SEE SHEET 2 FOR INDEX OF SHEETS

STATE OF TEXAS
DEPARTMENT OF TRANSPORTATION

FM 422
MAIN LANE DESIGN SPEED = 45 MPH
ADT (2022) = 350
ADT (20 YR PROJECTED ADT) = 600
FUNCTIONAL CLASSIFICATION: MAJOR COLLECTOR

FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		SHEET NO.
6	F 2B24(123)		1
STATE	DIST.	COUNTY	
TEXAS	WFS.	BAYLOR	
CONT.	SECT.	JOB	HIGHWAY NO.
0814	01	036	FM 422

PLANS OF PROPOSED
STATE HIGHWAY IMPROVEMENT

FEDERAL AID PROJECT NO. :F 2B24(123)
CONTROL SECTION JOB : 0814-01-036

BAYLOR COUNTY
FM 422

LIMITS: FROM STADIUM DRIVE
TO FM 1790

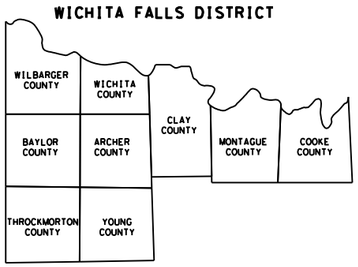
TOTAL LENGTH OF PROJECT =

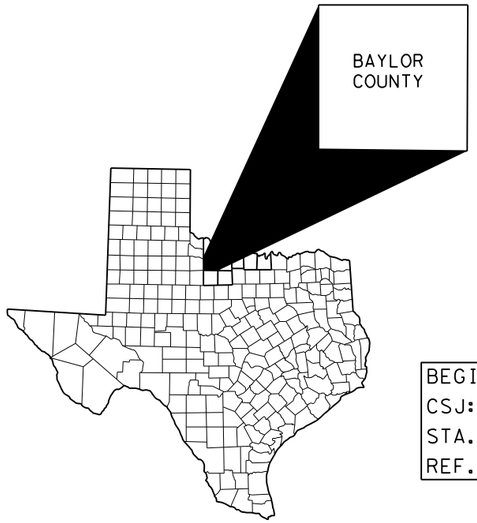
BRIDGE	= 0.00 FT.	=	0.000MI.
ROADWAY	= 31,888.29 FT.	=	6.039MI.
TOTAL	= 31,888.29 FT.	=	6.039MI.

TYPE OF WORK: REHABILITATION OF EXISTING ROADWAY
CONSISTING OF: PROVIDE ADDITIONAL PAVEMENT WIDTH

CONTRACTOR NAME:_____
CONTRACTOR ADDRESS:_____
LETTING DATE:_____
DATE WORK BEGAN:_____
DATE WORK COMPLETED:_____
DATE OF ACCEPTANCE:_____

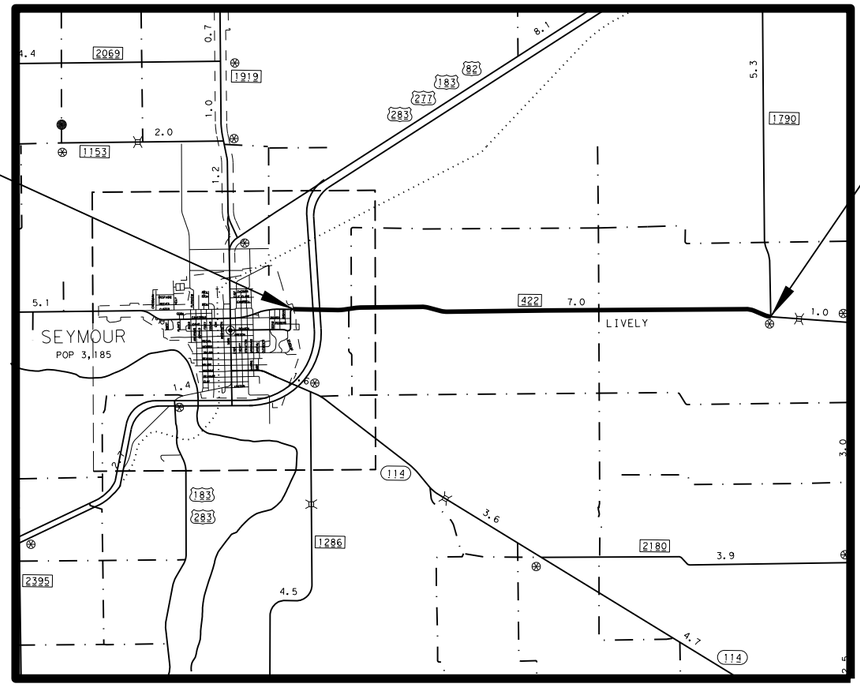
WICHITA FALLS DISTRICT





BEGIN PROJECT
CSJ: 0814-01-036
STA. 45+00.00
REF. MARKER 446-0.941

END PROJECT
CSJ: 0814-01-036
STA. 363+88.29
REF. MARKER 450+1.048



0 1 2
SCALE IN MILES

NO EXCEPTIONS
NO EQUATIONS
NO RAILROAD CROSSINGS

Texas Department of Transportation ®
© TxDOT 2024

SUBMITTED FOR LETTING 04/04/2024
Bryson Lawrence, P.E.
DESIGN ENGINEER

RECOMMENDED FOR LETTING 04/05/2024
James S. Reaves P.E.
DISTRICT DIRECTOR OF TRANSPORTATION PLANNING AND DEVELOPMENT

RECOMMENDED FOR LETTING 04/05/2024
Michael D. Barnes P.E.
DISTRICT ENGINEER

COUNTY_____ PROJ. NO._____
HWY. NO._____ LETTING DATE_____
DATE ACCEPTED_____

SPECIFICATIONS ADOPTED BY THE TEXAS DEPARTMENT OF TRANSPORTATION, NOVEMBER 1, 2014, AND SPECIFICATION ITEMS LISTED AND DATED AS FOLLOWS, SHALL GOVERN ON THIS PROJECT: REQUIRED CONTRACT PROVISIONS FEDERAL-AID CONSTRUCTION CONTRACTS (FORM FHWA 1273, OCT 2023).

FILE: pw://txdot.projectwiseonline.com:TXDOT2/Documents/03 - WFS/Design Projects/081401036/4 - Design/Plan Set/1. General/TITLESHEET FM 422
DATE: 4/2/2024

INDEX OF SHEETS

STATE OF TEXAS
BRYSON P. LAWRENCE
129839
LICENSED
PROFESSIONAL ENGINEER

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

Bryson Lawrence, P.E. — 05/03/2024

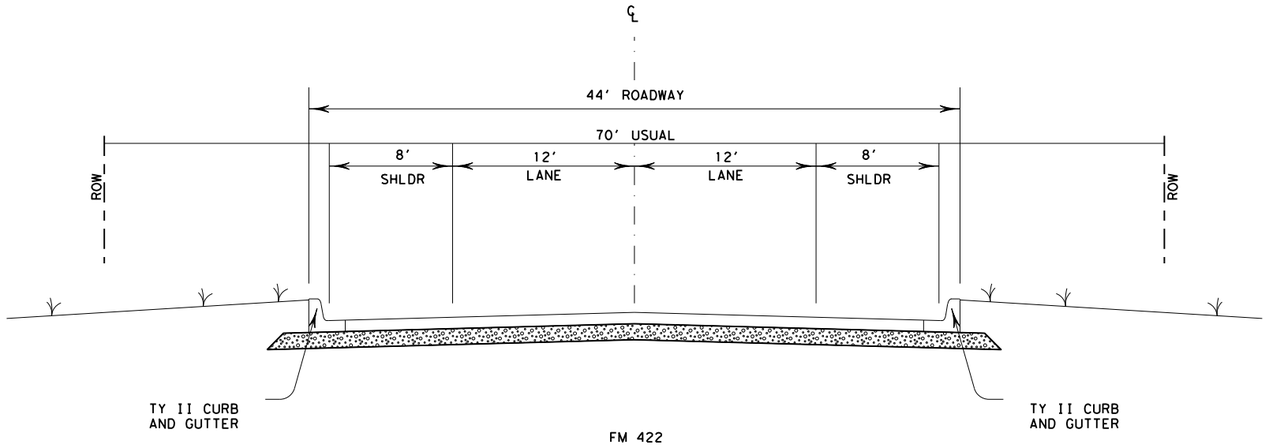
NAME — DATE

Texas Department of Transportation

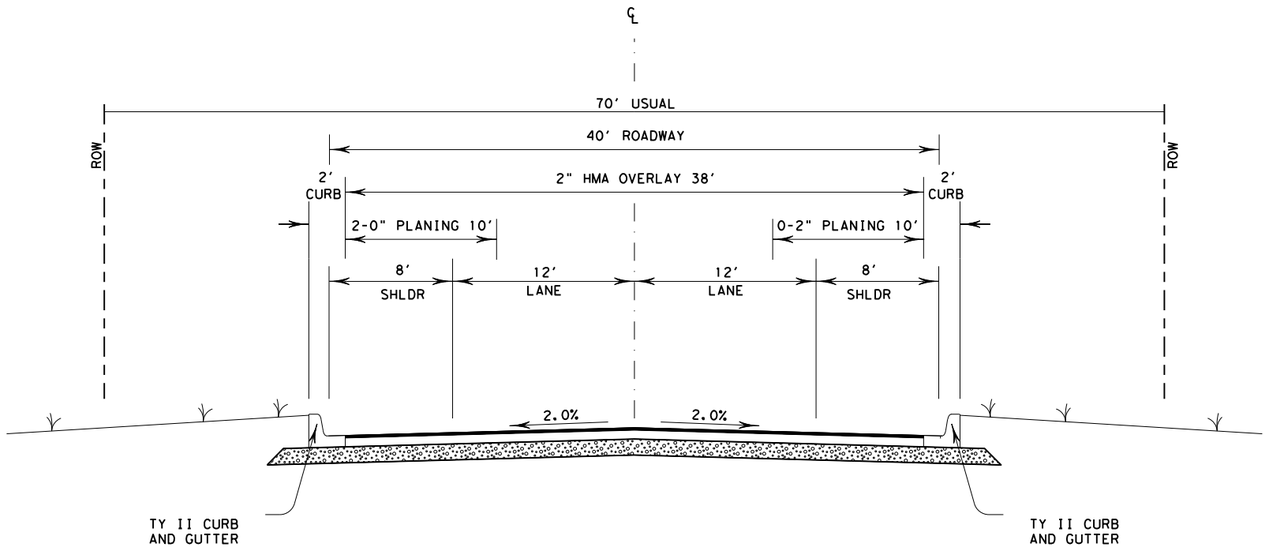
FM 422
INDEX OF SHEETS

CONT	SECT	JOB	HIGHWAY
0814	01	036	FM 422
DIST	COUNTY		SHEET NO.
WFS.	BAYLOR		2

DATE: 5/2/2024 4:13:00 PM
FILE: pw://txdot.projectwiseonline.com:TXDOT2/Documents/03 - WFS/Design Projects/0814010364 - Design/Plan Set/1. General/INDEX OF SHEETS.dgn



FM 422
EXISTING TYPICAL SECTION
STA. 45+00.00 TO STA. 54+95.14



FM 422
PROPOSED TYPICAL SECTION
STA. 45+00.00 TO STA. 54+95.14

MATCH ALL EXISTING CROSS SLOPES
INCLUDING AREAS WITH EXISTING SUPERELEVATION

STATE OF TEXAS
BRYSON P. LAWRENCE
129839
LICENSED
PROFESSIONAL ENGINEER

Bryson Lawrence, P.E.

04/04/2024

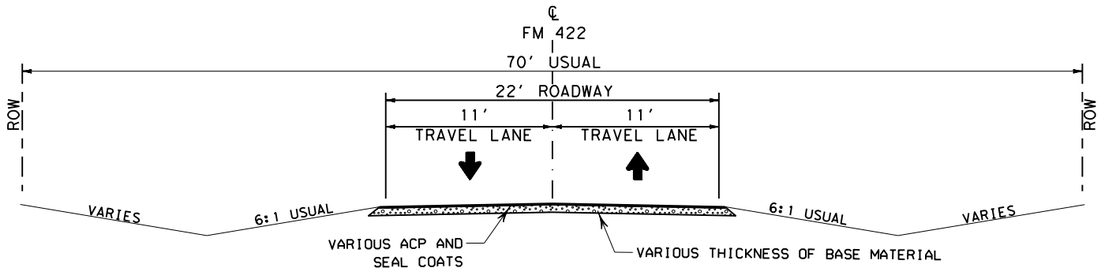
FM 422
TYPICAL SECTIONS

Texas Department of Transportation®

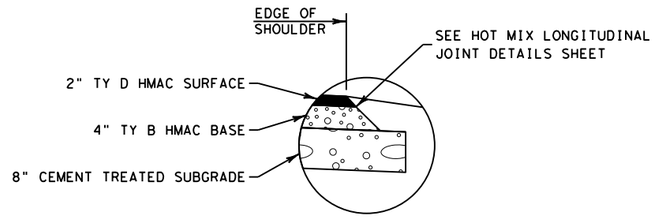
SHEET 1 OF 4

CONT	SECT	JOB	HIGHWAY
0814	01	036	FM 422
DIST	COUNTY		SHEET NO.
WFS.	BAYLOR		3

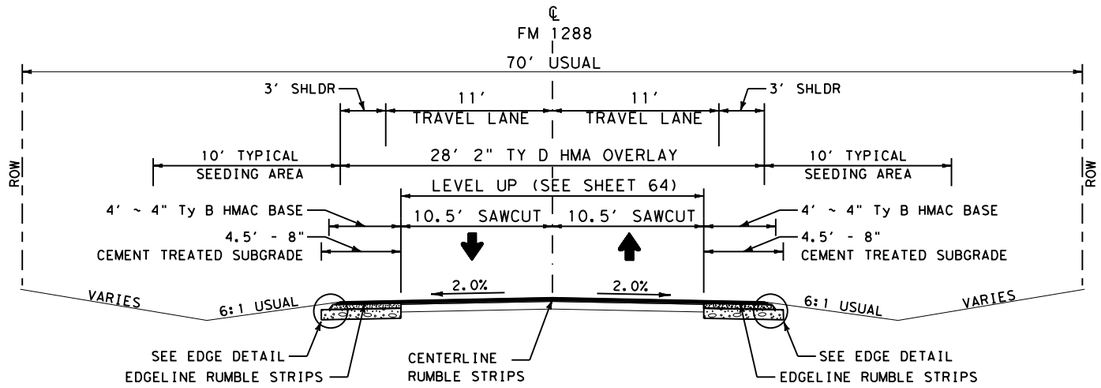
DATE: 4/4/2024 12:01:42 PM
FILE: pw://txdot.projectwiseonline.com:TXDOT2/Documents/03 - WFS/Design Projects/0814010364 - Design/Plan Set/1. General/TYPICAL SECTIONS FM 422



FM 422
EXISTING TYPICAL SECTION
STA. 54+95.14 TO STA. 59+82.15
STA. 62+04.76 TO STA. 64+56.47
STA. 66+60.70 TO STA. 363+88.29



EDGE DETAIL



FM 422
PROPOSED TYPICAL SECTION
STA. 54+95.14 TO STA. 59+82.15
STA. 62+04.76 TO STA. 64+56.47
STA. 66+60.70 TO STA. 363+88.29

STATE OF TEXAS
BRYSON P. LAWRENCE
129839
LICENSED
PROFESSIONAL ENGINEER

Bryson Lawrence, P.E.

03/29/2024

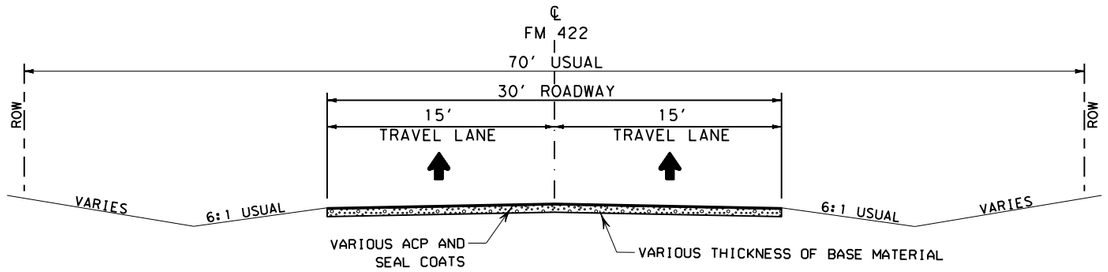
FM 422
TYPICAL SECTIONS

Texas Department of Transportation®

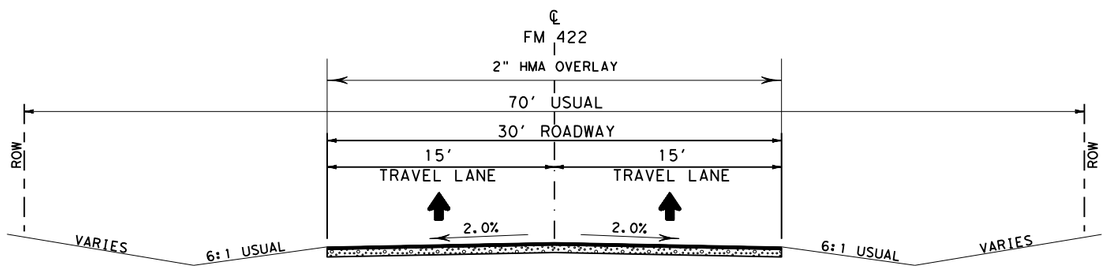
SHEET 2 OF 4

CONT	SECT	JOB	HIGHWAY
0814	01	036	FM 422
DIST	COUNTY		SHEET NO.
WFS.	BAYLOR		4

DATE: 3/29/2024 1:10:27 PM
FILE: pw://txdot.projectwiseonline.com:TXDOT2/Documents/03 - WFS/Design Projects/0814010364 - Design/Plan Set/1. General/TYPICAL SECTIONS FM 422



FM 422
EXISTING TYPICAL SECTION
STA. 59+82.15 TO STA. 62+04.76
STA. 64+56.47 TO STA. 65+81.05



FM 422
PROPOSED TYPICAL SECTION
STA. 59+82.15 TO STA. 62+04.76
STA. 64+56.47 TO STA. 65+81.05

MATCH ALL EXISTING CROSS SLOPES
INCLUDING AREAS WITH EXISTING SUPERELEVATION

STATE OF TEXAS
BRYSON P. LAWRENCE
129839
LICENSED
PROFESSIONAL ENGINEER

Bryson Lawrence, P.E.

03/29/2024

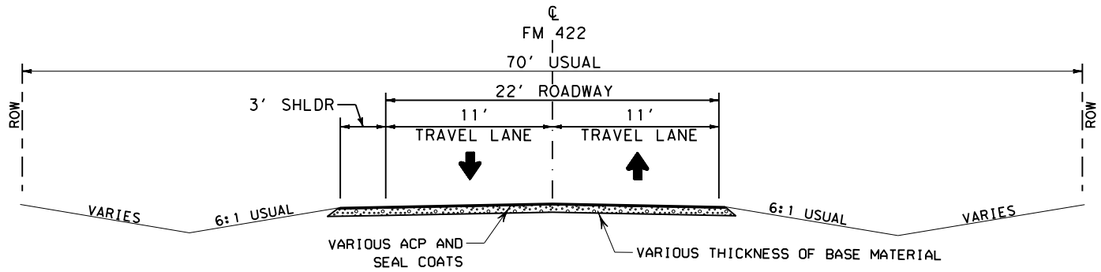
FM 422
TYPICAL SECTIONS

Texas Department of Transportation®

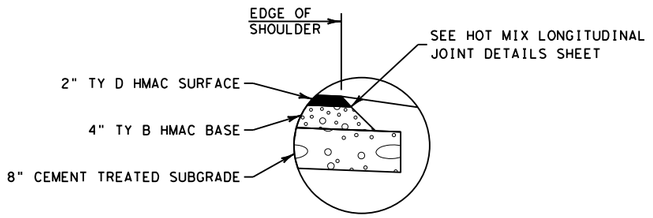
SHEET 3 OF 4

CONT	SECT	JOB	HIGHWAY
0814	01	036	FM 422
DIST	COUNTY		SHEET NO.
WFS.	BAYLOR		5

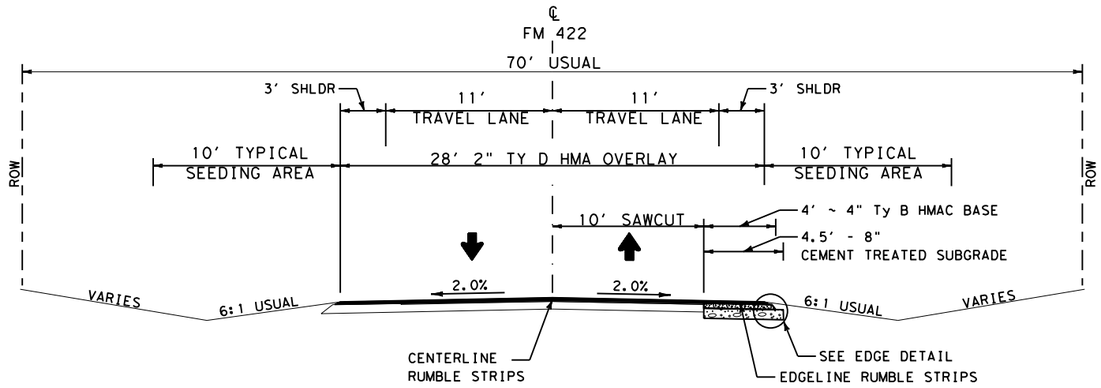
DATE: 3/29/2024 1:10:28 PM
FILE: pw://txdot.projectwiseonline.com:TXDOT2/Documents/03 - WFS/Design Projects/0814010364 - Design/Plan Set/1. General/TYPICAL SECTIONS FM 422



FM 422
EXISTING TYPICAL SECTION
STA. 65+81.05 TO STA. 66+60.70



EDGE DETAIL



FM 422
PROPOSED TYPICAL SECTION
STA. 65+81.05 TO STA. 66+60.70

MATCH ALL EXISTING CROSS SLOPES
INCLUDING AREAS WITH EXISTING SUPERELEVATION

STATE OF TEXAS
BRYSON P. LAWRENCE
129839
LICENSED
PROFESSIONAL ENGINEER

Bryson Lawrence, P.E.

03/29/2024

FM 422
TYPICAL SECTIONS

SHEET 4 OF 4

CONT	SECT	JOB	HIGHWAY
0814	01	036	FM 422
DIST	COUNTY		SHEET NO.
WFS.	BAYLOR		6

DATE: 3/29/2024 1:10:28 PM
FILE: pw://txdot.projectwiseonline.com:TXDOT2/Documents/03 - WFS/Design Projects/0814010364 - Design/Plan Set/1. General/TYPICAL SECTIONS FM 422

GENERAL NOTES

Basis of Estimate:

Item - Description	Rate*	Unit
166 - Fertilizer	100 LB of Nitrogen / acre with a 3:1:1 ratio of N, P, K	LB
168 - Vegetative Watering	1.4 GAL/SY per Application every 2 weeks for 3 months	MG
275 - Cement (6")	4% by weight Est @ 120 LB /CU FT	TON
310 – Prime Coat (MC-30)	0.25 GAL/SY	GAL
314 – Emulsified Asphalt Treatment (Erosion Control) (MS-2 or SS-1)	0.20 GAL/SY	GAL
3076 – Dense Graded Hot Mix Asphalt	110 LB / SY / Inch	TON
3084 – Bonding Course	0.06 GAL/SY (Residual)	GAL

For Contractor's information only, actual production rates may vary.

General Requirements

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

Zachary Husen, P.E.: Zachary.Husen@txdot.gov

Questions may also 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.

Bid Item Specific General Notes

Item 4 - Scope of Work
For the preconstruction conference submit a work schedule; temporary water pollution control plan; material sources; the person responsible for the SW3P; written utility coordination plan; certification statements; request for proposed subcontractors and letters designating the project superintendent, safety officer, and payroll officer.

Item 5 - Control of the Work
Provide the Engineer with a minimum 24 hours' notice for work requiring inspection or testing.

Item 6 - Control of Materials
In accordance with production sampling and the sampler will split each HMAC sample into three (3) equal portions in accordance with TEX-200-F and label these portions as "Contractor", "Engineer", and "Referee". Deliver Engineer and Referee samples to the Graham Area Office Laboratory for testing.

To comply with the latest provisions of Build America, Buy America Act (BABA Act) of the Bipartisan Infrastructure Law, the Contractor must submit a notarized 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

- No significant traffic generator events were identified for this project.

Use an all-weather material in conjunction with item 7.2.4. This work will not be paid for directly but will be subsidiary to item 132.

Item 8 - Prosecution and Progress
For this project, contract time will be computed as described in Item 8 based on a Standard Workweek (8.3.1.4.)

Item Specific

Item 110 - Excavation
Any payment for earthwork beyond plan quantity must be supported by original DTM and final DTM and average end area calculations, per specification. TxDOT will not consider truck tickets, borrow pit DTM, or other mechanisms for measuring additional embankment or excavation. Original DTM must be obtained prior to project disturbance.

Item 132 - Embankment
All borrow/aggregate sites shall meet the requirements of the Texas Aggregate Quarry and Pit Safety Act which can be found at www.txdot.gov/inside-txdot/division/maintenance/quarry.html This material shall consist of suitable earth material such as loam, clay or other materials that will form a stable embankment and be free from vegetation or other objectionable matter. Any embankment needed from a borrow pit must first be approved by the Engineer.

Windrow approximately 4" of existing grass and topsoil adjacent to the right of way line or vegetative buffer zone prior to beginning earthwork operations. Upon completion of earthwork operations scarify the slopes and ditches longitudinally to a depth of approximately 4 inches and return the windrowed material to the slopes and the ditches as a permanent erosion control measure. This work will not be paid for directly but is considered subsidiary to item 132.

Any payment for earthwork beyond plan quantity must be supported by original DTM and final DTM and average end area calculations, per specification. TxDOT will not consider truck tickets, borrow pit DTM, or other mechanisms for measuring additional embankment or excavation. Original DTM must be obtained prior to project disturbance.

Item 134 – Backfilling Pavement Edges
For Type A Backfill, Use easily cultivated fertile backfill that is free from objectionable material and resists erosion. Ensure that the soil obtained from sites outside the right of way has a pH of 5.5 to 8.5, per Tex-128-E and a PI <=15, per Tex-106-E. Soil is subject to testing by the Engineer.

Backfill pavement edges in accordance with "Hot Mix Longitudinal Joint Detail" sheet.

RAP generated from this project may be used as backfill material.

The thickness of backfill material varies and Contractor shall bid accordingly. The Contractor will ensure that 95% of the backfill materials pass a 2-inch sieve.

Complete backfilling operations within 14 days after the surface course is completed. Failure to complete backfilling during this time will result in the withholding of payment for all hot mix placed until all backfilling has been completed.

Item 164 - Seeding for Erosion Control
Temporary seeding will be required in several small areas as work progresses to comply with the storm water pollution prevention plan and may require multiple mobilizations of seeding crew.

The Engineer may blend temporary and permanent seeding according to the temperatures and time of year in order to achieve maximum coverage in the least amount of time.

The Contractor is responsible for the protection and maintenance of all seeded areas until final acceptance of the project. Maintenance includes:

1. Protection of seeded and mulched areas against traffic.

2. Fully mowing the project twice (2) for a rehab/widening job or once (1) for an overlay. This work will not be paid for directly.

Item 168 - Vegetative Watering
Water as directed by the Engineer all areas that receive seed to sustain grass growth to obtain a minimum 70% vegetative cover within the right of way. This may require the Contractor to water the newly established grass for a period of up to three months after all other work on the contract is completed and before the project is accepted. Watering shall be done at times determined by the Engineer in order to minimize any loss due to evaporation.

Item 310 – Cement Treatment (Road Mixed)
No substitute prime will be allowed on this project.

Item 354 – Planing and Texturing Pavement
Refer to the Hot Mix Longitudinal Joint Detail for all edge treatments. This work will be considered subsidiary to item 354.

Construct butt joints at all locations where planning, inlay, and overlay operations begin and end.

Contractor to verify manhole locations, if applicable, before milling operations begin.

Material is to be used as backfill pavement edges any remaining material will become property of TXDOT and be stockpiled at the following location: FM 422 & US 183 intersection in the Northeast corner

Item 467 - Safety End Treatment
For all Type II SETs, provide riprap aprons as shown on the plans.

Item 502 - Barricades, Signs, and Traffic Handling
The Traffic Control Plan (TCP) for this project includes the plans, the Texas Manual on Traffic Control Devices, Barricade and Construction Standard Sheets, Standard TCP Sheets, and as otherwise required by the Engineer.

The Contractor's person responsible for TCP compliance is available by local telephone 24 hours a day and must respond to traffic control needs within 45 minutes of being notified.

Work will not be permitted without adequate traffic control devices in place. Work will only be permitted on one side of the roadway at any time.

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.

Work vehicles within 30 feet of the traveled way shall have strobe lights or rotating beacons in use.

Wear appropriate personal protective equipment at all times while outside of vehicles and equipment on the project.

Provide adequate flagging on side roads to ensure that traffic flow is not compromised during one way traffic control operations.

Repair barricades within 48 hours after barricade report has been delivered to the Contractor. Failure to comply will cease all work until barricades are repaired to the satisfaction of the Department. Replace all damaged traffic control devices immediately. Remove any damaged traffic control devices from the project within 24 hours.

Failure to make necessary corrections to Traffic Control items based on barricade inspections will be cause for withholding the monthly estimate until such corrections are made.

Remove from the roadway and store in a central location approved by the Engineer all temporary traffic control devices, such as cones, barrels, portable signs, vertical panels, etc., which will not be used within 24 hours. This includes removal of temporary traffic control devices from the roadway over the weekend.

Refer to the "Treatment for Various Edge Conditions" for the proper traffic control devices to be used for the various edge conditions.

The use of Portable Traffic Signals are not required, but may be used as an option to the Contractor.

Cover or remove portable CW 8-12 "NO CENTER STRIPE" signs immediately upon completion of striping of the roadway.

A pilot car is required for this project. Provide a "Queue time" of no longer than 10 (ten) minutes during roadway work operations. When traffic backs up behind the placement of striping and/or raised pavement markers, cease operations and pull over to alleviate vehicle queues every 1 mile or every 10 minutes whichever comes first.

Item 506 - Temporary Erosion, Sedimentation, and Environmental Controls
Anticipate multiple mobilizations for SWP3 work.

Verify locations and dimensions of BMP's and obtain the Engineer's approval prior to placement. BMP locations indicated on the plans are approximate and may be adjusted as necessary by the Engineer.

The Contractor shall develop a dewatering plan per the TCEQ Construction General Permit to mitigate planned and unplanned dewatering operations. This plan must be submitted to TxDOT for review and approval prior to ground disturbance activities.

The disturbed area for this project, as shown on the plans, is 25 acres. The total disturbed area (TDA) will establish the required authorization for storm water discharges. The TDA of the project will be determined as described by the Environmental Permits Issues and Commitments (EPIC) sheet.

Contractor shall meet the requirements for the Project SW3P binder as described on the SW3P sheet.

The Contractor shall collect and dispose of all waste material as required by the Storm Water Pollution Prevention Plan (SW3P).

If sediment escapes the construction site, immediately stop all work on the project, remove the sediment, and modify the SW3P site plan to prevent future non-compliance issues.

The Contractor shall install concrete truck washouts as shown on the WFS-TA-BMP plan sheet. This work including materials and labor will not be measured or paid for directly but will be subsidiary to Item 506.

Item 530 - Intersections, Driveways, and Turnouts
Removal of existing asphalt or concrete driveways will not be paid for directly but will be considered subsidiary to this pay item.

Coordinate the replacement of driveways with the property owners prior to performing work. Driveway locations and widths will be verified by the Engineer before placement.

Saw cut existing concrete and asphaltic concrete drives to create a smooth joint with the proposed driveway or street.

When intersections of roadways are encountered extend final 2" overlay to the ROW line regardless of existing ACP driveway structures.

Item 644 – Small Roadside Sign Assemblies
The Contractor shall provide signpost support castings for the Texas triangular universal slipbase system which contains clamping bolts. Texas triangular universal slipbase system which contains set screws will not be permitted.

The Contractor is responsible for verifying sign locations prior to final placement. Stake sign support locations for verification by the Engineer and obtain approval from the Engineer prior to placement of sign supports.

Item 666 - Reflectorized Pavement Markings
The Contractor is responsible for verifying passing/no-passing zones for final stripe. Poly-dot the locations of the proposed reflectorized pavement markings and obtain approval from the Engineer prior to placement.

Use Type II beads on all striping.

Remove temporary tabs from all roads prior to striping. Removal of tabs will be subsidiary to pertinent items.

The lead vehicle and trail vehicle will be required for all striping operations as shown on TCP (3-1)-13.

Item 672 - Raised Pavement Markers
Raised pavement marker adhesive will meet the requirements of Departmental Materials Specifications DMS-6130, “Bituminous Adhesive for Pavement Markers”.

The lead vehicle and trail vehicle(s) will be required for all marker installation operations as shown on TCP(3-3)-14.

Item 3076 – Dense-Graded Hot-Mix Asphalt
Provide mixture Type B using PG binder 64-22 for widening and provide mixture Type D using PG binder 70-28 for overlay work. No Substitute PG Binder will be allowed on this project.

Type B widening base shall be installed in one lifts.

Design the surface mixture using the Superpave gyratory compactor with a minimum asphalt content of 5.4% and with a target lab mold density of 96.0%.

Hamburg Wheel Test requirements for this project will be a minimum of 5K passes @ 12.5 mm rut depth for PG 64-22 and 10K passes @ 12.5 mm rut depth for PG 70-28

The use of Recycled Asphalt Shingles (RAS) or Recycled Asphalt Pavement (RAP) will not be permitted in the surface mix for this project.

Level up and Pavement Repair is to be performed prior to widening.

Item 3084 – Bonding Course
Spray paver will not be used unless otherwise authorized by the Engineer. Additional quantity has been added for treatment of vertical surface of saw cuts.

Estimate & Quantity Sheet

CONTROLLING PROJECT ID 0814-01-036 **DISTRICT** Wichita Falls **COUNTY** Baylor
HIGHWAY FM 422

			CONTROL SECTION JOB		**0814-01-036**	TOTAL EST.	TOTAL FINAL
			PROJECT ID		**A00097429**		
			COUNTY		**Baylor**		
			HIGHWAY		**FM 422**		
ALT	**BID CODE**	**DESCRIPTION**	**UNIT**	EST.	FINAL		
	104-6017	REMOVING CONC (DRIVEWAYS)	SY	272.000		272.000	
	110-6001	EXCAVATION (ROADWAY)	CY	2,246.000		2,246.000	
	132-6004	EMBANKMENT (FINAL)(DENS CONT)(TY B)	CY	3,223.000		3,223.000	
	134-6002	BACKFILL (TY B)	STA	307.000		307.000	
	164-6009	BROADCAST SEED (TEMP) (WARM)	SY	16,997.000		16,997.000	
	164-6011	BROADCAST SEED (TEMP) (COOL)	SY	16,997.000		16,997.000	
	164-6033	DRILL SEEDING (PERM) (RURAL) (SANDY)	SY	33,994.000		33,994.000	
	168-6001	VEGETATIVE WATERING	MG	294.000		294.000	
	275-6001	CEMENT	TON	523.000		523.000	
	275-6010	CEMENT TREAT (SUBGRADE) (8")	SY	30,592.000		30,592.000	
	310-6009	PRIME COAT (MC-30)	GAL	7,649.000		7,649.000	
	314-6013	EMULS ASPH (EROSN CONT)(CSS-1H)	GAL	8,515.000		8,515.000	
	351-6004	FLEXIBLE PAVEMENT STRUCTURE REPAIR(8")	SY	2,500.000		2,500.000	
	354-6002	PLAN & TEXT ASPH CONC PAV(0" TO 2")	SY	1,511.000		1,511.000	
	400-6005	CEM STABIL BKFL	CY	85.000		85.000	
	400-6006	CUT & RESTORING PAV	SY	175.000		175.000	
	402-6001	TRENCH EXCAVATION PROTECTION	LF	27.000		27.000	
	403-6001	TEMPORARY SPL SHORING	SF	124.000		124.000	
	462-6051	CONC BOX CULV (5 FT X 3 FT)(EXTEND)	LF	114.000		114.000	
	464-6005	RC PIPE (CL III)(24 IN)	LF	268.000		268.000	
	464-6007	RC PIPE (CL III)(30 IN)	LF	234.000		234.000	
	464-6008	RC PIPE (CL III)(36 IN)	LF	46.000		46.000	
	466-6097	HEADWALL (CH - PW - 0) (DIA= 24 IN)	EA	2.000		2.000	
	466-6099	HEADWALL (CH - PW - 0) (DIA= 30 IN)	EA	4.000		4.000	
	466-6101	HEADWALL (CH - PW - 0) (DIA= 36 IN)	EA	2.000		2.000	
	466-6193	WINGWALL (PW - 2) (HW=4 FT)	EA	3.000		3.000	
	466-6194	WINGWALL (PW - 2) (HW=5 FT)	EA	1.000		1.000	
	467-6363	SET (TY II) (18 IN) (RCP) (6: 1) (P)	EA	34.000		34.000	
	467-6390	SET (TY II) (24 IN) (RCP) (4: 1) (C)	EA	11.000		11.000	
	467-6394	SET (TY II) (24 IN) (RCP) (6: 1) (C)	EA	2.000		2.000	
	467-6395	SET (TY II) (24 IN) (RCP) (6: 1) (P)	EA	8.000		8.000	
	467-6419	SET (TY II) (30 IN) (RCP) (4: 1) (C)	EA	2.000		2.000	
	467-6423	SET (TY II) (30 IN) (RCP) (6: 1) (P)	EA	2.000		2.000	
	496-6005	REMOV STR (WINGWALL)	EA	4.000		4.000	
	496-6007	REMOV STR (PIPE)	LF	1,025.000		1,025.000	
	500-6001	MOBILIZATION	LS	1.000		1.000	
	502-6001	BARRICADES, SIGNS AND TRAFFIC HANDLING	MO	19.000		19.000	

Estimate & Quantity Sheet

CONTROLLING PROJECT ID 0814-01-036 **DISTRICT** Wichita Falls **COUNTY** Baylor
HIGHWAY FM 422

			CONTROL SECTION JOB		**0814-01-036**	TOTAL EST.	TOTAL FINAL
			PROJECT ID		**A00097429**		
			COUNTY		**Baylor**		
			HIGHWAY		**FM 422**		
ALT	**BID CODE**	**DESCRIPTION**	**UNIT**	EST.	FINAL		
	506-6038	TEMP SEDMT CONT FENCE (INSTALL)	LF	975.000		975.000	
	506-6039	TEMP SEDMT CONT FENCE (REMOVE)	LF	975.000		975.000	
	506-6041	BIODEG EROSN CONT LOGS (INSTL) (12")	LF	560.000		560.000	
	506-6043	BIODEG EROSN CONT LOGS (REMOVE)	LF	560.000		560.000	
	530-6004	DRIVEWAYS (CONC)	SY	272.000		272.000	
	530-6005	DRIVEWAYS (ACP)	SY	1,095.000		1,095.000	
	530-6008	TURNOUTS (ACP)	SY	308.000		308.000	
	530-6016	DRIVEWAYS (BASE)	SY	2,089.000		2,089.000	
	533-6001	RUMBLE STRIPS (SHOULDER)	LF	63,940.000		63,940.000	
	533-6002	RUMBLE STRIPS (CENTERLINE)	LF	31,970.000		31,970.000	
	560-6005	MAILBOX INSTALL-D (TWG-POST) TY 2	EA	1.000		1.000	
	560-6011	MAILBOX INSTALL-S (TWW-POST) TY 4	EA	13.000		13.000	
	644-6004	IN SM RD SN SUP&AM TY10BWG(1)SA(T)	EA	16.000		16.000	
	644-6007	IN SM RD SN SUP&AM TY10BWG(1)SA(U)	EA	2.000		2.000	
	644-6033	IN SM RD SN SUP&AM TYS80(1)SA(U)	EA	1.000		1.000	
	644-6060	IN SM RD SN SUP&AM TYTWT(1)WS(P)	EA	16.000		16.000	
	644-6076	REMOVE SM RD SN SUP&AM	EA	35.000		35.000	
	658-6062	INSTL DEL ASSM (D-SW)SZ 1(BRF)GF2(BI)	EA	36.000		36.000	
	658-6100	INSTL OM ASSM (OM-2Z)(WFLX)GND(BI)	EA	36.000		36.000	
	662-6111	WK ZN PAV MRK SHT TERM (TAB)TY Y-2	EA	4,569.000		4,569.000	
	666-6309	RE PM W/RET REQ TY I (W)6"(SLD)(100MIL)	LF	63,600.000		63,600.000	
	666-6318	RE PM W/RET REQ TY I (Y)6"(BRK)(100MIL)	LF	34,600.000		34,600.000	
	666-6321	RE PM W/RET REQ TY I (Y)6"(SLD)(100MIL)	LF	11,565.000		11,565.000	
	3076-6001	D-GR HMA TY-B PG64-22	TON	6,731.000		6,731.000	
	3076-6038	D-GR HMA TY-D PG64-22 (LEVEL-UP)	TON	783.000		783.000	
	3076-6046	D-GR HMA TY-D SAC-B PG70-28	TON	11,090.000		11,090.000	
	3084-6001	BONDING COURSE	GAL	7,882.000		7,882.000	
	4122-6023	THERMO PIPE(18")(PP)(TY S)(TY II)	LF	534.000		534.000	
	4122-6024	THERMO PIPE(24")(PP)(TY S)(TY II)	LF	154.000		154.000	
	6185-6002	TMA (STATIONARY)	DAY	283.000		283.000	
	6185-6005	TMA (MOBILE OPERATION)	DAY	8.000		8.000	
	18	EROSION CONTROL MAINTENANCE: CONTRACTOR FORCE ACCOUNT WORK (PART)	LS	1.000		1.000	
		SAFETY CONTINGENCY: CONTRACTOR FORCE ACCOUNT WORK (PARTICIPATING)	LS	1.000		1.000	

SUMMARY OF ROADWAY ITEMS

FM 422	104 6017	110 6001	132 6004	134 6002	275 6001	275 6010	310 6009	314 6013	351 6004	354 6002	533 6001	533 6002	560 6005	560 6011	658 6100	3076 6001	3076 6038	3076 6046	3084 6001	6185 6002
	REMOVING CONC (DRIVEWAYS)	EXCAVATION (ROADWAY)	EMBANKMENT (FINAL)(DENS CONT)(TY B)	BACKFILL (TY B)	CEMENT	CEMENT TREAT (SUBGRADE) (8")	PRIME COAT (MC-30)	EMULS ASPH (EROSN CONT)(CSS-1H)	FLEXIBLE PAVEMENT STRUCTURE REPAIR(8")	PLAN & TEXT ASPH CONC PAV(0" TO 2")	RUMBLE STRIPS (SHOULDER)	RUMBLE STRIPS (CENTERLINE)	MAILBOX INSTALL-D (TWG-POST) TY 2	MAILBOX INSTALL-S (TWW-POST) TY 4	INSTL OM ASSM (OM-2Z)(WFLX)GND(BI)	D-GR HMA TY-B PG64-22	D-GR HMA TY-D PG64-22 (LEVEL-UP)	D-GR HMA TY-D SAC-B PG70-28	BONDING COURSE	TMA (STATIONARY)
	SY	CY	CY	STA	TON	SY	GAL	GAL	SY	SY	LF	LF	EA	EA	EA	TON	TON	TON	GAL	DAY
CSJ: 0814-01-036									2500						4					272
SHEET 1 OF 14 STA 45+00 TO 69+00	140	96	19	11	18	1021	256	296		889	4800	2400		2		225		962	587	
SHEET 2 OF 14 STA 69+00 TO 93+00		161	443	24	41	2400	600	667			4800	2400		2		528	187	822	592	
SHEET 3 OF 14 STA 93+00 TO 117+00		193	113	24	41	2400	600	667			4800	2400				528	8	822	592	
SHEET 4 OF 14 STA 117+00 TO 141+00		165	442	24	41	2400	600	667			4800	2400	1			528	123	822	592	
SHEET 5 OF 14 STA 141+00 TO 165+00		186	211	24	41	2400	600	667			4800	2400		2		528	166	822	592	
SHEET 6 OF 14 STA 165+00 TO 189+00		196	67	24	41	2400	600	667			4800	2400				528		822	592	
SHEET 7 OF 14 STA 189+00 TO 213+00		169	226	24	41	2400	600	667			4800	2400		1		528		822	592	
SHEET 8 OF 14 STA 213+00 TO 237+00		175	216	24	41	2400	600	667			4800	2400				528		822	592	
SHEET 9 OF 14 STA 237+00 TO 261+00		187	225	24	41	2400	600	667			4800	2400				528		822	592	
SHEET 10 OF 14 STA 261+00 TO 285+00		164	159	24	41	2400	600	667			4800	2400				528		822	592	
SHEET 11 OF 14 STA 285+00 TO 309+00		166	219	24	41	2400	600	667			4800	2400		2		528		822	592	
SHEET 12 OF 14 STA 309+00 TO 333+00		159	360	24	41	2400	600	667			4800	2400		2		528		822	592	
SHEET 13 OF 14 STA 333+00 TO 357+00		153	433	24	41	2400	600	667			4800	2400		2		528	218	822	592	
SHEET 14 OF 14 STA 357+00 TO 364+70.45	132	76	90	8	13	771	193	215		622	1540	770				170	81	264	191	
PROJECT TOTALS	272	2246	3223	307	523	30592	7649	8515	2500	1511	63940	31970	1	13	4	6731	783	11090	7882	272

SUMMARY OF SIGNING ITEMS

LOCATION	644 6004	644 6007	644 6033	644 6060	644 6076	658 6062
	IN SM RD SN SUP&AM TY10BWG(1) SA(T)	IN SM RD SN SUP&AM TY10BWG(1) SA(U)	IN SM RD SN SUP&AM TYS80(1)SA(U)	IN SM RD SN SUP&AM TYTWT(1)WS (P)	REMOVE SM RD SN SUP&AM	INSTL DEL ASSM (D-SW)SZ 1(BRF)GF2(BI)
	EA	EA	EA	EA	EA	EA
CSJ: 0814-01-036						
SHEET 1 OF 14 STA 45+00 TO 69+00	1			1	1	4
SHEET 2 OF 14 STA 69+00 TO 93+00	5			6	12	4
SHEET 3 OF 14 STA 93+00 TO 117+00	1			1	2	4
SHEET 4 OF 14 STA 117+00 TO 141+00	1				1	4
SHEET 5 OF 14 STA 141+00 TO 165+00	1				1	
SHEET 6 OF 14 STA 165+00 TO 189+00						
SHEET 7 OF 14 STA 189+00 TO 213+00				1	1	4
SHEET 8 OF 14 STA 213+00 TO 237+00						2
SHEET 9 OF 14 STA 237+00 TO 261+00	2			3	5	4
SHEET 10 OF 14 STA 261+00 TO 285+00						2
SHEET 11 OF 14 STA 285+00 TO 309+00				1	1	2
SHEET 12 OF 14 STA 309+00 TO 333+00						4
SHEET 13 OF 14 STA 333+00 TO 357+00	3			2	5	2
SHEET 14 OF 14 STA 357+00 TO 364+70.45	2	2	1	1	6	
PROJECT TOTALS	16	2	1	16	35	36

DATE: 4/4/2024 3:56:34 PM
FILE: ... 1. General/QUANTITY SUMMARY.dgn

Texas Department of Transportation

FM 422

QUANTITY SUMMARY

CONT	SECT	JOB	HIGHWAY
0814	01	036	FM 422

DIST	COUNTY	SHEET NO.
WFS.	BAYLOR	13

SUMMARY OF DRAINAGE ITEMS

LOCATION	400 6005	400 6006	402 6001	403 6001	462 6051	464 6005	464 6007	464 6008	466 6097	466 6099	466 6101	466 6193	466 6194	467 6390	467 6395	467 6419	496 6005	496 6007
	CEM STABIL BKFL	CUT & RESTORING PAV	TRENCH EXCAVATION PROTECTION	TEMPORARY SPL SHORING	CONC BOX CULV (5 FT X 3 FT)(EXTEND)	RC PIPE (CL III)(24 IN)	RC PIPE (CL III)(30 IN)	RC PIPE (CL III)(36 IN)	HEADWALL (CH - PW - 0) (DIA= 24 IN)	HEADWALL (CH - PW - 0) (DIA= 30 IN)	HEADWALL (CH - PW - 0) (DIA= 36 IN)	WINGWALL (PW - 2) (HW=4 FT)	WINGWALL (PW - 2) (HW=5 FT)	SET (TY II) (24 IN) (RCP) (4: 1) (C)	SET (TY II) (24 IN) (RCP) (6: 1) (P)	SET (TY II) (30 IN) (RCP) (4: 1) (C)	REMOV STR (WINGWALL)	REMOV STR (PIPE)
	CY	SY	LF	SF	LF	LF	LF	LF	EA	EA	EA	EA	EA	EA	EA	EA	EA	LF
CSJ: 0814-01-036																		
STR 1 STA 70+19				106	57							1	1				2	
STR 2 STA 94+80																		
STR 3 STA 104+39	10	14					40							2				38
STR 4 STA 129+48					57							2					2	
STR 5 STA 194+88	12	25				38								2				37
STR 6 STA 198+05	6	18						46			2							40
STR 7 STA 227+18	11	16					46			2								37
STR 8 STA 239+51	9	16					50			2								37
STR 9 STA 259+84	5	14				56								1	2			38
STR 10 STA 278+59	5	14				42								2				37
STR 11 STA 294+27	5	14				40								2				36
STR 12 STA 311+15	8	16	27	18			44									2		43
STR 13 STA 330+55	5	14				48			1					1				34
STR 14 STA 344+98	9	14				44			1					1				36
PROJECT TOTALS	85	175	27	124	114	268	180	46	2	4	2	3	1	11	2	2	4	413

DATE: 4/4/2024 3:56:35 PM
FILE: ...General/QUANTITY SUMMARY.dgn

Texas Department of Transportation

FM 422

QUANTITY SUMMARY

 SHEET 2 OF 4

CONT	SECT	JOB	HIGHWAY
0814	01	036	FM 422
DIST	COUNTY		SHEET NO.
WFS.	BAYLOR		14

NOTE:

1. DRIVEWAYS 1 THROUGH 10 HAVE NO PROPOSED WORK

SUMMARY OF SIDEROAD QUANTITIES

LOCATION		SIDE ROAD NUMBER	"W"	"L"	RADII		AREA	104 6017 REMOVING CONC (DRIVEWAYS)	464 6007 RC PIPE (CL III)(30 IN)	467 6363 SET (TY II) (18 IN) (RCP) (6: 1) (P)	467 6395 SET (TY II) (24 IN) (RCP) (6: 1) (P)	467 6410 SET (TY II) (30 IN) (CMP) (6: 1) (P)	496 6007 REMOV STR (PIPE)	530 6004 DRIVEWAYS (CONC)	530 6005 DRIVEWAYS (ACP)	530 6016 DRIVEWAYS (BASE)	4122 6023 THERMO PIPE(18")(PP)(TY S)(TY II)	4122 6024 THERMO PIPE(24")(PP)(TY S)(TY II)
STA	RT or LT		FT	FT	R1	R2	SY	SY		EA	EA	EA	LF	SY	SY	SY	LF	LF
56+31.17	RT	11	22	21	15	15	63	63						63				
58+33.48	RT	12	28	21	15	15	77	77						77				
58+79.10	RT	13	16	21	15	15	49									49		
59+74.19	RT	14	32	21	15	15	86									86		
72+13.35	RT	15	20	21	15	15	58								58			
73+13.93	LT	16	16	21	15	15	49									49		
83+56.16	RT	17	20	21	30	30	90								90			
85+54.95	LT	18	48	21	30	30	155								155			
87+36.20	RT	19	12	21	15	15	39			2			22			39	24	
92+53.15	LT	20	12	21	15	15	39			2			22			39	24	
104+10.00	LT	21	30	21	15	15	81			2						81	42	
112+61.30	LT	22	12	21	15	15	39									39		
112+94.20	RT	23	14	21	15	15	44									44		
119+82.67	LT	24	18	21	15	15	53				2		44			53		44
121+21.66	LT	25	18	21	15	15	53				2		38		53			38
121+37.41	RT	26	14	21	15	15	44			2			18		44		26	
121+90.57	RT	27	14	21	15	15	44			2			32			44	32	
139+95.79	LT	28	14	21	15	15	44				2		24		44			32
140+28.47	RT	29	12	21	15	15	39			2			22			39	26	
142+29.03	RT	30	18	21	30	30	85			2			40			85	40	
146+99.46	LT	31	18	21	30	30	85			2			24		85		32	
156+18.96	LT	32	20	21	15	15	58			2			66			58	18	
156+81.10	LT	33	10	21	15	15	35			2						35	24	
162+68.48	LT	34	20	21	15	15	58			2			32		58		32	
168+91.69	RT	35	14	21	15	15	44									44		
179+75.77	LT	36	20	21	30	30	90									90		
182+00.00	LT	37	30	21	15	15	81			2						81	44	
206+56.42	LT	38	24	21	15	15	67				2		40			67		40
208+20.78	RT	39	36	21	30	30	127			2			62			127	62	
218+00.15	RT	40	16	21	15	15	49			2			20			49	28	
236+04.10	RT	41	20	21	15	15	58									58		
249+08.96	RT	42	22	21	30	30	95								95			
249+09.11	LT	43	22	21	30	30	95								95			
252+84.24	LT	44	20	21	15	15	58									58		
261+28.00	RT	45	24	21	15	15	67									67		
274+62.00	LT	46	36	21	15	15	95									95		
282+59.94	LT	47	16	21	15	15	49									49		
289+56.87	LT	48	28	21	30	30	109									109		
289+79.42	RT	49	24	21	15	15	67								67			
296+24.00	LT	50	28	21	15	15	77									77		
301+30.42	LT	51	56	21	30	30	174									174		
302+06.00	RT	52	30	21	15	15	81									81		
316+40.37	RT	53	50	21	15	15	128								128			
317+44.77	LT	54	36	21	30	30	127									127		
320+30.00	LT	55	14	21	15	15	44			2			26			44	26	
332+38.20	LT	56	18	21	30	30	85									85		
332+77.54	RT	57	12	21	15	15	39			2			26			39	26	
346+87.25	LT	58	16	21	15	15	49			2						49	28	
358+37.00	LT	59	30	21	15	15	81									81		
358+67.43	RT	60	30	21	15	15	81									81		
363+27.94	LT	61	38	21	30	30	132	132	54			2	54	132				
							TOTAL =	272	54	34	8	0	612	272	972	2472	534	154

Texas Department of Transportation

FM 422

QUANTITY SUMMARY

CONT	SECT	JOB	HIGHWAY
0814	01	036	FM 422

DIST	COUNTY	SHEET NO.
WFS.	BAYLOR	15

DATE: 4/4/2024 3:56:35 PM
FILE: pw://txdot-pw.bentley.com:TxDOT/Documents/Projects/08140136/01 Design/Plan Set/1. General/QUANTITY SUMMARY.dgn

SUMMARY OF TURNOUT ITEMS

PLAN LAYOUT SHEET NUMBER	LOCATION	TURNOUT NUMBER	530 6008 TURNOUT (ACP)	560 6011 MAILBOX INSTALL-S (TWW-POST) TY 4	560 6005 MAILBOX INSTALL-D (TWG-POST) TY 2	COMMENTS
			SY	EA	EA	
CSJ: 0814-01-036						
1	57+74.00	TO 01	22	1		MATCH ROADWAY GRADE
	59+21.00	TO 02	22	1		MATCH ROADWAY GRADE
		SUB TOTAL =	44	2		
CSJ: 0814-01-036						
2	71+58.00	TO 03	22	1		MATCH ROADWAY GRADE
	85+88.00	TO 04	22	1		MATCH ROADWAY GRADE
		SUB TOTAL =	44	2		
CSJ: 0814-01-036						
4	120+55.00	TO 05	22		1	MATCH ROADWAY GRADE
		SUB TOTAL =	22		1	
CSJ: 0814-01-036						
5	146+85.00	TO 06	22	1		MATCH ROADWAY GRADE
	162+30.0	TO 07	22	1		MATCH ROADWAY GRADE
		SUB TOTAL =	44	2		
CSJ: 0814-01-036						
7	206+38.00	TO 08	22	1		MATCH ROADWAY GRADE
		SUB TOTAL =	22	1		
CSJ: 0814-01-036						
11	290+37.00	TO 09	22	1		MATCH ROADWAY GRADE
	300+70.0	TO 10	22	1		MATCH ROADWAY GRADE
		SUB TOTAL =	44	2		
CSJ: 0814-01-036						
12	316+54.00	TO 11	22	1		MATCH ROADWAY GRADE
	317+11.0	TO 12	22	1		MATCH ROADWAY GRADE
		SUB TOTAL =	44	2		
CSJ: 0814-01-036						
13	333+30.00	TO 13	22	1		MATCH ROADWAY GRADE
	346+32.0	TO 14	22	1		MATCH ROADWAY GRADE
		SUB TOTAL =	44	2		
		PROJECT TOTAL =	308	13	1	

SUMMARY OF EROSION CONTROL ITEMS

LOCATION	164 6009 BROADCAST SEED (TEMP) (WARM)	164 6011 BROADCAST SEED (TEMP) (COOL)	164 6033 DRILL SEEDING (PERM) (RURAL) (SANDY)	168 6001 VEGETATIVE WATERING	506 6038 TEMP SEDMT CONT FENCE (INSTALL)	506 6039 TEMP SEDMT CONT FENCE (REMOVE)	506 6041 BIODEG EROSN CONT LOGS (INSTL) (12")	506 6043 BIODEG EROSN CONT LOGS (REMOVE)
	SY	SY	SY	MG	LF	LF	LF	LF
CSJ: 0814-01-036								
SHEET 1 OF 14 STA 45+00 TO 69+00	567	567	1134	10	100	100		
SHEET 2 OF 14 STA 69+00 TO 93+00	1334	1334	2667	23	80	80	80	80
SHEET 3 OF 14 STA 93+00 TO 117+00	1334	1334	2667	23	60	60		
SHEET 4 OF 14 STA 117+00 TO 141+00	1334	1334	2667	23	100	100		
SHEET 5 OF 14 STA 141+00 TO 165+00	1334	1334	2667	23			80	80
SHEET 6 OF 14 STA 165+00 TO 189+00	1334	1334	2667	23				
SHEET 7 OF 14 STA 189+00 TO 213+00	1334	1334	2667	23	120	120		
SHEET 8 OF 14 STA 213+00 TO 237+00	1334	1334	2667	23	120	120		
SHEET 9 OF 14 STA 237+00 TO 261+00	1334	1334	2667	23	35	35	80	80
SHEET 10 OF 14 STA 261+00 TO 285+00	1334	1334	2667	23	160	160		
SHEET 11 OF 14 STA 285+00 TO 309+00	1334	1334	2667	23	140	140		
SHEET 12 OF 14 STA 309+00 TO 333+00	1334	1334	2667	23	50	50		
SHEET 13 OF 14 STA 333+00 TO 357+00	1334	1334	2667	23	60	60	80	80
SHEET 14 OF 14 STA 357+00 TO 364+70.45	428	428	856	8	30	30		
PROJECT TOTALS	16997	16997	33994	294	1055	1055	320	320

SUMMARY OF PAVEMENT MARKING ITEMS

LOCATION	662 6111 WK ZN PAV MRK SHT TERM (TAB)TY Y-2	666 6309 RE PM W/RET REQ TY I (W)6"(SLD)(100MIL)	666 6318 RE PM W/RET REQ TY I (Y)6"(BRK)(100MIL)	666 6321 RE PM W/RET REQ TY I (Y)6"(SLD)(100MIL)	6185 6005 TMA (MOBILE OPERATION)
	EA	LF	LF	LF	DAY
CSJ: 0814-01-036	4569	63600	34600	11565	8
PROJECT TOTALS	4569	63600	34600	11565	8

DATE: 4/4/2024 4:09:07 PM

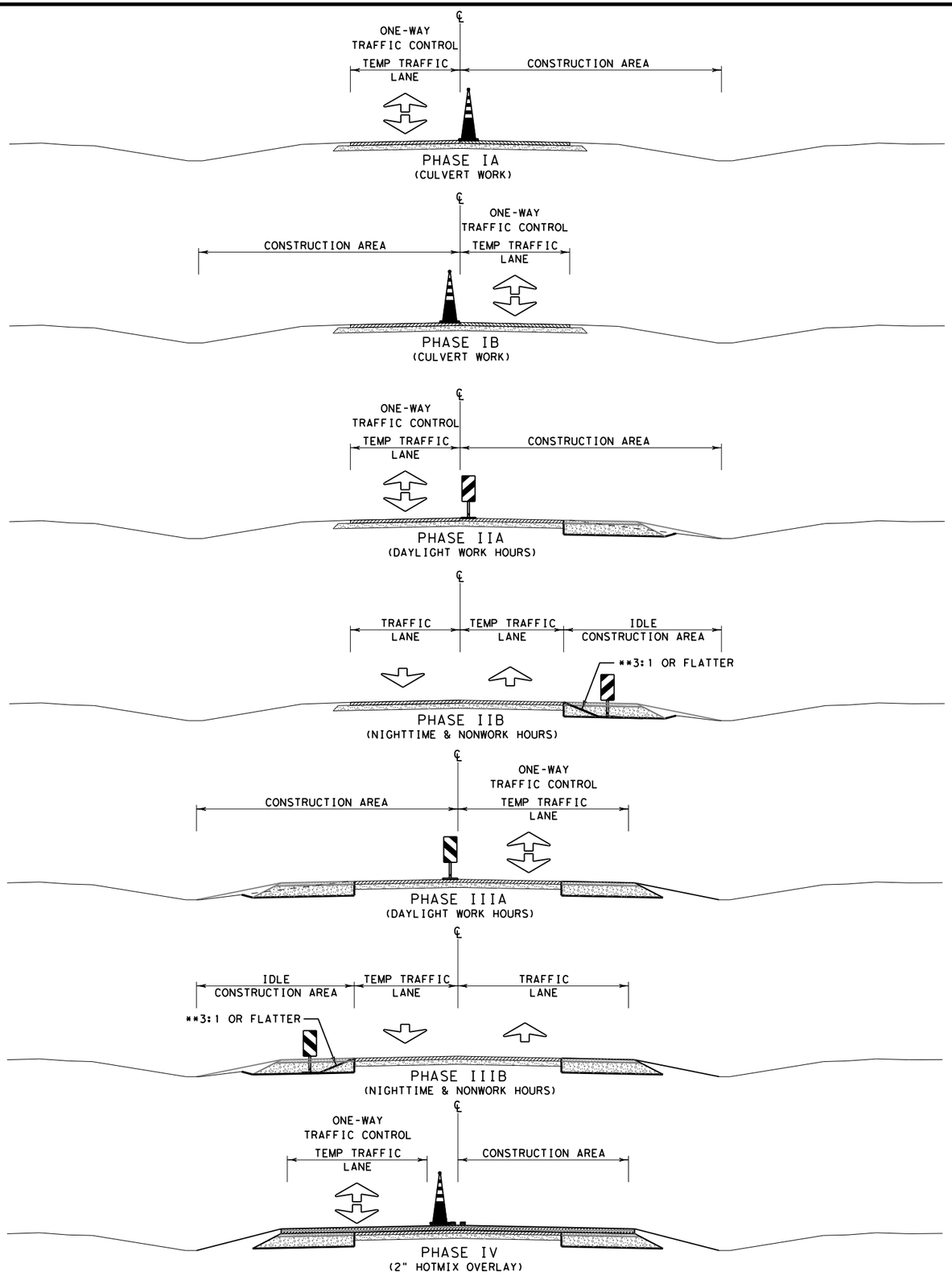
Texas Department of Transportation

FM 422

QUANTITY SUMMARY

SHEET 4 OF 4

CONT	SECT	JOB	HIGHWAY
0814	01	036	FM 422
DIST	COUNTY		SHEET NO.
WFS.	BAYLOR		16



SEQUENCE OF WORK:

PHASE I: COMPLETE CULVERT WORK, COMPLETE ALL PAVEMENT REPAIR, AND COMPLETE ALL LEVEL UP WORK. REFER TO CUT & RESTORE DETAILS FOR ADDITIONAL CULVERT WORK INFORMATION. REFER TO SUPERELEVATION DETAILS FOR ADDITIONAL LEVEL UP INFORMATION.

PHASE II: COMPLETE PHASE II CONSTRUCTION ACCORDING TO TYPICAL.

PHASE III: COMPLETE PHASE III CONSTRUCTION ACCORDING TO TYPICAL.

PHASE IV: PLACE 2" HMAC OVERLAY. COMPLETE RUMBLE STRIPS & FINAL STRIPING OPERATIONS.

NOTES:

LIMIT LANE CLOSURES ALONG HIGHWAY INTERSECTIONS, AND AT CROSS STREETS, TO THE HOURS DIRECTED BY THE ENGINEER.

WORK ON BOTH SIDES OF THE ROAD AT THE SAME TIME WILL NOT BE ALLOWED. PHASE II WORK SHALL BE COMPLETED PRIOR TO BEGINNING PHASE III.

PHASE II MAY START ALONGSIDE PHASE I IN AREAS WHERE PHASE I WORK HAS BEEN COMPLETED AND DOES NOT INTERFERE WITH THE ROADWAY WIDENING.

MAXIMUM LANE CLOSURE WITH ONE-WAY TRAFFIC CONTROL SHALL BE TWO MILES. ONE-WAY TRAFFIC CONTROL MAY BE EXTENDED BY THE ENGINEER WHEN THE CONTRACTOR PROVES TO HAVE ADEQUATE FORCES & EQUIPMENT TO PERFORM MORE WORK.

ALL ONE-WAY TRAFFIC CONTROL WILL NOT BE PAID FOR DIRECTLY, BUT SHALL BE CONSIDERED SUBSIDIARY TO PERTINENT BID ITEMS.

PILOT CAR SHALL BE REQUIRED FOR ALL ONE-WAY TRAFFIC CONTROL OPERATIONS.

CW 8-9a "Shoulder Drop-Off" OR CW 8-11 "Uneven Lanes" SIGNS PLUS VERTICAL PANELS SHALL BE PLACED DURING PHASES IIB & IIIB AT A MAXIMUM SPACING OF 1,800 FT.

PHASES II & III CHANNELIZING DEVICES SHOWN ARE BACK TO BACK MOUNTED PORTABLE VERTICAL PANELS ON SELF-RIGHTING SUPPORTS AS DESCRIBED ON BC(9)-21.

PHASE IV CHANNELIZING DEVICES SHOWN ARE 42 INCH, TWO-PIECE CONE AS DESCRIBED ON BC(10)-21.

* - BARRICADE & CONSTRUCTION STDS BC(1-12)-21 REQUIRED FOR ALL PHASES. REFER TO WORK ZONE STANDARD (WZ) SHEETS FOR ADDITIONAL DETAILS. STANDARDS SHOWN ARE CONSIDERED TO BE THE MINIMUM REQUIREMENTS FOR WORK ZONE SIGNING AND TRAFFIC CONTROL. ADDITIONAL OR OTHER DEVICES MAY BE REQUIRED AS DIRECTED BY THE ENGINEER.

** - THE 3:1 SLOPE BACKFILL FOR END OF DAY OPERATIONS SHALL CONSIST OF CLEAN STONE, SCREENED MATERIALS NOT CONTAINING ANY FINES, OR OTHER MATERIALS APPROVED BY THE ENGINEER. INSTALLATION OF THIS MATERIAL WILL BE CONDUCTED FROM THE ROADWAY SIDE OF THE PROJECT TO PROTECT THE SURFACE OF THE PRIME SUBRADE. WHEN WORK IS RESUMED ON THIS EXCAVETED AREA, THIS BACKFILL MATERIAL SHALL BE INCORPORATED INTO THE ROAD WORK OR DISPOSED OF AS APPROVED BY THE ENGINEER. MATERIALS AND LABOR FOR THIS WORK WILL NOT BE PAID FOR DIRECTLY BUT WILL BE SUBSIDIARY TO ITEM 110 EXCAVATION (ROADWAY).

STATE OF TEXAS
BRYSON P. LAWRENCE
129839
LICENSED
PROFESSIONAL ENGINEER

Bryson Lawrence, P.E.

04/04/2024

Texas Department of Transportation

FM 422

SEQUENCE OF WORK

SHEET 1 OF 1

CONT	SECT	JOB	HIGHWAY
0814	01	036	FM 422
DIST	COUNTY		SHEET NO.
WFS.	BAYLOR		17

DATE: 3/29/2024 1:12:26 PM
FILE: pw://txdot.projectwiseonline.com:TXDOT2/Documents/03 - WFS/Design Projects/0814010364 - Design/Plan Set/2. TCP/SEQUENCE OF WORK.dgn

DATE: 3/29/2024 1:12:39 PM
FILE: pw://txdot.projectwiseonline.com:TXDOT2/Documents/03 - WFS/Design Projects/0814010364 - Design/Plan Set/2. TCP/BC(1)-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

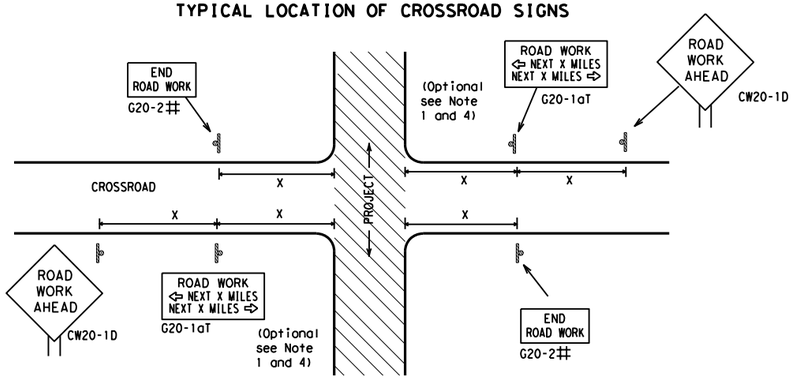
BARRICADE AND CONSTRUCTION GENERAL NOTES AND REQUIREMENTS

BC(1)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0814	01	036	FM 422
4-03 7-13	DIST	COUNTY		SHEET NO.
9-07 8-14	WFS.	BAYLOR		18
5-10 5-21				

DATE: 3/29/2024 1:12:40 PM
FILE: pw://txdot.projectwiseonline.com:TXDOT2/Documents/03 - WFS/Design Projects/08140103674/Design/Plan Set/2. TCP/BC(1)-21.dgn

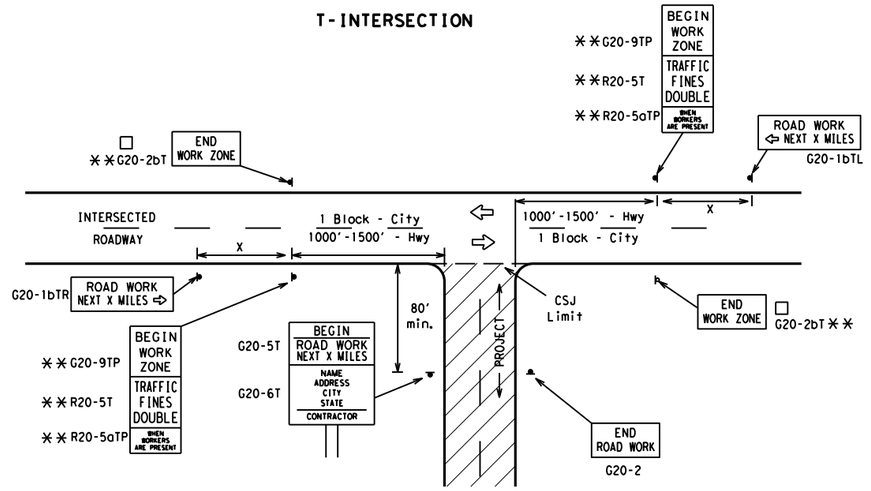
TYPICAL LOCATION OF CROSSROAD SIGNS



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]

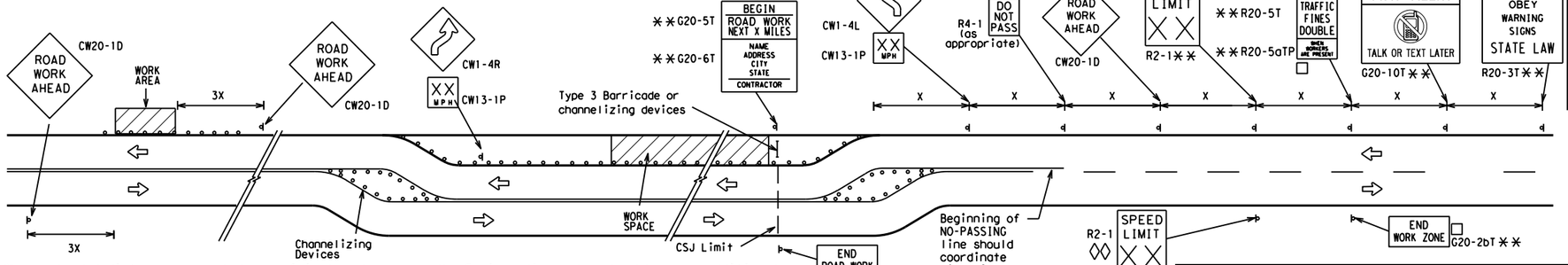
* For typical sign spacings on divided highways, expressways and freeways, see Part 6 of the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD) typical application diagrams or TCP Standard Sheets.

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

GENERAL NOTES

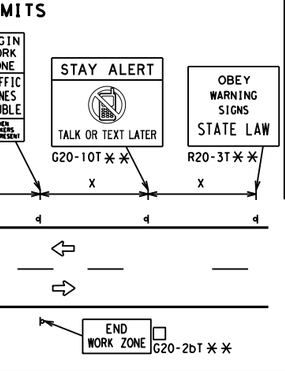
1. Special or larger size signs may be used as necessary.
2. Distance between signs should be increased as required to have 1500 feet advance warning.
3. Distance between signs should be increased as required to have 1/2 mile or more advance warning.
4. 36" x 36" "ROAD WORK AHEAD" (CW20-1D)signs may 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

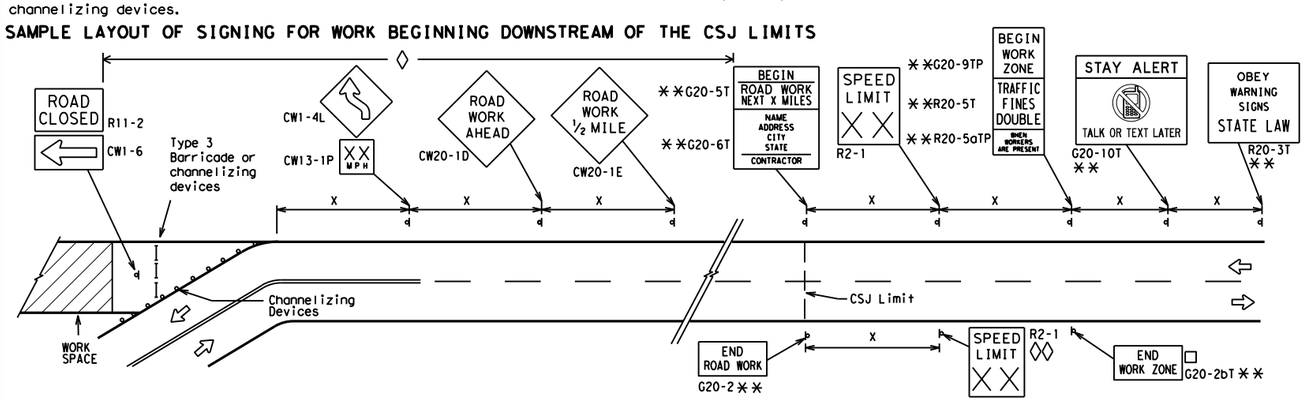


When extended distances occur between minimal work spaces, the Engineer/Inspector should ensure additional "ROAD WORK AHEAD"(CW20-1D)signs are placed in advance of these work areas to remind drivers they are still within the project limits. See the applicable TCP sheets for exact location and spacing 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	0814	01	036	FM 422
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	WFS.	BAYLOR		19

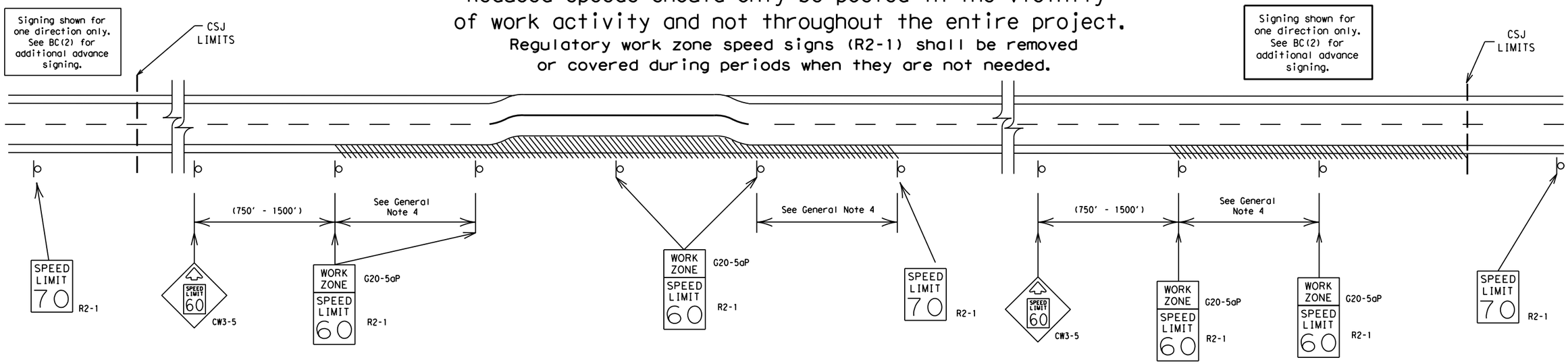
DATE: 3/29/2024 1:12:40 PM
FILE: pw://txdot.projectwiseonline.com:TXDOT2/Documents/03 - WFS/Design Projects/0814001036/24 - Design/bc-21.dgn

TYPICAL APPLICATION OF WORK ZONE SPEED LIMIT SIGNS

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

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

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



GUIDANCE FOR USE:

LONG/INTERMEDIATE TERM WORK ZONE SPEED LIMITS

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

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

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

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

SHORT TERM WORK ZONE SPEED LIMITS

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

Texas Department of Transportation

Traffic Safety Division Standard

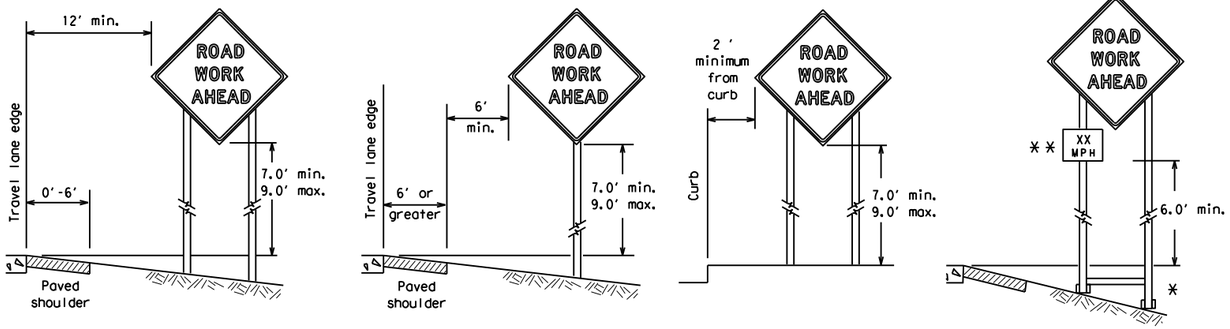
BARRICADE AND CONSTRUCTION WORK ZONE SPEED LIMIT

BC(3)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0814	01	036	FM 422
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	WFS.	BAYLOR		20

DATE: 3/29/2024 1:12:41 PM
FILE: pw://txdot.projectwiseonline.com:TXDOT2/Documents/03 - WFS/Design Projects/081401036/4 - Design/Plan Set/2. TCP/BC(1)-21.dgn

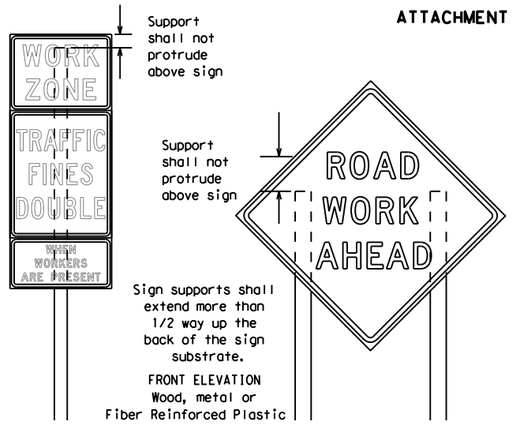
TYPICAL MINIMUM CLEARANCES FOR LONG TERM AND INTERMEDIATE TERM SIGNS

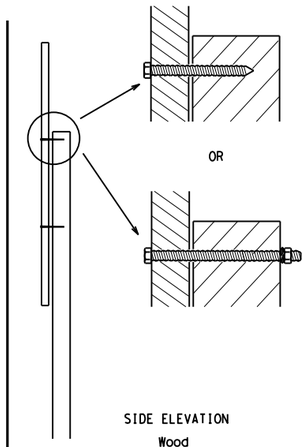


* When placing skid supports on unlevel ground, the leg post lengths must be adjusted so the sign appears straight and plumb. Objects shall NOT be placed under skids as a means of leveling.

** 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





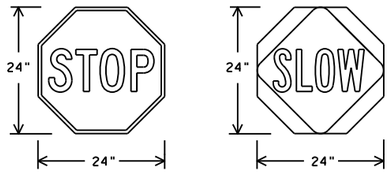
Attachment to wooden supports will be by bolts and nuts or screws. Use TxDOT's or manufacturer's recommended procedures for attaching sign substrates to other types of sign supports

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.

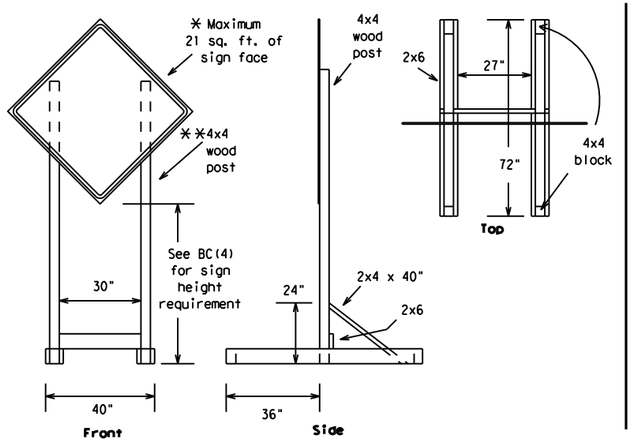
Texas Department of Transportation | Traffic Safety Division Standard

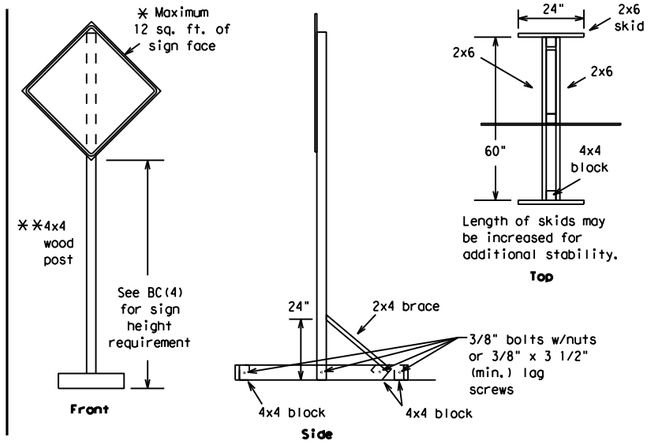
BARRICADE AND CONSTRUCTION TEMPORARY SIGN NOTES

BC(4)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0814	01	036	FM 422
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	WFS	BAYLOR		21

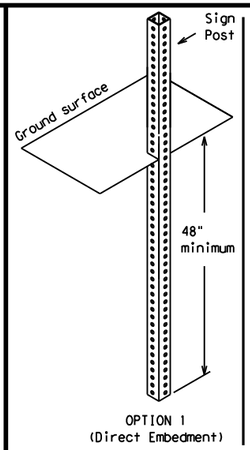
DATE: 3/29/2024 1:12:42 PM
FILE: pw://txdot.projectwiseonline.com:TXDOT2/Documents/03 - WFS/Design Projects/081401036/4 - Design/Plan Set/2. TCP/BC(1)-21.dgn

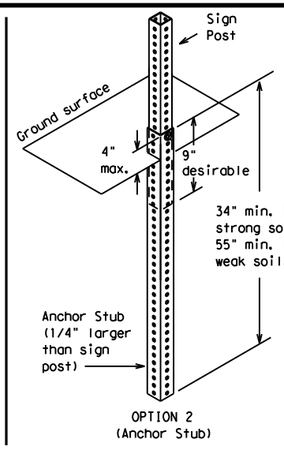


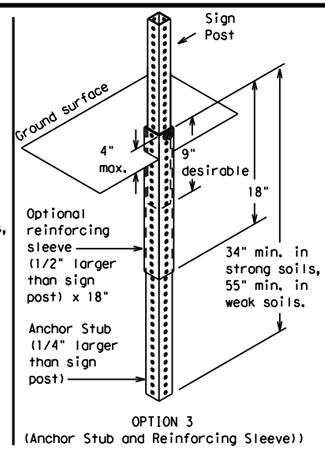


SKID MOUNTED WOOD SIGN SUPPORTS

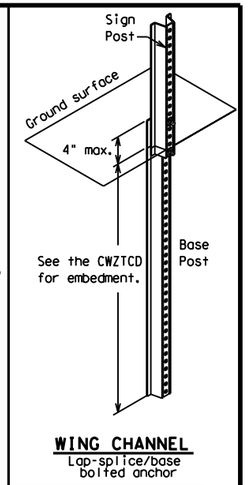
* LONG/INTERMEDIATE TERM STATIONARY - PORTABLE SKID MOUNTED SIGN SUPPORTS







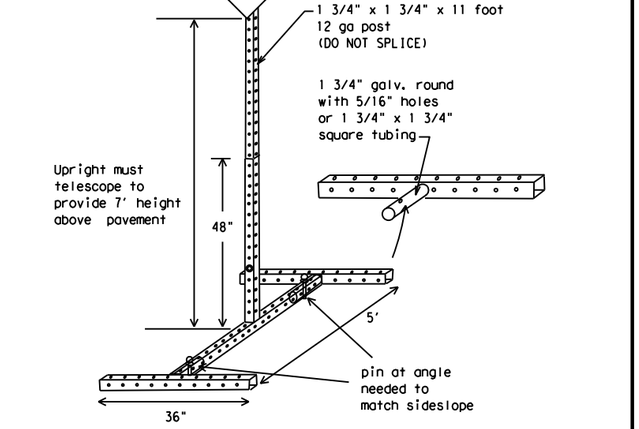
PERFORATED SQUARE METAL TUBING

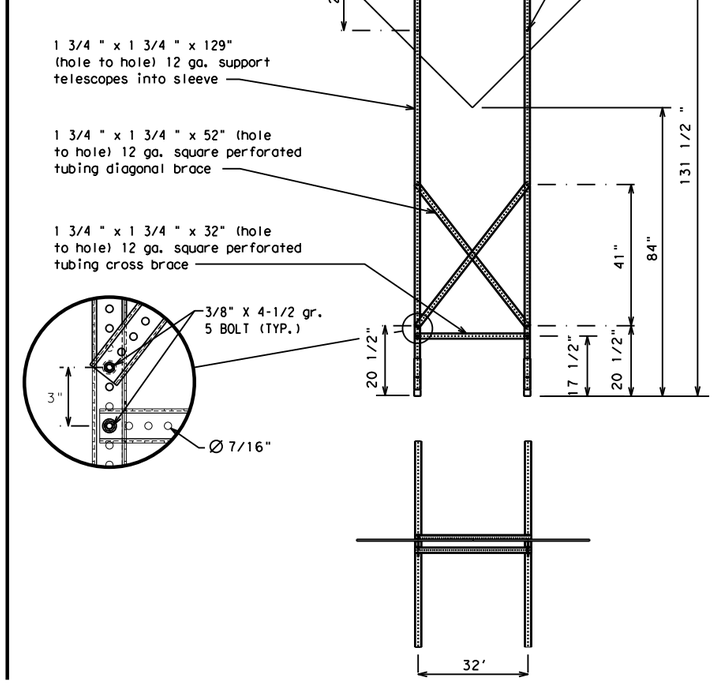


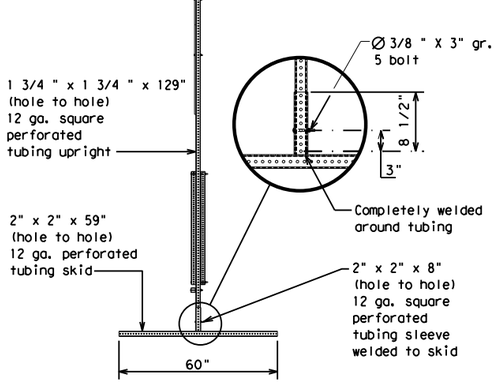
WING CHANNEL
Lap-splice/base bolted anchor

GROUND MOUNTED SIGN SUPPORTS

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







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.

SHEET 5 OF 12

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	0814	01	036	FM 422
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	WFS.	BAYLOR		22

DATE: 3/29/2024 1:12:43 PM
FILE: pw://txdot.projectwiseonline.com:TXDOT2/Documents/03 - WFS/Design Projects/0814010364 - Design/Plan Set/2. TCP/BC(1)-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
Major	MAJ
Miles	MI
Miles Per Hour	MPH
Minor	MNR
Monday	MON
Normal	NORM
North	N
Northbound	(route) N
Parking	PKING
Road	RD
Right Lane	RT LN
Saturday	SAT
Service Road	SERV RD
Shoulder	SHLDR
Slippery	SLIP
South	S
Southbound	(route) S
Speed	SPD
Street	ST
Sunday	SUN
Telephone	PHONE
Temporary	TEMP
Thursday	THURS
To Downtown	TO DWNTN
Traffic	TRAF
Travelers	TRVLRS
Tuesday	TUES
Time Minutes	TIME MIN
Upper Level	UPR LEVEL
Vehicles (s)	VEH, VEHS
Warning	WARN
Wednesday	WED
Weight Limit	WT LIMIT
West	W
Westbound	(route) W
Wet Pavement	WET PVMT
Will Not	WONT

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

RECOMMENDED PHASES AND FORMATS FOR PCMS MESSAGES DURING ROADWORK ACTIVITIES

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

Phase 1: Condition Lists

Road/Lane/Ramp Closure List

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

Other Condition List

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

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

Phase 2: Possible Component Lists

Action to Take/Effect on Travel List

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

Location List

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

Warning List

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

** Advance Notice List

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

* See Application Guidelines Note 6.

APPLICATION GUIDELINES

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

WORDING ALTERNATIVES

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

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

FULL MATRIX PCMS SIGNS

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

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)

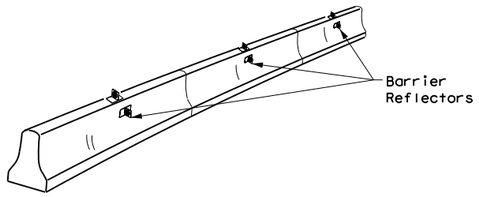
BC(6)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0814	01	036	FM 422
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	WFS	BAYLOR		23

100

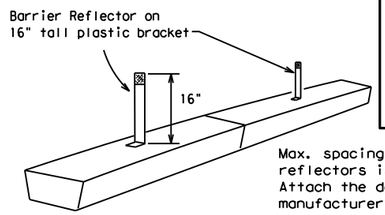
DATE: 3/29/2024 1:12:44 PM
FILE: pw://txdot.projectwiseonline.com:TXDOT2/Documents/03 - WFS/Design Projects/0814010364 - Design/Plan Set/2. TCP/BC(1)-21.dgn

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.

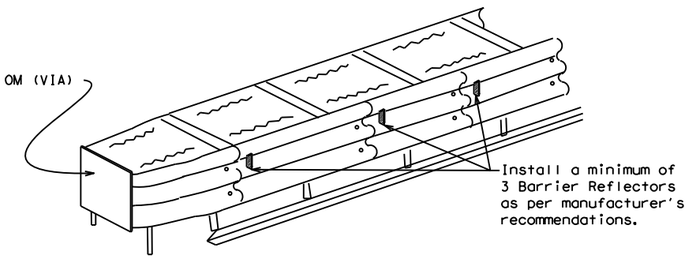


Max. spacing of barrier reflectors is 20 feet. Attach the delineators as per manufacturer's recommendations.

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)

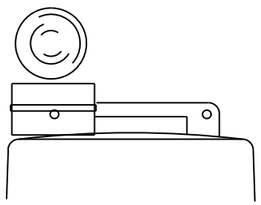


DELINEATION OF END TREATMENTS

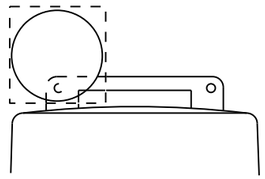
END TREATMENTS FOR CTB'S USED IN WORK ZONES

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

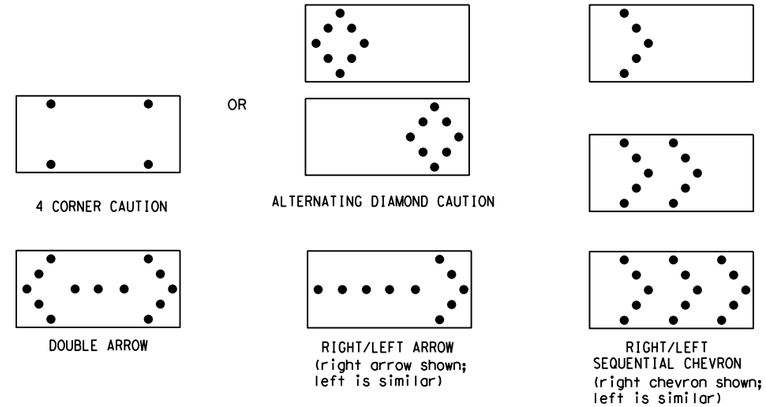
1. Type A flashing warning lights are intended to warn drivers that they are approaching or are in a potentially hazardous area.
2. Type A random flashing warning lights are not intended for delineation and shall not be used in a series.
3. A series of sequential flashing warning lights placed on channelizing 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	0814	01	036	FM 422
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	WFS.	BAYLOR		24

TOT

DATE: 3/29/2024 1:12:45 PM
FILE: pw://txdot.projectwiseonline.com:TXDOT2/Documents/03 - WFS/Design Projects/08140136/4 - Design/Plan Set/2. TCP/BC(1)-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:

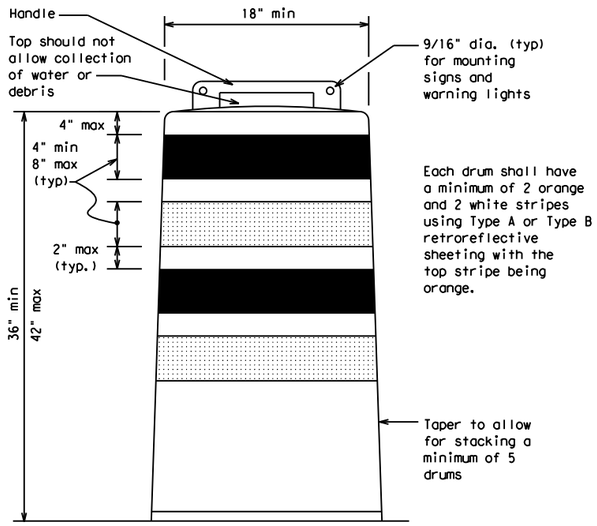
1. Plastic drums shall be a two-piece design; the "body" of the drum shall be the top portion and the "base" shall be the bottom.
2. The body and base shall lock together in such a manner that the body separates from the base when impacted by a vehicle traveling at a speed of 20 MPH or greater but prevents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

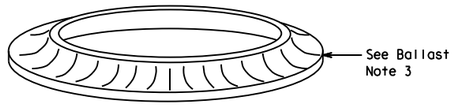
RETROREFLECTIVE SHEETING

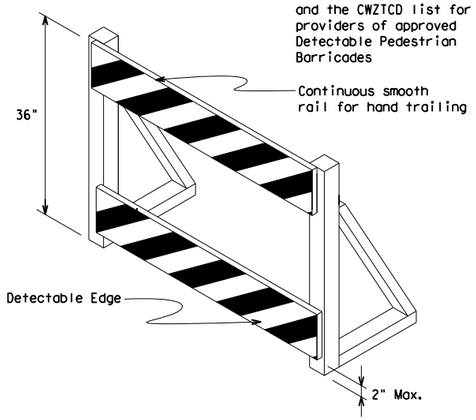
1. The stripes used on drums shall be constructed of sheeting meeting the color and retroreflectivity requirements of Departmental Materials Specification DMS-8300, "Sign Face Materials," Type A or Type B reflective sheeting shall be supplied unless otherwise specified in the plans.
2. The sheeting shall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

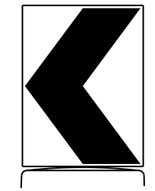




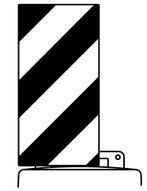


DETECTABLE PEDESTRIAN BARRICADES

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

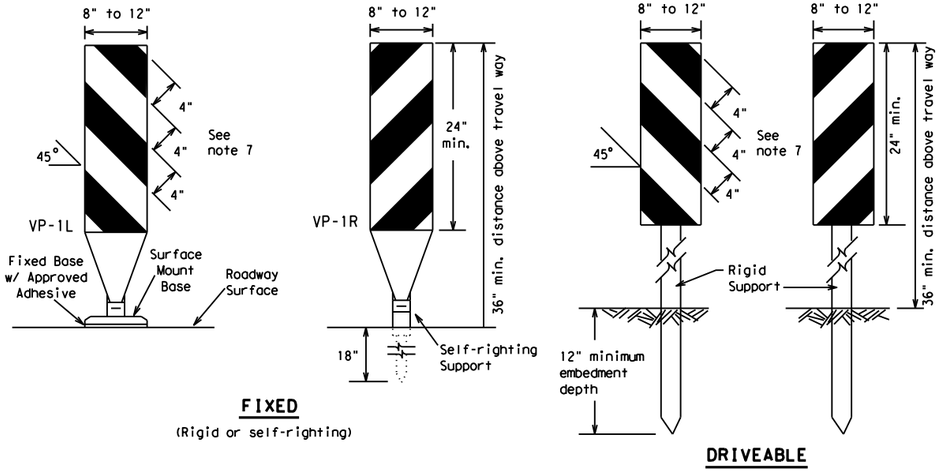
BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(8)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0814	01	036	FM 422
4-03 8-14	DIST	COUNTY		SHEET NO.
9-07 5-21	WFS.	BAYLOR		25
7-13				

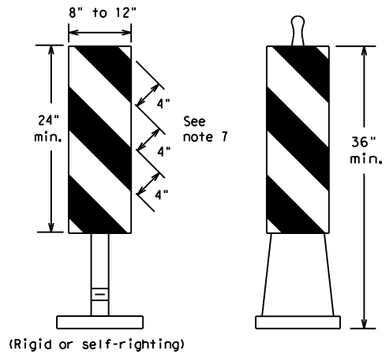
102

DATE: 3/29/2024 1:12:46 PM
FILE: pw://txdot.projectwiseonline.com:TXDOT2/Documents/03 - WFS/Design Projects/0814010364 - Design/Plan Set/2. TCP/BC(1)-21.dgn



FIXED
(Rigid or self-righting)

DRIVEABLE

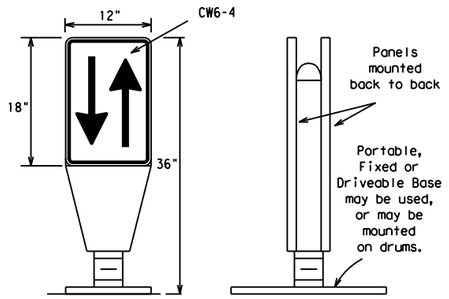


(Rigid or self-righting)

PORTABLE

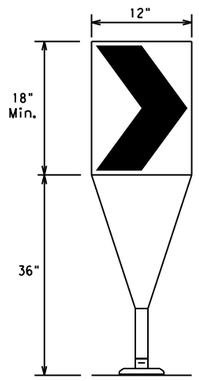
1. Vertical Panels (VP's) are normally used to channelize traffic or divide opposing lanes of traffic.
2. VP's may be used in daytime or nighttime situations. They may be used at the edge of shoulder drop-offs and other areas such as lane transitions where positive daytime and nighttime delineation is 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)



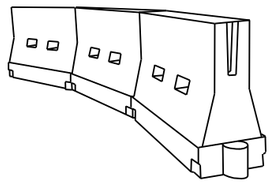
Fixed Base w/ Approved Adhesive (Driveable Base, or Flexible Support can be used)

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

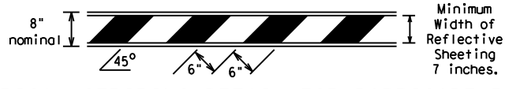
FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0814	01	036	FM 422
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	WFS.	BAYLOR		26

DATE: 3/29/2024 1:12:46 PM
FILE: pw://txdot.projectwiseonline.com:TXDOT2/Documents/03 - WFS/Design Projects/0814010364 - Design/Plan Set/2. TCP/BC(1)-21.dgn

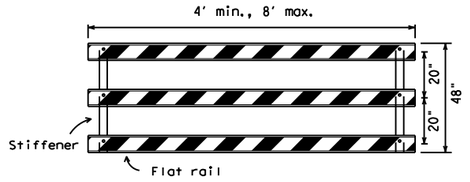
TYPE 3 BARRICADES

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.



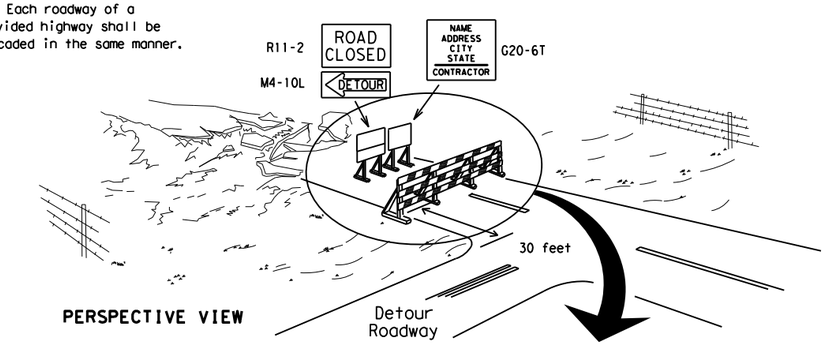
TYPICAL STRIPING DETAIL FOR BARRICADE RAIL



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

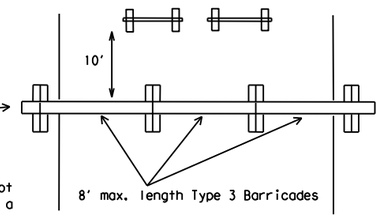
TYPICAL PANEL DETAIL FOR SKID OR POST TYPE BARRICADES

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



PERSPECTIVE VIEW

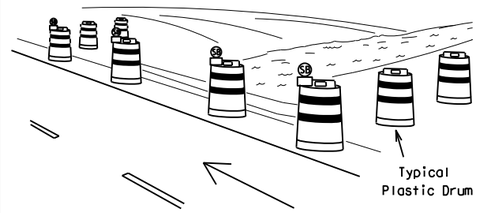
The three rails on Type 3 barricades shall be reflectorized orange and reflective white stripes on one side facing one-way traffic and both sides for two-way traffic.
Barricade striping should slant downward in the direction of detour.



PLAN VIEW

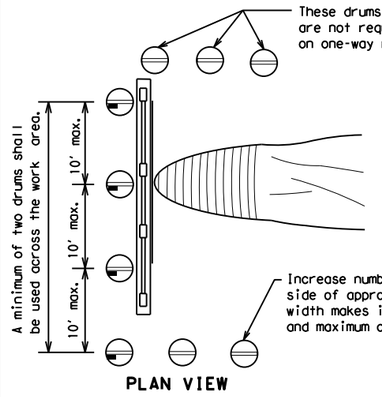
1. Signs should be mounted on independent supports at a 7 foot mounting height in center of roadway. The signs should be a minimum of 10 feet behind Type 3 Barricades.
2. Advance signing shall be as specified elsewhere in the plans.

TYPE 3 BARRICADE (POST AND SKID) TYPICAL APPLICATION



PERSPECTIVE VIEW

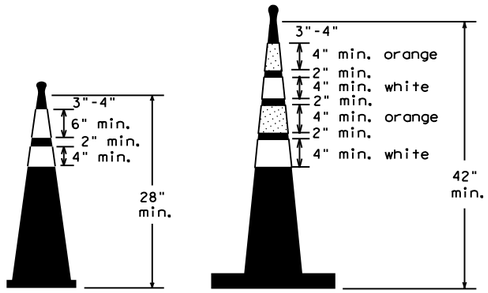
1. Where positive redirectional capability is provided, drums may be omitted.
2. Plastic construction fencing may be used with drums for safety as required in the plans.
3. Vertical Panels on flexible support may be substituted for drums when the shoulder width is less than 4 feet.
4. When the shoulder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

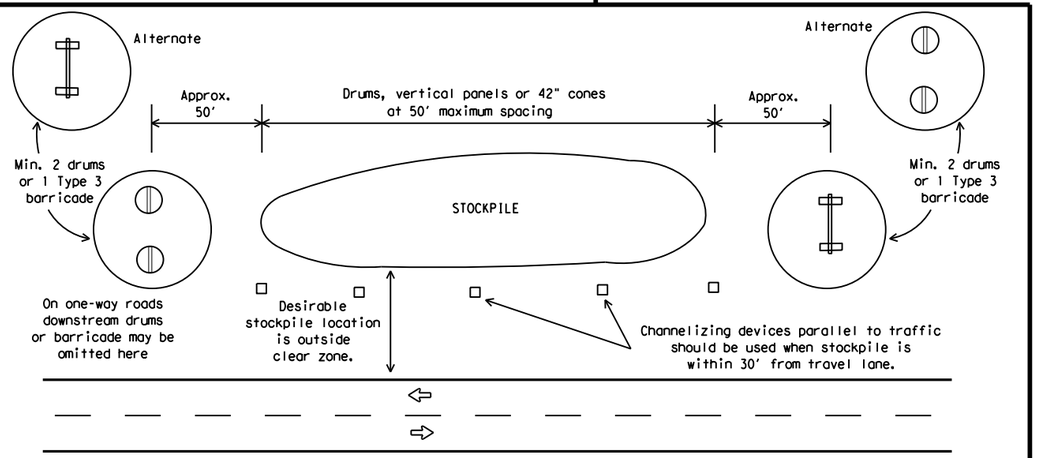
PLAN VIEW

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	0814	01	036	FM 422
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	WFS.	BAYLOR		27

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.

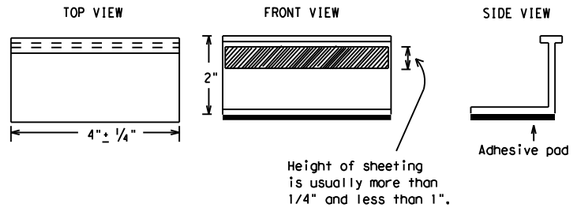
MAINTAINING WORK ZONE PAVEMENT MARKINGS

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

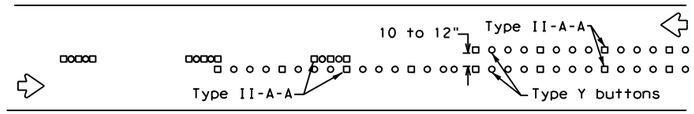
FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 1998	CONT	SECT	JOB	HIGHWAY
REVISIONS	0814	01	036	FM 422
2-98 9-07 5-21	DIST	COUNTY		SHEET NO.
1-02 7-13	WFS.	BAYLOR		28
11-02 8-14				

105

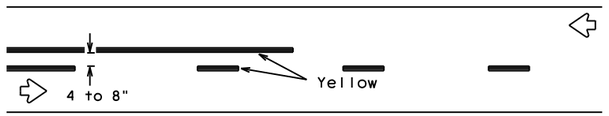
DATE: 3/29/2024 1:12:48 PM
FILE: pw:/txdot.projectwiseonline.com:TXDOT2/Documents/03 - WFS/Design Projects/081401036/4 - Design/Plan Set/2. TCP/BC(1)-21.dgn

PAVEMENT MARKING PATTERNS

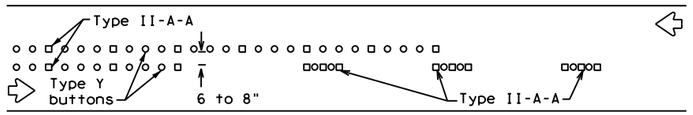
REFLECTORIZED PAVEMENT MARKINGS - PATTERN A



RAISED PAVEMENT MARKERS - PATTERN A



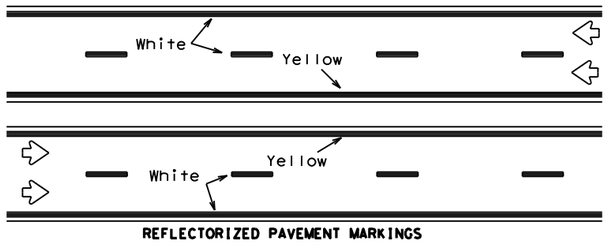
REFLECTORIZED PAVEMENT MARKINGS - PATTERN B



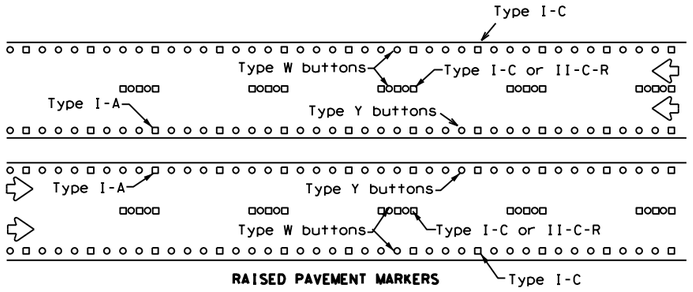
RAISED PAVEMENT MARKERS - PATTERN B

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



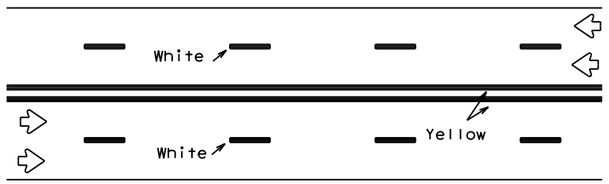
REFLECTORIZED PAVEMENT MARKINGS



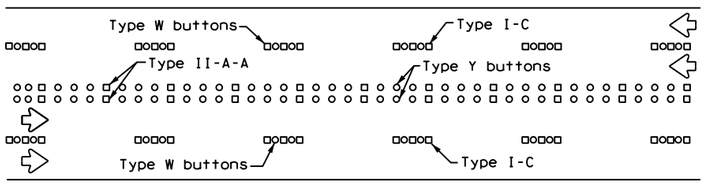
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

EDGE & LANE LINES FOR DIVIDED HIGHWAY



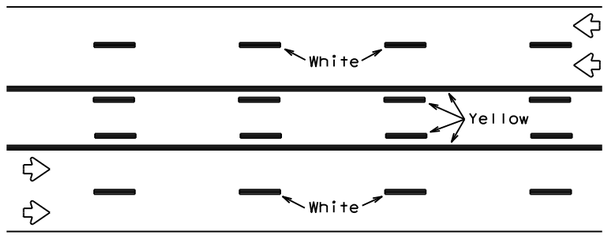
REFLECTORIZED PAVEMENT MARKINGS



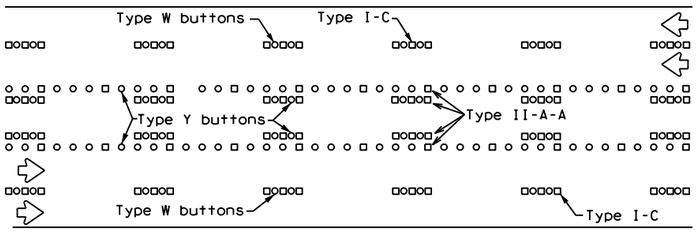
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS



REFLECTORIZED PAVEMENT MARKINGS



RAISED PAVEMENT MARKERS

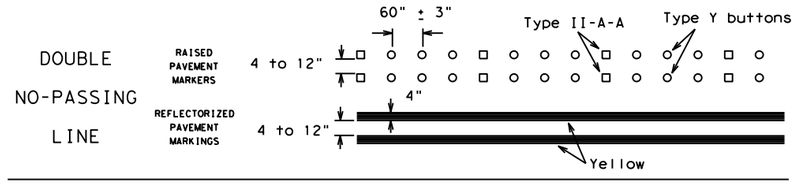
Prefabricated markings may be substituted for reflectorized pavement markings.

TWO-WAY LEFT TURN LANE

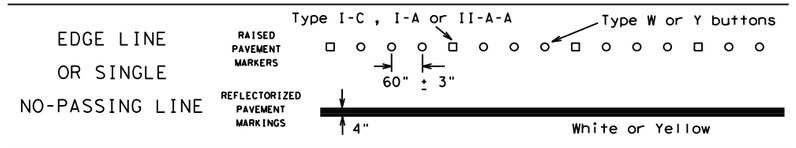
STANDARD WORK ZONE PAVEMENT MARKINGS DETAILS

SOLID LINES

DOUBLE NO-PASSING LINE

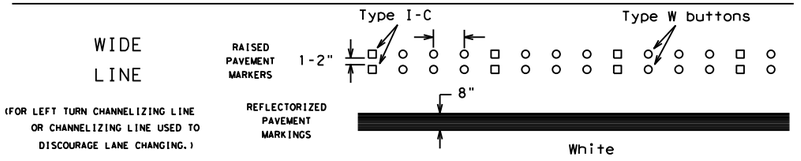


EDGE LINE OR SINGLE NO-PASSING LINE



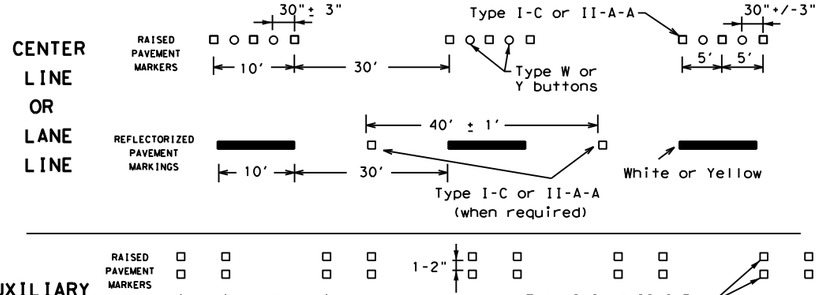
WIDE LINE

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

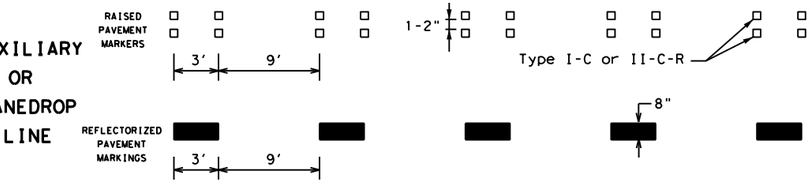


BROKEN LINES

CENTER LINE OR LANE LINE

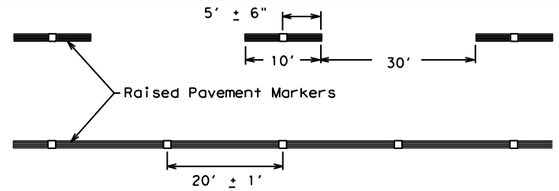


AUXILIARY OR LANEDROP LINE



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

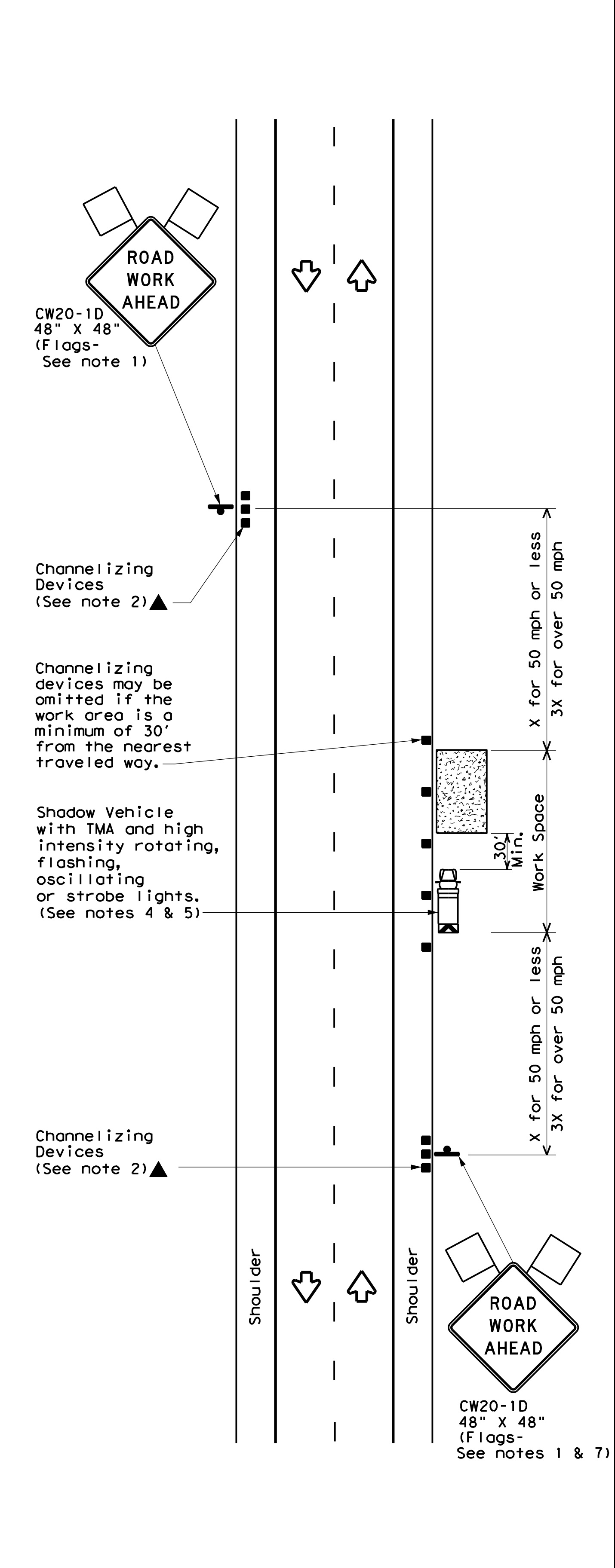
BARRICADE AND CONSTRUCTION PAVEMENT MARKING PATTERNS

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	0814	01	036	FM 422
	DIST	COUNTY		SHEET NO.
	WFS.	BAYLOR		29

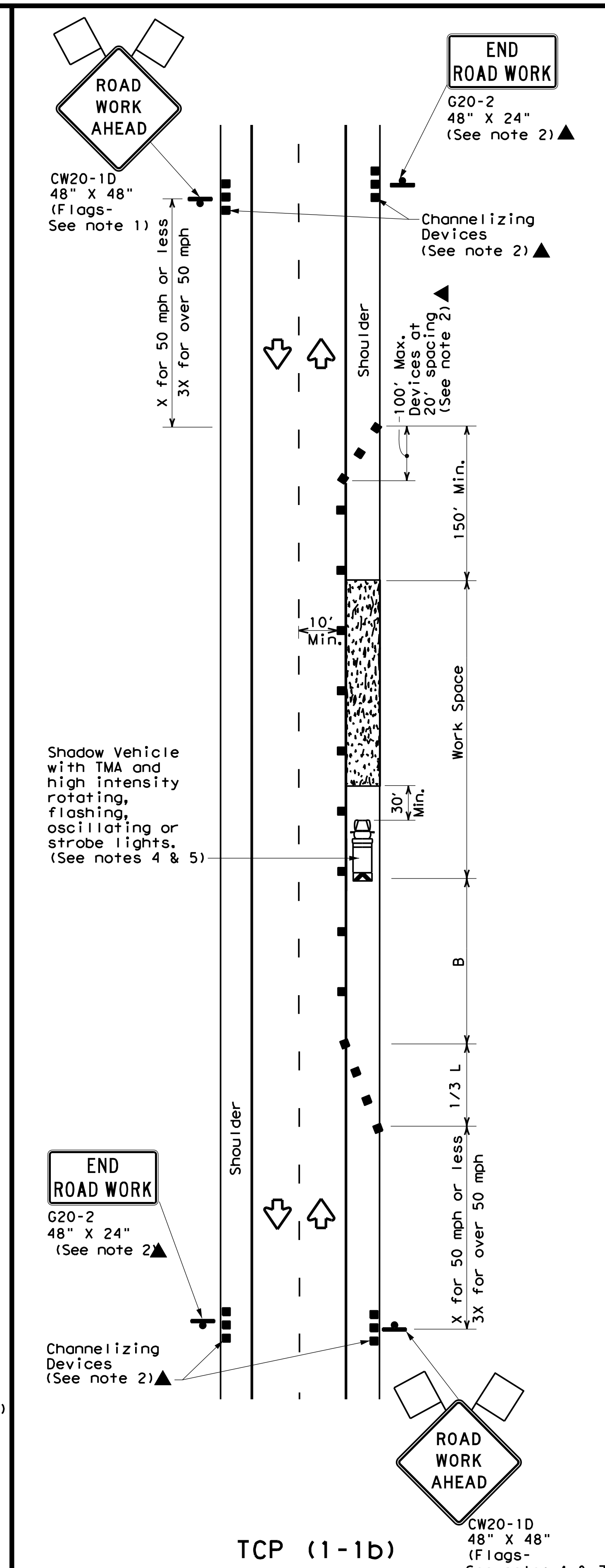
106

DATE: 3/29/2024 1:13:00 PM
FILE: pw://txdot.projectwiseonline.com:TXDOT2/Documents/03 - WFS/Design Projects/...



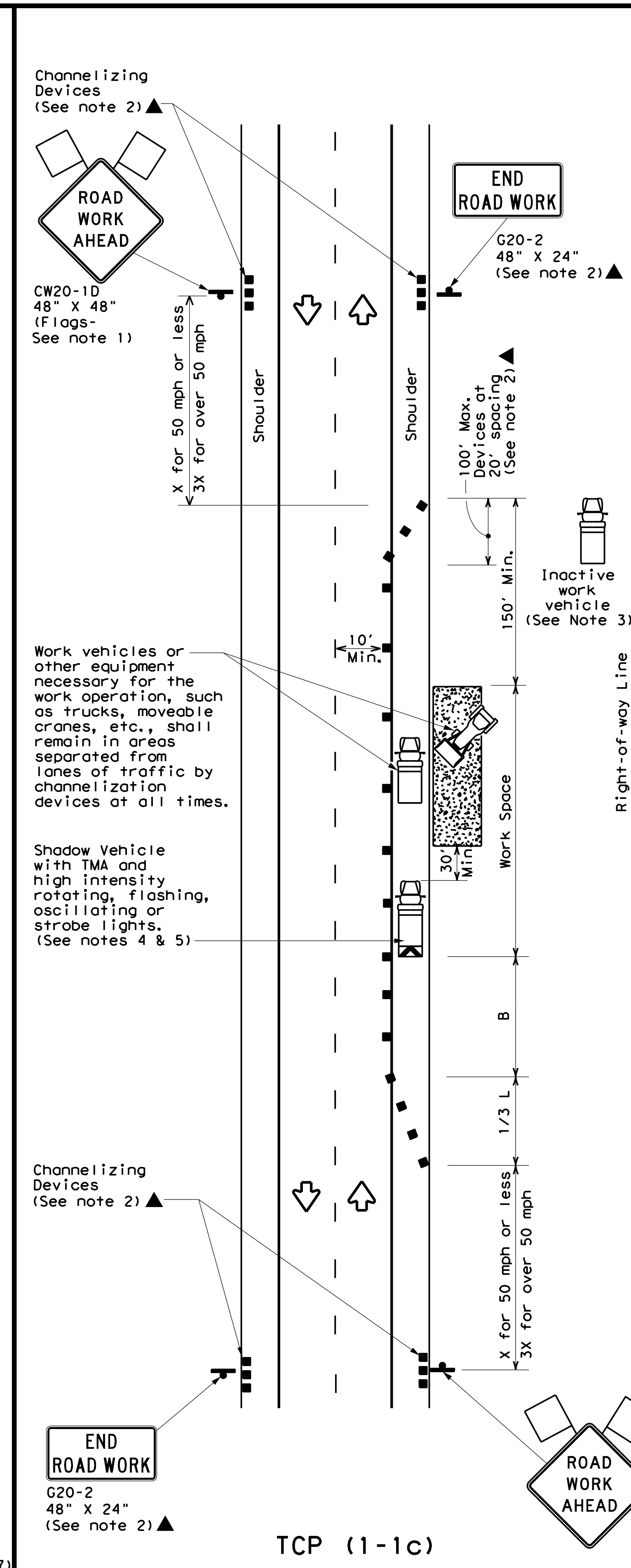
TCP (1-1a)

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

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

TYPICAL USAGE

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

GENERAL NOTES

1. Flags attached to signs where shown are REQUIRED.
2. All traffic control devices illustrated are REQUIRED, except those denoted with the triangle symbol may be omitted when stated elsewhere in the plans, or for routine maintenance work, when approved by the Engineer.
3. 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.

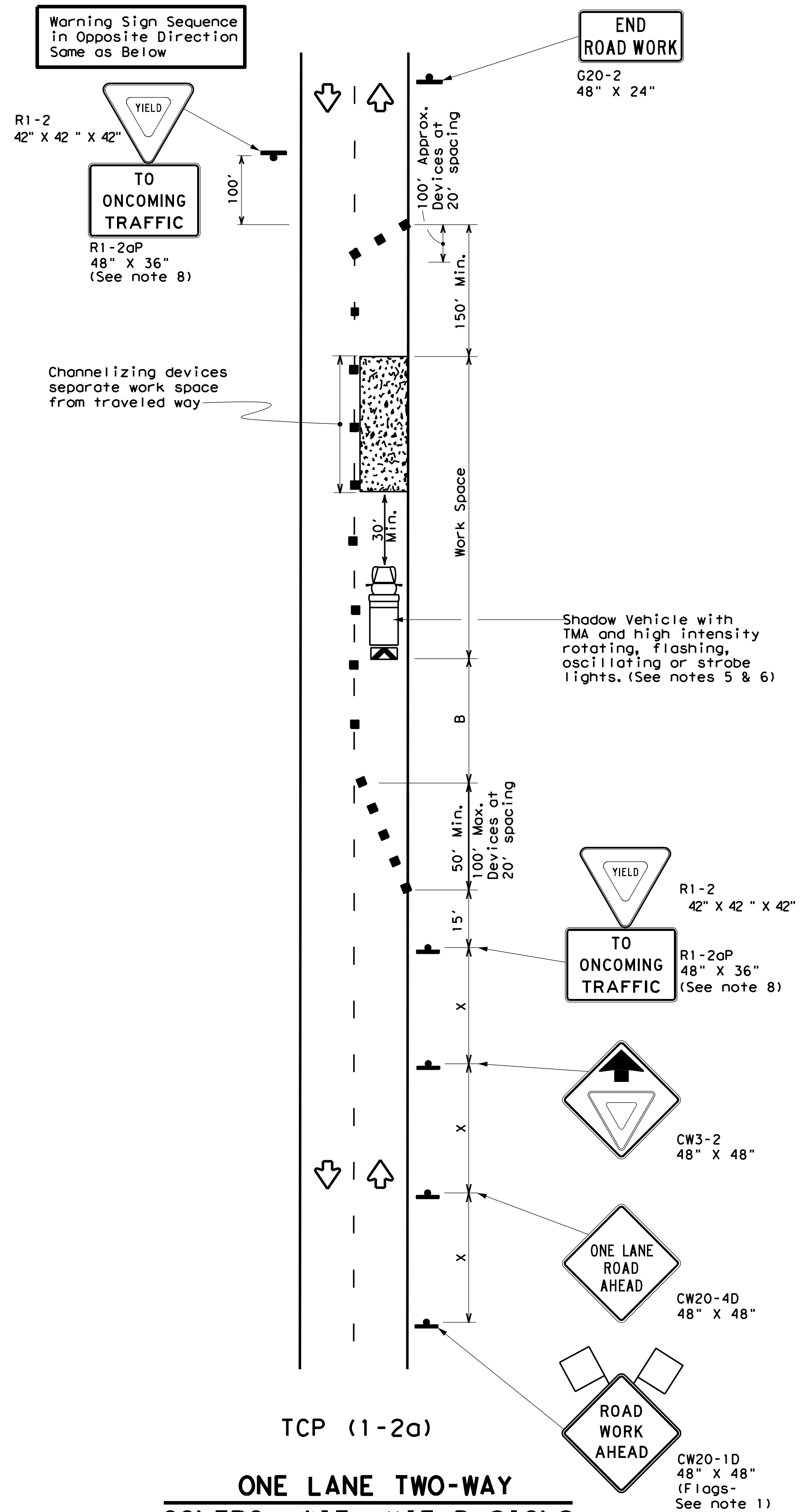
Texas Department of Transportation — Traffic Operations Division Standard

TRAFFIC CONTROL PLAN CONVENTIONAL ROAD SHOULDER WORK

TCP(1-1)-18

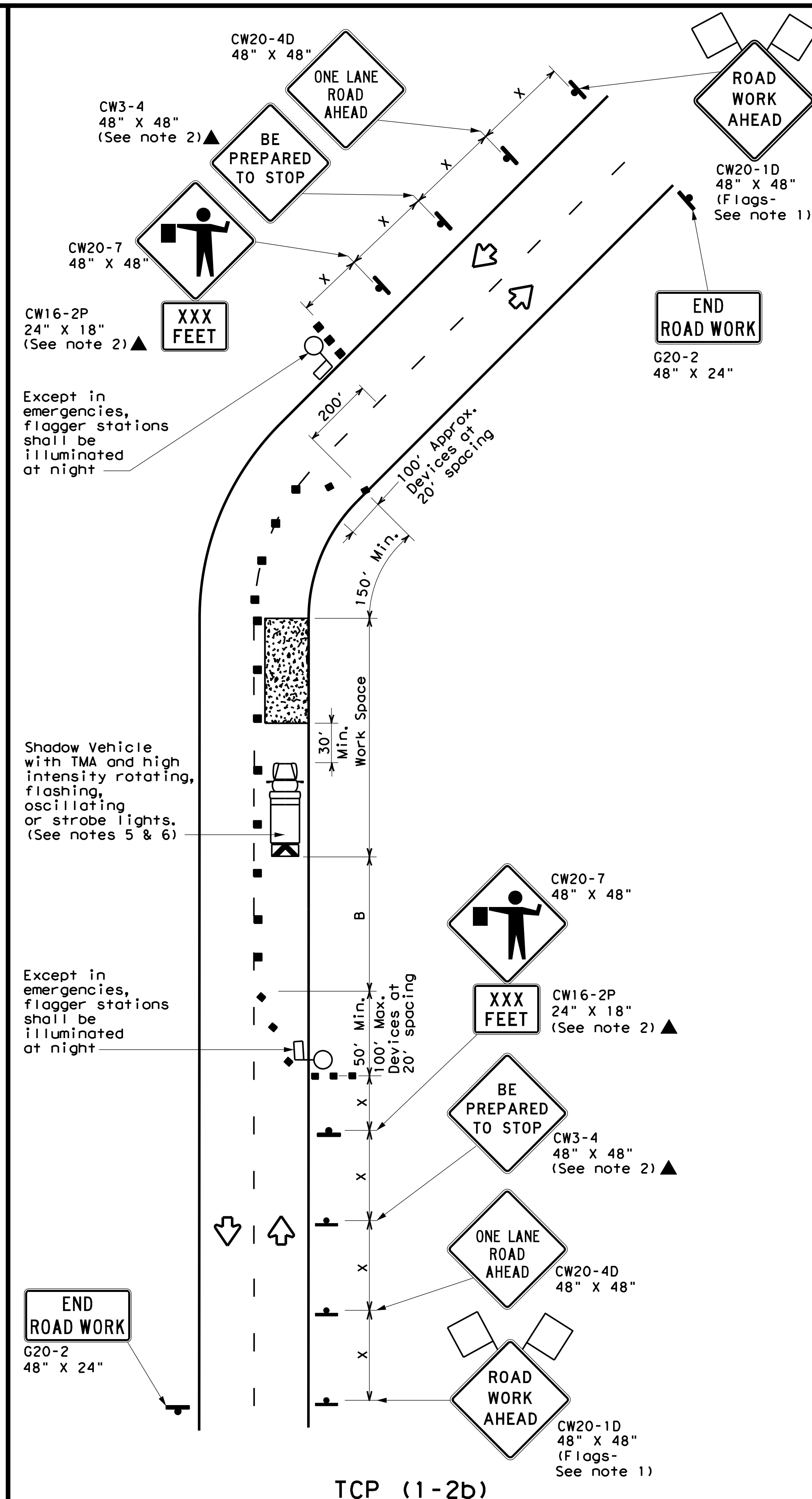
FILE: tcp1-1-18.dgn	DN:	CK:	DW:	CK:
© TxDOT December 1985	CONT 0814	SECT 01	JOB 036	HIGHWAY FM 422
REVISIONS 2-94 4-98 8-95 2-12 1-97 2-18	DIST WFS.		COUNTY BAYLOR	SHEET NO. 30

151



ONE LANE TWO-WAY CONTROL WITH YIELD SIGNS

(Less than 2000 ADT - See note 7)



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

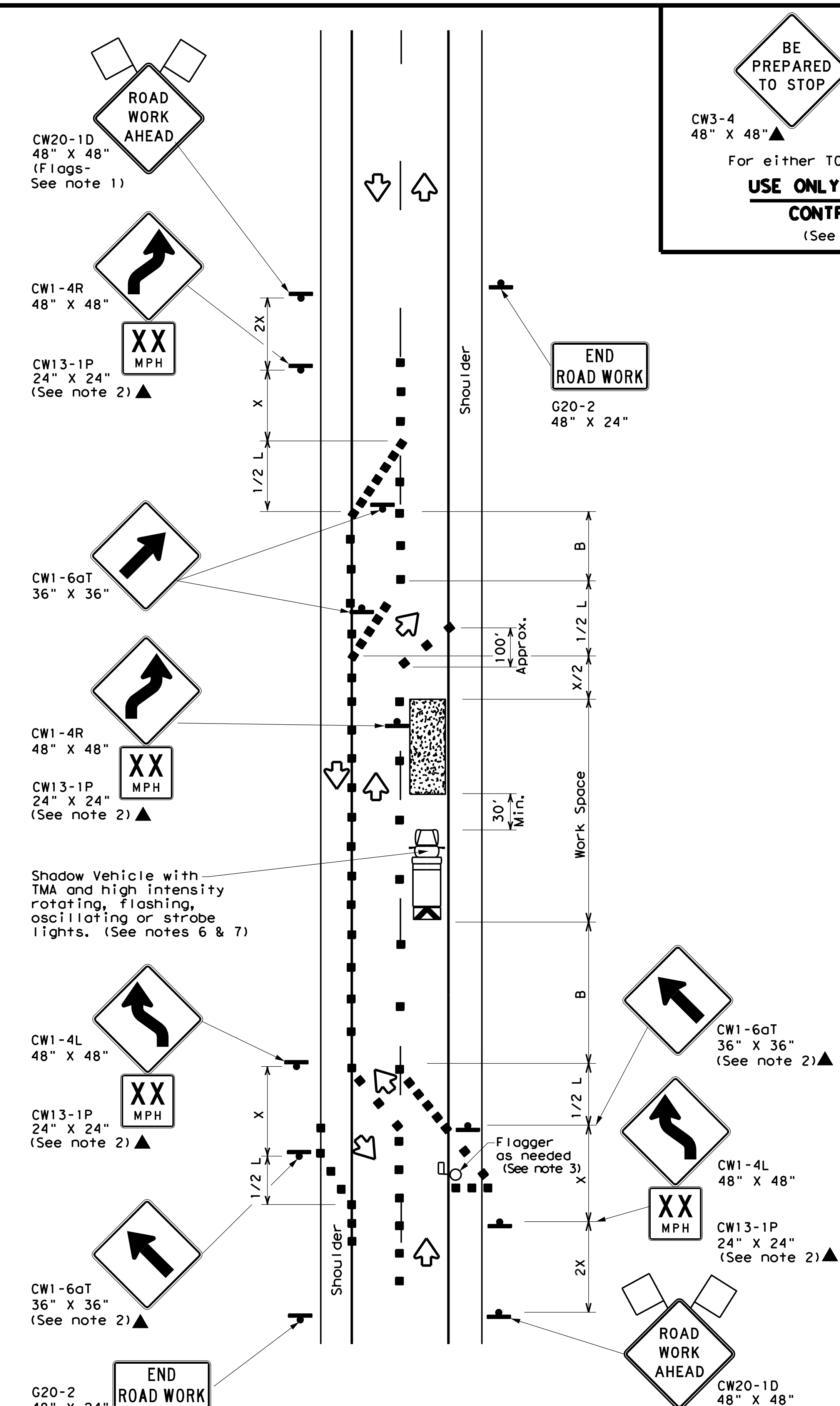
FILE: tcp1-2-18.dgn	DN:	CK:	DW:	CK:

CONT	SECT	JOB	HIGHWAY
0814	01	036	FM 422

DIST	COUNTY	SHEET NO.
WFS.	BAYLOR	31

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

DATE: 3/29/2024 1:13:29 PM
FILE: pw://txdot.projectwiseonline.com:TXDOT2/Documents/03 - WFS/Design Projects/...



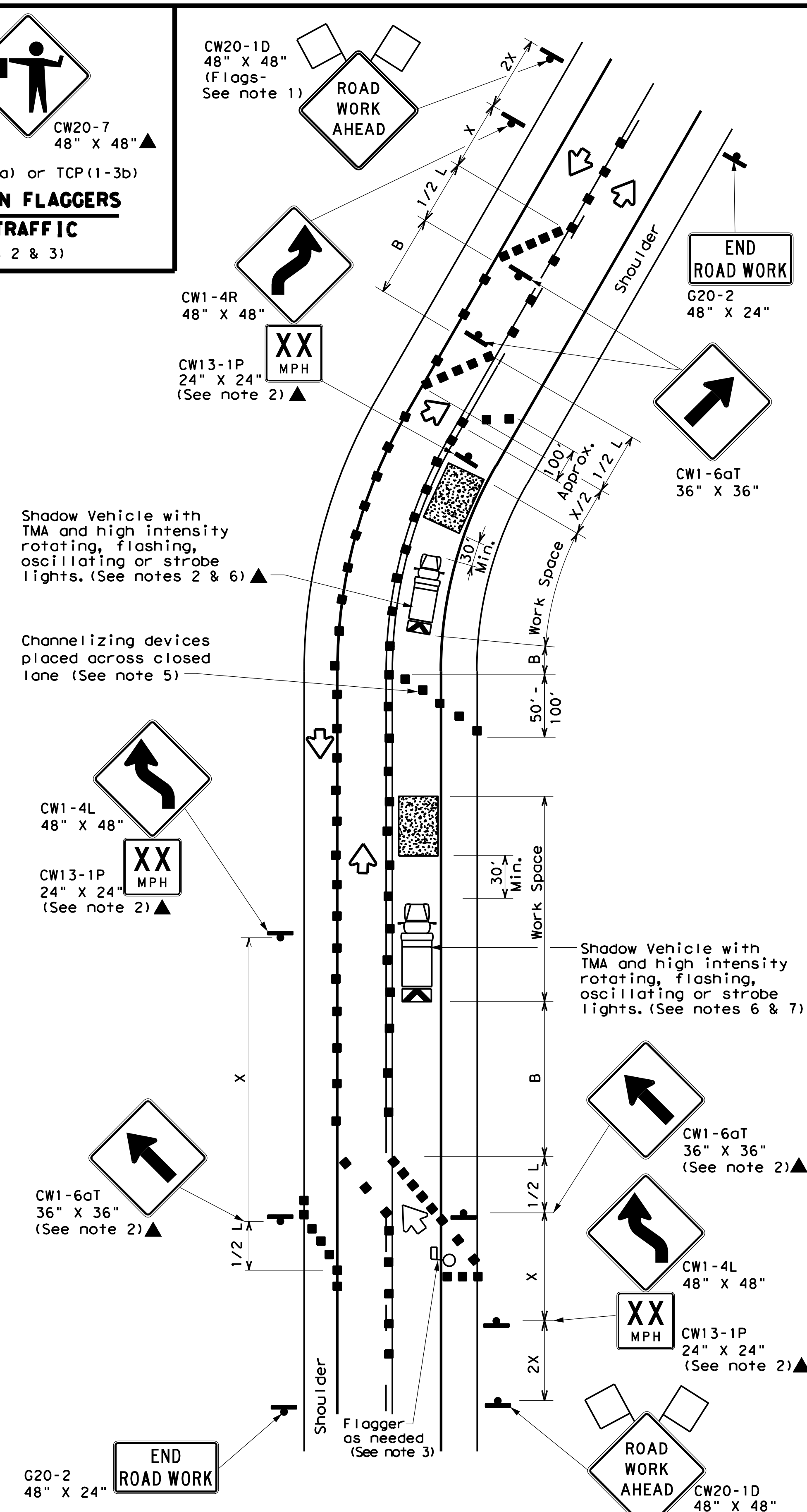
TCP (1-3a)
2-LANE ROADWAY WITH PAVED SHOULDERS

ONE LANE CLOSED
ADEQUATE FIELD OF VIEW

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

USE ONLY WHEN FLAGGERS CONTROL TRAFFIC

(See Notes 2 & 3)



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

ONE LANE CLOSED
INADEQUATE FIELD OF VIEW

LEGEND

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

Texas Department of Transportation

Traffic Operations Division Standard

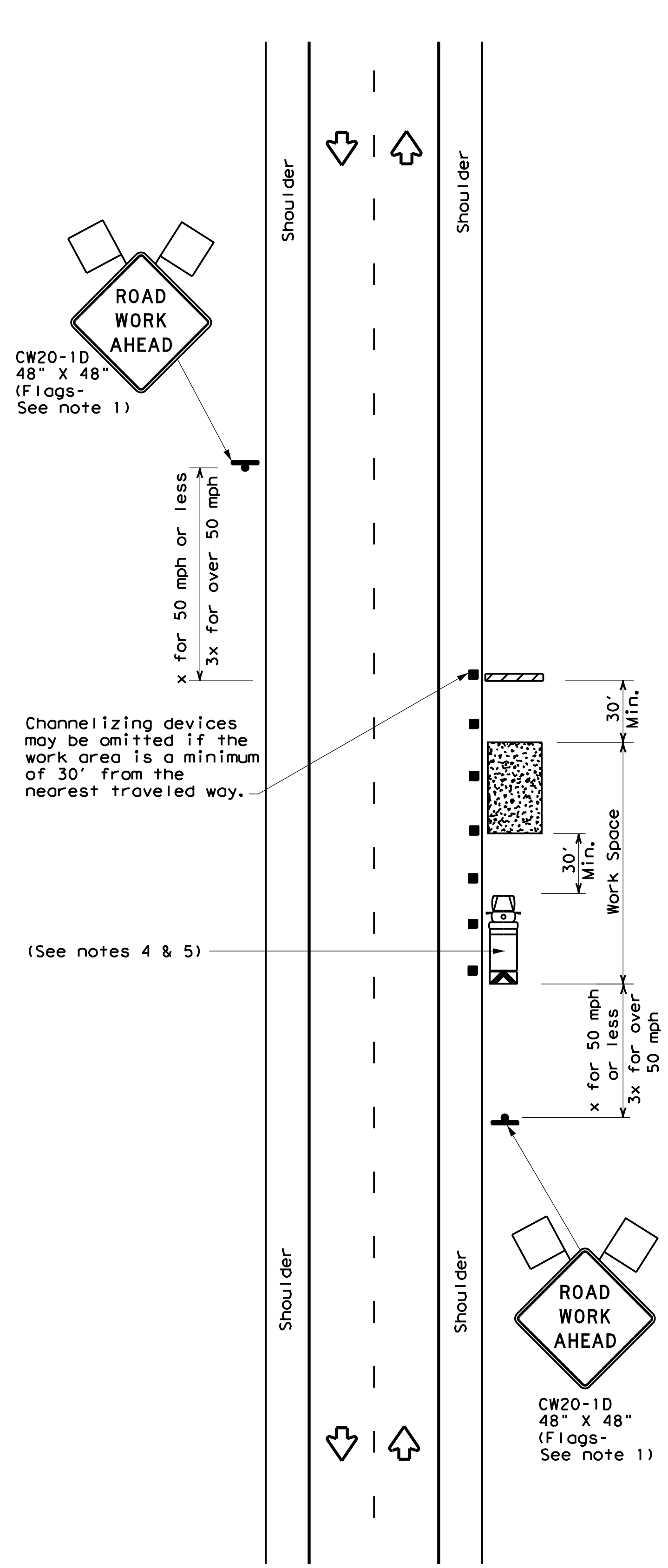
TRAFFIC CONTROL PLAN TRAFFIC SHIFTS ON TWO LANE ROADS

TCP(1-3)-18

FILE: tcp1-3-18.dgn	DN:	CK:	DW:	CK:
©TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS 2-94 4-98 8-95 2-12 1-97 2-18	0814	01	036	FM 422
	DIST	COUNTY		SHEET NO.
	WFS.	BAYLOR		32

153

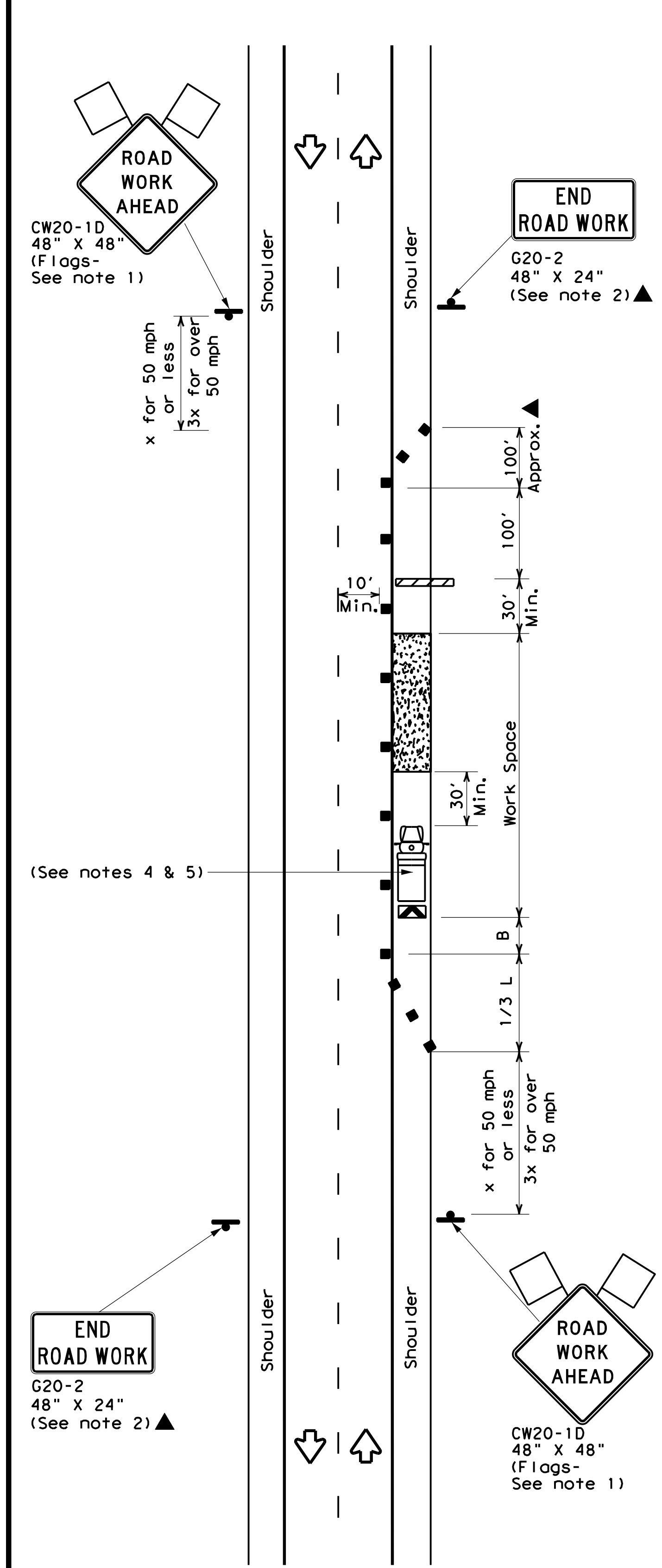
DATE: 3/29/2024 1:13:42 PM
FILE: pw://txdot.projectwiseonline.com:TXDOT2/Documents/03 - WFS/Design Projects/...



TCP (2-1a)

WORK SPACE NEAR SHOULDER

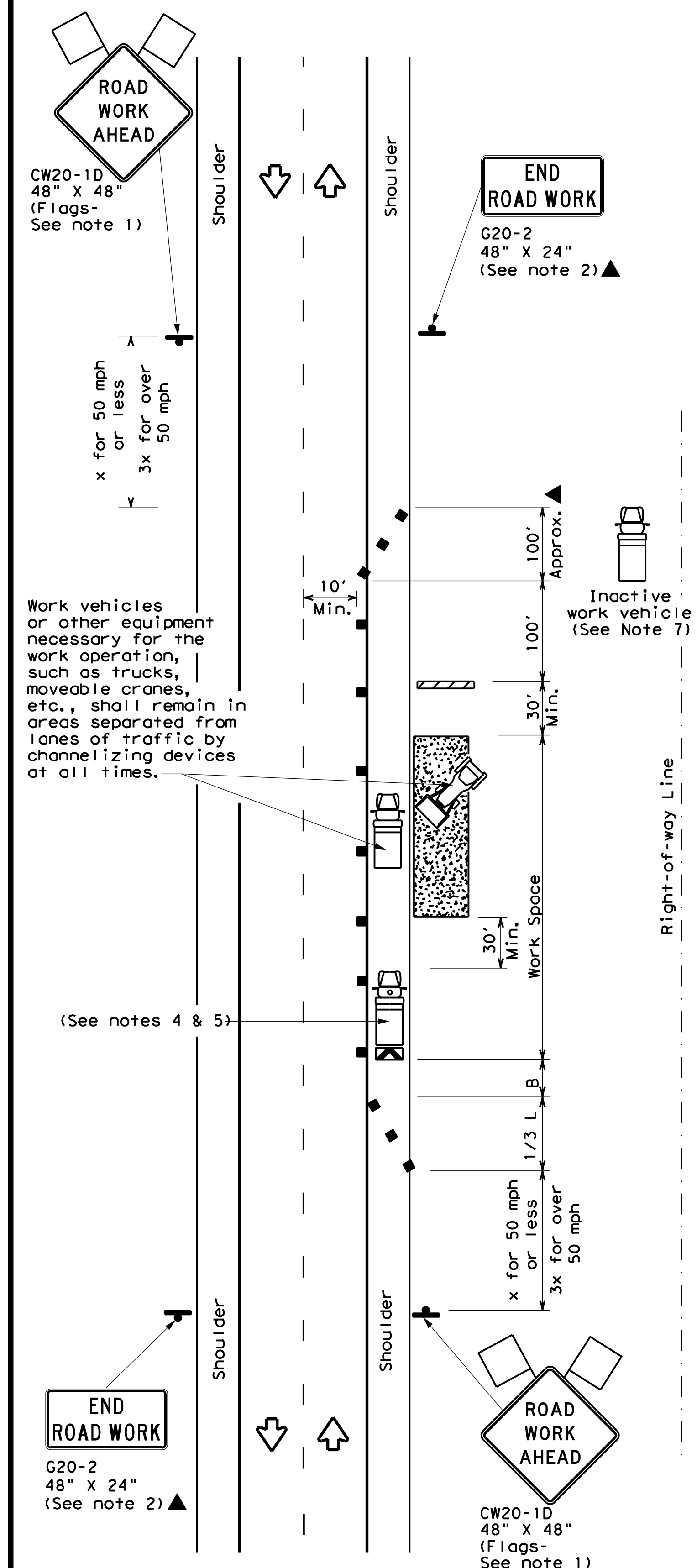
Conventional Roads



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

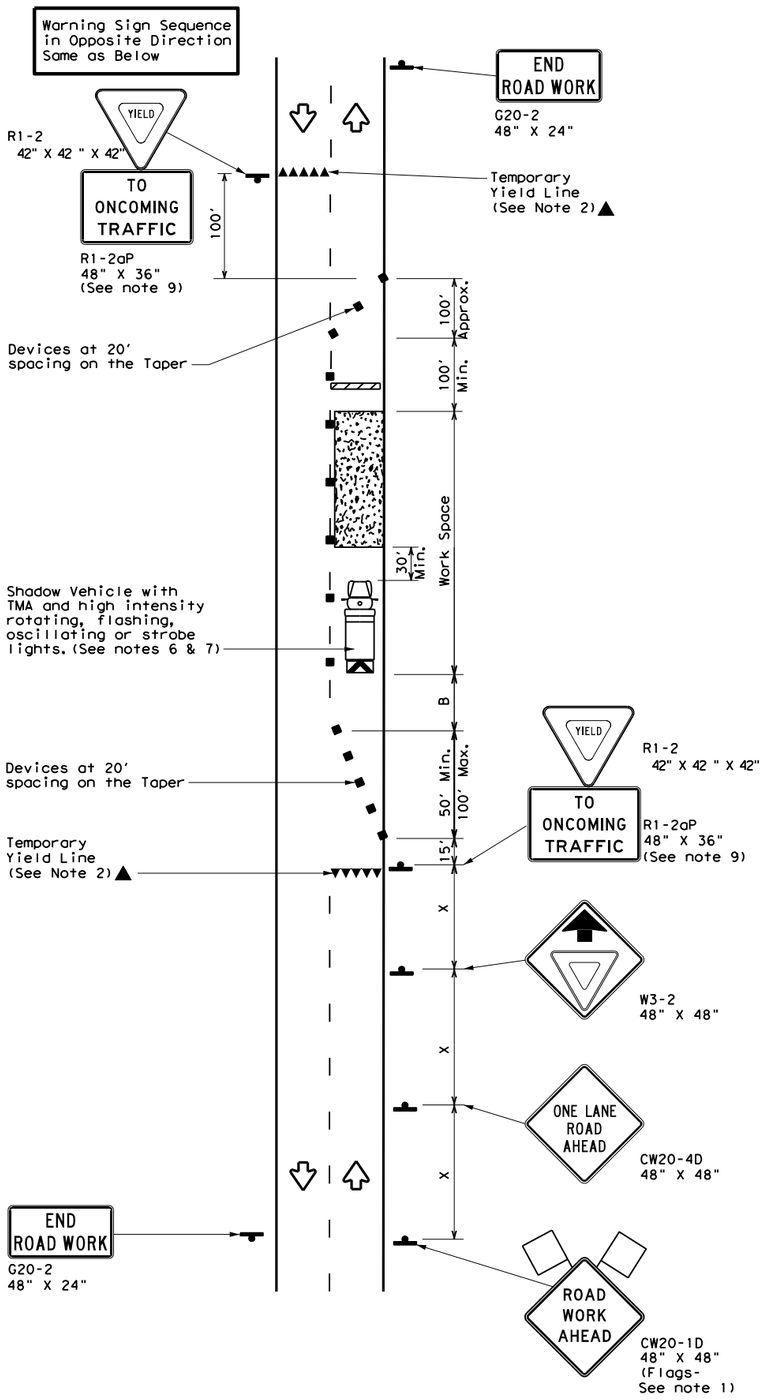
TRAFFIC CONTROL PLAN CONVENTIONAL ROAD SHOULDER WORK

TCP(2-1)-18

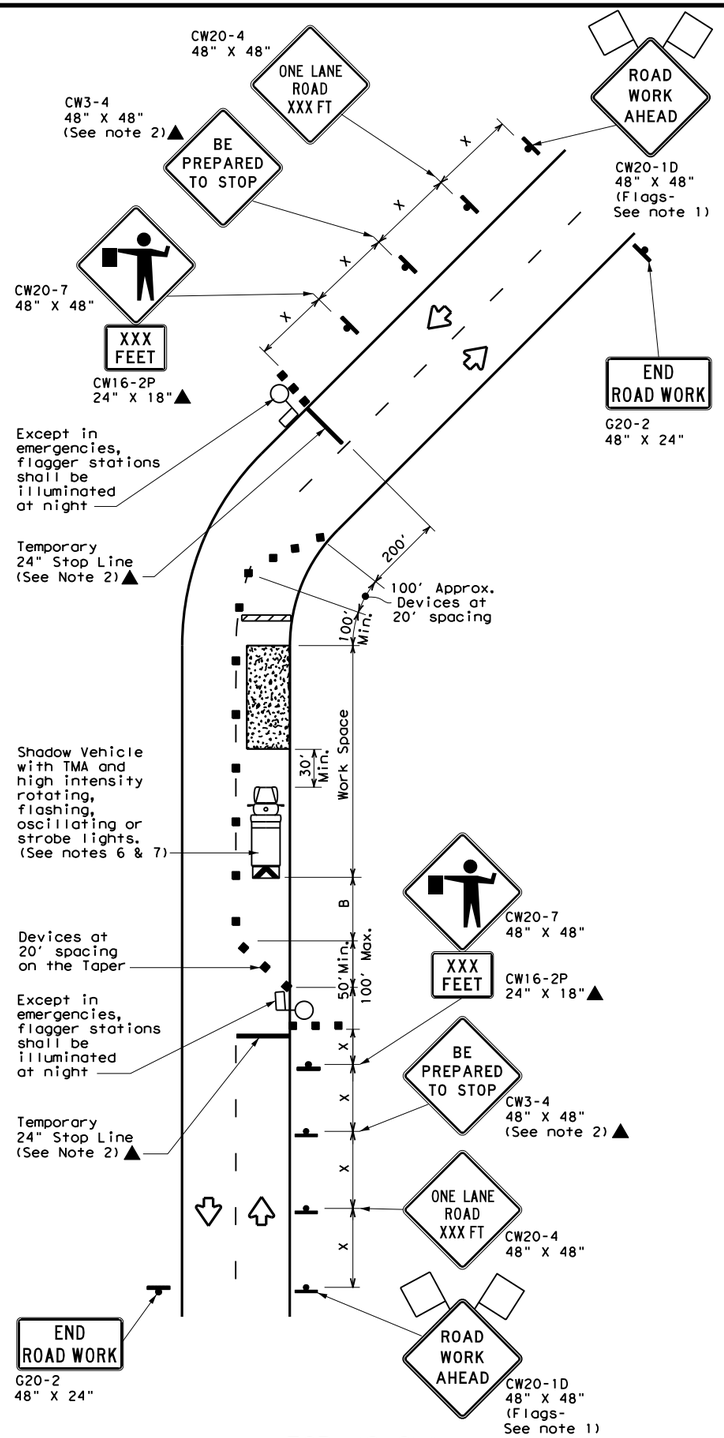
FILE: tcp2-1-18.dgn	DN:	CK:	DW:	CK:
© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS 2-94 4-98 8-95 2-12 1-97 2-18	0814	01	036	FM 422
	DIST		COUNTY	SHEET NO.
	WFS.		BAYLOR	33

161

DATE: 3/29/2024 1:13:54 PM
FILE: pw://txdot.projectwiseonline.com:TXDOT2/Documents/03 - WFS/Design Projects/0814-01-036 FM 422/tcp2-2-18.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)

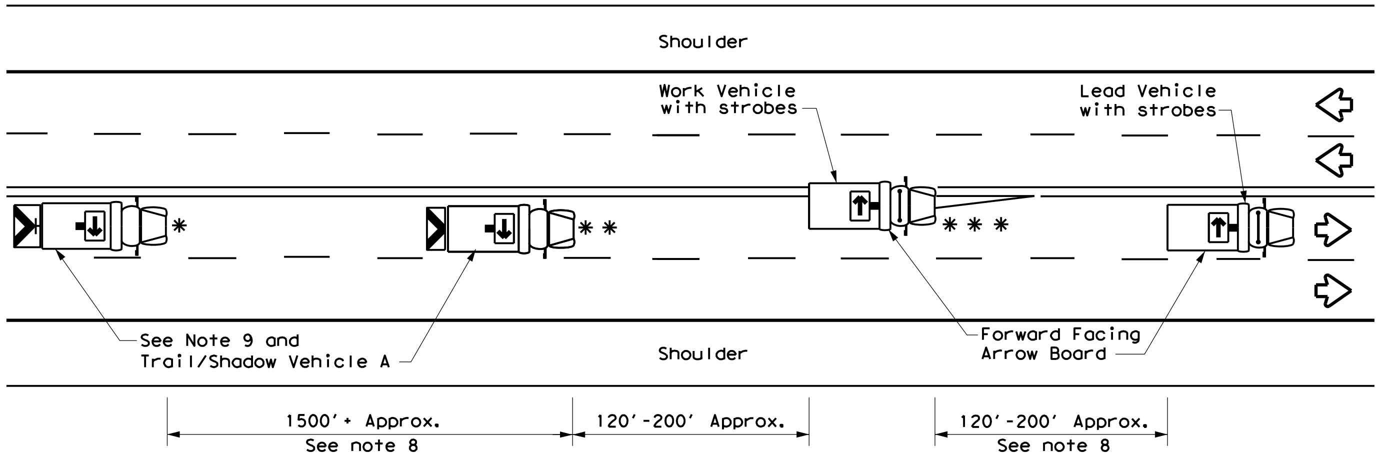
10. Channelizing devices on the center line may be omitted when a pilot car is leading traffic and approved by the Engineer.
11. If the work space is located near a horizontal or vertical curve, the buffer distances should be increased in order to maintain stopping sight distance to the flagger and a 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

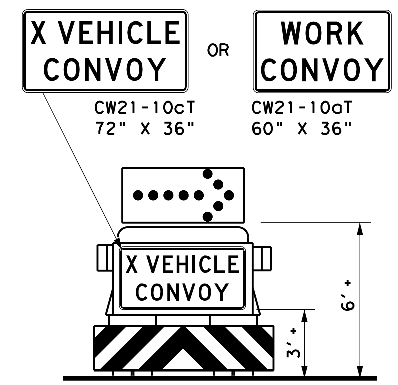
TCP(2-2)-18

FILE: tcp2-2-18.dgn	DN:	CK:	DW:	CK:
©TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS	0814	01	036	FM 422
8-95 3-03	DIST	COUNTY		SHEET NO.
1-97 2-12	WFS.	BAYLOR		34
4-98 2-18				



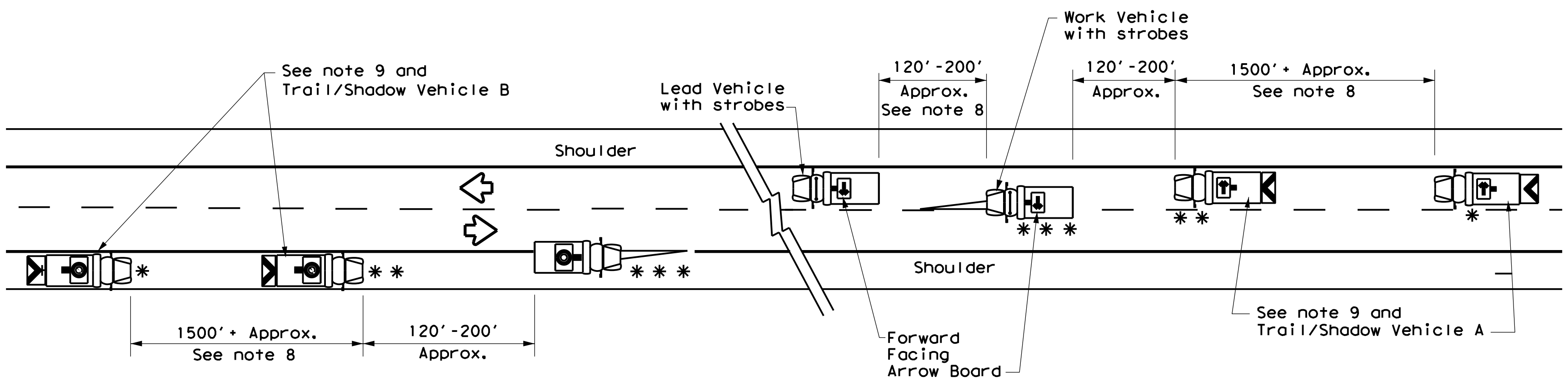
TCP (3-1a)

UNDIVIDED MULTILANE ROADWAY



TRAIL/SHADOW VEHICLE A

with RIGHT Directional
display Flashing Arrow Board

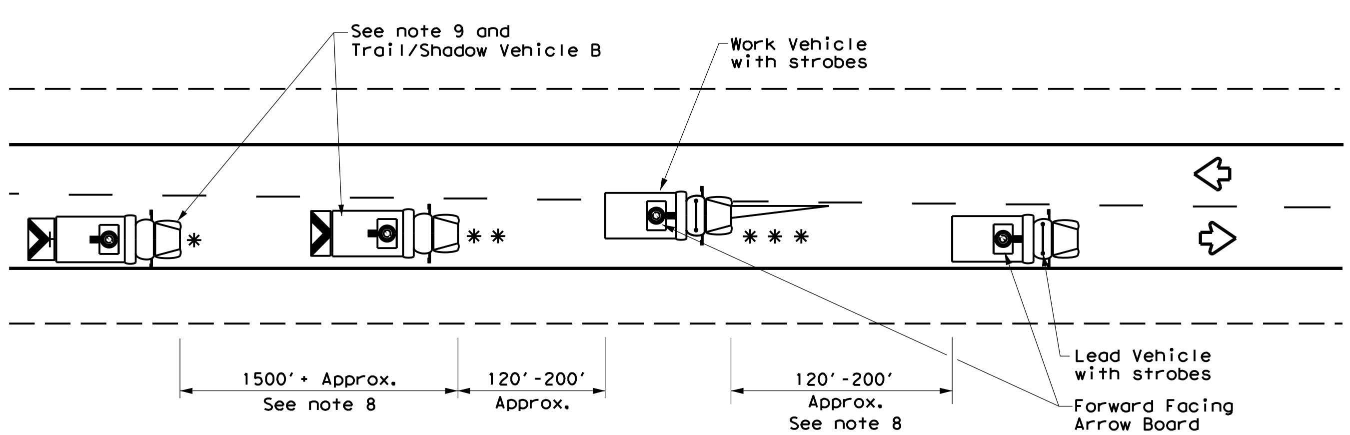


WORK ON SHOULDER

WORK ON TRAVEL LANE

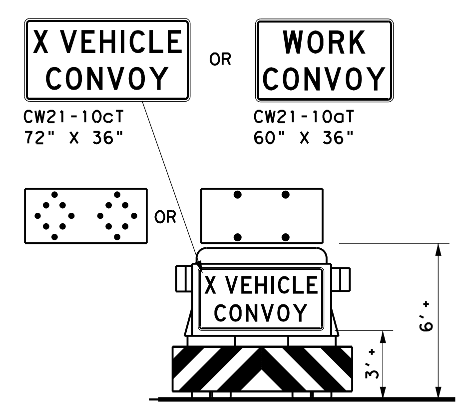
TCP (3-1b)

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.

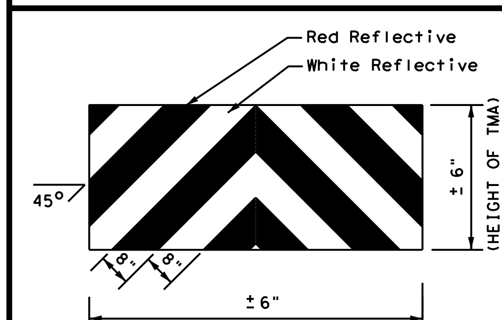
6. Each vehicle shall have two-way radio communication capability.

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

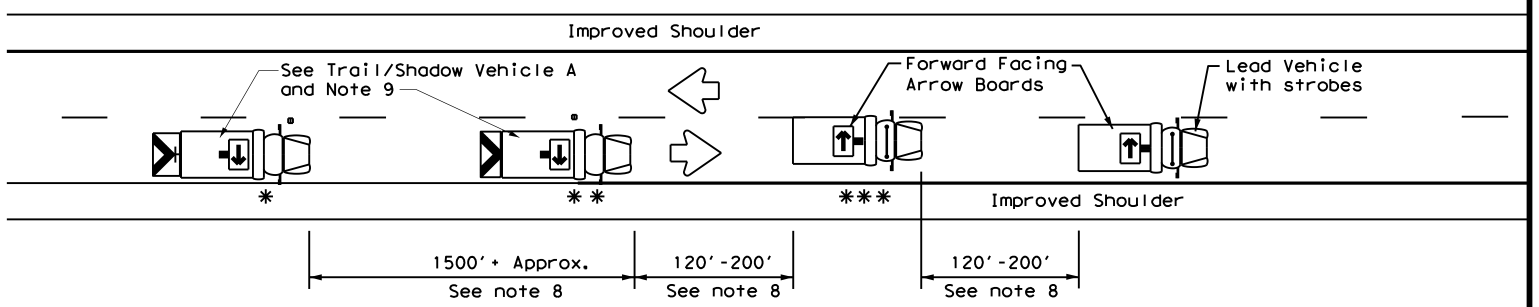
Traffic Operations Division Standard

TRAFFIC CONTROL PLAN MOBILE OPERATIONS UNDIVIDED HIGHWAYS

TCP(3-1)-13

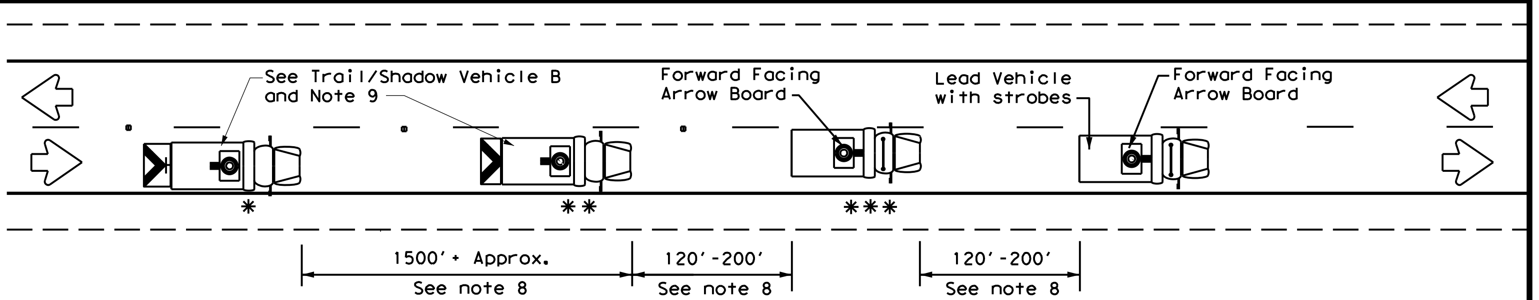
FILE: tcp3-1.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS 2-94 4-98 8-95 7-13 1-97	0814	01	036	FM 422
	DIST		COUNTY	SHEET NO.
	WFS.		BAYLOR	35

175



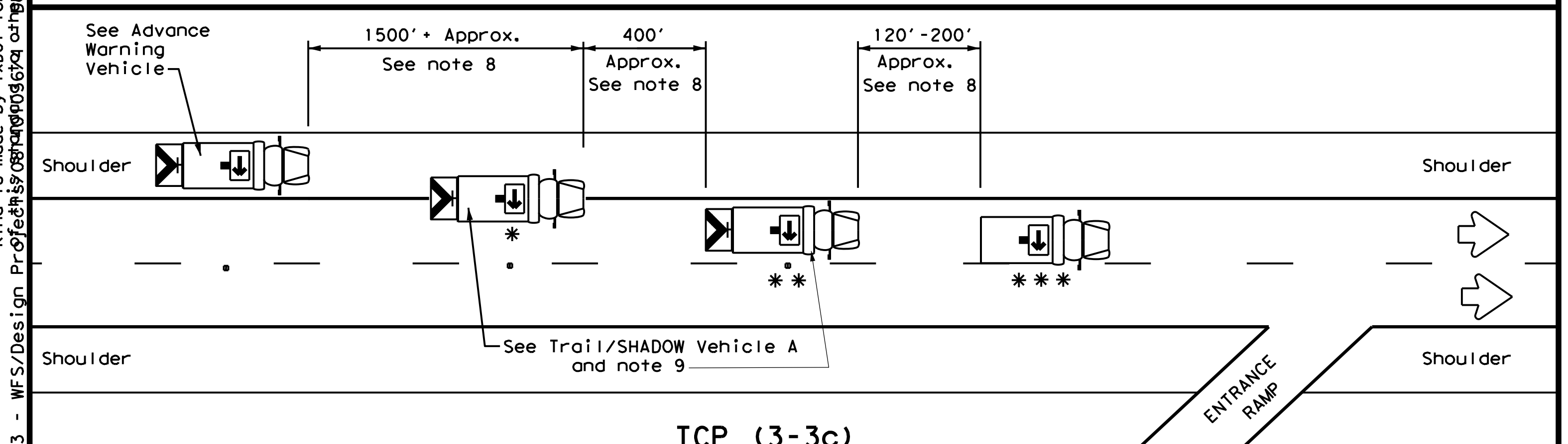
TCP (3-3a)

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



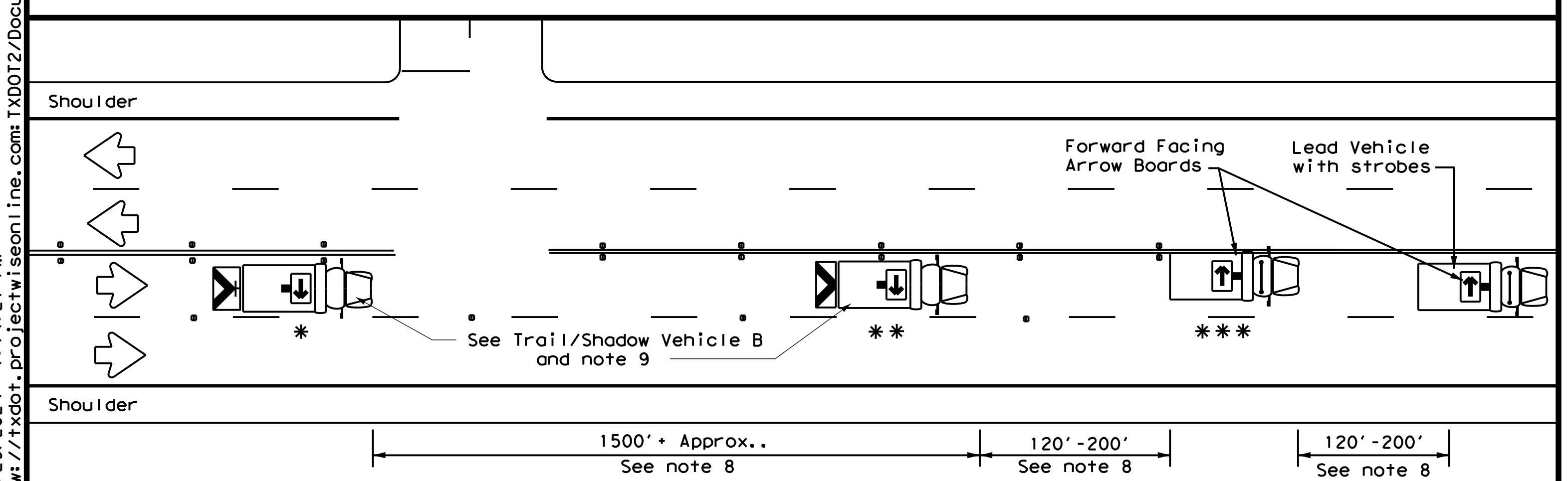
TCP (3-3b)

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



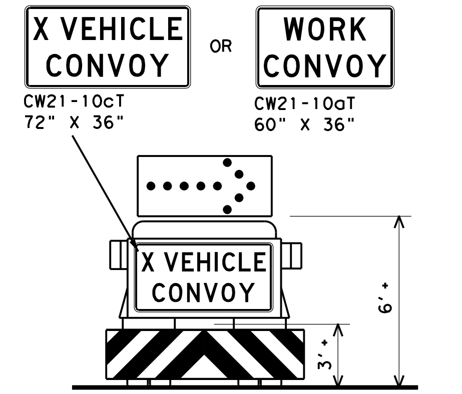
TCP (3-3c)

DIVIDED MULTILANE HIGHWAY



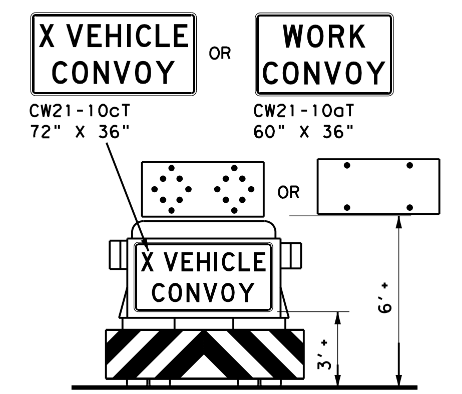
TCP (3-3d)

UNDIVIDED MULTILANE HIGHWAY



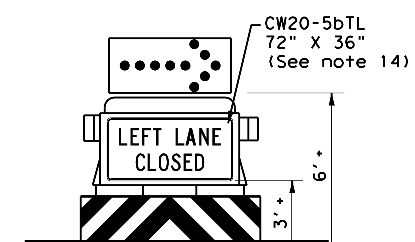
TRAIL/SHADOW VEHICLE A

with RIGHT Directional display Flashing Arrow Board

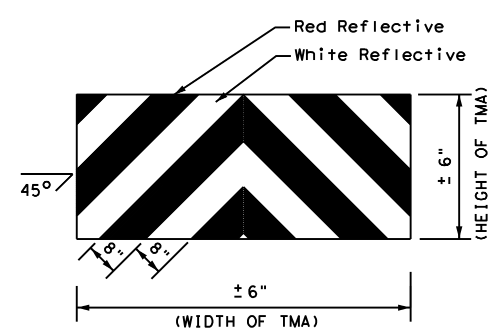


TRAIL/SHADOW VEHICLE B

with Flashing Arrow Board in Caution Mode



ADVANCE WARNING VEHICLE



STRIPING FOR TMA

LEGEND

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 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.

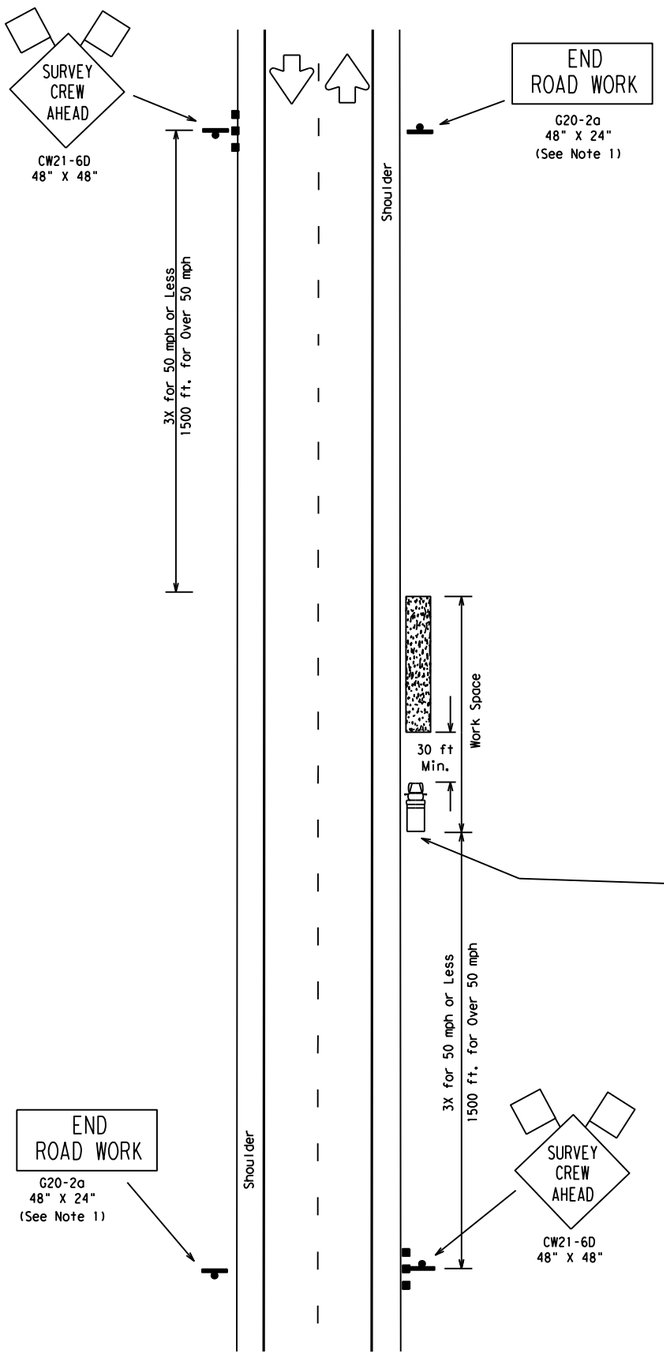
Texas Department of Transportation
Traffic Operations Division Standard

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

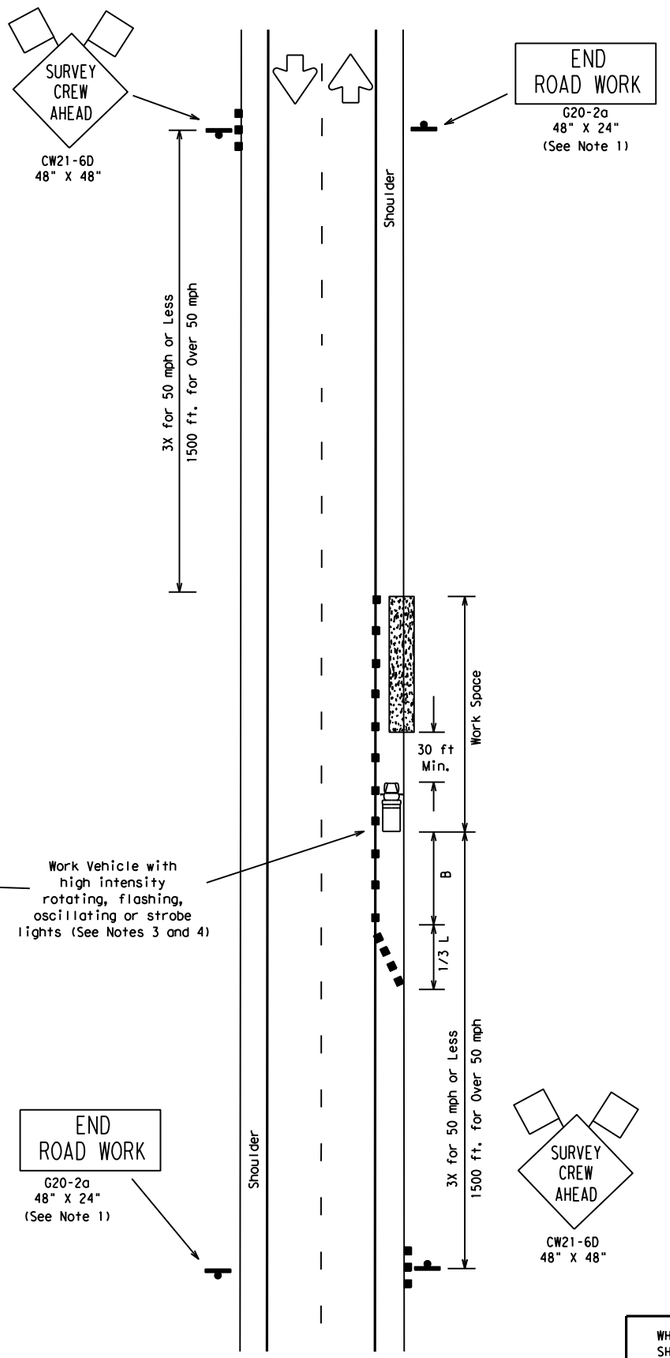
FILE: tcp3-3.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT September 1987	CONT	SECT	JOB	HIGHWAY
REVISIONS 2-94 4-98 8-95 7-13 1-97 7-14	0814	01	036	FM 422
	DIST		COUNTY	SHEET NO.
	WFS.		BAYLOR	36

177

DATE: 3/29/2024 1:14:35 PM
FILE: pw://txdot.projectwiseonline.com:TXDOT2/Documents/03 - WFS/Design Projects/0814010360/4 - Design/Plan Set/2. TCP/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 (M) 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

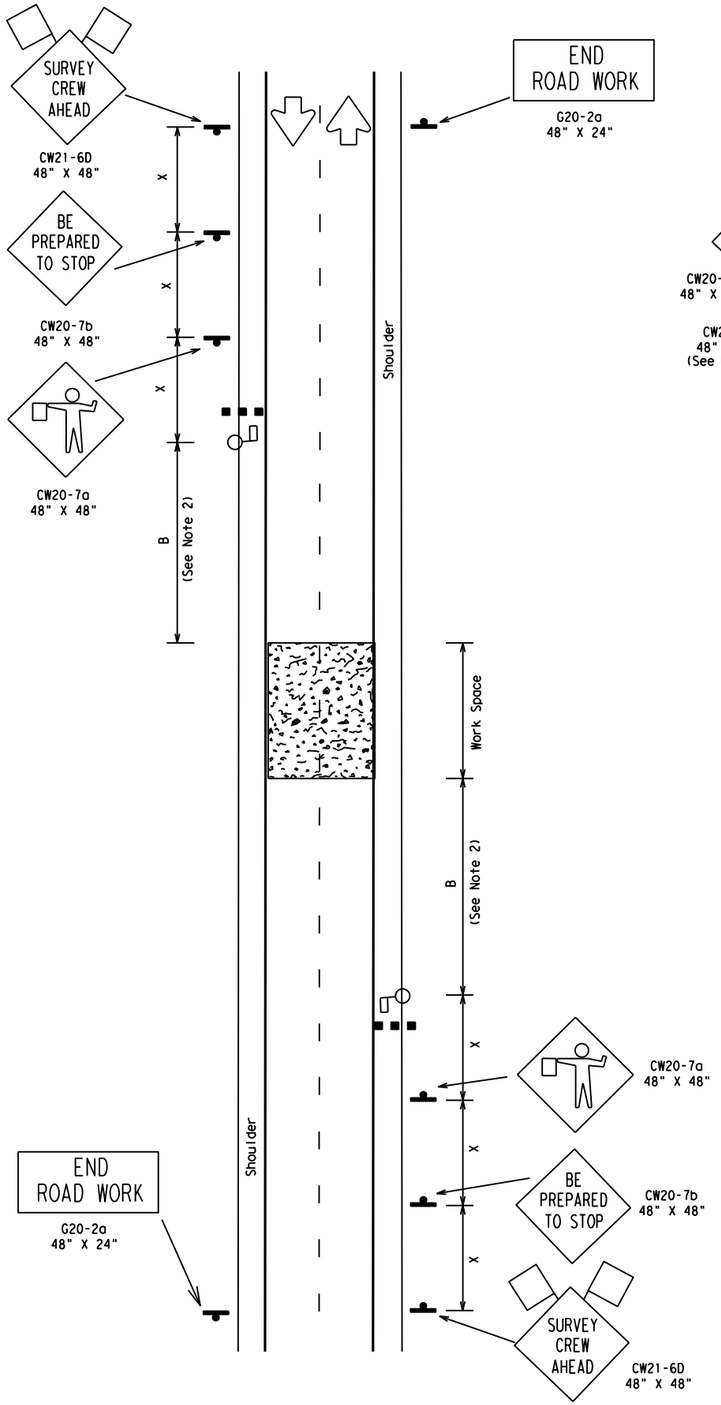
TCP(S-1)-08A

REVISIONS
8-08

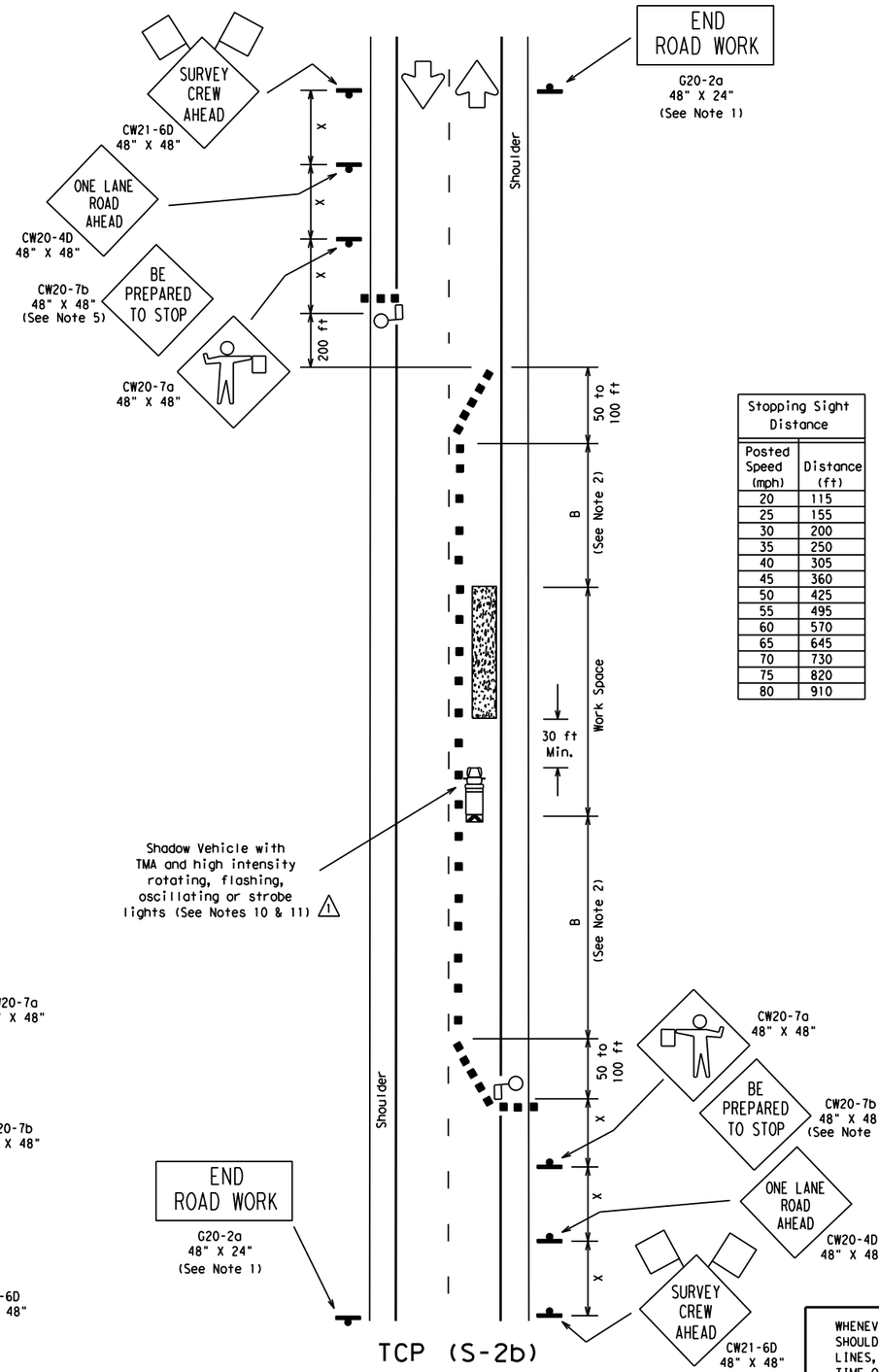
DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT

CONT	SECT	JOB	HIGHWAY
0814	01	036	FM 422
DIST	COUNTY		SHEET NO.
WFS.	BAYLOR		37

DATE: 3/29/2024 1:14:48 PM
FILE: pw://txdot.projectwiseonline.com:TXDOT2/Documents/03 - WFS/Design Projects/0814010364 - Design/Plan Set/2. TCP/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

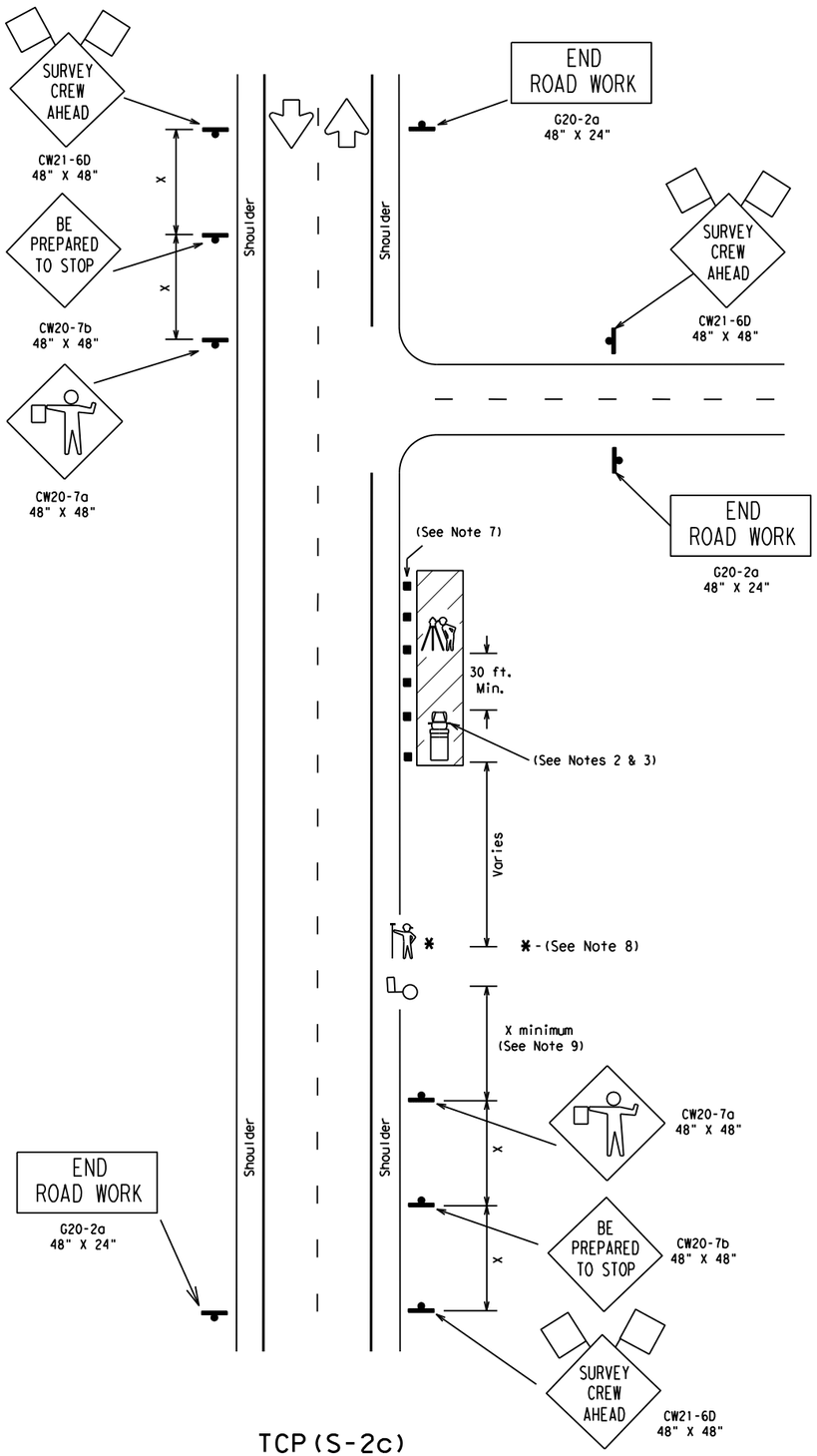
REVISIONS
8-08

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

CONT	SECT	JOB	HIGHWAY
0814	01	036	FM 422

DIST	COUNTY	SHEET NO.
WFS	BAYLOR	38

DATE: 3/29/2024 1:15:01 PM
FILE: pw://txdot.projectwiseonline.com:TXDOT2/Documents/03 - WFS/Design Projects/0814036/4 - Design/Plan Set/2. TCP/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
0814	01	036	FM 422
DIST	COUNTY		SHEET NO.
WFS.	BAYLOR		39

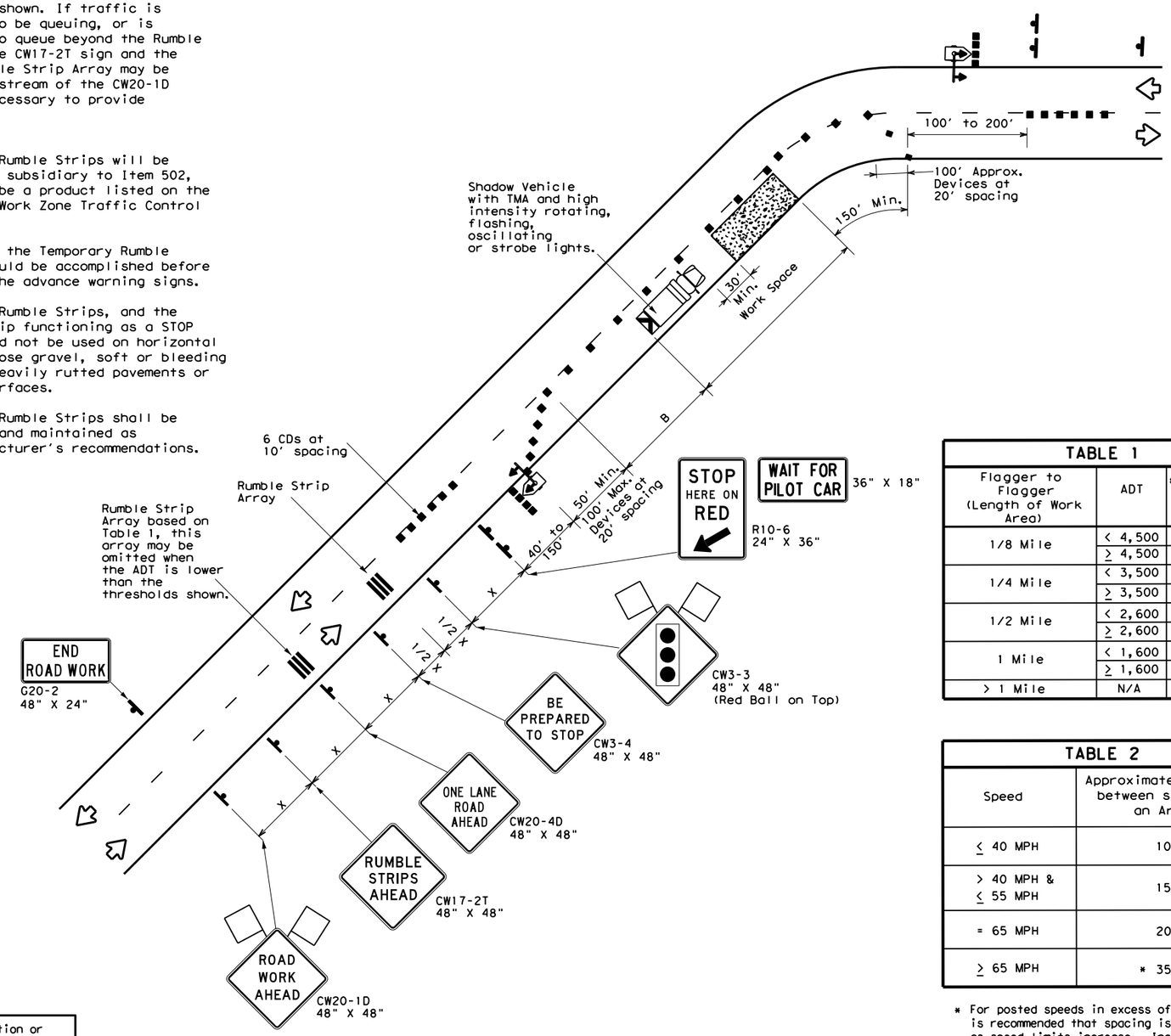
212A

DATE:
FILE:

RUMBLE STRIP GENERAL NOTES

1. Each Rumble Strip Array should consist of three rumble strips spaced center to center at the spacing shown in Table 2, placed transverse across the lane at locations shown.
2. The CW17-2T "RUMBLE STRIPS AHEAD" sign should be located after the CW20-1D "ROAD WORK AHEAD sign and spaced as shown. If traffic is observed to be queuing, or is expected to queue beyond the Rumble Strips, the CW17-2T sign and the first Rumble Strip Array may be located upstream of the CW20-1D sign as necessary to provide needed warning.
3. Temporary Rumble Strips will be considered subsidiary to Item 502, and shall be a product listed on the Compliant Work Zone Traffic Control Devices.
4. Removal of the Temporary Rumble Strips should be accomplished before removing the advance warning signs.
5. Temporary Rumble Strips, and the rumble strip functioning as a STOP bar, 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.

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



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

ONE LANE TWO-WAY CONTROL
WITH PORTABLE TRAFFIC SIGNAL & RUMBLE STRIPS

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

TABLE 2

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

* 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.

REVIEWED AND APPROVED BY
DISTRICT SAFETY REVIEW TEAM
1-21-2022

LEGEND

	Type 3 Barricade		Channelizing Devices (CDs)
	Heavy Work Vehicle		Truck Mounted Attenuator (TMA)
	Temporary or Portable Traffic Signal	M	Portable Changeable Message Sign (PCMS)
	Sign		Traffic Flow
	Flag		

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
	✓	✓		

TCP GENERAL NOTES

1. Flags attached to signs where shown are REQUIRED.
2. Portable traffic signals should be located to provide adequate stopping sight distance for approaching morotist (See table above).
3. 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.
4. Additional Shadow Vehicles with TMAs may be positioned off the paved surface, next to those shown in order to protect wider work spaces.
5. The R10-6 "STOP HERE ON RED" arrow sign shall be offset so as not to obscure the lenses of the Portable Traffic Signals.
6. Proper alignment of overhead signal with on-coming lane should be ensured.
7. For Short Duration and Short Term Stationary refer to WZ(RS)-22 for rumble strip placement and signs.
8. Use of a pilot car is optional, if a pilot car is used it may control the operation of the signal and the "WAIT FOR PILOT CAR" sign is to be used as shown.
9. If pilot car is used to guide vehicles through traffic control zone, vehicle shall have an identification name displayed and "PILOT CAR FOLLOW ME" (G20-4) sign or message board mounted in a conspicuous position on rear.
10. Channelizing devices on the center-line may be ommitted when a pilot car is leading traffic and approved by the Engineer.

STATE OF TEXAS
BRYSON P. LAWRENCE
129839
LICENSED PROFESSIONAL ENGINEER

Bryson Lawrence, P.E.

03/29/2024

Texas Department of Transportation
Wichita Falls District

TRAFFIC CONTROL PLAN
ONE LANE TWO-WAY CONTROL USING PORTABLE TRAFFIC SIGNAL & RUMBLE STRIPS

REVISIONS

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

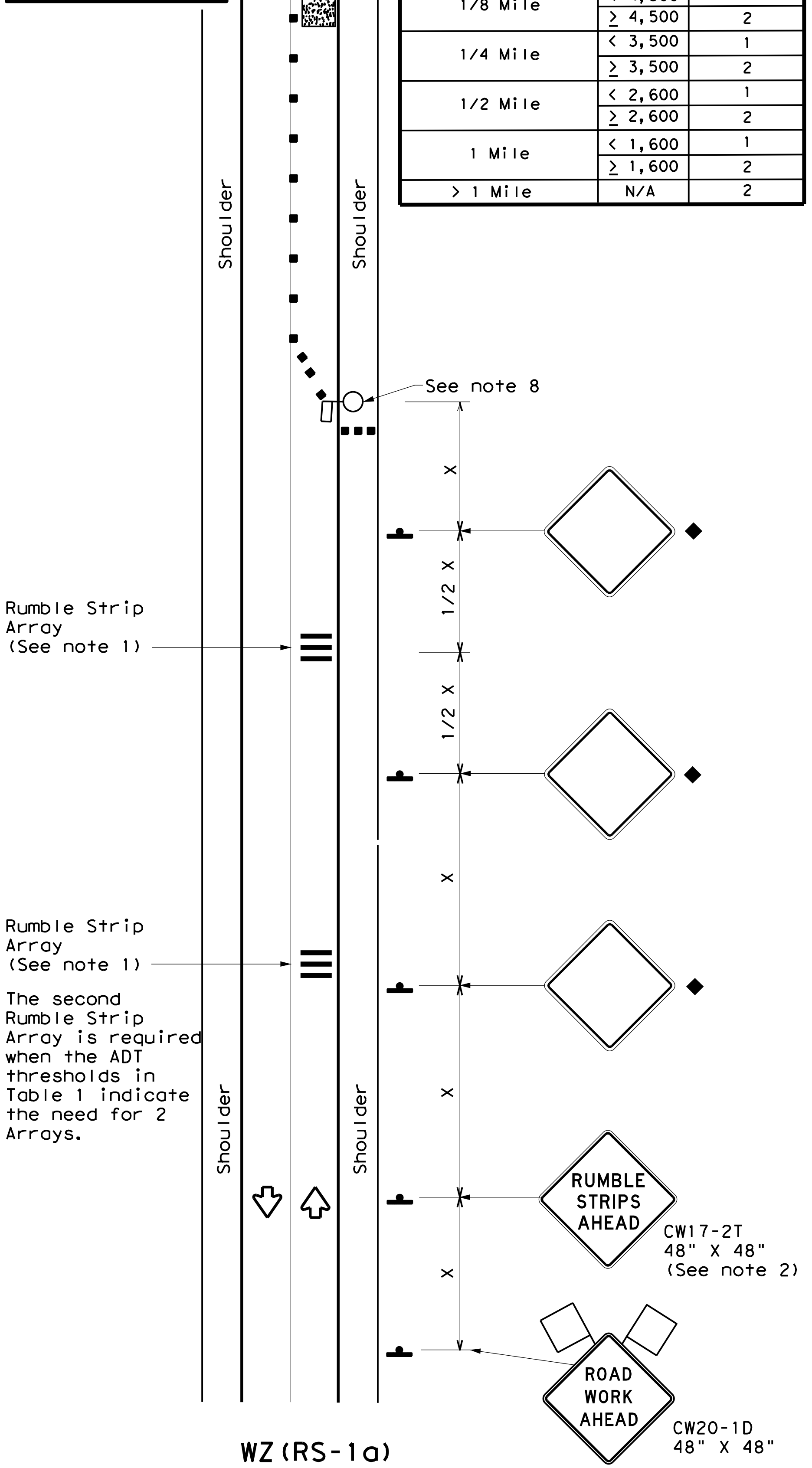
CONT	SECT	JOB	HIGHWAY
0814	01	036	FM 422
DIST	COUNTY		SHEET NO.
WFS.	BAYLOR		40

DATE: 3/29/2024 1:15:27 PM
FILE: pw://txdot.projectwiseonline.com:TXDOT2/Documents/03 - WFS/Design Projects/

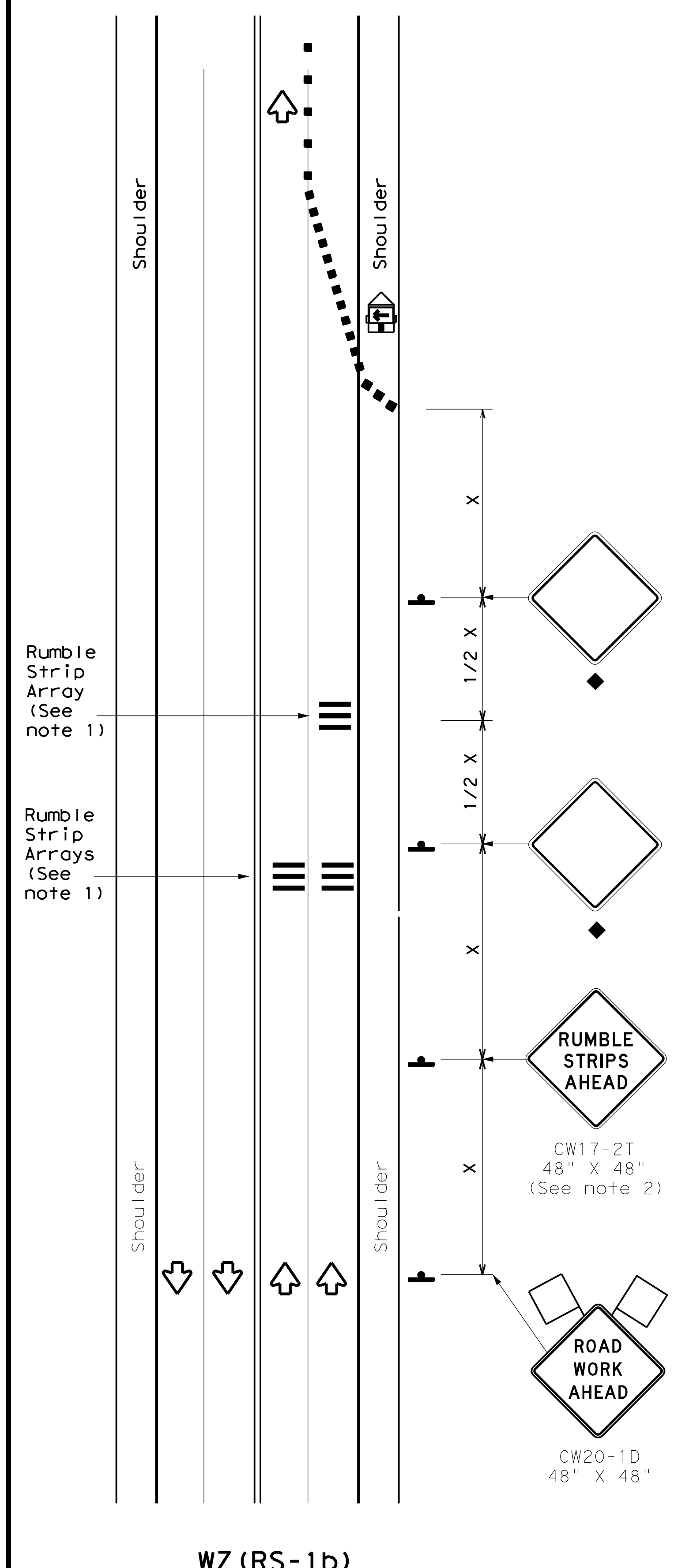
Warning sign and rumble strip sequence in opposite direction is same as below.

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.

TABLE 2

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

LEGEND

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

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

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	0814	01	036	FM 422
	DIST	COUNTY		SHEET NO.
	WFS.	BAYLOR		41

117

DATE: 3/29/2024 1:15:40 PM
FILE: pw://txdot.projectwiseonline.com:TXDOT2/Documents/03 - WFS/Design Projects/08140100364 - Design/Plan Set/2. TCP/WZ(STPM)-23.dgn

WORK ZONE SHORT TERM PAVEMENT MARKINGS DETAILS

SOLID LINES

DOUBLE NO-PASSING LINE

TABS: 4" to 12" | 20' ± 6" | Type Y-2

TAPE: 4" to 12" | 6" | 20' ± 6" | Yellow | 4.5' ± 6"

SINGLE NO-PASSING LINE or CHANNELIZATION LINE

TABS: 20' ± 6" | Type Y-2 or W

TAPE: 6" | 20' ± 6" | 4.5' ± 6" | Yellow or White

BROKEN LINES

(FOR CENTER LINE OR LANE LINE)

TABS: 40' ± 1' | Type Y-2 or W

TAPE: 6" | 40' ± 1' | 1' ± 3" | 4.5' ± 6" | Yellow or White

WIDE DOTTED LINES

(FOR LANE DROP LINES)

TABS: 12' ± 6" | 4" ± 1" | 3' ± 3" | Type W

TAPE: 12" | 12' ± 6" | 3' ± 3" | White

WIDE GORE MARKINGS

TABS: 20' ± 6" | 4" ± 1" | Type W

TAPE: 12" | 20' ± 6" | 4.5' ± 6" | White

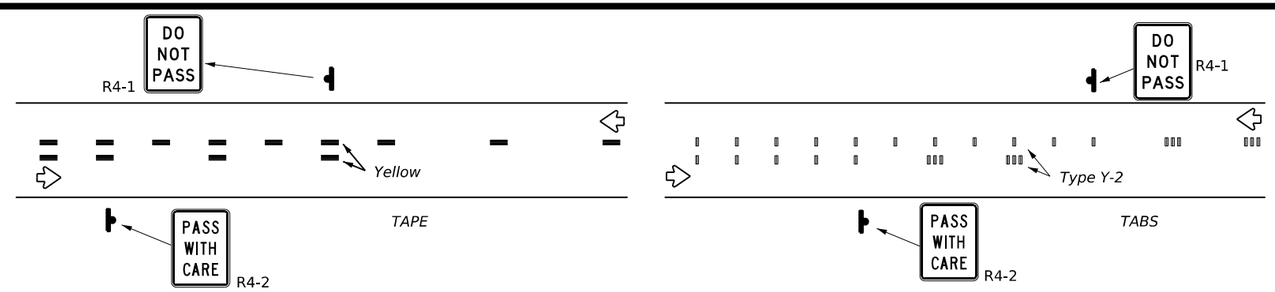
NOTES:

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

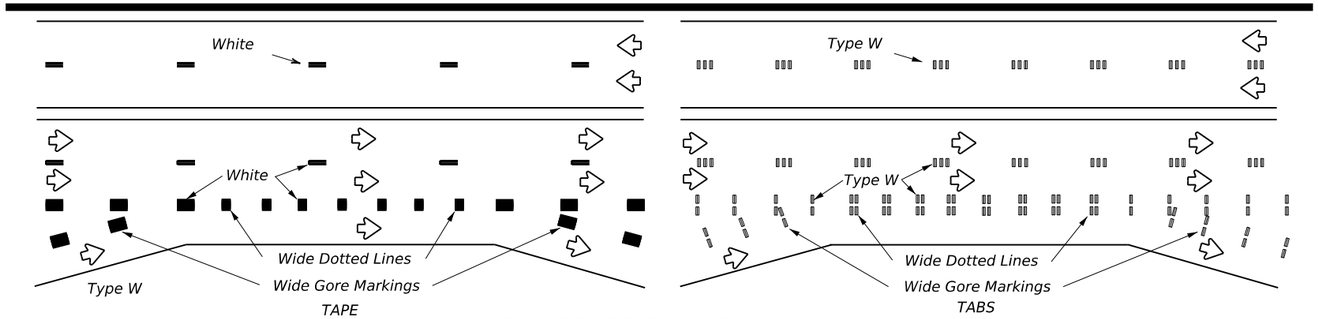
TEMPORARY FLEXIBLE, REFLECTIVE ROADWAY MARKER TABS (TABS)

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

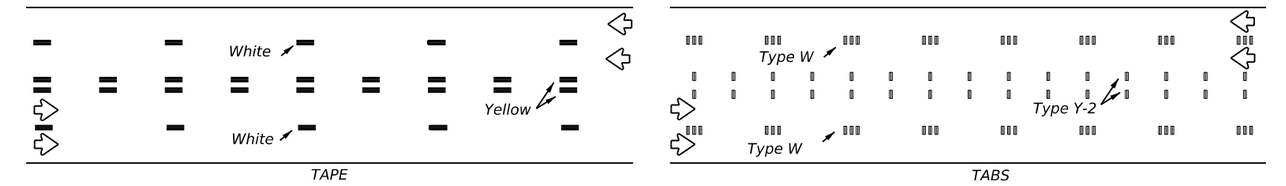
WORK ZONE SHORT TERM PAVEMENT MARKINGS PATTERNS



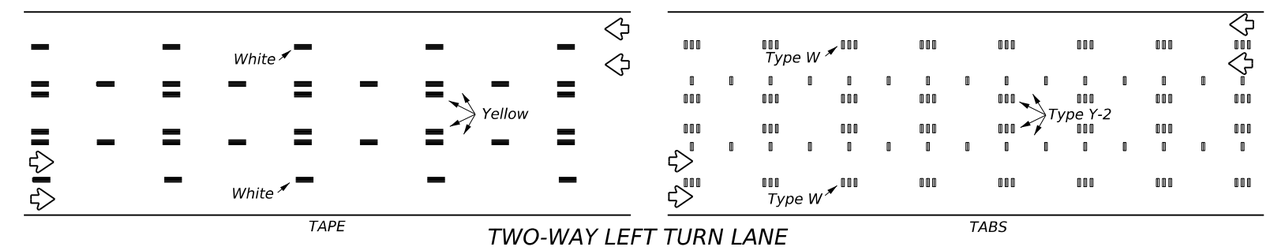
CENTER LINE & NO-PASSING ZONE BARRIER LINES FOR TWO LANE TWO-WAY HIGHWAYS



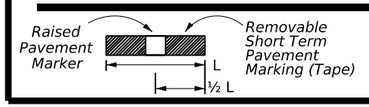
LANE LINES FOR DIVIDED HIGHWAY



LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS



TWO-WAY LEFT TURN LANE



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

PREFABRICATED PAVEMENT MARKINGS

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

RAISED PAVEMENT MARKERS

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

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

1. DMSs referenced above can be found along with embedded links to their respective MPLs at the following website:

http://www.txdot.gov/business/contractors_consultants/material_specifications/default.htm

Texas Department of Transportation

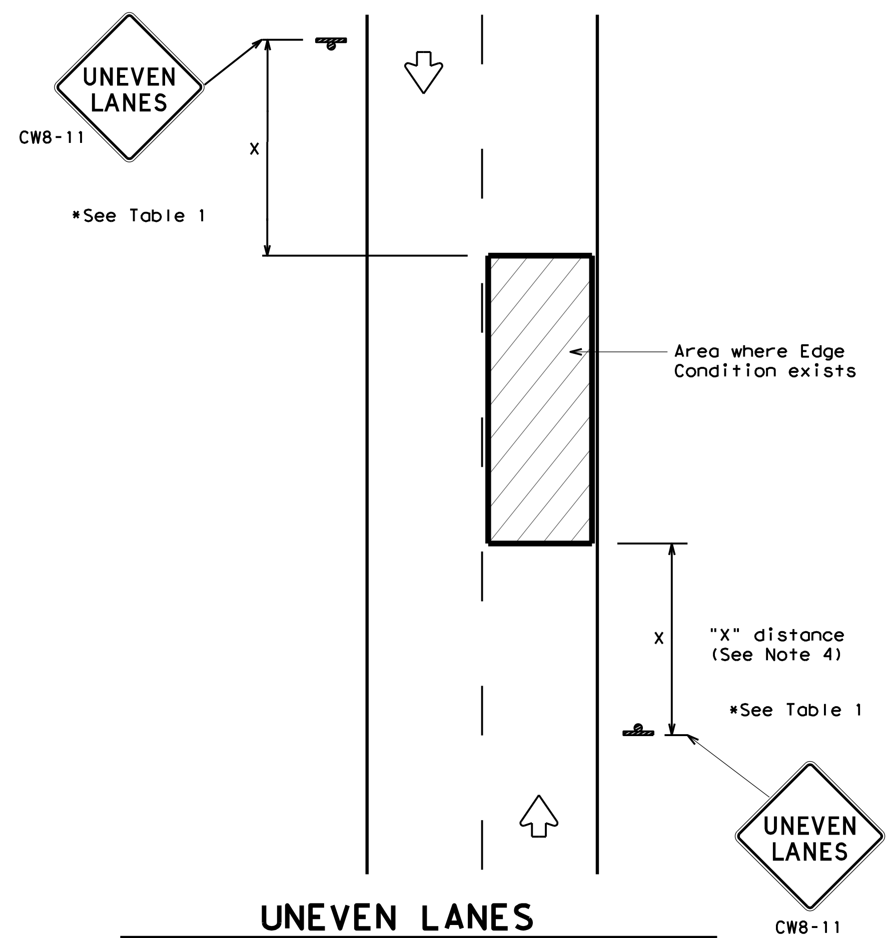
Traffic Safety Division Standard

WORK ZONE SHORT TERM PAVEMENT MARKINGS

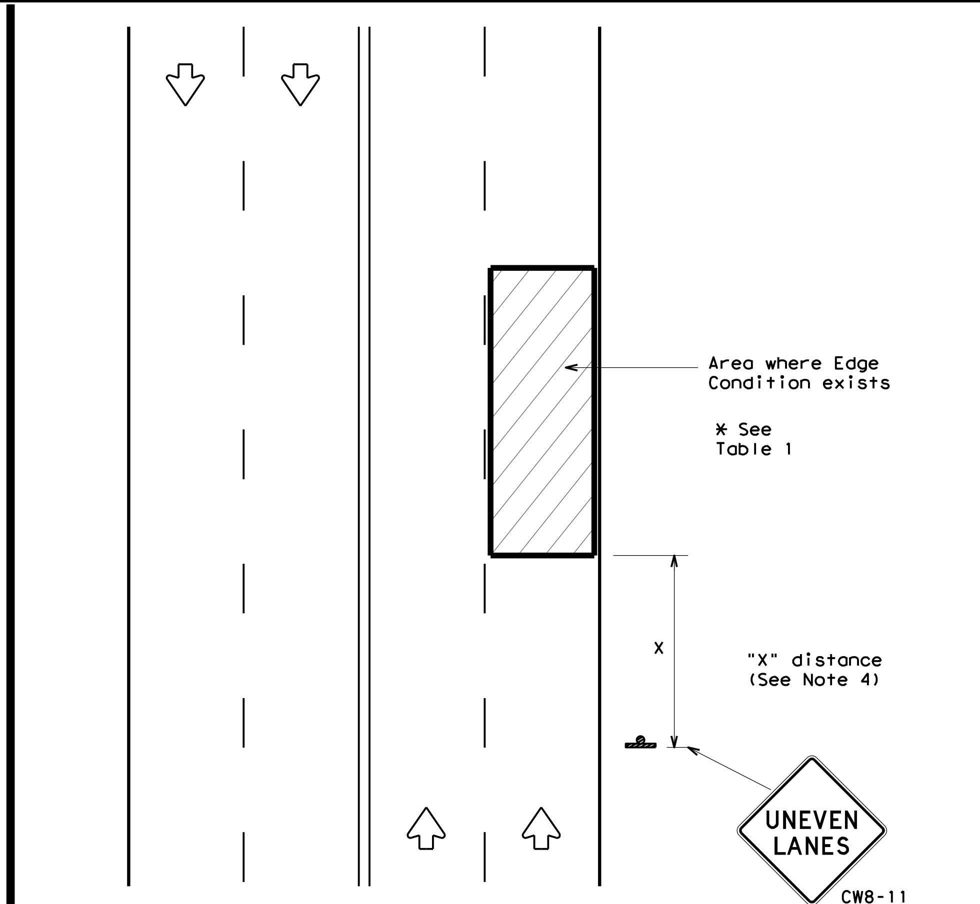
WZ(STPM)-23

FILE: wzstpm-23.dgn	DN:	CK:	DW:	CK:
©TxDOT February 2023	CONT	SECT	JOB	HIGHWAY
REVISIONS	0814	01	036	FM 422
4-92 7-13	DIST	COUNTY		SHEET NO.
1-97 2-23	WFS.	BAYLOR		42
3-03				

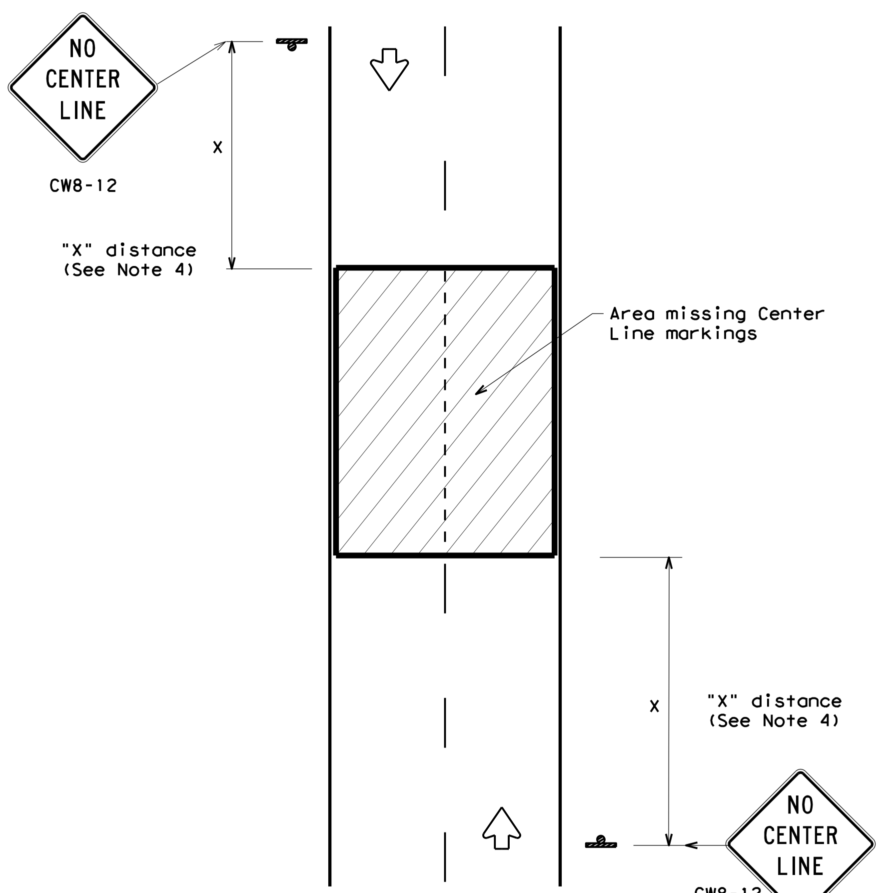
DATE: 3/29/2024 1:15:53 PM
FILE: pw://txdot.projectwiseonline.com:TXDOT2/Documents/03 - WFS/Design Projects/0814...



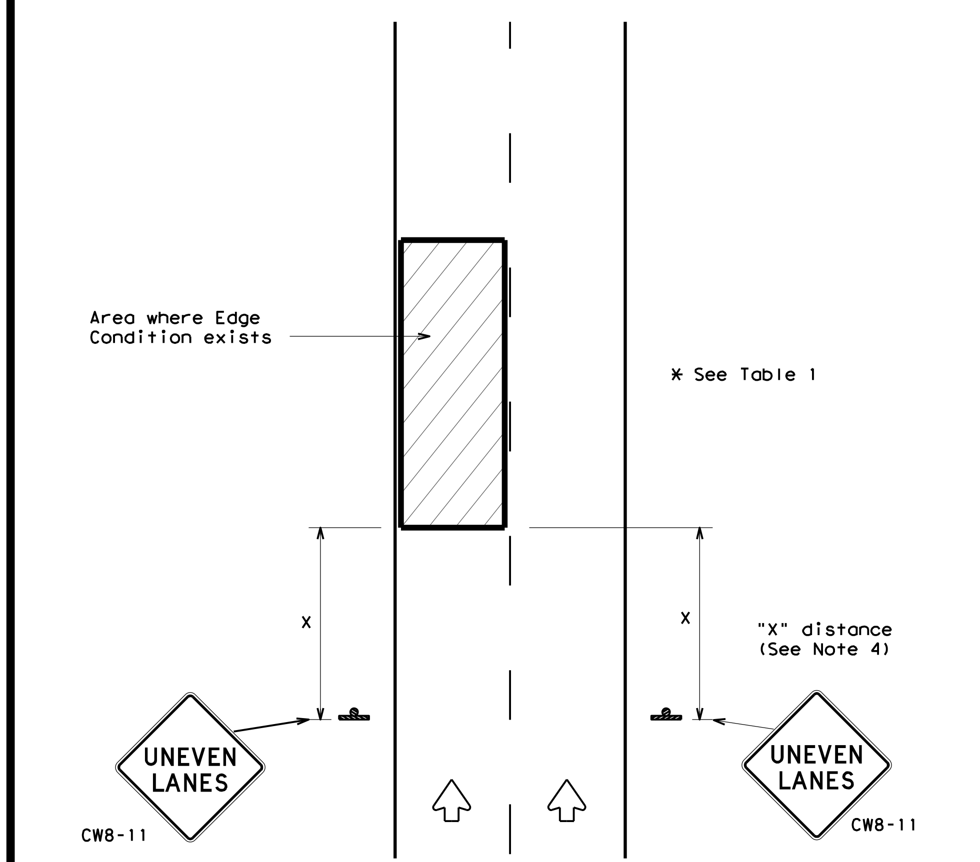
UNEVEN LANES
TWO LANE CONVENTIONAL ROAD



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

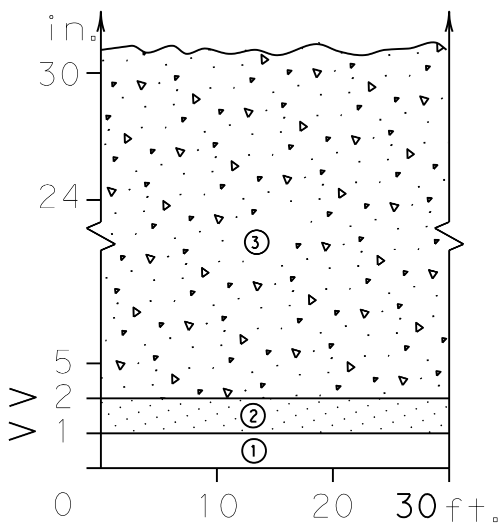
WZ(UL)-13

FILE: wzul-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT April 1992	CONT	SECT	JOB	HIGHWAY
REVISIONS	0814	01	036	FM 422
8-95 2-98 7-13	DIST		COUNTY	SHEET NO.
1-97 3-03	WFS.		BAYLOR	43

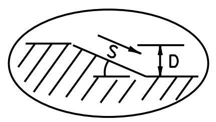
112

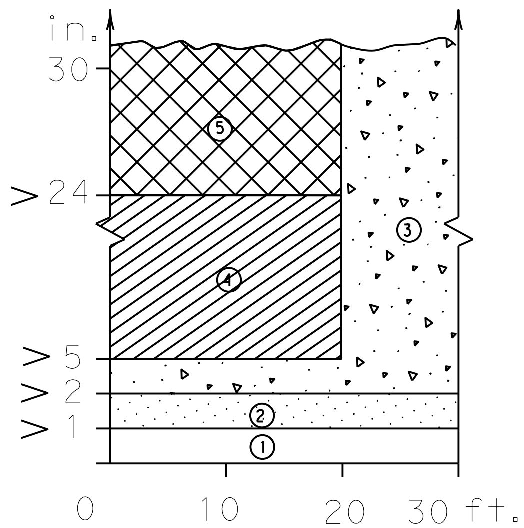
DEFINITION OF TREATMENT ZONES
FOR VARIOUS EDGE CONDITIONS

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

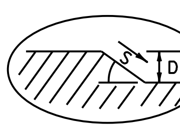


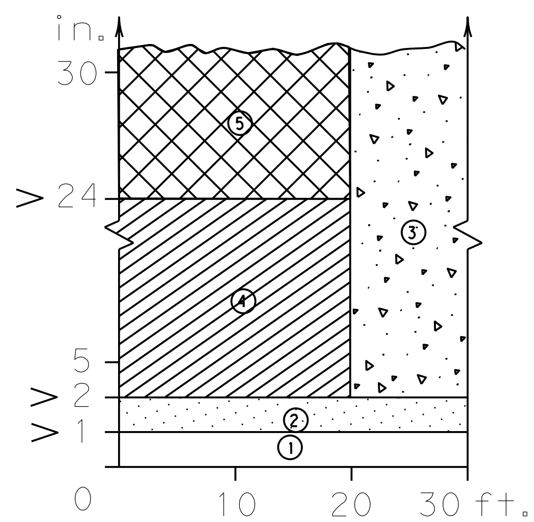
Edge Condition I
S = (3:1) (or flatter)



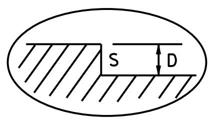


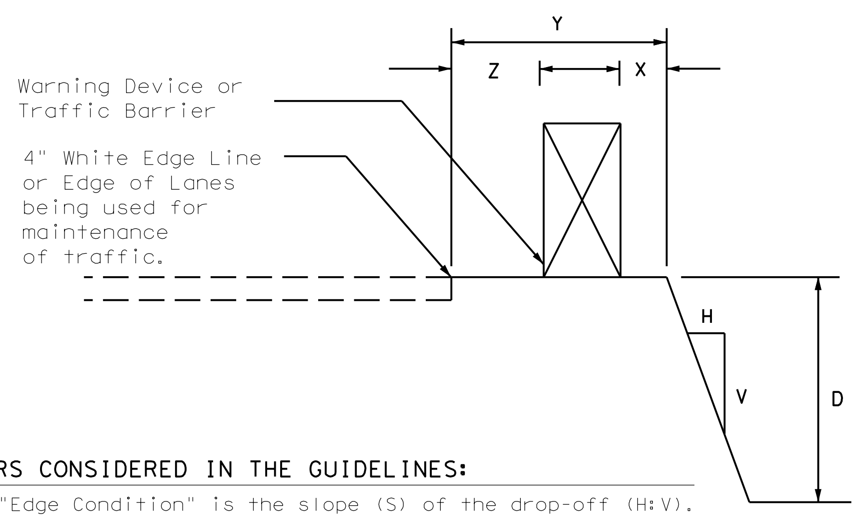
Edge Condition II
S = ((2.99):1) to (1:1)





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





FACTORS CONSIDERED IN THE GUIDELINES:

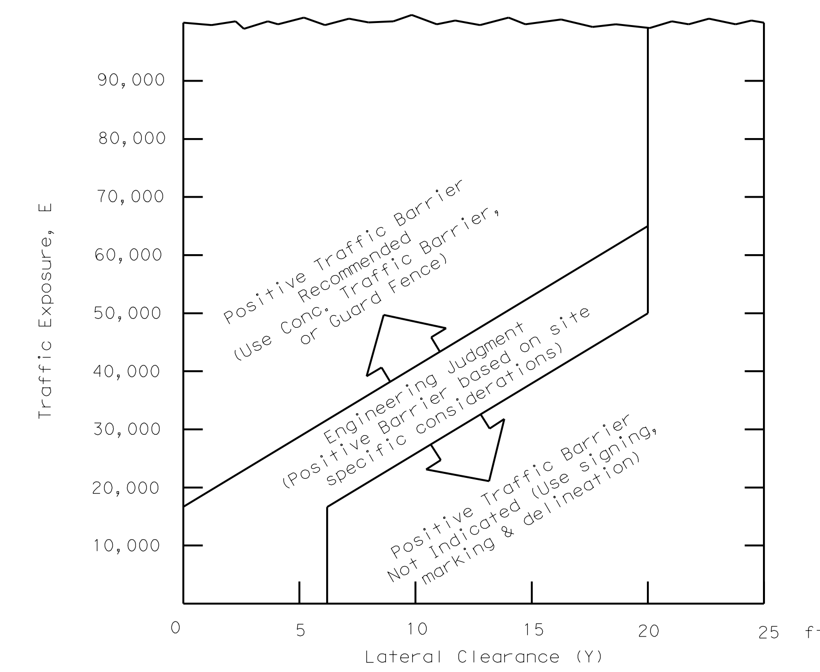
1. The "Edge Condition" is the slope (S) of the drop-off (H:V). The "Edge Height is the depth of the drop-off "D".
2. Distance "X" is to be the maximum practical under job conditions. Two feet minimum for high speed conditions. Distance "Y" is the lateral clearance from edge of travel lane to edge of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

Zone	Treatment Types Guidelines:
①	No treatment
②	CW 8-11 "Uneven Lanes" signs.
③	CW 8-9a Shoulder Drop-Off" or CW 8-11 signs plus vertical panels.
④	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.

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 differen-tial when "D" is greater than 5 inches and up to 24 inches. When "D" exceeds 24 inches, the possibility of rollover is greater for most vehicles.
4. Milling or overlay operations that result in Edge Condition III should not be in place without appropriate warning treatments, and these conditions should not be left in place for extended periods of time.

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



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

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.

STATE OF TEXAS
BRYSON P. LAWRENCE
129839
LICENSED
PROFESSIONAL ENGINEER

Date 03/29/2024

Bryson Lawrence, P.E.

Texas Department of Transportation

Traffic Safety Division Standard

TREATMENT FOR VARIOUS EDGE CONDITIONS

FILE: edgecon.dgn	DN:	CK:	DW:	CK:
©TxDOT August 2000	CONT 0814	SECT 01	JOB 036	HIGHWAY FM 422
REVISIONS 03-01 08-01 9-21	DIST WFS.		COUNTY BAYLOR	SHEET NO. 44

DATE: 3/29/2024 1:16:07 PM
FILE: pw://txdot.projectwiseonline.com:TXDOT2/Documents/03 - WFS/Design Projects/...TREATMENT FOR VARIOUS EDGE CONDITIONS.dgn

Alignment Name: FM 422
Alignment Style: Alignment\Baseline

Station	Northing	Easting

Element: Linear
POT ( ) 45+00.000 R1 7264399.000 1740984.375
PC ( ) 45+22.291 R1 7264397.782 1741006.632
Tangential Direction: S86°51'55.390"E
Tangential Length: 22.291

Element: Circular
PC ( ) 45+22.291 R1 7264397.782 1741006.632
PI ( ) 45+30.839 R1 7264397.314 1741015.168
CC ( ) 7264127.997 1740991.858
PT ( ) 45+39.381 R1 7264396.308 1741023.656
Radius: 270.188
Delta: 03°37'26.854" Right
Degree of Curvature (Arc): 21°12'21.124"
Length: 17.090

Tangent: 8.548
Chord: 17.087
Middle Ordinate: 0.135
External: 0.135
Back Tangent Direction: S86°51'55.390"E
Back Radial Direction: S03°08'04.610"W
Chord Direction: S85°03'11.963"E
Ahead Radial Direction: S06°45'31.464"W
Ahead Tangent Direction: S83°14'28.536"E

Element: Linear
PT ( ) 45+39.381 R1 7264396.308 1741023.656
PC ( ) 45+76.976 R1 7264391.884 1741060.989
Tangential Direction: S83°14'28.536"E
Tangential Length: 37.595

Element: Circular
PC ( ) 45+76.976 R1 7264391.884 1741060.989
PI ( ) 47+26.702 R1 7264374.262 1741209.676
CC ( ) 7267926.725 1741479.912
PT ( ) 48+76.253 R1 7264369.190 1741359.317
Radius: 3559.578
Delta: 04°49'02.040" Left
Degree of Curvature (Arc): 01°36'34.641"
Length: 299.277

Tangent: 149.727
Chord: 299.189
Middle Ordinate: 3.145
External: 3.148
Back Tangent Direction: S83°14'28.536"E
Back Radial Direction: S06°45'31.464"W
Chord Direction: S85°38'59.556"E
Ahead Radial Direction: S01°56'29.424"W
Ahead Tangent Direction: S88°03'30.576"E

Element: Linear
PT ( ) 48+76.253 R1 7264369.190 1741359.317
PC ( ) 77+35.393 R1 7264272.324 1744216.816
Tangential Direction: S88°03'30.576"E
Tangential Length: 2859.140

Element: Circular
PC ( ) 77+35.393 R1 7264272.324 1744216.816
PI ( ) 79+15.051 R1 7264266.238 1744396.370
CC ( ) 7266276.740 1744284.763
PT ( ) 80+93.752 R1 7264292.161 1744574.148
Radius: 2005.567
Delta: 10°14'15.834" Left
Degree of Curvature (Arc): 02°51'24.615"
Length: 358.359

Tangent: 179.658
Chord: 357.882
Middle Ordinate: 7.999
External: 8.031
Back Tangent Direction: S88°03'30.576"E
Back Radial Direction: S01°56'29.424"W
Chord Direction: N86°49'21.506"E
Ahead Radial Direction: S08°17'46.411"E
Ahead Tangent Direction: N81°42'13.589"E

Element: Linear
( ) 80+93.752 R1 7264292.161 1744574.148
( ) 87+47.406 R1 7264386.477 1745220.962
Tangential Direction: N81°42'13.589"E
Tangential Length: 653.654

Element: Circular
( ) 87+47.406 R1 7264386.477 1745220.962
( ) 89+48.542 R1 7264415.499 1745419.993
( ) 7261796.530 1745598.620
( ) 91+48.889 R1 7264413.770 1745621.121
Radius: 2617.337
Delta: 08°47'19.657" Right
Degree of Curvature (Arc): 02°11'20.713"
Length: 401.482

Tangent: 201.136
Chord: 401.089
Middle Ordinate: 7.694
External: 7.717
Back Tangent Direction: N81°42'13.589"E
Back Radial Direction: S08°17'46.411"E
Chord Direction: N86°05'53.418"E
Ahead Radial Direction: S00°29'33.246"W
Ahead Tangent Direction: S89°30'26.754"E

Element: Linear
( ) 91+48.889 R1 7264413.770 1745621.121
( ) 111+94.552 R1 7264396.184 1747666.709
Tangential Direction: S89°30'26.754"E
Tangential Length: 2045.664

Element: Linear
( ) 111+94.552 R1 7264396.184 1747666.709
( ) 132+06.070 R1 7264388.683 1749678.213
Tangential Direction: S89°47'10.810"E
Tangential Length: 2011.518

Element: Circular
( ) 132+06.070 R1 7264388.683 1749678.213
( ) 134+18.860 R1 7264387.889 1749891.001
( ) 7262800.772 1749672.291
( ) 136+29.130 R1 7264331.100 1750096.073
Radius: 1587.922
Delta: 15°15'53.759" Right
Degree of Curvature (Arc): 03°36'29.609"
Length: 423.059

Tangent: 212.790
Chord: 421.809
Middle Ordinate: 14.068
External: 14.194
Back Tangent Direction: S89°47'10.810"E
Back Radial Direction: S00°12'49.190"W
Chord Direction: S82°09'13.931"E
Ahead Radial Direction: S15°28'42.949"W
Ahead Tangent Direction: S74°31'17.051"E

Element: Linear
( ) 136+29.130 R1 7264331.100 1750096.073
( ) 144+79.760 R1 7264104.085 1750915.852
Tangential Direction: S74°31'17.051"E
Tangential Length: 850.631

Element: Circular
( ) 144+79.760 R1 7264104.085 1750915.852
( ) 146+86.661 R1 7264048.868 1751115.249
( ) 7265576.793 1751323.677
( ) 148+91.061 R1 7264048.661 1751322.150
Radius: 1528.133
Delta: 15°25'16.747" Left
Degree of Curvature (Arc): 03°44'57.834"
Length: 411.301

Tangent: 206.901
Chord: 410.061
Middle Ordinate: 13.817
External: 13.943
Back Tangent Direction: S74°31'17.051"E
Back Radial Direction: S15°28'42.949"W
Chord Direction: S82°13'55.425"E
Ahead Radial Direction: S00°03'26.202"W
Ahead Tangent Direction: S89°56'33.798"E

Element: Linear
PT ( ) 148+91.061 R1 7264048.661 1751322.150
PI ( ) 180+46.872 R1 7264045.506 1754477.959
Tangential Direction: S89°56'33.798"E
Tangential Length: 3155.811

Element: Linear
PI (BL CL-19) 180+46.872 R1 7264045.506 1754477.959
PI ( ) 223+26.332 R1 7264046.119 1758757.419
Tangential Direction: N89°59'30.449"E
Tangential Length: 4279.460

Element: Linear
PI (BL CL-20) 223+26.332 R1 7264046.119 1758757.419
PI ( ) 247+50.007 R1 7264035.958 1761181.073
Tangential Direction: S89°45'35.271"E
Tangential Length: 2423.675

Element: Linear
PI ( ) 247+50.007 R1 7264035.958 1761181.073
PI ( ) 300+94.915 R1 7263995.120 1766525.824
Tangential Direction: S89°33'43.990"E
Tangential Length: 5344.907

Element: Linear
PI (BL CL-22) 300+94.915 R1 7263995.120 1766525.824
PI ( ) 334+60.666 R1 7263975.492 1769891.518
Tangential Direction: S89°39'57.097"E
Tangential Length: 3365.751

Element: Linear
PI ( ) 334+60.666 R1 7263975.492 1769891.518
PC ( ) 345+82.036 R1 7263962.218 1771012.810
Tangential Direction: S89°19'18.435"E
Tangential Length: 1121.370

Element: Circular
PC ( ) 345+82.036 R1 7263962.218 1771012.810
PI ( ) 349+00.081 R1 7263958.454 1771330.832
CC ( ) 7262382.942 1770994.115
PT ( ) 352+09.730 R1 7263831.892 1771622.610
Radius: 1579.387
Delta: 22°46'15.655" Right
Degree of Curvature (Arc): 03°37'39.804"
Length: 627.694

Tangent: 318.044
Chord: 623.571
Middle Ordinate: 31.081
External: 31.704
Back Tangent Direction: S89°19'18.435"E
Back Radial Direction: S00°40'41.565"W
Chord Direction: S77°56'10.607"E
Ahead Radial Direction: S23°26'57.220"W
Ahead Tangent Direction: S66°33'02.780"E

Element: Linear
PT ( ) 352+09.730 R1 7263831.892 1771622.610
PC ( ) 358+60.943 R1 7263572.751 1772220.041
Tangential Direction: S66°33'02.780"E
Tangential Length: 651.212

Element: Circular
PC ( ) 358+60.943 R1 7263572.751 1772220.041
PI ( ) 360+87.775 R1 7263482.486 1772428.140
CC ( ) 7264912.665 1772801.241
PT ( ) 363+11.011 R1 7263459.590 1772653.814
Radius: 1460.535
Delta: 17°39'21.193" Left
Degree of Curvature (Arc): 03°55'22.551"
Length: 450.069

Tangent: 226.832
Chord: 448.290
Middle Ordinate: 17.302
External: 17.509
Back Tangent Direction: S66°33'02.780"E
Back Radial Direction: S23°26'57.220"W
Chord Direction: S75°22'43.377"E
Ahead Radial Direction: S05°47'36.026"W
Ahead Tangent Direction: S84°12'23.974"E

Element: Linear
PT ( ) 363+11.011 R1 7263459.590 1772653.814
POT ( ) 364+70.450 R1 7263443.496 1772812.438
Tangential Direction: S84°12'23.974"E
Tangential Length: 159.438

STATE OF TEXAS
BRYSON P. LAWRENCE
129839
LICENSED
PROFESSIONAL ENGINEER

Bryson Lawrence, P.E.

03/29/2024

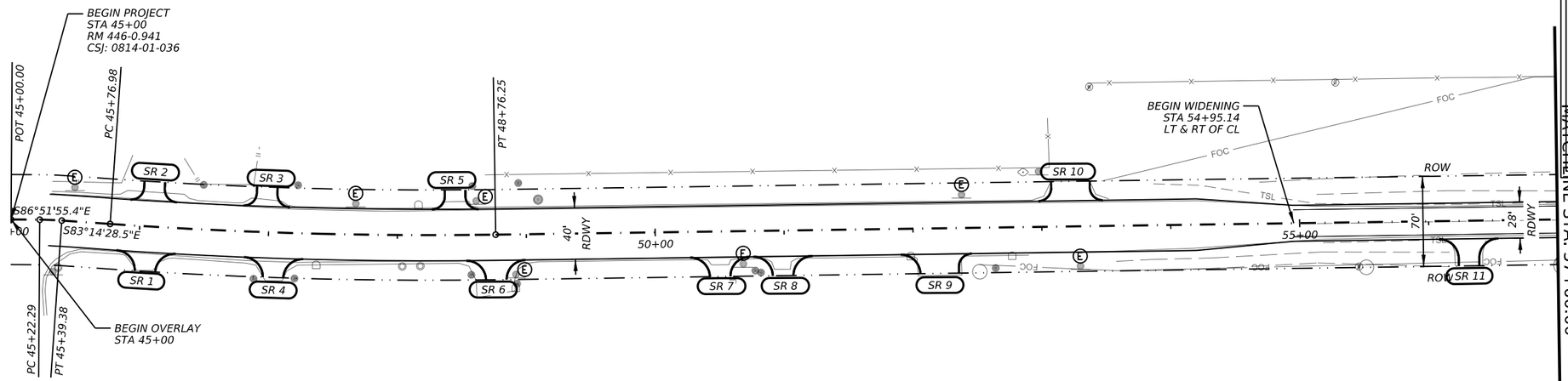
Texas Department of Transportation

FM 422

ALIGNMENT DATA

CONT	SECT	JOB	HIGHWAY
0814	01	0036	FM 422
DIST	COUNTY		SHEET NO.
WFS	BAYLOR		45

DATE: 3/29/2024 1:16:20 PM
FILE: pw://txdot.projectwiseonline.com:TXDOT2/Documents/03 - WFS/Design Projects/0814010364 - Design/Plan Set/3. Roadway/ALIGNMENT DATA



PI 45+30.84
Δ 03°37'26.9" (RT)
D 21°12'21.1"
T 8.55'
L 17.09'
R 270.19'
PC 45+22.29
PT 45+39.38

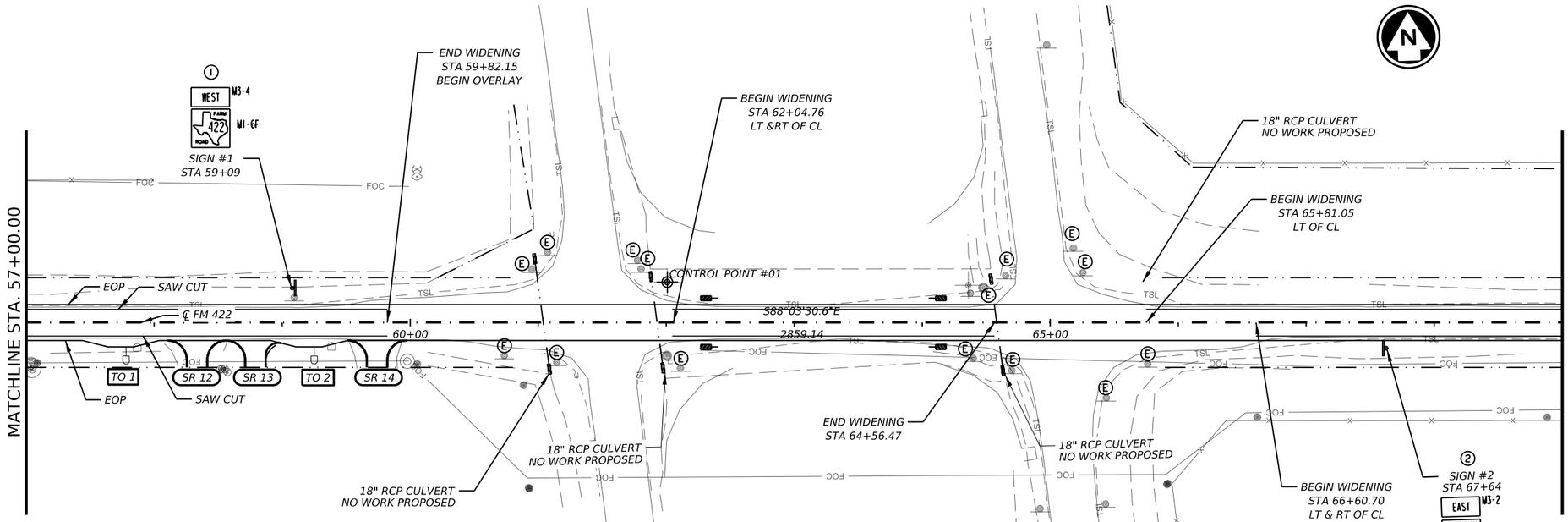
PI 47+26.70
Δ 04°49'02.0" (LT)
D 01°36'34.6"
T 149.73'
L 299.28'
R 3559.58'
PC 45+76.98
PT 48+76.25

MATCHLINE STA. 57+00.00

NOTE: DRIVEWAYS 1-10 HAVE NO PROPOSED WORK

LEGEND

- SIGN
- SINGLE MAILBOX
- DOUBLE MAILBOX
- OBJECT MARKER(TY 2)
- SIDE ROAD NUMBER - PROPOSED
- TURN OUT NUMBER - PROPOSED
- BI-DIRECTIONAL DELINEATOR
- PROPOSED SIGN
- EXISTING SIGN - NO WORK
- EXISTING SIGN - REMOVE



Control Point	NORTHING	EASTING	ELEVATION	STA	OFFSET
CP 01	7264355.924	1742684.265	1344.601	62+00.89	31.629' LT
CP 02	7264345.465	1742919.186	1345.469	64+36.03	29.135' LT

STATE OF TEXAS
BRYSON P. LAWRENCE
129839
LICENSED
PROFESSIONAL ENGINEER

Bryson Lawrence, P.E.

04/04/2024

Texas Department of Transportation

FM 422

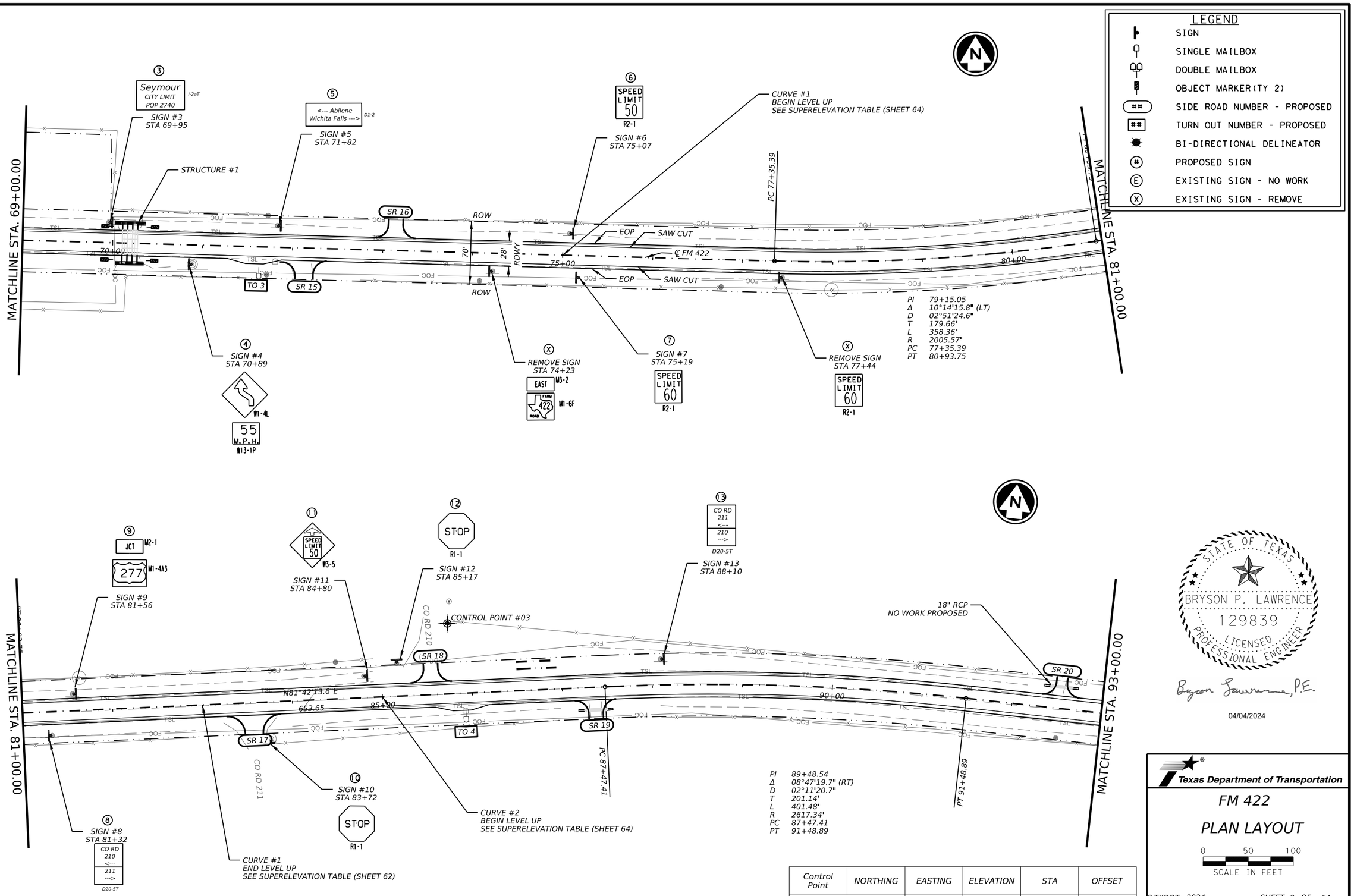
PLAN LAYOUT

0 50 100
SCALE IN FEET

SHEET 1 OF 14

CONT	SECT	JOB	HIGHWAY
0814	01	036	FM 422
DIST	COUNTY		SHEET NO.
WFS.	BAYLOR		46

DATE: 4/2/2024 9:42:00 AM
FILE: pw://txdot.projectwiseonline.com:TXDOT2/Documents/03 - WFS/Design Projects/0814010036/4 - Design/Plan Set/3. Roadway/PLAN LAYOUT



Control Point	NORTHING	EASTING	ELEVATION	STA	OFFSET
CP 03	7264439.163	1745039.693	1363.689	85+75.64	78.289' LT

STATE OF TEXAS
BRYSON P. LAWRENCE
129839
LICENSED PROFESSIONAL ENGINEER

Bryson Lawrence, P.E.

04/04/2024

Texas Department of Transportation

FM 422

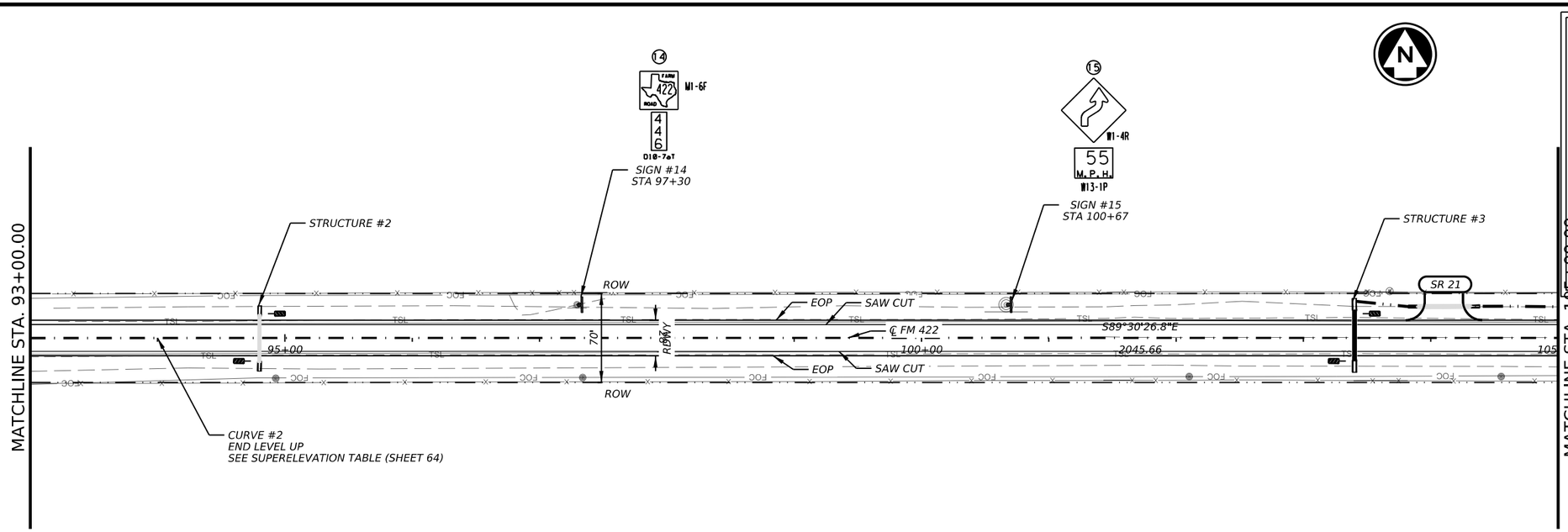
PLAN LAYOUT

0 50 100
SCALE IN FEET

SHEET 2 OF 14

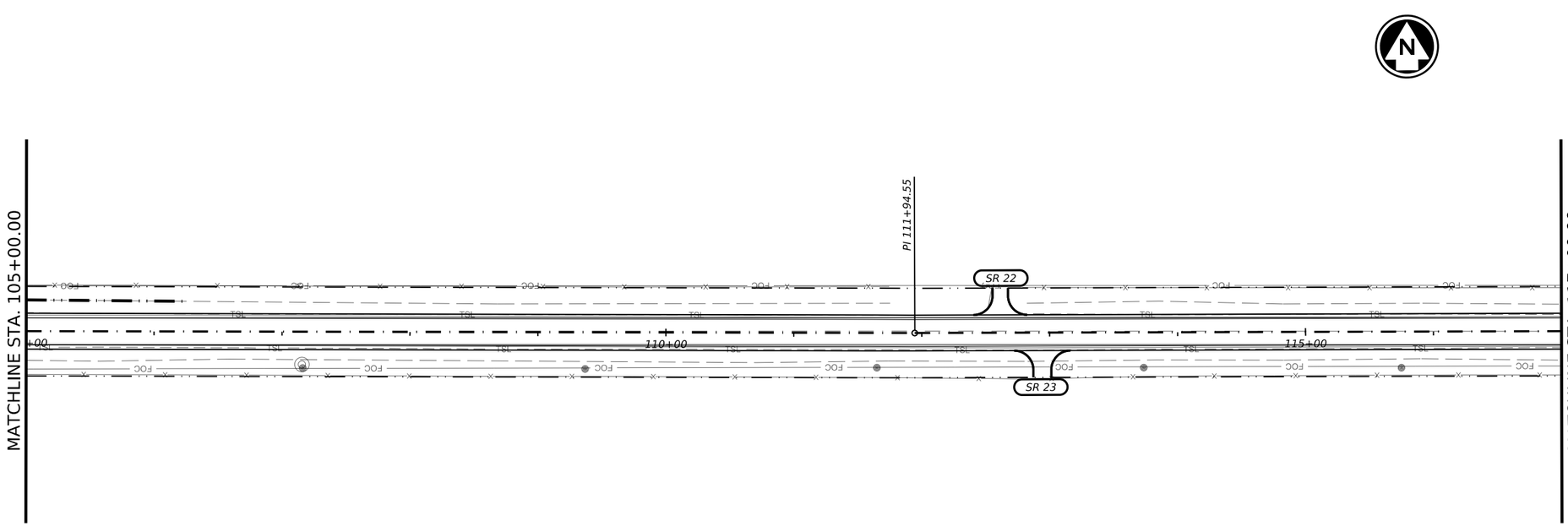
CONT	SECT	JOB	HIGHWAY
0814	01	036	FM 422
DIST	COUNTY		SHEET NO.
WFS.	BAYLOR		47

DATE: 4/2/2024 9:42:04 AM
FILE: pw://txdot.projectwiseonline.com:TXDOT2/Documents/03 - WFS/Design Projects/0814010364 - Design/Plan Set/3. Roadway/PLAN LAYOUT



LEGEND

- SIGN
- SINGLE MAILBOX
- DOUBLE MAILBOX
- OBJECT MARKER(TY 2)
- ## SIDE ROAD NUMBER - PROPOSED
- ## TURN OUT NUMBER - PROPOSED
- BI-DIRECTIONAL DELINEATOR
- (#) PROPOSED SIGN
- (E) EXISTING SIGN - NO WORK
- (X) EXISTING SIGN - REMOVE



STATE OF TEXAS
BRYSON P. LAWRENCE
129839
LICENSED
PROFESSIONAL ENGINEER

Bryson Lawrence, P.E.

04/04/2024

Texas Department of Transportation

FM 422

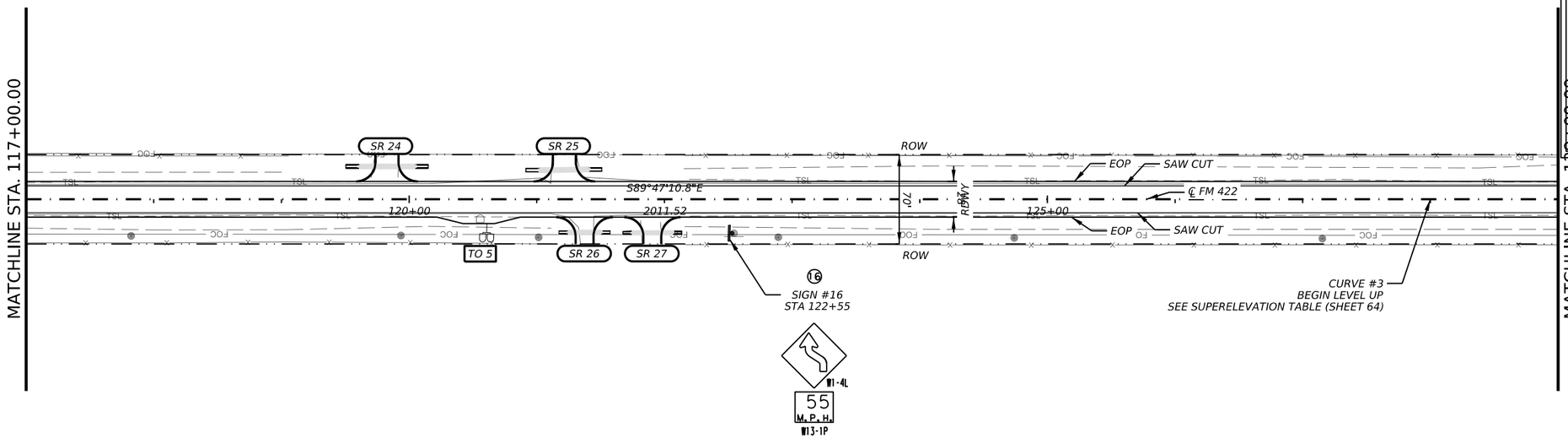
PLAN LAYOUT

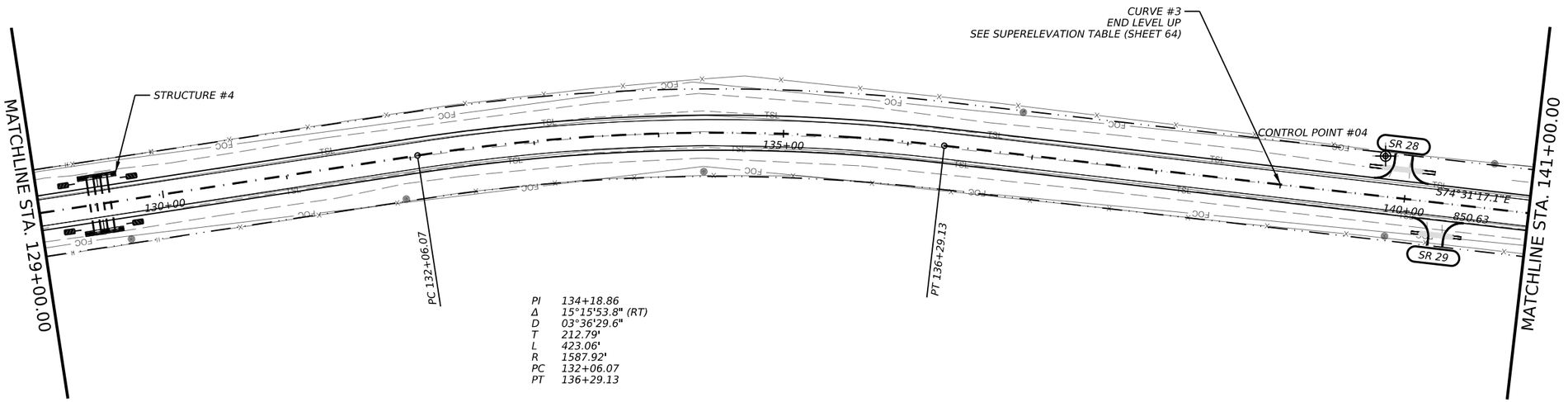
0 50 100
SCALE IN FEET

SHEET 3 OF 14

CONT	SECT	JOB	HIGHWAY
0814	01	036	FM 422
DIST	COUNTY		SHEET NO.
WFS.	BAYLOR		48

DATE: 4/2/2024 9:42:05 AM
FILE: pw://txdot.projectwiseonline.com:TXDOT2/Documents/03 - WFS/Design Projects/0814010036/4 - Design/Plan Set/3. Roadway/PLAN LAYOUT





PI 134+18.86
Δ 15°15'53.8" (RT)
D 03°36'29.6"
T 212.79'
L 423.06'
R 1587.92'
PC 132+06.07
PT 136+29.13

Control Point	NORTHING	EASTING	ELEVATION	STA	OFFSET
CP 04	7264268.306	1750443.831	1372.205	139+81.03	32.292' LT

LEGEND

- SIGN
- SINGLE MAILBOX
- DOUBLE MAILBOX
- OBJECT MARKER(TY 2)
- SIDE ROAD NUMBER - PROPOSED
- TURN OUT NUMBER - PROPOSED
- BI-DIRECTIONAL DELINEATOR
- (#) PROPOSED SIGN
- (E) EXISTING SIGN - NO WORK
- (X) EXISTING SIGN - REMOVE

STATE OF TEXAS
BRYSON P. LAWRENCE
129839
LICENSED
PROFESSIONAL ENGINEER

Bryson Lawrence, P.E.

04/04/2024

Texas Department of Transportation

FM 422

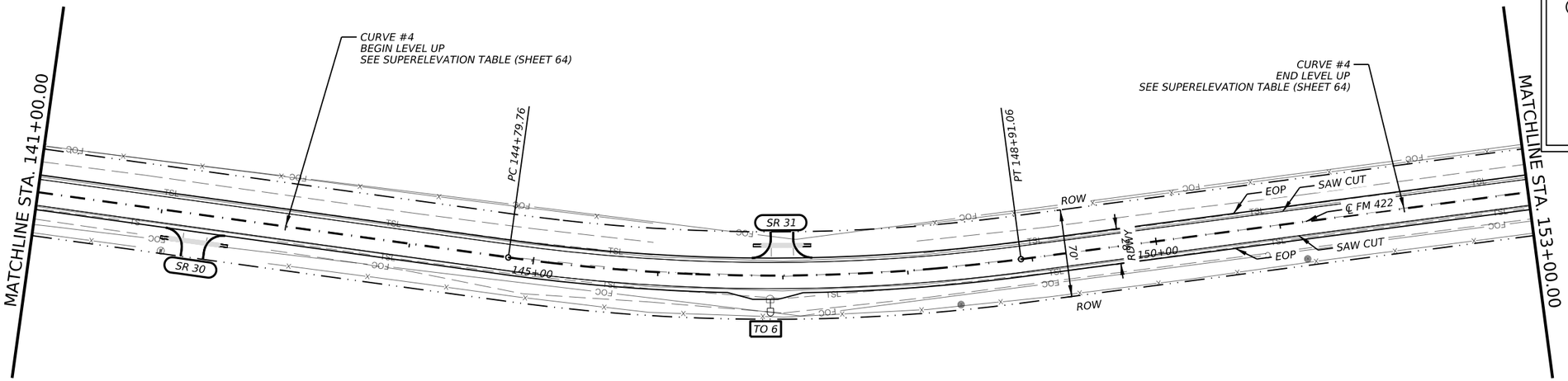
PLAN LAYOUT

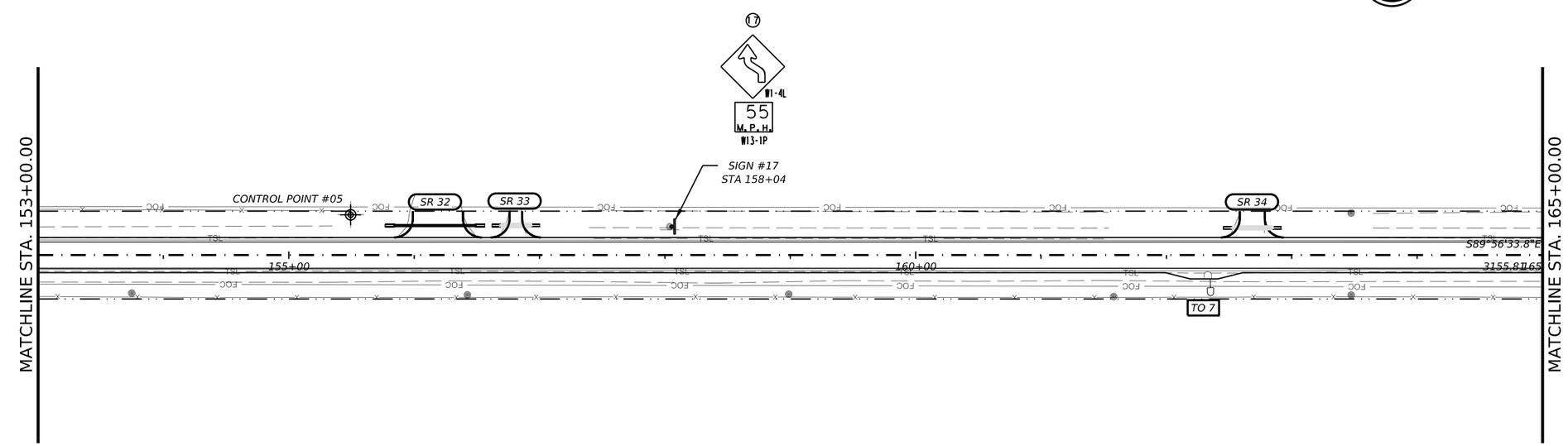
0 50 100
SCALE IN FEET

SHEET 4 OF 14

CONT	SECT	JOB	HIGHWAY
0814	01	036	FM 422
DIST	COUNTY		SHEET NO.
WFS.	BAYLOR		49

DATE: 4/2/2024 9:42:06 AM
FILE: pw://txdot.projectwiseonline.com:TXDOT2/Documents/03 - WFS/Design Projects/0814010364 - Design/Plan Set/3. Roadway/PLAN LAYOUT





PI	146+86.66
Δ	15°25'16.7" (LT)
D	03°44'57.8"
T	206.90'
L	411.30'
R	1528.13'
PC	144+79.76
PT	148+91.06

LEGEND

- SIGN
- SINGLE MAILBOX
- DOUBLE MAILBOX
- OBJECT MARKER(TY 2)
- SIDE ROAD NUMBER - PROPOSED
- TURN OUT NUMBER - PROPOSED
- BI-DIRECTIONAL DELINEATOR
- (#) PROPOSED SIGN
- (E) EXISTING SIGN - NO WORK
- (X) EXISTING SIGN - REMOVE

Control Point	NORTHING	EASTING	ELEVATION	STA	OFFSET
CP 05	7264080.303	1751980.512	1387.696	155+49.39	32.300' LT

STATE OF TEXAS
BRYSON P. LAWRENCE
129839
LICENSED
PROFESSIONAL ENGINEER

Bryson Lawrence, P.E.

04/04/2024

Texas Department of Transportation

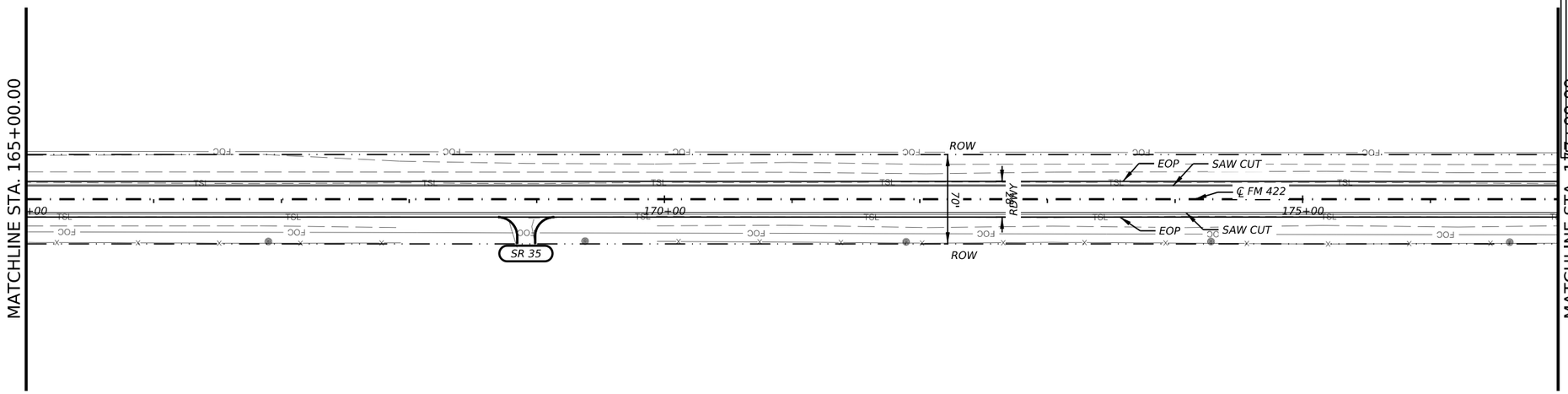
FM 422

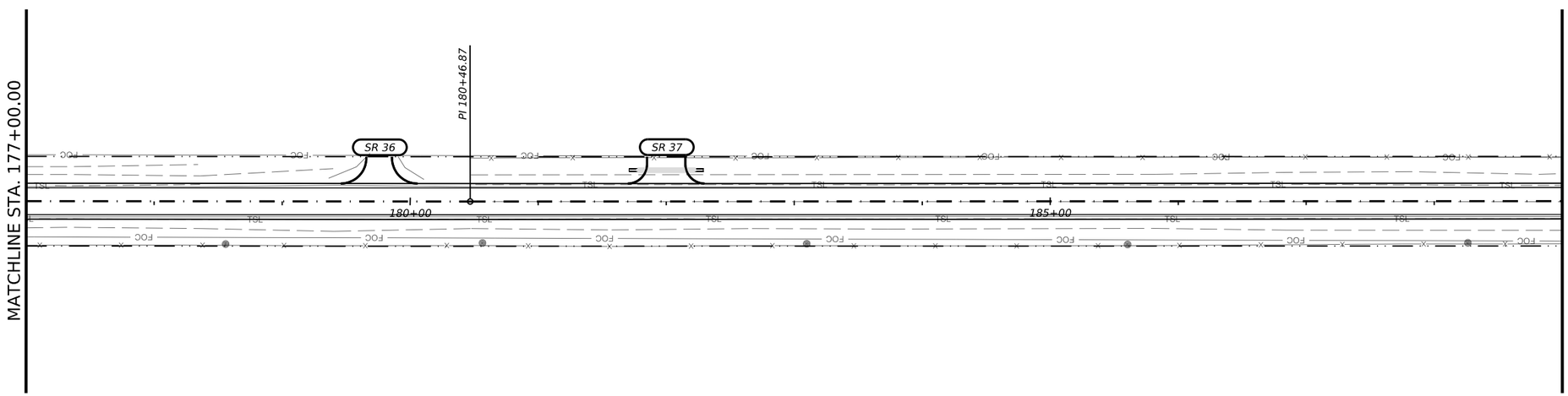
PLAN LAYOUT

0 50 100
SCALE IN FEET

CONT	SECT	JOB	HIGHWAY
0814	01	036	FM 422
DIST	COUNTY		SHEET NO.
WFS.	BAYLOR		50

DATE: 4/2/2024 9:42:09 AM
FILE: pw://txdot.projectwiseonline.com:TXDOT2/Documents/03 - WFS/Design Projects/081401036/4 - Design/Plan Set/3. Roadway/PLAN LAYOUT





LEGEND

- SIGN
- SINGLE MAILBOX
- DOUBLE MAILBOX
- OBJECT MARKER(TY 2)
- SIDE ROAD NUMBER - PROPOSED
- TURN OUT NUMBER - PROPOSED
- BI-DIRECTIONAL DELINEATOR
- PROPOSED SIGN
- EXISTING SIGN - NO WORK
- EXISTING SIGN - REMOVE

STATE OF TEXAS
BRYSON P. LAWRENCE
129839
LICENSED
PROFESSIONAL ENGINEER

Bryson Lawrence, P.E.

04/04/2024

Texas Department of Transportation

FM 422

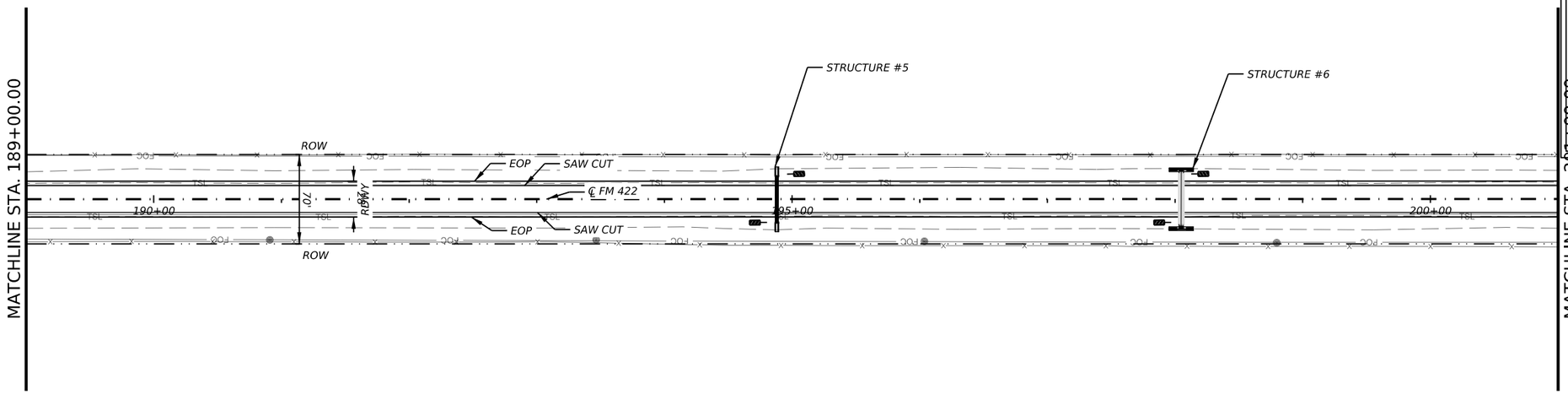
PLAN LAYOUT

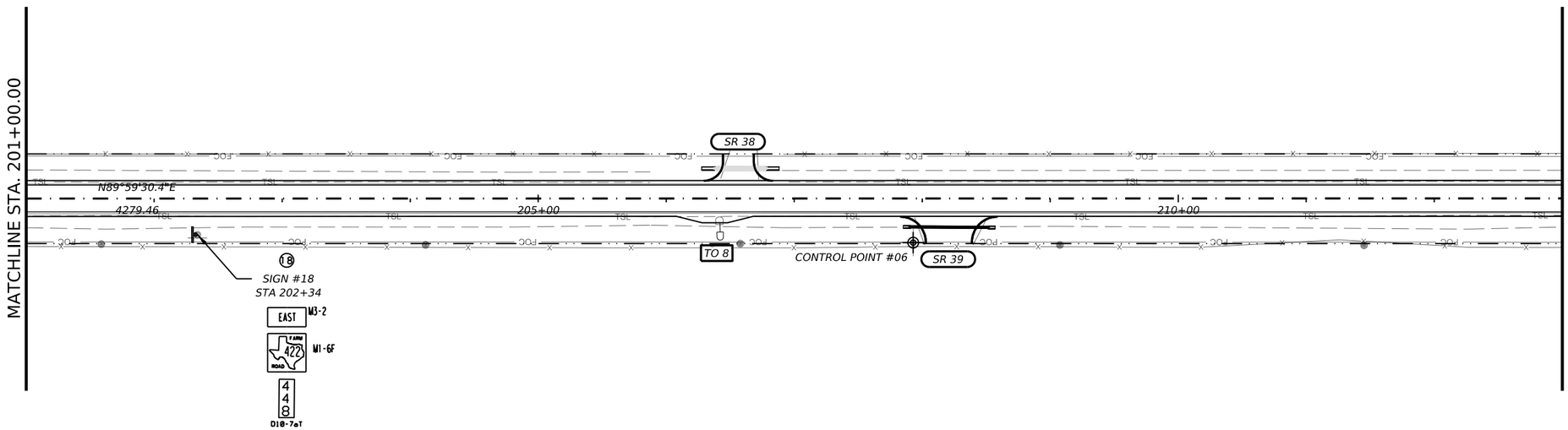
0 50 100
SCALE IN FEET

SHEET 6 OF 14

CONT	SECT	JOB	HIGHWAY
0814	01	036	FM 422
DIST	COUNTY		SHEET NO.
WFS.	BAYLOR		51

DATE: 4/2/2024 9:42:10 AM
FILE: pw://txdot.projectwiseonline.com:TXDOT2/Documents/03 - WFS/Design Projects/0814010036/4 - Design/Plan Set/3. Roadway/PLAN LAYOUT





Control Point	NORTHING	EASTING	ELEVATION	STA	OFFSET
CP 06	7264011.377	1757224.050	1413.047	207+92.96	34.522' RT

LEGEND

- SIGN
- SINGLE MAILBOX
- DOUBLE MAILBOX
- OBJECT MARKER(TY 2)
- SIDE ROAD NUMBER - PROPOSED
- TURN OUT NUMBER - PROPOSED
- BI-DIRECTIONAL DELINEATOR
- PROPOSED SIGN
- EXISTING SIGN - NO WORK
- EXISTING SIGN - REMOVE

STATE OF TEXAS
BRYSON P. LAWRENCE
129839
LICENSED
PROFESSIONAL ENGINEER

Bryson Lawrence, P.E.

04/04/2024

Texas Department of Transportation

FM 422

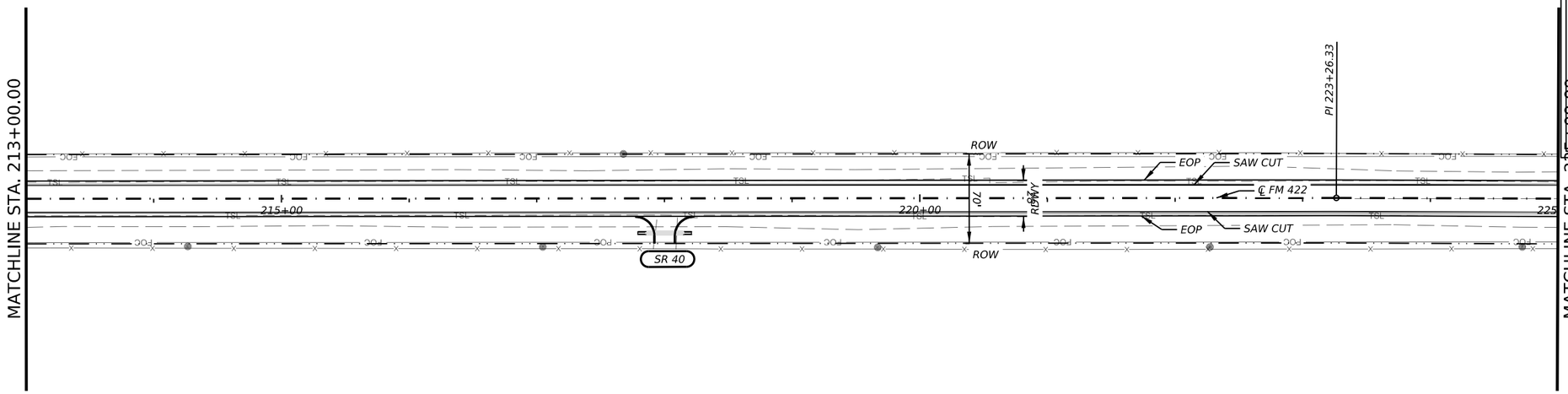
PLAN LAYOUT

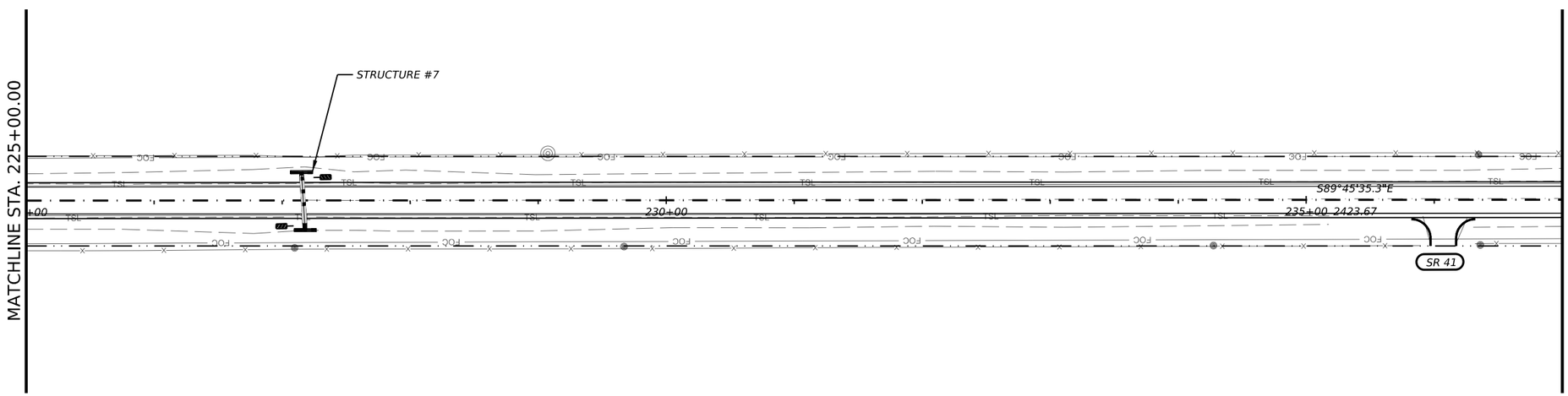
0 50 100
SCALE IN FEET

SHEET 7 OF 14

CONT	SECT	JOB	HIGHWAY
0814	01	036	FM 422
DIST	COUNTY		SHEET NO.
WFS.	BAYLOR		52

DATE: 4/2/2024 9:42:12 AM
FILE: pw://txdot.projectwiseonline.com:TXDOT2/Documents/03 - WFS/Design Projects/0814010361/4 - Design/Plan Set/3. Roadway/PLAN LAYOUT





LEGEND

- SIGN
- SINGLE MAILBOX
- DOUBLE MAILBOX
- OBJECT MARKER(TY 2)
- SIDE ROAD NUMBER - PROPOSED
- TURN OUT NUMBER - PROPOSED
- BI-DIRECTIONAL DELINEATOR
- PROPOSED SIGN
- EXISTING SIGN - NO WORK
- EXISTING SIGN - REMOVE

STATE OF TEXAS
BRYSON P. LAWRENCE
129839
LICENSED
PROFESSIONAL ENGINEER

Bryson Lawrence, P.E.

04/04/2024

Texas Department of Transportation

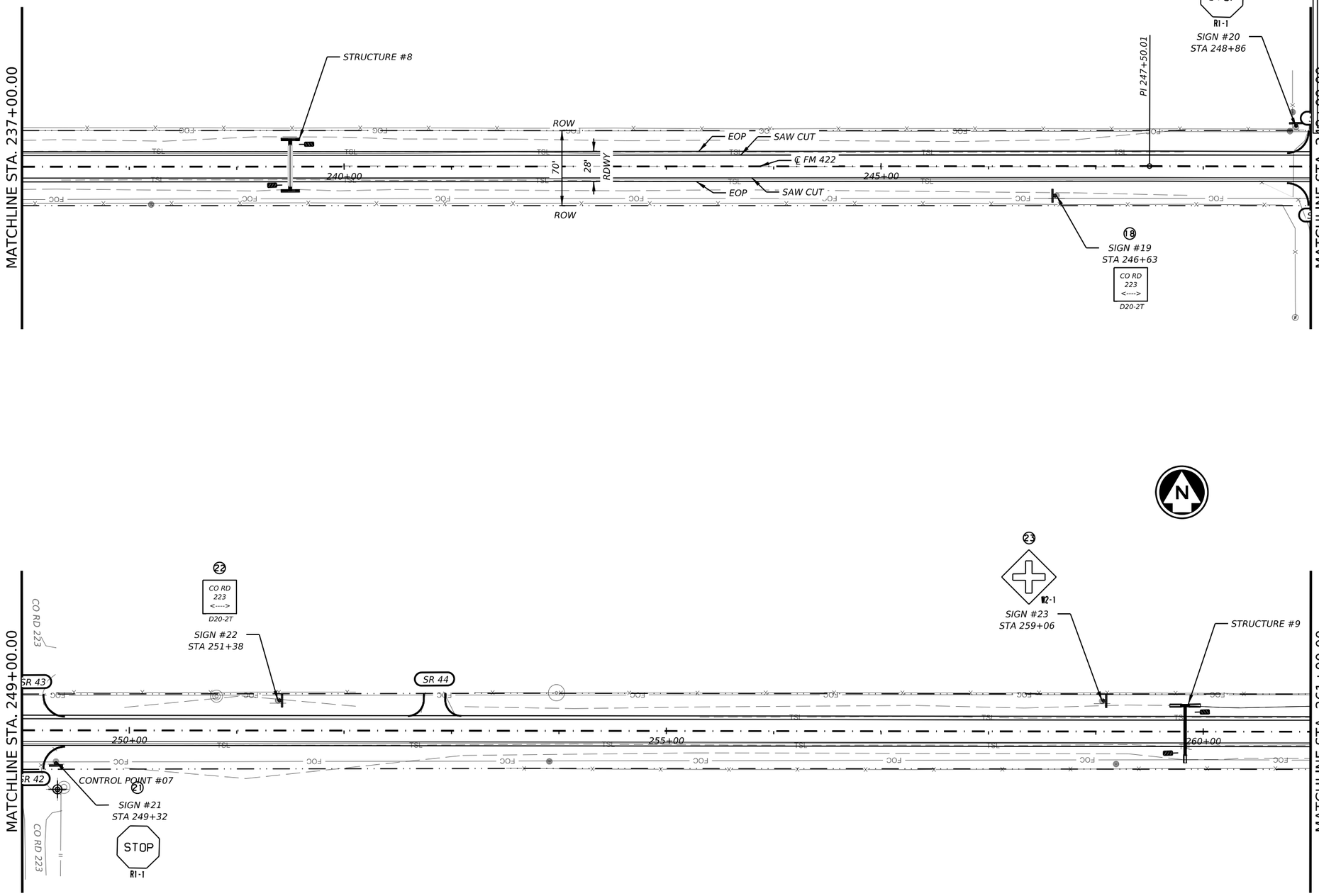
FM 422

PLAN LAYOUT

0 50 100
SCALE IN FEET

CONT	SECT	JOB	HIGHWAY
0814	01	036	FM 422
DIST	COUNTY		SHEET NO.
WFS.	BAYLOR		53

DATE: 4/2/2024 9:42:13 AM
FILE: pw://txdot.projectwiseonline.com:TXDOT2/Documents/03 - WFS/Design Projects/0814010036/4 - Design/Plan Set/3. Roadway/PLAN LAYOUT



Control Point	NORTHING	EASTING	ELEVATION	STA	OFFSET
CP 07	7263979.540	1761363.742	1437.829	249+33.10	55.021' RT

STATE OF TEXAS
BRYSON P. LAWRENCE
129839
LICENSED
PROFESSIONAL ENGINEER

Bryson Lawrence, P.E.

04/04/2024

Texas Department of Transportation

FM 422

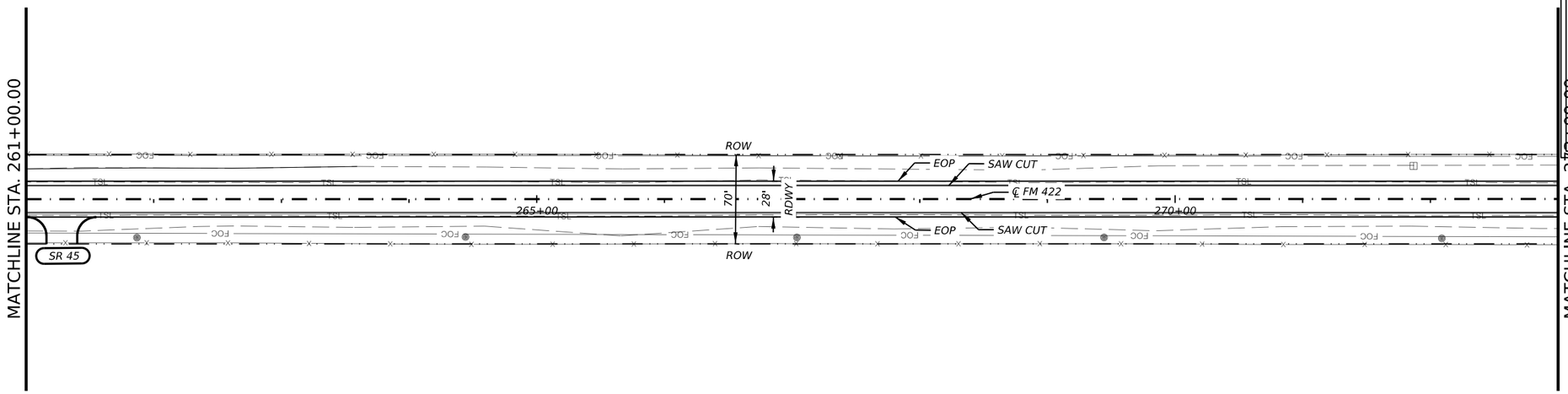
PLAN LAYOUT

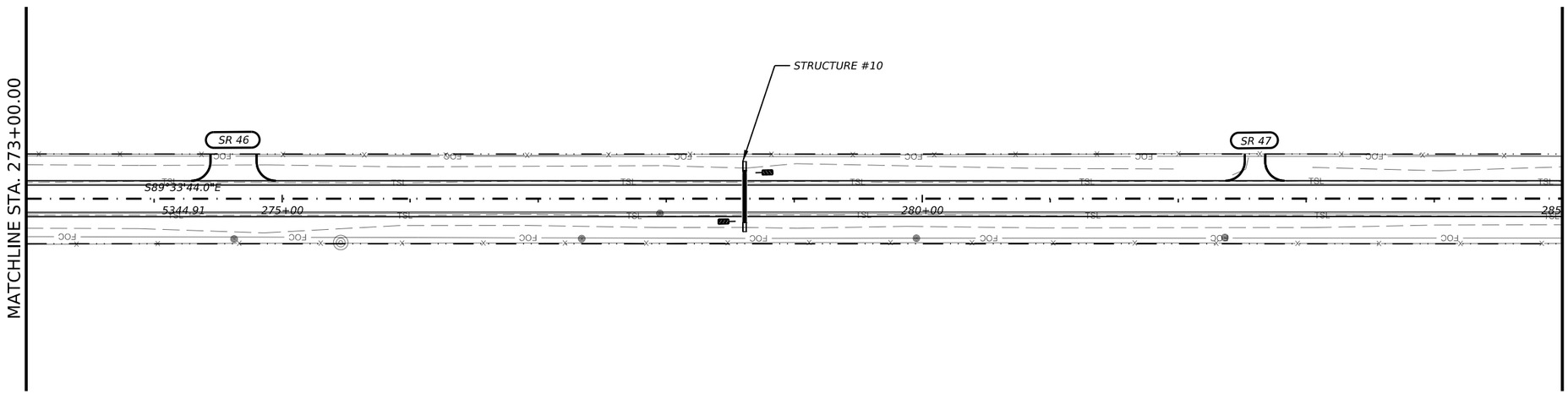
0 50 100
SCALE IN FEET

SHEET 9 OF 14

CONT	SECT	JOB	HIGHWAY
0814	01	036	FM 422
DIST	COUNTY		SHEET NO.
WFS.	BAYLOR		54

DATE: 4/2/2024 9:42:15 AM
FILE: pw://txdot.projectwiseonline.com:TXDOT2/Documents/03 - WFS/Design Projects/0814010036/4 - Design/Plan Set/3. Roadway/PLAN LAYOUT





LEGEND

- SIGN
- SINGLE MAILBOX
- DOUBLE MAILBOX
- OBJECT MARKER(TY 2)
- SIDE ROAD NUMBER - PROPOSED
- TURN OUT NUMBER - PROPOSED
- BI-DIRECTIONAL DELINEATOR
- PROPOSED SIGN
- EXISTING SIGN - NO WORK
- EXISTING SIGN - REMOVE

STATE OF TEXAS
BRYSON P. LAWRENCE
129839
LICENSED
PROFESSIONAL ENGINEER

Bryson Lawrence, P.E.

04/04/2024

Texas Department of Transportation

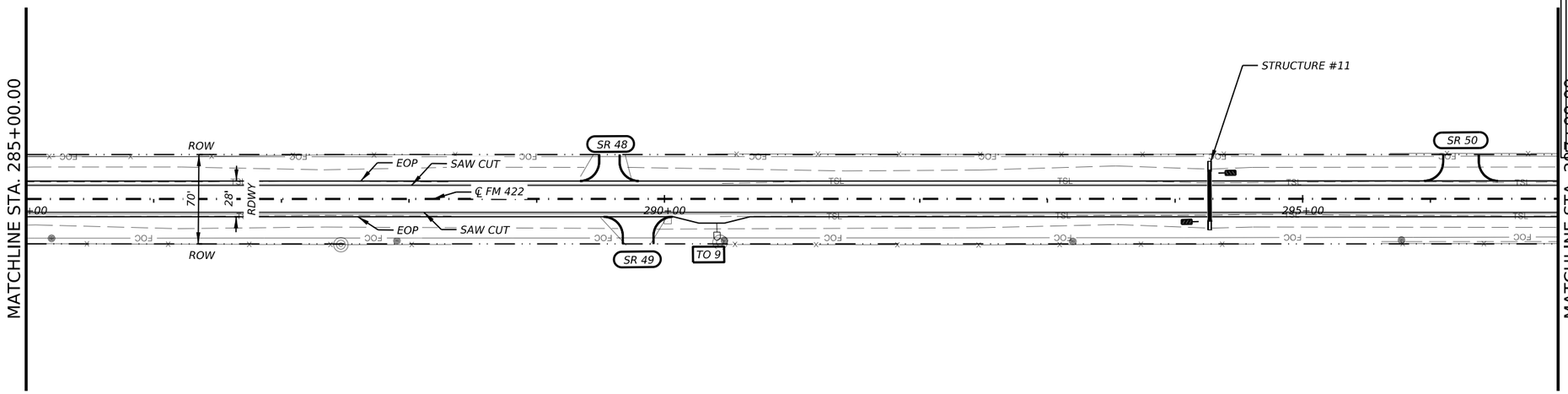
FM 422

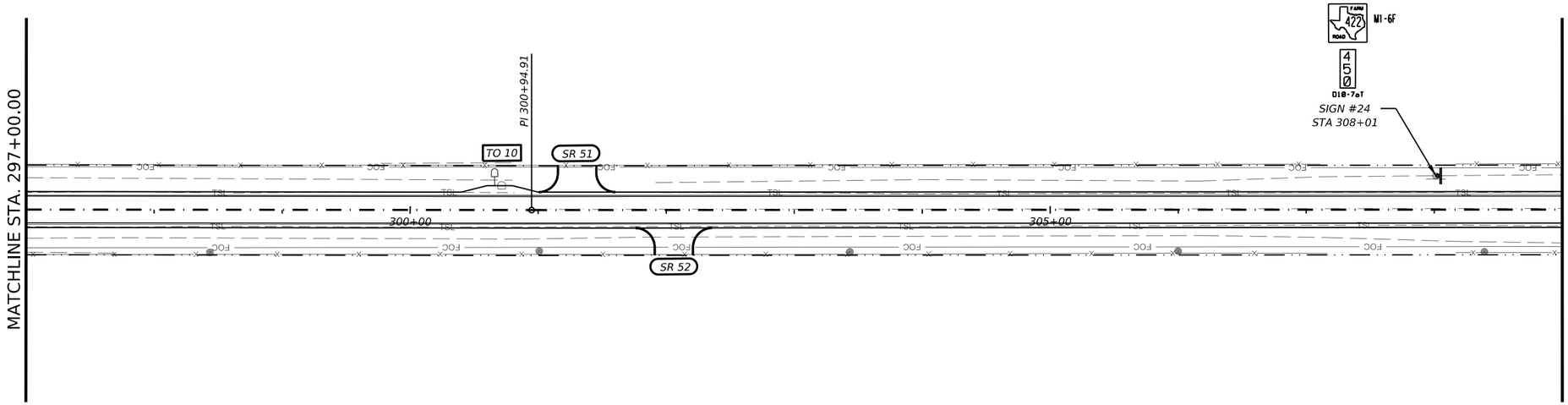
PLAN LAYOUT

0 50 100
SCALE IN FEET

CONT	SECT	JOB	HIGHWAY
0814	01	036	FM 422
DIST	COUNTY		SHEET NO.
WFS.	BAYLOR		55

DATE: 4/2/2024 9:42:16 AM
FILE: pw://txdot.projectwiseonline.com:TXDOT2/Documents/03 - WFS/Design Projects/0814010036/4 - Design/Plan Set/3. Roadway/PLAN LAYOUT





LEGEND

- SIGN
- SINGLE MAILBOX
- DOUBLE MAILBOX
- OBJECT MARKER(TY 2)
- SIDE ROAD NUMBER - PROPOSED
- TURN OUT NUMBER - PROPOSED
- BI-DIRECTIONAL DELINEATOR
- (#) PROPOSED SIGN
- (E) EXISTING SIGN - NO WORK
- (X) EXISTING SIGN - REMOVE

STATE OF TEXAS
BRYSON P. LAWRENCE
129839
LICENSED
PROFESSIONAL ENGINEER

Bryson Lawrence, P.E.

04/04/2024

Texas Department of Transportation

FM 422

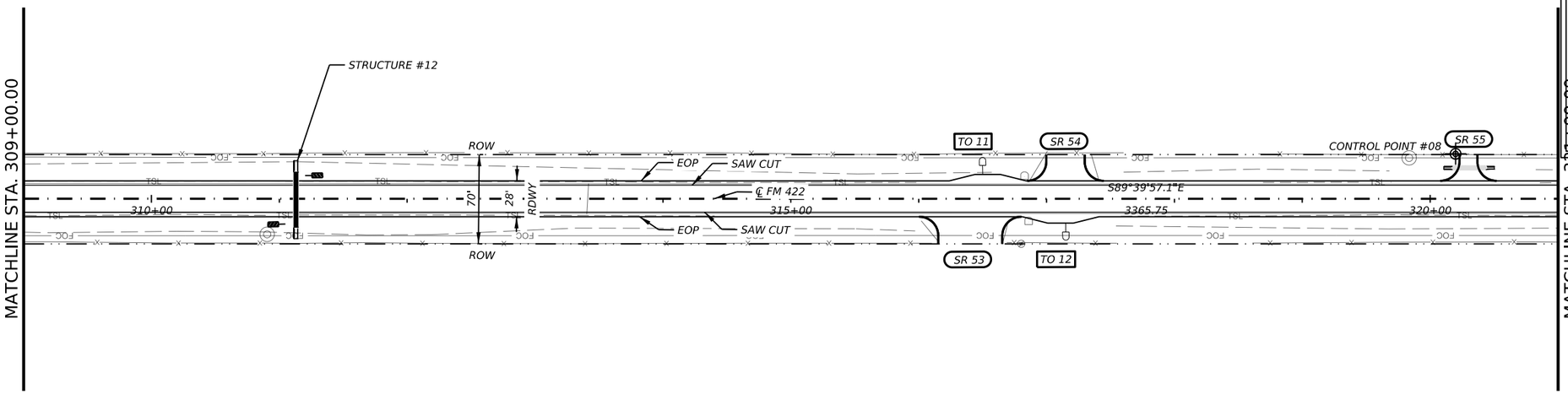
PLAN LAYOUT

0 50 100
SCALE IN FEET

CONT	SECT	JOB	HIGHWAY
0814	01	036	FM 422
DIST	COUNTY		SHEET NO.
WFS.	BAYLOR		56

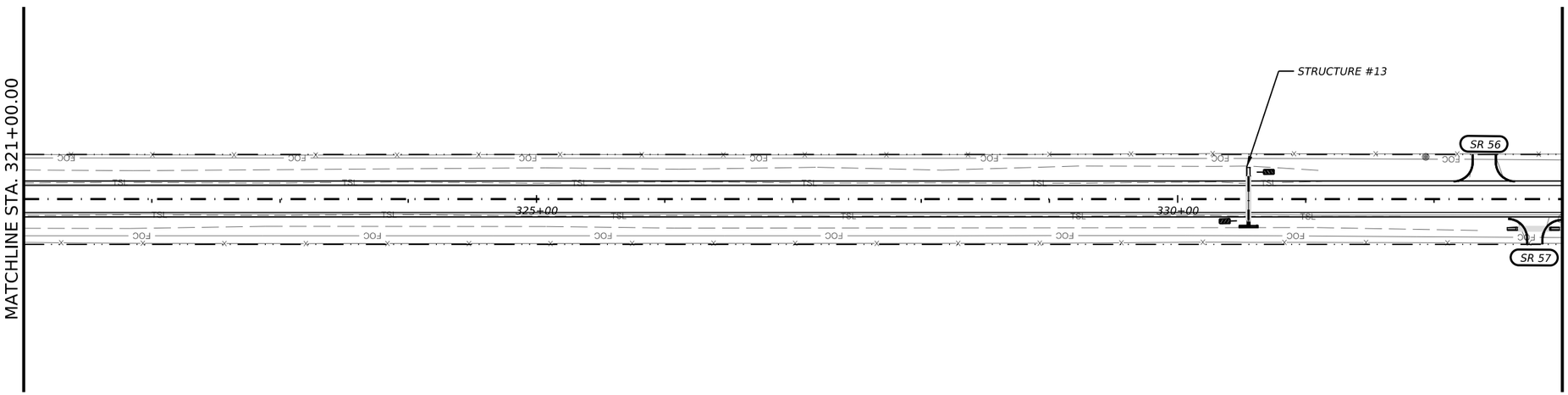
DATE: 4/2/2024 9:42:17 AM
FILE: pw://txdot.projectwiseonline.com:TXDOT2/Documents/03 - WFS/Design Projects/0814010036/4 - Design/Plan Set/3. Roadway/PLAN LAYOUT

Control Point	NORTHING	EASTING	ELEVATION	STA	OFFSET
CP 08	7264019.015	1768450.978	1386.671	320+19.90	35.121' LT



LEGEND

- SIGN
- SINGLE MAILBOX
- DOUBLE MAILBOX
- OBJECT MARKER(TY 2)
- SIDE ROAD NUMBER - PROPOSED
- TURN OUT NUMBER - PROPOSED
- BI-DIRECTIONAL DELINEATOR
- PROPOSED SIGN
- EXISTING SIGN - NO WORK
- EXISTING SIGN - REMOVE



STATE OF TEXAS
BRYSON P. LAWRENCE
129839
LICENSED
PROFESSIONAL ENGINEER

Bryson Lawrence, P.E.

04/04/2024

Texas Department of Transportation

FM 422

PLAN LAYOUT

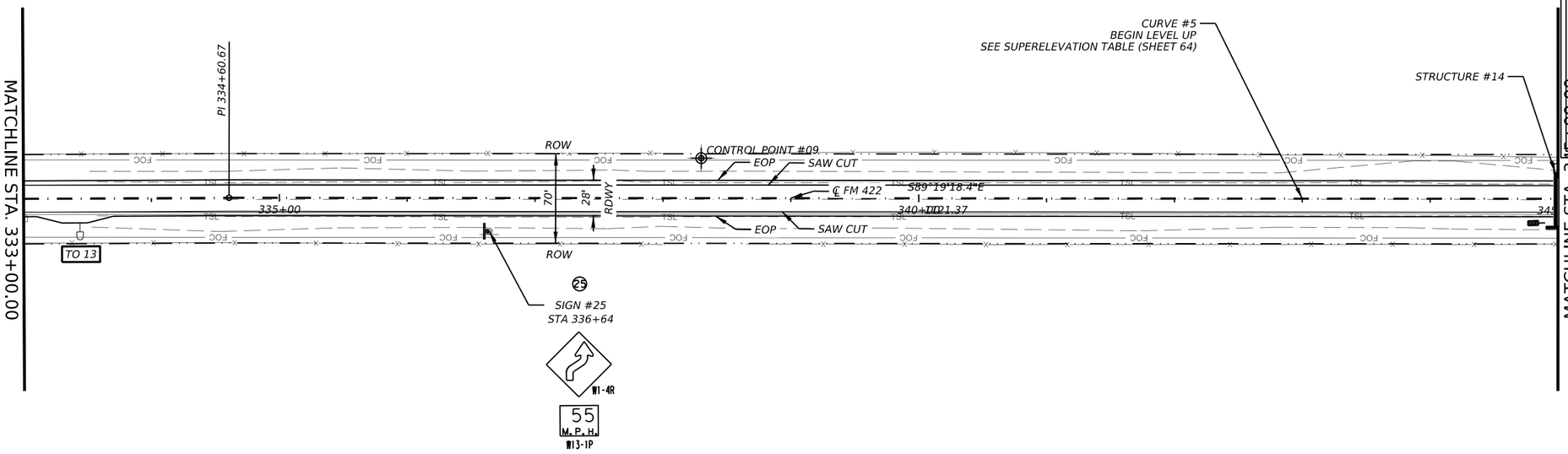
0 50 100
SCALE IN FEET

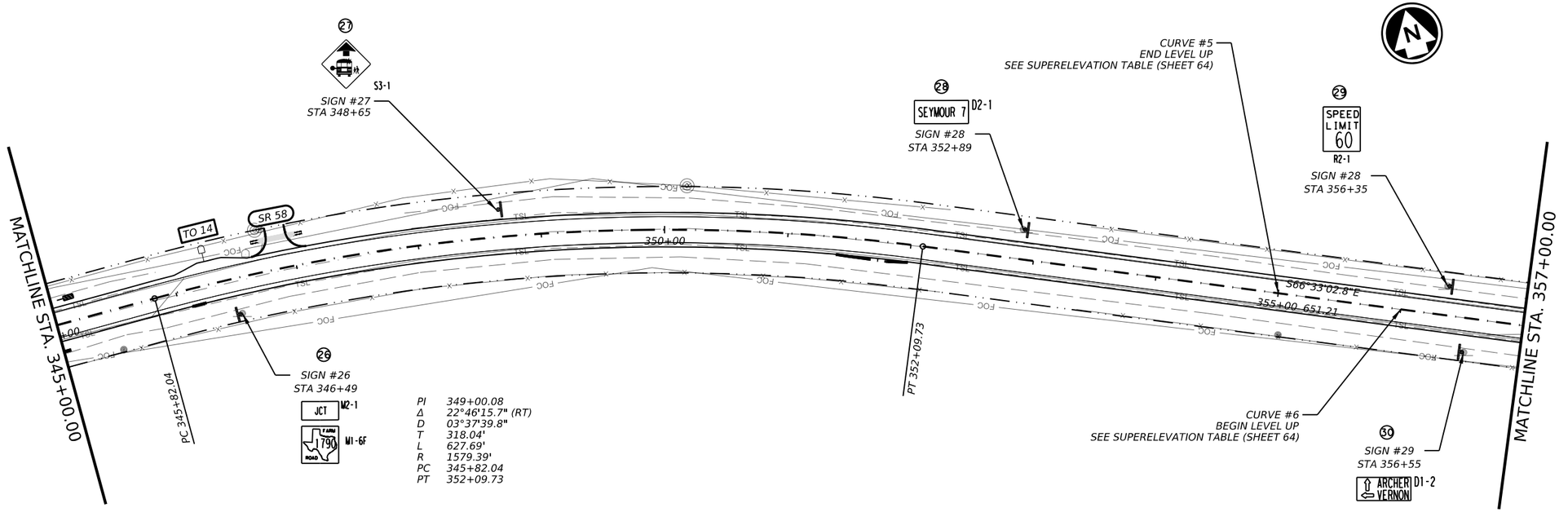
SHEET 12 OF 14

CONT	SECT	JOB	HIGHWAY
0814	01	036	FM 422
DIST	COUNTY		SHEET NO.
WFS.	BAYLOR		57

DATE: 4/2/2024 9:42:19 AM
FILE: pw://txdot.projectwiseonline.com:TXDOT2/Documents/03 - WFS/Design Projects/081401036/4 - Design/Plan Set/3. Roadway/PLAN LAYOUT

Control Point	NORTHING	EASTING	ELEVATION	STA	OFFSET
CP 09	7264002.379	1770261.161	1366.731	338+29.96	31.261' LT





PI	349+00.08
Δ	22°46'15.7" (RT)
D	03°37'39.8"
T	318.04'
L	627.69'
R	1579.39'
PC	345+82.04
PT	352+09.73

LEGEND

- SIGN
- SINGLE MAILBOX
- DOUBLE MAILBOX
- OBJECT MARKER(TY 2)
- SIDE ROAD NUMBER - PROPOSED
- TURN OUT NUMBER - PROPOSED
- BI-DIRECTIONAL DELINEATOR
- (##) PROPOSED SIGN
- (E) EXISTING SIGN - NO WORK
- (X) EXISTING SIGN - REMOVE

STATE OF TEXAS
BRYSON P. LAWRENCE
129839
LICENSED
PROFESSIONAL ENGINEER

Bryson Lawrence, P.E.

04/04/2024

Texas Department of Transportation

FM 422

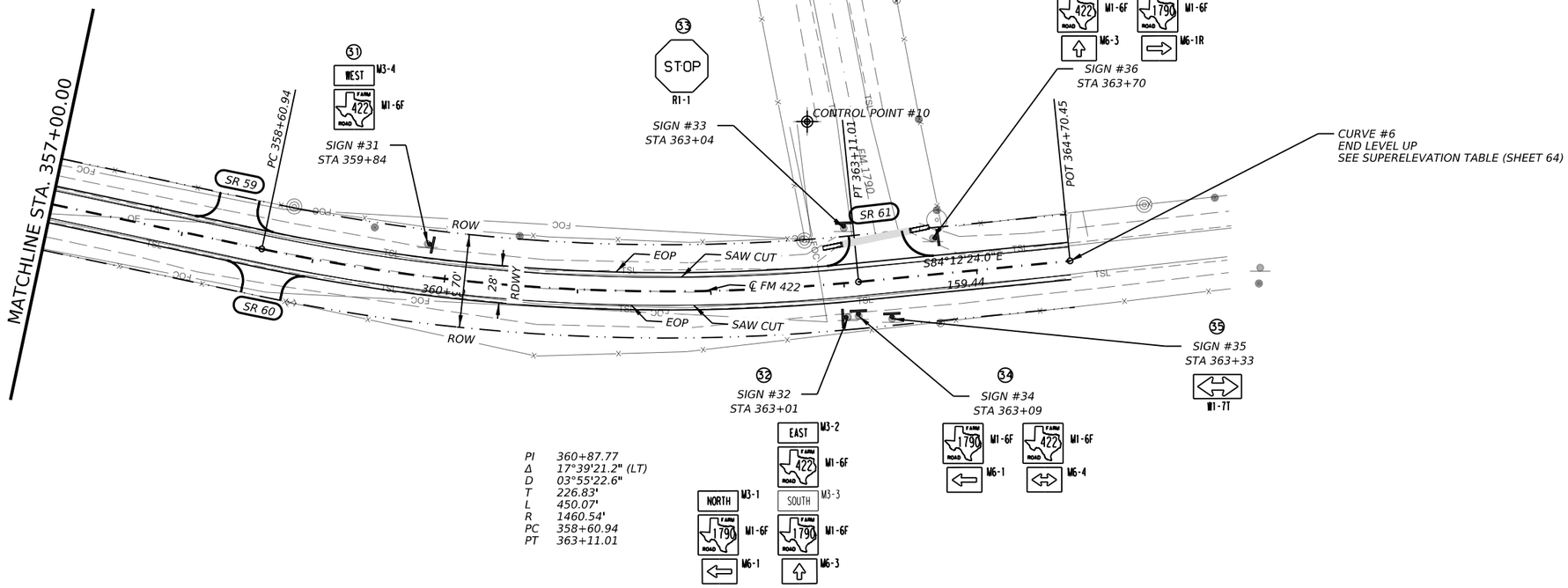
PLAN LAYOUT

0 50 100
SCALE IN FEET

CONT	SECT	JOB	HIGHWAY
0814	01	036	FM 422
DIST	COUNTY		SHEET NO.
WFS.	BAYLOR		58

DATE: 4/2/2024 4:46:19 PM
FILE: pw://txdot.projectwiseonline.com:TXDOT2/Documents/03 - WFS/Design Projects/0814010364 - Design/Plan Set/3. Roadway/PLAN LAYOUT

Control Point	NORTHING	EASTING	ELEVATION	STA	OFFSET
CP 10	7263585.068	1772639.936	1330.930	363+82.10	123.174' LT



PI	360+87.77
Δ	17°39'21.2" (LT)
D	03°55'22.6"
T	226.83'
L	450.07'
R	1460.54'
PC	358+60.94
PT	363+11.01

LEGEND

- SIGN
- SINGLE MAILBOX
- DOUBLE MAILBOX
- OBJECT MARKER(TY 2)
- SIDE ROAD NUMBER - PROPOSED
- TURN OUT NUMBER - PROPOSED
- BI-DIRECTIONAL DELINEATOR
- PROPOSED SIGN
- EXISTING SIGN - NO WORK
- EXISTING SIGN - REMOVE

STATE OF TEXAS
BRYSON P. LAWRENCE
129839
LICENSED
PROFESSIONAL ENGINEER

Bryson Lawrence, P.E.

04/04/2024

Texas Department of Transportation

FM 422

PLAN LAYOUT

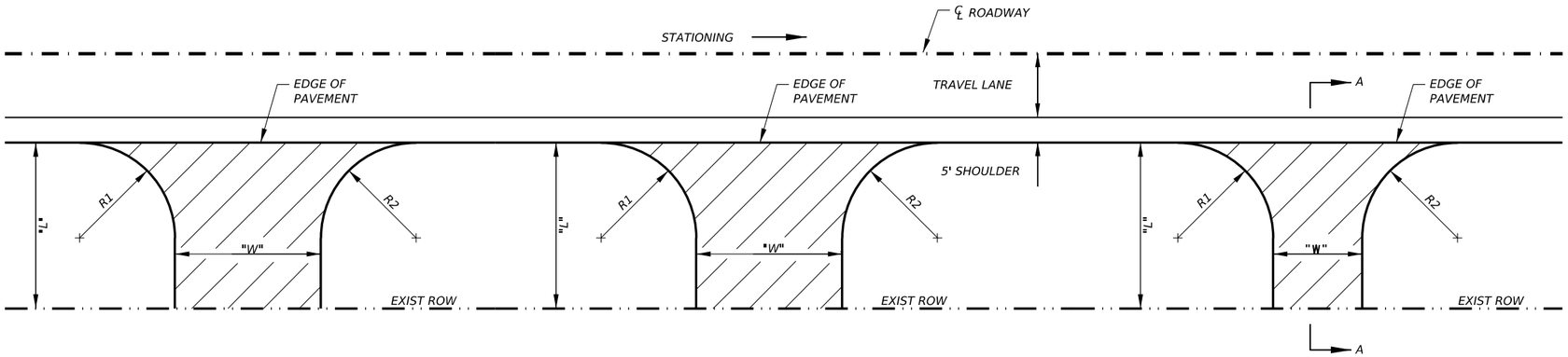
0 50 100
SCALE IN FEET

CONT	SECT	JOB	HIGHWAY
0814	01	036	FM 422
DIST	COUNTY		SHEET NO.
WFS.	BAYLOR		59

DATE: 4/2/2024 9:42:23 AM
FILE: pw://txdot.projectwiseonline.com:TXDOT2/Documents/03 - WFS/Design Projects/081401036/4 - Design/Plan Set/3. Roadway/PLAN LAYOUT

NOTES:

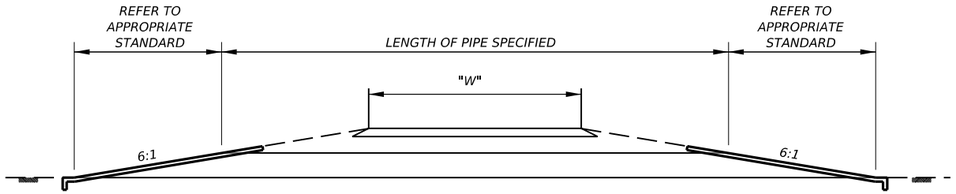
1. USE #3 REBAR AT 18' SPACING WITH 2" OF COVER



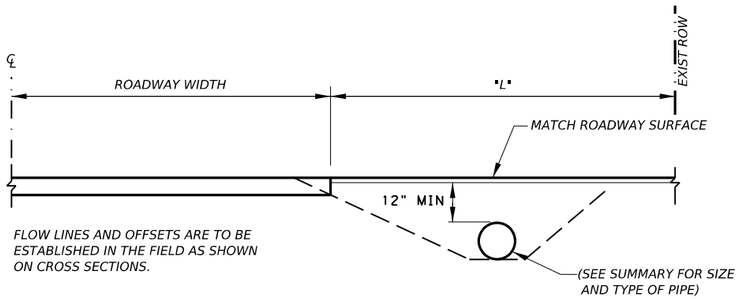
PLAN OF TYPICAL FM ROAD INTERSECTION DETAIL

PLAN OF TYPICAL COUNTY ROAD

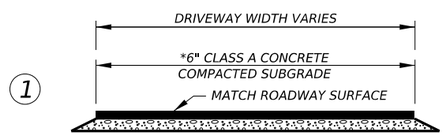
PLAN OF TYPICAL PRIVATE DRIVEWAY



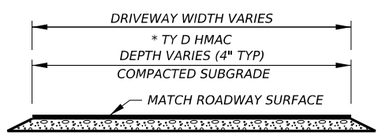
DETAIL SHOWING MEASUREMENT OF SIDEROAD PIPE



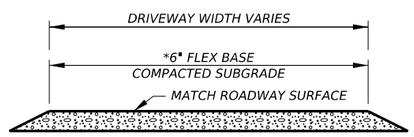
SECTION A-A SIDEROAD W/ PIPE



CONCRETE SIDEROAD TYPICAL SECTION



ACP SIDEROAD TYPICAL SECTION



BASE SIDEROAD TYPICAL SECTION

* FOR CONTRACTORS INFORMATION ONLY.
SUBSIDIARY TO ITEM 530

STATE OF TEXAS
BRYSON P. LAWRENCE
129839
LICENSED
PROFESSIONAL ENGINEER

Bryson Lawrence, P.E.

04/04/2024

Texas Department of Transportation

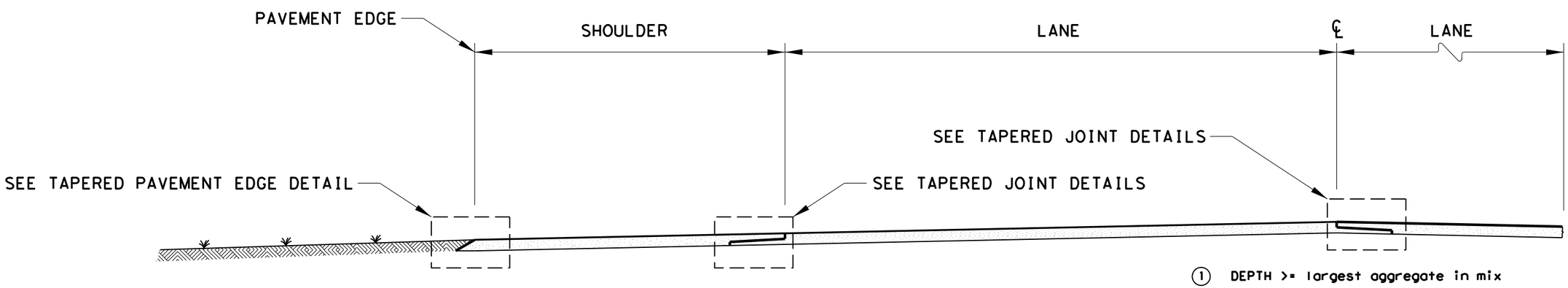
FM 422

SIDEROAD DETAILS

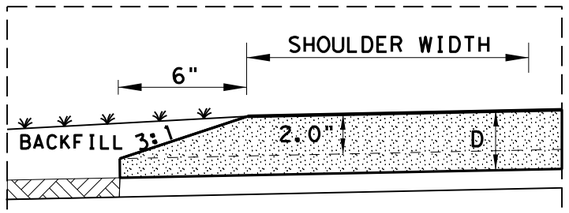
SHEET 1 OF 1

CONT	SECT	JOB	HIGHWAY
0814	01	036	FM 422
DIST	COUNTY		SHEET NO.
WFS.	BAYLOR		60

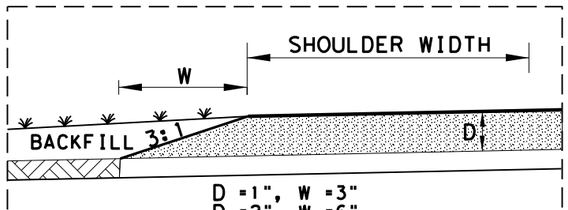
DATE: 4/3/2024 2:23:29 PM
FILE: pw://txdot.projectwiseonline.com:TXDOT2/Documents/03 - WFS/Design Projects/081401036/4 - Design/Plan Set/3. Roadway/SIDEROAD DETAILS.dgn



① DEPTH >= largest aggregate in mix

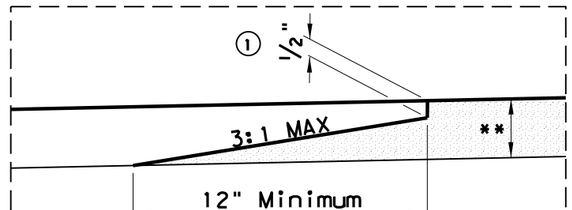


TAPERED PAVEMENT EDGE DETAIL"SAFETY EDGE" WHEN D IS > 2.0"

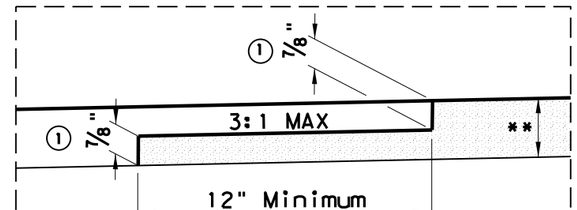


D =1", W =3"
D =2", W =6"

TAPERED PAVEMENT EDGE DETAIL"SAFETY EDGE" WHEN D IS 2.0" OR LESS



TAPERED JOINT DETAIL HMA LIFT THICKNESS LESS THAN 2"



TAPERED JOINT DETAIL HMA LIFT THICKNESS MORE THAN 2"

** 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 SCREED ATTACHMENT WHICH WILL PRODUCE THE DESIRED SHAPE WITH THE MAIN SCREED. USE OF AN EXTERNAL STRIKE-OFF DEVICE TO MODIFY THE MAT SHAPE AFTER PASSING OF THE SCREED WILL NOT BE ALLOWED. 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.

PAVEMENT EDGES SHALL BE CONSTRUCTED BY TAPERING THE BITUMINOUS MAT. THE TAPERED PORTION SHALL BE PLACED WITHIN THE NORMAL LANE WIDTH UNLESS OTHERWISE SHOWN ON THE PLANS. THE TAPERED PORTION OF THE MAT SHALL BE CONSTRUCTED BY THE USE OF AN APPROVED SCREED ATTACHMENT WHICH WILL PRODUCE THE DESIRED SHAPE WITH THE MAIN SCREED. USE OF AN EXTERNAL STRIKE-OFF DEVICE TO MODIFY THE MAT SHAPE AFTER PASSING OF THE SCREED WILL NOT BE ALLOWED. COMPACTION OF THE PAVEMENT EDGE TAPER WILL BE REQUIRED TO AS NEAR TO FINAL DENSITY AS POSSIBLE.

STATE OF TEXAS
BRYSON P. LAWRENCE
129839
LICENSED PROFESSIONAL ENGINEER

Bryson Lawrence, P.E.

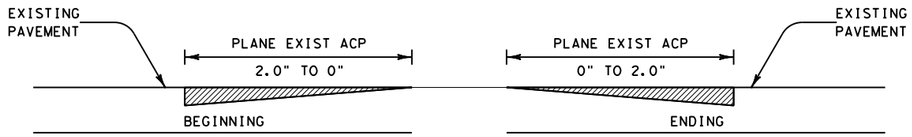
03/29/2024

FM 422
HOT MIX LONGITUDINAL JOINT DETAILS

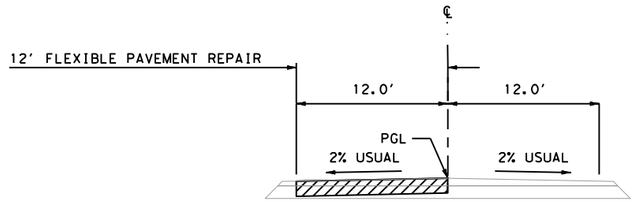
Texas Department of Transportation
SHEET 1 OF 1

CONT	SECT	JOB	HIGHWAY
0814	01	036	FM 422
DIST	COUNTY		SHEET NO.
WFS.	BAYLOR		61

DATE: 3/29/2024 1:17:21 PM
FILE: pw://txdot.projectwiseonline.com:TXDOT2/Documents/03 - WFS/Design Projects/0814010364 - Design/Plan Set/3. Roadway/HOT MIX LONGITUDINAL JOINT DETAIL.dgn
DGN: CK:



TYPICAL PLANING & OVERLAY ①
@ BEGINNING AND ENDING OF
PROJECT DETAIL



FM 422

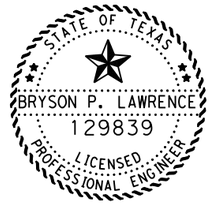
PROPOSED TYPICAL PAVEMENT ②
REPAIR SECTION
(SAME FOR BOTH LANES OF TRAVEL)

NOTES:

① THIS DETAIL SHALL BE USED FOR CONSTRUCTING BUTT JOINTS AT ALL BEGINNING/ENDING PROJECT LOCATIONS AND SHALL BE TAPERED AS SHOWN OR AS DIRECTED BY THE ENGINEER.

② VERIFY LOCATIONS WITH THE ENGINEER PRIOR TO BEGINNING PAVEMENT REPAIR.

COORDINATE FLEXIBLE PAVEMENT STRUCTURE REPAIR WITH THE ENGINEER PRIOR TO CONSTRUCTING THE WIDENING.



Bryson Lawrence, P.E.

03/29/2024

Texas Department of Transportation

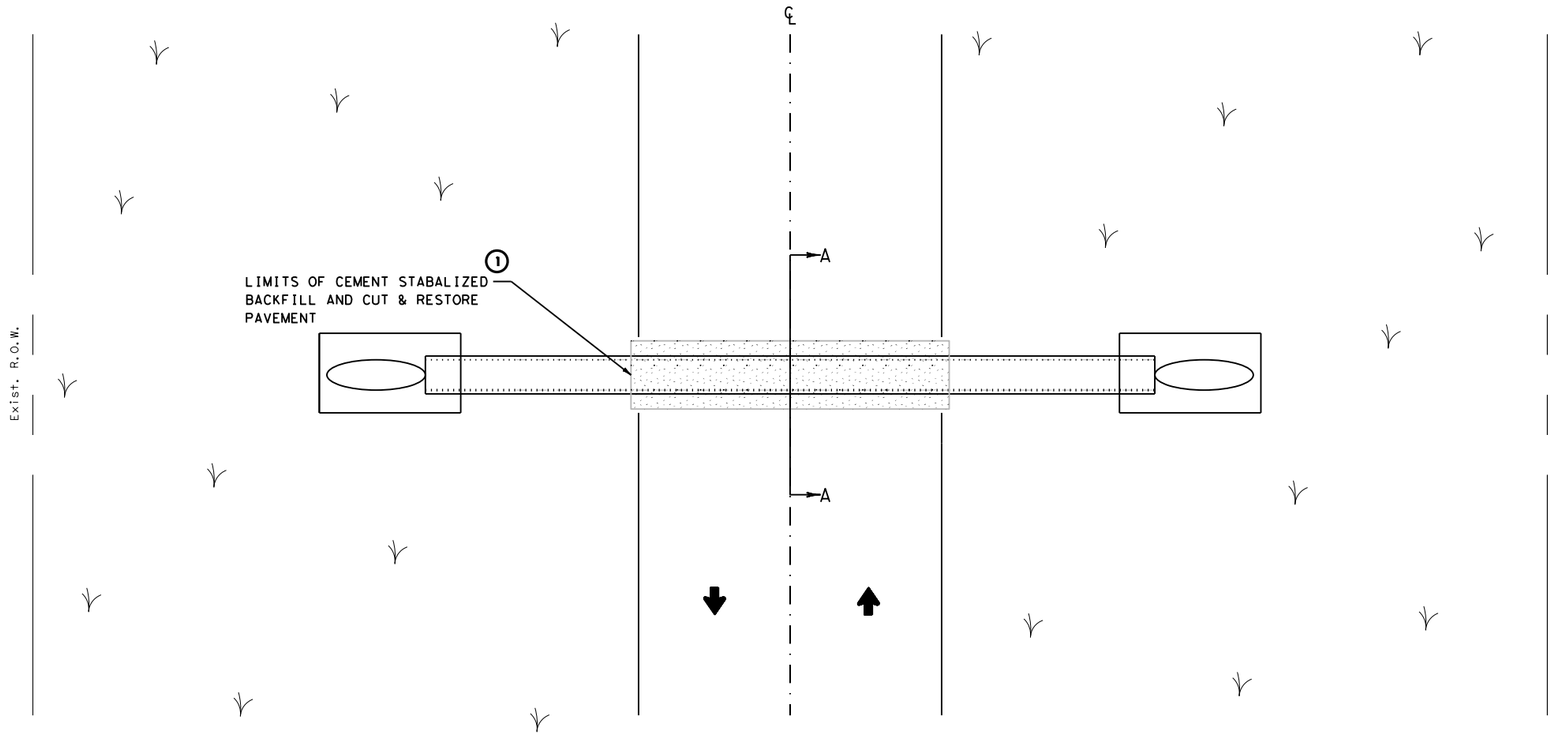
FM 422

MISCELLANEOUS DETAILS

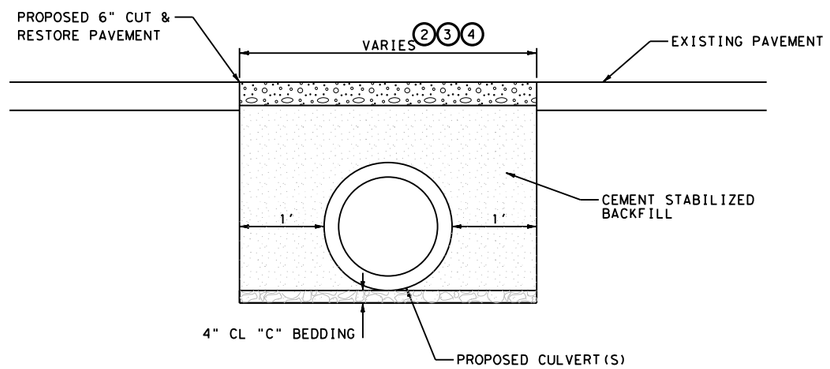
 SHEET 1 OF 1

CONT	SECT	JOB	HIGHWAY
0814	01	036	FM 422
DIST	COUNTY		SHEET NO.
WFS.	BAYLOR		62

DATE: 3/29/2024 1:17:34 PM
FILE: pw://txdot.projectwiseonline.com:TXDOT2/Documents/03 - WFS/Design Projects/0814010361/4 - Design/Plan Set/3. Roadway/MISCELLANEOUS DETAILS.dgn



PLAN VIEW



SECTION A-A

NOTES:

1. LIMITS OF CEMENT STABILIZED BACKFILL AND CUT & RESTORE PAVEMENT SHALL EXTEND 6" BEYOND EXISTING EDGE OF PAVEMENT ON EACH SIDE OF THE ROADWAY.
2. PLACE CEMENT STABILIZED BACKFILL AT DEPTH TO ALLOW A MINIMUM DEPTH OF 6" OF HOTMIX PLACEMENT.
3. USE TY B HOTMIX UNLESS OTHERWISE APPROVED BY ENGINEER.
4. USE APPROVED TACK COAT FOR VERTICAL CUTS IN PAVEMENTS, SUBSIDIARY TO ITEM 400

WORK ON BOTH SIDES OF THE ROAD AT THE SAME TIME WILL NOT BE ALLOWED. COMPLETE CULVERT REPLACEMENT AND CUT & RESTORE PAVEMENT SO THAT ROADWAY WILL BE OPENED TO TWO LANES OF TRAFFIC BEFORE THE END OF THE WORKDAY.

CUT & RESTORE DETAILS

NOT TO SCALE

STATE OF TEXAS
BRYSON P. LAWRENCE
129839
LICENSED PROFESSIONAL ENGINEER

Bryson Lawrence, P.E.

04/04/2024

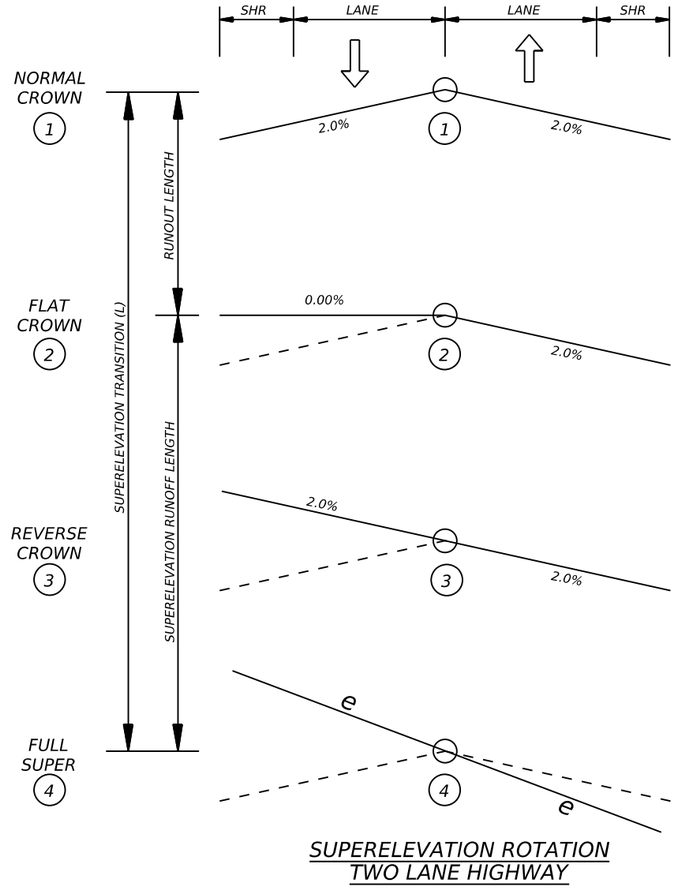
FM 422
CUT & RESTORE DETAILS

Texas Department of Transportation
SHEET 1 OF 1

CONT	SECT	JOB	HIGHWAY
0814	01	036	FM 422
DIST	COUNTY		SHEET NO.
WFS.	BAYLOR		63

DATE: 4/3/2024 5:18:25 PM
FILE: pw://txdot.projectwiseonline.com:TXDOT2/Documents/03 - WFS/Design Projects/0814010364 - Design/Plan Set/5. Drainage/CUT & RESTORE DETAILS.dgn

DN: | CK: | DW: | CK:



SUPERELEVATION ROTATION
TWO LANE HIGHWAY

NOTE:
FOR GRAPHICAL REPRESENTATION ONLY
SEE TABLE FOR ACTUAL PLAN SLOPES

e = PROPOSED SUPERELEVATION RATE

THE CROSS SLOPE BREAK BETWEEN THE SHOULDER AND TRAVELED LANE SHOULD BE LIMITED TO AN ALGEBRAIC DIFFERENCE OF 6%.

FM 422 SUPERELEVATION TABLE

PC STATION	PT STATION	CURVE	RADIUS	DESIGN SPEED	PROPOSED SUPERELEVATION RATE (%)	CALCULATED TRANSITION LENGTH	BEGIN TRANSITION LEFT SHOULDER	BEGIN TRANSITION LEFT LANE	BEGIN TRANSITION RIGHT LANE	BEGIN TRANSITION RIGHT SHOULDER	BEGIN FULL SUPER	END FULL SUPER	END TRANSITION LEFT SHOULDER	END TRANSITION LEFT LANE	END TRANSITION RIGHT LANE	END TRANSITION RIGHT SHOULDER
		LT OR RT	(FT)			(FT)										
77+35.39	80+93.75	LT	2005.57	45	3.8	118	77+22.00	77+22.00	76+41.00	76+41.00	77+59.00	80+70.00	81+07.00	81+07.00	81+88.00	81+88.00
87+47.41	91+48.89	RT	2617.34	45	3.2	106	86+63.00	86+63.00	87+44.00	87+44.00	87+69.00	91+28.00	92+34.00	92+34.00	91+52.00	91+52.00
132+06.07	13,629.13	RT	1587.92	55	5.40	173.00	130+85.00	130+85.00	131+78.00	131+78.00	132+58.00	135+77.00	137+50.00	137+50.00	136+56.00	136+56.00
144+79.76	14,891.06	LT	1528.13	55	5.60	178.00	144+49.00	144+49.00	143+55.00	143+55.00	145+33.00	148+38.00	149+22.00	149+22.00	150+16.00	150+16.00
345+84.71	35,208.77	RT	1570.22	60	6.00	196.00	344+48.00	344+48.00	345+46.00	345+46.00	346+44.00	351+50.00	353+46.00	353+46.00	352+48.00	352+48.00
358+60.91	36,310.98	LT	1460.54	60	6.00	196.00	358+22.00	358+22.00	357+24.00	357+24.00	359+20.00	362+52.00	363+50.00	363+50.00	364+48.00	364+48.00

LEVEL UP QUANTITIES

CURVE	BEGIN STA	END STA	LEVEL UP (TONS)	ADD WEDGE (TONS)	TOTAL
1	75+00.00	83+00.00	169.00	18.00	187.00
2	85+00.00	94+00.00	8	0	8
3	128+00.00	139+00.00	112	11	123
4	143+00.00	152+00.00	155	11	166
5	343+00.00	355+00.00	196	22	218
6	356+00.00	364+70.45	76	5	81
		TOTALS	716	67	783

NOTES:

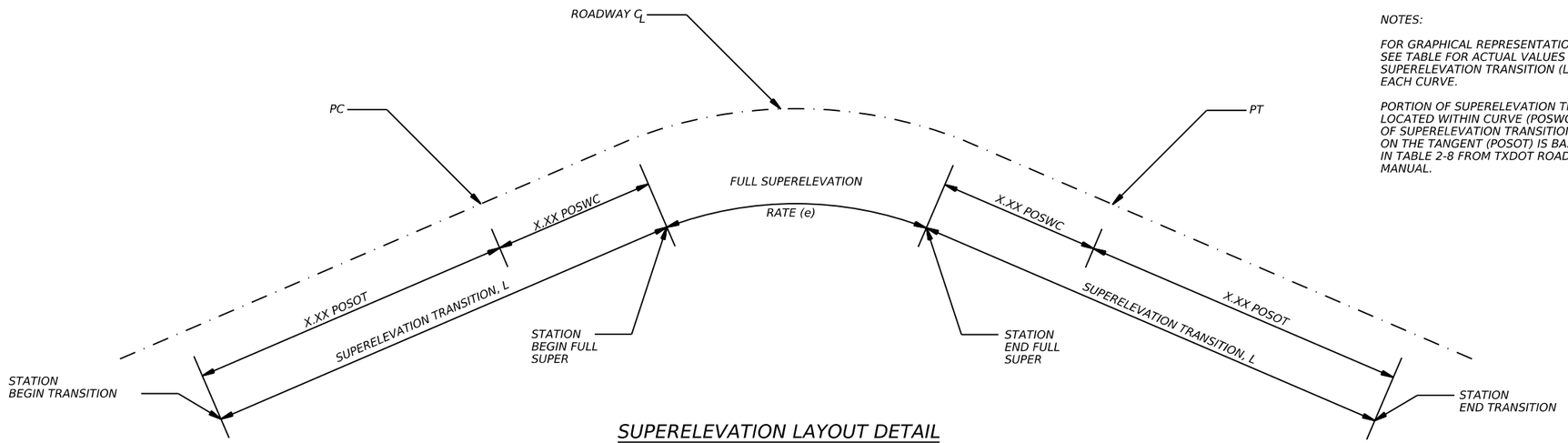
REFER TO ROADWAY DESIGN MANUAL (RDM) OR AASHTO A POLICY ON GEOMETRIC DESIGN OF HIGHWAYS AND STREETS FOR DETAILS NOT SHOWN.

Emax IS BASED ON A VALUE OF 6 PERCENT.

MULTILANE ADJUSTMENT FACTOR USED FOR MORE THAN ONE LANE BEING ROTATED. SEE TABLE 2-7 RDM.

PORTION OF SUPERELEVATION TRANSITION LOCATED ON THE TANGENT IS BASED ON TABLE 2-8 OF RDM.

AXIS OF ROTATION IS LOCATED AT CENTERLINE OF ROADWAY.



SUPERELEVATION LAYOUT DETAIL

NOTES:

FOR GRAPHICAL REPRESENTATION ONLY
SEE TABLE FOR ACTUAL VALUES OF SUPERELEVATION TRANSITION (L) FOR EACH CURVE.

PORTION OF SUPERELEVATION TRANSITION LOCATED WITHIN CURVE (POSWC) AND PORTION OF SUPERELEVATION TRANSITION LOCATED ON THE TANGENT (POSOT) IS BASED ON DATA IN TABLE 2-8 FROM TXDOT ROADWAY DESIGN MANUAL.

NOT TO SCALE

STATE OF TEXAS
BRYSON P. LAWRENCE
129839
LICENSED
PROFESSIONAL ENGINEER

Bryson Lawrence, P.E.

03/29/2024

Texas Department of Transportation

FM 422

SUPERELEVATION DETAILS

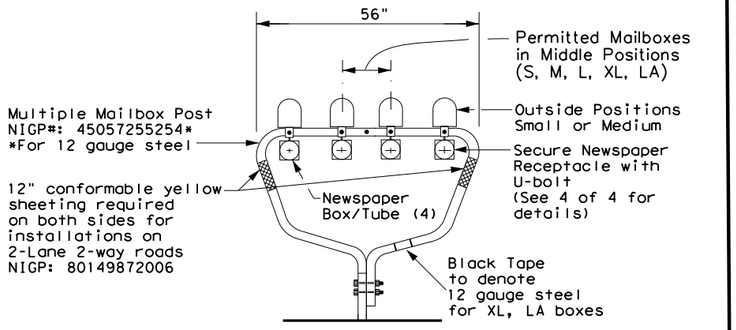
SHEET 1 OF 1

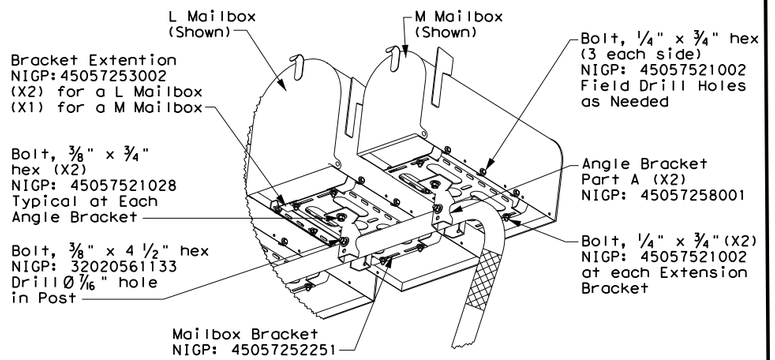
CONT	SECT	JOB	HIGHWAY
0814	01	036	FM 422
DIST	COUNTY		SHEET NO.
WFS.	BAYLOR		64

DATE: 3/29/2024 1:18:00 PM
FILE: pw://txdot.projectwiseonline.com:TXDOT2/Documents/03 - WFS/Design Projects/08140103614 - Design/Plan Set/3. Roadway/SUPERELEVATION DETAILS

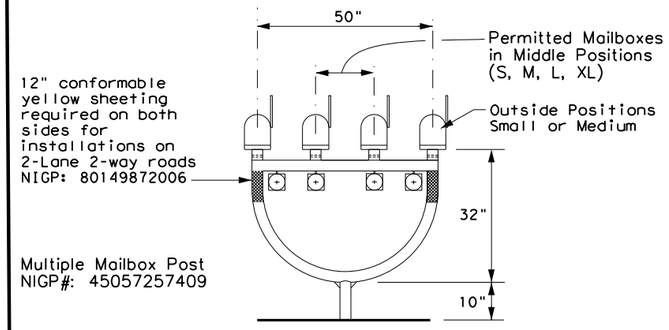
DATE:
FILE:

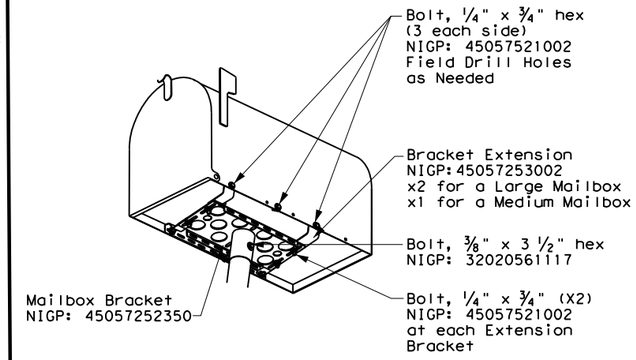
TYPE 1 - MULTIPLE





TYPE 4 - MULTIPLE





MAILBOX SIZES

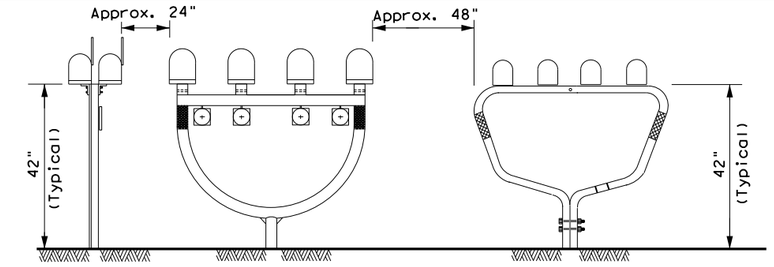
MAILBOX SIZE	TYPICAL DIMENSIONS			MAX **
	LENGTH	WIDTH	HEIGHT	WEIGHT
SMALL	19 1/2"	6"	7"	6 LBS
MEDIUM	22 1/2" *	8" *	11 1/2" *	8 LBS
LARGE	23 1/2"	11 1/2"	13 1/2"	11 LBS
EXTRA LARGE	18"	14"	12"	13 LBS
LOCKABLE	18"	11 1/2"	15"	23 LBS

* 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.

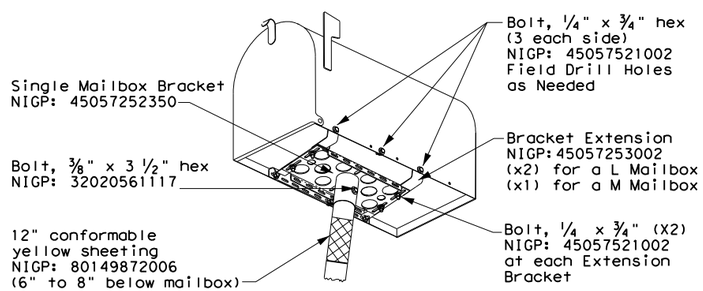
TYPICAL INSTALLATION MEASUREMENTS

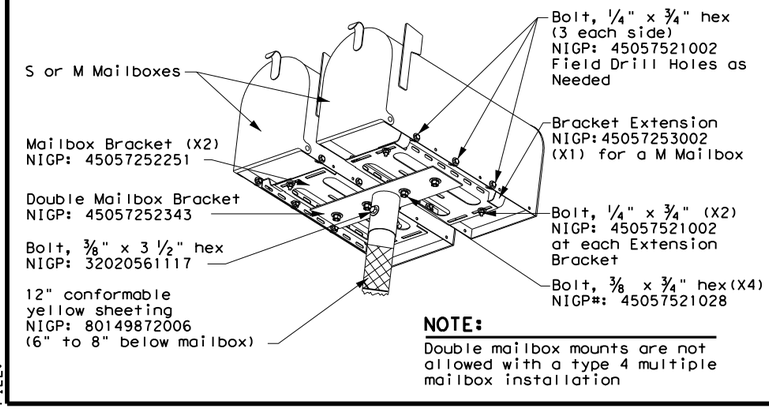


NOTE:

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

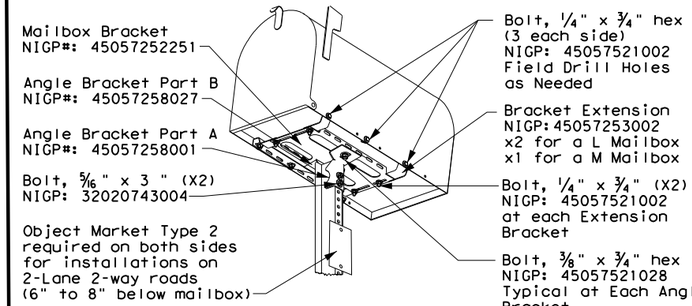


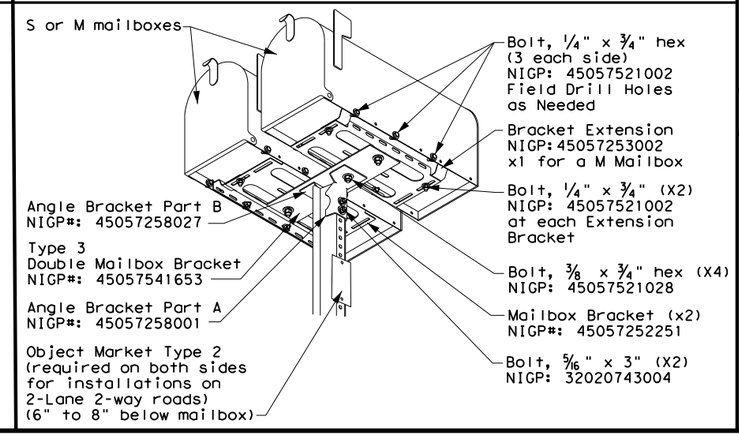


NOTE:

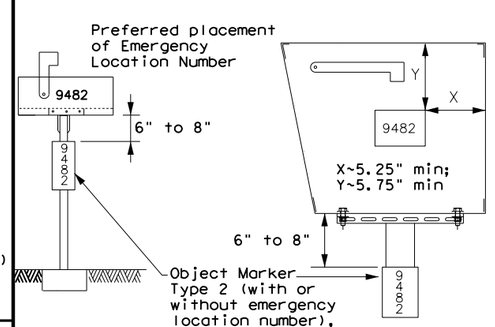
Double mailbox mounts are not allowed with a type 4 multiple mailbox installation

TYPE 3 - SINGLE/DOUBLE





PLACEMENT OF EMERGENCY LOCATION NUMBER

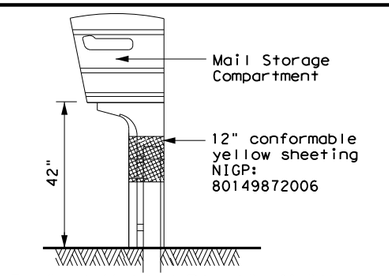


NOTES:

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

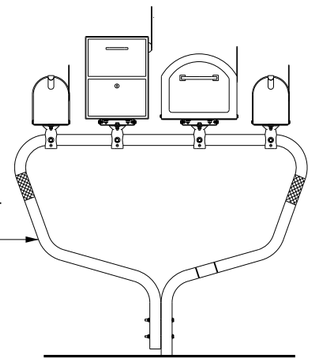
MAILBOX MOUNTING AND ASSEMBLY

MB(1)-21

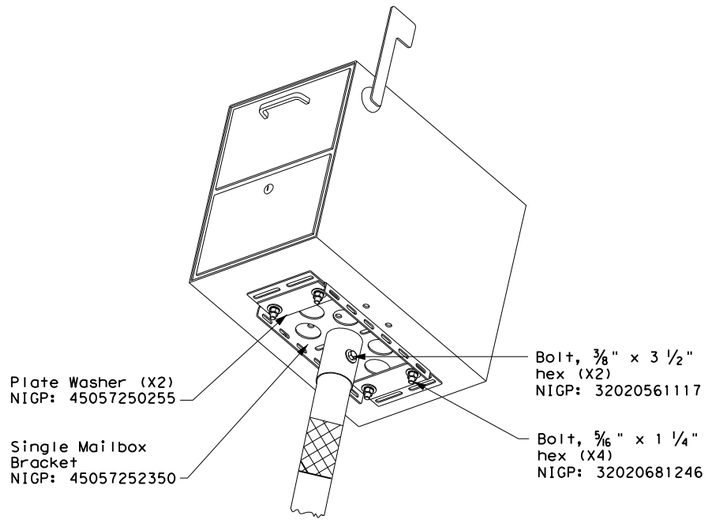
FILE: MB-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT March 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS 2/2005 11/2009 4/2015 6/2005 1/2011 11/2006 7/2014	0814	01	036	FM 422
	DIST	COUNTY		SHEET NO.
	WFS.	BAYLOR		65

DATE:
FILE:

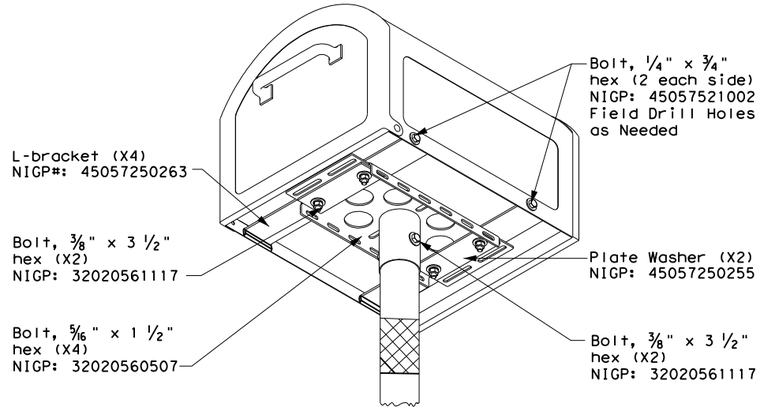
TYPE 1- MULTI LOCKABLE AND XL MAILBOX



TYPE 2/4 - SINGLE LOCKABLE MAILBOX

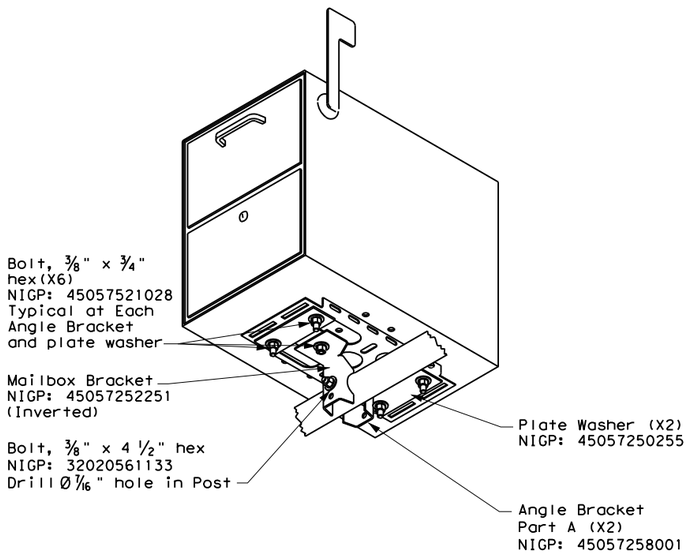


TYPE 2/4 - SINGLE XL MAILBOX

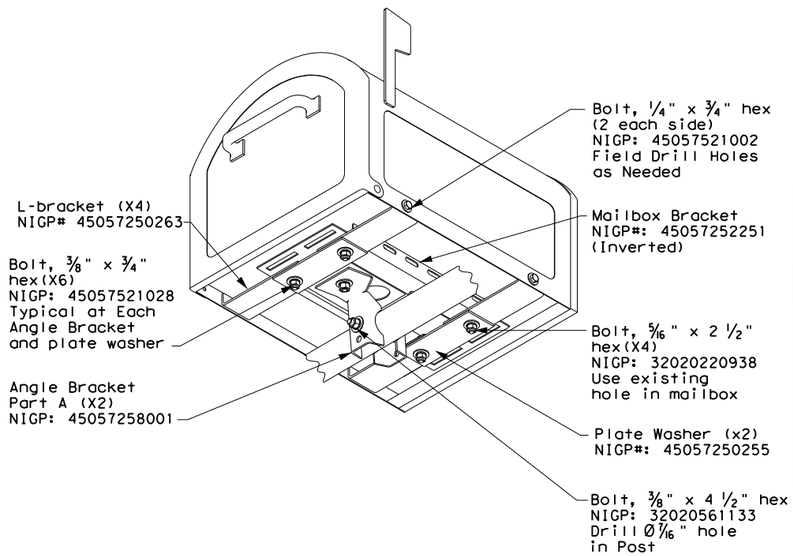


NOTE:
Follow same configuration when mounting an XL mailbox on a Type 4 multi post.

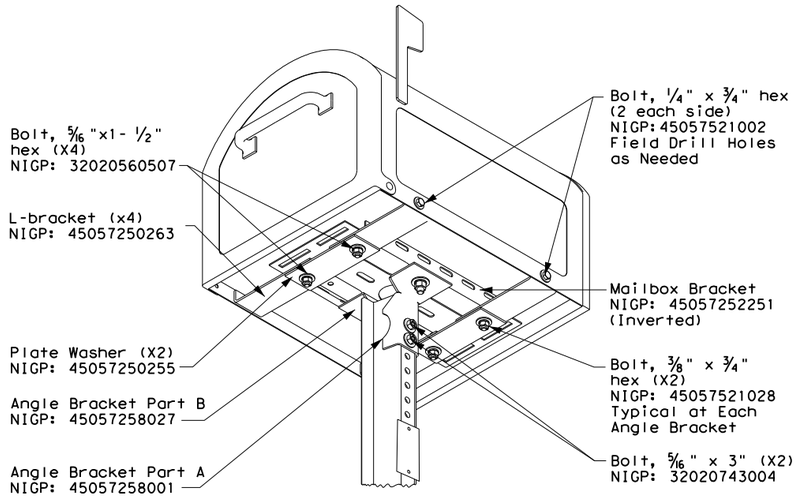
TYPE 1 MULTI – LOCKABLE ARCHITECTURAL (LA)



TYPE 1 MULTI – XL MAILBOX



TYPE 3 - XL MAILBOX MOUNTING



Texas Department of Transportation

Maintenance Division Standard

XL AND LOCKABLE ARCHITECTURAL MAILBOX ASSEMBLY

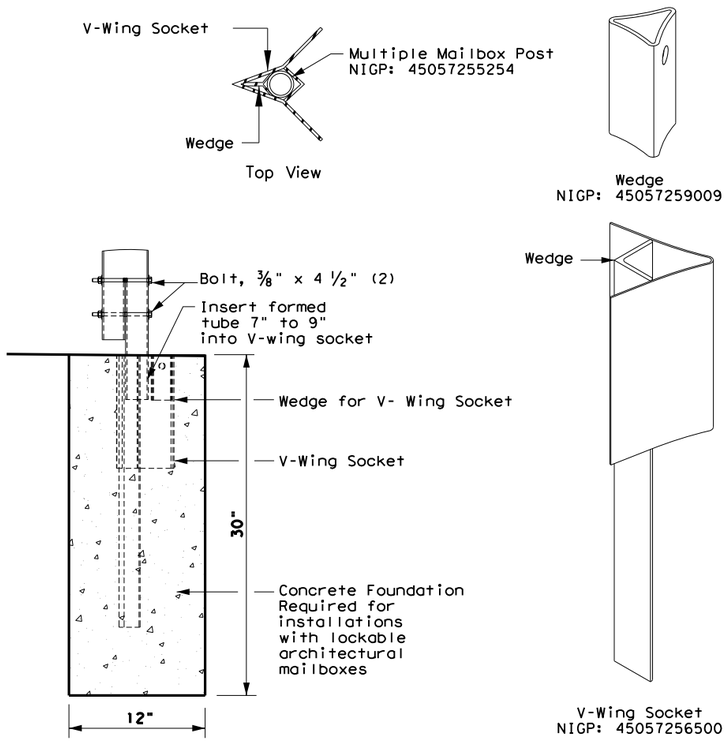
MB(2)-21

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	0814	01	036	FM 422
	DIST	COUNTY		SHEET NO.
	WFS.	BAYLOR		66

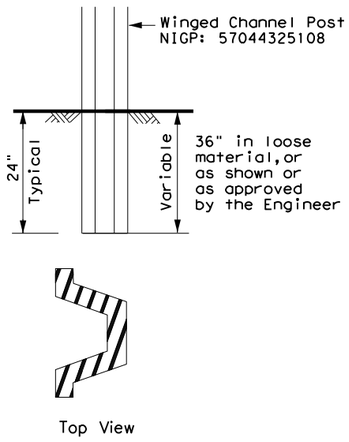
DATE:
FILE:

TYPE 1 - SUPPORT/FOUNDATION

Thin Wall Tube w/ V-LOC Anchorage



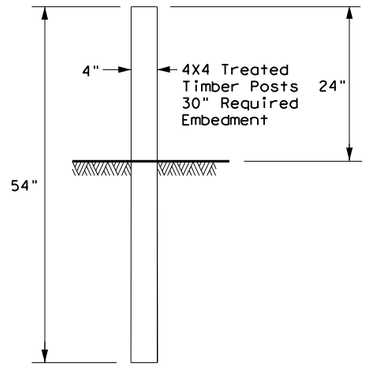
TYPE 3 - SUPPORT/FOUNDATION



NOTES:

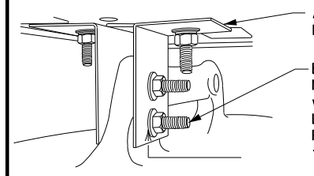
1. Attach Object Marker (OM) facing direction of traffic.
2. OM will also be required on opposite side if installed on a 2-Lane, 2-Way roadway.

TYPE 5 - SUPPORT/FOUNDATION



Molded Plastic Mailboxes shall be installed on 4"x4" treated timber posts only. The use of steel pipe or structural tubing in place of timber post is prohibited.

TYPE 6 - TEMPORARY MAILBOX SUPPORT



Plastic Drum NIGP: 55093383655
Rubber Collar NIGP: 55093387102

NOTES:

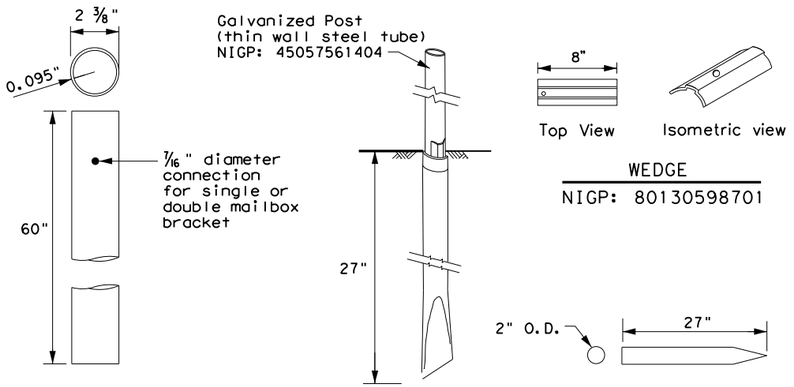
1. Place on approved plastic drum as shown in the Compliant Work Zone Traffic Control Devices (CWZTCD).
2. Existing attachment hardware shall be used unless damaged. Damaged hardware shall be replaced.

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

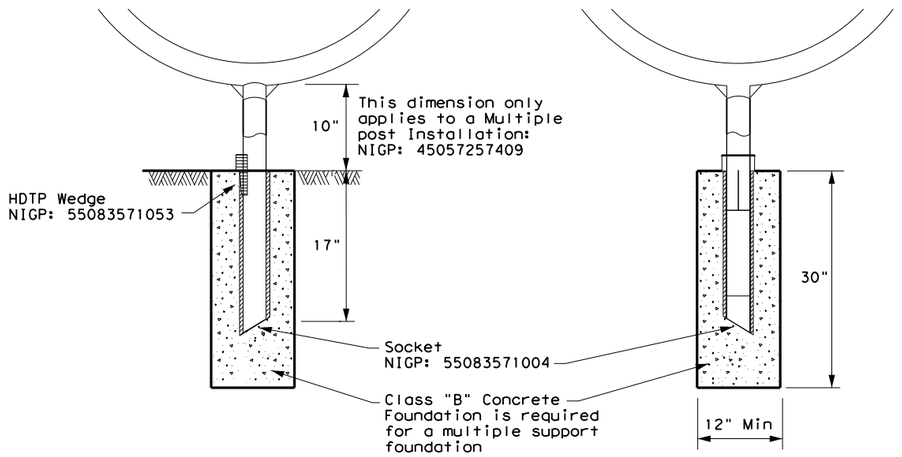


MAILBOX POST

WEDGE ANCHOR
NIGP: 80130238407

TYPE 4 - SUPPORT/FOUNDATION

Whitecoated steel post NIGP: 45057561107
Multiple post NIGP: 45057257409
Recycled Rubber post (RR) NIGP: 45057561057



SHEET 3 OF 4

Texas Department of Transportation

Maintenance Division Standard

MAILBOX SUPPORT AND FOUNDATION

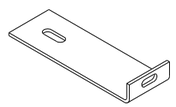
MB(3)-21

FILE: MB-21.dgn	DN:	CK:	DW:	CK:
© TxDOT March 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS 2/2005 11/2009 4/2015 6/2005 1/2011 11/2006 7/2014	0814	01	036	FM 422
	DIST	COUNTY		SHEET NO.
	WFS.	BAYLOR		67

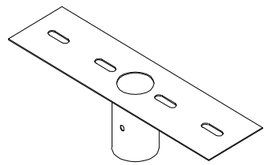
DISCLAIMER:
The use of this standard is governed by the "Texas Engineering Practice Act". No warranty of any kind is made by TxDOT for any purpose whatsoever. TxDOT assumes no responsibility for the conversion of this standard to other formats or for incorrect results or damages resulting from its use.

DATE:
FILE:

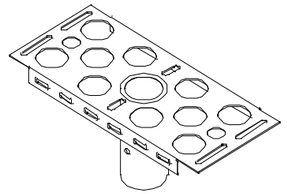
TYPE	TYPE 1	TYPE 2	TYPE 3	TYPE 4			TYPE 5	TYPE 6
Configuration	Multiple	Single or Double	Single or Double	Single	Double	Multiple	Single	Single
Mailbox Size NIGP #	Outside Position: S or M Inside Position: S, M, L, XL, or LA	Single: S, M, L, XL, or LA Double: SS, SM, MM	Single: S, M, L, or XL Double: 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



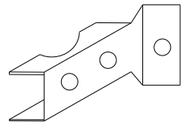
NIGP: 45057250263
L-Bracket x4 for
XL sized mailboxes



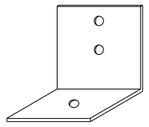
NIGP: 45057252343
Double Mailbox Bracket
For Type 2 and Type 4
double mount



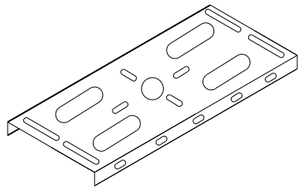
NIGP: 45057252350
Single Mailbox Bracket
For Type 2 single and for
Type 4 single and multi mount



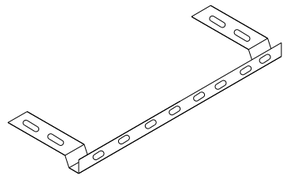
NIGP: 45057258001
Part "A" Angle Bracket
For Type 1 multi (2 per mailbox)
and Type 3 single and double



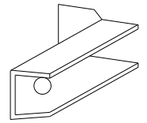
NIGP: 45057251055
Type 6 Angle Bracket
(2 per mailbox)



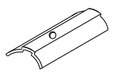
NIGP: 45057252251
Mailbox Bracket
For Type 1 multi and
any double mount (use 2)



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



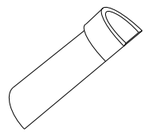
NIGP: 45057258027
Part "B" Angle Bracket
For Type 3 single
and double



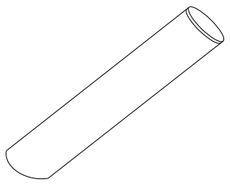
NIGP: 80130598701
Wedge for Type 2

NIGP: 45057250255
Plate Washer for Architecural
and XL Mailboxes

NIGP: 45057541653
Type 3 double mailbox bracket

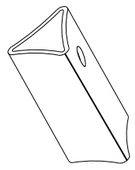


NIGP: 55083571053
Type 4 Mailbox Wedge

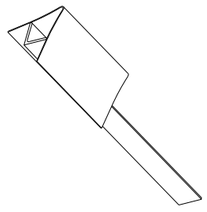


NIGP: 55083571004
Type 4 Mailbox Socket

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

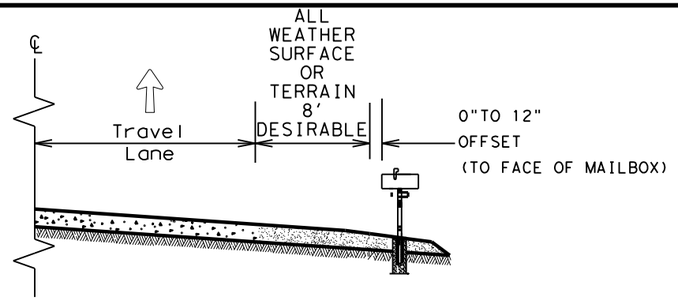
Type of Foundation
- Ty 1 = V-Loc
- Ty 2 = Wedge Anchor Steel System
- Ty 3 = Winged Channel post
- Ty 4 = Wedge Anchor Plastic System
- Ty 5 = 4 X 4 Post

Texas Department of Transportation — Maintenance Division Standard

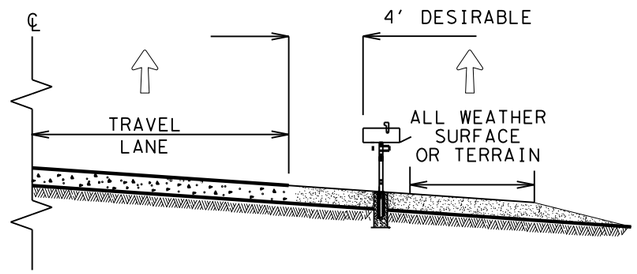
NIGP PARTS LIST AND COMPATIBILITY

MB(4)-21

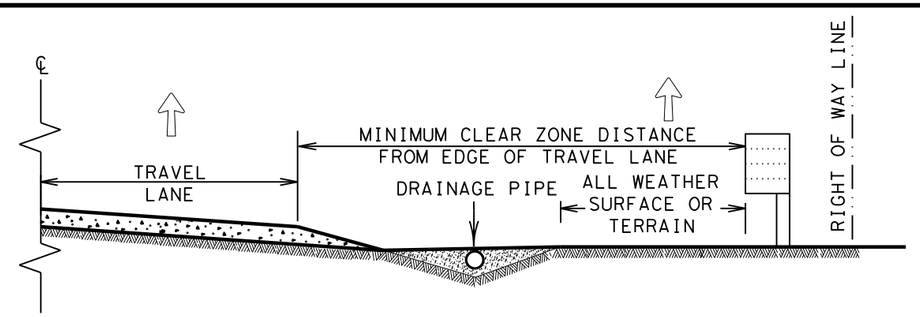
FILE: MB-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT March 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS 2/2005 11/2009 4/2015 6/2005 1/2011 11/2006 7/2014	0814	01	036	FM 422
	DIST	COUNTY		SHEET NO.
	WFS.	BAYLOR		68



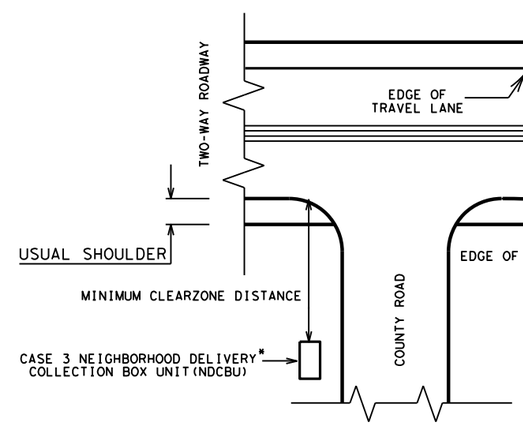
CASE 1. OFF TRAVEL WAY DELIVERY

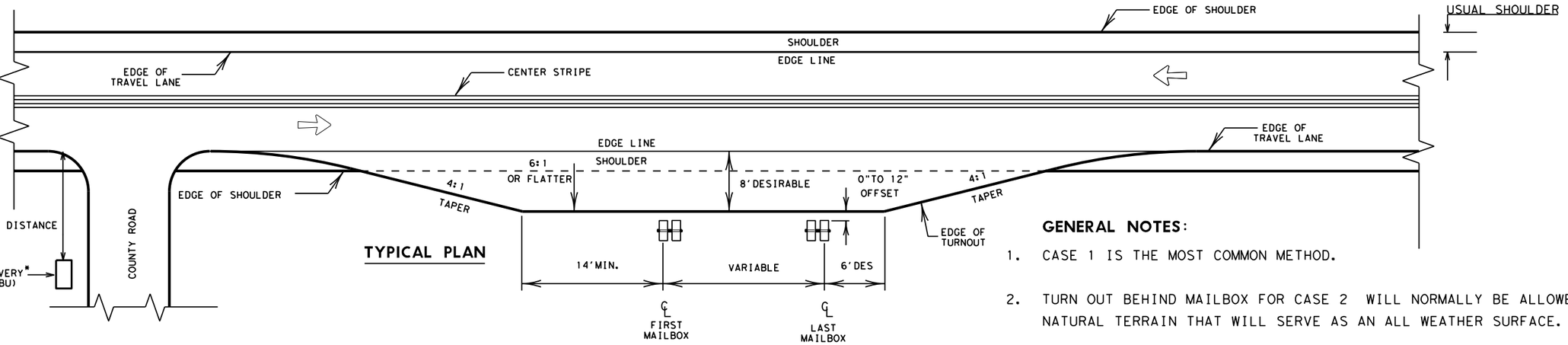


CASE 2. BACK SIDE DELIVERY

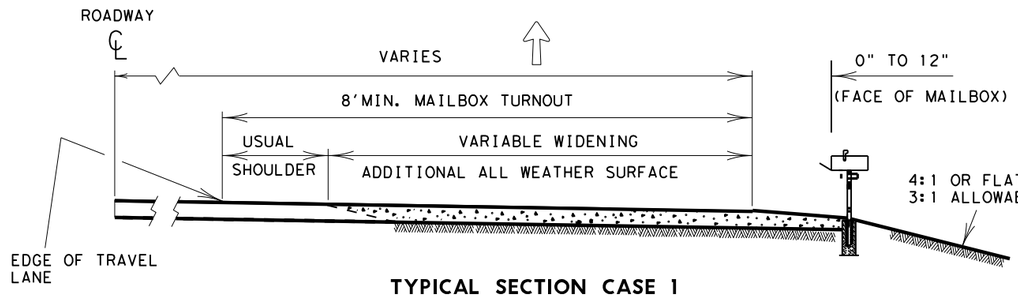


CASE 3. DELIVERY NEAR RIGHT OF WAY LINE





TYPICAL PLAN



TYPICAL SECTION CASE 1

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.

*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

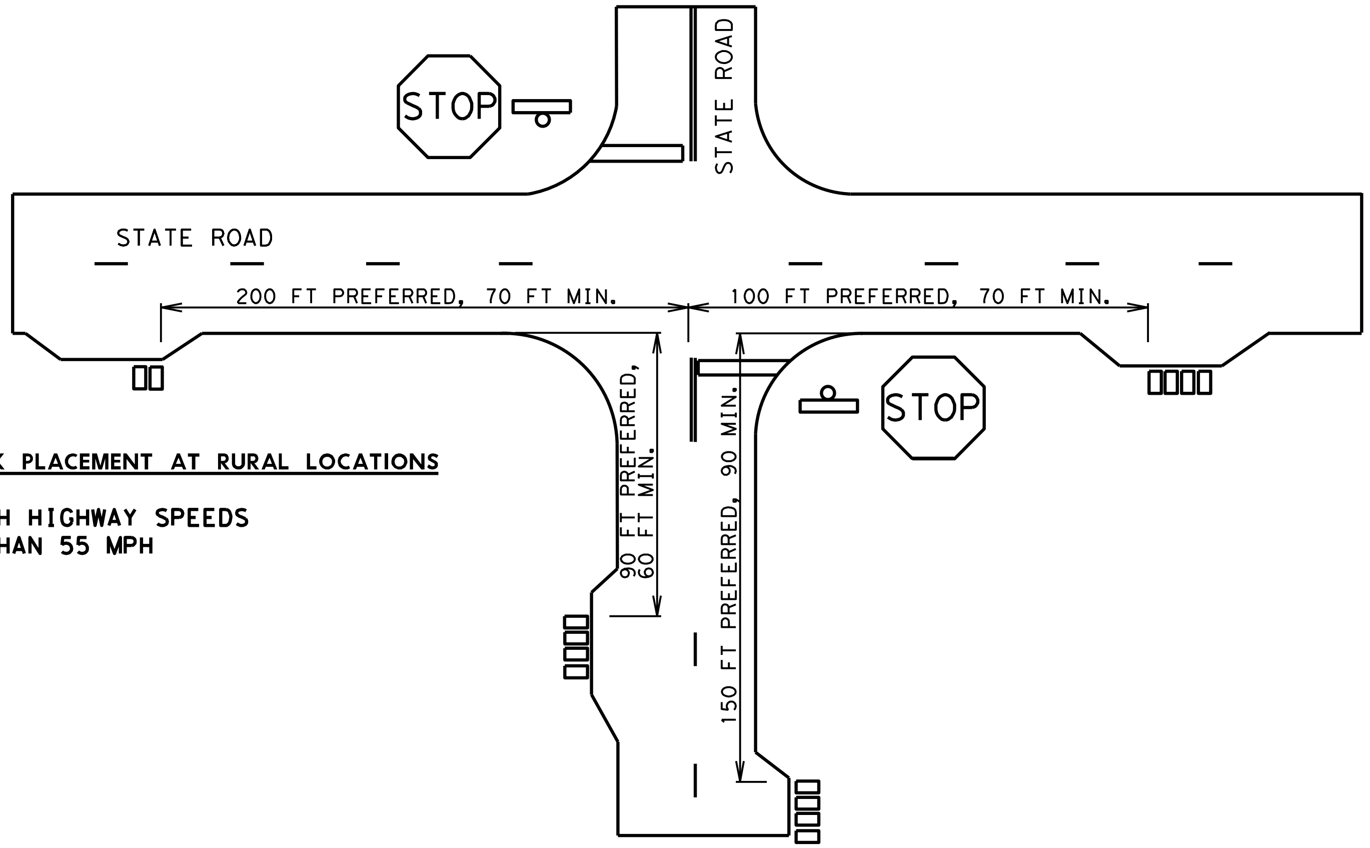
MAILBOX SIDE ROAD PLACEMENT AND TURNOUTS

MBP(1)-22

FILE: MBP-22.DGN	DN: VS	CK:	DW: VS	CK:
© TxDOT OCTOBER 2022	CONT	SECT	JOB	HIGHWAY
REVISIONS 12/2012 5/2014	0814	01	036	FM 422
	DIST	COUNTY		SHEET NO.
	WFS.	BAYLOR		69

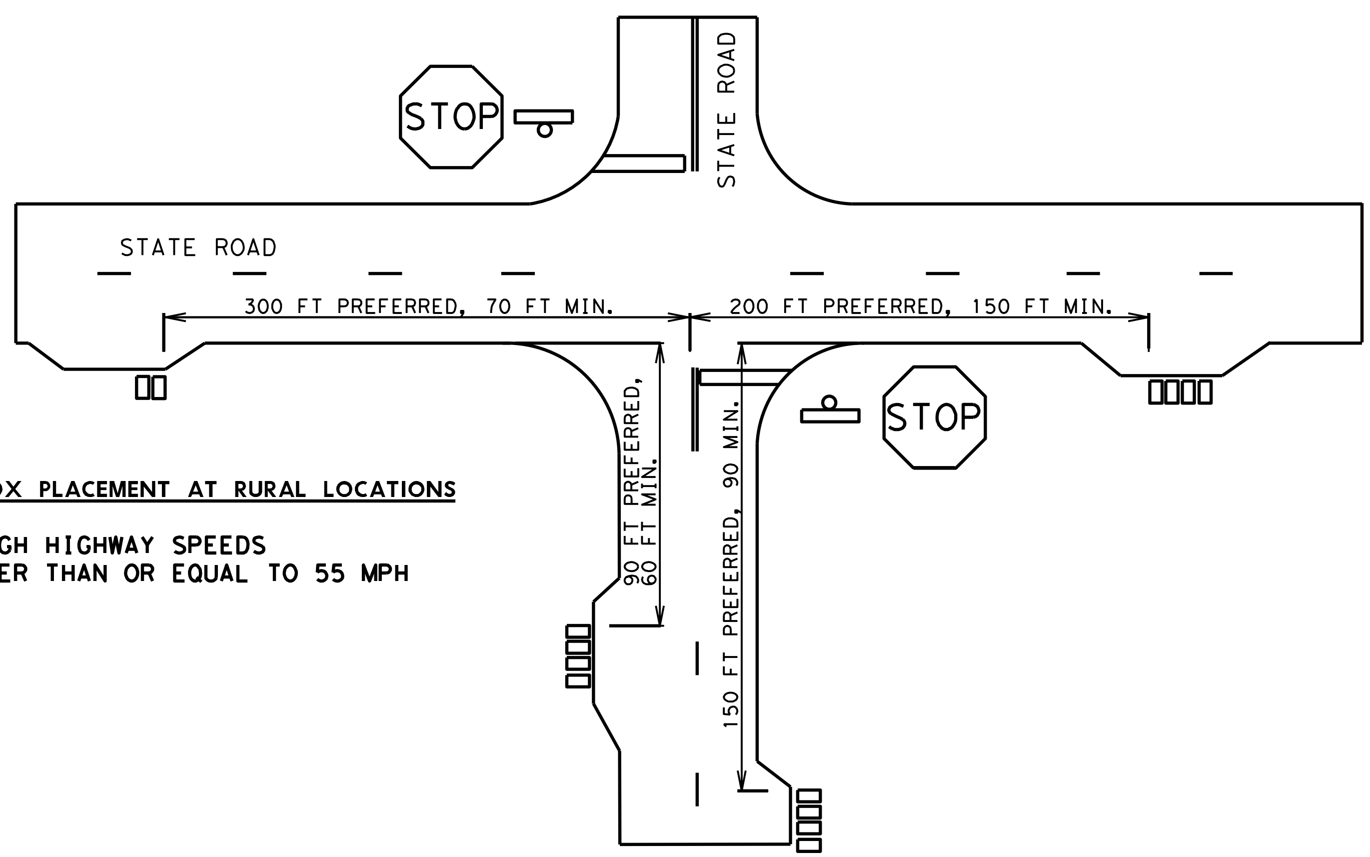
DATE: 3/29/2024 1:18:29 PM
FILE: pw://txdot.projectwiseonline.com:TXDOT2/Documents/03 - WFS/Design Projects/MBP1922.dgn

DATE: 3/29/2024 1:18:29 PM
FILE: pw://txdot.projectwiseonline.com:TXDOT2/Documents/03 - WFS/Design Projects/[illegible]



MAILBOX PLACEMENT AT RURAL LOCATIONS

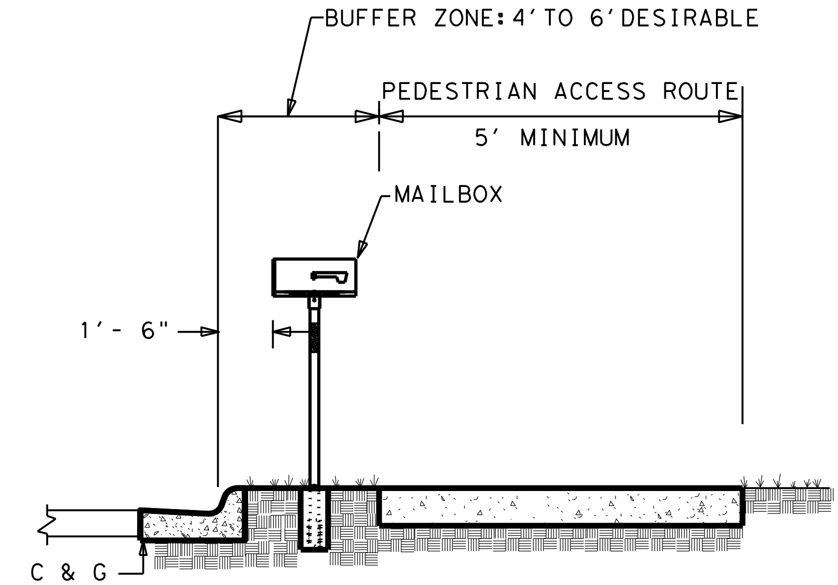
THROUGH HIGHWAY SPEEDS
LESS THAN 55 MPH



MAILBOX PLACEMENT AT RURAL LOCATIONS

THROUGH HIGHWAY SPEEDS
GREATER THAN OR EQUAL TO 55 MPH

CURB AND GUTTER MAILBOX INSTALLATION



NOTES:

1. A NON-TRAVERSABLE SURFACE MUST BE INSTALLED NEAR THE MAILBOX (NATURAL VEGETATION OR OTHER) IN THE BUFFER ZONE. ALTERNATIVELY, A BASE WITH A MINIMUM HEIGHT OF 2.5 INCHES MAY BE INSTALLED SO THAT THE EDGE OF THE MAILBOX DOES NOT EXTEND OUT MORE THAN 4 INCHES HORIZONTALLY BEYOND THE BASE.

2. THE SIDEWALK WIDTH MAY BE REDUCED TO 4 FOOT FOR SHORT DISTANCES AROUND THE MAILBOX IF NEEDED.

3. MAINTAIN A MINIMUM OF 5 FEET BETWEEN OBSTRUCTIONS IN THE PEDESTRIAN ACCESS ROUTE.

Texas Department of Transportation — Maintenance Division Standard

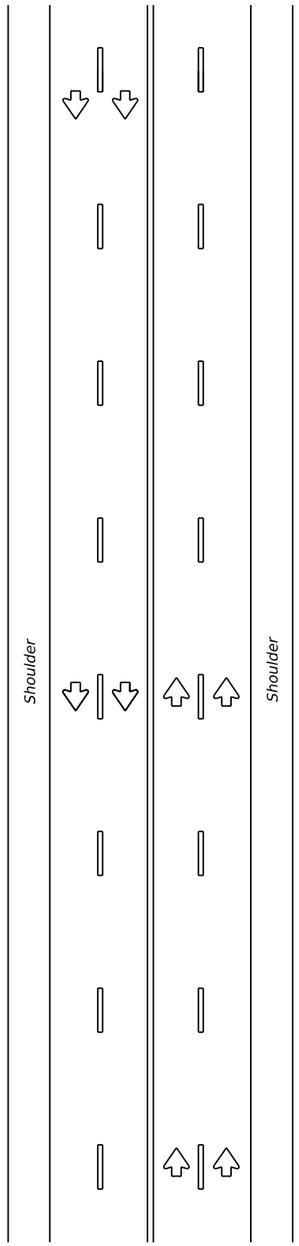
MAILBOX PLACEMENT
CURBS & INTERSECTIONS

MBP(2)-22

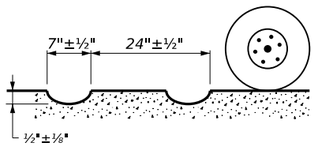
FILE: MBP-22.DGN	DN: VS		CK:	DW: VS		CK:
© TxDOT OCTOBER 2022	CONT	SECT	JOB		HIGHWAY	
REVISIONS	0814	01	036		FM 422	
12/2012 5/2014	DIST		COUNTY			SHEET NO.
	WFS.		BAYLOR			70

DATE: 5/2/2024 4:13:13 PM
FILE: pw://txdot.projectwiseonline.com:TXDOT2/Documents/03 - WFS/Design Projects/0814010364 - Design Plan Set/3. Roadway/RS(3)-23.dgn

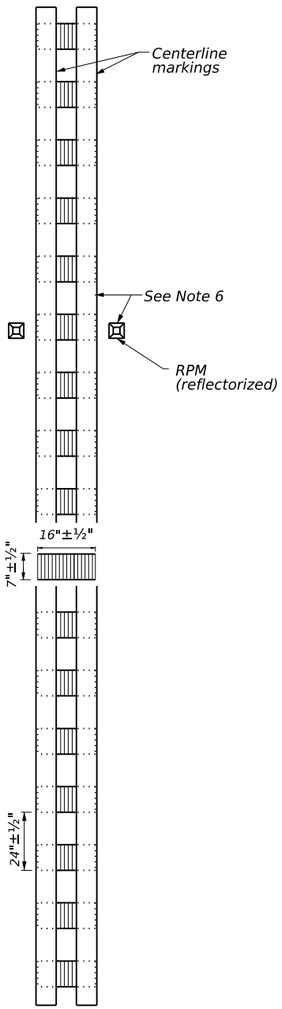
CENTERLINE RUMBLE STRIPS



MULTILANE UNDIVIDED HIGHWAY WITH SHOULDER

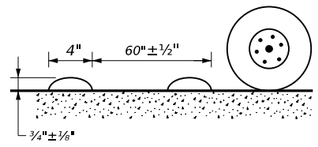


PROFILE VIEW

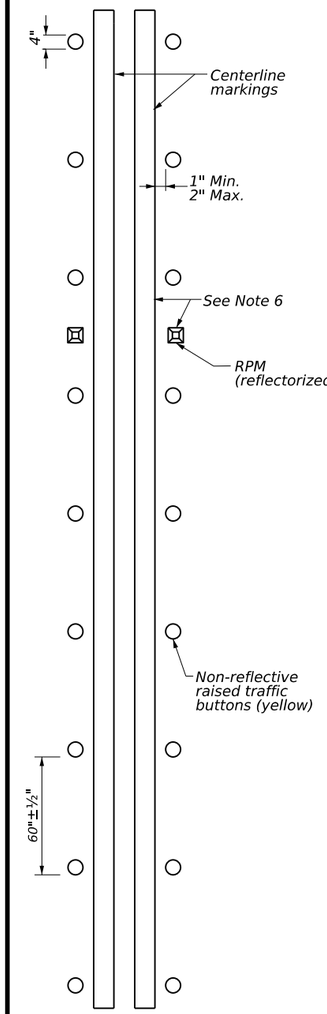


PLAN VIEW
OPTION 1

MILLED CENTERLINE RUMBLE STRIPS

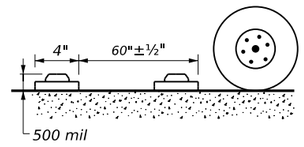


PROFILE VIEW

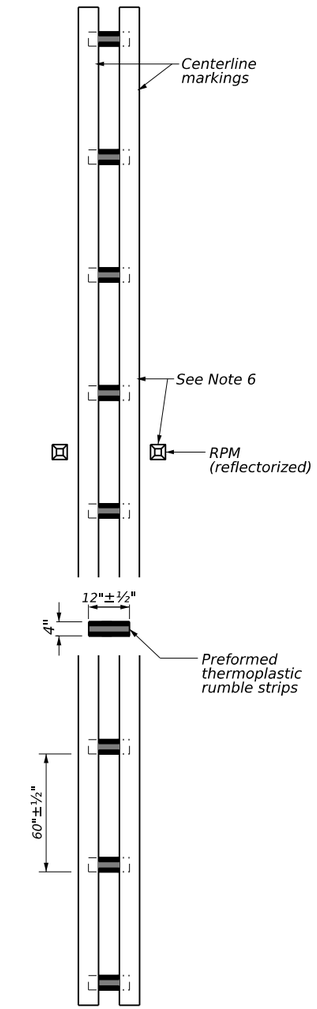


PLAN VIEW
OPTION 2

RAISED CENTERLINE RUMBLE STRIPS

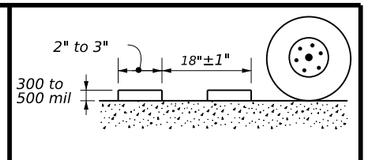


PROFILE VIEW

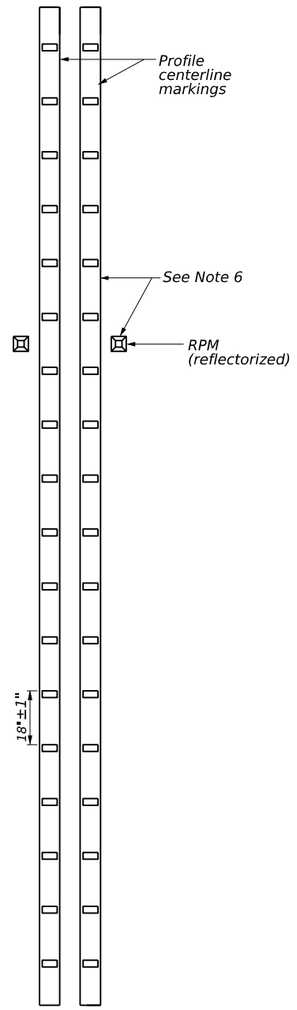


PLAN VIEW
OPTION 3

PREFORMED THERMOPLASTIC RUMBLE STRIPS



PROFILE VIEW



PLAN VIEW
OPTION 4

PROFILE CENTERLINE MARKINGS

GENERAL NOTES

1. This standard sheet provides guidelines for installing centerline rumble strips on multilane undivided highways.
2. Centerline and edge line rumble strips or profile markings shall not be placedon 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 beused if approved by the Traffic Safety Division.
5. Breaks in milled centerline rumble strips shall occur at least 50 feet and nomore than 150 feet in advance of bridges, railroad crossing, intersections ordriveways with high usage of large trucks.
6. Use standard sheet PM(2) for positioning, dimensioning, and spacing of all reflective raised pavement markers, pavement markings and profile markings.
7. Consideration should be given to noise levels when centerline rumble strips are to be installed near residential areas, schools, churches, etc. A 3/8 inch deep (minimum) milled rumble strip may be considered in these areas.
8. Pavement markings must be applied over milled centerline rumble strips for normal centerline spacing. For wider medians, specify in the plans the exact placement of the rumble strips. Place the rumble strips under each centerline marking or centered in the middle of the median.

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 color of the button should be yellow for a continuous no passing roadway. The button will be paid for under Item 672, "Raised Pavement Markers." Non-reflective traffic buttons must meet the requirements of DMS-4300.
11. Consideration shall be given to bicyclists. See RS(6).

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

12. See standard sheet RS(2).

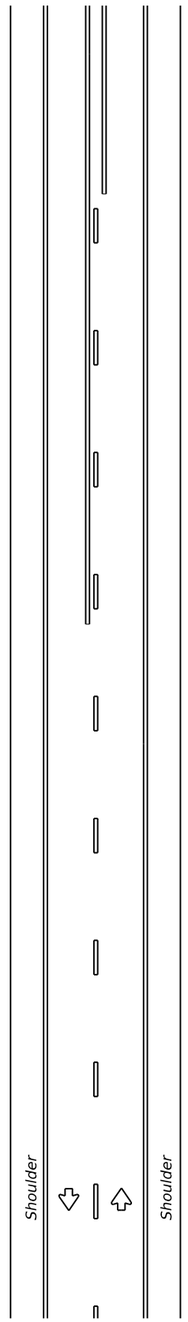
Texas Department of Transportation

Traffic Safety Division Standard

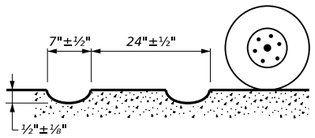
CENTERLINE RUMBLE STRIPS ON MULTILANE UNDIVIDED HIGHWAYS RS(3)-23

FILE: rs(3)-23.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT January 2023	CONT	SECT	JOB	HIGHWAY
REVISIONS	0814	01	036	FM 422
10-13 1-23	DIST	COUNTY		SHEET NO.
	WFS.	BAYLOR		71

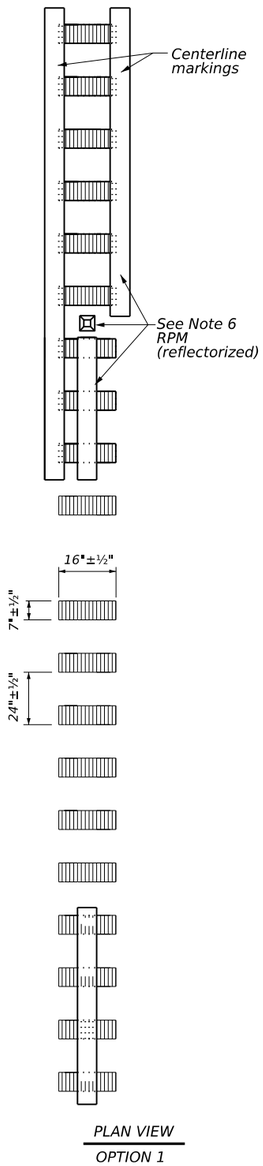
CENTERLINE RUMBLE STRIPS



TWO LANE TWO-WAY HIGHWAYS

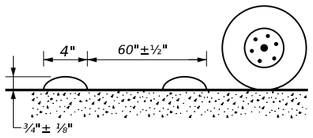


PROFILE VIEW

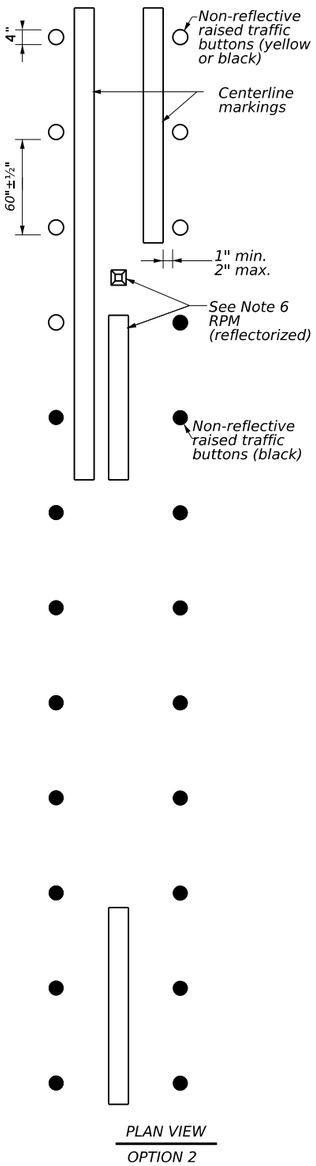


PLAN VIEW
OPTION 1

MILLED CENTERLINE RUMBLE STRIPS

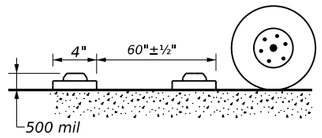


PROFILE VIEW

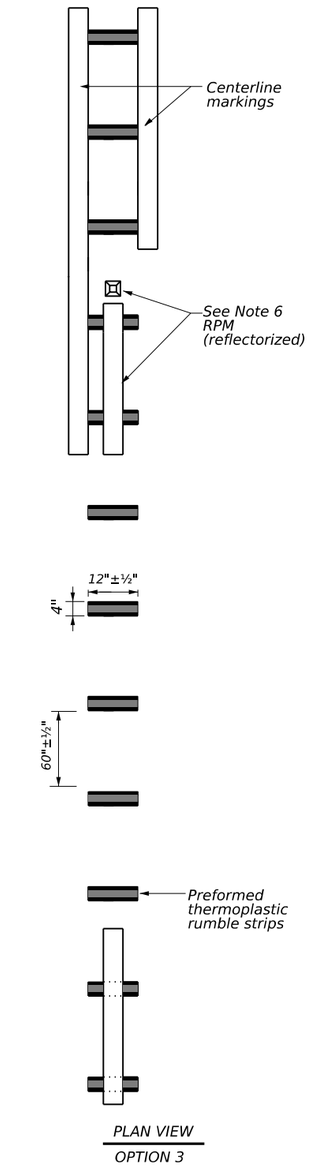


PLAN VIEW
OPTION 2

RAISED CENTERLINE RUMBLE STRIPS

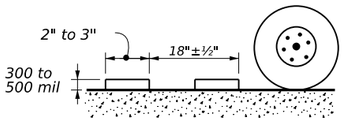


PROFILE VIEW

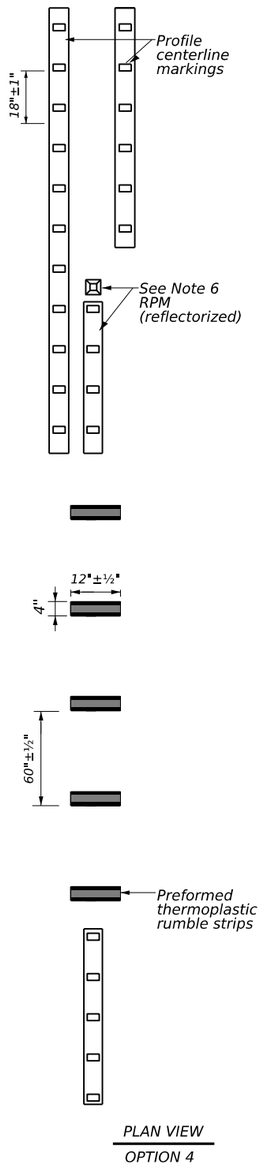


PLAN VIEW
OPTION 3

PREFORMED THERMOPLASTIC RUMBLE STRIPS



PROFILE VIEW



PLAN VIEW
OPTION 4

PROFILE CENTERLINE MARKINGS AND PREFORMED THERMOPLASTIC RUMBLE 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 edge line 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 Safety 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 or driveways with high usage of large trucks.
6. Use standard sheet PM(2) for positioning, dimensioning, and spacing of all reflective raised pavement markers, pavement markings and profile markings.
7. Consideration should be given to noise levels when centerline rumble strips are to be installed near residential areas, schools, churches, etc. A 3/8 inch deep (minimum) 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.
12. Consideration shall be given to bicyclists. See RS(6).

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

13. See standard sheet RS(2).

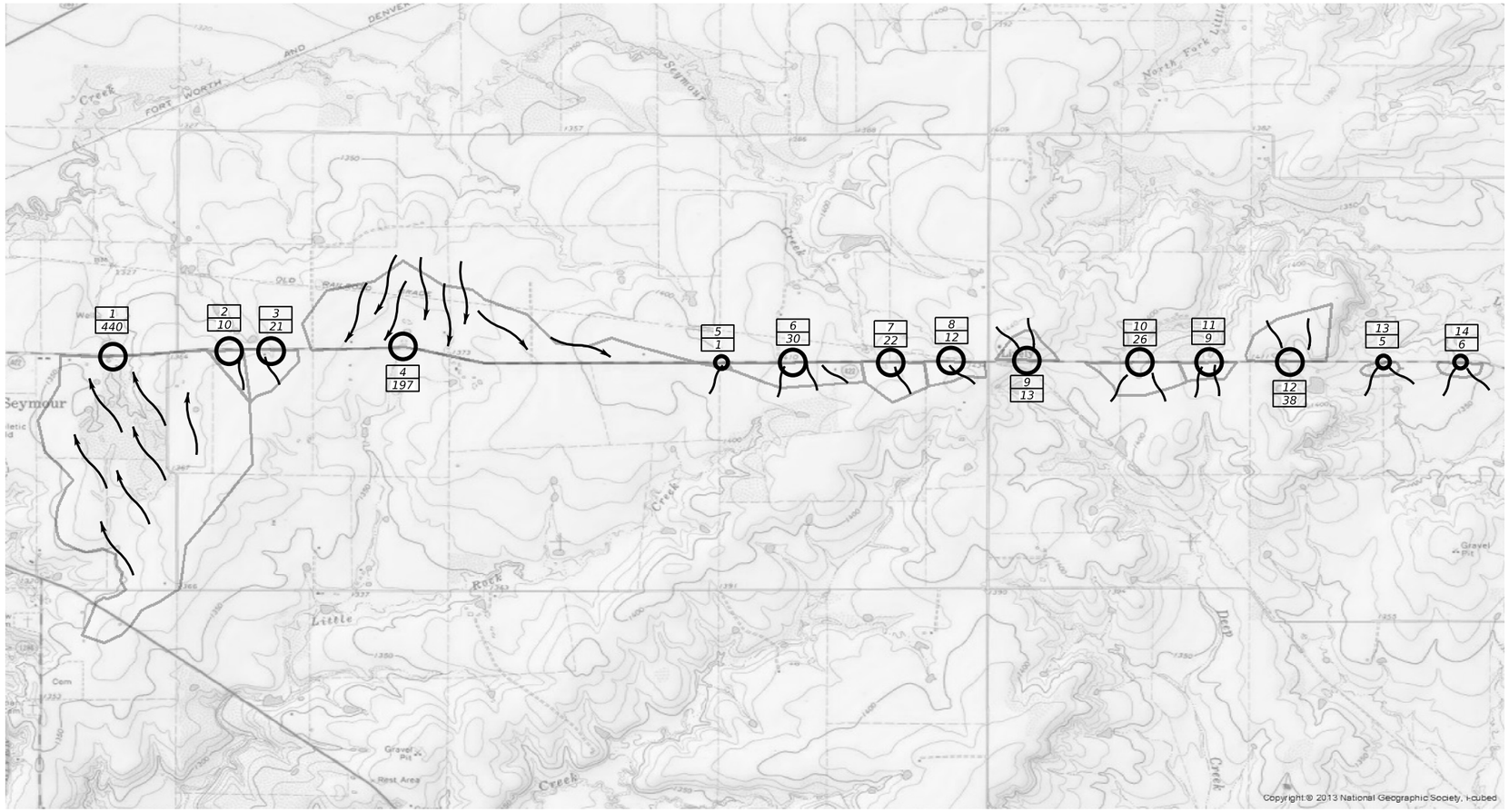
Texas Department of Transportation

Traffic Safety Division Standard

CENTERLINE RUMBLE STRIPS ON TWO LANE TWO-WAY HIGHWAYS RS(4)-23

FILE: rs(4)-23.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT January 2023	CONT	SECT	JOB	HIGHWAY
REVISIONS	0814	01	036	FM 422
10-13 1-23	DIST	COUNTY		SHEET NO.
	WFS.	BAYLOR		72

DATE: 5/2/2024 4:13:26 PM
FILE: pw://txdot.projectwiseonline.com:TXDOT2/Documents/03 - WFS/Design Projects/0814010364 - Design Set/3. Roadway/RS(4)-23.dgn



CSJ: 0814-01-036 RATIONAL METHOD

STR. #	AREA acres	C	tc min.	2 YR I in / hr	2 YR Q cfs	5 YR I in / hr	5 YR Q cfs	10 YR I in / hr	10 YR Q cfs	25 YR I in / hr	25 YR Q cfs	50 YR I in / hr	50 YR Q cfs	100 YR I in / hr	100 YR Q cfs	REMARKS
2	10	0.30	21	2.94	8.8	4.03	12.1	4.91	14.7	6.16	18.5	7.15	21.5	8.26	24.8	OVERTOPPING AT 25 YR
3	21	0.18	17	2.94	11.1	4.03	15.3	4.91	18.6	6.16	18.5	7.15	21.5	8.26	24.8	OVERTOPPING AT 10 YR
5	1	0.05	10	2.94	0.1	4.03	0.2	4.91	0.2	6.14	0.3	7.14	0.4	8.24	0.4	NO OVERTOPPING
6	30	0.05	17	2.94	4.4	4.03	6.0	4.91	7.4	6.14	9.2	7.14	10.7	8.24	12.4	NO OVERTOPPING
7	22	0.14	18	2.94	9.2	4.04	12.6	4.91	15.3	6.14	19.2	7.13	19.2	8.22	22.3	NO OVERTOPPING
8	12	0.10	18	2.94	3.5	4.04	4.8	4.91	5.9	6.14	7.4	7.13	8.6	8.22	9.9	NO OVERTOPPING
9	13	0.15	17	2.94	5.9	4.04	8.1	4.91	9.9	6.14	12.3	7.12	14.3	8.21	16.5	NO OVERTOPPING
10	26	0.05	22	2.94	3.8	4.04	5.3	4.91	6.4	6.14	8.0	7.12	9.3	8.21	10.7	NO OVERTOPPING
11	9	0.05	16	2.94	1.3	4.04	1.8	4.91	2.2	6.14	2.8	7.12	3.2	8.21	3.7	NO OVERTOPPING
12	38	0.05	19	2.94	5.6	4.03	7.7	4.91	9.3	6.16	11.7	7.15	13.6	8.26	15.7	NO OVERTOPPING
13	5	0.50	17	2.95	7.4	4.04	10.1	4.91	12.3	6.14	15.4	7.12	17.8	8.20	20.5	NO OVERTOPPING
14	6	0.05	19	2.95	0.9	4.04	1.2	4.91	1.5	6.14	1.8	7.12	2.1	8.20	2.5	NO OVERTOPPING

NRCS METHOD HEC-HMS VERION 4.11
CSJ: 0814-01-036

STR. #	AREA (SQ MI.)	DESIGN FREQ	RUNOFF CURVE #	TIME OF CON. (MIN.)	LAG TIME (MIN.)	2 YR	5 YR	10 YR	25 YR	50 YR	100 YR	REMARKS
1	0.6875	10 YR	66	25.76	15.45	293.1	368.3	592.6	943.2	1412.0	1575.8	OVERTOPPING AT 25 YR
4	0.3078	10 YR	66	32.53	19.52	103.9	136.4	241.2	418.6	663.3	742.9	NO OVERTOPPING

LEGEND

XX (STRUCTURE #)
XX (DRAINAGE AREA (SQ MI))
STRUCTURE LOCATION
FLOW ARROWS

NOTE:
1. INTENSITY VALUES WERE DETERMINED USING NOAA ATLAS 14, VOLUME 11, VERSION 2.0

STATE OF TEXAS
BRYSON P. LAWRENCE
129839
LICENSED
PROFESSIONAL ENGINEER

Bryson Lawrence, P.E.

03/29/2024

Texas Department of Transportation

FM 422

DRAINAGE AREA MAP
&
HYDROLOGY DATA

SHEET 1 OF 1

CONT	SECT	JOB	HIGHWAY
0814	01	036	FM 422
DIST	COUNTY		SHEET NO.
WFS.	BAYLOR		73

DATE: 3/29/2024 2:51:35 PM
FILE: pw://txdot.projectwiseonline.com:TXDOT2/Documents/03 - WFS/Design Projects/0814010364 - Design/Plan Set/5. Drainage/FM 422 Drainage Area Map

HYDRAULIC DATA (HY-8 FHWA version 7.50)

STRUCTURE		DESCRIPTION	CROWN ELEVATION	LENGTH (FT)	CULV		D.S. CHANNEL		FREQ = 10 YR						FREQ = 100 YR					
					SLOPE (%)	Manning "n"	SLOPE (%)	Manning "n"	Q	HW	TW	NORMAL DEPTH	VELOCITY TAILWATER	VELOCITY OUTLET	Q	HW	TW	NORMAL DEPTH	VELOCITY TAILWATER	VELOCITY OUTLET
									(CFS)	(FT)	(FT)	(FT)	(FT/S)	(FT/S)	(CFS)	(FT)	(FT)	(FT)	(FT/S)	(FT/S)
1	EXIST	1- 5X3 BOX	1342.40	27.00	0.81%	0.012	1.20%	0.03	592.6	1339.05	2.41	1.17	8.78	11.28	1576	1343.08	4.55	2.04	12.36	10.40
	PROP	1- 5X3 BOX		46.00	0.81%	0.012				1339.14	2.41	1.16	8.78	11.33		1343.10	4.55	2.02	12.36	10.37
2	EXIST	1-24" RCP	1361.20	38.00	0.21%	0.12	1.20%	0.03	14.7	1362.35	1.19	0.90	4.13	4.68	24.8	1363.27	1.76	1.07	4.71	11.59
	PROP	SEE EXISTING																		
3	EXIST	1- 24" CMP	1370.83	38.00	0.20%	0.024	2.80%	0.03	18.6	1370.11	1.04	2.00	5.98	6.25	31.3	1370.94	1.52	2.00	6.87	6.73
	PROP	1- 24" RCP		38.00	0.20%	0.012				1369.99	1.04	1.03	5.98	6.16		1370.92	1.52	1.18	6.87	11.93
4	EXIST	1- 5X3 BOX	1367.00	27.00	0.08%	0.012	1.20%	0.03	241.2	1364.03	1.37	0.67	6.29	7.95	742.9	1365.89	2.79	1.37	9.52	12.06
	PROP	1- 5X3 BOX		56.00	0.08%	0.012				1364.09	1.37	0.69	6.29	7.82		1366.01	2.79	1.39	9.52	5.50
5	EXIST	1-24" CMP	1406.30	37.00	1.66%	0.024	1.20%	0.03	0.2	1403.50	0.07	0.16	0.92	0.21	0.4	1403.60	0.11	0.22	1.20	0.39
	PROP	1-24" RCP		37.00	1.66%	0.012				1403.49	0.07	0.11	0.92	0.21		1403.57	0.11	0.16	1.20	0.39
6	EXIST	1-36" CMP	1407.00	40.00	0.33%	0.024	0.60%	0.03	7.4	1404.15	0.93	1.24	2.65	3.31	12.4	1404.56	1.35	1.68	3.06	3.56
	PROP	1-36" RCP		46.00	0.33%	0.012				1404.33	0.93	0.86	2.65	3.22		1404.71	1.35	1.12	3.06	3.50
7	EXIST	1-30" CMP	1422.90	37.00	3.51%	0.024	2.00%	0.03	15.3	1420.99	1.02	1.05	5.02	3.22	25.7	1422.01	1.49	1.42	5.76	8.94
	PROP	1-30" RCP		46.00	3.51%	0.012				1421.13	1.02	0.72	5.02	13.05		1421.95	1.49	0.95	5.76	15.09
8	EXIST	1-30" CMP	1431.20	37.00	0.59%	0.024	2.40%	0.03	15.3	1428.53	0.95	1.84	5.35	5.82	25.7	1429.54	1.39	2.50	6.17	7.10
	PROP	1-30" RCP		49.00	0.59%	0.012				1428.42	0.95	1.18	5.35	5.82		1429.24	1.39	1.63	6.17	7.10
9	EXIST	1-24" CMP	1418.60	38.00	3.68%	0.024	3.00%	0.03	9.9	1417.32	0.65	0.90	5.07	7.18	16.5	1418.29	0.93	1.23	5.92	8.12
	PROP	1-24" RCP		47.00	3.68%	0.012				1417.35	0.65	0.61	5.07	12.19		1418.10	0.93	0.80	5.92	14.04
10	EXIST	1-24" CMP	1398.60	37.00	2.24%	0.024	1.00%	0.03	6.4	1395.82	0.70	0.81	3.03	2.48	10.7	1396.37	1.01	1.10	3.54	3.54
	PROP	1-24" RCP		41.00	2.24%	0.012				1395.83	0.70	0.56	3.03	2.34		1396.31	1.01	0.74	3.54	3.45
11	EXIST	1-18" CMP	1409.00	36.00	4.61%	0.024	3.40%	0.03	2.2	1406.83	0.23	0.43	3.14	5.25	3.7	1407.13	0.33	0.57	3.79	6.07
	PROP	1-24" RCP		40.00	4.61%	0.012				1406.70	0.23	0.28	3.14	8.30		1406.92	0.33	0.36	3.79	9.65
12	EXIST	1-24" CMP	1395.20	43.00	0.50%	0.024	1.80%	0.03	9.3	1391.29	0.74	2.00	4.17	5.32	20.5	1392.20	1.08	2.00	4.87	6.54
	PROP	1-24" RCP		43.00	0.50%	0.012				1391.18	0.61	1.04	5.08	5.32		1391.89	0.88	1.49	5.97	6.54
13	EXIST	1-24" CMP	1368.12	34.00	0.59%	0.024	3.20%	0.03	12.3	1366.80	0.74	2.00	5.55	5.90	2.1	1368.15	1.06	2.00	6.45	7.19
	PROP	1-24" RCP		40.00	0.59%	0.012				1366.66	0.74	1.17	5.55	5.90		1367.73	1.06	2.00	6.45	7.50
14	EXIST	1-18" CMP	1353.53	36.00	0.78%	0.024	1.80%	0.03	1.2	1350.49	0.19	0.50	2.06	2.50	0	1350.71	0.28	0.68	2.52	3.51
	PROP	1-24" RCP		44.00	0.78%	0.012				1350.41	0.19	0.32	2.06	1.78		1350.59	0.28	0.42	2.52	2.55

GENERAL NOTES:

1. PRECIPITATION DEPTHS USED WERE OBTAINED FROM NOAA ATLAS 14, VOLUME 11, VERSION 2, OF DEPTH- DURATION FREQUENCY OF PRECIPITATION ANNUAL MAXIMA (AMS) FOR TEXAS LOCATION: SEYMOUR, TX LAT: 33.6325°LON: -99.2897°

2. LAG TIME = 0.7 X TIME OF CONCENTRATION (Tc)

3. COMPOSITE CURVE NUMBERS WERE CALCULATED USING NRCS CN LOSS MODEL AND ACCOUNTED FOR DIFFERING LAND USE AND HYDROLOGICAL SOIL GROUPS FOUND WITHIN THE RESPECTIVE WATERSHED BY USING THE WEB SOIL SURVEY.

COMPUTATIONAL NOTES:

1. THERE HAS BEEN NO HISTORY OF ANY FLOODING OF THE ROADWAY FOR ALL STRUCTURES LISTED AS PER AREA ENGINEER ZACH HUSEN AND MAINTENANCE SUPERVISOR CRAIG HOSTAS.

2. THESE CALCULATIONS WERE PERFORMED TO VERIFY THAT THE MODIFICATIONS DO NOT SIGNIFICANTLY IMPACT HYDRAULIC PERFORMANCE.

3. RESULTS WERE BASED ON UNOBSTRUCTED FLOW.

4. NO WORK IS TO BE PERFORMED ON STRUCTURE 2

STATE OF TEXAS
BRYSON P. LAWRENCE
129839
LICENSED
PROFESSIONAL ENGINEER

Bryson Lawrence, P.E.

03/29/2024

Texas Department of Transportation

FM 422

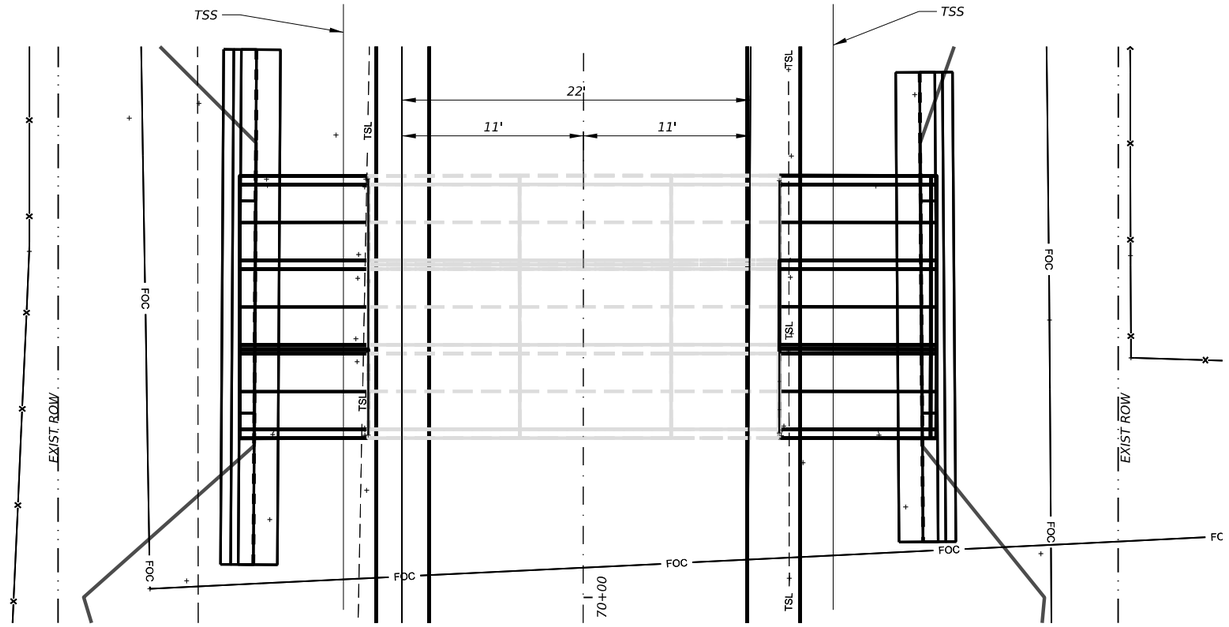
HYDRAULIC DATA

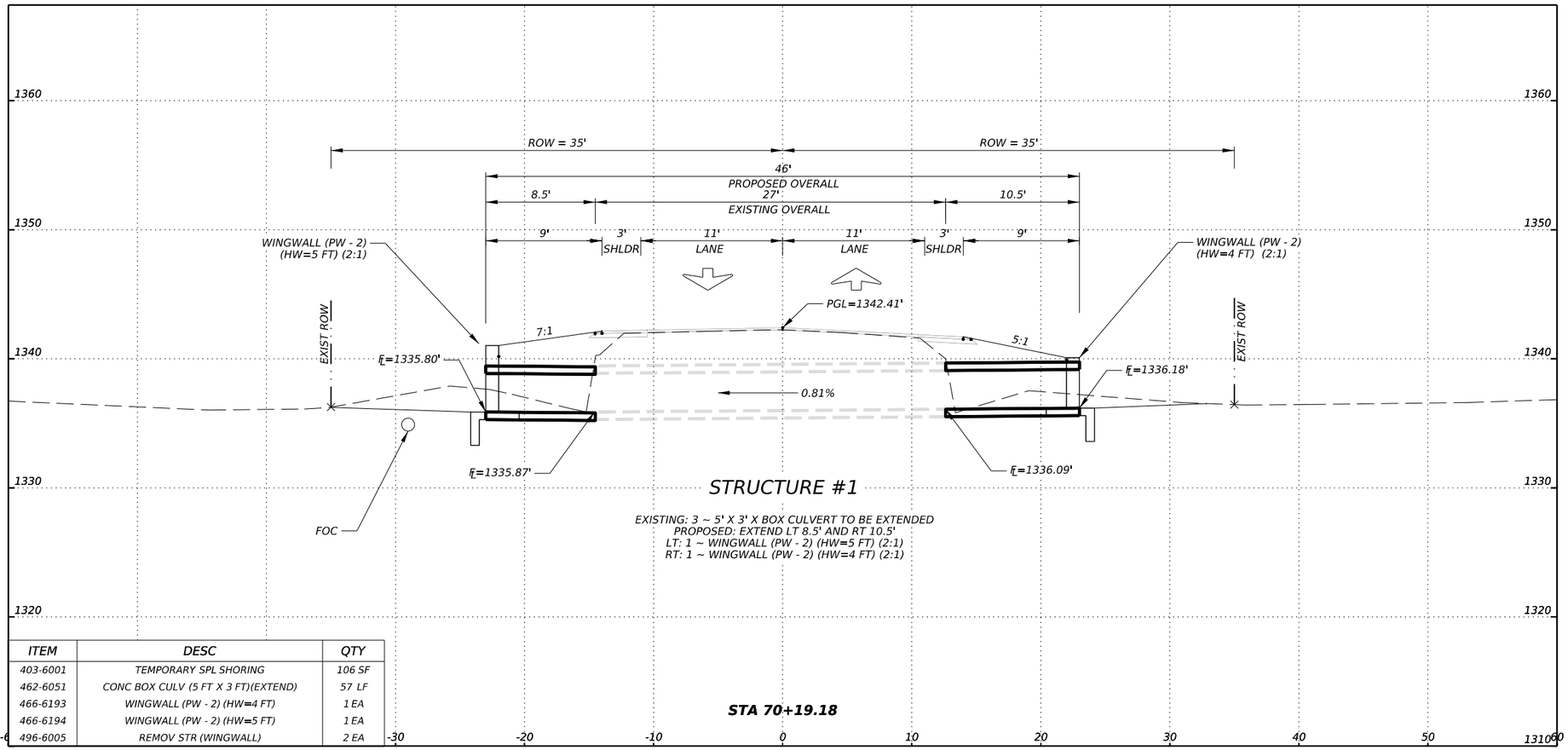
SHEET 1 OF 1

CONT	SECT	JOB	HIGHWAY
0814	01	036	FM 422
DIST	COUNTY		SHEET NO.
WFS.	BAYLOR		74

CK DW CK DW

DATE: 3/29/2024 1:19:23 PM
FILE: pw://txdot.projectwiseonline.com:TXDOT2/Documents/03 - WFS/Design Projects/0814010364 - Design/Plan Set/5. Drainage/HYDRAULIC DATA





STRUCTURE #1

EXISTING: 3 ~ 5' X 3' X BOX CULVERT TO BE EXTENDED
PROPOSED: EXTEND LT 8.5' AND RT 10.5'
LT: 1 ~ WINGWALL (PW - 2) (HW=5 FT) (2:1)
RT: 1 ~ WINGWALL (PW - 2) (HW=4 FT) (2:1)

ITEM	DESC	QTY
403-6001	TEMPORARY SPL SHORING	106 SF
462-6051	CONC BOX CULV (5 FT X 3 FT)(EXTEND)	57 LF
466-6193	WINGWALL (PW - 2) (HW=4 FT)	1 EA
466-6194	WINGWALL (PW - 2) (HW=5 FT)	1 EA
496-6005	REMOV STR (WINGWALL)	2 EA

STA 70+19.18

LOCATE UTILITIES BEFORE ANY EXCAVATION
DEPTHS HAVE NOT BEEN VERIFIED

FULL DEPTH HOTMIX FOR BOX CULVERTS

STATE OF TEXAS
BRYSON P. LAWRENCE
129839
LICENSED
PROFESSIONAL ENGINEER

Bryson Lawrence, P.E.

04/04/2024

Texas Department of Transportation

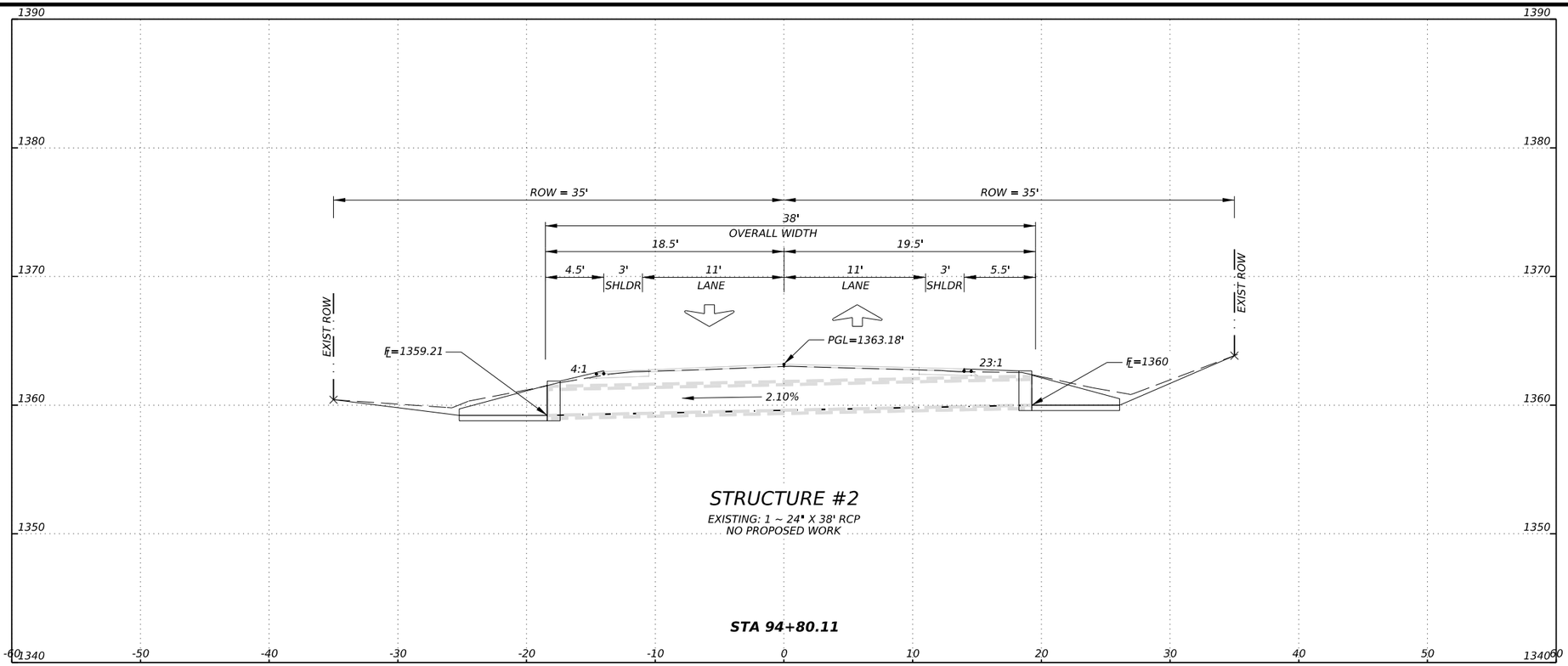
FM 422
CULVERT PROFILES

0 5 10
SCALE IN FEET

 2024 SHEET 1 OF 8

CONT	SECT	JOB	HIGHWAY
0814	01	036	FM 422
DIST	COUNTY		SHEET NO.
WFS.	BAYLOR		75

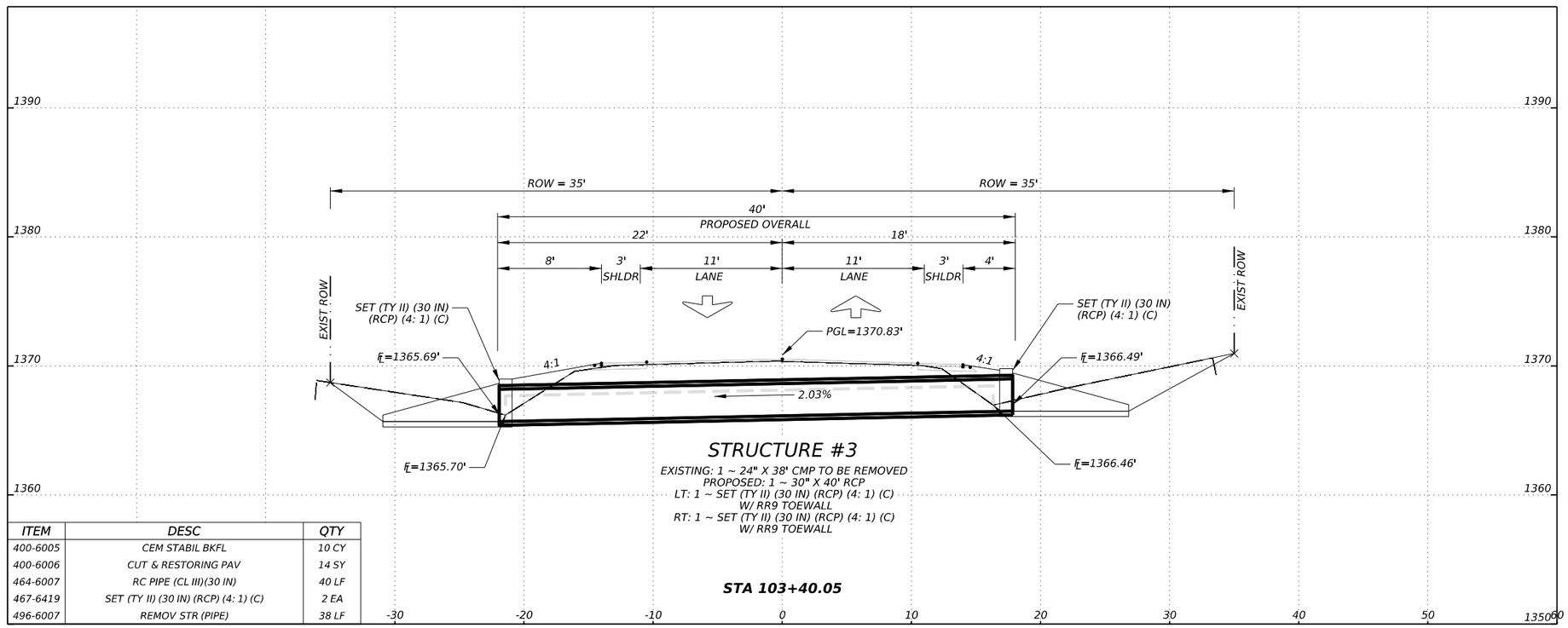
DATE: 4/3/2024 2:24:01 PM
FILE: pw://txdot.projectwiseonline.com:TXDOT2/Documents/03 - WFS/Design Projects/0814010364 - Design/Plan Set/5. Drainage/CULVERT LAYOUTS



STRUCTURE #2

EXISTING: 1 ~ 24" X 38' RCP
NO PROPOSED WORK

STA 94+80.11



STRUCTURE #3

EXISTING: 1 ~ 24" X 38' CMP TO BE REMOVED
PROPOSED: 1 ~ 30" X 40' RCP
LT: 1 ~ SET (TY II) (30 IN) (RCP) (4: 1) (C)
W/ RR9 TOEWALL
RT: 1 ~ SET (TY II) (30 IN) (RCP) (4: 1) (C)
W/ RR9 TOEWALL

STA 103+40.05

ITEM	DESC	QTY
400-6005	CEM STABIL BKFL	10 CY
400-6006	CUT & RESTORING PAV	14 SY
464-6007	RC PIPE (CL III)(30 IN)	40 LF
467-6419	SET (TY II) (30 IN) (RCP) (4: 1) (C)	2 EA
496-6007	REMOV STR (PIPE)	38 LF

LOCATE UTILITIES BEFORE ANY EXCAVATION
DEPTHS HAVE NOT BEEN VERIFIED

STRUCTURE 2'S SETS ARE IN PLACE AND NO WORK IS PROPOSED

FULL DEPTH HOTMIX FOR BOX CULVERTS

STATE OF TEXAS
BRYSON P. LAWRENCE
129839
LICENSED
PROFESSIONAL ENGINEER

Bryson Lawrence, P.E.

04/04/2024

Texas Department of Transportation

FM 422
CULVERT PROFILES

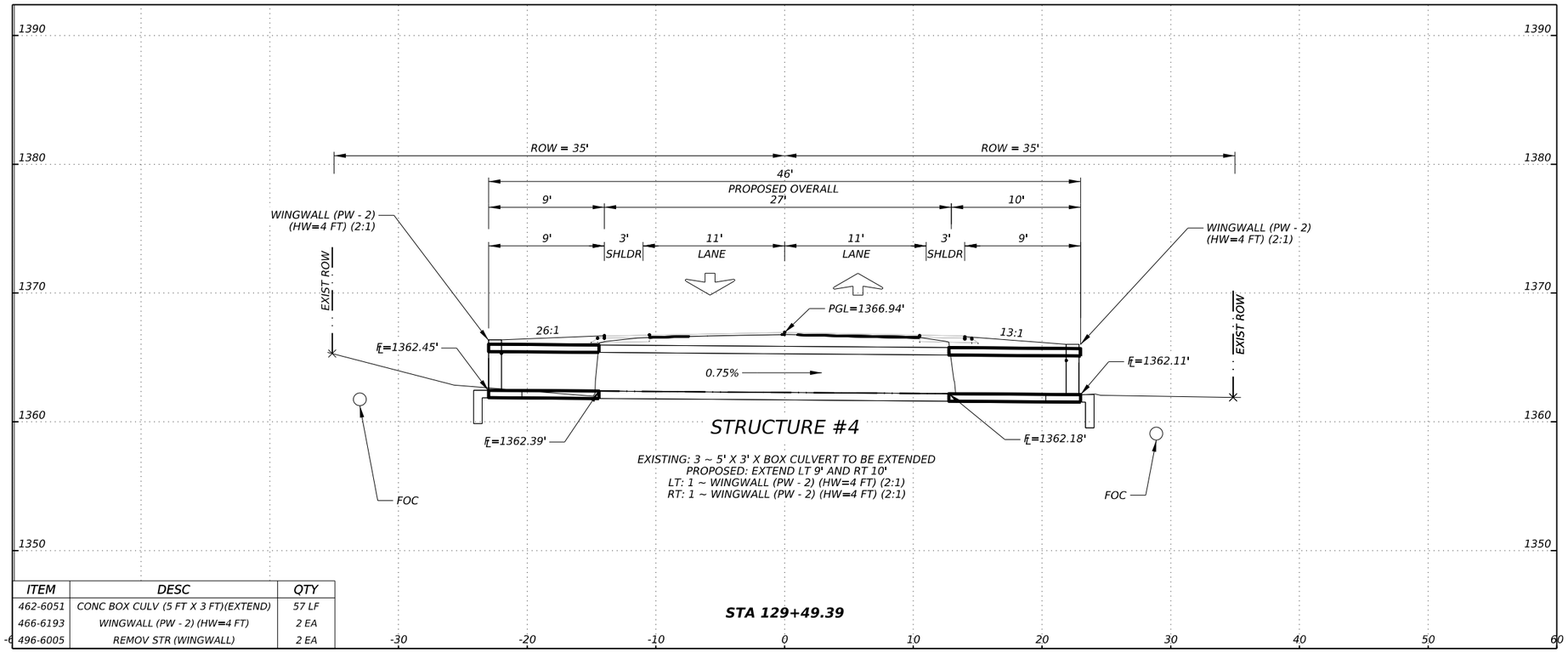
0 5 10
SCALE IN FEET

SHEET 2 OF 8

CONT	SECT	JOB	HIGHWAY
0814	01	036	FM 422

DIST	COUNTY	SHEET NO.
WFS.	BAYLOR	76

DATE: 4/3/2024 2:24:04 PM
FILE: pw://txdot.projectwiseonline.com:TXDOT2/Documents/03 - WFS/Design Projects/0814010364 - Design/Plan Set/5. Drainage/CULVERT LAYOUTS

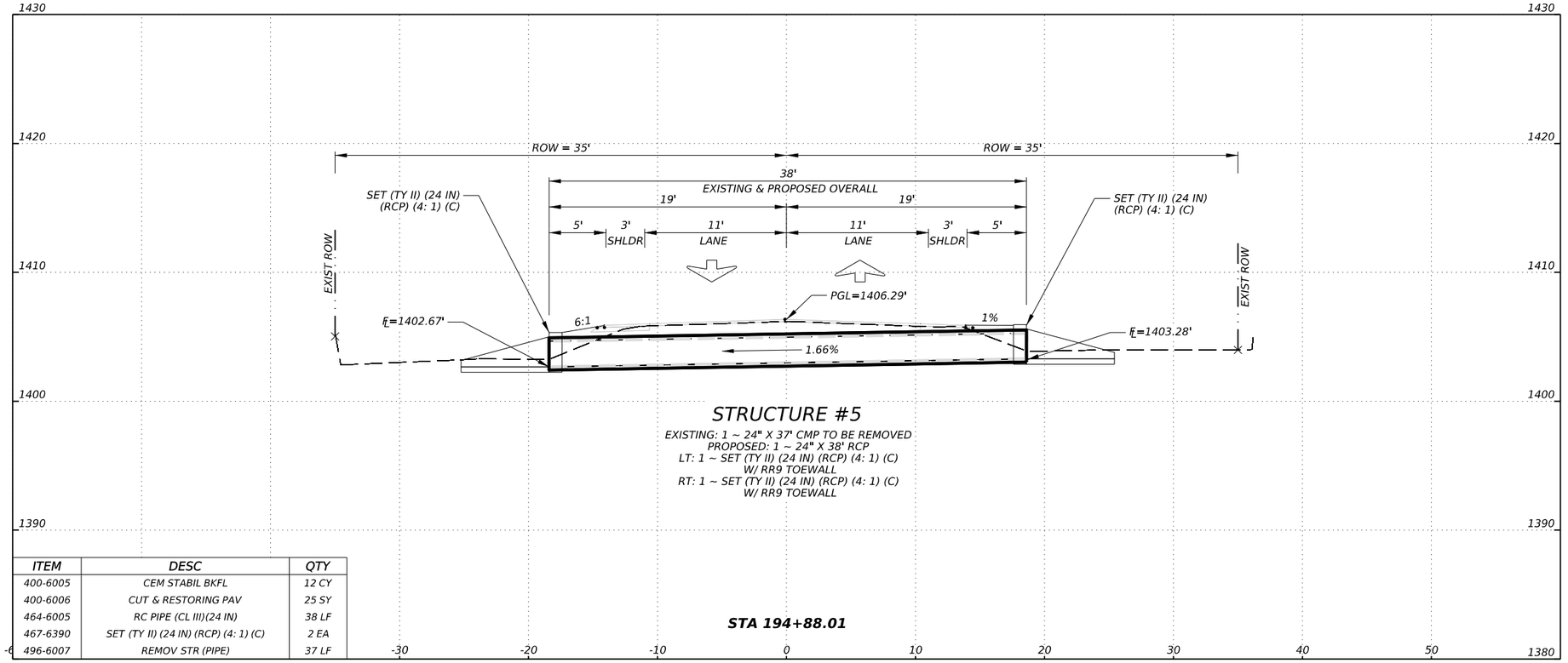


STRUCTURE #4

EXISTING: 3 ~ 5' X 3' X BOX CULVERT TO BE EXTENDED
PROPOSED: EXTEND LT 9' AND RT 10'
LT: 1 ~ WINGWALL (PW - 2) (HW=4 FT) (2:1)
RT: 1 ~ WINGWALL (PW - 2) (HW=4 FT) (2:1)

ITEM	DESC	QTY
462-6051	CONC BOX CULV (5 FT X 3 FT)(EXTEND)	57 LF
466-6193	WINGWALL (PW - 2) (HW=4 FT)	2 EA
496-6005	REMOV STR (WINGWALL)	2 EA

STA 129+49.39



STRUCTURE #5

EXISTING: 1 ~ 24" X 37' CMP TO BE REMOVED
PROPOSED: 1 ~ 24" X 38' RCP
LT: 1 ~ SET (TY II) (24 IN) (RCP) (4: 1) (C)
W/ RR9 TOEWALL
RT: 1 ~ SET (TY II) (24 IN) (RCP) (4: 1) (C)
W/ RR9 TOEWALL

ITEM	DESC	QTY
400-6005	CEM STABIL BKFL	12 CY
400-6006	CUT & RESTORING PAV	25 SY
464-6005	RC PIPE (CL III)(24 IN)	38 LF
467-6390	SET (TY II) (24 IN) (RCP) (4: 1) (C)	2 EA
496-6007	REMOV STR (PIPE)	37 LF

STA 194+88.01

LOCATE UTILITIES BEFORE ANY EXCAVATION
DEPTHS HAVE NOT BEEN VERIFIED

FULL DEPTH HOTMIX FOR BOX CULVERTS

STATE OF TEXAS
BRYSON P. LAWRENCE
129839
LICENSED
PROFESSIONAL ENGINEER

Bryson Lawrence, P.E.

04/04/2024

Texas Department of Transportation

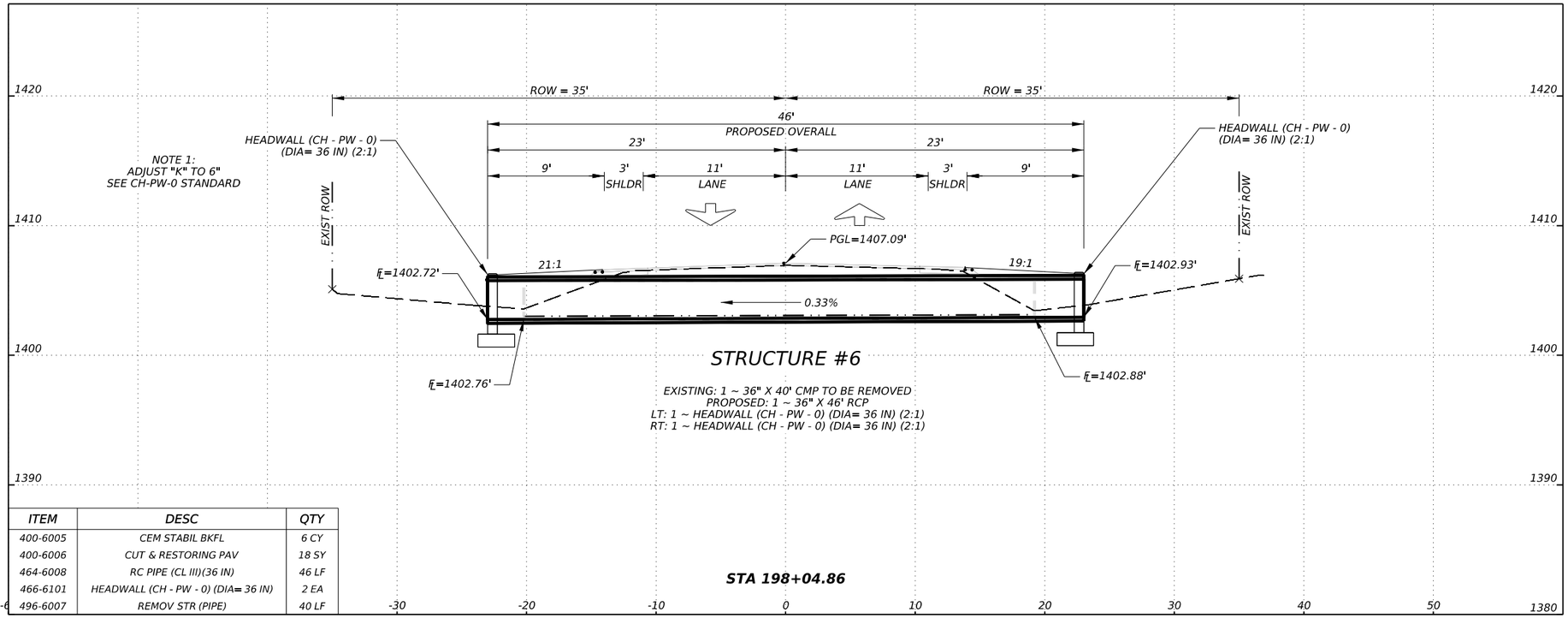
FM 422
CULVERT PROFILES

0 5 10
SCALE IN FEET

SHEET 3 OF 8

CONT	SECT	JOB	HIGHWAY
0814	01	036	FM 422
DIST	COUNTY		SHEET NO.
WFS.	BAYLOR		77

DATE: 4/3/2024 2:24:10 PM
FILE: pw://txdot.projectwiseonline.com:TXDOT2/Documents/03 - WFS/Design Projects/0814010364 - Design/Plan Set/5. Drainage/CULVERT LAYOUTS

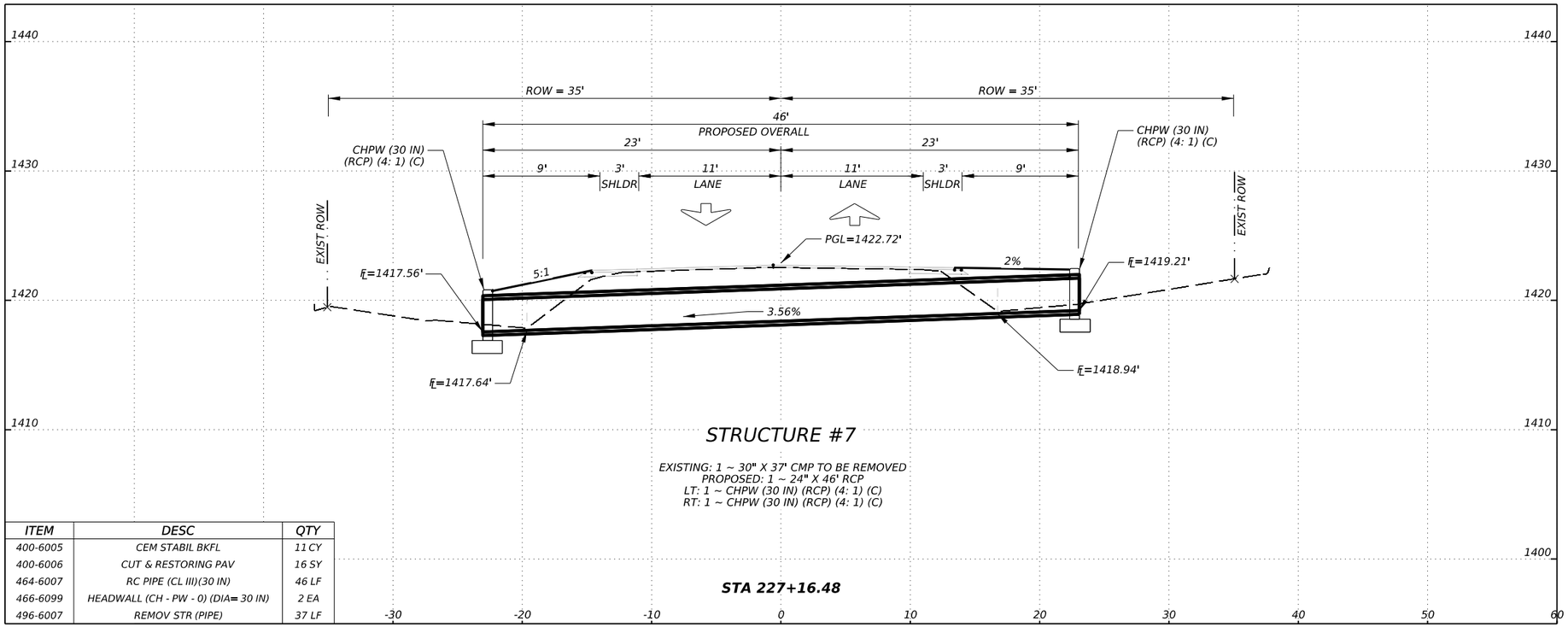


STRUCTURE #6

EXISTING: 1 ~ 36" X 40' CMP TO BE REMOVED
PROPOSED: 1 ~ 36" X 46' RCP
LT: 1 ~ HEADWALL (CH - PW - 0) (DIA= 36 IN) (2:1)
RT: 1 ~ HEADWALL (CH - PW - 0) (DIA= 36 IN) (2:1)

ITEM	DESC	QTY
400-6005	CEM STABIL BKFL	6 CY
400-6006	CUT & RESTORING PAV	18 SY
464-6008	RC PIPE (CL III)(36 IN)	46 LF
466-6101	HEADWALL (CH - PW - 0) (DIA= 36 IN)	2 EA
496-6007	REMOV STR (PIPE)	40 LF

STA 198+04.86



STRUCTURE #7

EXISTING: 1 ~ 30" X 37' CMP TO BE REMOVED
PROPOSED: 1 ~ 24" X 46' RCP
LT: 1 ~ CHPW (30 IN) (RCP) (4: 1) (C)
RT: 1 ~ CHPW (30 IN) (RCP) (4: 1) (C)

ITEM	DESC	QTY
400-6005	CEM STABIL BKFL	11 CY
400-6006	CUT & RESTORING PAV	16 SY
464-6007	RC PIPE (CL III)(30 IN)	46 LF
466-6099	HEADWALL (CH - PW - 0) (DIA= 30 IN)	2 EA
496-6007	REMOV STR (PIPE)	37 LF

STA 227+16.48

LOCATE UTILITIES BEFORE ANY EXCAVATION
DEPTHS HAVE NOT BEEN VERIFIED

FULL DEPTH HOTMIX FOR BOX CULVERTS

STATE OF TEXAS
BRYSON P. LAWRENCE
129839
LICENSED
PROFESSIONAL ENGINEER

Bryson Lawrence, P.E.

04/04/2024

Texas Department of Transportation

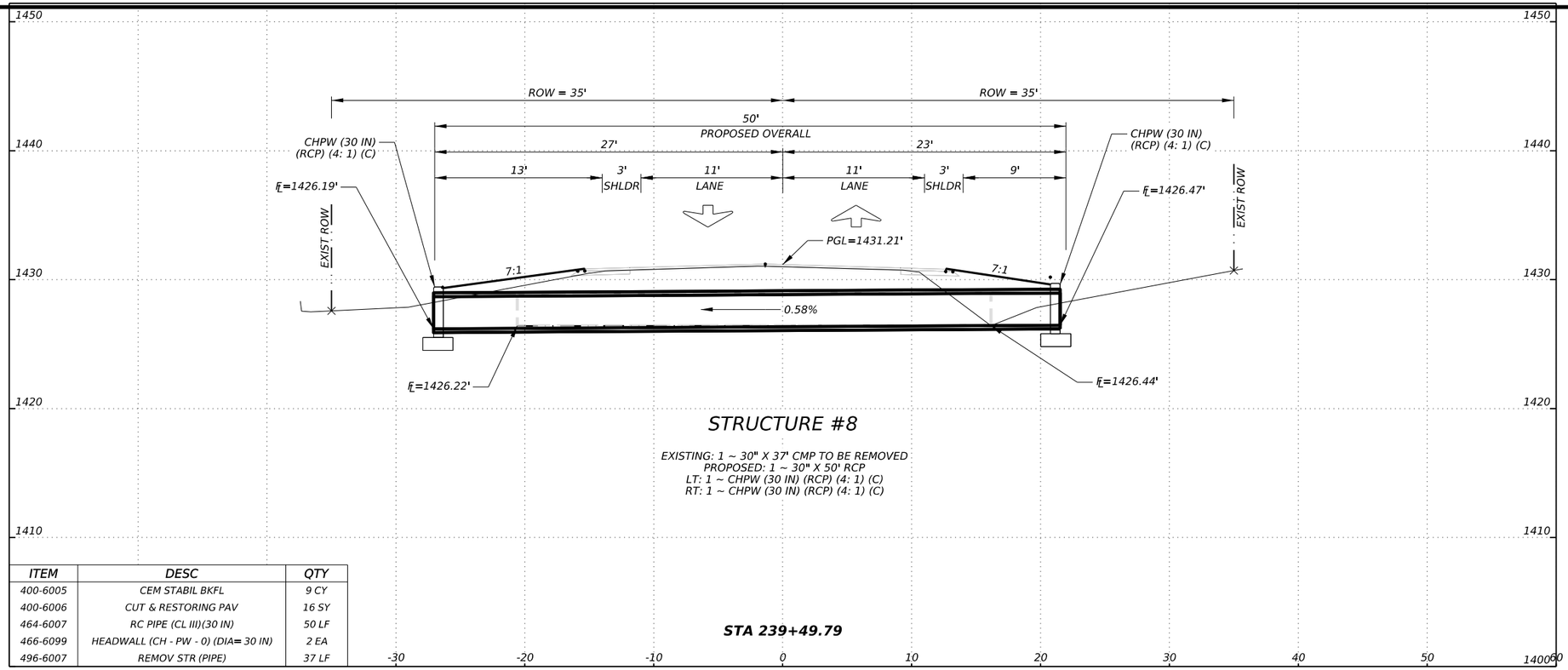
FM 422
CULVERT PROFILES

0 5 10
SCALE IN FEET

SHEET 4 OF 8

CONT	SECT	JOB	HIGHWAY
0814	01	036	FM 422
DIST	COUNTY		SHEET NO.
WFS.	BAYLOR		78

DATE: 4/3/2024 2:24:13 PM
FILE: pw://txdot.projectwiseonline.com:TXDOT2/Documents/03 - WFS/Design Projects/0814010364 - Design/Plan Set/5. Drainage/CULVERT LAYOUTS

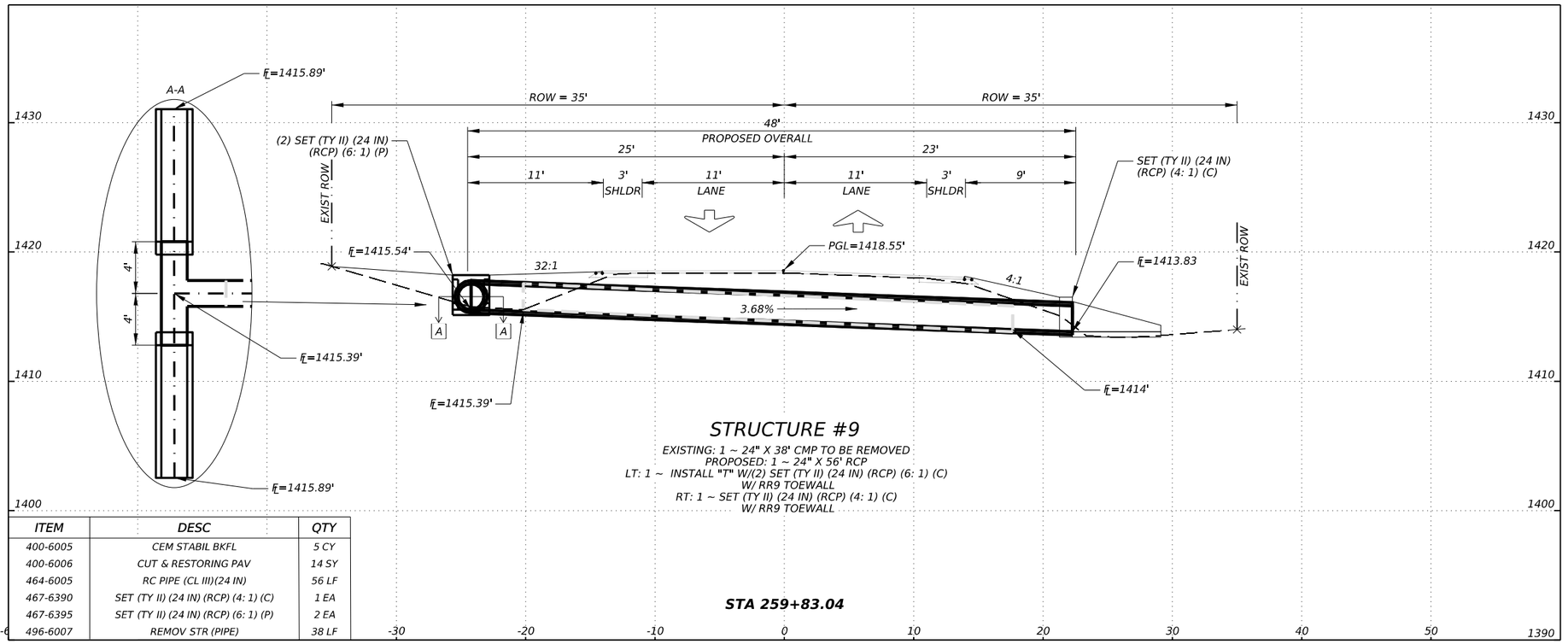


STRUCTURE #8

EXISTING: 1 ~ 30" X 37' CMP TO BE REMOVED
PROPOSED: 1 ~ 30" X 50' RCP
LT: 1 ~ CHPW (30 IN) (RCP) (4: 1) (C)
RT: 1 ~ CHPW (30 IN) (RCP) (4: 1) (C)

ITEM	DESC	QTY
400-6005	CEM STABIL BKFL	9 CY
400-6006	CUT & RESTORING PAV	16 SY
464-6007	RC PIPE (CL III)(30 IN)	50 LF
466-6099	HEADWALL (CH - PW - 0) (DIA= 30 IN)	2 EA
496-6007	REMOV STR (PIPE)	37 LF

STA 239+49.79



STRUCTURE #9

EXISTING: 1 ~ 24" X 38' CMP TO BE REMOVED
PROPOSED: 1 ~ 24" X 56' RCP
LT: 1 ~ INSTALL "T" W/(2) SET (TY II) (24 IN) (RCP) (6: 1) (C)
W/ RR9 TOEWALL
RT: 1 ~ SET (TY II) (24 IN) (RCP) (4: 1) (C)
W/ RR9 TOEWALL

ITEM	DESC	QTY
400-6005	CEM STABIL BKFL	5 CY
400-6006	CUT & RESTORING PAV	14 SY
464-6005	RC PIPE (CL III)(24 IN)	56 LF
467-6390	SET (TY II) (24 IN) (RCP) (4: 1) (C)	1 EA
467-6395	SET (TY II) (24 IN) (RCP) (6: 1) (P)	2 EA
496-6007	REMOV STR (PIPE)	38 LF

STA 259+83.04

LOCATE UTILITIES BEFORE ANY EXCAVATION
DEPTHS HAVE NOT BEEN VERIFIED

FULL DEPTH HOTMIX FOR BOX CULVERTS

STATE OF TEXAS
BRYSON P. LAWRENCE
129839
LICENSED
PROFESSIONAL ENGINEER

Bryson Lawrence, P.E.

04/04/2024

Texas Department of Transportation

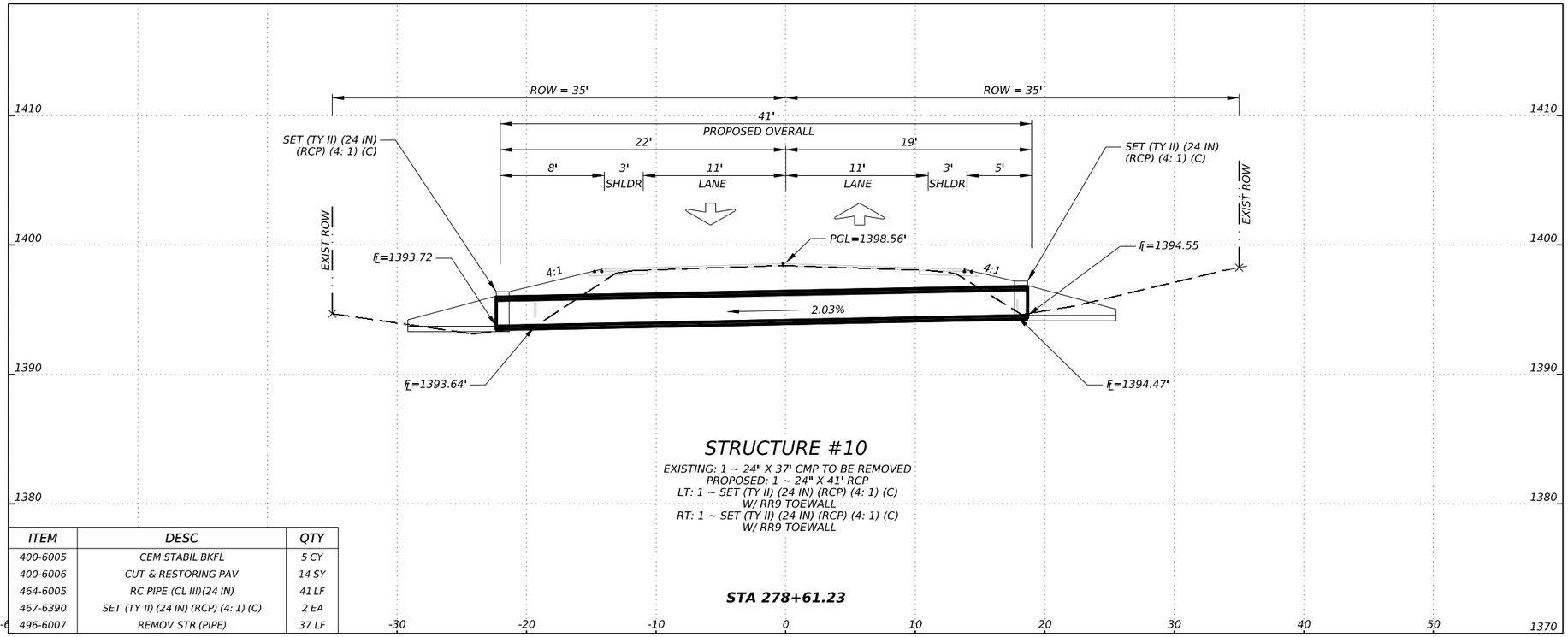
FM 422
CULVERT PROFILES

0 5 10
SCALE IN FEET

SHEET 5 OF 8

CONT	SECT	JOB	HIGHWAY
0814	01	036	FM 422
DIST	COUNTY		SHEET NO.
WFS.	BAYLOR		79

DATE: 4/3/2024 2:24:16 PM
FILE: pw://txdot.projectwiseonline.com:TXDOT2/Documents/03 - WFS/Design Projects/0814010364 - Design/Plan Set/5. Drainage/CULVERT LAYOUTS

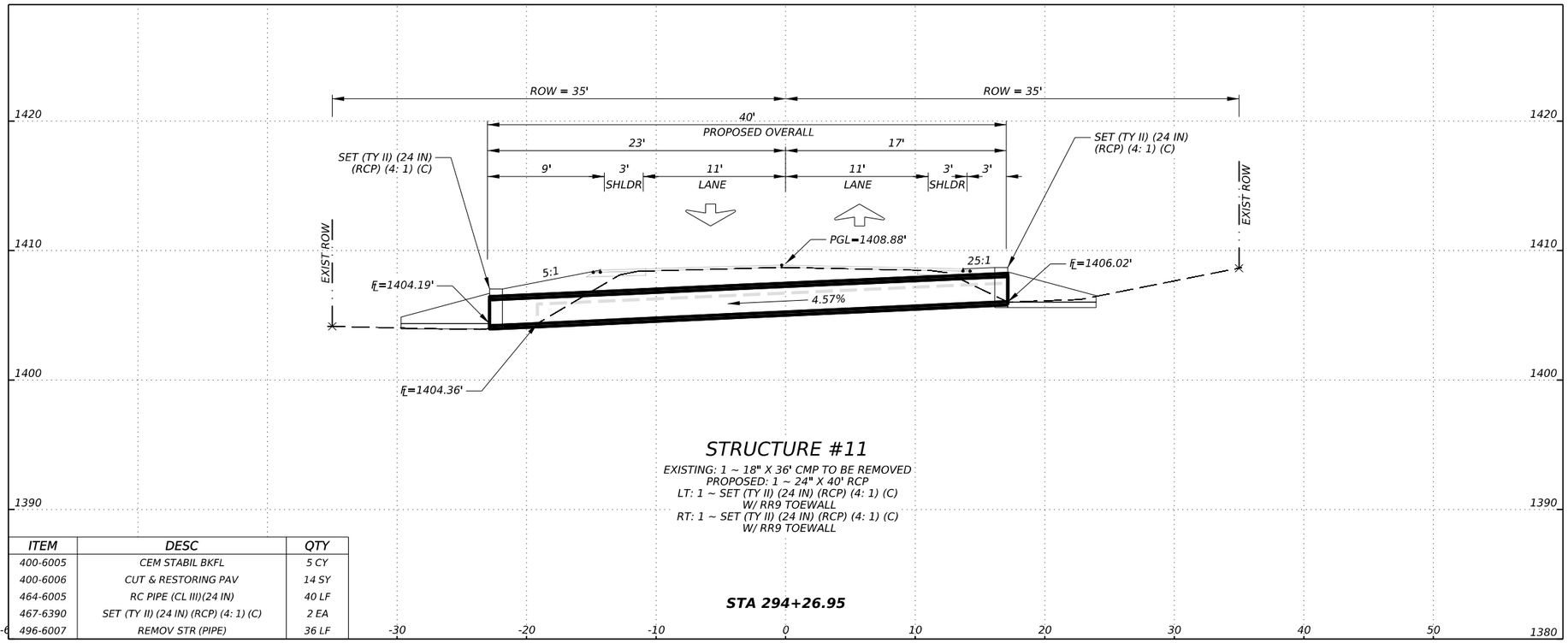


STRUCTURE #10

EXISTING: 1 ~ 24" X 37' CMP TO BE REMOVED
PROPOSED: 1 ~ 24" X 41' RCP
LT: 1 ~ SET (TY II) (24 IN) (RCP) (4: 1) (C)
W/ RR9 TOEWALL
RT: 1 ~ SET (TY II) (24 IN) (RCP) (4: 1) (C)
W/ RR9 TOEWALL

STA 278+61.23

ITEM	DESC	QTY
400-6005	CEM STABIL BKFL	5 CY
400-6006	CUT & RESTORING PAV	14 SY
464-6005	RC PIPE (CL III)(24 IN)	41 LF
467-6390	SET (TY II) (24 IN) (RCP) (4: 1) (C)	2 EA
496-6007	REMOV STR (PIPE)	37 LF



STRUCTURE #11

EXISTING: 1 ~ 18" X 36' CMP TO BE REMOVED
PROPOSED: 1 ~ 24" X 40' RCP
LT: 1 ~ SET (TY II) (24 IN) (RCP) (4: 1) (C)
W/ RR9 TOEWALL
RT: 1 ~ SET (TY II) (24 IN) (RCP) (4: 1) (C)
W/ RR9 TOEWALL

STA 294+26.95

ITEM	DESC	QTY
400-6005	CEM STABIL BKFL	5 CY
400-6006	CUT & RESTORING PAV	14 SY
464-6005	RC PIPE (CL III)(24 IN)	40 LF
467-6390	SET (TY II) (24 IN) (RCP) (4: 1) (C)	2 EA
496-6007	REMOV STR (PIPE)	36 LF

LOCATE UTILITIES BEFORE ANY EXCAVATION
DEPTHS HAVE NOT BEEN VERIFIED

FULL DEPTH HOTMIX FOR BOX CULVERTS

STATE OF TEXAS
BRYSON P. LAWRENCE
129839
LICENSED
PROFESSIONAL ENGINEER

Bryson Lawrence, P.E.

04/04/2024

Texas Department of Transportation

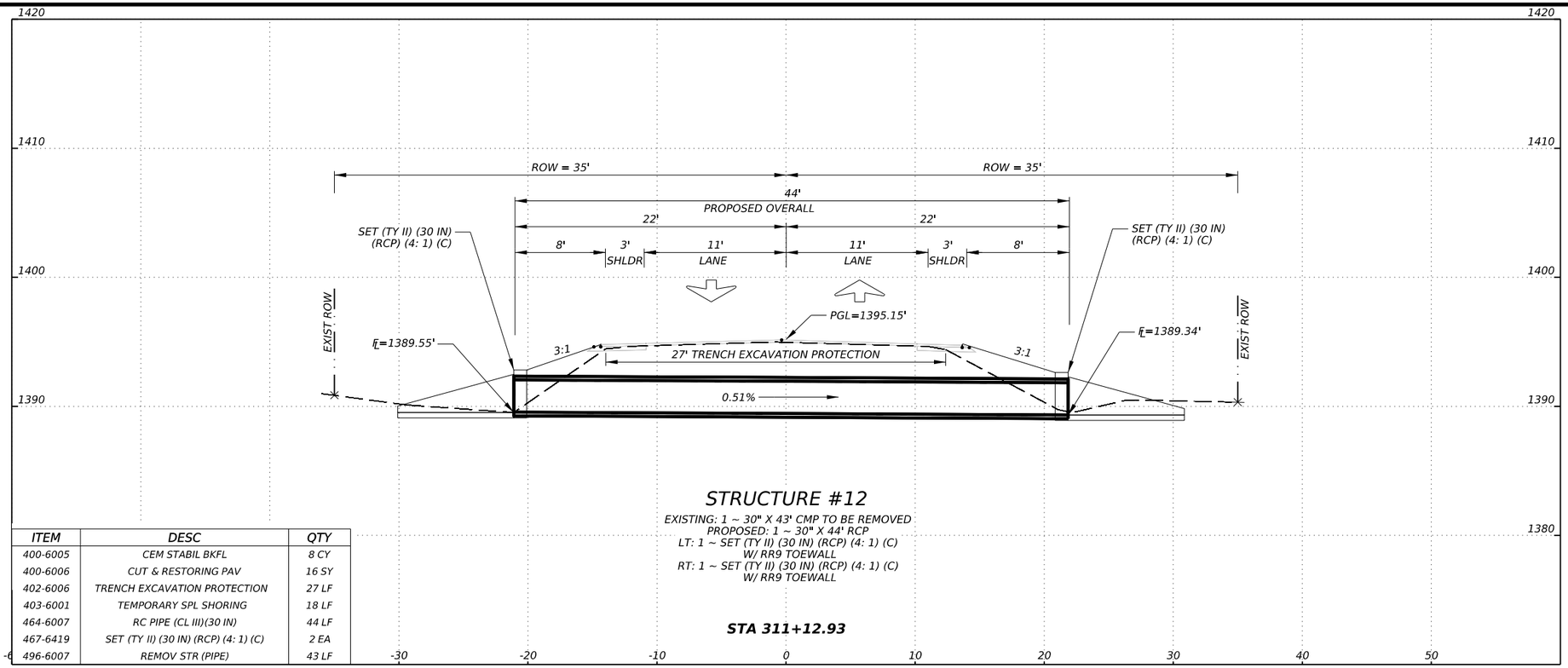
FM 422
CULVERT PROFILES

0 5 10
SCALE IN FEET

 2024 SHEET 6 OF 8

CONT	SECT	JOB	HIGHWAY
0814	01	036	FM 422
DIST	COUNTY		SHEET NO.
WFS.	BAYLOR		80

DATE: 4/3/2024 2:24:21 PM
FILE: pw://txdot.projectwiseonline.com:TXDOT2/Documents/03 - WFS/Design Projects/0814010364 - Design/Plan Set/5. Drainage/CULVERT LAYOUTS

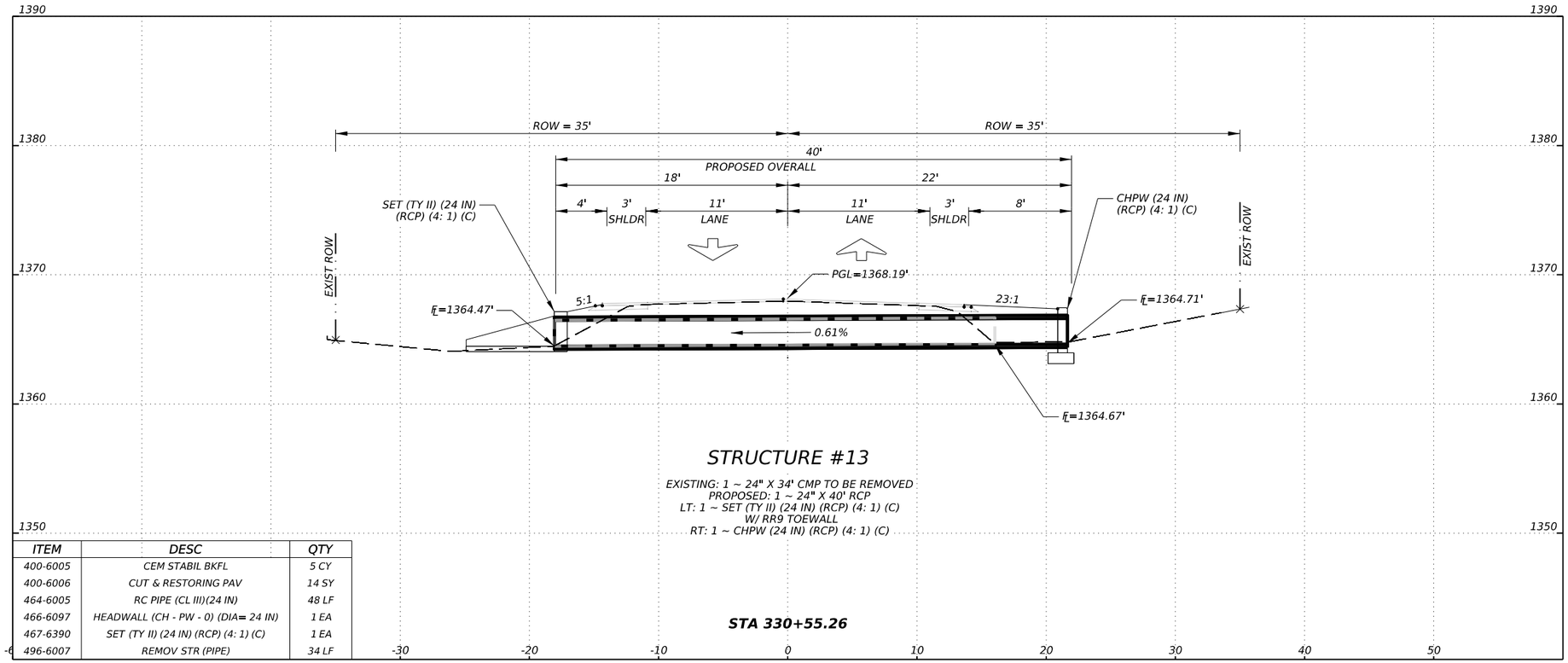


STRUCTURE #12

EXISTING: 1 ~ 30" X 43' CMP TO BE REMOVED
PROPOSED: 1 ~ 30" X 44' RCP
LT: 1 ~ SET (TY II) (30 IN) (RCP) (4: 1) (C)
W/ RR9 TOEWALL
RT: 1 ~ SET (TY II) (30 IN) (RCP) (4: 1) (C)
W/ RR9 TOEWALL

STA 311+12.93

ITEM	DESC	QTY
400-6005	CEM STABIL BKFL	8 CY
400-6006	CUT & RESTORING PAV	16 SY
402-6006	TRENCH EXCAVATION PROTECTION	27 LF
403-6001	TEMPORARY SPL SHORING	18 LF
464-6007	RC PIPE (CL III)(30 IN)	44 LF
467-6419	SET (TY II) (30 IN) (RCP) (4: 1) (C)	2 EA
496-6007	REMOV STR (PIPE)	43 LF



STRUCTURE #13

EXISTING: 1 ~ 24" X 34' CMP TO BE REMOVED
PROPOSED: 1 ~ 24" X 40' RCP
LT: 1 ~ SET (TY II) (24 IN) (RCP) (4: 1) (C)
W/ RR9 TOEWALL
RT: 1 ~ CHPW (24 IN) (RCP) (4: 1) (C)

STA 330+55.26

ITEM	DESC	QTY
400-6005	CEM STABIL BKFL	5 CY
400-6006	CUT & RESTORING PAV	14 SY
464-6005	RC PIPE (CL III)(24 IN)	48 LF
466-6097	HEADWALL (CH - PW - 0) (DIA= 24 IN)	1 EA
467-6390	SET (TY II) (24 IN) (RCP) (4: 1) (C)	1 EA
496-6007	REMOV STR (PIPE)	34 LF

LOCATE UTILITIES BEFORE ANY EXCAVATION
DEPTHS HAVE NOT BEEN VERIFIED

FULL DEPTH HOTMIX FOR BOX CULVERTS

STATE OF TEXAS
BRYSON P. LAWRENCE
129839
LICENSED
PROFESSIONAL ENGINEER

Bryson Lawrence, P.E.

04/04/2024

Texas Department of Transportation

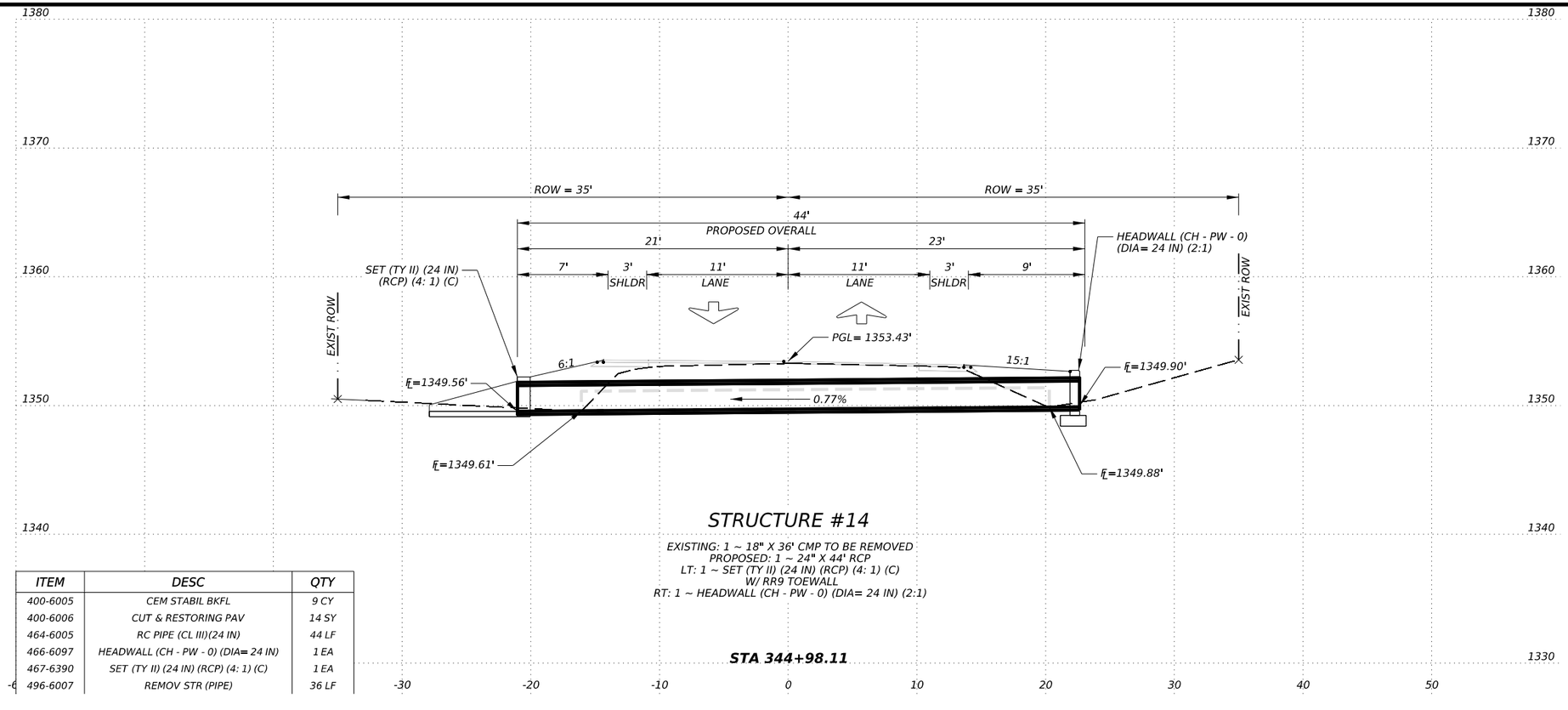
FM 422
CULVERT PROFILES

0 5 10
SCALE IN FEET

 2024 SHEET 7 OF 8

CONT	SECT	JOB	HIGHWAY
0814	01	036	FM 422
DIST	COUNTY		SHEET NO.
WFS.	BAYLOR		81

DATE: 4/3/2024 2:24:24 PM
FILE: pw://txdot.projectwiseonline.com:TXDOT2/Documents/03 - WFS/Design Projects/0814010364 - Design/Plan Set/5. Drainage/CULVERT LAYOUTS



STRUCTURE #14

EXISTING: 1 ~ 18" X 36' CMP TO BE REMOVED
PROPOSED: 1 ~ 24" X 44' RCP
LT: 1 ~ SET (TY II) (24 IN) (RCP) (4: 1) (C)
W/ RR9 TOEWALL
RT: 1 ~ HEADWALL (CH - PW - 0) (DIA= 24 IN) (2:1)

STA 344+98.11

ITEM	DESC	QTY
400-6005	CEM STABIL BKFL	9 CY
400-6006	CUT & RESTORING PAV	14 SY
464-6005	RC PIPE (CL III)(24 IN)	44 LF
466-6097	HEADWALL (CH - PW - 0) (DIA= 24 IN)	1 EA
467-6390	SET (TY II) (24 IN) (RCP) (4: 1) (C)	1 EA
496-6007	REMOV STR (PIPE)	36 LF

LOCATE UTILITIES BEFORE ANY EXCAVATION
DEPTHS HAVE NOT BEEN VERIFIED

FULL DEPTH HOTMIX FOR BOX CULVERTS

STATE OF TEXAS
BRYSON P. LAWRENCE
129839
LICENSED
PROFESSIONAL ENGINEER

Bryson Lawrence, P.E.

04/04/2024

Texas Department of Transportation

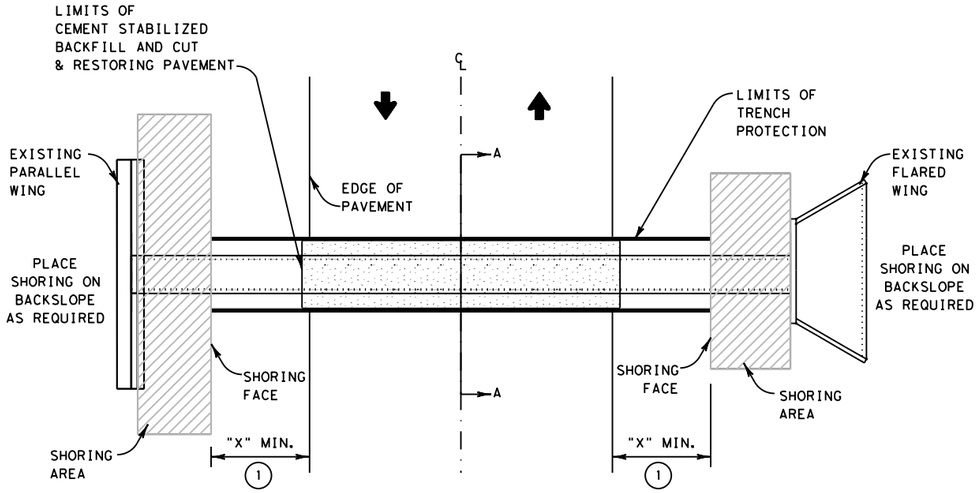
FM 422
CULVERT PROFILES

0 5 10
SCALE IN FEET

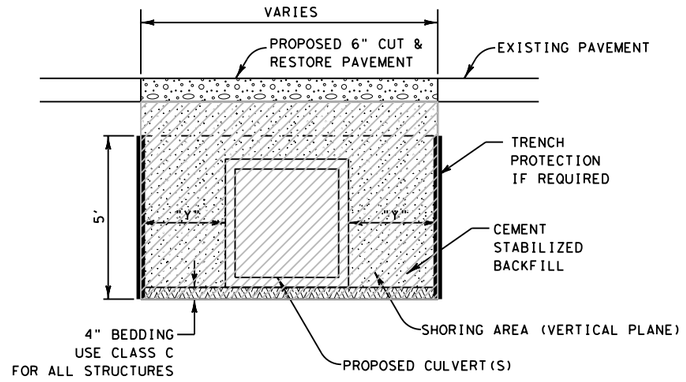
 SHEET 8 OF 8

CONT	SECT	JOB	HIGHWAY
0814	01	036	FM 422
DIST	COUNTY		SHEET NO.
WFS.	BAYLOR		82

DATE: 4/3/2024 2:24:26 PM
FILE: pw://txdot.projectwiseonline.com:TXDOT2/Documents/03 - WFS/Design Projects/081401036/4 - Design/Plan Set/5. Drainage/CULVERT LAYOUTS



PLAN VIEW
TYPICAL SECTION



SECTION A-A
SHORING AND CUT & RESTORING PAVEMENT DETAIL

SURFACE AREA IN A VERTICAL PLANE TO BE MEASURED AND PAID IF GREATER THAN FIVE FEET. THIS SHALL INCLUDE INGRESS/EGRESS AREAS.

CEMENT STABILIZED BACKFILL

SL:1 = SLOPE RATIO (HORIZONTAL : 1 VERTICAL) SEE REQUIREMENTS BASED ON SOIL TYPE

(1) ADEQUATE PHYSICAL BARRIER PROTECTION SHALL BE PROVIDED AT ALL EXCAVATIONS IN ACCORDANCE WITH WORKSHEET FOR EDGE CONDITION TREATMENT TYPES AND BC(10)-14. THIS SHALL BE AS DIRECTED BY THE ENGINEER.

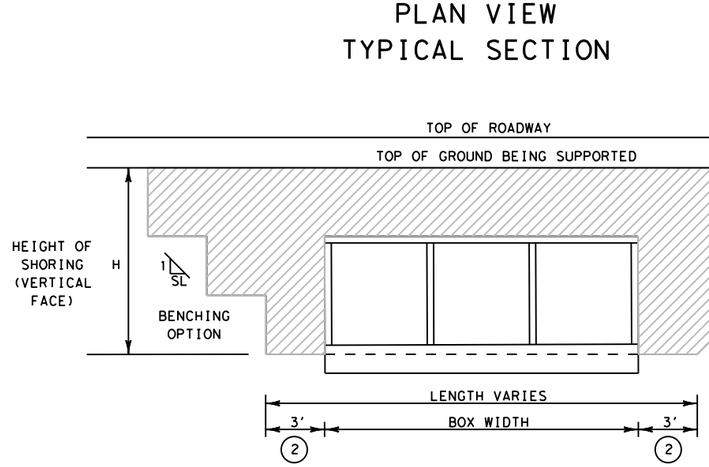
EMBANKMENT FRONT SLOPE SHALL BE A 3:1 OR FLATTER FROM EDGE OF PAVEMENT TO SHORING FACE. SEE EDGE CONDITION TREATMENT TYPES FOR REQUIRED DEVICES.

MINIMUM "X" OFFSET DISTANCE SHALL BE SPECIFIED IN SHORING PLAN SUBMITTED BY THE CONTRACTOR AND BASED ON SPECIFIC STRUCTURE LOCATION. THIS OFFSET WILL BE BASED ON SOIL TYPES, STABILITY, SLOPE ANALYSIS, AND SURCHARGE LOADING, BUT IN NO CASE SHALL IT BE LESS THAN 5 FEET.

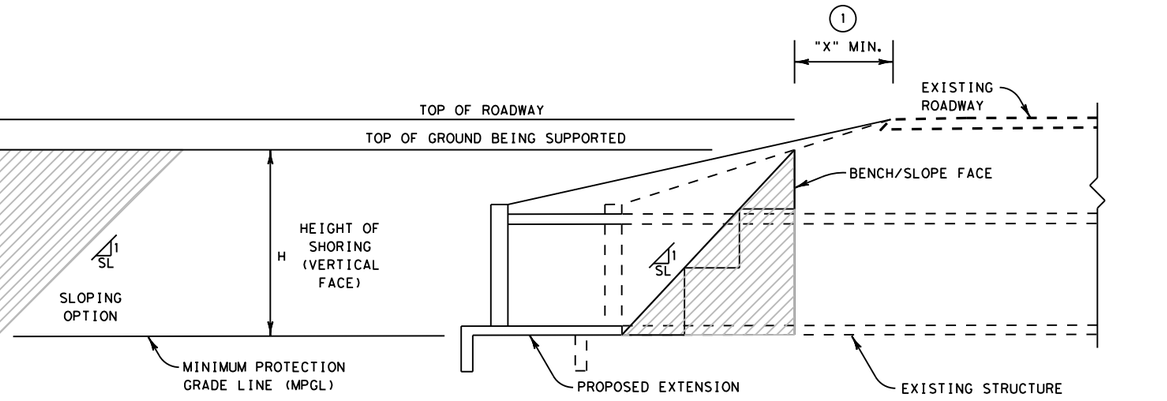
(2) DISTANCE IS MEASURED FROM END OF BOX OR END TREATMENT PLUS 3 FEET IF SHORING PLACEMENT IS REQUIRED.

"Y" ~ DIMENSION AS SPECIFIED BY ITEM 400 BUT NO LESS THAN ONE FOOT.

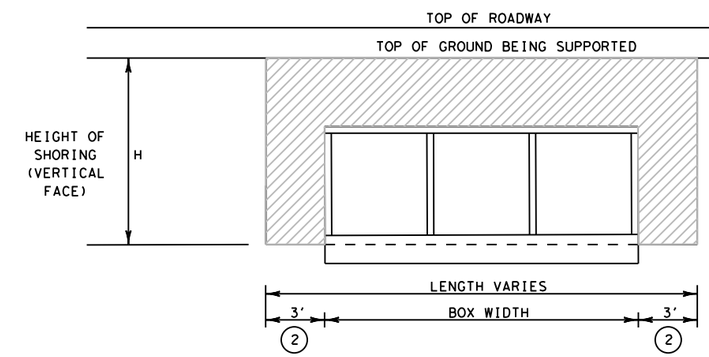
DETAILS AND NOTES SHOWN ARE GENERIC ILLUSTRATIONS AND DO NOT COVER ALL POSSIBLE SCENARIOS THAT MAY BE ENCOUNTERED ON A PROJECT. THE DETAILS ARE NOT A SUBSTITUTE FOR THE REQUIRED SPECIFIC ENGINEERED PLAN THAT IS TO BE SUBMITTED FOR APPROVAL AT EACH LOCATION THAT REQUIRES TEMPORARY SPECIAL SHORING. ALL ENGINEERED PLAN REQUIREMENTS SHALL COMPLY WITH OSHA STANDARDS 29 CFR PART 1926, SUBPART P.



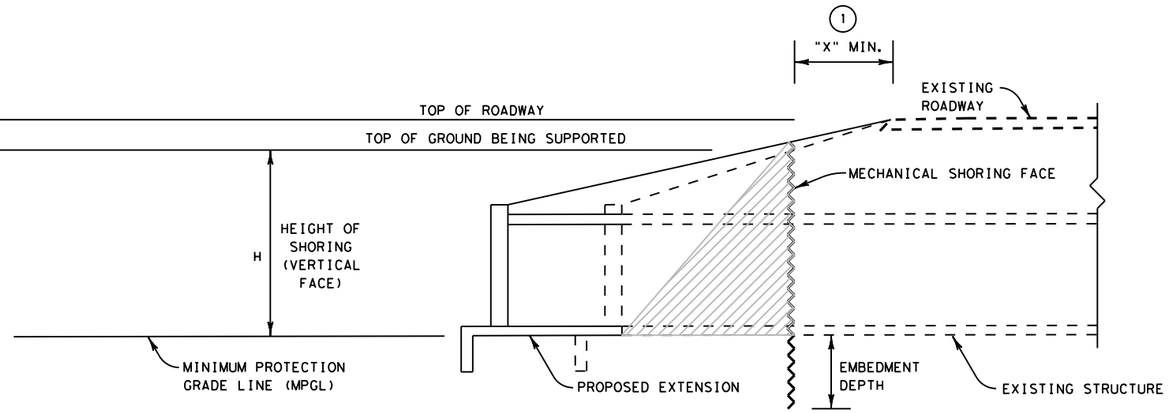
PROFILE VIEW
SLOPING/BENCHING



CROSS SECTION VIEW
SLOPING/BENCHING



PROFILE VIEW
MECHANICAL SHORING



CROSS SECTION VIEW
MECHANICAL SHORING

STATE OF TEXAS
BRYSON P. LAWRENCE
129839
LICENSED PROFESSIONAL ENGINEER

Bryson Lawrence, P.E.

03/29/2024

FM 422

TEMPORARY SPECIAL SHORING DETAILS

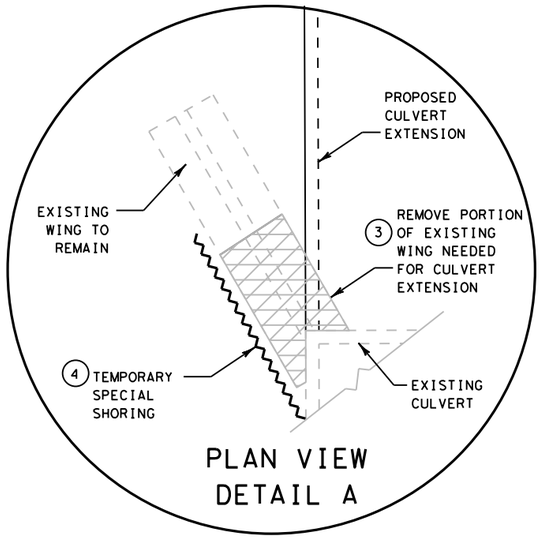
NOT TO SCALE

Texas Department of Transportation®

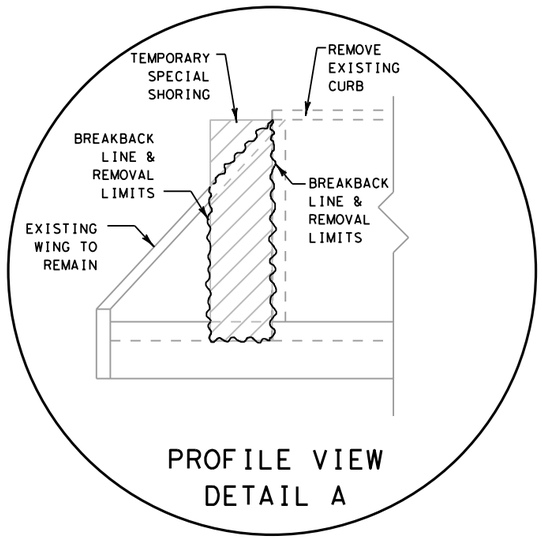
SHEET 1 OF 6

CONT	SECT	JOB	HIGHWAY
0814	01	036	FM 422
DIST	COUNTY		SHEET NO.
WFS.	BAYLOR		83

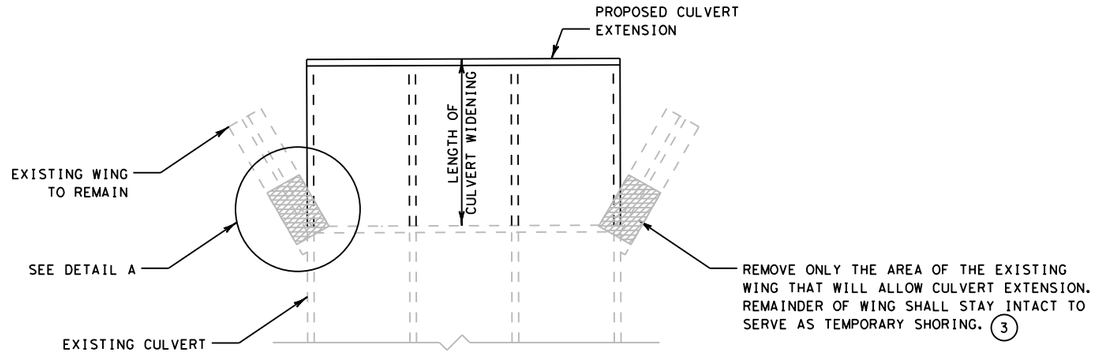
DATE: 3/29/2024 1:20:01 PM
FILE: pw://txdot.projectwiseonline.com:TXDOT2/Documents/03 - WFS/Design Projects/081401036/4 - Design/Plan Set/5. Drainage/TEMPORARY SPECIAL SHORING DETAILS



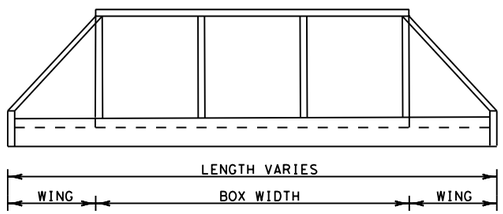
PLAN VIEW
DETAIL A



PROFILE VIEW
DETAIL A



PLAN VIEW
BOX CULVERT EXTENSION WITH
PARTIAL SECTION OF FLARED WINGS REMAINING IN PLACE



PROFILE VIEW
EXISTING BOX CULVERT WITH FLARED WINGS

SURFACE AREA IN A VERTICAL PLANE TO BE MEASURED AND PAID IF GREATER THAN FIVE FEET.

REMOVAL AREA

(3) AREA AND EXTENT OF REMOVAL SHOWN MAY VARY. REMAINDER OF EXISTING WING MAY REMAIN IN PLACE IF PROPER BACKFILL AND A MINIMUM FILL HEIGHT CAN BE ACHIEVED. IN SOME CASES THE EXISTING WING MAY HAVE TO BE FULLY REMOVED. THE ENGINEER SHALL APPROVE BREAKBACK LINES AND AREA TO REMAIN OR TO BE REMOVED PRIOR TO BEGINNING WORK. PAYMENT FOR ALL WORK SHALL BE SUBSIDIARY TO SHORING ITEMS.

(4) PLACE SHORING FOR PROTECTION IN AREA WHERE EXISTING WING WAS REMOVED AS DESIGNED BY ENGINEERED PLAN SUBMITTED BY CONTRACTOR.

DETAILS AND NOTES SHOWN ARE GENERIC ILLUSTRATIONS AND DO NOT COVER ALL POSSIBLE SCENARIOS THAT MAY BE ENCOUNTERED ON A PROJECT. THE DETAILS ARE NOT A SUBSTITUTE FOR THE REQUIRED SPECIFIC ENGINEERED PLAN THAT IS TO BE SUBMITTED FOR APPROVAL AT EACH LOCATION THAT REQUIRES TEMPORARY SPECIAL SHORING. ALL ENGINEERED PLAN REQUIREMENTS SHALL COMPLY WITH OSHA STANDARDS 29 CFR PART 1926, SUBPART P.

STATE OF TEXAS
BRYSON P. LAWRENCE
129839
LICENSED PROFESSIONAL ENGINEER

Bryson Lawrence, P.E.

03/29/2024

FM 422

TEMPORARY SPECIAL SHORING DETAILS

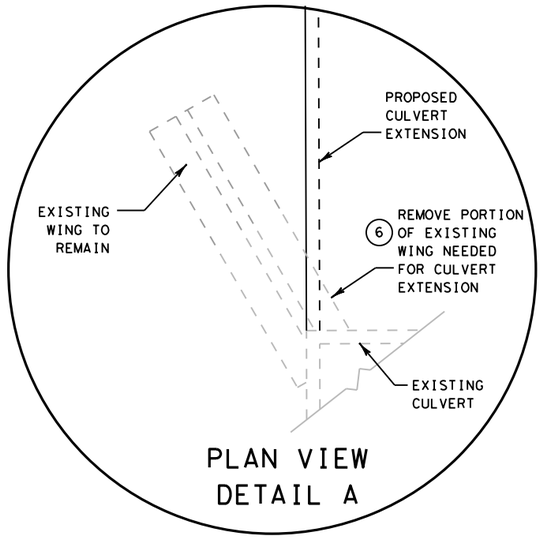
NOT TO SCALE

Texas Department of Transportation®

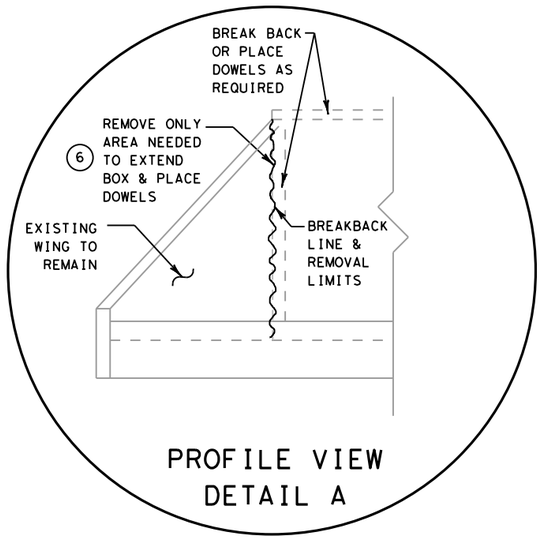
SHEET 2 OF 6

CONT	SECT	JOB	HIGHWAY
0814	01	036	FM 422
DIST	COUNTY		SHEET NO.
WFS.	BAYLOR		84

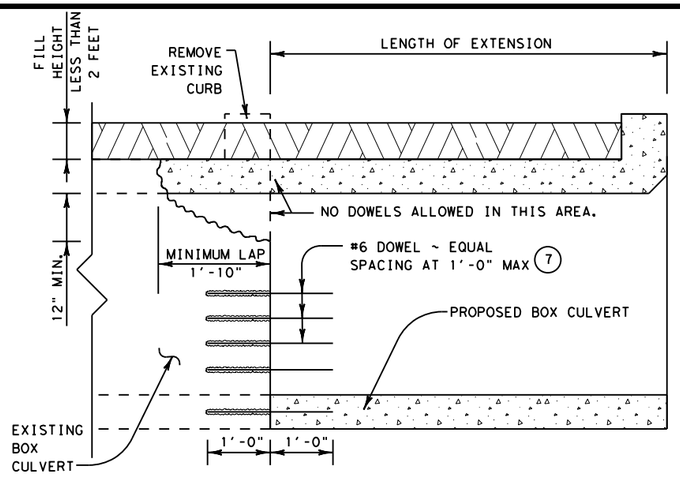
DATE: 3/29/2024 1:20:01 PM
FILE: pw://txdot.projectwiseonline.com:TXDOT2/Documents/03 - WFS/Design Projects/081401036/4 - Design/Plan Set/5. Drainage/TEMPORARY SPECIAL SHORING DETAILS



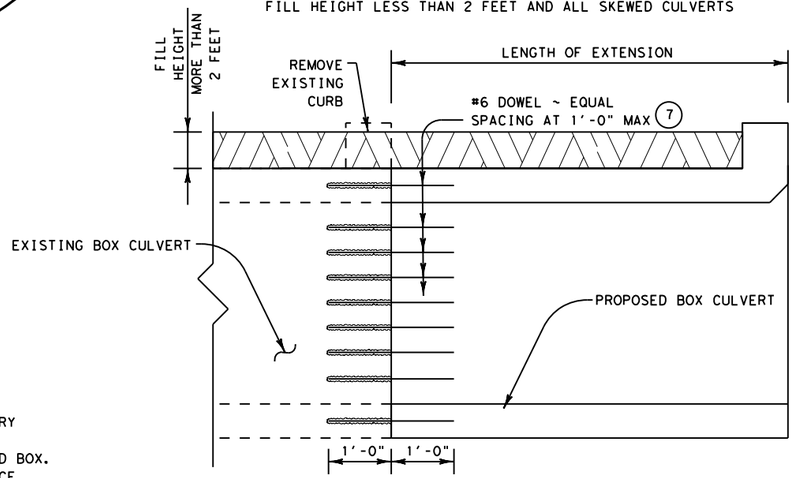
PLAN VIEW
DETAIL A



PROFILE VIEW
DETAIL A



LENGTHENING DETAIL TYPICAL 7
FILL HEIGHT LESS THAN 2 FEET AND ALL SKEWED CULVERTS



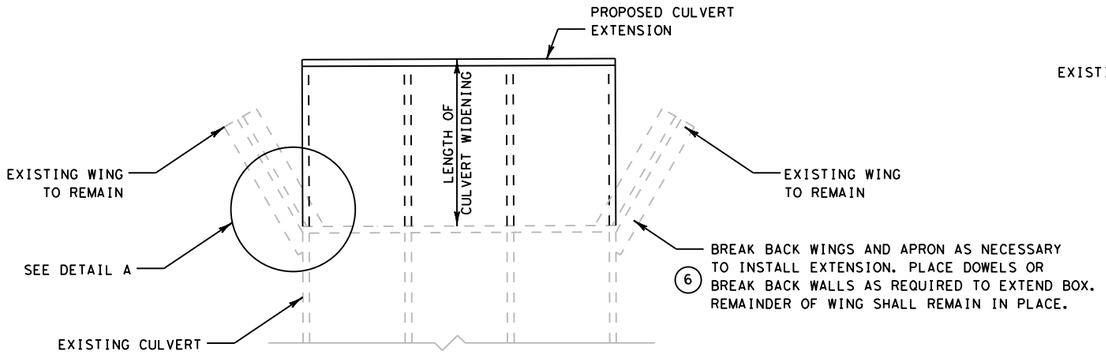
LENGTHENING DETAIL TYPICAL 7
FILL HEIGHT MORE THAN 2 FEET AND NOT A SKEWED CULVERT

6 REMAINDER OF EXISTING WING MAY REMAIN IN PLACE IF PROPER BACKFILL AND A MINIMUM FILL HEIGHT CAN BE ACHIEVED. ENGINEER SHALL APPROVE BREAKBACK LINES AND AREA TO REMAIN OR TO BE REMOVED PRIOR TO BEGINNING WORK.

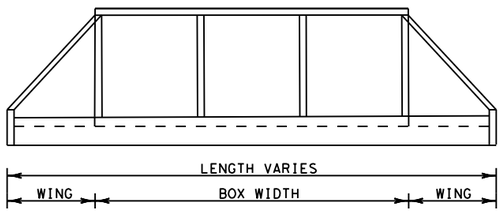
7 FOR BOX CULVERTS WITH LESS THAN 2'-0" OF FILL, BREAK BACK THE TOP SLAB TO PROVIDE A 1'-10" MINIMUM LAP OF THE EXISTING LONGITUDINAL BARS WITH THE LONGITUDINAL BARS IN THE EXTENSION. DOWELS ARE NOT ALLOWED FOR BOX CULVERTS WITH LESS THAN 2'-0" OF FILL.

FOR BOX CULVERTS WITH MORE 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. 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'-0" CENTER-TO-CENTER SPACING. MINIMUM EMBEDMENT DEPTH IS 12".

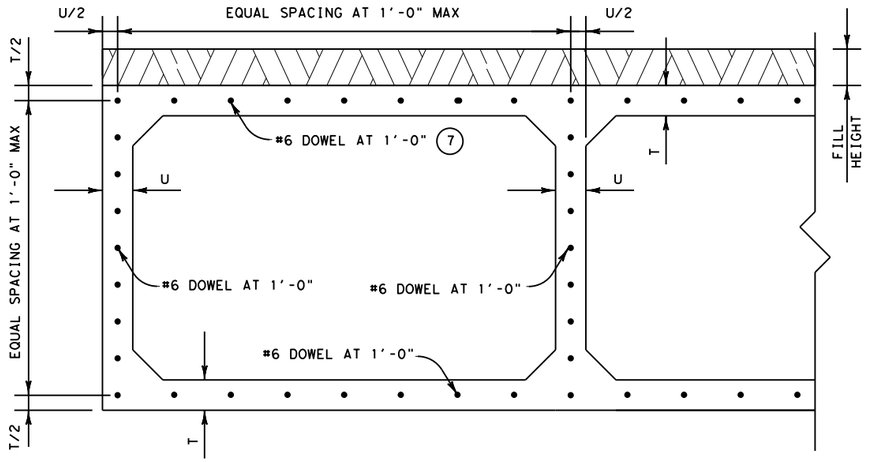
CORE AND GROUT #6 DOWEL 1'-0" INTO EXISTING STRUCTURE AS SHOWN IN ACCORDANCE WITH ITEM 420.4.7.10, "CONCRETE STRUCTURES" ~ INSTALLATION OF DOWELS AND ANCHOR BOLTS."



PLAN VIEW
BOX CULVERT EXTENSION WITH
FLARED WINGS REMAINING IN PLACE



PROFILE VIEW
EXISTING BOX CULVERT WITH FLARED WINGS



LENGTHENING DETAIL TYPICAL SECTION 7
NOTE: ONLY SHOWING DOWELS OTHER REINFORCING NOT SHOWN FOR CLARITY.

STATE OF TEXAS
BRYSON P. LAWRENCE
129839
LICENSED PROFESSIONAL ENGINEER

Bryson Lawrence, P.E.

03/29/2024

FM 422

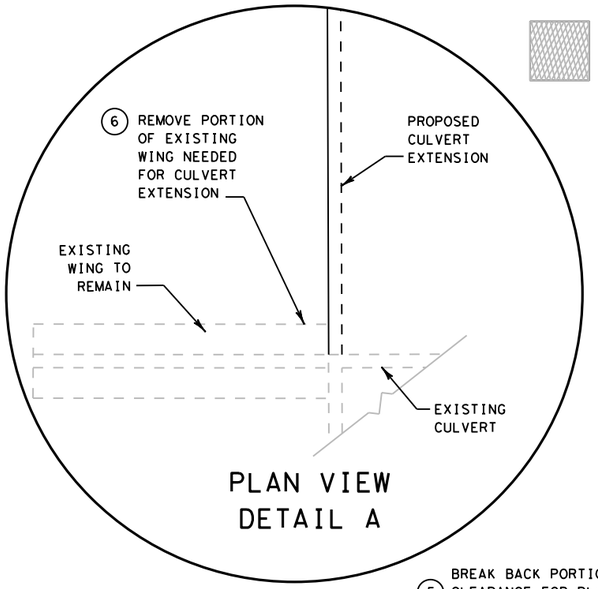
TEMPORARY SPECIAL SHORING DETAILS

NOT TO SCALE

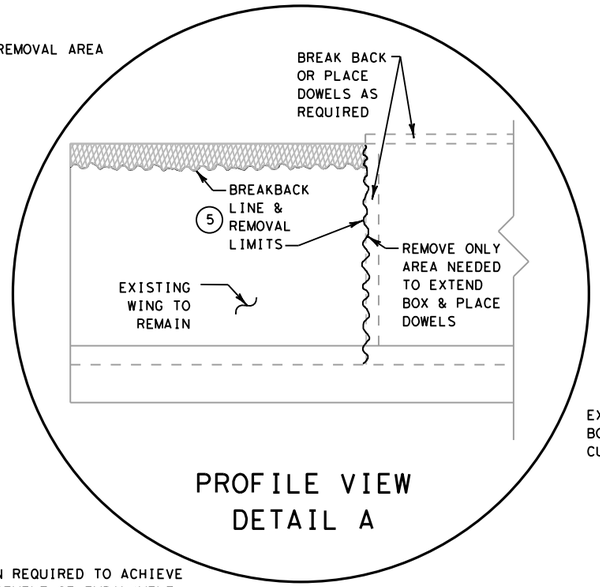
© 2024 Texas Department of Transportation®

CONT	SECT	JOB	HIGHWAY
0814	01	036	FM 422
DIST	COUNTY		SHEET NO.
WFS.	BAYLOR		85

DATE: 3/29/2024 1:20:02 PM
FILE: pw://txdot.projectwiseonline.com:TXDOT2/Documents/03 - WFS/Design Projects/0814010364 - Design/Plan Set/5. Drainage/TEMPORARY SPECIAL SHORING DETAILS

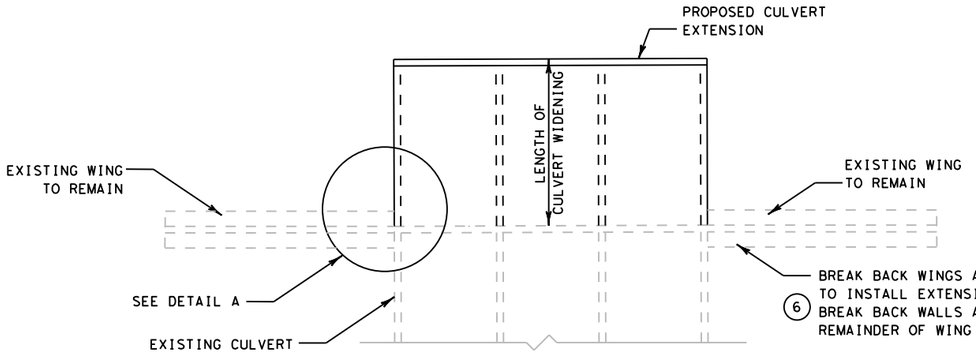


PLAN VIEW
DETAIL A

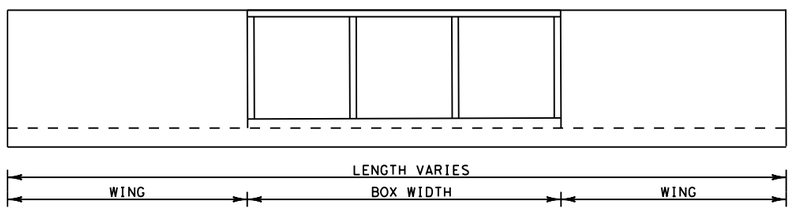


PROFILE VIEW
DETAIL A

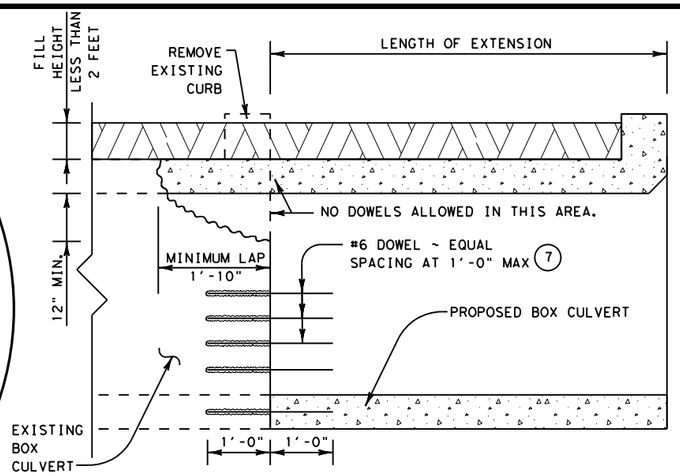
5 BREAK BACK PORTION REQUIRED TO achieve CLEARANCE FOR PLACEMENT OF EMBANKMENT FOR FRONT SLOPE AS REQUIRED BY TYPICAL.



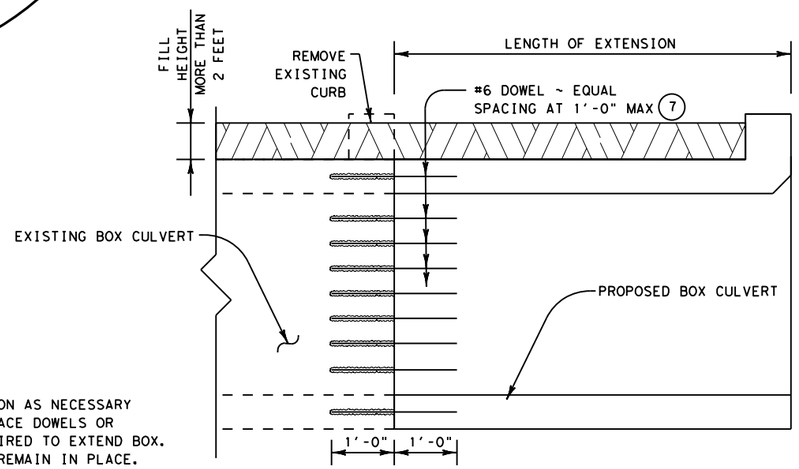
PLAN VIEW
BOX CULVERT EXTENSION WITH
PARTIAL SECTION OF PARALLEL
WINGS REMAINING IN PLACE



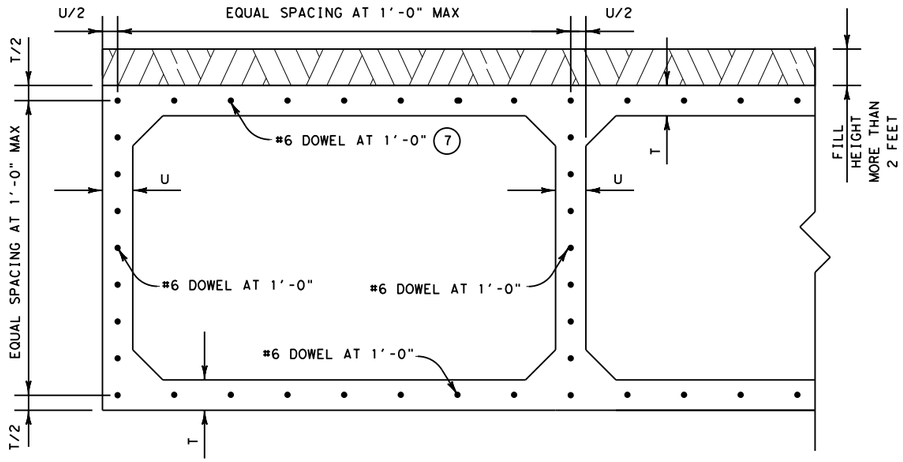
PROFILE VIEW
EXISTING BOX CULVERT WITH PARALLEL WINGS



LENGTHENING DETAIL TYPICAL 7
FILL HEIGHT LESS THAN 2 FEET AND ALL SKEWED CULVERTS



LENGTHENING DETAIL TYPICAL 7
FILL HEIGHT MORE THAN 2 FEET AND NOT A SKEWED CULVERT



LENGTHENING DETAIL TYPICAL SECTION 7
NOTE: ONLY SHOWING DOWELS OTHER REINFORCING NOT SHOWN FOR CLARITY.

6 REMAINDER OF EXISTING WING MAY REMAIN IN PLACE IF PROPER BACKFILL AND A MINIMUM FILL HEIGHT CAN BE ACHIEVED. ENGINEER SHALL APPROVE BREAKBACK LINES AND AREA TO REMAIN OR TO BE REMOVED PRIOR TO BEGINNING WORK.

7 FOR 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. DOWELS ARE NOT ALLOWED FOR BOX CULVERTS WITH LESS THAN 2'-0" OF FILL.

FOR BOX CULVERTS WITH MORE 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. 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'-0" CENTER-TO-CENTER SPACING. MINIMUM EMBEDMENT DEPTH IS 12".

CORE AND GROUT #6 DOWEL 1'-0" INTO EXISTING STRUCTURE AS SHOWN IN ACCORDANCE WITH ITEM 420.4.7.10, "CONCRETE STRUCTURES" ~ INSTALLATION OF DOWELS AND ANCHOR BOLTS."

STATE OF TEXAS
BRYSON P. LAWRENCE
129839
LICENSED PROFESSIONAL ENGINEER

Bryson Lawrence, P.E.

03/29/2024

FM 422

TEMPORARY SPECIAL SHORING DETAILS

NOT TO SCALE

© 2024 Texas Department of Transportation®

CONT	SECT	JOB	HIGHWAY
0814	01	036	FM 422
DIST	COUNTY		SHEET NO.
WFS.	BAYLOR		86

TEMPORARY SHORING AND TRENCH PROTECTION GENERAL NOTES:

THE SHORING PLAN SHALL ADDRESS VERY CLEARLY WITH RESPECT TO THE PROPOSED CONTRACTORS SEQUENCE OF WORK AND METHODS FOR SHORING FOR THE DURATION OF THE PROJECT EXPOSURE.

THE SHORING PLAN SHALL NOT BE A GENERIC PLAN BUT VERY SPECIFIC IN REGARDS TO EACH LOCATION THAT REQUIRES SHORING WITH ALL RELEVANT MATERIALS TO BE USED WITH SPECIFICATIONS DETAILING THOSE MATERIALS ALONG WITH ANY MANUFACTURERS SPECIFICATIONS OF MATERIALS BEING USED.

BENCHING, SLOPING, MECHANICAL SHORING INSTALLED OUTSIDE LIMITS SHOWN WILL NOT BE PAID FOR UNLESS APPROVED IN WRITING BY THE ENGINEER.

SUBSTITUTION OF BENCHING/SLOPING FOR MECHANICAL SHORING WILL NOT BE PERMITTED UNLESS APPROVED IN WRITING BY THE ENGINEER.

SUBSITUTION OF MECHANICAL SHORING FOR BENCHING/SLOPING WILL NOT BE PERMITTED UNLESS APPROVED IN WRITING BY THE ENGINEER.

DETAILED SHORING PLAN WILL BE CONSIDERED PREREQUISITE TO SUBSTITUTION OF ORIGINAL SHORING PROPOSED IN PLAN.

SUBMIT SOIL CLASSIFICATION AND IDENTIFICATION TESTING THAT IS PERFORMED FOR EACH STRUCTURE TO THE ENGINEER PRIOR TO COMMENCING WORK.

CALCULATIONS THAT ARE SUBMITTED SHALL INCLUDE A GLOBAL STABILITY ANALYSIS TO ENSURE IMPLEMENTATION OF THE SHORING DOES NOT CREATE A HAZARD TO THE ROADWAY. ALL DESIGN CALCULATIONS SHALL CLEARLY INDICATE DESIGN ASSUMPTIONS, SOIL PARAMETERS, SURCHARGE LOADING AND GEOMETRY USED FOR ANALYSIS AND ALL OTHER INFORMATION DEEMED PERTINENT. TYPICAL SECTIONS SHOULD BE SUBMITTED TO VERIFY THE MODELS AND METHODS PROPOSED FOR USE BY THE CONTRACTOR ACCOUNT FOR SURCHARGE LOADING.

SUBMIT COMPETENT PERSONS NAME THAT WILL BE ON SITE WHILE SHORING SYSTEMS ARE IN USE. THAT PERSON SHALL BE RESPONSIBLE FOR MAKING SURE THAT ALL ELEMENTS OF THE PLAN ARE ADHERED TO AND SHALL NOTIFY THE ENGINEER IF CONDITIONS ENCOUNTERED ARE DIFFERENT THAN ANTICIPATED AND SHOWN ON THE SUBMITTED AND APPROVED PLAN.

SHORING MUST BE PROPERLY INSTALLED PRIOR TO EXCAVATION. LOCATION OF SHORING SHOWN IS DIAGRAMMATIC AND NOT THE MEANS AND METHOD OF DOING THE WORK.

EVALUATION OF THE EXISTING WINGWALL TO REMAIN SHALL BE PERFORMED TO ENSURE STABILITY OF THE WALL ONCE DETACHED FROM EXISTING CULVERT WALL. SUBMIT THIS EVALUATION FOR APPROVAL PRIOR TO PERFORMING ANY REMOVAL.

SHORING ITEM WILL BE MEASURED BY THE SQUARE FOOT OF SURFACE AREA OF A VERTICAL PLANE AT THE FACE OF THE SHORING BETWEEN THE TOP OF THE GROUND BEING SUPPORTED AND THE MINIMUM PROTECTION GRADE LINE SHOWN.

SHORING PROJECTING ABOVE THE LEVEL OF THE GROUND BEING SUPPORTED AND CAUSED BY THE CONTRACTORS OPERATIONS WILL NOT BE MEASURED FOR PAYMENT. SHORING THAT PROJECTS ABOVE THE LEVEL OF THE GROUND AND PRESENTS A HAZARD TO THE TRAVELING PUBLIC SHALL BE PROTECTED BY MEANS AND METHODS APPROVED BY THE ENGINEER AND AT THE EXPENSE OF THE CONTRACTOR PERFORMING THE WORK AND SUBSIDAIRY TO ITEM 403.

TRENCH PROTECTION WILL BE MEASURED BY THE LINEAR FOOT OF PROTECTION IN PLACE.

TRENCHES OR EXCAVATIONS LESS THAN FIVE FEET IN DEPTH SHALL ALSO BE EFFECTIVELY PROTECTED WHEN EXAMINATION OF GROUND INDICATES HAZARDOUS GROUND MOVEMENT MAY BE EXPECTED.

WHERE TRENCH PROTECTION IS SHOWN IN THE ROADWAY AREA NO BENCHING OR SLOPING WILL BE ALLOWED.

DETAILS AND NOTES SHOWN ARE GENERIC ILLUSTRATIONS AND DO NOT COVER ALL POSSIBLE SCENARIOS THAT MY BE ENCOUNTERED ON A PROJECT. THE DETAILS ARE NOT A SUBSTITUTE FOR THE REQUIRED SPECIFIC ENGINEERED PLAN THAT IS TO BE SUBMITTED FOR APPROVAL AT EACH LOCATION THAT REQUIRES TEMPORARY SPECIAL SHORING. ALL ENGINEERED PLAN REQUIREMENTS FOR THOSE LOCATIONS SHALL COMPLY WITH OSHA STANDARDS 29 CFR PART 1926, SUBPART P AND AASHTO STANDARDS SPECIFICATIONS FOR HIGHWAY BRIDGES OR AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS AND AREMA MANUAL FOR RAILWAY ENGINEERING FOR RAILROAD LOADING.

SEE ITEM 402 TRENCH PROTECTION AND ITEM 403 TEMPORARY SPECIAL SHORING FOR ADDITIONAL REQUIREMENTS NOT STATED.

REQUIREMENTS BEFORE BEGINNING SHORING WORK OPERATIONS:

1. SUBMIT DETAILS AND DESIGN CALCULATIONS BEARING THE SEAL OF A LICENSED PROFESSIONAL ENGINEER FOR APPROVAL THAT COMPLIES WITH OSHA STANDARDS AND INTERPRETATIONS, 29 CFR 1926, SUBPART P, EXCAVATIONS. DESIGN STRUCTURAL SYSTEMS TO COMPLY WITH AASHTO STANDARD SPECIFICATIONS FOR HIGHWAY BRIDGES OR AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS.
2. SUBMIT PROPOSED SEQUENCE OF WORK AND METHOD FOR SHORING IF DIFFERENT THAN PROPOSED IN THE SUBMITTED ENGINEERED PLAN.
3. RECEIVE APPROVAL FOR SUBSTITUTE SHORING AS SHOWN IN THE SUBMITTED ENGINEERED PLAN.
4. SUBMIT COMPETENT PERSONS NAME THAT WILL BE ON SITE.
5. SUBMIT SOIL CLASSIFICATION AND IDENTIFICATION TEST FOR EACH SPECIFIC STRUCTURE LOCATION.
6. PROCEED WITH WORK ONLY AFTER APPROVAL IS GIVEN BY THE ENGINEER.

MAXIMUM ALLOWABLE SLOPES PER 29 CFR 1926.652		
SOIL TYPE	SLOPE (H:V)	ANGLE (DEGREES)
STABLE ROCK	VERTICAL	90
TYPE A	3/4 : 1	53
TYPE B	1 : 1	45
TYPE C	1 ½ : 1	34

MAXIMUM ALLOWABLE DEPTH OF CUT/TRENCH VARIES. SEE APPROVED ENGINEERED PLAN FOR SPECIFICS. SLOPES SHALL BE FLATTENED WHEN AN EXCAVATION HAS WATER CONDITIONS, SILTY MATERIALS, LOOSE BOULDERS, AND AREAS WHERE EROSION, DEEP FROST ACTION, SLIDE PLANES APPEAR, LOADING IMPOSED BY STRUCTURES, SURCHARGE LOADING FROM EQUIPMENT, OVERLYING MATERIAL LOADING, OR STORED MATERIAL; AND VIBRATION FROM EQUIPMENT, BLASTING, TRAFFIC OR OTHER SOURCES ARE PRESENT.

CUT AND RESTORING PAVEMENT GENERAL NOTES:

LIMITS OF CEMENT STABILIZED BACKFILL AND CUT & RESTORE PAVEMENT SHALL EXTEND 6" BEYOND EXISTING EDGE OF PAVEMENT ON EACH SIDE OF THE ROADWAY.

SEE QUANTITY SUMMARY FOR TEMPORARY SPECIAL SHORING AND TRENCH PROTECTION QUANTITIES AT APPLICABLE STRUCTURES.

TEMPORARY SPECIAL SHORING SHALL BE PLACED ON VERTICAL PLANE PARALLEL TO THE ROADWAY AS SHOWN ON SECTION A-A AND AS DESIGNED BY SUBMITTED ENGINEERED PLAN.

ON MULTI-BARREL STRUCTURES, ACCOUNT FOR ADDITIONAL BARREL WIDTHS AND BARREL SPACING. SEE CULVERT DATA SHEET FOR PROPOSED WORK AND APPLICABLE STANDARDS FOR STRUCTURE DIMENSIONS.

PLACE CEMENT STABILIZED BACKFILL AT DEPTH TO ALLOW A MINIMUM DEPTH OF 6" OF HOTMIX PLACEMENT.

HOT MIX TYPE TO BE APPROVED BY THE ENGINEER.

LENGTHENING AND SPECIAL NOTES FOR DOWEL OPERATIONS:

THE BREAK BACK LINES, AS SHOWN OR AS LOCATED AND APPROVED BY THE ENGINEER, SHALL BE SAW CUT(SCORED) 1" DEEP AND NORMAL TO THE CONCRETE SURFACE AS TO PROVIDE A CLEAN FIT UP OF NEW CONSTRUCTION. AFTER SCORING, REMOVE DAMAGED PORTIONS OF THE EXISTING STRUCTURE AND REPAIR AREAS TO A NEAT CONDITION MATCHING THE ORIGINAL PROFILE.

CARE SHALL BE TAKEN IN BREAKING BACK THE CONCRETE SO THAT EXISTING REINFORCING CAN BE RE-USED IF NEEDED. EXPOSED REINFORCING WHICH REMAINS FIRMLY ANCHORED TO THE CONCRETE SHALL BE CLEANED AND INCORPORATED INTO THE NEW CONSTRUCTION.

THE ROUGHENED, EXPOSED CONCRETE SURFACES SHALL BE CLEANED OF ALL LOOSE DEBRIS PRIOR TO THE PLACEMENT OF NEW CONCRETE.

UNLESS OTHERWISE APPROVED BY THE ENGINEER, USE ONLY HAND TOOLS OR POWER-DRIVEN CHIPPING HAMMERS (15-LB CLASS MAXIMUM) TO REMOVE CONCRETE ADJACENT TO EXTENSION AREA TO AVOID DAMAGING SURROUNDING CONCRETE.

HOLES SHALL BE DRILLED WITH A NON-IMPACT, ROTARY CORE DRILL AND CLEANED PER TXDOT SPECIFICATION REQUIREMENTS AND ADHESIVE MANUFACTURER'S INSTRUCTIONS. NO IMPACT HAMMER DRILLS WILL BE ALLOWED. NOTE THAT A SPECIAL DRILL BIT (TO CUT THROUGH EXISTING REINFORCING) MAY BE REQUIRED. ANCHORS SHALL BE INSTALLED PER ADHESIVE MANUFACTURER'S INSTRUCTIONS. SEE ITEM 420 "CONCRETE STRUCTURES SECTION 420.4.7.10 INSTALLATION OF DOWELS AND ANCHOR BOLTS IN ADDITION TO ITEM 450 RAILING FOR ALL INSTALLATION REQUIREMENTS.

ANCHOR ADHESIVE CHOSEN MUST BE ABLE TO ACHIEVE A BASIC BOND STRENGTH IN TENSION, N_{ba}, OF 26.4 KIPS. SUBMIT SIGNED AND SEALED CALCULATIONS OR THE MANUFACTURERS 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.

STATE OF TEXAS
BRYSON P. LAWRENCE
129839
LICENSED PROFESSIONAL ENGINEER

Bryson Lawrence, P.E.

03/29/2024

FM 422

TEMPORARY SPECIAL SHORING DETAILS

CONT	SECT	JOB	HIGHWAY
0814	01	036	FM 422
DIST	COUNTY		SHEET NO.
WFS.	BAYLOR		87

SUMMARY OF TEMPORARY SPECIAL SHORING & TRENCH PROTECTION											
STRUCTURE #	STATION	STRUCTURE TYPE	DESCRIPTION OF STRUCTURE	LEFT/RIGHT	EXISTING END TREATMENT TYPE	TYPE OF SHORING		TRENCH PROTECTION (LF)	**RETAIN EXISTING PARALLEL WING (YES/NO)	**RETAIN EXISTING FLARED WING (YES/NO)	REMARKS
						BENCH OR SLOPING (SF)	MECHANICAL (SF)				
1	70+19.00	BOX	3 ~ 5' X 3'	LEFT	FLARED WINGS		53		NO	NO	
1	70+19.00	BOX	3 ~ 5' X 3'	RIGHT	FLARED WINGS		53		NO	NO	
12	311+15.00	CMP	24" X 43"	LEFT	NONE		9		NO	NO	
12	311+15.00	CMP	24" X 43"	RIGHT	NONE		9		NO	NO	

NOTE:
EVALUATION OF THE EXISTING WINGWALL TO REMAIN SHALL BE PERFORMED TO ENSURE STABILITY OF THE WALL ONCE DETACHED FROM EXISTING CULVERT WALL. SUBMIT THIS EVALUATION FOR APPROVAL PRIOR TO PERFORMING ANY REMOVAL.

STATE OF TEXAS
BRYSON P. LAWRENCE
129839
LICENSED PROFESSIONAL ENGINEER

Bryson Lawrence, P.E.

04/04/2024

FM 422

TEMPORARY SPECIAL SHORING DETAILS

Texas Department of Transportation®

SHEET 6 OF 6

CONT	SECT	JOB	HIGHWAY
0814	01	036	FM 422
DIST	COUNTY		SHEET NO.
WFS.	BAYLOR		88

DATE: 4/4/2024 9:55:41 AM
FILE: pw://txdot.projectwiseonline.com:TXDOT2/Documents/03 - WFS/Design Projects/0814010364 - Design/Plan Set/5. Drainage/TEMPORARY SPECIAL SHORING DETAILS

Culvert Station and/or Creek Name	Description of Box Culert No.Spans ~ Span X Height	Max Fill Height (ft)	Applicable Box Culvert Standard	Applicable Wingwall or End Treatment Standard	Skew Angle (0°,15°, 30° or 45°)	Side Slope or Channel Slope (SL:1)	T Culvert Top Slab Thick's (in)	U Culvert Wall Thick's (in)	C Estimated Curb Height (ft)	Hw Height of Wing (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 (C.Y.)	Class "C" Conc. (Curb) (CY)	Class "C" Conc. (Wing.) (CY)	Total Wingwall Area (SF)
STR 1 STA 70+19.18 (Lt)	3 ~ 5' X 3'	3'	MC-5-20	PW-2	0	2:1	8"	7"	1.500	5.167	N/A	N/A	8.333	17.333	N/A	0.0	1.0	6.6	80
STR 1 STA 70+19.18 (Rt)	3 ~ 5' X 3'	3'	MC-5-20	PW-2	0	2:1	8"	7"	0.250	3.917	N/A	N/A	6.833	17.333	N/A	0.0	0.2	4.8	52
STR 4 STA 129+49.39 (Both)	3 ~ 5' X 3'	3'	MC-5-20	PW-2	0	2:1	8"	7"	0.250	3.917	N/A	N/A	6.833	17.333	N/A	0.0	0.4	9.6	104

DATE: 4/2/2024 9:55:37 AM
FILE: pw://txdot.projectwiseonline.com:TXDOT2/Documents/03 - WFS/Design Projects/0814010364 - Design/Plan Set/5. Drainage/BCS.dgn

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.

STATE OF TEXAS
BRYSON P. LAWRENCE
129839
LICENSED PROFESSIONAL ENGINEER

Byron Lawrence, P.E.

04/04/2024

Texas Department of Transportation

Bridge Division Standard

BOX CULVERT SUPPLEMENT
WINGS AND END TREATMENTS

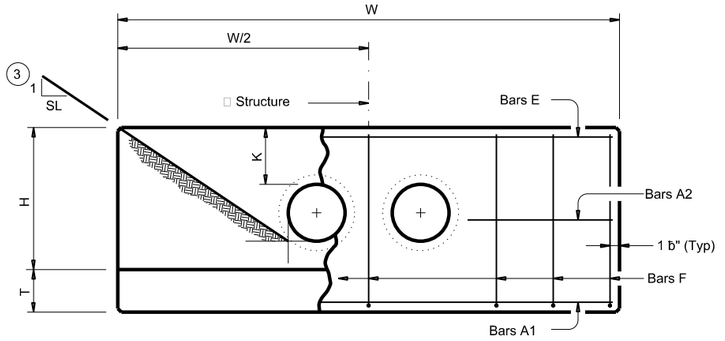
BCS

FILE: BCS.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0814	01	036	FM 422
	DIST	COUNTY		SHEET NO.
	WFS.	BAYLOR		89

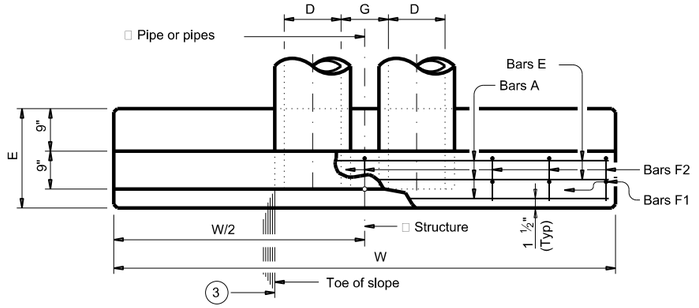
DATE: 3/29/2024 1:20:28 PM
FILE: pw://txdot.projectwiseonline.com:TXDOT2/Documents/03 - WFS/Design Projects/0814010364 - Design/Plan Set/5. Drainage/CH-PW-0.dgn

TABLE OF VARIABLE DIMENSIONS AND QUANTITIES FOR ONE HEADWALL (5)

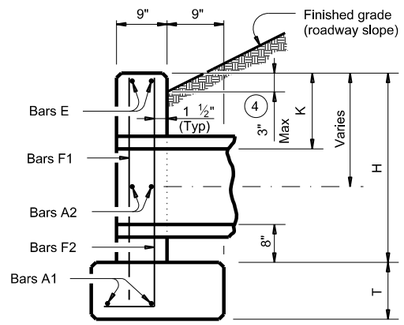
Slope	Dia of Pipe (D)	Values for One Pipe W	Values for One Pipe Reinf (Lbs) (1)	Values for One Pipe Conc (CY) (2)	Values To Be Added for Each Addt'l Pipe W	Values To Be Added for Each Addt'l Pipe Reinf (Lbs) (1)	Values To Be Added for Each Addt'l Pipe Conc (CY) (2)
2:1	12"	9' - 0"	122	1.1	1' - 9"	15	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



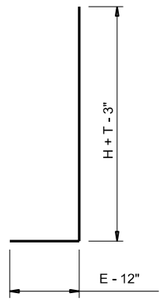
ELEVATION



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

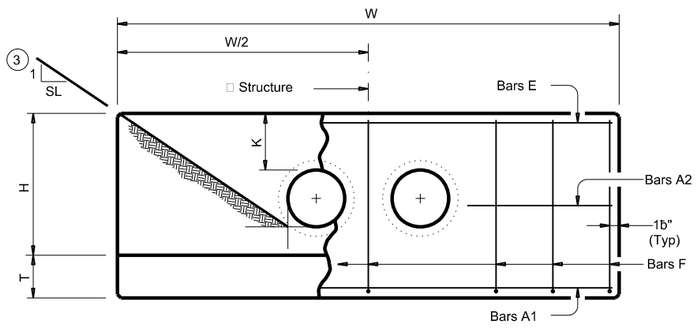
CH-PW-0

FILE:	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020 REVISIONS	CONT	SECT	JOB	HIGHWAY
	0814	01	036	FM 422
	DIST	COUNTY		SHEET NO.
	WFS.	BAYLOR		90

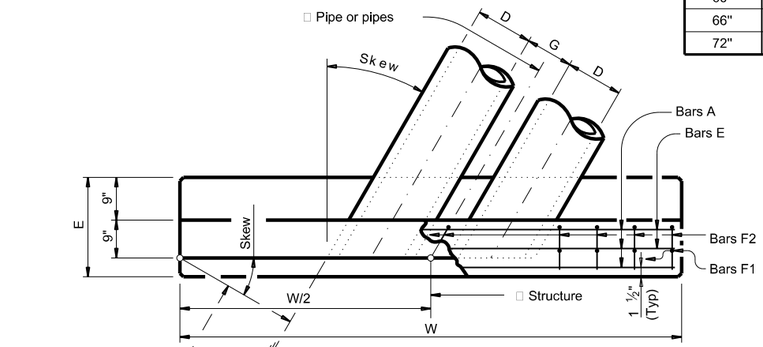
DATE: 3/29/2024 1:20:41 PM
pw://txdot.projectwiseonline.com:TXDOT2/Documents/03 - WFS/Design Projects/081401036/4 - Design/Plan Set/5. Drainage/CH-PW-S.dgn

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' - 1"	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



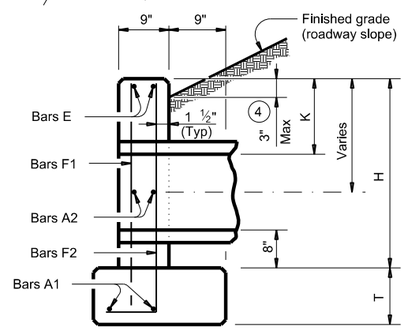
Lengths of wings based on SL:1 slope along this line.

3

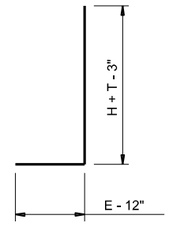
Toe of slope

PLAN OF SKEWED PIPES

Showing 30° skew.



SECTION AT CENTER OF PIPE



BARS F2

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.

(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).

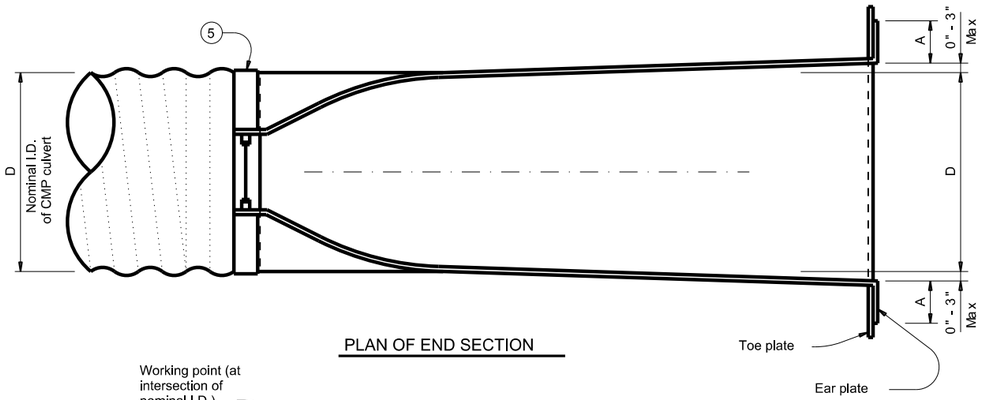
Texas Department of Transportation — Bridge Division Standard

CONCRETE HEADWALLS
WITH PARALLEL WINGS FOR SKEWED PIPE CULVERTS

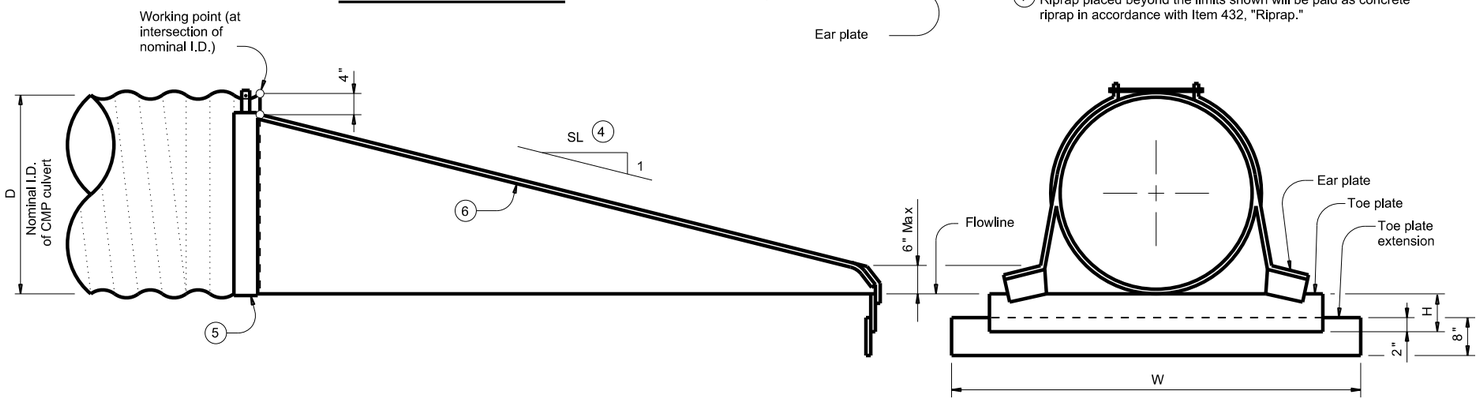
CH-PW-S

FILE: CH-PW-S.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0814	01	036	FM 422
	DIST	COUNTY		SHEET NO.
	WFS.	BAYLOR		91

DATE: 3/29/2024 1:20:53 PM
FILE: pw://txdot.projectwiseonline.com:TXDOT2/Documents/03 - WFS/Design Projects/0814010364 - Design/Plan Set/5. Drainage/GS-ES-CD.dgn



PLAN OF END SECTION



SIDE ELEVATION OF END SECTION

END ELEVATION OF END SECTION

1. Provide size of pipe runner as shown in the tables. Cross pipe is the same size as the pipe runner. Cross pipe stub out and bottom anchor pipe are the next smaller size pipe as shown in the Standard Pipe Sizes and Max Pipe Runner Length table.
2. Values shown are minimum requirements.
3. Provide all 3-piece apron sections with 12 gage sides and 10 gage center panels.
4. Recommended values of slope are 3:1, 4:1, and 6:1. All quantities, calculations, and dimensions shown herein are based on these recommended values. Slope of 3:1 or flatter is required for vehicle safety.
5. Connection between corrugated metal pipe (CMP) culvert and galvanized prefabricated end section may be with strap and bolt as shown or other combinations of threaded rods and/or coupling bands.
6. Reinforce upper edge of prefabricated end section with minimum $\frac{3}{8}$" dia smooth or deformed bar (pre-galvanized).
7. Riprap placed beyond the limits shown will be paid as concrete riprap in accordance with Item 432, "Riprap."

CROSS PIPE LENGTHS, PIPE RUNNER LENGTHS, AND REQUIRED PIPE SIZES (1)

D (Nominal) (Culvert I.D.)	Cross Pipe Length	3:1 Side Slope		4:1 Side Slope		6:1 Side Slope	
		Pipe Runner Length	Pipe Runner Size	Pipe Runner Length	Pipe Runner Size	Pipe Runner Length	Pipe Runner Size
≤ 24"	N/A	N/A	N/A	N/A	N/A	N/A	N/A
30"	3' - 11"	5' - 0"	3.500 x 0.216	7' - 1"	3.500 x 0.216	11' - 3"	4.500 x 0.237
36"	4' - 5"	6' - 7"	3.500 x 0.216	9' - 2"	3.500 x 0.216	14' - 4"	4.500 x 0.237
42"	4' - 11"	8' - 2"	3.500 x 0.216	11' - 2"	4.500 x 0.237	17' - 4"	4.500 x 0.237
48"	5' - 5"	9' - 9"	3.500 x 0.216	13' - 3"	4.500 x 0.237	20' - 4"	5.563 x 0.258
54"	5' - 11"	11' - 3"	4.500 x 0.237	15' - 4"	4.500 x 0.237	23' - 5"	5.563 x 0.258
60"	6' - 5"	12' - 10"	4.500 x 0.237	17' - 4"	4.500 x 0.237	26' - 5"	5.563 x 0.258

PREFABRICATED END SECTION INFORMATION

D (Nominal) (Culvert I.D.)	Pipe Runner Required	H (2)	A (2)	W (2)	Gage (2)
≤ 24"	No	6"	9"	D + 24"	16
30"	Skew > 15°	9"	12"	D + 32"	14
36"	All skews	9"	12"	D + 32"	14
≥ 42	All skews	12"	16"	D + 40"	12/10 (3)

STANDARD PIPE SIZES AND MAX PIPE RUNNER LENGTH (1)

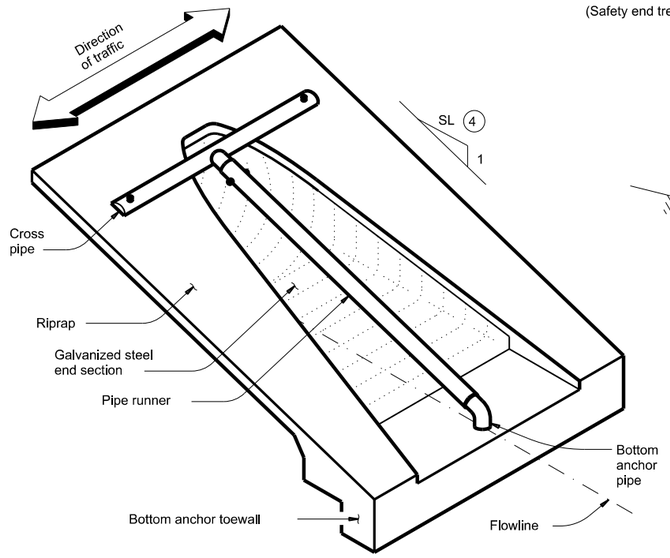
HSS Size	STD Size	Max Pipe Runner Length
2.375 x 0.154	2"	N/A
3.500 x 0.216	3"	10' - 0"
4.500 x 0.237	4"	19' - 8"
5.563 x 0.258	5"	34' - 2"

MATERIAL NOTES:
Provide pipe runners, cross pipes, and anchor pipes conforming to ASTM A1085, A500 Gr B, A53 (Type E or S, Gr B), or API 5LX52.
Provide ASTM A307 bolts and nuts.
Galvanize all steel components, except reinforcement, after fabrication. Repair galvanizing damaged during transport or construction in accordance with the specification.
Toe plate extensions are required only when shown elsewhere in the plans.
Concrete riprap is required only when pipe runners are required, unless otherwise shown in the plans. Provide concrete riprap in accordance with Item 432, "Riprap." Use Bottom Anchor Toewall Option B1 when an alternate end section with pre-attached pipe runners is supplied.
Synthetic fibers listed on the "Fibers for Concrete" Material Producer List (MPL) may be used in lieu of reinforcing steel in concrete riprap unless noted otherwise.

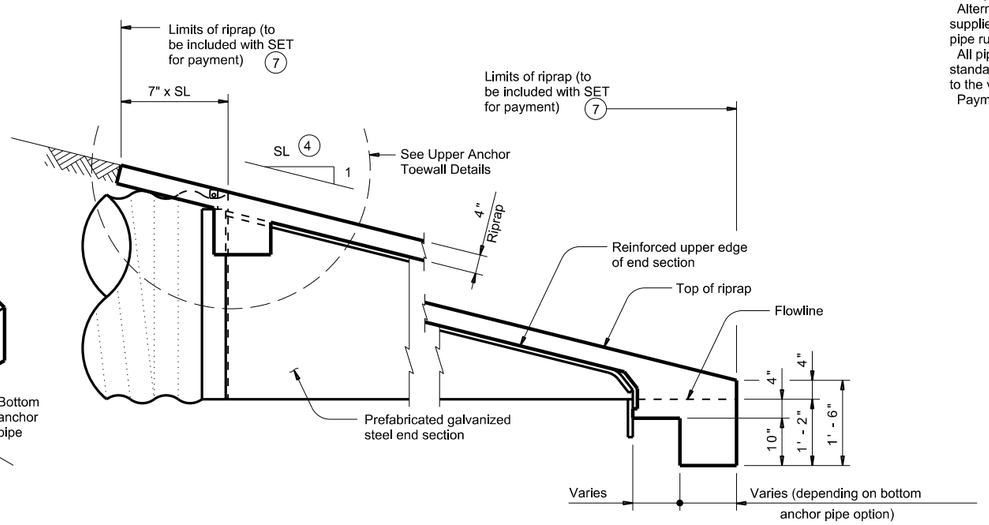
GENERAL NOTES:
Safety end treatments (SET) shown herein are intended for use in those installations where out of control vehicles are likely to traverse the openings approximately perpendicular to the pipe runners.
Pipe runners are designed for a traversing load of 1,800 pounds at yield as recommended by Research Report 280-1, "Safety Treatment of Roadside Cross-Drainage Structures", Texas Transportation Institute, March 1981.
Alternate styles of end sections, including those with pre-attached pipe runners, may be supplied. Alternate styles must meet all of the following: design values shown in tables for pipe runner size; H, A, W, and gage for end section; and material requirements noted.
All pipe runners, calculations, and dimensions are based on the End Section shown on this standard. Alternate styles of end sections will require that appropriate adjustments be made to the values presented on this standard.
Payment for riprap and toewall is included in price bid for each safety end treatment.

PREFABRICATED GALVANIZED STEEL END SECTION DETAILS

(Safety end treatment and riprap not shown for clarity.)



ISOMETRIC VIEW OF TYPICAL INSTALLATION



SIDE ELEVATION OF CAST-IN-PLACE CONCRETE

(Pipe runners are not shown for clarity.)

SHEET 1 OF 2

Texas Department of Transportation

Bridge Division Standard

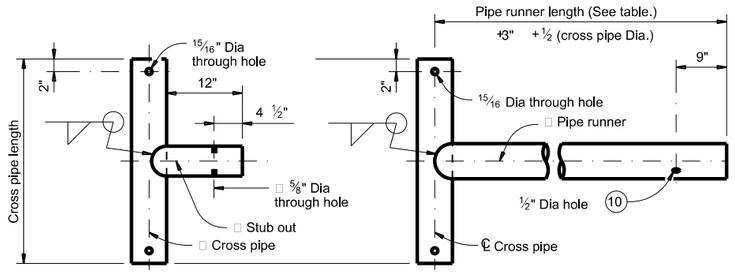
PREFABRICATED GALVANIZED STEEL END SECTION SAFETY END TREATMENT

FOR 12" TO 60" DIA CMP CULVERTS
TYPE II ~ CROSS DRAINAGE

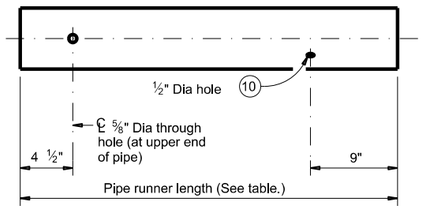
GS-ES-CD

FILE:	DN: TxDOT	CK: TxDOT	DW: JRP	CK: GAF
©TxDOT February 2020 REVISIONS	CONT	SECT	JOB	HIGHWAY
	0814	01	036	FM 422
	DIST	COUNTY		SHEET NO.
	WFS.	BAYLOR		92

DATE: 3/29/2024 1:20:54 PM
FILE: pw://txdot.projectwiseonline.com:TXDOT2/Documents/03 - WFS/Design Projects/081401036/4 - Design/Plan Set/5. Drainage/GS-ES-CD.dgn



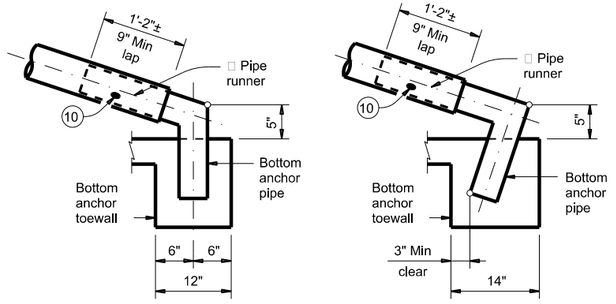
CROSS PIPE AND CONNECTIONS DETAILS



PIPE RUNNER DETAILS

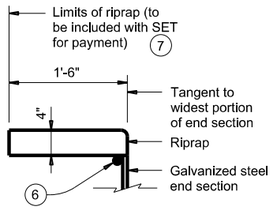
BOTTOM ANCHOR PIPE DETAILS

11

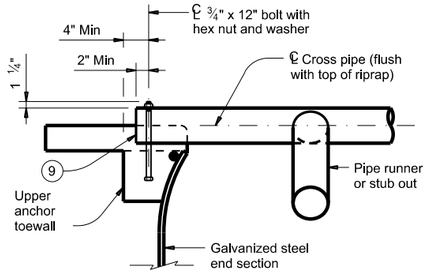


BOTTOM ANCHOR TOEWALL DETAILS

(End section and riprap are not shown for clarity.)

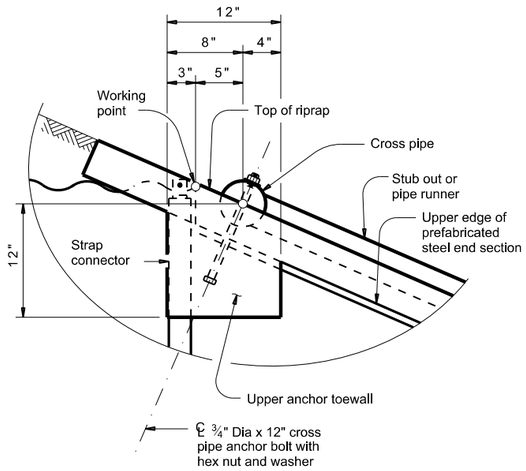


SHOWING TYPICAL RIPRAP

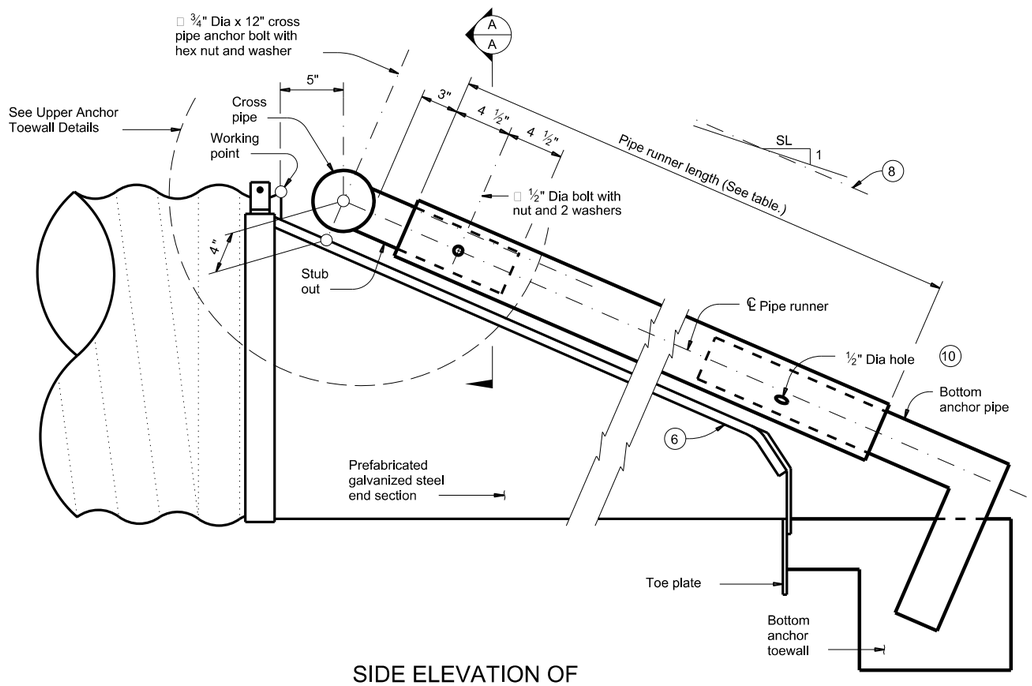


SHOWING CROSS PIPE AND UPPER ANCHOR TOEWALL

SECTION A-A



UPPER ANCHOR TOEWALL DETAILS



SIDE ELEVATION OF PIPE RUNNER INSTALLATION

(Showing pipe runner with Cross Pipe Connection Option A1 and Bottom Anchor Pipe Option B2. Riprap not shown for clarity.)

ESTIMATED CONCRETE RIPRAP QUANTITIES (CY)

12

Nominal Culvert I.D.	3:1 Side Slope	4:1 Side Slope	6:1 Side Slope
12"	0.5	0.6	0.9
15"	0.6	0.7	1.0
18"	0.6	0.8	1.1
21"	0.7	0.8	1.2
24"	0.7	0.9	1.3
27"	0.8	1.0	1.4
30"	0.9	1.1	1.5
33"	0.9	1.1	1.6
36"	1.0	1.2	1.7
42"	1.1	1.4	1.9
48"	1.2	1.5	2.1
54"	1.3	1.7	2.3
60"	1.5	1.8	2.6

6 Reinforce upper edge of prefabricated end section with minimum ⅜" dia smooth or deformed bar (pre-galvanized).

7 Riprap placed beyond the limits shown will be paid as concrete riprap in accordance with Item 432, "Riprap."

8 Note that actual slope of pipe runner may vary slightly from side slope of riprap and upper edge of prefabricated end section.

9 Take care of ensure that riprap concrete does not flow into the crosspipe so as to permit disassembly of the bolted connection to allow cleanout access.

10 After installation, inspect the ⅜" hole to ensure that the lap of the pipe runner with the bottom anchor pipe is adequate.

11 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.

12 Quantities shown are for one end of one corrugated metal pipe (CMP) culvert . For multiple pipe culverts quantities will need to be adjusted. Riprap quantities are for Contractor's information only.

Texas Department of Transportation

Bridge Division Standard

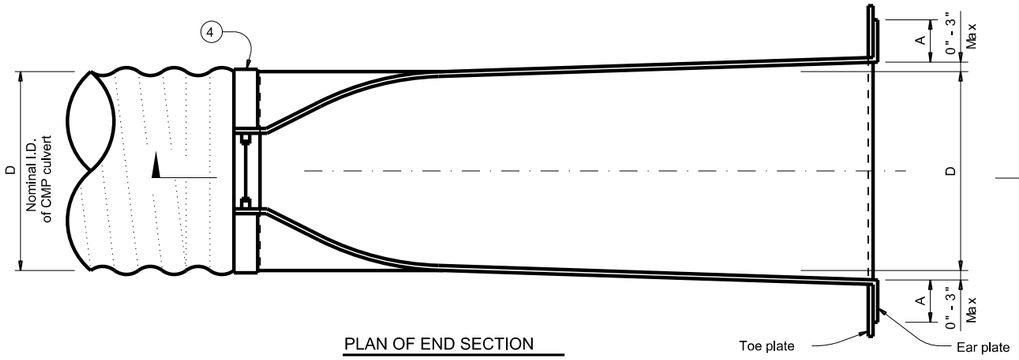
PREFABRICATED GALVANIZED STEEL END SECTION SAFETY END TREATMENT

FOR 12" TO 60" DIA CMP CULVERTS
TYPE II ~ CROSS DRAINAGE

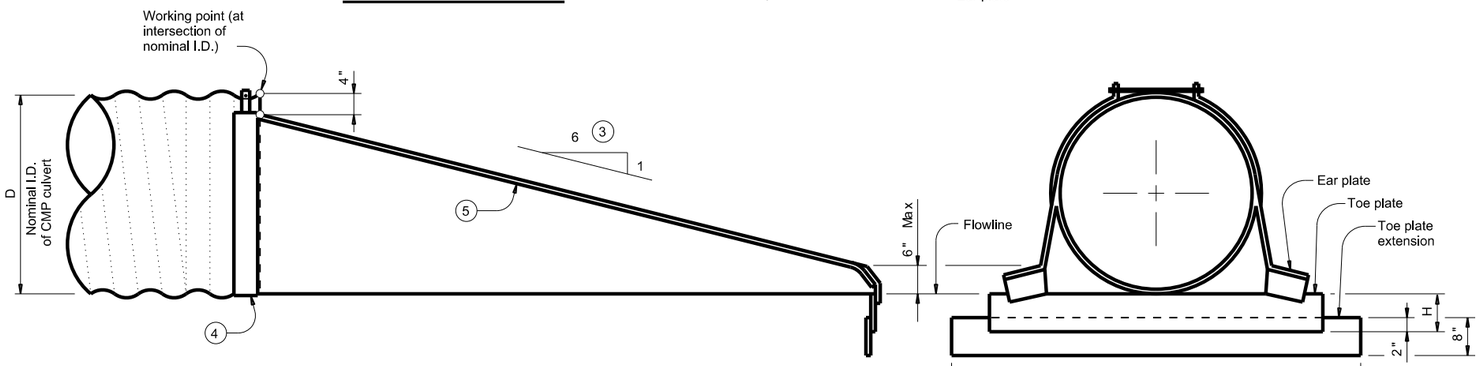
GS-ES-CD

FILE:	DN: TxDOT	CK: TxDOT	DW: JRP	CK: GAF
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0814	01	036	FM 422
	DIST	COUNTY		SHEET NO.
	WFS.	BAYLOR		93

DATE: 3/29/2024 1:21:06 PM
FILE: pw://txdot.projectwiseonline.com:TXDOT2/Documents/03 - WFS/Design Projects/081401036/4 - Design/Plan Set/5. Drainage/GS-ES-PD.dgn



PLAN OF END SECTION



SIDE ELEVATION OF END SECTION

END ELEVATION OF END SECTION

1. Provide size and lengths of cross pipes as shown in the tables, except the first cross pipe from the bottom and the saddle pipe must be 3 b".
2. Provide all 3-piece apron sections with 12 gage sides and 10 gage center panels.
3. Match cross slope as shown elsewhere in the plans. All quantities, calculations, and dimensions shown herein are based on the 6:1 Slope. 6:1 slope or flatter is required for vehicle safety.
4. Connection between corrugated metal pipe (CMP) culvert and galvanized prefabricated end section may be with strap and bolt as shown or other combinations of threaded rods and/or coupling bands.
5. Reinforce upper edge of prefabricated end section with minimum b" dia smooth or deformed bar (pre-galvanized).
6. Values shown are minimum requirements.
7. Riprap placed beyond the limits shown will be paid as concrete riprap in accordance with Item 432, "Riprap."

CROSS PIPE LENGTHS AND REQUIRED PIPE SIZES (1)

D (Nominal) Culvert I.D.)	Cross Pipe Length	Cross Pipes Required	Cross Pipe Size
≤ 30"	N/A	No	N/A
36"	4' - 5"	Yes	4.500 x 0.237
42"	4' - 11"		
48"	5' - 5"	Yes	5.563 x 0.258
54"	5' - 11"		
60"	6' - 5"		

PREFABRICATED END SECTION INFORMATION

D (Nominal) (Culvert I.D.)	H (6)	A (6)	W (6)	Gage (6)
≤ 24"	6"	9"	D + 24"	16
30"	9"	12"	D + 32"	14
36"	9"	12"	D + 32"	14
≥ 42	12"	16"	D + 40"	12/10 (2)

STANDARD PIPE SIZES (1)

HSS Size	STD Size
4.000 x 0.154	2"
4.500 x 0.216	3"
5.563 x 0.237	4"

MATERIAL NOTES:

Provide cross pipes and saddle pipes conforming to ASTM A1085, A500 Gr B, A53 (Type E or S, Gr B), or API 5LX52.

Provide ASTM A307 bolts and nuts.

Galvanize all steel components, except reinforcement, after fabrication. Repair galvanizing damaged during transport or construction in accordance with the specification.

Toe plate extensions are required only when shown elsewhere in the plans.

Concrete riprap is required only when cross pipes are required, unless otherwise shown in the plans. Provide concrete riprap in accordance with Item 432, "Riprap." Bolted anchor toewall may be omitted when an alternate end section with pre-attached cross pipes is supplied.

Synthetic fibers listed on the "Fibers for Concrete" Material Producer List (MPL) may be used in lieu of reinforcing steel in concrete riprap unless noted otherwise.

GENERAL NOTES:

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.

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.

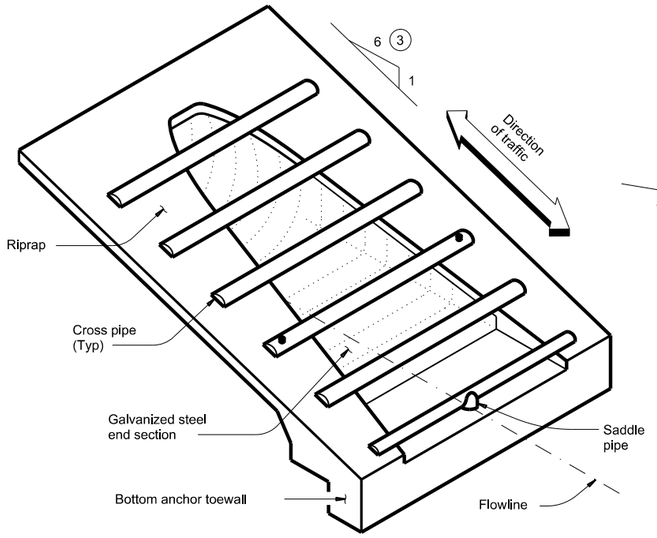
Alternate styles of end sections, including those with pre-attached cross pipes, may be supplied. Alternate styles must meet all of the following: design values shown in tables for cross pipe size; spacing of cross pipes and location of first cross pipe; H, A, W, and gage for end section; and material requirements noted.

All cross pipes, calculations, and dimensions are based on the end section shown on this standard. Alternate styles of end sections will require that appropriate adjustments be made to the values presented on this standard.

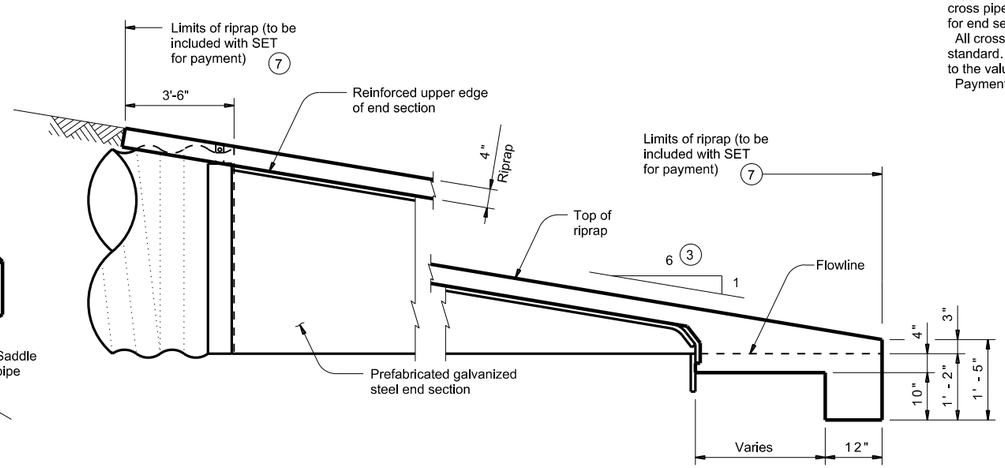
Payment for riprap and toewall is included in price bid for each safety end treatment.

PREFABRICATED GALVANIZED STEEL END SECTION DETAILS

(Safety end treatment and riprap are not shown for clarity.)



ISOMETRIC VIEW OF TYPICAL INSTALLATION



SIDE ELEVATION OF CAST-IN-PLACE CONCRETE

(Cross pipes are not shown for clarity.)

SHEET 1 OF 2

Texas Department of Transportation

Bridge Division Standard

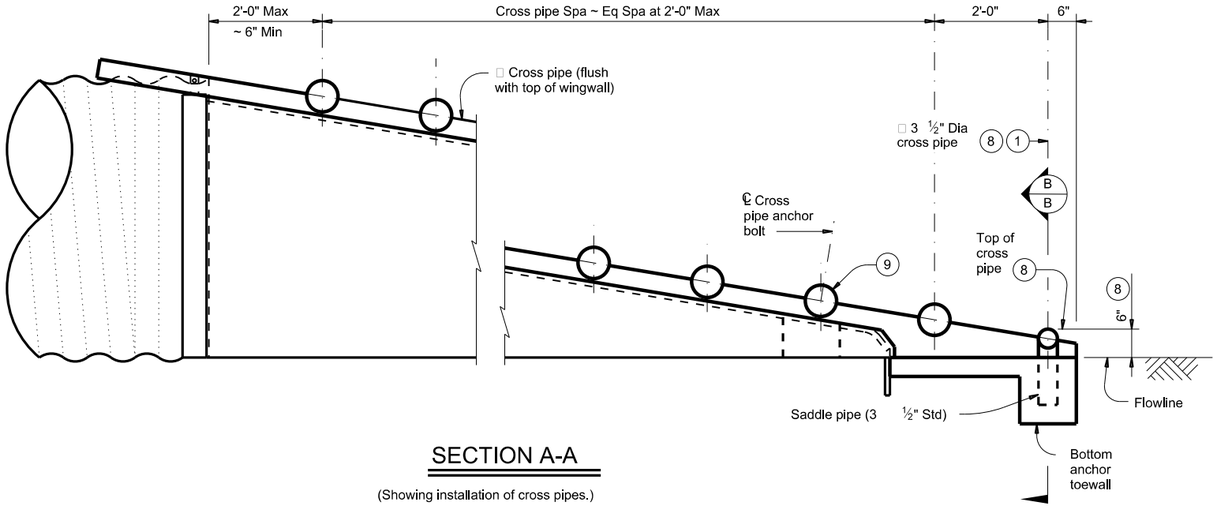
PREFABRICATED GALVANIZED STEEL END SECTION SAFETY END TREATMENT

FOR 12" TO 60" DIA CMP CULVERTS
TYPE II ~ PARALLEL DRAINAGE

GS-ES-PD

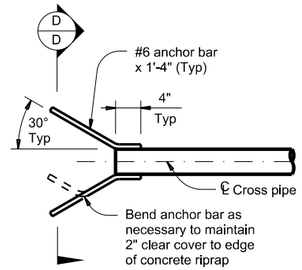
FILE:	DN: TxDOT	CK: TxDOT	DW: JRP	CK: GAF
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0814	01	036	FM 422
	DIST	COUNTY		SHEET NO.
	WFS.	BAYLOR		94

DATE: 3/29/2024 1:21:06 PM
FILE: pw://txdot.projectwiseonline.com:TXDOT2/Documents/03 - WFS/Design Projects/081401036/4 - Design/Plan Set/5. Drainage/GS-ES-PD.dgn

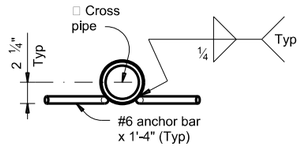


SECTION A-A

(Showing installation of cross pipes.)



PART PLAN

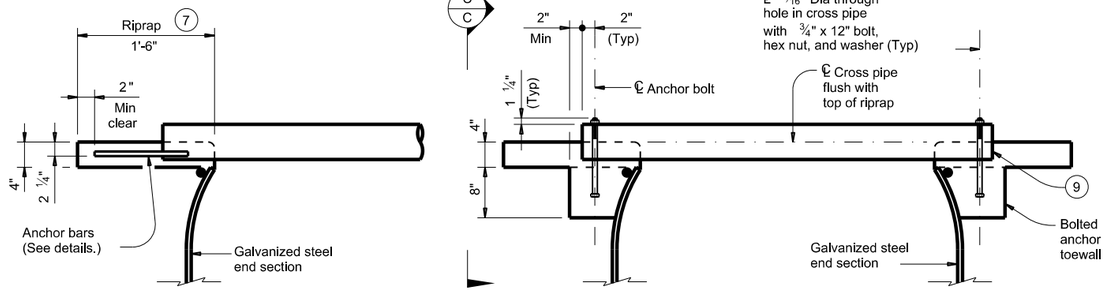


SECTION D-D

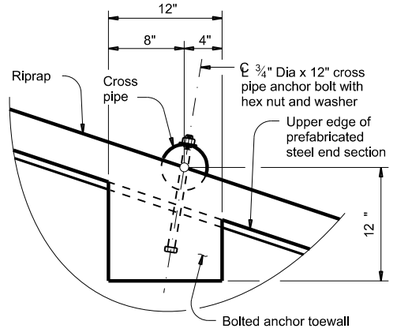
ANCHOR BAR DETAILS

ESTIMATED CONCRETE RIPRAP QUANTITIES

D (Nominal Culvert I.D.)	Concrete (CY)
12"	0.8
15"	0.9
18"	1.0
21"	1.1
24"	1.2
27"	1.3
30"	1.4
33"	1.5
36"	1.6
42"	1.8
48"	2.0
54"	2.2
60"	2.4

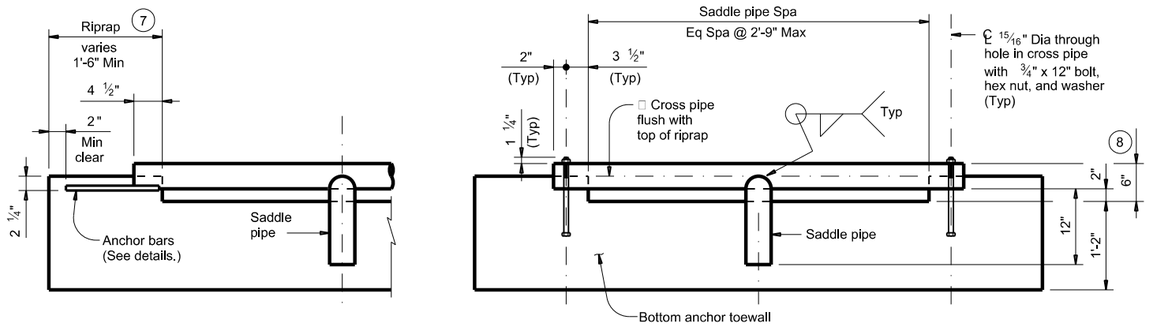


SECTION THROUGH INSTALLATION OF TYPICAL FULL CROSS PIPE



SECTION C-C

(Showing bolted anchor details.)



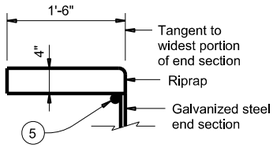
SECTION THROUGH INSTALLATION OF 3 ½" FIRST CROSS PIPE

WITH ANCHOR BARS & RIPRAP

WITH BOLTED ANCHOR

SECTION B-B

(Showing installation of cross pipes.)



CROSS SECTION OF TYPICAL RIPRAP

(1) Provide size and lengths of cross pipes as shown in the tables, except the first cross pipe from the bottom and the saddle pipe must be 3 ½". All other values shown are minimum requirements.

(5) Reinforce upper edge of prefabricated end section with minimum ⅜" diameter smooth or deformed bar (pre-galvanized).

(7) Riprap placed beyond the limits shown will be paid as concrete riprap in accordance with Item 432, "Riprap."

(8) The proper installation of the first cross pipe is critical for vehicle safety. The top of the first cross pipe must be placed at no more than 6" above the flow line.

(9) The third cross pipe from the bottom of the culvert must always be installed using a bolted connection. Ensure that concrete does not flow into this cross pipe so as to permit disassembly of the bolted connection to allow cleanout access.

(10) Riprap quantities shown are for one end of one culvert only. For multiple culverts, quantities will need to be adjusted. Riprap quantities are for Contractor's information only.

Texas Department of Transportation

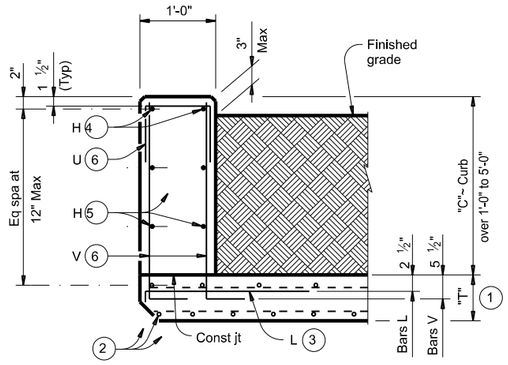
Bridge Division Standard

PREFABRICATED GALVANIZED STEEL END SECTION SAFETY END TREATMENT

FOR 12" TO 60" DIA CMP CULVERTS
TYPE II ~ PARALLEL DRAINAGE

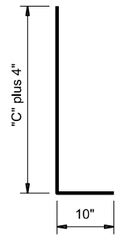
GS-ES-PD

FILE:	DN: TxDOT	CK: TxDOT	DW: JRP	CK: GAF
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0814	01	036	FM 422
	DIST	COUNTY		SHEET NO.
	WFS.	BAYLOR		95

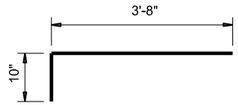


TYPICAL SECTION

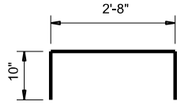
Used for curbs over 1'-0" to 5'-0"



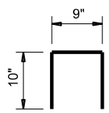
BARS V (#5) (6)
Spaced at 12" Max



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

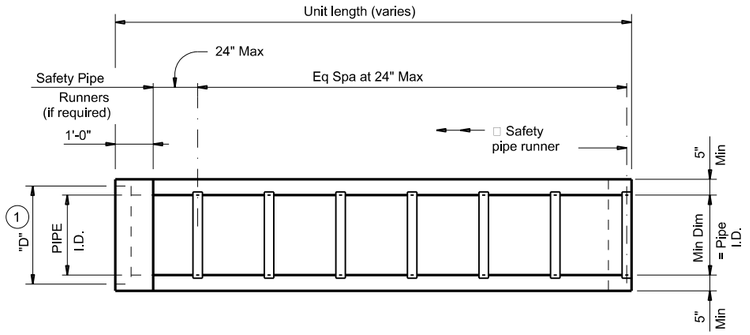
EXTENDED CURB DETAILS
FOR BOX CULVERTS WITH CURBS OVER 1'-0" TO 5'-0" TALL

ECD

FILE:	DN: GAF	CK: TxDOT	DW: TxDOT	CK: GAF
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0814	01	036	FM 422
	DIST	COUNTY		SHEET NO.
	WFS.	BAYLOR		96

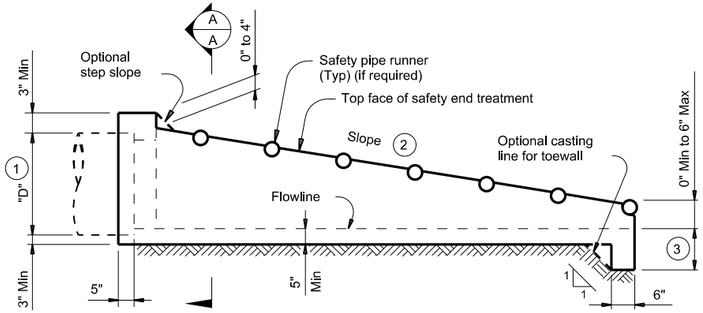
DATE: 4/3/2024 5:36:59 PM
FILE: T:\WFSDESGN\Plans\0814-01\036\4 - Design\Plan Set\1.General\CD-ECD-20.dgn

DATE: 3/29/2024 1:22:31 PM
FILE: pw://txdot.projectwiseonline.com:TXDOT2/Documents/03 - WFS/Design Projects/081401036/4 - Design/Plan Set/5. Drainage/PSET-SP.dgn



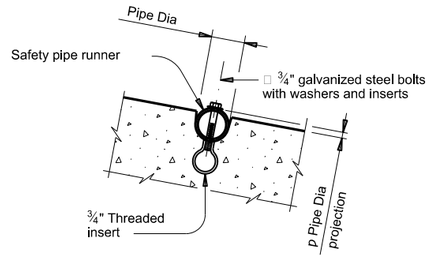
PLAN

(Showing bell end connection.)



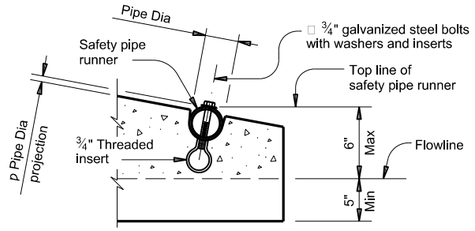
LONGITUDINAL ELEVATION

(Showing bell end connection.)

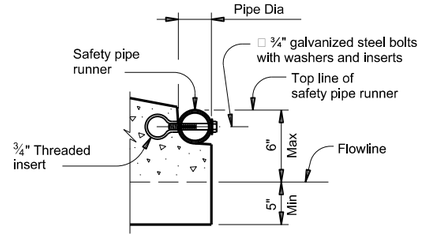


INSTALLATION DETAIL FOR SAFETY PIPE RUNNERS

(If required)



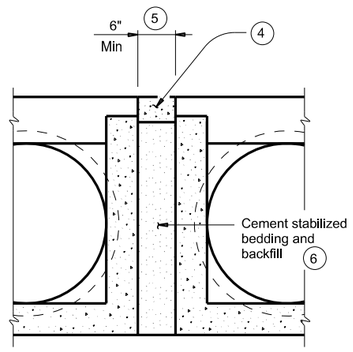
OPTION A



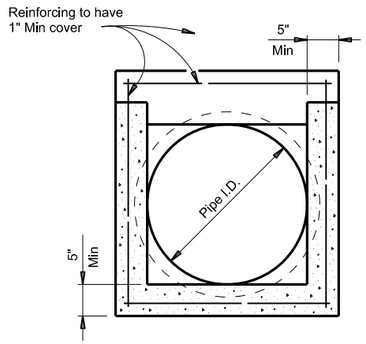
OPTION B

END DETAILS FOR INSTALLATION OF SAFETY PIPE RUNNERS

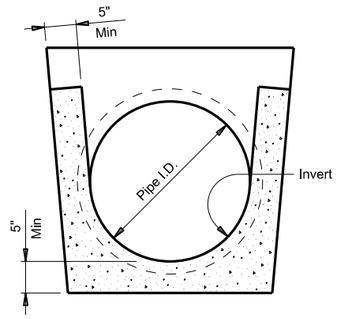
(If required)



MULTIPLE PIPE INSTALLATION

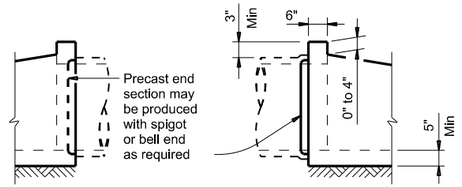


OPTION WITH SQUARE BOTTOM



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

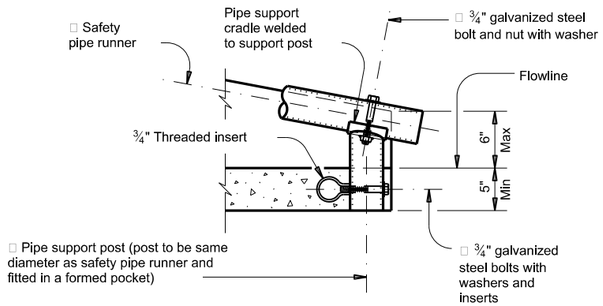
PSET-SP

FILE:	DN: RLW	CK: KLR	DW: JTR	CK: GAF
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS 12-21: Added 42" TP	0814	01	036	FM 422
	DIST	COUNTY		SHEET NO.
	WFS.	BAYLOR		97

DATE: 3/29/2024 1:22:44 PM
FILE: pw://txdot.projectwiseonline.com:TXDOT2/Documents/03 - WFS/Design Projects/08140103/4 - Design/Plan Set/5. Drainage/PSET-SC.dgn

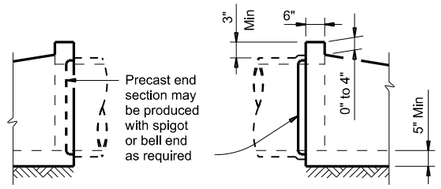
REQUIREMENTS FOR CULVERT PIPES AND SAFETY PIPE RUNNERS

Pipe I.D.	RCP Wall "B" Thickness	TP Wall Thickness (8)	"D" (1)	Slope	Min Length of Unit	Single Pipe		Multiple Pipes	
						Skew	Pipe Runners Required	Skew	Pipe Runners Required
12"	2"	1.15"	17.00"	3:1	2' - 11"	≤ 45°	No	≤ 45°	No
				4:1	3' - 6"				
				6:1	4' - 9"				
15"	2 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"				



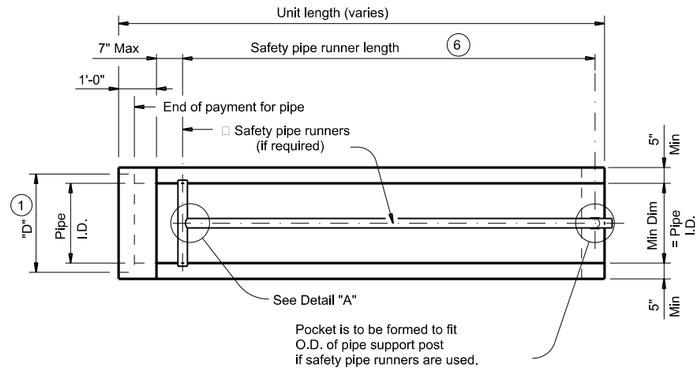
END DETAIL FOR INSTALLATION OF SAFETY PIPE RUNNERS

(If required)



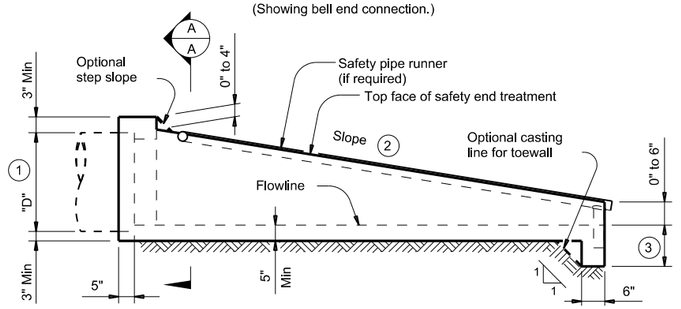
OPTIONAL JOINT FOR RCP

(Showing joint between RCP and precast safety end treatment)



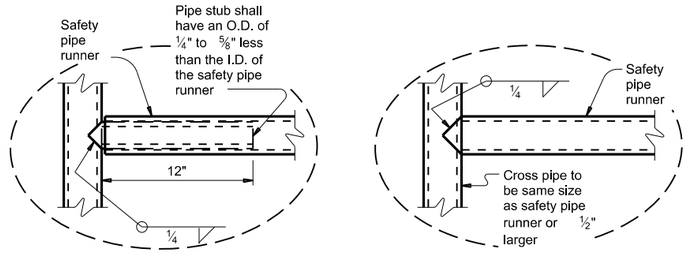
PLAN

(Showing bell end connection.)

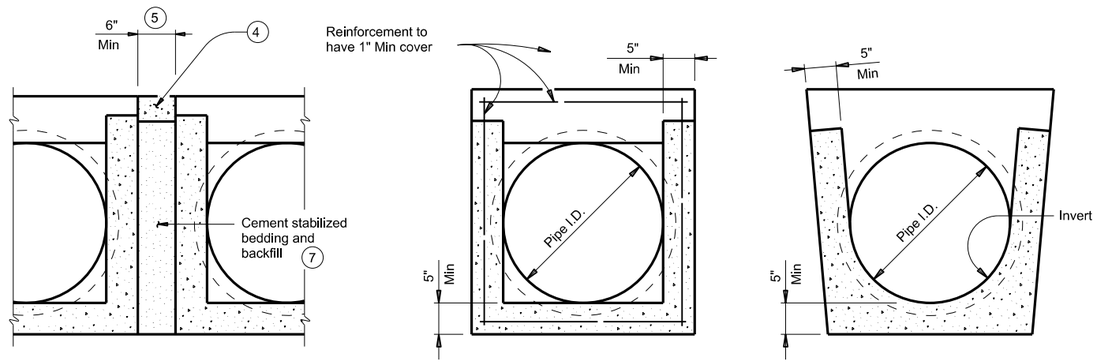


LONGITUDINAL ELEVATION

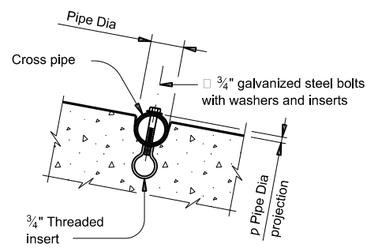
(Showing bell end connection.)



(If required)



SECTION A-A



INSTALLATION DETAIL FOR SAFETY PIPE RUNNERS

(If required)

SAFETY PIPE RUNNER DIMENSIONS

Max Safety Pipe Runner Length	Required Pipe Runner Size		
	Pipe Size	Pipe O.D.	Pipe I.D.
11' - 2"	3" STD	3.500"	3.068"
15' - 6"	3 ½" STD	4.000"	3.548"
20' - 10"	4" STD	4.500"	4.026"
35' - 4"	5" STD	5.563"	5.047"

(1) Dimension "D" is based on reinforced concrete pipe (RCP) meeting the requirements of ASTM C-76, Class III, (RCP Wall "B" thickness). Adjust "D" for any other wall thickness used. For thermoplastic pipe (TP) take into account the annular space requirements for grouted connections.

(2) Slope as shown elsewhere in plans. Slope of 3:1 or flatter is required for vehicle safety.

(3) Toewall to be used only when dimension is shown elsewhere in the plans.

(4) Fill the top 4" of void between precast end treatments with concrete riprap. Concrete riprap is considered subsidiary to the Item 467, "Safety End Treatment."

(5) Adjust clear distance between pipes to provide for the minimum distance between safety end treatments.

(6) Measured along slope.

(7) Provide cement stabilized bedding and backfill in accordance with the Item 400, "Excavation and Backfill for Structures." Bedding and backfill is considered subsidiary to the Item 467, "Safety End Treatment." When concrete riprap is specified around the safety end treatment, backfill as directed by Engineer.

(8) Thermoplastic pipe wall thickness may vary. Adjust accordingly. Thermoplastic pipe requires the safety end treatments to have a bell end for grouted connections.

GENERAL NOTES:

Precast safety end treatment for reinforced concrete pipe (RCP), and thermoplastic pipe (TP) may be used for TYPE II end treatment as specified in Item "Safety End Treatment."

When precast safety end treatment is used as a Contractor's alternate to mitered RCP, riprap will not be required unless noted otherwise on the plans.

Synthetic fibers listed on the "Fibers for Concrete" Material Producer List (MPL) may be used in lieu of steel reinforcing in riprap concrete unless noted otherwise.

Manufacture this product in accordance with Item 467, "Safety End Treatment" except as noted below :

A. Provide minimum reinforcing of #4 at 6" (Grade 40) or #4 at 9" (Grade 60) each way or 6"x6" - D12 x D12 or 5"x5" - D10 x D10 welded wire reinforcement (WWR).

B. For precast (steel formed) sections, provide Class "C" concrete (f'c = 3,600 psi).

At the option and expense of the Contractor, the next larger size of safety end treatment may be furnished as long as the "D" dimension cast is that of the required size of pipe.

Pipe runners are designed for a traversing load of 1,800 Lbs at yield as recommended by Research Report 280-1, "Safety Treatment of Roadside Cross-Drainage Structures", Texas Transportation Institute, March 1981.

Provide safety pipe runners, cross pipes, pipe support posts, and pipe stubs meeting the requirements of ASTM A53 (Type E or S, Grade B), ASTM A500 (Grade B), or API 5LX52.

Galvanize all steel components except reinforcing steel after fabrication. Repair galvanizing damaged during transport or construction in accordance with the specifications.

Connect RCP using the Optional Joint for RCP detail shown or in accordance with Item 464 "Reinforced Concrete Pipe." Connect TP by grouting. See Pipe and Box Grouted Connections (PBGC) standard for grouted connections with TP and precast safety end treatment.

Texas Department of Transportation

Bridge Division Standard

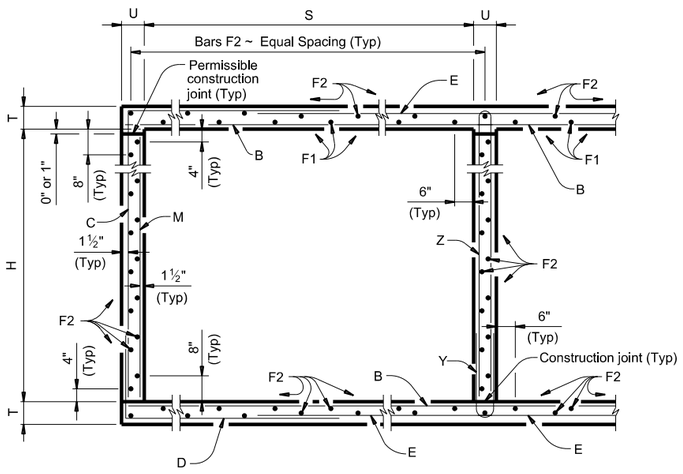
PRECAST SAFETY END TREATMENT

TYPE II ~ CROSS DRAINAGE

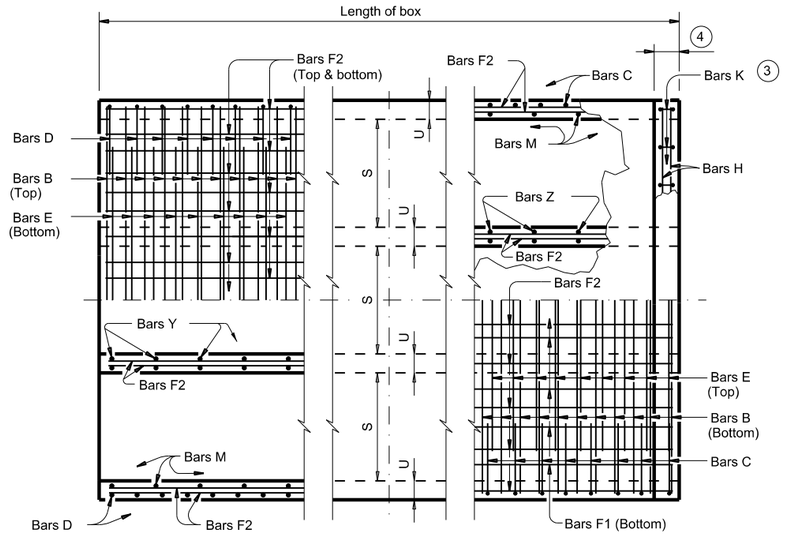
PSET-SC

FILE: PSET-SC.dgn	DN: RLW	CK: KLR	DW: JTR	CK: GAF
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS 12-21: Added 42" TP	0814	01	036	FM 422
	DIST	COUNTY		SHEET NO.
	WFS.	BAYLOR		98

DATE: 3/29/2024 1:22:57 PM
FILE: pw://txdot.projectwiseonline.com:TXDOT2/Documents/03 - WFS/Design Projects/081401036/4 - Design/Plan Set/5. Drainage/MC-5-20.dgn



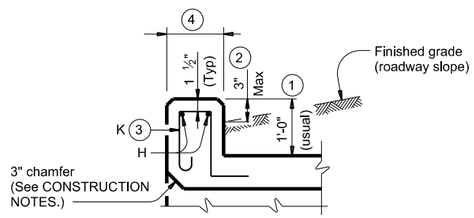
TYPICAL SECTION



BOTTOM SLAB

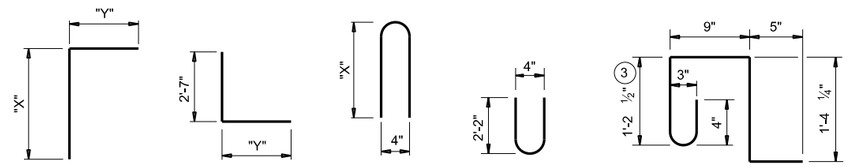
TOP SLAB

PART PLANS



SECTION THRU CURB

TABLE OF BAR DIMENSIONS		
H	"X"	"Y"
2'-0"	2'-6 ½"	3'-8 ½"
3'-0"	3'-6 ½"	3'-8 ½"
4'-0"	4'-6 ½"	3'-8 ½"
5'-0"	5'-6 ½"	3'-8 ½"



BARS C | BARS D | BARS Z | BARS Y | BARS K (#4) (Spa = 1'-0" Max) (Length = 4'-2")

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

(2) For vehicle safety, the following requirements must be met:
- For structures without bridge rail, construct curbs no more than 3" above finished grade.
- For structures with bridge rail, construct curbs flush with finished grade.

Reduce curb heights, if necessary, to meet the above requirements. No changes will be made in quantities and no additional compensation will be allowed for this work.

(3) For curbs less than 1'-0" high, tilt Bars K or reduce bar height as necessary to maintain cover. For curbs less than 3" high, Bars K may be omitted.

(4) 1'-0" typical. 2'-3" when the Rail Anchorage Curb (RAC) standard sheet is referred to elsewhere in the plans.

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

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

CONSTRUCTION NOTES:

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

MATERIAL NOTES:

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

Provide bar laps, where required, as follows:
- Uncoated or galvanized ~ #4 = 1'-8" Min
- Uncoated or galvanized ~ #5 = 2'-1" Min
- Uncoated or galvanized ~ #6 = 2'-6" Min

GENERAL NOTES:

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

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

HL93 LOADING

Texas Department of Transportation

Bridge Division Standard

MULTIPLE BOX CULVERTS CAST-IN-PLACE

5'-0" SPAN
0' TO 20' FILL

MC-5-20

FILE:	DN: TBE	CK: BMP	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0814	01	036	FM 422
	DIST	COUNTY		SHEET NO.
	WFS.	BAYLOR		99

DATE: 3/29/2024 1:22:57 PM
FILE: pw://txdot.projectwiseonline.com:TXDOT2/Documents/03 - WFS/Design Projects/0814010364 - Design/Plan Set/5. Drainage/MC-5-20.dgn

NUMBER OF SPANS	SECTION DIMENSIONS				BILLS OF REINFORCING STEEL (For Box Length = 40 feet)																																QUANTITIES					
					Bars B					Bars C & D							Bars E					Bars F1 ~ #4				Bars F2 ~ #4				Bars M ~ #4				Bars Y & Z ~ #4								Bars H 4 ~ #4		Bars K		Per Foot of Barrel		Curb		Total	
	S	H	T	U	No.	Size	Spa	Length	Wt	No.	Size	Spa	Bars C		Bars D		No.	Size	Spa	Length	Wt	No.	Spa	Length	Wt	No.	Spa	Length	Wt	No.	Spa	Length	Wt	No.	Spa	Bars Y		Bars Z		Length	Wt	No.	Wt	Conc (CY)	Renf (Lb)	Conc (CY)	Renf (Lb)	Conc (CY)	Renf (Lb)
													Length	Wt	Length	Wt																					Length	Wt	Length	Wt										
2	5' - 0"	2' - 0"	8"	7"	108	#5	9"	11' - 6"	1,295	108	#5	9"	6' - 3"	704	6' - 4"	713	108	#5	9"	8' - 8"	976	8	18"	39' - 9"	212	38	18"	39' - 9"	1,009	108	9"	2' - 0"	144	54	9"	4' - 7"	165	5' - 3"	189	11' - 6"	31	26	72	0.710	135.2	0.9	103	29.3	5,510
3	5' - 0"	2' - 0"	8"	7"	108	#5	9"	17' - 1"	1,924	108	#5	9"	6' - 3"	704	6' - 4"	713	108	#5	9"	14' - 3"	1,605	12	18"	39' - 9"	319	54	18"	39' - 9"	1,434	108	9"	2' - 0"	144	108	9"	4' - 7"	331	5' - 3"	379	17' - 1"	46	38	106	1.029	188.8	1.3	152	42.4	7,705
4	5' - 0"	2' - 0"	8"	7"	108	#5	9"	22' - 8"	2,553	108	#5	9"	6' - 3"	704	6' - 4"	713	108	#5	9"	19' - 10"	2,234	16	18"	39' - 9"	425	70	18"	39' - 9"	1,859	108	9"	2' - 0"	144	162	9"	4' - 7"	496	5' - 3"	568	22' - 8"	61	48	134	1.348	242.4	1.7	195	55.6	9,891
5	5' - 0"	2' - 0"	8"	7"	108	#5	9"	28' - 3"	3,182	108	#5	9"	6' - 3"	704	6' - 4"	713	108	#5	9"	25' - 5"	2,863	20	18"	39' - 9"	531	86	18"	39' - 9"	2,284	108	9"	2' - 0"	144	216	9"	4' - 7"	661	5' - 3"	758	28' - 3"	75	60	167	1.667	296.0	2.1	242	68.8	12,082
6	5' - 0"	2' - 0"	8"	7"	108	#5	9"	33' - 10"	3,811	108	#5	9"	6' - 3"	704	6' - 4"	713	108	#5	9"	31' - 0"	3,492	24	18"	39' - 9"	637	102	18"	39' - 9"	2,708	108	9"	2' - 0"	144	270	9"	4' - 7"	827	5' - 3"	947	33' - 10"	90	70	195	1.986	349.6	2.5	285	82.0	14,268
2	5' - 0"	3' - 0"	8"	7"	108	#6	9"	11' - 6"	1,865	108	#5	9"	7' - 3"	817	6' - 4"	713	108	#5	9"	8' - 8"	976	8	18"	39' - 9"	212	44	18"	39' - 9"	1,168	108	9"	3' - 0"	216	54	9"	4' - 7"	165	7' - 3"	262	11' - 6"	31	26	72	0.775	159.9	0.9	103	31.9	6,497
3	5' - 0"	3' - 0"	8"	7"	108	#6	9"	17' - 1"	2,771	108	#5	9"	7' - 3"	817	6' - 4"	713	108	#5	9"	14' - 3"	1,605	12	18"	39' - 9"	319	62	18"	39' - 9"	1,646	108	9"	3' - 0"	216	108	9"	4' - 7"	331	7' - 3"	523	17' - 1"	46	38	106	1.115	223.5	1.3	152	45.9	9,093
4	5' - 0"	3' - 0"	8"	7"	108	#6	9"	22' - 8"	3,677	108	#5	9"	7' - 3"	817	6' - 4"	713	108	#5	9"	19' - 10"	2,234	16	18"	39' - 9"	425	80	18"	39' - 9"	2,124	108	9"	3' - 0"	216	162	9"	4' - 7"	496	7' - 3"	785	22' - 8"	61	48	134	1.456	287.2	1.7	195	59.9	11,682
5	5' - 0"	3' - 0"	8"	7"	108	#6	9"	28' - 3"	4,583	108	#5	9"	7' - 3"	817	6' - 4"	713	108	#5	9"	25' - 5"	2,863	20	18"	39' - 9"	531	98	18"	39' - 9"	2,602	108	9"	3' - 0"	216	216	9"	4' - 7"	661	7' - 3"	1,046	28' - 3"	75	60	167	1.796	350.8	2.1	242	73.9	14,274
6	5' - 0"	3' - 0"	8"	7"	108	#6	9"	33' - 10"	5,488	108	#5	9"	7' - 3"	817	6' - 4"	713	108	#5	9"	31' - 0"	3,492	24	18"	39' - 9"	637	116	18"	39' - 9"	3,080	108	9"	3' - 0"	216	270	9"	4' - 7"	827	7' - 3"	1,308	33' - 10"	90	70	195	2.137	414.5	2.5	285	88.0	16,863
2	5' - 0"	4' - 0"	8"	7"	108	#6	9"	11' - 6"	1,865	108	#5	9"	8' - 3"	929	6' - 4"	713	108	#5	9"	8' - 8"	976	8	18"	39' - 9"	212	44	18"	39' - 9"	1,168	108	9"	4' - 0"	289	54	9"	4' - 7"	165	9' - 3"	334	11' - 6"	31	26	72	0.840	166.3	0.9	103	34.5	6,754
3	5' - 0"	4' - 0"	8"	7"	108	#6	9"	17' - 1"	2,771	108	#5	9"	8' - 3"	929	6' - 4"	713	108	#5	9"	14' - 3"	1,605	12	18"	39' - 9"	319	62	18"	39' - 9"	1,646	108	9"	4' - 0"	289	108	9"	4' - 7"	331	9' - 3"	667	17' - 1"	46	38	106	1.202	231.8	1.3	152	49.4	9,422
4	5' - 0"	4' - 0"	8"	7"	108	#6	9"	22' - 8"	3,677	108	#5	9"	8' - 3"	929	6' - 4"	713	108	#5	9"	19' - 10"	2,234	16	18"	39' - 9"	425	80	18"	39' - 9"	2,124	108	9"	4' - 0"	289	162	9"	4' - 7"	496	9' - 3"	1,001	22' - 8"	61	48	134	1.564	297.2	1.7	195	64.3	12,083
5	5' - 0"	4' - 0"	8"	7"	108	#6	9"	28' - 3"	4,583	108	#5	9"	8' - 3"	929	6' - 4"	713	108	#5	9"	25' - 5"	2,863	20	18"	39' - 9"	531	98	18"	39' - 9"	2,602	108	9"	4' - 0"	289	216	9"	4' - 7"	661	9' - 3"	1,335	28' - 3"	75	60	167	1.926	362.7	2.1	242	79.1	14,748
6	5' - 0"	4' - 0"	8"	7"	108	#6	9"	33' - 10"	5,488	108	#5	9"	8' - 3"	929	6' - 4"	713	108	#5	9"	31' - 0"	3,492	24	18"	39' - 9"	637	116	18"	39' - 9"	3,080	108	9"	4' - 0"	289	270	9"	4' - 7"	827	9' - 3"	1,668	33' - 10"	90	70	195	2.288	428.1	2.5	285	94.0	17,408
2	5' - 0"	5' - 0"	8"	7"	108	#6	9"	11' - 6"	1,865	108	#5	9"	9' - 3"	1,042	6' - 4"	713	108	#5	9"	8' - 8"	976	8	18"	39' - 9"	212	50	18"	39' - 9"	1,328	108	9"	5' - 0"	361	54	9"	4' - 7"	165	11' - 3"	406	11' - 6"	31	26	72	0.904	176.7	0.9	103	37.0	7,171
3	5' - 0"	5' - 0"	8"	7"	108	#6	9"	17' - 1"	2,771	108	#5	9"	9' - 3"	1,042	6' - 4"	713	108	#5	9"	14' - 3"	1,605	12	18"	39' - 9"	319	70	18"	39' - 9"	1,859	108	9"	5' - 0"	361	108	9"	4' - 7"	331	11' - 3"	812	17' - 1"	46	38	106	1.288	245.3	1.3	152	52.8	9,965
4	5' - 0"	5' - 0"	8"	7"	108	#6	9"	22' - 8"	3,677	108	#5	9"	9' - 3"	1,042	6' - 4"	713	108	#5	9"	19' - 10"	2,234	16	18"	39' - 9"	425	90	18"	39' - 9"	2,390	108	9"	5' - 0"	361	162	9"	4' - 7"	496	11' - 3"	1,217	22' - 8"	61	48	134	1.672	313.9	1.7	195	68.6	12,750
5	5' - 0"	5' - 0"	8"	7"	108	#6	9"	28' - 3"	4,583	108	#5	9"	9' - 3"	1,042	6' - 4"	713	108	#5	9"	25' - 5"	2,863	20	18"	39' - 9"	531	110	18"	39' - 9"	2,921	108	9"	5' - 0"	361	216	9"	4' - 7"	661	11' - 3"	1,623	28' - 3"	75	60	167	2.056	382.5	2.1	242	84.3	15,540
6	5' - 0"	5' - 0"	8"	7"	108	#6	9"	33' - 10"	5,488	108	#5	9"	9' - 3"	1,042	6' - 4"	713	108	#5	9"	31' - 0"	3,492	24	18"	39' - 9"	637	130	18"	39' - 9"	3,452	108	9"	5' - 0"	361	270	9"	4' - 7"	827	11' - 3"	2,029	33' - 10"	90	70	195	2.439	451.0	2.5	285	100.1	18,326

HL93 LOADING SHEET 2 OF 2

Texas Department of Transportation

Bridge Division Standard

MULTIPLE BOX CULVERTS CAST-IN-PLACE

5'-0" SPAN
0' TO 20' FILL

MC-5-20

FILE:	DN: TBE	CK: BMP	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0814	01	036	FM 422
	DIST	COUNTY		SHEET NO.
	WFS.	BAYLOR		100

DATE: 3/29/2024 1:23:09 PM
FILE: pw://txdot.projectwiseonline.com:TXDOT2/Documents/03 - WFS/Design Projects/081401036/4 - Design/Plan Set/5. Drainage/PW.dgn

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

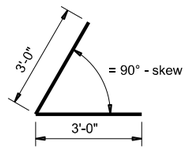
Dimensions					Variable Reinforcing				Estimated Quantities per ft of wing (2~wings) (4)		Estimated Quantities per ft of Toewall (1~toewall)	
Maximum Wingwall Height Hw	W	X	Y	Z	Bars J1		Bars J2					
					Size	Spa	Size	Spa	Reinf Lb/Ft	Conc (CY/Ft)	Reinf (Lb/Ft)	Conc (CY/Ft)
2'-6"	2'-10"	10"	1'-0"	7"	#4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

TABLE OF WINGWALL REINFORCING
(2~wings)

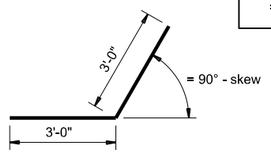
Bar	Size	No.	Spa
D1	#6	~	1'-0"
D2	#6	~	1'-0"
E1	#4	~	1'-0"
F	#4	~	1'-0"
G	#6	~	8"
M1	#4	4	~
P	#4	~	1'-0"
V	#4	~	1'-0"

TABLE OF TOEWALL REINFORCING

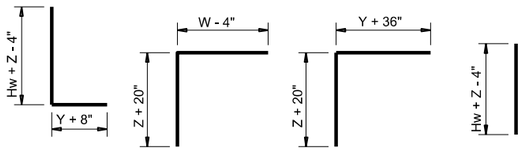
Bar	Size	No.	Spa
J3	#4	~	1'-0"
M2	#4	2	~
E2	#4	~	1'-0"



BARS D1



BARS D2



BARS J1 BARS J2 BARS J3 BARS V

WING DIMENSION FORMULAS:

(All values are in feet.)

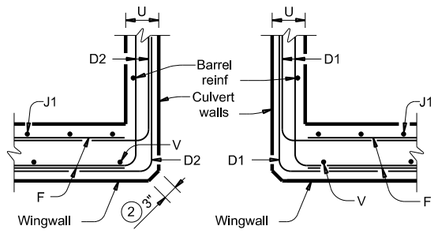
Hw = H + T + C
Lw = (Hw) (SL) ÷ cosine (θ) for Type PW-1
= (Hw - 1') (SL) ÷ cosine (θ) for Type PW-2 and Hw 4' ≥
= (Hw - 0.5') (SL) ÷ cosine (θ) for Type PW-2 and Hw 4' <

For cast-in-place culverts:
Ltw = [(N) (S) + (N + 1) (U)] ÷ cosine (θ)

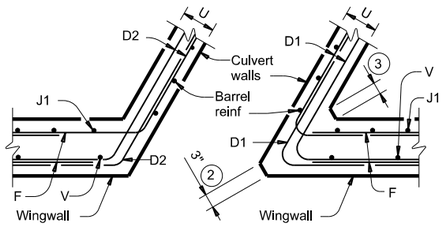
For precast culverts:
Ltw = [(N) (2 U + S) + (N - 1) (0.5')] ÷ cosine (θ)
Total Wingwall Area (two wings ~ SF)
= (2)(Hw)(Lw) for Type PW-1
= (2)(Hw)(Lw) - 6 SF for Type PW-2 and Hw 4' ≥
= (2)(Hw)(Lw) - 1.5 SF for Type PW-2 and Hw 4' <

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

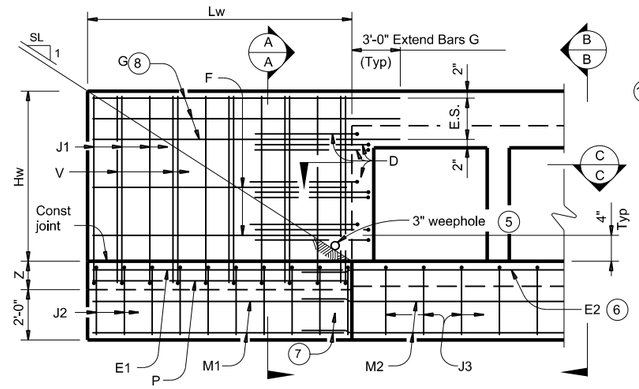
See applicable box culvert standard sheet for S, H, T, and U values.



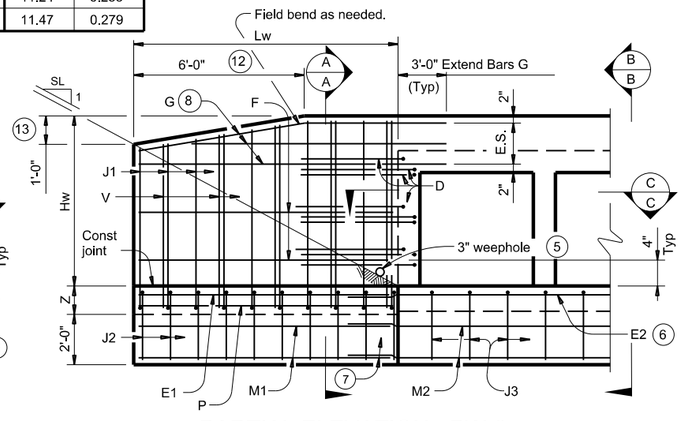
SECTION C-C - PW-1



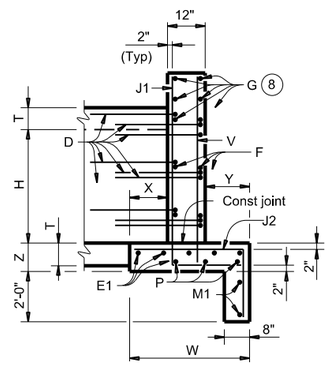
SECTION C-C - PW-2



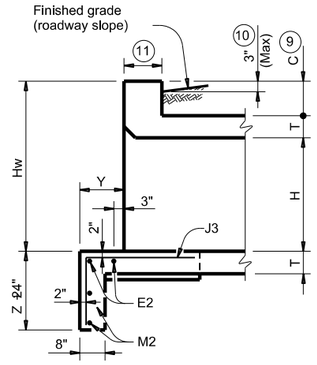
PARTIAL ELEVATION - PW-1



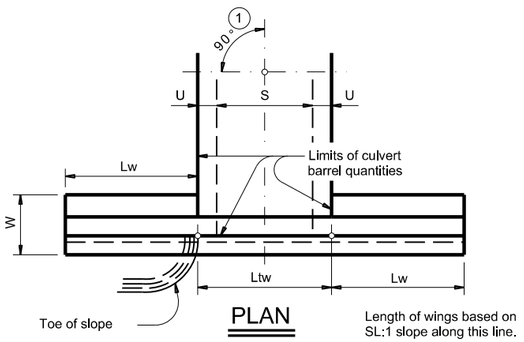
PARTIAL ELEVATION - PW-2



SECTION A-A
(Showing wing reinforcement.)

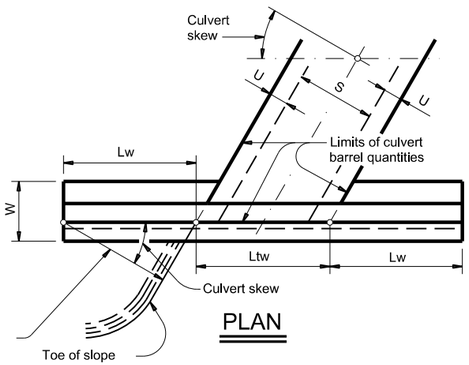


SECTION B-B
(Showing wing reinforcement.)



PLAN

DETAILS FOR NON-SKEWED BOX CULVERTS



PLAN

DETAILS FOR SKEWED BOX CULVERTS
(Showing 30° skew.)

1. Skew = 0°
2. At discharge end, chamfer may be ¾" minimum.
3. For 15° skew ~ 1"
   For 30° skew ~ 2"
   For 45° skew ~ 3"
4. Quantities shown are for two Type PW-1 wings. Adjust concrete volume for Type PW-2 wings. To determine estimated quantities for two wings, multiply the tabulated values by Lw. Quantities shown do not include weight of Bars D.
5. Provide weepholes for Hw = 5'-0" and greater. Fill around weepholes with coarse gravel.
6. Extend Bars E2 1'-6" minimum into the wingwall footing.
7. Lap Bars M1 1'-6" minimum with Bars M2.
8. Place Bars G as shown, equally spaced at 8" maximum. Provide at least two pairs of Bars G per wing.
9. 0" Min to 5'-0" Max. Estimated curb heights are shown elsewhere in the plans. For structures with pedestrian rail or curbs taller than 1'-0, refer to the Extended Curb Details (ECD) standard sheet. For structures with T631 or T631LS bridge rail, refer to the Mounting Details for T631 & T631LS Rails (T631-CM) standard sheet. Refer to the Box Culvert Rail Mounting Details (RAC) standard sheet for structures with bridge rail other than T631 or T631LS.
10. For vehicle safety, the following requirements must be met:
    - For structures without bridge rail, construct curbs no more than 3" above finished grade.
    - For structures with bridge rail, construct curbs flush with finished grade.

    Reduce curb heights, if necessary, to meet the above requirements. No changes will be made in quantities and no additional compensation will be allowed for this work.
11. 1'-0" typical. 2'-3" when the Box Culvert Rail Mounting Details (RAC) standard sheet is referred to elsewhere in the plans.
12. 3'-0" for Hw < 4'.
13. 6" for Hw < 4'.

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

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

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

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

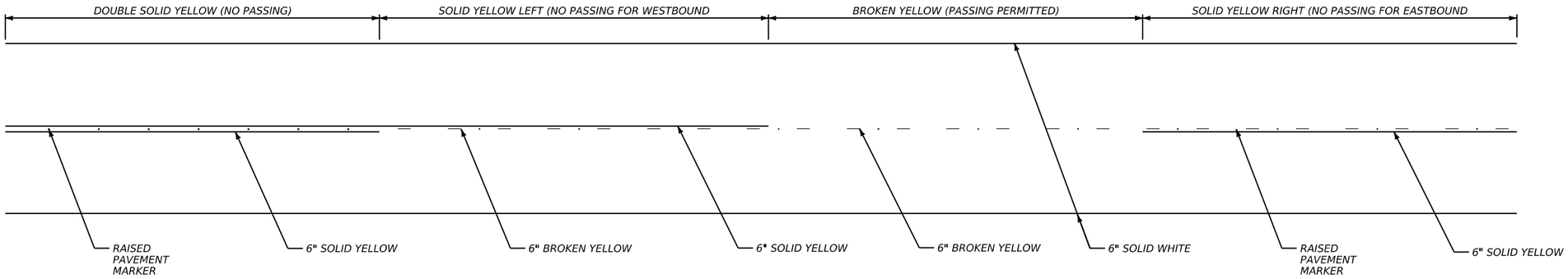
Texas Department of Transportation

Bridge Division Standard

CONCRETE WINGWALLS
WITH PARALLEL WINGS FOR BOX CULVERTS TYPES PW-1 AND PW-2

PW

FILE:	DN: GAF	CK: CAT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0814	01	036	FM 422
	DIST	COUNTY		SHEET NO.
	WFS.	BAYLOR		101



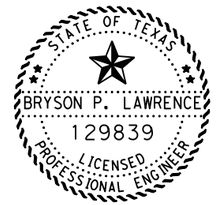
STRIPING CONVENTION

STRIPING LAYOUT

LOCATION			DOUBLE SOLID	SOLID BROKEN	BROKEN
STA	TO	STA			
45+00.00	TO	72+50.88	X		
72+50.88	TO	80+69.28		X	
80+69.28	TO	88+08.48	X		
88+08.48	TO	93+62.88		X	
93+62.88	TO	98+38.08	X		
98+38.08	TO	116+86.08		X	
116+86.08	TO	123+46.08			X
123+46.08	TO	133+75.68		X	
133+75.68	TO	145+10.88	X		
145+10.88	TO	156+72.48		X	
156+72.48	TO	221+14.08			X
221+14.08	TO	235+97.76		X	
235+97.76	TO	252+02.88	X		
252+02.88	TO	263+38.08		X	
263+38.08	TO	278+95.68			X
278+95.68	TO	290+30.88		X	
290+30.88	TO	314+86.08	X		
314+86.08	TO	339+41.28		X	
339+41.28	TO	362+69.76	X		

NOTES:

REFER TO APPLICABLE STANDARDS FOR PLACEMENT AND SPACING OF RAISED PAVEMENT MARKERS AND PAVEMENT MARKINGS.



Bryson Lawrence, P.E.

04/01/2024

Texas Department of Transportation

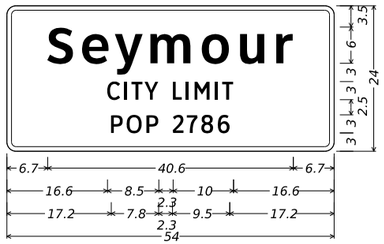
FM 422

PAVEMENT MARKING LAYOUT

SHEET 1 OF 1

CONT	SECT	JOB	HIGHWAY
0814	01	036	FM 422
DIST	COUNTY		SHEET NO.
WFS.	BAYLOR		102

DATE: 3/29/2024 1:23:25 PM
FILE: pw://txdot.projectwiseonline.com:TXDOT2/Documents/03 - WFS/Design Projects/081401036/4 - Design/Plan Set/8. Traffic/PAVEMENT MARKING LAYOUT

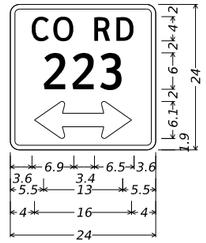


I-2aT 6in;
1.5" Radius, 0.8" Border, White on Green;
"Seymour", ClearviewHwy-5-W-R;
"CITY LIMIT", ClearviewHwy-3-W;
"POP 2786", ClearviewHwy-3-W;

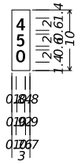
D1-2 6in LT-RT;

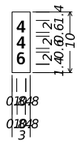
1.5" Radius, 0.8" Border, White on Green;
Standard Arrow Custom 9.0" X 6.1" 180°; "Abilene", ClearviewHwy-3-W;

1.5" Radius, 0.8" Border, White on Green;
"Wichita Falls", ClearviewHwy-3-W; Standard Arrow Custom 9.0" X 6.1" 0°;



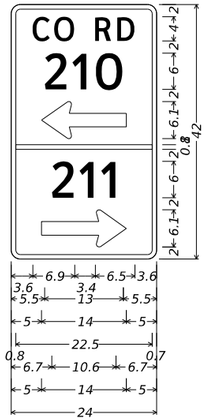
D20-2T_24x24;
1.5" Radius, 0.8" Border, White on Green;
"CO RD", ClearviewHwy-3-W;
"223", ClearviewHwy-3-W;



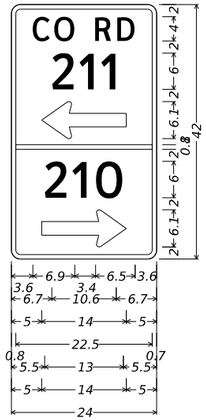


D10-7aT 3in;
No border, White on Green;
"4", ClearviewHwy-4-W;
"5", ClearviewHwy-4-W;
"0", ClearviewHwy-4-W;

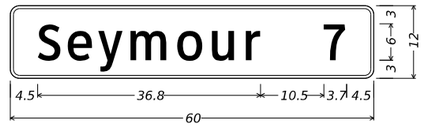
D10-7aT 3in;
No border, White on Green;
"4", ClearviewHwy-4-W;
"4", ClearviewHwy-4-W;
"6", ClearviewHwy-4-W;



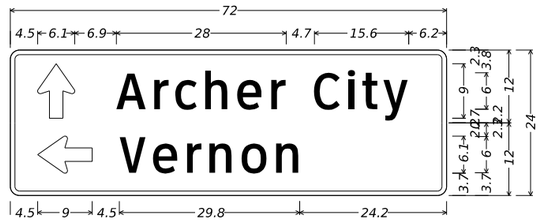
D20-5T_24x42;
1.5" Radius, 0.8" Border, White on Green;
"CO RD", ClearviewHwy-3-W;
"210", ClearviewHwy-3-W;
Standard Arrow Custom 14.0" X 6.1" 180°;
"211", ClearviewHwy-3-W;
Standard Arrow Custom 14.0" X 6.1" 0°;



D20-5T_24x42;
1.5" Radius, 0.8" Border, White on Green;
"CO RD", ClearviewHwy-3-W;
"211", ClearviewHwy-3-W;
Standard Arrow Custom 14.0" X 6.1" 180°;
"210", ClearviewHwy-3-W;
Standard Arrow Custom 14.0" X 6.1" 0°;



D2-1 6in;
1.5" Radius, 0.5" Border, White on Green;
"Seymour", ClearviewHwy-3-W; "7", ClearviewHwy-3-W;



D1-2 6in UP-LT;

1.5" Radius, 0.8" Border, White on Green;
Standard Arrow Custom 9.0" X 6.1" 90°;
"Archer City", ClearviewHwy-3-W;

1.5" Radius, 0.8" Border, White on Green;
Standard Arrow Custom 9.0" X 6.1" 180°;
"Vernon", ClearviewHwy-3-W;

STATE OF TEXAS
BRYSON P. LAWRENCE
129839
LICENSED
PROFESSIONAL ENGINEER

Bryson Lawrence, P.E.

04/04/2024

Texas Department of Transportation

FM 422

SMALL SIGN DETAILS

SHEET 1 OF 1

CONT	SECT	JOB	HIGHWAY
0814	01	036	FM 422
DIST	COUNTY		SHEET NO.
WFS.	BAYLOR		103

DATE: 3/29/2024 1:23:41 PM
FILE: pw://txdot.projectwiseonline.com:TXDOT2/Documents/03 - WFS/Design Projects/0814010364 - Design/Plan Set/8. Traffic/SMALL SIGN DETAILS

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"	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: TY N, TY S
1	1	M3-4	WEST <AUXILIARY SIGN>	24 x 12	X		TWT	1	WS	P		
		M1-6F	<FM SHIELD> FARM ROAD (422)	24 x 24	X							
			STA 59+09 LT OF CL									
	2	M3-2	EAST <AUXILIARY SIGN>	24 x 12	X		TWT	1	WS	P		
		M1-6F	<FM SHIELD> FARM ROAD (422)	24 x 24								
			STA 67+64 RT OF CL									
	3	I-2aT	SEYMOUR CITY LIMIT (2786)	54 x 24	X		10BWG	1	SA	T		
			STA 69+95 LT OF CL									
	4	W1-4L	SYMBOL - REVERSE CURVE LEFT	36 x 36	X		10BWG	1	SA	T		
		W13-1P	55 MPH <ADVISORY SPEED PLAQUE>	18 x 18								
			STA 70+89 RT OF CL									
	5	D1-2	<--- ABILENE ---> WICHITA FALLS	84 x 24	X		10BWG	1	SA	T		
			STA 71+82 RT OF CL									
	6	R2-1	SPEED LIMIT (50)	30 x 36	X		TWT	1	WS	P		
			STA 75+07 LT OF CL									
	7	R2-1	SPEED LIMIT (60)	30 x 36	X		TWT	1	WS	P		
			STA 75+19 RT OF CL									
	8	D20-5T	<--- CO RD 210 ---> CO RD 211	24 x 42	X		TWT	1	WS	P		
			STA 81+32 RT OF CL									
	9	M2-1	JCT <AUXILIARY SIGN>	21 x 15	X		TWT	1	WS	P		
		M1-4(3 dgt)	<US HIGHWAY ROUTE SHIELD> (277)	30 x 24								
			STA 81+56 LT OF CL									
	10	R1-1	STOP	36 x 36	X		10BWG	1	SA	T		
			STA 83+72 RT OF CL									
	11	W3-5	<SYMBOL - REDUCED SPEED AHD> (50)	36 x 36	X		10BWG	1	SA	T		
			STA 84+80 LT OF CL									
	12	R1-1	STOP	36 x 36	X		10BWG	1	SA	T		
			STA 85+17 LT OF CL									
	13	D20-5T	<--- CO RD 211 ---> CO RD 210	24 X 42	X		TWT	1	WS	P		
			STA 88+10 LT OF CL									
	14	M1-6F	<FM SHIELD> FARM ROAD (422)	24 x 24	X		TWT	1	WS	P		
		D10-7aT	<3 DIGIT VERTICAL NUMBER> (446)	3 x 10								
			STA 97+30 LT OF CL									
	15	W1-4R	SYMBOL - REVERSE CURVE RIGHT	36 x 36	X		10BWG	1	SA	T		
		W13-1P	55 MPH <ADVISORY SPEED PLAQUE>	18 x 18								
			STA 100+67 LT OF CL									
	16	W1-4L	#REF!	36 x 36	X		10BWG	1	SA	T		
		W13-1P	SYMBOL - REVERSE CURVE LEFT	18 x 18								
			STA 122+55 RT OF CL									
	17	W1-4L	SYMBOL - REVERSE CURVE LEFT	36 x 36	X		10BWG	1	SA	T		
		W13-1P	55 MPH <ADVISORY SPEED PLAQUE>	18 x 18								
			STA 158+04 LT OF CL									

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

SOSS

FILE: sums16.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT May 1987	CONT	SECT	JOB	HIGHWAY
REVISIONS 4-16 8-16	0814	01	036	FM 422
	DIST		COUNTY	SHEET NO.
	WFS.		BAYLOR	104

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	POSTS	ANCHOR TYPE	MOUNTING DESIGNATION: PREFABRICATED	MOUNTING DESIGNATION	BRIDGE MOUNT CLEARANCE SIGNS (See Note 2)
							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
	18	M3-2	EAST <AUXILIARY SIGN>	24 x 12	X		TWT	1	WS	P		
		M1-6F	<FM SHIELD> FARM ROAD (422)	24 x 24								
		D10-7aT	<3 DIGIT VERTICAL NUMBER>(448)	3 x 10								
			STA 202+34 RT OF CL									
	19	D20-2T	COUNTY ROAD (223)	24 x 24	X		TWT	1	WS	P		
			STA 246+63 LT OF CL									
	20	R1-1	STOP	36 x 36	X		10BWG	1	SA	T		
			STA 248+86 LT OF CL									
	21	R1-1	STOP	36 x 36	X		10BWG	1	SA	T		
			STA 249+32 RT OF CL									
	22	D20-2T	COUNTY ROAD (223)	24 x 24	X		TWT	1	WS	P		
			STA 251+38 LT OF CL									
	23	W2-1	SYMBOL - 4-WAY INTERSECTION AHEAD	30 x 30	X		TWT	1	WS	P		
			STA 259+06 LT OF CL									
	24	M1-6F	<FM SHIELD> FARM ROAD (422)	24 x 24	X		TWT	1	WS	P		
		D10-7aT	<3 DIGIT VERTICAL NUMBER> (450)	3 x 10								
			STA 308+01 LT OF CL									
	25	W1-4R	SYMBOL - REVERSE CURVE RIGHT	36 x 36	X		10BWG	1	SA	T		
		W13-1P	55 MPH <ADVISORY SPEED PLAQUE>	18 x 18								
			STA 336+64 RT OF CL									
	26	M2-1	JCT <AUXILIARY SIGN>	21 x 15	X		TWT	1	WS	P		
		M1-6F	<FM SHIELD> FARM ROAD (1790)	24 x 24								
			STA 346+49 RT OF CL									
	27	D2-1	(SEYMOUR) (7) <1 LINE>	60 x 12	X		10BWG	1	SA	T		
			STA 352+89 LT OF CL									
	28	R2-1	SPEED LIMIT (60)	30 x 36	X		TWT	1	WS	P		
			STA 356+35 LT OF CL									
	29	D1-2	/\ ARCHER CITY <-- VERNON	72 x 24	X		10BWG	1	SA	T		
			STA 356+55 RT OF CL									
	30	M3-4	WEST <AUXILIARY SIGN>	24 x 12	X		TWT	1	WS	P		
		M1-6F	<FM SHIELD> FARM ROAD (422)	24 x 24								
			STA 359+84 LT OF CL									
	31	M3-2	EAST <AUXILIARY SIGN>	24 x 12	X		S80	1	SA	U		
		M1-6F	<FM SHIELD> FARM ROAD (422)	24 x 24								
		M3-3	SOUTH <AUXILIARY SIGN>	24 x 12								
		M1-6F	<FM SHIELD> FARM ROAD (1790)	24 x 24								
		M6-3	<ARROW - VERTICAL STRGHT> <AUX. SIGN>	21 x 15								
		M3-1	NORTH <AUXILIARY SIGN>	24 x 12								
		M1-6F	<FM SHIELD> FARM ROAD (1790)	24 x 24								
		M6-1	<ARROW - HORIZ. STRGHT> <AUXILIARY SIGN>	21 x 15								
			STA 363+01 RT OF CL									
	32	R1-1	STOP	36 x 36	X		10BWG	1	SA	T		
			STA 363+04 LT OF CL									

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

SOSS

FILE: sums16.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT May 1987	CONT 0814	SECT 01	JOB 036	HIGHWAY FM 422
REVISIONS 4-16 8-16	DIST WFS.	COUNTY BAYLOR		SHEET NO. 105

18

DATE: 3/29/2024 1:26:48 PM
FILE: pw://txdot.projectwiseonline.com:TXDOT2/Documents/03 - WFS/Design Projects/...

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	POSTS	ANCHOR TYPE	MOUNTING DESIGNATION: PREFABRICATED	MOUNTING DESIGNATION	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"	1EXT or 2EXT = # of Ext BM = Extruded Wind Beam WC = 1.12 #/ft Wing Channel EXAL= Extruded Alum Sign Panels	TY N TY S
	33	M1-6F	<FM SHIELD> FARM ROAD (1790)	24 x 24	X		10BWG	1	SA	U		
		M6-4	<ARROW - DUAL LEFT & RIGHT> <AUX. SIGN>	21 x 15								
		M1-6F	<FM SHIELD> FARM ROAD (422)	24 x 24								
		M6-1	<ARROW - HORIZ. STRGHT> <AUXILIARY SIGN>	21 x 15								
			STA 363+09 RT OF CL									
	34	W1-7T	<BI-DIRECTIONAL LRG ARRW w/ CHEVRONS>	96 x 36	X		10BWG	1	SA	T		
			STA 363+33 RT OF CL									
	35	M1-6F	<FM SHIELD> FARM ROAD (422)	24 x 24	X		10BWG	1	SA	U		
		M6-3	<ARROW - VERTICAL STRGHT> <AUX. SIGN>	21 x 15								
		M1-6F	<FM SHIELD> FARM ROAD (1790)	24 x 24								
		M6-1	<ARROW - HORIZ. STRGHT> <AUXILIARY SIGN>	21 x 15								
			STA 363+70 LT OF CL									

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: 3/29/2024 1:26:48 PM
FILE: pw://txdot.projectwiseonline.com:TXDOT2/Documents/03 - WFS/Design Projects/...

Texas Department of Transportation

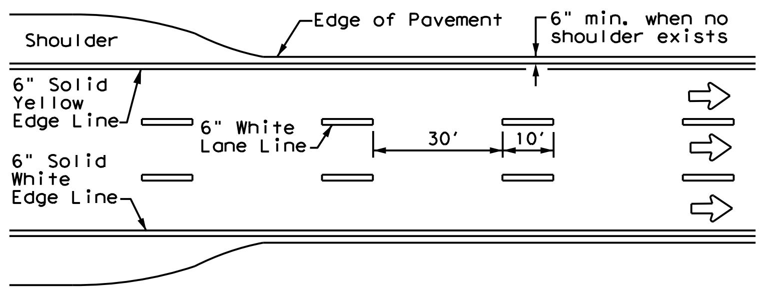
Traffic Operations Division Standard

SUMMARY OF SMALL SIGNS

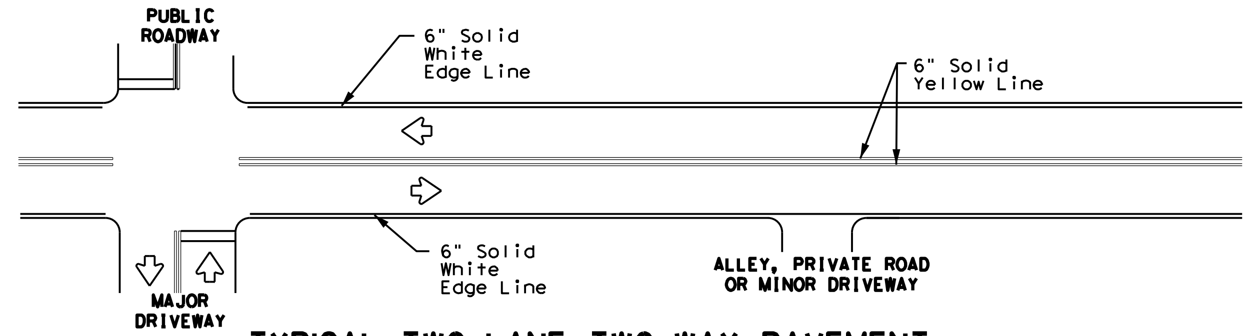
SOSS

FILE: sums16.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT May 1987	CONT	SECT	JOB	HIGHWAY
REVISIONS 4-16 8-16	0814	01	036	FM 422
	DIST	COUNTY		SHEET NO.
	WFS.	BAYLOR		106

18



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



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

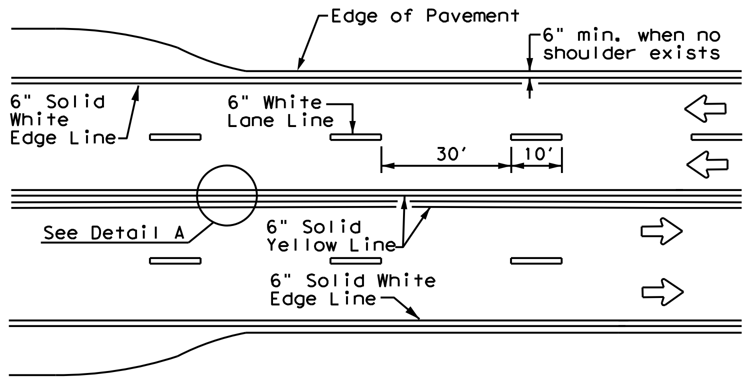
GENERAL NOTES

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.

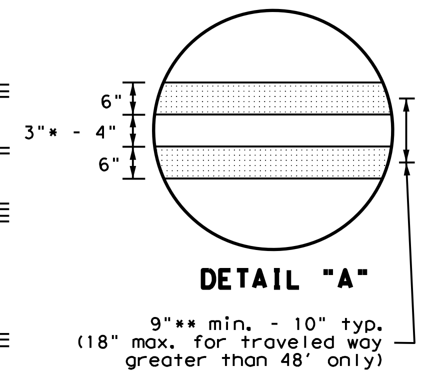
2. The traveled way includes only that portion of the roadway used for vehicular travel. It does not include the parking lanes, sidewalks, berms and shoulders. The traveled ways shall be measured from the center of edge line to the center of edge line of a two lane roadway.

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

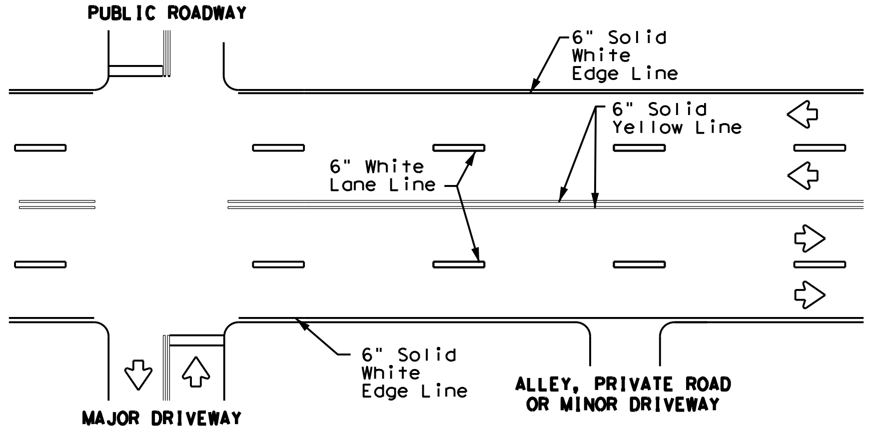


DETAIL "A"

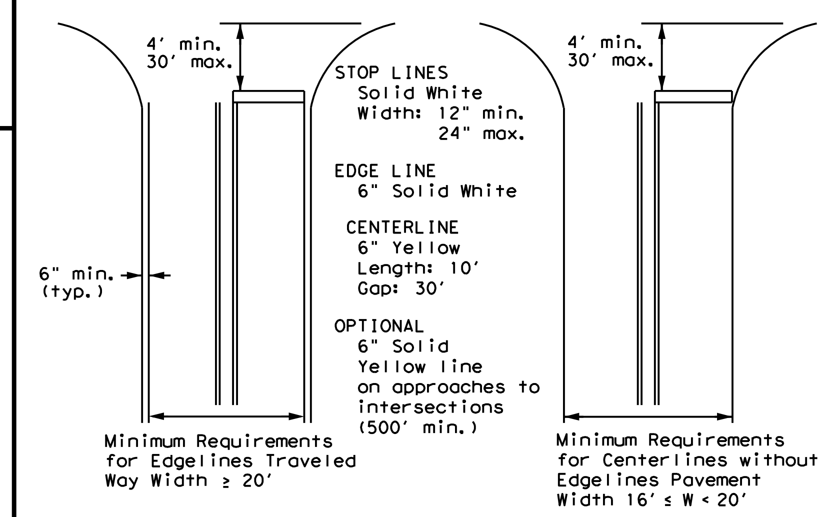
9"** min. - 10" typ. (18" max. for traveled way greater than 48' only)

* 2" minimum for restripe projects when approved by the Engineer.

** 8" minimum for restripe projects when approved by the Engineer.



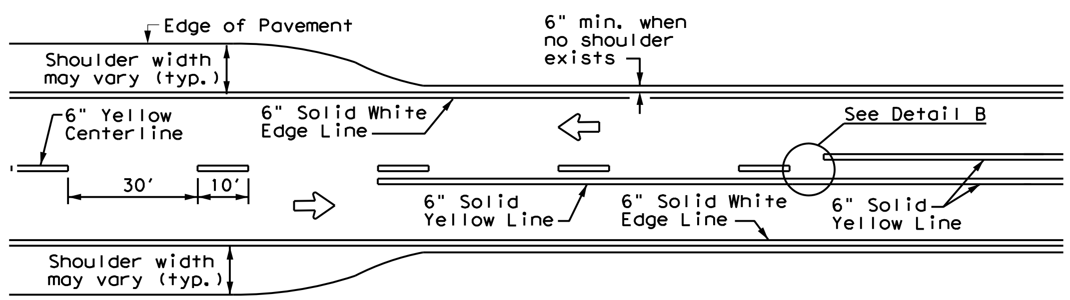
TYPICAL MULTI-LANE, TWO-WAY PAVEMENT
MARKINGS THROUGH INTERSECTIONS



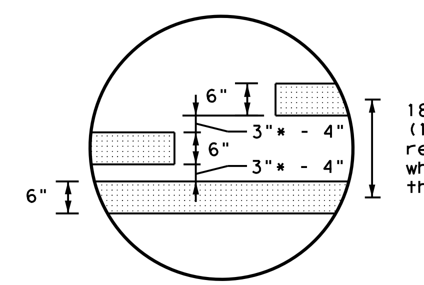
NOTE: Traveled way is exclusive of shoulder widths. Refer to General Note 2 for additional details.

GUIDE FOR PLACEMENT OF STOP LINES,
EDGE LINE & CENTERLINE

Based on Traveled Way and Pavement Widths for Undivided Roadways



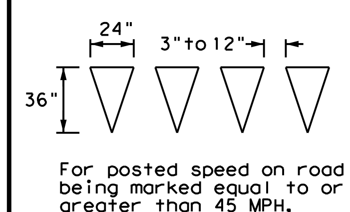
TWO LANE TWO-WAY ROADWAY
WITH OR WITHOUT SHOULDERS



18" min. - 20" max. (16" minimum for restripe projects when approved by the Engineer.)

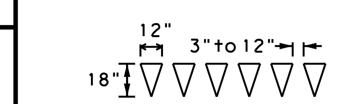
DETAIL "B"

* 2" minimum for restripe projects when approved by the Engineer.

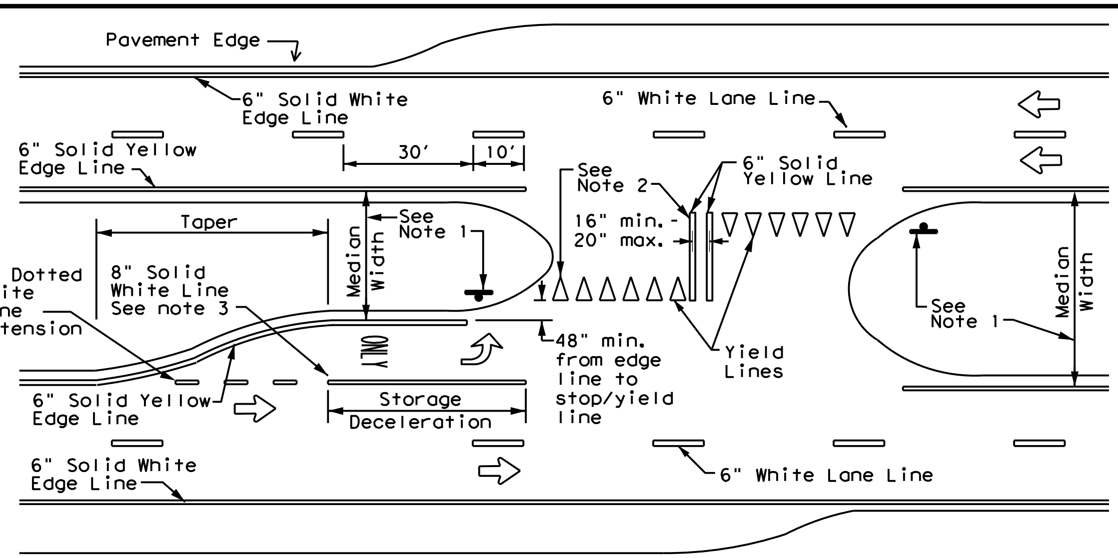


For posted speed on road being marked equal to or greater than 45 MPH.

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

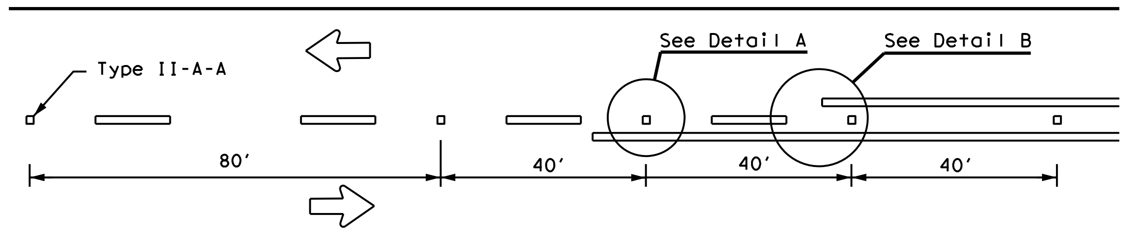
PM(1)-22

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	0814	01	036	FM 422
	DIST		COUNTY	SHEET NO.
	WFS.		BAYLOR	107

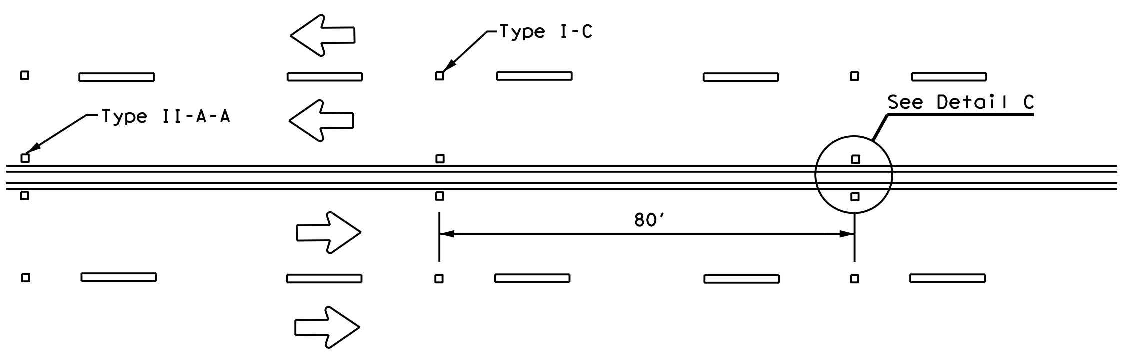
22A

DATE: 3/29/2024 1:27:13 PM
FILE: pw://txdot.projectwiseonline.com:TXDOT2/Documents/03 - WFS/Design Pro...

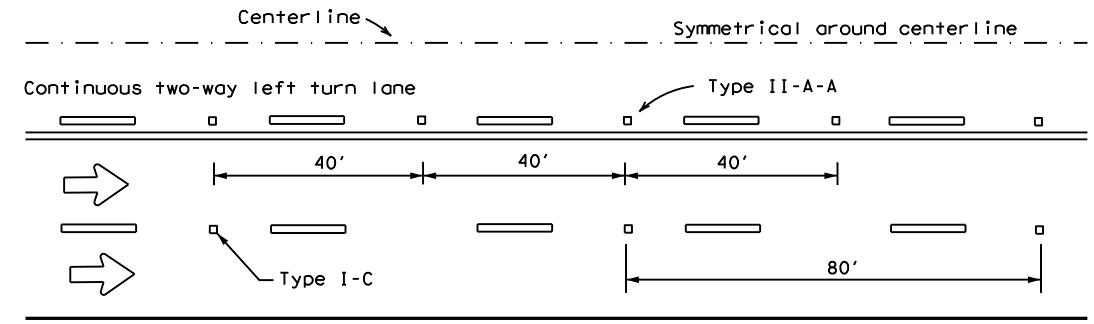
REFLECTIVE RAISED PAVEMENT MARKERS FOR VEHICLE POSITIONING GUIDANCE



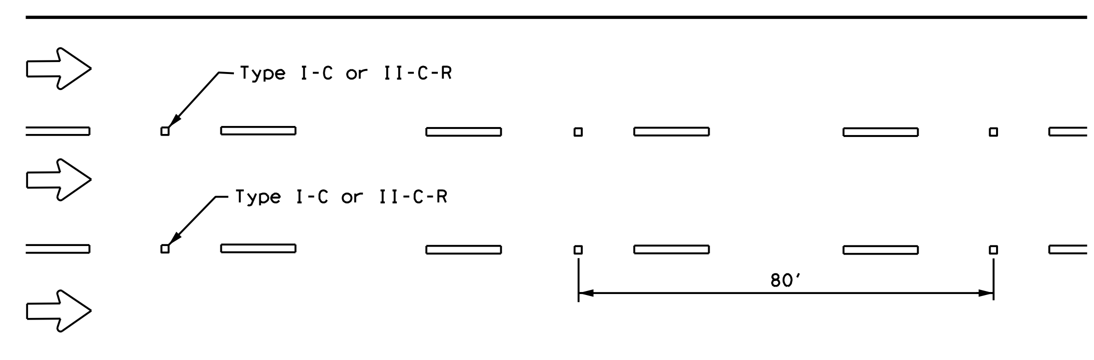
CENTERLINE FOR ALL TWO LANE TWO-WAY ROADWAYS



CENTERLINE & LANE LINES FOR FOUR LANE TWO-WAY ROADWAYS



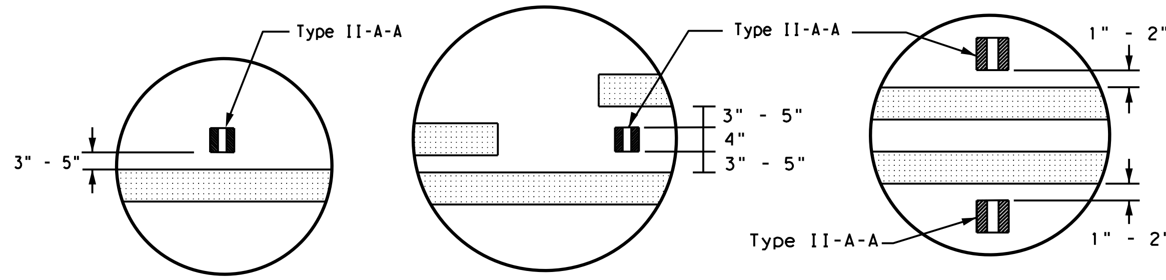
CENTERLINE AND LANE LINES FOR TWO-WAY LEFT TURN LANE



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.

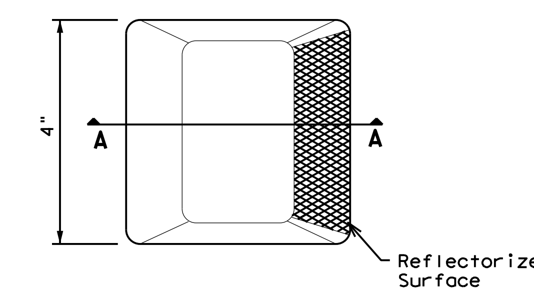
See Note 3.



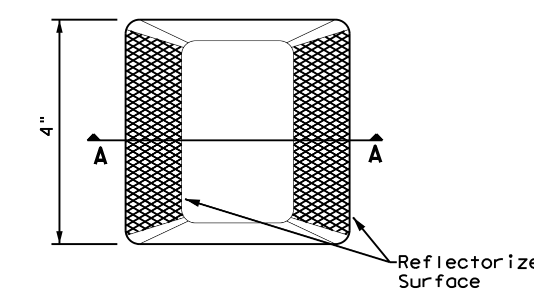
DETAIL "A" DETAIL "B" DETAIL "C"

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

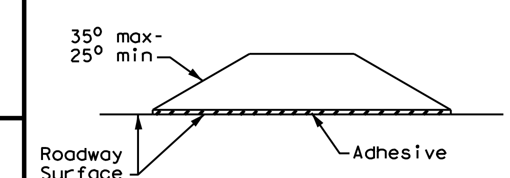
All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.



Type I (Top View)

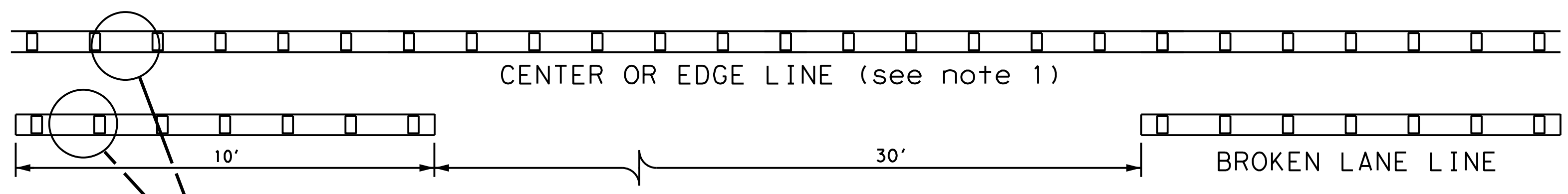


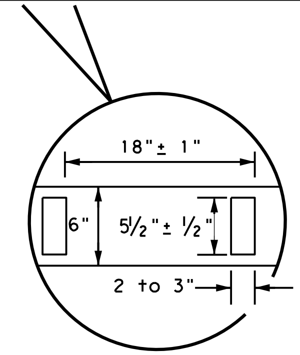
Type II (Top View)



SECTION A

RAISED PAVEMENT MARKERS

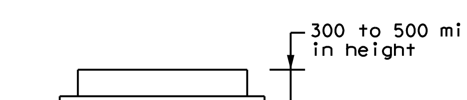




6" EDGE LINE, 6" CENTERLINE OR 6" LANE LINE

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.

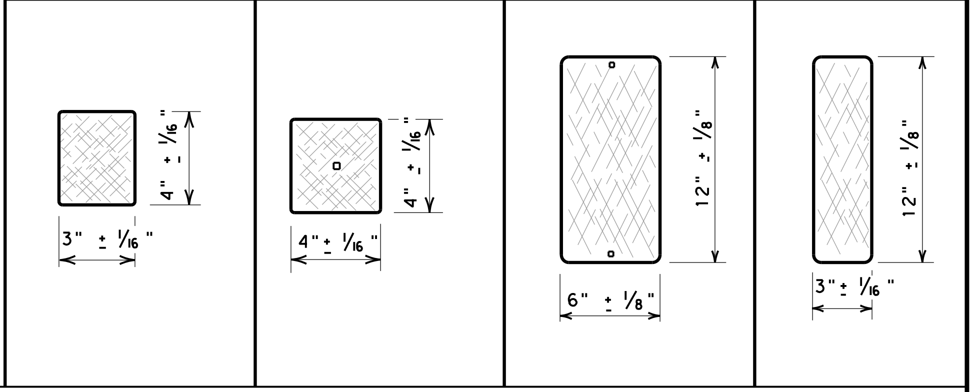
Texas Department of Transportation — Traffic Safety Division Standard

POSITION GUIDANCE USING RAISED MARKERS REFLECTORIZED 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	0814	01	036	FM 422
	DIST		COUNTY	SHEET NO.
	WFS.		BAYLOR	108

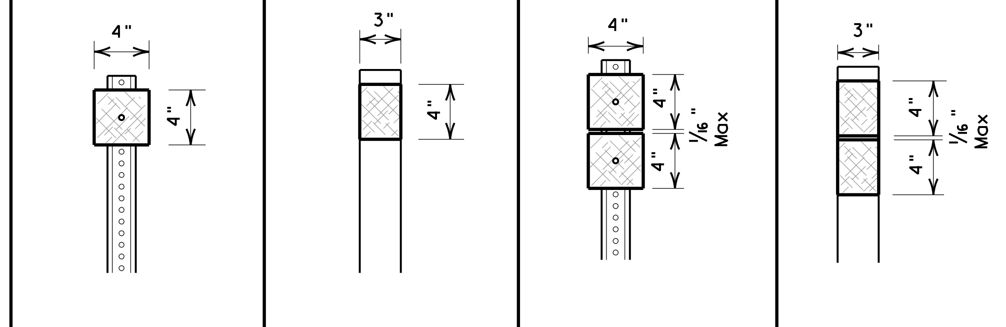
22B

REFLECTOR UNIT SIZES FOR DELINEATORS AND OBJECT MARKERS



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

DELINEATORS



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

D & OM DESCRIPTIVE CODES

INSTL DEL ASSM (D-XX)SZ X (XXXX)XXX(XX)

NUMBER OF REFLECTORS
S = Single
D = Double

COLOR OF REFLECTORS
W = White
Y = Yellow
R = Red

REFLECTOR UNIT SIZE
1 or 2

TYPE OF POST OR DELINEATOR
WC = Wing Channel Post
YFLX = Yellow Flexible Post
WFLX = White Flexible Post

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)

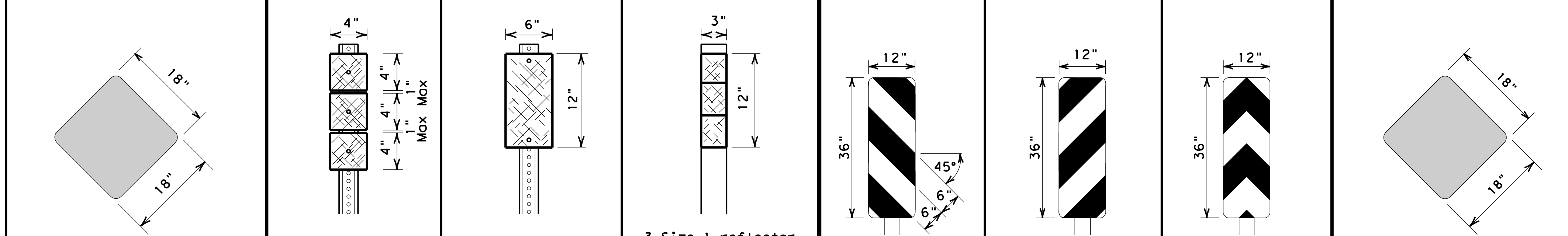
TYPE OF POST
WC = Wing Channel Post
WFLX = White Flexible Post
TWT = Thin Walled Tubing

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

DIRECTION
If Required
BI = Bi-Directional

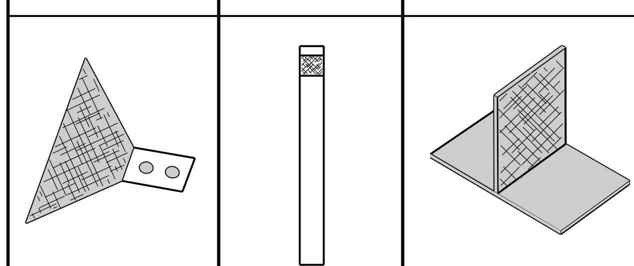
DEPARTMENTAL MATERIAL SPECIFICATIONS	
FLEXIBLE DELINEATOR & OBJECT MARKER POSTS (EMBEDDED & SURFACE MOUNT TYPES)	DMS-4400
SIGN FACE MATERIALS	DMS-8300
DELINEATORS, OBJECT MARKERS AND BARRIER REFLECTORS	DMS-8600

OBJECT MARKERS



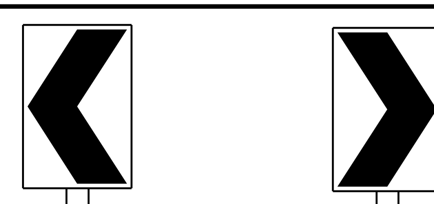
	Type 1 (OM-1)	Type 2 (OM-2)			Type 3 (OM-3)			Type 4 (OM-4)
	OM-1	OM-2X	OM-2Y	OM-2Z	OM-3L	OM-3R	OM-3C	OM-4
DEVICE		3-Size 2 reflector units	1-Size 3 reflector unit	3-Size 1 reflector units or 1-Size 4 reflector unit				
SHEETING	Yellow-Type B_{FL} or C_{FL} Sheeting	Yellow - Type B or C Sheeting			Alternating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

BARRIER REFLECTORS (BRF)



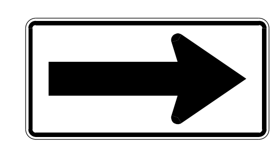
	GF1	GF2	CTB
DEVICE			
	1. Barrier reflectors shall meet the requirements of DMS 8600. 2. Approved Barrier Reflectors are listed on the "Barrier Reflectors" Material Producer List at: www.txdot.gov.		
SHEETING	Yellow, White, Red		
NOTE	1. Reflective sheeting shall have a minimum dimension of 3 inches and minimum surface area of 9 square inches.		

CHEVRONS



W1-8

ONE DIRECTION LARGE ARROW



W1-6

	CHEVRONS				ONE DIRECTION LARGE ARROW	
DEVICE	W1-8				W1-6	
SIZE (W x L)	18"x 24" (Conventional)	24"x 30" (Conventional Oversize)	30"x 36" (Expressway)	36" x 48" (Freeway)	48" x 24" (Conventional)	60" x 30" (Expressway & Freeway)
MOUNTING HEIGHT	4'-0" or 7'-0"		7'-0" Only		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 10-09 3-15 4-10 7-20	0814	01	036	FM 422
	DIST	COUNTY		SHEET NO.
	WFS.	BAYLOR		109

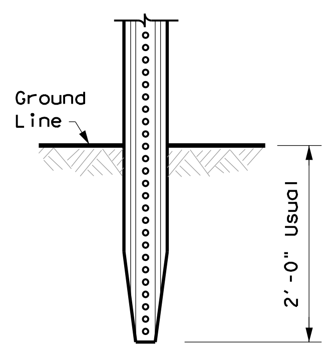
20A

DATE: 3/29/2024 1:27:25 PM
FILE: pw://txdot.projectwiseonline.com:TXDOT2/Documents/03 - WFS/Design Projects/08140103614 ... D&OM(1)-20.dgn

POST TYPE AND SUPPORT FOUNDATION DETAILS

WING CHANNEL (WC)

GND

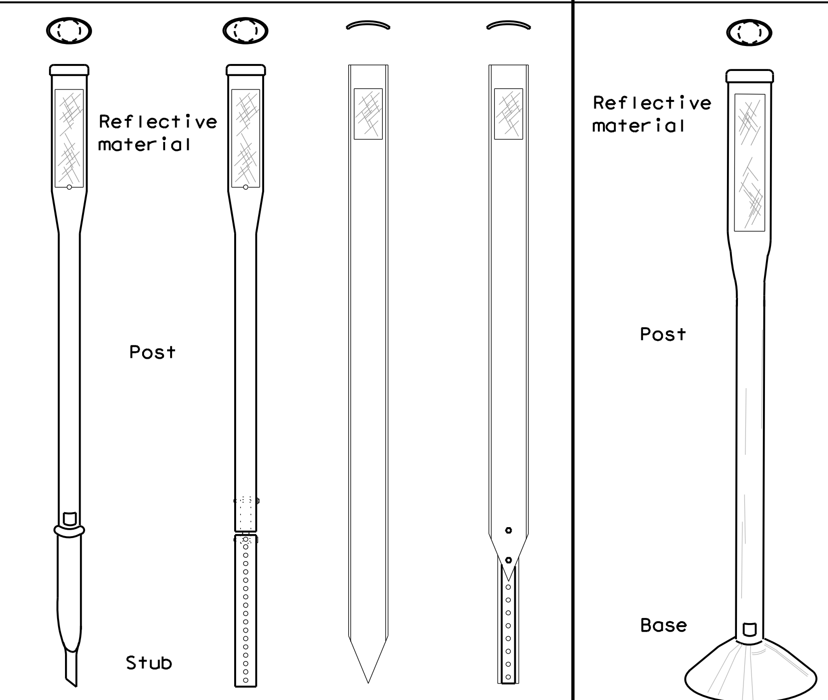


NOTES

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

FLEXIBLE POSTS (YFLX, WFLX)

GND — EMBEDDED / SRF — SURFACE MOUNT



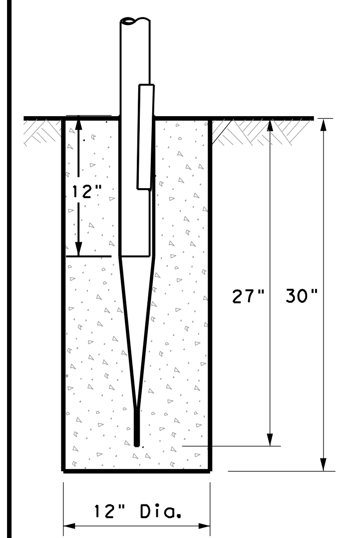
EMBEDDED | SURFACE MOUNT

NOTES

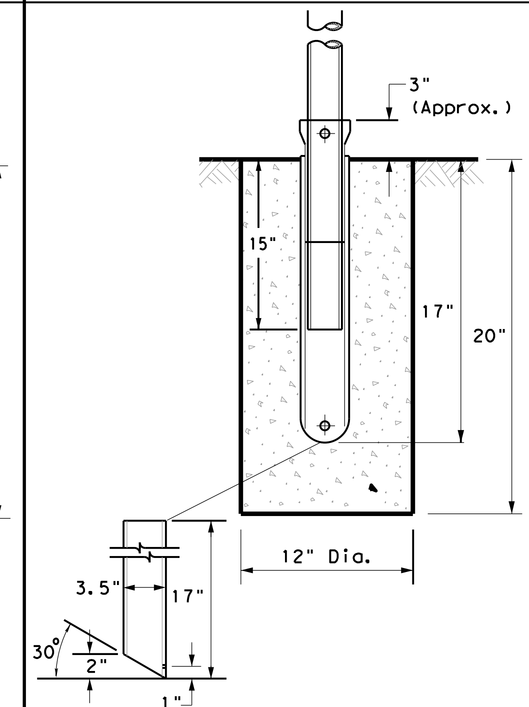
1. See "Flexible Delineator and Object Marker Posts" Material Producer List for approved devices.
2. Install per manufacturer's recommendations.
3. Post length may vary to meet field conditions.
4. When using yellow delineators with flexible posts to separate opposing direction of travel, such as centerline or median use, the flexible posts shall be yellow.

WEDGE ANCHOR SYSTEMS

WAS — STEEL



WAP — PLASTIC



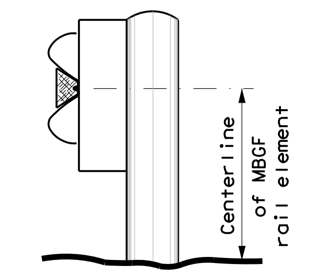
NOTE

1. Install per manufacturer's recommendations.

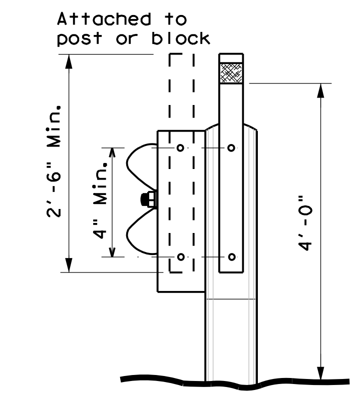
TYPE OF BARRIER MOUNTS

GUARD FENCE ATTACHMENT

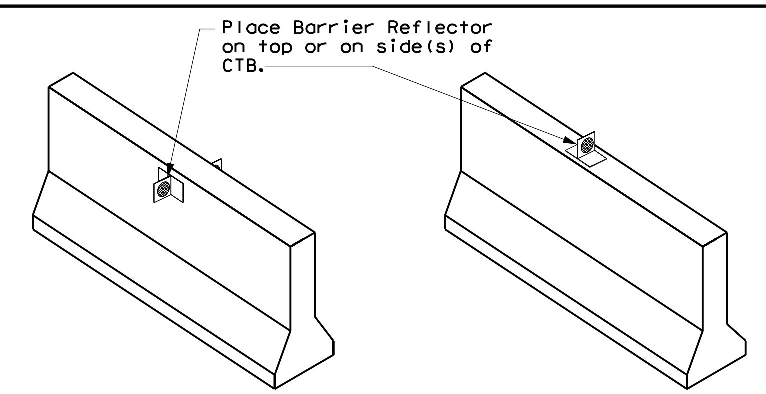
GF1



GF2



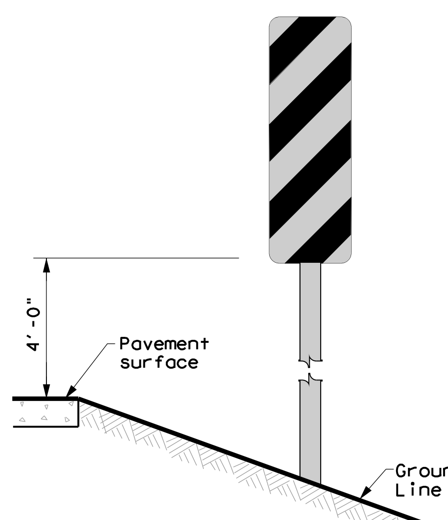
CONCRETE TRAFFIC BARRIER (CTB)



GENERAL NOTES

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

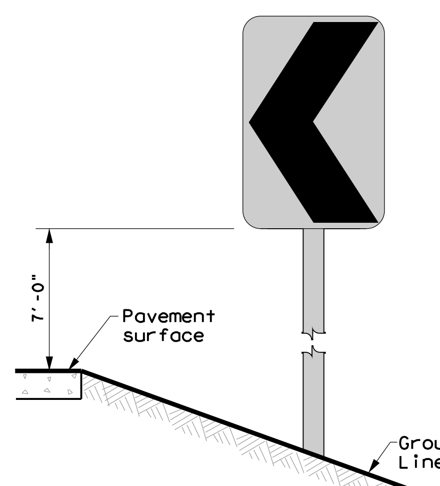
TYPES 1, 3, AND 4 OBJECT MARKERS AND CHEVRONS



NOTE

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

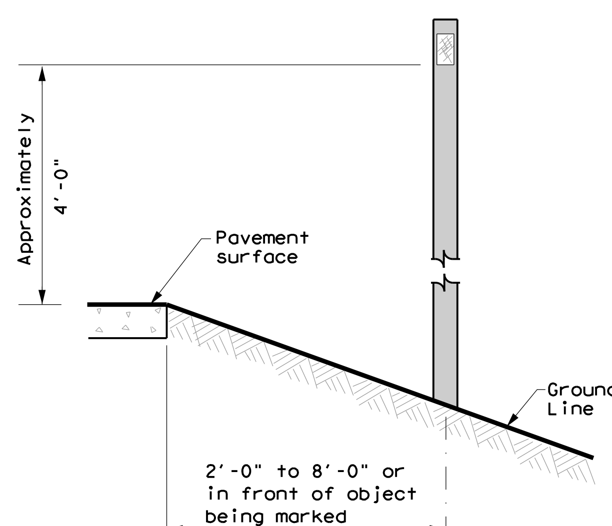
CHEVRONS AND ONE DIRECTION LARGE ARROW SIGN



NOTE

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

DELINEATORS AND TYPE 2 OBJECT MARKERS



See general notes 1, 2 and 3.

Texas Department of Transportation — Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER INSTALLATION

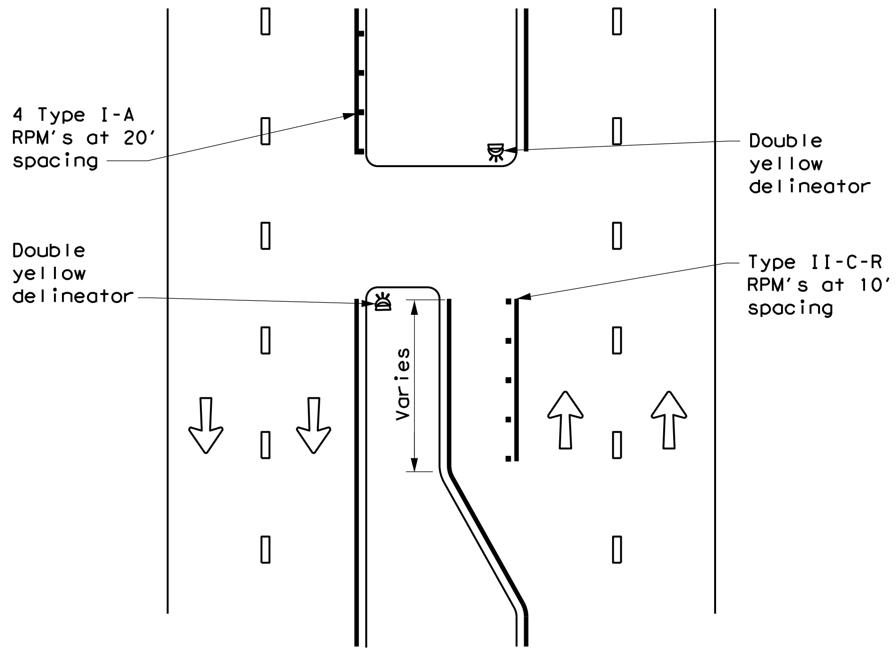
D & OM(2)-20

FILE: dom2-20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
© TxDOT August 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS	0814	01	036	FM 422
10-09 3-15 / 4-10 7-20	DIST		COUNTY	SHEET NO.
	WFS.		BAYLOR	110

20B

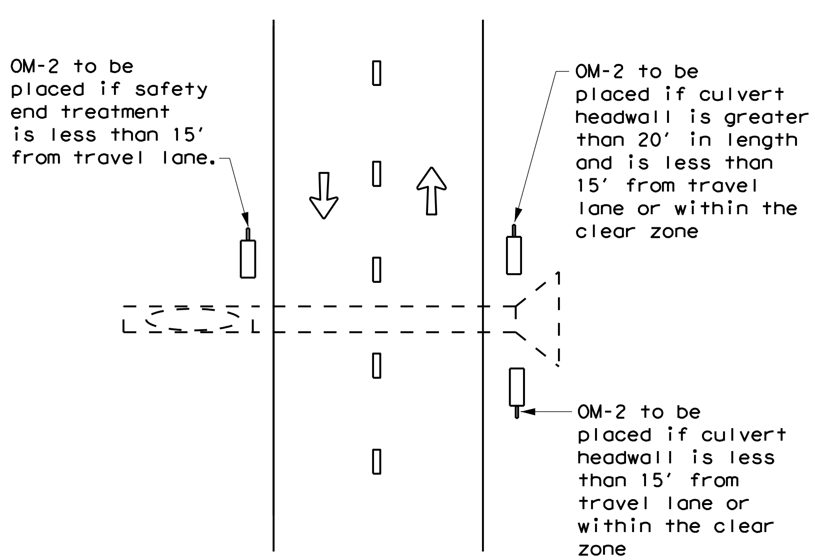
DATE: 3/29/2024 1:27:36 PM
FILE: pw://txdot.projectwiseonline.com:TXDOT2/Documents/03 - WFS/Design Projects/...

CROSSOVERS



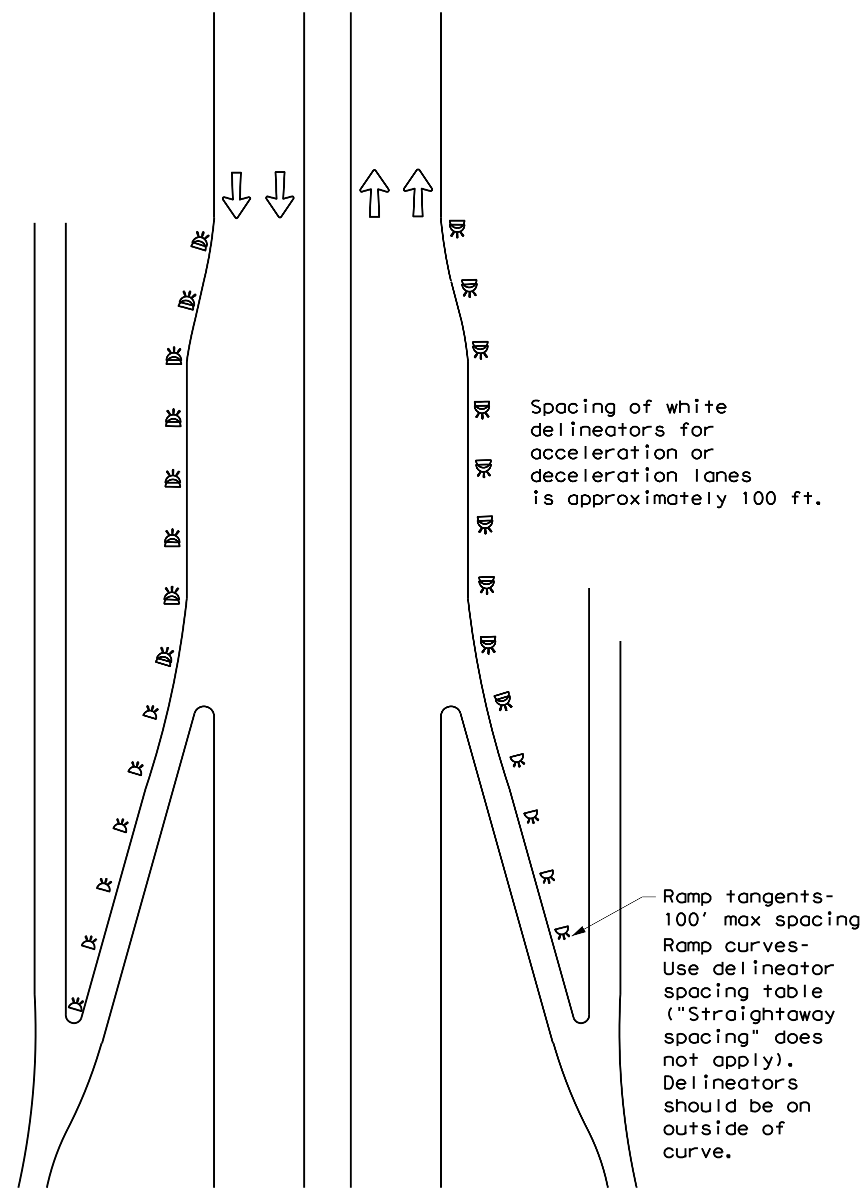
DETAIL 1

FOR CULVERTS WITHOUT MBGF



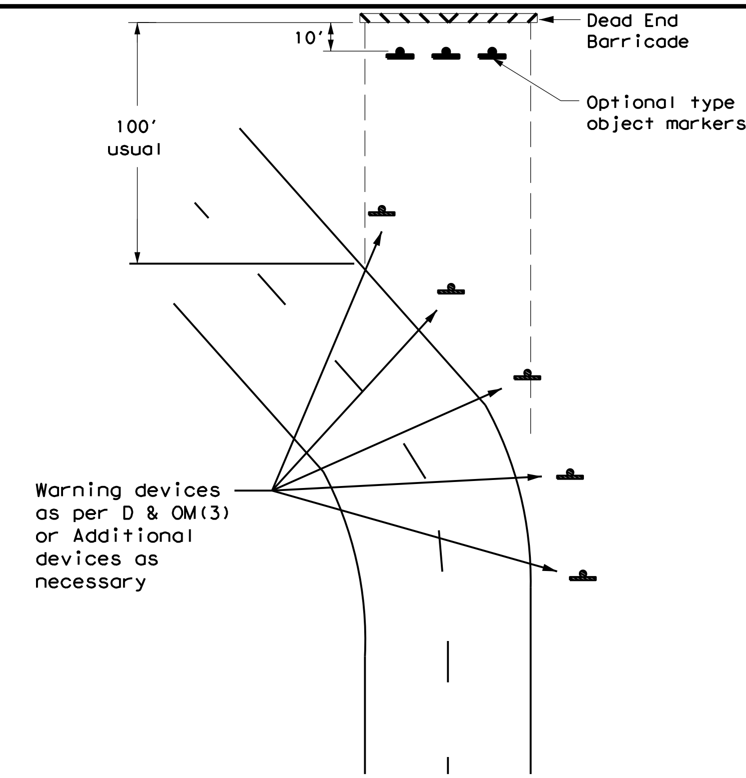
DETAIL 2

FREEWAY DELINEATION FOR RAMPS AND ACCELERATION/DECELERATION LANES



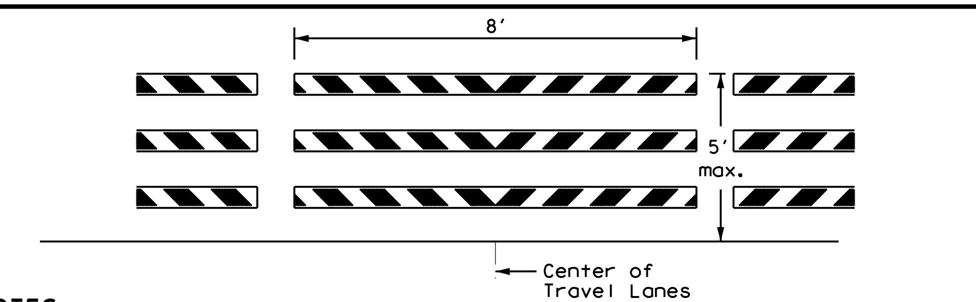
DETAIL 3

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	0814	01	036	FM 422
	DIST		COUNTY	SHEET NO.
	WFS.		BAYLOR	111

20D

DATE: 3/29/2024 1:28:01 PM
FILE: pw://txdot.projectwiseonline.com:TXDOT2/Documents/03 - WFS/Design Projects/081403 6/4 - Design/Plan Set/8. Traffic/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)

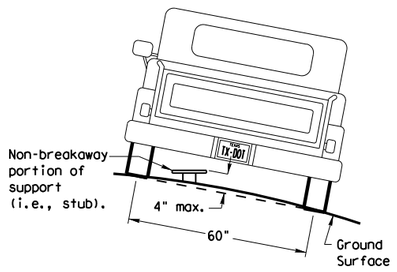
Anchor Type

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))

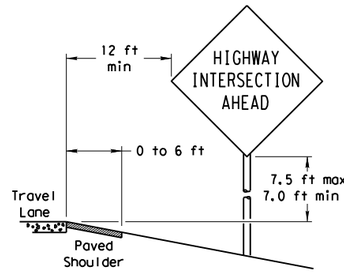
REQUIRED CLEARANCE FOR BREAKAWAY SUPPORT



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).

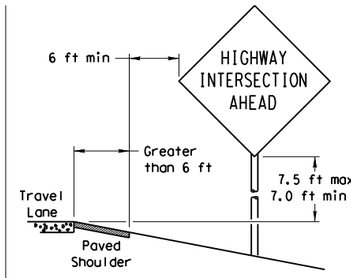
SIGN LOCATION

PAVED SHOULDERS



LESS THAN 6 FT. WIDE

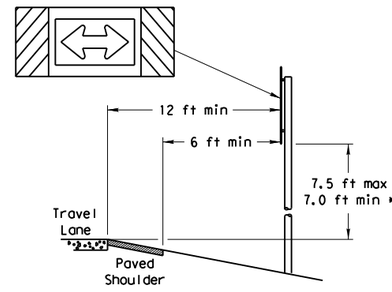
When the shoulder is 6 ft. or less in width, the sign must be placed at least 12 ft. from the edge of the travel lane.



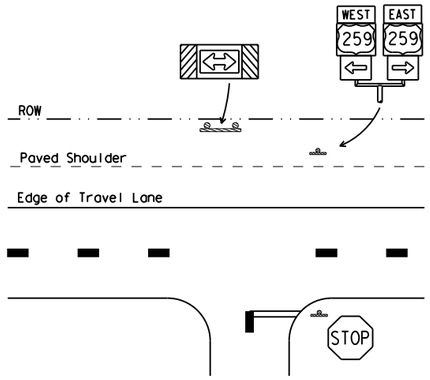
GREATER THAN 6 FT. WIDE

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.

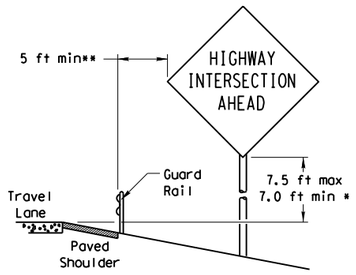
T-INTERSECTION



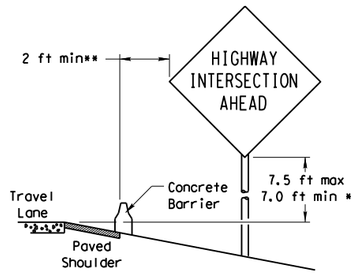
When this sign is needed at the end of a two-lane, two way roadway, the right edge of the sign should be in line with the centerline of the roadway. Place as close to ROW as practical.



BEHIND BARRIER



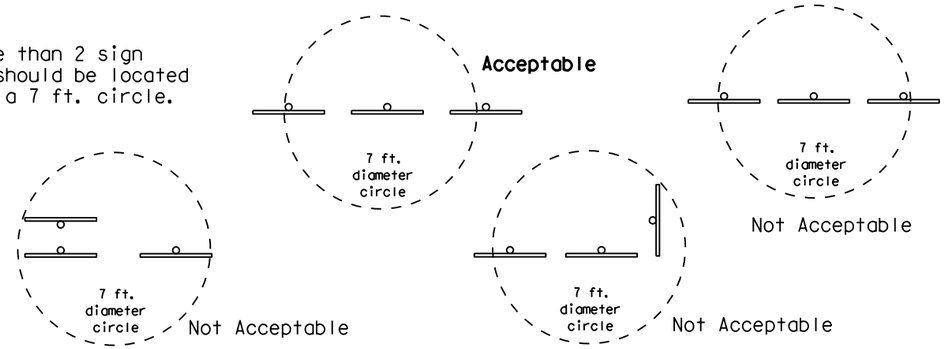
BEHIND GUARDRAIL



BEHIND CONCRETE BARRIER

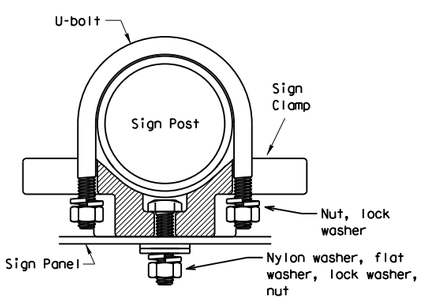
**Sign clearance based on distance required for proper guard rail or concrete barrier performance.

No more than 2 sign posts should be located within a 7 ft. circle.



TYPICAL SIGN ATTACHMENT DETAIL

Single Signs

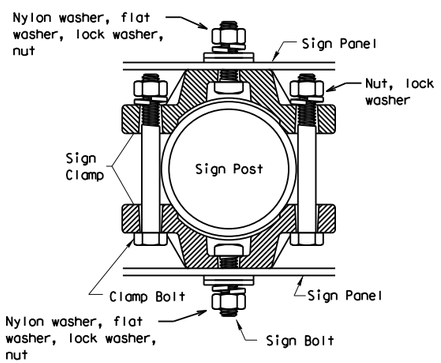


Bolts used to mount sign panels to the clamp are 5/16-18 UNC galvanized square head with nut, nylon washer, flat washer and lock washer. The bolt length is 1 inch for aluminum.

When two sign clamps are used to mount signs back-to-back, use a 5/16-18 UNC galvanized hex head per ASTM A307 with nut and helical-spring lock washer. The approximate bolt lengths for various post sizes and sign clamp types are given in the table at right. The bolt length may need to be adjusted depending upon field conditions.

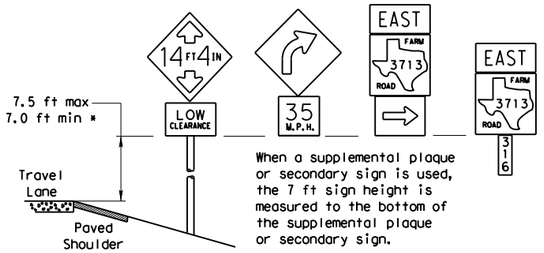
Sign clamps may be either the specific size clamp or the universal clamp.

Back-to-Back Signs



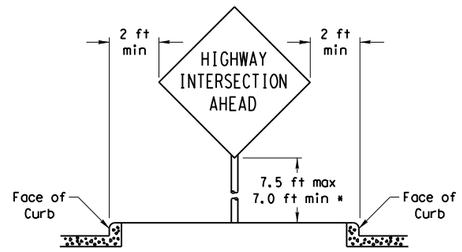
Pipe Diameter	Approximate Bolt Length	
	Specific Clamp	Universal Clamp
2" nominal	3"	3 or 3 1/2"
2 1/2" nominal	3 or 3 1/2"	3 1/2 or 4"
3" nominal	3 1/2 or 4"	4 1/2"

SIGNS WITH PLAQUES



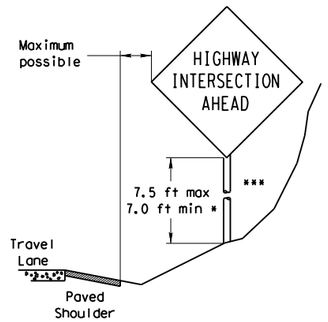
When a supplemental plaque or secondary sign is used, the 7 ft sign height is measured to the bottom of the supplemental plaque or secondary sign.

CURB & GUTTER OR RAISED ISLAND



RESTRICTED RIGHT-OF-WAY

(When 6 ft min. is not possible.)



Right-of-way restrictions may be created by rocks, water, vegetation, forest, buildings, a narrow island, or other factors.

In situations where a lateral restriction prevents the minimum horizontal clearance from the edge of the travel lane, signs should be placed as far from the travel lane as practical.

*** Post may be shorter if protected by guardrail or if Engineer determines the post could not be hit due to extreme slope.

* 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

Texas Department of Transportation
Traffic Operations Division

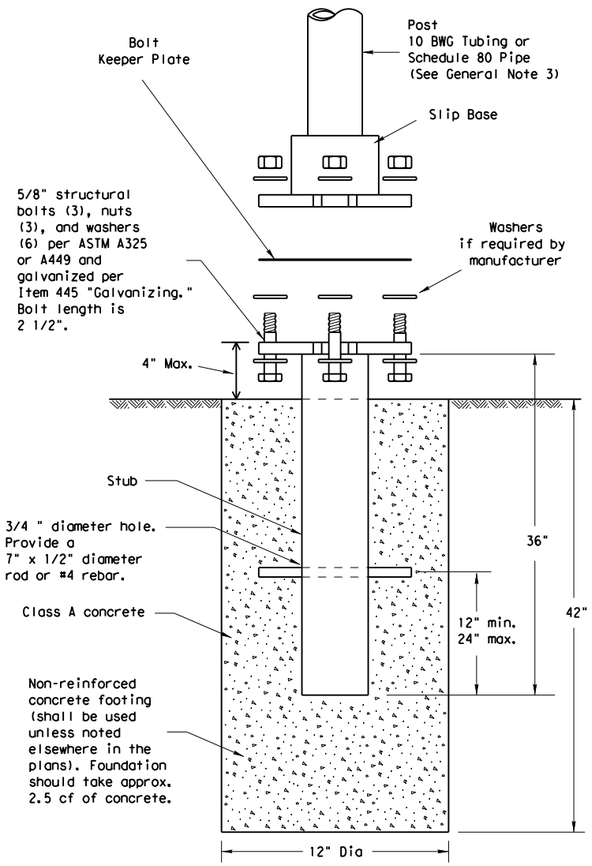
SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS GENERAL NOTES & DETAILS

SMD(GEN)-08

REVISIONS	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
9-08	CONT	SECT	JOB	HIGHWAY
	0814	01	036	FM 422
	DIST	COUNTY		SHEET NO.
	WFS.	BAYLOR		112

DATE: 3/29/2024 1:28:13 PM
FILE: pw://txdot.projectwiseonline.com:TXDOT2/Documents/03 - WFS/Design Projects/0814010364 - Design/Plan Set/8. Traffic/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.

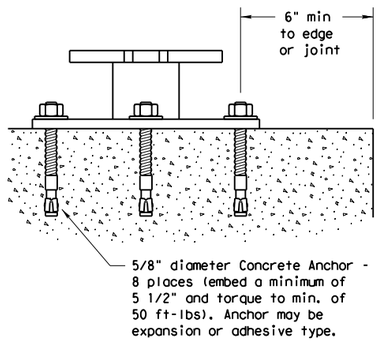
   Schedule 80 Pipe (2.875" outside diameter)
   - 0.276" nominal wall thickness
   - Steel tubing per ASTM A500 Gr C
   - Other seamless or electric-resistance welded steel tubing or pipe with equivalent outside diameter and wall thickness may be used if they meet the following:
     - 46,000 PSI minimum 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

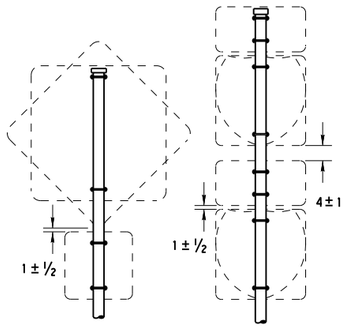
SMD(SLIP-1)-08

DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
REVISIONS 9-08			

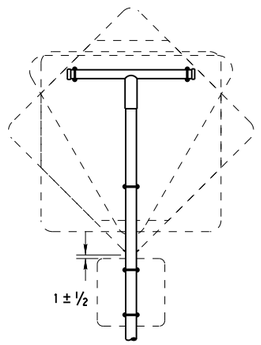
CONT	SECT	JOB	HIGHWAY
0814	01	036	FM 422

DIST	COUNTY	SHEET NO.
WFS.	BAYLOR	113

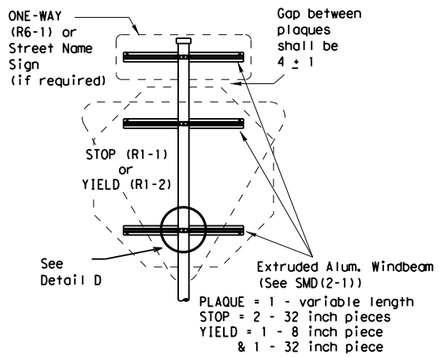
DATE: 3/29/2024 1:28:25 PM
FILE: pw://txdot.projectwiseonline.com:TXDOT2/Documents/03 - WFS/Design Projects/081401036/4 - Design/Plan Set/8. Traffic/SMD(SLIP-2)-08.dgn



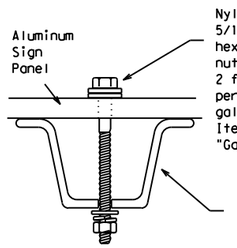
SM RD SGN ASSM TY XXXXX(1)XX(P)



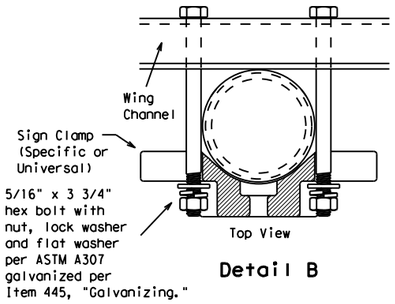
SM RD SGN ASSM TY XXXXX(1)XX(T)



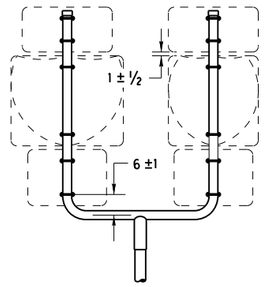
SM RD SGN ASSM TY XXXXX(1)XX(P-BM)



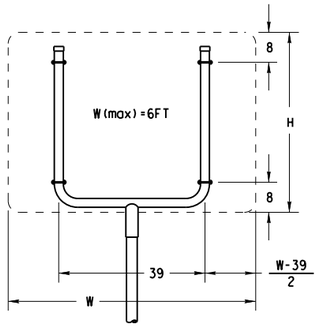
Detail A



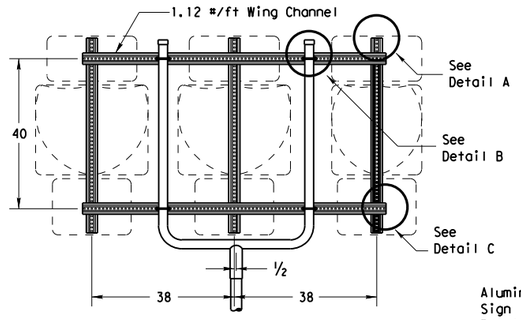
Detail B



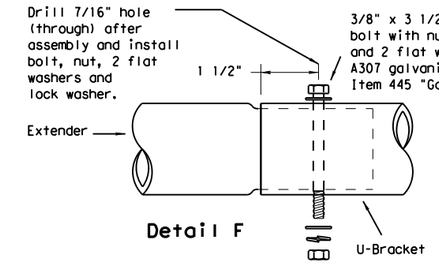
SM RD SGN ASSM TY XXXXX(1)XX(U)



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

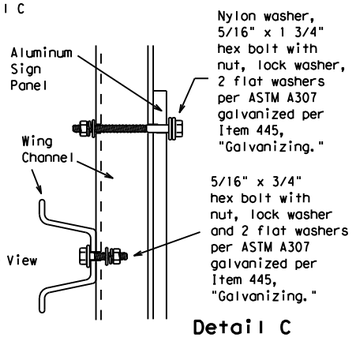


SM RD SGN ASSM TY XXXXX(1)XX(U-WC)
(See Note 11)

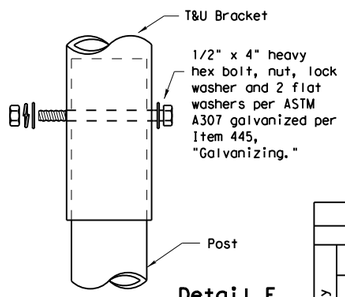


Detail F

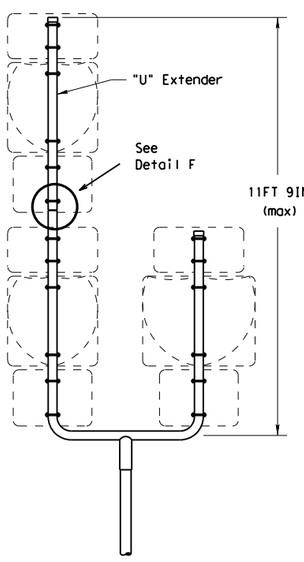
Splices shall only be allowed behind the sign substrate.



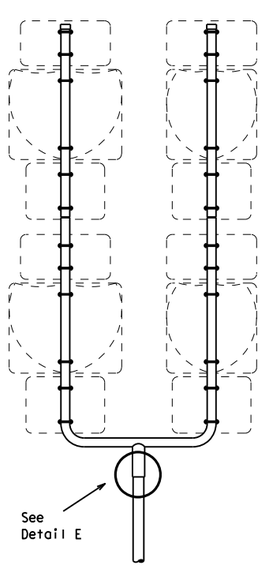
Detail C



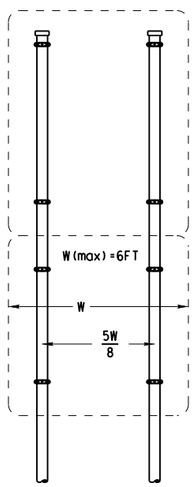
Detail E



SM RD SGN ASSM TY S80(1)XX(U-1EXT)

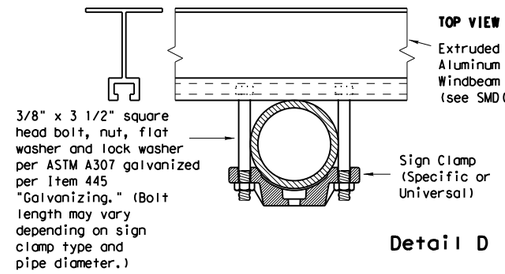


SM RD SGN ASSM TY S80(1)XX(U-2EXT)

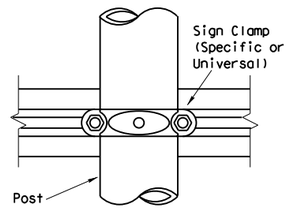


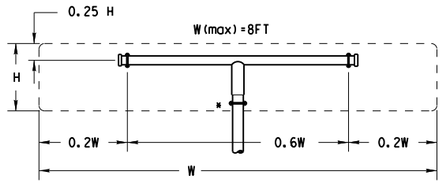
SM RD SGN ASSYM TY XXXXX(2)XX(P)

SIDE VIEW



Detail D

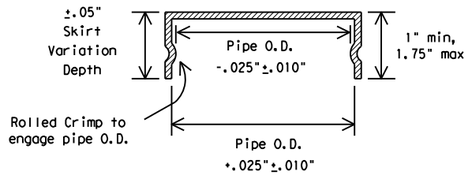




SM RD SGN ASSM TY XXXXX(1)XX(T)
(* - See Note 12)

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

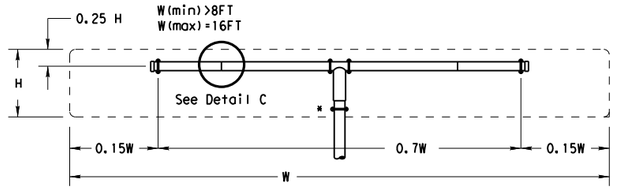
DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT

CONT	SECT	JOB	HIGHWAY
0814	01	036	FM 422

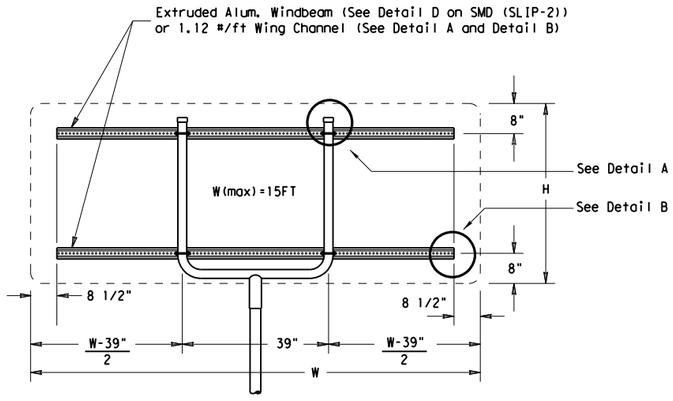
DIST	COUNTY	SHEET NO.
WFS.	BAYLOR	114

9-08 REVISIONS

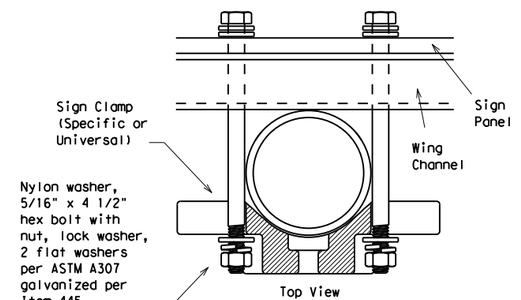
DATE: 3/29/2024 1:28:36 PM
FILE: pw://txdot.projectwiseonline.com:TXDOT2/Documents/03 - WFS/Design Projects/08140103614 - Design/Plan Set/8. Traffic/SMD(SLIP-3)-08.dgn



SM RD SGN ASSM TY XXXXX(1)XX(T-2EXT)
(* - See Note 12)

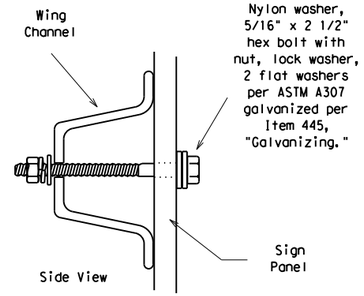


SM RD SGN ASSM TY XXXXX(1)XX(U-XX)

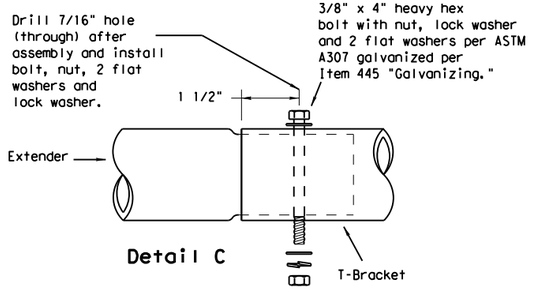


Top View

Detail A



Detail B



Detail C

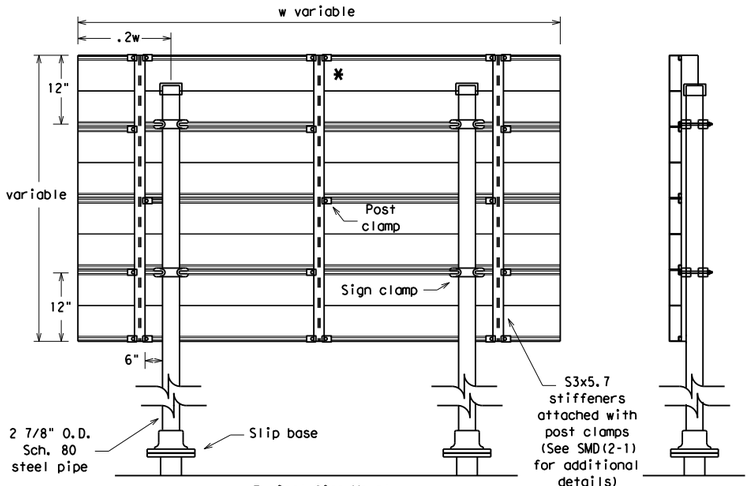
Splices shall only be allowed behind the sign substrate.

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.

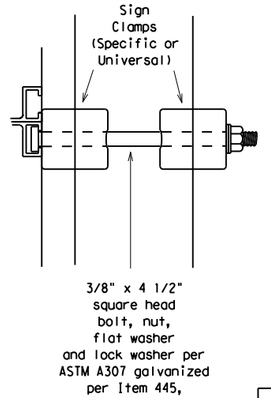


Typical Sign Mount

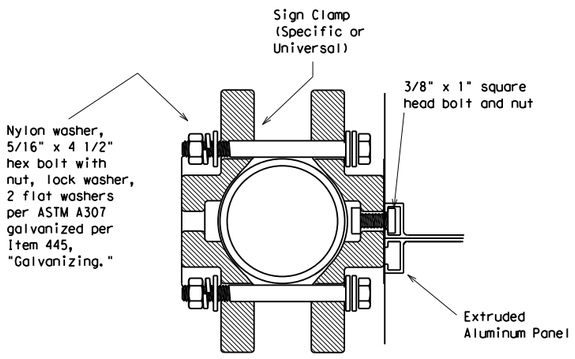
SM RD SGN ASSM TY S80(2)XX(P-EXAL)

* Additional stiffener placed at approximate center of signs when sign width is greater than 10'.

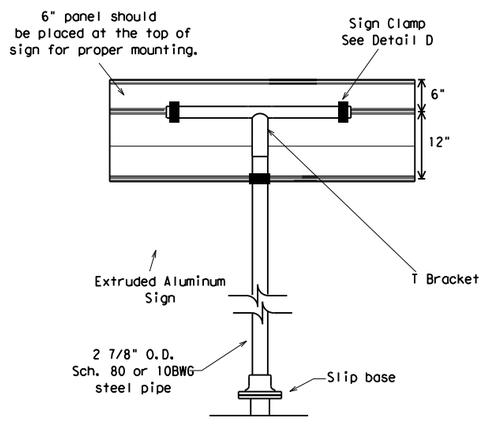
See Detail E
for clamp installation



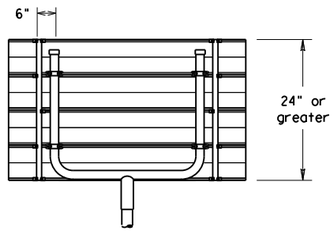
Detail E



Detail D
EXTRUDED ALUMINUM SIGN WITH T BRACKET



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

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

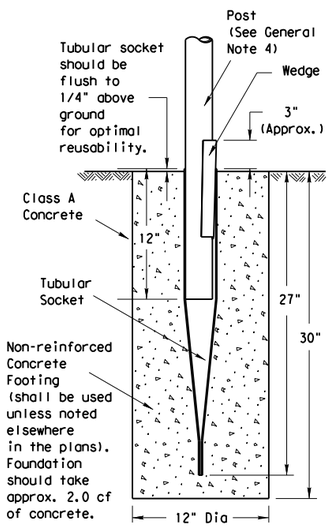
SIGN MOUNTING DETAILS
SMALL ROADSIDE SIGNS
TRIANGULAR SLIPBASE SYSTEM

SMD(SLIP-3)-08

REVISIONS	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
9-08	CONT	SECT	JOB	HIGHWAY
	0814	01	036	FM 422
	DIST	COUNTY		SHEET NO.
	WFS.	BAYLOR		115

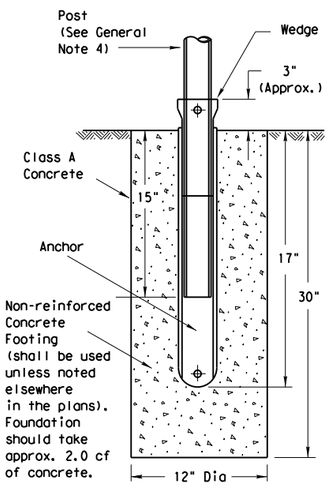
DATE: 3/29/2024 1:28:49 PM
FILE: pw://txdot.projectwiseonline.com:TXDOT2/Documents/03 - WFS/Design Projects/0814010364 - Design/Plan Set/8. Traffic/SMD(TWT)-08.dgn

Wedge Anchor Steel System



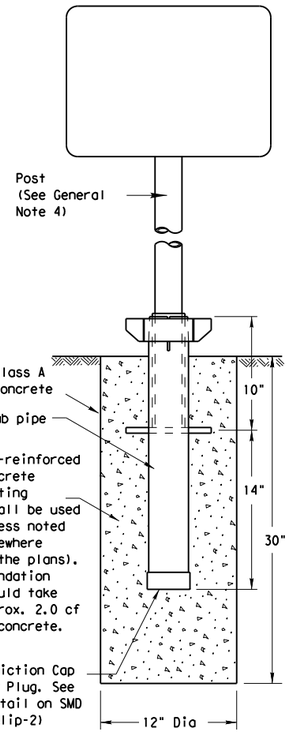
SM RD SGN ASSM TY TWT(X)WS(X)

Wedge Anchor High Density Polyethylene (HDPE) System

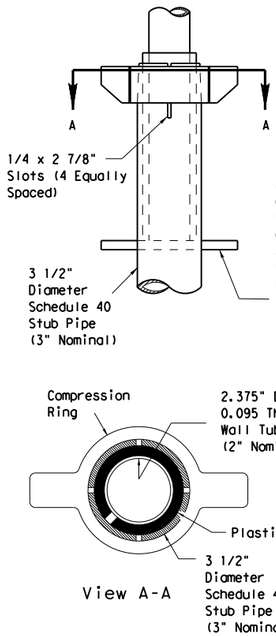


SMD RD SGN ASSM TY TWT(X)WP(X)

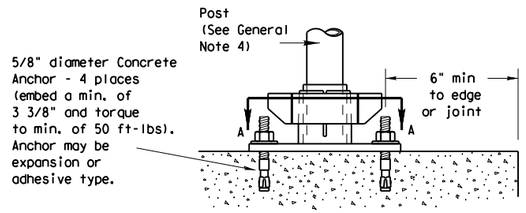
Universal Anchor System with Thin-Walled Tubing Post



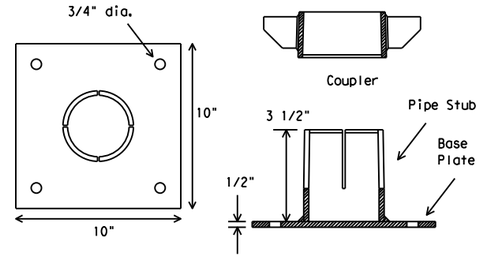
SM RD SGN ASSM TY TWT(X)UA(P)



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.

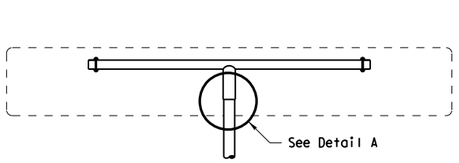


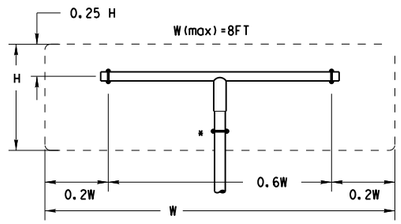
Concrete anchor consists of 5/8" diameter stud bolt with UNC series bolt threads on the upper end. A heavy hex nut per ASTM A563 and hardened washer per ASTM F436. The stud bolt shall have minimum yield and ultimate tensile strengths of 50 and 75 ksi, respectively. Nuts, bolts and washers shall be galvanized 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.



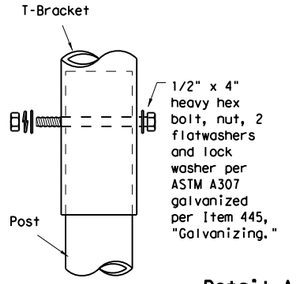
SM RD SGN ASSM TY TWT(X)UB(P)

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

9-08 REVISIONS

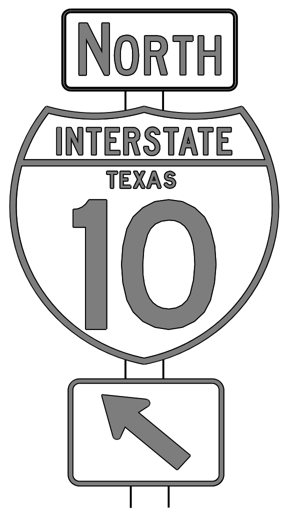
CONT	SECT	JOB	HIGHWAY
0814	01	036	FM 422
DIST	COUNTY		SHEET NO.
WFS.	BAYLOR		116

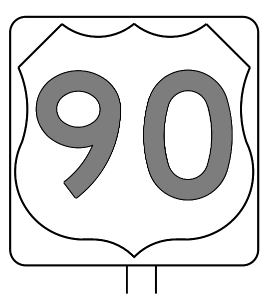
26E

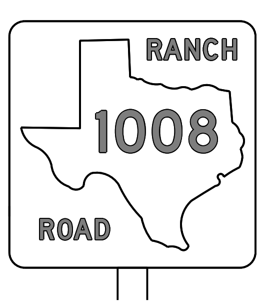
DATE: 3/29/2024 1:29:01 PM
FILE: pw://txdot.projectwiseonline.com:TXDOT2/Documents/03 - WFS/Design Projects/...

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



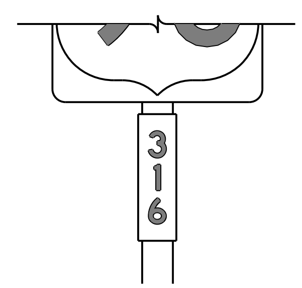


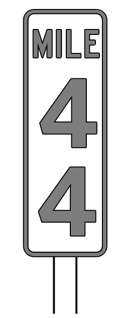


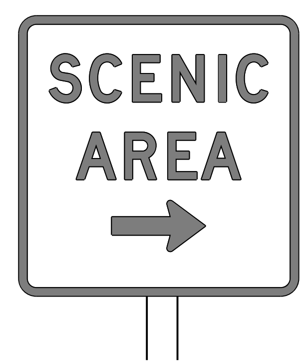
TYPICAL EXAMPLES

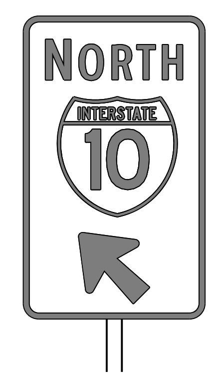
REQUIREMENTS FOR BLUE, BROWN & GREEN D AND I SERIES GUIDE SIGNS

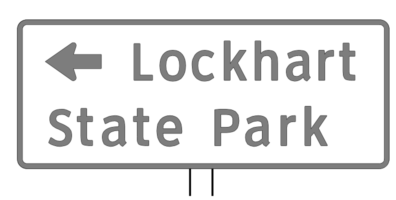
SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	ALL	TYPE B OR C SHEETING
LEGEND & BORDERS	WHITE	TYPE D SHEETING
LEGEND, SYMBOLS & BORDERS	ALL OTHERS	TYPE B OR C SHEETING

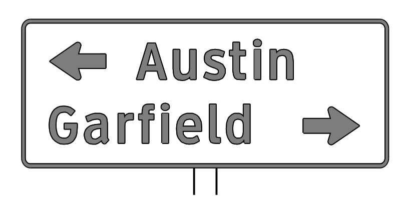












TYPICAL EXAMPLES

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

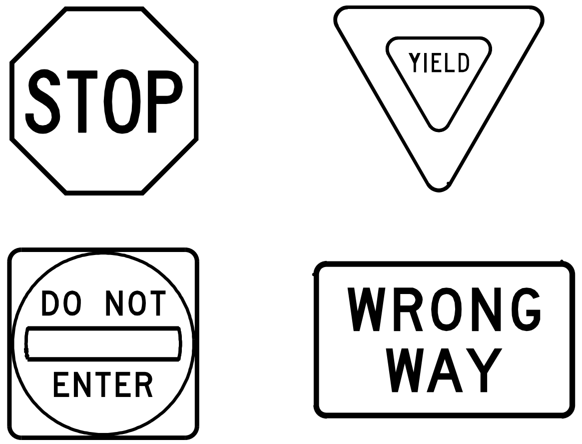
TYPICAL SIGN REQUIREMENTS

TSR(3)-13

FILE: tsr3-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT October 2003	CONT	SECT	JOB	HIGHWAY
REVISIONS	0814	01	036	FM 422
12-03 7-13	DIST		COUNTY	SHEET NO.
9-08	WFS.		BAYLOR	117

DATE: 3/29/2024 1:29:13 PM
FILE: pw://txdot.projectwiseonline.com:TXDOT2/Documents/03 - WFS/Design Projects/0814...

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



REQUIREMENTS FOR FOUR SPECIFIC SIGNS ONLY

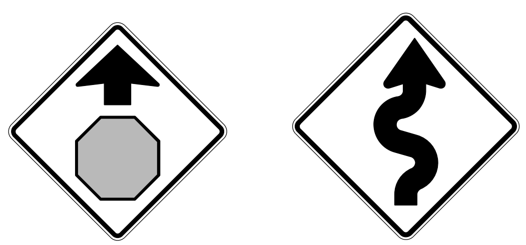
SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	RED	TYPE B OR C SHEETING
BACKGROUND	WHITE	TYPE B OR C SHEETING
LEGEND & BORDERS	WHITE	TYPE B OR C SHEETING
LEGEND	RED	TYPE B OR C SHEETING

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

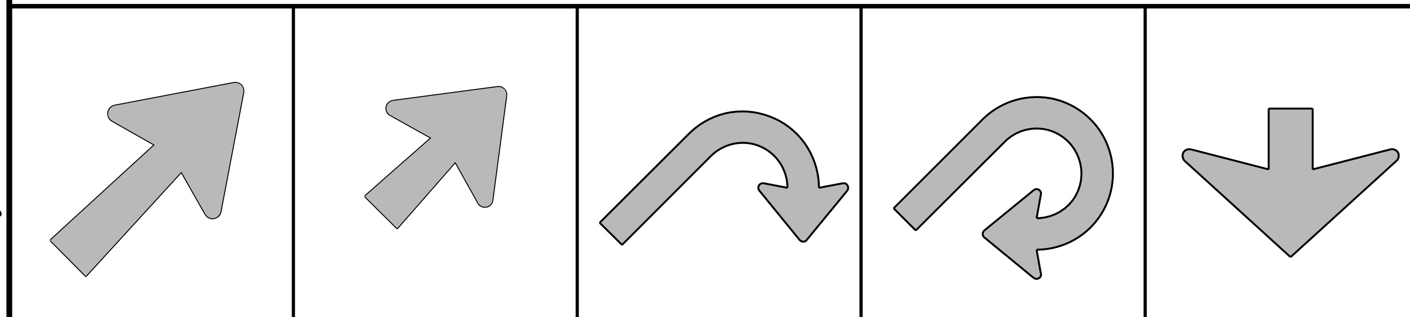
TYPICAL SIGN REQUIREMENTS

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	0814	01	036	FM 422
	DIST		COUNTY	SHEET NO.
	WFS.		BAYLOR	118

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

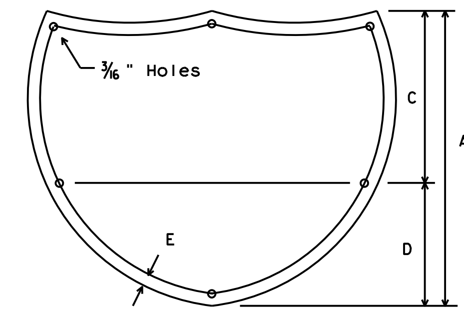
NOTE

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.

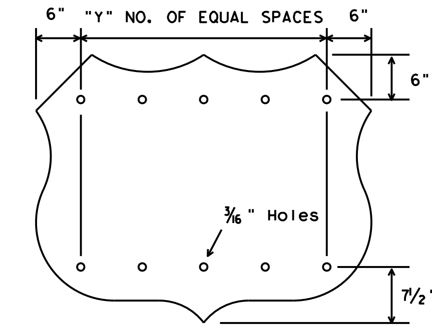
http://www.txdot.gov/

SIGN BLANK PUNCHING DETAILS FOR ATTACHMENTS WHEN SPECIFIED TO BE TYPE A ALUMINUM SIGNS (FOR MOUNTING TO GUIDE SIGN FACE)



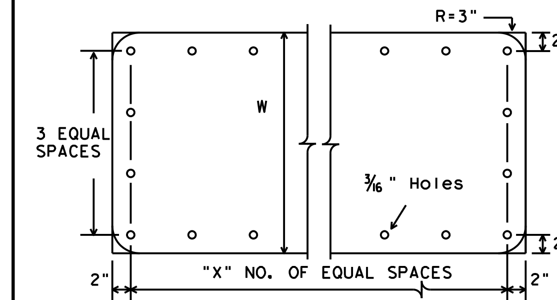
INTERSTATE ROUTE MARKERS

A	C	D	E
36	21	15	1 1/2
48	28	20	1 3/4



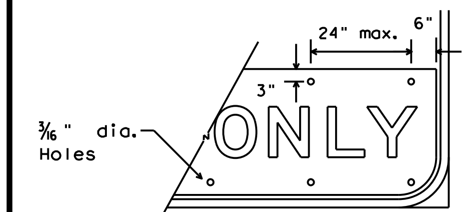
U.S. ROUTE MARKERS

Sign Size	"Y"
24x24	2
30x24	3
36x36	3
45x36	4
48x48	4
60x48	5



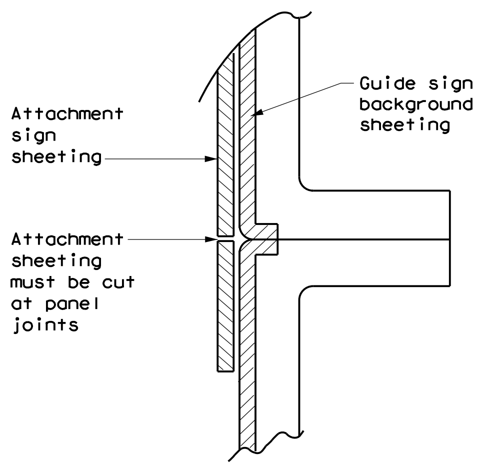
STATE ROUTE MARKERS

No. of Digits	W	X
4	24	4
4	36	5
4	48	6
3	24	3
3	36	4
3	48	5

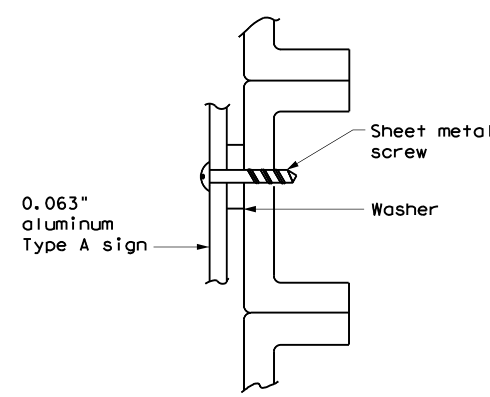


EXIT ONLY PANEL

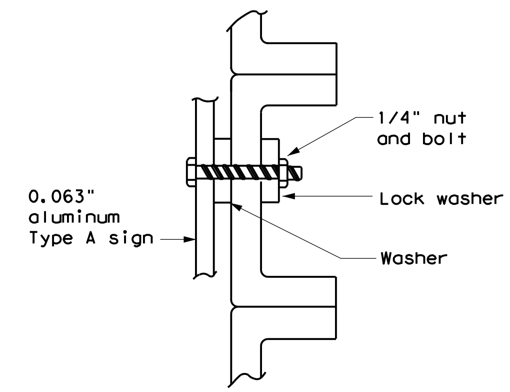
MOUNTING DETAILS OF ATTACHMENTS TO GUIDE SIGN FACE ("EXIT ONLY" AND "LEFT EXIT" PANELS, ROUTE MARKERS AND OTHER ATTACHMENTS)



DIRECT APPLIED ATTACHMENT



SCREW ATTACHMENT



NUT/BOLT ATTACHMENT

NOTE:

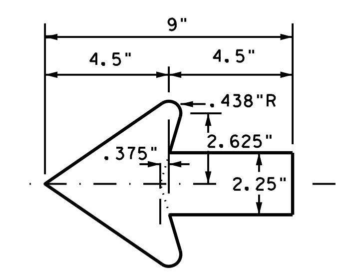
1. Sheeting for legend, symbols, and borders must be cut at panel joints.
2. Direct applied attachment signs will be subsidiary to "Aluminum Signs" or "Fiberglass Signs".

NOTE:

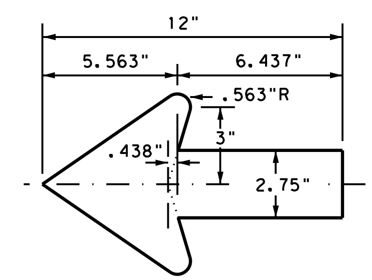
Furnish Type A aluminum sign attachments only when specified in the plans. These signs will be paid for under "Aluminum Signs".

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

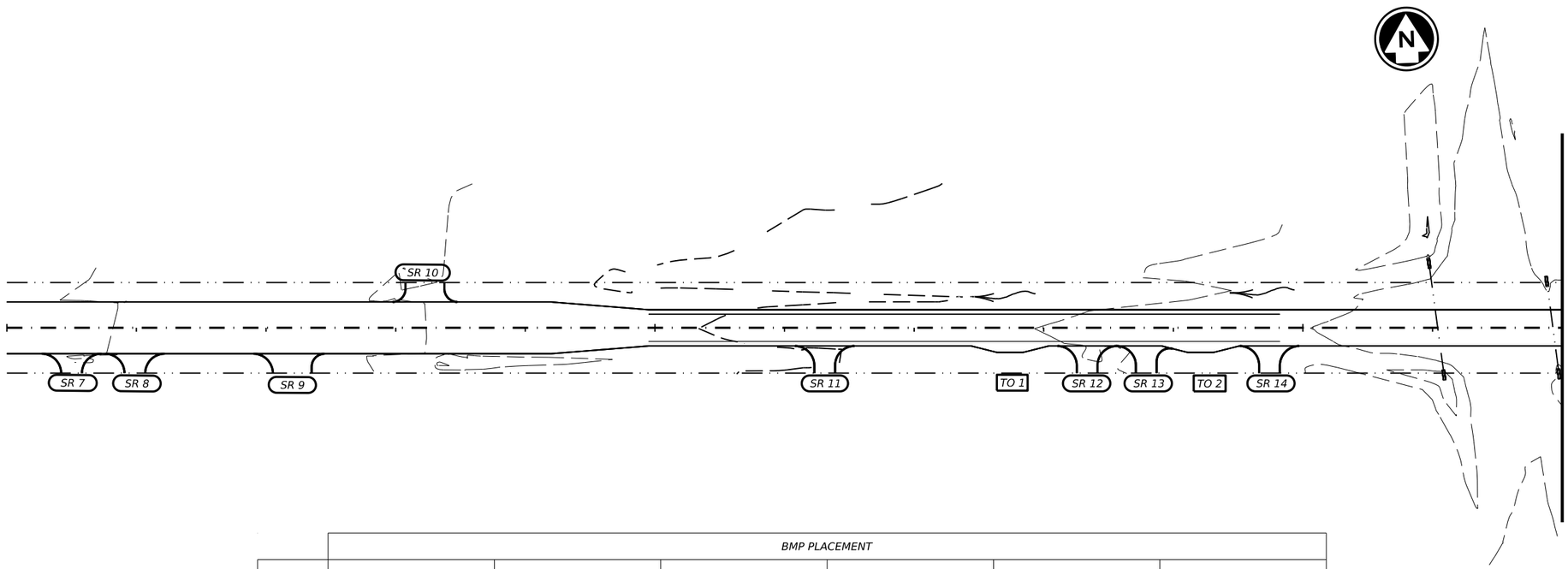
Traffic Operations Division Standard

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	0814	01	036	FM 422
12-03 7-13 9-08	DIST		COUNTY	SHEET NO.
	WFS.		BAYLOR	119

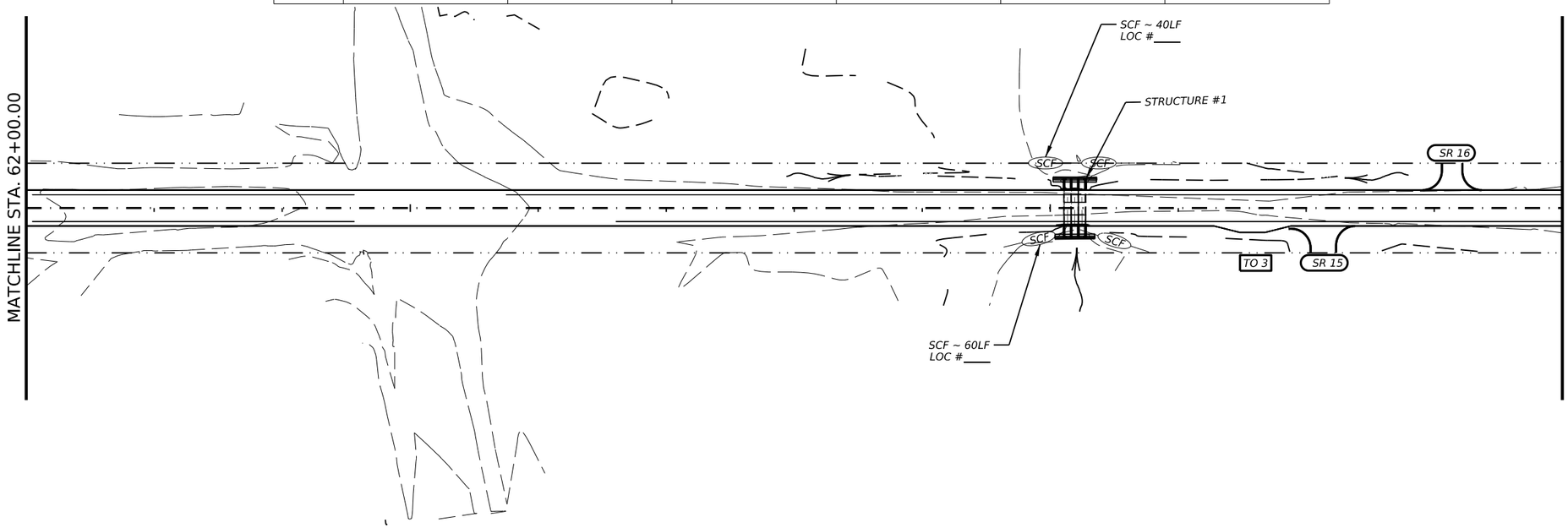
DATE: 3/29/2024 1:29:24 PM
FILE: pw://txdot.projectwiseonline.com:TXDOT2/Documents/03 - WFS/Design Projects/...



LEGEND

RFD2	Rock Filter Dam (Type 2)
ECL	ErosionControl Log
SCF	Sediment Control Fence
	Runoff Flow Arrow

	BMP PLACEMENT					
	DATE INSTALLED	DATE DISTURBED	DATE MAINTAINED	DATE REPLACED	DATE STABALIZED	DATE REMOVED
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						



STATE OF TEXAS
BRYSON P. LAWRENCE
129839
LICENSED
PROFESSIONAL ENGINEER

Bryson Lawrence, P.E.

04/01/2024

Texas Department of Transportation

FM 422

SW3P LAYOUT

0 50 100

SCALE IN FEET

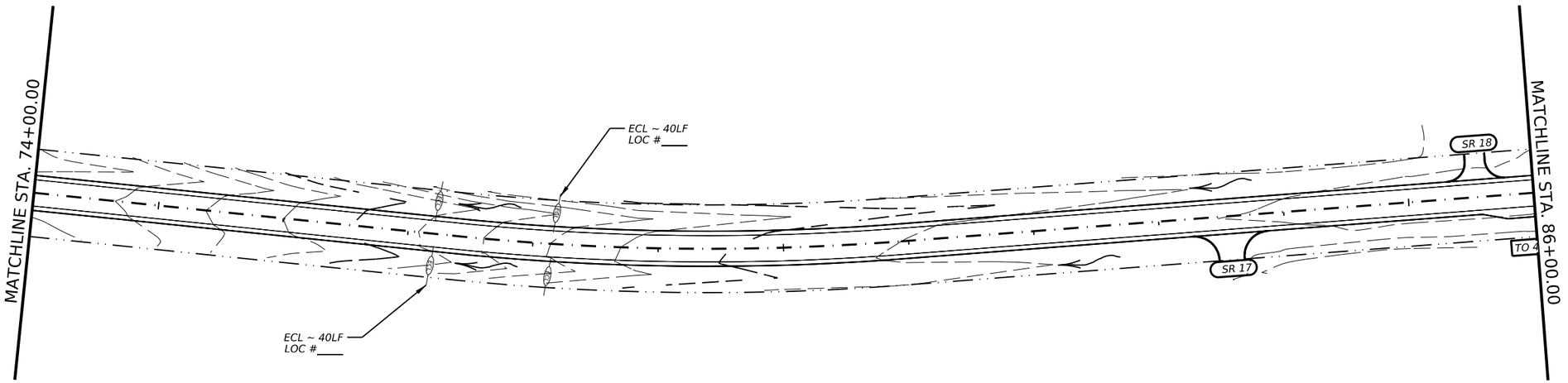
SHEET 1 OF 14

CONT	SECT	JOB	HIGHWAY
0814	01	036	FM 422
DIST	COUNTY		SHEET NO.
WFS.	BAYLOR		120

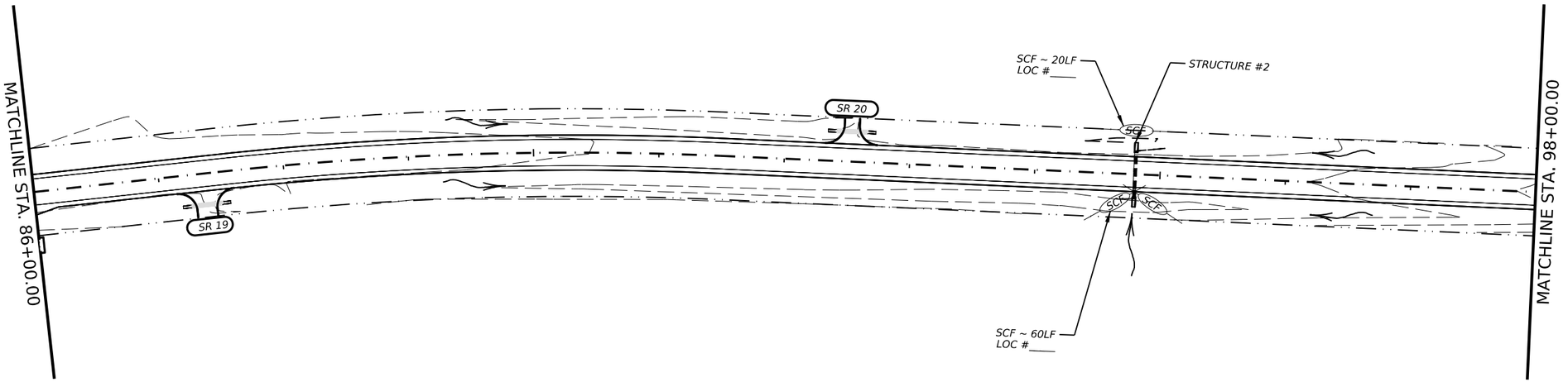
DATE: 3/29/2024 1:29:40 PM
FILE: pw://txdot.projectwiseonline.com:TXDOT2/Documents/03 - WFS/Design Projects/081401036/4 - Design/Plan Set/9. Environmental/SW3P LAYOUT.dgn

CK
DW
CK
DW

LEGEND	
RFD2	Rock Filter Dam (Type 2)
ECL	ErosionControl Log
SCF	Sediment Control Fence
	Runoff Flow Arrow



	BMP PLACEMENT					
	DATE INSTALLED	DATE DISTURBED	DATE MAINTAINED	DATE REPLACED	DATE STABALIZED	DATE REMOVED
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						



STATE OF TEXAS
BRYSON P. LAWRENCE
129839
LICENSED
PROFESSIONAL ENGINEER

Bryson Lawrence, P.E.

04/01/2024

Texas Department of Transportation

FM 422

SW3P LAYOUT

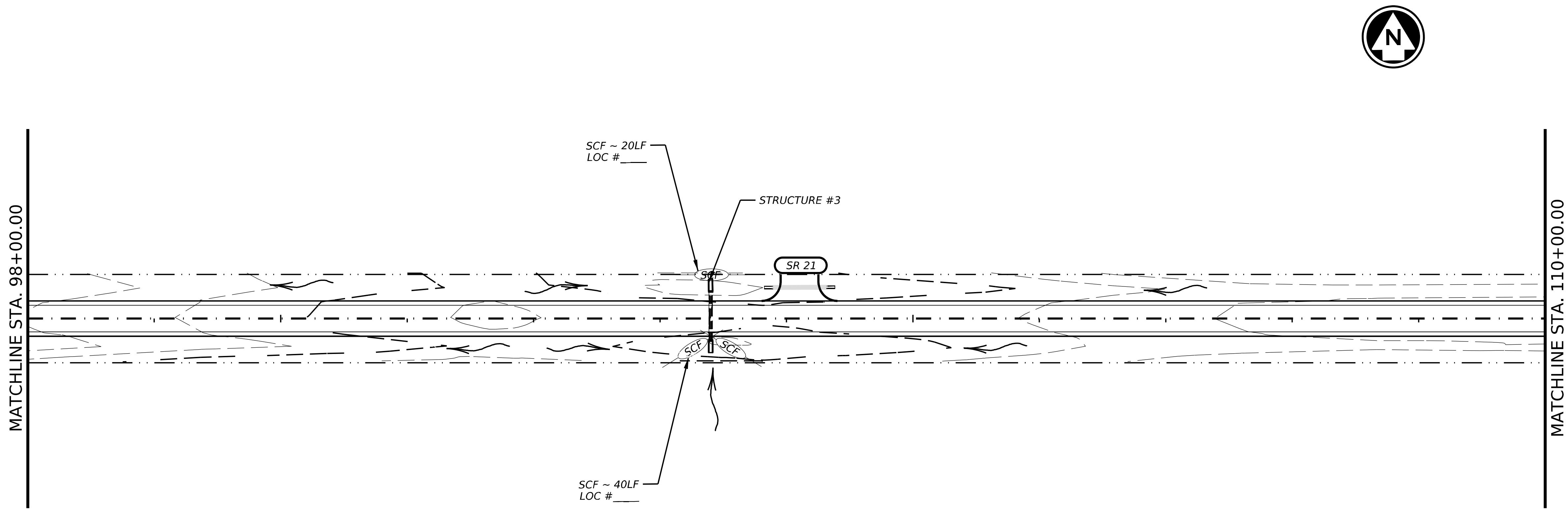
0 50 100

SCALE IN FEET

SHEET 2 OF 14

CONT	SECT	JOB	HIGHWAY
0814	01	036	FM 422
DIST	COUNTY		SHEET NO.
WFS.	BAYLOR		121

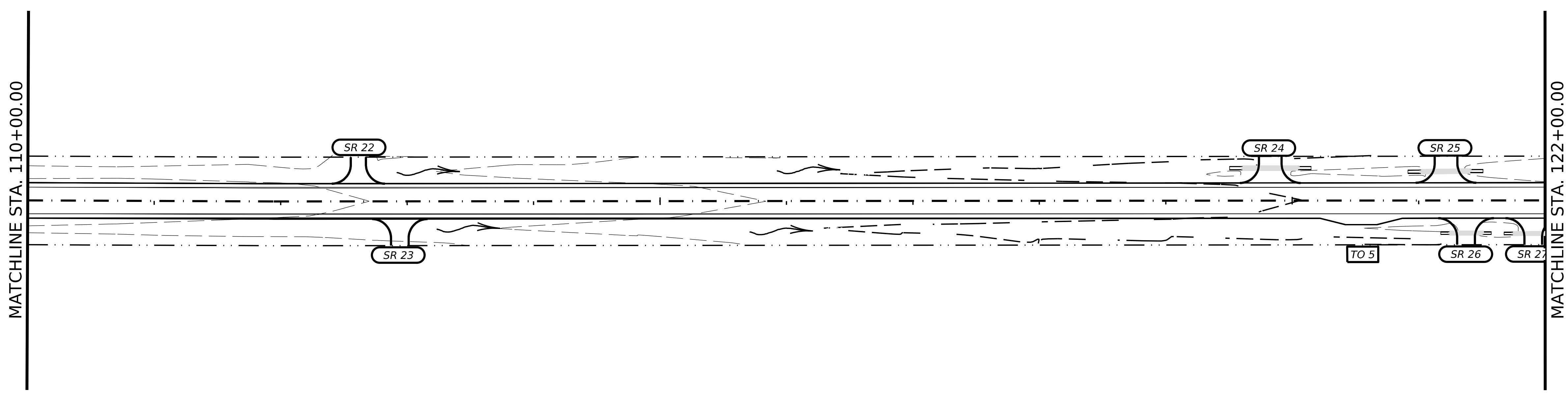
DATE: 3/29/2024 1:29:41 PM
FILE: pw://txdot.projectwiseonline.com:TXDOT2/Documents/03 - WFS/Design Projects/081401036/4 - Design/Plan Set/9. Environmental/SW3P LAYOUT.dgn



LEGEND

Symbol	Description
RFD2	Rock Filter Dam (Type 2)
ECL	ErosionControl Log
SCF	Sediment Control Fence
	Runoff Flow Arrow

	BMP PLACEMENT					
	DATE INSTALLED	DATE DISTURBED	DATE MAINTAINED	DATE REPLACED	DATE STABALIZED	DATE REMOVED
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						



STATE OF TEXAS
BRYSON P. LAWRENCE
129839
LICENSED
PROFESSIONAL ENGINEER

Bryson Lawrence, P.E.

04/01/2024

Texas Department of Transportation

FM 422

SW3P LAYOUT

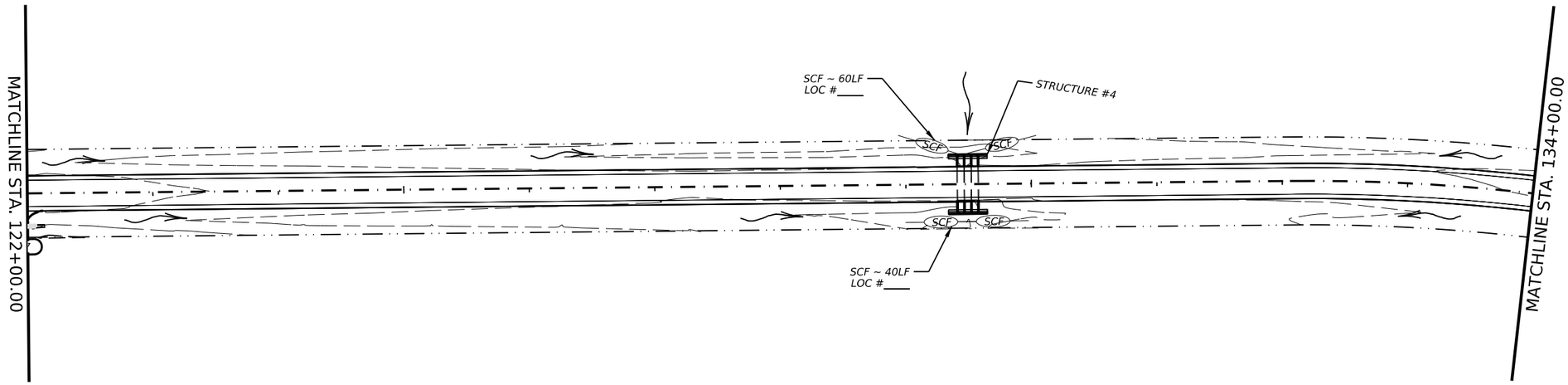
0 50 100
SCALE IN FEET

SHEET 3 OF 14

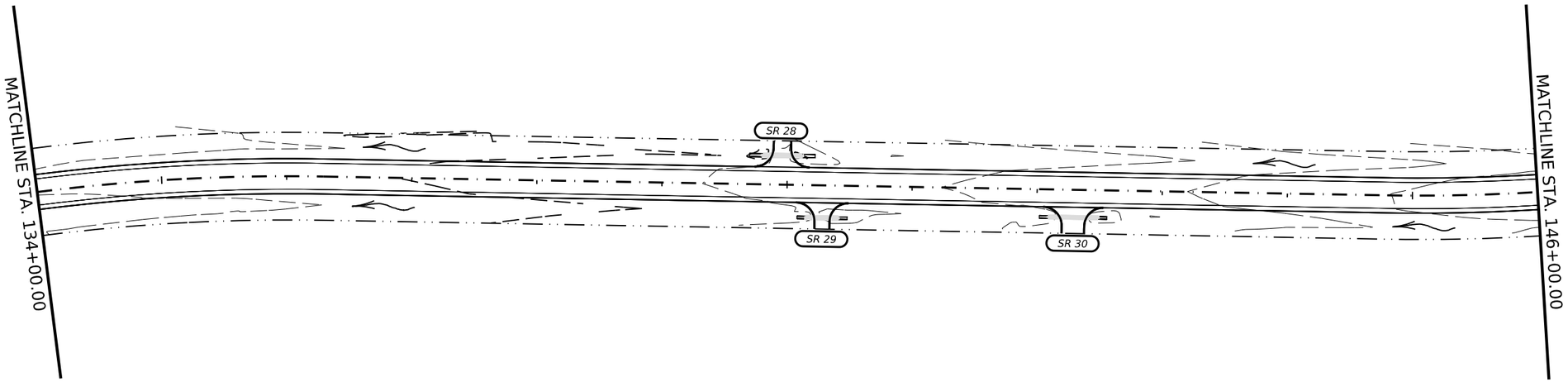
CONT	SECT	JOB	HIGHWAY
0814	01	036	FM 422

DIST	COUNTY	SHEET NO.
WFS.	BAYLOR	122

DATE: 3/29/2024 1:29:41 PM
FILE: pw://txdot.projectwiseonline.com:TXDOT2/Documents/03 - WFS/Design Projects/0814010364 - Design/Plan Set/9. Environmental/SW3P LAYOUT.dgn



	BMP PLACEMENT					
	DATE INSTALLED	DATE DISTURBED	DATE MAINTAINED	DATE REPLACED	DATE STABALIZED	DATE REMOVED
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						



LEGEND

RFD2	Rock Filter Dam (Type 2)
ECL	ErosionControl Log
SCF	Sediment Control Fence
	Runoff Flow Arrow

STATE OF TEXAS
BRYSON P. LAWRENCE
129839
LICENSED
PROFESSIONAL ENGINEER

Byron Lawrence, P.E.

04/01/2024

Texas Department of Transportation

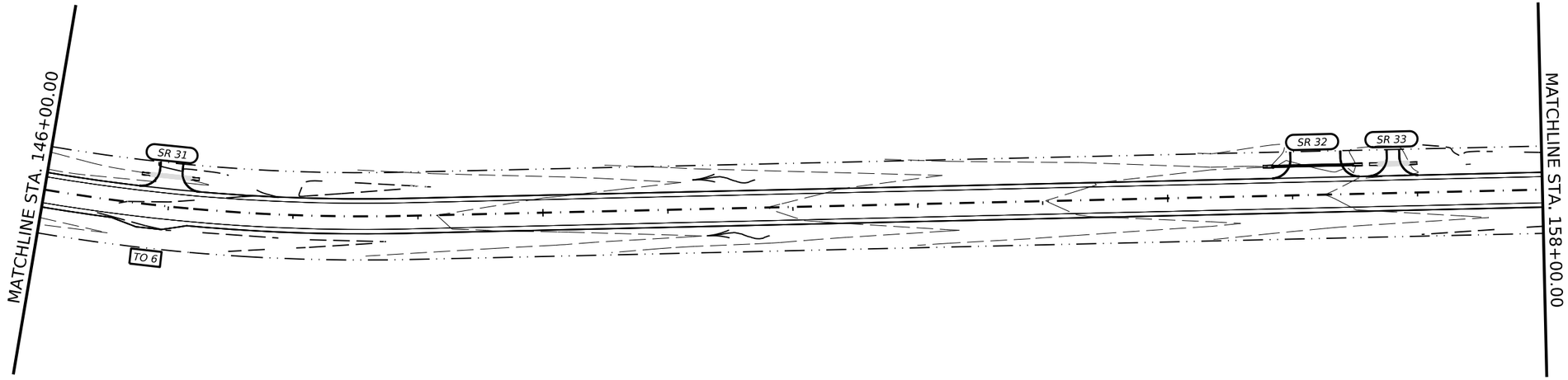
FM 422

SW3P LAYOUT

0 50 100
SCALE IN FEET

CONT	SECT	JOB	HIGHWAY
0814	01	036	FM 422
DIST	COUNTY		SHEET NO.
WFS.	BAYLOR		123

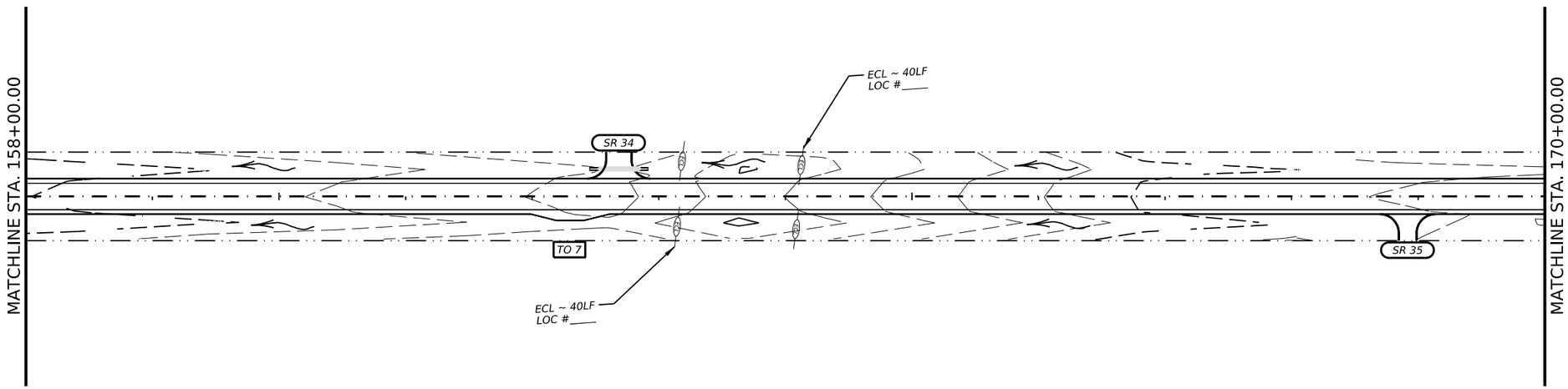
DATE: 3/29/2024 1:29:42 PM
FILE: pw://txdot.projectwiseonline.com:TXDOT2/Documents/03 - WFS/Design Projects/0814010361/4 - Design/Plan Set/9. Environmental/SW3P LAYOUT.dgn



LEGEND

RFD2	Rock Filter Dam (Type 2)
ECL	ErosionControl Log
SCF	Sediment Control Fence
	Runoff Flow Arrow

	BMP PLACEMENT					
	DATE INSTALLED	DATE DISTURBED	DATE MAINTAINED	DATE REPLACED	DATE STABALIZED	DATE REMOVED
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						



STATE OF TEXAS
BRYSON P. LAWRENCE
129839
LICENSED
PROFESSIONAL ENGINEER

Bryson Lawrence, P.E.

04/01/2024

Texas Department of Transportation

FM 422

SW3P LAYOUT

0 50 100

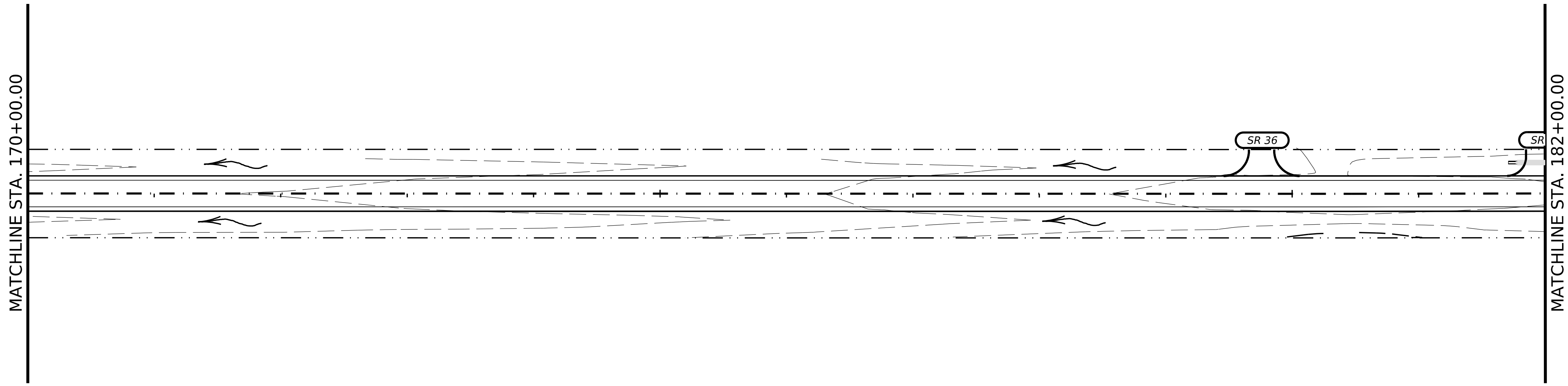
SCALE IN FEET

SHEET 5 OF 14

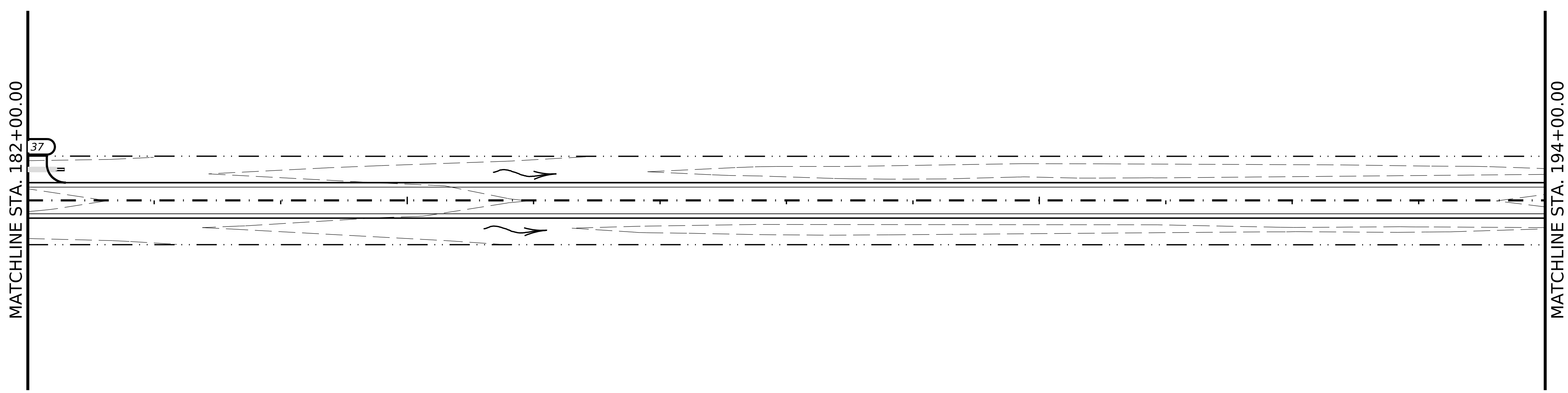
CONT	SECT	JOB	HIGHWAY
0814	01	036	FM 422
DIST	COUNTY		SHEET NO.
WFS.	BAYLOR		124

DATE: 3/29/2024 1:29:43 PM
FILE: pw://txdot.projectwiseonline.com:TXDOT2/Documents/03 - WFS/Design Projects/0814010036/4 - Design/Plan Set/9. Environmental/SW3P LAYOUT.dgn

LEGEND	
RFD2	Rock Filter Dam (Type 2)
ECL	ErosionControl Log
SCF	Sediment Control Fence
(arrow)	Runoff Flow Arrow



	BMP PLACEMENT					
	DATE INSTALLED	DATE DISTURBED	DATE MAINTAINED	DATE REPLACED	DATE STABALIZED	DATE REMOVED
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						



STATE OF TEXAS
BRYSON P. LAWRENCE
129839
LICENSED
PROFESSIONAL ENGINEER

Bryson Lawrence, P.E.

04/01/2024

Texas Department of Transportation

FM 422

SW3P LAYOUT

0 50 100
SCALE IN FEET

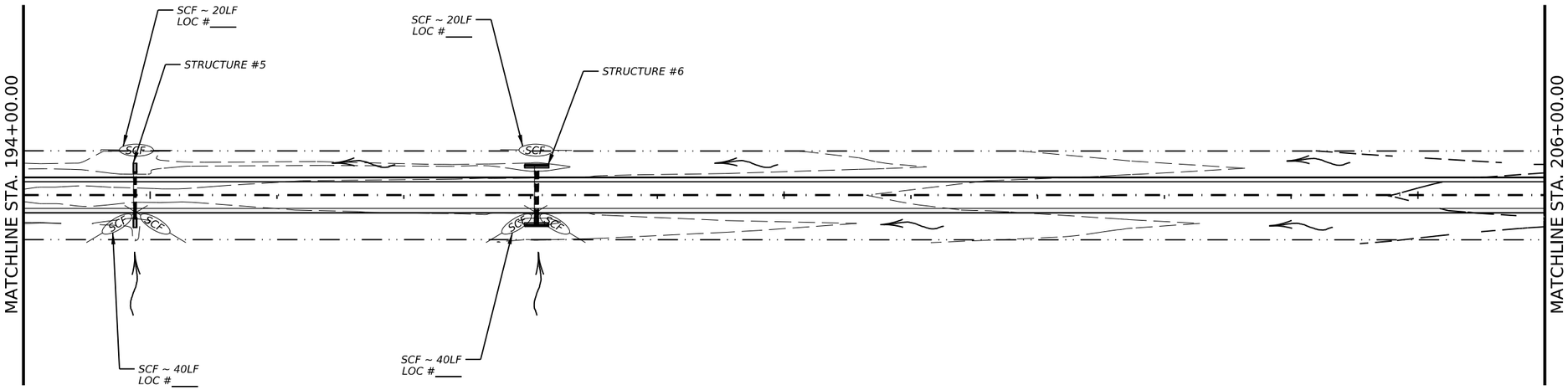
 SHEET 6 OF 14

CONT	SECT	JOB	HIGHWAY
0814	01	036	FM 422

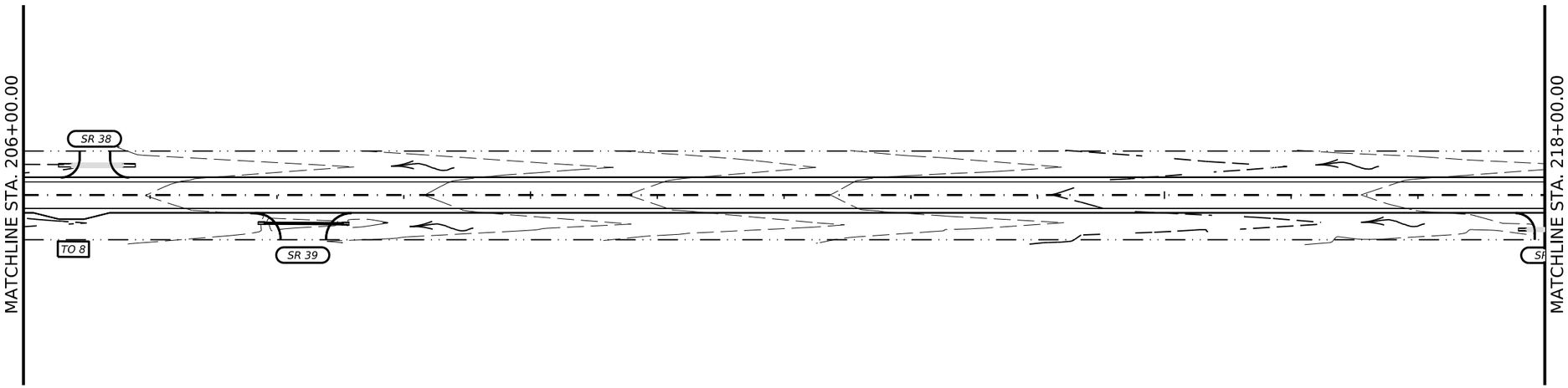
DIST	COUNTY	SHEET NO.
WFS.	BAYLOR	125

DATE: 3/29/2024 1:29:44 PM
FILE: pw://txdot.projectwiseonline.com:TXDOT2/Documents/03 - WFS/Design Projects/0814010036/4 - Design/Plan Set/9. Environmental/SW3P LAYOUT.dgn

DN: CK: DW: CK:



	BMP PLACEMENT					
	DATE INSTALLED	DATE DISTURBED	DATE MAINTAINED	DATE REPLACED	DATE STABALIZED	DATE REMOVED
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						



LEGEND

RFD2	Rock Filter Dam (Type 2)
ECL	ErosionControl Log
SCF	Sediment Control Fence
	Runoff Flow Arrow

STATE OF TEXAS
BRYSON P. LAWRENCE
129839
LICENSED
PROFESSIONAL ENGINEER

Bryson Lawrence, P.E.

04/01/2024

Texas Department of Transportation

FM 422

SW3P LAYOUT

0 50 100

SCALE IN FEET

SHEET 7 OF 14

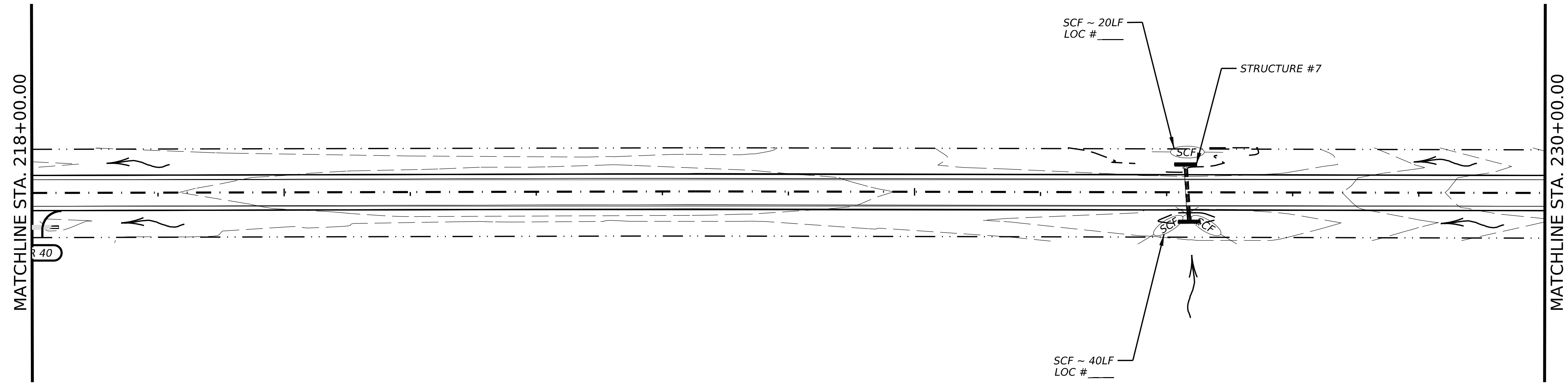
CONT	SECT	JOB	HIGHWAY
0814	01	036	FM 422
DIST	COUNTY		SHEET NO.
WFS.	BAYLOR		126

DATE: 3/29/2024 1:29:44 PM
FILE: pw://txdot.projectwiseonline.com:TXDOT2/Documents/03 - WFS/Design Projects/0814010036/4 - Design/Plan Set/9. Environmental/SW3P LAYOUT.dgn

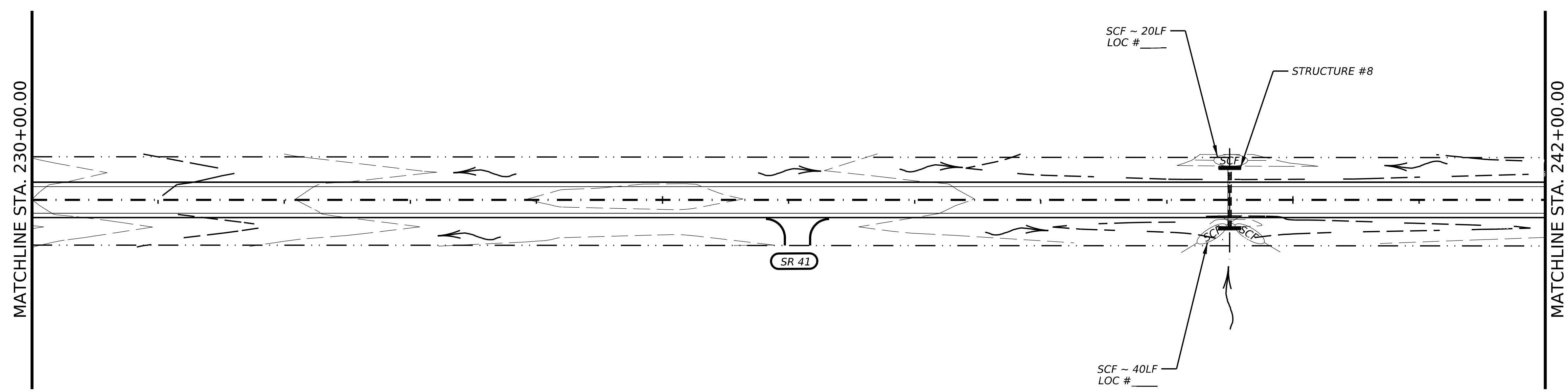
DATE: 3/29/2024 1:29:45 PM
FILE: pw:\\txdot.projectwiseonline.com:TXDOT2/Documents/03 - WFS/Design Projects/0814010364 - Design/Plan Set/9. Environmental/SW3P LAYOUT.dgn

LEGEND

Symbol	Description
RFD2	Rock Filter Dam (Type 2)
ECL	ErosionControl Log
SCF	Sediment Control Fence
(arrow)	Runoff Flow Arrow



	BMP PLACEMENT					
	DATE INSTALLED	DATE DISTURBED	DATE MAINTAINED	DATE REPLACED	DATE STABALIZED	DATE REMOVED
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						



STATE OF TEXAS
BRYSON P. LAWRENCE
129839
LICENSED
PROFESSIONAL ENGINEER

Bryson Lawrence, P.E.

04/01/2024

Texas Department of Transportation

FM 422

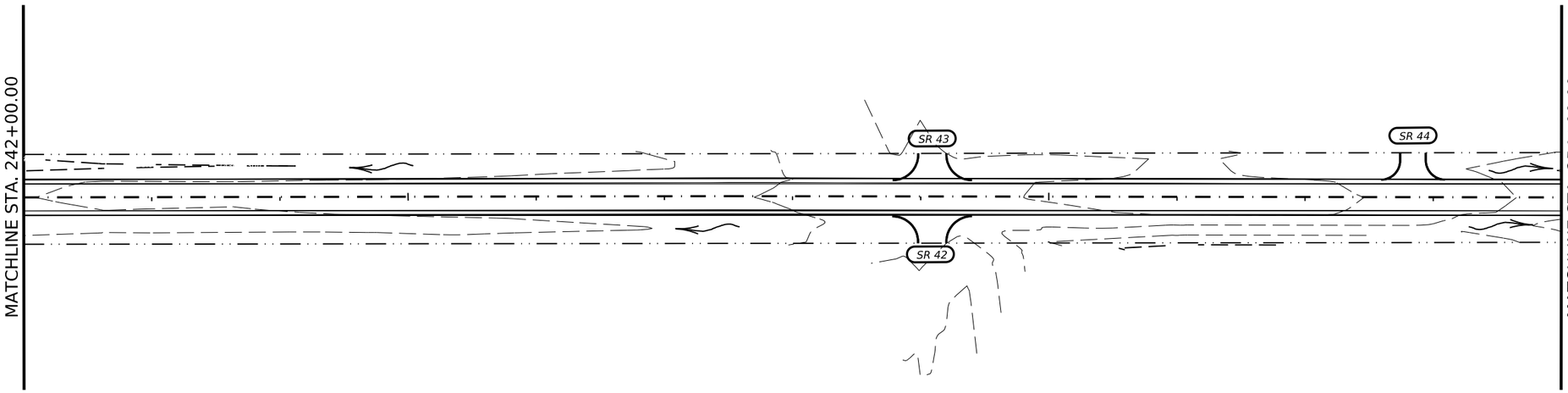
SW3P LAYOUT

0 50 100
SCALE IN FEET

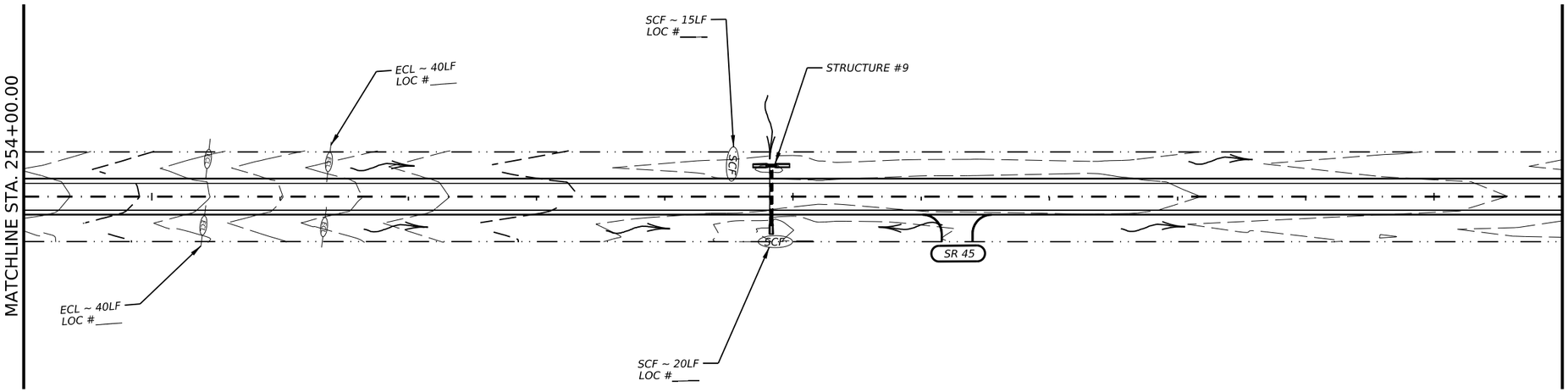
SHEET 8 OF 14

CONT	SECT	JOB	HIGHWAY
0814	01	036	FM 422
DIST	COUNTY		SHEET NO.
WFS.	BAYLOR		127

CK
DW
CK
DW



	BMP PLACEMENT					
	DATE INSTALLED	DATE DISTURBED	DATE MAINTAINED	DATE REPLACED	DATE STABALIZED	DATE REMOVED
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						



LEGEND

RFD2	Rock Filter Dam (Type 2)
ECL	ErosionControl Log
SCF	Sediment Control Fence
	Runoff Flow Arrow

STATE OF TEXAS
BRYSON P. LAWRENCE
129839
LICENSED
PROFESSIONAL ENGINEER

Bryson Lawrence, P.E.

04/01/2024

Texas Department of Transportation

FM 422

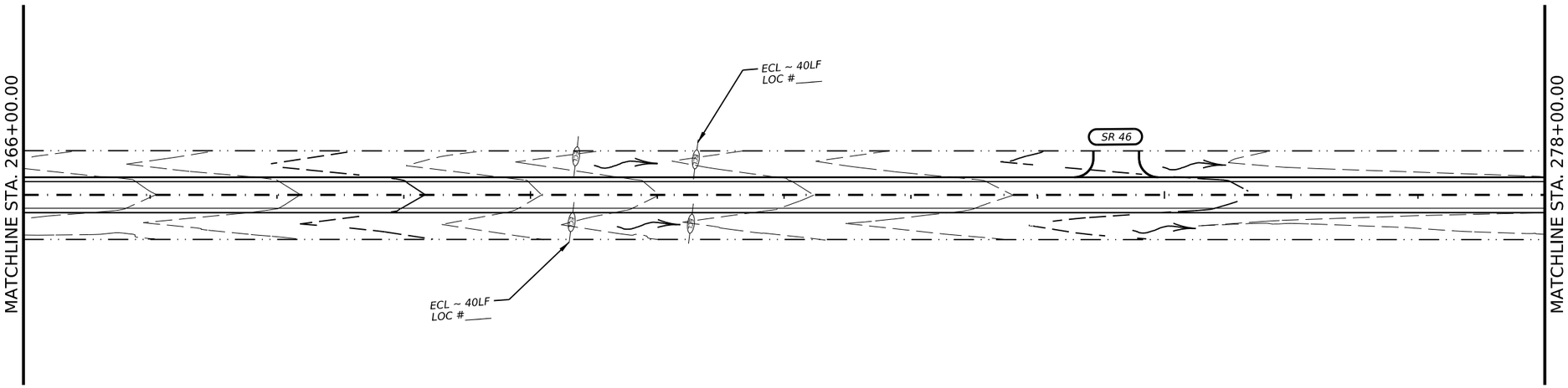
SW3P LAYOUT

0 50 100
SCALE IN FEET

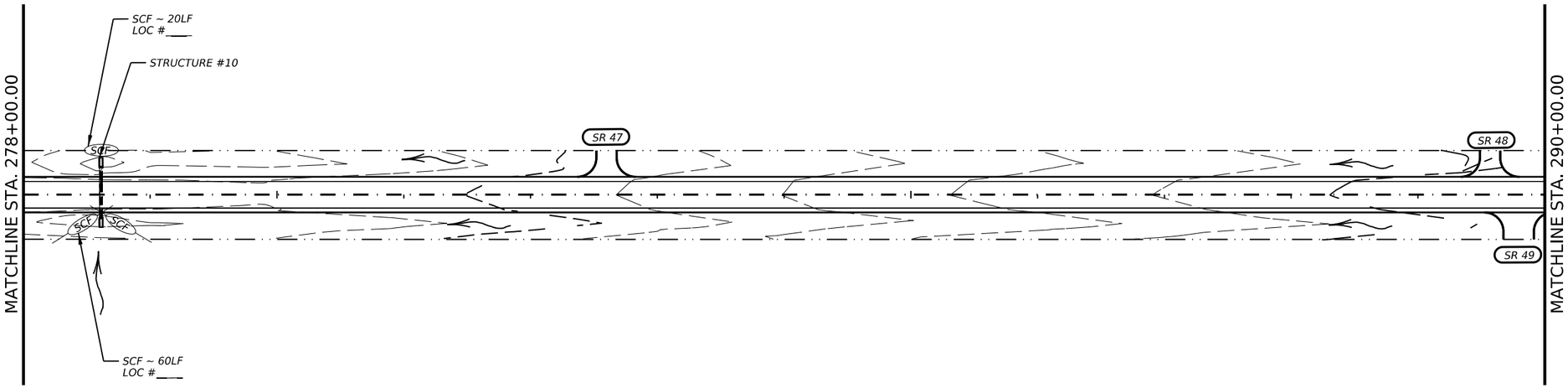
SHEET 9 OF 14

CONT	SECT	JOB	HIGHWAY
0814	01	036	FM 422
DIST	COUNTY		SHEET NO.
WFS.	BAYLOR		128

DATE: 3/29/2024 1:29:46 PM
FILE: pw://txdot.projectwiseonline.com:TXDOT2/Documents/03 - WFS/Design Projects/0814010361/4 - Design/Plan Set/9. Environmental/SW3P LAYOUT.dgn



	BMP PLACEMENT					
	DATE INSTALLED	DATE DISTURBED	DATE MAINTAINED	DATE REPLACED	DATE STABALIZED	DATE REMOVED
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						



LEGEND

RFD2	Rock Filter Dam (Type 2)
ECL	ErosionControl Log
SCF	Sediment Control Fence
	Runoff Flow Arrow

STATE OF TEXAS
BRYSON P. LAWRENCE
129839
LICENSED
PROFESSIONAL ENGINEER

Bryson Lawrence, P.E.

04/01/2024

Texas Department of Transportation

FM 422

SW3P LAYOUT

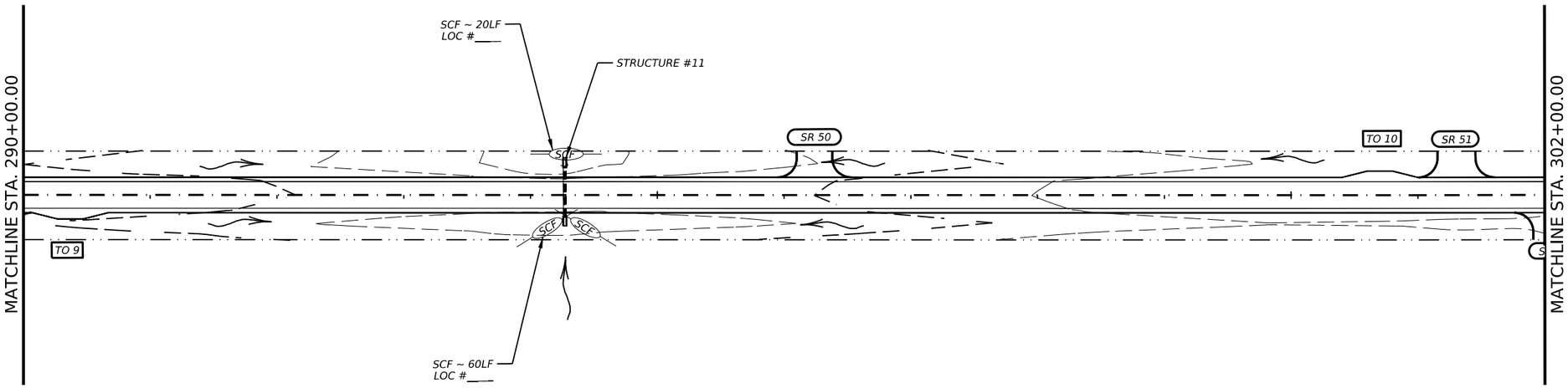
0 50 100

SCALE IN FEET

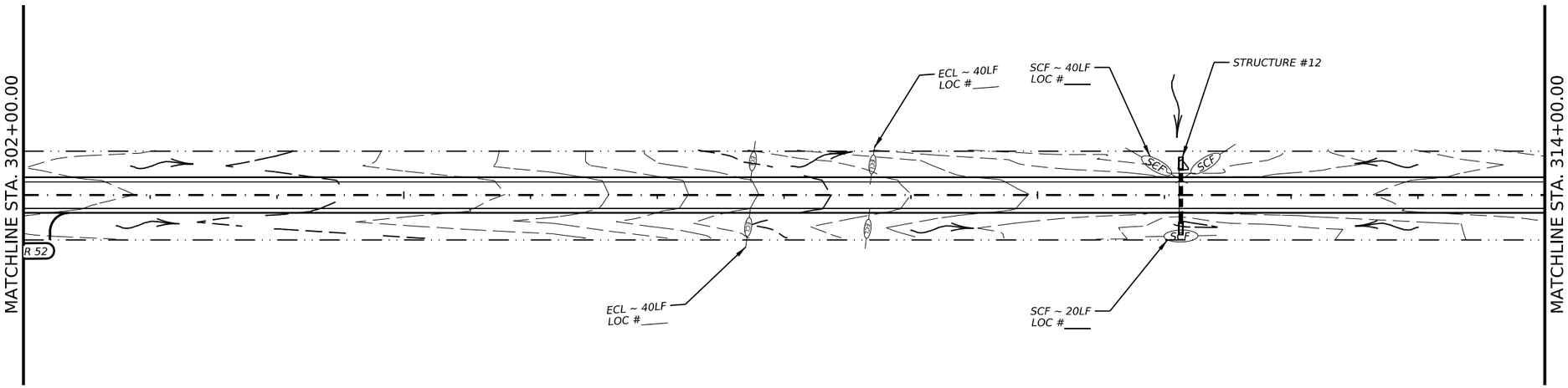
SHEET 10 OF 14

CONT	SECT	JOB	HIGHWAY
0814	01	036	FM 422
DIST	COUNTY		SHEET NO.
WFS.	BAYLOR		129

DATE: 3/29/2024 1:29:47 PM
FILE: pw://txdot.projectwiseonline.com:TXDOT2/Documents/03 - WFS/Design Projects/081401036/4 - Design/Plan Set/9. Environmental/SW3P LAYOUT.dgn



	BMP PLACEMENT					
	DATE INSTALLED	DATE DISTURBED	DATE MAINTAINED	DATE REPLACED	DATE STABALIZED	DATE REMOVED
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						



LEGEND

RFD2	Rock Filter Dam (Type 2)
ECL	ErosionControl Log
SCF	Sediment Control Fence
	Runoff Flow Arrow

STATE OF TEXAS
BRYSON P. LAWRENCE
129839
LICENSED
PROFESSIONAL ENGINEER

Bryson Lawrence, P.E.

04/01/2024

Texas Department of Transportation

FM 422

SW3P LAYOUT

0 50 100

SCALE IN FEET

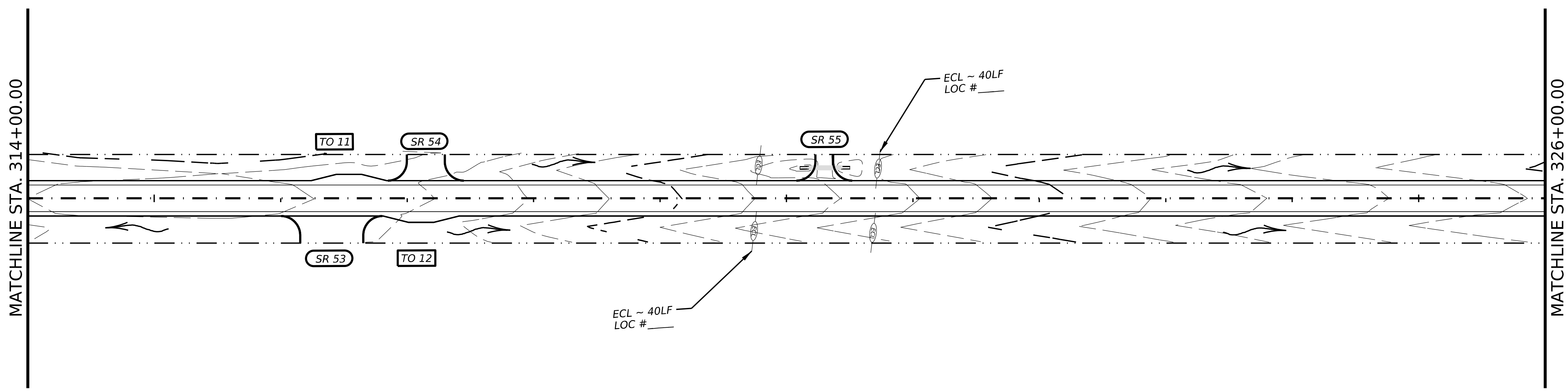
SHEET 11 OF 14

CONT	SECT	JOB	HIGHWAY
0814	01	036	FM 422
DIST	COUNTY		SHEET NO.
WFS.	BAYLOR		130

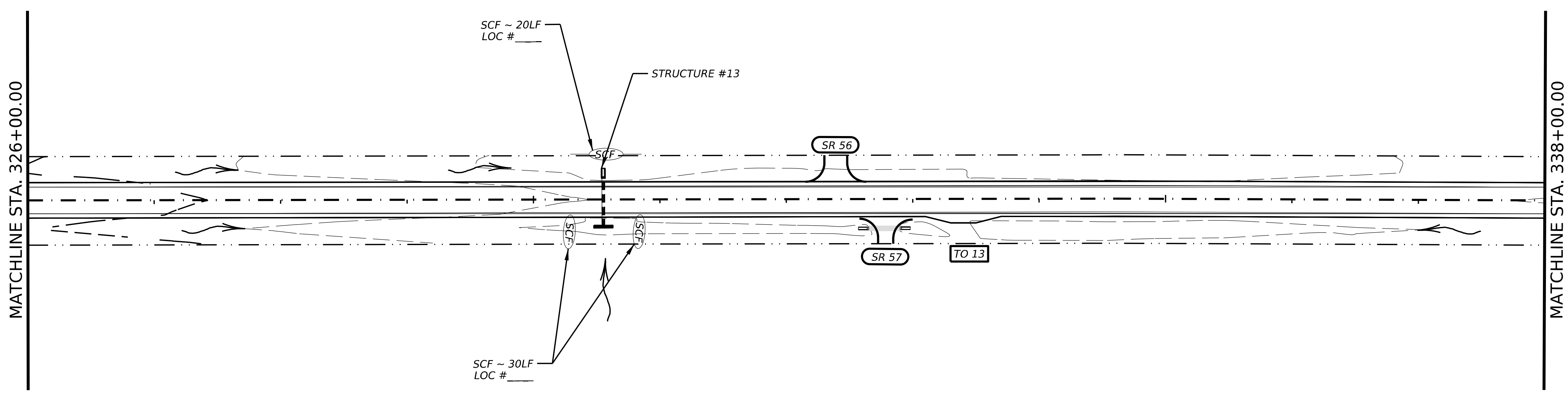
DATE: 3/29/2024 1:29:48 PM
FILE: pw://txdot.projectwiseonline.com:TXDOT2/Documents/03 - WFS/Design Projects/0814010361/4 - Design/Plan Set/9. Environmental/SW3P LAYOUT.dgn

LEGEND

Symbol	Description
RFD2	Rock Filter Dam (Type 2)
ECL	ErosionControl Log
SCF	Sediment Control Fence
	Runoff Flow Arrow



	BMP PLACEMENT					
	DATE INSTALLED	DATE DISTURBED	DATE MAINTAINED	DATE REPLACED	DATE STABALIZED	DATE REMOVED
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						



STATE OF TEXAS
BRYSON P. LAWRENCE
129839
LICENSED PROFESSIONAL ENGINEER

Bryson Lawrence, P.E.

04/01/2024

Texas Department of Transportation

FM 422

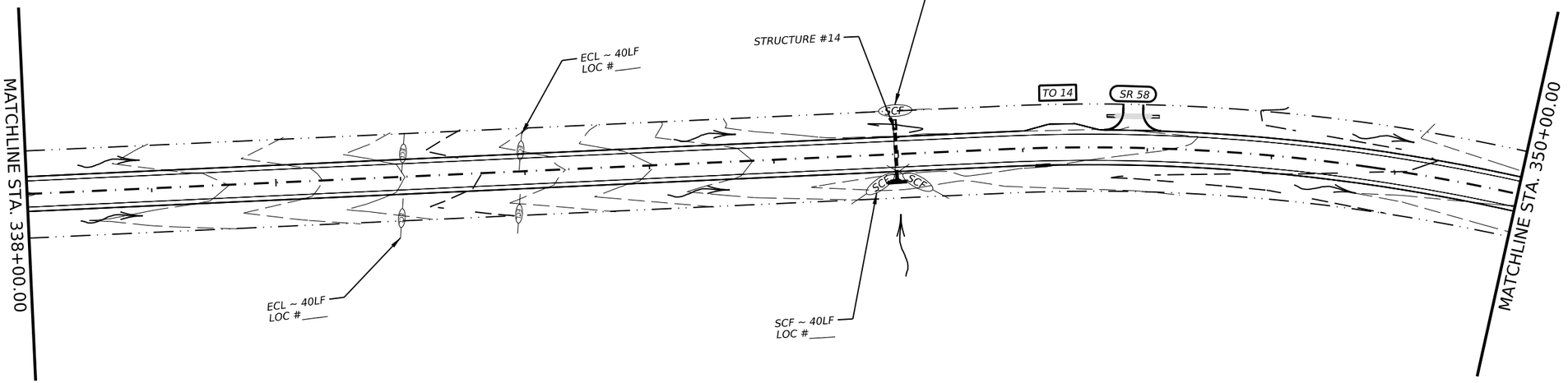
SW3P LAYOUT

0 50 100
SCALE IN FEET

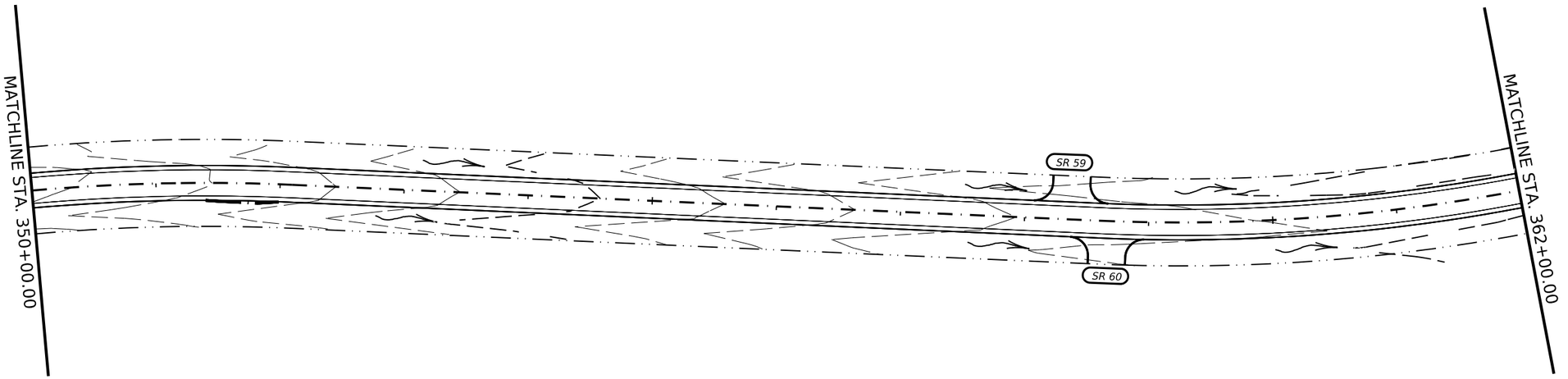
SHEET 12 OF 14

CONT	SECT	JOB	HIGHWAY
0814	01	036	FM 422
DIST	COUNTY		SHEET NO.
WFS.	BAYLOR		131

DATE: 3/29/2024 1:29:48 PM
FILE: pw:\\txdot.projectwiseonline.com:TXDOT2/Documents/03 - WFS/Design Projects/0814010364 - Design/Plan Set/9. Environmental/SW3P LAYOUT.dgn



	BMP PLACEMENT					
	DATE INSTALLED	DATE DISTURBED	DATE MAINTAINED	DATE REPLACED	DATE STABALIZED	DATE REMOVED
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						



LEGEND

RFD2	Rock Filter Dam (Type 2)
ECL	ErosionControl Log
SCF	Sediment Control Fence
	Runoff Flow Arrow

STATE OF TEXAS
BRYSON P. LAWRENCE
129839
LICENSED
PROFESSIONAL ENGINEER

Bryson Lawrence, P.E.

04/01/2024

Texas Department of Transportation

FM 422

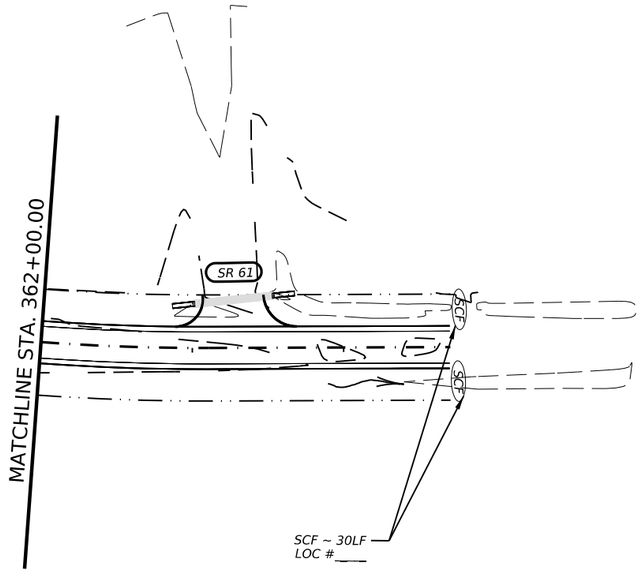
SW3P LAYOUT

0 50 100
SCALE IN FEET

SHEET 13 OF 14

CONT	SECT	JOB	HIGHWAY
0814	01	036	FM 422
DIST	COUNTY		SHEET NO.
WFS.	BAYLOR		132

DATE: 3/29/2024 1:29:49 PM
FILE: pw://txdot.projectwiseonline.com:TXDOT2/Documents/03 - WFS/Design Projects/081401036/4 - Design/Plan Set/9. Environmental/SW3P LAYOUT.dgn



	BMP PLACEMENT					
	DATE INSTALLED	DATE DISTURBED	DATE MAINTAINED	DATE REPLACED	DATE STABALIZED	DATE REMOVED
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						

LEGEND

RFD2	Rock Filter Dam (Type 2)
ECL	ErosionControl Log
SCF	Sediment Control Fence
	Runoff Flow Arrow

STATE OF TEXAS
BRYSON P. LAWRENCE
129839
LICENSED
PROFESSIONAL ENGINEER

Bryson Lawrence, P.E.

04/01/2024

Texas Department of Transportation

FM 422

SW3P LAYOUT

0 50 100

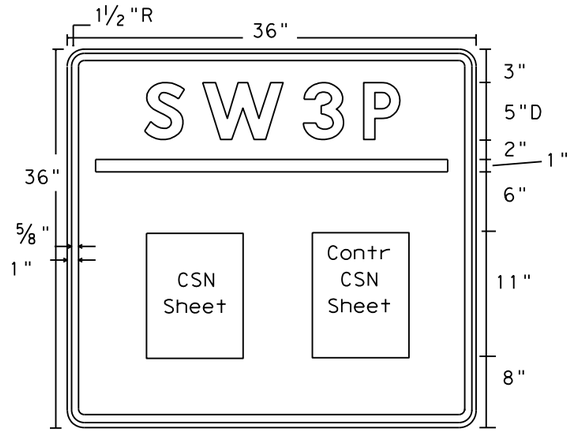
SCALE IN FEET

 SHEET 14 OF 14

CONT	SECT	JOB	HIGHWAY
0814	01	036	FM 422
DIST	COUNTY		SHEET NO.
WFS.	BAYLOR		133

CK | DW | CK | DW

DATE: 3/29/2024 1:29:50 PM
FILE: pw://txdot.projectwiseonline.com:TXDOT2/Documents/03 - WFS/Design Projects/0814010361/4 - Design/Plan Set/9. Environmental/SW3P LAYOUT.dgn



Sign Dimensions

36" X 36"

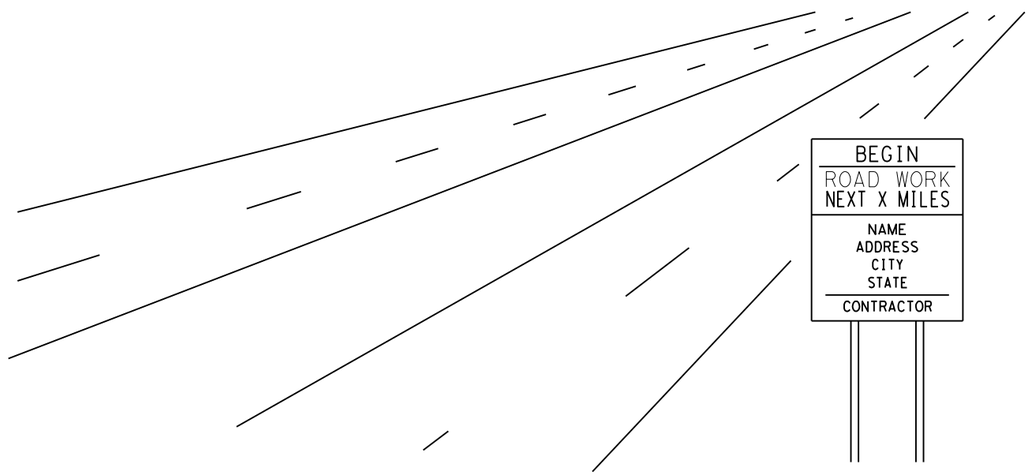
Letters - White
Numbers - White
Border - White
Background - Blue

GENERAL NOTES:

1. The alphabets and lateral spacing between letters and numerals shall conform with the "Texas Manual on Uniform Traffic Control Devices for Streets and Highways", (TMUTCD) latest edition, and the "Compliant Work Zone Traffic Control Devices List". Lateral spacing of text shall provide a balanced appearance. All materials shall conform to Department Specifications.
2. Legend and border may be applied by reverse screening process with transparent colored ink, cut-out white reflective sheeting applied to colored background or combination thereof. Background shall be reflective sheeting Type C.
3. CSN & CCSN Sheets will be laminated and attached to the sign with an adhesive. Ensure sheets remain dry. (See Figure 1).
4. Signs should be placed just inside the right of way line at the project limits at a readable height. If the sign cannot be placed outside the clear zone, it must adhere to the TMUTCD. If placed outside the clear zone, SW3P sign may be placed perpedicular or parallel to ROW line.
5. Final location of the signs will be approved by the Engineer.

SW3P SIGN

TxDOT Large or Small Construction
Site Notice (CSN) &
Contractor Large or Small Construction
Site Notice (CCSN)



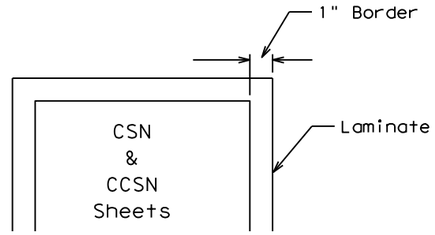
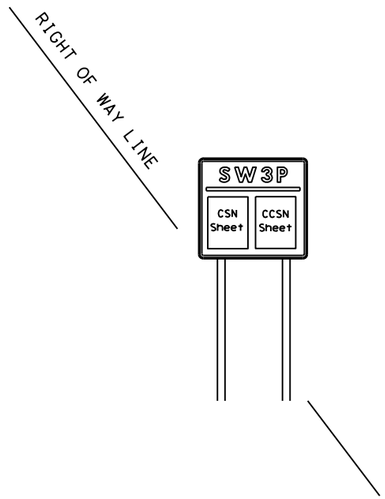


Figure 1



DEPARTMENT MATERIAL SPECIFICATIONS	
PLYWOOD SIGN BLANKS	DMS-7100
FLAT SURFACE REFLECTIVE SHEETING	DMS-8300
VINYL NON-REFLECTIVE DECAL SHEETING	DMS-8320

COLOR	USAGE	REFLECTIVE SHEETING OR OTHER MATERIAL
BLUE	BACKGROUND	TYPE C (FLUORESCENT PRISMATIC)
WHITE	LEGEND & BORDERS	VINYL NON-REFLECTIVE DECAL SHEETING

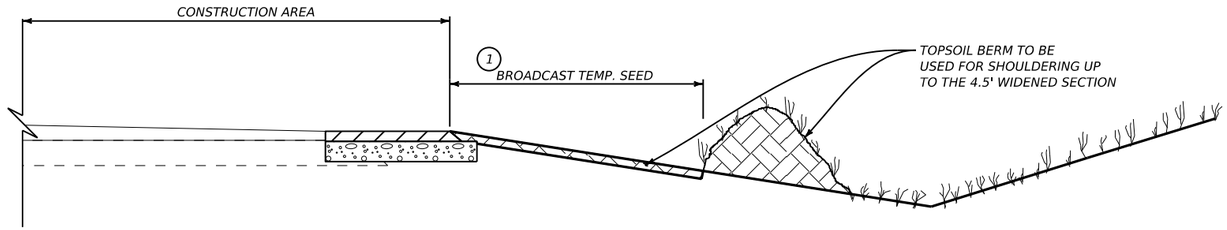
Texas Department of Transportation
WICHITA FALLS DISTRICT STANDARD

FM 422

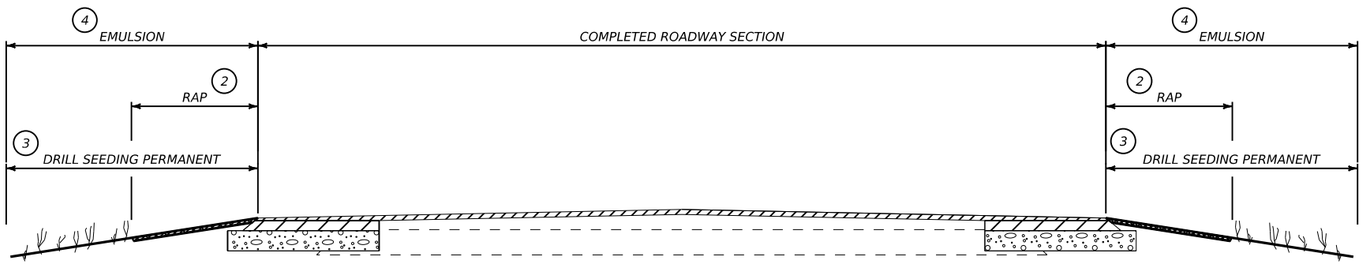
SW3P SIGN

FILE:	DN: TxDOT	CK:	DW:	CK:
©TxDOT 2024	DISTRICT	FEDERAL AID PROJECT		HIGHWAY
	WFS.	SEE TITLE SHEET		FM 422
REVISION DATE: 5/12/17	COUNTY	CONTROL	SECT	JOB / SHEET
	BAYLOR	0814	01	036 / 134

PATH:
LEVELS DISPLAYED



PROPOSED TEMPORARY
SEEDING TYPICAL



PROPOSED PERMANENT
SEEDING TYPICAL

NOTES:

1. BROADCAST TEMPORARY SEED ESTIMATED @ 10' ONCE THE NATIVE TOP SOIL BERM HAS BEEN SHOULDERED UP TO THE WIDENED SECTION. REFER TO THE WFS-TA-VES PLAN SHEET FOR SEEDING MIXTURES.
2. REFER TO THE GENERAL NOTES FOR THE LOCATION OF THE RECYCLED ASPHALT PAVEMENT. PLACEMENT DISTANCE IS TO BE A MINIMUM OF 4' OR AS NEEDED TO ACHIEVE SMOOTH TIE IN TO EXISTING FRONT SLOPE. REFER TO BMP#15 ON WFS-TA-BMP PLAN SHEET. (USE TOP SOIL BERM IF THERE IS NO RAP AVAILABLE)
3. DRILL SEEDING PERMANENT SEED ESTIMATED @ 10' ONCE ALL DISTURBANCE ACTIVITIES HAVE BEEN COMPLETED. REFER TO THE VEGETATIVE ESTABLISHMENT PLAN SHEET FOR SEEDING MIXTURES.
4. EMULSION HAS BEEN ESTIMATED AT A MINIMUM OF 5' REFER TO THE BASIS OF ESTIMATES FOR THE APPLICATION RATE.

MULTIPLE MOBILIZATIONS WILL BE REQUIRED DURING THE TEMPORARY SEEDING OPERATIONS. THE CONTRACTOR WILL NEED TO ADJUST WIDENING OPERATIONS DURING THIS PHASE OF CONSTRUCTION IN ORDER TO ESTABLISH VEGETATION AS ROAD IS BEING WIDENED. VEGETATION ESTABLISHMENT SHALL BE ONGOING AS ROAD WORK PROGRESSES.

STATE OF TEXAS
BRYSON P. LAWRENCE
129839
LICENSED
PROFESSIONAL ENGINEER

Bryson Lawrence, P.E.

04/04/2024

Texas Department of Transportation

FM 422

VEGETATIVE ESTABLISHMENT DETAIL

SHEET 1 OF 1

CONT	SECT	JOB	HIGHWAY
0814	01	036	FM 422
DIST	COUNTY		SHEET NO.
WFS.	BAYLOR		135

CK | DW | CK | DW

DATE: 4/4/2024 9:56:01 AM
FILE: pw://txdot.projectwiseonline.com:TXDOT2/Documents/03 - WFS/Design Projects/081401036/4 - Design/Plan Set/9. Environmental/VEGETATIVE ESTABLISHMENT DETAIL.dgn

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 soil disturbing activity and for projects that have Environmental, Permits, Issues, and Commitments (EPICs) dependent on stormwater controls and water quality measures TxDOT will maintain a SWP3 with all pertinent records, correspondence, environmental documents, etc. at the project field office, Area Office, or electronically.

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):
0814-01-036

1.2 PROJECT LIMITS:
From: STADIUM DR

To: FM 1790

1.3 PROJECT COORDINATES:
BEGIN: (Lat) 33.5959204 ,(Long) -99.2463496

END: (Lat) _____ ,(Long) -99.1430756

1.4 TOTAL PROJECT AREA (Acres): 50.697

1.5 TOTAL AREA TO BE DISTURBED (Acres): 25

1.6 NATURE OF CONSTRUCTION ACTIVITY:
Grading, excavation, culvert and channel cleaning, ditch grading, embankment erosion, sediment controls, and seeding.

1.7 MAJOR SOIL TYPES:

Soil Type	Description
Leeray Clay	0-1% grades, Covered with 90-100% grass and 10-15% trees with a few gravel county roads and driveways.

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
	SEYMOUR CREEK
	DEEP CREEK
	ROCK CREEK

* 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

STATE OF TEXAS
BRYSON P. LAWRENCE
129839
LICENSED PROFESSIONAL ENGINEER

Bryson Lawrence, P.E.

05/03/2024

STORMWATER POLLUTION PREVENTION PLAN (SWP3)

July 2023 Sheet 1 of 2

Texas Department of Transportation

FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
	F 2B24(123)		136
STATE	STATE DIST.	COUNTY	
TEXAS	DIS	BAYLOR	
CONT.	SECT.	JOB	HIGHWAY NO.
0814	01	036	FM 422

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

- [x] [ ] Protection of Existing Vegetation
- [ ] [ ] Vegetated Buffer Zones
- [ ] [ ] Soil Retention Blankets
- [ ] [ ] Geotextiles
- [ ] [ ] Mulching/ Hydromulching
- [ ] [ ] Soil Surface Treatments
- [x] [ ] Temporary Seeding
- [ ] [x] Permanent Planting, Sodding or Seeding
- [x] [ ] Biodegradable Erosion Control Logs
- [x] [ ] Rock Filter Dams/ Rock Check Dams
- [ ] [ ] Vertical Tracking
- [ ] [ ] Interceptor Swale
- [ ] [ ] Riprap
- [ ] [ ] Diversion Dike
- [ ] [ ] Temporary Pipe Slope Drain
- [x] [ ] Embankment for Erosion Control
- [ ] [ ] Paved Flumes
- [ ] [ ] Other: _____
- [ ] [ ] Other: _____
- [ ] [ ] Other: _____
- [ ] [ ] Other: _____

2.2 SEDIMENT CONTROL BMPs:

T / P

- [x] [ ] Biodegradable Erosion Control Logs
- [ ] [ ] Dewatering Controls
- [x] [ ] Inlet Protection
- [ ] [ ] Rock Filter Dams/ Rock Check Dams
- [ ] [ ] Sandbag Berms
- [x] [ ] 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:

- [x] Excess dirt/mud on road removed daily
- [x] Haul roads dampened for dust control
- [x] Loaded haul trucks to be covered with tarpaulin
- [x] Stabilized construction exit
- [ ] Daily street sweeping
- [ ] Other: _____
- [ ] Other: _____
- [ ] Other: _____
- [ ] Other: _____

2.5 POLLUTION PREVENTION MEASURES:

- [ ] Chemical Management
- [x] Concrete and Materials Waste Management
- [x] Debris and Trash Management
- [x] Dust Control
- [x] 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:

- [x] Fire hydrant flushings
- [x] Irrigation drainage
- [x] Pavement washwater (where spills or leaks have not occurred, and detergents are not used)
- [x] Potable water sources
- [x] Springs
- [x] Uncontaminated groundwater
- [x] Water used to wash vehicles or control dust
- [x] Other allowable non-stormwater discharges as allowed by TPDES GP TXR150000.

2.8 DEWATERING:

Dewatering discharges of accumulated stormwater, groundwater, and surface water including discharges from dewatering of trenches, excavations, foundations, vaults, and other points of accumulation are prohibited unless managed by appropriate controls to prevent and minimize the offsite discharge of sediment and other pollutants.

2.9 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.

When dewatering activities are present, a daily inspection will be conducted once per day during those activities and documented in accordance with CGP and TxDOT requirements.

2.10 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.

STATE OF TEXAS
BRYSON P. LAWRENCE
129839
LICENSED
PROFESSIONAL ENGINEER
Bryson Lawrence, P.E.

05/03/2024

STORMWATER POLLUTION PREVENTION PLAN (SWP3)

July 2023 Sheet 2 of 2

Texas Department of Transportation

FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
	F 2B24(123)		137
STATE	STATE DIST.	COUNTY	
TEXAS	DIS	BAYLOR	
CONT.	SECT.	JOB	HIGHWAY NO.
0814	01	036	FM 422

I. STORMWATER POLLUTION PREVENTION-CLEAN WATER ACT SECTION 402

TPDES TXR 150000: Stormwater Discharge Permit or Construction General Permit required for projects with 1 or more acres disturbed soil. Projects with any disturbed soil must protect for erosion and sedimentation in accordance with Item 506.

List MS4 Operator(s) that may receive discharges from this project. They may need to be notified prior to construction activities.

1. None
2.

- [ ] No Action Required
- [x] Required Action

Action No.

5 ACRES OR MORE:

1. The project disturbs five or more acres of surface area. The total disturbed acreage is the combined acreage to be disturbed on the project and the contractors PSL.
2. The Department will post a large site notice, file a notice of intent (NOI), notice of change (NOC), if applicable, and a notice of termination (NOT) along with other requirements per TPDES GP TXR 150000 as the entity having operational control over plans and specifications for work shown on the plans in the right of way.
3. The Contractor shall file a NOI, NOC, if applicable, and a NOT and post a large site notice along with other requirements as the entity of having day-to-day operational control of the work shown on the plans in the right of way.
4. Send a copy of the NOI, NOC, NOT to any non-TxDOT MS4 operators that receive discharges from the project, if applicable.

II. WORK IN OR NEAR STREAMS, WATERBODIES AND WETLANDS CLEAN WATER ACT SECTIONS 401 AND 404

USACE Permit required for filling, dredging, excavating or other work in any water bodies, rivers, creeks, streams, wetlands or wet areas.

The Contractor must adhere to all of the terms and conditions associated with the following permit(s):

- [ ] No Permit Required
- [ ] Nationwide Permit 14 - PCN not Required (less than 1/10th acre waters or wetlands affected)
- [ ] Nationwide Permit 14 - PCN Required (1/10 to <1/2 acre, 1/3 in tidal waters)
- [ ] Individual 404 Permit Required
- [x] Other Nationwide Permit Required: NWP# 3a

Required Actions: List waters of the US permit applies to, location in project and check Best Management Practices planned to control erosion, sedimentation and post-project TSS.

III. CULTURAL RESOURCES

Refer to TxDOT Standard Specifications in the event historical issues or archeological artifacts are found during construction. Upon discovery of archeological artifacts (bones, burnt rock, flint, pottery, etc.) cease work in the immediate area and contact the Engineer immediately.

- [x] No Action Required
- [ ] Required Action

Action No.

1. If burial remains and/or artifacts are discovered cease work and contact the WFS District Environmental Coordinator. If discovered, tribes request immediate notification by TxDOT.
2. No impacts off right-of-way are permitted without coordinating with the DEQC and/or EC.

IV. VEGETATION RESOURCES

Preserve native vegetation to the extent practical.
Contractor must adhere to Construction Specification Requirements Specs 162, 164, 192, 193, 506, 730, 751, 752 in order to comply with requirements for invasive species, beneficial landscaping, and tree/brush removal commitments.

- [ ] No Action Required
- [x] Required Action

Action No.

1. Impacts to vegetation should be kept to the minimum necessary.
2. Trees shall be trimmed rather than removed when feasible.
3. Disturbed areas should be re-vegetated according to TxDOT's standard practices for rural areas, which to the extent practicable, is in compliance with Executive Memorandum on Beneficial Landscaping, if applicable.

V. FEDERAL LISTED, PROPOSED THREATENED, ENDANGERED SPECIES, CRITICAL HABITAT, STATE LISTED SPECIES, CANDIDATE SPECIES AND MIGRATORY BIRDS.

- [ ] No Action Required
- [x] Required Action

Action No.

Bird BMPs: Migratory birds may arrive in the project area to breed during construction of the proposed project. Per the Migratory Bird Treaty Act (MBTA), measures would be taken to avoid disturbing or killing of migratory birds. Prior to construction, perform daytime surveys for nests including under bridges and in culverts to determine if they are active before removal. Nests that are active should not be disturbed. Do not disturb, destroy, or remove active nests, including ground nesting birds, during the nesting season, March through August. Avoid the removal of unoccupied, inactive nests, as practicable. Prevent the establishment of active nests prior to nesting season on TxDOT owned and operated facilities and structures proposed for replacement or repair. Do not collect, capture, relocate, or transport birds, eggs, young, or active nests without a permit.

Mammal BMPs: Contractor will be advised of the potential occurrence of the long-tailed weasel, eastern spotted skunk, black-tailed prairie dog, to avoid harming the species if encountered, and to avoid unnecessary impacts to dens.

Terrestrial Reptile BMPs: Visually inspect excavation areas for trapped wildlife prior to backfilling. Inform contractors that if reptiles are found on project site allow species to safely leave the project area.

Amphibian and Aquatic Reptile BMPs: Contractors will be advised of potential occurrence of the Woodhouse's Toad in the project area, and to avoid harming them if encountered. Project specific locations (PSLs) within state-owned ROW should be located in uplands away from aquatic features.

LIST OF ABBREVIATIONS

BMP:	Best Management Practice	SPCC:	Spill Prevention Control and Countermeasure
CGP:	Construction General Permit	SW3P:	Storm Water Pollution Prevention Plan
DSHS:	Texas Department of State Health Services	PCN:	Pre-Construction Notification
FHWA:	Federal Highway Administration	PSL:	Project Specific Location
MOA:	Memorandum of Agreement	TCEQ:	Texas Commission on Environmental Quality
MOU:	Memorandum of Understanding	TPDES:	Texas Pollutant Discharge Elimination System
MS4:	Municipal Separate Stormwater Sewer System	TPWD:	Texas Parks and Wildlife Department
MBTA:	Migratory Bird Treaty Act	TxDOT:	Texas Department of Transportation
NOT:	Notice of Termination	T&E:	Threatened and Endangered Species
NWP:	Nationwide Permit	USACE:	U.S. Army Corps of Engineers
NOI:	Notice of Intent	USFWS:	U.S. Fish and Wildlife Service

VI. HAZARDOUS MATERIALS OR CONTAMINATION ISSUES

General (applies to all projects):

Comply with the Hazard Communication Act (the Act) for personnel who will be working with hazardous materials by conducting safety meetings prior to beginning construction and making workers aware of potential hazards in the workplace. Ensure that all workers are provided with personal protective equipment appropriate for any hazardous materials used.

Obtain and keep on-site Material Safety Data Sheets (MSDS) for all hazardous products used on the project, which may include, but are not limited to the following categories: Paints, acids, solvents, asphalt products, chemical additives, fuels and concrete curing compounds or additives. Provide protected storage, off bare ground and covered, for products which may be hazardous. Maintain product labelling as required by the Act.

Maintain an adequate supply of on-site spill response materials, as indicated in the MSDS. In the event of a spill, take actions to mitigate the spill as indicated in the MSDS, in accordance with safe work practices, and contact the District Spill Coordinator immediately. The Contractor shall be responsible for the proper containment and cleanup of all product spills.

Contact the Engineer if any of the following are detected:

* Dead or distressed vegetation (not identified as normal)
* Trash piles, drums, canister, barrels, etc.
* Undesirable smells or odors
* Evidence of leaching or seepage of substances

Does the project involve any bridge class structure rehabilitation or replacements (bridge class structures not including box culverts)?

- [ ] Yes
- [x] No

If "No", then no further action is required.
If "Yes", then TxDOT is responsible for completing asbestos assessment/inspection.

Are the results of the asbestos inspection positive (is asbestos present)?

- [ ] Yes
- [ ] No

If "Yes", then TxDOT must retain a DSHS licensed asbestos consultant to assist with the notification, develop abatement/mitigation procedures, and perform management activities as necessary. The notification form to DSHS must be postmarked at least 15 working days prior to scheduled demolition.

If "No", then TxDOT is still required to notify DSHS 15 working days prior to any scheduled demolition.

In either case, the Contractor is responsible for providing the date(s) for abatement activities and/or demolition with careful coordination between the Engineer and asbestos consultant in order to minimize construction delays and subsequent claims.

Any other evidence indicating possible hazardous materials or contamination discovered on site. Hazardous Materials or Contamination Issues Specific to this Project:

- [ ] No Action Required
- [x] Required Action

If sheen or other contamination is visible in the waters of the U.S., or on the project site, the site shall be immediately cleaned up in accordance with local, state and federal regulations.

VII. OTHER ENVIRONMENTAL ISSUES

(includes regional issues such as Edwards Aquifer District, etc.)

- [ ] No Action Required
- [x] Required Action

Action No.

1. Keep noise to a minimum. Reduce idling of vehicles and equipment.
2. Maintain project site. Minimize dust and airborne particles to the maximum extent practical.
3. Collect sanitary waste in accordance with local regulations by a sanitary waste collector. Portable units shall not be placed in or near a waterway or drainage area.
4. TxDOT EMS Policy Statement (English & Spanish) should be displayed at the construction site.
5. Collect all waste materials, trash, and debris from the construction site daily and deposit into a metal dumpster having a secure cover.

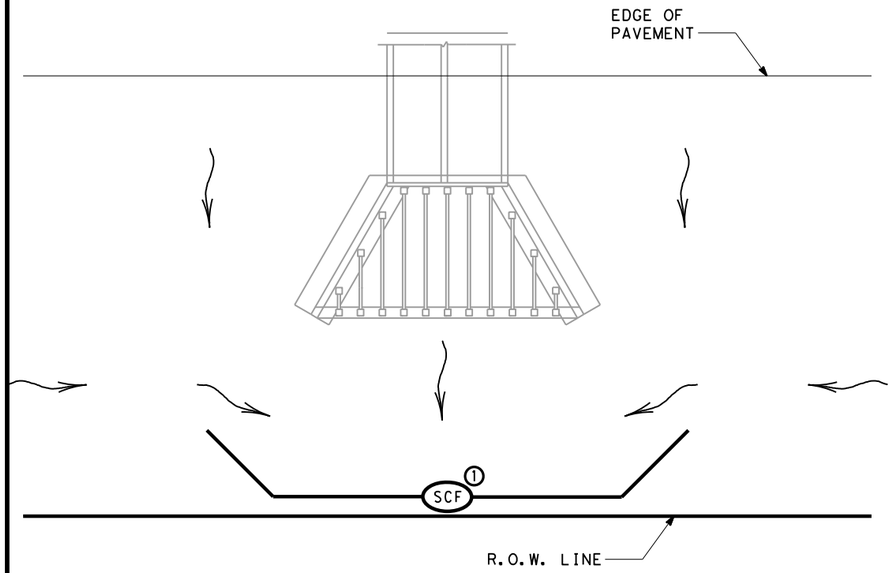
Texas Department of Transportation

Design Division Standard

ENVIRONMENTAL PERMITS, ISSUES AND COMMITMENTS

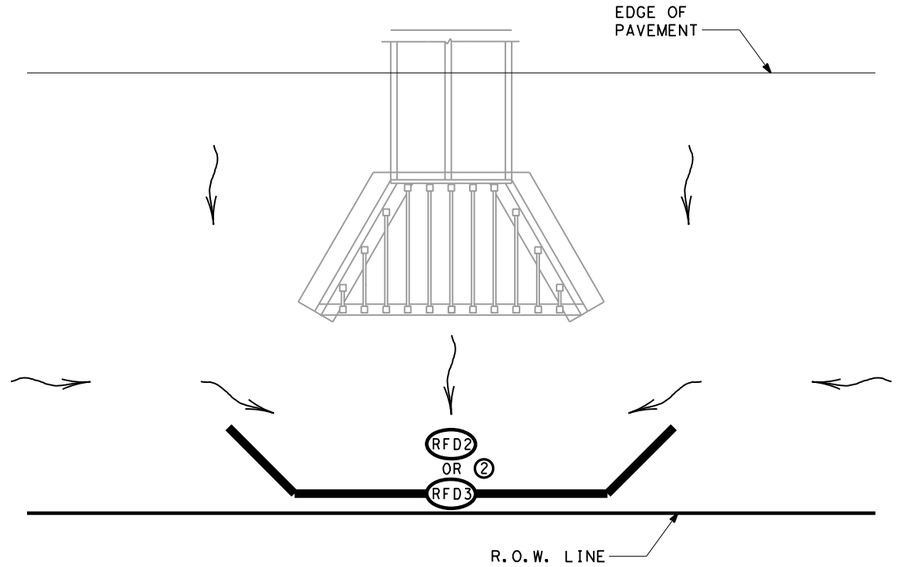
EPIC

FILE: epic.dgn	DN: TxDOT	CK: RG	DW: VP	CK: AR
© TxDOT: February 2015	CONT	SECT	JOB	HIGHWAY
REVISIONS 12-12-2011 (DS) 05-07-14 ADDED NOTE SECTION IV. 01-23-2015 SECTION I (CHANGED ITEM 1122 TO ITEM 506, ADDED GRASSY SWALES.	0814	01	036	FM 422
	DIST	COUNTY		SHEET NO.
	WFS.	BAYLOR		138



BEST MANAGEMENT PRACTICE (BMP) #1

FOR NON-404 STREAMS ONLY ~ SEDIMENT CONTROL AT EXIT OF CULVERT



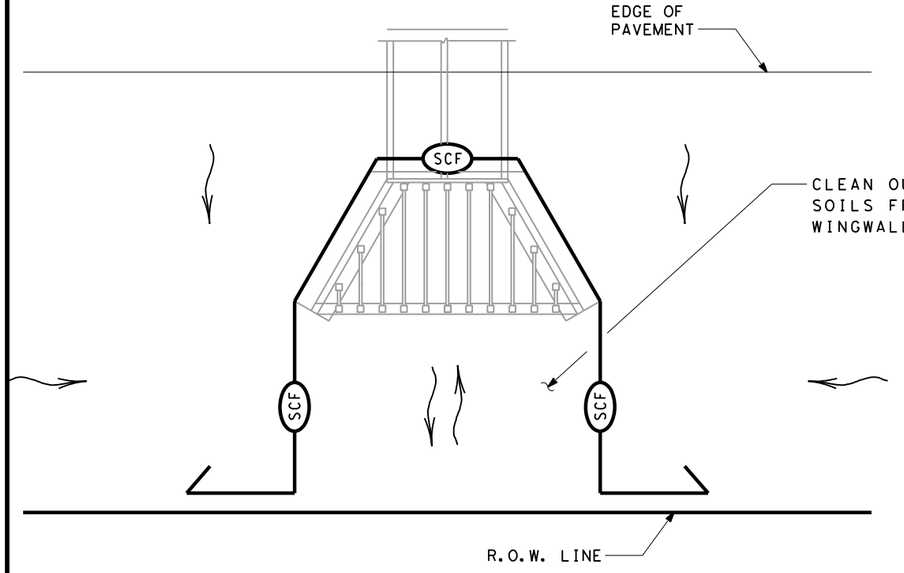
BEST MANAGEMENT PRACTICE (BMP) #2

FOR NON-404 STREAMS ONLY ~ SEDIMENT CONTROL AT EXIT OF CULVERT

SCF	SEDIMENT CONTROL FENCE
RFD2	ROCK FILTER DAM (TY 2)
RFD3	ROCK FILTER DAM (TY 3)
	DIRECTION OF FLOW

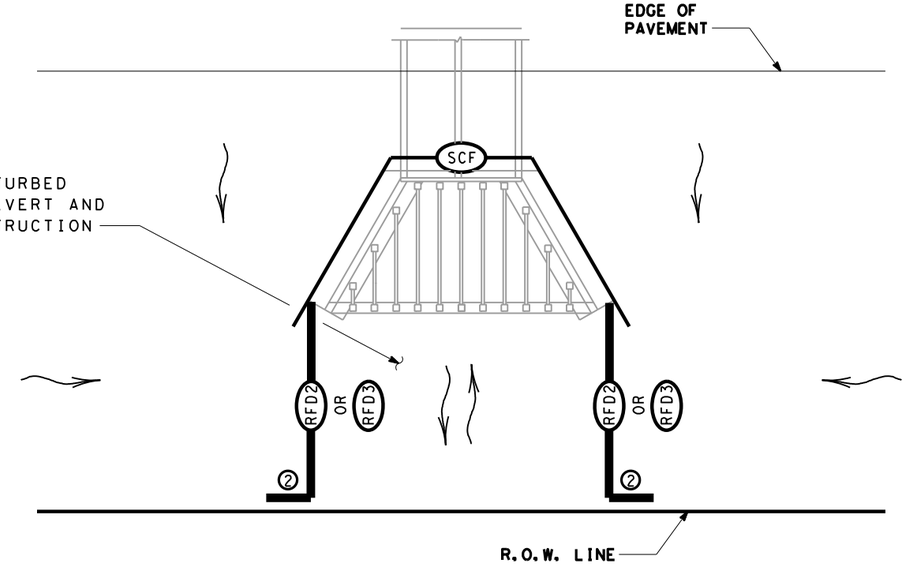
NOTES:

1. EXTEND SILT FENCE SO STORM WATER DOES NOT GO AROUND THE ENDS. USE L-HOOKS ON ENDS AS REQUIRED.
2. EXTEND ROCK FILTER DAM SO STORM WATER DOES NOT GO AROUND THE ENDS.



BEST MANAGEMENT PRACTICE (BMP) #3

FOR 404 OR NON-404 STREAMS ~ SEDIMENT CONTROL AT EXIT OR ENTRANCE OF CULVERT



BEST MANAGEMENT PRACTICE (BMP) #4

FOR 404 OR NON-404 STREAMS ~ SEDIMENT CONTROL AT EXIT OR ENTRANCE OF CULVERT

STATE OF TEXAS
BRYSON P. LAWRENCE
129839
LICENSED
PROFESSIONAL ENGINEER

Bryson Lawrence, P.E.

04/01/2024

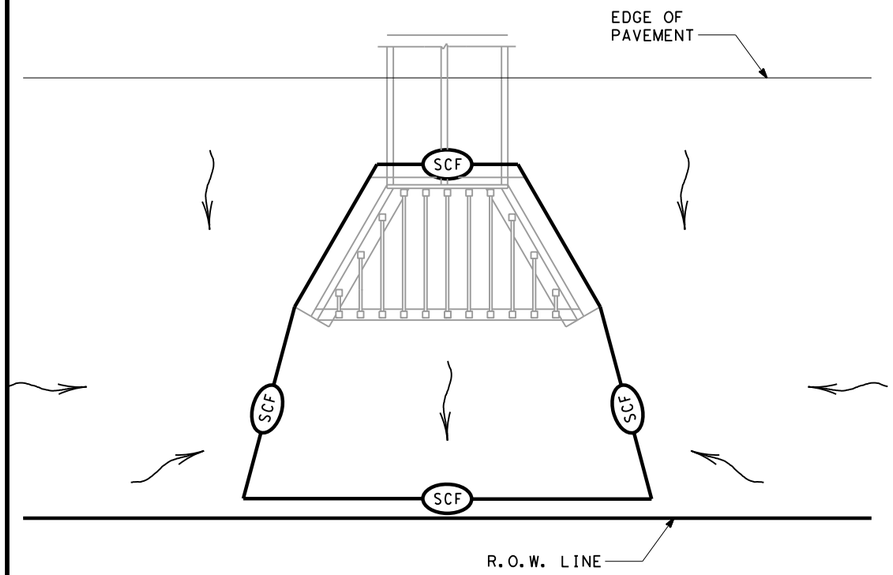
SCALE = NTS SHEET 1 OF 5

Texas Department of Transportation
Wichita Falls District Standard

TYPICAL APPLICATIONS FOR BEST MANAGEMENT PRACTICES

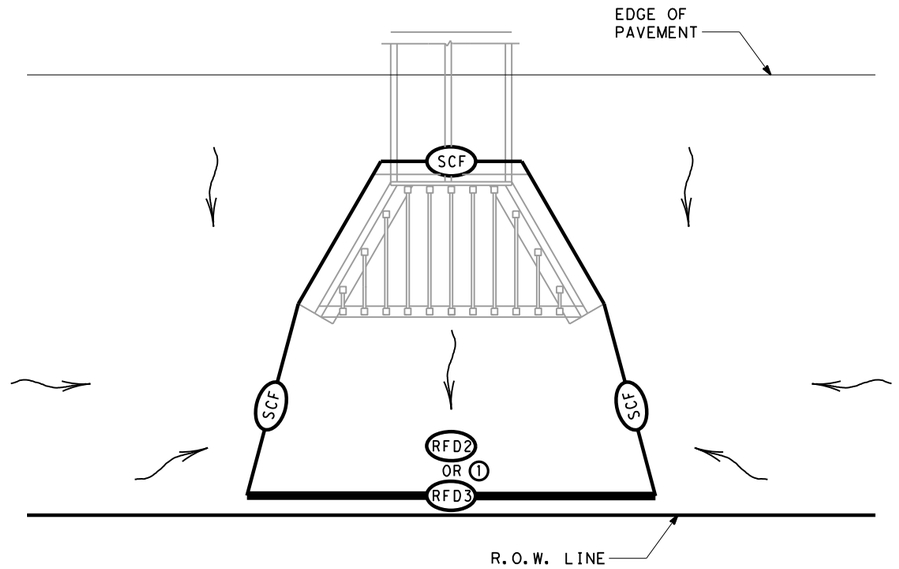
WFS-TA-BMP

FILE: BMPLAYOUTS.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT	
© TxDOT 2009	CONT	SECT	JOB	HIGHWAY	
REVISIONS JULY 2019	0814	01	036	FM 422	
	DIST	COUNTY		SHEET NO.	
	WFS.	BAYLOR		139	



BEST MANAGEMENT PRACTICE (BMP) #5

FOR NON-404 STREAMS ONLY ~ SEDIMENT CONTROL AT EXIT OF CULVERT



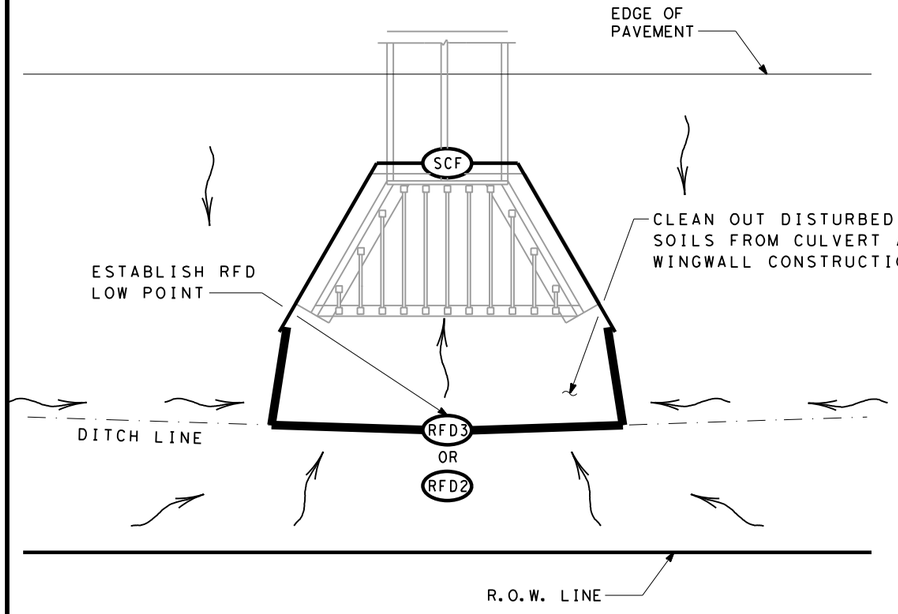
BEST MANAGEMENT PRACTICE (BMP) #6

FOR NON-404 STREAMS ONLY ~ SEDIMENT CONTROL AT EXIT OF CULVERT

SCF	SEDIMENT CONTROL FENCE
RFD2	ROCK FILTER DAM (TY 2)
RFD3	ROCK FILTER DAM (TY 3)
	DIRECTION OF FLOW

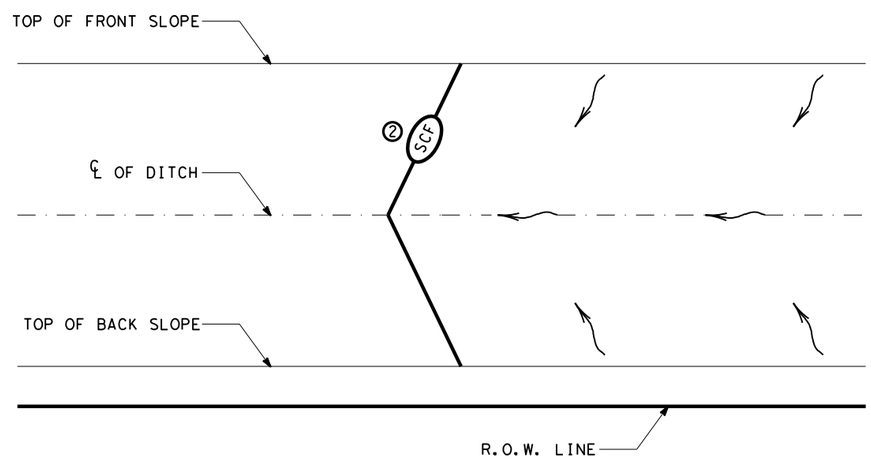
NOTES:

1. PROVIDE OVERLAP OF SILT FENCE WITH ROCK FILTER DAM.
2. ROCK FILTER DAMS OR EARTH/GRASSED EMBANKMENTS CAN BE SUBSTITUTED AS DIRECTED.



BEST MANAGEMENT PRACTICE (BMP) #7

FOR NON-404 STREAMS ONLY ~ SEDIMENT CONTROL AT ENTRANCE OF CULVERT



BEST MANAGEMENT PRACTICE (BMP) #8

BOUNDRY SEDIMENT CONTROL ~ BOTH ENDS OF CONTROL TERMINATED UP SLOPE

STATE OF TEXAS
BRYSON P. LAWRENCE
129839
LICENSED
PROFESSIONAL ENGINEER

Bryson Lawrence, P.E.

04/01/2024

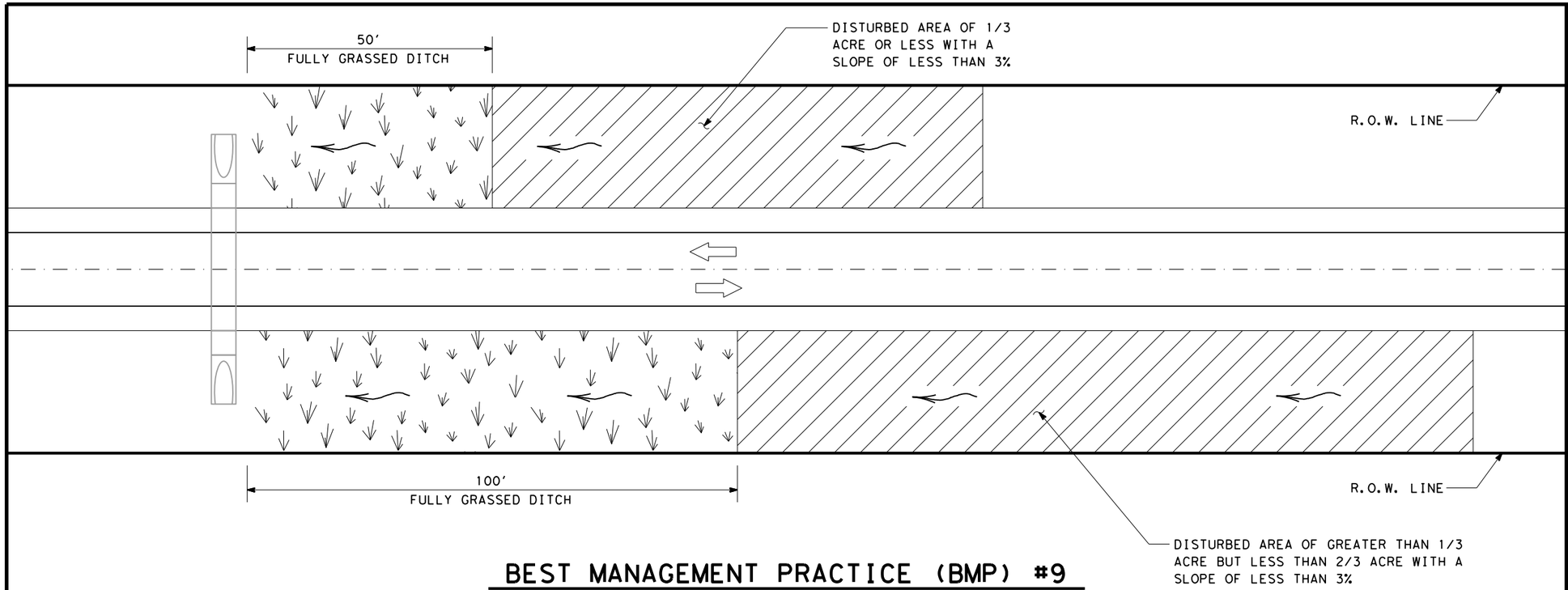
SCALE = NTS SHEET 2 OF 5

Texas Department of Transportation
Wichita Falls District Standard

TYPICAL APPLICATIONS FOR BEST MANAGEMENT PRACTICES

WFS-TA-BMP

FILE: BMPLAYOUTS.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT	
©TxDOT 2009	CONT	SECT	JOB	HIGHWAY	
REVISIONS JULY 2019	0814	01	036	FM 422	
	DIST	COUNTY		SHEET NO.	
	WFS.	BAYLOR		140	



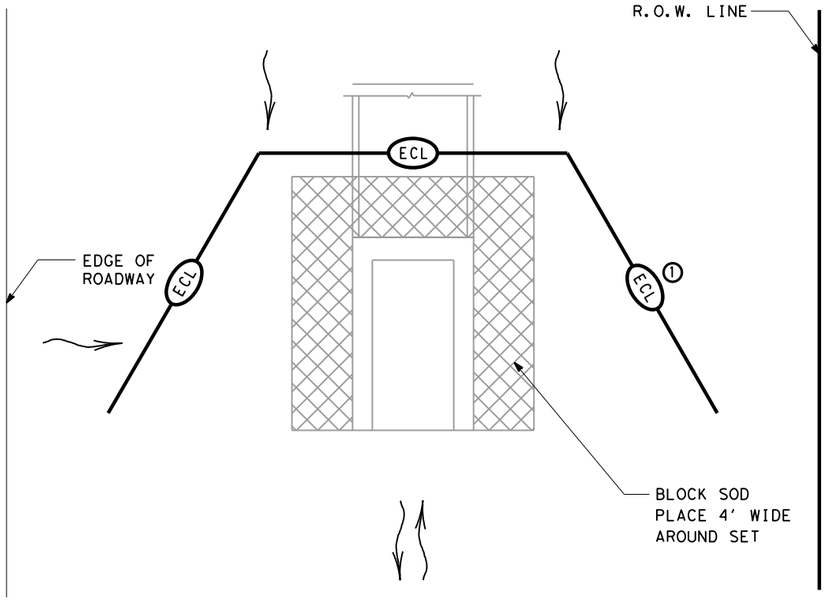
BEST MANAGEMENT PRACTICE (BMP) #9

USE OF VEGETATIVE BUFFERS IN PLACE OF TEMPORARY SEDIMENT CONTROLS SUCH AS SILT FENCE AND ROCK FILTER DAMS

	FULLY GRASSED DITCH
	DISTURBED AREA
	DIRECTION OF FLOW
ECL	EROSION CONTROL LOG
	SOD

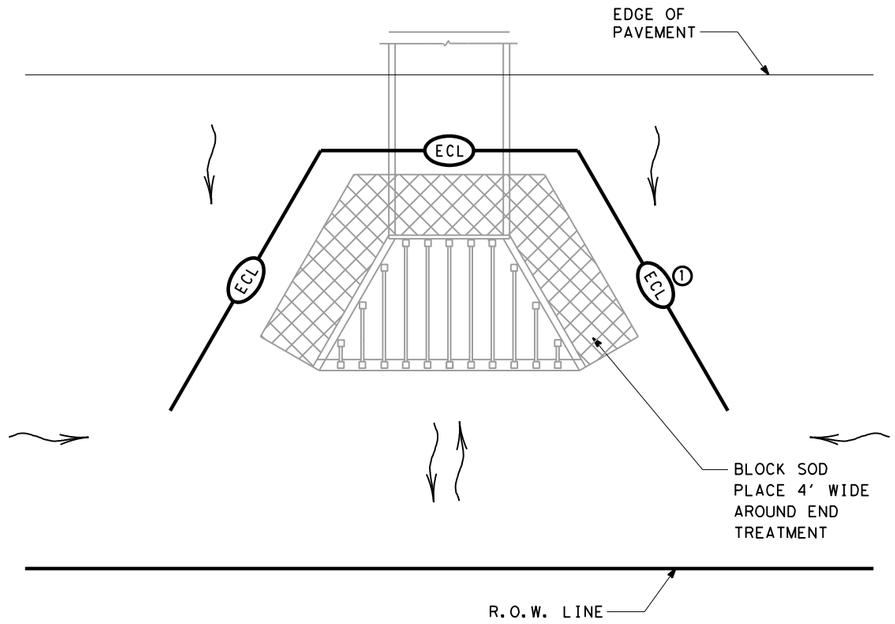
NOTES:

1. SEDIMENT CONTROL FENCE, OR OTHER DEVICES CAN BE SUBSTITUTED AS DIRECTED BY THE ENGINEER.



BEST MANAGEMENT PRACTICE (BMP) #10

SEDIMENT CONTROL AT PARALLEL DRAINAGE STRUCTURE ENTRANCE/EXIT



BEST MANAGEMENT PRACTICE (BMP) #11

SEDIMENT CONTROL AT CROSS DRAINAGE STRUCTURE ENTRANCE/EXIT

STATE OF TEXAS
BRYSON P. LAWRENCE
129839
LICENSED PROFESSIONAL ENGINEER

Bryson Lawrence, P.E.

04/01/2024

SCALE = NTS SHEET 3 OF 5

Texas Department of Transportation
Wichita Falls District Standard

TYPICAL APPLICATIONS FOR BEST MANAGEMENT PRACTICES

WFS-TA-BMP

FILE: BMPLAYOUTS.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT	
©TxDOT 2009	CONT	SECT	JOB	HIGHWAY	
REVISIONS JULY 2019	0814	01	036	FM 422	
	DIST	COUNTY		SHEET NO.	
	WFS.	BAYLOR		141	

DEPARTMENT MATERIAL SPECIFICATIONS	
PLYWOOD SIGN BLANKS	DMS-7100
FLAT SURFACE REFLECTIVE SHEETING	DMS-8300
VINYL NON-REFLECTIVE DECAL SHEETING	DMS-8320

COLOR	USAGE	REFLECTIVE SHEETING OR OTHER MATERIAL
WHITE	BACKGROUND	TYPE C (FLUORESCENT PRISMATIC)
BLACK	LEGEND & BORDERS	VINYL NON-REFLECTIVE DECAL SHEETING

SIGN GENERAL NOTES:

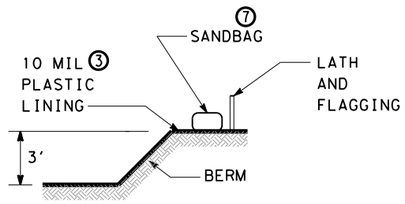
A. THE ALPHABETS AND LATERAL SPACING BETWEEN LETTERS AND NUMERALS SHALL CONFORM WITH THE "TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES FOR STREETS AND HIGHWAYS", (TMUTCD) LATEST EDITION, AND THE "COMPLIANT WORK ZONE TRAFFIC CONTROL DEVICES LIST". LATERAL SPACING OF TEXT SHALL PROVIDE A BALANCED APPEARANCE. ALL MATERIALS SHALL CONFORM TO DEPARTMENT SPECIFICATIONS.

B. LEGEND AND BORDER MAY BE APPLIED BY REVERSE SCREENING PROCESS WITH TRANSPARENT COLORED INK, CUT-OUT WHITE REFLECTIVE SHEETING APPLIED TO COLORED BACKGROUND OR COMBINATION THEREOF. BACKGROUND SHALL BE REFLECTIVE SHEETING TYPE C.

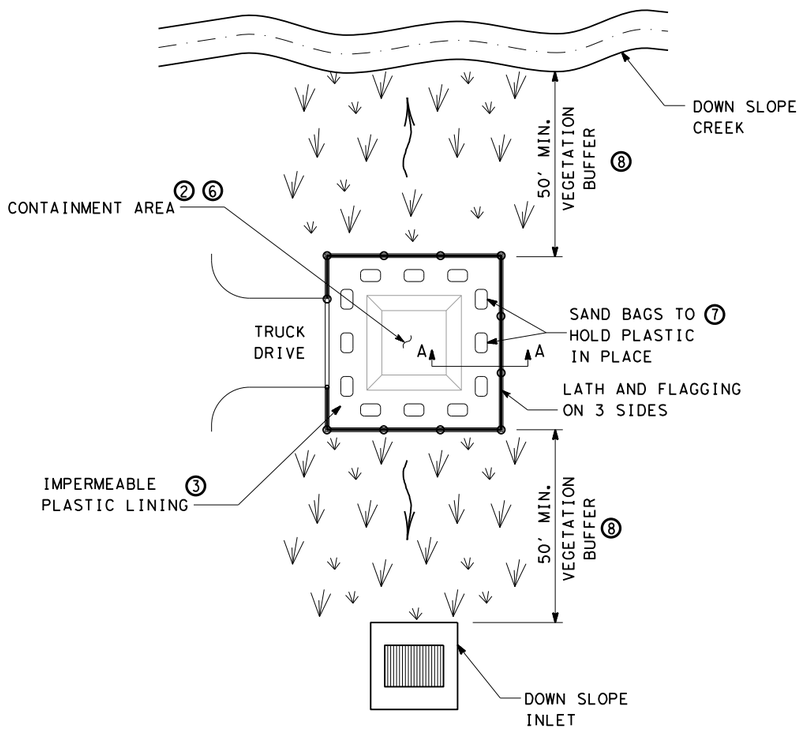
C. FINAL SIGN LOCATION SHALL BE AS APPROVED BY THE ENGINEER. IF THE SIGN CANNOT BE PLACED OUTSIDE THE CLEAR ZONE, IT MUST ADHERE TO THE TMUTCD. IF PLACED OUTSIDE THE CLEAR ZONE, SIGN MAY BE PLACED PERPENDICULAR OR PARALLEL TO ROW LINE.

D. SIGN DIMENSION IS 42" WIDE X 24" TALL WITH 5" BLACK LETTERS.

CONCRETE WASHOUT SIGN DETAIL (10)

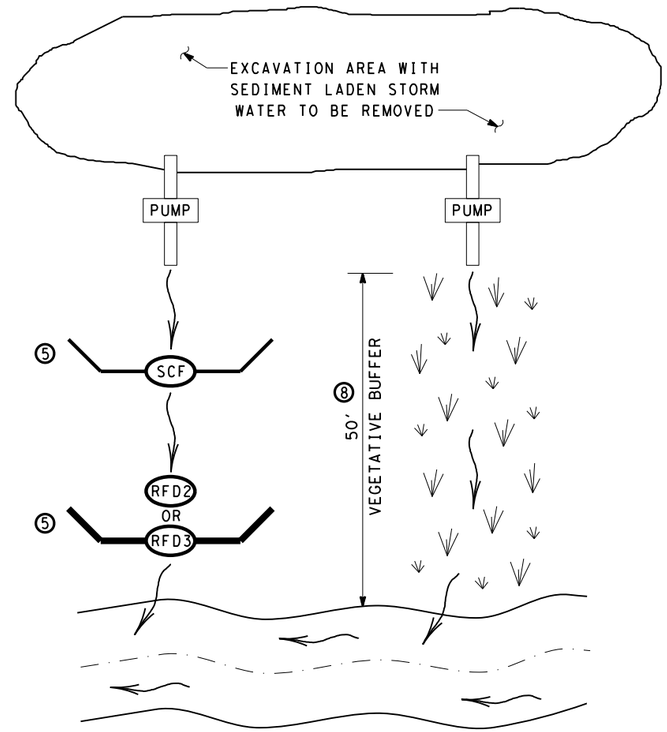


SECTION A-A



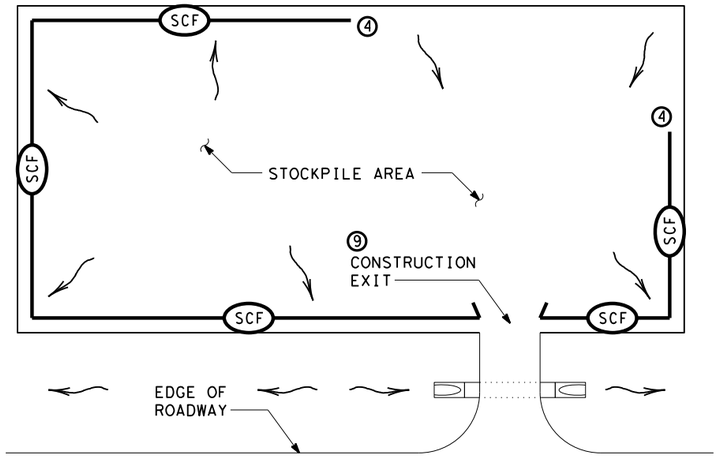
BEST MANAGEMENT PRACTICE (BMP) #12

CONCRETE TRUCK WASHOUT AREA (10)



BEST MANAGEMENT PRACTICE (BMP) #13

PUMPED STORM WATER SEDIMENT CONTROLS (1)



BEST MANAGEMENT PRACTICE (BMP) #14

STOCKPILE SEDIMENT CONTROL

	VEGETATIVE BUFFER
	DIRECTION OF FLOW
SCF	SEDIMENT CONTROL FENCE
RFD2	ROCK FILTER DAM (TY 2)
RFD3	ROCK FILTER DAM (TY 3)

NOTES:

1. PUMPED STORM WATER FROM AN EXCAVATION AREA SHOULD BE DISCHARGED IN A 50' VEGETATIVE BARRIER OR THROUGH TWO TEMPORARY SEDIMENT CONTROLS.
2. WHEN CONTAINMENT AREA REACHES 1' FREEBOARD, DISCONTINUE WASHOUT PLACEMENT AND REMOVE MATERIAL UPON SOLIDIFICATION.
3. EACH TIME SOLIDIFIED MATERIAL IS REMOVED REPLACE PLASTIC SHEETING. USE 10 MIL PLASTIC LINING MINIMUM.
4. START SEDIMENT CONTROL AT LOCATION SO ALL STORM WATER WITH SEDIMENT IS COLLECTED
5. ROCK FILTER DAMS, SEDIMENT CONTROL FENCE, OR OTHER DEVICES CAN BE SUBSTITUTED AS DIRECTED.
6. ACTUAL SIZE, LAYOUT, & LOCATION WILL BE DETERMINED IN THE FIELD.
7. AN EARTHEN BERM MAY BE USED IN LIEU OF SANDBAGS.
8. VEGETATIVE BUFFER SHOULD HAVE AT A MINIMUM 70% VEGETATIVE COVERAGE
9. PLACEMENT OF DEVICES FOR OFFSITE TRACKING AS APPLICABLE AND/OR DIRECTED BY THE ENGINEER.
10. ALL ITEMS REQUIRED FOR CONCRETE WASHOUT AND SIGN SHALL BE SUBSIDIARY TO ITEM 506.

STATE OF TEXAS
BRYSON P. LAWRENCE
129839
LICENSED
PROFESSIONAL ENGINEER

Bryson Lawrence, P.E.

04/01/2024

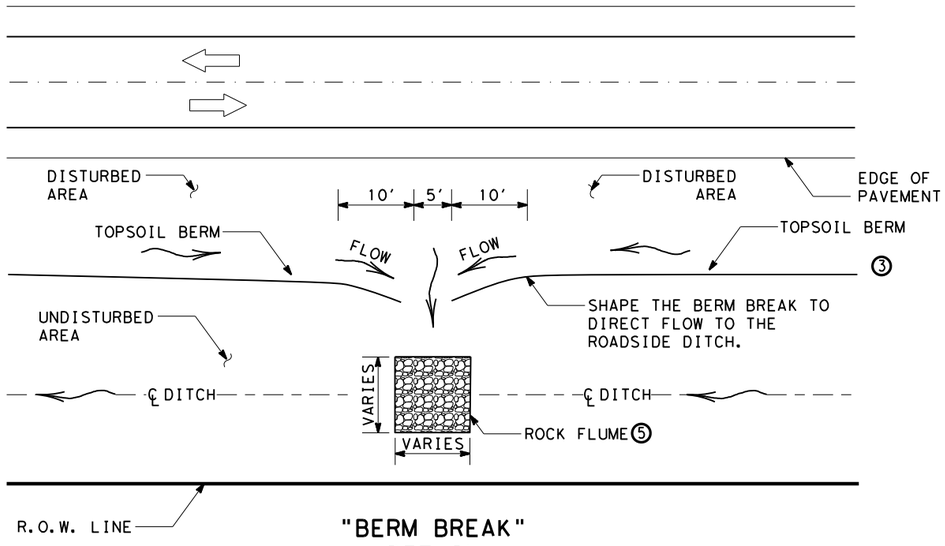
SCALE = NTS SHEET 4 OF 5

Texas Department of Transportation
Wichita Falls District

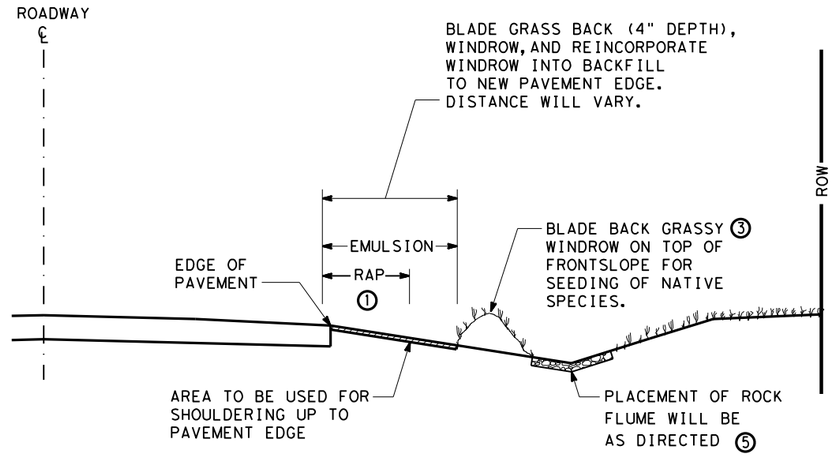
TYPICAL APPLICATIONS FOR BEST MANAGEMENT PRACTICES

WFS-TA-BMP

FILE: BMPLAYOUTS.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
©TxDOT 2009	CONT	SECT	JOB	HIGHWAY
REVISIONS JULY 2019	0814	01	036	FM 422
	DIST	COUNTY		SHEET NO.
	WFS.	BAYLOR		142



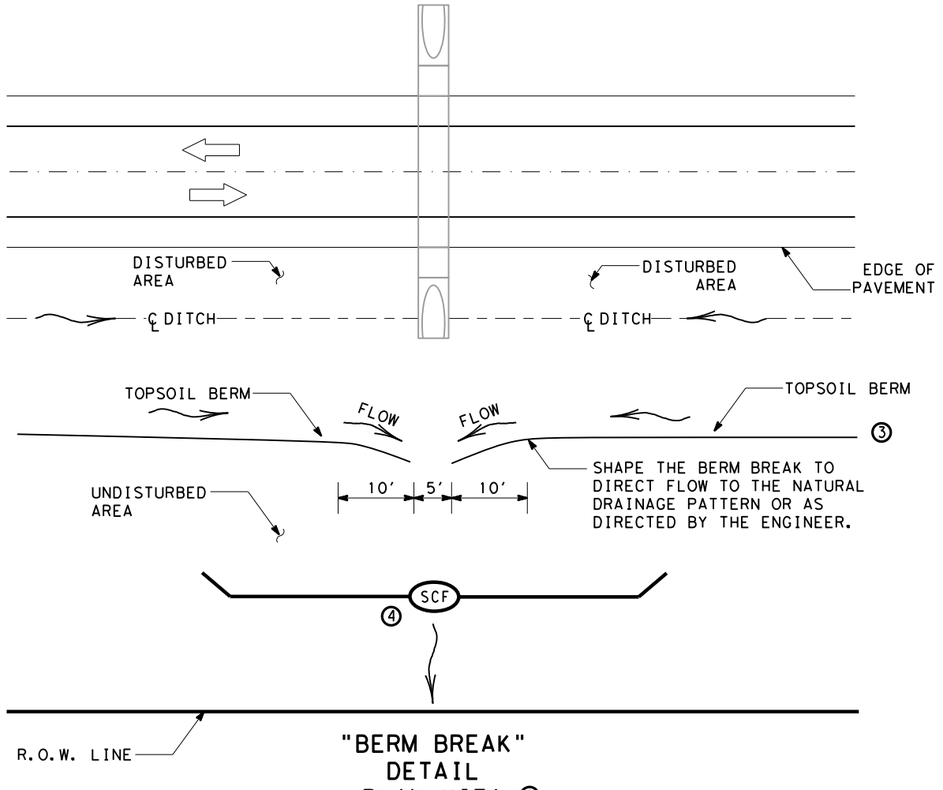
"BERM BREAK" DETAIL PLAN VIEW ②



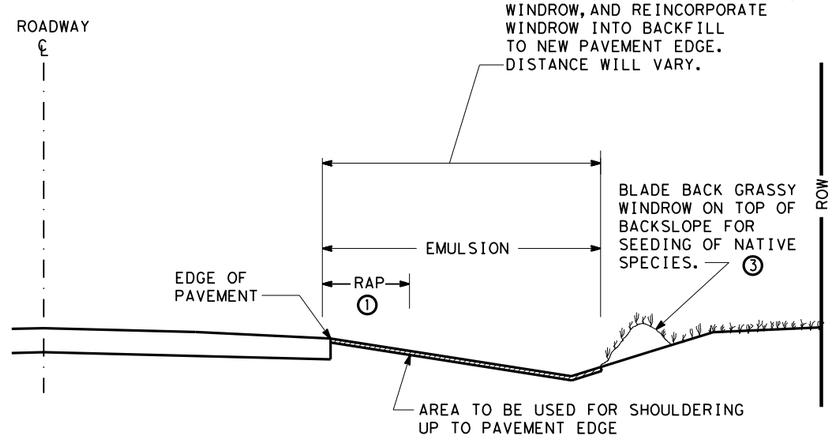
TYPICAL DITCH SECTION
SHOWING BERM/WINDROW OF TOPSOIL

BEST MANAGEMENT PRACTICE (BMP) #15

SEDIMENT CONTROL AND BERM DETAIL
WITH BERM ON FRONTSLOPE



"BERM BREAK" DETAIL PLAN VIEW ②



TYPICAL DITCH SECTION
SHOWING BERM/WINDROW OF TOPSOIL

BEST MANAGEMENT PRACTICE (BMP) #16

SEDIMENT CONTROL AND BERM DETAIL AT CROSS DRAINAGE STRUCTURE
WITH BERM ON BACKSLOPE

	FULLY GRASSED DITCH
	DISTURBED AREA
	DIRECTION OF FLOW
SCF	SEDIMENT CONTROL FENCE
	ROCK FLUME~ENERGY DISSAPATOR
	BERM

NOTES:

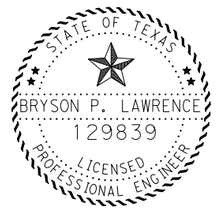
① AS DIRECTED PLACE RAP ADJACENT TO EDGE OF PAVEMENT AS A BACKFILL MATERIAL. PLACEMENT DISTANCE IS TO BE A MINIMUM OF 4' OR AS NEEDED TO ACHIEVE SMOOTH TIE IN TO EXISTING FRONT SLOPE.

② BREAK BERM SO THAT MAXIMUM FLOW LENGTH ALONG THE BERM IS LESS THAN 1000'. BREAK BERM IN LOW AREAS WHERE FLOW MAY OVERTOP THE BERM. DO NOT BREAK BERM ON HILLTOPS OR WHERE RUNOFF AND SEDIMENT FLOW DIRECTLY OFF THE ROW.

③ LOCATION OF BERM WILL VARY. BERM COULD BE PLACED ON FRONTSLOPE OR BACKSLOPE DEPENDING ON FIELD CONDITIONS. SEE SPECIFIC SW3P LAYOUT SHEET FOR MORE DETAILS ON LOCATION OF BERM.

④ ROCK FILTER DAMS, SEDIMENT CONTROL FENCE, EROSION CONTROL LOGS, ROCK FLUME, OR OTHER DEVICES CAN BE SUBSTITUTED AS DIRECTED. DEVICE MAY NOT BE NEEDED IN ALL LOCATIONS. SEE SPECIFIC SW3P LAYOUT SHEET FOR MORE DETAILS ON LOCATION OF DEVICES.

⑤ PLACE ROCK FLUME DISSAPATOR AS DIRECTED BY THE ENGINEER. SIZE AND LOCATIONS OF ROCK FLUME WILL VARY. PROVIDE ROCK OR RUBBLE WITH A 3" TO 6" AGGREGATE. SECURE ROCK WITH 20-GAUGE GALVANIZED WOVEN WIRE MESH WITH 1" DIAMTER HEXAGONAL OPENINGS. ROCK SHOULD BE PLACED ON THE MESH AND MESH SHALL BE FOLDED AT THE UPSTREAM SIDE OVER THE ROCK AND TIGHTLY SECURED TO ITSELF ON THE DOWNSTREAM SIDE USING WIRE TIES. PAYMENT WILL BE MADE BY ITEM TEMP PAVED FLUME (INSTALL).



Bryson Lawrence, P.E.

04/01/2024

SCALE = NTS SHEET 5 OF 5

Texas Department of Transportation
Wichita Falls District Standard

TYPICAL APPLICATIONS FOR BEST MANAGEMENT PRACTICES

WFS-TA-BMP

FILE: BMPLAYOUTS.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
© TxDOT 2009	CONT	SECT	JOB	HIGHWAY
REVISIONS JULY 2019	0814	01	036	FM 422
	DIST	COUNTY		SHEET NO.
	WFS.	BAYLOR		143

ITEM 164 SEEDING FOR EROSION CONTROL

SEED (PERMANENT) (URBAN) (SAND or CLAY)

"WARM SEASON" PLANTING DATES	SEED MIXTURE	PURE LIVE SEED RATE & PLANT DEPTH.
PERMANENT: EARLY SPRING SEED FROM FEBRUARY 1st THROUGH May 15th. AS AREAS OF THE ROW ARE PREPARED AND DETERMINED READY FOR DRILL SEEDING.	NEW CROP: BUFFALO GRASS (Texoka) COMMON BERMUDA GRASS (HULLED) BLUE GRAMA (NATIVE)	4.0 LBS PLS / ACRE 5.0 LBS PLS / ACRE 1.5 LBS PLS / ACRE @1/4 -1/2" Soil Depth
SOIL PREPARATION EQUIPMENT AND PRACTICES: RIPPER --- DISK --- HARROW --- CULTI-PACKER .		

ITEM 164 SEEDING FOR EROSION CONTROL

SEED (TEMPORARY) (URBAN) WARM SEASON SEEDING

"WARM SEASON" PLANTING DATES	SEED MIXTURE	PURE LIVE SEED RATE & PLANT DEPTH.
TEMPORARY: LATE SPRING & SUMMER SEED FROM MAY 16th THROUGH AUGUST 31st. AS AREAS OF THE ROW ARE PREPARED AND DETERMINED READY FOR DRILL SEEDING.	NEW CROP SEED: TYPE : BUFFALOGRASS (TEXOKA) COMMON BERMUDA GRASS (UNHULLED) FOXTAIL MILLET	 3.0 LBS PLS / ACRE 4.0 LBS PLS / ACRE 15. LBS PLS / ACRE @ 1" Soil Depth
SOIL PREPARATION EQUIPMENT AND PRACTICES: RIPPER --- DISK --- HARROW --- CULTI-PACKER .		

ITEM 164 SEEDING FOR EROSION CONTROL

SEED (PERMANENT) (RURAL) (CLAY)

"WARM SEASON" PLANTING DATES	SEED MIXTURE	PURE LIVE SEED RATE & PLANT DEPTH.
PERMANENT: EARLY SPRING SEED FROM FEBRUARY 1st THROUGH May 15th. AS AREAS OF THE ROW ARE PREPARED AND DETERMINED READY FOR DRILL SEEDING.	NEW CROP: GREEN SPRANGLETOP SIDEOATS GRAMA BUFFALOGRASS BERMUDA GRASS BLACKWELL SWITCHGRASS ILLINOIS BUNDLEFLOWER	1.5 LBS PLS / ACRE 1.5 LBS PLS / ACRE 3.0 LBS PLS / ACRE 2.0 LBS PLS / ACRE 1.0 LBS PLS / ACRE 0.5 LBS PLS / ACRE @1/4 -1/2" Soil Depth
SOIL PREPARATION EQUIPMENT AND PRACTICES: RIPPER --- DISK --- HARROW --- CULTI-PACKER .		

ITEM 164 SEEDING FOR EROSION CONTROL

SEED (TEMPORARY) (RURAL) WARM SEASON SEEDING

"WARM SEASON" PLANTING DATES	SEED MIXTURE	PURE LIVE SEED RATE & PLANT DEPTH.
TEMPORARY: LATE SPRING & SUMMER SEED FROM MAY 16th THROUGH AUGUST 31st. AS AREAS OF THE ROW ARE PREPARED AND DETERMINED READY FOR DRILL SEEDING.	NEW CROP SEED: TYPE : BUFFALOGRASS (TEXOKA) BERMUDA GRASS (UNHULLED) GREEN SPRANGLETOP FOXTAIL MILLET	 3.0 LBS PLS / ACRE 4.0 LBS PLS / ACRE 2.0 LBS PLS / ACRE 20. LBS PLS / ACRE @ 1" Soil Depth
SOIL PREPARATION EQUIPMENT AND PRACTICES: RIPPER --- DISK --- HARROW --- CULTI-PACKER .		

ITEM 164 SEEDING FOR EROSION CONTROL

SEED (PERMANENT) (RURAL) (SANDY)

"WARM SEASON" PLANTING DATES	SEED MIXTURE	PURE LIVE SEED RATE & PLANT DEPTH.
PERMANENT: EARLY SPRING SEED FROM FEBRUARY 1st THROUGH May 15th. AS AREAS OF THE ROW ARE PREPARED AND DETERMINED READY FOR DRILL SEEDING.	NEW CROP: GREEN SPRANGLETOP BERMUDA GRASS SAND LOVEGRASS SAND DROPSEED WEEPING LOVEGRASS BLUE GRAMA PARTRIDGE PEAS (COMANCHE)	1.5 LBS PLS / ACRE 2.0 LBS PLS / ACRE 1.0 LBS PLS / ACRE 1.0 LBS PLS / ACRE 1.0 LBS PLS / ACRE 1.0 LBS PLS / ACRE 1.0 LBS PLS / ACRE @1/4 -1/2" Soil Depth
SOIL PREPARATION EQUIPMENT AND PRACTICES: RIPPER --- DISK --- HARROW --- CULTI-PACKER .		

NOTES:

1. SEE NOTES ON TA-VES SHEET 2 OF 2 FOR ADDITIONAL INFORMATION.

STATE OF TEXAS
BRYSON P. LAWRENCE
129839
LICENSED
PROFESSIONAL ENGINEER

Bryson Lawrence, P.E.

04/01/2024

SCALE = NTS SHEET 1 OF 2

Texas Department of Transportation
Wichita Falls District Standard

TYPICAL APPLICATION FOR VEGETATION ESTABLISHMENT SHEET

WFS-TA-VES

FILE: BMPLAYOUTS.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
© TxDOT 2009	CONT	SECT	JOB	HIGHWAY
REVISIONS JULY 2019	0814	01	036	FM 422
	DIST	COUNTY		SHEET NO.
	WFS.	BAYLOR		144

ITEM 164 SEEDING FOR EROSION CONTROL

SEED (TEMPORARY) (URBAN) COOL SEASON SEEDING

"COOL SEASON" PLANTING DATES	SEED MIXTURE	PURE LIVE SEED RATE & PLANT DEPTH.
TEMPORARY: EARLY FALL SEED FROM SEPTEMBER 1st THROUGH DECEMBER 1st. AS AREAS OF THE ROW ARE PREPARED AND DETERMINED READY FOR DRILL SEEDING.	NEW CROP SEED: TYPE : BUFFALOGRASS (TEXOKA) COMMON BERMUDA GRASS (UNHULLED) TALL FESCUE ANNUAL RYE GRASS	 3.0 LBS PLS / ACRE 4.0 LBS PLS / ACRE 4.0 LBS PLS / ACRE 15.0 LBS PLS / ACRE @ 1" Soil Depth
SOIL PREPARATION EQUIPMENT AND PRACTICES: RIPPER --- DISK --- HARROW --- CULTI-PACKER .		

ITEM 164 SEEDING FOR EROSION CONTROL

SEED (TEMPORARY) (RURAL) COOL SEASON SEEDING

"COOL SEASON" PLANTING DATES	SEED MIXTURE	PURE LIVE SEED RATE & PLANT DEPTH.
TEMPORARY: EARLY FALL SEED FROM SEPTEMBER 1st THROUGH DECEMBER 1st. AS AREAS OF THE ROW ARE PREPARED AND DETERMINED READY FOR DRILL SEEDING.	NEW CROP SEED: TYPE : BUFFALOGRASS (TEXOKA) BERMUDA GRASS (UNHULLED) GREEN SPRANGLETOP WESTERN WHEATGRASS CANADA WILD RYE GRASS ELBON RYE GRASS	 3.0 LBS PLS / ACRE 4.0 LBS PLS / ACRE 2.0 LBS PLS / ACRE 3.0 LBS PLS / ACRE 2.0 LBS PLS / ACRE 15.0 LBS PLS / ACRE @ 1" Soil Depth
SOIL PREPARATION EQUIPMENT AND PRACTICES: RIPPER --- DISK --- HARROW --- CULTI-PACKER .		

NOTES:

1. ALL SEED MIXTURE TYPES SHALL BE PURCHASED IN PRE- MIXED BAGS, "BY TYPE" BLENDED BY THE GROWER SHIPPER.
2. SOILS THAT ARE COMPACTED, HAVE CLODS, SHALL BE REWORKED UNTIL READY FOR SEEDING. AS DIRECTED.
3. ALL SOIL SURFACES SHALL BE LEVEL WITH NATURAL FLOWING SMOOTH GRADES. NO TIRE RUTS OR FURTHER TRAFFIC ALLOWED.
4. SOIL SURFACE SHALL BE FIRM BUT NOT COMPACTED, ALLOWING 1/4" DEPRESSION UNDER NORMAL FOOT TRAFFIC.
5. SEED 100% OF THE BED AREA. NO SKIPS OR VOID AREAS ALLOWED. EXAMPLE: AREAS AROUND SIGN POSTS AND INLETS.
6. SEED UP TO THE FIRST 6" OF THE EDGE OF PAVEMENT. AS DIRECTED, HAND RAKE ISOLATED SEEDED AREAS.
7. WEIGH ALL CALIBRATED SEED SAMPLES FOR ACCURACY AND PRESENT DOCUMENTATION TO ENGINEER.

FOR DRILL SEEDING

8. USE ONLY PROFESSIONAL NATIVE GRASS OR TURF GRASS (MULTI- 3 BIN) DRILL SEEDERS. NO DROP SEEDERS ALLOWED. OTHER TYPES OF SEEDERS AS APPROVED BY THE ENGINEER.
9. CALIBRATE DRILL SEEDER FOR SPECIFIED (PLS) PER ACRE BEFORE DRILL SEEDING.
10. DRILL SEEDER MUST BE EQUIPPED WITH THE LARGE FRONT CUTTING COULTERS DURING THE INSPECTION OF DRILL SEEDER.

FOR BROADCAST SEEDING

11. USE ONLY COMMERCIAL TYPE CYCLONE TYPE SPREADERS.
12. CALIBRATE CYCLONE SPREADER FOR 1000 Sq. Ft. (PLS) PER ACRE BEFORE SEEDING.
13. TO PREVENT SEED SEPARATION IN SPREADERS, SPREAD ALL SEED TYPES INDEPENDENTLY IN A SEPARATE APPLICATION.
14. IMMEDIATELY AFTER SEEDING, IN ONE OR TWO OPERATIONS, CULTI-PACK THE SEEDED SOILS AND FIRM SEED INTO SURFACE.
15. DISCONTINUE SEEDING IF WIND EXCEEDS 10 MPH.

ITEM 314 EMULSIFIED ASPHALT TREATMENT

TIME SCHEDULE	FUNCTIONAL USE:
IMMEDIATELY AFTER: SOIL PREPARATION OR WITHIN 24 HOURS AFTER SEEDING, APPLY THE TACK COAT TO DESIGNATED SOIL SURFACES.	SOIL EROSION CONTROL, OR MOISTURE RETENTION BARRIER.

NOTES:

1. ALL TRUCK APPLICATIONS SHALL BE COMPLETED IN ONE PASS OF THE DISTRIBUTOR. ALL TOUCH UP WORK WILL BE FINISHED BY HAND AND HOSE PROCEDURES. APPLY FROM EDGE OF PAVEMENT THROUGH THE FULL SPECIFIED AREAS.
2. ENGINEER WILL INSPECT FOR ACCURACY THE OVERALL DEPTH OF THE APPLIED TACK COAT MATERIALS.
3. FURTHER VEHICULAR TRAFFIC IS NOT ALLOWED ON LAID BY TACK COAT SURFACES. AT THE CONTRACTORS EXPENSE ALL DAMAGES TO TACK COAT SURFACES WILL BE RE -SHOT AS DIRECTED BY THE ENGINEER.
4. USE MATERIALS AS SPECIFIED FOR EROSION CONTROL ON TABLE 18 IN ITEM 300 ASPHALTS, OILS, AND EMULSIONS, AT A RATE OF 0.25 GAL/SY.

ITEM 166 FERTILIZER

TIME SCHEDULE	FUNCTIONAL USE:
AFTER TOPSOIL PLOWING PREPARATIONS ARE COMPLETED, FERTILIZE ROW SOIL SURFACES AND HARROW 2" TO 4" DEEP INTO PLACE.	PLANT NUTRIENTS FOR PLANT AND ROOT DEVELOPMENT.

FERTILIZER SHALL BE EVENLY DISTRIBUTED AT A RATE OF 100 LBS OF NITROGEN PER ACRE.
THE BREAK DOWN OF THE NITROGEN ELEMENT SHALL BE IN A 50% SLOW RELEASE FORM.
ANALYSIS OF THE (NPK) IS: 3:1:1 OR AS DIRECTED BY THE AREA ENGINEER.

ITEM 166 NOTES:

1. BROADCAST SPECIFIED FERTILIZER FROM THE EDGE OF PAVEMENT, THROUGH THE ENTIRE ROW SEED BED AREA. APPLICATIONS FOR EDGE OF PAVEMENT, CULVERTS, SIGN POST AREAS, GUARD RAILS AND ISOLATED AREAS SHALL BE APPLIED BY WALK BEHIND SPREADERS AND BY HAND. NO FERTILIZER ALLOWED ON PAVEMENT SURFACES.

2. ALL SPREADERS SHALL BE CALIBRATED BY THE CONTRACTOR AND THE ENGINEER FOR ACCURACY AND PERFORMANCE. SHALL USE UNOPENED 50# BAGS OF SPECIFIED FERTILIZER FOR DAILY CALIBRATIONS. APPLICATION SHALL BE A EVEN DISTRIBUTION OF PRODUCT ON DESIGNATED SOIL SURFACES.

3. FERTILIZER SHALL BE DELIVERED IN 50# BAGS UNLESS OTHERWISE SPECIFIED OR APPROVED PRIOR TO DELIVERY. BAGS SHALL BE CLEARLY LABELED SHOWING CONTENTS. IF BULK FERTILIZER IS APPROVED, DOCUMENTATION WILL BE REQUIRED FOR EACH LOAD OF MATERIAL DELIVERED VERIFYING AUTHENTICITY OF THE MATERIAL. CULTURAL PROCEDURES ARE UNDER THE DIRECTION OF THE TXDOT AREA ENGINEER.

STATE OF TEXAS
BRYSON P. LAWRENCE
129839
LICENSED PROFESSIONAL ENGINEER

Bryson Lawrence, P.E.

04/01/2024

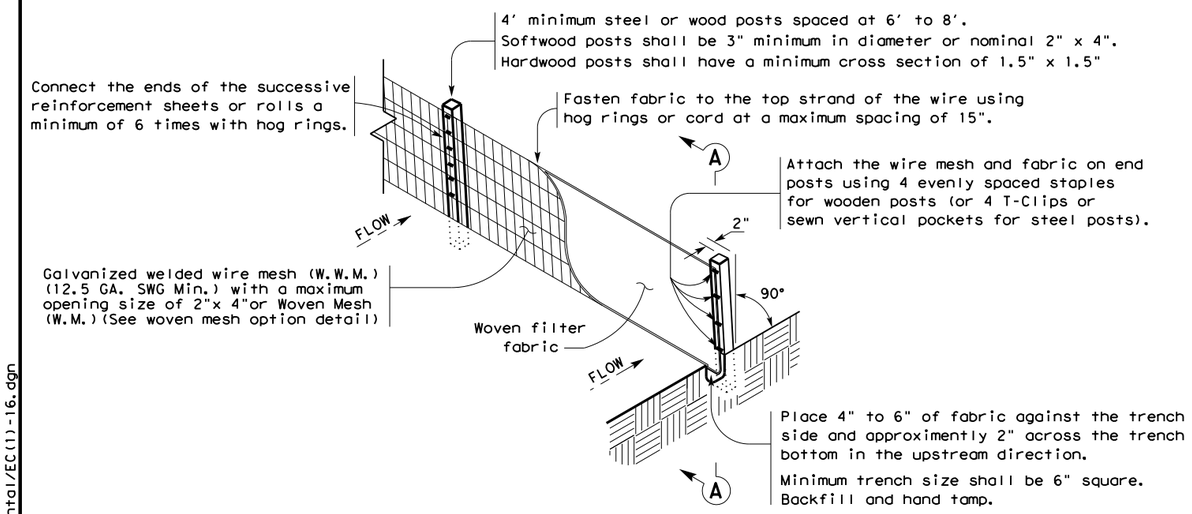
SCALE = NTS SHEET 2 OF 2

Texas Department of Transportation
Wichita Falls District Standard

TYPICAL APPLICATION FOR VEGETATION ESTABLISHMENT SHEET

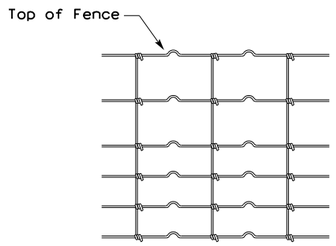
WFS-TA-VES

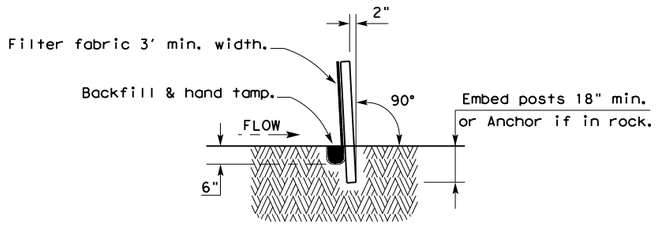
FILE: BMPLAYOUTS.dgn		DN: TXDOT		CK: TXDOT	DW: TXDOT		CK: TXDOT
© TxDOT 2009		CONT	SECT	JOB		HIGHWAY	
REVISIONS JULY 2019		0814	01	036		FM 422	
		DIST		COUNTY			SHEET NO.
		WFS.		BAYLOR			145



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.

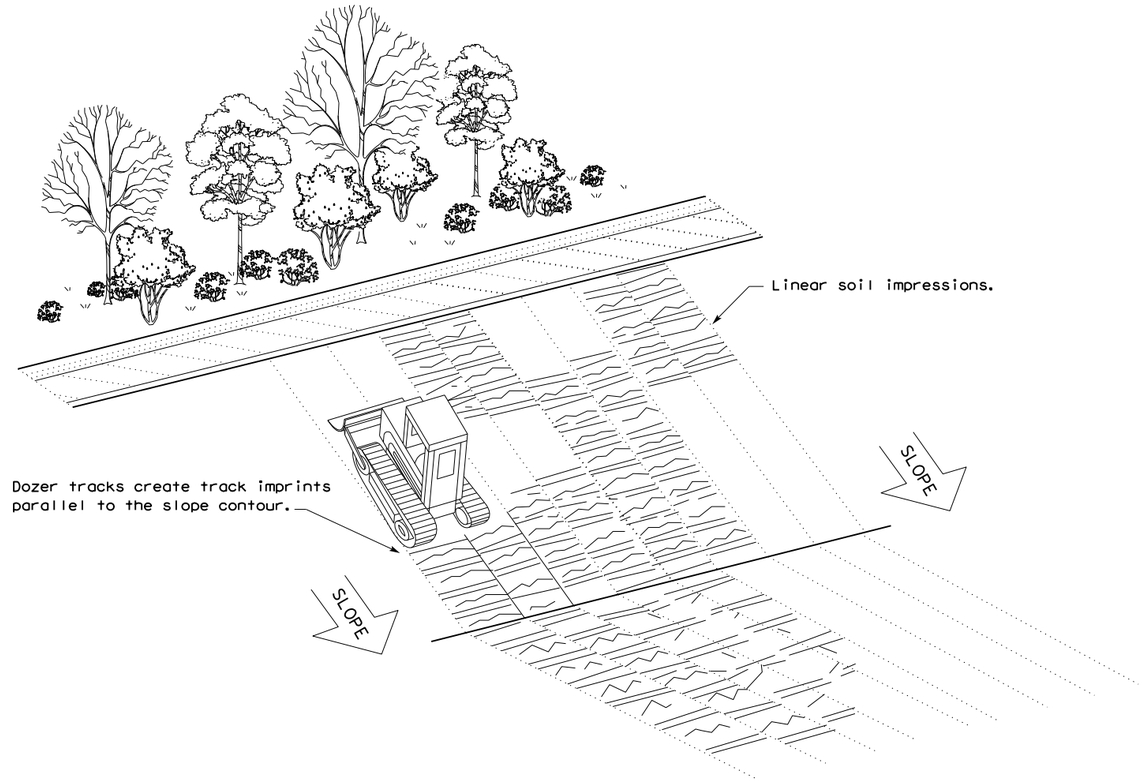
LEGEND

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

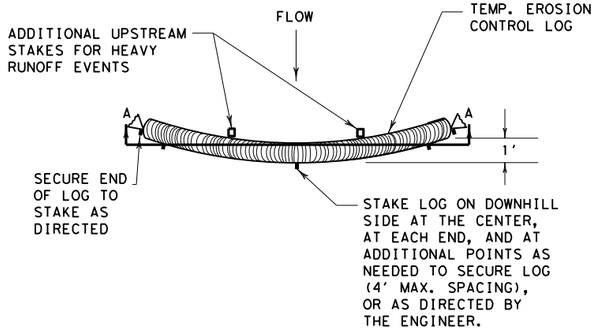
FENCE & VERTICAL TRACKING

EC(1)-16

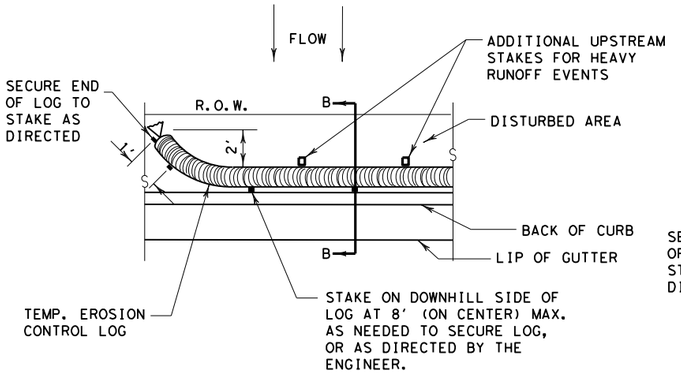
FILE: ec116	DN: TxDOT	CK: KM	DW: VP	DN/CK: LS
© TxDOT: JULY 2016	CONT	SECT	JOB	HIGHWAY
REVISIONS	0814	01	036	FM 422
	DIST	COUNTY		SHEET NO.
	WFS.	BAYLOR		146

3/8/2024
pw:\\txdot.projectwiseonline.com:TXDOT2/Documents/03 - WFS/Design Projects/081401036/4 - Design/Plan Set/9. Environmental/EC(1)-16.dgn

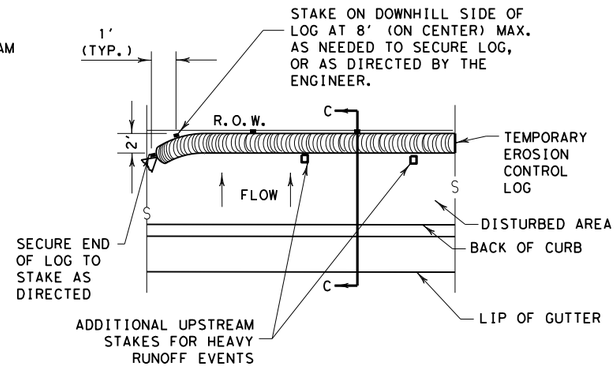
DATE: 3/29/2024
FILE: pw://txdot.projectwiseonline.com:TXDOT2/Documents/03 - WFS/Design Projects/081401036/4 - Design/Plan Set/9. Environmental/EC(9)-16.dgn



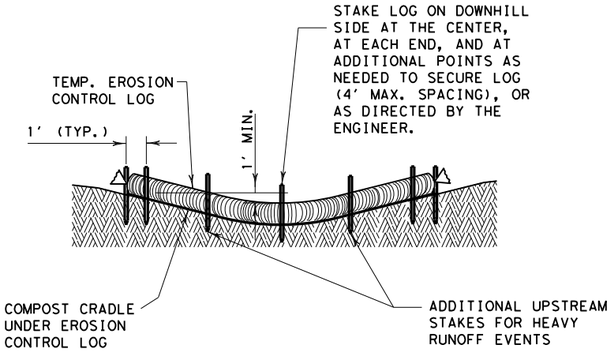
PLAN VIEW



PLAN VIEW



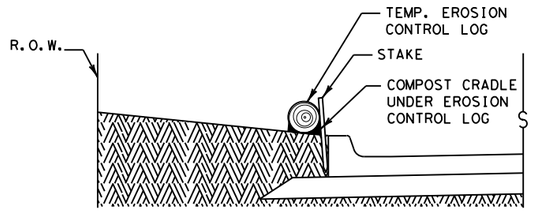
PLAN VIEW



SECTION A-A

EROSION CONTROL LOG DAM

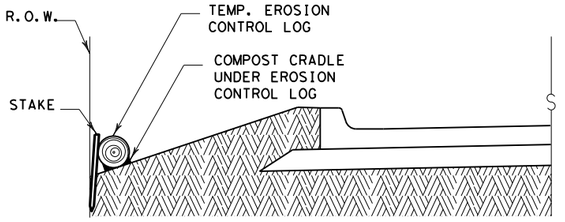
CL-D



SECTION B-B

EROSION CONTROL LOG AT BACK OF CURB

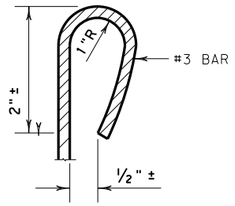
CL-BOC



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.

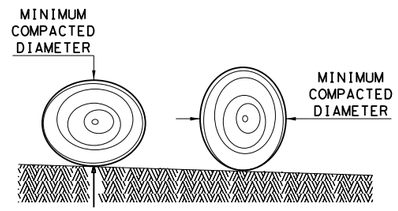
Log Traps: The drainage area for a sediment trap should not exceed 5 acres. The trap capacity should be 1800 CF/Acre (0.5" over the drainage area).

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

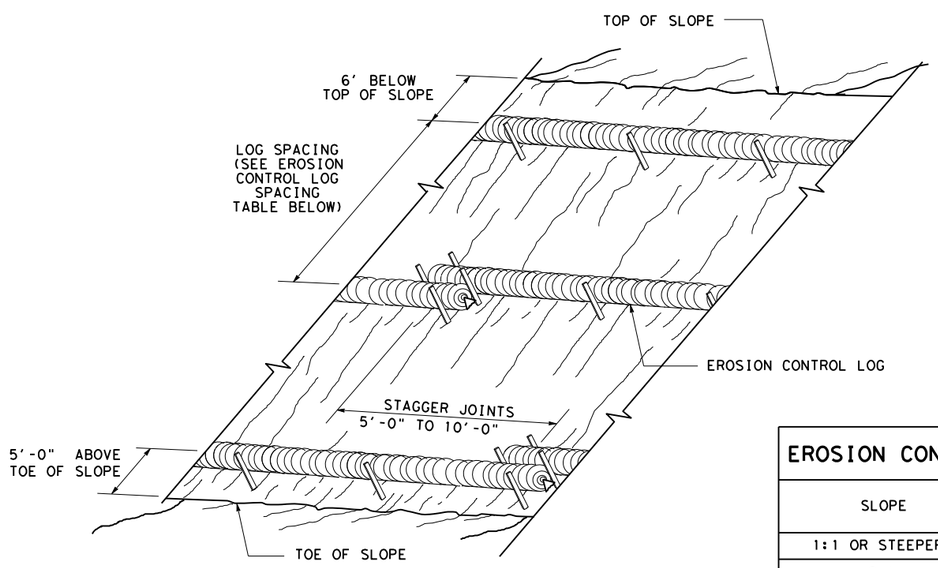
TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

EROSION CONTROL LOG

EC(9)-16

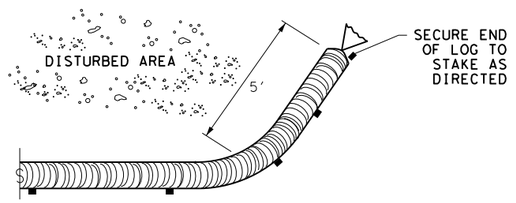
FILE: ec916	DN: TxDOT		CK: KM		DW: LS/PT	CK: LS
© TxDOT: JULY 2016	CONT	SECT	JOB		HIGHWAY	
REVISIONS	0814	01	036		FM 422	
	DIST		COUNTY			SHEET NO.
	WFS.		BAYLOR			147

DATE: 3/29/2024
FILE: pw://txdot.projectwiseonline.com:TXDOT2/Documents/03 - WFS/Design Projects/081401036/4 - Design/Plan Set/9. Environmental/EC(9)-16.dgn



EROSION CONTROL LOGS ON SLOPES
STAKE AND TRENCHING ANCHORING

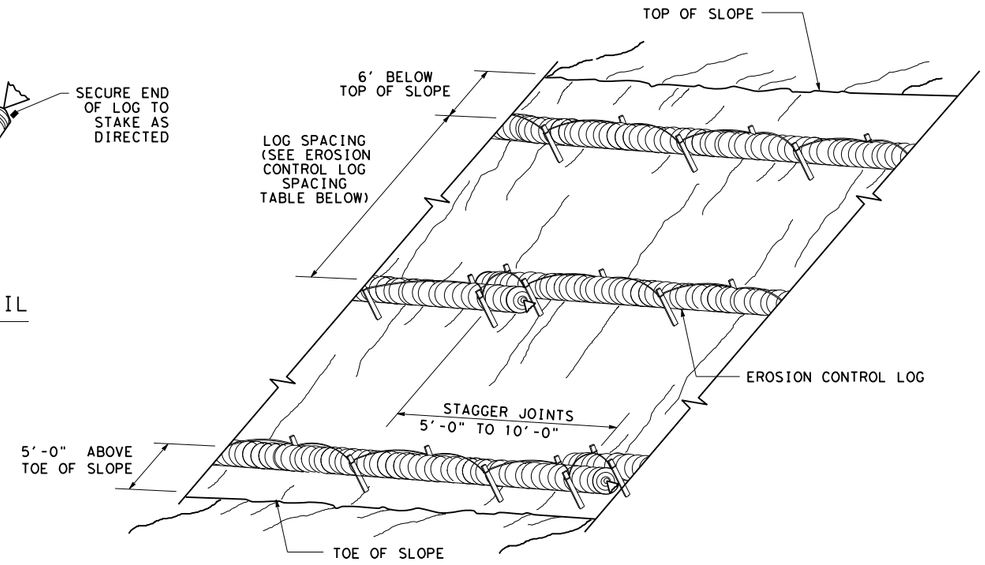
CL-SST



END SECTION RAP DETAIL

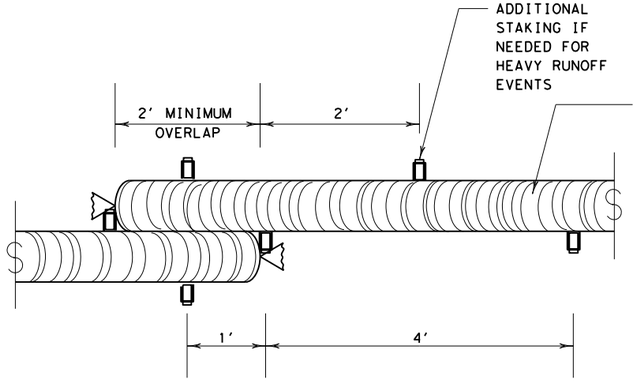
EROSION CONTROL LOG SPACING TABLE				
SLOPE	LOG DIAMETER			
	6"	8"	12"	18"
1:1 OR STEEPER	5'	10'	15'	20'
2:1	10'	20'	30'	40'
3:1	15'	30'	45'	60'
4:1 OR FLATTER	20'	40'	60'	80'

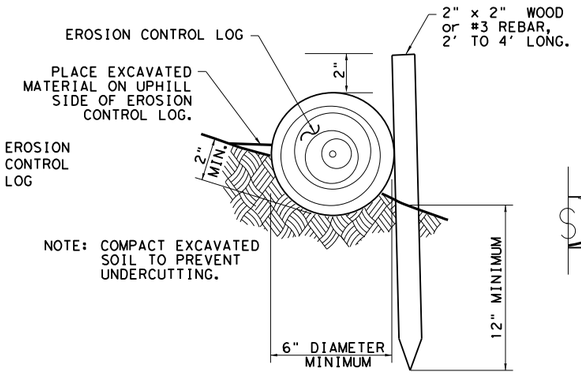
* ADJUSTMENTS CAN BE MADE FOR SOIL TYPE:
SOFT, LOAMY SOILS-ADJUST ROWS CLOSER TOGETHER;
HARD, ROCKY SOILS- ADJUST ROWS FARTHER APART



EROSION CONTROL LOGS ON SLOPES
STAKE AND LASHING ANCHORING

CL-SSL

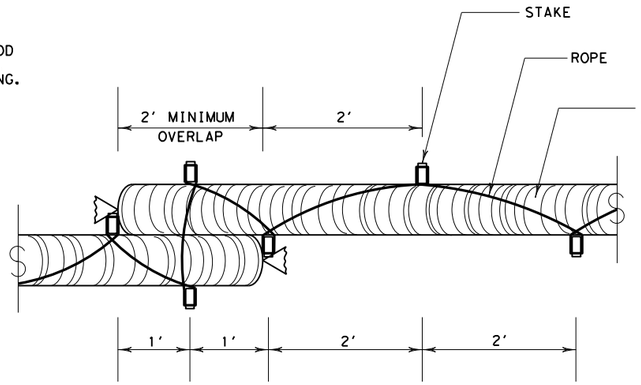


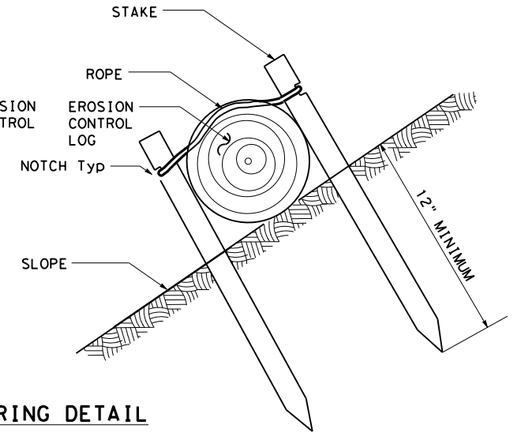


STAKE AND TRENCHING ANCHORING DETAIL

CL-SST

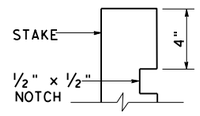
TRENCH DEPTH TABLE	
LOG DIAMETER	DEPTH
6"	2"
8"	3"
12"	4"
18"	5"





STAKE AND LASHING ANCHORING DETAIL

CL-SSL



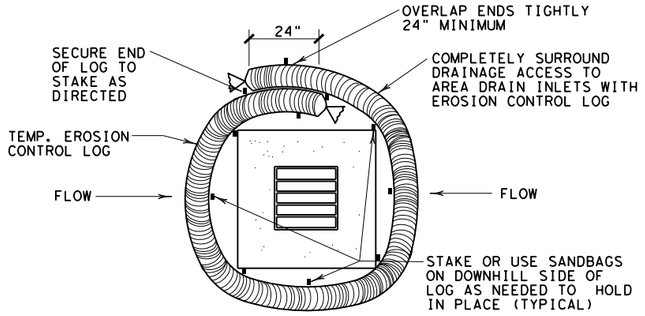
STAKE NOTCH DETAIL

Texas Department of Transportation — Design Division Standard

TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES
EROSION CONTROL LOG
EC(9)-16

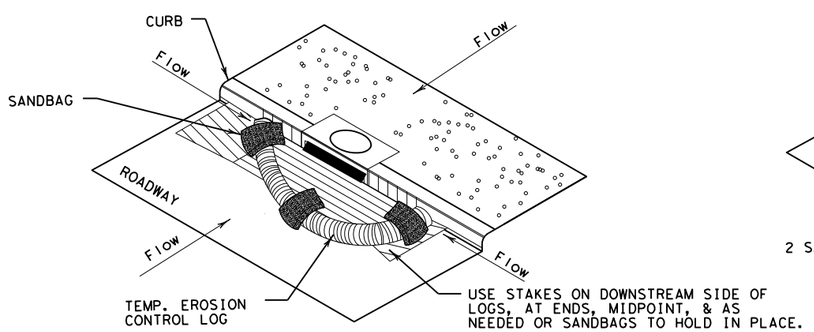
FILE: ec116	DN: TxDOT	CK: KM	DW: LS/PT	CK: LS
© TxDOT: JULY 2016	CONT	SECT	JOB	HIGHWAY
REVISIONS	0814	01	036	FM 422
	DIST	COUNTY		SHEET NO.
	WFS.	BAYLOR		148

DATE: 3/29/2024
FILE: pw://txdot.projectwiseonline.com:TXDOT2/Documents/03 - WFS/Design Projects/081401036/4 - Design/Plan Set/9. Environmental/EC(9)-16.dgn



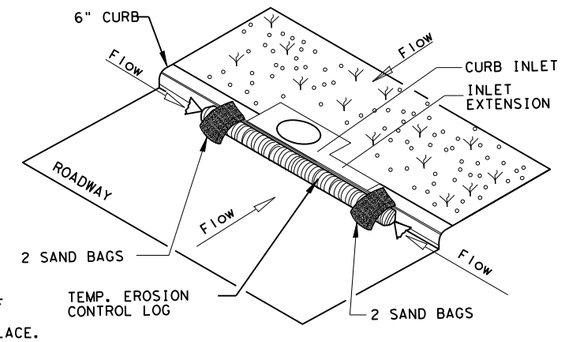
EROSION CONTROL LOG AT DROP INLET

CL-DI



EROSION CONTROL LOG AT CURB INLET

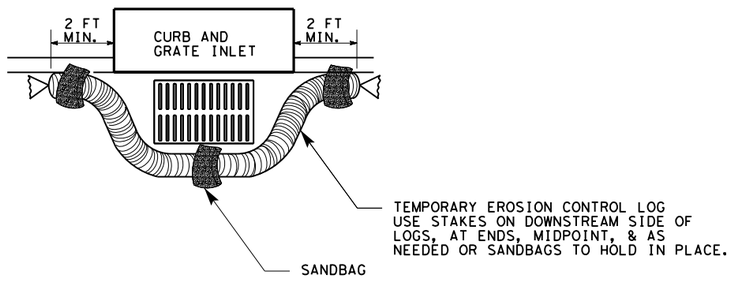
CL-CI



EROSION CONTROL LOG AT CURB INLET

CL-CI

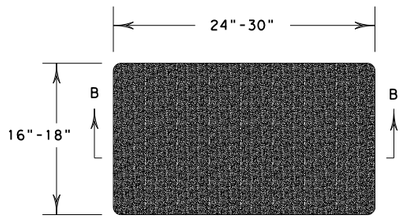
NOTE:
EROSION CONTROL LOGS USED AT CURB INLETS SHOULD ONLY BE USED IF THEY WILL NOT IMPEDE TRAFFIC OR FLOOD THE ROADWAY OR WHEN THE STORM SEWER SYSTEM IS NOT FULLY FUNCTIONAL.



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	0814	01	036		FM 422	
	DIST	COUNTY				SHEET NO.
	WFS.	BAYLOR				149