SEE SHEET 2 FOR INDEX OF SHEETS

STATE OF TEXAS
DEPARTMENT OF TRANSPORTATION

DESIGN SPEED = 55 MPH
A.A.D.T.(2021) = 434
A.A.D.T.(2041) = 608
% TRUCKS = 13

FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
6	BR 2023 (245)		1
STATE	STATE DIST.	COUNTY	
TEXAS	ELP	CULBERSON	
CONT.	SECT.	JOB	HIGHWAY NO.
0233	05	038	SH 54

PLANS OF PROPOSED
STATE HIGHWAY IMPROVEMENT

BR 2023 (245)
CSJ: 0233-05-038

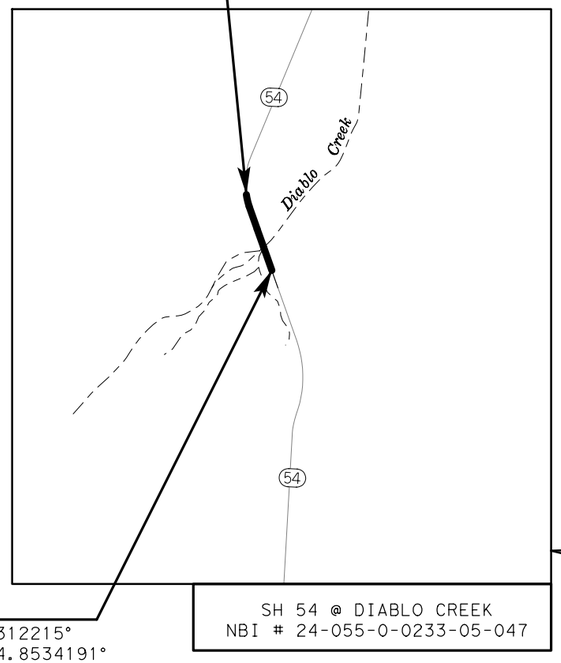
SH 54
DIABLO CREEK STRUCTURE
CULBERSON COUNTY

NET LENGTH OF ROADWAY= 1884.96FT. = 0.357 MI.
NET LENGTH OF BRIDGE = 240.00FT. = 0.045 MI.
NET LENGTH OF PROJECT= 2124.96FT. = 0.402 MI.

LIMITS: AT DIABLO CREEK
FROM: 1500 FT. NORTH OF CROSSING
TO: 1500 FT. SOUTH OF CROSSING

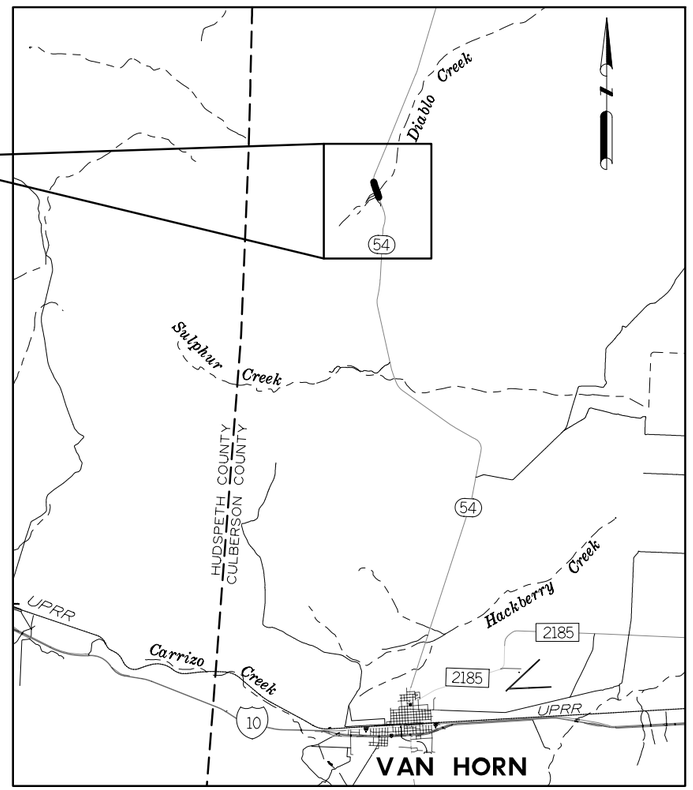
FOR THE CONSTRUCTION OF A BRIDGE AT DIABLO CREEK
CONSISTING OF BRIDGE AND APPROACHES

BEGIN PROJECT
LATITUDE: 31.2366714°
LONGITUDE: -104.8558106°
MP: 38.24
RM: 366+1.812



SH 54 @ DIABLO CREEK
NBI # 24-055-0-0233-05-047

END PROJECT
LATITUDE: 31.2312215°
LONGITUDE: -104.8534191°
MP: 38.642
RM: 368+0.206

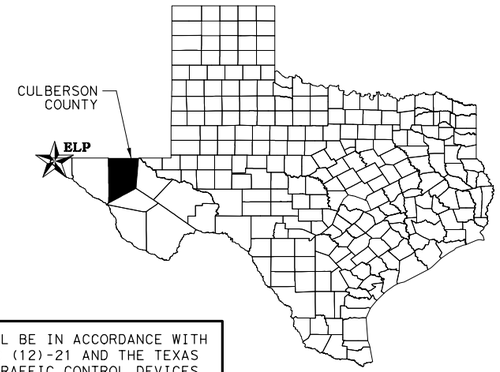


EXCEPTIONS: NONE
EQUATIONS: NONE
RAILROAD CROSSING: NONE
TDLR: NOT REQUIRED

CONTRACTOR: _____
TIME CHARGES BEGAN: _____
DATE CONTRACTOR BEGAN WORK: _____
DATE WORK WAS COMPLETED: _____
DATE WORK WAS ACCEPTED: _____
TOTAL DAYS CHARGED: _____
ORIGINAL CONTRACT AMOUNT: $ _____
AMOUNT OF CONTRACT AMENDMENTS: $ _____
FINAL CONTRACT COST: $ _____

_____ 20 _____

_____
ALPINE AREA ENGINEER



REQUIRED SIGNS SHALL BE IN ACCORDANCE WITH BC(1)-21 THROUGH BC (12)-21 AND THE TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES

PREPARED BY:

STATE OF TEXAS
R. CRUZ-RODRIGUEZ
82856
LICENSED
PROFESSIONAL ENGINEER

Rafael Cruz-Rodriguez, P.E.

09/02/22

RAFAEL CRUZ-RODRIGUEZ, PE
PROJECT MANAGER
OMEGA ENGINEERS, INC.
FIRM # F-2147

DATE

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 CONTRACTS (FORM FHWA 1273, JULY, 2022)

OMEGA ENGINEERS, INC.
8200 N. MOPAC EXPWY, SUITE 280
AUSTIN, TEXAS 78759
OMEGAENGINEERS.COM
TX PE Firm Reg. No. F-2147
P:512 575 2288 F:281 647 9184

Texas Department of Transportation

2022

RECOMMENDED FOR LETTING: 9/6/2022
DocuSigned by: Eduardo Perales, P.E.
2778C60AB5F7438...
SAFETY REVIEW COMMITTEE CHAIRMAN

RECOMMENDED FOR LETTING: 9/6/2022
DocuSigned by: L. Raul Ortega Jr., P.E.
0F1750B98760474...
DISTRICT DIRECTOR OF TRANSPORTATION
PLANNING AND DEVELOPMENT

APPROVED FOR LETTING: 9/6/2022
DocuSigned by: Tomas Trevino, P.E.
7A68C5EA0D94496...
DISTRICT ENGINEER

COUNTY CULBERSON PROJ. NO. BR 2023 (245)
HWY. NO. SH 54 LETTING DATE NOV. 2022
DATE ACCEPTED _____

PLOTTED ON: 9/1/2022 7:03:05 AM
$FILEABBREV$

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2	INDEX OF SHEETS
3	PROJECT LAYOUT
4	EXISTING TYPICAL SECTIONS
5-6	PROPOSED TYPICAL SECTIONS
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8, 8A-8B	ESTIMATE & QUANTITY SHEETS
9	TCP SUMMARY SHEET
10	EARTHWORK QUANTITIES SUMMARY SHEET
11	ROADWAY & REMOVALS SUMMARY SHEET
12	SHEET PILING SUMMARY SHEET
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	TRAFFIC CONTROL PLAN
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THE STANDARD SHEETS SPECIFICALLY IDENTIFIED "*" HAVE BEEN SELECTED BY ME OR UNDER MY SUPERVISION AND ARE APPLICABLE TO THE PROJECT.

STATE OF TEXAS
R. CRUZ-RODRIGUEZ
82856
LICENSED PROFESSIONAL ENGINEER

Rafael Cruz-Rodriguez, P.E.

09-27-2022

OMEGA ENGINEERS, INC.
8200 N MOPAC EXPRESSWAY, STE #280
AUSTIN, TEXAS 78759
OMEGAENGINEERS.COM
TX PE Firm Reg. No. F-2147
P:512 575 2288 F:281 647 9184

Texas Department of Transportation®

SH 54 @ DIABLO CREEK

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SHEET 1 OF 1

		FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
DSN	OEI	6	SEE TITLE SHEET		2
CHK	OEI	STATE	DIST.	COUNTY	
DRN	OEI	TEXAS	ELP	CULBERSON	
CHK	OEI	CONT.	SECT.	JOB	HIGHWAY NO.
		0233	05	038	SH 54

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9/29/2022
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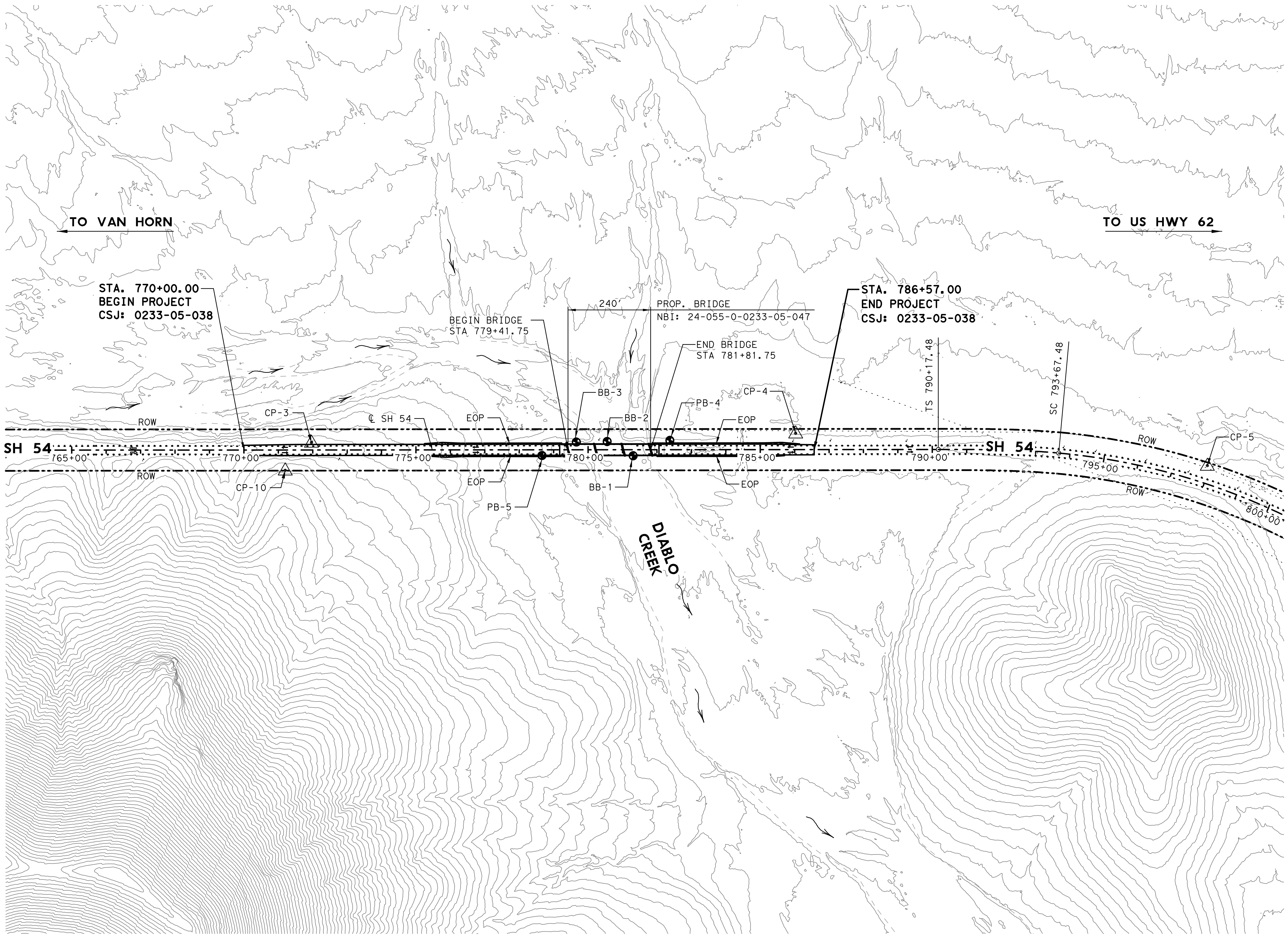

NOTES:

1. SEE HORIZONTAL ALIGNMENT DATA FOR INFORMATION.
2. SEE HORIZONTAL & VERTICAL CONTROL DATA SHEETS FOR INFORMATION.
3. CONTRACTOR TO VERIFY CONTROL POINTS WITH ENGINEER PRIOR TO STARTING ANY CONSTRUCTION.

LEGEND

- ⇆ TRAFFIC FLOW
- DRAINAGE FLOW
- BORE HOLE
- CONTROL POINT

DATE	BY	REV	REVISION

STATE OF TEXAS
R. CRUZ-RODRIGUEZ
82856
LICENSED PROFESSIONAL ENGINEER

Rafael Cruz-Rodriguez, P.E.
09-27-2022

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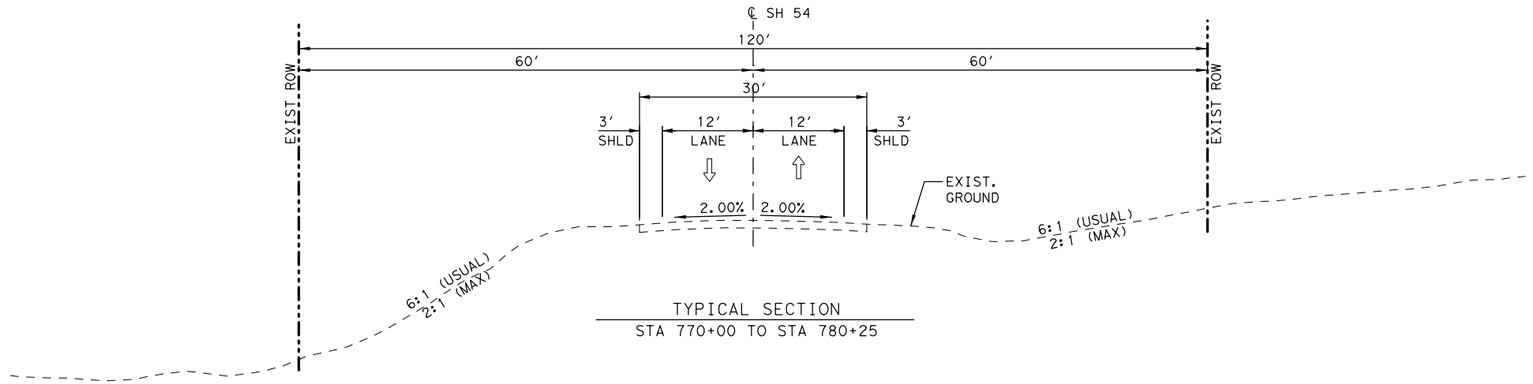
Texas Department of Transportation®

SH 54 @ DIABLO CREEK

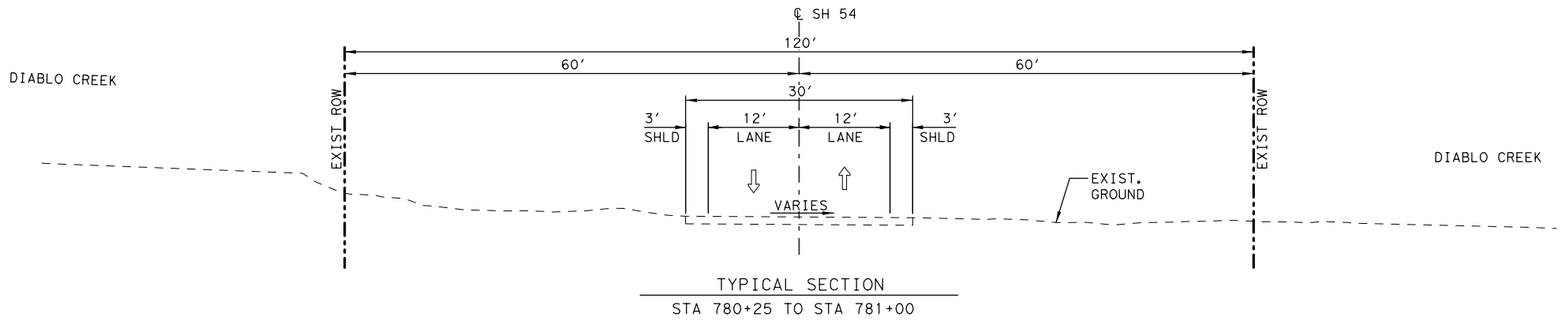
PROJECT LAYOUT

SHEET 1 OF 1

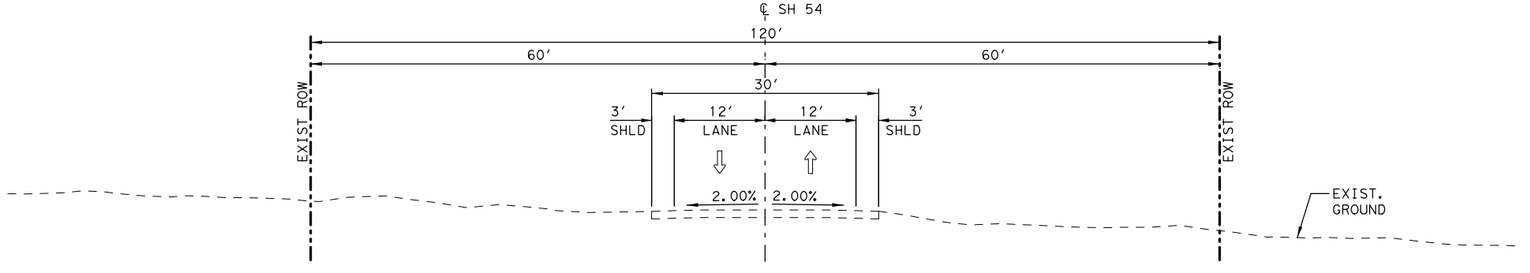
DSN	OEI	FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
		6	SEE TITLE SHEET		3
CHK	OEI	STATE	DIST.	COUNTY	
		TEXAS	ELP	CULBERSON	
DRN	OEI	CONT.	SECT.	JOB	HIGHWAY NO.
CHK	OEI	0233	05	038	SH 54



TYPICAL SECTION
STA 770+00 TO STA 780+25



TYPICAL SECTION
STA 780+25 TO STA 781+00



TYPICAL SECTION
STA 781+00 TO STA 786+57

0 10 20
SCALE: 1"=20'

NOTES:

1. TYPICAL SECTIONS ARE FOR GENERAL INFORMATION ONLY. REFER TO STANDARDS FOR PROPER CONSTRUCTION.
2. EXISTING TYPICAL SECTIONS ACQUIRED FROM CONSTRUCTION PLAN SET CSJ: 0233-05-011 COMPLETED 05/31/1943, CONSTRUCTION PLAN SET NO: M-233-5-15 COMPLETED 12/18/1945, AND SURVEYED PAVEMENT MARKINGS.
3. SEE HORIZONTAL ALIGNMENT DATA SHEET FOR ADDITIONAL INFORMATION.
4. SEE HORIZONTAL AND VERTICAL CONTROL DATA SHEETS FOR ADDITIONAL INFORMATION.
5. ALL DIMENSIONS ARE TO THE EDGE OF PAVEMENT UNLESS OTHERWISE INDICATED.
6. SEE P&P SHEETS FOR INFORMATION.

DATE	BY	REV	REVISION

STATE OF TEXAS
R. CRUZ-RODRIGUEZ
82856
LICENSED PROFESSIONAL ENGINEER
Rafael Cruz-Rodriguez, P.E.
09-27-2022

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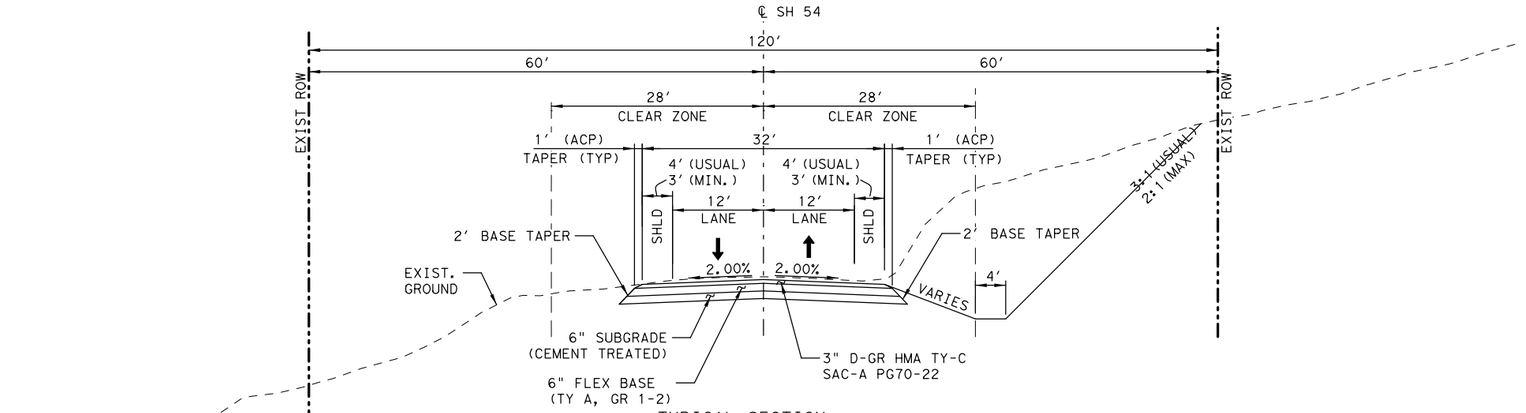
SH 54 @ DIABLO CREEK

EXISTING TYPICAL SECTIONS

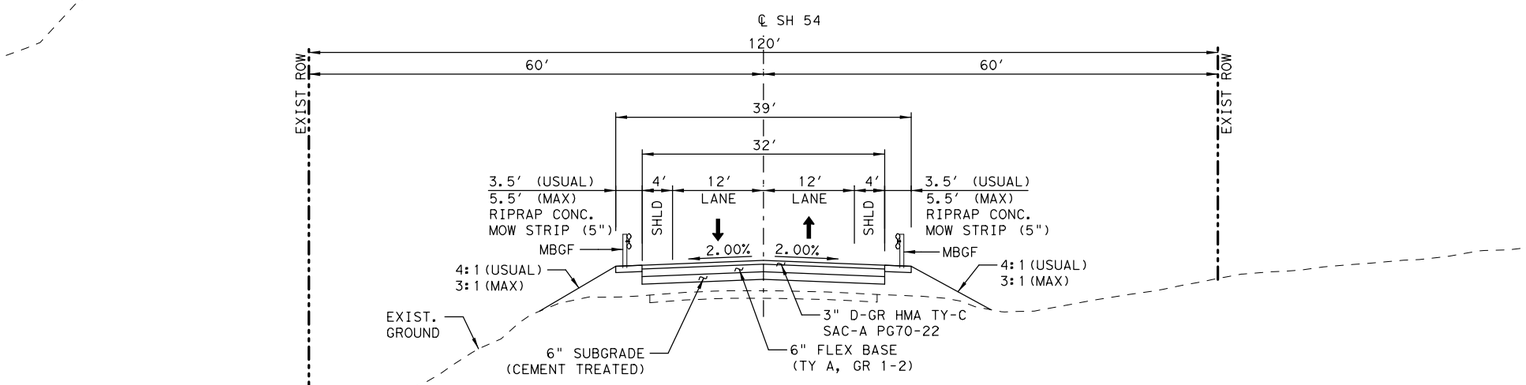
SHEET 1 OF 1

		FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
DSN	OEI	6	SEE TITLE SHEET		4
CHK	OEI	STATE	DIST.	COUNTY	
DRN	OEI	TEXAS	ELP	CULBERSON	
CHK	OEI	CONT.	SECT.	JOB	HIGHWAY NO.
		0233	05	038	SH 54



TYPICAL SECTION

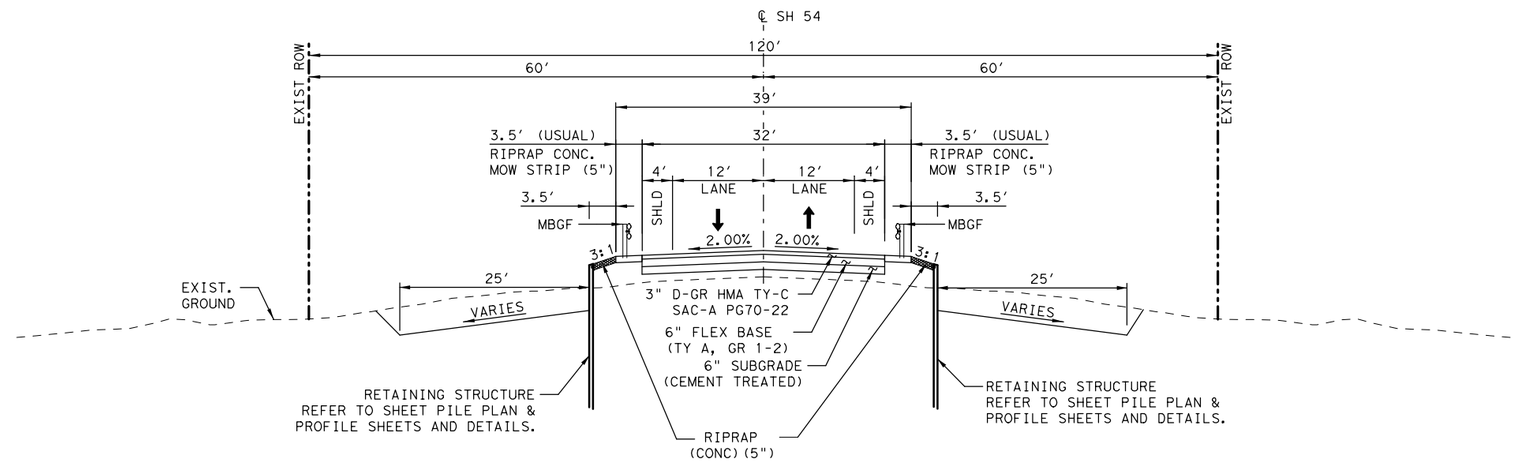
STA. 770+00 - (STA. 775+25 (LT), STA. 775+34 (RT))



TYPICAL SECTION

(STA. 775+25 (LT), STA. 775+34 (RT)) - STA 776+50

STA. 783+00 - (STA. 786+14 (LT), STA. 785+64 (RT))



TYPICAL SECTION

STA. 776+50 - STA 783+00

(BRIDGE LIMITS STA. 779+41.75 - STA. 781+81.75)

0 10 20

SCALE: 1"=20'

NOTES:

1. TYPICAL SECTIONS ARE FOR GENERAL INFORMATION ONLY. REFER TO STANDARDS FOR PROPER CONSTRUCTION.
2. EXISTING TYPICAL SECTIONS ACQUIRED FROM CONSTRUCTION PLAN SET CSJ: 0233-05-011 COMPLETED 05/31/1943, CONSTRUCTION PLAN SET NO: M-233-5-15 COMPLETED 12/18/1945, AND SURVEYED PAVEMENT MARKINGS.
3. SEE HORIZONTAL ALIGNMENT DATA SHEET FOR ADDITIONAL INFORMATION.
4. SEE HORIZONTAL AND VERTICAL CONTROL DATA SHEETS FOR ADDITIONAL INFORMATION.
5. ALL DIMENSIONS ARE TO THE EDGE OF PAVEMENT UNLESS OTHERWISE INDICATED.
6. SEE P&P SHEETS FOR INFORMATION.
7. SEE CROSS SECTIONS FOR INFORMATION.

DATE	BY	REV	REVISION

STATE OF TEXAS
R. CRUZ-RODRIGUEZ
82856
LICENSED
PROFESSIONAL ENGINEER

Rafael Cruz-Rodriguez, P.E.

09-27-2022

OMEGA ENGINEERS, INC.
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TX PE Firm Reg. No. F-2147
P:512 575 2288 F:281 647 9184

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SH 54 @ DIABLO CREEK

PROPOSED TYPICAL SECTIONS

SHEET 1 OF 2

		FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
DSN	OEI	6	SEE TITLE SHEET		5
CHK	OEI	STATE	DIST.	COUNTY	
DRN	OEI	TEXAS	ELP	CULBERSON	
CHK	OEI	CONT.	SECT.	JOB	HIGHWAY NO.
		0233	05	038	SH 54

9/27/2022
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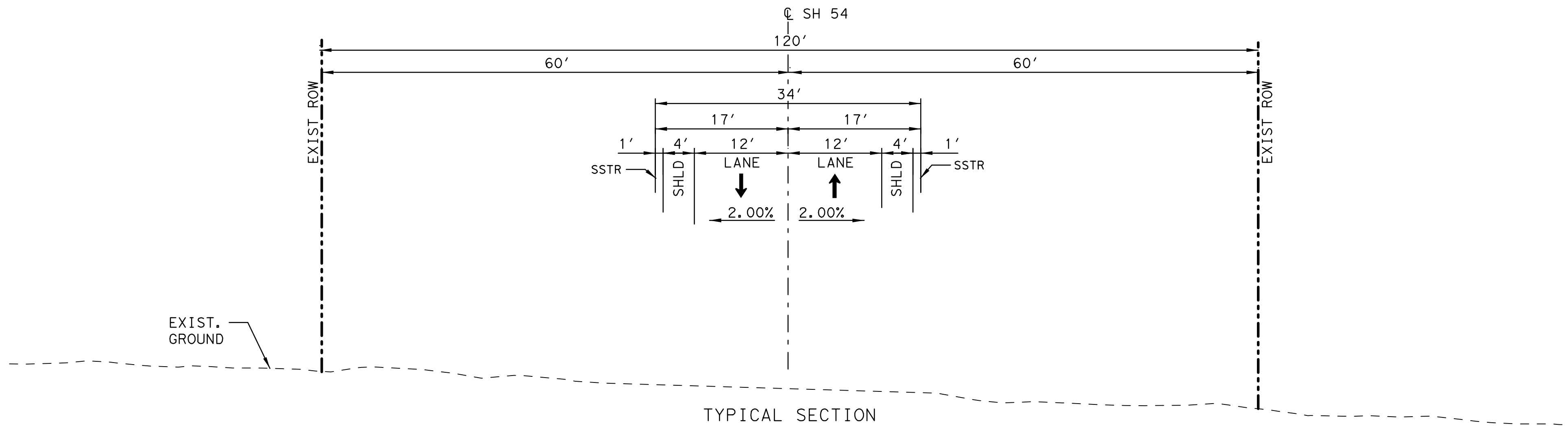
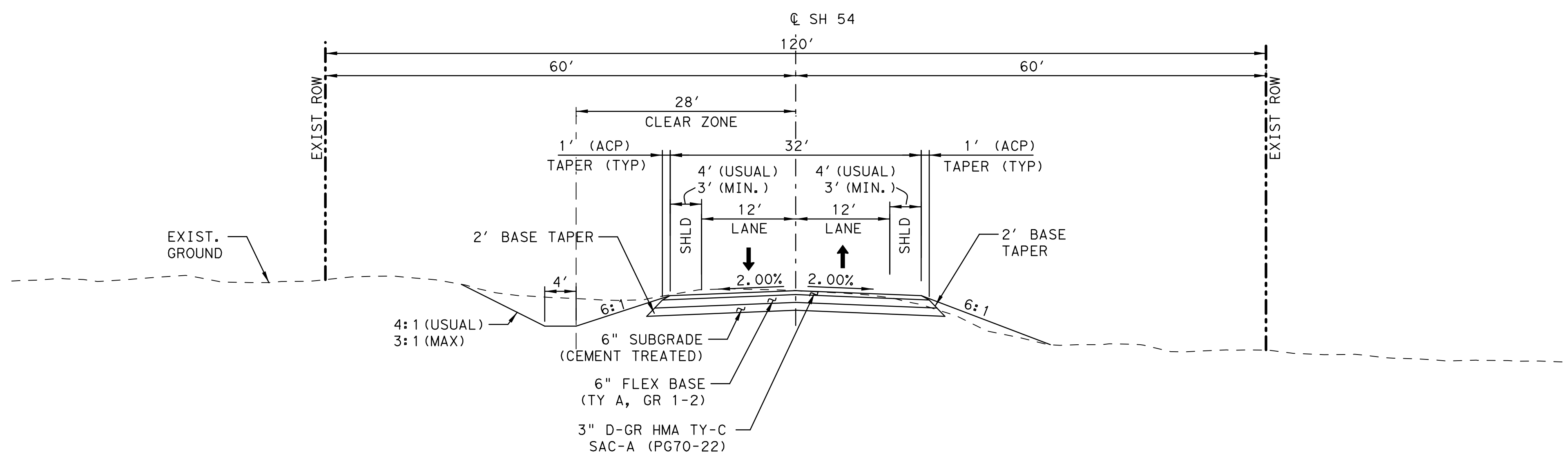


TYPICAL SECTION
STA. 779+41.75 - STA. 781+81.75

REFER TO BRIDGE LAYOUT SHEETS
FOR INFORMATION AND DETAILS



TYPICAL SECTION
(STA. 786+14 (LT), STA. 785+64 (RT)) - STA. 786+57.00

NOTES:

1. TYPICAL SECTIONS ARE FOR GENERAL INFORMATION ONLY. REFER TO STANDARDS FOR PROPER CONSTRUCTION.
2. EXISTING TYPICAL SECTIONS ACQUIRED FROM CONSTRUCTION PLAN SET CSJ: 0233-05-011 COMPLETED 05/31/1943, CONSTRUCTION PLAN SET NO: M-233-5-15 COMPLETED 12/18/1945, AND SURVEYED PAVEMENT MARKINGS.
3. SEE HORIZONTAL ALIGNMENT DATA SHEET FOR ADDITIONAL INFORMATION.
4. SEE HORIZONTAL AND VERTICAL CONTROL DATA SHEETS FOR ADDITIONAL INFORMATION.
5. ALL DIMENSIONS ARE TO THE EDGE OF PAVEMENT UNLESS OTHERWISE INDICATED.
6. SEE P&P SHEETS FOR INFORMATION.
7. SEE CROSS SECTIONS FOR INFORMATION.

DATE	BY	REV	REVISION

STATE OF TEXAS
R. CRUZ-RODRIGUEZ
82856
LICENSED
PROFESSIONAL ENGINEER
P.E.
09-27-2022

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Texas Department of Transportation®

SH 54 @ DIABLO CREEK

PROPOSED TYPICAL SECTIONS

DSN	OEI	FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
		6	SEE TITLE SHEET		6
CHK	OEI	STATE	DIST.	COUNTY	
		TEXAS	ELP	CULBERSON	
DRN	OEI	CONT.	SECT.	JOB	HIGHWAY NO.
CHK	OEI	0233	05	038	SH 54

General Notes:

Tests to be in accordance with the Department's Standard Test Methods

Table 1
Compaction Requirements for Subgrade and Base Courses

Item	Description	Outside Roadway Course Density
132[1,2,3]	EMBANKMENT (FINAL)(DENSITY CONTROL) (TY A)	(See Below)

1. **To a depth of 6 in. below natural ground scarify and compact to a 95% minimum.**
2. **From natural ground to 24 in. below finished subgrade, 98% minimum compaction.**
3. **From 24 in. below finished subgrade to finished subgrade, 100% minimum compaction.**

Table 2
Basis of Estimate

Item	Description	Rate
247	FLBS (RDWY DEL) (TY A GR 1-2)	840 LBS/CF
310	PRIME COAT (MULTI OPTION)	0.20 gal/sq. yd
3076	DENSE GRADED HOT MIX ASPHALT TACK COAT (TRAIL)	1 in. = 110 lb/sq. yd. 0.15 GAL/SY

1. **Deviation from the rates shown shall require approval.**

General Requirements

Maintain the entire project area in a neat and orderly manner throughout the duration of the work. Remove all construction litter and undesirable vegetation within the right of way inside the project limits. This work will be subsidiary to the various bid items.

General Project Description – This project consists of the construction of a new bridge structure over Diablo Creek in Culberson County. The project includes approach work. Blading hours have been established on the project for cleaning channel in the event of large flood events during construction. These items will be used at the discretion of the Engineer. Refer to General Geotechnical Subsurface Soils Characterization Evaluation Report for SH 54 Diablo Creek New Bridge Construction Project, prepared by CQC for this project.
It is required for Contractors to become familiar with project site prior to submitting bids.

Where nighttime work is approved, provide adequate lighting for the entire work site as directed. This will be considered subsidiary to the various bid items.

Comply with all Occupational Safety & Health Administration (OSHA) and United States Environmental Protection Agency (EPA) regulations as well as all local and State requirements.

Refer to the various traffic control plan project overview sheets for the proposed sequence of work. Changes will not be permitted, except as approved in writing by the Engineer. Any proposed changes to the TCP must be signed and sealed by a Professional Engineer in the State of Texas, and the original sealing Engineer must be informed of the changes. For any and all TCP changes requested by the Contractor, the Contractor must indicate how the proposed changes will affect subsequent construction phases of the project, and also must indicate any impacts the proposed TCP changes will have on the overall project safety and completions. All costs of preparing TCP changes will be the Contractor's responsibility.

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

Christopher Weber, PE
Alpine Area Engineer
Christopher.Weber@txdot.gov

Aldo Madrid, PE
Director of Construction
Aldo.Madrid@txdot.gov

Monica Ruiz, PE
District Const. Engineer
Monica.Ruiz@txdot.gov

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

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

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

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

Item 4 – Scope of Work

Schedule and perform all work to assure proper drainage during the course of construction operations. All labor, tools, equipment and supervision required, to ensure drainage, removal, and handling of water shall be considered incidental work.

Repair any existing pavement, utilities, structures, etc., damaged as a result of construction operations, at no additional cost to the Department.

Item 5 – Control of the Work

The Department will furnish horizontal and vertical reference points. Contractor must verify horizontal and vertical reference points with conventional survey methods before proceeding with construction activities. Verification must be submitted for review and approval to the Department's R.P.L.S. prior to start of construction. Any discrepancies not reported will be at no additional cost to the Department.

Plan datum for this project is NAD 83 for horizontal and NAVD 88 for elevation based. Electronic earthwork cross sections are available upon request, at bidding Contractor's expense, at the Area Engineer's office.

Keep traveled surfaces used in hauling operations clear and free of dirt or other material. Existing pavement, utilities, structures, etc. damaged because of the operations will be repaired at no additional cost to the Department.

Protect from damage and destruction all areas of the right of way, which are not included in the actual limits of the proposed construction areas. Exercise care to prevent damage to trees, vegetation, and other natural features. Protect trees, shrubs, and other landscape features from abuse, marring, or damage within the actual construction and/or fenced protection areas designated for preservation.

Restore any area disturbed or damaged to a condition "as good as" or "better than" prior to start of construction operation. This work will be at the Contractor's expense.

Precast Alternate Proposals.

When a precast or cast-in-place concrete element is included in the plans, a precast concrete alternate may be submitted in accordance with "Standard Operating Procedure for Alternate Precast Proposal Submission" found online at https://www.txdot.gov/inside-txdot/forms-publications/consultants-contractors/publications/bridge.html#design

Acceptance or denial of an alternate is at the sole discretion of the Engineer. Impacts to the project schedule and any additional costs resulting from the use of alternates are the sole responsibility of the Contractor.

Item 7 – Legal Relations and Responsibilities

Comply with all requirements of the Environmental Permits Issues and Commitments (EPIC) Sheet.

Do not discharge any liquid pollutant from vehicles onto the roadside. Immediately clean spills and dispose in compliance with local, state, and federal regulations to the satisfaction of the Engineer at no additional cost to the Department.

Occupational Safety & Health Administration (OSHA) regulations prohibit operations that bring people or equipment within 10 ft. of an energized electrical line. Where workers and/or equipment may be close to an energized electrical line, notify the electrical power company and make all necessary adjustments to ensure the safety of workers near the energized line.

Roadway closures during the following key dates and/or special events are prohibited unless approved in writing by the Engineer:

No closures will be permitted the week of Thanksgiving.
No closures will be permitted from Christmas Eve to New Year's Day.
No closures will be permitted from Good Friday to Easter Sunday.
No closures will be permitted the Saturday and Sunday before Memorial Day and Labor Day.
No closures will be permitted on Saturday or Sunday when July 4th falls on a Friday or Monday.
No closures will be permitted during weekday peak hours and legal holidays.
Nighttime is considered from 9 P.M. to 5 A.M. during weekdays, not including Fridays.

Coordinate with Engineer for scheduled nighttime work at least 48 hours in advance.

Law Enforcement Personnel

Submit charge summary and invoices using the Department forms.
Patrol vehicles must be clearly marked to correspond with the officer's agency and equipped with appropriate lights to identify them as law enforcement. For patrol vehicles not owned by a law enforcement agency, markings will be retroreflective and legible from 100 ft. from both sides and the rear of the vehicle. Lights will be high intensity and visible from all angles.

No payment will be made for law enforcement personnel needed for moving equipment or payment for drive time to/from the event site.

Item 8 – Prosecution and Progress

Working days will be calculated in accordance with Section 8.3.1.5., "Calendar Day."

Create and Maintain a Critical Path Method (CPM) Schedule.

Submit baseline schedule and obtain approval prior to beginning construction. The monthly progress payment will be held if the monthly update is not submitted.

Provide a Project Schedule Summary Report monthly along with the monthly progress schedule.

Prior to beginning operations, schedule and attend a preconstruction conference with the Engineer. Provide the Engineer a written outline of the proposed sequence of work (CPM Schedule) and a preliminary schedule of activities. Provide a letter designating a project scheduler.

Item 9 – Measurement and Payment

Monthly progress payments will be made for items of work completed by the 27th day of each month. Any work completed after the 27th will be included for payment in the subsequent monthly progress payment.

Submit Material on Hand (MOH) payment requests at least **two (2)** working days before the 27th of the month for payment consideration on that month's estimate.

When approved, provide uniformed, off-duty law enforcement officers with marked vehicles during work that requires a lane closure. The officer in marked vehicles shall be located as approved to monitor or direct traffic during the closure. The method used to direct traffic at signalized intersections shall be as approved. Additional officers and vehicles may be provided when approved or directed.

Complete the daily tracking form provided by the department and submit invoices that agree with the tracking form for payment at the end of each month approved services were provided.
Show proof of certification by the Texas Commission on Law Enforcement Standards.

All law enforcement personnel used in Work Zone Traffic Control shall be trained for performing duties in work zones and are required to take “Safe and Effective Use of Law Enforcement Personnel in Work Zones” (Course #133119) which can be found online at the following site: www.nhi.fhwa.dot.gov

Certificates of completion should be available to all who finish the course. These should be kept by the officers to substantiate completion when reporting to the work site.

Minimums, scheduling fees, etc. will not be paid; Department will consider paying cancellation fees on a case-by-case basis.

Item 100 – Preparing Right of Way

Removal of existing loose aggregate, concrete, asphalt, and any other materials deleterious to plant growth encountered within the limits during initial grading is subsidiary to this Item.

Remove and disposed of properly all concrete, asphalt, and materials deleterious to plant growth from all planting beds during initial grading and bed preparation and prior to plant installation subsidiary to this Item.

Item 110 – Excavation

To eliminate all drop-off conditions, construct tapers as directed. This work will not be paid for directly but will be considered subsidiary to pertinent bid items.

Excavate to finish subgrade. Scarify subgrade to a uniform depth at least 6 in. below finish subgrade elevation in areas where base or pavement structure will be placed on subgrade. Manipulate and compact subgrade in accordance with Section 132.3.4., “Compaction Methods.” Compact to 100% relative density in accordance with Section 132.3.4.2., “Density Control.”

Item 132 – Embankment

Scarify and compact top 6 in. of existing roadway as directed before additional embankment or base course is placed. This work is subsidiary to various bid items.

Track the side slopes of the embankment to control erosion. This work will be subsidiary to various bid items.

Subgrade compaction will be density control and subsidiary to this Item.

Item 150 – Blading

Sprinkling and rolling which may be required during the operation of item 150, will not be measured or paid for directly but will be considered subsidiary to this item.

Eighty (80) hours of blading have been identified on the project. These hours will be used for cleanup of the project area only as directed by the Engineer. They are intended to be used for cleanup deposited sediments and debris after any major storm event.

Item 216 – Proof Rolling

Forty (40) hours of proof rolling have been identified for the project. These hours are to be used for proof rolling areas where subgrade requires additional compaction to achieve desired compaction levels. Locations shall be approved by the Engineer prior to proof rolling. Refer to General Geotechnical Subsurface Soils Characterization Evaluation Report for SH 54 Diablo Creek New Bridge Construction Project, prepared by CQC for his project.

Item 247 – Flexible Base

A 20-ton vibratory pad foot roller will be required for compaction of lifts 10 inches or greater, unless otherwise directed by the Engineer.

When requested, stake with blue tops at 100-foot intervals, the lines, and grade shown in the plans. (For Item 247.4)

Provide flexible base that does not exceed a sulfate content of 1,000 ppm when tested in accordance with Tex-145-E. The sulfate concentration of water used for compaction shall not exceed 2,000 ppm.

Item 310 – Prime Coat

Cure prime coat for at least 48 hr. prior to beginning hot-mix asphalt placement operations, unless otherwise directed.

When multi option is allowed, provide AE-P, SS-1H or CSS-1H.

Contractor to provide a test sample of prime coat to the engineer prior to production. Material must be tested and approved by the engineer prior to application.

Place seal coat or pavement course as shown on the plans within 14 calendar days of initial prime coat application. Otherwise, reapply prime coat as directed by the Engineer. Reapplication of the prime coat will be at the Contractor's expense.

Item 354 – Planing and Texturing Pavement

When a bridge deck is planed and textured, remove excess material. Do not broom to the sides of the bridge, under guardrail, etc. Cover or protect all sealed expansion joints, rails on bridge, and all railroad tracks encountered as approved by the engineer. Clean all of these features if they weren't properly protected. This work is subsidiary work to applicable bid items. Refer to Item 438, "Cleaning and Sealing Joints," for procedures and methods.

The Department will retain ownership of planed materials. The asphalt removed under this item shall be salvaged and stockpiled in separate stockpiles as directed by the Engineer at the following location:

Approximately 2 miles north of the project limits.

Contact the Van Horn Maintenance Supervisor at (432) 283-2501 for coordination prior to delivery of materials. Stack in piles 12 to 13 feet maximum height. Place silt fence along the perimeter of stockpiled material. Silt fence will be paid under Item 506, "Temporary Erosion, Sedimentation, and Environmental Controls". Final quantity of silt fence to be approved by the engineer prior to stockpiling. Hauling of material and incidentals to complete this work is subsidiary to this Item.

Item 400 – Excavation and Backfill for Structures

The trench bottom for pre-cast concrete pipe will not require undercutting, use flowable backfill, unless otherwise directed.

Item 416 – Drilled Shaft Foundations

Stake all foundation locations for approval by the Engineer prior to commencement of drilling operations. Coordinate with the Utility companies for utility location within the project limits. Repair any damage to existing utilities to the satisfaction of the Engineer and the utility owner at no additional cost to the Department.

Use Class "C" concrete.

Cover drilled shafts with plywood and delineate them with cones, to the satisfaction of the Engineer, when not working in them and after work hours.

Replace faulty anchor bolts as directed. Do not weld anchor bolts.

Remove spoils, daily, out of the drainage areas or as directed.

Item 420 – Concrete Substructures

Provide High Performance Concrete (HPC) and Epoxy Coated Reinforcement Steel for all elements listed below:

Bridge Abutments

Bridge Bent Caps

Bridge Columns

Provide Epoxy Coated Reinforcement Steel for Bent Web walls.

Item 422 – Concrete Superstructures

Provide High Performance Concrete (HPC) and Epoxy Coated Reinforcement Steel for all elements listed below:

Bridge Slab

Approach Slab

Bridge Railing

Item 432 – Riprap

Wire mesh and fibers for concrete not allowed on this project for this Item. Reinforce all concrete riprap using bar reinforcement conforming to Item 440, "Reinforcement for Concrete," as shown on the plans, or as directed.

Finish concrete riprap with a smooth (wood float) finish, unless otherwise directed.
Obtain approval for all stone riprap material sources.

Item 442 – Metal for Structures

Prepare and submit the field erection drawings in accordance with Item 441, "Steel Structures," for approval prior to construction. Show details for additional temporary lateral bracing to be used to secure plate girders from wind loads during erection and construction on the field erection drawings. Additional temporary shoring may include, but is not limited to guy wires with deadman anchors, etc. Temporary lateral bracing may be removed upon approval. Temporary lateral bracing will not be paid for directly but will be subsidiary to this Item.

Item 502 – Barricades, Signs, and Traffic Handling

Prior to beginning construction, the Engineer shall approve the routing of traffic and sequence of work.

Additional signs and barricades, placed as directed, shall be considered subsidiary to this Item.
In accordance with Section 7.2.6.1, designate, in writing, a Contractor Responsible Person (CRP) and a CRP alternate to take full responsibility for the set-up, maintenance, and necessary corrective measures of the traffic control plan. The CRP or CRP alternate must be present at site and implement the initial set up of every traffic control phase/stage, at each location, and/or each call out, for the entire duration of the project.

At the written request of the Engineer, immediately remove the CRP or CRP alternate from the project if, in the opinion of the Engineer, is not competent, not present at initial TCP set-ups, or does not perform in a proper, skillful, or safe manner. These individuals shall not be reinstated without written consent of the Engineer.
CRP and CRP alternate must be trained using Department approved training. Provide a copy of the certificate of completion to the Engineer for project records. Refer to Table 3 for Department approved Training.

Table 3
Contractor Responsible Person and Alternate

Provider	Course Number	Course Title	Duration	Notes
American Traffic Safety Services Association	TCS	Traffic Control Supervisor	2 days	
National Highway Institute	133112 133113	Design and Operation of Work Zone Traffic Control Work Zone Traffic Control for Maintenance Operations	1 day 1 day	Both courses are required to meet minimum required training.
Texas Engineering Extension Services	133112A	Design and Operation of Work Zone Traffic Control	3 days	
University of Texas Arlington Division for Enterprise Development	WKZ421	Traffic Control Supervisor	16 hours	Contact UTA for training needs.

All contractor workers involved with the traffic control implementation and maintenance must participate and complete a Department approved training course. Provide a copy of the certificate of completion to the Engineer for project records. Refer to Table 4 for Department approved training.

Table 4
Other Work Zone Personnel

Provider	Course Number	Course Title	Duration	Notes
American Traffic Safety Services Association	TCT	Traffic Control Technician	1 day	
Texas Engineering Extension Services	HWS002	Work Zone Traffic Control	16 hours	Identical to HWS-410. Counts for 3 year CRP requirement.
National Highway Institute	133116	Maintenance of Traffic for Technicians	5 hours	Web based
National Highway Institute	134109-I	Maintenance Training Series: Basics of Work Zone Traffic Control	1 hour	Free, Web based
University of Texas at Arlington, Division for Enterprise Development	WKZ100	Work Zone Safety: Temporary Traffic Control	4 hours	Note name change. Free, Web based
TxDOT/AGC Joint Development	N/A	Safe Workers Awareness Highway Construction Work Zone Hazards	16 minutes 18 minutes	Videos available through AGC of Texas offices. English & Spanish
AGC America	N/A	Highway Work Zone Safety Training	1 day	
Texas Engineering Extension Service	HWS400	Temporary Traffic Control Worker	4 hours	Contact TEEX, if interested in course
TxDOT/AGC Joint Development	N/A	Work Zone Fundamentals	10 minutes	Videos available through ACT of Texas offices. English & Spanish

Contractor may choose to train workers involved with the traffic control implementation and maintenance with a contractor developed training in lieu of Department approved training. Contractor developed training must be equivalent to the Department approved training shown in Table 3. Provide the Engineer a copy of the course curriculum for pre-approval, prior to conducting the contractor developed training. Provide the Engineer a copy of the log of attendees after training completion for project records.
Existing regulatory signs, route marker auxiliaries, guide signs, and warning signs that must be removed due to widening shall be relocated temporarily and erected on approved supports at locations shown in the plans, or as directed. This work will not be paid for directly but considered subsidiary to this Item.

Notify the Department officials when major traffic changes are to be made, such as detours. Coordinate with the Department on all traffic changes. Advance notification for the following week's work must be made by 5 P.M. on Wednesdays.

If Law Enforcement Personnel is required by the Engineer, coordinate with local law enforcement as directed or agreed. Complete the weekly tracking form provided by the Department and submit invoices with 5% allowance for Law Enforcement payments by Contractor that agree with the tracking form for payment at the end of each month where approved services were provided.

Provide access to intersecting side roads and driveways at all times, unless otherwise directed.
Any approved change to the sequence of work or TCP, must be signed and sealed by a Contractor's Licensed Professional Engineer assuming full responsibility for any additional barricade signs and devices needed.

Use striping operations to channelize traffic into the newly completed roadway, as directed. Maintain shoulders and median areas in a condition capable of serving as emergency paths, as approved. This work will be subsidiary to this Item.

Use portable changeable message signs (PCMS) to alert public of construction two weeks prior to construction.

Use flaggers when directed. Provide two-way radio communication for all flaggers.

Place and maintain sufficient additional warning signs, beacons, delineators, and barricades to always warn and guide the public of all hazards through the construction zone, and as directed.

Use flashing arrow boards on all tapers for each lane closure. Subsidiary to this Item.

Some signs, barricades, and channelization devices may not be shown at the precise or measured position. Place the barricades, devices, or signs, with approval, in positions to meet field conditions.

Fill any holes left by barricade or sign supports and restore the area to its original condition, this work shall be subsidiary to this item.

Use Type A flashing warning lights or delineators to mark open excavation, footings, foundations, or other obstructions near lanes that may be open to traffic, as directed.

For additional information pertaining to channelization, signing, spacing details, and flagging procedures required to regulate, warn, and guide traffic through project, refer to the "Barricade and Construction Standards," BC(1)-21 to BC (12)-21 and to the current *Texas Manual on Uniform Traffic Control Devices(TMUTCD).*

Remove or cover signs that do not apply to current conditions at the end of each day's work.

Repair and/or replace all signs damaged by the public or due to weather events.

Safety Contingency

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

Item 506 – Temporary Erosion, Sedimentation, and Environmental Controls

Place Best Method Practices (BMP's) in locations as designated in the plans or as directed to meet field conditions.

Place a weatherproof bulletin board containing the Texas Commission on Environmental Quality (TCEQ) required information on the project at a site as directed. Post the following documents:

1. TCEQ "TPDES Storm Water Program" Construction Site Notice; Primary Construction Site Notices from both Contractor and Department, completed and signed.
2. TCEQ "Primary Notice of Intents," from both Contractor and Department; and
3. TCEQ "TPDES Permit.

Place rain gauge(s) at locations as designated.

The total disturbed area for this project is approximately 3.70 acres. Establish the authorization requirements for Storm Water Discharges for soil disturbed area in this project, all project locations in the Contract, and Contractor Project Specific Locations (PSLs), within one mile of the project limits. Both the Department and the Contractor shall obtain an authorization to discharge storm water from TCEQ for the construction activities shown on the plans. Obtain required authorization from the TCEQ for any Contractor PSLs for construction support activities on or off right of way. When the total area disturbed for all projects in the Contract and PSLs within one mile of the project limits exceeds five acres, provide a copy of the Contractor Notice of Intent (NOI) PSLs on the right of way to the Engineer (to the appropriate Municipal Separate Storm Sewer System (MS4) Operator when on an Off-system State route).

Best Method Practices (BMP's) may be adjusted to meet field conditions, or as directed. Engineer will verify all locations prior to placement of BMPs. Within the project limits, keep all inlets functional as long as possible to accept storm water as part of the Storm Water Pollution Prevention Plan (SWP3), as directed.

Grading operations will be limited to the catch point of the proposed cross-section.

Preserve any vegetation outside these limits.

Erosion Control Contingency

A contractor Force Account "Erosion Control Contingency" has been established for this project. It is intended to be utilized for Erosion Control cleanup, in the event of storm events flooding the on-site detours, work zone or affecting the construction area, or any nature event that could not be foreseen during the project planning or design stages. These enhancements will be mutually agreed upon by the Engineer and the Contractor's Responsible Person based on timeline of the events. The Engineer may choose to use existing bid items if it does not slow the implementation of enhancements.

Item 508 – Constructing Detours

The project requires on-site detours to remain within the existing ROW. Please follow grades and lane dimensions as shown on the plans. Follow all TxDOT Specifications for the construction of such detours. Cross Sections are available for information.

Temporary pavement utilized under this item shall be delivered to the Maintenance yard after use.

Item 585 – Ride Quality for Pavement Surfaces

Use Surface Test Type A to govern ride quality for finished riding surfaces of travel lanes. Notify the District Laboratory 48 hours prior to conducting Surface Test Type B. Properly mark all starting/ending points, and leave-out sections prior to testing. Deliver test results within 24 hours of testing. Provide all profile measurements in electronic data to ELP-LAB@txdot.gov using the format specified in Tex-1001-S.

"Payment Adjustment, Schedule 2" will be used for the travel lanes.

An IRI > 95 will require corrective action.

Use diamond grinding or equivalent to correct areas of localized roughness. For flexible pavements, use CSS-1H emulsion to fog seal the corrected areas.

Milling will not be allowed as a corrective action for excessive deviations in the surface layer of hot mix.

Item 644 – Small Roadside Sign Assemblies

Stake all sign locations and receive approval prior to sign placement.

The 2-1/2 inch, Schedule 10 post will meet the following requirements:

- 0.120 in. nominal wall thickness
- Seamless or electric-resistance welded steel tubing or pipe
- Steel will be HSLAS Grade 55 per ASTM A1011 or ASTM A1008

Other steel may be used, if it meets the following:

- 55,000 psi minimum yield strength
- 70,000 psi minimum tensile strength
- 20% minimum elongation in 2 in.
- Wall thickness (uncoated) to be within the range of 0.108 in. to 0.132 in. galvanization per ASTM A123 or ASTM A653 G90

For precoated steel tubing (ASTM A653), recoat tube outside diameter weld seam by metalizing with zinc wire per ASTM B833.

Verify all post lengths to ensure the proper sign height. Remove and replace any sign installed incorrectly. This work will be done at no expense to the Department.

Provide Texas Universal Triangular Slip Base clamp type for all signs as shown on SMD (SLIP-1)-08.

As directed, relocate some regulatory and guide signs before construction begins. Mark and locate each reference marker perpendicular to the road and along the right of way, or as directed, prior to removal. Re-erect reference markers at their original location upon completion of construction.

All signs removed will remain property of the Contractor.

Item 658 – Delineator and Object Marker Assemblies

Verify all locations with the Engineer prior to installation.

Removal and proper disposal of all existing delineators, object markers, and any non-standard hardware assemblies are not paid directly, but will be considered subsidiary to pertinent items for payment.

Item 662 – Work Zone Pavement Markings

In those areas where existing pavement markings are to be covered or removed, field locate and record the existing pavement markings by survey or other approved method by the Engineer as directed. Place final striping on these locations.

Remove and properly dispose of tabs upon completion of the final striping. This work is considered subsidiary to various bid items.

Place tabs as per the Department's Standard sheet TCP (7-1)-13. Place raised pavement markers in accordance with applicable standards and as directed.

Item 666 – Retroreflectorized Pavement Markings

Use a pilot line for final striping and remove pilot line after all striping is complete. Removal will be in accordance with the methods specified in Item 677, "Eliminating Existing Pavement Markings and Markers," and will be subsidiary to this Item.

Air blasting is required as pavement surface preparation.

In those areas where existing pavement markings are to be covered or removed, field locate and record the existing pavement markings by survey or other approved method by the Engineer as directed. Place final striping on these locations.

Item 672 – Raised Pavement Markers

Use a pilot line for final striping and remove pilot line after all striping is complete. Removal in accordance with the methods specified in Item 677, "Eliminating Existing Pavement Markings and Markers," and will be subsidiary to this Item.

Air blasting is required for pavement surface preparation.

Furnish adhesives that conform to DMS-6100, "Epoxies and Adhesives," and DMS-6130, "Bituminous Adhesive for Pavement Markers," for this Item.

Do not place raised pavement markers when the pavement surface temperature is below 60°F.

Removal of all existing raised pavement markers will be considered subsidiary to the various bid items.

Item 6001 – Portable Changeable Message Sign

Provide messages as directed by the Engineer.

Provide three (3) Portable Changeable Message Signs (PCMS) as advanced notification for two weeks prior to beginning project and throughout duration of project as directed. One of the Three (3) will be spare, and used as directed by the Engineer.

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

All TMA Operators must participate in a TMA workshop to be conducted by the El Paso District Safety Office, on the proper use of TMAs, prior to working on Department Right of Way (ROW). A certificate of completion will be issued to TMA Operators that successfully complete the TMA workshop. The certificate of completion must be carried by TMA Operators at all times while working on Department right of way.

Acquire the TCP and TMA Operator's certificates of completion prior to the authorization to begin work. No time suspension will be granted, and no traffic control work will be allowed without certificates of completion.

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

The supporting vehicle for the TMA shall have a minimum gross (i.e., ballasted) vehicular weight of 19,000 pounds.

Table 5
Basis of Estimate for Stationary TMAs

Basis of Estimate for Stationary TMAs				
Phase	Standard	Required	Additional	TOTAL
1,2	TCP (2-1)c	4		4
ALL	Line Diagram	2	1(Spare)	3

Table 6
Basis of Estimate for Mobile TMAs

Basis of Estimate for Mobile TMAs			
Standard	Required	Additional	TOTAL
TCP (S-2)	1		1
TCP (3-1)b	4		4
TCP (3-3)a	2		2

Estimate & Quantity Sheet

CONTROLLING PROJECT ID 0233-05-038 **DISTRICT** El Paso **COUNTY** Culberson
HIGHWAY SH 54

						TOTAL EST.	TOTAL FINAL
		CONTROL SECTION JOB		**0233-05-038**			
		PROJECT ID		**A00183066**			
		COUNTY		**Culberson**			
		HIGHWAY		**SH 54**			
ALT	**BID CODE**	**DESCRIPTION**	**UNIT**	EST.	FINAL		
	100-6001	PREPARING ROW	AC	5.000		5.000	
	105-6043	REMOVING STAB BASE & ASPH PAV (0-6")	SY	4,500.000		4,500.000	
	110-6001	EXCAVATION (ROADWAY)	CY	3,112.000		3,112.000	
	110-6003	EXCAVATION (SPECIAL)	CY	5,150.000		5,150.000	
	132-6002	EMBANKMENT (FINAL)(DENS CONT)(TY A)	CY	7,275.000		7,275.000	
	132-6056	EMBANKMENT (FINAL)(ORD COMP)(TY C2)(DS)	CY	78.000		78.000	
	216-6001	PROOF ROLLING	HR	40.000		40.000	
	247-6121	FL BS (RDWY DEL) (TY A GR 1-2)	TON	100.800		100.800	
	275-6019	CEMENT TREAT (SUBGRADE)(6")	SY	5,201.000		5,201.000	
	310-6001	PRIME COAT (MULTI OPTION)	GAL	780.000		780.000	
	354-6002	PLAN & TEXT ASPH CONC PAV(0" TO 2")	SY	1,728.000		1,728.000	
	400-6005	CEM STABIL BKFL	CY	234.500		234.500	
	403-6001	TEMPORARY SPL SHORING	SF	1,670.000		1,670.000	
	407-6006	SHEET PILING (PZ - 40)	SF	14,729.000		14,729.000	
	416-6001	DRILL SHAFT (18 IN)	LF	130.000		130.000	
	416-6004	DRILL SHAFT (36 IN)	LF	410.000		410.000	
	420-6014	CL C CONC (ABUT)(HPC)	CY	48.900		48.900	
	420-6030	CL C CONC (CAP)(HPC)	CY	31.800		31.800	
	420-6038	CL C CONC (COLUMN)(HPC)	CY	8.800		8.800	
	420-6156	CL C CONC (WEBWALL)	CY	9.400		9.400	
	422-6002	REINF CONC SLAB (HPC)	SF	8,160.000		8,160.000	
	422-6016	APPROACH SLAB (HPC)	CY	62.400		62.400	
	425-6036	PRESTR CONC GIRDER (TX34)	LF	953.920		953.920	
	432-6010	RIPRAP (CONC)(CL B)(5 IN)	CY	77.000		77.000	
	432-6046	RIPRAP (MOW STRIP)(5 IN)	CY	91.000		91.000	
	450-6111	RAIL (TY SSTR) (W/DRAIN SLOT) (HPC)	LF	536.000		536.000	
	454-6020	SEALED EXPANSION JOINT (4 IN) (SEJ - B)	LF	68.000		68.000	
	462-6063	CONC BOX CULV (8 FT X 4 FT)(EXTEND)	LF	32.000		32.000	
	480-6001	CLEAN EXIST CULVERTS	EA	1.000		1.000	
	496-6008	REMOV STR (BOX CULVERT)	LF	32.000		32.000	
	500-6001	MOBILIZATION	LS	1.000		1.000	
	502-6001	BARRICADES, SIGNS AND TRAFFIC HANDLING	MO	8.000		8.000	
	506-6002	ROCK FILTER DAMS (INSTALL) (TY 2)	LF	15.000		15.000	
	506-6011	ROCK FILTER DAMS (REMOVE)	LF	15.000		15.000	
	506-6020	CONSTRUCTION EXITS (INSTALL) (TY 1)	SY	275.000		275.000	
	506-6024	CONSTRUCTION EXITS (REMOVE)	SY	275.000		275.000	
	506-6032	BLADING WORK (EROSION & SEDMT CONT)	HR	80.000		80.000	

Estimate & Quantity Sheet

CONTROLLING PROJECT ID 0233-05-038 **DISTRICT** El Paso **COUNTY** Culberson
HIGHWAY SH 54

			CONTROL SECTION JOB		**0233-05-038**	TOTAL EST.	TOTAL FINAL
			PROJECT ID		**A00183066**		
			COUNTY		**Culberson**		
			HIGHWAY		**SH 54**		
ALT	**BID CODE**	**DESCRIPTION**	**UNIT**	EST.	FINAL		
	506-6038	TEMP SEDMT CONT FENCE (INSTALL)	LF	4,194.000		4,194.000	
	506-6039	TEMP SEDMT CONT FENCE (REMOVE)	LF	4,194.000		4,194.000	
	508-6001	CONSTRUCTING DETOURS	SY	1,001.000		1,001.000	
	510-6003	ONE-WAY TRAF CONT (PORT TRAF SIG)	MO	8.000		8.000	
	512-6009	PORT CTB (FUR & INST)(LOW PROF)(TY 1)	LF	980.000		980.000	
	512-6010	PORT CTB (FUR & INST)(LOW PROF)(TY 2)	LF	80.000		80.000	
	512-6057	PORT CTB (REMOVE)(LOW PROF)(TY 1)	LF	980.000		980.000	
	512-6058	PORT CTB (REMOVE)(LOW PROF)(TY 2)	LF	80.000		80.000	
	533-6003	RUMBLE STRIPS (SHOULDER) ASPHALT	LF	4,080.000		4,080.000	
	540-6001	MTL W-BEAM GD FEN (TIM POST)	LF	2,200.000		2,200.000	
	540-6006	MTL BEAM GD FEN TRANS (THRIE-BEAM)	EA	4.000		4.000	
	540-6016	DOWNSTREAM ANCHOR TERMINAL SECTION	EA	2.000		2.000	
	542-6001	REMOVE METAL BEAM GUARD FENCE	LF	1,100.000		1,100.000	
	544-6001	GUARDRAIL END TREATMENT (INSTALL)	EA	6.000		6.000	
	544-6003	GUARDRAIL END TREATMENT (REMOVE)	EA	4.000		4.000	
	552-6001	WIRE FENCE (TY A)	LF	3,600.000		3,600.000	
	644-6001	IN SM RD SN SUP&AM TY10BWG(1)SA(P)	EA	8.000		8.000	
	644-6076	REMOVE SM RD SN SUP&AM	EA	7.000		7.000	
	658-6014	INSTL DEL ASSM (D-SW)SZ (BRF)CTB (BI)	EA	6.000		6.000	
	658-6060	REMOVE DELIN & OBJECT MARKER ASSMS	EA	4.000		4.000	
	658-6061	INSTL DEL ASSM (D-SW)SZ 1(BRF)GF2	EA	17.000		17.000	
	658-6103	INSTL OM ASSM (OM-3L)(WFLX)GND)GND	EA	4.000		4.000	
	662-6050	WK ZN PAV MRK REMOV (REFL) TY II-A-A	EA	96.000		96.000	
	662-6063	WK ZN PAV MRK REMOV (W)4"(SLD)	LF	7,190.000		7,190.000	
	662-6095	WK ZN PAV MRK REMOV (Y)4"(SLD)	LF	5,210.000		5,210.000	
	662-6109	WK ZN PAV MRK SHT TERM (TAB)TY W	EA	100.000		100.000	
	662-6110	WK ZN PAV MRK SHT TERM (TAB)TY Y	EA	100.000		100.000	
	662-6111	WK ZN PAV MRK SHT TERM (TAB)TY Y-2	EA	100.000		100.000	
	666-6342	REF PROF PAV MRK TY I(W)4"(SLD)(100MIL)	LF	4,080.000		4,080.000	
	666-6344	REF PROF PAV MRK TY I(Y)4"(BRK)(100MIL)	LF	320.000		320.000	
	666-6345	REF PROF PAV MRK TY I(Y)4"(SLD)(100MIL)	LF	3,306.000		3,306.000	
	672-6009	REFL PAV MRKR TY II-A-A	EA	39.000		39.000	
	677-6001	ELIM EXT PAV MRK & MRKS (4")	LF	3,963.000		3,963.000	
	678-6001	PAV SURF PREP FOR MRK (4")	LF	7,386.000		7,386.000	
	700-6001	POTHOLE REPAIR (STANDARD)	SY	100.000		100.000	
	740-6005	ANTI - GRAFFITI COATNG(PERMNENT-TY III)	SF	3,581.000		3,581.000	
	3076-6026	D-GR HMA TY-C SAC-A PG70-22 (EXEMPT)	TON	1,316.000		1,316.000	

Estimate & Quantity Sheet

CONTROLLING PROJECT ID 0233-05-038 **DISTRICT** El Paso **COUNTY** Culberson
HIGHWAY SH 54

						TOTAL EST.	TOTAL FINAL
		CONTROL SECTION JOB		**0233-05-038**			
		PROJECT ID		**A00183066**			
		COUNTY		**Culberson**			
		HIGHWAY		**SH 54**			
ALT	**BID CODE**	**DESCRIPTION**	**UNIT**	EST.	FINAL		
	4171-6001	INSTALL BRIDGE IDENTIFICATION NUMBERS	EA	2.000		2.000	
	6001-6002	PORTABLE CHANGEABLE MESSAGE SIGN	EA	3.000		3.000	
	6056-6001	PREFORMED IN-LANE(TRANS) RUMBLE STRIP	LF	216.000		216.000	
	6185-6002	TMA (STATIONARY)	DAY	600.000		600.000	
	6185-6005	TMA (MOBILE OPERATION)	DAY	20.000		20.000	
	7148-6019	FURNISH ADDITIONAL FLAGGER	HR	80.000		80.000	
	18	LAW ENFORCEMENT: CONTRACTOR FORCE ACCOUNT WORK (PARTICIPATING)	LS	1.000		1.000	
		EROSION CONTROL MAINTENANCE: CONTRACTOR FORCE ACCOUNT WORK (PART)	LS	1.000		1.000	
		SAFETY CONTINGENCY: CONTRACTOR FORCE ACCOUNT WORK (PARTICIPATING)	LS	1.000		1.000	

SUMMARY OF TCP ITEMS												
SHEET	403 6001	*** 462 6063	*** 480 6001	*** 496 6008	500 6001	502 6001	508 6001	510 6003	512 6009	512 6010	512 6057	512 6058
	TEMPORARY SPL SHORING	CONC BOX CULV (8 FT X 4 FT) (EXTEND)	CLEAN EXIST CULVERTS	REMOV STR (BOX CULVERT)	MOBILIZATION	BARRICADES, SIGNS AND TRAFFIC HANDLING	CONSTRUCTING DETOURS	ONE-WAY TRAF CONT (PORT TRAF SIG)	PORT CTB (FUR & INST)(LOW PROF)(TY 1)	PORT CTB (FUR & INST)(LOW PROF)(TY 2)	PORT CTB (REMOVE)(LOW PROF)(TY 1)	PORT CTB (REMOVE)(LOW PROF)(TY 2)
	SF	LF	EA	LF	LS	MO	SY	MO	LF	LF	LF	LF
SH54			1		1							
PHASE 1	1670	32				8	1001	8				
PHASE 2									980	80		
PHASE 3				32							980	80
PROJECT TOTALS	1670	32	1	32	1	8	1001	8	980	80	980	80

SUMMARY OF TCP ITEMS										
SHEET	540 6001	542 6001	544 6001	544 6003	662 6050	662 6063	662 6095	* 662 6109	* 662 6110	* 662 6111
	MTL W-BEAM GD FEN (TIM POST)	REMOVE METAL BEAM GUARD FENCE	GUARDRAIL END TREATMENT (INSTALL)	GUARDRAIL END TREATMENT (REMOVE)	WK ZN PAV MRK REMOV (REFL) TY II-A-A	WK ZN PAV MRK REMOV (W)4"(SLD)	WK ZN PAV MRK REMOV (Y)4"(SLD)	WK ZN PAV MRK SHT TERM (TAB)TY W	WK ZN PAV MRK SHT TERM (TAB)TY Y	WK ZN PAV MRK SHT TERM (TAB)TY Y-2
	LF	LF	EA	EA	EA	LF	LF	EA	EA	EA
SH54										
PHASE 1	1100		4							
PHASE 2					96	4000	1920			
PHASE 3		1100		4		3190	3290	100	100	100
PROJECT TOTALS	1100	1100	4	4	96	7190	5210	100	100	100

SUMMARY OF TCP ITEMS						
SHEET	677 6001	* 6001 6002	# 6056 6001	*6185 6002	* 6185 6005	*7148 6019
	ELIM EXT PAV MRK & MRKS (4")	PORTABLE CHANGEABLE MESSAGE SIGN	PREFORMED IN-LANE(TRANS) RUMBLE STRIP	TMA (STATIONARY)	TMA (MOBILE OPERATION)	FURNISH ADDITIONAL FLAGGER
	LF	EA	LF	DAY	DAY	HR
SH54		3		600	20	80
PHASE 1			216			
PHASE 2	1895					
PHASE 3						
PROJECT TOTALS	1895	3	216	600	20	80

\# REFER TO THE TCP LINE DIAGRAM FOR QUANTITIES TO REMAIN FOR THE DURATION OF THE PROJECT.

* TO BE USED AS DIRECTED BY THE ENGINEER

*** REFER TO TEMPORARY CULVERT EXTENSION DETAIL FOR QUANTITIES.

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SH 54 @ DIABLO CREEK

TCP
SUMMARY SHEET

SHEET 1 OF 1

		FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
DSN	OEI	6	SEE TITLE SHEET		9
CHK	OEI	STATE	DIST.	COUNTY	
DRN	OEI	TEXAS	ELP	CULBERSON	
CHK	OEI	CONT.	SECT.	JOB	HIGHWAY NO.
		0233	05	038	SH 54

SUMMARY OF EARTHWORK
DETOURS

STATION (SH54)	110	132
	6003	6002
	EXCAVATION (SPECIAL)	EMBANKMENT (FINAL)
	CY	CY
771+00	0	0
771+50	3	0
772+00	6	0
772+50	5	3
773+00	6	8
773+50	10	8
774+00	16	2
774+50	36	0
775+00	96	0
775+50	178	0
776+00	235	0
776+50	257	0
777+00	203	0
777+50	165	0
778+00	221	0
778+50	261	0
779+00	244	0
779+50	219	1
780+00	121	15
780+50	13	35
781+00	0	21
781+50	150	0
782+00	267	0
782+50	223	0
783+00	182	0
783+50	110	0
784+00	44	0
784+50	11	121
785+00	0	137
785+50	6	20
786+00	15	5
786+50	21	2
787+00	22	0
787+50	21	0
788+00	21	0
788+50	16	0
789+00	5	0
DETOUR TOTAL	3409	379

SUMMARY OF EARTHWORK
SH 54

STATION (SH54)	110	132	110
	6001	6002	6003
	EXCAVATION (ROADWAY)	EMBANKMENT (FINAL)	EXCAVATION (SPECIAL)
	CY	CY	CY
770+00.00 R1			
770+50.00 R1	174	0	149
771+00.00 R1	427	0	382
771+50.00 R1	519	3	486
772+00.00 R1	509	7	455
772+50.00 R1	429	4	269
773+00.00 R1	312	0	
773+50.00 R1	220	3	
774+00.00 R1	148	13	
774+50.00 R1	101	33	
775+00.00 R1	83	57	
775+50.00 R1	58	98	
776+00.00 R1	21	161	
776+50.00 R1	1	260	
777+00.00 R1	3	371	
777+50.00 R1	4	482	
778+00.00 R1	3	579	
778+50.00 R1	3	658	
779+00.00 R1	2	811	
779+50.00 R1	3	653	
780+00.00 R1	2	195	
780+50.00 R1	0	0	
781+00.00 R1	0	0	
781+50.00 R1	0	0	
782+00.00 R1	27	223	
782+50.00 R1	33	363	
783+00.00 R1	10	275	
783+50.00 R1	7	223	
784+00.00 R1	9	140	
784+50.00 R1	26	58	
785+00.00 R1	54	30	
785+50.00 R1	68	38	
786+00.00 R1	78	18	
786+50.00 R1	87	3	
787+00.00 R1	14	0	
TOTAL	3438	5760	1741

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SH 54 @ DIABLO CREEK

EARTHWORK QUANTITIES SUMMARY SHEET

SHEET 1 OF 1

		FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
DSN	OEI	6	SEE TITLE SHEET		10
CHK	OEI	STATE	DIST.	COUNTY	
DRN	OEI	TEXAS	ELP	CULBERSON	
CHK	OEI	CONT.	SECT.	JOB	HIGHWAY NO.
		0233	05	038	SH 54

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SUMMARY OF ROADWAY ITEMS										
SHEET	110 6001	110 6003	132 6002	* 216 6001	* 247 6121	275 6019	310 6001	354 6002	432 6010	432 6046
	EXCAVATION (ROADWAY)	EXCAVATION (SPECIAL)	EMBANKMENT (FINAL) (DENS CONT) (TY A)	PROOF ROLLING	FL BS (RDWY DEL) (TY A GR 1-2)	CEMENT TREAT (SUBGRADE) (6")	PRIME COAT (MULTI OPTION)	PLAN & TEXT ASPH CONC PAV (0" TO 2")	RIPRAP (CONC) (CL B) (5 IN)	RIPRAP (MOW STRIP) (5 IN)
	CY	CY	CY	HR	TON	SY	GAL	SY	CY	CY
SH54										
ON-SITE DETOUR P&P		3409	379		60					
ROADWAY PLAN & PROFILE	3112	1741	6896	40	41	5201	780	1728		91
PROJECT TOTALS	3112	5150	7275	40	101	5201	780	1728	0	91

SHEET	506 6032	540 6001	540 6006	540 6016	544 6001 *	700 6001*	3076 6026
	BLADING WORK (EROSION & SEDMT CONT)	MTL W-BEAM GD FEN (TIM POST)	MTL BEAM GD FEN TRANS (THRIE-BEAM)	DOWNSTREAM ANCHOR TERMINAL SECTION	GUARDRAIL END TREATMENT (INSTALL)	POTHOLE REPAIR (STANDARD)	D-GR HMA TY-C SAC-A PG70-22 (EXEMPT)
	HR	LF	EA	EA	EA	SY	TON
SH54							
ON-SITE DETOUR P&P							485
ROADWAY PLAN & PROFILE	80	1100	4	2	2	100	831
PROJECT TOTALS	80	1100	4	2	2	100	1316

* TO BE USED AT THE DISCRETION OF THE ENGINEER.

SUMMARY OF REMOVAL ITEMS						
SHEET	100 6001	105 6043	552 6001	644 6076	658 6060	677 6001
	## PREPARING ROW	REMOVING STAB BASE & ASPH PAV (0-6")	WIRE FENCE (TY A)	REMOVE SM RD SN SUP&AM	REMOVE DELIN & OBJECT MARKER ASSMS	ELIM EXT PAV MRK & MRKS (4")
	AC	SY		EA	EA	LF
REMOVAL LAYOUT SHEET 1 OF 2	5	4500	3600	6	4	978
REMOVAL LAYOUT SHEET 2 OF 2				1		1090
TOTALS	5	4500	3600	7	4	2068

EXISTING FENCE REMOVAL WILL BE PAID UNDER PREP ROW BID ITEM. THIS INCLUDES ALL MATERIALS, LABOR, DISPOSAL AND INCIDENTALS. ESTIMATED LENGTH TO BE REMOVED IS 3600 LF. ALL EXISTING POSTS MUST BE INCLUDED IN THE REMOVAL.

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SH 54 @ DIABLO CREEK

ROADWAY & REMOVALS SUMMARY SHEET

SHEET 1 OF 1

		FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
DSN	OEI	6	SEE TITLE SHEET		11
CHK	OEI	STATE	DIST.	COUNTY	
DRN	OEI	TEXAS	ELP	CULBERSON	
CHK	OEI	CONT.	SECT.	JOB	HIGHWAY NO.
		0233	05	038	SH 54

SUMMARY OF SHEET PILING ITEMS			
SHEET	132 6056	407 6006	432 6010
	EMBANKMENT (FINAL)(ORD COMP) (TY C2)(DS)	SHEET PILING (PZ-40)	RIPRAP (CONC)(CLB)(5IN)
	CY	SF	CY
SHEET 1 OF 5	16	5457	24
SHEET 2 OF 5	22	3848	17
SHEET 3 OF 5		2255	10
SHEET 4 OF 5		1692	10
SHEET 5 OF 5	40	1477	16
SHEET TOTALS	78	14729	77

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SHEET PILING SUMMARY SHEET

SHEET 1 OF 1

		FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
DSN	OEI	6	SEE TITLE SHEET		12
CHK	OEI	STATE	DIST.	COUNTY	
DRN	OEI	TEXAS	ELP	CULBERSON	
CHK	OEI	CONT.	SECT.	JOB	HIGHWAY NO.
		0233	05	038	SH 54

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SUMMARY OF PAVEMENT MARKINGS						
SHEET	533 6003	666 6342	666 6344	666 6345	672 6009	678 6001
	RUMBLE STRIPS (SHOULDER) ASPHALT	REF PROF PAV MRK TY I(W)4"(SLD)(100MIL)	REF PROF PAV MRK TY I(Y)4"(BRK)(100MIL)	REF PROF PAV MRK TY I(Y)4"(SLD)(100MIL)	REFL PAV MRKR TY II-A-A	PAV SURF PREP FOR MRK (4")
	LF	LF	LF	LF	EA	LF
SH54						
PAVEMENT MARKING LAYOUT						
1 OF 1	4,080	4,080	320	3,306	39	7,386
PROJECT TOTALS	4,080	4,080	320	3,306	39	7,386

SUMMARY OF SMALL SIGNS				
SHEET	644 6001	658 6061	658 6014	658 6103
	IN SM RD SN SUP&AM TY10BWG(1)SA(P)	INSTL DEL ASSM (D-SW)SZ 1(BRF)GF2	INSTL DEL ASSM (D-SW)SZ (BRF)CTB (BI)	INSTL OM ASSM (OM-3L)(WFLX)GN D)GND
	EA	EA	EA	EA
SH54				
SMALL SIGN LAYOUT				
1 OF 1	8	17	6	4
PROJECT TOTALS	8	17	6	4

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SIGNING & PAVEMENT MARKINGS SUMMARY SHEET

SHEET 1 OF 1

		FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
DSN	OEI	6	SEE TITLE SHEET		13
CHK	OEI	STATE	DIST.	COUNTY	
DRN	OEI	TEXAS	ELP	CULBERSON	
CHK	OEI	CONT.	SECT.	JOB	HIGHWAY NO.
		0233	05	038	SH 54

SUMMARY OF SWP3 ITEMS						
SHEET	506	506	506	506	506	506
	6002	6011	6020	6024	6038	6039
	ROCK FILTER DAMS (INSTALL) (TY 2)	ROCK FILTER DAMS (REMOVE)	CONSTRUCTION EXITS (INSTALL) (TY 1)	CONSTRUCTION EXITS (REMOVE)	TEMP SEDMT CONT FENCE (INSTALL)	TEMP SEDMT CONT FENCE (REMOVE)
	LF	LF	LF	LF	CY	CY
SWP3 Phase 1	15		110	110	4194	
SWP3 Phase 2			110	110		
SWP3 Phase 3		15	55	55		4194
PROJECT TOTALS	15	15	275	275	4194	4194

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SWP3 QUANTITIES SUMMARY SHEET

SHEET 1 OF 1

		FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
DSN	OEI	6	SEE TITLE SHEET		14
CHK	OEI	STATE	DIST.	COUNTY	
DRN	OEI	TEXAS	ELP	CULBERSON	
CHK	OEI	CONT.	SECT.	JOB	HIGHWAY NO.
		0233	05	038	SH 54

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PHASE 1: CONSTRUCT TEMPORARY DETOUR

- INSTALL APPLICABLE TRAFFIC CONTROL DEVICES AND PROJECT LIMITS SIGNS.
- INSTALL APPLICABLE BMP's
- INSTALL SHEET PILE
- INSTALL AND CONSTRUCT TEMPORARY DETOUR PAVEMENT
- INSTALL ONE-WAY TCP (PORTABLE TRAFFIC SIGNAL)

PHASE 2: CONSTRUCT PROPOSED BRIDGE STRUCTURE

- PLACE APPLICABLE TRAFFIC CONTROL DEVICES.
- PERFORM ROAD CLOSURE & DETOUR USING ONE-WAY TCP PORTABLE TRAFFIC SIGNAL.
- CONSTRUCT PROPOSED BRIDGE STRUCTURE AND APPROACHES.
- CONSTRUCT PROPOSED SB ROADWAY FROM STA 773+80.08 TO STA 786+57.00.
- COMPLETE CONSTRUCTION OF NB ROADWAY.

PHASE 3: REMOVE TEMPORARY DETOUR & COMPLETE SB

- PLACE APPLICABLE TRAFFIC CONTROL DEVICES.
- REMOVE LPCTB, MBGF AND SGT FROM TEMPORARY DETOUR
- REMOVE TEMPORARY DETOUR.
- COMPLETE SB ROADWAY FROM STA 770+00 TO STA 773+80.08.
- COMPLETE CHANNEL GRADING

PHASE 4: OPEN TO ULTIMATE OPERATION

- REMOVE TRAFFIC CONTROL DEVICES AND BMP's
- ALL ULTIMATE STRIPING TO BE REPLACED ACCORDING TO PROPOSED PAVEMENT MARKING PLANS UNDER MOBILE TCP.
- OPEN ALL MOVEMENTS TO ULTIMATE OPERATION.

SH 54 TCP STANDARDS SELECTION TABLE

TYPE OF WORK	TXDOT STANDARD	SUGGESTED USE	SHEET DIAGRAM
PHASE 1			
INSTALLATION OF SWP3/EROSION CONTROL MEASURES AND CONSTRUCTION OF TEMPORARY DETOUR AND WORKZONE STRIPING. INSTALL SHEET PILE. SET UP ONE-WAY TCP USING PORTABLE TRAFFIC SIGNAL.	WZ(BRK), TCP(2-1)-18, WZ(STPM), TCP(2-7), TCP(2-8)	SHOULDER CLOSURE AND PAVEMENT MARKINGS, CONSTRUCT DETOUR, SHEET PILE INSTALLATION, TEMP. CULVERT EXTENSION	TCP(2-1b), TCP(2-1c), TCP(2-7a), TCP(2-8b)
PHASE 2			
TEMPORARY DETOUR. THE MAINLANE CLOSURE IS FOR THE REMOVAL OF EXISTING PAVEMENT, CONSTRUCTION OF THE PROPOSED BRIDGE, APPROACHES AND REMAINING SHEET PILE.	LPCB-13, TCP(2-7)-18, TCP(2-8)-18, WZ(STPM), AND WZ(UL)	CLOSE MAIN LANE AND SHIFT TRAFFIC FROM MAIN LANE TRAFFIC TO DETOUR	TCP(2-7a) TCP(2-8b)
PHASE 3			
SH 54 SB MAINLANE COMPLETION.	LPCB-13, TCP(2-2)-18, TCP(2-8)-18, TCP(3-1), TCP(3-3)	MAINLANE CLOSURES, SHOULDER CLOSURES	TCP(2-2b), TCP(3-1b), TCP(3-3b)
PHASE 4			
REMOVAL OF PROJECT LIMITS SIGNS. TCP SIGNS AND SWP3/EROSION CONTROL MEASURES. ULTIMATE STRIPING	TCP(2-1)-18, TCP(3-1)	ROADWAY PAVEMENT MARKINGS, SHOULDER CLOSURES	TCP(2-1b), TCP(3-1b), TCP(3-3b)

NOTE:

1. REFER TO TCP LINE DIAGRAM FOR INFORMATION.

GENERAL NOTES FOR THE CONSTRUCTION SEQUENCE

1. ALL BEGINNING AND ENDING BARRICADES AND SIGNS ARE TO REMAIN IN PLACE FOR THE DURATION OF THE PROJECT.
2. THE CONTRACTOR SHALL PROVIDE FOR SAFE AND CONVENIENT INGRESS AND EGRESS TO THE CONSTRUCTION AREA.
3. THE CONTRACTOR MAY BE REQUIRED TO FURNISH ADDITIONAL BARRICADES, SIGNS, AND WARNING LIGHTS TO MAINTAIN TRAFFIC AND PROMOTE MOTORISTS SAFETY. ANY SUCH ADDITIONAL SIGNS AND BARRICADES SHALL BE CONSIDERED SUBSIDIARY TO ITEM 502.
4. ALL SIGNS SHALL BE NEW AND KEPT CLEAN FOR THE DURATION OF THE PROJECT.
5. SIGNS, PAVEMENT MARKINGS, CHANNELIZING DEVICES, AND OTHER TRAFFIC CONTROL DEVICES THAT ARE INCONSISTENT WITH INTENDED TRAVEL PATHS THROUGH THE PROJECT AREA SHALL BE REMOVED IMMEDIATELY. THIS WORK SHALL BE CONSIDERED SUBSIDIARY TO ITEM 502.
6. ALL TRAFFIC CONTROL DEVICES SHALL BE REMOVED WHEN NO LONGER NEEDED. WHEN WORK IS SUSPENDED FOR SHORT TIME PERIOD, ADVANCED WARNING SIGNS THAT ARE NO LONGER APPROPRIATE SHALL BE REMOVED FROM THE PROJECT AREA.
7. SHORT TERM FLEXIBLE REFLECTIVE ROADWAY TABS SHALL BE USED TO DELINEATE THE CENTERLINE FOR A MAXIMUM OF 14 DAYS. PERMANENT STRIPING SHALL THEN BE PLACED IN ACCORDANCE WITH ALL APPLICABLE STANDARDS. THE CONTRACTOR SHOULD BE AWARE, DEPENDING ON THE SEQUENCE OF CONSTRUCTION, THE STRIPING CREW MAY HAVE SEVERAL MOVE-INS. ALL SHORT TERM FLEXIBLE REFLECTIVE ROADWAY TABS SHALL BE REPLACED AS NEEDED WITHIN THAT 14 DAY PERIOD AT THE CONTRACTOR'S EXPENSE.
8. THE CONTRACTOR MAY SUBMIT AN ALTERNATE TCP AND/OR AN ALTERNATE SEQUENCE OF CONSTRUCTION, IN ADVANCE AND IN WRITING, SUBJECT TO THE APPROVAL OF THE ENGINEER. SUBMIT CONTRACTOR-PROPOSED TCP CHANGES, SIGNED AND SEALED BY A LICENSED PROFESSIONAL ENGINEER, FOR APPROVAL BY THE ENGINEER.

UNEVEN LANES

1. ANY VERTICAL OR NEAR VERTICAL LONGITUDINAL FACE EXCEEDING 1 INCH IN HEIGHT IN THE PAVEMENT SURFACE OPEN TO TRAFFIC AT THE END OF THE WORK DAY SHALL BE SLOPED A MINIMUM OF 3:1. TRANSVERSE FACES THAT ARE PRESENT AT THE END OF THE WORK DAY SHALL BE TAPERED IN A MANNER ACCEPTABLE TO THE ENGINEER.
2. SIGNING FOR UNEVEN LANES (CW8-11) SHOULD BE INSTALLED IN ADVANCE TO THE CONDITION AND REPEATED EVERY 1 MILE. SIGNS INSTALLED ALONG THE UNEVEN LANE CONDITION SHOULD BE SUPPLEMENTED WITH THE NEXT XX MILES SIGN (CW7-3aP) OR ADVISORY SPEED SIGN (CW13-1). SEE WZ(UL)-13 FOR ADDITIONAL DETAILS.
3. UNEVEN LANE SIGNS (CW8-11) SHALL BE ERECTED ON BOTH ENDS ON THE AREA WHERE THERE IS A DIFFERENCE IN ELEVATION BETWEEN ADJACENT LANES GREATER THAN ONE INCH.

PAVEMENT DROP-OFF

1. SIGNING FOR PAVEMENT DROP-OFF (CW8-9a) SHOULD BE INSTALLED IN ADVANCE OF THE CONDITION AND REPEATED EVERY 1 MILE. SIGNS INSTALLED ALONG THE PAVEMENT EDGE SHOULD BE SUPPLEMENTED WITH THE NEXT XX MILES SIGN (CW21-16) OR ADVISORY SPEED SIGN (SCW13-1).

DATE	BY	REV	REVISION

STATE OF TEXAS
R. CRUZ-RODRIGUEZ
82856
LICENSED
PROFESSIONAL ENGINEER
Rafael Cruz-Rodriguez, P.E.
09-27-2022

OMEGA ENGINEERS, INC.
8200 N MOPAC EXPRESSWAY, STE #280
AUSTIN, TEXAS 78759
OMEGAENGINEERS.COM
TX PE Firm Reg. No. F-2147
P:512 575 2288 F:281 647 9184

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SH 54 @ DIABLO CREEK

TCP NARRATIVE & STANDARD SELECTION TABLE

SHEET 1 OF 1

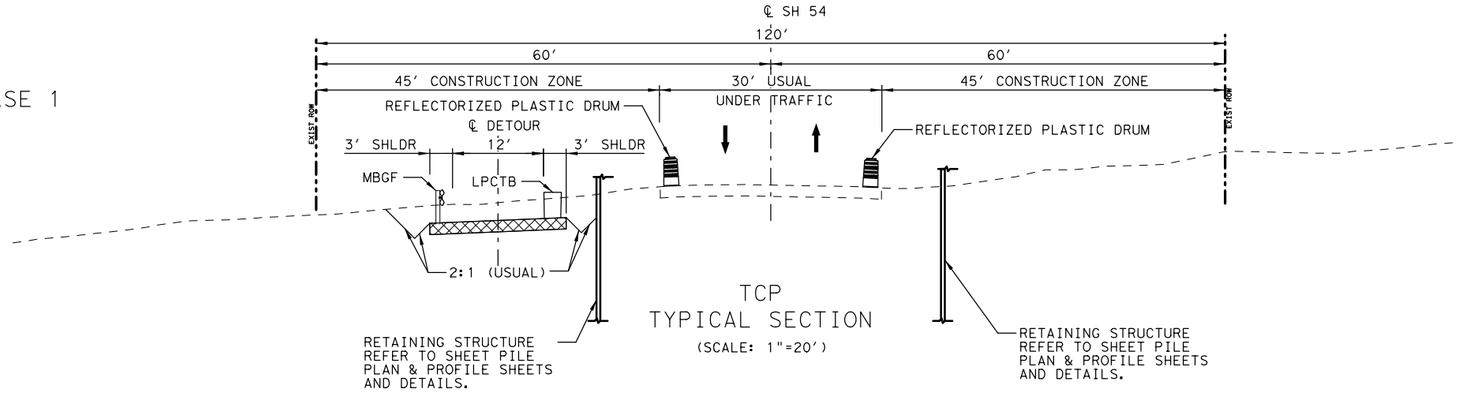
		FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
DSN	OEI	6	SEE TITLE SHEET		15
CHK	OEI	STATE	DIST.	COUNTY	
DRN	OEI	TEXAS	ELP	CULBERSON	
CHK	OEI	CONT.	SECT.	JOB	HIGHWAY NO.
		0233	05	038	SH 54

0 10 20
SCALE: 1"=20'

LEGEND

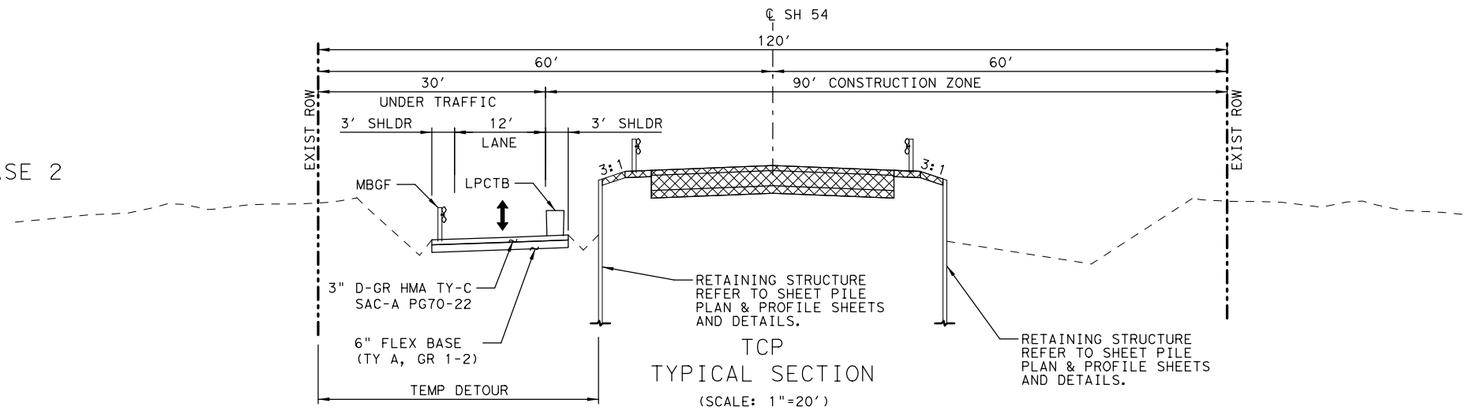
→ PROPOSED TRAFFIC FLOW

PHASE 1



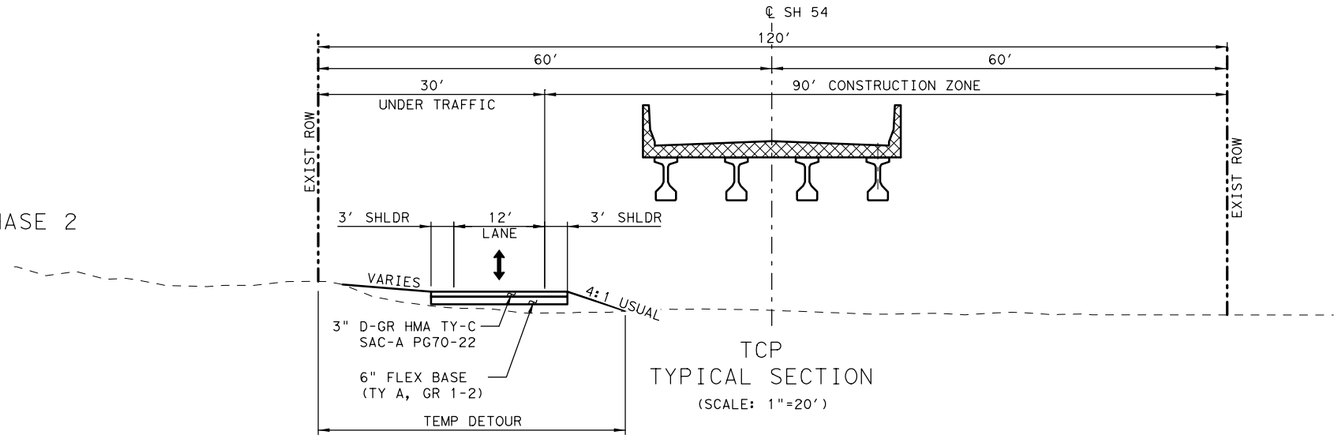
TCP
TYPICAL SECTION
(SCALE: 1"=20')

PHASE 2



TCP
TYPICAL SECTION
(SCALE: 1"=20')

PHASE 2



TCP
TYPICAL SECTION
(SCALE: 1"=20')

DATE	BY	REV	REVISION

STATE OF TEXAS
R. CRUZ-RODRIGUEZ
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Texas Department of Transportation®

SH 54 @ DIABLO CREEK

TCP
ON-SITE TEMPORARY DETOUR
TYPICAL SECTIONS

SHEET 1 OF 1

DSN	OEI	FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
CHK	OEI	6	SEE TITLE SHEET		16
DRN	OEI	STATE	DIST.	COUNTY	
CHK	OEI	TEXAS	ELP	CULBERSON	
		CONT.	SECT.	JOB	HIGHWAY NO.
		0233	05	038	SH 54

9/27/2022
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TWO WAY DETOUR

Beginning chain DET_W description

Point DETW01 N 10,442,366.2958 E 884,652.2651 Sta 770+00.00

Course from DETW01 to PC DET_W1 N 19° 41′ 37.88" W Dist 19.9376

		Curve Data		
Curve DET_W1				
P.I. Station	770+81.21	N 10,442,442.7517	E	884,624.8991
Delta =	5° 36′ 43.85" (LT)			
Degree =	4° 35′ 01.18"			
Tangent =	61.2684			
Length =	122.4388			
Radius =	1,250.0000			
External =	1.5006			
Long Chord =	122.3898			
Mid. Ord. =	1.4988			
P.C. Station	770+19.94	N 10,442,385.0672	E	884,645.5462
P.T. Station	771+42.38	N 10,442,498.1406	E	884,598.7098
C.C.		N 10,441,963.8242	E	883,468.6629
Back = N	19° 41′ 37.89" W			
Ahead = N	25° 18′ 21.73" W			
Chord Bear = N	22° 29′ 59.81" W			

Course from PT DET_W1 to PC DET_W2 N 25° 18′ 21.73" W Dist 245.5823

		Curve Data		
Curve DET_W2				
P.I. Station	774+49.23	N 10,442,775.5452	E	884,467.5455
Delta =	5° 36′ 43.84" (RT)			
Degree =	4° 35′ 01.18"			
Tangent =	61.2684			
Length =	122.4388			
Radius =	1,250.0000			
External =	1.5006			
Long Chord =	122.3898			
Mid. Ord. =	1.4988			
P.C. Station	773+87.96	N 10,442,720.1563	E	884,493.7349
P.T. Station	775+10.40	N 10,442,833.2298	E	884,446.8984
C.C.		N 10,443,254.4727	E	885,623.7818
Back = N	25° 18′ 21.73" W			
Ahead = N	19° 41′ 37.89" W			
Chord Bear = N	22° 29′ 59.81" W			

Course from PT DET_W2 to PC DET_W3 N 19° 41′ 37.89" W Dist 996.1701

		Curve Data		
Curve DET_W3				
P.I. Station	785+67.86	N 10,443,828.8352	E	884,090.5405
Delta =	5° 36′ 50.85" (RT)			
Degree =	4° 35′ 01.18"			
Tangent =	61.2896			
Length =	122.4812			
Radius =	1,250.0000			
External =	1.5017			
Long Chord =	122.4322			
Mid. Ord. =	1.4999			
P.C. Station	785+06.57	N 10,443,771.1306	E	884,111.1947
P.T. Station	786+29.05	N 10,443,888.2836	E	884,075.6304
C.C.		N 10,444,192.3735	E	885,288.0781
Back = N	19° 41′ 37.89" W			
Ahead = N	14° 04′ 47.04" W			
Chord Bear = N	16° 53′ 12.47" W			

Course from PT DET_W3 to PC DET_W4 N 14° 04′ 47.04" W Dist 245.4171

		Curve Data		
Curve DET_W4				
P.I. Station	789+35.73	N 10,444,185.7533	E	884,001.0230
Delta =	5° 36′ 43.06" (LT)			
Degree =	4° 35′ 01.18"			
Tangent =	61.2660			
Length =	122.4340			
Radius =	1,250.0000			
External =	1.5005			
Long Chord =	122.3851			
Mid. Ord. =	1.4987			
P.C. Station	788+74.47	N 10,444,126.3279	E	884,015.9273
P.T. Station	789+96.90	N 10,444,243.4364	E	883,980.3789
C.C.		N 10,443,822.2379	E	882,803.4797
Back = N	14° 04′ 47.04" W			
Ahead = N	19° 41′ 30.11" W			
Chord Bear = N	16° 53′ 08.57" W			

Course from PT DET_W4 to DETW02 N 19° 41′ 30.12" W Dist 3.0977

Point DETW02 N 10,444,246.3530 E 883,979.3351 Sta 790+00.00

Ending chain DET_W description

DATE	BY	REV	REVISION

STATE OF TEXAS
R. CRUZ-RODRIGUEZ
82856
LICENSED
PROFESSIONAL ENGINEER

Rafael Cruz-Rodriguez, P.E.

09-27-2022

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SH 54 @ DIABLO CREEK

ON-SITE TEMPORARY DETOUR
HORIZONTAL ALIGNMENT DATA

SHEET 1 OF 1

		FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
DSN	OEI	6	SEE TITLE SHEET		17
CHK	OEI	STATE	DIST.	COUNTY	
DRN	OEI	TEXAS	ELP	CULBERSON	
CHK	OEI	CONT.	SECT.	JOB	HIGHWAY NO.
		0233	05	038	SH 54

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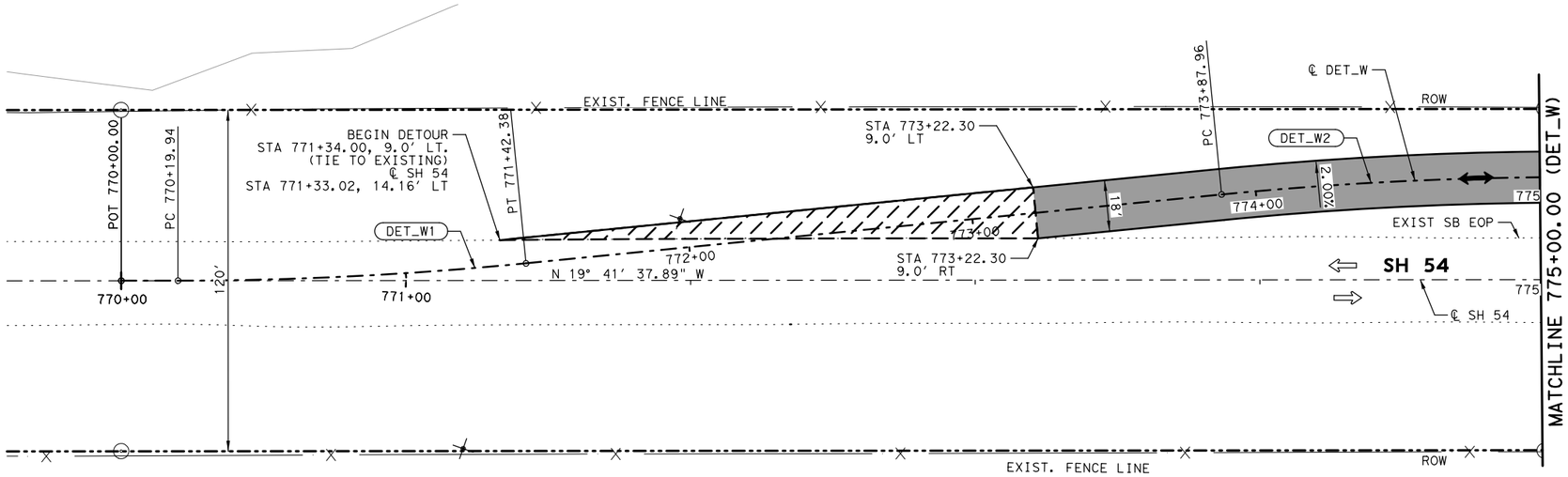
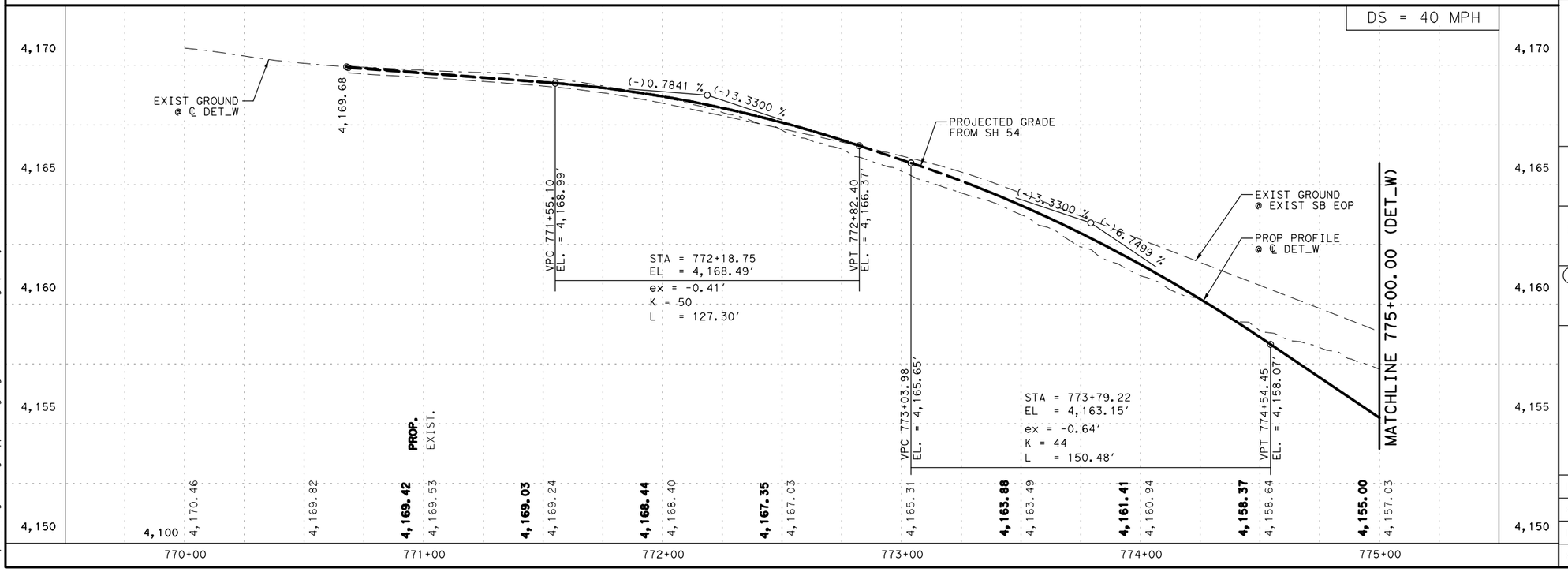
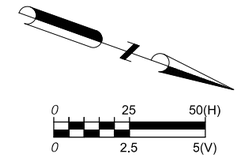
Curve Data					
Curve DET_W1					
P.I. Station	770+81.21	N	10,442,448.4353	E	884,623.4953
Delta =	5° 36′ 43.84" (LT)				
Degree =	4° 35′ 01.18"				
Tangent =	61.2684				
Length =	122.4388				
Radius =	1,250.0000				
External =	1.5006				
Long Chord =	122.3898				
Mid. Ord. =	1.4988				
P.C. Station	770+19.94	N	10,442,390.7497	E	884,644.1396
P.T. Station	771+42.38	N	10,442,503.8255	E	884,597.3087
C.C.		N	10,441,969.5646	E	883,467.2356
Back = N	19° 41′ 27.76" W				
Ahead = N	25° 18′ 11.60" W				
Chord Bear = N	22° 29′ 49.68" W				

Curve Data					
Curve DET_W2					
P.I. Station	774+49.23	N	10,442,775.5452	E	884,467.5455
Delta =	5° 36′ 43.84" (RT)				
Degree =	4° 35′ 01.18"				
Tangent =	61.2684				
Length =	122.4388				
Radius =	1,250.0000				
External =	1.5006				
Long Chord =	122.3898				
Mid. Ord. =	1.4988				
P.C. Station	773+87.96	N	10,442,720.1563	E	884,493.7349
P.T. Station	775+10.40	N	10,442,833.2298	E	884,446.8984
C.C.		N	10,443,254.4727	E	885,623.7818
Back = N	25° 18′ 21.73" W				
Ahead = N	19° 41′ 37.89" W				
Chord Bear = N	22° 29′ 59.81" W				







LEGEND

- EXISTING TRAFFIC
- PROPOSED TRAFFIC
- DIRECTION OF FLOW
- PROPOSED TEMPORARY PAVEMENT
- EXIST PAVEMENT WIDENING

NOTES:

1. REFER TO REMOVAL LAYOUTS FOR INFORMATION ON ITEMS TO BE REMOVED.
2. REFER TO CROSS SECTIONS FOR SIDE SLOPES AND CROSS-SLOPES.

DATE	BY	REV	REVISION

STATE OF TEXAS
R. CRUZ-RODRIGUEZ
82856
LICENSED
PROFESSIONAL
Rafael Cruz-Rodriguez, P.E.
09-27-2022

OMEGA ENGINEERS, INC.
8200 N MOPAC EXPRESSWAY, STE #280
AUSTIN, TEXAS 78759
OMEGAENGINEERS.COM
TX PE Firm Reg. No. F-2147
P:512 575 2288 F:281 647 9184

Texas Department of Transportation®

SH 54 @ DIABLO CREEK

ON-SITE TEMPORARY DETOUR PLAN & PROFILE

STA 770+00 TO STA 775+00

SHEET 1 OF 4

		FED.RD. DIV.NO.	PROJECT NO.	SHEET NO.
DSN	OEI	6	SEE TITLE SHEET	18
CHK	OEI	STATE	DIST.	COUNTY
DRN	OEI	TEXAS	ELP	CULBERSON
CHK	OEI	CONT.	SECT.	JOB / HIGHWAY NO.
		0233	05	038 / SH 54

9/27/2022
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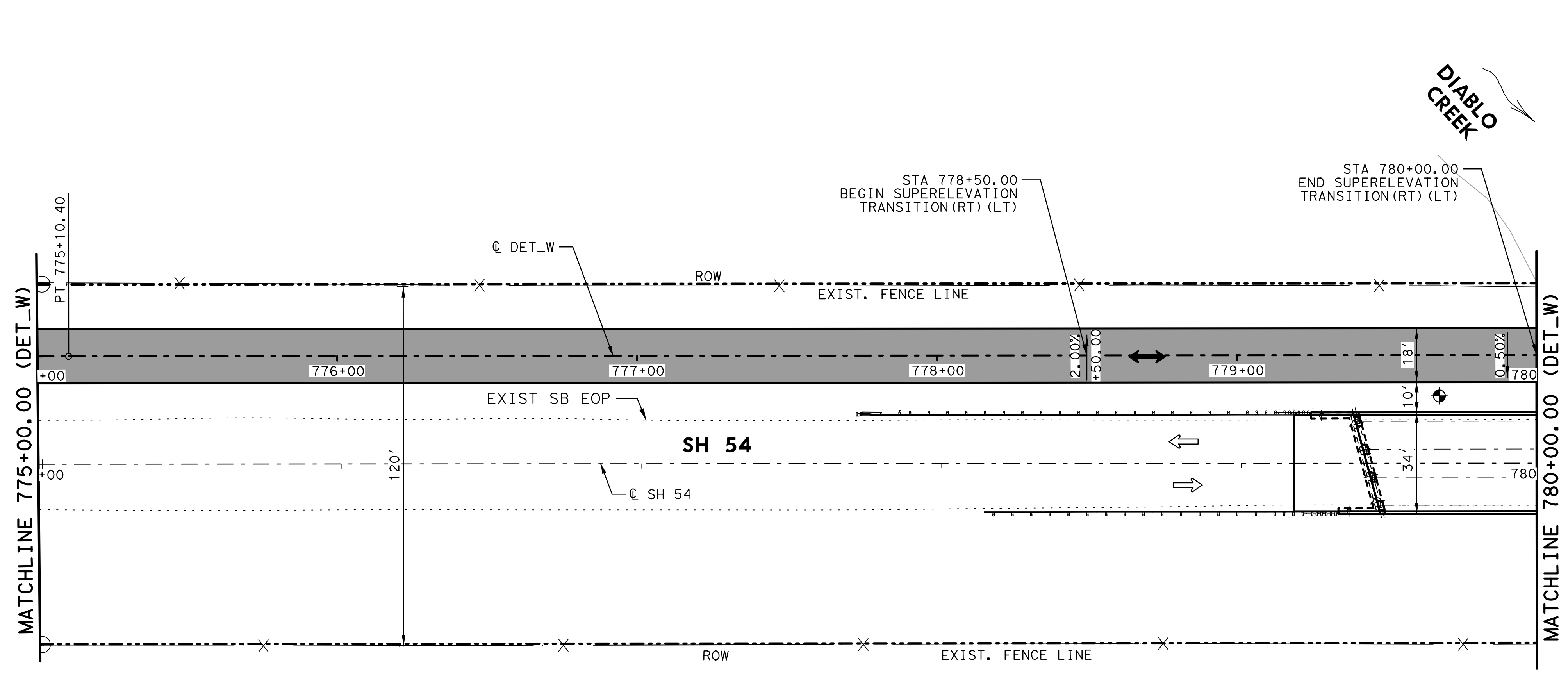


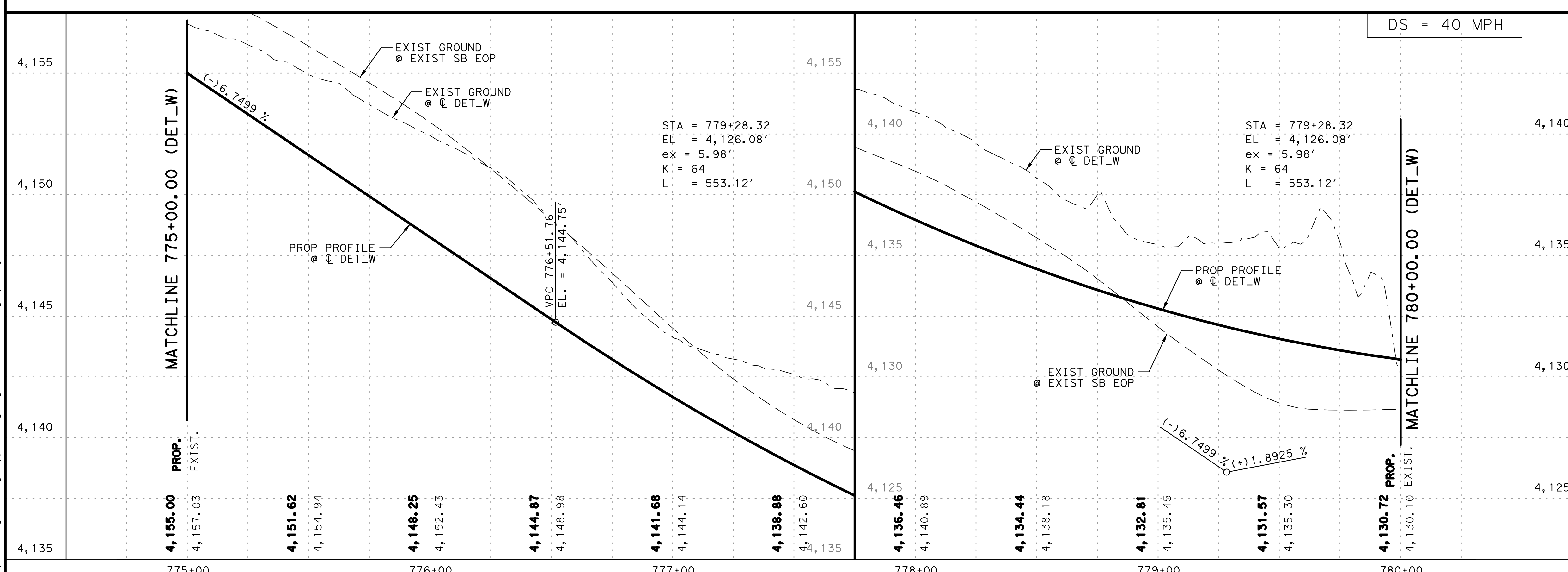
LEGEND

- EXISTING TRAFFIC
- PROPOSED TRAFFIC
- DIRECTION OF FLOW
- PROPOSED TEMPORARY PAVEMENT
- EXIST PAVEMENT WIDENING

Scale: 0, 25, 50(H); 0, 2.5, 5(V)

NOTES:

1. REFER TO REMOVAL LAYOUTS FOR INFORMATION ON ITEMS TO BE REMOVED.
2. REFER TO CROSS SECTIONS FOR SIDE SLOPES AND CROSS-SLOPES.



DATE	BY	REV	REVISION

STATE OF TEXAS
R. CRUZ-RODRIGUEZ
82856
LICENSED PROFESSIONAL ENGINEER

Rafael Cruz-Rodriguez, P.E.
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SH 54 @ DIABLO CREEK

ON-SITE TEMPORARY DETOUR PLAN & PROFILE

STA 775+00 TO STA 780+00

DSN	OEI	FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
		6	SEE TITLE SHEET		19
CHK	OEI	STATE	DIST.	COUNTY	
		TEXAS	ELP	CULBERSON	
DRN	OEI	CONT.	SECT.	JOB	HIGHWAY NO.
CHK	OEI	0233	05	038	SH 54

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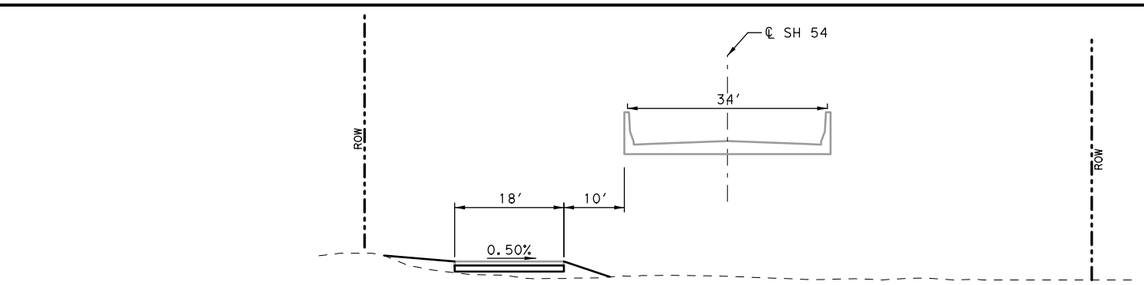
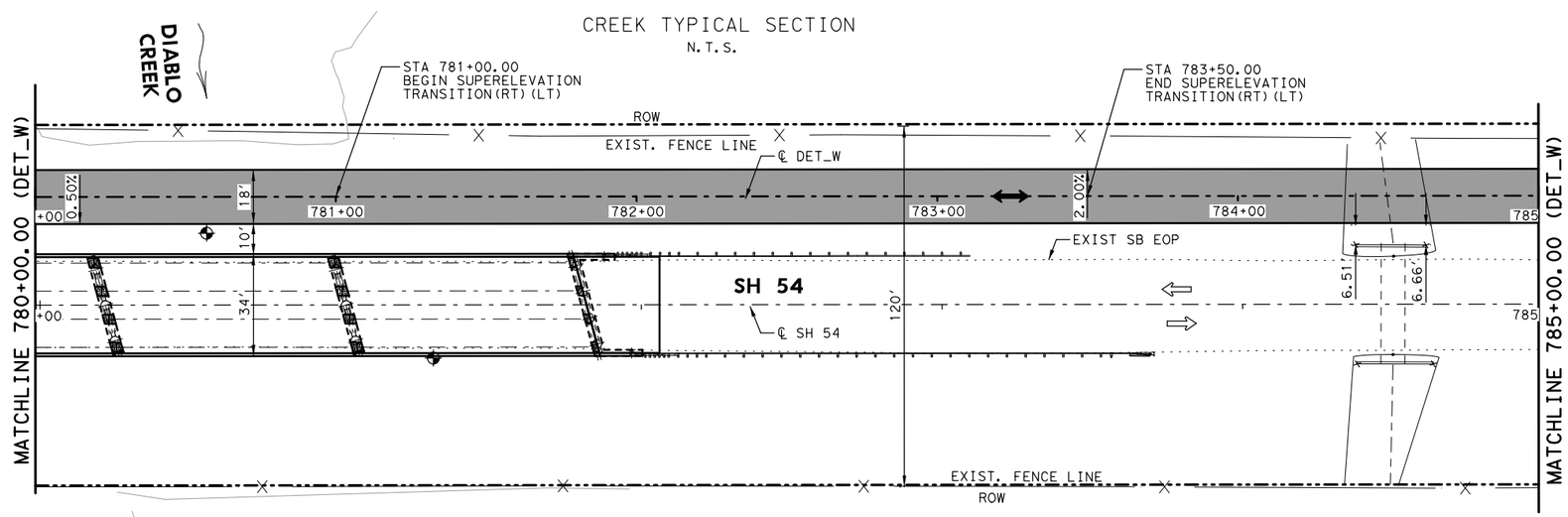
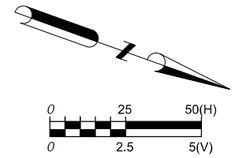


CREEK TYPICAL SECTION
N.T.S.



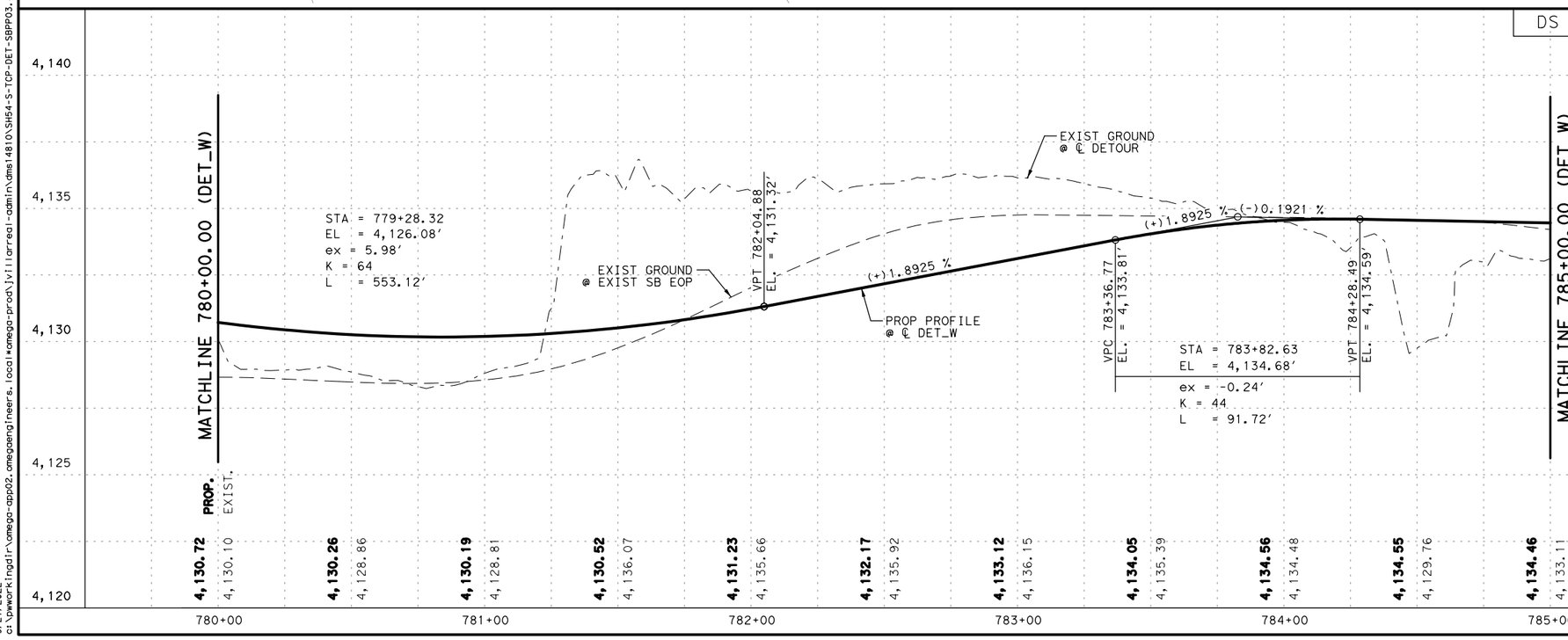


LEGEND

- EXISTING TRAFFIC
- PROPOSED TRAFFIC
- DIRECTION OF FLOW
- PROPOSED TEMPORARY PAVEMENT
- EXIST PAVEMENT WIDENING

NOTES:

1. REFER TO REMOVAL LAYOUTS FOR INFORMATION ON ITEMS TO BE REMOVED.
2. REFER TO CROSS SECTIONS FOR SIDE SLOPES AND CROSS-SLOPES.



DATE	BY	REV	REVISION

STATE OF TEXAS
R. CRUZ-RODRIGUEZ
82856
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Rafael Cruz-Rodriguez, P.E.
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SH 54 @ DIABLO CREEK

ON-SITE TEMPORARY DETOUR PLAN & PROFILE

STA 780+00 TO STA 785+00

SHEET 3 OF 4

		FED. RD. DIV. NO.	PROJECT NO.	SHEET NO.
DSN	OEI	6	SEE TITLE SHEET	20
CHK	OEI	STATE	DIST.	COUNTY
DRN	OEI	TEXAS	ELP	CULBERSON
CHK	OEI	CONT.	SECT.	JOB / HIGHWAY NO.
		0233	05	038 / SH 54

9/27/2022
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Curve Data

Curve DET_W3					
P.I. Station	785+67.86	N	10,443,828.8352	E	884,090.5405
Delta =	5° 36′ 50.85" (RT)				
Degree =	4° 35′ 01.18"				
Tangent =	61.2896				
Length =	122.4812				
Radius =	1,250.0000				
External =	1.5017				
Long Chord =	122.4322				
Mid. Ord. =	1.4999				
P.C. Station	785+06.57	N	10,443,771.1306	E	884,111.1947
P.T. Station	786+29.05	N	10,443,888.2836	E	884,075.6304
C.C.		N	10,444,192.3735	E	885,288.0781
Back = N 19° 41′ 37.89" W					
Ahead = N 14° 04′ 47.04" W					
Chord Bear = N 16° 53′ 12.47" W					

Curve Data

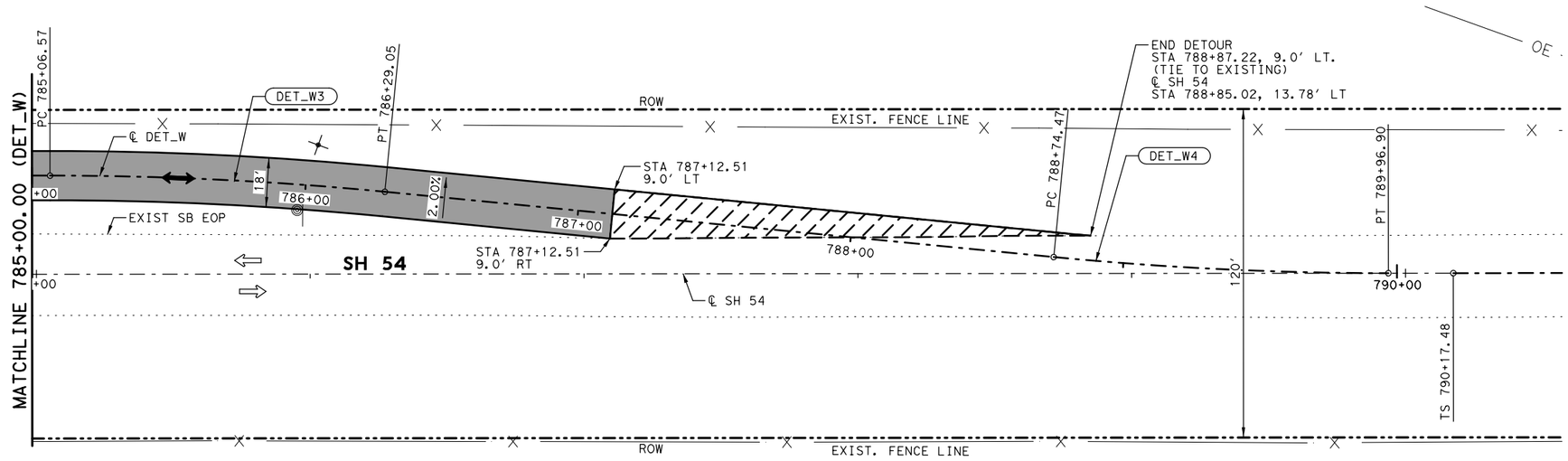
Curve DET_W4					
P.I. Station	789+35.73	N	10,444,185.7533	E	884,001.0230
Delta =	5° 36′ 43.06" (LT)				
Degree =	4° 35′ 01.18"				
Tangent =	61.2660				
Length =	122.4340				
Radius =	1,250.0000				
External =	1.5005				
Long Chord =	122.3851				
Mid. Ord. =	1.4987				
P.C. Station	788+74.47	N	10,444,126.3279	E	884,015.9273
P.T. Station	789+96.90	N	10,444,243.4364	E	883,980.3789
C.C.		N	10,443,822.2379	E	882,803.4797
Back = N 14° 04′ 47.04" W					
Ahead = N 19° 41′ 30.11" W					
Chord Bear = N 16° 53′ 08.57" W					

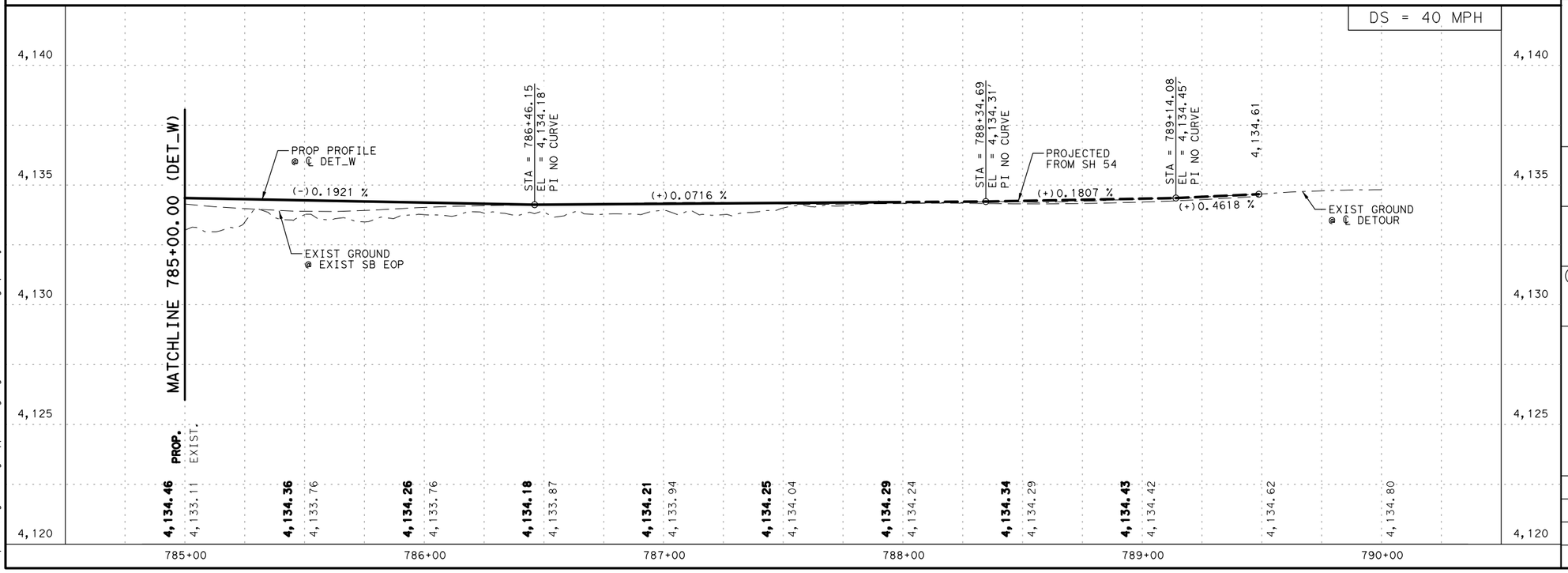
LEGEND

- EXISTING TRAFFIC
- PROPOSED TRAFFIC
- DIRECTION OF FLOW
- PROPOSED TEMPORARY PAVEMENT
- EXIST PAVEMENT WIDENING

NOTES:

1. REFER TO REMOVAL LAYOUTS FOR INFORMATION ON ITEMS TO BE REMOVED.
2. REFER TO CROSS SECTIONS FOR SIDE SLOPES AND CROSS-SLOPES.





DATE	BY	REV	REVISION

STATE OF TEXAS
R. CRUZ-RODRIGUEZ
82856
LICENSED
PROFESSIONAL ENGINEER

Rafael Cruz-Rodriguez, P.E.

09-27-2022

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Texas Department of Transportation®

SH 54 @ DIABLO CREEK

ON-SITE TEMPORARY DETOUR PLAN & PROFILE

STA 785+00 TO STA 790+00

SHEET 4 OF 4

DSN	OEI	FED. RD. DIV. NO.	PROJECT NO.	SHEET NO.
CHK	OEI	6	SEE TITLE SHEET	21
DRN	OEI	STATE	DIST.	COUNTY
CHK	OEI	TEXAS	ELP	CULBERSON
		CONT.	SECT.	JOB / HIGHWAY NO.
		0233	05	038 / SH 54

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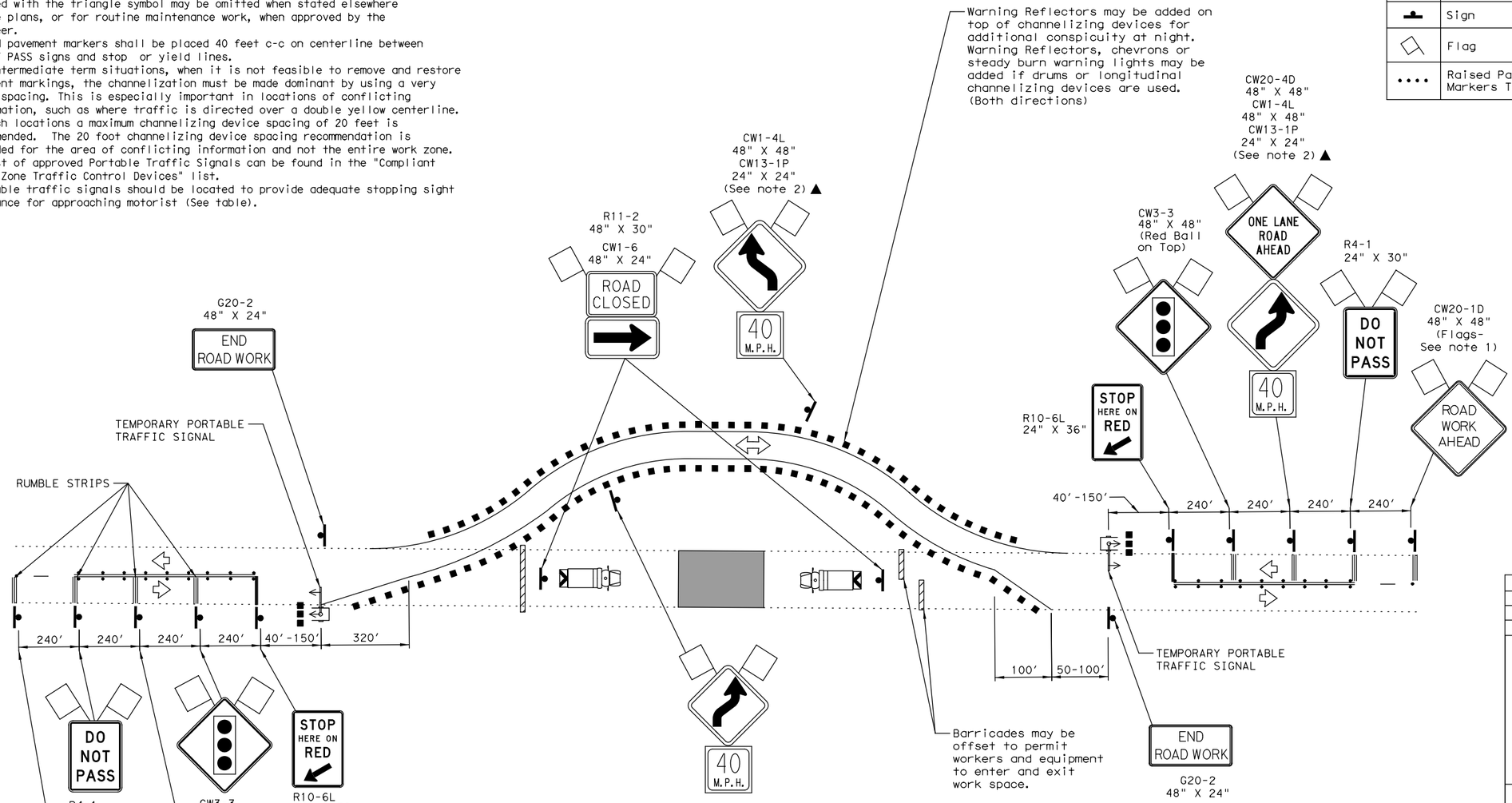
GENERAL NOTES

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. Raised pavement markers shall be placed 40 feet c-c on centerline between DO NOT PASS signs and stop or yield lines.
4. For intermediate term situations, when it is not feasible to remove and restore pavement markings, the channelization must be made dominant by using a very close spacing. This is especially important in locations of conflicting information, such as where traffic is directed over a double yellow centerline. In such locations a maximum channelizing device spacing of 20 feet is recommended. The 20 foot channelizing device spacing recommendation is intended for the area of conflicting information and not the entire work zone.
5. A list of approved Portable Traffic Signals can be found in the "Compliant Work Zone Traffic Control Devices" list.
6. Portable traffic signals should be located to provide adequate stopping sight distance for approaching motorist (See table).

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



Posted Speed ✳	Formula	Minimum Desirable Taper Lengths ✳✳ 10′ Offset	11′ Offset	12′ Offset	Suggested Maximum Spacing of Channelizing Devices: On a Taper	On a Tangent	Minimum Sign Spacing "X" Distance	Suggested Longitudinal Buffer Space "B"
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
			✓	✓

NOTES:

1. CONTRACTOR TO PROVIDE ACCESS TO CONSTRUCTION PLAN PRIOR TO STARTING CONSTRUCTION.
2. PLAN SHALL BE APPROVED BY ENGINEER PRIOR TO STARTING CONSTRUCTION.

WHEN IT IS ANTICIPATED THAT A STORM EVENT MIGHT BE IMPACTING THE JOB SITE, CONTRACTOR IS TO REMOVE CHANNELIZING DEVICES THAT ARE ALONG THE MAINSTREAM CHANNEL. THIS IS TO AVOID DEVICES BEING WASHED OUT AND IMPACT DOWNSTREAM PROPERTIES.

REFER TO TCP(2-7a) and TCP(2-8b) FOR ADDITIONAL INFORMATION

DATE	BY	REV	REVISION

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SH 54 @ DIABLO CREEK

TCP LINE DIAGRAM FOR ONE LANE TWO-WAY TCP

DSN	OEI	FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
CHK	OEI	6	SEE TITLE SHEET		22
DRN	OEI	STATE	DIST.	COUNTY	
CHK	OEI	TEXAS	ELP	CULBERSON	
		CONT.	SECT.	JOB	HIGHWAY NO.
		0233	05	038	SH 54

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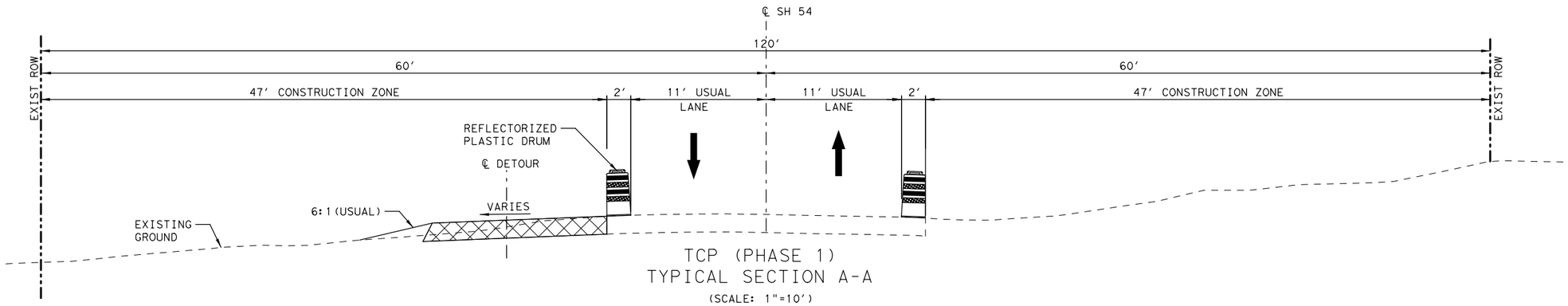
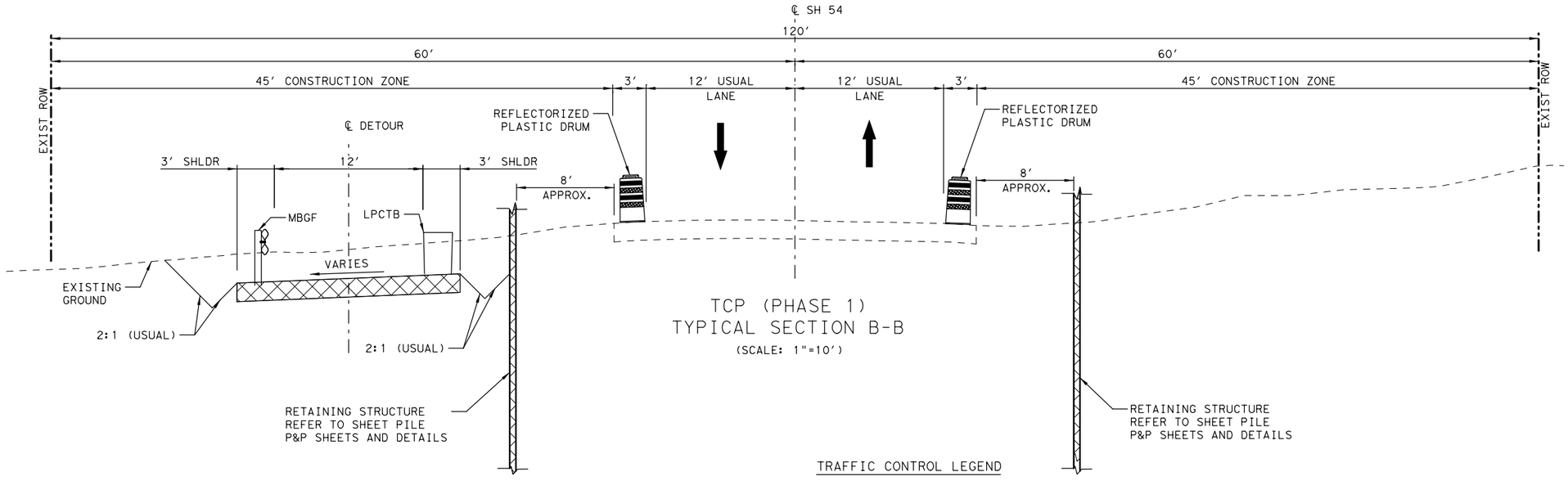


TCP (PHASE 1)
TYPICAL SECTION A-A
(SCALE: 1"=10′)



TCP (PHASE 1)
TYPICAL SECTION B-B
(SCALE: 1"=10′)

TRAFFIC CONTROL LEGEND

- EXISTING TRAFFIC FLOW
- PROPOSED TRAFFIC FLOW
- CONSTRUCTION THIS PHASE
- PVMT. CONSTRUCTED IN PREVIOUS PHASE
- TYPE III BARRICADE
- CHANNELIZING DEVICE (PLASTIC BARRELS/DRUMS)
- LOW PROFILE CONCRETE BARRIER (LPCB)
- TEMPORARY PORTABLE TRAFFIC SIGNAL

DATE	BY	REV	REVISION

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SH 54 @ DIABLO CREEK

TRAFFIC CONTROL PLAN PHASE 1

SHEET 1 OF 2

		FED.RD. DIV.NO.	PROJECT NO.	SHEET NO.
DSN	OEI	6	SEE TITLE SHEET	23
CHK	OEI	STATE	DIST.	COUNTY
DRN	OEI	TEXAS	ELP	CULBERSON
CHK	OEI	CONT.	SECT.	JOB / HIGHWAY NO.
		0233	05	038 / SH 54

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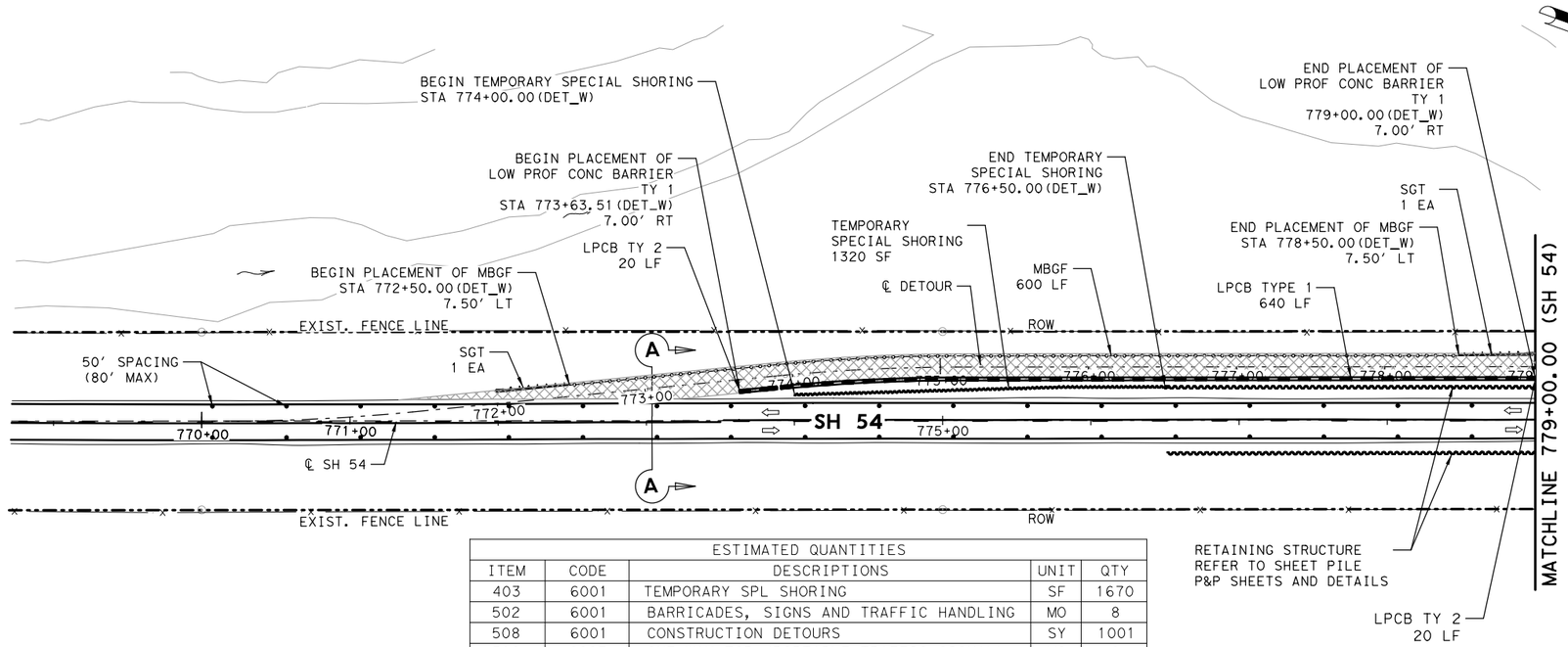
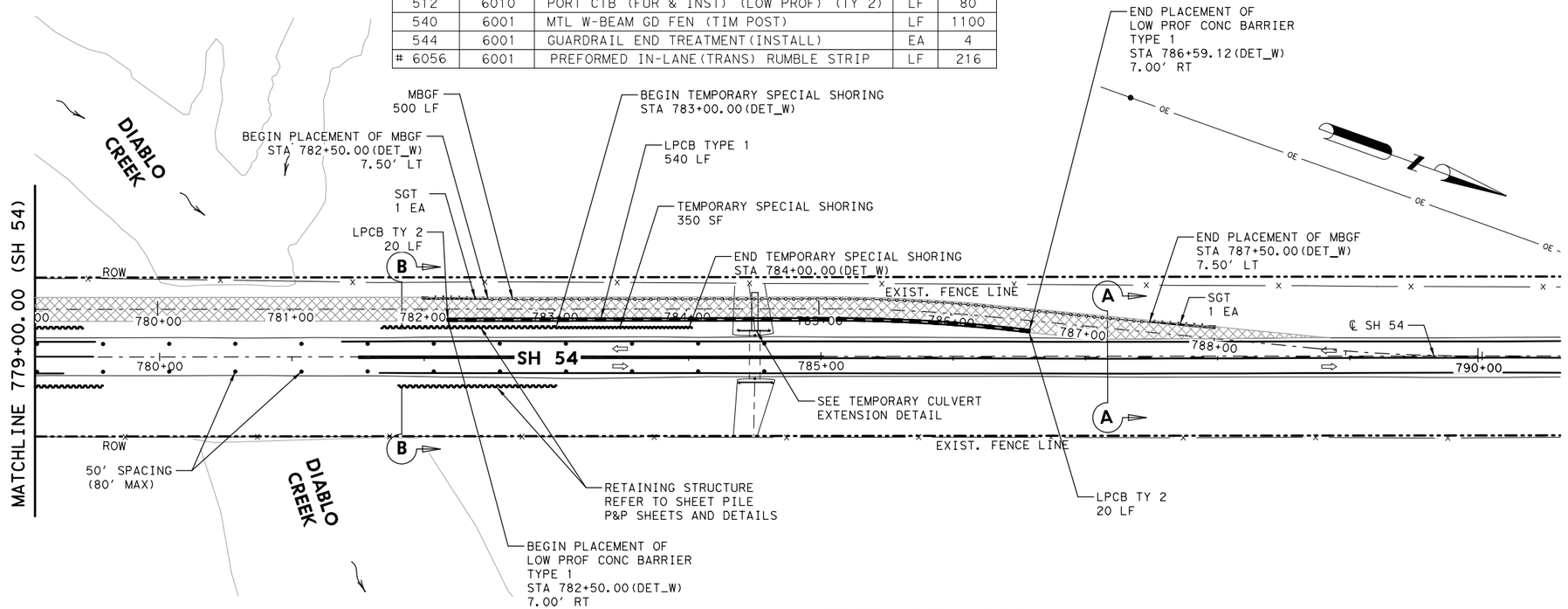


0 50 100
SCALE: 1"=100'

NOTES:

1. REFER TO TCP LINE DIAGRAM SHEET FOR LOCATION AND QUANTITY OF PREFORMED IN-LANE(TRANS) RUMBLE STRIP.
2. QUANTITY SHOWN ON THIS SHEET FOR TABULATION PURPOSES.
3. REFER TO TCP TYPICAL SECTIONS FOR STRIPING.

ESTIMATED QUANTITIES				
ITEM	CODE	DESCRIPTIONS	UNIT	QTY
403	6001	TEMPORARY SPL SHORING	SF	1670
502	6001	BARRICADES, SIGNS AND TRAFFIC HANDLING	MO	8
508	6001	CONSTRUCTION DETOURS	SY	1001
510	6003	ONE WAY TCP (PORTABLE TRAFFIC SIGNAL)	MO	8
512	6009	PORT CTB (FUR & INST) (LOW PROF) (TY 1)	LF	980
512	6010	PORT CTB (FUR & INST) (LOW PROF) (TY 2)	LF	80
540	6001	MTL W-BEAM GD FEN (TIM POST)	LF	1100
544	6001	GUARDRAIL END TREATMENT(INSTALL)	EA	4
# 6056	6001	PREFORMED IN-LANE(TRANS) RUMBLE STRIP	LF	216



TRAFFIC CONTROL LEGEND

- EXISTING TRAFFIC FLOW
- PROPOSED TRAFFIC FLOW
- CONSTRUCTION THIS PHASE
- PVMT. CONSTRUCTED IN PREVIOUS PHASE
- H TYPE III BARRICADE
- • CHANNELIZING DEVICE (PLASTIC BARRELS/DRUMS)
- LOW PROFILE CONCRETE BARRIER (LPCB)
- TEMPORARY PORTABLE TRAFFIC SIGNAL

DATE	BY	REV	REVISION

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SH 54 @ DIABLO CREEK

TRAFFIC CONTROL PLAN
PHASE 1

SHEET 2 OF 2

		FED.RD. DIV.NO.	PROJECT NO.	SHEET NO.
DSN	OEI	6	SEE TITLE SHEET	24
CHK	OEI	STATE	DIST.	COUNTY
DRN	OEI	TEXAS	ELP	CULBERSON
CHK	OEI	CONT.	SECT.	JOB / HIGHWAY NO.
		0233	05	038 / SH 54

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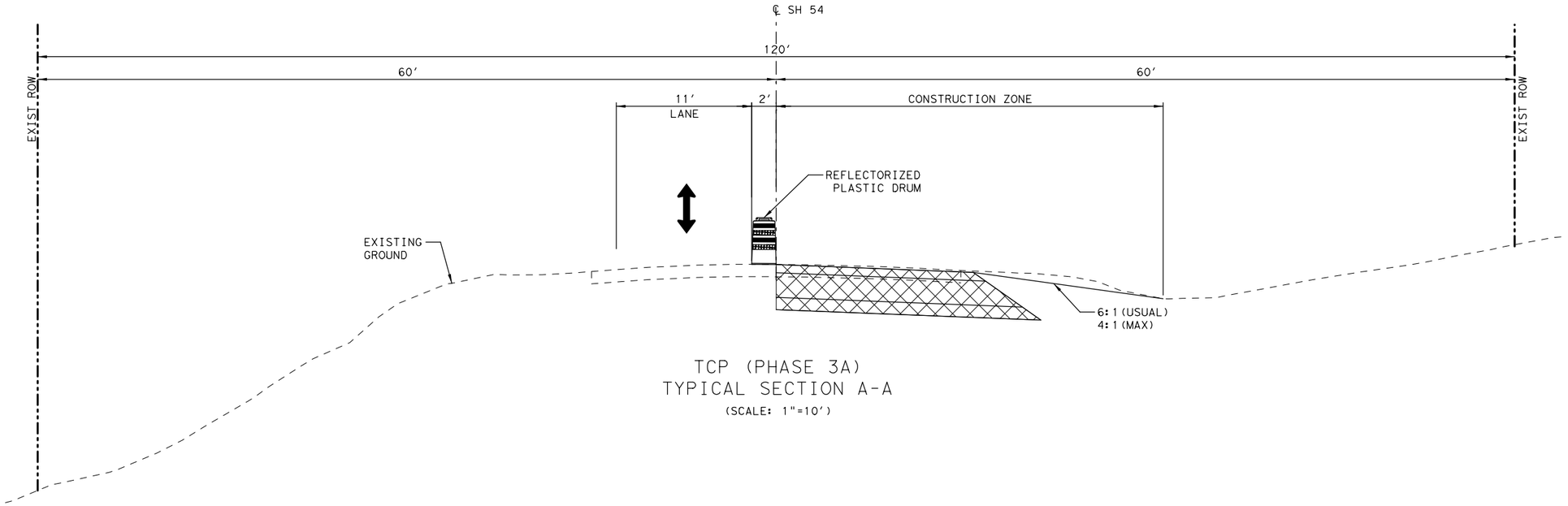

TCP (PHASE 3A)
TYPICAL SECTION A-A
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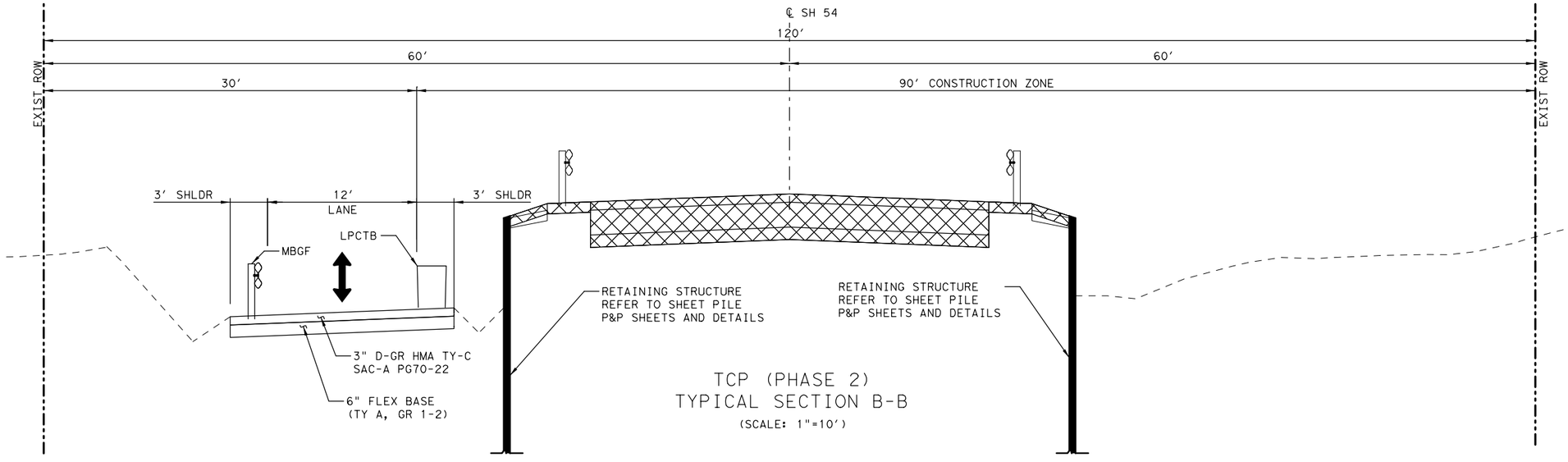

TCP (PHASE 2)
TYPICAL SECTION B-B
(SCALE: 1"=10′)

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TRAFFIC CONTROL PLAN
PHASE 2

SHEET 1 OF 3

		FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
DSN	OEI	6	SEE TITLE SHEET		25
CHK	OEI	STATE	DIST.	COUNTY	
DRN	OEI	TEXAS	ELP	CULBERSON	
CHK	OEI	CONT.	SECT.	JOB	HIGHWAY NO.
		0233	05	038	SH 54

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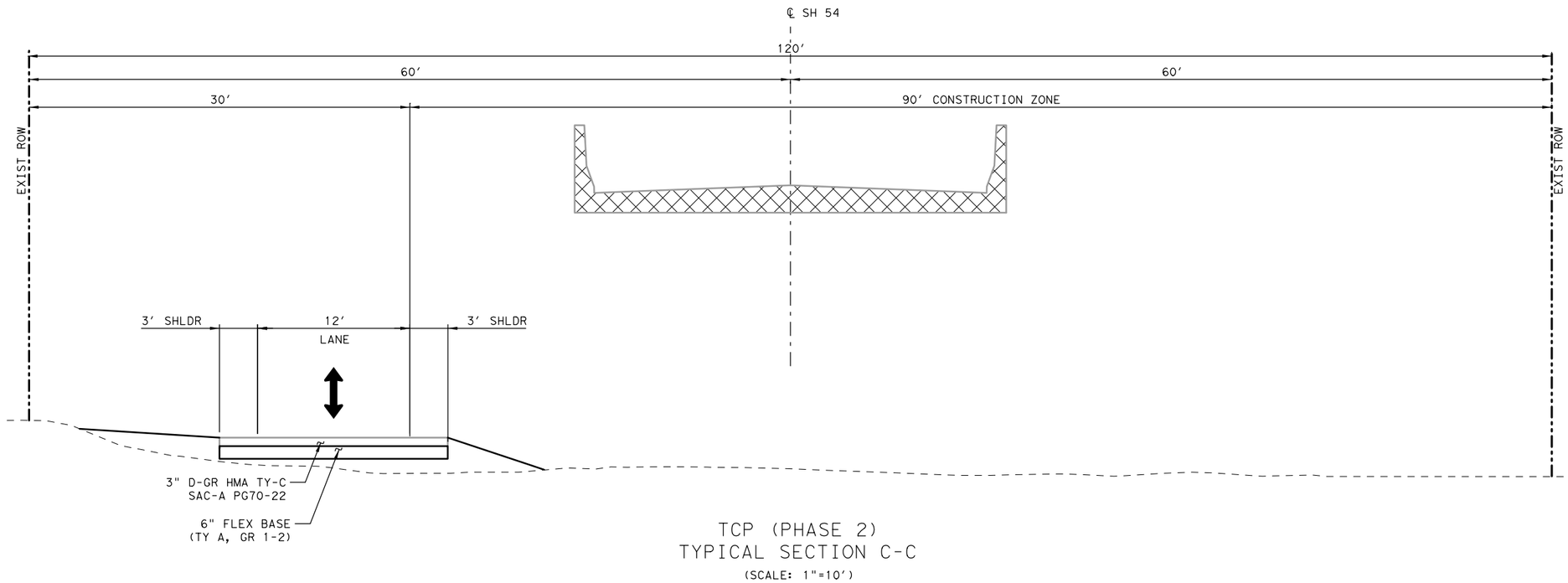

TCP (PHASE 2)
TYPICAL SECTION C-C
(SCALE: 1"=10′)

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SH 54 @ DIABLO CREEK

TRAFFIC CONTROL PLAN
PHASE 2

SHEET 2 OF 3

		FED.RD. DIV.NO.	PROJECT NO.	SHEET NO.
DSN	OEI	6	SEE TITLE SHEET	26
CHK	OEI	STATE	DIST.	COUNTY
DRN	OEI	TEXAS	ELP	CULBERSON
CHK	OEI	CONT.	SECT.	JOB / HIGHWAY NO.
		0233	05	038 / SH 54

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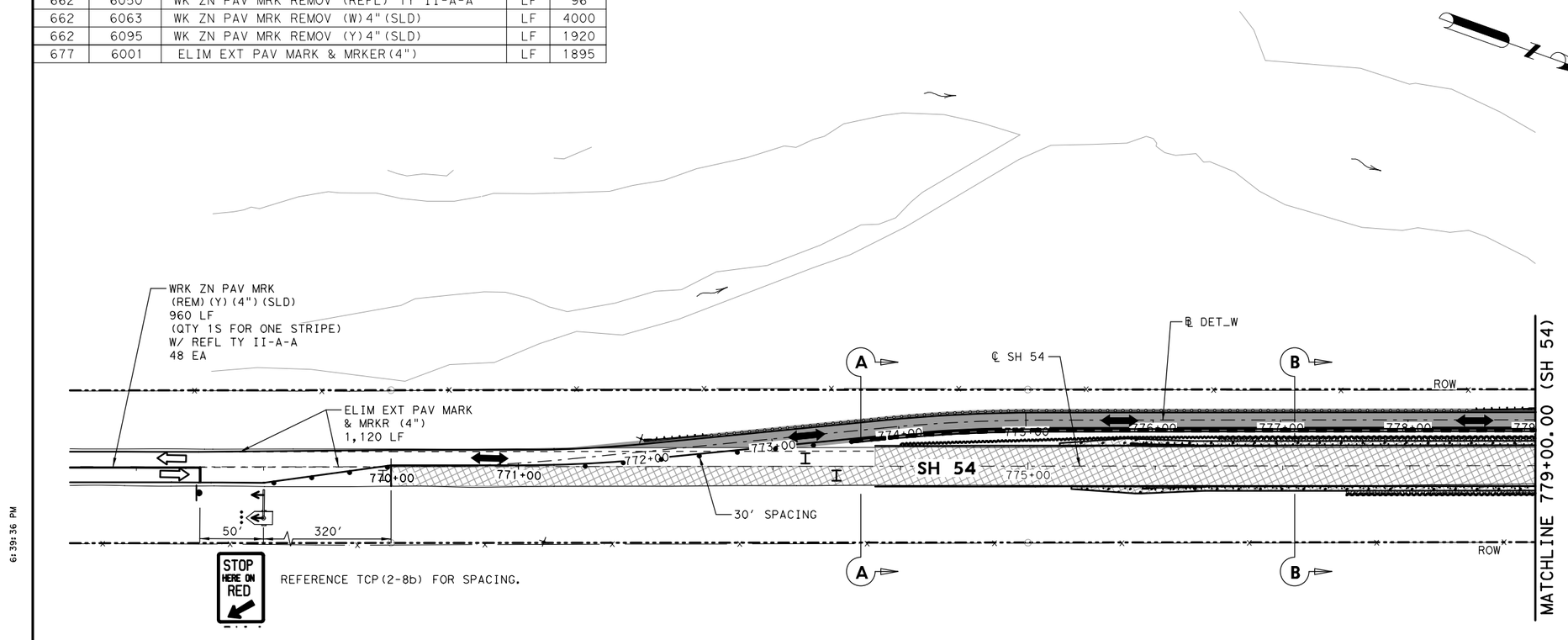
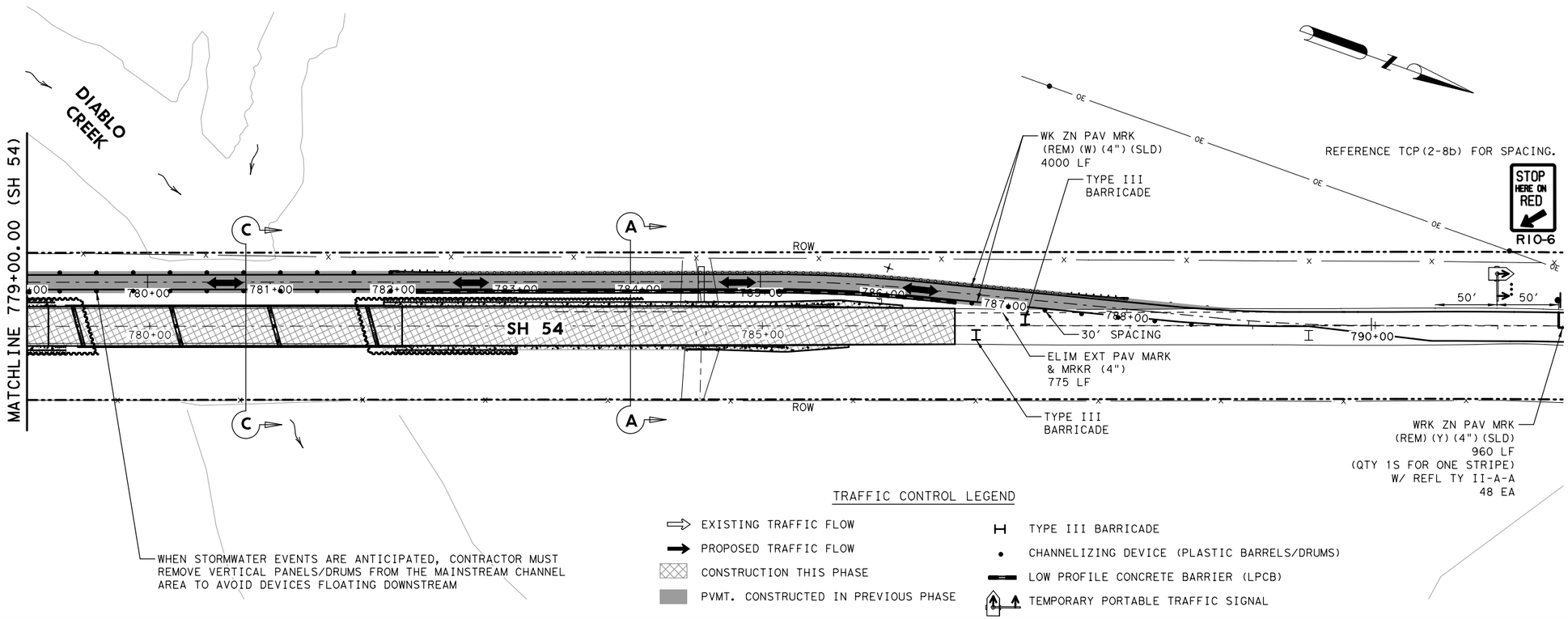
ESTIMATED QUANTITIES				
ITEM	CODE	DESCRIPTIONS	UNIT	QTY
662	6050	WK ZN PAV MRK REMOV (REFL) TY II-A-A	LF	96
662	6063	WK ZN PAV MRK REMOV (W)4"(SLD)	LF	4000
662	6095	WK ZN PAV MRK REMOV (Y)4"(SLD)	LF	1920
677	6001	ELIM EXT PAV MARK & MRKER(4")	LF	1895





TRAFFIC CONTROL LEGEND

- EXISTING TRAFFIC FLOW
- PROPOSED TRAFFIC FLOW
- CONSTRUCTION THIS PHASE
- PVMT. CONSTRUCTED IN PREVIOUS PHASE
- TYPE III BARRICADE
- CHANNELIZING DEVICE (PLASTIC BARRELS/DRUMS)
- LOW PROFILE CONCRETE BARRIER (LPCB)
- TEMPORARY PORTABLE TRAFFIC SIGNAL

NOTES:

1. SEE "TCP LINE DIAGRAM" FOR ADDITIONAL INFORMATION.
2. SEE TxDOT STANDARD FOR PLACEMENT OF LPCB.
3. REFER TO TCP TYPICAL SECTIONS FOR STRIPING.

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SH 54 @ DIABLO CREEK

TRAFFIC CONTROL PLAN PHASE 2

SHEET 3 OF 3

		FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
DSN	OEI	6	SEE TITLE SHEET		27
CHK	OEI	STATE	DIST.	COUNTY	
DRN	OEI	TEXAS	ELP	CULBERSON	
CHK	OEI	CONT.	SECT.	JOB	HIGHWAY NO.
		0233	05	038	SH 54

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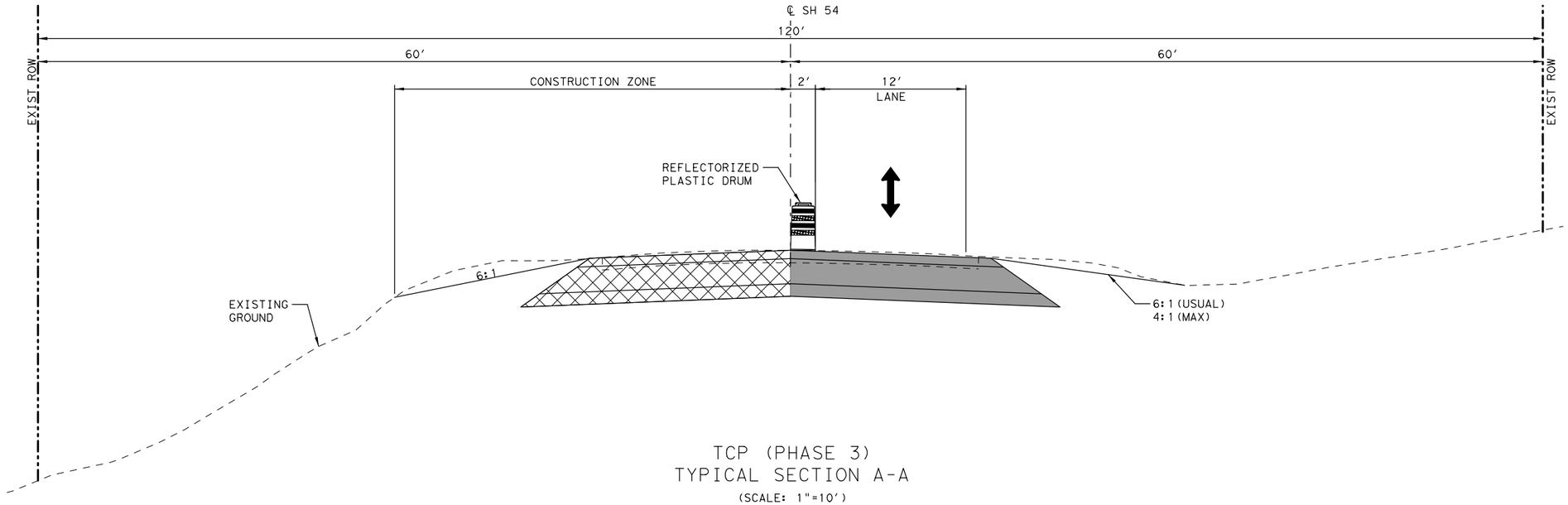

TCP (PHASE 3)
TYPICAL SECTION A-A
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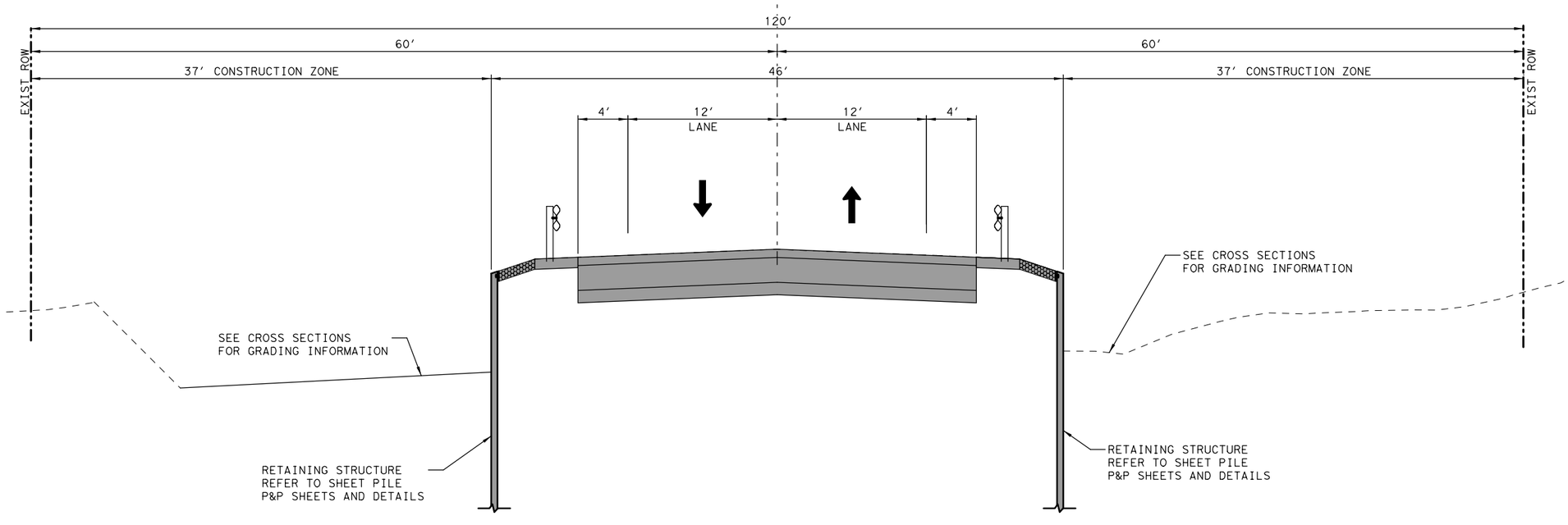

TCP (PHASE 3)
TYPICAL SECTION B-B
(SCALE: 1"=10′)

DATE	BY	REV	REVISION

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TRAFFIC CONTROL PLAN
PHASE 3

SHEET 1 OF 2

		FED. RD. DIV. NO.	PROJECT NO.	SHEET NO.
DSN	OEI	6	SEE TITLE SHEET	28
CHK	OEI	STATE	DIST.	COUNTY
DRN	OEI	TEXAS	ELP	CULBERSON
CHK	OEI	CONT.	SECT.	JOB / HIGHWAY NO.
		0233	05	038 / SH 54

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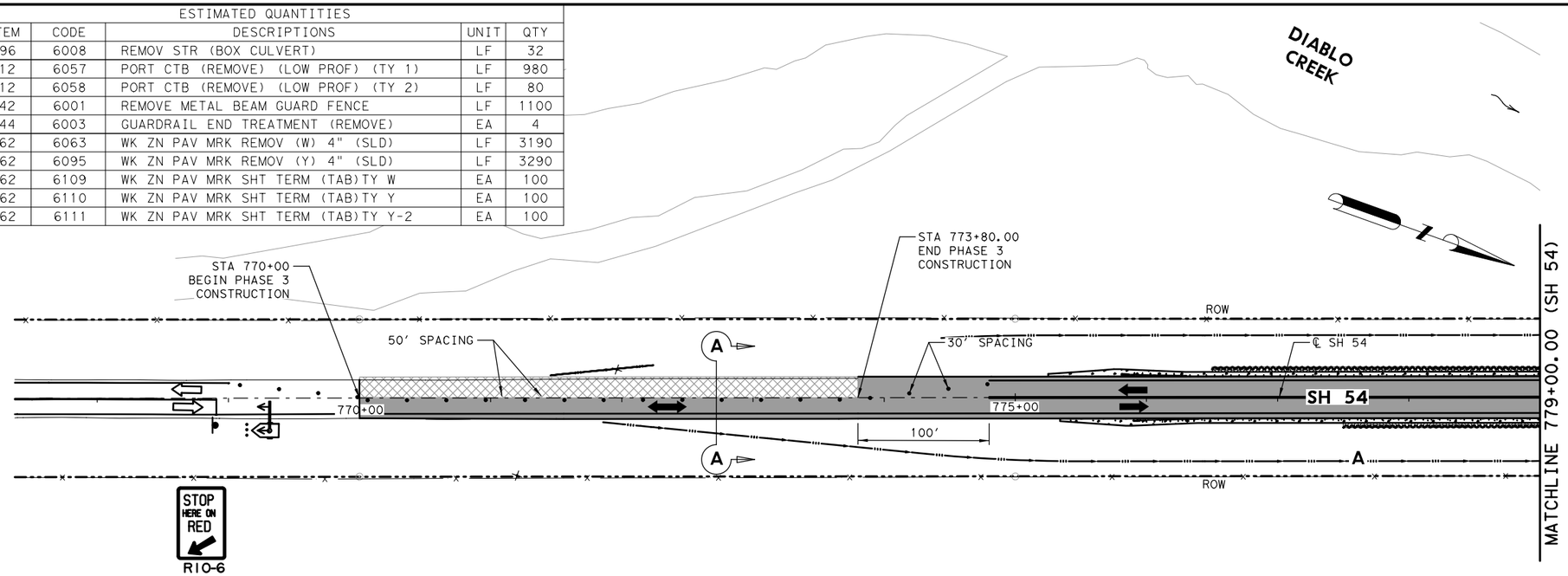
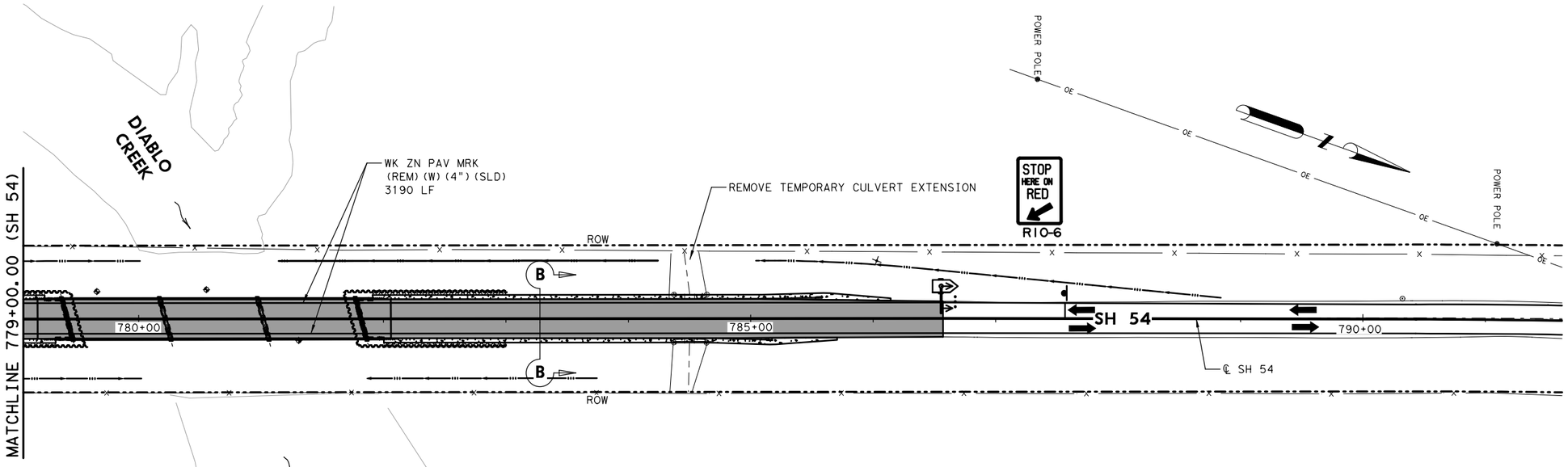
ESTIMATED QUANTITIES				
ITEM	CODE	DESCRIPTIONS	UNIT	QTY
496	6008	REMOV STR (BOX CULVERT)	LF	32
512	6057	PORT CTB (REMOVE) (LOW PROF) (TY 1)	LF	980
512	6058	PORT CTB (REMOVE) (LOW PROF) (TY 2)	LF	80
542	6001	REMOVE METAL BEAM GUARD FENCE	LF	1100
544	6003	GUARDRAIL END TREATMENT (REMOVE)	EA	4
662	6063	WK ZN PAV MRK REMOV (W) 4" (SLD)	LF	3190
662	6095	WK ZN PAV MRK REMOV (Y) 4" (SLD)	LF	3290
662	6109	WK ZN PAV MRK SHT TERM (TAB)TY W	EA	100
662	6110	WK ZN PAV MRK SHT TERM (TAB)TY Y	EA	100
662	6111	WK ZN PAV MRK SHT TERM (TAB)TY Y-2	EA	100



0 50 100
SCALE: 1"=100'

NOTES:

1. WK ZN PAV MRK SHT TERM TABS TO BE INSTALLED TO SUPPLEMENT MARKINGS.
2. REFER TO TCP TYPICAL SECTIONS FOR STRIPING.



TRAFFIC CONTROL LEGEND

- EXISTING TRAFFIC FLOW
- PROPOSED TRAFFIC FLOW
- CONSTRUCTION THIS PHASE
- PVMT. CONSTRUCTED IN PREVIOUS PHASE
- TYPE III BARRICADE
- CHANNELIZING DEVICE (PLASTIC BARRELS/DRUMS)
- LOW PROFILE CONCRETE BARRIER (LPCB)
- TEMPORARY PORTABLE TRAFFIC SIGNAL

DATE	BY	REV	REVISION

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TRAFFIC CONTROL PLAN PHASE 3

SHEET 2 OF 2

		FED.RD. DIV.NO.	PROJECT NO.	SHEET NO.
DSN	OEI	6	SEE TITLE SHEET	29
CHK	OEI	STATE	DIST.	COUNTY
DRN	OEI	TEXAS	ELP	CULBERSON
CHK	OEI	CONT.	SECT.	JOB / HIGHWAY NO.
		0233	05	038 / SH 54

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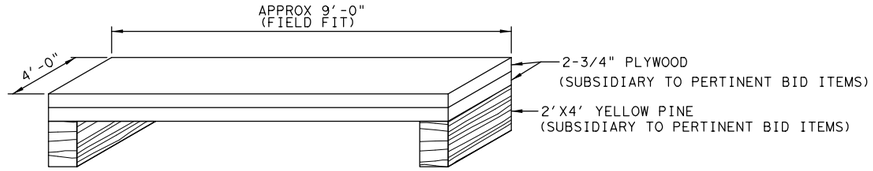

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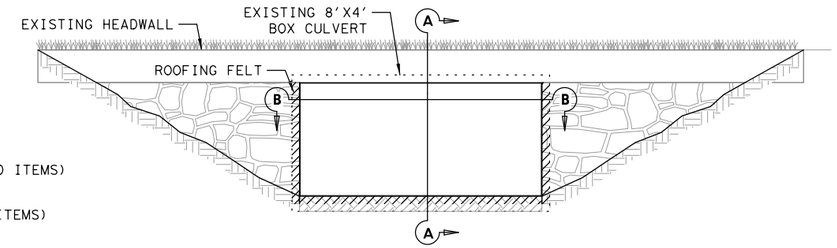
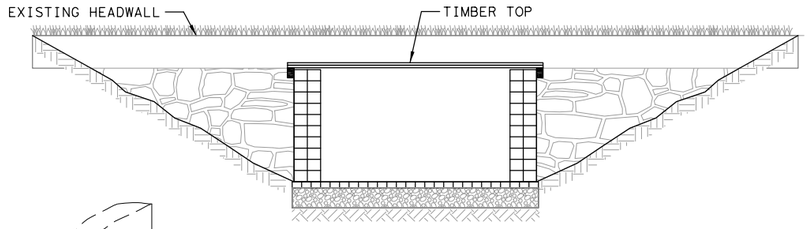
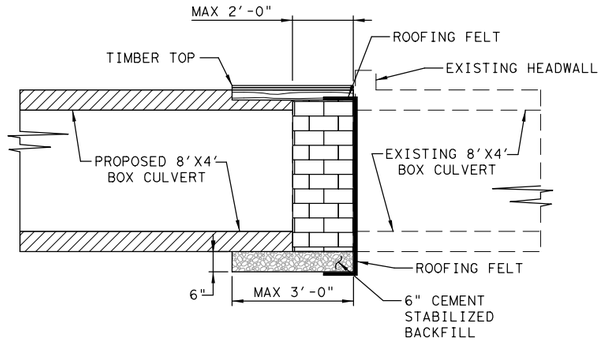


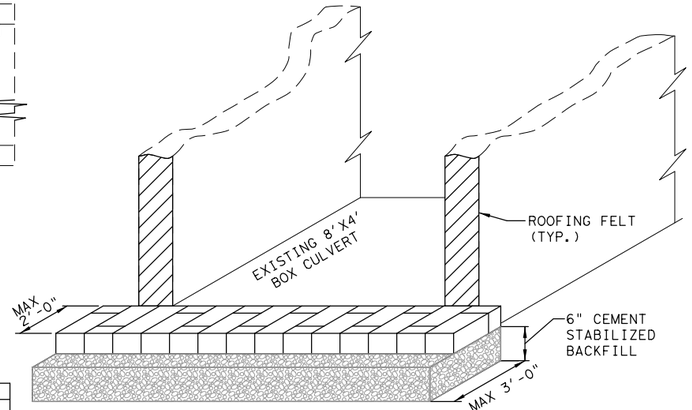


NOTES:

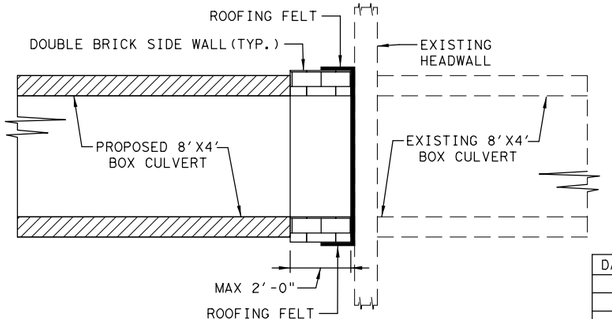
1. FLOWABLE BACKFILL TO BE PLACED FOR FULL LENGTH OF EXISTING BOX CULVERT.
2. ALL TEMPORARY STRUCTURES TO BE REMOVED AT END OF PROJECT.
3. SEE LPCB-13 LOW PROFILE CONCRETE BARRIER FOR INSTALLATION INFORMATION.
4. ROOFING FELT TO COVER ALL EXISTING 8'X4' BOX CULVERT SURFACE IN CONTACT WITH TEMPORARY PROPOSED 8'X4' CULVERT. ROOFING FELT IS SUBSIDIARY TO PERTINENT BID ITEMS.
5. BRICK COLLAR TO BE SUBSIDIARY TO BOX CULVERT EXTENSION(INSTALLATION & REMOVAL)
6. BACKFILL WITH CEMENT STABILIZED MATERIAL WILL BE REQUIRED FOR ALL STRUCTURES UNDER DETOUR.
7. FOLLOW BACKFILL DETAIL FOR BOX CULVERTS IN A GRADED OR PAVED AREA INCLUDING DETOURS AS SHOWN ON THE EXCAVATION AND BACKFILL DETAILS (NEXT SHEET).



SECTION A-A
NTS



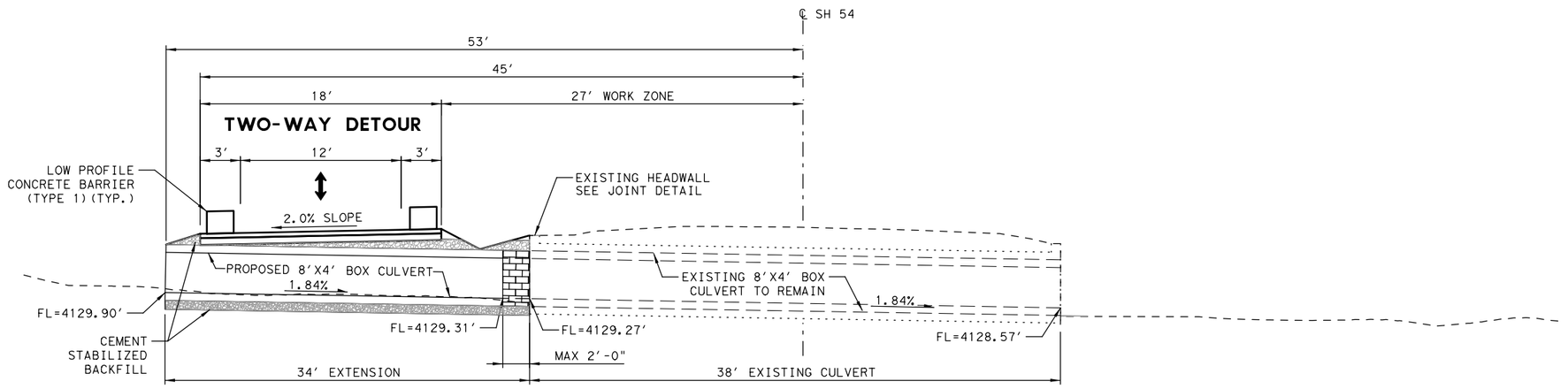
JOINT DETAILS
NTS



SECTION B-B
NTS

ESTIMATED QUANTITIES				
ITEM	CODE	DESCRIPTION	UNIT	QTY
** 400	6005	CEM STABIL BKFL	CY	34
462	6019	CONC BOX CULV (8 FT X 4 FT)	LF	32
480	6001	CLEAN EXIST CULVERTS	EA	1
496	6008	REMOV STR (BOX CULVERT)	LF	32

** FOR CONTRACTOR'S INFORMATION ONLY. TO BE CONSIDERED SUBSIDIARY TO ALL THE PERTINENT BID ITEMS.



C/L SH54
STA 784+44.68
EXISTING 8'X4'X38 LF BOX CULVERT
PROPOSED 8'X4'X32 LF, 1-EXTENSION LEFT,
W/ BRICK COLLAR
SCALE: 1"=20'

DATE	BY	REV	REVISION

STATE OF TEXAS
R. CRUZ-RODRIGUEZ
82856
LICENSED PROFESSIONAL ENGINEER

Rafael Cruz-Rodriguez, P.E.

09-27-2022

OMEGA ENGINEERS, INC.
8200 N MOPAC EXPRESSWAY, STE #280
AUSTIN, TEXAS 78759
OMEGAENGINEERS.COM
TX PE Firm Reg. No. F-2147
P:512 575 2288 F:281 647 9184

Texas Department of Transportation®

SH 54 @ DIABLO CREEK

TEMPORARY CULVERT EXTENSION DETAIL

DSN	OEI	FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
		6	SEE TITLE SHEET		30
CHK	OEI	STATE	DIST.	COUNTY	
DRN	OEI	TEXAS	ELP	CULBERSON	
		CONT.	SECT.	JOB	HIGHWAY NO.
CHK	OEI	0233	05	038	SH 54

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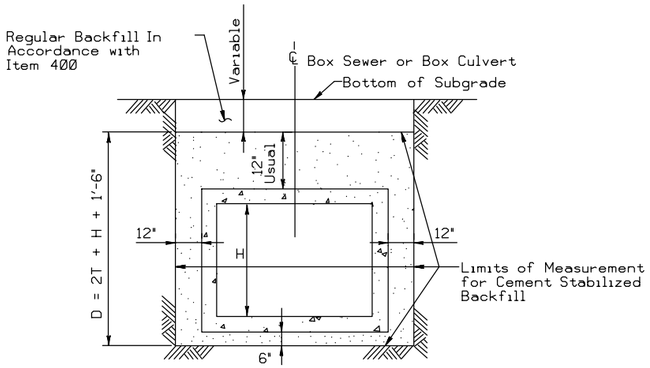
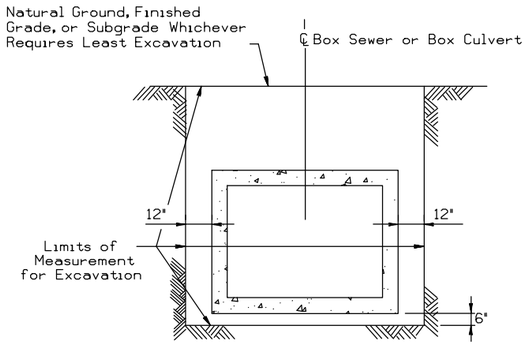


BACKFILL DETAIL

BOX CULVERTS
IN A GRADED OR PAVED AREA
INCLUDING DETOURS *



EXCAVATION DETAIL

BOX CULVERTS
IN A GRADED AREA

NOTE:

Rubber gaskets shall be required for all joints on proposed cross drainage, pipe culverts and proposed storm sewer systems, unless otherwise shown in the plans.

* Backfill with cement stabilized material will be required for all structures under detours unless noted otherwise in the General Notes.

D = Depth
H = Height
T = Thickness
R = Radius
Dia = Diameter

DATE	BY	REV	REVISION

STATE OF TEXAS
R. CRUZ-RODRIGUEZ
82856
LICENSED PROFESSIONAL ENGINEER
Rafael Cruz-Rodriguez, P.E.
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TX PE Firm Reg. No. F-2147
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SH 54 @ DIABLO CREEK

EXCAVATION AND BACKFILL DETAILS

		FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
DSN	OEI	6	SEE TITLE SHEET		31
CHK	OEI	STATE	DIST.	COUNTY	
DRN	OEI	TEXAS	ELP	CULBERSON	
CHK	OEI	CONT.	SECT.	JOB	HIGHWAY NO.
		0233	05	038	SH 54

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DEFINITION OF TREATMENT ZONES FOR VARIOUS EDGE CONDITIONS

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

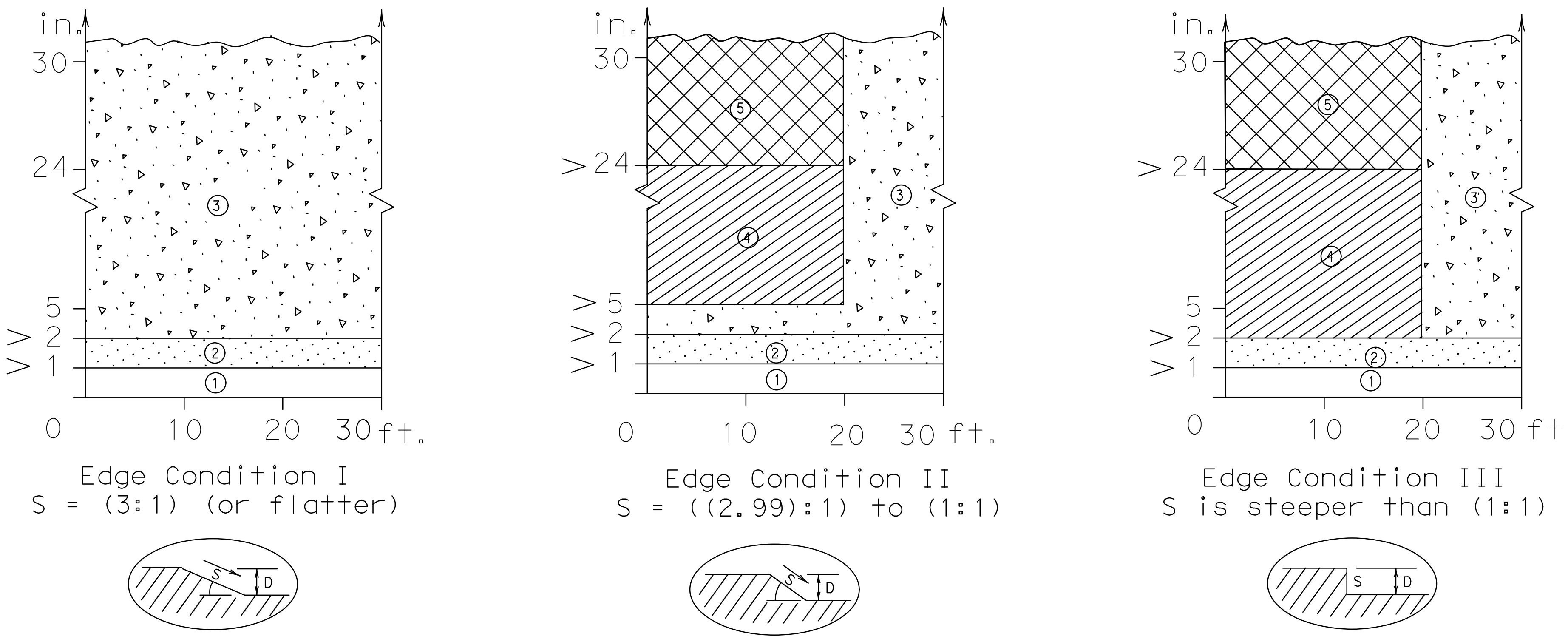
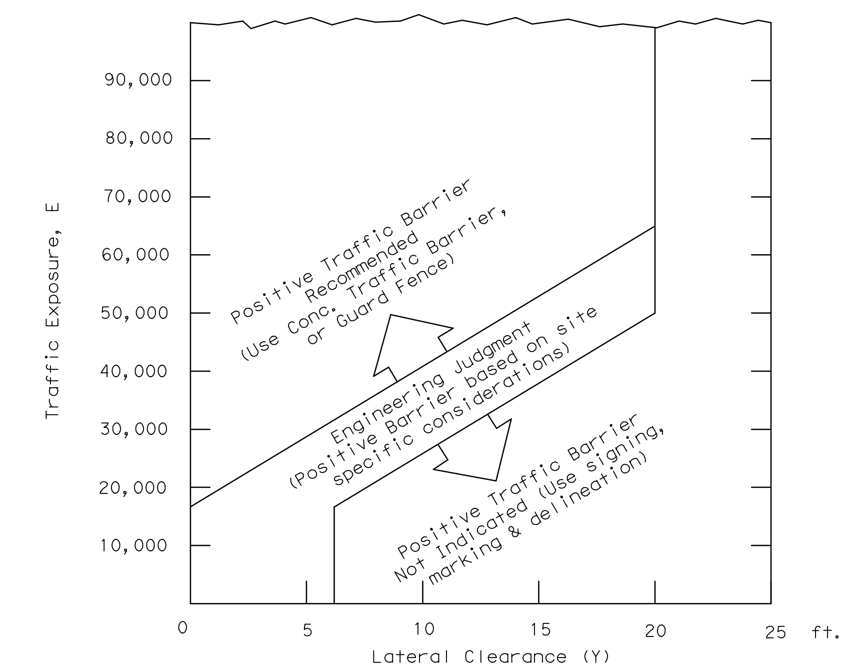
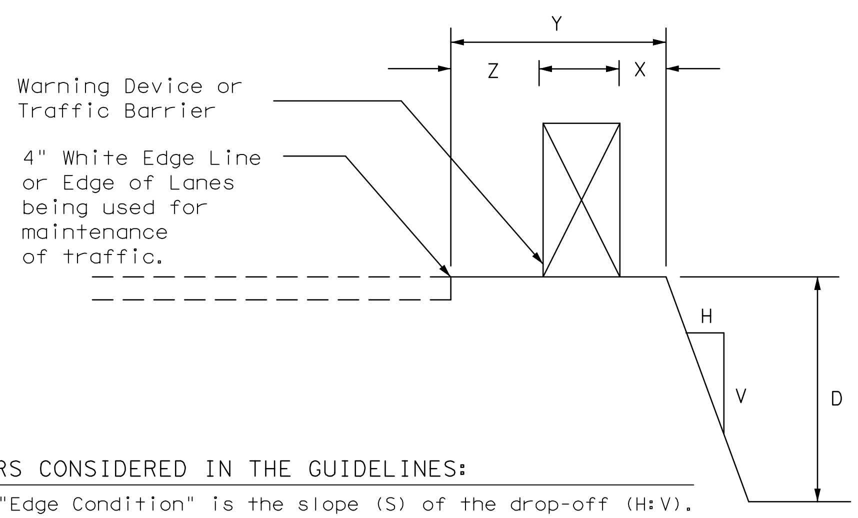


FIGURE-1: CONDITIONS INDICATING USE OF POSITIVE BARRIER FOR ZONE 5



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

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



Zone	Treatment Types Guidelines:
1	No treatment
2	CW 8-11 "Uneven Lanes" signs.
3	CW 8-9a Shoulder Drop-Off" or CW 8-11 signs plus vertical panels.
4	CW8-9a or CW 8-11, signs plus drums. Where restricted space precludes the use of drums, use vertical panels. An edge slope to that of the profered Edge Condition I.
5	Check indications (Figure-1) for possitive barrier. Where positive barrier is not indicated, the treatment shown above for Zone-4 may be used after consideration of other applicable factors.

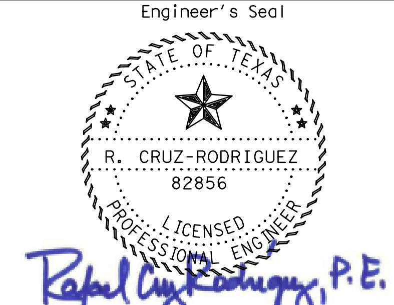
FACTORS CONSIDERED IN THE GUIDELINES:

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

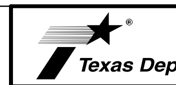
Edge Condition Notes:

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

Engineer's Seal



Date 9/27/2022



Traffic Safety Division Standard

TREATMENT FOR VARIOUS EDGE CONDITIONS

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©TxDOT August 2000	CONT	SECT	JOB	HIGHWAY
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9-21	DIST		COUNTY	SHEET NO.
	ELP		CULBERSON	32

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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

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION GENERAL NOTES AND REQUIREMENTS

BC(1)-21

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©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS 4-03 7-13	0233	05	038	SH 54
9-07 8-14	DIST	COUNTY		SHEET NO.
5-10 5-21	ELP	CULBERSON		33

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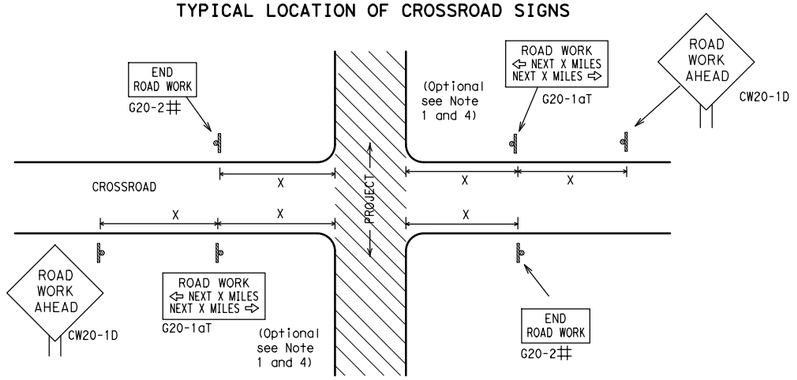
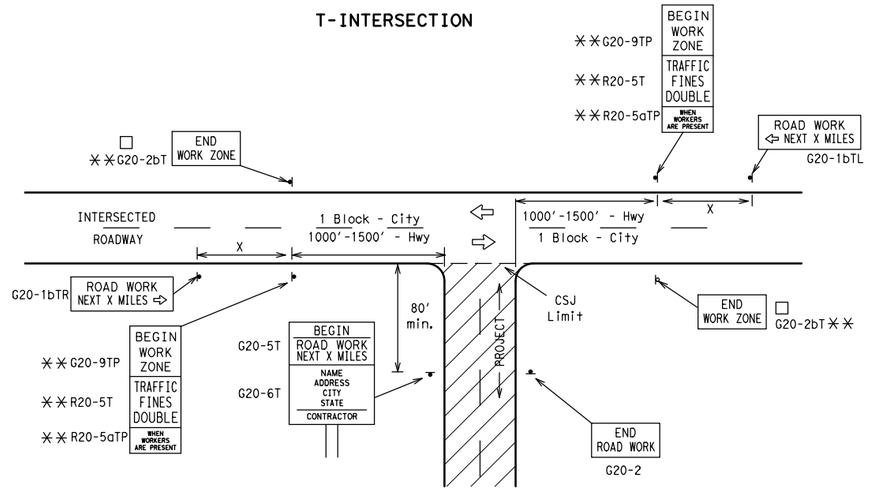
TYPICAL LOCATION OF CROSSROAD SIGNS



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]

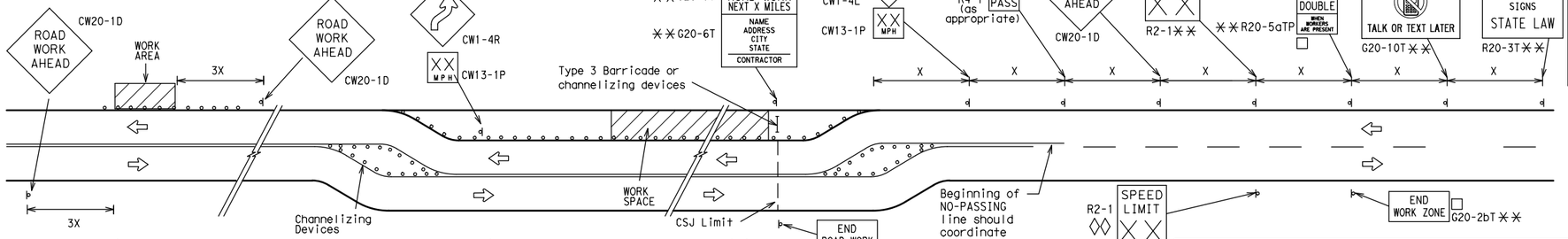
* For typical sign spacings on divided highways, expressways and freeways, see Part 6 of the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD) typical application diagrams or TCP Standard Sheets.

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

GENERAL NOTES

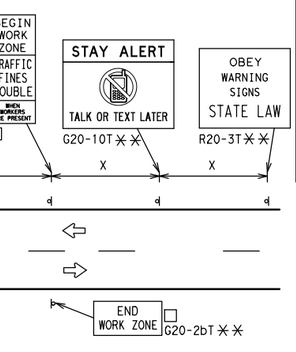
1. Special or larger size signs may be used as necessary.
2. Distance between signs should be increased as required to have 1500 feet advance warning.
3. Distance between signs should be increased as required to have 1/2 mile or more advance warning.
4. 36" x 36" "ROAD WORK AHEAD" (CW20-1D)signs may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

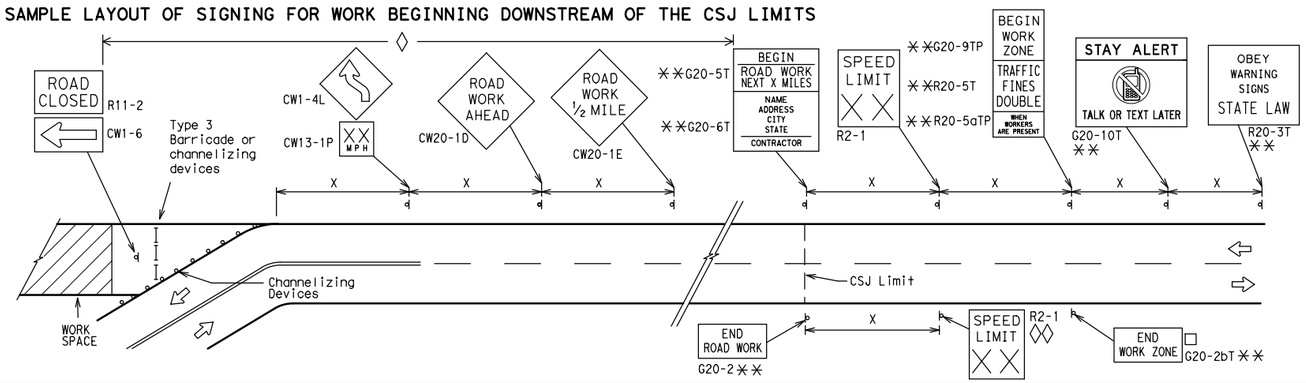


When extended distances occur between minimal work spaces, the Engineer/Inspector should ensure additional "ROAD WORK AHEAD"(CW20-1D)signs are placed in advance of these work areas to remind drivers they are still within the project limits. See the applicable TCP sheets for exact location and spacing 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
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7-13 5-21	ELP	CULBERSON		34

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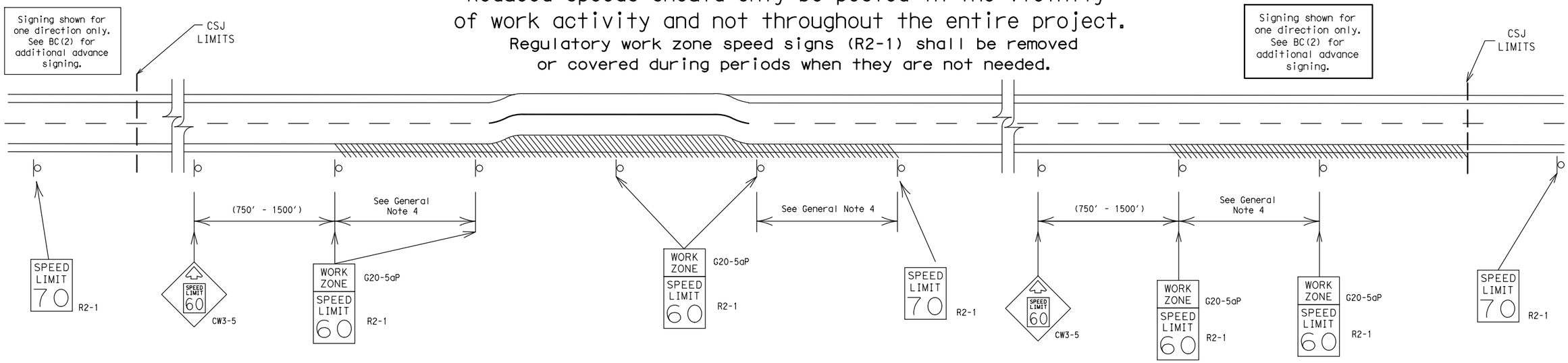
TYPICAL APPLICATION OF WORK ZONE SPEED LIMIT SIGNS

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
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS 9-07 8-14 7-13 5-21	0233	05	038	SH 54
	DIST	COUNTY		SHEET NO.
	ELP	CULBERSON		35

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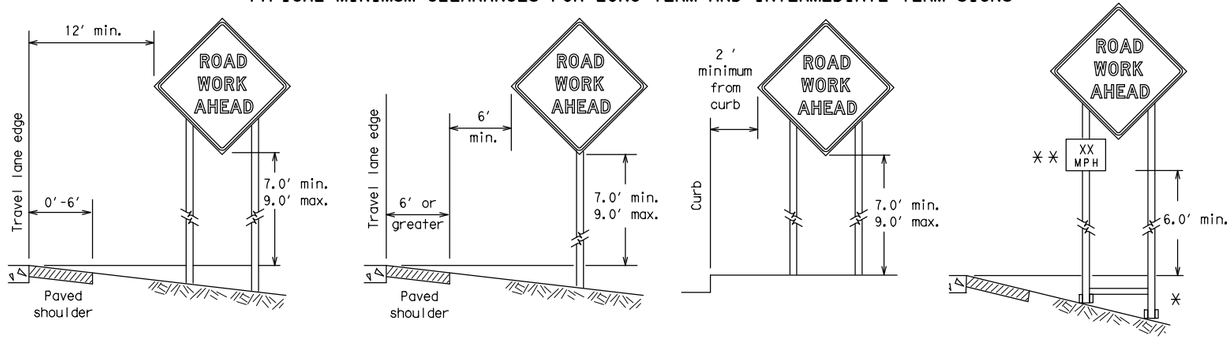
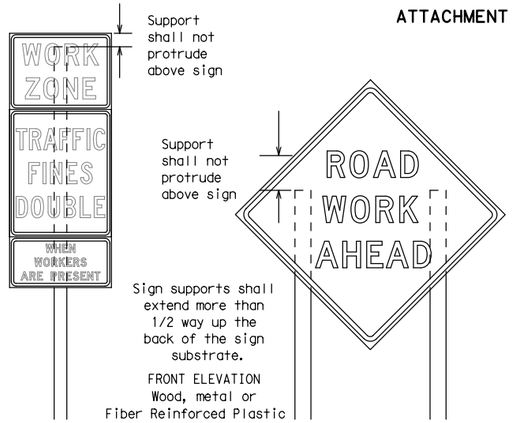
TYPICAL MINIMUM CLEARANCES FOR LONG TERM AND INTERMEDIATE TERM SIGNS

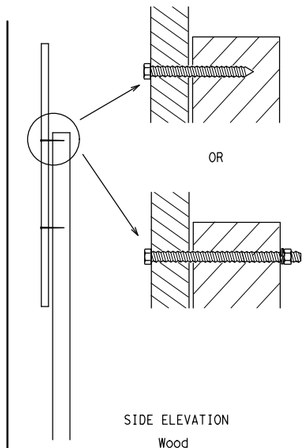


⚹ When placing skid supports on unlevel ground, the leg post lengths must be adjusted so the sign appears straight and plumb. Objects shall NOT be placed under skids as a means of leveling.

⚹⚹ 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





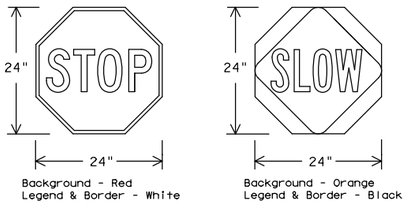
Attachment to wooden supports will be by bolts and nuts or screws. Use TxDOT's or manufacturer's recommended procedures for attaching sign substrates to other types of sign supports

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

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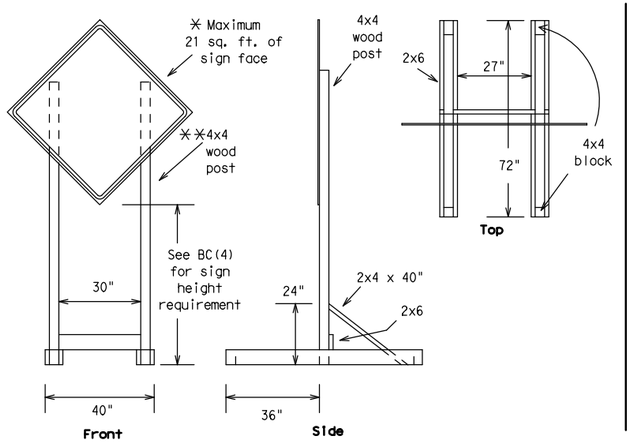
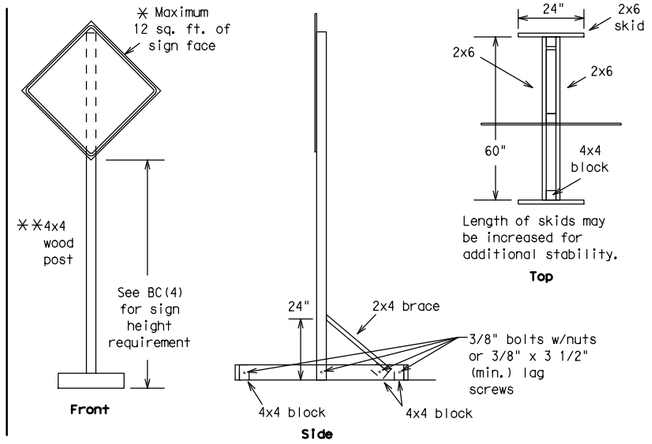
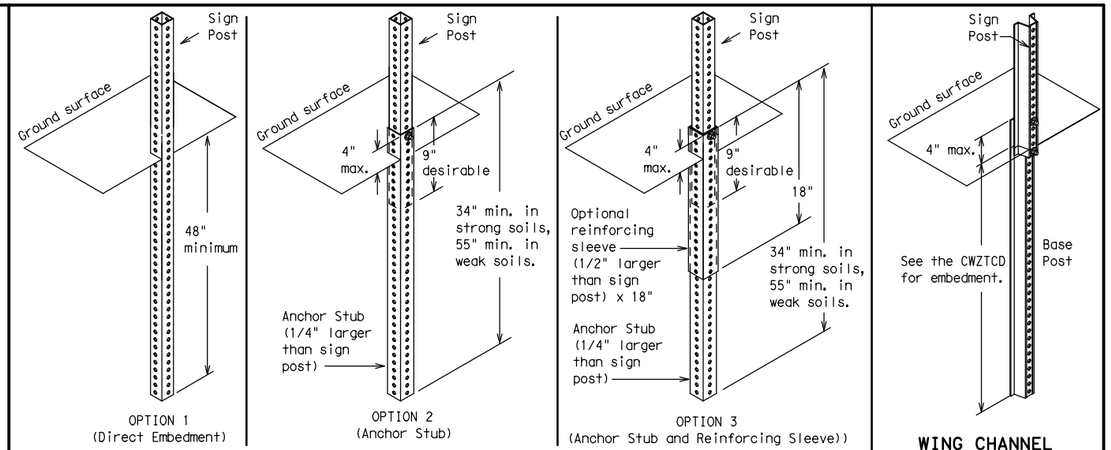




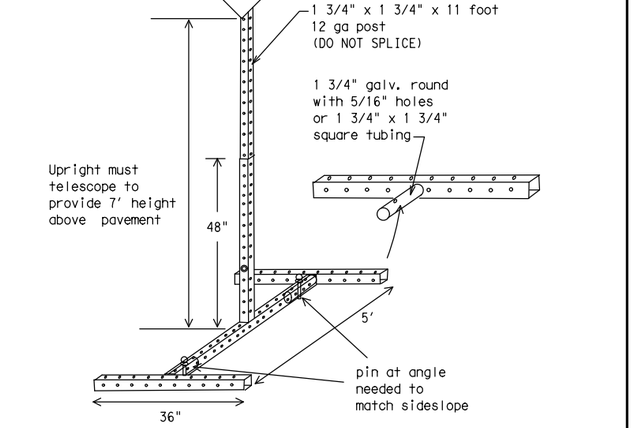
SKID MOUNTED WOOD SIGN SUPPORTS

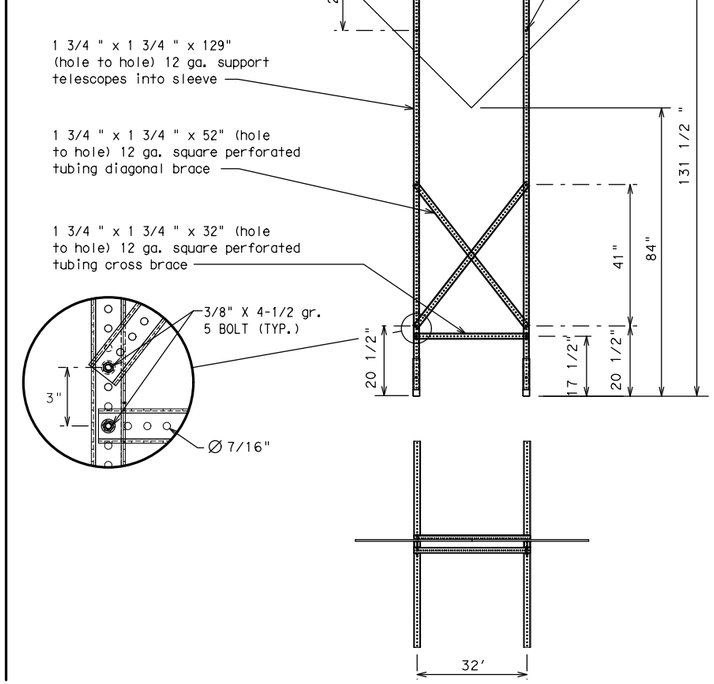
* LONG/INTERMEDIATE TERM STATIONARY - PORTABLE SKID MOUNTED SIGN SUPPORTS

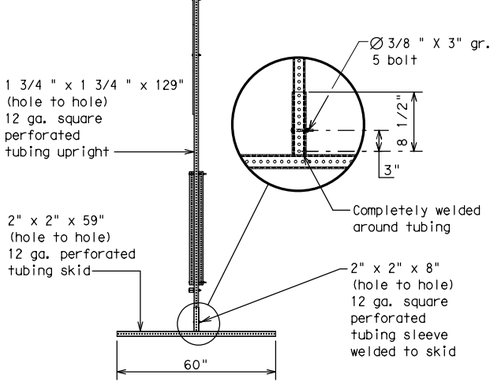


GROUND MOUNTED SIGN SUPPORTS

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.

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION TYPICAL SIGN SUPPORT

BC(5)-21

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9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	ELP	CULBERSON		37

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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

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

** See Application Guidelines Note 6.

APPLICATION GUIDELINES

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

WORDING ALTERNATIVES

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

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

FULL MATRIX PCMS SIGNS

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

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)

BC(6)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0233	05	038	SH 54
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	ELP	CULBERSON		38

100

DATE: 9/27/2022 11:14:30 AM
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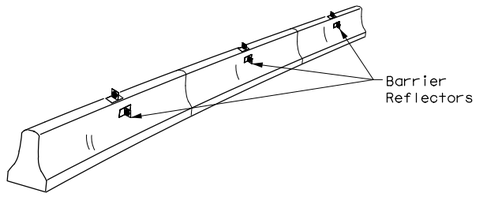
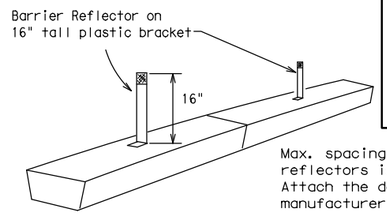
1. Barrier Reflectors shall be pre-qualified, and conform to the color and reflectivity requirements of DMS-8600. A list of prequalified Barrier Reflectors can be found at the Material Producer List web address shown on BC(1).
2. Color of Barrier Reflectors shall be as specified in the TMUTCD. The cost 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.

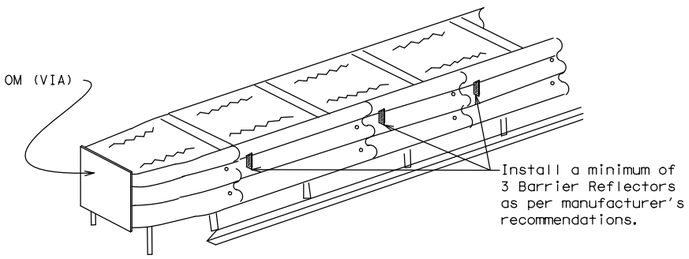


Max. spacing of barrier reflectors is 20 feet. Attach the delineators as per manufacturer's recommendations.

LOW PROFILE CONCRETE BARRIER (LPCB) USED IN WORK ZONES

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

LOW PROFILE CONCRETE BARRIER (LPCB)

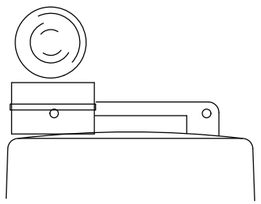


DELINEATION OF END TREATMENTS

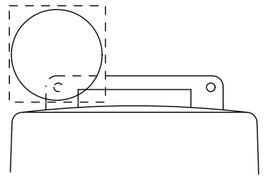
END TREATMENTS FOR CTB'S USED IN WORK ZONES

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

BARRIER REFLECTORS FOR CONCRETE TRAFFIC BARRIER AND ATTENUATORS



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



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

WARNING LIGHTS

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

WARNING LIGHTS MOUNTED ON PLASTIC DRUMS

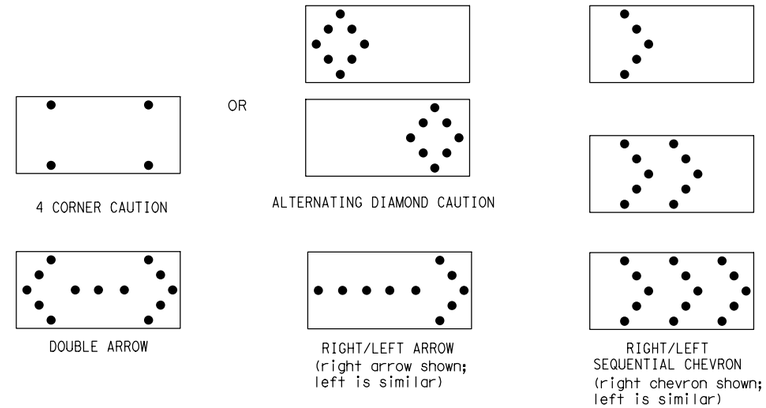
1. Type A flashing warning lights are intended to warn drivers that they are approaching or are in a potentially hazardous area.
2. Type A random flashing warning lights are not intended for delineation and shall not be used in a series.
3. A series of sequential flashing warning lights placed on channelizing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

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

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

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

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



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

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

ATTENTION

Flashing Arrow Boards shall be equipped with automatic dimming devices.

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

FLASHING ARROW BOARDS

TRUCK-MOUNTED ATTENUATORS

1. Truck-mounted attenuators (TMA) used on TxDOT facilities must meet the requirements outlined in the Manual for Assessing Safety Hardware (MASH).
2. Refer to the CWZTCD for the requirements of Level 2 or Level 3 TMAs.
3. Refer to the CWZTCD for a list of approved TMAs.
4. TMAs are required on freeways unless otherwise noted in the plans.
5. A TMA should be used anytime that it can be positioned 30 to 100 feet in advance of the area of crew exposure without adversely affecting the work performance.
6. The only reason a TMA should not be required is when a work area is spread down the roadway and the work crew is an extended distance from the TMA.

Texas Department of Transportation

Traffic Safety Division Standard

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

BC(7)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0233	05	038	SH 54
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	ELP	CULBERSON		39

101

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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:

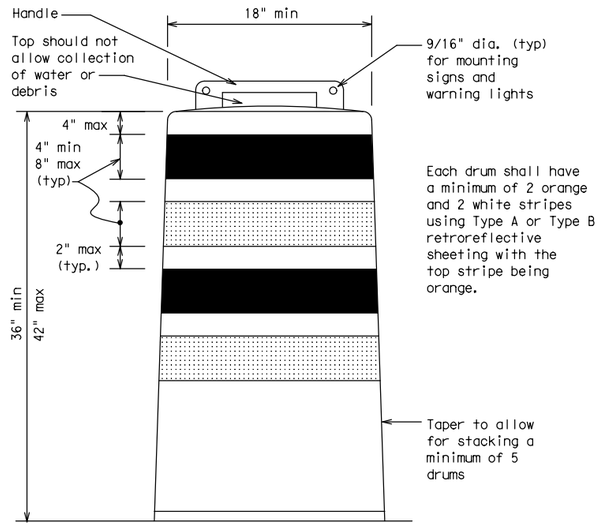
1. Plastic drums shall be a two-piece design; the "body" of the drum shall be the top portion and the "base" shall be the bottom.
2. The body and base shall lock together in such a manner that the body separates from the base when impacted by a vehicle traveling at a speed of 20 MPH or greater but prevents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

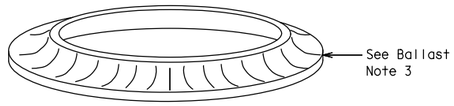
RETROREFLECTIVE SHEETING

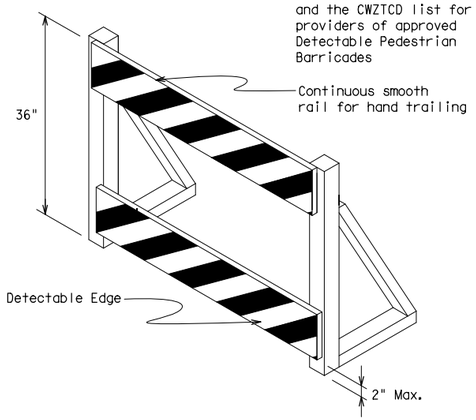
1. The stripes used on drums shall be constructed of sheeting meeting the color and retroreflectivity requirements of Departmental Materials Specification DMS-8300, "Sign Face Materials," Type A or Type B reflective sheeting shall be supplied unless otherwise specified in the plans.
2. The sheeting shall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

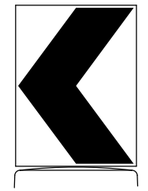




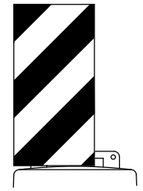


DETECTABLE PEDESTRIAN BARRICADES

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

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0233	05	038	SH 54
4-03 8-14	DIST	COUNTY		SHEET NO.
9-07 5-21	ELP	CULBERSON		40
7-13				

102

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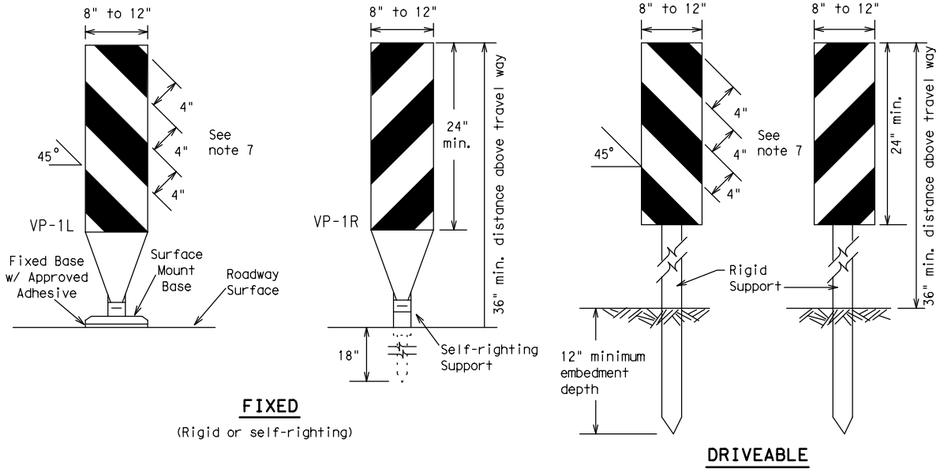
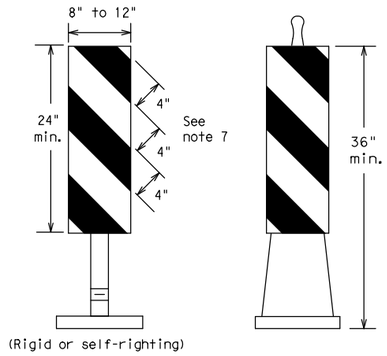


FIXED
(Rigid or self-righting)

DRIVEABLE

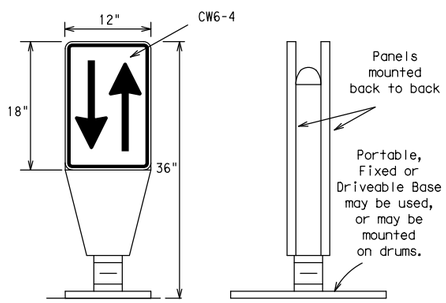


(Rigid or self-righting)

PORTABLE

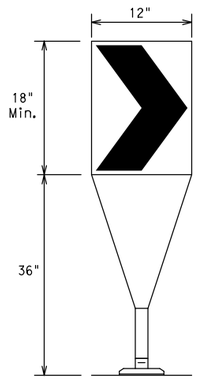
1. Vertical Panels (VP's) are normally used to channelize traffic or divide opposing lanes of traffic.
2. VP's may be used in daytime or nighttime situations. They may be used at the edge of shoulder drop-offs and other areas such as lane transitions where positive daytime and nighttime delineation is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



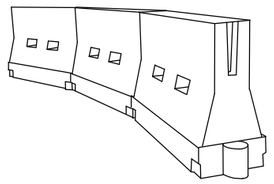
Fixed Base w/ Approved Adhesive (Driveable Base, or Flexible Support can be used)

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

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

SUGGESTED MAXIMUM SPACING OF CHANNELIZING DEVICES AND MINIMUM DESIRABLE TAPER LENGTHS

SHEET 9 OF 12

Texas Department of Transportation | Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(9)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0233	05	038	SH 54
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7-13 5-21	ELP	CULBERSON		41

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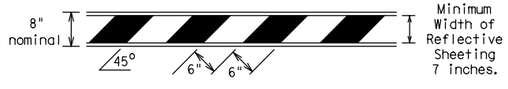
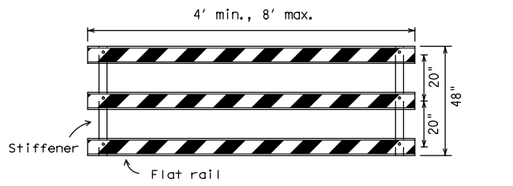
TYPE 3 BARRICADES

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.



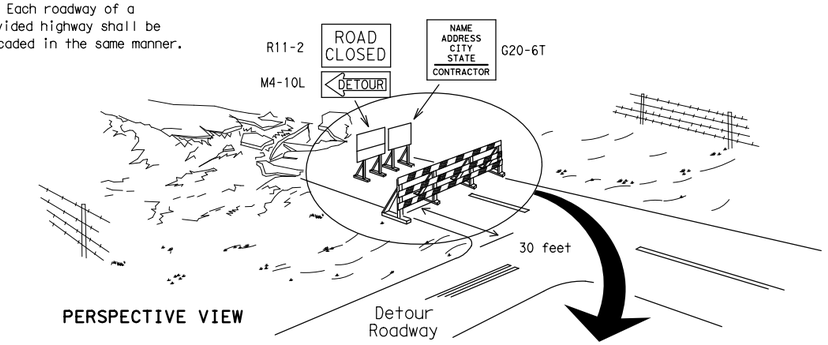
TYPICAL STRIPING DETAIL FOR BARRICADE RAIL



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

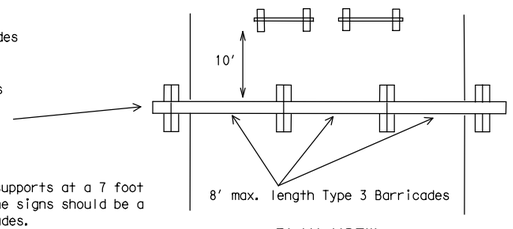
TYPICAL PANEL DETAIL FOR SKID OR POST TYPE BARRICADES

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



PERSPECTIVE VIEW

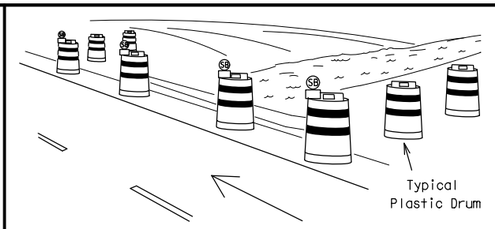
The three rails on Type 3 barricades shall be reflectorized orange and reflective white stripes on one side facing one-way traffic and both sides for two-way traffic.
Barricade striping should slant downward in the direction of detour.



PLAN VIEW

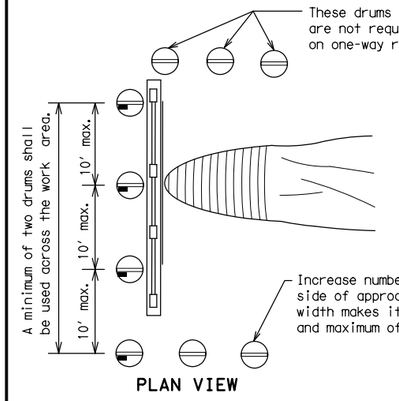
1. Signs should be mounted on independent supports at a 7 foot mounting height in center of roadway. The signs should be a minimum of 10 feet behind Type 3 Barricades.
2. Advance signing shall be as specified elsewhere in the plans.

TYPE 3 BARRICADE (POST AND SKID) TYPICAL APPLICATION



PERSPECTIVE VIEW

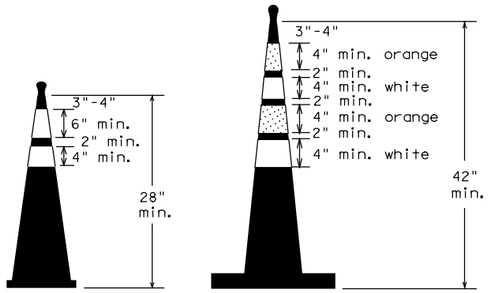
1. Where positive redirectional capability is provided, drums may be omitted.
2. Plastic construction fencing may be used with drums for safety as required in the plans.
3. Vertical Panels on flexible support may be substituted for drums when the shoulder width is less than 4 feet.
4. When the shoulder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



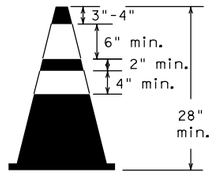
PLAN VIEW

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

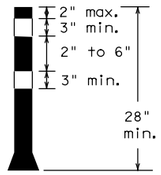
CULVERT WIDENING OR OTHER ISOLATED WORK WITHIN THE PROJECT LIMITS



Two-Piece cones



One-Piece cones

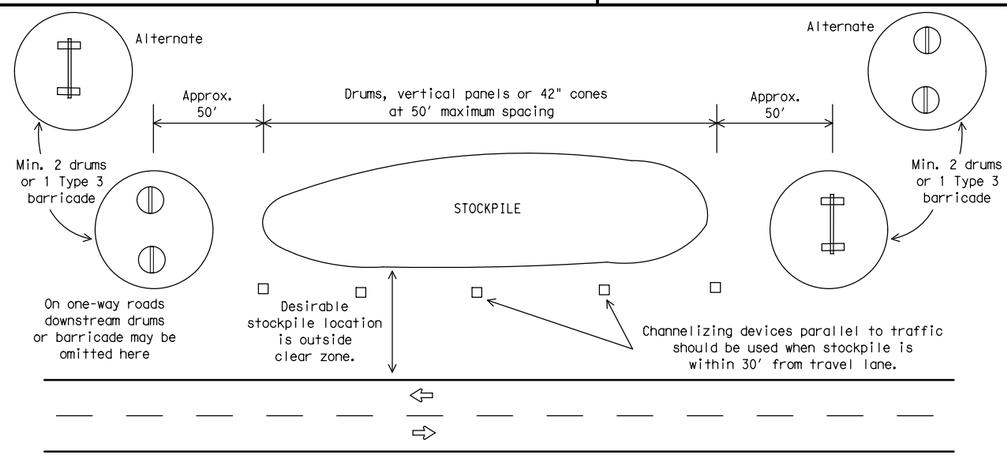


Tubular Marker

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

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.

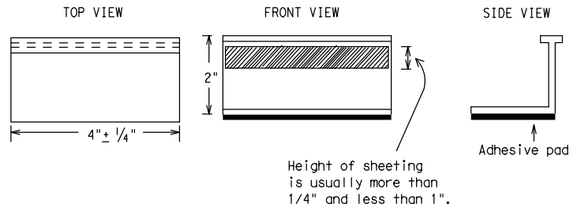
MAINTAINING WORK ZONE PAVEMENT MARKINGS

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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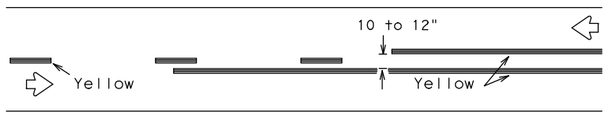
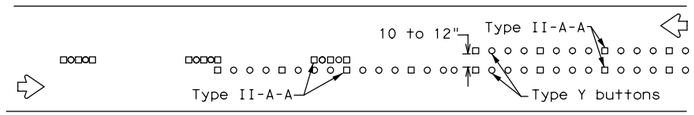
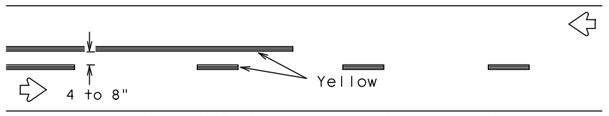
PAVEMENT MARKING PATTERNS



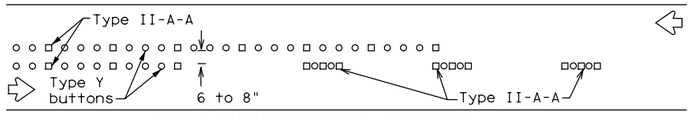
REFLECTORIZED PAVEMENT MARKINGS - PATTERN A



RAISED PAVEMENT MARKERS - PATTERN A



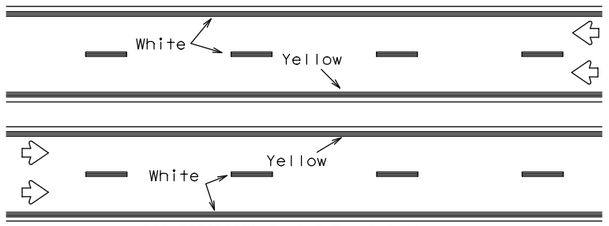
REFLECTORIZED PAVEMENT MARKINGS - PATTERN B



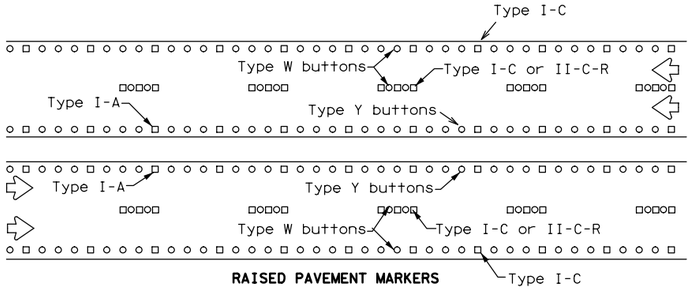
RAISED PAVEMENT MARKERS - PATTERN B

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



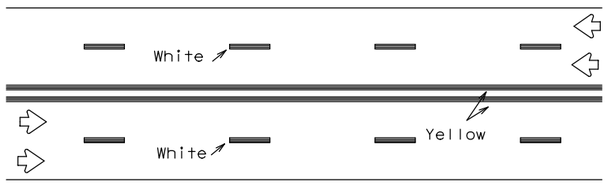
REFLECTORIZED PAVEMENT MARKINGS



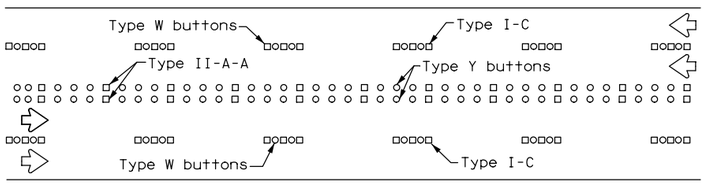
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

EDGE & LANE LINES FOR DIVIDED HIGHWAY



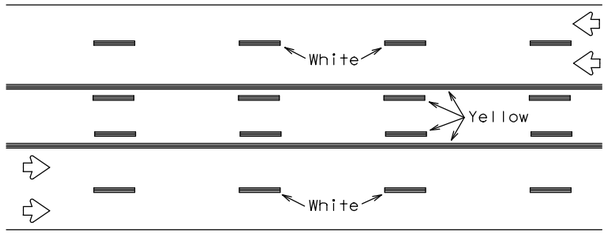
REFLECTORIZED PAVEMENT MARKINGS



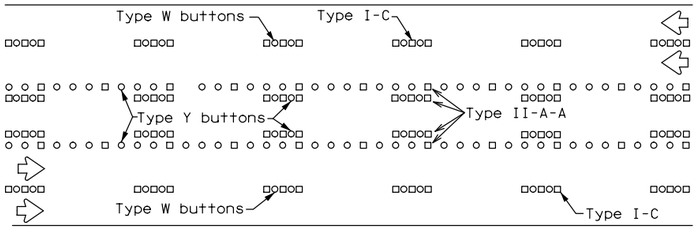
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS



REFLECTORIZED PAVEMENT MARKINGS



RAISED PAVEMENT MARKERS

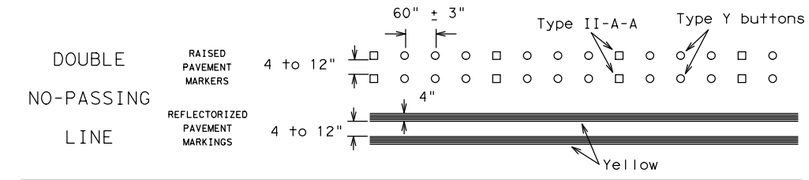
Prefabricated markings may be substituted for reflectorized pavement markings.

TWO-WAY LEFT TURN LANE

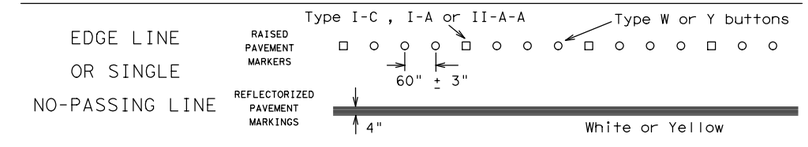
STANDARD WORK ZONE PAVEMENT MARKINGS DETAILS

SOLID LINES

DOUBLE NO-PASSING LINE

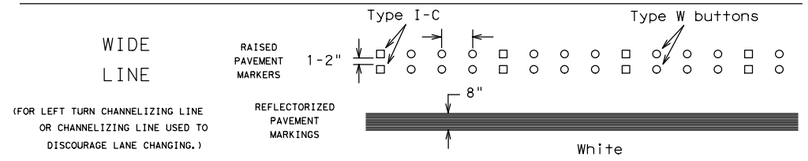


EDGE LINE OR SINGLE NO-PASSING LINE



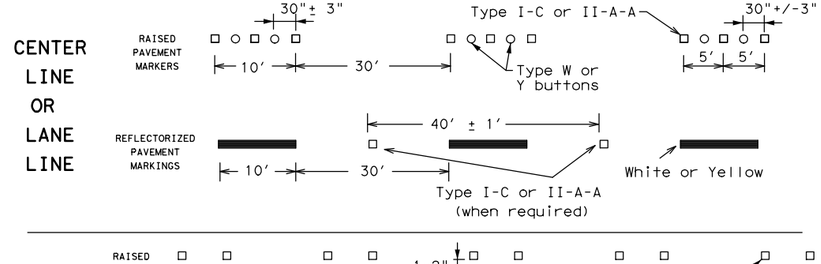
WIDE LINE

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

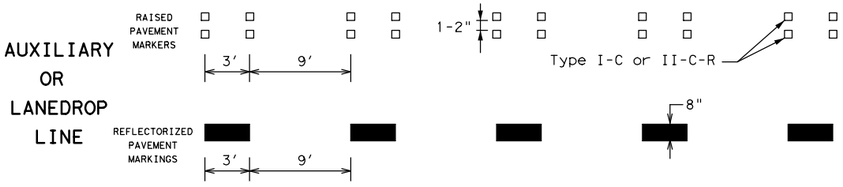


BROKEN LINES

CENTER LINE OR LANE LINE

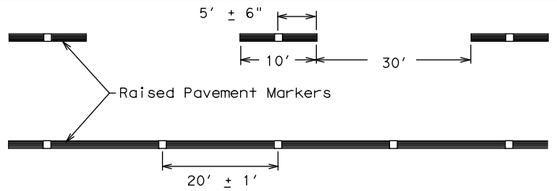


AUXILIARY OR LANEDROP LINE



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	0233	05	038	SH 54
	DIST	COUNTY		SHEET NO.
	ELP	CULBERSON		44

DATE: 9/27/2022, 11:14:40 AM
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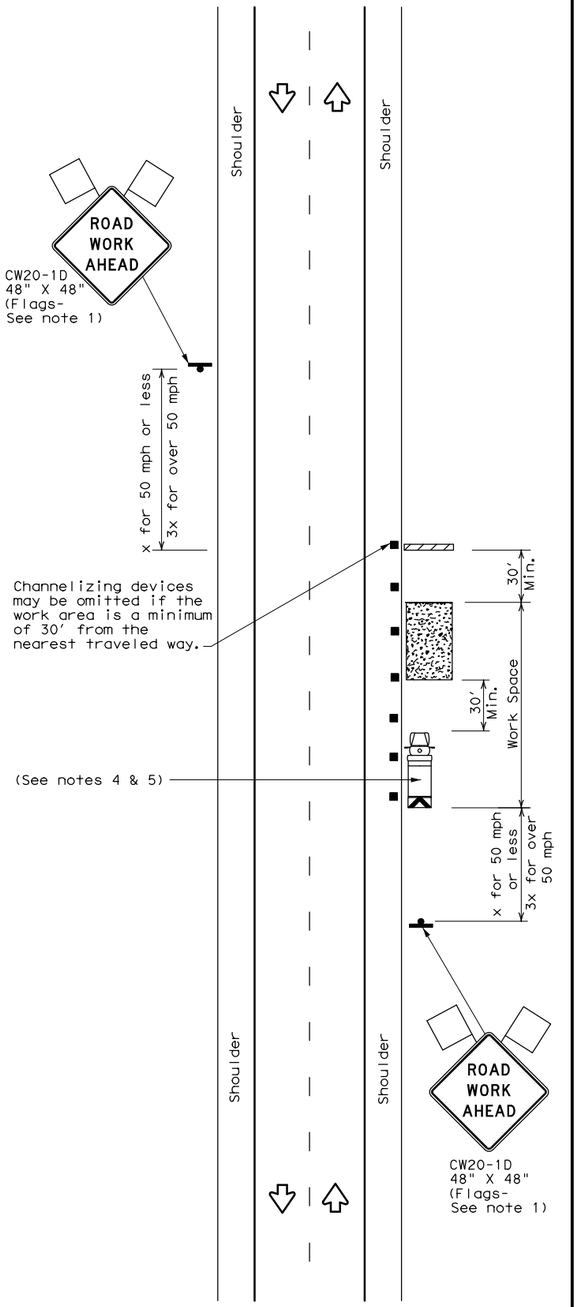
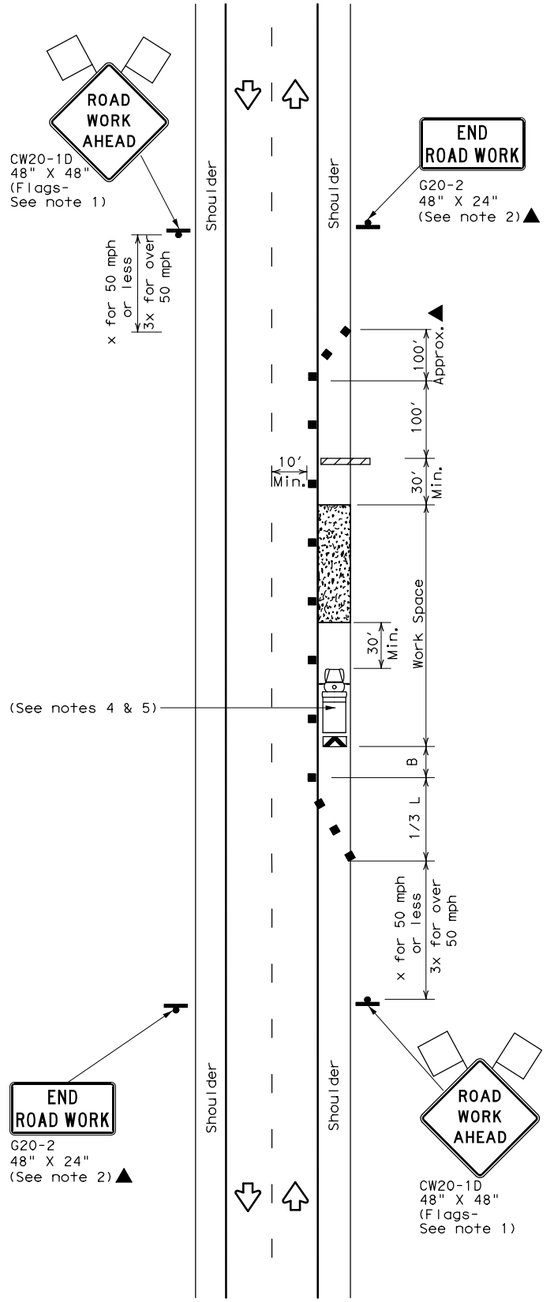


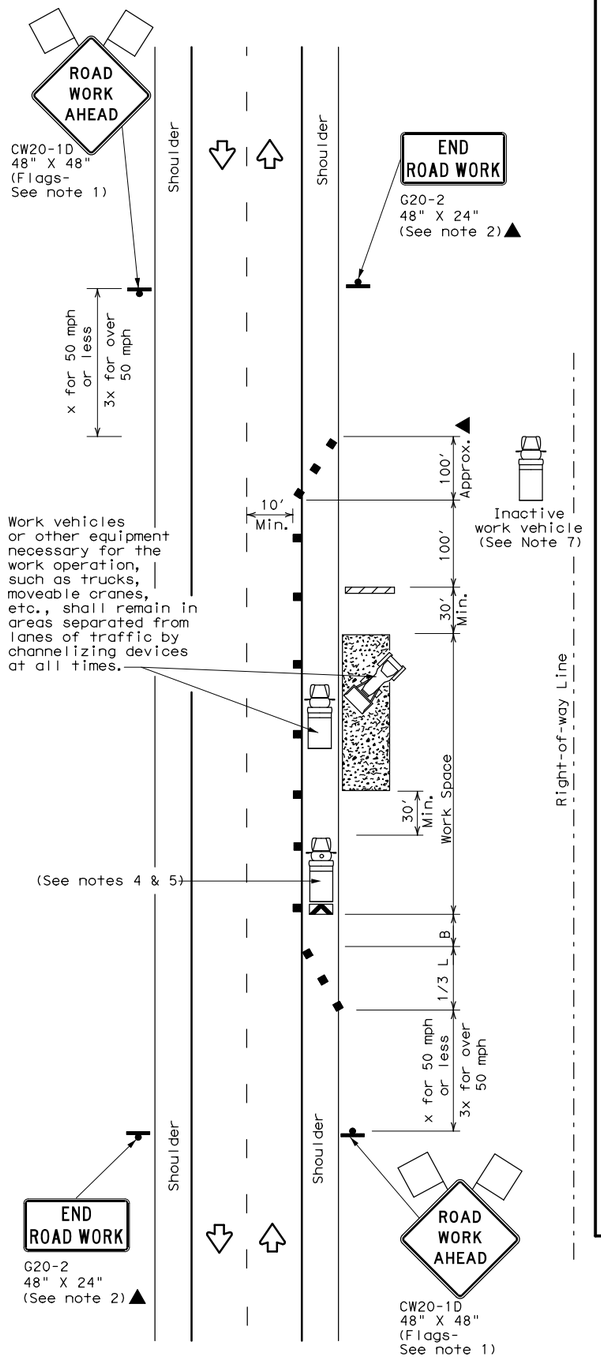
TCP (2-1a)

WORK SPACE NEAR SHOULDER
Conventional Roads



TCP (2-1b)

WORK SPACE ON SHOULDER
Conventional Roads



TCP (2-1c)

WORK VEHICLES ON SHOULDER
Conventional Roads

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

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

✳ Conventional Roads Only

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

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

GENERAL NOTES

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

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN CONVENTIONAL ROAD SHOULDER WORK

TCP(2-1)-18

FILE: tcp2-1-18.dgn	DN:	CK:	DW:	CK:
© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS	0233	05	038	SH 54
2-94 4-98	DIST	COUNTY		SHEET NO.
8-95 2-12	ELP	CULBERSON		45
1-97 2-18				

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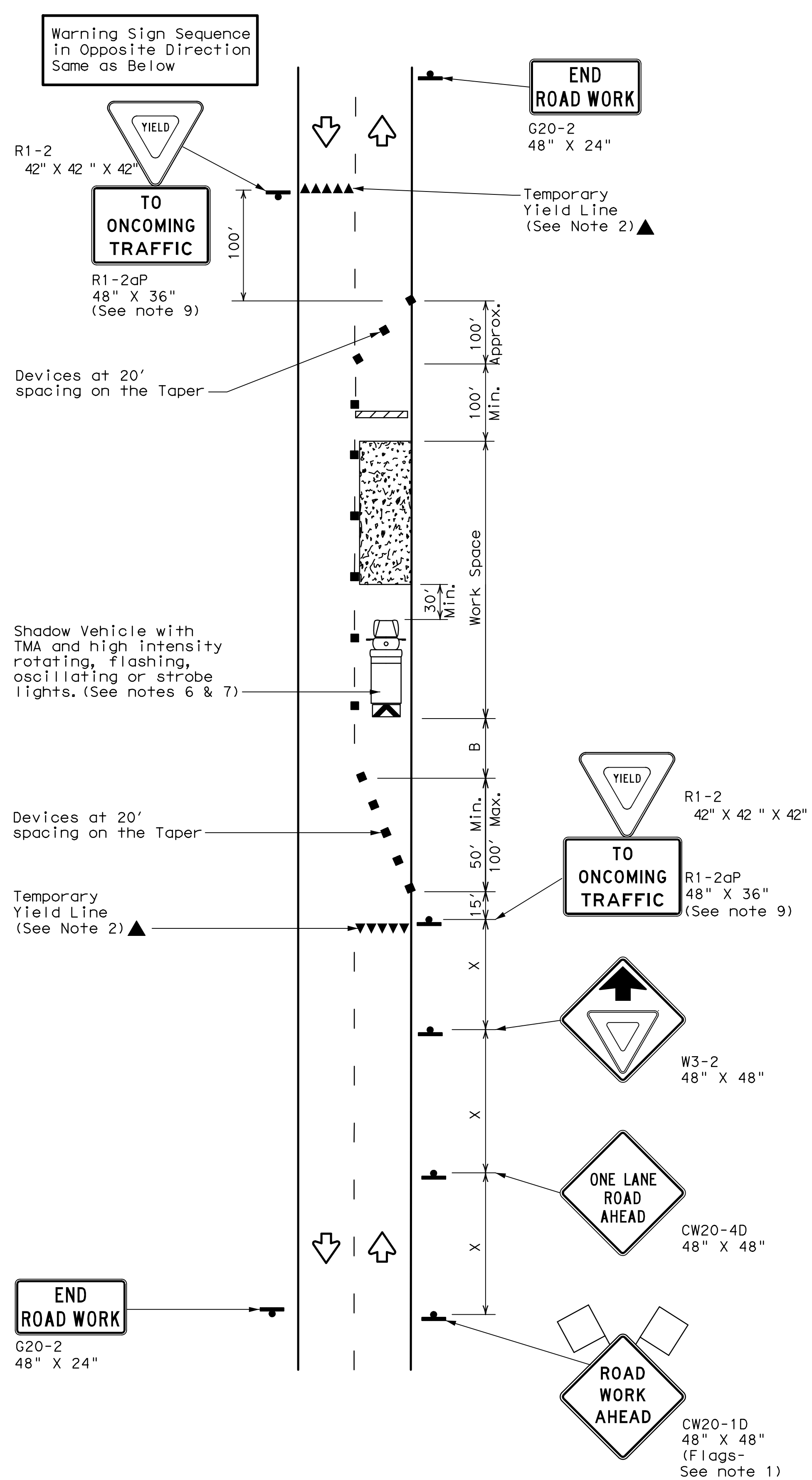
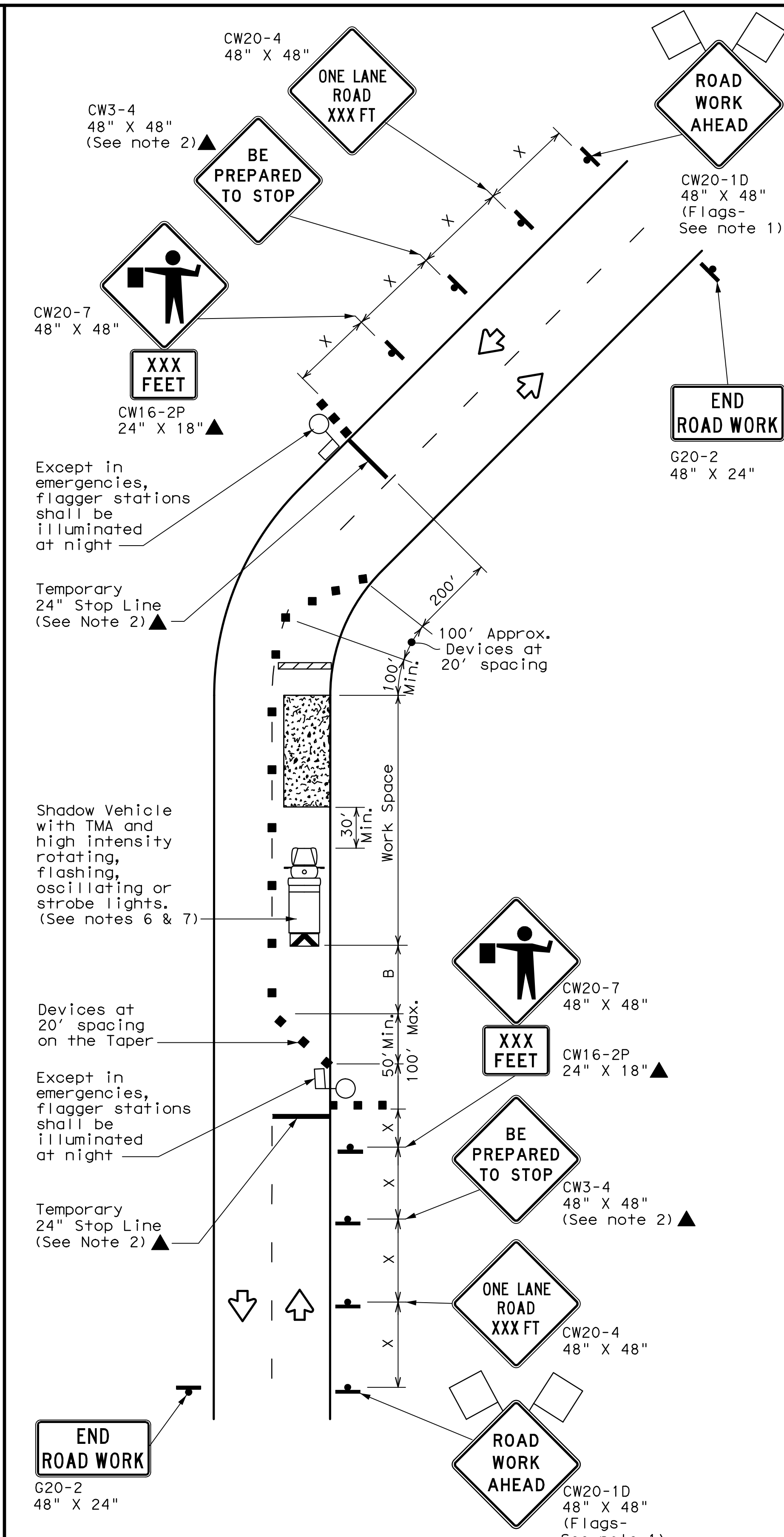


TCP (2-2a)
2-LANE ROADWAY WITHOUT PAVED SHOULDERS
ONE LANE TWO-WAY
CONTROL WITH YIELD SIGNS
(Less than 2000 ADT - See Note 9)



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

LEGEND

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

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

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

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

GENERAL NOTES

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

TCP (2-2a)

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

TCP (2-2b)

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

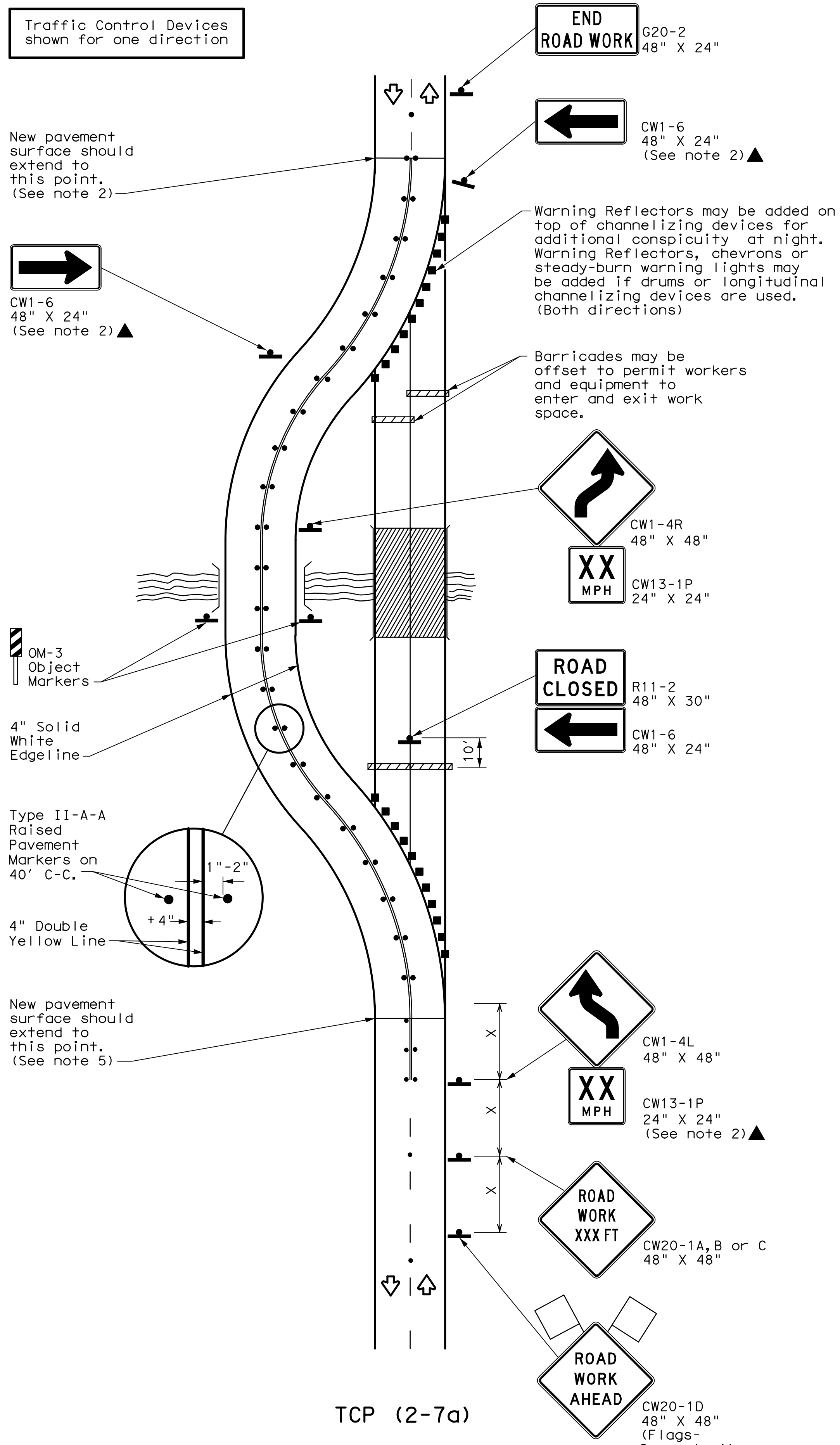
Texas Department of Transportation
Traffic Operations Division Standard

TRAFFIC CONTROL PLAN ONE-LANE TWO-WAY TRAFFIC CONTROL

TCP(2-2)-18

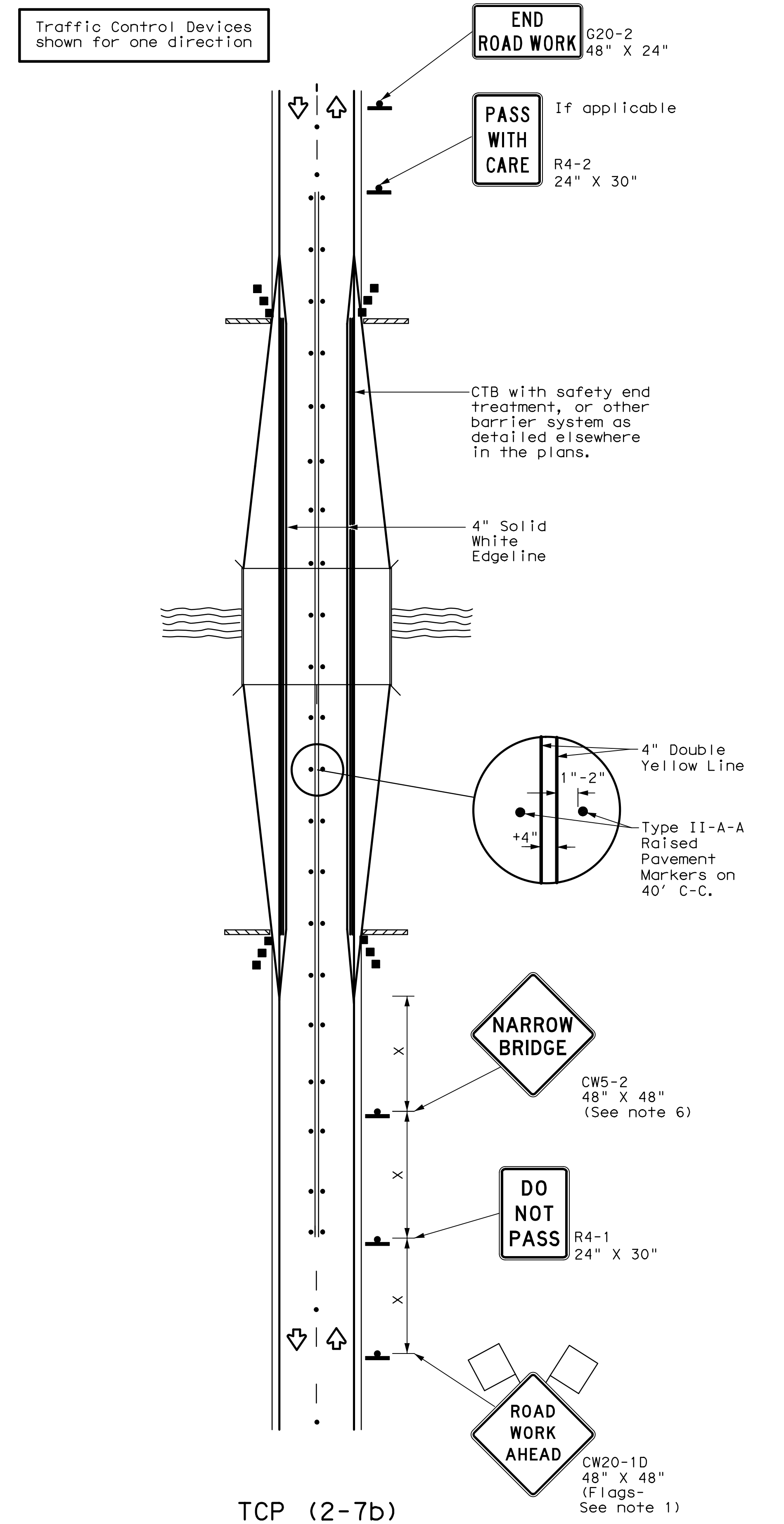
FILE: tcp2-2-18.dgn		DN:	CK:	DW:	CK:
©TxDOT December 1985		CONT	SECT	JOB	HIGHWAY
REVISIONS 8-95 3-03 1-97 2-12 4-98 2-18		0233	05	038	SH 54
		DIST		COUNTY	SHEET NO.
		ELP		CULBERSON	46

162



TCP (2-7a)

ROADWAY DIVERSION



TCP (2-7b)

BRIDGE WIDENING

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

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

✱ Conventional Roads Only

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

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

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.

TCP (2-7a)

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

TCP (2-7b)

6. The CW5-2 "Narrow Bridge" sign may be omitted if lane and shoulder widths are maintained.

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN DIVERSIONS AND NARROW BRIDGES

TCP(2-7)-18

FILE: tcp2-7-18.dgn	DN:	CK:	DW:	CK:
©TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS 8-95 3-03 1-97 2-12 4-98 2-18	0233	05	038	SH 54
	DIST		COUNTY	SHEET NO.
	ELP		CULBERSON	47

167

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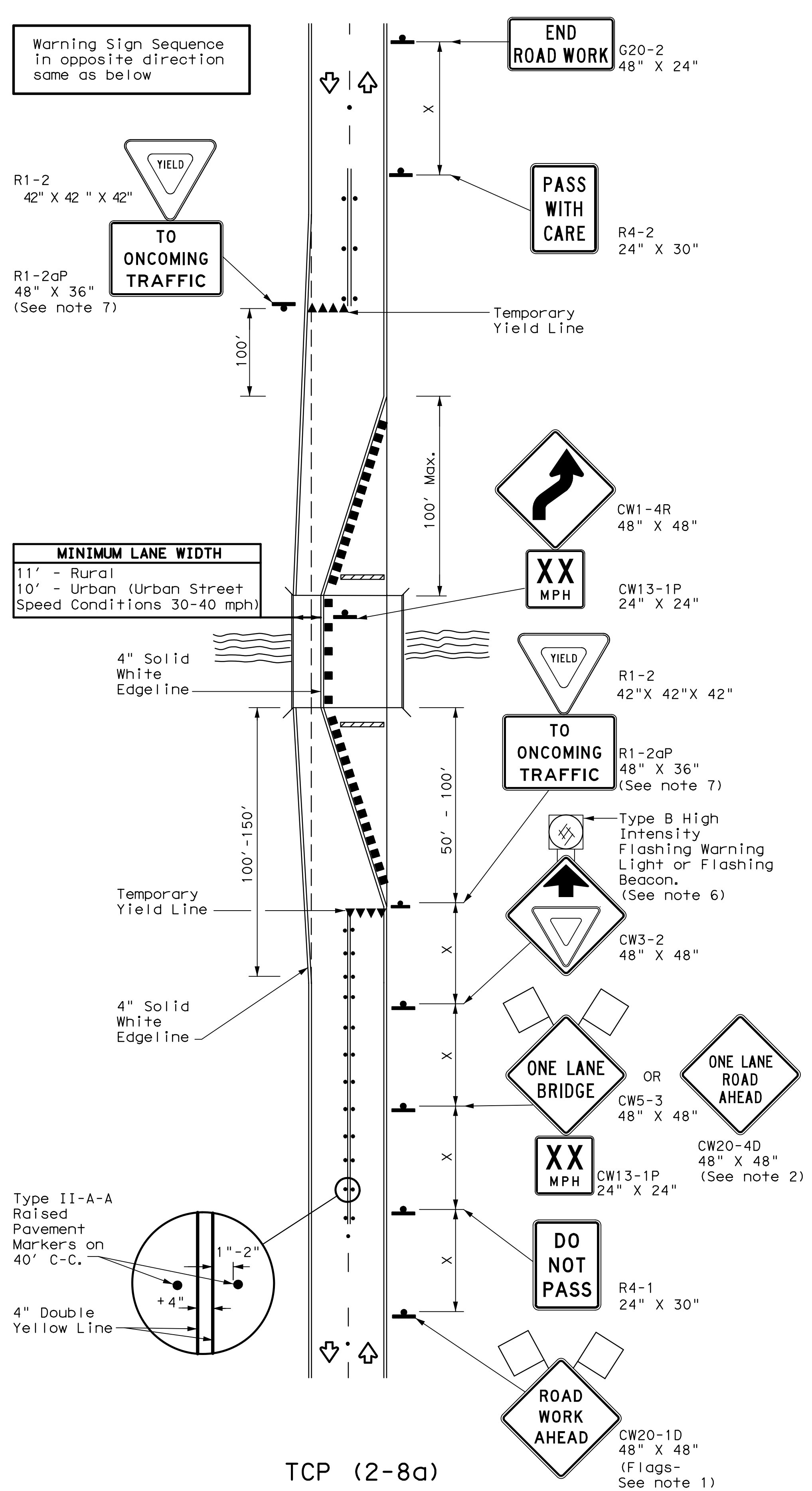
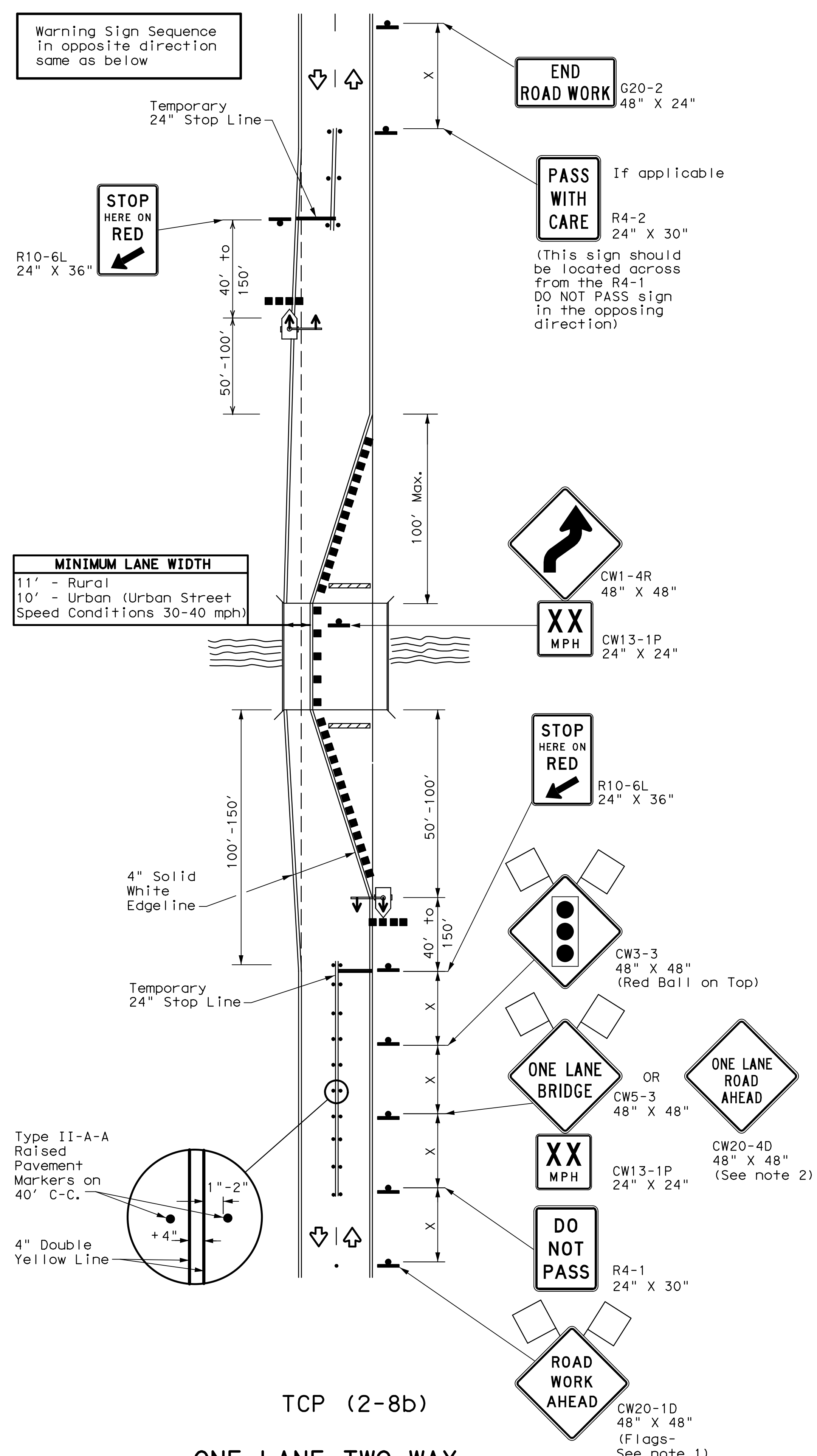


TCP (2-8a)

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



TCP (2-8b)

ONE LANE TWO-WAY
TRAFFIC CONTROL WITH TRAFFIC SIGNAL

LEGEND

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

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

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

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

GENERAL NOTES

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

TCP (2-8a)

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

TCP (2-8b)

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

Texas Department of Transportation — Traffic Operations Division Standard

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

TCP(2-8)-18

FILE: tcp2-8-18.dgn		DN:		CK:	DW:	CK:
©TxDOT	December 1985	CONT	SECT	JOB		HIGHWAY
REVISIONS 8-95 3-03 1-97 2-12 4-98 2-18		0233	05	038		SH 54
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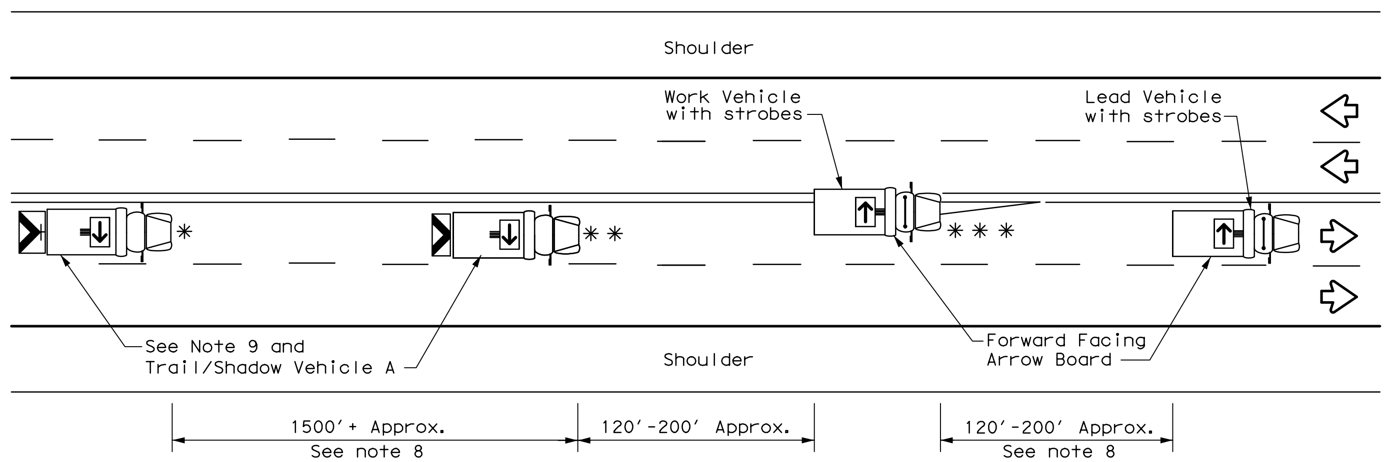
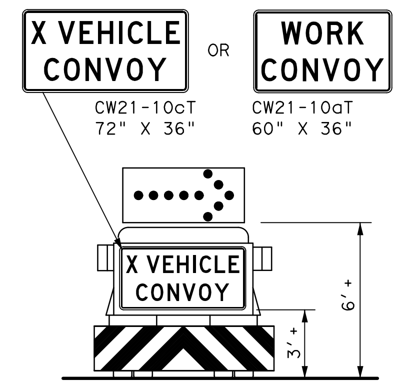
		ELP		CULBERSON		48



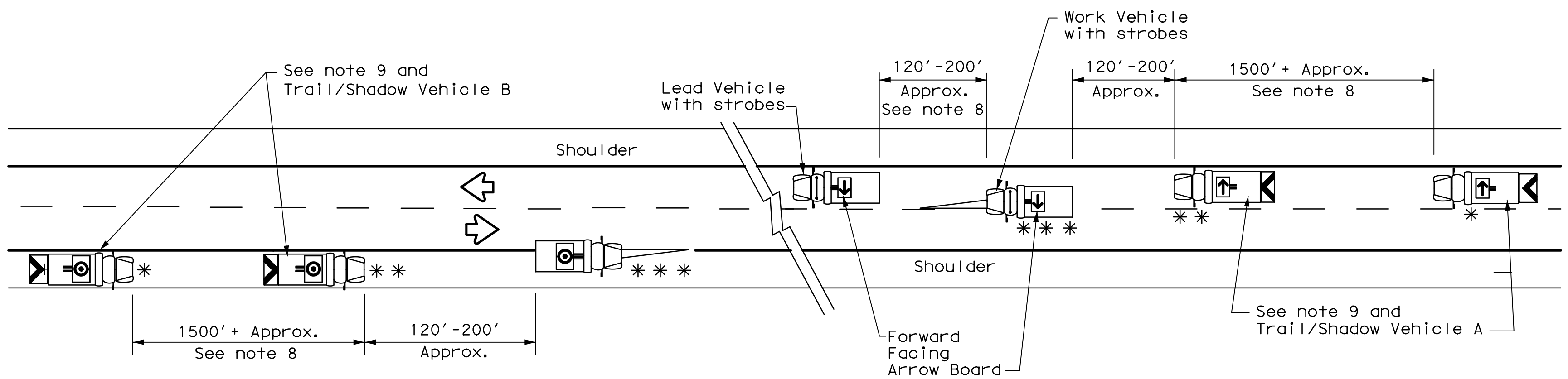
TCP (3-1a)

UNDIVIDED MULTILANE ROADWAY



TRAIL/SHADOW VEHICLE A

with RIGHT Directional display Flashing Arrow Board

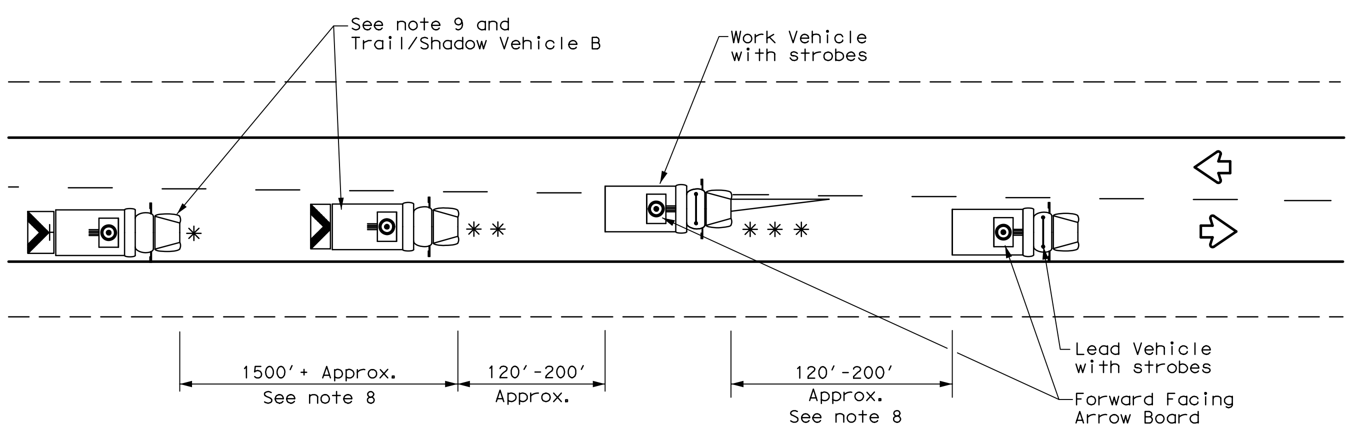


WORK ON SHOULDER

WORK ON TRAVEL LANE

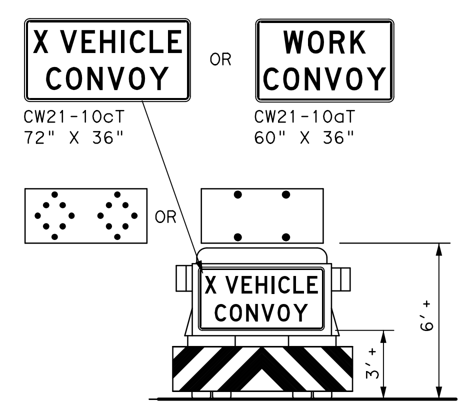
TCP (3-1b)

TWO-WAY ROADWAY WITH PAVED SHOULDERS



TCP (3-1c)

TWO-WAY ROADWAY WITHOUT PAVED SHOULDERS



TRAIL/SHADOW VEHICLE B

with Flashing Arrow Board in CAUTION display

LEGEND

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

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

GENERAL NOTES

1. TRAIL, SHADOW, and LEAD vehicles shall be equipped with arrow boards as illustrated. When a LEAD vehicle is not used the WORK vehicle must be equipped with an arrow board. The Engineer will determine if the LEAD VEHICLE and/or TRAIL VEHICLE are required based on prevailing roadway conditions, traffic volume, and sight distance restrictions.

2. The use of amber high intensity rotating, flashing, oscillating, or strobe lights on vehicles are required. Blue high intensity rotating, flashing, oscillating or strobe lights when mounted on the driver's side of the vehicle may be operated simultaneously with the amber beacons or strobe lights.

3. The use of truck mounted attenuators (TMA) on the SHADOW VEHICLE and TRAIL VEHICLE are required.

4. Reflective sheeting on the rear of the TMA shall meet or exceed the reflectivity and color requirements of DEPARTMENTAL MATERIAL SPECIFICATION DMS 8300, Type A.

5. Flashing arrow boards shall be Type B or Type C as per the Barricade and Construction (BC) standards. The board shall be controlled from inside the vehicle.

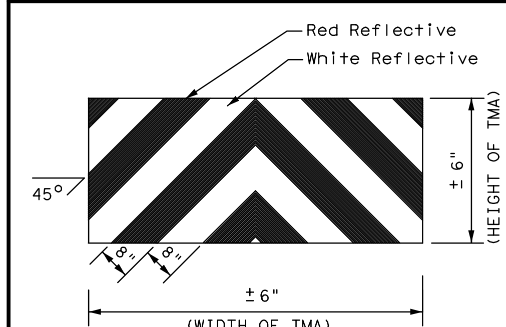
6. Each vehicle shall have two-way radio communication capability.

7. When work convoys must change lanes, the TRAIL VEHICLE should change lanes first to shadow the other convoy vehicles.

8. Vehicle spacing between the TRAIL VEHICLE and the SHADOW VEHICLE will vary depending on sight distance restrictions. Motorists approaching the work convoy should be able to see the TRAIL VEHICLE in time to slow down and/or change lanes as they approach the TRAIL VEHICLE. Vehicle spacing between the WORK VEHICLE and SHADOW VEHICLE and vehicle spacing between WORK VEHICLE and LEAD VEHICLE may vary according to terrain, work activity and other factors.

9. "X VEHICLE CONVOY" (CW21-10cT) or "WORK CONVOY" (CW21-10aT) signs shall be used on TRAIL VEHICLES and SHADOW VEHICLES as shown. As an option 48" X 48" diamond shaped "WORK CONVOY"(CW21-10T) or "X VEHICLE CONVOY" (CW21-10bT) signs may be used where adequate mounting space exists. When used, the X VEHICLE CONVOY sign shall have the number of the convoy vehicles displayed on the sign in the number designation "X" location. The "X VEHICLE CONVOY" sign shall not be used on the SHADOW VEHICLE if a TRAIL VEHICLE is used.

10. On two-lane two-way roadways, the work and protection vehicles should pull over periodically to allow motor vehicle traffic to pass. If motorists are not allowed to pass the work convoy, a "DO NOT PASS" (R4-1) sign should be placed on the back of the rearmost protection vehicle.



STRIPING FOR TMA

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN MOBILE OPERATIONS UNDIVIDED HIGHWAYS

TCP(3-1)-13

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©TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS 2-94 4-98 8-95 7-13 1-97	0233	05	038	SH 54
	DIST		COUNTY	SHEET NO.
	ELP		CULBERSON	49

175

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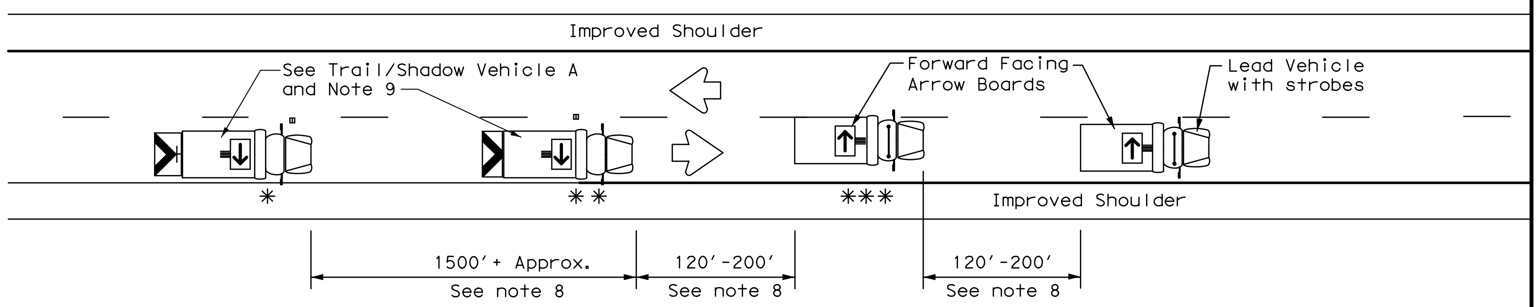
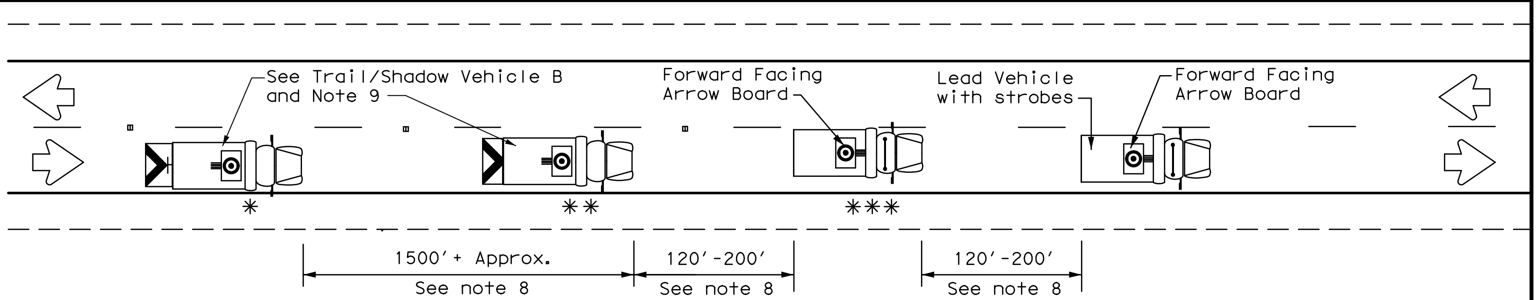
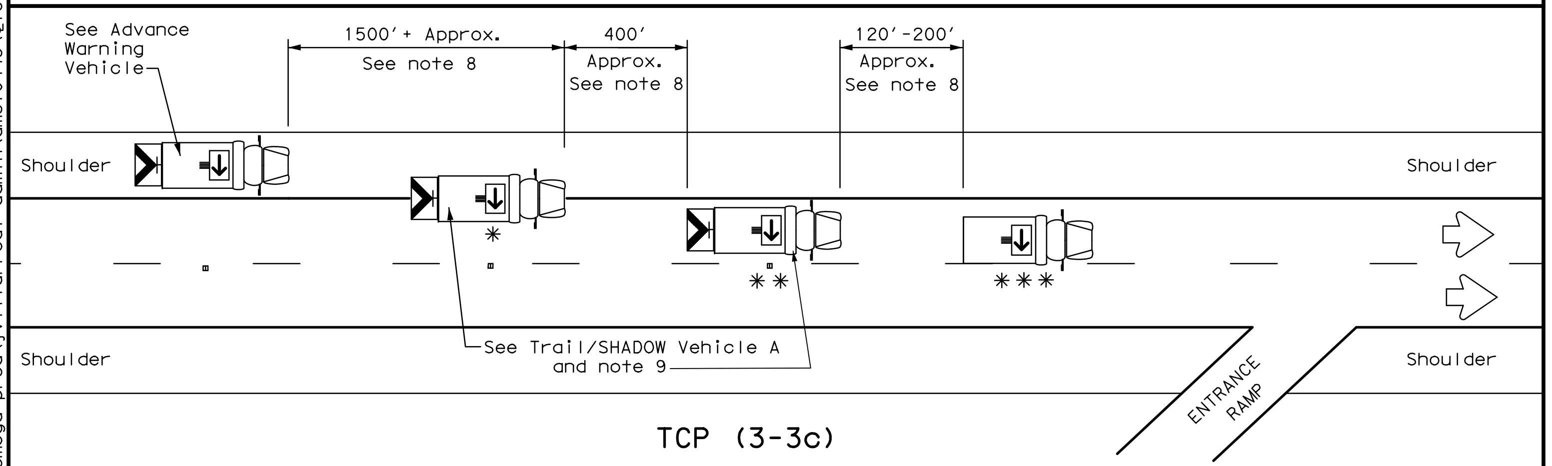


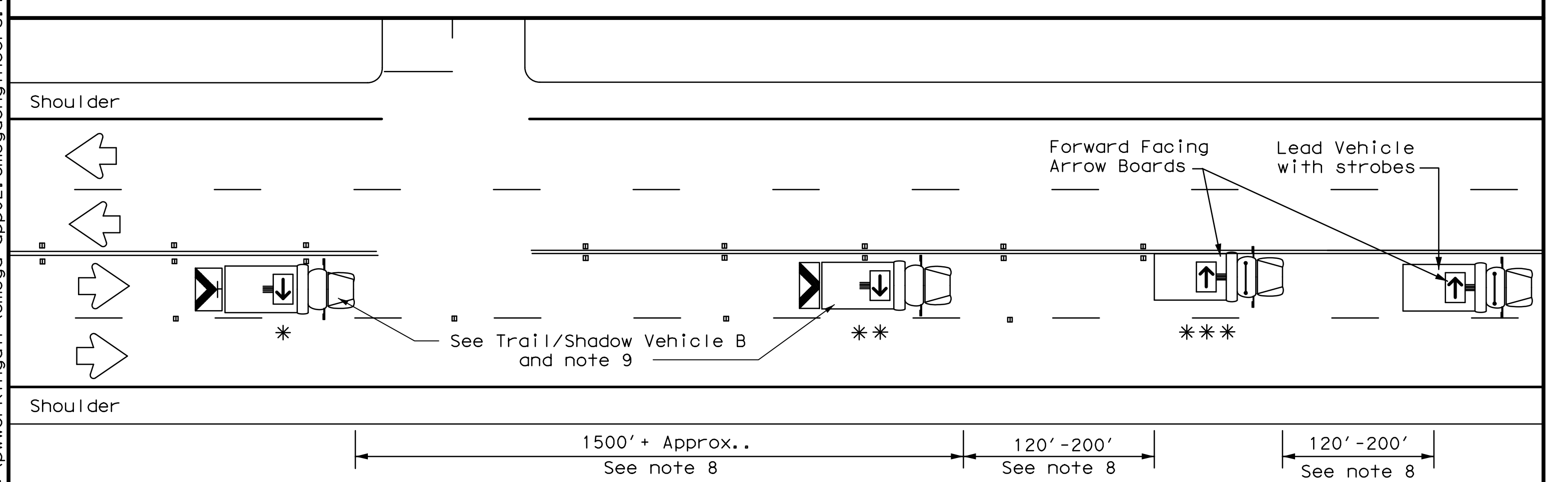
TCP (3-3a)
TWO LANE HIGHWAY WITH PAVED SHOULDERS
(WORK ON TRAVEL LANE)



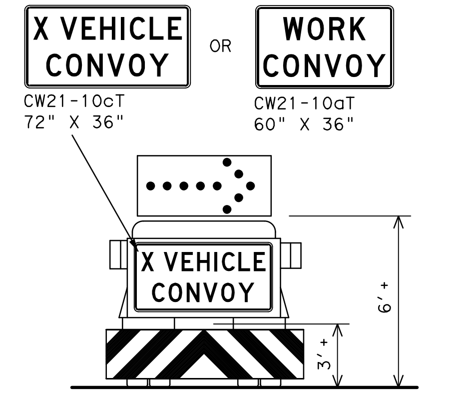
TCP (3-3b)
TWO LANE HIGHWAY WITHOUT PAVED SHOULDERS
(WORK ON TRAVEL LANE)



TCP (3-3c)
DIVIDED MULTILANE HIGHWAY

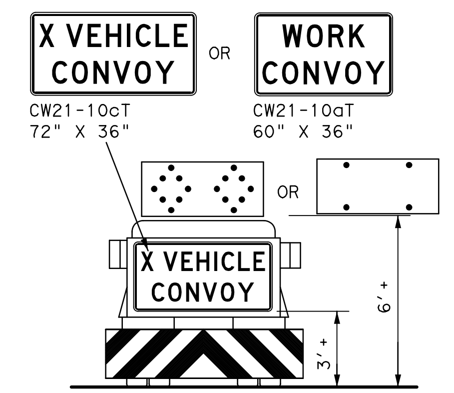


TCP (3-3d)
UNDIVIDED MULTILANE HIGHWAY



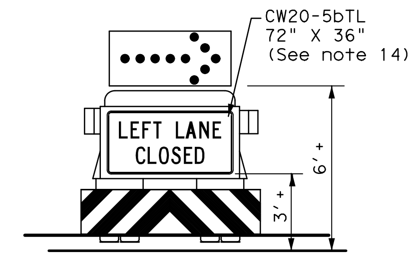
TRAIL/SHADOW VEHICLE A

with RIGHT Directional display Flashing Arrow Board

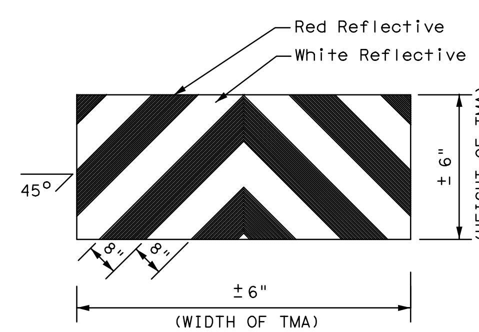


TRAIL/SHADOW VEHICLE B

with Flashing Arrow Board in Caution Mode



ADVANCE WARNING VEHICLE



STRIPING FOR TMA

LEGEND

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

TYPICAL USAGE

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

GENERAL NOTES

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

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN MOBILE OPERATIONS RAISED PAVEMENT MARKER INSTALLATION/ REMOVAL

TCP(3-3)-14

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©TxDOT September 1987	CONT	SECT	JOB	HIGHWAY	
REVISIONS 2-94 4-98 8-95 7-13 1-97 7-14	0233	05	038	SH 54	
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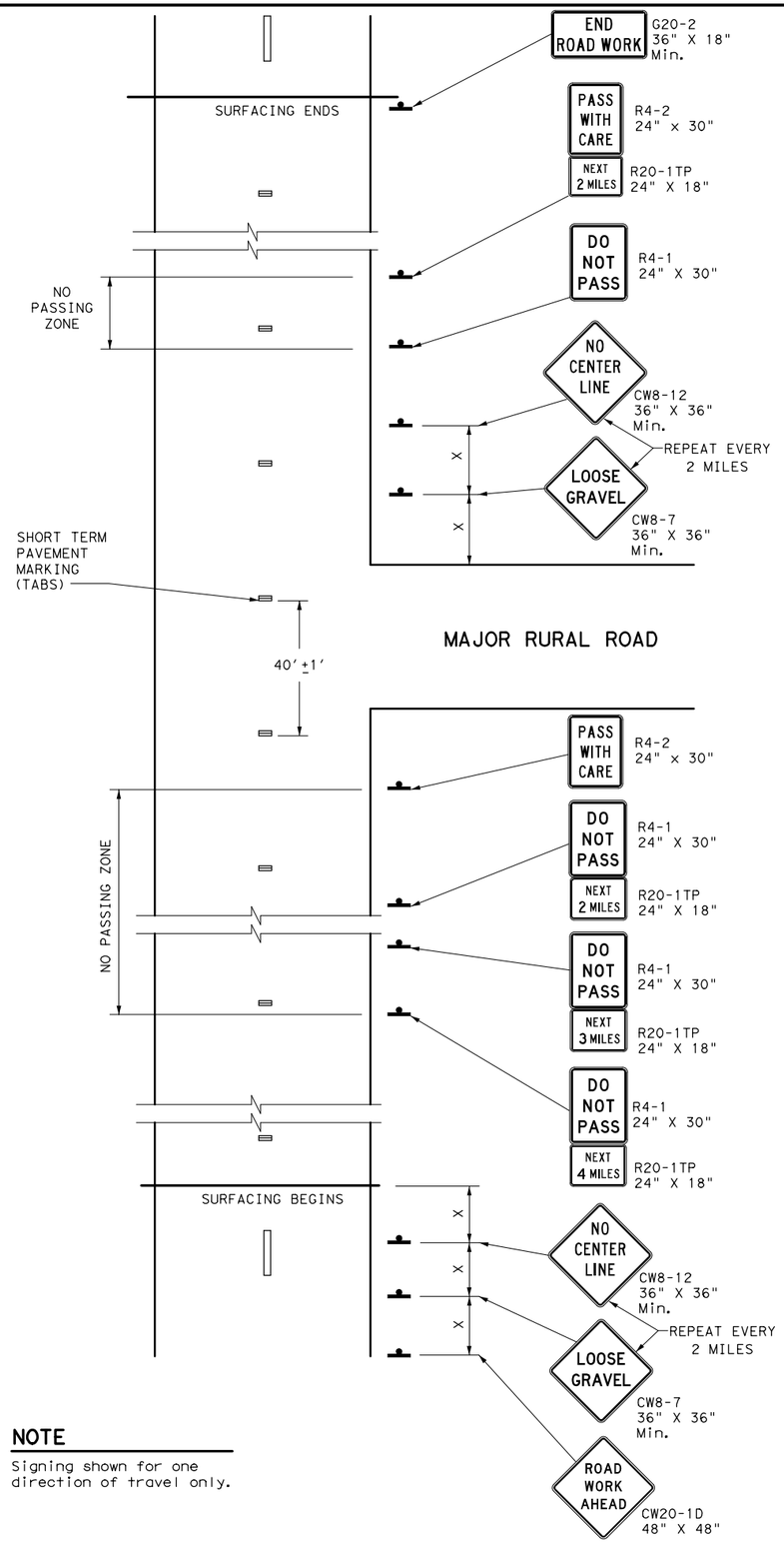
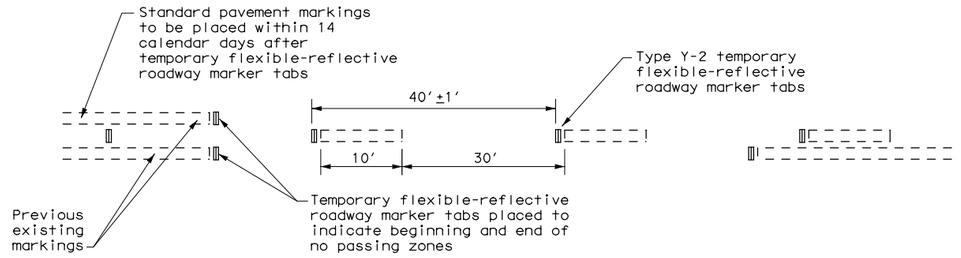


NOTE

Signing shown for one direction of travel only.

NO PASSING ZONES ON TWO-LANE TWO-WAY ROADS



TABS ON CENTERLINES OF TWO-LANE TWO-WAY ROADS

For seal coat, micro-surface or similar operations

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

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

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

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

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

"NO CENTER LINE" SIGN (CW8-12)

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

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

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

"LOOSE GRAVEL" SIGN (CW8-7)

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

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

PAVEMENT MARKINGS

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

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

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

COORDINATION OF SIGN LOCATIONS

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

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

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

* Conventional Roads Only

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

GENERAL NOTES

1. The traffic control devices detailed on this sheet will be furnished and erected as directed by the Engineer on sections of roadway where tabs must be placed prior to the surfacing operation which will cover or obliterate the existing pavement markings.
2. The devices shown on this sheet are to be used to supplement those required by the BC Standards or others required elsewhere in the plans.
3. Signs shall be erected as detailed on the BC Standards or the Compliant Work Zone Traffic Control Devices List (CWZTCD) on supports approved for Long-Term / Intermediate-Term Work Zone Sign Supports.
4. When surfacing operations take place on divided highways, freeways or expressways, the size of diamond shaped construction warning signs shall be 48" x 48".
5. Signs on divided highways, freeways and expressways will be placed on both right and left sides of the roadway based on roadway conditions as directed by the Engineer.

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL DETAILS FOR SURFACING OPERATIONS

TCP(7-1)-13

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©TxDOT	March 1991	CONT	SECT	JOB	HIGHWAY
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4-92 4-98		DIST	COUNTY		SHEET NO.
1-97 7-13		ELP	CULBERSON		51

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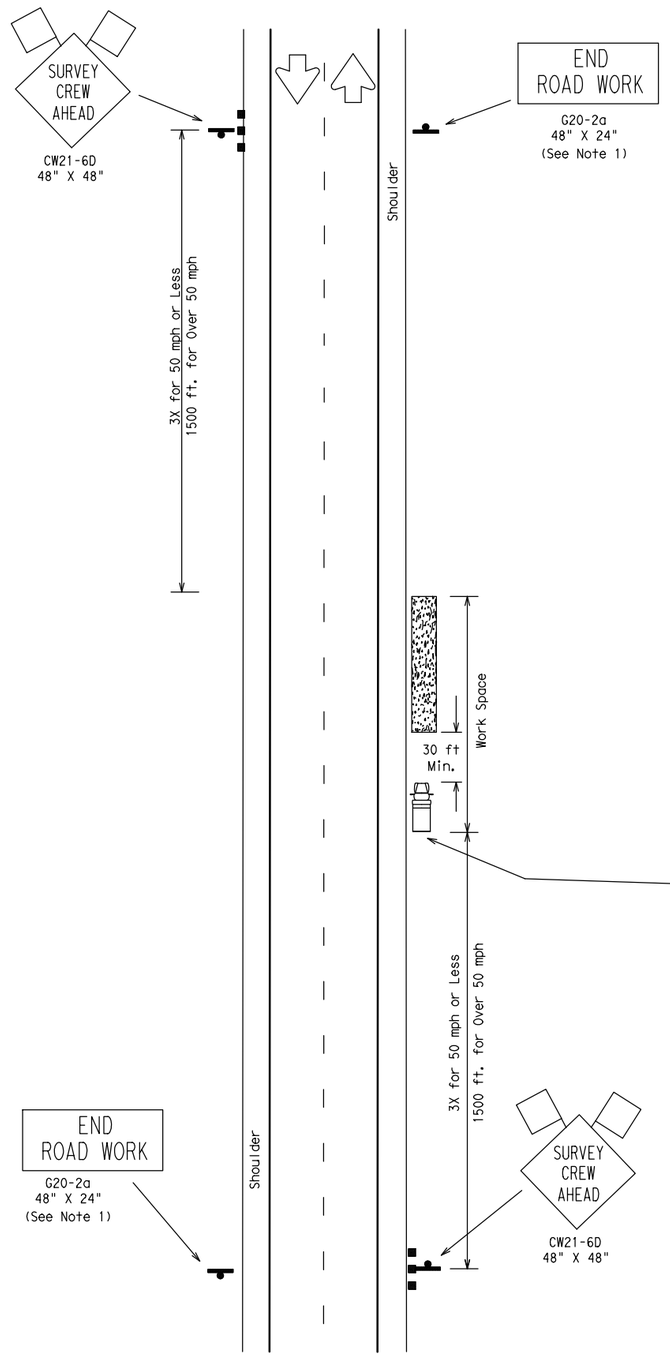
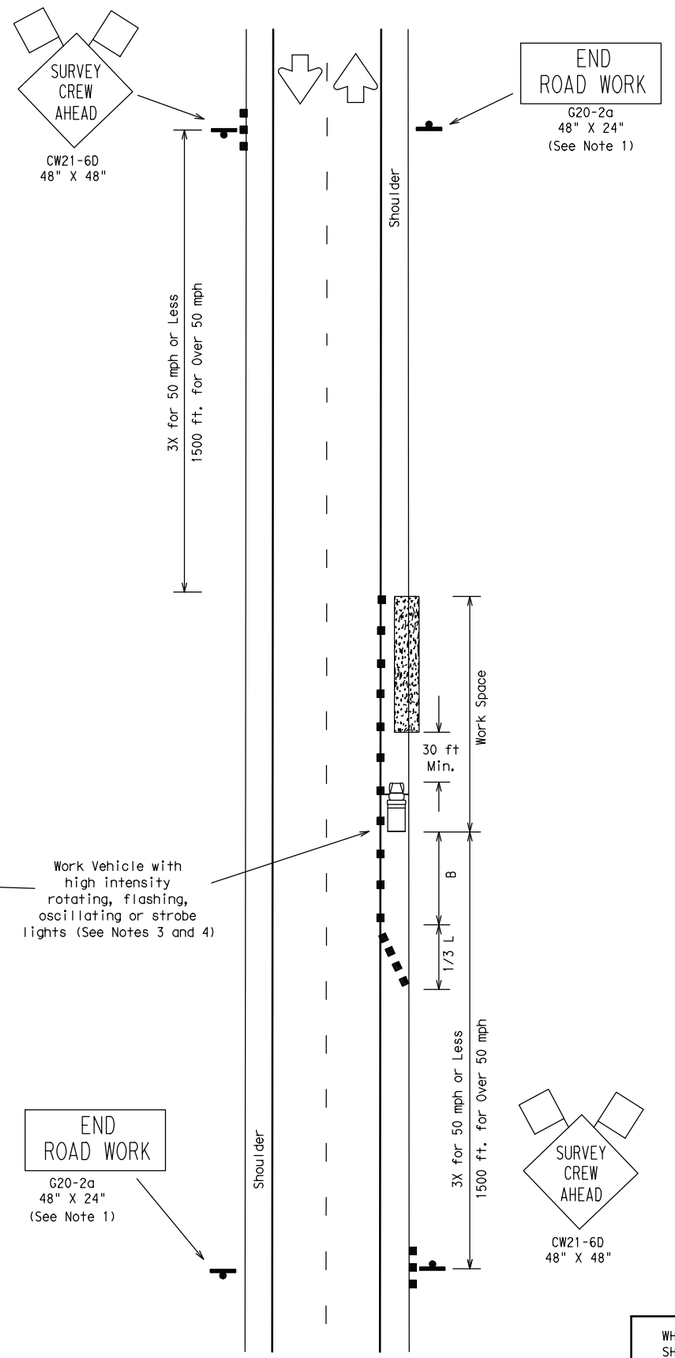


TCP (S-1a)
WORK OFF SHOULDER OR PAVED SURFACE



TCP (S-1b)
WORK ON SHOULDER

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

✳ Conventional Roads Only

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

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

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

GENERAL NOTES:

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

TCP(S-1a)

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

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

8-18-08 Revision
1 Corrected misspelling.

Texas Department of Transportation
Traffic Operations Division

TRAFFIC CONTROL PLAN FOR SURVEYING OPERATIONS

TCP(S-1)-08A

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

REVISIONS
8-08

CONT	SECT	JOB	HIGHWAY
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ELP	CULBERSON	52

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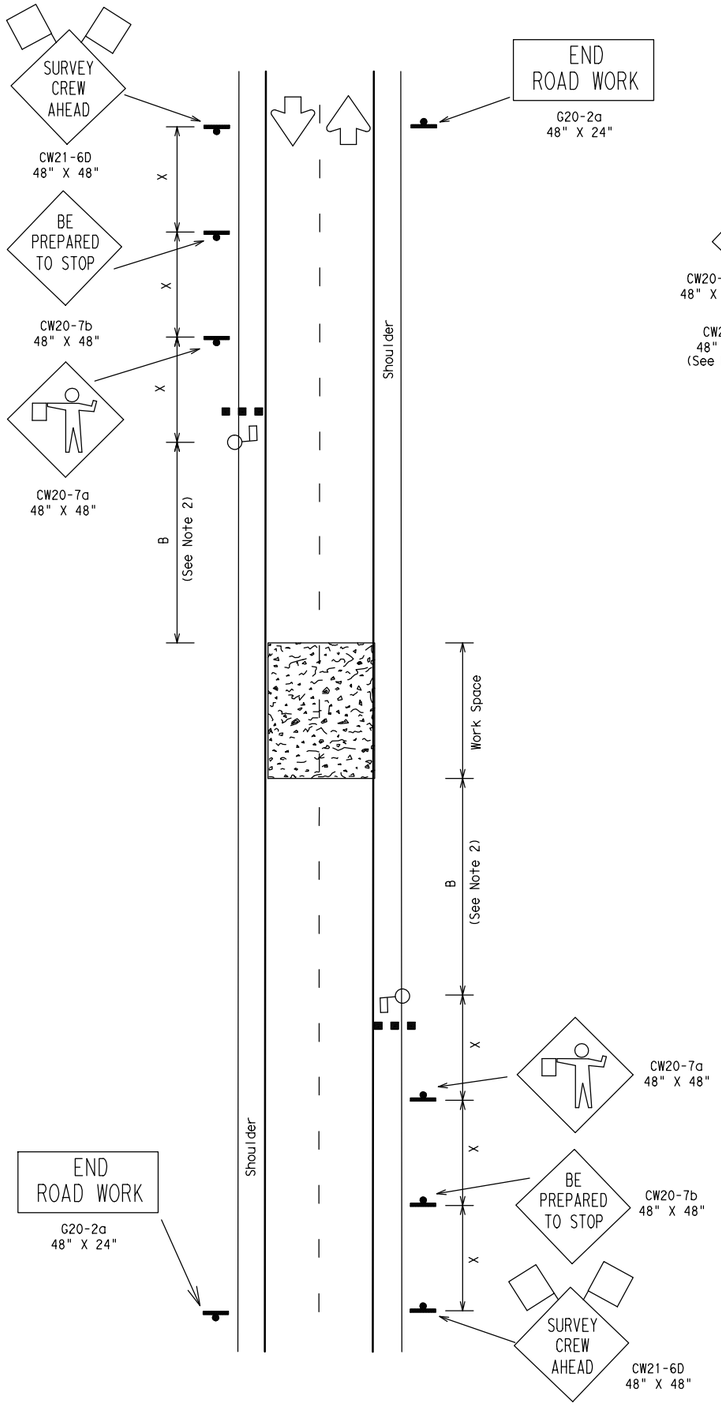
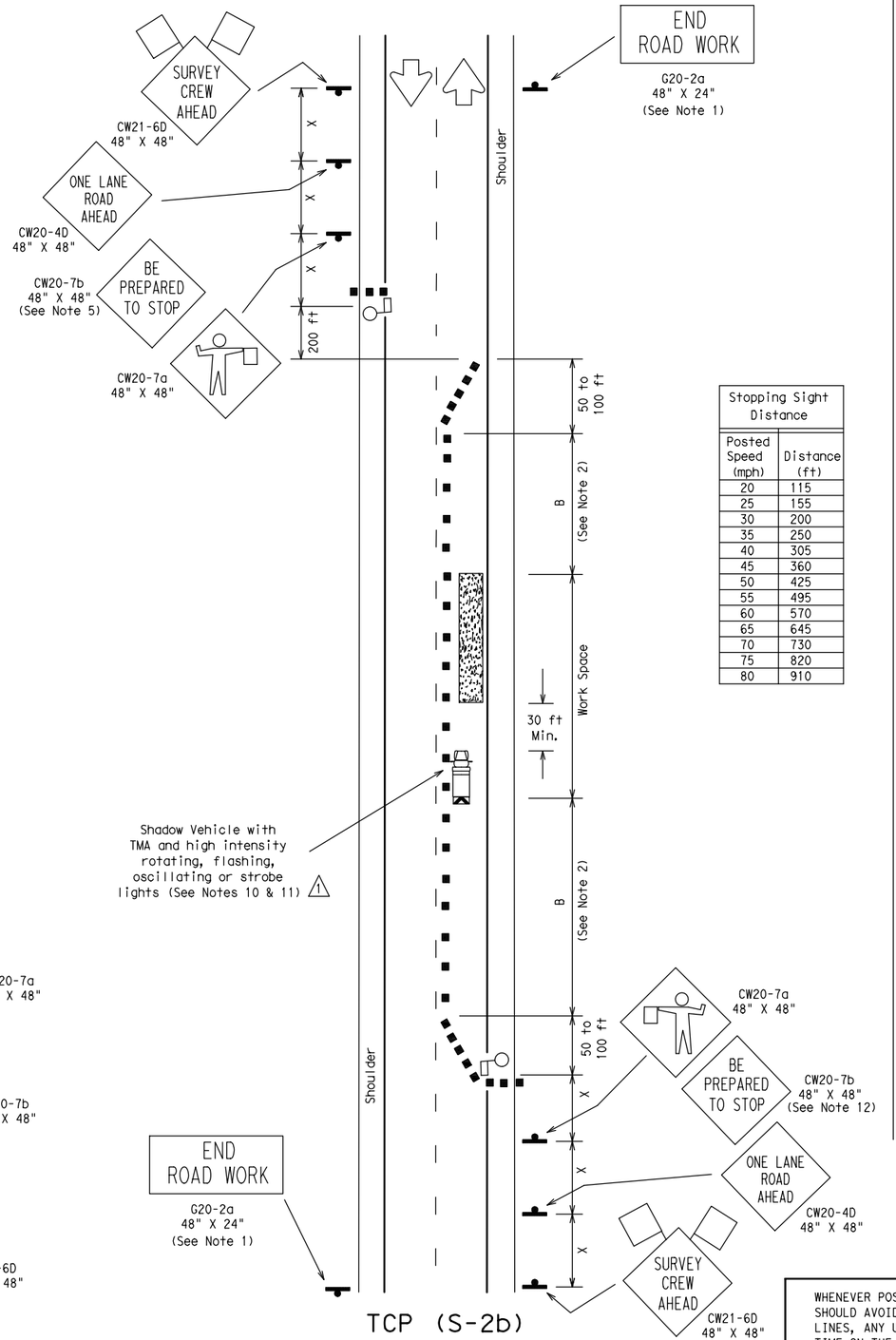


TCP (S-2a)
ROAD CLOSED FOR LESS THAN 20 MINUTES -
OFF PEAK TRAFFIC HOURS
WITH OR WITHOUT SHOULDERS



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

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

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

✳ Conventional Roads Only

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

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

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

GENERAL NOTES:

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

TCP(S-2a)

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

TCP (S-2B)

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

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

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

Texas Department of Transportation
Traffic Operations Division

TRAFFIC CONTROL PLAN FOR SURVEYING OPERATIONS

TCP(S-2)-08A

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

REVISIONS
8-08

CONT	SECT	JOB	HIGHWAY
0233	05	038	SH 54
DIST	COUNTY		SHEET NO.
ELP	CULBERSON		53

DATE: 9/27/2022 11:15:17 AM
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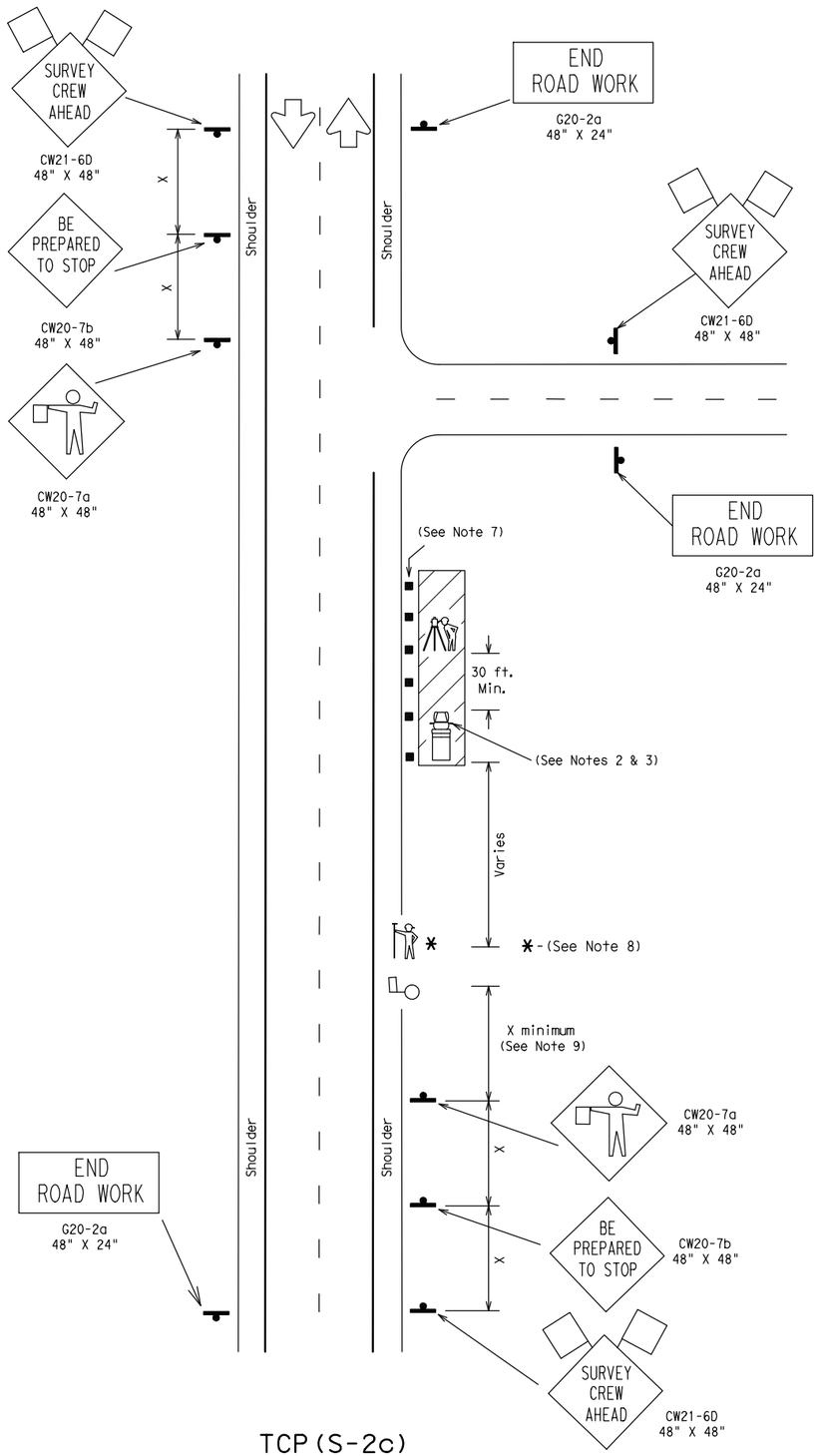

TCP(S-2c)

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

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

✳ Conventional Roads Only

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

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

DEFINITIONS:

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

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

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

GENERAL NOTES:

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

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

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

Texas Department of Transportation
Traffic Operations Division

TRAFFIC CONTROL PLAN FOR SURVEYING OPERATIONS

TCP(S-2c)-10

REVISIONS

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

CONT	SECT	JOB	HIGHWAY
0233	05	038	SH 54

DIST	COUNTY	SHEET NO.
ELP	CULBERSON	54

212A

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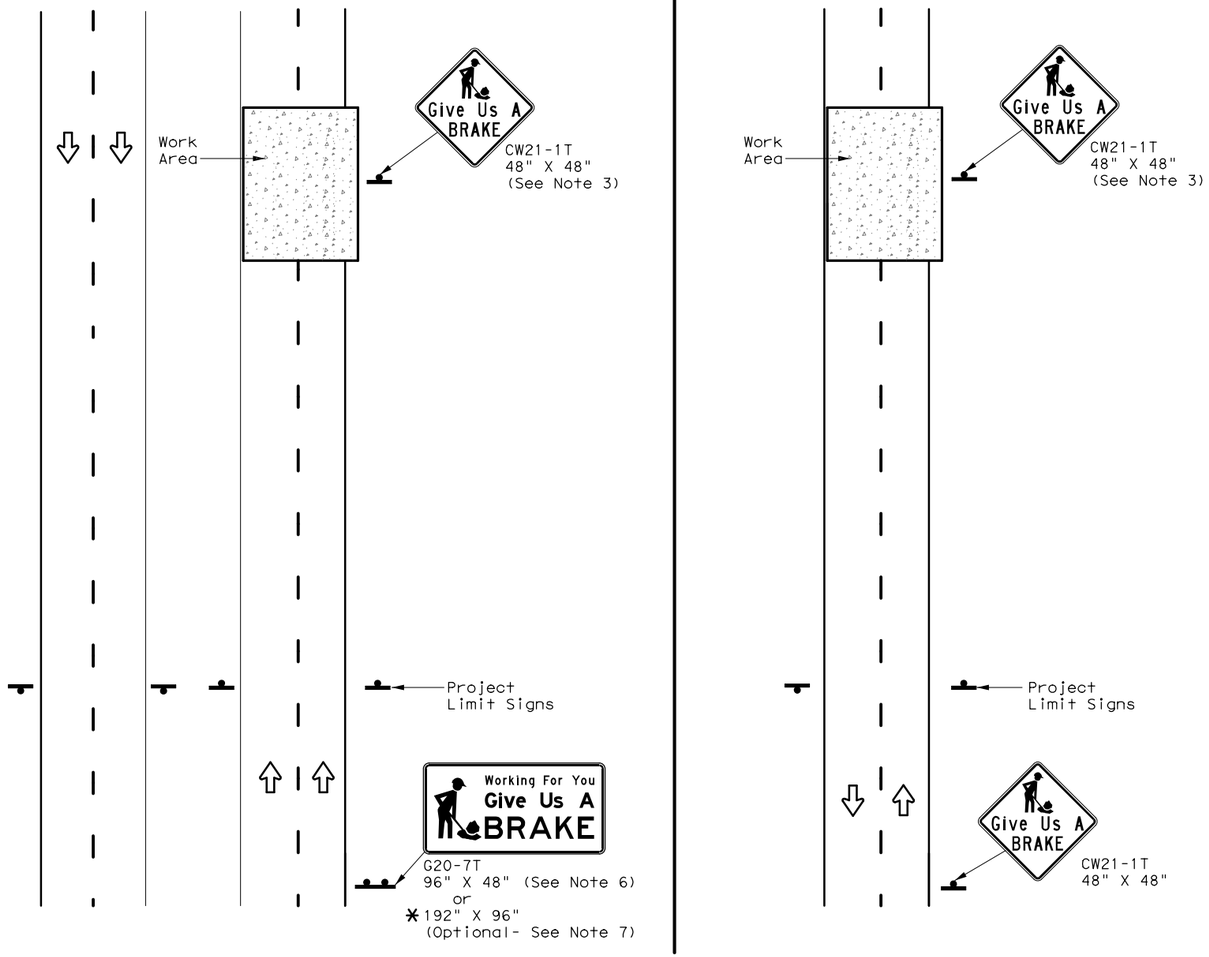


SIGNS ARE SHOWN FOR ONE DIRECTION OF TRAVEL

* When the optional larger WORKING FOR YOU GIVE US A BRAKE (G20-7T) 192" x 96" sign is required, the locations shall be noted elsewhere in the plans.

SUMMARY OF LARGE SIGNS

BACKGROUND COLOR	SIGN DESIGNATION	SIGN	SIGN DIMENSIONS	REFLECTIVE SHEETING	SQ FT	GALVANIZED STRUCTURAL STEEL			DRILLED SHAFT 24" DIA. (LF)
						Size	(LF) ①	(LF) ②	
Orange	G20-7T	Working For You Give Us A BRAKE	96" X 48"	Type B_{FL} or C_{FL}	32	▲	▲	▲	▲
Orange	G20-7T	Working For You Give Us A BRAKE	192" X 96"	Type B_{FL} or C_{FL}	128	W8x18	16	17	12

▲ See Note 6 Below

LEGEND	
	Sign
	Large Sign
	Traffic Flow

DEPARTMENTAL MATERIAL SPECIFICATIONS	
PLYWOOD SIGN BLANKS	DMS-7100
ALUMINUM SIGN BLANKS	DMS-7110
SIGN FACE MATERIALS	DMS-8300

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

GENERAL NOTES

1. See BC and SMD sheets for additional sign support details.
2. Sign locations shall be approved by the Engineer.
3. For projects more than two miles in length, Give Us a BRAKE signs should be repeated halfway through the project. The Give Us a Brake (CW21-1T) may be used for this purpose.
4. Work zone speed limits are sometimes used in conjunction with GIVE US A BRAKE signing. See BC(3) for location and spacing of construction speed zone signing when required.
5. Give Us a Brake (CW21-1T) signs and supports shall be considered subsidiary to Item 502, "Barricades, Signs and Traffic Handling."
6. The 96" X 48" Working For You Give Us A BRAKE (G20-7T) may use a 1/2" or 5/8" plywood substrate or 0.125" aluminum sheeting substrate and may be supported by two 4" x 6" wood posts with drilled holes for breakaway as per BC(5) and will be subsidiary to Item 502.
7. The Working For You Give Us A BRAKE (G20-7T) 192" X 96" sign shall be paid for under the following specification items:
   Item 636 - Aluminum Signs
   Item 647 - Large Roadside Sign Supports and Assemblies.
   Item 416 - Drilled Shaft Foundations
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.

Texas Department of Transportation

Traffic Operations Division Standard

WORK ZONE "GIVE US A BRAKE" SIGNS

WZ(BRK)-13

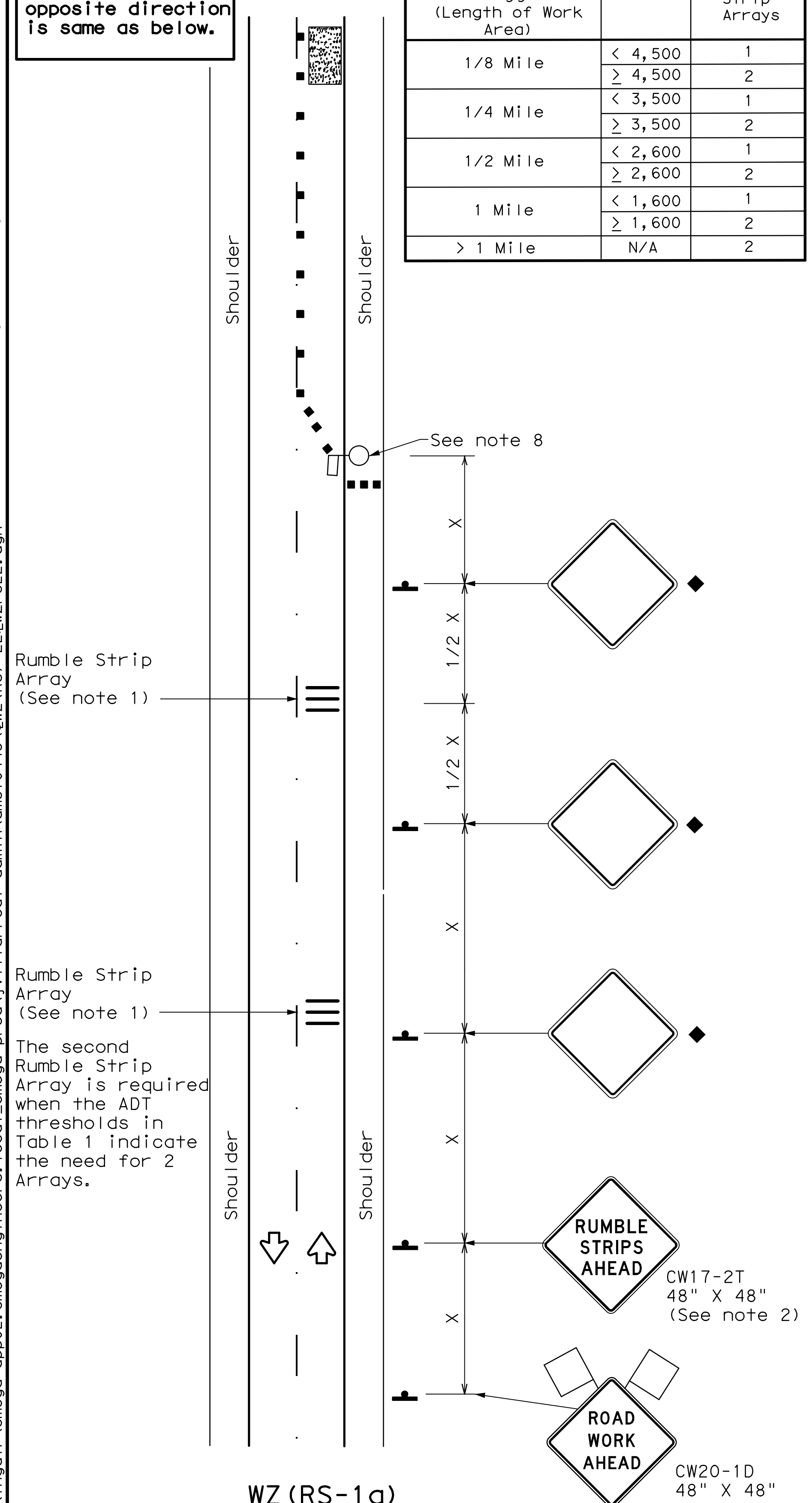
FILE: wzbrk-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT August 1995	CONT	SECT	JOB	HIGHWAY
REVISIONS	0233	05	038	SH 54
6-96 5-98 7-13	DIST	COUNTY		SHEET NO.
8-96 3-03	ELP	CULBERSON		55

116

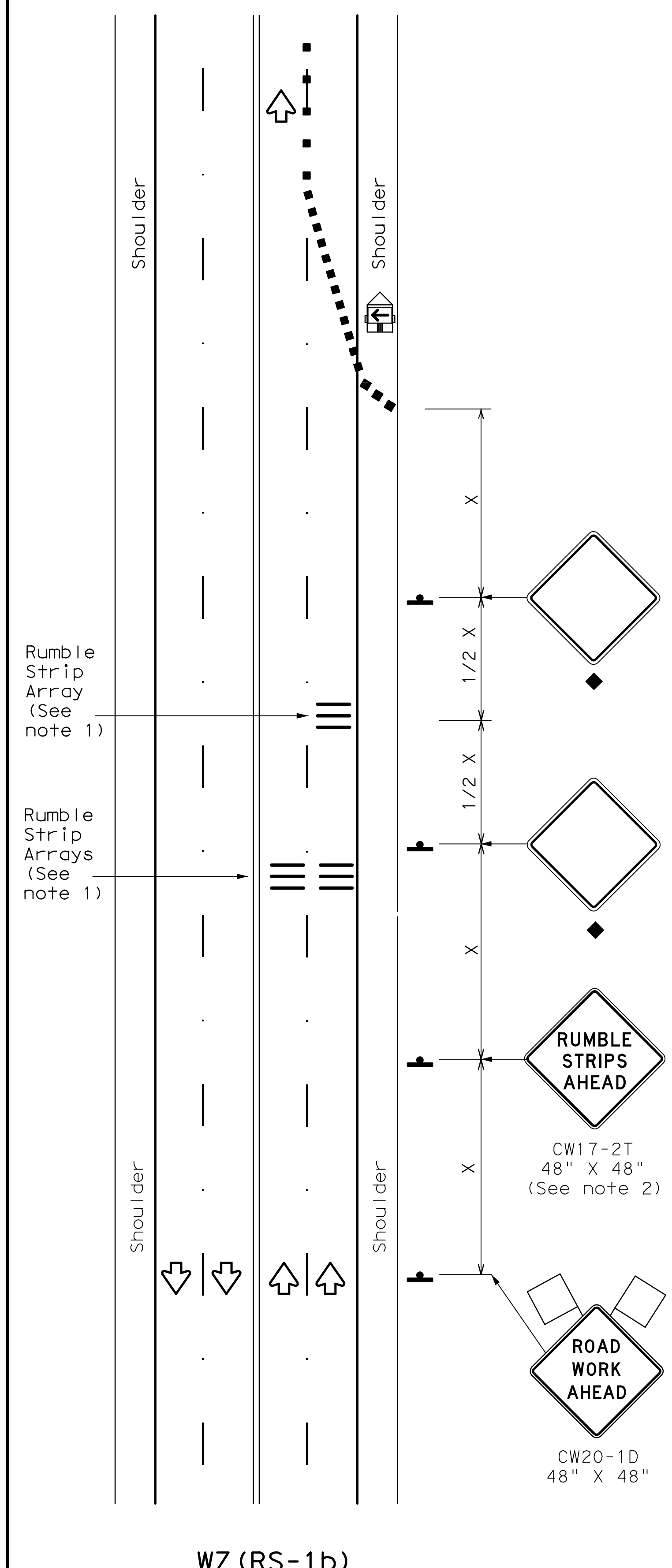
Warning sign and rumble strip sequence in opposite direction is same as below.

TABLE 1

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



RUMBLE STRIPS ON ONE-LANE TWO-WAY APPLICATION



RUMBLE STRIPS FOR LANE CLOSURE ON CONVENTIONAL ROADWAY

GENERAL NOTES

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

TABLE 2

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

LEGEND

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

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

✱ Conventional Roads Only

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

TYPICAL USAGE

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

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

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

Texas Department of Transportation

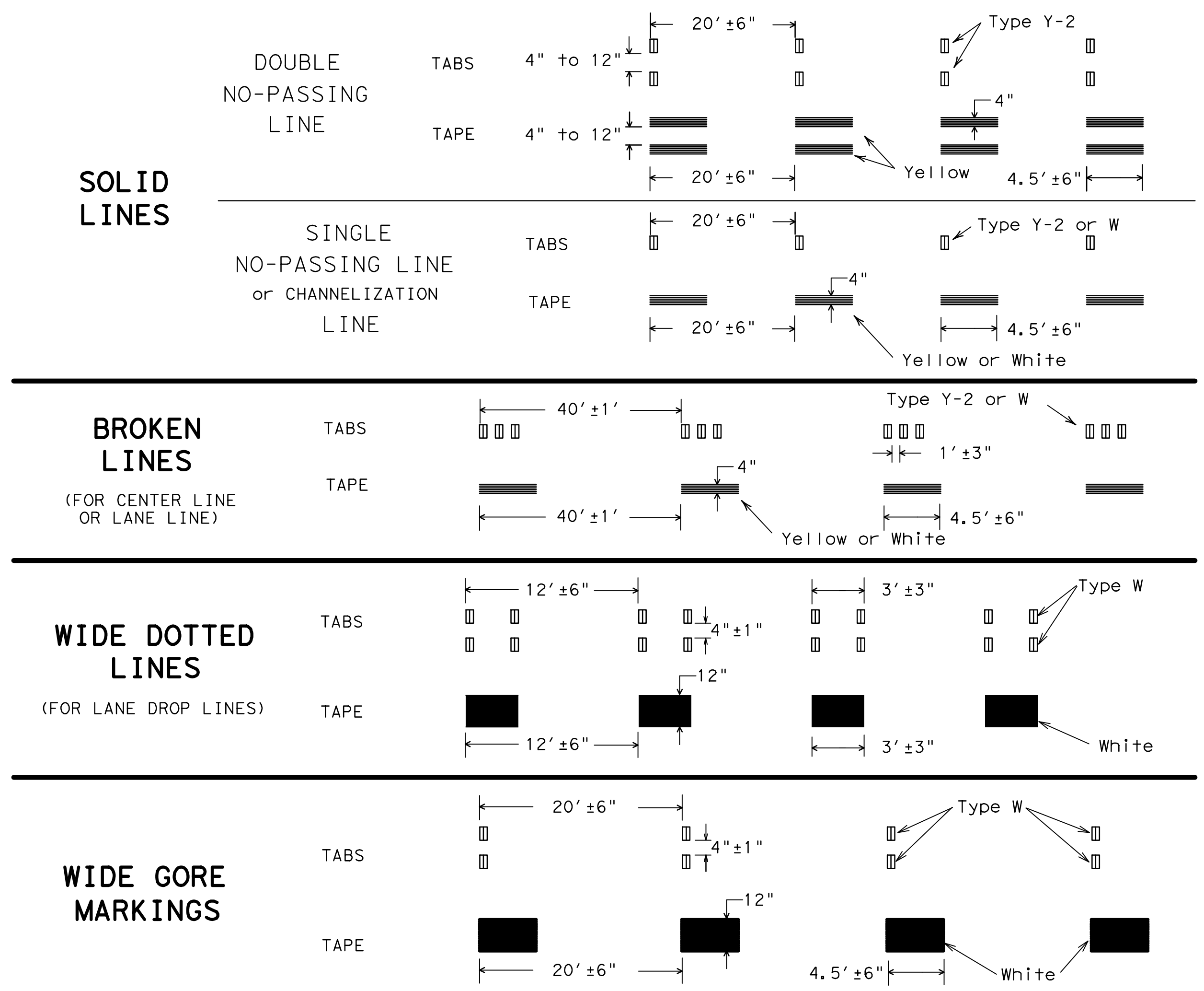
Traffic Safety Division Standard

TEMPORARY RUMBLE STRIPS

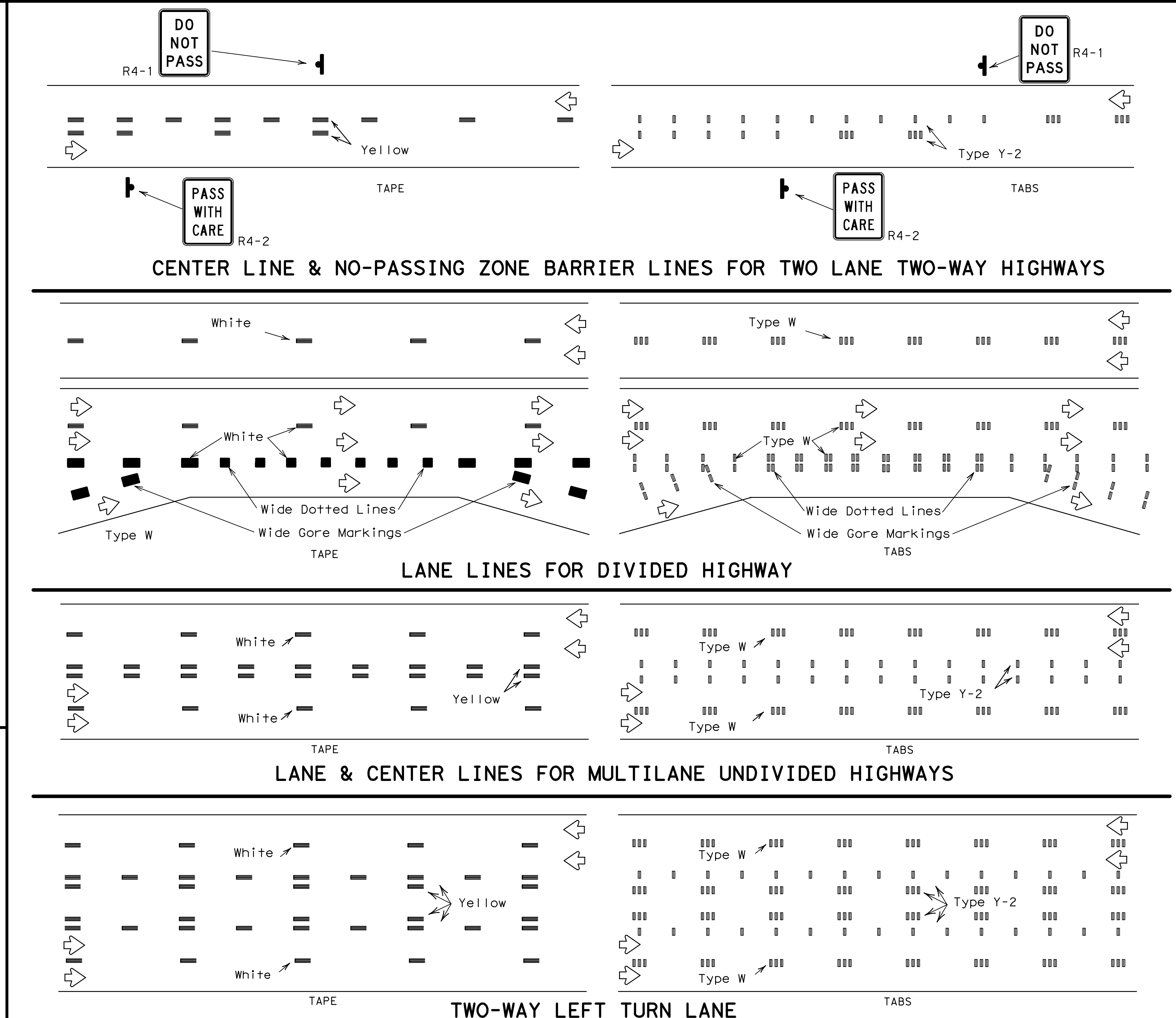
WZ(RS)-22

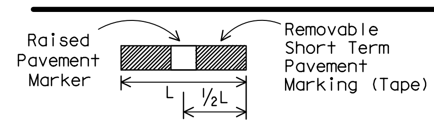
FILE: wzrs22.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2012	CONT 0233	SECT 05	JOB 038	HIGHWAY SH 54
REVISIONS 2-14 1-22 4-16	DIST ELP		COUNTY CULBERSON	SHEET NO. 56

WORK ZONE SHORT TERM PAVEMENT MARKINGS DETAILS



WORK ZONE SHORT TERM PAVEMENT MARKINGS PATTERNS





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

NOTES:

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

TEMPORARY FLEXIBLE, REFLECTIVE ROADWAY MARKER TABS (TABS)

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

PREFABRICATED PAVEMENT MARKINGS

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

RAISED PAVEMENT MARKERS

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

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

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

Texas Department of Transportation — Traffic Operations Division Standard

WORK ZONE SHORT TERM PAVEMENT MARKINGS

WZ(STPM)-13

FILE: wzstpm-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT April 1992	CONT	SECT	JOB	HIGHWAY
REVISIONS 1-97 3-03 7-13	0233	05	038	SH 54
	DIST		COUNTY	SHEET NO.
	ELP		CULBERSON	57

111

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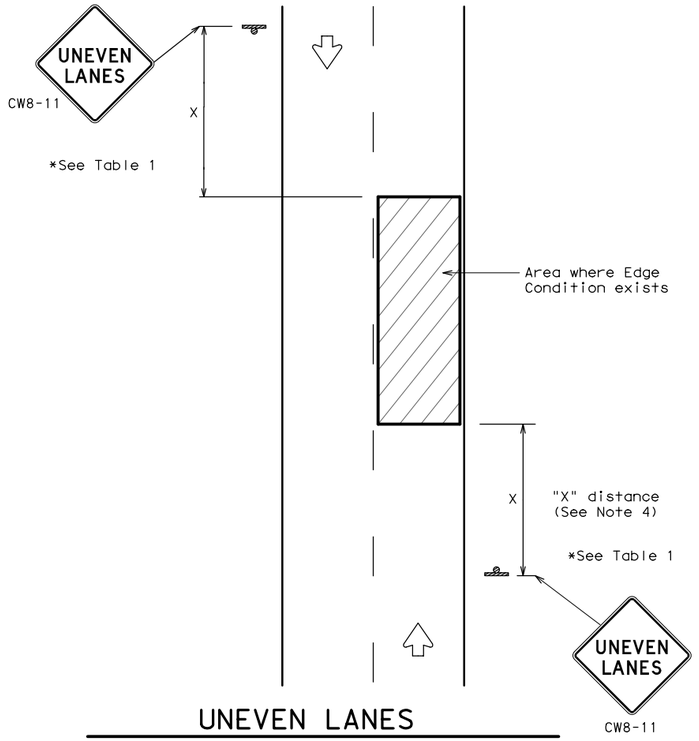
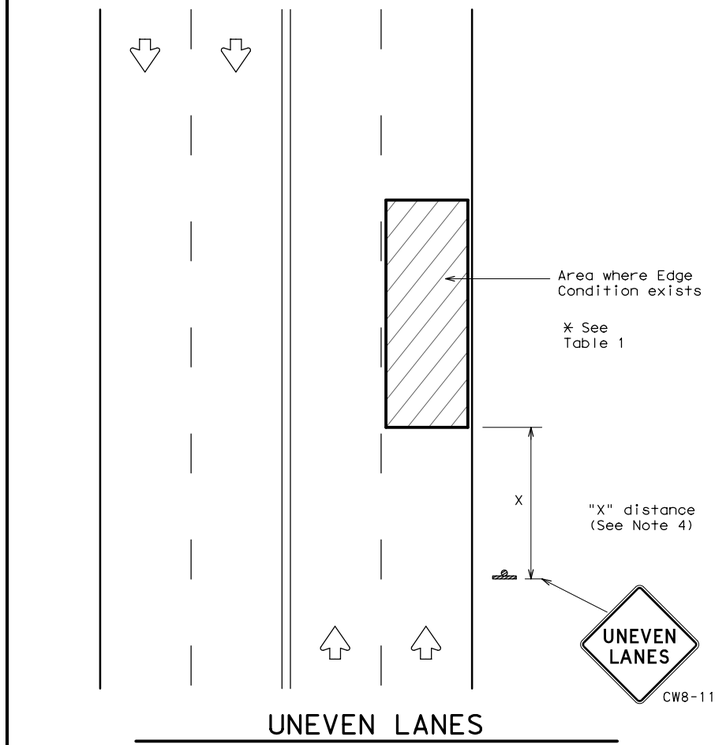
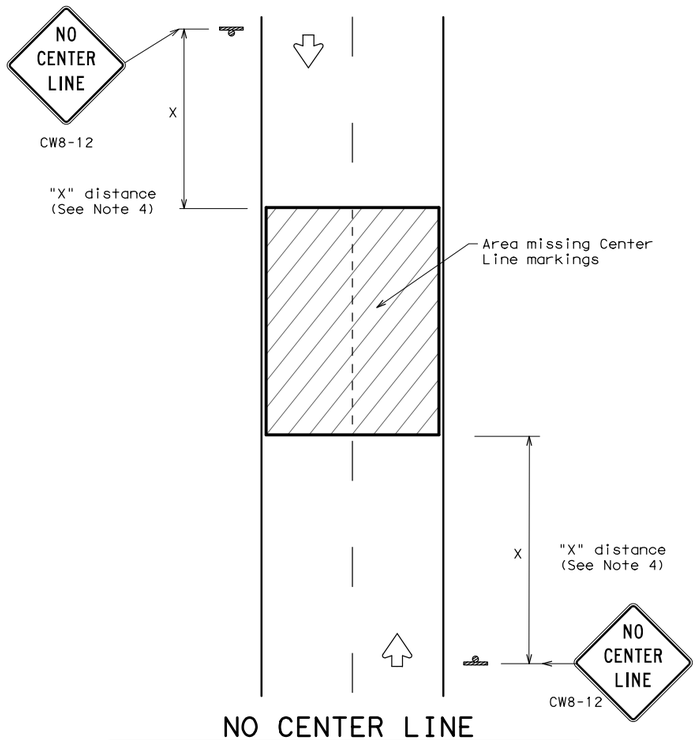


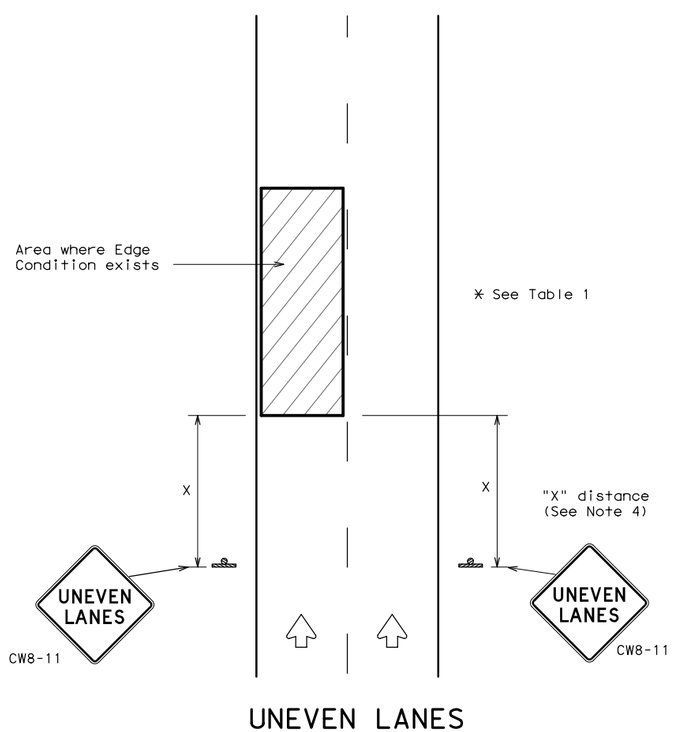
UNEVEN LANES
TWO LANE CONVENTIONAL ROAD



UNEVEN LANES
FOUR LANE CONVENTIONAL ROAD



NO CENTER LINE
TWO LANE CONVENTIONAL ROAD



UNEVEN LANES
DIVIDED ROADWAY

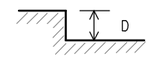
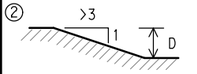
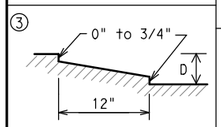
DEPARTMENTAL MATERIAL SPECIFICATIONS	
PERMANENT PREFABRICATED PAVEMENT MARKINGS	DMS-8240
TEMPORARY (REMOVABLE) PREFABRICATED PAVEMENT MARKINGS	DMS-8241
SIGN FACE MATERIALS	DMS-8300

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

GENERAL NOTES

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

TABLE 1

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

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

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

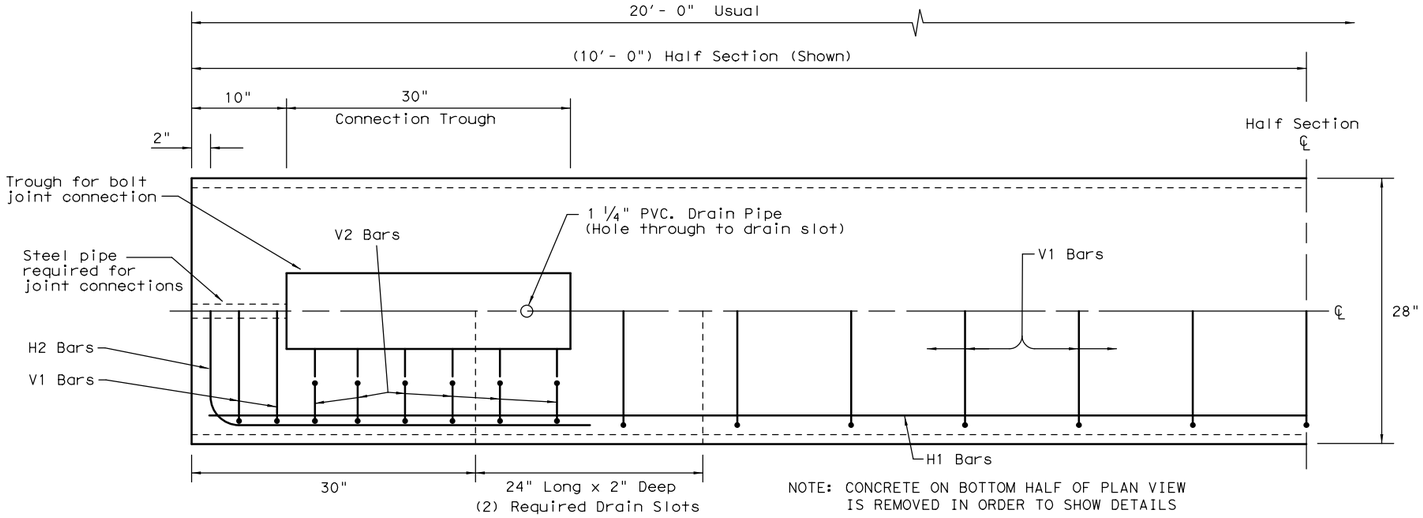
Texas Department of Transportation

Traffic Operations Division Standard

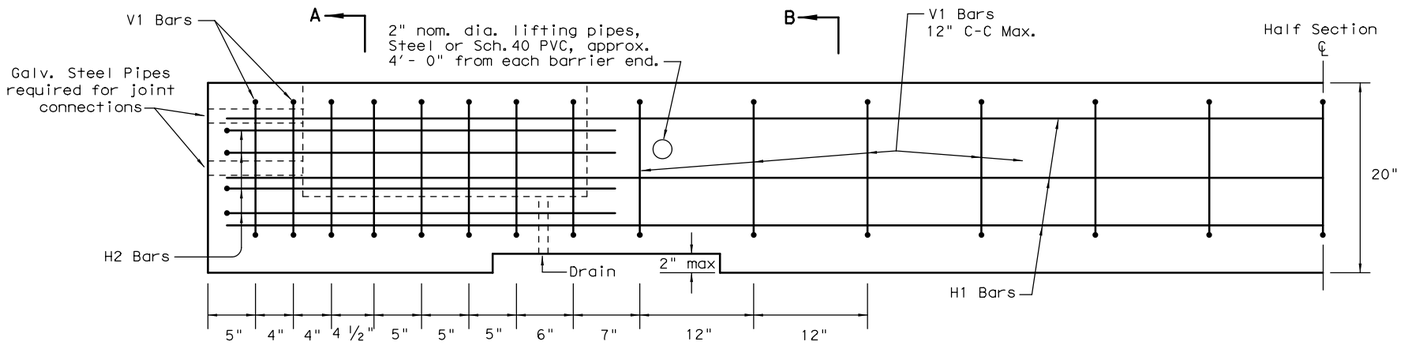
SIGNING FOR UNEVEN LANES

WZ(UL)-13

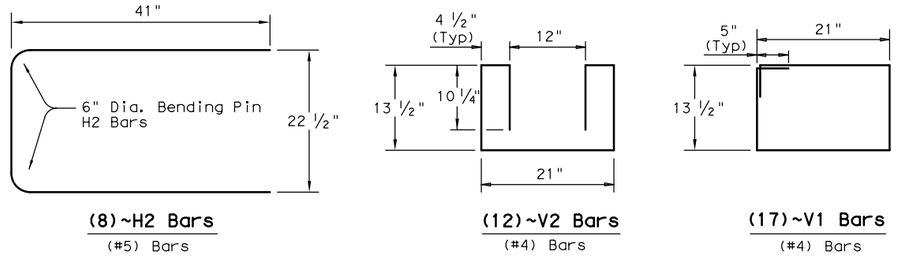
FILE: wzul-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT April 1992	CONT	SECT	JOB	HIGHWAY
REVISIONS	0233	05	038	SH 54
8-95 2-98 7-13	DIST	COUNTY		SHEET NO.
1-97 3-03	ELP	CULBERSON		58



PLAN
(TYPE 1) BARRIER SEGMENT
(SYMMETRICAL ABOUT CENTER LINES)



ELEVATION
(TYPE 1) BARRIER SEGMENT
(SYMMETRICAL ABOUT CENTER LINES)



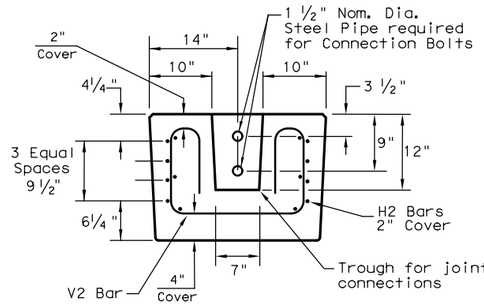
(8)~H2 Bars (#5) Bars

(12)~V2 Bars (#4) Bars

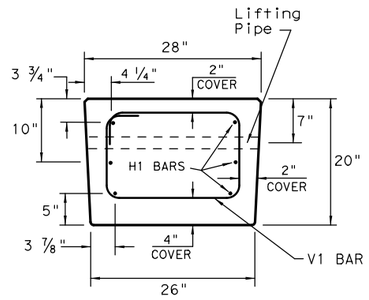
(17)~V1 Bars (#4) Bars

REINFORCING STEEL DETAILS
TYPE 1 - BARRIER SEGMENT

Note: Use 2" Dia. Bending Pin, unless otherwise shown



SECTION A-A



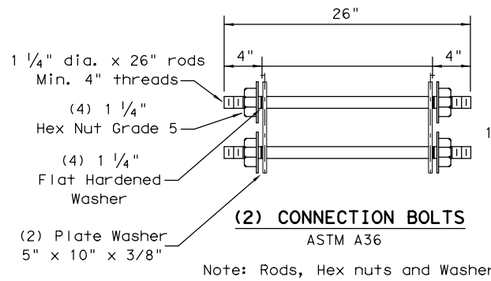
SECTION B-B

GENERAL NOTES

1. Low Profile Concrete Barrier (LPCB), is approved for use in temporary work zone locations, where the posted speed is 45 mph, or less.
2. Concrete shall be Class H for precast barrier with a minimum compressive strength of 3,600 psi.
3. Where used, rebar reinforcement shall be Grade 60 and conform to ASTM A615.
4. Precast LPCB barrier length shall be 20 ft.
5. All barrier edges shall have ¾" chamfer or a tooled radius.
6. Joint connection hardware shall be in accordance with Item 449, "Anchor Bolts." and is considered subsidiary.
7. Steel pipe required for joint connection bolts shall be galvanized in accordance with Item 445,"Galvanizing."
8. Welded wire reinforcement (WWR) may be used in lieu of conventional reinforcement for Type 1 barrier, and shall meet the requirements shown.

FOR CONTRACTORS INFORMATION ONLY

(TYPE 1) APPROX. QUANTITIES 20 FT. SECTION		
CONCRETE	CY	2.6
REINFORCING STEEL	LBS	330
TOTAL BARRIER WT.	LBS	11000



(2) CONNECTION BOLTS
ASTM A36

Note: Rods, Hex nuts and Washers shall be Galvanized.

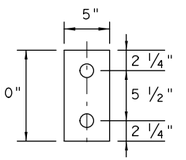
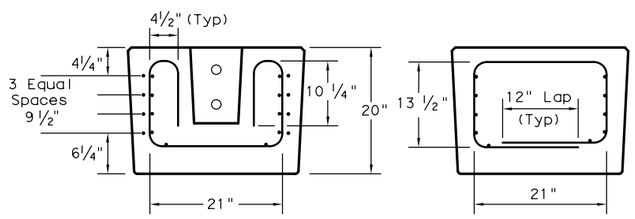


PLATE WASHER
5" x 10" x ⅜"



SECTION A-A SECTION B-B

(WWR) GENERAL NOTES

1. Deformed Welded Wire Reinforcement shall conform to ASTM A497.
2. Welded wire cage may be cut or bent, if necessary, but must be approved by the Engineer.
3. Combinations of reinforcing steel and WWR are permitted, as directed by the Engineer. The dimensions from the end of the barrier section to the first wire shall not exceed 3".

REQUIRED (WWR) WIRE DESIGN

8 ~ (D31) Horizontal Wires (Equally spaced)
10 ~ (D20) Horizontal Wires (Equally spaced)
29 ~ (D20) Vertical Wires (Spaced as shown in Elevation View)

WELDED WIRE REINFORCEMENT (WWR)- OPTIONAL REINFORCING

SHEET 1 OF 2

Texas Department of Transportation — Design Division Standard

LOW PROFILE CONCRETE BARRIER
PRECAST BARRIER (TYPE 1)
LPCB-13

FILE: lpcb13.dgn	DN: TxDOT	CK: AM	DW: VP	CK:
©TxDOT December 2010	CONT	SECT	JOB	HIGHWAY
REVISIONS	0233	05	038	SH 54
	DIST	COUNTY		SHEET NO.
	ELP	CULBERSON		59

DATE: 9/27/2022
FILE: c:\pwworkingdir\omega-app02.omegaengineers.local_omega-prod\jvillarreal-admin\dms10445\@LPCB-13@lpcb13.dgn

DATE: 9/27/2022
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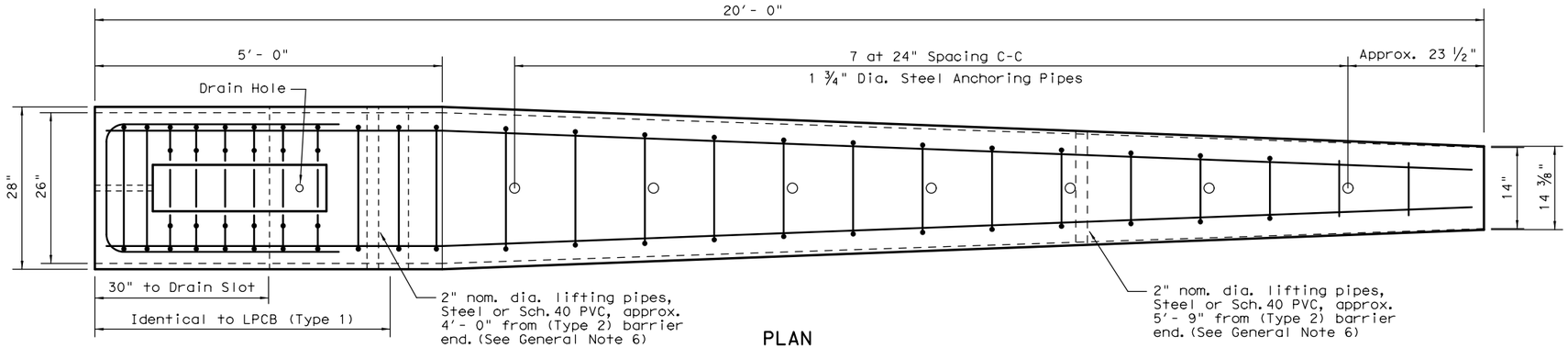
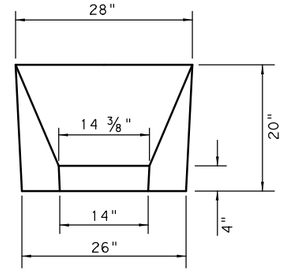
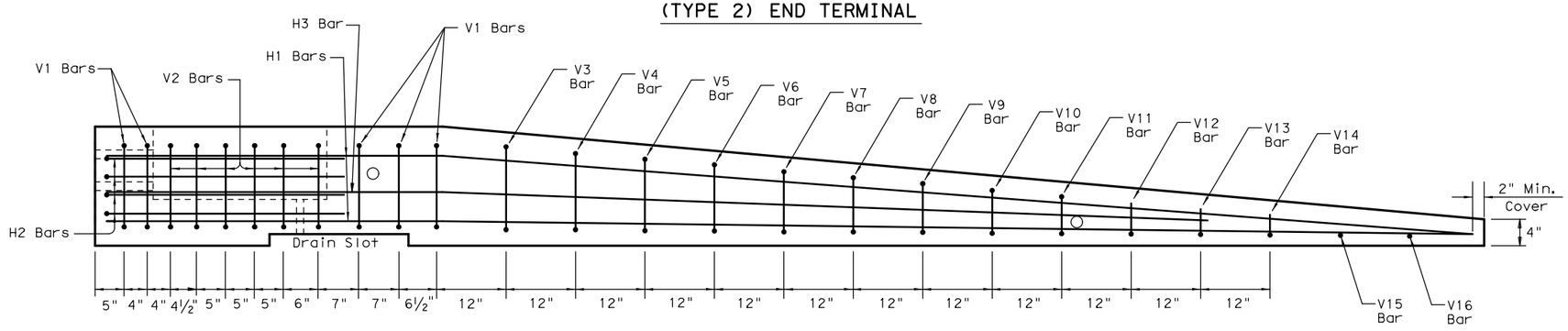


PLAN
(TYPE 2) END TERMINAL



APPROACH VIEW

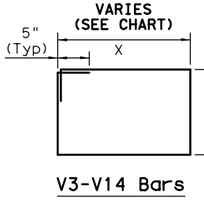


ELEVATION
(TYPE 2) END TERMINAL

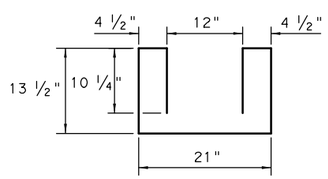
Note:
Anchoring pipes not shown in Elevation View

TYPE 2 - NOTES

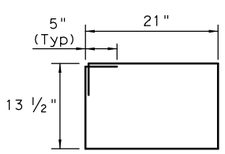
1. Welded wire reinforcment (WWR) is "not" an option for Type 2 Barrier.
2. Type 2 Barrier shall be used as an end treatment for the Type 1 barrier segments, when applicable.
3. The end treatment can be used without the anchor pins in locations that can accommodate approximately 4 ft. of lateral displacement of the end treatment. The use of non-pinned end treatment does not affect the performance or the deflection of the Low-Profile barrier system.
4. The anchor pins are all the same length and are to be driven flush with the top of the (Type 2) barrier surface.
5. The bends in the H3 and H1 bars are slight, no formal bend is necessary.
6. The Type 2 barrier segment must be lifted from the rear first, to prevent cracking of sloped section.
7. See LPCB sheet 1 for additional information.



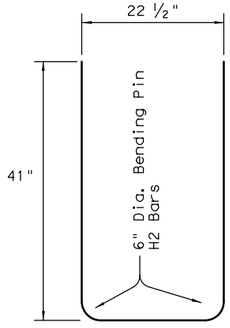
V3-V14 Bars



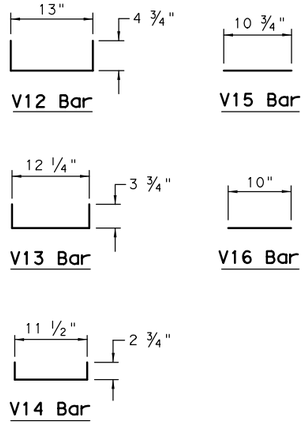
(6)~V2 Bars



(5)~V1 Bars



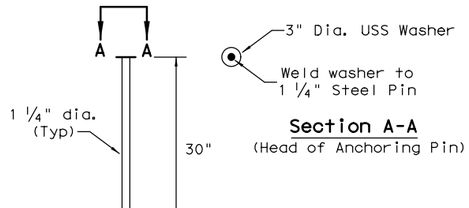
(4)~H2 Bars
(#5) Bars



Note: All V Bars are (#4)

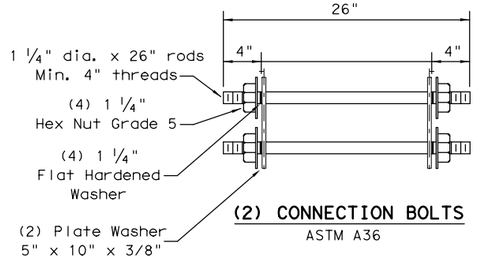
BAR (#4)	X (IN.)	Y (IN.)
V3 BAR	20 ¼	14 ½
V4 BAR	19 ½	13 ½
V5 BAR	18 ½	12 ¼
V6 BAR	17 ½	11 ¼
V7 BAR	17	10 ¼
V8 BAR	16 ¼	9
V9 BAR	15 ½	8
V10 BAR	14 ½	7
V11 BAR	13 ¾	6

REINFORCING STEEL DETAILS
TYPE 2 - END TERMINAL



(7) Anchor Pins
ASTM A36 Steel
(See Note 3)

Section A-A
(Head of Anchoring Pin)

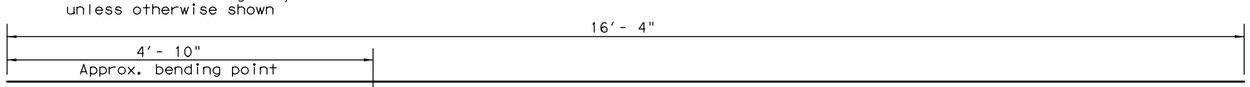


(2) CONNECTION BOLTS
ASTM A36

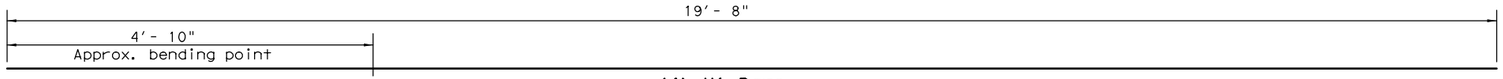
PLATE WASHER
5" x 10" x ⅜"

Note: Rods, Hex nuts and Washers shall be Galvanized.

Note: Use 2" Dia. Bending Pin, unless otherwise shown



(2)~H3 Bars
(#5) Bar



Note: Bends on H1 and H3 bars are slight and do not require formal bends.

(4)~H1 Bars
(#5) Bar

FOR CONTRACTORS INFORMATION ONLY

(TYPE 2) APPROX. QUANTITIES	20 FT. SECTION	
CONCRETE	CY	1.65
REINFORCING STEEL	LBS	240
TOTAL BARRIER WT.	LBS	7000

Texas Department of Transportation

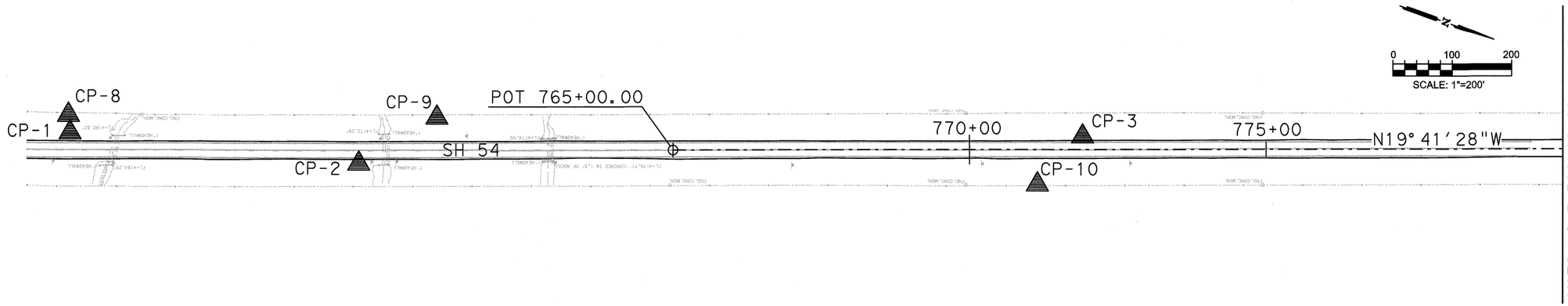
Design Division Standard

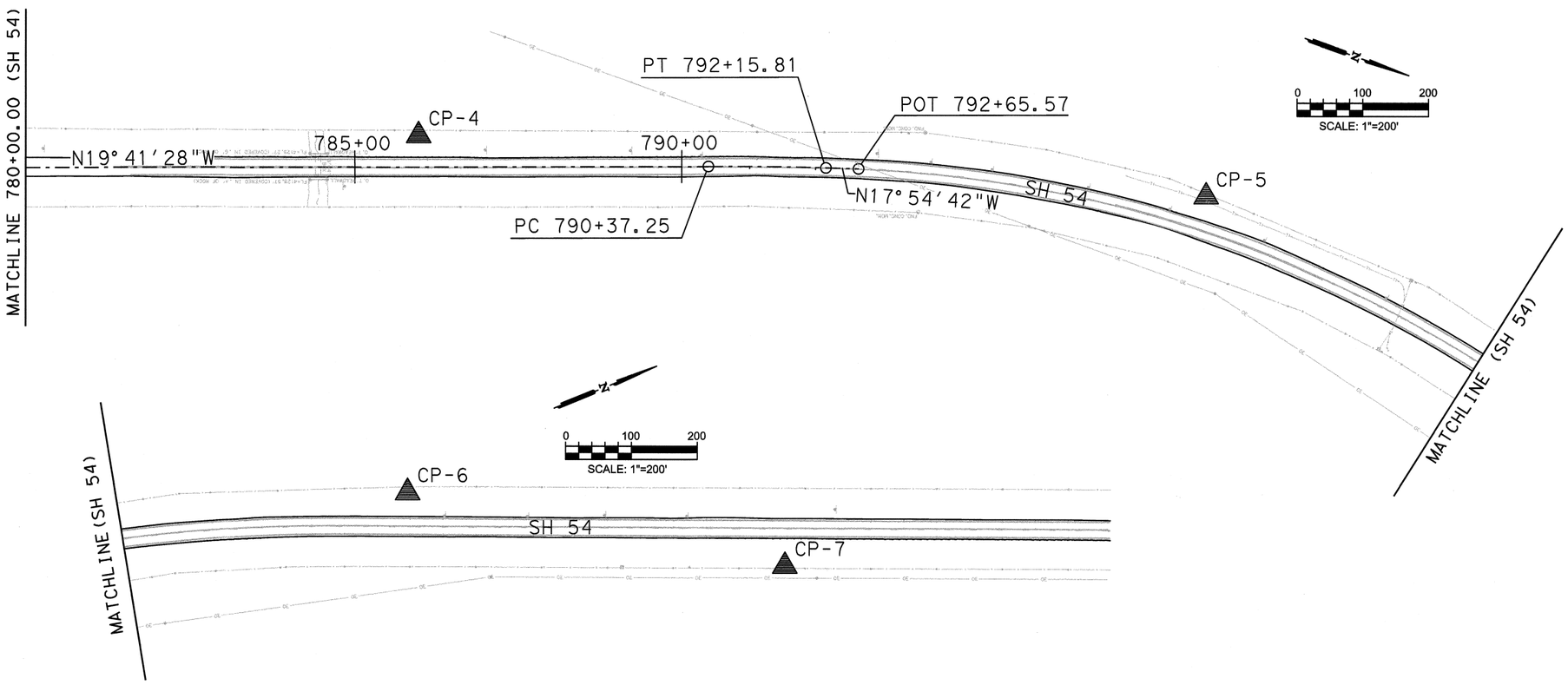
LOW PROFILE CONCRETE BARRIER
PRECAST BARRIER (TYPE 2)
LPCB-13

FILE: lpcb13.dgn	DN: TxDOT	CK: AM	DW: VP	CK:
©TxDOT December 2010	CONT	SECT	JOB	HIGHWAY
REVISIONS	0233	05	038	SH 54
	DIST	COUNTY		SHEET NO.
	ELP	CULBERSON		60

100% SUBMITTAL - MAY 13, 2022

$TIME$





SURVEY CONTROL TABLE				
MONUMENT	NORTHING	EASTING	ELEVATION	MONUMENT DESCRIPTION
CP-1	10,440,933.84	885,132.64	4,191.44	SET 5/8" I.R. W/TxDOT ALUM. CAP
CP-2	10,441,409.78	885,018.00	4,181.50	SET 5/8" I.R. W/TxDOT ALUM. CAP
CP-3	10,442,543.82	884,565.75	4,167.81	SET 5/8" I.R. W/TxDOT ALUM. CAP
CP-4	10,443,859.60	884,067.71	4,134.47	SET 5/8" I.R. W/TxDOT ALUM. CAP
CP-5	10,445,017.55	883,753.82	4,137.36	SET 5/8" I.R. W/TxDOT ALUM. CAP
CP-6	10,445,979.54	883,962.08	4,122.90	SET 5/8" I.R. W/TxDOT ALUM. CAP
CP-7	10,446,468.88	884,280.75	4,108.05	SET 5/8" I.R. W/TxDOT ALUM. CAP
CP-8	10,440,921.47	885,105.78	4,188.18	SET 5/8" I.R. W/TxDOT ALUM. CAP
CP-9	10,441,507.93	884,901.29	4,174.21	SET 5/8" I.R. W/TxDOT ALUM. CAP
CP-10	10,442,499.25	884,667.46	4,183.04	SET 5/8" I.R. W/TxDOT ALUM. CAP

NOTES:

1. ALL BEARINGS AND COORDINATES SHOWN HEREON ARE BASED ON THE TEXAS STATE PLANE COORDINATE SYSTEM, CENTRAL ZONE (4203), NORTH AMERICAN DATUM OF 1983 (NAD 83), 2011 ADJ, EPOCH 2010.000.

2. ALL ELEVATIONS SHOWN HEREON ARE ORTHOMETRIC VALUES REFERENCED TO THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD 88), REALIZED USING GEOID 18.

3. COORDINATES AND DISTANCES ARE IN U.S. SURVEY FEET, SURFACE VALUES, AND MAY BE CONVERTED TO GRID VALUES BY APPLYING THE TXDOT SURFACE ADJUSTMENT FACTOR (SAF), SAF = 1.00025, USING THE FORMULA: SURFACE / SAF = GRID

4. HORIZONTAL CONTROL VALUES REFERENCED HEREON ARE BASED ON STATIC GNSS OBSERVATIONS TIED TO NGS CONTINUALLY OPERATING REFERENCE STATIONS (CORS) TXEL AND TXKM WERE HELD FIXED USING THEIR PUBLISHED HORIZONTAL VALUES.

5. VERTICAL CONTROL VALUES REFERENCED HEREON ARE BASED ON STATIC GNSS OBSERVATIONS TIED TO NGS CONTINUALLY OPERATING REFERENCE STATION (CORS) AND DIGITAL LEVELING. TXEL and TXKM WERE HELD FIXED USING THEIR PUBLISHED VERTICAL VALUE.

DATE	BY	REV	REVISION

STATE OF TEXAS REGISTERED CHRISTOPHER B. WELLS 6615 PROFESSIONAL LAND SURVEYOR

CobbFendley
TBPELS Engineering Firm No. F-274
Land Surveying Firm No. 10046700
13430 Northwest Freeway, Suite 1100
Houston, Texas 77040
713.462.3242 | www.cobbfendley.com

OMEGA ENGINEERS, INC.
8200 N MOPAC EXPRESSWAY, STE #280
AUSTIN, TEXAS 78759
OMEGAENGINEERS.COM
TX PE Firm Reg. No. F-2147
P:512 575 2288 F:281 647 9184

SH 54 @ DIABLO CREEK

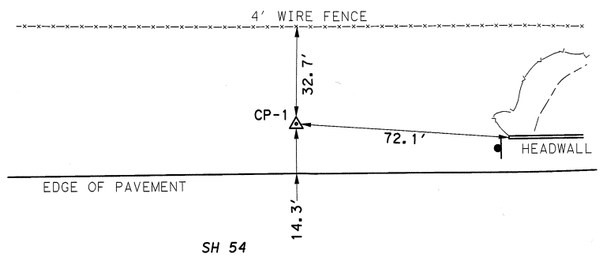
HORIZONTAL AND VERTICAL SURVEY CONTROL INDEX SHEET

		FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
DSN	UO	6	SEE TITLE SHEET		61
CHK	UO	STATE	DIST.	COUNTY	
DRN	BM	TEXAS	ELP	CULBERSON	
CHK	UO	CONT.	SECT.	JOB	HIGHWAY NO.
		Ø233	Ø5	Ø38	SH 54

$DATE$
$FILE$

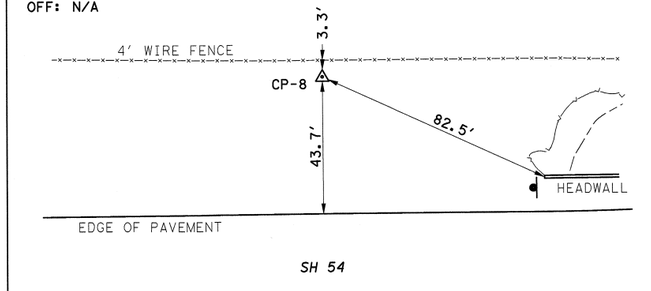
100% SUBMITTAL - MAY 13, 2022

CP-1
SET 5/8"I.R. W/TXDOT
ALUMINUM CAP
N: 10,440,933.84
E: 885,132.64
ELEV: 4191.44'
STA: N/A
OFF: N/A



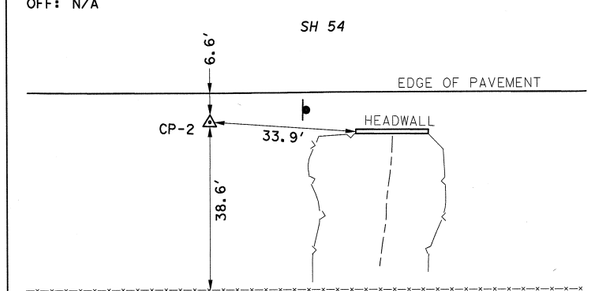
SET 5/8" IRON ROD W/ TXDOT ALUMINUM CAP LOCATED ON THE NORTH SIDE OF VAN HORN, APPROX. 12.2 MILES NORTH OF FM 2185.

CP-8
SET 5/8"I.R. W/TXDOT
ALUMINUM CAP
N: 10,440,921.47
E: 885,105.78
ELEV: 4188.18'
STA: N/A
OFF: N/A



SET 5/8" IRON ROD W/ TXDOT ALUMINUM CAP LOCATED ON THE NORTH SIDE OF VAN HORN, APPROX. 12.2 MILES NORTH OF FM 2185.

CP-2
SET 5/8"I.R. W/TXDOT
ALUMINUM CAP
N: 10,441,409.78
E: 885,018.00
ELEV: 4181.50'
STA: N/A
OFF: N/A



SET 5/8" IRON ROD W/ TXDOT ALUMINUM CAP LOCATED ON THE NORTH SIDE OF VAN HORN, APPROX. 12.3 MILES NORTH OF FM 2185.

NOTES:

1. ALL BEARINGS AND COORDINATES SHOWN HEREON ARE BASED ON THE TEXAS STATE PLANE COORDINATE SYSTEM, CENTRAL ZONE (4203), NORTH AMERICAN DATUM OF 1983 (NAD 83), 2011 ADJ, EPOCH 2010.000.

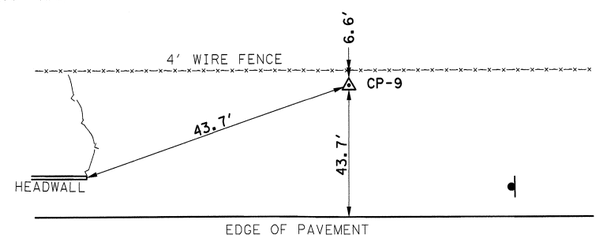
2. ALL ELEVATIONS SHOWN HEREON ARE ORTHOMETRIC VALUES REFERENCED TO THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD 88), REALIZED USING GEOID 18.

3. COORDINATES AND DISTANCES ARE IN U.S. SURVEY FEET, SURFACE VALUES, AND MAY BE CONVERTED TO GRID VALUES BY APPLYING THE TXDOT SURFACE ADJUSTMENT FACTOR (SAF). SAF = 1.00025, USING THE FORMULA: SURFACE / SAF = GRID

4. HORIZONTAL CONTROL VALUES REFERENCED HEREON ARE BASED ON STATIC GNSS OBSERVATIONS TIED TO NGS CONTINUALLY OPERATING REFERENCE STATIONS (CORS) TXEL AND TXKM WERE HELD FIXED USING THEIR PUBLISHED HORIZONTAL VALUES.

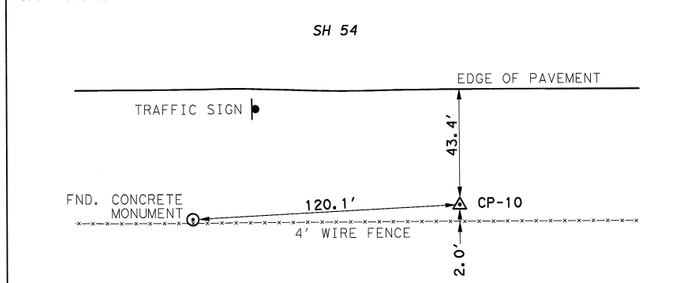
5. VERTICAL CONTROL VALUES REFERENCED HEREON ARE BASED ON STATIC GNSS OBSERVATIONS TIED TO NGS CONTINUALLY OPERATING REFERENCE STATION (CORS) AND DIGITAL LEVELING. TXEL and TXKM WERE HELD FIXED USING THEIR PUBLISHED VERTICAL VALUE.

CP-9
SET 5/8"I.R. W/TXDOT
ALUMINUM CAP
N: 10,441,507.93
E: 884,901.29
ELEV: 4174.21'
STA: N/A
OFF: N/A



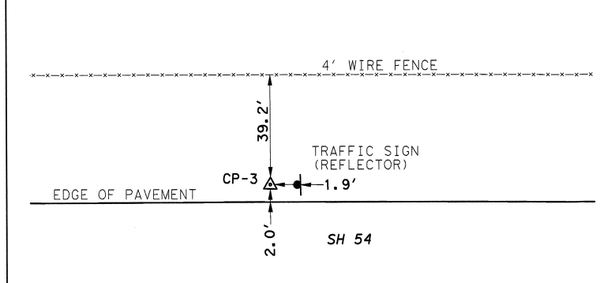
SET 5/8" IRON ROD W/ TXDOT ALUMINUM CAP LOCATED ON THE NORTH SIDE OF VAN HORN, APPROX. 12.3 MILES NORTH OF FM 2185.

CP-10
SET 5/8"I.R. W/TXDOT
ALUMINUM CAP
N: 10,442,499.25
E: 884,667.46
ELEV: 4183.04'
STA: 771+14.23
OFF: 58.52 RT.



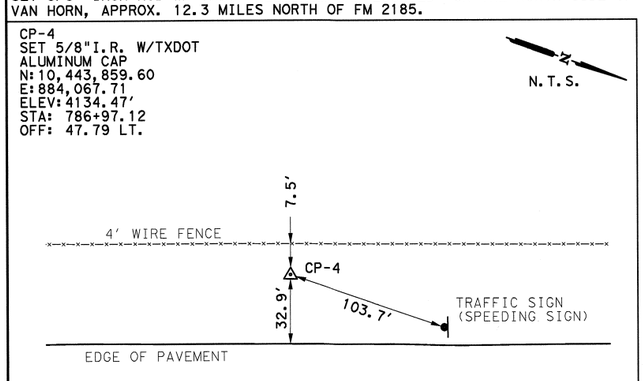
SET 5/8" IRON ROD W/ TXDOT ALUMINUM CAP LOCATED ON THE NORTH SIDE OF VAN HORN, APPROX. 12.5 MILES NORTH OF FM 2185.

CP-3
SET 5/8"I.R. W/TXDOT
ALUMINUM CAP
N: 10,442,543.82
E: 884,565.75
ELEV: 4167.81'
STA: 771+90.47
OFF: 22.22 LT.



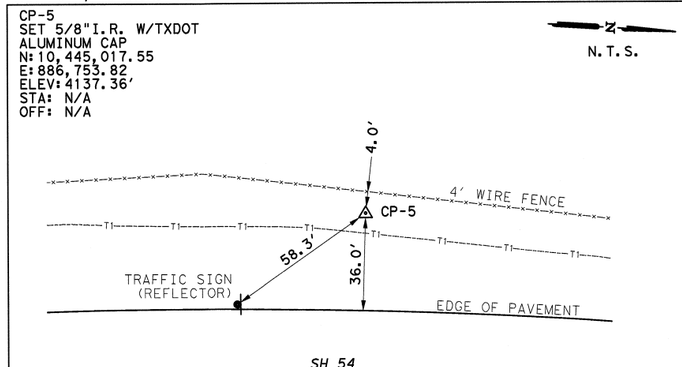
SET 5/8" IRON ROD W/ TXDOT ALUMINUM CAP LOCATED ON THE NORTH SIDE OF VAN HORN, APPROX. 12.5 MILES NORTH OF FM 2185.

CP-4
SET 5/8"I.R. W/TXDOT
ALUMINUM CAP
N: 10,443,859.60
E: 884,067.71
ELEV: 4134.47'
STA: 786+97.12
OFF: 47.79 LT.



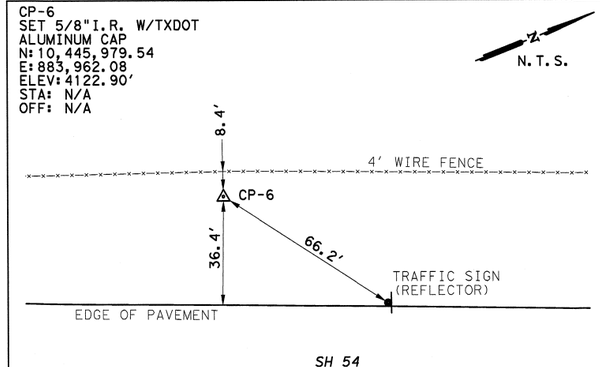
SET 5/8" IRON ROD W/ TXDOT ALUMINUM CAP LOCATED ON THE NORTH SIDE OF VAN HORN, APPROX. 12.8 MILES NORTH OF FM 2185.

CP-5
SET 5/8"I.R. W/TXDOT
ALUMINUM CAP
N: 10,445,017.55
E: 886,753.82
ELEV: 4137.36'
STA: N/A
OFF: N/A



SET 5/8" IRON ROD W/ TXDOT ALUMINUM CAP LOCATED ON THE NORTH SIDE OF VAN HORN, APPROX. 13.0 MILES NORTH OF FM 2185.

CP-6
SET 5/8"I.R. W/TXDOT
ALUMINUM CAP
N: 10,445,979.54
E: 883,962.08
ELEV: 4122.90'
STA: N/A
OFF: N/A



SET 5/8" IRON ROD W/ TXDOT ALUMINUM CAP LOCATED ON THE NORTH SIDE OF VAN HORN, APPROX. 12.2 MILES NORTH OF FM 2185.

DATE	BY	REV	REVISION

STATE OF TEXAS REGISTERED CHRISTOPHER B. WELLS 6615 PROFESSIONAL LAND SURVEYOR

CobbFendley
TBPELS Engineering Firm No. F-274
Land Surveying Firm No. 10046700
13430 Northwest Freeway, Suite 1100
Houston, Texas 77040
713.462.3242 | www.cobbfendley.com

OMEGA ENGINEERS, INC.
8200 N MOPAC EXPRESSWAY, STE #280
AUSTIN, TEXAS 78759
OMEGAENGINEERS.COM
TX PE Firm Reg. No. F-2147
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Texas Department of Transportation®

SH 54 @ DIABLO CREEK

HORIZONTAL & VERTICAL CONTROL DATA SHEET

SHEET 1 OF 2

DSN	UO	FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
CHK	UO	6	SEE TITLE SHEET		62
		STATE	DIST.	COUNTY	
DRN	BM	TEXAS	ELP	CULBERSON	
CHK	UO	CONT.	SECT.	JOB	HIGHWAY NO.
		0233	05	038	SH 54

$TIME$
$DATE$
$FILE$

SH 54

Beginning chain SH54 description

Point SH5401 N 10,440,812.8098 E 885,208.3057 Sta 753+50.00

Course from SH5401 to TS SP01B N 19° 41′ 37.89" W Dist 3,667.4774

Spiral SP01B Type 1 Spiral Element

Angle	5° 15′ 00.00" (RT)	P	2.6717	BK N	19° 41′ 37.89" W
LS	350.0000	K	174.9510	AH N	14° 26′ 37.89" W
R	1,909.8593	LT	233.4360	CB N	17° 56′ 38.34" W
YS	10.6837	ST	116.7600	Defl	1° 44′ 59.55"
XS	349.7063	LC	349.8694	Deg	3° 00′ 00.00"

Spiral Coordinates

Point	North	East	Station
TS	10,444,265.7642	883,972.3866	790+17.48
PI	10,444,485.5458	883,893.7200	792+50.91
SC	10,444,598.6154	883,864.5964	793+67.48
CC	10,445,074.9939	885,714.0899	

Curve Data

Curve SP01					
P.I. Station	799+07.01	N	10,445,121.0977	E	883,730.0194
Delta =	31° 33′ 00.00" (RT)				
Degree =	3° 00′ 00.00"				
Tangent =	539.5358				
Length =	1,051.6667				
Radius =	1,909.8593				
External =	74.7468				
Long Chord =	1,038.4301				
Mid. Ord. =	71.9316				
P.C. Station	793+67.48	N	10,444,598.6154	E	883,864.5964
P.T. Station	804+19.14	N	10,445,636.7652	E	883,888.7199
C.C.		N	10,445,074.9939	E	885,714.0899
Back =	N 14° 26′ 37.89" W				
Ahead =	N 17° 06′ 22.11" E				
Chord Bear =	N 1° 19′ 52.11" E				

Spiral SP01A Type 2 Spiral Element

Angle	5° 15′ 00.00" (RT)	P	2.6717	BK N	17° 06′ 22.11" E
LS	350.0000	K	174.9510	AH N	22° 21′ 22.11" E
R	1,909.8593	LT	233.4360	CB N	20° 36′ 22.56" E
YS	10.6837	ST	116.7600	Defl	1° 44′ 59.55"
XS	349.7063	LC	349.8694	Deg	3° 00′ 00.00"

Spiral Coordinates

Point	North	East	Station
CS	10,445,636.7652	883,888.7199	804+19.14
PI	10,445,748.3600	883,923.0640	805+35.90
ST	10,445,964.2504	884,011.8544	807+69.14
CC	10,445,074.9939	885,714.0899	

Course from ST SP01A to SH5402 N 22° 21′ 22.11" E Dist 2,230.8495

Point SH5402 N 10,448,027.4235 E 884,860.3860 Sta 829+99.99

Ending chain SH54 description

DATE	BY	REV	REVISION

STATE OF TEXAS
R. CRUZ-RODRIGUEZ
82856
LICENSED PROFESSIONAL ENGINEER

Rafael Cruz-Rodriguez, P.E.

09-27-2022

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AUSTIN, TEXAS 78759
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SH 54 @ DIABLO CREEK

HORIZONTAL ALIGNMENT DATA

SHEET 1 OF 1

		FED. RD. DIV. NO.	PROJECT NO.	SHEET NO.
DSN	OEI	6	SEE TITLE SHEET	63
CHK	OEI	STATE	DIST.	COUNTY
DRN	OEI	TEXAS	ELP	CULBERSON
CHK	OEI	CONT.	SECT.	JOB / HIGHWAY NO.
		0233	05	038 / SH 54

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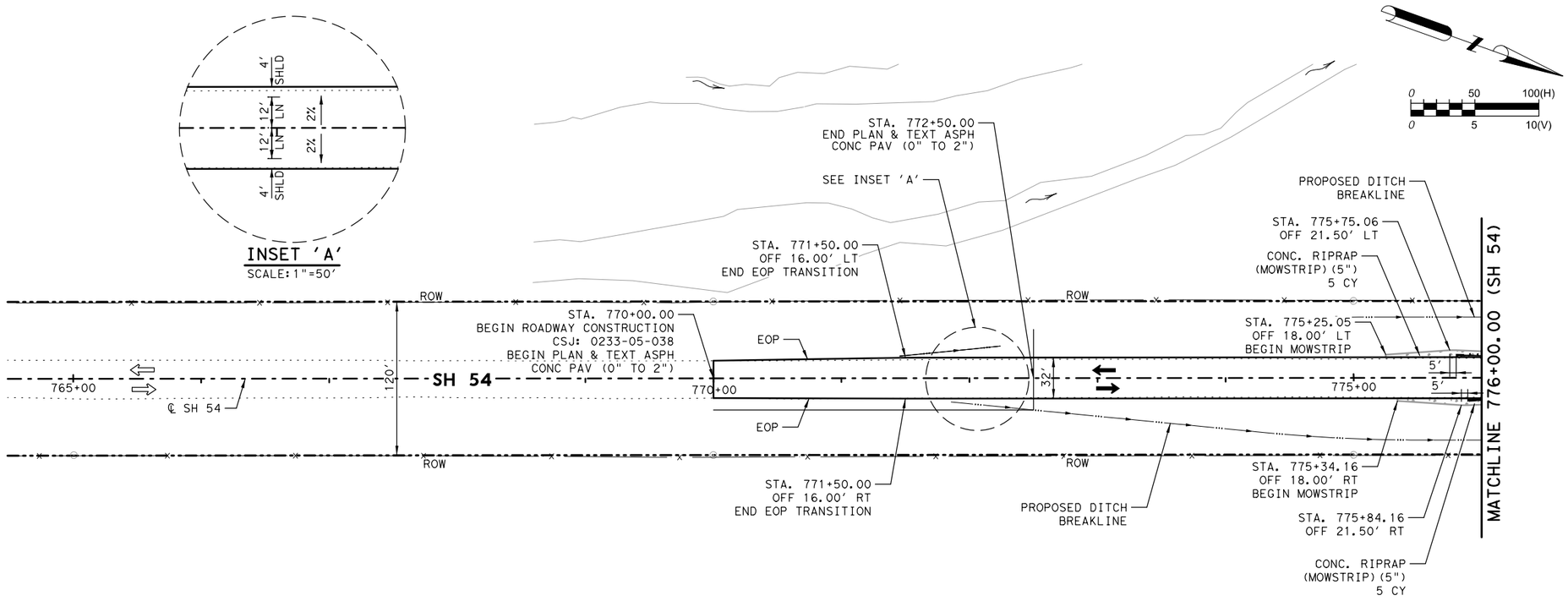
SCALE: 1"=50'



LEGEND

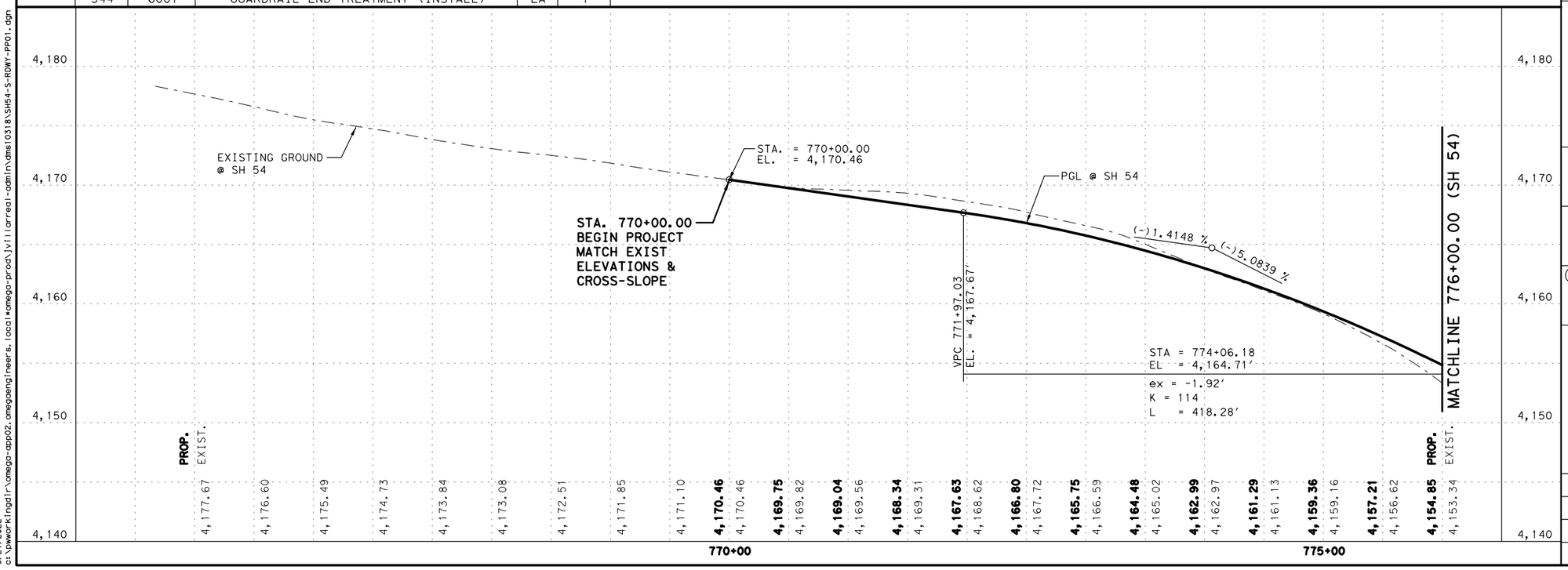
- EXISTING TRAFFIC
- PROPOSED TRAFFIC
- DIRECTION OF FLOW
- SHEET PILE
- CONC. MOW STRIP (5")
- CONC. RIPRAP (5")

NOTES:

1. SEE CONTROL DATA SHEETS FOR INFORMATION.
2. SEE HORIZONTAL ALIGNMENT DATA SHEETS FOR INFORMATION.
3. REFER TO BRIDGE LAYOUT SHEETS FOR INFORMATION.
4. SEE REMOVAL LAYOUT SHEETS FOR INFORMATION.
5. SEE CROSS-SECTIONS FOR SIDE SLOPES AND DETAILS.

ESTIMATED QUANTITIES				
ITEM	CODE	DESCRIPTIONS	UNIT	QTY
354	6002	PLAN &TEXT ASPH CONC PAV (0" TO 2")	SY	865
432	6046	RIPRAP (MOW STRIP) (5 IN)	CY	10
540	6016	DOWNSTREAM ANCHOR TERMINAL SECTION	EA	1
544	6001	GUARDRAIL END TREATMENT (INSTALL)	EA	1

REFER TO PLAN & PROFILE SHEET 2 OF 3 FOR INFORMATION REGARDING SGT, MBGF TRANSITION, AND LENGTHS.



DATE	BY	REV	REVISION

STATE OF TEXAS
R. CRUZ-RODRIGUEZ
82856
LICENSED
PROFESSIONAL ENGINEER

Rafael Cruz-Rodriguez, P.E.
09-27-2022

OMEGA ENGINEERS, INC.
8200 N MOPAC EXPRESSWAY, STE #280
AUSTIN, TEXAS 78759
OMEGAENGINEERS.COM
TX PE Firm Reg. No. F-2147
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SH 54 @ DIABLO CREEK

PLAN & PROFILE

STA. 765+00 TO STA. 776+00

SHEET 1 OF 3

		FED. RD. DIV. NO.	PROJECT NO.	SHEET NO.
DSN	OEI	6	SEE TITLE SHEET	64
CHK	OEI	STATE	DIST.	COUNTY
DRN	OEI	TEXAS	ELP	CULBERSON
CHK	OEI	CONT.	SECT.	JOB / HIGHWAY NO.
		0233	05	038 / SH 54

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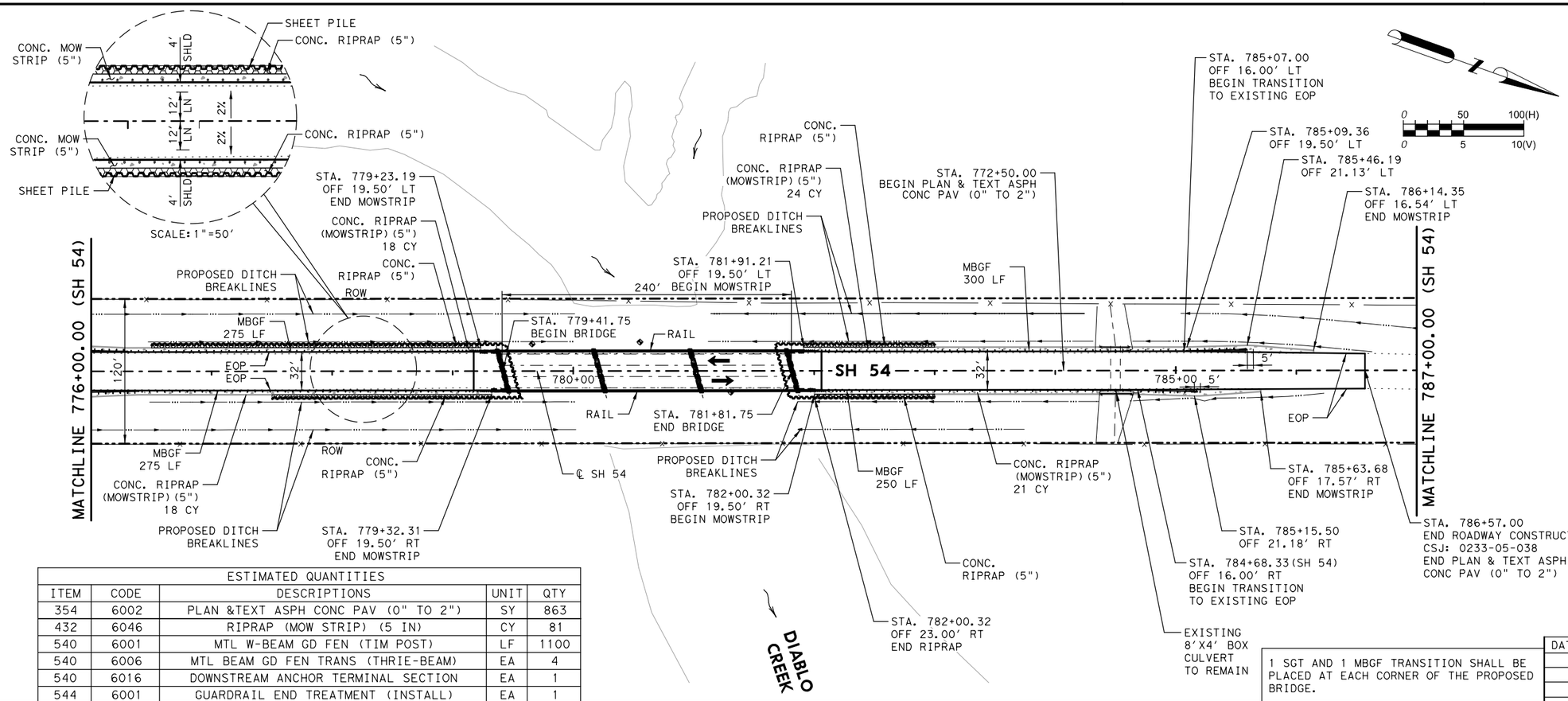


LEGEND

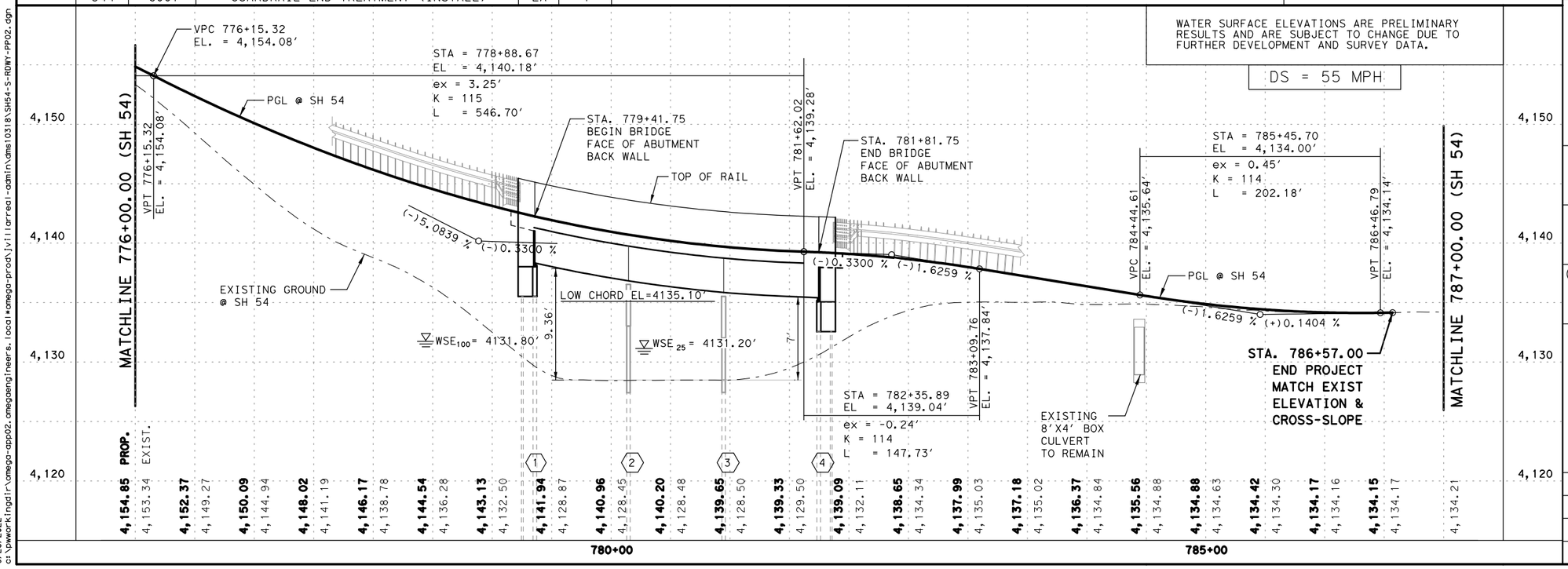
- EXISTING TRAFFIC
- PROPOSED TRAFFIC
- DIRECTION OF FLOW
- SHEET PILE
- CONC. MOW STRIP (5")
- CONC. RIPRAP (5")
- (#) BENT / ABUTMENT #

NOTES:

1. SEE CONTROL DATA SHEETS FOR INFORMATION.
2. SEE HORIZONTAL ALIGNMENT DATA SHEETS FOR INFORMATION.
3. REFER TO BRIDGE LAYOUT SHEETS FOR INFORMATION.
4. SEE REMOVAL LAYOUT SHEETS FOR INFORMATION.
5. SEE CROSS-SECTIONS FOR SIDE SLOPES AND DETAILS.

ESTIMATED QUANTITIES				
ITEM	CODE	DESCRIPTIONS	UNIT	QTY
354	6002	PLAN &TEXT ASPH CONC PAV (0" TO 2")	SY	863
432	6046	RIPRAP (MOW STRIP) (5 IN)	CY	81
540	6001	MTL W-BEAM GD FEN (TIM POST)	LF	1100
540	6006	MTL BEAM GD FEN TRANS (THRIE-BEAM)	EA	4
540	6016	DOWNSTREAM ANCHOR TERMINAL SECTION	EA	1
544	6001	GUARDRAIL END TREATMENT (INSTALL)	EA	1

1 SGT AND 1 MBGF TRANSITION SHALL BE PLACED AT EACH CORNER OF THE PROPOSED BRIDGE.



DATE	BY	REV	REVISION

STATE OF TEXAS
R. CRUZ-RODRIGUEZ
82856
LICENSED PROFESSIONAL ENGINEER
Rafael Cruz-Rodriguez, P.E.
09-27-2022

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AUSTIN, TEXAS 78759
OMEGAENGINEERS.COM
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Texas Department of Transportation®

SH 54 @ DIABLO CREEK

PLAN & PROFILE

STA. 776+00 TO STA. 787+00

SHEET 2 OF 3

DSN	OEI	FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
CHK	OEI	6	SEE TITLE SHEET		65
DRN	OEI	STATE	DIST.	COUNTY	
		TEXAS	ELP	CULBERSON	
CHK	OEI	CONT.	SECT.	JOB	HIGHWAY NO.
		0233	05	038	SH 54

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9/28/2022
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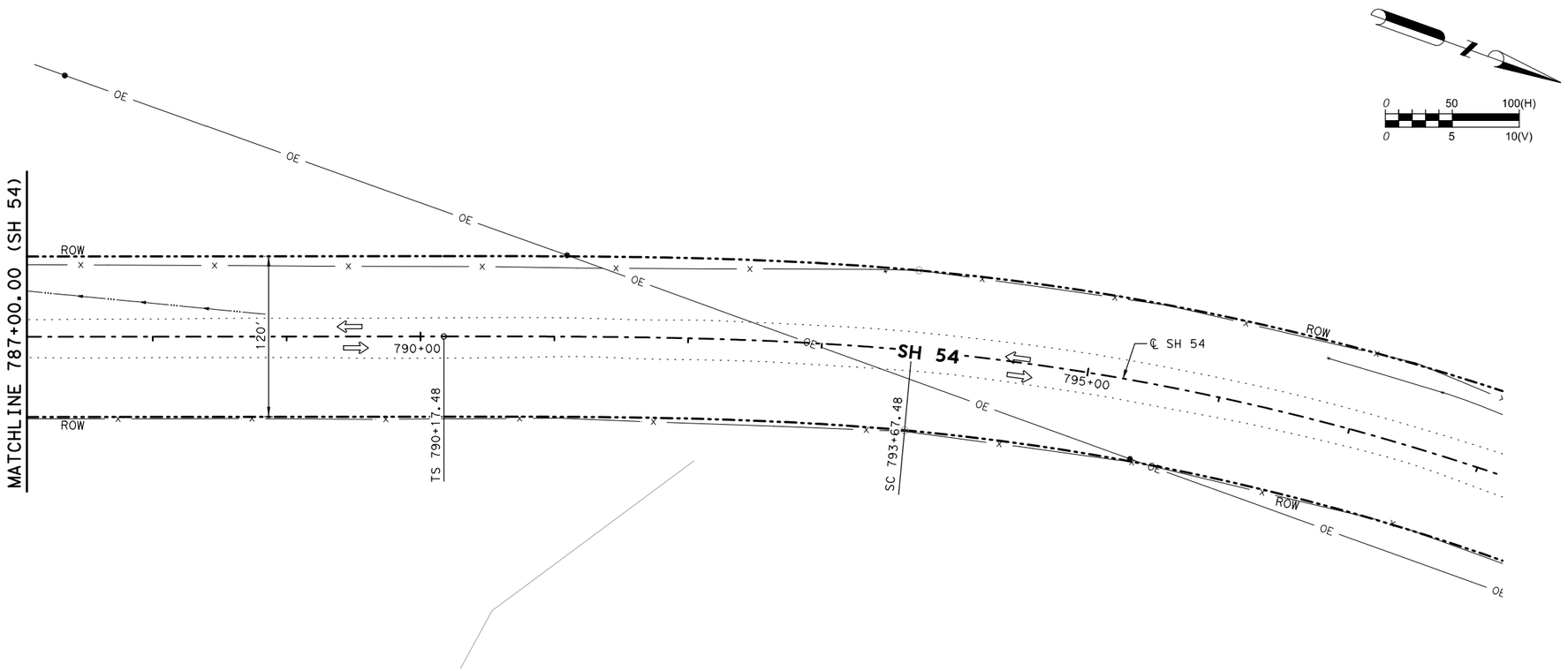
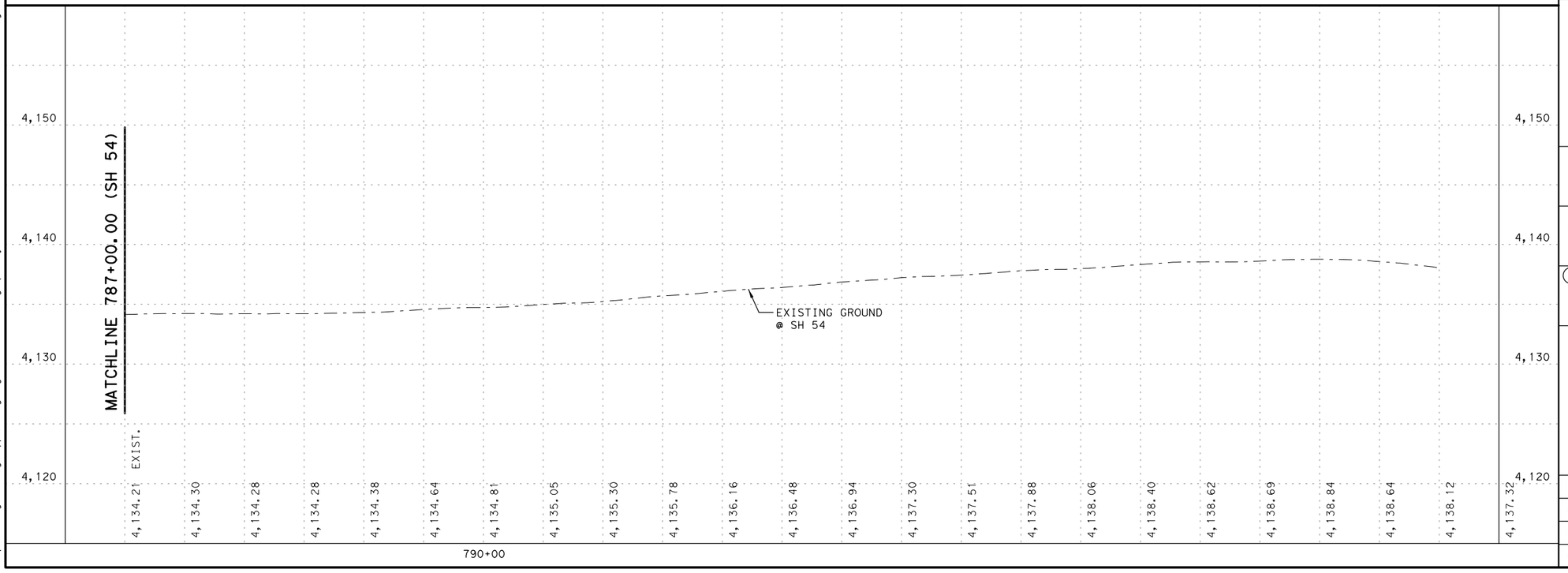


LEGEND

- EXISTING TRAFFIC
- PROPOSED TRAFFIC
- DIRECTION OF FLOW
- SHEET PILE
- CONC. MOW STRIP (5")
- CONC. RIPRAP (5")

NOTES:

1. SEE CONTROL DATA SHEETS FOR INFORMATION.
2. SEE HORIZONTAL ALIGNMENT DATA SHEETS FOR INFORMATION.
3. REFER TO BRIDGE LAYOUT SHEETS FOR INFORMATION.
4. SEE REMOVAL LAYOUT SHEETS FOR INFORMATION.
5. SEE CROSS-SECTIONS FOR SIDE SLOPES AND DETAILS.



DATE	BY	REV	REVISION

STATE OF TEXAS
R. CRUZ-RODRIGUEZ
82856
LICENSED PROFESSIONAL ENGINEER

Rafael Cruz-Rodriguez, P.E.

09-27-2022

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Texas Department of Transportation®

SH 54 @ DIABLO CREEK

PLAN & PROFILE

STA 787+00 TO STA 795+00

SHEET 3 OF 3

		FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
DSN	OEI	6	SEE TITLE SHEET		66
CHK	OEI	STATE	DIST.	COUNTY	
DRN	OEI	TEXAS	ELP	CULBERSON	
CHK	OEI	CONT.	SECT.	JOB	HIGHWAY NO.
		0233	05	038	SH 54

9/27/2022
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DATE: 9/27/2022 11:16:20 AM
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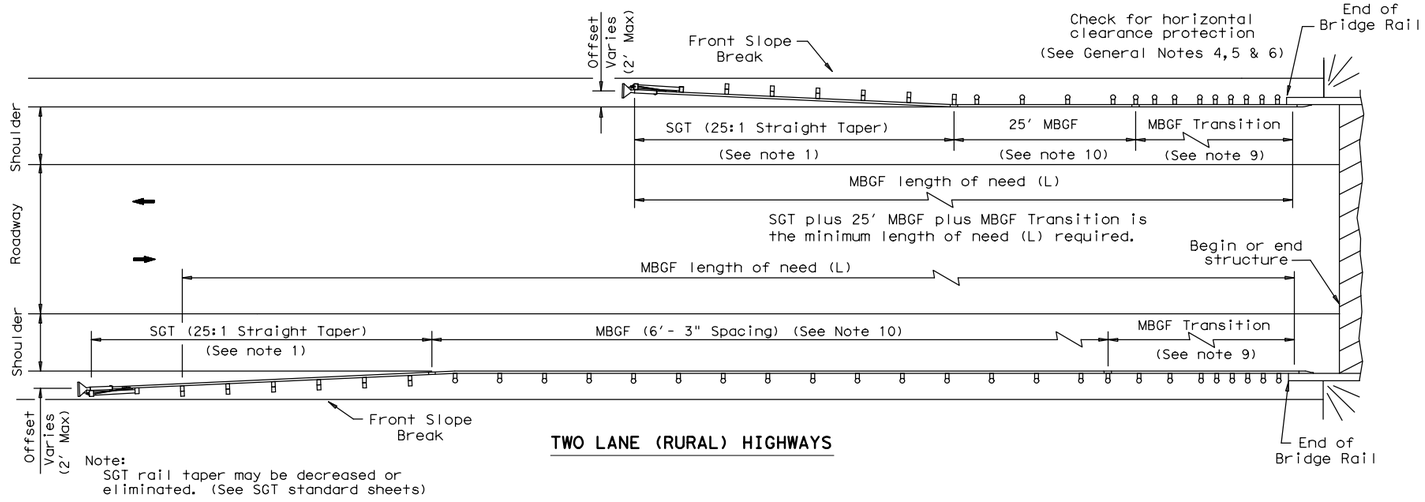
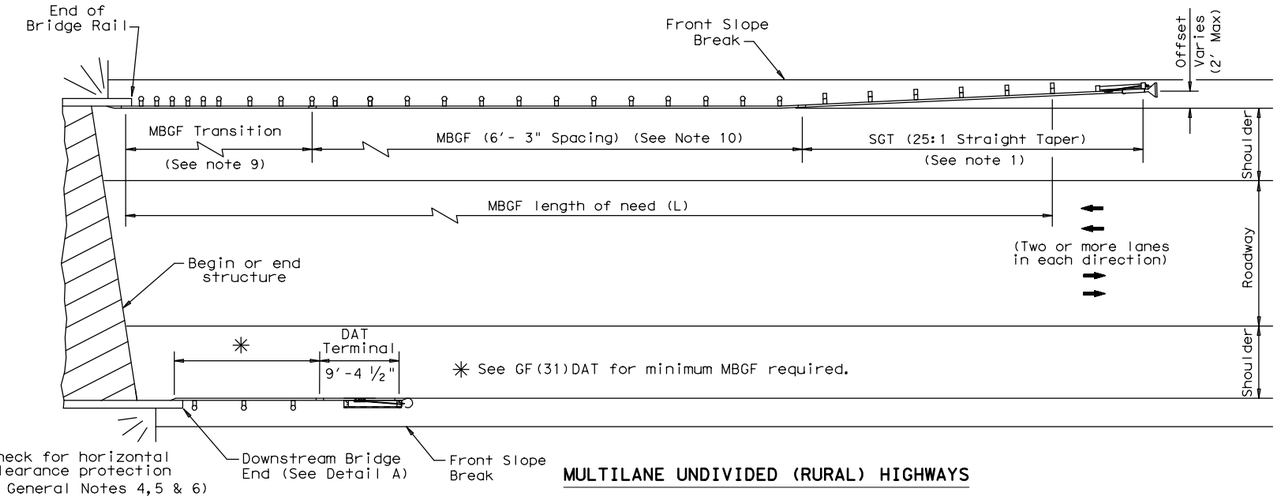
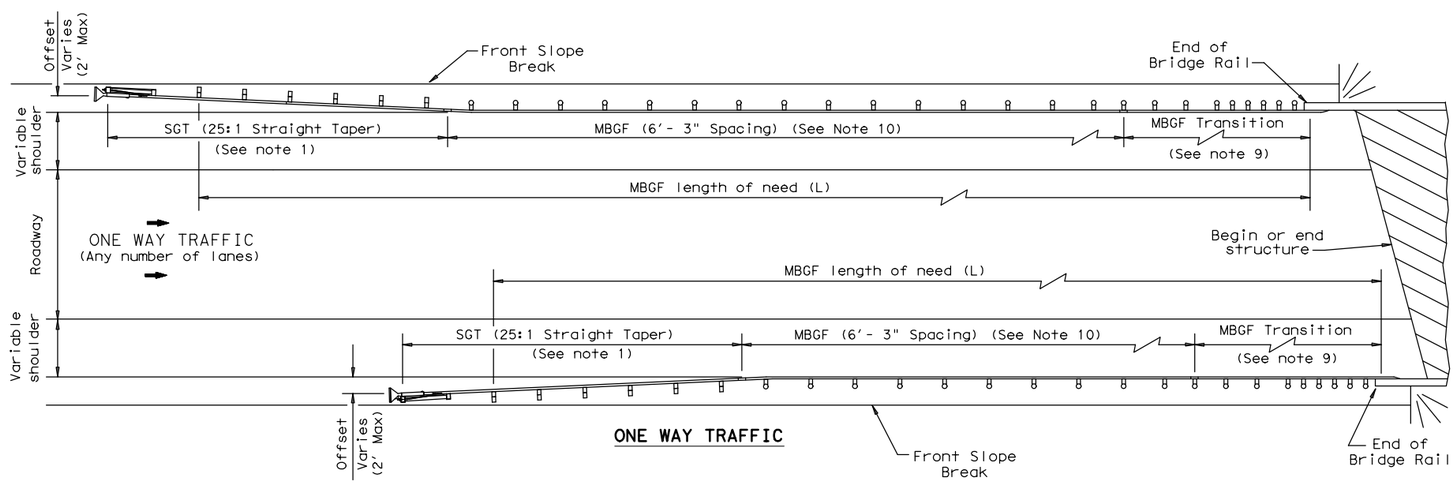


TWO LANE (RURAL) HIGHWAYS

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



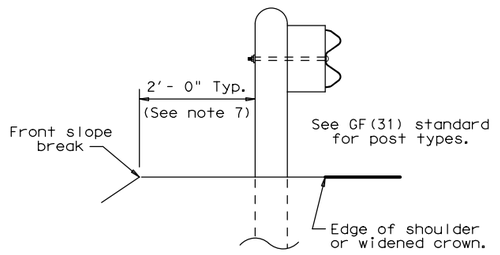
MULTILANE UNDIVIDED (RURAL) HIGHWAYS



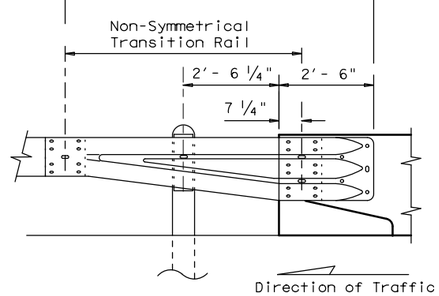
ONE WAY TRAFFIC

GENERAL NOTES

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



TYPICAL CROSS SECTION AT MBGF



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

DETAIL A

Showing Downstream Rail Attachment

Texas Department of Transportation

Design Division Standard

BRIDGE END DETAILS

(METAL BEAM GUARD FENCE APPLICATIONS TO RIGID RAILS)

BED-14

FILE: bed14.dgn	DN: TxDOT	CK: AM	DW: BD/VP	CK: CGL
© TxDOT:	CONT	SECT	JOB	HIGHWAY
REVISIONS REVISED APRIL 2014 SEE (MEMO 0414)	0233	05	038	SH 54
	DIST	COUNTY		SHEET NO.
	ELP	CULBERSON		67

DATE: 9/27/2022
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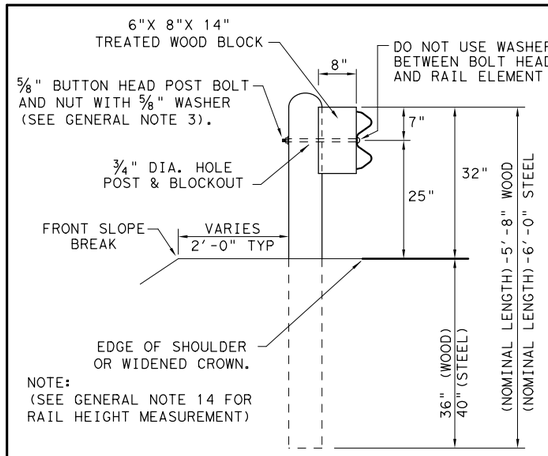
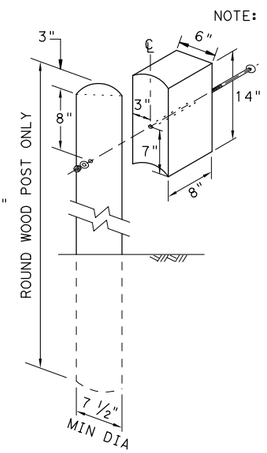
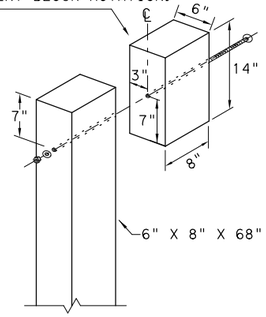


TYPICAL POST PLACEMENT

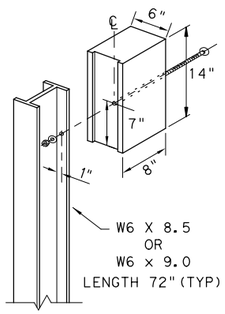


WOOD BLOCK TO ROUND WOOD POST

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

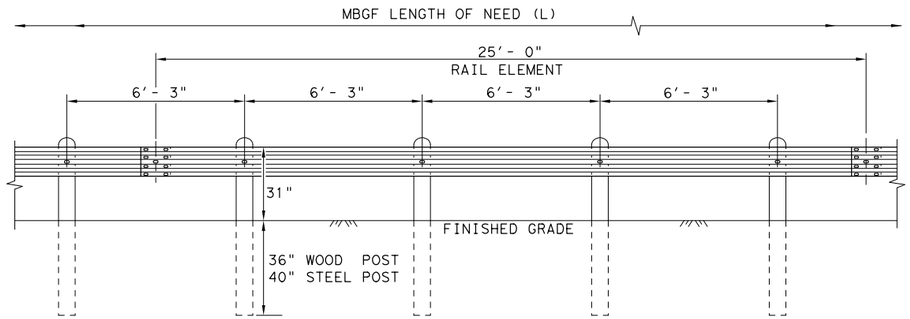


WOOD BLOCK TO RECTANGULAR WOOD POST



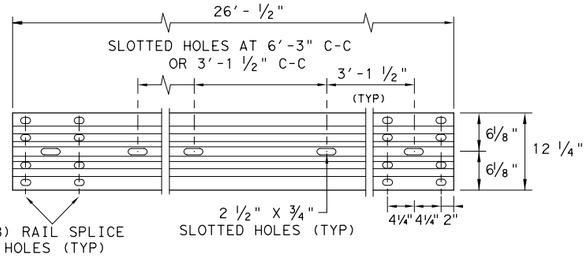
ROUTED WOOD BLOCK TO I-BEAM STEEL POST

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



ELEVATION
MID-SPAN RAIL SPLICE

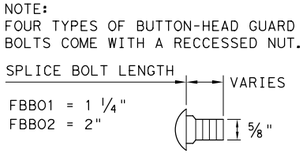
SHOWING A 25'- 0" SECTION OF W-BEAM RAIL. (SEE GENERAL NOTE 2)



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

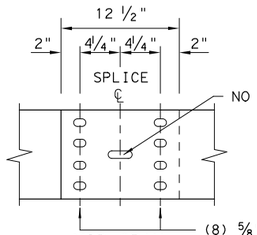
NOTES: SEE GENERAL NOTE 2 FOR ALLOWABLE RAIL TYPES.
SEE RAIL SPLICE DETAIL FOR REQUIRED HARDWARE.

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



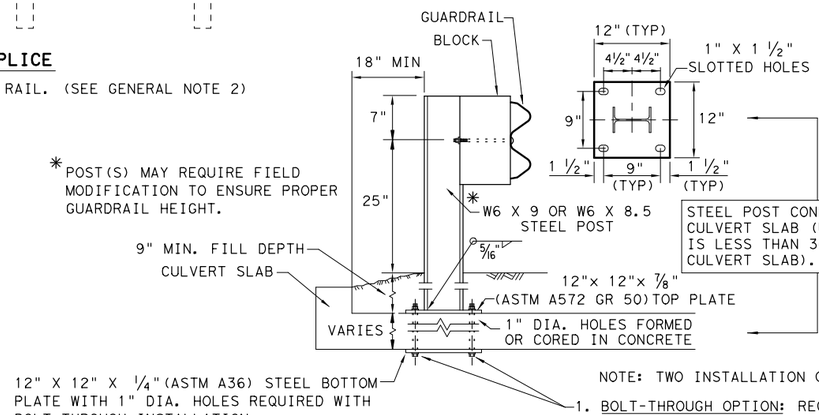
BUTTON HEAD BOLT

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



MID-SPAN RAIL SPLICE DETAIL

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



LOW FILL CULVERT POST

NOTE: TWO INSTALLATION OPTIONS.

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

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

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

GENERAL NOTES

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

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

Texas Department of Transportation — Design Division Standard

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

FILE: gf3119.dgn	DN: TxDOT	CK: KM	DW: VP	CK: CGL/AG
©TxDOT:	CONT	SECT	JOB	HIGHWAY
REVISIONS	0233	05	038	SH 54
	DIST	COUNTY		SHEET NO.
	ELP	CULBERSON		68

DATE: 9/27/2022
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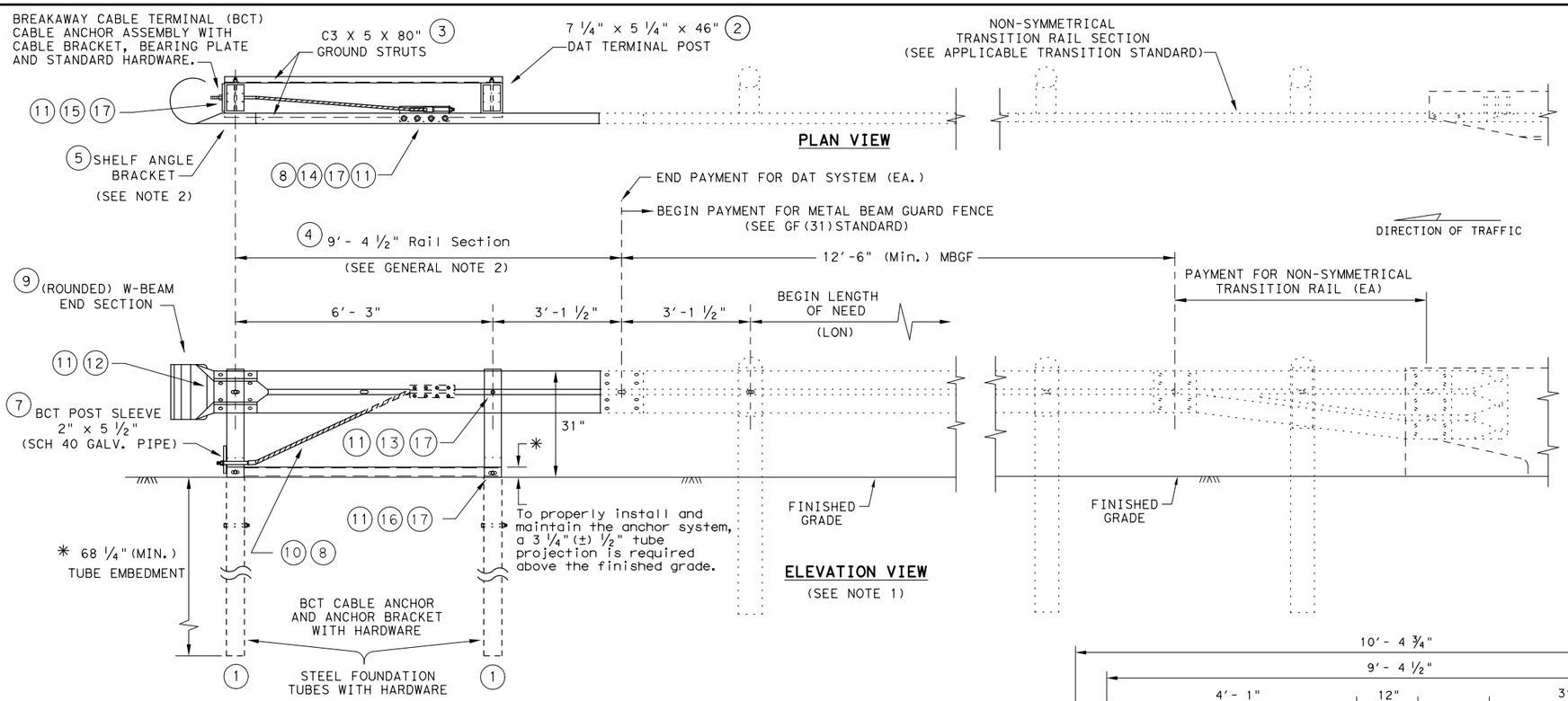


DOWNSTREAM ANCHOR TERMINAL (DAT)

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

GENERAL NOTES

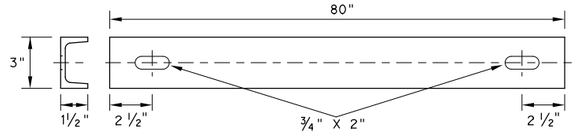
1. THE DETAIL SHOWN IS THE MINIMUM LENGTH OF NEED (LON) FOR A DOWNSTREAM ANCHOR TERMINAL (DAT) CONNECTED TO A CONCRETE RAIL.
2. THE RAIL SECTION AT THE END POST IS SUPPORTED BY THE SHELF ANGLE BRACKET. THE RAIL ELEMENT IS NOT ATTACHED TO THE END POST.
3. THE FOUNDATION TUBES SHALL NOT PROJECT MORE THAN 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

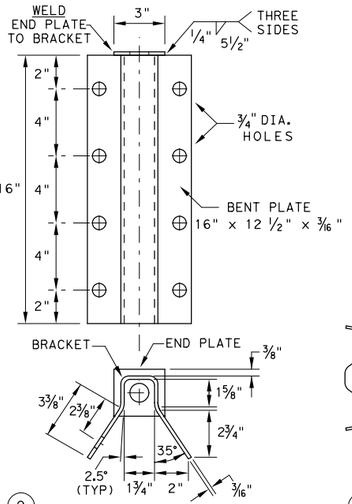
IF A MOW STRIP IS REQUIRED WITH THE DAT INSTALLATION THE LEAVE-OUT AREA AROUND THE STEEL FOUNDATION TUBES AND THE TWO CHANNEL STRUTS MAY BE OMITTED. THIS WILL REQUIRE A FULL POUR AT THE FOUNDATION TUBES.

#	(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

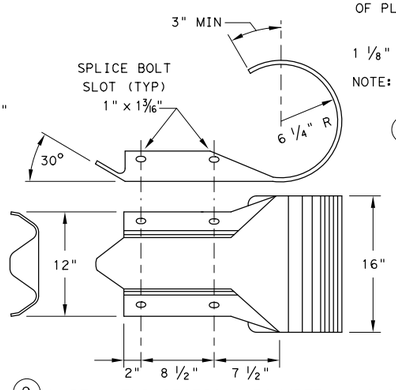
(4) **TERMINAL RAIL ELEMENT FOR DAT**



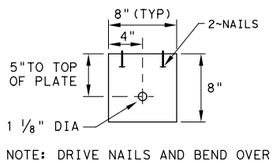
(3) **CHANNEL STRUT**
C3 X 5 X 80", GRADE A36



(8) **GUARDRAIL ANCHOR BRACKET**

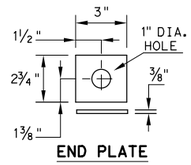


(9) **W-BEAM END SECTION (ROUNDED) (12 GA.)**

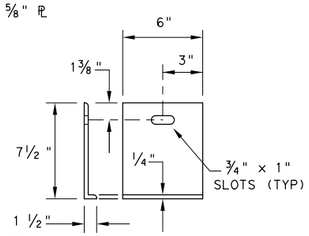


NOTE: DRIVE NAILS AND BEND OVER TO PREVENT PLATE ROTATION

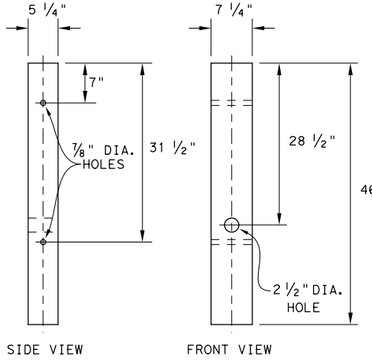
(6) **BEARING PLATE**
8"x 8"x 5/8" PL



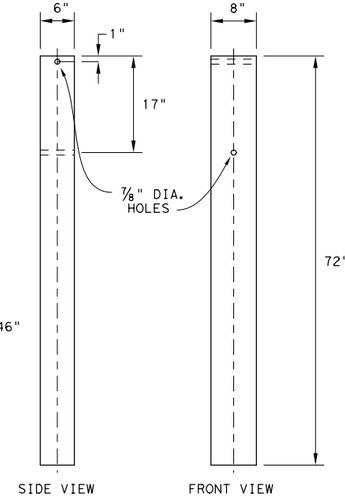
END PLATE



(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

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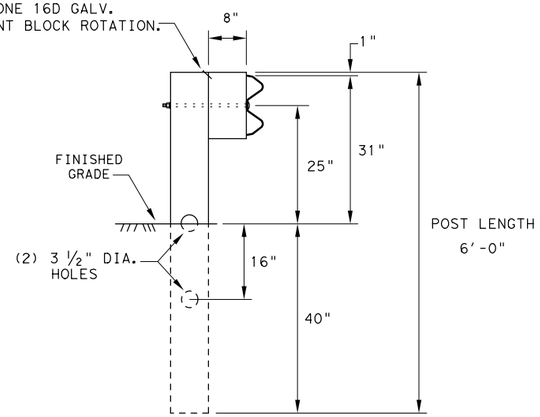
©TxDOT:	CONT	SECT	JOB	HIGHWAY
REVISIONS	0233	05	038	SH 54
	DIST	COUNTY		SHEET NO.
	ELP	CULBERSON		69

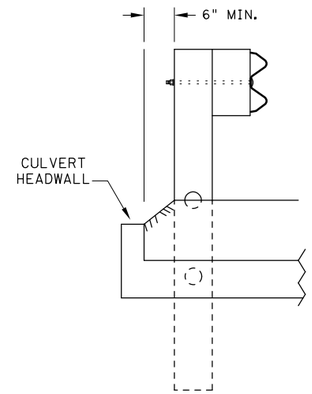
DATE: 9/27/2022
FILE: c:\pwworkingdir\omega-app02.omegaengineers.local_omega-prod\jvillarreal-admin\dms10444\GF(31)LS-19fgf31ls19.dgn

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



RECTANGULAR CRT POST (6"X 8" X 6' LONG)

(6) CRT REQUIRED
SEE ELEVATION DETAIL FOR LOCATIONS



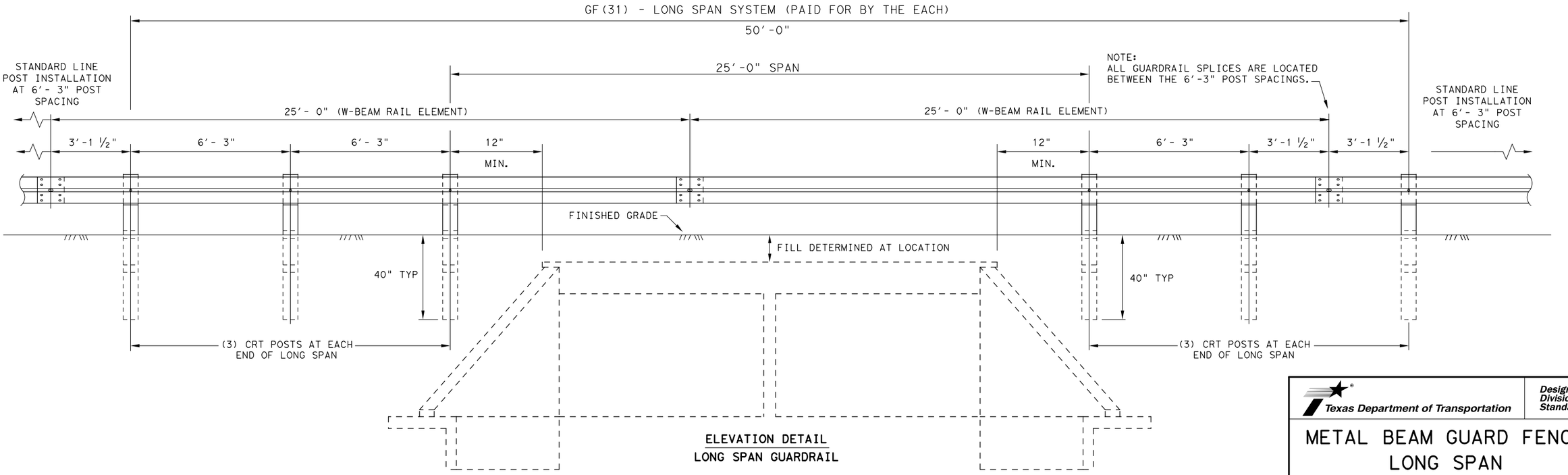
LATERAL OFFSET BETWEEN THE GUARDRAIL AND THE CULVERT HEADWALL

GENERAL NOTES

1. THE TYPE OF LINE POST (ROUND WOOD POST, RECTANGULAR WOOD POST, OR STEEL POST) WILL BE AS SHOWN IN THE PLANS. THE EXACT POSITION OF THE TRANSITIONS SHALL BE AS SHOWN IN THE PLANS OR AS DIRECTED BY THE ENGINEER. STEEL POSTS TO BE GALVANIZED IN ACCORDANCE WITH ITEM 445, "GALVANIZING."
2. RAIL ELEMENT SHALL MEET ALL REQUIREMENTS OF ITEM 540, "METAL BEAM GUARD FENCE" EXCEPT AS MODIFIED ON THE PLANS. THE CONTRACTOR MAY FURNISH RAIL ELEMENTS OF 12'- 6" OR 25'- 0" NOMINAL LENGTHS.
3. RAIL POST HOLES ARE OFFSET 3'- 1 ½" FROM STANDARD GUARDRAIL TO ACCOMMODATE THE MIDSPAN SPLICING.
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 NO MORE THAN 1" BEYOND IT.
5. FITTINGS (BOLTS, NUTS, AND WASHERS) SHALL BE GALVANIZED IN ACCORDANCE WITH ITEM 445, "GALVANIZING". FITTINGS SHALL BE SUBSIDIARY TO THE BID ITEM.
6. WHERE SOLID ROCK IS ENCOUNTERED, CONTACT THE DESIGN DIVISION FOR ADDITIONAL GUIDANCE. (512) 416-2678
7. POSTS SHALL NOT BE SET IN CONCRETE, OF ANY DEPTH.
8. REFER TO GF(31) STANDARD SHEET FOR ADDITIONAL DETAILS.
9. FLAME CUTTING OF HOLES IN GUARDRAIL SHALL NOT BE PERMITTED. IF YOU ENCOUNTER MIS-ALIGNED BOLT HOLES IN GUARDRAIL CONTACT THE DESIGN DIVISION FOR ADDITIONAL INFORMATION & OPTIONS.

DIRECTION OF TRAFFIC

NOTE: SEE GF(31) STANDARD FOR STANDARD LINE POSTS.



ELEVATION DETAIL
LONG SPAN GUARDRAIL

Texas Department of Transportation

Design Division Standard

METAL BEAM GUARD FENCE LONG SPAN TL-3 MASH COMPLIANT

GF(31)LS-19

FILE: gf31ls19.dgn	DN: TxDOT	CK: KM	DW: VP	CK: CGL/AG	
©TxDOT: NOVEMBER 2019	CONT	SECT	JOB	HIGHWAY	
REVISIONS	0233	05	038	SH 54	
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	ELP	CULBERSON		70	

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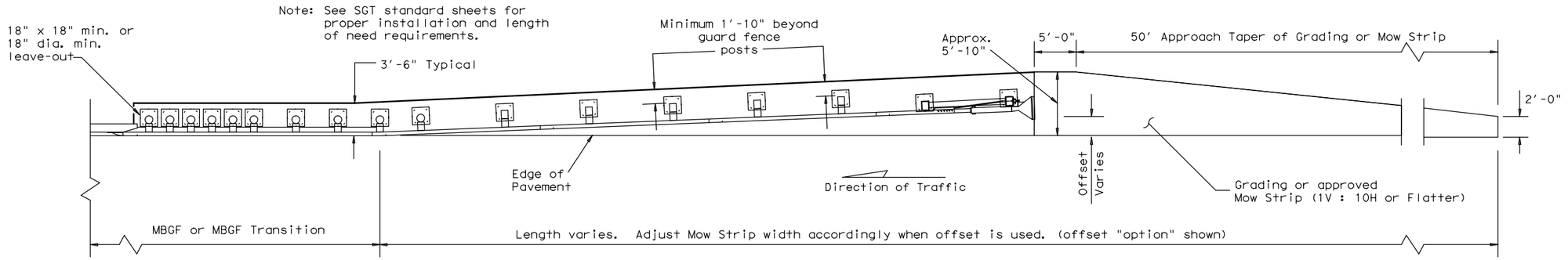
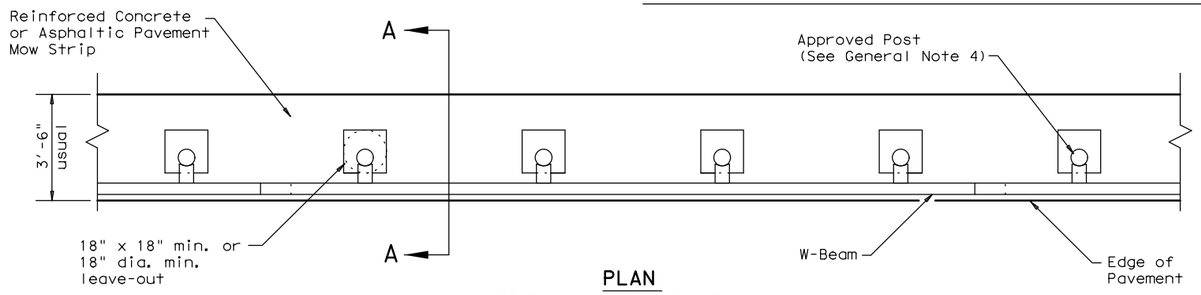
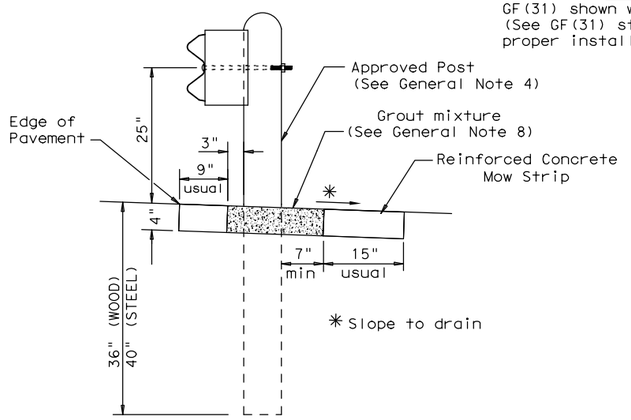


GRADING AND MOW STRIP AT GUARDRAIL END TREATMENTS



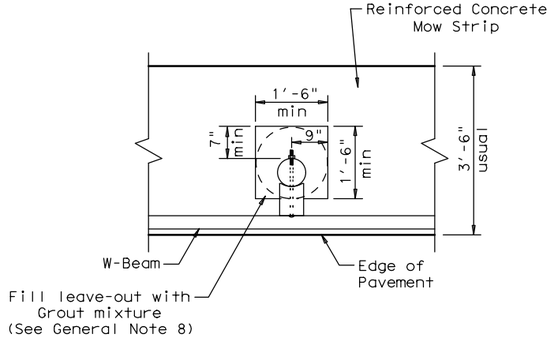
PLAN

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



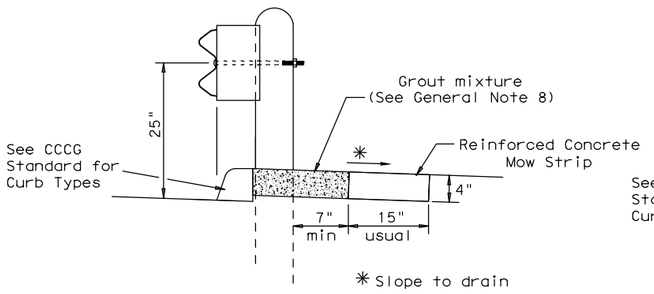
SECTION A-A

Typical



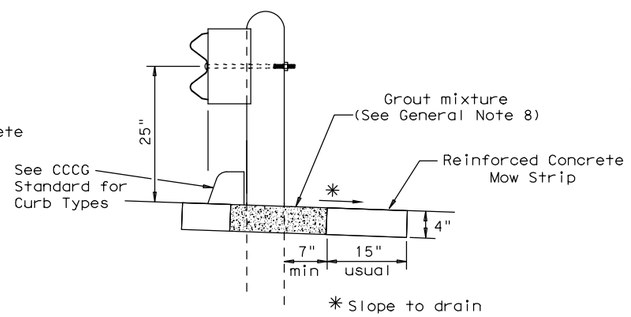
MOW STRIP DETAIL

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



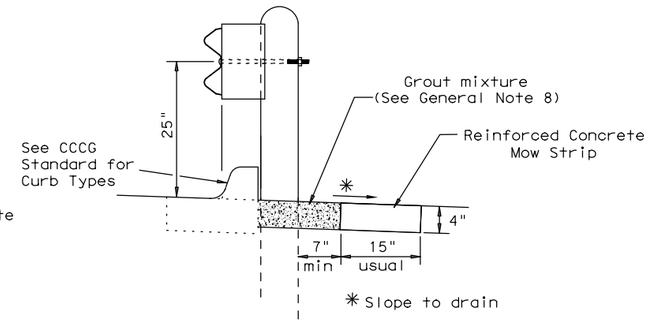
CURB OPTION (1)

This option will increase the post embedment throughout the system.



CURB OPTION (2)

Curb shown on top of mow strip



CURB OPTION (3)

Note: Site Condition(s)

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

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

GENERAL NOTES

1. This mow strip design is for use with metal beam guard fence, guard fence transitions, and guard fence end treatments. See applicable GF(31) MBGF or GF(31) Transition Standard sheet for additional information.
2. Mow strips shall be reinforced concrete with (wire mesh or synthetic fiber), as shown on the plans and will be paid for under the pertinent bid item. Reinforced concrete shall be placed in accordance with Item 432, "Riprap." The use of the synthetic fiber in lieu of steel reinforcing is acceptable, provided the fiber producer is on the Department Material Producer List (MPL), maintained by TxDOT, Construction Division.
3. The leave-out behind the post shall be a minimum of 7".
4. Only steel (W6 x 8.5 or W6 x 9.0), or 7 ½" Dia. round wood posts are acceptable for use in the mow strip. See GF(31) Standard for additional details.
5. Other curb placement options may be used. Curbs are not considered part of the mow strip and will be paid for under other pertinent bid item.
6. Thickness of the mow strip will be 4".
7. The limits of payment for reinforced concrete will include leave-outs for the posts.
8. The leave-outs shall be filled with a Grout mixture consisting of: 2719 pounds sand, 188 pounds Type 1 or II cement, and 550 pounds of water per cubic yard, with a 28-day compressive strength of approximately 230 psi or less. Provide grout with a consistency that will flow into and completely fill all voids. Due to auger size, larger leave-out dimensions are acceptable from both an impact performance and maintenance repair standpoint (Suggested Maximum leave-out of 20"). Payment for furnishing and placing the grout mixture will be subsidiary to the pay item of riprap mow strip.

Texas Department of Transportation

Design Division Standard

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

GF(31)MS-19

FILE: gf31ms19.dgn	DN: TxDOT	CK: KM	DW: VP	CK: CGL/AG
© TxDOT:	CONT	SECT	JOB	HIGHWAY
REVISIONS	0233	05	038	SH 54
	DIST	COUNTY		SHEET NO.
	ELP	CULBERSON		71

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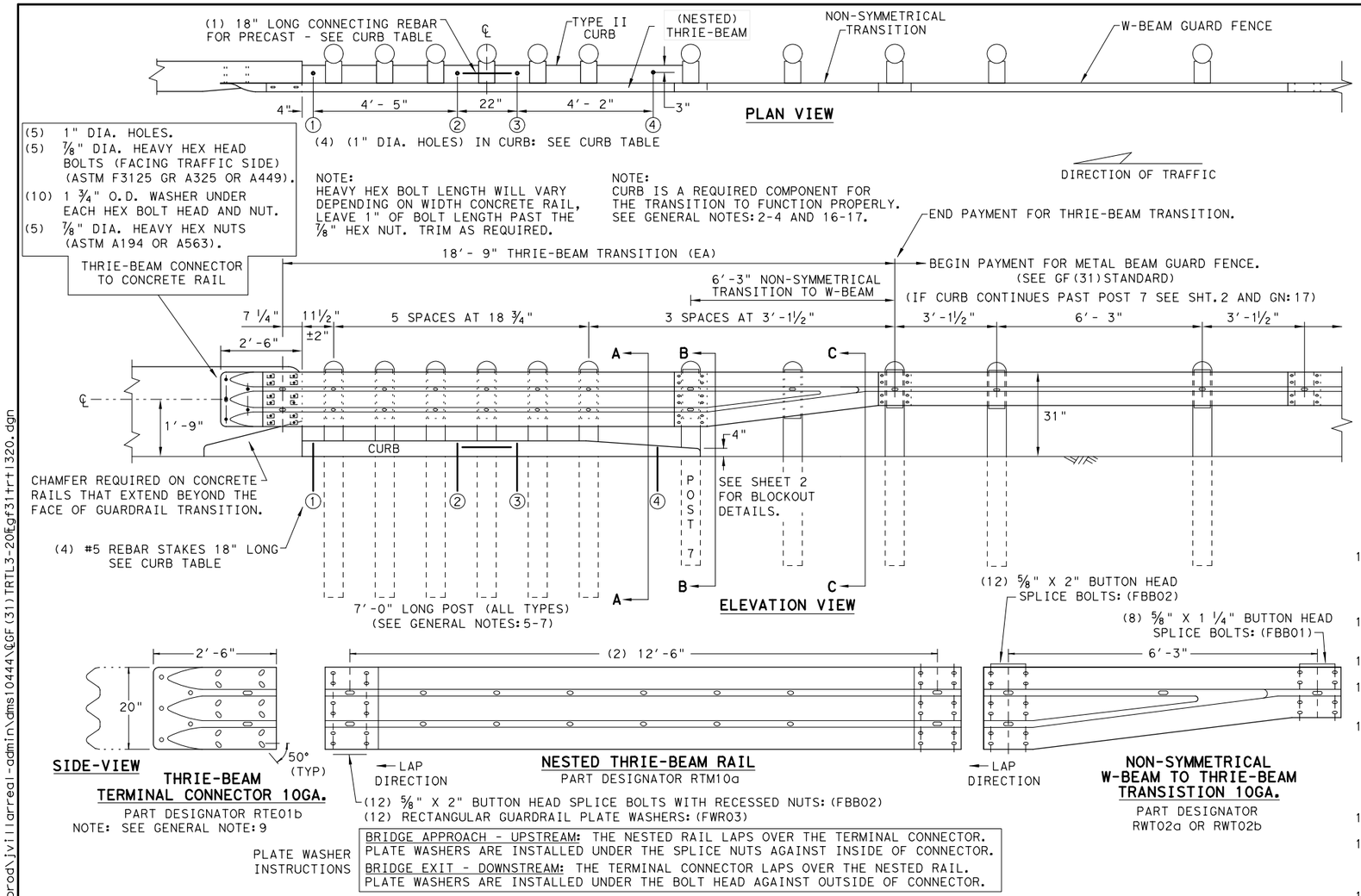


GENERAL NOTES

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.

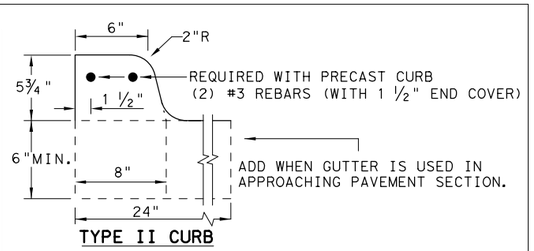
THRIE-BEAM TERMINAL - CURB TABLE

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.



TYPE II CURB

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

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

TYPE II CURB DETAILS

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: gf31trt1320.dgn	DN: TxDOT	CK: KM	DW: VP	CK: CGL/AG	
©TxDOT: NOVEMBER 2020	CONT	SECT	JOB	HIGHWAY	
REVISIONS	0233	05	038	SH 54	
	DIST	COUNTY		SHEET NO.	
	ELP	CULBERSON		72	

DATE: 9/27/2022
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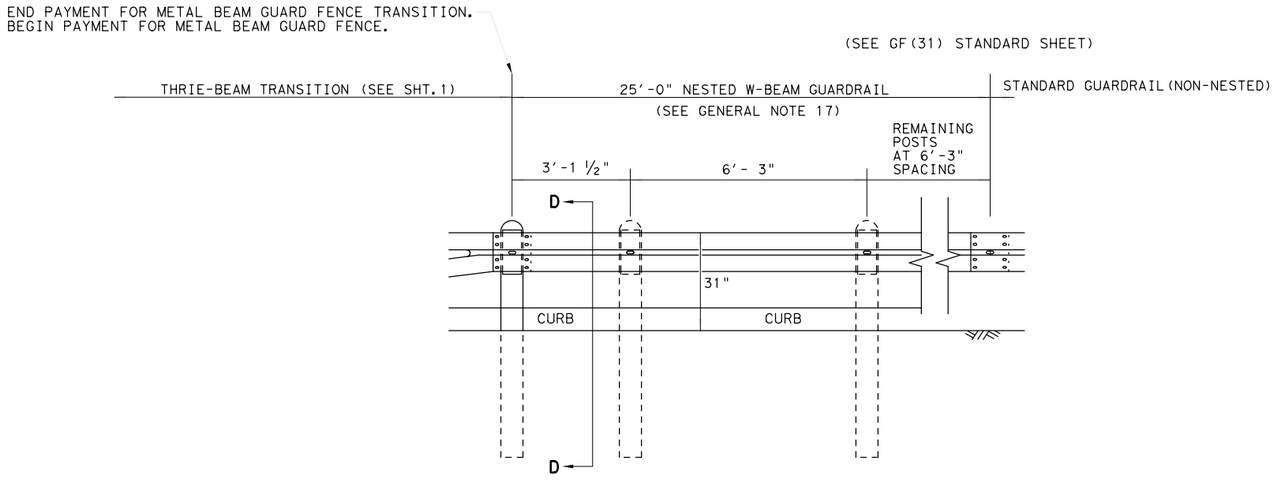
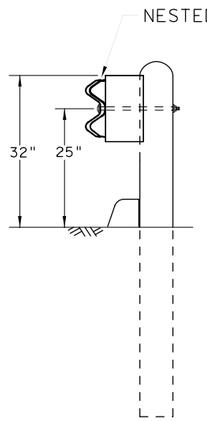
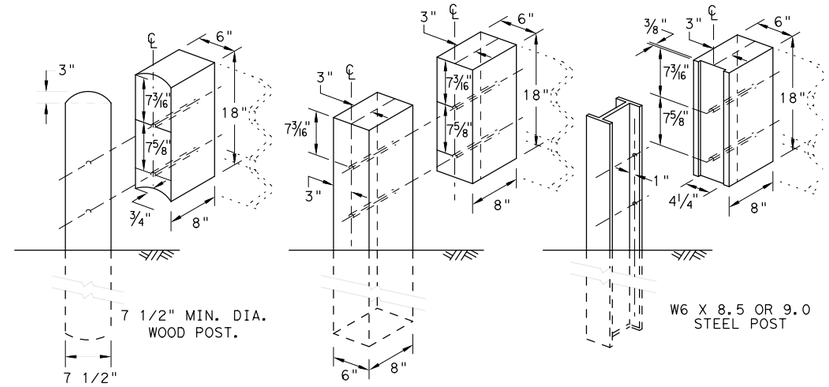
REQUIRED ALTERNATIVE FOR CONTINUOUS CURB EXTENDING PAST POST 7 (SEE SHT. 1 GENERAL NOTE 17)



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: gf31trt1320.dgn	DN: TxDOT	CK: KM	DW: KM	CK: CGL/AG	
©TxDOT: NOVEMBER 2020	CONT	SECT	JOB	HIGHWAY	
REVISIONS	0233	05	038	SH 54	
	DIST	COUNTY		SHEET NO.	
	ELP	CULBERSON		73	

DATE: 9/27/2022
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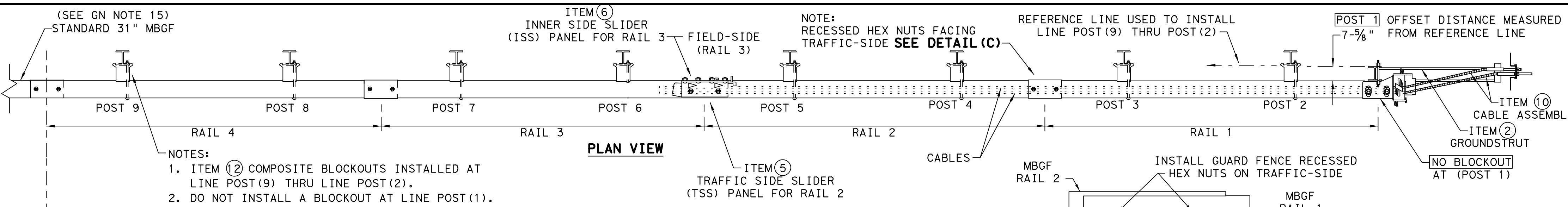
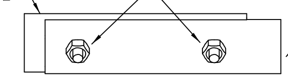
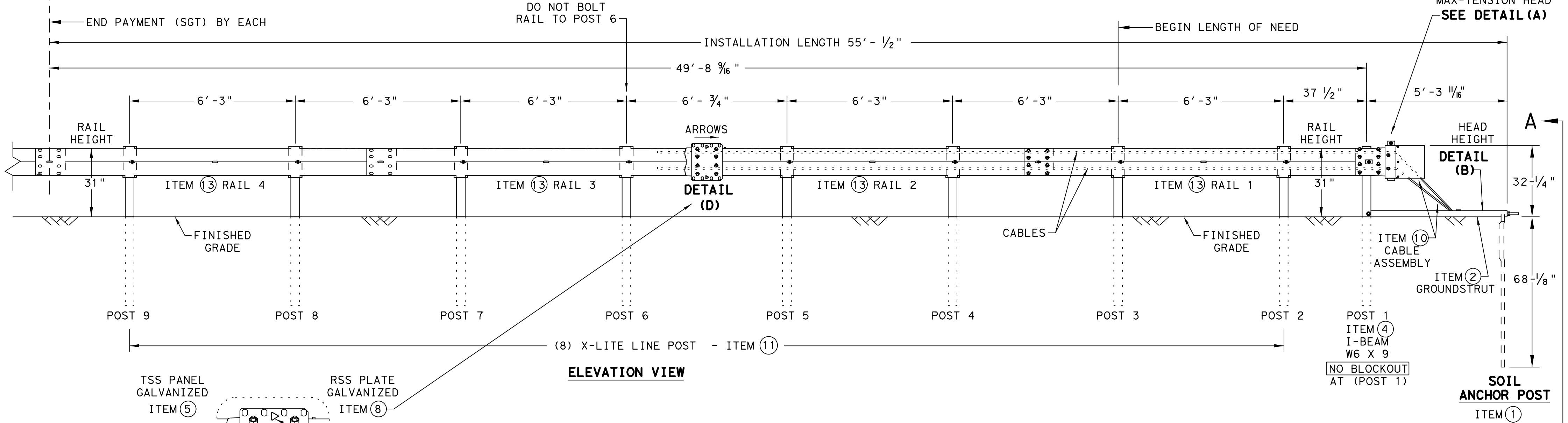


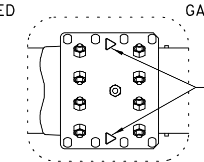
PLAN VIEW



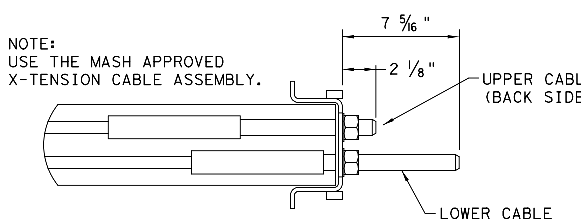
DETAIL (C)



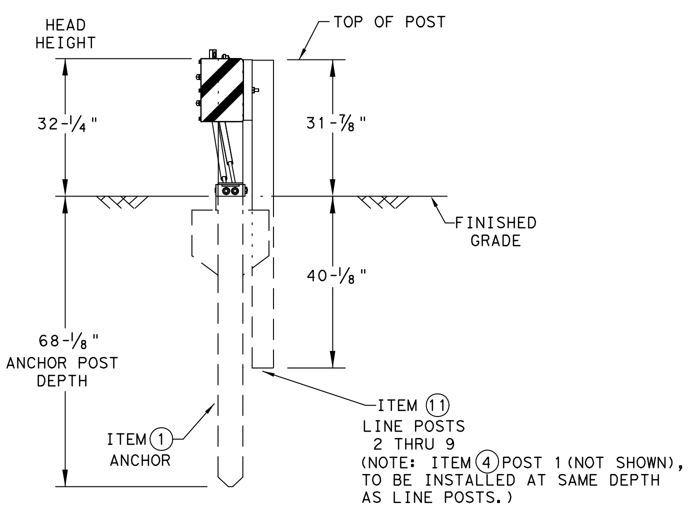
ELEVATION VIEW



TSS PANEL AND RSS PLATE
DETAIL (D)

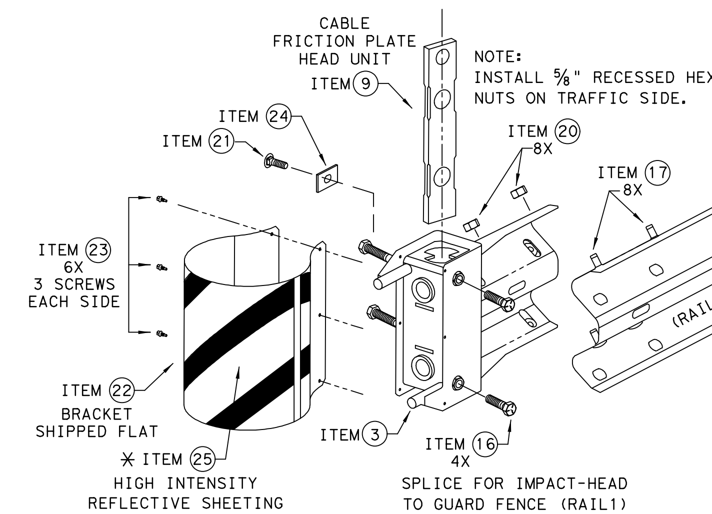


DETAIL (B)



SOIL ANCHOR, POST 1
& LINE POST 2 THRU 9

SECTION VIEW A-A



DETAIL (A)

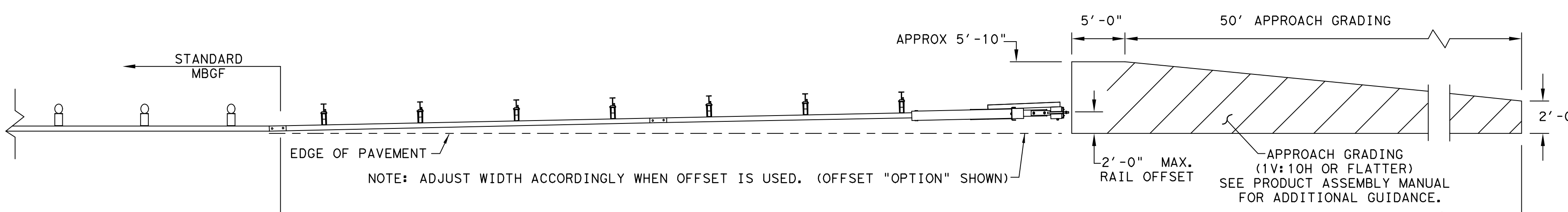
GENERAL NOTES

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

	ITEM #	PART NUMBER	DESCRIPTION	QTY
	1	BSI-1610060-00	SOIL ANCHOR - GALVANIZED	1
	2	BSI-1610061-00	GROUND STRUT - GALVANIZED	1
	3	BSI-1610062-00	MAX-TENSION IMPACT HEAD	1
	4	BSI-1610063-00	W6x9 I-BEAM POST 6FT.-GALVANIZED	1
	5	BSI-1610064-00	TSS PANEL - TRAFFIC SIDE SLIDER	1
	6	BSI-1610065-00	ISS PANEL - INNER SIDE SLIDER	1
	7	BSI-1610066-00	TOOTH - GEOMET	1
	8	BSI-1610067-00	RSS PLATE - REAR SIDE SLIDER	1
	9	B061058	CABLE FRICTION PLATE - HEAD UNIT	1
	10	BSI-1610069-00	CABLE ASSEMBLY - MASH X-TENSION	2
	11	BSI-1012078-00	X-LITE LINE POST-GALVANIZED	8
	12	B090534	8" W-BEAM COMPOSITE-BLOCKOUT XT110	8
	13	BSI-4004386	12'-6" W-BEAM GUARD FENCE PANELS 12GA.	4
	14	BSI-1102027-00	X-LITE SQUARE WASHER	1
	15	BSI-2001886	5/8" X 7" THREAD BOLT HH (GR.5)GEOMET	1
	16	BSI-2001885	3/4" X 3" ALL-THREAD BOLT HH (GR.5)GEOMET	4
	17	4001115	5/8" X 1 1/4" GUARD FENCE BOLTS (GR.2)MGAL	48
	18	2001840	5/8" X 10" GUARD FENCE BOLTS MGAL	8
	19	2001636	5/8" WASHER F436 STRUCTURAL MGAL	2
	20	4001116	5/8" RECESSED GUARD FENCE NUT (GR.2)MGAL	59
	21	BSI-2001888	5/8" X 2" ALL THREAD BOLT (GR.5)GEOMET	1
	22	BSI-1701063-00	DELINEATION MOUNTING (BRACKET)	1
	23	BSI-2001887	1/4" X 3/4" SCREW SD HH 410SS	7
	24	4002051	GUARDRAIL WASHER RECT AASHTO FWR03	1
*	25	SEE NOTE BELOW	HIGH INTENSITY REFLECTIVE SHEETING	1
**	26	4002337	8" W-BEAM TIMBER-BLOCKOUT, PDB01B	8
**	27	BSI-4004431	25' W-BEAM GUARDRAIL PANEL, 8-SPACE, 12GA.	2
	28	MANMAX Rev-(D)	MAX-TENSION INSTALLATION INSTRUCTIONS	1

* TO BE PROVIDED BY DISTRIBUTOR OR CONTRACTOR.

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



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

APPROACH GRADING AT GUARDRAIL END TREATMENTS

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

Texas Department of Transportation — Design Division Standard

MAX-TENSION END TERMINAL
MASH - TL-3

SGT(11S)31-18

FILE: sgt11s3118.dgn	DN: TxDOT	CK: KM	DW: TxDOT	CK: CL
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	ELP		CULBERSON	74

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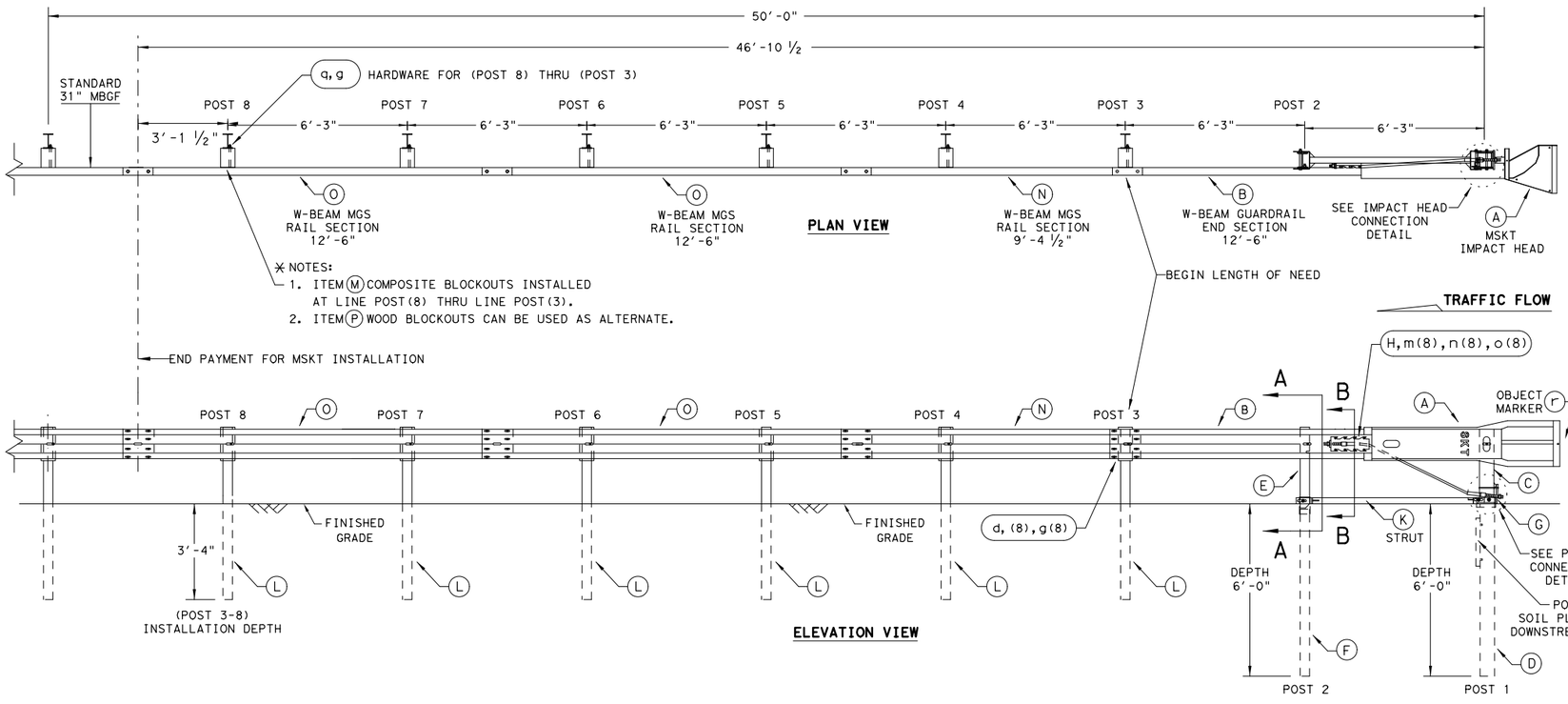
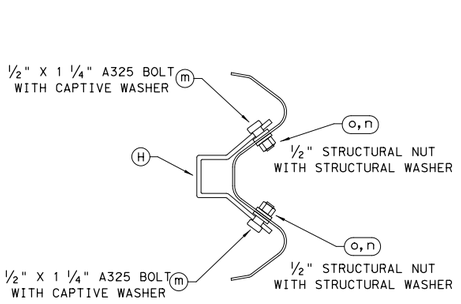
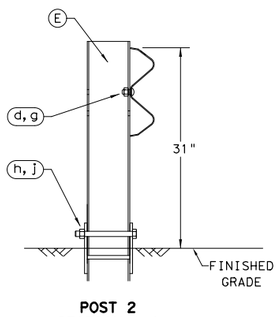
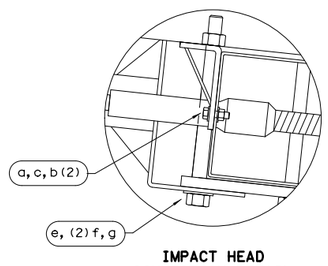
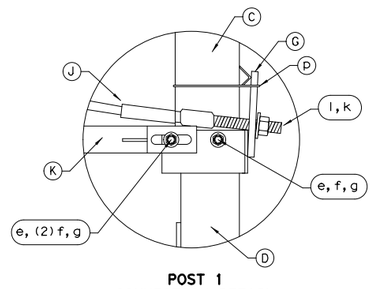


NOTE: SEE (GENERAL NOTE 14) FOR DRIVING CAP INFORMATION.









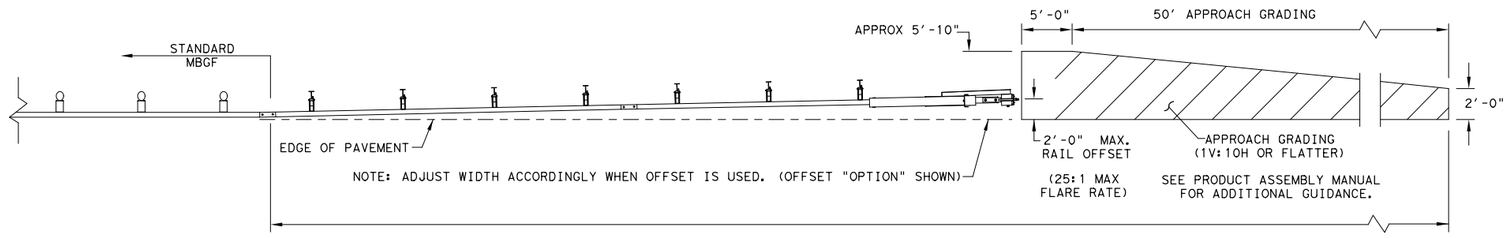
GENERAL NOTES

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

SEE NOTES: ✳

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

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



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	
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	DIST	COUNTY				SHEET NO.	
	ELP	CULBERSON				75	

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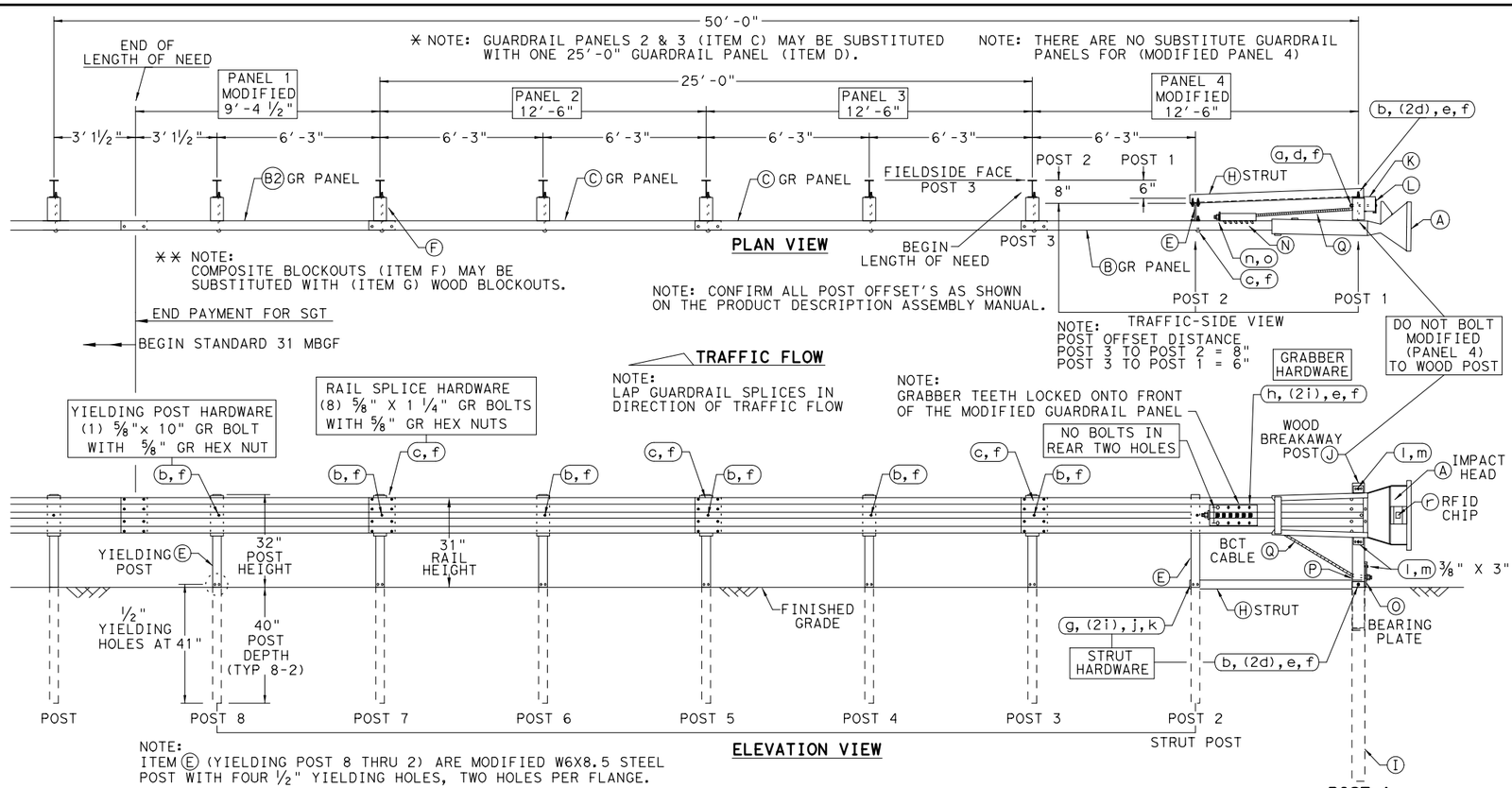
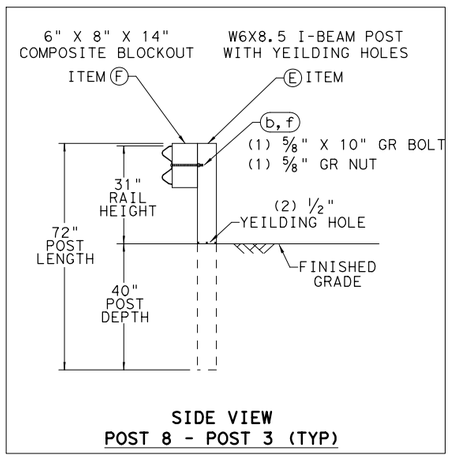


GENERAL NOTES

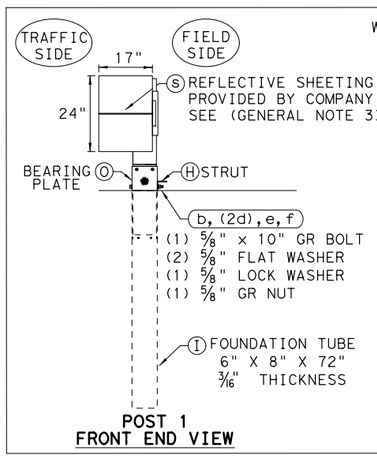
1. FOR SPECIFIC INFORMATION REGARDING INSTALLATION AND TECHNICAL GUIDANCE OF THE SYSTEM, CONTACT: SPIG INDUSTRY, INC. AT 1(267) 644-9510. 14675 INDUSTRIAL PARK RD; BRISTOL, VA 24202
2. FOR INSTALLATION, REPAIR AND MAINTENANCE REFER TO THE MANUFACTURER'S; SGET END TERMINAL, PRODUCT DESCRIPTION ASSEMBLY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

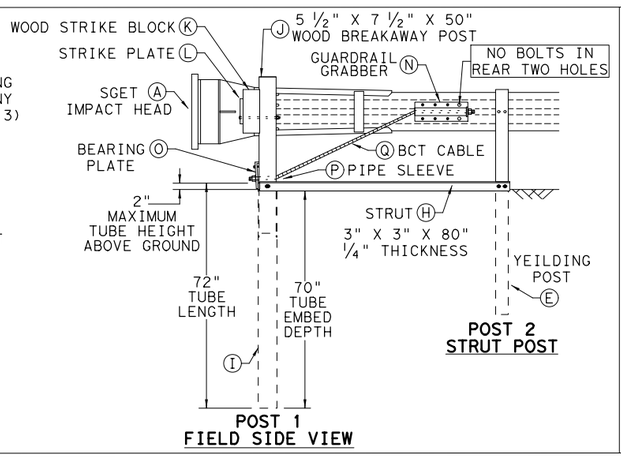
ALTERNATIVE ITEMS
NOTE: SEE PLAN VIEW
* ITEM D
** ITEM G



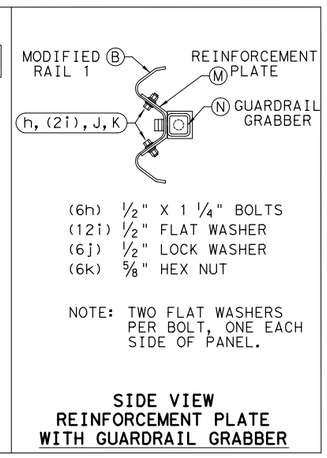
SIDE VIEW
POST 8 - POST 3 (TYP)



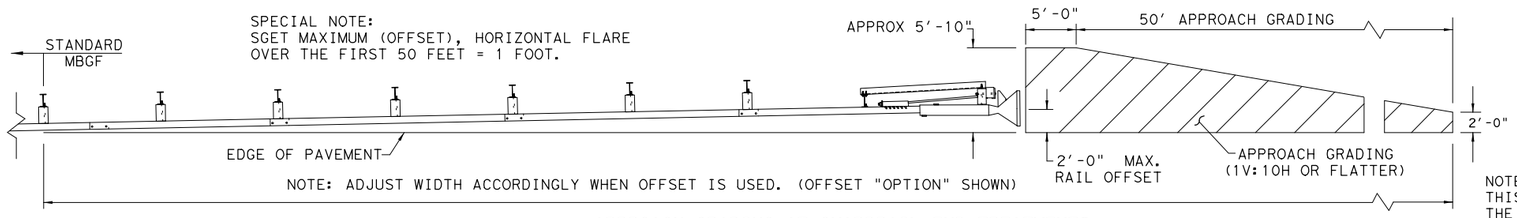
POST 1
FRONT END VIEW



POST 1
FIELD SIDE VIEW



SIDE VIEW
REINFORCEMENT PLATE
WITH GUARDRAIL GRABBER



APPROACH GRADING AT GUARDRAIL END TREATMENTS

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

Texas Department of Transportation
Design Division Standard

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

FILE: sgt153120.dgn	DN: TxDOT	CK: KM	DW: VP	CK: VP		
© TxDOT: APRIL 2020	CONT	SECT	JOB	HIGHWAY		
REVISIONS	0233	05	038	SH 54		
	DIST	COUNTY		SHEET NO.		
	ELP	CULBERSON		76		

DATE: 9/27/2022
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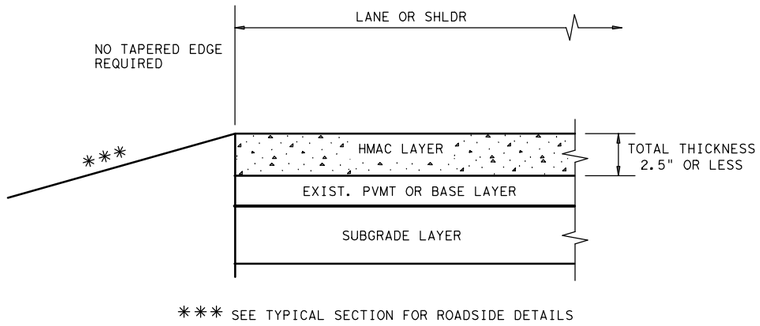
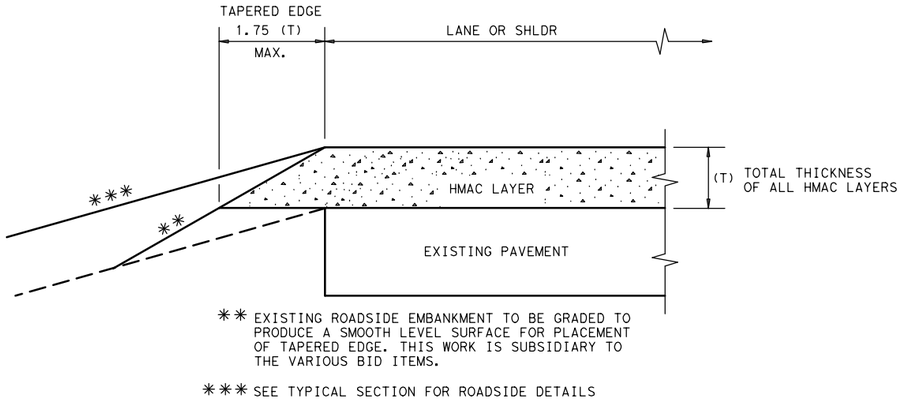


*** SEE TYPICAL SECTION FOR ROADSIDE DETAILS

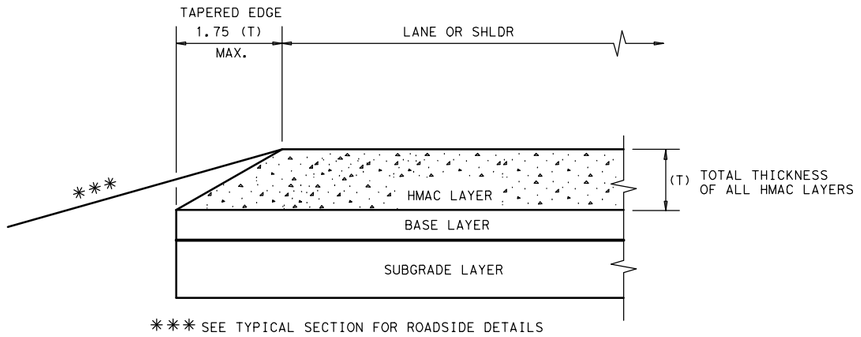
CONDITION - 1
THIN HMAC SURFACES OR HMAC OVERLAY WITH THICKNESS OF 2.5" OR LESS



** EXISTING ROADSIDE EMBANKMENT TO BE GRADED TO PRODUCE A SMOOTH LEVEL SURFACE FOR PLACEMENT OF TAPERED EDGE. THIS WORK IS SUBSIDIARY TO THE VARIOUS BID ITEMS.

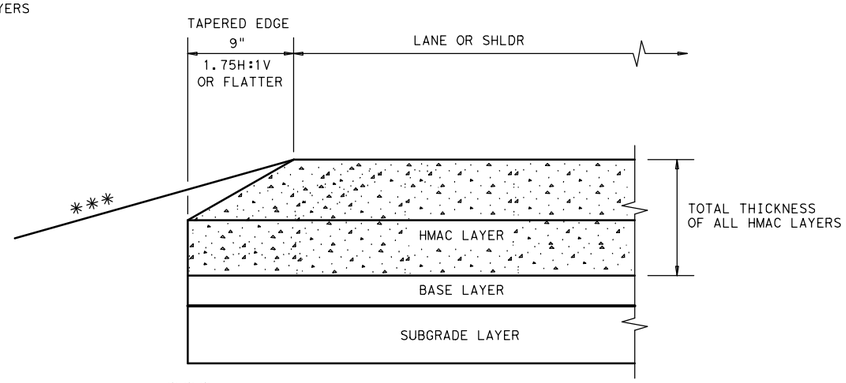
*** SEE TYPICAL SECTION FOR ROADSIDE DETAILS

CONDITION - 2
OVERLAY OF EXISTING PAVEMENT HMAC THICKNESS 2.5" TO 5"



*** SEE TYPICAL SECTION FOR ROADSIDE DETAILS

CONDITION - 3
NEW OR RECONSTRUCTED PAVEMENT HMAC THICKNESS 2.5" TO 5"



*** SEE TYPICAL SECTION FOR ROADSIDE DETAILS

CONDITION - 4
NEW OR RECONSTRUCTED PAVEMENT HMAC THICKNESS 5" OR GREATER

(NOT TO SCALE)

GENERAL NOTES

1. UNLESS OTHERWISE SHOWN IN THE PLANS, A VERTICAL EDGE IS PERMISSIBLE FOR HMAC PLACED GREATER THAN 5" BELOW THE EDGE OF PAVEMENT AND FOR THICKNESS OF HMAC LESS THAN 2.5".
2. FOR FURTHER INFORMATION REGARDING THE ROADSIDE AND PAVEMENT DETAILS, SEE TYPICAL SECTIONS.
3. PAYMENT FOR TAPERED EDGE WILL BE IN ACCORDANCE WITH APPLICABLE ITEMS IN THE CONTRACT.
4. THE SLOPE OF THE TAPERED EDGE SHALL BE 1.75H:1V OR FLATTER.
5. THE TAPERED EDGE SHALL BE PRODUCED BY USE OF A SCREED ATTACHMENT CAPABLE OF PRODUCING A SMOOTH COMPACTED SURFACE. ADDITIONAL COMPACTING EFFORT BEHIND THE SCREED IS NOT REQUIRED.

Texas Department of Transportation | Design Division Standard

TAPERED EDGE DETAILS
HMAC PAVEMENT

TE(HMAC)-11

FILE: tehmac11.dgn	DN: TxDOT	CK: RL	DW: KB	CK:
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REVISIONS	0233	05	038	SH 54
	DIST	COUNTY		SHEET NO.
	ELP	CULBERSON		77

DATE: 9/27/2022
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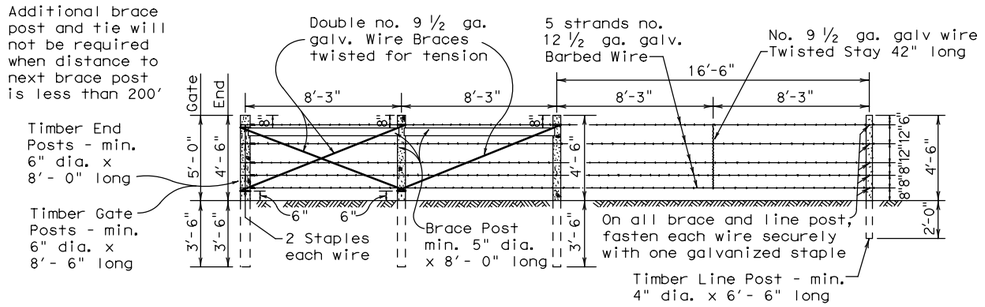
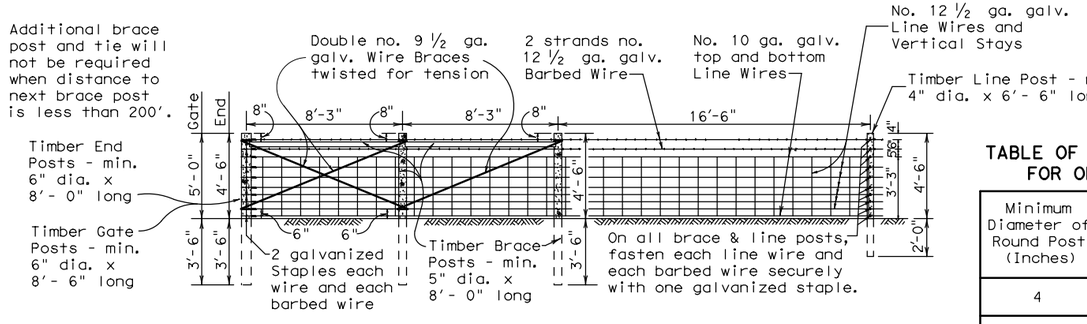


SECTION GALVANIZED BARBED WIRE FENCE WITH WOOD POSTS

Bracing Detail Used at Ends and Gates

TYPE "A" FENCE

(See General Note 6)



SECTION GALVANIZED WOVEN WIRE FENCE WITH WOOD POSTS

Bracing Detail Used at Ends and Gates

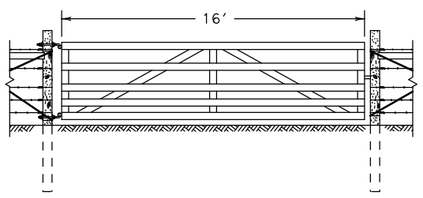
TYPE "B" FENCE

(See General Note 6)

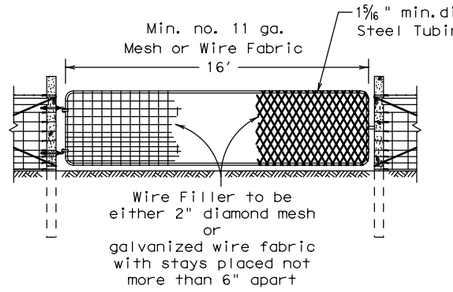
TABLE OF EQUIVALENT SIZES FOR OPTIONAL SHAPE

Minimum Diameter of Round Post (Inches)	Minimum Equivalent Dimension for Each Side of Square Post (Inches)
4	3 ½
5	4 ½
6	5 ¼

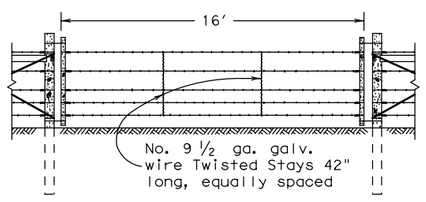
Metal gate shall consist of 5 panels not less than 4'- 4" high and shall be aluminum or galvanized metal and of good quality. Gate and hardware shall meet the approval of the Engineer.



DETAIL TYPE 1 GATE



DETAIL TYPE 2 GATE

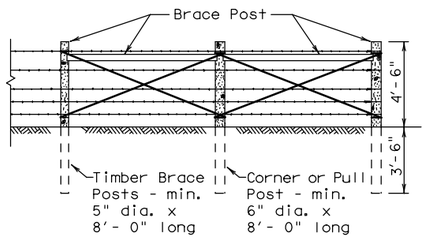


DETAIL TYPE 3 GATE

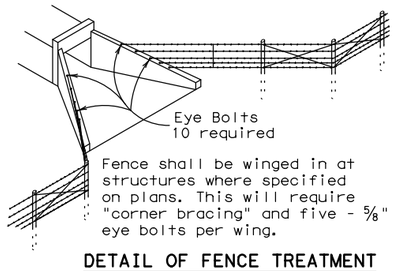
GENERAL NOTES

1. Any high point which interferes with the placing of wire mesh shall be excavated to provide 2" clearance.
2. Latches for Type 1 and Type 2 gates shall be good commercial quality and design latches of the spring, fork or chain type. All latches shall be suitable for the gate and shall be approved by the Engineer.
3. Hinges for Type 2 gates shall be commercial design approved by the Engineer suitable for post and gate.
4. Concrete shall be of the design and consistency approved by the Engineer and shall contain not less than 4 sacks of cement per cubic yard. Concrete footings are to be crowned at the top to shed water.
5. If rock is encountered at a depth less than the embedded depth required, a 15" or larger diameter hole shall be drilled for the post and the post shall be set in concrete. If rock is encountered at a depth of 1'- 6" or more below the ground surface, the hole shall be drilled to the required depth. If rock is encountered at a depth less than 1'- 6" below the ground surface, the holes shall be drilled a minimum of 2'- 0" into the rock or to the depth whichever is the lesser depth.
6. Barbed Wire shall be in accordance with ASTM A 121 (Class 1) Design designation 12-2-4-1 4R or 12-2-5-1 4R, or as approved by the Engineer.

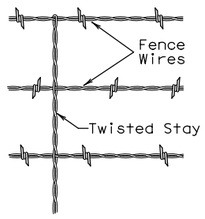
   Woven Wire Fence (Type B) shall be in accordance with ASTM A 116 (Class 1) No. 12-1/2 Grade 60 (See Table 1 ASTM A 116) to the height and design shown on the plans, or as approved by the Engineer.
7. The location of gates and corner posts will be as indicated elsewhere on these plans.
8. Square wood posts may be used in lieu of round posts provided minimum equivalent size requirements, as shown are met. All wood posts shall be in accordance with Item 552, "Wire Fence."



CORNER OR PULL POST ASSEMBLY

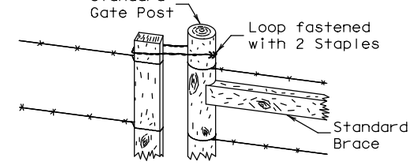


DETAIL OF FENCE TREATMENT AT STRUCTURES



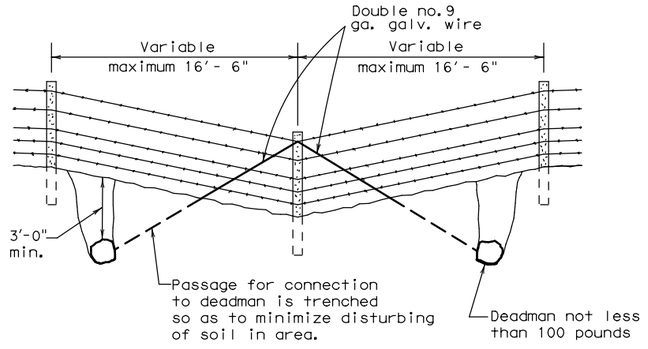
DETAIL OF STAY

(Barbed wire fence)



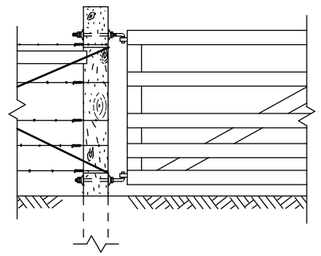
Loop to be made from two strands twisted no. 9 ½ ga. galv. smooth wire, and to be securely fastened to gate post with two galv. staples.

DETAIL FASTENER TYPE 3 GATE

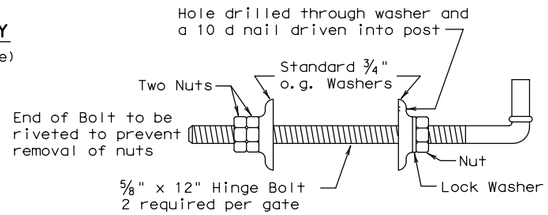


DETAIL OF FENCE SAG

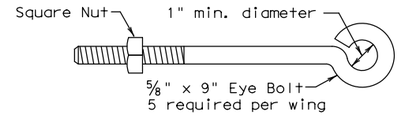
(Single Line Connection)



DETAIL SHOWING INSTALLATION OF HINGES OF TYPE 1 & 2 GATE



DETAIL OF GATE HINGE BOLT ASSEMBLY



DETAIL OF EYE BOLT

Texas Department of Transportation

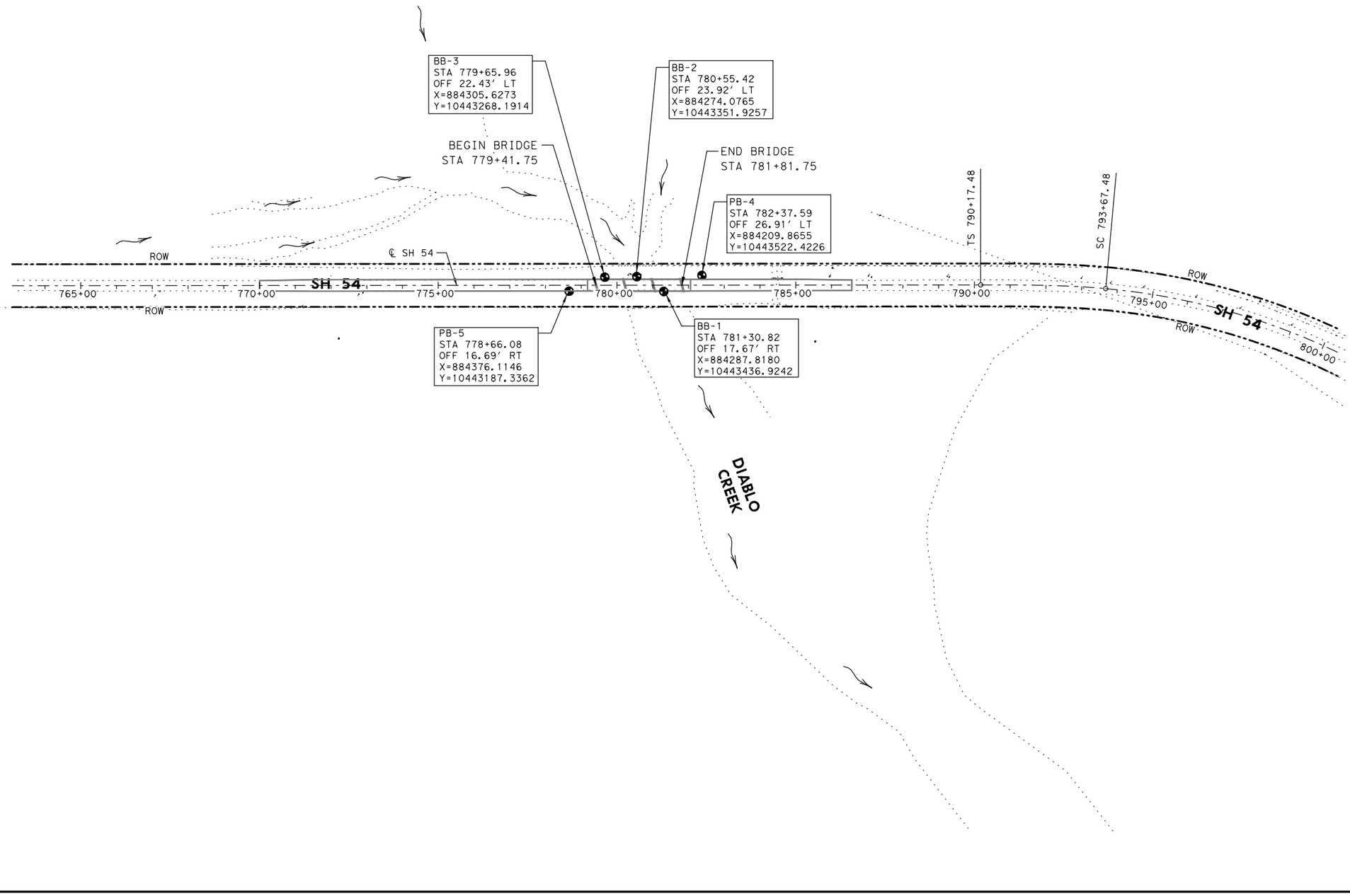
Design Division Standard

BARBED WIRE AND WOVEN WIRE FENCE

(WOOD POSTS)

WF(1)-10

FILE: wf110.dgn	DN: TxDOT	CK: AM	DW: VP	CK:
©TxDOT 1994	CONT	SECT	JOB	HIGHWAY
REVISIONS	0233	05	038	SH 54
	DIST	COUNTY		SHEET NO.
	ELP	CULBERSON		78



0 150 300

SCALE: 1"=300'

NOTES:

1. COORDINATES ARE IN US SURVEY FEET, DISPLAYED IN SURFACE VALUES, AND MAY BE CONVERTED TO GRID BY DIVIDING BY THE TXDOT SURFACE ADJUSTMENT FACTOR OF 1.00025.
2. SEE HORIZONTAL & VERTICAL CONTROL DATA SHEETS FOR INFORMATION.

LEGEND

- BORE HOLE LOCATION
- DRAINAGE FLOW

DATE	BY	REV	REVISION

STATE OF TEXAS
JAIME ROJAS
89944
LICENSED PROFESSIONAL ENGINEER

09-01-2022

construction quality control testing and engineering
TX PE FIrm Reg. No. F-10632

OMEGA ENGINEERS, INC.
8200 N MOPAC EXPRESSWAY, STE #280
AUSTIN, TEXAS 78759
OMEGAENGINEERS.COM
TX PE Firm Reg. No. F-2147
P:512 575 2288 F:281 647 9184

Texas Department of Transportation®

SH 54 @ DIABLO CREEK

BORE HOLE LAYOUT

SHEET 1 OF 1

		FED.RD. DIV.NO.	PROJECT NO.	SHEET NO.
DSN	OEI	6	SEE TITLE SHEET	79
CHK	OEI	STATE	DIST.	COUNTY
DRN	OEI	TEXAS	ELP	CULBERSON
CHK	OEI	CONT.	SECT.	JOB / HIGHWAY NO.
		0233	05	038 / SH 54

9/27/2022
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DRILLING LOG

WinCore Version 3.1	County: Culberson	Hole: BB-1	District: El Paso		
	Highway: State Highway 54	Structure: Bridge and Pavement	Date: 3/15/22		
	CSJ: 0233-05-038	Station: 781+30.82	Grnd. Elev.: 4134.00 ft		
		Offset: 17.67' RT	GW Elev.: N/A		

Elev. (ft)	LOG	Texas Cone Penetrometer	Strata Description	Triaxial Test Lateral Press. (psi)	Triaxial Test Deviator Stress (psi)	MC	LL	PI	Additional Remarks
		19 (6) 15 (6)	GRAVEL, Fine, Sandy, Silty, Reddish Brown to Dark Brown, Subrounded, Slightly Compact, Slightly Moist with traces of clay particles.Fine, Sandy, Silty, Reddish Brown to Dark Brown, Subrounded, Dry to Slightly Compact, Slightly Moist with traces of clay particles.						
4129. 5		13 (6) 11 (6)				2.7	0	0	-200%: 10
			GRAVEL, Fine, Sandy, Poorly Graded, Reddish Brown to Dark Brown, Subrounded, Slightly Compact, Dry with silt. (GP-GM)						
10		50 (2) 50 (1)							
4119. 15		50 (1) 50 (1)				6.3	28	15	-200%:63
			CLAY, Sandy, Moderate Plasticity, Pinkish Brown to Whittish Brown, Very Dense, Slightly Moist with traces of gravel. (CL) (CL)						
4114. 20		50 (1) 50 (1)				4.2	21	7	-200%:40
			GRAVEL, Fine to Coarse Grained, Clayey, Silty, Reddish Brown to Tannish Brown, Very Dense, Slightly Moist with traces of calcareous material and gravel. (GC-GM)						
4109. 25		50 (1) 50 (1)				4.9	20	6	-200%:57
			CLAY, Silty, Sandy, Low Plasticity, Orange Brown to Tannish Brown, Very Dense, Slightly Moist with traces of gravel. (CL-ML) (CL)						
4104. 30		50 (1) 50 (1)				0.2	0	0	-200%: 28

Remarks: Boring Location: See Attached Boring Location Plan: A1-1. ***Borehole elevations are preliminary and shall be updated once topographic plan is provided.***

The ground water elevation was not determined during the course of this boring.

Driller: SC   Logger: PG/JC   Organization: CQC

\\192.168.1.102\CQC Working Files\GEO\Reports\2022\22-005 - TXDOT Diablo Creek Bridge Reconstruction (OMEGA)\06-Preliminary Report\Bp Idl\Wincore Analysis\22-005_WB.coll\JRCLG

DRILLING LOG

WinCore Version 3.1	County: Culberson	Hole: BB-1	District: El Paso		
	Highway: State Highway 54	Structure: Bridge and Pavement	Date: 3/15/22		
	CSJ: 0233-05-038	Station: 781+30.82	Grnd. Elev.: 4134.00 ft		
		Offset: 17.67' RT	GW Elev.: N/A		

Elev. (ft)	LOG	Texas Cone Penetrometer	Strata Description	Triaxial Test Lateral Press. (psi)	Triaxial Test Deviator Stress (psi)	MC	LL	PI	Additional Remarks
			GRAVEL, (SAND) Fine to Coarse Grained, Gravelly, Silty, Whittish Gray to Brownnish Gray, Subrounded to Subangular, Very Dense, Dry.(GM)						
35		50 (1) 50 (1)							
40		50 (1) 50 (1)				0.3	0	0	-200%: 14
4092.									
45									
50									
55									
60									

Remarks: Boring Location: See Attached Boring Location Plan: A1-1. ***Borehole elevations are preliminary and shall be updated once topographic plan is provided.***

The ground water elevation was not determined during the course of this boring.

Driller: SC   Logger: PG/JC   Organization: CQC

\\192.168.1.102\CQC Working Files\GEO\Reports\2022\22-005 - TXDOT Diablo Creek Bridge Reconstruction (OMEGA)\06-Preliminary Report\Bp Idl\Wincore Analysis\22-005_WB.coll\JRCLG

DATE	BY	REV	REVISION

STATE OF TEXAS
JAIME ROJAS
89944
LICENSED
PROFESSIONAL ENGINEER
09-01-2022

construction quality control testing and engineering
TX PE Firm Reg. No. F-10632

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8200 N MOPAC EXPRESSWAY, STE #280
AUSTIN, TEXAS 78759
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TX PE Firm Reg. No. F-2147
P:512 575 2288 F:281 647 9184

Texas Department of Transportation®

SH 54 @ DIABLO CREEK

BOREHOLE DETAILS
BOREHOLE BB-1

SHEET 1 OF 5

DSN	OEI	FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
		6	SEE TITLE SHEET		80
CHK	OEI	STATE	DIST.	COUNTY	
DRN	OEI	TEXAS	ELP	CULBERSON	
		CONT.	SECT.	JOB	HIGHWAY NO.
CHK	OEI	0233	05	038	SH 54

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DRILLING LOG

WinCore Version 3.1

County	Culberson	Hole	BB-2	District	El Paso
Highway	State Highway 54	Structure	Bridge and Pavement	Date	3/16/22
CSJ	0233-05-038	Station	780+55.42	Grnd. Elev.	4134.00 ft
		Offset	23.92' LT	GW Elev.	N/A

Elev. (ft)	LOG	Texas Cone Penetrometer	Strata Description	Triaxial Test: Lateral Press. (psi)	Triaxial Test: Deviator Stress (psi)	Properties: MC	Properties: LL	Properties: PI	Properties: Wet Den. (pcf)	Additional Remarks
		33 (6) 40 (6)	GRAVEL, (SAND) Fine to Coarse Grained, Gravelly, Silty, Reddish Brown to Dark Brown, Subrounded, Compact, Slightly Moist to Moist with traces of clay particles. (GM)			5.0	0	0		-200%: 17
5		42 (6) 50 (5)				4.0	19	2		-200%:18
4124. 10		33 (6) 44 (6)	CLAY, Silty, Sandy, Low Plasticity, Reddish Brown to Tannish Brown, Hard, Moist with traces of gravel. (CL-ML) (CL)			10.3	23	7		-200%: 52
4119. 15		50 (3) 50 (1)	GRAVEL, (SAND) Fine to Coarse Grained, Gravelly, Clayey, Reddish Brown to Dark Brown, Compact, Moist. (GC)			12.3	36	22		-200%: 35
4114. 20		50 (1) 50 (1)	GRAVEL, (SAND) Fine to Coarse Grained, Gravelly, Silty, Whittish Gray to Blueish Gray, Subrounded to Subangular, Very Dense, Dry. (GM)							
25		50 (1) 50 (1)				0.6	0	0		-200%: 15
30		50 (1) 50 (1)								
35		50 (1) 50 (1)				0.4	0	0		-200%: 19
40		50 (1) 50 (1)								
45		50 (1) 50 (1)								
50		50 (1) 50 (1)								
55		50 (1) 50 (1)				0.2	0	0		-200%: 21
60		50 (1) 50 (1)								

Remarks: Boring Location: See Attached Boring Location Plan: A1-1. ***Borehole elevations are preliminary and shall be updated once topographic plan is provided.***

The ground water elevation was not determined during the course of this boring.

Driller: SC   Logger: PG/JC   Organization: CQC

\\192.168.1.102\CQC Working Files\GEO\Reports\2022\22-005 - TXDOT Diablo Creek Bridge Reconstruction (OMEGA)\06-Preliminary Report Prep Info\Wincore Analysis\22-005_WB.cor Prepared By: LLA Reviewed By: JR CLG

DRILLING LOG

WinCore Version 3.1

County	Culberson	Hole	BB-2	District	El Paso
Highway	State Highway 54	Structure	Bridge and Pavement	Date	3/16/22
CSJ	0233-05-038	Station	780+55.42	Grnd. Elev.	4134.00 ft
		Offset	23.92' LT	GW Elev.	N/A

Elev. (ft)	LOG	Texas Cone Penetrometer	Strata Description	Triaxial Test: Lateral Press. (psi)	Triaxial Test: Deviator Stress (psi)	Properties: MC	Properties: LL	Properties: PI	Properties: Wet Den. (pcf)	Additional Remarks
			GRAVEL, (SAND) Fine to Coarse Grained, Gravelly, Silty, Whittish Gray to Blueish Gray, Subrounded to Subangular, Very Dense, Dry. (GM)							
65		50 (1) 50 (1)								
4067.										
70										
75										
80										
85										
90										
95										
100										
105										
110										
115										
120										

Remarks: Boring Location: See Attached Boring Location Plan: A1-1. ***Borehole elevations are preliminary and shall be updated once topographic plan is provided.***

The ground water elevation was not determined during the course of this boring.

Driller: SC   Logger: PG/JC   Organization: CQC

\\192.168.1.102\CQC Working Files\GEO\Reports\2022\22-005 - TXDOT Diablo Creek Bridge Reconstruction (OMEGA)\06-Preliminary Report Prep Info\Wincore Analysis\22-005_WB.cor Prepared By: LLA Reviewed By: JR CLG

DATE	BY	REV	REVISION

JAIME ROJAS
89944
LICENSED PROFESSIONAL ENGINEER
STATE OF TEXAS
09-01-2022

construction quality control testing and engineering
TX PE Firm Reg. No. F-10632

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Texas Department of Transportation®

SH 54 @ DIABLO CREEK

BOREHOLE DETAILS
BOREHOLE BB-2

SHEET 2 OF 5

DSN	OEI	FED.RD. DIV.NO. 6	PROJECT NO. SEE TITLE SHEET		SHEET NO. 81
CHK	OEI	STATE: TEXAS	DIST.: ELP	COUNTY: CULBERSON	
DRN	OEI	CONT.: 0233	SECT.: 05	JOB: 038	HIGHWAY NO.: SH 54
CHK	OEI				

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DRILLING LOG

WinCore
Version 3.1

County	Culberson	Hole	BB-3	District	El Paso
Highway	State Highway 54	Structure	Bridge and Pavement	Date	3/17/22
CSJ	0233-05-038	Station	779+65.96	Grnd. Elev.	4135.00 ft
		Offset	22.43' LT	GW Elev.	N/A

Elev. (ft)	LOG	Texas Cone Penetrometer	Strata Description	Triaxial Test: Lateral Press. (psi)	Triaxial Test: Deviator Stress (psi)	Properties: MC	Properties: LL	Properties: PI	Properties: Wet Den. (pcf)	Additional Remarks
		35 (6) 42 (6)	GRAVEL, (SAND) Fine to Coarse Grained, Gravelly, Silty, Reddish Brown to Light Brown, Subrounded, Compact, Slightly Moist to Moist. (GM)			3.9	0	0		-200%: 22
5		50 (1) 50 (1)				6.3	0	0		-200%: 18
		50 (1) 50 (1)								
4125. 10			GRAVEL, (SAND) Fine to Coarse Grained, Gravelly, Well Graded, Whittish Gray to Blueish Gray, Subrounded to Subangular, Very Dense, Dry with silt. (GW-GM)							
15		50 (1) 50 (1)				0.8	0	0		-200%: 9
20		50 (1) 50 (1)								
25		50 (1) 50 (1)								
		50 (1) 50 (1)				0.5	0	0		-200%: 13
4105. 30			GRAVEL, (SAND) Fine to Coarse Grained, Gravelly, Silty, Whittish Gray to Blueish Gray, Subrounded to Subangular, Very Dense, Dry. (GM)							
35		50 (1) 50 (1)								
40		50 (1) 50 (1)				0.3	0	0		-200%: 19
45		50 (1) 50 (1)								
50		50 (1) 50 (1)								
55		50 (1) 50 (1)				0.1	0	0		-200%: 33
60		50 (1) 50 (1)								
65		50 (1) 50 (1)								
4068.										
70										
75										

Remarks: Boring Location: See Attached Boring Location Plan: A1-1. ***Borehole elevations are preliminary and shall be updated once topographic plan is provided.***

The ground water elevation was not determined during the course of this boring.

Driller: SC | Logger: JC | Organization: CQC

\\192.168.1.102\CQC Working Files\GEO\Reports\2022\22-005 - TXDOT Diablo Creek Bridge Reconstruction (OMEGA)\06-Preliminary Report Prep Info\Wincore Analysis\22-005_WB.cod\JJ\JCLG

DATE	BY	REV	REVISION

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LICENSED
PROFESSIONAL ENGINEER

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Texas Department of Transportation®

SH 54 @ DIABLO CREEK

BOREHOLE DETAILS
BOREHOLE BB-3

SHEET 3 OF 5

		FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
DSN	OEI	6	SEE TITLE SHEET		82
CHK	OEI	STATE	DIST.	COUNTY	
		TEXAS	ELP	CULBERSON	
DRN	OEI	CONT.	SECT.	JOB	HIGHWAY NO.
CHK	OEI	0233	05	038	SH 54

DRILLING LOG

WinCore
Version 3.1

County	Culberson	Hole	PB-4	District	El Paso
Highway	State Highway 54	Structure	Bridge and Pavement	Date	3/16/22
CSJ	0233-05-038	Station	782+37.59	Grnd. Elev.	4135.00 ft
		Offset	26.91' LT	GW Elev.	N/A

Elev. (ft)	Texas Cone Penetrometer	Strata Description	Triaxial Test: Lateral Press. (psi)	Triaxial Test: Deviator Stress (psi)	Properties: MC	Properties: LL	Properties: PI	Properties: Wet Den. (pcf)	Additional Remarks
	30 (6) 29 (6)	GRAVEL, (SAND) Fine to Coarse Grained, Gravelly, Silty, Reddish Brown to Tannish Brown, Subrounded, Compact, Dry. (GM)			1.8	20	3		-200%: 16
	50 (1) 50 (1)								
4130. 5	50 (1) 50 (1)				2.3	22	8		-200%:16
		GRAVEL, Fine, Sandy, Clayey, Whittish Brown to Reddish Brown, Subrounded to Subangular, Very Dense, Dry to Slightly Moist with traces of clay particles. (GC)							
	50 (1) 50 (1)								
4125. 10	50 (1) 50 (1)				3.7	26	14		-200%:42
		GRAVEL, (SAND) Fine to Coarse Grained, Gravelly, Clayey, Whittish Brown to Reddish Brown, Subrounded to Subangular, Very Dense, Dry to Slightly Moist with traces of clay particles. (GC) (SC)							
4123.									
15									

Remarks: Boring Location: See Attached Boring Location Plan: A1-1. ***Borehole elevations are preliminary and shall be updated once topographic plan is provided.***

The ground water elevation was not determined during the course of this boring.

Driler: SC | Logger: JC | Organization: CQC

\\192.168.1.102\CQC Working Files\GEO\Reports\2022\22-005 - TXDOT Diablo Creek Bridge Reconstruction (OMEGA)\06-Preliminary Report Pp Ido\Wincore Analysis\22-005_WB.col\JUJRCLG

DATE	BY	REV	REVISION

STATE OF TEXAS
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Texas Department of Transportation®

SH 54 @ DIABLO CREEK

BOREHOLE DETAILS
BOREHOLE PB-4

SHEET 4 OF 5

DSN	OEI	FED.RD. DIV.NO. 6	PROJECT NO. SEE TITLE SHEET		SHEET NO. 83
CHK	OEI	STATE TEXAS	DIST. ELP	COUNTY CULBERSON	
DRN	OEI	CONT. 0233	SECT. 05	JOB 038	HIGHWAY NO. SH 54
CHK	OEI				

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DRILLING LOG

WinCore Version 3.1	County: Culberson	Hole: PB-5	District: El Paso
	Highway: State Highway 54	Structure: Bridge and Pavement	Date: 3/17/22
	CSJ: 0233-05-038	Station: 778+66.08	Grnd. Elev.: 4140.00 ft
		Offset: 16.69' RT	GW Elev.: N/A

Elev. (ft)	Texas Cone Penetrometer	Strata Description	Triaxial Test: Lateral Press. (psi)	Triaxial Test: Deviator Stress (psi)	MC	LL	PI	Wet Den. (pcf)	Additional Remarks
	30 (6) 48 (6)	GRAVEL, (SAND) Fine to Coarse Grained, Gravelly, Silty, Reddish Brown to Dark Brown, Subrounded, Compact, Dry. (GM)							
	39 (6) 46 (6)								
	41 (6) 31 (6)								
4135. 5		GRAVEL, (SAND) Fine to Coarse Grained, Gravelly, Clayey, Whittish Brown to Light Brown, Very Dense, Dry to Slightly Moist. (GC)							
	50 (1) 50 (1)								
10	50 (1) 50 (1)								
4128.									
15									

Remarks: Boring Location: See Attached Boring Location Plan: A1-1. ***Borehole elevations are preliminary and shall be updated once topographic plan is provided.***

The ground water elevation was not determined during the course of this boring.

Driller: SC Logger: PG/JC Organization: CQC

\\192.168.1.102\CQC Working Files\GEO\Reports\2022\22-005 - TXDOT Diablo Creek Bridge Reconstruction (OMEGA)\06-Preliminary Report Prep Info\Wincore Analysis\22-005_WB.cod.UpdCLG

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DATE	BY	REV	REVISION

STATE OF TEXAS
JAIME ROJAS
89944
LICENSED PROFESSIONAL ENGINEER

09-01-2022

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Texas Department of Transportation®

SH 54 @ DIABLO CREEK

BOREHOLE DETAILS
BOREHOLE PB-5

SHEET 5 OF 5

DSN	OEI	FED.RD. DIV.NO. 6	PROJECT NO. SEE TITLE SHEET			SHEET NO. 84
CHK	OEI	STATE: TEXAS	DIST.: ELP	COUNTY: CULBERSON		
DRN	OEI	CONT.: 0233	SECT.: 05	JOB: 038	HIGHWAY NO.: SH 54	
CHK	OEI					

HORIZONTAL ALIGNMENT DATA FOR SHEET PILES

Beginning chain SPWALL_1 description
==========

Point SPWALL0101 N 10,442,970.5243 E 884,411.5641 Sta 776+50.00

Course from SPWALL0101 to SPWALL0102 N 19° 41′ 37.89" W Dist 294.6625

Point SPWALL0102 N 10,443,247.9510 E 884,312.2645 Sta 779+44.66

==========
Ending chain SPWALL_1 description

Beginning chain SPWALL_2 description
==========

Point SPWALL0201 N 10,443,247.9510 E 884,312.2645 Sta 10+00.00

Course from SPWALL0201 to SPWALL0202 N 55° 18′ 31.61" E Dist 47.6221

Point SPWALL0202 N 10,443,275.0553 E 884,351.4209 Sta 10+47.62

==========
Ending chain SPWALL_2 description

Beginning chain SPWALL_3 description
==========

Point SPWALL0301 N 10,442,986.0260 E 884,454.8734 Sta 776+50.00

Course from SPWALL0301 to SPWALL0302 N 19° 41′ 37.89" W Dist 306.9859

Point SPWALL0302 N 10,443,275.0553 E 884,351.4209 Sta 779+56.99

==========
Ending chain SPWALL_3 description

Beginning chain SPWALL_4 description
==========

Point SPWALL0401 N 10,443,456.9654 E 884,237.4518 Sta 781+66.66

Course from SPWALL0401 to SPWALL0402 N 19° 41′ 37.89" W Dist 133.3375

Point SPWALL0402 N 10,443,582.5036 E 884,192.5178 Sta 783+00.00

==========
Ending chain SPWALL_4 description

Beginning chain SPWALL_5 description
==========

Point SPWALL0501 N 10,443,456.9654 E 884,237.4518 Sta 20+00.00

Course from SPWALL0501 to SPWALL0502 N 55° 18′ 31.56" E Dist 47.6221

Point SPWALL0502 N 10,443,484.0698 E 884,276.6082 Sta 20+47.62

==========
Ending chain SPWALL_5 description

Beginning chain SPWALL_6 description
==========

Point SPWALL0601 N 10,443,484.0698 E 884,276.6082 Sta 781+78.99

Course from SPWALL0601 to SPWALL0602 N 19° 41′ 37.89" W Dist 121.0141

Point SPWALL0602 N 10,443,598.0053 E 884,235.8271 Sta 783+00.00

==========
Ending chain SPWALL_6 description

DATE	BY	REV	REVISION

STATE OF TEXAS
RUDY L. GOMEZ
58664
REGISTERED PROFESSIONAL ENGINEER
9/28/2022

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OMEGAENGINEERS.COM
TX PE Firm Reg. No. F-2147
PH512 575 2288 FI281 647 9184

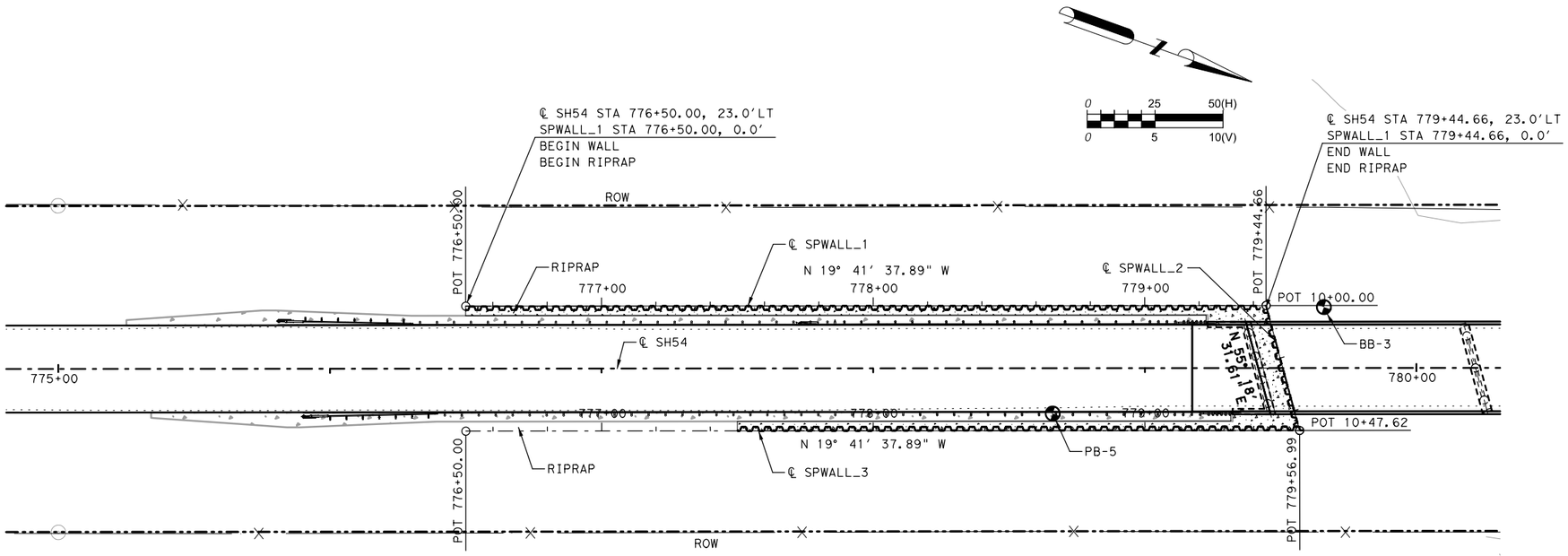
Texas Department of Transportation®

SH 54 @ DIABLO CREEK

SHEET PILE
HORIZONTAL ALIGNMENT DATA

SHEET 1 OF 1

		FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
DSN	OEI	6	SEE TITLE SHEET		85
CHK	OEI	STATE	DIST.	COUNTY	
DRN	OEI	TEXAS	ELP	CULBERSON	
CHK	OEI	CONT.	SECT.	JOB	HIGHWAY NO.
		0233	05	038	SH 54



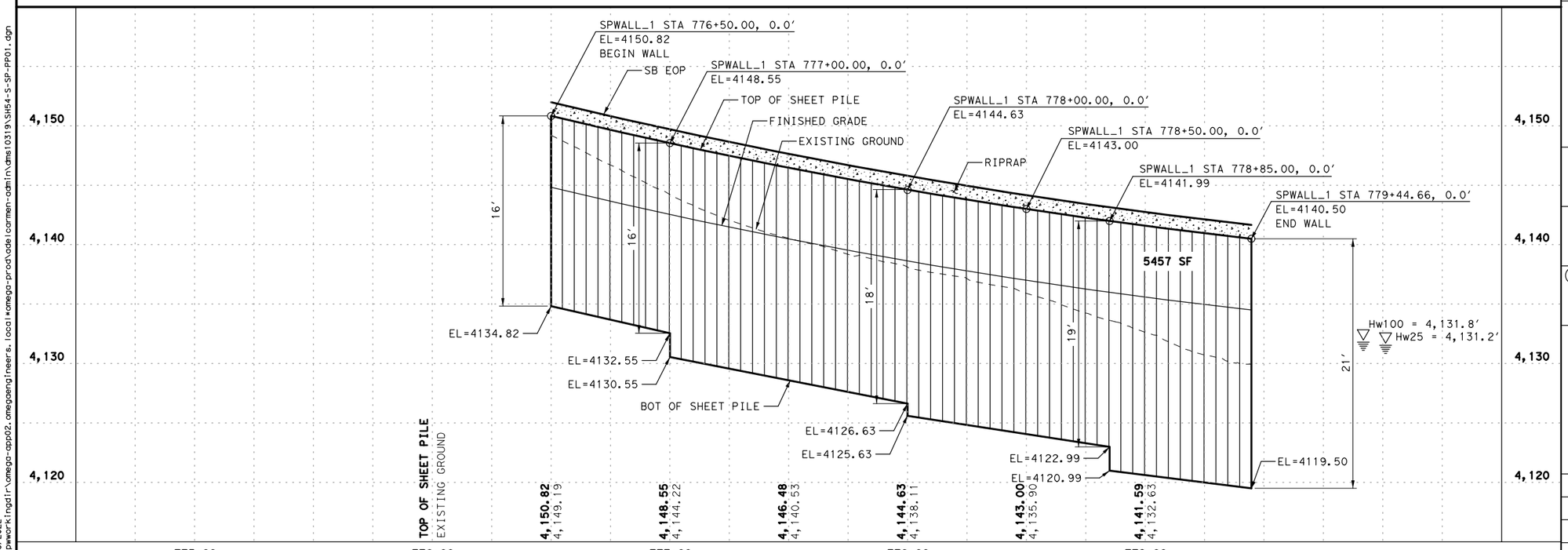
LEGEND

- SHEET PILE LINE
- CONC RIPRAP
- METAL BEAM GUARD FENCE
- BORING HOLE

NOTES:

1. SEE CONTROL DATA SHEETS FOR INFORMATION.
2. SEE HORIZONTAL ALIGNMENT DATA SHEETS FOR INFORMATION.
3. REFER TO BRIDGE LAYOUT SHEETS FOR INFORMATION.
4. SEE REMOVAL LAYOUT SHEETS FOR INFORMATION.
5. SEE CROSS-SECTIONS FOR SIDE SLOPES AND DETAILS.
6. REFER TO THE SHEET PILE MISC DETAILS FOR ADDITIONAL DETAILS.
7. CONTRACTOR SHALL FURNISH STEEL THAT MEETS ASTM A690 (1989b) FOR SHEET PILING.

ESTIMATED QUANTITIES				
ITEM	CODE	DESCRIPTION	UNIT	QTY
132	6056	EMBANKMENT (FINAL)(ORD COMP)(TY C2)(DS)	CY	16
407	6006	SHEET PILING (PZ-40)	SF	5457
432	6010	RIPRAP (CONC)(CLB)(5 IN)	CY	24



DATE	BY	REV	REVISION

STATE OF TEXAS
RUDY L. GOMEZ
58664
REGISTERED PROFESSIONAL ENGINEER
9/28/2022

OMEGA ENGINEERS, INC.
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SH 54 @ DIABLO CREEK

SHEET PILE PLAN & PROFILE SPWALL_1

SHEET 1 OF 5

		FED.RD. DIV.NO.	PROJECT NO.	SHEET NO.
DSN	OEI	6	SEE TITLE SHEET	86
CHK	OEI	STATE	DIST.	COUNTY
DRN	OEI	TEXAS	ELP	CULBERSON
CHK	OEI	CONT.	SECT.	JOB / HIGHWAY NO.
		0233	05	038 / SH 54

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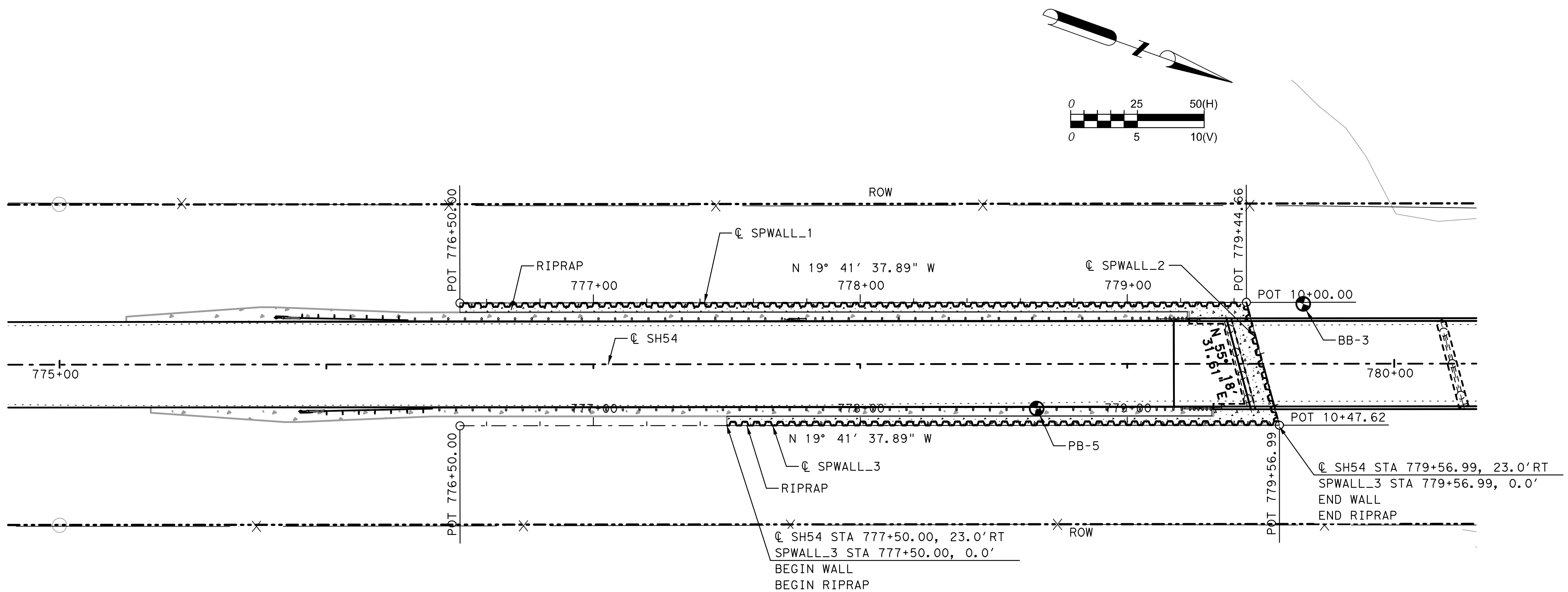


LEGEND

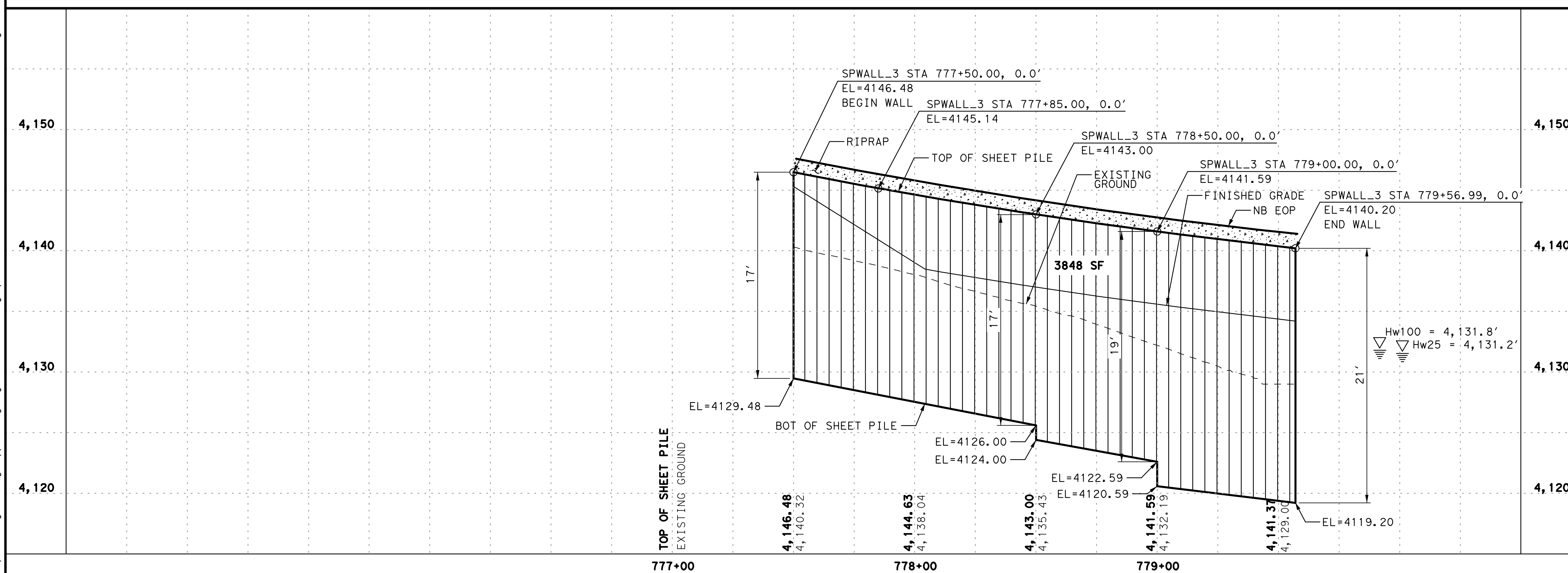
- SHEET PILE LINE
- CONC RIPRAP
- METAL BEAM GUARD FENCE
- BORING HOLE

NOTES:

1. SEE CONTROL DATA SHEETS FOR INFORMATION.
2. SEE HORIZONTAL ALIGNMENT DATA SHEETS FOR INFORMATION.
3. REFER TO BRIDGE LAYOUT SHEETS FOR INFORMATION.
4. SEE REMOVAL LAYOUT SHEETS FOR INFORMATION.
5. SEE CROSS-SECTIONS FOR SIDE SLOPES AND DETAILS.
6. REFER TO THE SHEET PILE MISC DETAILS FOR ADDITIONAL DETAILS.
7. CONTRACTOR SHALL FURNISH STEEL THAT MEETS ASTM A690 (1989b) FOR SHEET PILING.

ESTIMATED QUANTITIES

ITEM	CODE	DESCRIPTION	UNIT	QTY
132	6056	EMBANKMENT (FINAL)(ORD COMP)(TY C2)(DS)	CY	22
407	6006	SHEET PILING (PZ-40)	SF	3848
432	6010	RIPRAP (CONC)(CLB)(5 IN)	CY	17



DATE	BY	REV	REVISION

STATE OF TEXAS — RUDY L. GOMEZ — 58664 — REGISTERED PROFESSIONAL ENGINEER — 9/28/2022

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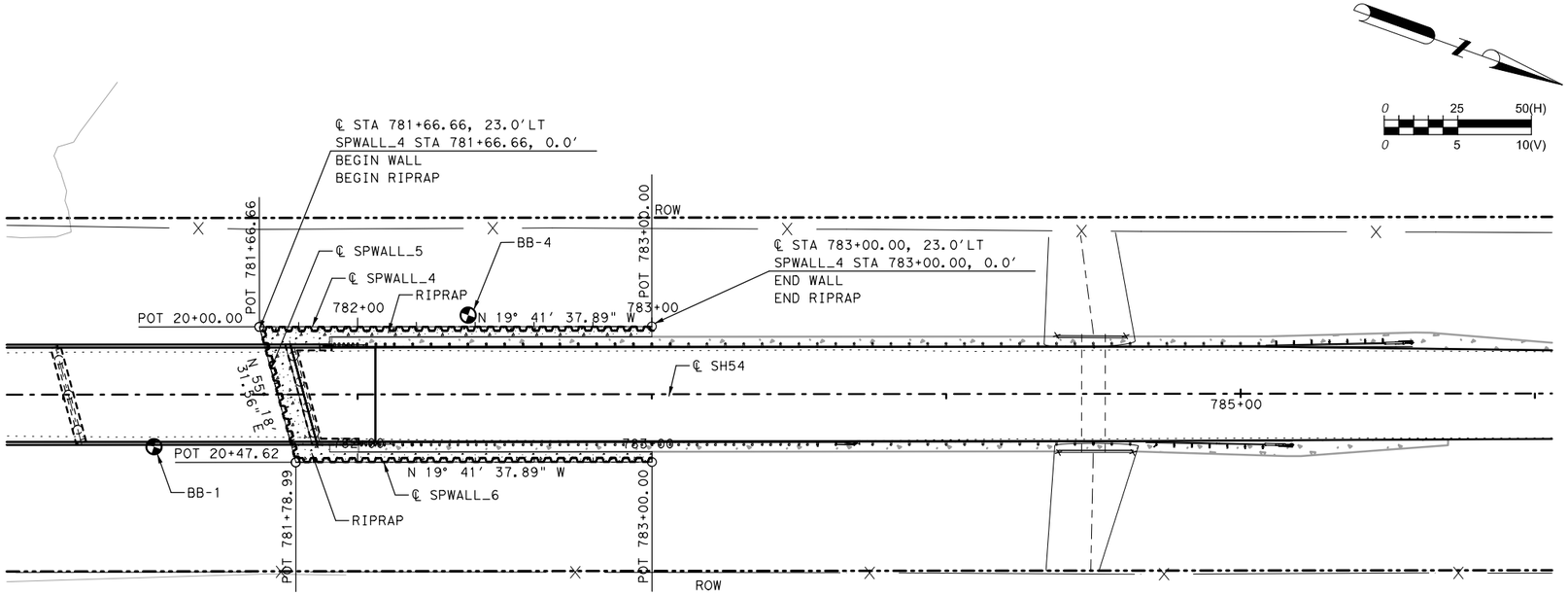
Texas Department of Transportation®

SH 54 @ DIABLO CREEK

SHEET PILE PLAN & PROFILE SPWALL_3

SHEET 2 OF 5

DSN	OEI	FED.RD. DIV.NO. 6	PROJECT NO. SEE TITLE SHEET		SHEET NO. 87
CHK	OEI	STATE TEXAS	DIST. ELP	COUNTY CULBERSON	
DRN	OEI	CONT. 0233	SECT. 05	JOB 038	HIGHWAY NO. SH 54
CHK	OEI				



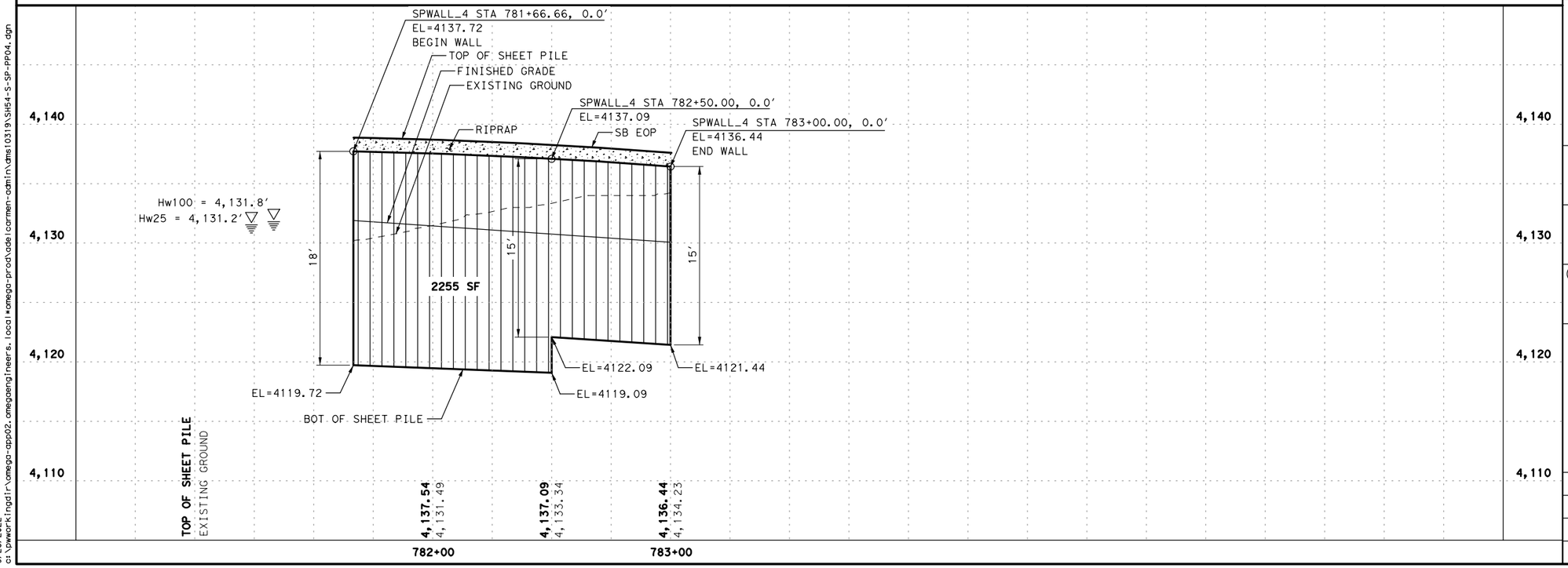
LEGEND

- SHEET PILE LINE
- CONC RIPRAP
- METAL BEAM GUARD FENCE
- BORING HOLE

ESTIMATED QUANTITIES				
ITEM	CODE	DESCRIPTION	UNIT	QTY
407	6006	SHEET PILING (PZ-40)	SF	2255
432	6010	RIPRAP (CONC)(CLB)(5 IN)	CY	10

NOTES:

1. SEE CONTROL DATA SHEETS FOR INFORMATION.
2. SEE HORIZONTAL ALIGNMENT DATA SHEETS FOR INFORMATION.
3. REFER TO BRIDGE LAYOUT SHEETS FOR INFORMATION.
4. SEE REMOVAL LAYOUT SHEETS FOR INFORMATION.
5. SEE CROSS-SECTIONS FOR SIDE SLOPES AND DETAILS.
6. REFER TO THE SHEET PILE MISC DETAILS FOR ADDITIONAL DETAILS.
7. CONTRACTOR SHALL FURNISH STEEL THAT MEETS ASTM A690 (1989b) FOR SHEET PILING.



DATE	BY	REV	REVISION

STATE OF TEXAS
RUDY L. GOMEZ
58664
REGISTERED PROFESSIONAL ENGINEER
9/28/2022

OMEGA ENGINEERS, INC.
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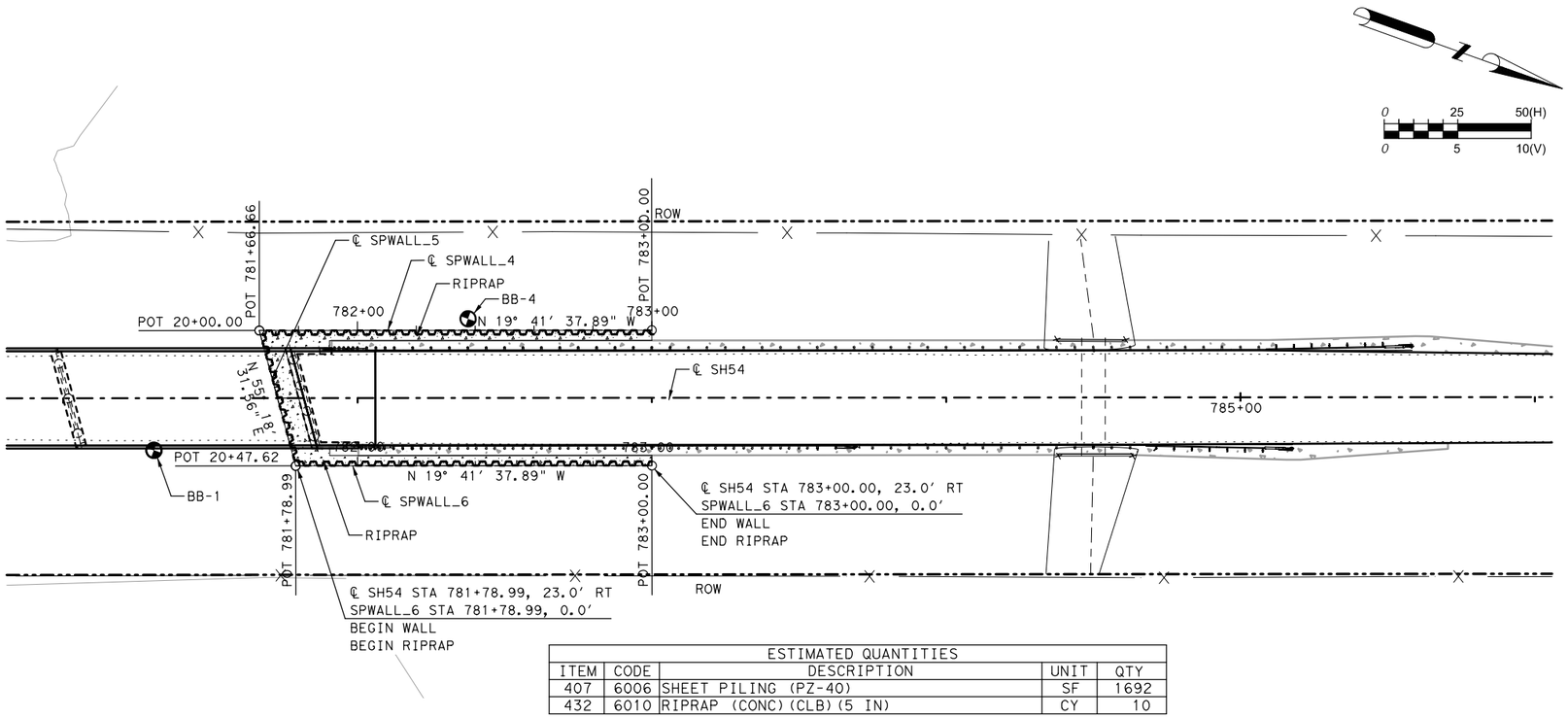
Texas Department of Transportation®

SH 54 @ DIABLO CREEK

SHEET PILE PLAN & PROFILE SPWALL_4

SHEET 3 OF 5

		FED.RD. DIV.NO.	PROJECT NO.	SHEET NO.
DSN	OEI	6	SEE TITLE SHEET	88
CHK	OEI	STATE	DIST.	COUNTY
DRN	OEI	TEXAS	ELP	CULBERSON
CHK	OEI	CONT.	SECT.	JOB / HIGHWAY NO.
		0233	05	038 / SH 54



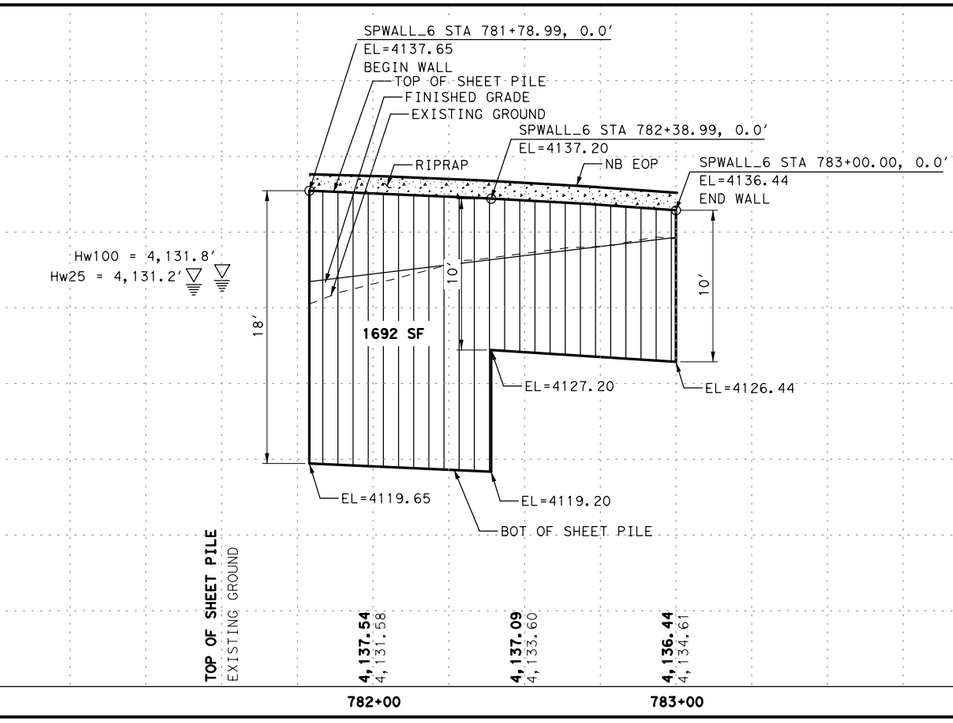
ESTIMATED QUANTITIES				
ITEM	CODE	DESCRIPTION	UNIT	QTY
407	6006	SHEET PILING (PZ-40)	SF	1692
432	6010	RIPRAP (CONC)(CLB)(5 IN)	CY	10

LEGEND

- SHEET PILE LINE
- CONC RIPRAP
- METAL BEAM GUARD FENCE
- BORING HOLE

NOTES:

1. SEE CONTROL DATA SHEETS FOR INFORMATION.
2. SEE HORIZONTAL ALIGNMENT DATA SHEETS FOR INFORMATION.
3. REFER TO BRIDGE LAYOUT SHEETS FOR INFORMATION.
4. SEE REMOVAL LAYOUT SHEETS FOR INFORMATION.
5. SEE CROSS-SECTIONS FOR SIDE SLOPES AND DETAILS.
6. REFER TO THE SHEET PILE MISC DETAILS FOR ADDITIONAL DETAILS.
7. CONTRACTOR SHALL FURNISH STEEL THAT MEETS ASTM A690 (1989b) FOR SHEET PILING.



DATE	BY	REV	REVISION

STATE OF TEXAS
RUDY L. GOMEZ
58664
REGISTERED PROFESSIONAL ENGINEER
9/28/2022

OMEGA ENGINEERS, INC.
8200 N MOPAC EXPRESSWAY, STE #280
AUSTIN, TEXAS 78759
OMEGAENGINEERS.COM
TX PE Firm Reg. No. F-2147
P:512 575 2288 F:281 647 9184

SH 54 @ DIABLO CREEK

SHEET PILE PLAN & PROFILE SPWALL_6

SHEET 4 OF 5

DSN	OEI	FED.RD. DIV.NO.	PROJECT NO.	SHEET NO.
CHK	OEI	6	SEE TITLE SHEET	89
DRN	OEI	STATE	DIST.	COUNTY
CHK	OEI	TEXAS	ELP	CULBERSON
		CONT.	SECT.	JOB / HIGHWAY NO.
		0233	05	038 / SH 54

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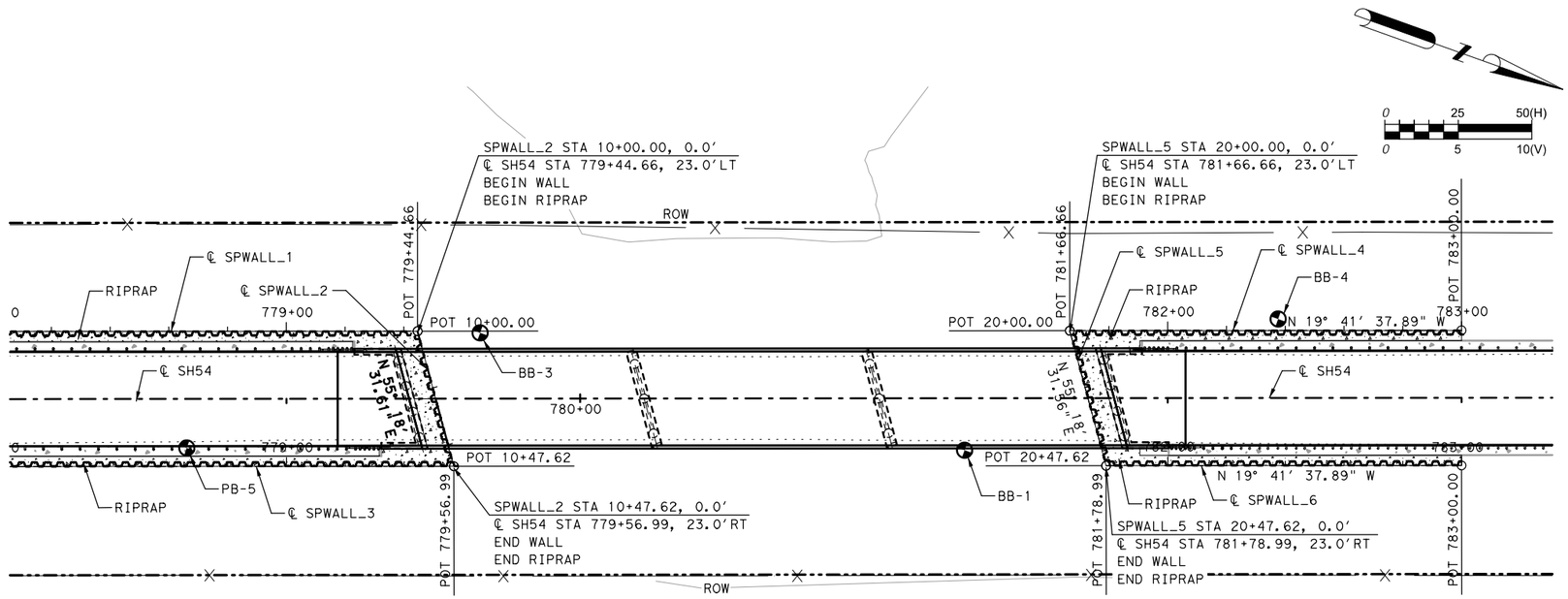


LEGEND

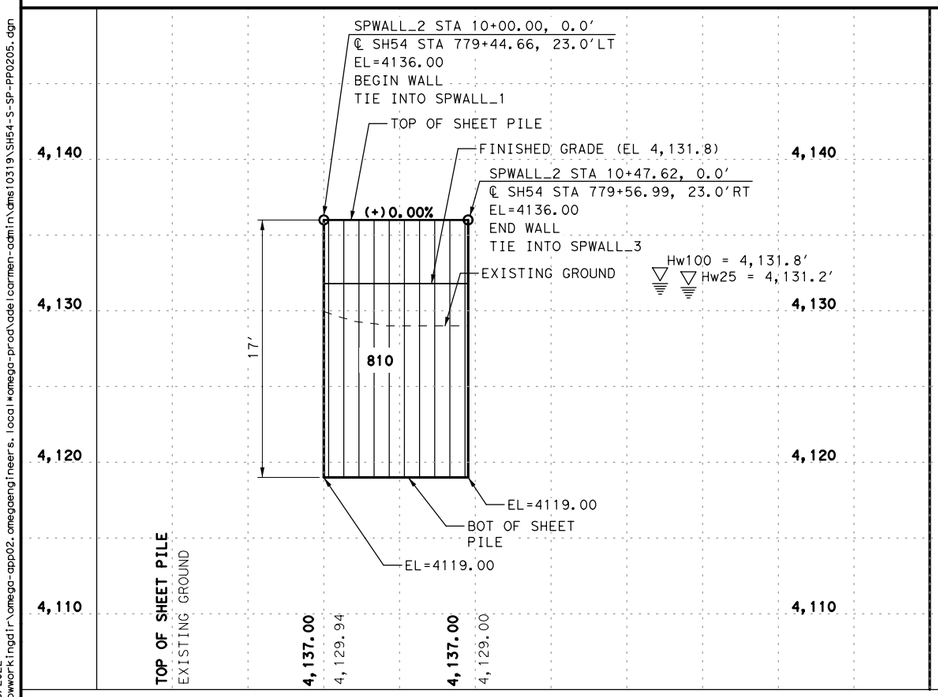
- SHEET PILE LINE
- CONC RIPRAP
- METAL BEAM GUARD FENCE
- BORING HOLE

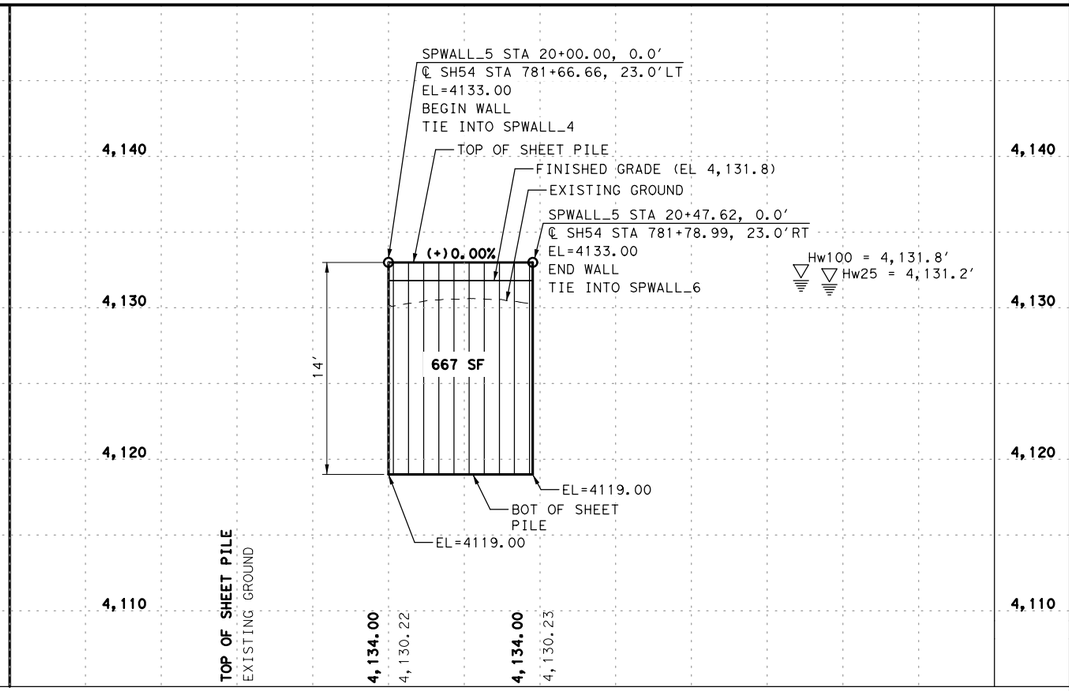
NOTES:

1. SEE CONTROL DATA SHEETS FOR INFORMATION.
2. SEE HORIZONTAL ALIGNMENT DATA SHEETS FOR INFORMATION.
3. REFER TO BRIDGE LAYOUT SHEETS FOR INFORMATION.
4. SEE REMOVAL LAYOUT SHEETS FOR INFORMATION.
5. SEE CROSS-SECTIONS FOR SIDE SLOPES AND DETAILS.
6. REFER TO THE SHEET PILE MISC DETAILS FOR ADDITIONAL DETAILS.
7. CONTRACTOR SHALL FURNISH STEEL THAT MEETS ASTM A690 (1989b) FOR SHEET PILING.

ESTIMATED QUANTITIES				
ITEM	CODE	DESCRIPTION	UNIT	QTY
132	6056	EMBANKMENT (FINAL)(ORD COMP)(TY C2)(DS)	CY	40
407	6006	SHEET PILING (PZ-40)	SF	810
432	6010	RIPRAP (CONC)(CLB)(5 IN)	CY	8

ESTIMATED QUANTITIES				
ITEM	CODE	DESCRIPTION	UNIT	QTY
407	6006	SHEET PILING (PZ-40)	SF	667
432	6010	RIPRAP (CONC)(CLB)(5 IN)	CY	8





DATE	BY	REV	REVISION

STATE OF TEXAS
RUDY L. GOMEZ
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9/28/2022

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SH 54 @ DIABLO CREEK

SHEET PILE PLAN & PROFILE SPWALL_2 & SPWALL_5

SHEET 5 OF 5

		FED.RD. DIV.NO.	PROJECT NO.	SHEET NO.
DSN	OEI	6	SEE TITLE SHEET	90
CHK	OEI	STATE	DIST.	COUNTY
DRN	OEI	TEXAS	ELP	CULBERSON
CHK	OEI	CONT.	SECT.	JOB / HIGHWAY NO.
		0233	05	038 / SH 54

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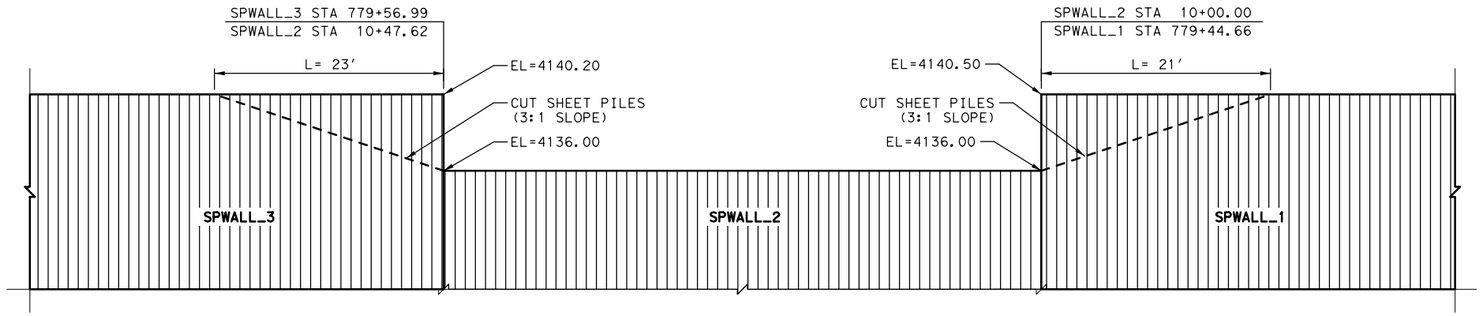
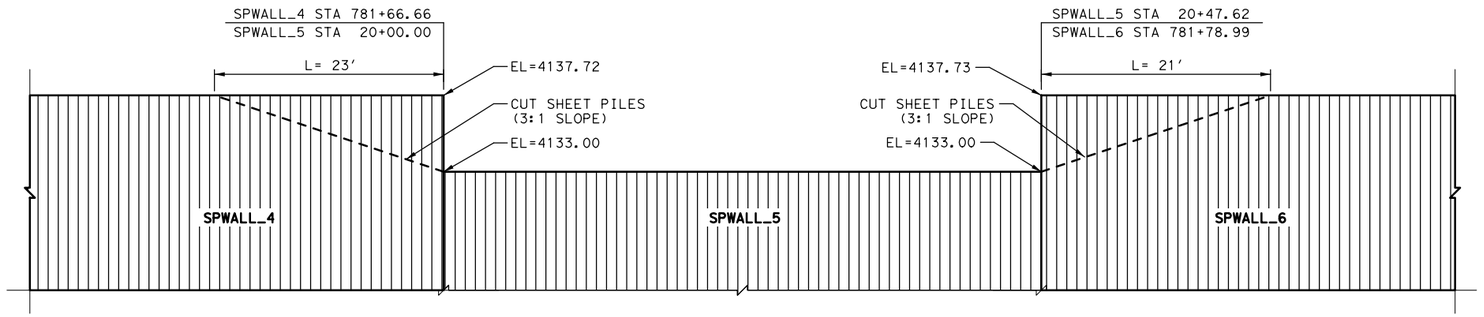
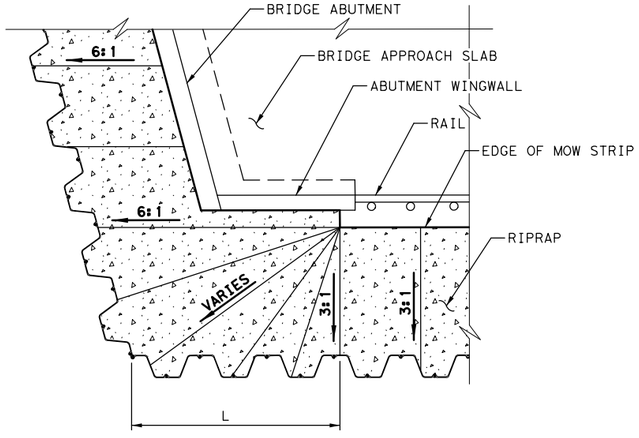


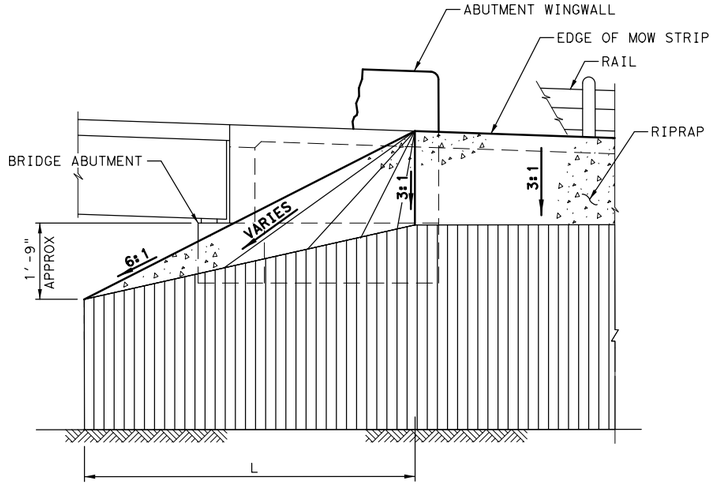
STEEL PILE CUTOFF ELEVATION
LOOKING SOUTH
(NTS)



STEEL PILE CUTOFF ELEVATION
LOOKING NORTH
(NTS)



PLAN
RIPRAP AT BRIDGE ABUTMENTS
(NTS)



ELEVATION
RIPRAP AT BRIDGE ABUTMENTS
(NTS)

NOTES

1. **CUT SHEET PILES PRIOR TO PLACEMENT OF CONCRETE RIPRAP**

DATE	BY	REV	REVISION

STATE OF TEXAS
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SH 54 @ DIABLO CREEK

SHEET PILE MISC DETAILS

SHEET 1 OF 3

DSN	OEI	FED.RD. DIV.NO.	PROJECT NO.	SHEET NO.
CHK	OEI	6	SEE TITLE SHEET	91
DRN	OEI	STATE	DIST.	COUNTY
CHK	OEI	TEXAS	ELP	CULBERSON
		CONT.	SECT.	JOB / HIGHWAY NO.
		0233	05	038 / SH 54

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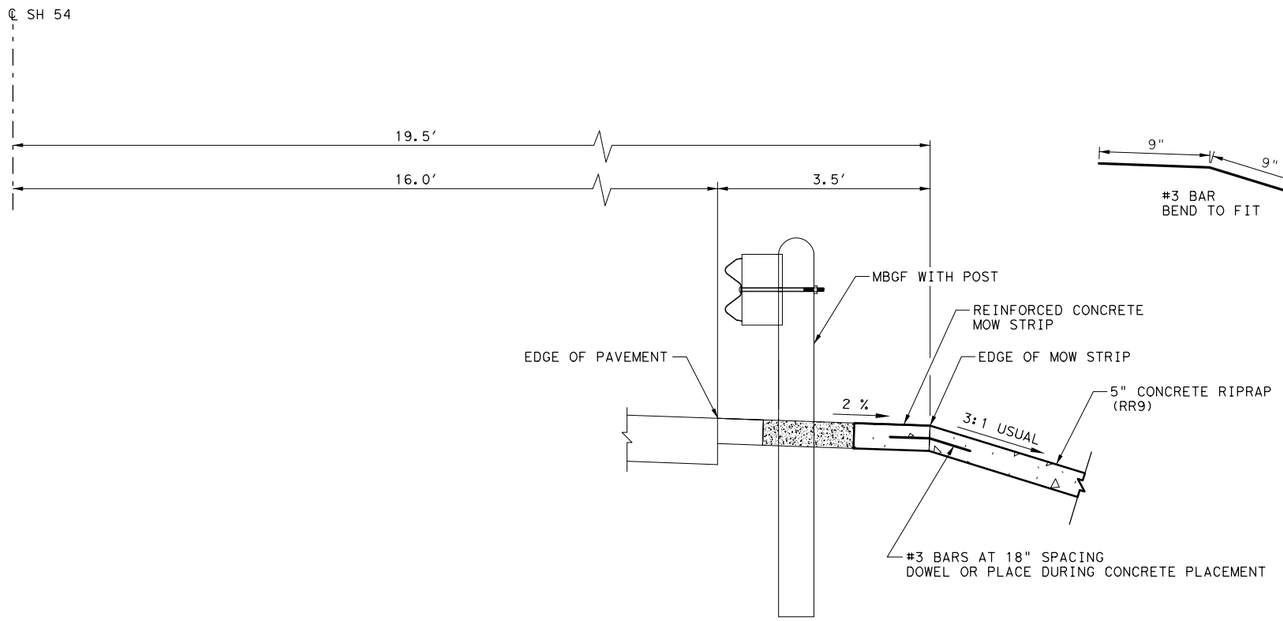
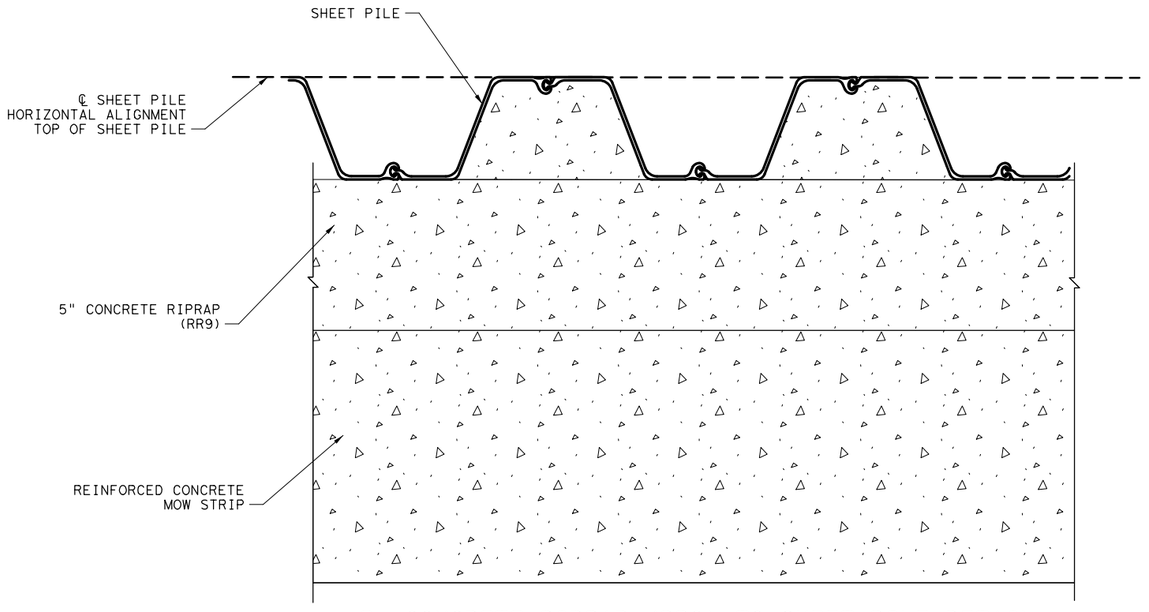


5" CONCRETE RIPRAP (RR9) TO MOW STRIP DETAIL
(NTS)



5" CONCRETE RIPRAP (RR9) TO SHEET PILE DETAIL
PLAN VIEW
(NTS)

DATE	BY	REV	REVISION

STATE OF TEXAS
RUDY L. GOMEZ
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9/28/2022

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OMEGAENGINEERS.COM
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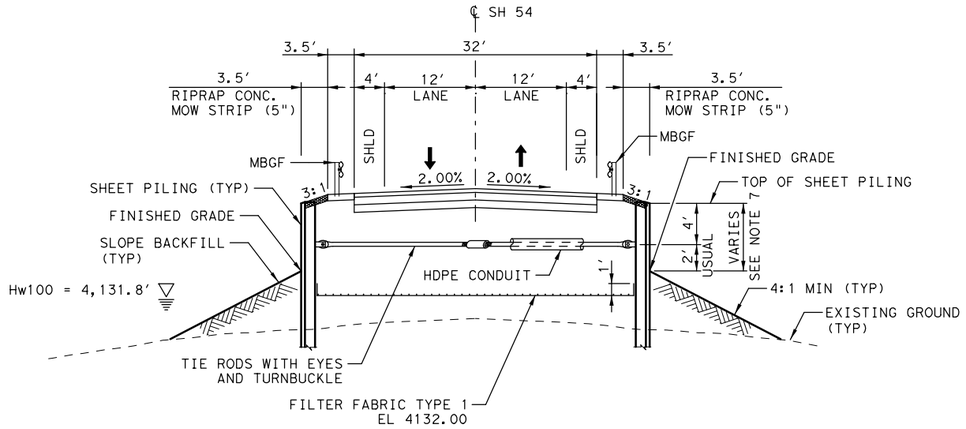
SH 54 @ DIABLO CREEK

SHEET PILE MISC DETAILS

SHEET 2 OF 3

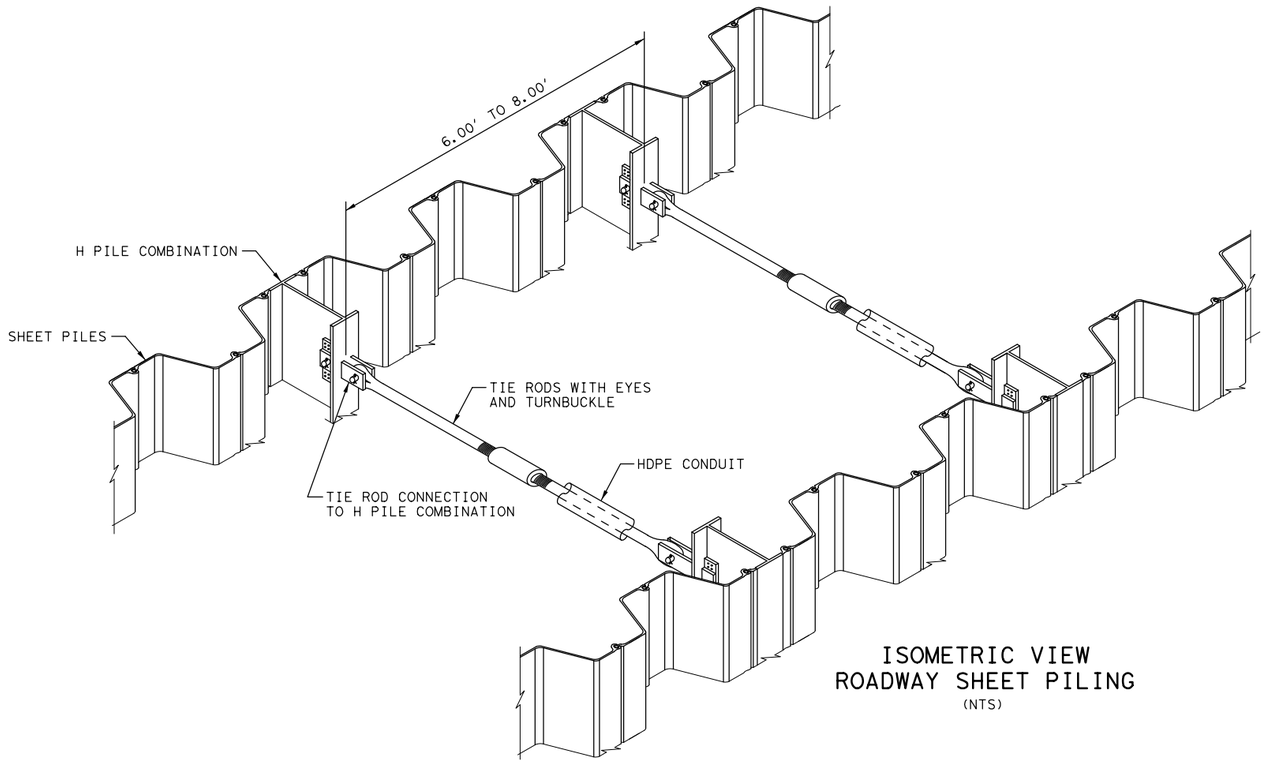
		FED.RD. DIV.NO.	PROJECT NO.	SHEET NO.
DSN	OEI	6	SEE TITLE SHEET	92
CHK	OEI	STATE	DIST.	COUNTY
DRN	OEI	TEXAS	ELP	CULBERSON
CHK	OEI	CONT.	SECT.	JOB / HIGHWAY NO.
		0233	05	038 / SH 54



TYPICAL SECTION ROADWAY SHEET PILING

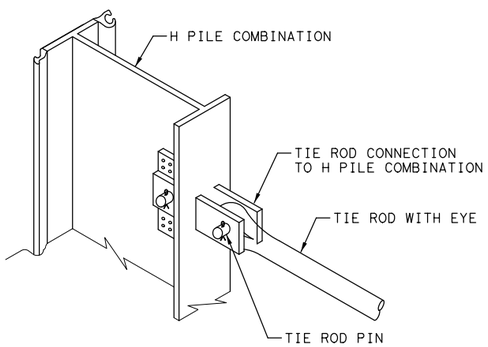
(NTS)

STA 776+50.00 - 779+44.66 LT
STA 777+50.00 - 779+56.99 RT
STA 781+66.66 - 783+00.00 LT
STA 781+78.99 - 783+00.00 RT



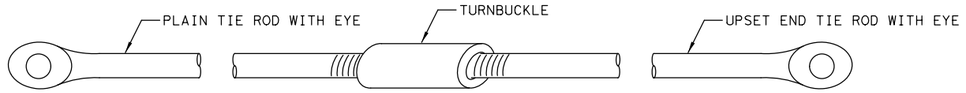
ISOMETRIC VIEW ROADWAY SHEET PILING

(NTS)



H PILE CONNECTION

(NTS)



TIE ROD AND TURNBUCKLE

(NTS)

NOTES:

1. TIE RODS AND TURNBUCKLES TO BE ENCASED IN HDPE CONDUIT.
2. PROVIDE TYPE 1 FILTER FABRIC IN ACCORDANCE WITH DMS-6200 AND TO BE INCIDENTAL TO ITEM 407 "SHEET PILING".
3. THE TIE ROD AND TURNBUCKLE, HDPE CONDUIT, H PILE CONNECTION AND ALL OTHER ITEMS REQUIRED FOR THE ATTACHMENT TO SHEET PILE ARE SUBSIDIARY TO ITEM 407 "SHEET PILING".
4. THE CONTRACTOR SHALL SUBMIT ALL SHOP DRAWINGS AND ANALYSIS OF THE COMPLETE SHEET PILE SYSTEM INCLUDING BUT NOT LIMITED TO SHEET PILE, H PILE CONNECTION, TIE RODS AND ALL OTHER ITEMS ASSOCIATED WITH THE COMPLETE INSTALLATION OF THE SHEET PILE. THIS IS SUBSIDIARY TO ITEM 407 "SHEET PILING".
5. TIE ROD TO BE 2 1/16" DIAMETER STEEL GRADE A572-50 OR EQUIVALENT.
6. H-PILES TO BE W30X191 STEEL GRADE A572-50 OR EQUIVALENT.
7. FINISHED GRADE LINE IS SHOWN ON SHEET PILE PLAN AND PROFILE DRAWINGS.

DATE	BY	REV	REVISION

STATE OF TEXAS
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9/28/2022

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Texas Department of Transportation®

SH 54 @ DIABLO CREEK

SHEET PILE MISC DETAILS

SHEET 3 OF 3

		FED.RD. DIV.NO.	PROJECT NO.	SHEET NO.
DSN	OEI	6	SEE TITLE SHEET	93
CHK	OEI	STATE	DIST.	COUNTY
DRN	OEI	TEXAS	ELP	CULBERSON
CHK	OEI	CONT.	SECT.	JOB / HIGHWAY NO.
		0233	05	038 / SH 54

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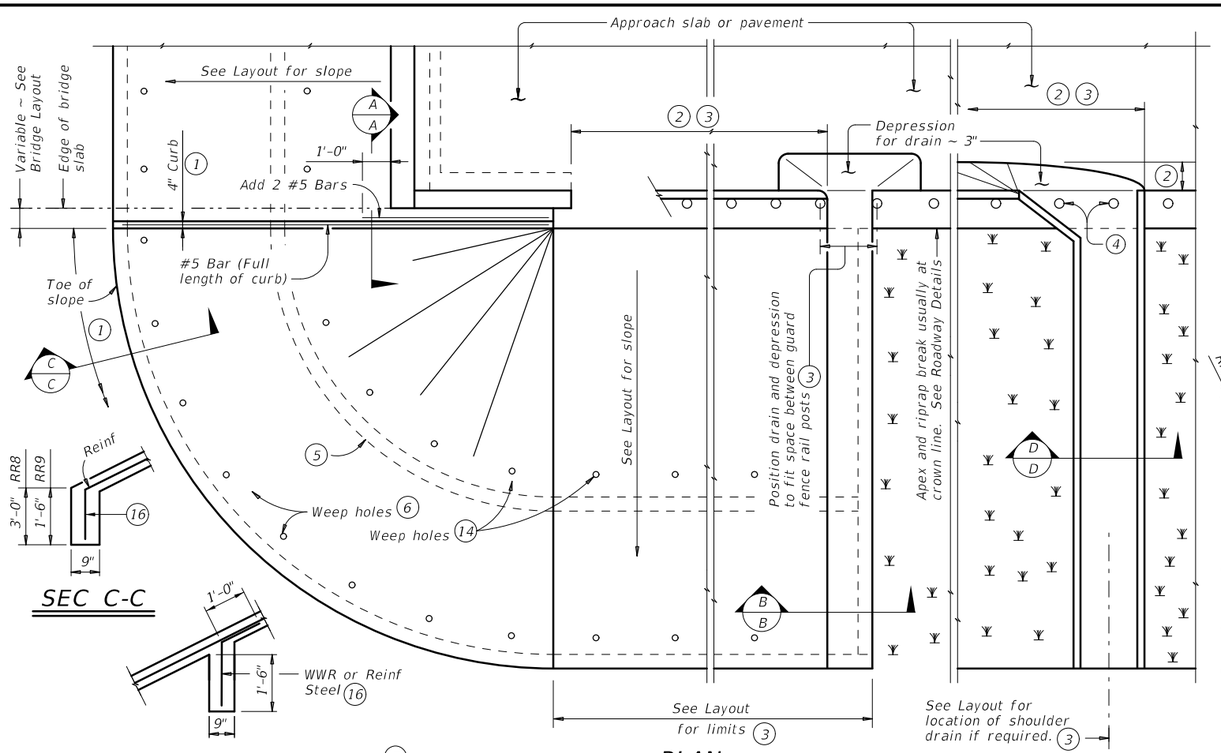
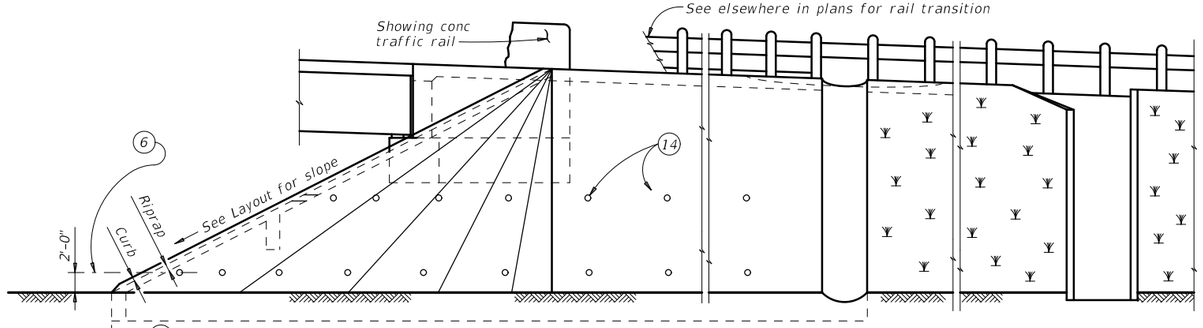


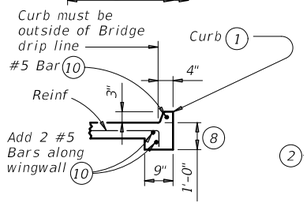
PLAN

SEC C-C

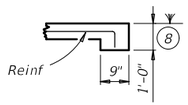
INTERMEDIATE TOEWALL



ELEVATION

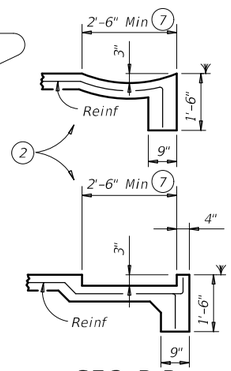


SEC A-A



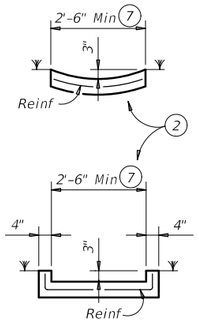
SEC B-B

(No drain)



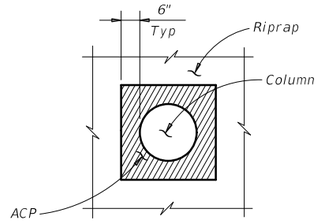
SEC B-B

(Shoulder drain integral with riprap)



SEC D-D

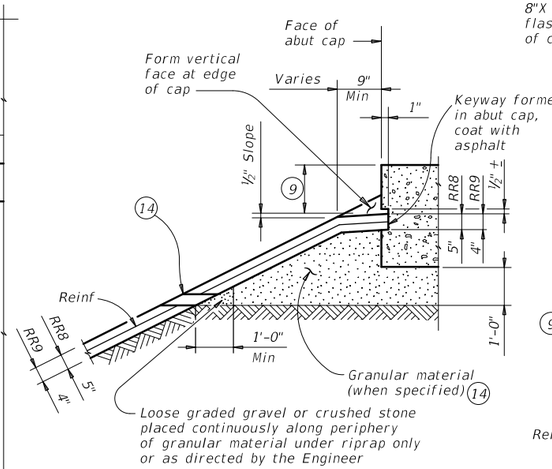
(Shoulder drain)



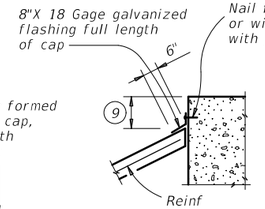
Riprap blockout to be filled with ACP. (Subsidiary to riprap)

RIPRAP DETAIL AT COLUMNS

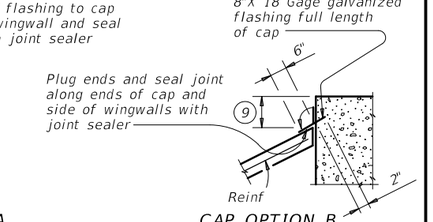
(As directed by the Engineer)



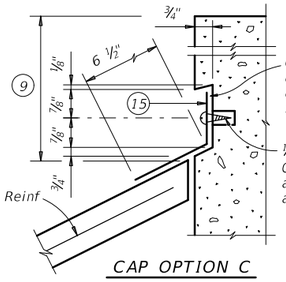
SHOWING KEYWAY OPTION



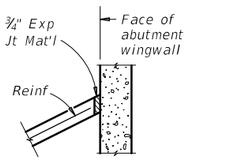
CAP OPTION A



CAP OPTION B

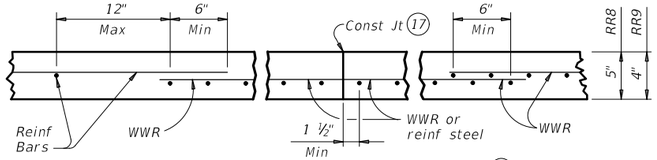


CAP OPTION C



SECT THRU RIPRAP AT WINGWALL (12)

SECTIONS THRU RIPRAP AT CAP (11)



REINFORCEMENT DETAILS (13)

See General Notes for optional synthetic fiber reinforcement.

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

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.

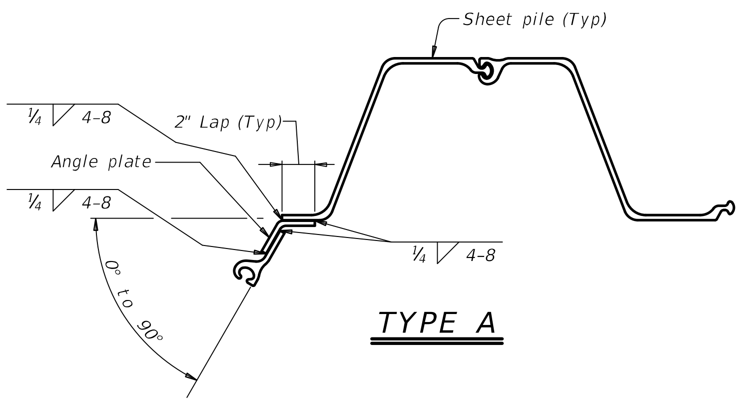
Texas Department of Transportation

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	0233	05	038	SH 54
	DIST	COUNTY		SHEET NO.
	ELP	CULBERSON		94



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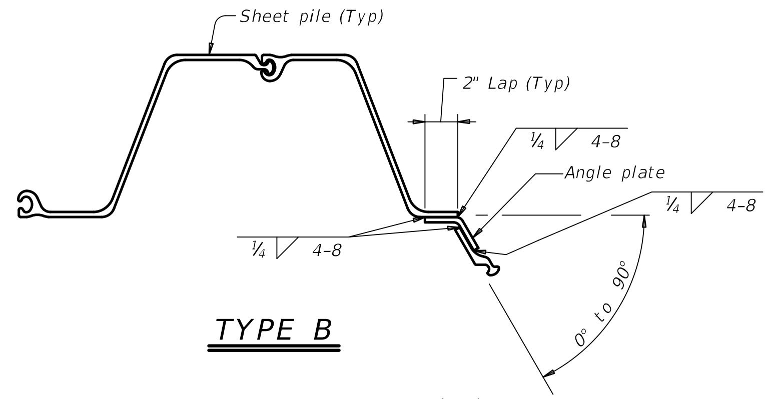
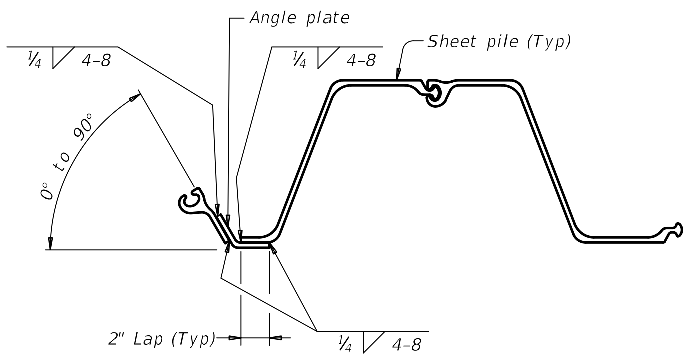
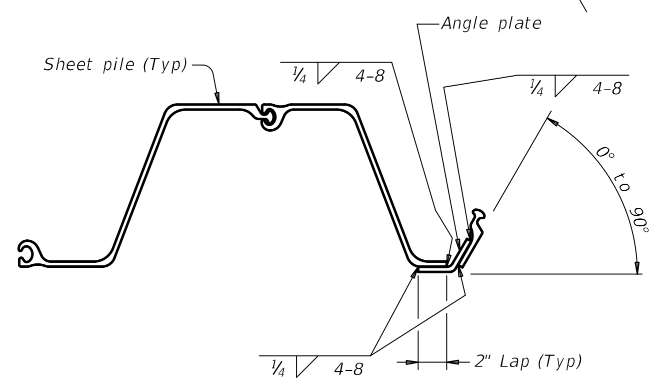


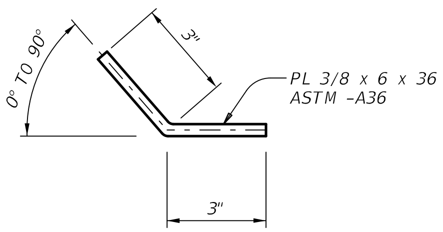
TYPE B



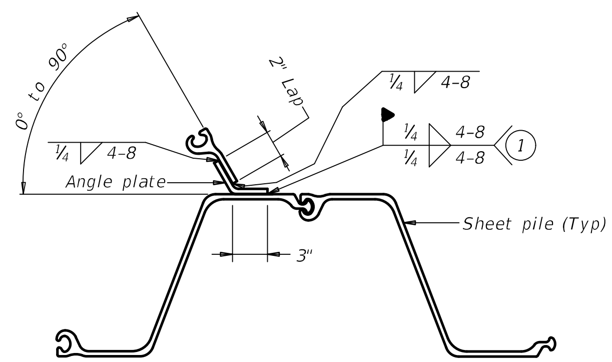
TYPE C



TYPE D



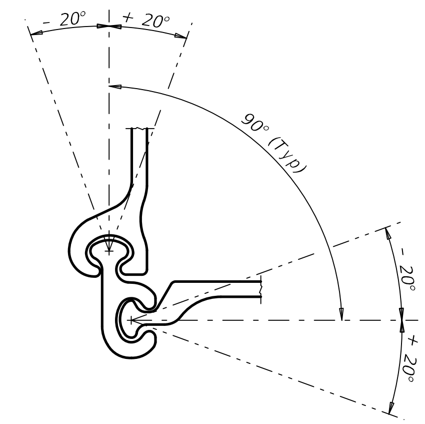
ANGLE PLATE DETAIL



TYPE E

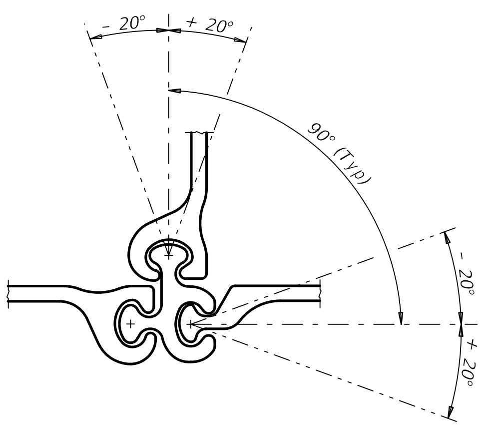
OPTION 1: PLATE WITH WELD

1 Remove paint at weld locations. Clean welded seam in accordance with Section 446.4.7.3.2.2. Stripe coat seam with intermediate coat and appearance coat in accordance with Item 446, "Field Cleaning and Painting Steel."



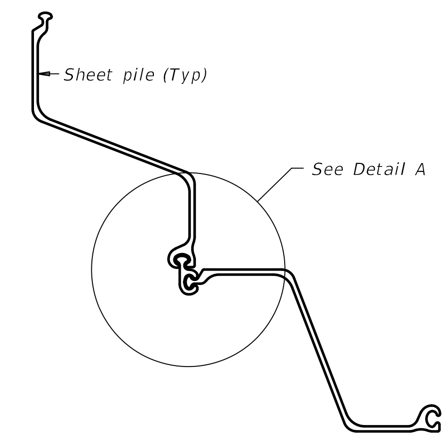
DETAIL A

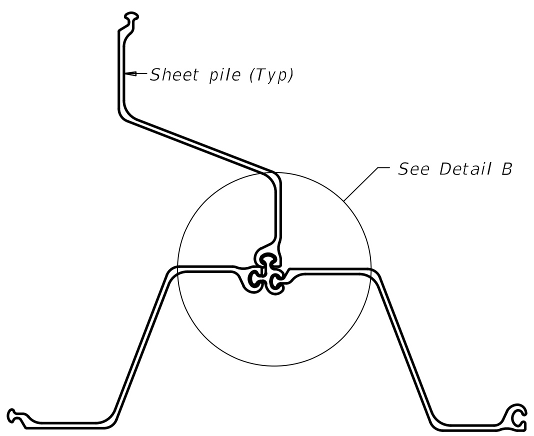
(Shown PZ 90® by PilePro®)



DETAIL B

(Shown PZ Tee® by PilePro®)





OPTION 2: PREFABRICATED

GENERAL NOTES:
The Contractor may use a prefabricated connector as shown above. The connectors shown are PZ 90® and PZ Tee®, which are produced by PilePro® (www.pilepro.com). An equivalent connector may also be used. Install the connector using the Manufacturer's guidelines. In brief, these are:
1. Thread the connector to the pile while the sheet pile is out of the ground. The connector will extend the full length of the sheet pile.
2. Tack weld the connector in place.
3. Drive the sheet pile with connector using normal procedures.
Provide sheet piling in accordance with Item 407, "Steel Piling".
Paint connector using same requirements for sheet piling, as shown elsewhere in the plans.

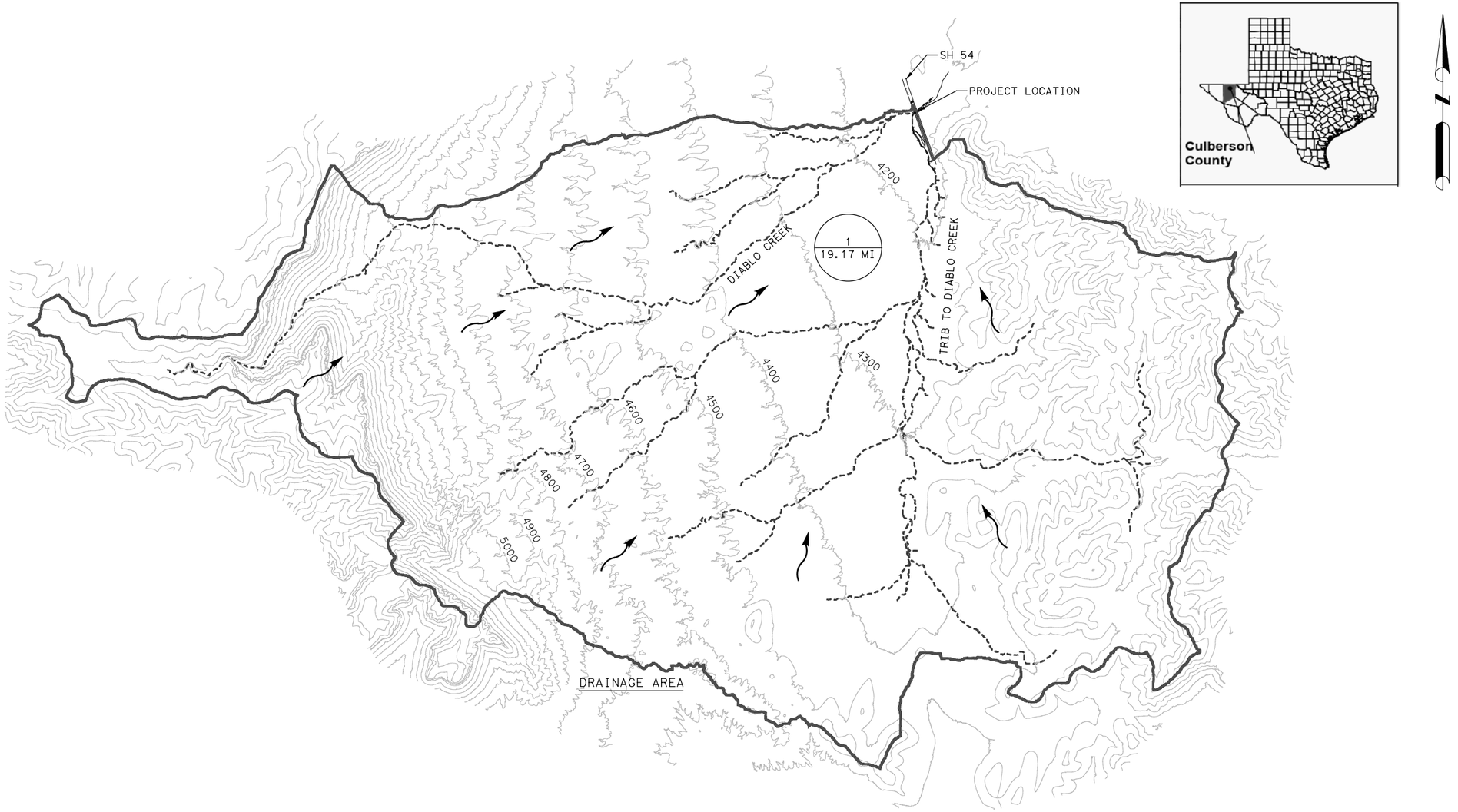
DATE: 9/27/2022 11:18:53 AM
FILE: c:\pwworkingdir\omega-app02.omegaengineers.local_omega-prod\jvillarreal\dms14496\sspcstde19.dgn

Texas Department of Transportation — Bridge Division Standard

STEEL SHEET PILING
CORNER DETAILS

SSPC

FILE: sspcstde-19.dgn		DN: TxDOT	CK: JGD	DW: AMS		CK: TxDOT	
©TxDOT April 2019		CONT	SECT	JOB		HIGHWAY	
REVISIONS		0233	05	038		SH 54	
		DIST		COUNTY		SHEET NO.	
		ELP		CULBERSON		95	



LEGEND

- X## / XX — SUB AREA ID / SQ MILES
- DRAINAGE AREA BOUNDARY
- 100 FT CONTOURS
- FLOW DIRECTION
- FLOW PATH
- TEXAS ROADWAYS

NOTES:

1. FEMA ZONE "A" WITHIN THE PROJECT AREA FIRM MAP #4801620650B NOVEMBER 1, 1985 CULBERSON COUNTY AND UNINCORPORTATED AREAS. NO FEMA EFFECTIVE MODEL, FIS REPORT AVAILABLE FOR THE PROJECT EXTENT
2. ALL ELEVATIONS ARE BASED ON NAVID 1988 VERTICAL DATUM.
3. THE DESIGN FREQUENCY FOR THIS BRIDGE IS THE 25-YR FREQUENCY AND CHECKED AGAINST 100-YR FREQUENCY.
4. HYDRAULIC ANALYSIS OF THE BRIDGE WAS PERFORMED USING THE US AMY CORP OF ENGINEERS (HEC-RAS VERSION 6.1.0)
5. THE BOUNDARY CONDITION USED FOR THE EXISTING AND PROPOSED HEC-RAS ANALYSIS WAS CRITICAL DEPTH FOR THE US & NORMAL DEPTH SLOPE, S=0.0204FT/FT FOR THE DS.
6. MANNING N VALUES FOR THE CHANNEL AND THE OVER BANKS ARE 0.03 AND 0.035, RESPECTIVELY.

0 2000 4000

SCALE: 1"= 4000'

DATE	BY	REV	REVISION

Runoff for Diablo Creek at SH 54						
Return Interval	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
NCRS Unit Hydrograph in HEC-HMS	2370	4162	5852	8375	10444	12668

Precipitation Frequency Estimates	Rainfall Depth (IN)						
Average Recurrence Intervals	2-YR	5-YR	10-YR	25-YR	50-YR	100-YR	500-YR
5-min:	0.347	0.439	0.515	0.619	0.699	0.778	0.962
10-min:	0.571	0.722	0.847	1.02	1.15	1.28	1.57
15-min:	0.676	0.857	1.01	1.21	1.37	1.53	1.89
30-min:	0.872	1.11	1.3	1.56	1.76	1.95	2.41
60-min:	1.06	1.35	1.58	1.9	2.14	2.39	2.96
2-hr:	1.23	1.53	1.8	2.18	2.5	2.82	3.58
3-hr:	1.32	1.63	1.91	2.34	2.7	3.09	3.99
6-hr:	1.49	1.83	2.16	2.68	3.14	3.65	4.83
12-hr:	1.67	2.13	2.56	3.22	3.8	4.44	6.04
24-hr:	1.88	2.5	3.07	3.93	4.65	5.45	7.56

STATE OF TEXAS
LARRY B. GREATHOUSE
115325
PROFESSIONAL ENGINEER
LICENSED

08-30-2022

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TX PE Firm Reg. No. F-2147
P:512 575 2288 F:281 647 9184

Texas Department of Transportation®

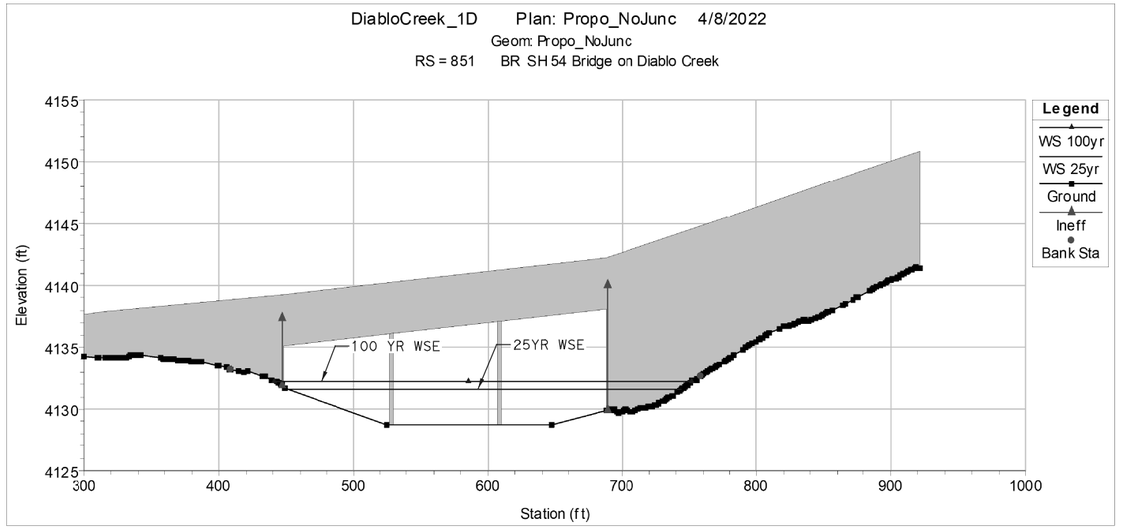
SH 54 @ DIABLO CREEK

DRAINAGE AREA MAP BRIDGE

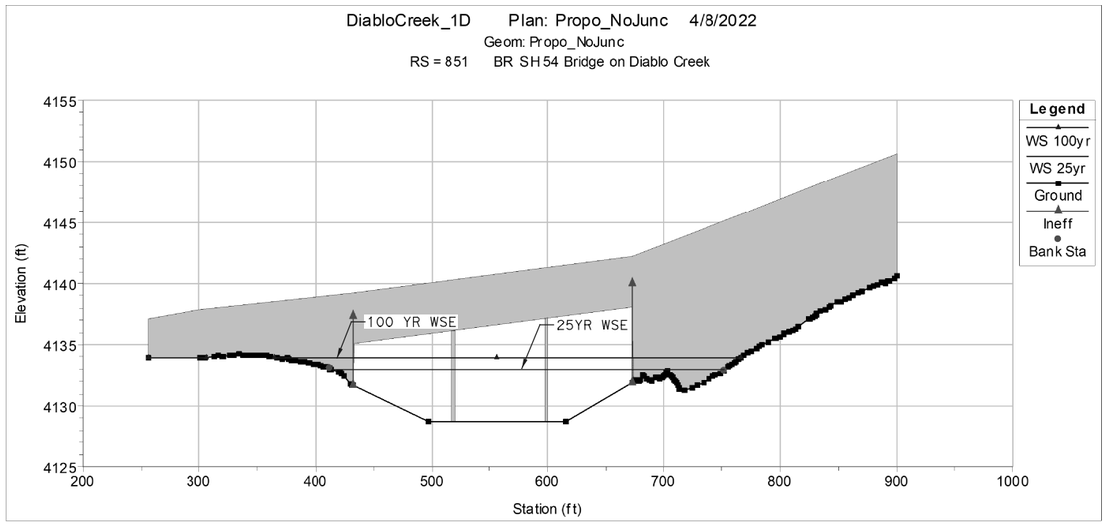
DSN	OEI	FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
CHK	OEI	6	SEE TITLE SHEET		96
DRN	OEI	STATE	DIST.	COUNTY	
CHK	OEI	TEXAS	ELP	CULBERSON	
		CONT.	SECT.	JOB	HIGHWAY NO.
		0233	05	038	SH 54

FINAL PLANS - SEPT 2, 2022

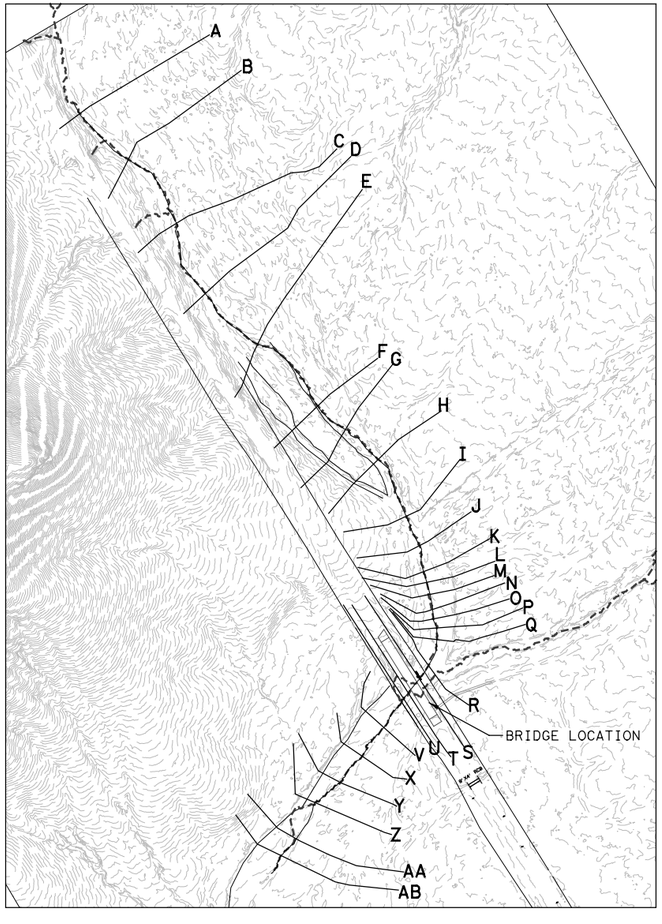
SH54 PROP BRIDGE US



SH 54 PROP BRIDGE DS



MODEL XS LOCATION



Stream X-Section	HEC-RAS STA.
A	3256
B	3033
C	2757
D	2491
E	2246
F	1949
G	1828
H	1674
I	1459
J	1352
K	1258
L	1226
M	1185
N	1118
O	1098
P	1071
Q	1033
R	941
S	878
T	824
U	796
V	676
X	544
Y	422
Z	302
AA	156
AB	76

HYDRUALIC MODEL OUTPUT TABLE

Location Description	HEC-RAS River Sta.	Rainfall Event	Flow (cfs)		Water Surface Elevation (ft)		Change in WSEL (ft)	Main Channel Velocity (ft/s)		Change in Velocity (ft/s)
			Existing	Proposed	Existing	Proposed	Proposed - Existing	Existing	Proposed	Proposed - Existing
Upstream SH 54 Diablo Creek Bridge	1098	25yr	8375	8375	4137.3	4137.3	0.0	15.65	15.65	0.0
	1098	100yr	12668	12668	4138.4	4138.4	0.0	17.75	17.75	0.0
Upstream SH 54 Diablo Creek Bridge	1071	25yr	8375	8375	4137.3	4137.3	0.0	14.52	14.52	0.0
	1071	100yr	12668	12668	4138.4	4138.4	0.0	16.77	16.77	0.0
Upstream SH 54 Diablo Creek Bridge	1033	25yr	8375	8375	4137.7	4137.7	0.0	11.96	11.96	0.0
	1033	100yr	12668	12668	4138.8	4138.8	0.0	14.46	14.46	0.0
Upstream SH 54 Diablo Creek Bridge	941	25yr	8375	8375	4134.8	4134.8	0.0	15.91	15.91	0.0
	941	100yr	12668	12668	4136.1	4136.1	0.0	17.41	17.41	0.0
Upstream SH 54 Diablo Creek Bridge	878	25yr	8375	8375	4131.4	4131.2	-0.3	17.83	18.38	0.6
	878	100yr	12668	12668	4132.0	4131.8	-0.1	20.26	20.59	0.3
SH 54 Diablo Creek Bridge	851									
Downstream SH 54 Diablo Creek Bridge	824	25yr	8375	8375	4132.6	4132.8	0.2	9.9	10.51	0.6
	824	100yr	12668	12668	4133.6	4133.6	0.1	10.47	12.62	2.2
Downstream SH 54 Diablo Creek Bridge	796	25yr	8375	8375	4132.7	4132.7	0.0	11.17	11.17	0.0
	796	100yr	12668	12668	4134.0	4134.0	0.0	12.45	12.45	0.0
Downstream SH 54 Diablo Creek Bridge	676	25yr	8375	8375	4131.1	4131.1	0.0	12.11	12.11	0.0
	676	100yr	12668	12668	4131.9	4131.9	0.0	14.44	14.44	0.0
Downstream SH 54 Diablo Creek Bridge	544	25yr	8375	8375	4129.9	4129.9	0.0	10.98	10.98	0.0
	544	100yr	12668	12668	4130.9	4130.9	0.0	12.71	12.71	0.0
Downstream SH 54 Diablo Creek Bridge	422	25yr	8375	8375	4127.8	4127.8	0.0	12.32	12.32	0.0
	422	100yr	12668	12668	4128.5	4128.5	0.0	14.57	14.57	0.0

DATE	BY	REV	REVISION

STATE OF TEXAS
LARRY B. GREATHOUSE
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Texas Department of Transportation®

SH 54 @ DIABLO CREEK

BRIDGE HYDDRAULIC DATA BRIDGE

DSN	OEI	FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
CHK	OEI	6	SEE TITLE SHEET		97
DRN	OEI	STATE	DIST.	COUNTY	
		TEXAS	ELP	CULBERSON	
CHK	OEI	CONT.	SECT.	JOB	HIGHWAY NO.
		0233	05	038	SH 54

8/30/2022
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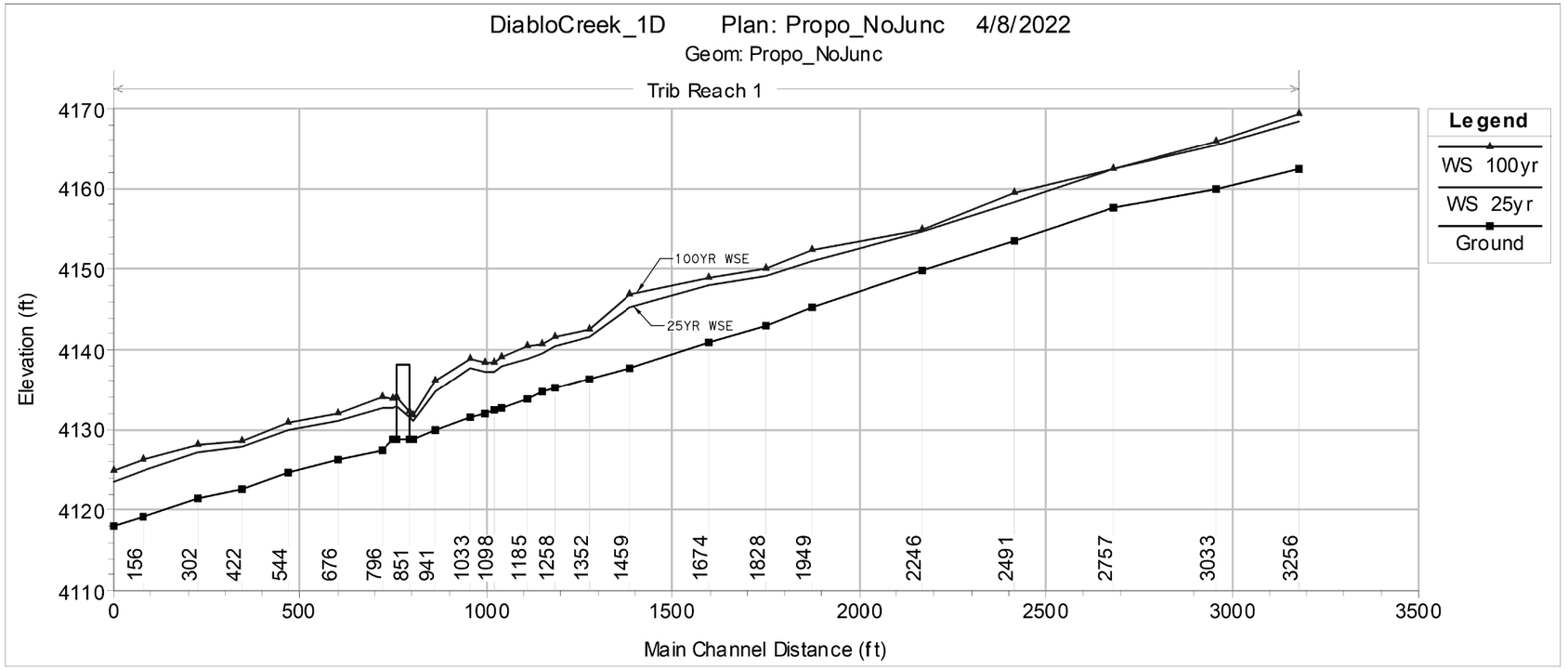
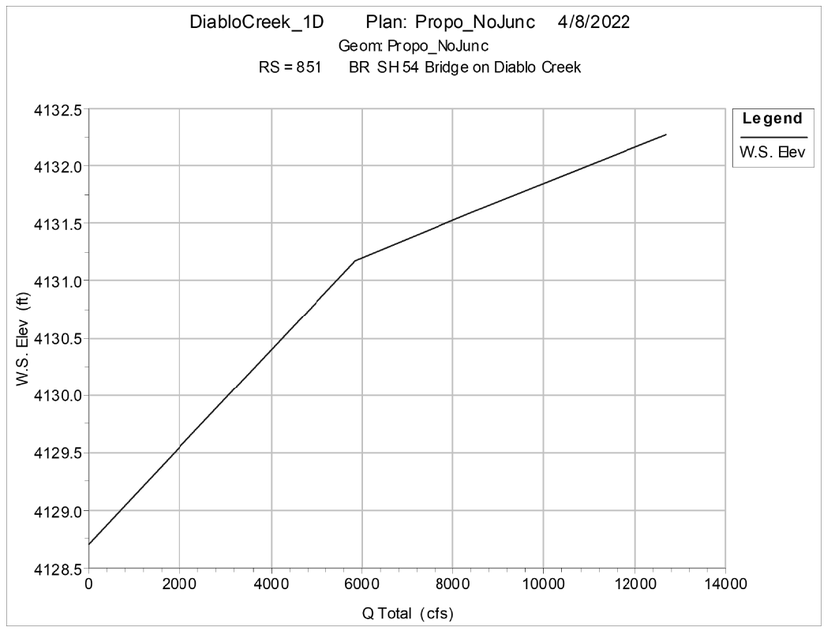
FINAL PLANS - SEPT 2, 2022

3:16:17 PM

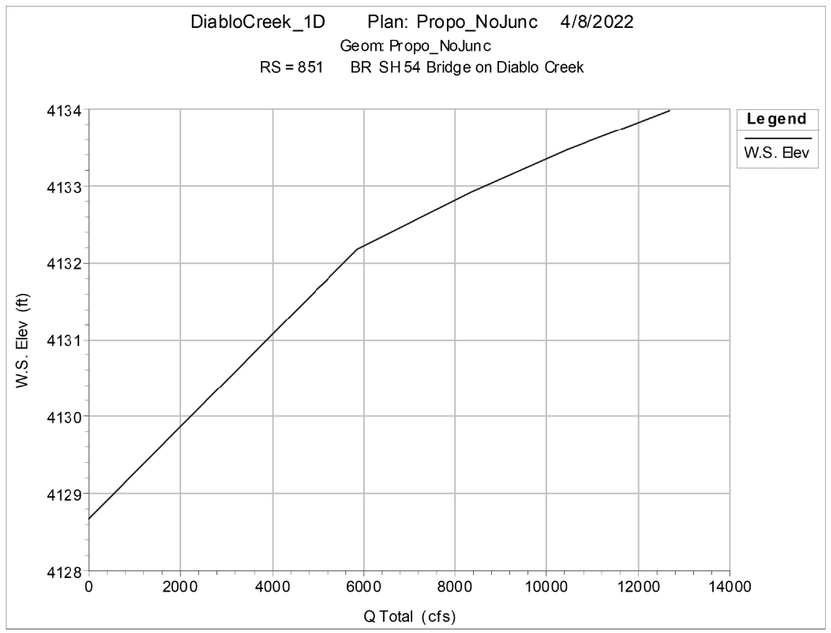
MODEL STREAM PROFILE



US RATING CURVE



DS RATING CURVE



DATE	BY	REV	REVISION

STATE OF TEXAS
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08-30-2022

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SH 54 @ DIABLO CREEK

BRIDGE HYDRUALIC DATA BRIDGE

DSN	OEI	FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
CHK	OEI	6	SEE TITLE SHEET		98
DRN	OEI	STATE	DIST.	COUNTY	
CHK	OEI	TEXAS	ELP	CULBERSON	
		CONT.	SECT.	JOB	HIGHWAY NO.
		0233	05	038	SH 54

8/30/2022
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FINAL PLANS - SEPT 2, 2022

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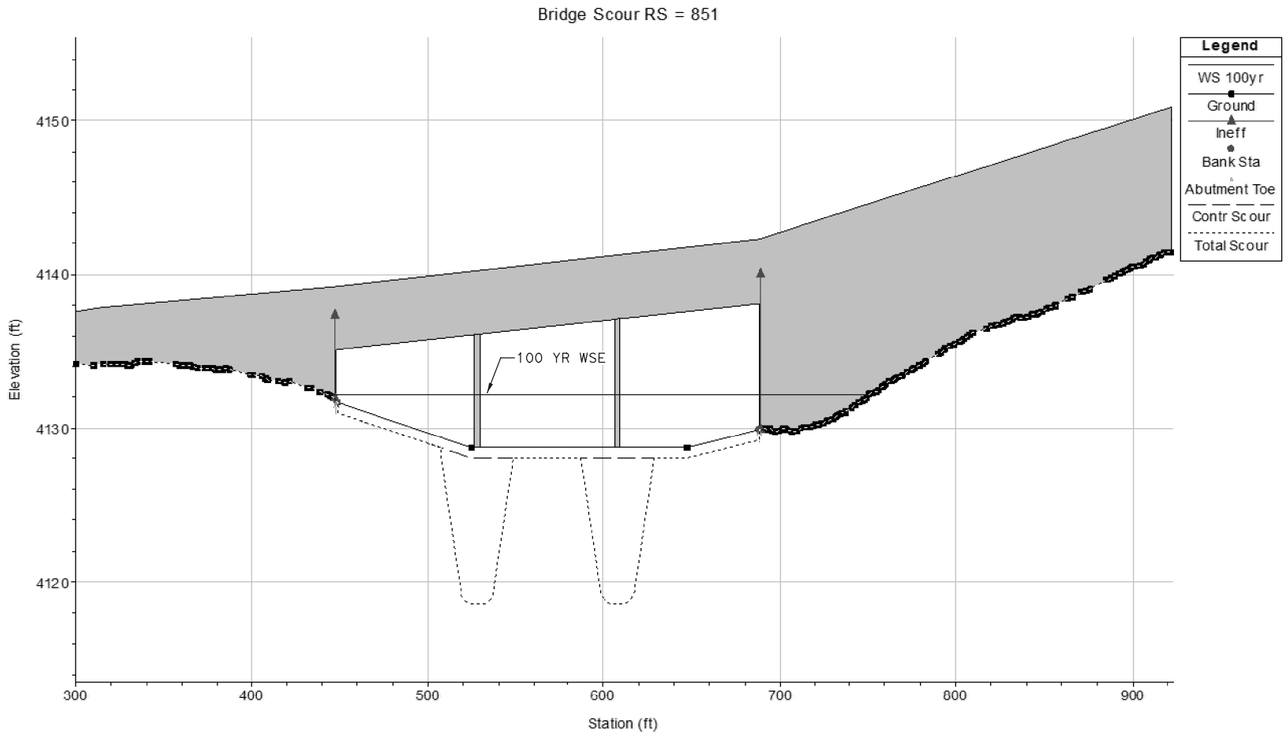

NOTES:

1. SEE THE HYDROLOGIC AND HYDRAULIC BRIDGE ANALYSIS-SH 54 @ DIABLO CREEK FOR FURTHER DISCUSSION ON SCOUR ANALYSIS
2. SCOUR ANALYSIS DETERMINED BY UTILISING HEC-18 CALCULATIONS AND HEC-RAS 6.0

ESTIMATED BRIDGE SCOUR ANALYSIS SUMMARY FOR SH 54 BRIDGE AT DIABLO CREEK		
	25-Yr Scour Depth (ft)	**100-Yr Scour Depth (ft)**
PIER SCOUR (CHNL)	8.71	9.51
PIER SCOUR (ROB)	0.00	0.00
PIER SCOUR (LOB)	0.00	0.00
CONTRACTION SCOUR (CHNL)	0.32	0.68
CONTRACTION SCOUR (ROB)	0.00	0.00
CONTRACTION SCOUR (LOB)	0.00	0.02
TOTAL SCOUR (CHNL)	9.03	10.19
TOTAL SCOUR (ROB)	0.00	0.00
TOTAL SCOUR (LOB)	0.00	0.02

HYDRAULIC DATA

Q25 (cfs)= 8,375 V25 (fps)= 18.38 WSE 25 (ft)= 4131.2
Q100 (cfs)= 12,668 V100 (fps)= 20.59 WSE 100 (ft)=4132.0

DATE	BY	REV	REVISION

STATE OF TEXAS
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SH 54 @ DIABLO CREEK

SCOUR ANALYSIS

DSN	OEI	FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
CHK	OEI	6	SEE TITLE SHEET		99
DRN	OEI	STATE	DIST.	COUNTY	
CHK	OEI	TEXAS	ELP	CULBERSON	
		CONT.	SECT.	JOB	HIGHWAY NO.
		0233	05	038	SH 54

8/30/2022
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SUMMARY OF BRIDGE ESTIMATED QUANTITIES

BRIDGE ELEMENT \ BID ITEM DESCRIPTION	400 - 6005 CEM STABIL BKFL	416 - 6001 DRILL SHAFT (18 IN)	416 - 6004 DRILL SHAFT (36 IN)	420 - 6014 CL "C" CONC (ABUT) (HPC)	420 - 6030 CL "C" CONC (CAP) (HPC)	420 - 6038 CL "C" CONC (COLUMN) (HPC)	420 - 6156 CL "C" CONC (WEBWALL)	422 - 6002 REINF CONC SLAB (HPC)	422 - 6016 APPROACH SLAB (HPC)	425 - 6036 PRESTR CONC GIRDER (Tx34)	450 - 6111 RAIL (TY SSTR) (W/ DRAIN SLOT) (HPC)	454 - 6020 SEALED EXPANSION JOINT (4 IN) (SEJ-B)	740 - 6005 ANTI - GRAFFITI COATING (PERMANENT-TY III)	4171 - 6001 INSTALL BRIDGE IDENTIFICATION NUMBER	(1) COLUMN ARMOR PROTECTION
	CY	LF	LF	CY	CY	CY	CY	SF	CY	LF	LF	LF	SF	EA	LB
2 - ABUTMENTS	167.5	130	260	48.9					62.4		56.0		374		
2 - INTERIOR BENTS			150		31.8	8.8	9.4								1,380
1 - 240.00' PRESTR CONC GIRDER UNIT								8,160		953.92	480.0	68	3,207	2	
TOTAL	167.5	130	410	48.9	31.8	8.8	9.4	8,160	62.4	953.92	536.0	68	3,581	2	1,380
				(2)	(2)	(3)									

(1) ARMOR PROTECTION ON UPSTREAM COLUMNS (INCLUDING ANGLES, STEEL PLATES, STUDS, AND WELDS) TO BE SUBSIDIARY TO BID ITEM 420-6038 CL "C" CONC (COLUMN) (HPC). QUANTITY IS FOR CONTRACTOR'S INFORMATION ONLY.

(2) QUANTITY INCLUDES SHEAR KEY CONCRETE.

(3) QUANTITY INCLUDES COLUMN PROTECTION CONCRETE.

BEARING SEAT ELEVATIONS

			GIRDER 1	GIRDER 2	GIRDER 3	GIRDER 4
ABUT	1	(FWD)	4137.836	4137.966	4137.911	4137.668
			GIRDER 1	GIRDER 2	GIRDER 3	GIRDER 4
BENT	2	(BK)	4136.331	4136.479	4136.440	4136.215
		(FWD)	4136.300	4136.447	4136.409	4136.184
			GIRDER 1	GIRDER 2	GIRDER 3	GIRDER 4
BENT	3	(BK)	4135.337	4135.501	4135.480	4135.272
		(FWD)	4135.319	4135.484	4135.463	4135.256
			GIRDER 1	GIRDER 2	GIRDER 3	GIRDER 4
ABUT	4	(BK)	4134.879	4135.054	4135.042	4134.842

DATE	BY	REV	REVISION

STATE OF TEXAS
JASON PATRICK BERRY
138339
LICENSED PROFESSIONAL ENGINEER
09/19/22

HL93 LOADING

OMEGA ENGINEERS, INC.
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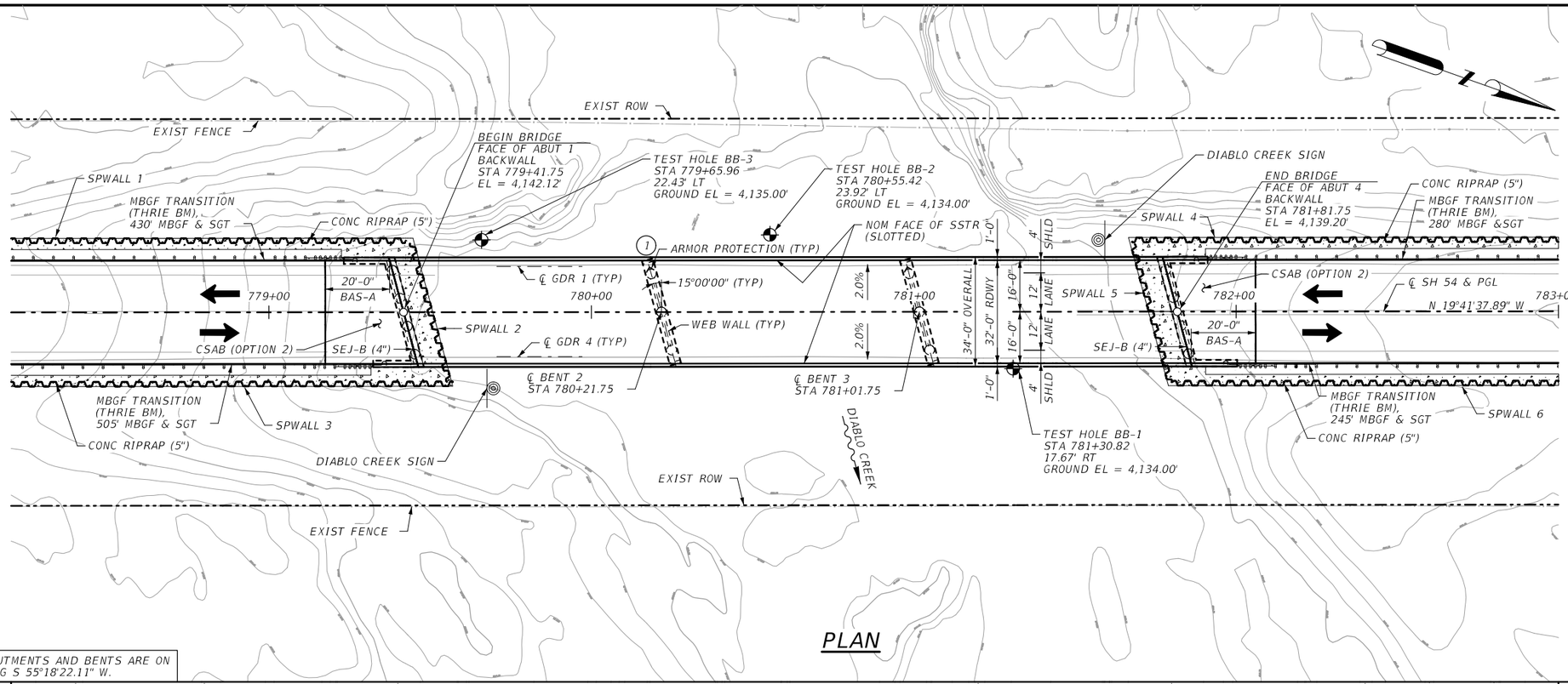
Texas Department of Transportation®

SH 54 @ DIABLO CREEK

ESTIMATED QUANTITIES & BEARING SEAT ELEVATIONS

DSN	OEI	FED. RD. DIV. NO.	PROJECT NO.	SHEET NO.
CHK	OEI	6	SEE TITLE SHEET	100
DRN	OEI	STATE	DIST.	COUNTY
CHK	OEI	TEXAS	ELP	CULBERSON
		CONT.	SECT.	JOB / HIGHWAY NO.
		0233	05	038 / SH 54



PLAN

ALL ABUTMENTS AND BENTS ARE ON BEARING S 55°18'22.11" W.

GENERAL NOTES:

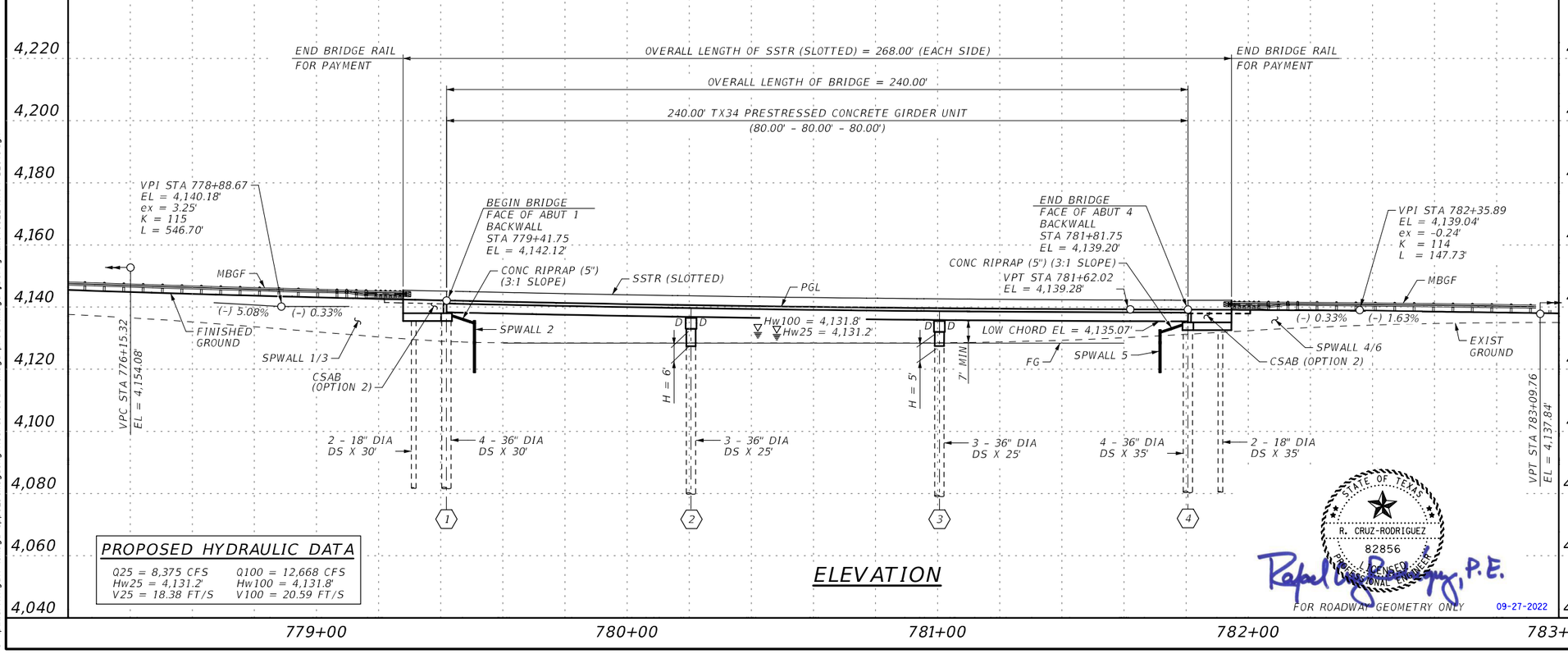
1. DESIGNED ACCORDING TO AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, 9TH EDITION (2020).
2. ALL DIMENSIONS ARE EITHER HORIZONTAL OR VERTICAL AND MUST BE CORRECTED FOR GRADE OR CROSS-SLOPE WHERE APPROPRIATE.
3. THE "H" VALUES SHOWN ARE ESTIMATED COLUMN HEIGHTS. THE CONTRACTOR IS RESPONSIBLE FOR CALCULATING THE ACTUAL COLUMN HEIGHTS BASED ON FIELD CONDITIONS.
4. CONTRACTOR SHALL VERIFY THE LOCATION AND DEPTH OF ALL UTILITIES PRIOR TO CONSTRUCTION OR FABRICATION.
5. "D" DENOTES CAPS WITH D BARS AND SLOTTED HOLES AT EXTERIOR GIRDERS.
6. SEE BOREHOLE DETAILS SHEETS FOR DRILLING LOGS.
7. SEE SHEET PILE PLAN & PROFILE FOR LIMITS OF RIPRAP.
8. EPOXY COATED REINFORCING STEEL SHALL BE USED FOR THE SLAB, RAILS, ABUTMENTS, BENTS, WEBWALLS AND COLUMNS.
9. TYPE II PORTLAND CEMENT TO BE UTILIZED IN MIX DESIGNS.
10. ANTI-GRAFFITI COATING FOR RAIL SHALL CONFORM TO BID ITEM 740-6005 ANTI-GRAFFITI COATING (PERMANENT TY III) AND BE APPLIED TO ALL VISIBLE RAIL SURFACES.

FOUNDATION NOTES:

1. ALL DRILLED SHAFTS AT BENTS AND ABUTMENTS ARE DESIGNED FOR COMBINED SKIN FRICTION AND POINT BEARING.
2. FOUND DRILLED SHAFTS AT THE LENGTHS SHOWN OR LONGER AS NECESSARY TO PENETRATE TWO SHAFT DIAMETERS INTO VERY DENSE SAND OR GRAVEL.
3. THE CONTRACTOR SHALL TAKE APPROPRIATE MEASURES TO STABILIZE THE DRILLED SHAFT HOLES IF GROUND WATER OR CAVING OF THE SOILS IS ENCOUNTERED.

ADT (2020): 371 VPD
ADT (2040): 519 VPD
DESIGN SPEED: 55 MPH
FUNCTIONAL CLASS: RURAL MAJOR COLLECTOR
NBI NO. 24-055-0-0233-05-047

(1) ARMOR PROTECTION ON UPSTREAM COLUMNS TO BE SUBSIDIARY TO BID ITEM 420-6038 CL "C" CONC (COLUMN) (HPC).



ELEVATION

PROPOSED HYDRAULIC DATA

Q25 = 8,375 CFS	Q100 = 12,668 CFS
Hw25 = 4,131.2'	Hw100 = 4,131.8'
V25 = 18.38 FT/S	V100 = 20.59 FT/S

FOR ROADWAY GEOMETRY ONLY
09-27-2022

DATE	BY	REV	REVISION

STATE OF TEXAS
JASON PATRICK BERRY
138339
LICENSED PROFESSIONAL ENGINEER
09/19/22
FOR BRIDGE DESIGN / FOUNDATION DESIGN

HL93 LOADING

0 20 40
SCALE: 1"=40'

OMEGA ENGINEERS, INC.
8200 N MOPAC EXPRESSWAY, STE #280
AUSTIN, TEXAS 78759
OMEGAENGINEERS.COM
TX PE Firm Reg. No. F-2147
Ph512 575 2288 Fx281 647 9184

Texas Department of Transportation®

SH 54 @ DIABLO CREEK

BRIDGE LAYOUT

DSN	OEI	FED.RD. DIV.NO.	PROJECT NO.	SHEET NO.
CHK	OEI	6	SEE TITLE SHEET	101
DRN	OEI	STATE: TEXAS	DIST.: ELP	COUNTY: CULBERSON
CHK	OEI	CONT.: 0233	SECT.: 05	JOB: 038	HIGHWAY NO.: SH 54

STATE OF TEXAS
R. CRUZ-RODRIGUEZ
82856
LICENSED PROFESSIONAL ENGINEER
Rafael Cruz-Rodriguez, P.E.

9/19/2022
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FINAL PLANS - SEPTEMBER 2, 2022

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8/26/2022
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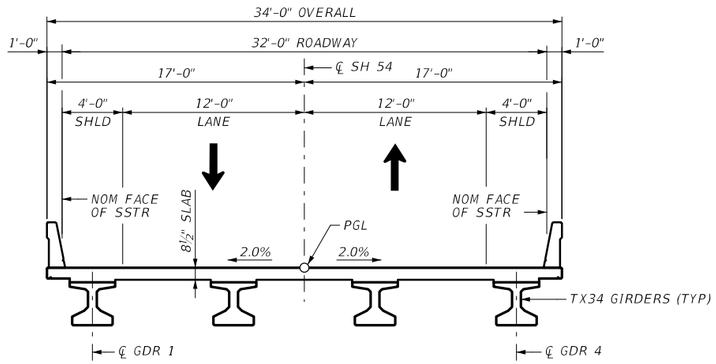
NOTES:

1. PROVIDE HPC CONCRETE FOR SLAB AND RAIL.
2. ALL REINFORCING STEEL SHALL BE EPOXY COATED.



TYPICAL TRANSVERSE SECTION

N.T.S.

DATE	BY	REV	REVISION

JASON PATRICK BERRY
138339
LICENSED PROFESSIONAL ENGINEER
09/02/22

HL93 LOADING

OMEGA ENGINEERS, INC.
8200 N MOPAC EXPRESSWAY, STE #280
AUSTIN, TEXAS 78759
OMEGAENGINEERS.COM
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P:512 575 2288 F:281 647 9184

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SH 54 @ DIABLO CREEK

BRIDGE TYPICAL SECTION

		FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
DSN	OEI	6	SEE TITLE SHEET		102
CHK	OEI	STATE	DIST.	COUNTY	
DRN	OEI	TEXAS	ELP	CULBERSON	
CHK	OEI	CONT.	SECT.	JOB	HIGHWAY NO.
		0233	05	038	SH 54

FINAL PLANS - SEPTEMBER 2, 2022

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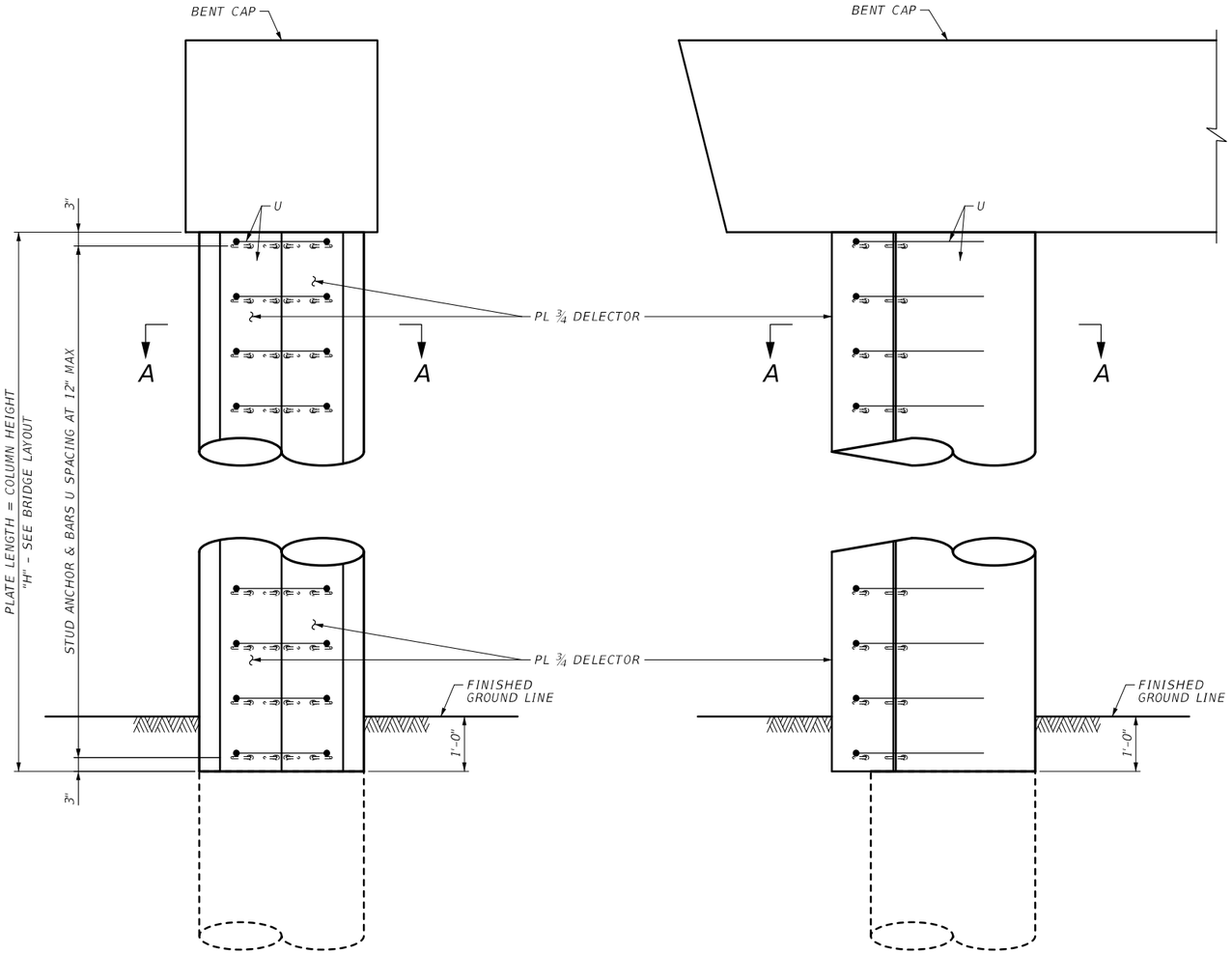
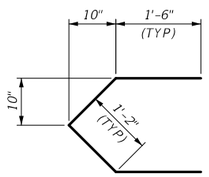


END VIEW

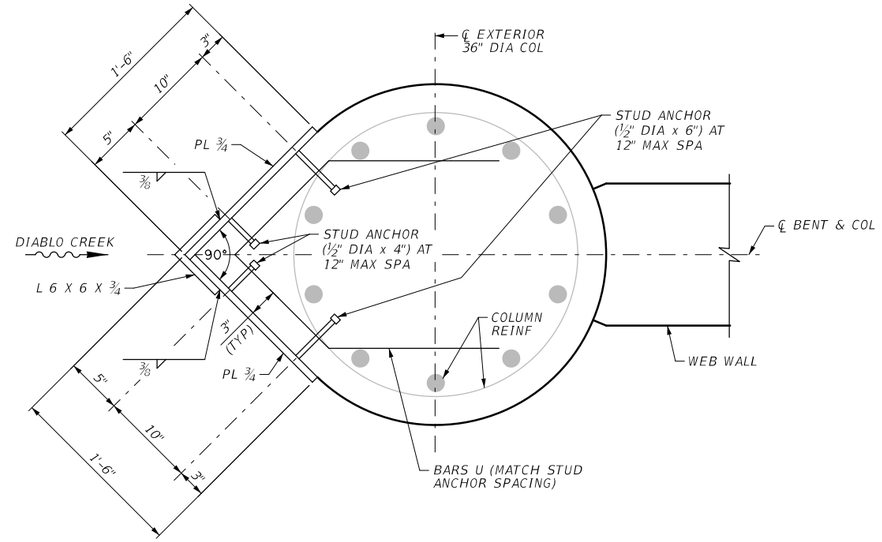
(L 6 X 6 X ¾ NOT SHOWN FOR CLARITY)

SIDE VIEW

(L 6 X 6 X ¾ NOT SHOWN FOR CLARITY)



BARS U



SECTION A-A

GENERAL NOTES:

1. SEE BRIDGE LAYOUT FOR FOUNDATION TYPE, SIZE, AND LENGTH.
2. SEE MODIFIED INTERIOR BENTS (BIG-32-15(MOD)) STANDARD FOR COLUMN DETAILS AND NOTES NOT SHOWN.
3. SEE COMMON FOUNDATION DETAILS (FD) STANDARD FOR ALL FOUNDATION DETAILS AND NOTES.
4. BENT COLUMN PROTECTION IS CONSIDERED SUBSIDIARY TO THE PERTINENT BID ITEMS.

MATERIAL NOTES:

1. PROVIDE CLASS C (HPC) CONCRETE.
2. PROVIDE GRADE 60 EPOXY COATED REINFORCING STEEL.
3. ALL STEEL COMPONENTS SHALL BE A36 GRADE STEEL.
4. WELD STUDS TO THE PLATE IN ACCORDANCE WITH AWS D1.5.

COLUMN PROTECTION SCHEDULE ONE COLUMN				ESTIMATED QUANTITY	
"H"	BARS U (# 4)			REINF STEEL	CL CONC (COLUMN)
FT	NO.	LENGTH	WEIGHT	LB	CY
5	6	5'-4"	22	22	0.1
6	7	5'-4"	25	25	0.1

DATE	BY	REV	REVISION

STATE OF TEXAS
JASON PATRICK BERRY
138339
LICENSED PROFESSIONAL ENGINEER

09/02/22

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OMEGA ENGINEERS, INC.
8200 N MOPAC EXPRESSWAY, STE #280
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SH 54 @ DIABLO CREEK

BENT COLUMN PROTECTION DETAILS

DSN	OEI	FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
CHK	OEI	6	SEE TITLE SHEET		103
DRN	OEI	STATE	DIST.	COUNTY	
CHK	OEI	TEXAS	ELP	CULBERSON	
		CONT.	SECT.	JOB	HIGHWAY NO.
		0233	05	038	SH 54

8/26/2022
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FINAL PLANS - SEPTEMBER 2, 2022

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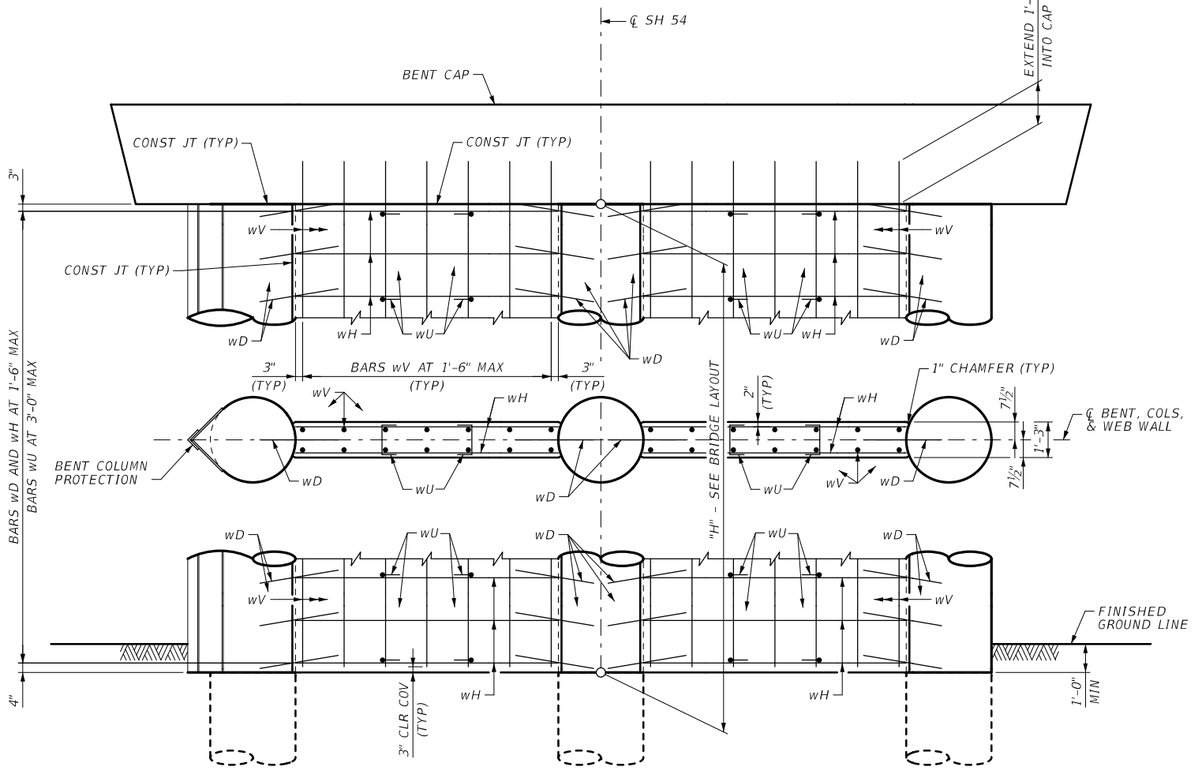
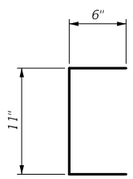


WEB WALL DETAIL

NOTE: EMBED BARS wD 1'-3" MINIMUM INTO COLUMN. AT CONTRACTOR'S OPTION, BARS wD MAY BE PLACED WITH THE COLUMN, OR MAY BE ATTACHED USING AN ADHESIVE ANCHORAGE SYSTEM WITH THE ANCHORAGE END SLOPED 1:6 INTO COLUMN. AT INTERIOR COLUMNS, THE CONTRACTOR HAS THE OPTION TO PLACE ONE BAR PASSING THROUGH THE FORMS INSTEAD OF TWO OPPOSING BARS.



BARS wU

WEB WALL SCHEDULE ONE WEB WALL											ESTIMATED QUANTITY (2 ~ WEB WALLS)	
"H"	BARS wD (# 6)			BARS wH (# 6)			BARS wU (6 ~ # 4)		BARS wV (14 ~ # 6)		REINF STEEL	CL CONC (WEBWALL)
FT	NO.	LENGTH	WEIGHT	NO.	LENGTH	WEIGHT	LENGTH	WEIGHT	LENGTH	WEIGHT	LB	CY
5	8	2'-9"	34	8	8'-11"	108	1'-11"	8	6'-4"	134	568	4.3
6	10	2'-9"	42	10	8'-11"	134	1'-11"	8	7'-4"	155	678	5.1

GENERAL NOTES:

1. SEE BRIDGE LAYOUT FOR FOUNDATION TYPE, SIZE, AND LENGTH.
2. SEE COMMON FOUNDATION DETAILS (FD) STANDARD FOR ALL FOUNDATION DETAILS AND NOTES.
3. SEE BENT COLUMN PROTECTION DETAILS FOR INFORMATION NOT SHOWN.

MATERIAL NOTES:

1. PROVIDE CLASS C CONCRETE (f'c = 3,600 PSI).
2. PROVIDE GRADE 60 REINFORCING STEEL.
3. ALL REINFORCING STEEL SHALL BE EPOXY COATED.

DATE	BY	REV	REVISION

STATE OF TEXAS
JASON PATRICK BERRY
138339
LICENSED PROFESSIONAL ENGINEER
09/02/22

HL93 LOADING

OMEGA ENGINEERS, INC.
8200 N MOPAC EXPRESSWAY, STE #280
AUSTIN, TEXAS 78759
OMEGAENGINEERS.COM
TX PE Firm Reg. No. F-2147
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SH 54 @ DIABLO CREEK

BENT WEB WALL DETAILS

DSN	OEI	FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
CHK	OEI	6	SEE TITLE SHEET		104
DRN	OEI	STATE	DIST.	COUNTY	
CHK	OEI	TEXAS	ELP	CULBERSON	
		CONT.	SECT.	JOB	HIGHWAY NO.
		0233	05	038	SH 54

COVER DIMENSIONS ARE CLEAR DIMENSIONS, UNLESS NOTED OTHERWISE. REINFORCING BAR DIMENSIONS SHOWN ARE OUT-TO-OUT OF BAR.

8/26/2022
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FINAL PLANS - SEPT 2, 2022

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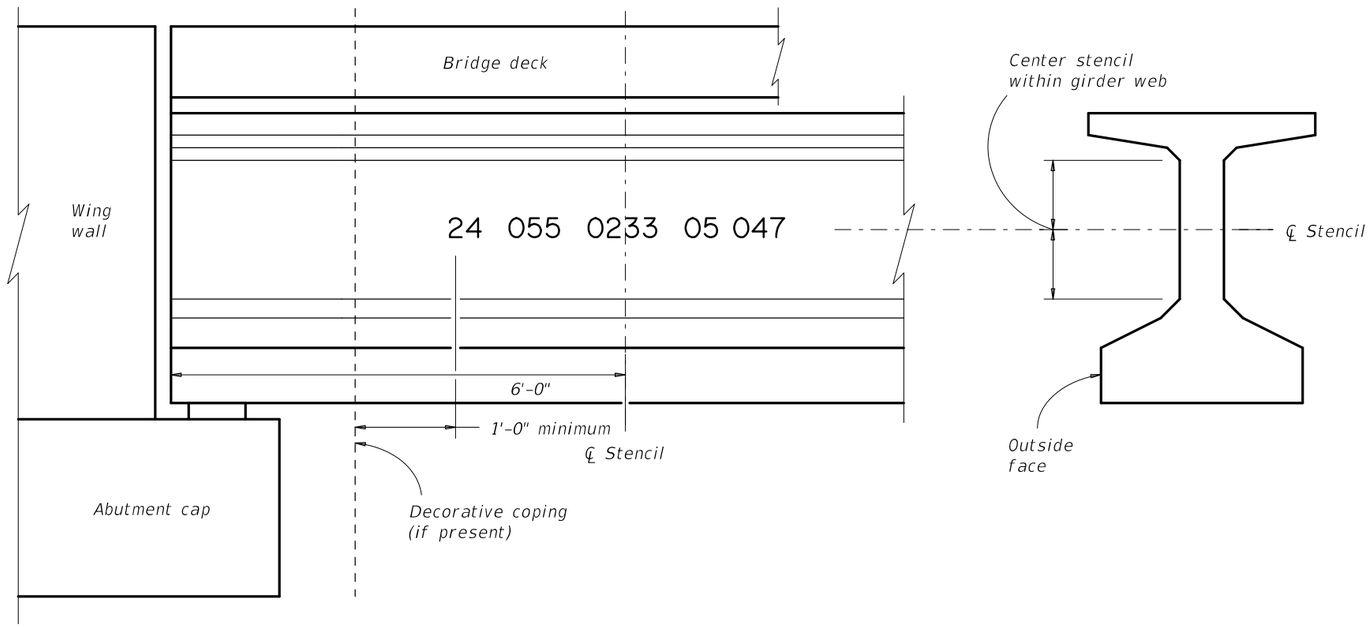
24 055 0233 05 047

District designation | County designation | Control number | Section nunber | Structure number

PAINTED STRUCTURE NUMBER DETAIL



TYPICAL BRIDGE CORNER (ELEVATION)

GENERAL NOTES:
Apply stucture number in accordance with Special Specification for Stenciling Permanent Structure Numbers.

DATE	BY	REV	REVISION

STATE OF TEXAS
R. CRUZ-RODRIGUEZ
82856
LICENSED PROFESSIONAL ENGINEER
Rafael Cruz-Rodriguez, P.E.
09-02-2022

OMEGA ENGINEERS, INC.
8200 N MOPAC EXPRESSWAY, STE #280
AUSTIN, TEXAS 78759
OMEGAENGINEERS.COM
TX PE Firm Reg. No. F-2147
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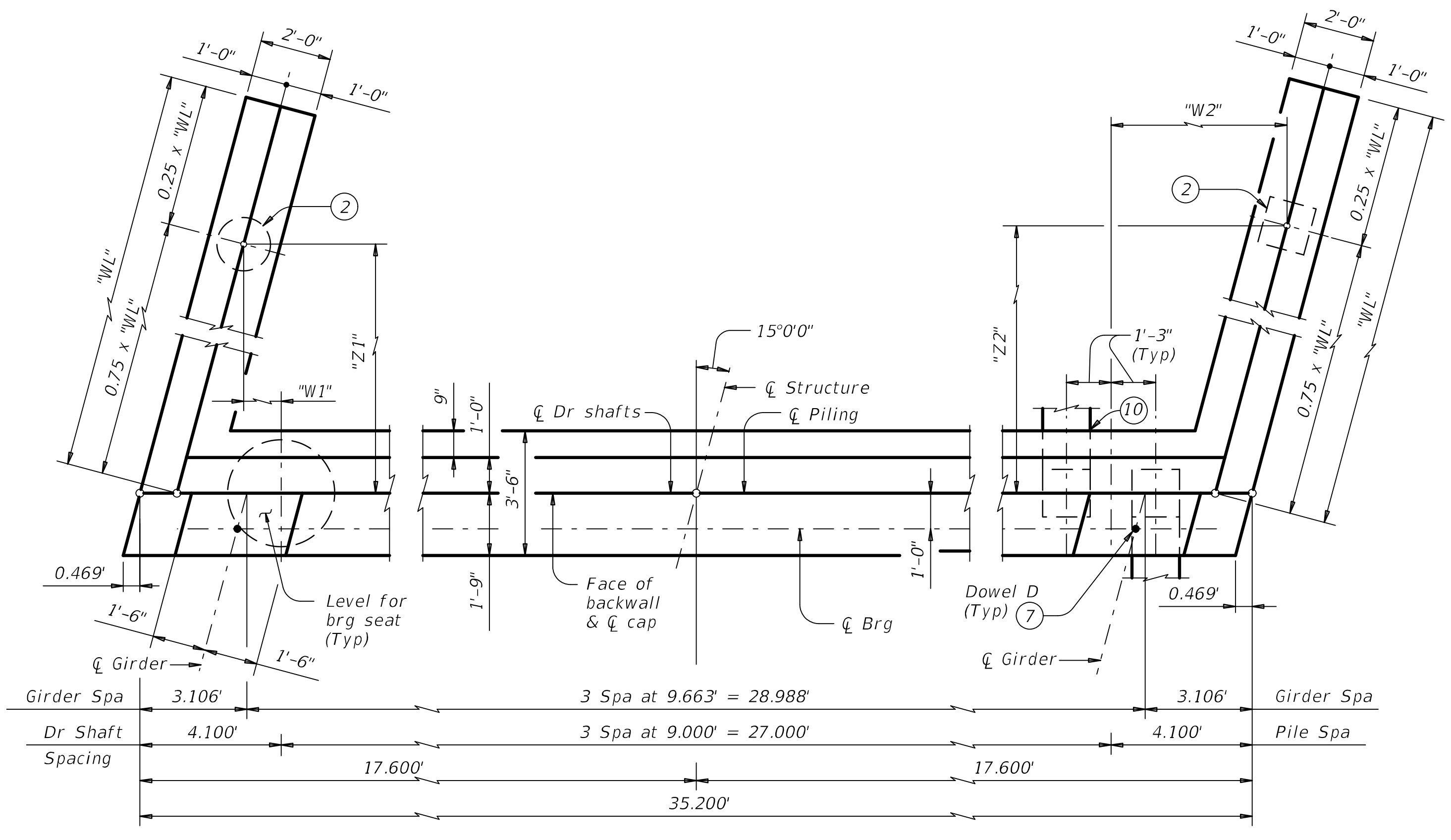
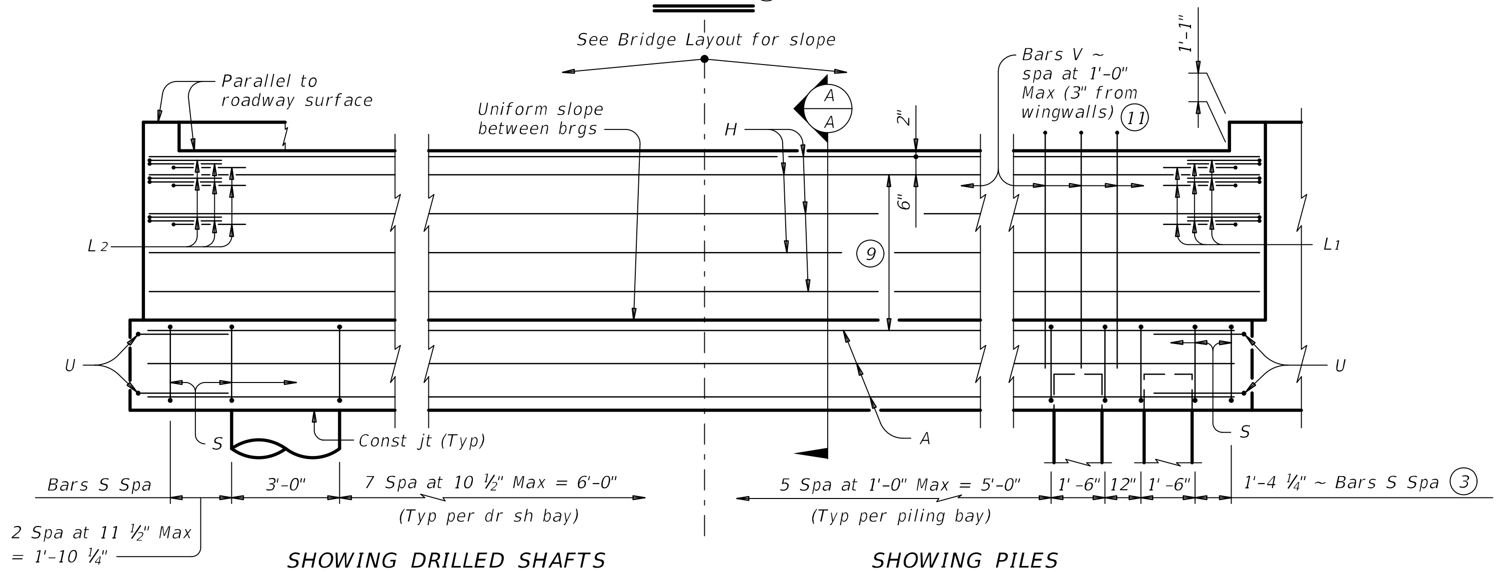
SH 54 @ DIABLO CREEK

BRIDGE NBI NUMBER STENCIL

		FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
DSN	OEI	6	SEE TITLE SHEET		105
CHK	OEI	STATE	DIST.	COUNTY	
DRN	OEI	TEXAS	ELP	CULBERSON	
CHK	OEI	CONT.	SECT.	JOB	HIGHWAY NO.
		0233	05	038	SH 54



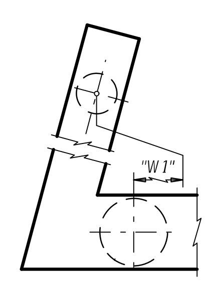
PLAN (1)



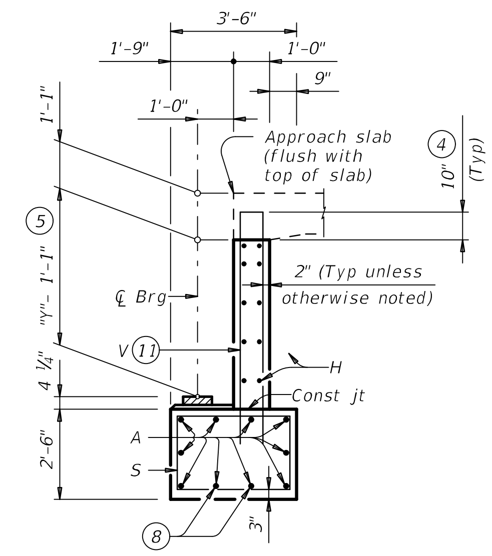
ELEVATION

TABLE A

Header Slope	Girder Type	Wingwall Type	Wingwall Lgth "WL"	"W1" (12)	"Z1"	"W2"	"Z2"
2:1	Tx28	Cantilevered	8.000'	Not Applicable			
	Tx34	Cantilevered	9.000'				
	Tx40	Cantilevered	10.000'				
	Tx46	Cantilevered	11.000'				
	Tx54	Founded	13.000'	0.541'	9.418'	5.588'	9.418'
3:1	Tx28	Cantilevered	12.000'	Not Applicable			
	Tx34	Founded	14.000'	0.347'	10.142'	5.782'	10.142'
	Tx40	Founded	15.000'	0.153'	10.867'	5.976'	10.867'
	Tx46	Founded	17.000'	-0.235'	12.316'	6.365'	12.316'
	Tx54	Founded	19.000'	-0.623'	13.764'	6.753'	13.764'

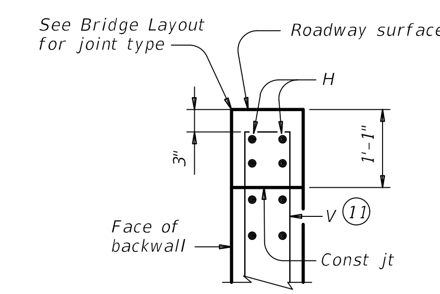


DETAIL A



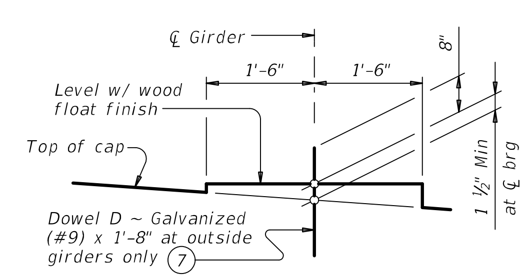
SECTION A-A

(With approach slab) (6)



BACKWALL DETAIL

(Without approach slab) (6)



BEARING SEAT DETAIL

(Bearing surface must be clean and free of all loose material before placing bearing pad.)

TABLE OF FOUNDATION LOADS

Span Length	All Girder Types	
Ft	Tons/Shaft	Tons/Pile
40	53	49
45	57	50
50	60	52
55	63	54
60	67	56
65	70	57
70	73	59
75	76	61
80	80	62
85	83	64
90	86	65
95	89	67
100	92	69
105	95	70
110	98	72
115	101	73
120	105	75

(1) See Table A for variable dimensions based on header slope and girder type.

(2) See Table A to determine if wingwall foundations are required.

(3) For piling larger than 16" adjust Bars S spacing as required to avoid piling.

(4) Increase as required to maintain 3" from finished grade.

(5) See Span details for "Y" value.

(6) See Bridge Layout to determine if approach slab is present.

(7) Omit Dowels D at end of multi-span unit. Adjust reinforcing steel total accordingly.

(8) With pile foundations, move Bars A shown to clear piles.

(9) Spacing based on girder type:
Tx28 ~ 3 spaces at 1'-0" Max
Tx34 ~ 3 spaces at 1'-0" Max
Tx40 ~ 4 spaces at 1'-0" Max
Tx46 ~ 4 spaces at 1'-0" Max
Tx54 ~ 5 spaces at 1'-0" Max

(10) See Detail A on FD standard.

(11) Field bend as needed to clear piles.

(12) Negative values for the "W1" dimension indicates a wingwall foundation on the other side of the cap foundation from what is shown in plan view. See Detail A.

GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications.
See Bridge Layout for header slope and foundation type, size and length.
See Common Foundation Details (FD) standard sheet for all foundation details and notes.
See Concrete Riprap (CRR) standard sheet or Stone Riprap (SRR) standard sheet for riprap attachment details, if applicable.
See applicable rail details for rail anchorage in wingwalls.
Details are drawn showing right forward skew. See Bridge Layout for actual skew direction.
These abutment details may be used with standard SIG-32-15 only.

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

MATERIAL NOTES:

Provide Class C concrete (f'c = 3,600 psi).
Provide Class C (HPC) concrete if shown elsewhere in the plans.
Provide Grade 60 epoxy coated reinforcing steel. 1
Galvanize dowel bars D.

MODIFICATIONS 5/12/2022

1. MATERIAL NOTES MODIFIED TO CALL FOR EPOXY COATED REINFORCING STEEL. V AND wV BAR EMBEDMENT DEPTHS INCREASED.

HL93 LOADING

SHEET 1 OF 3

Texas Department of Transportation

Bridge Division Standard

ABUTMENTS

TYPE TX28 THRU TX54
PRESTR CONC I-GIRDERS
32' ROADWAY 15° SKEW

AIG-32-15(MOD)

FILE: aig42sts-17.dgn	DN: TAR	CK: KCM	DW: JTR	CK: TAR
©TxDOT	CONT	SECT	JOB	HIGHWAY
REVISIONS	0233	05	038	SH 54
	DIST		COUNTY	SHEET NO.
	ELP		CULBERSON	106

STATE OF TEXAS
JASON PATRICK BERRY
138339
LICENSED
PROFESSIONAL ENGINEER

08/29/22

DATE: 8/26/2022 3:30:21 PM
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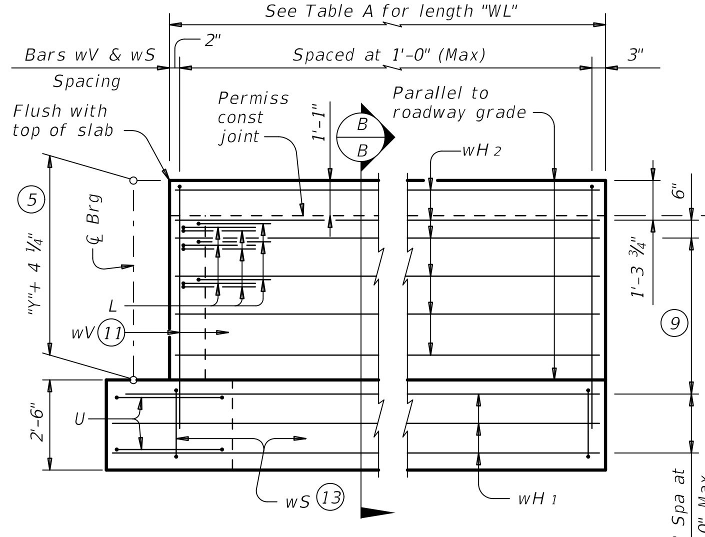
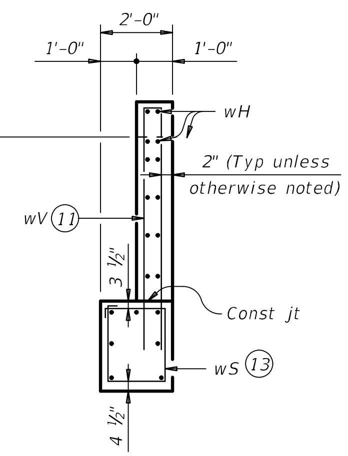
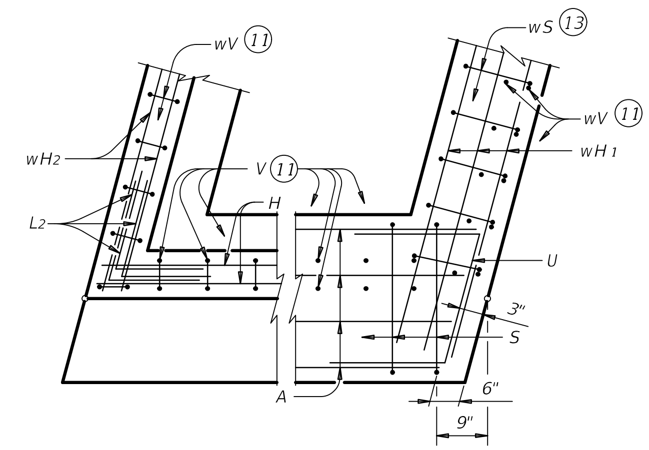


WINGWALL ELEVATION



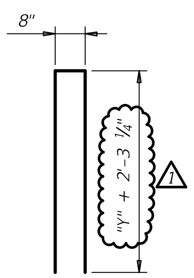
SECTION B-B



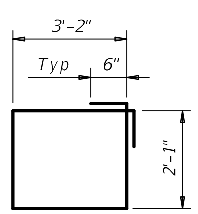
BACKWALL

CAP

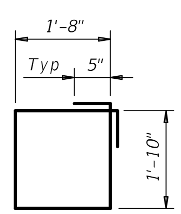
CORNER DETAILS



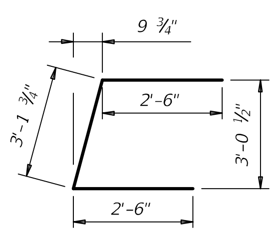
BARS V & wV (5)



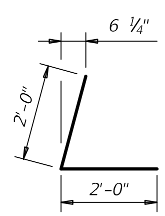
BARS S



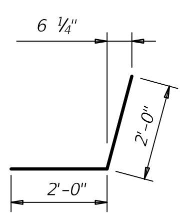
BARS wS



BARS U



BARS L2



BARS L1

(5) See Span details for "Y" value.

(9) Spacing based on girder type:
Tx28 ~ 3 spaces at 1'-0" Max
Tx34 ~ 3 spaces at 1'-0" Max
Tx40 ~ 4 spaces at 1'-0" Max
Tx46 ~ 4 spaces at 1'-0" Max
Tx54 ~ 5 spaces at 1'-0" Max

(11) Field bend as needed to clear piles.

(13) Adjust as required to avoid piling.

MODIFICATIONS	5/12/2022
1. MATERIAL NOTES MODIFIED TO CALL FOR EPOXY COATED REINFORCING STEEL. V AND wV BAR EMBEDMENT DEPTHS INCREASED.	

HL93 LOADING SHEET 2 OF 3

Texas Department of Transportation — Bridge Division Standard

ABUTMENTS
TYPE TX28 THRU TX54
PRESTR CONC I-GIRDERS
32' ROADWAY 15° SKEW

AIG-32-15(MOD)

FILE: aig42sts-17.dgn	DN: TAR	CK: KCM	DW: JTR	CK: TAR
©TxDOT	CONT	SECT	JOB	HIGHWAY
REVISIONS	0233	05	038	SH 54
	DIST		COUNTY	SHEET NO.
	ELP		CULBERSON	107

STATE OF TEXAS — JASON PATRICK BERRY — 138339 — LICENSED PROFESSIONAL ENGINEER
08/29/22

DATE: 8/26/2022 3:30:22 PM
FILE: c:\pwworkingdir\omega-app02.omegaengineers.local_omega-prod\omega_jberry\dms10461\aig42sts-17.dgn

TABLES OF ESTIMATED QUANTITIES WITH 2:1 HEADER SLOPE (14)

TYPE Tx28 Girders

Bar	No.	Size	Length	Weight
A	10	#11	34'-3"	1,820
D (7)	2	#9	1'-8"	11
H	8	#6	34'-10"	419
L1	9	#6	4'-0"	54
L2	9	#6	4'-0"	54
S	30	#5	11'-6"	360
U	4	#6	8'-2"	49
V	34	#5	11'-4"	402
wH1	14	#6	9'-5"	198
wH2	20	#6	7'-8"	230
wS	18	#4	7'-10"	94
wV	18	#5	11'-4"	213
Reinforcing Steel			Lb	3,904
Class "C" Concrete			CY	19.0

TYPE Tx34 Girders

Bar	No.	Size	Length	Weight
A	10	#11	34'-3"	1,820
D (7)	2	#9	1'-8"	11
H	8	#6	34'-10"	419
L1	9	#6	4'-0"	54
L2	9	#6	4'-0"	54
S	30	#5	11'-6"	360
U	4	#6	8'-2"	49
V	34	#5	12'-4"	437
wH1	14	#6	10'-5"	219
wH2	20	#6	8'-8"	260
wS	20	#4	7'-10"	105
wV	20	#5	12'-4"	257
Reinforcing Steel			Lb	4,045
Class "C" Concrete			CY	20.6

TYPE Tx40 Girders

Bar	No.	Size	Length	Weight
A	10	#11	34'-3"	1,820
D (7)	2	#9	1'-8"	11
H	10	#6	34'-10"	523
L1	9	#6	4'-0"	54
L2	9	#6	4'-0"	54
S	30	#5	11'-6"	360
U	4	#6	8'-2"	49
V	34	#5	13'-4"	473
wH1	14	#6	11'-5"	240
wH2	24	#6	9'-8"	348
wS	22	#4	7'-10"	115
wV	22	#5	13'-4"	306
Reinforcing Steel			Lb	4,353
Class "C" Concrete			CY	22.3

TYPE Tx46 Girders

Bar	No.	Size	Length	Weight
A	10	#11	34'-3"	1,820
D (7)	2	#9	1'-8"	11
H	10	#6	34'-10"	523
L1	9	#6	4'-0"	54
L2	9	#6	4'-0"	54
S	30	#5	11'-6"	360
U	4	#6	8'-2"	49
V	34	#5	14'-4"	508
wH1	14	#6	12'-5"	261
wH2	24	#6	10'-8"	385
wS	24	#4	7'-10"	126
wV	24	#5	14'-4"	359
Reinforcing Steel			Lb	4,510
Class "C" Concrete			CY	24.0

TYPE Tx54 Girders

Bar	No.	Size	Length	Weight
A	10	#11	34'-3"	1,820
D (7)	2	#9	1'-8"	11
H	12	#6	34'-10"	628
L1	9	#6	4'-0"	54
L2	9	#6	4'-0"	54
S	30	#5	11'-6"	360
U	4	#6	8'-2"	49
V	34	#5	15'-8"	556
wH1	14	#6	14'-5"	303
wH2	28	#6	12'-8"	533
wS	28	#4	7'-10"	147
wV	28	#5	15'-8"	458
Reinforcing Steel			Lb	4,973
Class "C" Concrete			CY	27.0

TABLES OF ESTIMATED QUANTITIES WITH 3:1 HEADER SLOPE (14)

TYPE Tx28 Girders

Bar	No.	Size	Length	Weight
A	10	#11	34'-3"	1,820
D (7)	2	#9	1'-8"	11
H	8	#6	34'-10"	419
L1	9	#6	4'-0"	54
L2	9	#6	4'-0"	54
S	30	#5	11'-6"	360
U	4	#6	8'-2"	49
V	34	#5	11'-4"	402
wH1	14	#6	13'-5"	282
wH2	20	#6	11'-8"	350
wS	26	#4	7'-10"	136
wV	26	#5	11'-4"	307
Reinforcing Steel			Lb	4,244
Class "C" Concrete			CY	21.6

TYPE Tx34 Girders

Bar	No.	Size	Length	Weight
A	10	#11	34'-3"	1,820
D (7)	2	#9	1'-8"	11
H	8	#6	34'-10"	419
L1	9	#6	4'-0"	54
L2	9	#6	4'-0"	54
S	30	#5	11'-6"	360
U	4	#6	8'-2"	49
V	34	#5	(1) 12'-10"	455
wH1	14	#6	15'-5"	324
wH2	20	#6	13'-8"	411
wS	30	#4	7'-10"	157
wV	30	#5	(1) 12'-10"	402
				(1)
Reinforcing Steel			Lb	4,516
Class "C" Concrete			CY	24.0

TYPE Tx40 Girders

Bar	No.	Size	Length	Weight
A	10	#11	34'-3"	1,820
D (7)	2	#9	1'-8"	11
H	10	#6	34'-10"	523
L1	9	#6	4'-0"	54
L2	9	#6	4'-0"	54
S	30	#5	11'-6"	360
U	4	#6	8'-2"	49
V	34	#5	13'-4"	473
wH1	14	#6	16'-5"	345
wH2	24	#6	14'-8"	529
wS	32	#4	7'-10"	167
wV	32	#5	13'-4"	445
Reinforcing Steel			Lb	4,830
Class "C" Concrete			CY	25.9

TYPE Tx46 Girders

Bar	No.	Size	Length	Weight
A	10	#11	34'-3"	1,820
D (7)	2	#9	1'-8"	11
H	10	#6	34'-10"	523
L1	9	#6	4'-0"	54
L2	9	#6	4'-0"	54
S	30	#5	11'-6"	360
U	4	#6	8'-2"	49
V	34	#5	14'-4"	508
wH1	14	#6	18'-5"	387
wH2	24	#6	16'-8"	601
wS	36	#4	7'-10"	188
wV	36	#5	14'-4"	538
Reinforcing Steel			Lb	5,093
Class "C" Concrete			CY	28.5

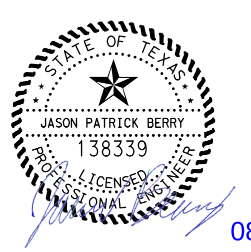
TYPE Tx54 Girders

Bar	No.	Size	Length	Weight
A	10	#11	34'-3"	1,820
D (7)	2	#9	1'-8"	11
H	12	#6	34'-10"	628
L1	9	#6	4'-0"	54
L2	9	#6	4'-0"	54
S	30	#5	11'-6"	360
U	4	#6	8'-2"	49
V	34	#5	15'-8"	556
wH1	14	#6	20'-5"	429
wH2	28	#6	18'-8"	785
wS	40	#4	7'-10"	209
wV	40	#5	15'-8"	654
Reinforcing Steel			Lb	5,609
Class "C" Concrete			CY	31.8

(7) Omit Dowels D at end of multi-span unit. Adjust reinforcing steel total accordingly.

(14) Quantities shown are for one abutment only (with approach slab). With no approach slab, add 1.3 CY Class "C" concrete and 209 lbs reinforcing steel for 4 additional Bars H.

MODIFICATIONS	5/12/2022
1. MATERIAL NOTES MODIFIED TO CALL FOR EPOXY COATED REINFORCING STEEL. V AND wV BAR EMBEDMENT DEPTHS INCREASED.	



08/29/22

HL93 LOADING

SHEET 3 OF 3

Texas Department of Transportation

Bridge Division Standard

ABUTMENTS

TYPE TX28 THRU TX54

PRESTR CONC I-GIRDERS

32' ROADWAY 15° SKEW

AIG-32-15(MOD)

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©TxDOT	CONT	SECT	JOB	HIGHWAY
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	DIST		COUNTY	SHEET NO.
	ELP		CULBERSON	108

DATE: 8/26/2022 3:30:22 PM
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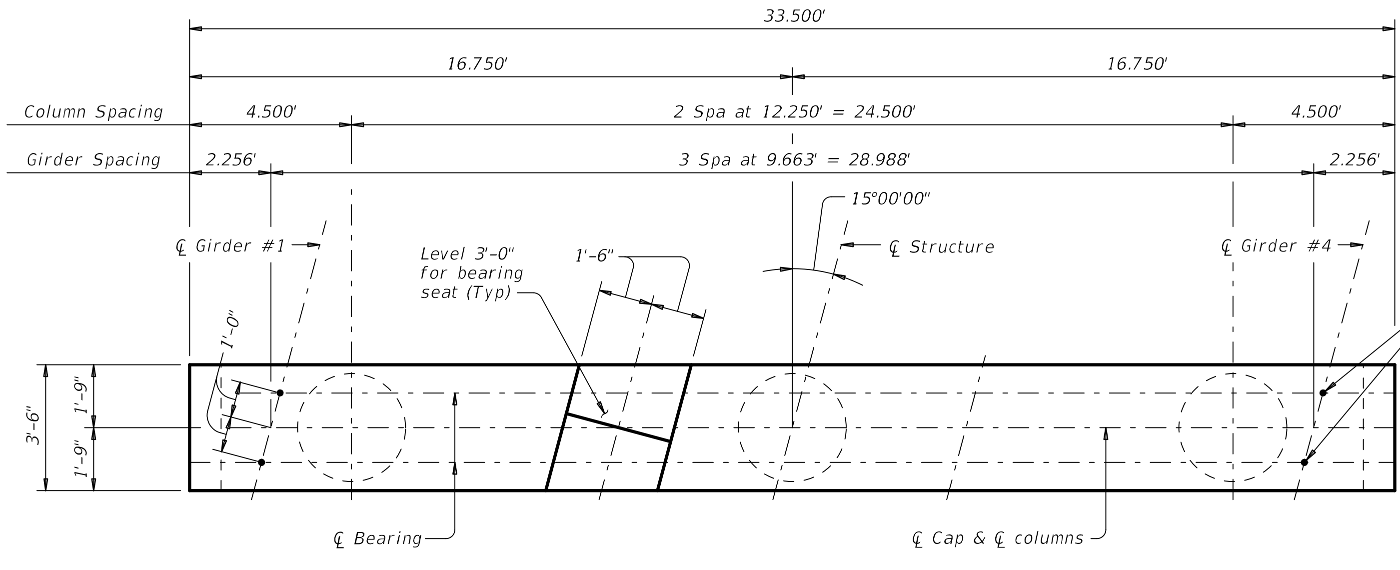
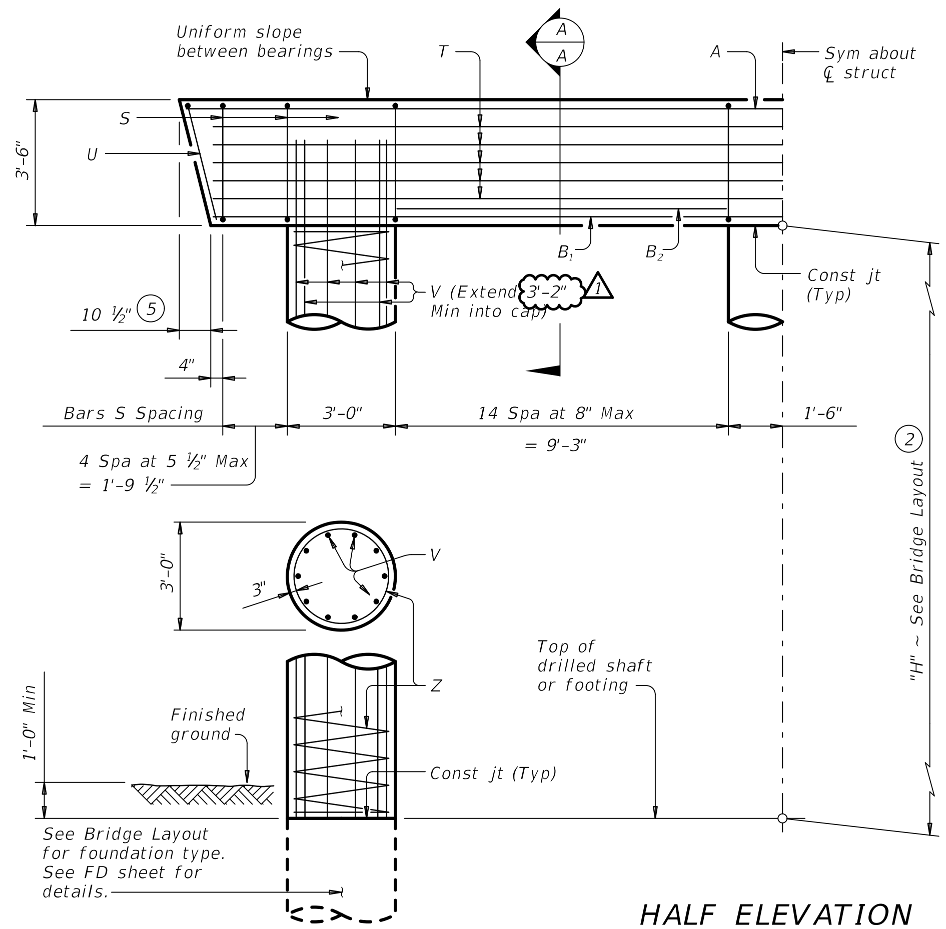
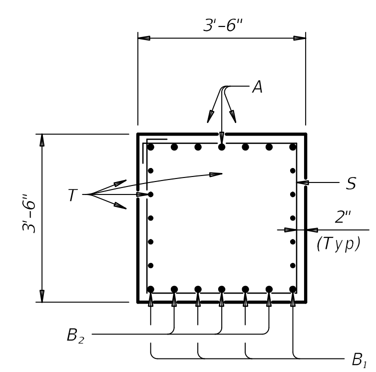


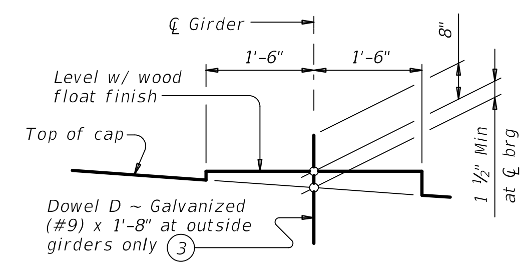
PLAN



HALF ELEVATION

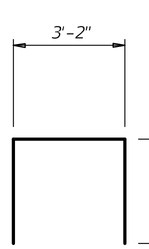


SECTION A-A

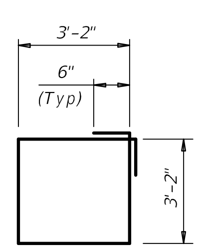


BEARING SEAT DETAIL

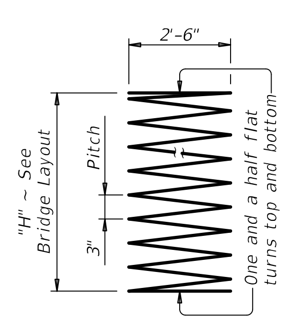
(Bearing surface must be clean and free of all loose material before placing bearing pad.)



BARS U



BARS S



BARS Z

1. Quantities shown are based on an "H" value of 36'. For each linear foot variation in "H" value, make the following adjustments:
   Bars V length, 1'-0"
   Bars Z length, 31'-5"
   Reinforcing steel, 165 Lb
   Class "C" conc (col), 0.78 CY
2. This standard may not be used for "H" heights exceeding 36'. In areas of very soft soil or where scour is anticipated, allowable "H" heights must be evaluated by the Engineer prior to the use of this standard.
3. Omit Dowels D at end of multi-span units. Adjust reinforcing steel total accordingly.
4. Foundation Loads based on "H" = 36'.
5. Measured parallel to top of cap cross-slope.

TABLE OF ESTIMATED QUANTITIES (1)

Bar	No.	Size	Length	Weight
A	7	#11	33'- 0"	1,227
B_1	4	#11	31'- 6"	670
B_2	6	#11	9'- 3"	295
D (3)	4	#9	1'- 8"	23
S	40	#5	13'- 8"	570
T	10	#5	31'- 6"	329
U	2	#5	9'- 8"	20
V	30	#9	1 39'- 2"	3,995
Z	3	#4	1,154'- 7"	2,314
Reinforcing Steel			Lb	1 9,443
Class "C" Concrete (Cap)			CY	15.0
Class "C" Concrete (Col)			CY	28.3

FOUNDATION LOADS (4)

Span Average	Drilled Shaft Loads	Pile Load (Tons/Pile)		
		3 Pile Ftg	4 Pile Ftg	5 Pile Ftg
Ft	Tons/Shaft			
40	113	41	31	26
45	122	44	34	28
50	130	47	36	29
55	139	50	38	31
60	147	52	40	33
65	155	55	42	34
70	164	58	44	36
75	172	61	46	38
80	180	63	48	39
85	189	66	50	41
90	197	69	52	43
95	205	72	54	44
100	213	74	56	46
105	221	77	58	47
110	230	80	61	49
115	238	83	63	51
120	246	85	65	52

GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications.
See Bridge Layout for foundation type, size and length.
See Common Foundation Details (FD) standard sheet for all foundation details and notes.
See Shear Key (IGSK) standard sheet for all shear key details and notes, if applicable.
Bent selected must be based on the average span length rounded up to the next 5 ft increment.
Details are drawn showing right forward skew. See Bridge Layout for actual skew directions.
~~These bent details may be used with standard SIG-32-15 only.~~
See Bent Column Protection Details sheet for column protection details. 1

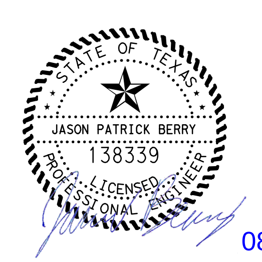
Cover dimensions are clear dimensions, unless noted otherwise.
Reinforcing bar dimensions shown are out-to-out of bar.

MATERIAL NOTES:

Provide Class C concrete (f'c = 3,600 psi).
~~Provide Class C (HPC) concrete if shown elsewhere in the plans.~~
Provide Grade 60 epoxy coated reinforcing steel. 1
Galvanize dowel bars D.

HL93 LOADING

MODIFICATIONS	05/12/22
1. MATERIAL NOTES MODIFIED TO CALL FOR EPOXY COATED REINFORCING STEEL. V BAR EMBEDMENT DEPTH INCREASED. NOTE ADDED TO REFERENCE BENT COLUMN PROTECTION DETAILS SHEET.	



08/29/22

Texas Department of Transportation

Bridge Division Standard

INTERIOR BENTS
TYPE TX28 THRU TX54
PRESTR CONC I-GIRDERS
32' ROADWAY 15° SKEW

BIG-32-15(MOD)

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©TxDOT August 2017	CONT	SECT	JOB	HIGHWAY
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	DIST		COUNTY	SHEET NO.
	ELP		CULBERSON	109

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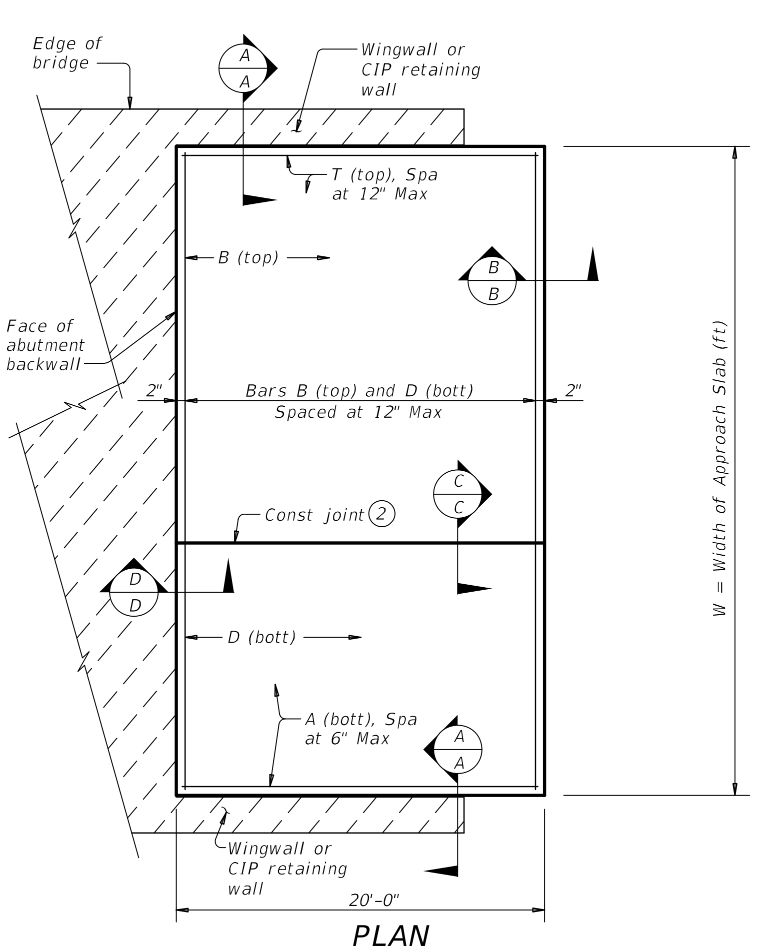
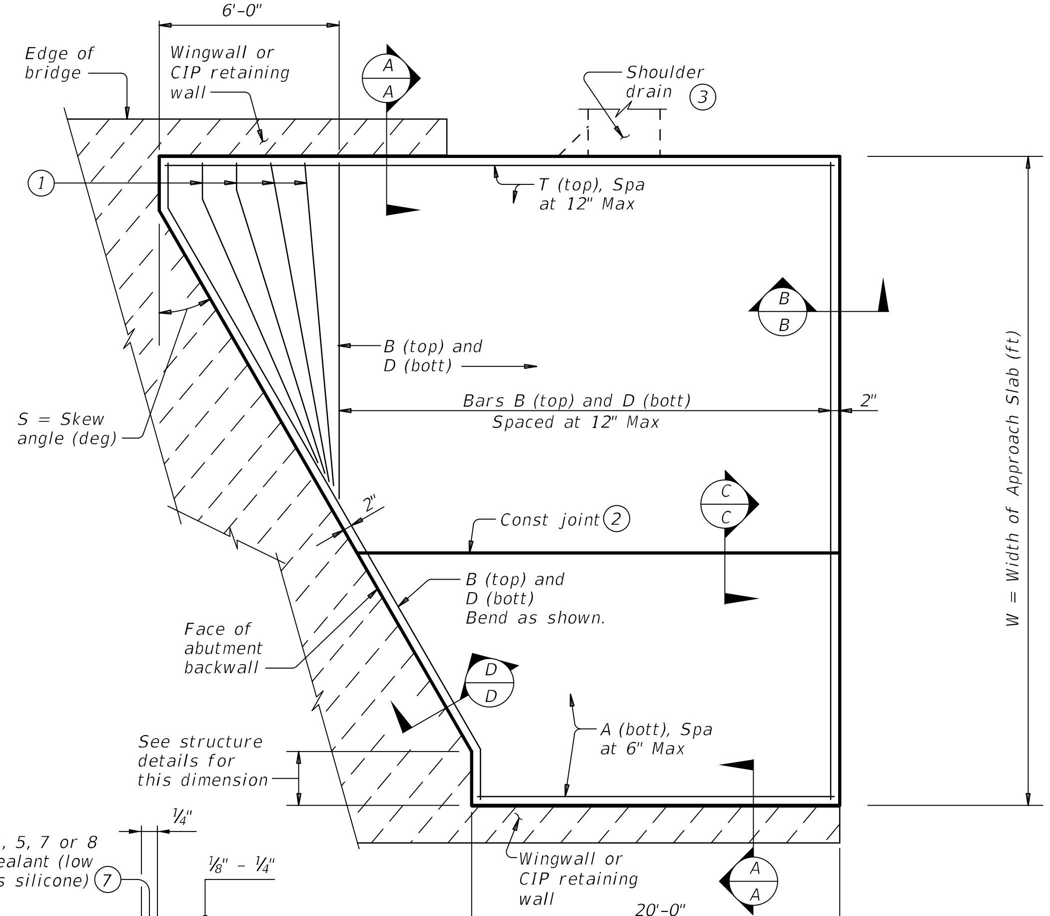
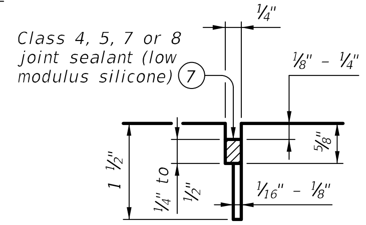


PLAN
(Showing non-skewed approach slab.)



PLAN
(Showing skewed approach slab.)



LONGITUDINAL SAW CUT JOINT DETAIL

BAR TABLE	
BAR	SIZE
A	#8
B	#5
D	#5
T	#5

APPROXIMATE QUANTITIES (4)

Reinf steel weight = 8.5 Lbs/SF of Approach Slab

Volume of Appr Slab Conc (CY) = $0.802W + 0.02W^2 \text{ Tan } S$

W = Width of Approach Slab (ft)

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.
5. Multiple piece tie bars are acceptable at longitudinal construction joints provided minimum laps shown are achieved.
6. See details elsewhere in plans for required cross-slope.
7. Place in accordance with Item 438.
8. Provide backer rod that is 25% larger than joint opening and compatible with the sealant.
9. 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.

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."

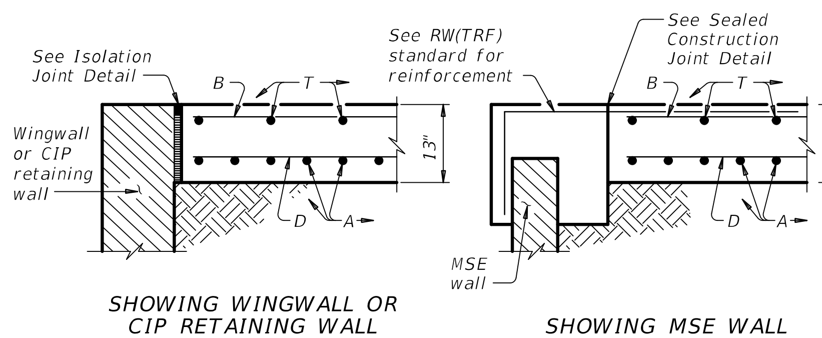
Construct the subgrade or subbase away from the bridge for a minimum distance of 100 feet prior to the approach slab, unless otherwise indicated on the plans.

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.

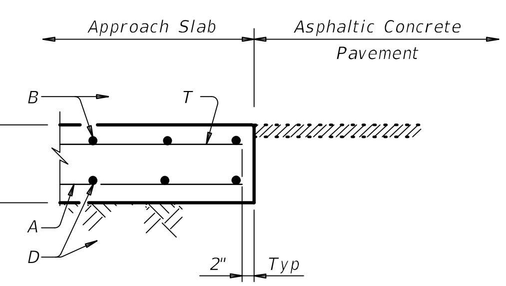
Cure for 4 days using water or membrane curing per Item 422.

All details shown herein are subsidiary to bridge approach slab.

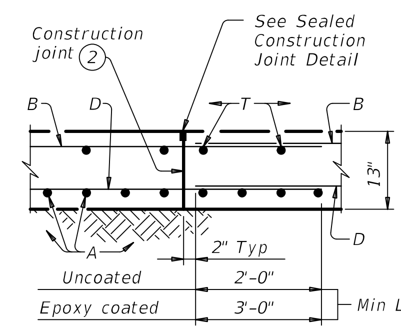
Cover dimensions are clear dimensions, unless noted otherwise.



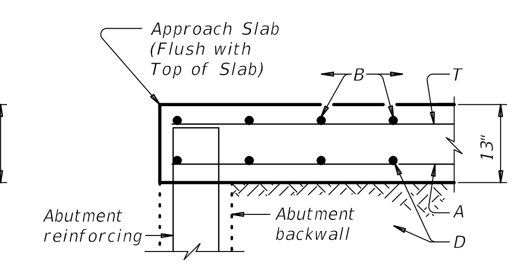
SECTION A-A



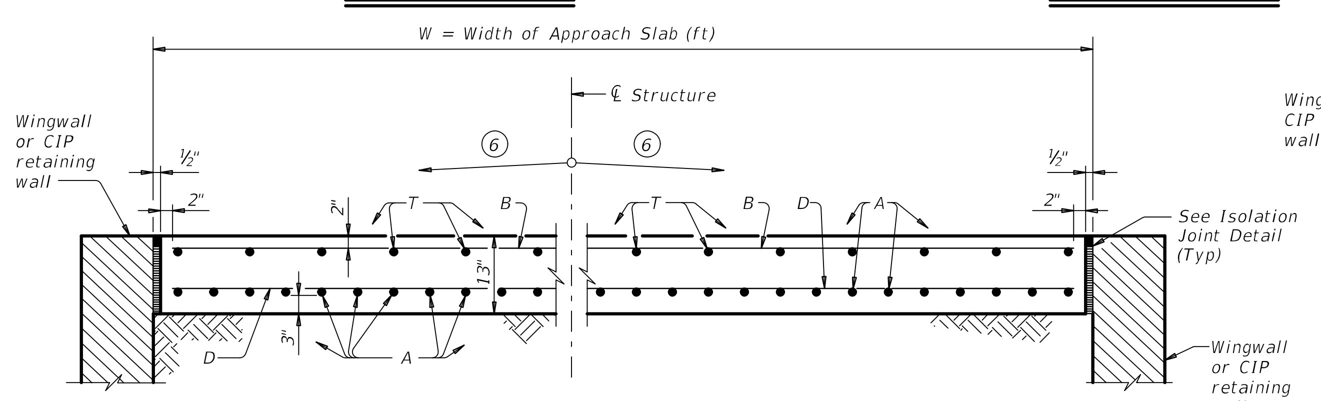
SECTION B-B



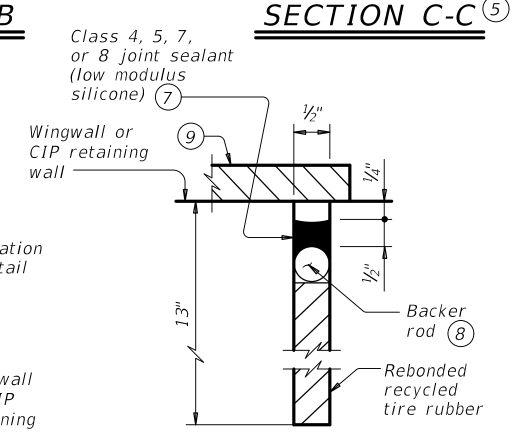
SECTION C-C (5)



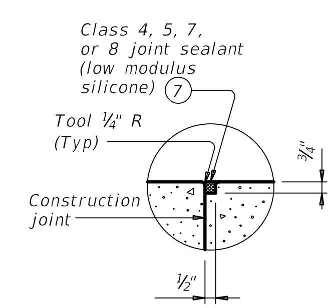
SECTION D-D



TYPICAL TRANSVERSE SECTION



ISOLATION JOINT DETAIL



SEALED CONSTRUCTION JOINT DETAIL

Texas Department of Transportation — Bridge Division Standard

BRIDGE APPROACH SLAB
ASPHALTIC CONCRETE PAVEMENT

BAS-A

FILE: basaste1-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0233	05	038	SH 54
02-20: Removed stress relieving pad.	DIST	COUNTY		SHEET NO.
	ELP	CULBERSON		110

DATE: 9/27/2022 11:19:29 AM
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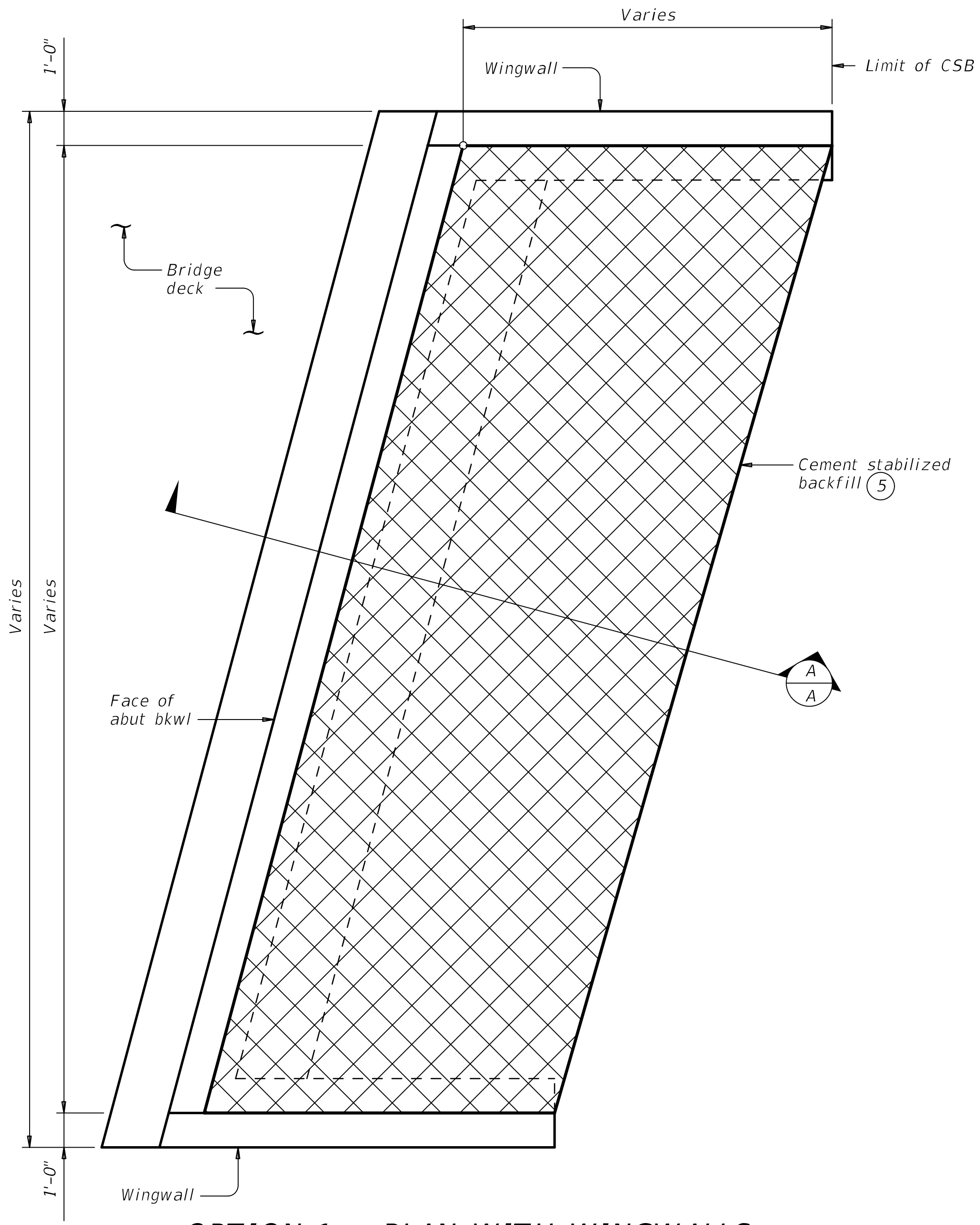
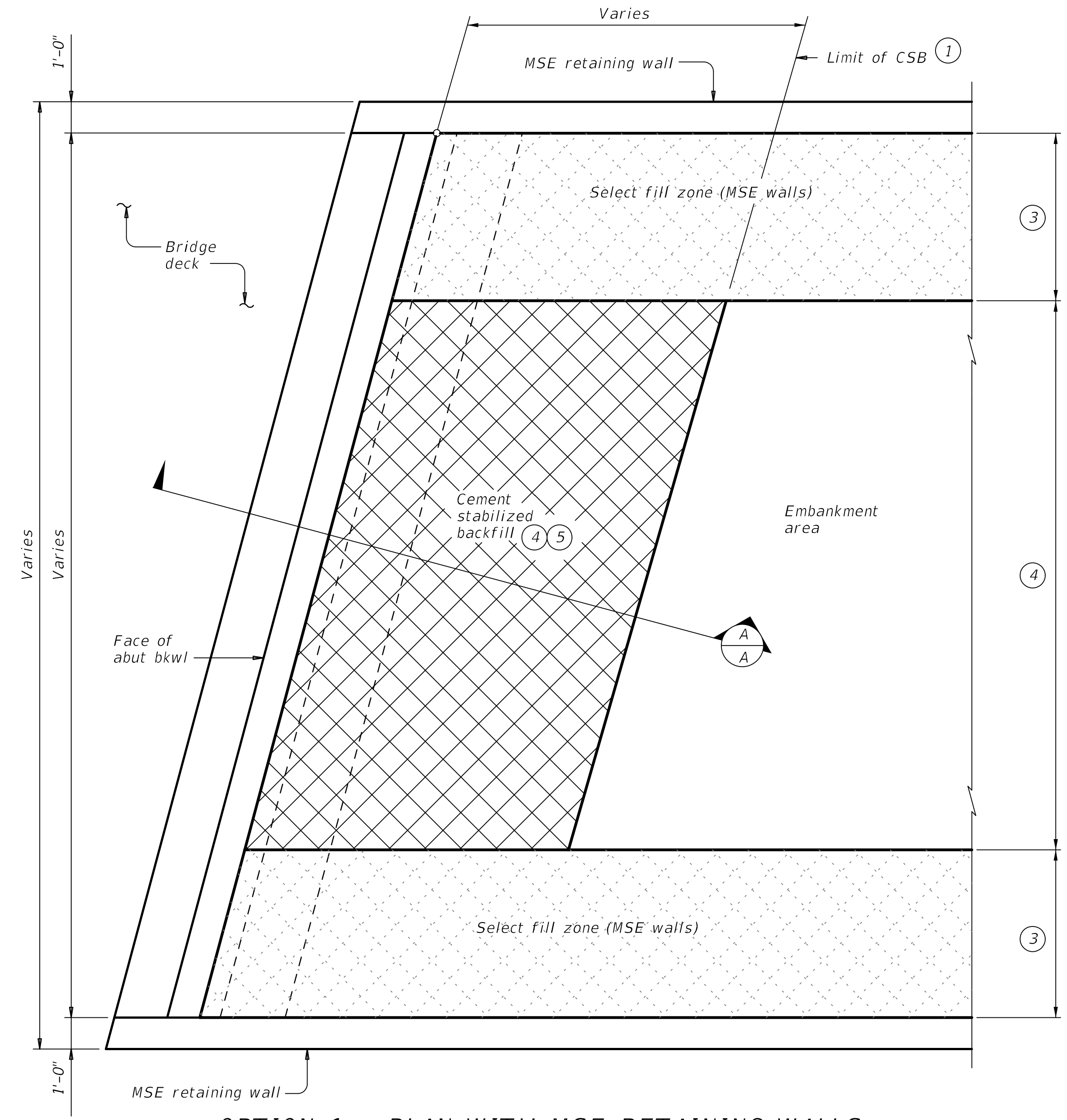


OPTION 1 ~ PLAN WITH WINGWALLS

Cast-in-place retaining walls similar.



OPTION 1 ~ PLAN WITH MSE RETAINING WALLS

(1) Usual limit of Cement Stabilized Backfill is at end of wingwall. Extend CSB limits as required to maintain a slope no steeper than 1:1 at bottom of backfill.

(2) Bench backfill as shown with 12" (approximate) bench depths.

(3) Where MSE retaining walls are present, adjust CSB limits to accommodate the select fill zone. See retaining wall details for additional information.

(4) When distance between select fill zones is less than 5'-0", MSE select fill may be substituted for cement stabilized backfill with approval from the Engineer.

(5) If shown in the plans flowable backfill can be used as a substitute for cement stabilized backfill with the following constraints:
  a). If flowable backfill is to be placed over MSE backfill then a filter fabric will be placed over the MSE backfill prior to placement of the flowable fill; and
  b). Place flowable fill in lifts not exceeding 2 feet in height, place each successive lift when the previous lift has stiffened/hardened (i.e. has lost its flowability).

GENERAL NOTES:

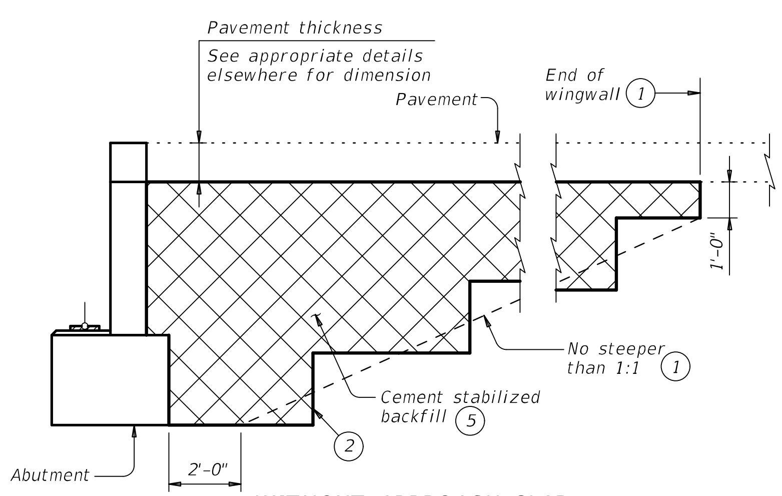
See the Bridge Layout for selected Option. Option 2 is intended for new construction requiring high plasticity embankment fill with a plasticity index (PI) greater than 30 or pavement built in poor native soil. Poor soils are defined as high plasticity clays or expansive clays. Option 1 is intended for construction only requiring PI controlled embankment fill or excavation in competent soils/rocks in order to construct the abutment.

Provide Cement Stabilized Backfill (CSB) meeting the requirements of Item 400, "Excavation and Backfill for Structures", to the limits shown at bridge abutments.

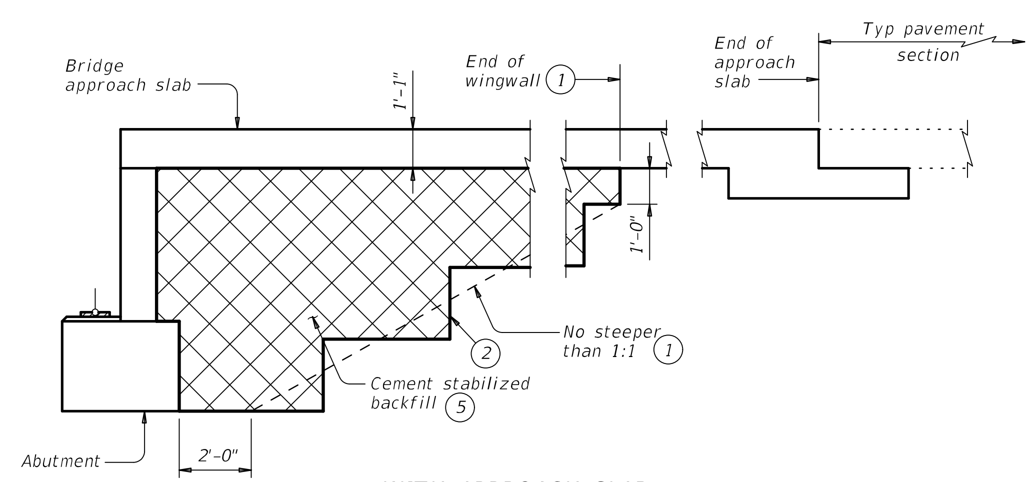
If required elsewhere in the plans, provide Flowable Backfill meeting the requirements of Item 401, "Flowable Backfill", to the limits shown at bridge abutments.

Details are drawn showing left forward skew. See Bridge Layout for actual skew direction.

These details do not apply when Concrete Block retaining walls are used in lieu of wingwalls.



WITHOUT APPROACH SLAB



WITH APPROACH SLAB

(Showing BAS-C, BAS-A similar.)

SECTION A-A

SHEET 1 OF 2

Texas Department of Transportation | Bridge Division Standard

CEMENT STABILIZED ABUTMENT BACKFILL
BRIDGE ABUTMENT

CSAB

FILE: csabste1-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
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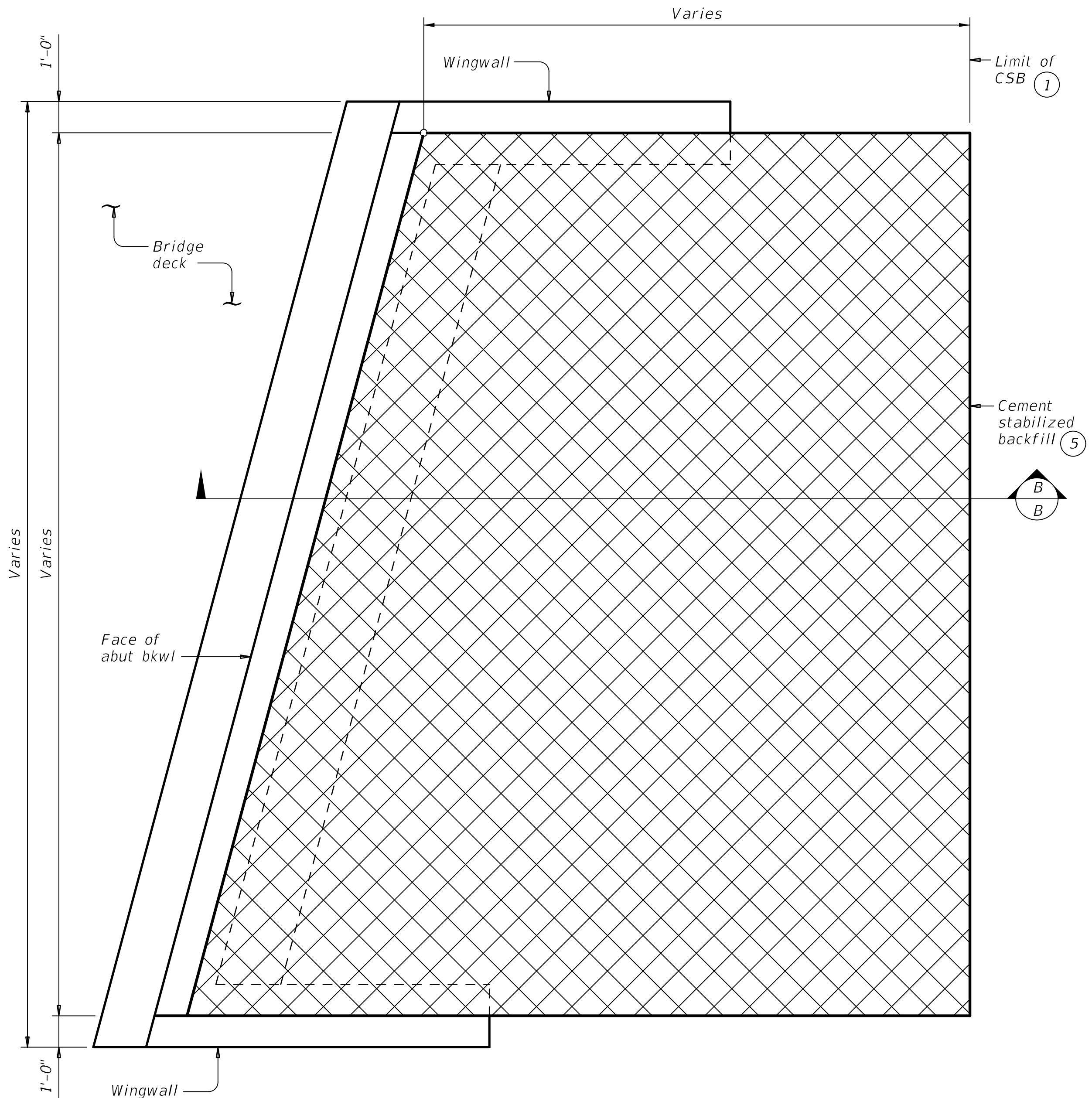
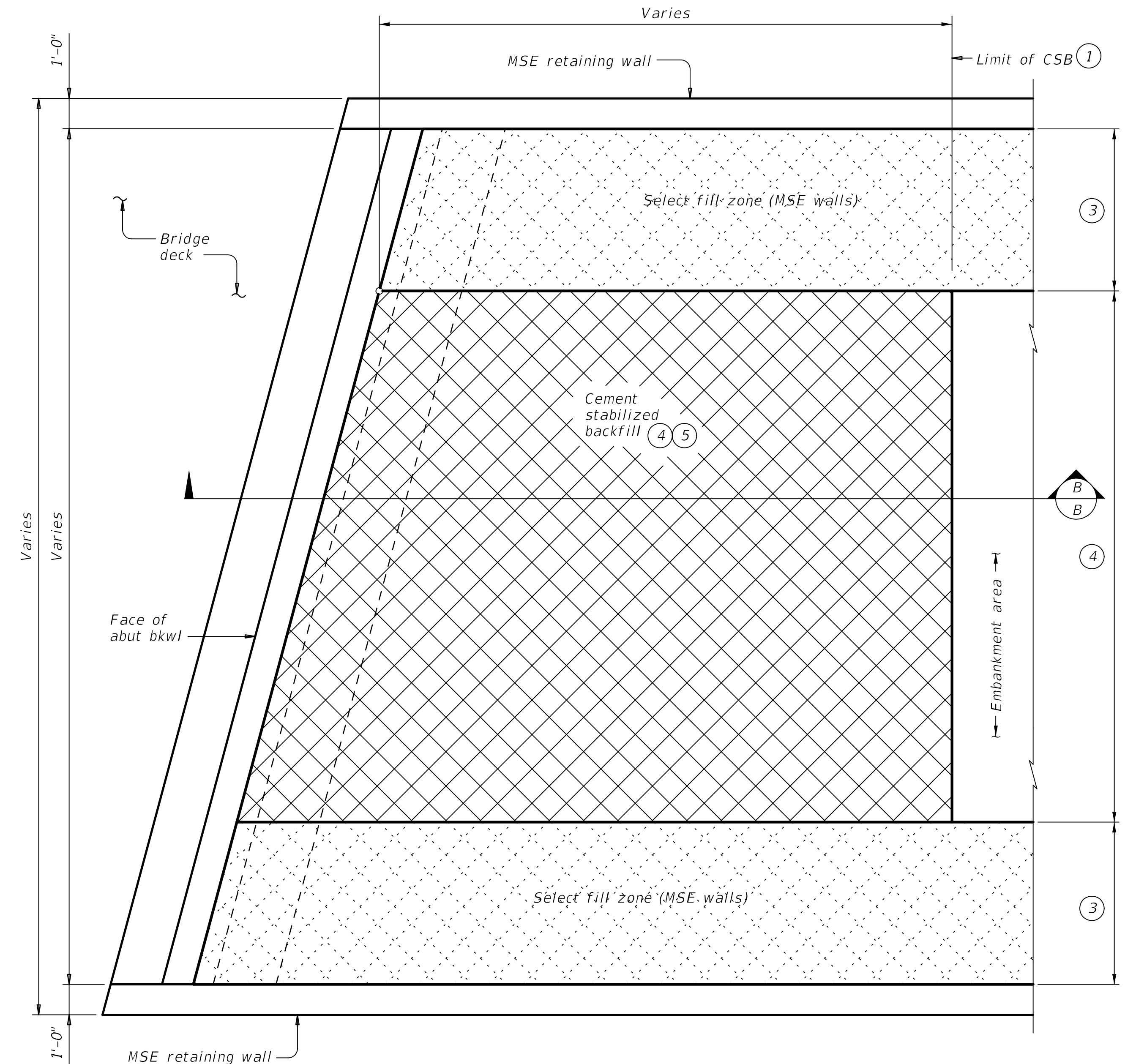
02-20: Added Option 2.	DIST		COUNTY	SHEET NO.
	ELP		CULBERSON	111



OPTION 2 ~ PLAN WITH WINGWALLS

Cast-in-place retaining walls similar.



OPTION 2 ~ PLAN WITH MSE RETAINING WALLS

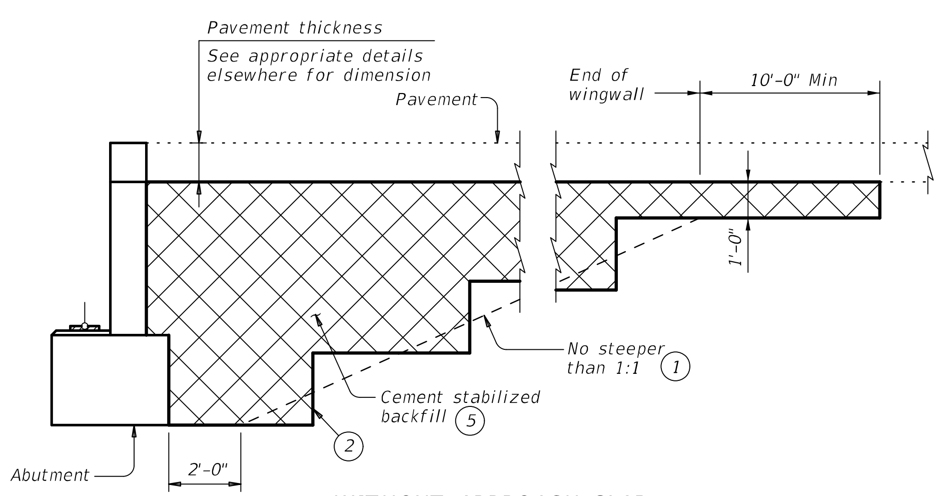
(1) Usual limit of Cement Stabilized Backfill is at end of wingwall. Extend CSB limits as required to maintain a slope no steeper than 1:1 at bottom of backfill.

(2) Bench backfill as shown with 12" (approximate) bench depths.

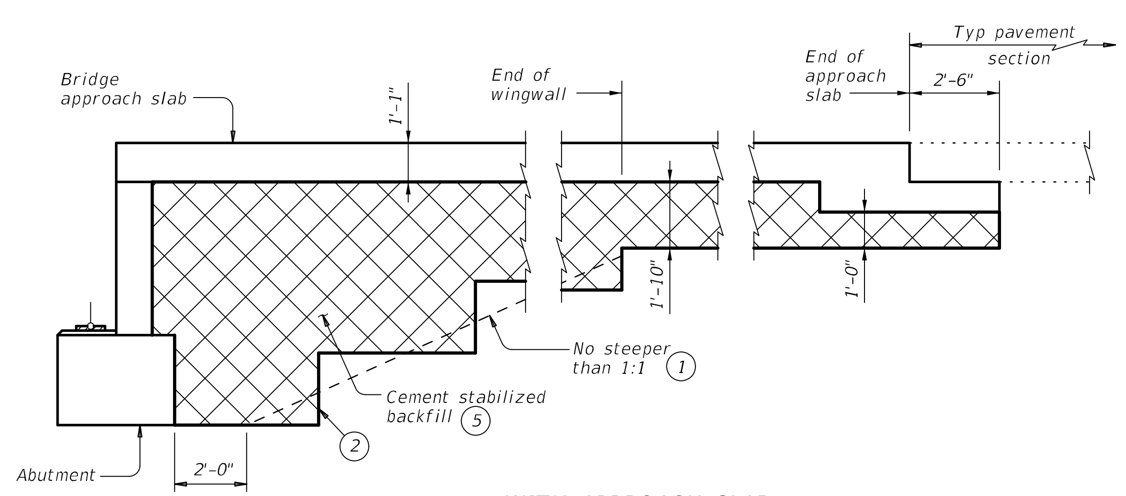
(3) Where MSE retaining walls are present, adjust CSB limits to accommodate the select fill zone. See retaining wall details for additional information.

(4) When distance between select fill zones is less than 5'-0", MSE select fill may be substituted for cement stabilized backfill with approval from the Engineer.

(5) If shown in the plans flowable backfill can be used as a substitute for cement stabilized backfill with the following constraints:
a). If flowable backfill is to be placed over MSE backfill then a filter fabric will be placed over the MSE backfill prior to placement of the flowable fill; and
b). Place flowable fill in lifts not exceeding 2 feet in height, place each successive lift when the previous lift has stiffened/hardened (i.e. has lost its flowability).



WITHOUT APPROACH SLAB



WITH APPROACH SLAB

(Showing BAS-C, BAS-A similar.)

SECTION B-B

SHEET 2 OF 2

Texas Department of Transportation

Bridge Division Standard

CEMENT STABILIZED ABUTMENT BACKFILL

BRIDGE ABUTMENT

CSAB

FILE: csabste1-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0233	05	038	SH 54
02-20: Added Option 2.	DIST		COUNTY	SHEET NO.
	ELP		CULBERSON	112

DATE: 9/27/2022 11:19:36 AM
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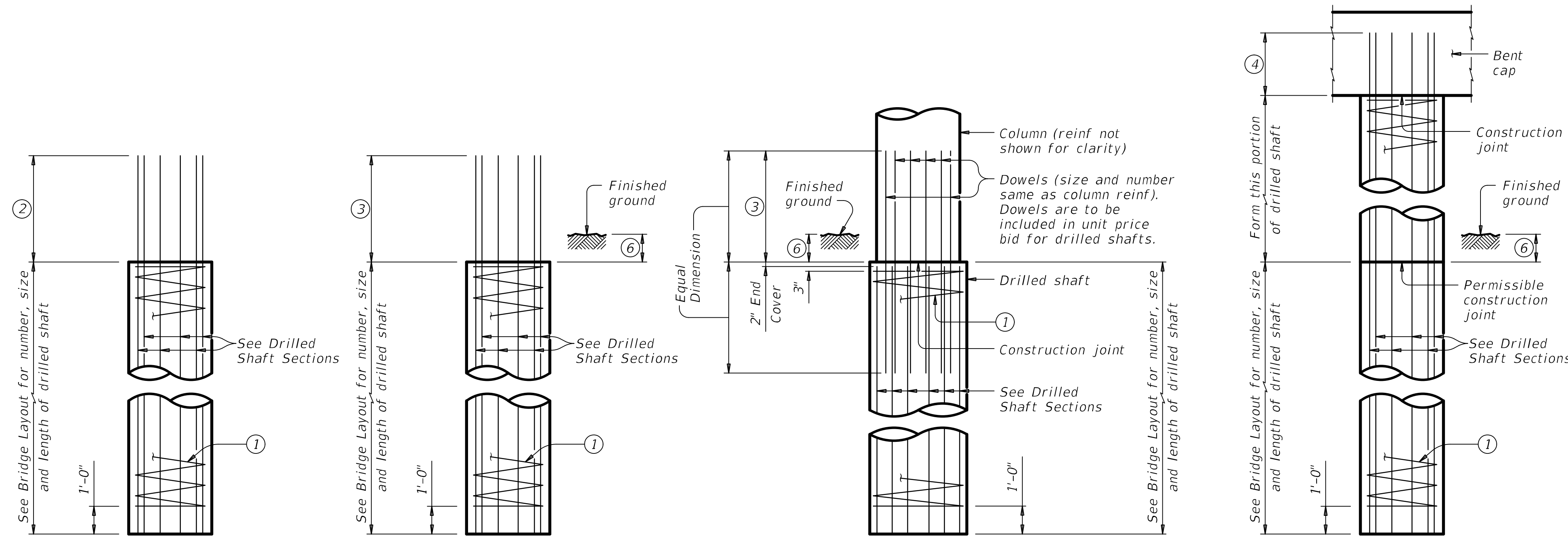
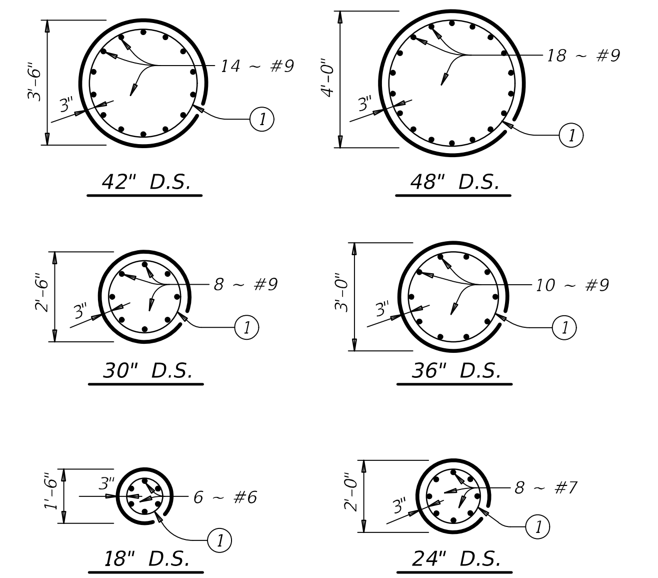


ABUTMENTS, WINGWALLS AND MULTI-DRILLED SHAFT FOOTINGS

INTERIOR BENTS DRILLED SHAFT DIA EQUAL TO COLUMN DIA

INTERIOR BENTS DRILLED SHAFT DIA GREATER THAN COLUMN DIA

OPTIONAL INTERIOR BENT DRILLED SHAFT DETAIL (5)

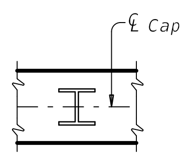


DRILLED SHAFT SECTIONS

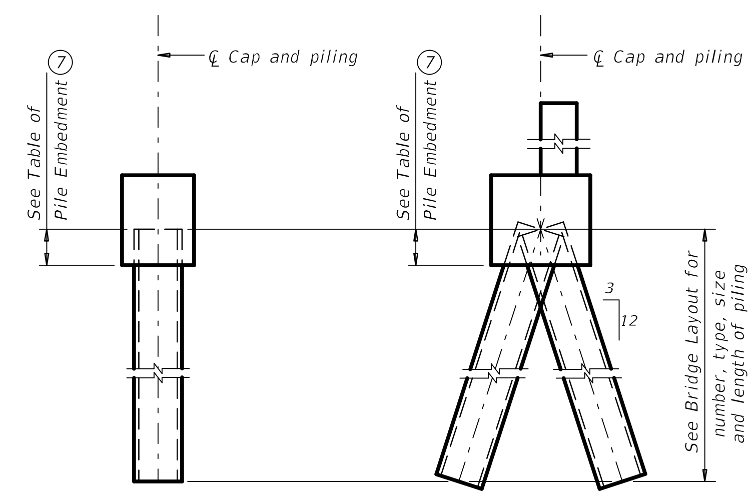
DRILLED SHAFT DETAILS

TABLE OF PILE EMBEDMENT	
Pile Type	Embedment Depth (Ft)
16" Sq Concrete 18" Sq Concrete HP14 Steel HP16 Steel	1'-0"
20" Sq Concrete 24" Sq Concrete HP18 Steel	1'-6"

See Prestressed Concrete Piling (CP) standard for additional details on concrete pile embedment.



ORIENTATION OF STEEL H-PILING

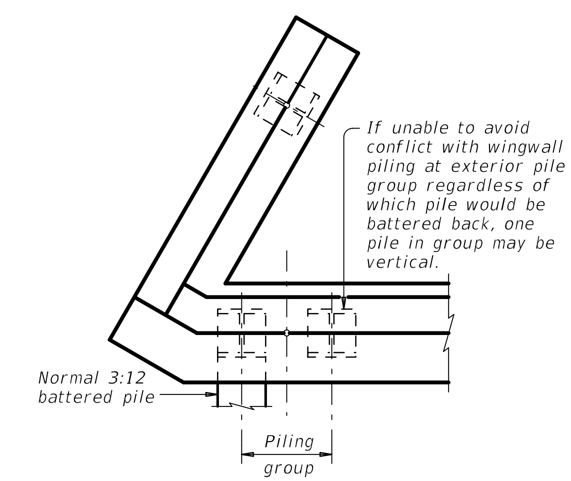


VERTICAL PILE

BATTERED PILE

PILING DETAILS

(Concrete or steel H)



DETAIL "A"

(Showing plan view of a 30° skewed abutment)

(1) #3 spiral at 6" pitch (one and a half flat turns top and bottom).

(2) Min extension into supported element:
#6 Bars = 1'-11"
#7 Bars = 2'-0"
#9 Bars = 2'-3"

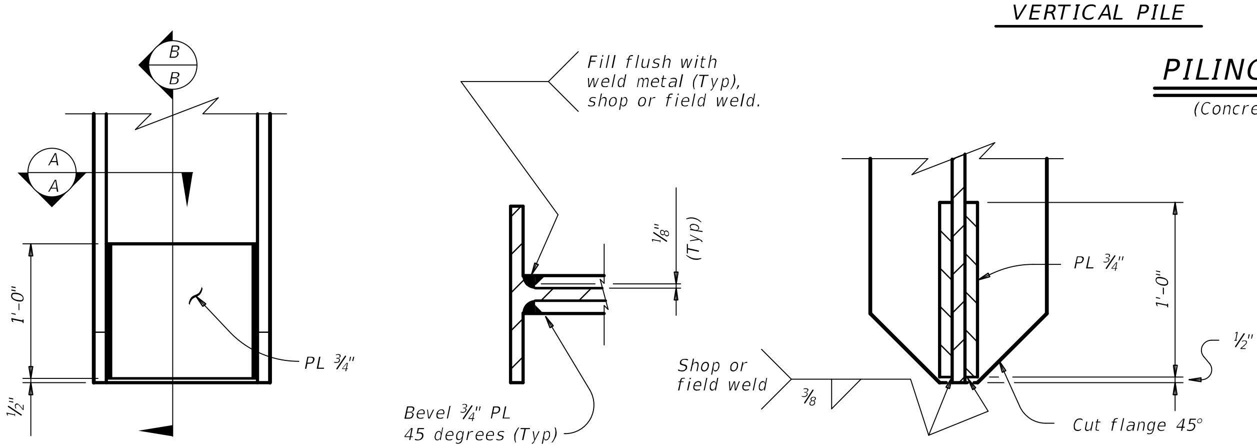
(3) Min lap with column reinf:
#7 Bars = 2'-11"
#9 Bars = 3'-9"
#11 Bars = 4'-8"

(4) Min extension into supported element:
#6 Bars = 1'-11"
#7 Bars = 2'-3"
#9 Bars = 2'-9"

(5) Drilled shafts may extend to the bottom of bent caps for "H" heights of 6 ft and less (as shown on the Bridge Layout), if approved. This option can only be used when the drilled shaft diameter equals the column diameter. Obtain approval of the forming method above the ground line prior to construction. No adjustments in payment will be made if this option is used.

(6) 1'-0" Min, unless shown otherwise on plans.

(7) Or as shown on plans.



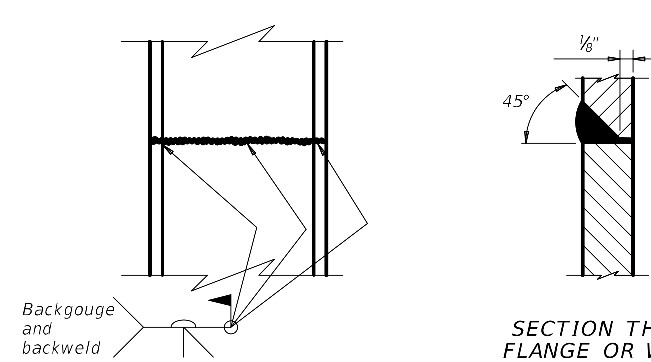
ELEVATION

SECTION A-A

SECTION B-B

STEEL H-PILE TIP REINFORCEMENT

See Item 407 "Steel Piling" to determine when tip reinforcement is required and for options to the details shown.



SECTION THRU FLANGE OR WEB

STEEL H-PILE SPLICE DETAIL

Use when required.

SHEET 1 OF 2

Texas Department of Transportation | Bridge Division Standard

COMMON FOUNDATION DETAILS

FD

FILE: fdstde01-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT April 2019	CONT 0233	SECT 05	JOB 038	HIGHWAY SH 54
REVISIONS 01-20: Added #11 bars to the FD bars.	DIST ELP		COUNTY CULBERSON	SHEET NO. 113

DATE: 9/27/2022 11:19:39 AM
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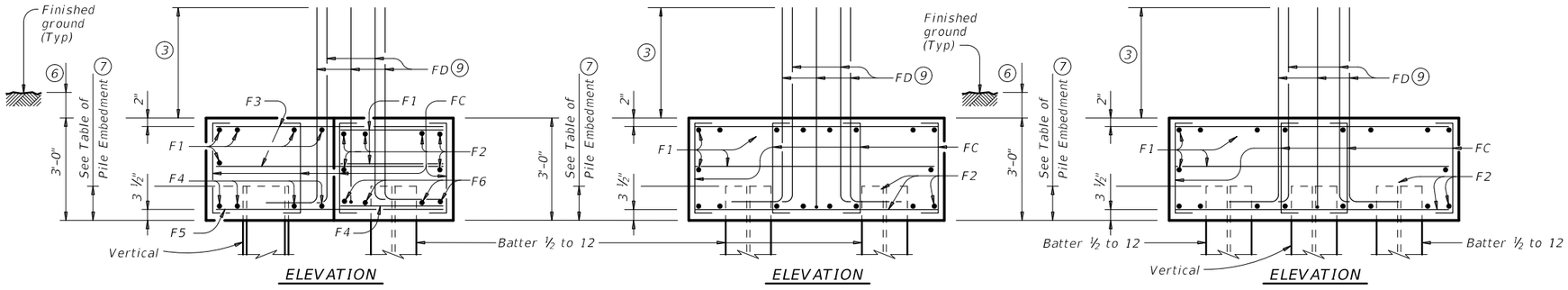
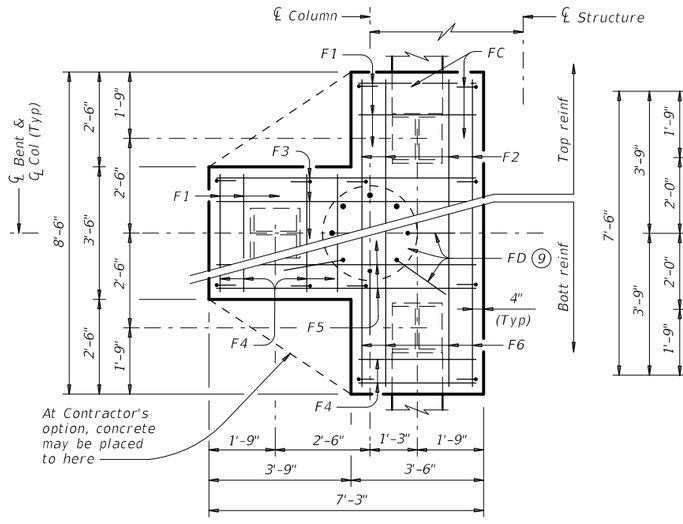
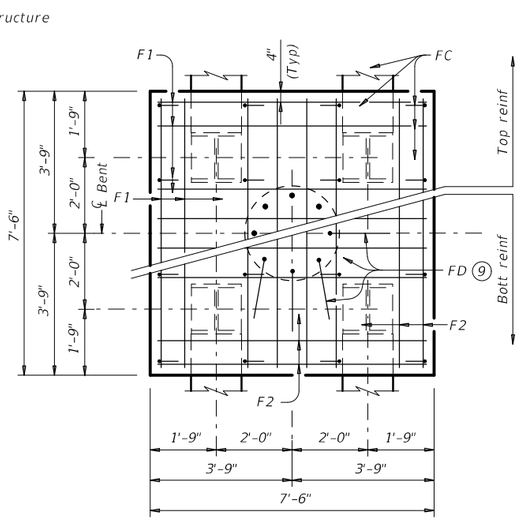




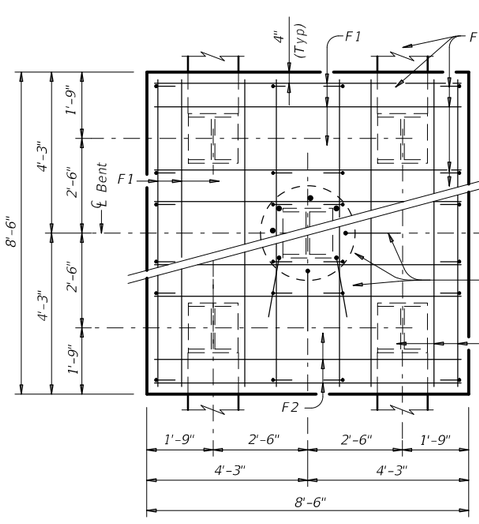
THREE PILE FOOTING (8)

For 36" Dia and smaller columns.



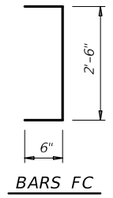
FOUR PILE FOOTING (8)

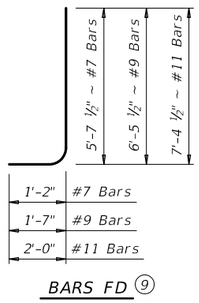
For 42" Dia and smaller columns.



FIVE PILE FOOTING (8)

For 42" Dia and smaller columns.





(3) Min lap with column reinforcing:
#7 Bars = 2'-11"
#9 Bars = 3'-9"
#11 Bars = 4'-8"

(6) 1'-0" Min, unless shown otherwise on plans.

(7) Or as shown on plans.

(8) See Bridge Layout for type, size and length of piling.

(9) Number and size of FD bars must match column reinforcing. Tie FD bars to the top of the bottom reinforcing mat.

(10) Adjust FD quantity, size and weight as needed to match column reinforcing.

TABLE OF FOOTING QUANTITIES FOR 30" COLUMNS

ONE 3 PILE FOOTING

Bar	No.	Size	Length	Weight
F1	11	#4	3'- 2"	23
F2	6	#4	8'- 2"	33
F3	6	#4	6'- 11"	28
F4	8	#9	3'- 2"	86
F5	4	#9	6'- 11"	94
F6	4	#9	8'- 2"	111
FC	12	#4	3'- 6"	28
FD (10)	8	#9	8'- 1"	220
Reinforcing Steel			Lb	623
Class "C" Concrete			CY	4.8

ONE 4 PILE FOOTING

Bar	No.	Size	Length	Weight
F1	20	#4	7'- 2"	96
F2	16	#8	7'- 2"	306
FC	16	#4	3'- 6"	37
FD (10)	8	#9	8'- 1"	220
Reinforcing Steel			Lb	659
Class "C" Concrete			CY	6.3

ONE 5 PILE FOOTING

Bar	No.	Size	Length	Weight
F1	20	#4	8'- 2"	109
F2	16	#9	8'- 2"	444
FC	24	#4	3'- 6"	56
FD (10)	8	#9	8'- 1"	220
Reinforcing Steel			Lb	829
Class "C" Concrete			CY	8.0

CONSTRUCTION NOTES:

See Bridge Layout for foundation type required. Use these foundation details unless shown otherwise.

Drive piling under abutment wingwalls to a minimum resistance of 10 Tons/Pile unless shown otherwise.

Provide Class C Concrete (f'c = 3,600 psi), unless shown otherwise.

Provide Grade 60 reinforcing steel.

Galvanize reinforcing if shown elsewhere in the plans.

Provide bar laps for drilled shaft reinforcing, where required, as follows:

Uncoated or galvanized (#6) ~ 2'-6"
Uncoated or galvanized (#7) ~ 2'-11"
Uncoated or galvanized (#9) ~ 3'-9"

GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications.

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

DESIGNER NOTES:

Do not use the drilled shaft details shown on this standard for retaining wall, noise wall, barrier, or sign foundations without structural evaluation.

Do not use the footings shown on this standard in direct contact with salt water or exposed to salt water spray.

Maximum allowable pile loads for the footings shown are:

72 Tons/Pile with 24" Dia Columns
80 Tons/Pile with 30" Dia Columns
100 Tons/Pile with 36" Dia Columns
120 Tons/Pile with 42" Dia Columns

Texas Department of Transportation

Bridge Division Standard

COMMON FOUNDATION DETAILS

FD

FILE: fdstde01-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0233	05	038	SH 54
01-20: Added #11 bars to the FD bars.	DIST	COUNTY		SHEET NO.
	ELP	CULBERSON		114

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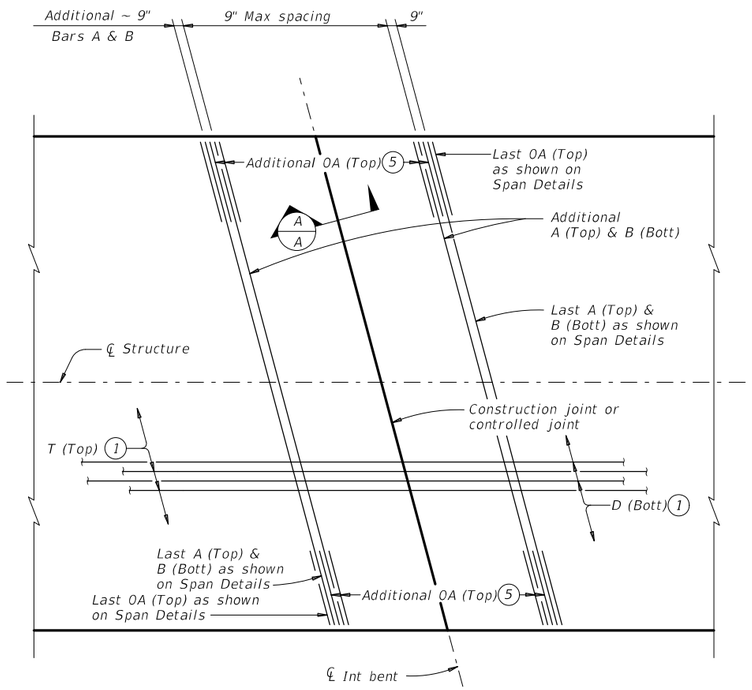
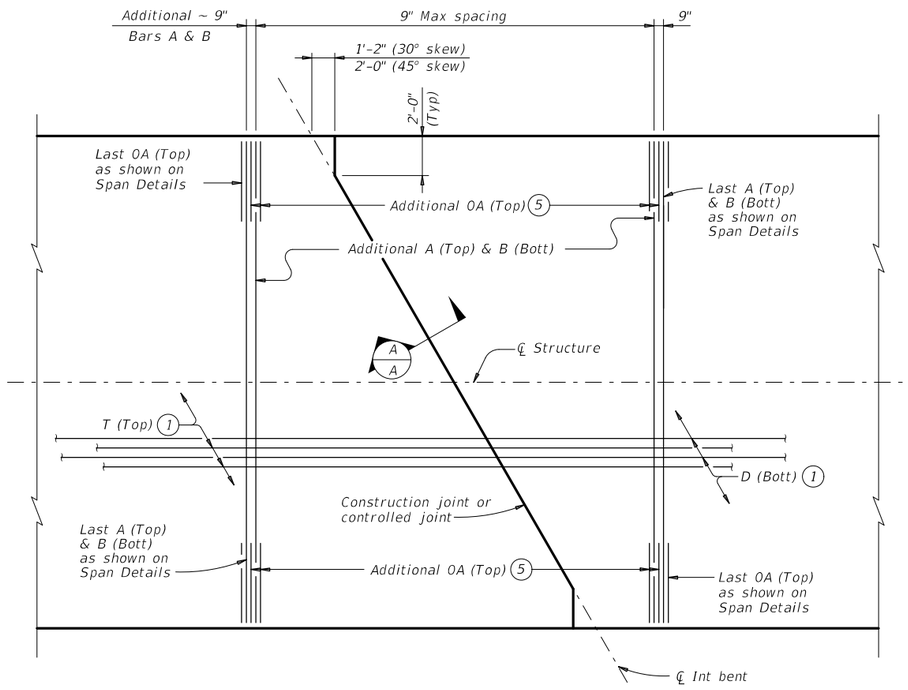


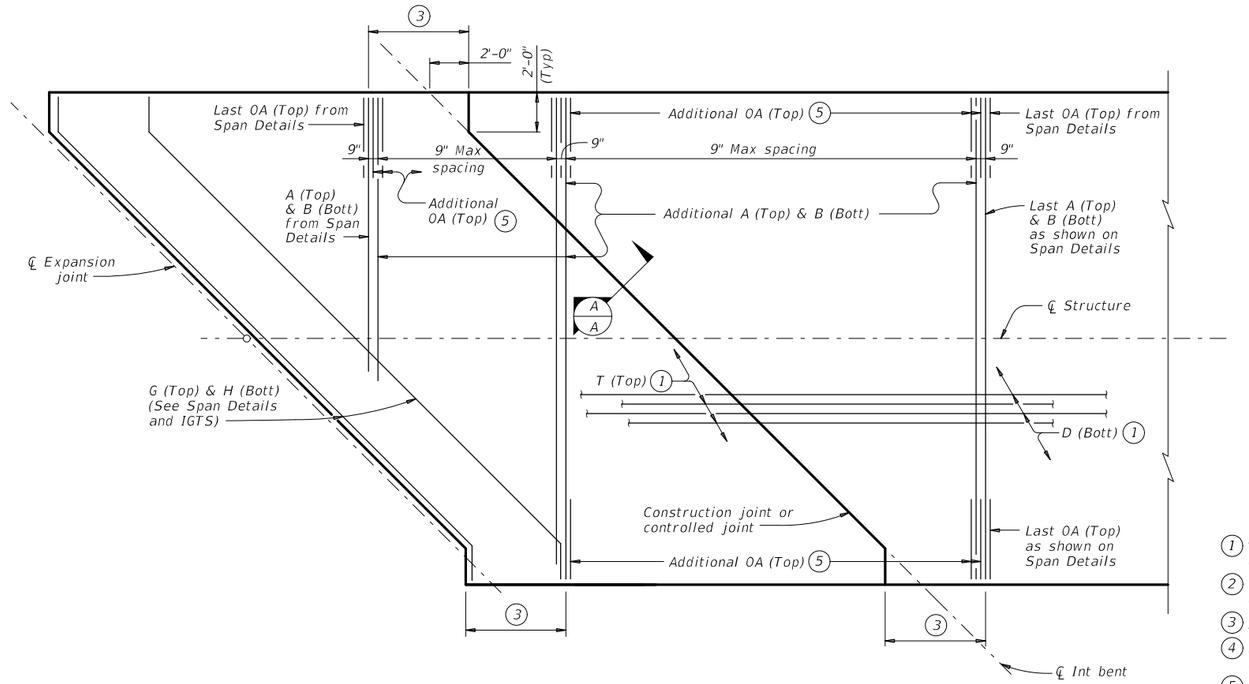
PLAN FOR 0° OR 15° SKEW

(Showing 15° skew)



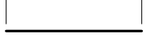
PLAN FOR 30° OR 45° SKEW

(Showing 30° skew)

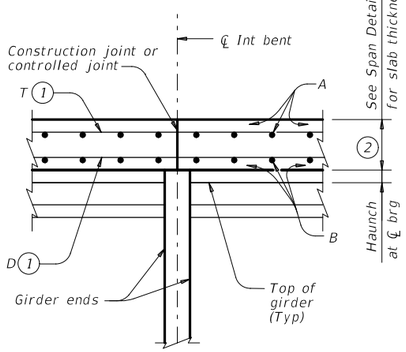


PLAN FOR 45° SKEW 4

(Showing short span condition.)



BARS OA (#5)



SECTION A-A

Bars 0A (Top) not shown for clarity.

1. Top and bottom mats must be continuous through joint.
2. Maintain a constant slab thickness over the bent.
3. 5'-4" as shown on Span Details.
4. Use these details when no full slab width bars A and B are shown on Span Details.
5. Bars 0A (Top) at 9" Max spacing between Bars A (Top).
6. Values in table assume a temperature change of 70° F after erection when calculating thermal movement in one direction (not total).

TABLE OF (6) ALLOWABLE UNIT LENGTH

Max Rdwy Grade, Percent	Unit Length Factor
0.00	4.1
1.00	3.9
2.00	3.7
3.00	3.5
4.00	3.3
5.00	3.1

Unit length must not exceed the length of the shortest end span times the Unit Length Factor shown in table or 400', whichever is less.

BAR TABLE

BAR	SIZE
A	#4
B	#4
D	#4
T	#4
0A	#5

The details shown on this sheet are applicable for two and three span units comprised of the same girder type.
Units may be comprised of different span lengths. See "Table of Allowable Unit Length".

GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications.

This standard is drawn showing right forward skew. See Bridge Layout for actual skew direction.

CONSTRUCTION NOTES:

Where multi-span units are indicated on the Bridge Layout, the thickened slab end details and reinforcement shown on IGTS standard (Bars AA, G, H, J, K, and M) and on the Span Details will be omitted where slabs are continuous over interior bents. At these locations, the slab details and reinforcement will be as shown on this sheet or on PCP standard (if using this option).

Thickened slab end reinforcement and details still apply at expansion joint locations (ends of units).

See Span Details for remainder of slab reinforcement and details.

MATERIAL NOTES:

Provide Grade 60 reinforcing steel.

Provide Class "S" concrete (f'c = 4,000 psi). Provide Class "S" (HPC) if shown elsewhere on the plans.

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

The details shown on this sheet are applicable for use only with the Prestressed Concrete I-Girder Standard Designs shown on standards IGSD-24, IGSD-28, IGSD-30, IGSD-32, IGSD-38, IGSD-40 and IGSD-44.

HL93 LOADING

Texas Department of Transportation

Bridge Division Standard

CONTINUOUS SLAB DETAILS

PRESTR CONC I-GIRDER SPANS

IGCS

FILE: igcs1sts-19.dgn	DN: JMH	CK: TxDOT	DW: JTR	CK: TxDOT
©TxDOT August 2017	CONT	SECT	JOB	HIGHWAY
REVISIONS	0233	05	038	SH 54
10-19: Added bubble note 6.	DIST	COUNTY		SHEET NO.
	ELP	CULBERSON		115

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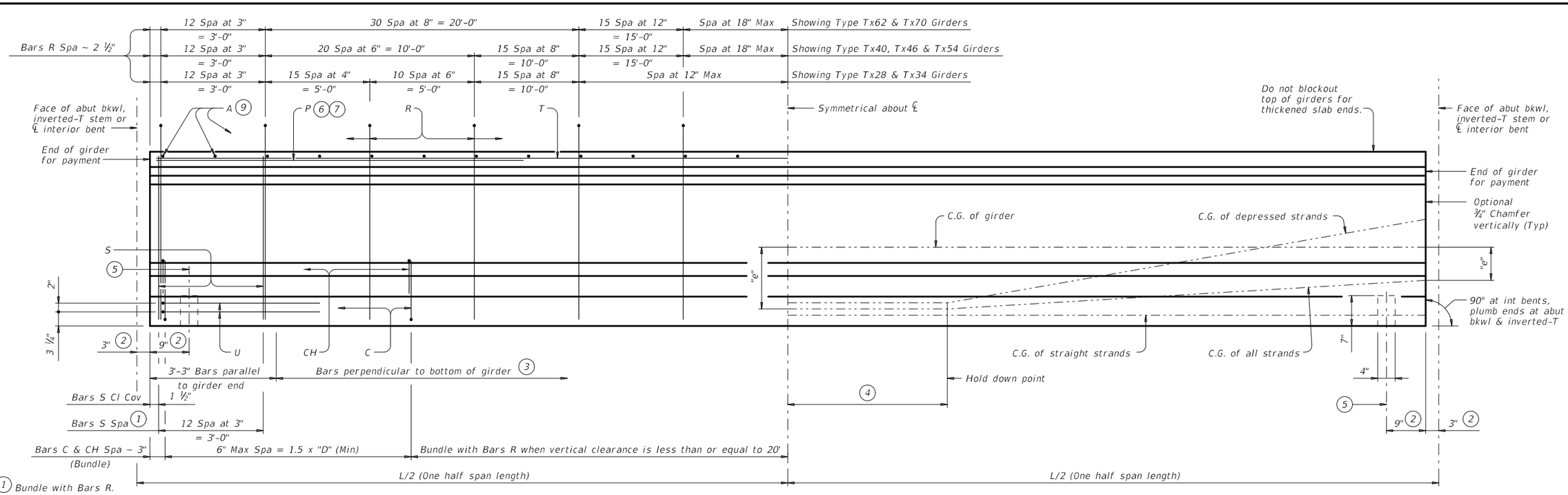


(1) Bundle with Bars R.

(2) Measured along ℄ Girder at interior bents; perpendicular to abutment bkwl or inverted-T stem.

(3) The average of the top and bottom spacing of Bars R cannot exceed the required spacing.

(4) L/20, but not less than 5'-0" (-0,+2').

(5) ℄ 4" x 1 ½" Vertical Slotted Hole at doweled girder end [labeled (D) on Bridge Layout]. Required for outside girder only or as shown on substructure details. Anchorage holes may be tapered (4 ¾" x 1 ⅝") at base. If holes are formed with sheet metal, forms may be left in place.

GIRDER ELEVATION

(6) Bars P (#6 x 15'-0") required in Tx62 and Tx70 girders. At the fabricator's option bars larger than #6 may be used. When L is less than 50 ft, Bars P are to be the same length as Bars T.

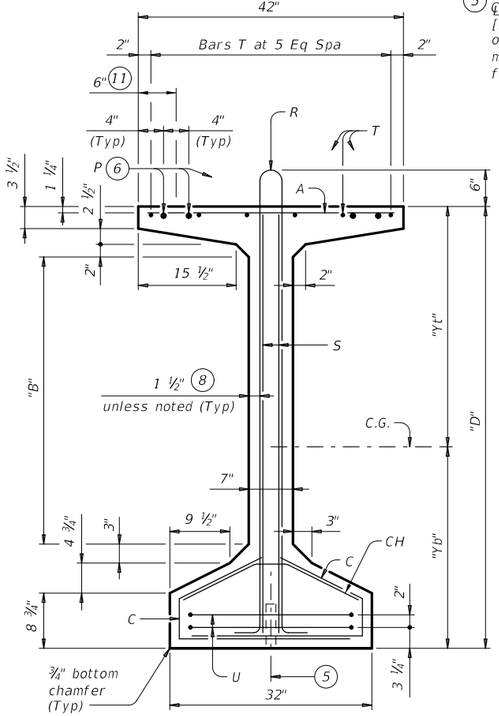
(7) Bars P (#6 x 15'-0") are only required in Tx28, Tx34, Tx40, Tx46, and Tx54 girders when "e" at girder ends exceeds 0.25 x "D". At the fabricator's option bars larger than #6 may be used. When L is less than 50 ft, Bars P are to be the same length as Bars T.

(8) 1 ⅜" Clear Cover to Bars S.

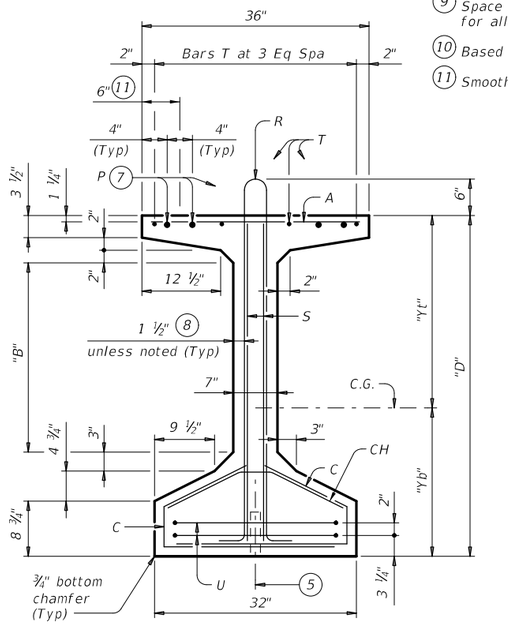
(9) Space Bars A at 6" Max for girders requiring overhang bracket hangers. Space at 12" Max for all other girders. Tie to Bars R as necessary. See standard IGMS for "Deck Forming Notes".

(10) Based on 155 pcf total weight of concrete and reinforcing steel.

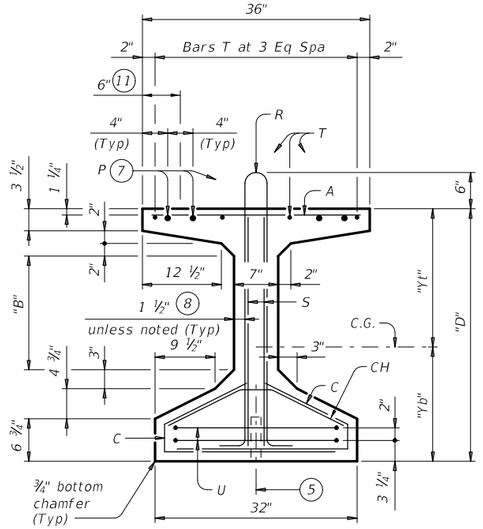
(11) Smooth trowel finish on the slab overhang side of exterior girder.



TYPE Tx62 & Tx70



TYPE Tx46 & Tx54



TYPE Tx28, Tx34 & Tx40

GIRDER DIMENSIONS AND SECTION PROPERTIES

Girder Type	"D" (in.)	"B" (in.)	"Yt" (in.)	"Yb" (in.)	Area (in.²)	"Ix" (in.⁴)	"Iy" (in.⁴)	Weight (10) (plf)
Tx28	28	6	15.02	12.98	585	52,772	40,559	630
Tx34	34	12	18.49	15.51	627	88,355	40,731	675
Tx40	40	18	21.90	18.10	669	134,990	40,902	720
Tx46	46	22	25.90	20.10	761	198,089	46,478	819
Tx54	54	30	30.49	23.51	817	299,740	46,707	880
Tx62	62	37 ½"	33.72	28.28	910	463,072	57,351	980
Tx70	70	45 ½"	38.09	31.91	966	628,747	57,579	1,040

GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications.
Provide Class H concrete.
Provide Grade 60 reinforcing steel.
An equal area of deformed Welded Wire Reinforcement (WWR) (ASTM A1064) may be substituted for Bars A, C, R or T unless otherwise noted.
It is permissible for bars or strands to come in contact with materials used in forming anchor holes.

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

HL93 LOADING

SHEET 1 OF 2

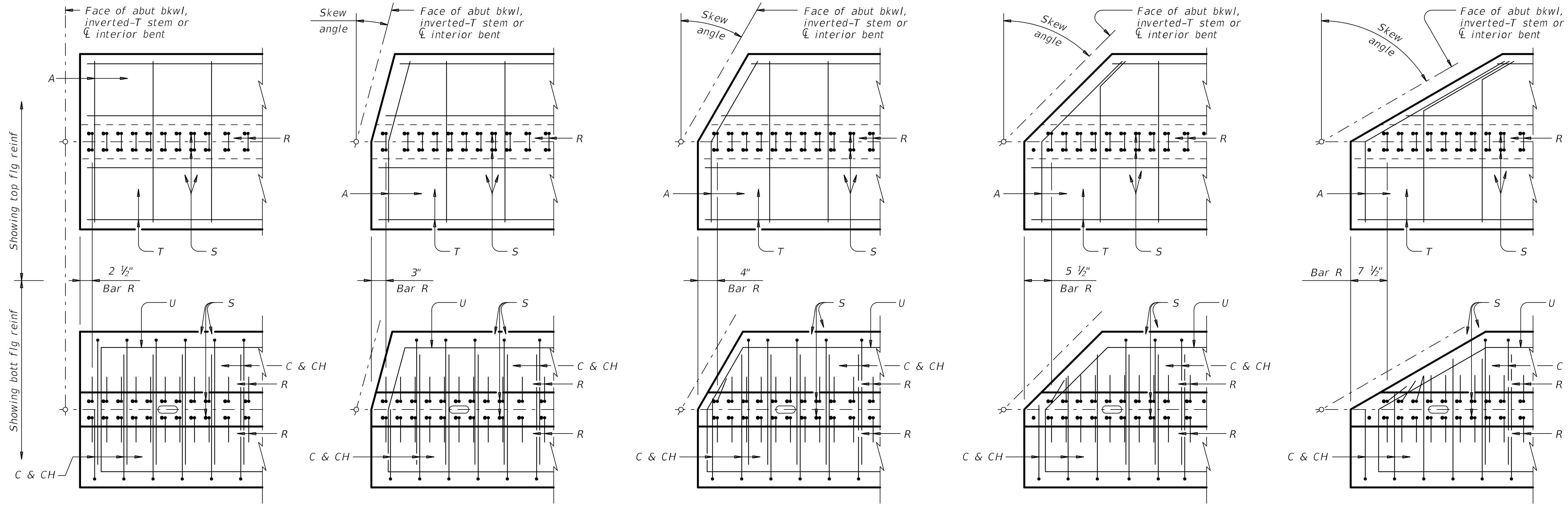
Texas Department of Transportation

Bridge Division Standard

PRESTRESSED CONCRETE I-GIRDER DETAILS

IGD

FILE: igdstds1-19.dgn	DN: TxDOT	CK: JMH	DW: JTR	CK: TAR
©TxDOT August 2017	CONT	SECT	JOB	HIGHWAY
REVISIONS	0233	05	038	SH 54
10-19: Added Bars C and CH full length for VC<= 20'	DIST	COUNTY		SHEET NO.
	ELP	CULBERSON		116



0° SKEW

15° SKEW

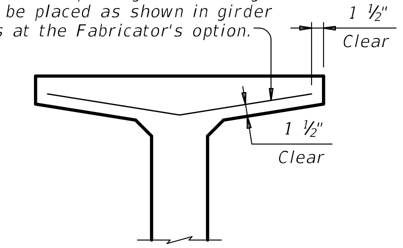
30° SKEW

45° SKEW

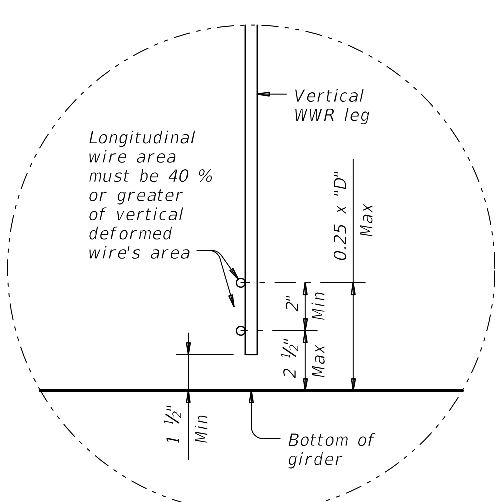
60° SKEW

PLAN OF GIRDER ENDS (12)

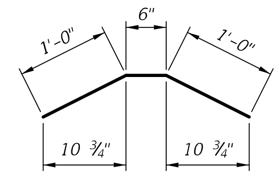
To control top flange cracking that may occur during form removal, additional top flange reinforcing may be placed as shown in girder ends at the Fabricator's option.



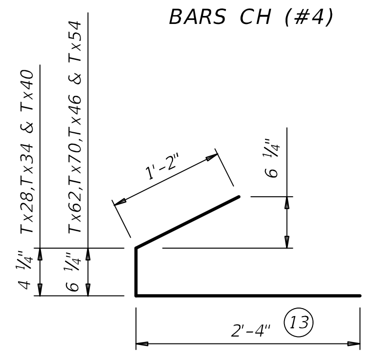
OPTIONAL TOP FLANGE REINFORCING DETAIL



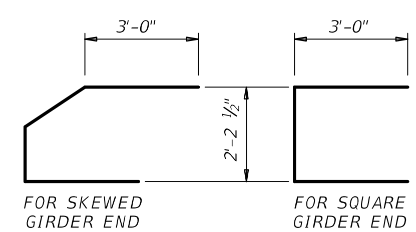
OPTIONAL WELDED WIRE REINFORCEMENT (WWR) DETAIL



BARS CH (#4)



BARS C (#4)



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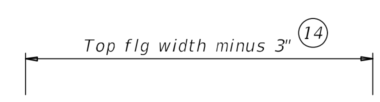
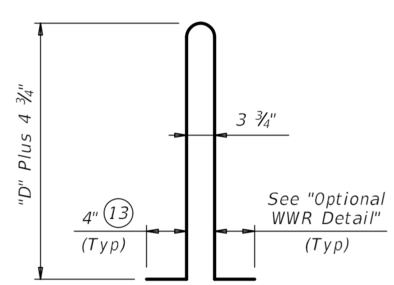
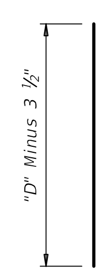


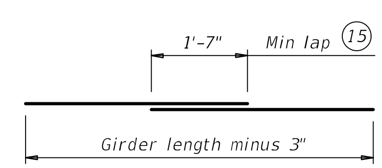
BARS A (#3)



BARS R (#4) (16)



BARS S (#6)



BARS T (#4)

(12) Reinforcing patterns shown are provided as guides to determine reinforcement placement in skewed ends. Place Bars S as close to girder end as cover requirements permit, which may prevent them to be bundled with Bars R.

(13) Bars may be cut or bent at skewed end as required.

(14) Increase as necessary for bars at skewed end.

(15) No portion of bar less than 10 ft.

(16) For Welded Wire Reinforcement (WWR) option, area of Bars R may be reduced in proportion to the increase in reinforcement yield strength over 60 ksi. Yield strength of WWR is limited to 75 ksi.

HL93 LOADING

SHEET 2 OF 2

Texas Department of Transportation | Bridge Division Standard

PRESTRESSED CONCRETE I-GIRDER DETAILS

IGD

FILE: igdstds1-19.dgn	DN: TxDOT	CK: JMH	DW: JTR	CK: TAR
©TxDOT August 2017	CONT	SECT	JOB	HIGHWAY
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10-19: Added Bars C and CH full length for VC<= 20'	DIST		COUNTY	SHEET NO.
	ELP		CULBERSON	117

DATE: 9/27/2022 11:19:46 AM
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DATE: 9/27/2022 11:19:50 AM
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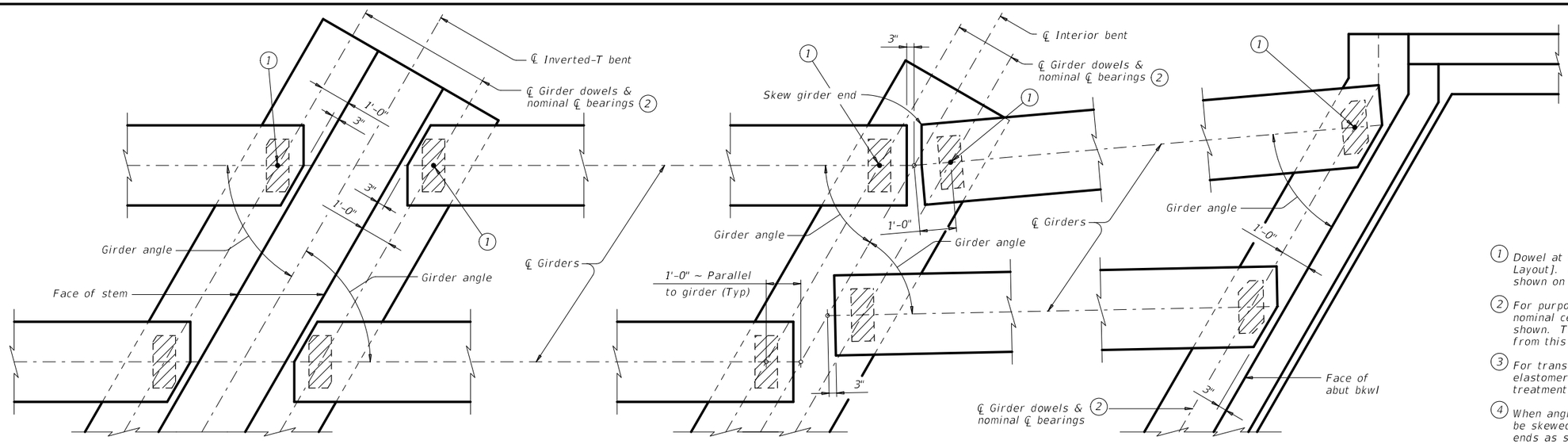


AT INVERTED-T BENT W/SKEW

AT CONVENTIONAL INTERIOR BENT W/SKEW

AT ABUTMENT W/SKEW (3)

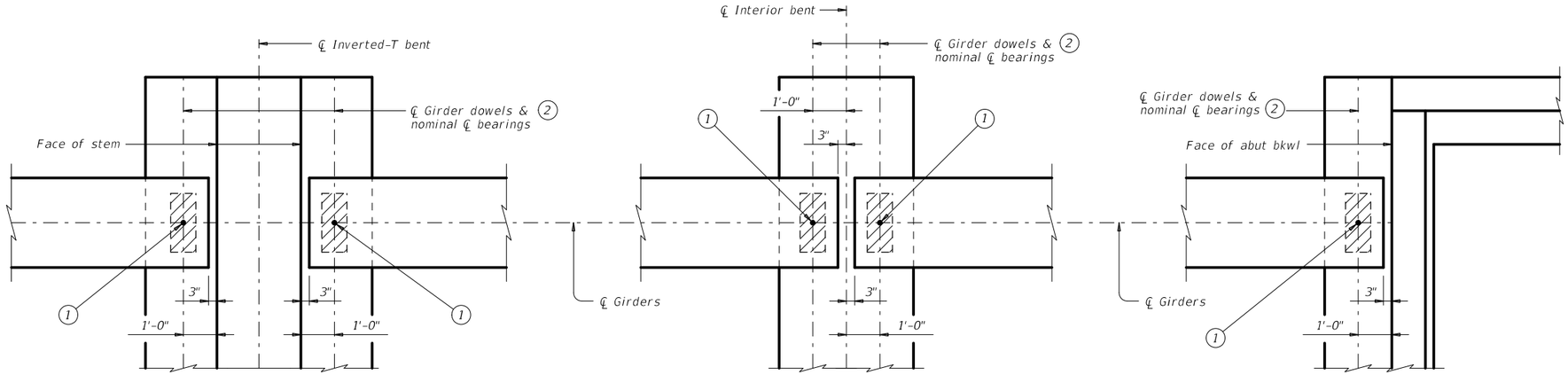
(1) Dowel at doweled girder end [labeled (D) on Bridge Layout]. Required for outside girder only or as shown on substructure details.

(2) For purposes of computing bearing seat elevations, nominal centerline of bearing must be defined as shown. The actual center of bearing pad may vary from this line.

(3) For transition bents with backwall, girder and elastomeric bearings must receive the same treatment as shown for abutments.

(4) When angle exceeds 0°, one or both girders ends must be skewed to maintain the clearance between girder ends as shown in view.

(5) See Table of Bearing Pad Dimensions for bearing size. Girder end skew angles in Table not applicable for this situation. Table reflects girder conflicts of this type on radial bents only.

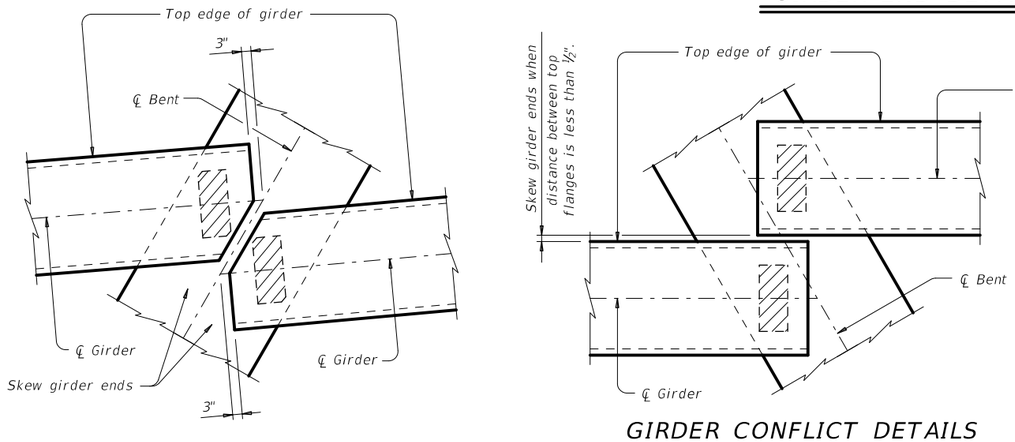


AT INVERTED-T BENT

AT CONVENTIONAL INTERIOR BENT

AT ABUTMENT (3)

GIRDER END DETAILS



GIRDER CONFLICT DETAILS

GENERAL NOTES:

These details accommodate skew angles up to 60°. Shop drawings for approval are required.

A bearing layout which identifies location and orientation of all bearings must be developed by the bearing fabricator. Permanently mark each bearing in accordance with the bearing layout. A copy of the bearing layout is to be provided to the Engineer.

Cost of furnishing and installing elastomeric bearings, including beveled and embedded steel plates, must be included in unit price bid for "Prestressed Concrete Girders".

HL93 LOADING SHEET 1 OF 3

Texas Department of Transportation — Bridge Division Standard

ELASTOMERIC BEARING AND GIRDER END DETAILS
PRESTR CONCRETE I-GIRDERS

IGEB

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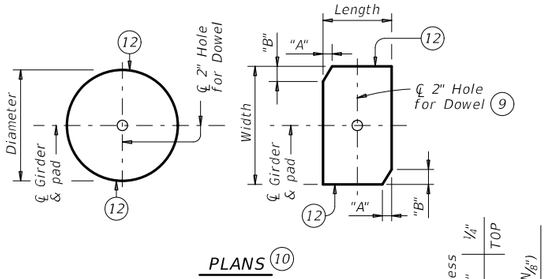
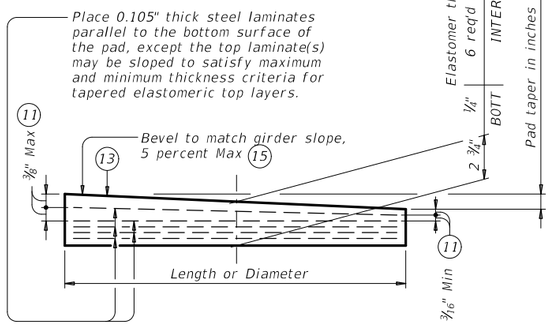


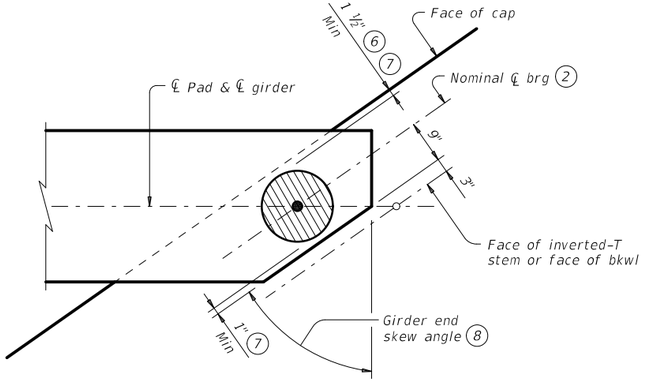
PLANS (10)



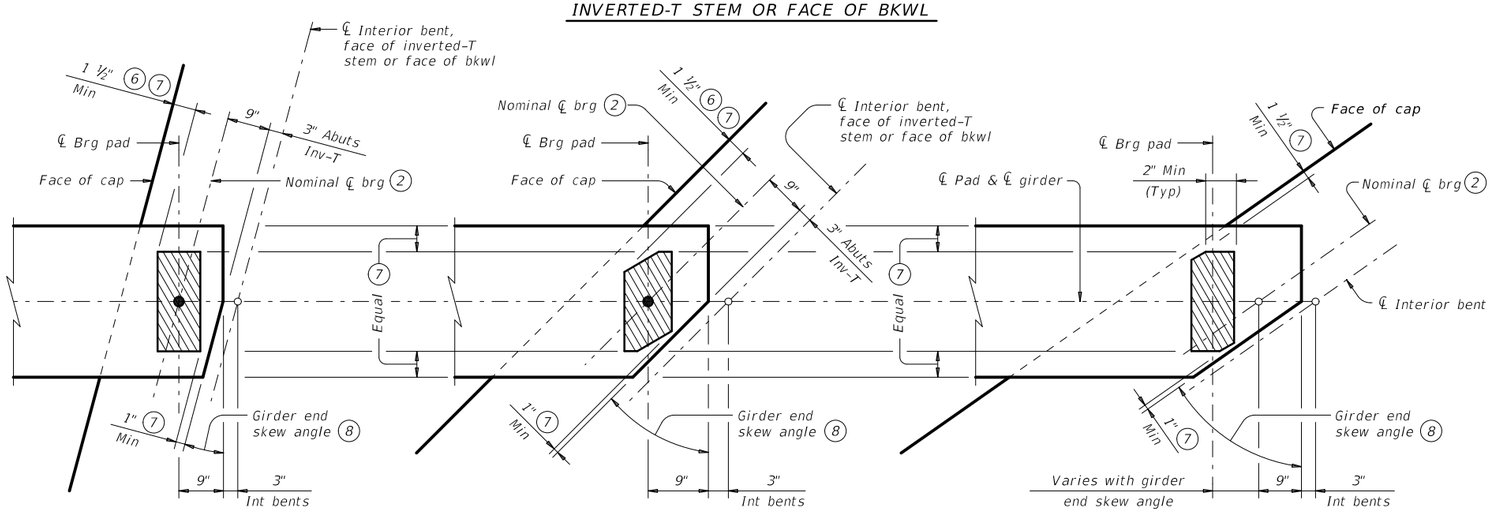
ELEVATION

LAMINATED ELASTOMERIC BEARING PAD

(50 DUROMETER)



ROUND BEARINGS FOR SKEWED GIRDER ENDS AT FACE OF INVERTED-T STEM OR FACE OF BKWL



SKEWED GIRDER ENDS AT INT BENTS, FACE OF INVERTED-T STEM OR FACE OF BKWL

SKEWED GIRDER ENDS AT CONVENTIONAL INTERIOR BENTS (16)

(NO GIRDER DOWELS)

BEARING PAD PLACEMENT DIAGRAMS

TABLE OF MINIMUM SUBSTRUCTURE DIMENSIONS (14)

Girder Type	Abutments	Int Bents	Inv-T Bents
	Face of Bkwl to Face of Cap	Overall Cap Width	Corbel Width
Tx28 thru Tx54	1'-9"	3'-6"	1'-10 ½"
Tx62 & Tx70	2'-0"	4'-0"	2'-1 ½"

TABLE OF BEARING PAD DIMENSIONS

Bent Type	Girder Type	Bearing Type (13)	Girder End Skew Angle Range	Pad Size Lgth x Wdth	Pad Clip Dimensions "A"	Pad Clip Dimensions "B"
ABUTMENTS, INVERTED-T AND TRANSITION BENTS WITH BACKWALLS	Tx28,Tx34, Tx40,Tx46 & Tx54	G-1-"N"	0° thru 21°	8" x 21"	---	---
		G-2-"N"	21°+ thru 30°	8" x 21"	1 ½"	2 ½"
		G-3-"N"	30°+ thru 45°	9" x 21"	4 ½"	4 ½"
		G-4-"N"	45°+ thru 60°	15" Dia	---	---
	Tx62 & Tx70	G-5-"N"	0° thru 21°	9" x 21"	---	---
		G-6-"N"	21°+ thru 30°	9" x 21"	1 ½"	2 ½"
		G-7-"N"	30°+ thru 45°	10" x 21"	4 ½"	4 ½"
		G-8-"N"	45°+ thru 60°	10" x 21"	7 ¼"	4 ¼"
CONVENTIONAL INTERIOR BENTS	Tx28,Tx34, Tx40,Tx46 & Tx54	---	---	---	---	---
		---	---	---	---	---
		G-1-"N"	0° thru 60°	8" x 21"	---	---
	Tx62 & Tx70	G-5-"N"	0° thru 60°	9" x 21"	---	---
CONVENTIONAL INTERIOR BENTS WITH SKEWED GIRDER ENDS (GIRDER CONFLICTS) (16)	Tx28,Tx34, Tx40,Tx46 & Tx54	G-1-"N"	0° thru 18°	8" x 21"	---	---
		G-2-"N"	18°+ thru 30°	8" x 21"	1 ½"	2 ½"
		G-9-"N"	30°+ thru 45°	8" x 21"	3"	3"
		G-10-"N"	45°+ thru 60°	9" x 21"	6"	3 ½"
	Tx62 & Tx70	G-5-"N"	0° thru 18°	9" x 21"	---	---
		G-5-"N"	18°+ thru 30°	9" x 21"	---	---
		G-11-"N"	30°+ thru 45°	9" x 21"	1 ½"	1 ½"
		G-12-"N"	45°+ thru 60°	9" x 21"	3"	1 ¾"

(2) For purposes of computing bearing seat elevations, nominal centerline of bearing must be defined as shown. The actual center of bearing pad may vary from this line.

(6) 3" for inverted-T.

(7) Place centerline pad as near nominal centerline bearing as possible between limits shown.

(8) Girder end skew angle is equal to 90° minus the girder angle except at some conflicting girders.

(9) Provide 2" dia hole only at locations required. See Substructure details for location.

(10) See Table of Bearing Pad Dimensions for dimensions.

(11) Maximum and minimum layer thicknesses shown are for elastomer only, on tapered layers.

(12) Locate Permanent Mark here.

(13) Indicate BEARING TYPE on all pads. For tapered pads, locate BEARING TYPE on the high side. The Fabricator must include the value of "N" (amount of taper in ⅛" increments) in this mark.
Examples: N=0, (for 0" taper)
N=1, (for ⅛" taper)
N=2, (for ¼" taper)
(etc.)
Fabricated pad top surface slope must not vary from plan girder slope by more than $\left(\frac{0.0625"}{\text{Length or Dia}}\right)$ IN/IN.

(14) Substructure dimensions must satisfy the minimums provided to accommodate the elastomeric bearings shown on this standard.

(15) See sheet 3 of 3 for beveled plate use when slopes exceed 5 percent.

(16) If girder end is skewed for a girder conflict at an interior bent and a beveled sole plate is required, use bearing type for abutments at this location. Location of bearing centerline is to be set as for abutments in this case.

HL93 LOADING SHEET 2 OF 3

Texas Department of Transportation | Bridge Division Standard

ELASTOMERIC BEARING AND GIRDER END DETAILS
PRESTR CONCRETE I-GIRDERS

IGEB

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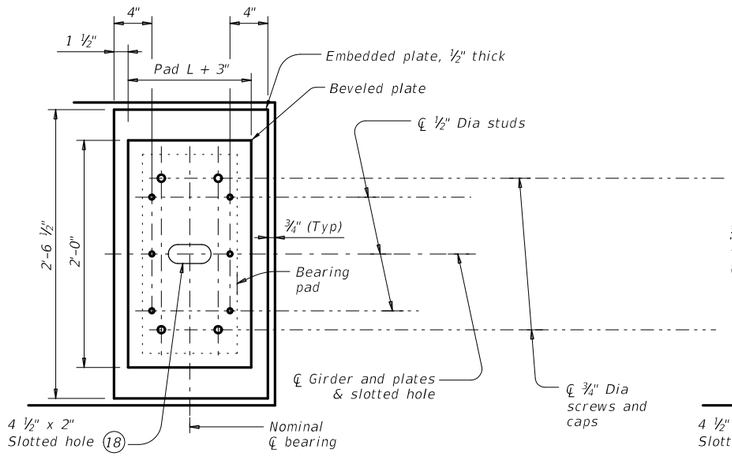
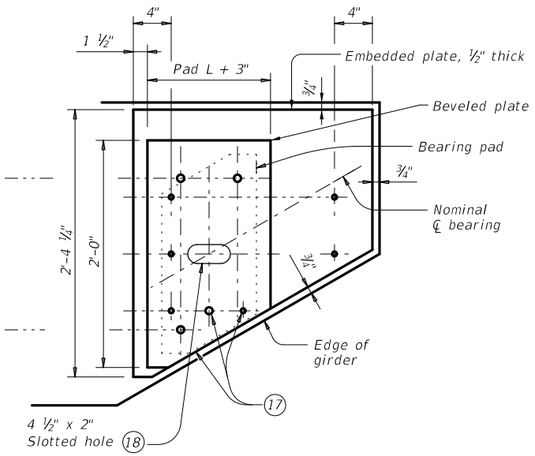
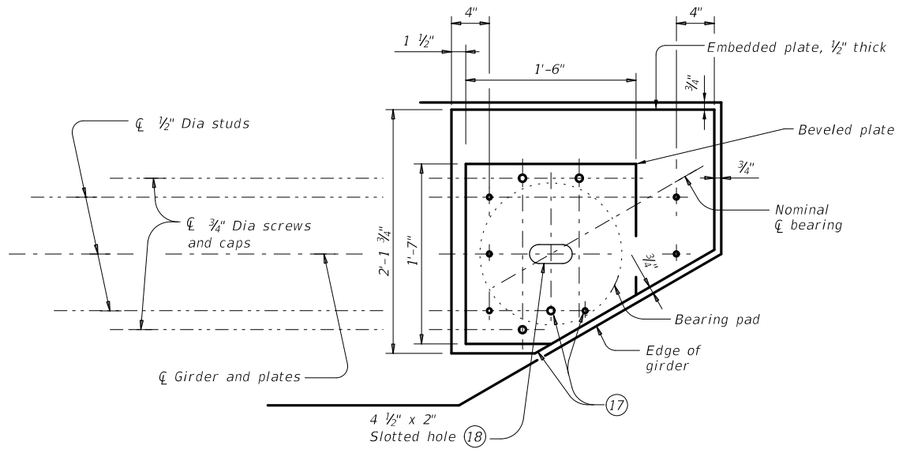


NORMAL GIRDER END
RECTANGULAR BEARING PAD

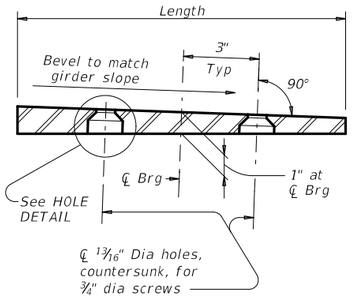


SKEWED GIRDER END
CLIPPED RECTANGULAR BEARING PAD

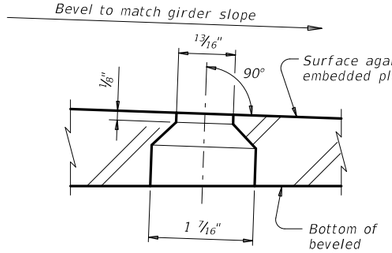


SKEWED GIRDER END
15" DIA BEARING PAD

PLAN VIEW OF SOLE PLATE DETAILS



SECTION



HOLE DETAIL

(17) Cut beveled and embedded plates to match girder end skew. Adjust location of screw and stud as shown when necessary.

(18) Slotted hole is required at doweled girder end locations.

SOLE PLATE NOTES:

Provide constant thickness elastomeric bearings with beveled and embedded steel sole plates in accordance with these details when the girder slope exceeds 5 percent or if otherwise required in the plans. Provide for all girders in the span.

On the shop drawings, dimension sole plates to the nearest 1/16" based on required thickness at centerline of bearing and slope of girder. Thickness tolerance variation from the approved shop drawings is 1/16"+/-, except variation from a plane parallel to the theoretical top surface can not exceed 1/16" total. Bearing surface tolerances listed in Item 424 apply to embedded and beveled plates.

Steel plate must conform to ASTM A36, A572 Gr 50, or A709 Gr 36 or Gr 50. Hot dip galvanize both the embedded plate and beveled sole plate after fabrication. Seal weld caps to embedded plate before galvanizing.

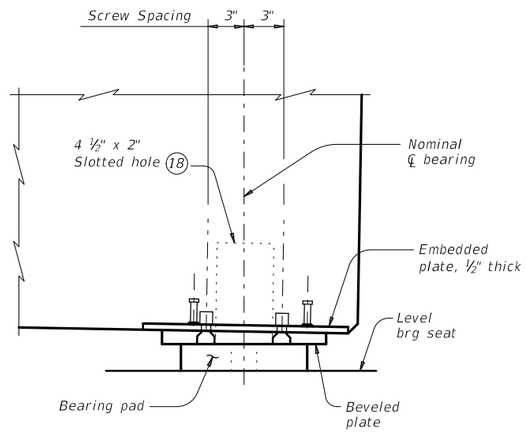
When determining if relocation of screw holes and studs are necessary for skewed girder ends, minimum clearance from screw or stud centerline to plate edge is 1.25".

Tap threads in the embedded plate only. Drill and tap prior to galvanizing.

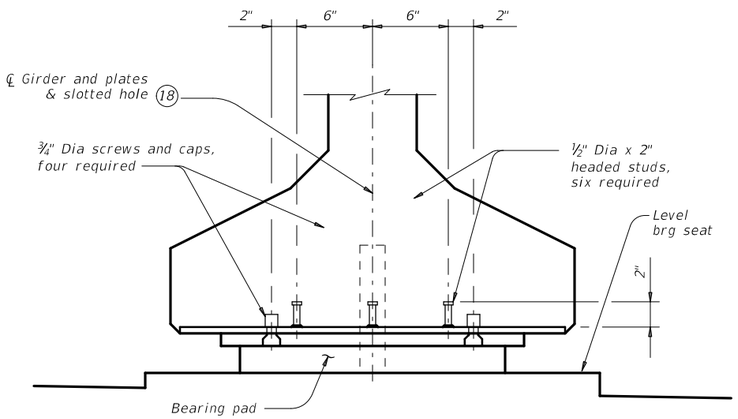
¾" Dia screws must be electroplated, socket flat head countersunk cap screws conforming to ASTM F835. Electroplating must conform to ASTM B633, SC 2, Type I. Provide screws long enough to maintain a ¾" minimum embedment into the embedded plate and galvanized cap. Provide galvanized steel caps (16 ga Min) with a nominal 1" inside diameter and deep enough to accommodate the screws, but not less than ½" deep or deeper than 1".

Install beveled sole plates prior to shipping girders. Installed screw heads must not protrude below the bottom of the beveled plate.

BEVELED PLATE DETAILS



SIDE ELEVATION



END ELEVATION
Showing normal girder end.

GIRDER DETAILS

HL93 LOADING SHEET 3 OF 3

Texas Department of Transportation | Bridge Division Standard

ELASTOMERIC BEARING AND GIRDER END DETAILS
PRESTR CONCRETE I-GIRDERS

IGEB

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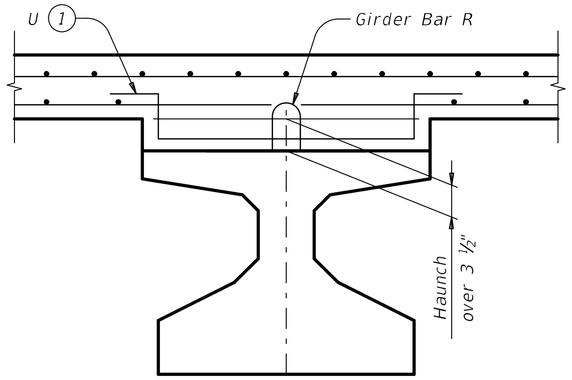
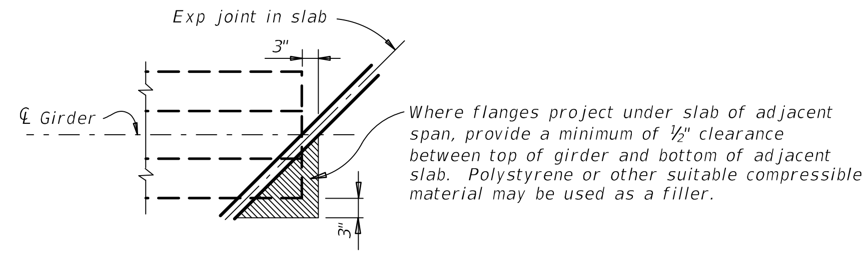
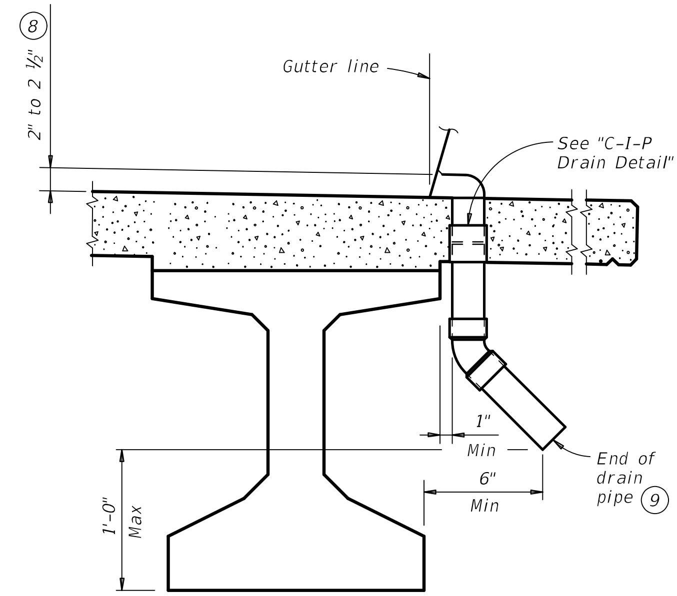


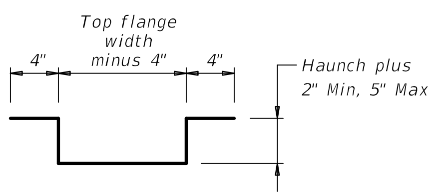
HAUNCH REINFORCING DETAIL



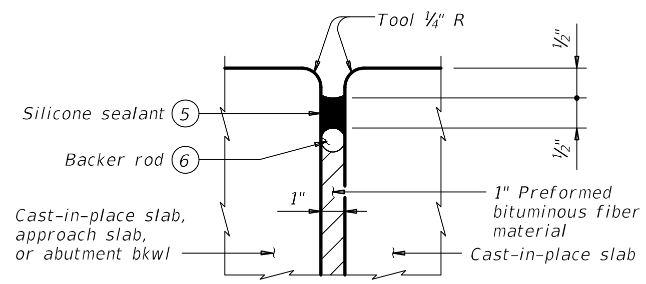
TREATMENT AT GIRDER END FOR SKEWED SPANS



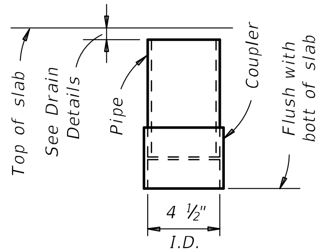
DRAIN DETAIL (10)



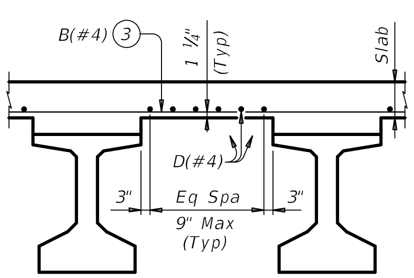
BARS U (#4)



TYPE A JOINT DETAIL (7)



C-I-P DRAIN DETAIL (2)



TYPICAL PART TRANSVERSE SLAB SECTION WITHOUT PCP (4)

Top reinforcing steel not shown for clarity.

(1) Space Bars U with girder Bars R in all areas where measured haunch exceeds 3 ½".

(2) Roughen outside of PVC with coarse rasp or equal to ensure bond with cast-in-place concrete.

(3) Bars B(#4) spaced at 9" Max with 2" end cover. Overhang option, Contractor's may end alternating bars B(#4) at centerline outside girder.

(4) Provide Grade 60 reinforcing steel. Provide bar laps, where required, as follows:
Uncoated ~ #4 = 1'-7"
Epoxy coated ~ #4 = 2'-5"

(5) Class 7 silicone sealant that conforms to DMS-6310. Install when ambient temperature is between 55°F and 85°F and rising. Engineer to determine allowable hours for sealant application.

(6) 1 ¼" backer rod must be compatible with joint sealant. Use of multiple pieces to create a backer rod cross section is not permitted. Top of backer rod must be convex as shown.

(7) The maximum distance between Type A expansion joints is 100'. See Bridge Layout for location of joints.

(8) Drain entrance formed in rail or sidewalk.

(9) Water may not be discharged onto girders.

(10) All drain pipe and fittings to be 4" diameter (Sch 40) PVC. See Item 481 "Pipe for Drains" for pipe, connections and solvent welding. Bend reinforcing steel to clear PVC 1". Drain length and location is as directed by the Engineer. Drains are not permitted over roadways or railways, or within 10'-0" of bent caps. Degrease outside of exposed PVC, apply acrylic water base primer, then coat with same surface finishing material as used for outside girder face. Variations of the above designs, as required for the type of rail used and its location on the structure, may be installed with the approval and direction of the Engineer.

GENERAL NOTES:
Designed according to AASHTO LRFD Bridge Design Specifications.
Payment for Type A joint will be as per Item 454, "Bridge Expansion Joints."
All other items (reinforcing steel, drains, etc.) shown on this sheet are subsidiary to other bid items.

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

DECK FORMWORK NOTES:
Overhang bracket hangers are limited to a safe working load of 3,600 lbs, applied to and along the axis of a coil rod at 45 degrees from vertical, regardless of higher loads permitted by hanger manufacturers. Do not place a hanger less than 12" from girder end. Space hangers accordingly.

Texas Department of Transportation — Bridge Division Standard

MISCELLANEOUS SLAB DETAILS
PRESTR CONCRETE I-GIRDERS

IGMS

FILE: igmssts1-19.dgn	DN: TxDOT		CK: TxDOT	DW: JTR		CK: TxDOT
©TxDOT August 2017	CONT	SECT	JOB		HIGHWAY	
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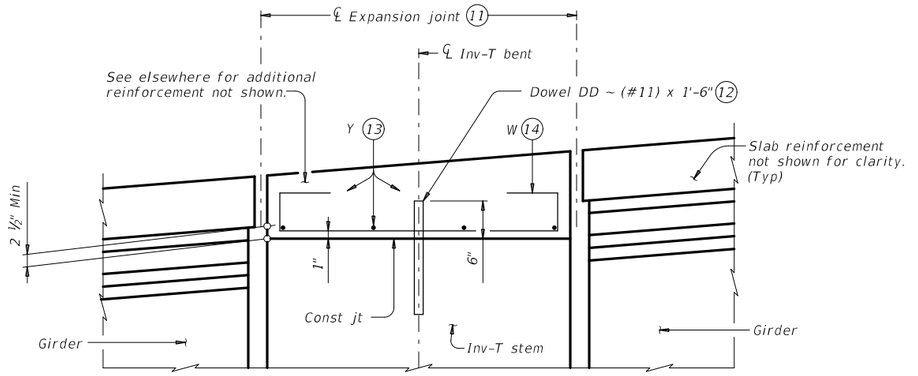

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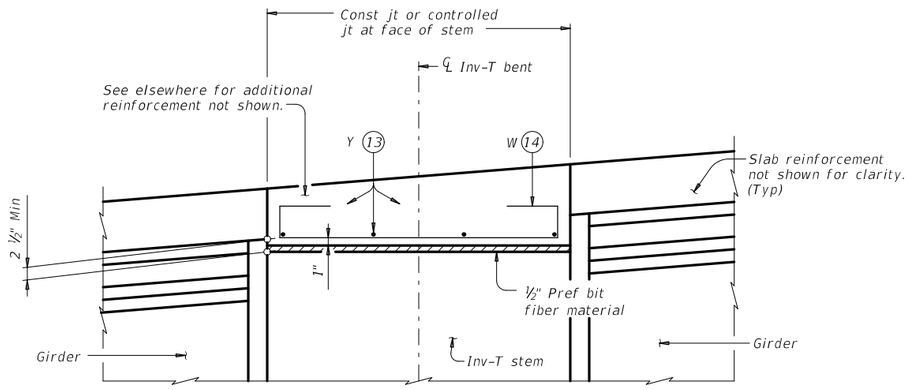
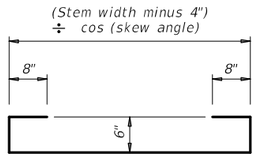
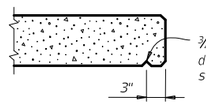


SHOWING CONST JTS OR CONTROLLED JTS

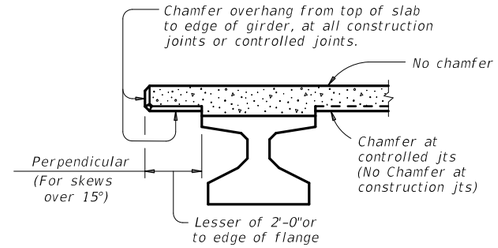
REINFORCEMENT OVER INV-T BENTS



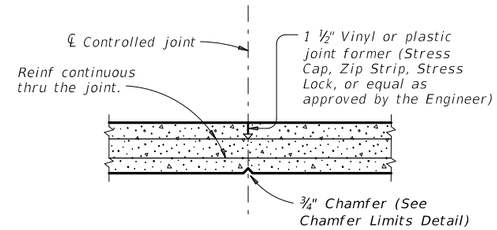
BARS W (#4)



DRIP BEAD DETAIL



CHAMFER LIMITS DETAIL (15)



CONTROLLED JOINT DETAIL

(Saw-cutting is not allowed)

(11) See Layout for joint type.

(12) Dowels DD (#11) spaced at 5 Ft Max. See Inv-T bents for quantity and location.

(13) Space Bars Y (#4) at 12" Max. Use 2" end cover. Number of Bars Y must satisfy spacing limit. Place parallel to bent.

(14) Space Bars W at 12" Max (3" from end of cap). Tilt if necessary to maintain cover requirements. Place parallel to longitudinal slab reinforcement.

(15) See Span details for type of joint and joint locations.

Texas Department of Transportation

Bridge Division Standard

MISCELLANEOUS SLAB DETAILS

PRESTR CONCRETE I-GIRDERS

IGMS

FILE: igmsstS1-19.dgn	DN: TxDOT	CK: TxDOT	DW: JTR	CK: TxDOT
©TxDOT August 2017	CONT	SECT	JOB	HIGHWAY
REVISIONS	0233	05	038	SH 54
10-19: Modified Note 7. Type A now a pay item.	DIST	COUNTY		SHEET NO.
	ELP	CULBERSON		122

STRUCTURE	DESIGNED GIRDERS								DEPRESSED STRAND PATTERN		CONCRETE		OPTIONAL DESIGN					LOAD RATING			
	SPAN NO.	GIRDER NO.	GIRDER TYPE	PRESTRESSING STRANDS					NO.	TO END	RELEASE STRGTH (1)	MINIMUM 28 DAY COMP STRGTH	DESIGN LOAD COMP STRESS (TOP ℄) (SERVICE I)	DESIGN LOAD TENSILE STRESS (BOTT ℄) (SERVICE III)	REQUIRED MINIMUM ULTIMATE MOMENT CAPACITY (STRENGTH I)	LIVE LOAD DISTRIBUTION FACTOR (2)		STRENGTH I		SERVICE III
				NON-STD STRAND PATTERN	TOTAL NO.	SIZE	STRGTH	"e" ℄	"e" END												
						(in)	fpu (ksi)	(in)	(in)		(in)	f'ci (ksi)	f'c (ksi)	fct(ksi)	fcb(ksi)	(kip-ft)	Moment	Shear	Inv	Opr	Inv
Type Tx28 Girders 32' Roadway 8.5" Slab	40	ALL	Tx28		14	0.6	270	10.48	9.34	2	10.5	4.000	5.000	1.189	-1.700	1731	0.850	1.070	1.58	2.04	2.01
	45	ALL	Tx28		14	0.6	270	10.48	9.34	2	10.5	4.000	5.400	1.507	-2.077	1717	0.820	1.080	1.48	1.91	1.57
	50	ALL	Tx28		16	0.6	270	10.23	9.23	4	8.5	4.000	5.800	1.853	-2.508	2040	0.800	1.080	1.39	1.80	1.30
	55	ALL	Tx28		18	0.6	270	10.04	8.26	4	12.5	4.100	6.400	2.247	-2.980	2377	0.780	1.090	1.26	1.69	1.07
	60	ALL	Tx28		22	0.6	270	9.75	7.57	4	16.5	4.800	6.900	2.655	-3.462	2715	0.760	1.090	1.24	1.82	1.05
	65	ALL	Tx28		26	0.6	270	9.56	7.71	4	16.5	5.600	7.300	3.104	-3.978	3064	0.740	1.100	1.09	1.76	1.07
Type Tx34 Girders 32' Roadway 8.5" Slab	40	ALL	Tx34		12	0.6	270	13.01	13.01			4.000	5.000	0.934	-1.303	1975	0.880	1.050	1.77	2.29	2.35
	45	ALL	Tx34		14	0.6	270	13.01	12.15	2	8.5	4.000	5.000	1.180	-1.588	2124	0.850	1.060	1.75	2.27	2.11
	50	ALL	Tx34		16	0.6	270	12.76	11.76	4	8.5	4.000	5.000	1.437	-1.907	2248	0.830	1.060	1.64	2.13	1.82
	55	ALL	Tx34		16	0.6	270	12.76	11.76	4	8.5	4.000	5.000	1.739	-2.263	2449	0.810	1.060	1.37	1.77	1.35
	60	ALL	Tx34		18	0.6	270	12.57	11.23	4	10.5	4.000	5.500	2.068	-2.640	2806	0.790	1.070	1.30	1.72	1.17
	65	ALL	Tx34		22	0.6	270	12.28	7.92	4	28.5	4.000	6.000	2.424	-3.039	3173	0.770	1.070	1.59	2.08	1.34
	70	ALL	Tx34		26	0.6	270	12.09	8.09	4	30.5	4.700	6.500	2.807	-3.458	3548	0.750	1.080	1.08	1.81	1.04
	75	ALL	Tx34		30	0.6	270	11.81	7.41	6	28.5	5.200	6.700	3.195	-3.894	3951	0.740	1.080	1.44	1.93	1.12
	80	ALL	Tx34		34	0.6	270	11.48	7.25	6	30.5	5.800	7.000	3.633	-4.373	4378	0.730	1.080	1.23	1.67	1.05
Type Tx40 Girders 32' Roadway 8.5" Slab	40	ALL	Tx40		12	0.6	270	15.60	15.60			4.000	5.000	0.768	-1.053	2052	0.910	1.030	2.02	2.62	2.88
	45	ALL	Tx40		14	0.6	270	15.60	15.60			4.700	5.000	0.967	-1.282	2430	0.880	1.040	2.01	2.61	2.63
	50	ALL	Tx40		14	0.6	270	15.60	15.60			4.500	5.000	1.195	-1.554	2558	0.860	1.040	1.91	2.48	2.29
	55	ALL	Tx40		16	0.6	270	15.35	14.35	4	8.5	4.000	5.000	1.442	-1.834	2685	0.830	1.050	1.60	2.07	1.79
	60	ALL	Tx40		18	0.6	270	15.16	13.82	4	10.5	4.000	5.000	1.687	-2.118	2875	0.810	1.050	1.57	2.03	1.61
	65	ALL	Tx40		18	0.6	270	15.16	13.82	4	10.5	4.000	5.000	1.978	-2.447	3277	0.800	1.060	1.31	1.70	1.22
	70	ALL	Tx40		20	0.6	270	15.00	13.40	4	12.5	4.000	5.200	2.288	-2.783	3666	0.780	1.060	1.13	1.68	1.08
	75	ALL	Tx40		24	0.6	270	14.77	9.77	4	34.5	4.100	5.700	2.619	-3.135	4064	0.760	1.060	1.60	2.07	1.26
	80	ALL	Tx40		28	0.6	270	14.60	10.60	4	32.5	4.900	6.000	2.964	-3.509	4498	0.750	1.070	1.27	1.99	1.14
	85	ALL	Tx40		32	0.6	270	14.23	8.60	6	36.5	5.100	6.200	3.328	-3.900	4944	0.740	1.070	1.29	2.04	1.08
	90	ALL	Tx40		36	0.6	270	13.93	9.27	6	34.5	5.900	6.600	3.695	-4.294	5394	0.730	1.070	1.33	1.75	1.07
Type Tx46 Girders 32' Roadway 8.5" Slab	40	ALL	Tx46		12	0.6	270	17.60	17.60			4.000	5.000	0.678	-0.844	2150	0.950	1.020	2.22	2.88	3.41
	45	ALL	Tx46		14	0.6	270	17.60	17.60			4.500	5.000	0.846	-1.024	2543	0.920	1.020	2.22	2.88	3.17
	50	ALL	Tx46		14	0.6	270	17.60	17.60			4.500	5.000	1.041	-1.235	3012	0.890	1.030	1.82	2.36	2.47
	55	ALL	Tx46		16	0.6	270	17.35	16.35	4	8.5	4.000	5.000	1.257	-1.465	3277	0.870	1.030	1.77	2.30	2.22
	60	ALL	Tx46		16	0.6	270	17.35	16.35	4	8.5	4.000	5.000	1.489	-1.701	3221	0.840	1.040	1.51	1.95	1.77
	65	ALL	Tx46		18	0.6	270	17.16	15.83	4	10.5	4.000	5.000	1.732	-1.957	3424	0.830	1.040	1.48	1.92	1.59
	70	ALL	Tx46		18	0.6	270	17.16	15.83	4	10.5	4.000	5.000	2.001	-2.227	3834	0.810	1.040	1.26	1.64	1.23
	75	ALL	Tx46		20	0.6	270	17.00	15.40	4	12.5	4.000	5.000	2.289	-2.510	4254	0.790	1.040	1.16	1.63	1.10
	80	ALL	Tx46		24	0.6	270	16.77	14.10	4	20.5	4.000	5.100	2.579	-2.804	4703	0.780	1.050	1.28	1.83	1.14
	85	ALL	Tx46		28	0.6	270	16.60	11.46	4	40.5	4.200	5.500	2.905	-3.125	5181	0.770	1.050	1.38	1.98	1.14
	90	ALL	Tx46		32	0.6	270	16.23	9.48	6	42.5	4.400	5.700	3.234	-3.438	5624	0.750	1.050	1.46	2.11	1.13
	95	ALL	Tx46		34	0.6	270	16.07	11.13	6	34.5	5.000	5.900	3.582	-3.777	6117	0.740	1.060	1.49	2.12	1.12
	100	ALL	Tx46		38	0.6	270	15.81	11.39	6	34.5	5.600	6.600	3.961	-4.139	6635	0.730	1.060	1.31	1.78	1.03

NON-STANDARD STRAND PATTERNS

PATTERN	STRAND ARRANGEMENT AT ℄ OF GIRDER

(1) Based on the following allowable stresses (ksi):

Compression = 0.65 f'ci

Tension = $0.24\sqrt{f'ci}$

Optional designs must likewise conform.

(2) Portion of full HL93.

DESIGN NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications. Load rated using Load and Resistance Factor Rating according to AASTHO Manual for Bridge Evaluation.

Optional designs for girders 120 feet or longer must have a calculated residual camber equal to or greater than that of the designed girder.

Prestress losses for the designed girders have been calculated for a relative humidity of 60 percent. Optional designs must likewise conform.

FABRICATION NOTES:

Provide Class H concrete.

Provide Grade 60 reinforcing steel bars.

Use low relaxation strands, each pretensioned to 75 percent of fpu.

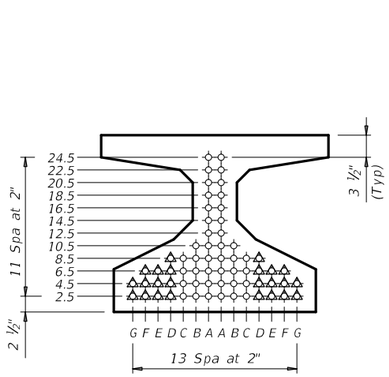
Strand debonding must comply with Item 424.4.2.2.2.4. Full-length debonded strands are only permitted in positions marked △. Double wrap full-length debonded strands in outer most position of each row.

When shown on this sheet, the Fabricator has the option of furnishing either the designed girder or an approved optional design. All optional design submittals must be signed, sealed and dated by a Professional Engineer registered in the State of Texas.

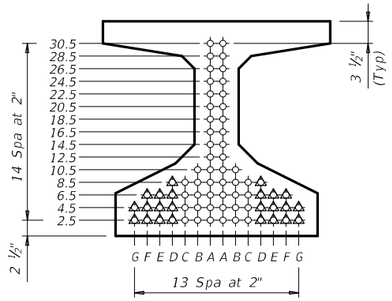
Seal cracks in girder ends exceeding 0.005" in width as directed by the Engineer. The fabricator is permitted to decrease the spacing of Bars R and S by providing additional bars to help limit crack width provided the decreased spacing results in no less than 1" clear between bars. The fabricator must take an approved corrective action if cracks greater than 0.005" form on a repetitive basis.

DEPRESSED STRAND DESIGNS:

Locate strands for the designed girder as low as possible on the 2" grid system unless a non-standard strand pattern is indicated. Fill row "2.5", then row "4.5", then row "6.5", etc., beginning each row in the "A" position and working outward until the required number of strands is reached. All strands in the "A" position must be depressed, maintaining the 2" spacing so that, at the girder ends, the upper two strands are in the position shown in the table.



TYPE Tx28



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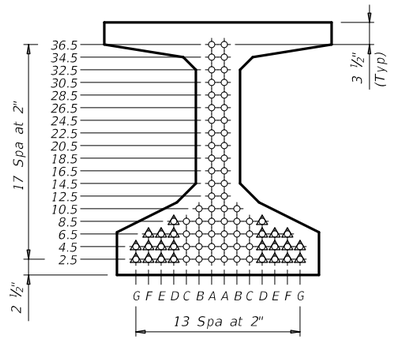

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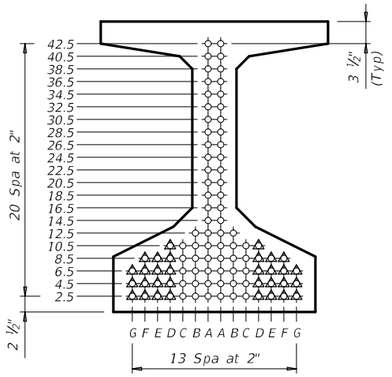


TYPE Tx46

HL93 LOADING SHEET 1 OF 2

Texas Department of Transportation

Bridge Division Standard

PRESTRESSED CONCRETE I-GIRDER STANDARD DESIGNS

32' ROADWAY

IGSD-32

FILE: ig06stds-21.dgn	DN: EFC	CK: AJF	DW: EFC	CK: TAR
©TxDOT August 2017	CONT	SECT	JOB	HIGHWAY
REVISIONS 10-19: Redesigned girders. 1-21: Added load rating.	0233	05	038	SH 54
	DIST	COUNTY		SHEET NO.
	ELP	CULBERSON		123

DATE: 9/27/2022 11:19:57 AM
FILE: c:\pwworkingdir\omega-app02.omegaengineers.local_omega-prod\jvillarreal\D0486871\ig06stds-21.dgn

STRUCTURE	DESIGNED GIRDERS									DEPRESSED STRAND PATTERN		CONCRETE		OPTIONAL DESIGN					LOAD RATING		
	SPAN NO.	GIRDER NO.	GIRDER TYPE	PRESTRESSING STRANDS: NON-STD STRAND PATTERN	TOTAL NO.	SIZE (in)	STRGTH fpu (ksi)	"e" ℄ (in)	"e" END (in)	NO.	TO END (in)	RELEASE STRGTH (1) f'ci (ksi)	MINIMUM 28 DAY COMP STRGTH f'c (ksi)	DESIGN LOAD COMP STRESS (TOP ℄) (SERVICE I) fct(ksi)	DESIGN LOAD TENSILE STRESS (BOTT ℄) (SERVICE III) fcb(ksi)	REQUIRED MINIMUM ULTIMATE MOMENT CAPACITY (STRENGTH I) (kip-ft)	LIVE LOAD DISTRIBUTION FACTOR (2) Moment	LIVE LOAD DISTRIBUTION FACTOR (2) Shear	STRENGTH I Inv	STRENGTH I Opr	SERVICE III Inv
Type Tx54 Girders 32' Roadway 8.5" Slab	40	ALL	Tx54		12	0.6	270	21.01	21.01			4.000	5.000	0.561	-0.686	2216	0.980	1.010	2.55	3.30	4.09
	45	ALL	Tx54		12	0.6	270	21.01	21.01			4.000	5.000	0.703	-0.835	2629	0.950	1.010	2.12	2.75	3.32
	50	ALL	Tx54		14	0.6	270	21.01	21.01			4.000	5.000	0.858	-1.003	3108	0.920	1.020	2.10	2.73	3.05
	55	ALL	Tx54		16	0.6	270	20.76	20.26	4	6.5	4.000	5.000	1.035	-1.189	3629	0.900	1.020	2.05	2.66	2.77
	60	ALL	Tx54		16	0.6	270	20.76	20.26	4	6.5	4.000	5.000	1.224	-1.381	3931	0.870	1.020	1.76	2.28	2.27
	65	ALL	Tx54		18	0.6	270	20.56	19.23	4	10.5	4.000	5.000	1.430	-1.588	4159	0.850	1.020	1.75	2.26	2.09
	70	ALL	Tx54		18	0.6	270	20.56	19.23	4	10.5	4.000	5.000	1.653	-1.815	4103	0.840	1.030	1.49	1.93	1.68
	75	ALL	Tx54		20	0.6	270	20.41	18.81	4	12.5	4.000	5.000	1.877	-2.035	4399	0.820	1.030	1.50	1.94	1.56
	80	ALL	Tx54		20	0.6	270	20.41	18.81	4	12.5	4.000	5.000	2.129	-2.284	4880	0.810	1.030	1.29	1.67	1.23
	85	ALL	Tx54		22	0.6	270	20.28	18.46	4	14.5	4.000	5.000	2.392	-2.534	5339	0.790	1.040	1.30	1.68	1.12
	90	ALL	Tx54		26	0.6	270	20.08	16.39	4	28.5	4.000	5.000	2.665	-2.800	5839	0.780	1.040	1.22	1.67	1.00
	95	ALL	Tx54		28	0.6	270	20.01	14.29	4	44.5	4.000	5.000	2.951	-3.075	6353	0.770	1.040	1.38	1.86	1.03
	100	ALL	Tx54		32	0.6	270	19.63	12.51	6	44.5	4.300	5.200	3.262	-3.370	6892	0.760	1.040	1.42	1.99	1.03
	105	ALL	Tx54		36	0.6	270	19.34	12.01	6	50.5	4.700	5.400	3.574	-3.667	7434	0.750	1.040	1.48	2.10	1.05
	110	ALL	Tx54		40	0.6	270	19.11	12.51	6	50.5	5.300	6.100	3.899	-3.973	7988	0.740	1.050	1.53	2.19	1.08
	115	ALL	Tx54		44	0.6	270	18.83	11.55	8	48.5	5.600	6.400	4.252	-4.301	8569	0.730	1.050	1.29	1.74	1.03
	120	ALL	Tx54	*	48	0.6	270	18.42	10.09	10	50.5	5.800	7.700	4.619	-4.640	9165	0.720	1.050	1.28	1.69	1.01
Type Tx62 Girders 32' Roadway 8.5" Slab	60	ALL	Tx62		16	0.6	270	25.53	25.53			4.000	5.000	0.961	-1.157	4309	0.900	1.010	1.98	2.56	2.74
	65	ALL	Tx62		16	0.6	270	25.53	25.53			4.000	5.000	1.121	-1.331	4614	0.880	1.010	1.69	2.19	2.26
	70	ALL	Tx62		18	0.6	270	25.33	25.33			4.000	5.000	1.292	-1.514	4894	0.860	1.020	1.71	2.21	2.12
	75	ALL	Tx62		18	0.6	270	25.33	25.33			4.000	5.000	1.475	-1.705	4844	0.840	1.020	1.48	1.92	1.75
	80	ALL	Tx62		20	0.6	270	25.18	24.38	4	8.5	4.000	5.000	1.659	-1.903	5116	0.830	1.020	1.49	1.93	1.64
	85	ALL	Tx62		20	0.6	270	25.18	24.38	4	8.5	4.000	5.000	1.866	-2.120	5578	0.820	1.020	1.29	1.67	1.32
	90	ALL	Tx62		20	0.6	270	25.18	24.38	4	8.5	4.500	5.500	2.080	-2.338	6072	0.800	1.030	1.31	1.70	1.23
	95	ALL	Tx62		24	0.6	270	24.94	22.94	4	16.5	4.000	5.000	2.310	-2.574	6621	0.790	1.030	1.31	1.70	1.12
	100	ALL	Tx62		26	0.6	270	24.85	22.39	4	20.5	4.000	5.000	2.531	-2.805	7159	0.780	1.030	1.27	1.70	1.03
	105	ALL	Tx62		30	0.6	270	24.58	14.18	6	58.5	4.800	5.800	2.771	-3.050	7723	0.770	1.030	1.64	2.16	1.31
	110	ALL	Tx62		34	0.6	270	24.25	15.42	6	56.5	4.200	5.000	3.020	-3.304	8301	0.760	1.030	1.60	2.10	1.21
	115	ALL	Tx62		36	0.6	270	24.11	17.44	6	46.5	4.700	5.600	3.291	-3.576	8909	0.750	1.030	1.53	2.04	1.13
	120	ALL	Tx62		40	0.6	270	23.88	16.68	6	54.5	5.100	6.000	3.545	-3.835	9493	0.740	1.040	1.63	2.12	1.47
	125	ALL	Tx62		44	0.6	270	23.60	14.87	8	56.5	5.300	6.100	3.836	-4.124	10128	0.730	1.040	1.51	2.04	1.35
	130	ALL	Tx62		48	0.6	270	23.28	15.28	8	56.5	5.800	6.700	4.144	-4.438	10849	0.730	1.040	1.44	1.80	1.11

NON-STANDARD STRAND PATTERNS

PATTERN	STRAND ARRANGEMENT AT ℄ OF GIRDER
*	2.5(14),4.5(14),6.5(14),8.5(4),10.5(2)

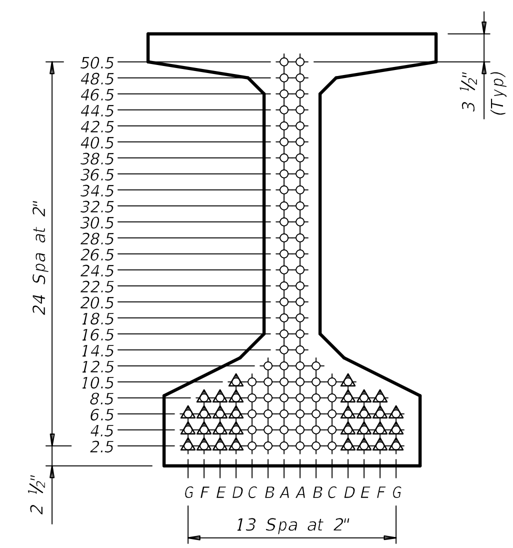
(1) Based on the following allowable stresses (ksi):

Compression = 0.65 f'ci

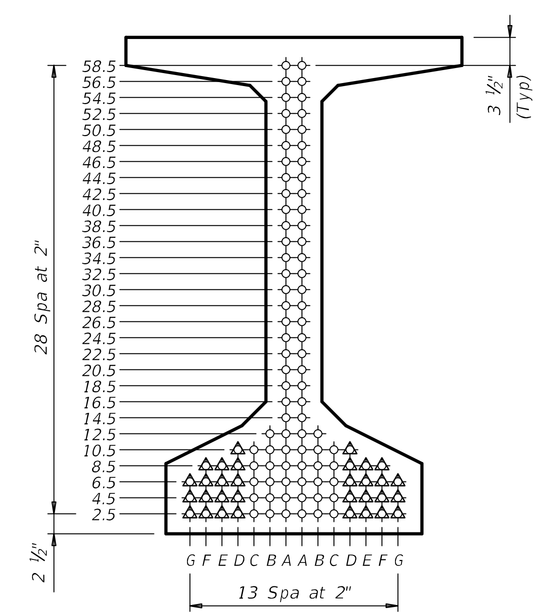
Tension = $0.24\sqrt{f'ci}$

Optional designs must likewise conform.

(2) Portion of full HL93.



TYPE Tx54



TYPE Tx62

HL93 LOADING

SHEET 2 OF 2

Texas Department of Transportation

Bridge Division Standard

PRESTRESSED CONCRETE I-GIRDER STANDARD DESIGNS

32' ROADWAY

IGSD-32

FILE: ig06stds-21.dgn	DN: EFC	CK: AJF	DW: EFC	CK: TAR
©TxDOT August 2017	CONT 0233	SECT 05	JOB 038	HIGHWAY SH 54
REVISIONS 10-19: Redesigned girders. 1-21: Added load rating.	DIST ELP	COUNTY CULBERSON		SHEET NO. 124

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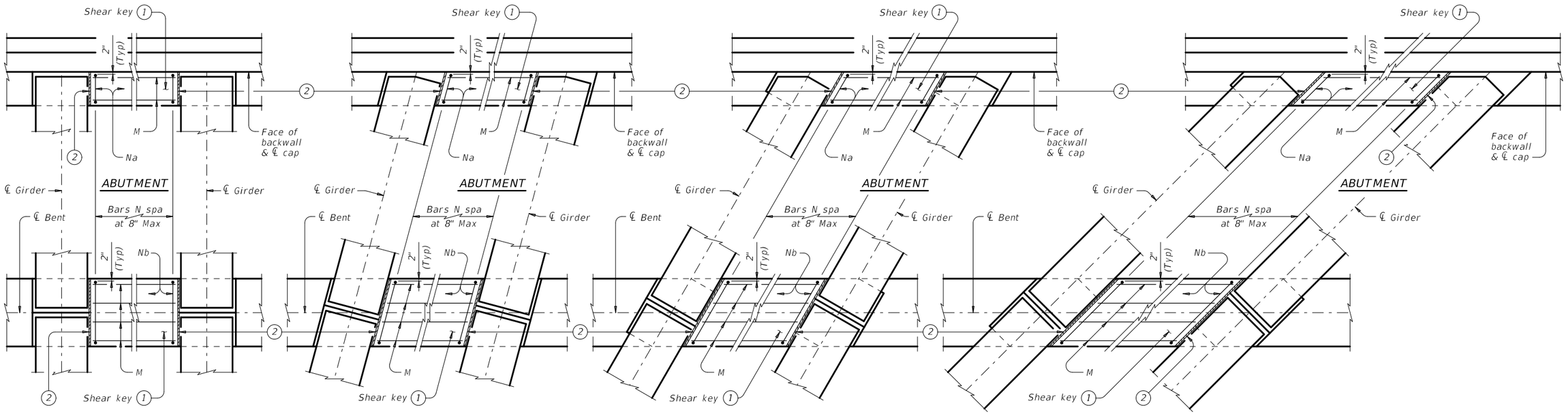


PARTIAL PLANS WITH NO SKEW

Showing shear keys on 3'–6" wide caps. 4'–0" caps similar.

PARTIAL PLANS WITH 15° SKEW

Showing shear keys on 3'–6" wide caps. 4'–0" caps similar.

PARTIAL PLANS WITH 30° SKEW

Showing shear keys on 3'–6" wide caps. 4'–0" caps similar.

PARTIAL PLANS WITH 45° SKEW

Showing shear keys on 3'–6" wide caps. 4'–0" caps similar.

(1) Place shear keys on the upstream side of structure between outside girder and next adjacent girder, unless shown otherwise on plans.

(2) UHMW polyethylene wear pad. (Typ)

(3) Leave a ¼" gap plus or minus between girder and face of wear pad. Cast wear pad with shear key, smooth side facing girder. Care must be taken to keep concrete from flowing under girder. Slope top of shear keys in accordance with Item 420.4.9, "Treatment and Finishing of Horizontal Surfaces."

(4) Measure at higher bearing seat elevation forward or back. Dimension based on typical bearing pad and bearing seat. Increase as necessary to maintain 5" overlap.

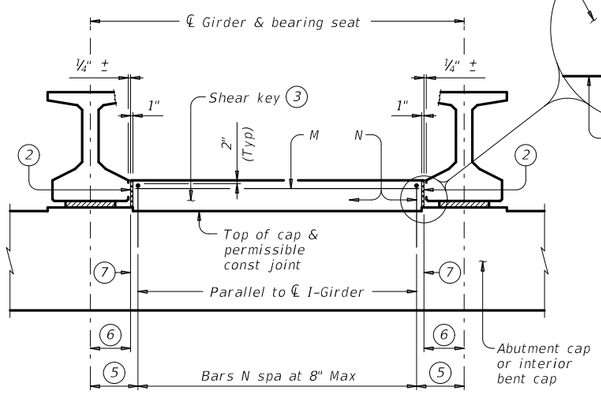
(5) With No Skew = 1'-8 ¼", measured along ℄ cap.
With Skew = 1'-8 ¼" ÷ Cos Skew, measured along ℄ cap.

(6) With No Skew = 1'-4 ¼", measured along ℄ cap.
With Skew = 1'-4 ¼" ÷ Cos Skew, measured along ℄ cap.

(7) Face of UHMW polyethylene wear pad. Smooth side of pad facing girder.

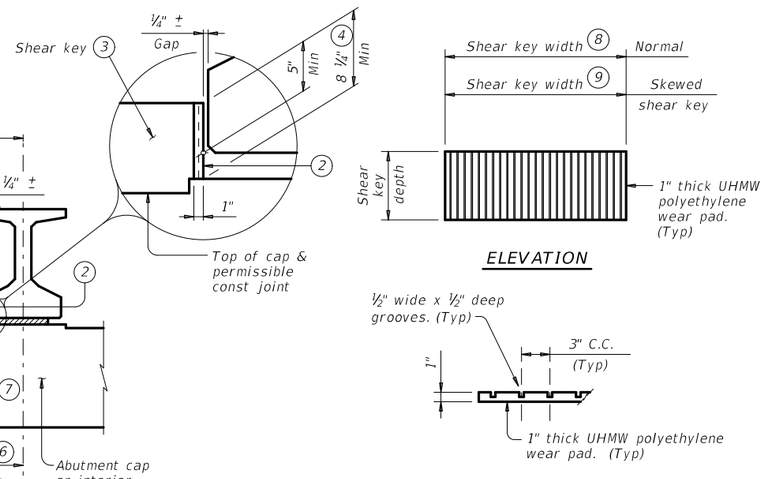
(8) Abutments = ½ Cap width.
Interior bents = Cap width.

(9) Abutments = ½ Cap width ÷ Cos Skew.
Interior bents = Cap width ÷ Cos Skew.

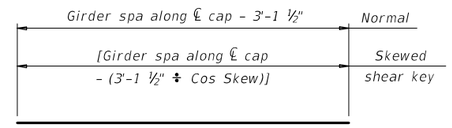


PARTIAL ELEVATION OF ABUTMENT OR INTERIOR BENT CAP (1)

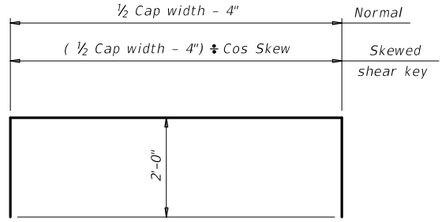
Showing shear key with girder Type Tx46. Other I-Girder types similar.



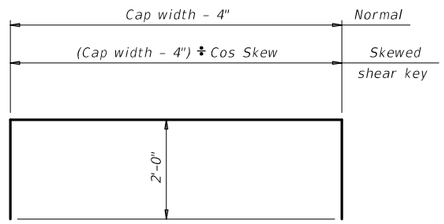
ULTRA HIGH MOLECULAR WEIGHT (UHMW) POLYETHYLENE WEAR PAD DETAILS



BARS M (#5)



BARS Na (#5)
(For abutments)



BARS Nb (#5)
(For interior bents)

CONSTRUCTION NOTES:

Provide Class "C" concrete (f'c = 3,600 psi). Provide Class "C" (HPC) if shown elsewhere on the plans.
Provide Grade 60 reinforcing steel.
Provide epoxy coated reinforcing steel for shear key if abutment or interior bent reinforcing steel is epoxy coated.
Provide Ultra High Molecular Weight (UHMW) polyethylene wear pads in accordance with ASTM D6712.

GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications.
Details showing skew are drawn showing right forward skew. See Bridge Layout for actual skew direction.
These details are limited to bridges skewed 45 degrees and less.
This standard is only applicable for I-Girders.
Modify details for bearing conditions, and girder spacing not shown on this standard. Details do not account for sole plate or pedestal bearing seat.
Include shear key concrete in abutment or bent concrete for payment.
UHMW polyethylene wear pads are subsidiary to Class "C" concrete.

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

Texas Department of Transportation

Bridge Division Standard

SHEAR KEY DETAILS
PRESTR CONCRETE I-GIRDERS

IGSK

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©TxDOT August 2017	CONT	SECT	JOB	HIGHWAY
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	ELP	CULBERSON		125

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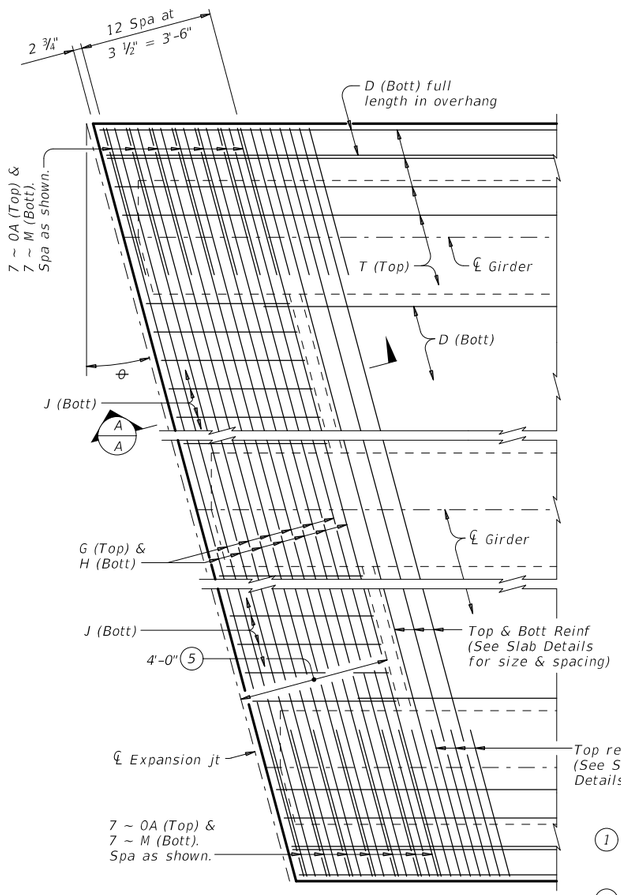
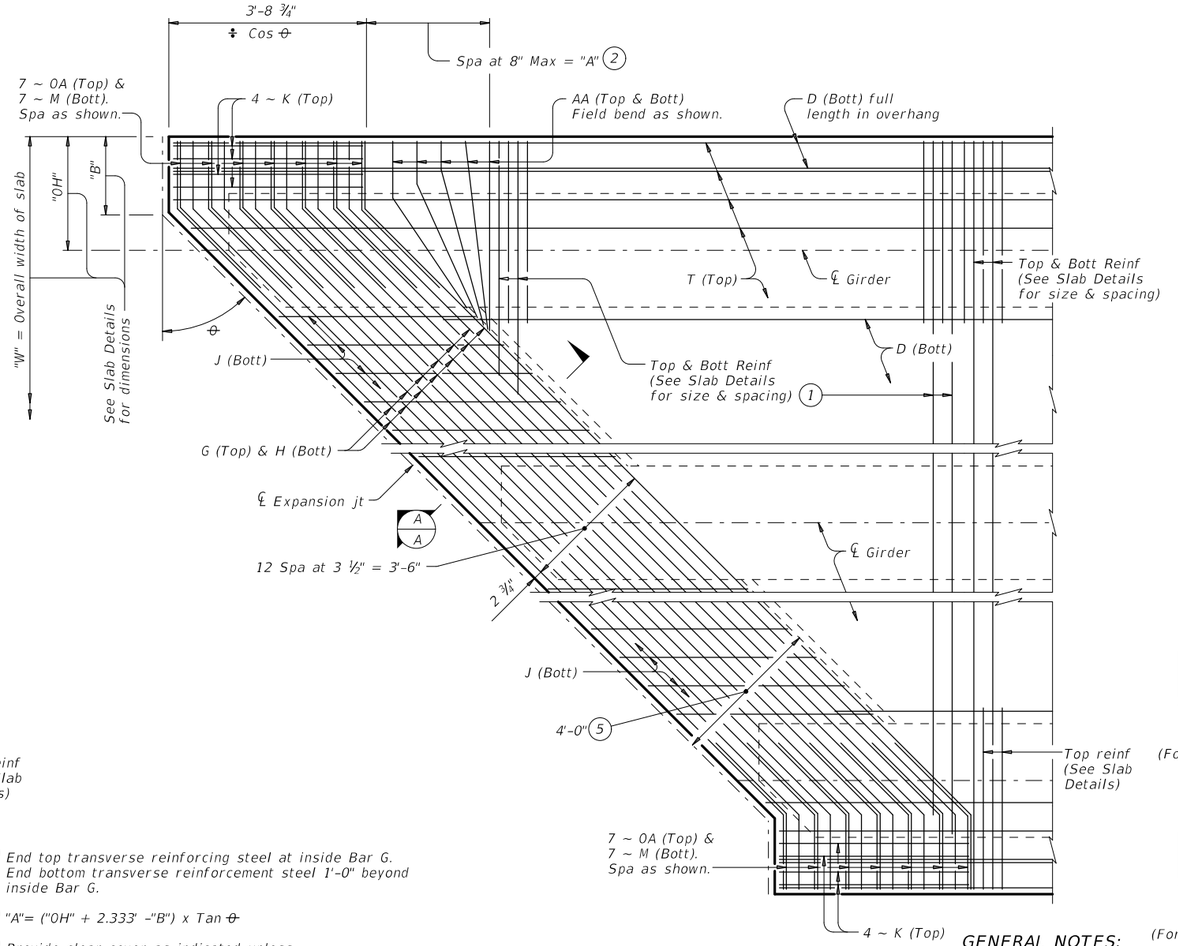


PARTIAL PLAN FOR SLABS WITHOUT BREAKBACK



PARTIAL PLAN FOR SLABS WITH BREAKBACK

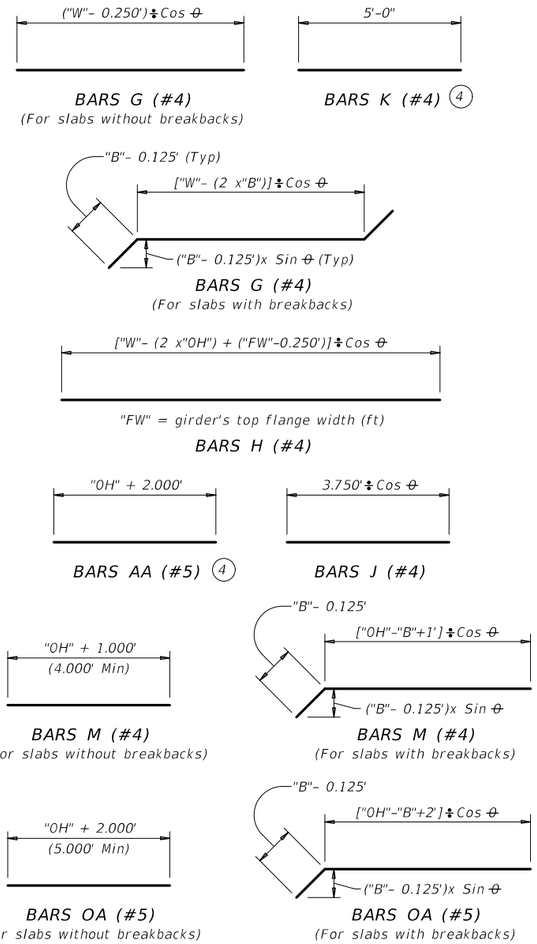
(1) End top transverse reinforcing steel at inside Bar G. End bottom transverse reinforcement steel 1'-0" beyond inside Bar G.

(2) "A"= ("0H" + 2.333' -"B") x Tan θ

(3) Provide clear cover as indicated unless otherwise shown on Span Details.

(4) Only required on slabs with breakbacks.

(5) Thickened slab end dimensioned perpendicular to face of bkwl, centerline interior bent or face of inverted-T stem.



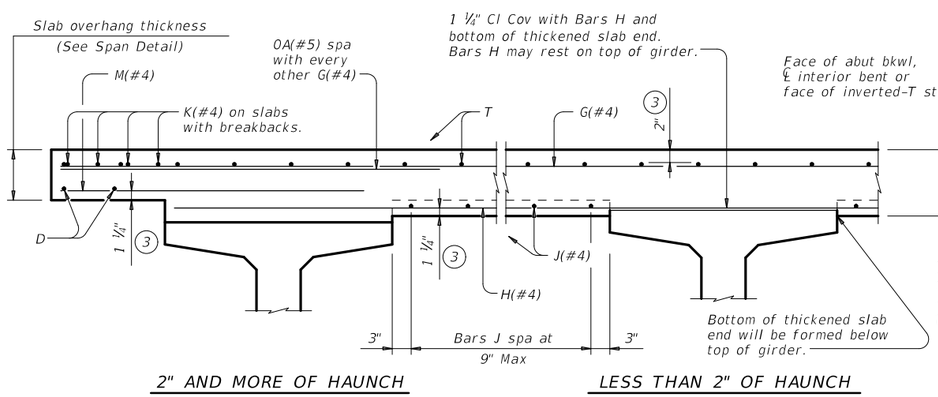
GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications.
These details are restricted to Prestressed Concrete I-Girder Spans.
These details are to be used in conjunction with the Span Details and PCP standard (if prestressed concrete panels are used).
When Option 2 from PCP standard is used, provide Bars AA, G, K and 0A in the slab.

MATERIAL NOTES:

Provide Grade 60 reinforcing steel.
If slab reinforcing steel is shown on the Slab Details to be epoxy coated, then Bars AA, G, K, H, J, M and 0A must be epoxy coated.
Provide bar laps, where required, as follows:
Uncoated ~ #4 = 1'-7"
Epoxy Coated ~ #4 = 2'-5"

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

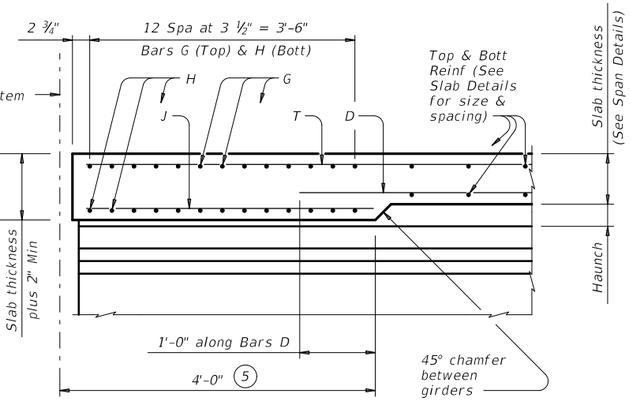


2" AND MORE OF HAUNCH

LESS THAN 2" OF HAUNCH

TYPICAL TRANSVERSE SECTION

(Showing Prestressed Conc I-Girders at ℄ Brg)



SECTION A-A

(Showing with 2" and more of haunch)

HL93 LOADING

Texas Department of Transportation

Bridge Division Standard

THICKENED SLAB END DETAILS

PRESTRESSED CONCRETE I-GIRDER SPANS

IGTS

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©TxDOT August 2017	CONT	SECT	JOB	HIGHWAY
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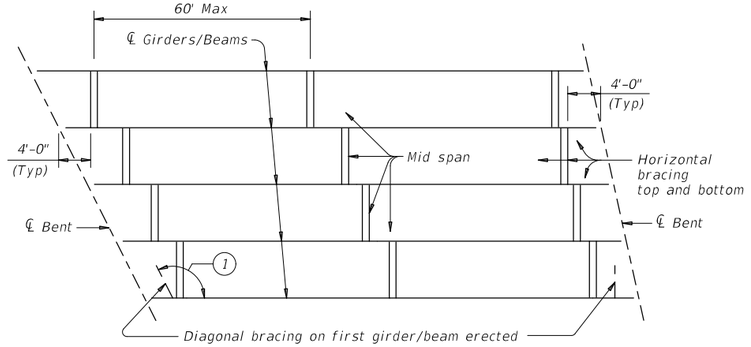
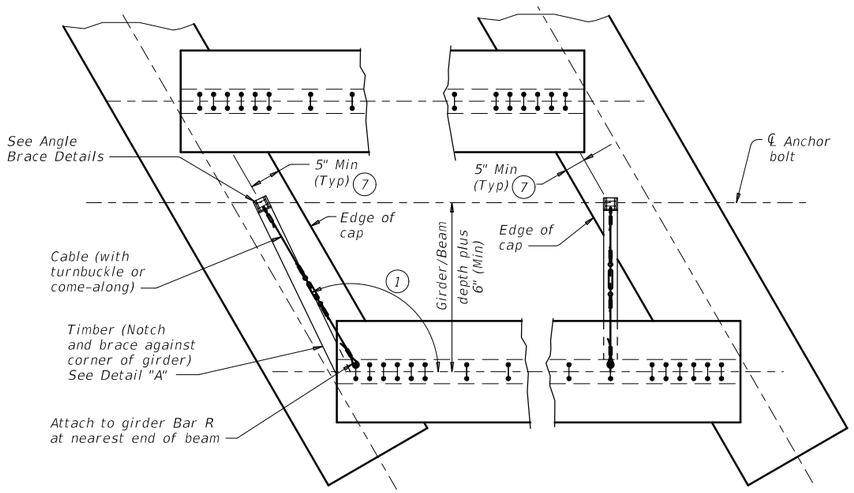
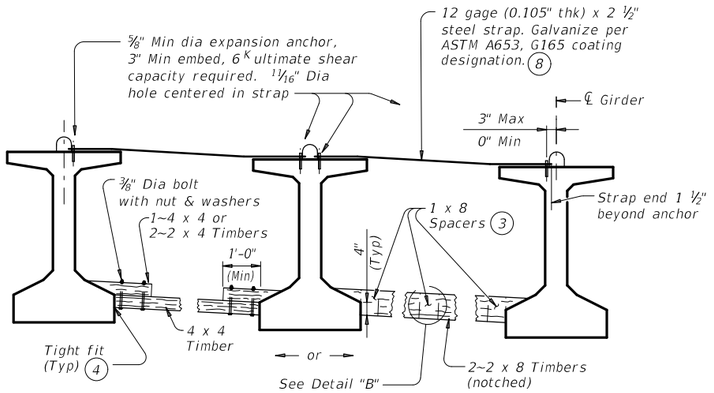


ERECTION BRACING

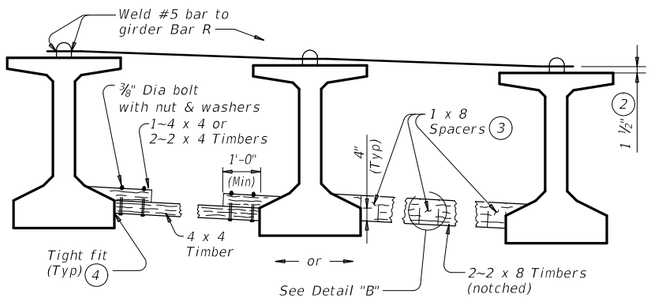


PLAN



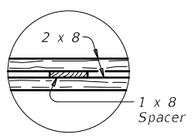
FOR ERECTION BRACING, OPTION 1

(This option is not allowed when slab is formed with PMDF or plywood.)



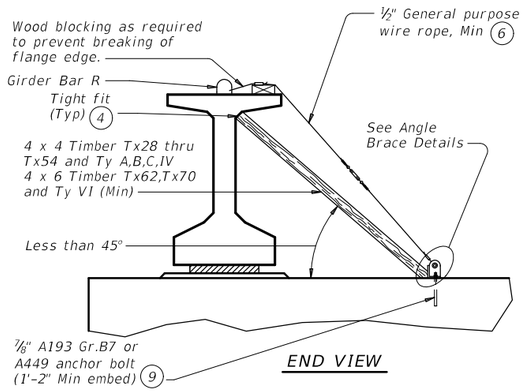
FOR ERECTION BRACING, OPTION 2

HORIZONTAL BRACING DETAILS 5



PLAN

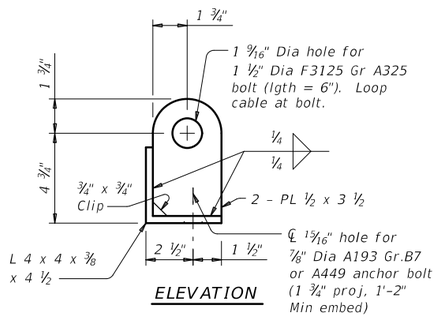
DETAIL "B"



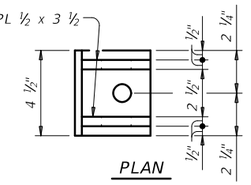
END VIEW

DIAGONAL BRACING DETAILS 5

(To be used on both ends of the first girder/beam erected in the span in each phase.)



ELEVATION



PLAN

ANGLE BRACE DETAILS

HAULING & ERECTION:

The Contractor's attention is directed to the possible lateral instability of prestressed concrete girders and beams over 130' long, especially during hauling and erection. The use of the following methods to improve stability is encouraged: Locate lifting devices at the maximum practical distance from girder ends; use external lateral stiffening devices during hauling and erection; lift with vertical lines using two machines; and take care in handling to minimize inertial and impact forces.

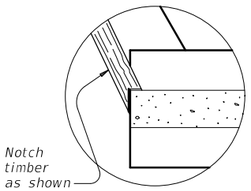
ERECTION BRACING:

Erection bracing details shown are considered the minimum for fulfilling the bracing requirements of Item 425.

Required erection bracing must be placed immediately after erection of each girder and remain in place until additional bracing as required for slab placement is in place. This standard is needed in all cases to meet requirements for Slab Placement Bracing.

PHASED CONSTRUCTION:

Place erection and slab placement bracing for all girders in a phase as shown in these details. For phases after first, also place erection and slab placement bracing between outer girder of completed phase and adjacent girder of current phase. When the phase construction joint is between girders, top bracing can be omitted.



DETAIL "A"

(1) If angle shown exceeds 120 degrees, move diagonal brace to other side of girder/beam and place square to girder/beam. This may prevent exterior girder from being erected first.

(2) Place and weld #5 bars as shown during erection. If forming deck with prestressed panels, bars can be temporarily removed, one at a time, during panel erection. Re-install bar prior to additional panel erection. Bars can rest on panels and be bent down and welded to girder Bars R (See Sheet 2 of 2).

(3) Clear distance between spacers must not exceed 3'. Nail together with 16d nails.

(4) Use wedges as necessary to obtain tight fit. Nail wedges to timbers.

(5) Pressure treated landscape timbers can not be used.

(6) All hardware used with cable must be able to develop a minimum 25 kips breaking strength. Use thimbles at all loops in cable. Install cable clamps with saddles bearing against the live end and U-bolts bearing aginst the dead end.

(7) It is acceptable to tie anchor bolts to cap reinforcement.

(8) Prior to installing, field bend strap to lay flush on both girders' top flange and slope between flange tips.

(9) Anchor bolt may be drilled and epoxied in place. Provide 25k minimum pullout. Core drill hole.

Texas Department of Transportation

Bridge Division Standard

MINIMUM ERECTION AND BRACING REQUIREMENTS
PRESTRESSED CONCRETE I-GIRDERS AND I-BEAMS

MEBR(C)

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©TxDOT August 2017 REVISIONS	CONT	SECT	JOB	HIGHWAY
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	ELP	CULBERSON		127

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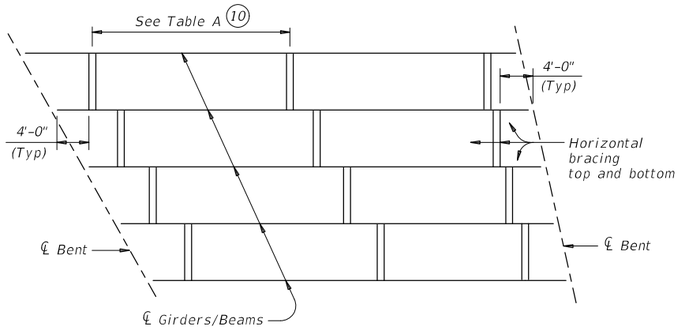


SLAB PLACEMENT BRACING

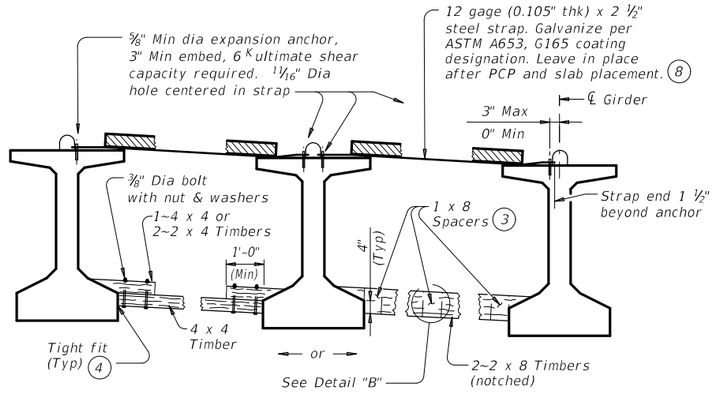
TABLE A

OPTION 1-RIGID BRACING (STEEL STRAP)

Girder or Beam Type	Maximum Bracing Spacing	
	Slab Overhang less than 4'-0" (11)	Slab Overhang 4'-0" and greater (11)
Tx28	¼ points	¼ points
Tx34	¼ points	¼ points
Tx40	¼ points	⅛ points
Tx46	¼ points	⅛ points
Tx54	¼ points	⅛ points
Tx62	¼ points	⅛ points
Tx70	¼ points	⅛ points
A	⅛ points	⅛ points
B	⅛ points	⅛ points
C	⅛ points	⅛ points
IV	¼ points	⅛ points
VI	¼ points	⅛ points

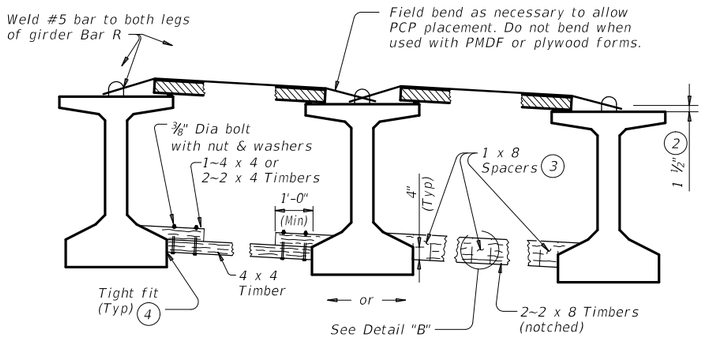
OPTION 2-FLEXIBLE BRACING (NO. 5 OVER PCP)

Girder or Beam Type	Maximum Bracing Spacing	
	Slab Overhang less than 4'-0" (11)	Slab Overhang 4'-0" and greater (11)
Tx28	¼ points	⅛ points
Tx34	¼ points	⅛ points
Tx40	¼ points	⅛ points
Tx46	¼ points	⅛ points
Tx54	¼ points	⅛ points
Tx62	¼ points	⅛ points
Tx70	¼ points	⅛ points
A	2.0 ft	1.5 ft
B	3.0 ft	2.0 ft
C	4.5 ft	2.0 ft
IV	¼ points	4.0 ft
VI	¼ points	4.0 ft



FOR SLAB PLACEMENT BRACING, OPTION 1 - RIGID

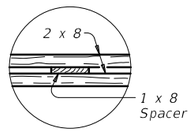
(Showing slab formed with PCP. This option is not allowed when slab is formed with PMDF or plywood.)



FOR SLAB PLACEMENT BRACING, OPTION 2 - FLEXIBLE

(Showing slab formed with PCP.)

HORIZONTAL BRACING DETAILS (5)



PLAN

DETAIL "B"

(2) Place and weld #5 bars as shown during erection. If forming deck with prestressed panels, bars can be temporarily removed, one at a time, during panel erection. Re-install bar prior to additional panel erection. Bars can rest on panels and be bent down and welded to girder Bars R.

(3) Clear distance between spacers must not exceed 3'. Nail together with 16d nails.

(4) Use wedges as necessary to obtain tight fit. Nail wedges to timbers.

(5) Pressure treated landscape timbers can not be used.

(8) Prior to installing, field bend strap to lay flush on both girders' top flange and slope between flange tips.

(10) Bracing spacing (¼ and ⅛ points) measured between first and last typical brace location.

(11) Measure slab overhang from centerline of girder or beam. When overhang varies in span, determine bracing spacing based on largest overhang.

SLAB PLACEMENT BRACING:

The details for slab placement bracing are considered minimum for fulfilling the requirements of Specification Items 422 and 425.

Required slab placement bracing must remain in place until slab concrete has attained a compressive strength of 3000 psi.

GENERAL NOTES:

Bracing details for spans longer than 150' are not provided. The Contractor must submit proposed bracing details for such conditions to the Engineer for approval prior to erection.

Systems equal to or better than those shown may be used provided details of such systems are submitted to and approved by the Engineer prior to erection.

Use of these systems or details does not relieve the Contractor of the responsibility for the adequacy of the bracing and the safety of the structure.

Removal of bracing for short periods of time to align girders and beams is permissible.

All turn-buckles, come-alongs, anchors and other connections must be capable of developing the full strength of the cable shown.

Furnish anchor bolts and nuts in accordance with Item 449, "Anchor Bolts".

Texas Department of Transportation

Bridge Division Standard

MINIMUM ERECTION AND BRACING REQUIREMENTS
PRESTRESSED CONCRETE I-GIRDERS AND I-BEAMS

MEBR(C)

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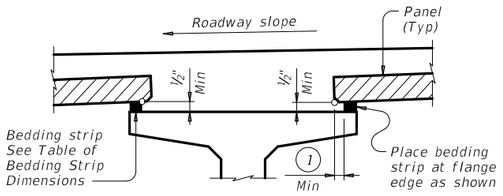
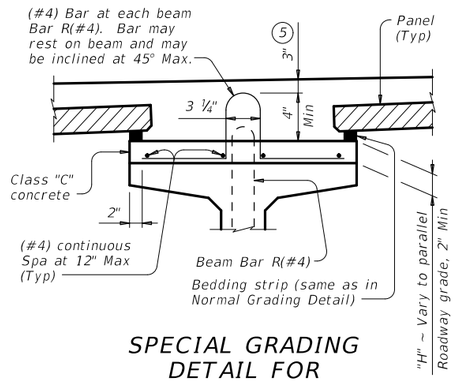


NORMAL GRADING DETAIL (3)

Showing prestressed concrete I-girders.
(Other beam types similar)



SPECIAL GRADING DETAIL FOR CONCRETE BEAMS

Showing prestressed concrete I-girders.
(Other beam types similar)

TABLE OF BEDDING STRIP DIMENSIONS		
WIDTH	HEIGHT (4)	
	Min	Max
1" (Min)	½"	2"
1 ¼"	½"	2 ½"
1 ½"	½"	3"
1 ¾"	½"	3 ½"
2"	½"	4"
2 ¼"	½"	4 ½" (2)
2 ½"	½"	5" (2)
2 ¾"	½"	5 ½" (2)
3" (Max)	½"	6" (2)

(1) 2" Min for I-giders, 1 ½" Min for all other beam types.

(2) Allowed for I-girders, not allowed on other beam types.

(3) To reduce the quantity of cast-in-place concrete, bedding strip thickness may be increased in ¼" increments. Bedding strips must be comprised of one layer. Bond bedding strips to the beams with an adhesive compatible with bedding strips. Bedding strips over 2.5" high may need to be bonded to panels. The same thickness strip must be used under any one panel edge and the maximum change in thickness between adjacent panels is ¼". Alternatively, bedding strips may be cut to grade. Panels may be supported by an alternate method, using a commercial product, if approved by the Engineer of Bridge Design, Bridge Division. If bedding strips exceed 6" high for I-Girders, 4" high for all other beam types, use Special Grading Detail for Concrete Beams or submit an alternate method to the Bridge Division for approval.

(4) Height must not exceed twice the width.

(5) Provide clear cover as indicated unless otherwise shown on Span Details.

(6) See Span Details and Thickened Slab End Details for top slab reinforcement and clear cover. Transverse top slab reinforcement may rest on top of prestressed concrete panels if necessary to maintain clear cover.

(7) Space Bars UP(#4) with Beam Bars R(#4) in all areas where measured haunch exceeds 3 ½" with I-girders, and 3" for all other beam types. Epoxy coating for Bars UP is not required.

(8) Do not locate construction joints on top of a panel.

(9) Butt adjacent bedding strips together with adhesive. Cut v-notches, approx ¼" deep, in the top of the bedding strips at 8' o.c..

CONSTRUCTION NOTES:

Erected panels must bear uniformly on bedding strips of extruded polystyrene placed along top flange edges.

Placing panels to minimize joint openings is recommended.

If additional blocking is needed, special grading details for supporting the panels and extra reinforcing between beam and slab will be considered subsidiary to deck construction.

Bars U, shown on PCP-FAB, may be bent over or cut off if necessary.

Care must be taken to ensure proper cleaning of construction debris and consolidation of concrete material under the edges of the panels. Bedding strips must be placed at beam flange edges so that adequate space is provided for the mortar to flow a minimum of 1 ½" under the panels as the slab concrete is placed.

To allow the proper amount of mortar to flow between beam and panel, the minimum vertical opening must be at least ½". Roadway cross-slope reduces the opening available for entry of the mortar. Bedding strips varying in thickness across the beam are therefore required.

For clear span between U-beams less than or equal to 18", see Permissible Slab Forming Detail on Miscellaneous Slab Detail sheets, UBMS.

MATERIAL NOTES:

Provide Grade 60 reinforcing steel in the cast-in-place slab. See Table of Reinforcing Steel for size and spacing of reinforcement.

If the top and bottom layer of reinforcing steel is shown on the Span Details to be epoxy coated, then the D, E, P, & Z bars must be epoxy coated.

Provide bar Laps, where required, as follows:
Uncoated ~ #4 = 1'-7"
Epoxy Coated ~ #4 = 2'-5"

GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications.

Panel placement may follow either Option 1 or Option 2 except Option 1 must be used if the skew exceeds 45 degrees.

Use of Prestressed Concrete Panels is not permitted for horizontally curved steel plate or tub girders. See Span Details for other possible restrictions on their use.

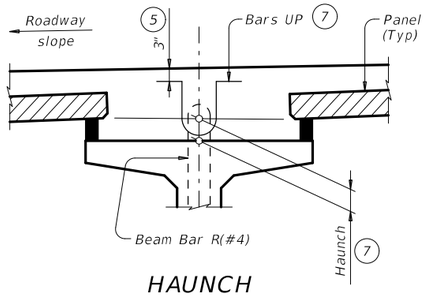
These details are to be used in conjunction with the Span Details, PCP-FAB and other applicable standard drawings.

When panel support (bedding strips) deviates from what is shown herein, provide details signed and sealed by a professional Engineer.

Any additional reinforcement or concrete required on this standard is considered subsidiary to the bid Item "Reinforced Concrete Slab".

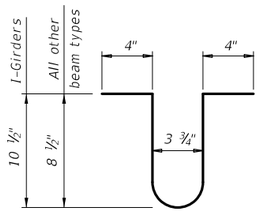
Cover dimensions are clear dimensions, unless noted otherwise.

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

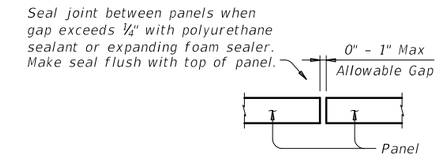


HAUNCH REINFORCING DETAIL

Showing prestressed concrete I-girders.
(Other beam types similar)

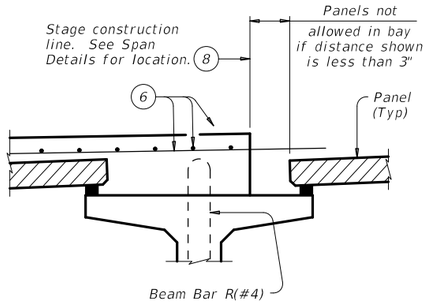


BARS UP (#4) (7)

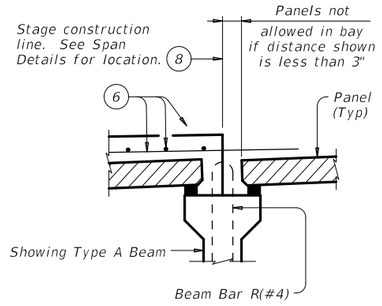


PANEL JOINTS

(Panel reinforcing not shown for clarity.
The gap cannot be considered as a panel fabrication tolerance. Adjust panel placement to minimize joint openings.)



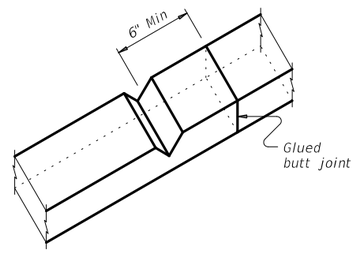
PRESTR CONC I-GIRDERS



PRESTR CONC I-BEAMS

STAGE CONSTRUCTION LIMITATIONS

(Other beam types similar)



BEDDING STRIP DETAIL (9)

HL93 LOADING SHEET 1 OF 4

Texas Department of Transportation | Bridge Division Standard

PRESTRESSED CONCRETE PANELS
DECK DETAILS

PCP

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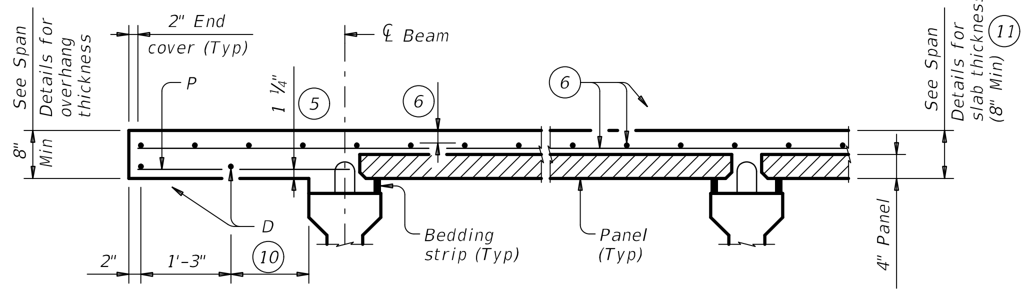
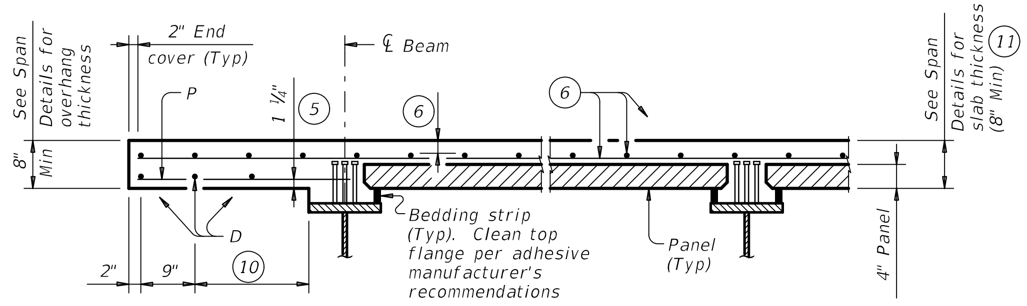
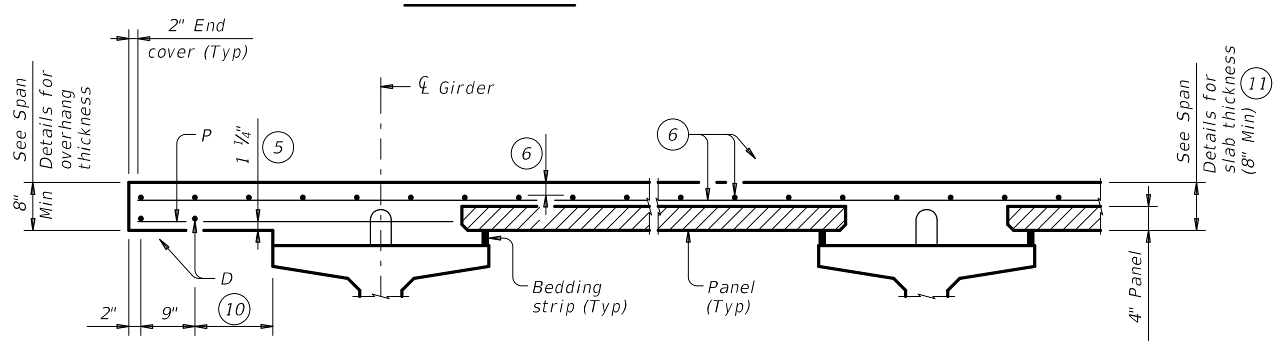


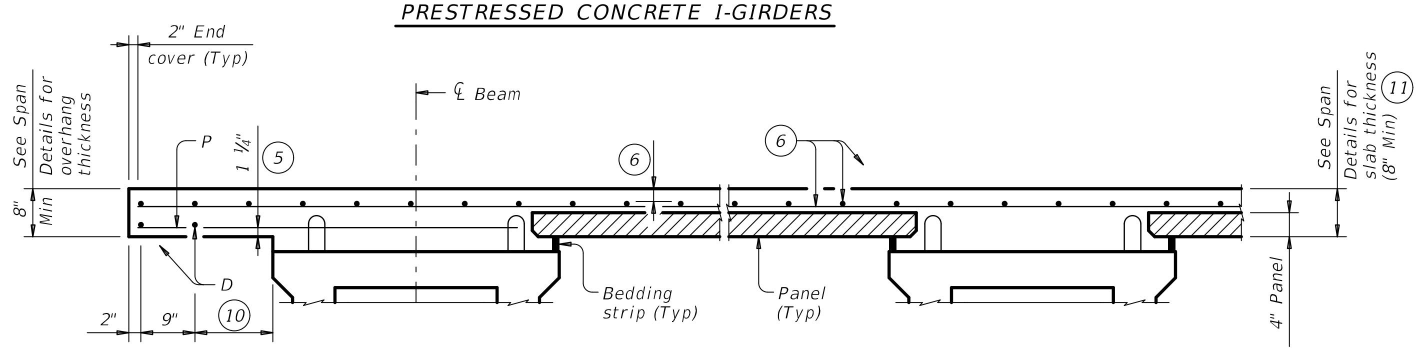
PRESTRESSED CONCRETE I-BEAMS



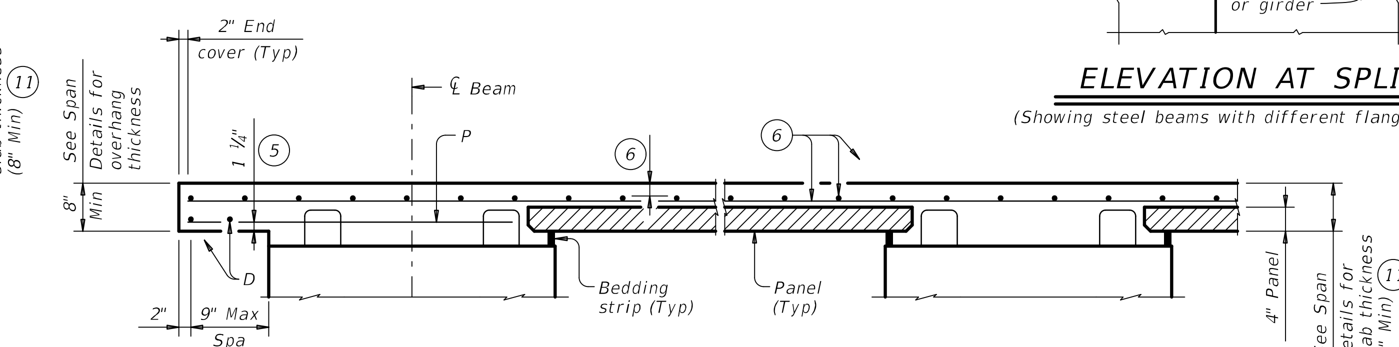
STEEL BEAMS



PRESTRESSED CONCRETE I-GIRDERS

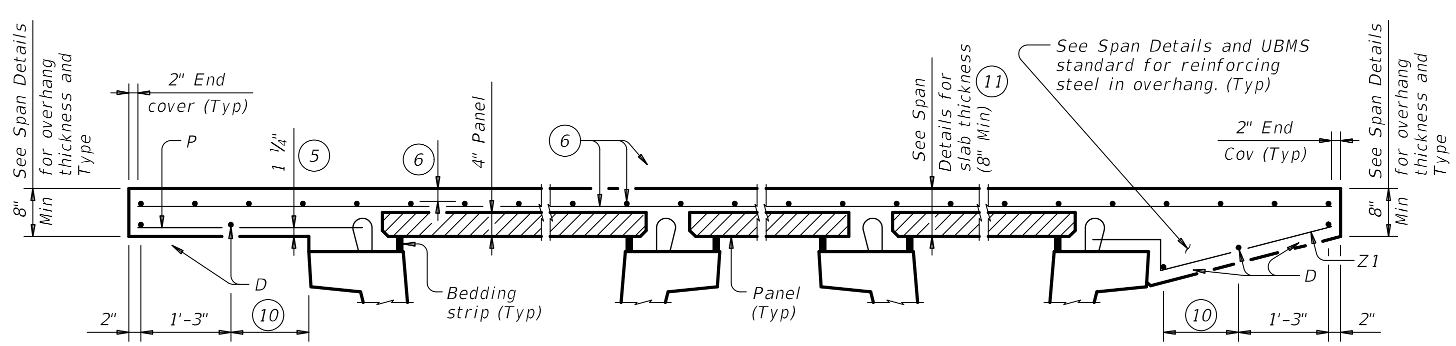


PRESTRESSED CONCRETE X-BEAMS



PRESTRESSED CONCRETE SPREAD SLAB BEAMS

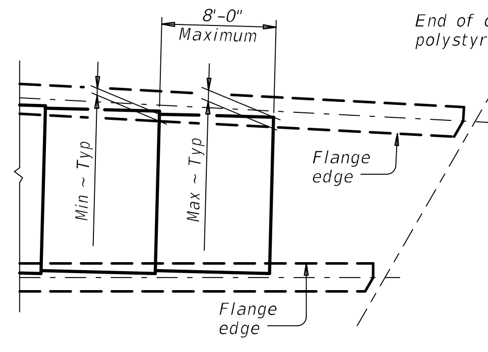
Bars P over exterior beams are still required when no overhang is used. In this case, only one Bar D, 2" from slab edge, is required.



NORMAL OVERHANG
WITH PRESTR CONC U-BEAMS

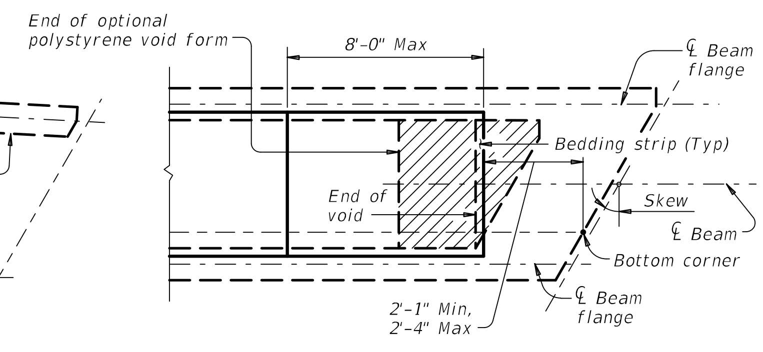
SLOPED OVERHANG
WITH PRESTR CONC U-BEAMS

TYPICAL PART
TRANSVERSE SECTIONS

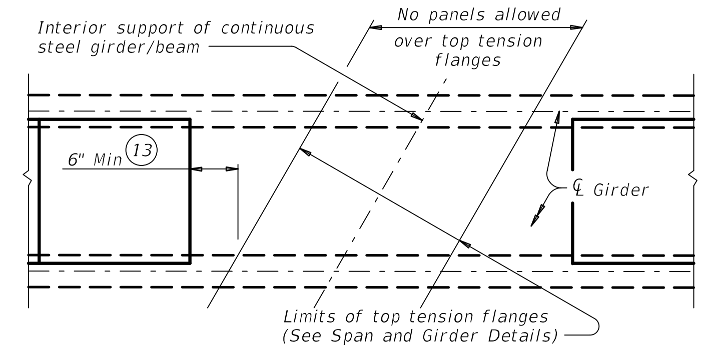


AT FLARED BEAMS OR GIRDERS

See PCP-FAB standard for Min and Max dimensions based on beam/girder type.



OVER CONC U-BEAMS



AT INT SUPPORTS OF CONTINUOUS STEEL GIRDERS

PART PLANS OF PANEL PLACEMENT

(5) Provide clear cover as indicated unless otherwise shown on Span Details.

(6) See Span Details and Thickened Slab End Details for top slab reinforcement and clear cover. Transverse top slab reinforcement may rest on top of prestressed concrete panels if necessary to maintain clear cover.

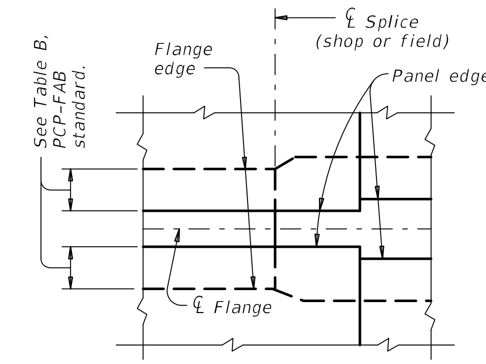
(9) Butt adjacent bedding strips together with adhesive. Cut v-notches, approx ¼" deep, in the top of the bedding strips at 8' o.c..

(10) Equally space additional bar if more than 1'-3" Max.

(11) The actual thickness constructed may exceed the slab thickness shown on the Span Details but the extra thickness may be no more than 2" (1" for prestressed concrete U-beams and steel beams). Bearing seat elevations or finished grade may be adjusted.

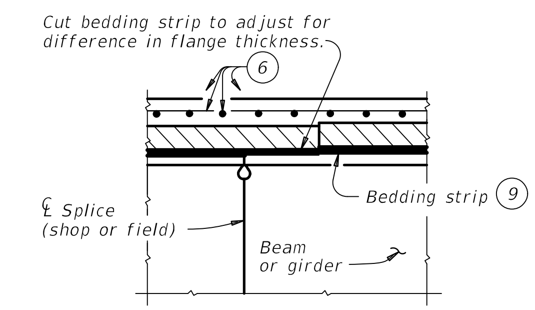
(12) Field adjust Bars Z1(#4) to match actual slope of slab overhangs. Width of slab overhang will vary along span with curved slab edges. Adjust Bar Z1(#4) dimensions to maintain proper cover. Bars Z2(#4) are located at Inverted-Tee stems only.

(13) Location of concrete placement sequence boundaries and bolted field splices should be considered by the contractor in determining panel limits.



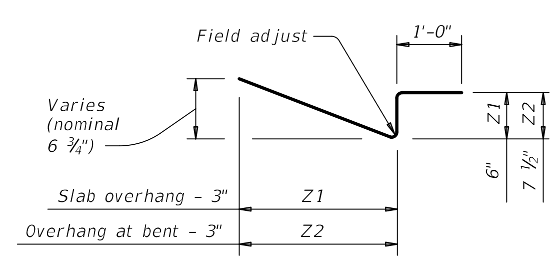
PLAN AT SPLICE

(Showing steel beams with flange width transition)



ELEVATION AT SPLICE

(Showing steel beams with different flange thickness)



BARS Z (#4) (12)

HL93 LOADING SHEET 2 OF 4

Texas Department of Transportation — Bridge Division Standard

PRESTRESSED CONCRETE PANELS
DECK DETAILS

PCP

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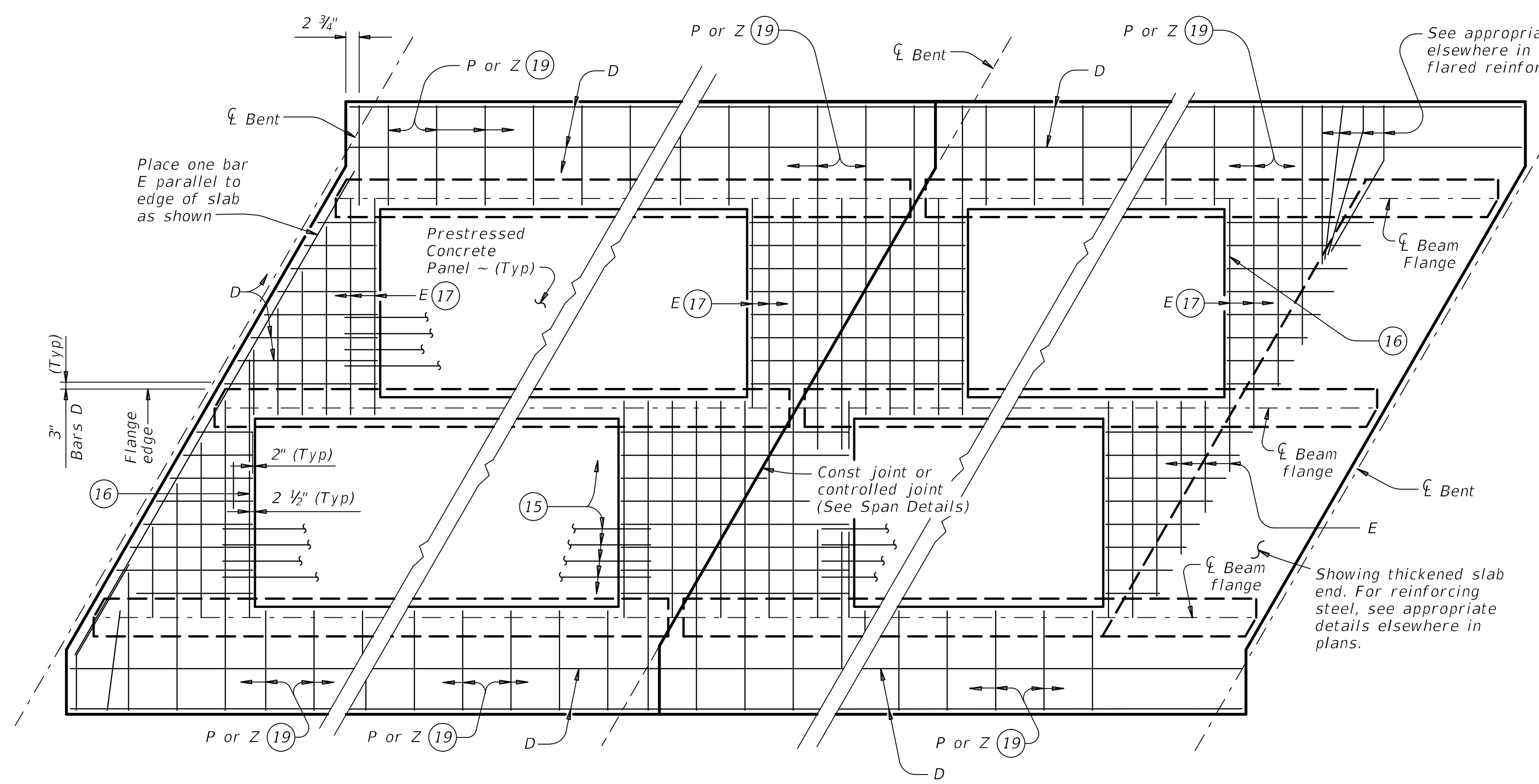
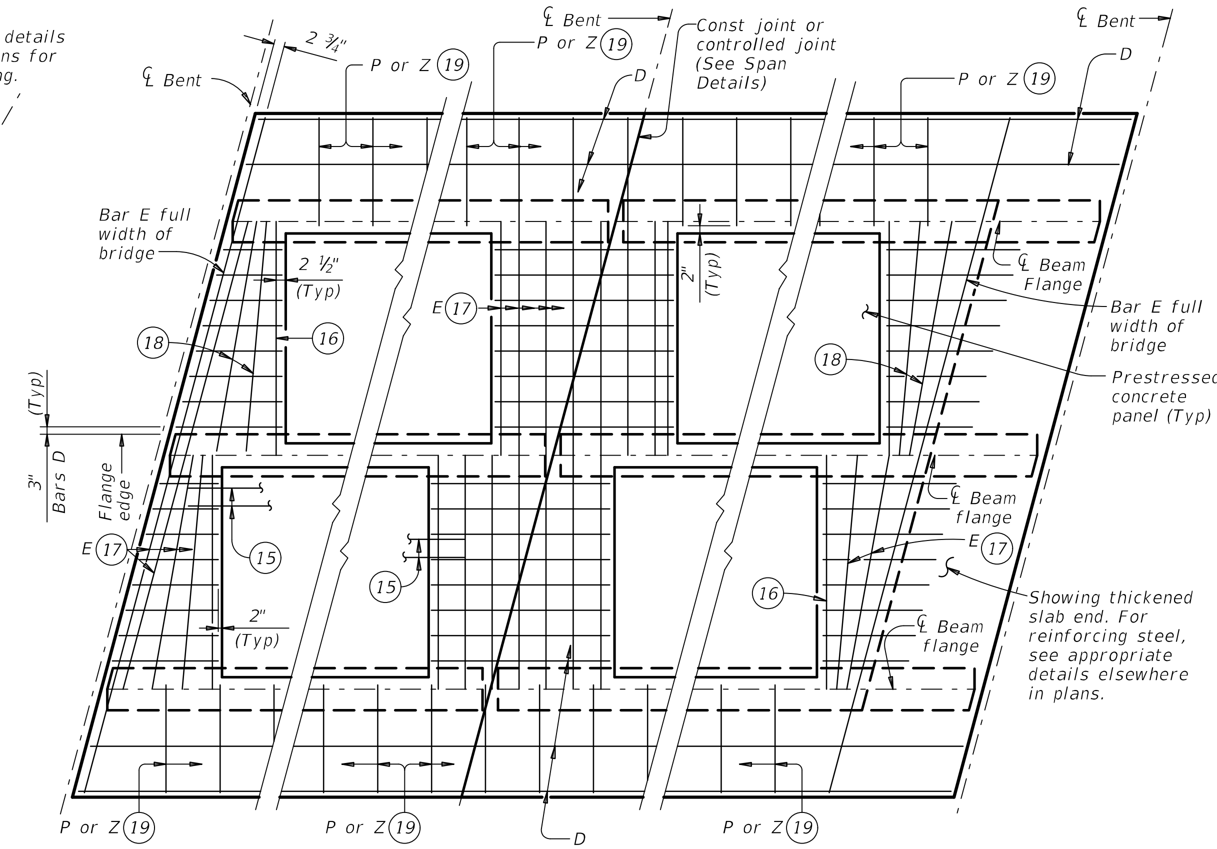


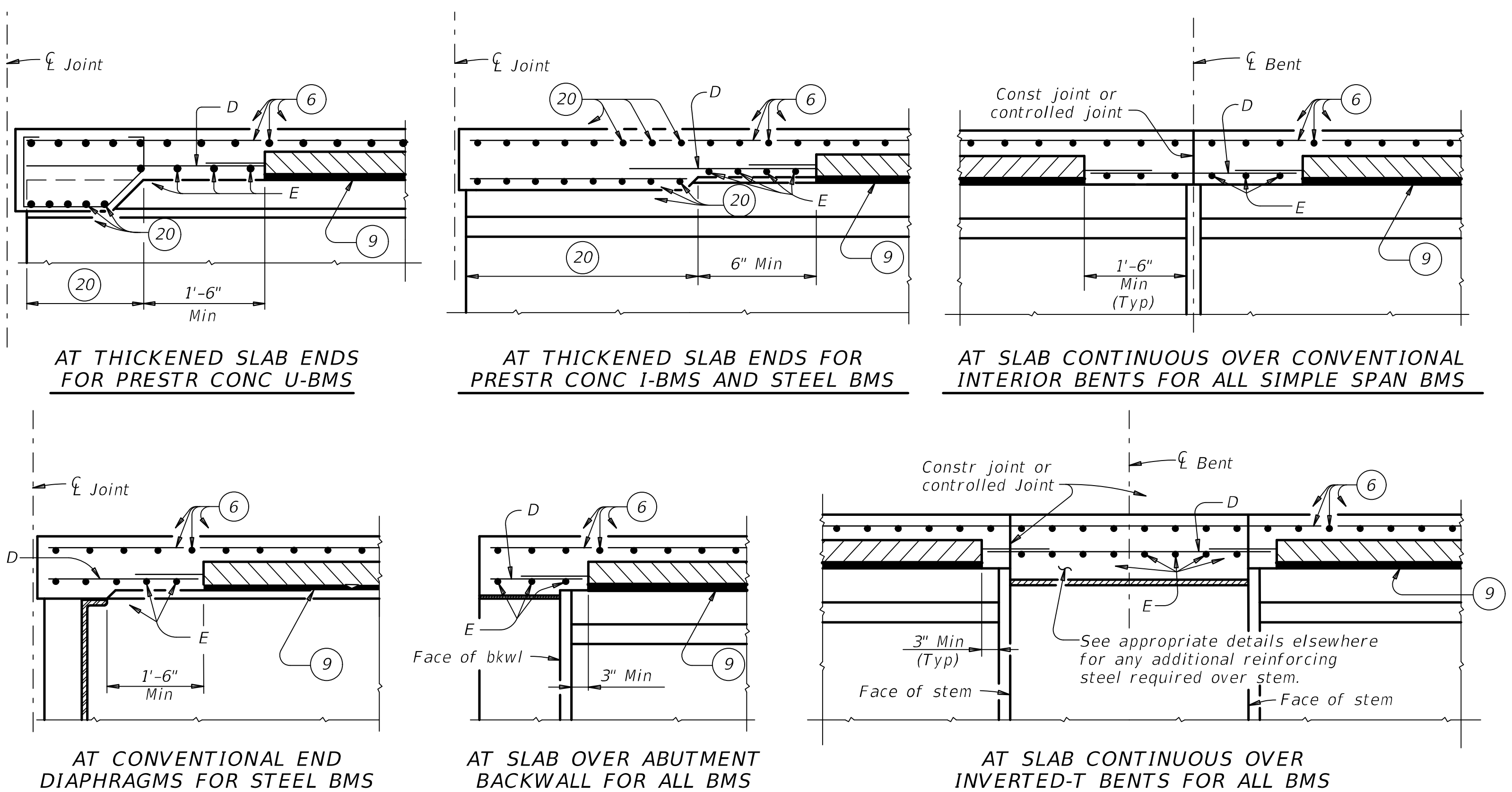
AT ALL SPAN ENDS UNLESS NOTED OTHERWISE | AT INTERIOR BENTS | AT THICKENED END SLABS

OPTION 1 ~ PLAN OF SLABS WITH NORMAL REINFORCEMENT



AT ALL SPAN ENDS UNLESS NOTED OTHERWISE | AT INTERIOR BENTS | AT THICKENED END SLABS

OPTION 1 ~ PLAN OF SLABS WITH SKEWED REINFORCEMENT



OPTION 1 ~ ELEVATIONS AT BEAM ENDS

(6) See Span Details and Thickened Slab End Details for top slab reinforcement and clear cover. Transverse top slab reinforcement may rest on top of prestressed concrete panels if necessary to maintain clear cover.

(9) Butt adjacent bedding strips together with adhesive. Cut v-notches, approx ¼" deep, in the top of the bedding strips at 8' o.c.

(14) Max Spacing as listed unless otherwise shown.

(15) At connection with cast-in-place slab, extend longitudinal panel reinforcement. See PCP-FAB for details.

(16) Maintain one Bar E(#4) parallel to panel ends (Typ).

(17) Bars E(#4) not continuous over beam flanges must overlap beam flange 6" Min.

(18) Add flared Bars E(#4) (Min Spa = 6", Max Spa = 12") as required at panel ends.

(19) Where possible, Bars E(#4) may be extended into overhangs to replace Bars P(#4). Bars Z(#4) are required for sloped overhangs with U-Beams.

(20) See appropriate thickened slab end details for reinforcing and limits of thickened slab end.

TABLE OF REINFORCING STEEL (14)

BAR	SIZE	Max Spa (in.)
D	#4	9
E	#4	9
P	#4	18
UP	#4	~
Z	#4	18

HL93 LOADING

Texas Department of Transportation — Bridge Division Standard

PRESTRESSED CONCRETE PANELS
DECK DETAILS

PCP

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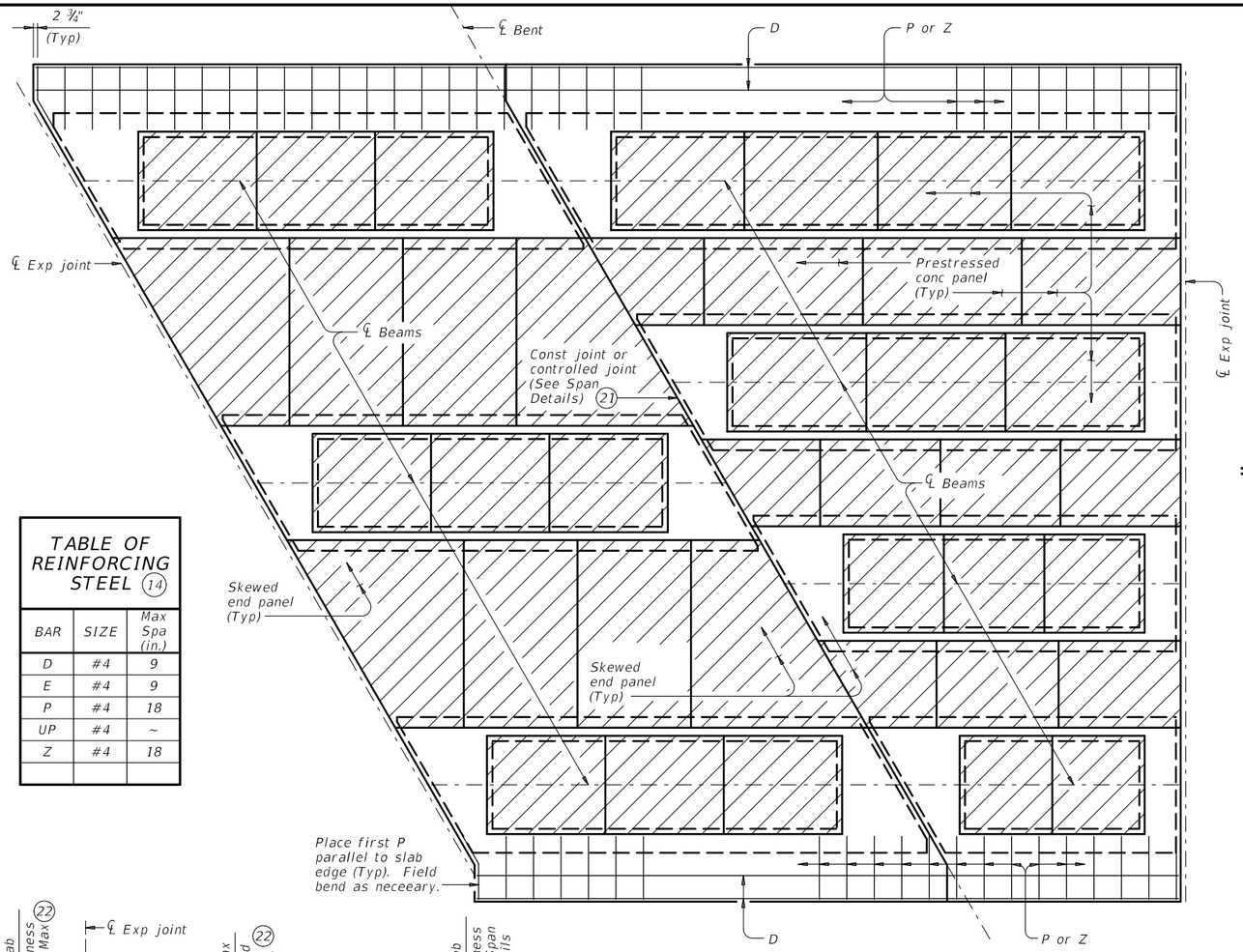
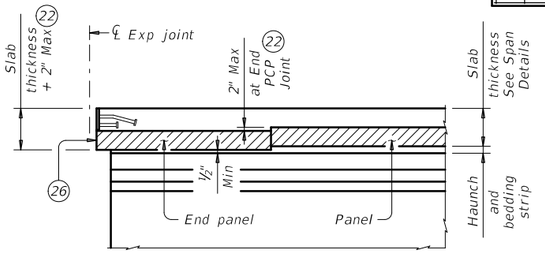


OPTION 2 ~ PLAN OF SLAB

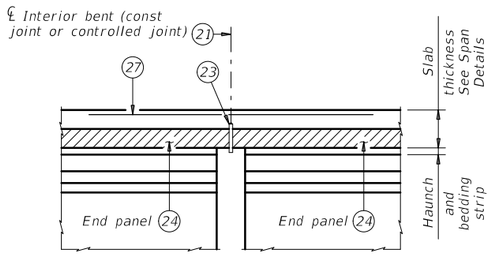
(Showing U-Beams; other beams similar)

TABLE OF REINFORCING STEEL (14)		
BAR	SIZE	Max Spa (in.)
D	#4	9
E	#4	9
P	#4	18
UP	#4	~
Z	#4	18



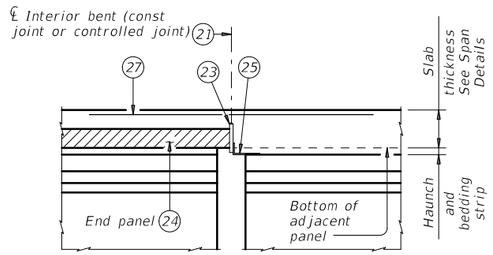
JOINTS (BETWEEN BEAMS/GIRDERS OR AT INV-T STEM)

For SEJ-A, SEJ-S(0), AJ, and Type A expansion joints only.



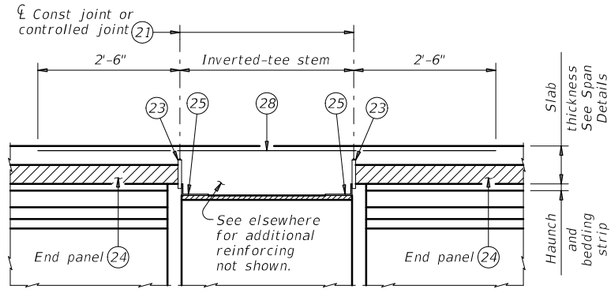
CONVENTIONAL INTERIOR BENT

Panel against panel between beams/girders.



CONVENTIONAL INTERIOR BENT

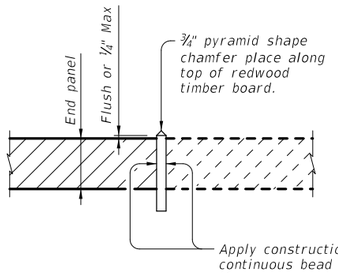
Panel against beam/girder end in adacent span.



INVERTED-T BENT

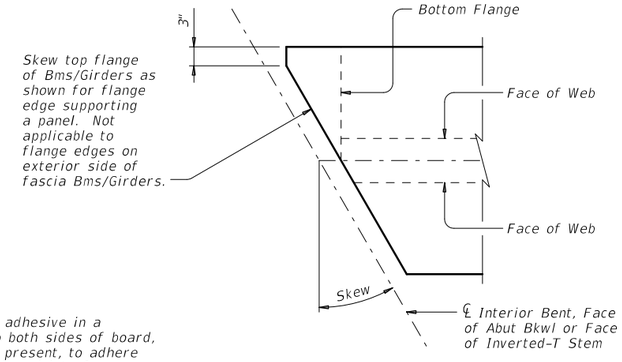
Panels against inverted-tee stem

OPTION 2 ~ ELEVATIONS AT BEAM ENDS (6)



ELEVATION EXAMPLE OF END PANEL AND TIMBER BOARD (23)

See "Option 2 ~ Elevation At Beam Ends".



OPTION 2 ~ SHOWING MODIFICATION TO BEAM/GIRDER TOP FLANGE FOR SKEWS OVER 5°

Showing I-Bm/I-Girder, U-Bms and Steel Bms similar.

(6) See Span Details and Thickened Slab End Details for top slab reinforcement and clear cover. Transverse top slab reinforcement may rest on top of prestressed concrete panels if necessary to maintain clear cover.

(14) Max Spacing as listed unless otherwise shown.

(21) 1 ½" Vinyl or plastic joint former at controlled joints (Stress Cap, Zip Strip, Stress Lock, or equal as approved by the Engineer.)

(22) End panel may be set up to 2" lower to accommodate expansion joint hardware, provided bedding strip is not less than ½" thick.

(23) ¾" thick redwood timber board, leave in place. Redwood timber board placed flush with top of panel or within ¼" Max above panel. Place ¾" pyramid shape chamfer along top of timber board. See "Elevation Example of End Panel and Timber Board". Place straight, within ¼" of centerline of bent or face of inverted-tee, across bridge width and end board at exterior flange edge of fascia beams/girders. Do not extend into overhang.

(24) Place panel within ½" of ¾" thick board.

(25) Permanent galvanized steel sheet form. Removable formwork is acceptable.

(26) Place end panel within ½" of expansion joint opening. End panel cannot encroach on required expansion joint opening.

(27) Place additional (#4) bar 5'-0" in length between every slab bars T. Center (#4) bar on Joint.

(28) Place additional (#4) bar continuous 2'-6" beyond each side of Inverted-T Stem between every slab bars T.

SPECIAL OPTION 2 CONSTRUCTION NOTES:

When Option 2 is chosen bottom mat of thickened end slab reinforcing is not required. Use the same top mat as shown on the Thickened Slab End Details sheet.

Placing panels adjacent to expansion joints and bent centerlines prior to completing interior panel placement is recommended. Saw cutting panels to fit is acceptable when approved by the Engineer. Minimum distance from a saw cut edge to a panel strand is 1 ½".

Do not extend the longitudinal panel reinforcement into the cast-in-place slab.

Top flanges of beams and girders on skewed bridges must be modified as shown on this drawing. The Contractor is responsible for coordinating this modification with the beam fabricator prior to submitting shop drawings for approval.

Fabricator may optionally skew the whole end. When electing to skew whole end, girder end details and bearing type at conventional interior bent must be changed to use condition at abutment. Fabricator must coordinate change in bearing type, bearing centerline location, and dowel location with Engineer and Contractor. Show appropriate changes on girder and bearing shop drawings.

Bending of anchor studs of expansion joints shown on standards AJ, SEJ-A and SEJ-S(0) is permissible if necessary to clear top of end panels. The Contractor is responsible for coordinating modifications with the joint fabricator. Submit shop drawings for approval when modifications to expansion joint hardware are made.

Bedding strips under skewed end panels must conform to the requirements of Item 422 except their minimum compressive strength must be 60 psi.

Provide Bars AA, G, K and 0A from standard IGTS in the slab.

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Texas Department of Transportation — Bridge Division Standard

PRESTRESSED CONCRETE PANELS
DECK DETAILS

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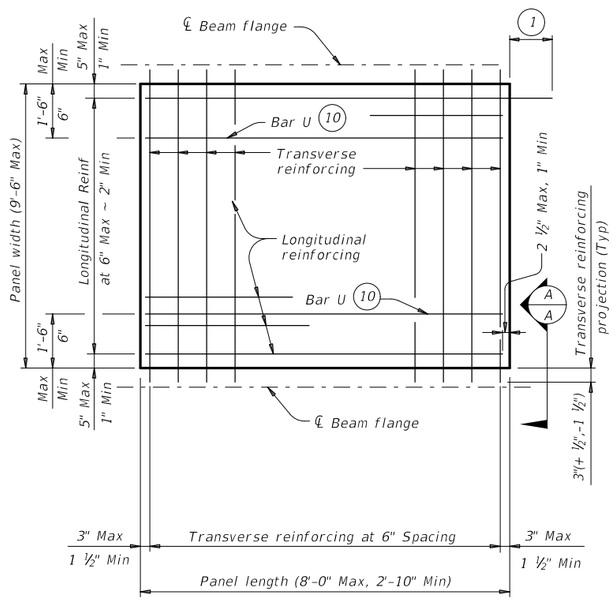
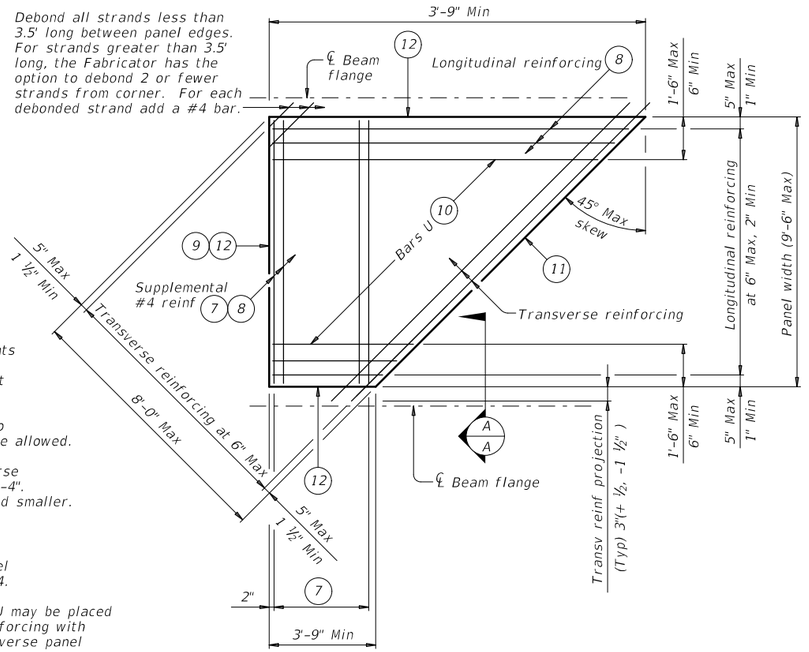


TYPICAL NON-SKEWED PANEL PLAN



TYPICAL SKEWED END PANEL PLAN

(Only to be used with details shown elsewhere in the plans.)

1. At connection with cast-in-place slab, extend longitudinal panel reinforcement 1'-0" (+2",-0") past panel end. Alternatively, provide (#3) x 2'-0" dowels at 6" Max Spacing and extend dowels 1'-0" past panel end.
2. Four loops required per panel.
3. Four loops required per panel. ⅜" or ½" strands may be used.
4. Normal dimensions must be used on spans with parallel beams. Maximum and Minimum dimensions apply only to spans with flared beams.
5. See Normal Grading Detail on PCP standard for lap requirements and bedding strip dimensions. Some laps shown in tables cannot utilize all bedding strip widths.
6. One Splice allowed per panel. No more than two sheets of WWR are allowed.
7. Provide (#4) bars under transverse reinforcing, 10 Spaces at 4" = 3'-4". Omit for 5 degree (1:12) skew and smaller.
8. End Cover 2 ½" Max, 1" Min.
9. Recess strands on indicated panel edge in accordance with Item 424.
10. At the fabricator's option, Bars U may be placed parallel to transverse panel reinforcing with horizontal legs in plane of transverse panel reinforcing.
11. Use length of indicated panel edge as panel width for purpose of determining type of transverse reinforcing.
12. Timber form work permissible this edge.

TABLE A (4) (5)

Beam Type	Normal (In.)	Min (In.)	Max (In.)
A	3	2 ½	3 ½
B	3	2 ½	3 ½
C	4	3	4 ½
IV	6	4	7 ½
VI	6 ½	4 ½"	8 ½
U40 – 54	5 ½	5 ½	7
Tx28-70	6	5	7 ½
XB20 – 40	4	3	4 ½
XSB12 – 15	4	3	4 ½

TABLE B (4) (5)

Top Flange Width	Normal (In.)	Min (In.)	Max (In.)
11" to 12"	2 ¾	2 ½	2 ¾
Over 12" to 15"	3 ¼	3	3 ¼
Over 15" to 18"	4	3	4 ¾
Over 18"	5	3 ½	6 ¼

GENERAL NOTES:

Provide Class H concrete for panels. Release strength f'ci=3,500 psi. Minimum 28 day strength f'c=5,000 psi.

Provide ¾" chamfer along bottom edge of panel on beam side.

Do not use epoxy-coated reinforcing steel bar or strand in panels.

Remove laitance from top panel surface.

Finish top of panel to a roughness between a No. 6 and No. 9 concrete surface profile, inclusive, as specified by the International Concrete Repair Institute (ICRI).

Shop drawings for the fabrication of panels will not require the Engineer's approval if fabrication is in accordance with the details shown on this standard.

A panel layout which identifies location of each panel must be developed by the Fabricator. Permanently mark each panel in accordance with the panel layout. A copy of the layout is to be provided to the Engineer.

TRANSVERSE PANEL REINFORCEMENT:

For panel widths over 5', use ⅜" or ½" Dia (270k) prestressing strands with a tension of 14.4 kips per strand.

For panel widths over 3'-6" up to and including 5', use ⅜" or ½" Dia (270k) prestressing strands with a tension of 14.4 kip per strand. Optionally, (#4) Grade 60 reinforcing bars may be used in lieu of prestressed strands.

For panel widths up to 3'-6", use (#4) Grade 60 reinforcing bars (prestressed strands alone are not allowed).

Place transverse panel reinforcement at panel centroid and space at 6" Max.

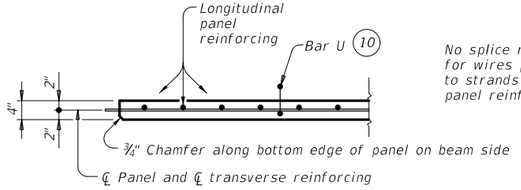
LONGITUDINAL PANEL REINFORCEMENT:

Any of the following options may be used for longitudinal panel reinforcement:

1. (#3) Grade 60 reinforcing steel at 6" Max Spacing. No splices allowed.
2. ⅜" Dia prestressing strands at 4 ½" Max Spacing (unstressed). No splices allowed.
3. ½" Dia prestressing strands at 6" Max Spacing (unstressed). No splices allowed.
4. Deformed Welded Wire Reinforcement (WWR) (ASTM A1064) providing 0.22 sq in per foot of panel width. Wires larger than D11 not permitted. Provide transverse wires to ensure proper handling of reinforcing. One splice per panel is allowed. See WWR Splice Detail.

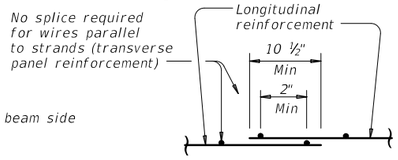
No combination of longitudinal reinforcement options in a panel is allowed.

Place longitudinal panel reinforcement above or below transverse panel reinforcement. Must be placed above transverse panel reinforcement for skewed end panels with supplemental (#4) reinforcement.

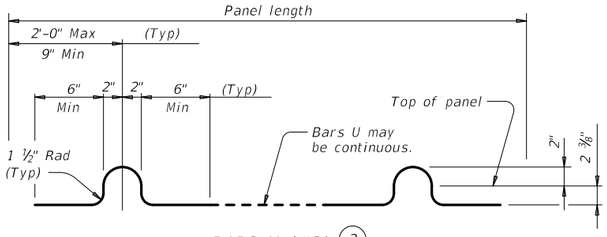


SECTION A-A

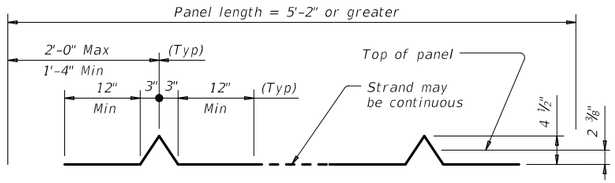
(Not showing supplemental #4 bars for skewed end panels.)



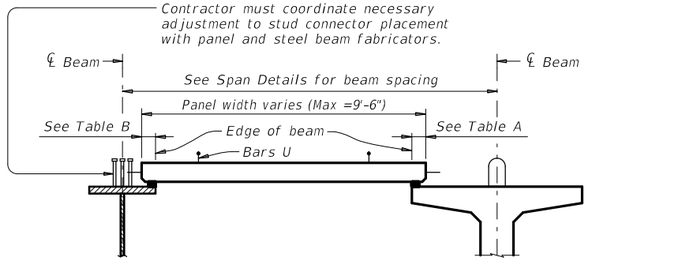
WELDED WIRE REINFORCEMENT (WWR) SPLICE DETAIL (6)



BARS U (#3) (2)



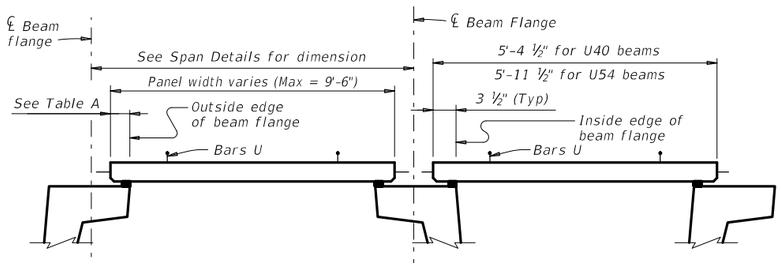
OPTIONAL STRAND FOR BARS U (3)



STEEL BEAMS

PRESTRESSED CONCRETE BEAMS OR GIRDERS

Typ unless noted otherwise



PRESTRESSED CONCRETE U-BEAMS

TYPICAL SECTIONS FOR DETERMINING PANEL WIDTH

HL93 LOADING

Texas Department of Transportation

Bridge Division Standard

PRESTRESSED CONCRETE PANEL FABRICATION DETAILS

PCP-FAB

FILE: pcpstde2-19.dgn	DN: TxDOT	CK: TxDOT	DW: JTR	CK: AES
©TxDOT April 2019 REVISIONS	CONT	SECT	JOB	HIGHWAY
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	ELP	CULBERSON		133

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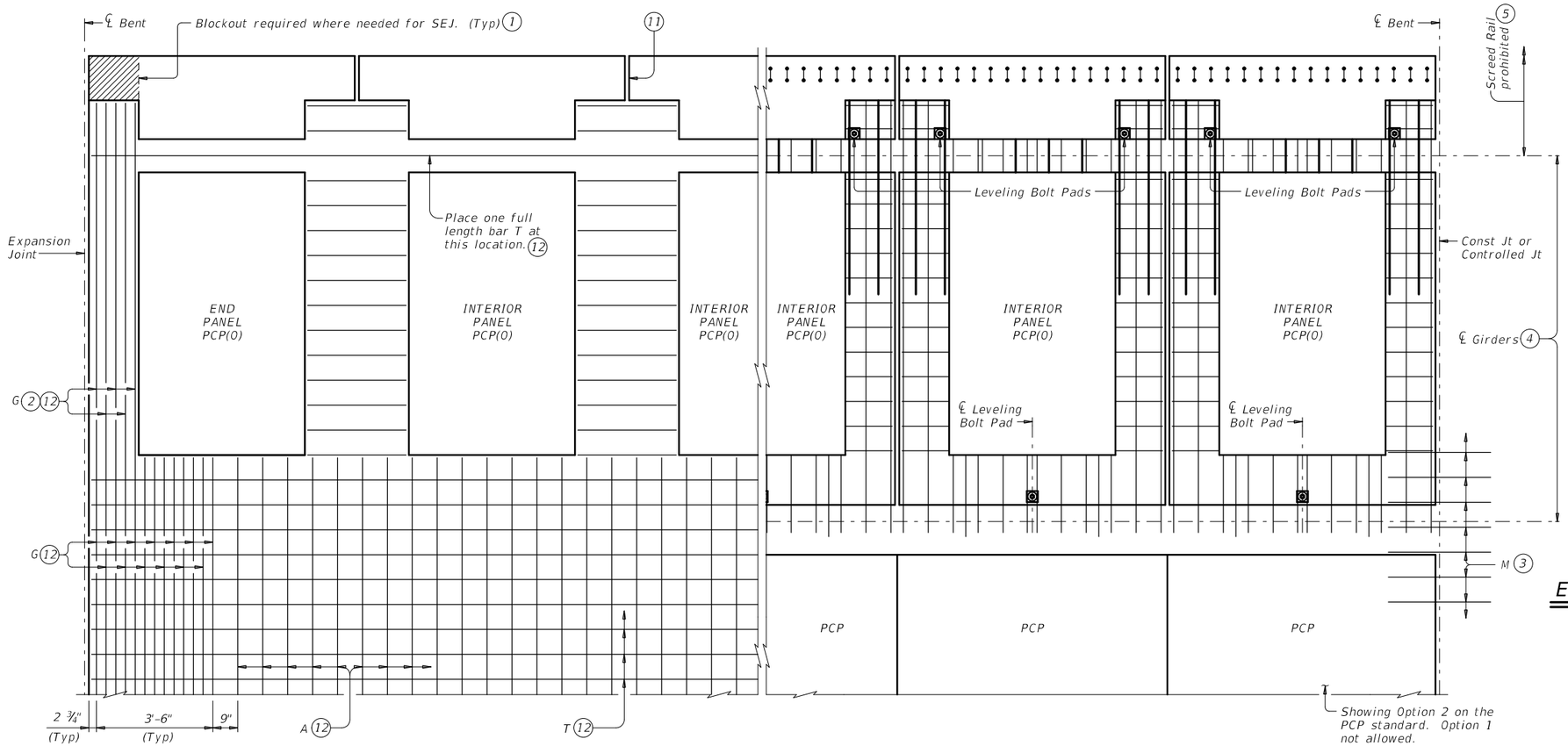


SHOWING FIELD PLACEMENT OF TOP REINFORCING STEEL

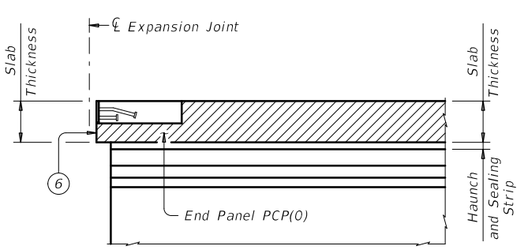
SHOWING PCP(0) EXPOSED REINFORCING STEEL

Field placed bars M shown for clarity.

PANEL LAYOUT

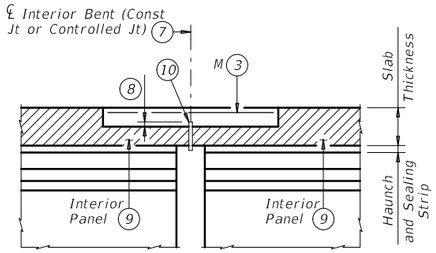
PCP(0) shown with gaps between panels for clarity.
The gap cannot be considered as a panel fabrication tolerance.

1. 1'-4" x 1'-6" x 4 ½" blockout to accommodate SEJ that require an upturn. Contractor to communicate with fabricator the location and type of SEJ to be utilized.
2. When blockout is required, extend bars G into blockout.
3. Place additional bars M 2'-11" in length on top of bars A and between every bar T. Center bars M at center of bent. Located at bents with construction joints or controlled joints only. Bars M may replace additional (#4) bars 5'-0" in length as shown on PCP standard in Option 2 ~ Elevations At Beam Ends. Option 1 not allowed.
4. It is recommended to profile every 4 ft by surveying each girder under PCP(0) for proper grading of panels.
5. Screed rail used to set grade for paving machine is not allowed past exterior girder as shown.
6. Place end panel PCP(0) within ½" of expansion joint opening. Do not encroach on required expansion joint opening.
7. Top Plastic Joint Former at Controlled Joints (Stress Cap, Zip Strip, Stress Lock, etc.) is not required with these Details.
8. 0" Min, ¾" Max, support as necessary.
9. Place panel within ½" of ¾" thick board.
10. ¾" thick wood/timber board, leave in place. Place straight, within ¼" of Centerline of Bent, across bridge width and end board at exterior flange edge of fascia girders. Do not extend into overhang.
11. Seal top of panel only, with a Class 4 sealant prior to rail construction. Typical between panels. Do not seal at Expansion Joints.
12. 1 ½" End Cover. (Typ)



EXPANSION JOINT

For SEJ-A, SEJ-S(0), AJ and Type A Expansion Joints only.

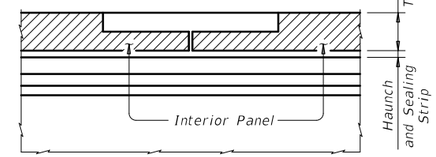


CONST JT OR CONTROLLED JT

Panel against Panel between Bms/Girders.

ELEVATIONS AT GIRDER ENDS WITH PCP(O)

Reinforcing steel not shown for clarity.



ELEVATION BETWEEN PCP(O)

The gap cannot be considered as a panel fabrication tolerance.
Reinforcing steel not shown for clarity.

HL93 LOADING SHEET 1 OF 2

Texas Department of Transportation — Bridge Division

PRECAST CONCRETE PANELS FOR OVERHANGS

PCP(O)

FILE: pcpostd1-17.dgn	DN: KLM	CK: DVL	DW: JTR	CK: KLM
©TxDOT August 2017	CONT	SECT	JOB	HIGHWAY
REVISIONS	0233	05	038	SH 54
	DIST	COUNTY		SHEET NO.
	ELP	CULBERSON		134

BAR TABLE		
BAR	SIZE	MAX SPA (IN)
A (12)(17)	#4	9"
G (12)(17)	#4	3½"
M	#4	9"
T (12)(17)	#4	9"

(4) It is recommended to profile every 4 ft by surveying each girder under PCP(O) for proper grading of panels.

(5) Screed rail used to set grade for paving machine is not allowed past exterior girder as shown.

(12) 1 ½" End Cover on bars. (Typ)

(13) Space bars UP(#4) with girder bars R(#4) in all areas where measured haunch exceeds 3 ½" with Prestressed Concrete I-Girders. Epoxy coating for Bars UP is not required.

(14) 6" plus or minus.

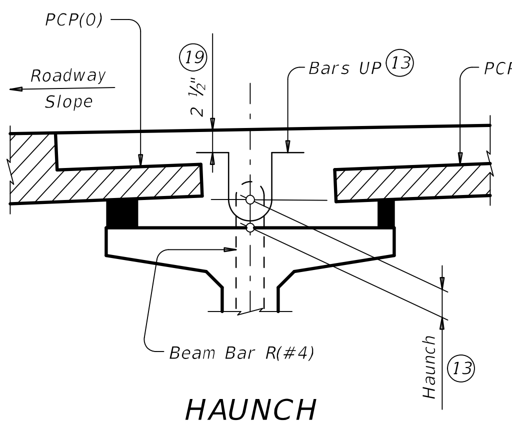
(15) Place sealing strip at flange edge as shown. Butt adjacent sealing strips longitudinally together with adhesive. Use pencil vibrators with concrete placement over girder and between sealing strips to avoid rupturing sealing strips. Cut sealing strips 2" higher than anticipated haunch thickness and compress to grade.

(16) (#3) Panel bars F must be field bent and welded to the R bars in girder. Two bars F per panel.

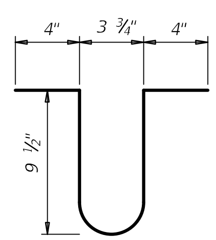
(17) Field placed bars that are allowed to be lapped. Reinforcing steel that protrudes from panels are not considered bars to be lapped. See "Material Notes" for applicable bar laps.

(18) ℄ Leveling Bolt Pad. 1" Dia Coil Rod or 1" Dia Coil Bolt shown, are furnished by the contractor. After grading each PCP(O) panel with the 1" Dia coil rods or coil bolts, secure each panel in its final resting position (plastic shims, welding, etc) and remove all 1" Dia coil rods or coil bolts for the cast-in-place concrete. Coil rods/bolts may be left in place at contractor's option. If coil rods/bolts are left in place, coil rods/bolts must have at least 2 ½" of cover to top of finish grade. Grading bolts are inadequate to carry all conceivable screed/construction loads. Panel support method must be calculated, location identified, and placed on shop drawings. Method chosen to support panels must be adequate for all construction loads. Panel support method must be placed/constructed after final grading and before screed rail placement.

(19) Unless shown otherwise on Span Details.



HAUNCH REINFORCING DETAIL (4)



BARS UP (#4) (13)

CONSTRUCTION NOTES:

Placing panels adjacent to expansion joints and bent centerlines prior to completing interior panel placement is recommended.

Ensure proper cleaning of construction debris and consolidation of concrete mortar under the edges of the panels. Place sealing strips at girder flange edges so that adequate space is provided for the mortar to flow a minimum of 8" transversely under the panels as the slab concrete is placed.

Panel placement with Option 1 on the PCP standard is not allowed.

It is recommended to profile every 4 ft by surveying each girder under PCP(O) for proper grading of panels.

To allow the proper amount of mortar to flow between girder and panel, maintain a minimum vertical opening of 1". Roadway cross-slope reduces the opening available for entry of the mortar. Sealing strips vary in thickness along girder are therefore required.

Seal the top panel with a Class 4 sealant as shown in the Panel Layout.

MATERIAL NOTES:

Provide Grade 60 reinforcing steel in cast-in-place slab. See Table of Reinforcing Steel for size and spacing of reinforcement.

If the reinforcing steel is shown on the Span Details to be epoxy coated, then epoxy coat bars A, G, M, & T.

Provide bar laps, where required, as follows:

Uncoated ~ #4 = 1'-7"

Epoxy Coated ~ #4 = 2'-5"

Provide sealing strips comprised of one layer low density polyurethane (1.0 Lbs density) foam sealing strips or equivalent. Oversize the height of sealing strips by 2". Bond sealing strips to the girder with 3M Scotch ® 4693 or equivalent adhesive compatible with sealing strips.

GENERAL NOTES:

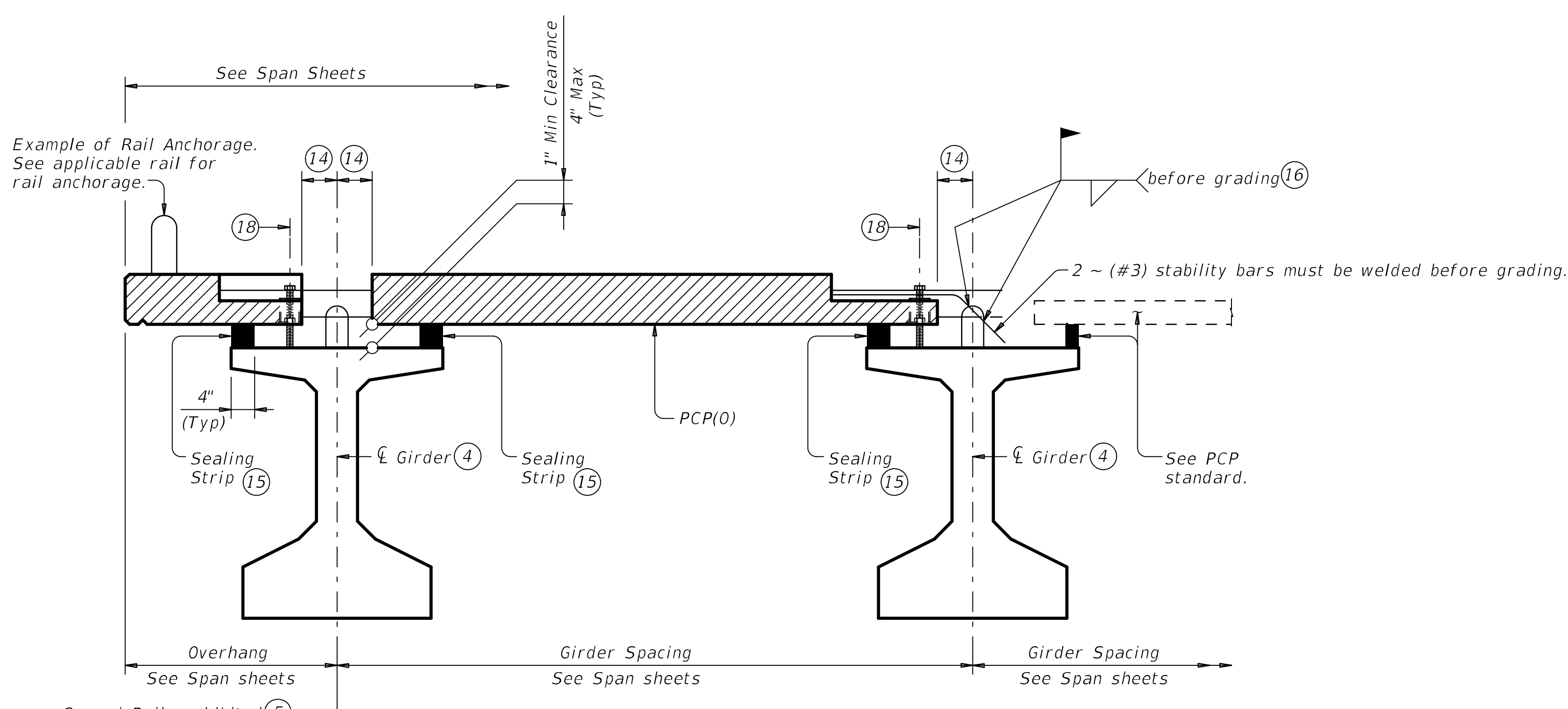
Designed according to AASHTO LRFD Specifications.

These details can be used as an option to construct the deck overhang when noted on the Span details and in conjunction with the PCP(O)-FAB, PCP and applicable Standard sheets.

These details are only applicable for Prestr Conc I-Girders.

Any additional reinforcement or concrete required on these details is subsidiary to the bid Item "Reinforced Concrete Slab".

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



TYPICAL TRANSVERSE SECTION

(Showing Girder Type Tx46)

HL93 LOADING SHEET 2 OF 2

Texas Department of Transportation — Bridge Division

PRECAST CONCRETE PANELS FOR OVERHANGS

PCP(O)

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	ELP	CULBERSON		135

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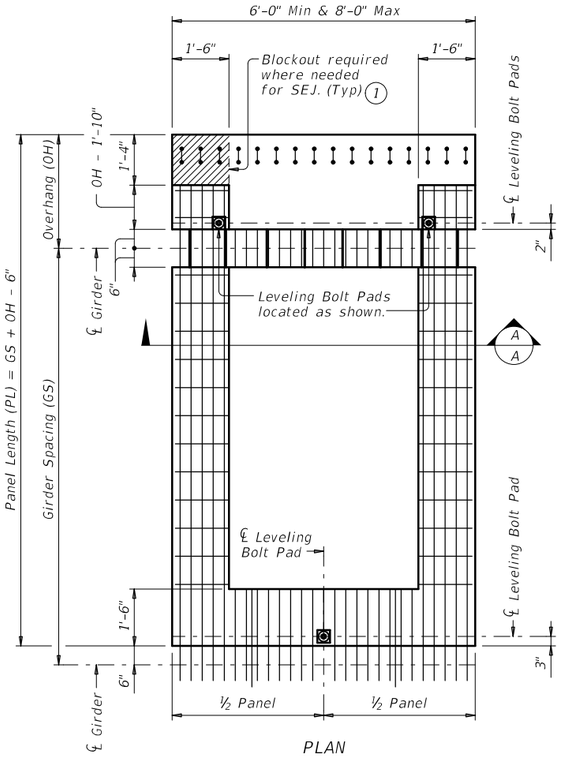
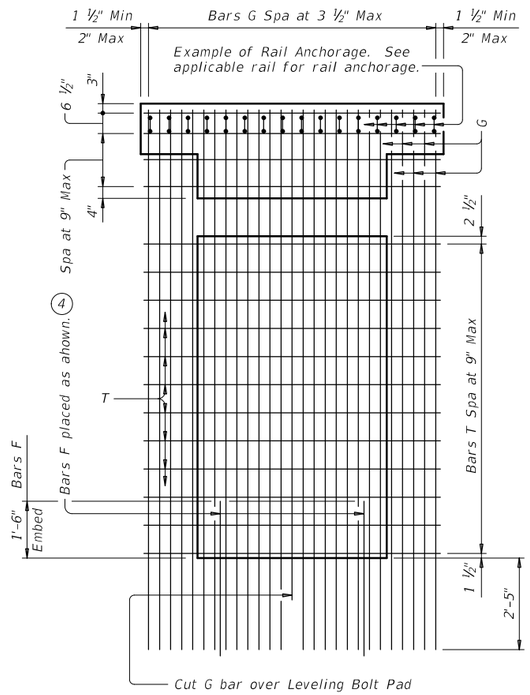
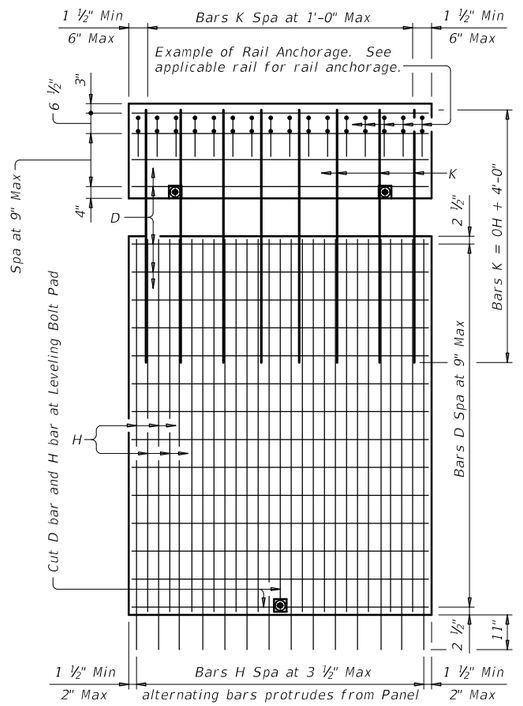
BAR TABLE	
BAR	SIZE
A (2)	#4
B (2)	#4
D (2) (3)	#4
F (3)	#3
G (2)	#4
H (2)	#4
K (2) (3)	#8
T (2) (3)	#4



PLAN



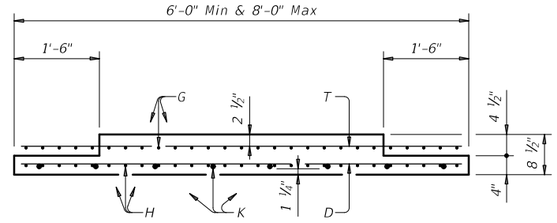
TOP REINFORCING STEEL



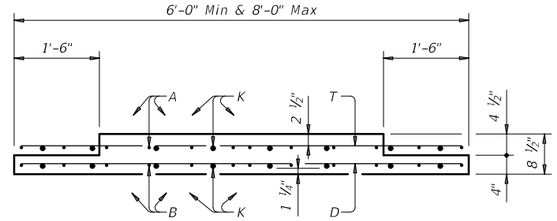
BOTTOM REINFORCING STEEL

END PANEL

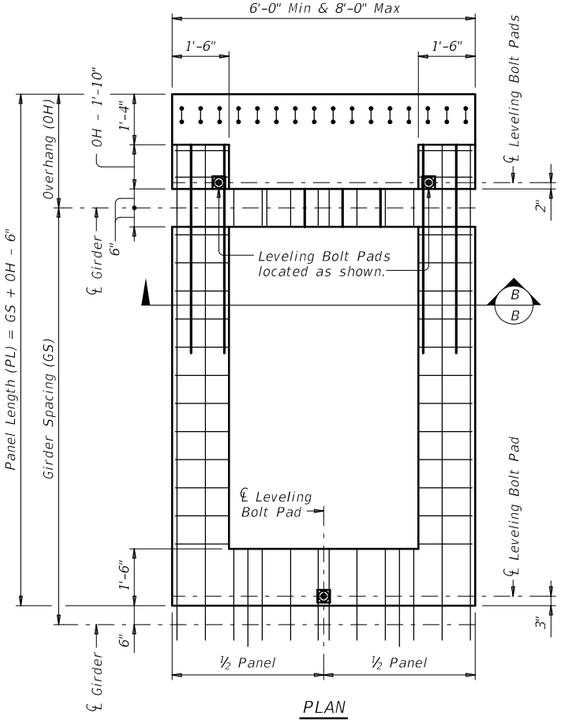
1. 1'-4" x 1'-6" x 4 ½" blockout to accommodate SEJ that require an upturn. Contractor to communicate with fabricator the location and type of SEJ to be utilized.
2. 1 ½" End Cover on bars. (Typ)
3. Bars that are not allowed to have lap splices.
4. Place F bars under bars T and against bars G.
5. Place F bars under bars T and between bars A.



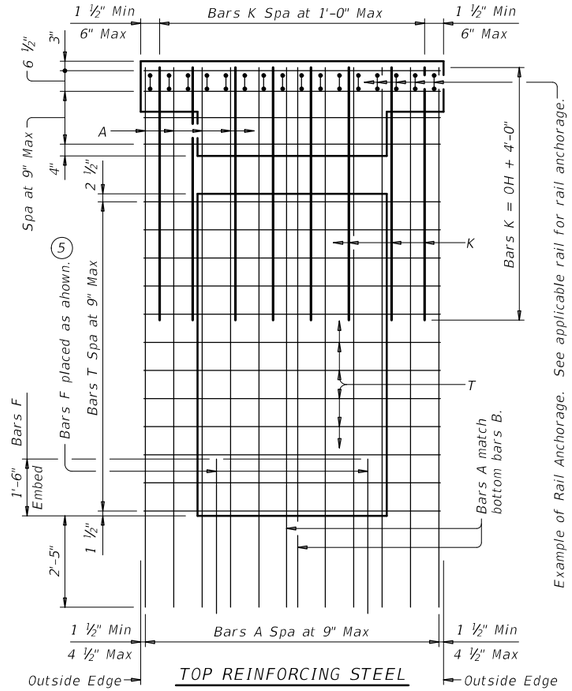
SECTION A-A



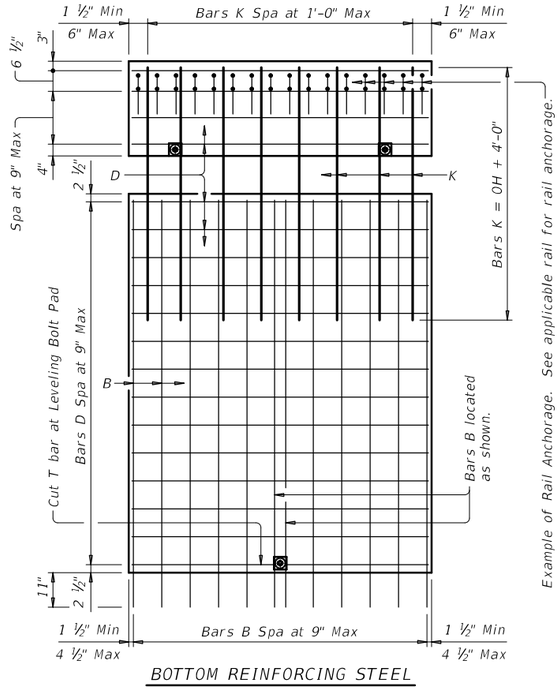
SECTION B-B



PLAN



TOP REINFORCING STEEL



BOTTOM REINFORCING STEEL

INTERIOR PANEL

HL93 LOADING SHEET 1 OF 2

Texas Department of Transportation — Bridge Division

PRECAST CONCRETE PANELS FOR OVERHANGS FABRICATION DETAILS

PCP(O)-FAB

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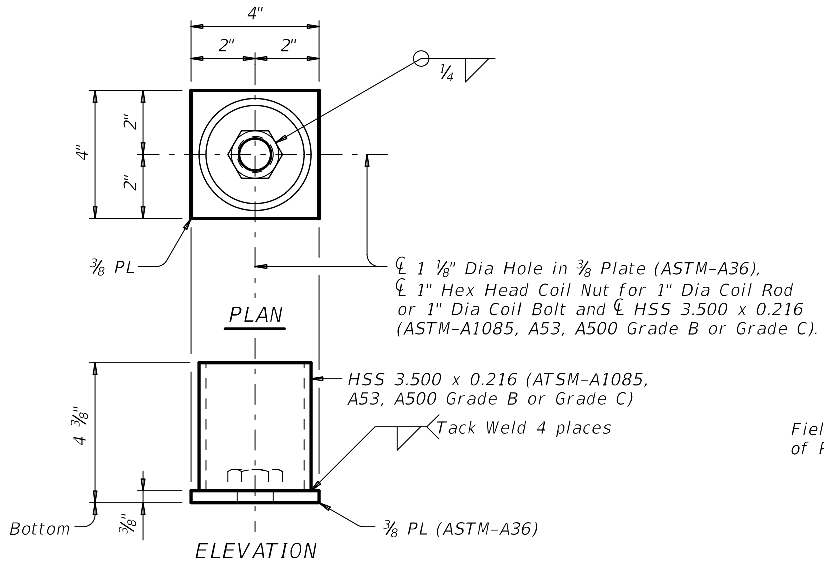
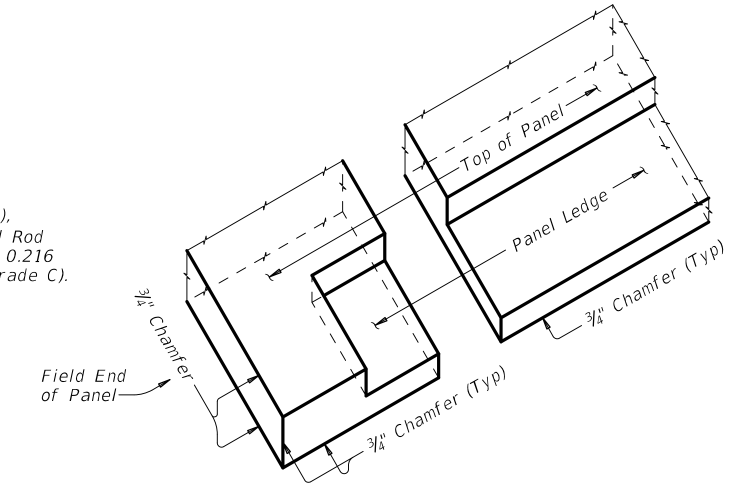


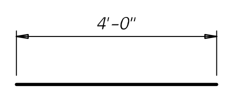
LEVELING BOLT PAD DETAILS

Galvanize if epoxy coated reinforcing steel is used in slab. Do not oil this assembly.

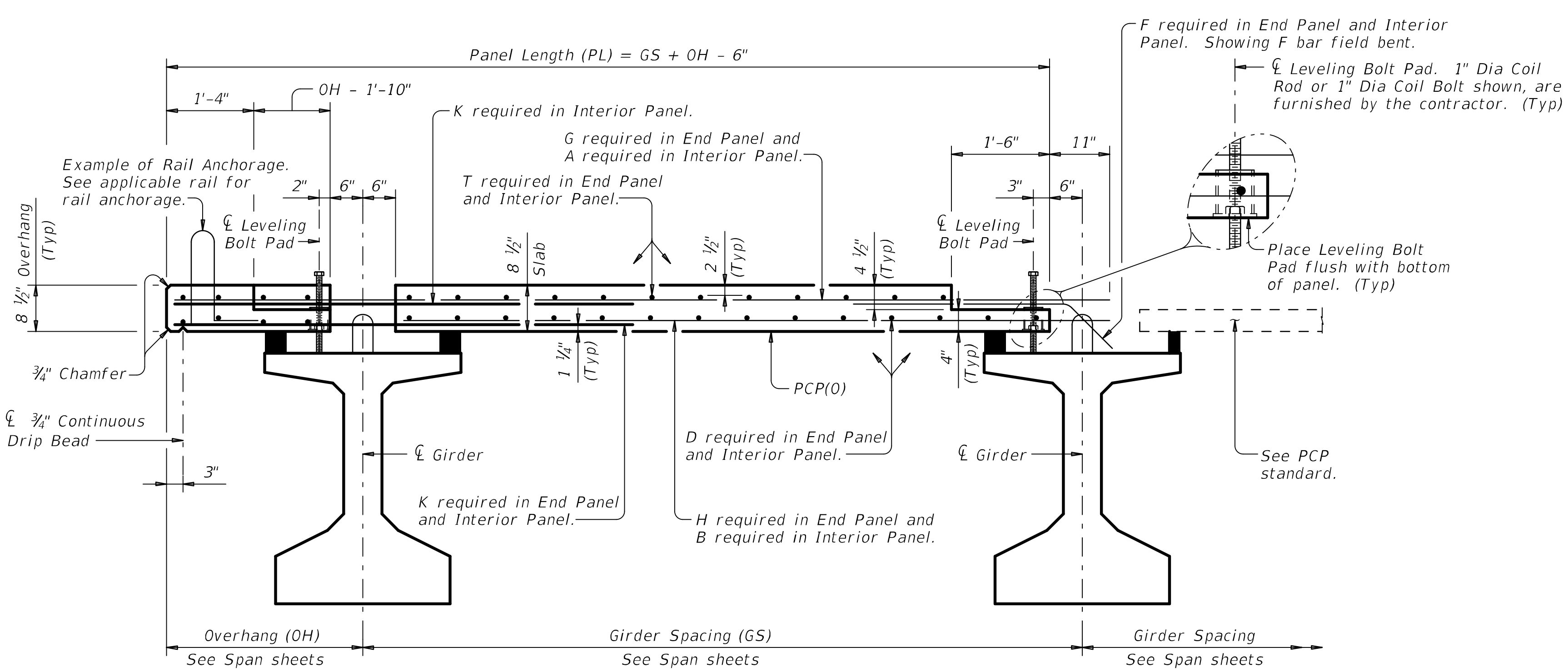


ISOMETRIC VIEW AT CORNER OF PANEL

Showing Typical Chamfers on Panel. Drip Bead and reinforcing steel not shown for clarity.



BARS F



TYPICAL TRANSVERSE SECTION

(Showing Girder Type Tx46)

CONSTRUCTION/FABRICATION NOTES:

Remove laitance from top panel surface.

Finish top surface area of panel with a broom finish. Finish top ledge of panel to a roughness between a No. 6 and No. 9 concrete surface profile, inclusive, as specified by the International Concrete Repair Institute (ICRI).

Provide 3/4" concrete chamfers as shown on these details.

Do not lap splice bars D, F, K & T. Bars A, B, G & H, may be spliced with only one lap splice allowed on each bar.

Panels must be fabricated by a fabricator meeting the requirements of DMS 7300 for Multi-Project Nonstressed Member Fabrication Plant.

MATERIAL NOTES:

Provide Class H concrete (f'c=4000 psi) in panels. Provide Class H (HPC) concrete for panels if required elsewhere in plans. Maximum large aggregate size is 1".

Provide material as shown on this standard for the Leveling Bolt Pad.

Provide Grade 60 conventional reinforcing steel.

Provide epoxy coated reinforcement for bars A, B, D, G, H, K & T if slab reinforcement is epoxy coated.

An equal area and spacing of deformed Welded Wire Reinforcement (WWR) ASTM-A1064 may be substituted for bars A, B, D, G, H & T, unless otherwise noted. Bars F and K can not be replaced with WWR.

Galvanize leveling bolt pad assembly if epoxy-coated reinforcing steel is used in slab.

GENERAL NOTES:

Designed according to AASHTO LRFD Specifications.

These details are only applicable for Prestr Conc I-Girders.

Any additional reinforcement, lifting devices or epoxy coated reinforcement required on these details are subsidiary to the bid Item "Reinforced Concrete Slab".

See railing details for rail anchorage in panel overhang.

A panel layout which identifies location of each panel must be developed by the fabricator. Permanently mark each panel in accordance with the panel layout. A copy of the layout is to be provided to the Engineer.

Submit stable lifting methods and devices to the Engineer for approval.

Shop drawings for the fabrication of panels will require the Engineer's approval.

Cover dimensions are clear dimensions, unless noted otherwise.

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

HL93 LOADING

Texas Department of Transportation — Bridge Division

PRECAST CONCRETE PANELS FOR OVERHANGS FABRICATION DETAILS

PCP(O)-FAB

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©TxDOT August 2017		CONT	SECT	JOB		HIGHWAY	
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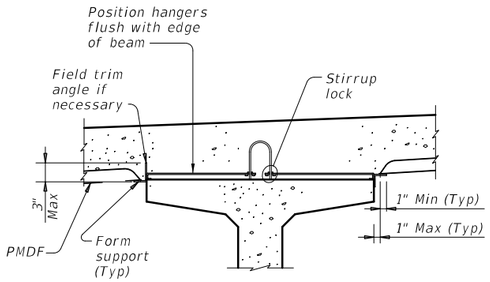
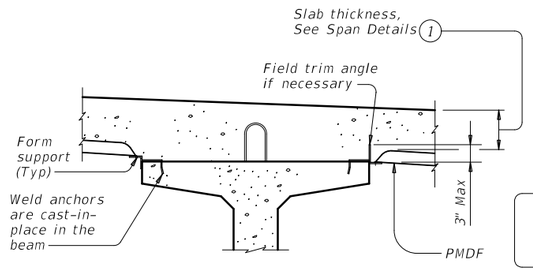
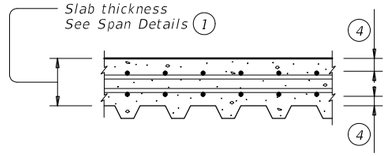


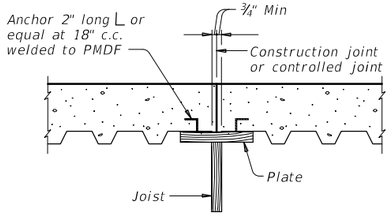
PRESTR CONC I-BEAMS AND I-GIRDERS WITH STIRRUP LOCKS



PRESTR CONC I-BEAMS AND I-GIRDERS WITH WELD ANCHORS

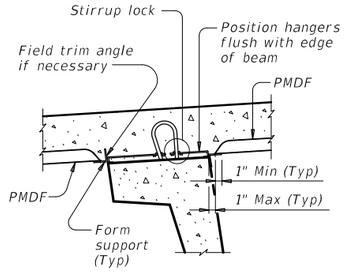


TYP LONGITUDINAL SLAB SECTION

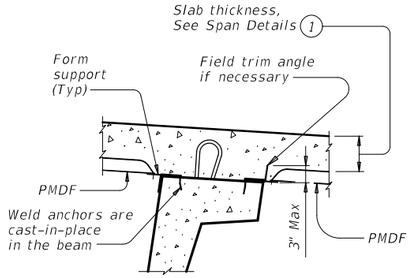


Note: In spans where PMD forms are used, timber forms must be used at construction joints. Adequate provision must be made to support edge of metal form and to provide anchorage of metal form to slab concrete where joined to wood forms.

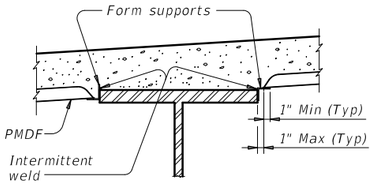
SECTION THRU CONSTRUCTION JOINT



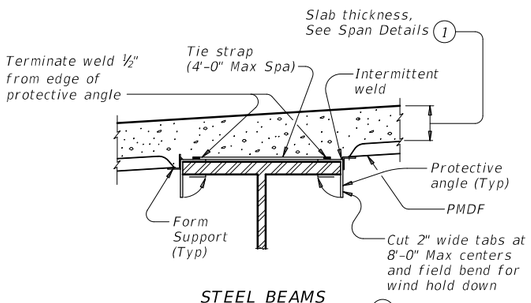
U-BEAMS WITH STIRRUP LOCKS



U-BEAMS WITH WELD ANCHORS

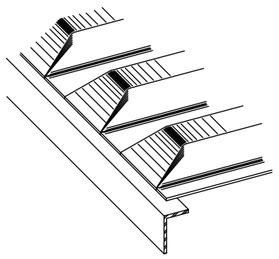


STEEL BEAMS AT COMPRESSION FLANGES

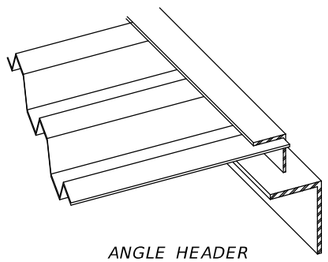


STEEL BEAMS AT TENSION FLANGES (2)

TYPICAL TRANSVERSE SECTIONS



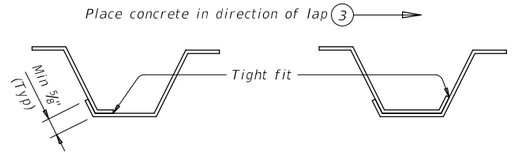
PRECLOSED



ANGLE HEADER

NOTE: This type is to be used for skewed ends only.

TYPES OF END CLOSURES



SIDE LAP DETAILS

(1) Slab thickness minus 5/8" if corrugations match reinforcing bars.

(2) Welding of form supports to tension flanges will not be permitted. Other methods of providing wind hold down resistance for PMDF in tension flange zones will be considered. At least one layer of sheet metal must be provided between the flange and the weld joint.

(3) The direction of concrete placement will be such that the upper layer of the form overlap is loaded first.

(4) See Span details for cover requirements.

GENERAL NOTES:

Steel for Permanent Metal Deck Forms (PMDF) and support angles shall conform to ASTM A653, structural steel (SS), with coating designation G165. Steel must have a minimum yield strength of 33 ksi. Minimum thickness of PMDF is 20 gage and that of support angles and protective angles is 12 gage.

Submit two copies of forming plans for PMDF to the Engineer. These plans must show all essential details of proposed form sheets, closures, fasteners, supports, connectors, special conditions and size and location of welds. These plans must clearly show areas of tension flanges for steel beams and provisions for protecting the tension flanges from welding notch effects by inclusion of separating sheet metal or other positive method. These plans must be designed, signed, and sealed by a licensed professional engineer. Department approval of these plans is not required, but the Department reserves the right to require modifications to the plans. The Contractor is responsible for the adequacy of these plans.

The details and notes shown on this standard are to be used as a guide in preparation of the forming plans.

All material, labor, tools and incidentals necessary to form a bridge deck with Permanent Metal Deck Forms is considered subsidiary to Item 422, "Concrete Superstructures".

FOR PRESTR CONC U-BEAM AND STEEL GIRDER BRIDGES:
Unless shown elsewhere in the plans, size, spacing, and orientation of bottom mat of slab reinforcement must match the top mat of reinforcing shown on the span details except all bottom mat bars are to be #5. Bottom mat reinforcement and additional concrete is subsidiary to Item 422 "Concrete Superstructures."

FOR PRESTR CONC TX-GIRDER BRIDGES:
See Miscellaneous Slab Details, Prestr Concrete I-Girders (IGMS) standard sheet for bottom mat reinforcing.

DESIGN NOTES:

As a minimum, PMDF and support angles must be designed for the dead load of the form, reinforcement and concrete plus 50 psf for construction loads. Flexural stresses due to these design loads must not exceed 75 percent of the yield strength of the steel. Allowable stress for weld metal must be 12,400 psi.

Maximum deflection under the weight of forms, reinforcement and concrete or 120 psf, whichever is greater, shall not exceed the following:

1/180 of the form design span, but not more than 0.50", for design spans of 10' or less.

1/240 of the form design span, but not more than 0.75", for design spans greater than 10'.

1/240 of the form design span, but not more than 0.75", for all design spans of railroad overpass bridge spans fully or partially over railroad right-of-way, and for all bridge spans of railroad underpass structures.

The form design span must not be less than the clear distance between beam flanges, measured parallel to the form flutes, minus 2".

CONSTRUCTION NOTES:

Form sheets must not be permitted to rest directly on the top of beam flanges. Form sheets must be securely fastened to form supports and must have a minimum bearing length of one inch at each end. Form supports must be placed in direct contact with beam flanges.

All attachments must be made by permissible welds, screws, bolts, clips or other means shown on the the forming plans. All sheet metal assembly screws must be installed with torque-limiting devices to prevent stripping. Only welds or bolts must be used to support vertical loads.

Welding and welds must be in accordance with the provisions of Item 448, "Structural Field Welding", pertaining to fillet welds. All welds must be made by a qualified welder in accordance with Item 448.

All permanently exposed form metal, where the galvanized coating has been damaged, must be thoroughly cleaned and repaired in accordance with Item 445, "Galvanizing". Minor heat discoloration in areas of welds need not be touched up.

Flutes must line up uniformly across the entire width of the structure where main reinforcing steel is located in the flute.

Construction joints will not be permitted unless shown on the plans. The location of and forming details for any construction joint used must be shown on the forming plans. Forms below a construction joint must be removed after curing of the slab.

A sequence for uniform vibration of concrete must be approved by the Engineer prior to concrete placement. Attention must be given to prevent damage to the forms, yet provide proper vibration to prevent voids or honeycomb in the flutes and at headers and/or construction joints.

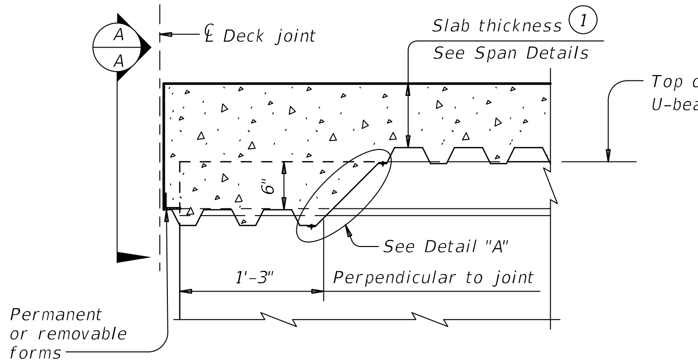
Texas Department of Transportation

Bridge Division Standard

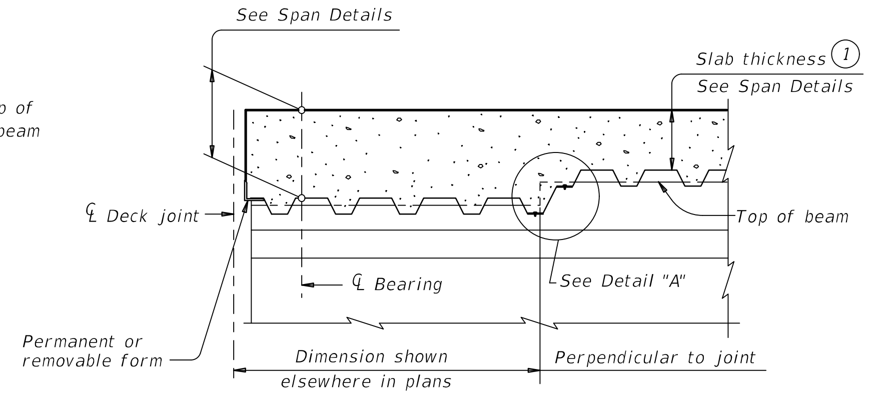
PERMANENT METAL DECK FORMS

PMDF

FILE: pmdfste1-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0233	05	038	SH 54
02-20: Modified box note by adding steel beams/girders and subsidiary.	DIST	COUNTY		SHEET NO.
12-21: Updated max deflection for RR.	ELP	CULBERSON		138

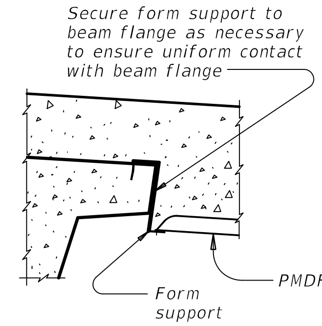


AT THICKENED SLAB END FOR U-BEAMS

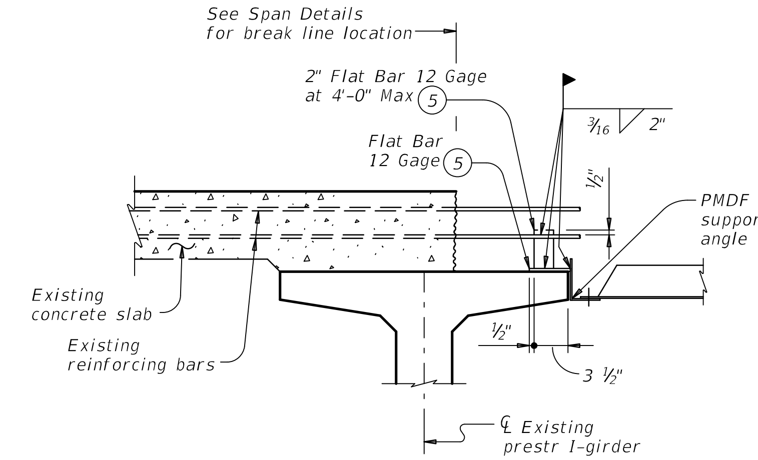


AT THICKENED SLAB END FOR PRESTRESSED I-BEAMS, I-GIRDERS AND STEEL BEAMS

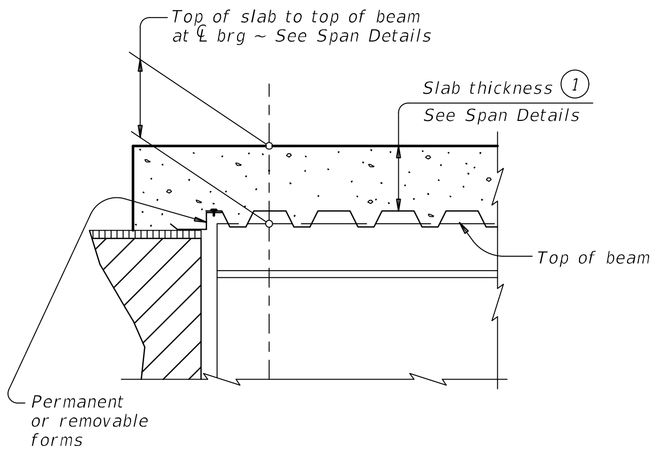
Showing I-beam block-out. No block-out for I-girders or steel beams.



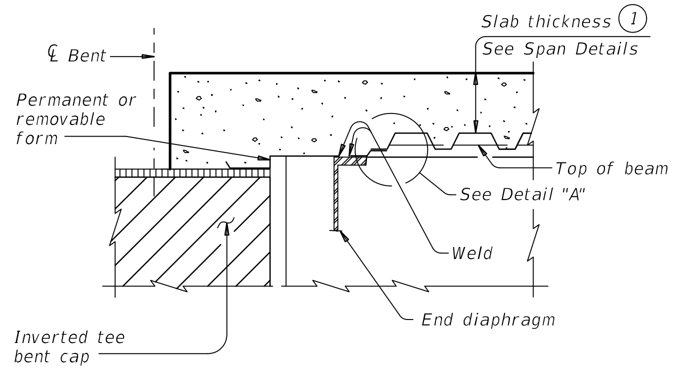
SECTION A-A



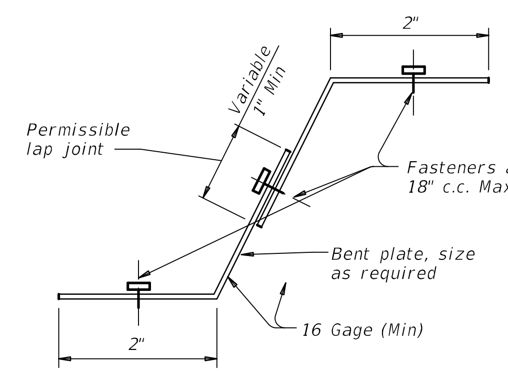
SHOWING PRESTRESSED CONCRETE I-BEAMS, I-GIRDERS AND U-BEAMS



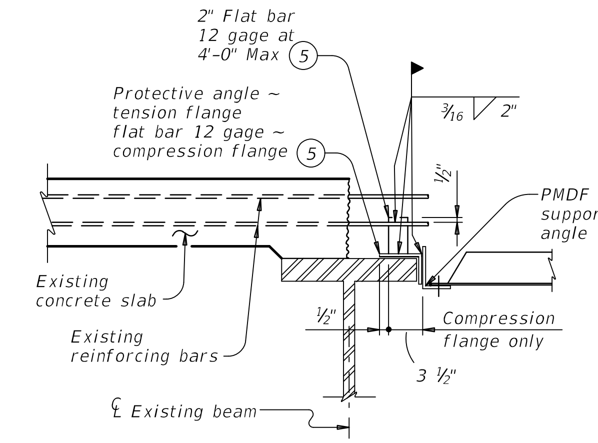
AT SLAB OVER ABUT BKWL OR INV TEE STEM FOR CONC BEAMS WITHOUT THICKENED SLAB END



AT SLAB OVER INV TEE STEM FOR STEEL BEAMS WITHOUT THICKENED SLAB END

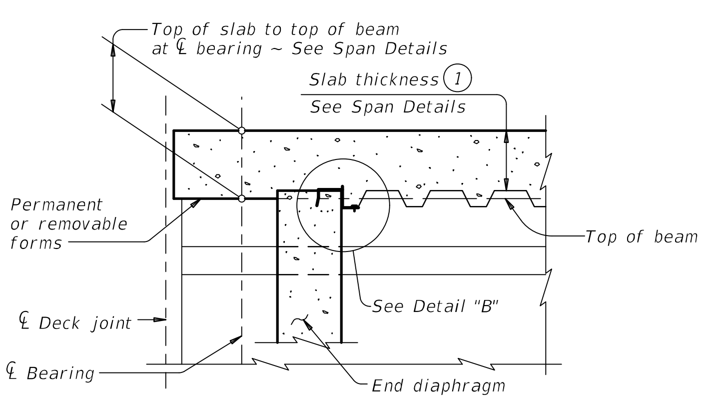


DETAIL "A"

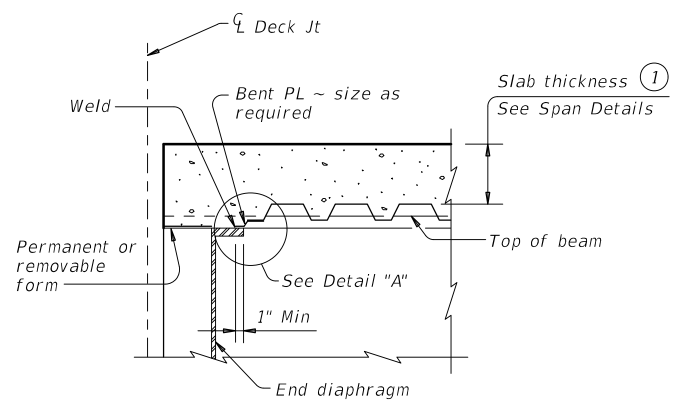


SHOWING STEEL BEAMS

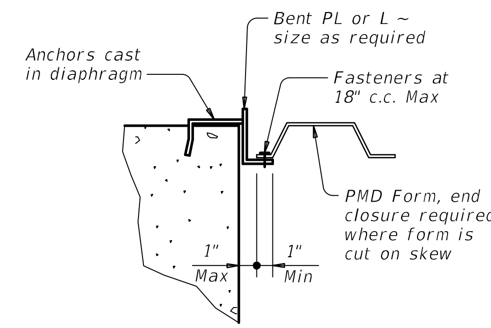
WIDENING DETAILS



AT CONC END DIAPHRAGM FOR PRESTRESSED I-BEAMS AND STEEL BEAMS



AT END DIAPHRAGM FOR STEEL BEAMS WITHOUT THICKENED SLAB END



DETAIL "B"

DETAILS AT ENDS OF BEAMS

(1) Slab thickness minus ⅜" if corrugations match reinforcing bars

(5) Minimum yield stress of 12 gage bars shall be 40 ksi

SHEET 2 OF 2

Texas Department of Transportation — Bridge Division Standard

PERMANENT METAL DECK FORMS

PMDF

FILE: pmdfste1-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0233	05	038	SH 54
02-20: Modified box note by adding steel beams/girders and subsidiary. 12-21: Updated max deflection for RR.	DIST		COUNTY	SHEET NO.
	ELP		CULBERSON	139

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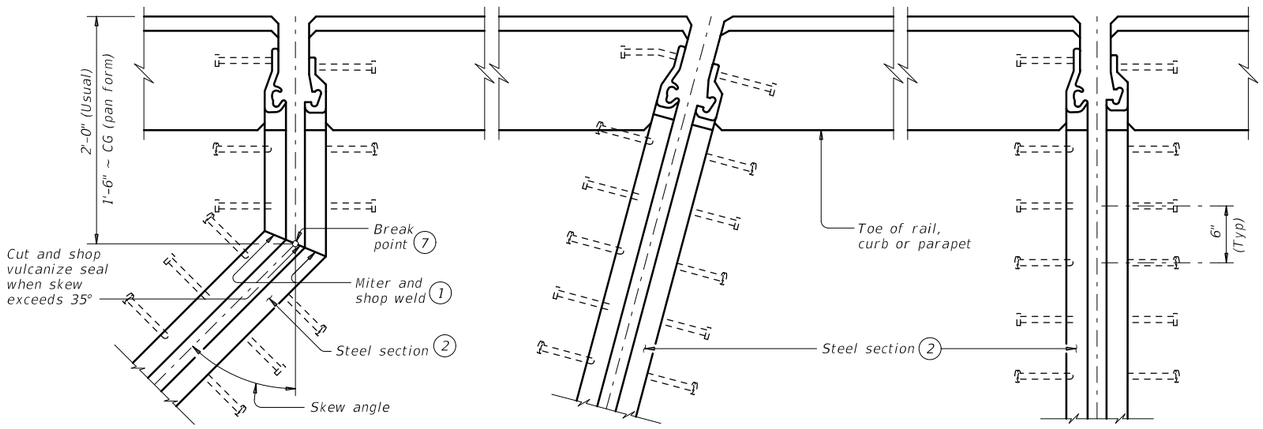
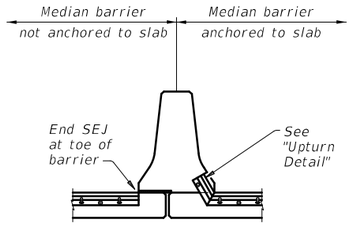
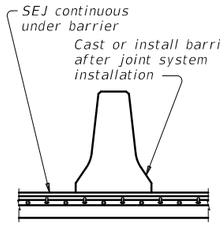


SHOWING SKEWS WITH SLAB BREAKBACKS | SHOWING SKEWS WITHOUT SLAB BREAKBACKS | SHOWING WITHOUT SKEWS AND SLAB BREAKBACKS

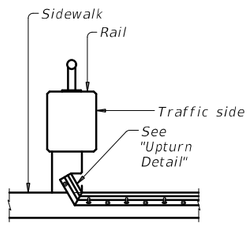
PLANS OF END CONDITIONS



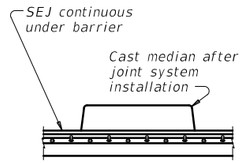
WITH OPEN DECK JOINT BELOW MEDIAN BARRIER



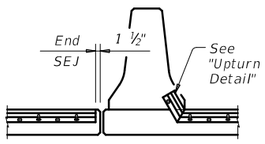
AT MEDIAN BARRIER



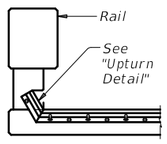
AT SIDEWALK BEHIND BRIDGE RAIL



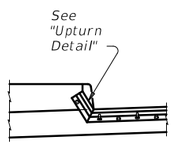
AT RAISED MEDIAN



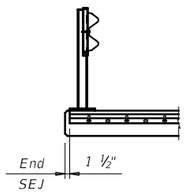
WITH OPEN DECK JOINT ADJACENT TO MEDIAN BARRIER



AT CONCRETE BRIDGE RAIL

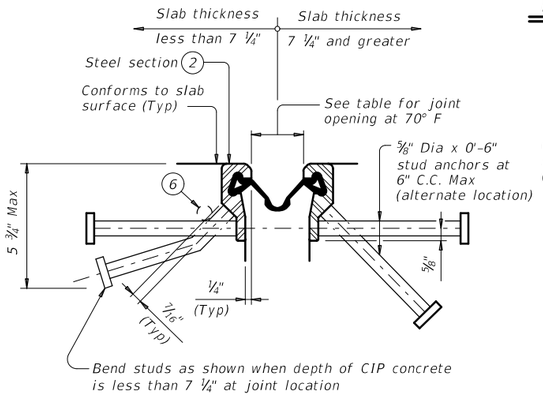


AT SIDEWALK

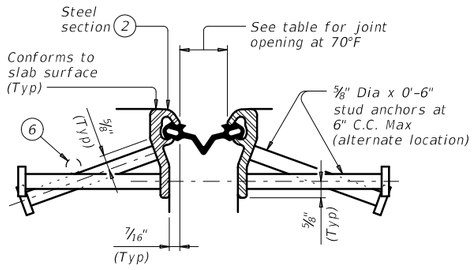


AT STEEL POST BRIDGE RAIL

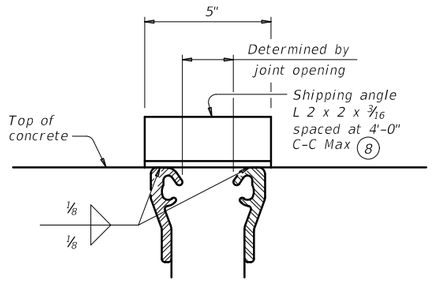
TYPICAL SECTIONS (5)



SECTION THRU WATSON BOWMAN ACME (SE-400 OR SE-500) JOINTS



SECTION THRU D.S. BROWN (A2R-400 OR A2R-XTRA) JOINTS



SHOWING D.S. BROWN (Ty SSCM2)
(All joints are similar.) (Studs are not shown for clarity.)

SHIPPING ANGLE

An alternate method of securing joint sections may be used if approved by the Bridge Division. Erection bolts are not allowed.

TABLE OF SEALED EXPANSION JOINT INFORMATION

MANUFACTURER	STEEL SECTION (2)	STRIP SEAL			
		4" JOINT		5" JOINT	
		Seal Type	Joint Opening (3)	Seal Type	Joint Opening (3)
D.S. Brown	Type SSCM2	A2R-400	1 ¾"	A2R-XTRA	2"
Watson Bowman Acme	Type R	SE-400	1 ¾"	SE-500	2"

REDUCED LONGITUDINAL MOVEMENT RANGE

SKEW (deg)	JOINT SIZE	
	4"	5"
0	4.0"	5.0"
15	4.0"	5.0"
30	3.5"	4.3"
45	2.8"	3.5"

DESIGN NOTES:

Joints installed on a skew have reduced ability to accommodate longitudinal movement. Use table values to determine the correct joint size for skewed installations.

For other skews over 25 degrees, calculate reduced movement range by multiplying joint size by cosine (skew).

(1) Remove all burrs which will be in contact with seal prior to making splice.

(2) Shape of steel section shown is typical. Variations in sections must be approved by the Engineer.

(3) These openings are also the recommended minimum installation openings.

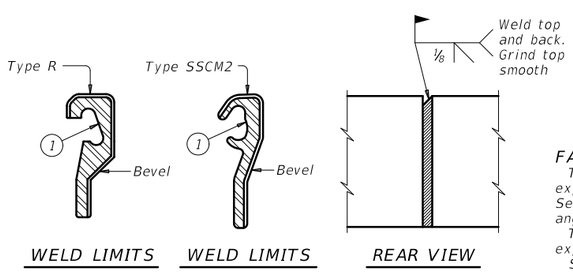
(4) Reduce for sidewalk or parapet heights less than 6".

(5) Other conditions affecting the joint profile should be noted elsewhere.

(6) Move transverse bars that are in conflict with SEJ studs, in either the bridge slab or approach slab, to rest at the junction of the studs.

(7) See Span details for location of break point.

(8) Align shipping angle perpendicular to joint.



WELD LIMITS | WELD LIMITS | REAR VIEW

FIELD SPLICE DETAIL

FABRICATION NOTES:

Temporarily shop assemble corresponding sections of sealed expansion joints (SEJ), check for fit, and match mark for shipment. Secure corresponding sections together for shipment with shipping angle. Do not use erection bolts.

The seal must be continuous and included in the price bid for sealed expansion joint.

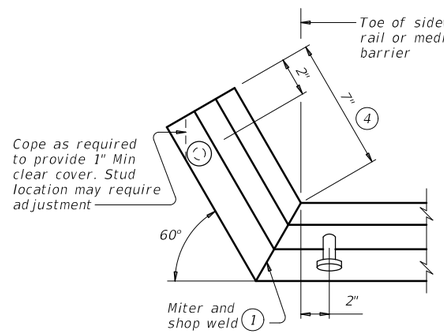
Ship steel sections in convenient lengths of 10'-0" Min and 24'-0" Max unless necessary for staged construction or widenings. One shop splice is permitted in each shipping length provided no piece is less than 2'-0" long and sufficient studs are added to limit the stud to shop splice distance to 2" Min and 4" Max.

Weld studs in accordance with AWS D1.1.

Butt weld all shop and field splices and grind smooth areas in contact with seal. Make all necessary field splice joint preparations in the shop.

Paint the entire steel section with System II or IV primer in accordance with Item 446, "Feild Cleaning and Painting Steel", unless required to galvanize when shown in the plans. Provide galvanizing in accordance with Item 445, "Galvanizing". Provide paints in accordance with Item 446.2. Prepare steel and apply paint in accordance with Item 446.4.7.3 and 446.4.7.4.

Shop drawings for the fabrication of sealed expansion joints will not require the Engineer's approval if fabrication is in accordance with the details shown on this standard.



UPTURN DETAIL

CONSTRUCTION NOTES:

Secure the sealed expansion joint in position and place to the proper grade and alignment by welding braces to adjacent reinforcing steel, to prestressed beam stirrups, or to anchors cast in concrete diaphragms. Include cost of temporary bracing in the price bid for sealed expansion joint.

Remove shipping angle immediately after each joint half is secured in place. Grind smooth, and touch up with organic zinc-rich paint.

Clean and prepare seal cavity for seal installation as per the Manufacturer's installation procedures.

GENERAL NOTES:

Provide sealed expansion joints in the size and at locations shown on the plans.

Minimum slab and overhang thickness required for the use of SEJ-M is 6 ½".

Texas Department of Transportation

Bridge Division Standard

SEALED EXPANSION JOINT TYPE M WITHOUT OVERLAY

SEJ-M

FILE: sejmste1-19.dgn	DN: TxDOT	CK: TxDOT	DW: JTR	CK: JMH
©TxDOT April 2019 REVISIONS	CONT	SECT	JOB	HIGHWAY
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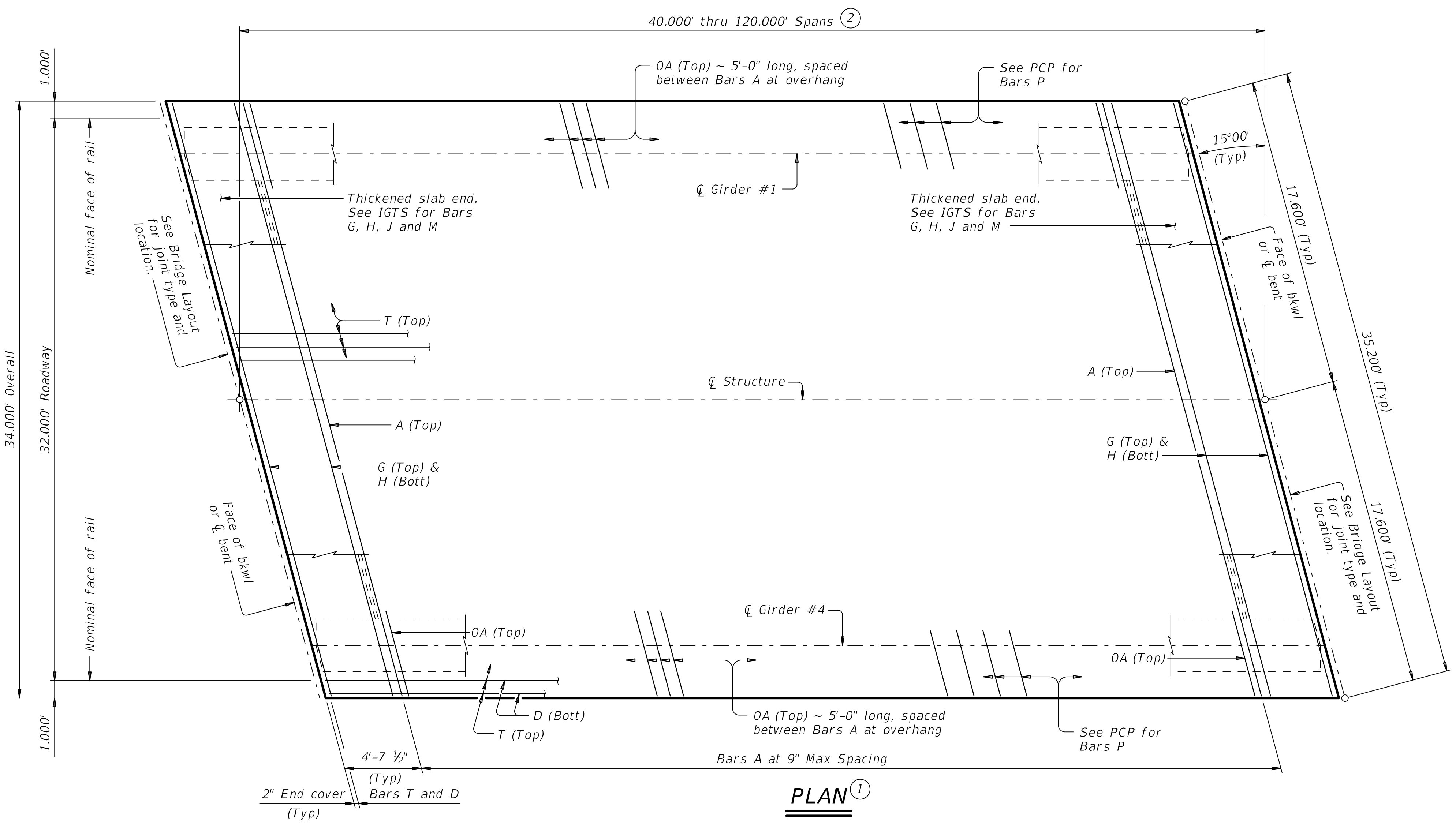
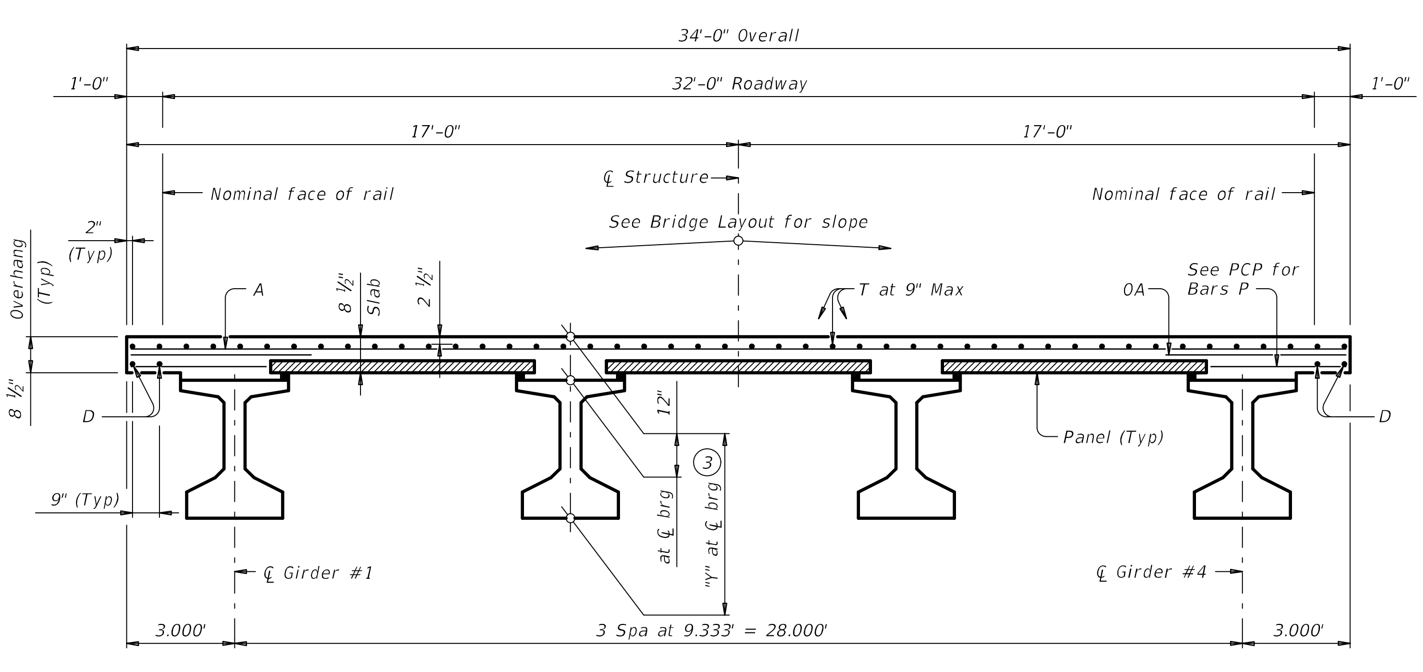
	DIST	COUNTY		SHEET NO.
	ELP	CULBERSON		140



PLAN (1)



TYPICAL TRANSVERSE SECTION

(Showing girder type Tx46)

BAR TABLE

BAR	SIZE
A	#4
D	#4
G	#4
H	#4
J	#4
M	#4
OA	#5
P	#4
T	#4

TABLE OF SECTION DEPTHS

GIRDER TYPE	"Y" AT ℄ BRG (3) Ft/In
Tx28	3'-4"
Tx34	3'-10"
Tx40	4'-4"
Tx46	4'-10"
Tx54	5'-6"

(1) If multi-span units (with slab continuous over interior bents) are indicated on the Bridge Layout, see standard IGCS for adjustment to slab reinforcement and quantities.

(2) Span lengths for prestressed concrete I-Girder type:
- Type Tx28 for spans lengths 40.000' thru 65.000'.
- Type Tx34 for spans lengths 40.000' thru 80.000'.
- Type Tx40 for spans lengths 40.000' thru 90.000'.
- Type Tx46 for spans lengths 40.000' thru 100.000'.
- Type Tx54 for spans lengths 40.000' thru 120.000'.

(3) "Y" value shown is based on theoretical girder camber, dead load deflection from an 8 1/2" concrete slab, a constant roadway grade, and using precast panels (PCP). The Contractor will adjust this value as necessary for any roadway vertical curve and/or if the precast overhang panel (PCP(0)) option is used.

HL93 LOADING

SHEET 1 OF 2

Texas Department of Transportation — Bridge Division Standard

PRESTRESSED CONCRETE I-GIRDER SPANS (TYPE Tx28 THRU Tx54)

32' ROADWAY 15° SKEW

SIG-32-15

FILE: sig42sts-19.dgn	DN: JMH	CK: ASB	DW: JTR	CK: TAR
©TxDOT August 2017	CONT 0233	SECT 05	JOB 038	HIGHWAY SH 54
REVISIONS 10-19: Increased "X" and "Y" Values	DIST ELP	COUNTY CULBERSON		SHEET NO. 141

DATE: 9/27/2022 11:20:33 AM
FILE: c:\pwworkingdir\omega-app02.omegaengineers.local_omega-prod\jvillarreal\dms10487\sig42sts-19.dgn

DATE: 9/27/2022 11:20:33 AM
FILE: c:\pwworkingdir\omega-app02.omegaengineers.local_omega-prod\jvillarreal\D0487\sig42sts-19.dgn

TABLE OF DEAD LOAD DEFLECTIONS

TYPE Tx28 GIRDERS

SPAN LENGTH	"A"	"B"
Ft	Ft	Ft
40	0.011	0.015
45	0.017	0.024
50	0.026	0.037
55	0.040	0.056
60	0.057	0.080
65	0.079	0.111

TYPE Tx34 GIRDERS

SPAN LENGTH	"A"	"B"
Ft	Ft	Ft
40	0.006	0.009
45	0.010	0.014
50	0.016	0.022
55	0.024	0.033
60	0.034	0.048
65	0.047	0.066
70	0.064	0.090
75	0.085	0.120
80	0.111	0.156

TYPE Tx40 GIRDERS

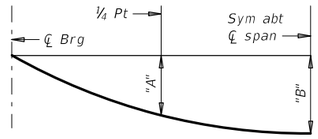
SPAN LENGTH	"A"	"B"
Ft	Ft	Ft
40	0.004	0.006
45	0.006	0.009
50	0.011	0.015
55	0.016	0.022
60	0.022	0.031
65	0.031	0.043
70	0.042	0.059
75	0.056	0.078
80	0.073	0.102
85	0.093	0.131
90	0.118	0.165

TYPE Tx46 GIRDERS

SPAN LENGTH	"A"	"B"
Ft	Ft	Ft
40	0.003	0.004
45	0.004	0.006
50	0.007	0.010
55	0.011	0.015
60	0.015	0.021
65	0.021	0.030
70	0.028	0.040
75	0.038	0.053
80	0.049	0.069
85	0.063	0.089
90	0.080	0.113
95	0.100	0.140
100	0.123	0.173

TYPE Tx54 GIRDERS

SPAN LENGTH	"A"	"B"
Ft	Ft	Ft
40	0.002	0.003
45	0.003	0.004
50	0.005	0.007
55	0.007	0.010
60	0.010	0.014
65	0.014	0.020
70	0.019	0.027
75	0.025	0.035
80	0.033	0.046
85	0.042	0.059
90	0.053	0.074
95	0.066	0.093
100	0.081	0.114
105	0.100	0.140
110	0.120	0.169
115	0.144	0.202
120	0.172	0.241



DEAD LOAD DEFLECTION DIAGRAM

Calculated deflections shown are due to the concrete slab on interior girders only (Ec = 5000 ksi). Adjust values as required for exterior girders and if optional slab forming is used. These values may require field verification.

TABLE OF ESTIMATED QUANTITIES

SPAN LENGTH	REINF CONCRETE SLAB	Prestressed Concrete Girders			TOTAL REINF STEEL (5)
		ABUT TO INT BT (4)	INT BT TO INT BT (4)	ABUT TO ABUT (4)	
Ft	SF	LF	LF	LF	Lb
40	1,360	157.96	158.00	157.93	3,128
45	1,530	177.96	178.00	177.93	3,519
50	1,700	197.96	198.00	197.93	3,910
55	1,870	217.96	218.00	217.93	4,301
60	2,040	237.96	238.00	237.93	4,692
65	2,210	257.96	258.00	257.93	5,083
70	2,380	277.96	278.00	277.93	5,474
75	2,550	297.96	298.00	297.93	5,865
80	2,720	317.96	318.00	317.93	6,256
85	2,890	337.96	338.00	337.93	6,647
90	3,060	357.96	358.00	357.93	7,038
95	3,230	377.96	378.00	377.93	7,429
100	3,400	397.96	398.00	397.93	7,820
105	3,570	417.96	418.00	417.93	8,211
110	3,740	437.96	438.00	437.93	8,602
115	3,910	457.96	458.00	457.93	8,993
120	4,080	477.96	478.00	477.93	9,384

(4) Fabricator will adjust lengths for girder slopes as required.

(5) Reinforcing steel weight is calculated using an approximate factor of 2.3 lbs/SF.

GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications.

Multi-span units, with slab continuous over interior bents, may be formed with the details shown on this sheet and standard IGCS.

See IGTS standard for Thickened Slab End details and quantity adjustments.

See PCP and PCP-FAB for panel details not shown.

See PCP(O) and PCP(O)-FAB for precast overhang panel details if this option is used.

See IGMS standard for miscellaneous details.

See applicable rail details for rail anchorage in slab.

See PMDF standard for details and quantity adjustments if this option is used.

This standard is drawn showing right forward skew. See Bridge Layout for actual skew direction.

This standard does not support the use of transition bents.

Cover dimensions are clear dimensions, unless noted otherwise.

MATERIAL NOTES:

Provide Class S concrete (f'_c = 4,000 psi).

Provide Class S (HPC) concrete if shown elsewhere in the plans.

Provide Grade 60 reinforcing steel.

Provide bar laps, where required, as follows:

Uncoated ~ #4 = 1'-7"

Epoxy coated ~ #4 = 2'-5"

Deformed Welded Wire Reinforcement (WWR) (ASTM A1064) of equal size and spacing may be substituted for Bars A, D, OA, P or T unless noted otherwise.

HL93 LOADING SHEET 2 OF 2

Texas Department of Transportation

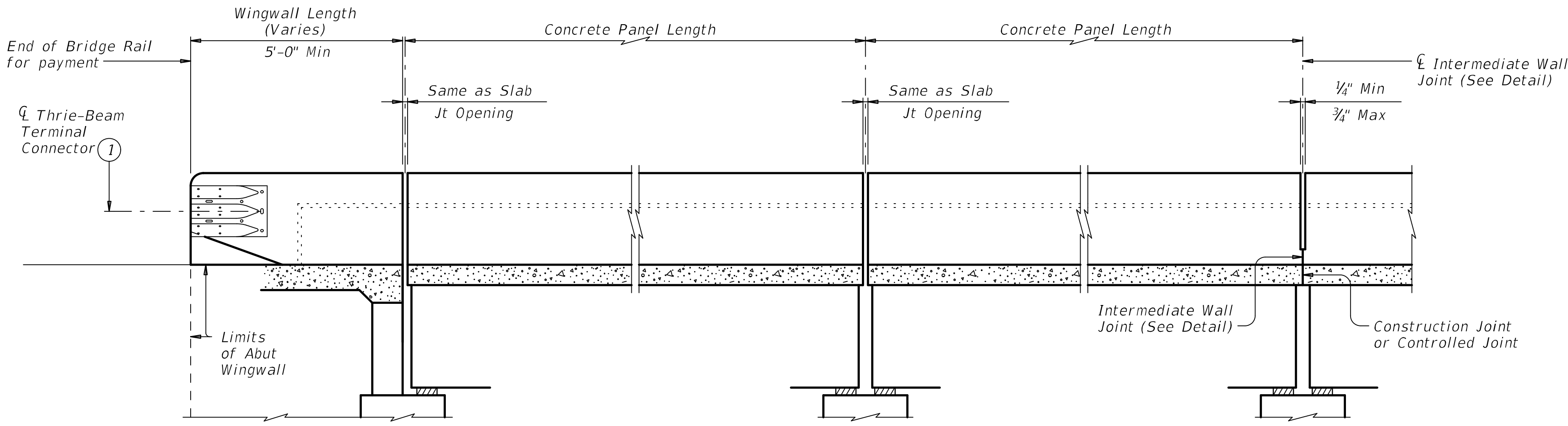
Bridge Division Standard

PRESTRESSED CONCRETE I-GIRDER SPANS (TYPE Tx28 THRU Tx54)

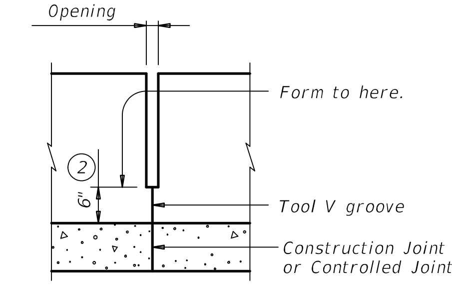
32' ROADWAY 15° SKEW

SIG-32-15

FILE: sig42sts-19.dgn	DN: JMH	CK: ASB	DW: JTR	CK: TAR
©TxDOT August 2017	CONT	SECT	JOB	HIGHWAY
REVISIONS 10-19: Increased "X" and "Y" Values	0233	05	038	SH 54
	DIST	COUNTY		SHEET NO.
	ELP	CULBERSON		142

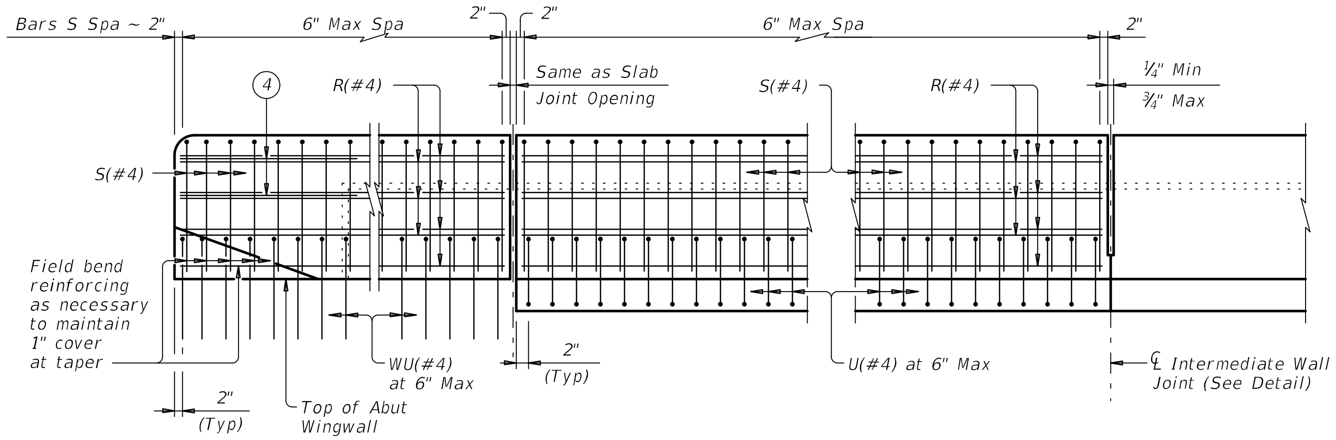


ROADWAY ELEVATION OF RAIL

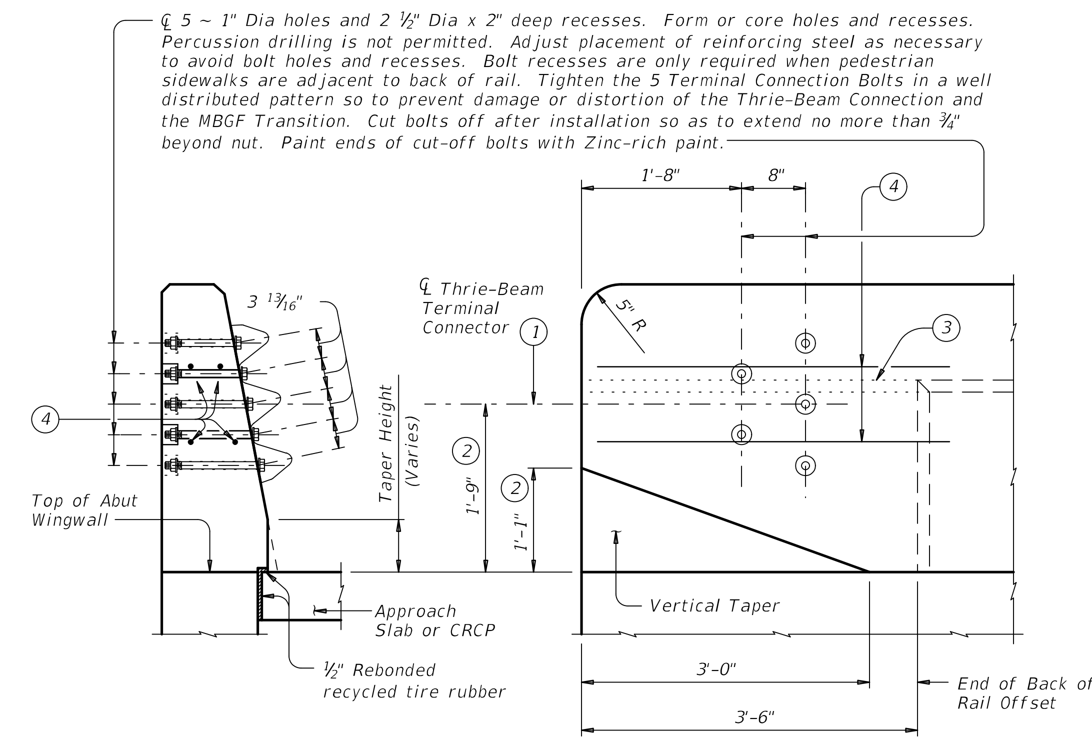


INTERMEDIATE WALL JOINT DETAIL

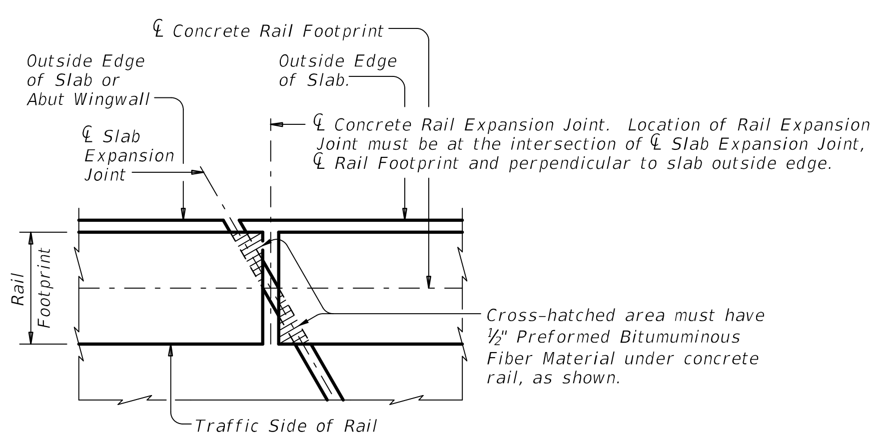
Provide at all interior bents without slab expansion joints.



ELEVATION SHOWING TYPICAL REINFORCING PLACEMENT



TERMINAL CONNECTION DETAILS



PLAN OF RAIL AT EXPANSION JOINTS

Example showing Slab Expansion Joints without breakbacks.

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

Texas Department of Transportation — Bridge Division Standard

TRAFFIC RAIL SINGLE SLOPE

TYPE SSTR

FILE: rlstd014-19.dgn	DN: TxDOT	CK: TxDOT	DW: JTR	CK: TxDOT
©TxDOT September 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0233	05	038	SH 54
	DIST	COUNTY		SHEET NO.
	ELP	CULBERSON		143

DATE: 9/27/2022 11:20:37 AM
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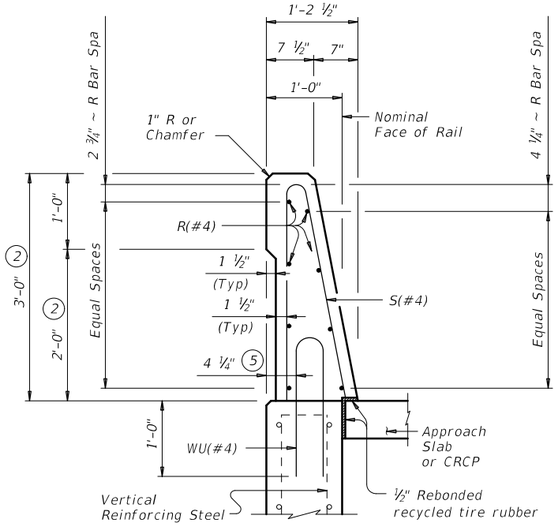
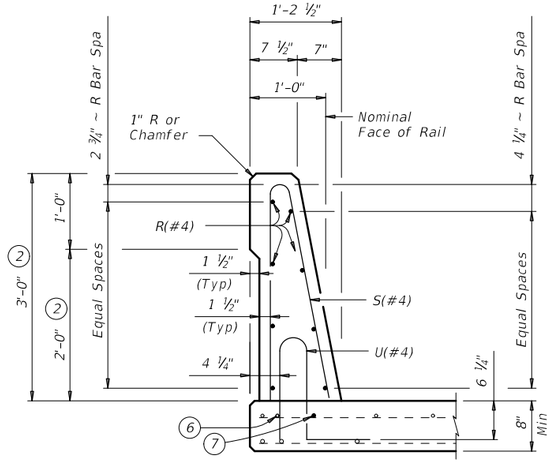


ON ABUTMENT WINGWALLS OR CIP RETAINING WALLS



ON BRIDGE SLAB

SECTIONS THRU RAIL

(2) Increase 2" for structures with Overlay.

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

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

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

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

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

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

CONSTRUCTION NOTES:

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

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

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

MATERIAL NOTES:

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

Provide Grade 60 reinforcing steel.

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

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

Provide bar laps, where required, as follows:

Uncoated or galvanized ~ #4 = 1'-7"
Epoxy coated ~ #4 = 2'-5"

GENERAL NOTES:

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

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

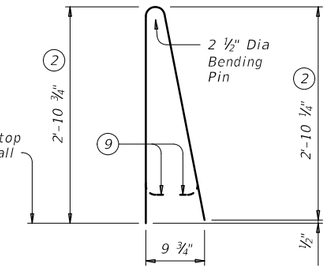
Rail anchorage details shown on this standard may require modification for select structure types. See appropriate details elsewhere in plans for these modifications.

Shop drawings will not be required for this rail.

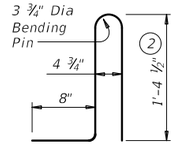
Average weight of railing with no overlay is 376 plf.

Cover dimensions are clear dimensions, unless noted otherwise.

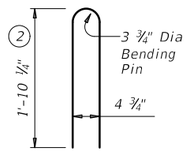
Reinforcing bar dimensions shown are out-to-out of bar.



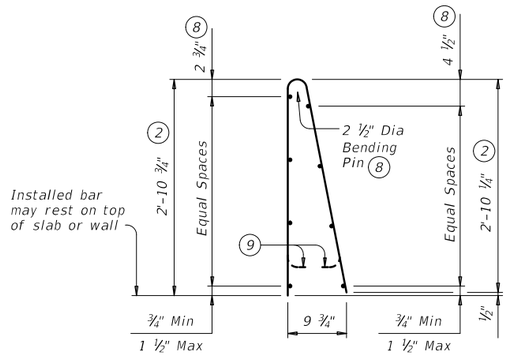
BARS S (#4)



BARS U (#4)

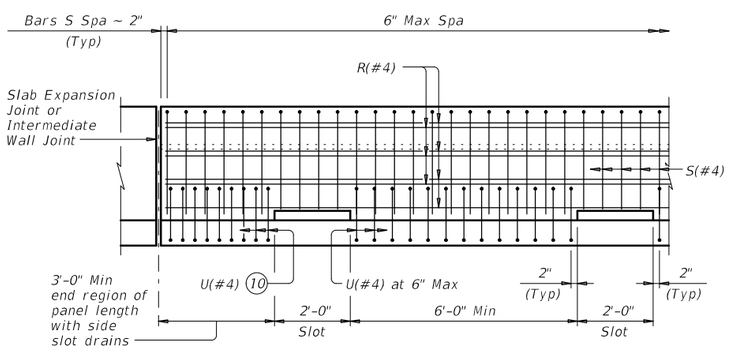


BARS WU (#4)



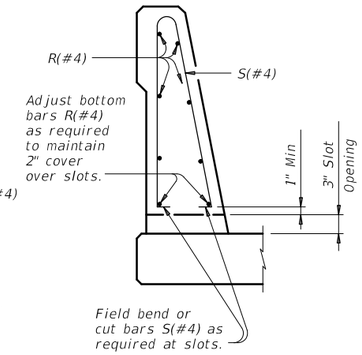
OPTIONAL WELDED WIRE REINFORCEMENT (WWR)

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



OPTIONAL SIDE SLOT DRAIN DETAIL

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



SECTION THRU OPTIONAL SIDE SLOT DRAIN

Texas Department of Transportation

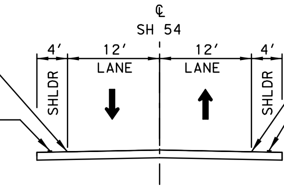
Bridge Division Standard

TRAFFIC RAIL SINGLE SLOPE

TYPE SSTR

FILE: rlstd014-19.dgn	DN: TxDOT	CK: TxDOT	DW: JTR	CK: TxDOT
©TxDOT September 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0233	05	038	SH 54
	DIST	COUNTY		SHEET NO.
	ELP	CULBERSON		144

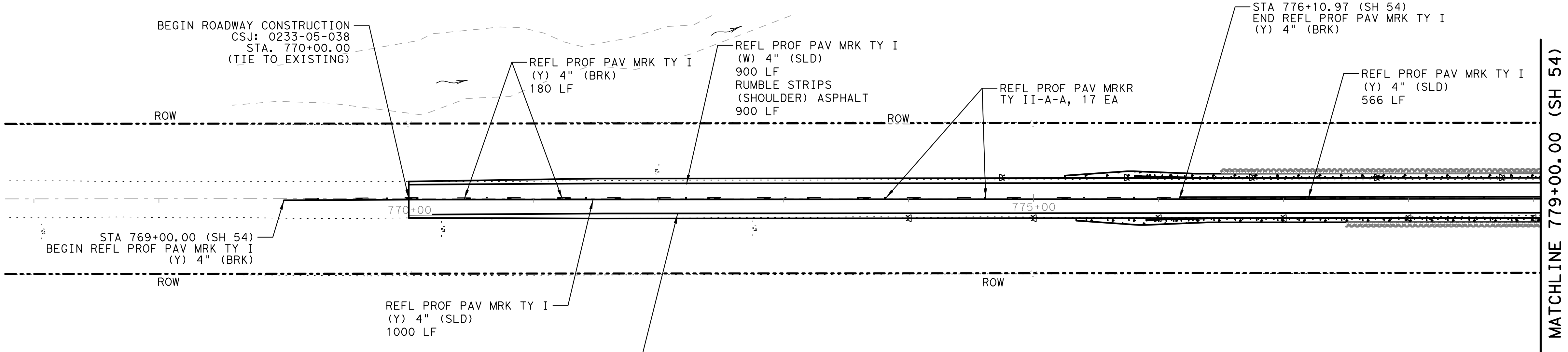
ESTIMATED QUANTITIES				
ITEM	CODE	DESCRIPTIONS	UNIT	QTY
533	6003	RUMBLE STRIPS (SHOULDER) ASPHALT	LF	4080
666	6342	REF PROF PAV MRK TY I(W)4"(SLD)(100MIL)	LF	4080
666	6344	REF PROF PAV MRK TY I(Y)4"(BRK)(100MIL)	LF	320
666	6345	REF PROF PAV MRK TY I(Y)4"(SLD)(100MIL)	LF	3306
672	6009	REFL PAV MRKR TY II-A-A	EA	39
678	6001	PAV SURF PREP FOR MRK (4")	LF	7386

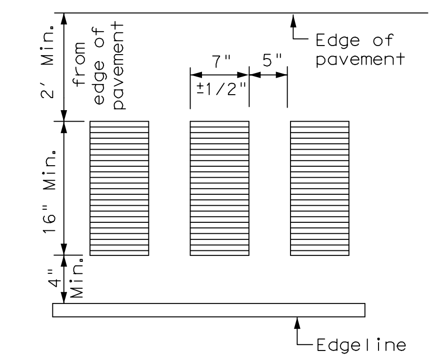


PAVEMENT MARKING TYPICAL

STA 770+00.00 TO STA 779+35.25
STA 781+75.25 TO STA 790+37.25
*SEE STANDARDS RS(3)-13 & RS(4)-13 FOR PLACEMENT OF RUMBLE STRIPS

0 50 100
SCALE: 1"=100'

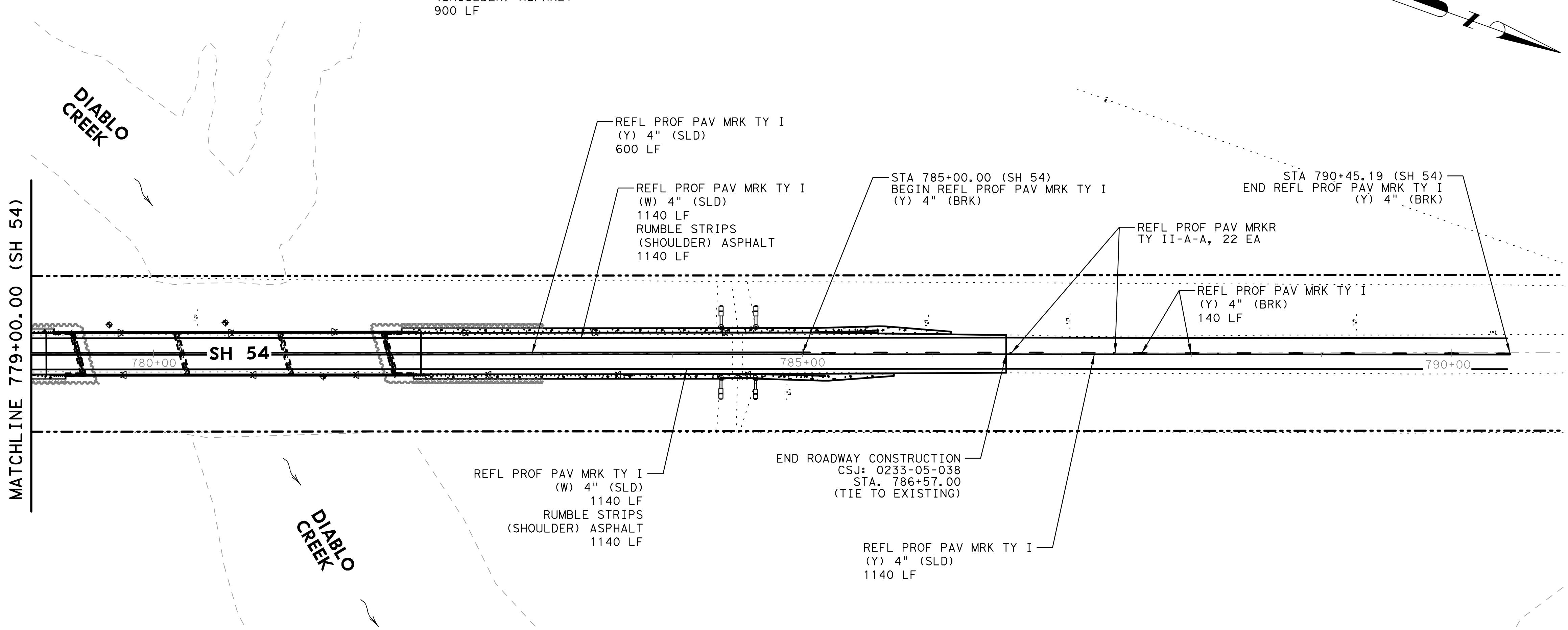




SHOULDER RUMBLE STRIPS DETAIL

NOTE:

1. SIGN AND DELINEATOR LOCATION SHOWN IS APPROXIMATE. COORDINATE FINAL LOCATION WITH THE ENGINEER.



DATE	BY	REV	REVISION

STATE OF TEXAS
R. CRUZ-RODRIGUEZ
82856
LICENSED PROFESSIONAL ENGINEER
Rafael Cruz-Rodriguez, P.E.
09-27-2022

OMEGA ENGINEERS, INC.
8200 N MOPAC EXPRESSWAY, STE #280
AUSTIN, TEXAS 78759
OMEGAENGINEERS.COM
TX PE Firm Reg. No. F-2147
P:512 575 2288 F:281 647 9184

Texas Department of Transportation®

SH 54 @ DIABLO CREEK

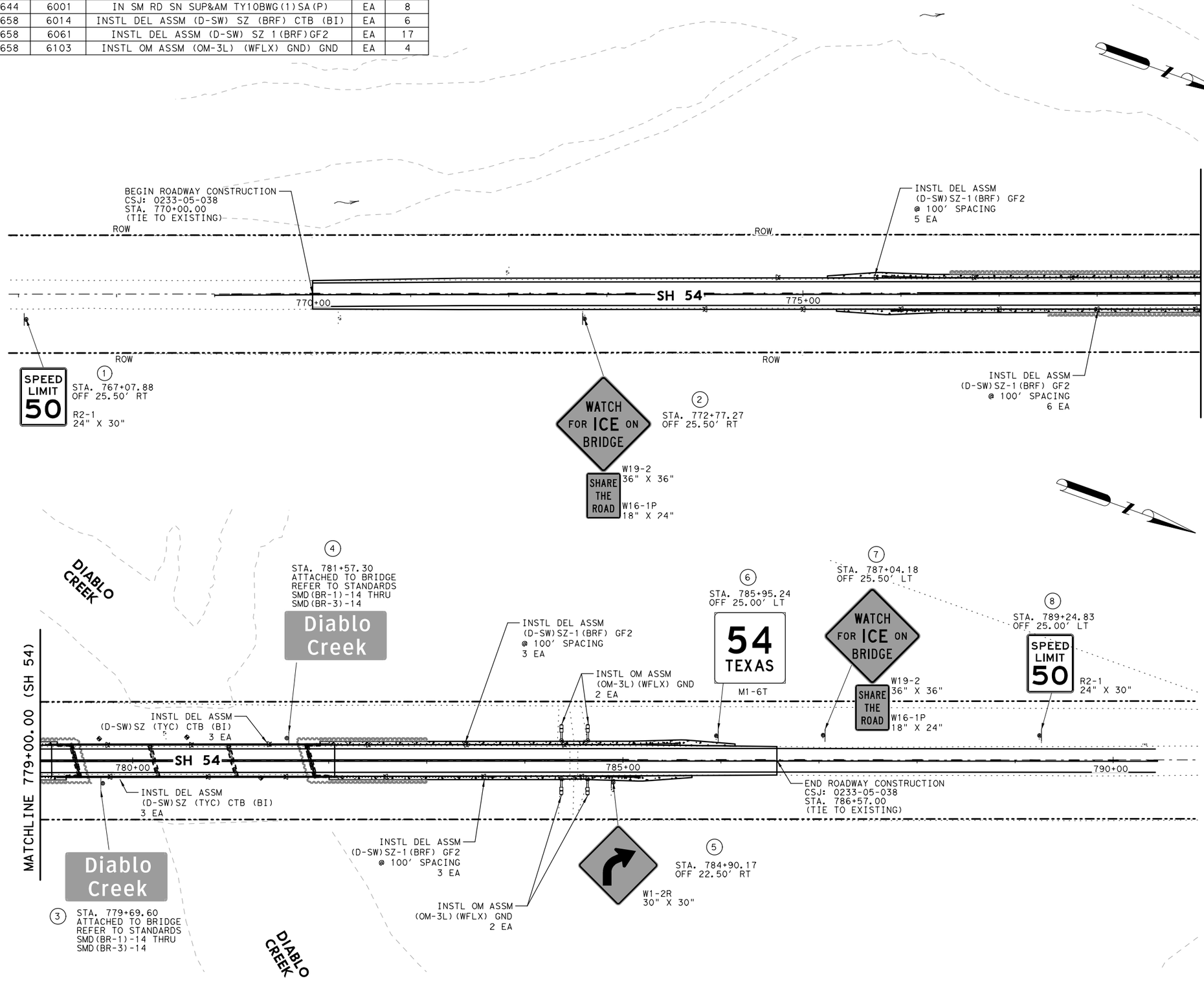
PAVEMENT MARKING LAYOUT

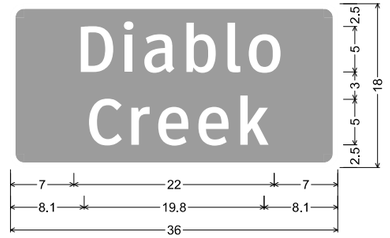
SHEET 1 OF 1

DSN	OEI	FED.RD. DIV.NO. 6	PROJECT NO. SEE TITLE SHEET		SHEET NO. 145
CHK	OEI	STATE	DIST.	COUNTY	
DRN	OEI	TEXAS	ELP	CULBERSON	
CHK	OEI	CONT. 0233	SECT. 05	JOB 038	HIGHWAY NO. SH 54

9:30:09 AM
9/29/2022
c:\pwworkingdir\omega-app02.omegaengineers.local#omega-prod\jvillarreal-admin\dms10327\SH54-S-TRF-SPM01.dgn

ESTIMATED QUANTITIES				
ITEM	CODE	DESCRIPTIONS	UNIT	QTY
644	6001	IN SM RD SN SUP&AM TY10BWG(1)SA(P)	EA	8
658	6014	INSTL DEL ASSM (D-SW) SZ (BRF) CTB (BI)	EA	6
658	6061	INSTL DEL ASSM (D-SW) SZ 1(BRF)GF2	EA	17
658	6103	INSTL OM ASSM (OM-3L) (WFLX) GND) GND	EA	4





I-3 5in;
1.5" Radius, 0.5" Border, White on, Green;
"Diablo", ClearviewHwy-3-W;
"Creek", ClearviewHwy-3-W;

I-3

NOTE:

1. SIGN AND DELINEATOR LOCATION SHOWN IS APPROXIMATE. COORDINATE FINAL LOCATION WITH THE ENGINEER.

DATE	BY	REV	REVISION

STATE OF TEXAS
R. CRUZ-RODRIGUEZ
82856
LICENSED PROFESSIONAL ENGINEER
Rafael Cruz-Rodriguez, P.E.
09-27-2022

OMEGA ENGINEERS, INC.
8200 N MOPAC EXPRESSWAY, STE #280
AUSTIN, TEXAS 78759
OMEGAENGINEERS.COM
TX PE Firm Reg. No. F-2147
P:512 575 2288 F:281 647 9184

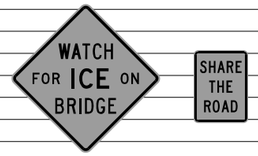
SH 54 @ DIABLO CREEK

SMALL SIGN LAYOUT

SHEET 1 OF 1

		FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
DSN	OEI	6	SEE TITLE SHEET		146
CHK	OEI	STATE	DIST.	COUNTY	
DRN	OEI	TEXAS	ELP	CULBERSON	
CHK	OEI	CONT.	SECT.	JOB	HIGHWAY NO.
		0233	05	038	SH 54

SUMMARY OF SMALL SIGNS

PLAN SHEET NO.	SIGN NO.	SIGN NOMENCLATURE	SIGN	DIMENSIONS	FLAT ALUMINUM (TYPE A)	EXAL ALUMINUM (TYPE G)	SM RD SGN ASSM TY XXXXX (X) XX (X-XXXX) POST TYPE	POSTS	ANCHOR TYPE	MOUNTING DESIGNATION PREFABRICATED	MOUNTING DESIGNATION 1EXT or 2EXT = # of Ext BM = Extruded Wind Beam WC = 1.12 #/ft Wing Channel EXAL= Extruded Alum Sign Panels	BRIDGE MOUNT CLEARANCE SIGNS (See Note 2) TY = TYPE
							FRP = Fiberglass TWT = Thin-Wall 10BWG = 10 BWG S80 = Sch 80	1 or 2	UA=Universal Conc UB=Universal Bolt SA=Slipbase-Conc SB=Slipbase-Bolt WS=Wedge Steel WP=Wedge Plastic	P = "Plain" T = "T" U = "U"		TY N TY S
1	1, 8	W8-15		24 x 30	X		10 BWG	1	SA	P		
1	2, 7	W19-2		36 X 36	X		10 BWG	1	SA	P		
		W16-1P		18 X 24								
1	3, 4	I-3		36 X 18			REFER TO SIGN SUPPORT STANDARD					
1	5	W1-2R		30 X 30	X		10 BWG	1	SA	P		
1	6	M1-6T		24 X 24	X		10 BWG	1	SA	P		

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

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

http://www.txdot.gov/

NOTE:

1. Sign supports shall be located as shown on the plans, except that the Engineer may shift the sign supports, within design guidelines, where necessary to secure a more desirable location or to avoid conflict with utilities. Unless otherwise shown on the plans, the Contractor shall stake and the Engineer will verify all sign support locations.
2. For installation of bridge mount clearance signs, see Bridge Mounted Clearance Sign Assembly (BMCS)Standard Sheet.
3. For Sign Support Descriptive Codes, see Sign Mounting Details Small Roadside Signs General Notes & Details SMD(GEN).

Texas Department of Transportation

Traffic Operations Division Standard

SUMMARY OF SMALL SIGNS

SOSS

FILE: sums16.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT May 1987	CONT	SECT	JOB	HIGHWAY
REVISIONS	0233	05	038	SH 54
4-16	DIST	COUNTY		SHEET NO.
8-16	ELP	CULBERSON		147

18

DATE: 9/27/2022 11:20:55 AM
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DATE: 9/27/2022 11:20:57 AM
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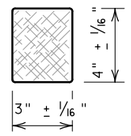
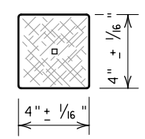
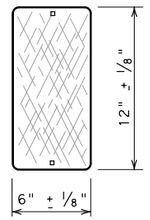
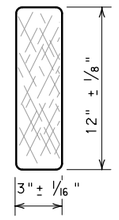
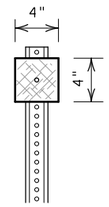
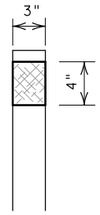
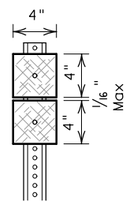
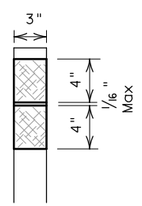
REFLECTOR UNIT SIZES FOR DELINEATORS AND OBJECT MARKERS

	SIZE 1	SIZE 2	SIZE 3	SIZE 4
DEVICE				
SHEETING	Yellow, White or Red Type B or C reflective sheeting			

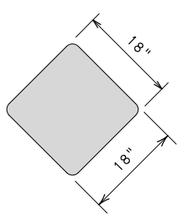
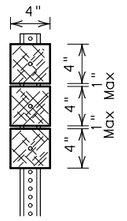
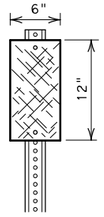
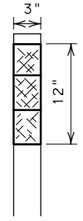
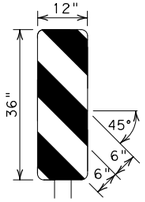
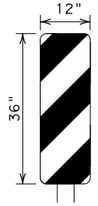
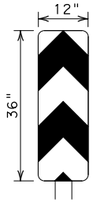
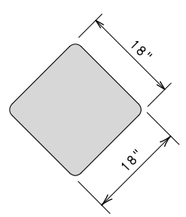
NOTE

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.

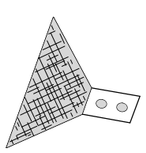
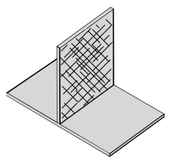
DELINEATORS

	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

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.

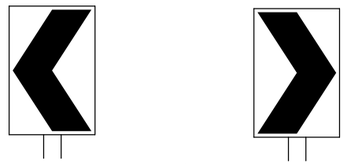
SHEETING: Yellow, White, Red

NOTE

1. Reflective sheeting shall have a minimum dimension of 3 inches and minimum surface area of 9 square inches.

CHEVRONS

DEVICE



W1-8

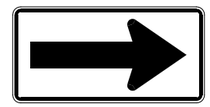
SIZE (W x L)	18"x 24" (Conventional)	24"x 30" (Conventional Oversize)	30"x 36" (Expressway)	36" x 48" (Freeway)
MOUNTING HEIGHT	4'-0" or 7'-0"		7'-0" Only	

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"	

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

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

NOTE:

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

Texas Department of Transportation

Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER MATERIAL DESCRIPTION

D & OM(1)-20

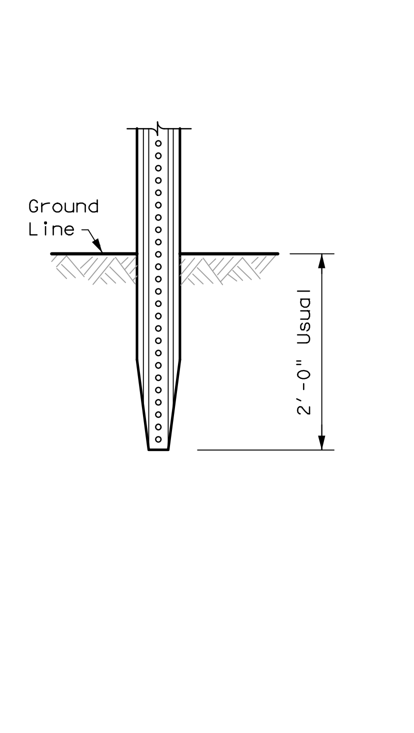
FILE: dom1-20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
©TxDOT August 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS	0233	05	038	SH 54
10-09 3-15	DIST	COUNTY		SHEET NO.
4-10 7-20	ELP	CULBERSON		148

20A

POST TYPE AND SUPPORT FOUNDATION DETAILS

WING CHANNEL (WC)

GND

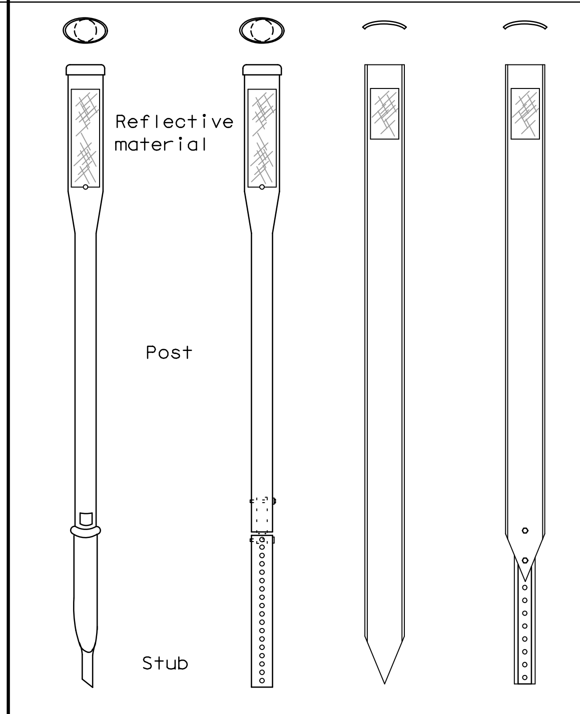


NOTES

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.

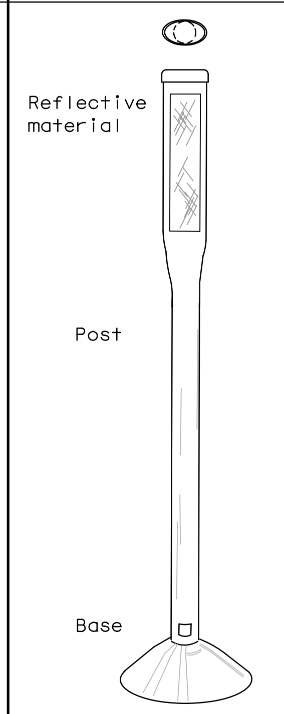
FLEXIBLE POSTS (YFLX, WFLX)

GND



EMBEDDED

SRF



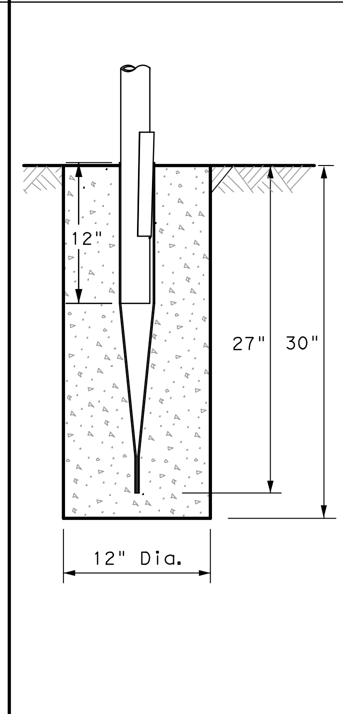
SURFACE MOUNT

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.

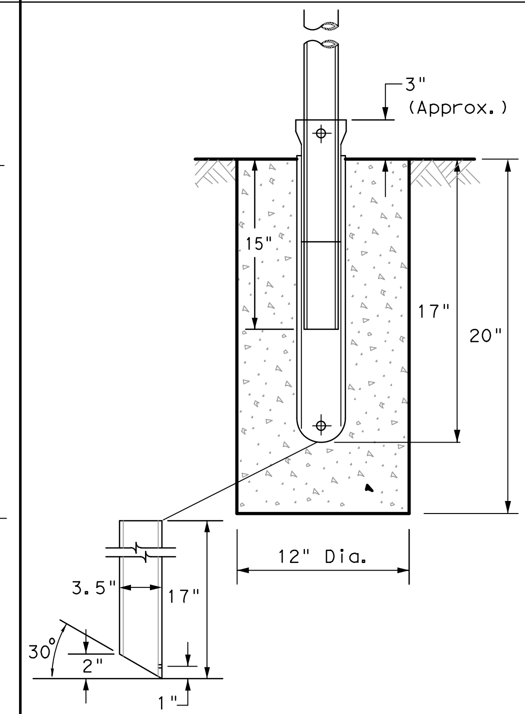
WEDGE ANCHOR SYSTEMS

WAS



STEEL

WAP



PLASTIC

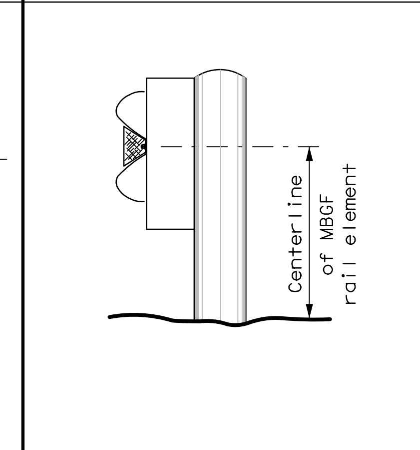
NOTE

1. Install per manufacturer's recommendations.

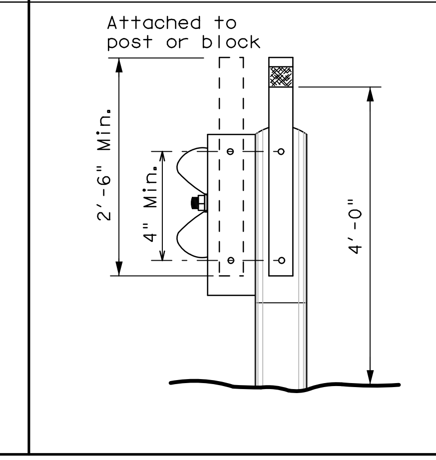
TYPE OF BARRIER MOUNTS

GUARD FENCE ATTACHMENT

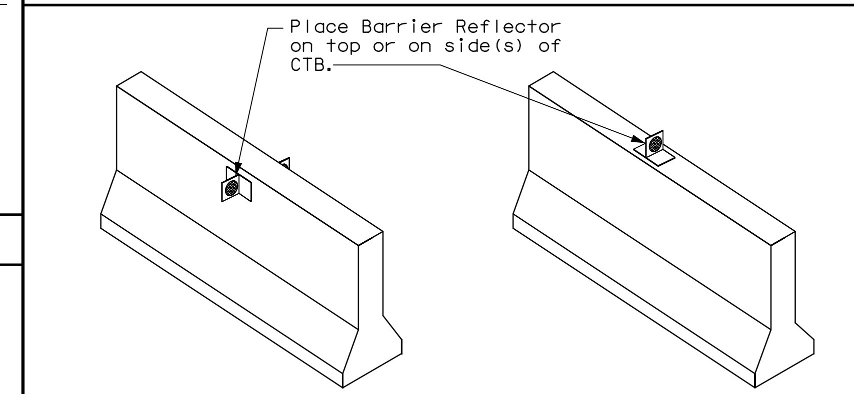
GF1



GF2



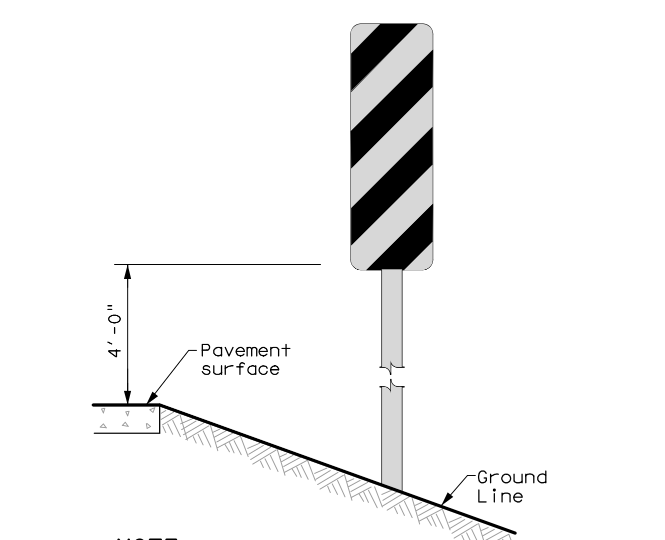
CONCRETE TRAFFIC BARRIER (CTB)



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.

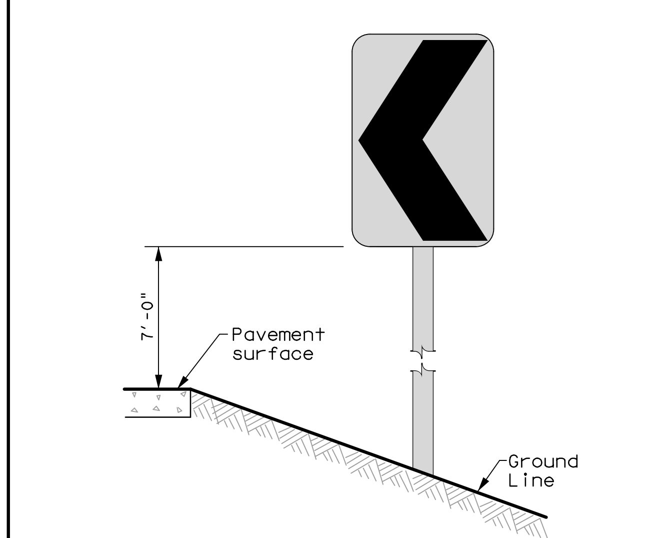
TYPES 1, 3, AND 4 OBJECT MARKERS AND CHEVRONS



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)

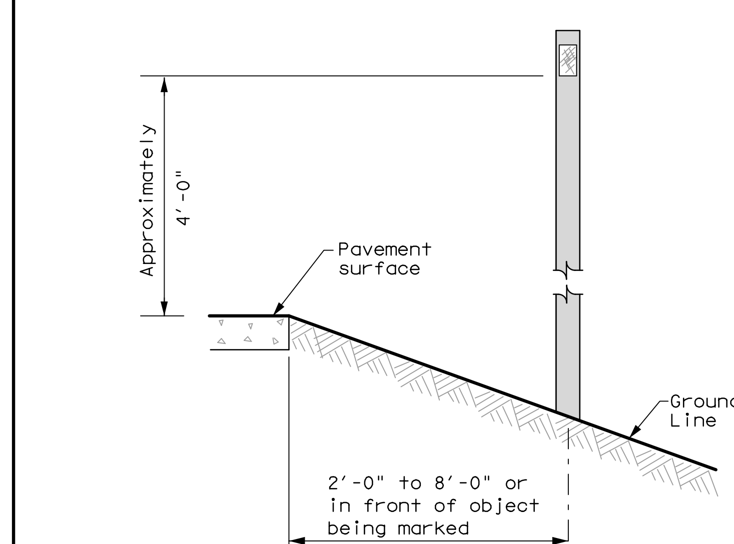
CHEVRONS AND ONE DIRECTION LARGE ARROW SIGN



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

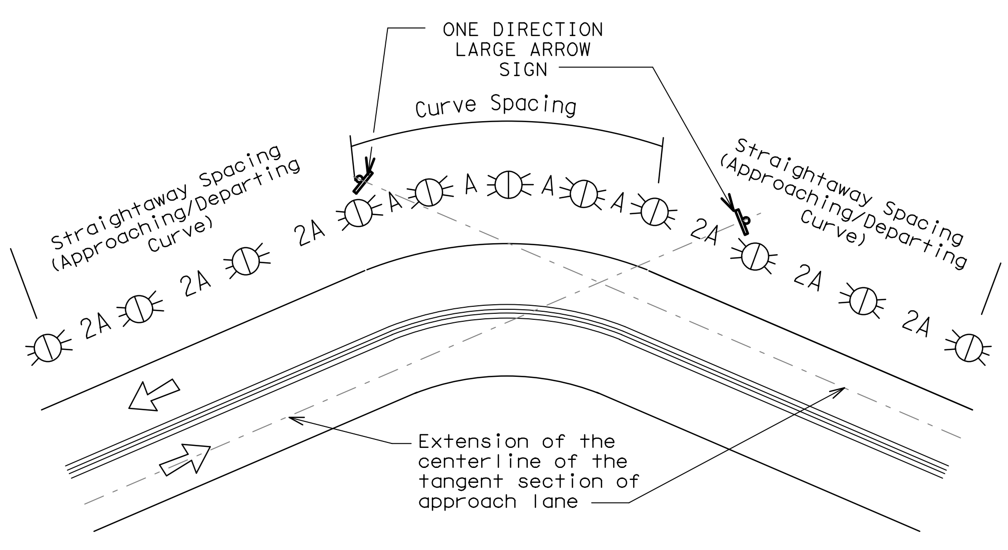
FILE: dom2-20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
©TxDOT August 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS	0233	05	038	SH 54
10-09 3-15	DIST		COUNTY	SHEET NO.
4-10 7-20	ELP		CULBERSON	149

20B

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 Advisory Speed: Curve (35 MPH or more)
5 MPH & 10 MPH	• RPMs	• RPMs
15 MPH & 20 MPH	• RPMs and One Direction Large Arrow sign	• RPMs and Chevrons; or • RPMs and One Direction Large Arrow sign where geometric conditions or roadside obstacles prevent the installation of chevrons.
25 MPH & more	• RPMs and Chevrons; or • RPMs and One Direction Large Arrow sign where geometric conditions or roadside obstacles prevent the installation of chevrons	• RPMs and Chevrons

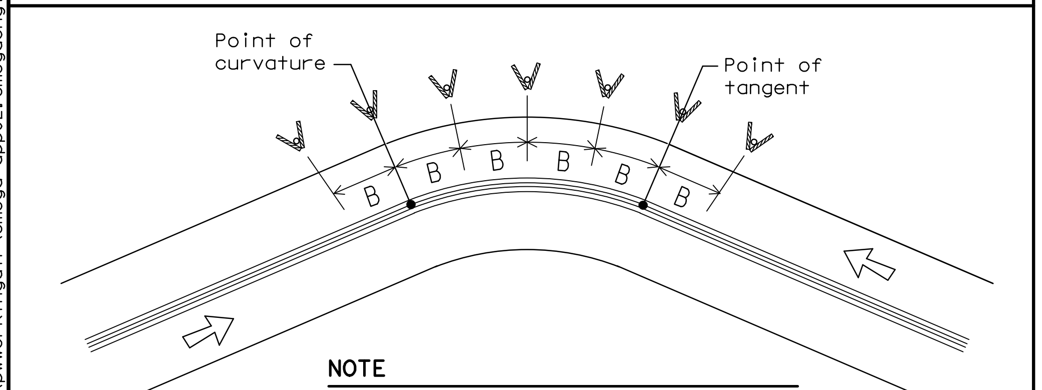
SUGGESTED SPACING FOR DELINEATORS ON HORIZONTAL CURVES



NOTE

ONE DIRECTION LARGE ARROW (W1-6) sign should be located at approximately and perpendicular to the extension of the centerline of the tangent section of approach lane.

SUGGESTED SPACING FOR CHEVRONS ON HORIZONTAL CURVES



NOTE

At least one chevron pair is installed beyond the point of tangent in tangent section.

DELINEATOR AND CHEVRON SPACING

WHEN DEGREE OF CURVE OR RADIUS IS KNOWN

Degree of Curve	Radius of Curve (FEET)	Spacing in Curve (FEET)	Spacing in Straightaway (FEET)	Chevron Spacing in Curve (FEET)
		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

Symbol	Description
	Bi-directional Delineator
	Delineator
	Sign

Texas Department of Transportation — Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER PLACEMENT DETAILS

D & OM(3)-20

FILE: dom3-20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
© TxDOT August 2004	CONT 0233	SECT 05	JOB 038	HIGHWAY SH 54
REVISIONS 3-15 8-15 8-15 7-20	DIST ELP		COUNTY CULBERSON	SHEET NO. 150

20C

DATE: 9/27/2022 11:21:03 AM
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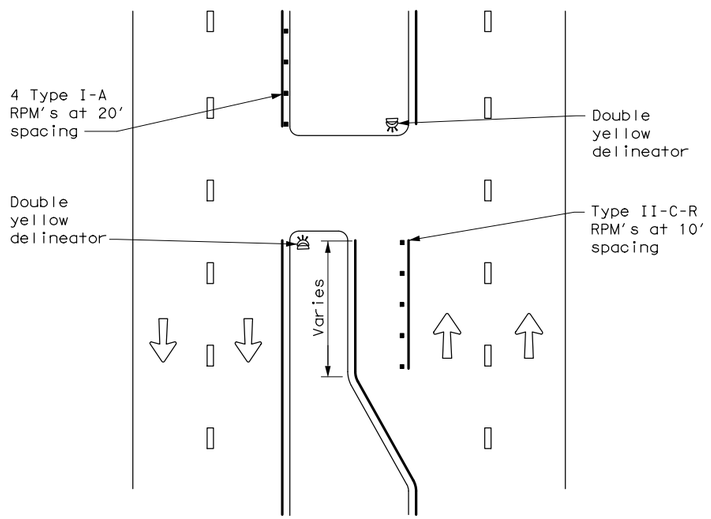
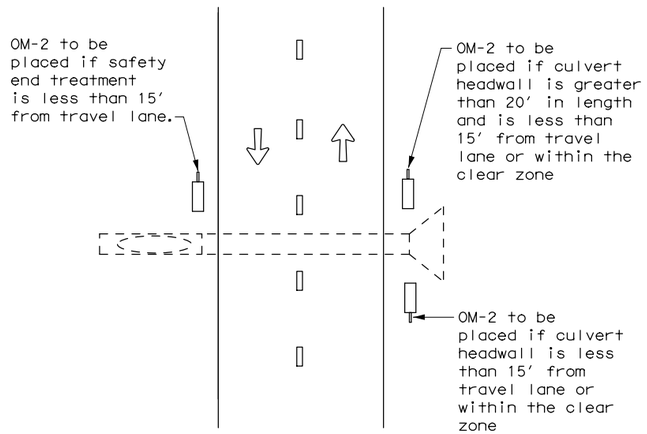
CROSSOVERS



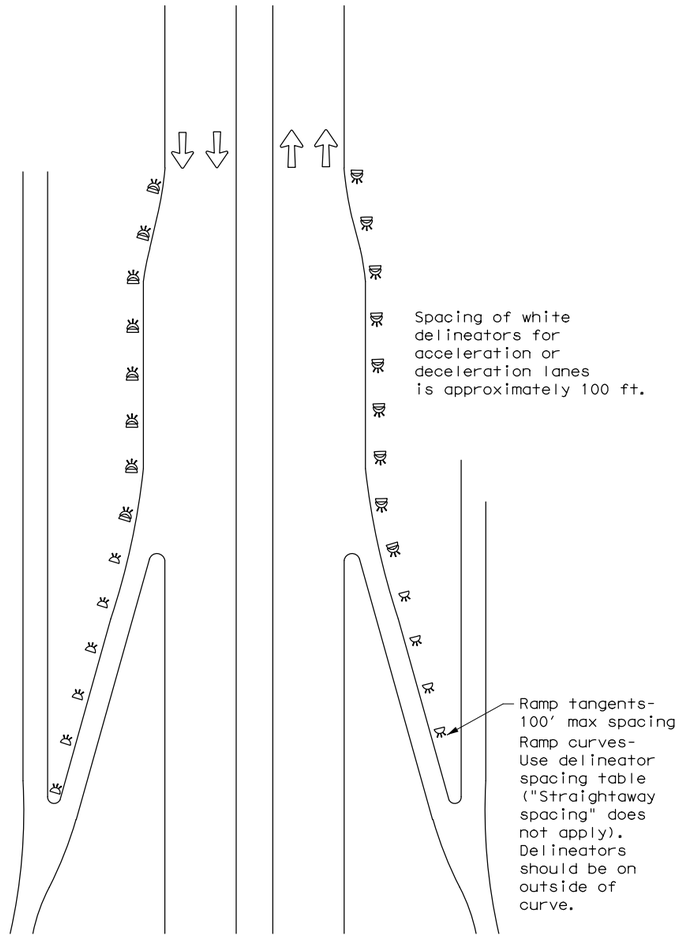
DETAIL 1

FOR CULVERTS WITHOUT MBGF



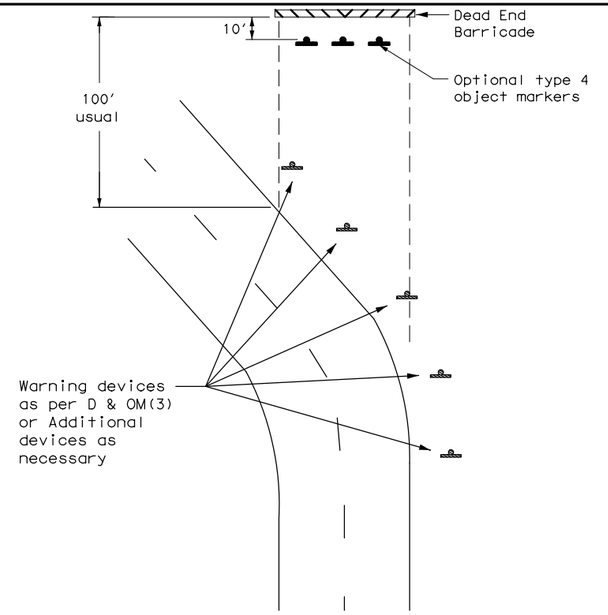
DETAIL 2

FREEWAY DELINEATION FOR RAMPS AND ACCELERATION/DECELERATION LANES



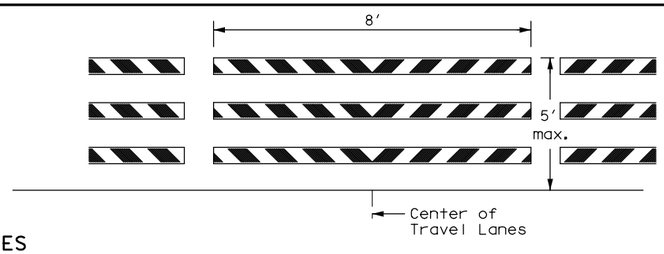
DETAIL 3

TYPICAL APPLICATION OF DEAD END BARRICADE



DETAIL 4

TYPICAL DEAD END BARRICADE INSTALLATION



NOTES

1. Barricade striping shall be red and white reflective sheeting for all permanent road closures.
2. Barricade striping is red and white sloping toward the center of the roadway.
3. Type 3 Barricade Supports should be anchored to soil or pavement as described in compliant Work Zone Traffic Control Devices List, section D.2.f and D.2.g.

DETAIL 5

LEGEND	
	Bidirectional Delineator
	Delineator
	OM-3
	Barricade
	Sign
	OM-2
	Double Delineator

Texas Department of Transportation

Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER PLACEMENT DETAILS

D & OM(4)-20

FILE: dom4-20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
©TxDOT August 2004	CONT	SECT	JOB	HIGHWAY
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3-15	DIST	COUNTY		SHEET NO.
7-20	ELP	CULBERSON		151

20D

DATE: 9/27/2022 11:21:08 AM
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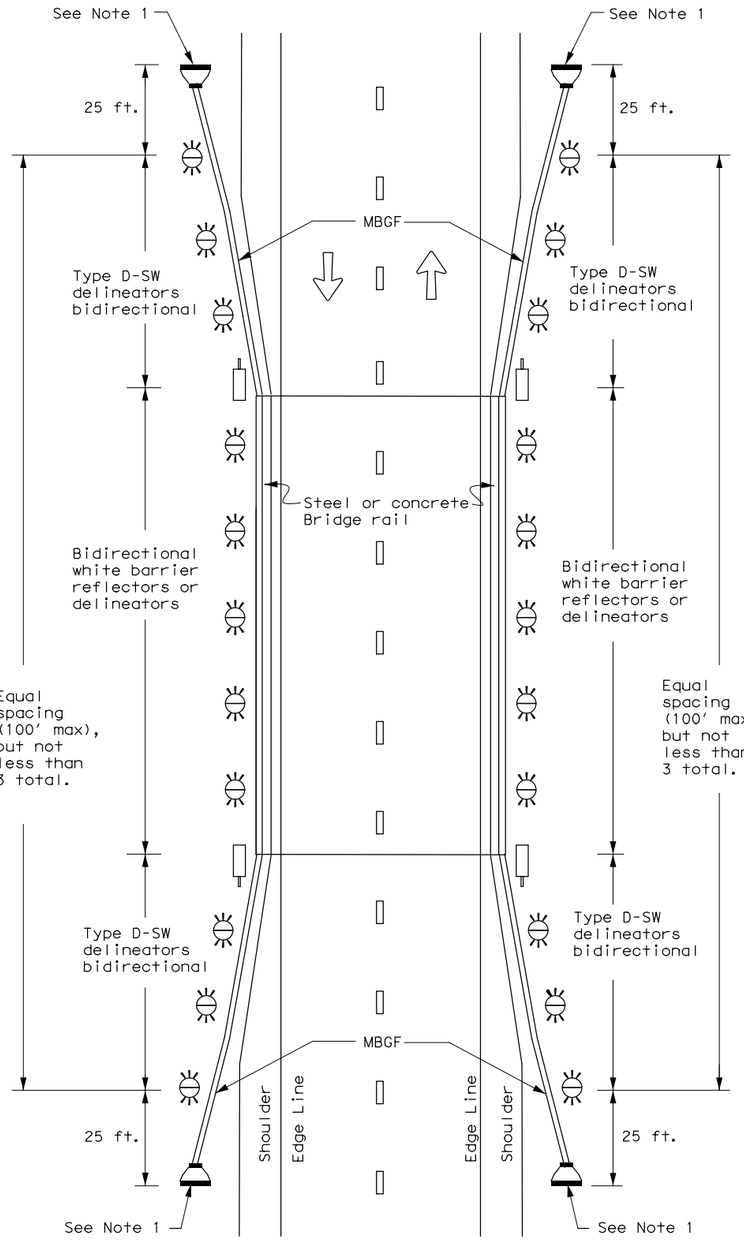
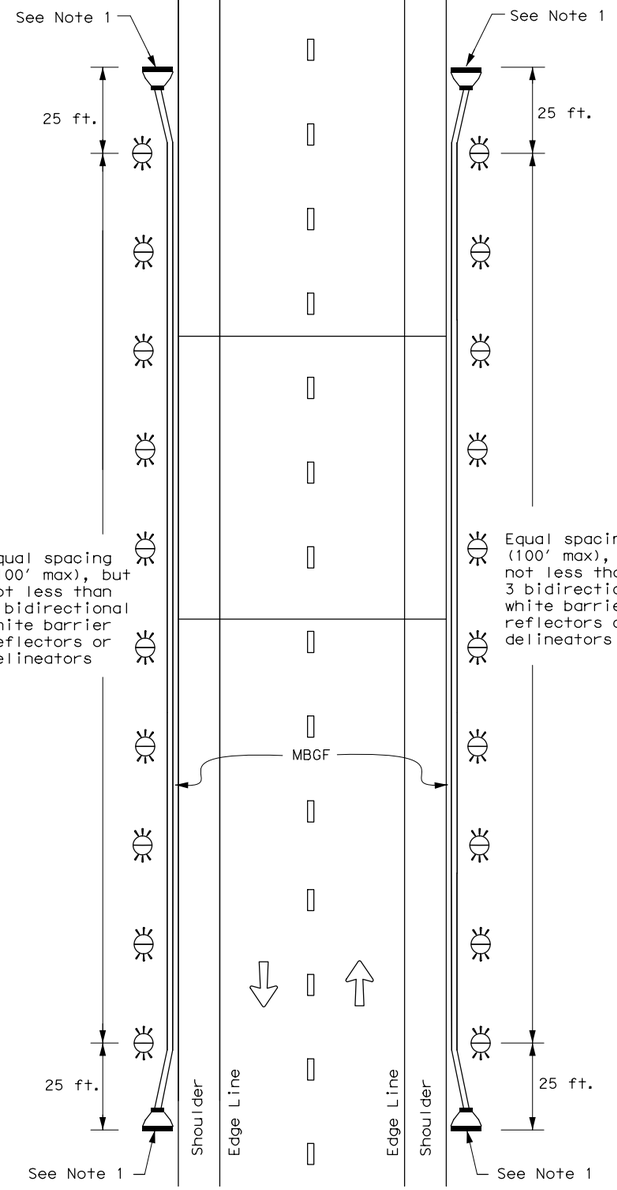
TWO-WAY, TWO LANE ROADWAY WITH REDUCED WIDTH APPROACH RAIL



NOTE:

1. Terminal ends require reflective sheeting provided by manufacturer per D & OM (VIA) or a Type 3 Object Marker (OM-3) in front of the terminal end.

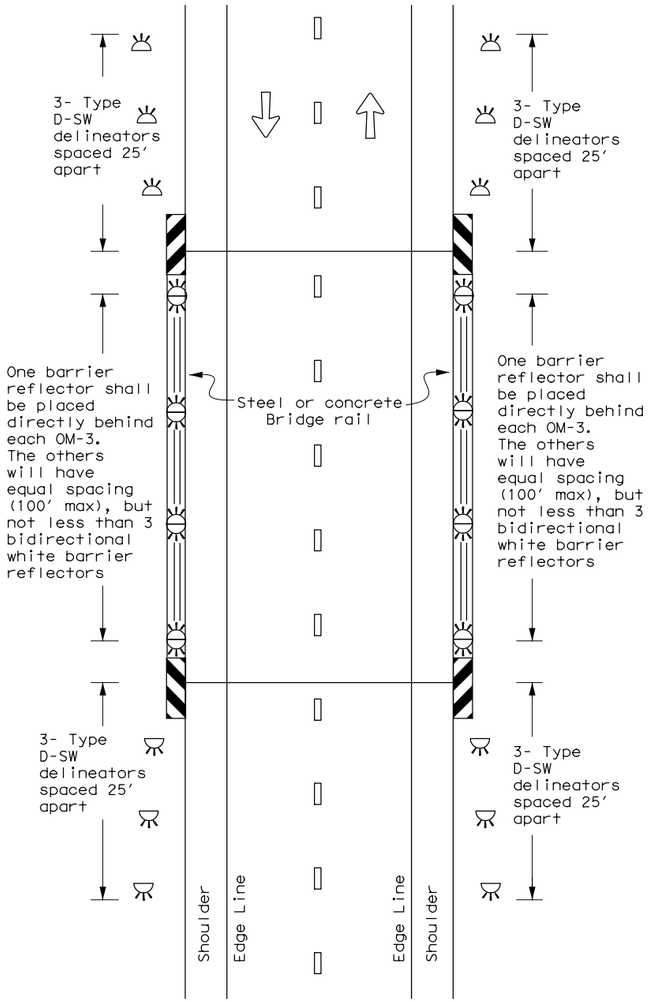
TWO-WAY, TWO LANE ROADWAY WITH METAL BEAM GUARD FENCE (MBGF)



NOTE:

1. Terminal ends require reflective sheeting provided by manufacturer per D & OM (VIA) or a Type 3 Object Marker (OM-3) in front of the terminal end.

TWO-WAY, TWO LANE ROADWAY BRIDGE WITH NO APPROACH RAIL



LEGEND

	Bidirectional Delineator
	Delineator
	OM-3
	OM-2
	Terminal End
	Traffic Flow

Texas Department of Transportation

Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER PLACEMENT DETAILS

D & OM(5)-20

FILE: dom5-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT	CONT	SECT	JOB	HIGHWAY
REVISIONS	0233	05	038	SH 54
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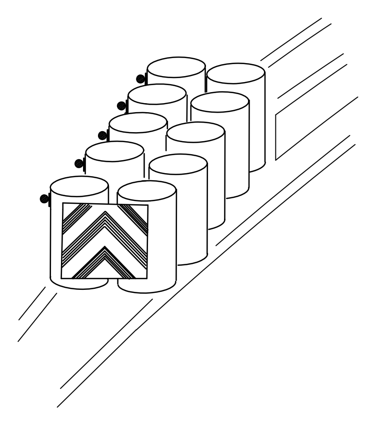
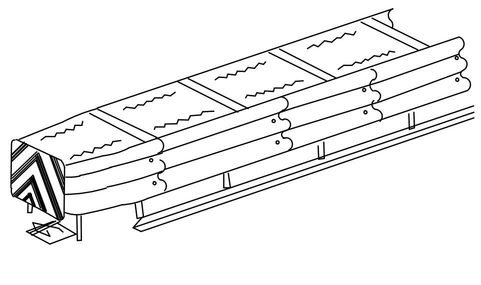
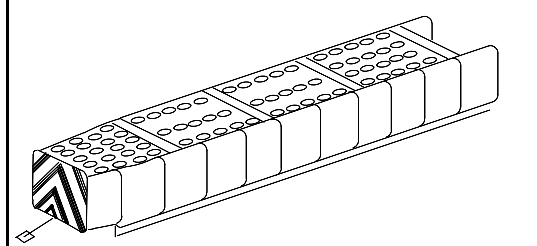
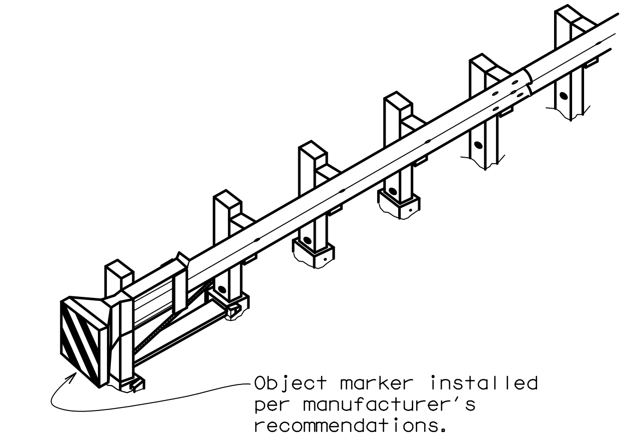
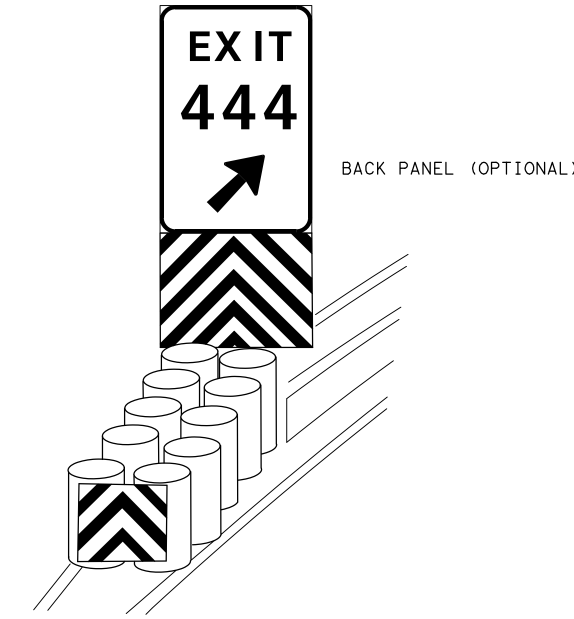
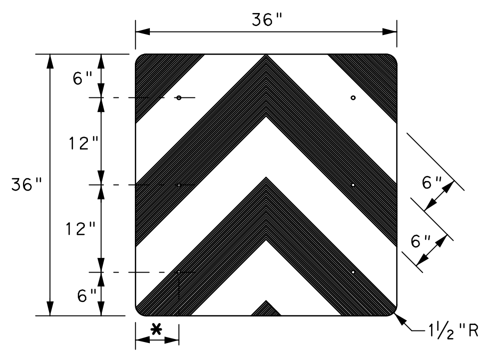
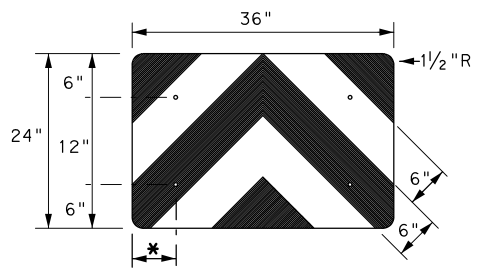
	ELP	CULBERSON		152

20E

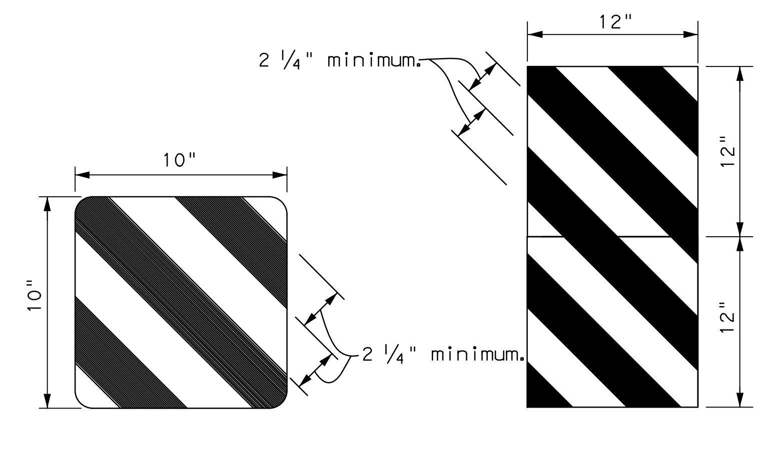







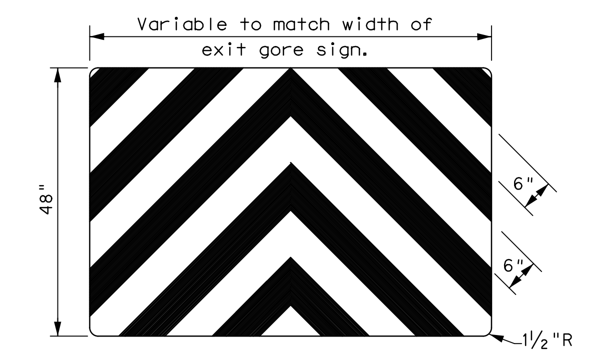


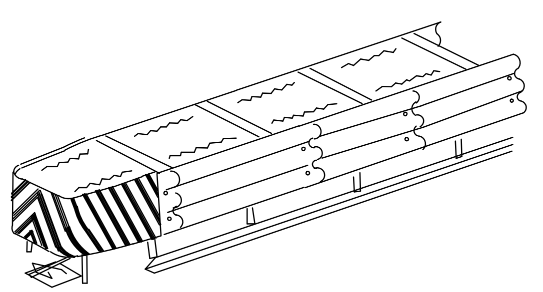
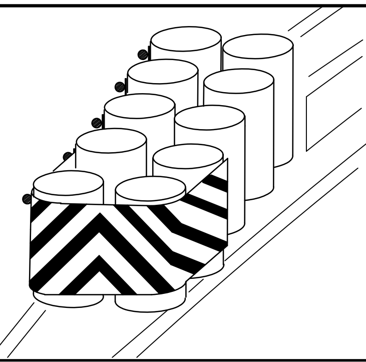


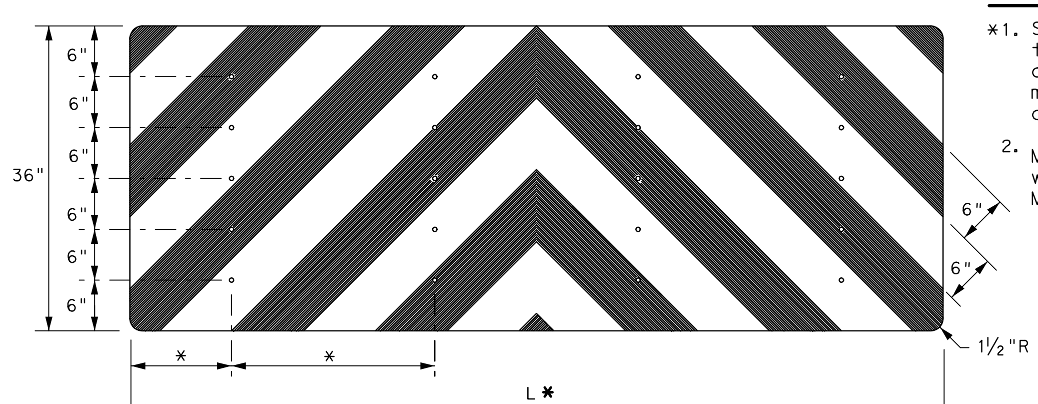
✱ Adjust to fit attenuator per manufacturer's recommendation, or as directed by the Engineer

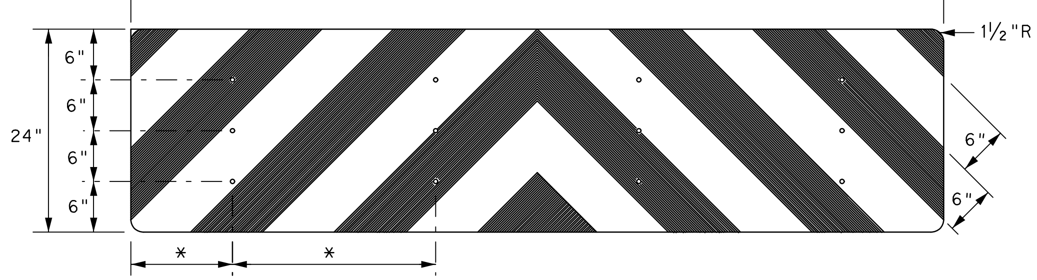


OBJECT MARKERS SMALLER THAN 3 FT^2







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	0233	05	038		SH 54
4-92 8-04	DIST		COUNTY		SHEET NO.
8-95 3-15 4-98 7-20	ELP		CULBERSON		153

20G

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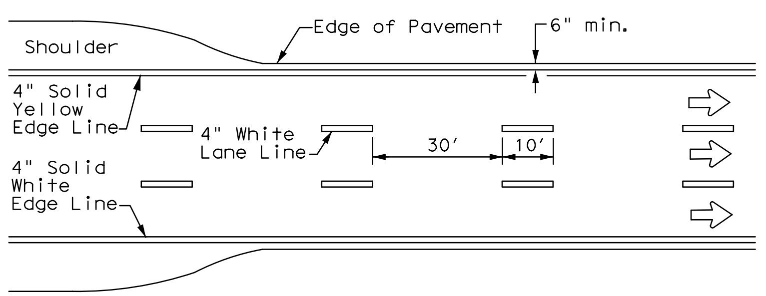
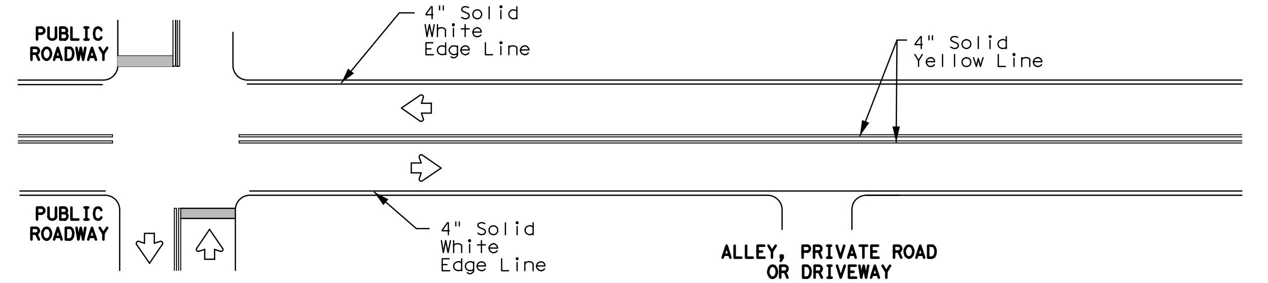
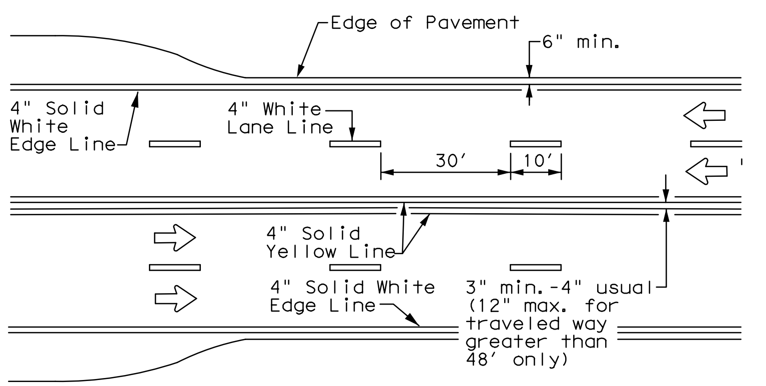


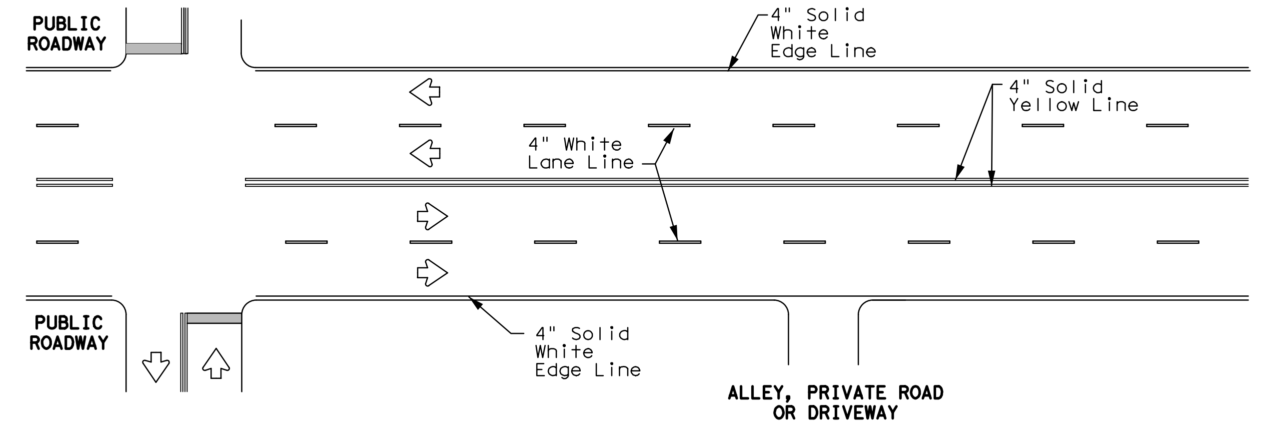
EDGE LINE AND LANE LINES
ONE-WAY ROADWAY
WITH OR WITHOUT SHOULDERS



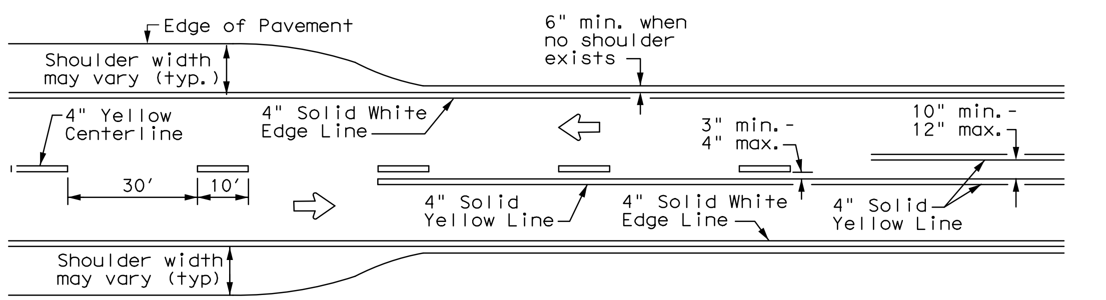
TYPICAL TWO-LANE, TWO-WAY PAVEMENT
MARKINGS THROUGH INTERSECTIONS



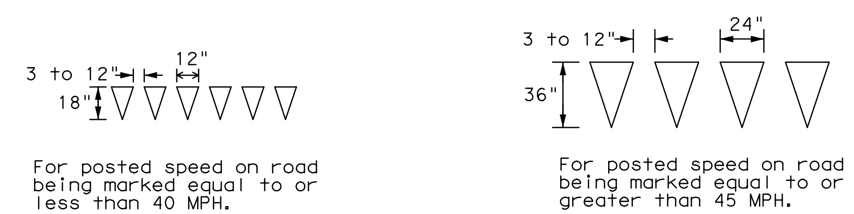
CENTERLINE AND LANE LINES
FOUR LANE TWO-WAY ROADWAY
WITH OR WITHOUT SHOULDERS



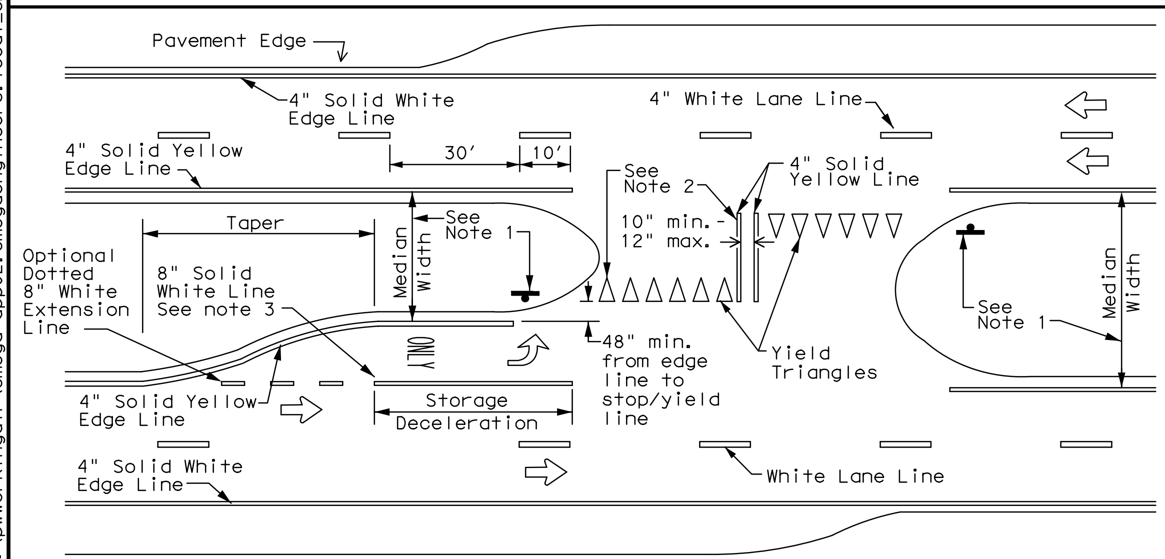
TYPICAL MULTI-LANE, TWO-WAY PAVEMENT
MARKINGS THROUGH INTERSECTIONS



TWO LANE TWO-WAY ROADWAY
WITH OR WITHOUT SHOULDERS



YIELD LINES



FOUR LANE DIVIDED ROADWAY CROSSOVERS

NOTES

1. Where divided highways are separated by median widths at the median opening itself of 30 feet or more, median openings shall be signed as two separate intersections. Each median opening has two width measurements, with one measurement for each approach. The narrow median width will be the controlling width to determine if signs are required. Yield signs are the typical intersection control. Stop signs are optional as determined by the Engineer.

2. Install median striping (double yellow centerlines and stop bars/yield triangles) when a 50' or greater median centerline can be placed. Stop bars shall only be used with stop signs. Yield traingles shall only be used with yield signs.

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

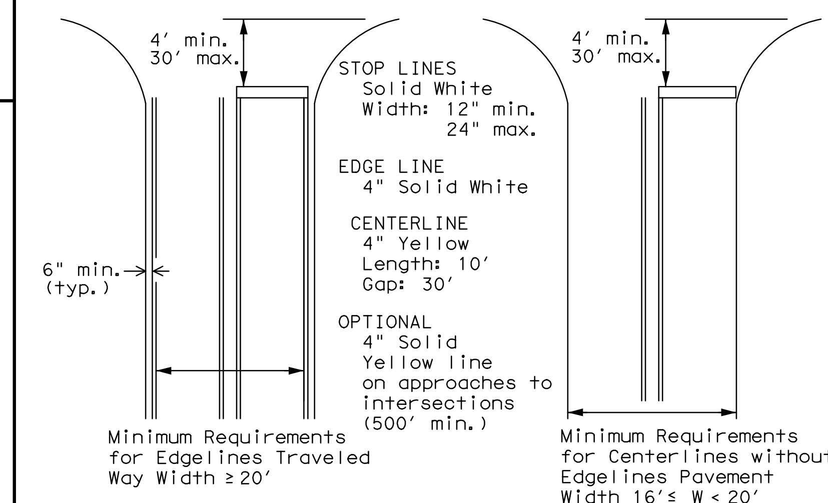
GENERAL NOTES

1. Edgeline striping shall be as shown in the plans or as directed by the Engineer. The edgeline should not be placed less less than 6 inches from the edge of pavement. This distance may vary due to pavement raveling or other conditions. Edgelines are not required in curb and gutter sections of roadways.

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

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

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



GUIDE FOR PLACEMENT OF STOP LINES,
EDGE LINE & CENTERLINE
Based on Traveled Way and Pavement Widths
for Undivided Highways

Texas Department of Transportation

Traffic Safety Division Standard

TYPICAL STANDARD PAVEMENT MARKINGS

PM(1)-20

FILE: pm1-20.dgn	DN:	CK:	DW:	CK:
©TxDOT November 1978	CONT 0233	SECT 05	JOB 038	HIGHWAY SH 54
REVISIONS 8-95 3-03 / 5-00 2-12 / 8-00 6-20	DIST ELP	COUNTY CULBERSON		SHEET NO. 154

22A

DATE: 9/27/2022 11:21:14 AM
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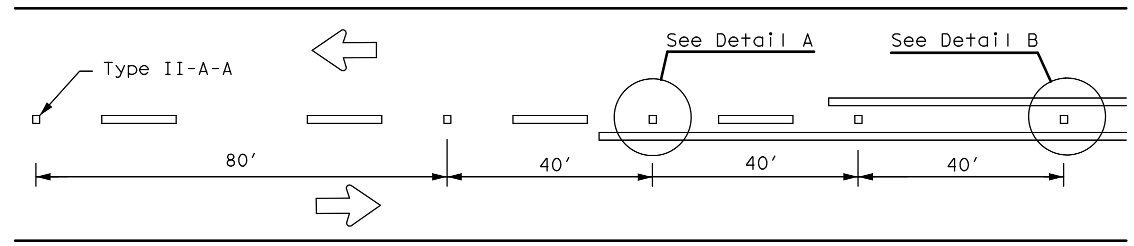
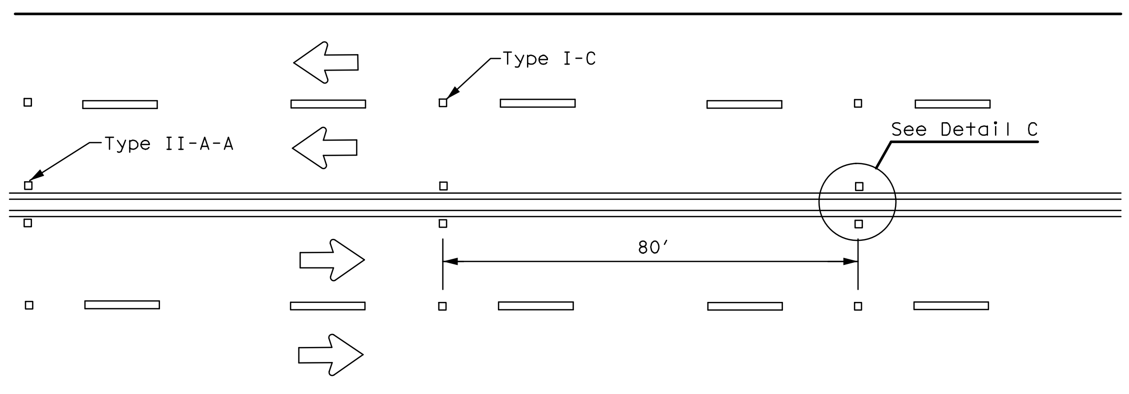
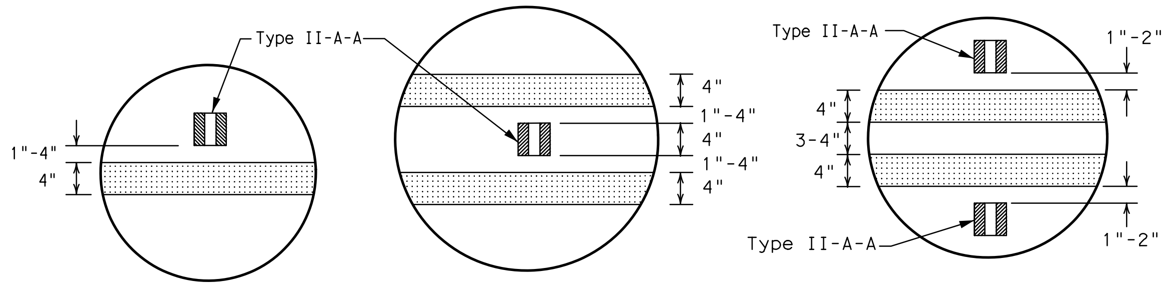
REFLECTIVE RAISED PAVEMENT MARKERS FOR VEHICLE POSITIONING GUIDANCE



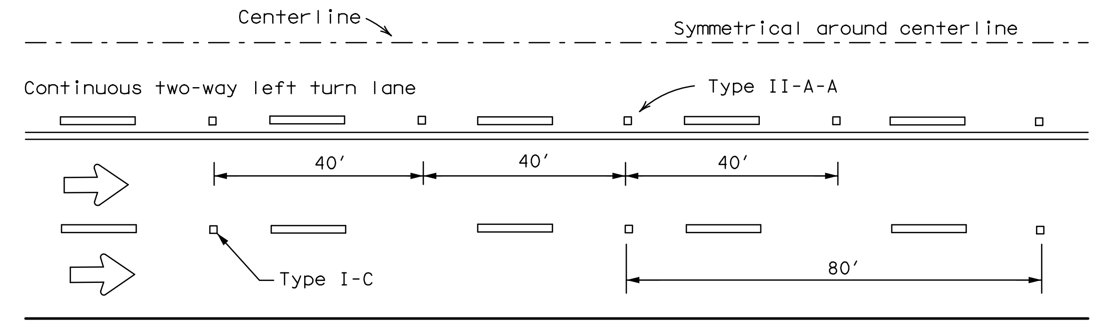
CENTERLINE FOR ALL TWO LANE ROADWAYS



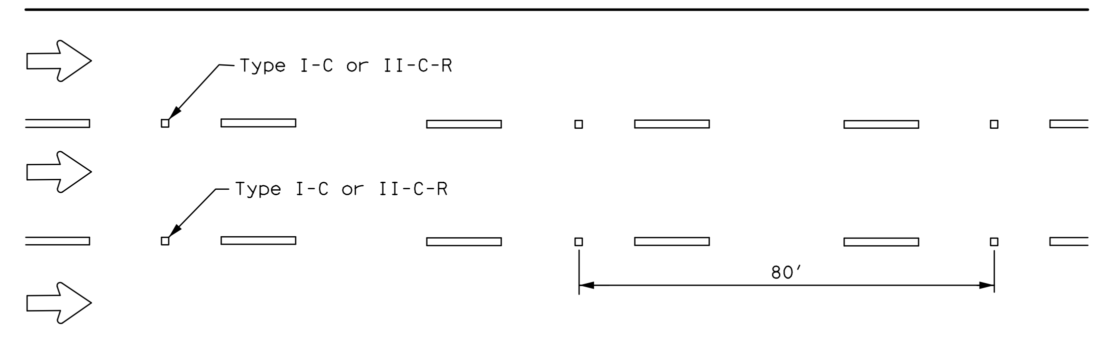
CENTERLINE & LANE LINES FOR FOUR LANE TWO-WAY HIGHWAYS



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



CENTERLINE AND LANE LINES FOR TWO-WAY LEFT TURN LANE

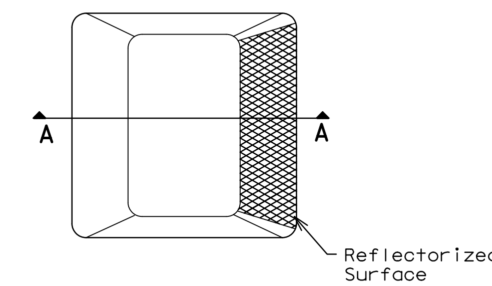


LANE LINES FOR ONE-WAY ROADWAY (NON-FREEWAY FACILITIES)

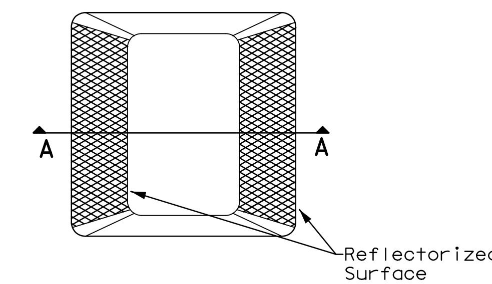
Raised pavement markers Type II-C-R shall have clear face toward normal traffic and red face toward wrong-way traffic.

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

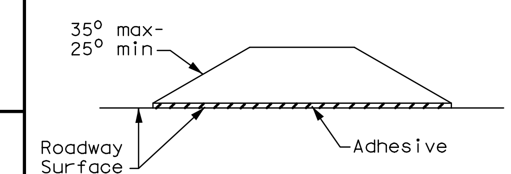
All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.



Type I (Top View)

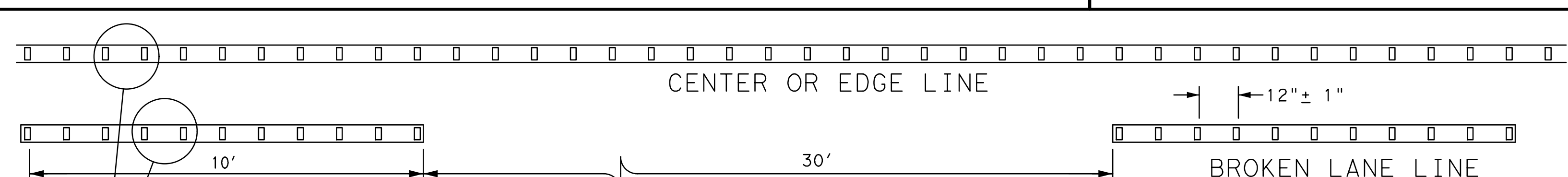


Type II (Top View)



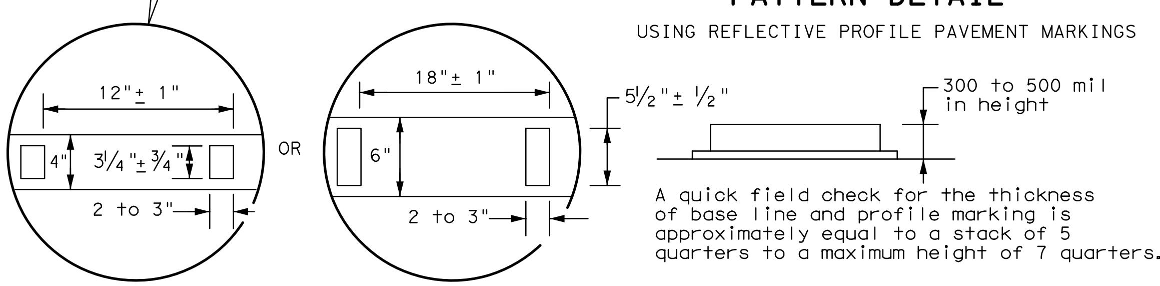
SECTION A

RAISED PAVEMENT MARKERS



REFLECTORIZED PROFILE PATTERN DETAIL

USING REFLECTIVE PROFILE PAVEMENT MARKINGS



4" EDGE LINE, CENTER LINE OR LANE LINE

OPTIONAL 6" EDGE LINE, CENTER LINE OR LANE LINE

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.

NOTE

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

GENERAL NOTES

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

Texas Department of Transportation — Traffic Safety Division Standard

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

FILE: pm2-20.dgn	DN:	CK:	DW:	CK:
© TxDOT April 1977	CONT	SECT	JOB	HIGHWAY
REVISIONS 4-92 2-10; 5-00 2-12; 8-00 6-20	0233	05	038	SH 54
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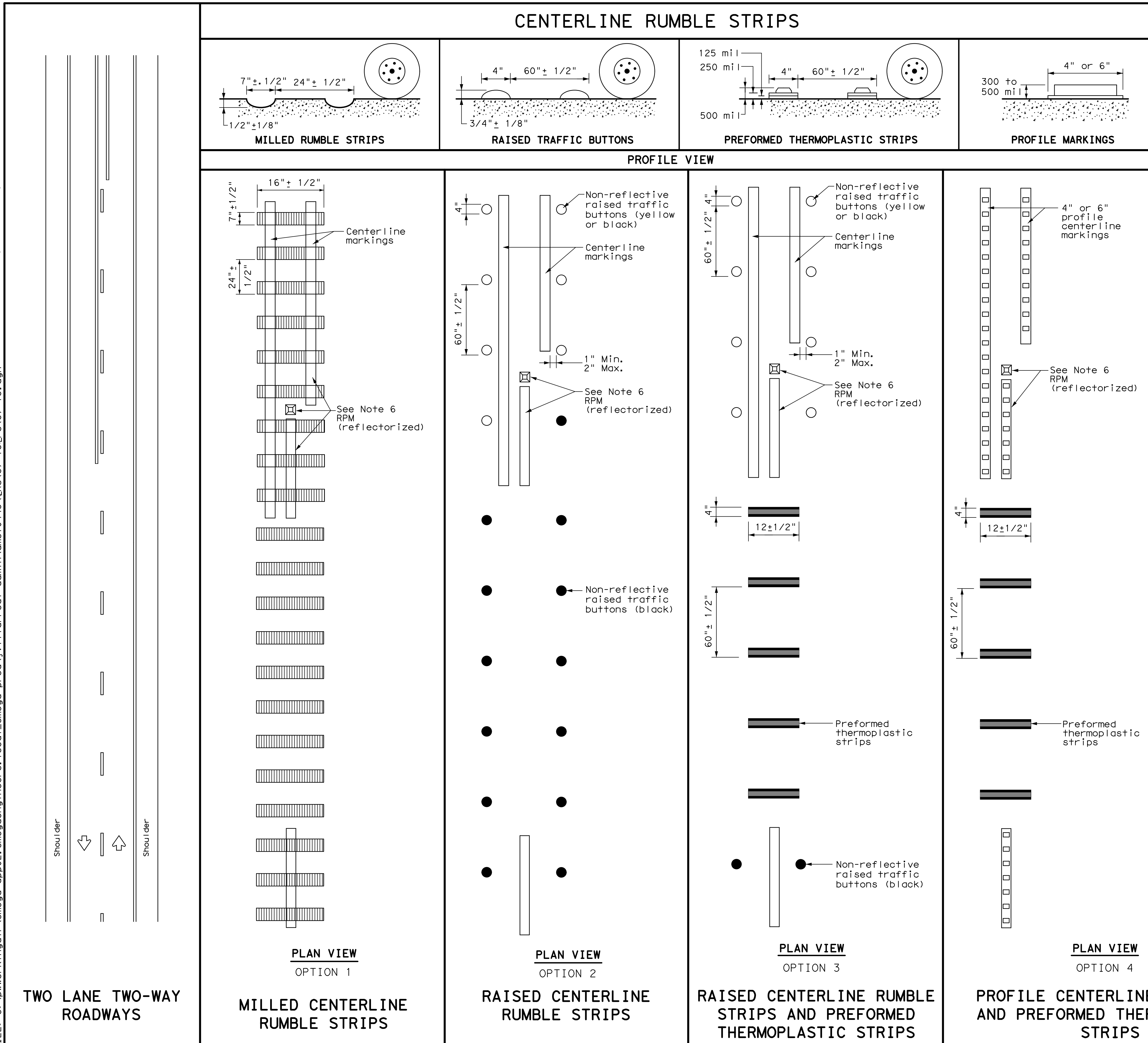
	ELP		CULBERSON	155

22B



GENERAL NOTES

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

WHEN INSTALLING CENTERLINE RUMBLE STRIPS:

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

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

12. See standard sheet RS(4).

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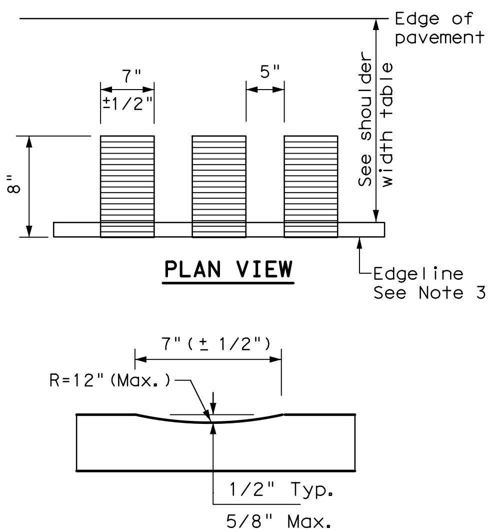
Texas Department of Transportation
Traffic Operations Division Standard

CENTERLINE RUMBLE STRIPS ON TWO LANE TWO-WAY HIGHWAYS

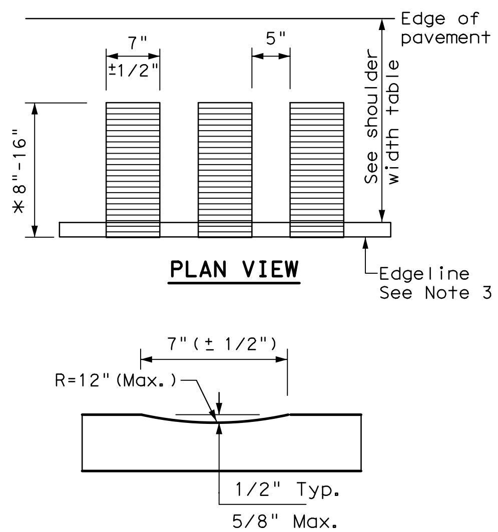
RS(3)-13

FILE: rs(3)-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT October 2013	CONT	SECT	JOB	HIGHWAY
REVISIONS	0233	05	038	SH 54
	DIST		COUNTY	SHEET NO.
	ELP		CULBERSON	156



PROFILE VIEW
OPTION 1

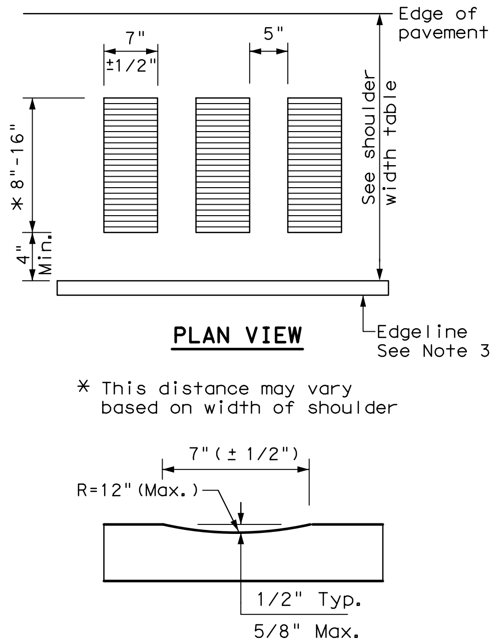
CONTINUOUS MILLED DEPRESSIONS
(Rumble Stripes)



* This distance may vary based on width of shoulder

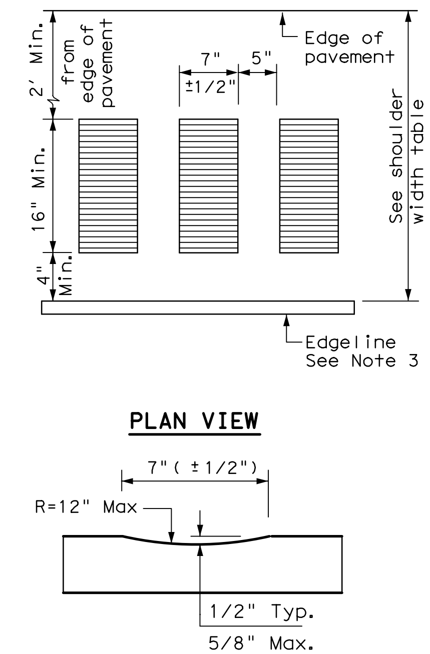
PROFILE VIEW
OPTION 2

CONTINUOUS MILLED DEPRESSIONS
(Rumble Stripes)



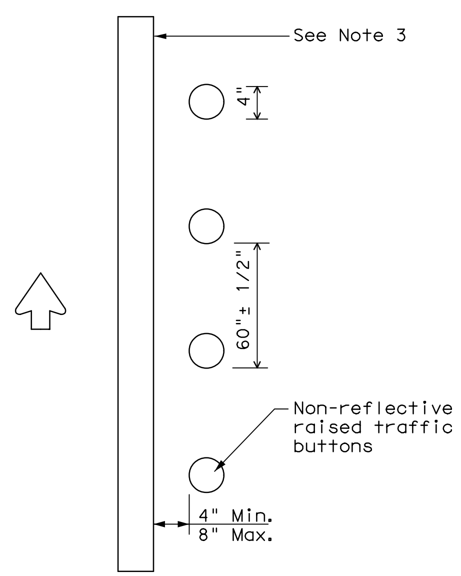
PROFILE VIEW
OPTION 3

CONTINUOUS MILLED DEPRESSIONS
(Rumble Strips)



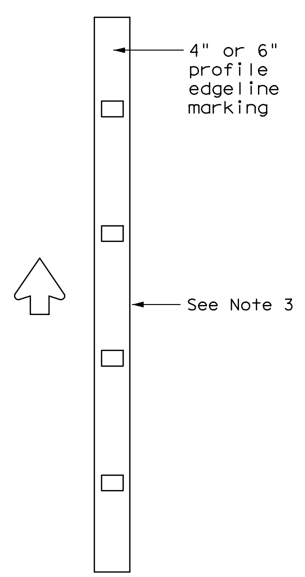
PROFILE VIEW
OPTION 4

CONTINUOUS MILLED DEPRESSIONS
(Rumble Strips)



PLAN VIEW
OPTION 5

RAISED EDGELINE RUMBLE STRIPS



PLAN VIEW
OPTION 6

PROFILE EDGELINE MARKINGS

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

GENERAL NOTES

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

WHEN INSTALLING MILLED DEPRESSION EDGELINE RUMBLE STRIPS:

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

WHEN INSTALLING RAISED OR PROFILE EDGELINE RUMBLE STRIPS:

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

Texas Department of Transportation
Traffic Operations Division Standard

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

FILE: rs(4)-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT October 2013	CONT 0233	SECT 05	JOB 038	HIGHWAY SH 54
REVISIONS	DIST ELP	COUNTY CULBERSON		SHEET NO. 157

DATE: 9/27/2022 11:21:26 AM
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SIGN SUPPORT DESCRIPTIVE CODES

(Descriptive Codes correspond to project estimate and quantities sheets)

SM RD SGN ASSM TY XXXXX(X)XX(X-XXXX)

Post Type

FRP = Fiberglass Reinforced Plastic Pipe (see SMD(FRP))
TWT = Thin-Walled Tubing (see SMD(TWT))
10BWG = 10 BWG Tubing (see SMD(SLIP-1) to (SLIP-3))
S80 = Schedule 80 Pipe (see SMD(SLIP-1) to (SLIP-3))

Number of Posts (1 or 2)

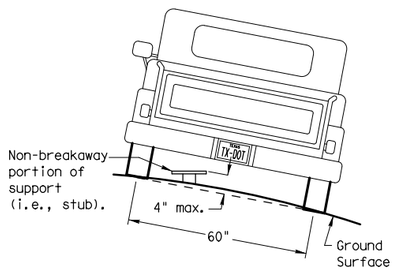
Anchor Type

UA = Universal Anchor - Concreted (see SMD(FRP) and (TWT))
UB = Universal Anchor - Bolted down (see SMD(FRP) and (TWT))
WS = Wedge Anchor Steel - (see SMD(TWT))
WP = Wedge Anchor Plastic (see SMD(TWT))
SA = Slipbase - Concreted (see SMD(SLIP-1) to (SLIP-3))
SB = Slipbase - Bolted Down (see SMD(SLIP-1) to (SLIP-3))

Sign Mounting Designation

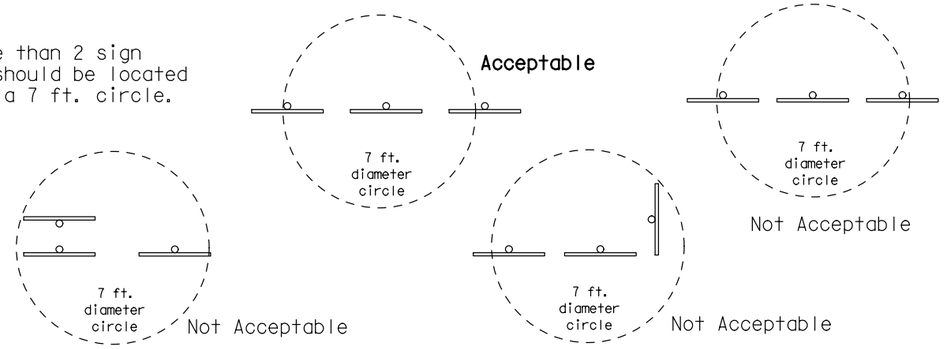
P = Prefab. "Plain" (see SMD(SLIP-1) to (SLIP-3), (TWT), (FRP))
T = Prefab. "T" (see SMD(SLIP-1) to (SLIP-3), (TWT))
U = Prefab. "U" (see SMD(SLIP-1) to (SLIP-3))
IF REQUIRED
1EXT or 2EXT = Number of Extensions (see SMD(SLIP-1) to (SLIP-3), (TWT))
BM = Extruded Wind Beam (see SMD(SLIP-1) to (SLIP-3))
WC = 1.12 #/ft Wing Channel (see SMD(SLIP-1) to (SLIP-3))
EXAL = Extruded Aluminum Sign Panels (see SMD(SLIP-1))

REQUIRED CLEARANCE FOR BREAKAWAY SUPPORT



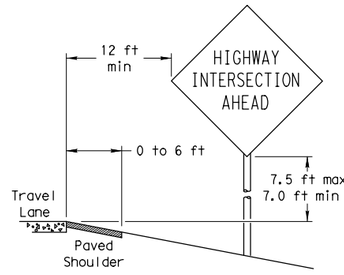
To avoid vehicle undercarriage snagging, any substantial remains of a breakaway support, when it is broken away, should not project more than 4 inches above a 60-inch chord (i.e., typical space between wheel paths).

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



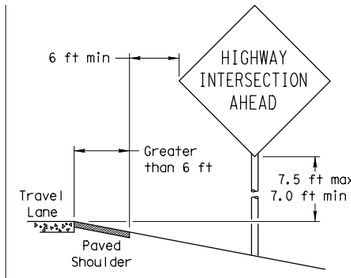
SIGN LOCATION

PAVED SHOULDERS



LESS THAN 6 FT. WIDE

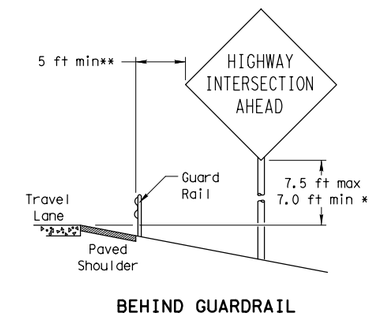
When the shoulder is 6 ft. or less in width, the sign must be placed at least 12 ft. from the edge of the travel lane.



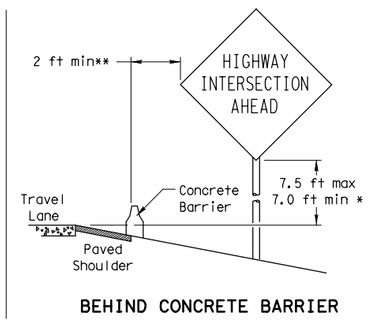
GREATER THAN 6 FT. WIDE

When the shoulder is greater than 6 ft in width, the sign must be placed at least 6 ft. from the edge of the shoulder.

BEHIND BARRIER



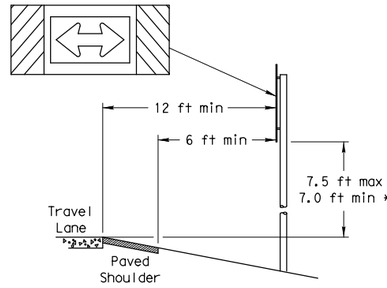
BEHIND GUARDRAIL



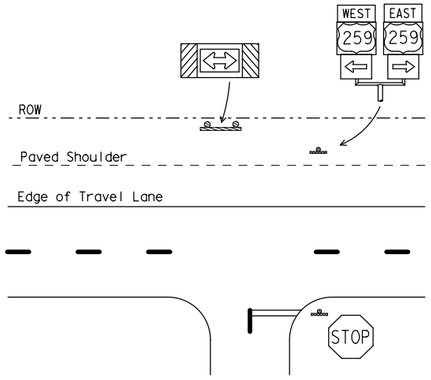
BEHIND CONCRETE BARRIER

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

T-INTERSECTION



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



* Signs shall be mounted using the following condition that results in the greatest sign elevation:

(1) a minimum of 7 to a maximum of 7.5 feet above the edge of the travel lane or

(2) a minimum of 7 to a maximum of 7.5 feet above the grade at the base of the support when sign is installed on the backslope.

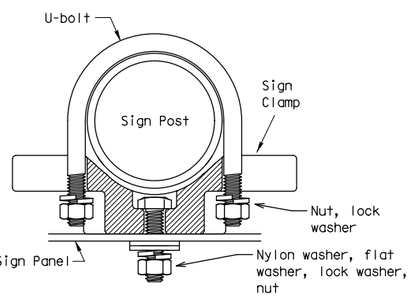
The maximum values may be increased when directed by the Engineer.

See the Traffic Operations Division website for detailed drawings of sign clamps, Triangular Slipbase System components and Wedge Anchor System components.

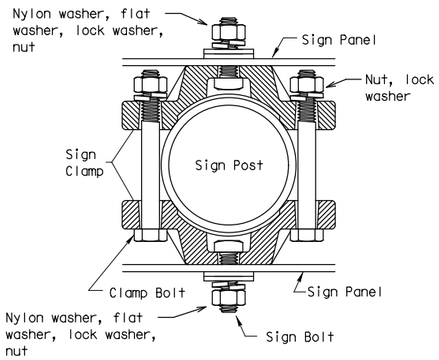
The website address is:
http://www.txdot.gov/publications/traffic.htm

TYPICAL SIGN ATTACHMENT DETAIL

Single Signs



Back-to-Back Signs



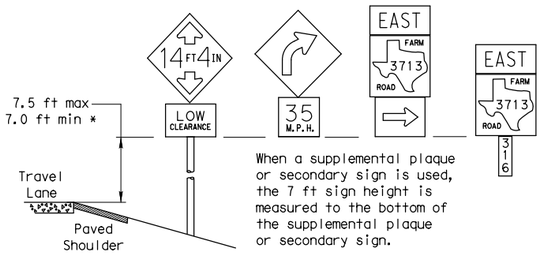
Bolts used to mount sign panels to the clamp are 5/16-18 UNC galvanized square head with nut, nylon washer, flat washer and lock washer. The bolt length is 1 inch for aluminum.

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

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

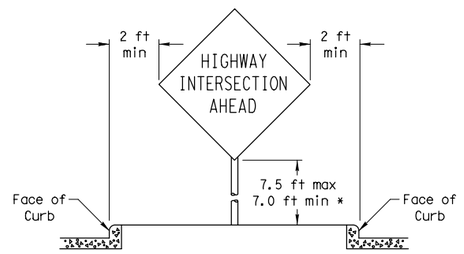
Pipe Diameter	Approximate Bolt Length	
	Specific Clamp	Universal Clamp
2" nominal	3"	3 or 3 1/2"
2 1/2" nominal	3 or 3 1/2"	3 1/2 or 4"
3" nominal	3 1/2 or 4"	4 1/2"

SIGNS WITH PLAQUES



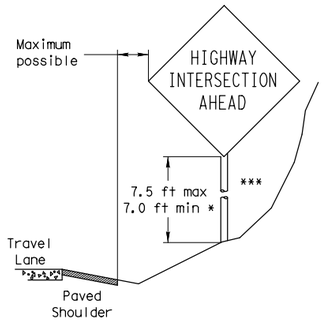
When a supplemental plaque or secondary sign is used, the 7 ft sign height is measured to the bottom of the supplemental plaque or secondary sign.

CURB & GUTTER OR RAISED ISLAND



RESTRICTED RIGHT-OF-WAY

(When 6 ft min. is not possible.)



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

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

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

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS GENERAL NOTES & DETAILS

SMD(GEN)-08

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

9-08 REVISIONS

CONT	SECT	JOB	HIGHWAY
0233	05	038	SH 54

DIST	COUNTY	SHEET NO.
ELP	CULBERSON	158

DATE: 9/27/2022 11:21:29 AM
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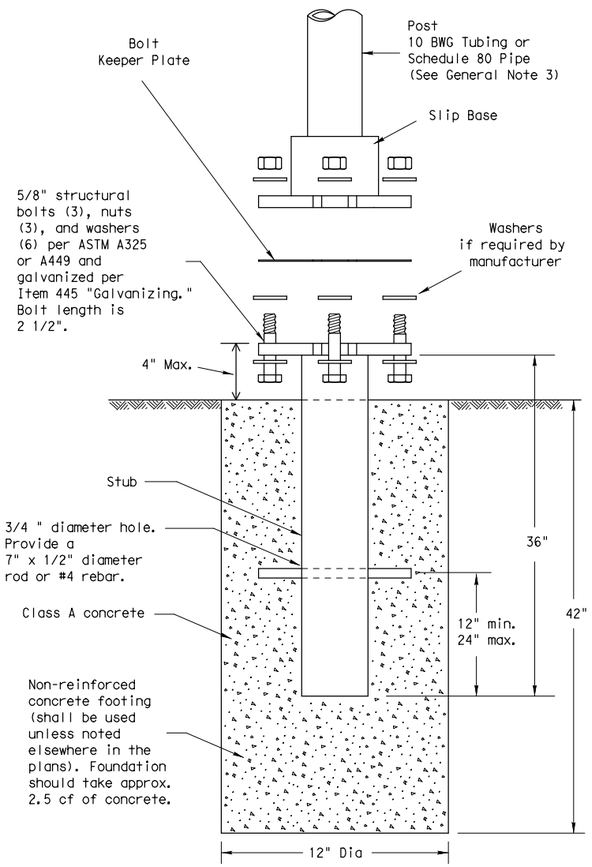
TRIANGULAR SLIPBASE INSTALLATION GENERAL REQUIREMENTS



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:

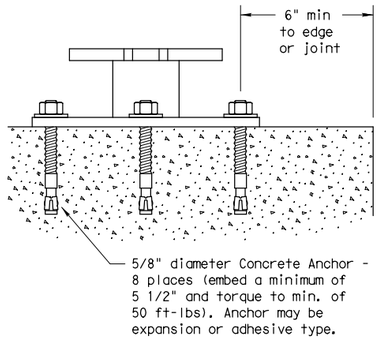
1. Slip base shall be permanently marked to indicate manufacturer. Method, design, and location of marking are subject to approval of the TxDOT Traffic Standards Engineer.
2. Material used as post with this system shall conform to the following specifications:
   10 BWG Tubing (2.875" outside diameter)
   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

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

REVISIONS
9-08

CONT	SECT	JOB	HIGHWAY
0233	05	038	SH 54

DIST	COUNTY	SHEET NO.
ELP	CULBERSON	159

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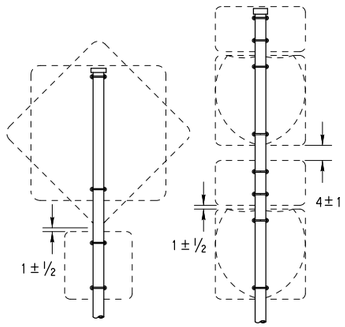
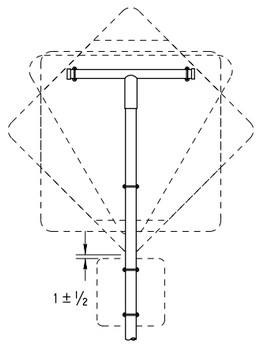
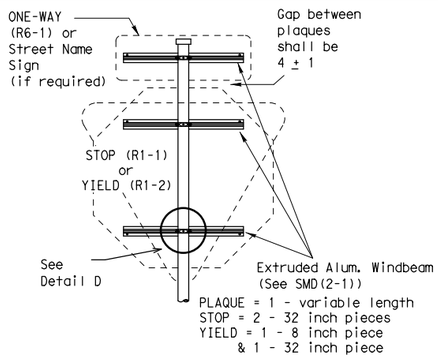


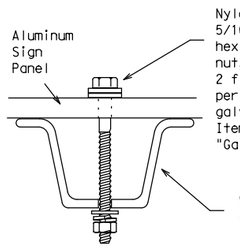
SM RD SGN ASSM TY XXXXX(1)XX(P)



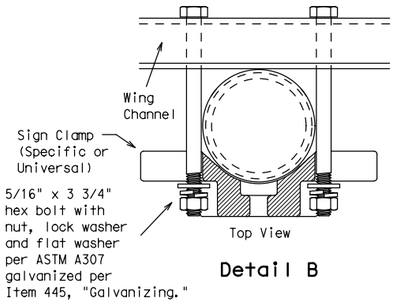
SM RD SGN ASSM TY XXXXX(1)XX(T)



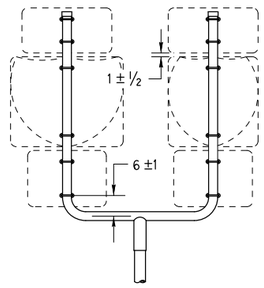
SM RD SGN ASSM TY XXXXX(1)XX(P-BM)



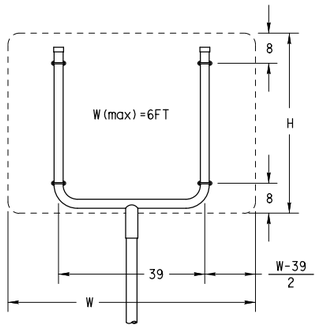
Detail A



Detail B



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



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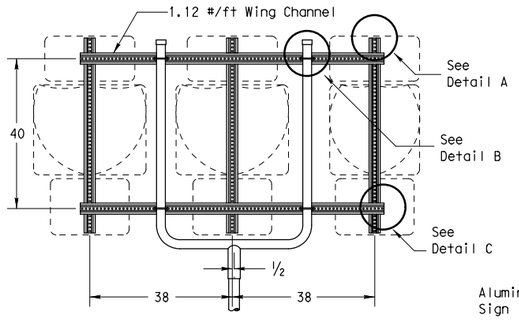
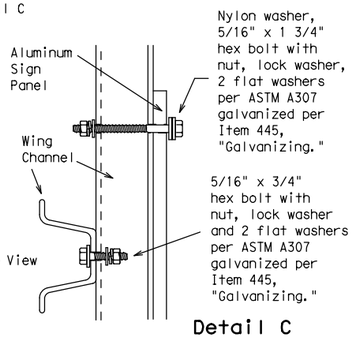
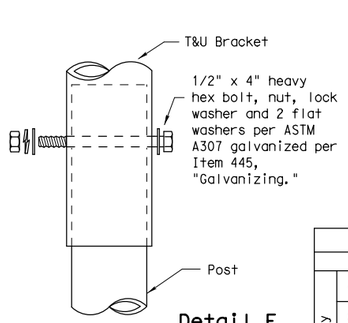


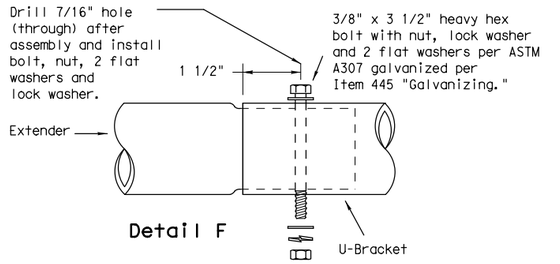
SM RD SGN ASSM TY XXXXX(1)XX(U-WC)
(See Note 11)



Detail C

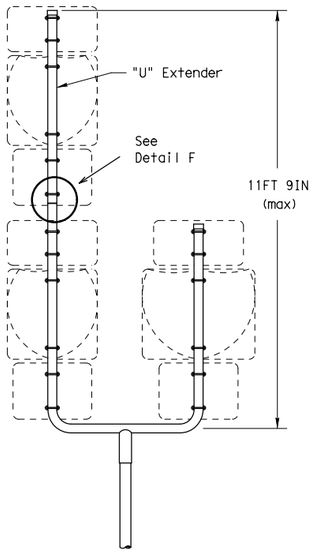


Detail E

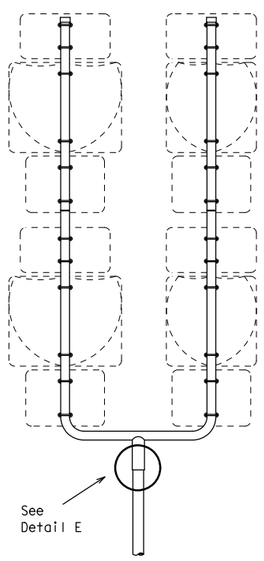


Detail F

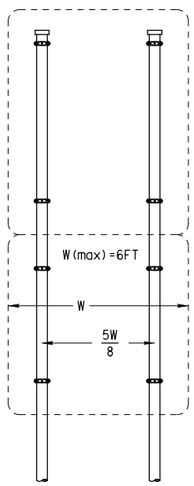
Splices shall only be allowed behind the sign substrate.



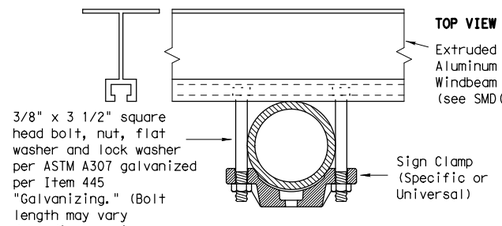
SM RD SGN ASSM TY S80(1)XX(U-1EXT)



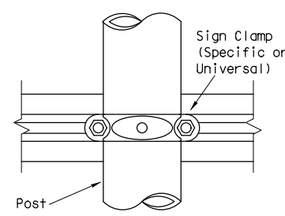
SM RD SGN ASSM TY S80(1)XX(U-2EXT)

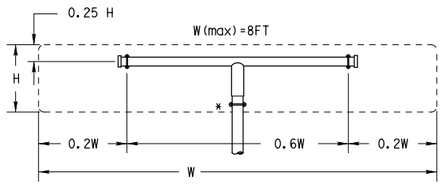


SM RD SGN ASSYM TY XXXXX(2)XX(P)



Detail D

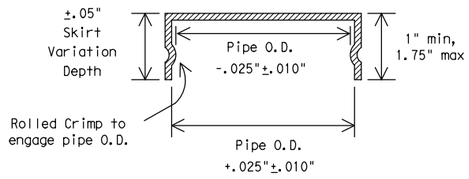




SM RD SGN ASSM TY XXXXX(1)XX(T)
(* - See Note 12)

All dimensions are in english unless detailed otherwise.

FRICTION CAP DETAIL



Friction caps may be manufactured from hot rolled or cold rolled steel sheets. The minimum sheet metal thickness shall be 24 gauge for all cap sizes.

The rim edges shall be reasonably straight and smooth. Caps shall be sized and formed in such a manner as to produce a drive-on friction fit and have no tendency to rock when seated on the pipe. The depth shall be sufficient to give positive protection against entrance of rainwater. They shall be free of sharp creases or indentations and show no evidence of metal fracture.

Caps shall have an electrodeposited coating of zinc in accordance with the requirements of ASTM B633 Class FE/ZN 8.

GENERAL NOTES:

1.

SIGN SUPPORT	# OF POSTS	MAX. SIGN AREA
10 BWG	1	16 SF
10 BWG	2	32 SF
Sch 80	1	32 SF
Sch 80	2	64 SF

2. The Engineer may require that a Schedule 80 post be used in place of a 10 BWG where a sign height is abnormally high due to a fill slope.
3. Sign supports shall not be spliced except where shown. Sign support posts shall not be spliced.
4. Aluminum sign blanks shall conform to Departmental Material Specifications DMS-7110 and shall have the following minimum thicknesses: 0.080 for signs less than 7.5 sq. ft., 0.100 for signs 7.5 to 15 sq. ft., and 0.125 for signs greater than 15 sq. ft.
5. Signs that require specific supports due to reasons in addition to windloading are indicated on the "REQUIRED SUPPORT" table on this sheet.
6. For horizontal rectangular signs fabricated from flat aluminum, T-brackets are used for signs 24 inches or less in height. U-brackets are used for signs of greater height.
7. When two triangular slipbase supports are used to support a single sign, they shall not be "rigidly" connected to each other except through the sign panel. This will allow each support to act independently when impacted by an errant vehicle.
8. Wing channel shall meet ASTM A 1011 SS Gr 50 and be galvanized per ASTM A 123.
9. Excess pipe, wing channel, or windbeam shall be cut off so that it does not extend beyond the sign panel (i.e., excess support shall not be visible when the sign is viewed from the front.) Repair galvanized coating at cut support ends per Item 445, "Galvanizing."
10. Additional route markers may be added vertically, provided the total sign area does not exceed the maximum allowable amount per Note 1.
11. Additional sign clamp required on the "T-bracket" post for 24 inch height signs. Place the clamp 3 inches above bottom of sign when possible.
12. Post open ends shall be fitted with Friction Caps.
13. Sign blanks shall be the sizes and shapes shown on the plans.

REQUIRED SUPPORT

	SIGN DESCRIPTION	SUPPORT
Regulatory	48-inch STOP sign (R1-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	60-inch YIELD sign (R1-2)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	48x16-inch ONE-WAY sign (R6-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	36x48, 48x36, and 48x48-inch signs	TY 10BWG(1)XX(T)
	48x60-inch signs	TY S80(1)XX(T)
Warning	48x48-inch signs (diamond or square)	TY 10BWG(1)XX(T)
	48x60-inch signs	TY S80(1)XX(T)
	48-inch Advance School X-ing sign (S1-1)	TY 10BWG(1)XX(T)
	48-inch School X-ing sign (S2-1)	TY 10BWG(1)XX(T)
	Large Arrow sign (W1-6 & W1-7)	TY 10BWG(1)XX(T)

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS TRIANGULAR SLIPBASE SYSTEM

SMD(SLIP-2)-08

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

CONT	SECT	JOB	HIGHWAY
0233	05	038	SH 54

DIST	COUNTY	SHEET NO.
ELP	CULBERSON	160

9-08 REVISIONS

26C

DATE: 9/27/2022 11:21:35 AM
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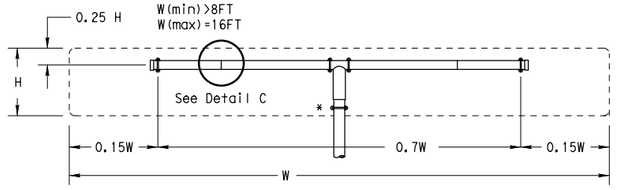
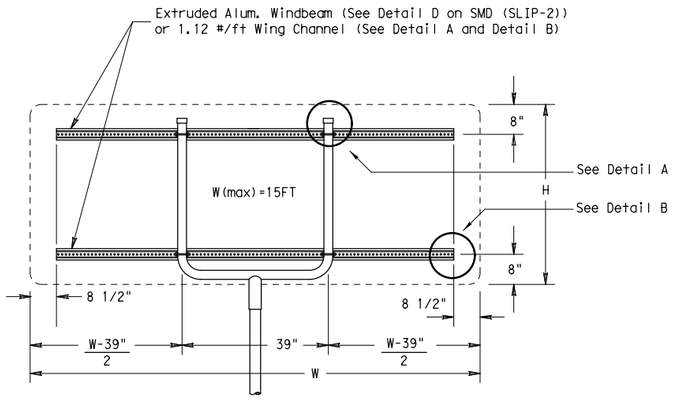
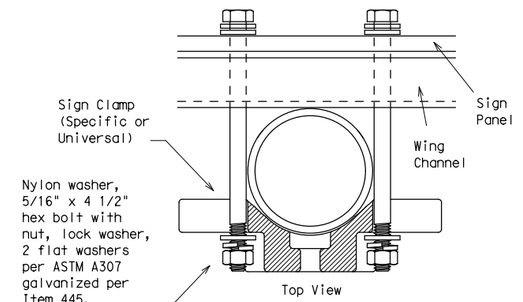


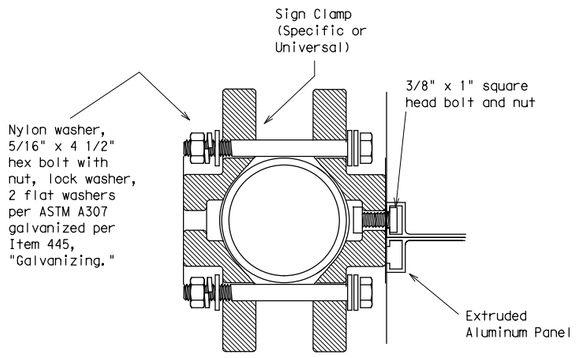
SM RD SGN ASSM TY XXXXX(1)XX(T-2EXT)
(* - See Note 12)



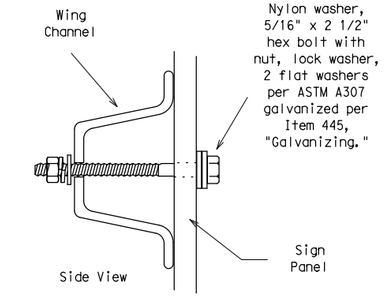
SM RD SGN ASSM TY XXXXX(1)XX(U-XX)



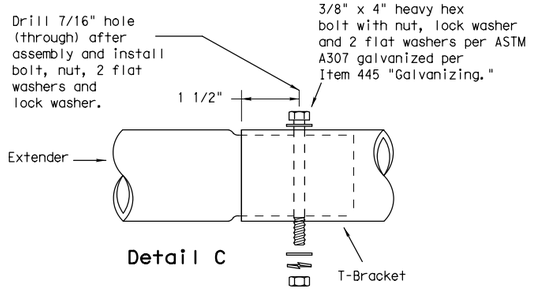
Detail A



Detail D
EXTRUDED ALUMINUM SIGN WITH T BRACKET

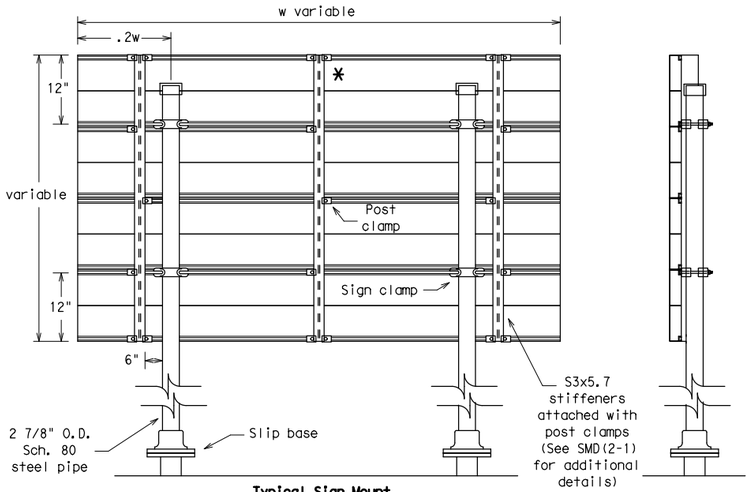


Detail B



Detail C

Splices shall only be allowed behind the sign substrate.

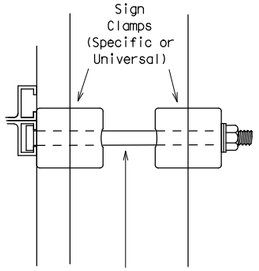


Typical Sign Mount

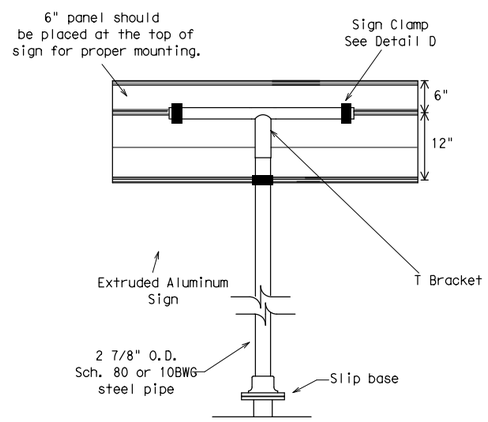
SM RD SGN ASSM TY S80(2)XX(P-EXAL)

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

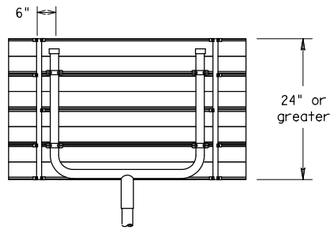
See Detail E
for clamp installation



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:

1.

SIGN SUPPORT	# OF POSTS	MAX. SIGN AREA
10 BWG	1	16 SF
10 BWG	2	32 SF
Sch 80	1	32 SF
Sch 80	2	64 SF

2. The Engineer may require that a Schedule 80 post be used in place of a 10 BWG where a sign height is abnormally high due to a fill slope.
3. Sign supports shall not be spliced except where shown. Sign support posts shall not be spliced.
4. Aluminum sign blanks shall conform to Departmental Material Specifications DMS-7110 and shall have the following minimum thicknesses: 0.080 for signs less than 7.5 sq. ft., 0.100 for signs 7.5 to 15 sq. ft., and 0.125 for signs greater than 15 sq. ft.
5. Signs that require specific supports due to reasons in addition to windloading are indicated on the "REQUIRED SUPPORT" table on this sheet.
6. For horizontal rectangular signs fabricated from flat aluminum, T-brackets are used for signs 24 inches or less in height. U-brackets are used for signs of greater height.
7. When two triangular slipbase supports are used to support a single sign, they shall not be "rigidly" connected to each other except through the sign panel. This will allow each support to act independently when impacted by an errant vehicle.
8. Wing channel shall meet ASTM A 1011 SS Gr 50 and be galvanized per ASTM A 123.
9. Excess pipe, wing channel, or windbeam shall be cut off so that it does not extend beyond the sign panel (i.e., excess support shall not be visible when the sign is viewed from the front.) Repair galvanized coating at cut support ends per Item 445, "Galvanizing."
10. Sign blanks shall be the sizes and shapes shown on the plans.
11. Additional sign clamp required on the "T-bracket" post for 24 inch high signs. Place the clamp 3 inches above bottom of sign when possible.
12. Post open ends shall be fitted with Friction Caps.

REQUIRED SUPPORT

	SIGN DESCRIPTION	SUPPORT
Regulatory	48-inch STOP sign (R1-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	60-inch YIELD sign (R1-2)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	48x16-inch ONE-WAY sign (R6-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	36x48, 48x36, and 48x48-inch signs	TY 10BWG(1)XX(T)
	48x60-inch signs	TY S80(1)XX(T)
Warning	48x48-inch signs (diamond or square)	TY 10BWG(1)XX(T)
	48x60-inch signs	TY S80(1)XX(T)
	48-inch Advance School X-ing sign (S1-1)	TY 10BWG(1)XX(T)
	48-inch School X-ing sign (S2-1)	TY 10BWG(1)XX(T)
	Large Arrow sign (W1-6 & W1-7)	TY 10BWG(1)XX(T)

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS
SMALL ROADSIDE SIGNS
TRIANGULAR SLIPBASE SYSTEM

SMD(SLIP-3)-08

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

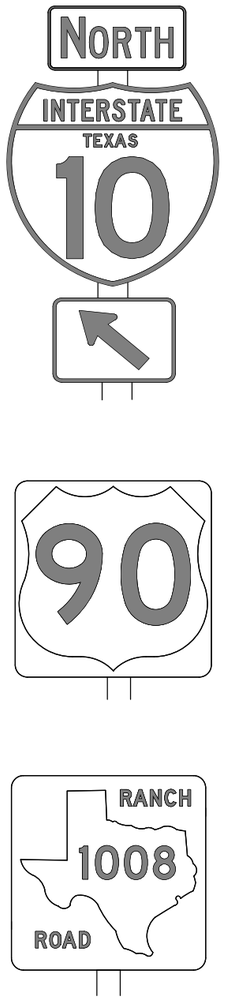
REVISIONS
9-08

CONT	SECT	JOB	HIGHWAY
0233	05	038	SH 54
DIST	COUNTY		SHEET NO.
ELP	CULBERSON		161

DATE: 9/27/2022 11:21:37 AM
FILE: c:\pwworkingdir\omega-app02.omegaengineers.local_omega-prod\jvillarreal.dgn

REQUIREMENTS FOR INDEPENDENT MOUNTED ROUTE SIGNS

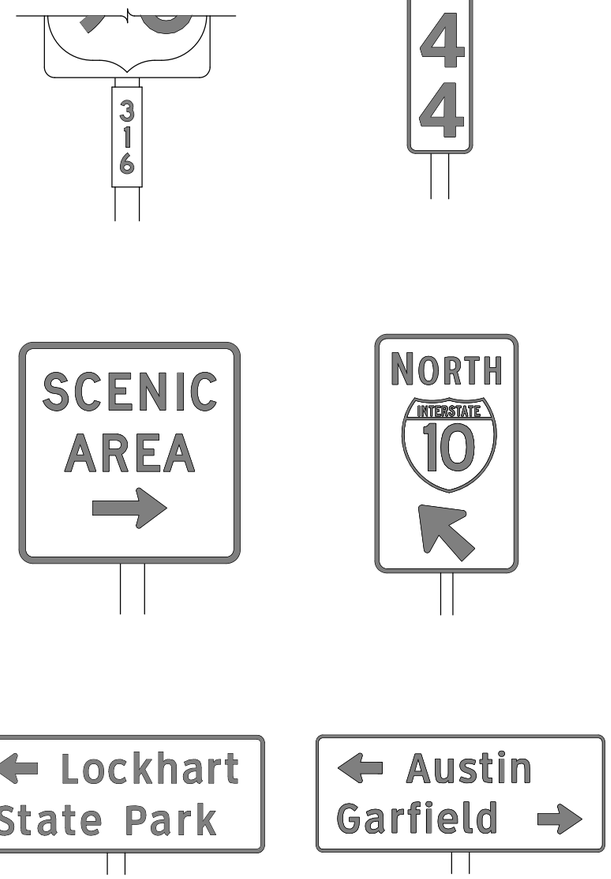
SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	WHITE	TYPE A SHEETING
BACKGROUND	ALL OTHERS	TYPE B OR C SHEETING
LEGEND & BORDERS	WHITE	TYPE A SHEETING
LEGEND & BORDERS	BLACK	ACRYLIC NON-REFLECTIVE FILM
LEGEND & BORDERS	ALL OTHERS	TYPE B or C SHEETING



TYPICAL EXAMPLES

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

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



TYPICAL EXAMPLES

GENERAL NOTES

1. Signs to be furnished shall be as detailed elsewhere in the plans and/or as shown on sign tabulation sheet. Standard sign designs and arrow dimensions can be found in the "Standard Highway Sign Designs for Texas" (SHSD).

2. White legend shall use the Clearview Alphabet. The following Clearview fonts shall be used to replace the existing white Federal Highway Administration (FHWA) Standard Highway Alphabets, when not specified in the SHSD, or in the plans.

B	CV-1W
C	CV-2W
D	CV-3W
E	CV-4W
Emod	CV-5WR
F	CV-6W

3. Route sign legend (ie. IH, US, SH and FM shields) shall use the Federal Highway Administration (FHWA) Standard Highway Alphabets B, C, D, E, Emod or F).

4. Lateral spacing between letters and numerals shall conform with the SHSD, and any approved changes thereto. Lateral spacing of legend shall provide a balanced appearance when spacing is not shown.

5. Independent mounted route sign with white or colored legend and borders shall be applied by screening process with transparent color ink, transparent colored overlay film to white background sheeting or cut-out white sheeting to colored background sheeting, or combination thereof. White legend, symbols and borders on all other signs shall be cut-out white sheeting applied to colored background sheeting.

6. Information regarding borders and radii for signs is found in the "Standard Highway Sign Designs for Texas". Dimensions shown and described for borders and corner radii on parent sign are nominal. Borders may vary in width as much as 1/2 inch. Corner radii above 3 inches may vary in width as much as 1 inch. Borders and corner radii within a parent sign must be of matching widths. The sign area outside the corner radius should be trimmed or rounded.

7. Sign substrate shall be any material that meets the Departmental Material Specification requirements of DMS-7110 or approved alternative.

8. Mounting details of roadside signs are shown in the "SMD series" Standard Plan Sheets.

DEPARTMENTAL MATERIAL SPECIFICATIONS	
ALUMINUM SIGN BLANKS	DMS-7110
SIGN FACE MATERIALS	DMS-8300

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

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

http://www.txdot.gov/

Texas Department of Transportation

Traffic Operations Division Standard

TYPICAL SIGN REQUIREMENTS

TSR(3)-13

FILE: tsr3-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT October 2003	CONT	SECT	JOB	HIGHWAY
REVISIONS	0233	05	038	SH 54
12-03 7-13	DIST	COUNTY		SHEET NO.
9-08	ELP	CULBERSON		162

3

DATE: 9/27/2022 11:21:40 AM
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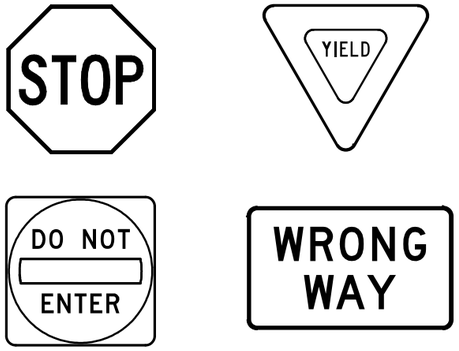
REQUIREMENTS FOR RED BACKGROUND REGULATORY SIGNS

(STOP, YIELD, DO NOT ENTER AND WRONG WAY SIGNS)



REQUIREMENTS FOR FOUR SPECIFIC SIGNS ONLY

SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	RED	TYPE B OR C SHEETING
BACKGROUND	WHITE	TYPE B OR C SHEETING
LEGEND & BORDERS	WHITE	TYPE B OR C SHEETING
LEGEND	RED	TYPE B OR C SHEETING

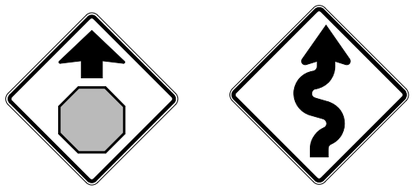
REQUIREMENTS FOR WHITE BACKGROUND REGULATORY SIGNS

(EXCLUDING STOP, YIELD, DO NOT ENTER AND WRONG WAY SIGNS)

TYPICAL EXAMPLES

SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	WHITE	TYPE A SHEETING
BACKGROUND	ALL OTHERS	TYPE B OR C SHEETING
LEGEND, BORDERS AND SYMBOLS	BLACK	ACRYLIC NON-REFLECTIVE FILM
LEGEND, BORDERS AND SYMBOLS	ALL OTHER	TYPE B OR C SHEETING

REQUIREMENTS FOR WARNING SIGNS



TYPICAL EXAMPLES

SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	FLOURESCENT YELLOW	TYPE B_{FL} OR C_{FL} SHEETING
LEGEND & BORDERS	BLACK	ACRYLIC NON-REFLECTIVE FILM
LEGEND & SYMBOLS	ALL OTHER	TYPE B OR C SHEETING

REQUIREMENTS FOR SCHOOL SIGNS

TYPICAL EXAMPLES

SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	WHITE	TYPE A SHEETING
BACKGROUND	FLOURESCENT YELLOW GREEN	TYPE B_{FL} OR C_{FL} SHEETING
LEGEND, BORDERS AND SYMBOLS	BLACK	ACRYLIC NON-REFLECTIVE FILM
SYMBOLS	RED	TYPE B OR C SHEETING

GENERAL NOTES

1. Signs to be furnished shall be as detailed elsewhere in the plans and/or as shown on sign tabulation sheet. Standard sign designs and arrow dimensions can be found in the "Standard Highway Sign Designs for Texas" (SHSD).
2. Sign legend shall use the Federal Highway Administration (FHWA) Standard Highway Alphabets (B, C, D, E, Emod or F).
3. Lateral spacing between letters and numerals shall conform with the SHSD, and any approved changes thereto. Lateral spacing of legend shall provide a balanced appearance when spacing is not shown.
4. Black legend and borders shall be applied by screening process or cut-out acrylic non-reflective black film to background sheeting, or combination thereof.
5. White legend and borders shall be applied by screening process with transparent colored ink, transparent colored overlay film to white background sheeting or cut-out white sheeting to colored background sheeting, or combination thereof.
6. Colored legend shall be applied by screening process with transparent colored ink, transparent colored overlay film or colored sheeting to background sheeting, or combination thereof.
7. Sign substrate shall be any material that meets the Departmental Material Specification requirements of DMS-7110 or approved alternative.
8. Mounting details for roadside mounted signs are shown in the "SMD series" Standard Plan Sheets.

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

DEPARTMENTAL MATERIAL SPECIFICATIONS	
ALUMINUM SIGN BLANKS	DMS-7110
SIGN FACE MATERIALS	DMS-8300

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

http://www.txdot.gov/

Texas Department of Transportation

Traffic Operations Division Standard

TYPICAL SIGN REQUIREMENTS

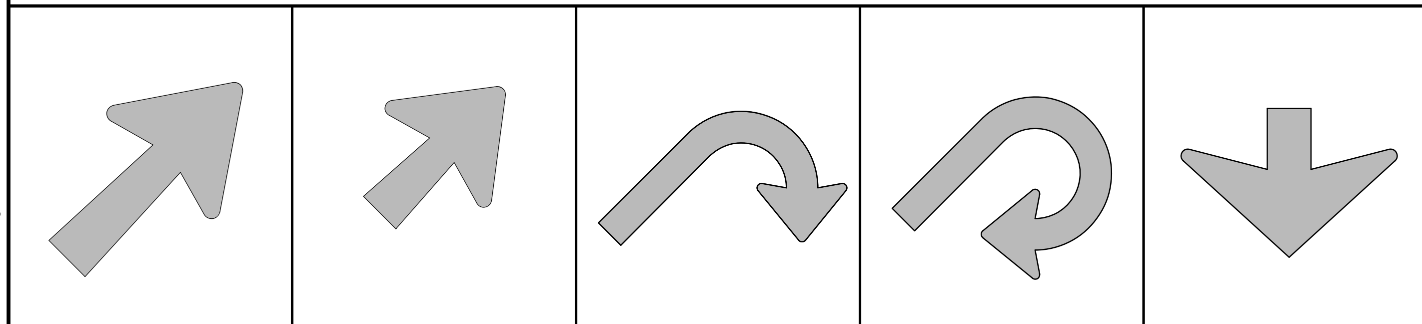
TSR(4)-13

FILE: tsr4-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT October 2003	CONT	SECT	JOB	HIGHWAY
REVISIONS	0233	05	038	SH 54
12-03 7-13	DIST	COUNTY		SHEET NO.
9-08	ELP	CULBERSON		163

4

ARROW DETAILS

for Large Ground-Mounted and Overhead Guide Signs



TYPE	LETTER SIZE	USE
A-1	10.67" U/L and 10" Caps	Single Lane Exits
A-2	13.33" U/L and 12" Caps	
A-3	16" & 20" U/L	
B-1	10.67" U/L and 10" Caps	Multiple Lane Exits
B-2	13.33" U/L and 12" Caps	
B-3	16" & 20" U/L	

CODE	USED ON SIGN NO.
E-3	E5-1aT
E-4	E5-1bT

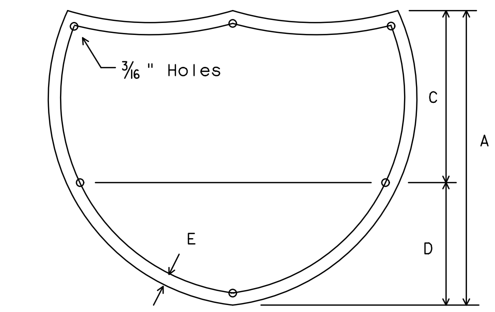
NOTE

Arrow dimensions are shown in the "Standard Highway Sign Designs for Texas" manual.

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

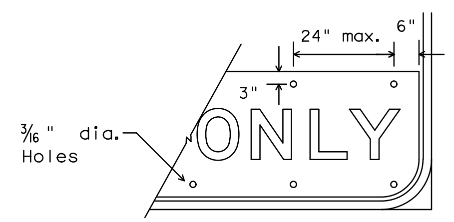
http://www.txdot.gov/

SIGN BLANK PUNCHING DETAILS FOR ATTACHMENTS WHEN SPECIFIED TO BE TYPE A ALUMINUM SIGNS (FOR MOUNTING TO GUIDE SIGN FACE)

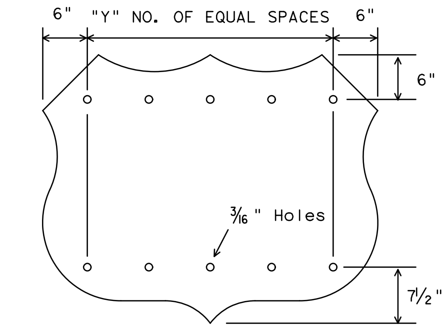


INTERSTATE ROUTE MARKERS

A	C	D	E
36	21	15	1 1/2
48	28	20	1 3/4

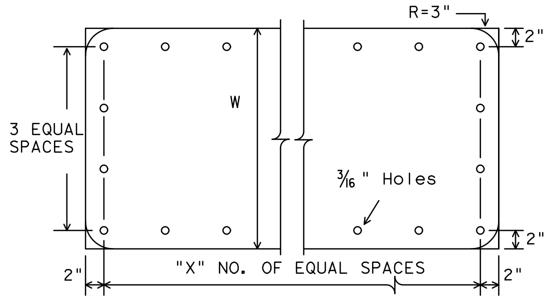


EXIT ONLY PANEL



U.S. ROUTE MARKERS

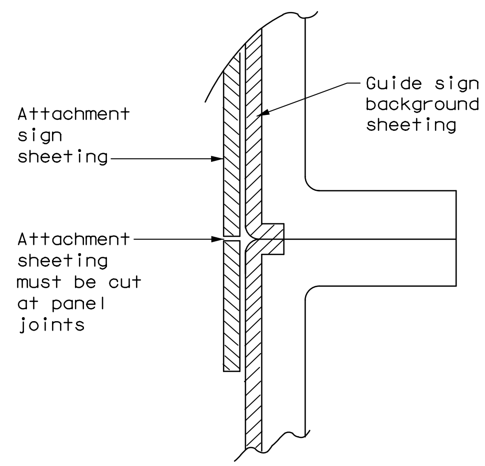
Sign Size	"Y"
24x24	2
30x24	3
36x36	3
45x36	4
48x48	4
60x48	5



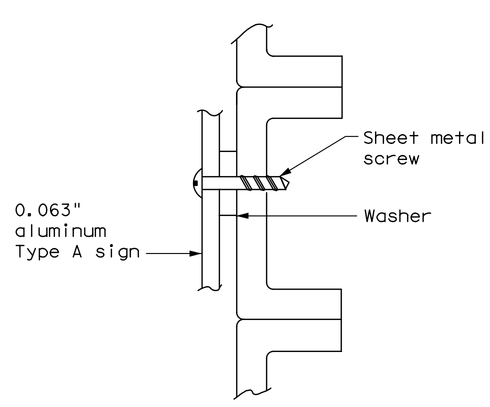
STATE ROUTE MARKERS

No. of Digits	W	X
4	24	4
4	36	5
4	48	6
3	24	3
3	36	4
3	48	5

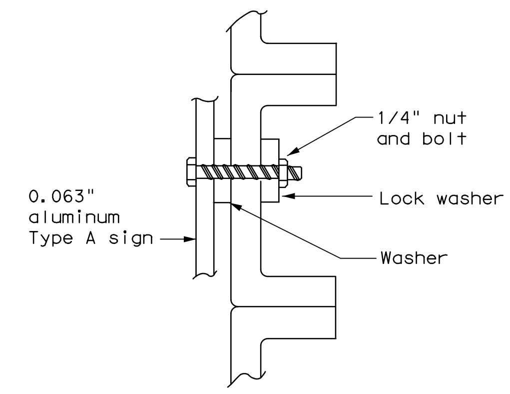
MOUNTING DETAILS OF ATTACHMENTS TO GUIDE SIGN FACE ("EXIT ONLY" AND "LEFT EXIT" PANELS, ROUTE MARKERS AND OTHER ATTACHMENTS)



DIRECT APPLIED ATTACHMENT



SCREW ATTACHMENT



NUT/BOLT ATTACHMENT

NOTE:

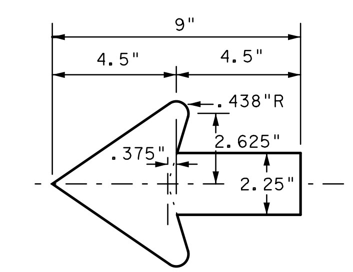
1. Sheeting for legend, symbols, and borders must be cut at panel joints.
2. Direct applied attachment signs will be subsidiary to "Aluminum Signs" or "Fiberglass Signs".

NOTE:

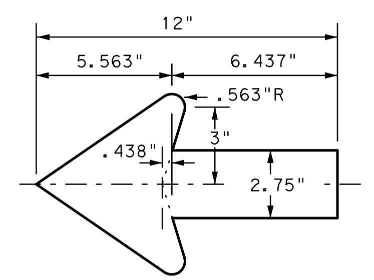
Furnish Type A aluminum sign attachments only when specified in the plans. These signs will be paid for under "Aluminum Signs".

ARROW DETAILS

for Destination Signs (Type D)



Standard arrow to be used with 6 inch letters.



Standard arrow to be used with 8 inch letters.

Texas Department of Transportation

Traffic Operations Division Standard

TYPICAL SIGN REQUIREMENTS

TSR(5)-13

FILE: tsr5-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT October 2003	CONT	SECT	JOB	HIGHWAY
REVISIONS	0233	05	038	SH 54
12-03 7-13 9-08	DIST		COUNTY	SHEET NO.
	ELP		CULBERSON	164

5

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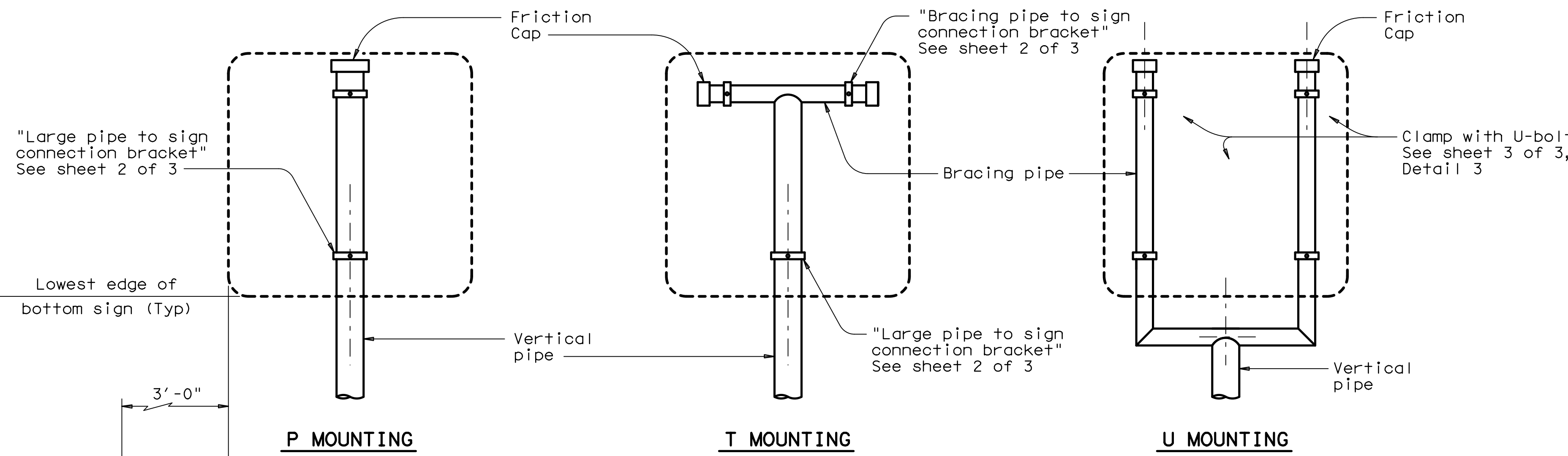
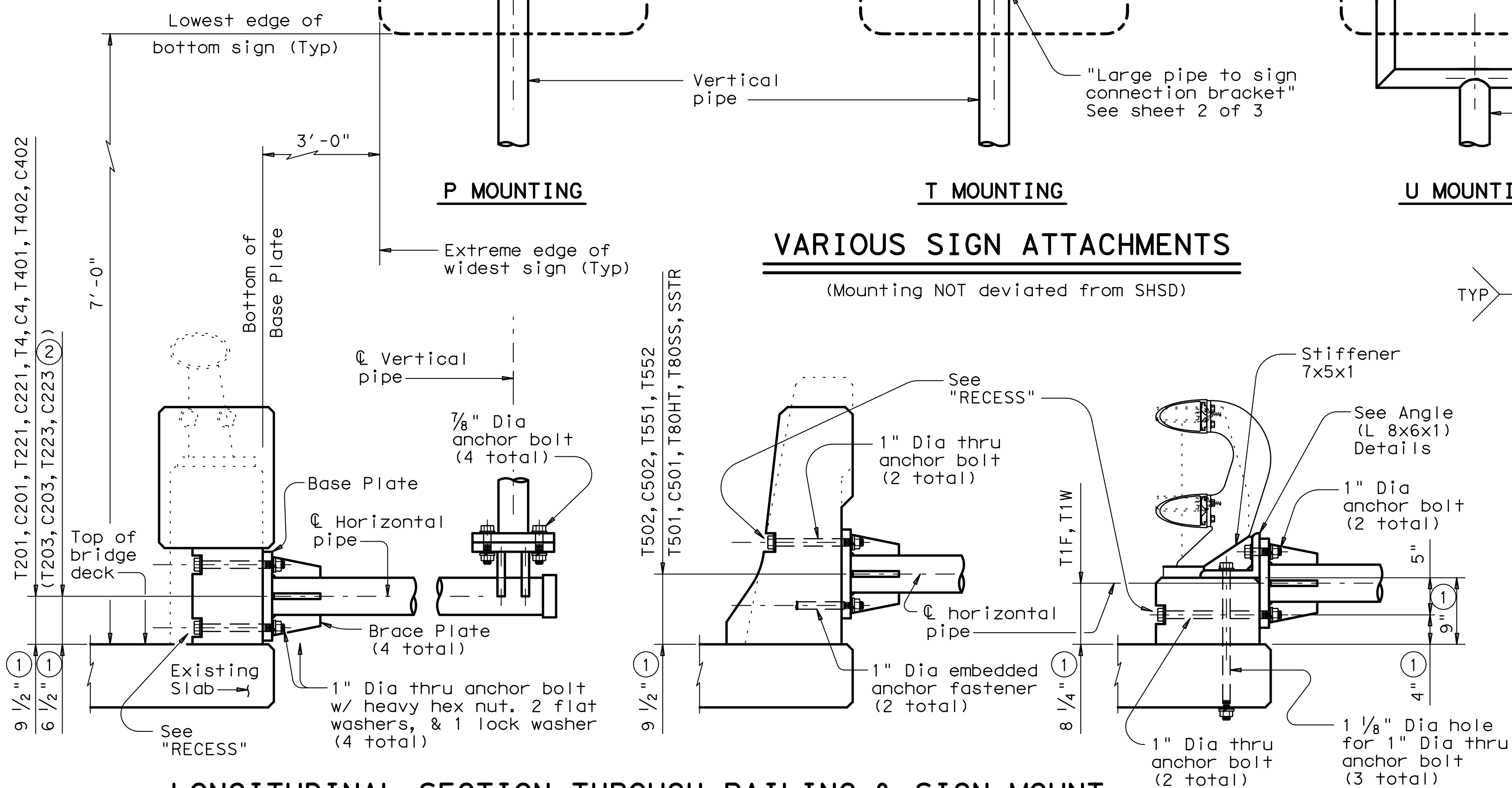


VARIOUS SIGN ATTACHMENTS

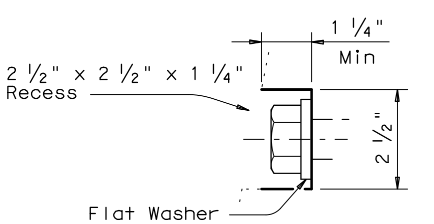
(Mounting NOT deviated from SHSD)



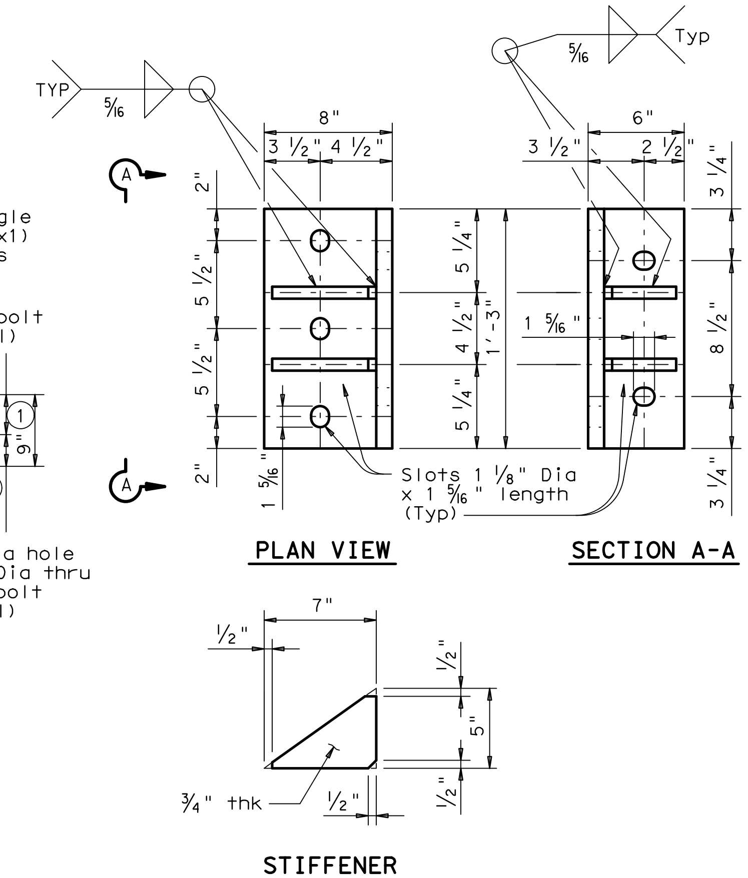
LONGITUDINAL SECTION THROUGH RAILING & SIGN MOUNT

(1) Increase 2" for structure with overlay.

(2) Attached at ℄ post.



RECESS



ANGLE (L 8x6x1) DETAILS

PIPE SIZE AND THICKNESS			
Pipe Placement / Design Wind Speed	Horizontal	Vertical	Bracing
90 mph	5" X-Strong (.375")	4" X-Strong (.337")	2 ½" Standard (.203")
130 mph	6" X-Strong (.432")	5" X-Strong (.375")	3" X-Strong (.300")

GENERAL NOTES:

Design conforms to 2013 AASHTO Standard Specifications for Highway Signs, Luminaires, and Traffic Signals and Interim Specifications thereto. Design 3-second gust wind speeds of 90 mph and 130 mph with a 1.14 gust factor,and a wind importance factor of 1.0 (50-year mean recurrence interval) for the supporting structures. For mounting connection between sign panel and pipe, wind importance factors of 0.71 and 0.54, for 90 mph and 130 mph winds, respectively, are applied to adjust the wind speeds to a 10-year mean recurrence interval.

See standard sheet WV & IZ(LTS2013) for the boundaries of each design wind zone. All mounting shall be based on 130 mph wind speed design except when located in 90 mph wind zone. Maximum panel area is 30 sq. ft. Maximum design height is 50 ft, with design height defined as the distance between natural ground (average elevation of surrounding terrain) and the center of sign(s) at the mounting location.

Material for pipe shall be ASTM A53 Grade B, or A501. Structural steel plates shall be ASTM A36, A572 Grade 50, or A588. Bolts used to connect pipe and mounting bracket, and wind beam to sign panel shall be ASTM A307. Anchor bolts shall be ASTM A325 or A193 B7. Each anchor bolt shall be provided with 2 flat washers, 1 lock washer, and 1 heavy hex nut. All parts shall be galvanized in accordance with Standard Specifications Item 445, "Galvanizing".

Attach horizontal pipe at least 2'-0" from the edge of any nearby drain slot.

Contractor shall verify applicable field dimensions before fabrication. Holes drilled through the railing parapet wall shall be drilled with rotary (coring or masonry drill) type equipment. Percussion (star) drilling shall not be allowed. Anchorage for pipe attached to rail shall be placed using an anchoring system approved by the engineer. Installation of anchor fasteners including hole depth, diameter and material shall be in accordance with the manufacturers' recommendation.

Each embedded anchor fastener shall resist an allowable design loading (after applying the reduction factors of bolt spacing and bolt edge distance) of:

	130 mph	90 mph
Tension	12.5 kips	7.5 kips
Shear	9.0 kips	5.0 kips

Each anchoring system shall provide a capacity to resist the required tension and shear acting simultaneously.

For sign connection to mounting, shop drill holes on sign blank in accordance with the current Standard Highway Sign Designs for Texas (SHSD). Additional hole(s) needed to meet a stipulated-type mounting may be field drilled. For multi-sign or back-to-back signs mounting, the engineer shall determine the proper type which ensures each individual mounting meets requirements.

Refer to Standard sheets SMD(GEN), SMD(SLIP-2 and SMD(2-1) for details not covered here.

Texas Department of Transportation

Traffic Operations Division Standard

BRIDGE RAILING SIGN MOUNT DETAILS

SMD(BR-1)-14

FILE: smdbr-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT August 2014	CONT	SECT	JOB	HIGHWAY
REVISIONS	0233	05	038	SH 54
	DIST	COUNTY		SHEET NO.
	ELP	CULBERSON		165

DATE: 9/27/2022 4:42:30 PM
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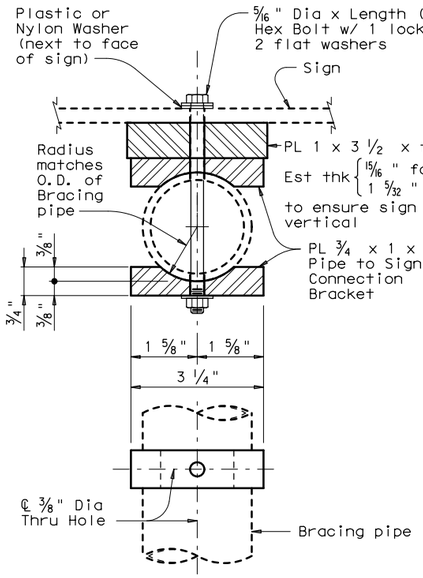
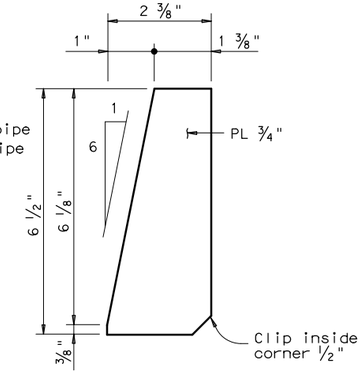
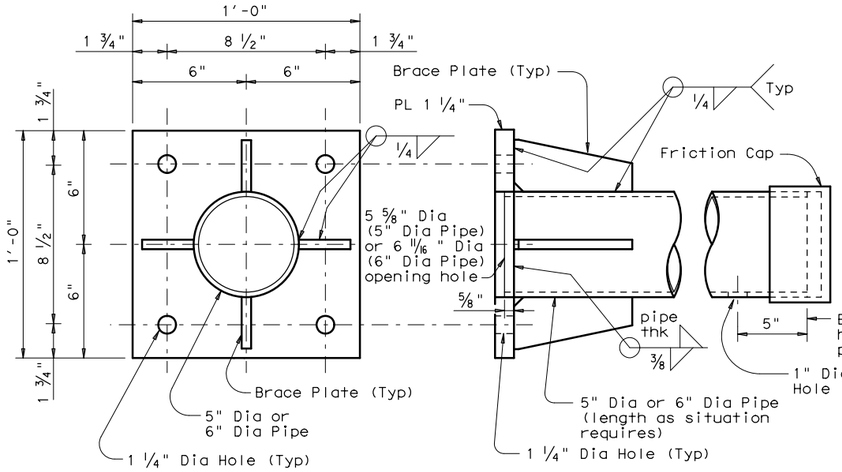


BRACING PIPE TO SIGN CONNECTION BRACKET DETAILS

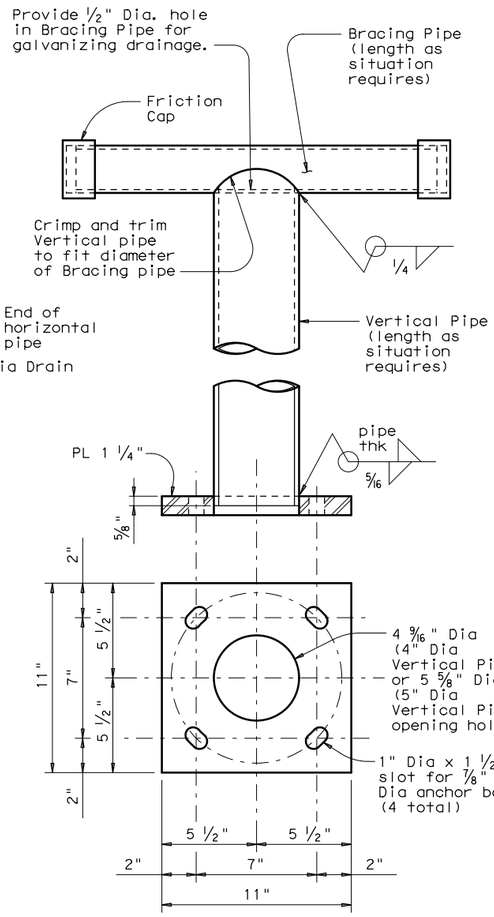
(Showing T Mounting)



BRACE PLATE DETAILS

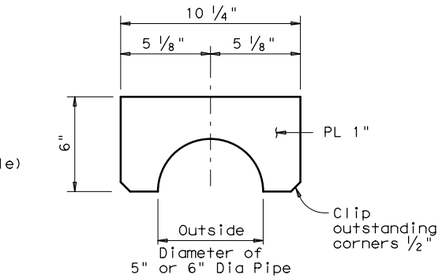


BASE PLATE DETAILS

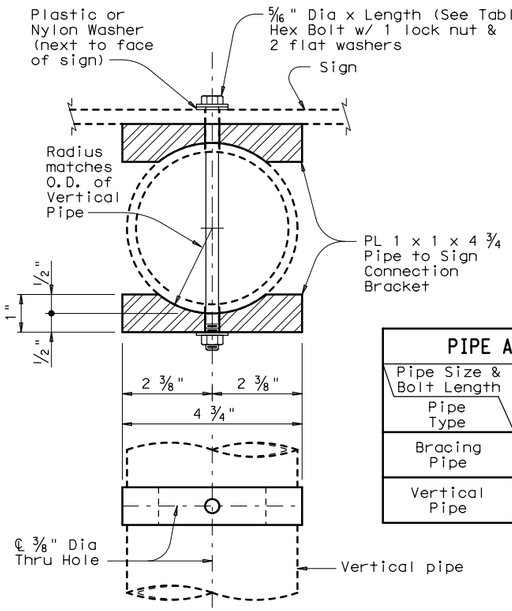


SIGN POLE & POLE BASE PLATE DETAILS

(Showing only T Mounting)



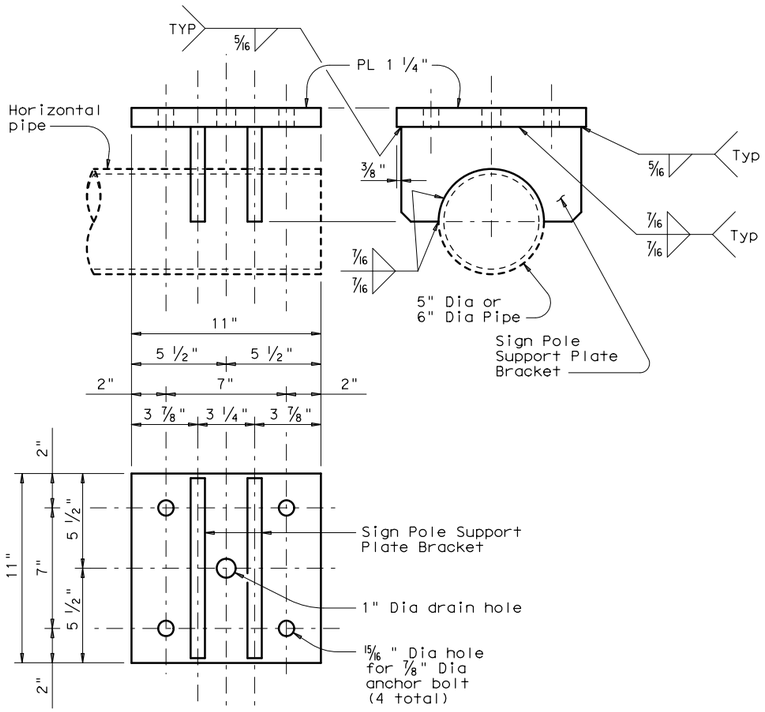
SIGN POLE SUPPORT PLATE BRACKET DETAILS



LARGE PIPE TO SIGN CONNECTION BRACKET DETAILS

(Showing P or T Mounting)

PIPE AND BOLT SPECIFICATIONS		
Pipe Size & Bolt Length / Pipe Type	Nominal Pipe Dia (in.)	Bolt Length (in.)
Bracing Pipe	2 1/2	6
	3	7
Vertical Pipe	4	7
	5	8



SIGN POLE SUPPORT PLATE DETAILS

SHEET 2 OF 3

Texas Department of Transportation

Traffic Operations Division Standard

BRIDGE RAILING SIGN MOUNT DETAILS

SMD(BR-2)-14

FILE: smdbr-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT August 2014	CONT	SECT	JOB	HIGHWAY
REVISIONS	0233	05	038	SH 54
	DIST	COUNTY		SHEET NO.
	ELP	CULBERSON		166

26H

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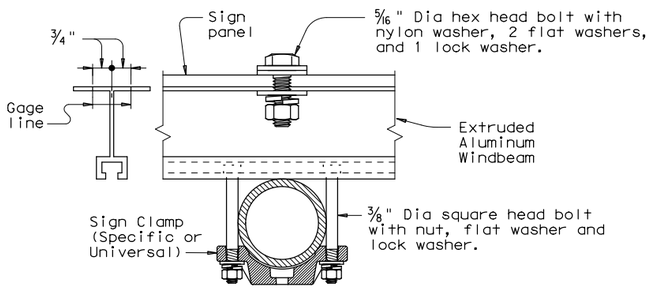
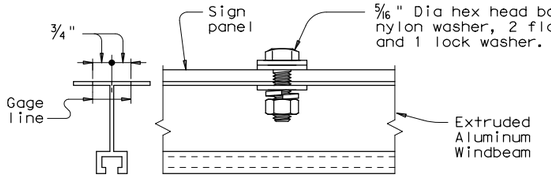
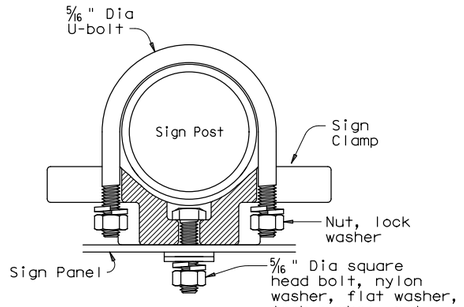


DETAIL 1



DETAIL 2

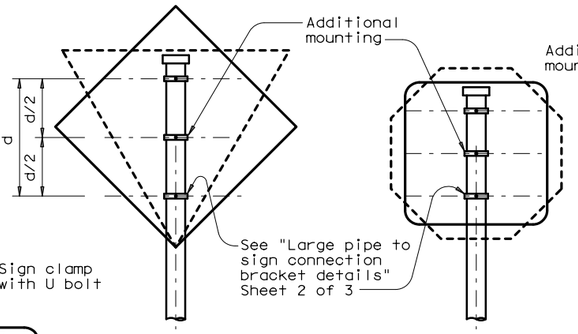


DETAIL 3

SIGN SHAPE	SQUARE			HORIZONTAL RECTANGLE			VERTICAL RECTANGLE			DIAMOND			OCTAGON			EQUILATERAL TRIANGLE			INTERSTATE SHIELD	PENTAGON (SCHOOL)	
Type of Sign Mounting on SHSD / Design Wind Speed	P	T	U	P	T	U	P	T	U	P	T	U	P	T	U	P	T	U	P	P	T
90 mph					(Type 23) 60"x48"	(Type 3) 72"x36" 78"x36"		(Type 2) 36"x48"			(Type 3) 60"x60"								(Type Special) 45"x36"		
						(Type 23) 72"x30" 84"x24"		(Type 32) 36"x60" 36"x72" 42"x60" 48"x54" 48"x60" 48"x72"													
								(Type 3) 48"x84"													
130 mph	(Type 1) 30"x30" 36"x36"	(Type 3) 48"x48"		(Type 1) 36"x24" 36"x30"	(Type 23) 48"x42" 54"x42" 60"x30" 66"x36" 84"x24"	(Type 3) 72"x36" 78"x36"	(Type 1) 30"x36" 30"x42"	(Type 3) 36"x48" 36"x60" 36"x72" 42"x60" 48"x54" 48"x60"	(Type 3) 48"x60"	(Type 1) 36"x36"	(Type 3) 48"x48" 60"x60"					(Type 1) 48"x48"			(Type Special) 36"x36" 45"x36"		
					(Type 3) 60"x48"	(Type 23) 72"x30" 84"x24"		(Type 4) 48"x72" 48"x84"													

Notes:
1. Drill holes in addition to the hole pattern of the Standard Highway Sign Designs for Texas (SHSD) at specified locations to meet a stipulated-type mounting indicated in the parenthesis ( ).
2. "Blank" in the above table indicates all other signs excluded from stipulated mounting shall be mounted in accordance with SHSD.

(1) In lieu of welding, the Fabricator may bend bracing pipe elbows if the following conditions are met:
a. Spacing between vertical bracing pipes is equal to or greater than 2'-6".
b. Bending radius is 12".
c. The distance between the lowest clamp and centerline of horizontal bent pipe is 13" max.



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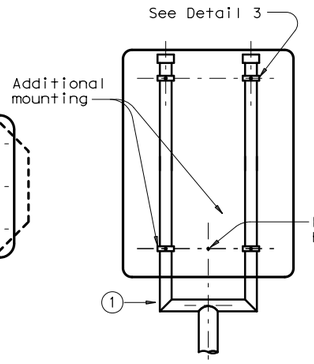

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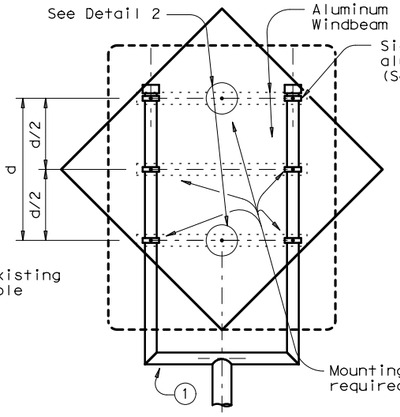

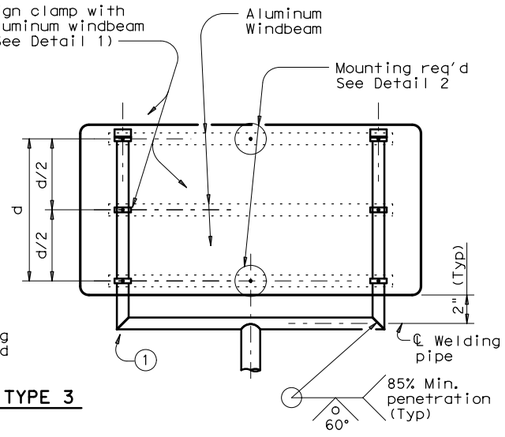

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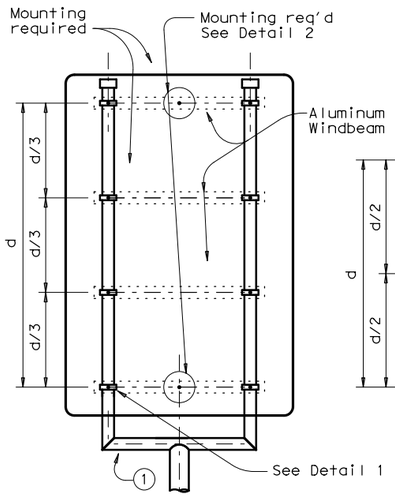

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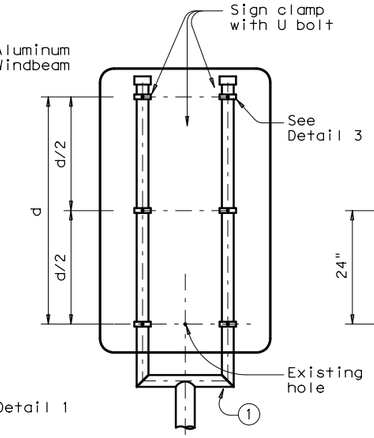

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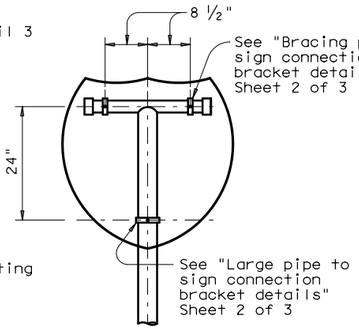
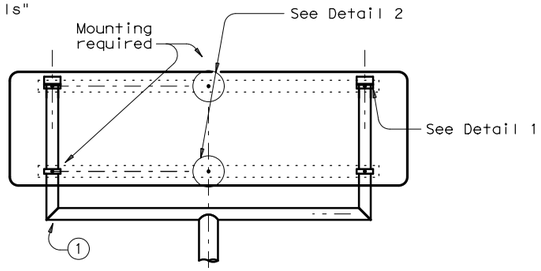


TYPE SPECIAL



TYPE 23

SHEET 3 OF 3

Texas Department of Transportation

Traffic Operations Division Standard

BRIDGE RAILING SIGN MOUNT DETAILS

SMD(BR-3)-14

FILE: smdbr-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT August 2014	CONT	SECT	JOB	HIGHWAY
REVISIONS	0233	05	038	SH 54
	DIST	COUNTY		SHEET NO.
	ELP	CULBERSON		167

26J

DATE: 9/27/2022
FILE: c:\pwworkingdir\omega-app02.omegaengineers.local_omega-prod\jvillarreal-admin\dms10446\epic.dgn

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. N/A

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.

2.

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. The existing Depression-era masonry culvert located north of the proposed new bridge would be temporarily extended to accommodate a temporary road detour. To protect the masonry culvert, the existing culvert would be protected with plywood panels and would be extended using a similar size culvert. The connection between the existing and temporary culverts would be made with brick. It is anticipated that the culvert extensions would be in place for eight months, which is the anticipated construction duration of the project. Following the completion of the project, all extensions would be removed and the masonry culvert would return to its existing condition.
2. No historic properties affected. However, if cultural materials are encountered during construction or disturbance activities, work should cease in the immediate area; work can continue where no cultural materials are present. Please contact the THC's Archeology Division at 512-463-6096 to consult on further actions that may be necessary to protect the cultural remains

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. The project contains rare plant species. See TPWD BMP Form for applicable Vegetation BMPs to be implemented for the project.

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. The project contains suitable habitat for state-listed species and SGCNs. See TPWD BMP Form for applicable Bat, Bird, General Design and Construction, Insect Pollinator, Terrestrial Amphibian, Vegetation, and Water Quality BMPs to be implemented for the project.

If any of the listed species are observed, cease work in the immediate area, do not disturb species or habitat and contact the Engineer immediately. The work may not remove active nests from bridges and other structures during nesting season of the birds associated with the nests. If caves or sinkholes are discovered, cease work in the immediate area, and contact the Engineer immediately.

LIST OF ABBREVIATIONS

BMP:	Best Management Practice	SPCC:	Spill Prevention Control and Countermeasure
CGP:	Construction General Permit	SW3P:	Storm Water Pollution Prevention Plan
DSHS:	Texas Department of State Health Services	PCN:	Pre-Construction Notification
FHWA:	Federal Highway Administration	PSL:	Project Specific Location
MOA:	Memorandum of Agreement	TCEQ:	Texas Commission on Environmental Quality
MOU:	Memorandum of Understanding	TPDES:	Texas Pollutant Discharge Elimination System
MS4:	Municipal Separate Stormwater Sewer System	TPWD:	Texas Parks and Wildlife Department
MBTA:	Migratory Bird Treaty Act	TxDOT:	Texas Department of Transportation
NOT:	Notice of Termination	T&E:	Threatened and Endangered Species
NWP:	Nationwide Permit	USACE:	U.S. Army Corps of Engineers
NOI:	Notice of Intent	USFWS:	U.S. Fish and Wildlife Service

VI. HAZARDOUS MATERIALS OR CONTAMINATION ISSUES

General (applies to all projects):

Comply with the Hazard Communication Act (the Act) for personnel who will be working with hazardous materials by conducting safety meetings prior to beginning construction and making workers aware of potential hazards in the workplace. Ensure that all workers are provided with personal protective equipment appropriate for any hazardous materials used.

Obtain and keep on-site Material Safety Data Sheets (MSDS) for all hazardous products used on the project, which may include, but are not limited to the following categories: Paints, acids, solvents, asphalt products, chemical additives, fuels and concrete curing compounds or additives. Provide protected storage, off bare ground and covered, for products which may be hazardous. Maintain product labelling as required by the Act.

Maintain an adequate supply of on-site spill response materials, as indicated in the MSDS. In the event of a spill, take actions to mitigate the spill as indicated in the MSDS, in accordance with safe work practices, and contact the District Spill Coordinator immediately. The Contractor shall be responsible for the proper containment and cleanup of all product spills.

Contact the Engineer if any of the following are detected:
* Dead or distressed vegetation (not identified as normal)
* Trash piles, drums, canister, barrels, etc.
* Undesirable smells or odors
* Evidence of leaching or seepage of substances

Does the project involve any bridge class structure rehabilitation or replacements (bridge class structures not including box culverts)?

☐ Yes ☒ No

If "No", then no further action is required.
If "Yes", then TxDOT is responsible for completing asbestos assessment/inspection.

Are the results of the asbestos inspection positive (is asbestos present)?

☐ Yes ☐ No

If "Yes", then TxDOT must retain a DSHS licensed asbestos consultant to assist with the notification, develop abatement/mitigation procedures, and perform management activities as necessary. The notification form to DSHS must be postmarked at least 15 working days prior to scheduled demolition.

If "No", then TxDOT is still required to notify DSHS 15 working days prior to any scheduled demolition.

In either case, the Contractor is responsible for providing the date(s) for abatement activities and/or demolition with careful coordination between the Engineer and asbestos consultant in order to minimize construction delays and subsequent claims.

Any other evidence indicating possible hazardous materials or contamination discovered on site. Hazardous Materials or Contamination Issues Specific to this Project:

☒ No Action Required ☐ Required Action

VII. OTHER ENVIRONMENTAL ISSUES

(includes regional issues such as Edwards Aquifer District, etc.)

☐ No Action Required ☒ Required Action

Action No.

1. The proposed project is located within a Federal Emergency Management Agency (FEMA) designated 100-year floodplain. The hydraulic design for this project shall be in accordance with current FHWA and TxDOT design policies. The facility shall permit the conveyance of the 100-year flood, inundation of the roadway being acceptable, without causing significant damage to the facility, stream or other property. The proposed project shall not increase the base flood elevation to a level that would violate applicable floodplain regulations and ordinances. Coordination with the local Floodplain Administrator shall be required.

STATE OF TEXAS
R. CRUZ-RODRIGUEZ
82856
LICENSED
PROFESSIONAL ENGINEER

Rafael Cruz-Rodriguez, P.E.

Texas Department of Transportation — Design Division Standard

ENVIRONMENTAL PERMITS, ISSUES AND COMMITMENTS

EPIC

FILE: epic.dgn	DN: TxDOT	CK: RG	DW: VP	CK: AR	
©TxDOT: February 2015	CONT	SECT	JOB	HIGHWAY	
REVISIONS 12-12-2011 (DS) 05-07-14 ADDED NOTE SECTION IV. 01-23-2015 SECTION I (CHANGED ITEM 1122 TO ITEM 506, ADDED GRASSY SWALES.	0233	05	038	SH 54	
	DIST	COUNTY		SHEET NO.	
	ELP	CULBERSON		168	

Form
Documentation of Texas Parks and Wildlife Department Best Management Practices

Project Name: **SH 54 at Diablo Creek**

CSJ(s): **0233-05-038**

County(ies): **Culberson County**

Date Form Completed: **6/9/2022**

Prepared by: **Nick Wallisch, Blanton & Associates**

Information on state-listed species, SGCN, water resources, and other natural resources can be found in the ECOS documents tab under the filenames specified in the e-mail sent to WHAB_TXDOT@tpwd.texas.gov.

1. Does the project impact any state parks, wildlife management areas, wildlife refuges, or other designated protected areas?

   ☒ No

   ☐ Yes

2. Does TxDOT need TPWD assistance in identifying and locating Section 404 mitigation opportunities for this project?

   ☒ No / N/A / Not yet determined

   ☐ Yes

3. Is there a species or resource challenge that TPWD can assist with additional guidance? If so, describe below:

   N/A

4. List all BMP that will be applied to this project per the document *Beneficial Management Practices: Avoiding, Minimizing, and Mitigating Impacts of Transportation Projects on State Natural Resources*.

   ***Note, these are BMP that TxDOT commits to implement at the time this form is completed. This list may change prior to or during construction based on changes to project impacts, design, etc.**

BMP to be Implemented:

Bat BMP
The following survey and exclusion protocols should be followed prior to commencement of construction activities. For the purposes of this document, structures are defined as bridges, culverts (concrete or metal), wells, and buildings.
• Inform TPWD WHAB during initial collaborative review phase for projects that may impact the following bat species:
o Any *Myotis* spp.
o Tricolored bat (*Perimyotis subflavus*)
• If identification of a bat species is in question, consult with TPWD or a qualified TxDOT biologist during initial collaborative review phase.
• For activities that have the potential to impact structures, cliffs or caves, or trees; a qualified biologist will perform a habitat assessment and occupancy survey of the feature(s) with roost potential as early in the planning process as possible or within one year before project letting.
• For roosts where occupancy is strongly suspected but unconfirmed during the initial survey, revisit feature(s) at most four weeks prior to scheduled disturbance to confirm absence of bats.
• If bats are present or recent signs of occupation (i.e., piles of guano, distinct musky odor, or staining and rub marks at potential entry points) are observed, take appropriate measures to ensure that bats are not harmed, such as implementing non-lethal exclusion activities or timing or phasing of construction.
• Exclusion devices can be installed by a qualified individual between September 1 and March 31. Exclusion devices should be used for a minimum of seven days when minimum nighttime temperatures are above 50°F AND minimum daytime temperatures are above 70°F. Prior to exclusion, ensure that alternate roosting habitat is available in the immediate area. If no suitable roosting habitat is available, installation of alternate roosts is recommended to replace the loss of an occupied roost. If alternate roost sites are not provided, bats may seek shelter in other inappropriate sites, such as buildings, in the surrounding area.
• If feature(s) used by bats are removed as a result of construction, replacement structures should incorporate bat-friendly design or artificial roosts should be constructed to replace these features.
• Conversion of property containing cave or cliff features to transportation purposes should be avoided.
• If gating a cave or abandoned mine is desired, consult with TPWD before installing gates. Gating should only be conducted by qualified groups with a history of successful gating operations. Gate designs must be approved by TPWD.
• In all instances, avoid harm or death to bats. Bats should only be handled as a last resort and after communication with TPWD.
• Coordinate with TPWD about the latest bat handling restrictions and protocols involving COVID-19 and bat handling. In general, all staff must follow the guidelines listed below:
o Do not handle bats if not part of a critical or time-sensitive research project. Contact TPWD to discuss your project needs before beginning work.
o All participants must follow CDC social-distancing guidelines.
o Wear a face mask to minimize the exchange of respiratory droplets such as a surgical mask, dust mask, or cloth mask when within 6 feet of a living bat.
o Use disposable exam gloves or other reusable gloves (e.g., rubber dish-washing gloves) that can be decontaminated to prevent spread of pathogens. Do not touch your face or other potentially contaminated surfaces with your gloves prior to handling bats.
o Limit handling to as few handlers as possible.
o Do not blow on bats for any reason.
o Use separate temporary holding containers for each bat such as disposable paper bags.

THESE ENVIRONMENTAL BEST MANAGEMENT PRACTICES (BMPs) ARE AN EXACT REPRODUCTION OF THE BMP'S LISTED ON THE ENVIRONMENTAL DOCUMENTS FOR SH 54 @ DIABLO CREEK AND ARE FOR INFORMATIONAL PURPOSES ONLY.

DATE	BY	REV	REVISION

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Texas Department of Transportation®

SH 54 @ DIABLO CREEK

ENVIRONMENTAL BEST MANAGEMENT PRACTICES

SHEET 1 OF 3

DSN	OEI	FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
CHK	OEI	6	SEE TITLE SHEET		169
DRN	OEI	STATE	DIST.	COUNTY	
CHK	OEI	TEXAS	ELP	CULBERSON	
		CONT.	SECT.	JOB	HIGHWAY NO.
		0233	05	038	SH 54

o Caves housing bats should be avoided unless absolutely necessary.
o Implement additional disinfection, quarantine, and cleaning procedures.
• Bat surveys of structures should include visual inspections of structural fissures (cracked or spalled concrete, damaged or split beams, split or damaged timber railings), crevices (expansion joints, space between parallel beams, spaces above supports piers), and alternative structures (drainage pipes, bolt cavities, open sections between support beams, swallow nests) for the presence of bats.
• Before excluding bats from any occupied structure, bat species, weather, temperature, season, and geographic location must be incorporated into any exclusion plans to avoid unnecessary harm or death to bats. Winter exclusion must entail a survey to confirm either, 1) bats are absent or 2) present but active (i.e., continuously active – not intermittently active due to arousals from hibernation).
o Avoid using materials that degrade quickly, like paper, steel wool or rags, to close holes.
o Avoid using products or making structural modifications that may block natural ventilation, like hanging plastic sheeting over an active roost entrance, thereby altering roost microclimate.
o Avoid using chemical and ultrasonic repellents.
o Avoid use of silicone, polyurethane or similar non-water-based caulk products.
o Avoid use of expandable foam products at occupied sites.
o Avoid the use of flexible netting attached with duct tape.
• In order to avoid entombing bats, exclusion activities should be only implemented by a qualified individual. A qualified individual or company should possess at least the following minimum qualifications:
o Experience in bat exclusion (the individual, not just the company).
o Proof of rabies pre-exposure vaccinations.
o Demonstrated knowledge of the relevant bat species, including maternity season date range and habitat requirements.
o Demonstrated knowledge of rabies and histoplasmosis in relation to bat roosts.
• Contact TPWD for additional resources and information to assist in executing successful bat exclusions that will avoid unnecessary harm or death in bats.

Bird BMP
In addition to complying with the Migratory Bird Treaty Act (MBTA) and Chapter 64 of the Parks and Wildlife Code (PWC) regarding nongame bird protections, perform the following BMP:
• Avoid vegetation clearing activities during the general bird nesting season, March through August, to minimize adverse impacts to birds.
• Prior to construction, perform daytime surveys for nests including under bridges and in culverts to determine if they are active before removal. Nests that are active should not be disturbed. If active nests are observed during surveys, TPWD recommends a 150-foot buffer of vegetation remain around the nests until the young have fledged or the nest is abandoned.
• Do not disturb, destroy, or remove active nests, including ground nesting birds, during the nesting season.
• If unoccupied, inactive nests will be removed, ensure that nests are not protected under the Endangered Species Act (ESA), MBTA, or BGEPA.
• Prevent the establishment of active nests during the nesting season on TxDOT owned and operated facilities and structures proposed for replacement or repair.
• Do not collect, capture, relocate, or transport birds, eggs, young, or active nests without a permit.
• Minimize extended human presence near nesting birds during construction and maintenance activities. Protect sensitive habitat areas with temporary barriers or fencing to limit human foot-traffic and off-road vehicle use to alert and discourage contractors from causing any unintentional impacts.
• Minimize construction noise above ambient levels during general bird nesting season to minimize adverse impacts on birds.
• Minimize construction lighting during the general bird nesting season by scheduling work activities between dawn and dusk.

General Design and Construction BMP
• Employees and contractors will be provided information prior to start of construction to educate personnel of the potential for all state-listed threatened species or other SGCN to occur within the project area and should be advised of relevant rules and regulations to protect plants, fish, and wildlife.

Form: Documentation of Texas Parks and Wildlife Department Best Management Practices

• Contractors will be informed to avoid harming all wildlife species if encountered and allow them to safely leave the project site. Due diligence should be used to avoid killing or harming any wildlife species in the implementation of transportation projects.
• Direct animals away from the construction area with the judicious use and placement of sediment control fencing to exclude wildlife. Exclusion fence should be buried at least 6 inches and be at least 24 inches high, maintained for the life of the project, and removed after construction is completed. Contractors should examine the inside of the exclusion area daily to determine if any wildlife species have been trapped inside the area of impact and provide safe egress opportunities prior to initiation of construction activities.
• Apply hydromulching and/or hydroseeding in areas for soil stabilization and/or revegetation of disturbed areas around wetlands and in riparian areas.
• If erosion control blankets or mats will be used, the product should not contain netting, but should only contain loosely woven natural fiber netting in which the mesh design allows the threads to move, therefore allowing expansion of the mesh openings. Plastic netting should be avoided.
• Project staging areas, stockpiles, temporary construction easements, and other project related sites should be situated in previously disturbed areas to avoid or minimize impacts to sensitive or unique habitats including intact native vegetation, floodplains, riparian corridors, wetlands, playa lakes, and habitat for wildlife species.
• When lighting is added, consider wildlife impacts from light pollution and incorporating dark-sky practices into design strategies. Minimize sky glow by focusing light downward, with full cutoff luminaries to avoid light emitting above the horizontal. The minimum amount of night-time lighting needed for safety and security should be used.

Insect Pollinator BMP
• Mowing should only be applied to 30% or less of a site in a given year when practical. In general, mowing is inadequate for management of native insect pollinator habitat in the long term, except to remove annual non-native plants during establishment (i.e., high-mowing before they flower) or to facilitate a light disking. When conducted it should be done post bloom or when host plants have gone dormant for the growing season. This can also be done by leaving strips of habitat farthest from road or highway corridors un-mowed when practical.
• If mowing is required during period of active bloom or high pollinator activity it should be implemented during the heat of the day and with a high mower deck to allow for pollinators to escape and to give late season blooming species a chance to recover and bloom.
• Deep soil disturbances, such as, tilling or deep disking in areas that host aggregations of ground-nesting bees should be avoided. Tilling and disking also may promote the invasion or germination of non-native plants. Different species of native ground-nesting bees prefer different soil conditions, although research suggests that many ground nesting bees prefer sandy, loamy sand or sandy loam soils. In areas with these soil types consider leaving open patches of soil.
• Allow dead trees to stand (so long as they do not pose a risk to property or people) and protect shrubs and herbaceous plants with pithy or hollow stems (e.g., cane fruits, sumac, elderberry), as these provide nesting habitat for tunnel-nesting native bees.
• Retain dead or dying branches whenever it is safe and practical at the edges of the ROW. Wood-boring beetle larvae often fill dead trees and branches with narrow tunnels into which tunnel-nesting bees will establish nests. Additionally, bumble bees may choose to nest in wood piles.
• Retain rotting logs at edges of the ROW where some bee species may burrow tunnels in which to nest.
• Protect sloped or well-drained ground sites where plants are sparse and direct access to soil is available. These are the areas where ground-nesting bees may dig nests. Turning the soil destroys all ground nests that are present at that depth and hinders the emergence of bees that are nesting deeper in the ground.
• Protect grassy thickets, or other areas of dense, low cover from mowing or other disturbance. These are the sites where bumble bees might find the nest cavities they need, as well as annual and perennial wildflowers that can provide important food resources.
• Where available and economical, native plants and seed should be procured from local eco-type providers. Seed mixes should be diverse and include as many ecoregion natives as possible ensuring full season floral resources. Species by Texas ecoregion can be found in the Texas Management

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DATE	BY	REV	REVISION

STATE OF TEXAS
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SH 54 @ DIABLO CREEK

ENVIRONMENTAL
BEST MANAGEMENT PRACTICES

SHEET 2 OF 3

		FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
DSN	OEI	6	SEE TITLE SHEET		170
CHK	OEI	STATE	DIST.	COUNTY	
DRN	OEI	TEXAS	ELP	CULBERSON	
CHK	OEI	CONT.	SECT.	JOB	HIGHWAY NO.
		0233	05	038	SH 54

Recommendations for Native Insect Pollinators in Texas document: https://tpwd.texas.gov/publications/pwdpubs/media/pwd_bk_w7000_1813.pdf.
• Planting at least three different native flowering plants within each of three blooming periods are recommended (spring, summer, early fall) in high rainfall regions of Texas. In drier regions of the state, a target of three native flowering plants within each of two blooming periods can be used.
• Habitat enhancements for native pollinators should include at least one native bunchgrass adapted to the site.
• Utilize an Integrated Pest Management Strategy (IPM) strategy for controlling weedy or invasive plants by minimizing broad use of certain herbicides and surfactants in close proximity to intact habitats utilized by native pollinators. Reduce application timing to periods of low pollinator activity and not during peak bloom season.

Terrestrial Amphibian and Reptile BMP
• For open trenches and excavated pits, install escape ramps at an angle of less than 45 degrees (1:1) in areas left uncovered. Visually inspect excavation areas for trapped wildlife prior to backfilling
• Avoid or minimize disturbing or removing cover objects, such as downed trees, rotting stumps, brush piles, and leaf litter. If avoidance or minimization is not practicable, consider removing cover objects prior to the start of the project and replace them at project completion.
• Examine heavy equipment stored on site before use, particularly after rain events when reptile and amphibian movements occur more often, to ensure use will not harm individuals that might be seeking temporary refuge.
• Due to increased activity (mating) of reptiles and amphibian during the spring, construction activities like clearing or grading should attempt to be scheduled outside of the spring (March-May) season. Also, timing ground disturbing activities before October when reptiles and amphibians become less active and may be using burrows in the project area is also encouraged.
• When designing roads with curbs, consider using Type I or Type III curbs to provide a gentle slope to enable turtles and small animals to get out of roadways.
• If Texas tortoises (*Gopherus berlandieri*) or box turtles (*Terrepene* spp.) are present in a project area, they should be removed from the area and relocated between 100 and 200 meters from the project area. After removal of the individuals, the area that will be disturbed during active construction and project specific locations should be fenced off to exclude reentry by turtles, tortoises, and other reptiles. The exclusion fence should be constructed and maintained as follows:
o The exclusion fence should be constructed with metal flashing or drift fence material.
o Rolled erosion control mesh material should not be used.
o The exclusion fence should be buried at least 6 inches deep and be at least 24 inches high.
o The exclusion fence should be maintained for the life of the project and only removed after the construction is completed and the disturbed site has been revegetated.
• After project is complete, revegetate disturbed areas with an appropriate locally sourced native seed mix. If erosion control blankets or mats will be used, the product should not contain netting, but should only contain loosely woven natural fiber netting in which the mesh design allows the threads to move, therefore allowing expansion of the mesh openings. Plastic netting should be avoided.

Vegetation BMP
• Minimize the amount of vegetation cleared. Removal of native vegetation, particularly mature native trees and shrubs should be avoided. Impacted vegetation should be replaced with in-kind on-site replacement/restoration of native vegetation.
• To minimize adverse effects, activities should be planned to preserve mature trees, particularly acorn, nut or berry producing varieties. These types of vegetation have high value to wildlife as food and cover.
• It is strongly recommended that trees greater than 12 inches in diameter at breast height (DBH) that are removed be replaced. TPWD's experience indicates that for ecologically effective replacement, a ratio of three trees for every one (3:1) lost should be provided to either on-site or off-site. Trees less than 12 inches DBH should be replaced at a 1:1 ratio.
• Replacement trees should be of equal or better wildlife quality than those removed and be regionally adapted native species.

• When trees are planted, a maintenance plan that ensures at least an 85 percent survival rate after three years should be developed for the replacement trees.
• The use of any non-native vegetation in landscaping and revegetation is discouraged. Locally adapted native species should be used.
• The use of seed mix that contains seeds from only regional ecotype native species is recommended.

Water Quality BMP
In addition to BMP required for a TCEQ Storm Water Pollution Prevention Plan and/or 401 Water Quality Certification:
• Minimize the use of equipment in streams and riparian areas during construction. When possible, equipment access should be from banks, bridge decks, or barges.
• When temporary stream crossings are unavoidable, remove stream crossings once they are no longer needed and stabilize banks and soils around the crossing.
• Wet-Bottomed detention ponds are recommended to benefit wildlife and downstream water quality. Consider potential wildlife-vehicle interactions when siting detention ponds.
• Rubbish found near bridges on TxDOT ROW should be removed and disposed of properly to minimize the risk of pollution. Rubbish does not include brush piles or snags.

5. List all TxDOT species protection specifications that will be applied to this project (e.g., Amphibian and Reptile Exclusion Fence, Bat Houses, etc.)

Species protection specifications to be Implemented:

N/A

DATE	BY	REV	REVISION

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SH 54 @ DIABLO CREEK

ENVIRONMENTAL BEST MANAGEMENT PRACTICES

SHEET 3 OF 3

		FED.RD. DIV.NO.	PROJECT NO.	SHEET NO.
DSN	OEI	6	SEE TITLE SHEET	171
CHK	OEI	STATE	DIST.	COUNTY
DRN	OEI	TEXAS	ELP	CULBERSON
CHK	OEI	CONT.	SECT.	JOB / HIGHWAY NO.
		0233	05	038 / SH 54

THESE ENVIRONMENTAL BEST MANAGEMENT PRACTICES (BMPs) ARE AN EXACT REPRODUCTION OF THE BMP'S LISTED ON THE ENVIRONMENTAL DOCUMENTS FOR SH 54 @ DIABLO CREEK AND ARE FOR INFORMATIONAL PURPOSES ONLY.

STORM WATER POLLUTION PREVENTION PLAN (SWP3):

This SWP3 has been developed in accordance with TPDES General Permit TXR150000. The operator, The Texas Department of Transportation ensures that: Project specifications provide that adequate BMPs have been developed for this project. The contractor shall be the party responsible for implementing the BMPs described herein. The contractor shall implement changes approved by the Project Engineer to the SWP3 within the times specified in the SWP3 or the TPDES General Permit. Operators affected by modifications to specifications will be notified in a timely manner.

1. SITE OR PROJECT DESCRIPTION:

NATURE OF THE CONSTRUCTION ACTIVITY: SEE TITLE SHEET

POTENTIAL POLLUTANTS AND	**SOURCES:**
Sediment laden storm water	*Storm water conveyance over disturbed areas*
Fuels, oils, and lubricants	*Construction vehicles and storage areas*
Construction debris and waste	*Various construction activities*
Sanitary waste	*Restroom facilities*
Trash	*Construction site and Receptacles*

SEQUENCE OF ACTIVITIES THAT WILL DISTURB SOILS:

1. *Prep existing ROW, including windrowing existing grass sod and mulch, excavation and embankment.*
2. *Rehabilitation of existing structures and installation of proposed extensions of structures.*
3. *Prep ROW for new roadway, including windrowing existing grass sod and mulch, excavation and embankment.*
4. *Construct new roadway, blading, placing subgrade, flexbase, and two course surface treatment.*
5. *Install all headwalls, wingwalls, and riprap as shown on plans.*
6. *Finish side slopes and spread back windrowed sod and mulch.*
7. *Install traffic devices and clean up project.*

AREAS:

TOTAL AREA OF PROJECT: 5.00 ACRES

TOTAL AREA OF SOIL DISTURBANCE: 3.70 ACRES

TOTAL AREA OFF-SITE: Acreage and Description to be Attached

WEIGHTED RUNOFF COEFFICIENT (BEFORE AND AFTER CONSTRUCTION):

DATA DESCRIBING THE SOIL:

Existing soils consist primarily of three soil types. From the northern project limit to south of the Diablo Creek crossing, the predominant soil type is Chipotle-Riverwash complex. From Diablo Creek to approximately 300 feet south of the crossing is predominantly Culberspeth-Chilicotal complex. The remaining project area south of Diablo Creek is predominantly Bissett-Rock outcrop complex.

GENERAL LOCATION MAP: SEE TITLE SHEET

DETAILED SITE MAP: SEE SW3P LAYOUTS

THE LOCATION AND DESCRIPTION OF CONCRETE AND ASPHALT PLANTS:

Supporting Concrete Plant Facilities shall be located off site.

Supporting Asphalt Plant Facilities shall be located off site.

NAME OF RECEIVING WATERS:

Diablo Creek, or Baylor Draw, and its tributaries drain into Baylor Pond. These features are ephemeral drainages that do not have a direct connection to a downstream Traditionally Navigable Water.

A COPY OF TPDES CGP TXR150000 IS INCLUDED IN THE SWP3 FILE.

REMARKS: ***See SWP3 Notebook for environmental, archeological, and historical documentation. See Environmental Permits, Issues and Commitments for additional information.***

401 WATER QUALITY CERTIFICATION: YES____ NO__X__

2. BEST MANAGEMENT PRACTICES (BMPs):

EROSION AND SEDIMENT CONTROLS: Erosion and sediment controls have been designed to retain sediment on-site. Controls shall be utilized to reduce off site transport of suspended sediments and pollutants if it is necessary to pump water from the site. Control measures shall be installed per specifications or as directed. Sediment must be removed from controls per the plan requirements or manufacturers recommendations, but no later than the time that design capacity has been reduced by 50%. If sediment escapes the site, accumulations will be removed to minimize further negative effects. Controls will be developed to limit the off site transportation of litter, construction debris, and construction materials.

INTERIM(INT), PERMANENT(PER), AND 401 CERTIFICATION BMP'S:

EROSION CONTROLS:	401	INT	PER
☒ *Compaction & Tracking of slopes*		X	
☐ *Diversion Dike*			
☒ *Preserve Existing Vegetation*			X
☒ *Soil Stabilization*		X	
☐ *Permanent Vegetation*			
☐ *No Erosion Controls are Required.*			

SEDIMENT CONTROLS:	401	INT	PER
☒ *Silt Fence*		X	
☒ *Rock Berm*		X	
☒ *Buffer Zones*			X
☐ *Vegetative Filter Strips*			
☐ *Ditch Block*			
☐ *No Sediment Controls are Required.*			

POST CONSTRUCTION TSS CONTROL (401 CERTIFICATION ONLY):

- ☐ *Vegetation Lined Drainage Ditch*
- ☐ *Retention/Irrigation*
- ☐ *Erosion Control Compost*
- ☐ *Grassy Swales*
- ☐ *Vegetative Filter Strips*
- ☒ *No Post Construction TSS Control Required.*

SEQUENCE OR SCHEDULE OF IMPLEMENTATION:

1. *Windrow topsoil to preserve seed bank*
2. *Install silt fences.*
3. *Install rock filter dams*
4. *Inspection of buffer zones*
5. *Windrow topsoil back over disturbed areas*
6. *Maintain silt fences.*
7. *Inspect until 70% vegetative cover is attained*

The El Paso District of the Texas Department of Transportation uses Site-Manager, a computer based construction record-keeping system. Documentation describing major grading activities, temporary or permanent cessation of construction, and stabilization measures is a part of this system and is incorporated by reference into this SWPPP.

Stabilization measures must be initiated within 14 days when practicable in portions of the site where construction has temporarily or permanently ceased, if earth disturbing activities will not be resumed within 21 days.

3. STRUCTURAL CONTROL PRACTICES:

Structural control practices for this project are listed elsewhere herein.

4. PERMANENT STORM WATER CONTROLS:

Structural control practices installed during construction will be maintained and inspected after construction has ceased on the site and until final stabilization is attained. Unless specified in the plans, after project acceptance TxDOT will assume maintenance responsibilities for the controls and measures. Other permanent controls include existing and proposed; riprap at culvert inlets and outlets, diversion dikes, swales, retaining walls, and other similar devices.

5. OTHER CONTROLS:

OFF-SITE VEHICLE TRACKING OF SEDIMENTS AND THE GENERATION OF DUST: The off site vehicle tracking of sediments shall be minimized by removal of excess dirt from the road and at entrances to the work site. The generation of dust will be minimized as directed by the Project Engineer by dampening haul roads and covering haul trucks with a tarpaulin.

CONSTRUCTION AND WASTE MATERIALS: The contractor will maintain a clean, orderly construction site. Construction waste including trash, rubble, scrap and vegetation shall be disposed of in lidded dumpsters or in a manner approved by the Project Engineer. Disposal methods must meet Federal, State, and Local waste management guidelines. No construction waste will be buried or burned on site. Spoils disposal, material storage, and materials resulting from the destruction of existing roads and structures shall be stored in areas designated by the Project Engineer and protected from run-off. All waterways shall be cleared of temporary embankment, temporary bridges, matting, false work, piling, debris, or other obstructions placed during construction operations, that are not part of the finished work, as soon as practicable. All excess soil generated by the construction will be collected and disposed of by the contractor. Disposal areas, stockpiles, and haul roads shall be constructed in a manner that will minimize and control the amount of sediment that may enter receiving waters. Disposal areas shall not be located in any wetland, water body, or stream bed.

POLLUTANT SOURCES FROM AREAS OTHER THAN CONSTRUCTION: Staging areas and vehicle maintenance areas shall be located and constructed in a manner to minimize the runoff of pollutants. If potential pollutant sources are identified after the start of construction, controls and measures shall be implemented as directed by the Project Engineer.

5. OTHER CONTROLS (CONT):

DEDICATED ASPHALT PLANTS: Asphalt or asphaltic material for this project will be produced off site. If the project requires a dedicated asphalt plant and the plant within 1 mile of the project limits it will be considered an off site PSL. Consideration shall be given to on site plant and storage facilities and measures implemented as directed by the Project Engineer.

DEDICATED CONCRETE PLANTS: Cement or Concrete material for this project will be produced off site. If the project requires a dedicated concrete plant and the plant is within 1 mile of the project limits it will be considered an off site PSL. Consideration shall be given to on site plant and storage facilities and measures implemented as directed by the Project Engineer. Concrete trucks shall be wasted or washed out in locations designated by the Project Engineer. The locations shall be protected by a berm sufficient to contain all waste and wash water. Wash water shall not be allowed to enter any storm drainage system or waterway. The residual material and contaminated soil shall be collected and disposed of in accordance with Federal, State, and Local guidelines. Staging areas and vehicle maintenance areas shall be located and constructed in a manner to minimize the runoff of pollutants.

HAZARDOUS MATERIALS AND SPILL REPORTING: The contractor shall take appropriate measures to prevent, minimize, and control the spillage or leakage of hazardous materials and any associated wastes on site and in maintenance and staging areas. hazardous materials shall include but are not limited to paints, acids, solvents, asphalt products, chemical additives, curing compounds, oils, fuels, and lubricants. Hazardous materials shall not be stored, accumulated, or transported in open containers subject to precipitation or spillage, but shall be stored, accumulated, or transported in closed containers of the type recommended by the manufacturer. In the event of a spill the Project Engineer should be contacted immediately. All spills shall be immediately cleaned and any contaminated soil removed and disposed of in accordance with Local, State, and Federal laws. Fuel tanks shall be protected by a secondary containment, such as a lined berm, capable of containing 1.5 times the capacity of the tank, or as approved by the Project Engineer.

OFF SITE PSLs: All off site project specific locations including dedicated asphalt plants, concrete plants, or utility installations, required by the contractor, are the contractor's responsibility. The contractor shall secure all permits required by local, state, or federal laws for off site PSLs. The contractor shall provide diagrams and areas of disturbance for all PSL's within 1 mile of the project.

SANITARY FACILITIES: All sanitary or septic wastes that are generated onsite shall be treated and disposed of in accordance with state and local regulations. Raw sewage or septage shall not be discharged or buried on site. Precaution shall be taken to prevent illicit discharges to storm water. Licensed waste management contractors shall be required to dispose of sanitary waste. Porta johns will be required for the construction site or as directed by the Project Engineer.

VELOCITY DISSIPATION DEVICES: Velocity dissipation devices shall be placed at discharge locations and along the length of any outfall channel as shown in the plans or as directed by the Project Engineer to provide a non-erosive flow velocity from the structure to a watercourse so that the natural physical and biological characteristics and functions are maintained and protected.

6. APPROVED STATE AND LOCAL PLANS:

This SWP3 is consistent with requirements specified in applicable sediment and erosion site plans or site permits, or storm water management site plans or permits approved by federal, state, or local officials.

7. MAINTENANCE:

Control measures shall be properly installed according to specifications. If inspections or other information indicates a control has been installed, used, or is performing inadequately, the contractor must replace or modify the control as soon as practicable after discovery. Control measures shall be maintained in effective operating condition. If inspections determine that BMPs are not operating effectively maintenance will be performed as necessary to continue the effectiveness of the controls. Maintenance must be accomplished as soon as practicable. Controls adjacent to creeks, culverts, bridges, and water crossings shall have priority. Controls that have been disabled, run over, removed, or otherwise rendered ineffective must be corrected immediately upon discovery.

8. INSPECTION OF CONTROLS:

A TxDOT inspector will inspect disturbed areas of the site that have not been finally stabilized, areas used for storage of materials that are exposed to precipitation, and structural controls for evidence of, or the potential for, pollutants entering the drainage system. Sediment and erosion controls measures identified in the SWP3 will be inspected to ensure that they are operating correctly. Locations where vehicles enter or exit the site will be inspected for evidence of off-site vehicle tracking. Inspections will be conducted every 14 calendar days and within 24 hours of the end of a storm event of 0.5 inches or greater. The SWP3 will be modified based on the result of these inspections. Revisions will be completed within 7 Calendar days following the inspection. Revised implementation schedules will be described in the SWP3 and implemented as soon as practicable. Rain gages wil 2022 maintained on site for the duration of the project. Reports summarizing the scope of the inspections are included in the SWP3 file.

9. NON-STORM WATER COMPONENTS:

The contractor shall be required to implement appropriate pollution prevention controls and measures for all eligible non-storm water components of the discharge as approved and directed by the Project Engineer.

TxDOT STORM WATER POLLUTION PREVENTION PLAN (SWP3)

Texas Department of Transportation

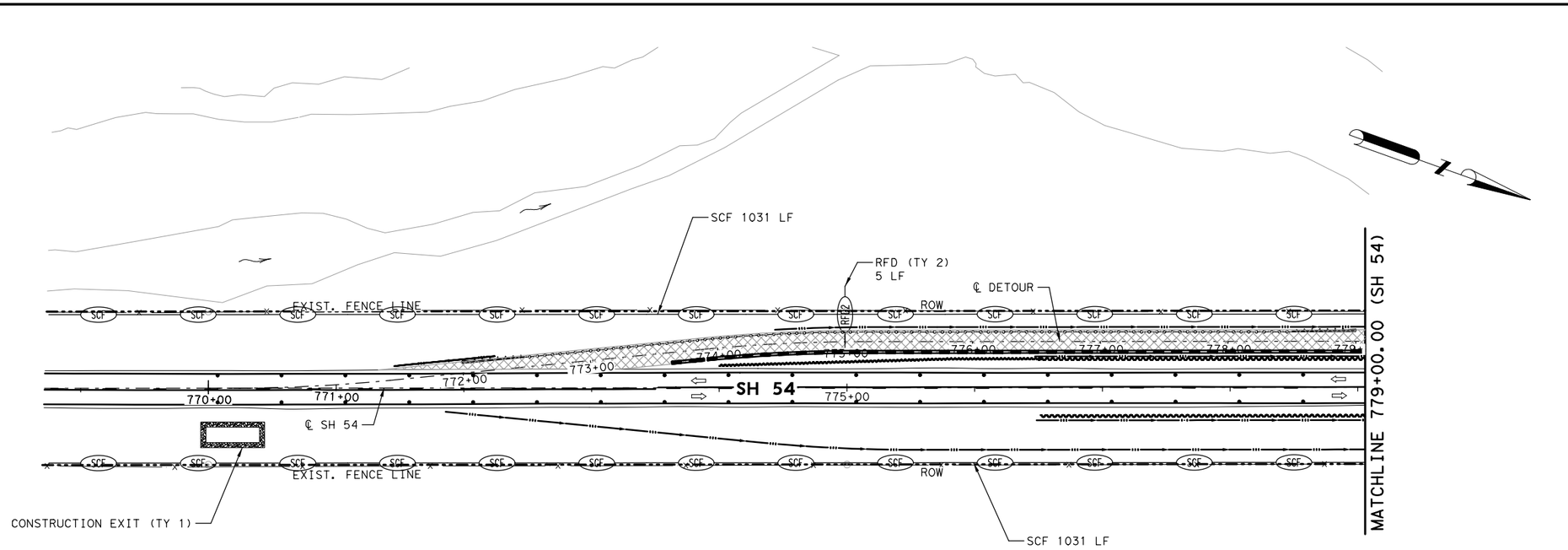
STATE OF TEXAS
MINH TRAN
84840
PROFESSIONAL LICENSED ENGINEER

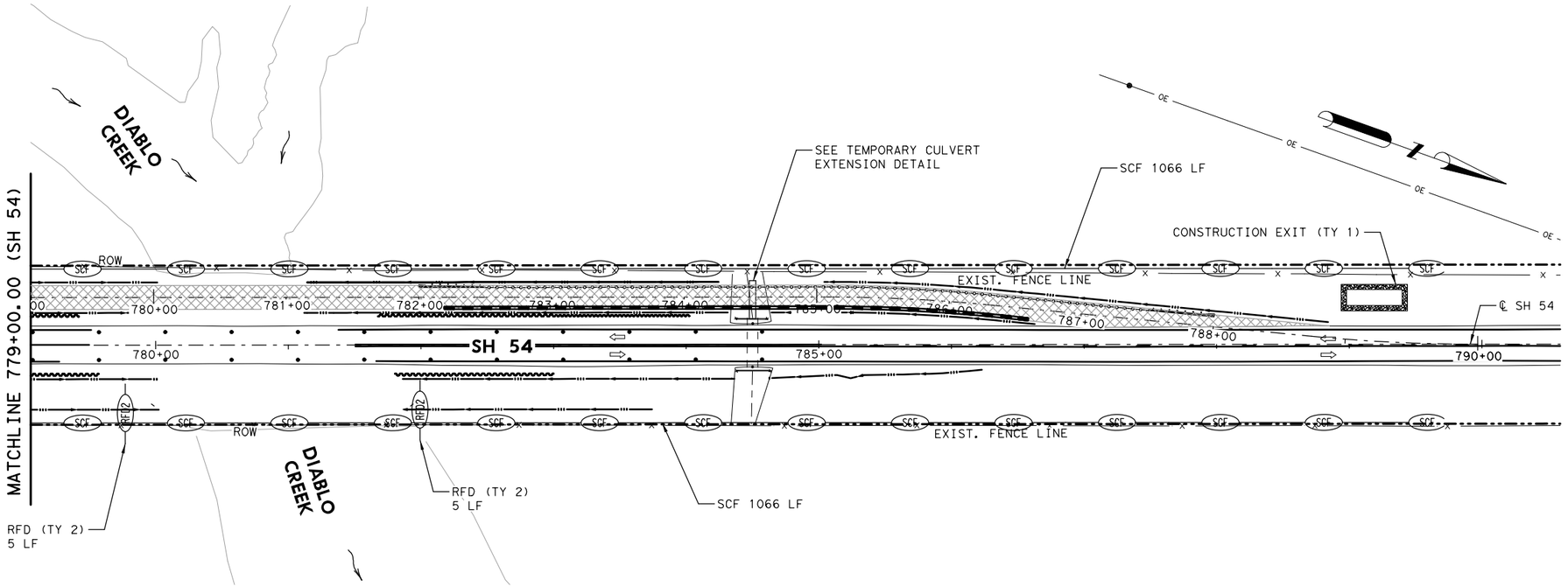
Minh Tran, P.E.

09/06/2022

FED.RD. DIV.NO.			SHEET NO.
6			172
STATE	STATE DIST.	COUNTY	
TEXAS	ELP	CULBERSON	
CONT.	SECT.	JOB	HIGHWAY NO.
0233	05	038	SH 54

REV: 07-2014





LEGEND

- RFD1 — ROCK FILTER DAM TYPE 1
- RFD2 — ROCK FILTER DAM TYPE 2
- RFD3 — ROCK FILTER DAM TYPE 3
- RFD4 — ROCK FILTER DAM TYPE 4
- SCF — TEMPORARY SEDIMENT CONTROL FENCE
- ECL — EROSION CONTROL LOG
- EROSION CONTROL LOG (INLET PROTECTION)
- TEMPORARY SEEDING
- PH# — CONSTRUCTION PHASE No.
- DITCH FLOW
- CONSTRUCTION EXIT (TYPE 1)

NOTES:

1. THE CONTRACTOR SHALL USE CONSTRUCTION EXITS TO MINIMIZE DEBRIS ON PAVEMENT. TEMPORARY CONSTRUCTION EXITS ARE TO BE PLACED DURING EACH PHASE FOR EACH DISTURBED AREA. LOCATIONS TO BE SPECIFIED BY THE ENGINEER.
2. PLACE SEDIMENT CONTROL MEASURES PRIOR TO INITIATING EACH PHASE OF CONSTRUCTION.
3. THE CONTRACTOR SHALL STAGE CONSTRUCTION OPERATIONS TO MINIMIZE DISTURBED AREAS.
4. THE CONTRACTOR SHALL EXPEDITE WORK ACTIVITIES TO BE DISTURBED AREAS AS SOON AS POSSIBLE TO RESTORE VEGETATION OR INSTALL FIRST PAVEMENT SUBSTRUCTURES.
5. REFER TO SWP3 DETAILS SHEET FOR LOCATIONS OF SEEDING. QUANTITIES FOR SEEDING ARE SHOWN ON SUMMARY OF SWP3 QUANTITIES.

0 50 100
SCALE: 1"=100'

ESTIMATED QUANTITIES				
ITEM	CODE	DESCRIPTIONS	UNIT	QTY
506	6002	ROCK FILTER DAMS (INSTALL) (TY 2)	LF	15
506	6020	CONSTRUCTION EXITS (TY 1)	SY	110
506	6024	CONSTRUCTION EXITS (REMOVE)	SY	110
506	6038	TEMP SEDMT CONT FENCE (INSTALL)	LF	4194

DATE	BY	REV	REVISION

STATE OF TEXAS
MINH TRAN
84840
LICENSED
PROFESSIONAL ENGINEER
Minh Tran, P.E.
09-01-2022

OMEGA ENGINEERS, INC.
8200 N MOPAC EXPRESSWAY, STE #280
AUSTIN, TEXAS 78759
OMEGAENGINEERS.COM
TX PE Firm Reg. No. F-2147
P:512 575 2288 F:281 647 9184

Texas Department of Transportation®

SH 54 @ DIABLO CREEK

SWP3 LAYOUT PHASE 1

SHEET 1 OF 3

		FED.RD. DIV.NO.	PROJECT NO.	SHEET NO.
DSN	OEI	6	SEE TITLE SHEET	173
CHK	OEI	STATE	DIST.	COUNTY
DRN	OEI	TEXAS	ELP	CULBERSON
CHK	OEI	CONT.	SECT.	JOB / HIGHWAY NO.
		0233	05	038 / SH 54

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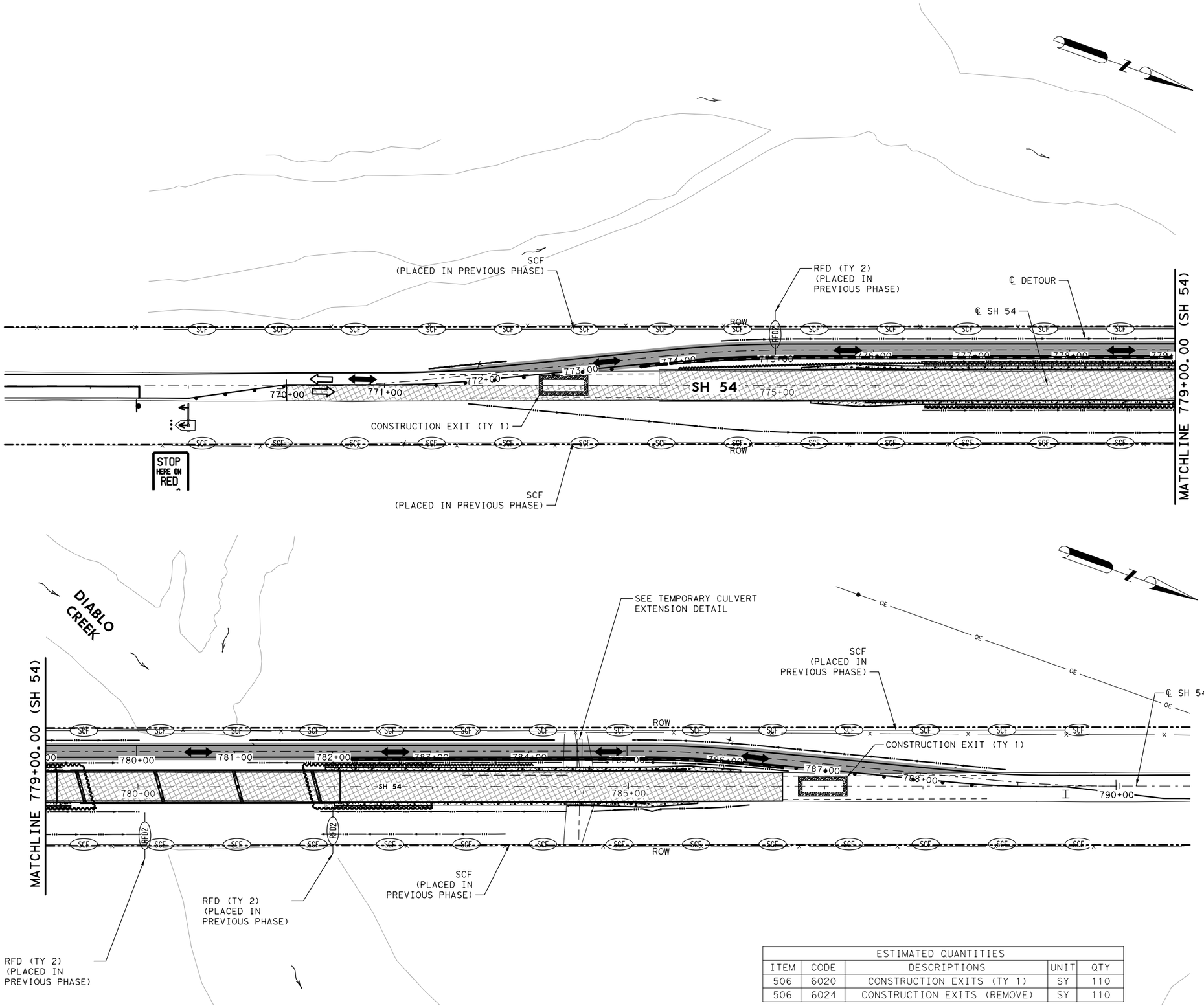

LEGEND

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- DITCH FLOW
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0 50 100
SCALE: 1"=100'

ESTIMATED QUANTITIES				
ITEM	CODE	DESCRIPTIONS	UNIT	QTY
506	6020	CONSTRUCTION EXITS (TY 1)	SY	110
506	6024	CONSTRUCTION EXITS (REMOVE)	SY	110

DATE	BY	REV	REVISION

STATE OF TEXAS
MINH TRAN
84840
LICENSED
PROFESSIONAL ENGINEER
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AUSTIN, TEXAS 78759
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SH 54 @ DIABLO CREEK

SWP3 LAYOUT
PHASE 2

SHEET 2 OF 3

DSN	OEI	FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
CHK	OEI	6	SEE TITLE SHEET		174
DRN	OEI	STATE	DIST.	COUNTY	
		TEXAS	ELP	CULBERSON	
CHK	OEI	CONT.	SECT.	JOB	HIGHWAY NO.
		0233	05	038	SH 54

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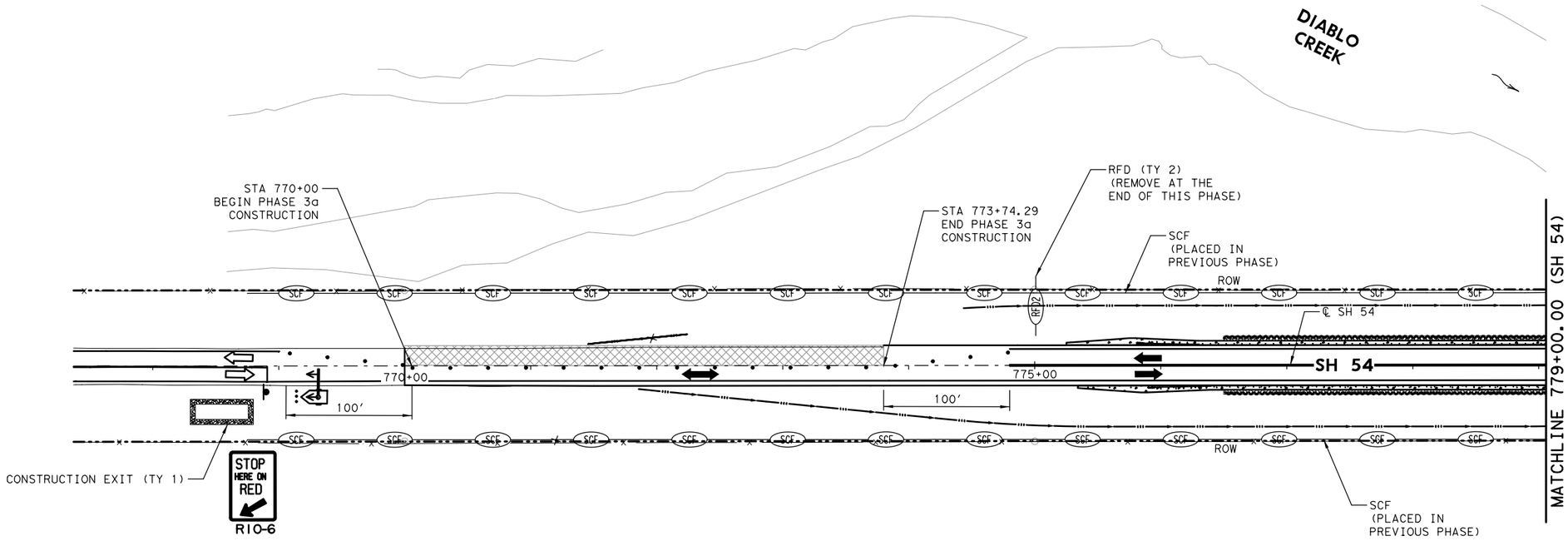

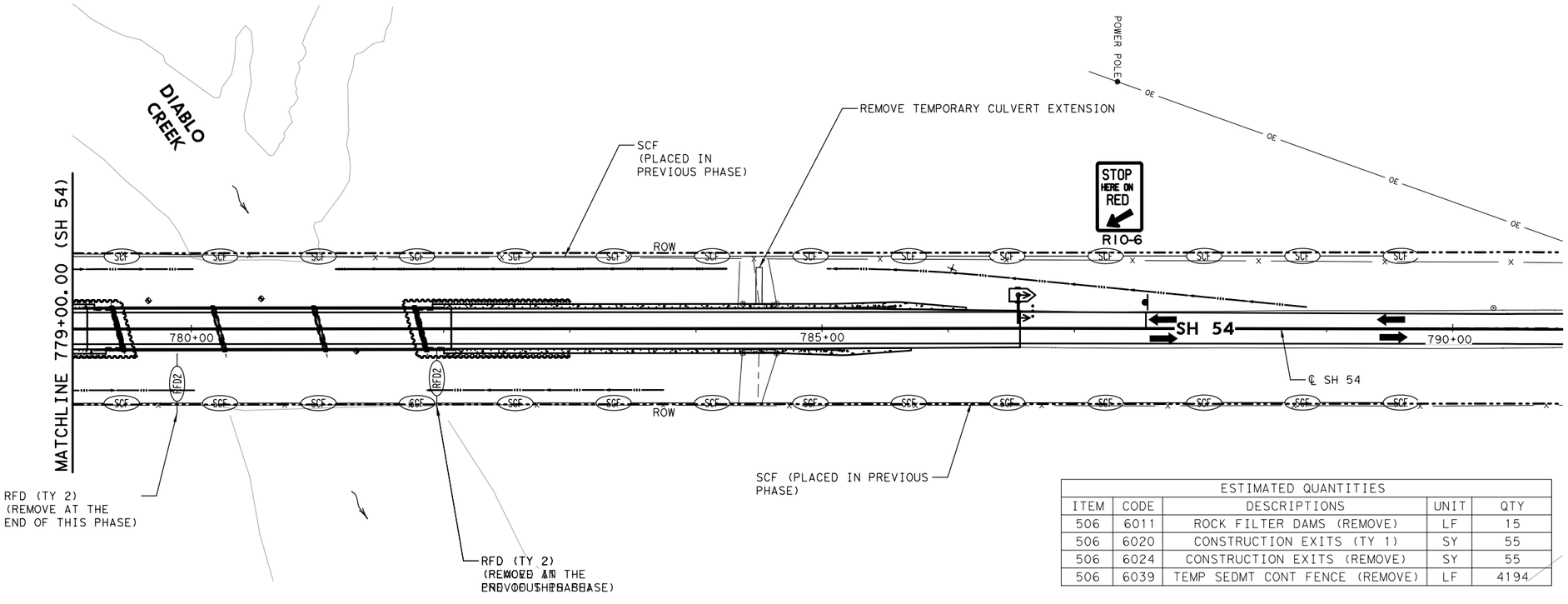

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- RFD3 — ROCK FILTER DAM TYPE 3
- RFD4 — ROCK FILTER DAM TYPE 4
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- EROSION CONTROL LOG (INLET PROTECTION)
- TEMPORARY SEEDING
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- DITCH FLOW
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0 50 100
SCALE: 1"=100'

ESTIMATED QUANTITIES				
ITEM	CODE	DESCRIPTIONS	UNIT	QTY
506	6011	ROCK FILTER DAMS (REMOVE)	LF	15
506	6020	CONSTRUCTION EXITS (TY 1)	SY	55
506	6024	CONSTRUCTION EXITS (REMOVE)	SY	55
506	6039	TEMP SEDMT CONT FENCE (REMOVE)	LF	4194

DATE	BY	REV	REVISION

STATE OF TEXAS
MINH TRAN
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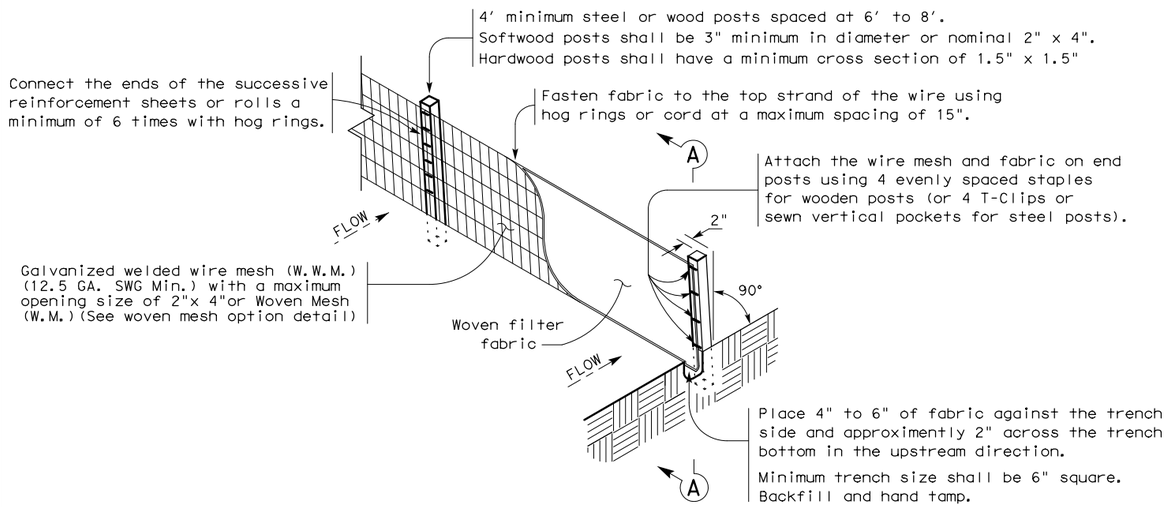
Texas Department of Transportation®

SH 54 @ DIABLO CREEK

SWP3 LAYOUT
PHASE 3

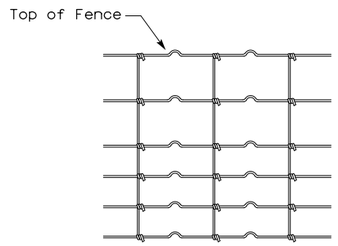
SHEET 3 OF 3

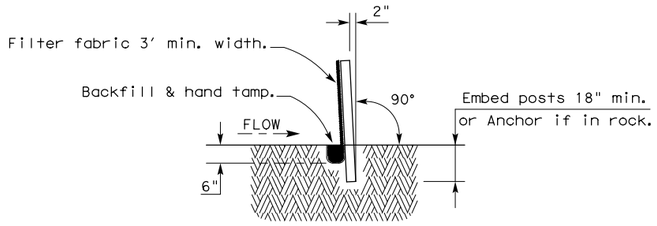
		FED. RD. DIV. NO.	PROJECT NO.	SHEET NO.
DSN	OEI	6	SEE TITLE SHEET	175
CHK	OEI	STATE	DIST.	COUNTY
DRN	OEI	TEXAS	ELP	CULBERSON
CHK	OEI	CONT.	SECT.	JOB / HIGHWAY NO.
		0233	05	038 / SH 54



TEMPORARY SEDIMENT CONTROL FENCE

SCF





SECTION A-A

HINGE JOINT KNOT WOVEN MESH (OPTION) DETAIL

Galvanized hinge joint knot woven mesh (12.5 GA.SWG Min.) requires a minimum of five horizontal wires spaced at a maximum of 12 inches apart and all vertical wires spaced at a maximum of 12 inches apart.

SEDIMENT CONTROL FENCE USAGE GUIDELINES

A sediment control fence may be constructed near the downstream perimeter of a disturbed area along a contour to intercept sediment from overland runoff. A 2 year storm frequency may be used to calculate the flow rate to be filtered.

Sediment control fence should be sized to filter a maximum flow through rate of 100 GPM/FT^2. Sediment control fence is not recommended to control erosion from a drainage area larger than 2 acres.

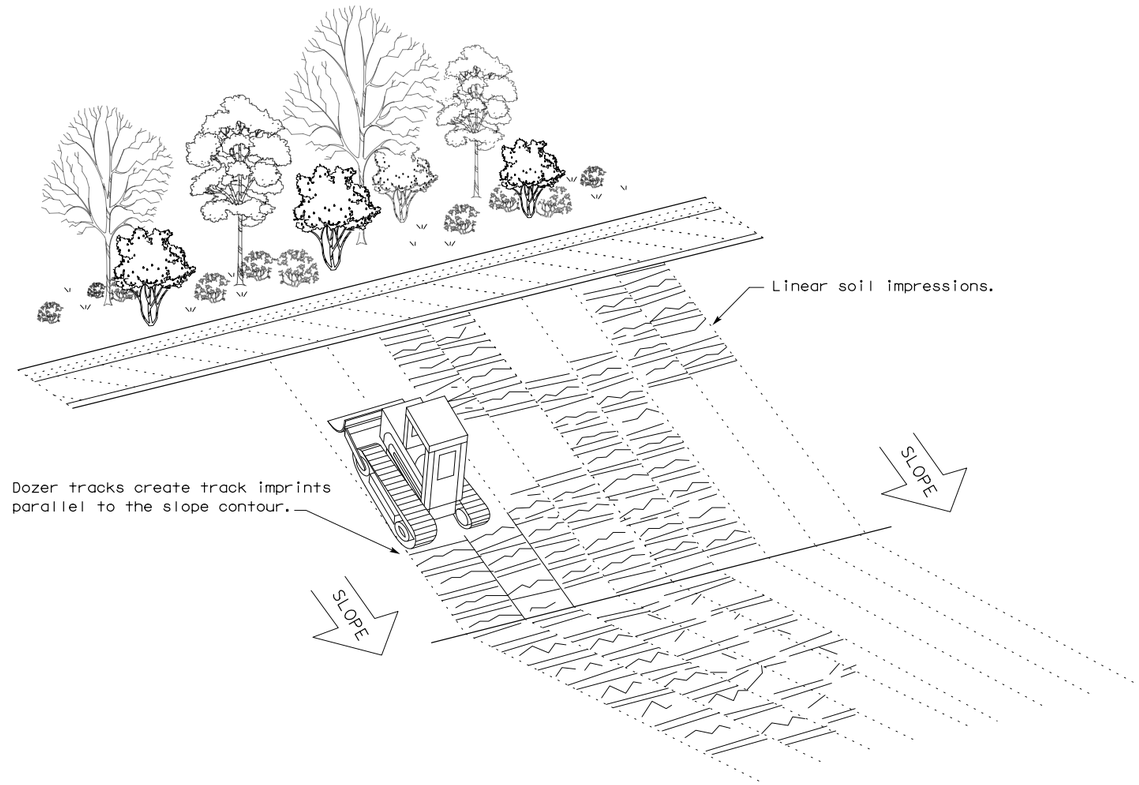
LEGEND

Sediment Control Fence

SCF

GENERAL NOTES

1. Vertical tracking is required on projects where soil distributing activities have occurred unless otherwise approved.
2. Perform vertical tracking on slopes to temporarily stabilize soil.
3. Provide equipment with a track undercarriage capable of producing linear soil impressions measuring a minimum of 12" in length by 2" to 4" in width by 1/2" to 2" in depth.
4. Do not exceed 12" between track impressions.
5. Install continous linear track impressions where the minimum 12" length impressions are perpendicular to the slope or direction of water flow.



VERTICAL TRACKING

Texas Department of Transportation

Design Division Standard

TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

FENCE & VERTICAL TRACKING

EC(1)-16

FILE: ec116	DN: TxDOT	CK: KM	DW: VP	DN/CK: LS
© TxDOT:	CONT	SECT	JOB	HIGHWAY
REVISIONS	0233	05	038	SH 54
	DIST	COUNTY		SHEET NO.
	ELP	CULBERSON		176

9/27/2022
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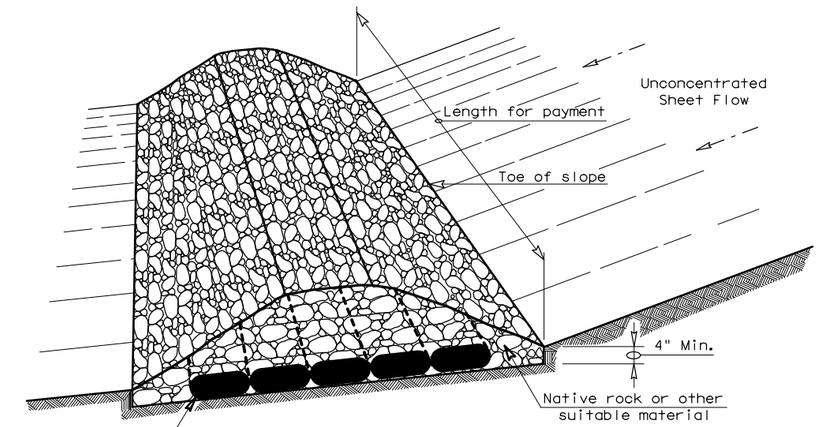
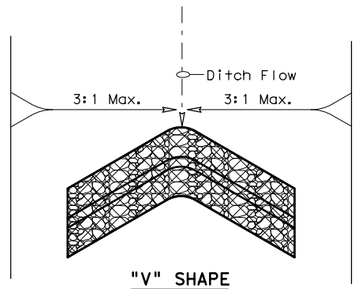
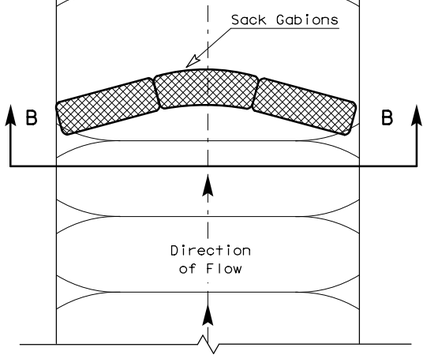


FILTER DAM AT TOE OF SLOPE

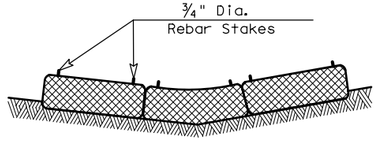
RFD1



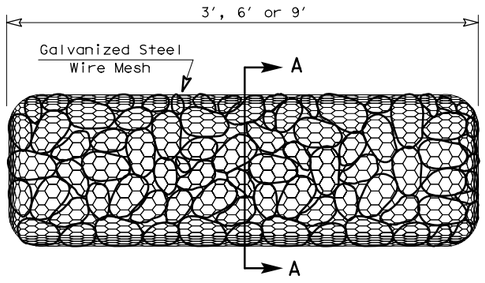
"V" SHAPE PLAN VIEW



PLAN VIEW

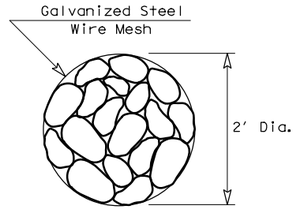


SECTION B-B

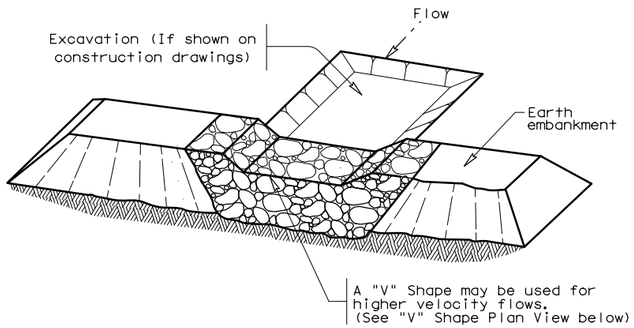


TYPE 4 (SACK GABIONS)

RFD4

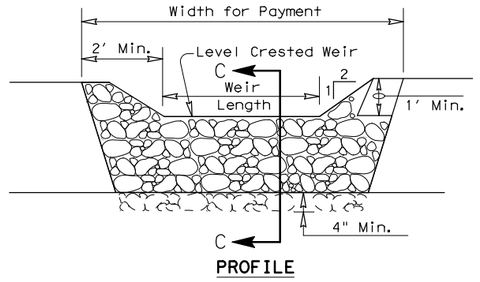


SECTION A-A

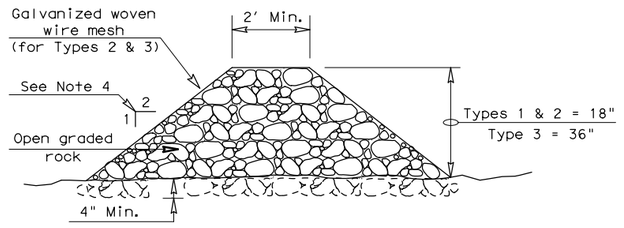


FILTER DAM AT SEDIMENT TRAP

RFD1 — OR — RFD2



PROFILE



SECTION C-C

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.

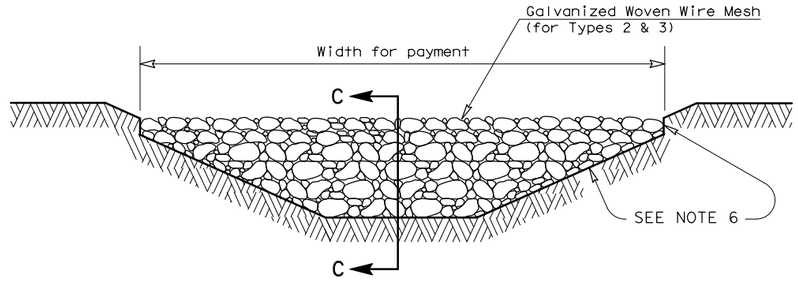
Type 1 (18" high with no wire mesh) (3" to 6" aggregate): Type 1 may be used at the toe of slopes, around inlets, in small ditches, and at dike or swale outlets. This type of dam is recommended to control erosion from a drainage area of 5 acres or less. Type 1 may not be used in concentrated high velocity 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.



FILTER DAM AT CHANNEL SECTIONS

RFD1 — OR — RFD2 — OR — RFD3

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:	CONT	SECT	JOB	HIGHWAY
REVISIONS	0233	05	038	SH 54
	DIST	COUNTY		SHEET NO.
	ELP	CULBERSON		177

DATE: 9/27/2022
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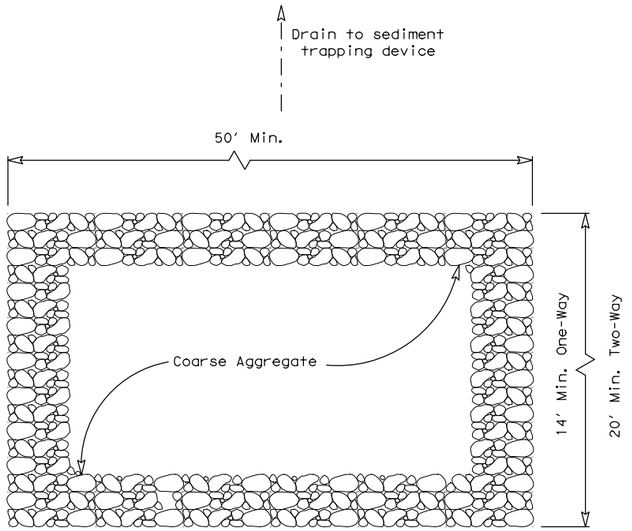
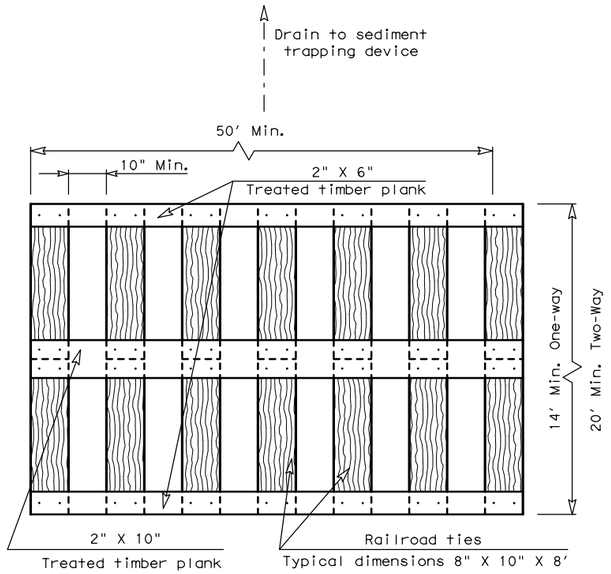


PLAN VIEW



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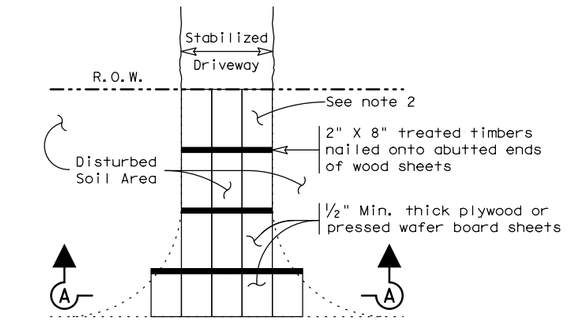
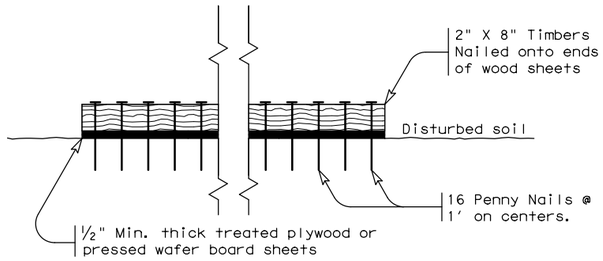


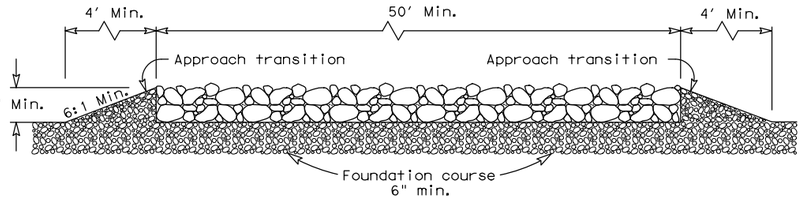
PLAN VIEW



SECTION A-A

CONSTRUCTION EXIT (TYPE 3)

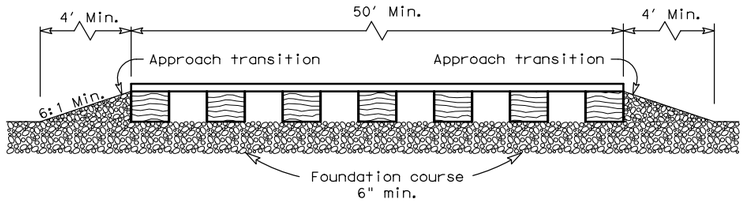
SHORT TERM



ELEVATION VIEW

CONSTRUCTION EXIT (TYPE 1)

ROCK CONSTRUCTION (LONG TERM)



ELEVATION VIEW

CONSTRUCTION EXIT (TYPE 2)

TIMBER CONSTRUCTION (LONG TERM)

GENERAL NOTES (TYPE 1)

1. The length of the type 1 construction exit shall be as indicated on the plans, but not less than 50′.
2. The coarse aggregate should be open graded with a size of 4" to 8".
3. The approach transitions should be no steeper than 6:1 and constructed as directed by the Engineer.
4. The construction exit foundation course shall be flexible base, bituminous concrete, portland cement concrete or other materialas approved by the Engineer.
5. The construction exit shall be graded to allow drainage to a sediment trapping device.
6. The guidelines shown hereon are suggestions only and may be modified by the Engineer.
7. Construct exits with a width of at least 14 ft. for one-way and 20 ft. for two-way traffic for the full width of the exit, or as directed by the engineer.

GENERAL NOTES (TYPE 2)

1. The length of the type 2 construction exit shall be as indicated on the plans, but not less than 50′.
2. The treated timber planks shall be attached to the railroad ties with ½"x 6" min. lag bolts. Other fasteners may be used as approved by the Engineer.
3. The treated timber planks shall be #2 grade min., and should be free from large and loose knots.
4. The approach transitions shall be no steeper than 6:1 and constructed as directed by the Engineer.
5. The construction exit foundation course shall be flexible base, bituminous concrete, portland cement concrete or other material as approved by the Engineer.
6. The construction exit should be graded to allow drainage to a sediment trapping device.
7. The guidelines shown hereon are suggestions only and may be modified by the Engineer.
8. Construct exits with a width of at least 14 ft. for one-way and 20 ft. for two-way traffic for the full width of the exit, or as directed by the engineer.

GENERAL NOTES (TYPE 3)

1. The length of the type 3 construction exit shall be as shown on the plans, or as directed by the Engineer.
2. The type 3 construction exit may be constructed from open graded crushed stone with a size of two to four inches spread a min. of 4" thick to the limits shown on the plans.
3. The treated timber planks shall be #2 grade min., and should be free from large and loose knots.
4. The guidelines shown hereon are suggestions only and may be modified by the Engineer.

Texas Department of Transportation

Design Division Standard

TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

CONSTRUCTION EXITS

EC(3)-16

FILE: ec316	DN: TxDOT	CK: KM	DW: VP	DN/CK: LS
©TxDOT: JULY 2016	CONT	SECT	JOB	HIGHWAY
REVISIONS	0233	05	038	SH 54
	DIST	COUNTY		SHEET NO.
	ELP	CULBERSON		178

DATE: 9/27/2022
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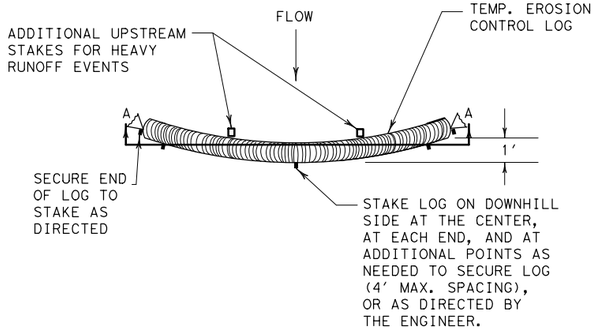
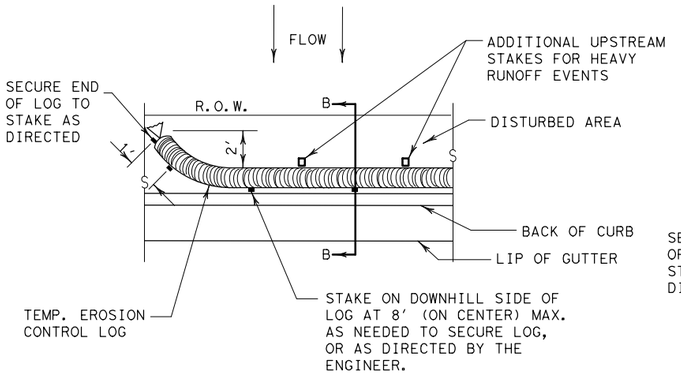


PLAN VIEW



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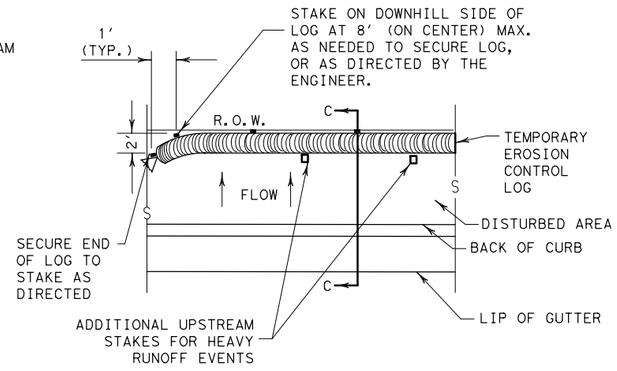
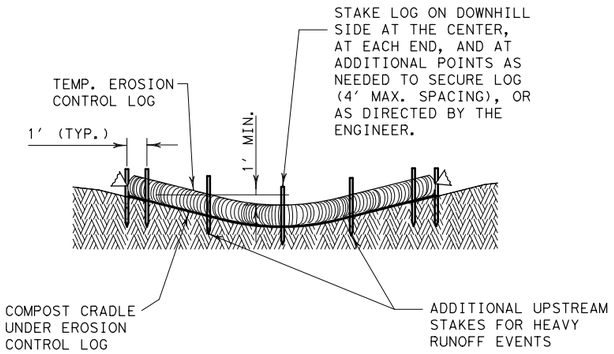


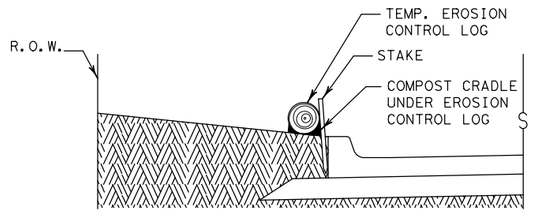
PLAN VIEW



SECTION A-A

EROSION CONTROL LOG DAM

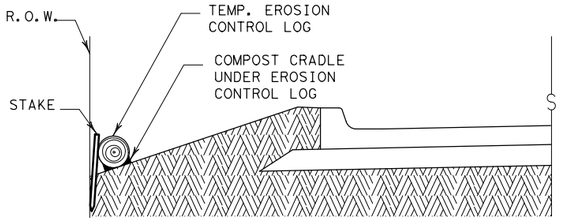
CL-D



SECTION B-B

EROSION CONTROL LOG AT BACK OF CURB

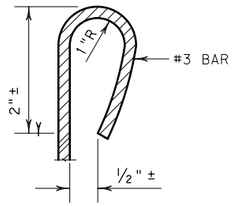
CL-BOC



SECTION C-C

EROSION CONTROL LOG AT EDGE OF RIGHT-OF-WAY

CL-ROW



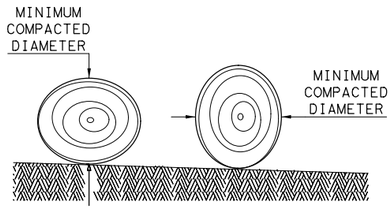
REBAR STAKE DETAIL

LEGEND

- CL-D — EROSION CONTROL LOG DAM
- CL-BOC — EROSION CONTROL LOG AT BACK OF CURB
- CL-ROW — EROSION CONTROL LOG AT EDGE OF RIGHT-OF-WAY
- CL-SST — EROSION CONTROL LOGS ON SLOPES STAKE AND TRENCHING ANCHORING
- CL-SSL — EROSION CONTROL LOGS ON SLOPES STAKE AND LASHING ANCHORING
- CL-DI — EROSION CONTROL LOG AT DROP INLET
- CL-CI — EROSION CONTROL LOG AT CURB INLET
- CL-GI — EROSION CONTROL LOG AT CURB & GRATE INLET

GENERAL NOTES:

1. EROSION CONTROL LOGS SHALL BE INSTALLED IN ACCORDANCE WITH MANFACTURER'S RECOMMENDATIONS, OR AS DIRECTED BY THE ENGINEER.
2. LENGTHS OF EROSION CONTROL LOGS SHALL BE IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS AND AS REQUIRED FOR THE PURPOSE INTENDED.
3. UNLESS OTHERWISE DIRECTED, USE BIODEGRADABLE OR PHOTODEGRADABLE CONTAINMENT MESH ONLY WHERE LOG WILL REMAIN IN PLACE AS PART OF A VEGETATIVE SYSTEM. FOR TEMPORARY INSTALLATIONS, USE RECYCLABLE CONTAINMENT MESH.
4. FILL LOGS WITH SUFFICIENT FILTER MATERIAL TO ACHIEVE THE MINIMUM COMPACTED DIAMETER SPECIFIED IN THE PLANS WITHOUT EXCESSIVE DEFORMATION.
5. STAKES SHALL BE 2" X 2" WOOD OR #3 REBAR, 2'-4' LONG, EMBEDDED SUCH THAT 2" PROTRUDES ABOVE LOG, OR AS DIRECTED BY THE ENGINEER.
6. DO NOT PLACE STAKES THROUGH CONTAINMENT MESH.
7. COMPOST CRADLE MATERIAL IS INCIDENTAL & WILL NOT BE PAID FOR SEPARATELY.
8. SANDBAGS USED AS ANCHORS SHALL BE PLACED ON TOP OF LOGS & SHALL BE OF SUFFICIENT SIZE TO HOLD LOGS IN PLACE.
9. TURN THE ENDS OF EACH ROW OF LOGS UPSLOPE TO PREVENT RUNOFF FROM FLOWING AROUND THE LOG.
10. FOR HEAVY RUNOFF EVENTS, ADDITIONAL UPSTREAM STAKES MAY BE NECESSARY TO KEEP LOG FROM FOLDING IN ON ITSELF.



DIAMETER MEASUREMENTS OF EROSION CONTROL LOGS SPECIFIED IN PLANS

SEDIMENT BASIN & TRAP USAGE GUIDELINES

An erosion control log sediment trap may be used to filter sediment out of runoff draining from an unstabilized area.

Log Traps: The drainage area for a sediment trap should not exceed 5 acres. The trap capacity should be 1800 CF/Acre (0.5" over the drainage area).

Control logs should be placed in the following locations:

1. Within drainage ditches spaced as needed or min. 500' on center
2. Immediately preceding ditch inlets or drain inlets
3. Just before the drainage enters a water course
4. Just before the drainage leaves the right of way
5. Just before the drainage leaves the construction limits where drainage flows away from the project.

The logs should be cleaned when the sediment has accumulated to a depth of 1/2 the log diameter.

Cleaning and removal of accumulated sediment deposits is incidental and will not be paid for separately.

Texas Department of Transportation

Design Division Standard

TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

EROSION CONTROL LOG

EC(9)-16

FILE: ec916		DN: TxDOT		CK: KM	DW: LS/PT		CK: LS
© TxDOT: JULY 2016		CONT	SECT	JOB		HIGHWAY	
REVISIONS		0233	05	038		SH 54	
		DIST		COUNTY			SHEET NO.
		ELP		CULBERSON			179

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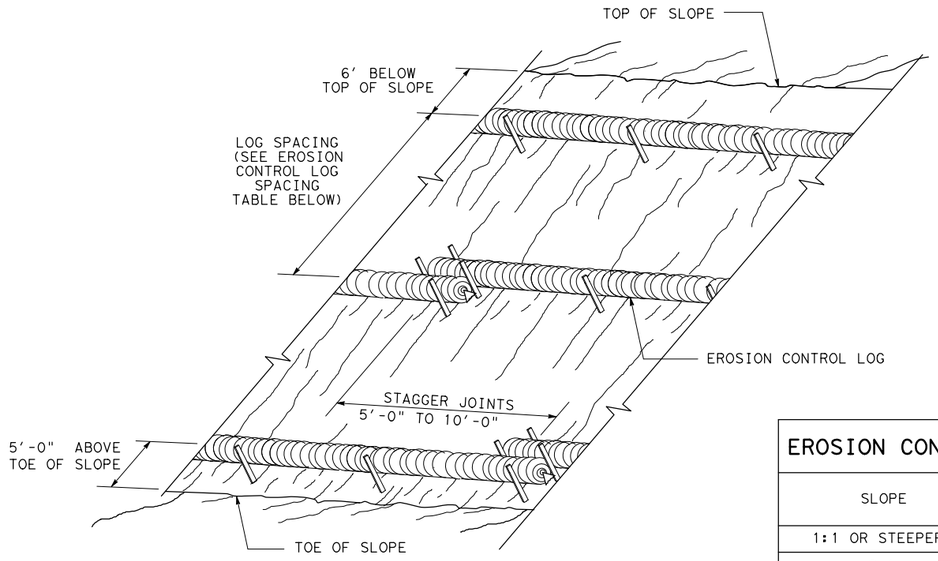
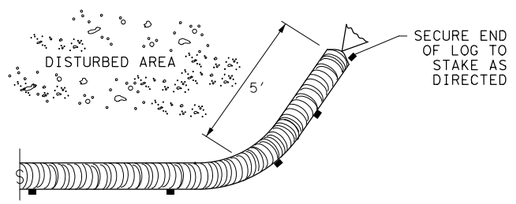


EROSION CONTROL LOGS ON SLOPES
STAKE AND TRENCHING ANCHORING

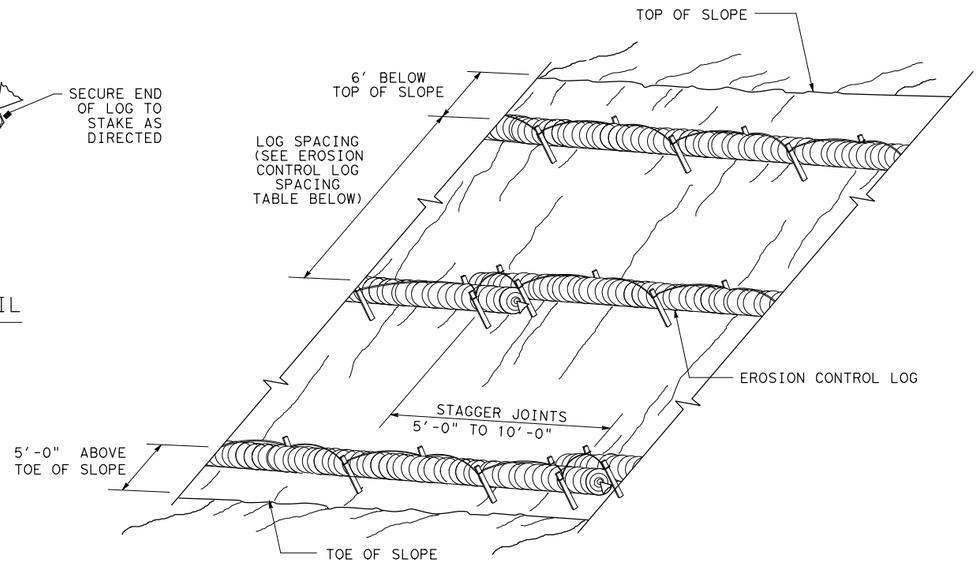
CL-SST



END SECTION RAP DETAIL

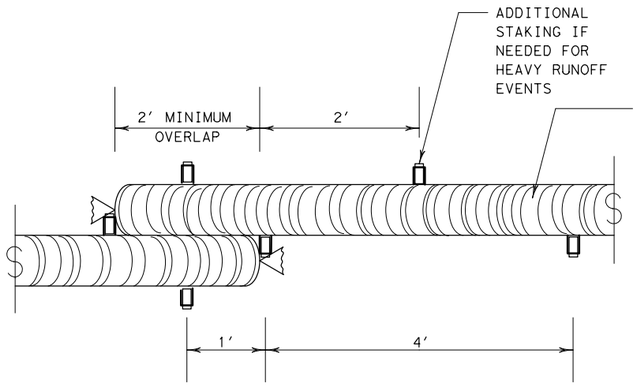
EROSION CONTROL LOG SPACING TABLE				
SLOPE	LOG DIAMETER			
	6"	8"	12"	18"
1:1 OR STEEPER	5′	10′	15′	20′
2:1	10′	20′	30′	40′
3:1	15′	30′	45′	60′
4:1 OR FLATTER	20′	40′	60′	80′

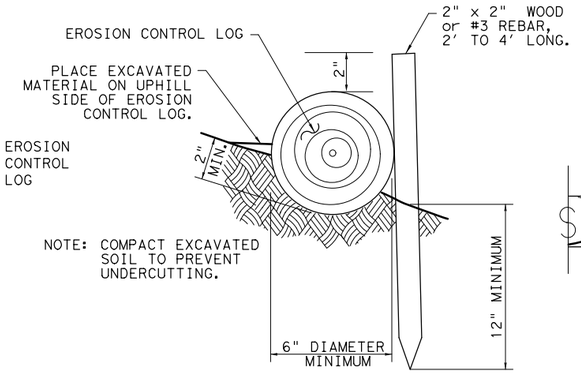
* ADJUSTMENTS CAN BE MADE FOR SOIL TYPE:
SOFT, LOAMY SOILS-ADJUST ROWS CLOSER TOGETHER;
HARD, ROCKY SOILS- ADJUST ROWS FARTHER APART



EROSION CONTROL LOGS ON SLOPES
STAKE AND LASHING ANCHORING

CL-SSL

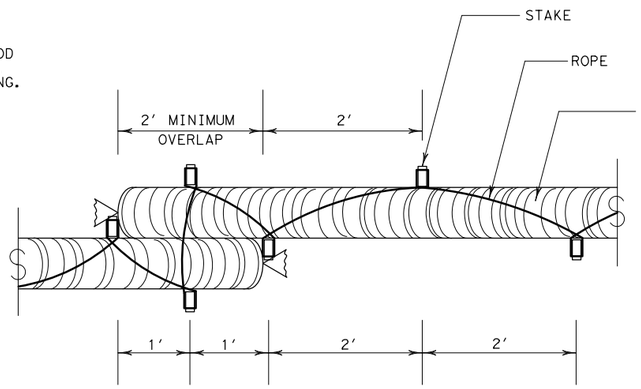


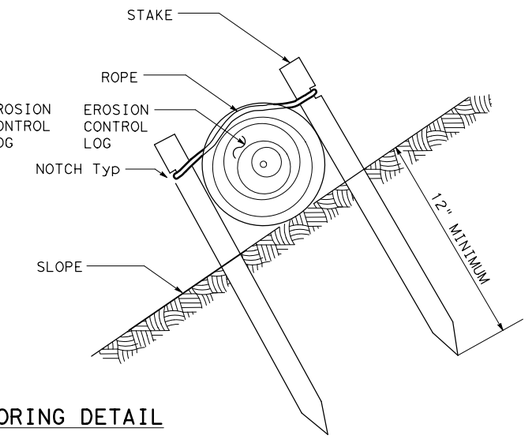


STAKE AND TRENCHING ANCHORING DETAIL

CL-SST

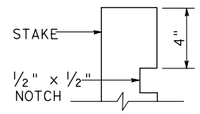
TRENCH DEPTH TABLE	
LOG DIAMETER	DEPTH
6"	2"
8"	3"
12"	4"
18"	5"





STAKE AND LASHING ANCHORING DETAIL

CL-SSL



STAKE NOTCH DETAIL

Texas Department of Transportation — Design Division Standard

TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES
EROSION CONTROL LOG
EC(9)-16

FILE: ec116	DN: TxDOT	CK: KM	DW: LS/PT	CK: LS
© TxDOT: JULY 2016	CONT	SECT	JOB	HIGHWAY
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	DIST	COUNTY		SHEET NO.
	ELP	CULBERSON		180

DATE: 9/27/2022
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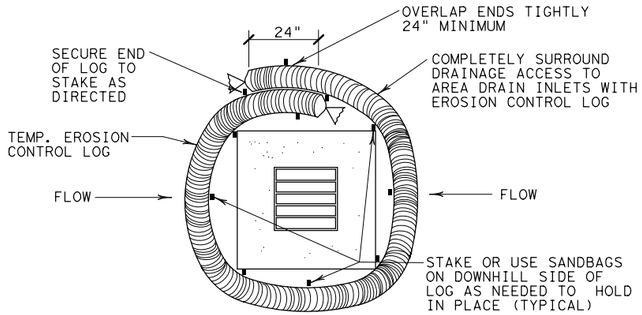
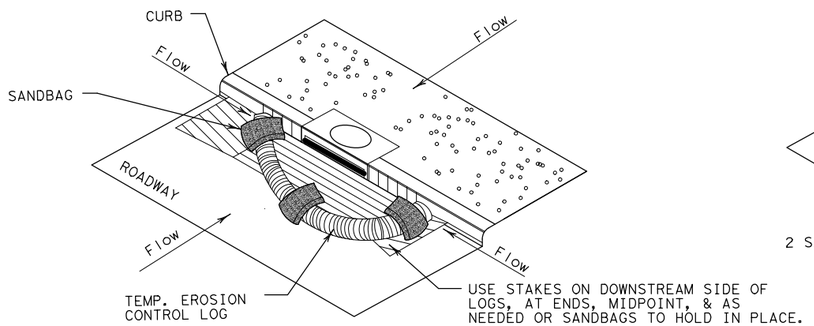


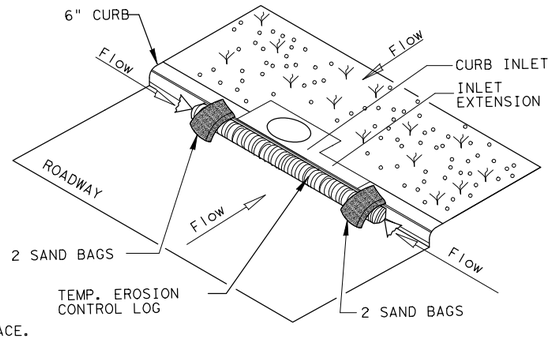
EROSION CONTROL LOG AT DROP INLET

CL-DI



EROSION CONTROL LOG AT CURB INLET

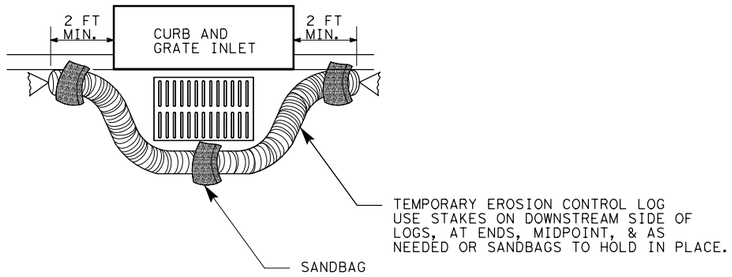
CL-CI



EROSION CONTROL LOG AT CURB INLET

CL-CI

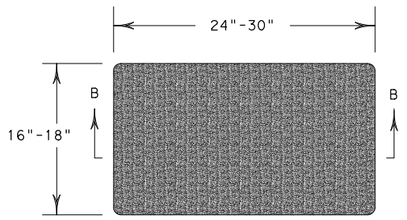
NOTE:
EROSION CONTROL LOGS USED AT CURB INLETS SHOULD ONLY BE USED IF THEY WILL NOT IMPEDE TRAFFIC OR FLOOD THE ROADWAY OR WHEN THE STORM SEWER SYSTEM IS NOT FULLY FUNCTIONAL.



EROSION CONTROL LOG AT CURB & GRADE INLET

CL-GI

SECTION B-B



SANDBAG DETAIL

SHEET 3 OF 3

Texas Department of Transportation | Design Division Standard

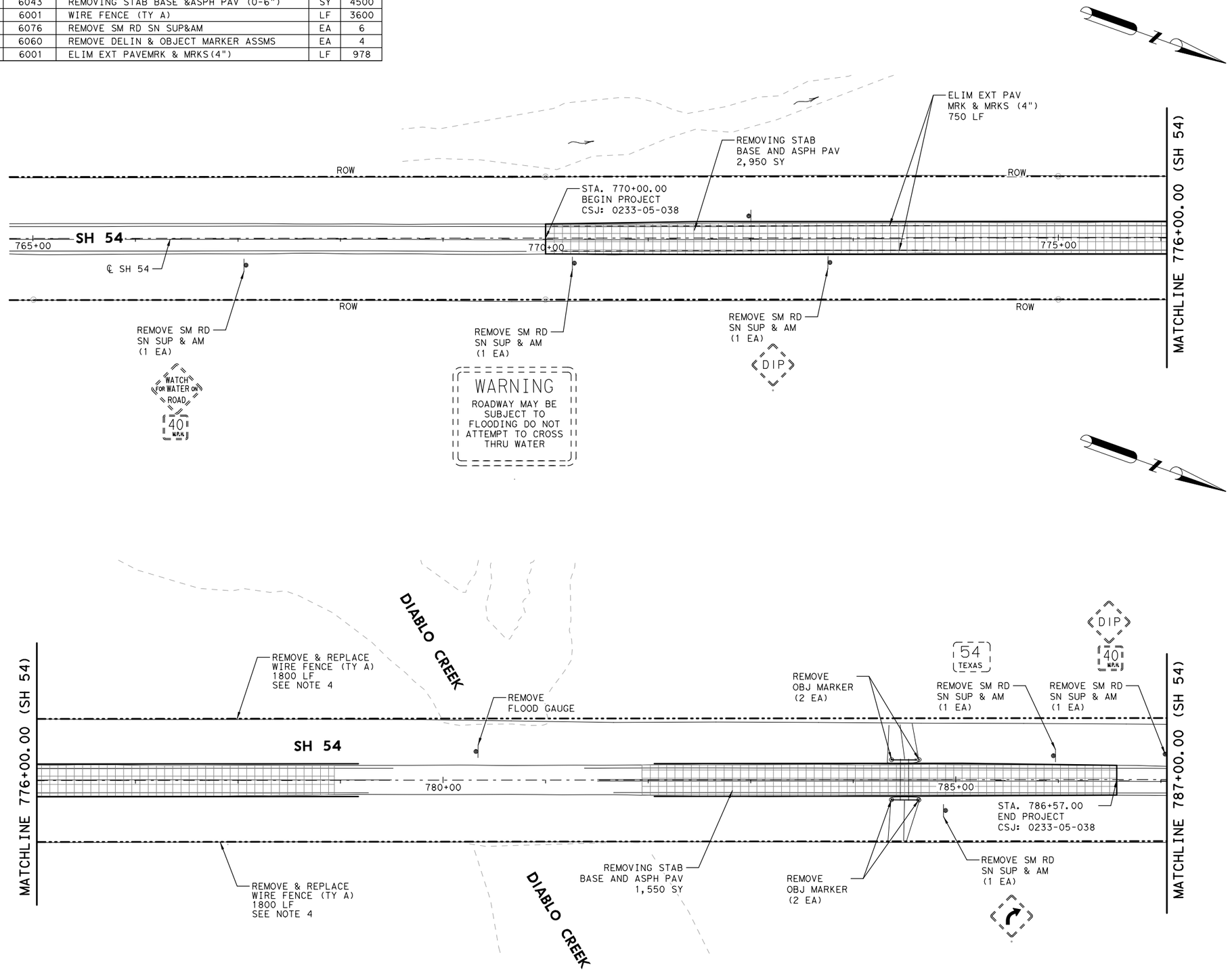
TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

EROSION CONTROL LOG

EC(9)-16

FILE: ec916	DN: TxDOT		CK: KM		DW: LS/PT		CK: LS
© TxDOT: JULY 2016	CONT	SECT	JOB		HIGHWAY		
REVISIONS	0233	05	038		SH 54		
	DIST	COUNTY			SHEET NO.		
	ELP	CULBERSON			181		

ESTIMATED QUANTITIES				
ITEM	CODE	DESCRIPTIONS	UNIT	QTY
100	6001	PREPARING ROW	AC	5
105	6043	REMOVING STAB BASE &ASPH PAV (0-6")	SY	4500
552	6001	WIRE FENCE (TY A)	LF	3600
644	6076	REMOVE SM RD SN SUP&AM	EA	6
658	6060	REMOVE DELIN & OBJECT MARKER ASSMS	EA	4
677	6001	ELIM EXT PAVEMRK & MRKS(4")	LF	978



LEGEND

REMOVING STAB BASE AND ASPH PAV

NOTES:

1. CONTRACTOR TO ACCEPT OWNERSHIP OF REMOVED MATERIALS UNLESS INDICATED OTHERWISE BY THE ENGINEER.
2. MATERIALS IDENTIFIED BY THE ENGINEER TO BE SALVAGED MUST BE KEPT IN GOOD CONDITION AND DELIVERTED TO A TXDOT DESIGNATED LOCATION.
3. DISPOSE REMOVED MATERIALS IN ACCORDANCE WITH FEDERAL, STATE, AND LOCAL REGULATIONS.
4. EXISTING FENCE REMOVAL WILL BE PAID UNDER PREP ROW BID ITEM. THIS INCLUDES ALL MATERIALS, LABOR, DISPOSED AND INCIDENTALS. ESTIMATED LENGTH TO BE REMOVED IS 3600 LF. ALL EXISTING POSTS MUST BE INCLUDED IN THE REMOVAL.

DATE	BY	REV	REVISION

STATE OF TEXAS
R. CRUZ-RODRIGUEZ
82856
LICENSED
PROFESSIONAL ENGINEER

Rafael Cruz-Rodriguez, P.E.

09-27-2022

OMEGA ENGINEERS, INC.
8200 N MOPAC EXPRESSWAY, STE #280
AUSTIN, TEXAS 78759
OMEGAENGINEERS.COM
TX PE Firm Reg. No. F-2147
Ph512 575 2288 Fx281 647 9184

Texas Department of Transportation®

SH 54 @ DIABLO CREEK

REMOVAL LAYOUT

SHEET 1 OF 2

		FED. RD. DIV. NO.	PROJECT NO.	SHEET NO.
DSN	OEI	6	SEE TITLE SHEET	182
CHK	OEI	STATE	DIST.	COUNTY
DRN	OEI	TEXAS	ELP	CULBERSON
CHK	OEI	CONT.	SECT.	JOB / HIGHWAY NO.
		0233	05	038 / SH 54

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9/29/2022
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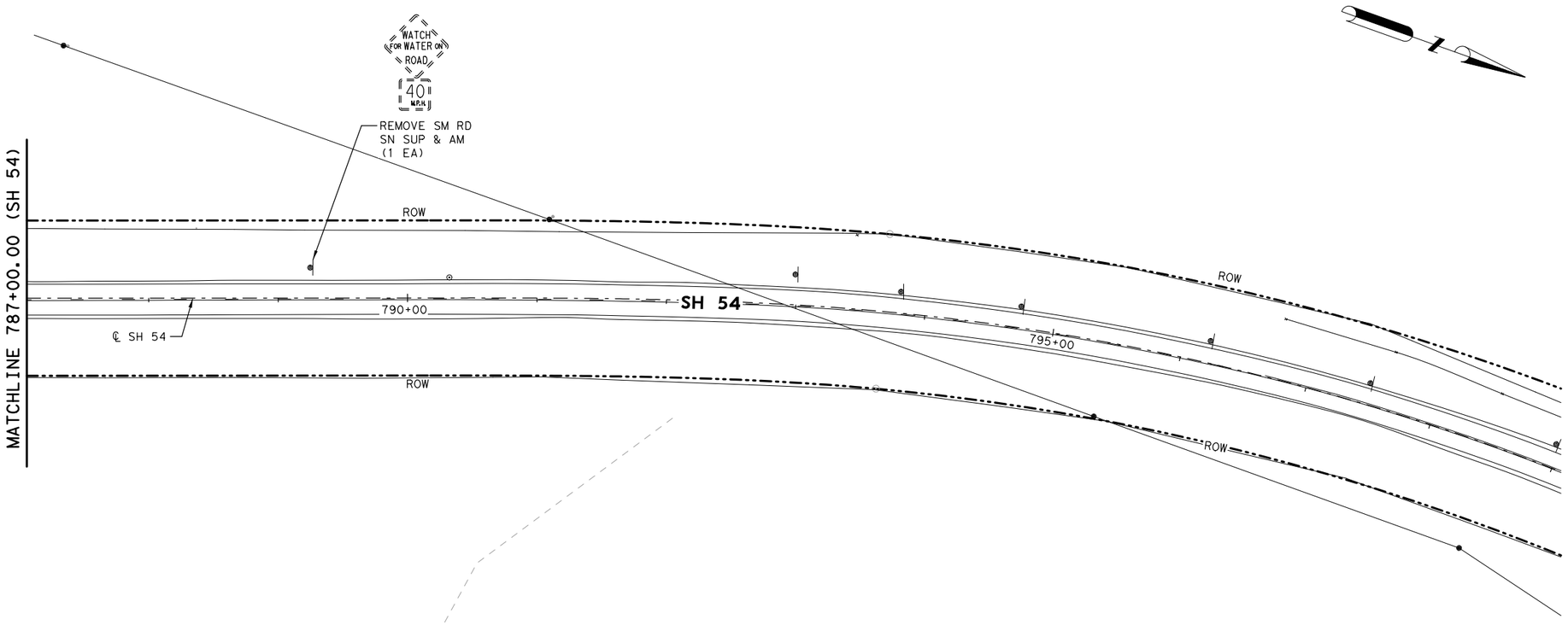

ESTIMATED QUANTITIES				
ITEM	CODE	DESCRIPTIONS	UNIT	QTY
644	6076	REMOVE SM RD SN SUP&AM	EA	1
677	6001	ELIM EXT PAV MRK & MRKS(4")	LF	1090

DATE	BY	REV	REVISION

STATE OF TEXAS
R. CRUZ-RODRIGUEZ
82856
LICENSED PROFESSIONAL ENGINEER

Rafael Cruz-Rodriguez, P.E.

09-27-2022

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SHEET 2 OF 2

		FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
DSN	OEI	6	SEE TITLE SHEET		183
CHK	OEI	STATE	DIST.	COUNTY	
DRN	OEI	TEXAS	ELP	CULBERSON	
CHK	OEI	CONT.	SECT.	JOB	HIGHWAY NO.
		0233	05	038	SH 54

9/27/2022
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