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FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
6	BR 2B23(292)		1
STATE	STATE DIST.	COUNTY	
TEXAS	ODA	MIDLAND	
CONT.	SECT.	JOB	HIGHWAY NO.
0906	32	050, ETC.	MAIN ST, ETC.

STATE OF TEXAS
DEPARTMENT OF TRANSPORTATION

INDEX OF SHEETS

SEE SHEET 2

PLANS OF PROPOSED
STATE HIGHWAY IMPROVEMENT

FEDERAL AID PROJECT NO. BR 2B23(292)

MIDLAND COUNTY
SCHARBAUER DRIVE

LIMITS: AT SCHARBAUER DRAW
TOTAL LENGTH = 108.38 FT. = 0.021 MI.

EAST BOUND SCHARBAUER DRIVE AT MIDLAND DRAW
TOTAL LENGTH = 211.24 FT. = 0.040 MI.

WEST BOUND SCHARBAUER DRIVE AT MIDLAND DRAW
TOTAL LENGTH = 126.33 FT. = 0.024 MI.
NET LENGTH OF PROJECT: 445.95 FT = 0.084 MI

FOR THE CONSTRUCTION OF BRIDGE REPLACEMENTS

CONSISTING OF
RECONSTRUCTION OF EXISTING BRIDGE CLASS CULVERTS
AND ADJACENT ROADWAYS AND INTERSECTIONS. INCLUDES
PAVEMENT, CULVERTS, RAIL, SIDEWALKS, PAVEMENT MARKINGS, AND SIGNS.

ROADWAY	FUNCTIONAL CLASSIFICATION	DESGIN SPEED (MPH)	2017 EXISTING AADT*	2021 EXISTING AADT*	2041 ESTIMATED AADT*
SCHARBAUER DRIVE @ MAIN ST	MINOR ARTERIAL	35	5,818		8,145
MAIN STREET	MAJOR COLLECTOR	35		3,535	4,949
SCHARBAUER DRIVE @ MIDLAND DRAW	MINOR ARTERIAL	35	2,128		2,979

*VALUES FROM TXDOT STATEWIDE PLANNING MAP

DESIGN SPEED BASED ON CITY OF MIDLAND ROADWAY AND TRAFFIC DESIGN REQUIREMENTS

FREESE AND NICHOLS
1500 Broadway Street, Suite 206
Lubbock, TX 79401
Phone - (806) 686-2700
Web www.freese.com

DocuSigned by:
Kevin Morris
4F92688EFCA041E...
11/3/2023

SCHARBAUER DRIVE
AT MIDLAND DRAW
CSJ:0906-32-058
STA.10+33.67 TO 11+60.00
CSJ:0906-32-061
STA. 9+91.22 TO 12+02.46

MAIN STREET AT
SCHARBAUER DRAW
CSJ:0906-32-050
STA.10+06.71 TO 11+15.09

Texas Department of Transportation

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CONCURRENCE: 11/4/2023 20__
DocuSigned by: Lori Blong
MAYOR, CITY OF

SUBMITTED FOR LETTING: 11/3/2023 20__
DocuSigned by: P.E.
AREA ENGINEER, P.E.

RECOMMENDED FOR LETTING: 11/3/2023 20__
DocuSigned by:
DIRECTOR OF TRANSPORTATION PLANNING AND DEVELOPMENT, P.E.

APPROVED FOR LETTING: 11/6/2023 20__
DocuSigned by: Eric L. Lykins, P.E.
DISTRICT ENGINEER, P.E.

INSPECTION BY REGISTERED ACCESSIBILITY
SPECIALIST(RAS) INSPECTION REQUIRED
TDLR PROJECT NO. TABS2023023702

SPECIFICATIONS ADOPTED BY THE TEXAS DEPARTMENT OF TRANSPORTATION, NOVEMBER 1, 2014 AND SPECIFICATION ITEMS LISTED AND DATED AS FOLLOWS, SHALL GOVERN ON THIS PROJECT: REQUIRED CONTRACT PROVISIONS FOR ALL FEDERAL-AID CONSTRUCTION CONTRACTS [(FORM FHWA 1273, OCTOBER 23, 2023).]

EXCEPTIONS: NONE
EQUATIONS: NONE
RR CROSSINGS: NONE

SCALE: NTS

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PRINTED DATE: 10/27/2023

COUNTY____ PROJ. NO.____
HWY. NO.____ LETTING DATE____
DATE ACCEPTED____

ver. 2018.01.00

1200.0000 ft / in.

HL 93 LOADING

Freese and Nichols, Inc.
Texas Registered Engineering Firm F-2144

NO	DATE	REVISION	APPROVED

STATE OF TEXAS
KEVIN MORRIS
105091
LICENSED
PROFESSIONAL ENGINEER

Kevin Morris 11/29/2023

KEVIN M. MORRIS, P.E. DATE

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

FREESE AND NICHOLS
1500 Broadway Street, Suite 206
Lubbock, TX 79401
Phone - (806) 686-2700
Web www.freese.com

Texas Department of Transportation
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SCHARBAUER DRIVE BRIDGE REPLACEMENTS

INDEX

SHEET 1 OF 1

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DAG	6	SEE TITLE SHEET FOR PROJECT NO.		MAIN ST
GRAPHICS KNW	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK KMM	TEXAS	ODA	MIDLAND	2
CHECK SRJ	CONTROL	SECTION	JOB	
	0906	32	050,ETC.	

11/28/2023
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Contractor questions on this project are to be addressed to the following individual(s):
ODA-PreLettingQuestions@txdot.gov

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

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

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

Item 5: Control of the Work

The following TxDOT Department standards have been modified for this project:

SW-0, MC-10-7, BAS-C, PM (1), PM (2), PM (3)

For any structures containing bird nests, schedule all work to complete the demolition of the existing structures identified in the plans between September 15, and March 15,. Failure to complete this work during the specified timeframe may cause construction delays due to environmental regulations.

The existing alignment is the control for the Contractor staking. Establish reference points for the control prior to removing the existing surface.

Use Method C for construction surveying.

In the event the finished surface does not conform to the typical sections or does not meet the required IRI, rework the non-conforming area to the limits necessary and employ additional survey control as directed.

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

Item 6: Control of Materials

Restrict storage of equipment and materials to approved areas. The Engineer will not approve storage in any TxDOT yard.

Promptly and properly dispose of any waste generated from servicing equipment on the project.

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

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

The Buy America Material Classification Sheet is located at the below link.
https://www.txdot.gov/business/resources/materials/buy-america-material-classification-sheet.html for clarification on material categorization.

The Contractor shall remove and dispose of the lead-containing paint (LCP) at the following locations if construction activities will disturb the LCP:

1. NBI# 06-165-0-B056-80-001: Approximately 300 SF of silver LCP on steel guardrails at 193,000 ppm.
2. NBI# 06-165-0-B042-60-001: Approximately 400 SF of silver LCP on steel guardrails and steel guardrail posts at 1,390 ppm.
3. NBI# 06-165-0-B042-60-002: Approximately 800 SF of silver LCP on steel guardrails and steel guardrail posts at 5,190 ppm.

Implement worker protections or engineering and work practice controls as needed to minimize worker risk of lead exposure when torch-cutting, heating, welding, or grinding metal components with lead-containing coatings. Comply with all applicable OSHA requirements including OSHA Standards and Interpretations, 29 CFR Part 1926.62 "Lead in Construction" and 29 CFR Part 1926.134 "Respiratory Protection", as well as all other applicable Local, State, and Federal regulatory requirements.

When practical, use mechanical methods (unbolting, mechanical shearing) to dismantle painted steel structural components. Where torch cutting, welding, burning, or grinding must be performed on steel components with lead-containing coatings, stripping back of lead paint at the affected areas may be used as a work practice control to minimize employee exposure to lead fumes.

Provide qualified personnel or subcontractors to perform lead paint mitigation work. Qualified personnel include those that are licensed, registered, or accredited by the Texas Department of State Health Services (DSHS) and insured for the appropriate lead-containing coating abatement activity, or personnel working under current, written Lead Compliance and Training Programs meeting the requirements specified in OSHA Standards and Interpretations, 29 CFR Part 1926.62 "Lead in Construction".

When stripping back of lead-containing coatings is required, include paint-stripping procedures in the project Demolition or in a separate Lead Paint Removal Work Plan. Use qualified personnel or subcontractors, as specified, to strip back lead paint as described in the plan or as directed.

Perform paint stripping work in accordance with the recommended procedures for stripping back lead-based paint found in the OSHA Technical Manual, Section V: Chapter 3 – Controlling Lead

Exposure in the Construction Industry, under work practice controls for welding, burning, and torch-cutting, or use an equivalent OSHA compliant method.

The Contractor must store all coating removal wastes in approved, secured, and leak-proof containers following completion of each work shift. Upon completion of the abatement activities, the Contractor must properly characterize the waste materials for transportation and disposal at an appropriate disposal facility. The Department, or the contractor performing the removal work, may sign as the Generator of the waste material produced by this item.

Contractor Force Account "Environmental" has been established for the payment of any removal and disposal of LCP.

Item 7: Legal Relations and Responsibilities

If access to the project is required through a new or unapproved driveway (i.e. Material source, stockpile location, field office, etc.), obtain an approved "Permit to Construct Access Driveway Facilities on Highway Right Of Way" (TxDOT Form 1058) before beginning any construction operations.

Utilities (public, private and TxDOT) exist throughout the project. Prior to any excavation, investigate to determine the utility locations within the project right of way. Contact the TxDOT Odessa Traffic Operations shop at 432-498-4690 to investigate and determine the location of any TxDOT utility that may exist within the project right of way. Exercise caution when excavating in areas where investigations have determined that utilities exist. The contractor is responsible for maintaining utility markings

No significant traffic generator events identified.

As an element of ensuring public safety and convenience under Article 7.2.4, the Contractor is hereby directed to open all closed lanes and shoulder and remove all traffic control devices from any areas where work is not being actively performed unless overnight traffic control is required and approved by the engineer. Removed devices must be stored outside of the clear zones near the right of way line or removed from the right of way line entirely.

At any time during construction that a previously installed crash cushion is damaged by the traveling public and is requested to be repaired by the Engineer, the repair will be paid at the same unit cost as the original installation.

Item 8: Prosecution and Progress

The following portions of the plans may affect the Contractor's planned construction sequencing. The Contractor's attention is directed to the appropriate plan sheet or standard sheet.

-Traffic Control Plan

-Storm Water Pollution Prevention Plan

-Environmental Permit, Issues And Commitments (EPIC)

Maintain ingress and egress to side streets and private property at all times.

Initiate the installation of Item 628 "Electrical Services" as part of the initial work sequence to allow TxDOT the lead-time necessary for coordination with utility companies to establish and provide for electrical service(s) proposed for this project.

Working days will be computed and charged in accordance with Article 8. 3.1.4. "Standard Workweek."

90 day lead time is needed to allow for sufficient time to obtain and produce materials needed for various bid items in this project.

Item 105: Removing Treated and Untreated Base and Asphalt Pavement

Saw cut and remove existing asphaltic pavement by an approved method.

Item 310: Prime Coat

MC-30 will have a minimum 72 hour curing time or as directed by the engineer.

Item 320: Equipment for Asphalt Concrete Pavement

A field laboratory is not required for this project.

Item 400: Excavation and Backfill for Structures

Aggregate for cement stabilized backfill will be an approved material.

The addition of cement stabilized backfill under the pipe will not be required for this project. However, the Contractor will be required to shape the subgrade (trench bottom) to conform to a Class C bedding in sand or loam. If rock or rock outcrops are encountered, a Class B bedding consisting of sand or chat material will be required under the pipe.

Item 420: Concrete Structures

Mass concrete will be measured in place.

Mass concrete will be paid for by the quantity shown in the plans.

Item 421: Hydraulic Cement Concrete

Furnish a job site curing tank equipped with a recording thermometer with the capability to chart temperatures for 24 hours, 7 days and 30 days. Furnish the Engineer with copies of the temperature records.

Furnish disposable 4" or 6" cylinder molds and caps that meet testing tolerances.

The Engineer will provide strength testing equipment for acceptance testing.

Furnish Type II or IP cement.

Furnish Type II or IP cement for cast-in-place concrete.

All plants and trucks may be inspected and approved by the Engineer in lieu of the NRMCA or Non-Department Engineer Sealed Certifications. The criteria and frequency of the Engineer approval of plants and trucks is the same used for NRMCA Certification.

Item 422: Concrete Superstructures

All accessories such as tie wires, bar chairs, supports or clips used with epoxy-coated reinforcement will be of steel, fully coated with epoxy or plastic.

Item 423: Retaining Walls

Stake all wall locations in the field, and have approved prior to wall construction.

Item 427: Surface Finishes for Concrete

For Surface Area I, provide a rub finish with the exception of abutments.

Item 432: Riprap

Use approved expansion joint material and place between the proposed riprap and curb and gutter.

Reinforce all riprap on this project with no. 3 bars spaced 12 inches O.C.B.W. or no. 4 bars spaced at 18 inches O.C.B.W.

Broom finish all riprap on this project unless otherwise directed.

Polypropylene fiber may not be used in lieu of reinforcing steel.

Item 450: Railing

Concrete and steel for 12-inch wide pedestrian rail foundation as shown in PRD-13 shall be considered subsidiary to the pedestrian handrail.

Item 479: Adjusting Manholes and Inlets

Raise the manholes and water valves up to finished roadway elevation, matching the finish cross-slope.

Item 502: Barricades, Signs, and Traffic Handling

Stop work immediately if any major traffic control element such as an advanced warning flashing panel or TMA or PCMS is not in good working order or control setup.

Maintain "No Center Line", "Do Not Pass" and "Pass With Care" signs until the permanent lane markings have been placed in accordance with plans.

Place orange fencing around sidewalk, wheelchair ramps and other pedestrian areas that pose a hazard to pedestrian traffic as directed.

Use Shoulder Drop-Off (CW8-9A) signs during construction when shoulder drop-off conditions are 3 inches or greater or as directed. Placement shall be in accordance with the "Texas Manual on Uniform Traffic Control Devices".

This project has an advisory work zone speed plaque of xx mph to be placed on the lane closed warning sign. This advisory plaque will be used to supplement the warning sign and to indicate speed for the condition indicated. The warning sign and advisory speed plaque will be removed by the State once the condition or need for the sign no longer exists.

Place chevrons, at a minimum, on every other drum used for outsides of curves, merging tapers and shifting tapers.

Vertical panels shall be self-righting.

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.

When construction operations result in a drop-off of more than 2 inches, a 3:1 or flatter slope will be required. The slope must be constructed with a compacted material capable of supporting vehicles as approved by the Engineer. This work shall be done expeditiously during daylight hours. Flaggers and appropriate signing to safely guide traffic through the work area will be required as directed by the Engineer. This shall be considered subsidiary to Item 502.

Item 506: Temporary Erosion, Sedimentation, and Environmental Controls

In accordance with the Construction General Permit (CGP), erosion control and stabilization measures should be initiated as soon as practicable to include (list what our stabilization measures are – for example, replacing topsoil from windrow, erosion control blankets, seeding, etc.)

The total disturbed area for this project is 0.70 Acres. The disturbed area in this project, all project locations in the contract, and Contractor Project Specific Locations (PSLS), within 1 mile of the project limits, for the contract will further establish the authorization requirements for storm water discharges. The department will obtain an authorization to discharge storm water from the Texas Commission On Environmental Quality (TCEQ) for the construction activities shown on the plans. The Contractor is to obtain any required authorization from the TCEQ for any Contractor PSLS for construction support activities on or off the right of way. When the total area disturbed for all projects in the contract and PSLS within 1 mile of the project limits exceeds 5 acres, provide a copy of the Contractor NOI for PSLS on the right of way, to the Engineer (or to the appropriate MS4 operator when on an off-state system route).

Upon acceptance of the project, all SW3P devices will become property of the State and maintenance responsibility is transferred to the State until final stabilization is attained.

Item 529: Concrete Curb, Gutter, and Combined Curb And Gutter

Use and place approved expansion joint material between the existing curb and the proposed curb and at least every 50 feet in the proposed curb sections.

Polypropylene fibers may not be used in lieu of reinforcing steel.

After construction, restore the adjacent surface to a condition approved by the Engineer. Consider this work subsidiary to this bid item.

Item 531: Sidewalks

Polypropylene fiber may not be used in lieu of reinforcing steel.

Item 540: Metal Beam Guard Fence

Provide steel post for this project.

Item 644: Small Roadside Sign Assemblies

All new sign supports for stop and yield signs will have a 12" red strip of Type C High Specific Intensity Reflective tape. Place the top of the tape 4' above the edge of the roadway. This work will not be paid for directly and will be subsidiary to the pertinent bid item.

For standard small sign details and dimensions, refer to the "Standard Highway Sign Designs for Texas (SHSD)"; a supplement to the Texas Manual on Uniform Traffic Control Devices (TMUTCD)".

Locate and mark existing reference marker(s) perpendicular to the road and along the right of way, or as directed, prior to removal. Erect new reference marker(s) at the original location, upon completion of construction.

Only bolt clamp style slip bases will be allowed for sign assemblies. Set screws will not be allowed.

Item 658: Delineator and Object Marker Assemblies

Delineator and object marker assembly posts shall be composed of post-consumer recycled materials. Embedded stub shall be perforated square tubing.

Item 662: Work Zone Pavement Markings

After permanent pavement markings are placed, pull tabs from hot mix surface and/or cut off tabs flush with the pavement on seal coat surface. Remove tabs from the project and dispose of properly.

Materials used for non-removable work zone pavement markings will be paint and beads or other approved materials.

Item 666 Retroreflectorized Pavement Markings

Type I markings shall meet the minimum retroreflectivity values defined by Article 4.4 Retroreflectivity Requirements.

This Contract totals more than 200,000 feet of pavement markings; use a mobile retroreflectometer for retroreflectivity measurements. Portable retroreflectometers may not be used for this Contract.

Place Type I pavement markings with a ribbon-gun application.

Measure thickness for markings in accordance with Tex-854-B using usage rates (Part II).

Item 677: Eliminating Existing Pavement Markings and Markers

Submit eliminating plan for approval by the Engineer in accordance with Item 677.

Use Surface Treatment Method to eliminate existing pavement markings and markers.

Furnish Class B Grade 4 aggregate for the surface treatment and apply at a rate of 100SY/CY or as directed by the Engineer.

Furnish AC 20-5TR/AC 20XP binder during warm weather and apply at a rate of 0.25 GAL/SY or as directed by the Engineer.

Furnish CRS-2P binder during cold weather and apply at a rate of 0.4 GAL/SY or as directed by the Engineer.

Item 685: Roadside Flashing Beacon Assemblies

Provide a minimum of 7 feet from the roadway surface to the bottom of the flashing signal head.

Use concrete drilled shaft foundations for this project.

Item 3076: Dense-Graded Hot-Mix Asphalt

Binder:

Provide a binder with a Performance Grade of 70-22 (PG 70-22) for the Type C & Type D mix.

Aggregate quality:

Furnish Class A aggregate for the Type C & Type D mix.

Magnesium sulfate soundness loss will not be greater than 20 when class "A" aggregate is required.

Mixture design:

The target laboratory molded density for mix will be 96.5 percent.

Test method Tex-530-C (Boil Test) will not be required.

Placement:

Semi-trailer type vehicles are prohibited from dumping directly into the finishing machine for the finished surface unless the trailer is equipped with an auger slatted chain or another approved conveyor.

No RAP will be allowed in surface courses.

No RAS will be allowed.

Mineral filler will not be allowed.

Lime will not be allowed as an anti-stripping agent.

Item 6001: Portable Changeable Message Sign

PCMS shall be placed in operation a minimum of one (1) week prior to construction. Location(s) and duration for PCMS shall be as directed by the Engineer;

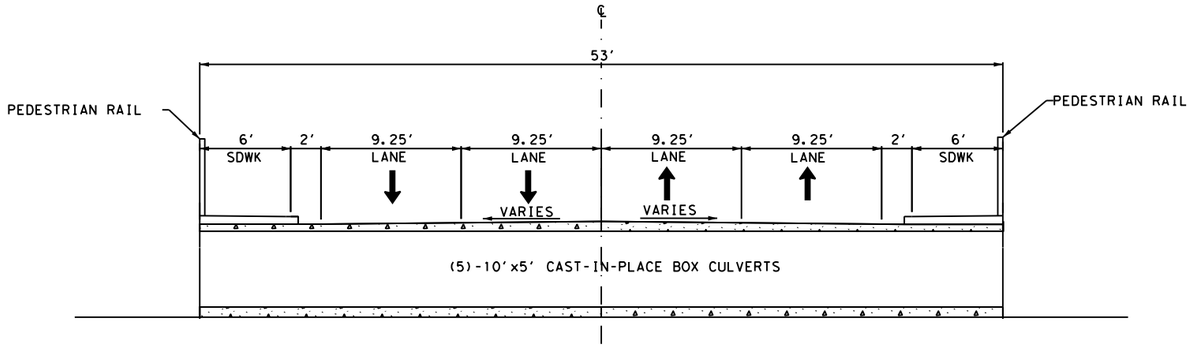
Item 6185: Truck Mounted Attenuator (TMA) and Trailer Attenuator (TA)

General Note 7 of TCP (2-6)-18 provides for additional shadow vehicle(s) with truck mounted attenuator (TMA); no additional shadow vehicle with TMA is included in the basis of estimate for this operation. The shadow vehicle(s) with TMA specified on the traffic control plan as "required" only is the quantity that has been estimated for this operation.

The Contractor will be responsible for determining if one or more operations will be ongoing at the same time to determine the total number of TMAs needed for the project.

TMA SUMMARY						Totals	
TCP	Req. No./Dy.	Opt. No./Dy.	Est. Days	Req. Days	Opt. Days	Stat. Req.	Stat. Opt.
2-6	1	2	144	144	288	144	288

0.08333317 ft / in.



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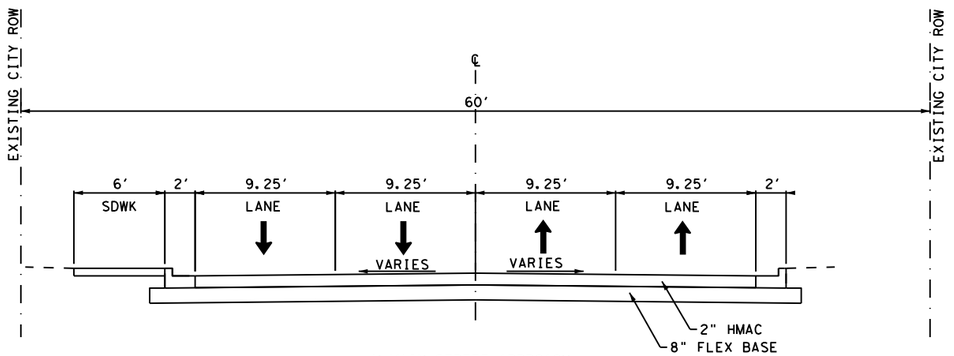
STA 10+29.58 TO STA 10+91.39



N MAIN STREET APPROACH
EXISTING TYPICAL
STA 10+06.71 TO STA 10+29.58
STA 10+91.39 TO STA 11+15.09

HL 93 LOADING

NO	DATE	REVISION	APPROVED

KEVIN MORRIS
105091
LICENSED
PROFESSIONAL ENGINEER
STATE OF TEXAS
10/27/2023
Freese and Nichols, Inc.
Texas Registered Engineering Firm F-2144

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Web www.freese.com

Texas Department of Transportation
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SCHARBAUER DRIVE
BRIDGE REPLACEMENTS

EXISTING TYPICAL SECTIONS
N MAIN STREET

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DAG	6	SEE TITLE SHEET FOR PROJECT NO.		MAIN ST
GRAPHICS KNW	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK KMM	TEXAS	ODA	MIDLAND	4
CHECK SRJ	CONTROL	SECTION	JOB	
	0906	32	050, ETC.	

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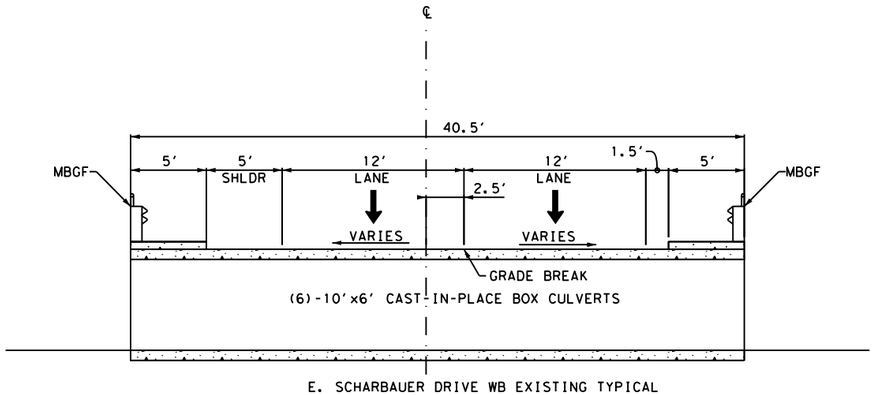

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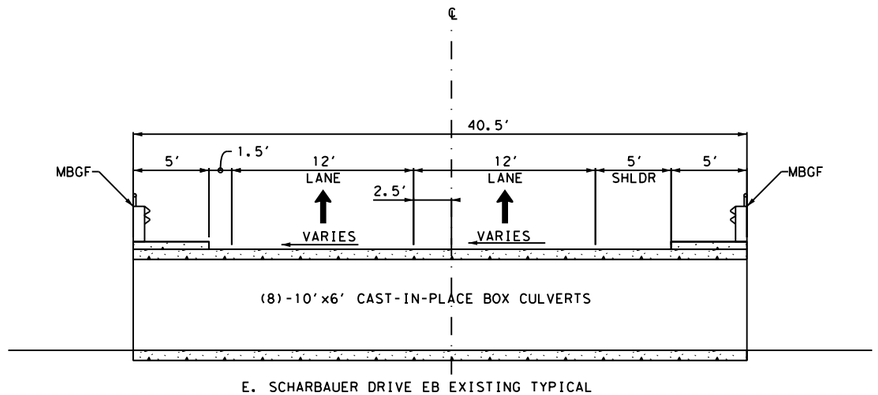

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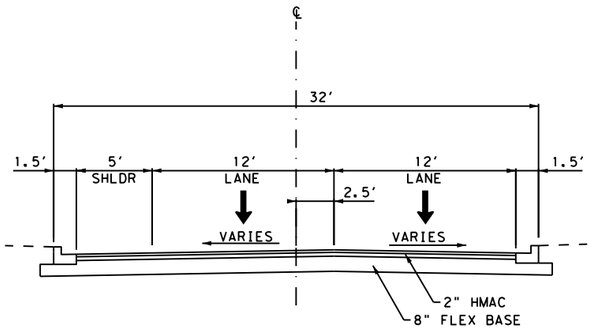

SCHARBAUER WB APPROACH
EXISTING TYPICAL
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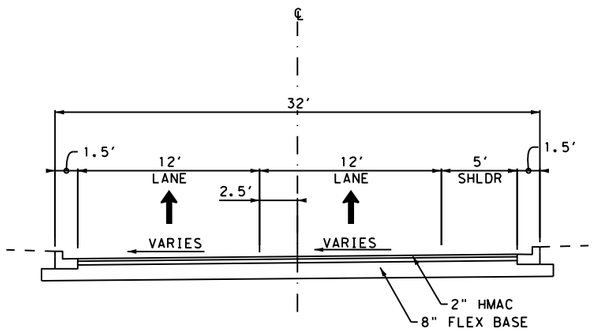

SCHARBAUER EB APPROACH
EXISTING TYPICAL
STA 10+06.22 TO STA 10+39.91
STA 11+60.09 TO STA 11+99.29

KEVIN MORRIS
105091
LICENSED
PROFESSIONAL ENGINEER
STATE OF TEXAS

Kevin Morris 10/27/2023

Freese and Nichols, Inc.
Texas Registered Engineering Firm F-2144

HL 93 LOADING

NO	DATE	REVISION	APPROVED

FREESE AND NICHOLS
1500 Broadway Street, Suite 206
Lubbock, TX 79401
Phone - (806) 686-2700
Web www.freese.com

Texas Department of Transportation
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SCHARBAUER DRIVE BRIDGE REPLACEMENTS

EXISTING TYPICAL SECTIONS E. SCHARBAUER DRIVE AT MIDLAND DRAW

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DAG	6	SEE TITLE SHEET FOR PROJECT NO.		MAIN ST
GRAPHICS KNW	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK KMM	TEXAS	ODA	MIDLAND	5
CHECK SRJ	CONTROL	SECTION	JOB	
	0906	32	050, ETC.	

10/27/2023
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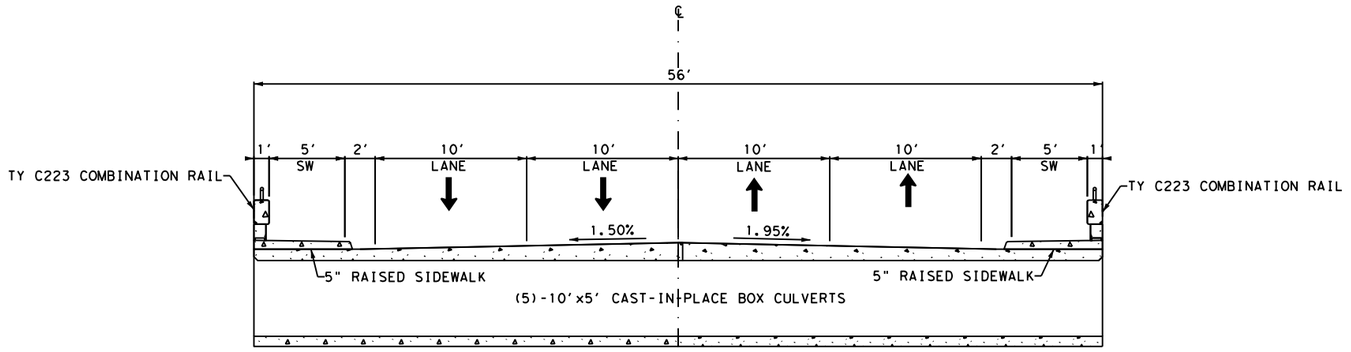

N MAIN STREET PROPOSED TYPICAL
STA 10+29.58 TO STA 10+91.39

HL 93 LOADING

STATE OF TEXAS
KEVIN MORRIS
105091
LICENSED
PROFESSIONAL ENGINEER

Kevin Morris 10/27/2023

Freese and Nichols, Inc.
Texas Registered Engineering Firm F-2144

NO	DATE	REVISION	APPROVED

FREESE AND NICHOLS
1500 Broadway Street, Suite 206
Lubbock, TX 79401
Phone - (806) 686-2700
Web www.freese.com

Texas Department of Transportation
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SCHARBAUER DRIVE
BRIDGE REPLACEMENTS

PROPOSED TYPICAL SECTIONS
N MAIN STREET

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DAG	6	SEE TITLE SHEET FOR PROJECT NO.		MAIN ST
GRAPHICS KNW	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK KMM	TEXAS	ODA	MIDLAND	6
CHECK SRJ	CONTROL	SECTION	JOB	
	0906	32	050,ETC.	

10/27/2023
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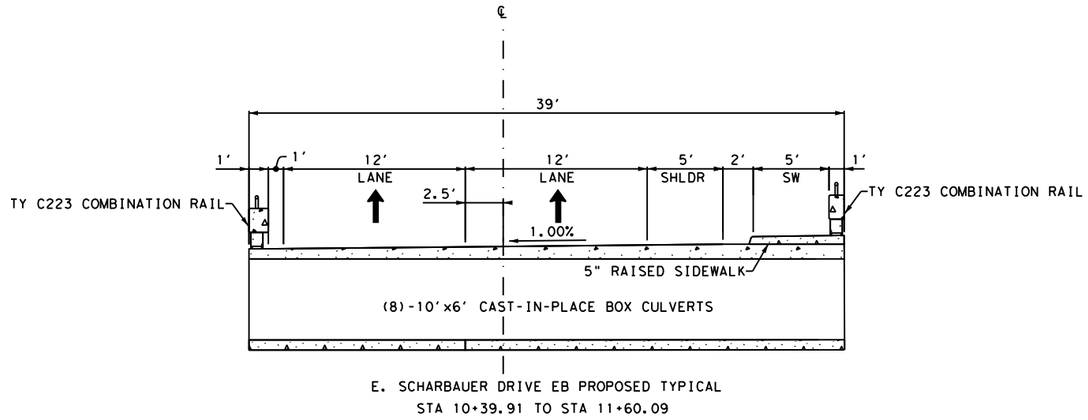
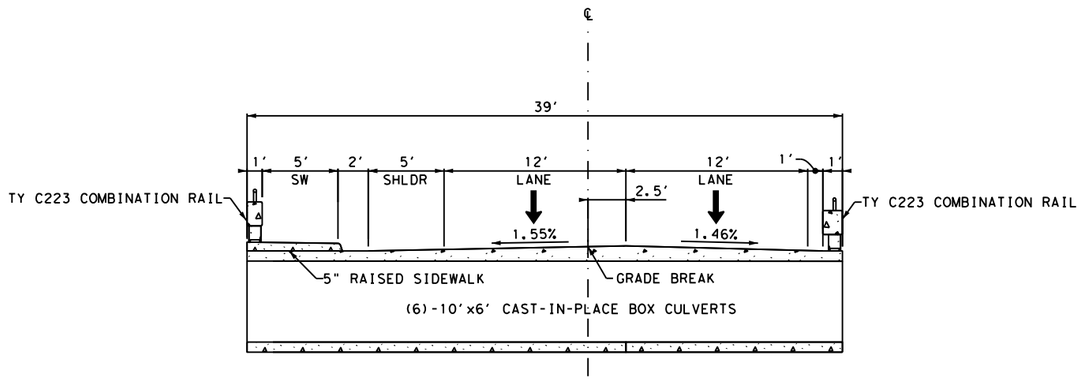
0.083333 ft / in.



E. SCHARBAUER DRIVE EB PROPOSED TYPICAL
STA 10+39.91 TO STA 11+60.09



E. SCHARBAUER DRIVE WB PROPOSED TYPICAL
STA 10+66.54 TO STA 11+33.46

HL 93 LOADING

NO	DATE	REVISION	APPROVED

KEVIN MORRIS
105091
LICENSED PROFESSIONAL ENGINEER
STATE OF TEXAS
10/27/2023
Freese and Nichols, Inc.
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SCHARBAUER DRIVE BRIDGE REPLACEMENTS

PROPOSED TYPICAL SECTIONS E SCHARBAUER DRIVE AT MIDLAND DRAW

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DAG	6	SEE TITLE SHEET FOR PROJECT NO.		MAIN ST
GRAPHICS KNW	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK KMM	TEXAS	ODA	MIDLAND	7
CHECK SRJ	CONTROL	SECTION	JOB	
	0906	32	050, ETC.	

10/27/2023
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Estimate & Quantity Sheet

CONTROLLING PROJECT ID 0906-32-050 **DISTRICT** Odessa **COUNTY** Midland
HIGHWAY MAIN ST, SCHARBAUER DR

				0906-32-050		0906-32-058		0906-32-061		TOTAL EST.	TOTAL FINAL
		CONTROL SECTION JOB									
		PROJECT ID		**A00099632**		**A00135613**		**A00193675**			
		COUNTY		**Midland**		**Midland**		**Midland**			
		HIGHWAY		**MAIN ST**		**SCHARBAUER DR**		**SCHARBAUER DR**			
ALT	**BID CODE**	**DESCRIPTION**	**UNIT**	EST.	FINAL	EST.	FINAL	EST.	FINAL		
	104-6001	REMOVING CONC (PAV)	SY	65.000						65.000	
	104-6009	REMOVING CONC (RIPRAP)	SY	211.000		129.000		861.000		1,201.000	
	104-6015	REMOVING CONC (SIDEWALKS)	SY			69.000		161.000		230.000	
	104-6022	REMOVING CONC (CURB AND GUTTER)	LF	182.000		106.000		124.000		412.000	
	104-6027	REMOVING CONC (APPR SLAB)	SY	118.000						118.000	
	105-6023	REMOVING STAB BASE AND ASPH PAV (5")	SY	240.000		197.000		201.000		638.000	
	216-6001	PROOF ROLLING	HR	16.000		2.000		2.000		20.000	
	251-6079	REWORK BS MTL (TY D)(SURF)(ORD COMP)	SY	237.000		25.000		39.000		301.000	
	310-6005	PRIME COAT (AE-P)	GAL	71.000		8.000		12.000		91.000	
	360-6018	CONC PVMT (JOINTED - CPCD) (8")	SY	85.000						85.000	
	400-6005	CEM STABIL BKFL	CY	3.000						3.000	
	402-6001	TRENCH EXCAVATION PROTECTION	LF			41.000		56.000		97.000	
	420-6051	CL C CONC (CULV)	CY	292.000		240.000		389.000		921.000	
	422-6013	BRIDGE SIDEWALK	SF	673.000		453.000		852.000		1,978.000	
	422-6015	APPROACH SLAB	CY	35.000		61.000		94.000		190.000	
	423-6008	RETAINING WALL (CAST - IN - PLACE)	SF	1,008.000						1,008.000	
	432-6001	RIPRAP (CONC)(4 IN)	CY	61.000		55.000		105.000		221.000	
	450-6032	RAIL (TY C223)	LF	125.000		136.000		243.000		504.000	
	466-6168	WINGWALL (FW - S) (HW=7 FT)	EA			2.000		2.000		4.000	
	466-6182	WINGWALL (PW - 1) (HW=7 FT)	EA					1.000		1.000	
	466-6210	WINGWALL (SW - 0) (HW=7 FT)	EA			2.000		1.000		3.000	
	466-6269	WINGWALL (SW-0)(HW=6FT)(MOD)	EA	4.000						4.000	
	479-6004	ADJUSTING MANHOLES (SANITARY)	EA	1.000		1.000		2.000		4.000	
	496-6005	REMOV STR (WINGWALL)	EA			4.000		4.000		8.000	
	496-6008	REMOV STR (BOX CULVERT)	LF	230.000		264.000		472.000		966.000	
	496-6099	REMOVE STR (RAIL)	LF	179.000		242.000		359.000		780.000	
	500-6001	MOBILIZATION	LS	0.010						0.010	
	502-6001	BARRICADES, SIGNS AND TRAFFIC HANDLING	MO	9.000						9.000	
	506-6003	ROCK FILTER DAMS (INSTALL) (TY 3)	LF	45.000		135.000		135.000		315.000	
	506-6011	ROCK FILTER DAMS (REMOVE)	LF	45.000		135.000		135.000		315.000	
	529-6002	CONC CURB (TY II)	LF	26.000						26.000	
	529-6008	CONC CURB & GUTTER (TY II)	LF	64.000		113.000		181.000		358.000	
	531-6005	CURB RAMPS (TY 2)	EA			2.000		2.000		4.000	
	531-6013	CURB RAMPS (TY 10)	EA	4.000						4.000	
	540-6002	MTL W-BEAM GD FEN (STEEL POST)	LF			50.000		275.000		325.000	
	540-6006	MTL BEAM GD FEN TRANS (THRIE-BEAM)	EA			1.000		1.000		2.000	
	540-6016	DOWNSTREAM ANCHOR TERMINAL SECTION	EA					1.000		1.000	

Estimate & Quantity Sheet

CONTROLLING PROJECT ID 0906-32-050 **DISTRICT** Odessa **COUNTY** Midland
HIGHWAY MAIN ST, SCHARBAUER DR

			CONTROL SECTION JOB	**0906-32-050**		**0906-32-058**		**0906-32-061**		TOTAL EST.	TOTAL FINAL
			PROJECT ID	**A00099632**		**A00135613**		**A00193675**			
			COUNTY	**Midland**		**Midland**		**Midland**			
			HIGHWAY	**MAIN ST**		**SCHARBAUER DR**		**SCHARBAUER DR**			
ALT	**BID CODE**	**DESCRIPTION**	**UNIT**	EST.	FINAL	EST.	FINAL	EST.	FINAL		
	544-6001	GUARDRAIL END TREATMENT (INSTALL)	EA			1.000		2.000		3.000	
	644-6009	IN SM RD SN SUP&AM TY10BWG(1)SB(P)	EA	1.000				1.000		2.000	
	644-6076	REMOVE SM RD SN SUP&AM	EA	5.000				1.000		6.000	
	658-6061	INSTL DEL ASSM (D-SW)SZ 1(BRF)GF2	EA					4.000		4.000	
	658-6064	INSTL DEL ASSM (D-SY)SZ 1(BRF)GF2	EA			4.000		7.000		11.000	
	662-6057	WK ZN PAV MRK REMOV (TRAF BTN) TY W	LF	1,590.000						1,590.000	
	666-6048	REFL PAV MRK TY I (W)24"(SLD)(100MIL)	LF	119.000						119.000	
	666-6078	REFL PAV MRK TY I (W)(WORD)(100MIL)	EA	4.000						4.000	
	666-6224	PAVEMENT SEALER 4"	LF	720.000		254.000		424.000		1,398.000	
	666-6230	PAVEMENT SEALER 24"	LF	51.000						51.000	
	666-6232	PAVEMENT SEALER (WORD)	EA	4.000						4.000	
	666-6300	RE PM W/RET REQ TY I (W)4"(BRK)(100MIL)	LF	616.000		127.000		212.000		955.000	
	666-6303	RE PM W/RET REQ TY I (W)4"(SLD)(100MIL)	LF			127.000		212.000		339.000	
	666-6315	RE PM W/RET REQ TY I (Y)4"(SLD)(100MIL)	LF	104.000						104.000	
	677-6001	ELIM EXT PAV MRK & MRKS (4")	LF	535.000						535.000	
	677-6007	ELIM EXT PAV MRK & MRKS (24")	LF	39.000						39.000	
	678-6001	PAV SURF PREP FOR MRK (4")	LF	720.000		254.000		424.000		1,398.000	
	678-6008	PAV SURF PREP FOR MRK (24")	LF	119.000						119.000	
	678-6016	PAV SURF PREP FOR MRK (WORD)	EA	4.000						4.000	
	685-6005	RELOCT RDSD FLSH BCN AM (SOLAR PWRD)	EA	4.000						4.000	
	3076-6023	D-GR HMA TY-C PG70-22	TON	42.000		5.000		7.000		54.000	
	3076-6040	D-GR HMA TY-D PG70-22	TON	30.000		3.000		5.000		38.000	
	3077-6075	TACK COAT	GAL	47.000		5.000		8.000		60.000	
	6001-6001	PORTABLE CHANGEABLE MESSAGE SIGN	DAY	144.000		204.000				348.000	
	6185-6002	TMA (STATIONARY)	DAY	144.000						144.000	
	18	ENVIRONMENTAL: CONTRACTOR FORCE ACCOUNT WORK (PARTICIPATING)	LS	1.000						1.000	
		SAFETY CONTINGENCY: CONTRACTOR FORCE ACCOUNT WORK (PARTICIPATING)	LS	1.000						1.000	
		EROSION CONTROL MAINTENANCE: CONTRACTOR FORCE ACCOUNT WORK (PART)	LS	1.000						1.000	

1200.0000 ft / in.

	WORKZONE SUMMARY			
	662	677	6001	6185
	6057	6001	6001	6002
	WK ZN PAV MRK REMOV (TRAF BTN) TY W	ELIM EXT PAV MRK & MRKS (4")	PORTABLE CHANGEABLE MESSAGE SIGN	TMA (STATIONARY)
UNIT	LF	LF	DAY	DAY
MAIN STREET	1590	535	144	144
WESTBOUND SCHARBAUER DRIVE			204	
EASTBOUND SCHARBAUER DRIVE				
PROJECT TOTALS	1590	535	348	144

	REMOVAL SUMMARY										
	104	104	104	104	104	105	496	496	496	644	677
	6001	6009	6015	6022	6027	6023	6005	6008	6099	6076	6007
	REMOVING CONC (PAV)	REMOVING CONC (RIPRAP)	REMOVING CONC (SIDEWALKS)	REMOVING CONC (CURB AND GUTTER)	REMOVING CONC (APPR SLAB)	REMOVING STAB BASE AND ASPH PAV (5")	REMOV STR (WINGWALL)	REMOV STR (BOX CULVERT)	REMOVE STR (RAIL)	REMOVE SM RD SN SUP&AM	ELIM EXT PAV MRK & MRKS (24")
UNIT	SY	SY	SY	LF	SY	SY	EA	LF	LF	EA	LF
MAIN STREET	65	211		182	118	240		230	179	5	39
WESTBOUND SCHARBAUER DRIVE		129	69	106		197	4	264	242		
EASTBOUND SCHARBAUER DRIVE		861	161	124		201	4	472	359	1	
PROJECT TOTALS	65	1201	230	412	118	638	8	966	780	6	39

							ROADWAY SUMMARY														
							216	251	310	360	400	529	529	531	531	540	540	540	544	3076	3076	3077
							6001	6079	6005	6018	6005	6002	6008	6005	6013	6002	6006	6016	6001	6023	6040	6075
	FROM	TO	BEGIN WIDTH	END WIDTH	AVG WIDTH	AREA	PROOF ROLLING	REWORK BS MTL (TY D)(SURF)(ORD COMP)	PRIME COAT (AE-P)	CONC PVMT (JOINTED - CPCD) (8")	CEM STABIL BKFL	CONC CURB (TY II)	CONC CURB & GUTTER (TY II)	CURB RAMPS (TY 2)	CURB RAMPS (TY 10)	MTL W-BEAM GD FEN (STEEL POST)	MTL BEAM GD FEN TRANS (THRIE-BEAM)	DOWNSTREAM ANCHOR TERMINAL SECTION	GUARDRAIL END TREATMENT (INSTALL)	D-GR HMA TY-C PG70-22 (3")	D-GR HMA TY-D PG70-22 (2")	TACK COAT
UNIT	STA	STA	FT	FT	FT	SY	HR	SY	GAL	SY	CY	LF	LF	EA	EA	LF	EA	EA	EA	TON	TON	GAL
LOCATION						DEPTH				8"	6"									3"	2"	
						RATE			0.30 GAL/SY											115 LBS/SY*IN	115 LBS/SY*IN	0.20 GAL/SY
MAIN STREET	00+09.25	01+06.98	11	12	12	126	16	126	38	85		26	64		4					22	15	25
	00+56.89	01+23.79	14	14	14	104		104	31		3									18	14	21
	01+23.79	01+33.32	14	0	7	7		7	2											2	1	1
WESTBOUND SCHARBAUER	10+33.67	10+41.58	29	29	29	25	2	25	8				113	2		50	1		1	5	3	5
EASTBOUND SCHARBAUER	09+91.22	10+03.22	29	29	29	39	2	39	12				181	2		275	1	1	2	7	5	8
PROJECT TOTALS							20	302	90	85	3	26	358	4	4	325	2	1	3	54	38	60

	DRAINAGE SUMMARY						
	402	423	432	466	466	466	466
	6001	6008	6001	6269	6210	6168	6182
	TRENCH EXCAVATION PROTECTION	RETAINING WALL (CAST - IN - PLACE)	RIPRAP (CONC) (4 IN)	WINGWALL (SW - 0) (HW=6 FT) (MOD)	WINGWALL (SW - 0) (HW=7 FT)	WINGWALL (FW - S) (HW=7 FT)	WINGWALL (PW - 1) (HW=7 FT)
UNIT	LF	SF	CY	EA	EA	EA	EA
MAIN STREET		1008	61	4			
WESTBOUND SCHARBAUER DRIVE	41		55		2	2	
EASTBOUND SCHARBAUER DRIVE	56		105		1	2	1
PROJECT TOTALS	97	1008	221	4	3	4	1

	EROSION CONTROL SUMMARY	
	506	506
	6003	6011
	ROCK FILTER DAMS (INSTALL) (TY 3)	ROCK FILTER DAMS (REMOVE)
UNIT	LF	LF
MAIN STREET	45	45
WESTBOUND SCHARBAUER DRIVE	135	135
EASTBOUND SCHARBAUER DRIVE	135	135
PROJECT TOTALS	315	315

HL 93 LOADING

STATE OF TEXAS
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PROFESSIONAL ENGINEER

11/29/2023

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Texas Registered Engineering Firm F-2144

NO	DATE	REVISION	APPROVED

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SCHARBAUER DRIVE BRIDGE REPLACEMENTS

CONSOLIDATED SUMMARY

SHEET 1 OF 2

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DAG	6	SEE TITLE SHEET FOR PROJECT NO.		MAIN ST
GRAPHICS KNW	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK KMM	TEXAS	ODA	MIDLAND	10
CHECK SRJ	CONTROL	SECTION	JOB	
	0906	32	050,ETC.	

1200.0000 ft / in.

	PAVEMENT MARKINGS SUMMARY														
	644	658	658	666	666	666	666	666	666	666	666	678	678	678	685
	6009	6061	6064	6300	6303	6048	6078	6315	6224	6230	6232	6001	6008	6016	6005
	IN SM RD SN SUP&AM TY10BWG(1)SB(P)	INSTL DEL ASSM (D-SW)SZ 1(BRF)GF2	INSTL DEL ASSM (D-SY)SZ 1(BRF)GF2	RE PM W/RET REQ TY I (W)4"(BRK)(100MIL)	RE PM W/RET REQ TY I (W)4"(SLD)(100MIL)	REFL PAV MRK TY I (W)24"(SLD)(100MIL)	REFL PAV MRK TY I (W)(WORD)(100MIL)	RE PM W/RET REQ TY I (Y)4"(SLD)(100MIL)	PAVEMENT SEALER 4"	PAVEMENT SEALER 24"	PAVEMENT SEALER (WORD)	PAV SURF PREP FOR MRK (4")	PAV SURF PREP FOR MRK (24")	PAV SURF PREP FOR MRK (WORD)	RELOCT RDSD FLSH BCN AM (SOLAR PWRD)
UNIT	EA	EA	EA	LF	LF	LF	EA	LF	LF	LF	EA	LF	LF	EA	EA
MAIN STREET	1			616		119	4	104	720	51	4	720	119	4	4
WESTBOUND SCHARBAUER DRIVE			4	127	127				254			254			
EASTBOUND SCHARBAUER DRIVE	1	4	7	212	212				424			424			
PROJECT TOTALS	2	4	11	955	339	119	4	104	1398	51	4	1398	119	4	4

	BRIDGE #1 SUMMARY			
	420	422	422	450
	6051	6013	6015	6032
	CL C CONC (CULV)	BRIDGE SIDEWALK	APPROACH SLAB	RAIL (TY C223)
UNIT	CY	SF	CY	LF
MAIN STREET BRIDGE	292	673	35	125
PROJECT TOTALS	292	673	35	125

	BRIDGE #4 SUMMARY			
	420	422	422	450
	6051	6013	6015	6032
	CL C CONC (CULV)	BRIDGE SIDEWALK	APPROACH SLAB	RAIL (TY C223)
UNIT	CY	SF	CY	LF
EASTBOUND SCHARBAUER DRIVE BRIDGE	389	852	94	243
PROJECT TOTALS	389	852	94	243

	BRIDGE #3 SUMMARY			
	420	422	422	450
	6051	6013	6015	6032
	CL C CONC (CULV)	BRIDGE SIDEWALK	APPROACH SLAB	RAIL (TY C223)
UNIT	CY	SF	CY	LF
WESTBOUND SCHARBAUER DRIVE BRIDGE	240	453	61	136
PROJECT TOTALS	240	453	61	136

	UTILITY SUMMARY
	479
	6004
	ADJUSTING MANHOLES (SANITARY)
UNIT	EA
MAIN STREET	1
WESTBOUND SCHARBAUER DRIVE	1
EASTBOUND SCHARBAUER DRIVE	2
PROJECT TOTALS	4

11/29/2023

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SCHARBAUER DRIVE BRIDGE REPLACEMENTS

CONSOLIDATED SUMMARY

SHEET 2 OF 2

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DAG	6	SEE TITLE SHEET FOR PROJECT NO.		MAIN ST
GRAPHICS KNW	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK KMM	TEXAS	ODA	MIDLAND	11
CHECK SRJ	CONTROL	SECTION	JOB	
	0906	32	050,ETC.	

11/28/2023
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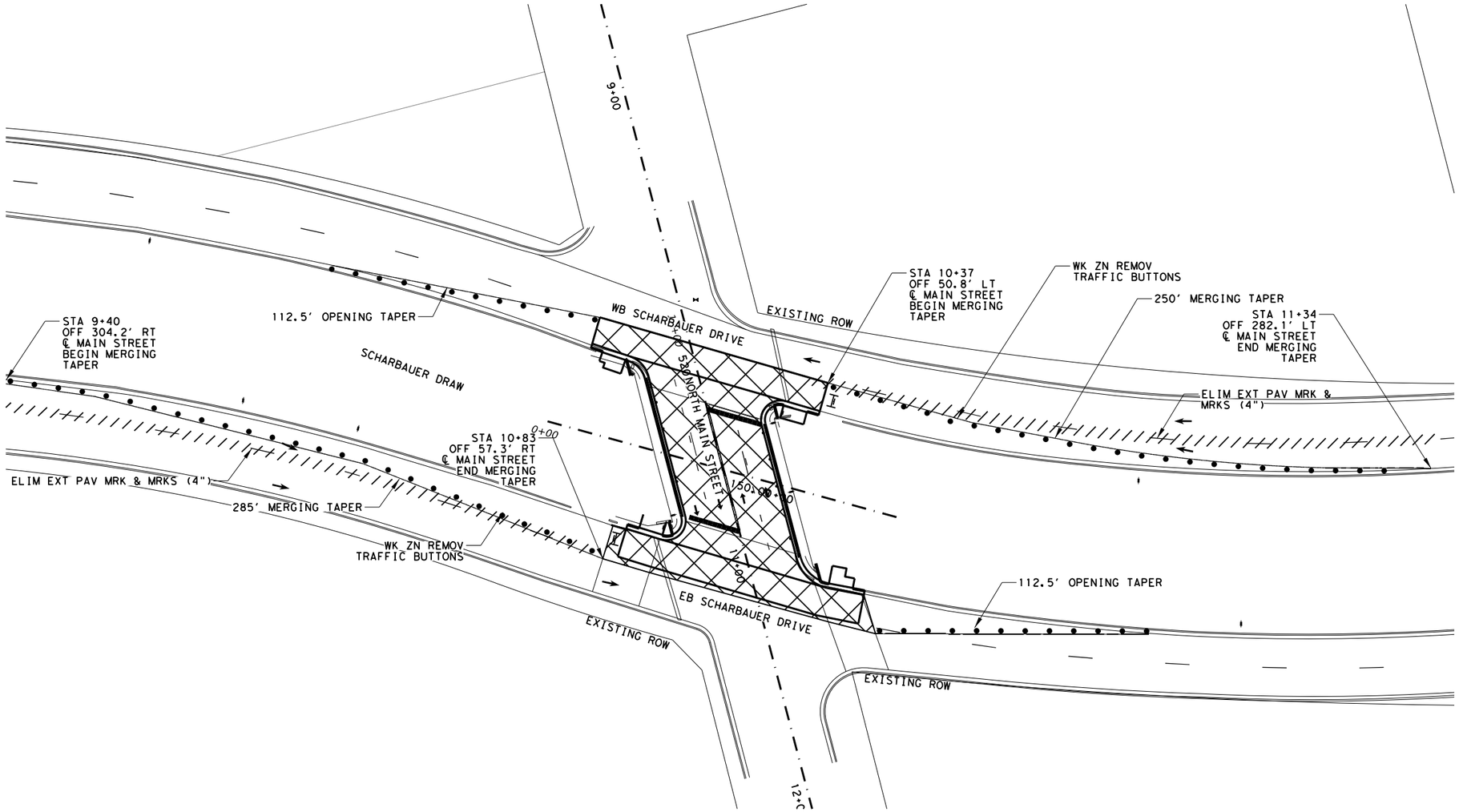

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0 25' 50'
HORIZONTAL SCALE

LEGEND

- CONSTRUCTED THIS PHASE
- TYPE III BARRICADE
- TRAFFIC DIRECTION

NOTE:

1. REFER TO TCP(2-6)-18 FOR WORKZONE ADVANCE SIGNING AND SIGN SPACING.
2. STATIONS AND OFFSETS SHOWN ARE RELATIVE TO NORTH MAIN STREET ALIGNMENT.

HL 93 LOADING

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SCHARBAUER DRIVE BRIDGE REPLACEMENTS

TRAFFIC CONTROL PLAN PHASE ONE

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DAG	6	SEE TITLE SHEET FOR PROJECT NO.		MAIN ST
GRAPHICS KNW	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK KMM	TEXAS	ODA	MIDLAND	
CHECK SRJ	CONTROL	SECTION	JOB	12
	0906	32	050,ETC.	

10/27/2023
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0.083333 ft / in.

N

NOT TO SCALE

LEGEND

CONSTRUCTED THIS PHASE

DETOUR SIGN

NOTE:

1. REFER TO TO TMUTCD FOR ADDITIONAL DETOUR SIGNING REQUIREMENTS.
2. ROAD CLOSED AHEAD AND DETOUR AHEAD SIGNAGE AT NORTH BOUND AND SOUTH BOUND MAIN STREET ACCORDING TO WZ(RCD)-13.

STATE OF TEXAS
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SCHARBAUER DRIVE BRIDGE REPLACEMENTS

DETOUR LAYOUT PHASE ONE MAIN STREET BRIDGE CLOSURE

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DAG	6	SEE TITLE SHEET FOR PROJECT NO.		MAIN ST
GRAPHICS KNW	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK KMM	TEXAS	ODA	MIDLAND	13
CHECK GRU	CONTROL	SECTION	JOB	
	0906	32	050, ETC.	

10/27/2023
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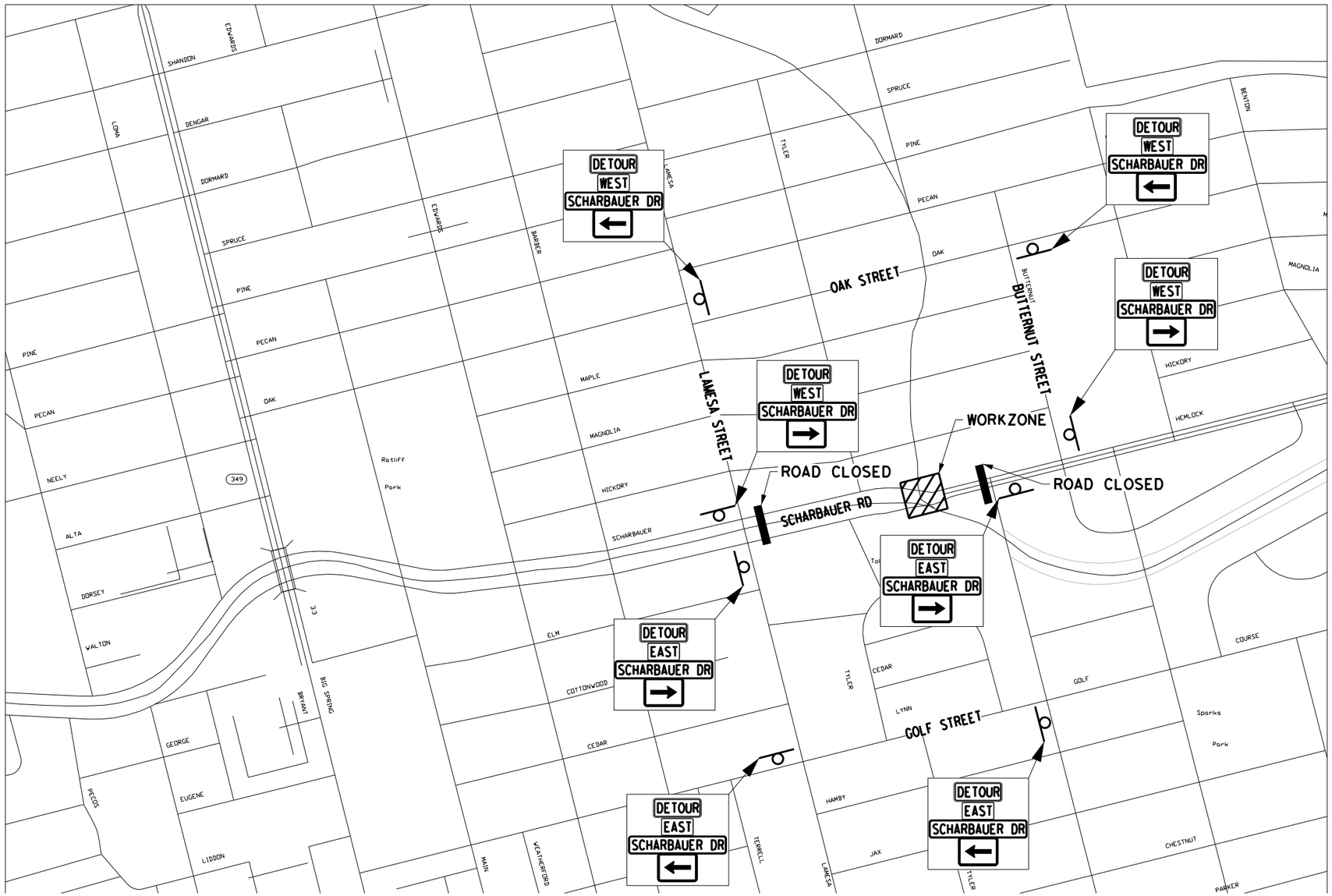
0.08333317 ft / in.



N

NOT TO SCALE

LEGEND

	CONSTRUCTED THIS PHASE
⊳	DETOUR SIGN

NOTE:

1. REFER TO TO TMUTCD FOR ADDITIONAL DETOUR SIGNING REQUIREMENTS.
2. ROAD CLOSED AHEAD AND DETOUR AHEAD SIGNAGE AT NORTH BOUND AND SOUTH BOUND SCHARBAUER DRIVE ACCORDING TO WZ(RCD)-13.

STATE OF TEXAS
KEVIN MORRIS
105091
LICENSED
PROFESSIONAL ENGINEER

Kevin Morris 10/27/2023

Freese and Nichols, Inc.
Texas Registered Engineering Firm F-2144

HL 93 LOADING

NO	DATE	REVISION	APPROVED

FREESE AND NICHOLS
1500 Broadway Street, Suite 206
Lubbock, TX 79401
Phone - (806) 686-2700
Web www.freese.com

Texas Department of Transportation
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SCHARBAUER DRIVE BRIDGE REPLACEMENTS

DETOUR LAYOUT PHASE TWO SCHARBAUER DRIVE BRIDGE CLOSURE

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DAG	6	SEE TITLE SHEET FOR PROJECT NO.		MAIN ST
GRAPHICS KNW	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK KMM	TEXAS	ODA	MIDLAND	14
CHECK SRJ	CONTROL	SECTION	JOB	
	0906	32	050, ETC.	

10/27/2023
N:\IF\Drawings\2. TCP\CV-TRT-PL-TCPDETOUR03.dgn

MDD22269 Date:10/27/2023 User:03997File:N:\IF\Drawings\2. TCP\CV-TRT-PL-TCPDETOUR03.dgn

CV-TRT-PL-TCPDETOUR03.dgn

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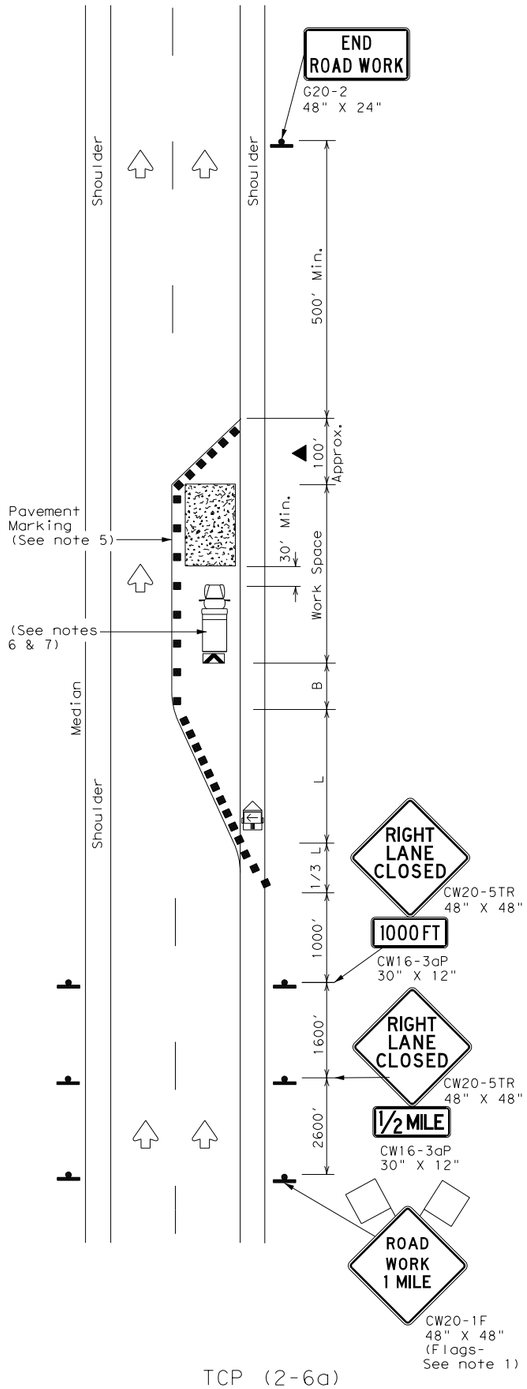
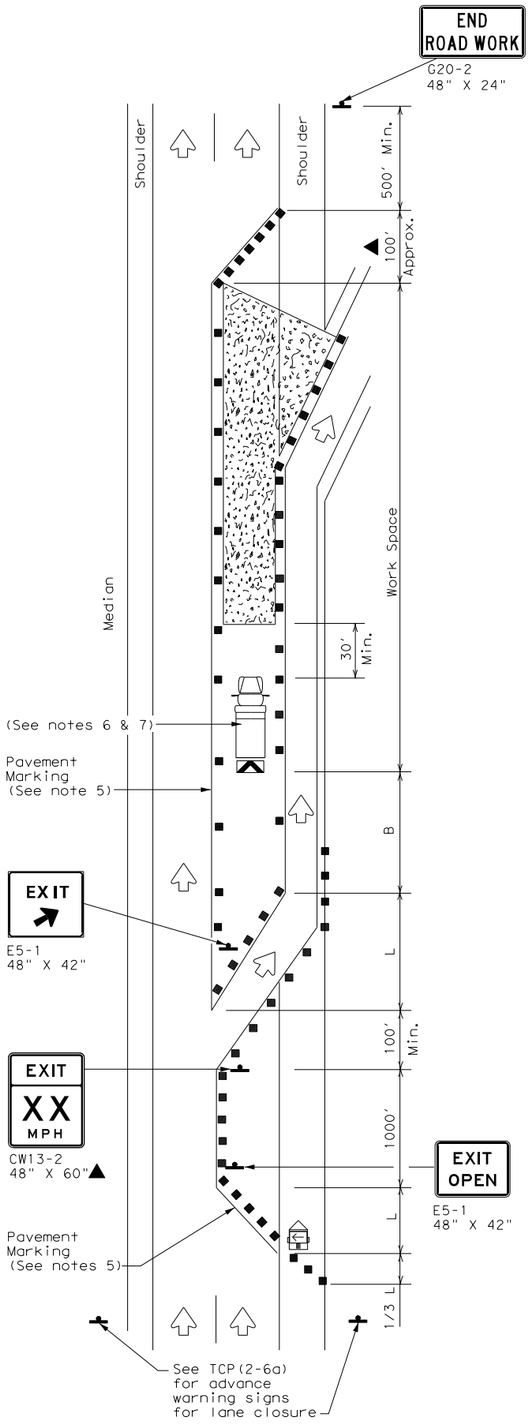


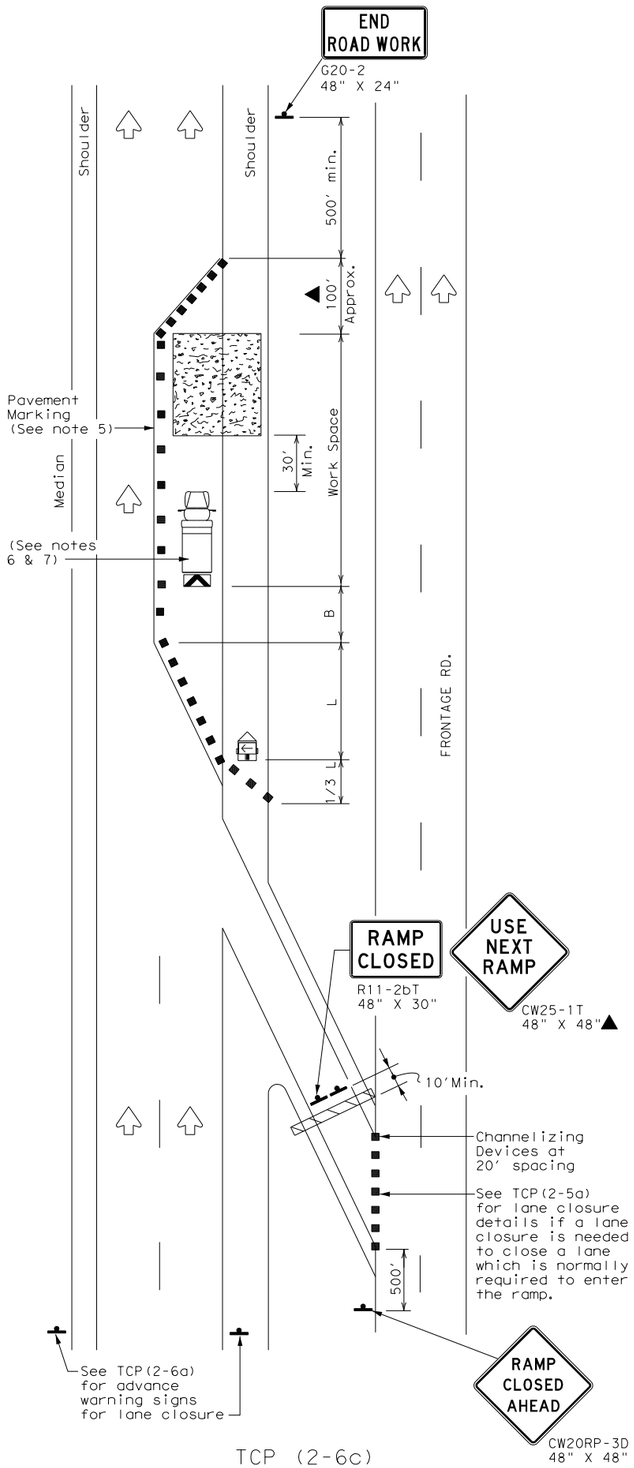
TCP (2-6a)

ONE LANE CLOSURE



TCP (2-6b)

LANE CLOSURE NEAR EXIT RAMPS



TCP (2-6c)

LANE CLOSURE NEAR ENTRANCE RAMPS

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

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

* Conventional Roads Only

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

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

GENERAL NOTES

1. Flags attached to signs where shown, are REQUIRED.
2. All traffic control devices illustrated are REQUIRED, except those denoted with the triangle symbol may be omitted when stated elsewhere in the plans, or for routine maintenance work, when approved by the Engineer.
3. Channelizing devices used to close lanes may be supplemented with the Chevron Alignment Sign placed on every other channelizing device. Chevrons may be attached to plastic drums as per BC Standards.
4. Channelizing devices used along the work space or along tangent sections may be supplemented with vertical panels (VP) placed on everyother channelizing device. If night time conditions make it difficult to see at least two VPs, the VPs may be placed on each channelizing device.
5. The placement of pavement markings may be omitted on Intermediate-term stationary work zones with the approval of the Engineer.
6. Shadow Vehicle with TMA and high intensity rotating, flashing,oscillating or strobe lights. Shadow Vehicle with TMA and high intensity rotating, flashing, oscillating or strobe lights. A Shadow Vehicle with a TMA should be used anytime it can be positioned 30 to 100 feet in advance of the area of crew exposure without adversely affecting the performance or quality of the work. If workers are no longer present but road or work conditions require the traffic control to remain in place, Type 3 Barricades or other channelizing devices may be substituted for the Shadow Vehicle and TMA.
7. Additional Shadow Vehicles with TMAs may be positioned in each closed lane, on the shoulder or off the paved surface, next to those shown in order to protect a wider work space.

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN LANE CLOSURES ON DIVIDED HIGHWAYS

TCP(2-6)-18

FILE: tcp2-6-18.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	0906	32	050, ETC	MAIN ST
	DIST	COUNTY		SHEET NO.
	ODA	MIDLAND		15

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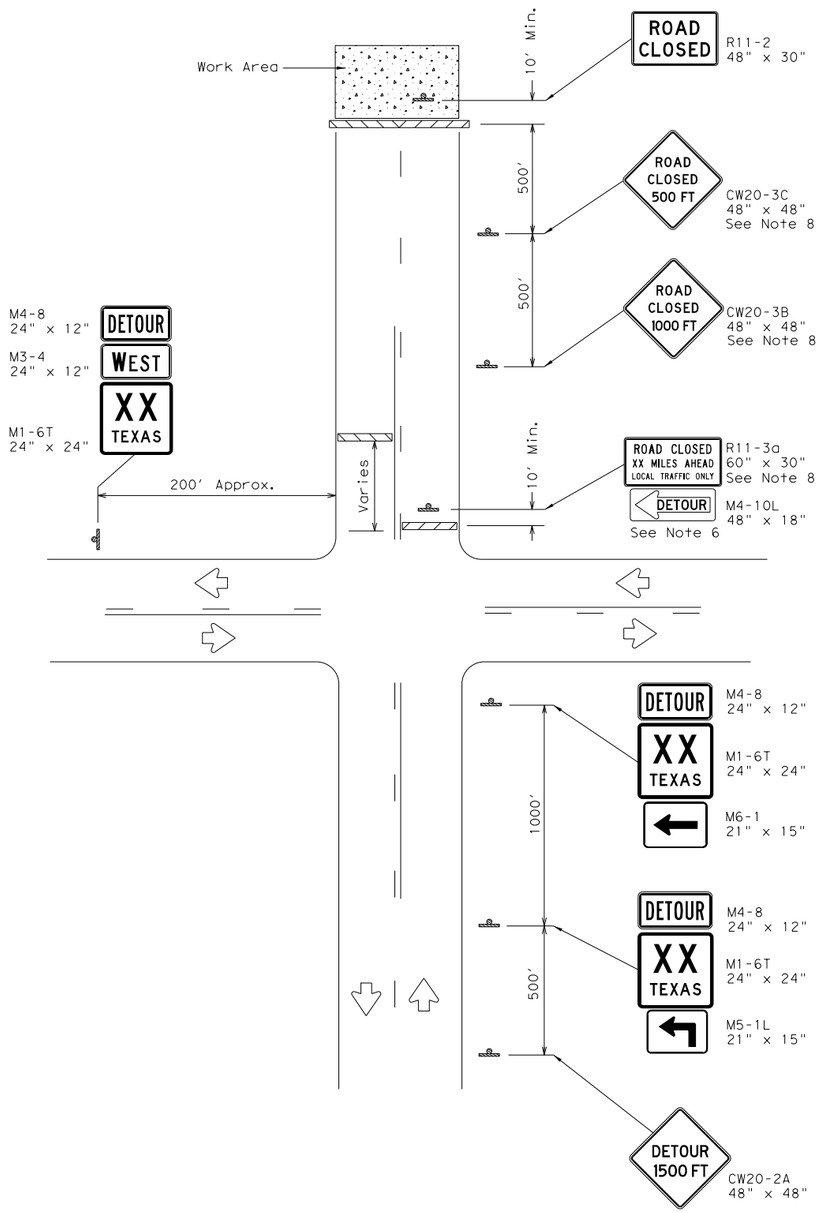
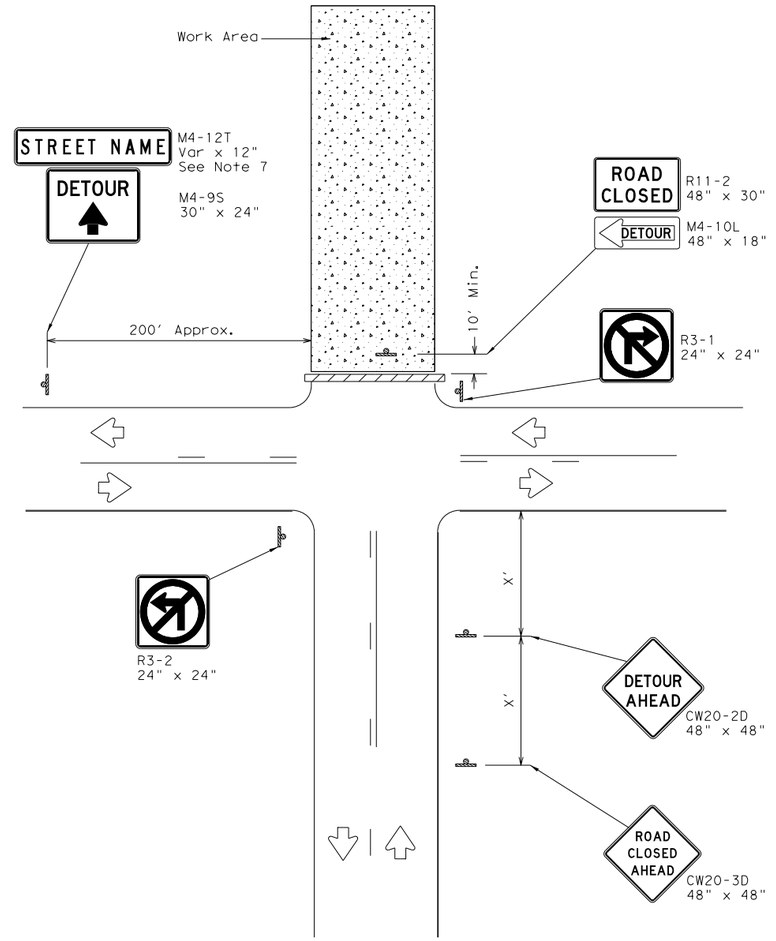


ROAD CLOSURE BEYOND THE INTERSECTION

Signing for a Numbered Route with an Off-Site Detour



ROAD CLOSURE AT THE INTERSECTION

Signing for an Un-numbered Route with an Off-Site Detour

LEGEND	
	Type 3 Barricade
	Sign

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

* Conventional Roads Only

GENERAL NOTES

1. This sheet is intended to provide details for temporary work zone road closures. For permanent road closure details see the D&OM standards.
2. Barricades used shall meet the requirements shown on Barricade and Construction Standard BC(10) and listed on the Compliant Work Zone Traffic Control Devices list (CWZTCD).
3. Stockpiled materials shall not be placed on the traffic side of barricades.
4. Barricades at the road closure should extend from pavement edge to pavement edge.
5. Detour signing shown is intended to illustrate the type of signing that is appropriate for numbered routes or un-numbered routes as labeled. It does not indicate the full extent of detour signing required. Detour routes should be signed as shown elsewhere in the plans.
6. If the road is open for a significant distance beyond the intersection or there are significant origin/destination points beyond the intersection, the signs and barricades at this location should be located at the edge of the traveled way.
7. The Street Name (M4-12T) sign is to be placed above the DETOUR (M4-9S) sign.
8. For urban areas where there is a shorter distance between the intersection and the actual closure location, the ROAD CLOSED XX MILES AHEAD (R11-3a) sign may be replaced with a ROAD CLOSED TO THRU TRAFFIC (R11-4) sign. If adequate space does not exist between the intersection and the closure a single ROAD CLOSED AHEAD (CW20-3D) sign spaced as per the table above may replace the ROAD CLOSED 1000 FT (CW20-3B) and ROAD CLOSED 500 FT (CW20-3C) signs.
9. Signs and barricades shown shall be subsidiary to Item 502. Locations where these details will be required shall be as shown elsewhere in the plans.

Texas Department of Transportation

Traffic Operations Division Standard

WORK ZONE ROAD CLOSURE DETAILS

WZ(RCD)-13

FILE: wzrcd-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT August 1995	CONT	SECT	JOB	HIGHWAY
REVISIONS	0906	32	050, ETC	MAIN ST
1-97 4-98 7-13	DIST	COUNTY		SHEET NO.
2-98 3-03	ODA	MIDLAND		16

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BARRICADE AND CONSTRUCTION (BC) STANDARD SHEETS GENERAL NOTES:

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

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

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

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

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

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

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

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

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

10. 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

SHEET 1 OF 12

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	0906	32	050, ETC	MAIN ST
4-03 7-13	DIST	COUNTY		SHEET NO.
9-07 8-14	ODA	MIDLAND		17
5-10 5-21				

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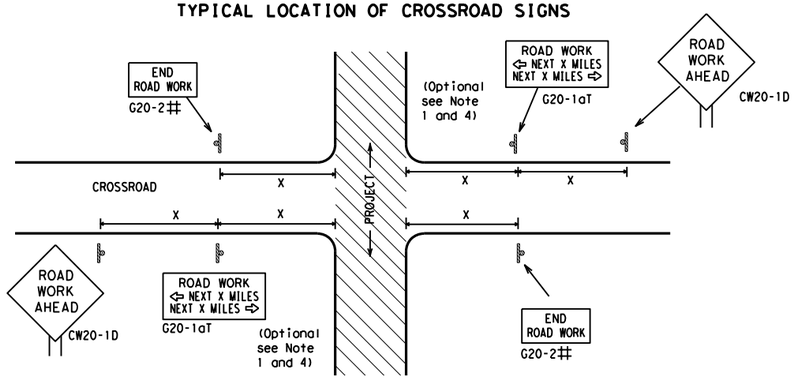
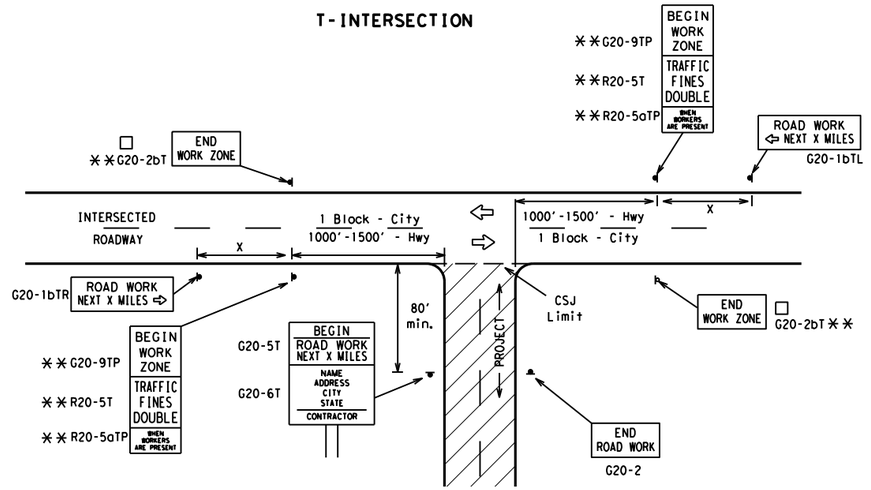
TYPICAL LOCATION OF CROSSROAD SIGNS



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

1. The typical minimum signing on a crossroad approach should be a "ROAD WORK AHEAD" (CW20-1D)sign and a (G20-2) "END ROAD WORK" sign, unless noted otherwise in plans.
2. The Engineer may use the reduced size 36" x 36" ROAD WORK AHEAD (CW20-1D) sign mounted back to back with the reduced size 36" x 18" "END ROAD WORK"(G20-2) sign on low volume crossroads (see Note 4 under "Typical Construction Warning Sign Size and Spacing"). See the "Standard Highway Sign Designs for Texas" manual for sign details. The Engineer may omit the advance warning signs on low volume crossroads. The Engineer will determine whether a road is low volume 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]

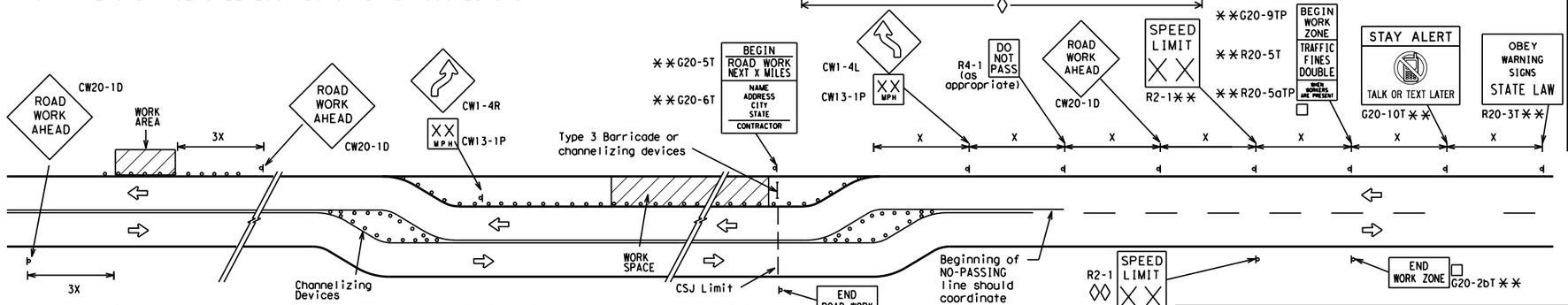
* For typical sign spacings on divided highways, expressways and freeways, see Part 6 of the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD) typical application diagrams or TCP Standard Sheets.

△ 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.

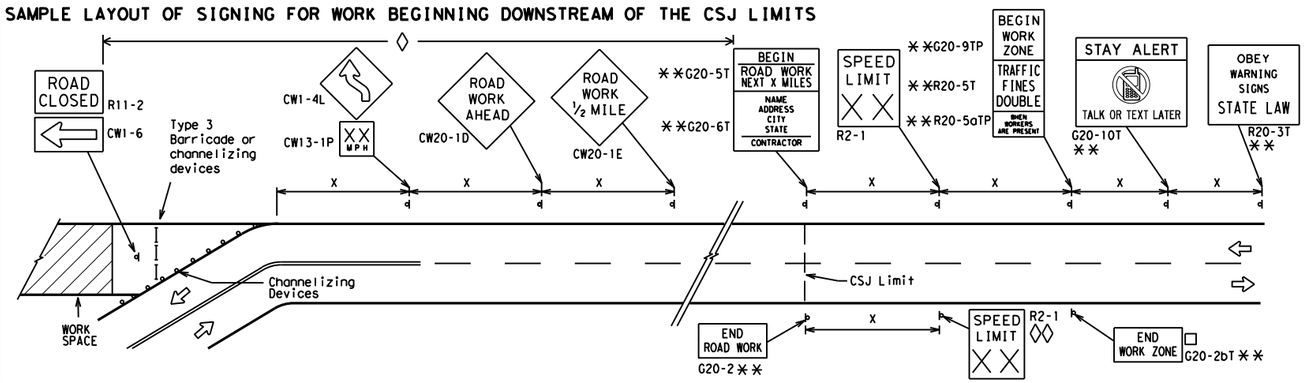
WORK AREAS IN MULTIPLE LOCATIONS WITHIN CSJ LIMITS



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	0906	32	050, ETC	MAIN ST
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	ODA	MIDLAND		18

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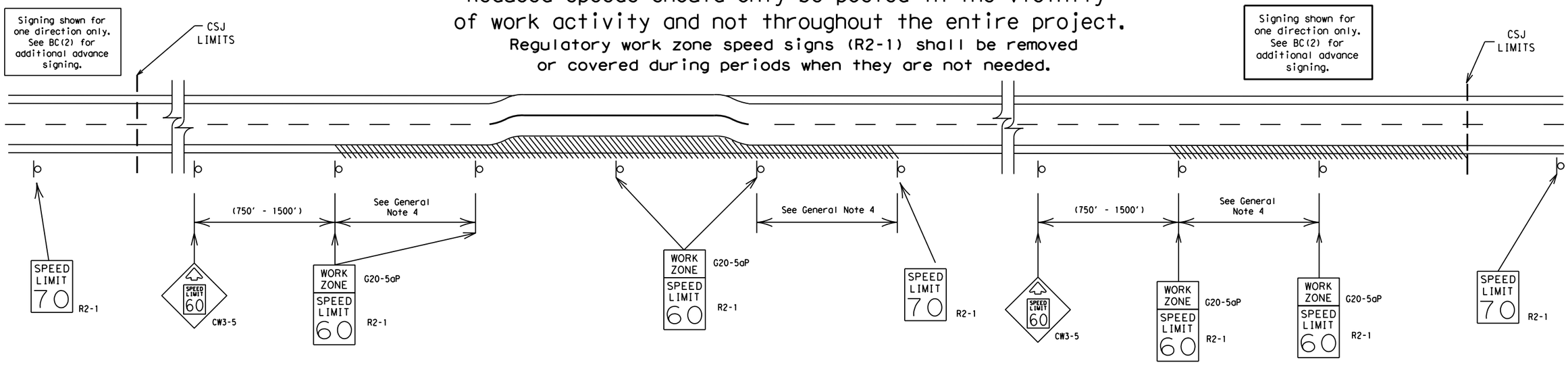
TYPICAL APPLICATION OF WORK ZONE SPEED LIMIT SIGNS

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

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

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



GUIDANCE FOR USE:

LONG/INTERMEDIATE TERM WORK ZONE SPEED LIMITS

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

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

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

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

SHORT TERM WORK ZONE SPEED LIMITS

This type of work zone speed limit may be included on the design of the traffic control plans when workers or equipment are not behind concrete barrier, when work activity is within 10 feet of the traveled way or actually in the 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
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REVISIONS	0906	32	050, ETC	MAIN ST
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	ODA	MIDLAND		19

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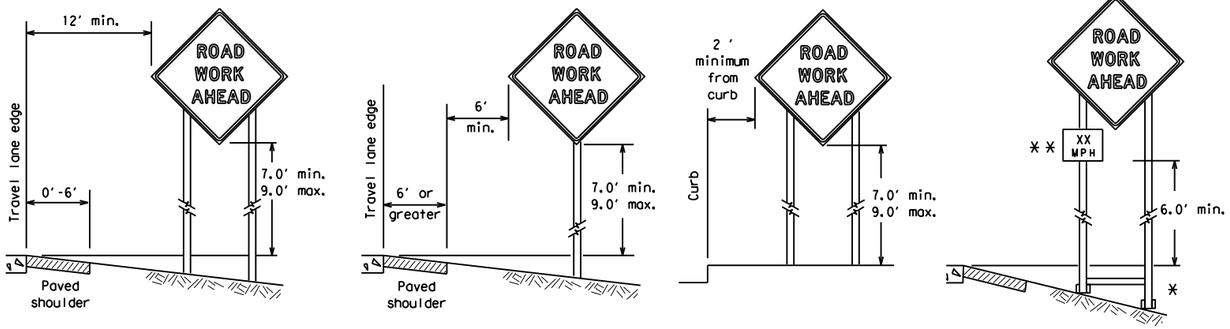
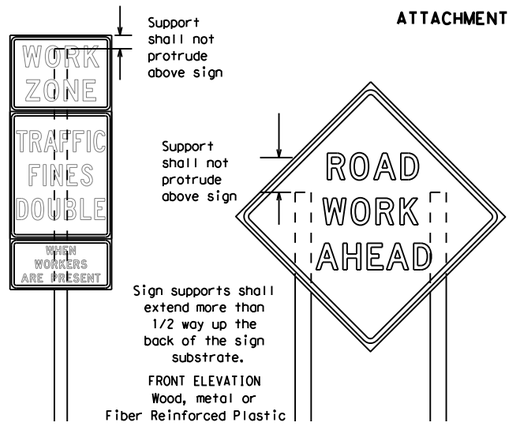
TYPICAL MINIMUM CLEARANCES FOR LONG TERM AND INTERMEDIATE TERM SIGNS

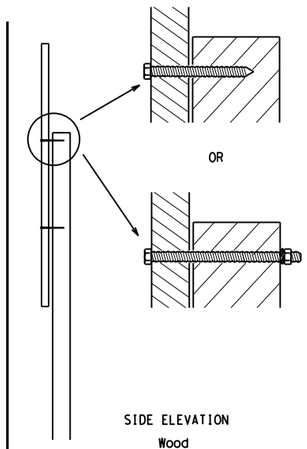


* When placing skid supports on unlevel ground, the leg post lengths must be adjusted so the sign appears straight and plumb. Objects shall NOT be placed under skids as a means of leveling.

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

ATTACHMENT FOR SIGN SUPPORTS





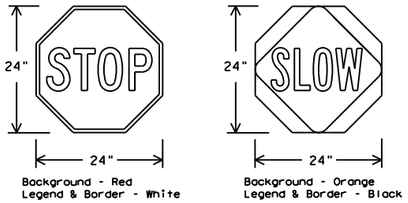
Attachment to wooden supports will be by bolts and nuts or screws. Use TxDOT's or manufacturer's recommended procedures for attaching sign substrates to other types of sign supports

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

Splicing embedded perforated square metal tubing in order to extend post height will only be allowed when the splice is made using four bolts, two above and two below the 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	0906	32	050, ETC	MAIN ST
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	ODA	MIDLAND		20

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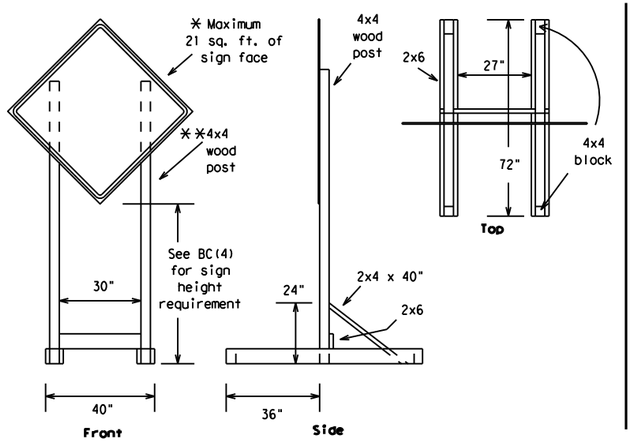
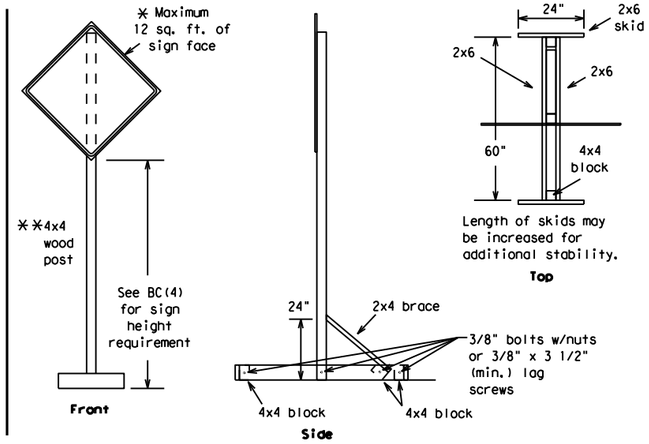
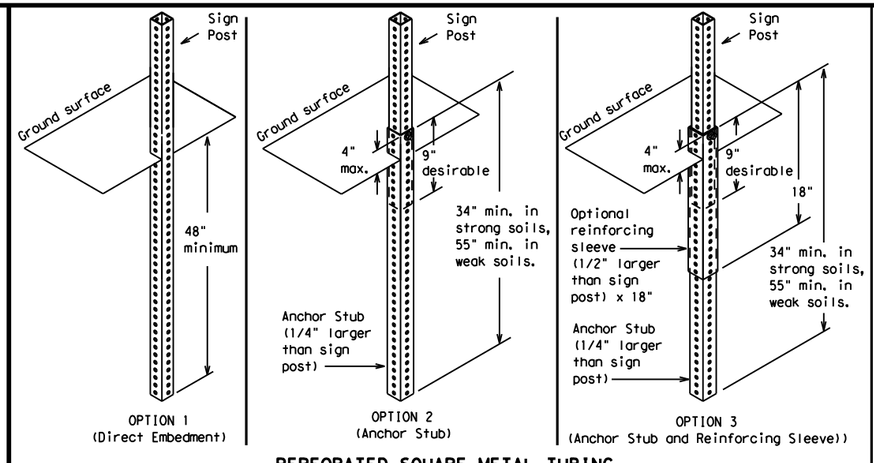




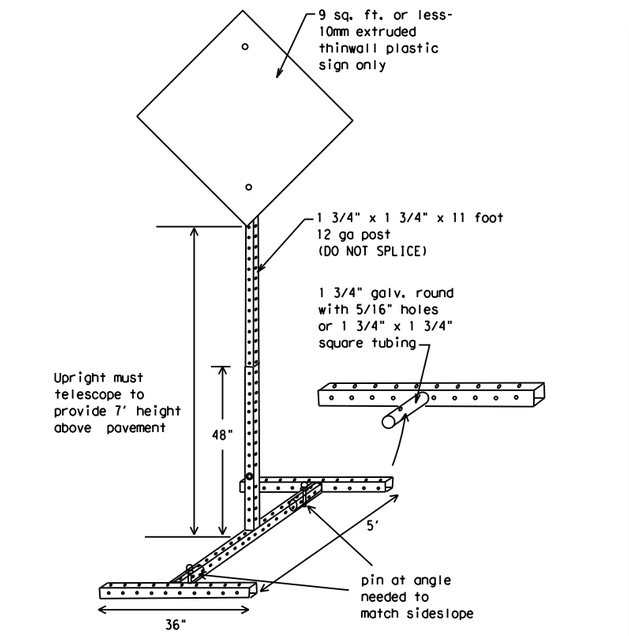
SKID MOUNTED WOOD SIGN SUPPORTS

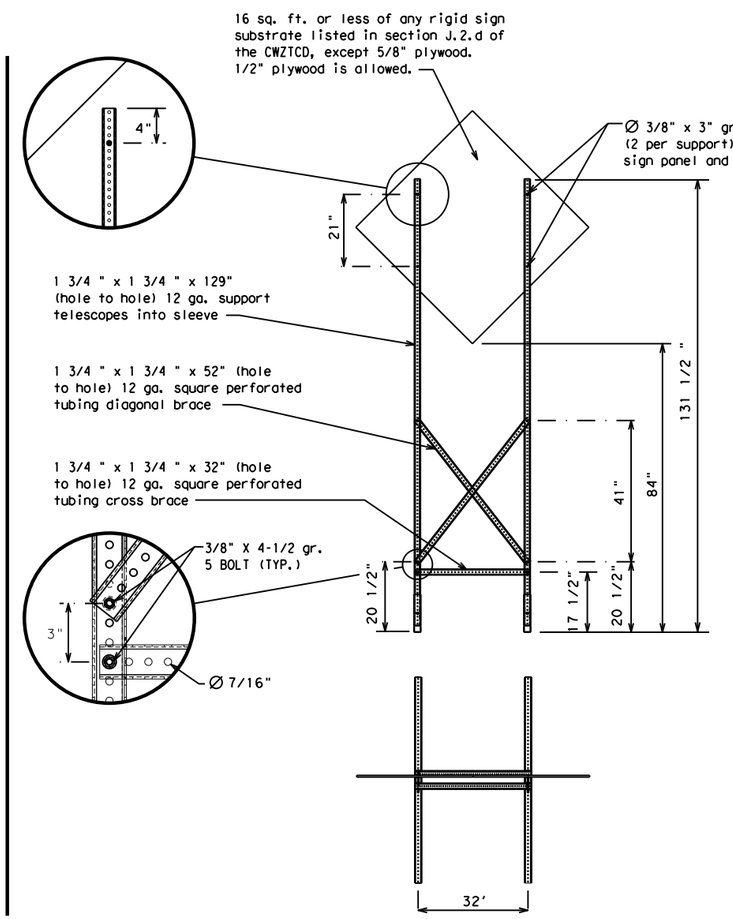
* LONG/INTERMEDIATE TERM STATIONARY - PORTABLE SKID MOUNTED SIGN SUPPORTS

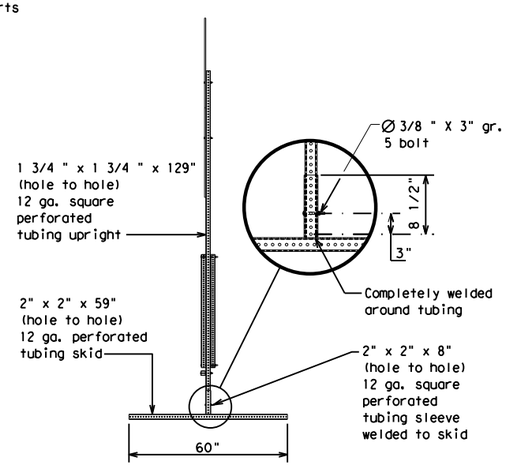


GROUND MOUNTED SIGN SUPPORTS

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







SKID MOUNTED PERFORATED SQUARE STEEL TUBING SIGN SUPPORTS

* 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
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REVISIONS	0906	32	050, ETC	MAIN ST
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	ODA	MIDLAND		21

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

PORTABLE CHANGEABLE MESSAGE SIGNS

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

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

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

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

RECOMMENDED PHASES AND FORMATS FOR PCMS MESSAGES DURING ROADWORK ACTIVITIES

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

Phase 1: Condition Lists

Road/Lane/Ramp Closure List

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

Other Condition List

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

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

Phase 2: Possible Component Lists

Action to Take/Effect on Travel List

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

Location List

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

Warning List

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

** Advance Notice List

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

** See Application Guidelines Note 6.

APPLICATION GUIDELINES

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

WORDING ALTERNATIVES

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

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

FULL MATRIX PCMS SIGNS

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

Texas Department of Transportation

Traffic 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
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REVISIONS		0906	32	050, ETC	MAIN ST
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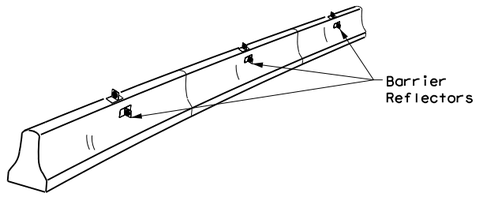
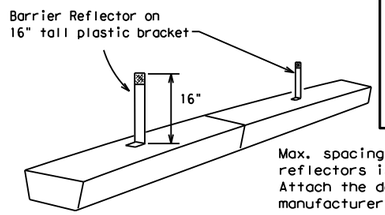
1. Barrier Reflectors shall be pre-qualified, and conform to the color and reflectivity requirements of DMS-8600. A list of prequalified Barrier Reflectors can be found at the Material Producer List web address shown on BC(1).
2. Color of Barrier Reflectors shall be as specified in the TMUTCD. The cost of the reflectors shall be considered subsidiary to Item 512.



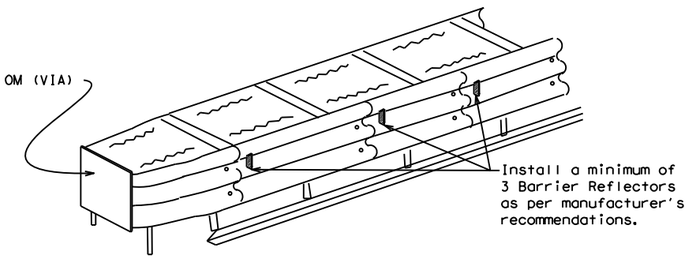
CONCRETE TRAFFIC BARRIER (CTB)

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



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

LOW PROFILE CONCRETE BARRIER (LPCB)



DELINEATION OF END TREATMENTS

LOW PROFILE CONCRETE BARRIER (LPCB) USED IN WORK ZONES

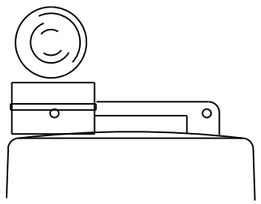
LPCB is approved for use in work zone locations, where the posted speed is 45mph, or less. See Roadway Standard Sheet LPCB.

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

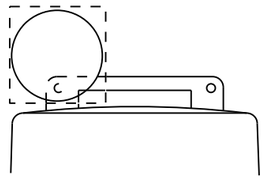
WARNING LIGHTS



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

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



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

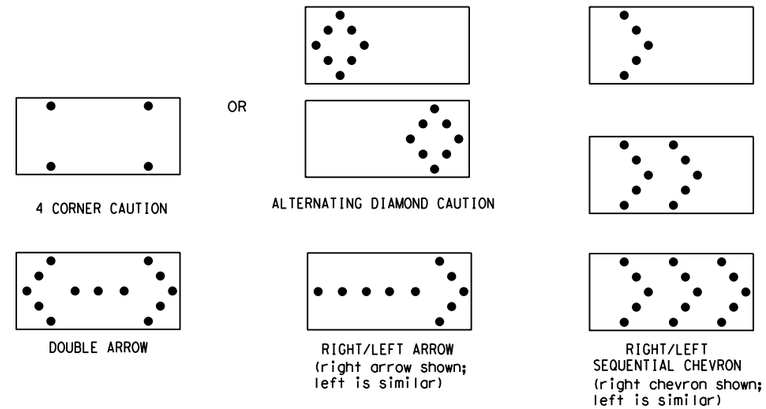
1. Type A flashing warning lights are intended to warn drivers that they are approaching or are in a potentially hazardous area.
2. Type A random flashing warning lights are not intended for delineation and shall not be used in a series.
3. A series of sequential flashing warning lights placed on channelizing 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.

SHEET 7 OF 12

Texas Department of Transportation — Traffic Safety Division Standard

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

BC(7)-21

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GENERAL NOTES

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

GENERAL DESIGN REQUIREMENTS

Pre-qualified plastic drums shall meet the following requirements:

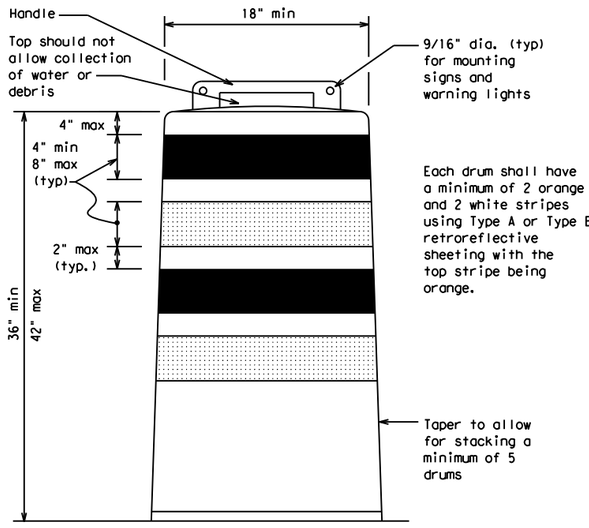
1. Plastic drums shall be a two-piece design; the "body" of the drum shall be the top portion and the "base" shall be the bottom.
2. The body and base shall lock together in such a manner that the body separates from the base when impacted by a vehicle traveling at a speed of 20 MPH or greater but prevents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

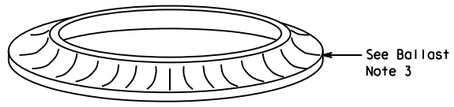
RETROREFLECTIVE SHEETING

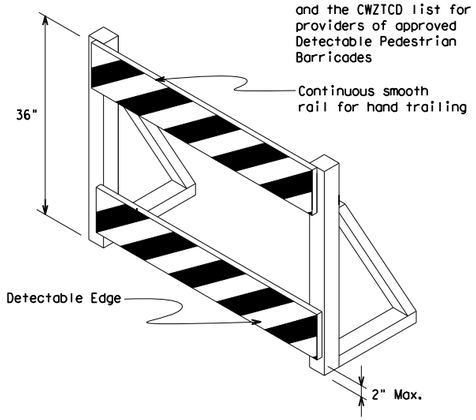
1. The stripes used on drums shall be constructed of sheeting meeting the color and retroreflectivity requirements of Departmental Materials Specification DMS-8300, "Sign Face Materials." Type A or Type B reflective sheeting shall be supplied unless otherwise specified in the plans.
2. The sheeting shall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

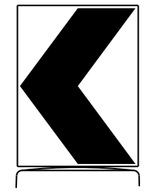




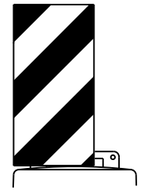


DETECTABLE PEDESTRIAN BARRICADES

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

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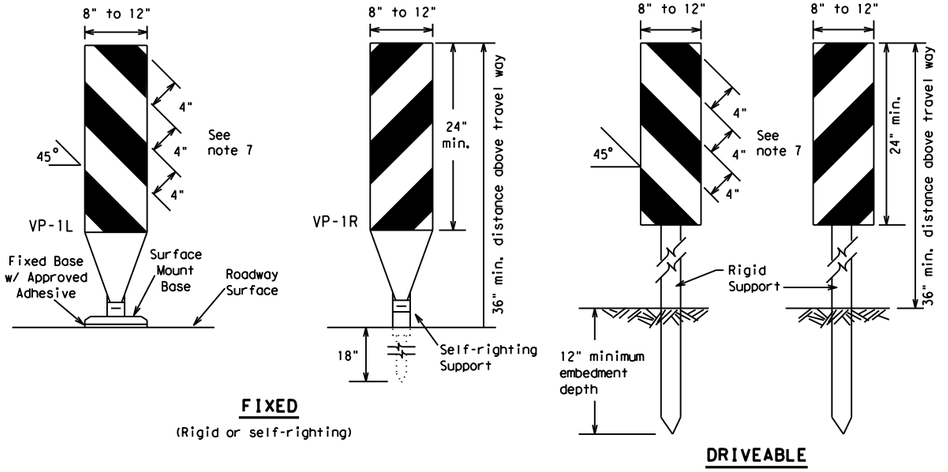
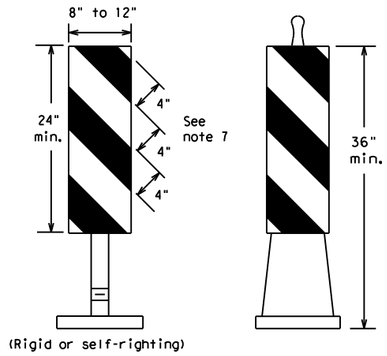


FIXED
(Rigid or self-righting)

DRIVEABLE

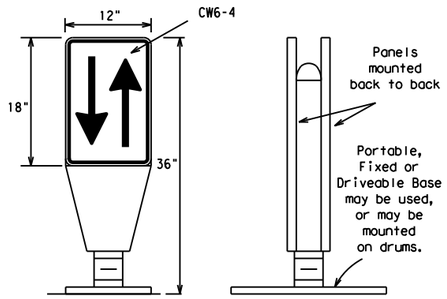


(Rigid or self-righting)

PORTABLE

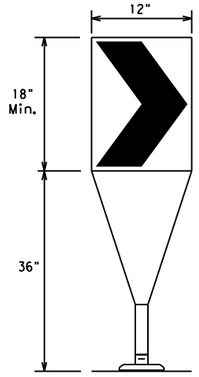
1. Vertical Panels (VP's) are normally used to channelize traffic or divide opposing lanes of traffic.
2. VP's may be used in daytime or nighttime situations. They may be used at the edge of shoulder drop-offs and other areas such as lane transitions where positive daytime and nighttime delineation is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



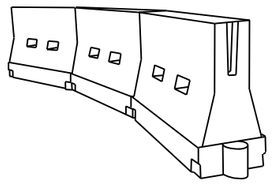
Fixed Base w/ Approved Adhesive
(Driveable Base, or Flexible Support can be used)

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
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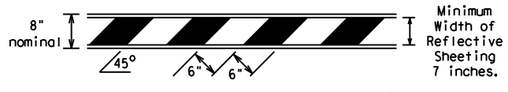
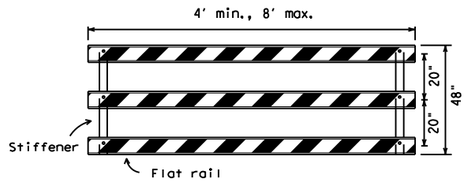
TYPE 3 BARRICADES

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

Barricades shall NOT be used as a sign support.



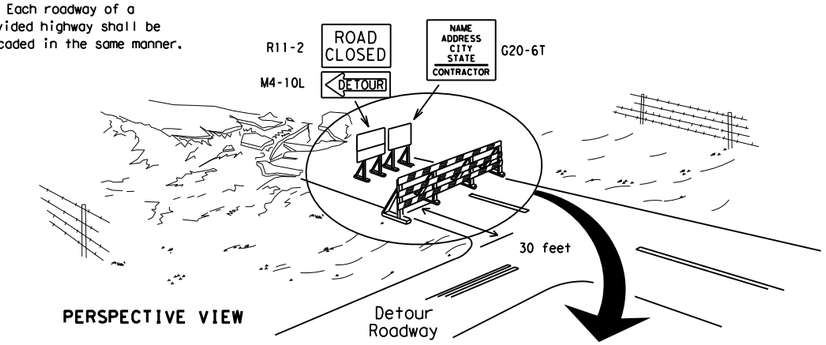
TYPICAL STRIPING DETAIL FOR BARRICADE RAIL



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

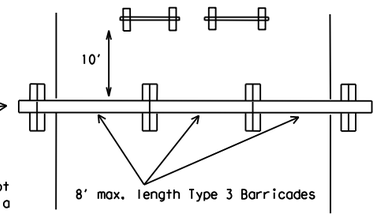
TYPICAL PANEL DETAIL FOR SKID OR POST TYPE BARRICADES

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



PERSPECTIVE VIEW

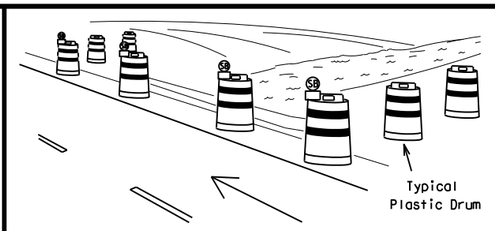
The three rails on Type 3 barricades shall be reflectorized orange and reflective white stripes on one side facing one-way traffic and both sides for two-way traffic.
Barricade striping should slant downward in the direction of detour.



PLAN VIEW

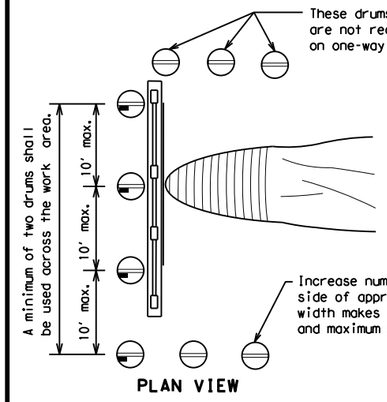
1. Signs should be mounted on independent supports at a 7 foot mounting height in center of roadway. The signs should be a minimum of 10 feet behind Type 3 Barricades.
2. Advance signing shall be as specified elsewhere in the plans.

TYPE 3 BARRICADE (POST AND SKID) TYPICAL APPLICATION



PERSPECTIVE VIEW

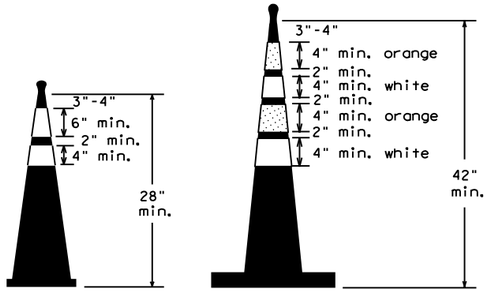
1. Where positive redirectional capability is provided, drums may be omitted.
2. Plastic construction fencing may be used with drums for safety as required in the plans.
3. Vertical Panels on flexible support may be substituted for drums when the shoulder width is less than 4 feet.
4. When the shoulder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



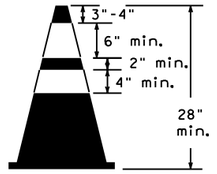
LEGEND	
	Plastic drum
	Plastic drum with steady burn light or yellow warning reflector
SB	Steady burn warning light or yellow warning reflector

PLAN VIEW

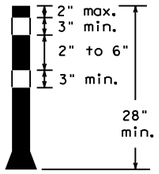
CULVERT WIDENING OR OTHER ISOLATED WORK WITHIN THE PROJECT LIMITS



Two-Piece cones



One-Piece cones

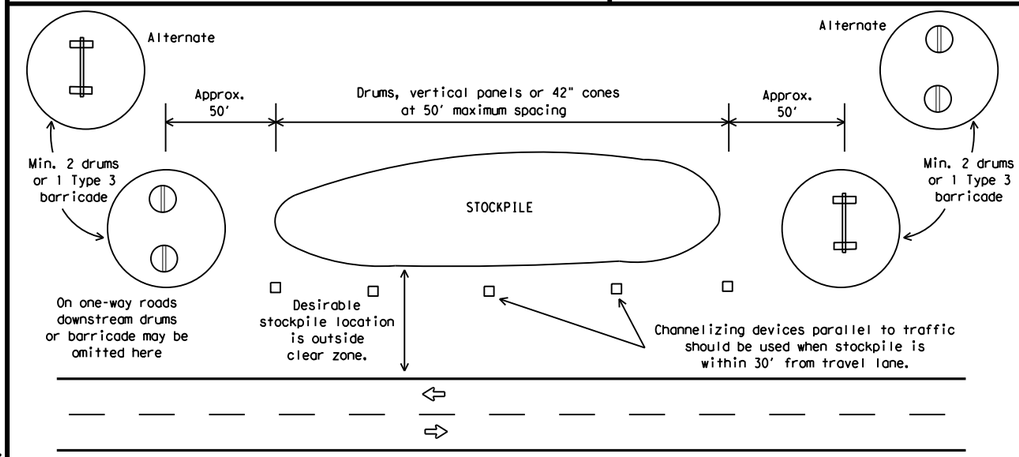


Tubular Marker

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

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

1. Traffic cones and tubular markers shall be predominantly orange, and meet the height and weight requirements shown above.
2. One-piece cones have the body and base of the cone molded in one consolidated unit. Two-piece cones have a cone shaped body and a separate rubber base, or ballast, that is added to keep the device upright and in place.
3. Two-piece cones may have a handle or loop extending up to 8" above the minimum height shown, in order to aid in retrieving the device.
4. Cones or tubular markers 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

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SHEET 10 OF 12

Texas Department of Transportation — Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(10)-21

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WORK ZONE PAVEMENT MARKINGS

GENERAL

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

RAISED PAVEMENT MARKERS

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

PREFABRICATED PAVEMENT MARKINGS

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

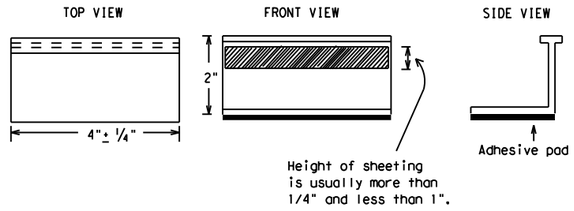
MAINTAINING WORK ZONE PAVEMENT MARKINGS

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

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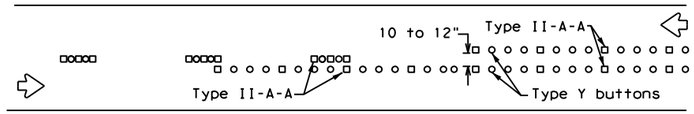
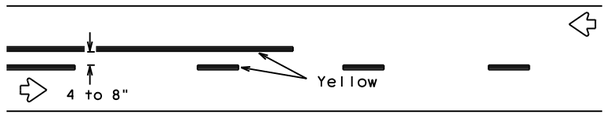
PAVEMENT MARKING PATTERNS

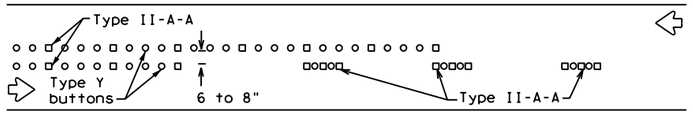
REFLECTORIZED PAVEMENT MARKINGS - PATTERN A



RAISED PAVEMENT MARKERS - PATTERN A



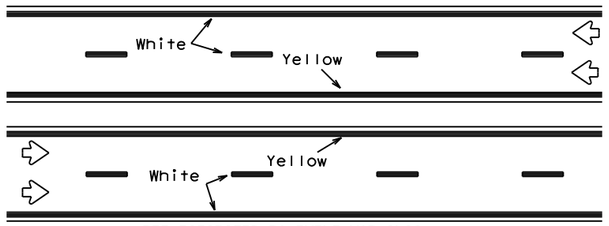
REFLECTORIZED PAVEMENT MARKINGS - PATTERN B



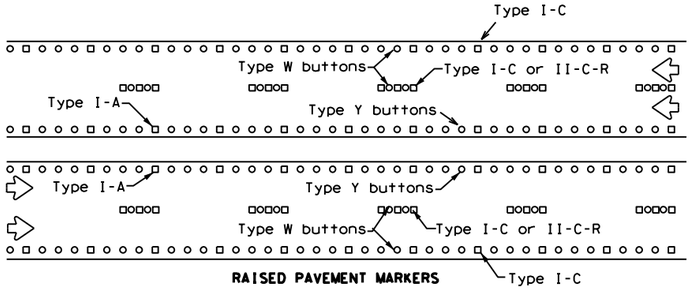
RAISED PAVEMENT MARKERS - PATTERN B

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



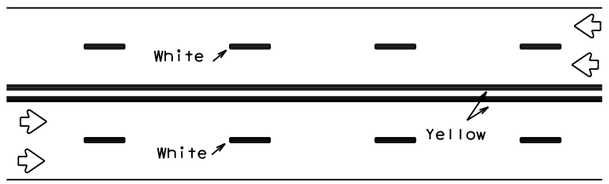
REFLECTORIZED PAVEMENT MARKINGS



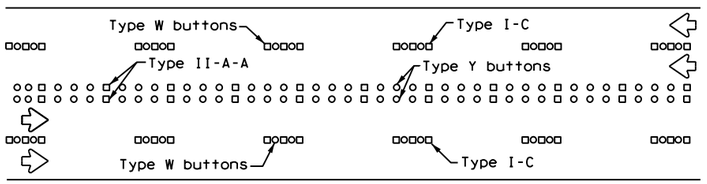
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

EDGE & LANE LINES FOR DIVIDED HIGHWAY



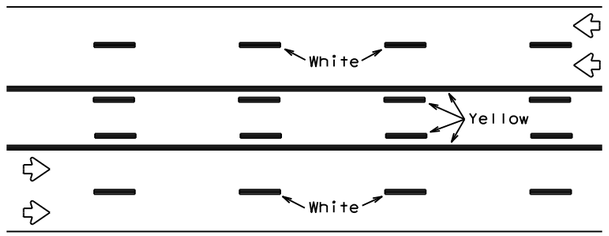
REFLECTORIZED PAVEMENT MARKINGS



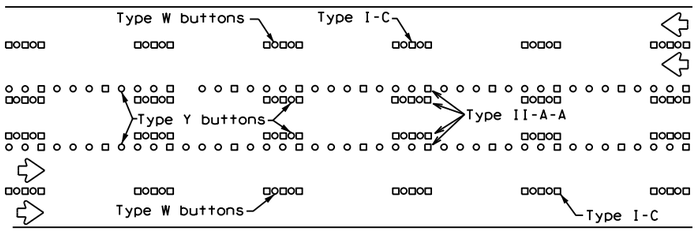
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS



REFLECTORIZED PAVEMENT MARKINGS



RAISED PAVEMENT MARKERS

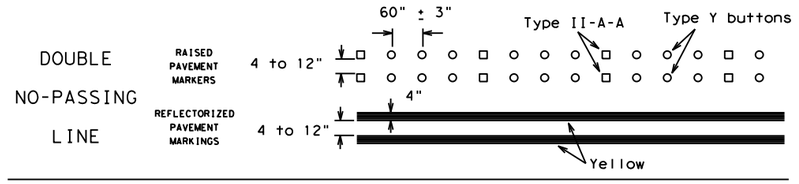
Prefabricated markings may be substituted for reflectorized pavement markings.

TWO-WAY LEFT TURN LANE

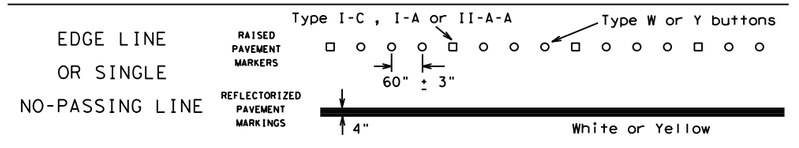
STANDARD WORK ZONE PAVEMENT MARKINGS DETAILS

SOLID LINES

DOUBLE NO-PASSING LINE

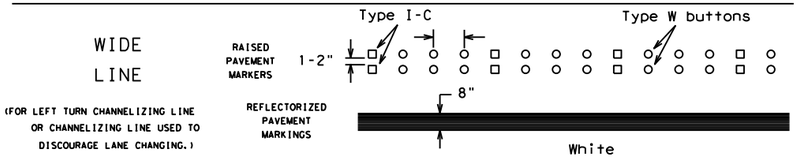


EDGE LINE OR SINGLE NO-PASSING LINE



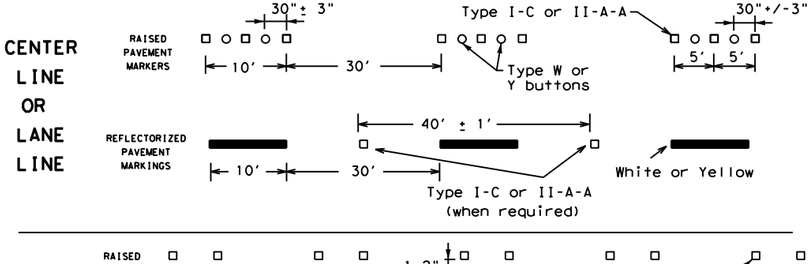
WIDE LINE

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

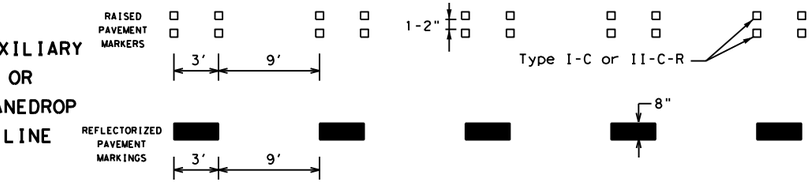


BROKEN LINES

CENTER LINE OR LANE LINE

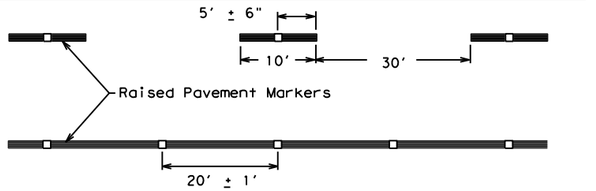


AUXILIARY OR LANEDROP LINE



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

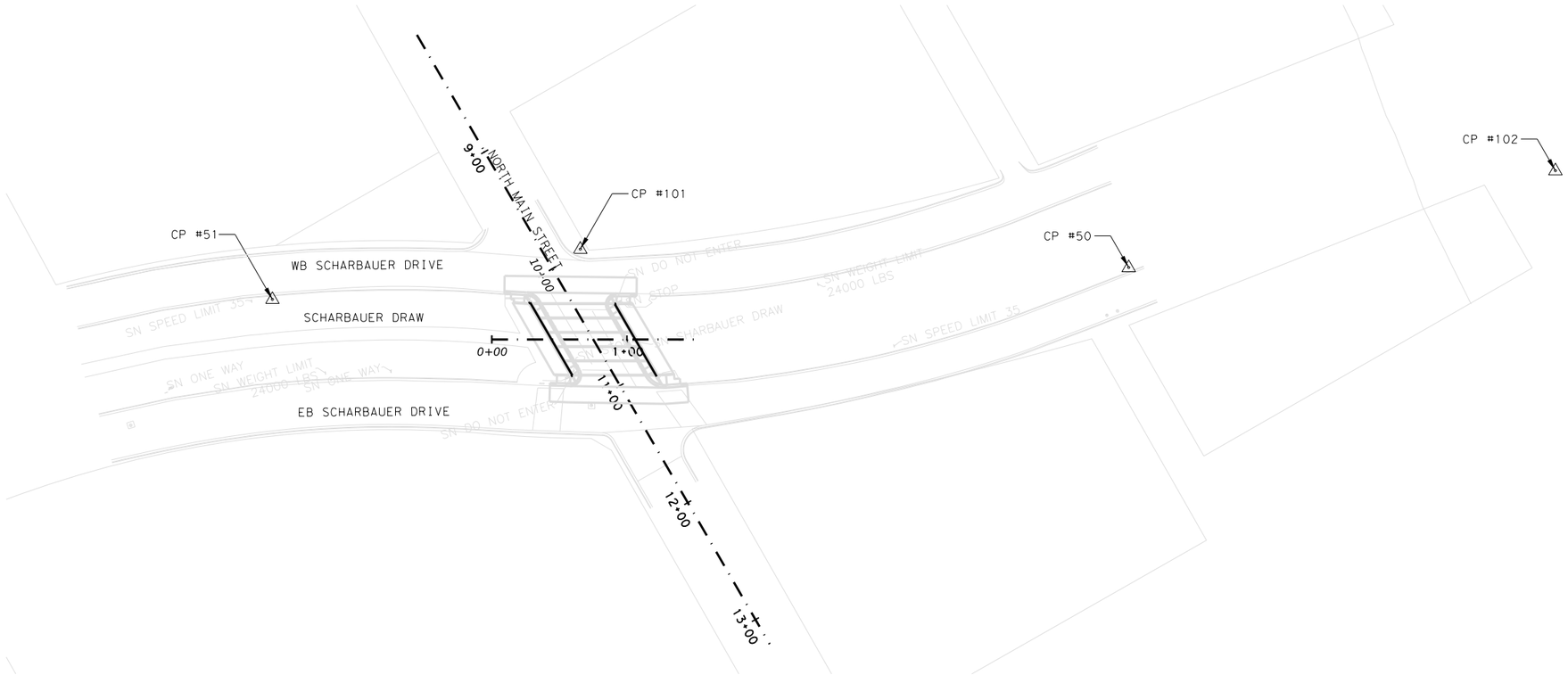
Traffic Safety Division Standard

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	0906	32	050, ETC	MAIN ST
	DIST	COUNTY		SHEET NO.
	ODA	MIDLAND		28

02861
0.08333317 ft / in.

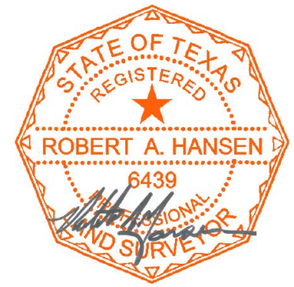


0 50' 100'
HORIZONTAL SCALE

NOTES:
1. ALL COORDINATES AND BEARINGS ARE IN US SURVEY FEET BASED ON THE TEXAS STATE PLANE COORDINATE SYSTEM, NORTH AMERICAN DATUM OF 1983.
2. ALL ELEVATIONS ARE REFERENCED TO THE NORTH AMERICAN DATUM OF 1988 (NAVD88) USING GEOID 12B AND ESTABLISHED USING A CLOSED LEVEL LOOP.
3. ALL COORDINATES AND DISTANCES ARE SURFACE VALUES AND CAN BE CONVERTED TO GRID VALUES BY DIVIDING BY THE PROJECT SURFACE ADJUSTMENT FACTOR OF 1.00012.

CONTROL POINT TABLE

POINT	NORTHING	EASTING	ELEVATION	DESCRIPTION
50	10704013.28	1756334.60	2766.57	CP /1/2"CIRS "BOWMAN CONTROL"
51	10704158.35	1755717.41	2768.91	CP /1/2"CIRS "BOWMAN CONTROL"
101	10704133.88	1755946.84	2769.03	BM /RR SPIKE IN PP
102	10703998.81	1756657.99	2768.90	BM /RR SPIKE IN PP



HL 93 LOADING

NO	DATE	REVISION	APPROVED

FREESE AND NICHOLS
1500 Broadway Street, Suite 206
Lubbock, TX 79401
Phone - (806) 686-2700
Web www.freese.com

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SCHARBAUER DRIVE BRIDGE REPLACEMENTS

SURVEY CONTROL INDEX SHEET N MAIN STREET (SHEET 1 OF 2)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DAG	6	SEE TITLE SHEET FOR PROJECT NO.		MAIN ST
GRAPHICS KNW	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK KMM	TEXAS	ODA	MIDLAND	29
CHECK SRJ	CONTROL	SECTION	JOB	
	0906	32	050,ETC.	

7/19/2023
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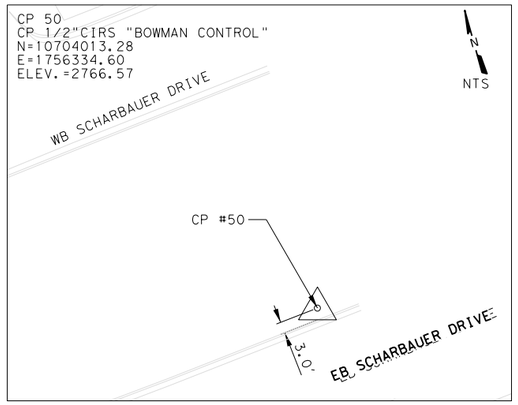
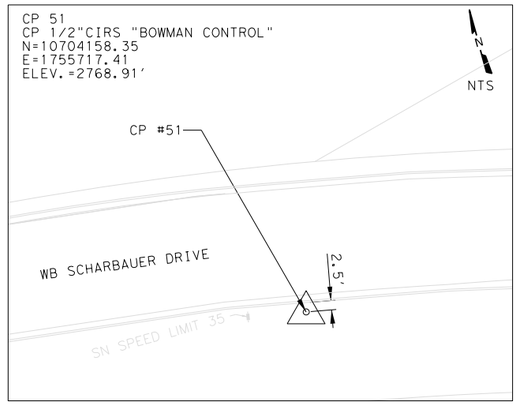
02861
0.08333317 ft / in.

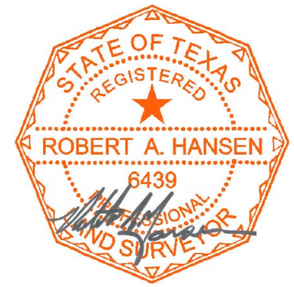


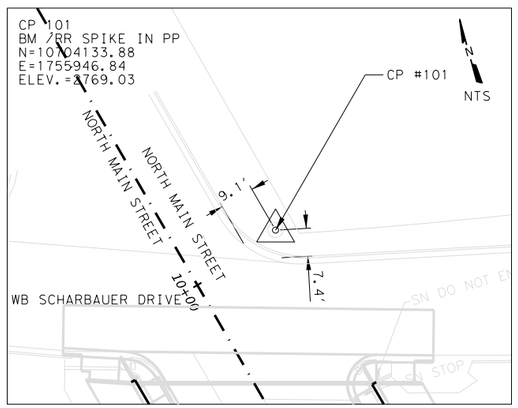
SET 1/2" CAPPED IRON ROD STAMPED "BOWMAN CONTROL" LOCATED 3.0 FEET NORTHERLY OF THE BACK OF CURB FOR THE EAST BOUND LANES OF E SCHARBAUER DRIVE, 294' WEST OF ITS INTERSECTION WITH NORTH EDWARDS STREET, 32.6' NORTHEAST OF A SANITARY SEWER MANHOLE.



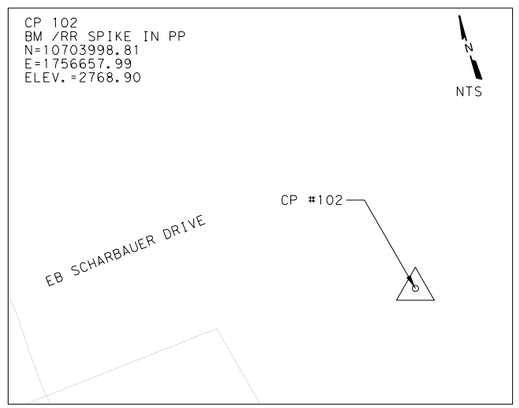
SET 1/2" CAPPED IRON ROD STAMPED "BOWMAN CONTROL" LOCATED 2.5' SOUTHERLY OF THE BACK OF CURB FOR THE WEST BOUND LANES OF E SCHARBAUER DRIVE, 206'WESTERLY OF ITS INTERSECTION WITH NORTH MAIN STREET,15.3' EASTERLY OF A 35MPH SPEED LIMIT SIGN.

NOTES:
1. ALL COORDINATES AND BEARINGS ARE IN US SURVEY FEET BASED ON THE TEXAS STATE PLANE COORDINATE SYSTEM, NORTH AMERICAN DATUM OF 1983.
2. ALL ELEVATIONS ARE REFERENCED TO THE NORTH AMERICAN DATUM OF 1988 (NAVD88) USING GEOID 12B AND ESTABLISHED USING A CLOSED LEVEL LOOP.
3. ALL COORDINATES AND DISTANCES ARE SURFACE VALUES AND CAN BE CONVERTED TO GRID VALUES BY DIVIDING BY THE PROJECT SURFACE ADJUSTMENT FACTOR OF 1.00012.





SET RAILROAD SPIKE IN A POWER POLE LOCATED AT THE NORTHEAST QUADRANT OF THE INTERSECTION OF EAST SCHARBAUER DRIVE WITH NORTH MAIN STREET, 19.9' EAST OF A WATER VALVE, 9.1' EAST, AND 7.4' NORTH OF THE BACK OF CURB.



SET RAILROAD SPIKE IN A POWER POLE LOCATED AT THE SOUTHEAST QUADRANT OF THE INTERSECTION OF EAST SCHARBAUER DRIVE WITH NORTH EDWARDS STREET, 30' SOUTH OF SCHARBAUER CENTERLINE, 20' EAST OF EDWARDS ST. CENTERLINE

HL 93 LOADING

NO	DATE	REVISION	APPROVED

FREESE AND NICHOLS
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Lubbock, TX 79401
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SCHARBAUER DRIVE BRIDGE REPLACEMENTS

SURVEY CONTROL INDEX SHEET N MAIN STREET (SHEET 2 OF 2)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DAG	6	SEE TITLE SHEET FOR PROJECT NO.		MAIN ST
GRAPHICS KNW	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK KMM	TEXAS	ODA	MIDLAND	30
CHECK SRJ	CONTROL	SECTION	JOB	
	0906	32	050,ETC.	

7/19/2023
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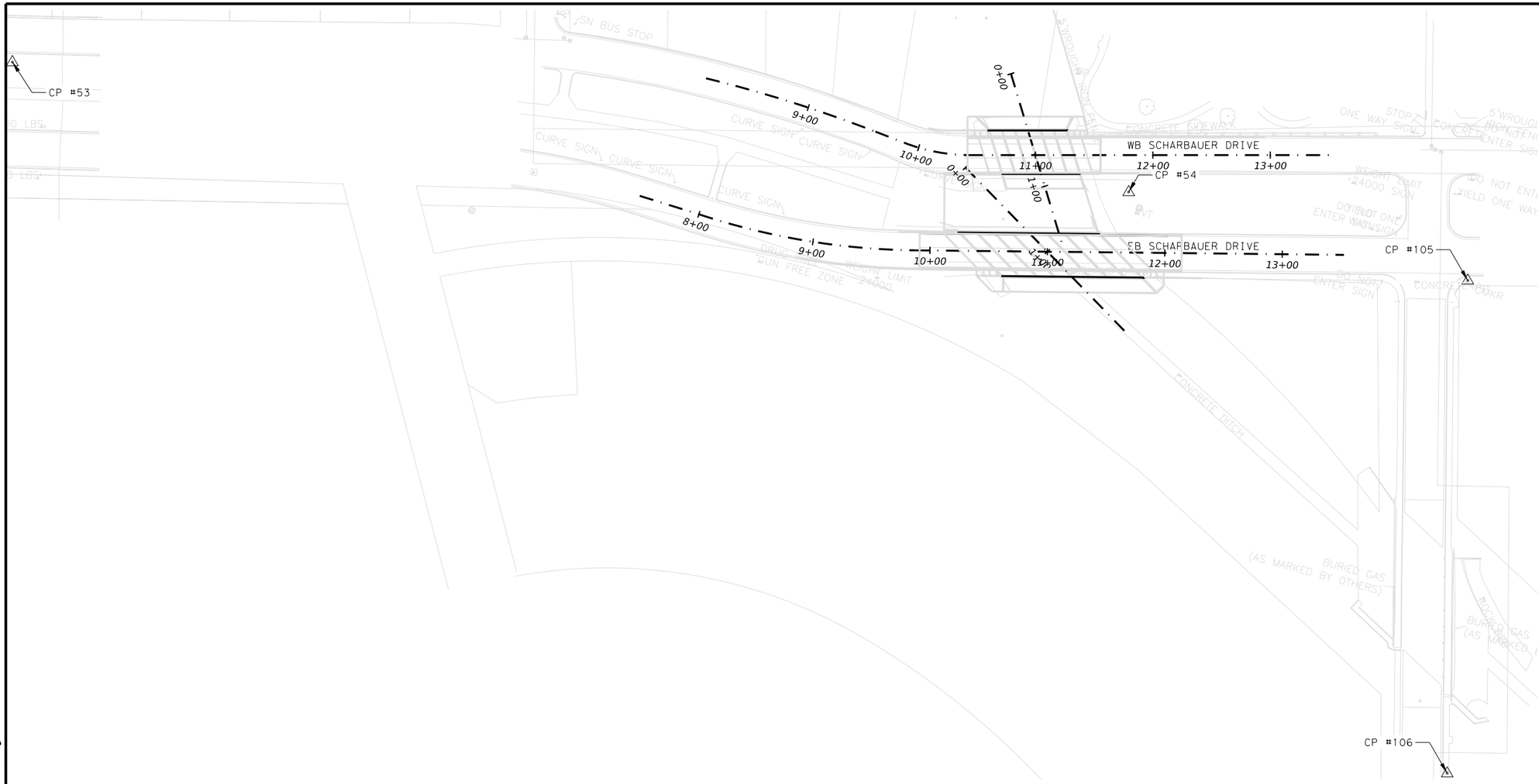

NOTES:
1. ALL COORDINATES AND BEARINGS ARE IN US SURVEY FEET BASED ON THE TEXAS STATE PLANE COORDINATE SYSTEM, NORTH AMERICAN DATUM OF 1983.

2. ALL ELEVATIONS ARE REFERENCED TO THE NORTH AMERICAN DATUM OF 1988 (NAVD88) USING GEOID 12B AND ESTABLISHED USING A CLOSED LEVEL LOOP.

3. ALL COORDINATES AND DISTANCES ARE SURFACE VALUES AND CAN BE CONVERTED TO GRID VALUES BY DIVIDING BY THE PROJECT SURFACE ADJUSTMENT FACTOR OF 1.00012.

STATE OF TEXAS
REGISTERED
ROBERT A. HANSEN
6439
PROFESSIONAL LAND SURVEYOR

HL 93 LOADING

CONTROL POINT TABLE				
POINT	NORTHING	EASTING	ELEVATION	DESCRIPTION
53	10704422.10	1758224.83	2763.90	1/2 CIRS "BOWMAN CONTROL"
54	10704560.61	1759171.77	2764.14	1/2 CIRS "BOWMAN CONTROL"
105	10704562.43	1759470.27	2764.36	RAILROAD SPIKE
106	10704152.40	1759561.67	2764.20	RAILROAD SPIKE

NO	DATE	REVISION	APPROVED

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SCHARBAUER DRIVE BRIDGE REPLACEMENTS

SURVEY CONTROL INDEX SHEET N SCHARBAUER DRIVE (SHEET 1 OF 2)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DAG	6	SEE TITLE SHEET FOR PROJECT NO.		MAIN ST
GRAPHICS KNW	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK KMM	TEXAS	ODA	MIDLAND	
CHECK SRJ	CONTROL	SECTION	JOB	31
	0906	32	050,ETC.	

02861
0.08333317 ft / in.
7/19/2023
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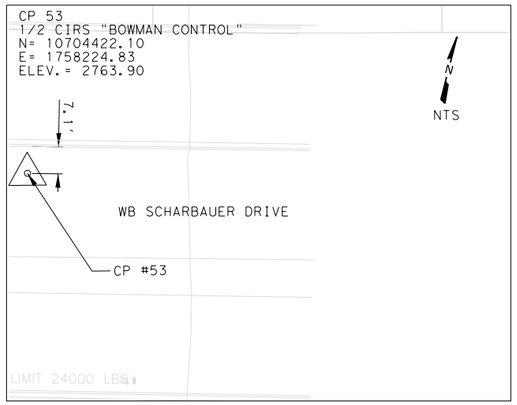
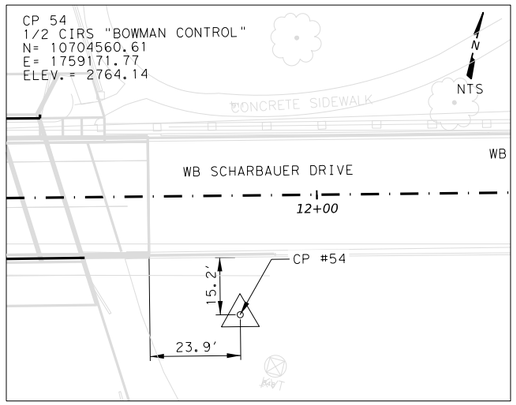
02861
0.08333317 ft / in.



SET 1/2" CAPPED IRON ROD STAMPED "BOWMAN CONTROL" LOCATED 7.1' SOUTHERLY OF THE BACK OF CURB FOR THE WEST BOUND LANES OF E SCHARBAUER DRIVE, 303' EASTERLY OF ITS INTERSECTION WITH NORTH LAMESA ROAD.



SET 1/2" CAPPED IRON ROD STAMPED "BOWMAN CONTROL" LOCATED 15.1' SOUTH OF THE BACK OF CURB FOR THE WEST BOUND LANES OF EAST SCHARBAUER DRIVE, 240' WEST OF NORTH CARVER STREET, 16.5' NORTHWESTERLY OF A ELECTRIC LINE TOWER

NOTES:
1. ALL COORDINATES AND BEARINGS ARE IN US SURVEY FEET BASED ON THE TEXAS STATE PLANE COORDINATE SYSTEM, NORTH AMERICAN DATUM OF 1983.
2. ALL ELEVATIONS ARE REFERENCED TO THE NORTH AMERICAN DATUM OF 1988 (NAVD88) USING GEOID 12B AND ESTABLISHED. USING A CLOSED LEVEL LOOP.
3. ALL COORDINATES AND DISTANCES ARE SURFACE VALUES AND CAN BE CONVERTED TO GRID VALUES BY DIVIDING BY THE PROJECT SURFACE ADJUSTMENT FACTOR OF 1.00012.

SET RAILROAD SPIKE IN A POWER POLE LOCATED 3.5' EAST OF THE BACK OF CURB FOR NORTH CARVER STREET, 30.5' SOUTH OF A BRIDGE MEMORIAL, 439' SOUTH OF THE INTERSECTION OF NORTH CARVER STREET WITH EAST SCHARBAUER DRIVE.

SET RAILROAD SPIKE IN A POWER POLE LOCATED AT THE SOUTHEAST QUADRANT OF THE INTERSECTION OF NORTH CARVER STREET WITH EAST SCHARBAUER DRIVE, 3.7' SOUTH OF THE BACK OF CURB FOR EAST SCHARBAUER DRIVE, 18.1' NORTHEAST OF THE BASE OF A STOPLIGHT SIGNAL POLE.

STATE OF TEXAS
REGISTERED
ROBERT A. HANSEN
6439
PROFESSIONAL LAND SURVEYOR

HL 93 LOADING

NO	DATE	REVISION	APPROVED

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SCHARBAUER DRIVE BRIDGE REPLACEMENTS

SURVEY CONTROL INDEX SHEET N SCHARBAUER DRIVE (SHEET 2 OF 2)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DAG	6	SEE TITLE SHEET FOR PROJECT NO.		MAIN ST
GRAPHICS KNW	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK KMM	TEXAS	ODA	MIDLAND	32
CHECK SRJ	CONTROL	SECTION	JOB	
	0906	32	050,ETC.	

7/19/2023
N:\IF\Drawings\3. Roadway\CV-TRT-DT-SURVEY-CONTROL.dgn

1200.0000 ft / in.

NORTH MAIN STREET

Beginning chain BL_MAIN description

Point 3 N 10,704,318.7801 E 1,755,872.3627 Sta 0+00.00

Course from 3 to 4 S 14° 42' 01.57" E Dist 520.9629

Point 4 N 10,703,814.8705 E 1,756,004.5650 Sta 5+20.96

Ending chain BL_MAIN description

EAST SCHARBAUER DRIVE - EASTBOUND LANES

Beginning chain BL_SCHEB description

Curve Data

Curve BL-SCHEB_1
P.I. Station 0+75.78 N 10,704,562.8582 E 1,758,874.8037
Delta = 7° 26' 56.97" (RT)
Degree = 4° 55' 20.07"
Tangent = 75.7751
Length = 151.3367
Radius = 1,164.0179
External = 2.4638
Long Chord = 151.2301
Mid. Ord. = 2.4586
P.C. Station 0+00.00 N 10,704,561.2447 E 1,758,799.0458
P.T. Station 1+51.34 N 10,704,554.6364 E 1,758,950.1315
C.C. N 10,703,397.4908 E 1,758,823.8317
Back = N 88° 46' 47.58" E
Ahead = S 83° 46' 15.45" E
Chord Bear = S 87° 29' 43.93" E

Course from PT BL-SCHEB_1 to PC BL-SCHEB_4 S 83° 46' 15.45" E Dist 26.2915

Curve Data

Curve BL-SCHEB_4
P.I. Station 2+06.72 N 10,704,548.6270 E 1,759,005.1883
Delta = 21° 11' 52.24" (LT)
Degree = 36° 51' 12.27"
Tangent = 29.0923
Length = 57.5194
Radius = 155.4694
External = 2.6985
Long Chord = 57.1919
Mid. Ord. = 2.6525
P.C. Station 1+77.63 N 10,704,551.7836 E 1,758,976.2678
P.T. Station 2+35.15 N 10,704,556.1414 E 1,759,033.2934
C.C. N 10,704,706.3352 E 1,758,993.1367
Back = S 83° 46' 15.45" E
Ahead = N 75° 01' 52.32" E
Chord Bear = N 85° 37' 48.44" E

Course from PT BL-SCHEB_4 to 14 N 75° 02' 12.40" E Dist 309.5363

Point 14 N 10,704,636.0633 E 1,759,332.3338 Sta 5+44.68

Ending chain BL_SCHEB description

EAST SCHARBAUER DRIVE - WESTBOUND LANES

Beginning chain BL_SCHWB description

Point 11 N 10,704,450.0035 E 1,758,770.4248 Sta 0+00.00

Course from 11 to PC BL-SCHWB_3 S 87° 31' 28.59" E Dist 53.2041

Curve Data

Curve BL-SCHWB_3
P.I. Station 1+47.57 N 10,704,442.3749 E 1,758,917.7939
Delta = 17° 35' 39.83" (LT)
Degree = 9° 23' 47.16"
Tangent = 94.3654
Length = 187.2453
Radius = 609.7604
External = 7.2587
Long Chord = 186.5105
Mid. Ord. = 7.1733
P.C. Station 0+53.20 N 10,704,447.7056 E 1,758,823.5792
P.T. Station 2+40.45 N 10,704,465.7725 E 1,759,009.2126
C.C. N 10,705,056.4924 E 1,758,858.0243
Back = S 86° 45' 42.00" E
Ahead = N 75° 38' 38.17" E
Chord Bear = N 84° 26' 28.09" E

Course from PT BL-SCHWB_3 to 12 N 75° 38' 38.17" E Dist 201.6884

Point 12 N 10,704,515.7806 E 1,759,204.6030 Sta 4+42.14

Course from 12 to 13 N 75° 40' 03.39" E Dist 163.2949

Point 13 N 10,704,556.2037 E 1,759,362.8155 Sta 6+05.43

Ending chain BL_SCHWB description

CULVERT #01

Beginning chain CULV01 description

Point 1 N 10,704,086.6829 E 1,755,866.1404 Sta 0+00.00

Course from 1 to 2 S 74° 38' 48.84" E Dist 150.0000

Point 2 N 10,704,046.9678 E 1,756,010.7873 Sta 1+50.00

Ending chain CULV01 description

CULVERT#03

Beginning chain CULV03 description

Point 15 N 10,704,631.9889 E 1,759,048.9209 Sta 0+00.00

Course from 15 to 16 S 31° 42' 23.42" E Dist 150.0000

Point 16 N 10,704,504.3761 E 1,759,127.7561 Sta 1+50.00

Ending chain CULV03 description

CULVERT#04

Beginning chain CULV04 description

Point 17 N 10,704,544.8669 E 1,759,032.1673 Sta 0+00.00

Course from 17 to 18 S 59° 10' 32.46" E Dist 200.0000

Point 18 N 10,704,442.3854 E 1,759,203.9158 Sta 2+00.00

Ending chain CULV04 description

STATE OF TEXAS
KEVIN MORRIS
105091
LICENSED
PROFESSIONAL ENGINEER

Kevin Morris 10/27/2023

Freese and Nichols, Inc.
Texas Registered Engineering Firm F-2144

HL 93 LOADING

NO	DATE	REVISION	APPROVED

FREESE AND NICHOLS
1500 Broadway Street, Suite 206
Lubbock, TX 79401
Phone - (806) 686-2700
Web www.freese.com

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SCHARBAUER DRIVE
BRIDGE REPLACEMENTS

HORIZONTAL ALIGNMENT DATA

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DAG	6	SEE TITLE SHEET FOR PROJECT NO.		MAIN ST
GRAPHICS KNW	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK KMM	TEXAS	ODA	MIDLAND	33
CHECK SRJ	CONTROL	SECTION	JOB	
	0906	32	050,ETC.	

10/27/2023
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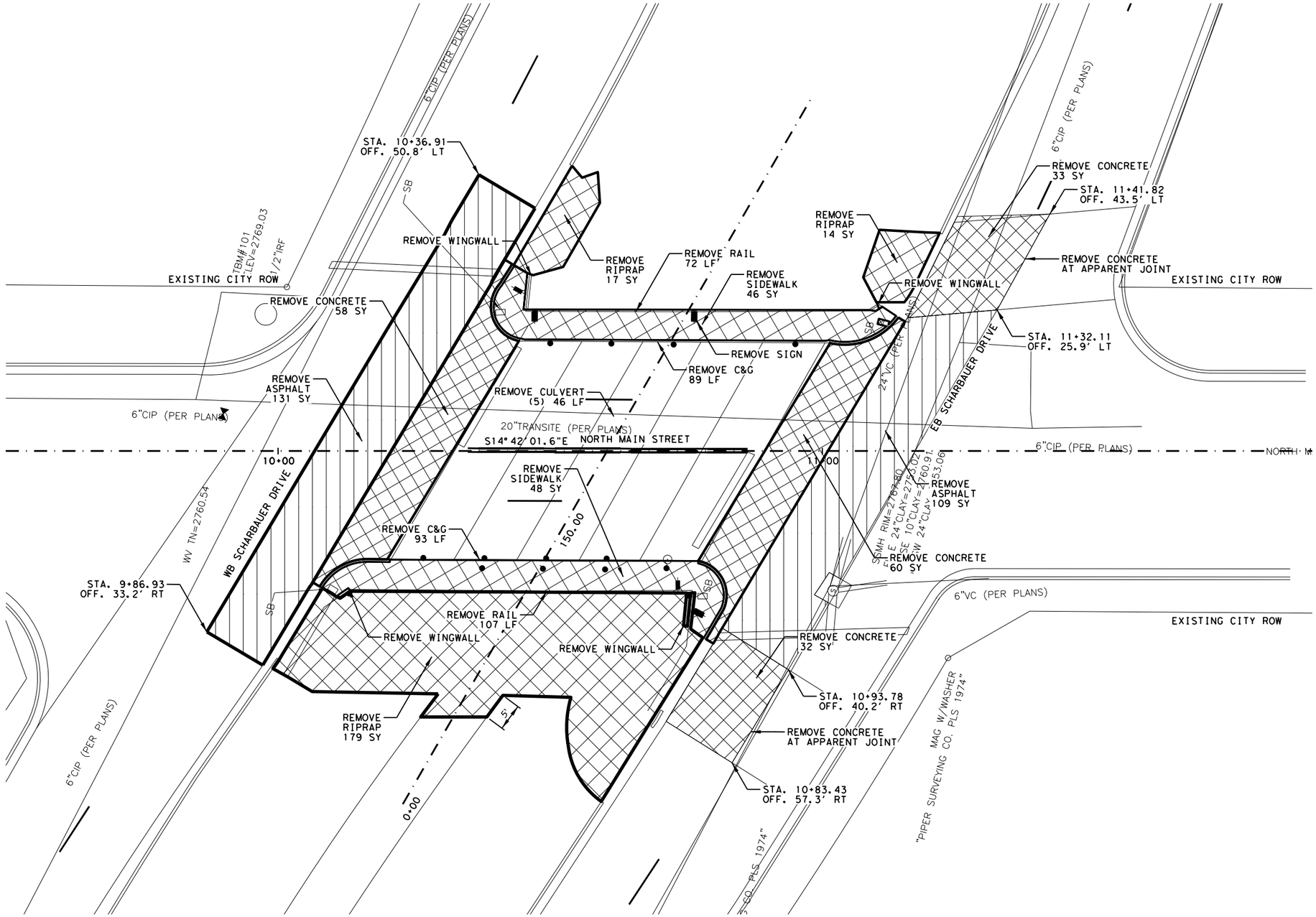
0.083333 ft / in.



HL 93 LOADING

NO	DATE	REVISION	APPROVED

KEVIN MORRIS
105091
LICENSED PROFESSIONAL ENGINEER
STATE OF TEXAS
10/27/2023
Freese and Nichols, Inc.
Texas Registered Engineering Firm F-2144

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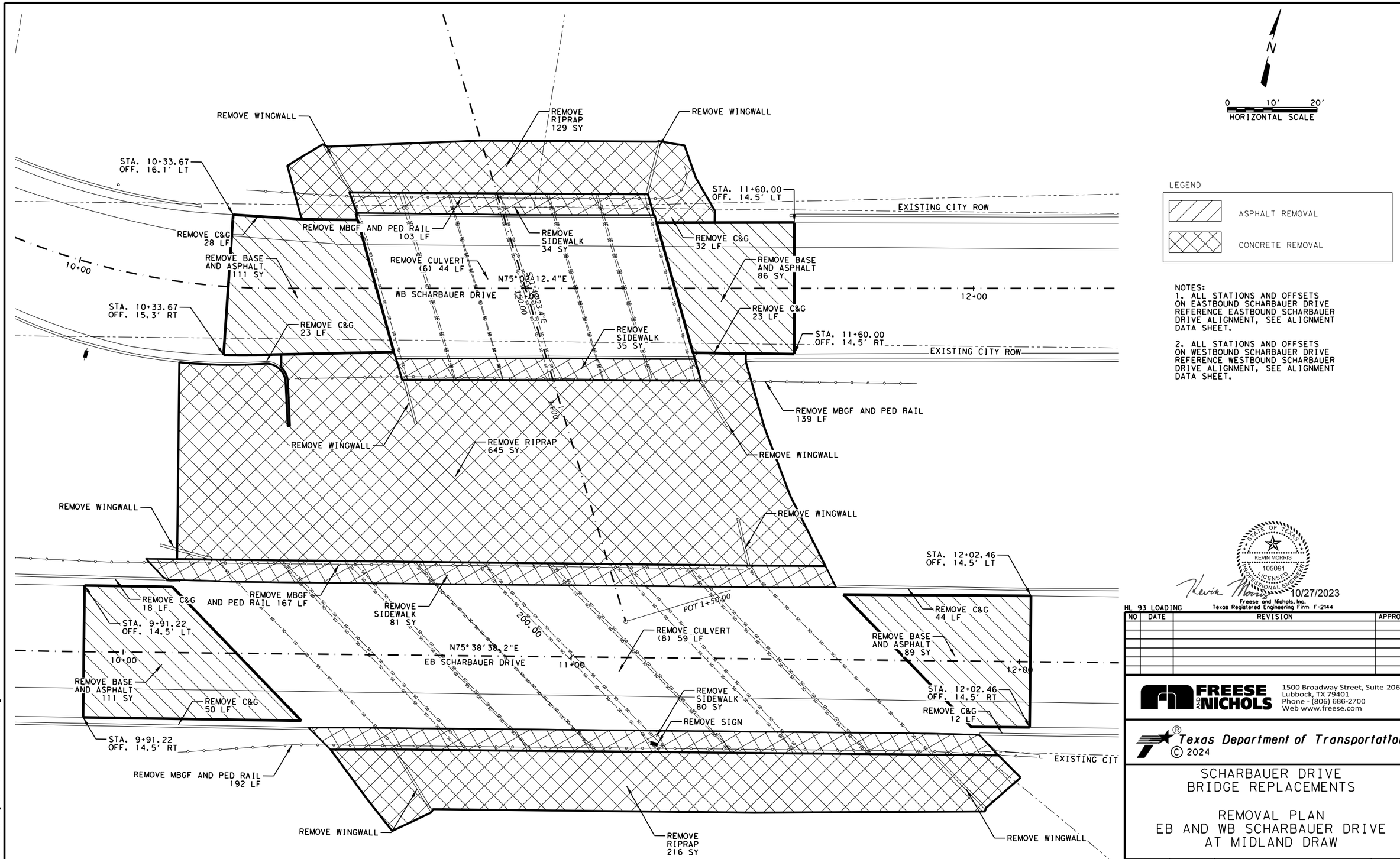
SCHARBAUER DRIVE BRIDGE REPLACEMENTS

REMOVAL PLAN NORTH MAIN STREET (SHEET 1 OF 1)

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DAG	6	SEE TITLE SHEET FOR PROJECT NO.		MAIN ST
GRAPHICS KNW	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK KMM	TEXAS	ODA	MIDLAND	34
CHECK SRJ	CONTROL	SECTION	JOB	
	0906	32	050, ETC.	

0.08333317 ft / in.



NOTES:
1. ALL STATIONS AND OFFSETS ON EASTBOUND SCHARBAUER DRIVE REFERENCE EASTBOUND SCHARBAUER DRIVE ALIGNMENT, SEE ALIGNMENT DATA SHEET.

2. ALL STATIONS AND OFFSETS ON WESTBOUND SCHARBAUER DRIVE REFERENCE WESTBOUND SCHARBAUER DRIVE ALIGNMENT, SEE ALIGNMENT DATA SHEET.

STATE OF TEXAS
KEVIN MORRIS
105091
LICENSED
PROFESSIONAL ENGINEER

10/27/2023

Freese and Nichols, Inc.
Texas Registered Engineering Firm F-2144

HL 93 LOADING

NO	DATE	REVISION	APPROVED

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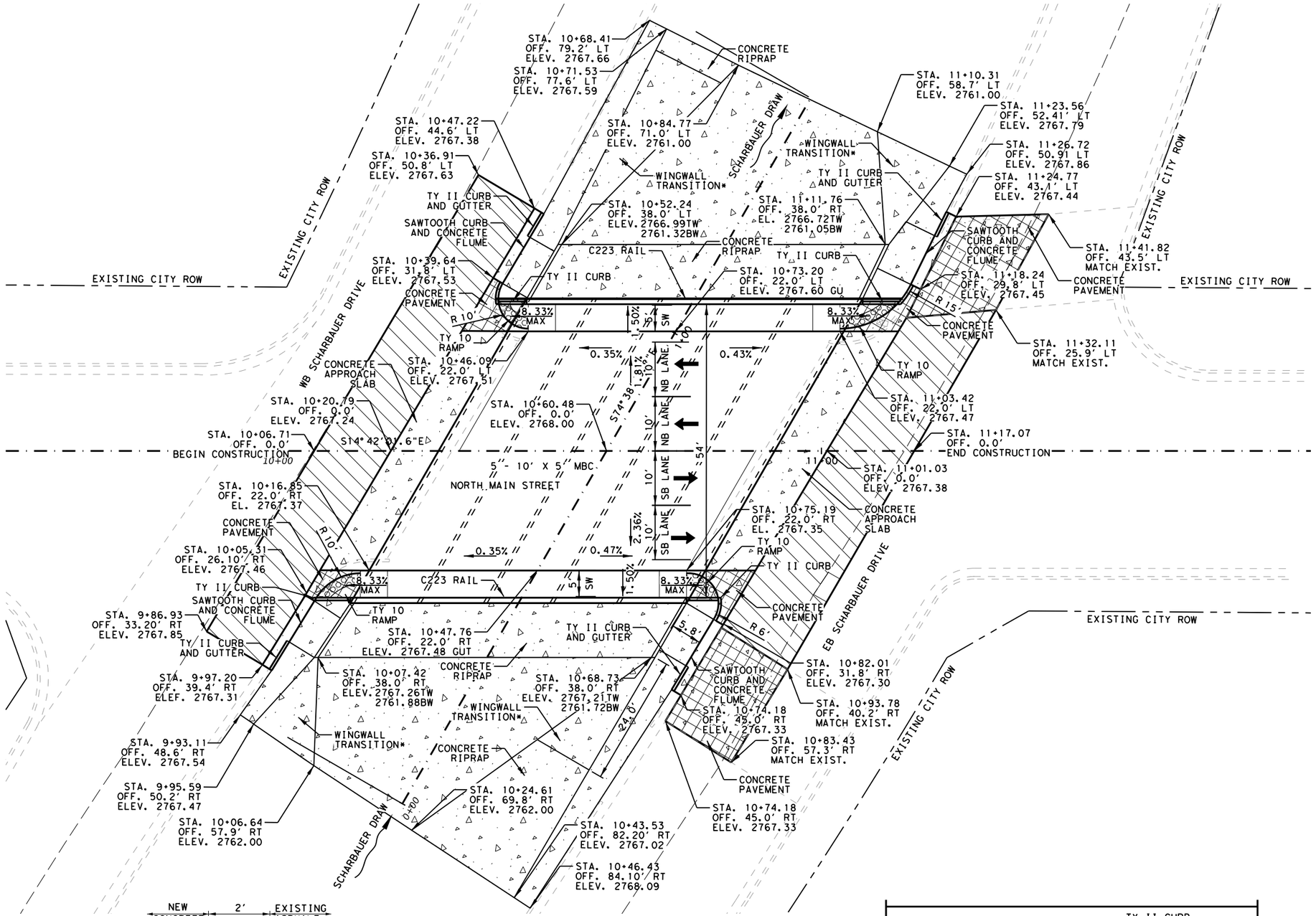
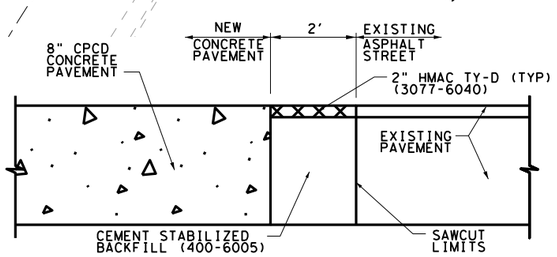
SCHARBAUER DRIVE BRIDGE REPLACEMENTS

REMOVAL PLAN EB AND WB SCHARBAUER DRIVE AT MIDLAND DRAW

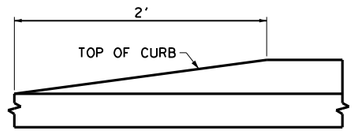
DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DAG	6	SEE TITLE SHEET FOR PROJECT NO.		MAIN ST
GRAPHICS KNW	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK KMM	TEXAS	ODA	MIDLAND	35
CHECK SRJ	CONTROL	SECTION	JOB	
	0906	32	050, ETC.	

0.083333 ft / in.

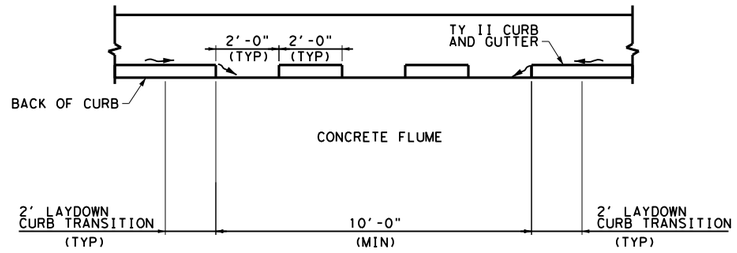




TYPICAL SECTION
NEW CONCRETE TIE TO EXISTING ASPHALT
NOT TO SCALE



LAYDOWN CURB TRANSITION
NOTE: TO BE PAID FOR AS TYPE II CURB AND GUTTER
NOT TO SCALE



SAWTOOTH CURB & GUTTER
NOT TO SCALE
PLAN VIEW

STATE OF TEXAS
KEVIN MORRIS
105091
LICENSED
PROFESSIONAL ENGINEER

Kevin Morris 10/27/2023

Freese and Nichols, Inc.
Texas Registered Engineering Firm F-2144

HL 93 LOADING

NO	DATE	REVISION	APPROVED

FREESE AND NICHOLS
1500 Broadway Street, Suite 206
Lubbock, TX 79401
Phone - (806) 686-2700
Web www.freese.com

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SCHARBAUER DRIVE BRIDGE REPLACEMENTS

ROADWAY LAYOUT NORTH MAIN STREET (SHEET 1 OF 1)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DAG	6	SEE TITLE SHEET FOR PROJECT NO.		MAIN ST
GRAPHICS KNW	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK KMM	TEXAS	ODA	MIDLAND	36
CHECK SRJ	CONTROL	SECTION	JOB	
	0906	32	050, ETC.	

10/27/2023
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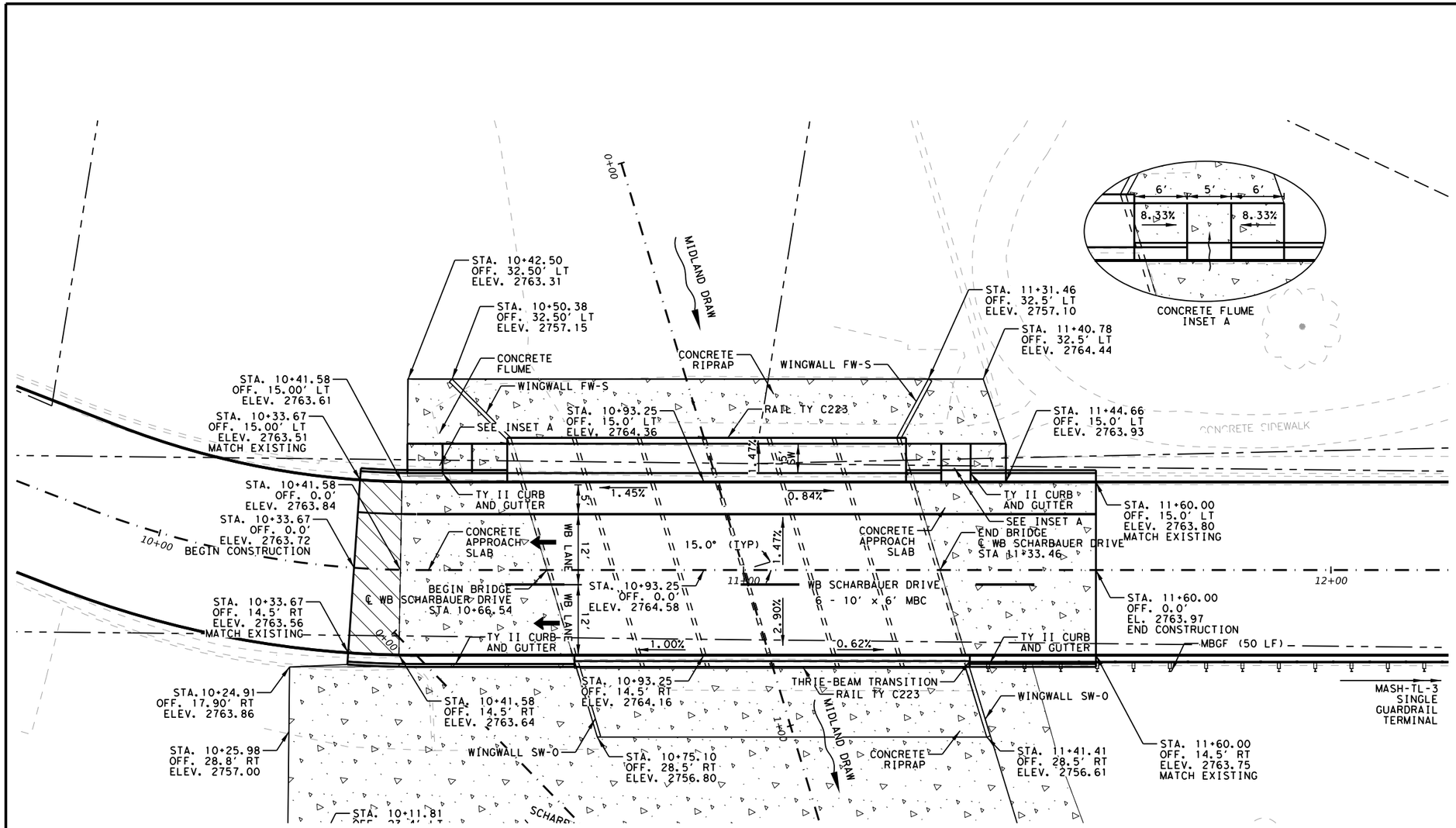
0.0833 ft / in.



STATE OF TEXAS
KEVIN MORRIS
105091
LICENSED PROFESSIONAL ENGINEER

Kevin Morris 11/29/2023

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SCHARBAUER DRIVE BRIDGE REPLACEMENTS

ROADWAY LAYOUT WB SCHARBAUER DRIVE

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DAG	6	SEE TITLE SHEET FOR PROJECT NO.		MAIN ST
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
KNW	TEXAS	ODA	MIDLAND	37
CHECK	CONTROL	SECTION	JOB	
KMM	0906	32	050,ETC.	
CHECK				
SRJ				

10/27/2023
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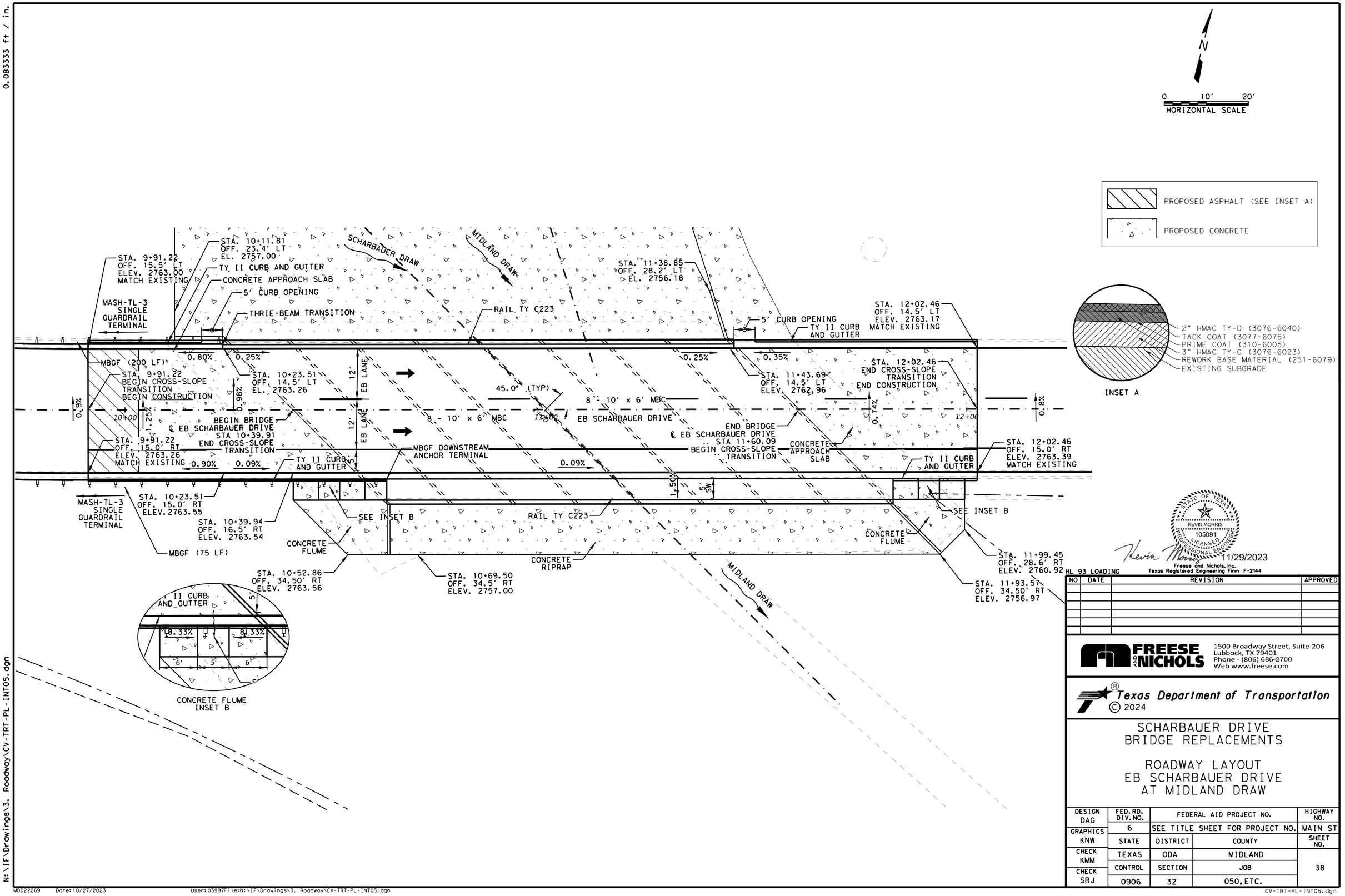

STATE OF TEXAS
KEVIN MORRIS
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LICENSED
PROFESSIONAL ENGINEER
Kevin Morris 11/29/2023
Freese and Nichols, Inc.
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SCHARBAUER DRIVE BRIDGE REPLACEMENTS

ROADWAY LAYOUT EB SCHARBAUER DRIVE AT MIDLAND DRAW

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DAG	6	SEE TITLE SHEET FOR PROJECT NO.		MAIN ST
GRAPHICS KNW	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK KMM	TEXAS	ODA	MIDLAND	
CHECK SRJ	CONTROL	SECTION	JOB	38
	0906	32	050, ETC.	

10/27/2023
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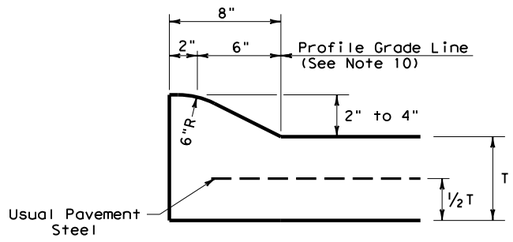
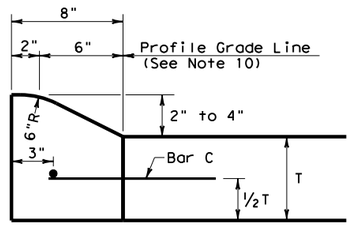
FILE:



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



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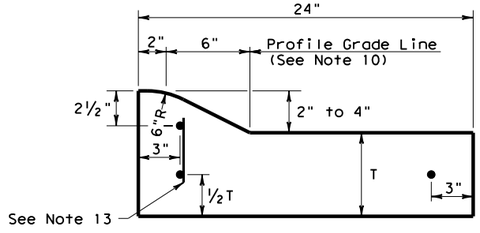
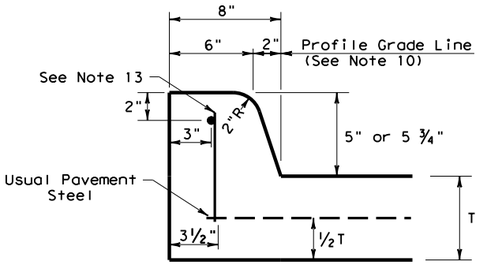


TYPE I CURB AND GUTTER
2" - 4" HEIGHT



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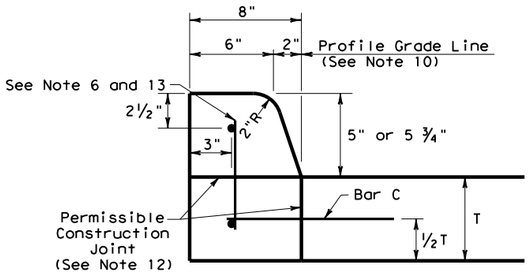

TYPE II CURB
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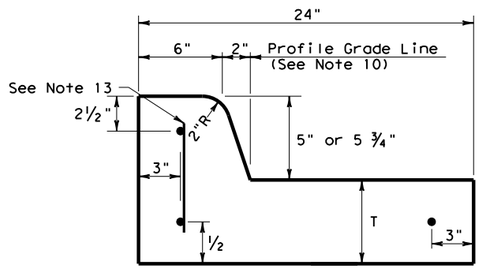
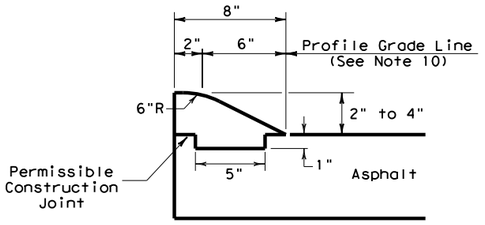
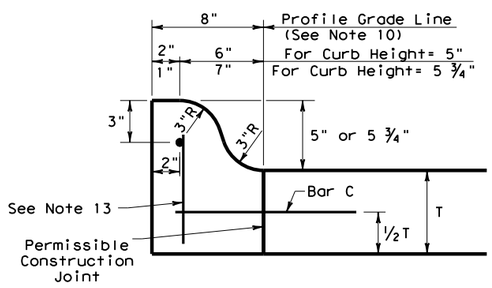


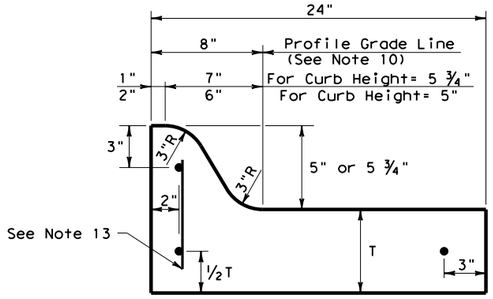
TYPE II CURB AND GUTTER
5" - 5 ¾" HEIGHT



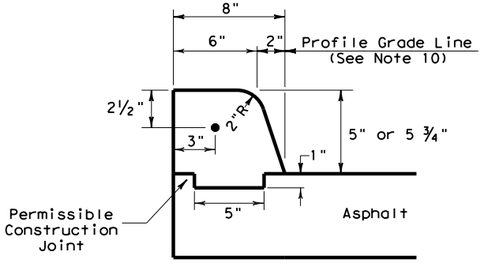
TYPE III CURB (KEYED)
2" - 4" HEIGHT



TYPE IIa CURB
5" - 5 ¾" HEIGHT



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



TYPE IV CURB (KEYED)
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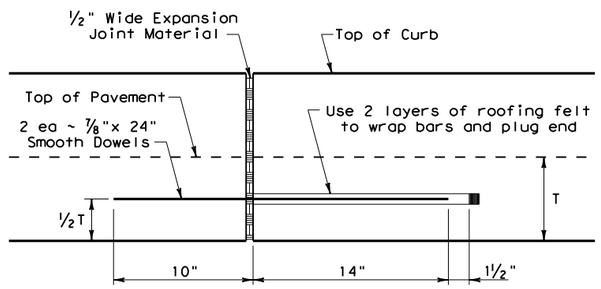
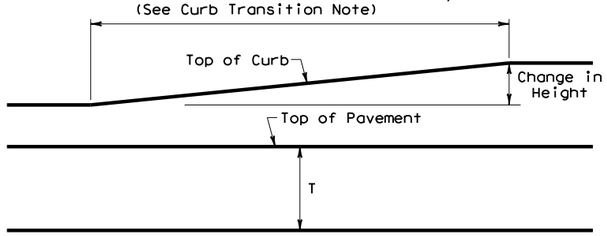


EXPANSION JOINT DETAIL

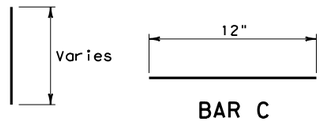
CURB TRANSITION NOTE:
Field conditions may require a longer or shorter transition, and shall be shown elsewhere in the plans, or as directed by the Engineer.



CURB TRANSITION
Note: To be paid for as Highest Curb

GENERAL NOTES

1. All materials and construction shall be in accordance with Item 529, "Concrete Curb, Gutter, and Combined Curb and Gutter."
2. Concrete shall be Class A.
3. When reinforcing bars are used, they shall be No.4 unless otherwise shown. The use of fiber reinforced concrete in lieu of reinforcing steel is acceptable. Use fibers meeting the requirements of DMS 4550, "Fibers for Concrete," and dose fibers in accordance with Material Producers List (MPL) "Fibers for Class A and B Concrete Applications."
4. Round exposed sharp edges with a rounding tool, to a minimum radius of ¼ inch.
5. All existing curbs and driveways to be removed shall be sawed or removed at existing joints.
6. Where concrete curb is to be placed on existing concrete pavement, Bar B may be drilled and grouted in place, or may be inserted into fresh concrete.
7. Expansion and contraction joints shall be constructed to match pavement joints in all curbs and curb and gutter adjacent to jointed concrete pavement. Where placement of curb or curb and gutter is not adjacent to concrete pavement, expansion joints shall be provided at structures, curb returns at streets, and at locations directed by The Engineer.
8. Vertical and horizontal dowel bars and transverse reinforcing bars shall be placed at four feet C~C.
9. Dimension 'T' shown is the thickness of concrete pavement. When curb is installed adjacent to flexible pavement dimension 'T' is 8" maximum.
10. Usual profile grade line. Refer to typical sections and plan-profile sheets for exact locations.
11. One-half inch expansion joint material shall be provided where curb or curb and gutter is adjacent to sidewalk or riprap.
12. When horizontal permissible construction joints are used, the longitudinal pavement steel shall be placed in accordance with pavement details shown elsewhere in the plans. Reinforcing steel for curb section shall then conform to that required for concrete curb.
13. Bar B placement as needed (typically at four ft. C-C) to support curb reinforcing steel during concrete placement.



BAR B

BAR C

Texas Department of Transportation

Design Division Standard

CONCRETE CURB AND CURB AND GUTTER

CCCG-22

FILE: cccg21.dgn	DN: TXDOT	CK: AN	DW: CS	CK: KM	
©TxDOT: JUNE 2022 REVISIONS	CONT	SECT	JOB	HIGHWAY	
	0906	32	050, ETC	MAIN ST	
	DIST	COUNTY		SHEET NO.	
	ODA	MIDLAND		39	

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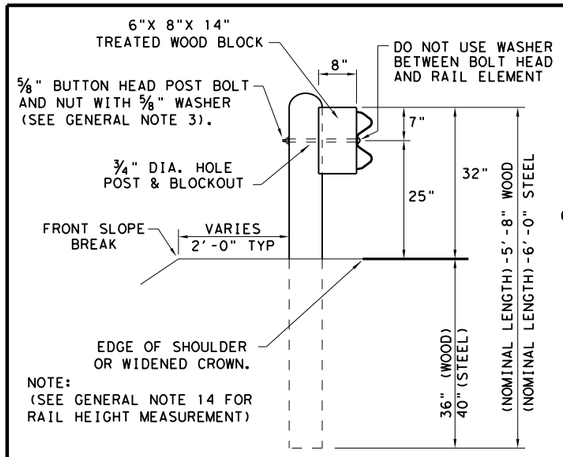
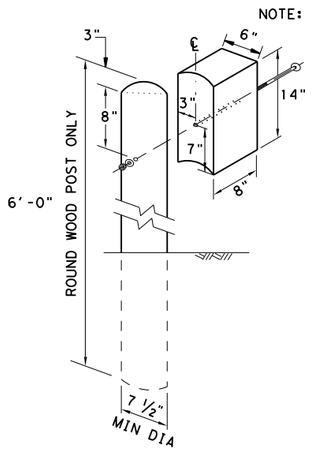
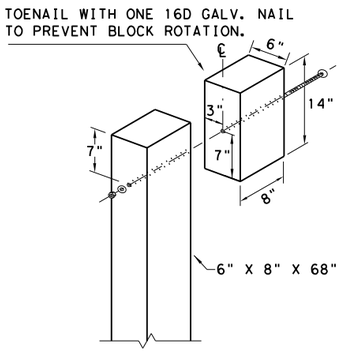


TYPICAL POST PLACEMENT

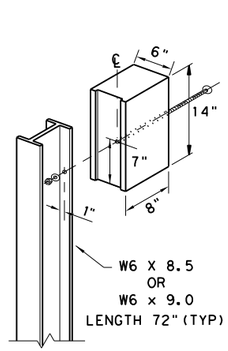


WOOD BLOCK TO ROUND WOOD POST

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

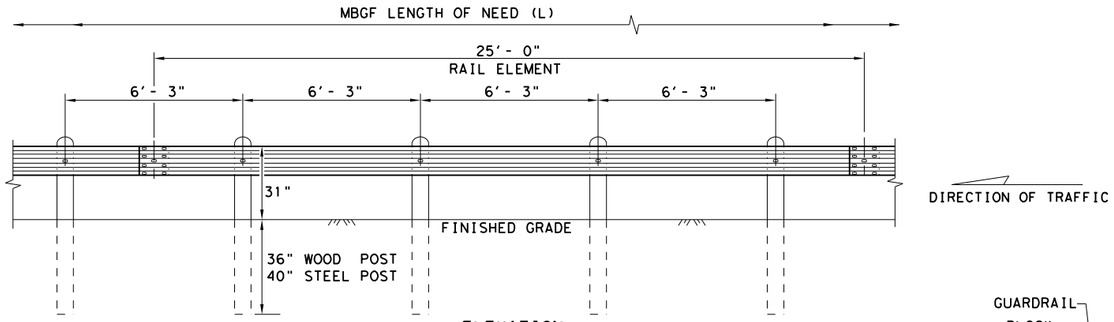


WOOD BLOCK TO RECTANGULAR WOOD POST



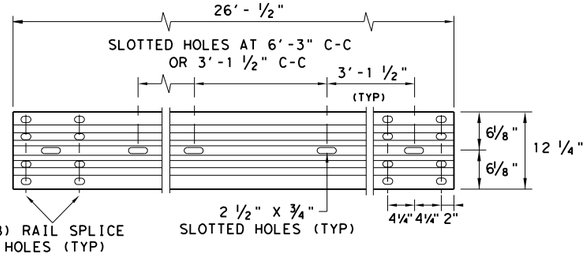
ROUTED WOOD BLOCK TO I-BEAM STEEL POST

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



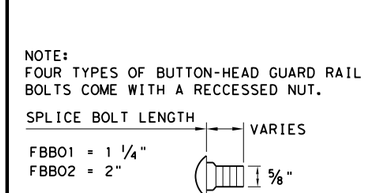
ELEVATION
MID-SPAN RAIL SPLICE

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



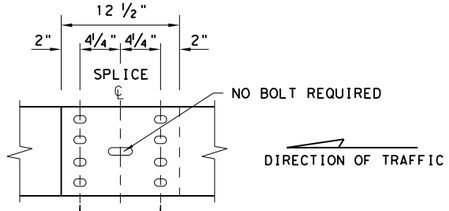
ELEVATION 25'- 0" (NOM.) W-BEAM SECTION

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



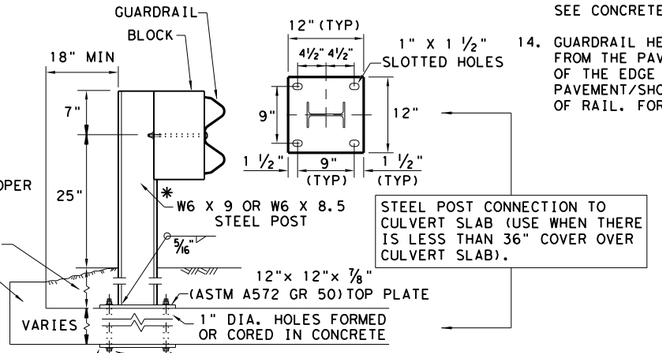
BUTTON HEAD BOLT

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



MID-SPAN RAIL SPLICE DETAIL

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



LOW FILL CULVERT POST

NOTE: TWO INSTALLATION OPTIONS.

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

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

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

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

GENERAL NOTES

1. THE TYPE OF POST (ROUND WOOD POST, RECTANGULAR WOOD POST, OR STEEL POST) WILL BE AS SHOWN IN THE PLANS. THE EXACT POSITION OF MBGF SHALL BE SHOWN IN THE PLANS OR AS DIRECTED BY THE ENGINEER. STEEL POSTS TO BE GALVANIZED IN ACCORDANCE WITH ITEM 445, "GALVANIZING."
2. RAIL ELEMENTS SHALL MEET THE REQUIREMENTS OF ITEM 540,"METAL BEAM GUARD FENCE" EXCEPT AS MODIFIED IN THE PLANS. THE CONTRACTOR MAY FURNISH RAIL ELEMENTS OF 25'- 0", OR 12'- 6" (NOM.) LENGTHS. RAIL ELEMENTS MAY HAVE SLOTTED HOLES AT 3'-1 ½" C-C OR 6'-3" C-C. A SPECIAL LENGTH OF RAIL MAY BE MANUFACTURED TO ACCOMMODATE THE DOWNSTREAM ANCHOR TERMINAL (DAT) AND THE TRANSITION SECTIONS OF GUARDRAIL.
3. BUTTON HEAD "POST BOLTS & NUTS" SHALL MEET THE REQUIREMENTS OF (ASTM A307), AND SHALL BE OF SUFFICIENT LENGTH TO EXTEND THROUGH THE FULL THICKNESS OF THE NUT AND ⅝" WASHER (FWC16a) AND NOT MORE THAN 1" BEYOND IT. TRIM REMAINING BOLT LENGTH TO MEET REQUIRED LENGTH.
4. FITTINGS (BOLTS, NUTS, AND WASHERS) SHALL BE GALVANIZED IN ACCORDANCE WITH ITEM 445,"GALVANIZING." FITTINGS SHALL BE SUBSIDIARY TO THE BID ITEM.
5. CROWN SHALL BE WIDENED TO ACCOMMODATE THE METAL BEAM GUARD FENCE.
6. THE LATERAL APPROACH TO THE GUARD FENCE, SHALL HAVE A MAXIMUM SLOPE OF 1V:10H.
7. IF SHOWN ELSEWHERE IN THE PLANS OR AS DIRECTED BY THE ENGINEER, THE GUARD FENCE MAY BE FLARED AT A RATE OF 25:1 OR FLATTER.
8. UNLESS OTHERWISE SHOWN IN THE PLANS, GUARD FENCE PLACED IN THE VICINITY OF CURBS SHALL BE POSITIONED SO THAT THE FACE OF CURB IS LOCATED DIRECTLY BELOW OR BEHIND THE FACE OF THE RAIL. RAIL PLACED OVER CURBS SHALL BE INSTALLED SO THAT THE POST BOLT IS LOCATED APPROXIMATELY 25 INCHES ABOVE THE GUTTER PAN OR EDGE OF SHOULDER.
9. APPLICATIONS IN SOLID ROCK ARE ONLY ALLOWED WITH STEEL POSTS. IF SOLID ROCK IS ENCOUNTERED WITHIN 0 TO 18" OF THE FINISHED GRADE, DRILL A 24" DIA. HOLE, 24" INTO THE ROCK. IF SOLID ROCK IS ENCOUNTERED BELOW 18", DRILL A 12" DIA. HOLE, 12" INTO THE ROCK OR TO THE STANDARD EMBEDMENT DEPTH, WHICHEVER MAYBE LESS. ANY EXCESS POST LENGTH, AFTER MEETING THESE DEPTHS, MAY BE FIELD CUT TO ENSURE PROPER GUARDRAIL MOUNTING HEIGHT. BACKFILL WITH COARSE AGGREGATE MATERIAL.
10. POSTS SHALL NOT BE SET IN CONCRETE, OF ANY DEPTH.
11. SPECIAL FABRICATION WILL BE REQUIRED AT INSTALLATION LOCATIONS HAVING A CURVATURE OF LESS THAN 150 FT. RADIUS.
12. UNLESS OTHERWISE SHOWN IN THE PLANS, A COMPOSITE MATERIAL BLOCK THAT MEETS THE REQUIREMENTS OF DMS-7210,"COMPOSITE MATERIAL POSTS AND BLOCKS FOR METAL BEAM GUARD FENCE" MAY BE SUBSTITUTED FOR BLOCKS OF SIMILAR DIMENSIONS. THE CONSTRUCTION DIVISION, TXDOT MAINTAINS A MATERIAL PRODUCER LIST (MPL) FOR PRODUCERS OF MATERIALS CONFORMING TO DMS-7210 ONLY PRODUCERS ON THE MPL MAY FURNISH COMPOSITE MATERIAL BLOCKS.
13. FOR THE LOW FILL CULVERT OPTION, POSTS LOCATED PARTIALLY OR WHOLLY BETWEEN PRECAST BOX CULVERT UNITS, THE USE OF A CAST-IN-PLACE CONCRETE CLOSURE BETWEEN BOXES IS REQUIRED. THE LENGTH OF THE CAST-IN-PLACE CONCRETE CLOSURE SHALL ACCOMMODATE THE PLACEMENT OF THE LOW FILL CULVERT OPTION. SEE CONCRETE CLOSURE DETAILS ON BRIDGE STANDARD SCP-MD.
14. GUARDRAIL HEIGHT MEASUREMENT: WHEN THE GUARDRAIL IS LOCATED ABOVE PAVEMENT, MEASURE THE HEIGHT FROM THE PAVEMENT TO THE TOP OF THE W-BEAM RAIL. WHEN THE GUARDRAIL IS LOCATED UP TO 2 FT. OFF OF THE EDGE OF PAVEMENT OR FOR A PAVEMENT OVERLAY, USE A 10-FOOT STRAIGHTEDGE TO EXTEND THE PAVEMENT/SHOULDER SLOPE TO THE BACK OF RAIL, MEASURE FROM THE BOTTOM OF STRAIGHTEDGE TO THE TOP OF RAIL. FOR GUARDRAIL LOCATED DOWN A 10:1 SLOPE, MEASURE FROM THE NOMINAL TERRAIN.

Texas Department of Transportation

Design Division Standard

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

FILE: gf3119.dgn	DN: TxDOT	CK: KM	DW: VP	CK: CGL/AG	
©TxDOT: NOVEMBER 2019	CONT	SECT	JOB	HIGHWAY	
REVISIONS	0906	32	050, ETC.	MAIN ST	
	DIST	COUNTY		SHEET NO.	
	ODA	MIDLAND		40	

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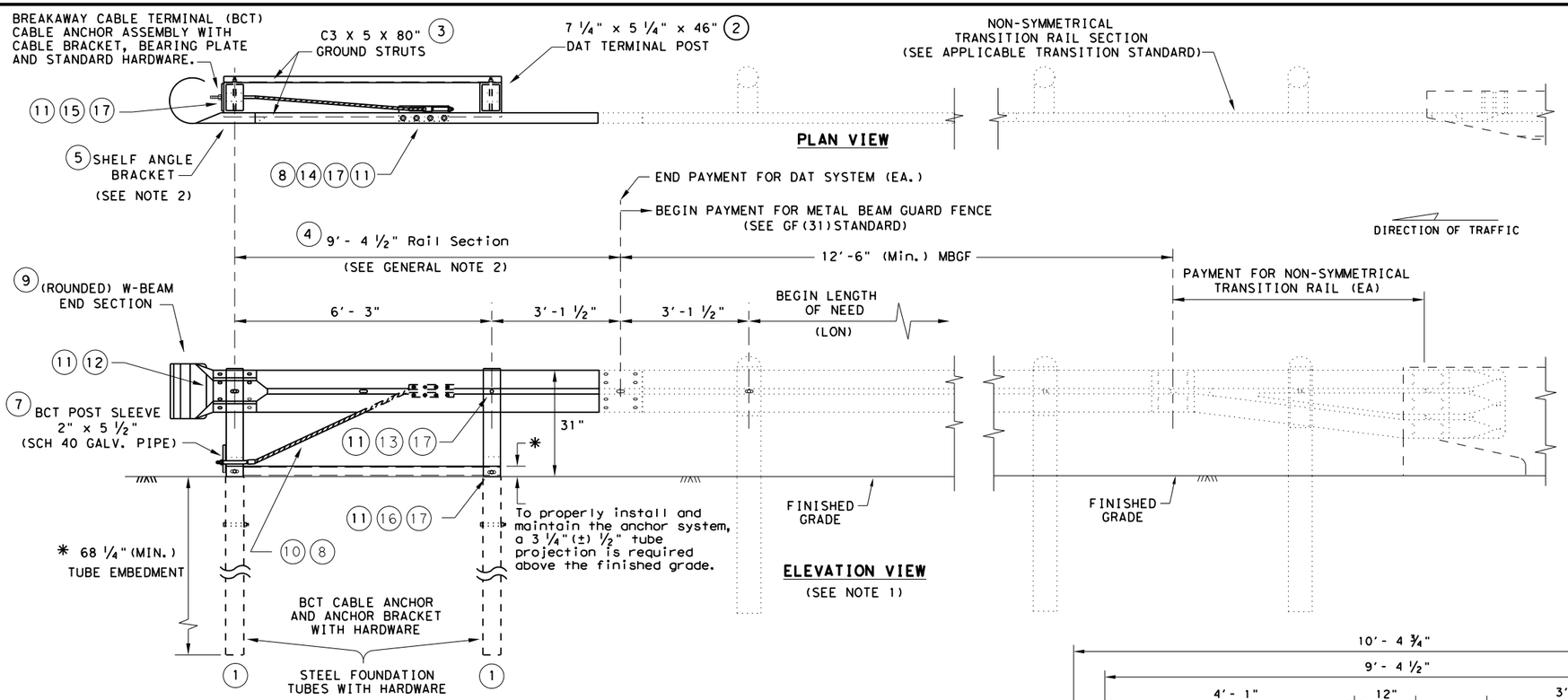


DOWNSTREAM ANCHOR TERMINAL (DAT)

NOTE: ONLY FOR DOWNSTREAM USE, WHEN LOCATED OUTSIDE THE HORIZONTAL CLEARANCE AREA OF OPPOSING TRAFFIC.

GENERAL NOTES

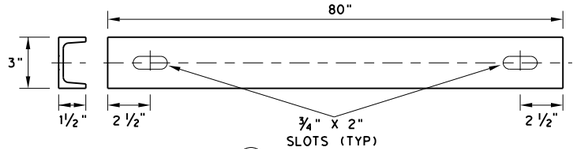
1. THE DETAIL SHOWN IS THE MINIMUM LENGTH OF NEED (LON) FOR A DOWNSTREAM ANCHOR TERMINAL (DAT) CONNECTED TO A CONCRETE RAIL.
2. THE RAIL SECTION AT THE END POST IS SUPPORTED BY THE SHELF ANGLE BRACKET. THE RAIL ELEMENT IS NOT ATTACHED TO THE END POST.
3. THE FOUNDATION TUBES SHALL NOT PROJECT MORE THAN 3 3/4" ABOVE THE FINISHED GRADE.
4. ALL HARDWARE FOR DAT SHALL BE ASTM A307 UNLESS OTHERWISE SHOWN.
5. REFER TO GF(31) SHEET FOR TERMINAL CONNECTION DETAILS.

MOW STRIP INSTALLATION

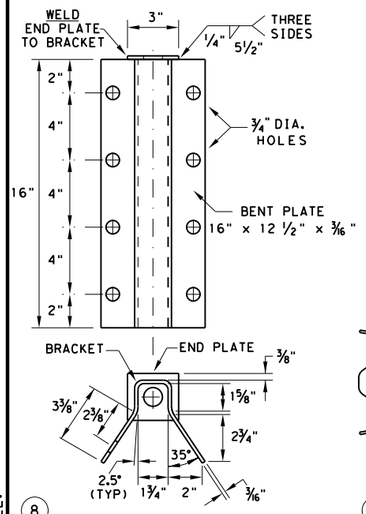
IF A MOW STRIP IS REQUIRED WITH THE DAT INSTALLATION THE LEAVE-OUT AREA AROUND THE STEEL FOUNDATION TUBES AND THE TWO CHANNEL STRUTS MAY BE OMITTED. THIS WILL REQUIRE A FULL POUR AT THE FOUNDATION TUBES.

#	(DAT) PARTS LIST	QTY
(1)	STEEL FOUNDATION TUBE	2
(2)	DAT TERMINAL POST	2
(3)	CHANNEL STRUT	2
(4)	TERMINAL RAIL ELEMENT	1
(5)	SHELF ANGLE BRACKET	1
(6)	BCT BEARING PLATE	1
(7)	BCT POST SLEEVE	1
(8)	GUARDRAIL ANCHOR BRACKET	1
(9)	(ROUNDED)W-BEAM END SECTION	1
(10)	BCT CABLE ANCHOR	1
(11)	RECESSED NUT, GUARDRAIL	20
(12)	1 1/4" BUTTON HEAD BOLT	4
(13)	10" BUTTON HEAD BOLT	2
(14)	5/8" X 2" HEX HEAD BOLT	8
(15)	5/8" X 8" HEX HEAD BOLT	4
(16)	5/8" X 10" HEX HEAD BOLT	2
(17)	5/8" FLAT WASHER	18

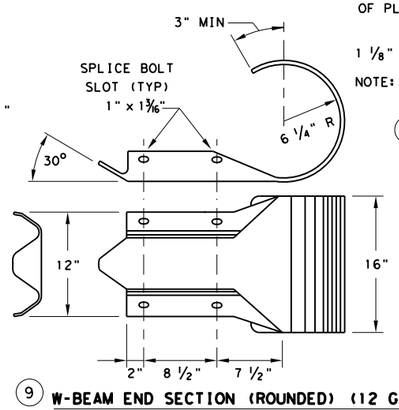
(4) TERMINAL RAIL ELEMENT FOR DAT



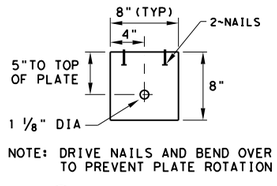
(3) CHANNEL STRUT
C3 X 5 X 80", GRADE A36



(8) GUARDRAIL ANCHOR BRACKET

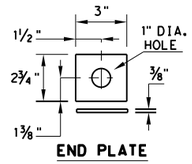


(9) W-BEAM END SECTION (ROUNDED) (12 GA.)

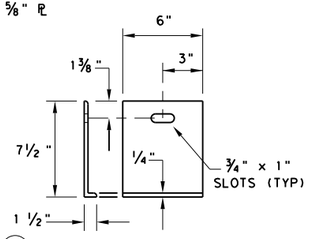


NOTE: DRIVE NAILS AND BEND OVER TO PREVENT PLATE ROTATION

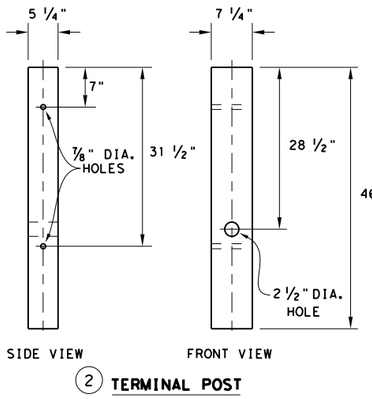
(6) BEARING PLATE
8"x 8"x 5/8" ℄



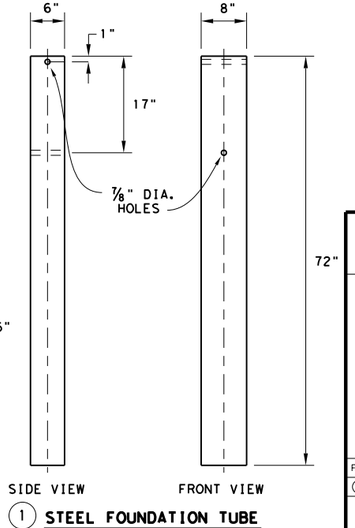
END PLATE



(5) SHELF ANGLE BRACKET



(2) TERMINAL POST
7 1/4"x 5 1/4"x 46" WOOD POST



(1) STEEL FOUNDATION TUBE
6"x 8"x 1/8" x 72" STEEL TUBE

Texas Department of Transportation

Design Division Standard

METAL BEAM GUARD FENCE (DOWNSTREAM ANCHOR TERMINAL) TL-3 MASH COMPLIANT

GF(31)DAT-19

FILE: gf31dat19.dgn	DN: TxDOT	CK: KM	DW: VP	CK: CGL/AG	
©TxDOT: NOVEMBER 2019	CONT	SECT	JOB	HIGHWAY	
REVISIONS	0906	32	050, ETC.	MAIN ST	
	DIST	COUNTY		SHEET NO.	
	ODA	MIDLAND		41	

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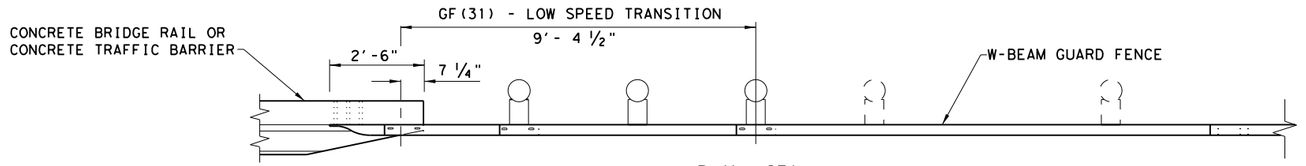
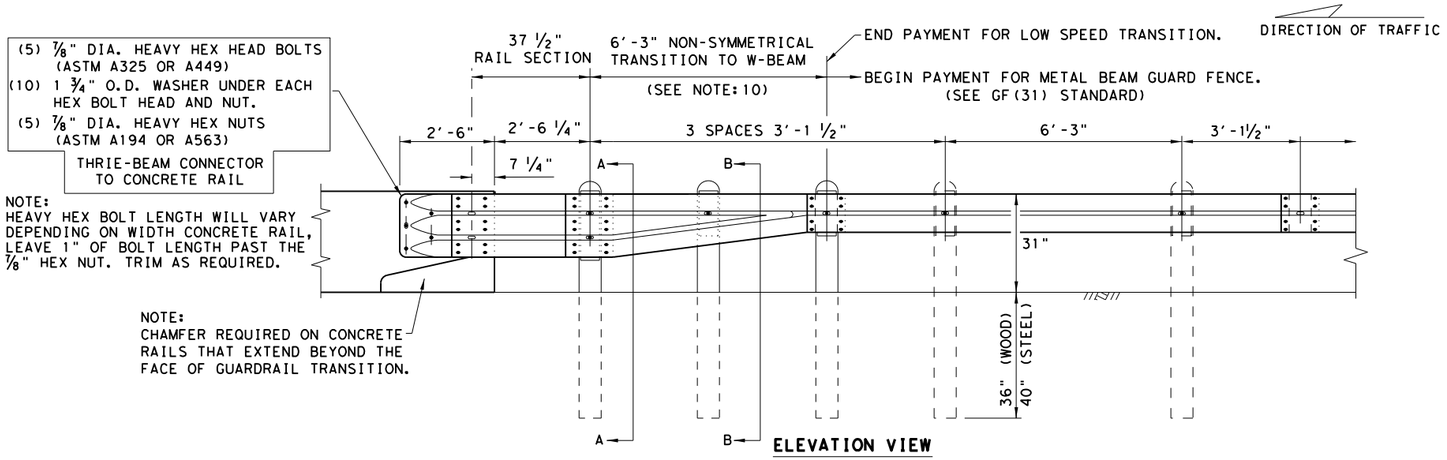


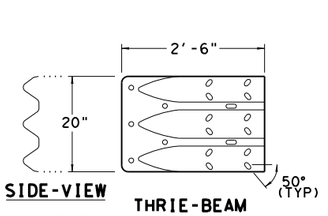
PLAN VIEW



ELEVATION VIEW

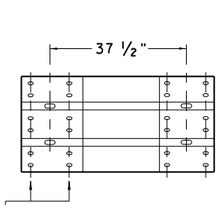
GENERAL NOTES

1. THE TYPE OF POST (ROUND WOOD POST, RECTANGULAR WOOD POST, OR STEEL POST) WILL BE AS SHOWN IN THE PLANS. THE EXACT POSITION OF TRANSITIONS SHALL BE AS SHOWN IN THE PLANS OR AS DIRECTED BY THE ENGINEER. REFER TO GF(31)STANDARD SHEET.
2. RAIL ELEMENT SHALL MEET THE REQUIREMENTS OF ITEM 540, "METAL BEAM GUARD FENCE" EXCEPT AS MODIFIED IN THE PLANS.
3. FITTINGS (BOLTS, NUTS, AND WASHERS) SHALL BE GALVANIZED IN ACCORDANCE WITH ITEM 445, "GALVANIZING." FITTINGS SHALL BE SUBSIDIARY TO THE BID ITEM REQUIRING CONSTRUCTION OF THE TRANSITION.
4. BUTTON HEAD "POST BOLTS & NUTS" SHALL MEET THE REQUIREMENTS OF (ASTM A307), AND SHALL BE OF SUFFICIENT LENGTH TO EXTEND THROUGH THE FULL THICKNESS OF THE NUT AND ⅝" WASHER (FWC16a) AND NOT MORE THAN 1" BEYOND IT. TRIM BOLT LENGTH TO MEET REQUIRED LENGTH.
5. POSTS SHALL NOT BE SET IN CONCRETE, OF ANY DEPTH.
6. CROWN SHALL BE WIDENED TO ACCOMMODATE TRANSITIONS.
7. WHERE SOLID ROCK IS ENCOUNTERED, CONTACT THE DESIGN DIVISION FOR ADDITIONAL GUIDANCE. (512) 416-2678
8. UNLESS OTHERWISE SHOWN IN THE PLANS, A COMPOSITE MATERIAL BLOCK THAT MEETS THE REQUIREMENTS OF DMS-7210, "COMPOSITE MATERIAL POSTS AND BLOCKS FOR METAL BEAM GUARD FENCE" MAY BE SUBSTITUTED FOR BLOCKS OF SIMILAR DIMENSIONS. THE CONSTRUCTION DIVISION, TXDOT, MAINTAINS A MATERIAL PRODUCER LIST (MPL) FOR PRODUCERS OF MATERIALS CONFORMING TO DMS-7210. ONLY PRODUCERS ON THE MPL CAN FURNISH COMPOSITE MATERIAL BLOCKS.
9. REFER TO GF(31)STANDARD SHEET & BRIDGE RAILING DETAILS FOR ADDITIONAL DETAILS.
10. FOR ROUND WOOD POSTS SYSTEMS, ALL ROUND WOOD POSTS SHALL BE 7 ½" DIA. MINIMUM THROUGHOUT THE TRANSITION.

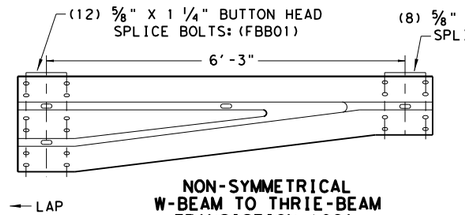


SIDE-VIEW

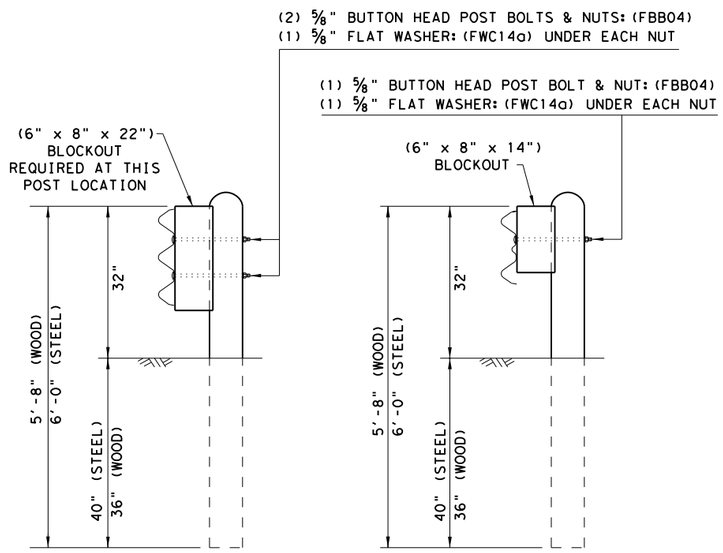
THRIE-BEAM TERMINAL CONNECTOR 10GA.
PART DESIGNATOR RTE01b



THRIE-BEAM RAIL SHORT SECTION 10GA.
PART DESIGNATOR RTM01a



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



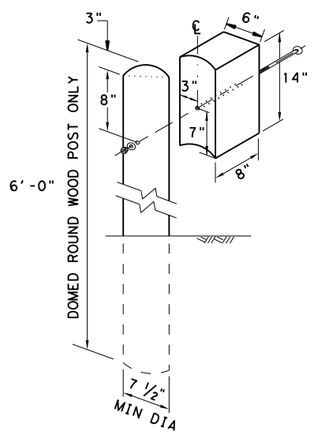
SECTION A-A

SECTION B-B

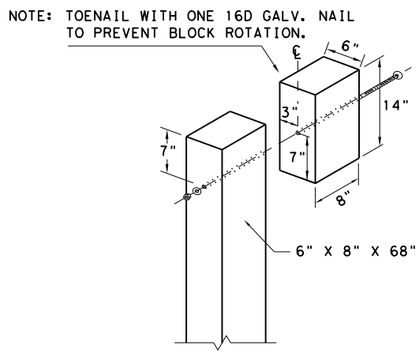
NOTE: * "WOOD" INDICATES DIMENSIONS FOR BOTH ROUND AND RECTANGULAR WOOD POST SYSTEMS.

PLATE WASHER INSTRUCTIONS

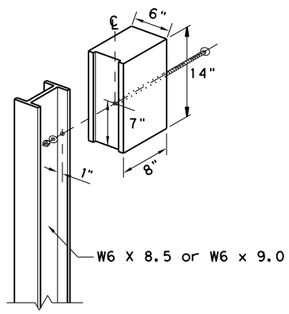
BRIDGE APPROACH - UPSTREAM: THE SHORT RAIL LAPS OVER THE TERMINAL CONNECTOR. PLATE WASHERS ARE INSTALLED UNDER THE SPLICE NUTS AGAINST INSIDE OF CONNECTOR.
BRIDGE EXIT - DOWNSTREAM: THE TERMINAL CONNECTOR LAPS OVER THE NESTED RAIL. PLATE WASHERS ARE INSTALLED UNDER THE BOLT HEAD AGAINST OUTSIDE OF CONNECTOR.



WOOD BLOCK TO ROUND WOOD POST



WOOD BLOCK TO RECTANGULAR WOOD POST



ROUTED WOOD BLOCK TO I-BEAM STEEL POST

LOW-SPEED TRANSITION

Texas Department of Transportation | Design Division Standard

METAL BEAM GUARD FENCE THRIE-BEAM TRANSITION TL-2 MASH COMPLIANT

GF(31)TR TL2-19

FILE: gf31trtl219.dgn	DN: TxDOT	CK: KM	DW: VP	CK: CGL/AG
©TxDOT: NOVEMBER 2019 REVISIONS	CONT	SECT	JOB	HIGHWAY
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				42

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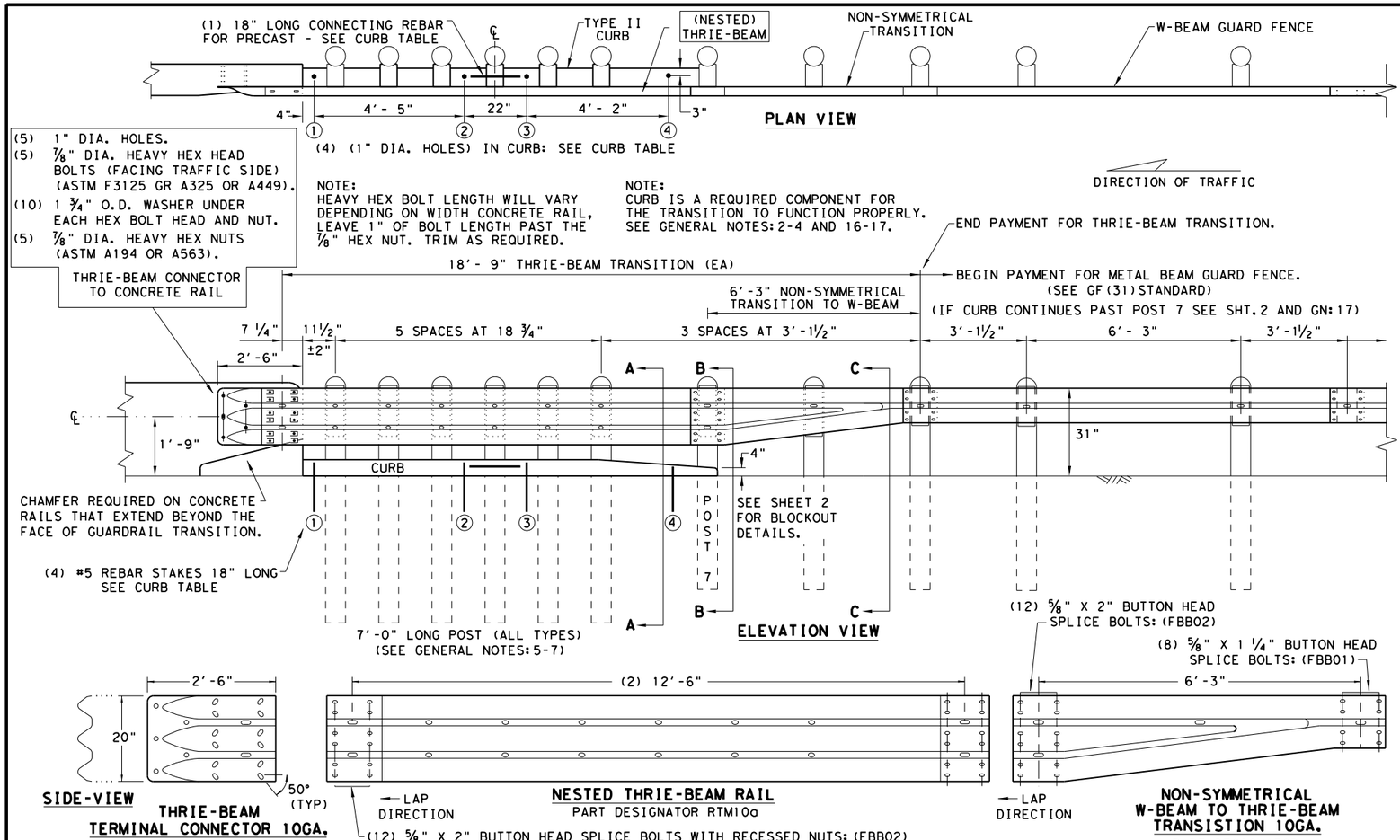
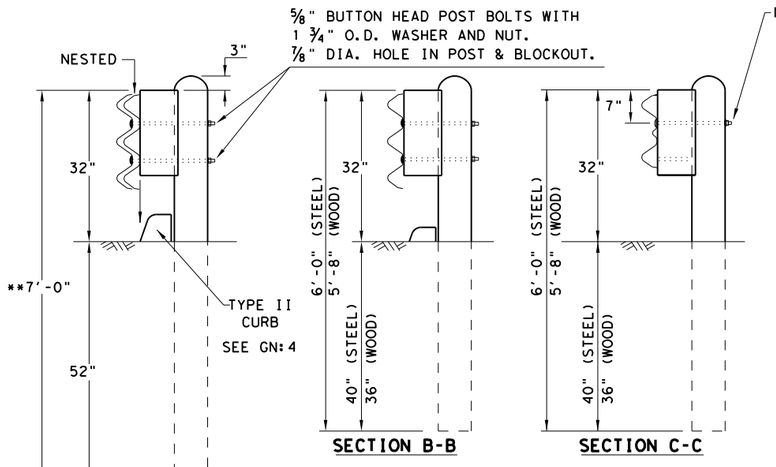
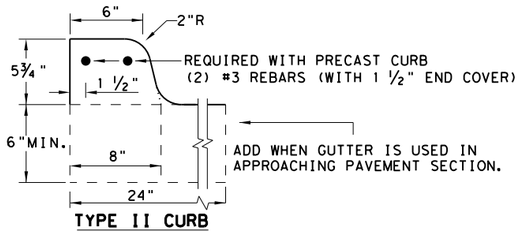


GENERAL NOTES

1. CONTACT THE DESIGN DIVISION FOR DRAINAGE CUT OUT OPTIONS NEEDED WITHIN THE CURB SECTION OF THE THRIE-BEAM TRANSITION. (512) 416-2678
2. CONCRETE CURB MAY BE CAST-IN-PLACE OR PRECAST AS SHOWN ON THIS SHEET. WHEN USED IN CONJUNCTION WITH THE THRIE-BEAM TRANSITIONS, CURB SHALL BE TYPE II (5- ¾" HEIGHT); SEE CURRENT CCCG STANDARD SHEET FOR FURTHER DETAILS. IF OTHER CURB HEIGHTS ARE SHOWN IN THE PLANS IN CONJUNCTION WITH THE TRANSITION, THE CURB HEIGHT MAY BE FROM 4" TO 8" WITH A RELATIVELY VERTICAL FACE. CONCRETE CURB SHALL BE CONTINUOUS TO THE SEVENTH POST UNLESS OTHERWISE SHOWN IN THE PLANS. SEE GENERAL NOTE: 17 FOR CIRCUMSTANCES WHERE CURB CONTINUES PAST POST 7.
3. CONCRETE CURB TYPE II SUBSIDIARY TO "METAL BEAM GUARD FENCE TRANSITION". IF NO ADDITIONAL CURB IS INDICATED BEYOND THE TRANSITION, THEN ANY CURB HEIGHT GREATER THAN 4" WILL BE TAPERED DOWN BEGINNING AT THE LAST 7 FT. POST TO A MAXIMUM HEIGHT OF 4" AT POST 7. IF SHOWN ELSEWHERE IN THE PLANS, ADDITIONAL CURB UNDERNEATH GUARDRAIL WILL BE PAID FOR BY THE LINEAR FOOT.
4. UNLESS OTHERWISE SHOWN IN THE PLANS, TRANSITIONS SHALL BE PLACED WITH THE BLOCKOUT FACE IN FRONT OF OR DIRECTLY ABOVE THE CURB FACE. SEE SECTION A-A.
5. FOR ROUND WOOD POST SYSTEMS, ALL ROUND WOOD POSTS SHALL BE 7 ½" DIA. MINIMUM THROUGHOUT THE THRIE-BEAM TRANSITION.
6. THE TYPE OF POST (ROUND WOOD POST, RECTANGULAR WOOD POST OR STEEL POST) WILL BE AS SHOWN IN THE PLANS. REFER TO GF(31) STANDARD SHEET.
7. THE POST LENGTH SHALL BE MARKED ON ALL 7'- 0" LONG POSTS BY THE MANUFACTURER. THE MARK SHALL BE LOCATED WITHIN THE TOP 1 FT. REGION OF THE POST, AT LEAST ⅝" IN HEIGHT, AND VISIBLE AFTER INSTALLATION. WOODEN POSTS SHALL BE MARKED WITH A BRAND, AND STEEL POSTS WITH A STENCIL BEFORE GALVANIZING.
8. POSTS SHALL NOT BE SET IN CONCRETE, OF ANY DEPTH.
9. RAIL ELEMENTS SHALL MEET THE REQUIREMENTS OF ITEM 540, "METAL BEAM GUARD FENCE" EXCEPT AS MODIFIED ON THE PLANS. THE THRIE-BEAM TERMINAL CONNECTOR AND THE THRIE-BEAM TRANSITION TO W-BEAM SHALL BE OF THE SAME MATERIAL, BUT SHALL NOT BE LESS THAN 10 GAUGE. CONTRACTOR SHALL VERIFY THAT THE LOCATIONS OF BOLT HOLES MATCH THOSE IN THE THRIE-BEAM TERMINAL CONNECTOR PRIOR TO ORDERING MATERIALS.
10. BUTTON HEAD "POST BOLTS & NUTS" SHALL MEET THE REQUIREMENTS OF (ASTM A307), AND SHALL BE OF SUFFICIENT LENGTH TO EXTEND THROUGH THE FULL THICKNESS OF THE NUT AND ⅝" WASHER (FWC16a) AND NOT MORE THAN 1" BEYOND IT. TRIM REMAINING BOLT LENGTH TO MEET REQUIRED LENGTH.
11. FITTINGS (BOLTS, NUTS, AND WASHERS) SHALL BE GALVANIZED IN ACCORDANCE WITH ITEM 445, "GALVANIZING". FITTINGS SHALL BE SUBSIDIARY TO THE BID ITEM.
12. CROWN SHALL BE WIDENED TO ACCOMMODATE TRANSITIONS.
13. WHERE SOLID ROCK IS ENCOUNTERED, CONTACT THE DESIGN DIVISION FOR ADDITIONAL GUIDANCE. (512) 416-2678
14. UNLESS OTHERWISE SHOWN IN THE PLANS, A COMPOSITE MATERIAL BLOCK THAT MEETS THE REQUIREMENTS OF DMS-7210, "COMPOSITE MATERIAL POSTS AND BLOCKS FOR METAL BEAM GUARD FENCE" MAY BE SUBSTITUTED FOR BLOCKS OF SIMILAR DIMENSIONS. TXDOT'S MATERIALS AND TESTS DIVISION MAINTAINS A MATERIAL PRODUCER LIST (MPL) FOR PRODUCERS OF MATERIALS CONFORMING TO DMS-7210. ONLY PRODUCERS ON THE MPL CAN FURNISH COMPOSITE MATERIAL BLOCKS.
15. REFER TO GF(31) STANDARD SHEET & BRIDGE RAILING DETAILS FOR ADDITIONAL DETAILS.
16. THE INSTALLATION OF THE TYPE II CURB IS CRITICAL FOR THE PERFORMANCE OF THE THRIE-BEAM TRANSITION SYSTEM. THE CURB PREVENTS (VEHICLE WHEEL SNAGGING) AT THE CONCRETE RAIL AND IS REQUIRED TO MEET MASH CRASH TEST CRITERIA.
17. IF CURB EXTENDS BEYOND POST 7, 25' OF NESTED W-BEAM GUARDRAIL SHALL BE INSTALLED BEYOND THE PAY LIMITS OF THRIE-BEAM TRANSITION SECTION, (SEE SHT.2). PAYMENT FOR THIS 25' SECTION WILL BE BY LINEAR FOOT, PAY ITEM "0540 6XXX MTL W-BEAM GD FEN (NESTED)(TIM POST)" OR "540 6XXX MTL W-BEAM GD FEN (NESTED)(STEEL POST)" AS APPLICABLE FOR POST TYPE. SEE SHT.2 FOR ADDITIONAL INFORMATION.



THRIE-BEAM TERMINAL - CURB TABLE
PRECAST CURB FULL LENGTH EQUALS 12'- 2" THE PRECAST CURB MAY BE FORMED INTO TWO SECTIONS.
CURB (1) LENGTH 5'- 8" CURB (2) LENGTH 6'- 6" TAPER CURB (2) TO A HEIGHT OF 4" AT POST 7
CONNECTING PRECAST CURB SECTIONS (1) & (2): FORM OR CORE 1" DIA. HOLE 9" LONG INTO EACH CURB END. USE (1) #5 GR.60 REBAR 18" LONG TO CONNECT BOTH CURBS.
SECURING PRECAST OR CAST-IN-PLACE TO FINISHED GRADE *: FORM OR CORE (4) 1" DIA. HOLES, SEE PLAN AND ELEVATION VIEWS FOR HOLE LOCATIONS. DRIVE (4) #5 GR.60 REBAR STAKES 18" LONG INTO THE GROUND AND ½" BELOW TOP OF CURB. FILL HOLES WITH APPROVED GROUT MIXTURE.



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

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

TYPE II CURB DETAILS

HIGH-SPEED TRANSITION

SHEET 1 OF 2

Texas Department of Transportation — Design Division Standard

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

GF(31)TR TL3-20

FILE: gf31trtl320.dgn	DN: TxDOT	CK: KM	DW: VP	CK: CGL/AG	
©TxDOT: NOVEMBER 2020	CONT	SECT	JOB	HIGHWAY	
REVISIONS	0906	32	050, ETC.	MAIN ST	
	DIST	COUNTY		SHEET NO.	
	ODA	MIDLAND		43	

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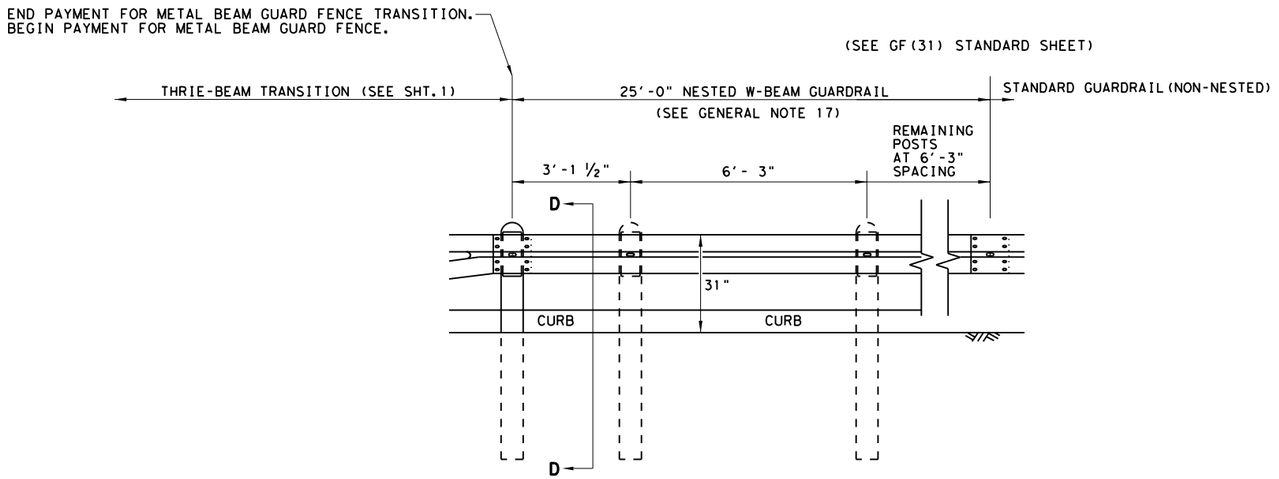
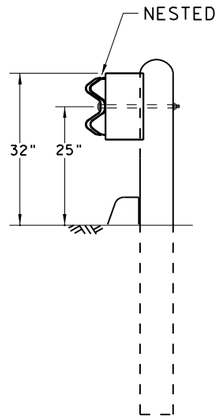
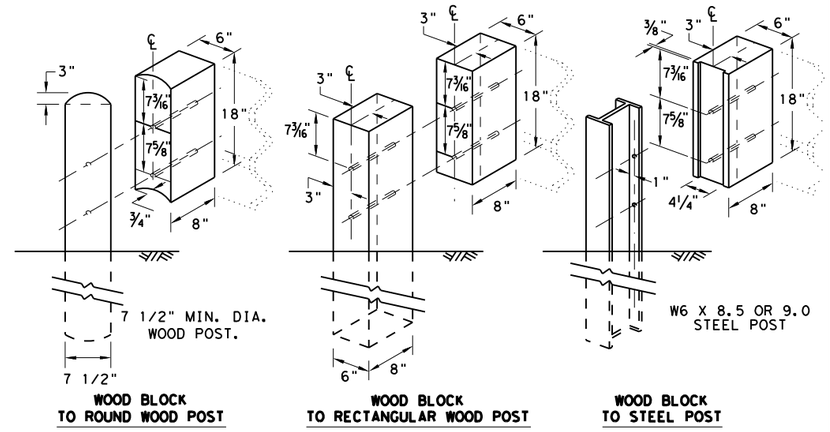
REQUIRED ALTERNATIVE FOR CONTINUOUS CURB EXTENDING PAST POST 7 (SEE SHT. 1 GENERAL NOTE 17)



ELEVATION VIEW



SECTION D-D



THRIE BEAM TRANSITION BLOCKOUT DETAILS

HIGH-SPEED TRANSITION

SHEET 2 OF 2

Texas Department of Transportation | Design Division Standard

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

GF(31)TR TL3-20

FILE: gf31tr1320.dgn	DN: TxDOT	CK: KM	DW: KM	CK: CGL/AG	
©TxDOT: NOVEMBER 2020	CONT	SECT	JOB	HIGHWAY	
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	DIST	COUNTY		SHEET NO.	
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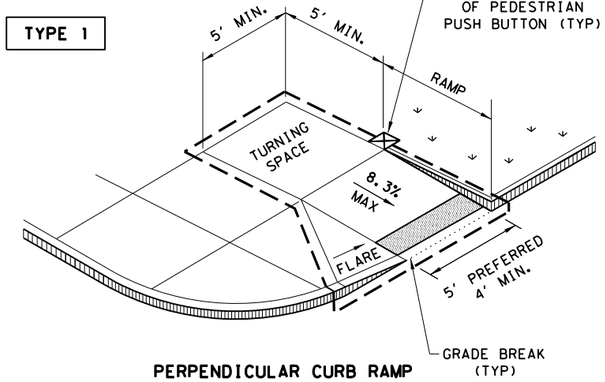
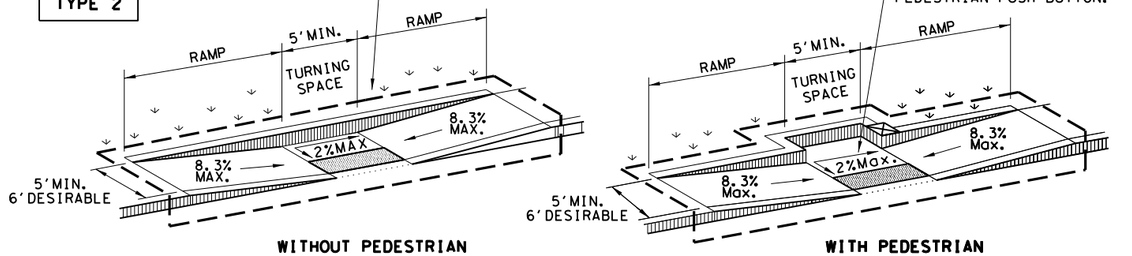
TYPE 1



PERPENDICULAR CURB RAMP

TYPE 2

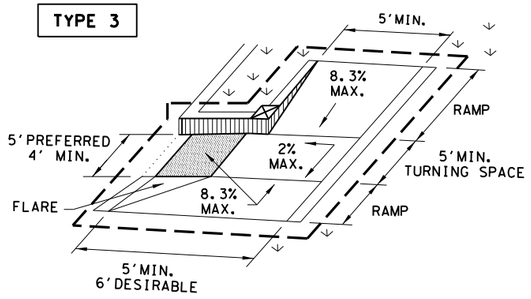


WITHOUT PEDESTRIAN PUSH BUTTON

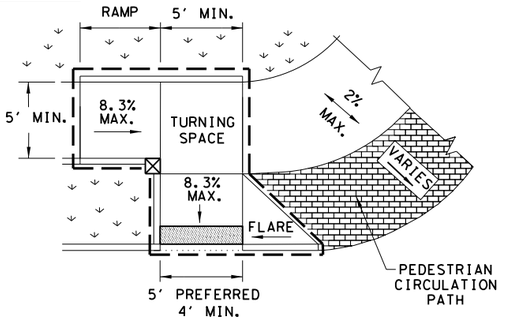
WITH PEDESTRIAN PUSH BUTTON

PARALLEL CURB RAMP

TYPE 3

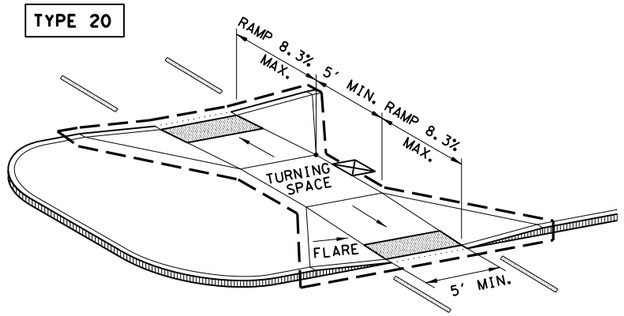


TYPE 6



COMBINATION CURB RAMPS

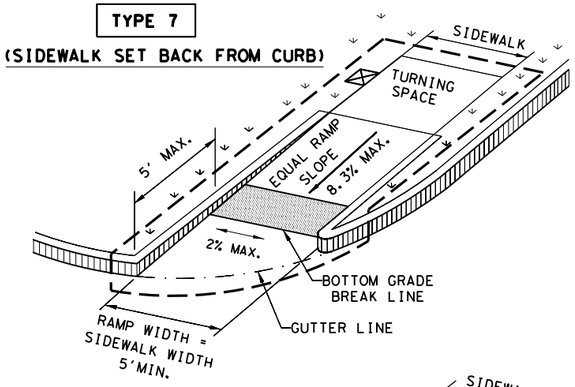
TYPE 20



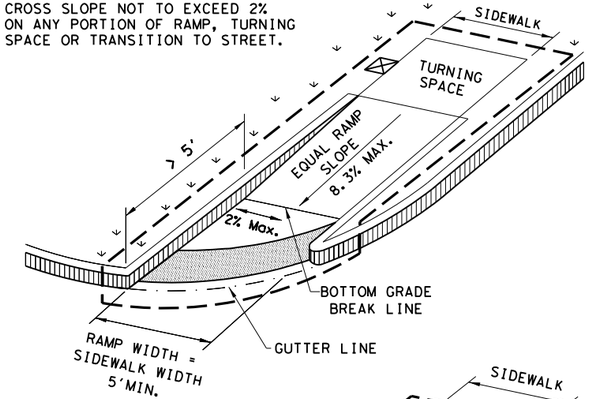
CURB RAMPS AT MEDIAN ISLANDS

TYPE 7

(SIDEWALK SET BACK FROM CURB)

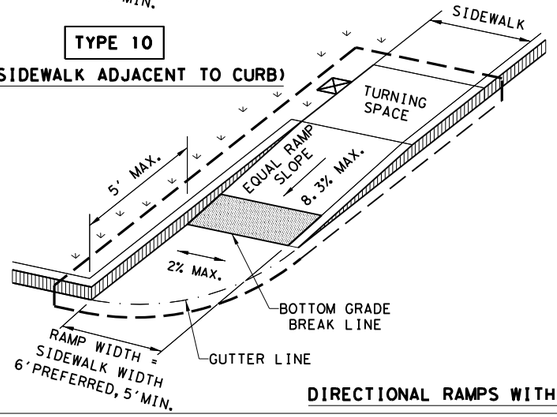


CROSS SLOPE NOT TO EXCEED 2% ON ANY PORTION OF RAMP, TURNING SPACE OR TRANSITION TO STREET.

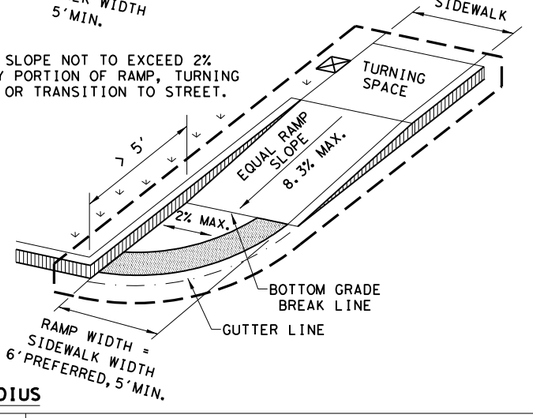


TYPE 10

(SIDEWALK ADJACENT TO CURB)

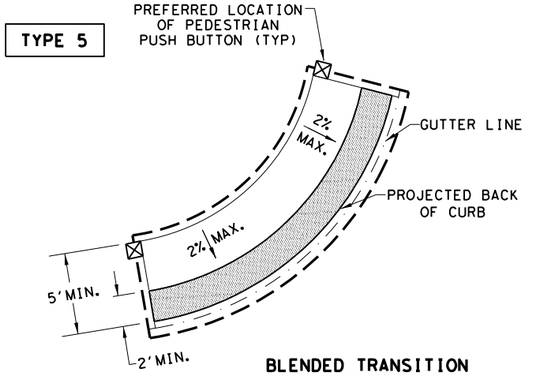


CROSS SLOPE NOT TO EXCEED 2% ON ANY PORTION OF RAMP, TURNING SPACE OR TRANSITION TO STREET.



DIRECTIONAL RAMPS WITHIN RADIUS

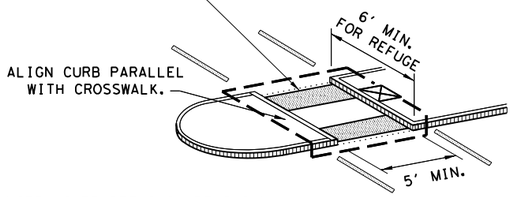
TYPE 5



BLENDED TRANSITION
(FLUSH LANDING)

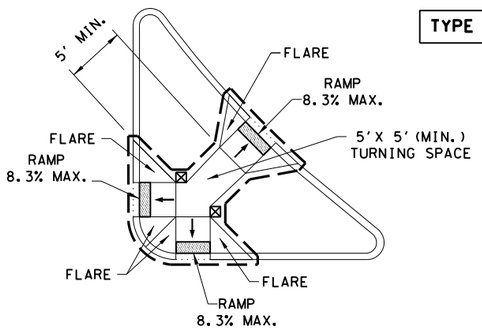
TYPE 21

INSTALL DETECTABLE WARNING SURFACE AT EACH END OF THE CUT-THROUGH RAMP WITH A MINIMUM 2' USUAL SIDEWALK SURFACE BETWEEN. IF MEDIAN IS LESS THAN 6' WIDE, ELIMINATE DETECTABLE WARNING SURFACES.



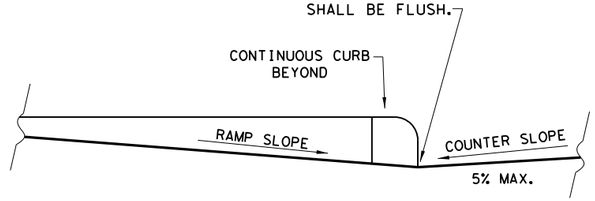
NOTE: CURB DETAILS ARE SHOWN ELSEWHERE IN THE PLANS.

TYPE 22



COMBINATION ISLAND RAMPS

BOTTOM GRADE BREAK OF CURB RAMP WILL NORMALLY BE AT GUTTER LINE. SURFACE SLOPES AT GRADE BREAKS SHALL BE FLUSH.



TYPICAL SECTION OF PERPENDICULAR CURB RAMP AT CONNECTION TO ROADWAY

NOTES / LEGEND:

SEE GENERAL NOTES ON SHEET 2 OF 4 FOR MORE INFORMATION.

DENOTES PLANTING OR NON-WALKING SURFACE NOT PART OF PEDESTRIAN CIRCULATION PATH.

DETECTABLE WARNING SURFACE

DENOTES PREFERRED LOCATION OF PEDESTRIAN PUSH BUTTON IF APPLICABLE.

GUTTER LINE

GRADE BREAK

RAMP LIMITS OF PAYMENT

SHEET 1 OF 4

Texas Department of Transportation

Design Division Standard

PEDESTRIAN FACILITIES CURB RAMPS

PED-18

FILE: ped18	DN: TxDOT	DW: VP	CK: KM	CK: PK & JG	
© TxDOT: MARCH, 2002	CONT	SECT	JOB	HIGHWAY	
REVISIONS	0906	32	050, ETC	MAIN ST	
REVISED 08, 2005 REVISED 06, 2012 REVISED 01, 2018	DIST	COUNTY		SHEET NO.	
	ODA	MIDLAND		45	

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DATE:
FILE:

GENERAL NOTES

CURB RAMPS

1. Install a curb ramp or blended transition at each pedestrian street crossing.
2. All slopes shown are maximum allowable. Cross slopes of 1.5% and lesser running should be used. Adjust curb ramp length or grade of approach sidewalks as directed.
3. Maximum allowable cross slope on sidewalk and curb ramp surfaces is 2%.
4. The minimum sidewalk width is 5'. Where the sidewalk is adjacent to the back of curb, a 6' sidewalk width is desirable. Where a 5' sidewalk cannot be provided due to site constraints, sidewalk width may be reduced to 4' for short distances. 5'x 5' passing areas at intervals not to exceed 200' are required.
5. Turning Spaces shall be 5'x 5' minimum. Cross slope shall be maximum 2%.
6. Clear space at the bottom of curb ramps shall be a minimum of 4'x 4' wholly contained within the crosswalk and wholly outside the parallel vehicular travel path.
7. Provide flared sides where the pedestrian circulation path crosses the curb ramp. Flared sides shall be sloped at 10% maximum, measured parallel to the curb. Returned curbs may be used only where pedestrians would not normally walk across the ramp, either because the adjacent surface is planted, substantially obstructed, or otherwise protected.
8. Additional information on curb ramp location, design, light reflective value and texture may be found in the latest draft of the Proposed Guidelines for Pedestrian Facilities in the Public Right of Way (PROWAG) as published by the U.S. Architectural and Transportation Barriers Compliance Board (Access Board).
9. To serve as a pedestrian refuge area, the median should be a minimum of 6' wide, measured from back of curbs. Medians should be designed to provide accessible passage over or through them.
10. Small channelization islands, which do not provide a minimum 5'x 5' landing at the top of curb ramps, shall be cut through level with the surface of the street.
11. Crosswalk dimensions, crosswalk markings and stop bar locations shall be as shown elsewhere in the plans. At intersections where crosswalk markings are not required, curb ramps shall align with theoretical crosswalks unless otherwise directed.
12. Provide curb ramps to connect the pedestrian access route at each pedestrian street crossing. Handrails are not required on curb ramps.
13. Curb ramps and landings shall be constructed and paid for in accordance with Item 531 "Sidewalks".
14. Place concrete at a minimum depth of 5" for ramps, flares and landings, unless otherwise directed.
15. Furnish and install No. 3 reinforcing steel bars at 18" o.c. both ways, unless otherwise directed.
16. Provide a smooth transition where the curb ramps connect to the street.
17. Curbs shown on sheet 1 within the limits of payment are considered part of the curb ramp for payment, whether it is concrete curb, gutter, or combined curb and gutter.
18. Existing features that comply with applicalble standards may remain in place unless otherwise shown on the plans.

DETECTABLE WARNING MATERIAL

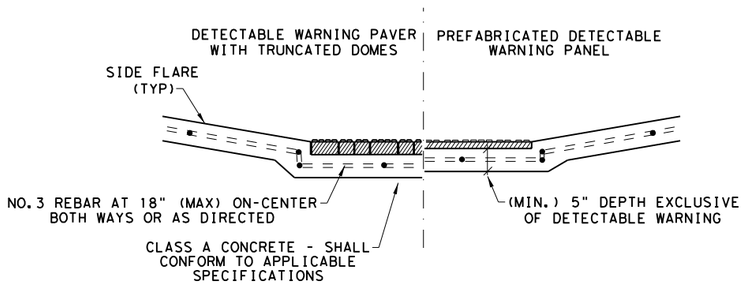
19. Curb ramps must contain a detectable warning surface that consists of raised truncated domes complying with PROWAG. The surface must contrast visually with adjoining surfaces, including side flares. Furnish and install an approved cast-in-place dark brown or dark red detectable warning surface material adjacent to uncolored concrete, unless specified elsewhere in the plans.
20. Detectable Warning Materials must meet TxDOT Departmental Materials Specification DMS 4350 and be listed on the Material Producer List. Install products in accordance with manufacturer's specifications.
21. Detectable warning surfaces must be firm, stable and slip resistant.
22. Detectable warning surfaces shall be a minimum of 24 inches in depth in the direction of pedestrian travel, and extend the full width of the curb ramp or landing where the pedestrian access route enters the street.
23. Detectable warning surfaces shall be located so that the edge nearest the curb line is at the back of curb and neither end of that edge is greater than 5 feet from the back of curb. Detectable warning surfaces may be curved along the corner radius.
24. Shaded areas on Sheet 1 of 4 indicate the approximate location for the detectable warning surface for each curb ramp type.

DETECTABLE WARNING PAVERS (IF USED)

25. Furnish detectable warning paver units meeting all requirements of ASTM C-936, C-33. Lay in a two by two unit basket weave pattern or as directed.
26. Lay full-size units first followed by closure units consisting of at least 25 percent (25%) of a full unit. Cut detectable warning paver units using a power saw.

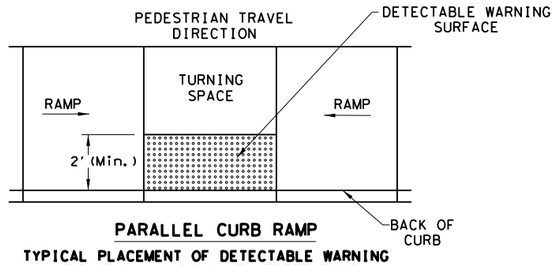
SIDEWALKS

27. Provide clear ground space at operable parts, including pedestrian push buttons. Operable parts shall be placed within unobstructed reach range specified in PROWAG section R406.
28. Place traffic signal or illumination poles, ground boxes, controller boxes, signs, drainage facilities and other items so as not to obstruct the pedestrian access route or clear ground space.
29. Street grades and cross slopes shall be as shown elsewhere in the plans.
30. Changes in level greater than 1/4 inch are not permitted.
31. The least possible grade should be used to maximize accessibility. The running slope of sidewalks and crosswalks within the public right of way may follow the grade of the parallel roadway. Where a continuous grade greater than five percent (5%) must be provided, handrails may be desirable to improve accessibility. Handrails may also be needed to protect pedestrians from potentially hazardous conditions. If provided, handrails shall comply with PROWAG R409.
32. Handrail extensions shall not protrude into the usable landing area or into intersecting pedestrian routes.
33. Driveways and turnouts shall be constructed and paid for in accordance with Item "Intersections, Driveways and Turnouts". Sidewalks shall be constructed and paid for in accordance with Item, "Sidewalks".
34. Sidewalk details are shown elsewhere in the plans.

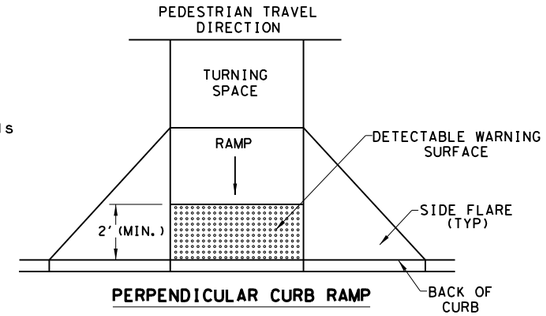


SECTION VIEW DETAIL
CURB RAMP AT DETECTIBLE WARNINGS

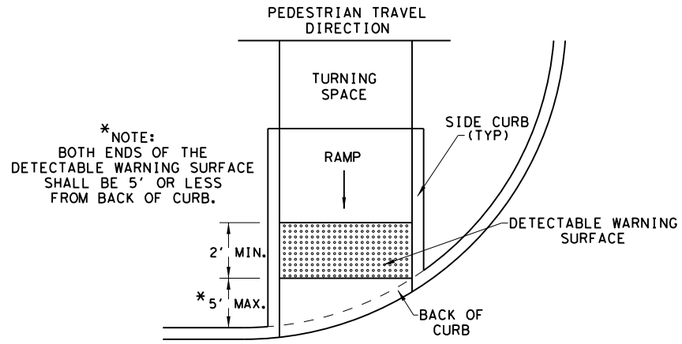
DETECTABLE WARNING SURFACE DETAILS



PARALLEL CURB RAMP
TYPICAL PLACEMENT OF DETECTABLE WARNING SURFACE ON LANDING AT STREET EDGE.



PERPENDICULAR CURB RAMP
TYPICAL PLACEMENT OF DETECTABLE WARNING SURFACE ON SLOPING RAMP RUN.



DIRECTIONAL CURB RAMP
TYPICAL PLACEMENT OF DETECTABLE WARNING SURFACE ON SLOPING RAMP RUN.

Texas Department of Transportation | Design Division Standard

PEDESTRIAN FACILITIES CURB RAMPS

PED-18

FILE: ped18	DN: TxDOT		DW: VP	CK: KM	CK: PK & JG
© TxDOT: MARCH, 2002	CONT	SECT	JOB		HIGHWAY
REVISIONS REVISED 08, 2005 REVISED 06, 2012 REVISED 01, 2018	0906	32	050, ETC		MAIN ST
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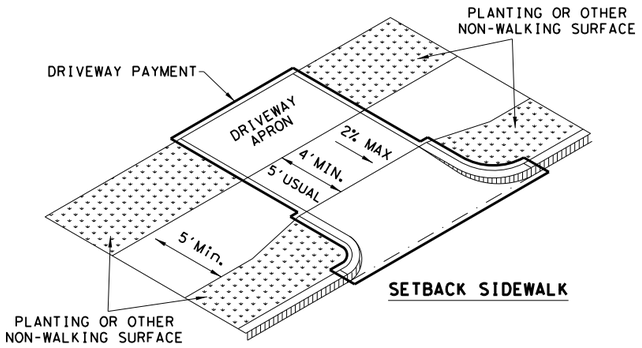
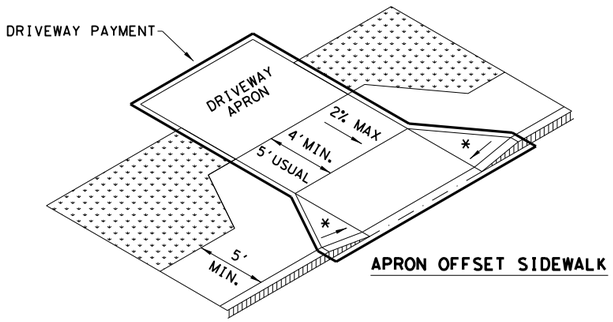
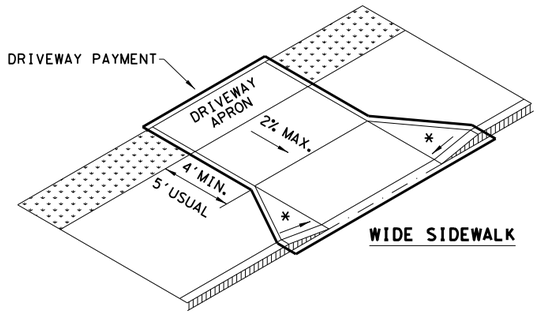
SIDEWALK TREATMENT AT DRIVEWAYS



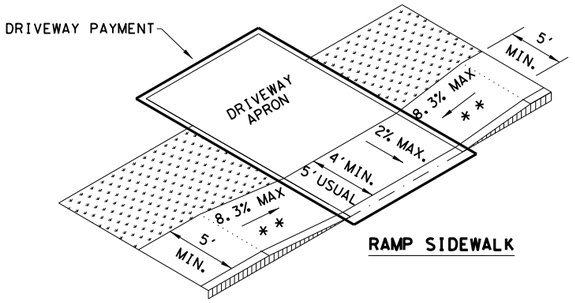
SETBACK SIDEWALK



APRON OFFSET SIDEWALK



WIDE SIDEWALK

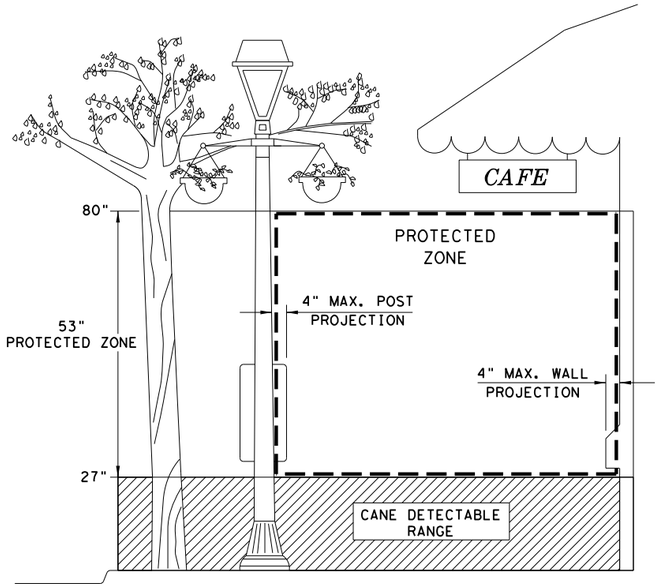


RAMP SIDEWALK

NOTES:

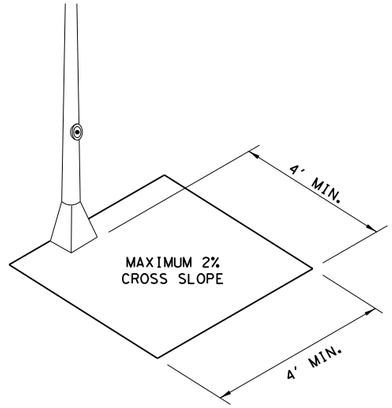
* WHERE DRIVEWAYS CROSS THE PEDESTRIAN ROUTE, SIDES SHALL BE FLARED AT 10% MAX SLOPE.

* * IF CURB HEIGHT IS GREATER THAN 6 INCHES, USE GRADE LESS THAN OR EQUAL TO 5%. HANDRAIL AND DETECTABLE WARNING ARE NOT REQUIRED.

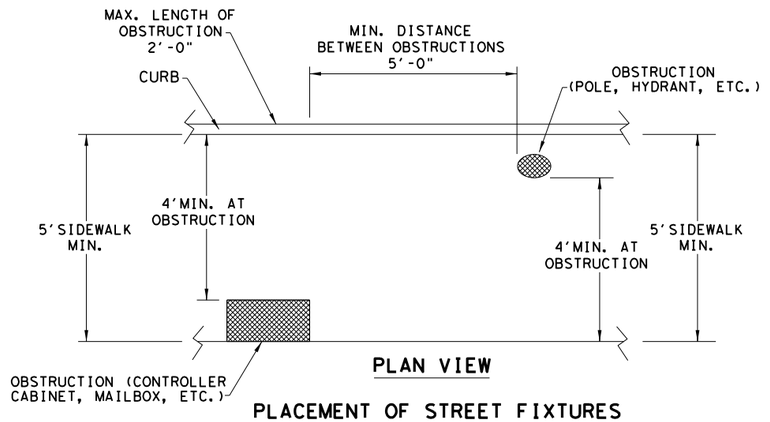


PROTECTED ZONE

NOTE: IN PEDESTRIAN CIRCULATION AREA, MAXIMUM 4" PROJECTION FOR POST OR WALL MOUNTED OBJECTS BETWEEN 27" AND 80" ABOVE THE SURFACE.



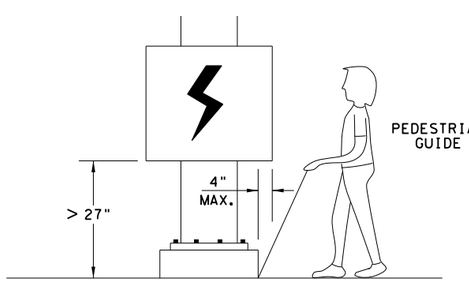
CLEAR SPACE ADJACENT TO PEDESTRIAN PUSH BUTTON



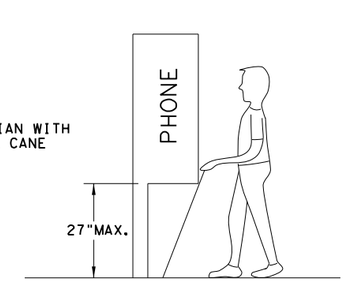
PLAN VIEW

PLACEMENT OF STREET FIXTURES

NOTE: ITEMS NOT INTENDED FOR PUBLIC USE. MINIMUM 4' X 4' CLEAR GROUND SPACE REQUIRED AT PUBLIC USE FIXTURES.



WHEN AN OBSTRUCTION OF A HEIGHT GREATER THAN 27" FROM THE SURFACE WOULD CREATE A PROTRUSION OF MORE THAN 4" INTO THE PEDESTRIAN CIRCULATION AREA, CONSTRUCT ADDITIONAL CURB OR FOUNDATION AT THE BOTTOM TO PROVIDE A MAXIMUM 4" OVERHANG.



PROTRUDING OBJECTS OF A HEIGHT ≤ 27" ARE DETECTABLE BY CANE AND DO NOT REQUIRE ADDITIONAL TREATMENT.

DETECTION BARRIER FOR VERTICAL CLEARANCE < 80"

Texas Department of Transportation

Design Division Standard

PEDESTRIAN FACILITIES CURB RAMPS

PED-18

FILE: ped18	DN: TxDOT		DW: VP	CK: KM	CK: PK & JG
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	DIST		COUNTY		SHEET NO.
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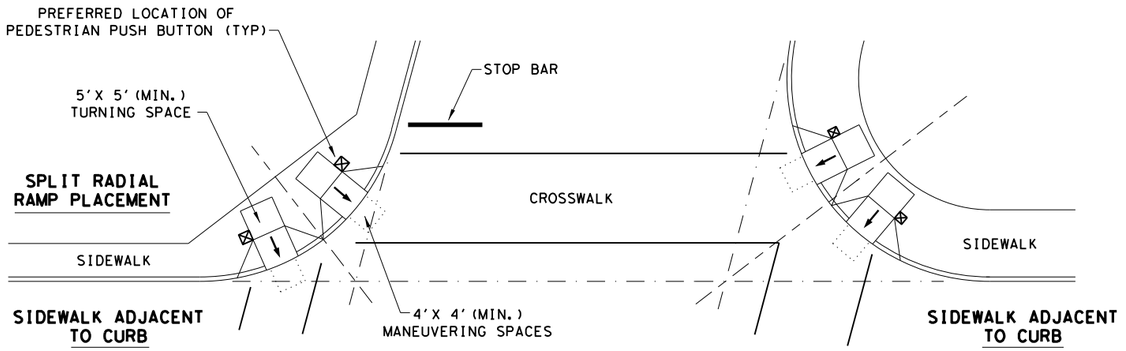
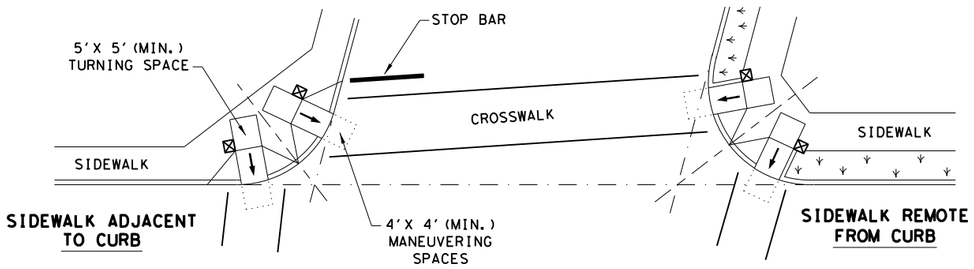
TYPICAL CROSSING LAYOUTS

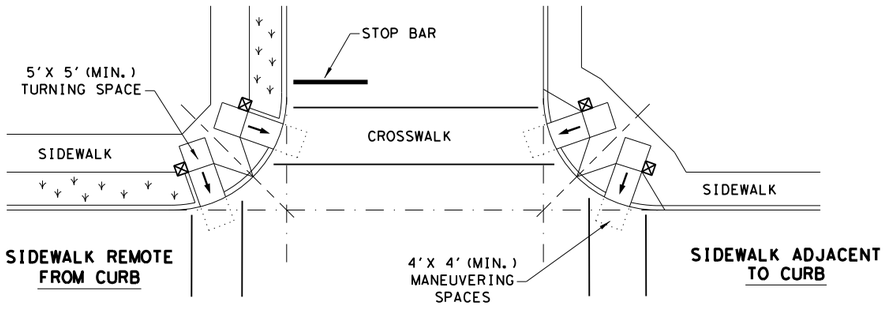
SEE SHEET 1 OF 4 FOR DETAILS AND DIMENSIONS



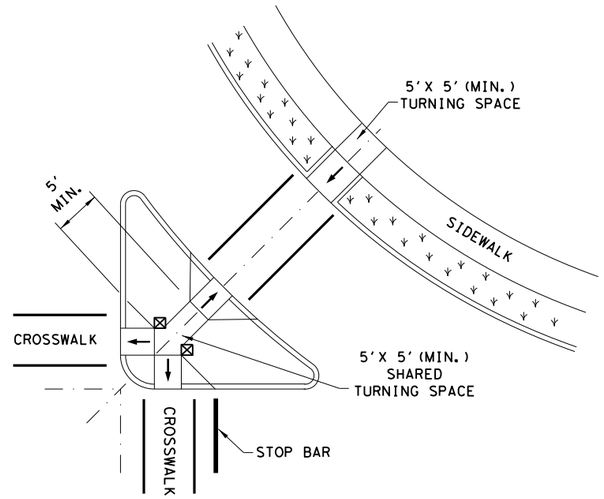
SKEWED INTERSECTION WITH "LARGE" RADIUS



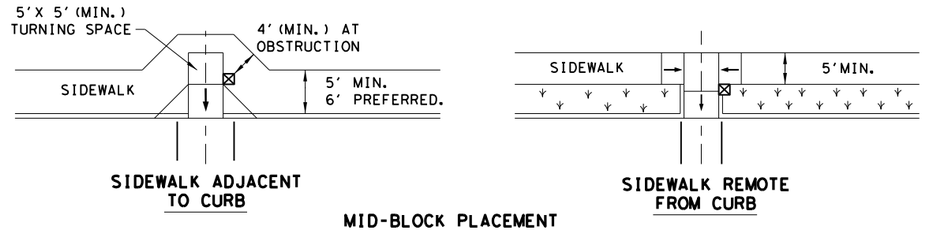
SKEWED INTERSECTION WITH "SMALL" RADIUS



NORMAL INTERSECTION WITH "SMALL" RADIUS



AT INTERSECTION
W/FREE RIGHT TURN & ISLAND



MID-BLOCK PLACEMENT
PERPENDICULAR RAMPS

LEGEND:

SHOWS DOWNWARD SLOPE. →

DENOTES PREFERRED LOCATION OF PEDESTRIAN PUSH BUTTON (IF APPLICABLE). ⊠

DENOTES PLANTING OR NON-WALKING SURFACE NOT PART OF PEDESTRIAN CIRCULATION PATH.

SHEET 4 OF 4

Texas Department of Transportation | Design Division Standard

PEDESTRIAN FACILITIES CURB RAMPS

PED-18

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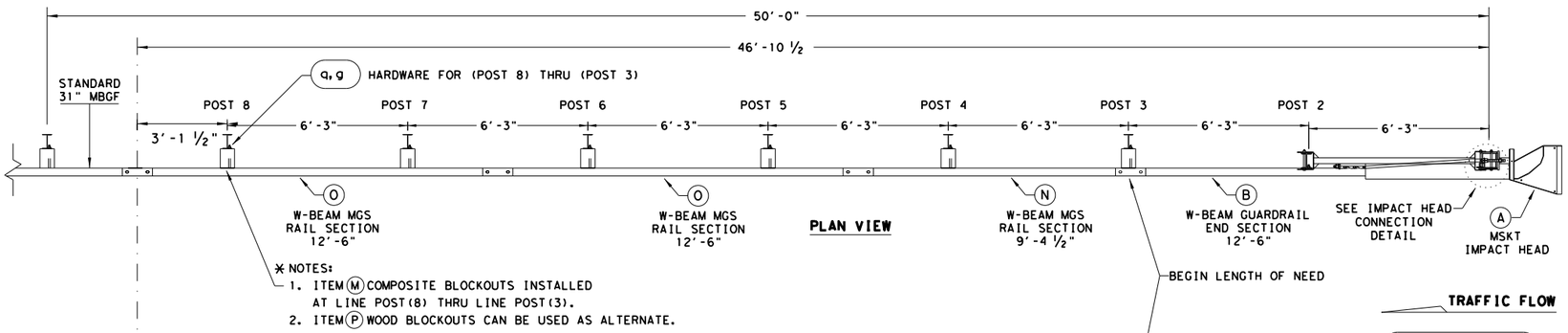
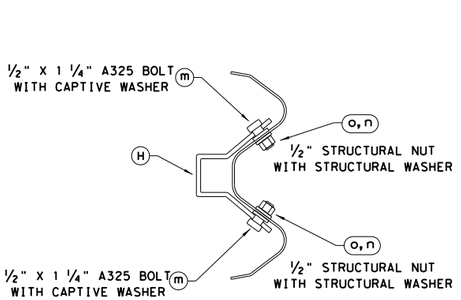
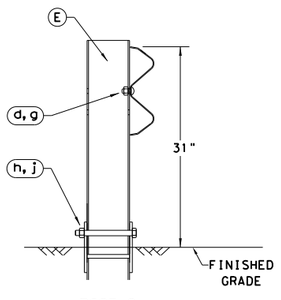
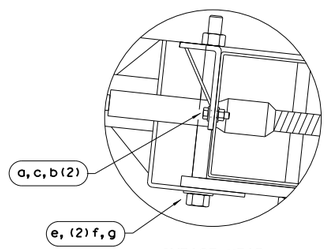
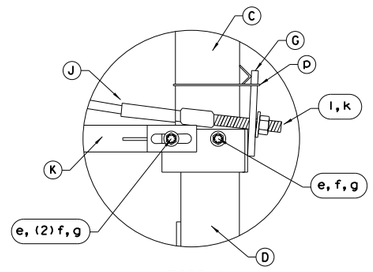


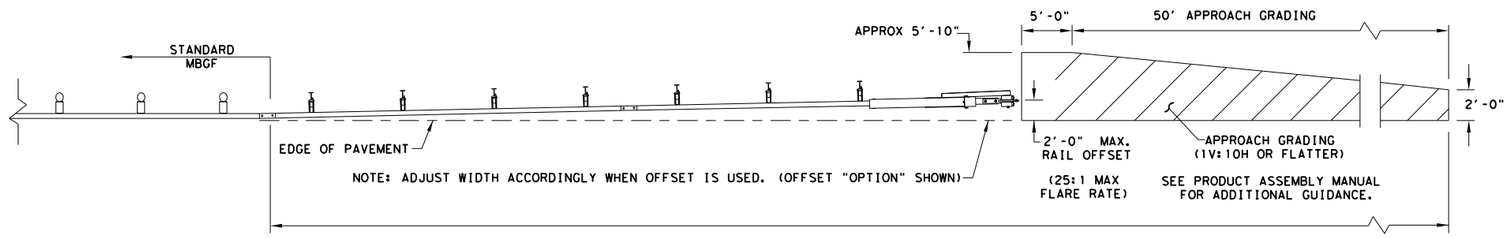
NOTE: SEE (GENERAL NOTE 14) FOR DRIVING CAP INFORMATION.











APPROACH GRADING AT GUARDRAIL END TREATMENTS

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

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

GENERAL NOTES

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

ITEM	QTY	MAIN SYSTEM COMPONENTS	ITEM NUMBERS
A	1	MSKT IMPACT HEAD	MS3000
B	1	W-BEAM GUARDRAIL END SECTION, 12 Ga.	SF1303
C	1	POST 1 - TOP (6" X 6" X 1/8" TUBE)	MTPHP1A
D	1	POST 1 - BOTTOM (6' W6X15)	MTPHP1B
E	1	POST 2 - ASSEMBLY TOP	UHP2A
F	1	POST 2 - ASSEMBLY BOTTOM (6' W6X9)	HP2B
G	1	BEARING PLATE	E750
H	1	CABLE ANCHOR BOX	S760
J	1	BCT CABLE ANCHOR ASSEMBLY	E770
K	1	GROUND STRUT	MS785
L	6	W6x9 OR W6x8.5 STEEL POST	P621
M	6	COMPOSITE BLOCKOUTS	CBSP-14
N	1	W-BEAM MGS RAIL SECTION (9'-4 1/2")	G12025
O	2	W-BEAM MGS RAIL SECTION (12'-6")	G1203A
P	6	WOOD BLOCKOUT 6" X 8" X 14"	P675
Q	1	W-BEAM MGS RAIL SECTION (25'-0")	G1209
		SMALL HARDWARE	
a	2	5/16" x 1" HEX BOLT (GRD 5)	B5160104A
b	4	5/16" WASHER	W0516
c	2	5/16" HEX NUT	N0516
d	25	5/8" Dia. x 1 1/4" SPLICE BOLT (POST 2)	B580122
e	2	5/8" Dia. x 9" HEX BOLT (GRD A449)	B580904A
f	3	5/8" WASHER	W050
g	33	5/8" Dia. H.G.R NUT	N050
h	1	3/4" Dia. x 8 1/2" HEX BOLT (GRD A449)	B340854A
j	1	3/4" Dia. HEX NUT	N030
k	2	1 ANCHOR CABLE HEX NUT	N100
l	2	1 ANCHOR CABLE WASHER	W100
m	8	1/2" x 1 1/4" A325 BOLT WITH CAPTIVE WASHER	SB12A
n	8	1/2" STRUCTURAL NUTS	N012A
o	8	1 1/16" O.D. x 9/16" I.D. STRUCTURAL WASHERS	W012A
p	1	BEARING PLATE RETAINER TIE	CT-100ST
q	6	5/8" x 10" H.G.R. BOLT	B581002
r	1	OBJECT MARKER 18" X 18"	E3151

SEE NOTES: *

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

Texas Department of Transportation

Design Division Standard

SINGLE GUARDRAIL TERMINAL

MSKT-MASH-TL-3

SGT(12S)31-18

FILE: sgt12s3118.dgn	DN:TxDOT	CK:KM	DW:VP	CK:CL	
© TxDOT: APRIL 2018	CONT	SECT	JOB	HIGHWAY	
REVISIONS	0906	32	050, ETC.	MAIN ST	
	DIST	COUNTY		SHEET NO.	
	ODA	MIDLAND		49	

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DATE:
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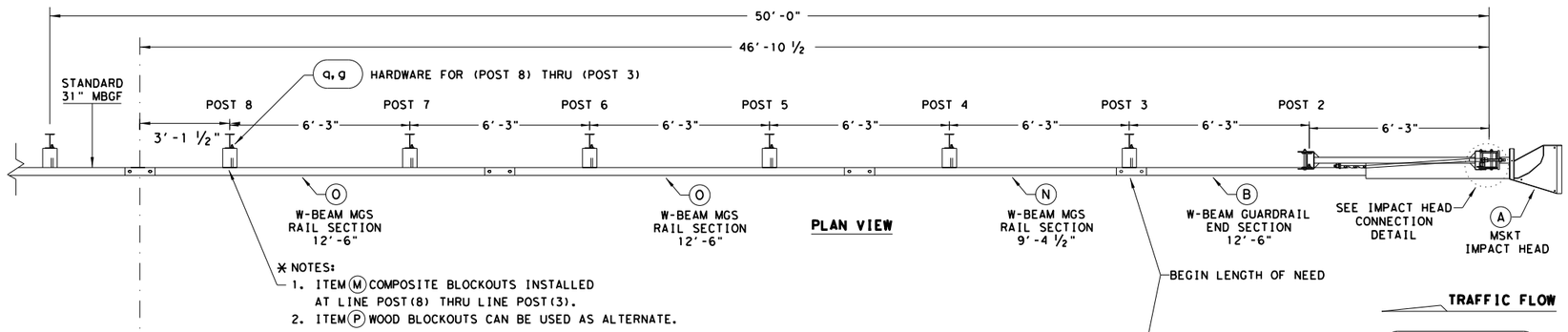
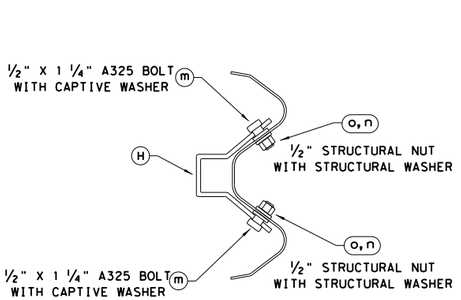
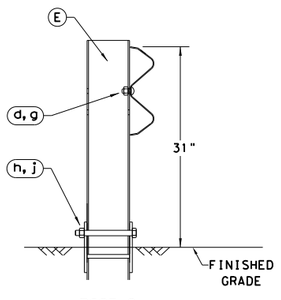
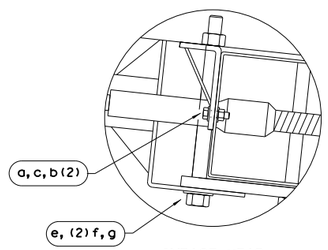
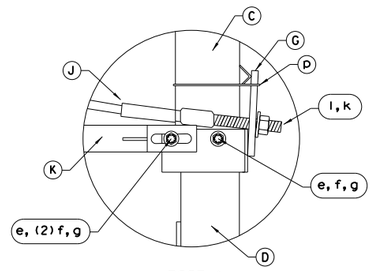


NOTE: SEE (GENERAL NOTE 14) FOR DRIVING CAP INFORMATION.









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8. IF SOLID ROCK IS ENCOUNTERED IN THE AREA OF (POST 1) AND / OR (POST 2) CONTACT THE MANUFACTURER, & REFER TO THE LATEST ROADWAY MBGF STANDARD FOR INSTALLATION GUIDANCE.
9. POSTS SHALL NOT BE SET IN CONCRETE.
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E	1	POST 2 - ASSEMBLY TOP	UHP2A
F	1	POST 2 - ASSEMBLY BOTTOM (6' W6X9)	HP2B
G	1	BEARING PLATE	E750
H	1	CABLE ANCHOR BOX	S760
J	1	BCT CABLE ANCHOR ASSEMBLY	E770
K	1	GROUND STRUT	MS785
L	6	W6x9 OR W6x8.5 STEEL POST	P621
M	6	COMPOSITE BLOCKOUTS	CBSP-14
N	1	W-BEAM MGS RAIL SECTION (9'-4 1/2")	G12025
O	2	W-BEAM MGS RAIL SECTION (12'-6")	G1203A
P	6	WOOD BLOCKOUT 6" X 8" X 14"	P675
Q	1	W-BEAM MGS RAIL SECTION (25'-0")	G1209
		SMALL HARDWARE	
a	2	5/16" x 1" HEX BOLT (GRD 5)	B5160104A
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c	2	5/16" HEX NUT	N0516
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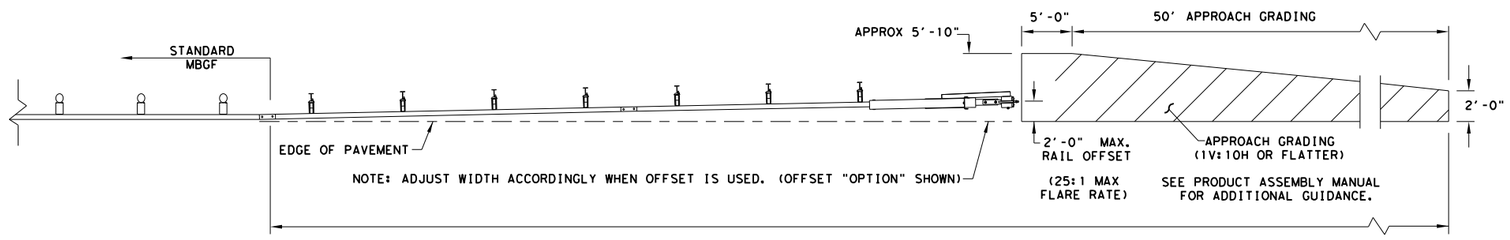
e	2	5/8" Dia. x 9" HEX BOLT (GRD A449)	B580904A
f	3	5/8" WASHER	W050
g	33	5/8" Dia. H.G.R NUT	N050
h	1	3/4" Dia. x 8 1/2" HEX BOLT (GRD A449)	B340854A
j	1	3/4" Dia. HEX NUT	N030
k	2	1 ANCHOR CABLE HEX NUT	N100
l	2	1 ANCHOR CABLE WASHER	W100
m	8	1/2" x 1 1/4" A325 BOLT WITH CAPTIVE WASHER	SB12A
n	8	1/2" STRUCTURAL NUTS	N012A
o	8	1 1/16" O.D. x 3/16" I.D. STRUCTURAL WASHERS	W012A
p	1	BEARING PLATE RETAINER TIE	CT-100ST
q	6	5/8" x 10" H.G.R. BOLT	B581002
r	1	OBJECT MARKER 18" X 18"	E3151

SEE NOTES: *

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



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

APPROACH GRADING AT GUARDRAIL END TREATMENTS

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

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

Texas Department of Transportation

Design Division Standard

SINGLE GUARDRAIL TERMINAL

MSKT-MASH-TL-3

SGT(12S)31-18

FILE: sgt12s3118.dgn	DN: TxDOT	CK: KM	DW: VP	CK: CL	
© TxDOT: APRIL 2018	CONT	SECT	JOB	HIGHWAY	
REVISIONS	0906	32	050, ETC.	MAIN ST	
	DIST	COUNTY		SHEET NO.	
	ODA	MIDLAND		49(A)	

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DATE:
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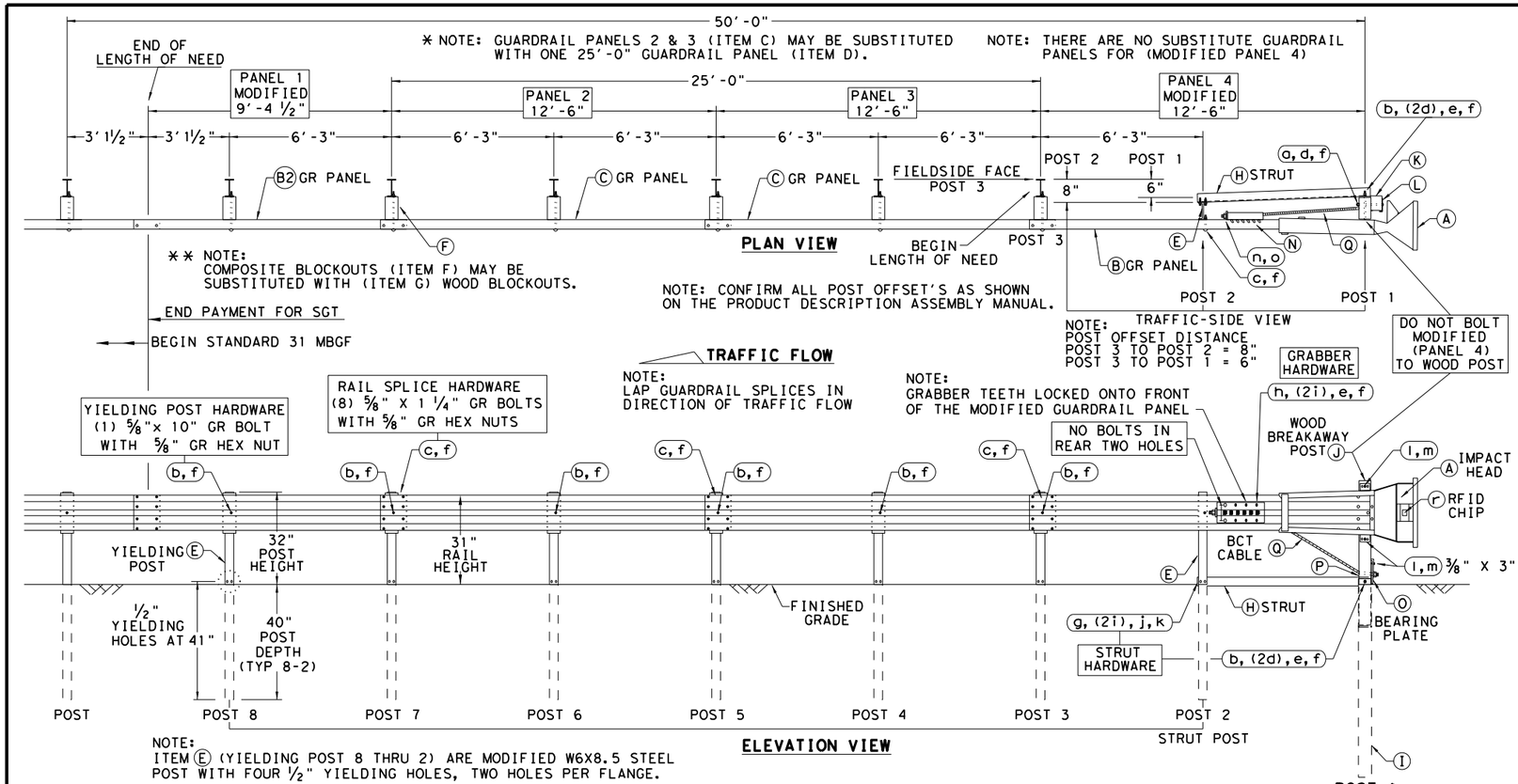
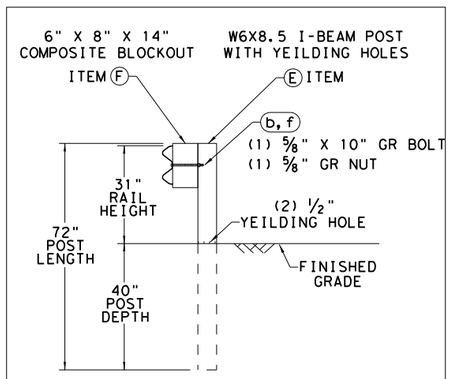


GENERAL NOTES

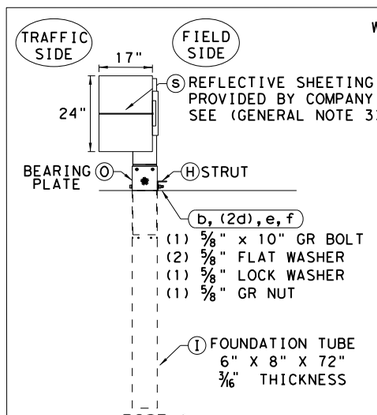
1. FOR SPECIFIC INFORMATION REGARDING INSTALLATION AND TECHNICAL GUIDANCE OF THE SYSTEM, CONTACT: SPIG INDUSTRY, INC. AT 1(267) 644-9510. 14675 INDUSTRIAL PARK RD; BRISTOL, VA 24202
2. FOR INSTALLATION, REPAIR AND MAINTENANCE REFER TO THE MANUFACTURER'S; SGET END TERMINAL, PRODUCT DESCRIPTION ASSEMBLY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

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

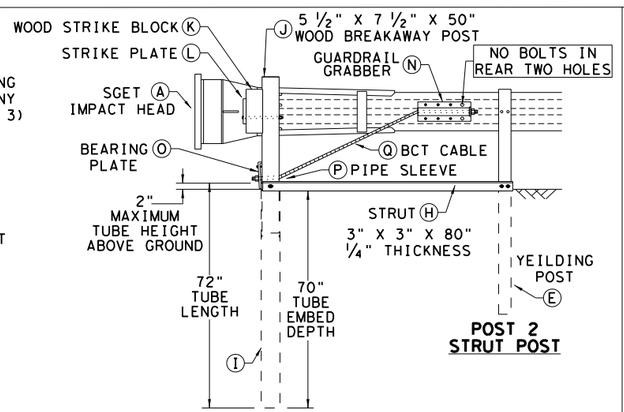
* ALTERNATIVE ITEMS
** NOTE: SEE PLAN VIEW



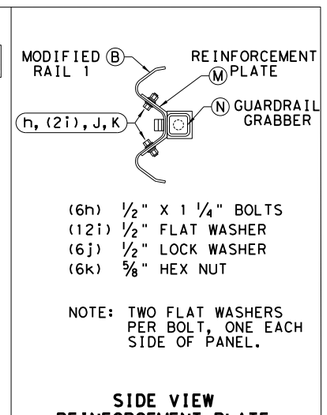
SIDE VIEW
POST 8 - POST 3 (TYP)



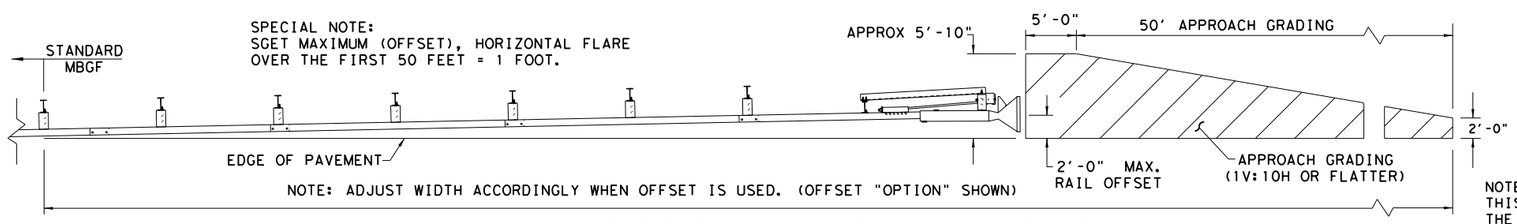
POST 1
FRONT END VIEW



POST 1
FIELD SIDE VIEW
POST 2
STRUT POST



SIDE VIEW
REINFORCEMENT PLATE
WITH GUARDRAIL GRABBER



APPROACH GRADING AT GUARDRAIL END TREATMENTS

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Texas Department of Transportation
Design Division Standard

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

FILE: sgt153120.dgn	DN: TxDOT	CK: KM	DW: VP	CK: VP		
©TxDOT: APRIL 2020	CONT	SECT	JOB	HIGHWAY		
REVISIONS	0906	32	050, ETC.	MAIN ST.		
	DIST	COUNTY		SHEET NO.		
	ODA	MIDLAND		49(B)		

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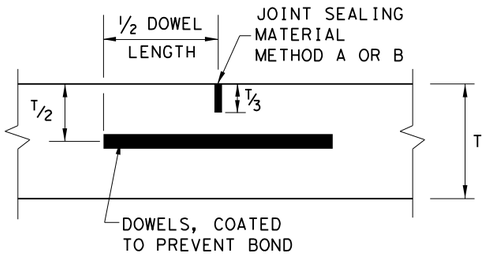
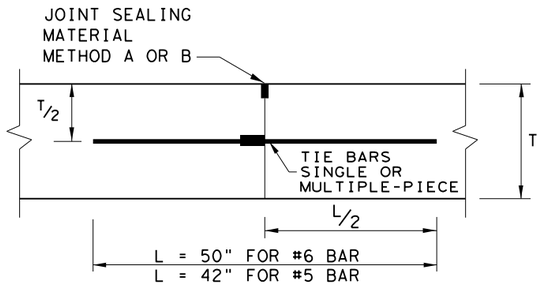
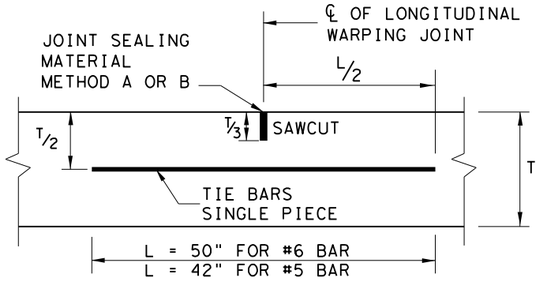


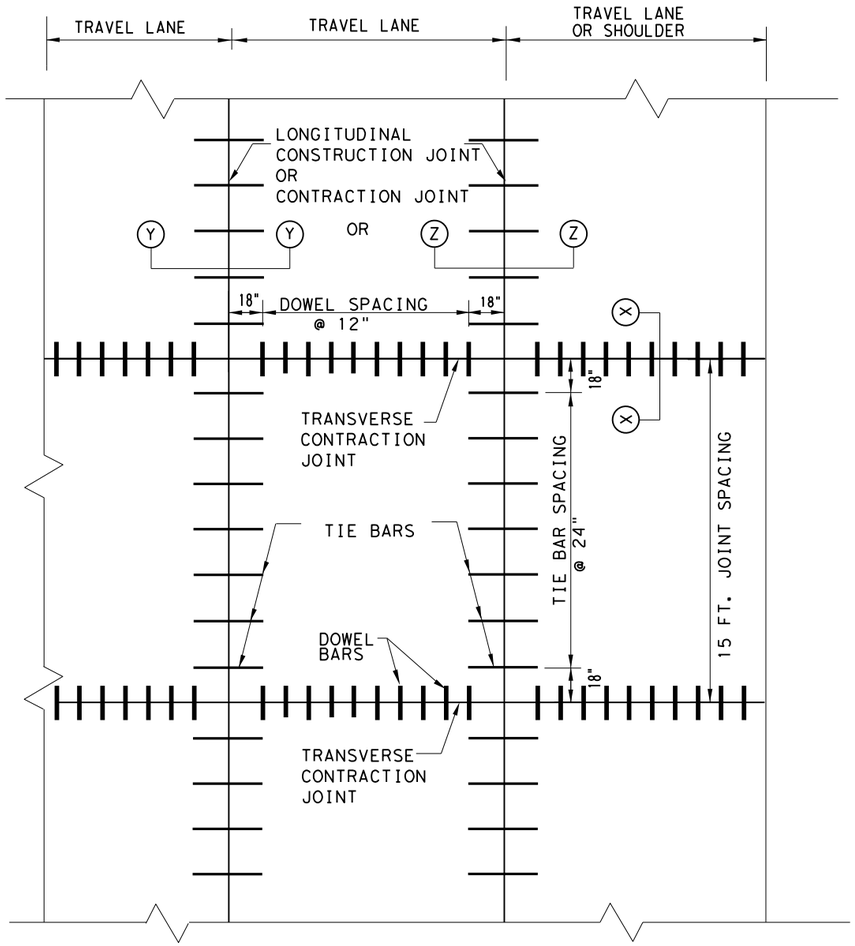
TRANSVERSE CONTRACTION JOINT
SECTION X-X



LONGITUDINAL CONSTRUCTION JOINT
SECTION Y-Y



LONGITUDINAL CONTRACTION JOINT
SECTION Z-Z



TYPICAL PAVEMENT LAYOUT
PLAN VIEW (NOT TO SCALE)

GENERAL NOTES

1. DETAILS FOR PAVEMENT WIDTH, PAVEMENT THICKNESS AND THE CROWN CROSS-SLOPE SHALL BE SHOWN ELSEWHERE IN THE PLANS. PAVEMENTS WIDER THAN 100 FT. WITHOUT A FREE LONGITUDINAL JOINT ARE NOT COVERED BY THIS STANDARD.
2. FOR FURTHER INFORMATION REGARDING THE PLACEMENT OF CONCRETE AND LOAD TRANSFER DEVICES REFER TO THE GOVERNING SPECIFICATION FOR "CONCRETE PAVEMENT".
3. THE SPACING BETWEEN TRANSVERSE CONTRACTION JOINTS SHALL BE 15 FT. UNLESS OTHERWISE SHOWN IN THE PLANS.
4. TRANSVERSE CONSTRUCTION JOINTS MAY BE FORMED BY USE OF METAL OR WOOD FORMS EQUAL IN DEPTH TO THE DEPTH OF PAVEMENT, OR BY METHODS APPROVED BY THE ENGINEER.
5. USE HAND-OPERATED IMMERSION VIBRATORS TO CONSOLIDATE THE CONCRETE ADJACENT TO ALL THE FORMED JOINTS.
6. PAVEMENT WIDTHS OF MORE THAN 15 FT. SHALL HAVE A LONGITUDINAL JOINT (SECTION Z-Z OR SECTION Y-Y). THESE JOINTS SHALL BE LOCATED WITHIN 6 IN. OF THE LANE LINE UNLESS THE JOINT LOCATION IS SHOWN ELSEWHERE ON THE PLANS.
7. THE JOINT BETWEEN OUTSIDE LANE AND SHOULDER SHALL BE A LONGITUDINAL CONTRACTION JOINT (SECTION Z-Z) UNLESS OTHERWISE SHOWN IN THE PLANS. THE SAW CUT DEPTH FOR THE LONGITUDIANL CONTRACTION JOINT (SECTION Z-Z) SHALL BE ONE THIRD OF THE SLABTHICKNESS (T/3).
8. WHEN TYING CONCRETE GUTTER AT A LONGITUDINAL JOINT, THE TIE BAR LENGTH OR POSITION MAY BE ADJUSTED. PROVIDE 3 IN. OF CONCRETE COVER FROM THE BACK OF GUTTER TO THE END OF TIE BAR.
9. REPLACE MISSING OR DAMAGED TIE BARS WITHOUT ADDITIONAL COMPENSATION BY DRILLING MIN. 10 IN. DEEP AND GROUTING TIE BARS WITH TYPE III, CLASS C EPOXY. MEET THE PULL-OUT TEST REQUIREMENTS IN ITEM 361.
10. WHEN AN MONOLITHIIC CURB IS SPECIFIED, THE JOINT IN THE CURB SHALL COINCIDE WITH PAVEMENT JOINTS AND MAY BE FORMED BY ANY MEANS APPROVED BY THE ENGINEER.
11. DOWEL BAR PLACEMENT TOLERANCE SHALL BE +/- 1/4 IN. HORIZONTALLY AND VERTICALLY UNLESS OTHERWISE SPECIFIED. WHERE DOWEL BAR BASKETS ARE USED, REMOVE THE SHIPPING WIRES.
12. THE DETAIL FOR JOINT SEALANT AND RESERVOIR IS SHOWN ON STANDARD SHEET "CONCRETE PAVING DETAILS, JOINT SEALS."

TABLE NO. 1 DOWELS (SMOOTH BARS)

SLAB THICKNESS T (IN.)	BAR DIA. AND LENGTH	AVERAGE SPACING (IN.)
6 to 7.5	1" X 18"	12
8 to 10	1 1/4" X 18"	12
>= 10.5	1 1/2" X 18"	12

TABLE NO. 2 TIE BARS (DEFORMED BARS)

SLAB THICKNESS T (IN.)	BAR SIZE	AVERAGE SPACING (IN.)
6 to 7.5	#5	24
>= 8	#6	24

Texas Department of Transportation

Design Division Standard

CONCRETE PAVEMENT DETAILS
CONTRACTION DESIGN
T-6 to 12 INCHES

CPCD-14

FILE: cpcd14.dgn	DN: TxDOT	CK: HC	DW: HC	CK: KM
©TxDOT: DECEMBER 2014	CONT	SECT	JOB	HIGHWAY
REVISIONS	0906	32	050, ETC	MAIN ST
	DIST	COUNTY		SHEET NO.
	ODA	MIDLAND		50

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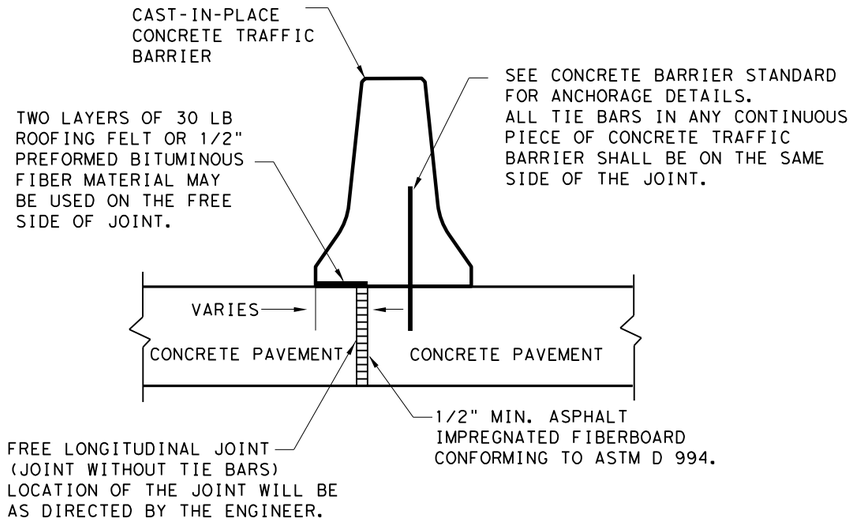
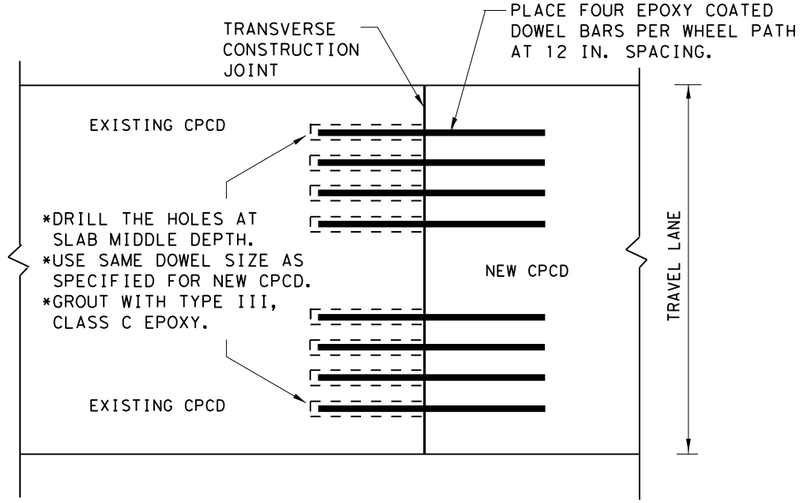
The use of this standard is governed by the "Texas Engineering Practice Act". No warranty of any kind is made by TxDOT for any purpose whatsoever. TxDOT assumes no responsibility for the conversion of this standard to other formats or for incorrect results or damages resulting from its use.

DATE:
FILE:



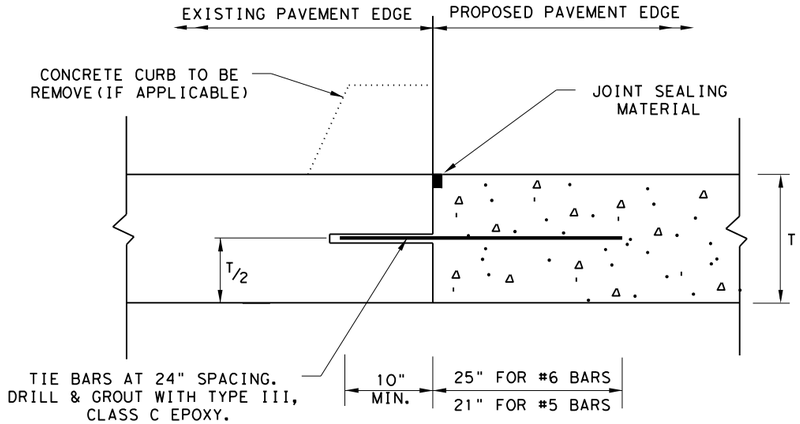
FREE LONGITUDINAL JOINT DETAIL



TRANSVERSE JOINT DETAIL

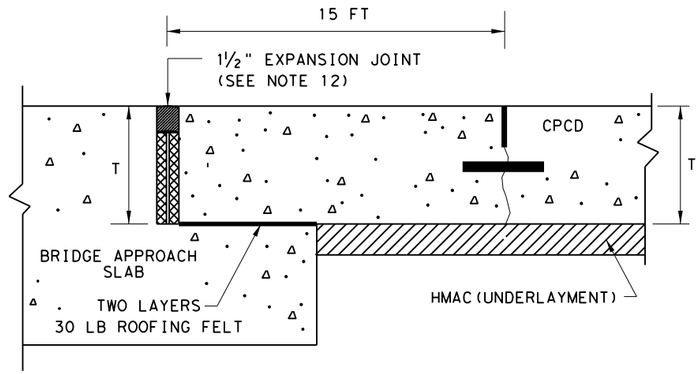
EXISTING CPCD TO NEW CPCD

PLAN VIEW (NOT TO SCALE)



1. BEFORE WIDENING WORK, DEMONSTRATE THAT THE BOND STRENGTH OF THE EPOXY-GROUTED TIE BARS MEETS THE REQUIREMENTS OF PULL-OUT TEST SPECIFIED IN ITEM 361.
2. SPACE TIE BARS AT 24" SPACING. USE #6 BARS FOR 8" AND THICKER SLABS, USE #5 BARS FOR LESS THAN 8" THICK SLABS.
3. THE TRANSVERSE JOINTS OF PROPOSED PAVEMENT SHALL COINCIDE WITH EXISTING PAVEMENT JOINTS UNLESS OTHERWISE SHOWN ON THE PLANS.

LONGITUDINAL WIDENING JOINT DETAIL



TRANSVERSE EXPANSION JOINT DETAIL

AT BRIDGE APPROACH

SHEET 2 OF 2

Texas Department of Transportation

Design Division Standard

CONCRETE PAVEMENT DETAILS
CONTRACTION DESIGN
T-6 to 12 INCHES

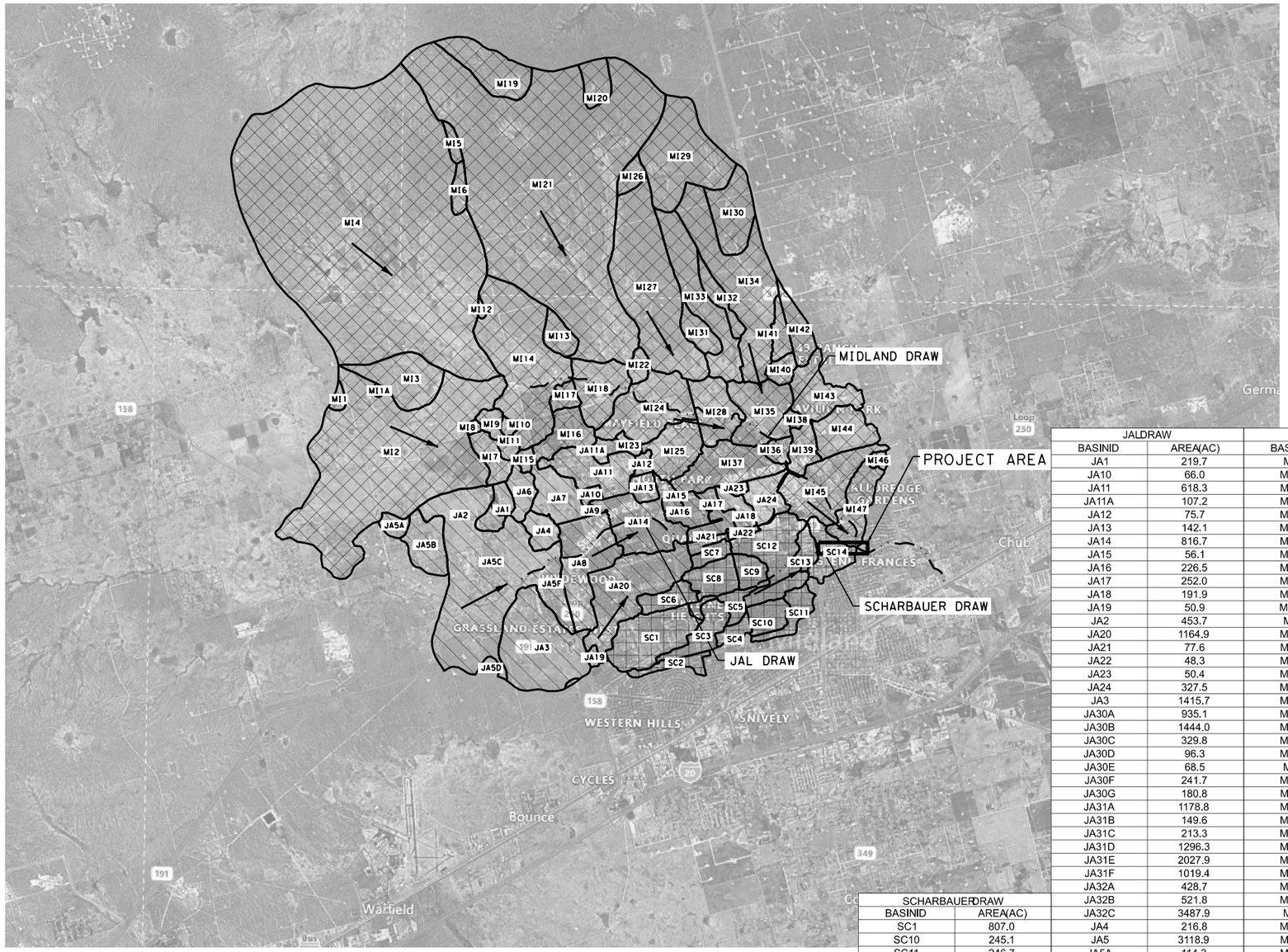
CPCD-14

FILE: cpcd14.dgn	DN: TxDOT		DN: HC	DW: HC		CK: KM
© TxDOT: DECEMBER 2014	CONT	SECT	JOB		HIGHWAY	
REVISIONS	0906	32	050, ETC		MAIN ST	
	DIST	COUNTY				SHEET NO.
	ODA	MIDLAND				51

12000.000000 ft / in.

N

0 6000' 12000'
HORIZONTAL SCALE



JALDRAW		MIDLAND DRAW	
BASINID	AREA(AC)	BASINID	AREA(AC)
JA1	219.7	MI1	58.9
JA10	66.0	MI10	50.1
JA11	618.3	MI11	75.8
JA11A	107.2	MI12	25.4
JA12	75.7	MI13	215.3
JA13	142.1	MI14	1992.6
JA14	816.7	MI15	79.7
JA15	56.1	MI16	387.0
JA16	226.5	MI17	131.5
JA17	252.0	MI18	601.6
JA18	191.9	MI19	627.0
JA19	50.9	MI1A	22.9
JA2	453.7	MI2	4990.0
JA20	1164.9	MI20	252.0
JA21	77.6	MI21	8779.4
JA22	48.3	MI22	117.9
JA23	50.4	MI23	73.8
JA24	327.5	MI24	938.3
JA3	1415.7	MI25	518.5
JA30A	935.1	MI26	145.9
JA30B	1444.0	MI27	2081.5
JA30C	329.8	MI28	534.6
JA30D	96.3	MI29	1337.9
JA30E	68.5	MI3	671.0
JA30F	241.7	MI30	599.8
JA30G	180.8	MI31	233.0
JA31A	1178.8	MI32	217.4
JA31B	149.6	MI33	949.4
JA31C	213.3	MI34	1634.1
JA31D	1296.3	MI35	706.5
JA31E	2027.9	MI36	121.4
JA31F	1019.4	MI37	729.4
JA32A	428.7	MI38	58.7
JA32B	521.8	MI39	256.5
JA32C	3487.9	MI4	11653.3
JA4	216.8	MI40	141.0
JA5	3118.9	MI41	178.5
JA5A	114.3	MI42	295.6
JA5A	110.8	MI43	561.1
JA5B	439.7	MI44	494.8
JA5B	428.5	MI45	848.8
JA5C	1176.8	MI46	59.8
JA5D	67.4	MI47	480.0
JA5E	661.7	MI5	88.2
JA5F	323.5	MI6	135.3
JA6	237.1	MI7	259.5
JA7	467.6	MI8	31.1
JA8	937.4	MI9	127.8
JA9	35.4		

SCHARBAUER DRAW	
BASINID	AREA(AC)
SC1	807.0
SC10	245.1
SC11	246.7
SC12	811.1
SC13	153.2
SC14	347.5
SC2	162.5
SC3	349.7
SC4	121.2
SC5	201.2
SC6	240.5
SC7	137.4
SC8	336.0
SC9	200.6

LEGEND

- DRAINAGE AREA BOUNDARY
- STREAMS
- FLOW DIRECTION
- MIDLAND DRAW CONTRIBUTING AREA
- JAL DRAW CONTRIBUTING AREA
- SCHARBAUER DRAW CONTRIBUTING AREA

NOTE: DRAINAGE SUB-BASIN AREAS SHOWN ARE DERIVED FROM THE FEMA FLOOD INSURANCE STUDY FOR MIDLAND DRAW, SCHARBAUER DRAW, AND JAL DRAW. FOR MORE INFORMATION, REFER TO THE FEMA FLOOD INSURANCE STUDY MAPS.

STATE OF TEXAS
HEATHER RAE KEISTER
100095
LICENSED
PROFESSIONAL ENGINEER
10/27/2023

Freese and Nichols, Inc.
Texas Registered Engineering Firm F-2144

HL 93 LOADING

NO	DATE	REVISION	APPROVED

FREESE AND NICHOLS
1500 Broadway Street, Suite 206
Lubbock, TX 79401
Phone - (806) 686-2700
Web www.freese.com

Texas Department of Transportation
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SCHARBAUER DRIVE BRIDGE REPLACEMENTS

DRAINAGE AREA MAP

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DAG	6	SEE TITLE SHEET FOR PROJECT NO.		MAIN ST
GRAPHICS KNW	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK KMM	TEXAS	ODA	MIDLAND	52
CHECK SRJ	CONTROL	SECTION	JOB	
	0906	32	050, ETC.	

10/27/2023
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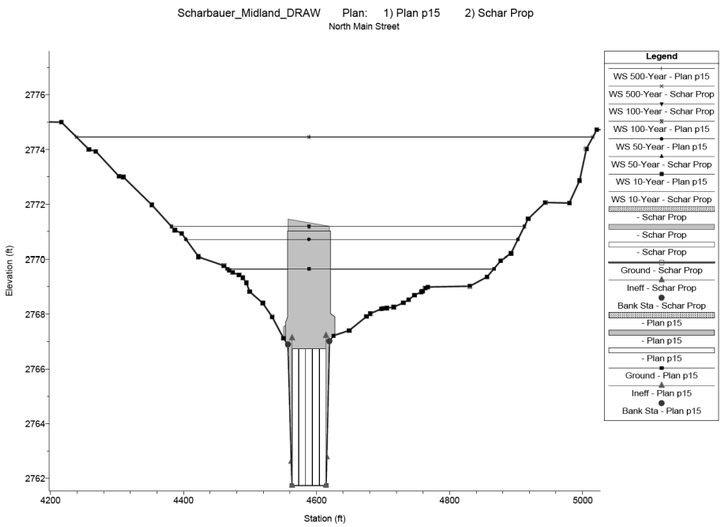
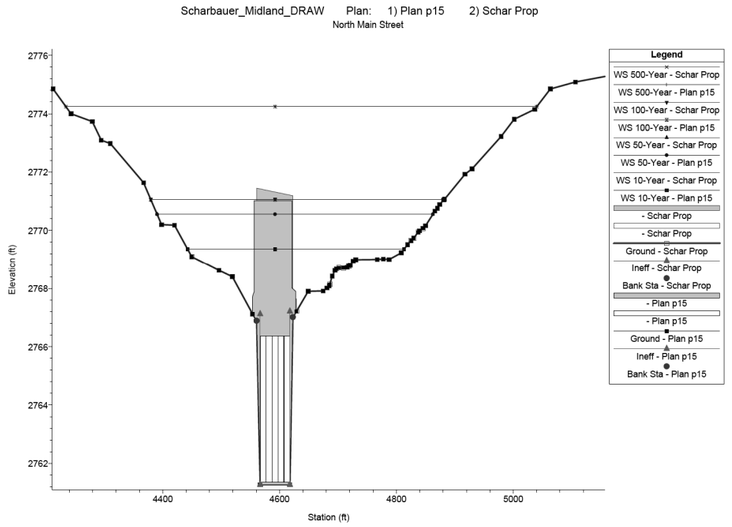
1200.0000 ft / in.

Main St (RS: 3190)													
River Station	Profile	Plan	Q Total	E.G Elev	W.S Elev	Vel Head	Frctn Loss	C & E Loss	Q Left	Q Channel	Q Right	Vel Total	Top Width
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft)	(cfs)	(cfs)	(cfs)	(ft/s)	(ft)
Upstream													
3220	10-Year	36 in Exist	1840	2769.89	2769.66	0.23			33.08	1713.08	93.83	2.22	400.57
3220	10-Year	Schar Prop	1840	2769.85	2769.63	0.22			31.26	1720.61	88.13	2.22	398.36
3220	50-Year	36 in Exist	2810	2771.03	2770.71	0.32			104.52	2412.03	293.45	2.13	499.11
3220	50-Year	Schar Prop	2810	2771.02	2770.71	0.31			101.21	2424.37	284.42	2.12	498.80
3220	100-Year	36 in Exist	3345	2771.54	2771.19	0.35			157.84	2761.59	425.57	2.14	530.79
3220	100-Year	Schar Prop	3345	2771.54	2771.19	0.35			154.09	2775.63	415.27	2.13	530.99
3220	500-Year	36 in Exist	8755	2775.08	2774.47	0.61			1011.24	5644.34	2099.42	2.34	777.34
3220	500-Year	Schar Prop	8755	2775.06	2774.45	0.61			992.74	5697.79	2064.47	2.34	775.96
3190			Culvert										
Downstream													
3160	10-Year	36 in Exist	1840	2769.57	2769.35	0.21	0.01	0.03	29.21	1775.25	35.54	2.48	370.67
3160	10-Year	Schar Prop	1840	2769.57	2769.36	0.21	0.01	0.03	29.22	1775.22	35.55	2.48	370.68
3160	50-Year	36 in Exist	2810	2770.85	2770.55	0.30	0.01	0.03	114.55	2523.57	171.88	2.26	472.17
3160	50-Year	Schar Prop	2810	2770.85	2770.55	0.30	0.01	0.03	114.59	2523.49	171.92	2.26	472.19
3160	100-Year	36 in Exist	3345	2771.40	2771.06	0.34	0.02	0.03	180.88	2898.75	265.37	2.24	501.95
3160	100-Year	Schar Prop	3345	2771.40	2771.06	0.34	0.02	0.03	180.93	2898.67	265.40	2.24	502.00
3160	500-Year	36 in Exist	8755	2774.95	2774.24	0.71	0.02	0.06	1031.85	6195.84	1527.31	2.49	806.25
3160	500-Year	Schar Prop	8755	2774.95	2774.24	0.71	0.02	0.06	1031.84	6195.90	1527.27	2.49	806.25

TYPICAL CROSS SECTION



UPSTREAM CROSS SECTION



DOWNSTREAM CROSS SECTION

STATE OF TEXAS
HEATHER RAE KEISTER
100095
LICENSED
PROFESSIONAL ENGINEER

Heather Keister 10/27/2023

Freese and Nichols, Inc.
Texas Registered Engineering Firm F-2144

HL 93 LOADING

NO	DATE	REVISION	APPROVED

FREESE AND NICHOLS
1500 Broadway Street, Suite 206
Lubbock, TX 79401
Phone - (806) 686-2700
Web www.freese.com

Texas Department of Transportation
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SCHARBAUER DRIVE
BRIDGE REPLACEMENTS

BRIDGE CLASS
HYDRAULIC DATA
MAIN STREET

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DAG	6	SEE TITLE SHEET FOR PROJECT NO.		MAIN ST
GRAPHICS KNW	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK KMM	TEXAS	ODA	MIDLAND	53
CHECK SRJ	CONTROL	SECTION	JOB	
	0906	32	050,ETC.	

10/27/2023
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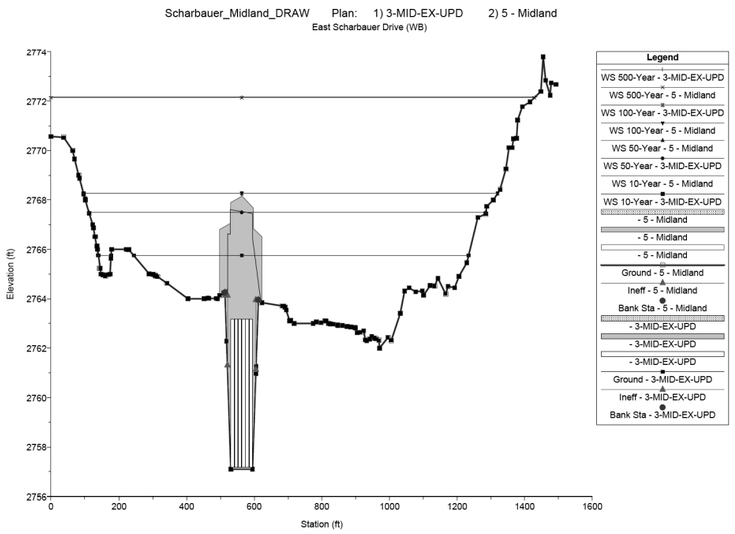
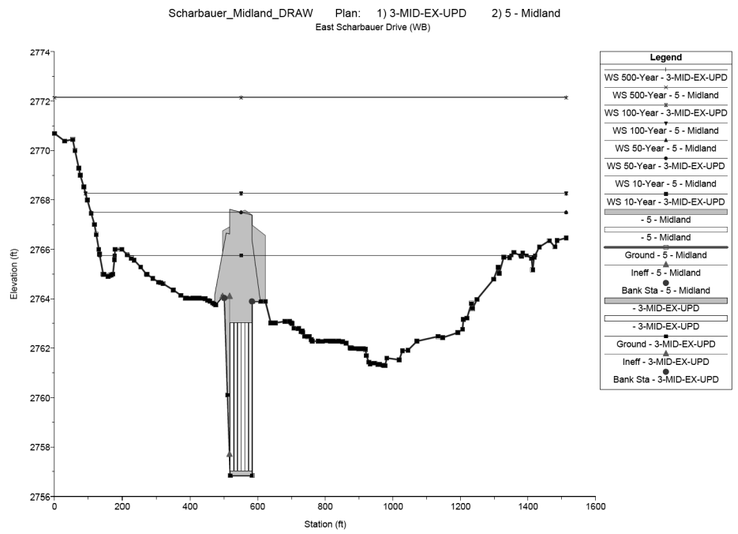
1200.0000 ft / in.

Westbound Scharbauer Drive (RS: 70172)													
River Station	Profile	Plan	Q Total	E.G Elev	W.S Elev	Vel Head	Frctn Loss	C & E Loss	Q Left	Q Channel	Q Right	Vel Total	Top Width
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft)	(cfs)	(cfs)	(cfs)	(ft/s)	(ft)
Upstream													
70175	10-Year	3-MID-EX-UPD	2565	2765.82	2765.75	0.07			116.98	1771.01	677.01	1.03	1027.88
70175	10-Year	5-MID-PROP UPD	2565	2765.82	2765.75	0.07			117.18	1769.80	678.02	1.03	1027.92
70175	50-Year	3-MID-EX-UPD	4635	2767.55	2767.49	0.07			518.26	2468.21	1648.53	1.05	1172.77
70175	50-Year	5-MID-PROP UPD	4635	2767.56	2767.49	0.07			519.33	2465.01	1650.67	1.05	1172.90
70175	100-Year	3-MID-EX-UPD	6280	2768.35	2768.27	0.08			855.77	3054.25	2369.98	1.17	1223.81
70175	100-Year	5-MID-PROP UPD	6280	2768.35	2768.27	0.08			856.19	3052.32	2371.49	1.17	1223.74
70175	500-Year	3-MID-EX-UPD	13350	2772.25	2772.17	0.08			2771.77	4734.17	5844.07	1.27	1431.01
70175	500-Year	5-MID-PROP UPD	13350	2772.22	2772.14	0.08			2764.21	4738.56	5847.23	1.28	1428.59
70172			Culvert										
Downstream													
70153	10-Year	3-MID-EX-UPD	2565	2765.81	2765.77	0.04	0.01	0.01	105.45	1383.11	1076.44	0.76	1217.44
70153	10-Year	5-MID-PROP UPD	2565	2765.81	2765.77	0.04	0.01	0.01	105.57	1382.78	1076.66	0.76	1218.19
70153	50-Year	3-MID-EX-UPD	4635	2767.54	2767.50	0.04	0.01	0.00	459.90	1910.67	2264.43	0.81	1405.28
70153	50-Year	5-MID-PROP UPD	4635	2767.55	2767.51	0.04	0.01	0.00	460.67	1908.79	2265.54	0.81	1405.41
70153	100-Year	3-MID-EX-UPD	6280	2768.33	2768.29	0.05	0.01	0.00	739.56	2317.28	3223.16	0.92	1421.37
70153	100-Year	5-MID-PROP UPD	6280	2768.33	2768.28	0.05	0.01	0.00	738.90	2318.75	3222.35	0.92	1421.28
70153	500-Year	3-MID-EX-UPD	13350	2772.20	2772.16	0.04	0.00	0.00	2324.90	3473.80	7551.30	1.07	1512.91
70153	500-Year	5-MID-PROP UPD	13350	2772.19	2772.15	0.04	0.00	0.00	2322.77	3476.45	7550.78	1.07	1512.91

TYPICAL CROSS SECTION



UPSTREAM CROSS SECTION



DOWNSTREAM CROSS SECTION

STATE OF TEXAS
HEATHER RAE KEISTER
100095
LICENSED
PROFESSIONAL ENGINEER

Heather Keister 10/27/2023

Freese and Nichols, Inc.
Texas Registered Engineering Firm F-2144

HL 93 LOADING

NO	DATE	REVISION	APPROVED

FREESE AND NICHOLS
1500 Broadway Street, Suite 206
Lubbock, TX 79401
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Texas Department of Transportation
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SCHARBAUER DRIVE
BRIDGE REPLACEMENTS

BRIDGE CLASS
HYDRAULIC DATA
WB SCHARAUER DRIVE

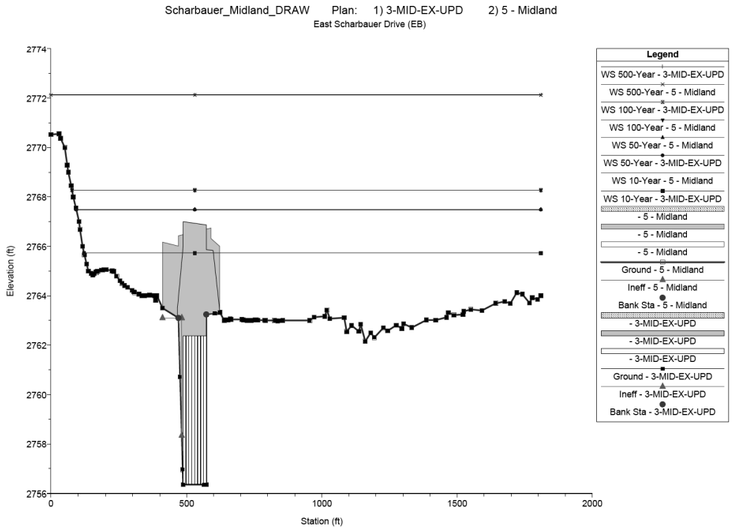
DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DAG	6	SEE TITLE SHEET FOR PROJECT NO.		MAIN ST
GRAPHICS KNW	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK KMM	TEXAS	ODA	MIDLAND	54
CHECK SRJ	CONTROL	SECTION	JOB	
	0906	32	050,ETC.	

10/27/2023
N:\IF\Drawings\5. Drainage\CV-TRT-PL-HYDR03.dgn

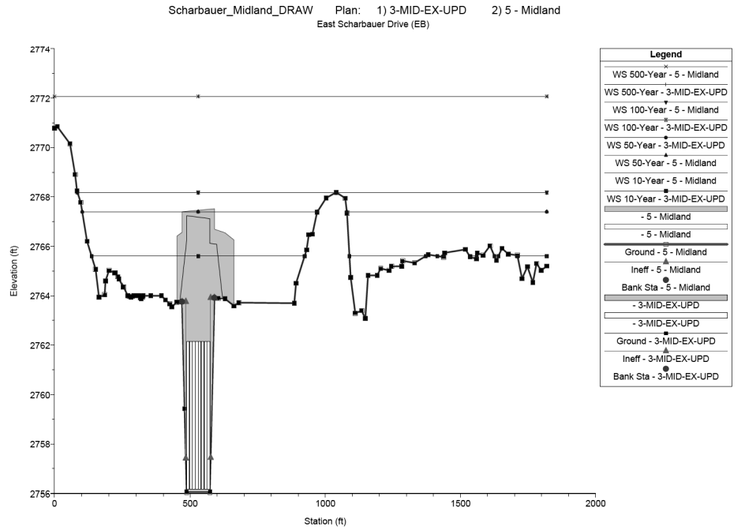
1200.0000 ft / in.

Eastbound Scharbauer Drive (RS: 70080)													
River Station	Profile	Plan	Q Total	E.G Elev	W.S Elev	Vel Head	Frctn Loss	C & E Loss	Q Left	Q Channel	Q Right	Vel Total	Top Width
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft)	(cfs)	(cfs)	(cfs)	(ft/s)	(ft)
Upstream													
70110	10-Year	3-MID-EX-UPD	4335	2765.79	2765.72	0.07			178.69	2419.62	1736.69	0.94	1687.49
70110	10-Year	5-MID-PROP UPD	4335	2765.79	2765.73	0.07			178.91	2418.72	1737.37	0.94	1687.53
70110	50-Year	3-MID-EX-UPD	6855	2767.53	2767.49	0.05			570.36	2802.33	3482.31	0.90	1716.46
70110	50-Year	5-MID-PROP UPD	6855	2767.54	2767.49	0.05			571.14	2799.82	3484.04	0.90	1716.59
70110	100-Year	3-MID-EX-UPD	8270	2768.33	2768.28	0.05			794.88	3050.66	4424.46	0.92	1732.42
70110	100-Year	5-MID-PROP UPD	8270	2768.32	2768.27	0.05			794.24	3052.52	4423.24	0.92	1732.34
70110	500-Year	3-MID-EX-UPD	18435	2772.19	2772.14	0.05			2512.86	4923.92	10998.23	1.17	1810.11
70110	500-Year	5-MID-PROP UPD	18435	2772.18	2772.13	0.05			2510.67	4927.44	10996.89	1.17	1810.11
70080			Culvert										
Downstream													
70058	10-Year	3-MID-EX-UPD	4335	2765.79	2765.60	0.18	0.03	0.04	222.39	3715.45	397.16	1.84	1242.27
70058	10-Year	5-MID-PROP UPD	4335	2765.79	2765.60	0.18	0.03	0.04	222.39	3715.45	397.16	1.84	1242.27
70058	50-Year	3-MID-EX-UPD	6855	2767.53	2767.40	0.13	0.02	0.05	740.75	4433.93	1680.31	1.34	1607.33
70058	50-Year	5-MID-PROP UPD	6855	2767.53	2767.40	0.13	0.02	0.05	740.75	4433.93	1680.31	1.34	1607.33
70058	100-Year	3-MID-EX-UPD	8270	2768.31	2768.18	0.13	0.02	0.04	1027.09	4843.28	2399.63	1.29	1732.56
70058	100-Year	5-MID-PROP UPD	8270	2768.31	2768.18	0.13	0.02	0.04	1027.09	4843.28	2399.63	1.29	1732.56
70058	500-Year	3-MID-EX-UPD	18435	2772.17	2772.07	0.10	0.01	0.02	2932.79	7094.39	8407.82	1.38	1819.70
70058	500-Year	5-MID-PROP UPD	18435	2772.17	2772.07	0.10	0.01	0.02	2932.79	7094.39	8407.82	1.38	1819.70

TYPICAL CROSS SECTION



UPSTREAM CROSS SECTION



DOWNSTREAM CROSS SECTION

STATE OF TEXAS
HEATHER RAE KEISTER
100095
LICENSED
PROFESSIONAL ENGINEER
10/27/2023

Freese and Nichols, Inc.
Texas Registered Engineering Firm F-2144

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NO	DATE	REVISION	APPROVED

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1500 Broadway Street, Suite 206
Lubbock, TX 79401
Phone - (806) 686-2700
Web www.freese.com

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SCHARBAUER DRIVE
BRIDGE REPLACEMENTS

BRIDGE CLASS
HYDRAULIC DATA
EB SCHARBAUER DRIVE

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DAG	6	SEE TITLE SHEET FOR PROJECT NO.		MAIN ST
GRAPHICS KNW	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK KMM	TEXAS	ODA	MIDLAND	55
CHECK SRJ	CONTROL	SECTION	JOB	
	0906	32	050,ETC.	

10/27/2023
N:\IF\Drawings\5. Drainage\CV-TRT-PL-HYDR04.dgn

1200.0000 ft / in.

EXISTING CULVERT

Main St (RS: 3190) EXISTING											
River Station	Profile	Plan	Q Total	Q Culv	W.S US	W.S DS	Culv WS Inlet	Culv WS Outlet	Culv Crt Depth	Culv Vel US	Culv Vel DS
			(cfs)	(cfs)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft/s)	(ft/s)
3190	10-Year	36 in Exist	1840	1840	2769.66	2769.35	2766.74	2766.36	2.54	4.58	4.58
3190	50-Year	36 in Exist	2810	2810	2770.71	2770.55	2766.74	2766.36	2.38	4.16	4.16
3190	100-Year	36 in Exist	3345	3345	2771.19	2771.06	2766.74	2766.36	2.22	3.76	3.76
3190	500-Year	36 in Exist	8755	8755	2774.47	2774.24	2766.74	2766.36	2.11	3.47	3.47

CULVERT DATA SUMMARY

Inlet Station	0.00 ft
Inlet Elevation	2761.74 ft
Outlet Station	58.00 ft
Outlet Elevation	2761.36 ft
Number of Barrels	5
Barrel Shape	Box
Barrel Span	115.00 in
Barrel Rise	60.00 in
Barrel Material	Concrete
Embedment	0.00 in
Barrel Manning's n	0.013
Culvert Type	Straight
Inlet Configuration	Headwall
Inlet Depression	0.00 in
Slope	0.0066

PROPOSED CULVERT

Main St (RS: 3190) PROPOSED											
River Station	Profile	Plan	Q Total	Q Culv	W.S US	W.S DS	Culv WS Inlet	Culv WS Outlet	Culv Crt Depth	Culv Vel US	Culv Vel DS
			(cfs)	(cfs)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft/s)	(ft/s)
3190	10-Year	Schar Prop	1840	1840	2769.63	2769.36	2766.74	2766.28	2.47	4.42	4.42
3190	50-Year	Schar Prop	2810	2810	2770.71	2770.55	2766.74	2766.28	2.30	3.96	3.96
3190	100-Year	Schar Prop	3345	3345	2771.19	2771.06	2766.74	2766.28	2.18	3.65	3.65
3190	500-Year	Schar Prop	8755	8755	2774.45	2774.24	2766.74	2766.28	1.98	3.15	3.15

CULVERT DATA SUMMARY

Inlet Station	0.00 ft
Inlet Elevation	2761.74 ft
Outlet Station	64.70 ft
Outlet Elevation	2761.28 ft
Number of Barrels	5
Barrel Shape	Box
Barrel Span	120.00 in
Barrel Rise	60.00 in
Barrel Material	Concrete
Embedment	0.00 in
Barrel Manning's n	0.013
Culvert Type	Straight
Inlet Configuration	Headwall
Inlet Depression	0.00 in
Slope	0.0071

STATE OF TEXAS
HEATHER RAE KEISTER
100095
LICENSED
PROFESSIONAL ENGINEER

10/27/2023

Freese and Nichols, Inc.
Texas Registered Engineering Firm F-2144

HL 93 LOADING

NO	DATE	REVISION	APPROVED

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1500 Broadway Street, Suite 206
Lubbock, TX 79401
Phone - (806) 686-2700
Web www.freese.com

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SCHARBAUER DRIVE
BRIDGE REPLACEMENTS

HYDRAULIC
DATA
MAIN STREET

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DAG	6	SEE TITLE SHEET FOR PROJECT NO.		MAIN ST
GRAPHICS KNW	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK KMM	TEXAS	ODA	MIDLAND	56
CHECK SRJ	CONTROL	SECTION	JOB	
	0906	32	050, ETC.	

10/27/2023
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1200.0000 ft / in.

EXISTING CULVERT

Westbound Scharbauer Drive (RS: 70172) EXISTING											
River Station	Profile	Plan	Q Total	Q Culv	W.S US	W.S DS	Culv WS Inlet	Culv WS Outlet	Culv Crt Depth	Culv Vel US	Culv Vel DS
			(cfs)	(cfs)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft/s)	(ft/s)
70172	10-Year	3-MID-EX-UPD	2565	2565	2765.75	2765.77	2763.18	2763.02	1.13	1.14	1.14
70172	50-Year	3-MID-EX-UPD	4635	4635	2767.49	2767.50	2763.18	2763.02	1.21	1.26	1.26
70172	100-Year	3-MID-EX-UPD	6280	6280	2768.27	2768.29	2763.18	2763.02	1.35	1.48	1.48
70172	500-Year	3-MID-EX-UPD	13350	13350	2772.17	2772.16	2763.18	2763.02	1.59	1.90	1.90

CULVERT DATA SUMMARY

Inlet Station	0.00 ft
Inlet Elevation	2757.18 ft
Outlet Station	43.5 ft
Outlet Elevation	2757.02 ft
Number of Barrels	6
Barrel Shape	Box
Barrel Span	120.00 in
Barrel Rise	72.00 in
Barrel Material	Concrete
Embedment	0.00 in
Barrel Manning's n	0.013
Culvert Type	Straight
Inlet Configuration	Headwall
Inlet Depression	0.00 in
Slope	0.0037

PROPOSED CULVERT

Westbound Scharbauer Drive (RS: 70172) PROPOSED											
River Station	Profile	Plan	Q Total	Q Culv	W.S US	W.S DS	Culv WS Inlet	Culv WS Outlet	Culv Crt Depth	Culv Vel US	Culv Vel DS
			(cfs)	(cfs)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft/s)	(ft/s)
70172	10-Year	5-MID-PROP UPD	2565	2565	2765.75	2765.77	2763.10	2762.84	1.27	1.36	1.36
70172	50-Year	5-MID-PROP UPD	4635	4635	2767.49	2767.51	2763.10	2762.84	1.31	1.42	1.42
70172	100-Year	5-MID-PROP UPD	6280	6280	2768.27	2768.28	2763.10	2762.84	1.53	1.80	1.80
70172	500-Year	5-MID-PROP UPD	13350	13350	2772.14	2772.15	2763.10	2762.84	1.54	1.80	1.80

CULVERT DATA SUMMARY

Inlet Station	0.00 ft
Inlet Elevation	2757.10 ft
Outlet Station	40.70 ft
Outlet Elevation	2756.84 ft
Number of Barrels	6
Barrel Shape	Box
Barrel Span	120.00 in
Barrel Rise	72.00 in
Barrel Material	Concrete
Embedment	0.00 in
Barrel Manning's n	0.013
Culvert Type	Straight
Inlet Configuration	Headwall
Inlet Depression	0.00 in
Slope	0.0064

STATE OF TEXAS
HEATHER RAE KEISTER
100095
LICENSED
PROFESSIONAL ENGINEER

10/27/2023

HL 93 LOADING

Freese and Nichols, Inc.
Texas Registered Engineering Firm F-2144

NO	DATE	REVISION	APPROVED

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Web www.freese.com

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SCHARBAUER DRIVE
BRIDGE REPLACEMENTS

HYDRAULIC
DATA
WB SCHARBAUER DRIVE

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DAG	6	SEE TITLE SHEET FOR PROJECT NO.		MAIN ST
GRAPHICS KNW	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK KMM	TEXAS	ODA	MIDLAND	57
CHECK SRJ	CONTROL	SECTION	JOB	
	0906	32	050,ETC.	

10/27/2023
N:\IF\Drawings\5. Drainage\CV-TRT-PL-HYDR07.dgn

1200.0000 ft / in.

EXISTING CULVERT

Eastbound Scharbauer Drive (RS: 70080) EXISTING											
River Station	Profile	Plan	Q Total	Q Culv	W.S US	W.S DS	Culv WS Inlet	Culv WS Outlet	Culv Crt Depth	Culv Vel US	Culv Vel DS
			(cfs)	(cfs)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft/s)	(ft/s)
70080	10-Year	3-MID-EX-UPD	4335	4335	2765.72	2765.60	2762.37	2762.16	0.89	0.80	0.80
70080	50-Year	3-MID-EX-UPD	6855	6855	2767.49	2767.40	2762.37	2762.16	0.82	0.71	0.71
70080	100-Year	3-MID-EX-UPD	8270	8270	2768.28	2768.18	2762.37	2762.16	1.20	1.24	1.24
70080	500-Year	3-MID-EX-UPD	18435	18435	2772.14	2772.07	2762.37	2762.16	1.19	1.23	1.23

CULVERT DATA SUMMARY

Inlet Station	0.00 ft
Inlet Elevation	2756.37 ft
Outlet Station	59.00 ft
Outlet Elevation	2756.16 ft
Number of Barrels	8
Barrel Shape	Box
Barrel Span	120.00 in
Barrel Rise	72.00 in
Barrel Material	Concrete
Embedment	0.00 in
Barrel Manning's n	0.013
Culvert Type	Straight
Inlet Configuration	Headwall
Inlet Depression	0.00 in
Slope	0.0036

PROPOSED CULVERT

Eastbound Scharbauer Drive (RS: 70080) PROPOSED											
River Station	Profile	Plan	Q Total	Q Culv	W.S US	W.S DS	Culv WS Inlet	Culv WS Outlet	Culv Crt Depth	Culv Vel US	Culv Vel DS
			(cfs)	(cfs)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft/s)	(ft/s)
70080	10-Year	5-MID-PROP UPD	4335	4335	2765.73	2765.60	2762.35	2762.06	1.20	1.24	1.24
70080	50-Year	5-MID-PROP UPD	6855	6855	2767.49	2767.40	2762.35	2762.06	1.28	1.38	1.38
70080	100-Year	5-MID-PROP UPD	8270	8270	2768.27	2768.18	2762.35	2762.06	1.37	1.52	1.52
70080	500-Year	5-MID-PROP UPD	18435	18435	2772.13	2772.07	2762.35	2762.06	1.11	1.11	1.11

CULVERT DATA SUMMARY

Inlet Station	0.00 ft
Inlet Elevation	2756.35 ft
Outlet Station	55.15 ft
Outlet Elevation	2756.06 ft
Number of Barrels	8
Barrel Shape	Box
Barrel Span	120.00 in
Barrel Rise	72.00 in
Barrel Material	Concrete
Embedment	0.00 in
Barrel Manning's n	0.013
Culvert Type	Straight
Inlet Configuration	Headwall
Inlet Depression	0.00 in
Slope	0.0053

STATE OF TEXAS
HEATHER RAE KEISTER
100095
LICENSED
PROFESSIONAL ENGINEER

10/27/2023

Freese and Nichols, Inc.
Texas Registered Engineering Firm F-2144

HL 93 LOADING

NO	DATE	REVISION	APPROVED

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Phone - (806) 686-2700
Web www.freese.com

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SCHARBAUER DRIVE
BRIDGE REPLACEMENTS

HYDRAULIC
DATA
EB SCHARBAUER DRIVE

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DAG	6	SEE TITLE SHEET FOR PROJECT NO.		MAIN ST
GRAPHICS KNW	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK KMM	TEXAS	ODA	MIDLAND	58
CHECK SRJ	CONTROL	SECTION	JOB	
	0906	32	050,ETC.	

10/27/2023
N:\IF\Drawings\5. Drainage\CV-TRT-PL-HYDR08.dgn

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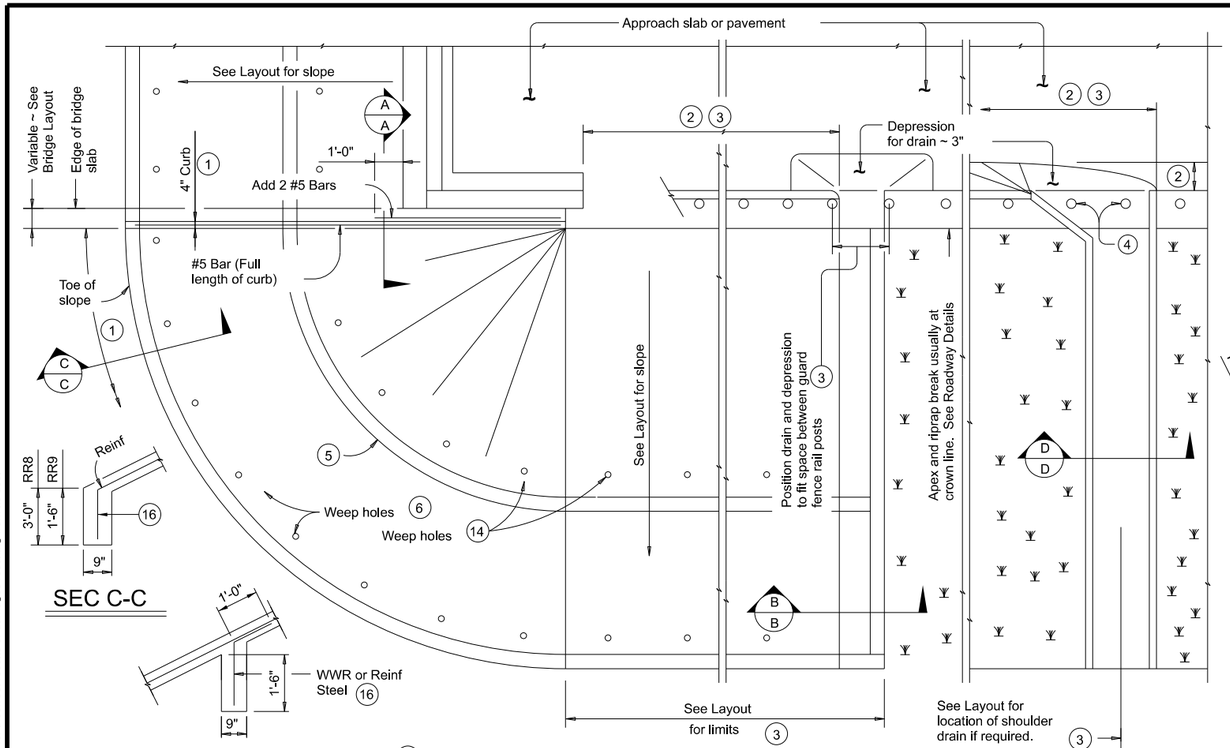
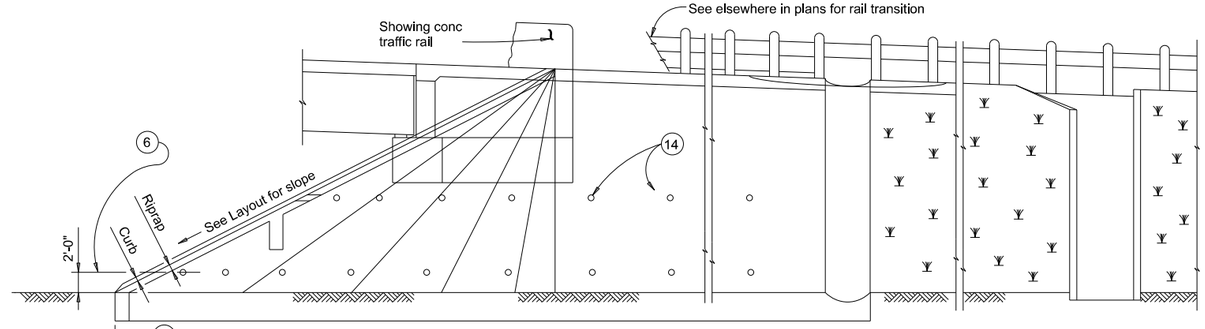
DATE:
FILE:



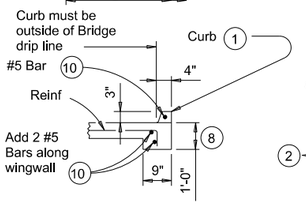
PLAN

SEC C-C

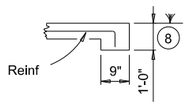
INTERMEDIATE TOEWALL (5)



ELEVATION

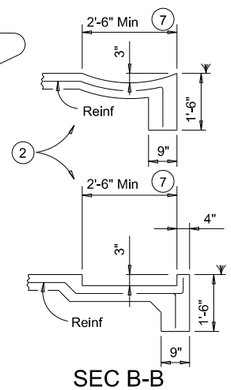


SEC A-A



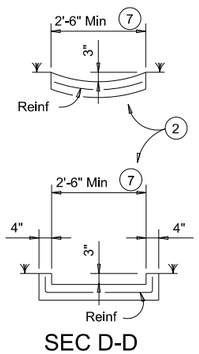
SEC B-B

(No drain)



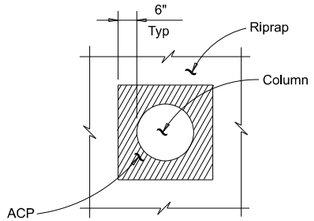
SEC B-B

(Shoulder drain integral with riprap)



SEC D-D

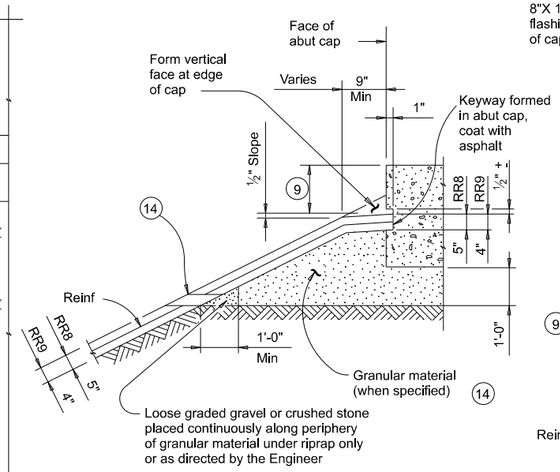
(Shoulder drain)



Riprap blockout to be filled with ACP. (Subsidiary to riprap)

RIPRAP DETAIL AT COLUMNS

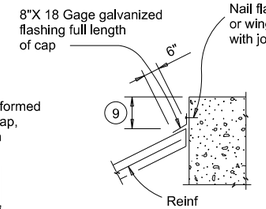
(As directed by the Engineer)



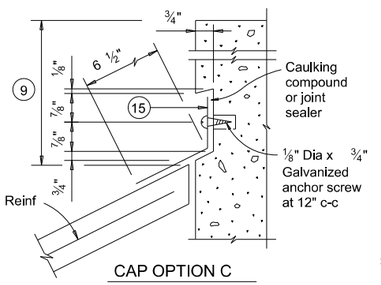
SHOWING KEYWAY OPTION

1. When riprap is shown extended around header on layout, extend slab and toewall as shown and eliminate 4" curb.
2. Limits and configuration of drains and depressions are as shown elsewhere in plans or as directed by the Engineer.
3. Location of shoulder drain must consider limitations imposed by rail transition. Do not locate shoulder drains at expansion joints between approach slab and concrete pavement.
4. See details elsewhere in plans for installation of guard fence posts through concrete riprap.
5. Provide intermediate toewall only when designated elsewhere in the plans or included in the specifications.
6. Provide lower level of 2" Dia weep holes at 10' c-c backed by 1 CF packet of gravel and galvanized hardware cloth at all locations unless directed by the Engineer to eliminate.
7. Use wider or other drain configurations if shown elsewhere in plans or if directed by the Engineer.
8. Wall extension may be reduced or modified if approved by the Engineer. Increase wall extension to 1'-6" whenever the optional intermediate toewall is called for in the plans.
9. Top of cap to top of riprap dimension varies as directed by the Engineer. Should be 9" Min for beam/slab type bridges and 1'-6" for slab span, box beam, or slab beam bridges.
10. #5 bars shown are required even when synthetic fiber reinforcing option is selected.
11. Provide sealing option for joint between the face of cap and riprap as designated by the Engineer or as shown elsewhere on plans.
12. Flashing (shown in Cap Option A) may be used at wingwall in addition to Exp Jt Mat'l if shown on plans or directed by the Engineer.
13. Provide #3 reinforcing bars at 18" Spa c-c. Provide Welded Wire Reinforcement (WWR) as 6x6-D2.9xD2.9 or D3xD3. Combinations of WWR and reinforcing bars may be used if both are permitted. Use lap splices of a minimum 6 inches, measured from the transverse wire of WWR, and the ends of reinforcing bars.
14. If granular material is specified, provide upper level of 2" Dia weep holes at 10' c-c backed by galvanized hardware cloth.
15. 8" x 18 Gage Galv Sheet Metal
16. Provide WWR or #3 bars, with 1'-0" extension into slope.
17. WWR or reinforcing steel is continuous through riprap construction joints. Provide WWR or reinforcing steel that extends 1'-1" minimum into adjacent riprap on each side of construction joint even if synthetic reinforcing fiber is utilized.

FOR CONTRACTOR'S INFORMATION ONLY:
5" of RR8 = 0.015 CY/SF
4" of RR9 = 0.012 CY/SF
#3 Reinf at 18" c-c = 0.501 Lbs/SF
6x6-D3xD3 = 0.408 Lbs/SF

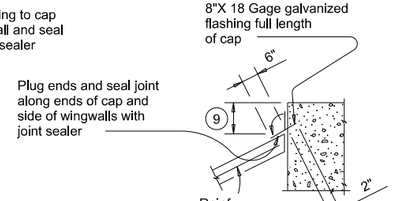


CAP OPTION A

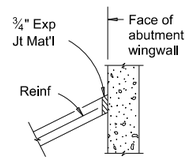


CAP OPTION C

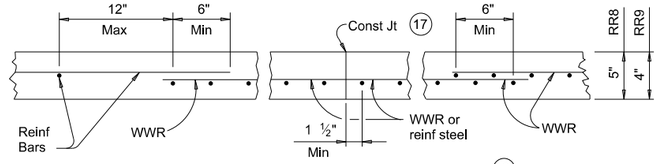
SECTIONS THRU RIPRAP AT CAP (11)



CAP OPTION B



SECT THRU RIPRAP AT WINGWALL (12)



REINFORCEMENT DETAILS (13)

See General Notes for optional synthetic fiber reinforcement.

GENERAL NOTES:

Provide Class "B" concrete (f'c = 2,000 psi) unless noted elsewhere in plans.

Provide Grade 60 reinforcing steel.

Provide deformed welded wire reinforcement (WWR) meeting ASTM A1064, unless otherwise shown.

Provide reinforcing bars, deformed WWR, or any suitable combination of both types for riprap reinforcing, unless specified elsewhere in the plans.

Optionally synthetic fibers may be used if approved by the Engineer. Provide synthetic fibers listed on the "Fibers for Concrete" Material Producer List (MPL) in lieu of steel reinforcing in riprap concrete.

Install construction joints or grooved joints extending the full slant slope height at intervals of approximately 20 feet unless otherwise directed by the Engineer.

Hardware cloth, loose grade stone behind weep holes, flashing, or other sealing material are subsidiary to the bid item "Riprap".

See Layout for limits of riprap.

RR8 is to be used on stream crossings.

RR9 is to be used on other embankments.

Texas Department of Transportation

Bridge Division Standard

CONCRETE RIPRAP AND SHOULDER DRAINS
EMBANKMENTS AT BRIDGE ENDS (TYPES RR8 & RR9)

CRR

FILE: crrstde1-19.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0906	32	050, ETC.	MAIN ST
	DIST	COUNTY		SHEET NO.
	ODA	MIDLAND		59

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

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

TABLE OF WINGWALL REINFORCING
(2~wings)

Bar	Size	No.	Spa
DL	#5	~	1'-0"
DS	#5	~	1'-0"
E	#4	~	1'-0"
F	#4	~	1'-0"
G	#6	4	~
M	#4	4	~
P	#4	~	1'-0"
RS	#5	3	~
RL	#5	3	~
V	#4	~	1'-0"

TABLE OF ESTIMATED CULVERT TOEWALL QUANTITIES

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

WING DIMENSION FORMULAS:

(All values are in feet.)

Hw = H + T + C - 0.250'
A = (Hw - 0.333')(SL)
B = (A) [tanget (θ + 15°)]
Lw = (A) ÷ [cosine (θ + 15°)]

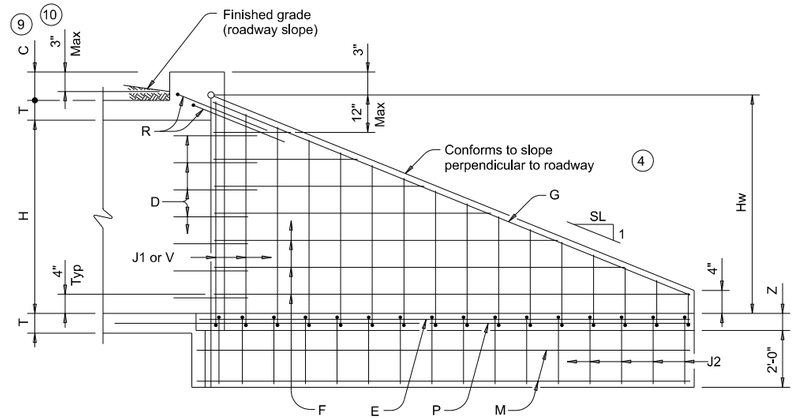
For cast-in-place culverts:
Ltw = [(N) (S) + (N + 1) (U)] ÷ cosine θ

For precast culverts:
Ltw = [(N) (2U + S) + (N - 1) (0.5')] ÷ cosine θ

Total wingwall area (two wings ~ SF) = 0.5 (Hw + 0.333') (Lw + A)

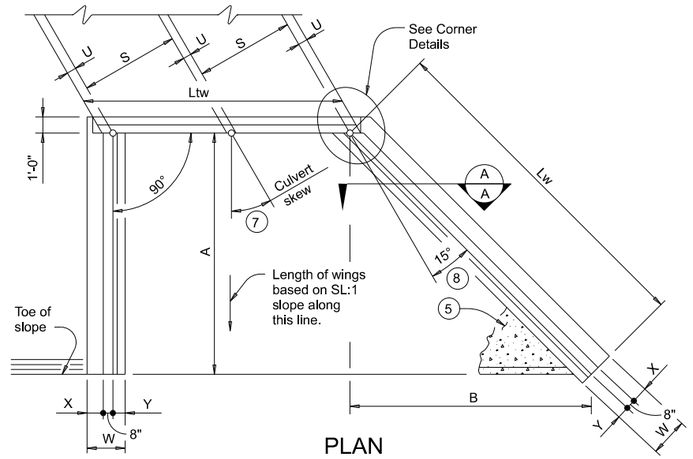
Hw = Height of wingwall
SL:1 = Side slope ratio (horizontal:1 vertical)
A = Length of short wingwalls
Lw = Length of long wingwall
Ltw = Culvert toewall length
N = Number of culvert spans
θ = Culvert skew

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



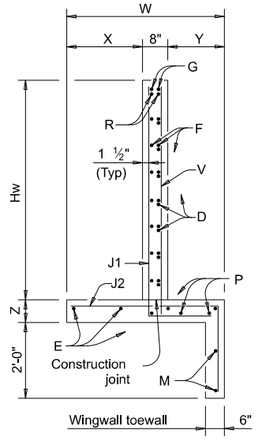
INSIDE ELEVATION

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

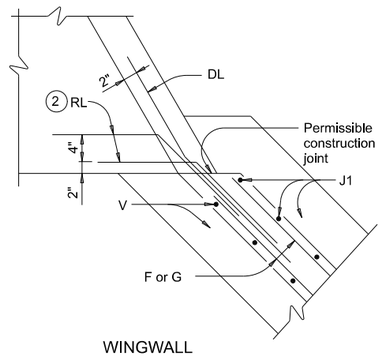


PLAN

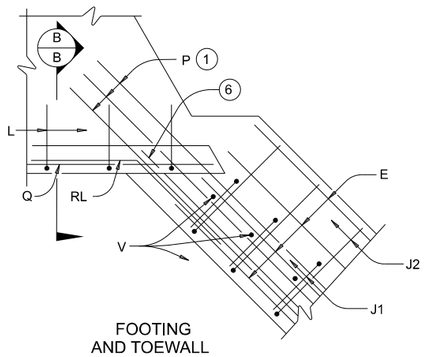
(Showing dimensions and 30° skew.)



SECTION A-A



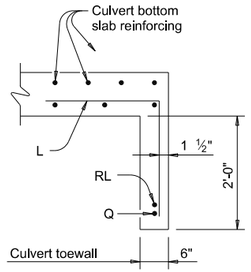
WINGWALL



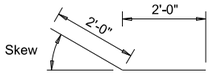
FOOTING AND TOEWALL

CORNER DETAILS

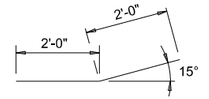
(Culvert and culvert toewall reinforcing not shown for clarity.)



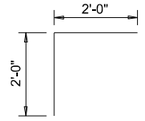
SECTION B-B ⑤



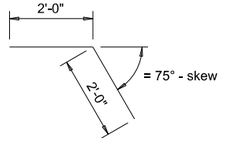
BARS DS
(Short wing)



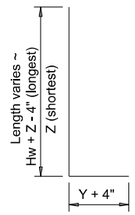
BARS DL
(Long wing)



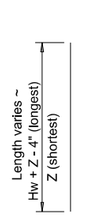
BARS RS
(Short wing)



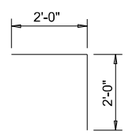
BARS RL
(Long wing)



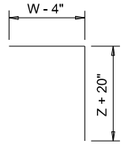
BARS J 1



BARS V



BARS L



BARS J2

1. Extend Bars P 3'-0" minimum into bottom slab of box culvert.
2. Adjust as necessary to maintain 1 1#2" clear cover and 4" minimum between bars.
3. Quantities shown are based on an average wing height for two wings (one structure end). To determine total quantities for two wings, multiply the tabulated values by 0.5 x (A + Lw).
4. Recommended values of side slope are: 2:1, 3:1, 4:1, and 6:1.
5. When shown elsewhere on the plans, construct 5" deep concrete riprap. Payment for riprap is as required by Item 432, "Riprap". Unless otherwise shown on the plans or directed by the Engineer, provide a 6" wide by 1'-6" deep reinforced concrete toewall along all edges of the riprap adjacent to natural ground; reinforce the toewall by extending typical riprap reinforcing into the toewall; and extend construction joints or grooved joints oriented in the direction of flow across the full distance of the riprap at intervals of approximately 20'. When such riprap is provided, the culvert toewall shown in SECTION B-B will not be required.
6. At Contractor's option, culvert toewall may be ended flush with wingwall toewall. Adjust reinforcing as needed.
7. Applicable values of skew are: 15°, 30°, and 45°.
8. Typical wingwall angle for all skews.
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.

MATERIAL NOTES:

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

GENERAL NOTES:

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

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

Texas Department of Transportation

Bridge Division Standard

CONCRETE WINGWALLS
WITH FLARED WINGS FOR SKEWED BOX CULVERTS

FW-S

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

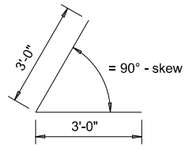
Dimensions					Variable Reinforcing				Estimated Quantities per ft of wing (2~wings) (4)		Estimated Quantities per ft of Toewall (1~toewall)	
Maximum Wingwall Height Hw	W	X	Y	Z	Bars J1		Bars J2					
					Size	Spa	Size	Spa	Reinf (Lb/Ft)	Conc (CY/Ft)	Reinf (Lb/Ft)	Conc (CY/Ft)
2'-6"	2'-10"	10"	1'-0"	7"	#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)

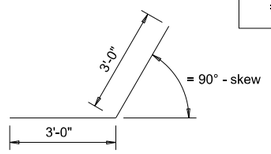
Bar	Size	No.	Spa
D1	#6	~	1'-0"
D2	#6	~	1'-0"
E1	#4	~	1'-0"
F	#4	~	1'-0"
G	#6	~	8"
M1	#4	4	~
P	#4	~	1'-0"
V	#4	~	1'-0"

TABLE OF TOEWALL REINFORCING

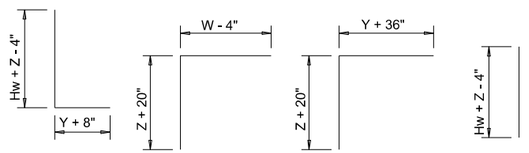
Bar	Size	No.	Spa
J3	#4	~	1'-0"
M2	#4	2	~
E2	#4	~	1'-0"



BARS D1



BARS D2



BARS J1 BARS J2 BARS J3 BARS V

WING DIMENSION FORMULAS:

(All values are in feet.)

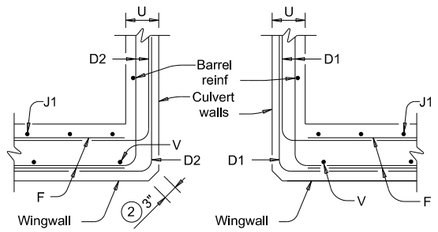
Hw = H + T + C
Lw = (Hw) (SL) ÷ cosine (θ) for Type PW-1
= (Hw - 1') (SL) ÷ cosine (θ) for Type PW-2 and Hw 4' ≥
= (Hw - 0.5') (SL) ÷ cosine (θ) for Type PW-2 and Hw 4' <

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

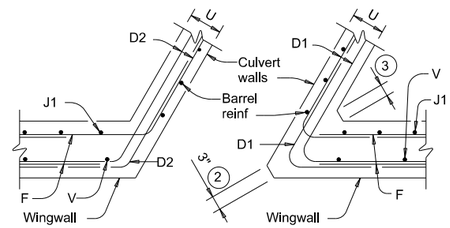
For precast culverts:
Ltw = [(N) (2 U + S) + (N - 1) (0.5')] ÷ cosine (θ)
Total Wingwall Area (two wings ~ SF)
= (2)(Hw)(Lw) for Type PW-1
= (2)(Hw)(Lw) - 6 SF for Type PW-2 and Hw 4' ≥
= (2)(Hw)(Lw) - 1.5 SF for Type PW-2 and Hw 4' <

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.



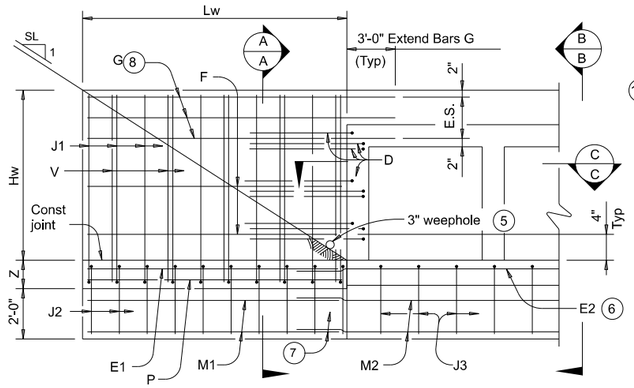
SECTION C-C - PW-1



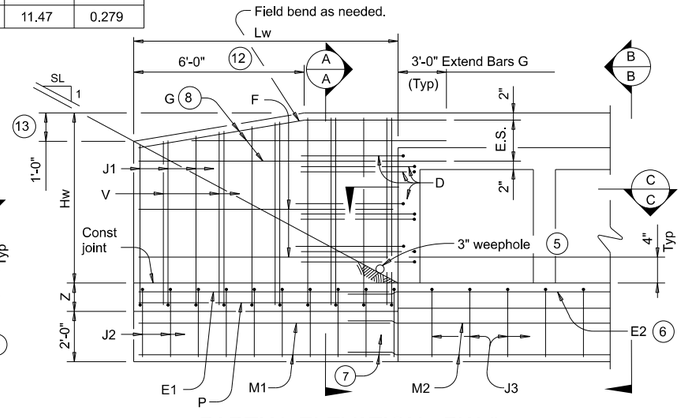
SECTION C-C - PW-2

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

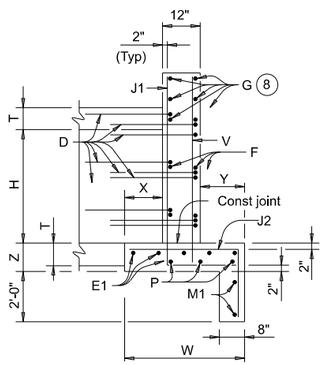
    Reduce curb heights, if necessary, to meet the above requirements. No changes will be made in quantities and no additional compensation will be allowed for this work.
11. 1'-0" typical. 2'-3" when the Box Culvert Rail Mounting Details (RAC) standard sheet is referred to elswhere in the plans.
12. 3'-0"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



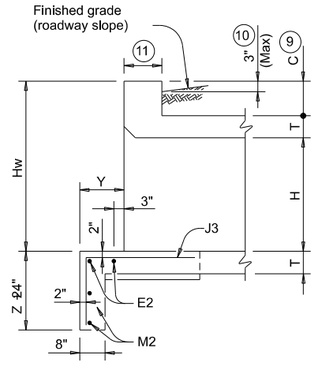
PARTIAL ELEVATION - PW-1



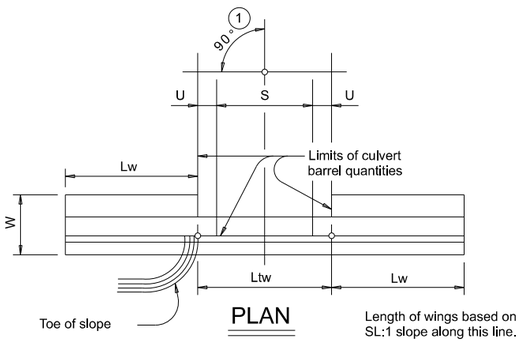
PARTIAL ELEVATION - PW-2



SECTION A-A
(Showing wing reinforcement.)

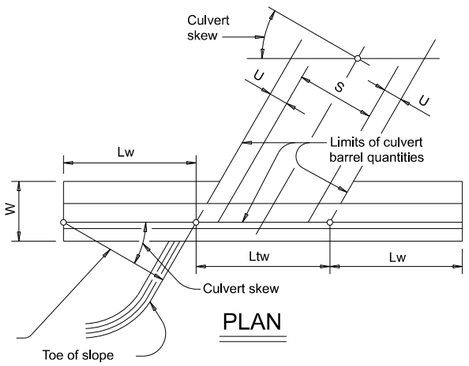


SECTION B-B
(Showing wing reinforcement.)



PLAN

DETAILS FOR NON-SKEWED BOX CULVERTS



PLAN

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

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

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

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

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

Texas Department of Transportation

Bridge Division Standard

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

PW

FILE:	pwstde01-20.dgn	DN: GAF	CK: CAT	DW: TxDOT	CK: TxDOT
©TxDOT	February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS		0906	32	050, ETC.	MAIN ST
		DIST	COUNTY		SHEET NO.
		ODA	MIDLAND		61

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:

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

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

TABLE OF WINGWALL REINFORCING
(2~wings)

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

TABLE OF ESTIMATED CULVERT TOEWALL QUANTITIES

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

WING DIMENSION FORMULAS:

(All values are in feet.)

Hw = H + T + C - 0.250'
Lw = (Hw - 0.333') (SL)

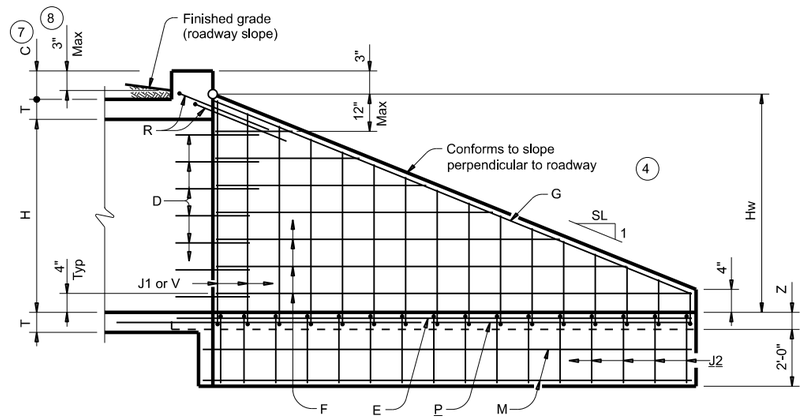
For cast-in-place culverts:
Ltw = (N) (S) + (N + 1) (U)

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

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

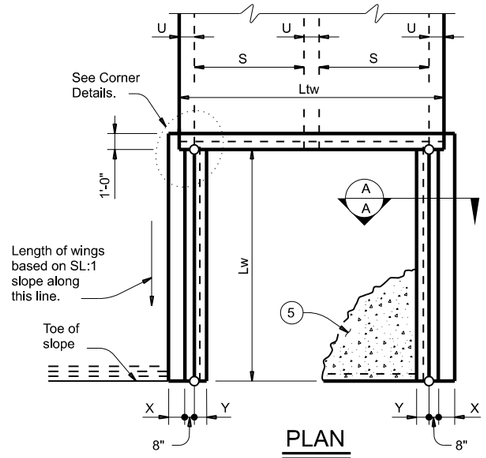
Hw = Height of wingwall
SL:1 = Side slope ratio (horizontal:1 vertical)
Lw = Length of wingwall
Ltw = Culvert toewall length
N = Number of culvert spans

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



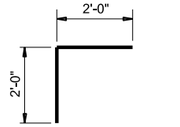
INSIDE ELEVATION

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

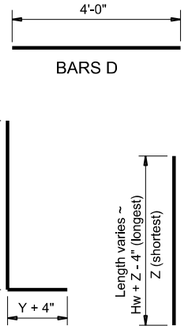


PLAN

(Showing dimensions.)



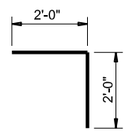
BARS R



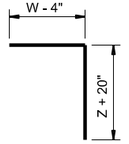
BARS J1

BARS V

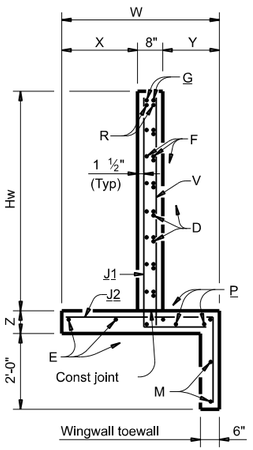
BARS D



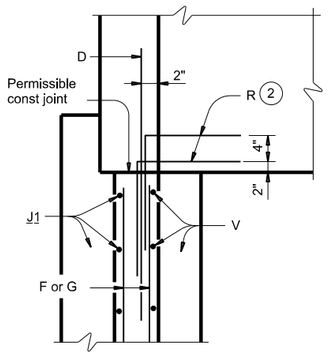
BARS L



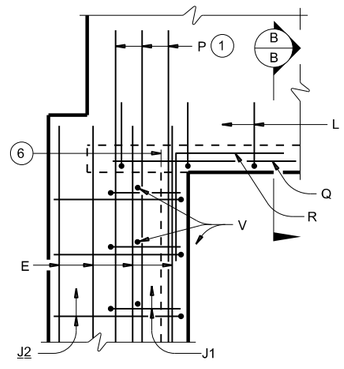
BARS J2



SECTION A-A

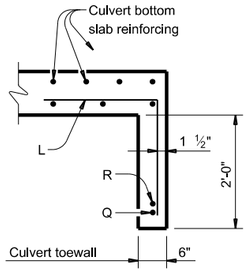


WINGWALL



FOOTING AND TOEWALL

CORNER DETAILS



SECTION B-B ⑤

1. Extend Bars P 3'-0" minimum into bottom slab of box culvert.
2. Adjust as necessary to maintain 1 1#2" clear cover and 4" minimum between bars.
3. Quantities shown are based on an average wing height for two wings (one structure end). To determine total quantities for two wings, multiply the tabulated values by Lw.
4. Recommended values of side slope are: 2:1, 3:1, 4:1, and 6:1.
5. When shown elsewhere on the plans, construct 5" deep concrete riprap. Payment for riprap is as required by Item 432, "Riprap". Unless otherwise shown on the plans or directed by the Engineer, provide a 6" wide by 1'-6" deep reinforced concrete toewall along all edges of the riprap adjacent to natural ground; reinforce the toewall by extending typical riprap reinforcing into the toewall; and extend construction joints or grooved joints oriented in the direction of flow across the full distance of the riprap at intervals of approximately 20'. When such riprap is provided, the culvert toewall shown in SECTION B-B will not be required.
6. At Contractor's option, culvert toewall may be ended flush with wingwall toewall. Adjust reinforcing as needed.
7. 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.
8. For vehicle safety, the following requirements must be met:
   - For structures without bridge rail, construct curbs no more than 3" above finished grade.
   - For structures with bridge rail, construct curbs flush with finished grade.

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

MATERIAL NOTES:

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

GENERAL NOTES:

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

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

Texas Department of Transportation

Bridge Division Standard

CONCRETE WINGWALLS
WITH STRAIGHT WINGS FOR 0° SKEW BOX CULVERTS

SW-O

FILE: sw-0std-20.dgn	DN: GAF	CK: CAT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0906	32	050, ETC.	MAIN ST
	DIST	COUNTY		SHEET NO.
	ODA	MIDLAND		62

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

Maximum Wingwall Height Hw	W	X	Y	Z	Variable Reinforcing Bars J1 Size	Bars J1 Spa	Bars J2 Size	Bars J2 Spa	Estimated Quantities per ft of wing length (2~wings) ③ Reinf (Lb/Ft)	Conc (CY/Ft)
5'-6"	4'-0"	1'-9"	1'-3"	1'-3"	#4	0-6"	#4	1'-0"	133.65	0.827
6'-0"	4'-6"	2'-1"	1'-5"	1'-6"	#4	0-6"	#4	1'-0"	162.29	0.994
7'-0"	5'-3"	2'-6"	1'-9"	1'-9"	#4	0-6"	#4	1'-0"	216.78	1.249
8'-0"	6'-0"	3'-0"	2'-0"	2'-0"	#4	0-6"	#4	1'-0"	297.02	1.531

TABLE OF WINGWALL REINFORCING
(2~wings)

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

TABLE OF ESTIMATED CULVERT TOEWALL QUANTITIES

Bar	Size	No.	Spa
L	#4	~	1'-6"
Q	#4	1	~
Reinf (Lb/Ft)			2.45
Conc (CY/Ft)			0.050

1 1

WING DIMENSION FORMULAS:

(All values are in feet.)

Hw = H + T + C - 0.250'
Lw = (Hw - 0.333')

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

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

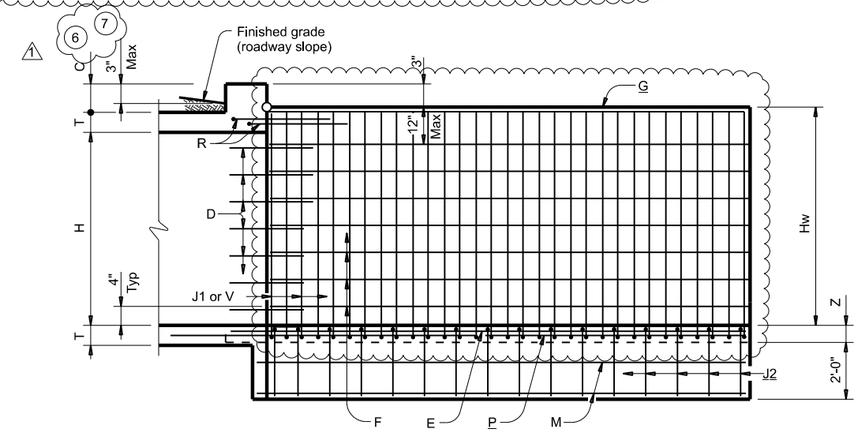
Total Wingwall Area (two wings ~ SF) = (Hw + 0.333') (Lw)

Hw = Height of wingwall
Lw = Length of wingwall
Ltw = Culvert toewall length
N = Number of culvert spans

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

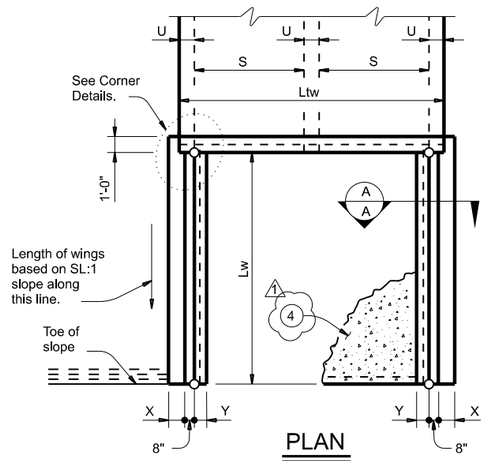
1. ① Extend Bars P 3'-0" minimum into bottom slab of box culvert.
2. ② Adjust as necessary to maintain 1 1 2" clear cover and 4" minimum between bars.
3. ③ Quantities shown are based on an average wing height for two wings (one structure end). To determine total quantities for two wings, multiply the tabulated values by Lw.
4. ④ When shown elsewhere on the plans, construct 5" deep concrete riprap. Payment for riprap is as required by Item 432, "Riprap". Unless otherwise shown on the plans or directed by the Engineer, provide a 6" wide by 1'-6" deep reinforced concrete toewall along all edges of the riprap adjacent to natural ground; reinforce the toewall by extending typical riprap reinforcing into the toewall; and extend construction joints or grooved joints oriented in the direction of flow across the full distance of the riprap at intervals of approximately 20'. When such riprap is provided, the culvert toewall shown in SECTION B-B will not be required.
5. ⑤ At Contractor's option, culvert toewall may be ended flush with wingwall toewall. Adjust reinforcing as needed.
6. ⑥ 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.
7. ⑦ For vehicle safety, the following requirements must be met:
   - For structures without bridge rail, construct curbs no more than 3" above finished grade.
   - For structures with bridge rail, construct curbs flush with finished grade.

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



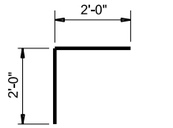
INSIDE ELEVATION

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

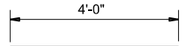


PLAN

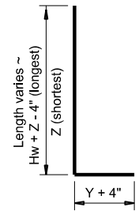
(Showing dimensions.)



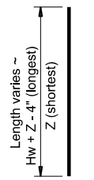
BARS R



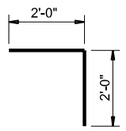
BARS D



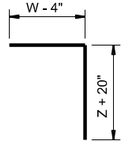
BARS J1



BARS V



BARS L



BARS J2

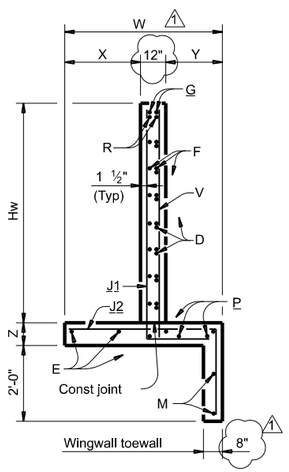
MATERIAL NOTES:

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

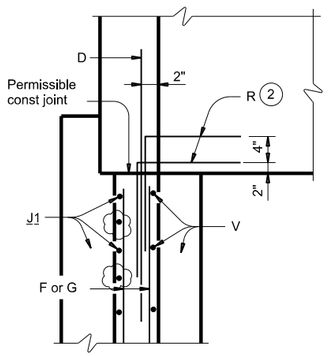
GENERAL NOTES:

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

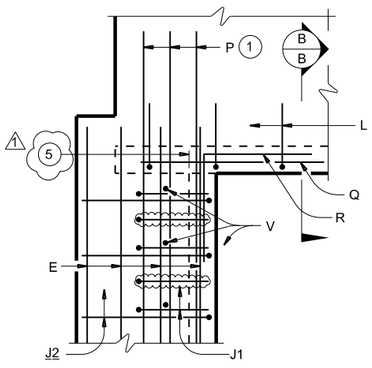
Cover dimensions are clear dimensions, unless noted otherwise.
Reinforcing dimensions are out-to-out of bars.



SECTION A-A

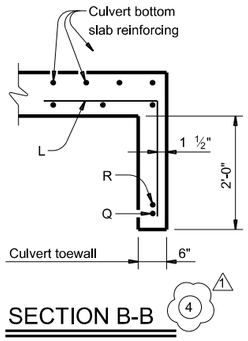


WINGWALL



FOOTING AND TOEWALL

CORNER DETAILS



SECTION B-B

1 ONLY

STATE OF TEXAS
MUNA MITCHELL
88652
LICENSED
PROFESSIONAL ENGINEER

10/27/2023

Texas Department of Transportation

Bridge Division Standard

CONCRETE WINGWALLS
WITH STRAIGHT WINGS FOR 0° SKEW BOX CULVERTS

SW-O (MOD)

FILE: sw-0std-20.dgn	DN: GAF	CK: CAT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0906	32	050, ETC.	MAIN ST
1 REMOVE SLOPE FROM WINGWALL	DIST	COUNTY		SHEET NO.
	ODA	MIDLAND		63

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Culvert Station and/or Creek Name followed by applicable end (Lt, Rt or Both)	Description of Box Culvert No. Spans ~ Span X Height	Max Fill Height (Ft)	Applicable Box Culvert Standard (4)	Applicable Wingwall or End Treatment Standard	Skew Angle (0°,15°, 30° or 45°)	Side Slope or Channel Slope Ratio (SL:1)	T Culvert Top Slab Thickness (In)	U Culvert Wall Thickness (In)	C Estimated Curb Height (Ft)	Hw Height of Wingwall (1) (Ft)	A Curb to End of Wingwall (Ft)	B Offset of End of Wingwall (Ft)	Lw Length of Longest Wingwall (Ft)	Ltw Culvert Toewall Length (Ft)	Atw Anchor Toewall Length (Ft)	Riprap Apron (CY)	Class "C" Conc (Curb) (2) (CY)	Class "C" Conc (Wingwall) (3) (CY)	Total Wingwall Area (SF)
CULVERT #01 (Both)	5 ~ 10' X 5'	0'	Non-Stndrd	SW-0 (MOD)	30	(VERTICAL)	10.75"	7"	0.000	5.646	N/A	N/A	5.313	61.776	N/A	0.0	0.0	6.2	64
CULVERT #03 (Lt)	6 ~ 10' X 6'	0'	Non-Stndrd	FW-S	15	2:1	12"	7"	0.000	6.750	12.883	7.409	14.819	66.344	N/A	0.0	0.0	8.2	98
CULVERT #03 (Rt)	6 ~ 10' X 6'	0'	Non-Stndrd	SW-0	15	2:1	12"	7"	0.000	6.750	N/A	N/A	12.833	66.344	N/A	0.0	0.0	7.8	91
CULVERT #04 (LT WEST) (Lt)	8 ~ 10' X 6'	0'	Non-Stndrd	PW-1	45	2:1	12.3"	7"	0.000	7.025	N/A	N/A	19.870	120.562	N/A	0.0	0.0	29.1	279
CULVERT #04 (LT EAST) (Lt)	8 ~ 10' X 6'	0'	Non-Stndrd	FW-S	45	2:1	12.3"	7"	0.000	6.775	12.883	22.315	25.767	120.562	N/A	0.0	0.0	12.5	137
CULVERT #04 (RT WEST) (Rt)	8 ~ 10' X 6'	0'	Non-Stndrd	FW-S	45	2:1	12.3"	7"	0.000	6.775	12.883	22.315	25.767	120.562	N/A	0.0	0.0	12.5	137
CULVERT #04 (RT WEST) (Rt)	8 ~ 10' X 6'	0'	Non-Stndrd	SW-0	45	2:1	12.3"	7"	0.000	6.775	N/A	N/A	12.883	120.562	N/A	0.0	0.0	9.8	92

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

SL:1 = Horizontal : 1 Vertical
· Side slope at culvert for flared or straight wingwalls.
· Channel slope for parallel wingwalls.
· Slope must be 3:1 or flatter for safety end treatments.

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

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

C = Curb height

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

Hw = Height of wingwall

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

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

Lw = Length of longest wingwall.

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

Atw = Length of anchor toewall (applicable to safety end treatment only)
Total Wingwall Area = Wingwall area in sq. ft. for two wingwalls (one structure end) if Lt or Rt.
Area for four wingwalls (two structure ends) if Both.

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

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

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

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

SPECIAL NOTE:

This sheet is a supplement to the box culvert standards. It is to be filled out by the culvert specifier and provides dimensions for the construction of the box culvert wingwalls and safety end treatments.

An Excel 2010 spreadsheet to assist in completing this table can be downloaded from the Bridge Standards (English) web page on the TxDOT web site. The completed sheet must be signed, sealed, and dated by a licensed Professional Engineer.

STATE OF TEXAS
KEVIN MORRIS
105091
LICENSED
PROFESSIONAL ENGINEER
10/27/2023

Texas Department of Transportation

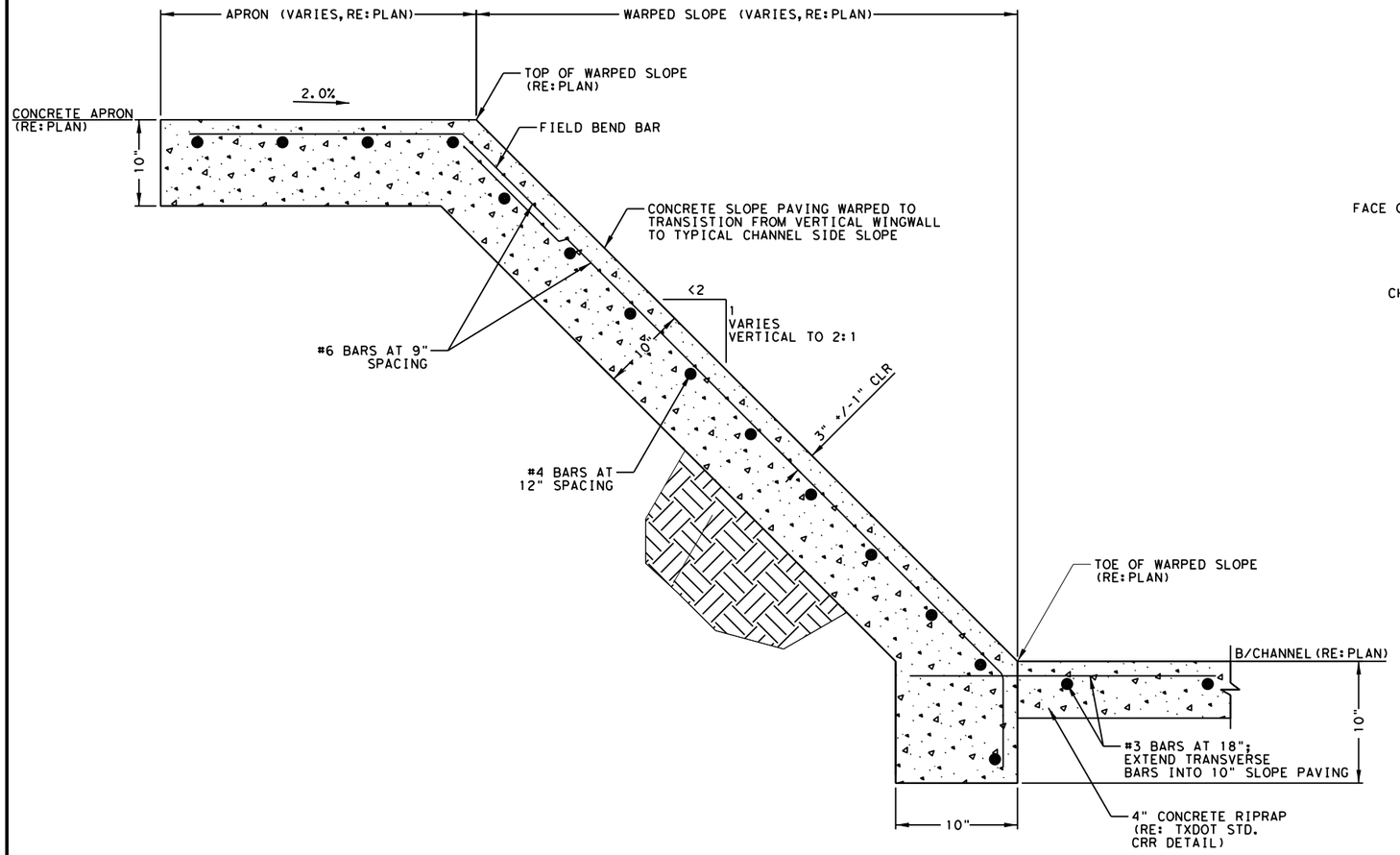
Bridge Division Standard

BOX CULVERT SUPPLEMENT
WINGS AND END TREATMENTS

BCS

FILE: bcsstde1-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0906	32	050, ETC.	MAIN ST
	DIST	COUNTY		SHEET NO.
	ODA	MIDLAND		64

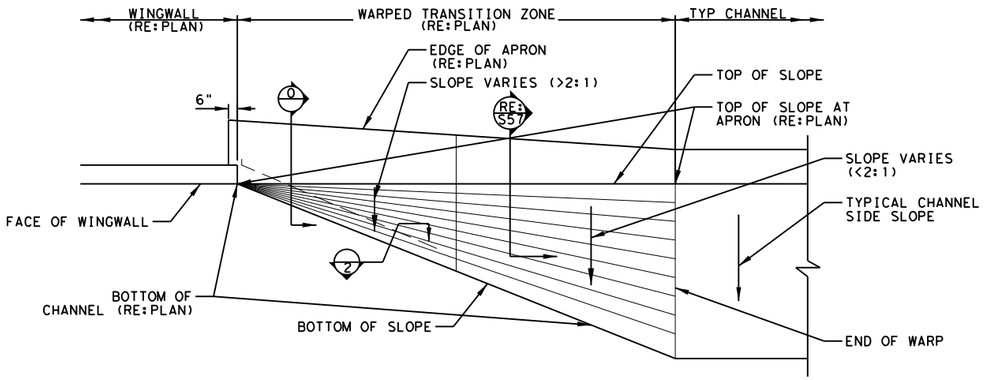
1.0000 ' / in.



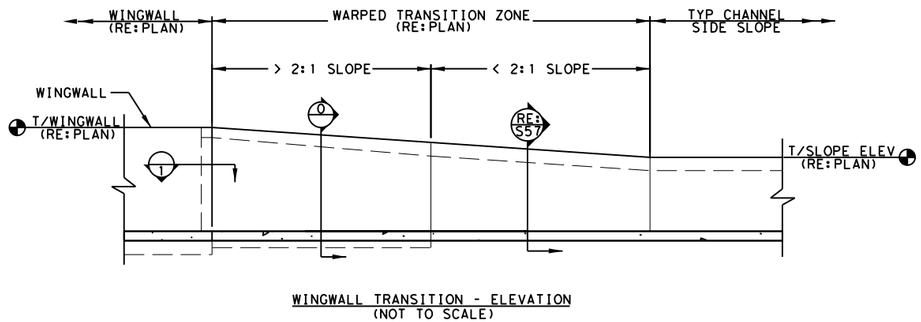
0/1 SECTION THROUGH TRANSITION SLOPE
(NOT TO SCALE)

NOTE:

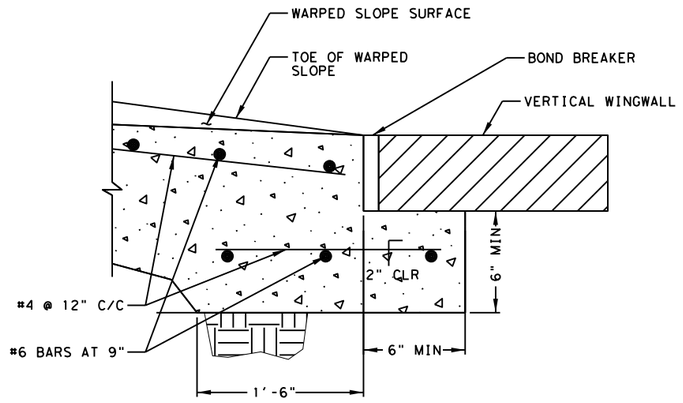
1. 10" THICKNESS AT SLOPES GREATER THAN 2(H):1(V), SEE DETAIL 2 FOR TRANSITION TO TXDOT STD. CRR.



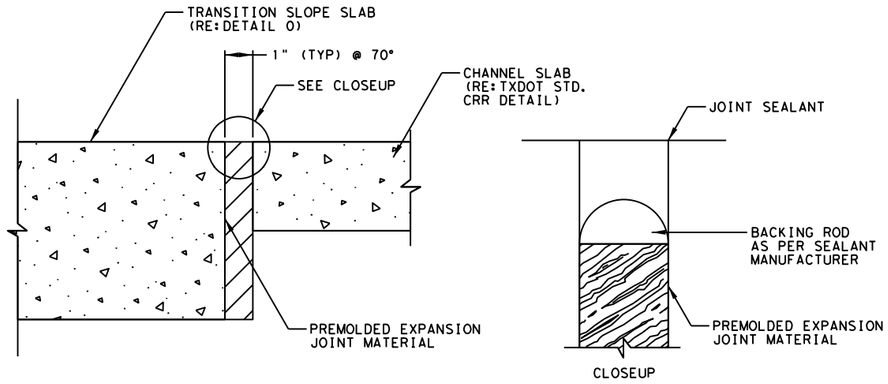
WINGWALL TRANSITION - PLAN
(NOT TO SCALE)



WINGWALL TRANSITION - ELEVATION
(NOT TO SCALE)



1/1 WING WALL TRANSITION DETAIL - PLAN VIEW
(NOT TO SCALE)



2/1 THICKNESS CHANGE JOINT DETAILS
(NOT TO SCALE)

Kevin Morris 10/27/2023
Freese and Nichols, Inc.
Texas Registered Engineering Firm F-2144

HL 93 LOADING

NO	DATE	REVISION	APPROVED

FREESE AND NICHOLS
1500 Broadway Street, Suite 206
Lubbock, TX 79401
Phone - (806) 686-2700
Web www.freese.com

Texas Department of Transportation
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SCHARBAUER DRIVE BRIDGE REPLACEMENTS

MISCELLANEOUS DRAINAGE DETAILS

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DAG	6	SEE TITLE SHEET FOR PROJECT NO.		MAIN ST
GRAPHICS KNW	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK KMM	TEXAS	ODA	MIDLAND	65
CHECK SRJ	CONTROL	SECTION	JOB	
	0906	32	050, ETC.	

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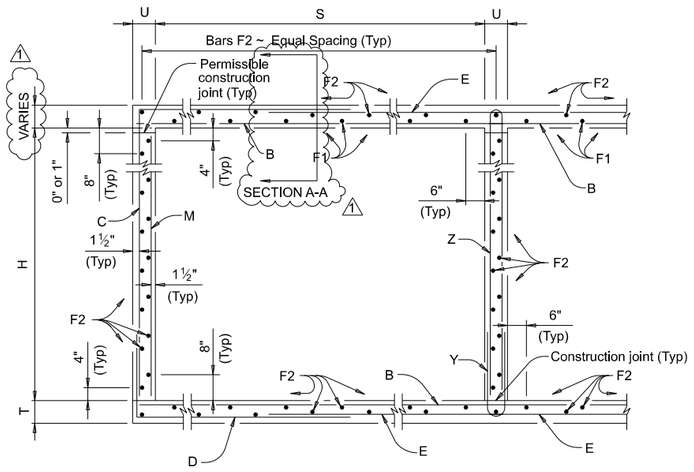
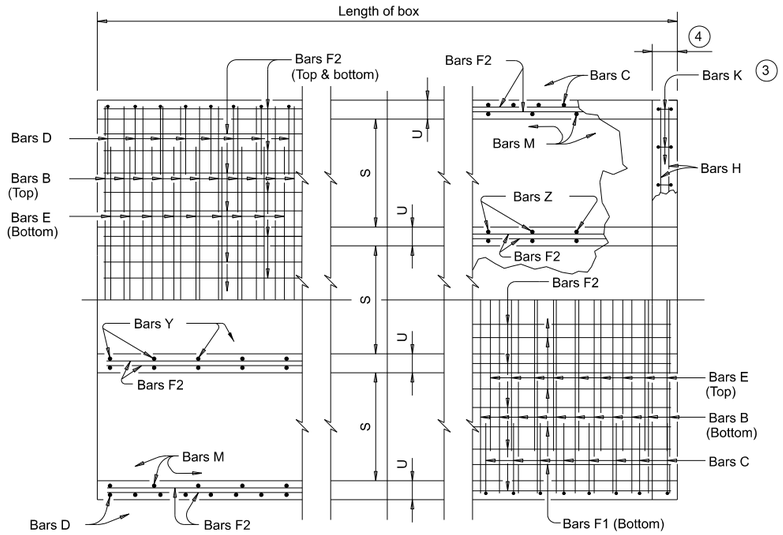
DATE:
FILE:



TYPICAL SECTION



BOTTOM SLAB TOP SLAB

PART PLANS

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

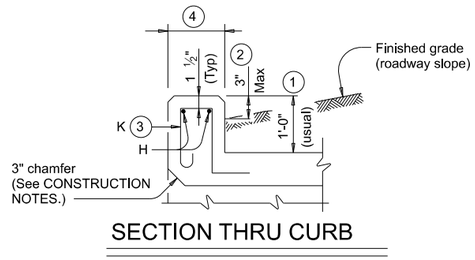
2. For vehicle safety, the following requirements must be met:
   · For structures without bridge rail, construct curbs no more than 3" above finished grade.
   · For structures with bridge rail, construct curbs flush with finished grade.
   Reduce curb heights, if necessary, to meet the above requirements. No changes will be made in quantities and no additional compensation will be allowed for this work.

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

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

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

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



SECTION THRU CURB

TABLE OF BAR DIMENSIONS

H	"X"	"Y"
4'-0"	4'-6 ½"	5'-9"
4'-6"	5'-0 ½"	5'-9"
5'-0"	5'-6 ½"	5'-9"
6'-0"	6'-6 ½"	5'-9"
7'-0"	7'-6 ½"	5'-9"
8'-0"	8'-6 ½"	5'-9"
9'-0"	9'-6 ½"	5'-9"
10'-0"	10'-6 ½"	5'-9"

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.

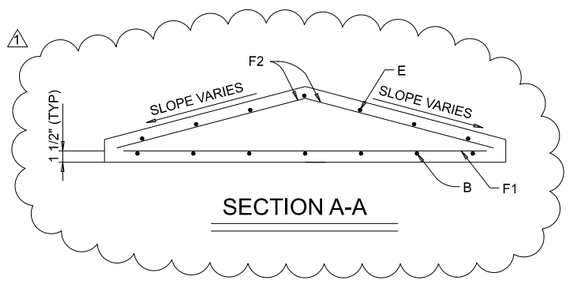
MATERIAL NOTES:

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

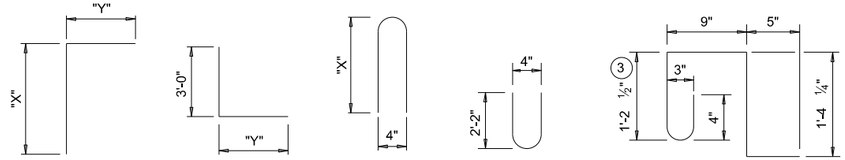
GENERAL NOTES:

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.



SECTION A-A



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

1 ONLY

STATE OF TEXAS
MUNA MITCHELL
88652
LICENSED
PROFESSIONAL ENGINEER

10/27/2023

HL93 LOADING SHEET 1 OF 2

Texas Department of Transportation

Bridge Division Standard

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

MC-10-7 (MOD)

FILE: mc107ste-20.dgn	DN: TBE	CK: BMP	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0906	32	050, ETC.	MAIN ST
1 ADD CROSS SLOPE TO TOP OF CULVERT	DIST	COUNTY		SHEET NO.
	ODA	MIDLAND		66

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BILLS OF REINFORCING STEEL (For Box Length = 40 feet)

NUMBER OF SPANS	SECTION DIMENSIONS				Bars B (5)					Bars C & D							Bars E					Bars F1 ~ #4				Bars F2 ~ #4				Bars M ~ #4				Bars Y & Z ~ #4								Bars H 4 ~ #4 (5)		Bars K		QUANTITIES					
													Bars C		Bars D																					Bars Y		Bars Z								Per Foot of Barrel		Curb		Total	
	S	H	T	U	No.	Size	Spa	Length	Wt	No.	Size	Spa	Length	Wt	Length	Wt	No.	Size	Spa	Length	Wt	No.	Spa	Length	Wt	No.	Spa	Length	Wt	No.	Spa	Length	Wt	No.	Spa	Length	Wt	No.	Spa	Length	Wt	Length	Wt	No.	Wt	Conc (CY)	Renf (Lb)	Conc (CY)	Renf (Lb)	Conc (CY)	Renf (Lb)
2	10' - 0"	4' - 0"	8"	7"	162	#6	6"	21' - 6"	5,231	108	#6	9"	10' - 4"	1,676	8' - 10"	1,433	162	#6	6"	15' - 4"	3,731	14	18"	39' - 9"	372	66	18"	39' - 9"	1,752	108	9"	4' - 0"	289	54	9"	4' - 7"	165	9' - 3"	334	21' - 6"	57	46	128	1.333	374.6	1.6	185	54.9	15,168
3	10' - 0"	4' - 0"	8"	7"	162	#6	6"	32' - 1"	7,807	108	#6	9"	10' - 4"	1,676	8' - 10"	1,433	162	#6	6"	25' - 11"	6,306	21	18"	39' - 9"	558	95	18"	39' - 9"	2,523	108	9"	4' - 0"	289	108	9"	4' - 7"	331	9' - 3"	667	32' - 1"	86	68	189	1.942	539.8	2.4	275	80.1	21,865
4	10' - 0"	4' - 0"	8"	7"	162	#6	6"	42' - 8"	10,382	108	#6	9"	10' - 4"	1,676	8' - 10"	1,433	162	#6	6"	36' - 6"	8,881	28	18"	39' - 9"	743	124	18"	39' - 9"	3,293	108	9"	4' - 0"	289	162	9"	4' - 7"	496	9' - 3"	1,001	42' - 8"	114	88	245	2.551	704.9	3.2	359	105.2	28,553
5	10' - 0"	4' - 0"	8"	7"	162	#6	6"	53' - 3"	12,957	108	#6	9"	10' - 4"	1,676	8' - 10"	1,433	162	#6	6"	47' - 1"	11,457	35	18"	39' - 9"	929	153	18"	39' - 9"	4,063	108	9"	4' - 0"	289	216	9"	4' - 7"	661	9' - 3"	1,335	53' - 3"	142	110	306	3.160	870.0	3.9	448	130.3	35,248
~~6~~ (1)	~~10' - 0"~~	~~4' - 0"~~	~~8"~~	~~7"~~	~~162~~	~~#6~~	~~6"~~	~~66' - 4"~~	~~16,140~~	~~108~~	~~#6~~	~~9"~~	~~10' - 4"~~	~~1,676~~	~~8' - 10"~~	~~1,433~~	~~162~~	~~#6~~	~~6"~~	~~57' - 8"~~	~~14,032~~	~~42~~	~~18"~~	~~39' - 9"~~	~~1,115~~	~~182~~	~~18"~~	~~39' - 9"~~	~~4,833~~	~~108~~	~~9"~~	~~4' - 0"~~	~~289~~	~~270~~	~~9"~~	~~4' - 7"~~	~~827~~	~~9' - 3"~~	~~1,668~~	~~65' - 6"~~	~~175~~	~~130~~	~~362~~	~~3.770~~	~~1,050.3~~	~~4.7~~	~~537~~	~~155.5~~	~~42,550~~
5	10' - 0"	4" - 6"	8"	7"	162	#6	6"	53' - 3"	12,957	108	#6	9"	10' - 10"	1,757	8' - 10"	1,433	162	#6	6"	47' - 1"	11,457	35	18"	39' - 9"	929	159	18"	39' - 9"	4,222	108	9"	4' - 6"	325	216	9"	4' - 7"	661	10' - 3"	1,479	53' - 3"	142	110	306	3.225	880.5	3.9	448	132.9	35,668
2	10' - 0"	5' - 0"	8"	7"	162	#6	6"	21' - 6"	5,231	108	#6	9"	11' - 4"	1,838	8' - 10"	1,433	162	#6	6"	15' - 4"	3,731	14	18"	39' - 9"	372	72	18"	39' - 9"	1,912	108	9"	5' - 0"	361	54	9"	4' - 7"	165	11' - 3"	406	21' - 6"	57	46	128	1.398	386.2	1.6	185	57.5	15,634
3	10' - 0"	5' - 0"	8"	7"	162	#6	6"	32' - 1"	7,807	108	#6	9"	11' - 4"	1,838	8' - 10"	1,433	162	#6	6"	25' - 11"	6,306	21	18"	39' - 9"	558	103	18"	39' - 9"	2,735	108	9"	5' - 0"	361	108	9"	4' - 7"	331	11' - 3"	812	32' - 1"	86	68	189	2.029	554.5	2.4	275	83.5	22,456
4	10' - 0"	5' - 0"	8"	7"	162	#6	6"	42' - 8"	10,382	108	#6	9"	11' - 4"	1,838	8' - 10"	1,433	162	#6	6"	36' - 6"	8,881	28	18"	39' - 9"	743	134	18"	39' - 9"	3,558	108	9"	5' - 0"	361	162	9"	4' - 7"	496	11' - 3"	1,217	42' - 8"	114	88	245	2.659	722.7	3.2	359	109.5	29,268
5	10' - 0"	5' - 0"	8"	7"	162	#6	6"	53' - 3"	12,957	108	#6	9"	11' - 4"	1,838	8' - 10"	1,433	162	#6	6"	47' - 1"	11,457	35	18"	39' - 9"	929	165	18"	39' - 9"	4,381	108	9"	5' - 0"	361	216	9"	4' - 7"	661	11' - 3"	1,623	53' - 3"	142	110	306	3.290	891.0	3.9	448	135.5	36,088
6	10' - 0"	5' - 0"	8"	7"	162	#6	6"	66' - 4"	16,140	108	#6	9"	11' - 4"	1,838	8' - 10"	1,433	162	#6	6"	57' - 8"	14,032	42	18"	39' - 9"	1,115	196	18"	39' - 9"	5,204	108	9"	5' - 0"	361	270	9"	4' - 7"	827	11' - 3"	2,029	65' - 6"	175	130	362	3.921	1,074.5	4.7	537	161.6	43,516
2	10' - 0"	6' - 0"	8"	7"	162	#6	6"	21' - 6"	5,231	108	#6	9"	12' - 4"	2,001	8' - 10"	1,433	162	#6	6"	15' - 4"	3,731	14	18"	39' - 9"	372	78	18"	39' - 9"	2,071	108	9"	6' - 0"	433	54	9"	4' - 7"	165	13' - 3"	478	21' - 6"	57	46	128	1.463	397.9	1.6	185	60.1	16,100
3	10' - 0"	6' - 0"	8"	7"	162	#6	6"	32' - 1"	7,807	108	#6	9"	12' - 4"	2,001	8' - 10"	1,433	162	#6	6"	25' - 11"	6,306	21	18"	39' - 9"	558	111	18"	39' - 9"	2,947	108	9"	6' - 0"	433	108	9"	4' - 7"	331	13' - 3"	956	32' - 1"	86	68	189	2.115	569.3	2.4	275	87.0	23,047
4	10' - 0"	6' - 0"	8"	7"	162	#6	6"	42' - 8"	10,382	108	#6	9"	12' - 4"	2,001	8' - 10"	1,433	162	#6	6"	36' - 6"	8,881	28	18"	39' - 9"	743	144	18"	39' - 9"	3,824	108	9"	6' - 0"	433	162	9"	4' - 7"	496	13' - 3"	1,434	42' - 8"	114	88	245	2.767	740.7	3.2	359	113.8	29,986
5	10' - 0"	6' - 0"	8"	7"	162	#6	6"	53' - 3"	12,957	108	#6	9"	12' - 4"	2,001	8' - 10"	1,433	162	#6	6"	47' - 1"	11,457	35	18"	39' - 9"	929	177	18"	39' - 9"	4,700	108	9"	6' - 0"	433	216	9"	4' - 7"	661	13' - 3"	1,912	53' - 3"	142	110	306	3.420	912.1	3.9	448	140.7	36,931
6	10' - 0"	6' - 0"	8"	7"	162	#6	6"	66' - 4"	16,140	108	#6	9"	12' - 4"	2,001	8' - 10"	1,433	162	#6	6"	57' - 8"	14,032	42	18"	39' - 9"	1,115	210	18"	39' - 9"	5,576	108	9"	6' - 0"	433	270	9"	4' - 7"	827	13' - 3"	2,390	65' - 6"	175	130	362	4.072	1,098.7	4.7	537	167.6	44,484
2	10' - 0"	7' - 0"	8"	7"	162	#6	6"	21' - 6"	5,231	108	#6	9"	13' - 4"	2,163	8' - 10"	1,433	162	#6	6"	15' - 4"	3,731	14	18"	39' - 9"	372	78	18"	39' - 9"	2,071	108	9"	7' - 0"	505	54	9"	4' - 7"	165	15' - 3"	550	21' - 6"	57	46	128	1.528	405.5	1.6	185	62.7	16,406
3	10' - 0"	7' - 0"	8"	7"	162	#6	6"	32' - 1"	7,807	108	#6	9"	13' - 4"	2,163	8' - 10"	1,433	162	#6	6"	25' - 11"	6,306	21	18"	39' - 9"	558	111	18"	39' - 9"	2,947	108	9"	7' - 0"	505	108	9"	4' - 7"	331	15' - 3"	1,100	32' - 1"	86	68	189	2.202	578.8	2.4	275	90.5	23,425
4	10' - 0"	7' - 0"	8"	7"	162	#6	6"	42' - 8"	10,382	108	#6	9"	13' - 4"	2,163	8' - 10"	1,433	162	#6	6"	36' - 6"	8,881	28	18"	39' - 9"	743	144	18"	39' - 9"	3,824	108	9"	7' - 0"	505	162	9"	4' - 7"	496	15' - 3"	1,650	42' - 8"	114	88	245	2.876	751.9	3.2	359	118.2	30,436
5	10' - 0"	7' - 0"	8"	7"	162	#6	6"	53' - 3"	12,957	108	#6	9"	13' - 4"	2,163	8' - 10"	1,433	162	#6	6"	47' - 1"	11,457	35	18"	39' - 9"	929	177	18"	39' - 9"	4,700	108	9"	7' - 0"	505	216	9"	4' - 7"	661	15' - 3"	2,200	53' - 3"	142	110	306	3.549	925.1	3.9	448	145.9	37,453
6	10' - 0"	7' - 0"	8"	7"	162	#6	6"	66' - 4"	16,140	108	#6	9"	13' - 4"	2,163	8' - 10"	1,433	162	#6	6"	57' - 8"	14,032	42	18"	39' - 9"	1,115	210	18"	39' - 9"	5,576	108	9"	7' - 0"	505	270	9"	4' - 7"	827	15' - 3"	2,750	65' - 6"	175	130	362	4.223	1,113.5	4.7	537	173.7	45,078
2	10' - 0"	8' - 0"	8"	7"	162	#6	6"	21' - 6"	5,231	108	#6	9"	14' - 4"	2,325	8' - 10"	1,433	162	#6	6"	15' - 4"	3,731	14	18"	39' - 9"	372	84	18"	39' - 9"	2,230	108	9"	8' - 0"	577	54	9"	4' - 7"	165	17' - 3"	622	21' - 6"	57	46	128	1.593	417.2	1.6	185	65.3	16,871
3	10' - 0"	8' - 0"	8"	7"	162	#6	6"	32' - 1"	7,807	108	#6	9"	14' - 4"	2,325	8' - 10"	1,433	162	#6	6"	25' - 11"	6,306	21	18"	39' - 9"	558	119	18"	39' - 9"	3,160	108	9"	8' - 0"	577	108	9"	4' - 7"	331	17' - 3"	1,244	32' - 1"	86	68	189	2.288	593.5	2.4	275	93.9	24,016
4	10' - 0"	8' - 0"	8"	7"	162	#6	6"	42' - 8"	10,382	108	#6	9"	14' - 4"	2,325	8' - 10"	1,433	162	#6	6"	36' - 6"	8,881	28	18"	39' - 9"	743	154	18"	39' - 9"	4,089	108	9"	8' - 0"	577	162	9"	4' - 7"	496	17' - 3"	1,867	42' - 8"	114	88	245	2.984	769.8	3.2	359	122.5	31,152
5	10' - 0"	8' - 0"	8"	7"	162	#6	6"	53' - 3"	12,957	108	#6	9"	14' - 4"	2,325	8' - 10"	1,433	162	#6	6"	47' - 1"	11,457	35	18"	39' - 9"	929	189	18"	39' - 9"	5,019	108	9"	8' - 0"	577	216	9"	4' - 7"	661	17' - 3"	2,489	53' - 3"	142	110	306	3.679	946.2	3.9	448	151.1	38,295
6	10' - 0"	8' - 0"	8"	7"	162	#6	6"	66' - 4"	16,140	108	#6	9"	14' - 4"	2,325	8' - 10"	1,433	162	#6	6"	57' - 8"	14,032	42	18"	39' - 9"	1,115	224	18"	39' - 9"	5,948	108	9"	8' - 0"	577	270	9"	4' - 7"	827	17' - 3"	3,111	65' - 6"	175	130	362	4.374	1,137.7	4.7	537	179.7	46,045
2	10' - 0"	9' - 0"	8"	7"	162	#6	6"	21' - 6"	5,231	162	#6	6"	15' - 4"	3,731	8' - 10"	2,149	162	#6	6"	15' - 4"	3,731	14	18"	39' - 9"	372	90	18"	39' - 9"	2,390	108	9"	9' - 0"	649	54	9"	4' - 7"	165	19' - 3"	694	21' - 6"	57	46	128	1.657	477.8	1.6	185	67.9	19,297
3	10' - 0"	9' - 0"	8"	7"	162	#6	6"	32' - 1"	7,807	162	#6	6"	15' - 4"	3,731	8' - 10"	2,149	162	#6	6"	25' - 11"	6,306	21	18"	39' - 9"	558	127	18"	39' - 9"	3,372	108	9"	9' - 0"	649	108	9"	4' - 7"	331	19' - 3"	1,389	32' - 1"	86	68	189	2.374	657.3	2.4	275	97.3	26,567
4	10' - 0"	9' - 0"	8"	7"	162	#6	6"	42' - 8"	10,382	162	#6	6"	15' - 4"	3,731	8' - 10"	2,149	162	#6	6"	36' - 6"	8,881	28	18"	39' - 9"	743	164	18"	39' - 9"	4,355	108	9"	9' - 0"	649	162	9"	4' - 7"	496	19' - 3"	2,083	42' - 8"	114	88	245	3.092	836.7	3.2	359	126.8	33,828
5	10' - 0"	9' - 0"	8"	7"	162	#6	6"	53' - 3"	12,957	162	#6	6"	15' - 4"	3,731	8' - 10"	2,149	162	#6	6"	47' - 1"	11,457	35	18"	39' - 9"	929	201	18"	39' - 9"	5,337	108	9"	9' - 0"	649	216	9"	4' - 7"	661	19' - 3"	2,778	53' - 3"	142	110	306	3.809	1,016.2	3.9	448	156.3	41,096
6	10' - 0"	9' - 0"	8"	7"	162	#6	6"	66' - 4"	16,140	162	#6	6"	15' - 4"	3,731	8' - 10"	2,149	162	#6	6"	57' - 8"	14,032	42	18"	39' - 9"	1,115	238	18"	39' - 9"	6,320	108	9"	9' - 0"	649	270	9"	4' - 7"	827	19' - 3"	3,472	65' - 6"	175	130	362	4.526	1,210.9	4.7	537	185.8	48,972
2	10' - 0"	10' - 0"	8"	7"	162	#6	6"	21' - 6"	5,231	162	#6	6"	16' - 4"	3,974	8' - 10"	2,149	162	#6	6"	15' - 4"	3,731	14	18"	39' - 9"	372	90	18"	39' - 9"	2,390	108	9"	10' - 0"	721	54	9"	4' - 7"	165	21' - 3"	767	21' - 6"	57	46	128	1.722	487.5	1.6	185	70.5	19,685
3	10' - 0"	10' - 0"	8"	7"	162	#6	6"	32' - 1"	7,807	162	#6	6"	16' - 4"	3,974	8' - 10"	2,149	162	#6	6"	25' - 11"	6,306	21	18"	39' - 9"	558	127	18"	39' - 9"	3,372	108	9"	10' - 0"	721	108	9"	4' - 7"	331	21' - 3"	1,533	32' - 1"	86	68	189	2.461	668.8	2.4	275	100.8	27,026
4	10' - 0"	10' - 0"	8"	7"	162	#6	6"	42' - 8"	10,382	162	#6	6"	16' - 4"	3,974	8' - 10"	2,149	162	#6	6"	36' - 6"	8,881	28	18"	39' - 9"	743	164	18"	39' - 9"	4,355	108	9"	10' - 0"	721	162	9"	4' - 7"	496	21' - 3"	2,300	42' - 8"	114	88	245	3.200	850.0	3.2	359	131.2	34,360
5	10' - 0"	10' - 0"	8"	7"	162	#6	6"	53' - 3"	12,957	162	#6	6"	16' - 4"	3,974	8' - 10"	2,149	162	#6	6"	47' - 1"	11,457	35	18"	39' - 9"	929	201	18"	39' - 9"	5,337	108	9"	10' - 0"	721	216	9"	4' - 7"	661	21' - 3"	3,066	53' - 3"	142	110	306	3.938	1,031.3	3.9	448	161.5	41,699
6	10' - 0"	10' - 0"	8"	7"	162	#6	6"	66' - 4"	16,140	162	#6	6"	16' - 4"	3,974	8' - 10"	2,149	162	#6	6"	57' - 8"	14,032	42	18"	39' - 9"	1,115	238	18"	39' - 9"	6,320	108	9"	10' - 0"	721	270	9"	4' - 7"	827	21' - 3"	3,833	65' - 6"	175	130	362	4.677	1,227.8	4.7	537	191.8	49,648

(5) Bar lengths over 60' include one bar lap; refer to MATERIAL NOTES for minimum lap lengths.

(1) ONLY

STATE OF TEXAS
MUNA MITCHELL
88652
LICENSED
PROFESSIONAL ENGINEER
10/27/2023

HL93 LOADING SHEET 2 OF 2

Texas Department of Transportation

Bridge Division Standard

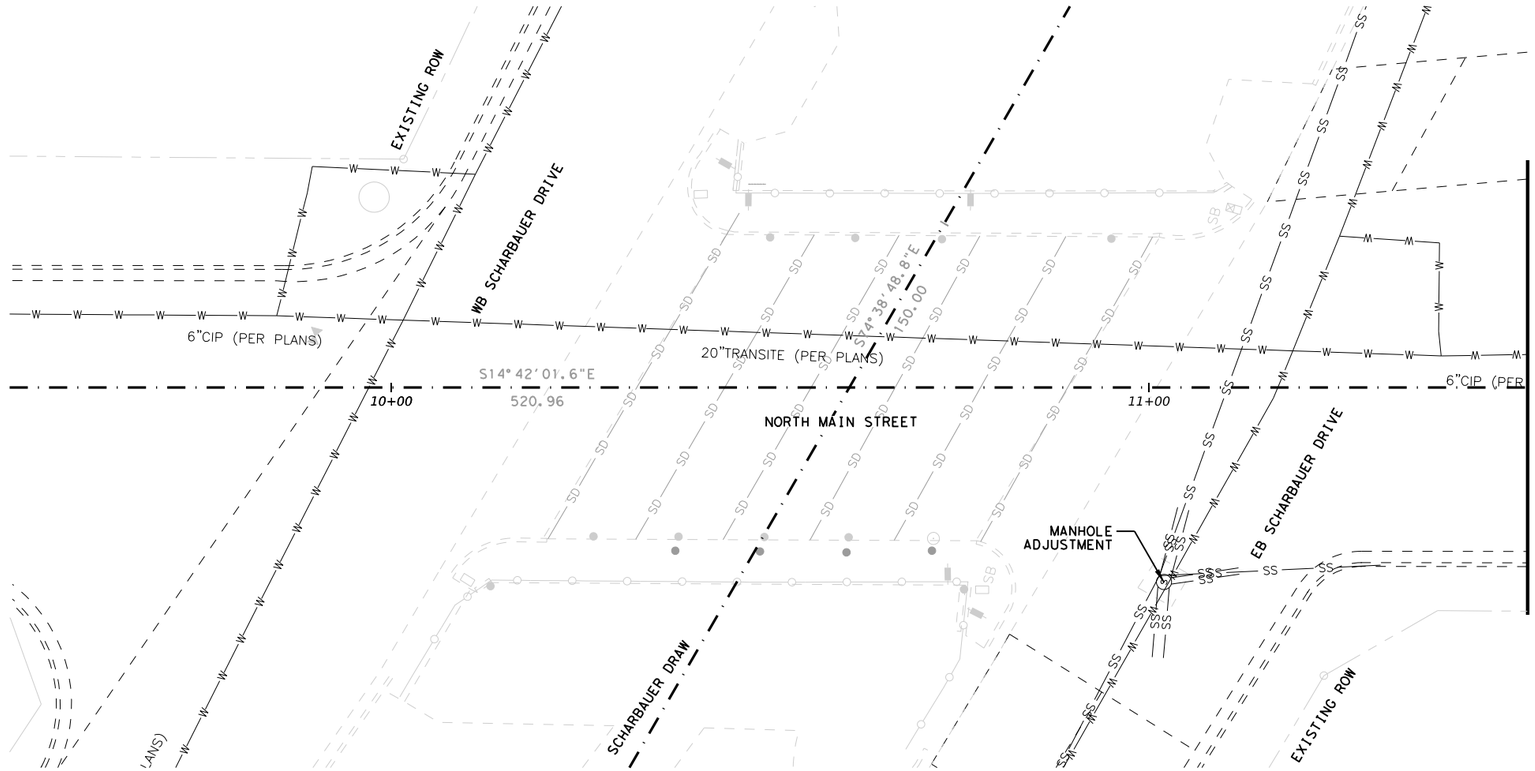
MULTIPLE BOX CULVERTS CAST-IN-PLACE

10'-0" SPAN
0' TO 7' FILL

MC-10-7 (MOD)

FILE: mc107ste-20.dgn	DN: TBE	CK: BMP	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0906	32	050, ETC.	MAIN ST
(1) ADD CULVERT SECTION	DIST	COUNTY		SHEET NO.
	ODA	MIDLAND		67

0.083333 ft / in.



CAUTION!! EXISTING OVERHEAD AND UNDERGROUND ELECTRIC LINES

N

0 10' 20'
HORIZONTAL SCALE

LEGEND OF UTILITY TYPES

W W W	WATER LINE
SS SS	SANITARY SEWER LINE
OE	OVERHEAD ELECTRIC LINE
E E E	UNDERGROUND ELECTRIC LINE
SD SD	STORM DRAIN LINE

NOTES:

1. MANHOLE ADJUSTMENTS SHALL BE PER CITY OF MIDLAND STANDARD DETAIL 319, EXISTING MANHOLE RING & COVER ADJUSTMENT.

2. MANHOLE COVERS WITHIN SCHARBAUER AND/OR MIDLAND DRAW SHALL BE PER CITY OF MIDLAND STANDARD DETAIL 504, WATER TIGHT WASTEWATER MANHOLE COVER. ALL OTHER MANHOLES SHALL BE CITY OF MIDLAND STANDARD DETAIL 503, TYPICAL WASTEWATER MANHOLE COVER.

STATE OF TEXAS
KEVIN MORRIS
105091
LICENSED
PROFESSIONAL ENGINEER

Kevin Morris 10/27/2023

Freese and Nichols, Inc.
Texas Registered Engineering Firm F-2144

HL 93 LOADING

NO	DATE	REVISION	APPROVED

FREESE AND NICHOLS
1500 Broadway Street, Suite 206
Lubbock, TX 79401
Phone - (806) 686-2700
Web www.freese.com

Texas Department of Transportation
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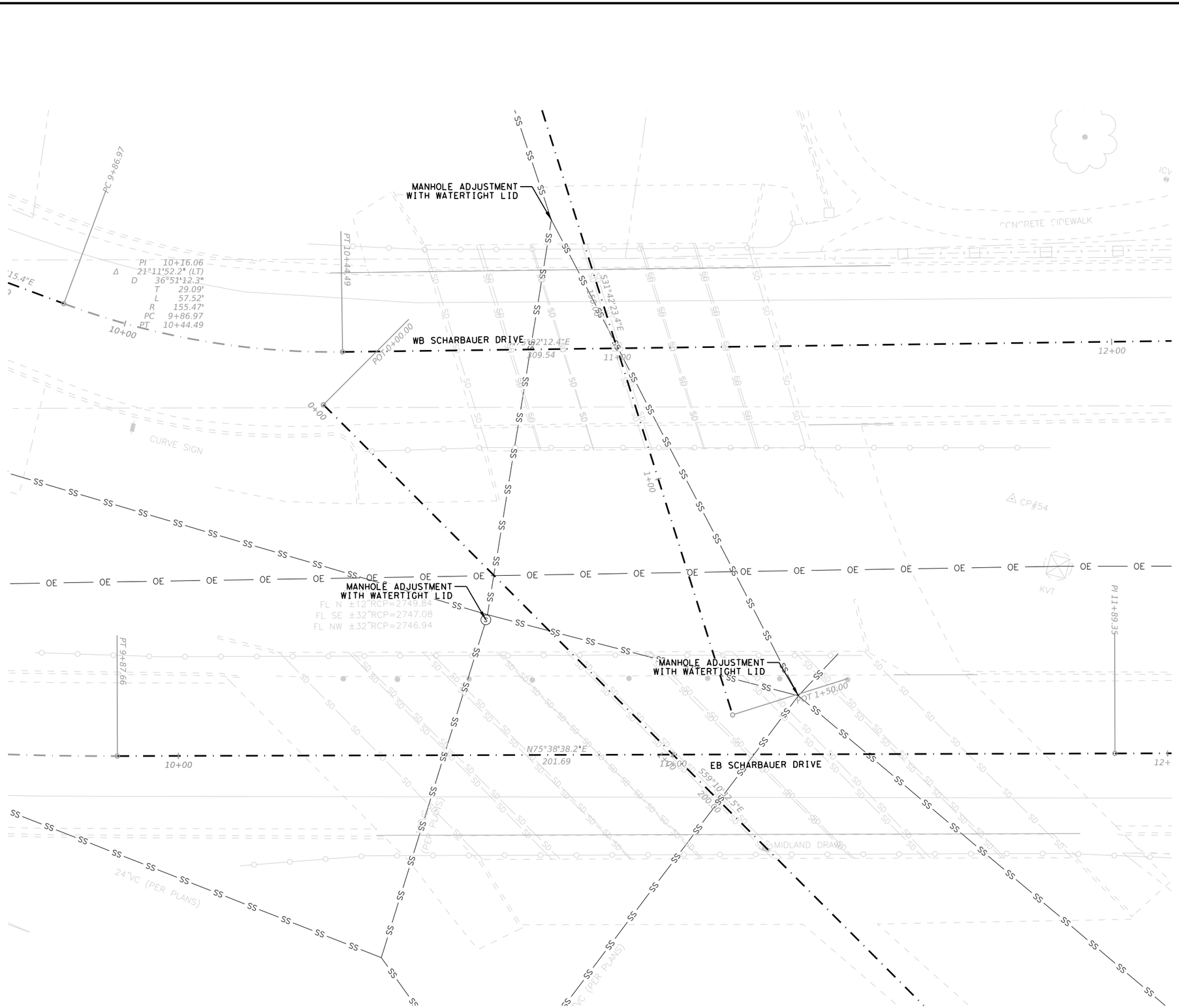
SCHARBAUER DRIVE BRIDGE REPLACEMENTS

EXISTING UTILITY LAYOUT NORTH MAIN STREET (SHEET 1 OF 2)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DAG	6	SEE TITLE SHEET FOR PROJECT NO.		MAIN ST
GRAPHICS KNW	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK KMM	TEXAS	ODA	MIDLAND	68
CHECK SRJ	CONTROL	SECTION	JOB	
	0906	32	050, ETC.	

0.08333317 ft / in.



CAUTION!! EXISTING OVERHEAD AND UNDERGROUND ELECTRIC LINES

N

0 10' 20'
HORIZONTAL SCALE

LEGEND OF UTILITY TYPES

- WATER LINE
- SANITARY SEWER LINE
- OVERHEAD ELECTRIC LINE
- UNDERGROUND ELECTRIC LINE
- STORM DRAIN LINE

NOTES:

1. MANHOLE ADJUSTMENTS SHALL BE PER CITY OF MIDLAND STANDARD DETAIL 319, EXISTING MANHOLE RING & COVER ADJUSTMENT.

2. MANHOLE COVERS WITHIN SCHARBAUER AND/OR MIDLAND DRAW SHALL BE PER CITY OF MIDLAND STANDARD DETAIL 504, WATER TIGHT WASTEWATER MANHOLE COVER. ALL OTHER MANHOLES SHALL BE CITY OF MIDLAND STANDARD DETAIL 503, TYPICAL WASTEWATER MANHOLE COVER.

STATE OF TEXAS
KEVIN MORRIS
105091
LICENSED
PROFESSIONAL ENGINEER

10/27/2023

Freese and Nichols, Inc.
Texas Registered Engineering Firm F-2144

HL 93 LOADING

NO	DATE	REVISION	APPROVED

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Lubbock, TX 79401
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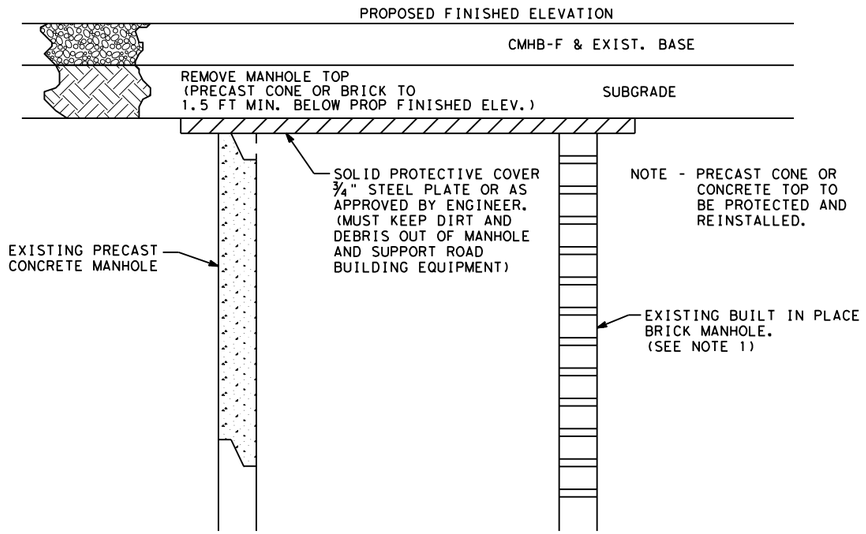
SCHARBAUER DRIVE BRIDGE REPLACEMENTS

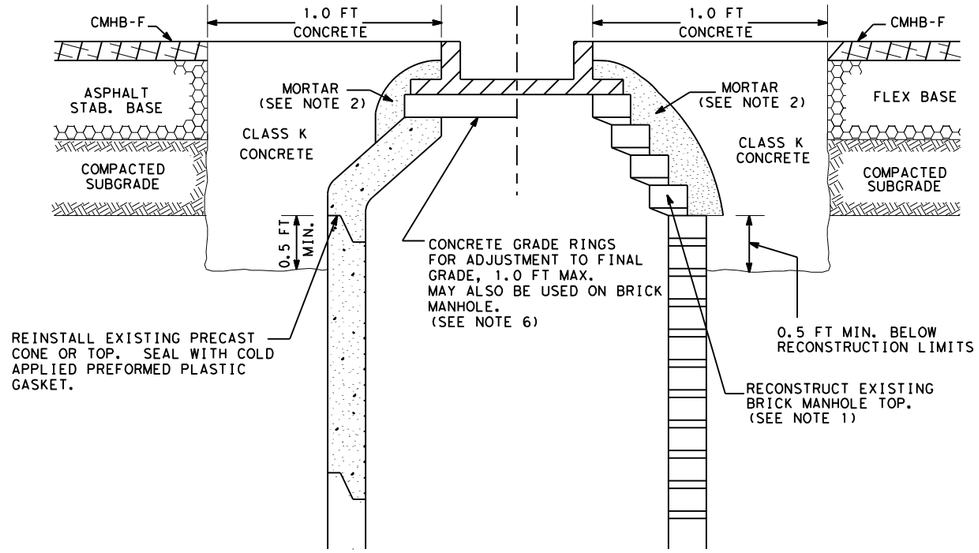
EXISTING UTILITY LAYOUT SCHARBAUER DRIVE (SHEET 2 OF 2)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DAG	6	SEE TITLE SHEET FOR PROJECT NO.		MAIN ST
GRAPHICS KNW	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK KMM	TEXAS	ODA	MIDLAND	69
CHECK SRJ	CONTROL	SECTION	JOB	
	0906	32	050, ETC.	

200.0000 ft / in.



DETAIL 1
MANHOLE TOP REMOVED



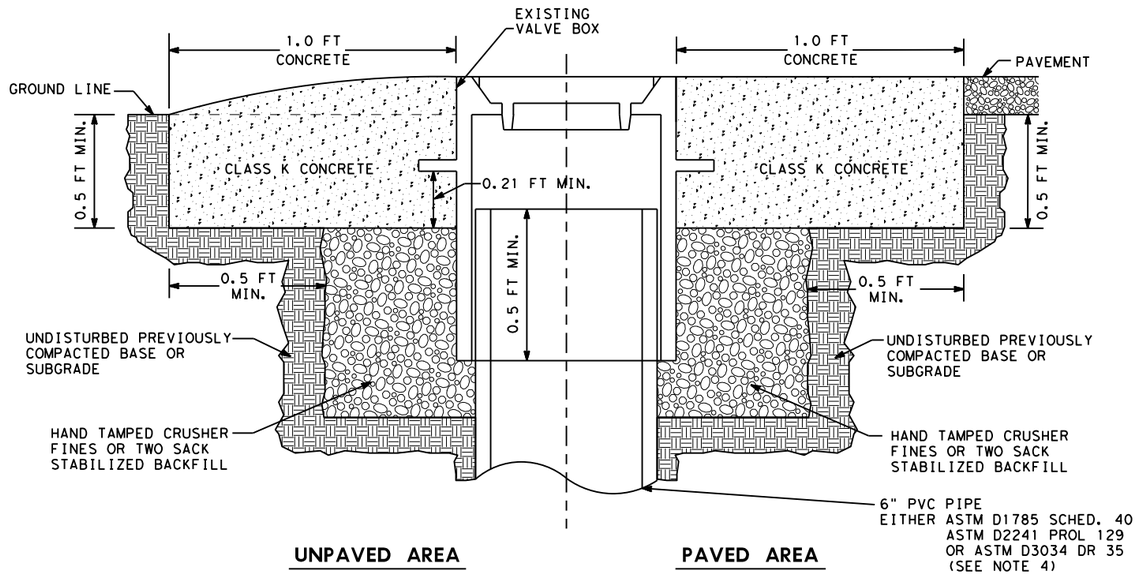
DETAIL 2
MANHOLE TOP REINSTALLED

NOTES:

1. MANHOLE BRICK TO BE NO. 1 COMMON BRICK - ASTM C-31 GRADE AM.
2. MORTAR ASTM C-150 TYPE 1 AND 3 PARTS WASHED SAND. ONE-THIRD OF 1 PART OF HYDRATED LIME MAY BE ADDED TO MORTAR.
3. ALL CONCRETE IS TO BE PROPERLY CONSOLIDATED.
4. WORK MAY REQUIRE ADDING PVC PIPE WHEN ADJUSTING WATER VALVE BOX TO PAVEMENT GRADE. IF ADDITIONAL PIPE IS REQUIRED, USE BELL SECTION WITH GASKET AND SET BELL DOWN OVER EXISTING PIPE RISER. A GASKETTED SELF-CENTERING COLLAR MAY BE USED IN LIEU OF THE BELL SECTION. ANY ADDITIONAL PVC PIPE REQUIRED SHALL BE SUBSIDIARY TO ADJUSTING WATER VALVES ITEM.
5. GRADE RINGS SHALL MEET STANDARD ASTM C478 AND SHALL BE OF 2", 4", 6" THICKNESS AS REQUIRED TO MATCH SITE CONDITIONS.

MANHOLE ADJUSTMENTS

LOCATIONS FOUND ON PLAN-PLAN SHEETS



UNPAVED AREA PAVED AREA

DETAIL FOR ADJUSTING VALVE BOX

LOCATIONS FOUND ON PLAN-PLAN SHEETS

HL 93 LOADING

NO	DATE	REVISION	APPROVED

STATE OF TEXAS
KEVIN MORRIS
105091
LICENSED
PROFESSIONAL ENGINEER
Kevin Morris 10/27/2023
Freese and Nichols, Inc.
Texas Registered Engineering Firm F-2144

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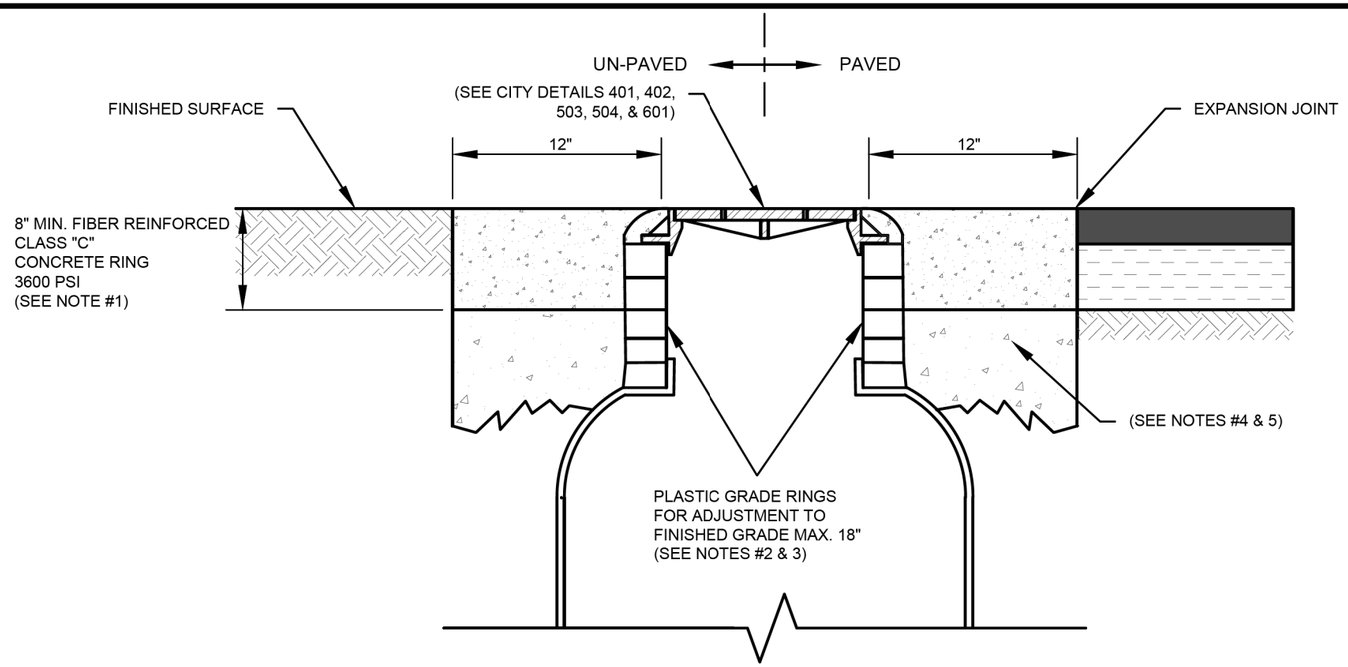
SCHARBAUER DRIVE
BRIDGE REPLACEMENTS

MANHOLE AND VALVE BOX
ADJUSTMENT DETAILS

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DAG	6	SEE TITLE SHEET FOR PROJECT NO.		MAIN ST
GRAPHICS KNW	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK KMM	TEXAS	ODA	MIDLAND	70
CHECK SRJ	CONTROL	SECTION	JOB	
	0906	32	050,ETC.	

10/27/2023
N:\IF\Drawings\6. Utilities\STANDARDS\CV-TRT-DT-UTIL01.dgn

1.0000 ft / in.



NEW MANHOLE RING & COVER ADJUSTMENT

NOTES:

1. INSTALL 12" MIN. FIBER REINFORCED CLASS "C" CONCRETE RING, 3600 PSI, WHEN MANHOLE IS LOCATED IN AN ARTERIAL R.O.W.
2. GRADE RINGS TO MEET ASTM STANDARD A48 AND TO BE 2", 4", OR 6" THICKNESS AS REQUIRED. INSTALL ASPHALT TAR IN THICK, UNIFORM COATING OVER ALL OUTER ADJUSTMENT RING SURFACES AND JOINTS.
3. ENGINEERING SERVICES REPRESENTATIVE AND UTILITY SERVICES REPRESENTATIVE MAY ALLOW GREATER ADJUSTMENT RING DEPTH TO ACCOMMODATE PAVING STRUCTURES.
4. REMOVE ALL MATERIAL EXCAVATED FROM SITE AND EXCAVATION.
5. FILL ANY OVER-EXCAVATION WITH FLOWABLE FILL 2-SACK (2-SACK = 188 LBS/CY, PORTLAND CEMENT).
6. MATERIALS AND CONSTRUCTION METHODS TO CONFORM TO CITY OF MIDLAND STANDARDS AND SPECIFICATIONS.
7. CONSTRUCT AS SHOWN UNLESS OTHERWISE APPROVED IN WRITING BY THE CITY ENGINEER.

MIDLAND Engineering Services

DRAWN: DPM	EFFECTIVE DATE: 10/01/2018	SCALE: NTS	DETAIL:
CHECKED: JCF	NEW MANHOLE RING & COVER ADJUSTMENT		318
APPROVED: MCC			

STATE OF TEXAS — KEVIN MORRIS — 105091 — LICENSED PROFESSIONAL ENGINEER

Kevin Morris 10/27/2023

Freese and Nichols, Inc. Texas Registered Engineering Firm F-2144

HL 93 LOADING

NO	DATE	REVISION	APPROVED

FREESE AND NICHOLS
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Lubbock, TX 79401
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SCHARBAUER DRIVE
BRIDGE REPLACEMENTS

CITY OF MIDLAND STANDARD
UTILITIES DETAILS
SHEET 1 OF 3

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DAG	6	SEE TITLE SHEET FOR PROJECT NO.		MAIN ST
GRAPHICS KNW	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK KMM	TEXAS	ODA	MIDLAND	71
CHECK SRJ	CONTROL	SECTION	JOB	
	0906	32	050, ETC.	

10/27/2023
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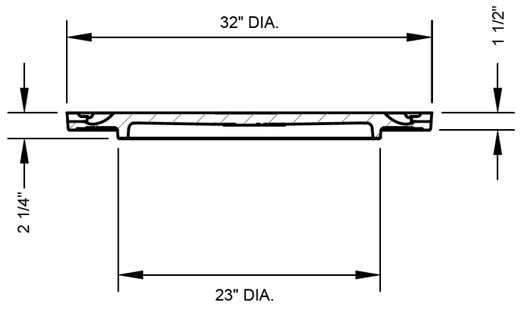

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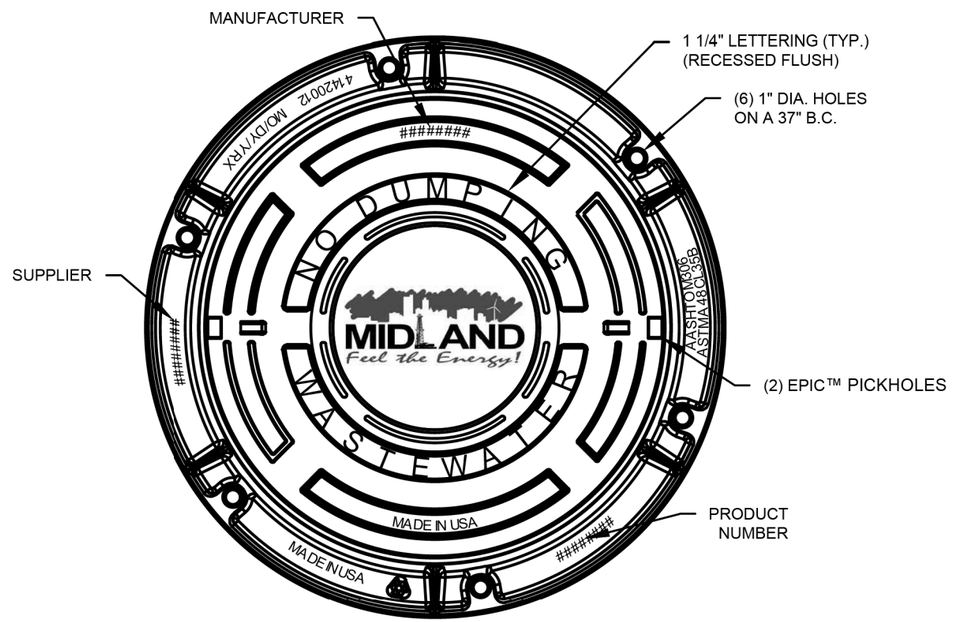

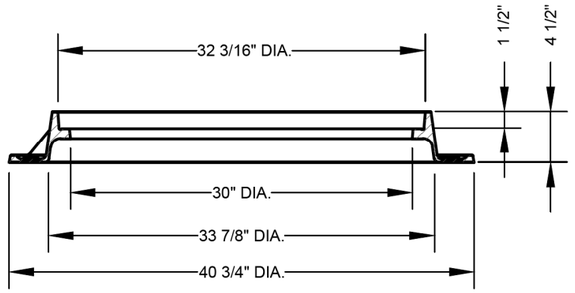

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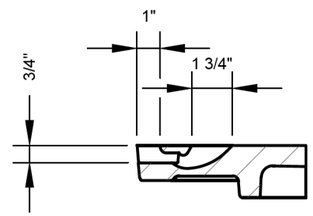

PICKHOLE DETAIL

NOTES:

1. MANHOLE COVERS TO BE CAST WITH THE FOLLOWING:
   "NO DUMPING"
   CITY OF MIDLAND LOGO
   "WASTEWATER"

   EAST JORDAN V1420Z1/V1430A ASSEMBLY OR APPROVED EQUAL
2. MATERIALS AND CONSTRUCTION METHODS TO CONFORM TO CITY OF MIDLAND STANDARDS AND SPECIFICATIONS.
3. CONSTRUCT AS SHOWN UNLESS OTHERWISE APPROVED IN WRITING BY THE CITY ENGINEER.

MIDLAND Engineering Services

DRAWN: DPM	EFFECTIVE DATE: 10/01/2018	SCALE: NTS	DETAIL:
CHECKED: JCF	TYPICAL WASTEWATER MANHOLE COVER		503
APPROVED: MCC			

STATE OF TEXAS · KEVIN MORRIS · 105091 · LICENSED PROFESSIONAL ENGINEER

Kevin Morris 10/27/2023

Freese and Nichols, Inc.
Texas Registered Engineering Firm F-2144

HL 93 LOADING

NO	DATE	REVISION	APPROVED

FREESE AND NICHOLS
1500 Broadway Street, Suite 206
Lubbock, TX 79401
Phone - (806) 686-2700
Web www.freese.com

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SCHARBAUER DRIVE
BRIDGE REPLACEMENTS

CITY OF MIDLAND STANDARD
UTILITIES DETAILS
SHEET 2 OF 3

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DAG	6	SEE TITLE SHEET FOR PROJECT NO.		MAIN ST
GRAPHICS KNW	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK KMM	TEXAS	ODA	MIDLAND	72
CHECK SRJ	CONTROL	SECTION	JOB	
	0906	32	050, ETC.	

10/27/2023
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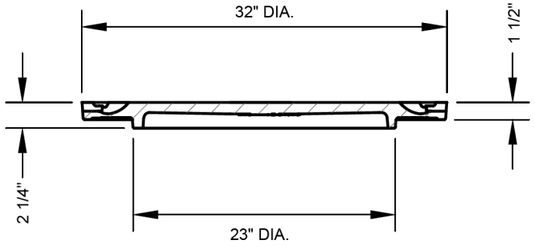
MDD22269 Date:10/27/2023 User:03997 File:N:\IF\Drawings\6. Utilities\STANDARDS\CV-DT-503.dgn CV-DT-503.dgn

1.0000 ft / in.

1.0000 ft / in.



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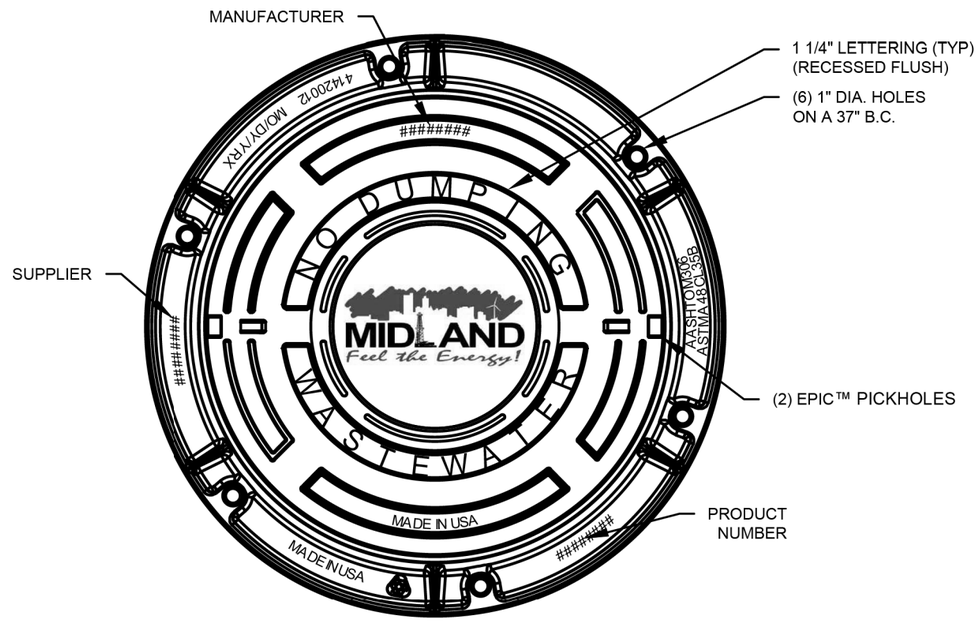

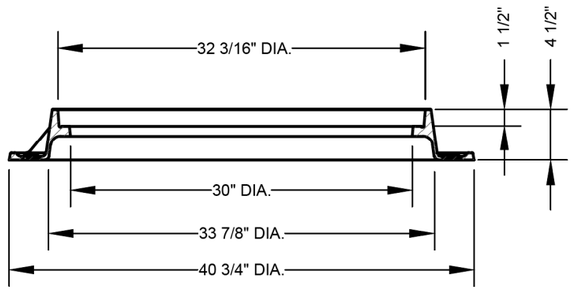

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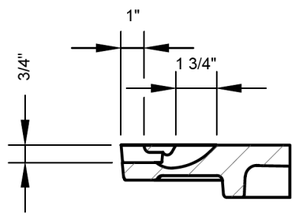

PICKHOLE DETAIL

NOTES:

1. MANHOLE COVERS TO BE CAST WITH THE FOLLOWING:
   "NO DUMPING"
   CITY OF MIDLAND LOGO
   "WASTEWATER"

   EAST JORDAN V1420ZPT/V1430APT ASSEMBLY OR APPROVED EQUAL

2. MATERIALS AND CONSTRUCTION METHODS TO CONFORM TO CITY OF MIDLAND STANDARDS AND SPECIFICATIONS.

3. CONSTRUCT AS SHOWN UNLESS OTHERWISE APPROVED IN WRITING BY THE CITY ENGINEER.

MIDLAND Engineering Services

DRAWN: DPM
CHECKED: JCF
APPROVED: MCC

EFFECTIVE DATE: 10/01/2018

SCALE: NTS

DETAIL: 504

WATER TIGHT WASTEWATER MANHOLE COVER

STATE OF TEXAS
KEVIN MORRIS
105091
LICENSED
PROFESSIONAL ENGINEER

Kevin Morris 10/27/2023

Freese and Nichols, Inc.
Texas Registered Engineering Firm F-2144

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Lubbock, TX 79401
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SCHARBAUER DRIVE
BRIDGE REPLACEMENTS

CITY OF MIDLAND STANDARD
UTILITIES DETAILS
SHEET 3 OF 3

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DAG	6	SEE TITLE SHEET FOR PROJECT NO.		MAIN ST
GRAPHICS KNW	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK KMM	TEXAS	ODA	MIDLAND	
CHECK SRJ	CONTROL	SECTION	JOB	73
	0906	32	050, ETC.	

10/27/2023
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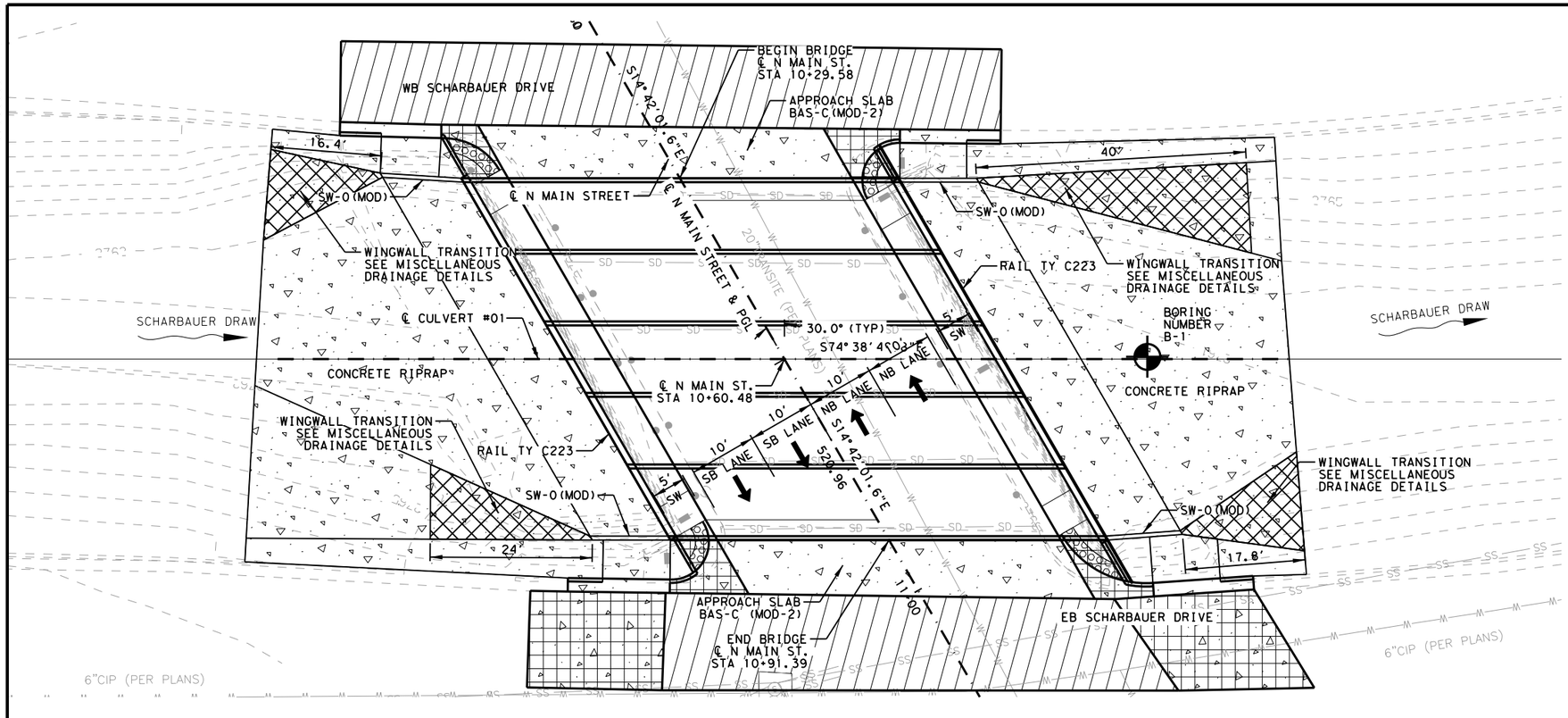
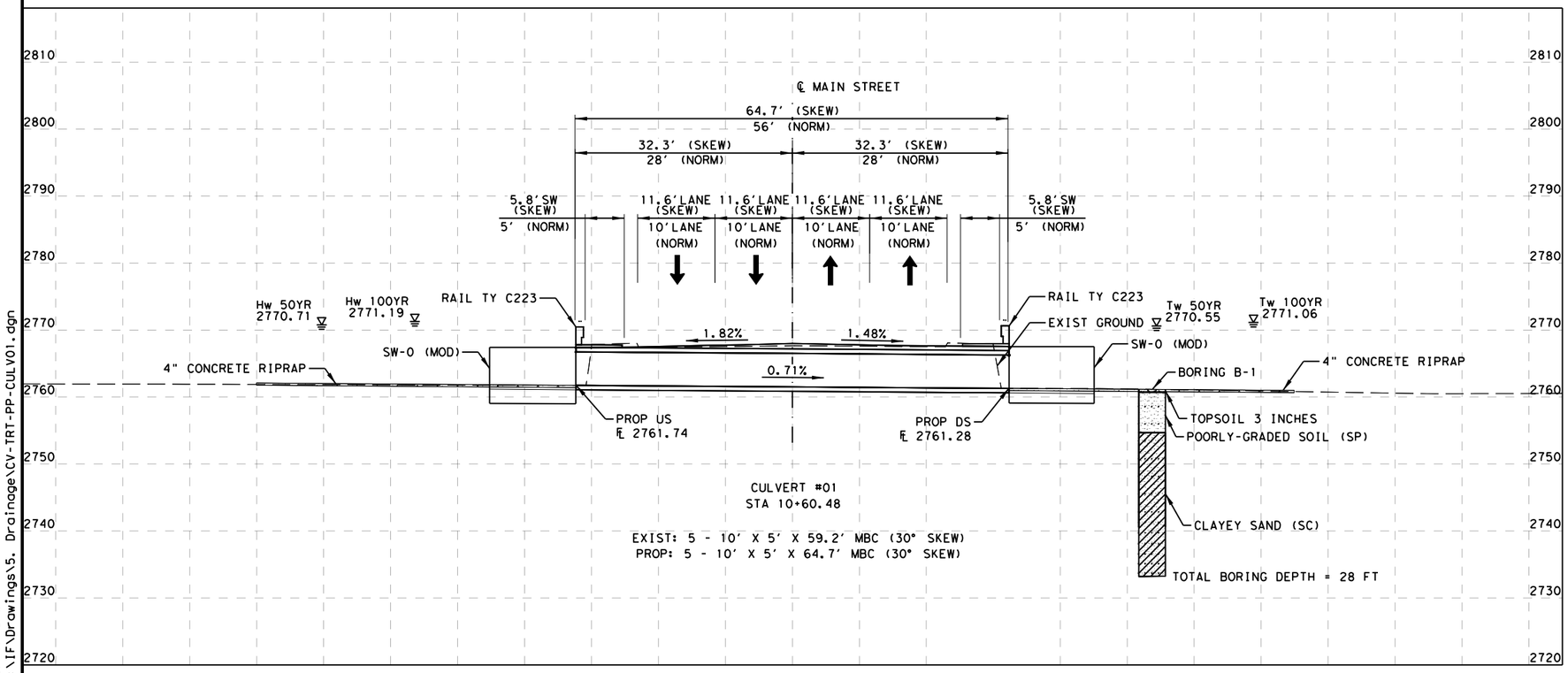
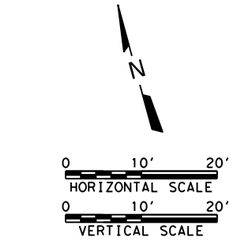
0.083333 ft / in.





CULVERT #01
STA 10+60.48

EXIST: 5 - 10' X 5' X 59.2' MBC (30° SKEW)
PROP: 5 - 10' X 5' X 64.7' MBC (30° SKEW)



GENERAL NOTES:

DESIGNED ACCORDING TO AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, 9TH EDITION (2020) AND TXDOT BRIDGE DESIGN MANUAL (NOV 2021)

SCHARBAUER DRIVE @ MAIN ST
DESIGN SPEED = 35 MPH
FUNCTIONAL CLASS = MINOR ARTERIAL
AADT (2017) = 5,818
AADT (2041) = 8,145

MAIN STREET
DESIGN SPEED = 35 MPH
FUNCTIONAL CLASS = MAJOR COLLECTOR
AADT (2021) = 3,535
AADT (2041) = 4,949

NOTE:
1. PROFILE DIMENSIONS ARE MEASURED ALONG PROPOSED CULVERT CENTERLINE

2. WINGWALL TRANSITIONS ARE TO BE PAID FOR AS RETAINING WALL.

HL 93 LOADING

NO	DATE	REVISION	APPROVED

STATE OF TEXAS
KEVIN MORRIS
105091
LICENSED
PROFESSIONAL ENGINEER
10/27/2023
Freese and Nichols, Inc.
Texas Registered Engineering Firm F-2144

FREESE AND NICHOLS
1500 Broadway Street, Suite 206
Lubbock, TX 79401
Phone - (806) 686-2700
Web www.freese.com

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SCHARBAUER DRIVE
BRIDGE REPLACEMENTS
BRIDGE CLASS CULVERT LAYOUT
MAIN STREET STA 10+60.48

CULVERT #01
EXIST NBI #06-165-0-B056-80-001
PROP NBI #06-165-0-B056-80-005

(SHEET 1 OF 1)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DAG	6	SEE TITLE SHEET FOR PROJECT NO.		MAIN ST
GRAPHICS KNW	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK KMM	TEXAS	ODA	MIDLAND	74
CHECK SRJ	CONTROL	SECTION	JOB	
	0906	32	050,ETC.	

10/27/2023
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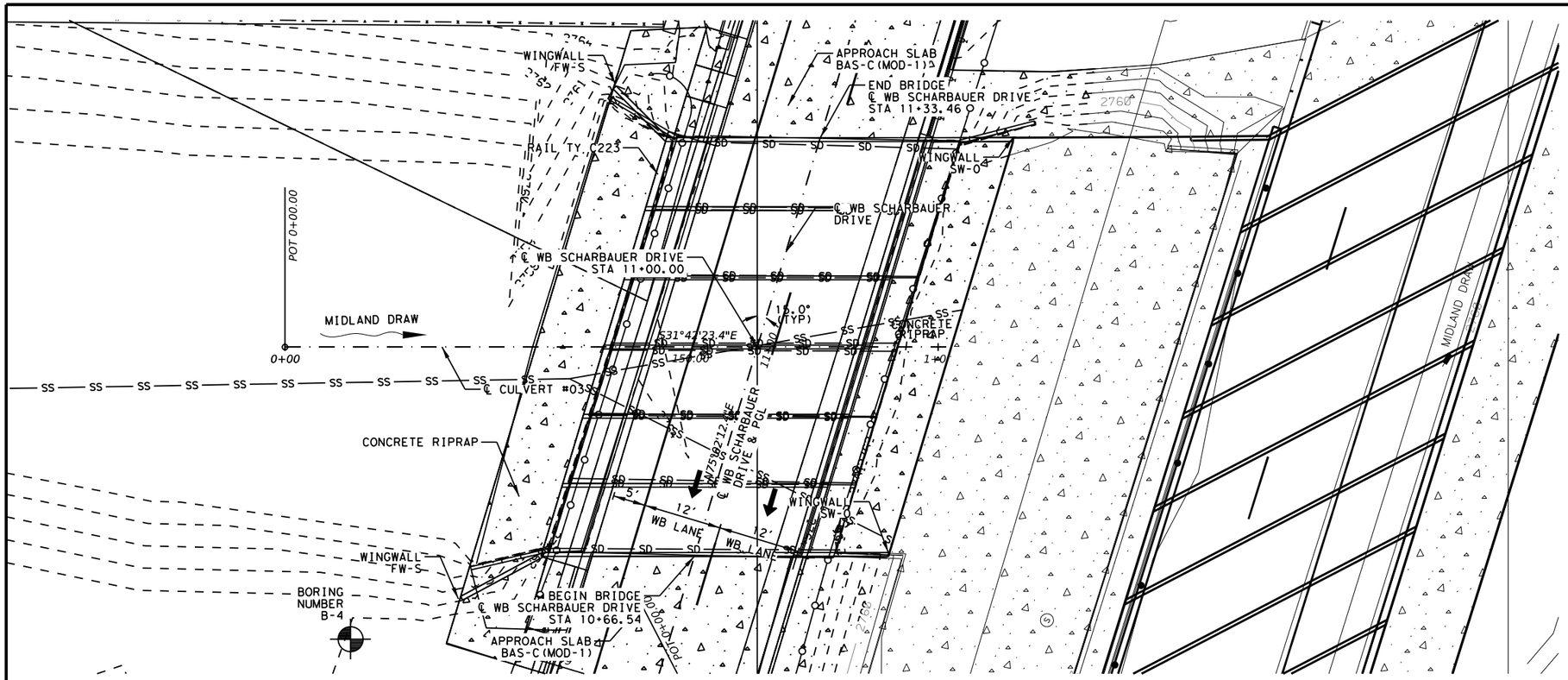
0.083333 ft / in.



N

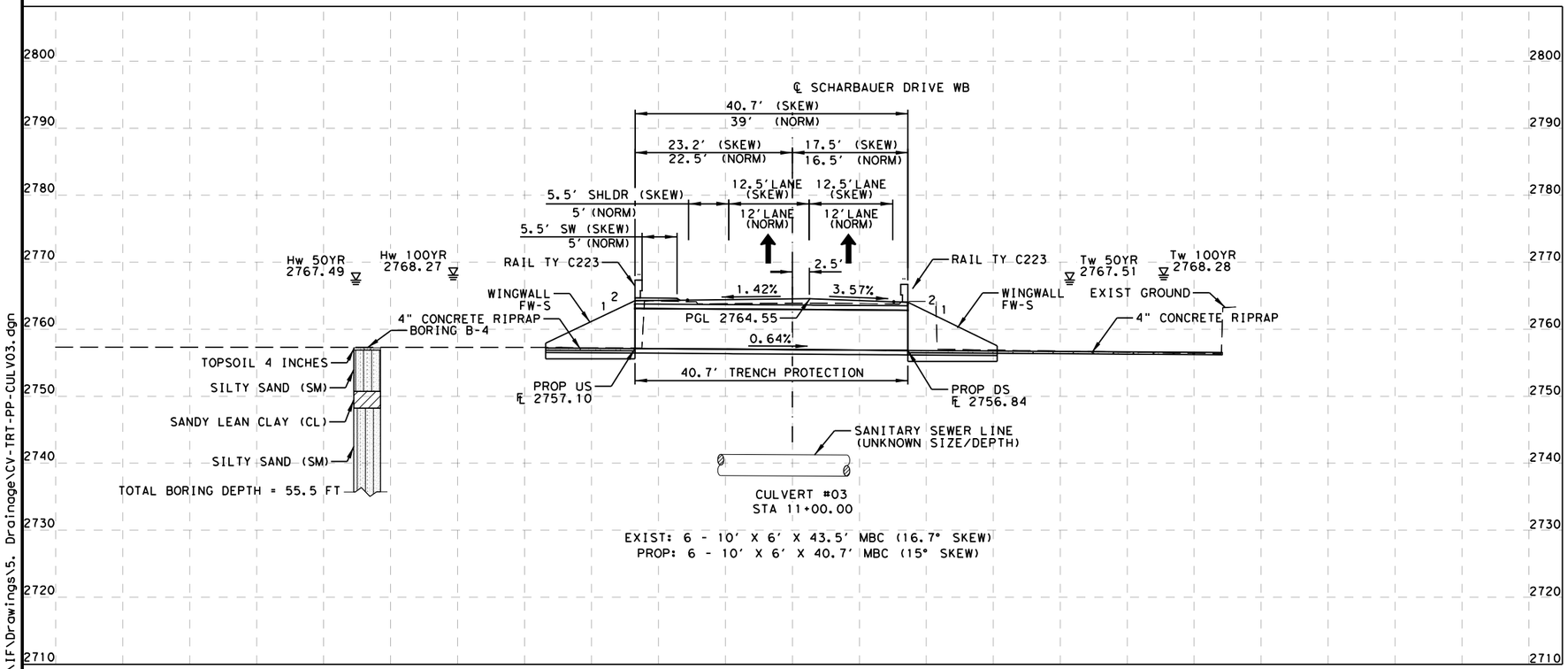
0 10' 20'
HORIZONTAL SCALE
0 10' 20'
VERTICAL SCALE

GENERAL NOTES:

DESIGNED ACCORDING TO AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, 9TH EDITION (2020) AND TXDOT BRIDGE DESIGN MANUAL (NOV 2021)

SCHARBAUER DRIVE @ MIDLAND DRAW
DESIGN SPEED = 35 MPH
FUNCTIONAL CLASS = MINOR ARTERIAL
AADT (2017) = 2,128
AADT (2041) = 2,979

NOTE:
PROFILE DIMENSIONS ARE MEASURED ALONG PROPOSED CULVERT CENTERLINE



EXIST: 6 - 10' X 6' X 43.5' MBC (16.7° SKEW)
PROP: 6 - 10' X 6' X 40.7' MBC (15° SKEW)

HL 93 LOADING

NO	DATE	REVISION	APPROVED

STATE OF TEXAS
KEVIN MORRIS
105091
LICENSED
PROFESSIONAL ENGINEER

Kevin Morris 10/27/2023

Freese and Nichols, Inc.
Texas Registered Engineering Firm F-2144

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1500 Broadway Street, Suite 206
Lubbock, TX 79401
Phone - (806) 686-2700
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SCHARBAUER DRIVE
BRIDGE REPLACEMENTS
BRIDGE CLASS CULVERT LAYOUT
WB SCHARBAUER DRIVE STA 11+00.00

CULVERT #03
EXIST NBI #06-165-0-B042-60-001
PROP NBI #06-165-0-B042-60-005

(SHEET 1 OF 1)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DAG	6	SEE TITLE SHEET FOR PROJECT NO.		MAIN ST
GRAPHICS KNW	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK KMM	TEXAS	ODA	MIDLAND	75
CHECK SRJ	CONTROL	SECTION	JOB	
	0906	32	050,ETC.	

10/27/2023
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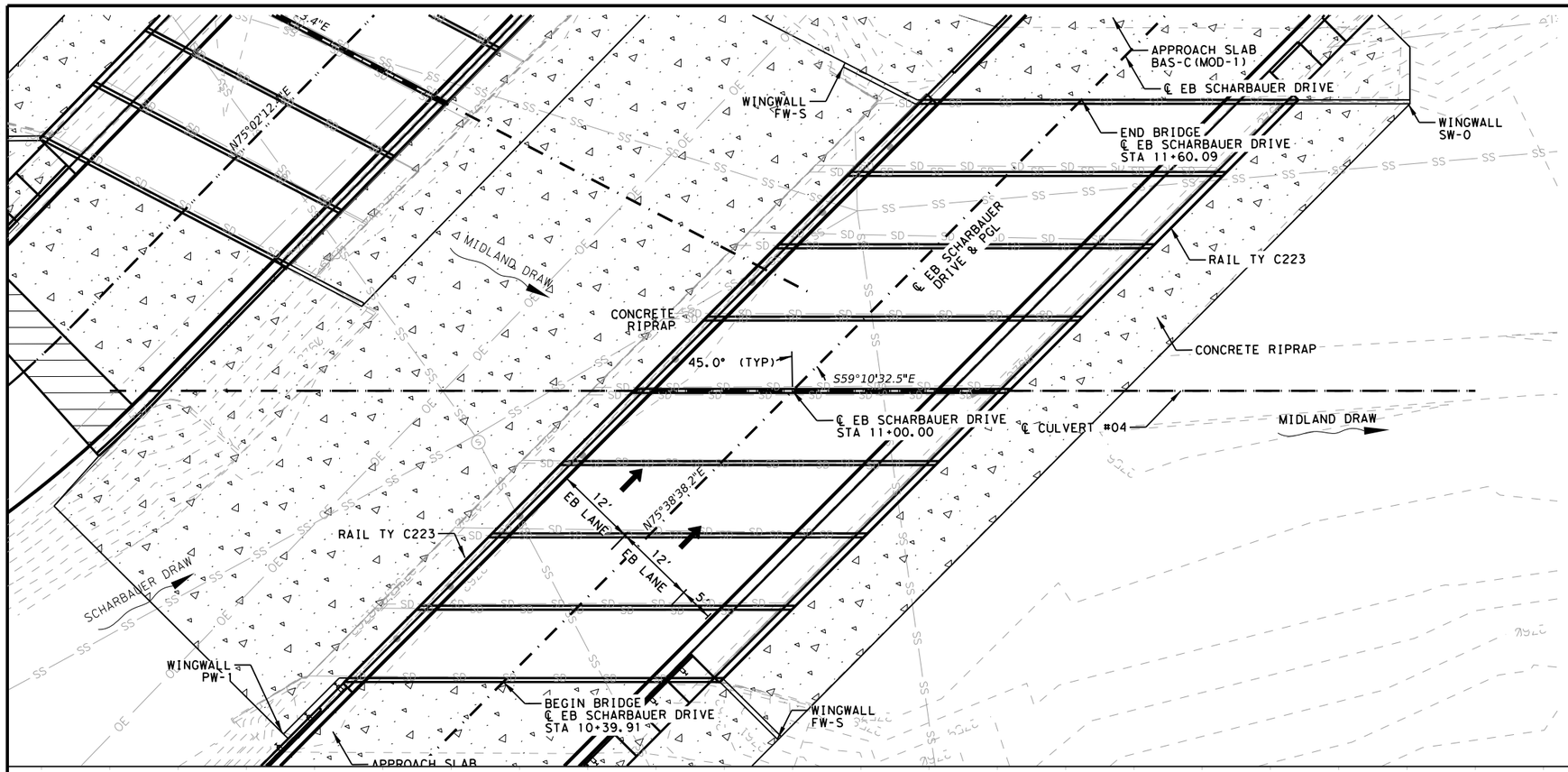

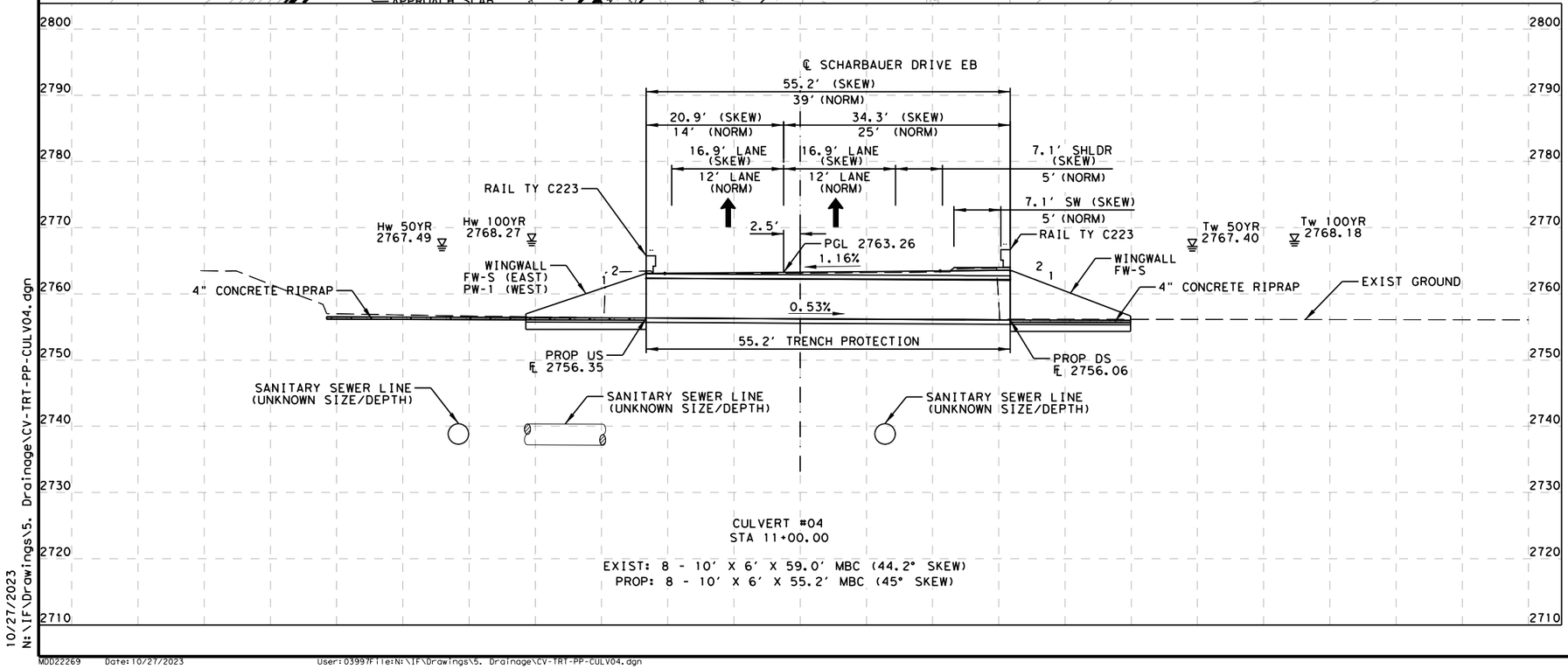

CULVERT #04
STA 11+00.00

EXIST: 8 - 10' X 6' X 59.0' MBC (44.2° SKEW)
PROP: 8 - 10' X 6' X 55.2' MBC (45° SKEW)

0.083333 ft / in.

N

0 10' 20'
HORIZONTAL SCALE
0 10' 20'
VERTICAL SCALE

GENERAL NOTES:

DESIGNED ACCORDING TO AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, 9TH EDITION (2020) AND TXDOT BRIDGE DESIGN MANUAL (NOV 2021)

SCHARBAUER DRIVE @ MIDLAND DRAW
DESIGN SPEED = 35 MPH
FUNCTIONAL CLASS = MINOR ARTERIAL
AADT (2017) = 2,128
AADT (2041) = 2,979

NOTE:
PROFILE DIMENSIONS ARE MEASURED ALONG PROPOSED CULVERT CENTERLINE

HL 93 LOADING

STATE OF TEXAS
KEVIN MORRIS
105091
LICENSED
PROFESSIONAL ENGINEER
Kevin Morris 10/27/2023
Freese and Nichols, Inc.
Texas Registered Engineering Firm F-2144

NO	DATE	REVISION	APPROVED

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1500 Broadway Street, Suite 206
Lubbock, TX 79401
Phone - (806) 686-2700
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SCHARBAUER DRIVE
BRIDGE REPLACEMENTS
BRIDGE CLASS CULVERT LAYOUT
EB SCHARBAUER DRIVE STA 11+00.00

CULVERT #04
EXIST NBI #06-165-0-B042-60-002
PROP NBI #06-165-0-B042-60-006

(SHEET 1 OF 1)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DAG	6	SEE TITLE SHEET FOR PROJECT NO.		MAIN ST
GRAPHICS KNW	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK KMM	TEXAS	ODA	MIDLAND	76
CHECK SRJ	CONTROL	SECTION	JOB	
	0906	32	050,ETC.	

10/27/2023
N:\IF\Drawings\5. Drainage\CV-TRT-PP-CULV04.dgn

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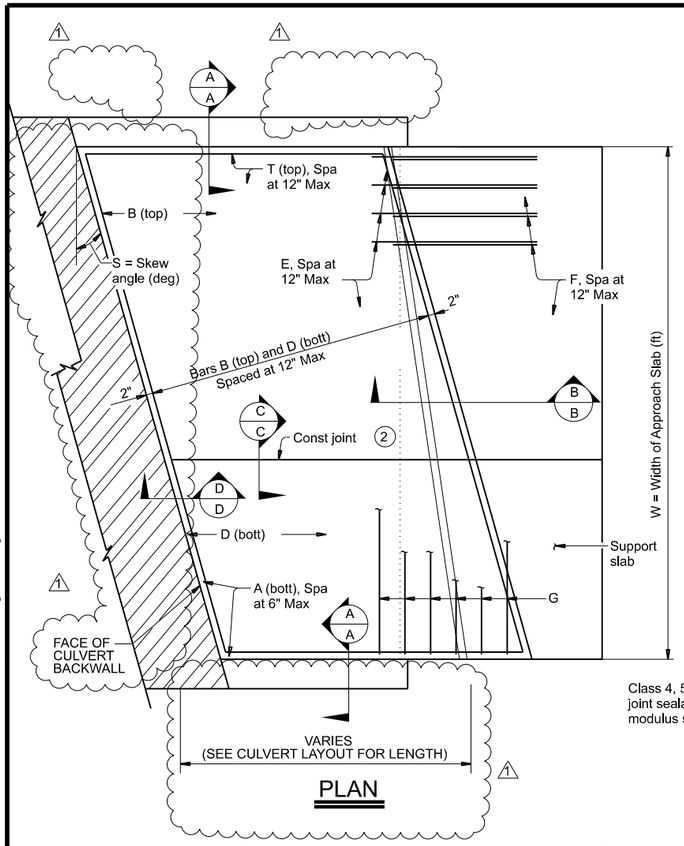
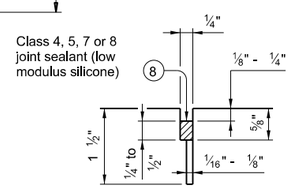
DATE:
FILE:



PLAN



LONGITUDINAL SAW CUT JOINT DETAIL

BAR TABLE	
BAR	SIZE
A	#8
B	#5
D	#5
E	#5
F	#5
G	#5
T	#5

APPROXIMATE QUANTITIES (4)

Reinf steel weight = 8.5 Lbs/SF of Approach Slab
= 18.4 Lbs/LF of Support Slab

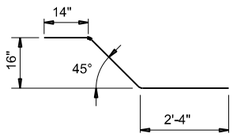
Vol of Appr Slab Conc (CY) = 1.057W - 0.008W x T + 0.02W² Tan S
(Includes Support Slab)

W = Width of Approach Slab (ft)

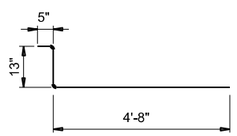
T = Conc Pavement Thickness (in)

S = Skew Angle (deg)

1. Flare Bars B and D in this region (1'-6" Max Spa, 3" Min Spa). Minimum flared bar length = 2'-6". Bend bars as necessary.
2. Provide longitudinal construction joints that align with longitudinal construction joints in the bridge slab with bridges built in stages. Other longitudinal construction joints must receive approval of the Engineer.
3. See details elsewhere in plans for shoulder drain location and details.
4. For Contractor's information only. Quantities shown are for one approach slab only.
5. On portion of support slab that supports the concrete pavement, adjust top surface elevation, if required, to accommodate concrete pavement thickness. Smooth trowel finish. Oil top of support slab with 60 grade oil and apply heavy coat of powdered graphite. Press down one layer of 30# roofing felt.
6. Multiple piece tie bars are acceptable at longitudinal construction joints provided minimum laps shown are achieved.
7. See details elsewhere in plans for required cross-slope.
8. Place in accordance with Item 438.
9. Provide backer rod that is 25% larger than joint opening and compatible with the sealant.
10. If bridge rail is present at the wingwall or CIP retaining wall, place ½" rebonded recycled tire rubber between concrete railing and top of approach slab as shown when concrete railing projects over the approach slab.



BARS E (#5)



BARS F (#5)

GENERAL NOTES:

Construct approach slab in accordance with Item 422.

Provide Class "S" concrete with a minimum compressive strength of 4,000 psi.

Provide Grade 60 reinforcing steel.

Provide longitudinal joints as shown on the Longitudinal Saw Cut Joint Detail at lane lines and shoulders when width between longitudinal construction joints or edges of approach slab exceeds 16 feet. Saw cut joints within 24 hours of concrete placement to a depth of 1 ½" and seal in accordance with Item 438. Alternately, provide a controlled joint consisting of 1 ½" vinyl or plastic joint former (Stress Cap, Zip Strip, Stress Lock, or equal as approved by the Engineer.)

Provide rebonded recycled tire rubber joint filler that meets the requirements of DMS-6310. "Joint Sealants and Fillers."

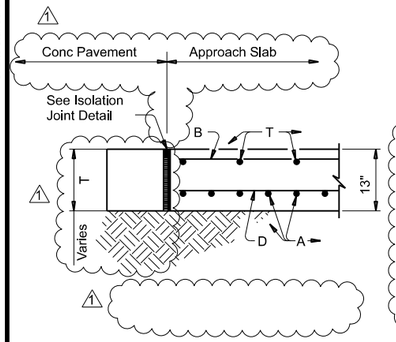
Construct the subgrade or subbase away from the bridge for a minimum distance of 100 feet prior to the approach slab, unless otherwise indicated on the plans.

Compact and finish the subgrade or foundation for the approach slab to the typical cross-section and to the lines and grades shown on the plans.

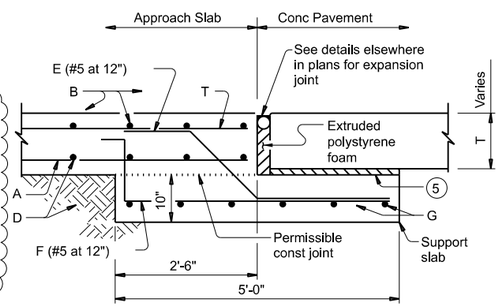
Cure for 4 days using water or membrane curing per Item 422.

All details shown herein are subsidiary to bridge approach slab.

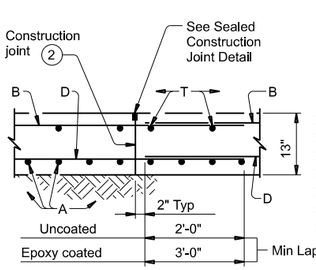
Cover dimensions are clear dimensions, unless noted otherwise.
Reinforcing bar dimensions shown are out-to-out of bar.



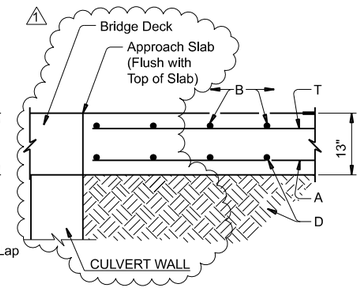
SECTION A-A



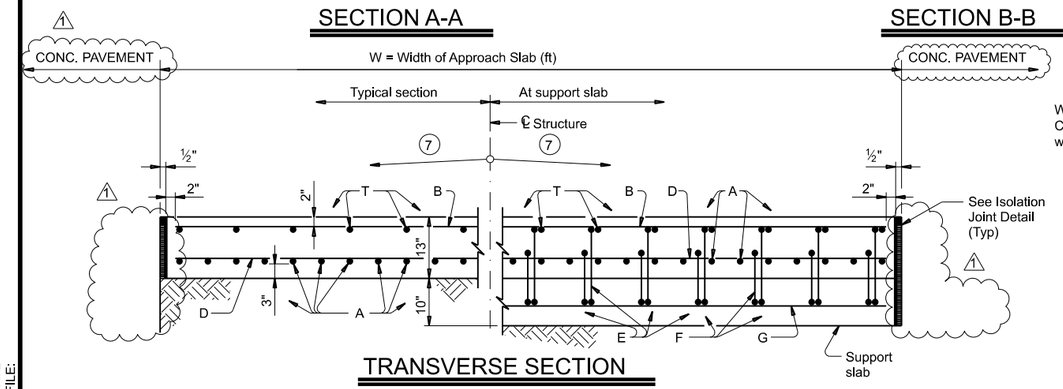
SECTION B-B



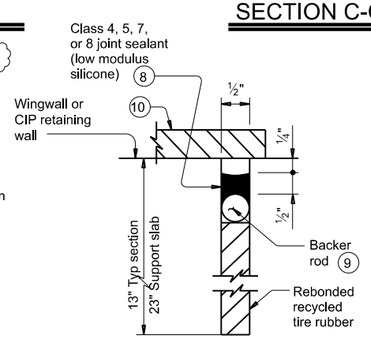
SECTION C-C (6)



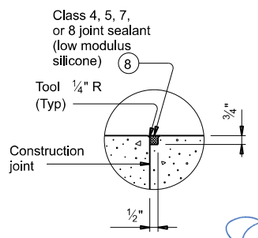
SECTION D-D



TRANSVERSE SECTION



ISOLATION JOINT DETAIL



SEALED CONSTRUCTION JOINT DETAIL

1 ONLY

STATE OF TEXAS
MUNA MITCHELL
88652
LICENSED
PROFESSIONAL ENGINEER

10/27/2023

Texas Department of Transportation

Bridge Division Standard

BRIDGE APPROACH SLAB

CONCRETE PAVEMENT

BAS-C (MOD-1)

FILE: bascste1-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0906	32	050, ETC.	MAIN ST
02-20: Removed stress relieving pad.	DIST	COUNTY		SHEET NO.
1 MODIFY SLAB LENGTH	ODA	MIDLAND		77

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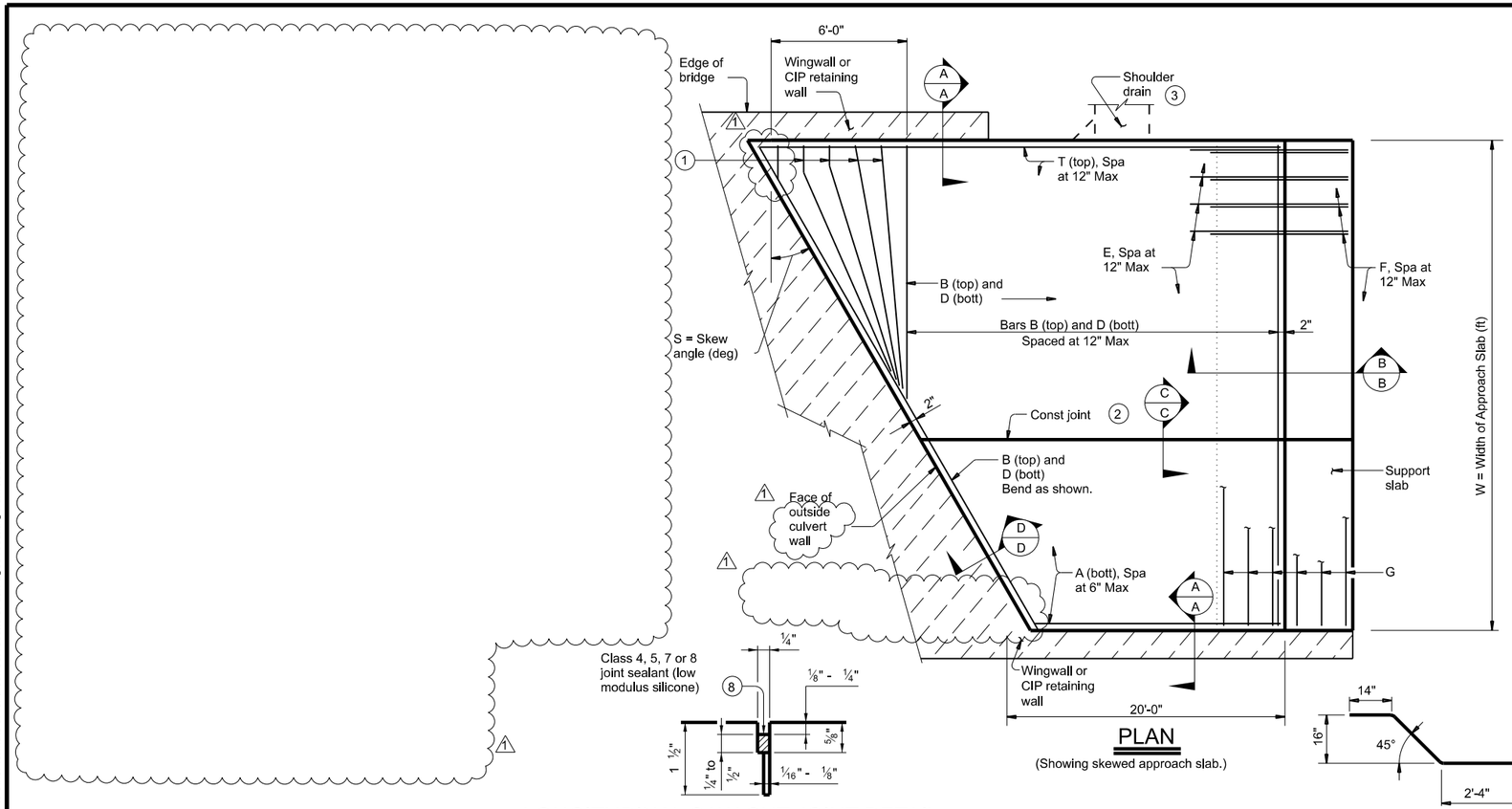
DATE:
FILE:



PLAN
(Showing skewed approach slab.)

LONGITUDINAL SAW CUT JOINT DETAIL

BAR TABLE	
BAR	SIZE
A	#8
B	#5
D	#5
E	#5
F	#5
G	#5
T	#5

APPROXIMATE QUANTITIES (4)

Reinf steel weight = 8.5 Lbs/SF of Approach Slab
= 18.4 Lbs/LF of Support Slab

Vol of Appr Slab Conc (CY) = 1.057W - 0.008W x T + 0.02W² Tan S
(Includes Support Slab)

W = Width of Approach Slab (ft)

T = Conc Pavement Thickness (in)

S = Skew Angle (deg)

(1) Flare Bars B and D in this region (1'-6" Max Spa, 3" Min Spa). Minimum flared bar length = 2'-6". Bend bars as necessary.

(2) Provide longitudinal construction joints that align with longitudinal construction joints in the bridge slab with bridges built in stages. Other longitudinal construction joints must receive approval of the Engineer.

(3) See details elsewhere in plans for shoulder drain location and details.

(4) For Contractor's information only. Quantities shown are for one approach slab only.

(5) On portion of support slab that supports the concrete pavement, adjust top surface elevation, if required, to accommodate concrete pavement thickness. Smooth trowel finish. Oil top of support slab with 60 grade oil and apply heavy coat of powdered graphite. Press down one layer of 30# roofing felt.

(6) Multiple piece tie bars are acceptable at longitudinal construction joints provided minimum laps shown are achieved.

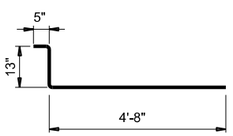
(7) See details elsewhere in plans for required cross-slope.

(8) Place in accordance with Item 438.

(9) Provide backer rod that is 25% larger than joint opening and compatible with the sealant.

(10) If bridge rail is present at the wingwall or CIP retaining wall, place ½" rebonded recycled tire rubber between concrete railing and top of approach slab as shown when concrete railing projects over the approach slab.

BARS E (#5)



BARS F (#5)

GENERAL NOTES:

Construct approach slab in accordance with Item 422.

Provide Class "S" concrete with a minimum compressive strength of 4,000 psi.

Provide Grade 60 reinforcing steel.

Provide longitudinal joints as shown on the Longitudinal Saw Cut Joint Detail at lane lines and shoulders when width between longitudinal construction joints or edges of approach slab exceeds 16 feet. Saw cut joints within 24 hours of concrete placement to a depth of 1 ½" and seal in accordance with Item 438. Alternately, provide a controlled joint consisting of 1 ½" vinyl or plastic joint former (Stress Cap, Zip Strip, Stress Lock, or equal as approved by the Engineer.)

Provide rebonded recycled tire rubber joint filler that meets the requirements of DMS-6310. "Joint Sealants and Fillers."

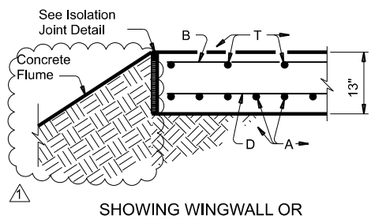
Construct the subgrade or subbase away from the bridge for a minimum distance of 100 feet prior to the approach slab, unless otherwise indicated on the plans.

Compact and finish the subgrade or foundation for the approach slab to the typical cross-section and to the lines and grades shown on the plans.

Cure for 4 days using water or membrane curing per Item 422.

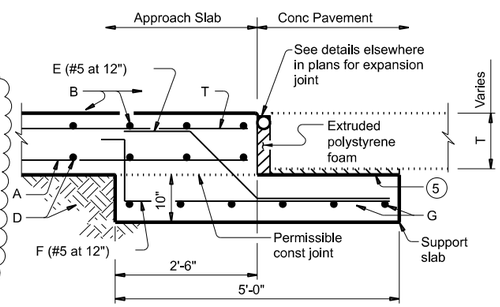
All details shown herein are subsidiary to bridge approach slab.

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

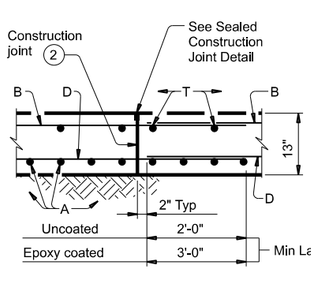


SHOWING WINGWALL OR CIP RETAINING WALL

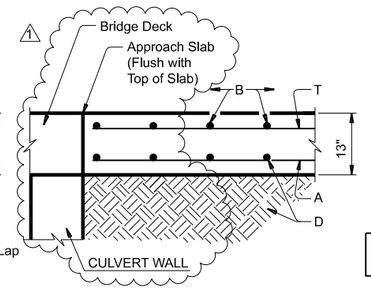
SECTION A-A



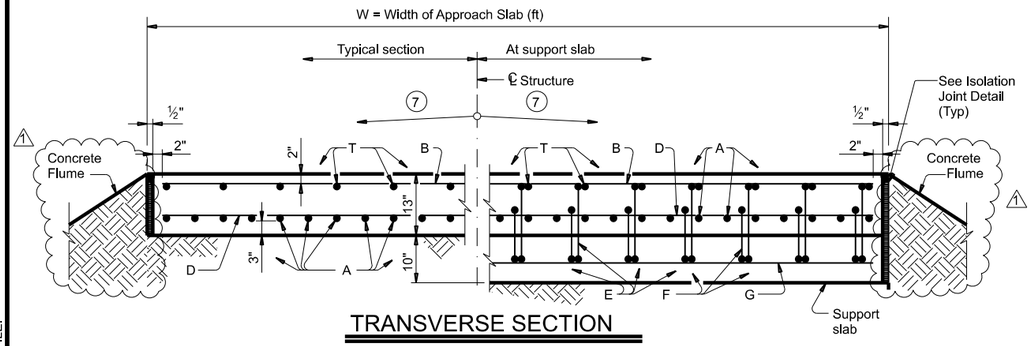
SECTION B-B



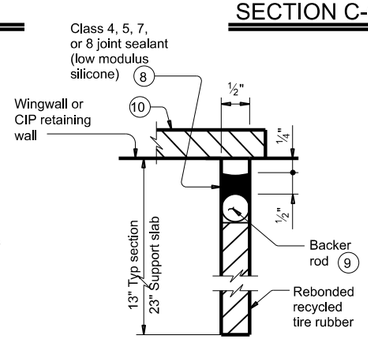
SECTION C-C (6)



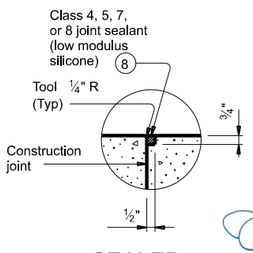
SECTION D-D



TRANSVERSE SECTION



ISOLATION JOINT DETAIL



SEALED CONSTRUCTION JOINT DETAIL

1 ONLY

10/27/2023

Texas Department of Transportation

Bridge Division Standard

BRIDGE APPROACH SLAB

CONCRETE PAVEMENT

BAS-C (MOD2)

FILE: bascste1-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0906	32	050, ETC.	MAIN ST
02-20: Removed stress relieving pad.	DIST	COUNTY		SHEET NO.
1 MODIFY SLAB LENGTH	ODA	MIDLAND		78

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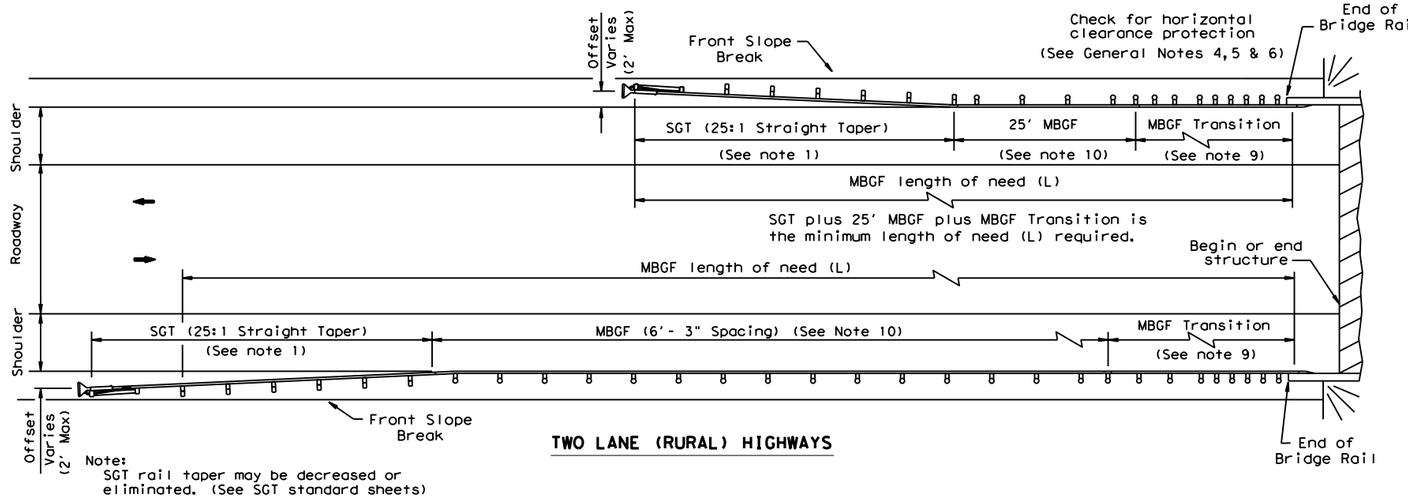
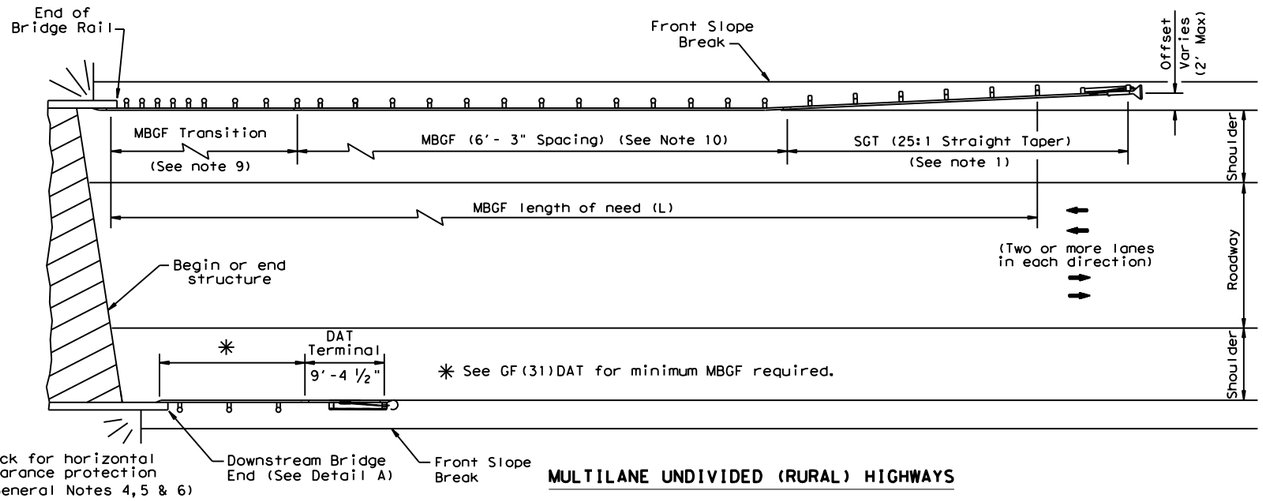
DATE: 10/27/2023 $TIME$
FILE: N:\IF\Drawings\S. Drainage\STANDARDS\bed14.dgn

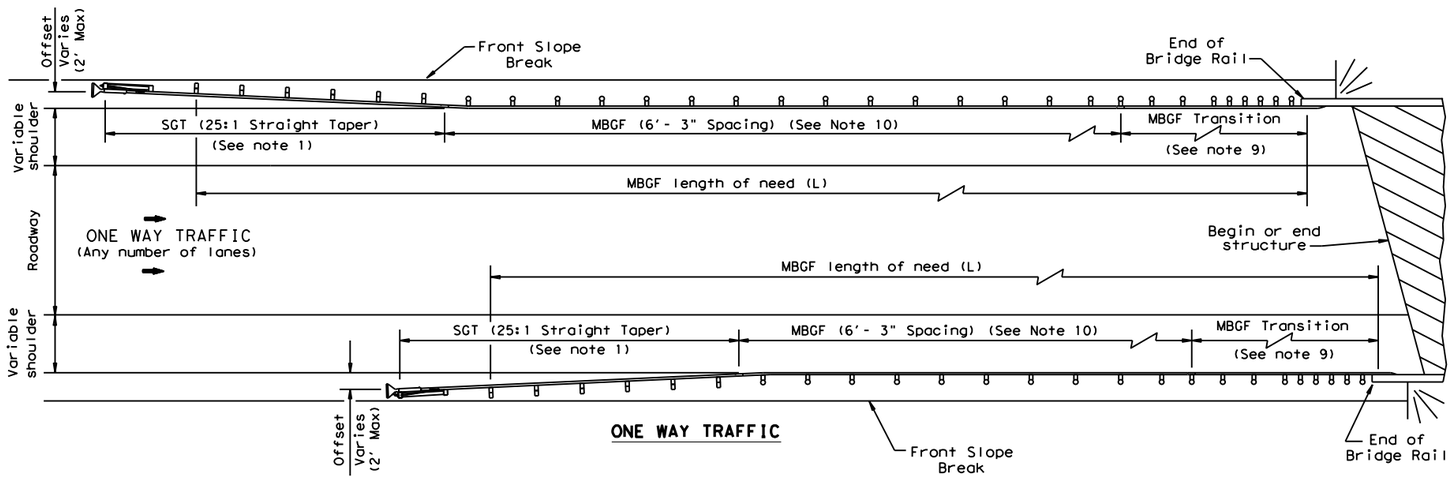


TWO LANE (RURAL) HIGHWAYS

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



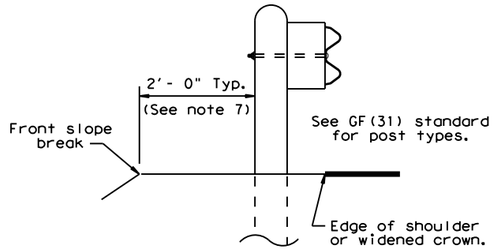
MULTILANE UNDIVIDED (RURAL) HIGHWAYS



ONE WAY TRAFFIC

GENERAL NOTES

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



TYPICAL CROSS SECTION AT MBGF

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

DETAIL A

Showing Downstream Rail Attachment

Texas Department of Transportation — Design Division Standard

BRIDGE END DETAILS

(METAL BEAM GUARD FENCE APPLICATIONS TO RIGID RAILS)

BED-14

FILE: bed14.dgn	DN: TxDOT	CK: AM	DW: BD/VP	CK: CGL
© TxDOT: December 2011	CONT	SECT	JOB	HIGHWAY
REVISIONS	0906	32	050, ETC.	MAIN ST
REVISED APRIL 2014 SEE (MEMO 0414)	DIST	COUNTY		SHEET NO.
	ODA	MIDLAND		79

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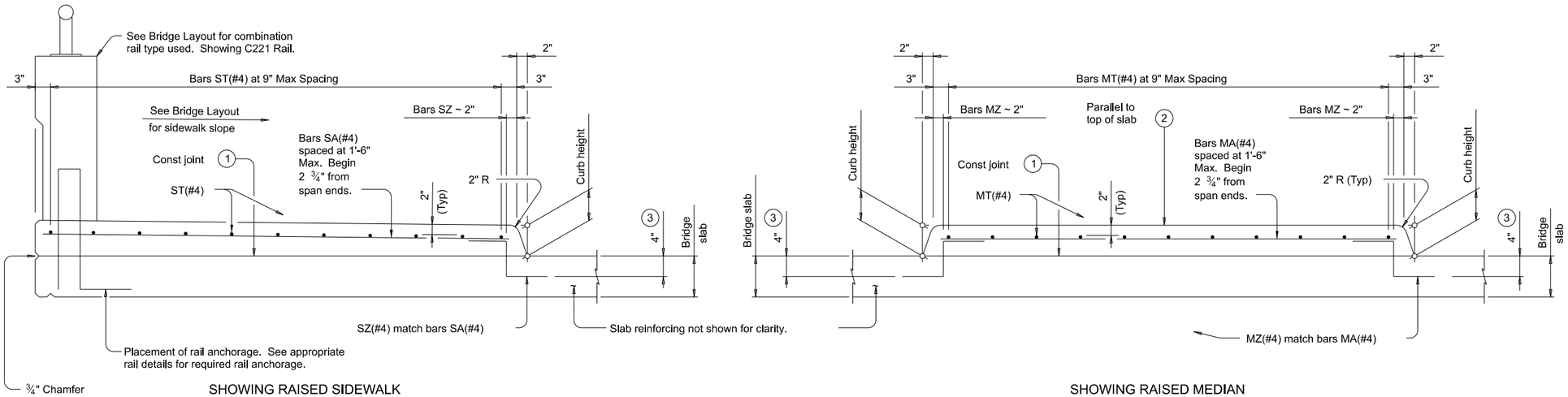
FILE:



TYPICAL TRANSVERSE SECTIONS

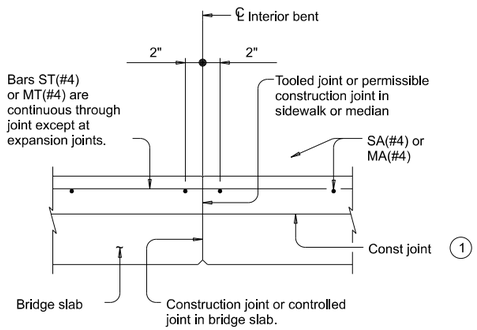
See Span Details for dimensions not shown.

1. Provide broom finish to top of bridge slab where raised sidewalk or raised median area is defined.
2. Unless noted otherwise on the span details.
3. Bars may rest on top of PCPs.

BARS SZ(#4) AND MZ(#4)

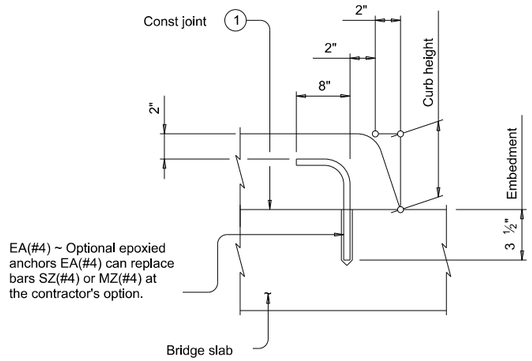
APPROVED SLIP RESISTANT PLATE	
Product	Manufacturer Website
Algrip ,Steel	www.algrip.com
Mebac #3, Steel	www.harscoikg.com
SlipNOT Grade 2, Steel	www.slipnot.com

Provide drain cover plates fabricated with a product from this list. No exceptions are permitted.



LONGITUDINAL SECTION AT INTERIOR BENT

At bents with expansion joints, provide an open joint in the sidewalk/median matching the deck's joint width.



OPTIONAL EPOXY ANCHORS

Embed EA(#4) bar into concrete with a Type III (Class C, D, E, or F) epoxy meeting the requirements of DMS-6100, "Epoxies and Adhesives". Follow manufacturer's directions for installing the epoxied anchor bars.

MATERIAL NOTES:

Provide the same concrete required for the bridge deck, Class S or Class S (HPC) concrete.

Provide Grade 60 reinforcing steel. Deformed welded wire reinforcement (WWR) meeting ASTM A1064 of equivalent size and spacing may be substituted for bars SA, ST, MA, and MT.

Provide epoxy coat or galvanize reinforcement if bridge deck reinforcement is required to be epoxy coated or galvanized.

Provide hot-dip galvanize slip resistant steel plate after fabrication in accordance with Item 445, "Galvanizing".

Chamfer or round edges approximately $\frac{1}{16}$" prior to galvanizing.

GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications.

Provide the following bar or wire lap lengths when required:
- Uncoated, 1'-7" Min
- Coated, 2'-5" Min

Submittal and approval of drain cover plate shop drawings is not required if fabrication is accordance with these details.

Raised sidewalks will be paid under Item 422 by the SF of Bridge Sidewalk or Bridge Sidewalk (HPC). Raised medians will be paid under Item 422 by the SF of Bridge Median or Bridge Median (HPC).

Payment for drain cover plates will be by the pound of "Structural Steel (Misc Non-Bridge)" as per Item 442, "Metal for Structures". Weight of one drain cover plate is 48 plf.

DESIGNER NOTES:

These details do not apply for longitudinal grades exceeding 5 percent.

Cover dimensions are clear dimensions, unless noted otherwise.

Reinforcing bar dimensions shown are out-to-out of bar.

SHEET 1 OF 2

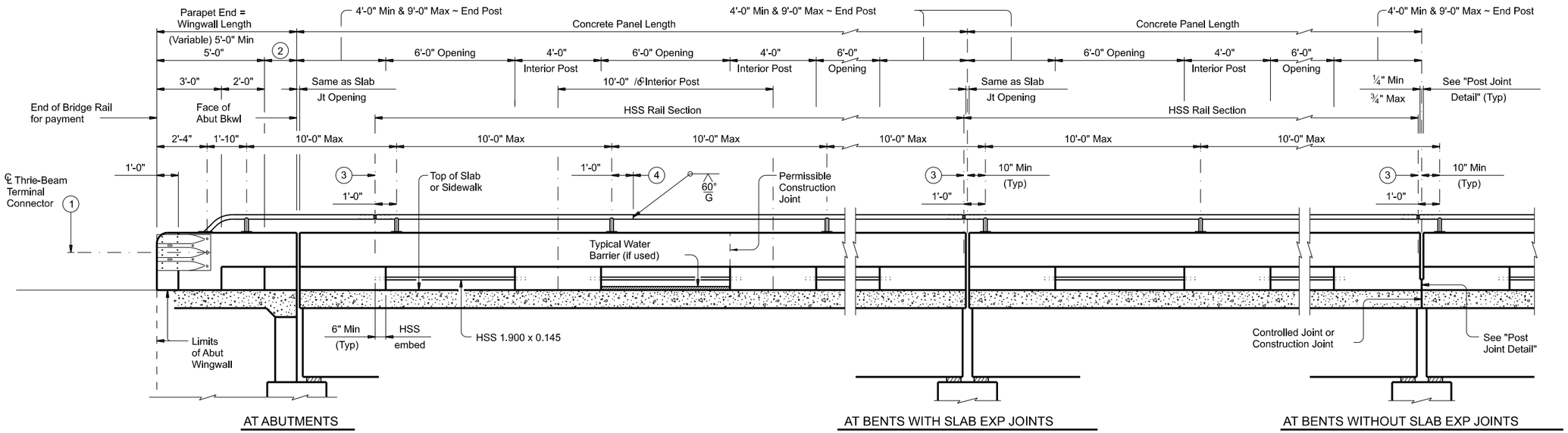
Texas Department of Transportation

Bridge Division Standard

BRIDGE RAISED SIDEWALK AND MEDIAN DETAILS

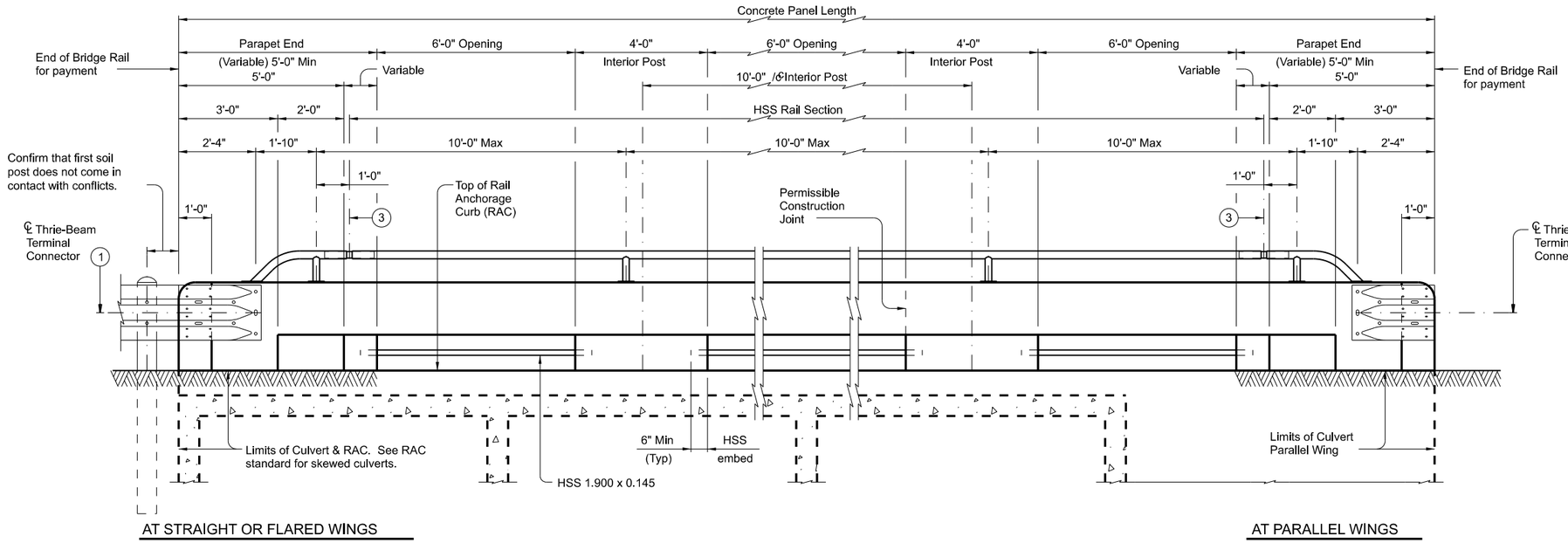
BRSM

FILE: brsmste1-19.dgn	DN: JMH	CK: TxDOT	DW: JTR	CK: TxDOT	
©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY	
REVISIONS	0906	32	050, ETC.	MAIN ST	
	DIST	COUNTY		SHEET NO.	
	ODA	MIDLAND		80	



ROADWAY ELEVATION OF RAIL ON BRIDGE

(Showing without raised sidewalk)



ROADWAY ELEVATION OF RAIL ON BOX CULVERTS

Showing 0° skew culvert. Skewed culverts similar. See RAC standard for details not shown.
Vertical joints in concrete rail are not required, unless shown elsewhere.

1. Terminal Connectors and associated hardware are to be paid for under the Item "Metal Beam Guard Fence". Attach Metal Beam Guard Fence Transitions to the bridge rail and extend along the embankment unless otherwise shown in the plans.
2. Wingwall Length minus 5'-0" (Varies)
3. ℄ Splice Jt or Exp Jt
4. One shop splice per HSS rail section is permitted with minimum 85 percent penetration. The weld may be square groove or single vee groove. Grind smooth.

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DATE:
FILE:

Kevin Morris 10/27/2023

SHEET 1 OF 4

Texas Department of Transportation

Bridge Division Standard

COMBINATION RAIL

TYPE C223

FILE: rlstd019-19.dgn	DN: TxDOT	CK: TxDOT	DW: JTR	CK: AES			
©TxDOT September 2019	CONT	SECT	JOB	HIGHWAY			
REVISIONS	0906	32	050, ETC.	MAIN ST			
	DIST	COUNTY		SHEET NO.			
	ODA	MIDLAND		81			

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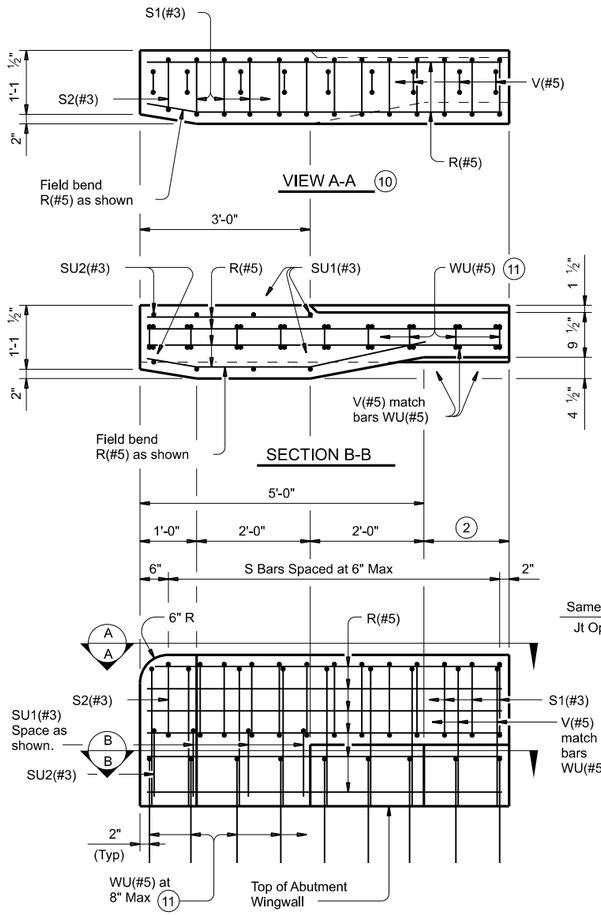
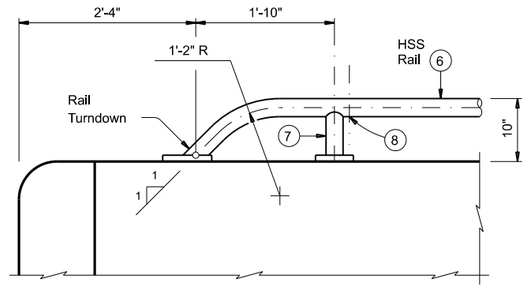
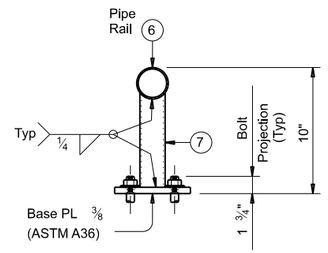
FILE:



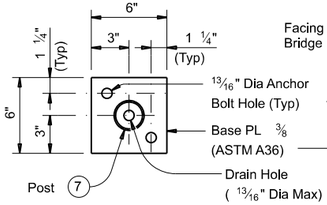


Note that at least two anchor points (as shown) are required for the Bridge Rail on the Abutment Wingwall. Longer Wingwalls may require more than two Rail anchorages.

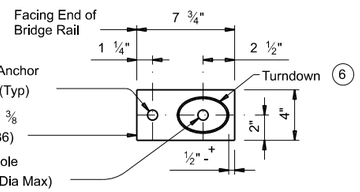
HSS RAIL TERMINAL DETAIL



TRANSVERSE SECTION

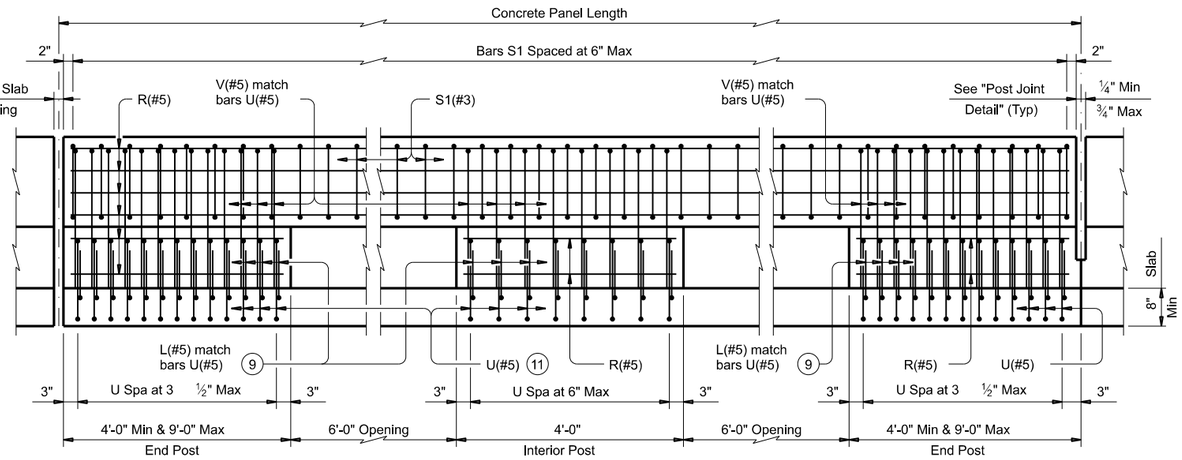


POST BASE PLATE PLAN



RAIL TURNDOWN BASE PLATE PLAN

HSS RAIL DETAILS



AT BENTS WITH SLAB EXP JOINTS

AT 4' INTERIOR POST

AT BENTS WITHOUT SLAB EXP JOINTS

ELEVATION SHOWING TYPICAL REINFORCING PLACEMENT

Showing rail on slab and without raised sidewalk. Rail on box culvert similar. HSS not shown for clarity.

(1) Terminal Connectors and associated hardware are to be paid for under the Item "Metal Beam Guard Fence". Attach Metal Beam Guard Fence Transitions to the bridge rail and extend along the embankment unless otherwise shown in the plans.

(2) Wingwall Length minus 5'-0" (Varies)

(5) Increase 2" for structures with overlay.

(6) HSS 2.875 x 0.203

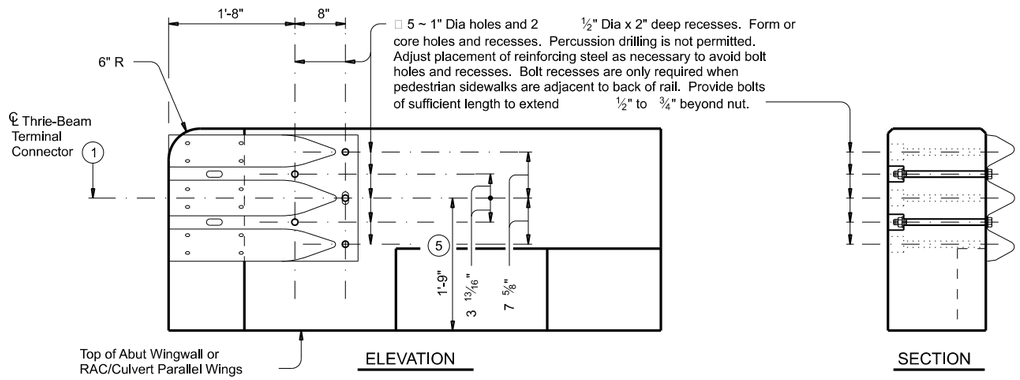
(7) HSS 2.375 x 0.154

(8) ⅜" Dia Hole in bottom of HSS rail (Minimum 1 hole between posts ~ Typ)

(9) Bars L(#5) are part of rail reinforcing and are included in unit price bid for railing. Space with Bars U. Bars L match slab bar cover. Bars L may be bundled with top slab reinforcing if spacing is equivalent. 10/27/2023

(10) Bars SU1(#3), SU2(#3) and WU(#5) not shown for clarity.

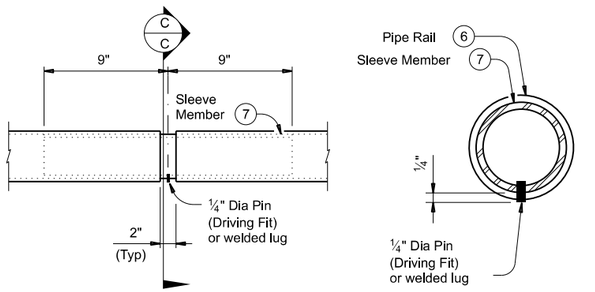
(11) Substitute Bars U(#5) for Bars WU(#5) when parapet end is located on anchorage curb over culvert top slab. Use Bars WU(#5) in culvert parallel wings.



ELEVATION

SECTION

TERMINAL CONNECTION DETAILS



AT SPLICE OR EXP JTS

SECTION C-C

PIPE SPLICE DETAILS

SHEET 2 OF 4

Texas Department of Transportation

Bridge Division Standard

COMBINATION RAIL

TYPE C223

FILE: rlstd019-19.dgn	DN: TxDOT	CK: TxDOT	DW: JTR	CK: AES
©TxDOT September 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0906	32	050, ETC.	MAIN ST
	DIST	COUNTY		SHEET NO.
	ODA	MIDLAND		82

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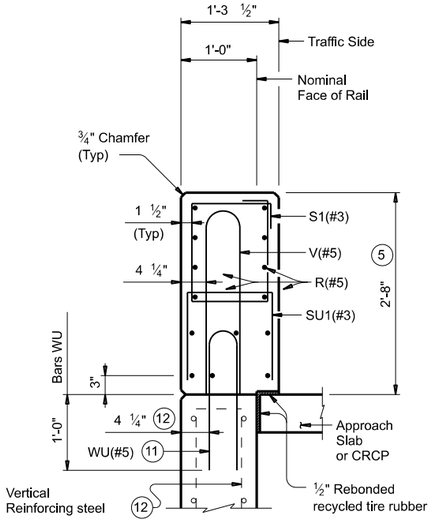
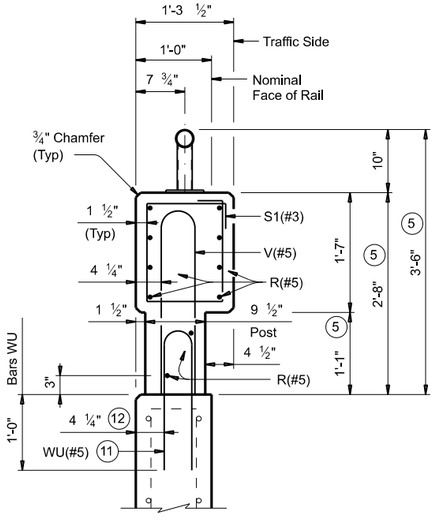
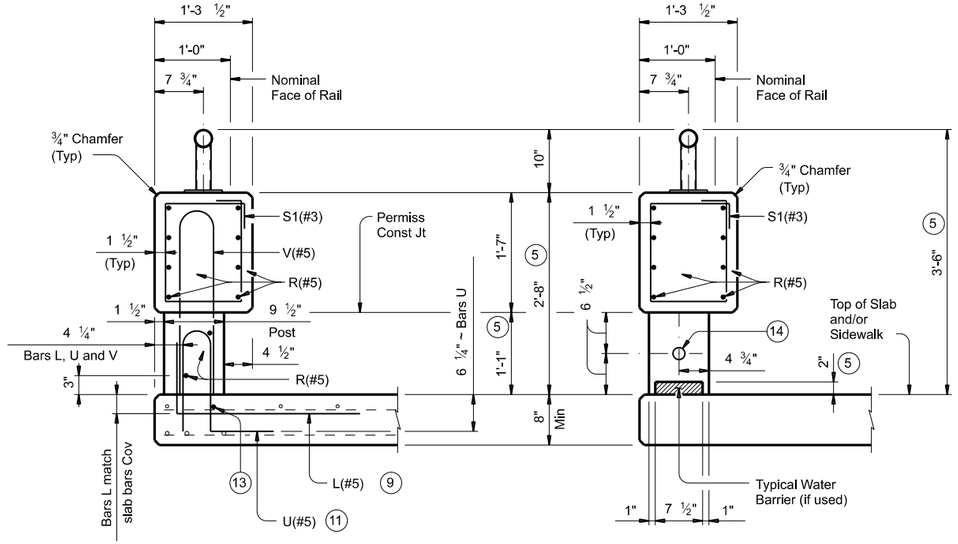
FILE:



SECTION D-D
ON ABUTMENT WINGWALLS
OR CIP RETAINING WALLS

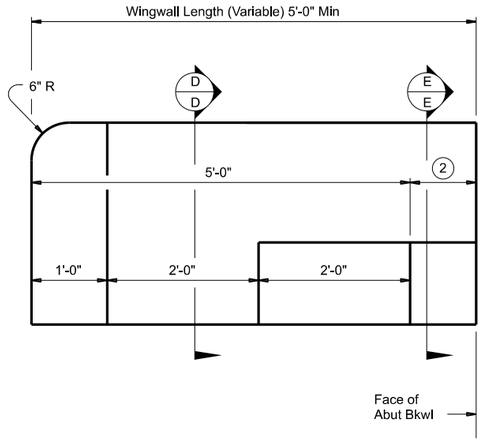


SECTION E-E
ON ABUTMENT WINGWALLS
OR CIP RETAINING WALLS



AT POST
ON BRIDGE SLAB

AT OPENING
ON BRIDGE SLAB

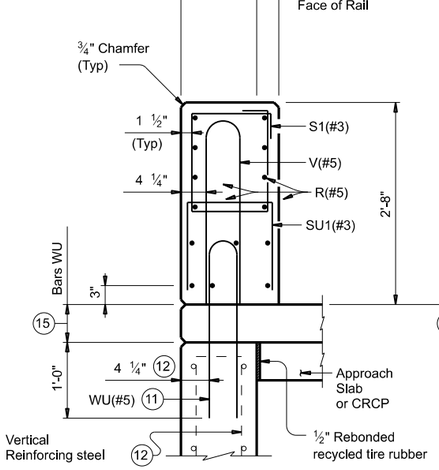


ELEVATION AT
ABUTMENT WINGWALL

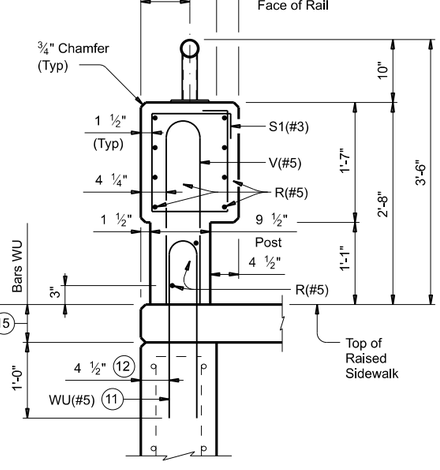
Box culvert parallel wings or rail anchorage curb similar.
HSS rail not shown for clarity.

SECTIONS THRU RAIL WITHOUT RAISED SIDEWALK

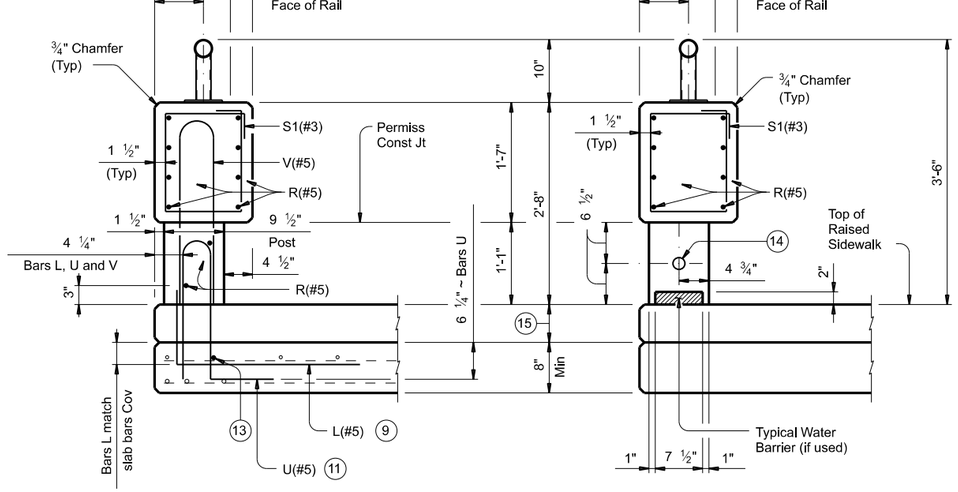
Sections on box culvert similar.



SECTION D-D
ON ABUTMENT WINGWALLS
OR CIP RETAINING WALLS

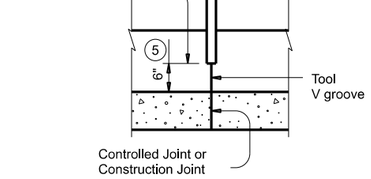


SECTION E-E
ON ABUTMENT WINGWALLS
OR CIP RETAINING WALLS



AT POST
ON BRIDGE SLAB

AT OPENING
ON BRIDGE SLAB



POST JOINT DETAIL

(Showing without raised sidewalk)
Provide at all interior bents without slab expansion joints.

SECTIONS THRU RAIL WITH RAISED SIDEWALK

Sections on box culvert similar.

(2) Wingwall Length minus 5'-0" (Varies)

(5) Increase 2" for structures with overlay.

(9) Bars L(#5) are part of rail reinforcing and are included in unit price bid for railing. Space with Bars U. Bars L match slab bar cover. Bars L may be bundled with top slab reinforcing if spacing is equivalent.

(11) Substitute Bars U(#5) for Bars WU(#5) when parapet end is located on anchorage curb over culvert top slab. Use Bars WU(#5) in culvert parallel wings.

(12) When vertical reinforcing has closer clear cover over horizontal reinforcing in abutment wingwalls on traffic side of wall, move the horizontal wingwall/retaining wall reinforcing to the inside of Bars WU where bars conflict.

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

(14) HSS 1.900 x 0.145

(15) Raised Sidewalk.

Texas Department of Transportation

Bridge Division Standard

COMBINATION RAIL

TYPE C223

FILE: dfstd019-19.dgn	DN: TxDOT	CK: TxDOT	DW: JTR	CK: AES	
©TxDOT September 2019	CONT	SECT	JOB	HIGHWAY	
REVISIONS	0906	32	050, ETC.	MAIN ST	
	DIST	COUNTY		SHEET NO.	
	ODA	MIDLAND		83	

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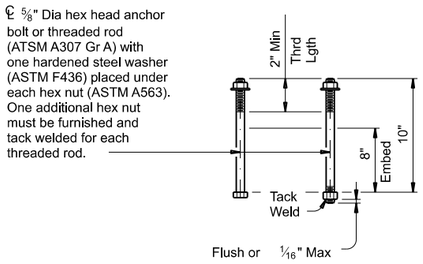
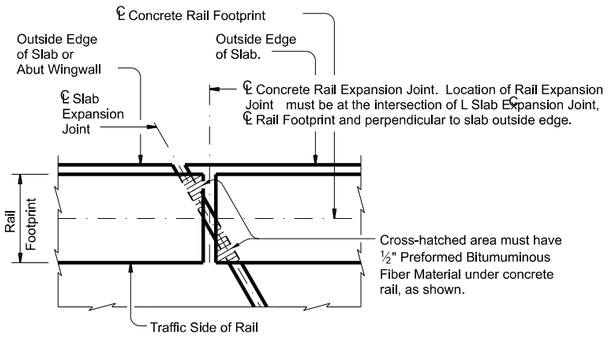
DATE:
FILE:

RAIL DATA FOR HORIZONTAL CURVES

	RADIUS TO FACE OF RAIL	MAX CHORD LENGTH	CONSTRUCT OR FABRICATE
HSS Rail	Over 2800'	29'-0"	Straight rail sections
	Over 1400' thru 2800'	14'-6"	To required radius or to chords shown
	Over 700' thru 1400'	7'-3"	
	Thru 700'	Zero	To required radius



CAST-IN-PLACE ANCHOR BOLT OPTIONS (16)



PLAN OF RAIL AT EXPANSION JOINTS

Example showing Slab Expansion Joints without breakbacks.

(5) Increase 2" for structures with overlay.

(16) See "Material Notes" for anchor bolt information.

(17) For raised sidewalks, add sidewalk height to total bar height. Use sidewalk height at rail's location.

(18) At the Contractor's option, Bars V may be replaced by extending Bars U to 2'-5 1/4" above the roadway/sidewalk surface without overlay.

CONSTRUCTION NOTES:

Face of rail, posts and parapet must be vertical transversely unless otherwise approved by the Engineer. HSS rail posts and opening end faces must be perpendicular to top of adjacent concrete parapet grade. Use epoxy mortar under HSS rail post base plates if gaps larger than 1/16" exist.

Provide water barriers at openings draining onto undercrossing roadways and sidewalks. They may be cast-in-place or precast in convenient lengths and bonded to the bridge deck with an approved epoxy cement.

HSS rail sections must not include less than two posts, and no more than four (except at Abutments).

Round or chamfer exposed edges of HSS rail and HSS rail posts to approximately 1/16" by grinding.

Test adhesive anchors in accordance with Item 450.3.3, "Tests". Test 3 anchors per 100 anchors installed. Perform corrective measures to provide adequate capacity if any of the tests do not meet the required test load. Repair damage from testing as directed.

At the Contractor's option anchor bolts may be cast with the parapet. See "Material Notes".

Chamfer all exposed corners.

MATERIAL NOTES:

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

Provide Grade 60 reinforcing steel.

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

Provide ASTM A1085, A500 Gr B or A53 Gr B for all HSS.

Galvanize all metal components of steel rail system. Apply additional coatings when shown elsewhere on the plans. When plans require paint over gavanizing, follow the requirements for painting galvanized steel in Item 445, "Galvanizing" and when field painting, Item 446, "Field Cleaning and Painting Steel". Sleeve members and anchor bolts must receive galvanization prior to installation and only field paint after installation unless directed otherwise by Engineer.

Deformed Welded Wire Reinforcing (WWR) (ASTM A1064) of equal size and spacing may be substituted for Bars U, V, and WU unless noted otherwise.

Anchor bolts must be 5/8" Dia ASTM A307 Gr A fully threaded rods with one hex nut and one hardened steel washer (ASTM F436) each. Nuts must conform to ASTM A563 requirements. Embed fully threaded rods into parapet wall with a Type III, Class C, D, E, or F anchor adhesive. Minimum adhesive anchor embedment depth is 3". Anchor adhesive chosen must be able to achieve a nominal bond strength in tension of a single anchor, Na, of 5 kips (edge distance must be accounted for). Submit signed and sealed calculations or the manufacturer's published literature showing the proposed anchor adhesive's ability to develop this load to the Engineer for approval prior to use. Anchor installation, including hole size, drilling, and clean out, must be in accordance with Item 450, "Railing".

Optional cast-in-place anchor bolts must be 5/8" Dia ASTM A307 Gr A bolts (or threaded rods with one tack welded hex nut each) with one hex nut and one hardened steel washer (ASTM F436) at each bolt. Nuts must conform to ASTM A563 requirements.

Provide bar laps, where required, as follows: Uncoated or galvanized ~ #5 = 2'-0"
Epoxy coated ~ #5 = 3'-0"

GENERAL NOTES:

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

Do not use this railing on bridges with expansion joints providing more than 2" movement.

Rail anchorage details shown on this standard may require modification for select structure types.

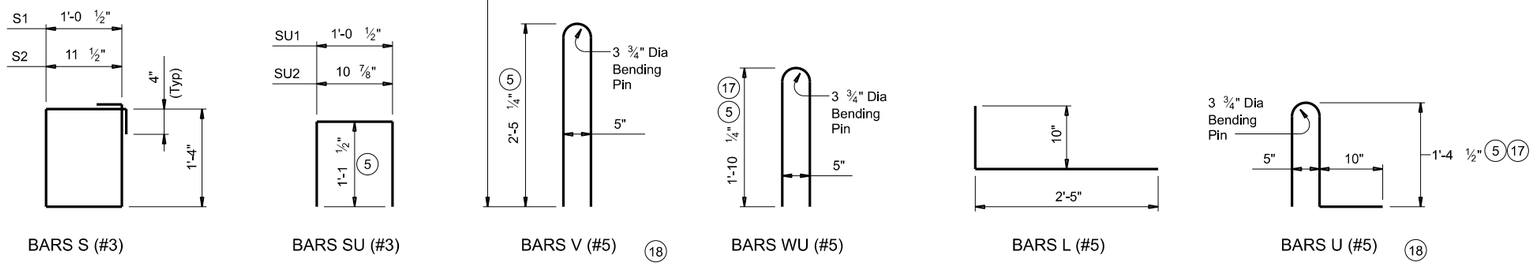
See appropriate details elsewhere in plans for these modifications.

Submit erection drawings showing panel lengths, HSS rail post spacing, and anchor bolt setting to the Engineer for approval.

Average weight of railing with no overlay:
370 plf total
358 plf (Conc)
12 plf (Steel)

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

Joanne Wong 10/27/2023



SHEET 4 OF 4

Texas Department of Transportation

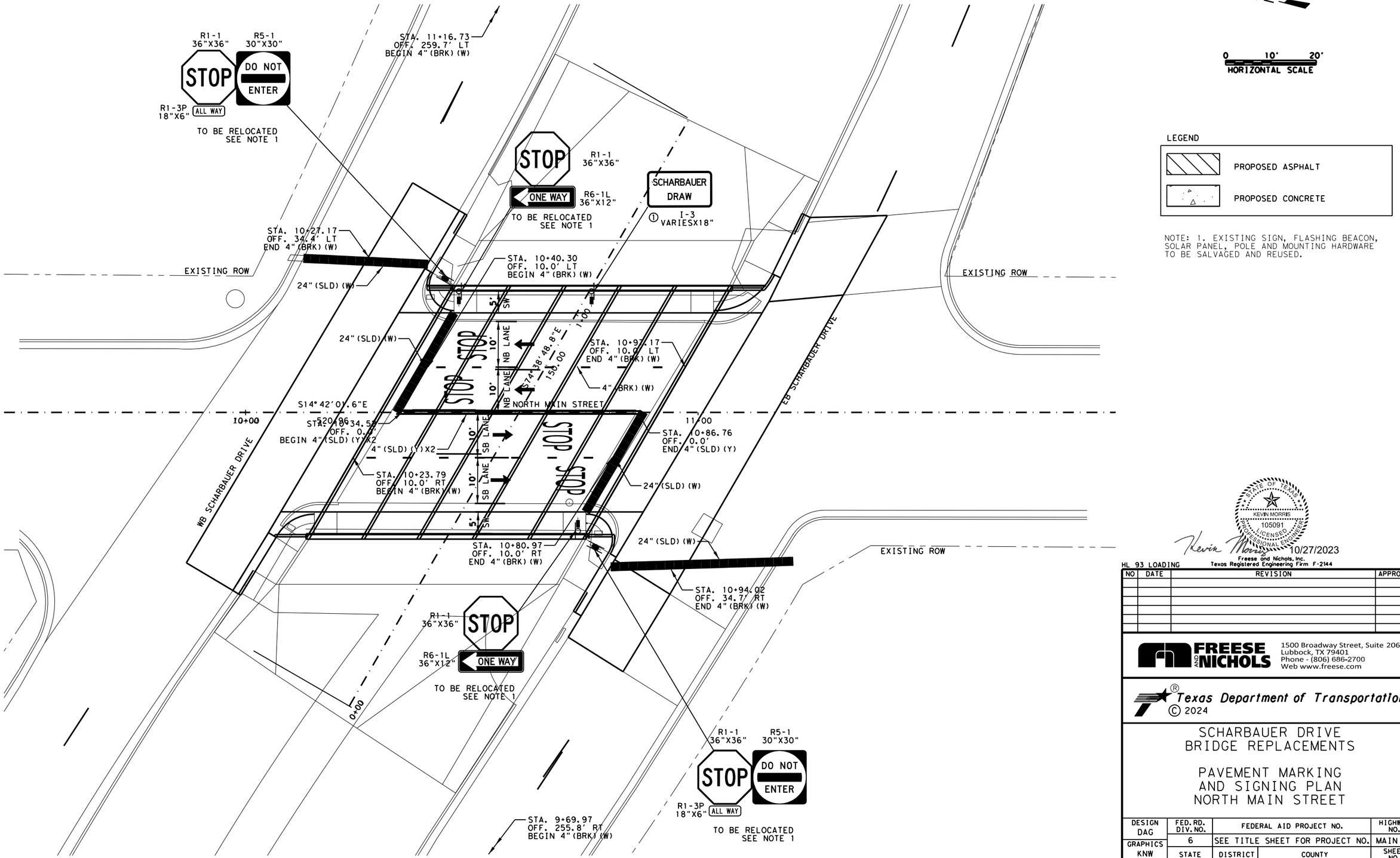
Bridge Division Standard

COMBINATION RAIL

TYPE C223

FILE: rlstd019-19.dgn	DN: TxDOT	CK: TxDOT	DW: JTR	CK: AES
©TxDOT September 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0906	32	050, ETC.	MAIN ST
	DIST	COUNTY		SHEET NO.
	ODA	MIDLAND		84

0.08333317 ft / in.



N

0 10' 20'
HORIZONTAL SCALE

LEGEND

PROPOSED ASPHALT

PROPOSED CONCRETE

NOTE: 1. EXISTING SIGN, FLASHING BEACON, SOLAR PANEL, POLE AND MOUNTING HARDWARE TO BE SALVAGED AND REUSED.

STATE OF TEXAS
KEVIN MORRIS
105091
LICENSED
PROFESSIONAL ENGINEER

Kevin Morris 10/27/2023

Freese and Nichols, Inc.
Texas Registered Engineering Firm F-2144

HL 93 LOADING

NO	DATE	REVISION	APPROVED

FREESE AND NICHOLS
1500 Broadway Street, Suite 206
Lubbock, TX 79401
Phone - (806) 686-2700
Web www.freese.com

Texas Department of Transportation
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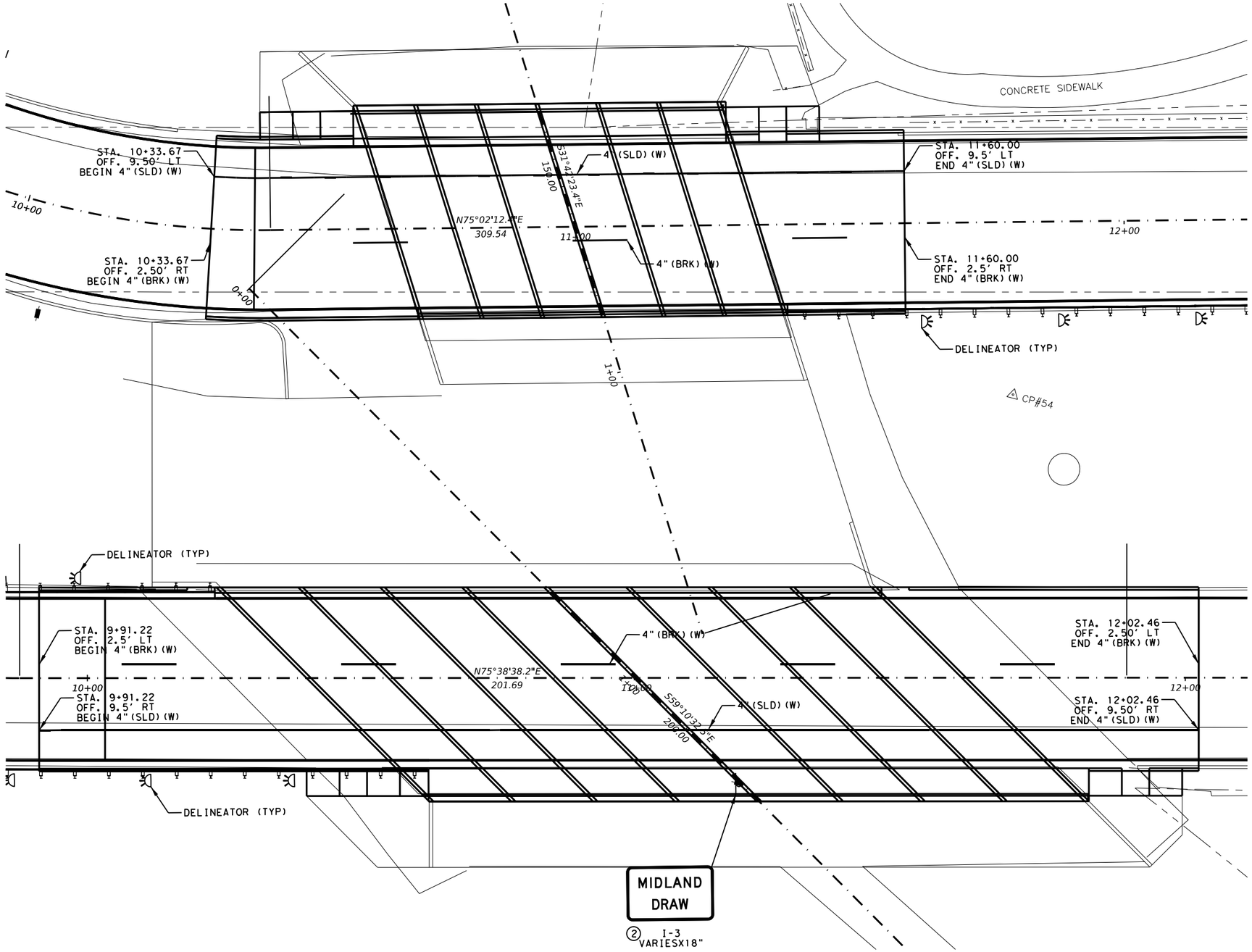
SCHARBAUER DRIVE BRIDGE REPLACEMENTS

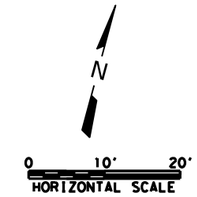
PAVEMENT MARKING AND SIGNING PLAN NORTH MAIN STREET

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DAG	6	SEE TITLE SHEET FOR PROJECT NO.		MAIN ST
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
KNW	TEXAS	ODA	MIDLAND	
CHECK	CONTROL	SECTION	JOB	85
KMM	0906	32	050, ETC.	
CHECK				
SRJ				

10/27/2023
N:\IF\Drawings\8. Traffic\CV-TRT-PL-PVMK01.dgn

0.08333317 ft / in.





10/27/2023

Freese and Nichols, Inc.
Texas Registered Engineering Firm F-2144

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SCHARBAUER DRIVE BRIDGE REPLACEMENTS

PAVEMENT MARKING AND SIGNING PLAN EB SCHARBAUER DRIVE

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DAG	6	SEE TITLE SHEET FOR PROJECT NO.		MAIN ST
GRAPHICS KNW	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK KMM	TEXAS	ODA	MIDLAND	86
CHECK SRJ	CONTROL	SECTION	JOB	
	0906	32	050,ETC.	

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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	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
85	1	I-3	SCHARBAUER DRIVE	VARIESX18"	X		10BWG	1	SB	P		
86	2	I-3	MIDLAND DRAW	VARIESX18"	X		10BWG	1	SB	P		

ALUMINUM SIGN BLANKS THICKNESS	
Square Feet	Minimum Thickness
Less than 7.5	0.080"
7.5 to 15	0.100"
Greater than 15	0.125"

The Standard Highway Sign Designs for Texas (SHSD) can be found at the following website.

http://www.txdot.gov/

NOTE:

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

2. For installation of bridge mount clearance signs, see Bridge Mounted Clearance Sign Assembly (BMCS)Standard Sheet.

3. For Sign Support Descriptive Codes, see Sign Mounting Details Small Roadside Signs General Notes & Details SMD(GEN).

STATE OF TEXAS
KEVIN MORRIS
105091
LICENSED
PROFESSIONAL ENGINEER

Kevin Morris 10/27/2023

Freese and Nichols, Inc.
Texas Registered Engineering Firm F-2144

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		0906	32	050, ETC.	MAIN ST
4-16		DIST	COUNTY		SHEET NO.
8-16		ODA	MIDLAND		87

100.00 FT / in.

PLAN SHEET NO.	LOC.	SIGN TYPE	SIGN TEXT	SIGN DIMENSIONS	0644-6009 REMOVE SM RD SN SUP & AM
SCHARBAUER DRIVE					EA.
34	MAIN	I-3	SCHARBAUER DRAW	VARIESX18"	1
35	EB SCH	I-3	MIDLAND DRAW	VARIESX18"	1
				SUBTOTAL:	2

KEVIN MORRIS
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PROFESSIONAL ENGINEER

Kevin Morris 10/27/2023

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SCHARBAUER DRIVE
BRIDGE REPLACEMENTS

SIGN REMOVAL SUMMARY

DESIGN DAG	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
GRAPHICS KNW	6	SEE TITLE SHEET FOR PROJECT NO.		MAIN ST
	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK KMM	TEXAS	ODA	MIDLAND	88
	CONTROL	SECTION	JOB	
CHECK SRJ	0906	32	050, ETC.	

10/27/2023
N:\IF\Drawings\8. Traffic\CV-TRT-DT-SIGN REMOVAL SUMMARY.dgn

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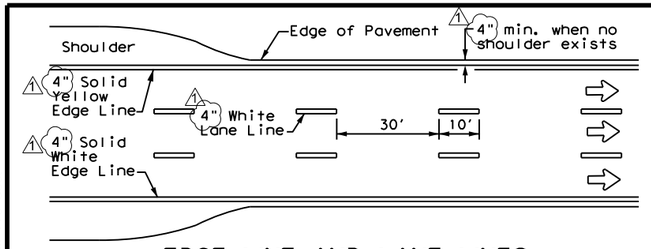
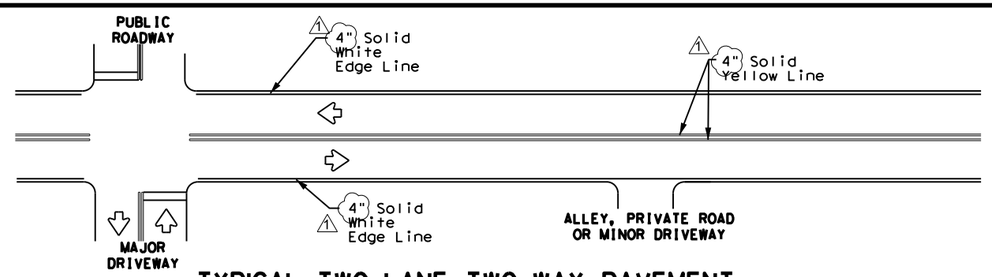
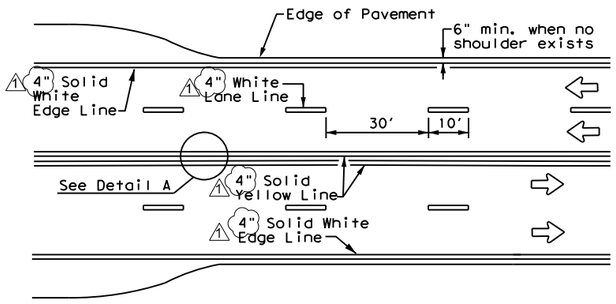


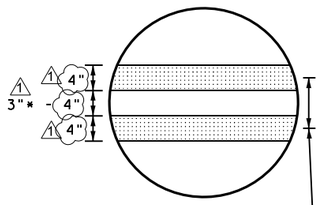
EDGE LINE AND LANE LINES ONE-WAY ROADWAY WITH OR WITHOUT SHOULDERS



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



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

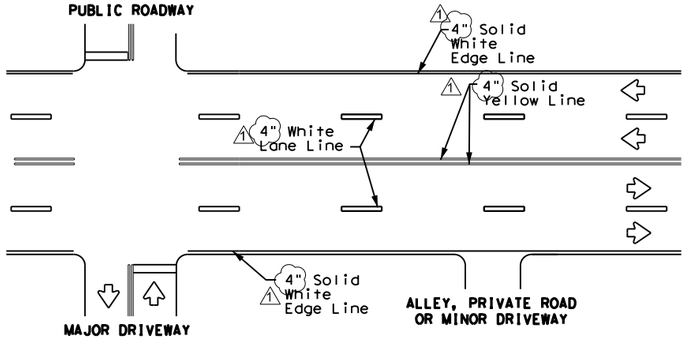


DETAIL "A"

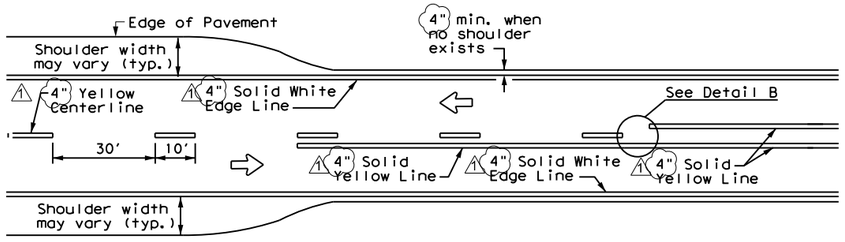
9"** min. - 10" typ.
(18" max. for traveled way greater than 48' only)

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

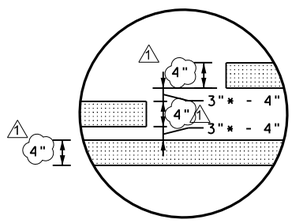
** 8" minimum for restripe projects when approved by the Engineer.



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

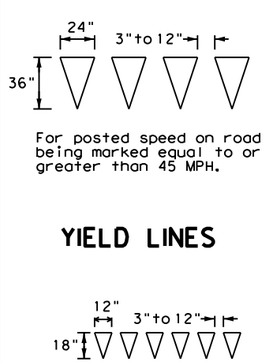


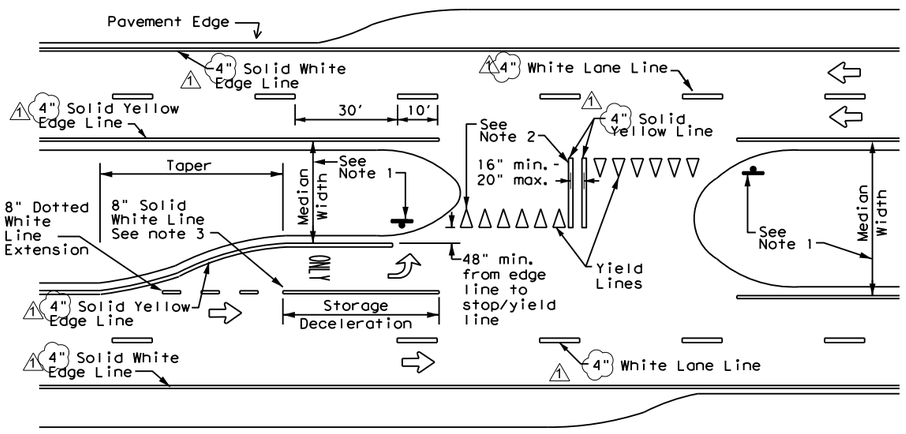
TWO LANE TWO-WAY ROADWAY WITH OR WITHOUT SHOULDERS



DETAIL "B"

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





FOUR LANE DIVIDED ROADWAY CROSSOVERS

NOTES

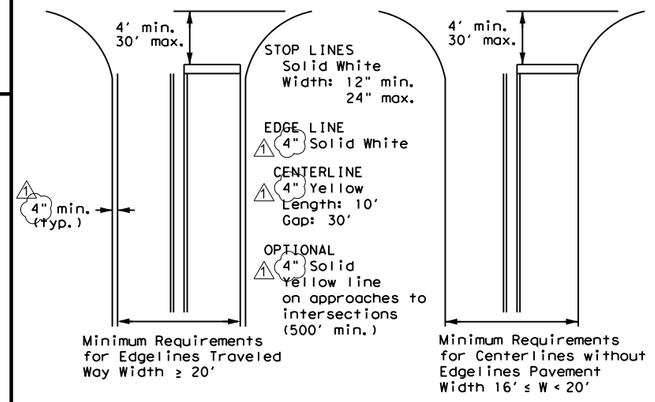
1. Where divided highways are separated by median widths at the median opening itself of 30 feet or more, median openings shall be signed as two separate intersections. Each median opening has two width measurements, with one measurement for each approach. The narrow median width will be the controlling 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.

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.



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

1 ONLY

STATE OF TEXAS
KEVIN MORRIS
105091
LICENSED PROFESSIONAL ENGINEER
Kevin Morris
10/27/2023

Texas Department of Transportation

Traffic Safety Division Standard

TYPICAL STANDARD PAVEMENT MARKINGS

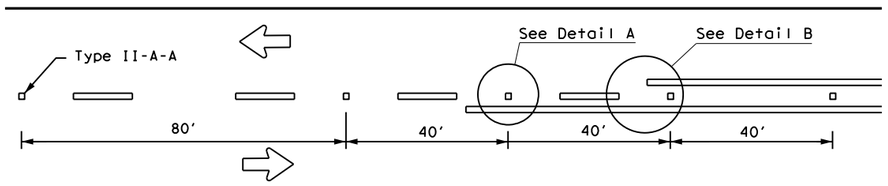
PM(1)-22 (MOD)

FILE: pm1-22.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT December 2022	CONT	SECT	JOB	HIGHWAY
REVISIONS 11-78 8-00 6-20 12-22	0906	32	050, ETC.	MAIN ST
8-95 3-03 1 CHANGED 6" TO 4"	DIST	COUNTY		SHEET NO.
5-00 2-12	ODA	MIDLAND		89

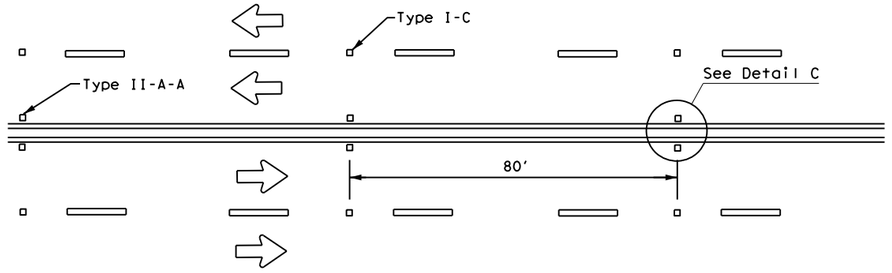
22A

DATE:
FILE:

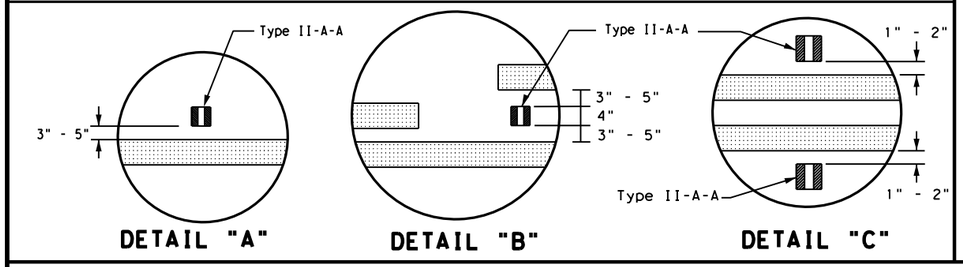
REFLECTIVE RAISED PAVEMENT MARKERS FOR VEHICLE POSITIONING GUIDANCE



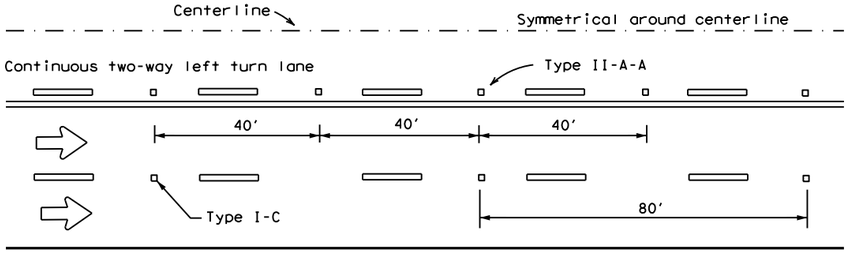
CENTERLINE FOR ALL TWO LANE TWO-WAY ROADWAYS



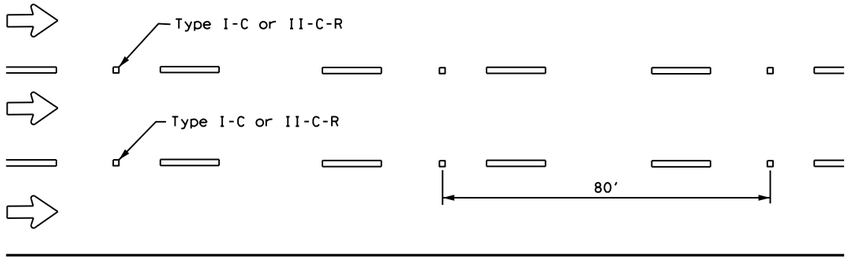
CENTERLINE & LANE LINES FOR FOUR LANE TWO-WAY ROADWAYS



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



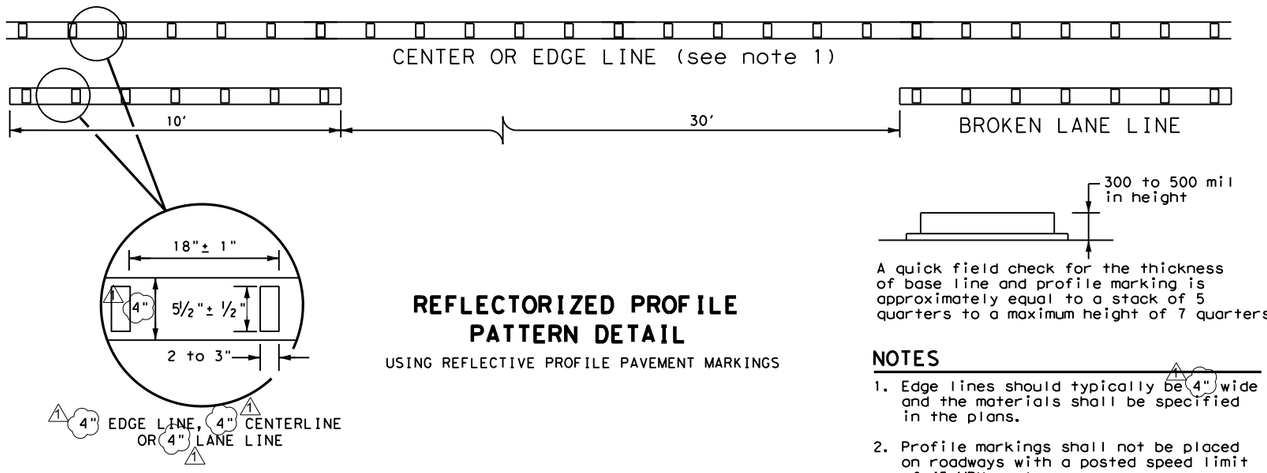
CENTERLINE AND LANE LINES FOR TWO-WAY LEFT TURN LANE



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

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

See Note 3.



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

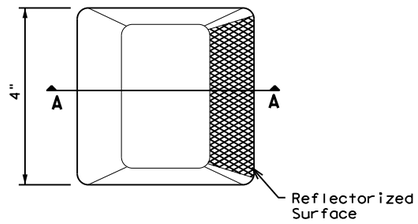
1. Edge lines should typically be 4" wide and the materials shall be specified in the plans.
2. Profile markings shall not be placed on roadways with a posted speed limit of 45 MPH or less.

GENERAL NOTES

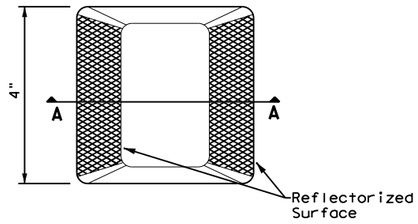
1. All raised pavement markers placed along broken lines shall be placed in line with and midway between the stripes.
2. On concrete pavements the raised pavement markers should be placed to one side of the longitudinal joints.
3. Use raised pavement marker Type I-C with undivided roadways, flush medians and two way left turn lanes. Use raised pavement marker Type II-C-R with divided highways and raised medians.

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

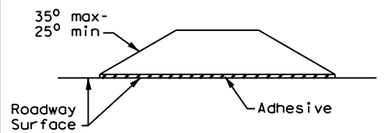
All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.



Type I (Top View)



Type II (Top View)



SECTION A

RAISED PAVEMENT MARKERS

1 ONLY

STATE OF TEXAS
KEVIN MORRIS
105091
LICENSED
PROFESSIONAL ENGINEER
Kevin Morris
10/27/2023

Texas Department of Transportation

Traffic Safety Division Standard

POSITION GUIDANCE USING RAISED MARKERS RELECTORIZED PROFILE MARKINGS

PM(2)-22 (MOD)

FILE: pm2-22.dgn	DN:	CK:	DW:	CK:
©TxDOT December 2022	CONT	SECT	JOB	HIGHWAY
REVISIONS	0906	32	050, ETC.	MAIN ST
4-77 8-00 6-20 12-22	DIST	COUNTY		SHEET NO.
4-92 2-10 1 CHANGED 6" TO 4"				
5-00 2-12	ODA	MIDLAND		90

22B

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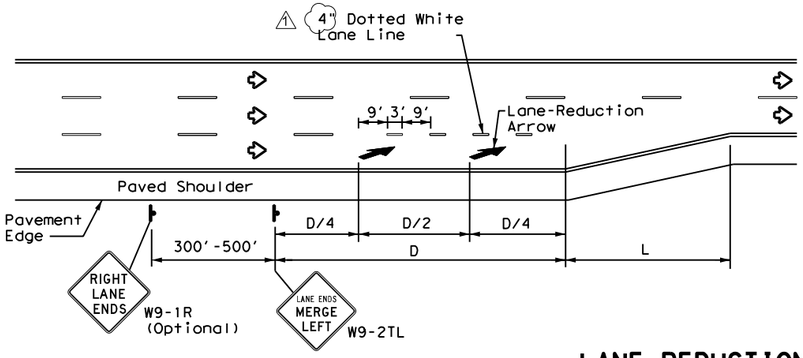
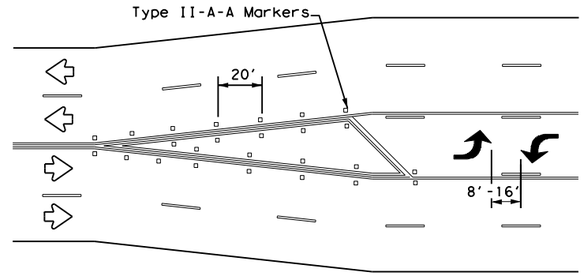


LANE REDUCTION

NOTES

1. Lane reduction pavement markings are used where the number of through lanes is reduced because of narrowing of the roadway or because of a section of on-street parking in what would otherwise be a through lane. For Texas Super 2 Passing Lanes, see TS2(PL) standard sheets.
2. On divided highways, an additional RIGHT LANE ENDS (W9-1R) sign may be installed in the median aligned with the W9-1R sign on the right side of the highway.
3. Lane reduction arrows are required for speeds of 45 mph or greater. An optional third lane reduction arrow may be added based on engineering judgement. If used, the optional third lane reduction arrow should be centered between the first and last lane reduction arrows.
4. For lane reductions on Freeways and Expressways, signing shall conform to the TxDOT Freeway Signing Handbook.

ADVANCED WARNING SIGN DISTANCE (D)		
Posted Speed	D (ft)	L (ft)
30 MPH	460	$L = \frac{WS^2}{60}$
35 MPH	565	
40 MPH	670	
45 MPH	775	L=WS
50 MPH	885	
55 MPH	990	
60 MPH	1,100	
65 MPH	1,200	
70 MPH	1,250	
75 MPH	1,350	



A two-way left-turn (TWLT) lane-use arrow pavement marking should be used at or just downstream from the beginning of a two-way left-turn lane within a corridor. Repeating the marking after each intersection or dedicated turn bay is not required unless stated elsewhere in the plans.

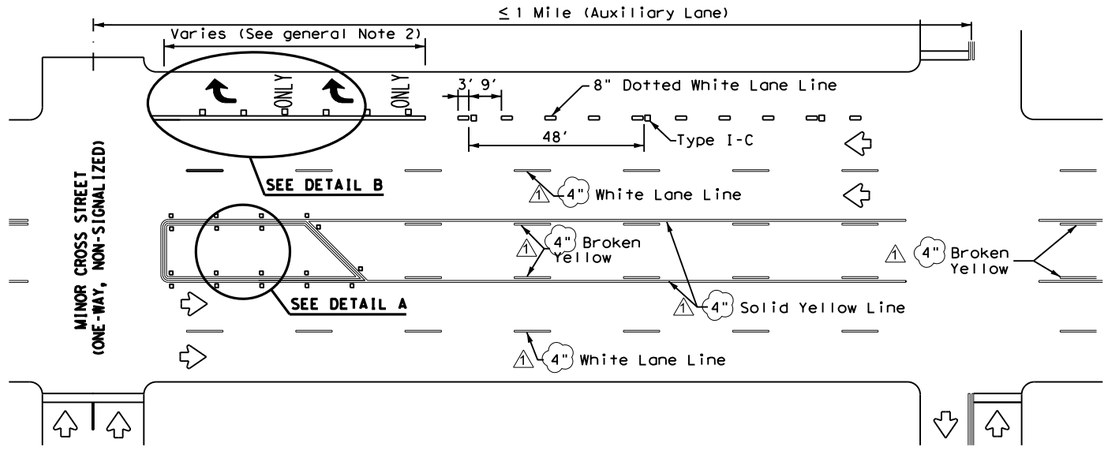
TYPICAL TRANSITION FOR TWLTL AND DIVIDED HIGHWAY

GENERAL NOTES

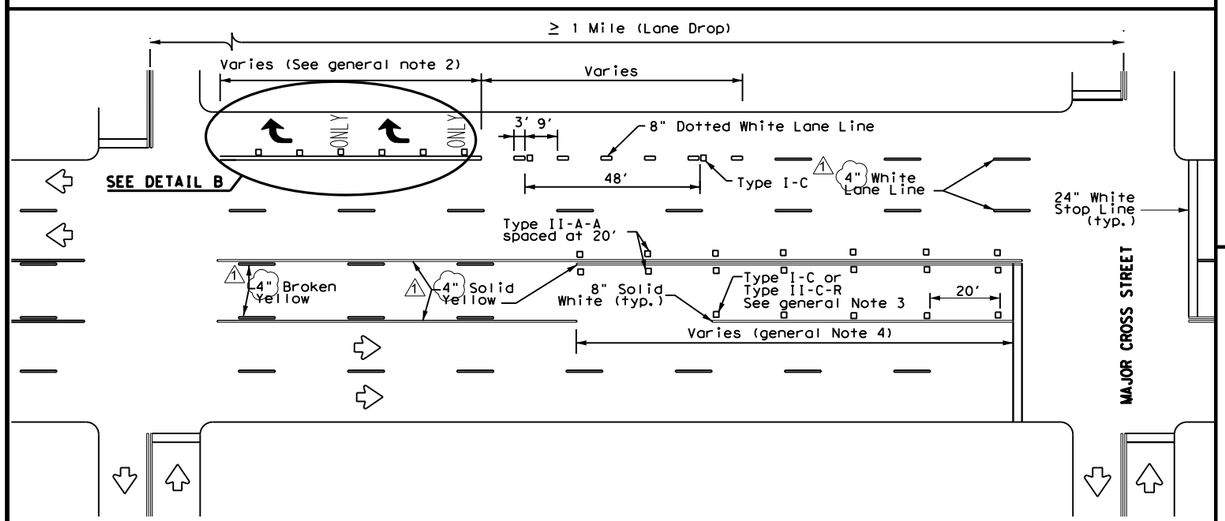
1. Lane use word and arrow markings shall be used where through lanes approaching an intersection become mandatory turn lanes. Lane use word and arrow markings should be used in auxiliary lanes of substantial length. Lane use arrow markings or word and arrow markings may be used in other lanes and turn bays for emphasis. Details for words and arrows are as shown in the Standard Highway Sign Designs for Texas.
2. When lane-use words and arrow markings are used, two sets of arrows should be used if the length of the bay is greater than 180 feet. When a single lane use arrow or word and arrow marking is used for a short turn lane, it should be located at or near the upstream end of the full-width turn lane.
3. Use raised pavement marker Type I-C with undivided highways, flush medians and two way left turn lanes. Use raised pavement marker Type II-C-R with divided highways and raised medians.
4. Length of turn bays, including taper, deceleration, and storage lengths shall be as shown on the plans or as directed by the Engineer. See Chapter 3 of the Roadway Design Manual for additional information on turning lanes or storage lengths.

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

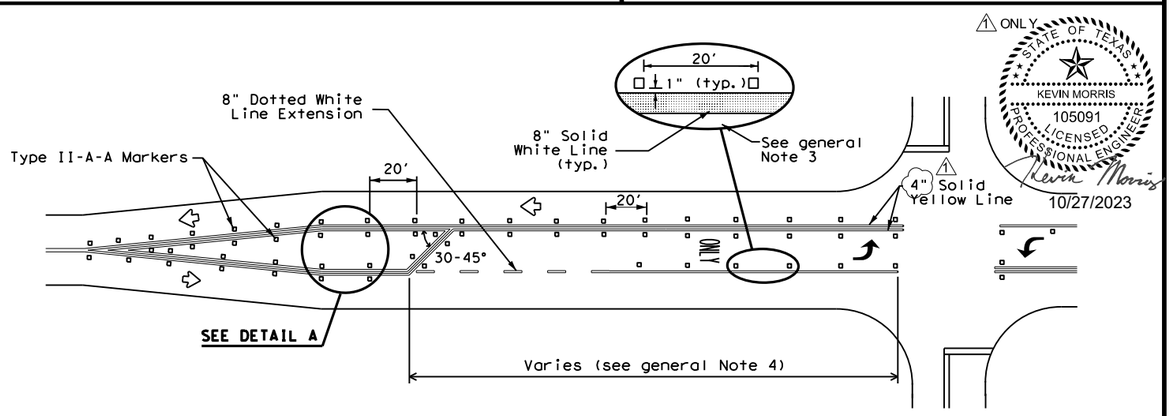
All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.



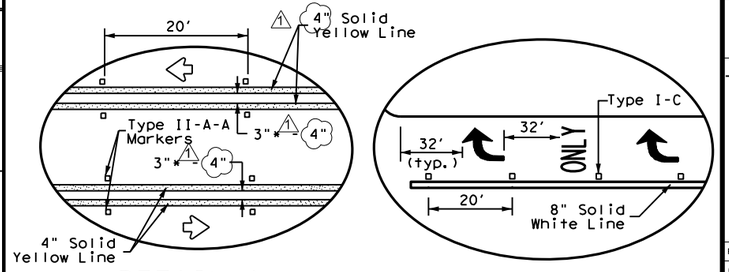
TYPICAL TWLTL AT ONE-WAY STREET AND RIGHT TURN AUXILIARY LANE



TYPICAL TWLTL AT TWO-WAY CROSS STREET AND RIGHT TURN LANE DROP



TYPICAL TWO-LANE ROADWAY INTERSECTION WITH LEFT TURN BAYS



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

Texas Department of Transportation

Traffic Safety Division Standard

TWO-WAY LEFT TURN LANES, RURAL LEFT TURN BAYS, AND LANE REDUCTION PAVEMENT MARKINGS

PM(3)-22 (MOD)

FILE: pm3-22.dgn	DN:	CK:	DW:	CK:
© TxDOT December 2022	CONT	SECT	JOB	HIGHWAY
REVISIONS 4-98 3-03 6-20 12-22	0906	32	050, ETC.	MAIN ST
5-00 2-10 1 CHANGED 6" TO 4"	DIST	COUNTY		SHEET NO.
8-00 2-12	ODA	MIDLAND		91

22C

DATE:
FILE:

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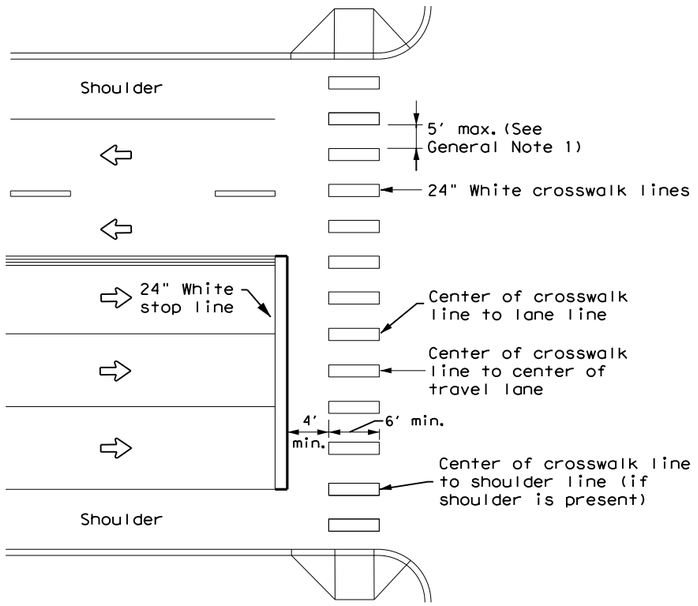
DATE:
FILE:



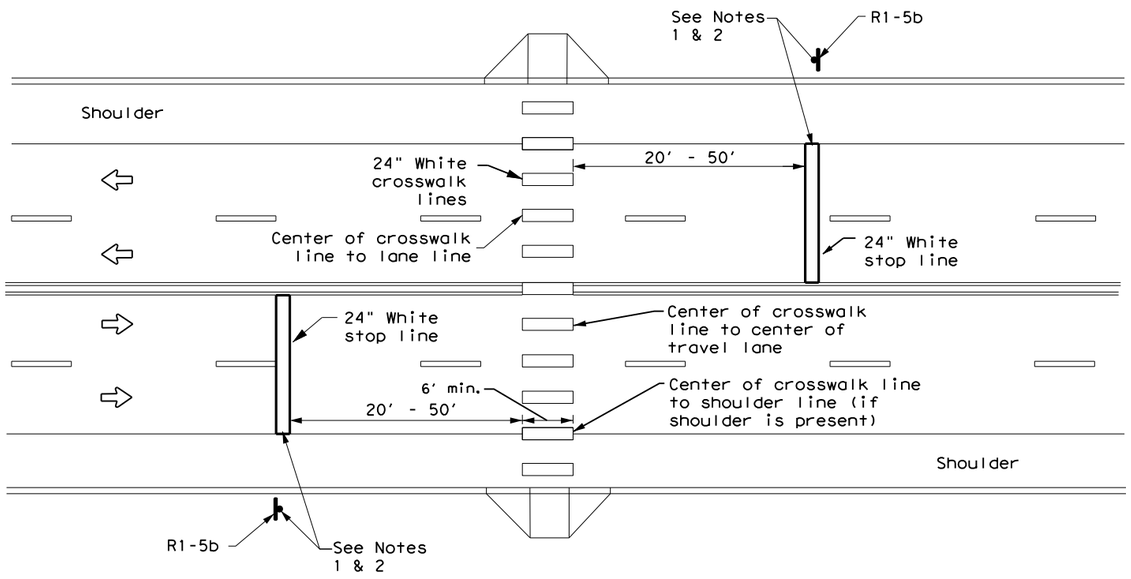
HIGH-VISIBILITY LONGITUDINAL CROSSWALK AT CONTROLLED APPROACH

GENERAL NOTES

1. Longitudinal crosswalk lines should not be placed in the wheel path of vehicles. Center the crosswalk lines on travel lanes, lane lines, and shoulder lines (if present).
2. A minimum 6" clear distance shall be provided to the curb face. If the last crosswalk line falls into this distance it must be omitted.
3. For divided roadways, adjustments in spacing of the crosswalk lines should be made in the median so that the crosswalk lines are maintained in their proper location across the travel portion of the roadway.
4. At skewed crosswalks, the crosswalk lines are to remain parallel to the lane lines.
5. Each crosswalk shall be a minimum of 6' wide.
6. The High-Visibility Longitudinal Crosswalk is the preferred crosswalk pattern on State Highways. Other crosswalk patterns as shown in the "Texas Manual on Uniform Traffic Control Devices" may be used. All crosswalk designs and dimension shall comply with the "Texas Manual on Uniform Traffic Control Devices."
7. Final placement of Stop Bar and Crosswalk shall be approved by the Engineer in the field.

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.



UNSIGNALIZED MIDBLOCK HIGH-VISIBILITY LONGITUDINAL CROSSWALK

NOTES:

1. Use stop bars with Stop Here For Pedestrians (R1-5b) signs at unsignalized midblock cross walks.
2. Use stop bars with STOP HERE ON RED (R10-6 or R10-6a) signs at mid block crosswalks controlled by traffic signals or pedestrian hybrid beacons.

Texas Department of Transportation

Traffic Safety Division Standard

CROSSWALK PAVEMENT MARKINGS

PM(4)-22A

FILE: pm4-22a.dgn	DN:	CK:	DW:	CK:
© TxDOT December 2022	CONT	SECT	JOB	HIGHWAY
REVISIONS	0906	32	050, ETC.	MAIN ST
6-20	DIST	COUNTY		SHEET NO.
6-22	ODA	MIDLAND		92
12-22				

22D

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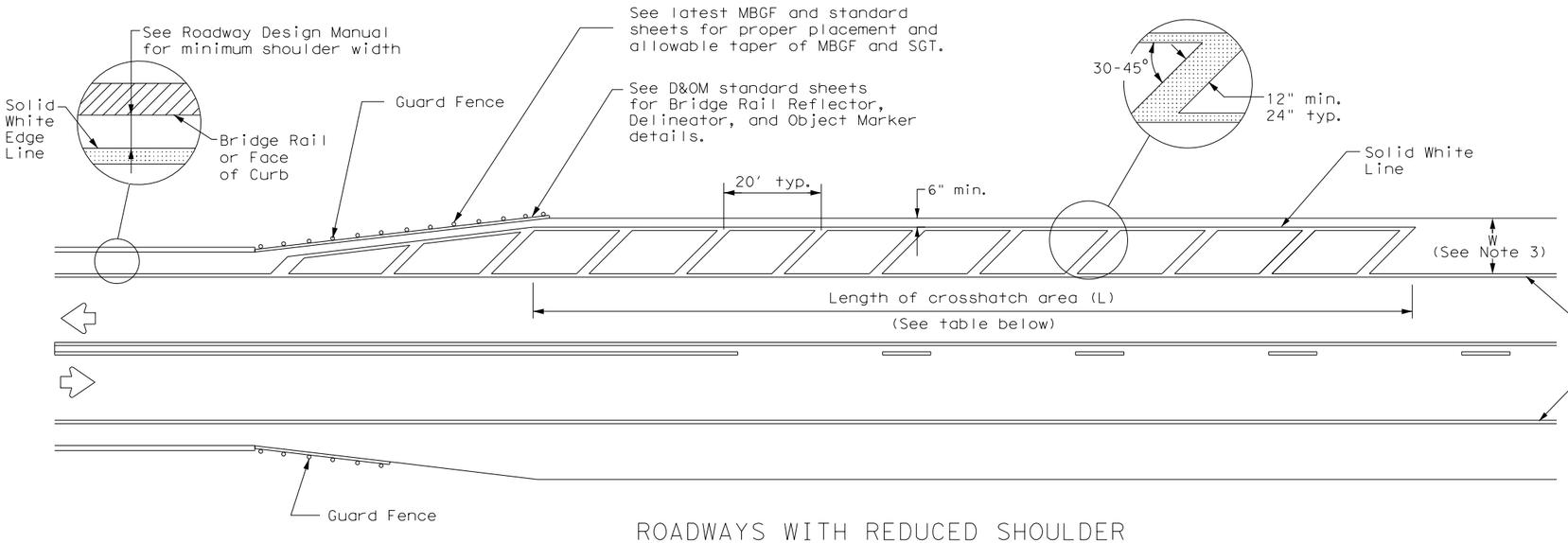

ROADWAYS WITH REDUCED SHOULDER
WIDTHS ACROSS BRIDGE OR CULVERT

CROSSHATCH LENGTH (L)	
Posted Speed (MPH)	L (ft)
30	300 ft
35	
40	
45	
50	500 ft
55	
60	
65	
70	
75	

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 4 inches from the bridge rail or face of curb or 6 inches from the edge of pavement. This distance may vary due to pavement raveling or other conditions.
2. No-passing zone on bridge approach is optional. If used, the no-passing zone shall be a minimum 500 feet long from the beginning of the bridge.
3. The crosshatching should be required if the shoulder width in advance of the bridge is 4 feet or wider and a reduction of at least 3 feet in shoulder width across the bridge occurs.
4. On divided highways, review both the right and left shoulder widths for the need for narrow bridge pavement markings.

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.

Texas Department of Transportation

Traffic Safety Division Standard

PAVEMENT MARKINGS FOR ROADWAYS WITH REDUCED SHOULDER WIDTHS ACROSS BRIDGE OR CULVERT

PM(5)-22

FILE: pm5-22.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT December 2022	CONT	SECT	JOB	HIGHWAY
REVISIONS	0906	32	050, ETC.	MAIN ST
	DIST	COUNTY		SHEET NO.
	ODA	MIDLAND		93

DATE:
FILE:

22E

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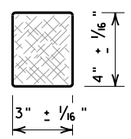
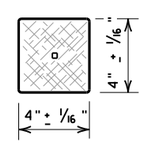
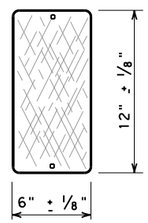
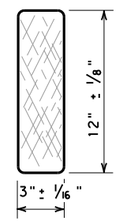
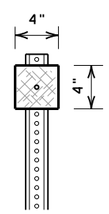
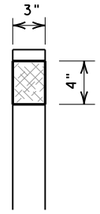
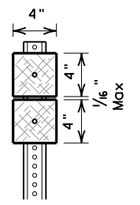
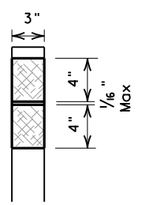
REFLECTOR UNIT SIZES FOR DELINEATORS AND OBJECT MARKERS

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

DELINEATORS

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

D & OM DESCRIPTIVE CODES

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

NUMBER OF REFLECTORS
S = Single
D = Double

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

REFLECTOR UNIT SIZE
1 or 2

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

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

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

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

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

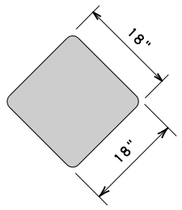
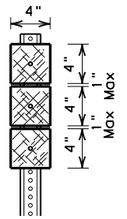
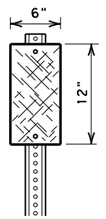
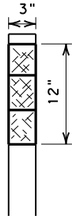
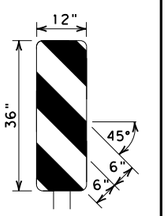
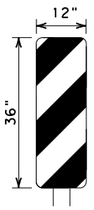
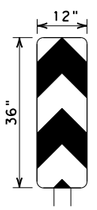
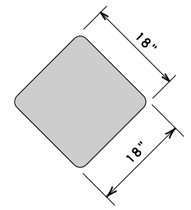
NUMBER OF REFLECTORS OR DIRECTION
X = 3-Size 2 reflector units (Type 2 only)
Y = 1-Size 3 reflector unit (Type 2 only)
Z = 3-Size 1 or 1-Size 4 reflector unit(s)(Type 2 only)
L = Left Side (Type 3 Object Marker only)
R = Right Side (Type 3 Object Marker only)
C = Center (Type 3 Object Marker only)

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

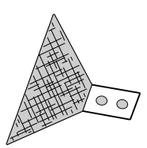
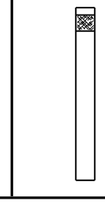
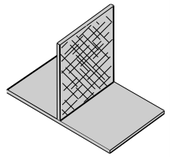
TYPE OF MOUNT
GND = Embedded (drivable)
SRF = Surface Mount
WAS = Wedge Anchor Steel
WAP = Wedge Anchor Plastic

DIRECTION
If Required
BI = Bi-Directional

OBJECT MARKERS

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

BARRIER REFLECTORS (BRF)

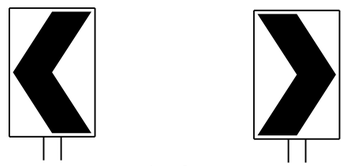
	GF1	GF2	CTB
DEVICE			

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

SHEETING: Yellow, White, Red

NOTE: 1. Reflective sheeting shall have a minimum dimension of 3 inches and minimum surface area of 9 square inches.

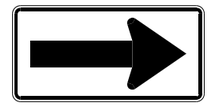
CHEVRONS

DEVICE:  W1-8

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

NOTE:
1. CHEVRON (W1-8) signs and ONE DIRECTION LARGE ARROW (W1-6) Signs shall be installed per Sign Mounting Details (SMD) Standard Sheets and paid under Item 644 (Small Roadside Sign Assemblies).
2. When there is a need to increase conspicuity, the Texas version of the ONE DIRECTION LARGE ARROW sign (W1-9T) may be used instead of the ONE DIRECTION LARGE ARROW (W1-6).

ONE DIRECTION LARGE ARROW

DEVICE:  W1-6

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

NOTE:

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

DEPARTMENTAL MATERIAL SPECIFICATIONS

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

Texas Department of Transportation

Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER MATERIAL DESCRIPTION

D & OM(1)-20

FILE: dom1-20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
©TxDOT August 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS	0906	32	050, ETC.	MAIN ST
10-09 3-15	DIST	COUNTY		SHEET NO.
4-10 7-20	ODA	MIDLAND		94

20A

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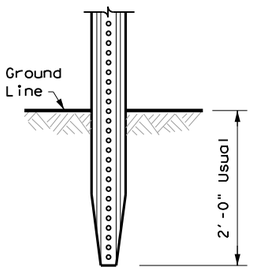
POST TYPE AND SUPPORT FOUNDATION DETAILS

WING CHANNEL (WC)

GND

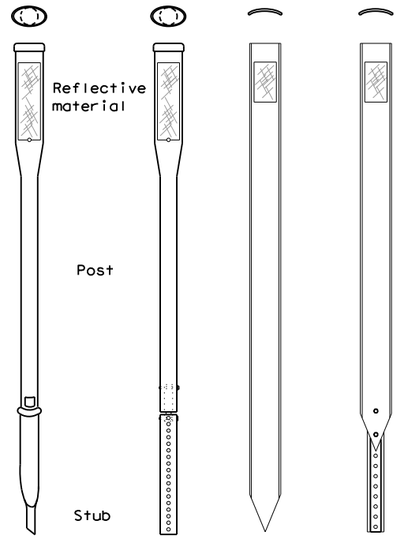


NOTES

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

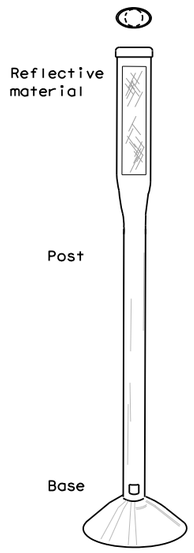
FLEXIBLE POSTS (YFLX, WFLX)

GND



EMBEDDED

SRF



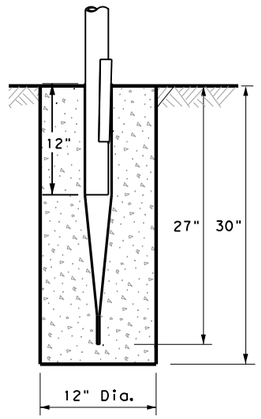
SURFACE MOUNT

NOTES

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

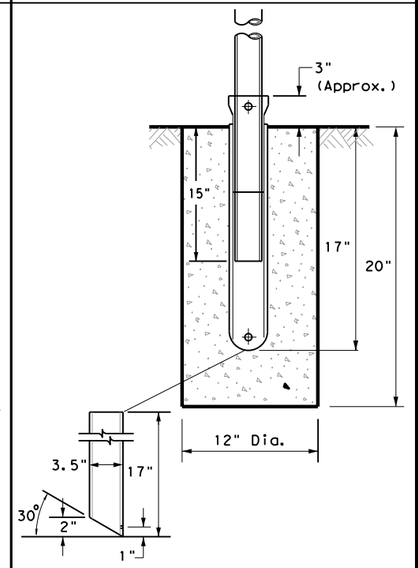
WEDGE ANCHOR SYSTEMS

WAS



STEEL

WAP



PLASTIC

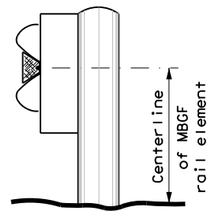
NOTE

1. Install per manufacturer's recommendations.

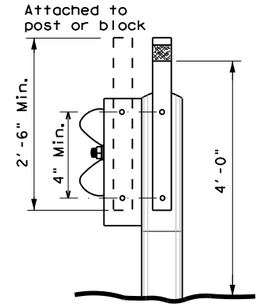
TYPE OF BARRIER MOUNTS

GUARD FENCE ATTACHMENT

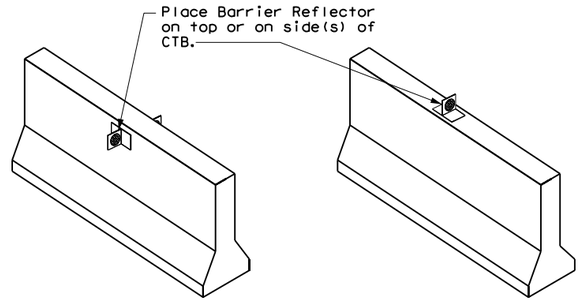
GF1



GF2



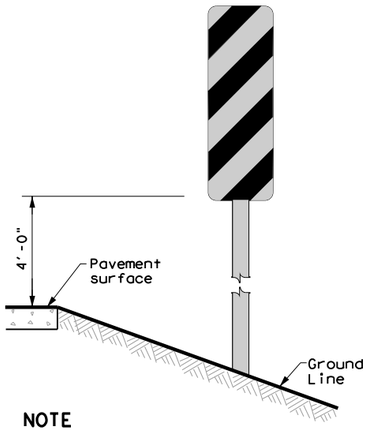
CONCRETE TRAFFIC BARRIER (CTB)



GENERAL NOTES

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

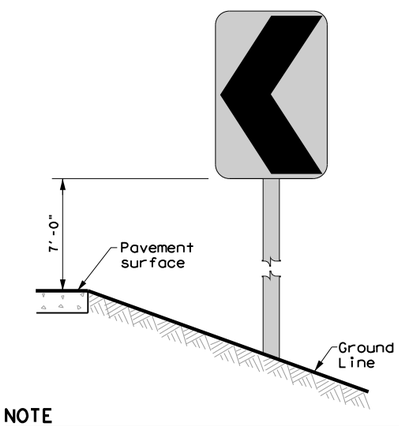
TYPES 1, 3, AND 4 OBJECT MARKERS AND CHEVRONS



NOTE

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

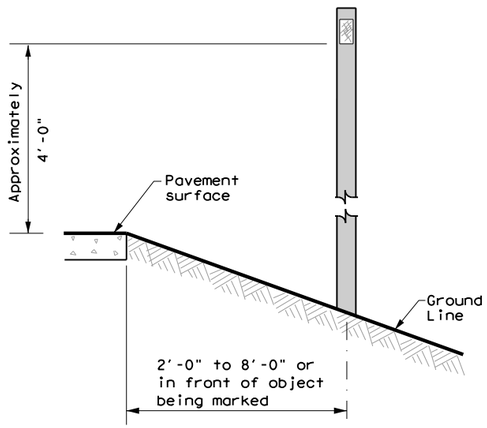
CHEVRONS AND ONE DIRECTION LARGE ARROW SIGN



NOTE

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

DELINEATORS AND TYPE 2 OBJECT MARKERS



See general notes 1, 2 and 3.

Texas Department of Transportation

Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER INSTALLATION

D & OM(2)-20

FILE: dom2-20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
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REVISIONS	0906	32	050, ETC.	MAIN ST
10-09 3-15	DIST	COUNTY		SHEET NO.
4-10 7-20	ODA	MIDLAND		95

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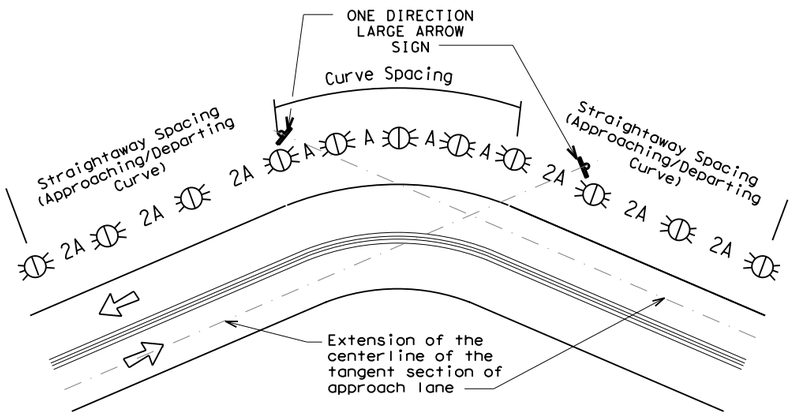
MINIMUM WARNING DEVICES AT CURVES WITH ADVISORY SPEEDS

Amount by which Advisory Speed is less than Posted Speed	Curve Advisory Speed	
	Turn (30 MPH or less)	Curve (35 MPH or more)
5 MPH & 10 MPH	• RPMs	• RPMs
15 MPH & 20 MPH	• RPMs and One Direction Large Arrow sign	• RPMs and Chevrons; or • RPMs and One Direction Large Arrow sign where geometric conditions or roadside obstacles prevent the installation of chevrons.
25 MPH & more	• RPMs and Chevrons; or • RPMs and One Direction Large Arrow sign where geometric conditions or roadside obstacles prevent the installation of chevrons	• RPMs and Chevrons

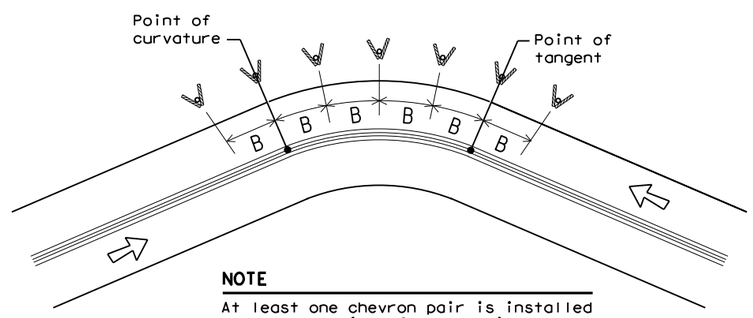
SUGGESTED SPACING FOR DELINEATORS ON HORIZONTAL CURVES



NOTE

ONE DIRECTION LARGE ARROW (W1-6) sign should be located at approximately and perpendicular to the extension of the centerline of the tangent section of approach lane.

SUGGESTED SPACING FOR CHEVRONS ON HORIZONTAL CURVES



NOTE

At least one chevron pair is installed beyond the point of tangent in tangent section.

DATE:
FILE:

DELINEATOR AND CHEVRON SPACING

WHEN DEGREE OF CURVE OR RADIUS IS KNOWN

Degree of Curve	FEET			
	Radius of Curve	Spacing in Curve	Spacing in Straightaway	Chevron Spacing in Curve
		A	2A	B
1	5730	225	450	—
2	2865	160	320	—
3	1910	130	260	200
4	1433	110	220	160
5	1146	100	200	160
6	955	90	180	160
7	819	85	170	160
8	716	75	150	160
9	637	75	150	120
10	573	70	140	120
11	521	65	130	120
12	478	60	120	120
13	441	60	120	120
14	409	55	110	80
15	382	55	110	80
16	358	55	110	80
19	302	50	100	80
23	249	40	80	80
29	198	35	70	40
38	151	30	60	40
57	101	20	40	40

Curve delineator approach and departure spacing should include 3 delineators spaced at 2A. This spacing should be used during design preparation or when the degree of curve is known.

DELINEATOR AND CHEVRON SPACING

WHEN DEGREE OF CURVE OR RADIUS IS NOT KNOWN

Advisory Speed (MPH)	Spacing in Curve	Spacing in Straightaway	Chevron Spacing in Curve
	A	2xA	B
65	130	260	200
60	110	220	160
55	100	200	160
50	85	170	160
45	75	150	120
40	70	140	120
35	60	120	120
30	55	110	80
25	50	100	80
20	40	80	80
15	35	70	40

If the degree of curve is not known, delineator spacing may be determined based on the Advisory Speed of the curve. Use the delineator curve spacing for each Advisory Speed (MPH).

DELINEATOR AND OBJECT MARKER APPLICATION AND SPACING

CONDITION	REQUIRED TREATMENT	MINIMUM SPACING
Frwy./Exp. Tangent	RPMs	See PM-series and FPM-series standard sheets
Frwy./Exp. Curve	Single delineators on right side	See delineator spacing table
Frwy/Exp.Ramp	Single delineators on at least one side of ramp (should be on outside of curves) (see Detail 3 on D&OM(4))	100 feet on ramp tangents Use delineator spacing table for ramp curves ("straightway spacing" does not apply to ramp curves)
Acceleration/Deceleration Lane	Double delineators (see Detail 3 on D&OM(4))	100 feet (See Detail 3 on D & OM (4))
Truck Escape Ramp	Single red delineators on both sides	50 feet
Bridge Rail (steel or concrete)and Metal Beam Guard Fence	Bi-Directional Delineators when undivided with one lane each direction Single Delineators when multiple lanes each direction	Equal spacing (100'max) but not less than 3 delineators
Concrete Traffic Barrier (CTB) or Steel Traffic Barrier	Barrier reflectors matching the color of the edge line	Equal spacing 100' max
Cable Barrier	Reflectors matching the color of the edge line	Every 5th cable barrier post (up to 100'max)
Guard Rail Terminus/Impact Head	Divided highway - Object marker on approach end Undivided 2-lane highways - Object marker on approach and departure end	Requires reflective sheeting provided by manufacturer per D & OM (VIA) or a Type 3 Object Marker (OM-3) in front of the terminal end See D & OM (5) and D & OM (6)
Bridges with no Approach Rail	Type 3 Object Marker (OM-3) at end of rail and 3 single delineators approaching rail	See D & OM(5)
Reduced Width Approaches to Bridge Rail	Type 2 and Type 3 Object Markers (OM-3) and 3 single delineators approaching bridge	Requires reflective sheeting provided by manufacturer per D & OM (VIA) or a Type 3 Object Marker (OM-3) in front of the terminal end See D & OM (5)
Culverts without MBGF	Type 2 Object Markers	See Detail 2 on D & OM(4)
Crossovers	Double yellow delineators and RPMs	See Detail 1 on D & OM (4)
Pavement Narrowing (lane merge) on Freeways/Expressway	Single delineators adjacent to affected lane for full length of transition	100 feet

NOTES

1. Unless indicated otherwise, the delineator or barrier reflector color shall conform to the color of the pavement edge line on the side of the road where the delineators or barrier reflectors are placed.
2. Barrier reflectors may be used to replace required delineators.
3. Single red delineators may be mounted on the back side of delineator posts for wrong way driver applications

LEGEND

	Bi-directional Delineator
	Delineator
	Sign

Texas Department of Transportation — Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER PLACEMENT DETAILS

D & OM(3)-20

FILE: dom3-20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
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REVISIONS	0906	32	050, ETC.	MAIN ST
3-15 8-15	DIST	COUNTY		SHEET NO.
8-15 7-20	ODA	MIDLAND		96

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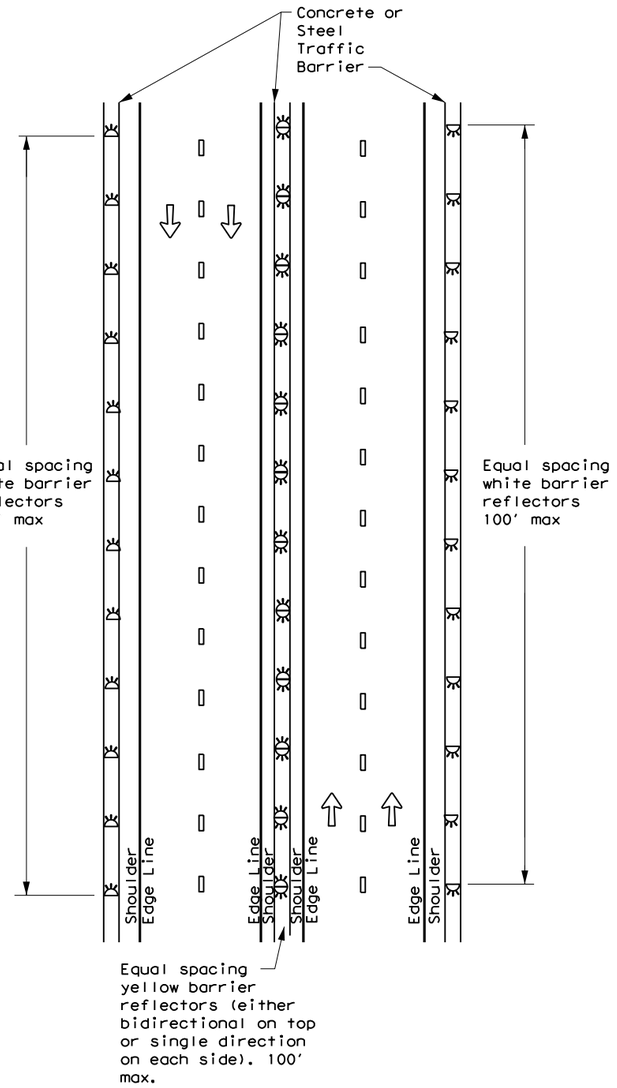
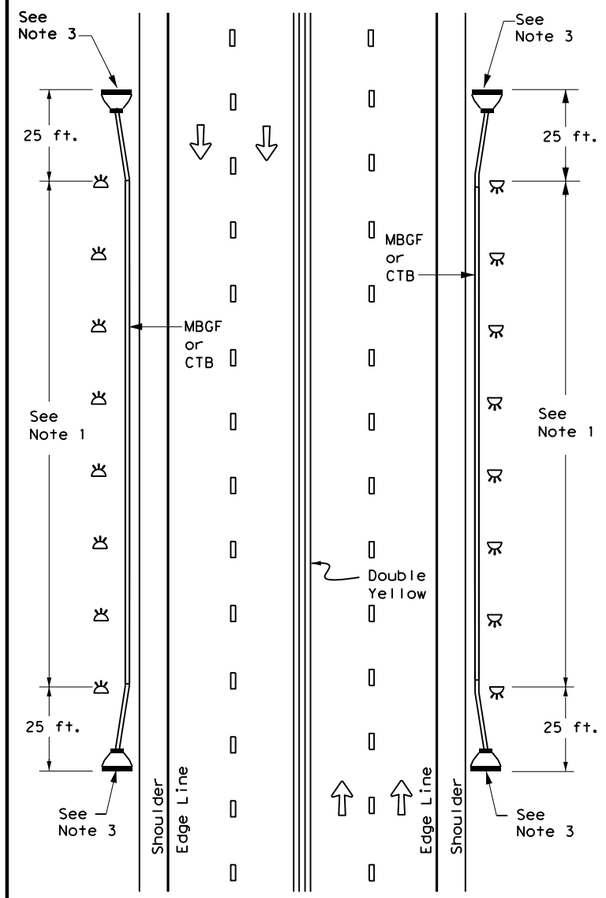
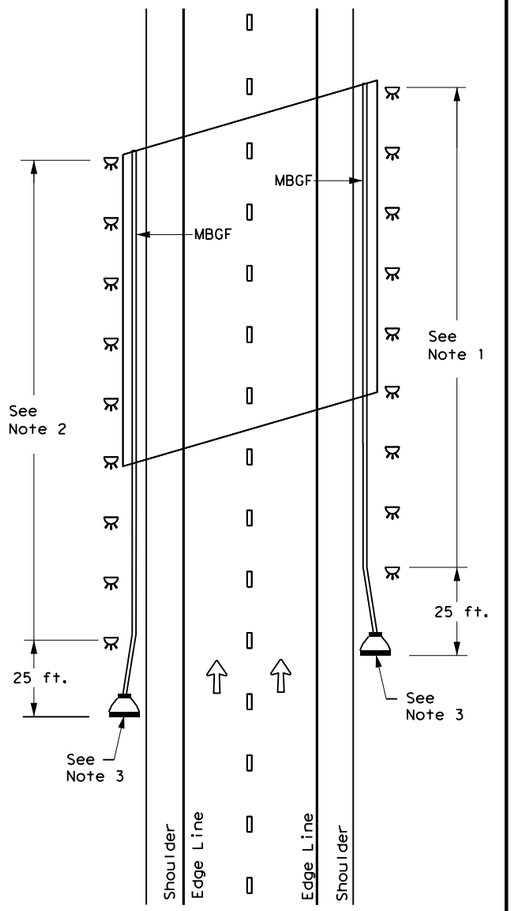
CONTINUOUS CONCRETE OR STEEL BARRIER



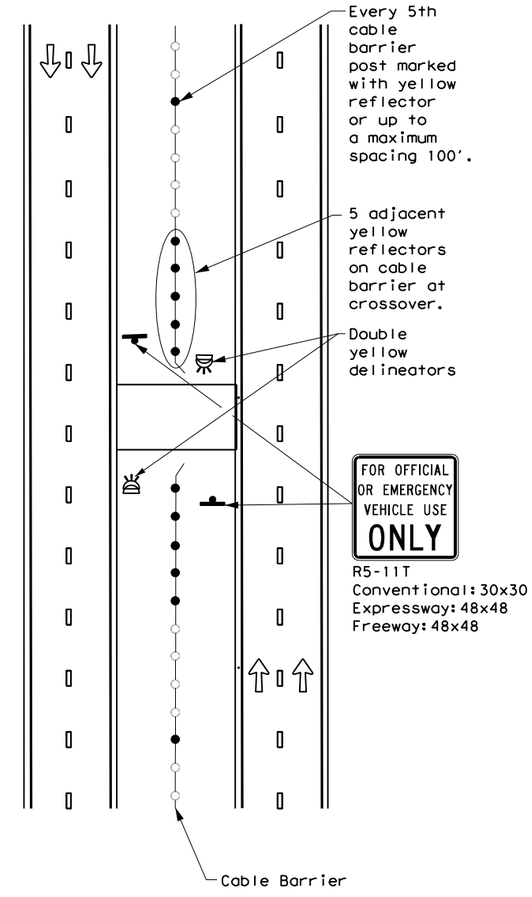
MULTI-LANE UNDIVIDED, TWO-WAY ROADWAY WITH METAL BEAM GUARD FENCE (MBGF)



DIVIDED ROADWAY WITH METAL BEAM GUARD FENCE (MBGF)



EMERGENCY CROSSOVER



NOTES

1. Equal spacing (100' max), but not less than 3 single directional white barrier reflectors or delineators. On Continuos Barrier, equal spacing (100' max.)
2. Equal spacing (100' max), but not less than 3 single directional yellow barrier reflectors or delineators.
3. Terminal ends require reflective sheeting provided by manufacturer per D & OM (VIA) or a Type 3 Object Marker (OM-3)in front of the terminal end.

LEGEND

	Bidirectional Delineator
	Delineator
	OM-3
	OM-2
	Terminal End
	Traffic Flow

Texas Department of Transportation

Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER PLACEMENT DETAILS

D & OM(6)-20

FILE: dom6-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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7-20	DIST	COUNTY		SHEET NO.
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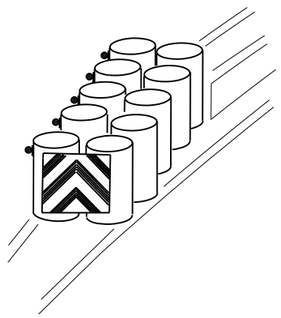
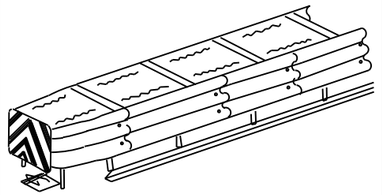
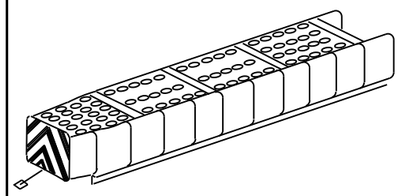
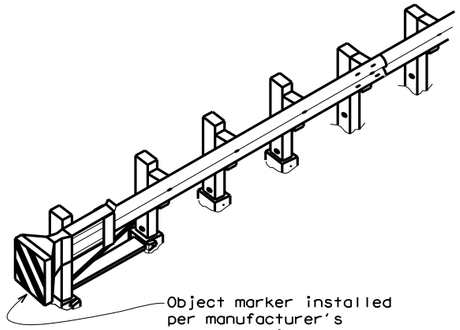
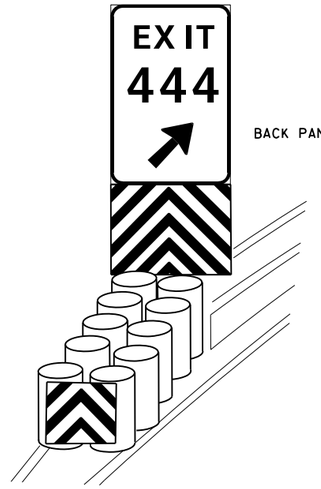
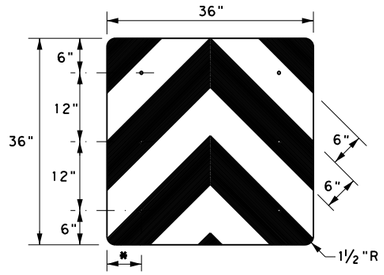


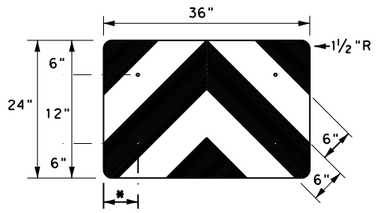




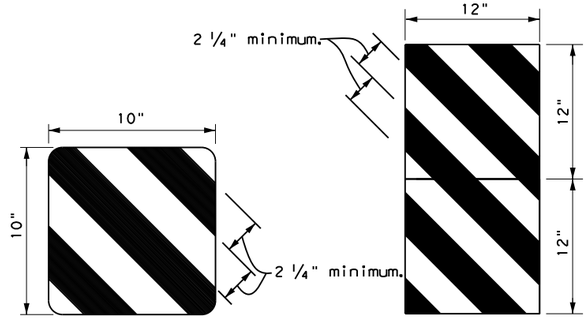




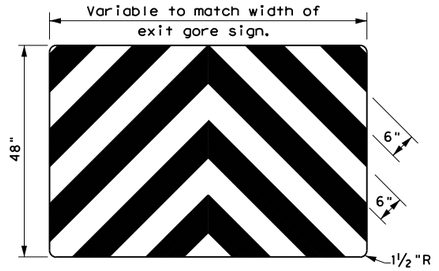


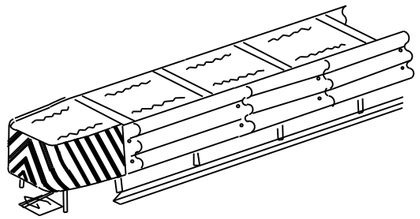


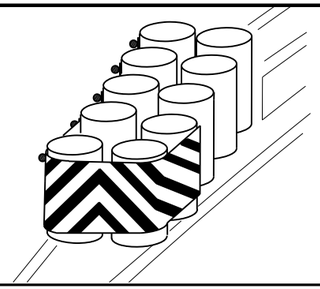
* Adjust to fit attenuator per manufacturer's recommendation, or as directed by the Engineer

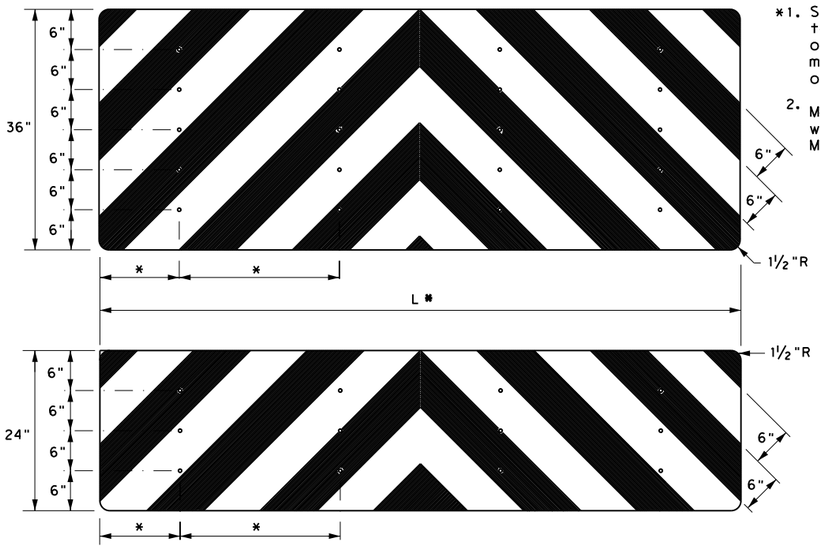


OBJECT MARKERS SMALLER THAN 3 FT^2









NOTES

*1. Spacing should be adjusted to attach through centerline of drum, per attenuator manufacturers recommendation, or as directed by the Engineer.

2. Mounting should be flush with top of attenuator. Minimum size 96" x 24".

NOTES

1. Object Markers shall conform to the Texas MUTCD and meet the color and reflectivity requirement of Department Material Specification DMS 8300. Background shall be yellow reflective sheeting (Type B or C) and Chevron shall be black.

2. Object Markers may be fabricated from adhesive backed reflective sheeting applied directly to guardrail end treatment, or applied directly to an "end cap" as per the manufacturer's recommendation. Direct applied sheeting shall provide a smooth surface and have no wrinkles, air bubbles, cuts or tears. A radius at the corners is not required for direct applied sheeting.

3. Object Marker size may be reduced to fit smaller devices. Width of alternating black and yellow stripes are typically 6". Object Markers smaller than 3ft may have reduced width stripes of a minimum of 2 ¼".

4. Pop rivets, screws, or nuts and bolts may be used to attach object markers and reflectors. Holes, slots or other openings may be cut or drilled through object markers to allow cable or other attachments.

5. Object Marker at nose of attenuator is subsidiary to the attenuator.

6. See D & OM (1-4) for required barrier reflectors.

Texas Department of Transportation

Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER FOR VEHICLE IMPACT ATTENUATORS

D & OM(VIA)-20

FILE: __domvia20.dgn__		DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
©TxDOT December 1989	CONT	SECT	JOB	HIGHWAY	
REVISIONS	0906	32	050, ETC.	MAIN ST.	
4-92 8-04	DIST	COUNTY		SHEET NO.	
8-95 3-15	ODA	MIDLAND		98	
4-98 7-20					

20G

DATE:
FILE:

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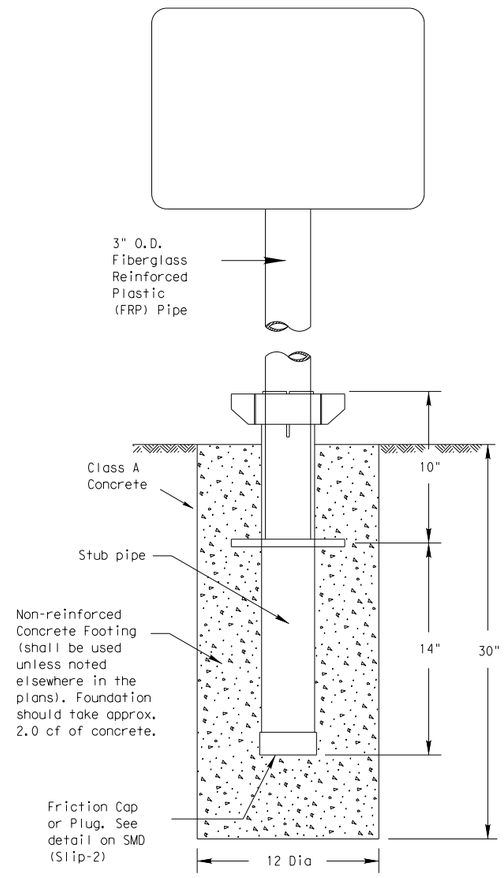
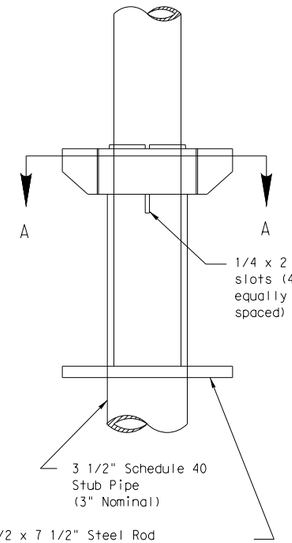
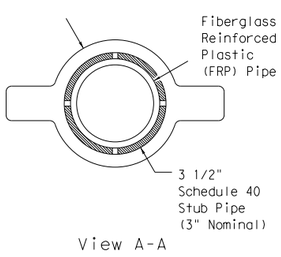
Universal Anchor System with Fiberglass Reinforced Plastic (FRP) Post



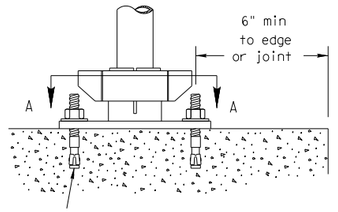


1/2 x 7 1/2" Steel Rod
Acts as a "stop" for the sign post and prevents stub from turning in the foundation.



View A-A

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



5/8" diameter Concrete Anchor - 4 places (embed a min. of 3 3/8" and torque to min. of 50 ft-lbs). Anchor may be expansion or adhesive type.

Concrete anchor consists of 5/8" diameter stud bolt with UNC series bolt threads on the upper end. A heavy hex nut per ASTM A563 and hardened washer per ASTM F436. The stud bolt shall have minimum yield and ultimate tensile strengths of 50 and 75 ksi, respectively. Nuts, bolts and washers shall be galvanized per Item 445, "Galvanizing." Top of bolt shall extend at least flush with top of nut when installed. The anchor, when installed in 4000 psi normal-weight concrete with a 3 3/8" minimum embedment, shall have a minimum allowable tension and shear of 2450 and 1525 psi, respectively. Adhesive type anchors shall have stud bolts installed with Type III epoxy per DMS-6100, "Epoxies and Adhesives." Adhesive anchors may be loaded after adequate epoxy cure time per the manufacturer's recommendations.

BOLT-DOWN DETAILS

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

GENERAL NOTES:

1. FRP sign supports for a single type sign support may be used for signs up to and including 16 square feet. Dual post installation may be used for signs up to and including 32 square feet.
2. All nuts, bolts and washers shall be galvanized per Item 445, "Galvanizing."
3. See the Traffic Operations Division website for detailed drawings of sign clamps. The website address is: http://www.txdot.gov/publications/traffic.htm

FRP POST REQUIREMENTS

1. Materials shall conform to the requirements of Departmental Material Specification DMS-4410 and will be furnished in a yellow or gray color as specified elsewhere in the plans.
2. Thickness of FRP sign support is 0.125" + 0.031", - 0.0".
3. FRP sign supports are prequalified by the Traffic Operations Division. Prequalification procedures are obtained by writing:
   Texas Department of Transportation
   Traffic Operations Division
   125 East 11th Street
   Austin, Texas 78701-2483

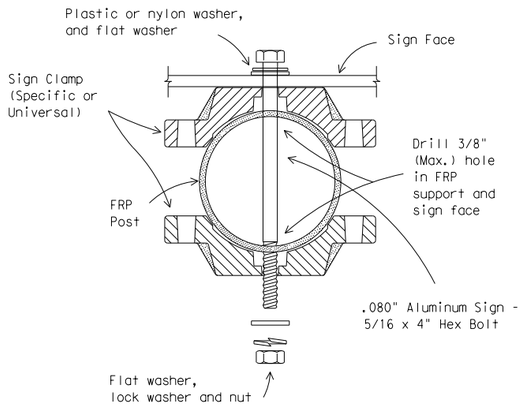
UNIVERSAL ANCHOR SYSTEM INSTALLATION PROCEDURES

1. Dig foundation hole. Where solid rock is encountered at ground level, the foundation shall be a minimum depth of 18". When solid rock is encountered below ground level, the foundation shall extend in the solid rock a minimum depth of 18" or provide a minimum foundation depth of 30". If solid rock is encountered, the socket/stub may be reduced in length as required to a minimum length of 18". Any material removed from the socket/stub shall be from the bottom and the clearance requirements given on SMD(GEN) must be followed. The inner surfaces of the socket/stub must remain free of concrete or other debris.
2. The Engineer may permit batches of concrete less than 2 cubic yards to be mixed with a portable, motor driven concrete mixer. For small placements less than 0.5 cubic yards, hand mixing in a suitable container may be allowed by Engineer. Concrete shall be Class A.
3. Insert base post in foundation hole to depths shown and fill hole with concrete. Cut base post from bottom and ensure a minimum of 18" embedment if installed in solid rock.
4. Level and plumb the base post with coupler using a torpedo level and let concrete set a minimum of 4 days, unless otherwise directed by Engineer. Bottom of base post slots shall be above the concrete footing.
5. Attach sign to FRP post.
6. Insert sign post into base post. Lower until the post comes to rest on the steel rod.
7. Use hammer to ensure the coupler is firmly seated. Top of coupler should be level with top of base post in most instances.
8. Check sign to ensure there is no twist. If loose, increase the tightening of coupler.

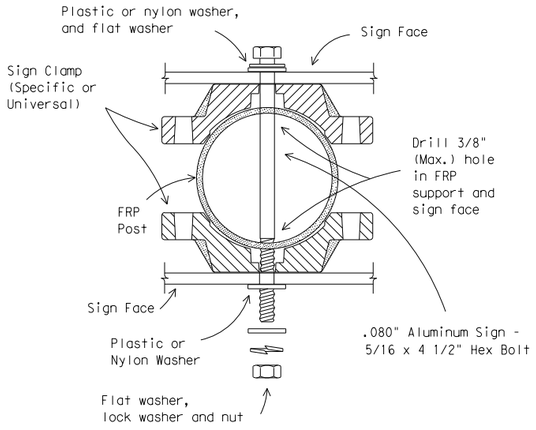
BOLT DOWN SIGN SUPPORT

1. Position base plate with coupler on existing concrete.
2. Drill holes into concrete and insert the 5/8" diameter bolts with wedge anchors, and tighten nuts.
3. Attach sign to FRP post.
4. Insert bottom of sign post into pipe stub.
5. Use hammer to ensure the coupler is firmly seated. Top of coupler should be level with top of base post in most instances.
6. Check sign to ensure there is no twist. If loose, increase the tightening of coupler.

Typical Sign Mounting Detail for FRP Support with Single Sign



Typical Sign Mounting Detail for FRP Support with Back-to-Back Signs



Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS UNIVERSAL ANCHOR SYSTEM WITH FRP POST

SMD(FRP)-08

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9-08 REVISIONS	CONT	SECT	JOB	HIGHWAY
	0906	32	050, ETC.	MAIN ST
	DIST	COUNTY		SHEET NO.
	ODA	MIDLAND		99

26F

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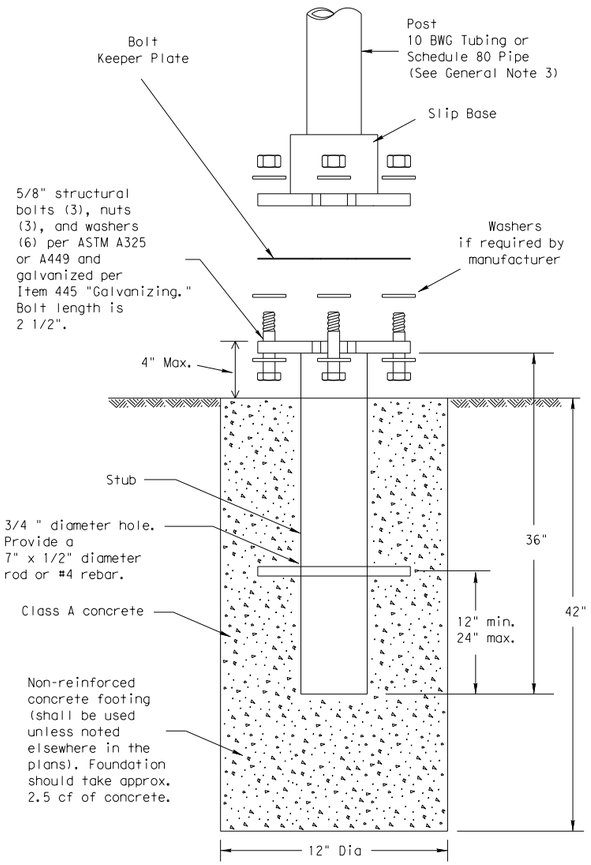
TRIANGULAR SLIPBASE INSTALLATION GENERAL REQUIREMENTS



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.

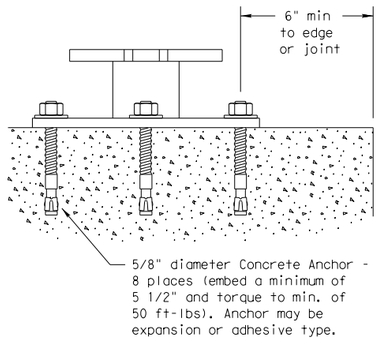
   Schedule 80 Pipe (2.875" outside diameter)
   - 0.276" nominal wall thickness
   - Steel tubing per ASTM A500 Gr C
   - Other seamless or electric-resistance welded steel tubing or pipe with equivalent outside diameter and wall thickness may be used if they meet the following:
     - 46,000 PSI minimum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

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REVISIONS
9-08

CONT	SECT	JOB	HIGHWAY
0906	32	050, ETC.	MAIN ST
DIST	COUNTY		SHEET NO.
ODA	MIDLAND		100

DATE:
FILE:

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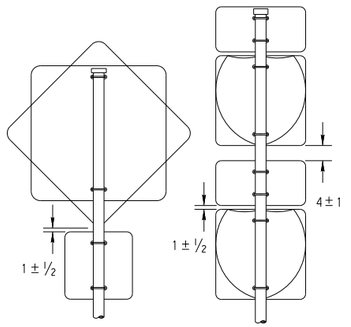
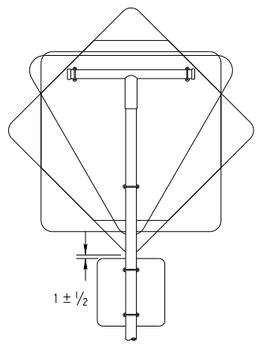


SM RD SGN ASSM TY XXXXX(1)XX(P)



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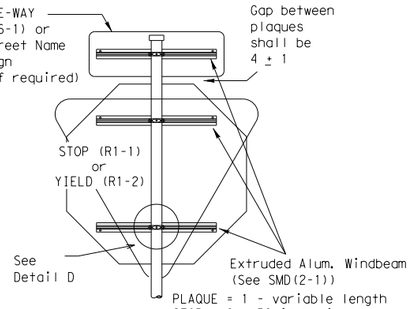

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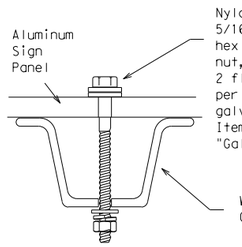
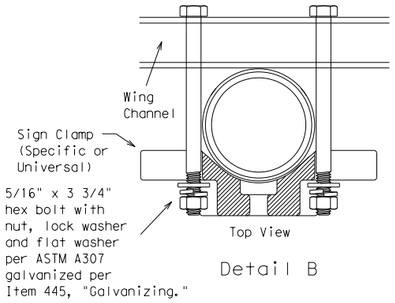


Detail A



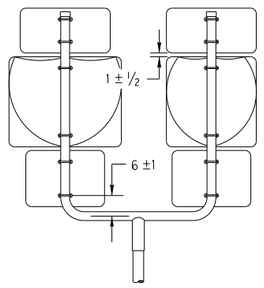
Detail B

GENERAL NOTES:

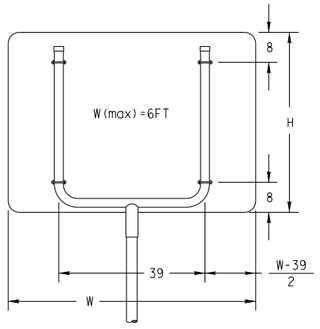
1.

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.



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



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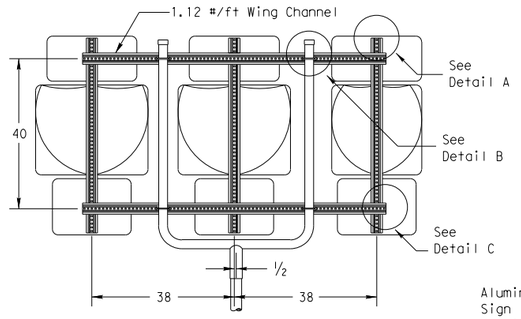
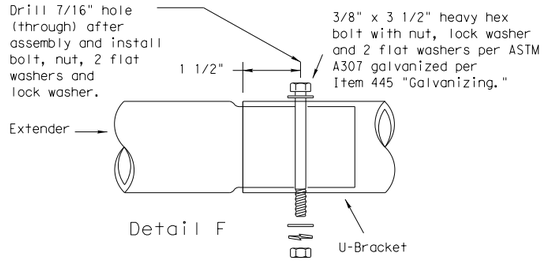
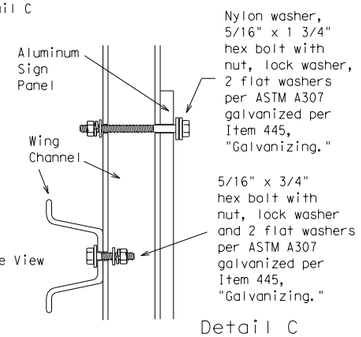


SM RD SGN ASSM TY XXXXX(1)XX(U-WC)
(See Note 11)

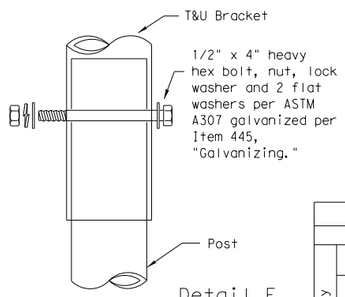


Detail F

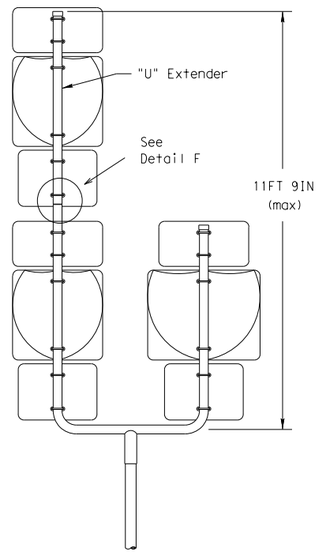
Splices shall only be allowed behind the sign substrate.



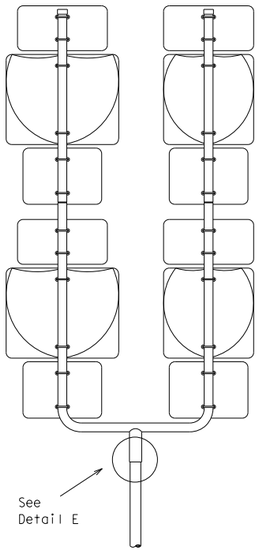
Detail C



Detail E



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



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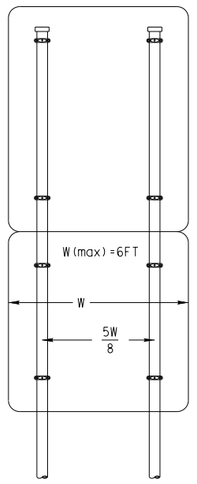
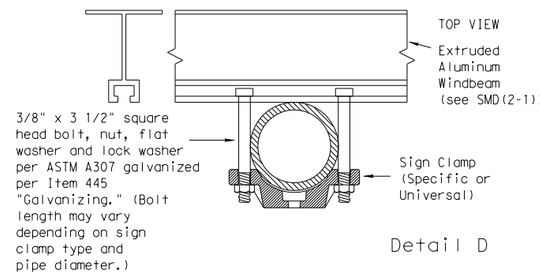
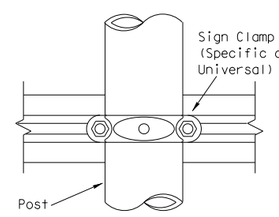


SM RD SGN ASSYM TY XXXXX(2)XX(P)

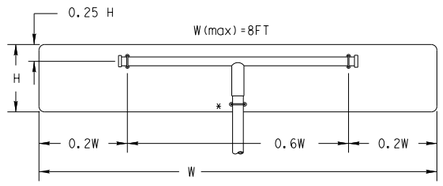
SIDE VIEW



Detail D



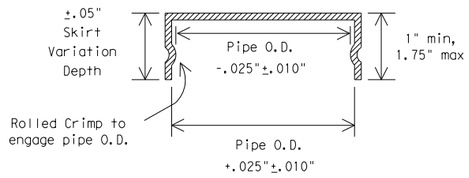
REQUIRED SUPPORT		
	SIGN DESCRIPTION	SUPPORT
Regulatory	48-inch STOP sign (R1-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	60-inch YIELD sign (R1-2)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	48x16-inch ONE-WAY sign (R6-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	36x48, 48x36, and 48x48-inch signs	TY 10BWG(1)XX(T)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



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.

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS
SMALL ROADSIDE SIGNS
TRIANGULAR SLIPBASE SYSTEM

SMD(SLIP-2)-08

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9-08	CONT	SECT	JOB	HIGHWAY
	0906	32	050, ETC.	MAIN ST
	DIST	COUNTY		SHEET NO.
	ODA	MIDLAND		101

26C

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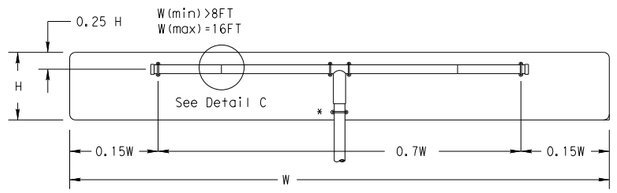
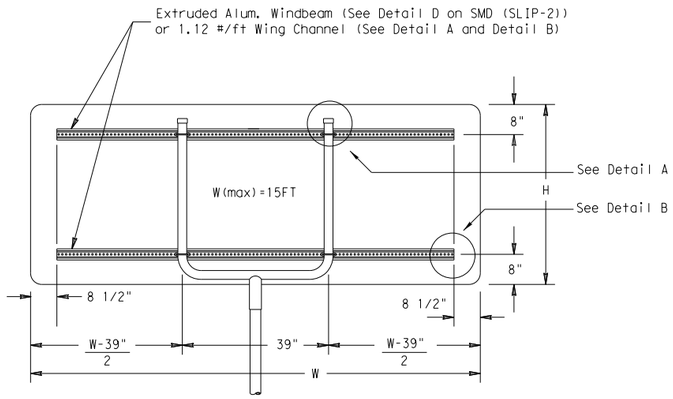
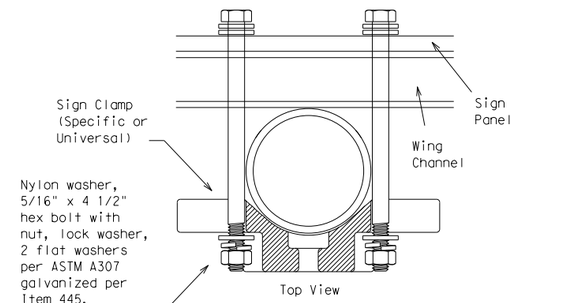


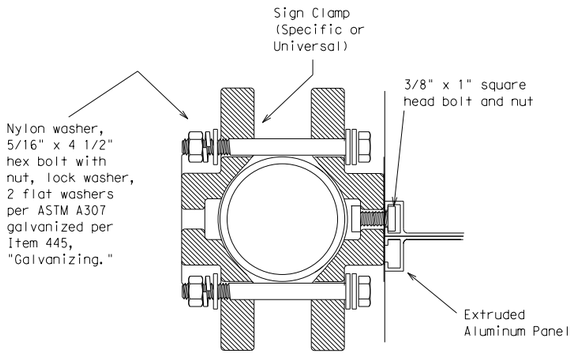
SM RD SGN ASSM TY XXXXX(1)XX(T-2EXT)
(* - See Note 12)



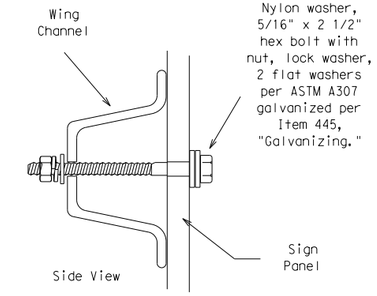
SM RD SGN ASSM TY XXXXX(1)XX(U-XX)



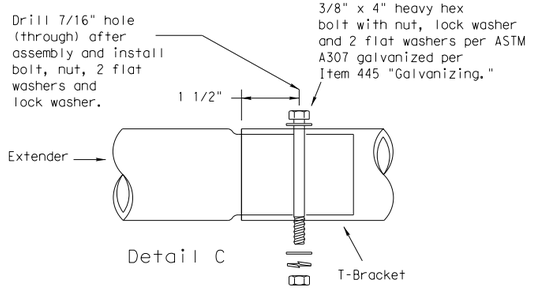
Detail A



Detail D
EXTRUDED ALUMINUM SIGN WITH T BRACKET

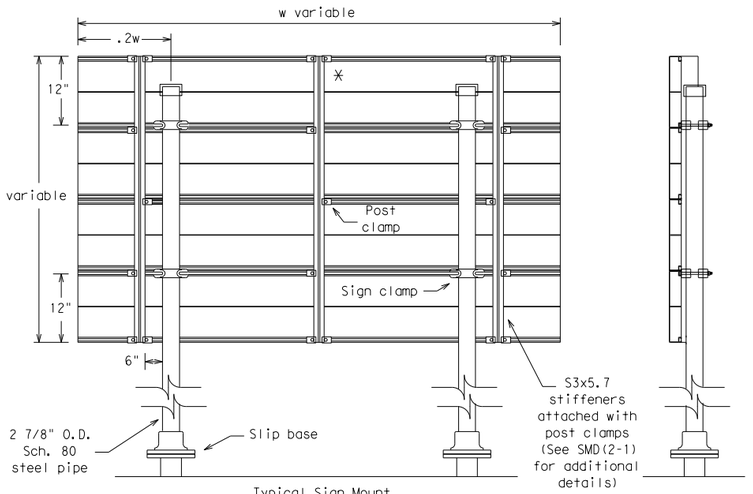


Detail B



Detail C

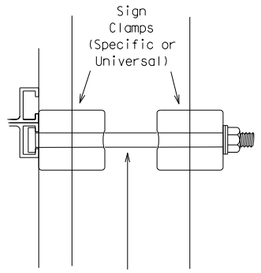
Splices shall only be allowed behind the sign substrate.



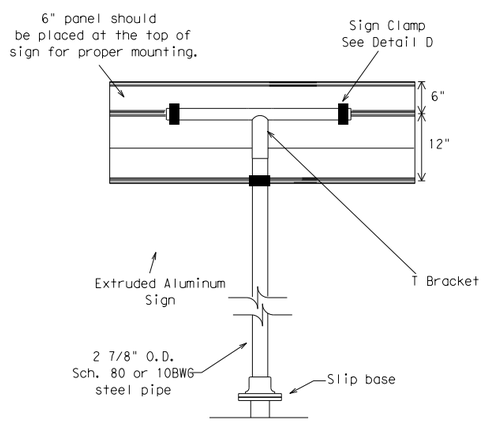
Typical Sign Mount
SM RD SGN ASSM TY S80(2)XX(P-EXAL)

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

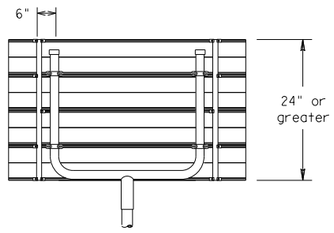
See Detail E
for clamp installation



Detail E



Extruded Aluminum Sign
With T Bracket



Use Extruded Alum. Windbeam as stiffeners
See SMD (2-1) for additional details

See Detail E
for clamp installation

GENERAL NOTES:

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

1. 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.
2. Sign supports shall not be spliced except where shown. Sign support posts shall not be spliced.
3. 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.
4. Signs that require specific supports due to reasons in addition to windloading are indicated on the "REQUIRED SUPPORT" table on this sheet.
5. 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.
6. 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.
7. Wing channel shall meet ASTM A 1011 SS Gr 50 and be galvanized per ASTM A 123.
8. 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."
9. Sign blanks shall be the sizes and shapes shown on the plans.
10. 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.
11. Post open ends shall be fitted with Friction Caps.

REQUIRED SUPPORT		
	SIGN DESCRIPTION	SUPPORT
Regulatory	48-inch STOP sign (R1-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	60-inch YIELD sign (R1-2)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	48x16-inch ONE-WAY sign (R6-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	36x48, 48x36, and 48x48-inch signs	TY 10BWG(1)XX(T)
	48x60-inch signs	TY S80(1)XX(T)
Warning	48x48-inch signs (diamond or square)	TY 10BWG(1)XX(T)
	48x60-inch signs	TY S80(1)XX(T)
	48-inch Advance School X-ing sign (S1-1)	TY 10BWG(1)XX(T)
	48-inch School X-ing sign (S2-1)	TY 10BWG(1)XX(T)
	Large Arrow sign (W1-6 & W1-7)	TY 10BWG(1)XX(T)

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS
SMALL ROADSIDE SIGNS
TRIANGULAR SLIPBASE SYSTEM

SMD(SLIP-3)-08

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CONT	SECT	JOB	HIGHWAY
0906	32	050, ETC.	MAIN ST
DIST	COUNTY		SHEET NO.
ODA	MIDLAND		102

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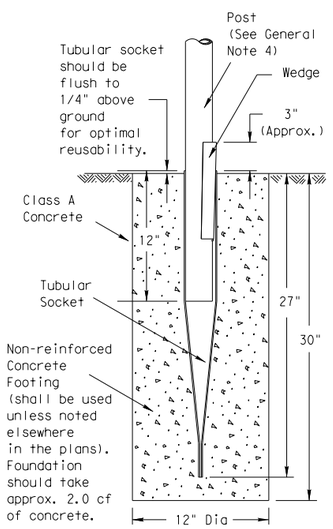
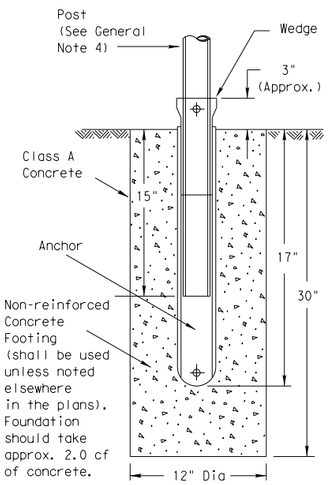
Wedge Anchor Steel System



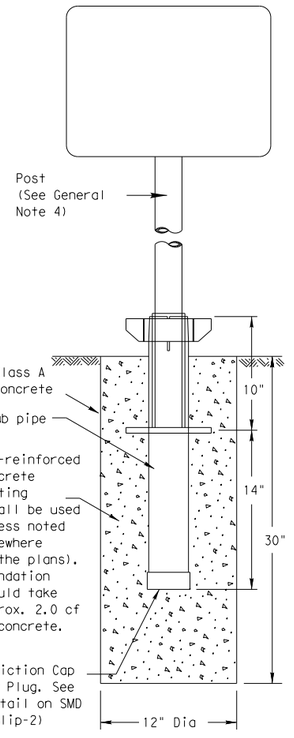
SM RD SGN ASSM TY TWT(X)WS(X)

Wedge Anchor High Density Polyethylene (HDPE) System

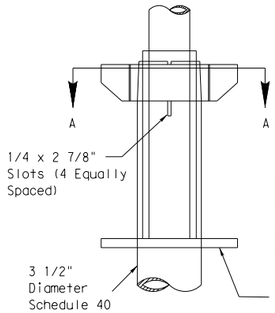


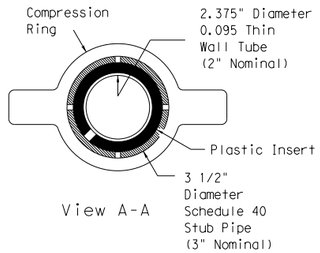
SMD RD SGN ASSM TY TWT(X)WP(X)

Universal Anchor System with Thin-Walled Tubing Post



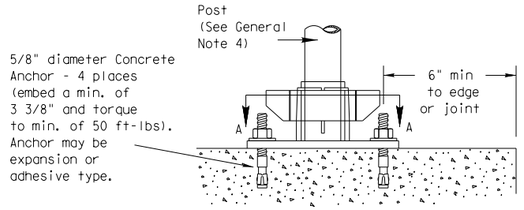
SM RD SGN ASSM TY TWT(X)UA(P)



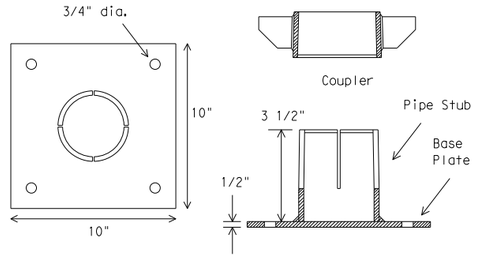


View A-A

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.

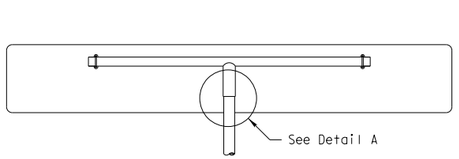


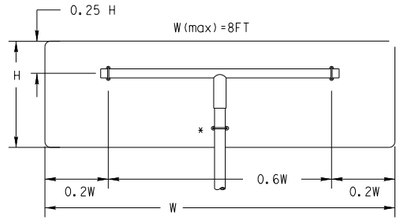
Concrete anchor consists of 5/8" diameter stud bolt with UNC series bolt threads on the upper end. A heavy hex nut per ASTM A563 and hardened washer per ASTM F436. The stud bolt shall have minimum yield and ultimate tensile strengths of 50 and 75 ksi, respectively. Nuts, bolts and washers shall be galvanized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

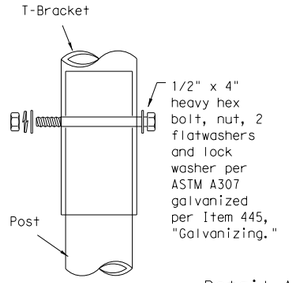
Sign Installation Using a Prefabricated T-Bracket for Thin-Wall Tubing Post





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

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9-08 REVISIONS

CONT	SECT	JOB	HIGHWAY
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DIST	COUNTY		SHEET NO.
ODA	MIDLAND		103

26E

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DATE:
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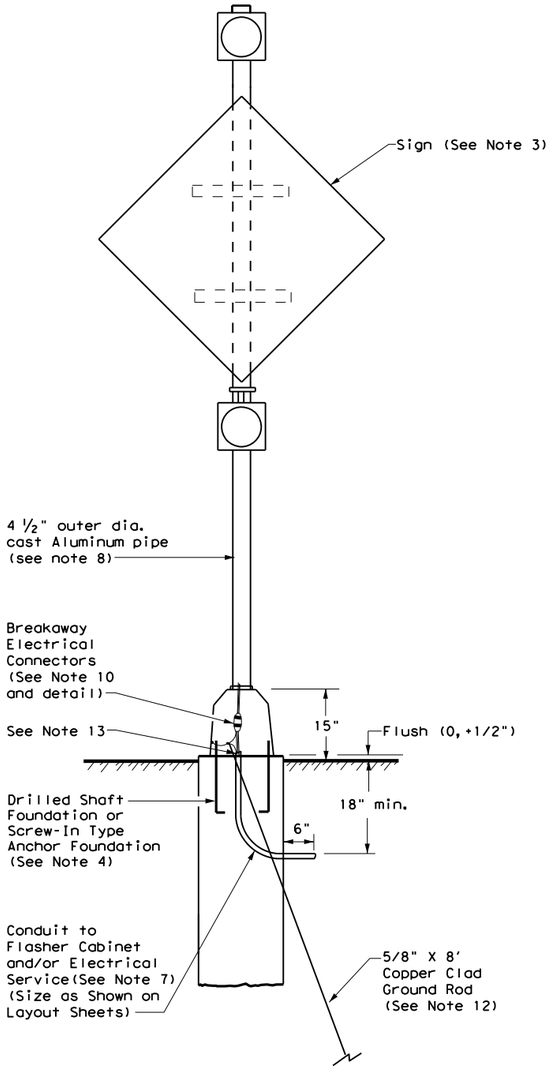
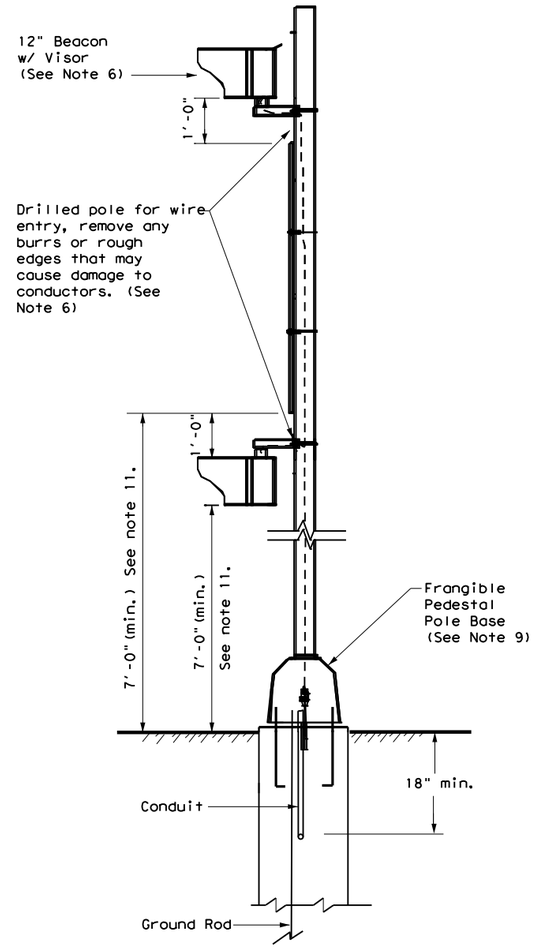
GENERAL NOTES:

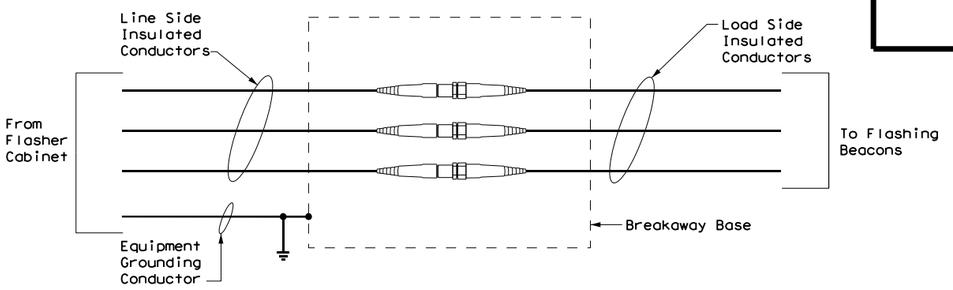
1. Details show a typical warning sign with two flashing beacon heads, other arrangements are possible. When only one beacon is required, install the upper beacon.
2. See Item 685, "Roadside Flashing Beacon Assemblies" for further requirements.
3. See SMD standard sheets for lateral and vertical clearances and sign mounting details. Install signs as shown on the sign layout sheets.
4. Use either a Screw-In Type Anchor Foundation or a Drilled Shaft Foundation as shown elsewhere in the plans. When plans require a Drilled Shaft Foundation, see standard sheet TS-FD. Install the Screw-In Type Anchor Foundation as per manufacturer's recommendations. On a slope, install one edge at ground level. Screw-In/Drilled Shaft Foundation is subsidiary to Item 685. Installation of a ground rod is not required for solar powered flashing beacon assemblies.
5. When used, provide Screw-In Type Anchor Foundations as shown on TxDOT's Material Producer List (MPL) in the file "Highway Traffic Signals".
6. Install beacon heads as shown here, as shown elsewhere on the plans, or as directed. Use hardware specifically designed for mounting beacon heads on poles.
7. Conduit in foundation and within 6 in. of foundation is subsidiary to the Item 685, "Roadside Flashing Beacon Assemblies."
8. Unless otherwise shown on the plans, pole shaft shall be one piece, Schedule 40 Aluminum pipe, ASTM B429 or B221 (Alloy 6061-T6 only). Aluminum conduit will not develop the necessary strength and will not be allowed.
9. Per manufacturer's recommendations, engage all threads on the pedestal pole base and pipe unless the pipe is fully seated into base. In high winds, use a pole and base collar assembly to add strength and prevent loosening of connection.
10. Provide single pole non-fused watertight breakaway electrical connectors for frangible pedestal pole bases, as shown on TxDOT's MPL in the file "Roadway Illumination and Electrical Supplies." Approved models are listed under Item 685. For ungrounded (hot) conductors, install a breakaway connector with a dummy fuse slug). For grounded (neutral) conductors, install a breakaway connector with a white colored marking and a permanently installed dummy fuse (slug).
11. Provide clearance as shown above the sidewalk or pavement grade at the edge of the road. When a bottom beacon is not used, mount the bottom of the sign at least 7 ft. above the sidewalk or pavement grade at the edge of the road.
12. Make connections to ground rods according to NEC. Ground rod clamps shall be listed for their intended purpose.
13. Ensure height of conduit and ground rod is below top of anchor bolts.



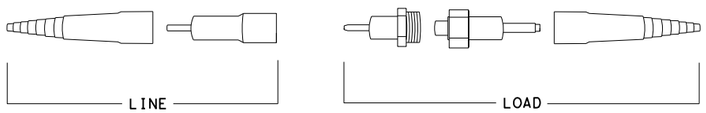
FRONT



SIDE



NON-FUSED BREAKAWAY ELECTRICAL CONNECTORS



NON-FUSED BREAKAWAY ELECTRICAL CONNECTORS
EXPLODED VIEW

Texas Department of Transportation

Traffic Operations Division Standard

ROADSIDE FLASHING BEACON ASSEMBLY

RFBA-13

FILE: rfba-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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REVISIONS 5-93 12-04 10-93 3-13 4-98	0906	32	050, ETC.	MAIN ST
	DIST	COUNTY		SHEET NO.
	ODA	MIDLAND		104

STORMWATER POLLUTION PRVENTION PLAN (SWP3):

This SWP3 has been developed in accordance with TxDOT policy for projects disturbing less than 1 acre of soil, and not part of a larger common plan of development.

For all projects with any soil disturbing activities, TxDOT will maintain a SWP3 with all pertinent records, correspondence, environmental documents, etc. at the project field office. If no field office is available, then this SWP3 shall be kept at the appropriate TxDOT Area Office.

This SWP3 is consistent with requirements specified in applicable stormwater plans, and the project's environmental permits, issues, and commitments (EPICs).

1.0 SITE/PROJECT DESCRIPTION

1.1 PROJECT CONTROL SECTION JOB (CSJ):
0906-32-050, etc

1.2 PROJECT LIMITS:
From: See Title Sheet

To: See Title Sheet

1.3 PROJECT COORDINATES:
BEGIN: (Lat)_____,(Long)_____

END: (Lat)_____,(Long)_____

1.4 TOTAL PROJECT AREA (Acres): 0.7

1.5 TOTAL AREA TO BE DISTURBED (Acres): 0.7

1.6 NATURE OF CONSTRUCTION ACTIVITY:
See Title Sheet

1.7 MAJOR SOIL TYPES:

Soil Type	Description
Topsoil	
Silty Sand (SM)	
Sandy Lean Clay (CL)\	
Poorly Graded Soil (SP)	
Clayey Sand (SC)	

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:

- [x] 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 2.3.)

- [x] Mobilization
- [x] Install sediment and erosion controls
- [ ] Blade existing topsoil into windrows, prep ROW, clear and grub
- [x] Remove existing pavement
- [ ] Grading operations, excavation, and embankment
- [ ] Excavate and prepare subgrade for proposed pavement widening
- [x] Remove existing culverts, safety end treatments (SETs)
- [x] Remove existing metal beam guard fence (MBGF), bridge rail
- [x] Install proposed pavement per plans
- [x] Install culverts, culvert extensions, SETs
- [x] Install mow strip, MBGF, bridge rail
- [x] Place flex base
- [x] Rework slopes, grade ditches
- [ ] Blade windrowed material back across slopes
- [ ] Revegetation of unpaved areas
- [x] Achieve site stabilization and remove sediment and erosion control measures
- [ ] Other: _____
- [ ] Other: _____
- [ ] Other: _____

1.10 POTENTIAL POLLUTANTS AND SOURCES:

- [x] Sediment laden stormwater from stormwater conveyance over disturbed area
- [x] Fuels, oils, and lubricants from construction vehicles, equipment, and storage
- [x] Solvents, paints, adhesives, etc. from various construction activities
- [x] Transported soils from offsite vehicle tracking
- [x] Construction debris and waste from various construction activities
- [ ] Contaminated water from excavation or dewatering pump-out water
- [x] Sanitary waste from onsite restroom facilities
- [x] Trash from various construction activities/receptacles
- [x] 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

* Add (*) for impaired waterbodies with pollutant in ().

1.12 ROLES AND RESPONSIBILITIES: TxDOT

- [X] Development of plans and specifications
- [X] Perform SWP3 inspections
- [X] Maintain SWP3 records and update to reflect daily operations
- [ ] Other: _____
- [ ] Other: _____

1.13 ROLES AND RESPONSIBILITIES: CONTRACTOR

- [X] Day To Day Operational Control
- [X] Maintain schedule of major construction activities
- [X] Install, maintain and modify BMPs
- [ ] Other: _____
- [ ] Other: _____
- [ ] Other: _____

STATE OF TEXAS
KEVIN MORRIS
105091
LICENSED
PROFESSIONAL ENGINEER

Kevin Morris 11/29/2023

Freese and Nichols, Inc.
Texas Registered Engineering Firm F-2144

STORMWATER POLLUTION PREVENTION PLAN (SWP3) (Less Than 1 Acre)

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Sheet 1 of 2

Texas Department of Transportation

FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
6	SEE TITLE SHEET FOR PROJECT NO.		105
STATE	STATE DIST.	COUNTY	
TEXAS	ODA	MIDLAND	
CONT.	SECT.	JOB	HIGHWAY NO.
0906	32	050, ETC.	MAIN ST

STORMWATER POLLUTION PRVENTION PLAN (SWP3):

2.0 BEST MANAGEMENT PRACTICES (BMPs) AND CONTROLS, INSPECTION, AND MAINTENANCE

The Contractor shall be the responsible party for implementing the BMPs described herein and for complying with the SWP3 for control of erosion and sedimentation during day-to-day operations. The Contractor shall implement changes to this SWP3 approved by TxDOT within the times specified in this SWP3 or the CGP.

2.1 EROSION CONTROL AND SOIL STABILIZATION BMPs:

T / P

- ☐ ☐ Protection of Existing Vegetation
- ☐ ☐ Vegetated Buffer Zones
- ☐ ☐ Soil Retention Blankets
- ☐ ☐ Geotextiles
- ☐ ☐ Mulching/ Hydromulching
- ☐ ☐ Soil Surface Treatments
- ☐ ☐ Temporary Seeding
- ☐ ☐ Permanent Planting, Sodding or Seeding
- ☐ ☐ Biodegradable Erosion Control Logs
- ☒ ☐ Rock Filter Dams/ Rock Check Dams
- ☐ ☐ Vertical Tracking
- ☐ ☐ Interceptor Swale
- ☐ ☒ Riprap
- ☐ ☐ Diversion Dike
- ☐ ☐ Temporary Pipe Slope Drain
- ☐ ☐ Embankment for Erosion Control
- ☐ ☒ Paved Flumes
- ☐ ☐ Other: _____
- ☐ ☐ Other: _____
- ☐ ☐ Other: _____
- ☐ ☐ Other: _____

2.2 SEDIMENT CONTROL BMPs:

T / P

- ☐ ☐ Biodegradable Erosion Control Logs
- ☐ ☐ Dewatering Controls
- ☐ ☐ Inlet Protection
- ☒ ☐ Rock Filter Dams/ Rock Check Dams
- ☐ ☐ Sandbag Berms
- ☐ ☐ Sediment Control Fence
- ☐ ☐ Stabilized Construction Exit
- ☐ ☐ Floating Turbidity Barrier
- ☐ ☐ Vegetated Buffer Zones
- ☐ ☐ Vegetated Filter Strips
- ☐ ☐ Other: _____
- ☐ ☐ Other: _____
- ☐ ☐ Other: _____
- ☐ ☐ Other: _____

Refer to the Environmental Layout Sheets/ SWP3 Layout Sheets located in Attachment 1.2 of this SWP3

2.3 PERMANENT CONTROLS:

(Coordinate post-construction BMPs with appropriate TxDOT maintenance sections.)

BMPs To Be Left In Place Post Construction:

Type	Stationing	
	From	To

Refer to the Environmental Layout Sheets/ SWP3 Layout Sheets located in Attachment 1.2 of this SWP3

2.4 OFFSITE VEHICLE TRACKING CONTROLS:

- ☐ Excess dirt/mud on road removed daily
- ☐ Haul roads dampened for dust control
- ☐ Loaded haul trucks to be covered with tarpaulin
- ☐ Stabilized construction exit
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____

2.5 POLLUTION PREVENTION MEASURES:

- ☒ Chemical Management
- ☒ Concrete and Materials Waste Management
- ☒ Debris and Trash Management
- ☐ Dust Control
- ☐ Sanitary Facilities
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____

2.6 VEGETATED BUFFER ZONES:

Natural vegetated buffers shall be maintained as feasible to protect adjacent surface waters. If vegetated natural buffer zones are not feasible due to site geometry, the appropriate additional sediment control measures have been incorporated into this SWP3.

Type	Stationing	
	From	To

Refer to the Environmental Layout Sheets/ SWP3 Layout Sheets located in Attachment 1.2 of this SWP3

2.7 ALLOWABLE NON-STORMWATER DISCHARGES:

- ☒ Fire hydrant flushings
- ☒ Irrigation drainage
- ☒ Pavement washwater (where spills or leaks have not occurred, and detergents are not used)
- ☒ Potable water sources
- ☒ Springs
- ☒ Uncontaminated groundwater
- ☒ Water used to wash vehicles or control dust
- ☒ Other allowable non-stormwater discharges as allowed by TPDES GP TXR150000.

2.8 INSPECTIONS:

All disturbed areas and erosion and sediment control devices shall be inspected at least once every seven (7) days. Inspections shall be performed by TxDOT as indicated on the Field Inspection and Maintenance Report Form 2118 and retained in Attachment 2.3 of this SWP3 .

2.9 MAINTENANCE:

Control measures shall be properly installed according to specifications. If it is determined that a BMP or control measure is not operating effectively, maintenance must be accomplished as soon as possible and before the next anticipated rain event, but in no case later than 7 calendar days after being able to access the site. Maintenance shall be performed by the Contractor as indicated on the Field Inspection and Maintenance Report Form 2118 and retained in Attachment 2.3 of this SWP3.

STATE OF TEXAS
KEVIN MORRIS
105091
LICENSED
PROFESSIONAL ENGINEER

11/29/2023

Freese and Nichols, Inc.
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STORMWATER POLLUTION PREVENTION PLAN (SWP3) (Less Than 1 Acre)

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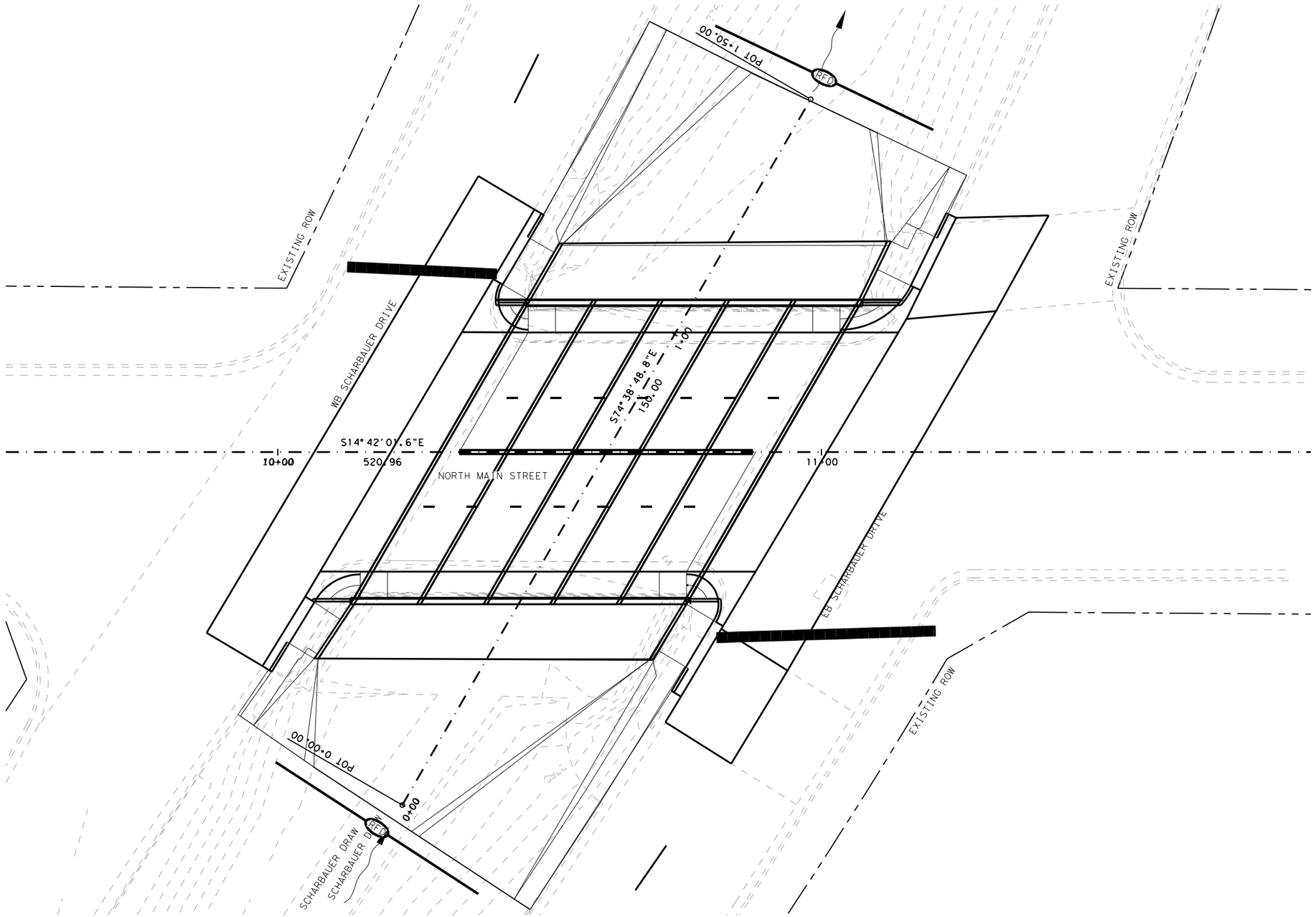
Texas Department of Transportation

FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
6	SEE TITLE SHEET FOR PROJECT NO.		106
STATE	STATE DIST.	COUNTY	
TEXAS	ODA	MIDLAND	
CONT.	SECT.	JOB	HIGHWAY NO.
0906	32	050, ETC.	MAIN ST

0.08333317 ft / in.



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0 10' 20'
HORIZONTAL SCALE

LEGEND

- FLOW ARROWS
- RFD — ROCK FILTER DAM TY 3

HL 93 LOADING

STATE OF TEXAS
KEVIN MORRIS
105091
LICENSED
PROFESSIONAL ENGINEER

Kevin Morris 10/27/2023

Freese and Nichols, Inc.
Texas Registered Engineering Firm F-2144

NO	DATE	REVISION	APPROVED

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1500 Broadway Street, Suite 206
Lubbock, TX 79401
Phone - (806) 686-2700
Web www.freese.com

Texas Department of Transportation
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SCHARBAUER DRIVE BRIDGE REPLACEMENTS

EROSION LAYOUT NORTH MAIN STREET (SHEET 1 OF 1)

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DAG	6	SEE TITLE SHEET FOR PROJECT NO.		MAIN ST
GRAPHICS KNW	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK KMM	TEXAS	ODA	MIDLAND	107
CHECK SRJ	CONTROL	SECTION	JOB	
	0906	32	050, ETC.	

10/27/2023
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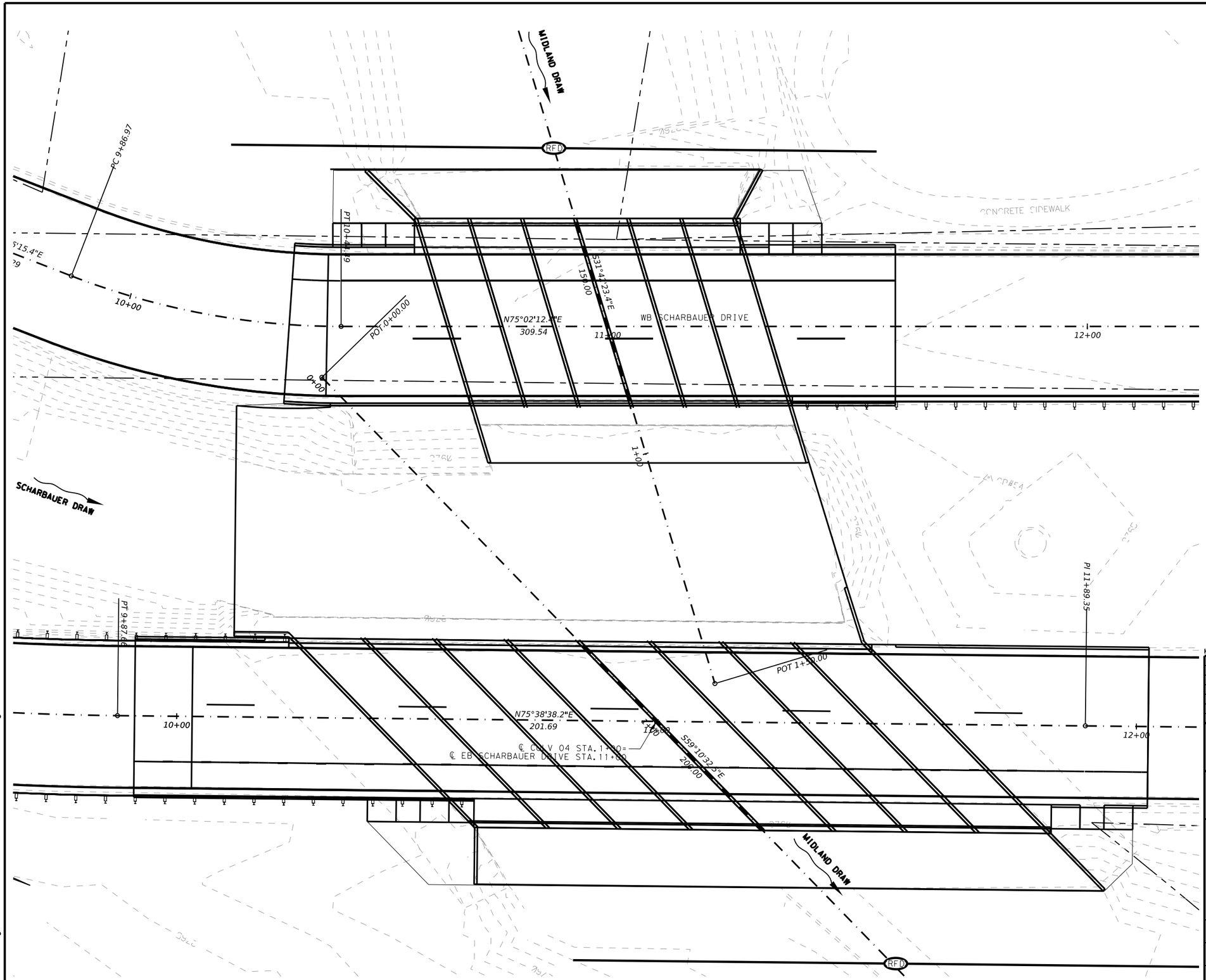

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0 10' 20'
HORIZONTAL SCALE

LEGEND

- FLOW ARROWS
- RFD — ROCK FILTER DAM TY 3

HL 93 LOADING

NO	DATE	REVISION	APPROVED

STATE OF TEXAS
KEVIN MORRIS
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LICENSED
PROFESSIONAL ENGINEER

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Lubbock, TX 79401
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Web www.freese.com

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SCHARBAUER DRIVE BRIDGE REPLACEMENTS

EROSION LAYOUT WB SCHARBAUER DRIVE

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DAG	6	SEE TITLE SHEET FOR PROJECT NO.		MAIN ST
GRAPHICS KNW	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK KMM	TEXAS	ODA	MIDLAND	108
CHECK SRJ	CONTROL	SECTION	JOB	
	0906	32	050,ETC.	

10/27/2023
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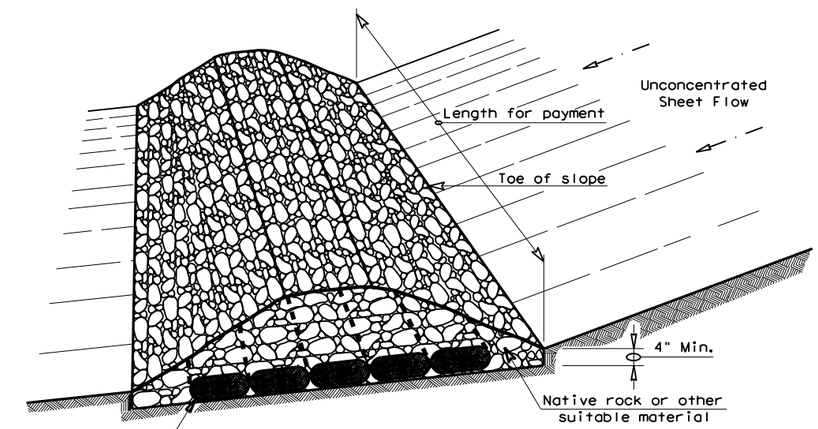
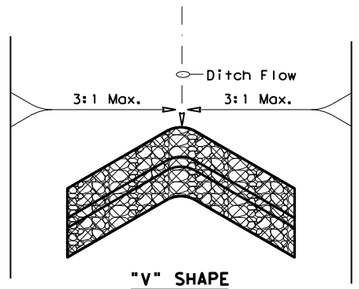
DATE:
FILE:



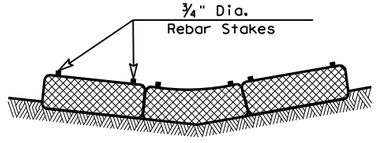
FILTER DAM AT TOE OF SLOPE

RFD1

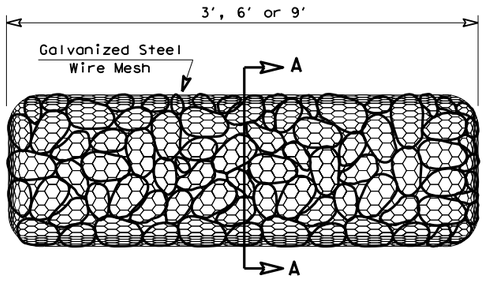


"V" SHAPE PLAN VIEW

PLAN VIEW

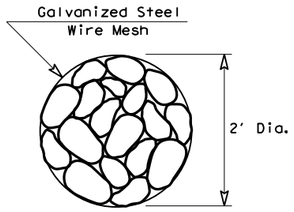


SECTION B-B

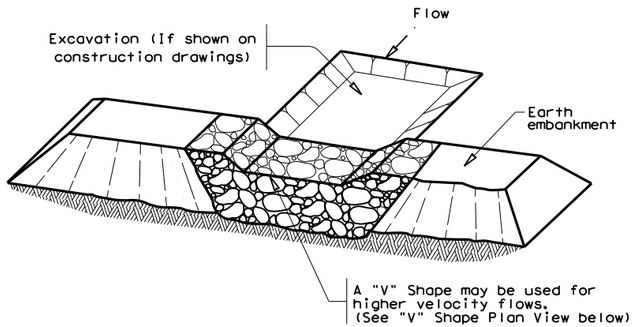


TYPE 4 (SACK GABIONS)

RFD4

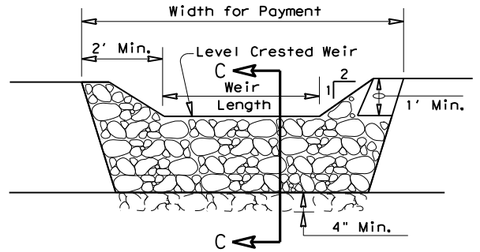


SECTION A-A

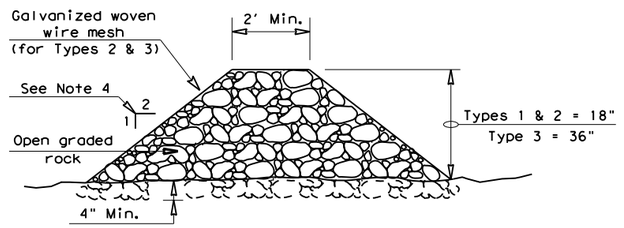


FILTER DAM AT SEDIMENT TRAP

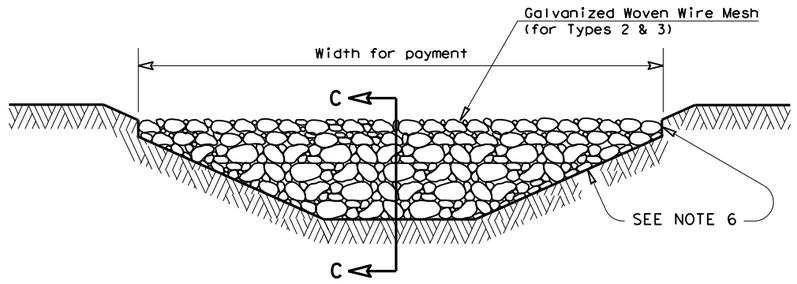
RFD1 — OR — RFD2



PROFILE



SECTION C-C



FILTER DAM AT CHANNEL SECTIONS

RFD1 — OR — RFD2 — OR — RFD3

ROCK FILTER DAM USAGE GUIDELINES

Rock Filter Dams should be constructed downstream from disturbed areas to intercept sediment from overland runoff and/or concentrated flow. The dams should be sized to filter a maximum flow through rate of 60 GPM/FT^2 of cross sectional area. A 2 year storm frequency may be used to calculate the flow rate.

Type 1 (18" high with no wire mesh) (3" to 6" aggregate): Type 1 may be used at the toe of slopes, around inlets, in small ditches, and at dike or swale outlets. This type of dam is recommended to control erosion from a drainage area of 5 acres or less. Type 1 may not be used in concentrated high velocity flows (approximently 8 Ft/Sec or more) in which aggregate wash out may occur. Sandbags may be used at the embedded foundation (4" deep min.) for better filtering efficiency of low flows if called for on the plans or directed by the Engineer.

Type 2 (18" high with wire mesh) (3" to 6" aggregate): Type 2 may be used in ditches and at dike or swale outlets.

Type 3 (36" high with wire mesh) (4" to 8" aggregate): Type 3 may be used in stream flow and should be secured to the stream bed.

Type 4 (Sack gabions) (3" to 6" aggregate): Type 4 May be used in ditches and smaller channels to form an erosion control dam.

Type 5: Provide rock filter dams as shown on plans.

GENERAL NOTES

1. If shown on the plans or directed by the Engineer, filter dams should be placed near the toe of slopes where erosion is anticipated, upstream and/or downstream at drainage structures, and in roadway ditches and channels to collect sediment.
2. Materials (aggregate, wire mesh, sandbags, etc.) shall be as indicated by the specification for "Rock Filter Dams for Erosion and Sedimentation Control".
3. The rock filter dam dimensions shall be as indicated on the SW3P plans.
4. Side slopes should be 2:1 or flatter. Dams within the safety zone shall have sideslopes of 6:1 or flatter.
5. Maintain a minimum of 1' between top of rock filter dam weir and top of embankment for filter dams at sediment traps.
6. Filter dams should be embedded a minimum of 4" into existing ground.
7. The sediment trap for ponding of sediment laden runoff shall be of the dimensions shown on the plans.
8. Rock filter dam types 2 & 3 shall be secured with 20 gauge galvanized woven wire mesh with 1" diameter hexagonal openings. The aggregate shall be placed on the mesh to the height & slopes specified. The mesh shall be folded at the upstream side over the aggregate and tightly secured to itself on the downstream side using wire ties or hog rings. For in stream use, the mesh should be secured or staked to the stream bed prior to aggregate placement.
9. Sack Gabions should be staked down with ¾" dia. rebar stakes, and have a double-twisted hexagonal weave with a nominal mesh opening of 2 ½" x 3 ¼"
10. Flow outlet should be onto a stabilized area (vegetation, rock, etc.).
11. The guidelines shown hereon are suggestions only and may be modified by the Engineer.

PLAN SHEET LEGEND

Type 1 Rock Filter Dam	RFD1
Type 2 Rock Filter Dam	RFD2
Type 3 Rock Filter Dam	RFD3
Type 4 Rock Filter Dam	RFD4

Texas Department of Transportation

Design Division Standard

TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

ROCK FILTER DAMS

EC(2)-16

FILE: ec216	DN: TxDOT	CK: KM	DW: VP	DN/CK: LS		
© TxDOT: JULY 2016	CONT	SECT	JOB		HIGHWAY	
REVISIONS	0906	32	050, ETC.		MAIN ST	
	DIST	COUNTY			SHEET NO.	
	ODA	MIDLAND			109	

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DATE:
FILE:

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. City of Midland

2.

☐ No Action Required ☒ Required Action

Action No.

1. Prevent stormwater pollution by controlling erosion and sedimentation in accordance with TPDES Permit TXR 150000

2. Comply with the SW3P and revise when necessary to control pollution or required by the Engineer.

3. Post Construction Site Notice (CSN) with SW3P information on or near the site, accessible to the public and TCEQ, EPA or other inspectors.

4. When Contractor project specific locations (PSL's) increase disturbed soil area to 5 acres or more, submit NOI to TCEQ and the Engineer.

II. WORK IN OR NEAR STREAMS, WATERBODIES AND WETLANDS CLEAN WATER ACT SECTIONS 401 AND 404

USACE Permit required for filling, dredging, excavating or other work in any water bodies, rivers, creeks, streams, wetlands or wet areas.

The Contractor must adhere to all of the terms and conditions associated with the following permit(s):

☐ No Permit Required

☒ Nationwide Permit 14 - PCN not Required (less than 1/10th acre waters or wetlands affected)

☐ Nationwide Permit 14 - PCN Required (1/10 to <1/2 acre, 1/3 in tidal waters)

☐ Individual 404 Permit Required

☐ Other Nationwide Permit Required: NWP# _____

Required Actions: List waters of the US permit applies to, location in project and check Best Management Practices planned to control erosion, sedimentation and post-project TSS.

1. **SCHARBAUER DRAW**

2. **MIDLAND DRAW**

3.

4.

The elevation of the ordinary high water marks of any areas requiring work to be performed in the waters of the US requiring the use of a nationwide permit can be found on the Bridge Layouts.

Best Management Practices:

Erosion	Sedimentation	Post-Construction TSS
☒ Temporary Vegetation	☐ Silt Fence	☐ Vegetative Filter Strips
☐ Blankets/Matting	☒ Rock Berm	☐ Retention/Irrigation Systems
☐ Mulch	☐ Triangular Filter Dike	☐ Extended Detention Basin
☐ Sodding	☐ Sand Bag Berm	☐ Constructed Wetlands
☐ Interceptor Swale	☐ Straw Bale Dike	☐ Wet Basin
☐ Diversion Dike	☐ Brush Berms	☐ Erosion Control Compost
☐ Erosion Control Compost	☐ Erosion Control Compost	☐ Mulch Filter Berm and Socks
☐ Mulch Filter Berm and Socks	☐ Mulch Filter Berm and Socks	☐ Compost Filter Berm and Socks
☐ Compost Filter Berm and Socks	☐ Compost Filter Berm and Socks	☒ Vegetation Lined Ditches
	☐ Stone Outlet Sediment Traps	☐ Sand Filter Systems
	☐ Sediment Basins	☐ Grassy Swales

III. CULTURAL RESOURCES

Refer to TxDOT Standard Specifications in the event historical issues or archeological artifacts are found during construction. Upon discovery of archeological artifacts (bones, burnt rock, flint, pottery, etc.) cease work in the immediate area and contact the Engineer immediately.

☒ No Action Required ☐ Required Action

Action No.

1.

IV. VEGETATION RESOURCES

Preserve native vegetation to the extent practical.
Contractor must adhere to Construction Specification Requirements Specs 162, 164, 192, 193, 506, 730, 751, 752 in order to comply with requirements for invasive species, beneficial landscaping, and tree/brush removal commitments.

☒ No Action Required ☐ Required Action

Action No.

1.

V. FEDERAL LISTED, PROPOSED THREATENED, ENDANGERED SPECIES, CRITICAL HABITAT, STATE LISTED SPECIES, CANDIDATE SPECIES AND MIGRATORY BIRDS.

☐ No Action Required ☒ Required Action

Action No.

1. **CONTRACTORS WILL AVOID HARM TO MIGRATORY BIRDS, EGGS AND ACTIVE NESTS. INACTIVE NESTS AND/OR VEGETATION SUSPECTED TO CONTAIN NESTS SHOULD BE REMOVED OUTSIDE OF NESTING SEASON. NESTING SEASON IS TYPICALLY MARCH 15 TO SEPTEMBER 15.**

If any of the listed species are observed, cease work in the immediate area, do not disturb species or habitat and contact the Engineer immediately. The work may not remove active nests from bridges and other structures during nesting season of the birds associated with the nests. If caves or sinkholes are discovered, cease work in the immediate area, and contact the Engineer immediately.

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.

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

Contact the Engineer if any of the following are detected:
* Dead or distressed vegetation (not identified as normal)
* Trash piles, drums, canister, barrels, etc.
* Undesirable smells or odors
* Evidence of leaching or seepage of substances

Does the project involve any bridge class structure rehabilitation or replacements (bridge class structures not including box culverts)?

☐ Yes ☒ No

If "No", then no further action is required.
If "Yes", then TxDOT is responsible for completing asbestos assessment/inspection.

Are the results of the asbestos inspection positive (is asbestos present)?

☐ Yes ☒ No

If "Yes", then TxDOT must retain a DSHS licensed asbestos consultant to assist with the notification, develop abatement/mitigation procedures, and perform management activities as necessary. The notification form to DSHS must be postmarked at least 15 working days prior to scheduled demolition.

If "No", then TxDOT is still required to notify DSHS 15 working days prior to any scheduled demolition.

In either case, the Contractor is responsible for providing the date(s) for abatement activities and/or demolition with careful coordination between the Engineer and asbestos consultant in order to minimize construction delays and subsequent claims.

Any other evidence indicating possible hazardous materials or contamination discovered on site. Hazardous Materials or Contamination Issues Specific to this Project:

☐ No Action Required ☒ Required Action

Action No.

1. Lead-containing paint (LCP) is located on or near the following structures and will need to be removed if construction activities structures and will need to be removed if construction activities will disturb the LCP:
   a. NBI# 06-165-0-B056-80-001: Approximately 300 SF of silver LCP on steel guardrails at 193,000 ppm.
   b. NBI# 06-165-0-B042-60-001: Approximately 400 SF of silver LCP on steel guardrails and steel guardrail posts at 1,390 ppm.
   c. NBI# 06-165-0-B042-60-002: Approximately 800 SF of silver LCP on steel guardrails and steel guardrail posts at 5,190 ppm.

2. For tasks which might expose an employee to lead above the permissible exposure limit (PEL), the Contractor shall be responsible for providing exposure assessment and worker protection as required under OSHA 1926.62 (Lead in Construction). Where stripping back of lead paint is performed as a protective measure, strip back sufficient LCP to facilitate the project work, as outlined in the project plans.

3. Lead-Containing Paint Inspection Reports are available for reference at the Odessa District Office.

VII. OTHER ENVIRONMENTAL ISSUES

(includes regional issues such as Edwards Aquifer District, etc.)

☒ No Action Required ☐ Required Action

Action No.

1.

2.

3.

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	0906	32	050, ETC		MAIN ST		
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.	DIST	COUNTY			SHEET NO.		
	ODA	MIDLAND			110		