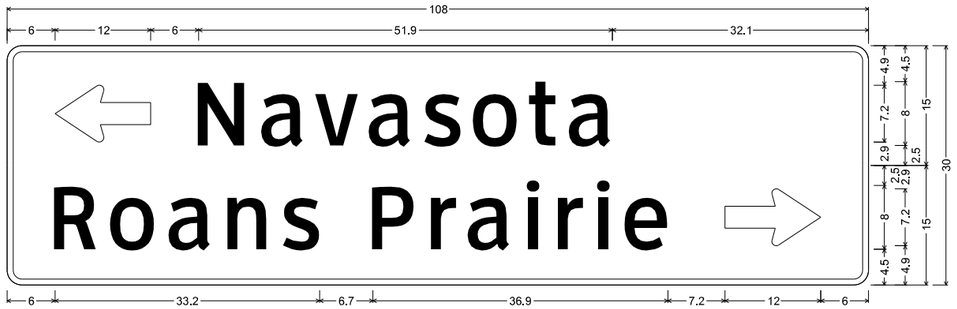
Texas Department of Transportation | Traffic Operations Division Standard

SUMMARY OF SMALL SIGNS (SH 6)

SOSS

FILE: sums16.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT May 1987	CONT	SECT	JOB	HIGHWAY
REVISIONS 4-16 8-16	0720	01	044, ETC.	FM 149, ETC.
	DIST		COUNTY	SHEET NO.
	BRY		GRIMES	168

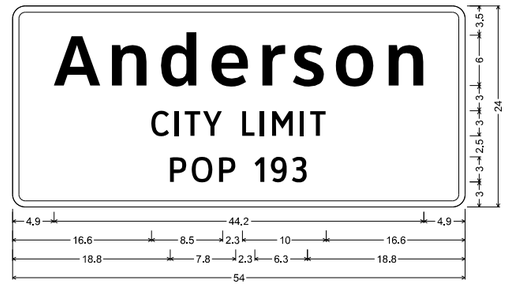
18



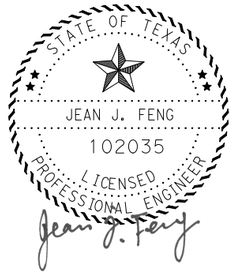
D1-2 8in LT-RT;

1.9" Radius, 0.8" Border, White on Green;
Standard Arrow Custom 12.0" X 7.1" 180°; "Navasota", ClearviewHwy-3-W;

1.9" Radius, 0.8" Border, White on Green;
"Roans Prairie", ClearviewHwy-3-W; Standard Arrow Custom 12.0" X 7.1" 0°;



I-2aT 6in;
1.5" Radius, 0.8" Border, White on, Green;
"Anderson", ClearviewHwy-5-W-R;
"CITY LIMIT", ClearviewHwy-3-W;
"POP 193", ClearviewHwy-3-W;



04/20/2023

PRINT DATE	REVISION DATE
4/19/2023	

Texas Department of Transportation
Bryan District

SMALL SIGN DETAILS (FM 149)

SHEET 1 OF 2 SHEETS

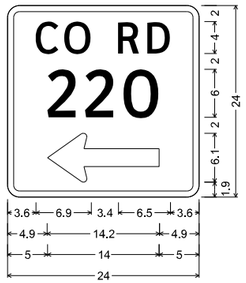
FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 149, ETC.

STATE	DISTRICT	COUNTY
TEXAS	BRY	GRIMES

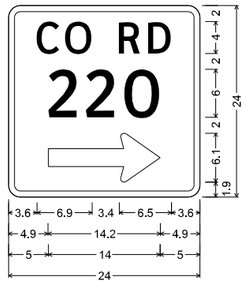
CONTROL	SECTION	JOB	SHEET NO.
0720	01	044, ETC.	169

REV DATE: 3/28/2023
CSJ: 0720-01-044

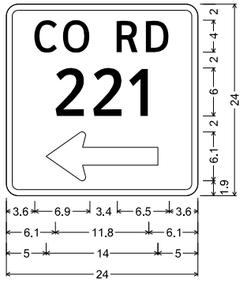
FILENAME: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY/Design Projects/0720010044/4 - Design/Plan Set/8. Traffic/8D. Signing Layout/SMALL SIGN DETAILS (FM 149)



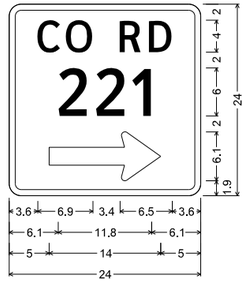
D20-1TL_24x24;
1.5" Radius, 0.8" Border, White on Green;
"CO RD", ClearviewHwy-3-W;
"220", ClearviewHwy-3-W;
Standard Arrow Custom 14.0" X 6.1" 180°;



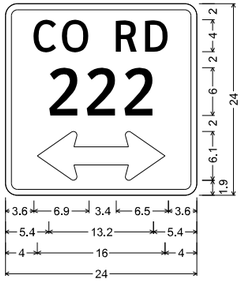
D20-1TR_24x24;
1.5" Radius, 0.8" Border, White on Green;
"CO RD", ClearviewHwy-3-W;
"220", ClearviewHwy-3-W;
Standard Arrow Custom 14.0" X 6.1" 0°;



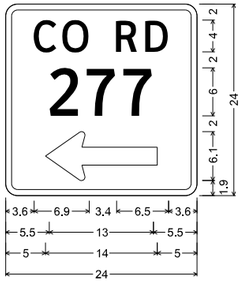
D20-1TL_24x24;
1.5" Radius, 0.8" Border, White on Green;
"CO RD", ClearviewHwy-3-W;
"221", ClearviewHwy-3-W;
Standard Arrow Custom 14.0" X 6.1" 180°;



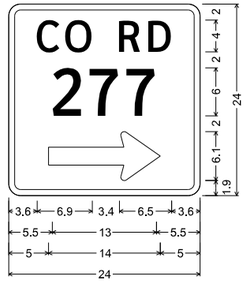
D20-1TR_24x24;
1.5" Radius, 0.8" Border, White on Green;
"CO RD", ClearviewHwy-3-W;
"221", ClearviewHwy-3-W;
Standard Arrow Custom 14.0" X 6.1" 0°;



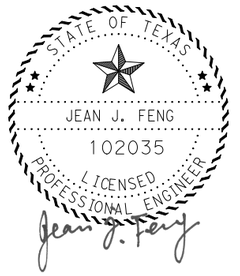
D20-2T_24x24;
1.5" Radius, 0.8" Border, White on Green;
"CO RD", ClearviewHwy-3-W;
"222", ClearviewHwy-3-W;



D20-1TL_24x24;
1.5" Radius, 0.8" Border, White on Green;
"CO RD", ClearviewHwy-3-W;
"277", ClearviewHwy-3-W;
Standard Arrow Custom 14.0" X 6.1" 180°;



D20-1TR_24x24;
1.5" Radius, 0.8" Border, White on Green;
"CO RD", ClearviewHwy-3-W;
"277", ClearviewHwy-3-W;
Standard Arrow Custom 14.0" X 6.1" 0°;



04/20/2023

PRINT DATE	REVISION DATE
4/19/2023	

Texas Department of Transportation
Bryan District

SMALL SIGN DETAILS (FM 149)

SHEET 2 OF 2 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 149, ETC.

STATE	DISTRICT	COUNTY
TEXAS	BRY	GRIMES

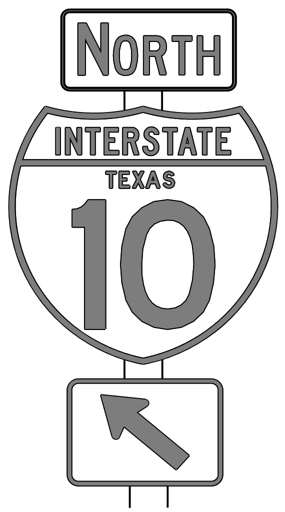
CONTROL	SECTION	JOB	SHEET NO.
0720	01	044, ETC.	170

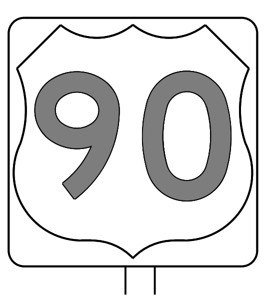
REV DATE: 3/28/2023
CSJs: 0720-01-044

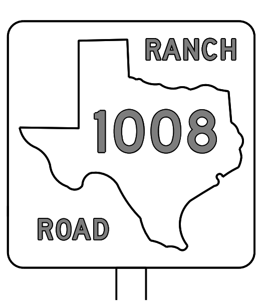
FILENAME: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY/Design Projects/0720010444 - Design/Plan Set/8. Traffic/8D. SigningLayout/SMALL SIGN DETAILS (FM 149)

REQUIREMENTS FOR INDEPENDENT MOUNTED ROUTE SIGNS

SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	WHITE	TYPE A SHEETING
BACKGROUND	ALL OTHERS	TYPE B OR C SHEETING
LEGEND & BORDERS	WHITE	TYPE A SHEETING
LEGEND & BORDERS	BLACK	ACRYLIC NON-REFLECTIVE FILM
LEGEND & BORDERS	ALL OTHERS	TYPE B or C SHEETING



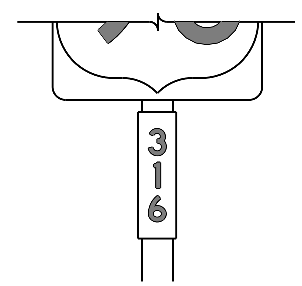


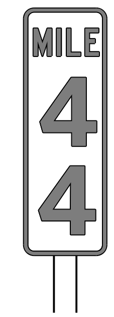


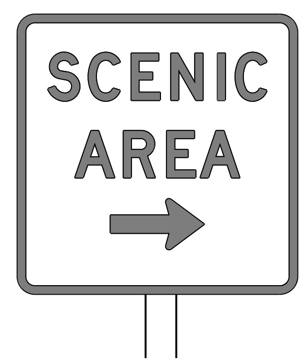
TYPICAL EXAMPLES

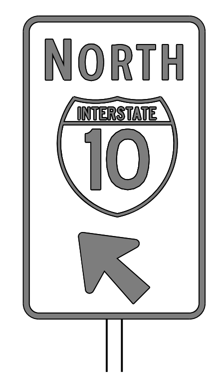
REQUIREMENTS FOR BLUE, BROWN & GREEN D AND I SERIES GUIDE SIGNS

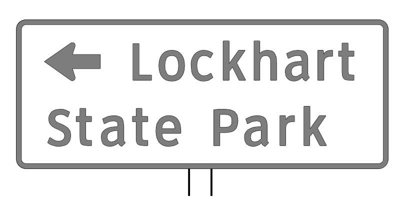
SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	ALL	TYPE B OR C SHEETING
LEGEND & BORDERS	WHITE	TYPE D SHEETING
LEGEND, SYMBOLS & BORDERS	ALL OTHERS	TYPE B OR C SHEETING

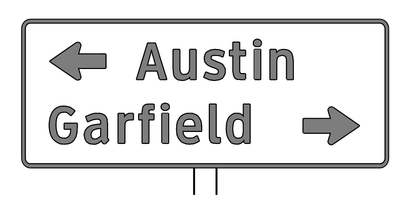












TYPICAL EXAMPLES

GENERAL NOTES

1. Signs to be furnished shall be as detailed elsewhere in the plans and/or as shown on sign tabulation sheet. Standard sign designs and arrow dimensions can be found in the "Standard Highway Sign Designs for Texas" (SHSD).
2. White legend shall use the Clearview Alphabet. The following Clearview fonts shall be used to replace the existing white Federal Highway Administration (FHWA) Standard Highway Alphabets, when not specified in the SHSD, or in the plans.

B	CV-1W
C	CV-2W
D	CV-3W
E	CV-4W
Emod	CV-5WR
F	CV-6W

3. Route sign legend (ie. IH, US, SH and FM shields) shall use the Federal Highway Administration (FHWA) Standard Highway Alphabets B, C, D, E, Emod or F).
4. Lateral spacing between letters and numerals shall conform with the SHSD, and any approved changes thereto. Lateral spacing of legend shall provide a balanced appearance when spacing is not shown.
5. Independent mounted route sign with white or colored legend and borders shall be applied by screening process with transparent color ink, transparent colored overlay film to white background sheeting or cut-out white sheeting to colored background sheeting, or combination thereof. White legend, symbols and borders on all other signs shall be cut-out white sheeting applied to colored background sheeting.
6. Information regarding borders and radii for signs is found in the "Standard Highway Sign Designs for Texas". Dimensions shown and described for borders and corner radii on parent sign are nominal. Borders may vary in width as much as 1/2 inch. Corner radii above 3 inches may vary in width as much as 1 inch. Borders and corner radii within a parent sign must be of matching widths. The sign area outside the corner radius should be trimmed or rounded.
7. Sign substrate shall be any material that meets the Departmental Material Specification requirements of DMS-7110 or approved alternative.
8. Mounting details of roadside signs are shown in the "SMD series" Standard Plan Sheets.

DEPARTMENTAL MATERIAL SPECIFICATIONS	
ALUMINUM SIGN BLANKS	DMS-7110
SIGN FACE MATERIALS	DMS-8300

ALUMINUM SIGN BLANKS THICKNESS	
Square Feet	Minimum Thickness
Less than 7.5	0.080
7.5 to 15	0.100
Greater than 15	0.125

The Standard Highway Sign Designs for Texas (SHSD) can be found at the following website.

http://www.txdot.gov/

Texas Department of Transportation

Traffic Operations Division Standard

TYPICAL SIGN REQUIREMENTS

TSR(3)-13

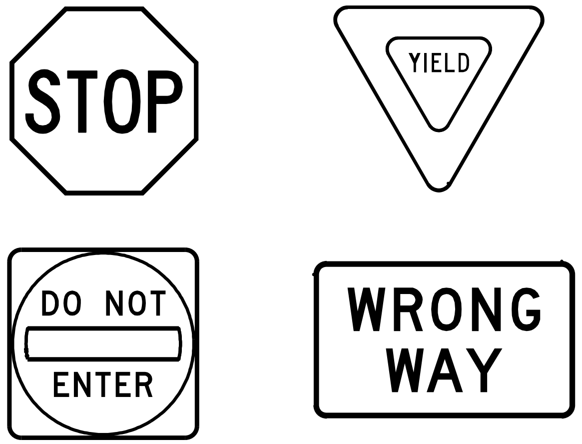
FILE: tsr3-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT October 2003	CONT	SECT	JOB	HIGHWAY
REVISIONS	0720	01	044, ETC.	FM 149, ETC.
12-03 7-13 9-08	DIST	COUNTY		SHEET NO.
	BRYAN	GRIMES		171

3

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

DATE: 4/19/2023 7:58:40 AM
FILE: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY/Design Projects/07200104412 other Design Files/ ...

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



REQUIREMENTS FOR FOUR SPECIFIC SIGNS ONLY

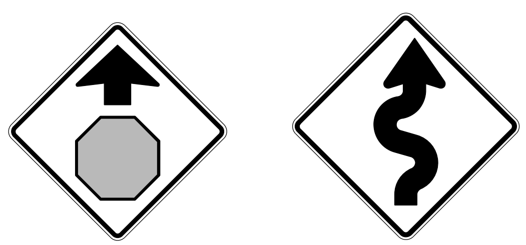
SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	RED	TYPE B OR C SHEETING
BACKGROUND	WHITE	TYPE B OR C SHEETING
LEGEND & BORDERS	WHITE	TYPE B OR C SHEETING
LEGEND	RED	TYPE B OR C SHEETING

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

TYPICAL EXAMPLES

SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	WHITE	TYPE A SHEETING
BACKGROUND	ALL OTHERS	TYPE B OR C SHEETING
LEGEND, BORDERS AND SYMBOLS	BLACK	ACRYLIC NON-REFLECTIVE FILM
LEGEND, BORDERS AND SYMBOLS	ALL OTHER	TYPE B OR C SHEETING

REQUIREMENTS FOR WARNING SIGNS



TYPICAL EXAMPLES

SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	FLOURESCENT YELLOW	TYPE B_{FL} OR C_{FL} SHEETING
LEGEND & BORDERS	BLACK	ACRYLIC NON-REFLECTIVE FILM
LEGEND & SYMBOLS	ALL OTHER	TYPE B OR C SHEETING

REQUIREMENTS FOR SCHOOL SIGNS

TYPICAL EXAMPLES

SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	WHITE	TYPE A SHEETING
BACKGROUND	FLOURESCENT YELLOW GREEN	TYPE B_{FL} OR C_{FL} SHEETING
LEGEND, BORDERS AND SYMBOLS	BLACK	ACRYLIC NON-REFLECTIVE FILM
SYMBOLS	RED	TYPE B OR C SHEETING

GENERAL NOTES

1. Signs to be furnished shall be as detailed elsewhere in the plans and/or as shown on sign tabulation sheet. Standard sign designs and arrow dimensions can be found in the "Standard Highway Sign Designs for Texas" (SHSD).
2. Sign legend shall use the Federal Highway Administration (FHWA) Standard Highway Alphabets (B, C, D, E, Emod or F).
3. Lateral spacing between letters and numerals shall conform with the SHSD, and any approved changes thereto. Lateral spacing of legend shall provide a balanced appearance when spacing is not shown.
4. Black legend and borders shall be applied by screening process or cut-out acrylic non-reflective black film to background sheeting, or combination thereof.
5. White legend and borders shall be applied by screening process with transparent colored ink, transparent colored overlay film to white background sheeting or cut-out white sheeting to colored background sheeting, or combination thereof.
6. Colored legend shall be applied by screening process with transparent colored ink, transparent colored overlay film or colored sheeting to background sheeting, or combination thereof.
7. Sign substrate shall be any material that meets the Departmental Material Specification requirements of DMS-7110 or approved alternative.
8. Mounting details for roadside mounted signs are shown in the "SMD series" Standard Plan Sheets.

ALUMINUM SIGN BLANKS THICKNESS	
Square Feet	Minimum Thickness
Less than 7.5	0.080
7.5 to 15	0.100
Greater than 15	0.125

DEPARTMENTAL MATERIAL SPECIFICATIONS	
ALUMINUM SIGN BLANKS	DMS-7110
SIGN FACE MATERIALS	DMS-8300

The Standard Highway Sign Designs for Texas (SHSD) can be found at the following website.

http://www.txdot.gov/

Texas Department of Transportation

Traffic Operations Division Standard

TYPICAL SIGN REQUIREMENTS

TSR(4)-13

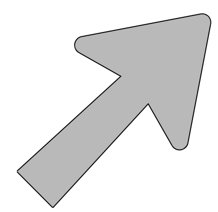
FILE: tsr4-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT October 2003	CONT	SECT	JOB	HIGHWAY
REVISIONS 12-03 7-13 9-08	0720	01	044, ETC.	FM 149, ETC.
	DIST		COUNTY	SHEET NO.
	BRYAN		GRIMES	172

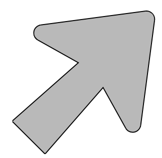
DATE: 4/19/2023 7:58:55 AM
FILE: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY/Design Projects/...

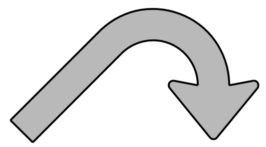
DATE: 4/19/2023 7:59:10 AM
FILE: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY/Design Projects/...

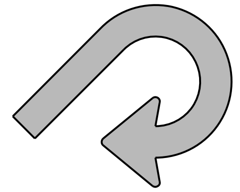
ARROW DETAILS

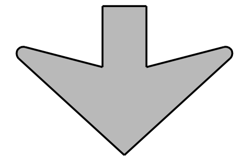
for Large Ground-Mounted and Overhead Guide Signs


Type A


Type B


E-3


E-4


Down Arrow

TYPE	LETTER SIZE	USE
A-1	10.67" U/L and 10" Caps	Single Lane Exits
A-2	13.33" U/L and 12" Caps	
A-3	16" & 20" U/L	
B-1	10.67" U/L and 10" Caps	Multiple Lane Exits
B-2	13.33" U/L and 12" Caps	
B-3	16" & 20" U/L	

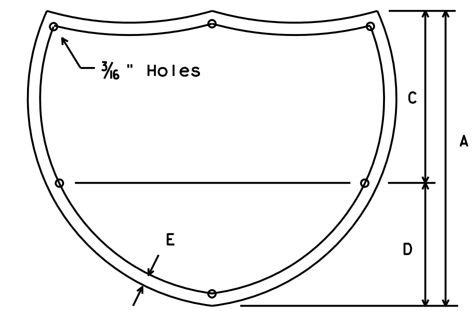
CODE	USED ON SIGN NO.
E-3	E5-1aT
E-4	E5-1bT

NOTE

Arrow dimensions are shown in the "Standard Highway Sign Designs for Texas" manual.

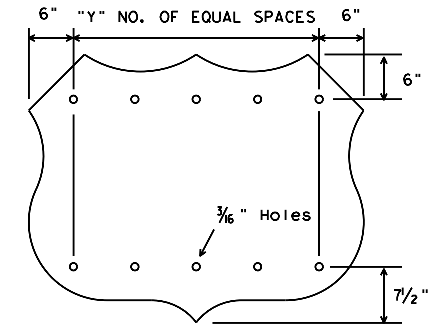
The Standard Highway Sign Designs for Texas (SHSD) can be found at the following website.
http://www.txdot.gov/

SIGN BLANK PUNCHING DETAILS FOR ATTACHMENTS WHEN SPECIFIED TO BE TYPE A ALUMINUM SIGNS (FOR MOUNTING TO GUIDE SIGN FACE)



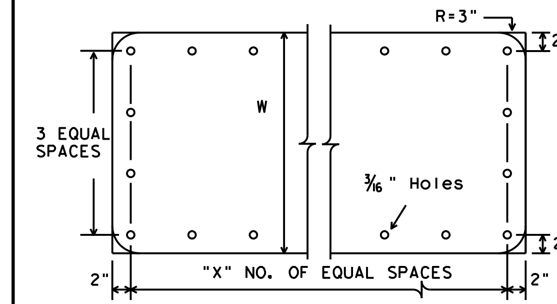
INTERSTATE ROUTE MARKERS

A	C	D	E
36	21	15	1 1/2
48	28	20	1 3/4



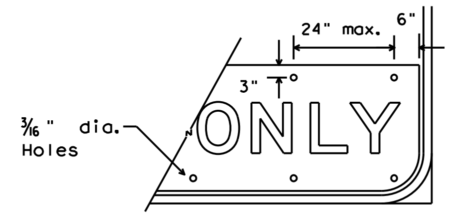
U.S. ROUTE MARKERS

Sign Size	"Y"
24x24	2
30x24	3
36x36	3
45x36	4
48x48	4
60x48	5



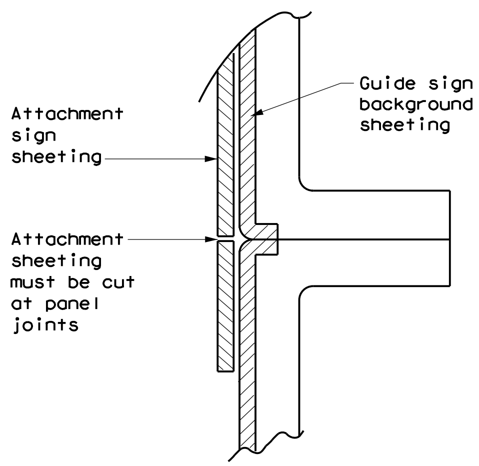
STATE ROUTE MARKERS

No. of Digits	W	X
4	24	4
4	36	5
4	48	6
3	24	3
3	36	4
3	48	5

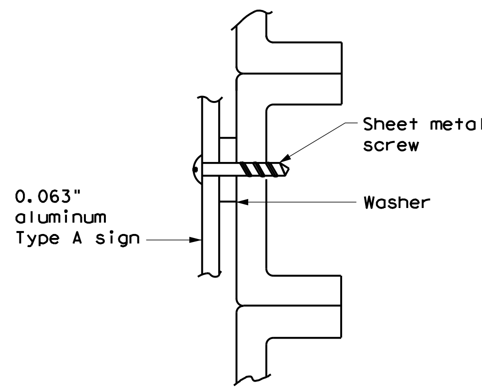


EXIT ONLY PANEL

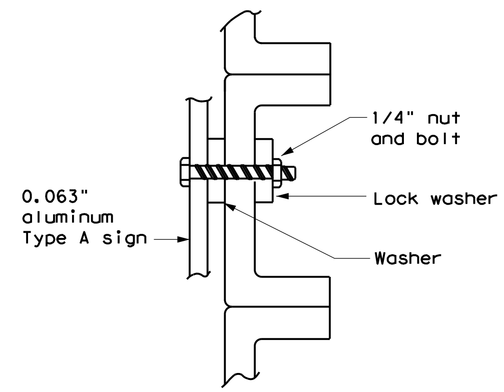
MOUNTING DETAILS OF ATTACHMENTS TO GUIDE SIGN FACE ("EXIT ONLY" AND "LEFT EXIT" PANELS, ROUTE MARKERS AND OTHER ATTACHMENTS)



DIRECT APPLIED ATTACHMENT



SCREW ATTACHMENT



NUT/BOLT ATTACHMENT

NOTE:

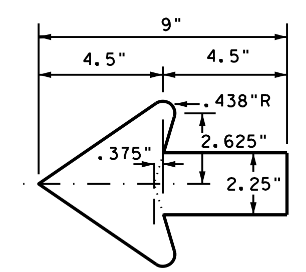
1. Sheeting for legend, symbols, and borders must be cut at panel joints.
2. Direct applied attachment signs will be subsidiary to "Aluminum Signs" or "Fiberglass Signs".

NOTE:

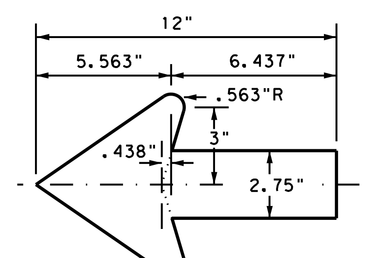
Furnish Type A aluminum sign attachments only when specified in the plans. These signs will be paid for under "Aluminum Signs".

ARROW DETAILS

for Destination Signs (Type D)



Standard arrow to be used with 6 inch letters.



Standard arrow to be used with 8 inch letters.

Texas Department of Transportation

Traffic Operations Division Standard

TYPICAL SIGN REQUIREMENTS

TSR(5)-13

FILE: tsr5-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT October 2003	CONT	SECT	JOB	HIGHWAY
REVISIONS 12-03 7-13 9-08	0720	01	044, ETC.	FM 149, ETC.
	DIST		COUNTY	SHEET NO.
	BRYAN		GRIMES	173

DATE: 4/19/2023 7:59:26 AM
FILE: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY/Design Projects/07200104/4 - Design/Plan Set/8. Traffic/8H. TrafficStandards/SMD(GEN)-08.dgn

SIGN SUPPORT DESCRIPTIVE CODES

(Descriptive Codes correspond to project estimate and quantities sheets)

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

Post Type

FRP = Fiberglass Reinforced Plastic Pipe (see SMD(FRP))
TWT = Thin-Walled Tubing (see SMD(TWT))
10BWG = 10 BWG Tubing (see SMD(SLIP-1) to (SLIP-3))
S80 = Schedule 80 Pipe (see SMD(SLIP-1) to (SLIP-3))

Number of Posts (1 or 2)

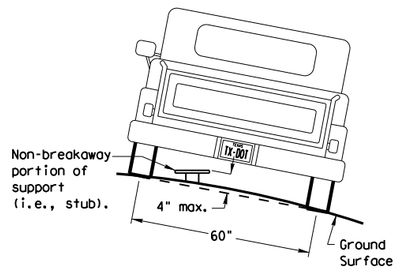
Anchor Type

UA = Universal Anchor - Concreted (see SMD(FRP) and (TWT))
UB = Universal Anchor - Bolted down (see SMD(FRP) and (TWT))
WS = Wedge Anchor Steel - (see SMD(TWT))
WP = Wedge Anchor Plastic (see SMD(TWT))
SA = Slipbase - Concreted (see SMD(SLIP-1) to (SLIP-3))
SB = Slipbase - Bolted Down (see SMD(SLIP-1) to (SLIP-3))

Sign Mounting Designation

P = Prefab. "Plain" (see SMD(SLIP-1) to (SLIP-3), (TWT), (FRP))
T = Prefab. "T" (see SMD(SLIP-1) to (SLIP-3), (TWT))
U = Prefab. "U" (see SMD(SLIP-1) to (SLIP-3))
IF REQUIRED
1EXT or 2EXT = Number of Extensions (see SMD(SLIP-1) to (SLIP-3), (TWT))
BM = Extruded Wind Beam (see SMD(SLIP-1) to (SLIP-3))
WC = 1.12 #/ft Wing Channel (see SMD(SLIP-1) to (SLIP-3))
EXAL = Extruded Aluminum Sign Panels (see SMD(SLIP-1))

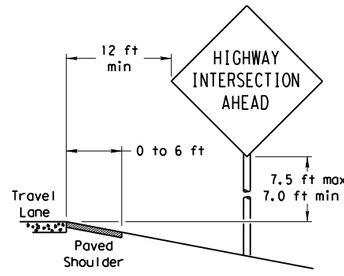
REQUIRED CLEARANCE FOR BREAKAWAY SUPPORT



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

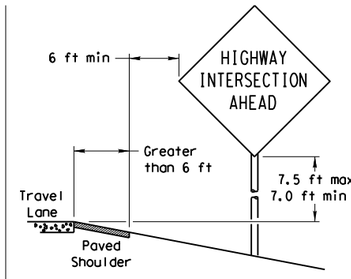
SIGN LOCATION

PAVED SHOULDERS



LESS THAN 6 FT. WIDE

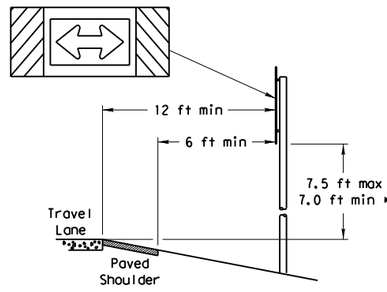
When the shoulder is 6 ft. or less in width, the sign must be placed at least 12 ft. from the edge of the travel lane.



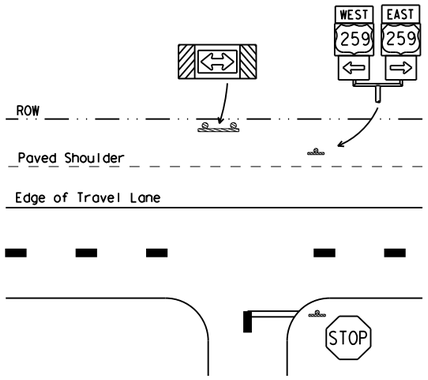
GREATER THAN 6 FT. WIDE

When the shoulder is greater than 6 ft in width, the sign must be placed at least 6 ft. from the edge of the shoulder.

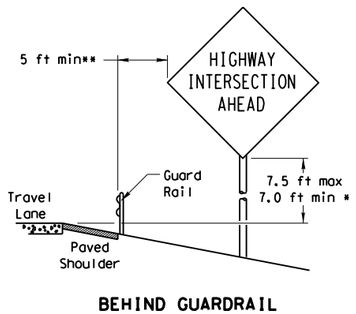
T-INTERSECTION



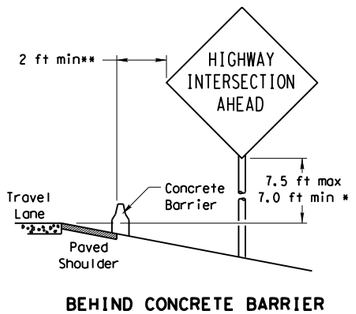
When this sign is needed at the end of a two-lane, two way roadway, the right edge of the sign should be in line with the centerline of the roadway. Place as close to ROW as practical.



BEHIND BARRIER



BEHIND GUARDRAIL



BEHIND CONCRETE BARRIER

**Sign clearance based on distance required for proper guard rail or concrete barrier performance.

* Signs shall be mounted using the following condition that results in the greatest sign elevation:

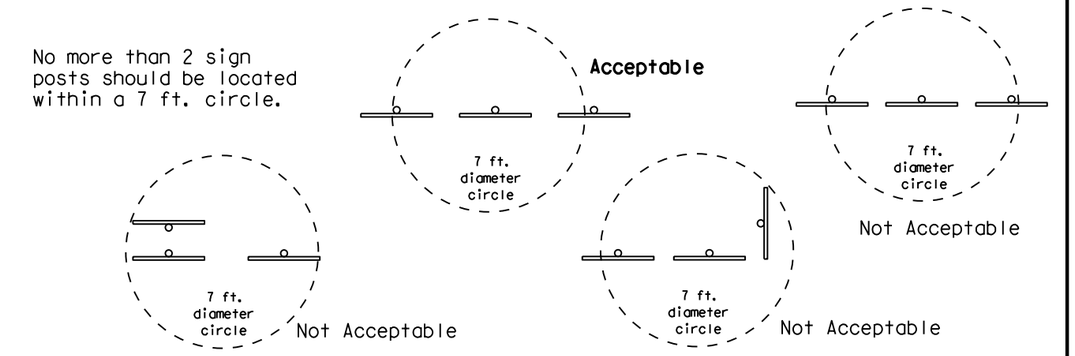
(1) a minimum of 7 to a maximum of 7.5 feet above the edge of the travel lane or

(2) a minimum of 7 to a maximum of 7.5 feet above the grade at the base of the support when sign is installed on the backslope.

The maximum values may be increased when directed by the Engineer.

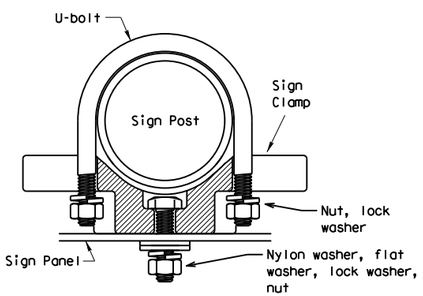
See the Traffic Operations Division website for detailed drawings of sign clamps, Triangular Slipbase System components and Wedge Anchor System components.

The website address is:
http://www.txdot.gov/publications/traffic.htm



TYPICAL SIGN ATTACHMENT DETAIL

Single Signs

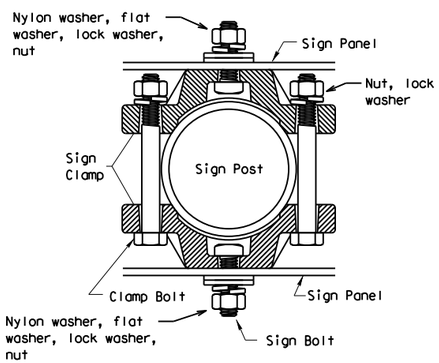


Bolts used to mount sign panels to the clamp are 5/16-18 UNC galvanized square head with nut, nylon washer, flat washer and lock washer. The bolt length is 1 inch for aluminum.

When two sign clamps are used to mount signs back-to-back, use a 5/16-18 UNC galvanized hex head per ASTM A307 with nut and helical-spring lock washer. The approximate bolt lengths for various post sizes and sign clamp types are given in the table at right. The bolt length may need to be adjusted depending upon field conditions.

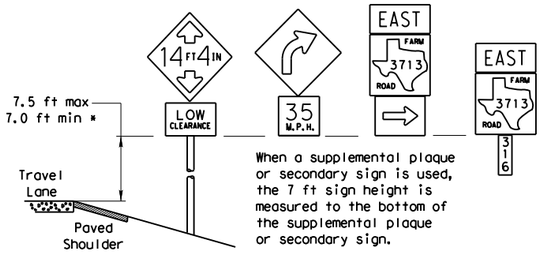
Sign clamps may be either the specific size clamp or the universal clamp.

Back-to-Back Signs



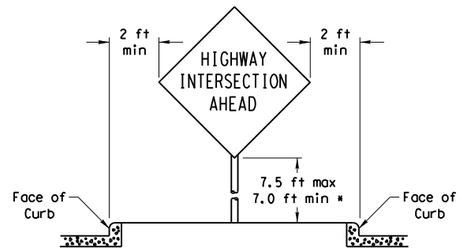
Pipe Diameter	Approximate Bolt Length	
	Specific Clamp	Universal Clamp
2" nominal	3"	3 or 3 1/2"
2 1/2" nominal	3 or 3 1/2"	3 1/2 or 4"
3" nominal	3 1/2 or 4"	4 1/2"

SIGNS WITH PLAQUES



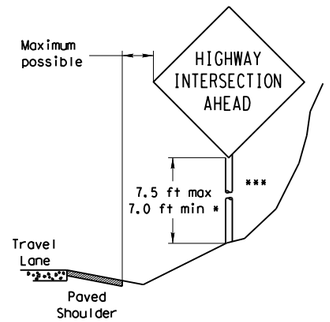
When a supplemental plaque or secondary sign is used, the 7 ft sign height is measured to the bottom of the supplemental plaque or secondary sign.

CURB & GUTTER OR RAISED ISLAND



RESTRICTED RIGHT-OF-WAY

(When 6 ft min. is not possible.)



Right-of-way restrictions may be created by rocks, water, vegetation, forest, buildings, a narrow island, or other factors.

In situations where a lateral restriction prevents the minimum horizontal clearance from the edge of the travel lane, signs should be placed as far from the travel lane as practical.

*** Post may be shorter if protected by guardrail or if Engineer determines the post could not be hit due to extreme slope.

Texas Department of Transportation
Traffic Operations Division

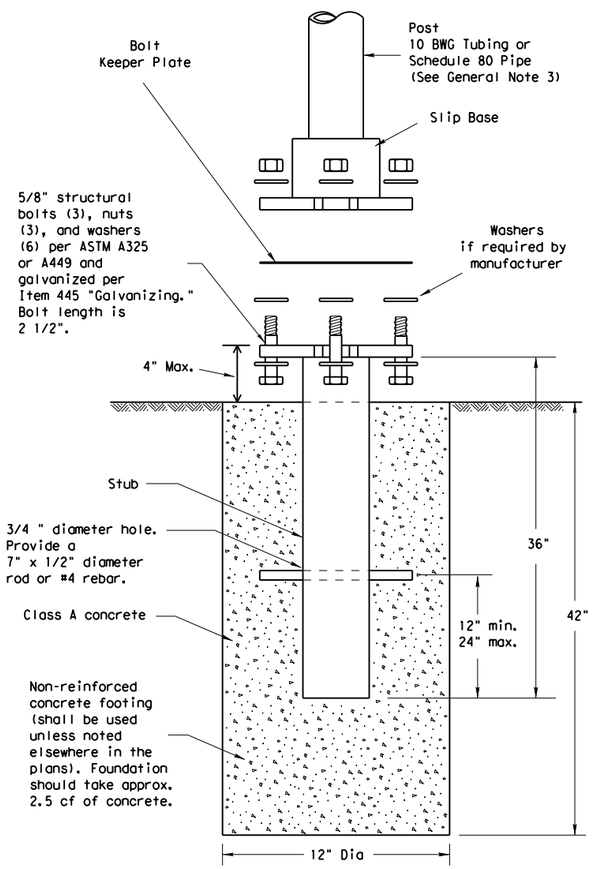
SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS GENERAL NOTES & DETAILS

SMD(GEN)-08

REVISIONS	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
9-08	CONT	SECT	JOB	HIGHWAY
	0720	01	044, ETC.	FM 149, ETC.
	DIST	COUNTY		SHEET NO.
	BRYAN	GRIMES		174

DATE: 4/19/2023 7:59:40 AM
FILE: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY/Design Projects/0720001044/Design/Plan Set/8. Traffic/8H. TrafficStandards/SMD(SLIP-1)-08.dgn

TRIANGULAR SLIPBASE INSTALLATION GENERAL REQUIREMENTS



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

NOTE

There are various devices approved for the Triangular Slipbase System. Please reference the Material Producer List for approved slip base systems. http://www.txdot.gov/business/producer_list.htm The devices shall be installed per manufacturers' recommendations. Installation procedures shall be provided to the Engineer by Contractor.

GENERAL NOTES:

1. Slip base shall be permanently marked to indicate manufacturer. Method, design, and location of marking are subject to approval of the TxDOT Traffic Standards Engineer.
2. Material used as post with this system shall conform to the following specifications:
   10 BWG Tubing (2.875" outside diameter)
   - 0.134" nominal wall thickness
   - Seamless or electric-resistance welded steel tubing or pipe
   - Steel shall be HSLAS Gr 55 per ASTM A1011 or ASTM A1008
   - Other steels may be used if they meet the following:
     - 55,000 PSI minimum yield strength
     - 70,000 PSI minimum tensile strength
     - 20% minimum elongation in 2"
   - Wall thickness (uncoated) shall be within the range of 0.122" to 0.138"
   - Outside diameter (uncoated) shall be within the range of 2.867" to 2.883"
   - Galvanization per ASTM A123 or ASTM A653 G210. For precoated steel tubing (ASTM A653), recoat tube outside diameter weld seam by metallizing with zinc wire per ASTM B833.

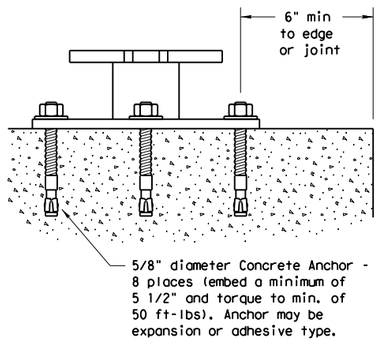
   Schedule 80 Pipe (2.875" outside diameter)
   - 0.276" nominal wall thickness
   - Steel tubing per ASTM A500 Gr C
   - Other seamless or electric-resistance welded steel tubing or pipe with equivalent outside diameter and wall thickness may be used if they meet the following:
     - 46,000 PSI minimum yield strength
     - 62,000 PSI minimum tensile strength
     - 21% minimum elongation in 2"
   - Wall thickness (uncoated) shall be within the range of 0.248" to 0.304"
   - Outside diameter (uncoated) shall be within the range of 2.855" to 2.895"
   - Galvanization per ASTM A123
3. See the Traffic Operations Division website for detailed drawings of sign clamps and Texas Universal Triangular Slipbase System components. The website address is: http://www.txdot.gov/publications/traffic.htm
4. Sign supports shall not be spliced except where shown. Sign support posts shall not be spliced.

ASSEMBLY PROCEDURE

Foundation
1. Prepare 12-inch diameter by 42-inch deep hole. If solid rock is encountered, the depth of the foundation may be reduced such that it is embedded a minimum of 18 inches into the solid rock.
2. The Engineer may permit batches of concrete less than 2 cubic yards to be mixed with a portable, motor-driven concrete mixer. For small placements less than 0.5 cubic yards, hand mixing in a suitable container may be allowed by Engineer. Concrete shall be Class A.
3. Push the pipe end of the slip base stub into the center of the concrete. Rotate the stub back and forth while pushing it down into the concrete to assure good contact between the concrete and stub. Continue to work the stub into the concrete until it is between 2 to 4 inches above the ground.
4. Plumb the stub. Allow a minimum of 4 days to set, unless otherwise directed by the Engineer.
5. The triangular slipbase system is multidirectional and is designed to release when struck from any direction.

Support
1. Cut support so that the bottom of the sign will be 7 to 7.5 feet above the edge of the travelway (i.e., edge of the closest lane) when slip plate is below the edge of pavement or 7 to 7.5 feet above slip plate when the slip plate is above the edge of the travelway. The cut shall be plumb and straight.
2. Attach sign to support using connections shown. When multiple signs are installed on the same support, ensure the minimum clearance between each sign is maintained. See SMD(SLIP-2) for clearances based on sign types.

CONCRETE ANCHOR



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

Concrete anchor consists of 5/8" diameter stud bolt with UNC series bolt threads on the upper end. Heavy hex nut per ASTM A563, and hardened washer per ASTM F436. The stud bolt shall have a minimum yield and ultimate tensile strength of 50 and 75 KSI, respectively. Nuts, bolts and washers shall be galvanized per Item 445, "Galvanizing." Adhesive type anchors shall have stud bolts installed with Type III epoxy per DMS-6100, "Epoxies and Adhesives." Adhesive anchors may be loaded after adequate epoxy cure time per the manufacturer's recommendations. Top of bolt shall extend at least flush with top of the nut when installed. The anchor, when installed in 4000 psi normal-weight concrete with a 5 1/2" minimum embedment, shall have a minimum allowable tension and shear of 3900 and 3100 psi, respectively.

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS TRIANGULAR SLIPBASE SYSTEM

SMD(SLIP-1)-08

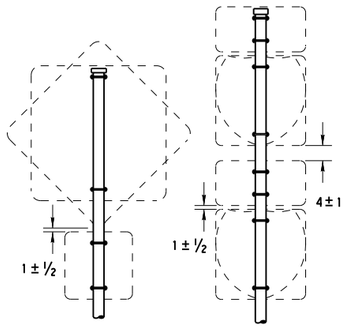
DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT

REVISIONS
9-08

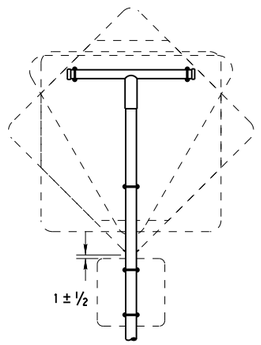
CONT	SECT	JOB	HIGHWAY
0720	01	044, ETC.	FM 149, ETC.

DIST	COUNTY	SHEET NO.
BRYAN	GRIMES	175

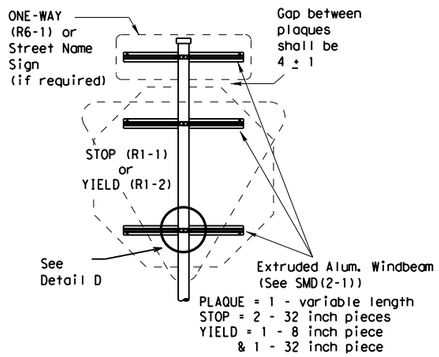
DATE: 4/19/2023 7:59:56 AM
FILE: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY/Design Projects/0720010044/4 - Design/Plan Set/8. Traffic/8H. TrafficStandards/SMD(SLIP-2)-08.dgn



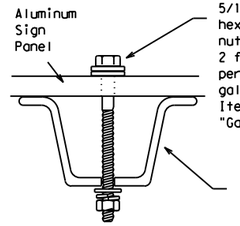
SM RD SGN ASSM TY XXXXX(1)XX(P)



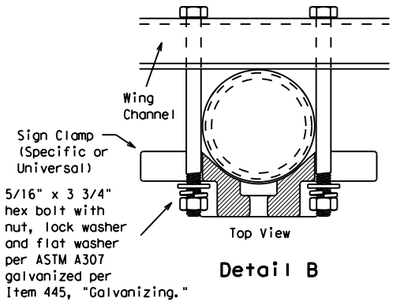
SM RD SGN ASSM TY XXXXX(1)XX(T)



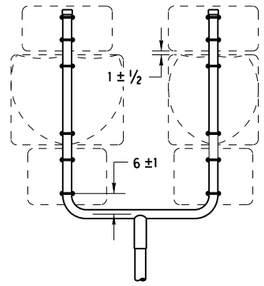
SM RD SGN ASSM TY XXXXX(1)XX(P-BM)



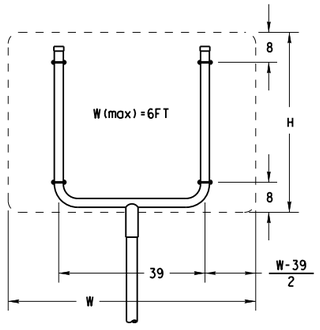
Detail A



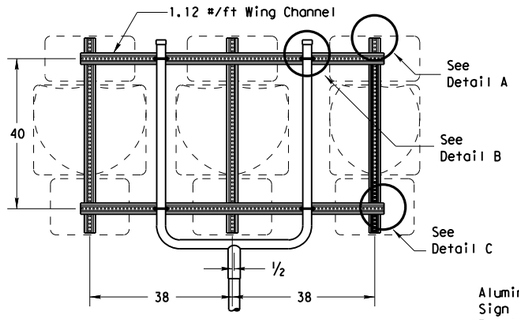
Detail B



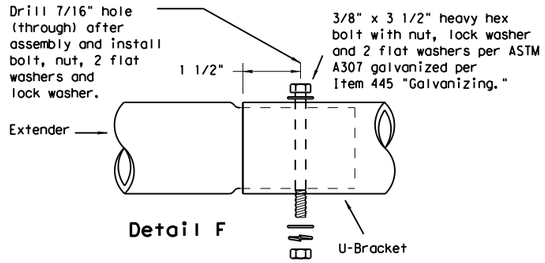
SM RD SGN ASSM TY XXXXX(1)XX(U)



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

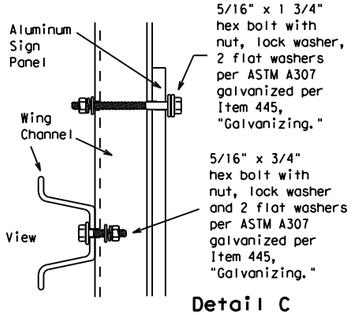


SM RD SGN ASSM TY XXXXX(1)XX(U-WC)
(See Note 11)

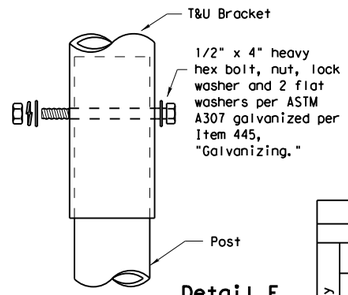


Detail F

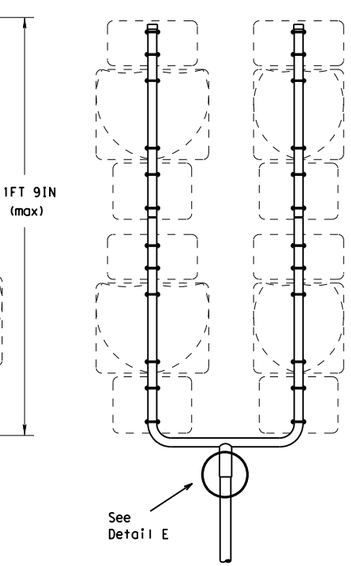
Splices shall only be allowed behind the sign substrate.



Detail C

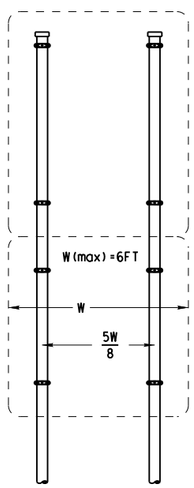


Detail E

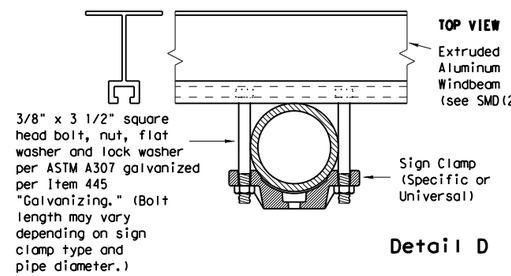


SM RD SGN ASSM TY S80(1)XX(U-1EXT)

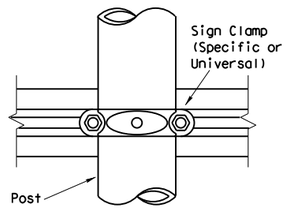
SM RD SGN ASSM TY S80(1)XX(U-2EXT)



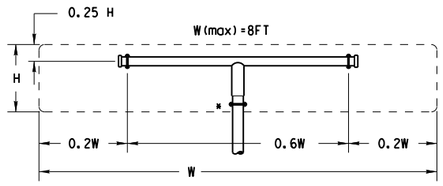
SM RD SGN ASSYM TY XXXXX(2)XX(P)



Detail D



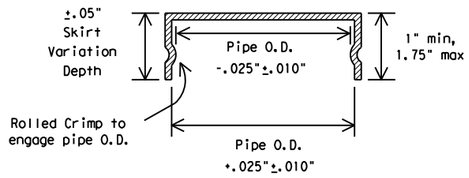
SIDE VIEW



SM RD SGN ASSM TY XXXXX(1)XX(T)
(* - See Note 12)

All dimensions are in english unless detailed otherwise.

FRICTION CAP DETAIL



Friction caps may be manufactured from hot rolled or cold rolled steel sheets. The minimum sheet metal thickness shall be 24 gauge for all cap sizes.

The rim edges shall be reasonably straight and smooth. Caps shall be sized and formed in such a manner as to produce a drive-on friction fit and have no tendency to rock when seated on the pipe. The depth shall be sufficient to give positive protection against entrance of rainwater. They shall be free of sharp creases or indentations and show no evidence of metal fracture.

Caps shall have an electrodeposited coating of zinc in accordance with the requirements of ASTM B633 Class FE/ZN 8.

GENERAL NOTES:

1.

SIGN SUPPORT	# OF POSTS	MAX. SIGN AREA
10 BWG	1	16 SF
10 BWG	2	32 SF
Sch 80	1	32 SF
Sch 80	2	64 SF

2. The Engineer may require that a Schedule 80 post be used in place of a 10 BWG where a sign height is abnormally high due to a fill slope.
3. Sign supports shall not be spliced except where shown. Sign support posts shall not be spliced.
4. Aluminum sign blanks shall conform to Departmental Material Specifications DMS-7110 and shall have the following minimum thicknesses: 0.080 for signs less than 7.5 sq. ft., 0.100 for signs 7.5 to 15 sq. ft., and 0.125 for signs greater than 15 sq. ft.
5. Signs that require specific supports due to reasons in addition to windloading are indicated on the "REQUIRED SUPPORT" table on this sheet.
6. For horizontal rectangular signs fabricated from flat aluminum, T-brackets are used for signs 24 inches or less in height. U-brackets are used for signs of greater height.
7. When two triangular slipbase supports are used to support a single sign, they shall not be "rigidly" connected to each other except through the sign panel. This will allow each support to act independently when impacted by an errant vehicle.
8. Wing channel shall meet ASTM A 1011 SS Gr 50 and be galvanized per ASTM A 123.
9. Excess pipe, wing channel, or windbeam shall be cut off so that it does not extend beyond the sign panel (i.e., excess support shall not be visible when the sign is viewed from the front.) Repair galvanized coating at cut support ends per Item 445, "Galvanizing."
10. Additional route markers may be added vertically, provided the total sign area does not exceed the maximum allowable amount per Note 1.
11. Additional sign clamp required on the "T-bracket" post for 24 inch height signs. Place the clamp 3 inches above bottom of sign when possible.
12. Post open ends shall be fitted with Friction Caps.
13. Sign blanks shall be the sizes and shapes shown on the plans.

REQUIRED SUPPORT

	SIGN DESCRIPTION	SUPPORT
Regulatory	48-inch STOP sign (R1-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	60-inch YIELD sign (R1-2)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	48x16-inch ONE-WAY sign (R6-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	36x48, 48x36, and 48x48-inch signs	TY 10BWG(1)XX(T)
	48x60-inch signs	TY S80(1)XX(T)
Warning	48x48-inch signs (diamond or square)	TY 10BWG(1)XX(T)
	48x60-inch signs	TY S80(1)XX(T)
	48-inch Advance School X-ing sign (S1-1)	TY 10BWG(1)XX(T)
	48-inch School X-ing sign (S2-1)	TY 10BWG(1)XX(T)
	Large Arrow sign (W1-6 & W1-7)	TY 10BWG(1)XX(T)

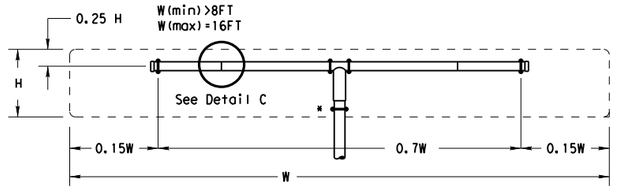
Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS TRIANGULAR SLIPBASE SYSTEM

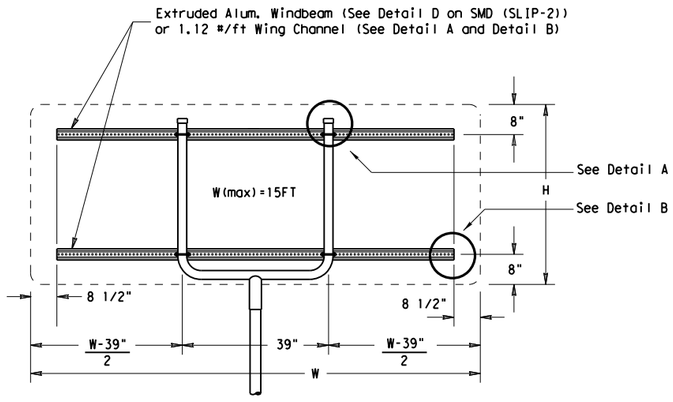
SMD(SLIP-2)-08

REVISIONS	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
9-08	CONT	SECT	JOB	HIGHWAY
	0720	01	044, ETC.	FM 149, ETC.
	DIST	COUNTY		SHEET NO.
	BRYAN	GRIMES		176

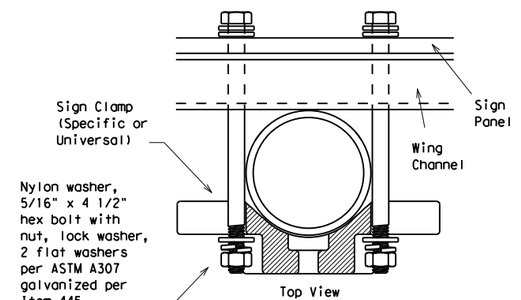
DATE: 4/19/2023 8:00:11 AM
FILE: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY/Design Projects/07200104/4 - Design/Plan Set/8. Traffic/8H. TrafficStandards/SMD(SLIP-3)-08.dgn



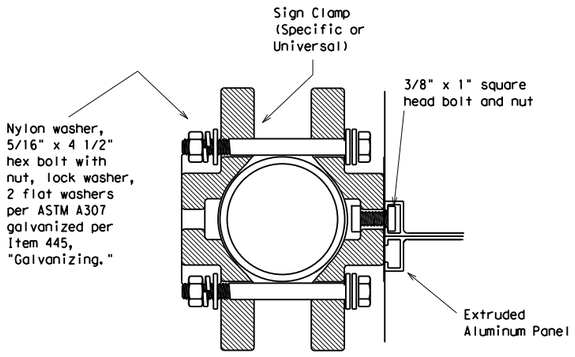
SM RD SGN ASSM TY XXXXX(1)XX(T-2EXT)
(* - See Note 12)



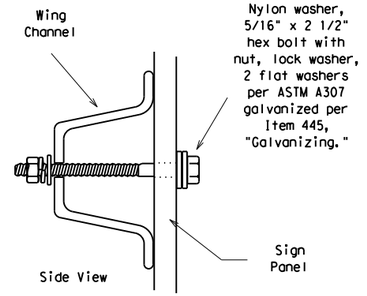
SM RD SGN ASSM TY XXXXX(1)XX(U-XX)



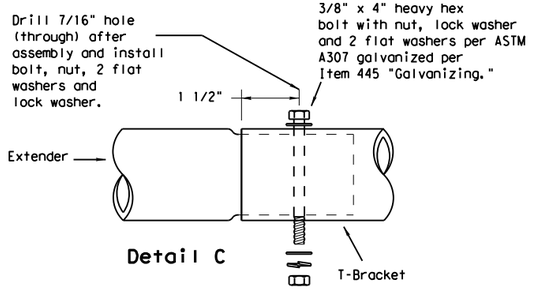
Detail A



Detail D
EXTRUDED ALUMINUM SIGN WITH T BRACKET

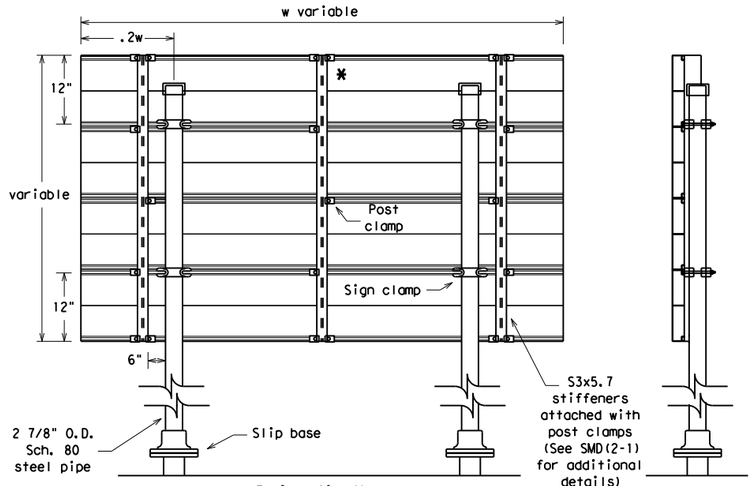


Detail B



Detail C

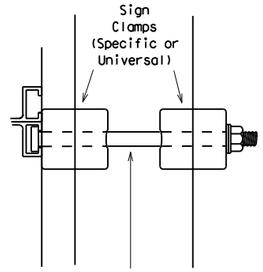
Splices shall only be allowed behind the sign substrate.



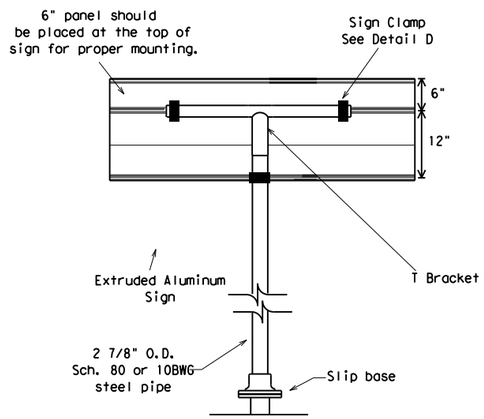
Typical Sign Mount

SM RD SGN ASSM TY S80(2)XX(P-EXAL)

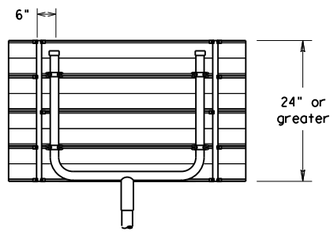
* Additional stiffener placed at approximate center of signs when sign width is greater than 10'.



Detail E



Extruded Aluminum Sign
With T Bracket



Use Extruded Alum. Windbeam as stiffeners
See SMD (2-1) for additional details

See Detail E
for clamp installation

GENERAL NOTES:

1.

SIGN SUPPORT	# OF POSTS	MAX. SIGN AREA
10 BWG	1	16 SF
10 BWG	2	32 SF
Sch 80	1	32 SF
Sch 80	2	64 SF

2. The Engineer may require that a Schedule 80 post be used in place of a 10 BWG where a sign height is abnormally high due to a fill slope.
3. Sign supports shall not be spliced except where shown. Sign support posts shall not be spliced.
4. Aluminum sign blanks shall conform to Departmental Material Specifications DMS-7110 and shall have the following minimum thicknesses: 0.080 for signs less than 7.5 sq. ft., 0.100 for signs 7.5 to 15 sq. ft., and 0.125 for signs greater than 15 sq. ft.
5. Signs that require specific supports due to reasons in addition to windloading are indicated on the "REQUIRED SUPPORT" table on this sheet.
6. For horizontal rectangular signs fabricated from flat aluminum, T-brackets are used for signs 24 inches or less in height. U-brackets are used for signs of greater height.
7. When two triangular slipbase supports are used to support a single sign, they shall not be "rigidly" connected to each other except through the sign panel. This will allow each support to act independently when impacted by an errant vehicle.
8. Wing channel shall meet ASTM A 1011 SS Gr 50 and be galvanized per ASTM A 123.
9. Excess pipe, wing channel, or windbeam shall be cut off so that it does not extend beyond the sign panel (i.e., excess support shall not be visible when the sign is viewed from the front.) Repair galvanized coating at cut support ends per Item 445, "Galvanizing."
10. Sign blanks shall be the sizes and shapes shown on the plans.
11. Additional sign clamp required on the "T-bracket" post for 24 inch high signs. Place the clamp 3 inches above bottom of sign when possible.
12. Post open ends shall be fitted with Friction Caps.

REQUIRED SUPPORT

	SIGN DESCRIPTION	SUPPORT
Regulatory	48-inch STOP sign (R1-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	60-inch YIELD sign (R1-2)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	48x16-inch ONE-WAY sign (R6-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	36x48, 48x36, and 48x48-inch signs	TY 10BWG(1)XX(T)
	48x60-inch signs	TY S80(1)XX(T)
Warning	48x48-inch signs (diamond or square)	TY 10BWG(1)XX(T)
	48x60-inch signs	TY S80(1)XX(T)
	48-inch Advance School X-ing sign (S1-1)	TY 10BWG(1)XX(T)
	48-inch School X-ing sign (S2-1)	TY 10BWG(1)XX(T)
	Large Arrow sign (W1-6 & W1-7)	TY 10BWG(1)XX(T)

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS TRIANGULAR SLIPBASE SYSTEM

SMD(SLIP-3)-08

REVISIONS
9-08

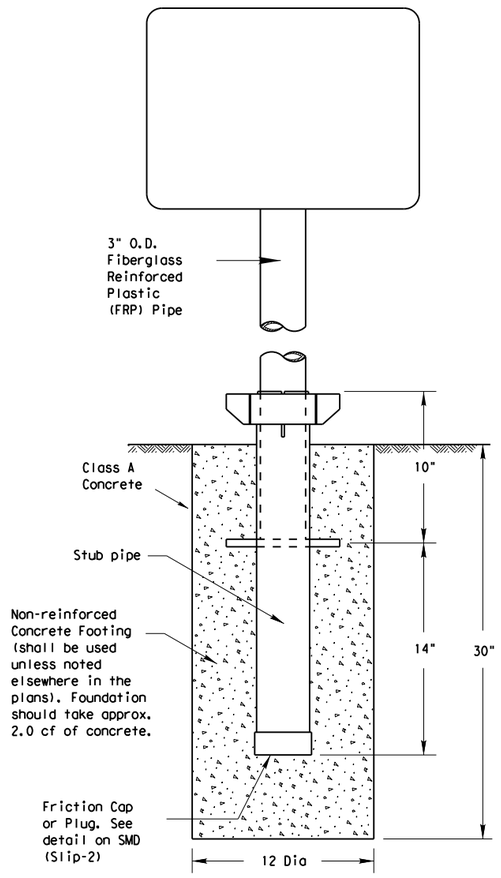
DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT

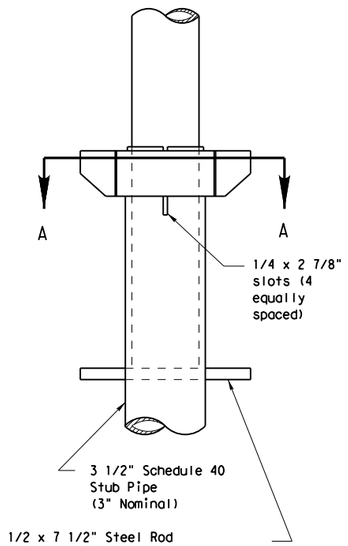
CONT	SECT	JOB	HIGHWAY
0720	01	044, ETC.	FM 149, ETC.

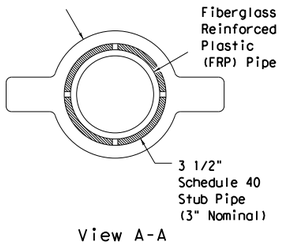
DIST	COUNTY	SHEET NO.
BRYAN	GRIMES	177

DATE: 4/19/2023 8:00:26 AM
FILE: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY/Design Projects/0720010044/4 - Design/Plan Set/8. Traffic/8H. TrafficStandards/SMD(FRP)-08.dgn

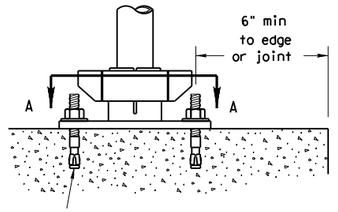
Universal Anchor System with Fiberglass Reinforced Plastic (FRP) Post







SM RD SGN ASSM TY FRP(X)UA(P)



Concrete anchor consists of 5/8" diameter stud bolt with UNC series bolt threads on the upper end. A heavy hex nut per ASTM A563 and hardened washer per ASTM F436. The stud bolt shall have minimum yield and ultimate tensile strengths of 50 and 75 ksi, respectively. Nuts, bolts and washers shall be galvanized per Item 445, "Galvanizing." Top of bolt shall extend at least flush with top of nut when installed. The anchor, when installed in 4000 psi normal-weight concrete with a 3 3/8" minimum embedment, shall have a minimum allowable tension and shear of 2450 and 1525 psi, respectively. Adhesive type anchors shall have stud bolts installed with Type III epoxy per DMS-6100, "Epoxies and Adhesives." Adhesive anchors may be loaded after adequate epoxy cure time per the manufacturer's recommendations.

BOLT-DOWN DETAILS

SM RD SGN ASSM TY FRP(X)UB(P)

GENERAL NOTES:

1. FRP sign supports for a single type sign support may be used for signs up to and including 16 square feet. Dual post installation may be used for signs up to and including 32 square feet.
2. All nuts, bolts and washers shall be galvanized per Item 445, "Galvanizing."
3. See the Traffic Operations Division website for detailed drawings of sign clamps. The website address is: http://www.txdot.gov/publications/traffic.htm

FRP POST REQUIREMENTS

1. Materials shall conform to the requirements of Departmental Material Specification DMS-4410 and will be furnished in a yellow or gray color as specified elsewhere in the plans.
2. Thickness of FRP sign support is 0.125" + 0.031", - 0.0".
3. FRP sign supports are prequalified by the Traffic Operations Division. Prequalification procedures are obtained by writing:
   Texas Department of Transportation
   Traffic Operations Division
   125 East 11th Street
   Austin, Texas 78701-2483

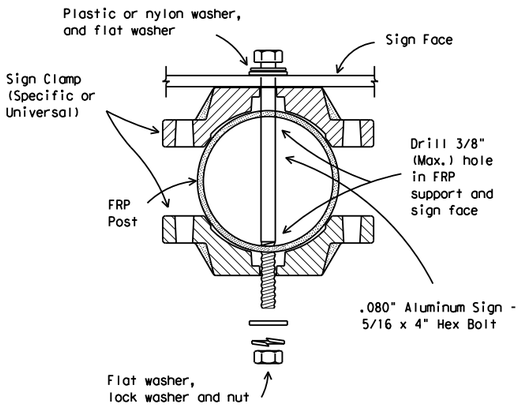
UNIVERSAL ANCHOR SYSTEM INSTALLATION PROCEDURES

1. Dig foundation hole. Where solid rock is encountered at ground level, the foundation shall be a minimum depth of 18". When solid rock is encountered below ground level, the foundation shall extend in the solid rock a minimum depth of 18" or provide a minimum foundation depth of 30". If solid rock is encountered, the socket/stub may be reduced in length as required to a minimum length of 18". Any material removed from the socket/stub shall be from the bottom and the clearance requirements given on SMD(GEN) must be followed. The inner surfaces of the socket/stub must remain free of concrete or other debris.
2. The Engineer may permit batches of concrete less than 2 cubic yards to be mixed with a portable, motor driven concrete mixer. For small placements less than 0.5 cubic yards, hand mixing in a suitable container may be allowed by Engineer. Concrete shall be Class A.
3. Insert base post in foundation hole to depths shown and fill hole with concrete. Cut base post from bottom and ensure a minimum of 18" embedment if installed in solid rock.
4. Level and plumb the base post with coupler using a torpedo level and let concrete set a minimum of 4 days, unless otherwise directed by Engineer. Bottom of base post slots shall be above the concrete footing.
5. Attach sign to FRP post.
6. Insert sign post into base post. Lower until the post comes to rest on the steel rod.
7. Use hammer to ensure the coupler is firmly seated. Top of coupler should be level with top of base post in most instances.
8. Check sign to ensure there is no twist. If loose, increase the tightening of coupler.

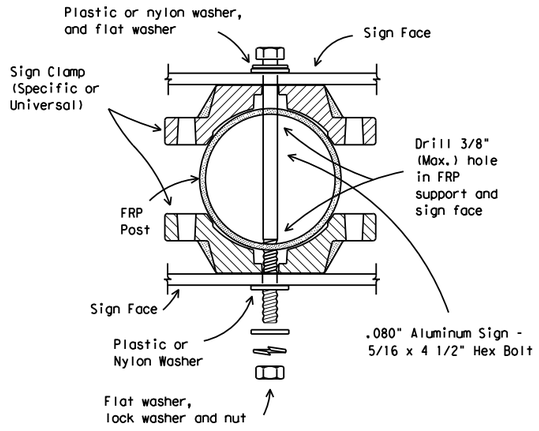
BOLT DOWN SIGN SUPPORT

1. Position base plate with coupler on existing concrete.
2. Drill holes into concrete and insert the 5/8" diameter bolts with wedge anchors, and tighten nuts.
3. Attach sign to FRP post.
4. Insert bottom of sign post into pipe stub.
5. Use hammer to ensure the coupler is firmly seated. Top of coupler should be level with top of base post in most instances.
6. Check sign to ensure there is no twist. If loose, increase the tightening of coupler.

Typical Sign Mounting Detail for FRP Support with Single Sign



Typical Sign Mounting Detail for FRP Support with Back-to-Back Signs



Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS UNIVERSAL ANCHOR SYSTEM WITH FRP POST

SMD(FRP)-08

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

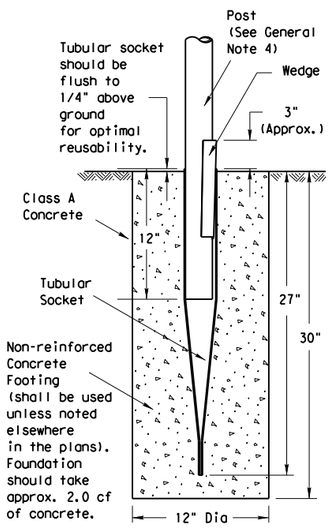
REVISIONS
9-08

CONT	SECT	JOB	HIGHWAY
0720	01	044, ETC.	FM 149, ETC.

DIST	COUNTY	SHEET NO.
BRYAN	GRIMES	178

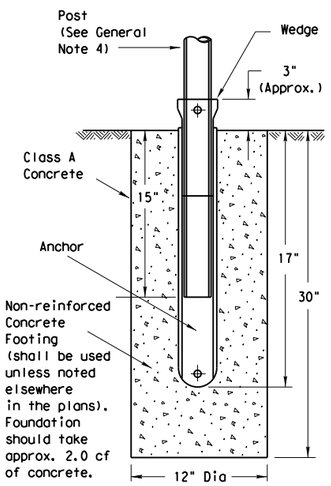
DATE: 4/19/2023 8:00:41 AM
FILE: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY/Design Projects/07200104/4 - Design/Plan Set/8. Traffic/8H. TrafficStandards/SMD(TWT)-08.dgn

Wedge Anchor Steel System



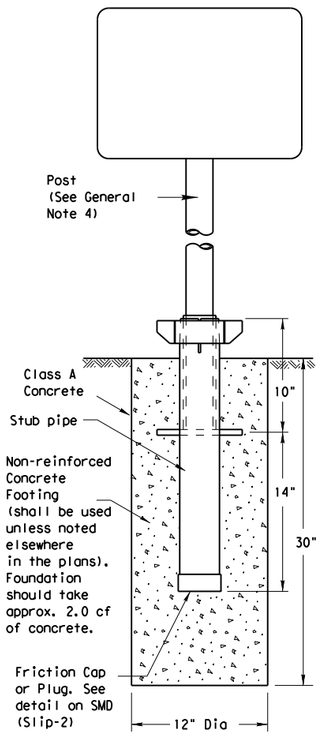
SM RD SGN ASSM TY TWT(X)WS(X)

Wedge Anchor High Density Polyethylene (HDPE) System

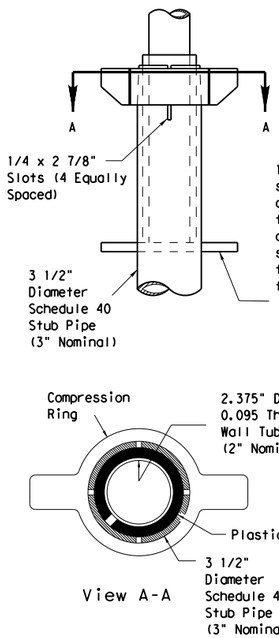


SMD RD SGN ASSM TY TWT(X)WP(X)

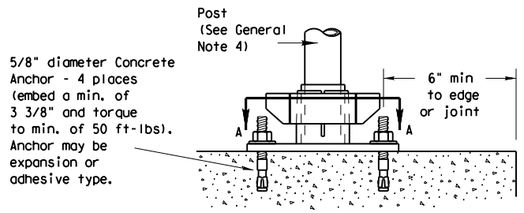
Universal Anchor System with Thin-Walled Tubing Post



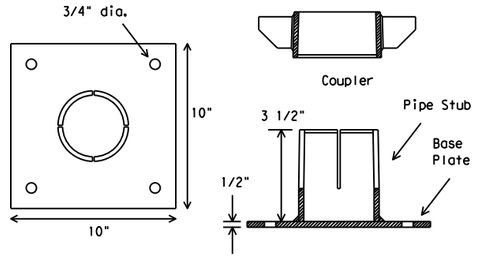
SM RD SGN ASSM TY TWT(X)UA(P)



Plastic insert must be used when using the TWT with either the Universal Anchor System or the Bolt Down Universal Anchor System. The insert should be approx. 10" long and cover the tubing from just above the top of the stub pipe to the bottom of the sign post when using the Universal Anchor System. The insert should be cut to approx. 4 1/2" when used with the Bolt Down Universal Anchor System.

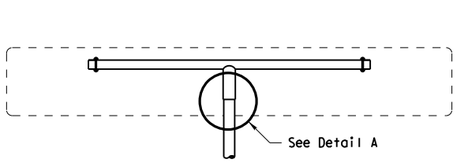


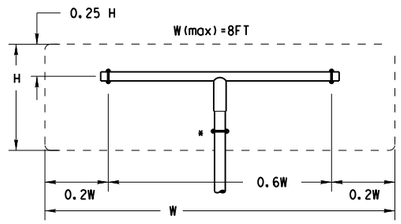
Concrete anchor consists of 5/8" diameter stud bolt with UNC series bolt threads on the upper end. A heavy hex nut per ASTM A563 and hardened washer per ASTM F436. The stud bolt shall have minimum yield and ultimate tensile strengths of 50 and 75 ksi, respectively. Nuts, bolts and washers shall be galvanized per Item 445, "Galvanizing." Top of bolt shall extend at least flush with top of nut when installed. The anchor, when installed in 4000 psi normal-weight concrete with a 3 3/8" minimum embedment, shall have a minimum allowable tension and shear of 2450 and 1525 psi, respectively. Adhesive type anchors shall have stud bolts installed with Type III epoxy per DMS-6100, "Epoxies and Adhesives." Adhesive anchors may be loaded after adequate epoxy cure time per the manufacturer's recommendations.



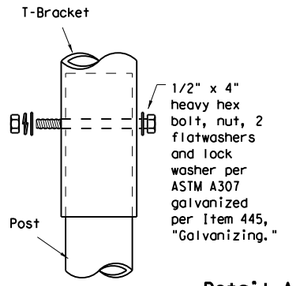
SM RD SGN ASSM TY TWT(X)UB(P)

Sign Installation Using a Prefabricated T-Bracket for Thin-Wall Tubing Post





SM RD SGN ASSM TY TWT(X)XX(T)
(* - See General Note 6)



Detail A

9/16" hole may need to be drilled through post to accommodate bolt.

NOTE

The devices shall be installed per manufacturer's recommendations.
Installation procedures shall be provided to the Engineer by Contractor.

GENERAL NOTES:

1. The Wedge Anchor System and the Universal Anchor System with thin wall tubing post may be used to support up to 10 square feet of sign area.
2. The tubular socket, wedge and prefabricated T-bracket shall be permanently marked to indicate manufacturer. Method, design, and location of marking are subject to the approval of the TxDOT Traffic Standards Engineer.
3. Except for posts (13 BWG Tubing), clamps, nuts and bolts, all components shall be prequalified. A list of prequalified vendors may be obtained from the Material Producer List web page. The website address is: http://www.txdot.gov/business/producer list.htm
4. Material used as post with this system shall conform to the following specifications:
   13 BWG Tubing (2.375" outside diameter) (TWT)
   0.095" nominal wall thickness
   Seamless or electric-resistance welded steel tubing
   Steel shall be HSLAS Gr 55 per ASTM A1011 or ASTM A1008
   Other steels may be used if they meet the following:
   55,000 PSI minimum yield strength
   70,000 PSI minimum tensile strength
   18% minimum elongation in 2"
   Wall thickness (uncoated) shall be within the range of .083" to .099"
   Outside diameter (uncoated) shall be within the range of 2.369" to 2.381"
   Galvanization per ASTM 123 or ASTM A653 G210. For precoated steel tubing (ASTM A653), recoat tube outside diameter weld seam by metallizing with zinc wire per ASTM B833.
5. Sign blanks shall be the sizes and shapes shown on the plans.
6. Additional sign clamp required on the "T-bracket" post for 24" high signs. Place clamp at least 3" above bottom of sign when possible.
7. Sign supports shall not be spliced except where shown. Sign support posts shall not be spliced.
8. See the Traffic Operations Division website for detailed drawings of sign clamps and Wedge Anchor System components. The website address is: http://www.txdot.gov/publications/traffic.htm

WEDGE ANCHOR SYSTEM INSTALLATION PROCEDURE

1. Dig foundation hole. Where solid rock is encountered at ground level, the foundation shall be a minimum depth of 18". When solid rock is encountered below ground level, the foundation shall extend in the solid rock a minimum depth of 18" or provide a minimum foundation depth of 30". If solid rock is encountered, the socket/stub may be reduced in length as required to a minimum length of 18". Any material removed from the socket/stub shall be from the bottom and the clearance requirements given on SMD(GEN) must be followed. The inner surfaces of the socket/stub must remain free of concrete or other debris.
2. The Engineer may permit batches of concrete less than 2 cubic yards to be mixed with a portable, motor driven concrete mixer. For small placements less than 0.5 cubic yards, hand mixing in a suitable container may be allowed by Engineer. Place concrete into hole until it is approximately flush with the ground. Concrete shall be Class A.
3. Insert tubular socket into concrete until top of socket is approximaely 1/4 " above the concrete footing.
4. Plumb the socket. Allow a minimum 4 days for concrete to set, unless otherwise directed by Engineer..
5. Attach the sign to the sign post.
6. Insert the sign post into socket and align sign face with roadway.
7. Drive the wedge into the socket to secure post. This will leave approximately 3 inches of the wedge exposed.

UNIVERSAL ANCHOR SYSTEM INSTALLATION PROCEDURE

1. Dig foundation hole. Where solid rock is encountered at ground level, the foundation shall be a minimum depth of 18". When solid rock is encountered below ground level, the foundation shall extend in the solid rock a minimum depth of 18" or provide a minimum foundation depth of 30". If solid rock is encountered, the socket/stub may be reduced in length as required to a minimum length of 18". Any material removed from the socket/stub shall be from the bottom and the clearance requirements given on SMD(GEN) must be followed. The inner surfaces of the socket/stub must remain free of concrete or other debris.
2. Insert base post in hole to depths shown and backfill hole with concrete.
3. Level and plumb the base post using a torpedo level and allow concrete adequate time to set. The bottom of the slots provided in the stub pipe shall remain above the top of the concrete foundation.
4. Attach the sign to the sign post.
5. Install plastic insert around bottom of post.
6. Insert sign post into base post. Lower until the post comes to rest on steel rod.
7. Seat compression ring using a hammer. Typically, the top of compression ring will be approximately level with top of stub post when optimally installed.
8. Check sign post by hand to ensure it is unable to turn. If loose, increase the tightening of the compression ring.

Texas Department of Transportation
Traffic Operations Division

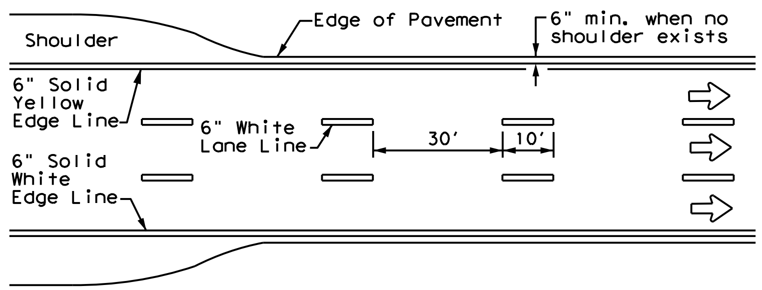
SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS WEDGE & UNIVERSAL ANCHOR WITH THIN WALL TUBING POST

SMD(TWT)-08

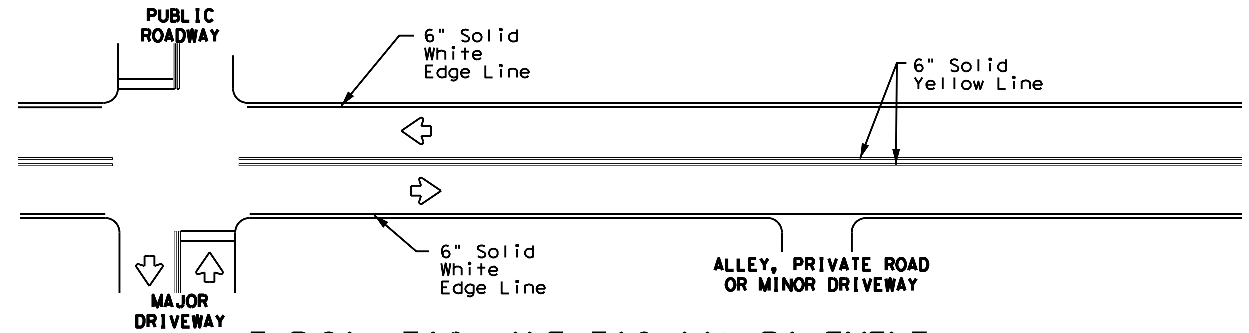
DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT

REVISIONS	CONT	SECT	JOB	HIGHWAY
9-08	0720	01	044, ETC.	FM 149, ETC.
	DIST	COUNTY		SHEET NO.
	BRYAN	GRIMES		179

26E



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



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

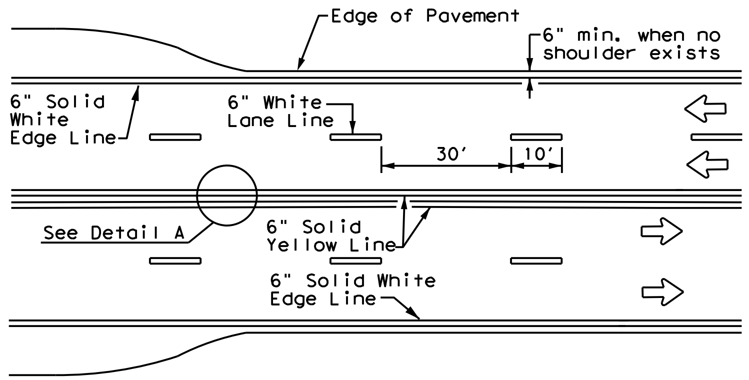
GENERAL NOTES

1. Edge line striping shall be as shown in the plans or as directed by the Engineer. The edge line should not be placed less than 6 inches from the edge of pavement. This distance may vary due to pavement raveling or other conditions. Edge lines are not required in curb and gutter sections of roadways.

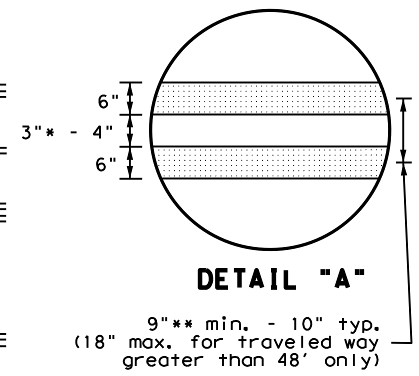
2. The traveled way includes only that portion of the roadway used for vehicular travel. It does not include the parking lanes, sidewalks, berms and shoulders. The traveled ways shall be measured from the center of edge line to the center of edge line of a two lane roadway.

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.



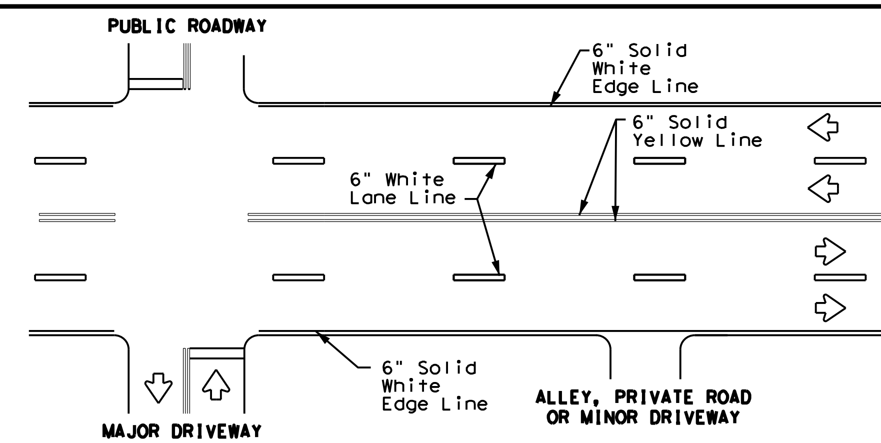
CENTERLINE AND LANE LINES FOUR LANE TWO-WAY ROADWAY WITH OR WITHOUT SHOULDERS



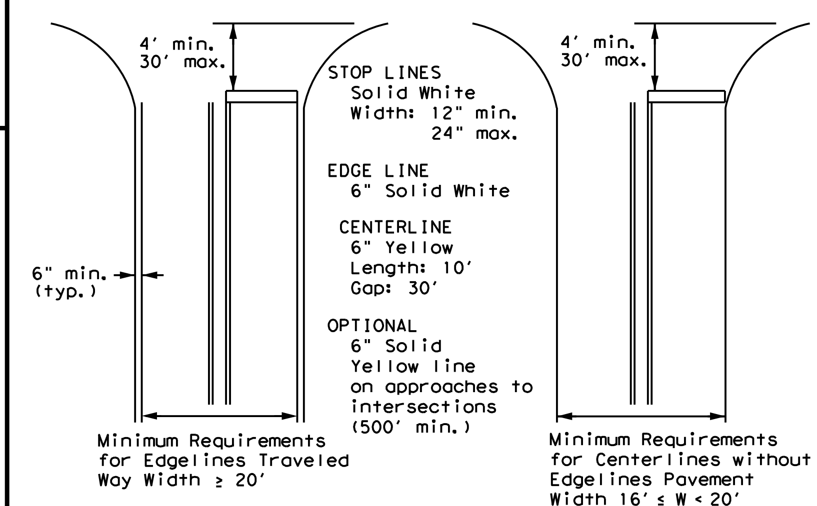
DETAIL "A"

9"** min. - 10" typ. (18" max. for traveled way greater than 48' only)

* 2" minimum for restripe projects when approved by the Engineer.
** 8" minimum for restripe projects when approved by the Engineer.



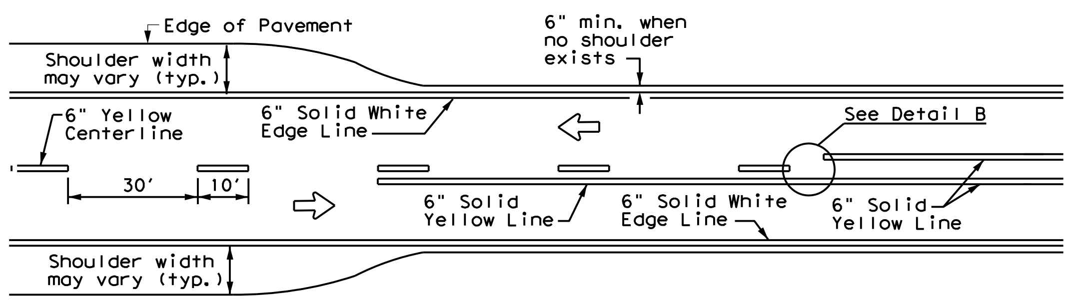
TYPICAL MULTI-LANE, TWO-WAY PAVEMENT MARKINGS THROUGH INTERSECTIONS



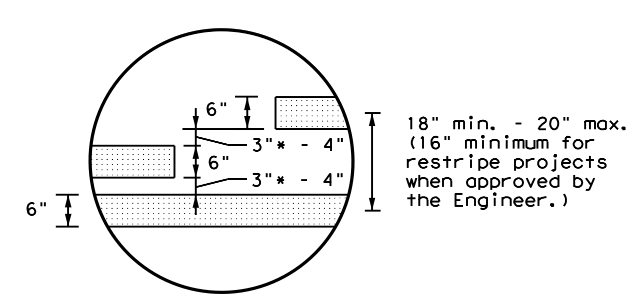
NOTE: Traveled way is exclusive of shoulder widths. Refer to General Note 2 for additional details.

GUIDE FOR PLACEMENT OF STOP LINES, EDGE LINE & CENTERLINE

Based on Traveled Way and Pavement Widths for Undivided Roadways

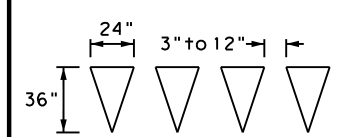


TWO LANE TWO-WAY ROADWAY WITH OR WITHOUT SHOULDERS



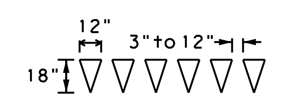
DETAIL "B"

* 2" minimum for restripe projects when approved by the Engineer.

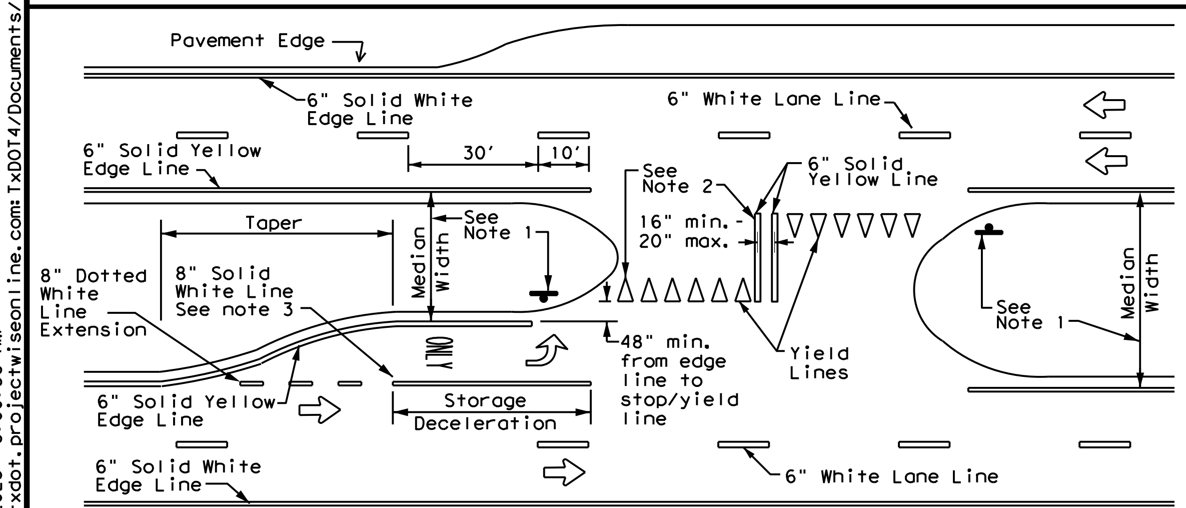


For posted speed on road being marked equal to or greater than 45 MPH.

YIELD LINES



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



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 and stop bars are optional as determined by the Engineer.

2. Install median striping (double yellow centerlines and stop lines/yield lines) when a 50' or greater median centerline can be placed. Stop lines shall only be used with stop signs. Yield lines 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.

Texas Department of Transportation — Traffic Safety Division Standard

TYPICAL STANDARD PAVEMENT MARKINGS

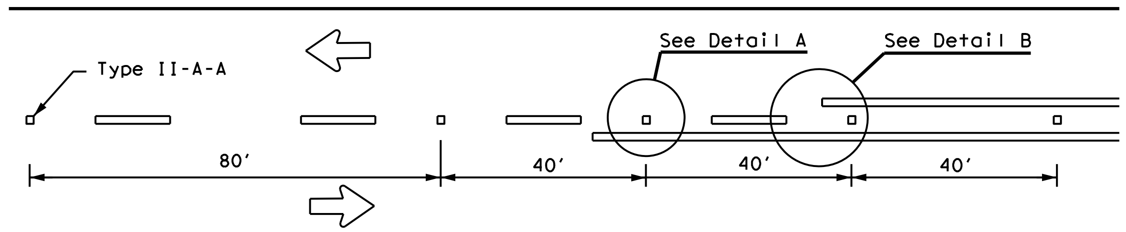
PM(1)-22

FILE: pm1-22.dgn	DN:	CK:	DW:	CK:
© TxDOT December 2022	CONT	SECT	JOB	HIGHWAY
REVISIONS 11-78 8-00 6-20; 8-95 3-03 12-22; 5-00 2-12	0720	01	044, ETC.	FM 149, ETC.
	DIST		COUNTY	SHEET NO.
	BRYAN		GRIMES	180

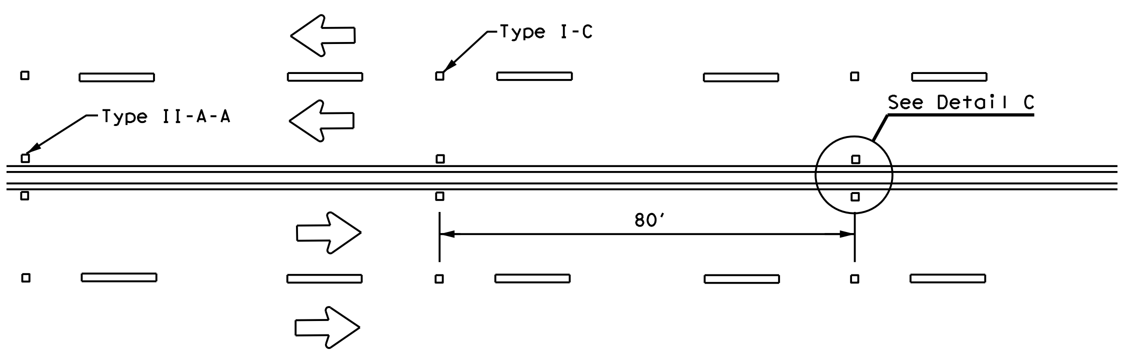
22A

DATE: 4/19/2023 8:00:56 AM
FILE: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY/Design Projects/0720...

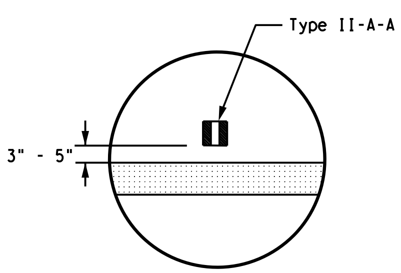
REFLECTIVE RAISED PAVEMENT MARKERS FOR VEHICLE POSITIONING GUIDANCE



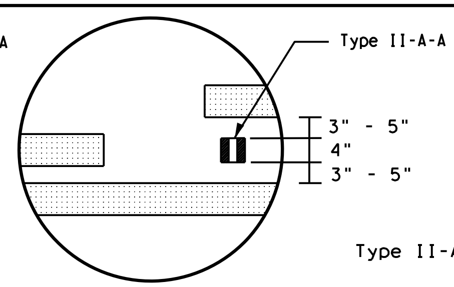
CENTERLINE FOR ALL TWO LANE TWO-WAY ROADWAYS



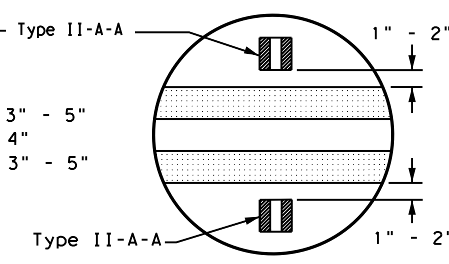
CENTERLINE & LANE LINES FOR FOUR LANE TWO-WAY ROADWAYS



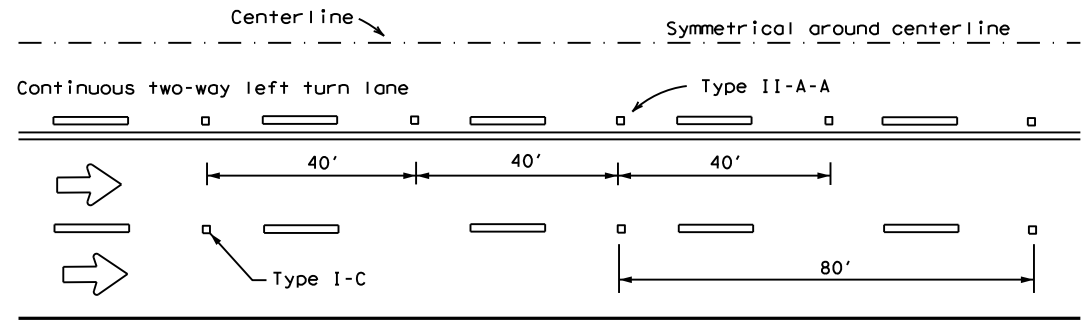
DETAIL "A"



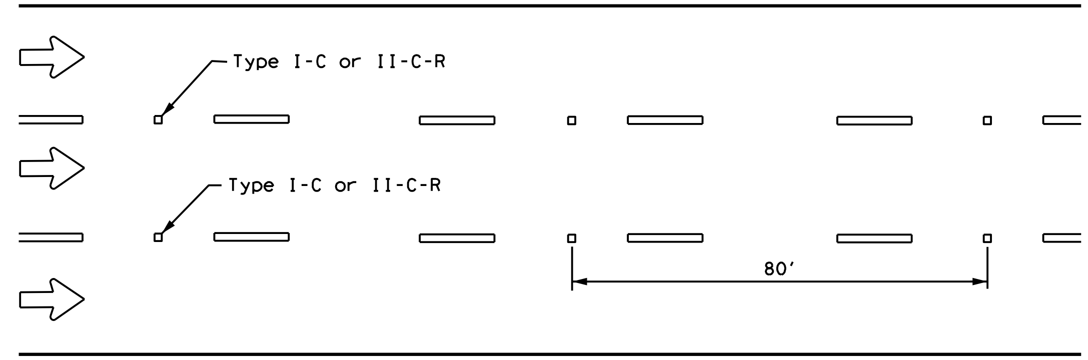
DETAIL "B"



DETAIL "C"



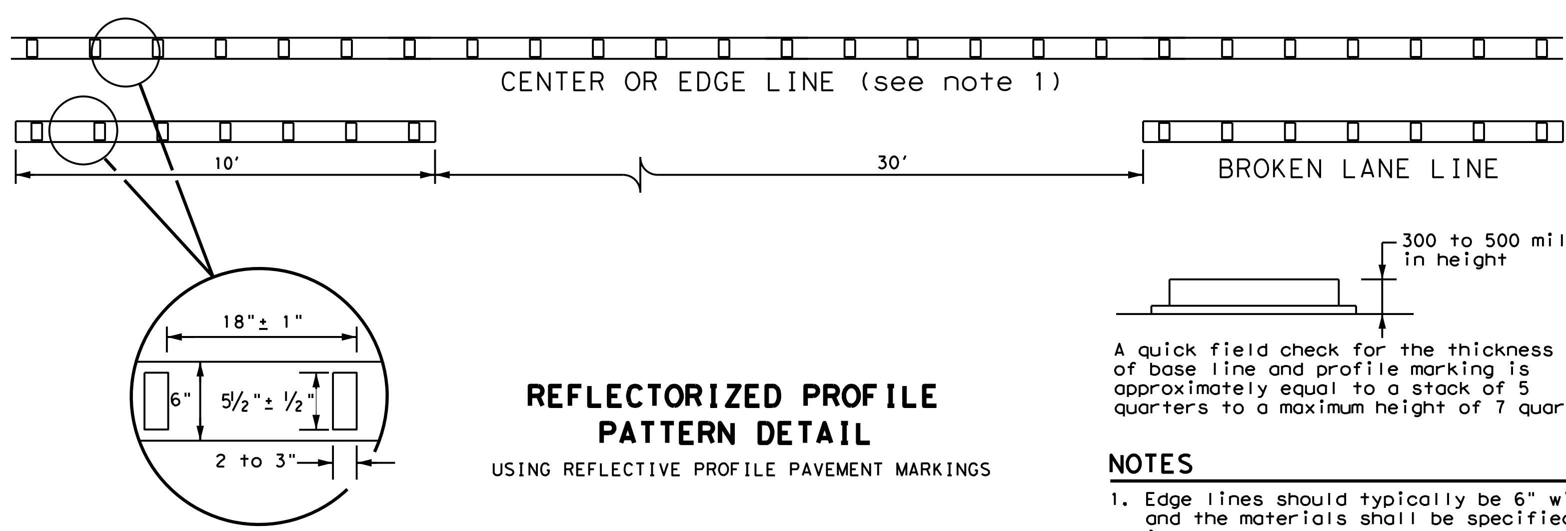
CENTERLINE AND LANE LINES FOR TWO-WAY LEFT TURN LANE



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.

See Note 3.



6" EDGE LINE, 6" CENTERLINE OR 6" LANE LINE

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.

NOTES

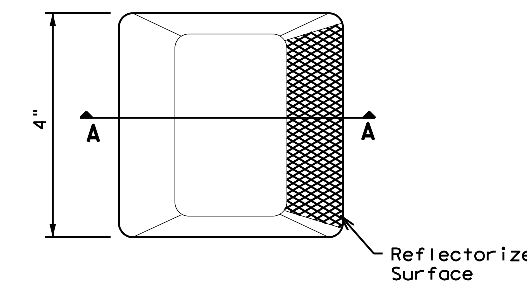
1. Edge lines should typically be 6" wide and the materials shall be specified in the plans.
2. Profile markings shall not be placed on roadways with a posted speed limit of 45 MPH or less.

GENERAL NOTES

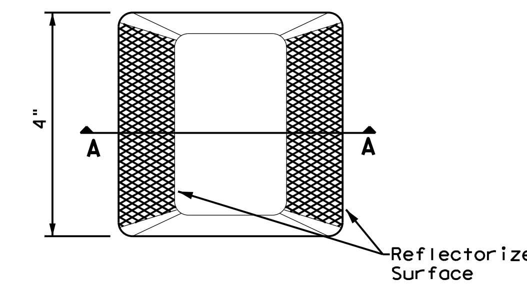
1. All raised pavement markers placed along broken lines shall be placed in line with and midway between the stripes.
2. On concrete pavements the raised pavement markers should be placed to one side of the longitudinal joints.
3. Use raised pavement marker Type I-C with undivided roadways, flush medians and two way left turn lanes. Use raised pavement marker Type II-C-R with divided highways and raised medians.

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

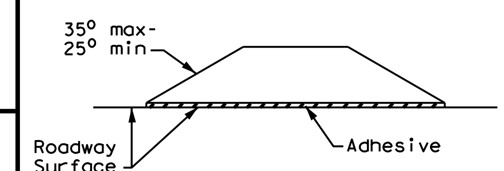
All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.



Type I (Top View)



Type II (Top View)



SECTION A

RAISED PAVEMENT MARKERS

Texas Department of Transportation

Traffic Safety Division Standard

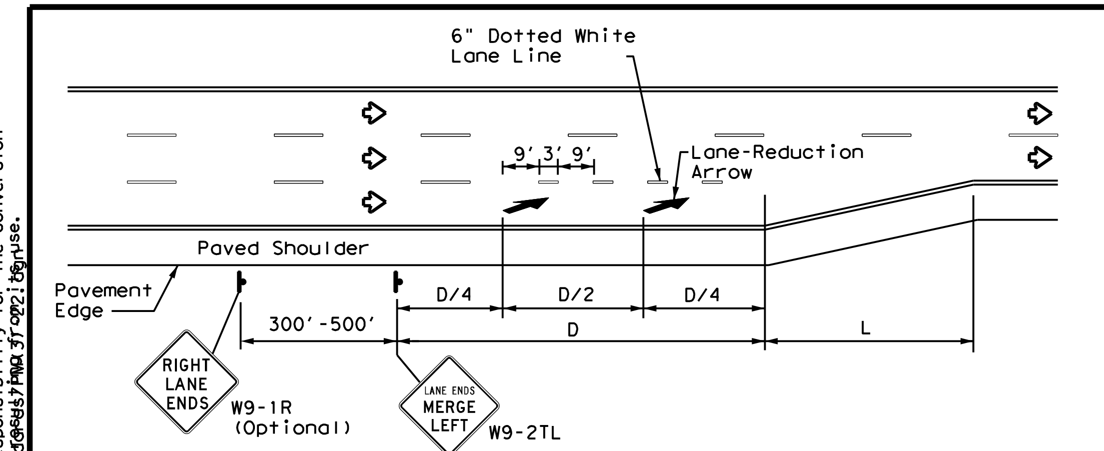
POSITION GUIDANCE USING RAISED MARKERS RELECTORIZED PROFILE MARKINGS PM(2)-22

FILE: pm2-22.dgn	DN:	CK:	DW:	CK:
© TxDOT December 2022	CONT	SECT	JOB	HIGHWAY
REVISIONS 4-77 8-00 6-20 4-92 2-10 12-22 5-00 2-12	0720	01	044, ETC.	FM 149, ETC.
	DIST		COUNTY	SHEET NO.
	BRYAN		GRIMES	181

22B

DATE: 4/19/2023 8:01:11 AM
FILE: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY/Design Projects/...

DATE: 4/19/2023 8:01:25 AM
FILE: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY/Design Projects/



LANE REDUCTION

NOTES

1. Lane reduction pavement markings are used where the number of through lanes is reduced because of narrowing of the roadway or because of a section of on-street parking in what would otherwise be a through lane. For Texas Super 2 Passing Lanes, see TS2(PL) standard sheets.
2. On divided highways, an additional RIGHT LANE ENDS (W9-1R) sign may be installed in the median aligned with the W9-1R sign on the right side of the highway.
3. Lane reduction arrows are required for speeds of 45 mph or greater. An optional third lane reduction arrow may be added based on engineering judgement. If used, the optional third lane reduction arrow should be centered between the first and last lane reduction arrows.
4. For lane reductions on Freeways and Expressways, signing shall conform to the TxDOT Freeway Signing Handbook.

ADVANCED WARNING SIGN DISTANCE (D)

Posted Speed	D (ft)	L (ft)
30 MPH	460	$L = \frac{WS^2}{60}$
35 MPH	565	
40 MPH	670	
45 MPH	775	L=WS
50 MPH	885	
55 MPH	990	
60 MPH	1,100	
65 MPH	1,200	
70 MPH	1,250	
75 MPH	1,350	

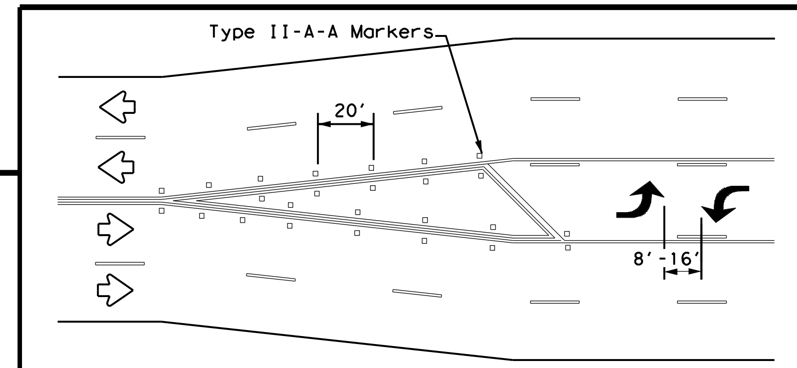
GENERAL NOTES

1. Lane use word and arrow markings shall be used where through lanes approaching an intersection become mandatory turn lanes. Lane use word and arrow markings should be used in auxiliary lanes of substantial length. Lane use arrow markings or word and arrow markings may be used in other lanes and turn bays for emphasis. Details for words and arrows are as shown in the Standard Highway Sign Designs for Texas.
2. When lane-use words and arrow markings are used, two sets of arrows should be used if the length of the bay is greater than 180 feet. When a single lane use arrow or word and arrow marking is used for a short turn lane, it should be located at or near the upstream end of the full-width turn lane.
3. Use raised pavement marker Type I-C with undivided highways, flush medians and two way left turn lanes. Use raised pavement marker Type II-C-R with divided highways and raised medians.
4. Length of turn bays, including taper, deceleration, and storage lengths shall be as shown on the plans or as directed by the Engineer. See Chapter 3 of the Roadway Design Manual for additional information on turning lanes or storage lengths.

MATERIAL SPECIFICATIONS

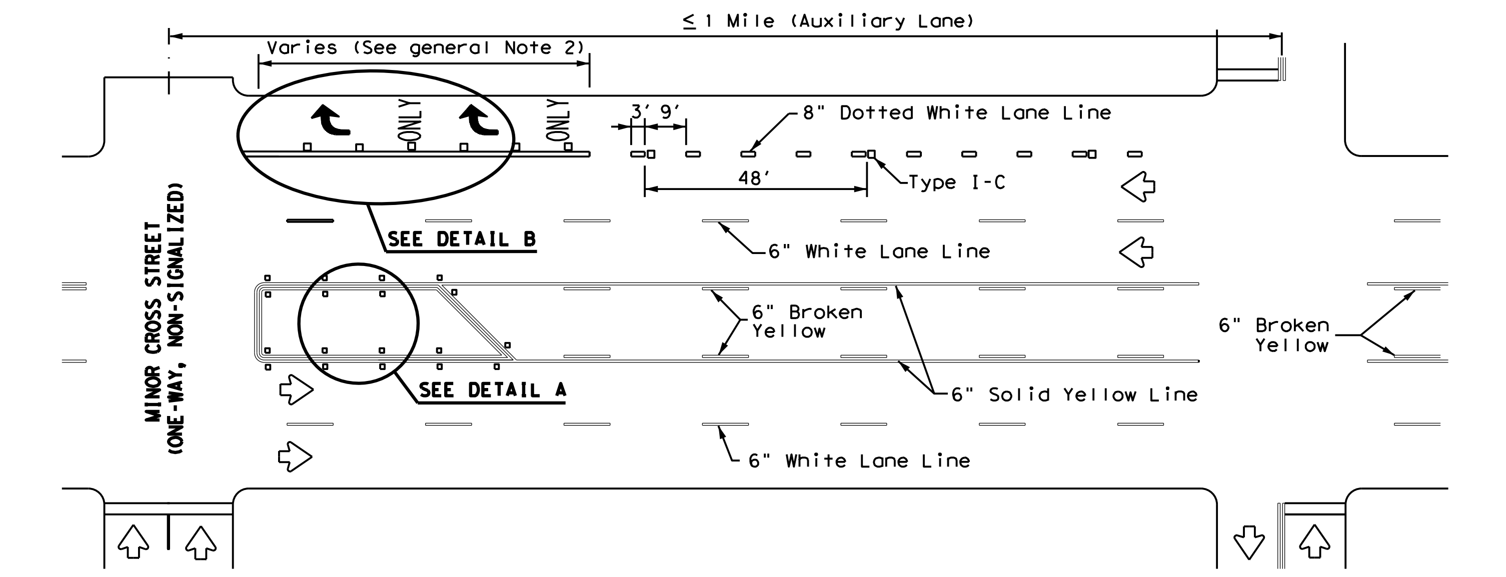
PAVEMENT MARKERS (REFLECTORIZED)	DMS-4200
EPOXY AND ADHESIVES	DMS-6100
BITUMINOUS ADHESIVE FOR PAVEMENT MARKERS	DMS-6130
TRAFFIC PAINT	DMS-8200
HOT APPLIED THERMOPLASTIC	DMS-8220
PERMANENT PREFABRICATED PAVEMENT MARKINGS	DMS-8240

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

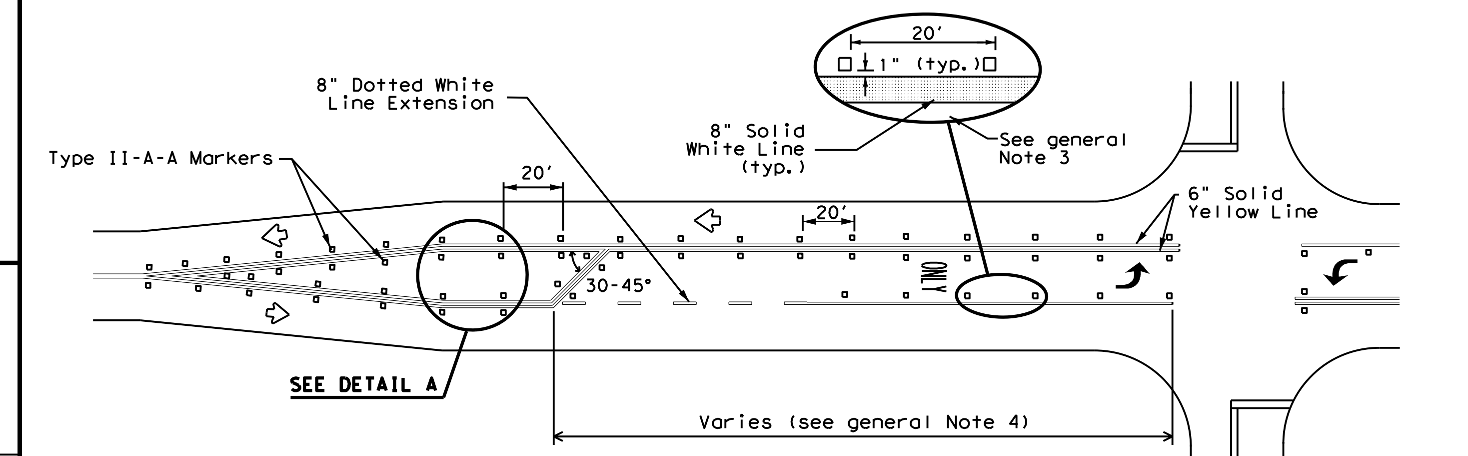


A two-way left-turn (TWLT) lane-use arrow pavement marking should be used at or just downstream from the beginning of a two-way left-turn lane within a corridor. Repeating the marking after each intersection or dedicated turn bay is not required unless stated elsewhere in the plans.

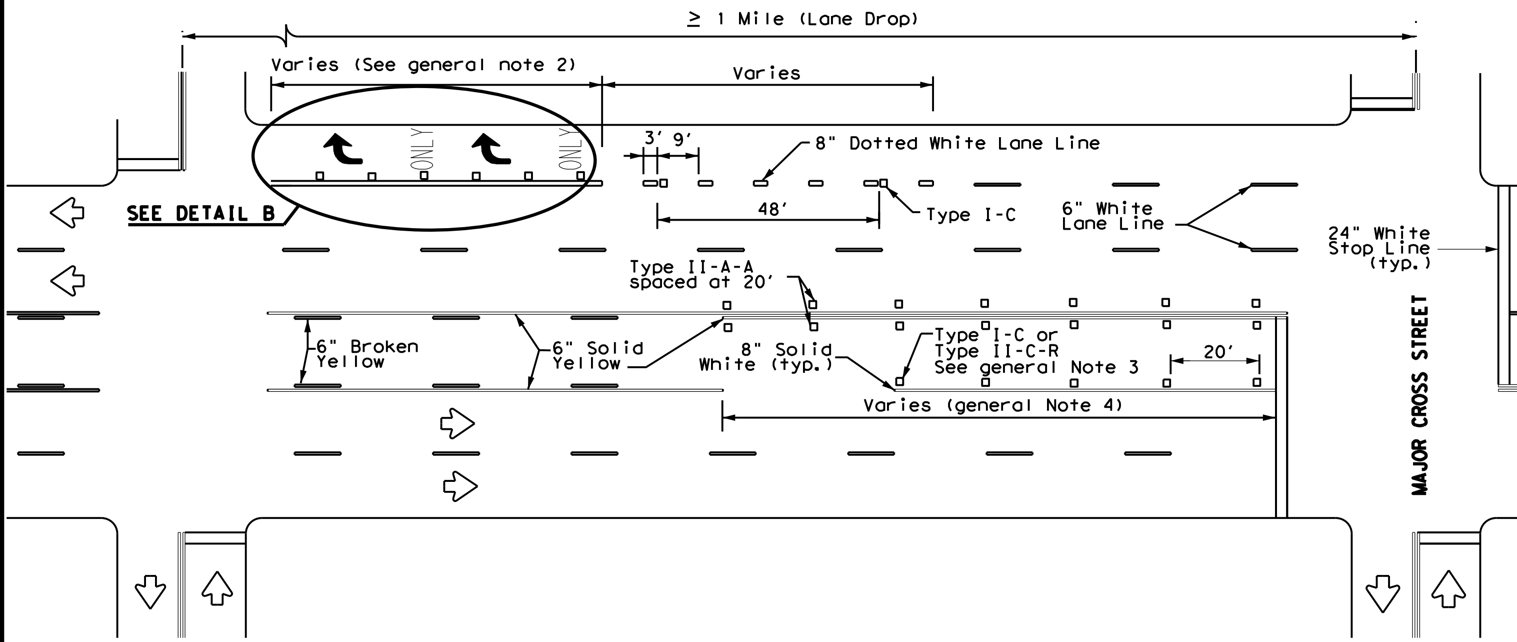
TYPICAL TRANSITION FOR TWLTL AND DIVIDED HIGHWAY



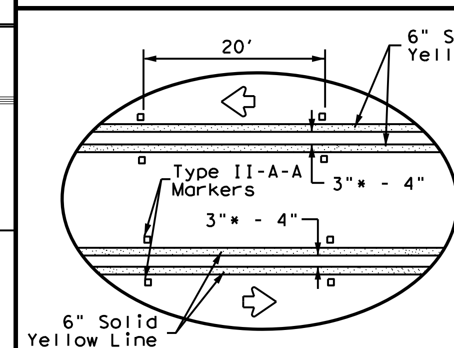
TYPICAL TWLTL AT ONE-WAY STREET AND RIGHT TURN AUXILIARY LANE



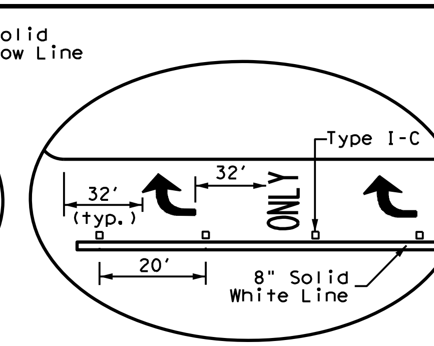
TYPICAL TWO-LANE ROADWAY INTERSECTION WITH LEFT TURN BAYS



TYPICAL TWLTL AT TWO-WAY CROSS STREET AND RIGHT TURN LANE DROP



DETAIL A



DETAIL B

* 2" minimum allowed for restripe projects when approved by the Engineer.

Texas Department of Transportation

Traffic Safety Division Standard

TWO-WAY LEFT TURN LANES, RURAL LEFT TURN BAYS, AND LANE REDUCTION PAVEMENT MARKINGS

PM(3)-22

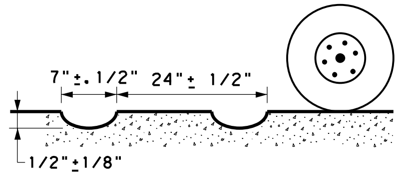
FILE: pm3-22.dgn	DN:	CK:	DW:	CK:
© TxDOT December 2022	CONT	SECT	JOB	HIGHWAY
REVISIONS 4-98 3-03 6-20 5-00 2-10 12-22 8-00 2-12	0720	01	044, ETC.	FM 149, ETC.
	DIST		COUNTY	SHEET NO.
	BRYAN		GRIMES	182

22C

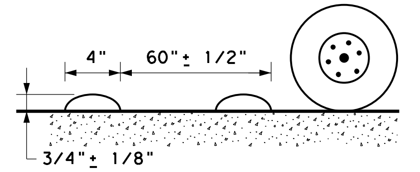
DISCLAIMER:
The use of this standard is governed by the "Texas Engineering Practice Act". No warranty of any kind is made by TxDOT for any purpose whatsoever. TxDOT assumes no responsibility for the conversion of this standard to other formats or for incorrect results or damages resulting from its use.

DATE: 4/19/2023 8:01:40 AM
FILE: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY/Design Projects/0720...

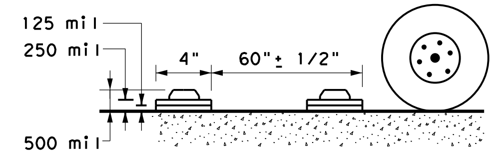
CENTERLINE RUMBLE STRIPS



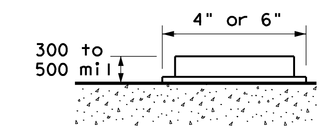
MILLED RUMBLE STRIPS



RAISED TRAFFIC BUTTONS

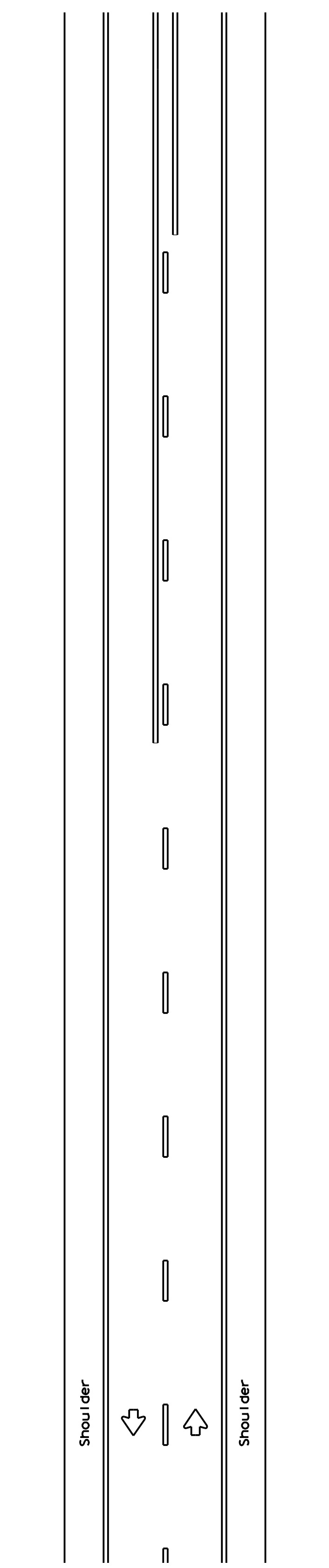


PREFORMED THERMOPLASTIC STRIPS

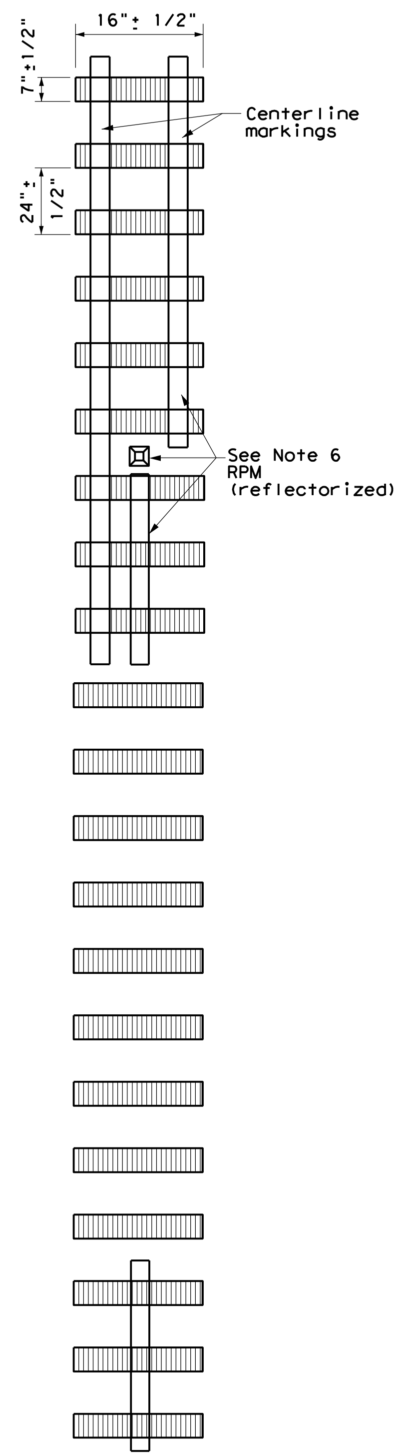


PROFILE MARKINGS

PROFILE VIEW



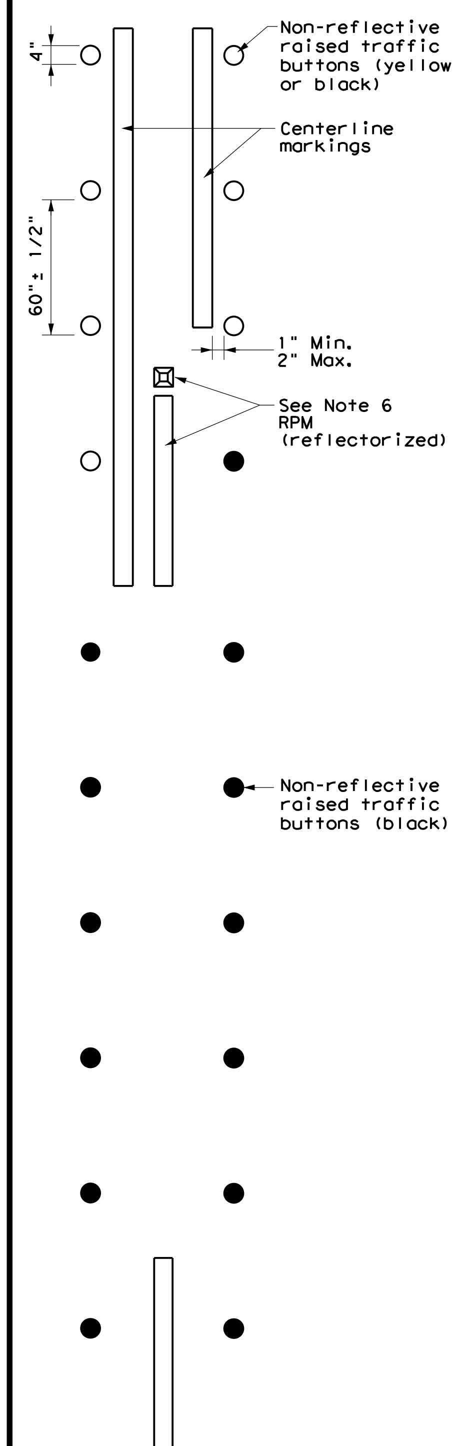
TWO LANE TWO-WAY ROADWAYS



PLAN VIEW

OPTION 1

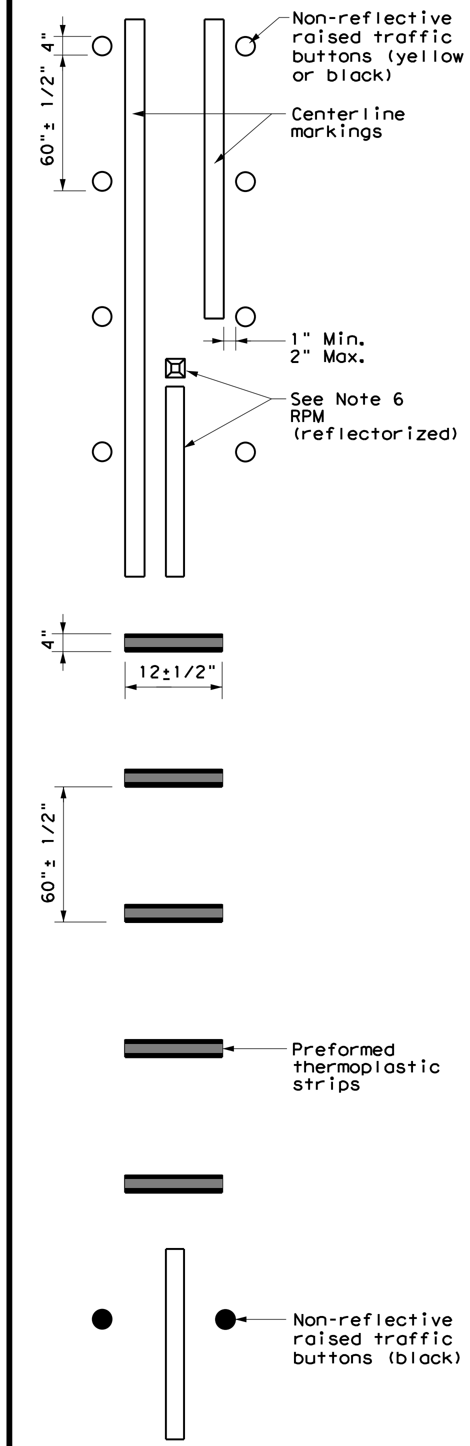
MILLED CENTERLINE RUMBLE STRIPS



PLAN VIEW

OPTION 2

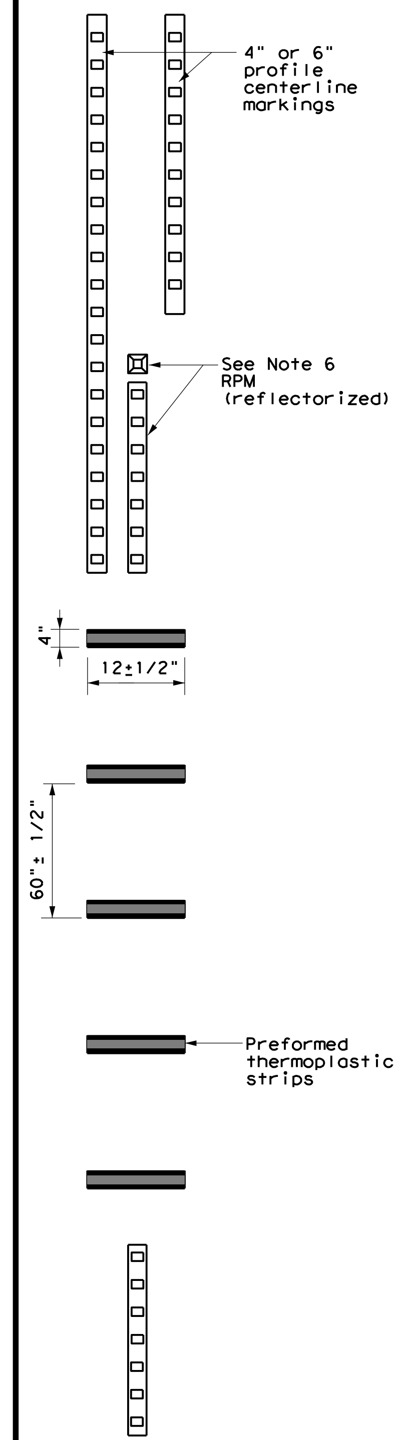
RAISED CENTERLINE RUMBLE STRIPS



PLAN VIEW

OPTION 3

RAISED CENTERLINE RUMBLE STRIPS AND PREFORMED THERMOPLASTIC STRIPS



PLAN VIEW

OPTION 4

PROFILE CENTERLINE MARKINGS AND PREFORMED THERMOPLASTIC STRIPS

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®

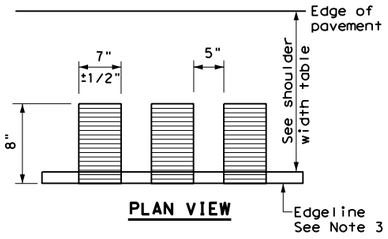
Traffic Operations Division Standard

CENTERLINE RUMBLE STRIPS ON TWO LANE TWO-WAY HIGHWAYS

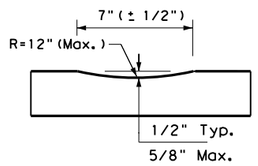
RS(3)-13

FILE: rs(3)-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT October 2013	CONT	SECT	JOB	HIGHWAY
REVISIONS	0720	01	044, ETC.	FM 149, ETC.
	DIST		COUNTY	SHEET NO.
	BRYAN		GRIMES	183

DATE: 4/19/2023 8:01:56 AM
FILE: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY/Design Projects/RS(4)-13.dgn

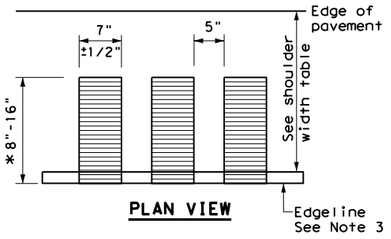


PLAN VIEW

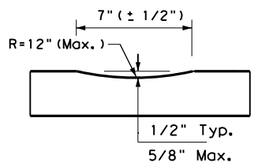


PROFILE VIEW
OPTION 1

CONTINUOUS MILLED DEPRESSIONS
(Rumble Stripes)



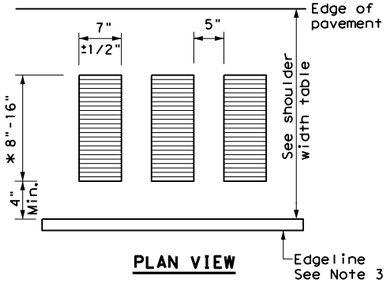
PLAN VIEW



* This distance may vary based on width of shoulder

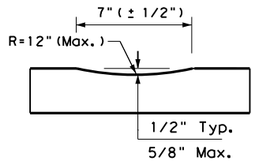
PROFILE VIEW
OPTION 2

CONTINUOUS MILLED DEPRESSIONS
(Rumble Stripes)



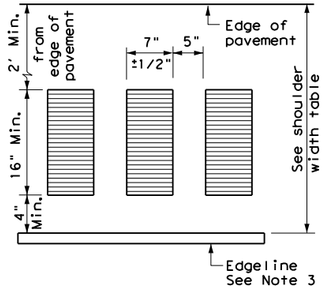
PLAN VIEW

* This distance may vary based on width of shoulder

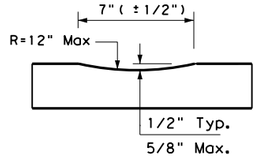


PROFILE VIEW
OPTION 3

CONTINUOUS MILLED DEPRESSIONS
(Rumble Strips)

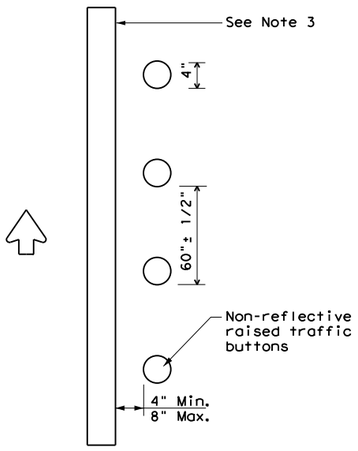


PLAN VIEW



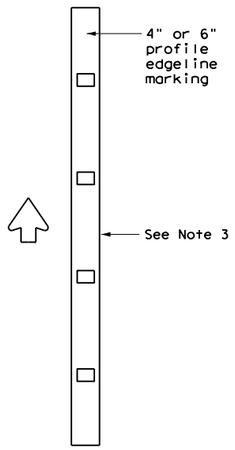
PROFILE VIEW
OPTION 4

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

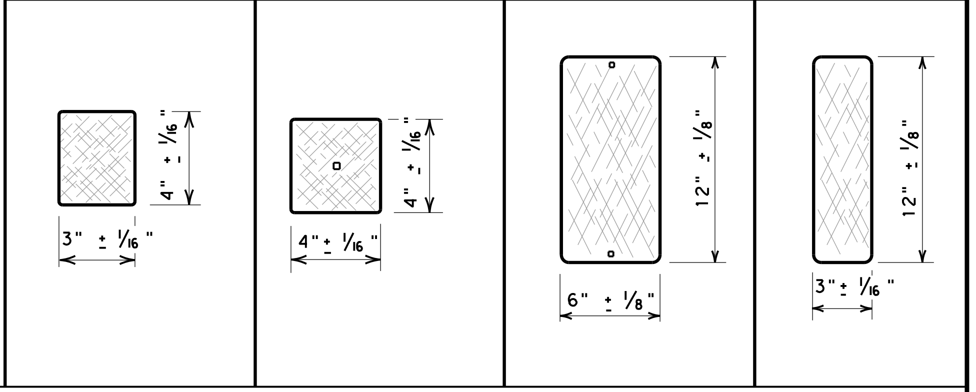
Traffic Operations Division Standard

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
REVISIONS	0720	01	044, ETC.	FM 149, ETC.
	DIST	COUNTY		SHEET NO.
	BRYAN	GRIMES		184

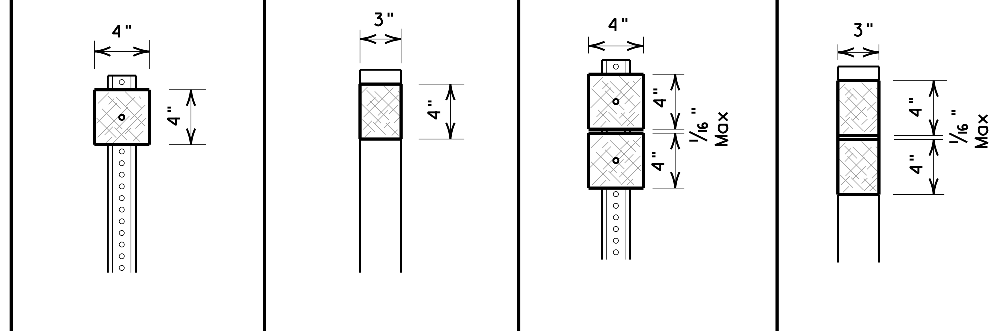
REFLECTOR UNIT SIZES FOR DELINEATORS AND OBJECT MARKERS

	SIZE 1	SIZE 2	SIZE 3	SIZE 4
DEVICE	3" ± 1/16" × 4" ± 1/16"	4" ± 1/16" × 4" ± 1/16"	6" ± 1/8" × 12" ± 1/8"	3" ± 1/16" × 12" ± 1/8"
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)

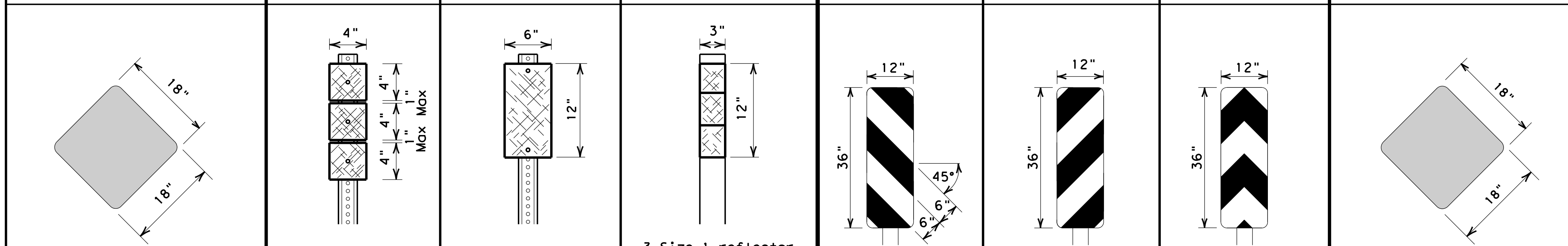
TYPE OF POST
WC = Wing Channel Post
WFLX = White Flexible Post
TWT = Thin Walled Tubing

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

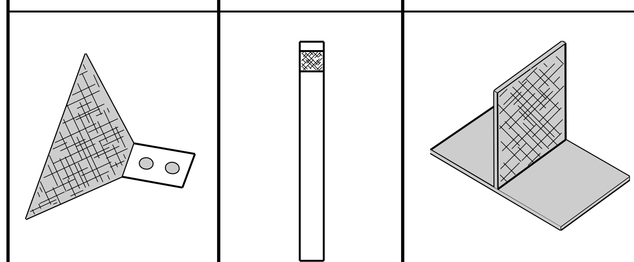


DEPARTMENTAL MATERIAL SPECIFICATIONS

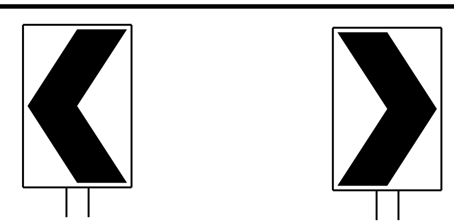
FLEXIBLE DELINEATOR & OBJECT MARKER POSTS (EMBEDDED & SURFACE MOUNT TYPES)	DMS-4400
SIGN FACE MATERIALS	DMS-8300
DELINEATORS, OBJECT MARKERS AND BARRIER REFLECTORS	DMS-8600

BARRIER REFLECTORS (BRF)

	GF1	GF2	CTB
DEVICE			
	1. Barrier reflectors shall meet the requirements of DMS 8600. 2. Approved Barrier Reflectors are listed on the "Barrier Reflectors" Material Producer List at: www.txdot.gov.		
SHEETING	Yellow, White, Red		
NOTE	1. Reflective sheeting shall have a minimum dimension of 3 inches and minimum surface area of 9 square inches.		



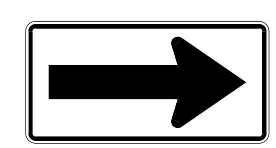
CHEVRONS



W1-8

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

ONE DIRECTION LARGE ARROW



W1-6

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

NOTE

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

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.

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		0720	01	044, ETC.	FM 149, ETC.
10-09 3-15		DIST		COUNTY	SHEET NO.
4-10 7-20		BRYAN		GRIMES	185

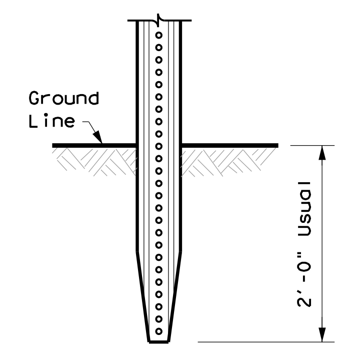
20A

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

POST TYPE AND SUPPORT FOUNDATION DETAILS

WING CHANNEL (WC)

GND

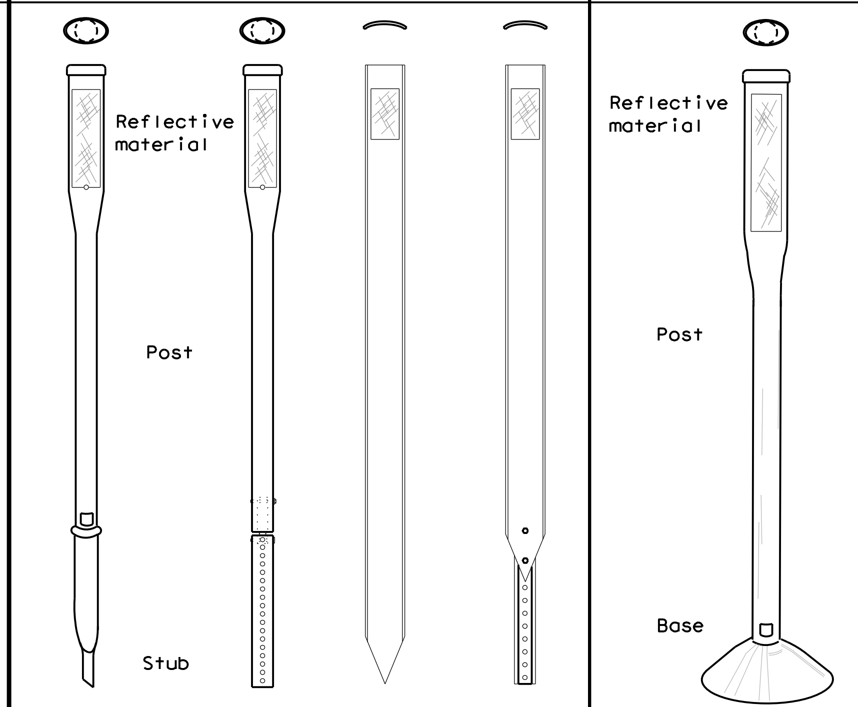


NOTES

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 / SRF

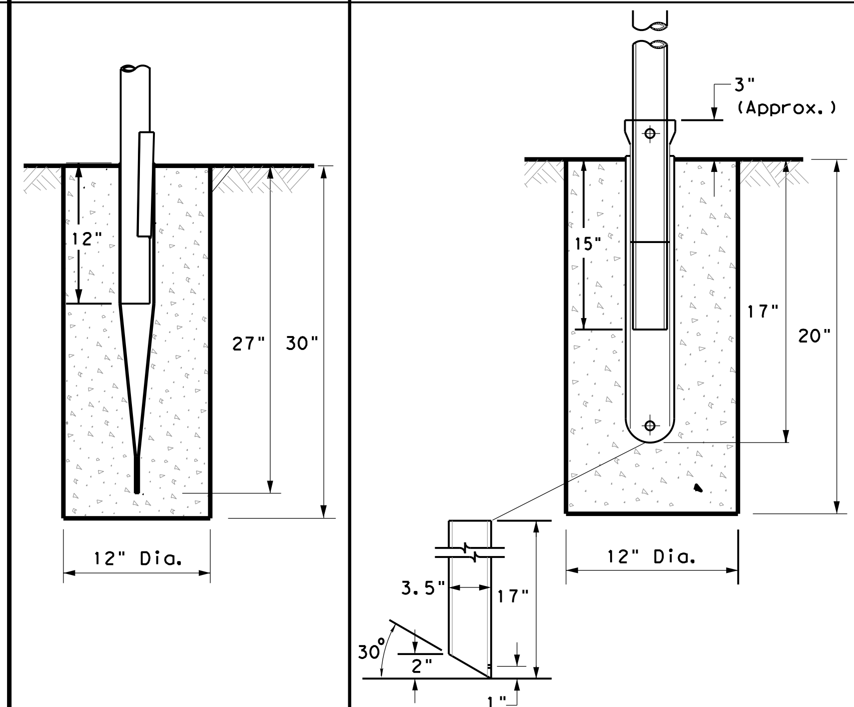


NOTES

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 / WAP



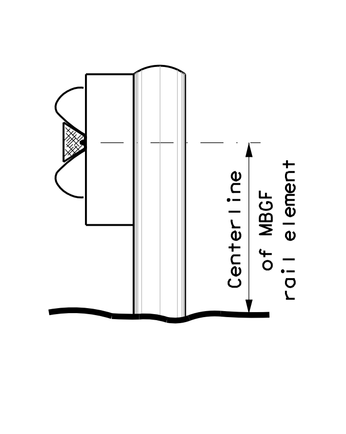
NOTE

1. Install per manufacturer's recommendations.

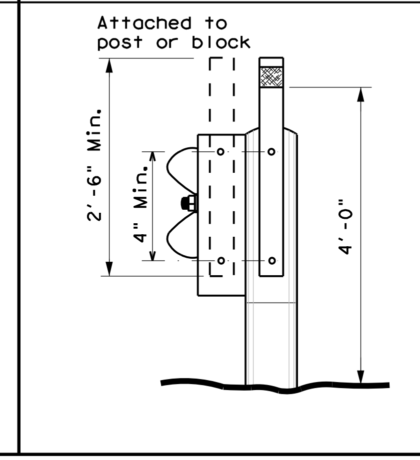
TYPE OF BARRIER MOUNTS

GUARD FENCE ATTACHMENT

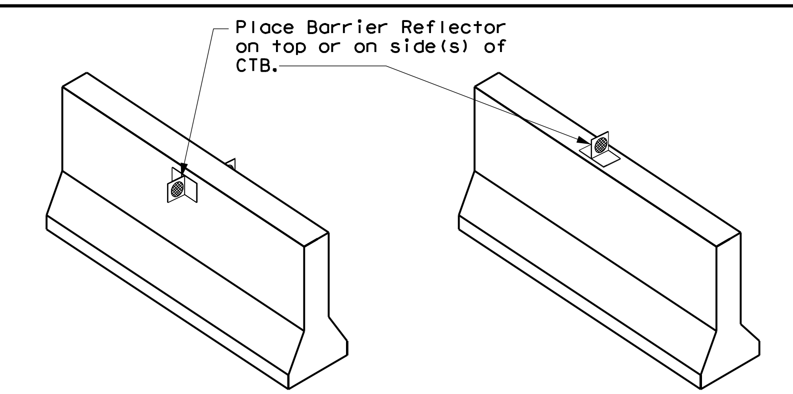
GF1



GF2



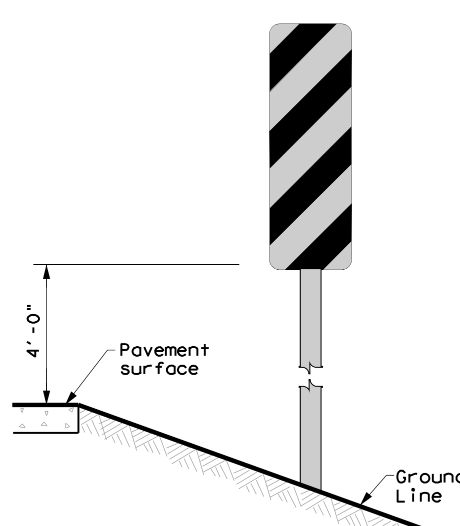
CONCRETE TRAFFIC BARRIER (CTB)



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.

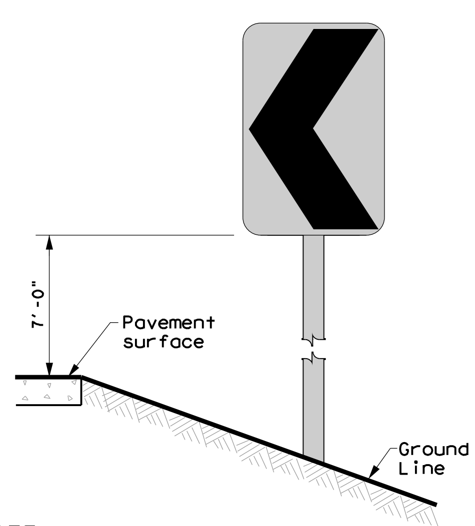
TYPES 1, 3, AND 4 OBJECT MARKERS AND CHEVRONS



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)

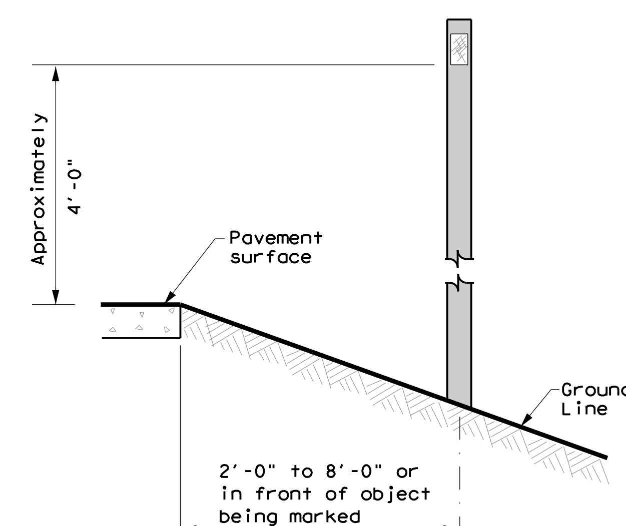
CHEVRONS AND ONE DIRECTION LARGE ARROW SIGN



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

FILE: dom2-20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
© TxDOT August 2004	CONT 0720	SECT 01	JOB 044, ETC.	HIGHWAY FM 149, ETC.
REVISIONS 10-09 3-15 4-10 7-20	DIST BRYAN		COUNTY GRIMES	SHEET NO. 186

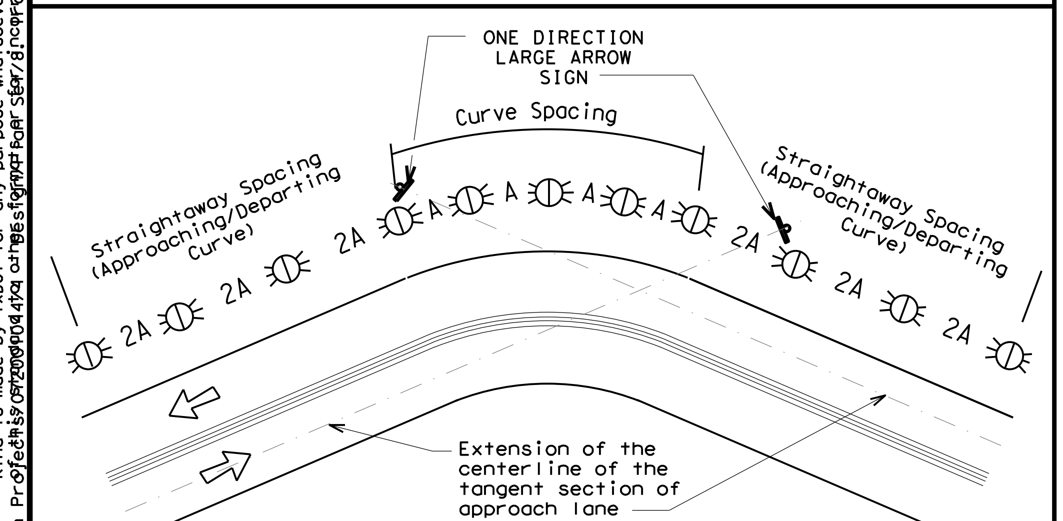
20B

DATE: 4/19/2023 8:02:25 AM
FILE: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY/Design Projects/0720-01-044/... /D & OM(2)-20.dgn

MINIMUM WARNING DEVICES AT CURVES WITH ADVISORY SPEEDS

Amount by which Advisory Speed is less than Posted Speed	Curve Advisory Speed	
	Turn (30 MPH or less)	Curve (35 MPH or more)
5 MPH & 10 MPH	• RPMs	• RPMs
15 MPH & 20 MPH	• RPMs and One Direction Large Arrow sign	• RPMs and Chevrons; or • RPMs and One Direction Large Arrow sign where geometric conditions or roadside obstacles prevent the installation of chevrons.
25 MPH & more	• RPMs and Chevrons; or • RPMs and One Direction Large Arrow sign where geometric conditions or roadside obstacles prevent the installation of chevrons	• RPMs and Chevrons

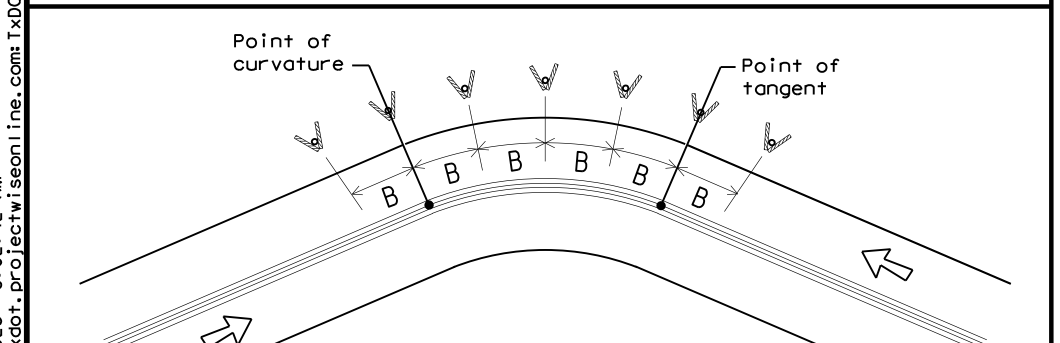
SUGGESTED SPACING FOR DELINEATORS ON HORIZONTAL CURVES



NOTE

ONE DIRECTION LARGE ARROW (W1-6) sign should be located at approximately and perpendicular to the extension of the centerline of the tangent section of approach lane.

SUGGESTED SPACING FOR CHEVRONS ON HORIZONTAL CURVES



NOTE

At least one chevron pair is installed beyond the point of tangent in tangent section.

DELINEATOR AND CHEVRON SPACING

WHEN DEGREE OF CURVE OR RADIUS IS KNOWN

Degree of Curve	FEET			
	Radius of Curve	Spacing in Curve	Spacing in Straightaway	Chevron Spacing in Curve
		A	2A	B
1	5730	225	450	—
2	2865	160	320	—
3	1910	130	260	200
4	1433	110	220	160
5	1146	100	200	160
6	955	90	180	160
7	819	85	170	160
8	716	75	150	160
9	637	75	150	120
10	573	70	140	120
11	521	65	130	120
12	478	60	120	120
13	441	60	120	120
14	409	55	110	80
15	382	55	110	80
16	358	55	110	80
19	302	50	100	80
23	249	40	80	80
29	198	35	70	40
38	151	30	60	40
57	101	20	40	40

Curve delineator approach and departure spacing should include 3 delineators spaced at 2A. This spacing should be used during design preparation or when the degree of curve is known.

DELINEATOR AND CHEVRON SPACING

WHEN DEGREE OF CURVE OR RADIUS IS NOT KNOWN

Advisory Speed (MPH)	Spacing in Curve	Spacing in Straightaway	Chevron Spacing in Curve
	A	2xA	B
65	130	260	200
60	110	220	160
55	100	200	160
50	85	170	160
45	75	150	120
40	70	140	120
35	60	120	120
30	55	110	80
25	50	100	80
20	40	80	80
15	35	70	40

If the degree of curve is not known, delineator spacing may be determined based on the Advisory Speed of the curve. Use the delineator curve spacing for each Advisory Speed (MPH).

DELINEATOR AND OBJECT MARKER APPLICATION AND SPACING

CONDITION	REQUIRED TREATMENT	MINIMUM SPACING
Frwy./Exp. Tangent	RPMs	See PM-series and FPM-series standard sheets
Frwy./Exp. Curve	Single delineators on right side	See delineator spacing table
Frwy/Exp. Ramp	Single delineators on at least one side of ramp (should be on outside of curves) (see Detail 3 on D&OM(4))	100 feet on ramp tangents Use delineator spacing table for ramp curves ("straightway spacing" does not apply to ramp curves)
Acceleration/Deceleration Lane	Double delineators (see Detail 3 on D&OM(4))	100 feet (See Detail 3 on D & OM (4))
Truck Escape Ramp	Single red delineators on both sides	50 feet
Bridge Rail (steel or concrete) and Metal Beam Guard Fence	Bi-Directional Delineators when undivided with one lane each direction Single Delineators when multiple lanes each direction	Equal spacing (100' max) but not less than 3 delineators
Concrete Traffic Barrier (CTB) or Steel Traffic Barrier	Barrier reflectors matching the color of the edge line	Equal spacing 100' max
Cable Barrier	Reflectors matching the color of the edge line	Every 5th cable barrier post (up to 100' max)
Guard Rail Terminus/Impact Head	Divided highway - Object marker on approach end Undivided 2-lane highways - Object marker on approach and departure end	Requires reflective sheeting provided by manufacturer per D & OM (VIA) or a Type 3 Object Marker (OM-3) in front of the terminal end See D & OM (5) and D & OM (6)
Bridges with no Approach Rail	Type 3 Object Marker (OM-3) at end of rail and 3 single delineators approaching rail	See D & OM(5)
Reduced Width Approaches to Bridge Rail	Type 2 and Type 3 Object Markers (OM-3) and 3 single delineators approaching bridge	Requires reflective sheeting provided by manufacturer per D & OM (VIA) or a Type 3 Object Marker (OM-3) in front of the terminal end See D & OM (5)
Culverts without MBGF	Type 2 Object Markers	See Detail 2 on D & OM(4)
Crossovers	Double yellow delineators and RPMs	See Detail 1 on D & OM (4)
Pavement Narrowing (lane merge) on Freeways/Expressway	Single delineators adjacent to affected lane for full length of transition	100 feet

NOTES

1. Unless indicated otherwise, the delineator or barrier reflector color shall conform to the color of the pavement edge line on the side of the road where the delineators or barrier reflectors are placed.
2. Barrier reflectors may be used to replace required delineators.
3. Single red delineators may be mounted on the back side of delineator posts for wrong way driver applications

LEGEND

- Bi-directional Delineator
- Delineator
- Sign

Texas Department of Transportation

Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER PLACEMENT DETAILS

D & OM(3)-20

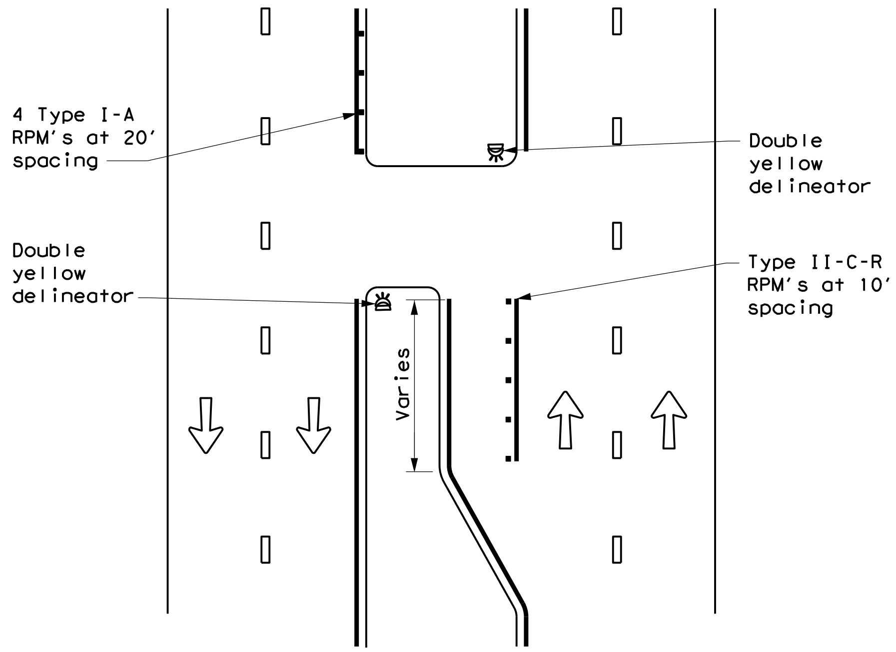
FILE: dom3-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT August 2004	CONT 0720	SECT 01	JOB 044, ETC.	HIGHWAY FM 149, ETC.
REVISIONS 3-15 8-15 8-15 7-20	DIST BRYAN		COUNTY GRIMES	SHEET NO. 187

20C

DATE: 4/19/2023 8:02:42 AM
FILE: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY/Design Pro

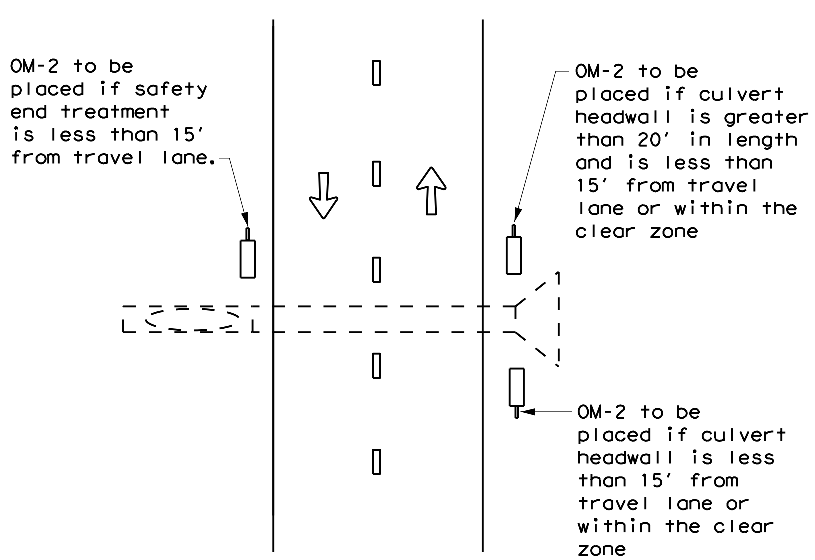
DATE: 4/19/2023 8:02:58 AM
FILE: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY/Design Projects/...

CROSSOVERS



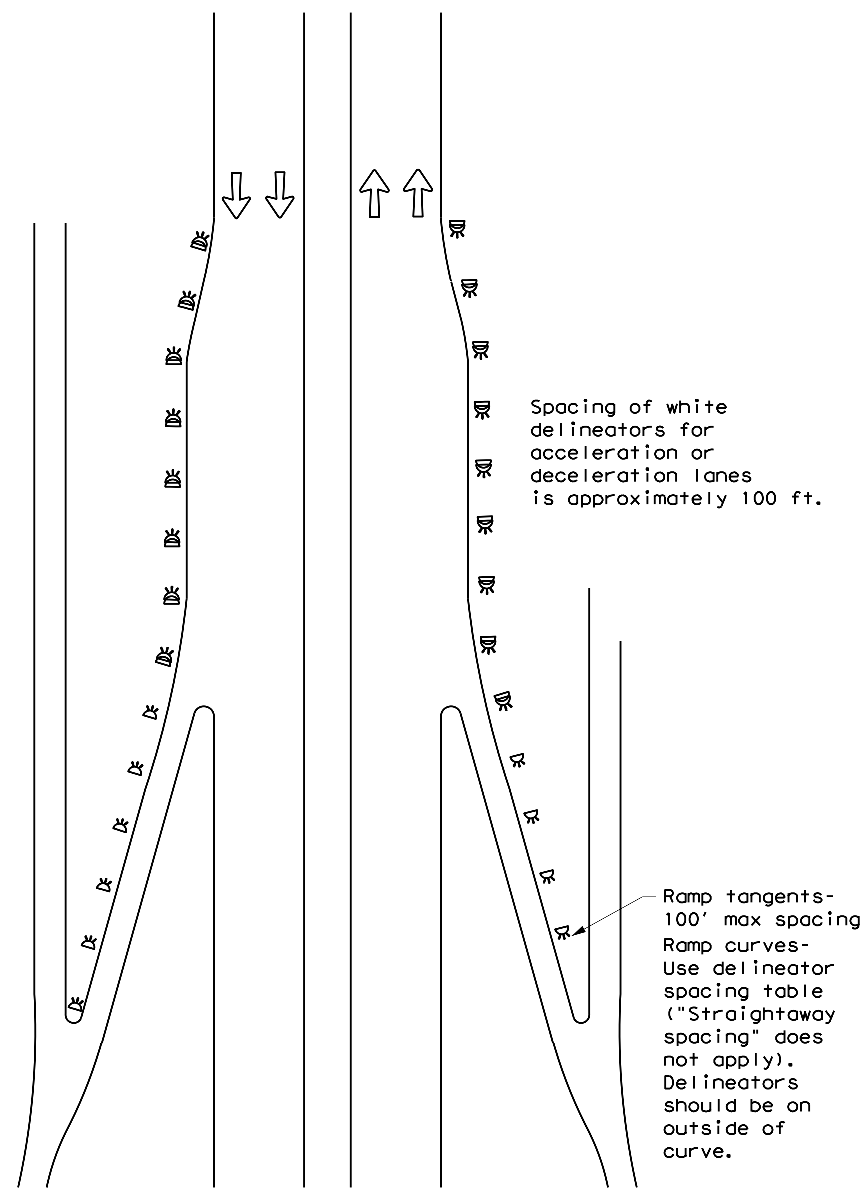
DETAIL 1

FOR CULVERTS WITHOUT MBGF



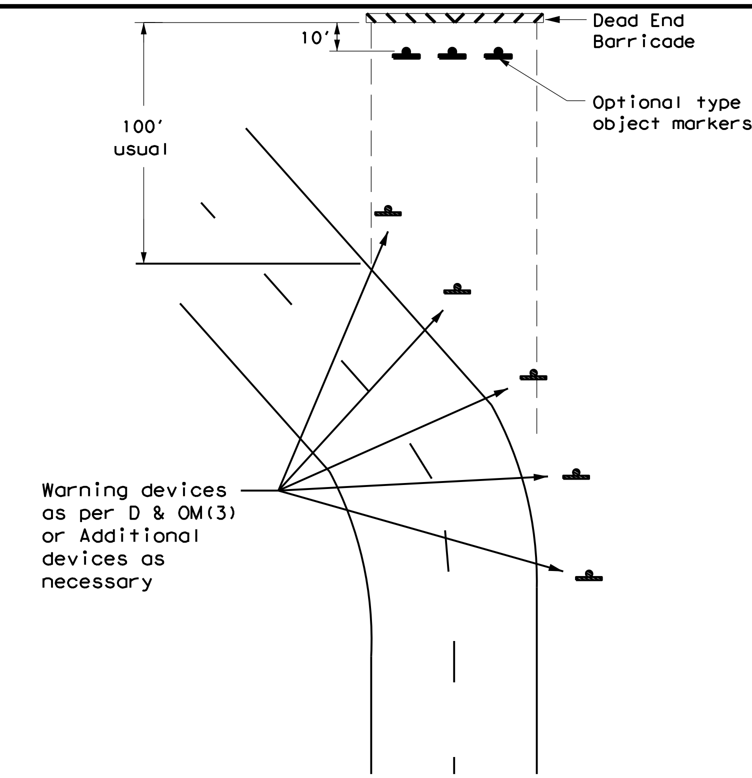
DETAIL 2

FREEWAY DELINEATION FOR RAMPS AND ACCELERATION/DECELERATION LANES



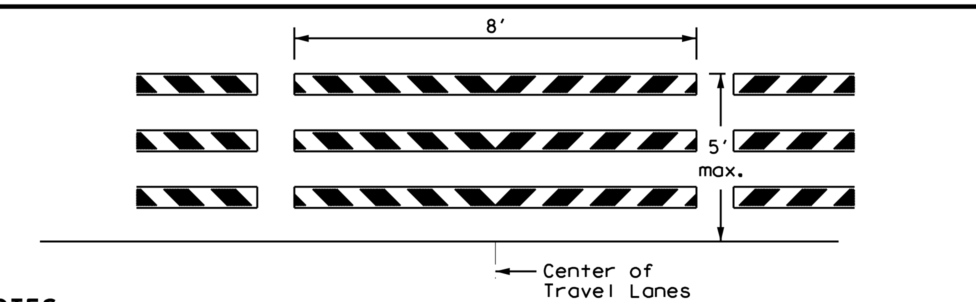
DETAIL 3

TYPICAL APPLICATION OF DEAD END BARRICADE



DETAIL 4

TYPICAL DEAD END BARRICADE INSTALLATION



NOTES

1. Barricade striping shall be red and white reflective sheeting for all permanent road closures.
2. Barricade striping is red and white sloping toward the center of the roadway.
3. Type 3 Barricade Supports should be anchored to soil or pavement as described in compliant Work Zone Traffic Control Devices List, section D.2.f and D.2.g.

DETAIL 5

LEGEND

Symbol	Description
	Bidirectional Delineator
	Delineator
	OM-3
	Barricade
	Sign
	OM-2
	Double Delineator

Texas Department of Transportation

Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER PLACEMENT DETAILS

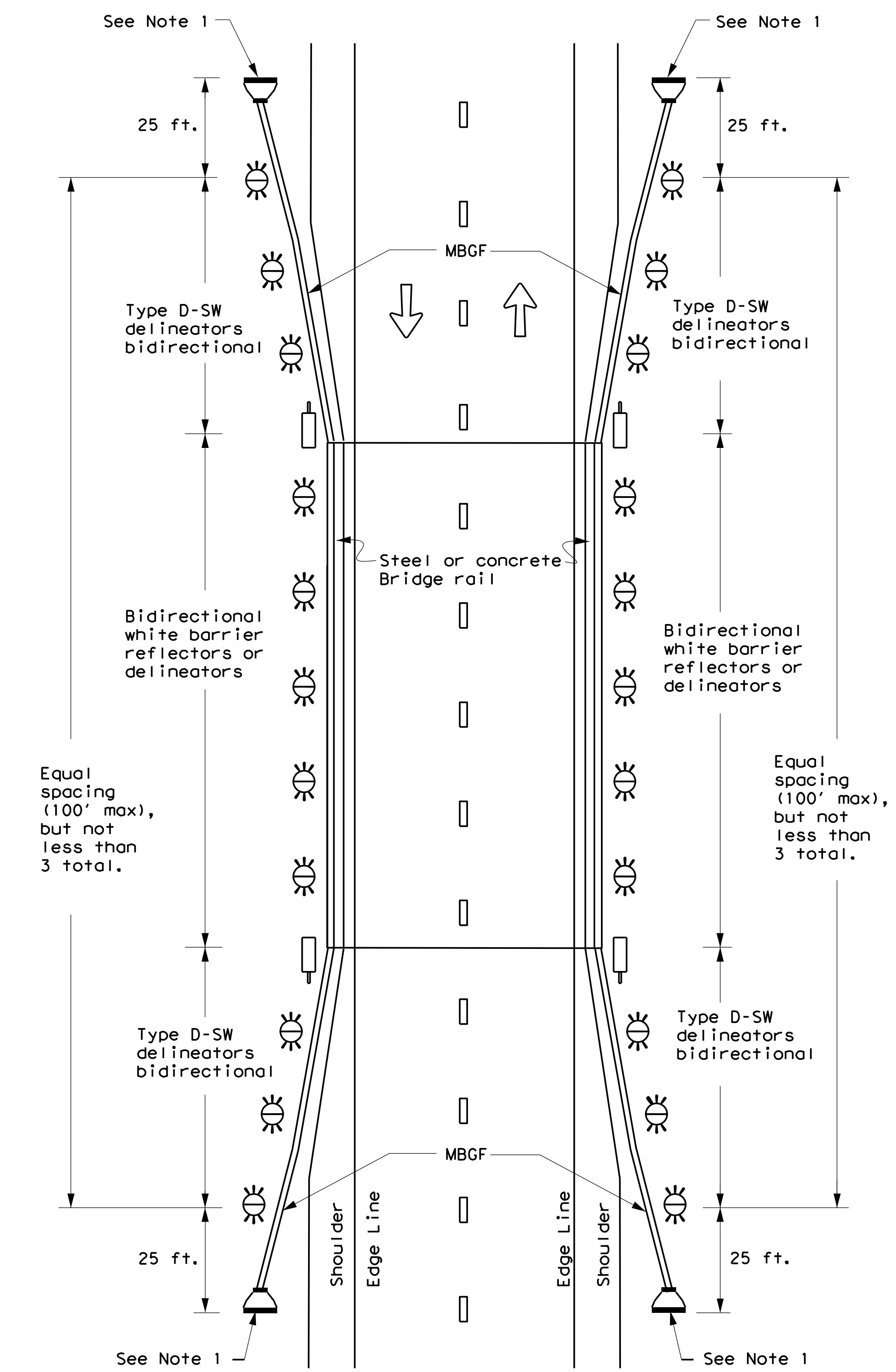
D & OM(4)-20

FILE: dom4-20.dgn		DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT August 2004	CONT	SECT	JOB		HIGHWAY
REVISIONS 3-15 7-20	0720	01	044, ETC.		FM 149, ETC.
	DIST		COUNTY		SHEET NO.
	BRYAN		GRIMES		188

20D

DATE: 4/19/2023 8:03:12 AM
FILE: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY/Design Pro...

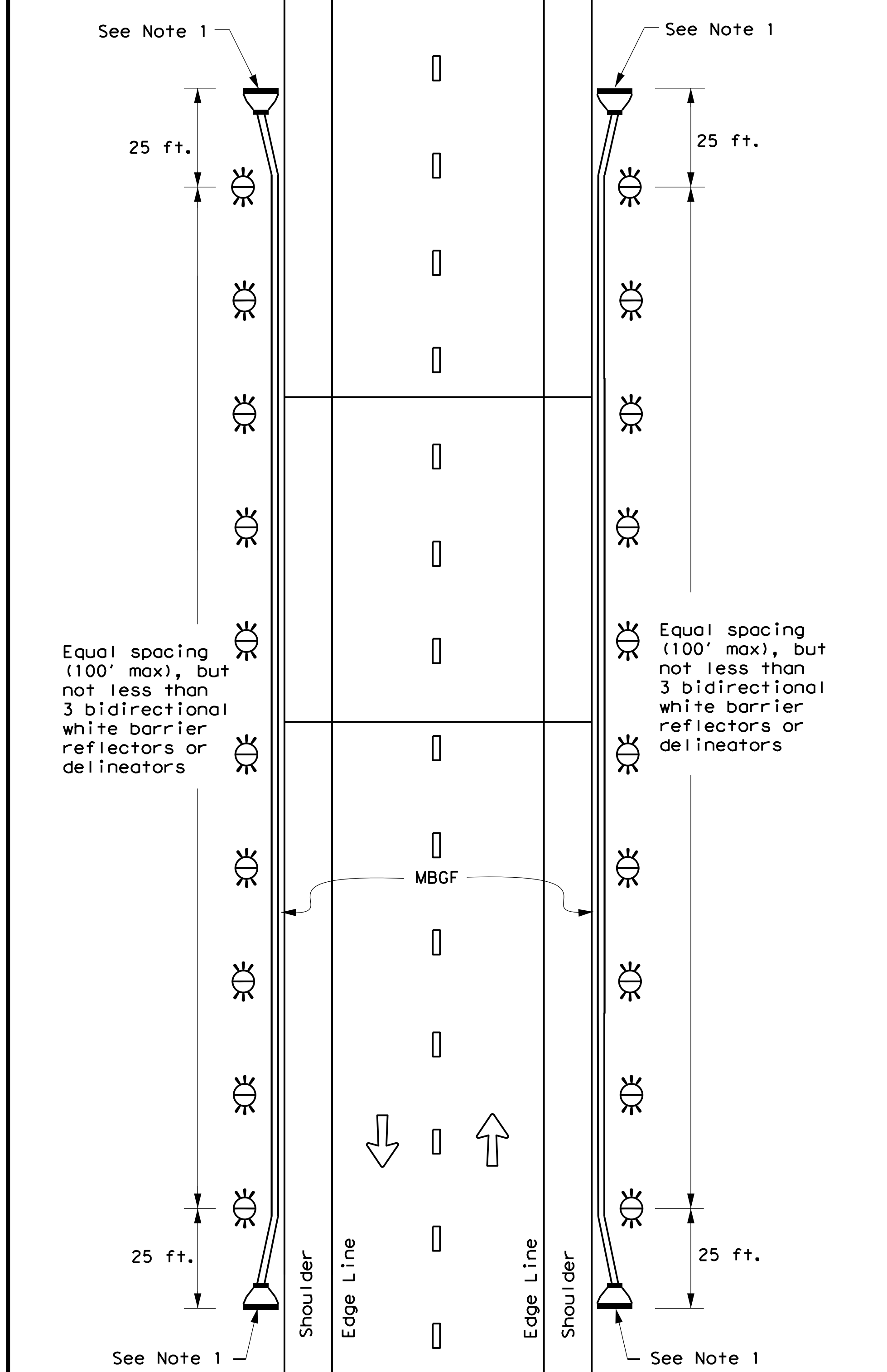
TWO-WAY, TWO LANE ROADWAY WITH REDUCED WIDTH APPROACH RAIL



NOTE:

1. Terminal ends require reflective sheeting provided by manufacturer per D & OM (VIA) or a Type 3 Object Marker (OM-3) in front of the terminal end.

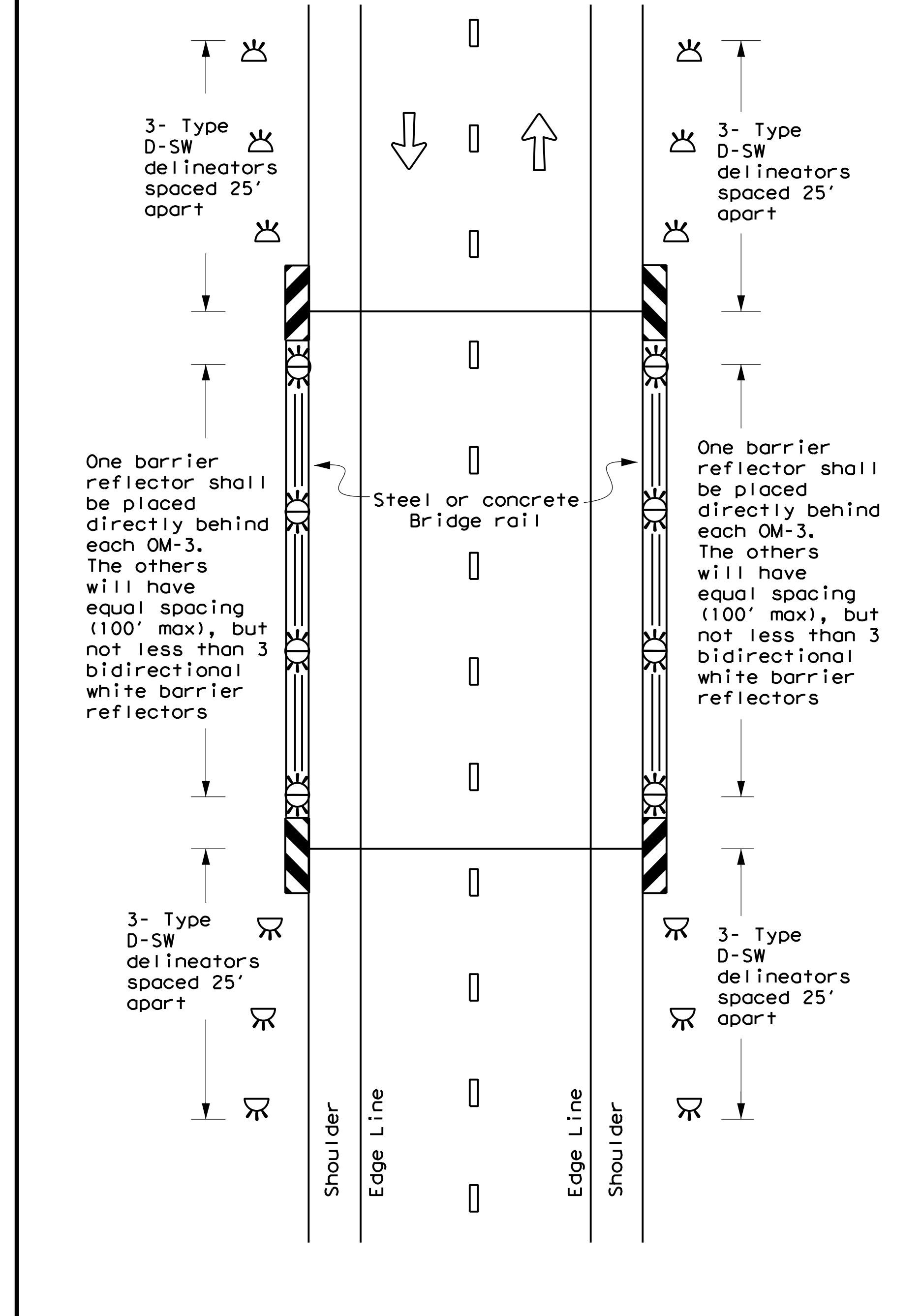
TWO-WAY, TWO LANE ROADWAY WITH METAL BEAM GUARD FENCE (MBGF)



NOTE:

1. Terminal ends require reflective sheeting provided by manufacturer per D & OM (VIA) or a Type 3 Object Marker (OM-3) in front of the terminal end.

TWO-WAY, TWO LANE ROADWAY BRIDGE WITH NO APPROACH RAIL



LEGEND

Symbol	Description
	Bidirectional Delineator
	Delineator
	OM-3
	OM-2
	Terminal End
	Traffic Flow

Texas Department of Transportation

Traffic Safety Division Standard

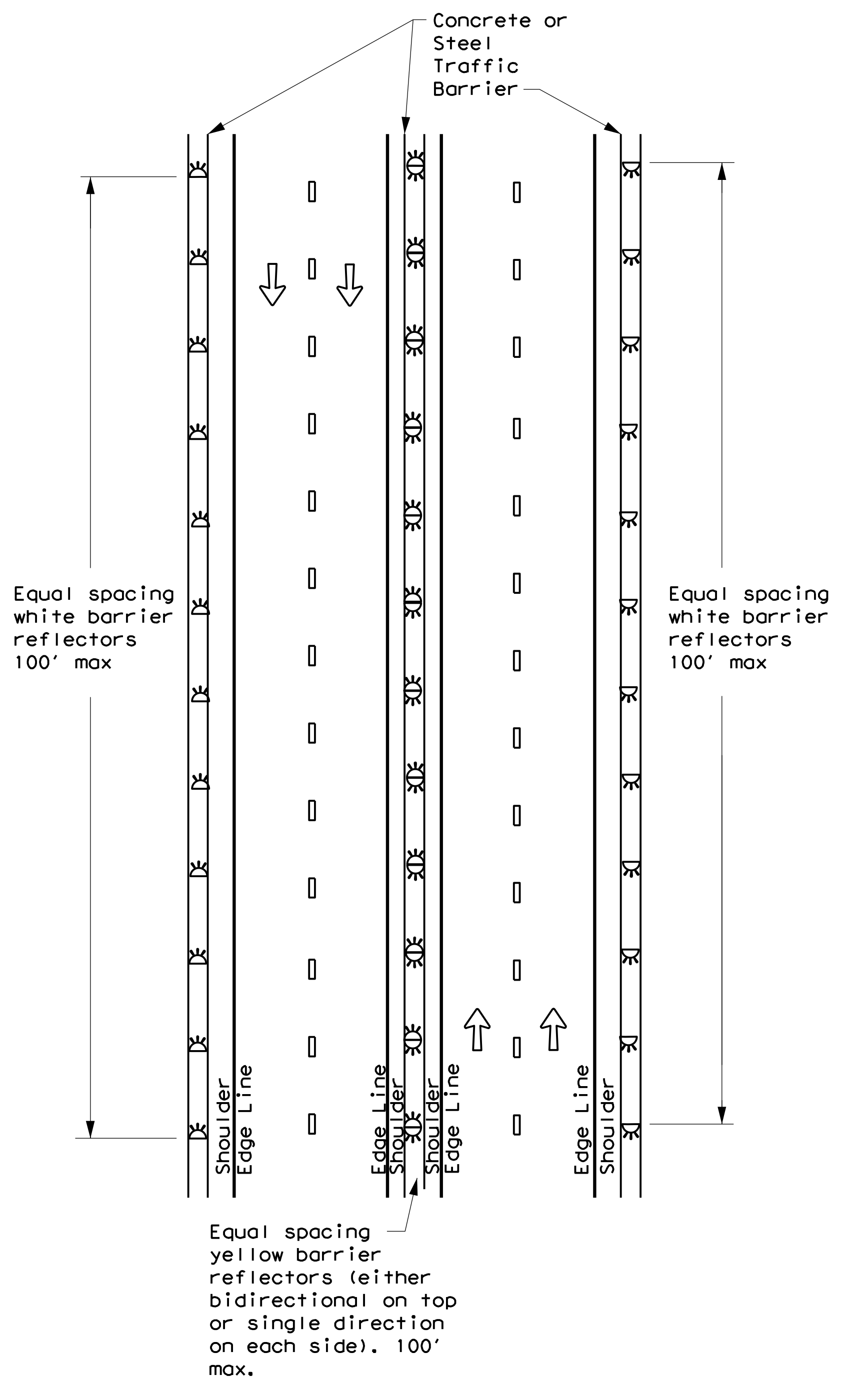
DELINEATOR & OBJECT MARKER PLACEMENT DETAILS

D & OM(5)-20

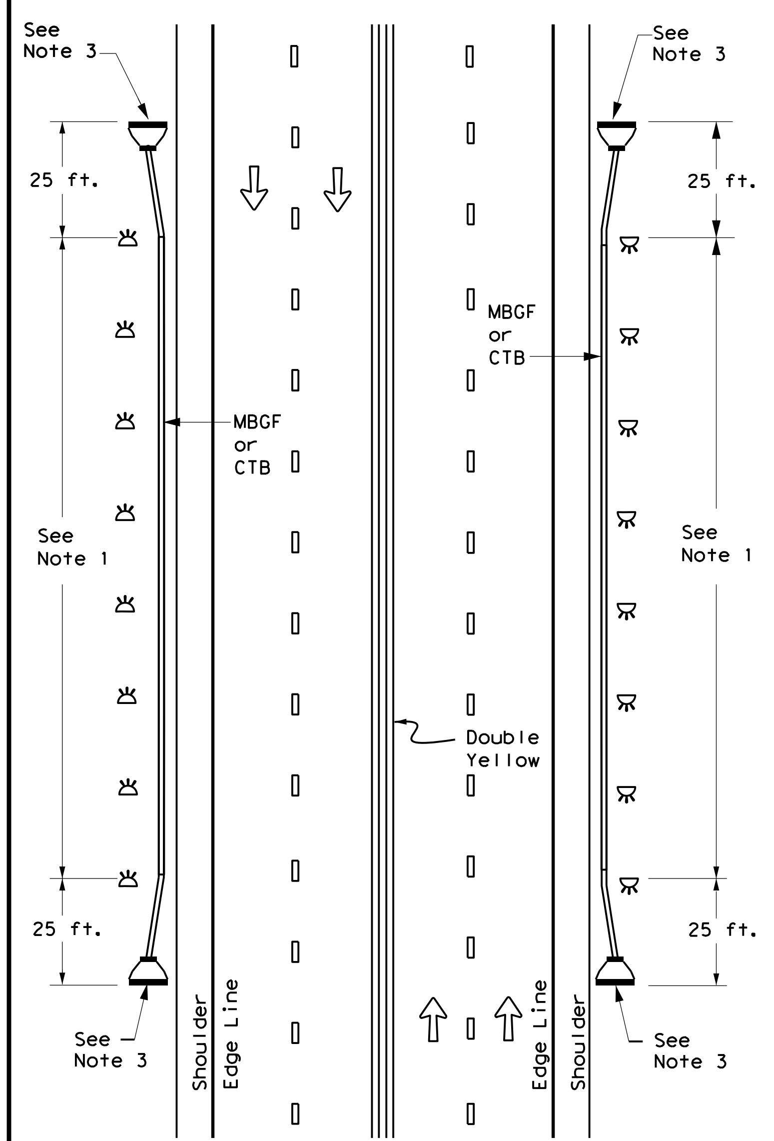
FILE: dom5-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT August 2015	CONT	SECT	JOB	HIGHWAY
REVISIONS	0720	01	044, ETC.	FM 149, ETC.
7-20	DIST		COUNTY	SHEET NO.
	BRYAN		GRIMES	189

20E

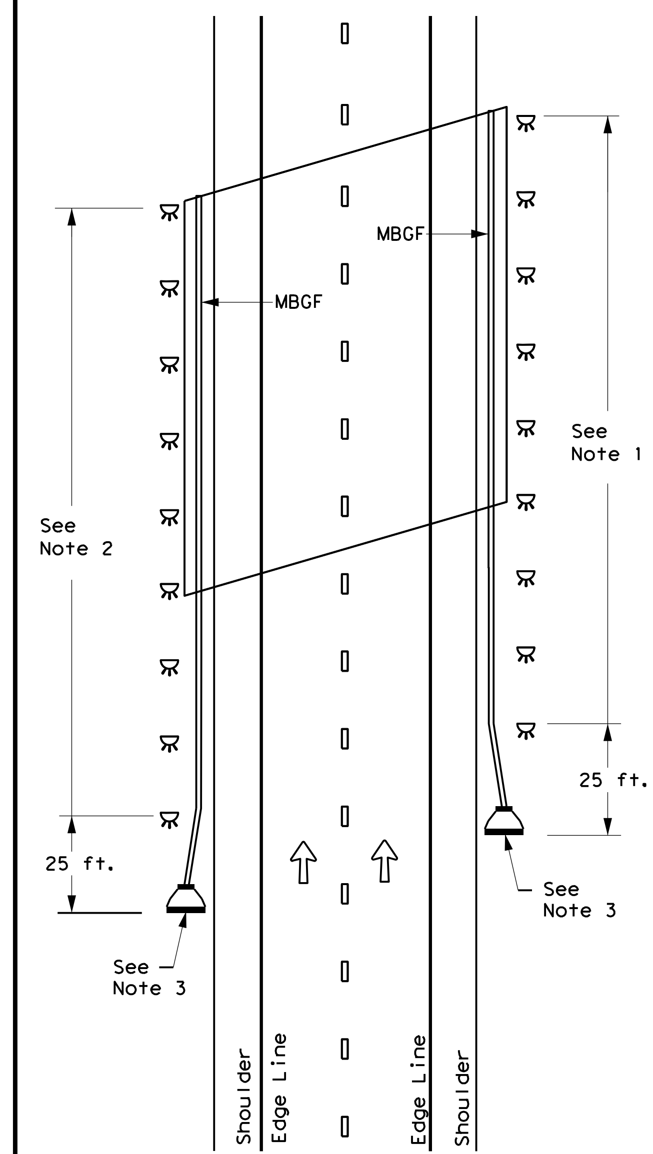
CONTINUOUS CONCRETE OR STEEL BARRIER



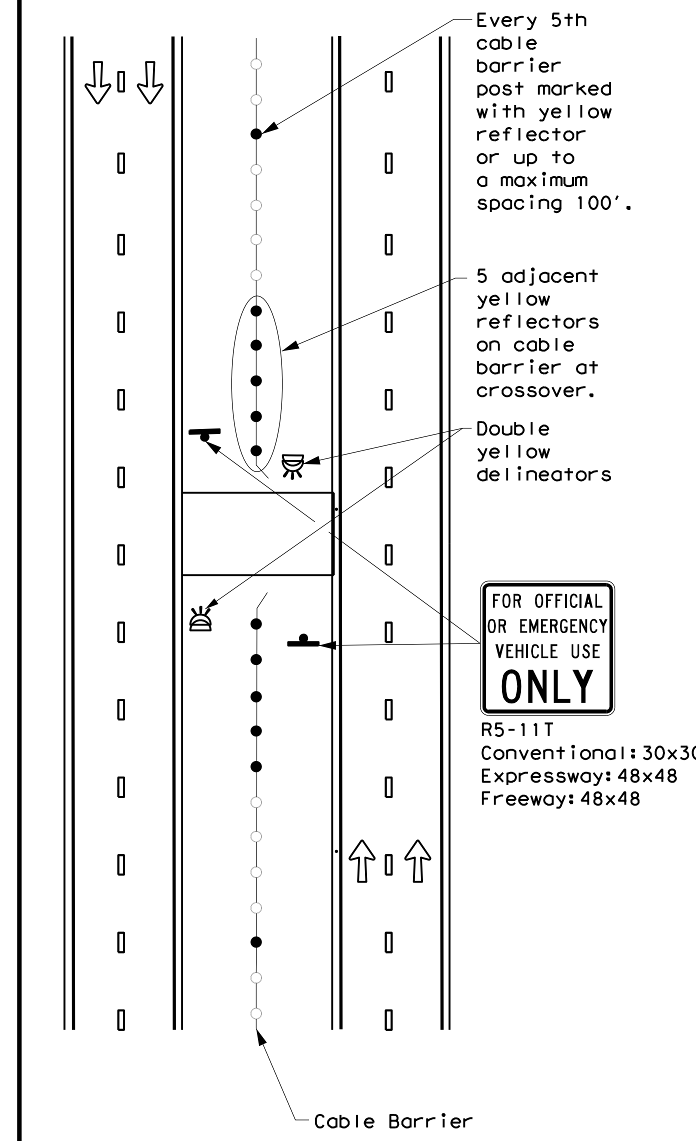
MULTI-LANE UNDIVIDED, TWO-WAY ROADWAY WITH METAL BEAM GUARD FENCE (MBGF)



DIVIDED ROADWAY WITH METAL BEAM GUARD FENCE (MBGF)



EMERGENCY CROSSOVER



NOTES

1. Equal spacing (100′ max), but not less than 3 single directional white barrier reflectors or delineators. On Continuos Barrier, equal spacing (100′ max.)

2. Equal spacing (100′ max), but not less than 3 single directional yellow barrier reflectors or delineators.

3. Terminal ends require reflective sheeting provided by manufacturer per D & OM (VIA) or a Type 3 Object Marker (OM-3) in front of the terminal end.

LEGEND

	Bidirectional Delineator
	Delineator
	OM-3
	OM-2
	Terminal End
	Traffic Flow

Texas Department of Transportation

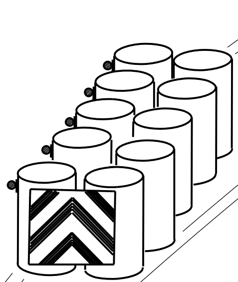
Traffic Safety Division Standard

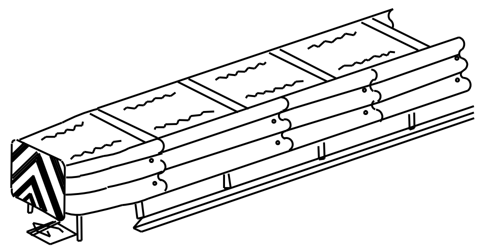
DELINEATOR & OBJECT MARKER PLACEMENT DETAILS

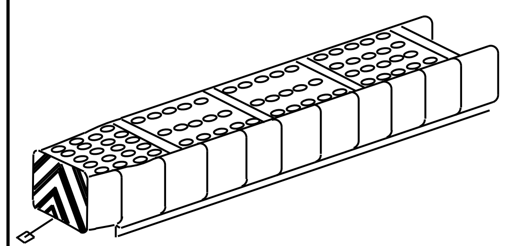
D & OM(6)-20

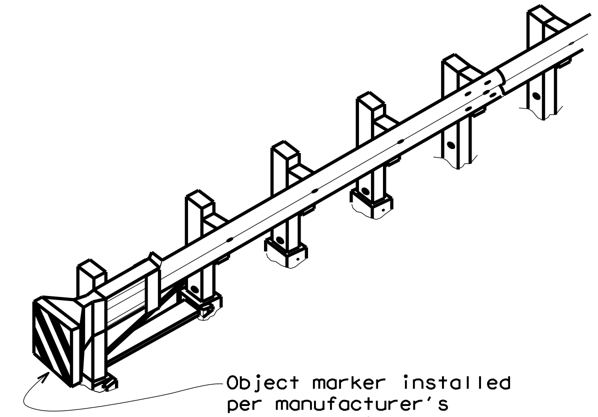
FILE: dom6-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT August 2015	CONT	SECT	JOB	HIGHWAY
REVISIONS	0720	01	044, ETC.	FM 149, ETC.
7-20	DIST		COUNTY	SHEET NO.
	BRYAN		GRIMES	190

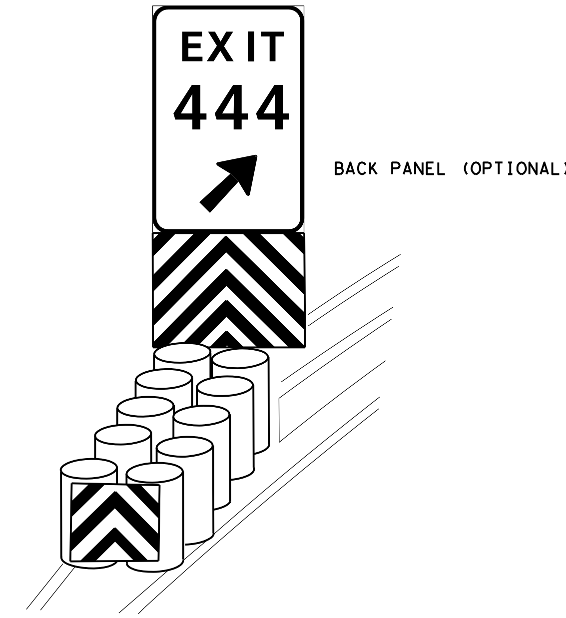
20F

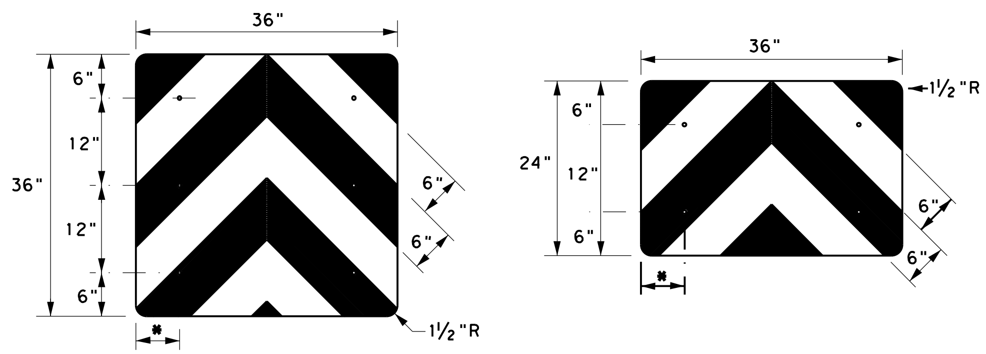




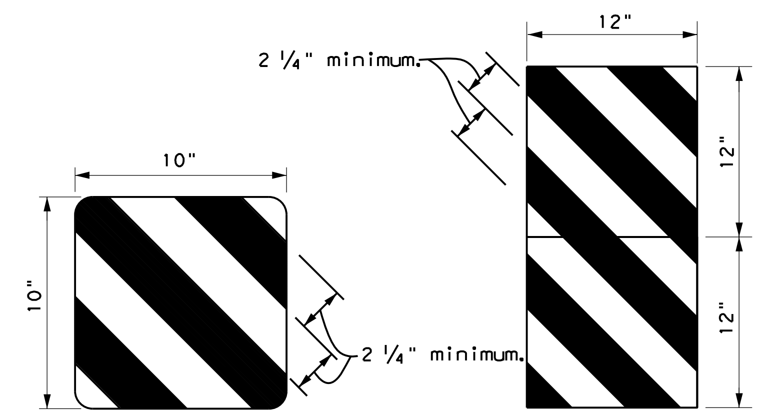




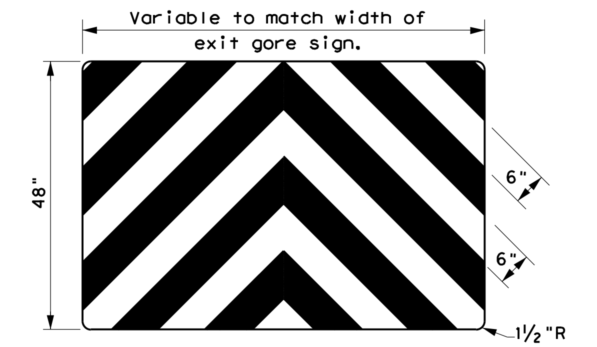


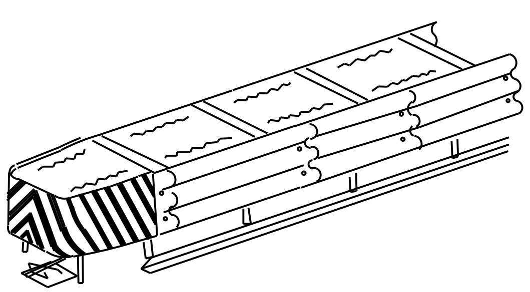


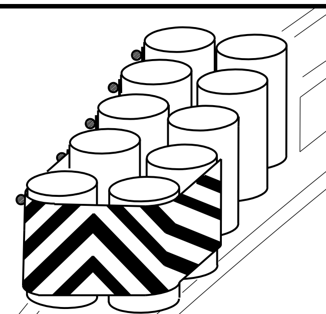
* Adjust to fit attenuator per manufacturer's recommendation, or as directed by the Engineer

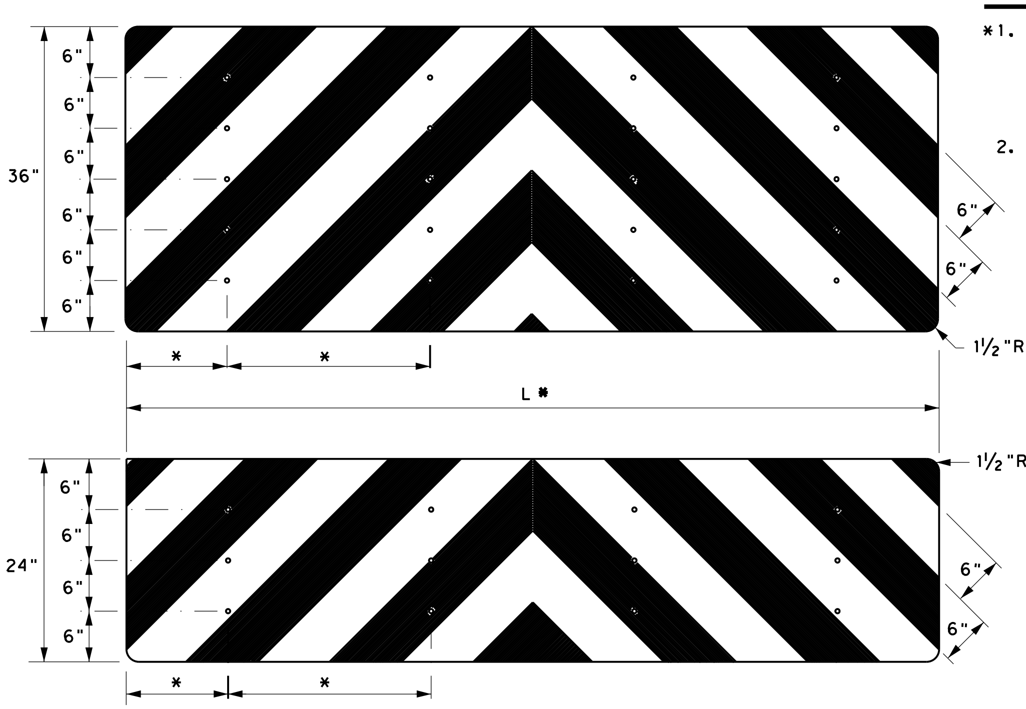


OBJECT MARKERS SMALLER THAN 3 FT^2









NOTES

*1. Spacing should be adjusted to attach through centerline of drum, per attenuator manufacturers recommendation, or as directed by the Engineer.

2. Mounting should be flush with top of attenuator. Minimum size 96" x 24".

NOTES

1. Object Markers shall conform to the Texas MUTCD and meet the color and reflectivity requirement of Department Material Specification DMS 8300. Background shall be yellow reflective sheeting (Type B or C) and Chevron shall be black.

2. Object Markers may be fabricated from adhesive backed reflective sheeting applied directly to guardrail end treatment, or applied directly to an "end cap" as per the manufacturer's recommendation. Direct applied sheeting shall provide a smooth surface and have no wrinkles, air bubbles, cuts or tears. A radius at the corners is not required for direct applied sheeting.

3. Object Marker size may be reduced to fit smaller devices. Width of alternating black and yellow stripes are typically 6". Object Markers smaller than 3ft may have reduced width stripes of a minimum of 2 ¼".

4. Pop rivets, screws, or nuts and bolts may be used to attach object markers and reflectors. Holes, slots or other openings may be cut or drilled through object markers to allow cable or other attachments.

5. Object Marker at nose of attenuator is subsidiary to the attenuator.

6. See D & OM (1-4) for required barrier reflectors.

Texas Department of Transportation

Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER FOR VEHICLE IMPACT ATTENUATORS

D & OM(VIA)-20

FILE: domvia20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
©TxDOT December 1989	CONT	SECT	JOB	HIGHWAY
REVISIONS	0720	01	044. ETC.	FM 149, ETC.
4-92 8-04 / 8-95 3-15 / 4-98 7-20	DIST		COUNTY	SHEET NO.
	BRYAN		GRIMES	191

20G

DATE: 4/19/2023 8:03:41 AM
FILE: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY/Design Projects/0720010441...

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. Project disturbance will be more than 5 acres. Contractor to submit NOI to TCEQ and the Engineer.

List MS4 Operator(s)that may receive discharges from this project. They may need to be notified prior to construction

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. STA 44+51
2. STA 66+04
3. STA 168+30
4. STA 245+52
5. STA 270+55

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

Action No.

1.

Refer to 2014 TxDOT Standard Specification Items:
7.7.6 Project Specific Locations
751 Landscape Maintenance

Contacts:

Mr. John D. Moravec
Environmental Coordinator
Texas Department of Transportation
Bryan District
2591 N. Earl Rudder Freeway
Bryan, TX 77803
Phone: (979) 778-9766
Fax: (979) 778-9702
e-mail: John.Moravec@txdot.gov

PRINT DATE	REVISION DATE
4/19/2023	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 149, ETC.
STATE	DISTRICT	COUNTY	
TEXAS	192	GRIMES	
CONTROL	SECTION	JOB	SHEET NO.
0720	01	044, ETC.	192

REV DATE: 4/18/2023
CSJ: 0720XXXXXX

FILENAME: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY/Design Projects/0720010444 - DesignPlan Set/10. Environmental/108. EPIC/ENVIRONMENTAL PERMITS, ISSUES, AND COMMENTS (EPIC)

STORMWATER POLLUTION PREVENTION PLAN (SWP3):

This SWP3 has been developed in accordance with the TPDES Construction General Permit TXR150000 (CGP). The Texas Department of Transportation (TxDOT) ensures that project specifications include adequate best management practices (BMPs) for this project.

For all projects with any soil disturbing activities, TxDOT will maintain a SWP3 with all pertinent records, correspondence, environmental documents, etc. at the project field office. If no field office is available, then this SWP3 shall be kept in the appropriate TxDOT Area Office.

This SWP3 is consistent with requirements specified in applicable stormwater plans and the projects environmental permits, issues, and commitments (EPICs). A copy of the CGP is included in Attachment 2.12 of the SWP3 binder.

1.0 SITE/PROJECT DESCRIPTION

1.1 PROJECT CONTROL SECTION JOB (CSJ):
CSJ: 0720-01-044

1.2 PROJECT LIMITS:
From: SH 90

To: FM 2562

1.3 PROJECT COORDINATES:
BEGIN: (Lat) 30.4908536 ,(Long) -95.9882125

END: (Lat) 30.5329435 ,(Long) -95.9155266

1.4 TOTAL PROJECT AREA (Acres): 65.7

1.5 TOTAL AREA TO BE DISTURBED (Acres): 5.82

1.6 NATURE OF CONSTRUCTION ACTIVITY:
For the construction of widen paved shoulders.

1.7 MAJOR SOIL TYPES:

Soil Type	Description
AnD Anna fine sandy loam	1-5% and 5-8% slopes
HuC Huntsburb loamy fine sand	1-5% slopes
FrC Frelsburg clay	1-5% slopes
BrD Brenham clay loam	3-8% slopes
LtD3 Latium clay	4-12% slopes, severly eroded
Go Gowker clay	frequently flooded

1.8 PROJECT SPECIFIC LOCATIONS (PSLs):
PSLs must be depicted on the Environmental Layout Sheets in Attachment 1.2 of this SWP3. PSLs may be identified during preconstruction meetings or during the construction process. Please choose from the options below:

☐ PSLs determined during preconstruction meeting
☒ PSLs determined during construction
☐ No PSLs planned for construction

Type	Sheet #s

All off-ROW PSLs required by the Contractor are the Contractor's responsibility. The Contractor shall secure all permits required by local, state, federal laws for off-ROW PSLs. The contractor shall provide diagrams, areas of disturbance, acreage, and BMPs for all off-ROW PSLs within one mile of the project.

1.9 CONSTRUCTION ACTIVITIES:
(Use the following list as a starting point when developing the Construction Activity Schedule and Ceasing Record in Attachment 2.5.)

☒ Mobilization
☒ Install sediment and erosion controls
☒ Blade existing topsoil into windrows, prep ROW, clear and grub
☐ Remove existing pavement
☒ Grading operations, excavation, and embankment
☒ Excavate and prepare subgrade for proposed pavement widening
☒ Remove existing culverts, safety end treatments (SETs)
☒ Remove existing metal beam guard fence (MBGF), bridge rail
☒ Install proposed pavement per plans
☒ Install culverts, culvert extensions, SETs
☒ Install mow strip, MBGF, bridge rail
☒ Place flex base
☒ Rework slopes, grade ditches
☒ Blade windrowed material back across slopes
☒ Revegetation of unpaved areas
☒ Achieve site stabilization and remove sediment and erosion control measures
☐ Other: _____
☐ Other: _____
☐ Other: _____

1.10 POTENTIAL POLLUTANTS AND SOURCES:

☐ Sediment laden stormwater from stormwater conveyance over disturbed area
☐ Fuels, oils, and lubricants from construction vehicles, equipment, and storage
☐ Solvents, paints, adhesives, etc. from various construction activities
☐ Transported soils from offsite vehicle tracking
☐ Construction debris and waste from various construction activities
☐ Contaminated water from excavation or dewatering pump-out water
☐ Sanitary waste from onsite restroom facilities
☐ Trash from various construction activities/receptacles
☐ Long-term stockpiles of material and waste
☐ Other: _____
☐ Other: _____
☐ Other: _____

1.11 RECEIVING WATERS:
Receiving waters must be depicted on the Environmental Layout Sheets in Attachment 1.2 of this SWP3. Include Segment # for receiving waters.

Tributaries	Classified Waterbody
Cross drainage structures collect into Holland Creek and flows 8.5 miles into the Navasota River and flows 3.15 miles into the Brazos River Segment 1209.	Brazos River Segment 1209

* Add (*) for impaired waterbodies with pollutant in ().

1.12 ROLES AND RESPONSIBILITIES: TxDOT

☒ Development of plans and specifications
☒ Submit Notice of Intent (NOI) to TCEQ (≥5 acres)
☒ Post Construction Site Notice
☐ Submit NOI/CSN to local MS4
☒ Perform SWP3 inspections
☒ Maintain SWP3 records and update to reflect daily operations
☒ Complete and submit Notice of Termination to TCEQ
☒ Maintain SWP3 records for 3 years
☐ Other: _____
☐ Other: _____
☐ Other: _____

1.13 ROLES AND RESPONSIBILITIES: CONTRACTOR

☒ Day To Day Operational Control
☒ Submit Notice of Intent (NOI) to TCEQ (≥5 acres)
☒ Post Construction Site Notice
☐ Submit NOI/CSN to local MS4
☒ Maintain schedule of major construction activities
☒ Install, maintain and modify BMPs
☒ Complete and submit Notice of Termination to TCEQ
☒ Maintain SWP3 records for 3 years
☐ Other: _____
☐ Other: _____
☐ Other: _____

1.14 LOCAL MUNICIPAL SEPARATE STORM SEWER SYSTEM (MS4) OPERATOR COORDINATION:

MS4 Entity
NA

(FM 149)
STORMWATER POLLUTION PREVENTION PLAN (SWP3)

Texas Department of Transportation

FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
6			193
STATE	STATE DIST.	COUNTY	
TEXAS	BRYAN	GRIMES	
CONT.	SECT.	JOB	HIGHWAY NO.
0720	01	044,ETC.	FM 149, ETC.

STORMWATER POLLUTION PREVENTION PLAN (SWP3):

2.0 BEST MANAGEMENT PRACTICES (BMPs) AND CONTROLS, INSPECTION, AND MAINTENANCE

The Contractor shall be the responsible party for implementing the BMPs described herein and for complying with the SWP3 for control of erosion and sedimentation during day-to-day operations. The Contractor shall implement changes to this SWP3 approved by TxDOT within the times specified in this SWP3 or the CGP.

2.1 EROSION CONTROL AND SOIL STABILIZATION BMPs:

T / P

- ☐ ☐ Protection of Existing Vegetation
- ☐ ☐ Vegetated Buffer Zones
- ☐ ☐ Soil Retention Blankets
- ☐ ☐ Geotextiles
- ☐ ☐ Mulching/ Hydromulching
- ☐ ☐ Soil Surface Treatments
- ☒ ☐ Temporary Seeding
- ☐ ☒ Permanent Planting, Sodding or Seeding
- ☒ ☐ Biodegradable Erosion Control Logs
- ☒ ☐ Rock Filter Dams/ Rock Check Dams
- ☒ ☐ Vertical Tracking
- ☐ ☐ Interceptor Swale
- ☐ ☐ Riprap
- ☐ ☐ Diversion Dike
- ☐ ☐ Temporary Pipe Slope Drain
- ☐ ☐ Embankment for Erosion Control
- ☐ ☐ Paved Flumes
- ☐ ☐ Other: _____
- ☐ ☐ Other: _____
- ☐ ☐ Other: _____
- ☐ ☐ Other: _____

2.2 SEDIMENT CONTROL BMPs:

T / P

- ☒ ☐ Biodegradable Erosion Control Logs
- ☐ ☐ Dewatering Controls
- ☐ ☐ Inlet Protection
- ☒ ☐ Rock Filter Dams/ Rock Check Dams
- ☐ ☐ Sandbag Berms
- ☒ ☐ Sediment Control Fence
- ☐ ☐ Stabilized Construction Exit
- ☐ ☐ Floating Turbidity Barrier
- ☐ ☐ Vegetated Buffer Zones
- ☐ ☐ Vegetated Filter Strips
- ☐ ☐ Other: _____
- ☐ ☐ Other: _____
- ☐ ☐ Other: _____
- ☐ ☐ Other: _____

Refer to the Environmental Layout Sheets/ SWP3 Layout Sheets located in Attachment 1.2 of this SWP3

Sediment control BMPs requiring design capacity calculations (See SWP3 Attachment 1.3.):

T / P

- ☐ ☐ Sediment Trap
  - ☐ Calculated volume runoff from 2-year, 24-hour storm for each acre of disturbed area
  - ☐ 3,600 cubic feet of storage per acre drained
- ☐ ☐ Sedimentation Basin
  - ☐ Not required (<10 acres disturbed)
  - ☐ Required (>10 acres) and implemented.
    - ☐ Calculated volume runoff from 2-year, 24-hour storm for each acre of disturbed area
    - ☐ 3,600 cubic feet of storage per acre drained
  - ☐ Required (>10 acres), but not feasible due to:
    - ☐ Available area/Site geometry
    - ☐ Site slope/Drainage patterns
    - ☐ Site soils/Geotechnical factors
    - ☐ Public safety
    - ☐ Other: _____

2.3 PERMANENT CONTROLS:

(Coordinate post-construction BMPs with appropriate TxDOT maintenance sections.)

BMPs To Be Left In Place Post Construction:

Type	Stationing	
	From	To

Refer to the Environmental Layout Sheets/ SWP3 Layout Sheets located in Attachment 1.2 of this SWP3

2.4 OFFSITE VEHICLE TRACKING CONTROLS:

- ☒ Excess dirt/mud on road removed daily
- ☐ Haul roads dampened for dust control
- ☒ Loaded haul trucks to be covered with tarpaulin
- ☐ Stabilized construction exit
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____

2.5 POLLUTION PREVENTION MEASURES:

- ☒ Chemical Management
- ☒ Concrete and Materials Waste Management
- ☒ Debris and Trash Management
- ☒ Dust Control
- ☒ Sanitary Facilities
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____

2.6 VEGETATED BUFFER ZONES:

Natural vegetated buffers shall be maintained as feasible to protect adjacent surface waters. If vegetated natural buffer zones are not feasible due to site geometry, the appropriate additional sediment control measures have been incorporated into this SWP3.

Type	Stationing	
	From	To

Refer to the Environmental Layout Sheets/ SWP3 Layout Sheets located in Attachment 1.2 of this SWP3

2.7 ALLOWABLE NON-STORMWATER DISCHARGES:

- ☒ Fire hydrant flushings
- ☒ Irrigation drainage
- ☒ Pavement washwater (where spills or leaks have not occurred, and detergents are not used)
- ☒ Potable water sources
- ☒ Springs
- ☒ Uncontaminated groundwater
- ☒ Water used to wash vehicles or control dust
- ☒ Other allowable non-stormwater discharges as allowed by TPDES GP TXR150000.

2.8 INSPECTIONS:

All disturbed areas and erosion and sediment control devices shall be inspected at least once every seven (7) days. Inspections shall be performed by TxDOT as indicated on the Field Inspection and Maintenance Report Form 2118 and retained in Attachment 2.5 of this SWP3 .

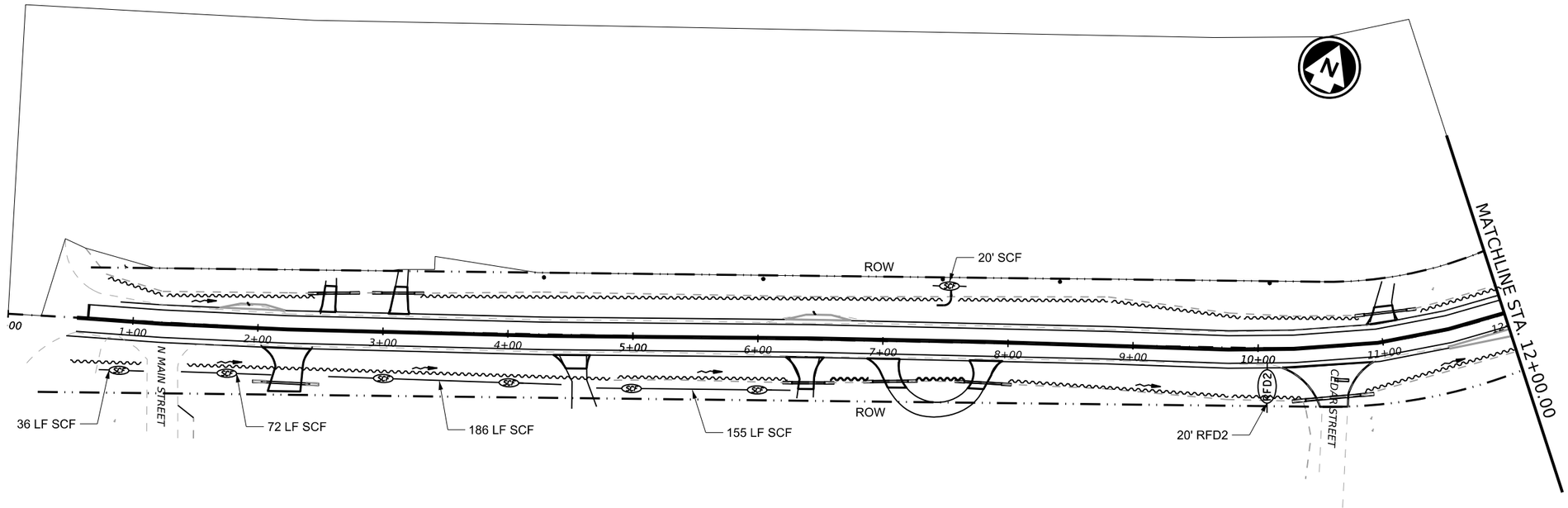
2.9 MAINTENANCE:

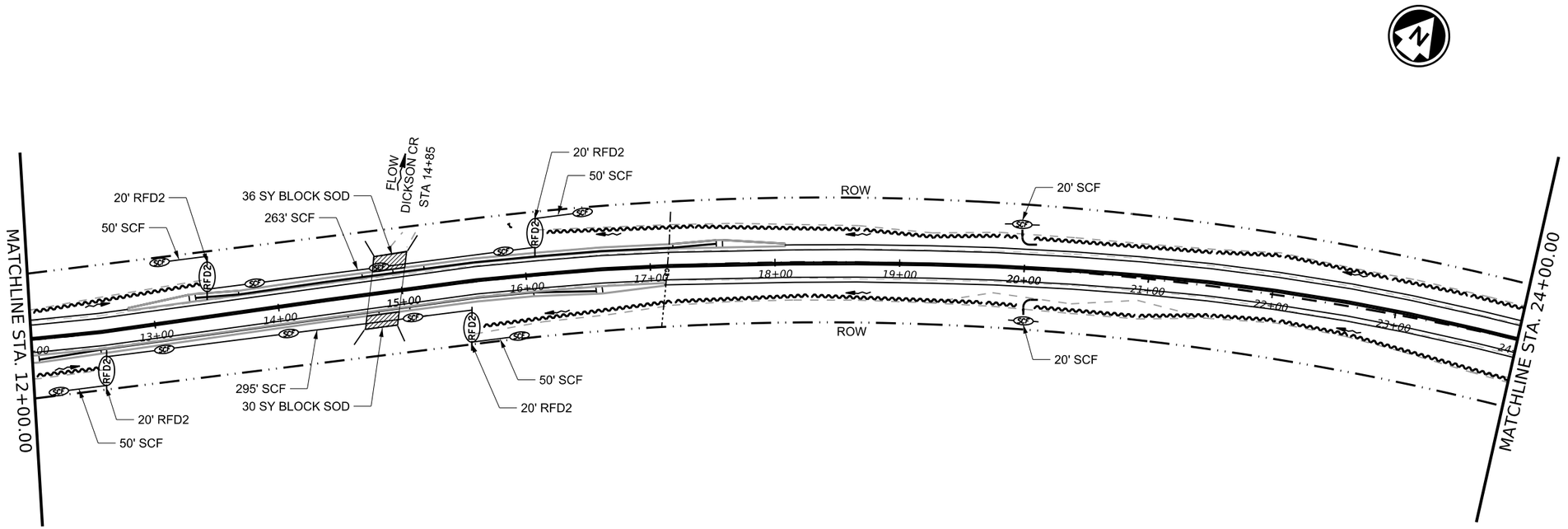
Control measures shall be properly installed according to specifications. If it is determined that a BMP or control measure is not operating effectively, maintenance must be accomplished as soon as possible and before the next anticipated rain event, but in no case later than 7 calendar days after being able to access the site. Maintenance shall be performed by the Contractor as indicated on the Field Inspection and Maintenance Report Form 2118 and retained in Attachment 2.5 of this SWP3.

(FM 149)
STORMWATER POLLUTION PREVENTION PLAN (SWP3)

Texas Department of Transportation

FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
6			194
STATE	STATE DIST.	COUNTY	
TEXAS	BRYAN	GRIMES	
CONT.	SECT.	JOB	HIGHWAY NO.
0720	01	044,ETC.	FM 149, ETC,





LEGEND	
	DIRECTION OF FLOW
	TOPSOIL BERM
	BERM BREAK
	BLOCK SOD
SCF	SEDIMENT CONTROL FENCE
RFD2	ROCK FILTER DAM (TY 2)
ECL	BIODEG EROSN CONT LOGS
(WOTUS)	WATERS OF THE US

GENERAL NOTES:

SEDIMENT CONTROL FENCE ESTIMATED AT 20' EACH, UNLESS OTHERWISE NOTED.
TY 1 AND TY 2 ROCK FILTER DAM ESTIMATED AT 20' EACH, ONLESS OTHERWISE NOTED.

STATE OF TEXAS
JEAN J. FENG
102035
LICENSED PROFESSIONAL ENGINEER

04/20/2023

HORIZONTAL
0 50 100 200 FT

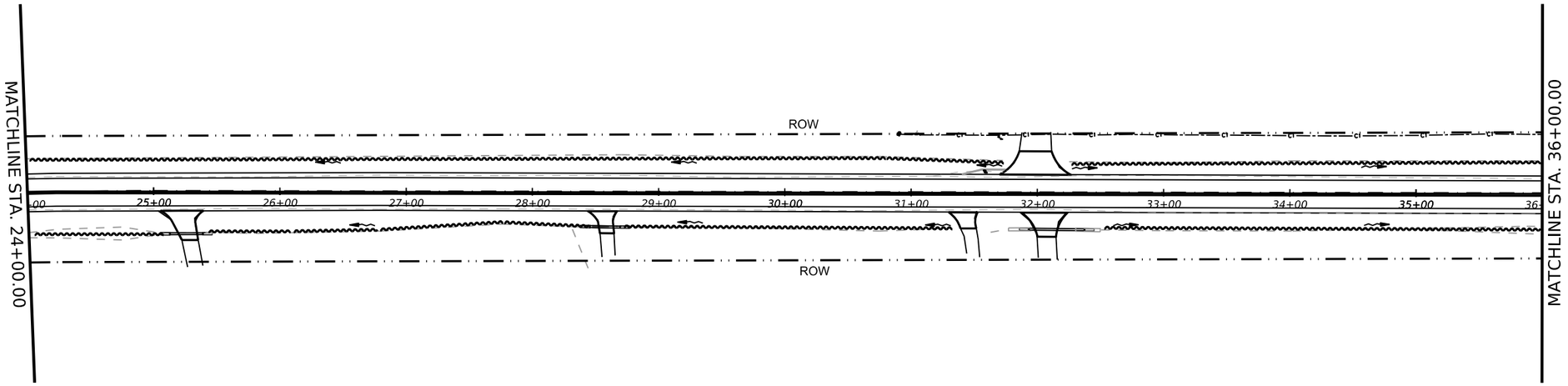
PRINT DATE	REVISION DATE
4/19/2023	

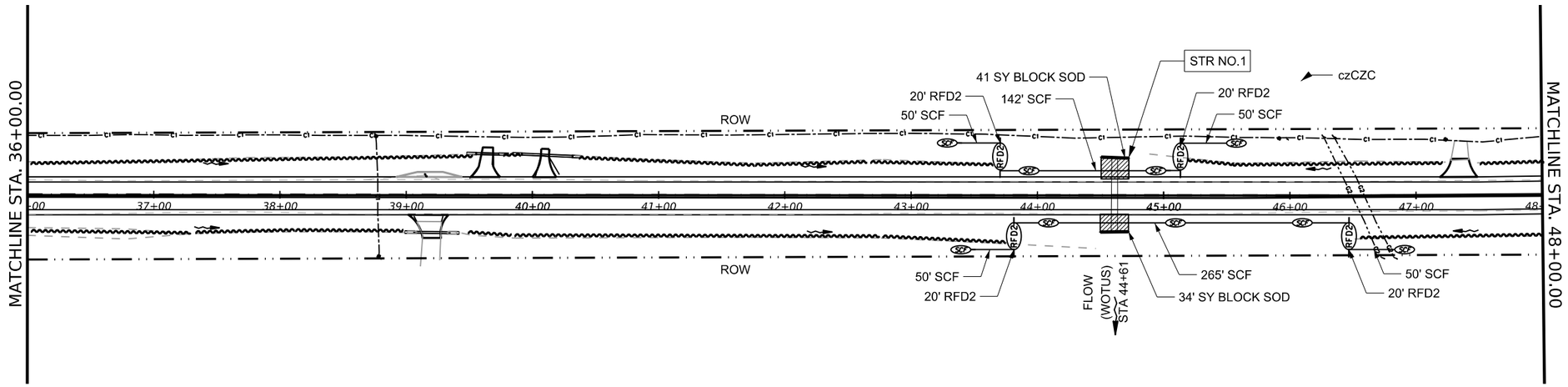
Texas Department of Transportation
Bryan District

SW3P LAYOUT (FM 149)

SHEET 1 OF 12 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER	
6		FM 149, ETC.	
STATE	DISTRICT	COUNTY	
TEXAS	BRY	GRIMES	
CONTROL	SECTION	JOB	SHEET NO.
0720	01	044, ETC.	195





LEGEND	
	DIRECTION OF FLOW
	TOPSOIL BERM
	BERM BREAK
	BLOCK SOD
SCF	SEDIMENT CONTROL FENCE
RFD2	ROCK FILTER DAM (TY 2)
ECL	BIODEG EROSN CONT LOGS
(WOTUS)	WATERS OF THE US

GENERAL NOTES:

SEDIMENT CONTROL FENCE ESTIMATED AT 20' EACH, UNLESS OTHERWISE NOTED.
TY 1 AND TY 2 ROCK FILTER DAM ESTIMATED AT 20' EACH, ONLESS OTHERWISE NOTED.

STATE OF TEXAS
JEAN J. FENG
102035
LICENSED PROFESSIONAL ENGINEER

04/20/2023

HORIZONTAL
0 50 100 200 FT

PRINT DATE	REVISION DATE
4/19/2023	

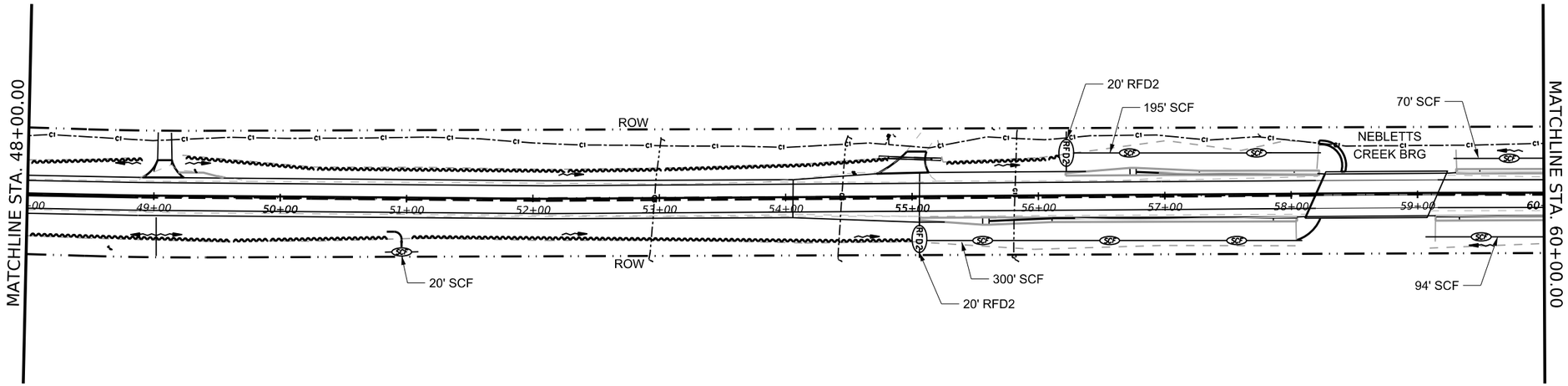
Texas Department of Transportation
Bryan District

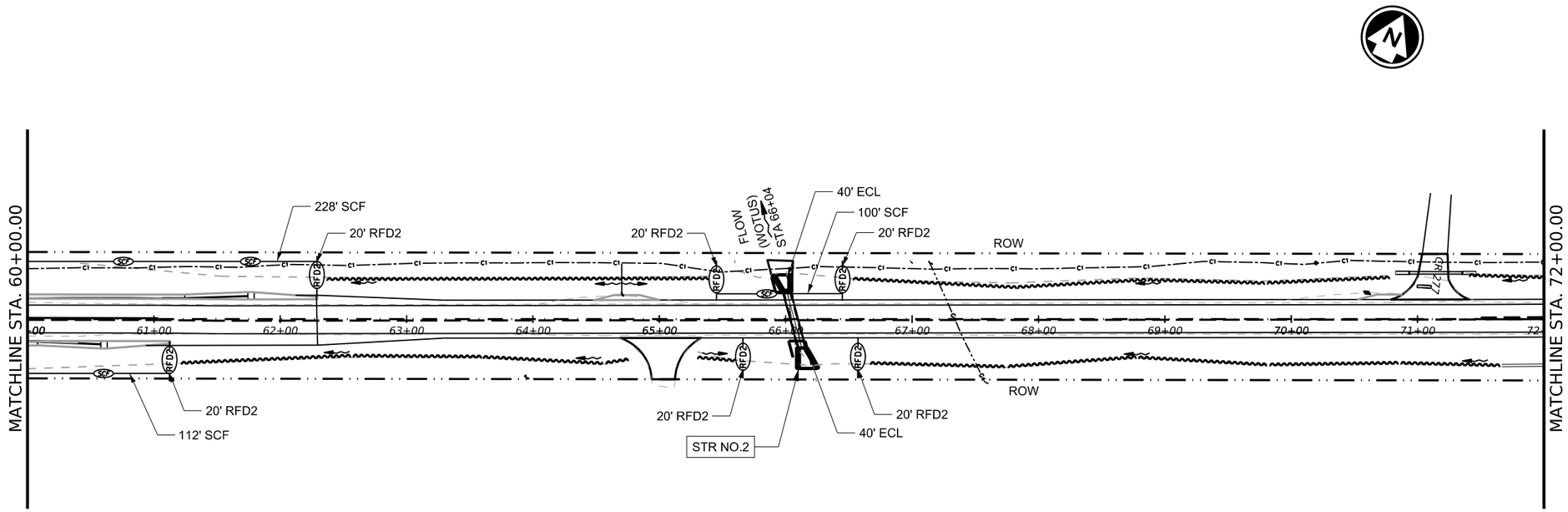
SW3P LAYOUT (FM 149)

SHEET 2 OF 12 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 149, ETC.

STATE	DISTRICT	COUNTY	
TEXAS	BRY	GRIMES	
CONTROL	SECTION	JOB	SHEET NO.
0720	01	044, ETC.	196





LEGEND	
	DIRECTION OF FLOW
	TOPSOIL BERM
	BERM BREAK
	BLOCK SOD
SCF	SEDIMENT CONTROL FENCE
RFD2	ROCK FILTER DAM (TY 2)
ECL	BIODEG EROSN CONT LOGS
(WOTUS)	WATERS OF THE US

GENERAL NOTES:

SEDIMENT CONTROL FENCE ESTIMATED AT 20' EACH, UNLESS OTHERWISE NOTED.
TY 1 AND TY 2 ROCK FILTER DAM ESTIMATED AT 20' EACH, ONLESS OTHERWISE NOTED.

STATE OF TEXAS
JEAN J. FENG
102035
LICENSED
PROFESSIONAL ENGINEER

04/20/2023

HORIZONTAL
0 50 100 200 FT

PRINT DATE	REVISION DATE
4/19/2023	

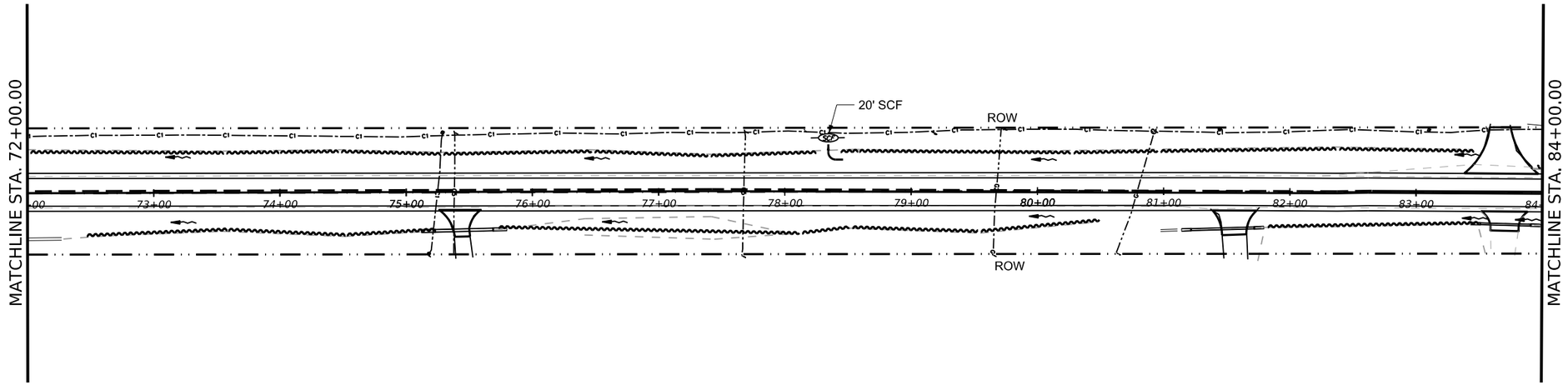
Texas Department of Transportation
Bryan District

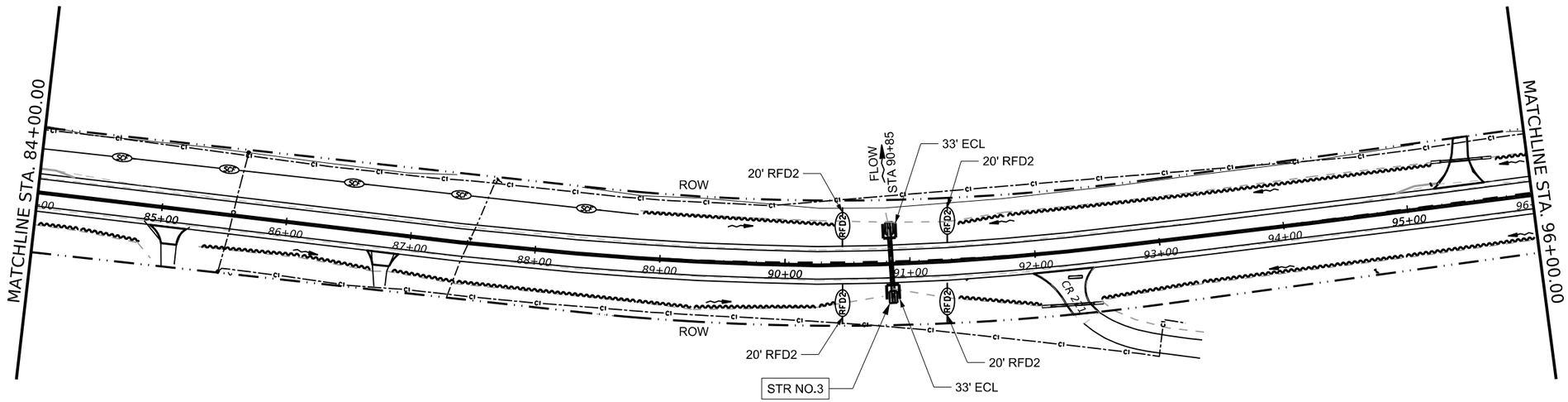
SW3P LAYOUT (FM 149)

SHEET 3 OF 12 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 149, ETC.

STATE	DISTRICT	COUNTY	
TEXAS	BRY	GRIMES	
CONTROL	SECTION	JOB	SHEET NO.
0720	01	044, ETC.	197





LEGEND	
	DIRECTION OF FLOW
	TOPSOIL BERM
	BERM BREAK
	BLOCK SOD
SCF	SEDIMENT CONTROL FENCE
RFD2	ROCK FILTER DAM (TY 2)
ECL	BIODEG EROSN CONT LOGS
(WOTUS)	WATERS OF THE US

GENERAL NOTES:

SEDIMENT CONTROL FENCE ESTIMATED AT 20' EACH, UNLESS OTHERWISE NOTED.
TY 1 AND TY 2 ROCK FILTER DAM ESTIMATED AT 20' EACH, ONLESS OTHERWISE NOTED.

STATE OF TEXAS
JEAN J. FENG
102035
LICENSED PROFESSIONAL ENGINEER

04/20/2023

HORIZONTAL
0 50 100 200 FT

PRINT DATE	REVISION DATE
4/19/2023	

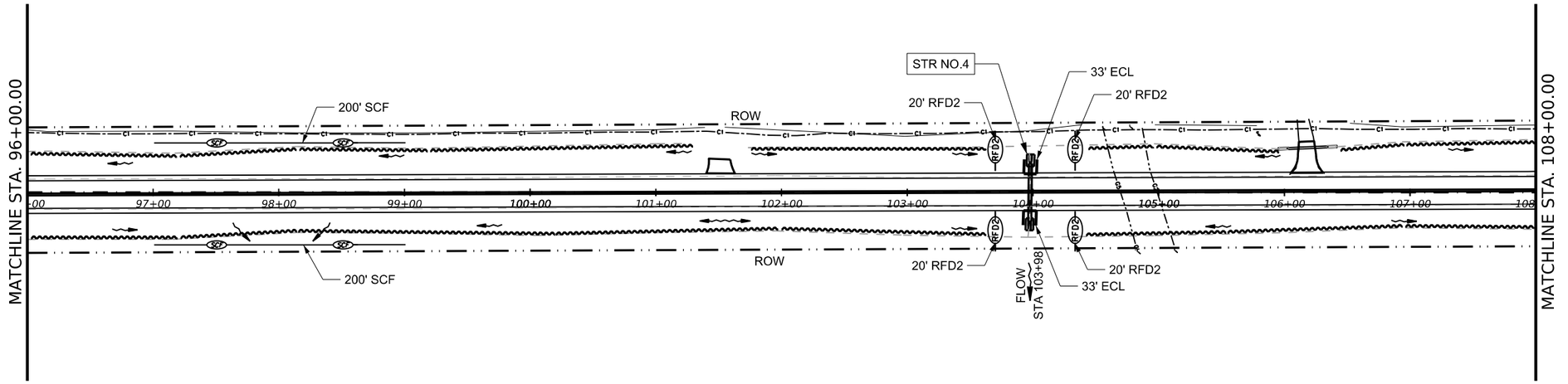
Texas Department of Transportation
Bryan District

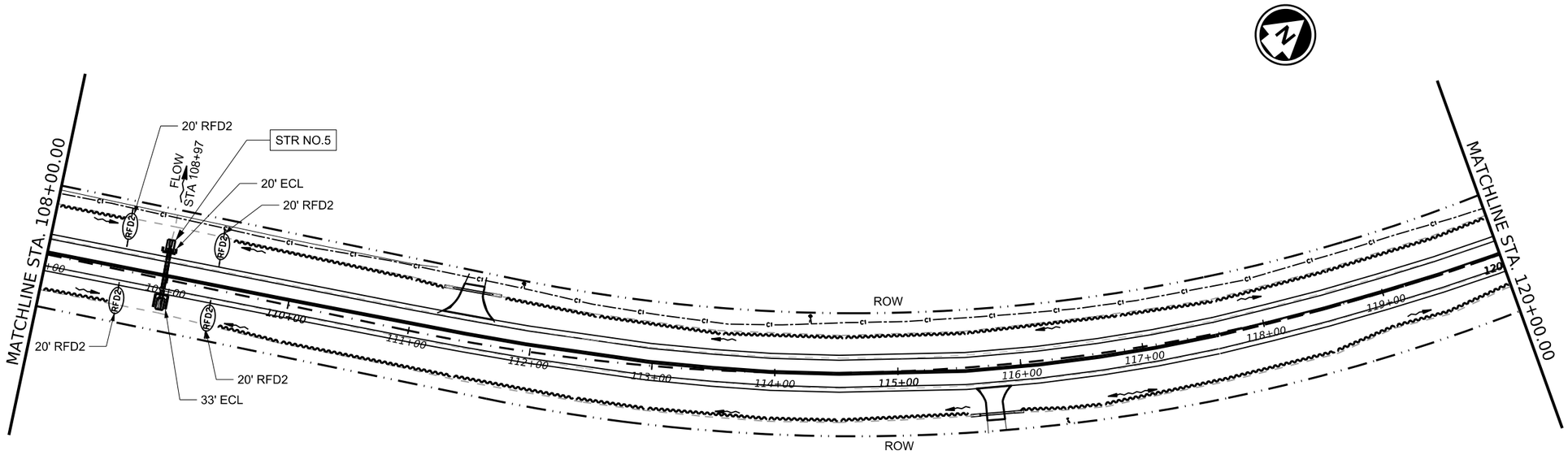
SW3P LAYOUT (FM 149)

SHEET 4 OF 12 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 149, ETC.

STATE	DISTRICT	COUNTY	
TEXAS	BRY	GRIMES	
CONTROL	SECTION	JOB	SHEET NO.
0720	01	044, ETC.	198





LEGEND	
	DIRECTION OF FLOW
	TOPSOIL BERM
	BERM BREAK
	BLOCK SOD
SCF	SEDIMENT CONTROL FENCE
RFD2	ROCK FILTER DAM (TY 2)
ECL	BIODEG EROSN CONT LOGS
(WOTUS)	WATERS OF THE US

GENERAL NOTES:

SEDIMENT CONTROL FENCE ESTIMATED AT 20' EACH, UNLESS OTHERWISE NOTED.
TY 1 AND TY 2 ROCK FILTER DAM ESTIMATED AT 20' EACH, ONLESS OTHERWISE NOTED.

STATE OF TEXAS
JEAN J. FENG
102035
LICENSED PROFESSIONAL ENGINEER

04/20/2023

HORIZONTAL
0 50 100 200 FT

PRINT DATE	REVISION DATE
4/19/2023	

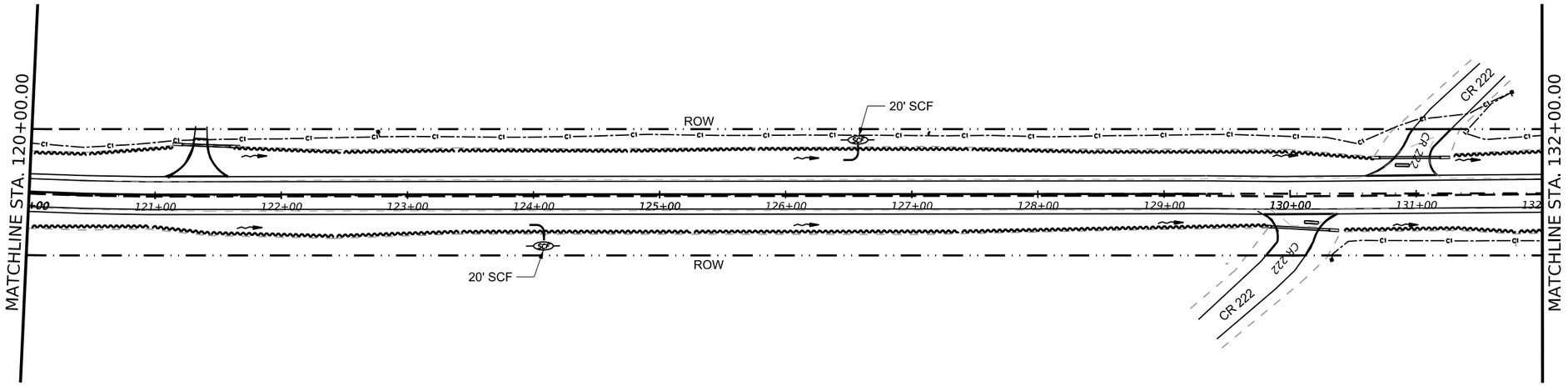
Texas Department of Transportation
Bryan District

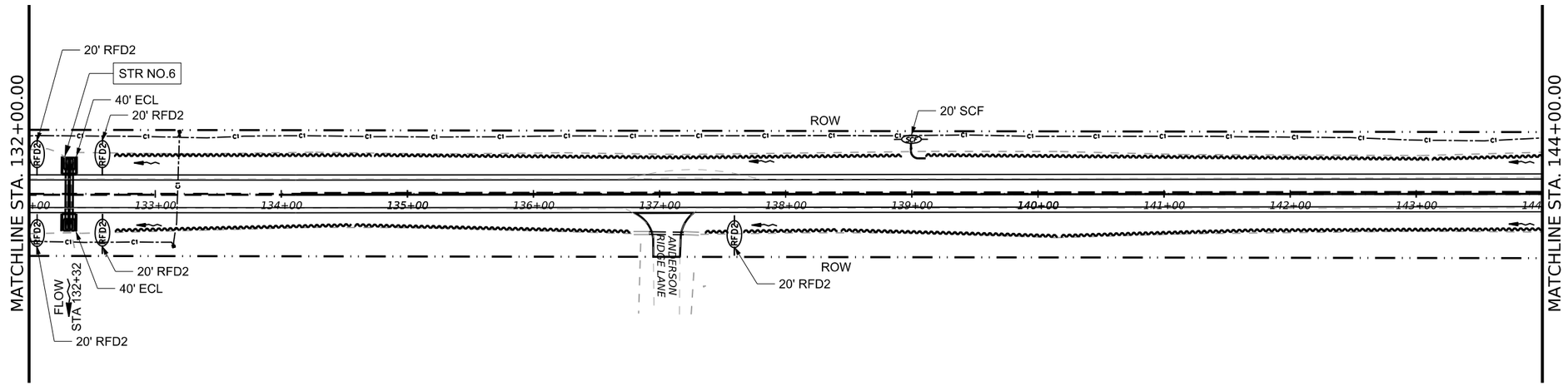
SW3P LAYOUT (FM 149)

SHEET 5 OF 12 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 149, ETC.

STATE	DISTRICT	COUNTY	
TEXAS	BRY	GRIMES	
CONTROL	SECTION	JOB	SHEET NO.
0720	01	044, ETC.	199





LEGEND	
	DIRECTION OF FLOW
	TOPSOIL BERM
	BERM BREAK
	BLOCK SOD
SCF	SEDIMENT CONTROL FENCE
RFD2	ROCK FILTER DAM (TY 2)
ECL	BIODEG EROSN CONT LOGS
(WOTUS)	WATERS OF THE US

GENERAL NOTES:

SEDIMENT CONTROL FENCE ESTIMATED AT 20' EACH, UNLESS OTHERWISE NOTED.
TY 1 AND TY 2 ROCK FILTER DAM ESTIMATED AT 20' EACH, ONLESS OTHERWISE NOTED.

STATE OF TEXAS
JEAN J. FENG
102035
LICENSED
PROFESSIONAL ENGINEER

04/20/2023

HORIZONTAL
0 50 100 200 FT

PRINT DATE	REVISION DATE
4/19/2023	

Texas Department of Transportation
Bryan District Standard

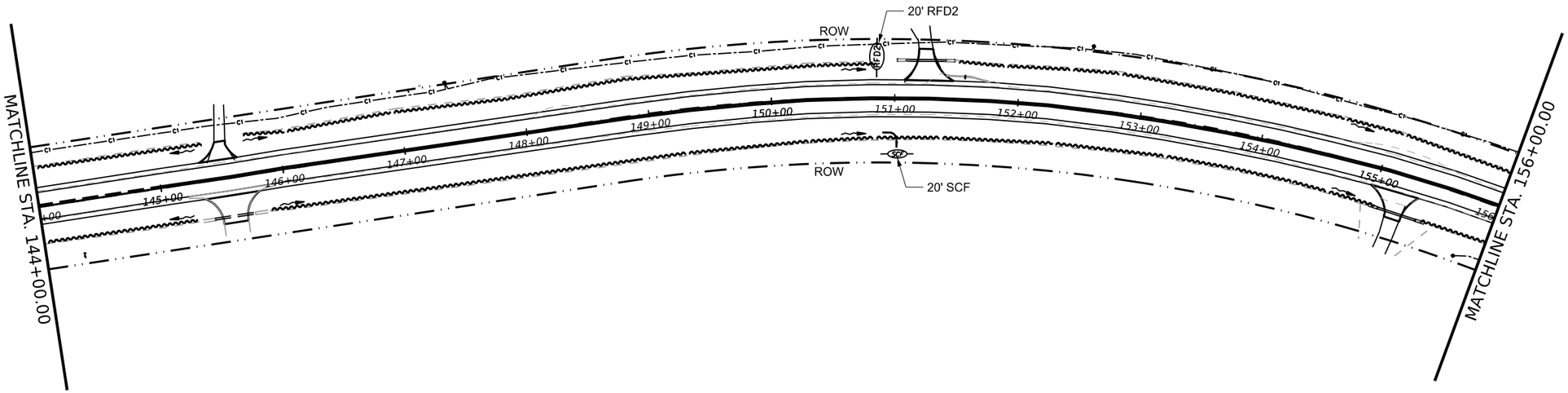
SW3P LAYOUT (FM 149)

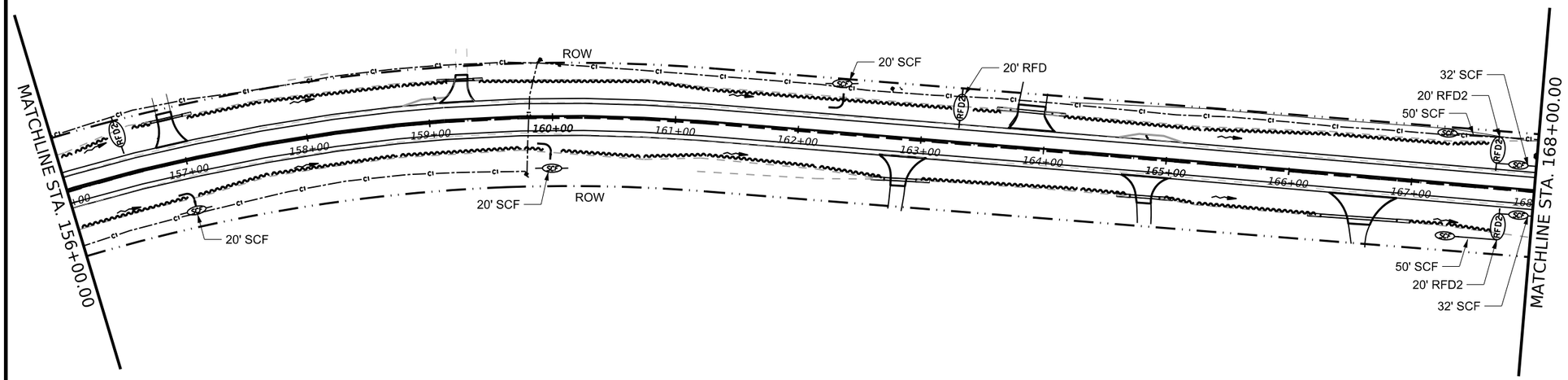
SHEET 6 OF 12 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 149, ETC.

STATE	DISTRICT	COUNTY
TEXAS	BRY	GRIMES

CONTROL	SECTION	JOB	SHEET NO.
0720	01	044, ETC.	200





LEGEND	
	DIRECTION OF FLOW
	TOPSOIL BERM
	BERM BREAK
	BLOCK SOD
SCF	SEDIMENT CONTROL FENCE
RFD2	ROCK FILTER DAM (TY 2)
ECL	BIODEG EROSN CONT LOGS
(WOTUS)	WATERS OF THE US

GENERAL NOTES:

SEDIMENT CONTROL FENCE ESTIMATED AT 20' EACH, UNLESS OTHERWISE NOTED.
TY 1 AND TY 2 ROCK FILTER DAM ESTIMATED AT 20' EACH, ONLESS OTHERWISE NOTED.

STATE OF TEXAS
JEAN J. FENG
102035
LICENSED PROFESSIONAL ENGINEER

04/20/2023

HORIZONTAL
0 50 100 200 FT

PRINT DATE	REVISION DATE
4/19/2023	

Texas Department of Transportation
Bryan District

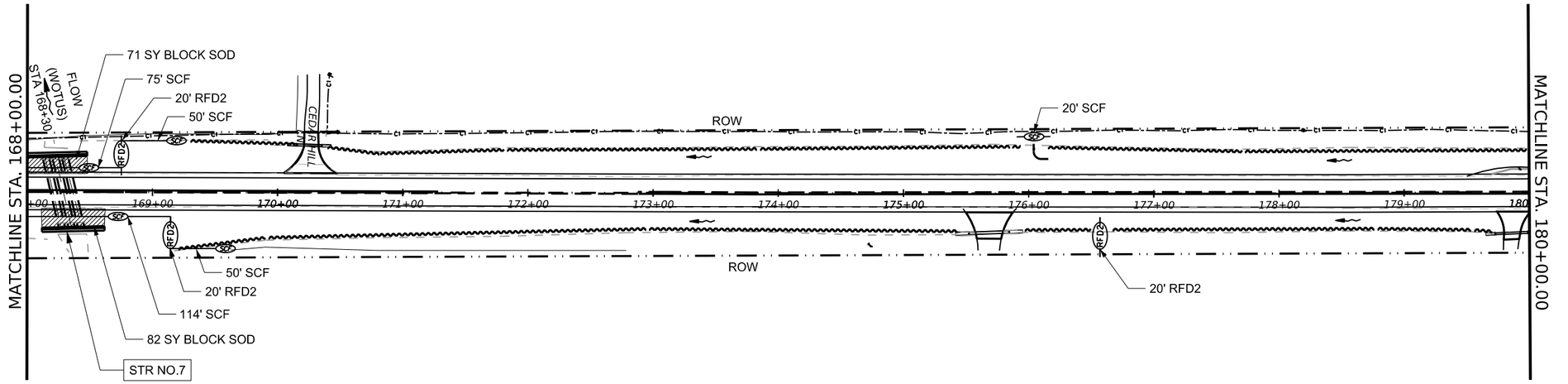
SW3P LAYOUT (FM 149)

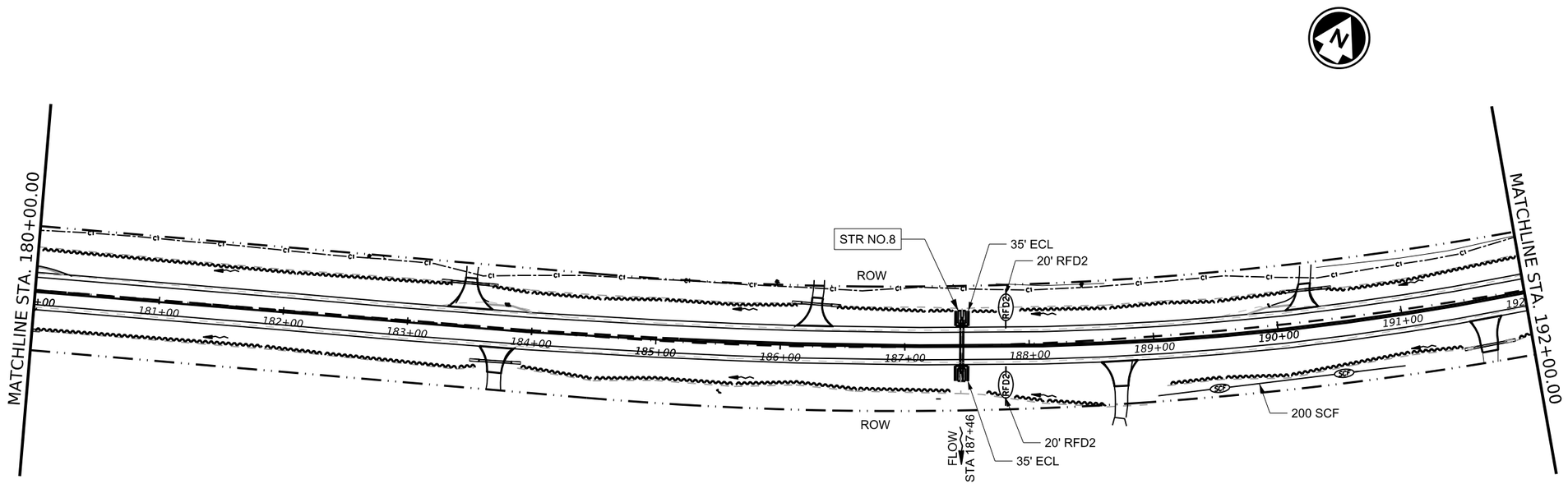
SHEET 7 OF 12 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 149, ETC.

STATE	DISTRICT	COUNTY
TEXAS	BRY	GRIMES

CONTROL	SECTION	JOB	SHEET NO.
0720	01	044, ETC.	201





LEGEND	
	DIRECTION OF FLOW
	TOPSOIL BERM
	BERM BREAK
	BLOCK SOD
SCF	SEDIMENT CONTROL FENCE
RFD2	ROCK FILTER DAM (TY 2)
ECL	BIODEG EROSN CONT LOGS
(WOTUS)	WATERS OF THE US

GENERAL NOTES:

SEDIMENT CONTROL FENCE ESTIMATED AT 20' EACH, UNLESS OTHERWISE NOTED.
TY 1 AND TY 2 ROCK FILTER DAM ESTIMATED AT 20' EACH, ONLESS OTHERWISE NOTED.

STATE OF TEXAS
JEAN J. FENG
102035
LICENSED PROFESSIONAL ENGINEER

04/20/2023

HORIZONTAL
0 50 100 200 FT

PRINT DATE	REVISION DATE
4/19/2023	

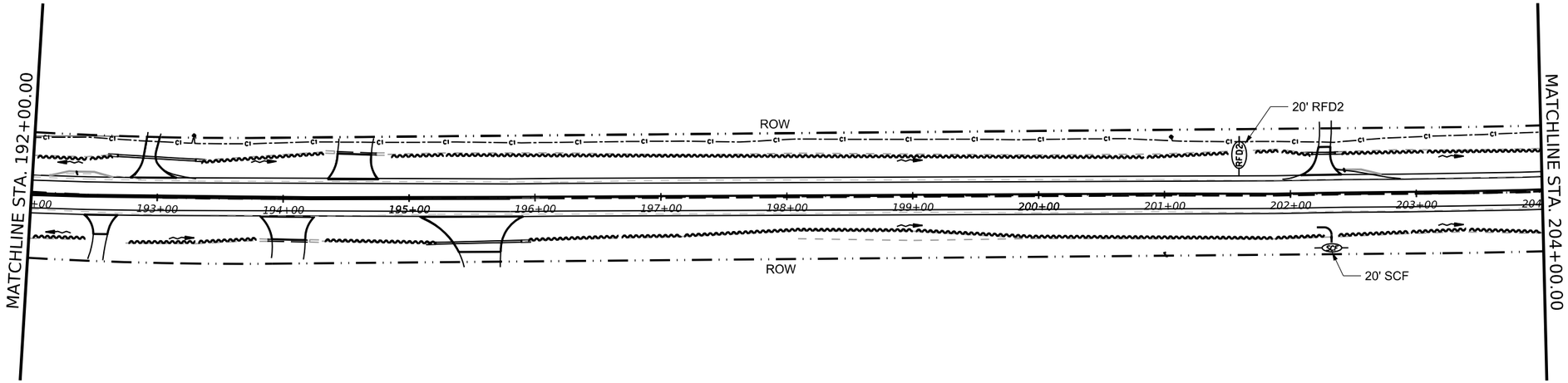
Texas Department of Transportation
Bryan District

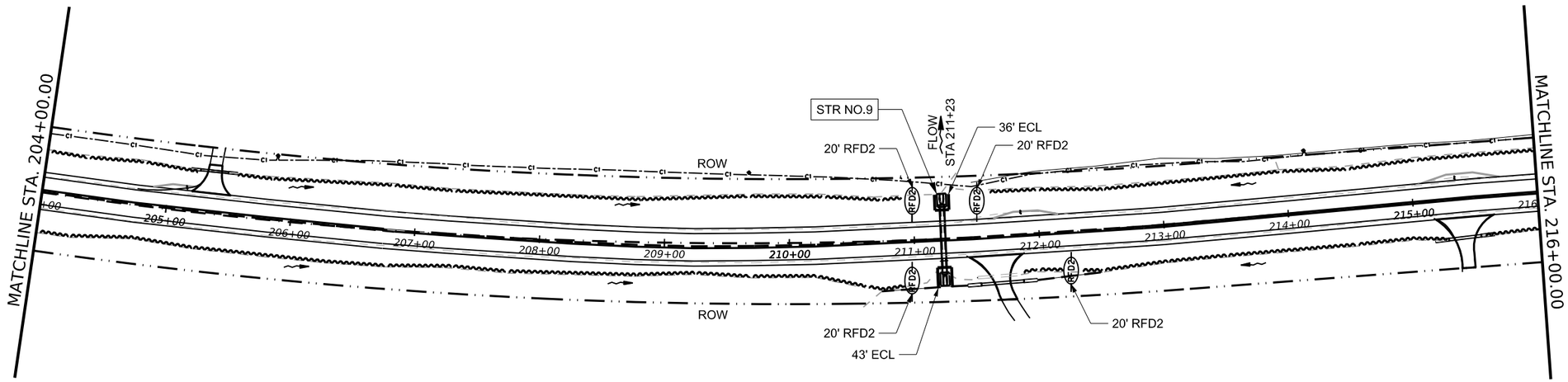
SW3P LAYOUT (FM 149)

SHEET 8 OF 12 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 149, ETC.

STATE	DISTRICT	COUNTY	
TEXAS	BRY	GRIMES	
CONTROL	SECTION	JOB	SHEET NO.
0720	01	044, ETC.	202





LEGEND	
	DIRECTION OF FLOW
	TOPSOIL BERM
	BERM BREAK
	BLOCK SOD
SCF	SEDIMENT CONTROL FENCE
RFD2	ROCK FILTER DAM (TY 2)
ECL	BIODEG EROSN CONT LOGS
(WOTUS)	WATERS OF THE US

GENERAL NOTES:

SEDIMENT CONTROL FENCE ESTIMATED AT 20' EACH, UNLESS OTHERWISE NOTED.
TY 1 AND TY 2 ROCK FILTER DAM ESTIMATED AT 20' EACH, ONLESS OTHERWISE NOTED.

STATE OF TEXAS
JEAN J. FENG
102035
LICENSED
PROFESSIONAL ENGINEER

04/20/2023

HORIZONTAL
0 50 100 200 FT

PRINT DATE	REVISION DATE
4/19/2023	

Texas Department of Transportation
Bryan District

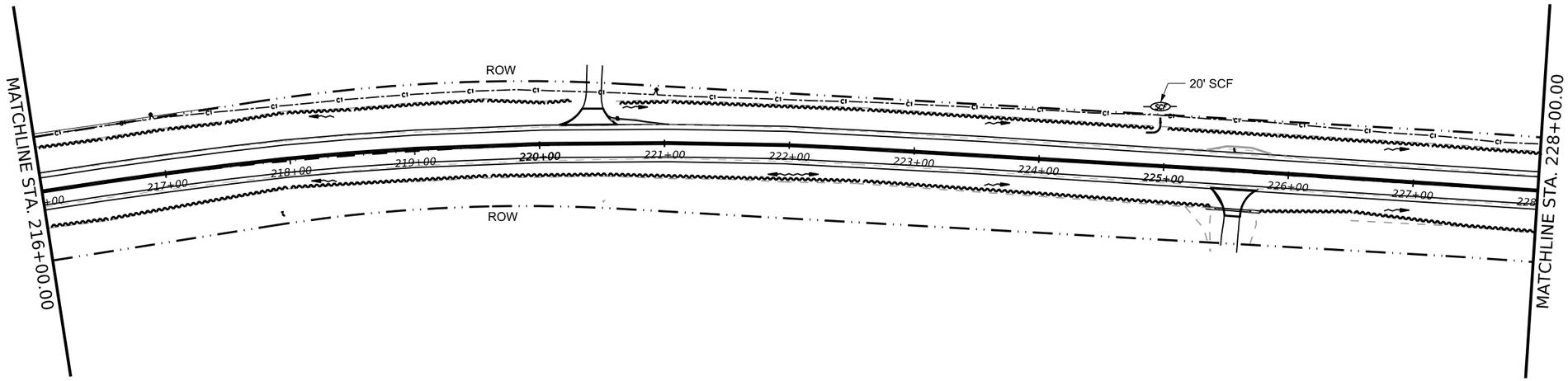
SW3P LAYOUT (FM 149)

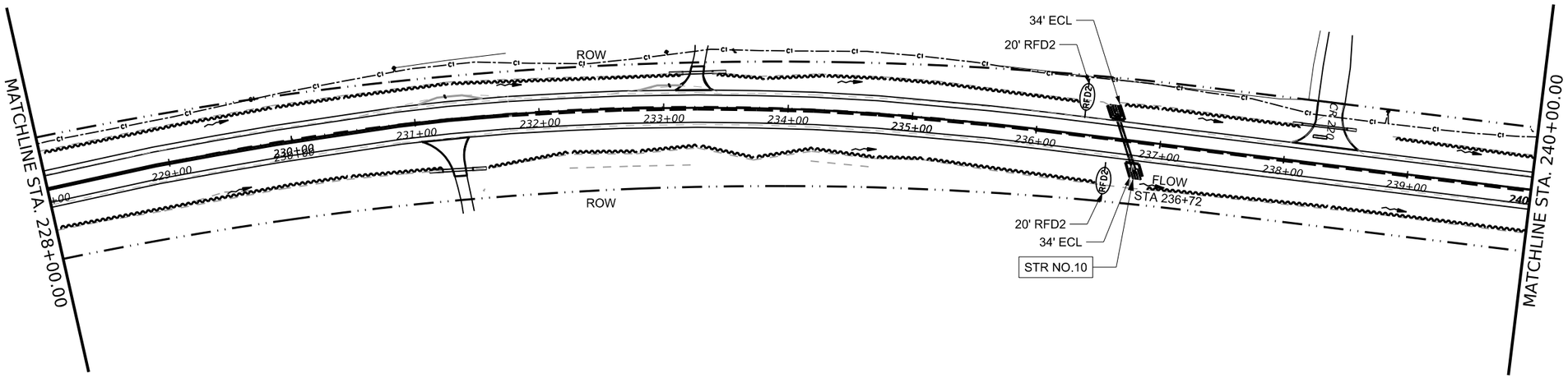
SHEET 9 OF 12 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 149, ETC.

STATE	DISTRICT	COUNTY
TEXAS	BRY	GRIMES

CONTROL	SECTION	JOB	SHEET NO.
0720	01	044, ETC.	203





LEGEND	
	DIRECTION OF FLOW
	TOPSOIL BERM
	BERM BREAK
	BLOCK SOD
SCF	SEDIMENT CONTROL FENCE
RFD2	ROCK FILTER DAM (TY 2)
ECL	BIODEG EROSN CONT LOGS
(WOTUS)	WATERS OF THE US

GENERAL NOTES:

SEDIMENT CONTROL FENCE ESTIMATED AT 20' EACH, UNLESS OTHERWISE NOTED.
TY 1 AND TY 2 ROCK FILTER DAM ESTIMATED AT 20' EACH, ONLESS OTHERWISE NOTED.

STATE OF TEXAS
JEAN J. FENG
102035
LICENSED PROFESSIONAL ENGINEER

04/20/2023

HORIZONTAL
0 50 100 200 FT

PRINT DATE	REVISION DATE
4/19/2023	

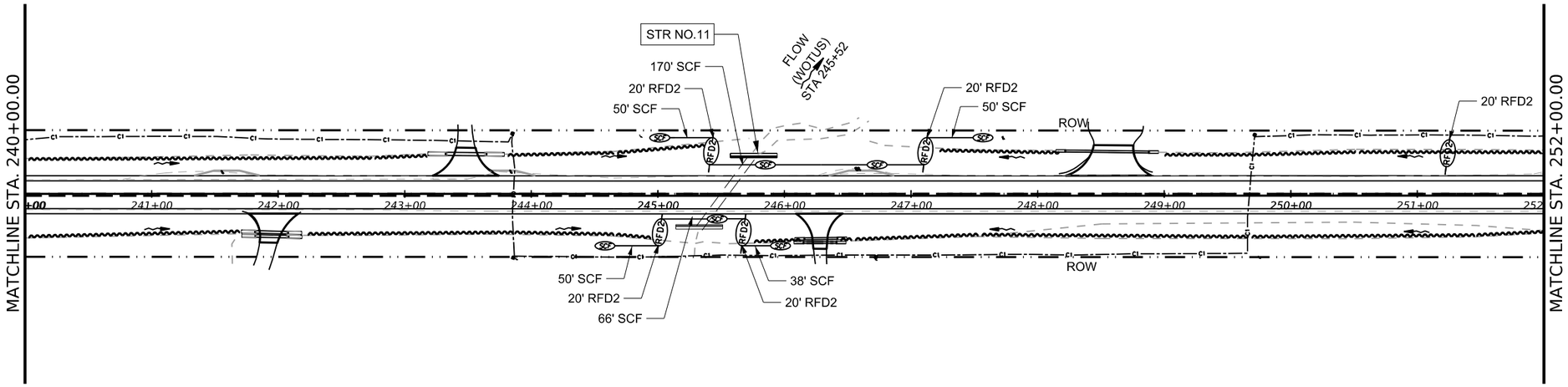
Texas Department of Transportation
Bryan District

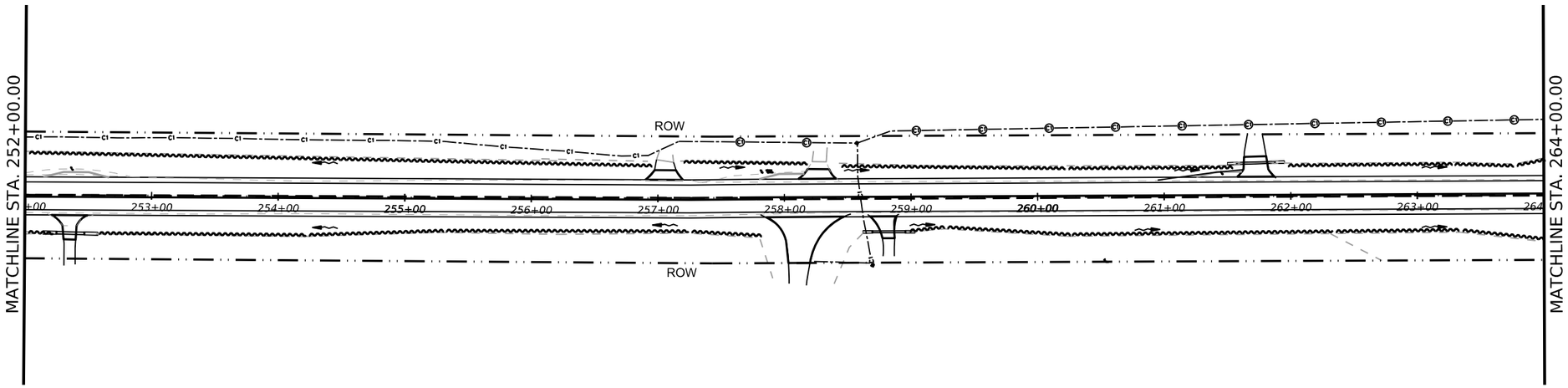
SW3P LAYOUT (FM 149)

SHEET 10 OF 12 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 149, ETC.

STATE	DISTRICT	COUNTY	
TEXAS	BRY	GRIMES	
CONTROL	SECTION	JOB	SHEET NO.
0720	01	044, ETC.	204





LEGEND	
	DIRECTION OF FLOW
	TOPSOIL BERM
	BERM BREAK
	BLOCK SOD
SCF	SEDIMENT CONTROL FENCE
RFD2	ROCK FILTER DAM (TY 2)
ECL	BIODEG EROSN CONT LOGS
(WOTUS)	WATERS OF THE US

GENERAL NOTES:

SEDIMENT CONTROL FENCE ESTIMATED AT 20' EACH, UNLESS OTHERWISE NOTED.
TY 1 AND TY 2 ROCK FILTER DAM ESTIMATED AT 20' EACH, ONLESS OTHERWISE NOTED.

STATE OF TEXAS
JEAN J. FENG
102035
LICENSED PROFESSIONAL ENGINEER

04/20/2023

HORIZONTAL
0 50 100 200 FT

PRINT DATE	REVISION DATE
4/19/2023	

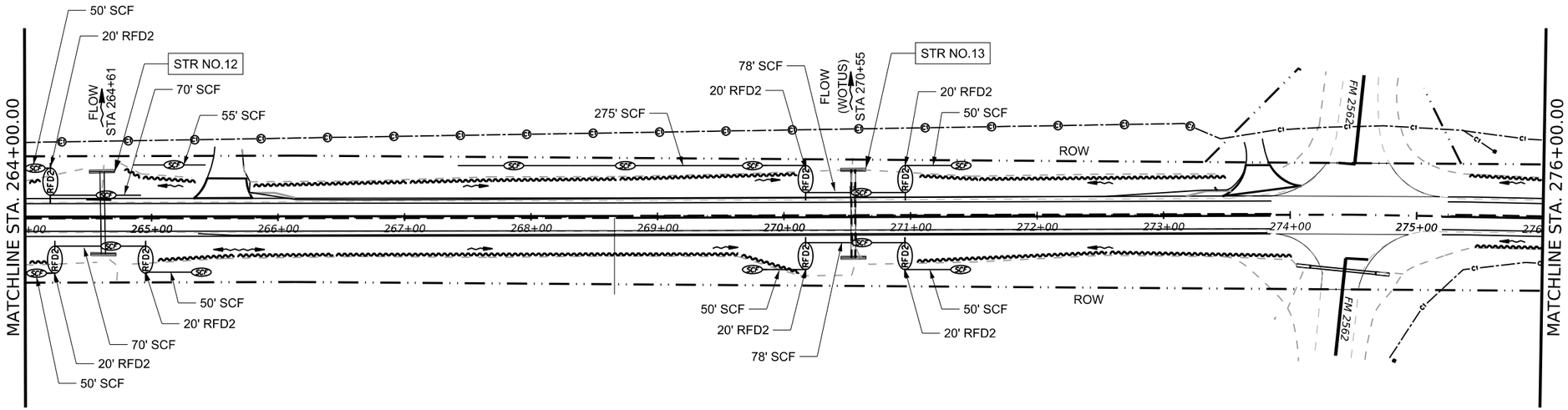
Texas Department of Transportation
Bryan District

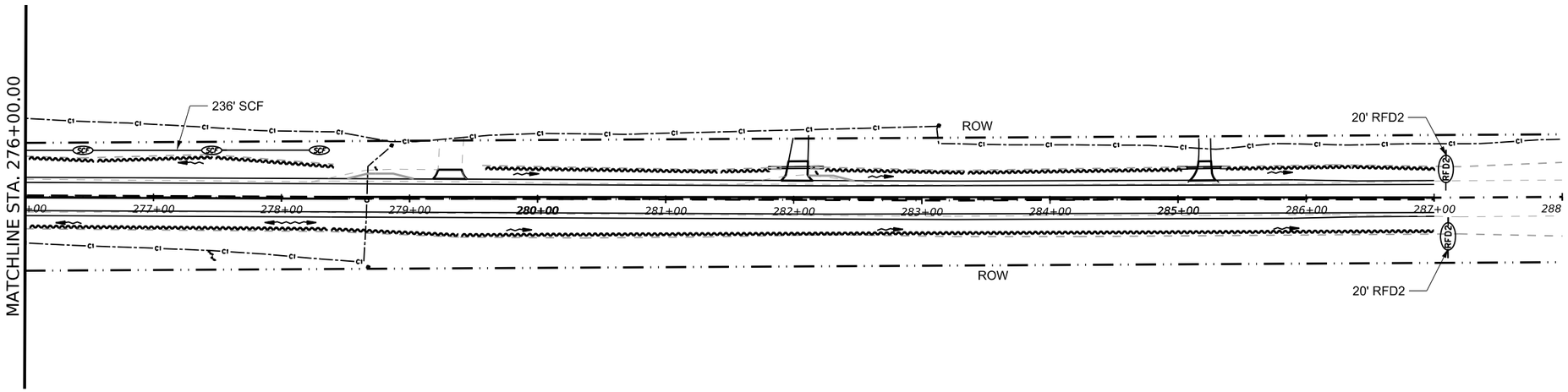
SW3P LAYOUT (FM 149)

SHEET 11 OF 12 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 149, ETC.

STATE	DISTRICT	COUNTY	
TEXAS	BRY	GRIMES	
CONTROL	SECTION	JOB	SHEET NO.
0720	01	044, ETC.	205





LEGEND

	DIRECTION OF FLOW
	TOPSOIL BERM
	BERM BREAK
	BLOCK SOD
SCF	SEDIMENT CONTROL FENCE
RFD2	ROCK FILTER DAM (TY 2)
ECL	BIODEG EROSN CONT LOGS
(WOTUS)	WATERS OF THE US

GENERAL NOTES:

SEDIMENT CONTROL FENCE ESTIMATED AT 20' EACH, UNLESS OTHERWISE NOTED.
TY 1 AND TY 2 ROCK FILTER DAM ESTIMATED AT 20' EACH, ONLESS OTHERWISE NOTED.

STATE OF TEXAS
JEAN J. FENG
102035
LICENSED PROFESSIONAL ENGINEER

04/20/2023

HORIZONTAL
0 50 100 200 FT

PRINT DATE	REVISION DATE
4/19/2023	

Texas Department of Transportation
Bryan District

SW3P LAYOUT (FM 149)

SHEET 12 OF 12 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 149, ETC.

STATE	DISTRICT	COUNTY	
TEXAS	BRY	GRIMES	
CONTROL	SECTION	JOB	SHEET NO.
0720	01	044, ETC.	206

STORMWATER POLLUTION PREVENTION PLAN (SWP3):

This SWP3 has been developed in accordance with the TPDES Construction General Permit TXR150000 (CGP). The Texas Department of Transportation (TxDOT) ensures that project specifications include adequate best management practices (BMPs) for this project.

For all projects with any soil disturbing activities, TxDOT will maintain a SWP3 with all pertinent records, correspondence, environmental documents, etc. at the project field office. If no field office is available, then this SWP3 shall be kept in the appropriate TxDOT Area Office.

This SWP3 is consistent with requirements specified in applicable stormwater plans and the projects environmental permits, issues, and commitments (EPICs). A copy of the CGP is included in Attachment 2.12 of the SWP3 binder.

1.0 SITE/PROJECT DESCRIPTION

1.1 PROJECT CONTROL SECTION JOB (CSJ):
0050-03-109

1.2 PROJECT LIMITS:
From: 0.3 MI N OF FM 2988

To: 0.1 MI S OF FM 2988

1.3 PROJECT COORDINATES:
BEGIN: (Lat) 30.313487 ,(Long) -96.047475

END: (Lat) 30.308035 ,(Long) -96.046503

1.4 TOTAL PROJECT AREA (Acres): 5.82

1.5 TOTAL AREA TO BE DISTURBED (Acres): 1.45

1.6 NATURE OF CONSTRUCTION ACTIVITY:
ADD ACCELERATION LANE

1.7 MAJOR SOIL TYPES:

Soil Type	Description
BrD	BRENHAM CLAY, 1-5% SLOPES

1.8 PROJECT SPECIFIC LOCATIONS (PSLs):
PSLs must be depicted on the Environmental Layout Sheets in Attachment 1.2 of this SWP3. PSLs may be identified during preconstruction meetings or during the construction process. Please choose from the options below:

☐ PSLs determined during preconstruction meeting
☒ PSLs determined during construction
☐ No PSLs planned for construction

Type	Sheet #s

All off-ROW PSLs required by the Contractor are the Contractor's responsibility. The Contractor shall secure all permits required by local, state, federal laws for off-ROW PSLs. The contractor shall provide diagrams, areas of disturbance, acreage, and BMPs for all off-ROW PSLs within one mile of the project.

1.9 CONSTRUCTION ACTIVITIES:
(Use the following list as a starting point when developing the Construction Activity Schedule and Ceasing Record in Attachment 2.5.)

☒ Mobilization
☒ Install sediment and erosion controls
☒ Blade existing topsoil into windrows, prep ROW, clear and grub
☐ Remove existing pavement
☒ Grading operations, excavation, and embankment
☒ Excavate and prepare subgrade for proposed pavement widening
☐ Remove existing culverts, safety end treatments (SETs)
☐ Remove existing metal beam guard fence (MBGF), bridge rail
☒ Install proposed pavement per plans
☒ Install culverts, culvert extensions, SETs
☒ Install mow strip, MBGF, bridge rail
☒ Place flex base
☒ Rework slopes, grade ditches
☒ Blade windrowed material back across slopes
☒ Revegetation of unpaved areas
☒ Achieve site stabilization and remove sediment and erosion control measures
☐ Other: _____
☐ Other: _____
☐ Other: _____

1.10 POTENTIAL POLLUTANTS AND SOURCES:

☒ Sediment laden stormwater from stormwater conveyance over disturbed area
☒ Fuels, oils, and lubricants from construction vehicles, equipment, and storage
☒ Solvents, paints, adhesives, etc. from various construction activities
☒ Transported soils from offsite vehicle tracking
☒ Construction debris and waste from various construction activities
☐ Contaminated water from excavation or dewatering pump-out water
☒ Sanitary waste from onsite restroom facilities
☒ Trash from various construction activities/receptacles
☐ Long-term stockpiles of material and waste
☐ Other: _____
☐ Other: _____
☐ Other: _____

1.11 RECEIVING WATERS:
Receiving waters must be depicted on the Environmental Layout Sheets in Attachment 1.2 of this SWP3. Include Segment # for receiving waters.

Tributaries	Classified Waterbody
SANDY CREEK	BRAZOS RIVER BASIN SEGMENT 1202

* Add (*) for impaired waterbodies with pollutant in ().

1.12 ROLES AND RESPONSIBILITIES: TxDOT

☒ Development of plans and specifications
☐ Submit Notice of Intent (NOI) to TCEQ (≥5 acres)
☒ Post Construction Site Notice
☐ Submit NOI/CSN to local MS4
☒ Perform SWP3 inspections
☒ Maintain SWP3 records and update to reflect daily operations
☐ Complete and submit Notice of Termination to TCEQ
☒ Maintain SWP3 records for 3 years
☐ Other: _____
☐ Other: _____
☐ Other: _____

1.13 ROLES AND RESPONSIBILITIES: CONTRACTOR

☒ Day To Day Operational Control
☐ Submit Notice of Intent (NOI) to TCEQ (≥5 acres)
☒ Post Construction Site Notice
☐ Submit NOI/CSN to local MS4
☒ Maintain schedule of major construction activities
☒ Install, maintain and modify BMPs
☐ Complete and submit Notice of Termination to TCEQ
☒ Maintain SWP3 records for 3 years
☐ Other: _____
☐ Other: _____
☐ Other: _____

1.14 LOCAL MUNICIPAL SEPARATE STORM SEWER SYSTEM (MS4) OPERATOR COORDINATION:

MS4 Entity

(SH 6)
STORMWATER POLLUTION PREVENTION PLAN (SWP3)

Texas Department of Transportation

FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
6			207
STATE	STATE DIST.	COUNTY	
TEXAS	BRY	GRIMES	
CONT.	SECT.	JOB	HIGHWAY NO.
0720	01	044, ETC.	FM 149, ETC.

STORMWATER POLLUTION PREVENTION PLAN (SWP3):

2.0 BEST MANAGEMENT PRACTICES (BMPs) AND CONTROLS, INSPECTION, AND MAINTENANCE

The Contractor shall be the responsible party for implementing the BMPs described herein and for complying with the SWP3 for control of erosion and sedimentation during day-to-day operations. The Contractor shall implement changes to this SWP3 approved by TxDOT within the times specified in this SWP3 or the CGP.

2.1 EROSION CONTROL AND SOIL STABILIZATION BMPs:

T / P

- ☐ ☐ Protection of Existing Vegetation
- ☐ ☐ Vegetated Buffer Zones
- ☐ ☐ Soil Retention Blankets
- ☐ ☐ Geotextiles
- ☐ ☐ Mulching/ Hydromulching
- ☐ ☐ Soil Surface Treatments
- ☒ ☐ Temporary Seeding
- ☐ ☒ Permanent Planting, Sodding or Seeding
- ☐ ☐ Biodegradable Erosion Control Logs
- ☒ ☐ Rock Filter Dams/ Rock Check Dams
- ☒ ☐ Vertical Tracking
- ☐ ☐ Interceptor Swale
- ☐ ☐ Riprap
- ☐ ☐ Diversion Dike
- ☐ ☐ Temporary Pipe Slope Drain
- ☐ ☐ Embankment for Erosion Control
- ☐ ☐ Paved Flumes
- ☐ ☐ Other: _____
- ☐ ☐ Other: _____
- ☐ ☐ Other: _____
- ☐ ☐ Other: _____

2.2 SEDIMENT CONTROL BMPs:

T / P

- ☐ ☐ Biodegradable Erosion Control Logs
- ☐ ☐ Dewatering Controls
- ☐ ☐ Inlet Protection
- ☒ ☐ Rock Filter Dams/ Rock Check Dams
- ☐ ☐ Sandbag Berms
- ☒ ☐ Sediment Control Fence
- ☐ ☐ Stabilized Construction Exit
- ☐ ☐ Floating Turbidity Barrier
- ☐ ☐ Vegetated Buffer Zones
- ☐ ☐ Vegetated Filter Strips
- ☐ ☐ Other: _____
- ☐ ☐ Other: _____
- ☐ ☐ Other: _____
- ☐ ☐ Other: _____

Refer to the Environmental Layout Sheets/ SWP3 Layout Sheets located in Attachment 1.2 of this SWP3

Sediment control BMPs requiring design capacity calculations (See SWP3 Attachment 1.3.):

T / P

- ☐ ☐ Sediment Trap
  - ☐ Calculated volume runoff from 2-year, 24-hour storm for each acre of disturbed area
  - ☐ 3,600 cubic feet of storage per acre drained
- ☐ ☐ Sedimentation Basin
  - ☐ Not required (<10 acres disturbed)
  - ☐ Required (>10 acres) and implemented.
    - ☐ Calculated volume runoff from 2-year, 24-hour storm for each acre of disturbed area
    - ☐ 3,600 cubic feet of storage per acre drained
  - ☐ Required (>10 acres), but not feasible due to:
    - ☐ Available area/Site geometry
    - ☐ Site slope/Drainage patterns
    - ☐ Site soils/Geotechnical factors
    - ☐ Public safety
    - ☐ Other: _____

2.3 PERMANENT CONTROLS:

(Coordinate post-construction BMPs with appropriate TxDOT maintenance sections.)

BMPs To Be Left In Place Post Construction:

Type	Stationing	
	From	To

Refer to the Environmental Layout Sheets/ SWP3 Layout Sheets located in Attachment 1.2 of this SWP3

2.4 OFFSITE VEHICLE TRACKING CONTROLS:

- ☒ Excess dirt/mud on road removed daily
- ☐ Haul roads dampened for dust control
- ☒ Loaded haul trucks to be covered with tarpaulin
- ☐ Stabilized construction exit
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____

2.5 POLLUTION PREVENTION MEASURES:

- ☒ Chemical Management
- ☒ Concrete and Materials Waste Management
- ☒ Debris and Trash Management
- ☒ Dust Control
- ☒ Sanitary Facilities
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____

2.6 VEGETATED BUFFER ZONES:

Natural vegetated buffers shall be maintained as feasible to protect adjacent surface waters. If vegetated natural buffer zones are not feasible due to site geometry, the appropriate additional sediment control measures have been incorporated into this SWP3.

Type	Stationing	
	From	To

Refer to the Environmental Layout Sheets/ SWP3 Layout Sheets located in Attachment 1.2 of this SWP3

2.7 ALLOWABLE NON-STORMWATER DISCHARGES:

- ☒ Fire hydrant flushings
- ☒ Irrigation drainage
- ☒ Pavement washwater (where spills or leaks have not occurred, and detergents are not used)
- ☒ Potable water sources
- ☒ Springs
- ☒ Uncontaminated groundwater
- ☒ Water used to wash vehicles or control dust
- ☒ Other allowable non-stormwater discharges as allowed by TPDES GP TXR150000.

2.8 INSPECTIONS:

All disturbed areas and erosion and sediment control devices shall be inspected at least once every seven (7) days. Inspections shall be performed by TxDOT as indicated on the Field Inspection and Maintenance Report Form 2118 and retained in Attachment 2.5 of this SWP3 .

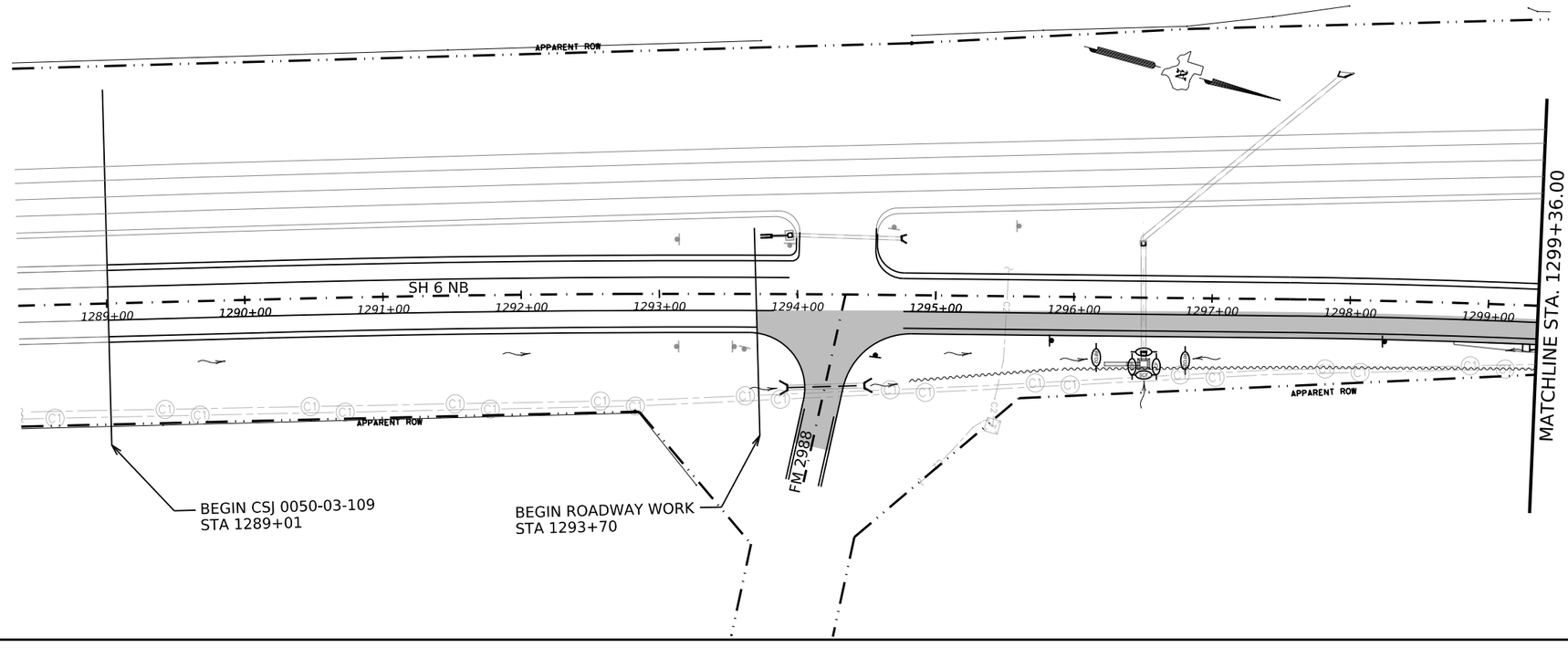
2.9 MAINTENANCE:

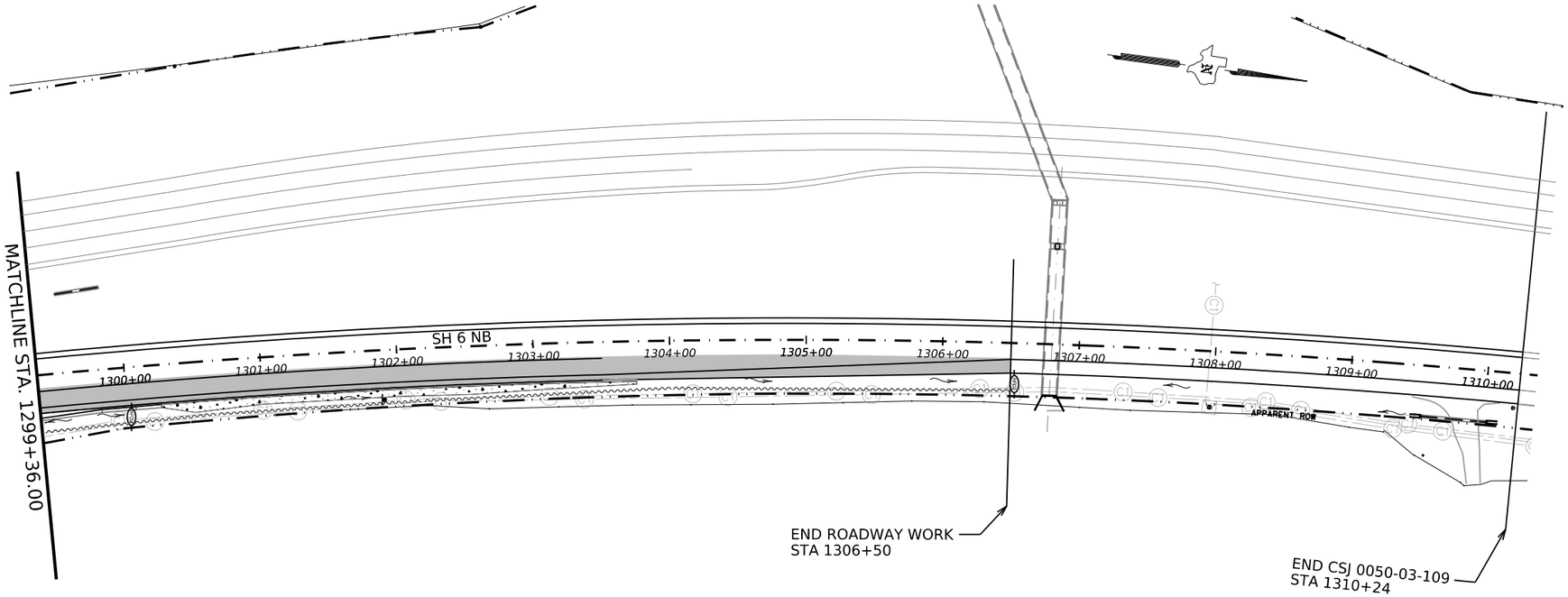
Control measures shall be properly installed according to specifications. If it is determined that a BMP or control measure is not operating effectively, maintenance must be accomplished as soon as possible and before the next anticipated rain event, but in no case later than 7 calendar days after being able to access the site. Maintenance shall be performed by the Contractor as indicated on the Field Inspection and Maintenance Report Form 2118 and retained in Attachment 2.5 of this SWP3.

(SH 6)
STORMWATER POLLUTION PREVENTION PLAN (SWP3)

Texas Department of Transportation

FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
6			208
STATE	STATE DIST.	COUNTY	
TEXAS	BRY	GRIMES	
CONT.	SECT.	JOB	HIGHWAY NO.
0720	01	044, ETC.	FM 149, ETC.





LEGEND

SCF	SEDIMENT CONTROL FENCE
RFD1	ROCK FILTER DAM (TY 1)
RFD2	ROCK FILTER DAM (TY 2)
	TOP SOIL BERM

GENERAL NOTES:

SEDIMENT CONTROL FENCE ESTIMATED AT 20' EACH, UNLESS OTHERWISE NOTED.
TY 1 AND TY 2 ROCK FILTER DAM ESTIMATED AT 20' EACH, ONLESS OTHERWISE NOTED.

STATE OF TEXAS
JEAN J. FENG
102035
LICENSED
PROFESSIONAL ENGINEER

04/20/2023

HORIZONTAL
0 50 100 200 FT

PRINT DATE	REVISION DATE
4/19/2023	

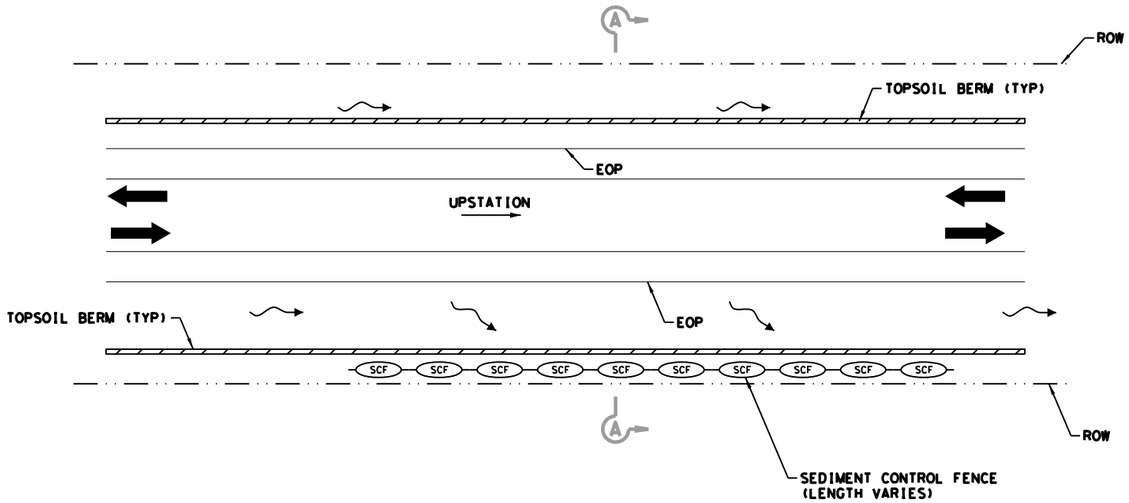
Texas Department of Transportation
Bryan District

SW3P LAYOUT (SH 6)

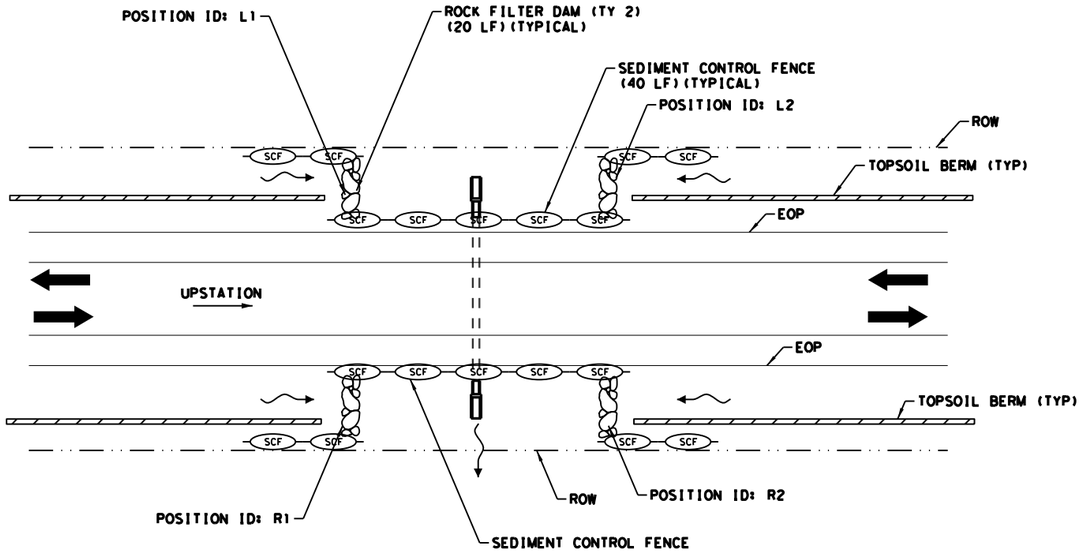
FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 149, ETC.

STATE	DISTRICT	COUNTY	
TEXAS	BRY	GRIMES	
CONTROL	SECTION	JOB	SHEET NO.
0720	01	044, ETC.	209

REV DATE: 4/17/2023
CSJ: 0050-03-109
FILENAME: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY/Design Projects/0050031094 - Design/Plan Set/10. Environmental/10A. SW3P/SW3P LAYOUT (SH 6)

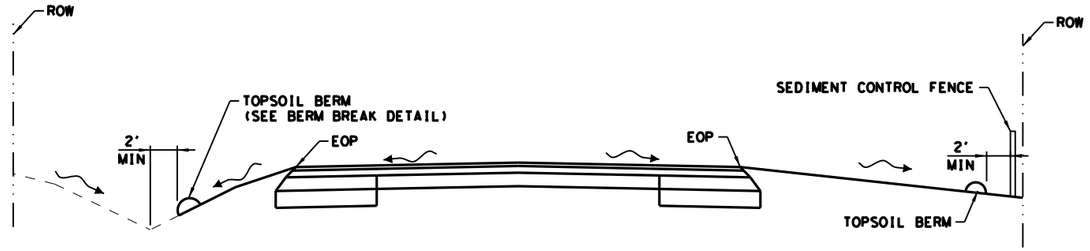


SEDIMENT CONTROL FENCE AT OFF-SITE FLOW

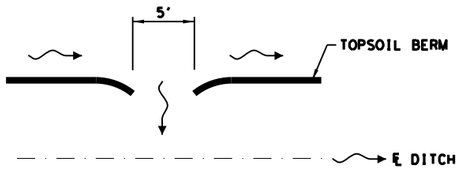


SW3P DEVICES AT CULVERTS

1. PLACE EACH END OF THE ROCK FILTER DAM SUFFICIENTLY HIGH TO PREVENT FLOW AROUND EITHER END OF THE DAM



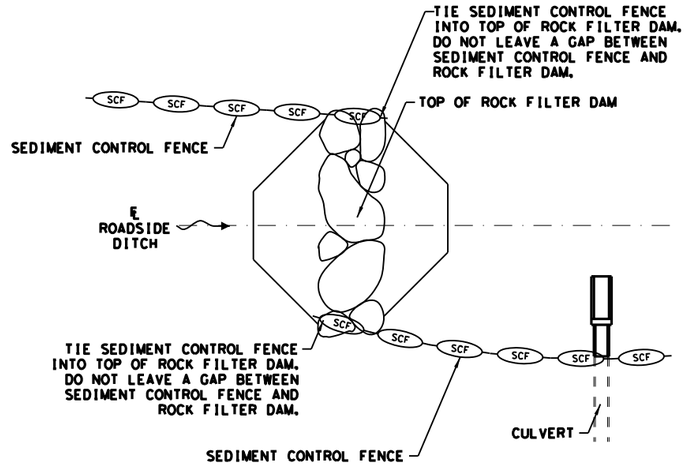
SECTION A-A



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.



SEDIMENT CONTROL FENCE - ROCK FILTER DAM TIE-IN

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.

STATE OF TEXAS
JEAN J. FENG
102035
LICENSED
PROFESSIONAL ENGINEER

04/20/2023

PRINT DATE	REVISION DATE
4/19/2023	

Texas Department of Transportation
Bryan District

SW3P DETAILS

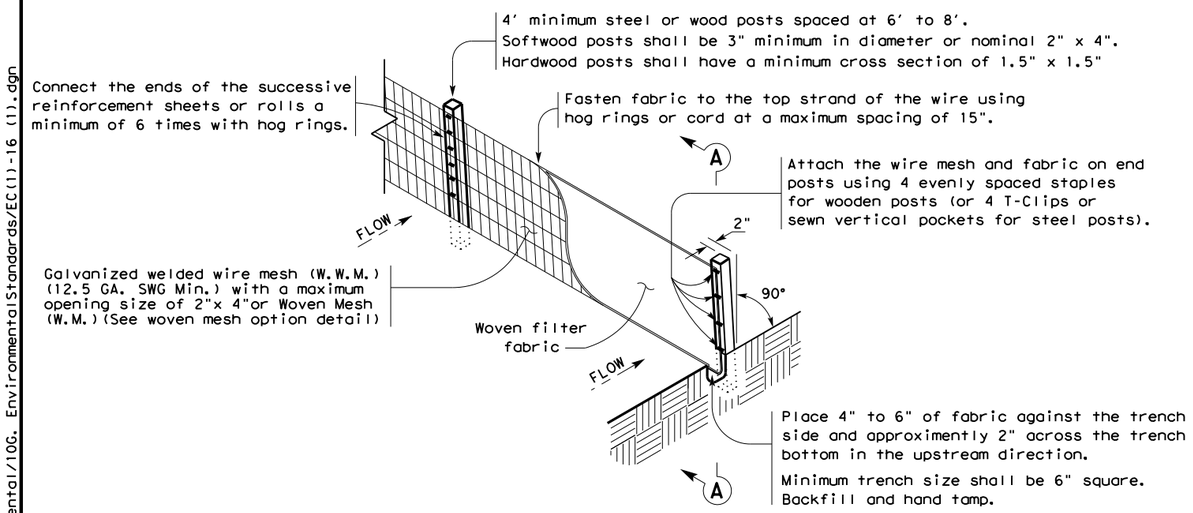
FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 149, ETC.

STATE	DISTRICT	COUNTY
TEXAS	BRY	GRIMES

CONTROL	SECTION	JOB	SHEET NO.
0720	01	044, ETC.	210

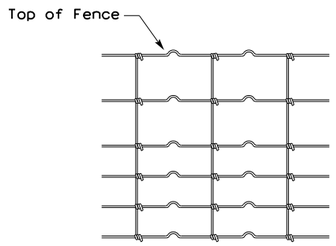
REV DATE: 3/28/2023
CSJ: 0720-01-044
FILENAME: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY/Design Projects/0720010444 - Design/Plan Set/10. Environmental/10A. SW3P/SW3P DETAILS.dgn

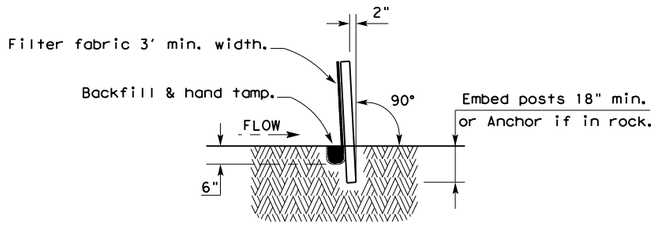
DATE: 4/19/2023
FILE: txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY/Design Projects/0720010044/4 - Design/Plan Set/10. Environmental/10G. EnvironmentalStandards/EC(1)-16 (1).dgn



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.

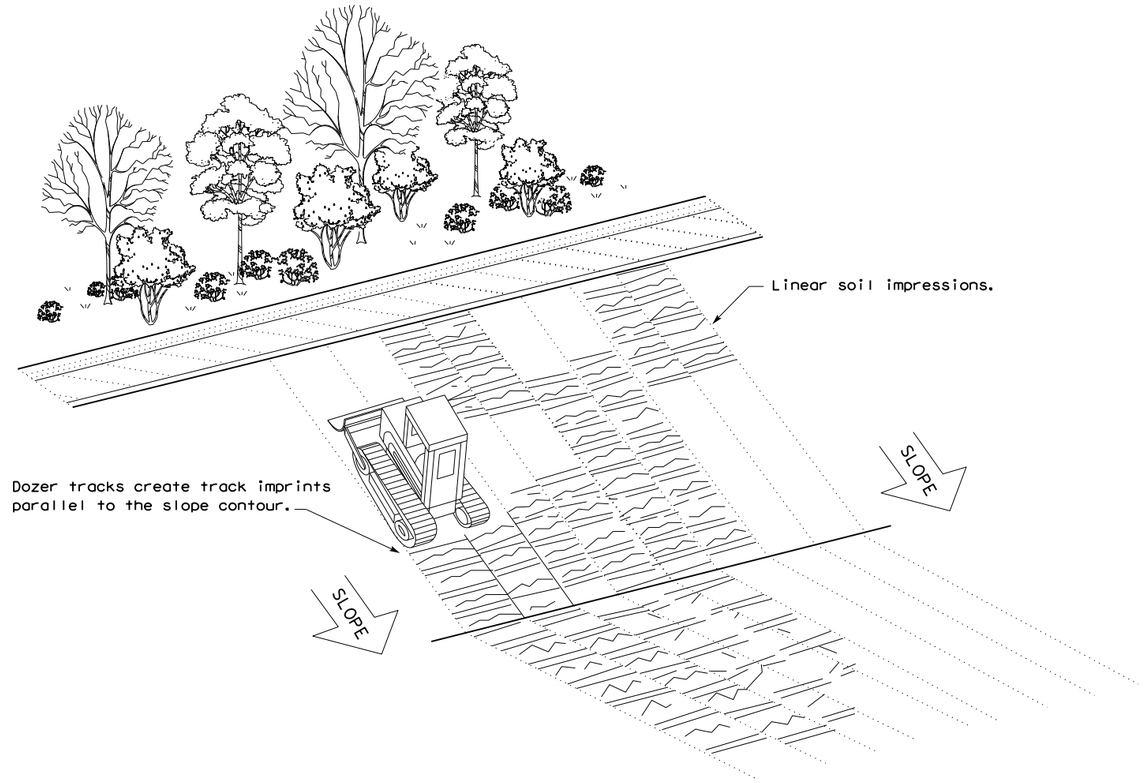
LEGEND

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

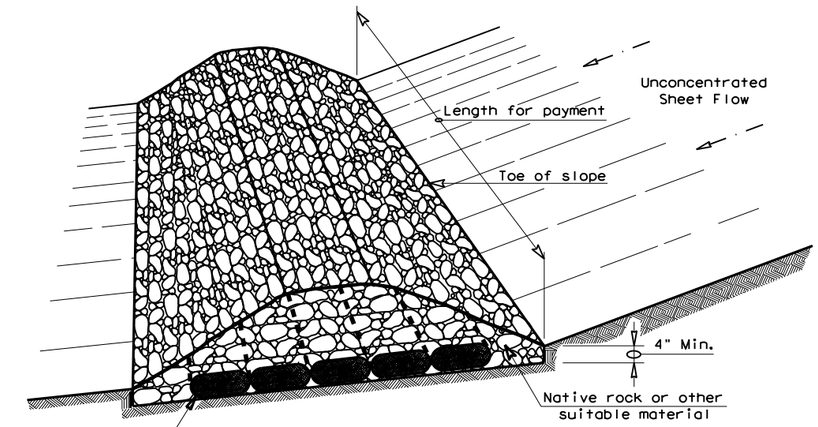
TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

FENCE & VERTICAL TRACKING

EC(1)-16

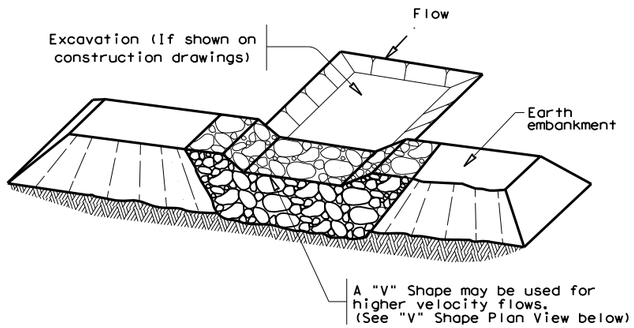
FILE: ec116	DN: TxDOT	CK: KM	DW: VP	DN/CK: LS
© TxDOT: JULY 2016	CONT	SECT	JOB	HIGHWAY
REVISIONS	0720	01	044, ETC.	FM 149, ETC.
	DIST	COUNTY		SHEET NO.
	BRYAN	GRIMES		211

DATE: 4/19/2023
FILE: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY/Design Projects/072001044/4 - Design/Plan Set/10. Environmental/10G. EnvironmentalStandards/EC(2)-16.dgn



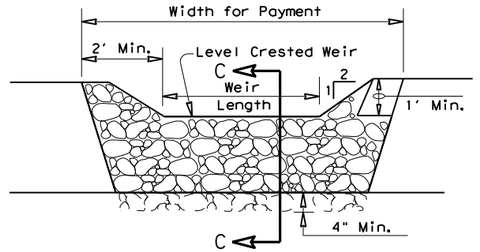
FILTER DAM AT TOE OF SLOPE

RFD1

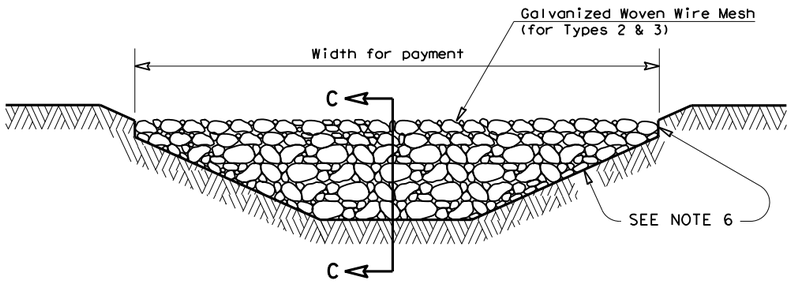


FILTER DAM AT SEDIMENT TRAP

RFD1 — OR — RFD2

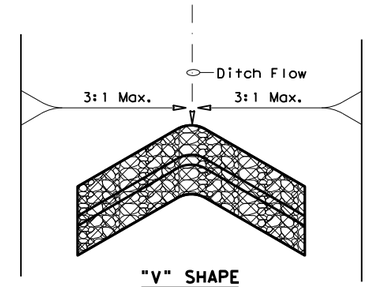


PROFILE

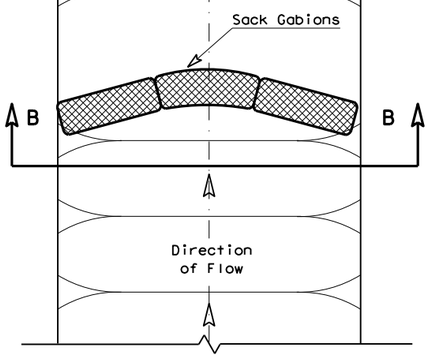


FILTER DAM AT CHANNEL SECTIONS

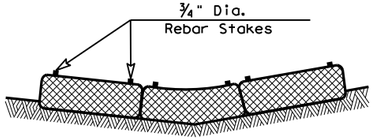
RFD1 — OR — RFD2 — OR — RFD3



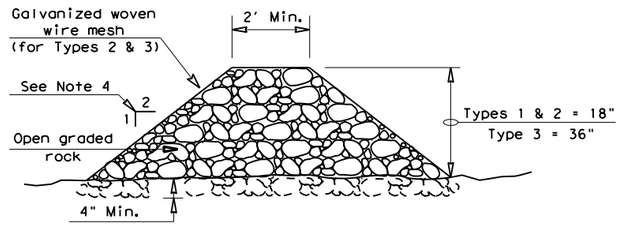
"V" SHAPE
PLAN VIEW



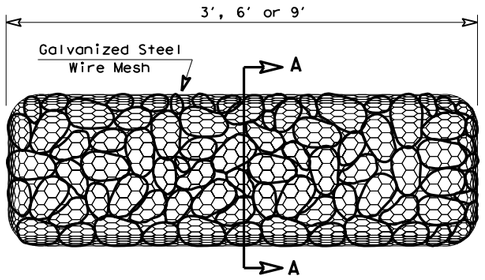
PLAN VIEW



SECTION B-B

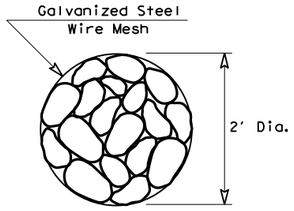


SECTION C-C



TYPE 4 (SACK GABIONS)

RFD4



SECTION A-A

ROCK FILTER DAM USAGE GUIDELINES

Rock Filter Dams should be constructed downstream from disturbed areas to intercept sediment from overland runoff and/or concentrated flow. The dams should be sized to filter a maximum flow through rate of 60 GPM/FT^2 of cross sectional area. A 2 year storm frequency may be used to calculate the flow rate.

Type 1 (18" high with no wire mesh) (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

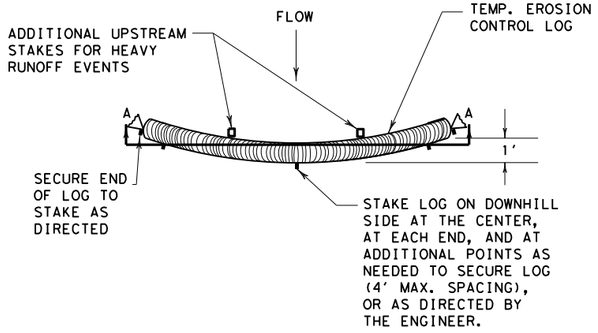
TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

ROCK FILTER DAMS

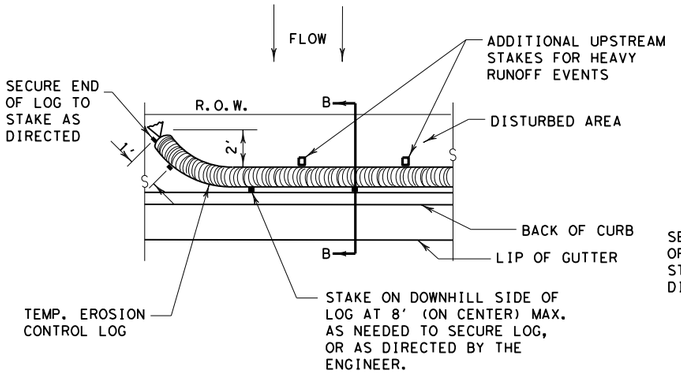
EC(2)-16

FILE: ec216	DN: TxDOT	CK: KM	DW: VP	DN/CK: LS
© TxDOT: JULY 2016	CONT	SECT	JOB	HIGHWAY
REVISIONS	0720	01	044, ETC.	FM 149, ETC.
	DIST	COUNTY		SHEET NO.
	BRYAN	GRIMES		212

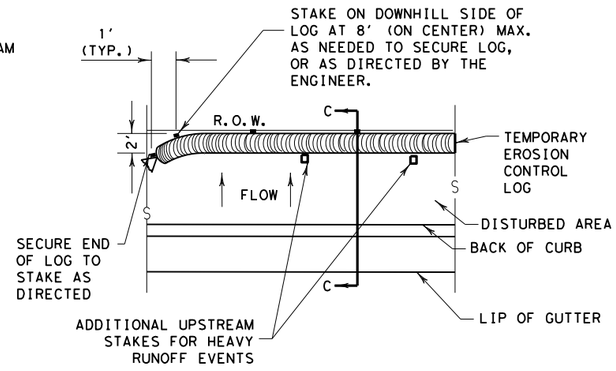
DATE: 4/19/2023
FILE: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY/Design Projects/0720010444 - Design/Plan Set/10. Environmental/10G. Environmental Standards/EC(9)-16.dgn



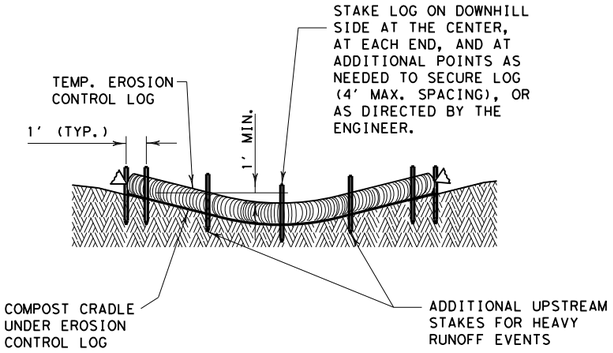
PLAN VIEW



PLAN VIEW



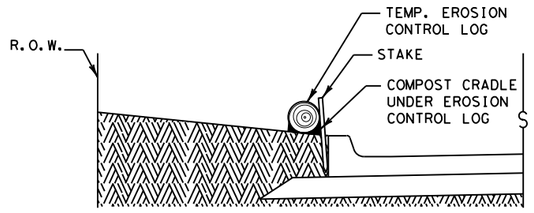
PLAN VIEW



SECTION A-A

EROSION CONTROL LOG DAM

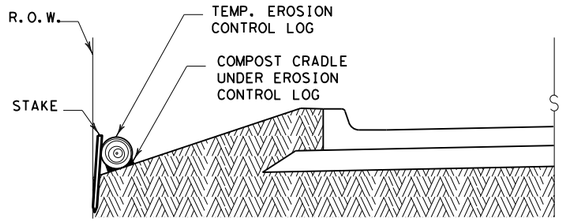
CL-D



SECTION B-B

EROSION CONTROL LOG AT BACK OF CURB

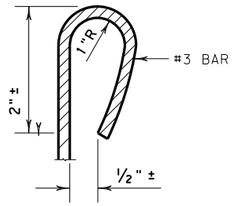
CL-BOC



SECTION C-C

EROSION CONTROL LOG AT EDGE OF RIGHT-OF-WAY

CL-ROW



REBAR STAKE DETAIL

LEGEND

- CL-D — EROSION CONTROL LOG DAM
- CL-BOC — EROSION CONTROL LOG AT BACK OF CURB
- CL-ROW — EROSION CONTROL LOG AT EDGE OF RIGHT-OF-WAY
- CL-SST — EROSION CONTROL LOGS ON SLOPES STAKE AND TRENCHING ANCHORING
- CL-SSL — EROSION CONTROL LOGS ON SLOPES STAKE AND LASHING ANCHORING
- CL-DI — EROSION CONTROL LOG AT DROP INLET
- CL-CI — EROSION CONTROL LOG AT CURB INLET
- CL-GI — EROSION CONTROL LOG AT CURB & GRATE INLET

GENERAL NOTES:

1. EROSION CONTROL LOGS SHALL BE INSTALLED IN ACCORDANCE WITH MANFACTURER'S RECOMMENDATIONS, OR AS DIRECTED BY THE ENGINEER.
2. LENGTHS OF EROSION CONTROL LOGS SHALL BE IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS AND AS REQUIRED FOR THE PURPOSE INTENDED.
3. UNLESS OTHERWISE DIRECTED, USE BIODEGRADABLE OR PHOTODEGRADABLE CONTAINMENT MESH ONLY WHERE LOG WILL REMAIN IN PLACE AS PART OF A VEGETATIVE SYSTEM. FOR TEMPORARY INSTALLATIONS, USE RECYCLABLE CONTAINMENT MESH.
4. FILL LOGS WITH SUFFICIENT FILTER MATERIAL TO ACHIEVE THE MINIMUM COMPACTED DIAMETER SPECIFIED IN THE PLANS WITHOUT EXCESSIVE DEFORMATION.
5. STAKES SHALL BE 2" X 2" WOOD OR #3 REBAR, 2'-4' LONG, EMBEDDED SUCH THAT 2" PROTRUDES ABOVE LOG, OR AS DIRECTED BY THE ENGINEER.
6. DO NOT PLACE STAKES THROUGH CONTAINMENT MESH.
7. COMPOST CRADLE MATERIAL IS INCIDENTAL & WILL NOT BE PAID FOR SEPARATELY.
8. SANDBAGS USED AS ANCHORS SHALL BE PLACED ON TOP OF LOGS & SHALL BE OF SUFFICIENT SIZE TO HOLD LOGS IN PLACE.
9. TURN THE ENDS OF EACH ROW OF LOGS UPSLOPE TO PREVENT RUNOFF FROM FLOWING AROUND THE LOG.
10. FOR HEAVY RUNOFF EVENTS, ADDITIONAL UPSTREAM STAKES MAY BE NECESSARY TO KEEP LOG FROM FOLDING IN ON ITSELF.

SEDIMENT BASIN & TRAP USAGE GUIDELINES

An erosion control log sediment trap may be used to filter sediment out of runoff draining from an unstabilized area.

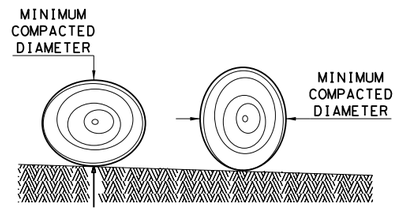
Log Traps: The drainage area for a sediment trap should not exceed 5 acres. The trap capacity should be 1800 CF/Acre (0.5" over the drainage area).

Control logs should be placed in the following locations:

1. Within drainage ditches spaced as needed or min. 500' on center
2. Immediately preceding ditch inlets or drain inlets
3. Just before the drainage enters a water course
4. Just before the drainage leaves the right of way
5. Just before the drainage leaves the construction limits where drainage flows away from the project.

The logs should be cleaned when the sediment has accumulated to a depth of 1/2 the log diameter.

Cleaning and removal of accumulated sediment deposits is incidental and will not be paid for separately.



DIAMETER MEASUREMENTS OF EROSION CONTROL LOGS SPECIFIED IN PLANS

Texas Department of Transportation

Design Division Standard

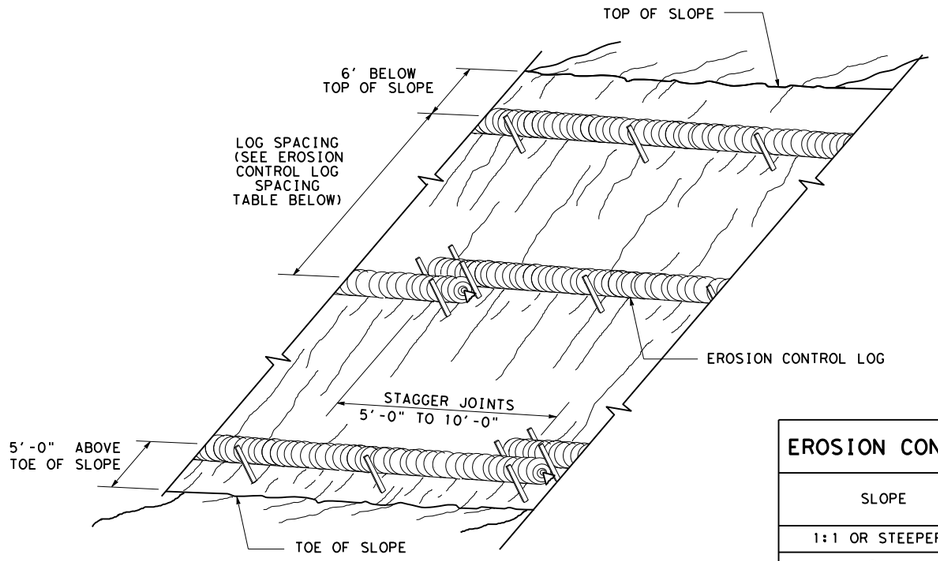
TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

EROSION CONTROL LOG

EC(9)-16

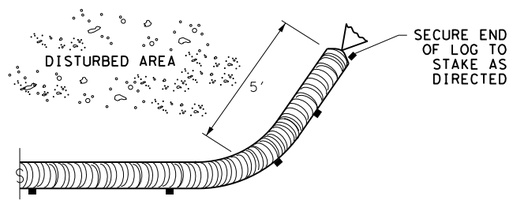
FILE: ec916	DN: TxDOT	CK: KM	DW: LS/PT	CK: LS
© TxDOT: JULY 2016	CONT	SECT	JOB	HIGHWAY
REVISIONS	0720	01	044, ETC.	FM 149, ETC.
	DIST	COUNTY		SHEET NO.
	BRYAN	GRIMES		213

DATE: 4/19/2023
FILE: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY/Design Projects/072001044/4 - Design/Plan Set/10. Environmental/10G. EnvironmentalStandards/EC(9)-16.dgn



EROSION CONTROL LOGS ON SLOPES
STAKE AND TRENCHING ANCHORING

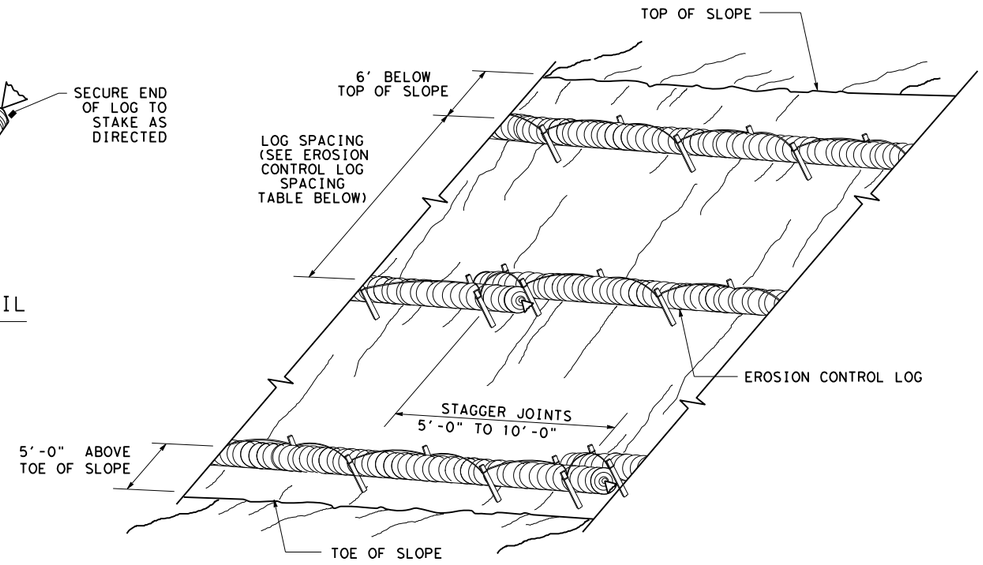
CL-SST



END SECTION RAP DETAIL

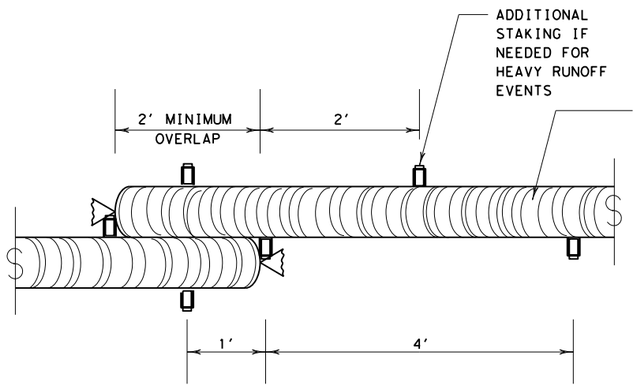
EROSION CONTROL LOG SPACING TABLE				
SLOPE	LOG DIAMETER			
	6"	8"	12"	18"
1:1 OR STEEPER	5'	10'	15'	20'
2:1	10'	20'	30'	40'
3:1	15'	30'	45'	60'
4:1 OR FLATTER	20'	40'	60'	80'

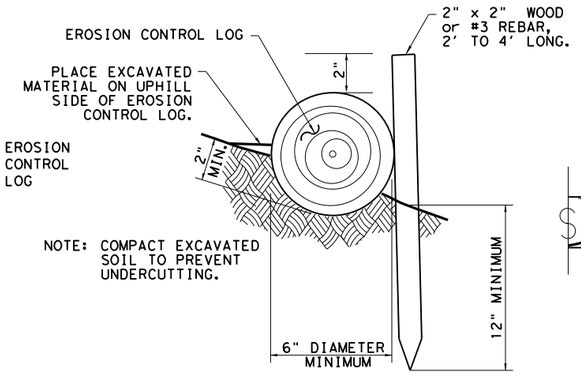
* ADJUSTMENTS CAN BE MADE FOR SOIL TYPE:
SOFT, LOAMY SOILS-ADJUST ROWS CLOSER TOGETHER;
HARD, ROCKY SOILS- ADJUST ROWS FARTHER APART



EROSION CONTROL LOGS ON SLOPES
STAKE AND LASHING ANCHORING

CL-SSL

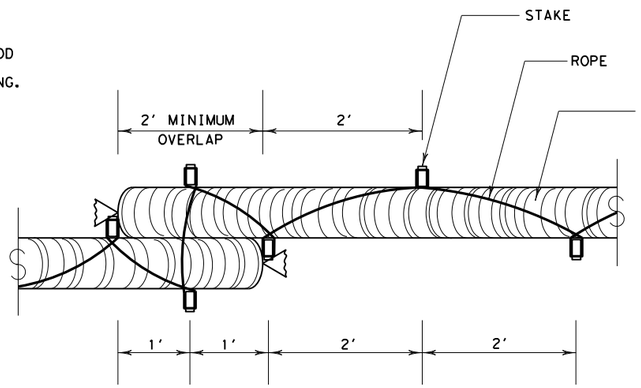




STAKE AND TRENCHING ANCHORING DETAIL

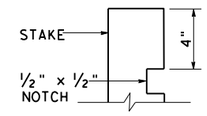
CL-SST

TRENCH DEPTH TABLE	
LOG DIAMETER	DEPTH
6"	2"
8"	3"
12"	4"
18"	5"

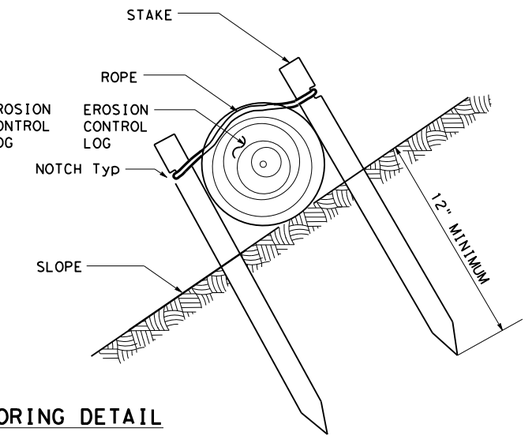


STAKE AND LASHING ANCHORING DETAIL

CL-SSL



STAKE NOTCH DETAIL

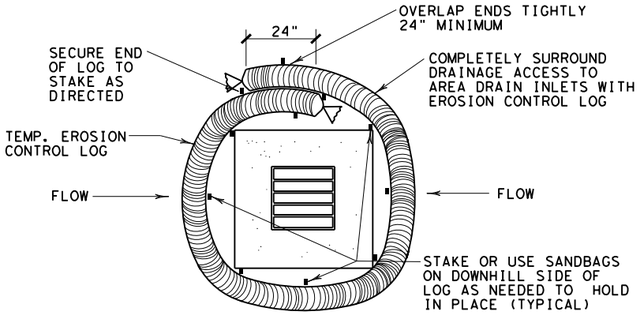


Texas Department of Transportation — Design Division Standard

TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES
EROSION CONTROL LOG
EC(9)-16

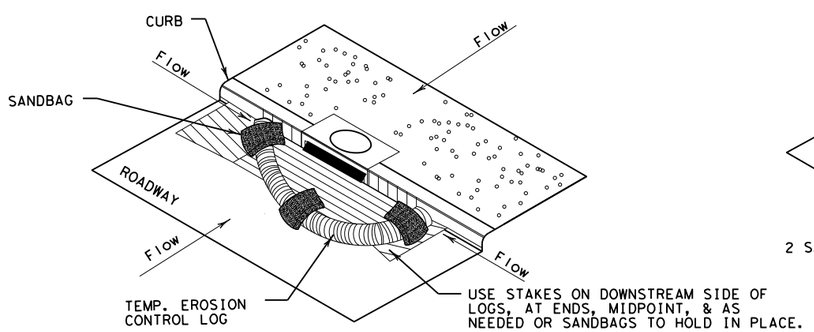
FILE: ec116	DN: TxDOT	CK: KM	DW: LS/PT	CK: LS
© TxDOT: JULY 2016	CONT	SECT	JOB	HIGHWAY
REVISIONS	0720	01	044, ETC.	FM 149, ETC.
	DIST	COUNTY		SHEET NO.
	BRYAN	GRIMES		214

DATE: 4/19/2023
FILE: pw://txdot.projectwiseonline.com:TxDOT4/Documents/17 - BRY/Design Projects/0720010044/4 - Design/Plan Set/10. Environmental/10G. EnvironmentalStandards/EC(9)-16.dgn



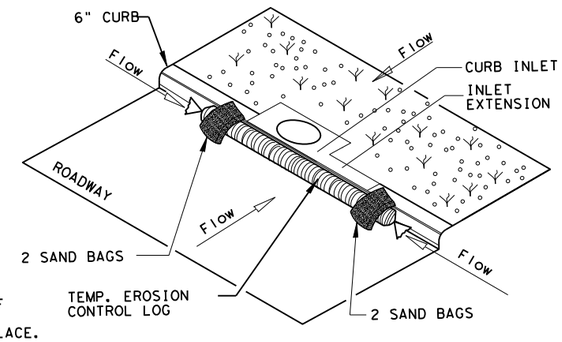
EROSION CONTROL LOG AT DROP INLET

CL-DI



EROSION CONTROL LOG AT CURB INLET

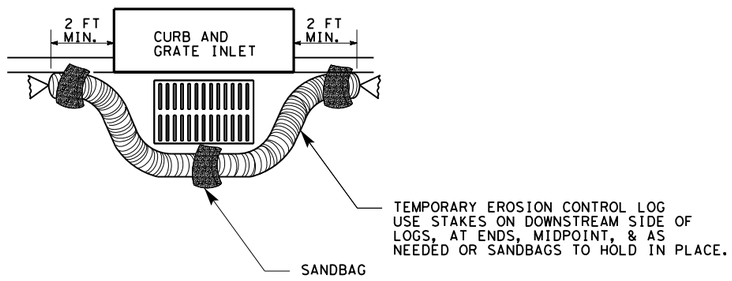
CL-CI



EROSION CONTROL LOG AT CURB INLET

CL-CI

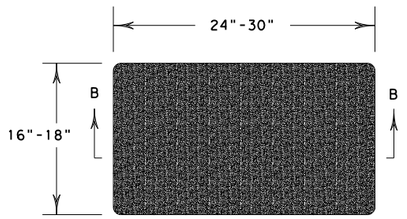
NOTE:
EROSION CONTROL LOGS USED AT CURB INLETS SHOULD ONLY BE USED IF THEY WILL NOT IMPEDE TRAFFIC OR FLOOD THE ROADWAY OR WHEN THE STORM SEWER SYSTEM IS NOT FULLY FUNCTIONAL.



EROSION CONTROL LOG AT CURB & GRADE INLET

CL-GI

SECTION B-B



SANDBAG DETAIL

SHEET 3 OF 3

Texas Department of Transportation

Design Division Standard

TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

EROSION CONTROL LOG

EC(9)-16

FILE: ec916	DN: TxDOT		CK: KM	DW: LS/PT		CK: LS
© TxDOT: JULY 2016	CONT	SECT	JOB		HIGHWAY	
REVISIONS	0720	01	044, ETC.		FM 149, ETC.	
	DIST	COUNTY			SHEET NO.	
	BRYAN	GRIMES			215	