FED.RD. DIV.NO.	FEDERAL PROJECT NO.		SHEET NO.
6	BR 2024(779)		001
STATE	STATE DIST.	COUNTY	
TEXAS	AMA	POTTER	
CONT.	SECT.	JOB	HIGHWAY NO.
0090	05	107	IH 40

IH 40.
DESIGN SPEED = 70
2023 ADT = 14,500
2043 ADT = 20,300
INTERSTATE HIGHWAY

HOPE RD.
DESIGN SPEED = 30
2023 ADT = 1,500
2043 ADT = 2,100
URBAN COLLECTOR

INDEX OF SHEETS

SHEET NO.	DESCRIPTION
1	TITLE SHEET
2	INDEX OF SHEETS

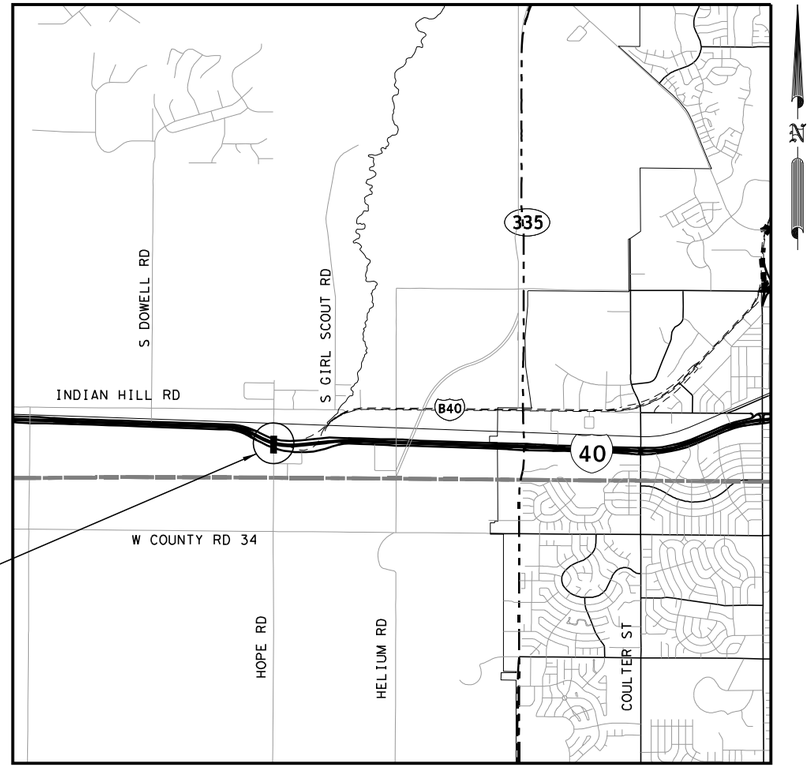
STATE OF TEXAS
DEPARTMENT OF TRANSPORTATION

PLANS OF PROPOSED
STATE HIGHWAY IMPROVEMENT
FEDERAL PROJECT: BR 2024(779)
HIGHWAY - IH 40
POTTER COUNTY

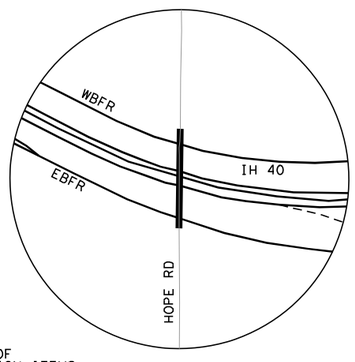
CONTROL: 0090-05-107

FOR THE CONSTRUCTION OF:REPLACE EXISTING BRIDGE
CONSISTING OF: BRIDGE REMOVAL, CONSTRUCT BRIDGE & APPROACH SLABS, ROADWAY WIDENING.

CSJ: 0090-05-107
LIMITS AT: HOPE ROAD
BRIDGE LENGTH = 172 FT. = 0.03 MILES
OLD NBI = 04-188-0-0090-05-055
NEW NBI = 04-188-0-0090-05-594
ROADWAY LENGTH = 672 FT. = 0.13 MILES
TOTAL LENGTH = 850 FT. = 0.16 MILES



BEGIN PROJECT STA: 0+78.00
END PROJECT STA: 9+09.49
CSJ: 0090-05-107



EXCEPTIONS:
NONE

RAILROADS:
NONE

EQUATIONS:
NONE

TDLR INSPECTION REQUIRED
REGISTERED #: TABS2024007487

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

FINAL PLANS

LETTING DATE:
DATE CONTRACTOR BEGAN WORK:
DATE WORK WAS COMPLETED & ACCEPTED:
FINAL CONTRACT COST: $
CONTRACTOR :
AREA ENGINEER:

Texas Department of Transportation

BRIDGEFARMER & ASSOCIATES, INC.
CONSULTING ENGINEERS
TBPE REGISTRATION NO. 264

DATE: 1/2/2024
RECOMMENDED FOR LETTING:
DocuSigned by: Joe Crumpett 2A500C249D094BA...
AREA ENGINEER

DATE: 1/4/2024
DocuSigned by: Kit Black 9B5A6EA6AE8B46E...
DISTRICT DIRECTOR OF TRANSPORTATION PLANNING AND DEVELOPMENT

DATE: 1/5/2024
APPROVED FOR LETTING:
DocuSigned by: Blair Johnson 8B80E3AEB2BC43A...
DISTRICT ENGINEER

I. GENERAL

II. TRAFFIC CONTROL PLAN

STANDARDS

III. ROADWAY DETAILS

STANDARDS

IV. DRAINAGE ITEMS

STANDARDS

V. RETAINING WALL SHEETS

STANDARDS

VI. BRIDGES

STANDARDS

VII. SIGNING AND PAVEMENT MARKINGS

STANDARDS

VIII. ILLUMINATION

STANDARDS

IX. ENVIRONMENTAL ISSUES

STANDARDS

THE STANDARD SHEETS IDENTIFIED HERE WERE SELECTED BY ME OR UNDER MY RESPONSIBLE SUPERVISION AS BEING APPLICABLE TO THIS PROJECT.

STATE OF TEXAS · JAMES W. LANGSTON · 73891 · LICENSED PROFESSIONAL ENGINEER

12/11/23

James W. Langston PE

Bridgefarmer & Associates, Inc.
TBPE Registration No. 264

NO.	DATE	DESCRIPTION	APPROV.

BRIDGEFARMER & ASSOCIATES, INC.
CONSULTING ENGINEERS
TBPE REGISTRATION NO. 264

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IH-40 AT HOPE ROAD

INDEX OF SHEETS

SHEET 1 OF 1

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DS	6	SEE TITLE SHEET		IH 40
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
DW	TEXAS	AMA	POTTER	002
CHECK CK1	CONTROL	SECTION	JOB	
CHECK CK2	0090	05	107	

150 0 150 300
SCALE: 1" = 300'

BEGIN CONSTRUCTION
BEGIN CONSTRUCTION DETOUR
WBFR

BEGIN CONSTRUCTION
BEGIN CONSTRUCTION DETOUR
EBFR

PC 97+00.00
POT 100+00.00
IH40 WBFR
PC 104+04.03
RETAINING WALL
RWNORTH
HOPE RD
CONSTRUCTION DETOUR
PROPOSED PAVEMENT
PT 116+70.19
POT 116+99.99
PC 118+62.01
PRC 122+48.23
PT 127+74.01
PC 129+34.47
IH40 WBFR
MATCH LINE

95+00
POT 95+00.00
PC 96+50.38
IH40 EBFR
PT 98+78.33
POT 100+00.00
PC 102+06.80
IH40
PROPOSED BRIDGE
SSCB AND CRASH CUSHION
RETAINING WALL RWSOUTH
IH40
PCC 115+72.89
PCC 119+25.99
IH40 EBFR
STORM DRAIN AND INLET (TYP)
PROPOSED FUTURE W-UTURN BRIDGE
PROPOSED PAVEMENT
EXTEND BOX CULVERT
CONSTRUCTION DETOUR
HOPE RD
DALANA ST
JOHNNY AVE

END CONSTRUCTION
END CONSTRUCTION DETOUR
WBFR

PRC 136+00.17
PT 144+50.54
135+00
140+00
MATCH LINE
135+00
PT 135+20.89

END CONSTRUCTION
END CONSTRUCTION DETOUR
EBFR

STATE OF TEXAS
JAMES W. LANGSTON
73891
LICENSED
PROFESSIONAL ENGINEER
12/11/23
James W. Langston PE

Bridgefarmer & Associates, Inc.
TBPE Registration No. 264

NO.	DATE	DESCRIPTION	APPROV.

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CONSULTING ENGINEERS
TBPE REGISTRATION NO. 264

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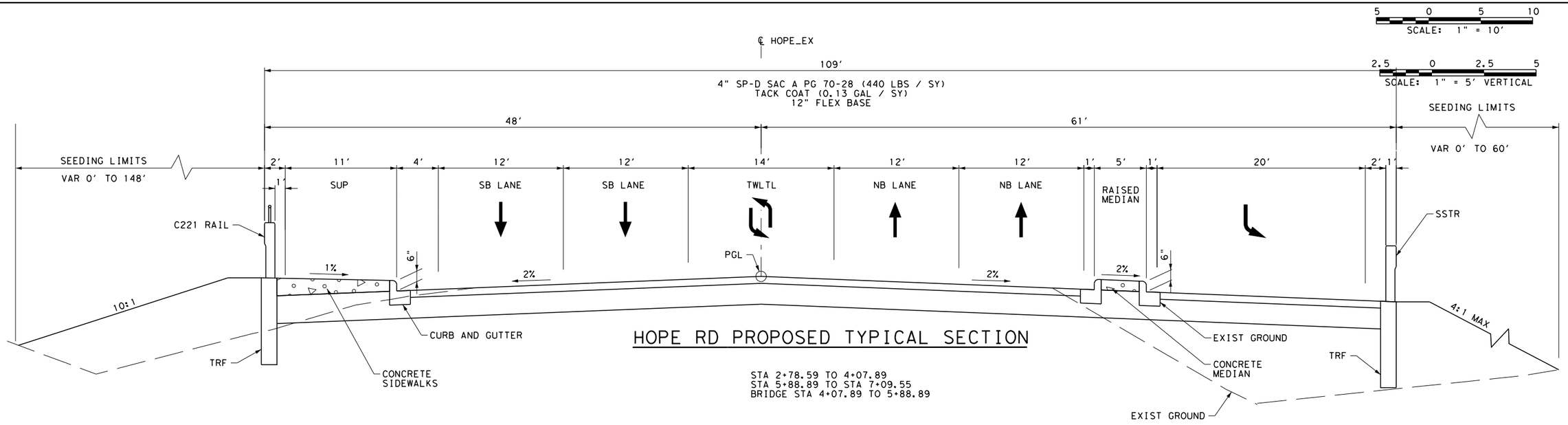
PROJECT LAYOUT

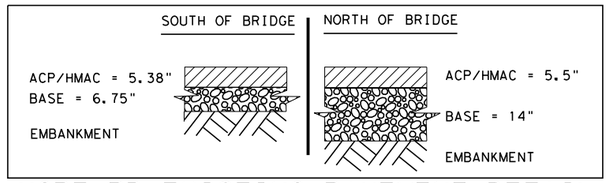
SHEET 1 OF 1

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DS	6	SEE TITLE SHEET		IH 40
GRAPHICS DW	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK CK1	TEXAS	AMA	POTTER	003
CHECK CK2	CONTROL	SECTION	JOB	
	0090	05	107	

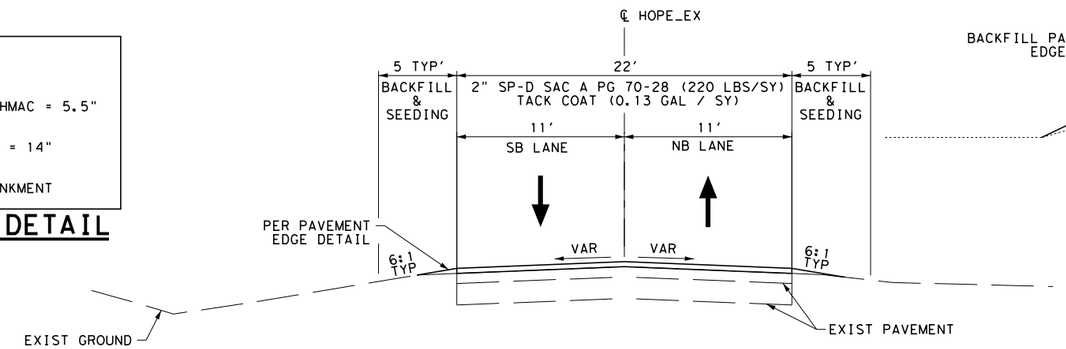


HOPE RD PROPOSED TYPICAL SECTION

STA 2+78.59 TO 4+07.89
STA 5+88.89 TO STA 7+09.55
BRIDGE STA 4+07.89 TO 5+88.89

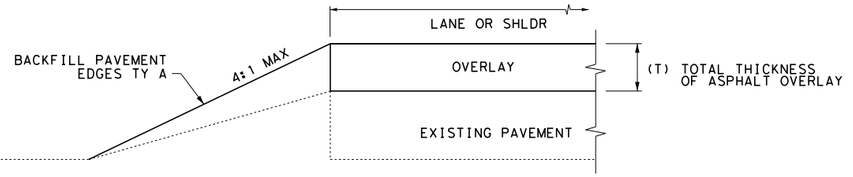


HOPE RD EXISTING PAVEMENT DETAIL



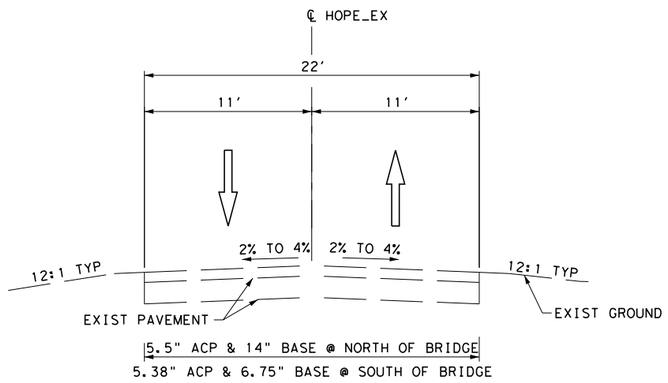
HOPE RD TYPICAL SECTION FOR DETOUR

STA 0+78.00 TO STA 2+78.59
STA 7+09.55 TO STA 9+09.49



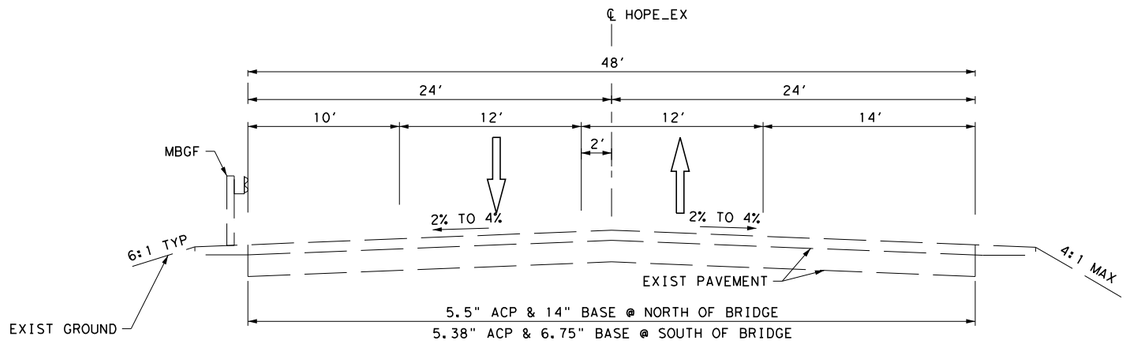
PAVEMENT EDGE DETAIL

NOT TO SCALE



HOPE RD EXISTING TYPICAL SECTION

STA 0+78.00 TO STA 2+78.59
STA 7+09.55 TO STA 9+09.49



HOPE RD EXISTING TYPICAL SECTION

STA 2+78.59 TO STA 3+70.14
STA 3+70.14 TO STA 6+44.81 BRIDGE
STA 6+44.81 TO STA 7+09.55

STATE OF TEXAS
JAMES W. LANGSTON
73891
LICENSED
PROFESSIONAL ENGINEER
12/11/23

James W. Langston PE
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NO.	DATE	DESCRIPTION	APPROV.

BRIDGEFARMER & ASSOCIATES, INC.
CONSULTING ENGINEERS
TBPE REGISTRATION NO. 264

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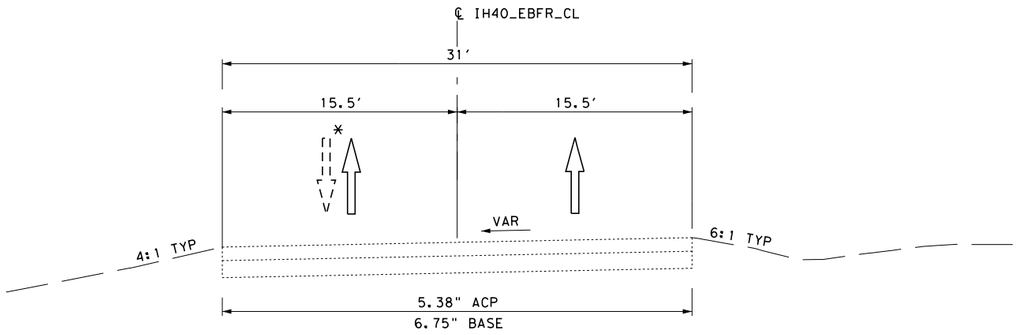
TYPICAL SECTIONS

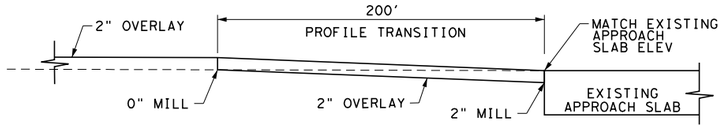
SHEET 1 OF 3

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DS	6	SEE TITLE SHEET		IH 40
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
DW	TEXAS	AMA	POTTER	004
CHECK	CONTROL	SECTION	JOB	
CK1	0090	05	107	
CHECK				
CK2				



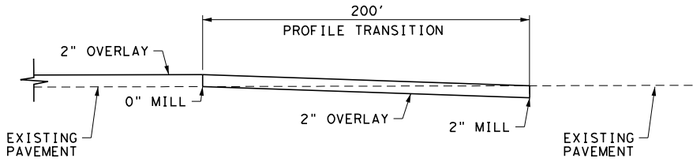
IH-40 EBFR EXISTING TYPICAL SECTION

NOTE:
BEG TO STA 108+00.00 = TWO WAY
STA 108+00.00 TO END = ONE WAY



MILL OVERLAY AT BRIDGE PROFILE TRANSITION

NOT TO SCALE

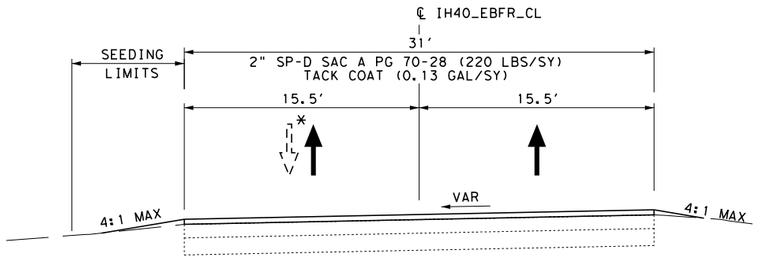


MILL / OVERLAY PROFILE TRANSITION

NOT TO SCALE

5 0 5 10
SCALE: 1" = 10′

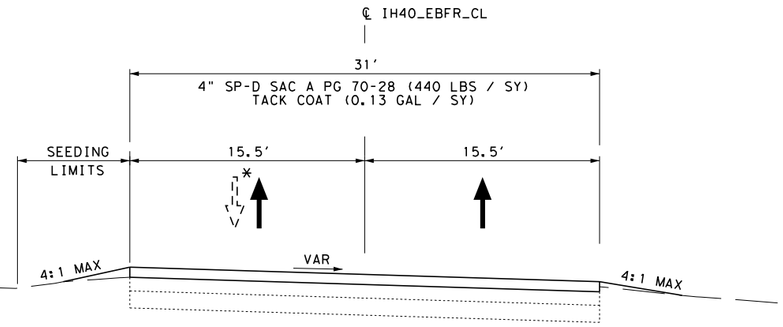
2.5 0 2.5 5
SCALE: 1" = 5′ VERTICAL



IH-40 EBFR TYPICAL SECTION FOR DETOURS PAVEMENT

NOTE:
* BEG TO STA 106+20.00 = TWO WAY
STA 110+00.00 TO END = ONE WAY

CHECK DETOUR PLANS FOR LIMITS OF OVERLAY



IH-40 EBFR PROPOSED TYPICAL SECTION

NOTE:
* STA 106+20.00 TO STA 108+00.00 = TWO WAY
STA 108+00.00 TO 110+00.00 = ONE WAY

12/11/23

STATE OF TEXAS
JAMES W. LANGSTON
73891
LICENSED
PROFESSIONAL ENGINEER

James W. Langston PE

Bridgefarmer & Associates, Inc.
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NO.	DATE	DESCRIPTION	APPROV.

BRIDGEFARMER & ASSOCIATES, INC.
CONSULTING ENGINEERS
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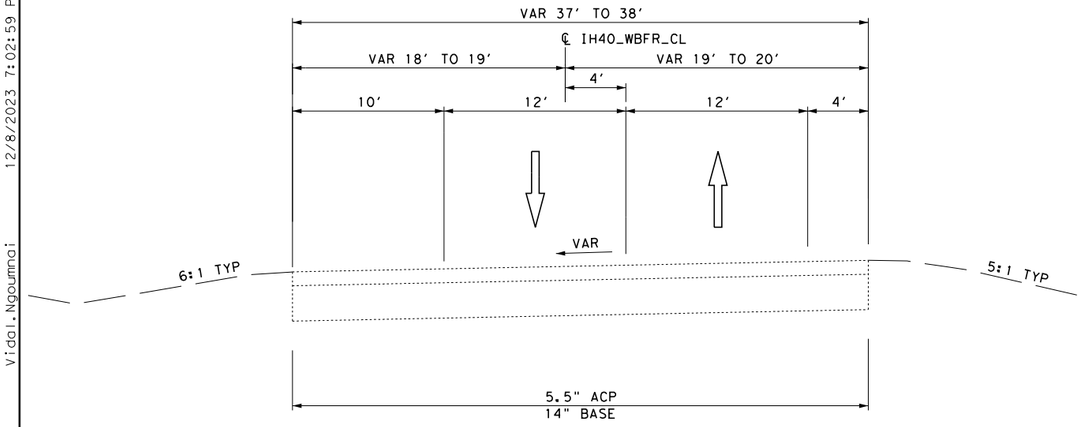
TYPICAL SECTIONS IH-40 EBFR

SHEET 2 OF 3

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DS	6	SEE TITLE SHEET		IH 40
GRAPHICS DW	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK CK1	TEXAS	AMA	POTTER	005
	CONTROL	SECTION	JOB	
CHECK CK2	0090	05	107	

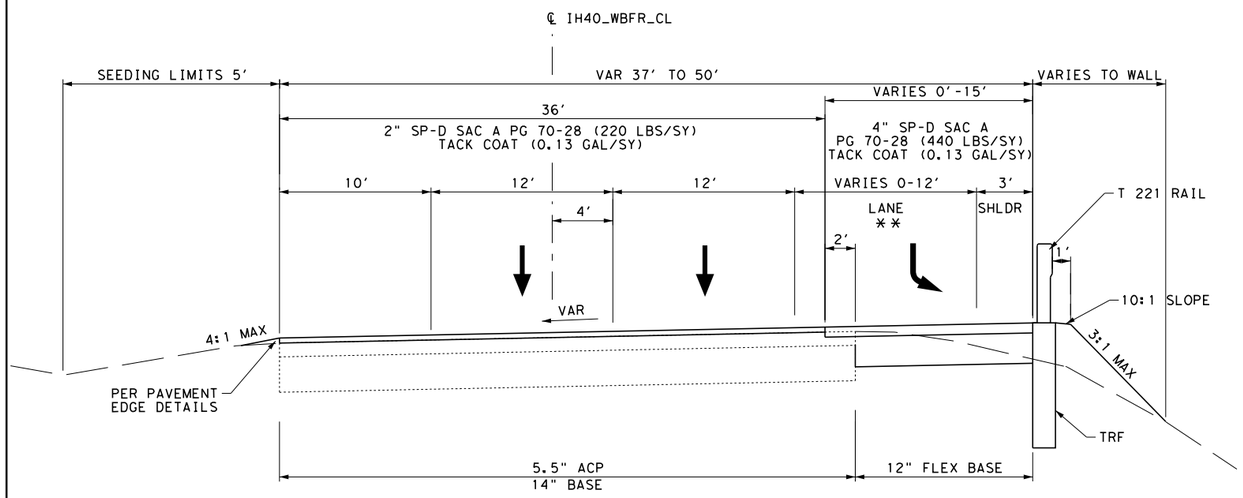
5 0 5 10
SCALE: 1" = 10'
VERT: NTS

2.5 0 2.5 5
SCALE: 1" = 5' VERTICAL



IH-40 WBFR EXISTING TYPICAL SECTION

BEG TO STA 104+49.00 = VAR 37 TO 38
STA 104+49.00 TO STA 110+66.00 = VAR 38 TO 37
STA 110+66.00 TO STA 114+60.93 = VAR 37 TO 38
STA 114+60.93 TO END = 38



IH-40 WBFR PROPOSED TYPICAL SECTION FOR OVERLAY AREA

CHECK DETOUR PLANS FOR LIMITS OF OVERLAY

NOTE:
* * 0' LANE BEG TO STA 109+45.41
12" LANE FROM STA 109+45.41 TO STA 113+10.00
0' TO 12" LANE FROM STA 113+10.00 TO STA 115+85.00
0' LANE FROM STA 115+85.00 TO END

STATE OF TEXAS
JAMES W. LANGSTON
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12/11/23
James W. Langston PE

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NO.	DATE	DESCRIPTION	APPROV.

BRIDGEFARMER & ASSOCIATES, INC.
CONSULTING ENGINEERS
TBPE REGISTRATION NO. 264

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TYPICAL SECTIONS IH-40 WBFR

SHEET 3 OF 3

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DS	6	SEE TITLE SHEET		IH 40
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
DW	TEXAS	AMA	POTTER	006
CHECK	CONTROL	SECTION	JOB	
CK1				
CHECK	0090	05	107	
CK2				

GENERAL NOTES

CSJ: 0090-05-107				
BASIS OF ESTIMATE FOR CONSTRUCTION				
Item	Description	Unit	Rate	
164	SEEDING		SEE PLAN SHEETS	
166	FERTILIZER		SEE PLAN SHEETS	
275	CEMENT TREAT (8")	SY	3% Cement at 21.6 LBS/SY	
310	PRIME COAT (MC-30)	GAL	0.25 GAL/SY	
314	EMULSION ASPHALT (MULTI) (MS-2 OR SS-1)	GAL	SEE NOTE 2	
3077(1)	SP-D SAC-A PG70-28	TON	4"	440 LB/SY/2000
		TON	2"	220 LB/SY/2000
3077	TACK COAT	GAL	.13 GAL / SY	
NOTE:				
(1)	SP-D SAC-A PG70-28 Weight Based On 110Lbs/SY/In			
(2)	40% Emulsified Asphalt 60% Water Mixture Applied At 0.25 Gal/Sy. Paid using 0.1 Gal/Sy.			

General

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

TO:	Amarillo Area Engineer	Joe.Chappell@txdot.gov
CC:	Assistant Area Engineer	CC.Sysombath@txdot.gov
	Director of Construction	Kenneth.Petr@txdot.gov
	Construction Manager	Darrell.Caldwell@txdot.gov

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

For Q&A's on Proposals navigate to:

https://tableau.txdot.gov/views/ProjectInformationDashboard/NoticetoContractors

Use the dashboard to navigate to the project you are interested in by scrolling or filtering the dashboard using the controls on the left. Hover over the blue hyperlink of the project you want to view the Q&A for and click on the link in the window that pops up.

All relevant project documentation including CTD and cross sections will be posted to TxDOT District's FTP website.

https://ftp.dot.state.tx.us/pub/txdot-info/Pre-Letting%20Responses/

Verify all survey control prior to beginning construction. Notify Engineer of any discrepancies in control prior to beginning construction.

There are no "reference markers" within the project limits.

The following Standard Detail Sheets have been modified:

BAS-A (MOD)
PBC-RC (MOD)
C-221 – for aesthetics only non-traffic side aesthetics
SSTR – for aesthetics only on the non-traffic side aesthetics

The Contractor is advised that a construction speed zone will be applicable for this project and is to be limited to the actual work areas under construction. The approved construction speed limit will be made available upon request to the Engineer.

Remove all excess material from bridge substructure resulting from all construction including planing, seal coat and ACP overlays. This work will not be paid for directly, but will be considered subsidiary to various bid items in the contract.

If portions of the right-of-way is used to store materials, equipment, and other uses with the approval of the Engineer, materials, equipment, etc., must either be located outside the 30 feet traffic safety clearance zone or be adequately protected.

Contractor facilities, such as asphalt plants, concrete plants, rock crushers, etc. are not allowed to be located within Department right of way.

The slopes indicated on the typical sections may be varied when fixed features required slopes are re-established as directed by the Engineer.

Dust caused by construction operations is to be controlled by applying water in conformance with the requirements of Item 204, "Sprinkling". Sprinkling for dust control will not be paid for directly, but will be considered as subsidiary work to the various bid items.

Verify all existing grades, elevations, and cross slopes that will connect to any proposed grades and elevations. If adjustments are warranted, the Contractor is to submit proposed changes to the Engineer for verification.

Item 5 Control of the Work

When a precast or cast-in-place concrete element is included in the plans, a precast concrete alternate may be submitted in accordance with "Standard Operating Procedure for Alternate Precast Proposal Submission" found online at:

https://www.txdot.gov/inside-txdot/forms-publications/consultants-contractors/publications/bridge.html#design

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

Item 6 Control of Materials

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

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

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

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

Item 7 Legal Relations and Responsibilities

The Cadillac Ranch car monument, and campground is to always remain accessible.

On IH 40 main lanes, no lane closures are to be allowed during Thanksgiving, Christmas, and New Year's Day holidays and the heavy travel days book-ending each holiday. Travel day coordination will be done with the Engineer to define what needs might fall at this time period.

The total area disturbed for this project is approximately *2.0* acres. The disturbed area in this project, all project locations in the Contract, and the Contractor Project Specific Locations (PSLs), within 1 mile of the project limits, for the Contract will further establish the authorization requirements for storm water discharges. The Department will obtain an authorization to discharge storm water from the Texas Commission on Environmental Quality (TCEQ) for the construction activities shown on the plans. The Contractor is to obtain required authorization from the TCEQ for Contractor PSLs for construction support activities on or off the ROW. When the total area disturbed in the Contract and PSLs within 1 mile of the project limits exceeds 5 acres, provide a copy of the Contractor NOI for PSLs on the ROW to the Engineer and to the local government that operates a separate storm sewer system.

Item 8 Prosecution and Progress

Create, maintain, and submit for acceptance, a Critical Path Method (CPM) project schedule and a Project Schedule Summary Report (PSSR) using computer software that is fully compatible with the latest version of Primavera Systems, Inc. or Primavera P6.
Provide CPM scheduling, in accordance to Item 8. Submit a separate detailed schedule and plan for the Bridge Demolition and Construction Phase a minimum of four weeks prior to the

anticipated start of this work. When the Contractor has made a final determination of the start date, the Contractor must notify the Engineer a minimum of seven days in advance.
Working days will be computed and charged in accordance with Article 8.3.1.1 Five-Day Workweek.

Lane Rental CSJ: 0090-05-107 (IH 40 and HOPE RD)

IH 40: The Contractor will be assessed lane rental charges anytime the IH 40 eastbound or westbound main lanes or frontage roads are, fully closed or obstructed.

All bridge related work within 16' lateral clearance of any IH 40 mainlane will require full closure of the mainlanes in that direction of travel. Full Closure is defined as a Multi Lane Closure when a single direction (eastbound or/and westbound) is closed to traffic.

The table below defines peak hours and off-peak hours for CSJ: 0090-05-107 (IH 40 and HOPE RD)

Peak Hours	Off-Peak Hours
Monday through Sunday 8 AM to 7 PM	Monday through Sunday 7 PM to 8 AM

The lane rental charge will be assessed as follows, but only when one or both main lane either eastbound or westbound is closed or obstructed:

LANE RENTAL RATES – IH 40 MAINLANES AT HOPE RD
West-bound

IH 40 Main Lane Closures	Peak Hours		Off-Peak Hours	
	Hourly Rental Rate	Closure Hours Credited	Hourly Rental Rate	Closure Hours Credited
Single Lane	$50/hour	220	$200/hour	50
Multi Lane Closure Westbound	$600/hour	44	$1200/hour	13

LANE RENTAL RATES – IH 40 MAINLANES AT HOPE RD
East-bound

IH 40 Main Lane Closures	Peak Hours		Off-Peak Hours	
	Hourly Rental Rate	Closure Hours Credited	Hourly Rental Rate	Closure Hours Credited
Single Lane	$50/hour	220	$200/hour	50
Multi Lane Closure East-bound	$600/hour	44	$1200/hour	13

*For Example:

1) A multi main lane closure for 3 hours during peak hours will result in 3 hrs, x 1 multi main lane closure = 3 hrs subtracted from the credited hours or $400 x 3 hrs x 1 multi main lane closure = $1200 if contractor has exhausted all credit hours allotted.

2) A single main lane closure for 2 hours during off - peak hours will result in 2 hrs, x 1 single main lane closure = 2 hrs subtracted from the credited hours or $800 x 2 hrs x 1 single main lane closure = $1600 if contractor has exhausted all credit hours allotted.

Milestone A CSJ: 0090-05-107 (IH 40 and HOPE RD) Bridge replacement

A Milestone A to construct HOPE RD Bridge is designated to facilitate construction as fast as possible.

The time allowed for the HOPE Bridge construction is 166 working days in accordance with Article 8.3.1.1 Five-Day Workweek.

Milestone A time charges will start when the HOPE RD bridge is closed for construction. Closed is defined as when all traffic is closed to the bridge.
Milestone A time charges will end when the following requirement are met.

1. The bridge and approach roadway has one North-bound Lane and one South-bound lane open to traffic and will remain open for the remaining duration of the project.
2. Any travel lane closure exceeding 10hrs will count as a milestone work day.

If the Milestone A is complete, as defined above, earlier than the stated number of working days, a bonus of $3,500 per day for a maximum of 30 days will be awarded. If the Milestone A is not completed, as defined above, within the stated number of days, contract administration and road user liquidated damages of $1500 per day will be assessed for each day more than the stated number of allowable working days for the HOPE RD project until the bridge is completed and open to traffic. The working period charged during the HOPE RD bridge Milestone A shall be included in the computation of the total time charges for the total completion of the project.

Item 110 Excavation

Prior to excavation and placement of embankment, the top-soil (6-inch depth) within the areas to be disturbed will be bladed into a windrow, or stockpiled, outside the limits of the fill slope. After all grading is completed; the top soil (6-inch depth) will be spread over the disturbed areas that will not receive concrete riprap. This work is not paid for directly, but will be considered as subsidiary work to the various bid items.

Item 132 Embankment

The plasticity index for TY B will not exceed 25.

Materials excavated from the project will be allowed to be used on the project as directed by the Engineer.

Item 150 Blading

Blading will be used for regrading the ditch along the East Bound Frontage Road.

Item 164 Seeding for Erosion Control

Perform planting operations in accordance with the recommendations contained in the latest version of the TxDOT manual "A Guide to Roadside Vegetation Establishment" developed by the Vegetation Management Section of the Maintenance Division.

Seeding may require more than one mobilization, depending upon the Contractor's sequence of work.

Item 166 Fertilizer

Fertilize all areas of project to be seeded or sodded in accordance with the Amarillo District Vegetation Specification Sheet.

Item 169 Soil Retention Blankets

All Class 1 Slope Protection will be the roll-out type, having netting on both sides. Hydraulically placed materials will not be allowed.

Item 247 Flexible Base

SPECIFICATION FOR FLEX BASE TY A, B OR D, GR 4								
GRADING REQUIREMENTS PERCENT RETAINED – SIEVES SIEVE SIZES INCHES					***SOIL CONSTANTS***		***MAX WET BALL*** *	***MAX % INCREASE IN PASSING # 40*** *
1 3/4	***7/8***	***3/8***	***# 4***	***# 40***	*L.L. MAX*	*P.I. MAX*		
0	*17-32*	*40-60*	*50-70*	*70-85*	*40*	*12*	*45*	*20*

*Applies to TY A material only.

Item 320 Equipment for Asphalt Concrete Pavement

A self-propelled, wheel mounted material transfer vehicle (MTV) capable of receiving hot mix from the haul trucks separate from the paver is required on all courses and all types of hot mix for this project. The MTV is to have a minimum storage capacity of approximately 25 tons, and equipped with a pivoting discharge conveyor and a means of completely remixing the hot mix prior to placement. The paver hopper is to be equipped with a separate surge storage insert with a minimum capacity of approximately 20 tons.

If used, the IR bar read out screen must be visible at all times to the Engineer.

When performing any scheduled work during night time hours (sunset to sunrise) all work areas will be fully illuminated using devices designed to not incumber or distract oncoming traffic. All illumination equipment must be approved by the Engineer in writing 48 hours before any scheduled night time work can begin. All associated equipment and labor is considered subsidiary to the item of work and will not be paid for directly.

Item 354 Planing and Texturing Pavement

The Contractor will retain ownership of planed materials.

Item 416 Drilled Shaft Foundations

A stabilization method is to be used to prevent caving of the material and is to be submitted as part of the Contractor's Safety Plan.

Item 420 Concrete Substructures

Slope top of Abutment Caps, Bent Caps, except the Bearing Seats, such that water will drain away from the Backwall. This work will not be paid for directly, but will be considered subsidiary to pertinent items.

Mass Concrete will be a plans quantity item.

Item 421 Hydraulic Cement Concrete

The sand equivalent value of fine aggregate is not to be less than 85 when subjected to test method tex-203-F.

The Engineer will perform all job control testing for acceptance.

The Engineer will provide strength-testing equipment when required in accordance with the Contract-controlling tests.

Furnish and maintain the following testing equipment:

- Test Molds

All cast-in-place concrete except for drilled shafts are to be air-entrained. Pre-cast and drilled shaft concrete may be air-entrained at the Contractor's option.

The Engineer will provide strength testing equipment for acceptance testing

Item 422 Concrete Superstructures

For the concrete for bridge deck, provide Class S concrete meeting the following:

- Do not use silica fume as a cement replacement.
- Include synthetic macro-fibers in all bridge slabs at a rate of 4 lbs/CY. The fibers shall conform to ASTM C1116 , Type III and have a minimum length of 2 inches. The following macro-fibers are approved for this project:
  - Euclid Tuf-Strand SF
  - Forta-Ferro
- Include a Shrinkage Reducing Admixture (SRA)(capillary tension reducing type) at a minimum rate of 1 gal/cy in cast-in-place bridge deck concrete. The shrinkage reducing admixture must be compatible with other admixture(s) in the mix and mix adjusted to maintain the required air-entrainment. Include type and dosage information in proposed mixed design for approval.

Provide a minimum of two work bridges for finishing operations, application of evaporation protection and application of interim cure.

Provide a minimum of 1 immersion type vibrator having a rubber or non-metallic head for each 25 ft. of bridge deck placement width. Additional vibrators may be required if the concrete consolidation required by the specification is not achieved.

Thoroughly saturate precast deck panels to obtain saturated surface dry (SSD) a minimum of 3 hours prior to placing concrete. Maintain SSD condition until deck concrete is placed.

The use of evaporation protection is required. Use the Wet Burlap method for evaporation protection, in accordance with Article 7 Section 1.2. The use of evaporation retardant is not allowed.

Use cotton mats for final curing. The burlap placed for evaporation protection can be left in place and covered with the cotton mats. At a minimum, cover the cotton mats with plastic and install soaker hoses sufficient to keep the cotton mats continuously wet for the duration of the required curing time.

Provide 1 ½" vinyl or plastic Joint Former (Stress Cap, Zip Strip, Stress Lock, or equal as approved by the Engineer) for all construction or controlled joints in the top of the continuous bridge slab.

Thickened slab ends will be required on all bridges regardless of skew.

Item 423 Retaining Wall

Provide the following surface finish for walls:

- See AMA MSE RETAINING WALL FINISH DETAIL sheet in the plans

Retaining Walls:

The color of the form liner finish on the retaining wall will be the dark color. The smooth finish along the top, edges, simulated columns and simulated coping of each panel will be the light color.

Directly on top of the select fill for the walls that are below pavement, place filter fabric material that meets the requirements of DMS -6200 Filter Fabric. This is to prevent road embankment or base from seeping into any potential void. Payment for this material is considered subsidiary to Item 423.

Item 425 Prestressed Concrete Structural Members

Calcium Nitrite, an inorganic corrosion inhibitor admixture, is to be added to prestressed concrete beams and panels at a dosage rate of 3.0 gal/cy.

Item 427 Surface Finishes for Concrete –

Provide a rub finish to Surface Area II as described in the standard specification.

Retaining Walls:

The color of the form liner finish on the retaining wall will be the dark color. The smooth finish along the top, edges, simulated columns and simulated coping of each panel will be the light color.

Areas and colors will be approved by the Engineer. This work will not be paid for directly, but will be considered subsidiary to Item 427.

Allowable substitutes for TY X waterproofing materials include:

- ♦ Macropoxy® 646 Fast Cure | Protective & Marine Coatings (sherwin-williams.com). Two coats at maximum coverage rate of 200 SF/Gal per coat
- ♦ Si-Prime + Si-Rex03 - Klaas Coatings North America (klaascoatings-northamerica.com). One coat of Si-Prime at maximum coverage rate of 200 SF/Gal and two coats Si-Rex03 at maximum coverage rate of 300 SF/Gal per coat
- ♦ Sikagard®-550 W Elastic (G) | Concrete Protection. Two coats at maximum coverage rate of 100 SF/Gal per coat
- ♦ Loxon® XP LX11-50 Series | Waterproofing Masonry Coating-Flat | Sherwin Williams. Two coats at maximum coverage rate of 100 SF/Gal per coat

Follow form liner manufacturer's recommended procedures for form liner construction.

The form liner will release clean and free of the concrete, without pulling or breaking concrete from the textured surface.

Seal all form liner joints, in a manner acceptable to prevent leakage at the surface.

Provide form liner surface finishes of the types and at locations shown in the plans.

Item 432 Riprap

All concrete riprap in contact with bridge abutments is to have joints made with a 6" fiber expansion joint material and be sealed with a joint sealer as approved by the Engineer. Afterward, use Cap Option A with 20 GA metal flashing for concrete riprap in contact with the abutment and wingwalls.

24" tie bars (#3 bars at 18" c-c) are to be used across all construction joints. Tie bars should be 12'' into each side of the construction joint. When tying new riprap into existing riprap drill and epoxy grout 8" minimum into existing concrete. This is to be considered subsidiary to the payment for riprap.

Provide an intermediate toe wall when rip rap exceeds 25' vertically.

Use of #3 rebar for reinforcing is required.

Item 440 Reinforcement for Concrete

At the Contractor's option, galvanized, low-carbon chromium (ASTM A1035), or zinc-coated hot-dip galvanized reinforcing steel may be substituted for the specified epoxy coated reinforcing steel. Any substitution will be done at no additional cost to the Department.

For bridge decks, provide GFRP bar reinforcement conforming to ASTM D7957/7957M in the top mat, except provide a minimum modulus of elasticity of 7,500ksi.

For bridge decks, provide galvanized or low-carbon chromium (ASTM A1035) reinforcement in the bottom mat of the overhangs. GFRP bars are permitted in the bottom mat if an alternative GFRP slab design with calculations signed and sealed by a professional engineer are provided.

Provide bar laps, where required, as follows:

galvanized or low-carbon chromium (ASTM A1035) - #4 = 2'-5"
GFRP - #5 = 2'-9"

Tie reinforcement for the top mat in the bridge slab at all intersections regardless of reinforcement spacing.

Item 450 Railing

Do not use drain slots in bridge rail.

Item 454 Bridge Expansion Joints

Use Sealtite Bridge Joint Sealant 50N or Chase Construction products Phyzite 380 premolded preformed compressible joint material or approved equal. Install per manufacturer's recommendation.

Item 460 Corrugated Metal Pipe

Corrugated Metal Pipe (CMP) used to provide a placeholder for future drilled shafts of a u-turn bridge are to be filled in with embankment material and capped with a 4" riprap concrete top.

Item 462 Concrete Box Culverts and Storm Drains

Joint material for reinforced concrete pipe is to be either cold applied preformed plastic gaskets or cold applied plastic asphalt sewer joint compound.

Backfill pipe up to the springline with granular material. The ponding method of backfilling will be allowed for the granular material only.

Item 464 Reinforced Concrete Pipe

Joint material for all pipes will be cold applied plastic asphalt sewer joint compound.

Bedding for pipe culverts is to be 6 inches of sand. The excavation required to place the sand will not be paid for directly but will be considered subsidiary to this item.

Backfill pipe up to the springline with granular material. The ponding method of backfilling will be allowed for the granular material only.

Item 465 Manholes and Inlets

Place concrete inverts in all inlets & manholes/Jct Boxes. This work will not be paid for directly but will be considered subsidiary to this item.

Item 466 Headwalls and Wingwalls

Do not use precast headwalls/wingwalls.

Item 467 Safety End Treatment

Pre-cast Safety End Treatments are allowed; however, a cast-in-place concrete apron will be required & will be subsidiary to the Safety End Treatment.

Item 480 Cleaning Existing Culverts

There are 2 culverts with approximately 3" to 4" of silt. The culvert under Hope Rd along the East Bound Frontage Road and the culvert downstream from this one at the entrance to the Cadillac Ranch facility.

Item 496 Removing Structures

Provide the Engineer a minimum of 15 working days' notice prior to beginning bridge demolition.

Removal of the approach slabs is considered subsidiary to this item.

Item 502 Barricades, Signs, and Traffic Handling

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

Temporary rumble strips will be required as shown on WZ(RS)-22 regardless of loose gravel, and/or soft or bleeding asphalt. Adjust the traffic control setup such that rumble strips are not placed in areas of heavily rutted pavements, unpaved surfaces, or horizontal curves. Temporary rumble strips will not be allowed on interstate highway.

The Contractor is to have the option of using either plastic drums, vertical panels, grabber cones or a combination where drums are shown as channelizing devices, as approved by the Engineer. Plastic drums are to be used in all transition areas in accordance with BC(8)-21 and WZ(TD)-17.

Furnish and install "soft shoulder" signs as directed by the Engineer. This work will not be paid for directly, but will be considered as subsidiary to item 502, "Barricades, Signs and Traffic Handling".

Provide a 3:1 backfill "safety slope" at the end of the day for any drop off exceeding 2" that is adjacent to a travel lane.

Notify the Engineer 24 hours prior to any lane closure.

Any work being done above travel lanes will require the lanes to be closed for traffic safety.

Item 504 Field Office and Laboratory

The following buildings will be required for this project:

One Type (D) structure, asphalt mix control laboratory

Each building is to be provided before work is begun on the pertinent construction items for which it is needed.

Any laboratory furnished is to be a minimum of 10 ft in width.

All-weather parking area and chain link security fence will not be required.

The Type D structures are to be equipped with the following in addition to requirements specified under item 504:

a. Safety equipment
   (1) One eye wash station
   (2) One fire extinguisher
   (3) One first aid kit

Furnish a Type D structure for the asphalt mix control laboratory for the Engineer's exclusive use. In addition to requirements of item 504, this structure is to have a minimum height of 8 feet and provide a minimum 400 square feet gross floor area for permanently located plants or 200 square feet for temporary located plants serving one project. The floor area will be partitioned into a minimum of two interconnected rooms, each room furnished with an exterior door and a minimum of two windows. The floor is to have sufficient strength to support the testing equipment and have an impervious covering.

The Type D structures are to be adequately air conditioned and be furnished with a minimum of one desk and three chairs. The structure is to be provided with a 240-volt electrical service entrance. The service is to consist of a minimum of 4 - 120 volt circuits with 20 amp breakers and no more than two grounded convenience outlets per circuit and provisions for a minimum of two 220-volt ovens with vents to the outside. The structure is to have a minimum of 2 convenience outlets per wall, and a utility sink with an adequate clean potable water supply for testing. The state building is to be equipped with at minimum a hot water dispenser or hot water heater capable of generating 1 gallon of water per use at 140º F with adequate water pressure. Space heaters for heating the structure are unacceptable. Portable structures are to be support blocked for stability and are to be tied down.

If needed, each building is to be moved to a new location as directed by the Engineer. Any building that is no longer required on the job after completion of the pertinent construction items may be released to the Contractor upon consent of the Engineer.

Item 506 Temporary Erosion, Sedimentation, and Environmental Controls

Erosion control devices are to be installed as needed in coordination with the work progress, or as directed by the Engineer.

Use wooden stakes to secure erosion control logs. Do not use rebar stakes.

Item 512 Portable Concrete Traffic Barrier

The state will furnish the portable concrete traffic barrier sections for Item 512, "Port. Concrete Traffic Barrier (Des Source)", the state will supply sufficient hardware to connect the sections together. The sections will be available at Soncy and IH 40.

When the Engineer determines that all phases of construction involving portable concrete traffic barriers are complete, the Contractor is to remove and deliver the PCTB sections, complete with

all mounting hardware, to IH 40 & FM 3319 (west of Vega). The Engineer will designate a location for unloading the PCTB sections. This work will be measured and paid for at the unit price bid for item 512, "Port Concrete Traffic Barrier (STKPL)".

Item 514 Permanent Concrete Traffic Barrier

The "Type 2" precast concrete traffic barrier is to be joined together using a "Type B" joint.

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

Expansion joints are to be at least one-half inch thick and spaced at maximum intervals of 40 feet. Planes of weakness are to be spaced at approximately ten feet intervals. Joint material will comply with ASTM-D 1751.

Item 531 Sidewalks

For sidewalks not on the bridge, to be constructed using: 1" compacted sand cushion, reinforcing steel to be 6"x6" W1.4 x W1.4 welded wire mesh (1 1/2" above sand) or No.3 bar 18" O.C. with grooved joint every 10' and 1/2" fiber board expansion joint every 40’.

Between back of curb and sidewalk 1/2” fiber board expansion joint will be used.

Item 540 Metal Beam Guard Fence

Drive steel posts for metal beam guard fence a minimum of 1/3 of the post length to final specified depth.

Item 542 Removing Metal Beam Guard Fence

All MBGF, GET & TAS materials determined by the Engineer to be salvageable will remain property of the Contractor.

Item 544 Guardrail End Treatments

Use Single Guardrail End Treatment (Ty III)(Steel Post).

Item 610 Roadway Illumination Assemblies

Furnish and install steel (not aluminum) roadway illumination poles. Fabricate roadway illumination assemblies in accordance with shop drawings approved by the department. Submit shop drawings for each projector use pre-approved standard shop drawings.

Copies of the standard shop drawings are on file with traffic operations division, bridge division, and the materials section of construction division. Additional shop drawings for roadway illumination assemblies built in accordance with these drawings are not required. Pre-approved shop drawing manufacturers and assembly model numbers can be found at https://www.txdot.gov/business/resources/materials/material-producer-list.html

Category is roadway illumination and electrical supplies.

For project specific special design shop drawings, furnish shop drawings of the complete assembly in accordance with item 441, “steel structures”. Deliver shop drawings to the Engineer at the project address.

Item 618 Conduit

The locations of conduit as shown are for diagrammatic purposed only and may be varied to meet local conditions, subject to approval. Backfill all open trenches before the end of the workday and do not leave any trench open overnight.

Item 620 Electrical Conductors

Provide breakaway electrical connectors for breakaway poles. Use Bussman HEBW, Littlefuse LEB, Ferraz-Shawmut FEB, or equal on ungrounded conductors. For grounded conductors, use Bussman HET, Littlefuse LET, Ferraz-Shawmut FEBN, or equal. These breakaway connectors have a white colored marking and a permanently installed solid neutral. See the latest RID (2) standard for additional details.

Item 624 Ground Boxes

Do not place ground boxes in driveways or wheelchair ramps. Alternate ground box locations will be as directed.

Item 644 Small Roadside Sign Supports and Assemblies

ALUMINUM SIGN BLANKS THICKNESS	Square Feet	Minimum Thickness
	Less than 7.5	0.100
	7.5 or Greater	0.125

All slip base signs will have a triangular slip base with a 2-bolt clamp to prevent rotation of signpost. Set screw type slip base will not be allowed.

A 7" x 1/2" diameter galvanized rod or #4 rebar is to be installed in the sign stub as shown on SMD(SLIP-1)-08 to prevent rotation of the sign stub in the concrete footing.

The exact locations of the large and small roadside signs are to be as designated by the Engineer.

The existing riprap aprons are to be removed and disposed of as approved by the Engineer. This work is not to be paid for directly, but will be considered subsidiary to the removal of foundations under this item.

Probe before drilling for foundations to determine the location of all utilities and structures. This work will not be paid for directly, but will be considered subsidiary to bid items involved.

Details for standard signs not shown on the signing standards of the signing detail plan sheets are to be in conformance with the department's "Standard Highway Sign Designs for Texas" Manual, Latest Edition.

Install a wrap of retroreflective sheeting conforming to DMS-8300 on all posts for small road sign assemblies. Sign post wraps will not be paid for directly, but are considered subsidiary to Item 644.

Install red sheeting on the posts containing the following signs:
Stop, Yield, Wrong Way & Do Not Enter

Install yellow sheeting on all other small sign posts.

Install all retroreflective wraps at a height of 4 ft. from bottom of the wrap to the edge of the travel lane surface. All retroreflective wraps will cover the full circumference of the sign post for a vertical width of 12 inches.

Item 658 Delineator and Object Marker Assemblies

For all concrete barrier, bridge rail, and guard fence post mounted applications provide hollow or tubular posts with approved anchorage.

Item 666 Reflectorized Pavement Markings

Retroreflectivity Requirements:

All Type I markings must meet the minimum retroreflectivity values for edgeline markings, centerline or no passing barrier-line, and lane lines when measured any time after 3 days, but not later than 10 days after application:

- White markings: 250 millicandelas per square meter per lux ($mcd/m^2/lx$)
- Yellow markings: 175 $mcd/m^2/lx$

Retroreflectivity Measurements: Mobile or portable retroreflectometers may be used at the Contractor’s discretion.

All Type I markings must meet the minimum retroreflectivity values for edgeline markings, centerline or no passing barrier-line, and lane lines when measured any time after 3 days, but not later than 10 days after application.

Item 3077 Superpave Mixtures

Use aggregate that meets the SAC requirement of class A.

Only fractionated RAP is allowed.

Use of RAS is not allowed.

All SP-D on this project is considered surface mix. A substitution PG binder is not allowed, as shown in Table 5.

When laying ACP on a roadway that has two or more lanes and the work is being done under traffic, then the adjacent lane or lanes are to be overlaid by the end of the following day.

Make a smooth, clean, minimum 1 inch deep butt joint where each end of the new pavement joins the existing pavement. Any method approved by the Engineer can be used to make the joint.

The District Lab will perform a maximum of 2(two) design verification tests. If additional verification tests are needed, the Contractor will be billed $3,500.00 per each additional verification test required to obtain an approved asphaltic concrete pavement mix design.

If lime is not used as an antistrip agent, then the production and placement testing frequency for the Boil test (TEX-530-C) shown in the table below.

Description	Test Method	Minimum Contractor Testing Frequency	Minimum Engineer Testing Frequency
Boil test	Tex-530-C	1 per lot	1 per 12 sublots

If used, the IR bar read out screen must be visible at all times to the Engineer.

Item 3096 Asphalts, Oils, and Emulsions

Asphalt from different sources is not to be blended.

The "Open" seasons for applying asphaltic materials and mixtures for the listed items are to be as follows, unless authorized otherwise in writing by the Engineer:

Item 6001 Portable Changeable Message Sign

Supply 2 Portable Changeable Message Signs (Type II – Lamp Matrix) for this project.
No payment will be made for removing and replacing damaged PCMS.

If the Contractor chooses to have more than one lane closure set-up at a time, provide additional PCMS in accordance with TCP at no additional charge to the department.

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

In addition to the shadow vehicles with truck mounted attenuator (TMA) that are specified as being required on the traffic control plan for this project, provide 0 additional shadow vehicle(s) with TMA for TCP (1-2)-18, (1-3)-18, (1-4)-18, (2-2)-18, (2-3)-23, (2-6)-18, (6-1)-12, (6-3)-12, (6-4)-12, (6-6)-12, (6-7)-12, (6-9)-14 as detailed on the General Notes of this standard sheets.

Therefore, 2 total shadow vehicles with TMA will be required for this type of work. The Contractor will be responsible for determining if one or more of these operations will be ongoing at the same time to determine the total number of TMAs needed for the project.

Estimate & Quantity Sheet

CONTROLLING PROJECT ID 0090-05-107 **DISTRICT** Amarillo **COUNTY** Potter
HIGHWAY IH 40

						TOTAL EST.	TOTAL FINAL
		CONTROL SECTION JOB		**0090-05-107**			
		PROJECT ID		**A00183717**			
		COUNTY		**Potter**			
		HIGHWAY		**IH 40**			
ALT	**BID CODE**	**DESCRIPTION**	**UNIT**	EST.	FINAL		
	104-6009	REMOVING CONC (RIPRAP)	SY	900.000		900.000	
	104-6054	REMOVING CONCRETE(MOW STRIP)	LF	1,452.000		1,452.000	
	105-6036	REMOVING STAB BASE & ASPH PAV(15"-20")	SY	697.000		697.000	
	110-6001	EXCAVATION (ROADWAY)	CY	3,453.000		3,453.000	
	132-6004	EMBANKMENT (FINAL)(DENS CONT)(TY B)	CY	15,770.000		15,770.000	
	150-6002	BLADING	HR	8.000		8.000	
	164-6023	CELL FBR MLCH SEED(PERM)(RURAL)(CLAY)	SY	27,860.000		27,860.000	
	169-6001	SOIL RETENTION BLANKETS (CL 1) (TY A)	SY	3,299.000		3,299.000	
	247-6258	FL BS (CMP IN PLC)(TY A OR B GR4)(12")	SY	2,202.000		2,202.000	
	354-6002	PLAN & TEXT ASPH CONC PAV(0" TO 2")	SY	6,250.000		6,250.000	
	400-6005	CEM STABIL BKFL	CY	625.000		625.000	
	402-6001	TRENCH EXCAVATION PROTECTION	LF	218.000		218.000	
	403-6001	TEMPORARY SPL SHORING	SF	6,309.000		6,309.000	
	416-6001	DRILL SHAFT (18 IN)	LF	250.000		250.000	
	416-6002	DRILL SHAFT (24 IN)	LF	12.000		12.000	
	416-6004	DRILL SHAFT (36 IN)	LF	1,397.000		1,397.000	
	416-6006	DRILL SHAFT (48 IN)	LF	517.000		517.000	
	420-6011	CL B CONC (FLUME)	CY	19.000		19.000	
	420-6013	CL C CONC (ABUT)	CY	92.700		92.700	
	420-6029	CL C CONC (CAP)	CY	51.800		51.800	
	420-6037	CL C CONC (COLUMN)	CY	84.300		84.300	
	420-6066	CL C CONC (RAIL FOUNDATION)	CY	150.000		150.000	
	422-6001	REINF CONC SLAB	SF	19,994.000		19,994.000	
	422-6011	BRIDGE MEDIAN	SF	1,251.000		1,251.000	
	422-6013	BRIDGE SIDEWALK	SF	3,253.000		3,253.000	
	422-6015	APPROACH SLAB	CY	330.500		330.500	
	423-6001	RETAINING WALL (MSE)	SF	13,071.000		13,071.000	
	425-6024	PRESTR CONC BOX BEAM (5XB34)	LF	2,157.690		2,157.690	
	427-6007	EPOXY WATERPROOF FINISH (TY X)	SF	991.000		991.000	
	432-6001	RIPRAP (CONC)(4 IN)	CY	5.000		5.000	
	432-6044	RIPRAP (CONC)(FLUME)	CY	81.000		81.000	
	432-6045	RIPRAP (MOW STRIP)(4 IN)	CY	51.000		51.000	
	442-6007	STR STEEL (MISC NON - BRIDGE)	LB	341.000		341.000	
	450-6023	RAIL (TY SSTR)	LF	1,111.600		1,111.600	
	450-6030	RAIL (TY C221)	LF	381.000		381.000	
	454-6007	HEADER TYPE EXPANSION JOINT	LF	232.000		232.000	
	460-6003	CMP (GAL STL 24 IN)	LF	90.000		90.000	

Estimate & Quantity Sheet

CONTROLLING PROJECT ID 0090-05-107 **DISTRICT** Amarillo **COUNTY** Potter
HIGHWAY IH 40

			CONTROL SECTION JOB	**0090-05-107**		TOTAL EST.	TOTAL FINAL
			PROJECT ID	**A00183717**			
			COUNTY	**Potter**			
			HIGHWAY	**IH 40**			
ALT	**BID CODE**	**DESCRIPTION**	**UNIT**	EST.	FINAL		
	460-6006	CMP (GAL STL 42 IN)	LF	155.000		155.000	
	462-6045	CONC BOX CULV (3 FT X 2 FT)(EXTEND)	LF	9.000		9.000	
	464-6005	RC PIPE (CL III)(24 IN)	LF	194.000		194.000	
	464-6007	RC PIPE (CL III)(30 IN)	LF	8.000		8.000	
	465-6562	INL(CMP)(PAZD-CZ)(FG)(5FTX5FT-4FTX4FT)	EA	3.000		3.000	
	467-6580	SET (REMOV & REINSTALL)	EA	1.000		1.000	
	480-6001	CLEAN EXIST CULVERTS	EA	2.000		2.000	
	496-6002	REMOV STR (INLET)	EA	2.000		2.000	
	496-6007	REMOV STR (PIPE)	LF	97.000		97.000	
	496-6010	REMOV STR (BRIDGE 100 - 499 FT LENGTH)	EA	1.000		1.000	
	500-6001	MOBILIZATION	LS	1.000		1.000	
	502-6001	BARRICADES, SIGNS AND TRAFFIC HANDLING	MO	9.000		9.000	
	506-6020	CONSTRUCTION EXITS (INSTALL) (TY 1)	SY	156.000		156.000	
	506-6024	CONSTRUCTION EXITS (REMOVE)	SY	156.000		156.000	
	506-6038	TEMP SEDMT CONT FENCE (INSTALL)	LF	140.000		140.000	
	506-6039	TEMP SEDMT CONT FENCE (REMOVE)	LF	140.000		140.000	
	506-6041	BIODEG EROSN CONT LOGS (INSTL) (12")	LF	140.000		140.000	
	506-6043	BIODEG EROSN CONT LOGS (REMOVE)	LF	140.000		140.000	
	508-6004	CONSTRUCTING DETOURS (TY 2)	SY	32,789.000		32,789.000	
	512-6017	PORT CTB (DES SOURCE)(F-SHAPE)(TY 1)	LF	600.000		600.000	
	512-6041	PORT CTB (STKPL)(F-SHAPE)(TY 1)	LF	600.000		600.000	
	514-6003	PERM CTB (SGL SLOPE) (TY 3) (42)	LF	370.000		370.000	
	529-6008	CONC CURB & GUTTER (TY II)	LF	270.000		270.000	
	531-6003	CONC SIDEWALKS (6")	SY	69.000		69.000	
	531-6015	CURB RAMPS (TY 20)	EA	2.000		2.000	
	536-6002	CONC MEDIAN	SY	58.000		58.000	
	540-6002	MTL W-BEAM GD FEN (STEEL POST)	LF	50.000		50.000	
	540-6006	MTL BEAM GD FEN TRANS (THRIE-BEAM)	EA	2.000		2.000	
	542-6001	REMOVE METAL BEAM GUARD FENCE	LF	1,275.000		1,275.000	
	542-6002	REMOVE TERMINAL ANCHOR SECTION	EA	2.000		2.000	
	542-6003	REMOVE DOWNSTREAM ANCHOR TERMINAL	EA	4.000		4.000	
	542-6004	RM MTL BM GD FENCE TRANS (THRIE-BEAM)	EA	2.000		2.000	
	543-6001	CABLE BARRIER SYSTEM (TL-3)	LF	856.000		856.000	
	543-6022	REMOVE CABLE BARRIER TERMINAL SECTION	EA	1.000		1.000	
	543-6024	INSTALL SALVAGE CABLE BAR TERM SECTION	EA	1.000		1.000	
	544-6001	GUARDRAIL END TREATMENT (INSTALL)	EA	2.000		2.000	
	545-6005	CRASH CUSH ATTEN (REMOVE)	EA	1.000		1.000	

Estimate & Quantity Sheet

CONTROLLING PROJECT ID 0090-05-107 **DISTRICT** Amarillo **COUNTY** Potter
HIGHWAY IH 40

			CONTROL SECTION JOB		**0090-05-107**	TOTAL EST.	TOTAL FINAL
			PROJECT ID		**A00183717**		
			COUNTY		**Potter**		
			HIGHWAY		**IH 40**		
ALT	**BID CODE**	**DESCRIPTION**	**UNIT**	EST.	FINAL		
	545-6019	CRASH CUSH ATTEN (INSTL)(S)(N)(TL3)	EA	3.000		3.000	
	610-6106	IN RD IL (U/P) (TY 2) (150W EQ) LED	EA	4.000		4.000	
	618-6046	CONDT (PVC) (SCH 80) (2")	LF	220.000		220.000	
	618-6047	CONDT (PVC) (SCH 80) (2") (BORE)	LF	80.000		80.000	
	618-6062	CONDT (RM) (3/4")	LF	220.000		220.000	
	620-6003	ELEC CONDR (NO.12) BARE	LF	240.000		240.000	
	620-6004	ELEC CONDR (NO.12) INSULATED	LF	480.000		480.000	
	620-6007	ELEC CONDR (NO.8) BARE	LF	325.000		325.000	
	620-6008	ELEC CONDR (NO.8) INSULATED	LF	650.000		650.000	
	624-6002	GROUND BOX TY A (122311)W/APRON	EA	2.000		2.000	
	644-6001	IN SM RD SN SUP&AM TY10BWG(1)SA(P)	EA	1.000		1.000	
	644-6004	IN SM RD SN SUP&AM TY10BWG(1)SA(T)	EA	2.000		2.000	
	644-6007	IN SM RD SN SUP&AM TY10BWG(1)SA(U)	EA	1.000		1.000	
	644-6027	IN SM RD SN SUP&AM TYS80(1)SA(P)	EA	5.000		5.000	
	644-6030	IN SM RD SN SUP&AM TYS80(1)SA(T)	EA	5.000		5.000	
	644-6033	IN SM RD SN SUP&AM TYS80(1)SA(U)	EA	1.000		1.000	
	644-6064	IN BRIDGE MNT CLEARANCE SGN ASSM(TY N)	EA	2.000		2.000	
	644-6076	REMOVE SM RD SN SUP&AM	EA	6.000		6.000	
	647-6002	RELOCATE LRSA	EA	1.000		1.000	
	658-6062	INSTL DEL ASSM (D-SW)SZ 1(BRF)GF2(BI)	EA	6.000		6.000	
	658-6071	INSTL DEL ASSM (D-SY)SZ (BRF)CTB (BI)	EA	15.000		15.000	
	666-6006	REFL PAV MRK TY I (W)4"(DOT)(100MIL)	LF	54.000		54.000	
	666-6063	REFL PAV MRK TY I(W)(UTURN ARW)(100MIL)	EA	2.000		2.000	
	666-6078	REFL PAV MRK TY I (W)(WORD)(100MIL)	EA	2.000		2.000	
	668-6033	PREFAB PAV MRK TY B (W)(18")(YLD TRI)	EA	8.000		8.000	
	668-6076	PREFAB PAV MRK TY C (W) (24") (SLD)	LF	62.000		62.000	
	672-6010	REFL PAV MRKR TY II-C-R	EA	146.000		146.000	
	678-6002	PAV SURF PREP FOR MRK (6")	LF	1,500.000		1,500.000	
	678-6004	PAV SURF PREP FOR MRK (8")	LF	676.000		676.000	
	3077-6058	SP MIXES SP-D SAC-A PG70-28	TON	865.000		865.000	
	4171-6001	INSTALL BRIDGE IDENTIFICATION NUMBERS	EA	2.000		2.000	
	6001-6002	PORTABLE CHANGEABLE MESSAGE SIGN	EA	2.000		2.000	
	6024-6008	HPPM W/RET REQ TY I(W)6"(BRK)(090MIL)	LF	1,640.000		1,640.000	
	6024-6011	HPPM W/RET REQ TY I(W)6"(SLD)(090MIL)	LF	10,350.000		10,350.000	
	6024-6012	HPPM W/RET REQ TY I(W)6"(SLD)(100MIL)	LF	1,777.000		1,777.000	
	6024-6023	HPPM W/RET REQ TY I(Y)6"(SLD)(090MIL)	LF	10,405.000		10,405.000	
	6185-6002	TMA (STATIONARY)	DAY	8.000		8.000	

Estimate & Quantity Sheet

CONTROLLING PROJECT ID 0090-05-107 **DISTRICT** Amarillo **COUNTY** Potter
HIGHWAY IH 40

						TOTAL EST.	TOTAL FINAL
		CONTROL SECTION JOB		**0090-05-107**			
		PROJECT ID		**A00183717**			
		COUNTY		**Potter**			
		HIGHWAY		**IH 40**			
ALT	**BID CODE**	**DESCRIPTION**	**UNIT**	EST.	FINAL		
	6185-6003	TMA (MOBILE OPERATION)	HR	40.000		40.000	
	18	SAFETY CONTINGENCY: CONTRACTOR FORCE ACCOUNT WORK (PARTICIPATING)	LS	1.000		1.000	
		EROSION CONTROL MAINTENANCE: CONTRACTOR FORCE ACCOUNT WORK (PART)	LS	1.000		1.000	

SUMMARY OF WORKZONE TRAFFIC CONTROL ITEMS

LOCATION	150 6002		508 6004	512 6017	512 6041	545 6005	545 6019
	BLADING		CONSTRUCTING DETOURS (TY 2) (2" OVERLAY: 220LB/SY/2000)	PORT CTB (DES SOURCE) (F-SHAPE) (TY 1)	PORT CTB (STKPL) (F-SHAPE) (TY 1)	CRASH CUSH ATTEN (REMOVE)	CRASH CUSH ATTEN (INSTL) (S) (N) (TL3)
	HR		SY	LF	LF	EA	EA
TRAFFIC CONTROL PLAN PHASE1	8		32789	600	600	1	1
TRAFFIC CONTROL PLAN PHASE2							
PROJECT TOTALS	**8**		**32789**	**600**	**600**	**1**	**1**

SUMMARY OF DRAINAGE ITEMS

LOCATION	402 6001	432 6001	462 6045	464 6005	464 6007	465 6562	467 6580	480 6001
	TRENCH EXCAVATION PROTECTION	RIPRAP (CONC) (4 IN)	CONC BOX CULV (3 FT X 2 FT) (EXT END)	RC PIPE (CL III) (24 IN)	RC PIPE (CL III) (30 IN)	INL (CMP) (PAZD-CZ) (FG) (5FTX5FT-4FTX4FT)	SET (REMOV & REINSTALL)	CLEAN EXIST CULVERTS
	LF	CY	LF	LF	LF	EA	EA	EA
CULVERT LAYOUT CUL-SOUTH								
HOPE RD		5	9				1	2
IH 40	218			194	8	3		
PROJECT TOTALS	218	5	9	194	8	3	1	2

SUMMARY OF ROADWAY ITEMS

LOCATION	110 6001	132 6004	247 6258	420 6066	432 6044	432 6045	450 6023	450 6030	514 6003	529 6008	531 6003	531 6015	536 6002	540 6002	540 6006	543 6001	543 6024	544 6001	545 6019	644 6064	3077 6058
	EXCAVATION (ROADWAY)	EMBANKMENT (FINAL) (DENS CONT) (TY B)	FL BS (CMP IN PLC) (TY A OR B GR4) (12")	CL C CONC (RAIL FOUNDATION)	RIPRAP (CONC) (FLUME)	RIPRAP (MOW STRIP) (4 IN)	RAIL (TY SSTR)	RAIL (TY C221)	PERM CTB (SGL SLOPE) (TY 3) (42)	CONC CURB & GUTTER (TY II)	CONC SIDEWALKS (6")	CURB RAMPS (TY 20)	CONC MEDIAN	MTL W-BEAM GD FEN (STEEL POST)	MTL BEAM GD FEN TRANS (THRIE-BEAM)	CABLE BARRIER SYSTEM (TL-3)	INSTALL SALVAGE CABLE BAR TERM SECTION	GUARDRAIL END TREATMENT (INSTALL)	CRASH CUSH ATTEN (INSTL) (S) (N) (TL3)	IN BRIDGE MNT CLEARANCE SGN ASSM (TY N)	SP MIXES SP-D SAC-A PG70-28 4": 440LB/SY/2000
	CY	CY	SY	CY	CY	CY	LF	LF	LF	LF	SY	EA	SY	LF	EA	LF	EA	EA	EA	EA	TON
TYPICAL SECTIONS	3453	15770																			
PLAN AND PROFILE HOPE RD			2202	150	81	51	902	170	370	270	69	2	58	50	2	856	1	2	2	2	865
PROJECT TOTALS	**3453**	**15770**	**2202**	**150**	**81**	**51**	**902**	**170**	**370**	**270**	**69**	**2**	**58**	**50**	**2**	**856**	**1**	**2**	**2**	**2**	**865**

SUMMARY OF REMOVAL ITEMS

LOCATION	104 6009	104 6054	105 6036	354 6002	496 6002	496 6007	496 6010	542 6001	542 6002	542 6003	542 6004	543 6022	644 6076
	REMOVING CONC (RIPRAP)	REMOVING CONCRETE (MOW STRIP)	REMOVING STAB BASE & ASPH PAV (15"-20")	PLAN & TEXT ASPH CONC PAV (0" TO 2")	REMOV STR (INLET)	REMOV STR (PIPE)	REMOV STR (BRIDGE 100 - 499 FT LENGTH)	REMOVE METAL BEAM GUARD FENCE	REMOVE TERMINAL ANCHOR SECTION	REMOVE DOWNSTREAM ANCHOR TERMINAL	RM MTL BM GD FENCE TRANS (THRIE-BEAM)	REMOVE CABLE BARRIER TERMINAL SECTION	REMOVE SM RD SN SUP&AM
	SY	LF	SY	SY	EA	LF	EA	LF	EA	EA	EA	EA	EA
REMOVAL PLAN	900	1452	697	6250	2	97	1	1275	2	4	2	1	6
PROJECT TOTALS	**900**	**1452**	**697**	**6250**	**2**	**97**	**1**	**1275**	**2**	**4**	**2**	**1**	**6**

SUMMARY OF RETAINING WALL ITEMS

LOCATION	400 6005	403 6001	420 6011	423 6001
	CEM STABIL BKFL	TEMPORARY SPL SHORING	CL B CONC (FLUME)	RETAINING WALL (MSE)
	CY	SF	CY	SF
RWNORTH	100	3797	10	7592
RWSOUTH	103	2512	9	5479
PROJECT TOTALS	**203**	**6309**	**19**	**13071**

SUMMARY OF ILLUMINATION ITEMS

LOCATION	610 6106	618 6046	618 6047	618 6062	620 6003	620 6004	620 6007	620 6008	624 6002
	IN RD IL (U/P) (TY 2) (150W EQ) LED	CONDT (PVC) (SCH 80) (2")	CONDT (PVC) (SCH 80) (2") (BORE)	CONDT (RM) (3/4")	ELEC CONDR (NO. 12) BARE	ELEC CONDR (NO. 12) INSULATED	ELEC CONDR (NO. 8) BARE	ELEC CONDR (NO. 8) INSULATED	GROUND BOX TY A (12231) W/APRON
	EA	LF	LF	LF	LF	LF	LF	LF	EA
IH 40	4	220	80	220	240	480	325	650	2
PROJECT TOTALS	4	220	80	220	240	480	325	650	2

NOTES:

FOR CONTRACTOR INFORMATION, ITEM 508 FOR CONSTRUCTING DETOURS INCLUDES:

LOCATION	3077 6058	3077 6075	134 6001
	SP MIXES SP-D SAC-A PG70-28 (2": 220LB/SY/2000)	TACK COAT (0.13 GAL/SY)	BACKFILL (TY A)
	TON	GAL	STA
TRAFFIC CONTROL PLAN PHASE1	3607	4263	86
PROJECT TOTALS	3607	4263	86

NO.	DATE	DESCRIPTION	APPROV.

BRIDGEFARMER & ASSOCIATES, INC.
CONSULTING ENGINEERS
TBPE REGISTRATION NO. 264

Texas Department of Transportation ©2023

IH-40 AT HOPE ROAD

SUMMARY OF QUANTITIES

SHEET 1 OF 2

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
VN	6	SEE TITLE SHEET		IH 40
GRAPHICS JL	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK JL	TEXAS	AMA	POTTER	009
CHECK	CONTROL	SECTION	JOB	
	0090	05	107	

SUMMARY OF SIGNING PAVEMENT MARKING ITEMS												
LOCATION	416	644	644	644	644	644	644	647	658	658	666	666
	6002	6001	6004	6007	6027	6030	6033	6002	6062	6071	6006	6063
	DRILL SHAFT (24 IN)	IN SM RD SN SUP & AM TY 10BGW (1) SA (P)	IN SM RD SN SUP & AM TY 10BGW (1) SA (T)	IN SM RD SN SUP & AM TY 10BGW (1) SA (U)	IN SM RD SN SUP & AM TY S80 (1) SA (P)	IN SM RD SN SUP & AM TY S80 (1) SA (T)	IN SM RD SN SUP & AM TY S80 (1) SA (U)	RELOCATE LRSA	INSTL DEL ASSM (D-SW)SZ 1 (BRF) GF2 (BI)	INSTL DEL ASSM (D-SY)SZ (BRF) CTB (BI)	REFL PAV MRK TY I (W) (4") (DOT)	PREFAB PAV MRK TY C (W) (U- TURN ARROW)
	LF	EA	EA	EA	EA	EA	EA	EA	EA	EA	LF	EA
PVMT MARK AND SIGNAGE	12	1	2	1	5	5	1	1	6	15	54	2
PROJECT TOTALS	**12**	**1**	**2**	**1**	**5**	**5**	**1**	**1**	**6**	**15**	**54**	**2**

SUMMARY OF SIGNING PAVEMENT MARKING ITEMS										
LOCATION	666	668	668	672	678	678	6024	6024	6024	6024
	6078	6033	6076	6010	6002	6004	6008	6011	6012	6023
	PREFAB PAV MRK TY C (W) (WORD)	PREFAB PAV MRK TY B (W)(18") (YLD TRI)	PREFAB PAV MRK TY C (W) (24") (SLD)	RAIS PAV MRK (REFL) TY II-C-R	PAV SURF PREP FOR MRK (6")	PAV SURF PREP FOR MRK (8")	HPPM W/RET REQ TY I(W)6"(BRK)(090 MIL)	HPPM W/RET REQ TY I(W)6"(SLD)(090 MIL)	HPPM W/RET REQ TY I(W)8"(SLD) (90MIL)	HPPM W/RET REQ TY I(Y)6"(SLD) (90MIL)
	EA	EA	LF	EA	LF	LF	LF	LF	LF	LF
PVMT MARK AND SIGNAGE	2	8	62	146	1500	676	1640	10350	1777	10405
PROJECT TOTALS	**2**	**8**	**62**	**146**	**1500**	**676**	**1640**	**10350**	**1777**	**10405**

SUMMARY OF SWP3 ITEMS								
LOCATION	164	169	506	506	506	506	506	506
	6023	6001	6020	6024	6038	6039	6041	6043
	CELL FBR MLCH SEED (PERM) (RURAL) (CLAY)	SOIL RETENTION BLANKETS (CL 1) (TY A)	CONSTRUCTION EXITS (INSTALL) (TY 1)	CONSTRUCTION EXITS (REMOVE)	TEMP SEDMT CONT FENCE (INSTALL)	TEMP SEDMT CONT FENCE (REMOVE)	BIODEG EROSN CONT LOGS (INSTL) (12")	BIODEG EROSN CONT LOGS (REMOVE)
	SY	SY	SY	LF	LF	LF	LF	LF
SW3P PH 1 & PH 2	27860	3299	156	156	140	140	140	140
PROJECT TOTALS	**27860**	**3299**	**156**	**156**	**140**	**140**	**140**	**140**

NO.	DATE	DESCRIPTION	APPROV.

2M ASSOCIATES, LLC
5930 PRESTON VIEW BLVD., SUITE A
DALLAS, TEXAS 75240
TBPE REGISTRATION NO.12158
PH: 214.863-1377
FAX 888-528-9180

SUMMARY OF QUANTITIES

SHEET 2 OF 2

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DH	6	SEE TITLE SHEET		IH 40
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
MK	TEXAS	AMA	POTTER	
CHECK	CONTROL	SECTION	JOB	
AM	0090	05	107	010
CHECK				
DH				

TCP NARRATIVE

GENERAL TCP NOTES:

* PROVIDE TWO (2) PORTABLE CHANGEABLE MESSAGE SIGNS (PCMS) FOR USE DURING CONSTRUCTION AND PLACED AS DIRECTED BY THE ENGINEER.

PHASE 1:
FRONTAGE ROAD OVERLAY

1. INSTALL PHASE I TEMPORARY TRAFFIC SIGNS AND BARRELS.

2. OVERLAY THE WBFR & EBFR FOLLOWING GUIDANCE IN THE STANDARD TCP(2-3)-23 FOR EBFR AND TCP(2-6)-18 FOR WBFR.

3. INSTALL BARRICADES AND TRAFFIC CONTROL DEVICES TO CLOSE HOPE ROAD.
   DETOUR NORTH/SOUTH TRAFFIC AWAY FROM THE INTERSECTION AND KEEP HOPE RD CLOSED THROUGH THE CONSTRUCTION DURATION.

PHASE 2:
BRIDGE DEMOLITION AND RECONSTRUCTION

1. INSTALL AND MAINTAIN EROSION CONTROL DEVICES.

2. MAINTAIN BARRICADES TO KEEP HOPE RD CLOSED BETWEEN THE FRONTAGE ROADS INTERSECTIONS. DETOUR LOCAL TRAFFIC.

3. DEMOLISH THE BRIDGE SPANS OVER EACH DIRECTION ON IH 40 MAINLANE.
   DEMOLISH ONLY ONE DIRECTION OF IH 40 MAINLANE ROAD AT A TIME (WESTBOUND OR EASTBOUND). MAINTAIN THE BRIDGE SPANS IN-PLACE OVER THE OPPOSITE IH 40 MAINLANE.

4. TO DEMOLISH BRIDGE OVER IH 40 MAIN LANES, SHIFT TRAFFIC TO THE ADJOINING FRONTAGE ROAD.
   - WHEN WORKING OVER IH 40 MAIN LANES, ONE SIDE OF IH 40 TRAFFIC AT A TIME CAN BE SHIFTED TO A TEMPORARY ONE-WAY, TWO-LANE, OPERATION ON THE ADJOINING FRONTAGE ROAD. THIS OPERATION WILL BE ALLOWED ONLY ON THE SAME SIDE WHERE WORK IS OCCURRING.
   - WHEN IH 40 TRAFFIC IS ON THE FRONTAGE ROAD, TWO-WAY TRAFFIC IS NOT ALLOWED ON THAT FRONTAGE ROAD. MAINTAIN 2-WAY TRAFFIC ON THE OTHER FRONTAGE ROAD AWAY FROM CONSTRUCTION.

5. ONLY ONE FRONTAGE ROAD AT A TIME CAN BE RESTRICTED TO ONE-WAY TRAFFIC.

6. IH 40 TRAFFIC CANNOT BE SHIFTED TO OPERATE ON THE FRONTAGE ROAD WITHOUT PRIOR APPROVAL. ALL FRONTAGE ROAD CLOSURES MUST BE PREAPPROVED BY THE ENGINEER. THE CONTRACTOR IS TO PROVIDE 3 WEEKS ADVANCE NOTICE OF ANY POTENTIAL ROAD CLOSURE, AND ADVERTISE FOR 2 WEEKS PRIOR TO THE ROAD CLOSURE USING CHANGEABLE MESSAGE BOARDS.

7. INSTALL EMBANKMENT AND BASE MATERIALS FOR FRONTAGE WIDENING. CONSTRUCT RETAINING WALLS WITH THE BRIDGE ABUTMENTS AND EMBANKMENT WORK.

8. CONSTRUCT THE HOPE RD APPROACHES AND BRIDGE SPANS OVER THE EB AND WB OF IH 40 MAINLANES TO MAINTAIN HOPE RD TRAFFIC:
   -ROUTE WB TRAFFIC ONTO WBFR.
   -ROUTE EB TRAFFIC ONTO EBFR.

9. SET BEAMS AND PANELS. DO NOT WORK OVER TRAFFIC. BEAMS OVER IH 40 CAN BE SET BY SHIFTING IH 40 TRAFFIC ONTO THE ADJOINING FRONTAGE ROAD. USE A NIGHT WORK OPERATION AND FOLLOW THE PREVIOUS NOTES ON IH 40 MAINLANES CLOSURES.

10. POUR DECK AND RAILS FOLLOWING THE LANE CLOSURE USED PREVOIUSLY WHEN WORK IS OVER IH 40 LANES OR SHOULDERS.

11. INSTALL ASPHALT CONCRETE ON FRONTAGE ROADS WIDENING.

12. FINISH ANCILLARY WORK & CLEAN UP.

STATE OF TEXAS
JAMES W. LANGSTON
73891
LICENSED
PROFESSIONAL ENGINEER
12/11/23
James W. Langston PE

Bridgefarmer & Associates, Inc.
TBPE Registration No. 264

NO.	DATE	DESCRIPTION	APPROV.

BRIDGEFARMER & ASSOCIATES, INC.
CONSULTING ENGINEERS
TBPE REGISTRATION NO. 264

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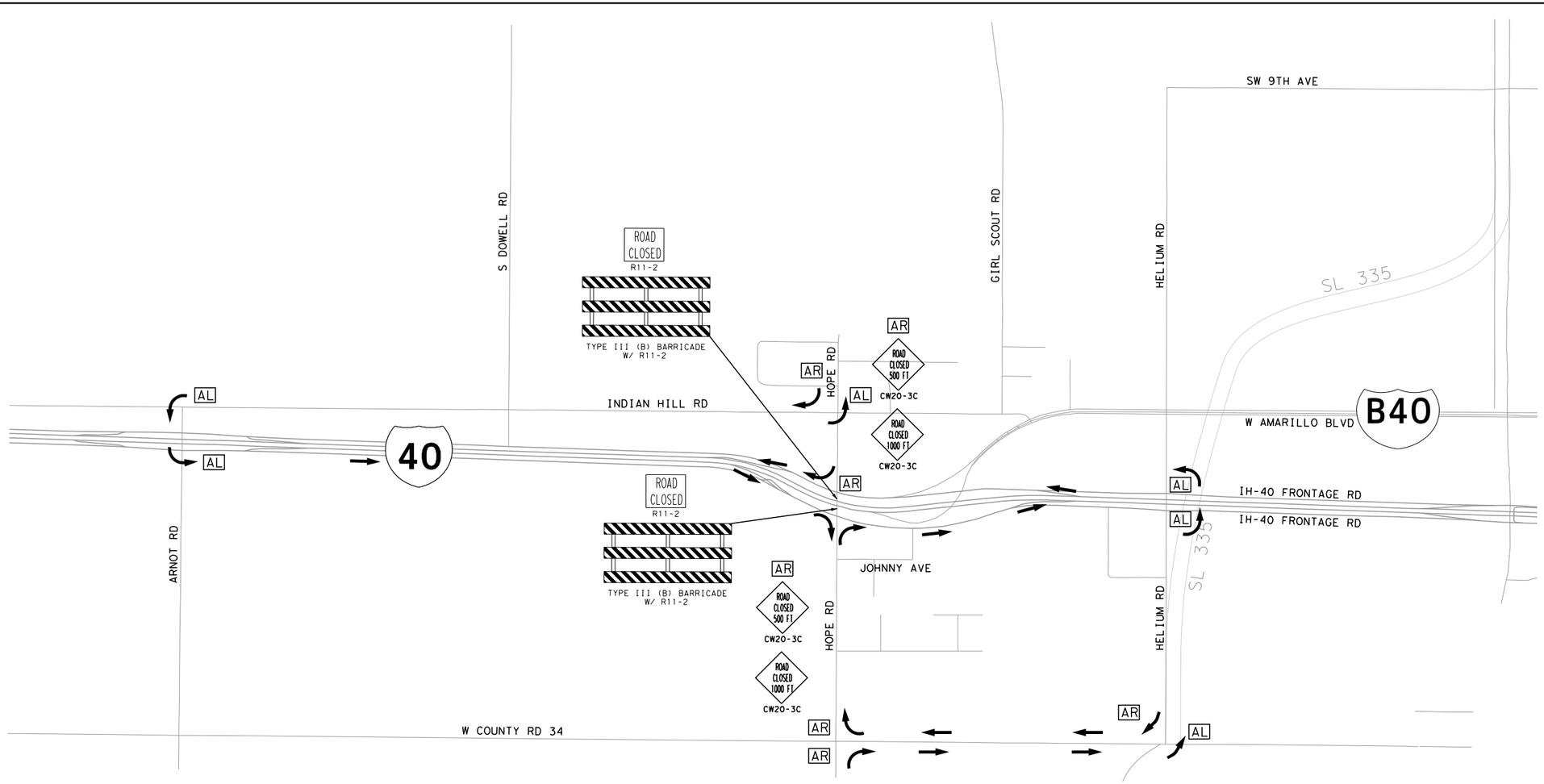
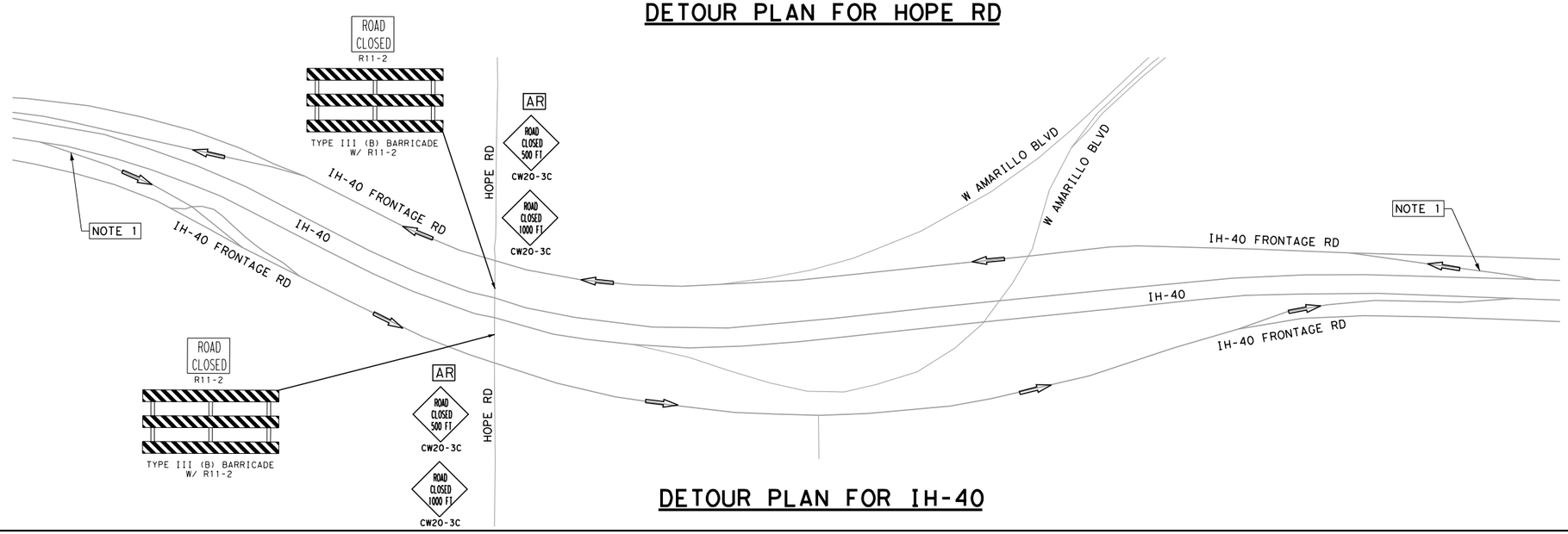
TCP NARRATIVE

SHEET 1 OF 1

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DS	6	SEE TITLE SHEET		IH 40
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
DW	TEXAS	AMA	POTTER	011
CHECK	CONTROL	SECTION	JOB	
CK1	0090	05	107	
CHECK				
CK2				



DETOUR PLAN FOR HOPE RD

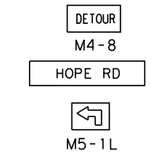


DETOUR PLAN FOR IH-40

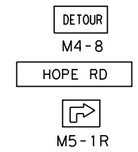
1000 0 1000 2000
SCALE: 1" = 2000'

TRAFFIC FLOW FOR LONG-TERM DETOUR PLAN

TRAFFIC FLOW FOR SHORT-TERM DETOUR PLAN



DETAIL AL



DETAIL AR

NOTES:

1. LOCATION TO EXIT TRAFFIC WHEN WORKING OVER IH40 LANES
2. PLACE BARRICADES AND CLOSE HOPE RD IN PHASE 1 FOLLOWING THE OVERLAY WORK.

Bridgefarmer & Associates, Inc.
TBPE Registration No. 264

NO.	DATE	DESCRIPTION	APPROV.

BRIDGEFARMER & ASSOCIATES, INC.
CONSULTING ENGINEERS
TBPE REGISTRATION NO. 264

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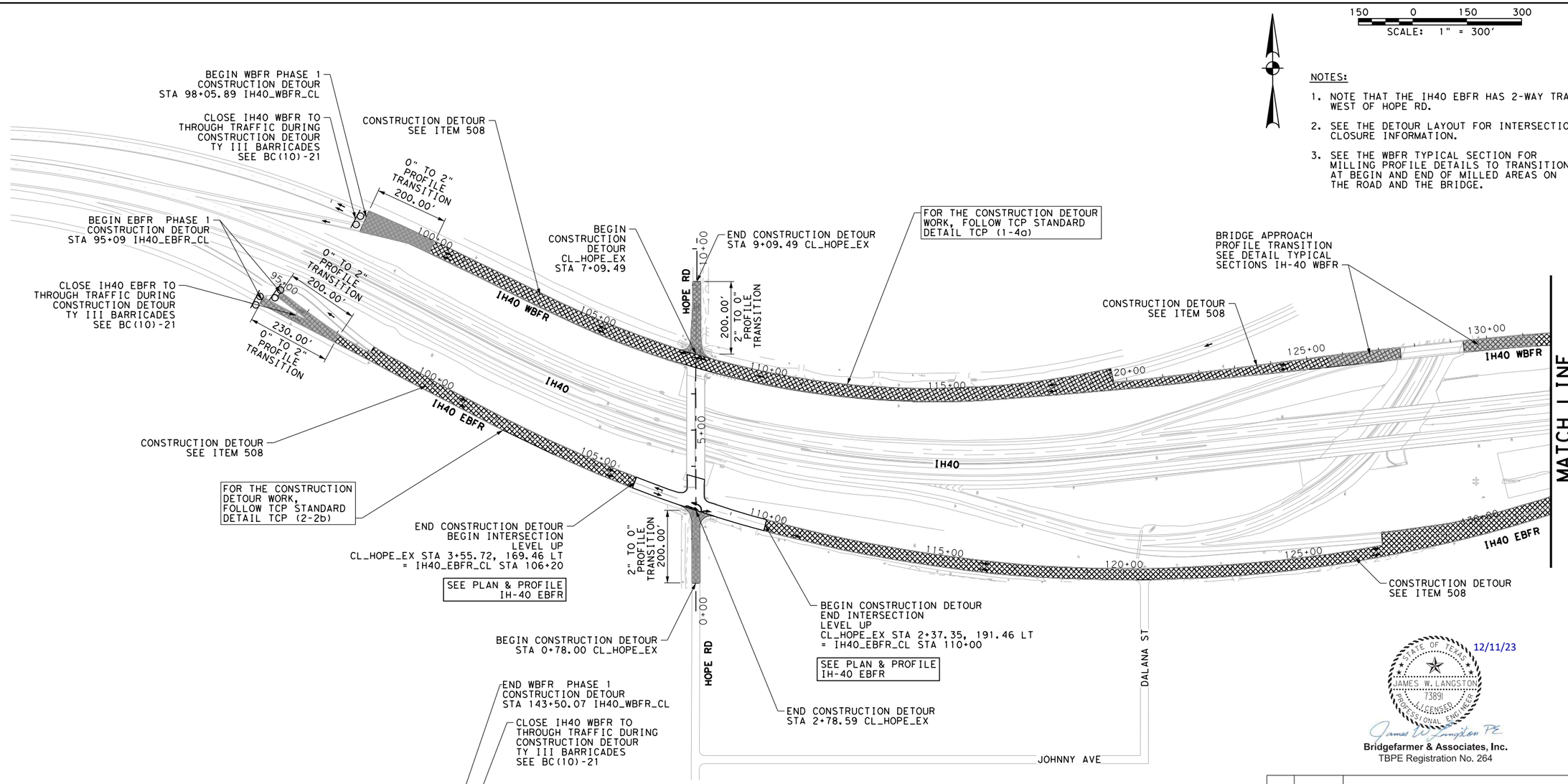
DETOUR LAYOUT

SHEET 1 OF 1

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
TS	6	SEE TITLE SHEET		IH 40
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
TS	TEXAS	AMA	POTTER	012
CHECK	CONTROL	SECTION	JOB	
JL	0090	05	107	
CHECK				
MS				



NOTES:

1. NOTE THAT THE IH40 EBFR HAS 2-WAY TRAFFIC WEST OF HOPE RD.
2. SEE THE DETOUR LAYOUT FOR INTERSECTION CLOSURE INFORMATION.
3. SEE THE WBFR TYPICAL SECTION FOR MILLING PROFILE DETAILS TO TRANSITION AT BEGIN AND END OF MILLED AREAS ON THE ROAD AND THE BRIDGE.

NOTES:

FOR CONTRACTOR INFORMATION, ITEM 508 FOR CONSTRUCTING DETOURS INCLUDES:

LOCATION	3077 6058	3077 6075	134 6001
	SP MIXES SP-D SAC-A PG70-28 (2": 220LB/SY/2000)	TACK COAT (0.13 GAL/SY)	BACKFILL (TY A)
	TON	GAL	STA
TRAFFIC CONTROL PLAN PHASE1	3607	4263	86
PROJECT TOTALS	3607	4263	86

STATE OF TEXAS JAMES W. LANGSTON 73891 LICENSED PROFESSIONAL ENGINEER 12/11/23

James W. Langston PE

Bridgefarmer & Associates, Inc.
TBPE Registration No. 264

NO.	DATE	DESCRIPTION	APPROV.

BRIDGEFARMER & ASSOCIATES, INC.
CONSULTING ENGINEERS
TBPE REGISTRATION NO. 264

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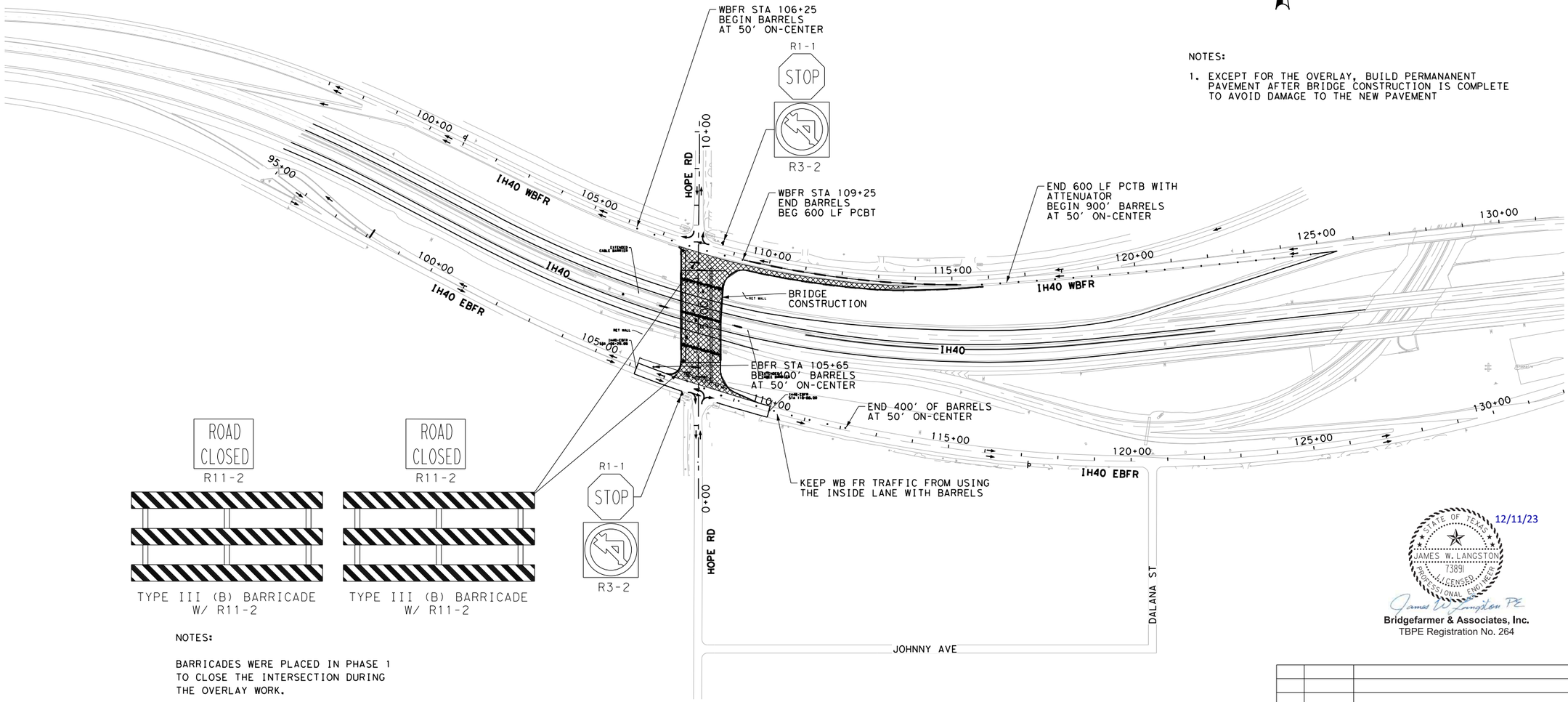
TRAFFIC CONTROL PLAN PHASE 1

SHEET 1 OF 2

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DS	6	SEE TITLE SHEET		IH 40
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
DW	TEXAS	AMA	POTTER	013
CHECK	CONTROL	SECTION	JOB	
CK1	0090	05	107	
CHECK				
CK2				

150 0 150 300
SCALE: 1" = 300'



TYPE III (B) BARRICADE
W/ R11-2

TYPE III (B) BARRICADE
W/ R11-2

NOTES:

BARRICADES WERE PLACED IN PHASE 1
TO CLOSE THE INTERSECTION DURING
THE OVERLAY WORK.

SEE TCP LAYOUT FOR INTERSECTION
CLOSURE DETAILS

NOTES:

1. EXCEPT FOR THE OVERLAY, BUILD PERMANANENT PAVEMENT AFTER BRIDGE CONSTRUCTION IS COMPLETE TO AVOID DAMAGE TO THE NEW PAVEMENT

STATE OF TEXAS
JAMES W. LANGSTON
73891
LICENSED
PROFESSIONAL ENGINEER
12/11/23

James W. Langston PE

Bridgefarmer & Associates, Inc.
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CONSULTING ENGINEERS
TBPE REGISTRATION NO. 264

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TRAFFIC CONTROL PLAN PHASE 2

SHEET 2 OF 2

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DS	6	SEE TITLE SHEET		IH 40
GRAPHICS DW	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK CK1	TEXAS	AMA	POTTER	014
CHECK CK2	CONTROL 0090	SECTION 05	JOB 107	

DATE: Vidal.Ngoumnai 12/8/2023 8:26:42 AM
FILE: c:\Bridgefarmer-pw\vidal.ngoumnai@bridgefarmer.com\dms21404\038402-bc-21-01.dgn

BARRICADE AND CONSTRUCTION (BC) STANDARD SHEETS GENERAL NOTES:

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

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

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

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

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

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

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

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

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

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

11. Traffic control devices should be in place only while work is actually in progress or a definite need exists.

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

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

WORKER SAFETY NOTES:

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

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

COMPLIANT WORKZONE TRAFFIC CONTROL DEVICES

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

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

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

Texas Department of Transportation

Traffic Safety Division Standard

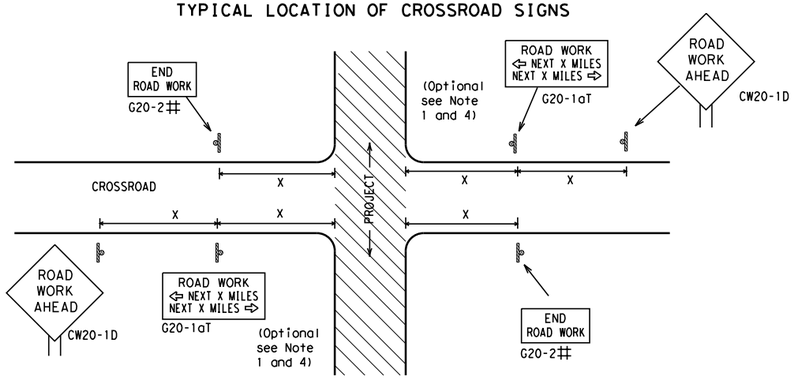
BARRICADE AND CONSTRUCTION GENERAL NOTES AND REQUIREMENTS

BC(1)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0090	05	107	IH40
4-03 7-13	DIST	COUNTY		SHEET NO.
9-07 8-14	AMA	POTTER		015
5-10 5-21				

DATE: Vidal.Ngoumnai 12/8/2023 8:26:48 AM
FILE: c:\Engineer-pw\vidal.ngoumnai@bridgefarmer.com\dms21404\038402-bc-21-02.dgn

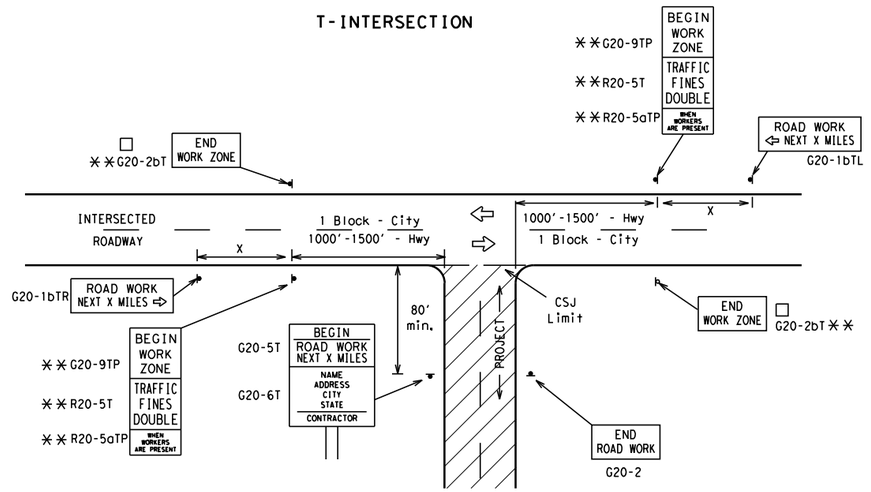
TYPICAL LOCATION OF CROSSROAD SIGNS



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

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

T-INTERSECTION



CSJ LIMITS AT T-INTERSECTION

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

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

SIZE

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

SPACING

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

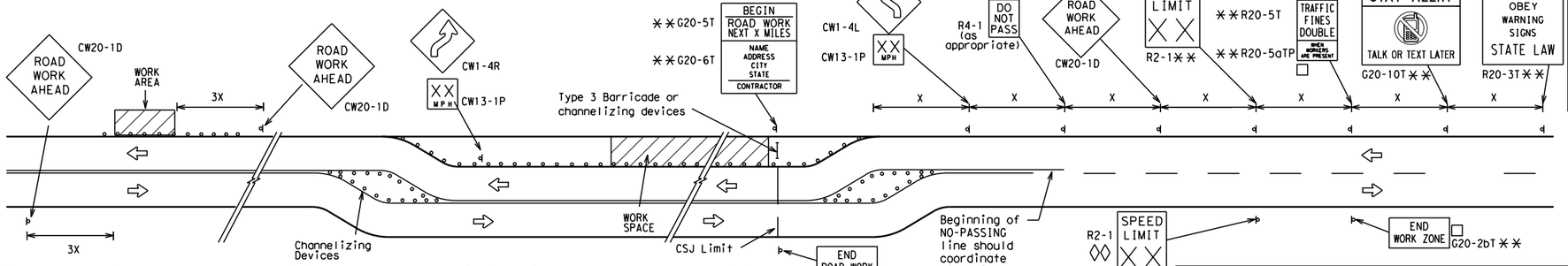
* For typical sign spacings on divided highways, expressways and freeways, see Part 6 of the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD) typical application diagrams or TCP Standard Sheets.

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

GENERAL NOTES

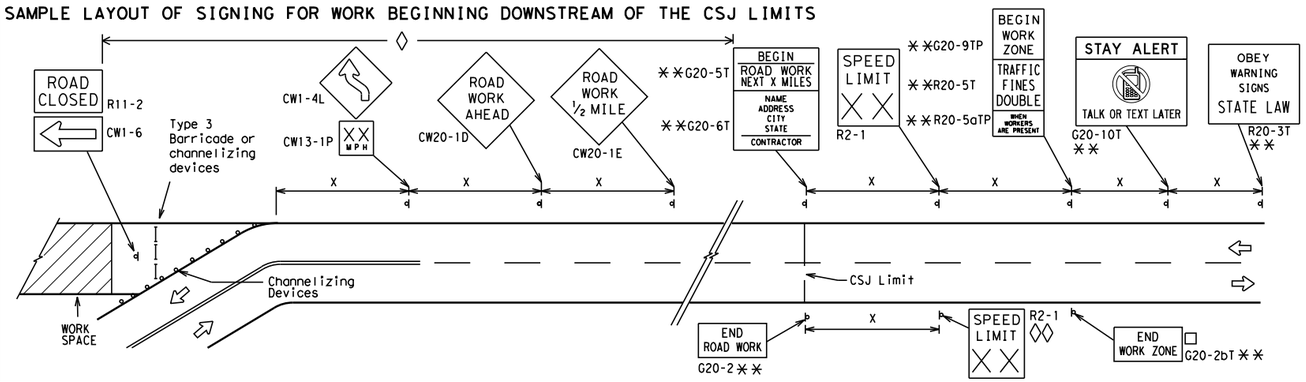
1. Special or larger size signs may be used as necessary.
2. Distance between signs should be increased as required to have 1500 feet advance warning.
3. Distance between signs should be increased as required to have 1/2 mile or more advance warning.
4. 36" x 36" "ROAD WORK AHEAD" (CW20-1D)signs may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

WORK AREAS IN MULTIPLE LOCATIONS WITHIN CSJ LIMITS



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

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



SAMPLE LAYOUT OF SIGNING FOR WORK BEGINNING AT THE CSJ LIMITS

NOTES

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

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

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

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

◊◊ Contractor will install a regulatory speed limit sign at the end of the work zone.

LEGEND

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

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION PROJECT LIMIT

BC(2)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0090	05	107	IH40
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	AMA	POTTER		016

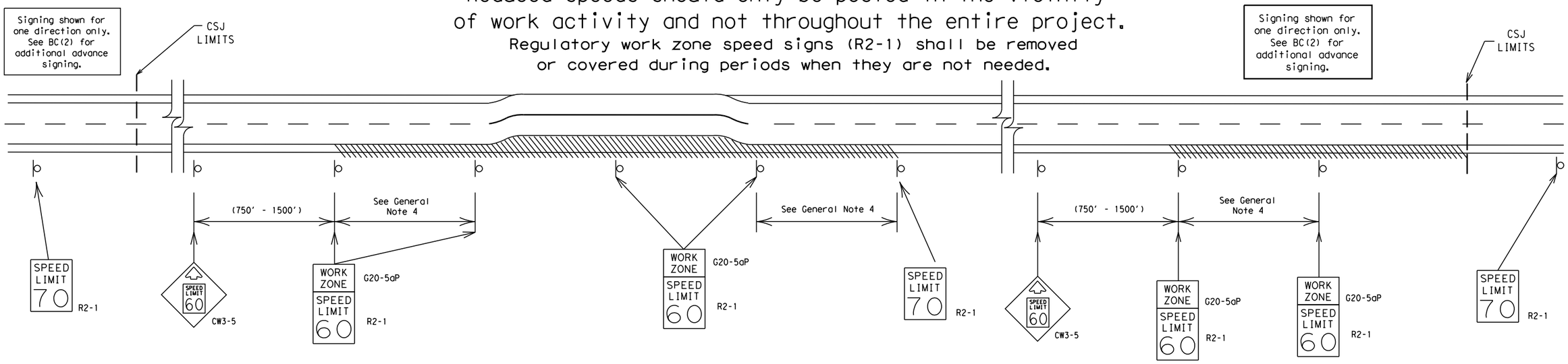
DATE: 12/8/2023 8:26:54 AM
FILE: c:\Bridgefarmer-pw\vidal.ngoumnai@bridgefarmer.com\dms21404\038402-bc-21-03.dgn
Vidal.Ngoumnai

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	0090	05	107	IH40
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7-13 5-21	AMA	POTTER		017

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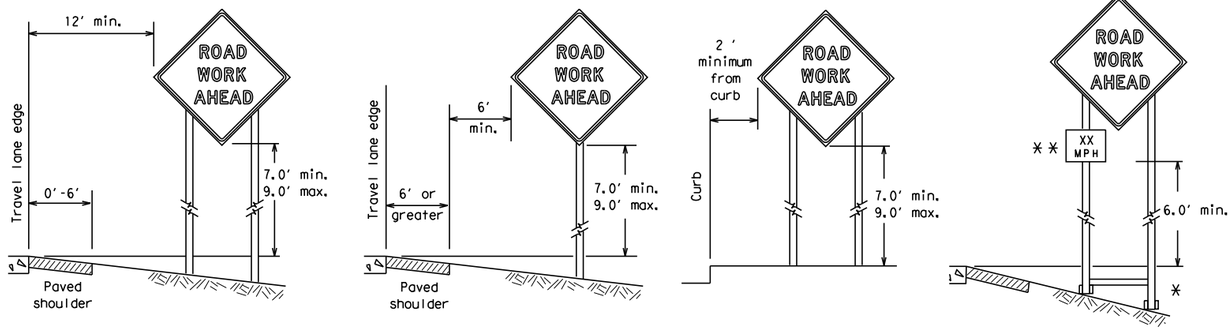
FILE: c:\Users\vidal.ngoumnai\bridgefarmer-pw\vidal.ngoumnai@bridgefarmer.com\dms\21404\038402-bc-21-04.dgn
Vidal.Ngoumnai

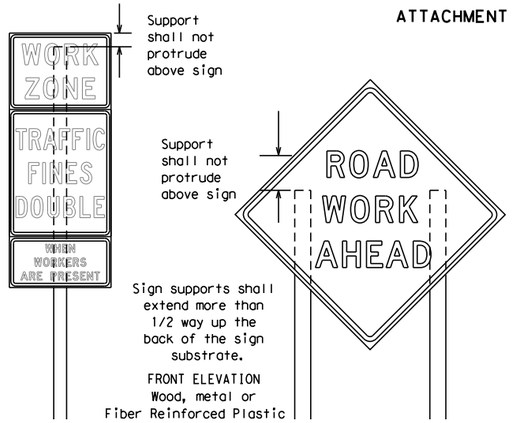
TYPICAL MINIMUM CLEARANCES FOR LONG TERM AND INTERMEDIATE TERM SIGNS

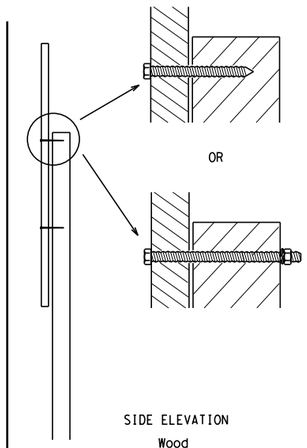


⁎ When placing skid supports on unlevel ground, the leg post lengths must be adjusted so the sign appears straight and plumb. Objects shall NOT be placed under skids as a means of leveling.

⁎⁎ 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





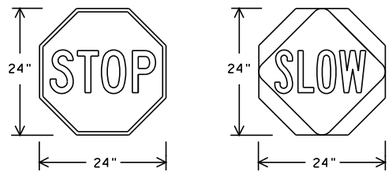
Attachment to wooden supports will be by bolts and nuts or screws. Use TxDOT's or manufacturer's recommended procedures for attaching sign substrates to other types of sign supports

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.



Background - Red
Legend & Border - White

Background - Orange
Legend & Border - Black

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.

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BARRICADE AND CONSTRUCTION TEMPORARY SIGN NOTES

BC(4)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0090	05	107	IH40
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	AMA	POTTER		018

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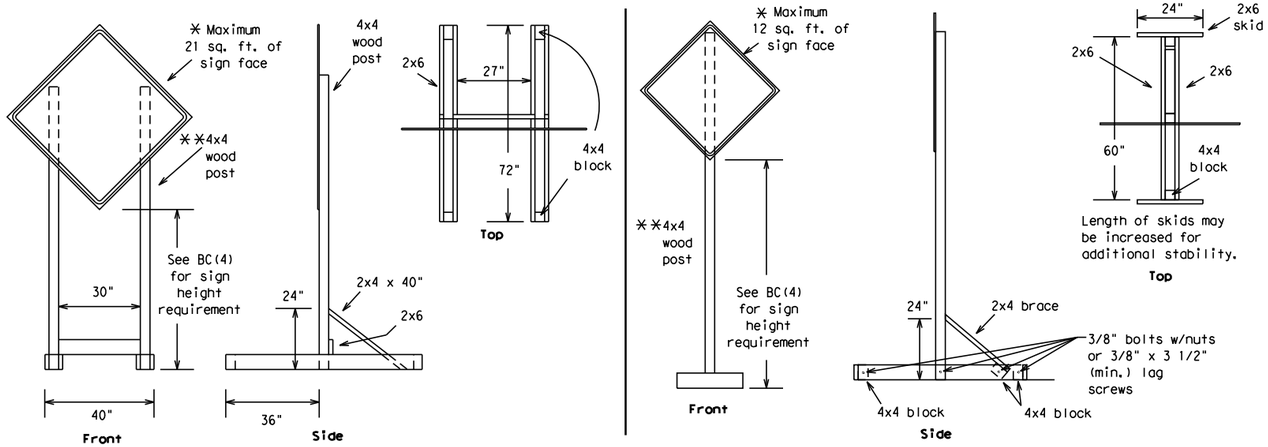
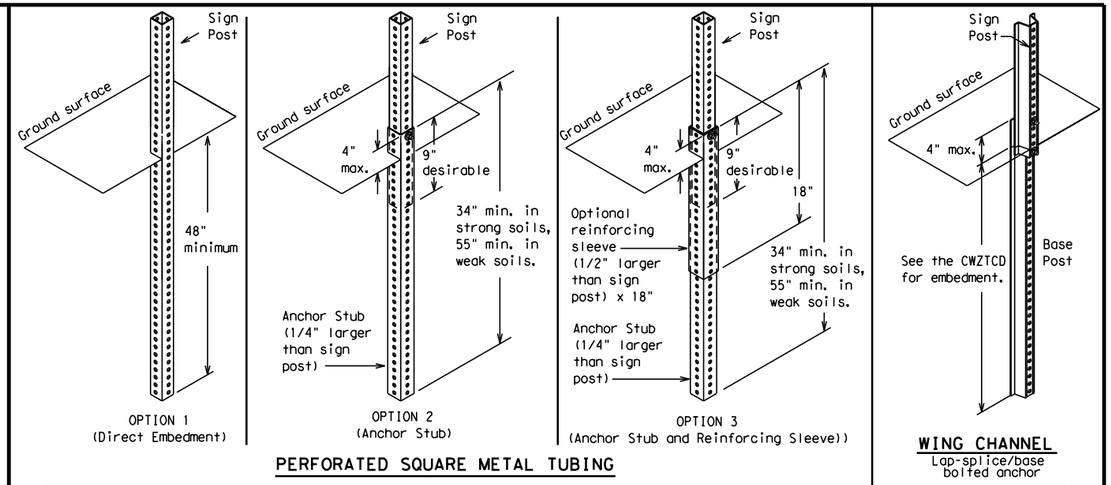
Vidal.Ngoumnai



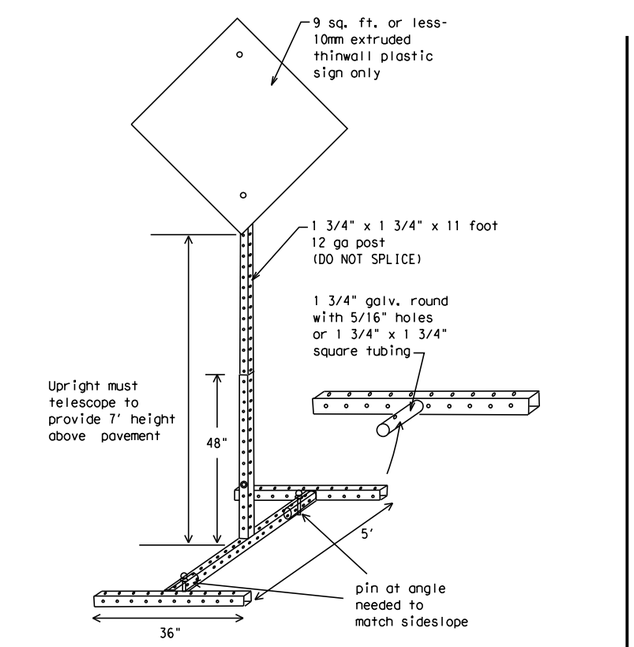
SKID MOUNTED WOOD SIGN SUPPORTS

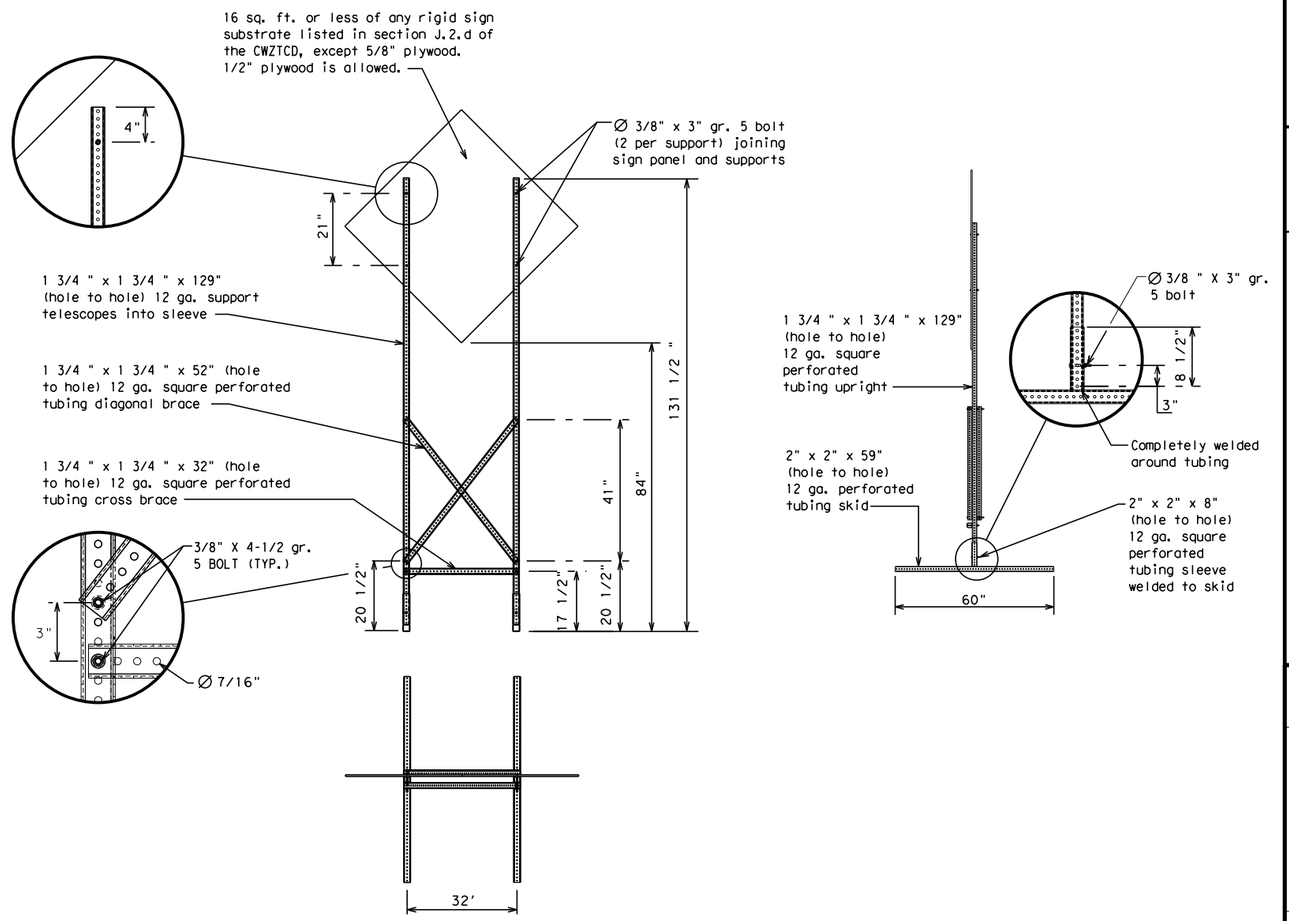
* LONG/INTERMEDIATE TERM STATIONARY - PORTABLE SKID MOUNTED SIGN SUPPORTS



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.

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BARRICADE AND CONSTRUCTION TYPICAL SIGN SUPPORT

BC(5)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0090	05	107	IH40
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	AMA	POTTER		019

DATE: 12/8/2023 8:27:10 AM
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Vidal.Ngoumnai

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
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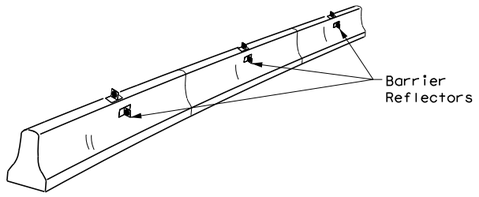
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	AMA	POTTER		020

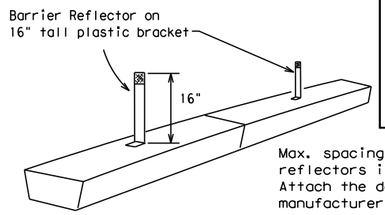
DATE: 12/8/2023 8:27:15 AM
FILE: c:\pw\ridgefarmer-pw\vidal.ngoumnai\d0038402\bc-21-07.dgn
USER: Vidal.Ngoumnai

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.

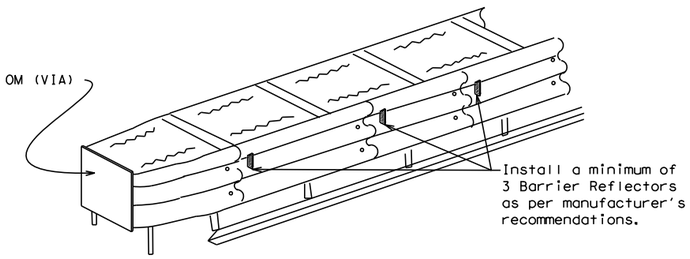


Max. spacing of barrier reflectors is 20 feet. Attach the delineators as per manufacturer's recommendations.

LOW PROFILE CONCRETE BARRIER (LPCB)

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.

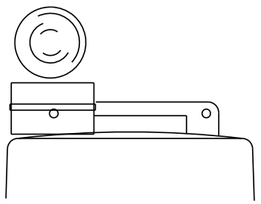


DELINEATION OF END TREATMENTS

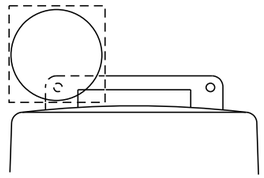
END TREATMENTS FOR CTB'S USED IN WORK ZONES

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

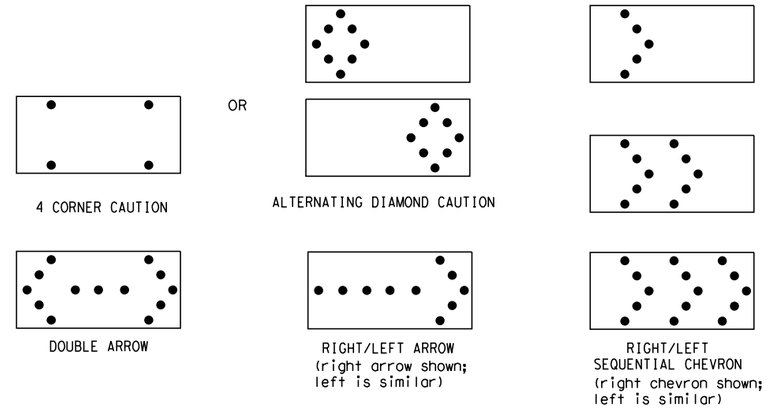
1. Type A flashing warning lights are intended to warn drivers that they are approaching or are in a potentially hazardous area.
2. Type A random flashing warning lights are not intended for delineation and shall not be used in a series.
3. A series of sequential flashing warning lights placed on channelizing 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	0090	05	107	IH40
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	AMA	POTTER		021

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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:

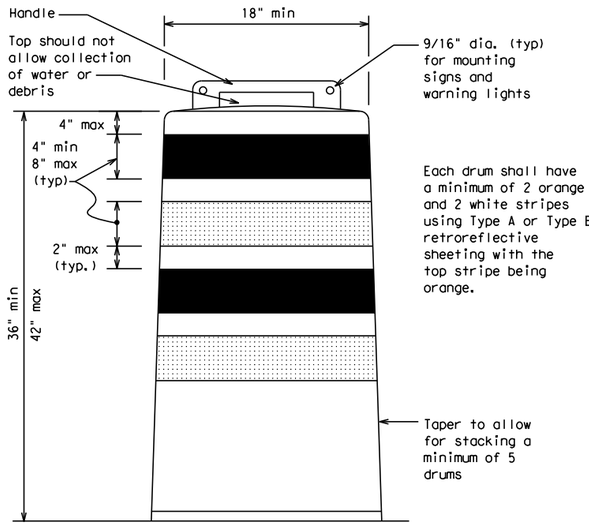
1. Plastic drums shall be a two-piece design; the "body" of the drum shall be the top portion and the "base" shall be the bottom.
2. The body and base shall lock together in such a manner that the body separates from the base when impacted by a vehicle traveling at a speed of 20 MPH or greater but prevents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

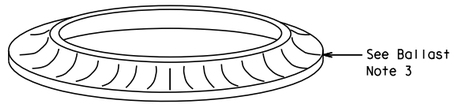
RETROREFLECTIVE SHEETING

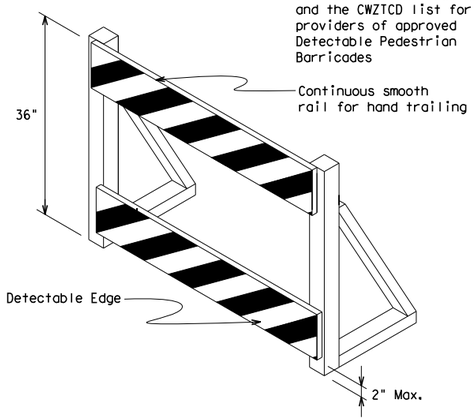
1. The stripes used on drums shall be constructed of sheeting meeting the color and retroreflectivity requirements of Departmental Materials Specification DMS-8300, "Sign Face Materials." Type A or Type B reflective sheeting shall be supplied unless otherwise specified in the plans.
2. The sheeting shall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

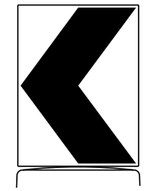




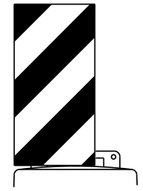


DETECTABLE PEDESTRIAN BARRICADES

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

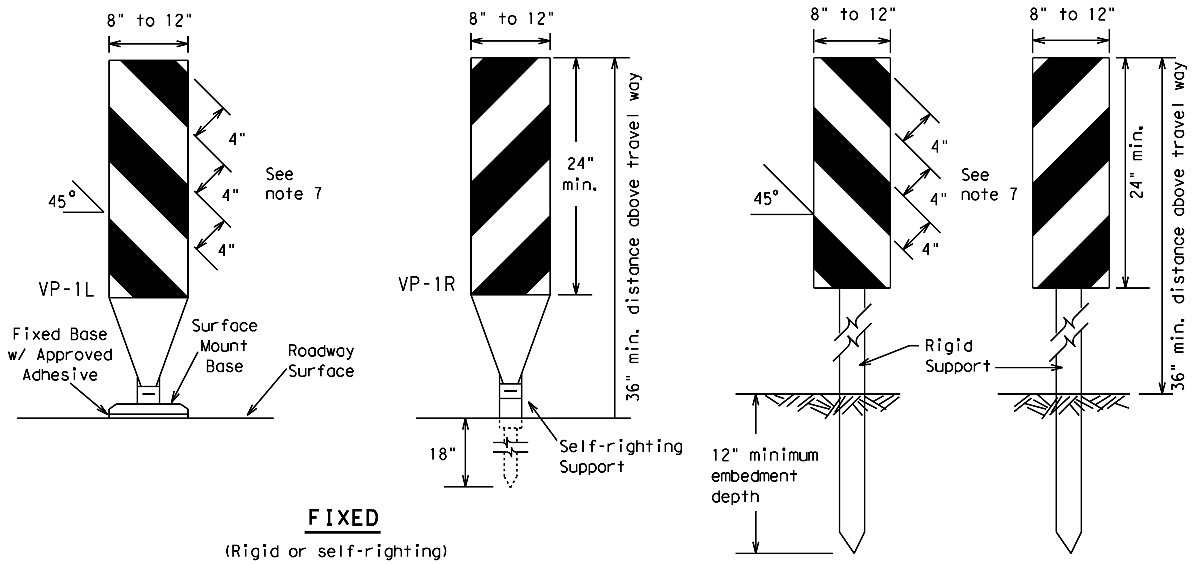
Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(8)-21

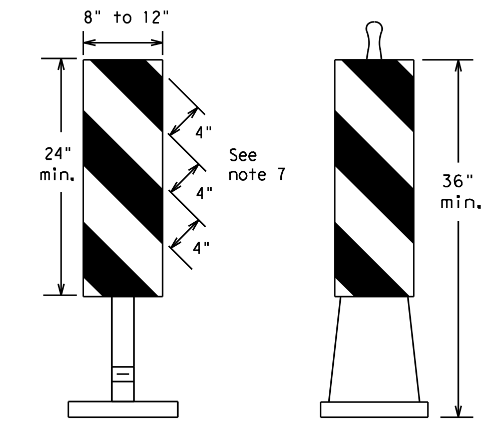
FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0090	05	107	IH40
4-03 8-14	DIST	COUNTY		SHEET NO.
9-07 5-21	AMA	POTTER		022
7-13				

102



FIXED
(Rigid or self-righting)

DRIVEABLE

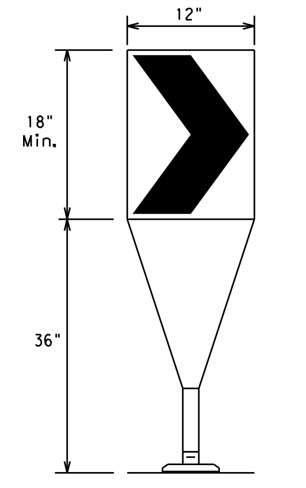


(Rigid or self-righting)

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)



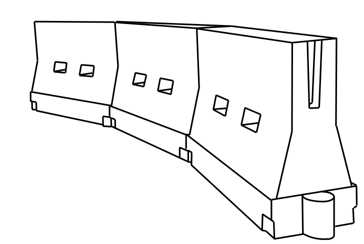
Fixed Base w/ Approved Adhesive (Driveable Base, or Flexible Support can be used)

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 out-side 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 nonreflec-tive 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 else-where 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)

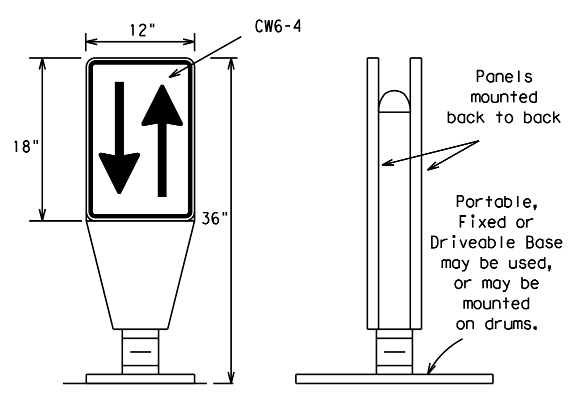
1. LCDs are crashworthy, lightweight, deformable devices that are highly visible, have good target value and can be connected together. They are not designed to contain or redirect a vehicle on impact.
2. LCDs may be used instead of a line of cones or drums.
3. LCDs shall be placed in accordance to application 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



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)

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

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	0090	05	107	IH40
9-07 8-14	DIST		COUNTY	SHEET NO.
7-13 5-21	AMA		POTTER	023

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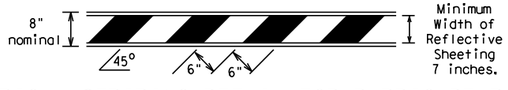
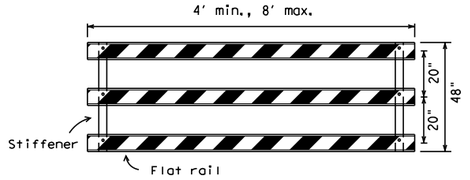
TYPE 3 BARRICADES

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.



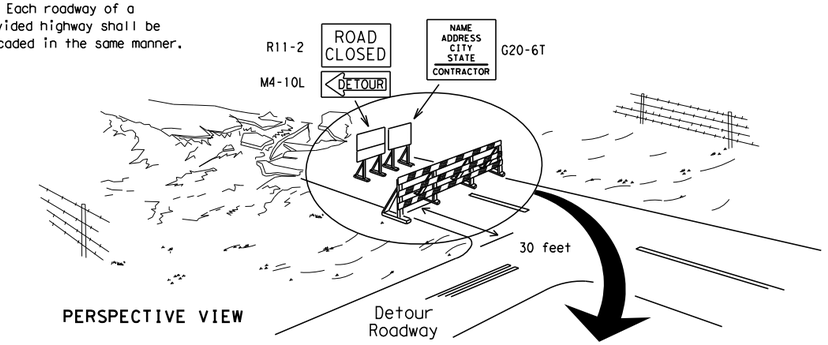
TYPICAL STRIPING DETAIL FOR BARRICADE RAIL



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

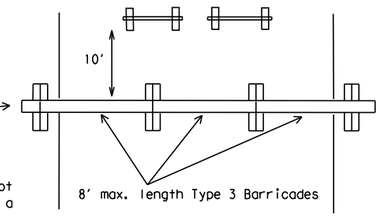
TYPICAL PANEL DETAIL FOR SKID OR POST TYPE BARRICADES

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



PERSPECTIVE VIEW

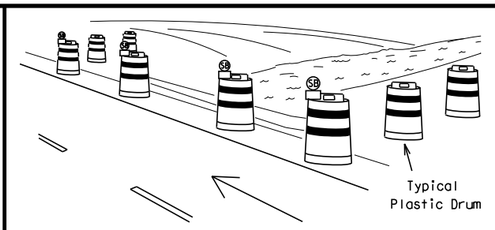
The three rails on Type 3 barricades shall be reflectorized orange and reflective white stripes on one side facing one-way traffic and both sides for two-way traffic.
Barricade striping should slant downward in the direction of detour.



PLAN VIEW

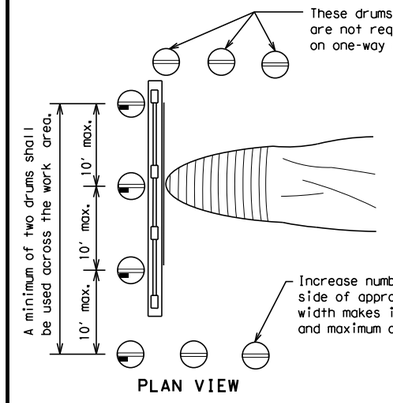
1. Signs should be mounted on independent supports at a 7 foot mounting height in center of roadway. The signs should be a minimum of 10 feet behind Type 3 Barricades.
2. Advance signing shall be as specified elsewhere in the plans.

TYPE 3 BARRICADE (POST AND SKID) TYPICAL APPLICATION



PERSPECTIVE VIEW

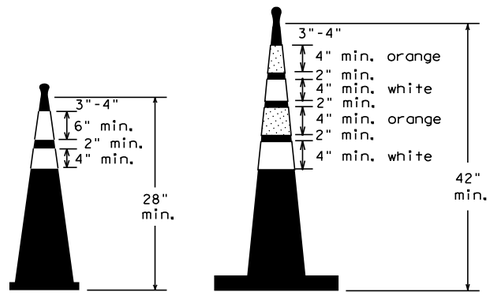
1. Where positive redirectional capability is provided, drums may be omitted.
2. Plastic construction fencing may be used with drums for safety as required in the plans.
3. Vertical Panels on flexible support may be substituted for drums when the shoulder width is less than 4 feet.
4. When the shoulder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



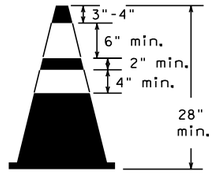
PLAN VIEW

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

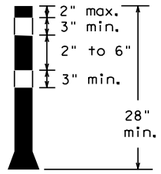
CULVERT WIDENING OR OTHER ISOLATED WORK WITHIN THE PROJECT LIMITS



Two-Piece cones



One-Piece cones

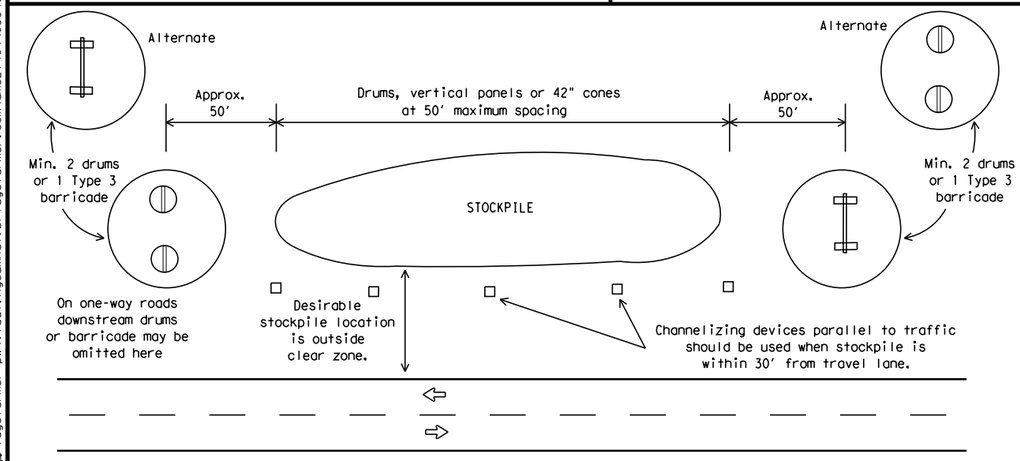


Tubular Marker

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

Texas Department of Transportation — Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(10)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS 9-07 8-14 7-13 5-21	0090	05	107	IH40
	DIST	COUNTY		SHEET NO.
	AMA	POTTER		024

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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.

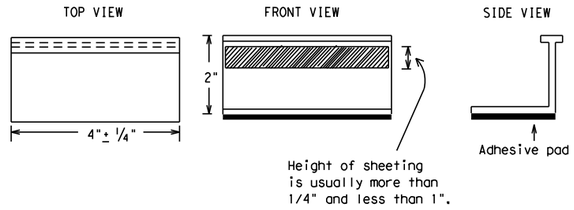
MAINTAINING WORK ZONE PAVEMENT MARKINGS

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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© TxDOT February 1998	CONT	SECT	JOB	HIGHWAY
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1-02 7-13	AMA	POTTER		025
11-02 8-14				

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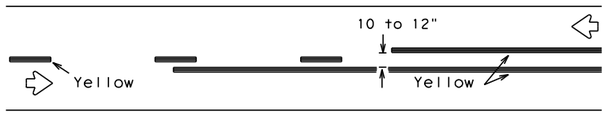
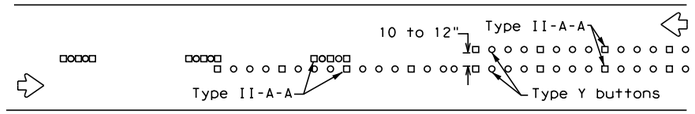
Vidal.Ngoumnai

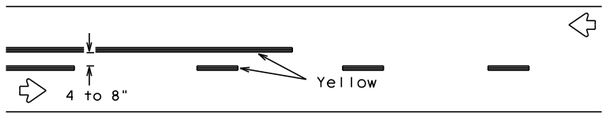
PAVEMENT MARKING PATTERNS



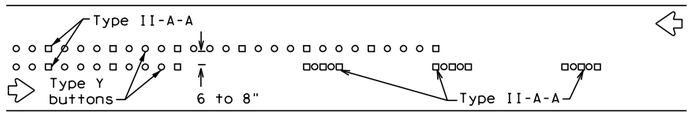
REFLECTORIZED PAVEMENT MARKINGS - PATTERN A



RAISED PAVEMENT MARKERS - PATTERN A



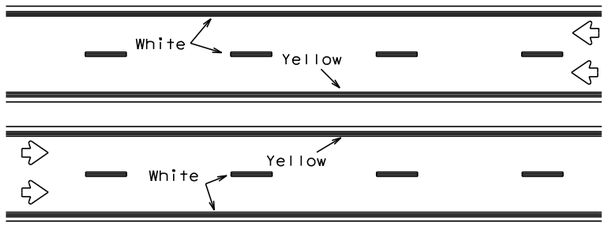
REFLECTORIZED PAVEMENT MARKINGS - PATTERN B



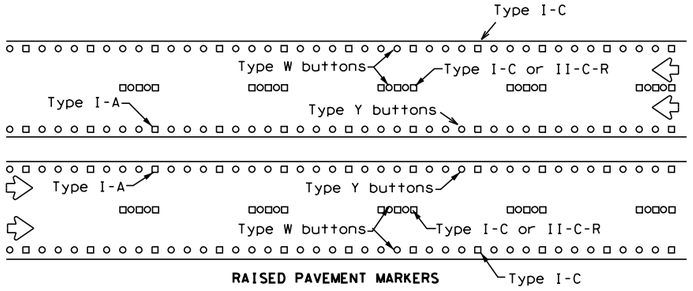
RAISED PAVEMENT MARKERS - PATTERN B

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



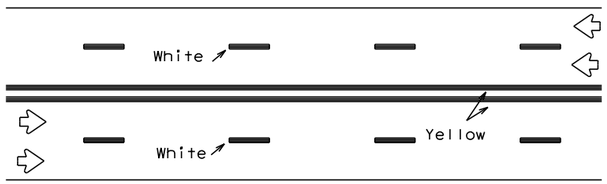
REFLECTORIZED PAVEMENT MARKINGS



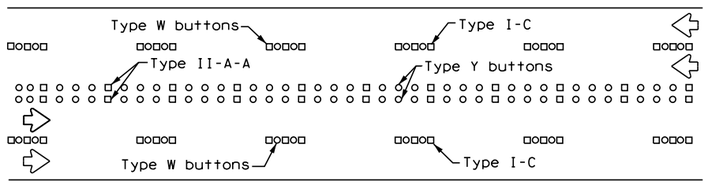
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

EDGE & LANE LINES FOR DIVIDED HIGHWAY



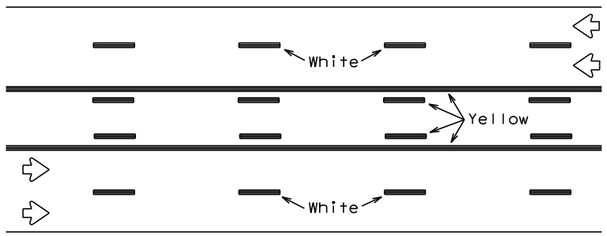
REFLECTORIZED PAVEMENT MARKINGS



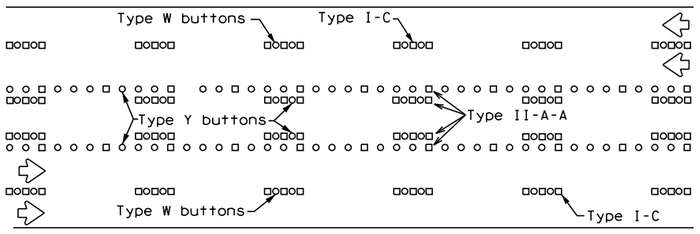
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS



REFLECTORIZED PAVEMENT MARKINGS



RAISED PAVEMENT MARKERS

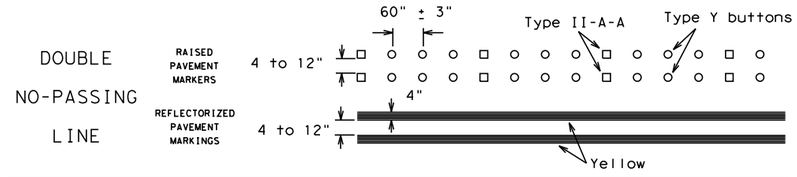
Prefabricated markings may be substituted for reflectorized pavement markings.

TWO-WAY LEFT TURN LANE

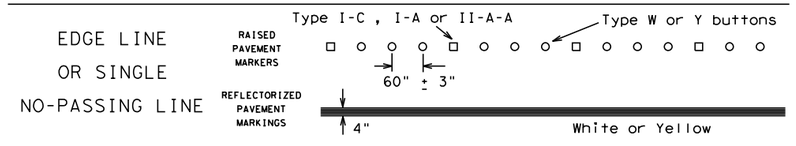
STANDARD WORK ZONE PAVEMENT MARKINGS DETAILS

SOLID LINES

DOUBLE NO-PASSING LINE

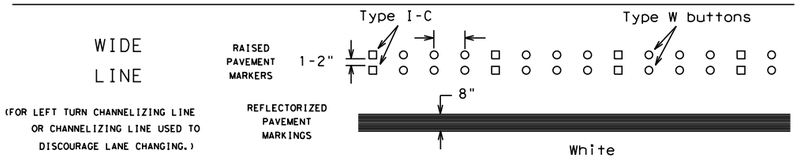


EDGE LINE OR SINGLE NO-PASSING LINE



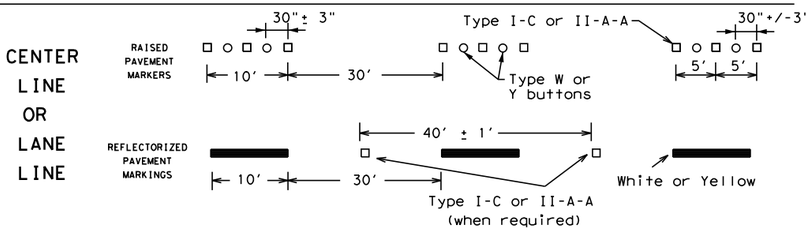
WIDE LINE

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

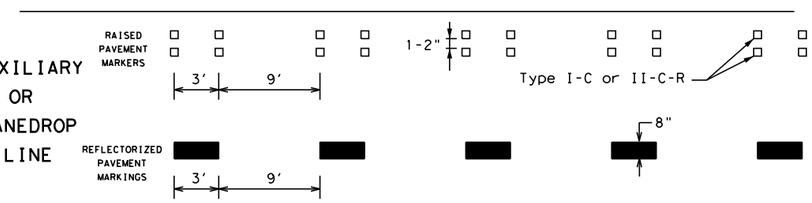


BROKEN LINES

CENTER LINE OR LANE LINE

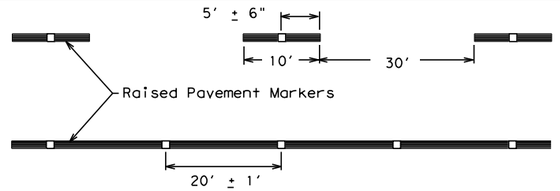


AUXILIARY OR LANEDROP LINE



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
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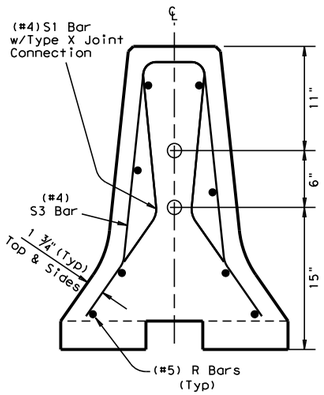
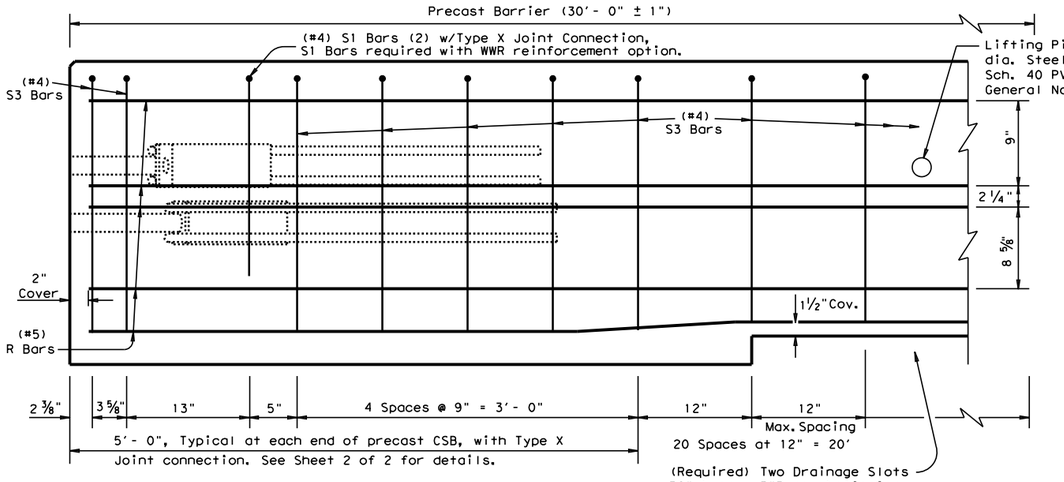


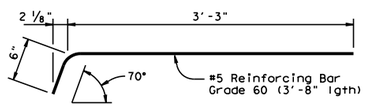
End View Precast Barrier

See sheet 2 of 3 for Joint connection Type X



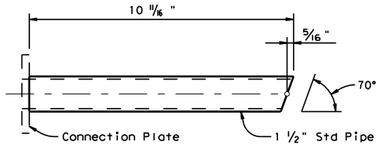
Reinforcement for Precast (CSB) Concrete Safety Barrier (Type 1)

Showing reinforcement for Joint Type X



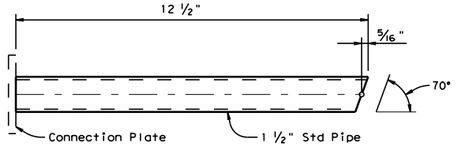
DEFORMED BAR ANCHOR DETAILS

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



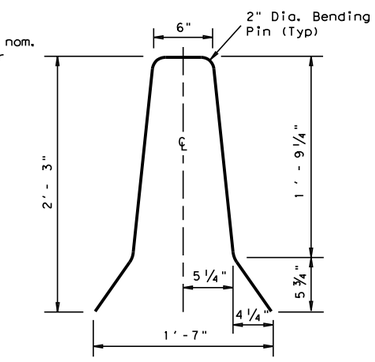
UPPER CONNECTION PIPE DETAILS

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



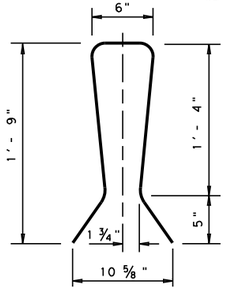
LOWER CONNECTION PIPE DETAILS

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



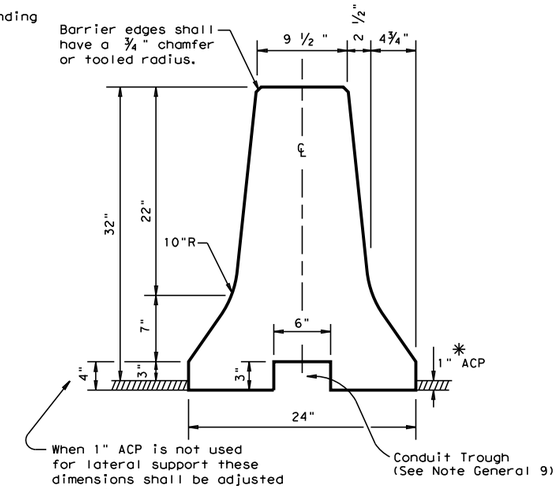
S3 Bar

#4 Bar



S1 Bar

#4 Bar (2)
(Joint Type X)

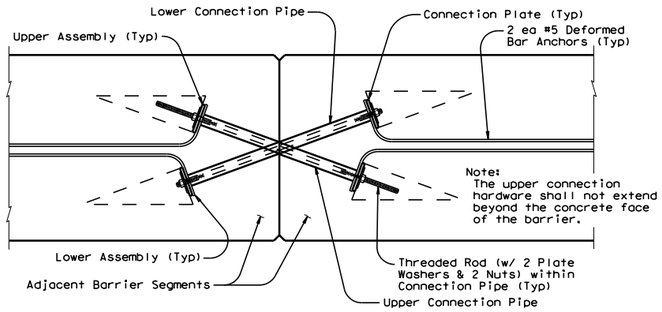


Concrete Safety Barrier

✳ When 1" ACP is "not" used as lateral support for permanent barrier placement. A permissible method of attaining the equivalent lateral support may be used, See CSB(6) sheet.

GENERAL NOTES

1. Concrete shall be Class H with a minimum compressive strength of 3,600 psi.
2. Where used, rebar reinforcement shall be Grade 60 and conform to ASTM A615.
3. Precast barrier length shall be 30 ft. unless otherwise specified on the plans.
4. All precast barrier edges shall have a ¾ " chamfer or tooled radius.
5. All concrete, reinforcement, joint connection systems, grout etc. as shown, are considered as part of the barrier payment.
6. All steel assemblies for joint shall be galvanized after fabrication in accordance with Item 445, "Galvanizing."
7. Regardless of the method of handling, barrier lifting points shall be approx. 7.5 feet from the ends of the barrier. Lifting devices and attachments to barrier sections shall be approved by the Engineer.
8. Surface finishing and grouting (where required) shall be two parts sand one part cement with enough water to make the mixture plastic. Grouting shall be done in a manner that will assure a smooth surface. Surface finishing shall be considered subsidiary to the various bid items involved.
9. Conduit trough when required shall be shown elsewhere on the plans, or as directed by the Engineer.



TYPE X JOINT INSTALLATION DETAIL

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

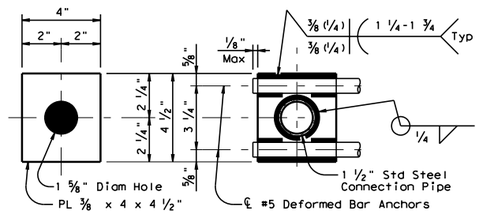
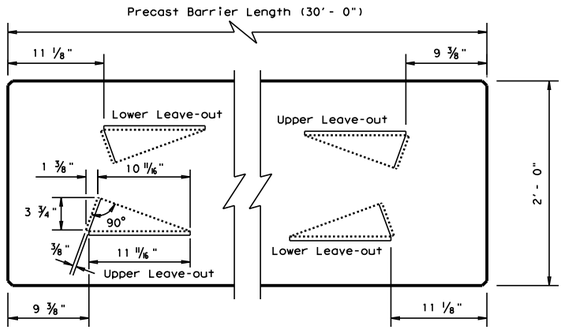


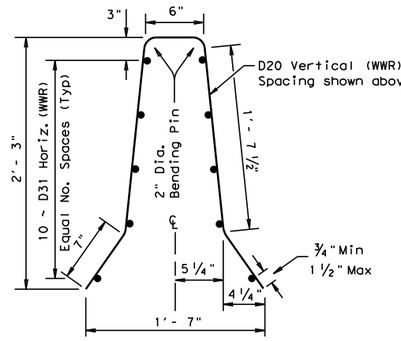
PLATE DIMENSIONS WELDING DETAILS

CONNECTION PLATE DETAILS

One (1) Plate required per assembly.
Four (4) required per Joint. All steel fittings for joint Type X shall be galvanized after fabrication in accordance with Item 445.



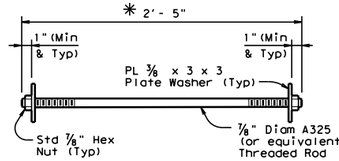
BARRIER PLAN AT END JOINTS



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

(WWR) General Notes

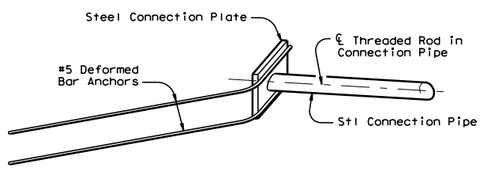
1. Deformed Welded Wire Reinforcement (WWR) shall conform to ASTM A497.
2. Welded wire cage may be cut or bent to accommodate the Type X joint connection and drainage slots, as directed by the Engineer.
3. All reinforcement shall comply with Item 440, "Reinforcing Steel."
4. Combinations of reinforcing steel and WWR will be permitted, as directed by the Engineer. The dimension from the end of the barrier section to the first wire shall not exceed 3".



CONNECTION BOLT OR THREADED ROD DETAIL

Two (2) Threaded Rods (Or Equivalent Hex Hd. Bolts)
(w/ Two (2) PL 3/8 x 3 x 3 Plate Washers & Two (2) Std Hex Nuts)
required per Joint.

✳ The connection hardware shall not extend beyond the concrete face of the barrier. Hex head bolts may be provided. The proper length of all hardware should be verified.



ISOMETRIC OF TYPICAL WELDED ASSEMBLY

Four (4) [2 Upper & 2 Lower] Assemblies required per Joint.

Weight of one Precast 30 ft. (CSB) segment = Approx. 6.5 Tons or 440 lbs per ft.

SHEET 1 OF 2

Texas Department of Transportation

Design Division Standard

CONCRETE SAFETY BARRIER (F-SHAPE)

PRECAST BARRIER (TYPE 1)

CSB(1)-10

FILE: csb110.dgn	DN: TxDOT	CK: AM	DW: BD	CK: VP
©TxDOT December 2010	CONT	SECT	JOB	HIGHWAY
REVISIONS	0090	05	107	IH40
	DIST	COUNTY		SHEET NO.
	AMA	POTTER		027

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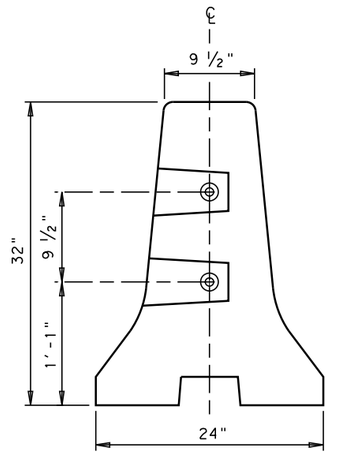
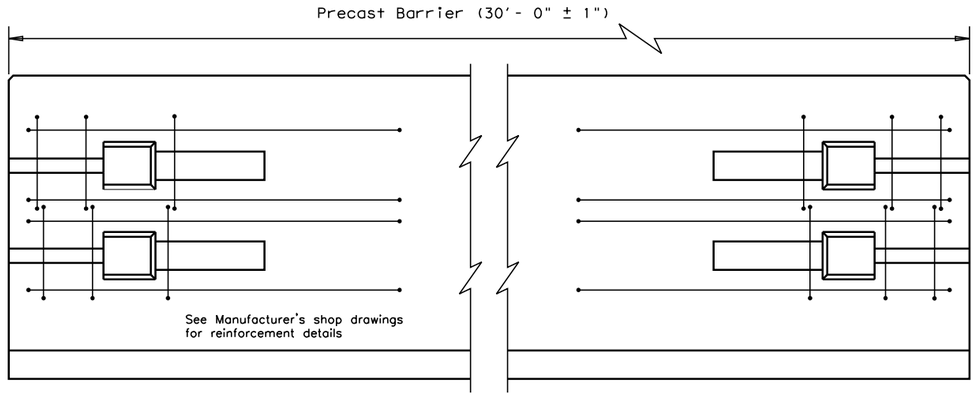
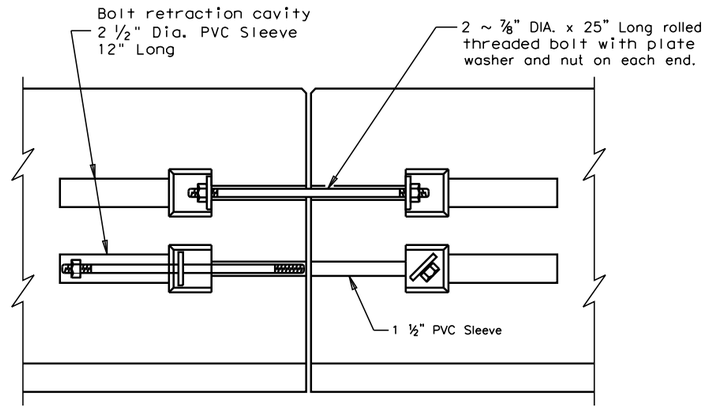
Vidal.Ngoumnai



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

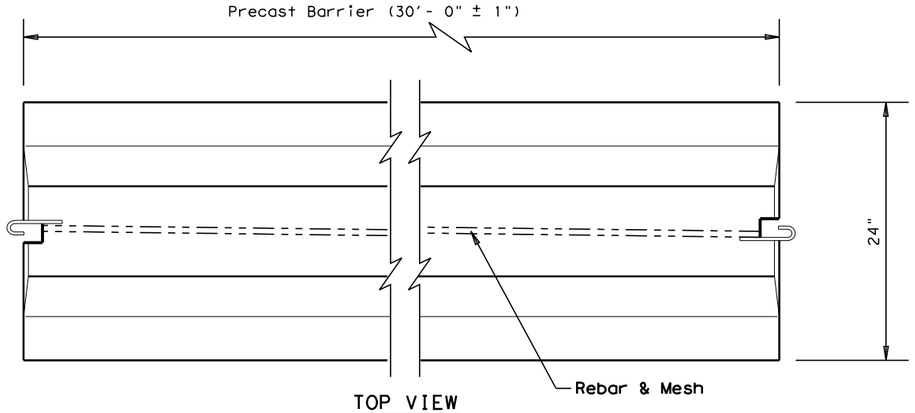


ELEVATION (CSB) QUICK-BOLT
See Manufacturer's shop drawing for additional details

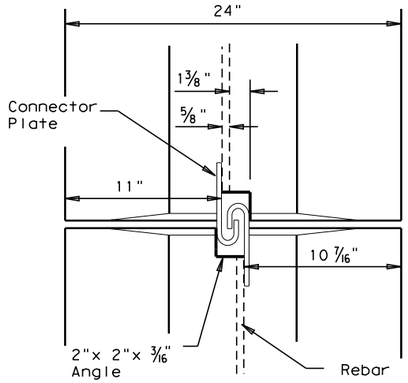


ELEVATION VIEW SHOWING JOINT CONNECTION
"QUICK-BOLT"

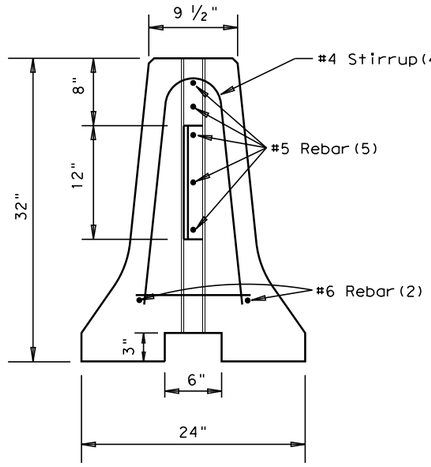
Joint Connection (Type Q)



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



VIEW FROM ABOVE
J-J HOOK CONNECTION



END VIEW
J-J HOOK CONNECTION

Joint Connection (Type J)

Proprietary Joint Connections (CSB)

Two proprietary joint connections are acceptable as alternates to the (Type X) connection shown, here on. These joint connections types are:

J-J Hooks by Easi-Set Industries, (800)547-4045
Quick-Bolt by Bexar Concrete, (210)497-3773

If one of these connection systems are exclusively specified in the plans, prior approval for sole source use must be obtained. Details of the connection components and barrier reinforcement for these systems, will be shown on the manufacturer's shop drawing(s) furnished to the Engineer.

Texas Department of Transportation
Design Division Standard

CONCRETE SAFETY BARRIER (F-SHAPE)

PRECAST BARRIER
(TYPE 1)

CSB(1)-10

FILE: csb110.dgn	DN: TxDOT	CK: AM	DW: BD	CK: VP
©TxDOT December 2010	CONT	SECT	JOB	HIGHWAY
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	DIST	COUNTY		SHEET NO.
	AMA	POTTER		028

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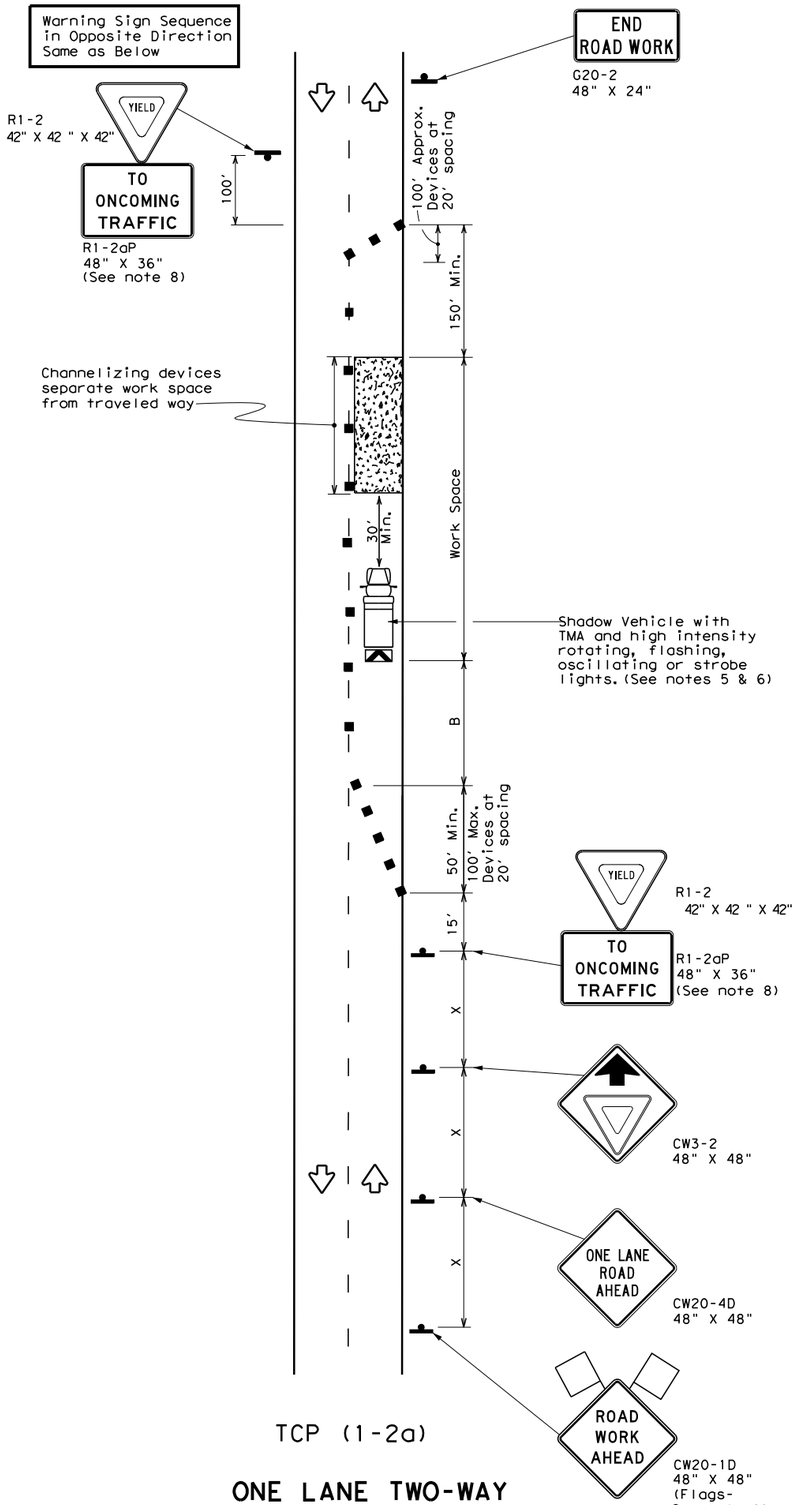
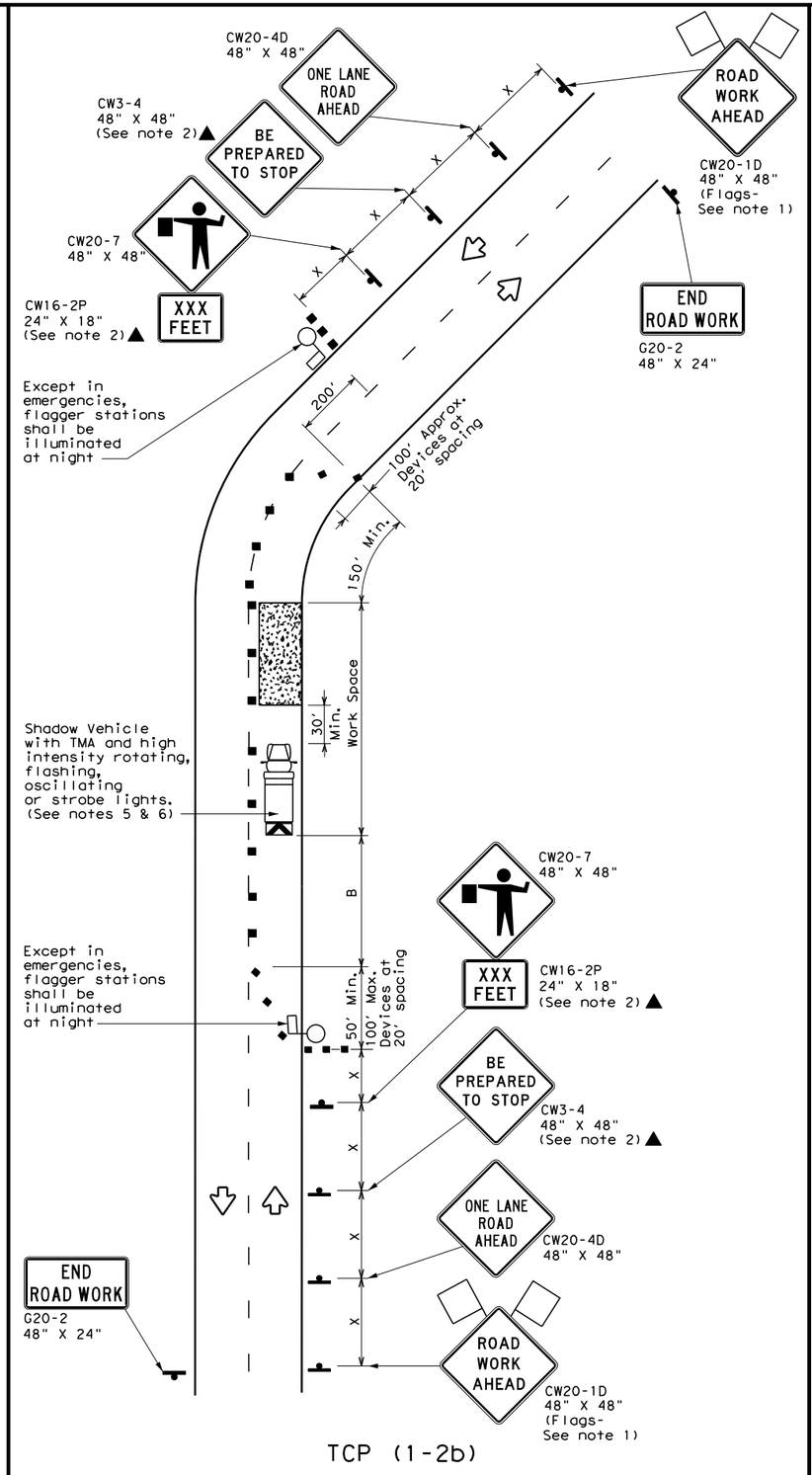
Vidal.Ngoumnai



TCP (1-2a)

ONE LANE TWO-WAY CONTROL WITH YIELD SIGNS

(Less than 2000 ADT - See note 7)



TCP (1-2b)

ONE LANE TWO-WAY CONTROL WITH FLAGGERS

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

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

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

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

GENERAL NOTES

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

TCP (1-2a)

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

TCP (1-2b)

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

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN ONE-LANE TWO-WAY TRAFFIC CONTROL

TCP(1-2)-18

FILE: tcp1-2-18.dgn	DN:	CK:	DW:	CK:
©TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS 4-90 4-98 2-94 2-12 1-97 2-18	0090	05	107	IH40
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	AMA	POTTER		029

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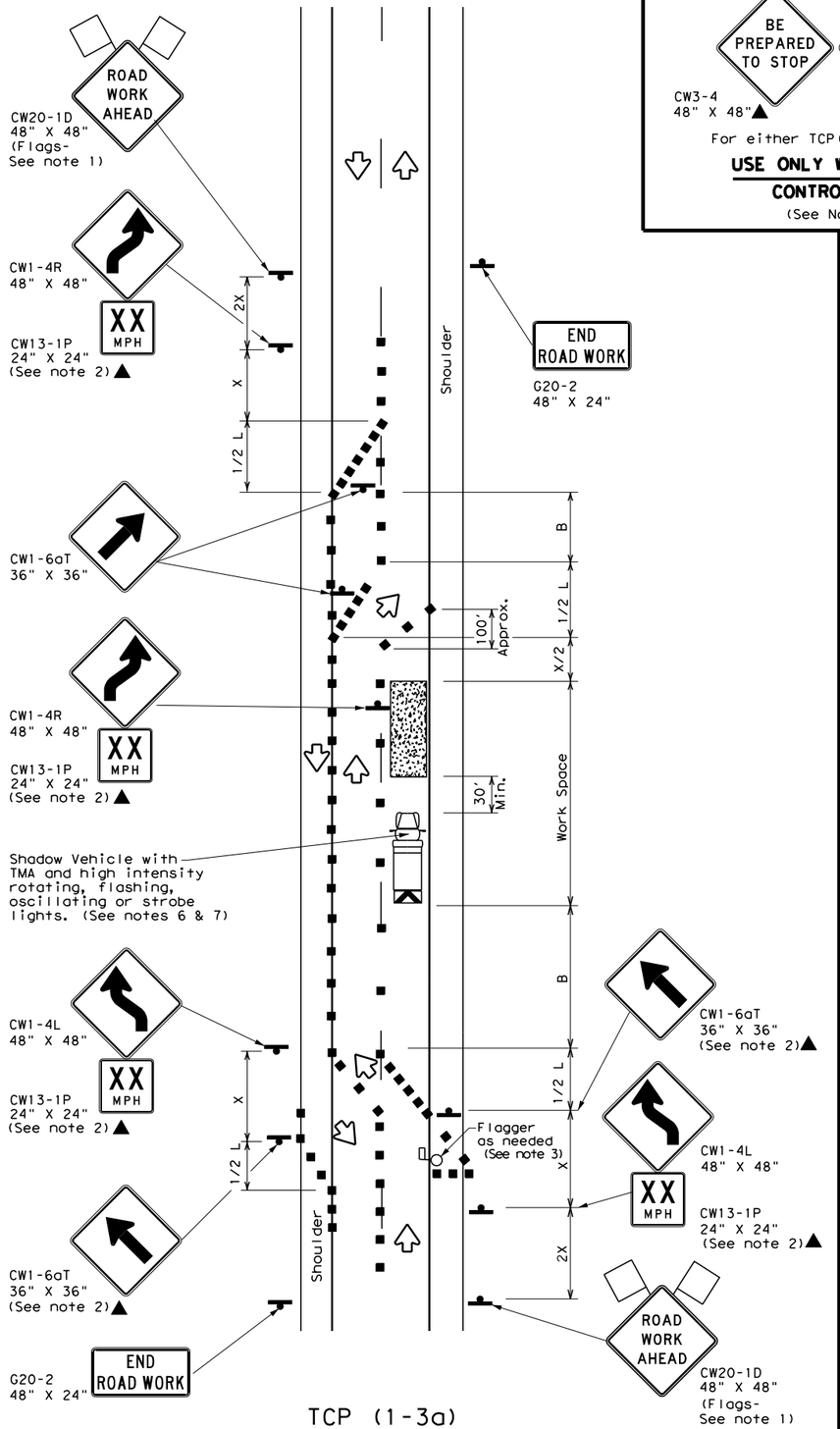
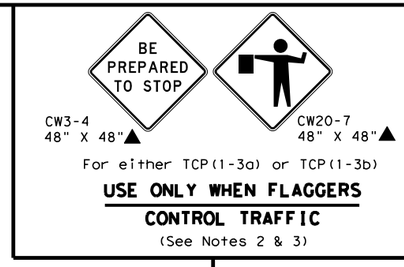


TCP (1-3a)
2-LANE ROADWAY WITH PAVED SHOULDERS

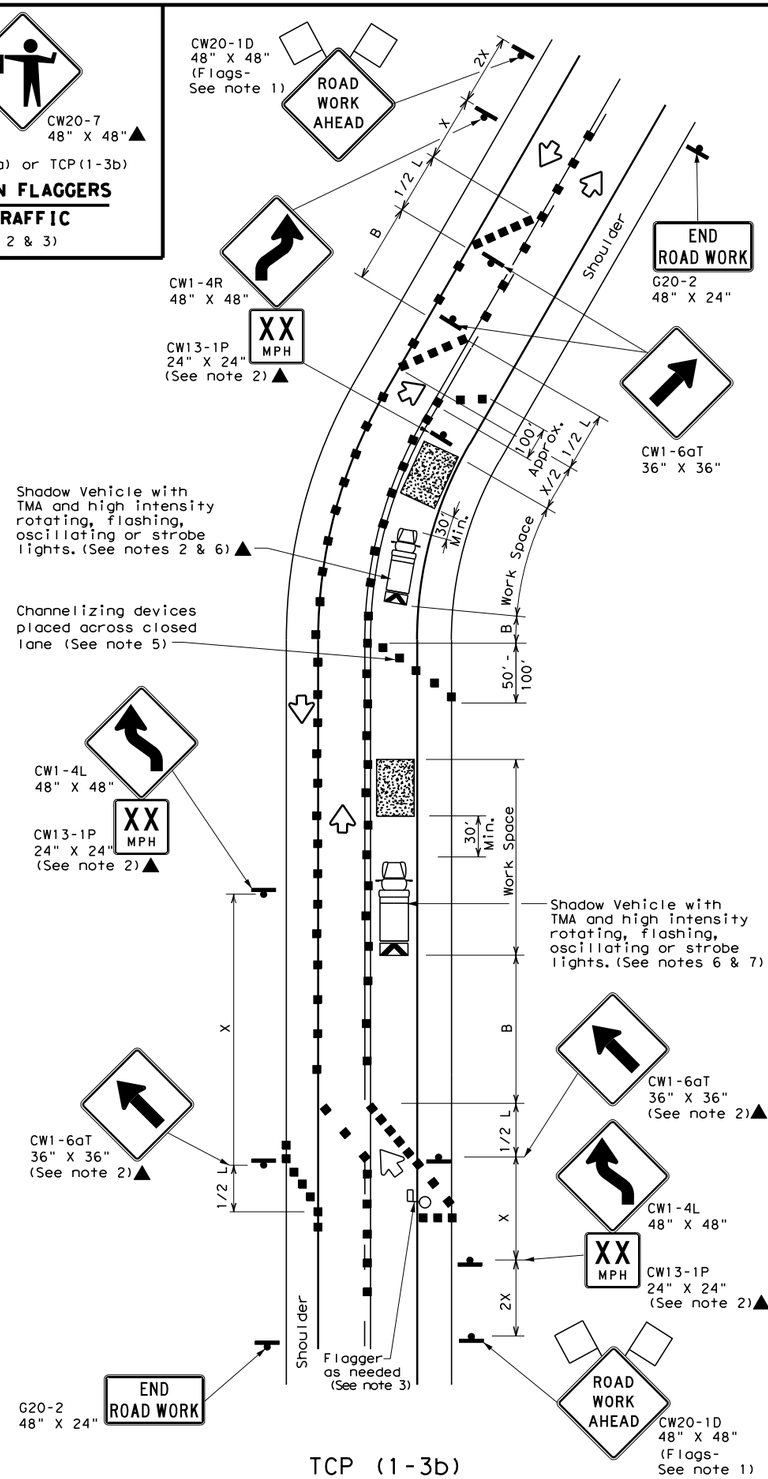
ONE LANE CLOSED
ADEQUATE FIELD OF VIEW



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

USE ONLY WHEN FLAGGERS CONTROL TRAFFIC

(See Notes 2 & 3)



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

ONE LANE CLOSED
INADEQUATE FIELD OF VIEW

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

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

* Conventional Roads Only

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

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

GENERAL NOTES

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

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN TRAFFIC SHIFTS ON TWO LANE ROADS

TCP(1-3)-18

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© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS	0090	05	107	IH40
2-94 4-98	DIST	COUNTY		SHEET NO.
8-95 2-12	AMA	POTTER		030
1-97 2-18				

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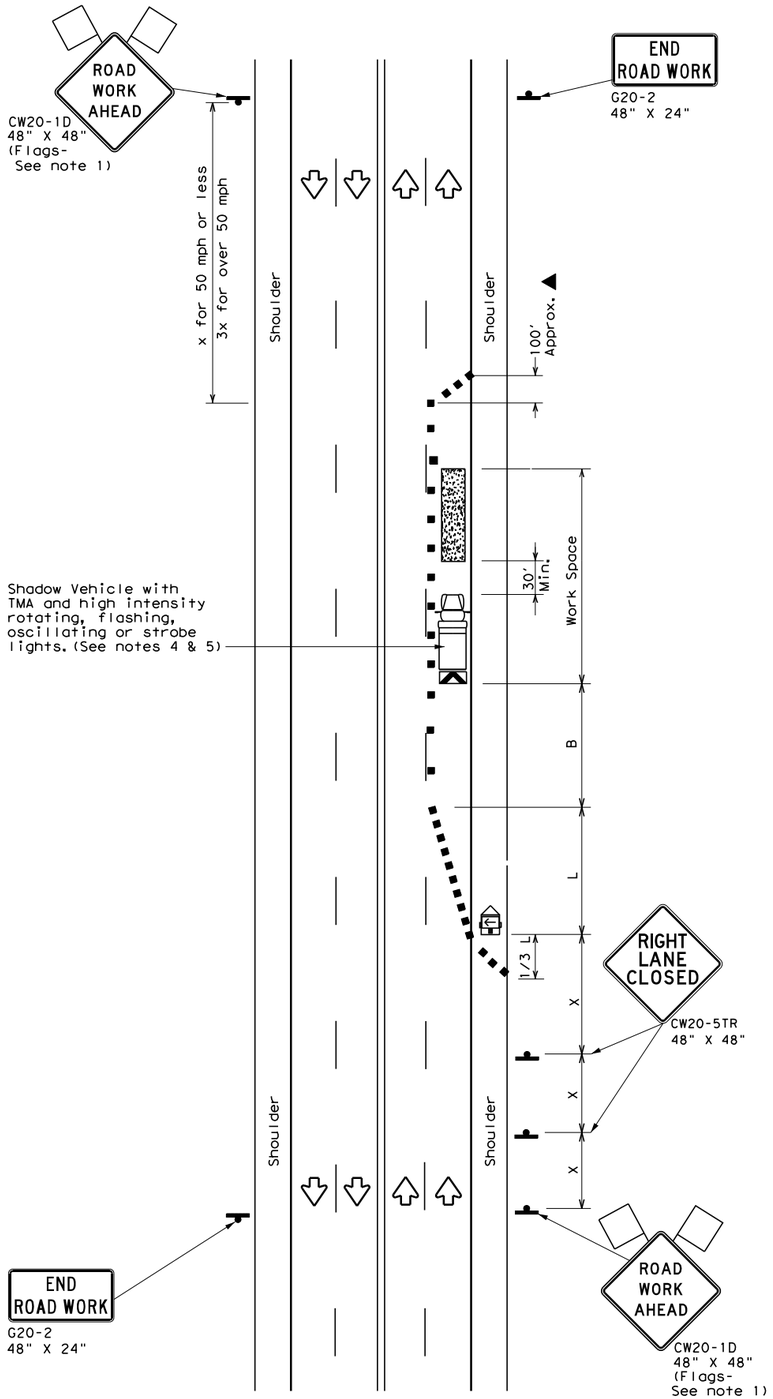
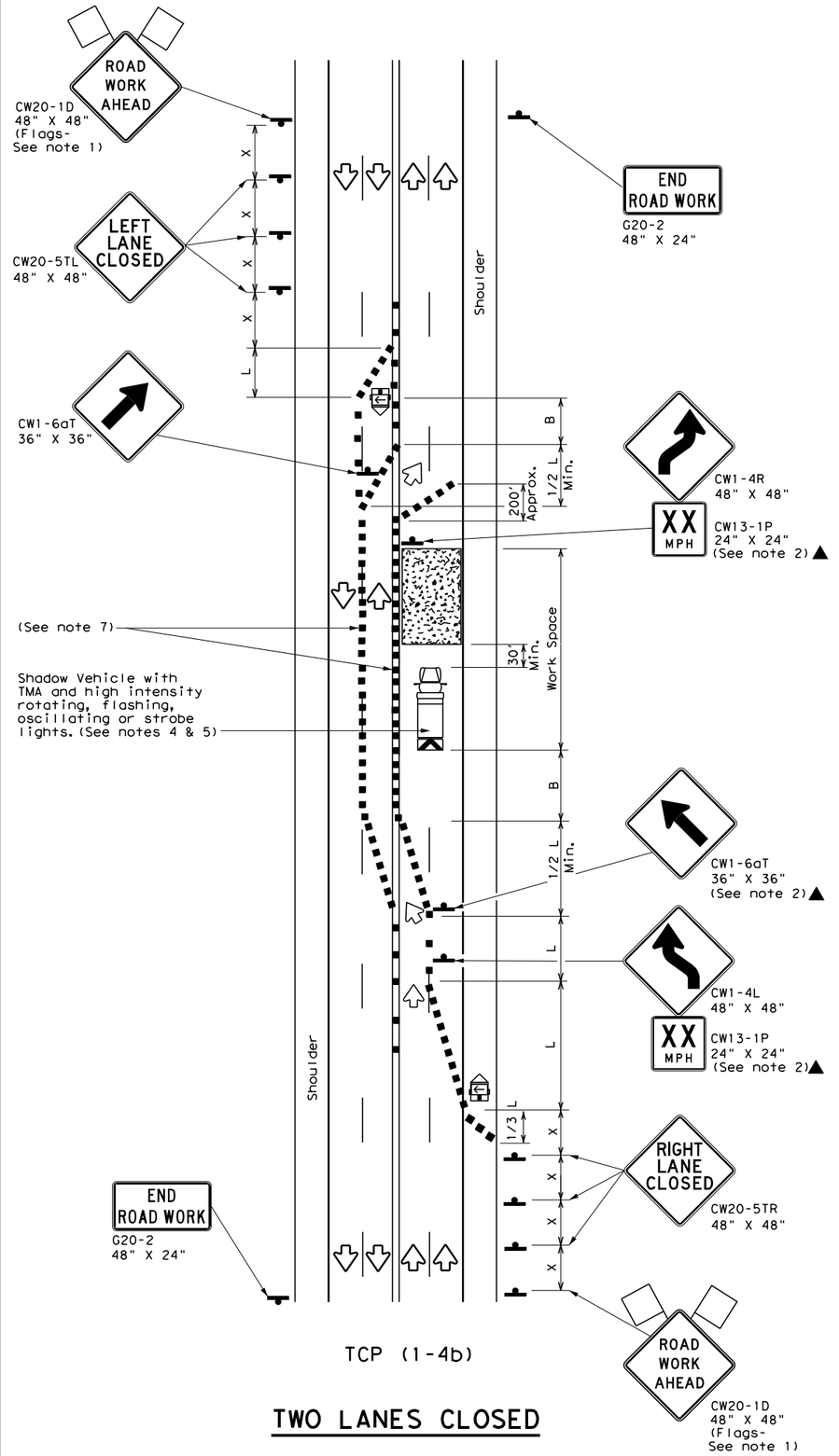


TCP (1-4a)

ONE LANE CLOSED



TCP (1-4b)

TWO LANES CLOSED

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

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

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

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

GENERAL NOTES

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

TCP (1-4a)

6. If this TCP is used for a left lane closure , CW20-5TL "LEFT LANE CLOSED" signs shall be used and channelizing devices shall be placed on the centerline where needed to protect the work space from opposing traffic with the arrow panel placed in the closed lane near the end of the merging taper.

TCP (1-4b)

7. Where traffic is directed over a yellow centerline, channelizing devices which separate two-way traffic should be spaced on tapers at 20' or 15' if posted speeds are 35 mph or slower, and for tangent sections, at 1/2S where S is the speed in mph. This tighter device spacing is intended for the areas of conflicting markings, not the entire work zone.

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN LANE CLOSURES ON MULTILANE CONVENTIONAL ROADS

TCP(1-4)-18

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8-95 2-12	AMA	POTTER		031
1-97 2-18				

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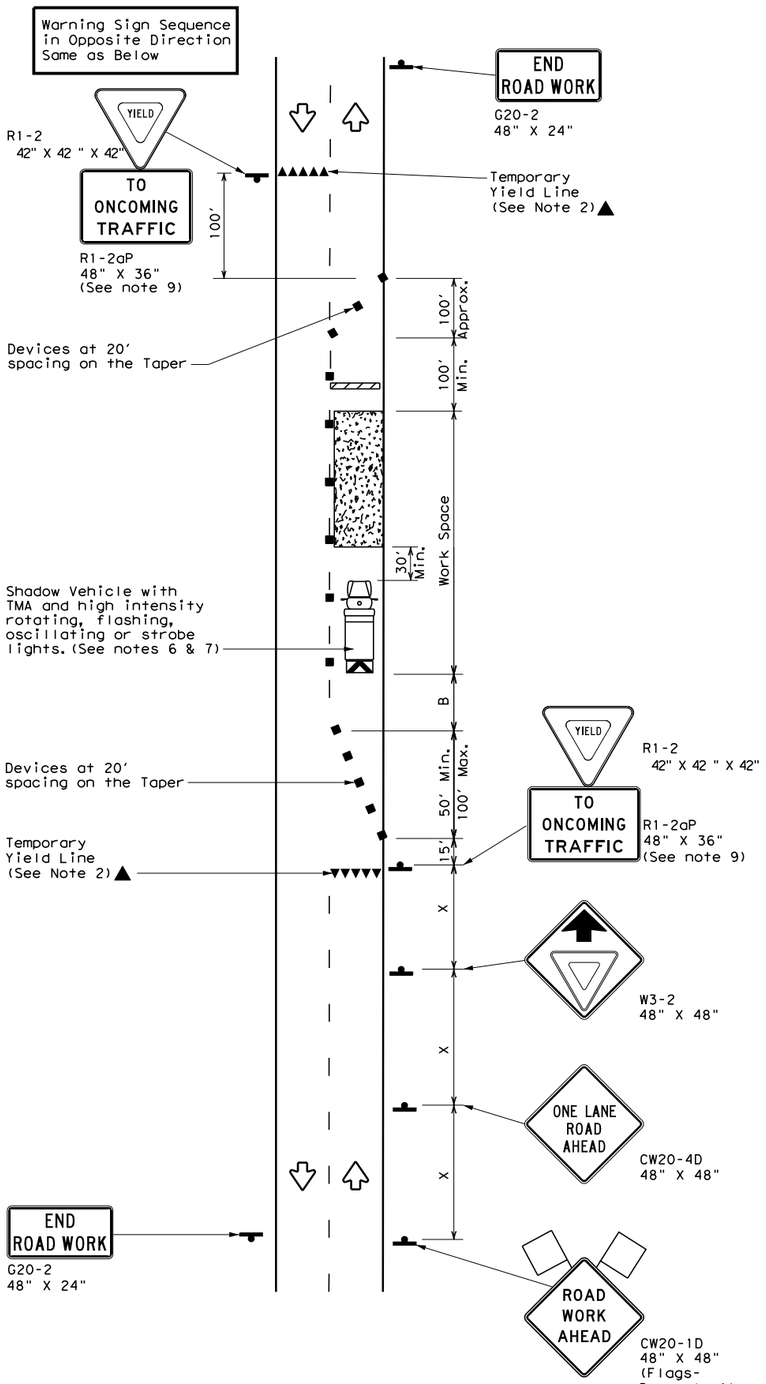
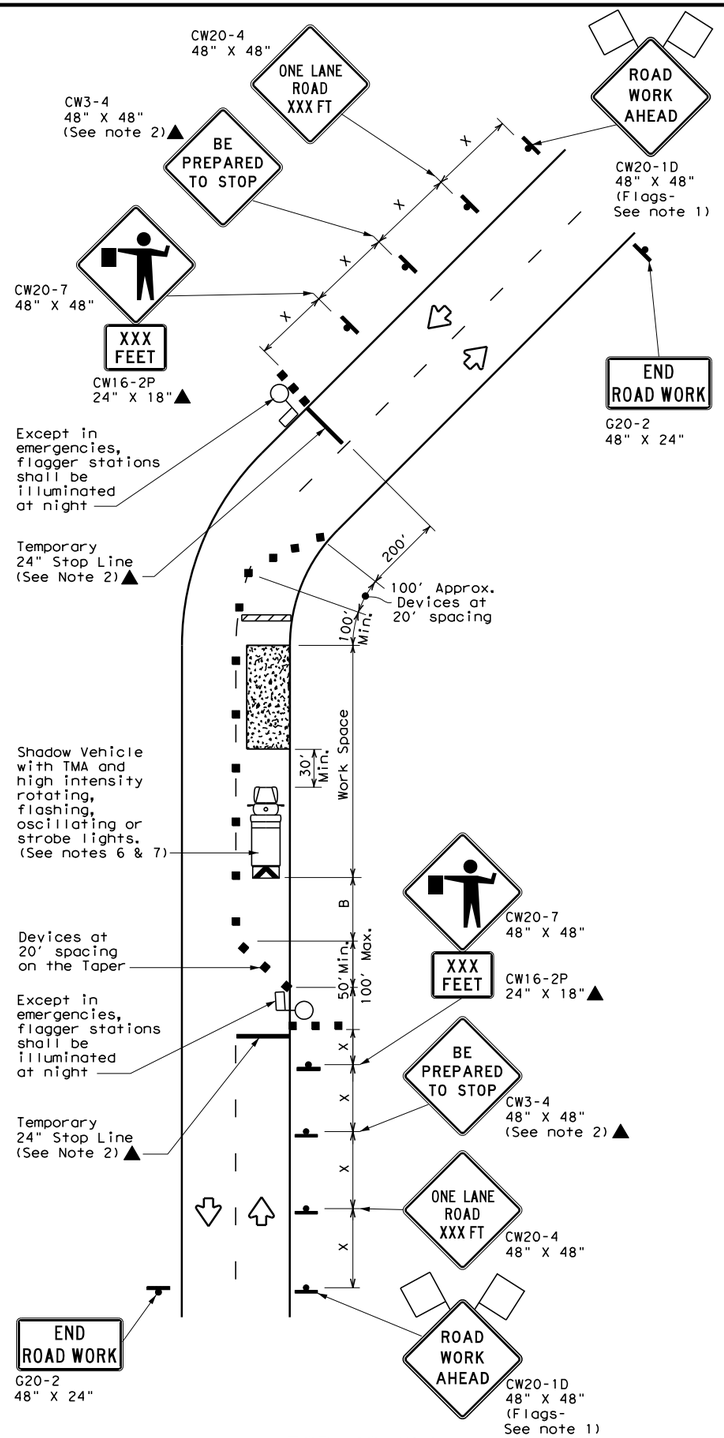


TCP (2-2a)
2-LANE ROADWAY WITHOUT PAVED SHOULDERS
ONE LANE TWO-WAY
CONTROL WITH YIELD SIGNS
(Less than 2000 ADT - See Note 9)



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

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

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

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

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

GENERAL NOTES

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

TCP (2-2a)

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

TCP (2-2b)

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

Texas Department of Transportation
Traffic Operations Division Standard

TRAFFIC CONTROL PLAN
ONE-LANE TWO-WAY
TRAFFIC CONTROL

TCP(2-2)-18

FILE: tcp2-2-18.dgn	DN:	CK:	DW:	CK:
©TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS 8-95 3-03	0090	05	107	IH40
1-97 2-12	DIST	COUNTY		SHEET NO.
4-98 2-18	AMA	POTTER		032

DATE: 12/8/2023 8:28:41 AM
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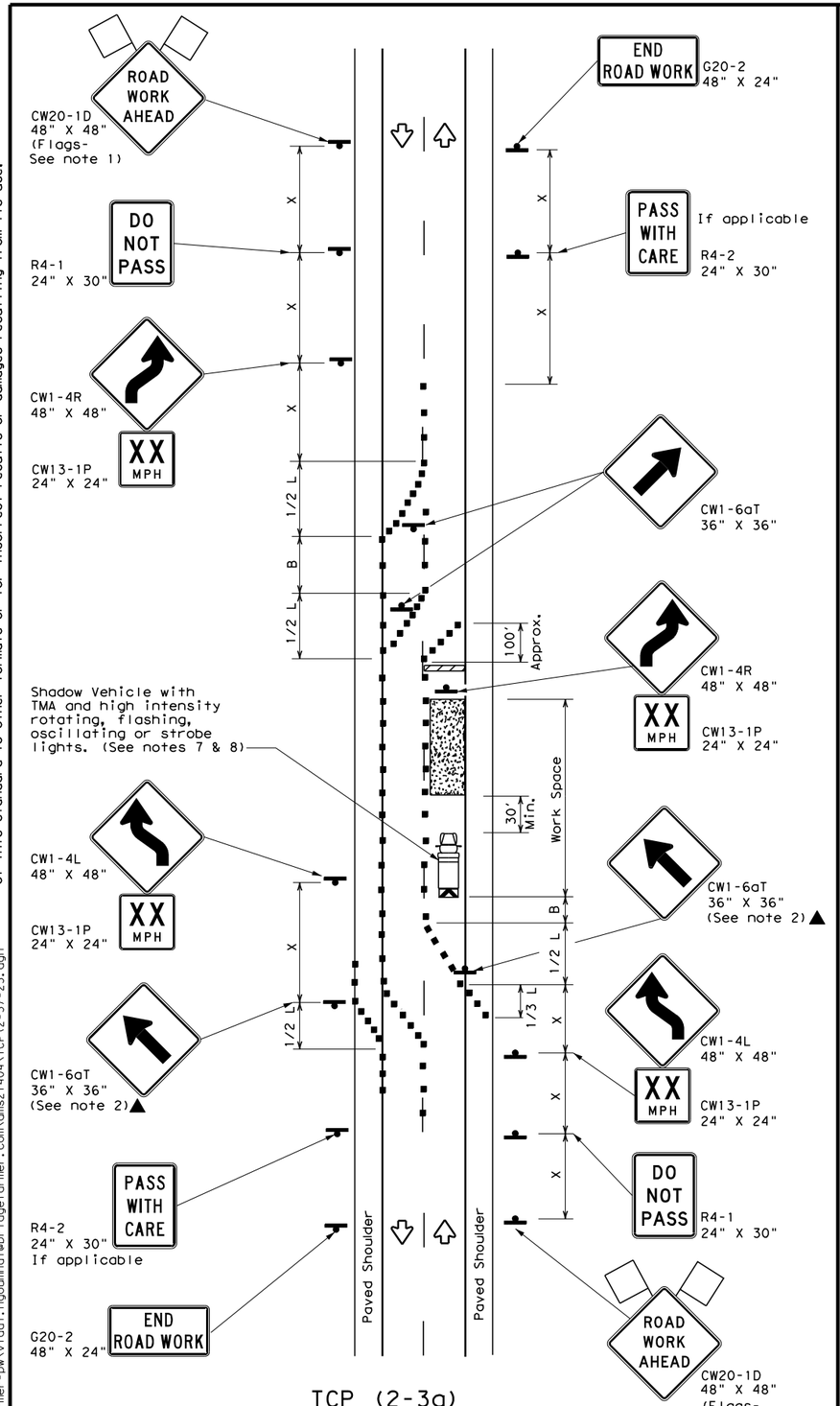
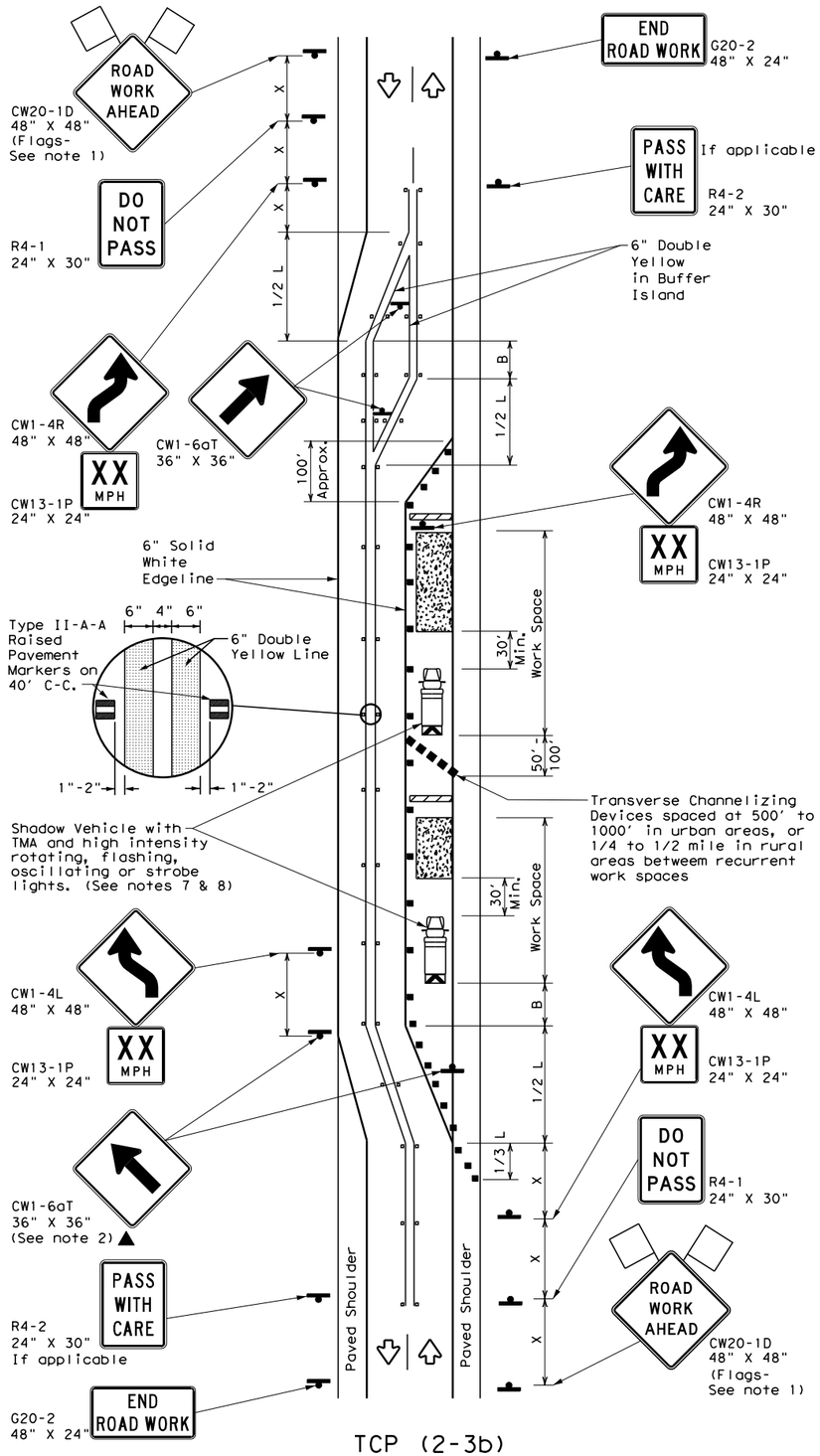
Vidal.Ngoumnai@bridgefarmer.com



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

ONE LANE CLOSED
ADEQUATE FIELD OF VIEW



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

ONE LANE CLOSED
INADEQUATE FIELD OF VIEW

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

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

* Conventional Roads Only

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

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

GENERAL NOTES

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

TCP (2-3a)

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

Texas Department of Transportation — Traffic Safety Division Standard

TRAFFIC CONTROL PLAN TRAFFIC SHIFTS ON TWO-LANE ROADS

TCP(2-3)-23

FILE: tcp(2-3)-23.dgn	DN:	CK:	DW:	CK:
© TxDOT April 2023	CONT	SECT	JOB	HIGHWAY
REVISIONS	0090	05	107	IH40
12-85 4-98 2-18	DIST	COUNTY		SHEET NO.
8-95 3-03 4-23	AMA	POTTER		033
1-97 2-12				

DATE: Vidal.Ngoumnai 12/8/2023 8:28:46 AM
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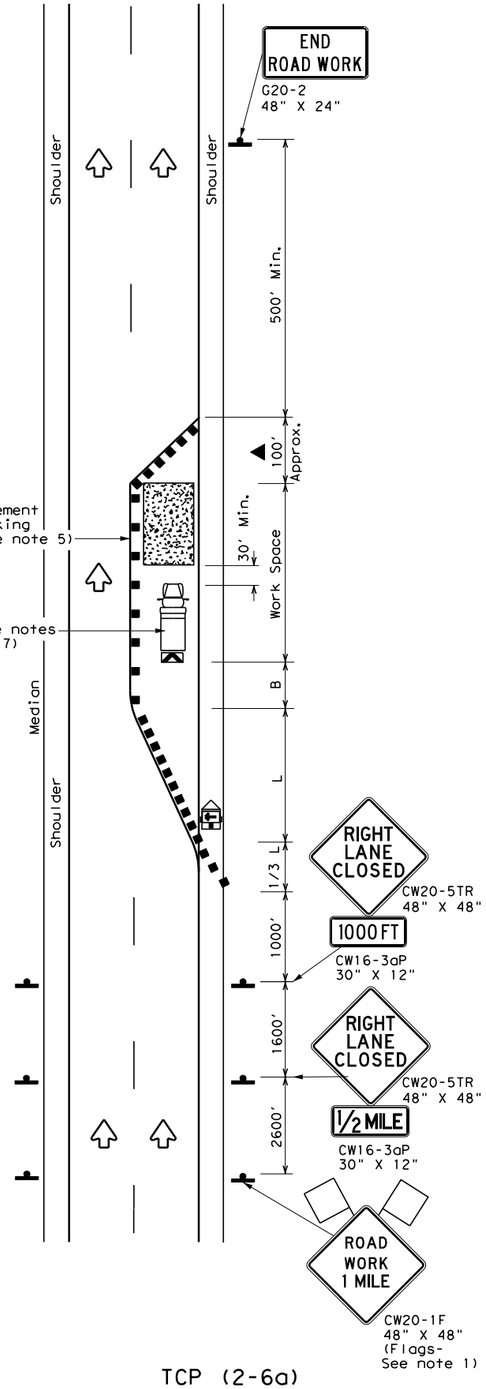
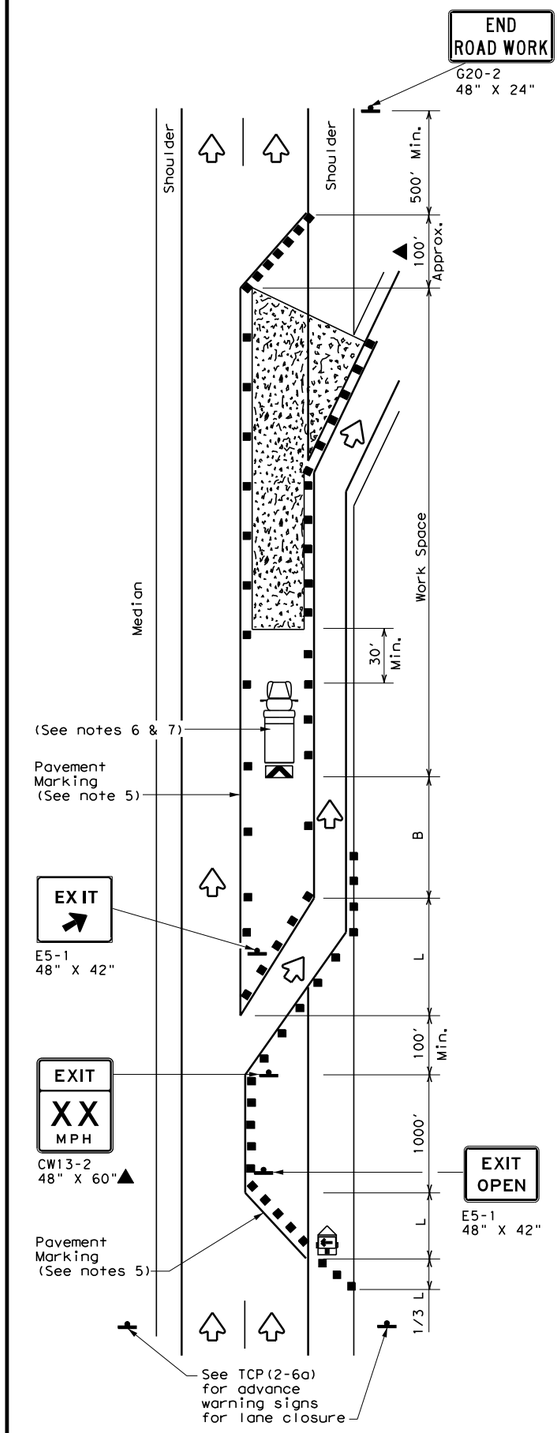


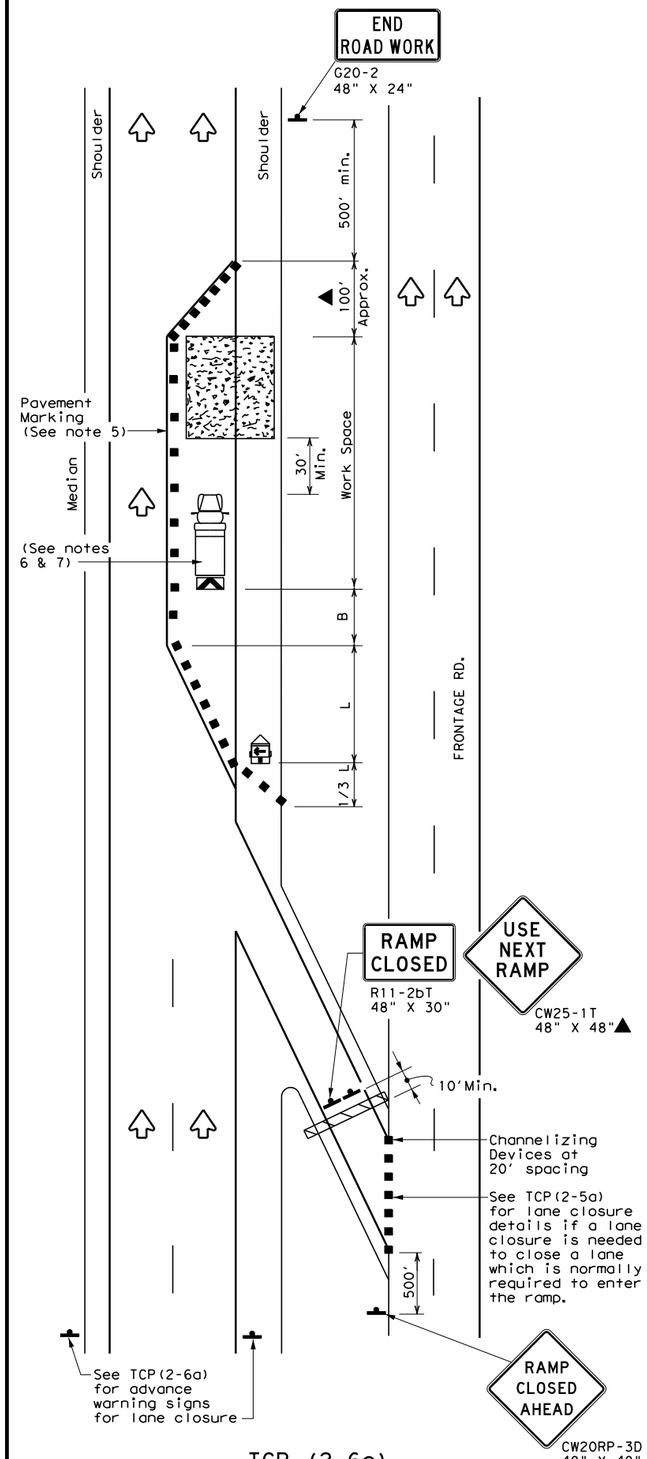
TCP (2-6a)

ONE LANE CLOSURE



TCP (2-6b)

LANE CLOSURE NEAR EXIT RAMPS



TCP (2-6c)

LANE CLOSURE NEAR ENTRANCE RAMPS

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

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

* Conventional Roads Only

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

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

GENERAL NOTES

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

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN LANE CLOSURES ON DIVIDED HIGHWAYS

TCP(2-6)-18

FILE: tcp2-6-18.dgn	DN:	CK:	DW:	CK:
© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS 2-94 4-98 8-95 2-12 1-97 2-18	0090	05	107	IH40
	DIST	COUNTY		SHEET NO.
	AMA	POTTER		034

DATE: 12/8/2023 8:28:52 AM
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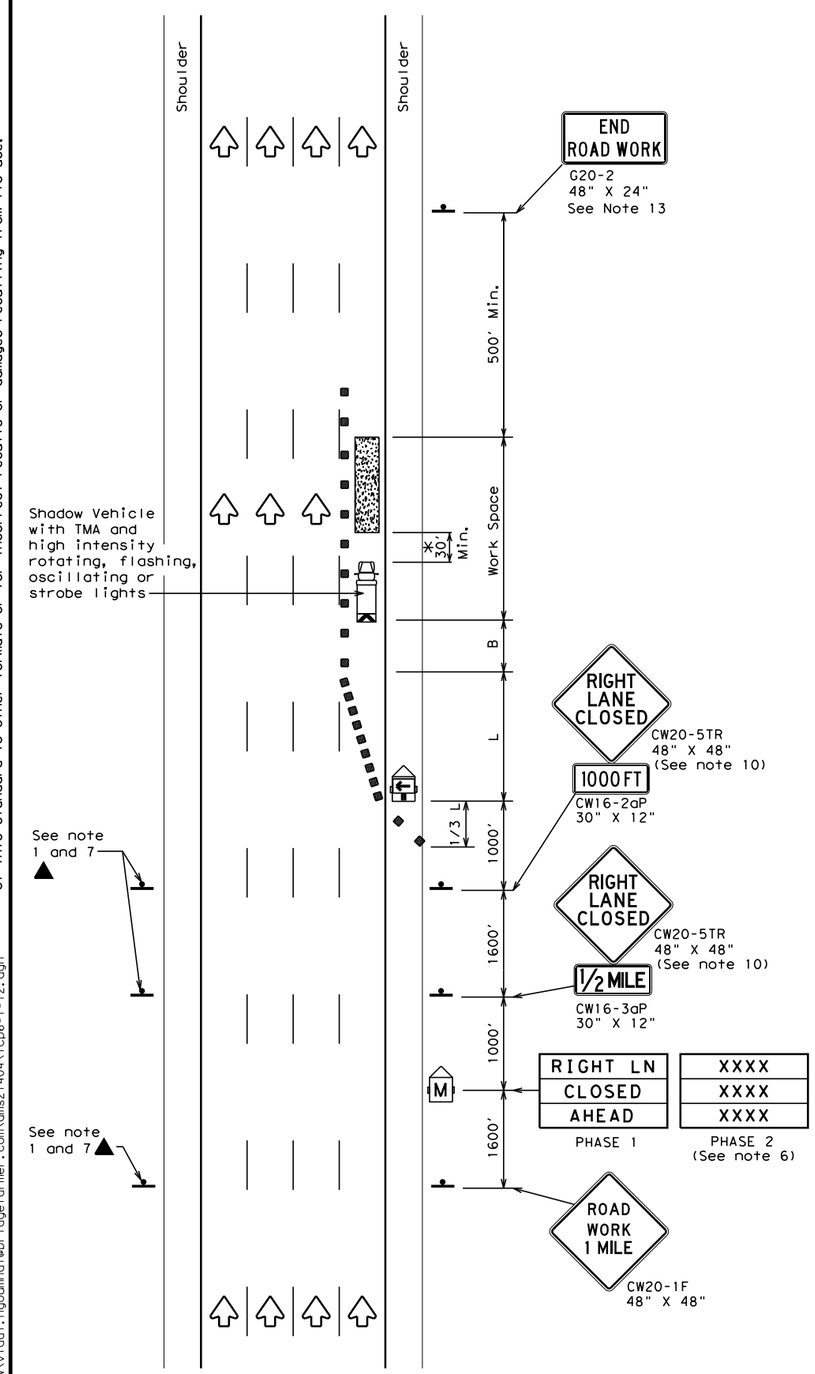
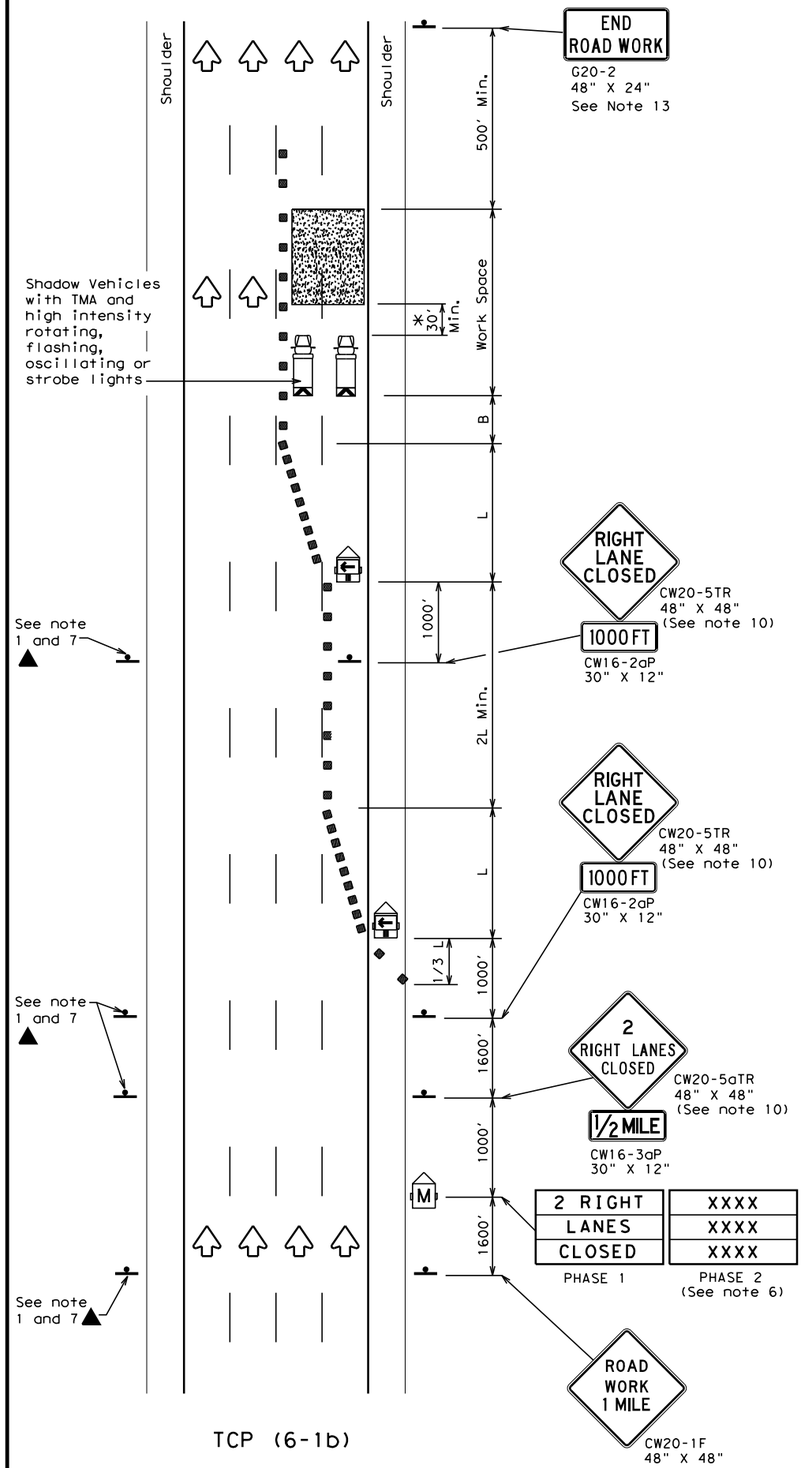


TCP (6-1a)

TYPICAL FREEWAY ONE LANE CLOSURE



TCP (6-1b)

TYPICAL FREEWAY TWO LANE CLOSURE

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

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

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

GENERAL NOTES

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

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

Texas Department of Transportation
Traffic Operations Division Standard

TRAFFIC CONTROL PLAN FREEWAY LANE CLOSURES

TCP(6-1)-12

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©TxDOT February 1998	CONT	SECT	JOB	HIGHWAY
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8-12	DIST	COUNTY		SHEET NO.
	AMA	POTTER		035

DATE: Vidal.Ngoumnai 12/8/2023 8:29:05 AM
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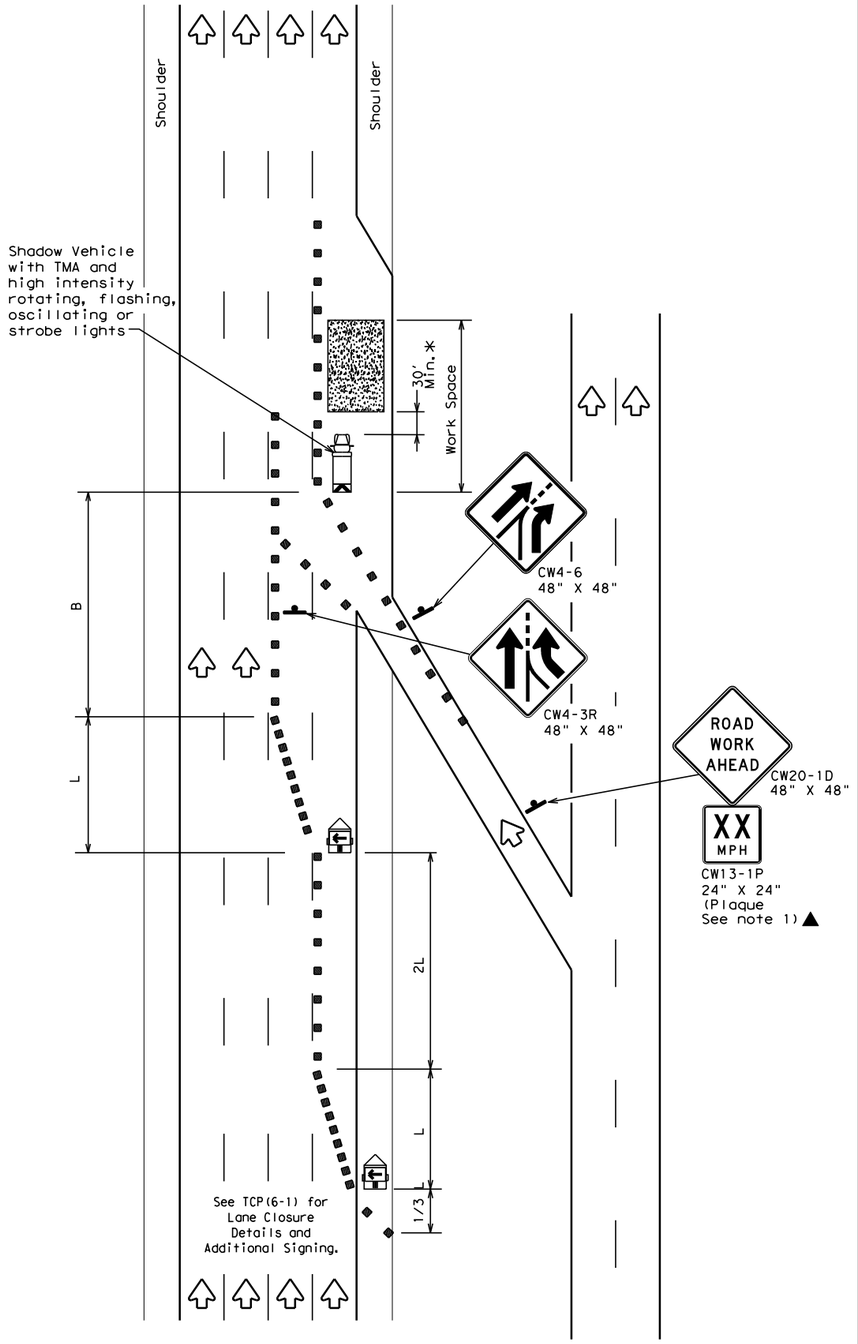
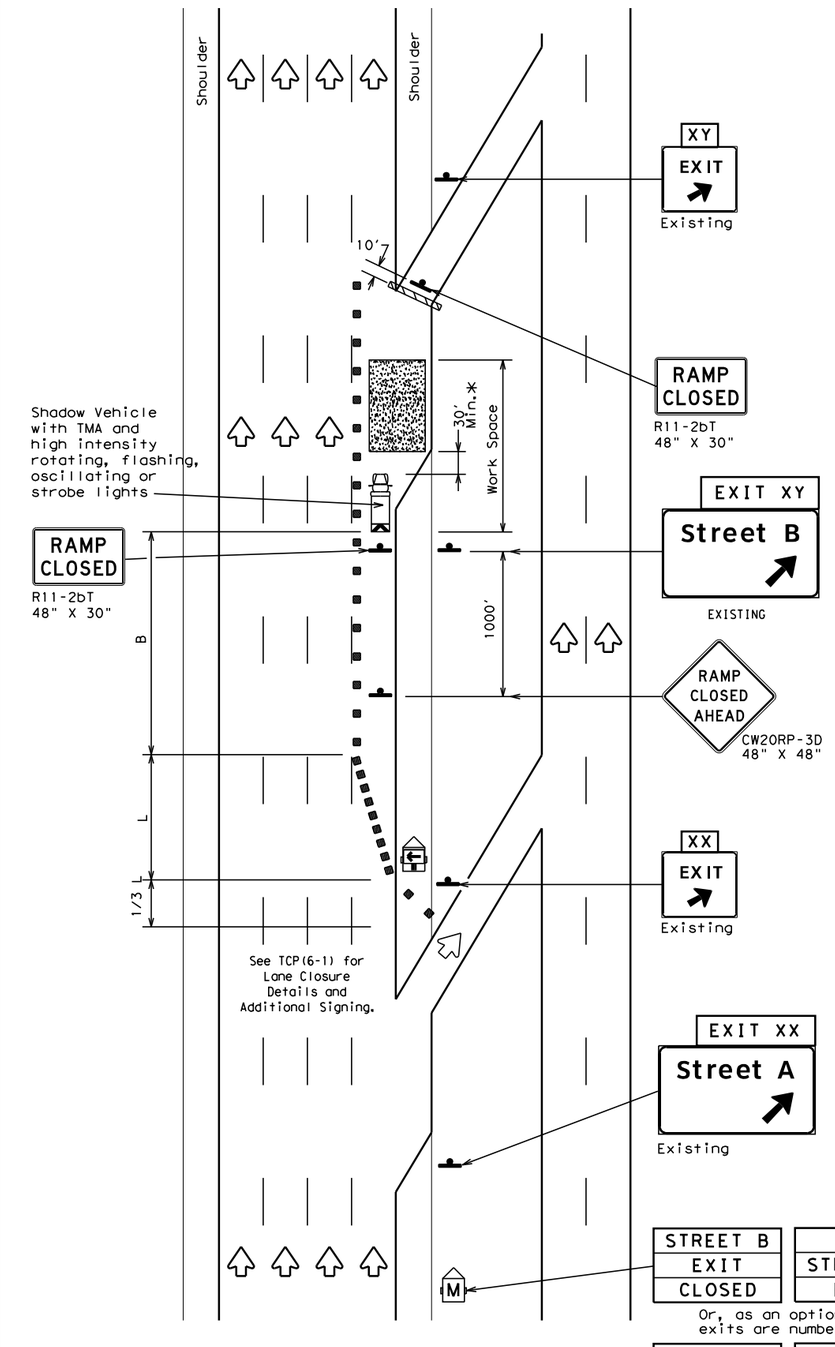


TCP (6-3a)

ENTRANCE RAMP OPEN



TCP (6-3b)

EXIT RAMP CLOSED

TRAFFIC EXITS PRIOR TO CLOSED RAMP

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

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

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

GENERAL NOTES:

1. All traffic control devices illustrated are REQUIRED. Devices denoted with the triangle symbol may be omitted when stated elsewhere in the plans.

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

Additional requirements for lane closures and advance signing shall be as shown on TCP (6-1) or as directed by the Engineer.

Texas Department of Transportation
Traffic Operations Division Standard

TRAFFIC CONTROL PLAN
WORK AREA BEYOND RAMP

TCP(6-3)-12

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©TxDOT February 1994	CONT	SECT	JOB	HIGHWAY
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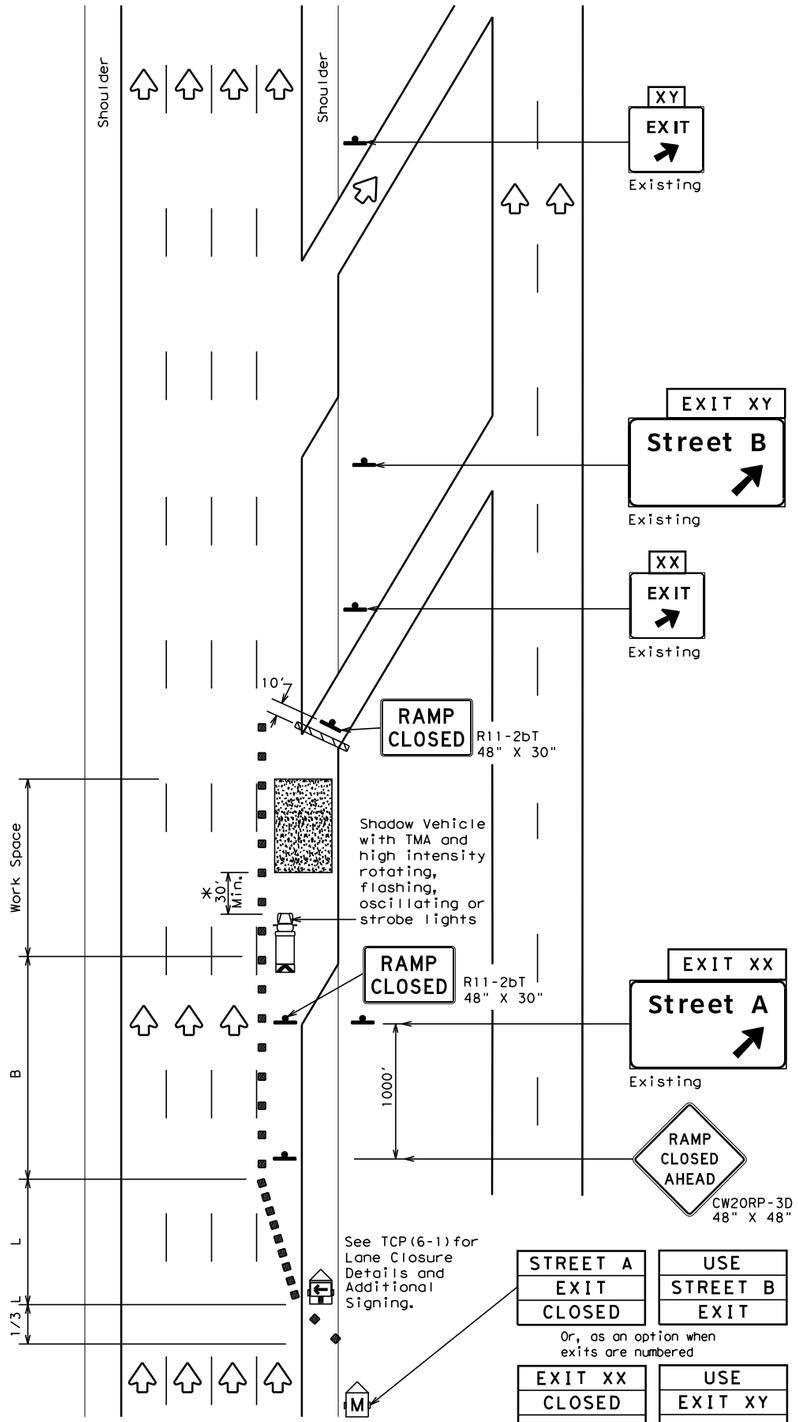
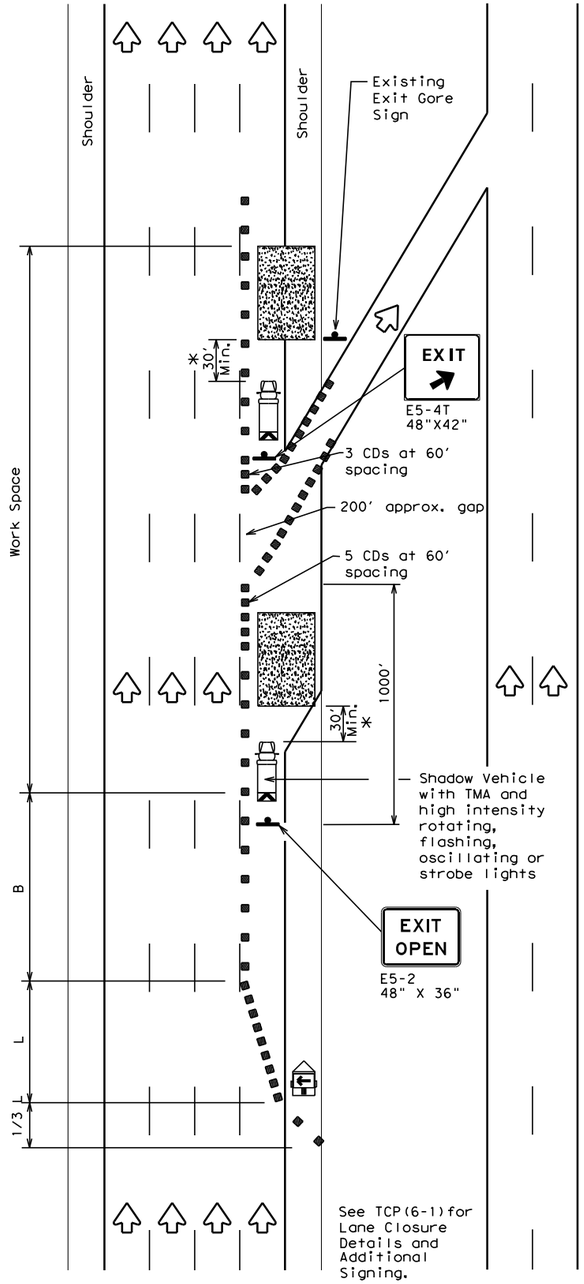
1-97 8-98	DIST	COUNTY		SHEET NO.
4-98 8-12	AMA	POTTER		036



TCP (6-4a)

EXIT RAMP CLOSED
TRAFFIC EXITS PAST CLOSED RAMP



TCP (6-4b)

EXIT RAMP OPEN

LEGEND			
	Type 3 Barricade		Channelizing Devices (CDs)
	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 "L" ** 10' Offset	11' Offset	12' Offset	Suggested Maximum Spacing of Channelizing Devices: On a Taper	On a Tangent	Suggested Longitudinal Buffer Space "B"
45	L=WS	450'	495'	540'	45'	90'	195'
50		500'	550'	600'	50'	100'	240'
55		550'	605'	660'	55'	110'	295'
60		600'	660'	720'	60'	120'	350'
65		650'	715'	780'	65'	130'	410'
70		700'	770'	840'	70'	140'	475'
75		750'	825'	900'	75'	150'	540'
80		800'	880'	960'	80'	160'	615'

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

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

GENERAL NOTES

1. All traffic control devices illustrated are REQUIRED. Devices denoted with the triangle symbol may be omitted when stated elsewhere in the plans.
2. See BC Standards for sign details.

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

Additional requirements for lane closures and advance signing shall be as shown on TCP (6-1) or as directed by the Engineer.

Texas Department of Transportation
Traffic Operations Division Standard

TRAFFIC CONTROL PLAN
WORK AREA AT EXIT RAMP

TCP(6-4)-12

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©TxDOT Feburary 1994	CONT	SECT	JOB	HIGHWAY
REVISIONS	0090	05	107	IH40
1-97 8-98	DIST	COUNTY		SHEET NO.
4-98 8-12	AMA	POTTER		037

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Vidal.Ngoumnai

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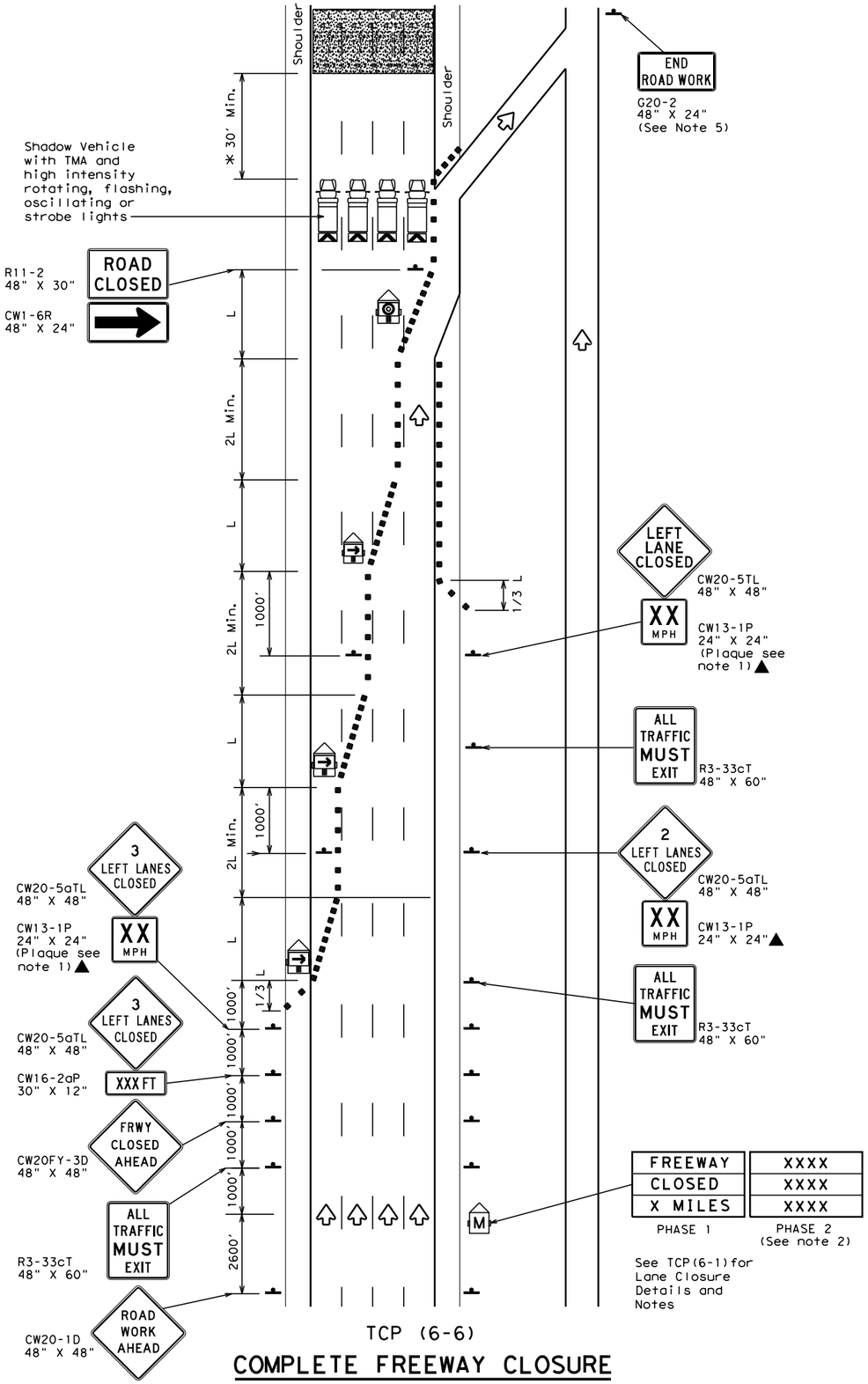

TCP (6-6)

COMPLETE FREEWAY CLOSURE

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

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

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

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

GENERAL NOTES

1. All traffic control devices illustrated are REQUIRED. Devices denoted with the triangle symbol may be omitted when stated elsewhere in the plans.
2. Phase 2 of the PCMS message should include appropriate information formatted as shown on BC(6), such as "MERGE RIGHT," recommended speed, delay, exit information, or other specific warnings.
3. Where queuing is anticipated beyond signing shown, additional PCMS signs, other warning signs, devices or Law Enforcement Officers should be available to warn approaching high speed traffic of the end of the queue, as directed by the Engineer.
4. Entrance ramps located from the advance warning area to the exit ramp should be closed whenever possible.
5. The END ROAD WORK (G20-2) sign may be omitted when it conflicts with G20-2 signs already in place on the project.

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

Additional requirements for lane closures and advance signing shall be as shown on TCP (6-1) or as directed by the Engineer.

Texas Department of Transportation
Traffic Operations Division Standard

TRAFFIC CONTROL PLAN FREEWAY CLOSURE

TCP(6-6)-12

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©TxDOT February 1994	CONT	SECT	JOB	HIGHWAY
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4-98 8-12	AMA	POTTER		038

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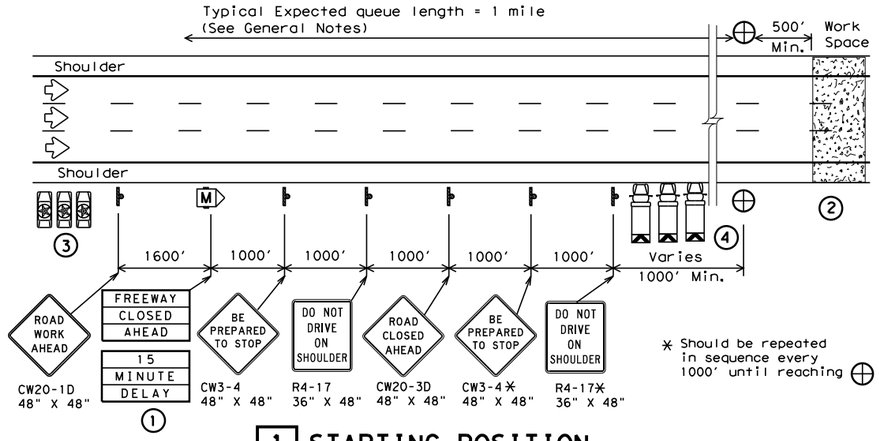


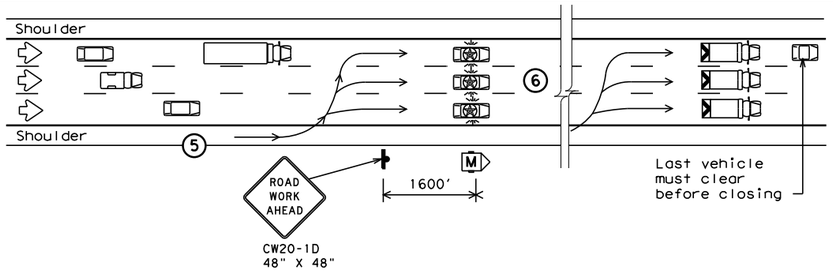
1 STARTING POSITION

(1) Traffic control devices should be installed or located near their intended position prior to beginning temporary roadway closure sequence. Duplicate signs should be erected on the median side of the roadway when median width permits. Warning signs should not be placed on the paved shoulders that will be used by the WARNING LEOV, or where movement of the LEOVs or barrier vehicles will be impeded.

(2) Prior to beginning the roadway closure sequence, all equipment, materials, personnel, and other items necessary to complete the work should be gathered near the work area. Entrance ramps located in the area where a queue is expected to build should be closed.

(3) There should be one LEOV for every lane to be controlled, plus a minimum of one to warn traffic approaching a queue. An additional lead law enforcement officer is desirable to remain with the Engineer's or Contractor's point of contact (POC) during the operation in order to improve communication with all LEOVs involved.

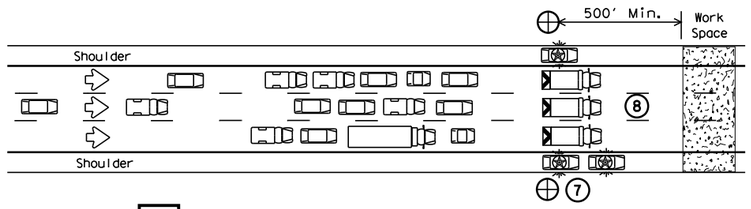
(4) One barrier vehicle with a Truck Mounted Attenuator and amber or blue and amber high intensity flashing/oscillating/strobe lighting shall be used for each lane to be closed.



2 REDUCING SPEED OPERATION

(5) Starting position of the LEOVs should be in advance of the most distant warning signs.

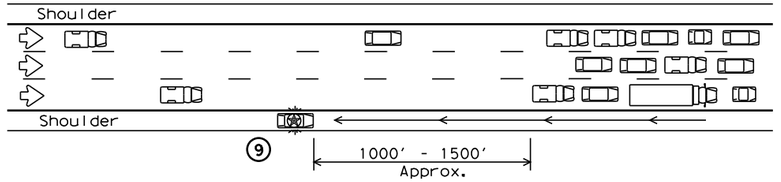
(6) Once the LEOVs have achieved an abreast blocking formation while traveling toward the CP, emergency lights and headlights should be turned "ON". The LEOVs should maintain formation, not allow traffic to pass, and begin to decelerate. The LEOVs should continue to decelerate, giving the barrier vehicles opportunity to be staged upstream of the work space after traffic has cleared. The LEOVs should then continue to decelerate slowly until bringing traffic to a stop near the barrier vehicles.



3 ALL TRAFFIC STOPPED AT CP

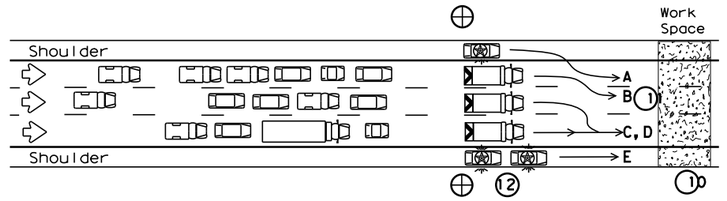
(7) Once traffic is stopped the LEOVs should park on the shoulders with emergency lighting "ON" in order to provide law enforcement presence at the closure and keep shoulders blocked ahead of the work space. They should stay in radio contact with the WARNING LEOV.

(8) The barrier vehicles should be parked, one in each lane, the parking brake set, with the high visibility flashing/oscillating/strobe lighting "ON," and the transmission in gear.



4 WARNING THE TRAFFIC QUEUE

(9) The WARNING LEOV should proceed to the right shoulder of the roadway, with emergency lights on approximately 1000' in advance of the traffic queue (stopped traffic) as the queue develops. When determined that limited sight distance situations (crest of hills, sharp roadway curvature, etc.) may occur to motorists approaching the queue, the WARNING LEOV may proceed 1/4 mile or more in advance of the queue.



5 RELEASING STOPPED TRAFFIC

(10) All equipment, materials, personnel, and other items should be removed from the roadway and maintain an adequate clear zone.

(11) When the roadway is clear for traffic, the LEOV should proceed forward from the left shoulder followed by the barrier vehicles, from left to right, as shown alphabetically in the plan view.

(12) The LEOV or LEOVs on the right shoulder may remain on the shoulder until satisfied that traffic is moving satisfactorily before merging or proceeding.

(13) LEOVs and barrier vehicles should re-group at their respective starting positions if necessary.

LEGEND			
■ ■	Channelizing Devices	⊕	Control Position (CP)
M	Portable Changeable Message Sign (PCMS)		Barrier Vehicle with Truck Mounted Attenuator
	Law Enforcement Officer's Vehicle(LEOV)		Traffic Flow

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

GENERAL NOTES

1. All traffic control devices shall conform with the latest edition of the Texas Manual on Uniform Traffic Control Devices (TMUTCD). Additional guidelines for traffic control devices may be found in the TMUTCD. Signs conflicting with the roadway closure sequence should be completely removed or covered. Additional traffic control devices may be required for closure of access roads, cross streets, exit and entrance ramps as directed by the Engineer.

2. Law enforcement officers and all workers involved should review and understand all procedures before the roadway closure sequence begins. Pre-work meetings may be held for this purpose. Local emergency services and media should have advance notification of roadway closure, expected dates and approximate times of closures.

3. Law enforcement officers shall be in uniform and have jurisdiction in the locale of the work area. An additional WARNING Law Enforcement Officer's Vehicle (LEOV) may be used on the median side of the roadway where median shoulder width permits (See sequence #9).

4. The roadway closure should be during off-peak hours, as shown in the plans, or as directed by the Engineer.

5. Work should be limited to approximately 15 minutes maximum duration unless otherwise directed by the Engineer based on existing roadway conditions. If the work is not complete within 15 minutes, or if the end of the traffic queue extends past the most distant advance warning signs, the work area should be cleared of all equipment, materials, personnel, and other items, and the roadway reopened. When the queue has dissipated and the traffic flow appears normal the roadway closure sequence may be repeated.

6. For traffic volumes greater than 1000 Passenger Cars Per Hour Per Lane (PCPHPL), or for roadway closures that exceed 15 minutes, see details elsewhere in the plan.

7. If traffic queues beyond the advance warning signs during one road closure sequence, the advance warning should be extended prior to repeating the road closure sequence. When possible, PCMS signs should be located in advance of the last available exit prior to the closure to allow motorists the choice of an alternate route.

THIS PLAN IS INTENDED TO BE USED AT LOCATIONS/TIMES WHEN TRAFFIC VOLUMES ARE LESS THAN 1000 PASSENGER CARS PER HOUR PER LANE.

Texas Department of Transportation
Traffic Operations Division Standard

TRAFFIC CONTROL PLAN SHORT DURATION FREEWAY CLOSURE SEQUENCE

TCP(6-7)-12

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©TxDOT February 1998	CONT	SECT	JOB	HIGHWAY
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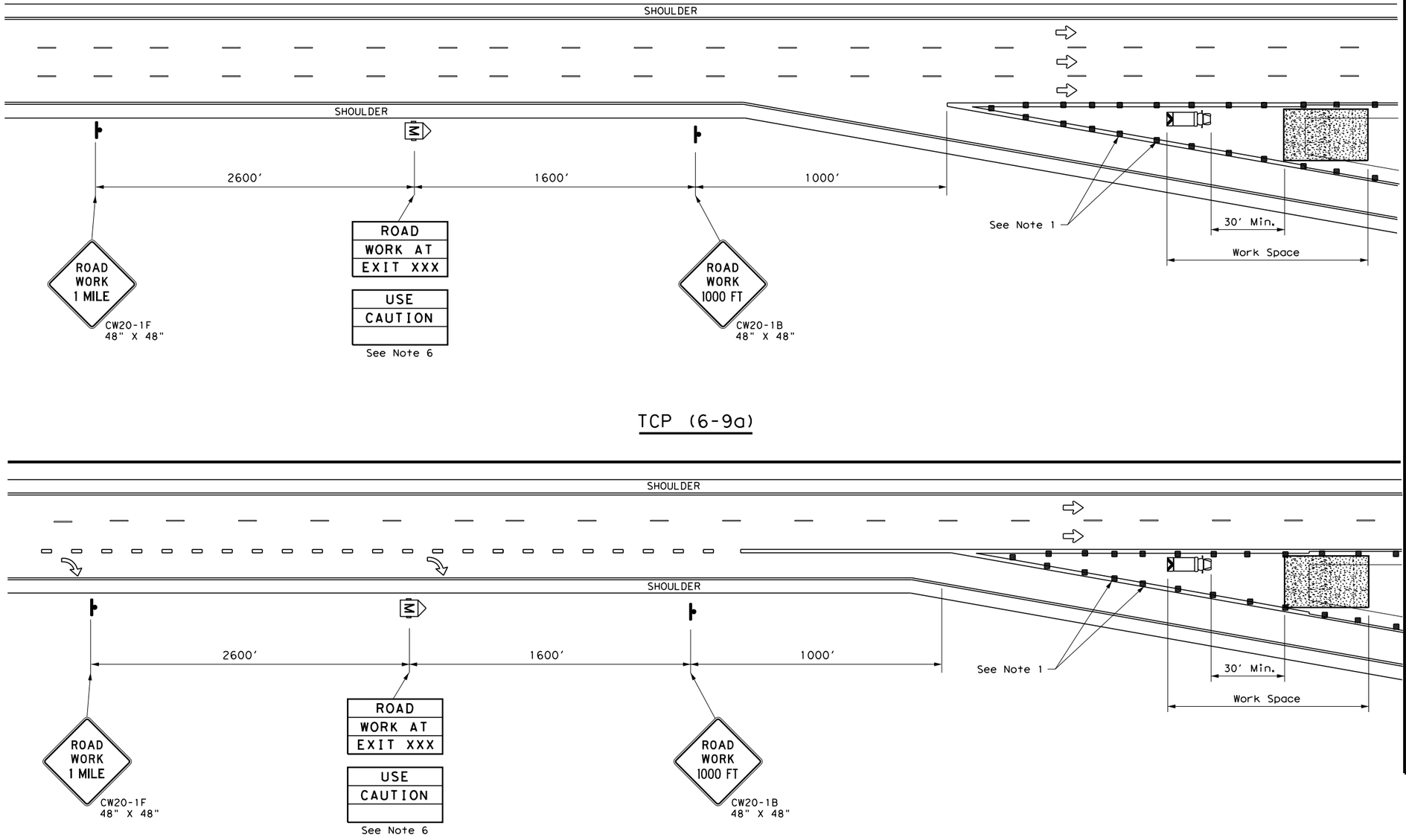

TCP (6-9a)

TCP (6-9b)

LEGEND			
	Type 3 Barricade		Channelizing Devices (CDs)
	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 "L" ** 10′ Offset	11′ Offset	12′ Offset	Suggested Maximum Spacing of Channelizing Devices On a Taper	On a Tangent	Suggested Longitudinal Buffer Space "B"
45	L=WS	450′	495′	540′	45′	90′	195′
50		500′	550′	600′	50′	100′	240′
55		550′	605′	660′	55′	110′	295′
60		600′	660′	720′	60′	120′	350′
65		650′	715′	780′	65′	130′	410′
70		700′	770′	840′	70′	140′	475′
75		750′	825′	900′	75′	150′	540′
80		800′	880′	960′	80′	160′	615′

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

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

GENERAL NOTES

1. Place channelizing devices in the gore at 20′ spacing.
2. See the Standard Highway Sign Design for Texas (SHSD) for sign details.
3. The PCMS may be omitted when a permanent DMS sign is available in an appropriate location to display a similar message as called for on the PCMS.
4. When it is determined that a through lane should be closed in addition to the exit ramp, refer to TCP(6-4) and TCP(6-8) for traffic control details.
5. Truck mounted attenuators are required.
6. The PCMS may be omitted if replaced with a "ROAD WORK ½ MILE" (CW20-1E).
7. Roadway ADT should be less than 10,000.

Texas Department of Transportation

Traffic Operations Division Standard

WORK IN EXIT GORE FOR ADT LESS THAN 10,000

TCP(6-9)-14

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©TxDOT February 2014	CONT	SECT	JOB	HIGHWAY
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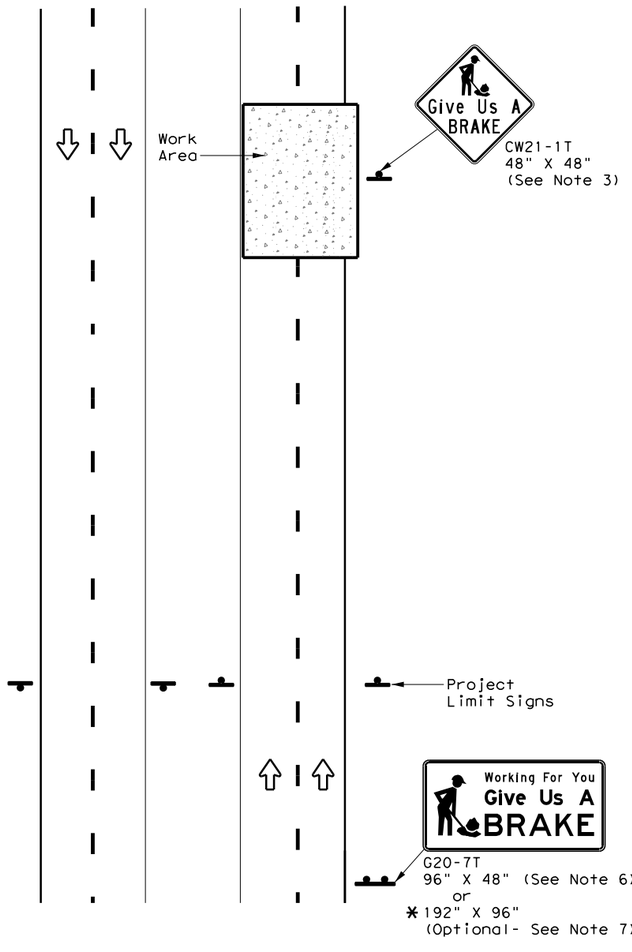
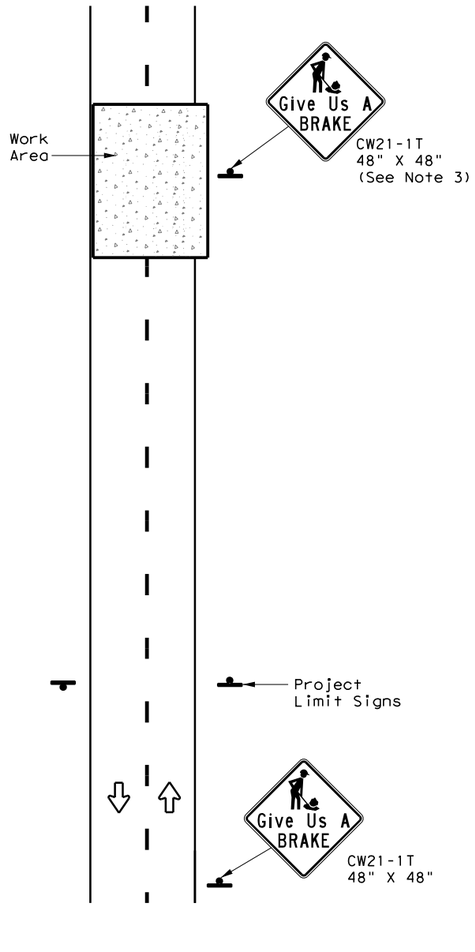


DIVIDED HIGHWAY



UNDIVIDED HIGHWAY

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 Size	GALVANIZED STRUCTURAL STEEL (LF) ①	GALVANIZED STRUCTURAL STEEL (LF) ②	DRILLED SHAFT 24" DIA. (LF)
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
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6-96 5-98 7-13	DIST	COUNTY		SHEET NO.
8-96 3-03	AMA	POTTER		041

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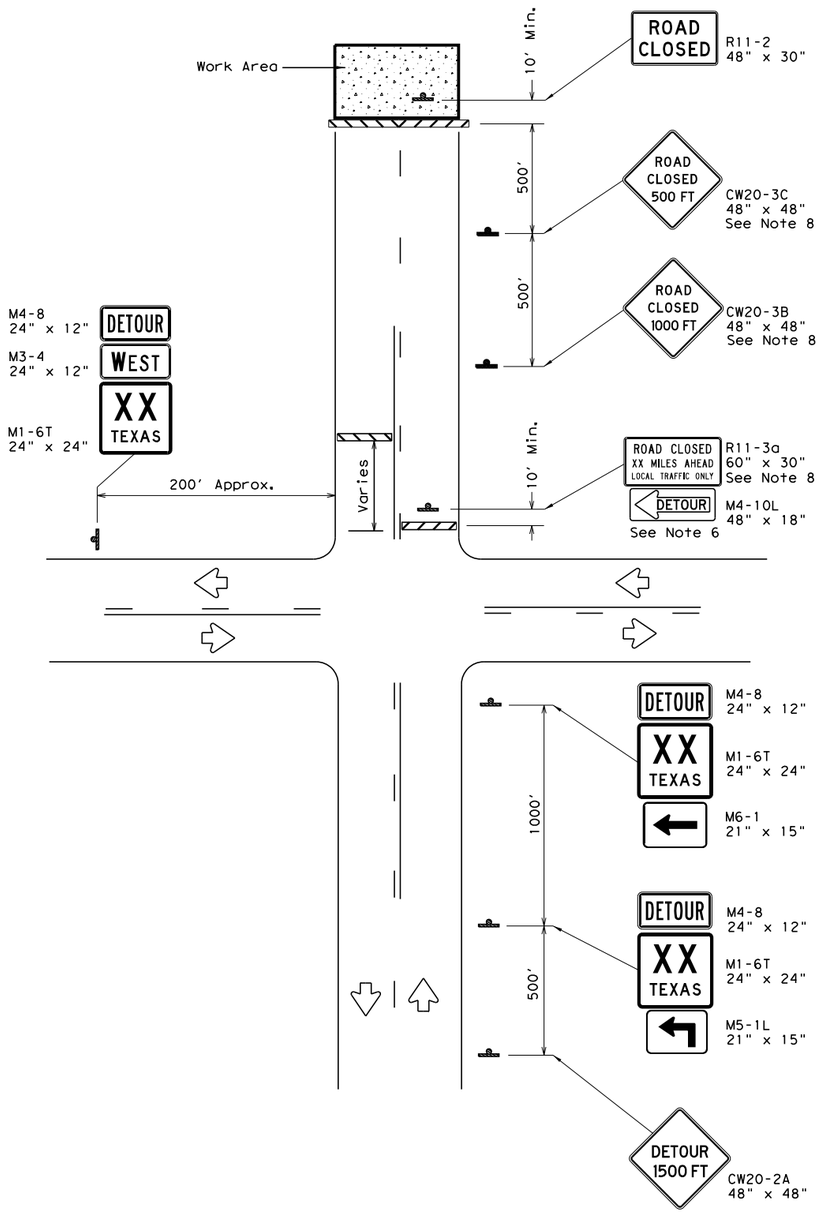
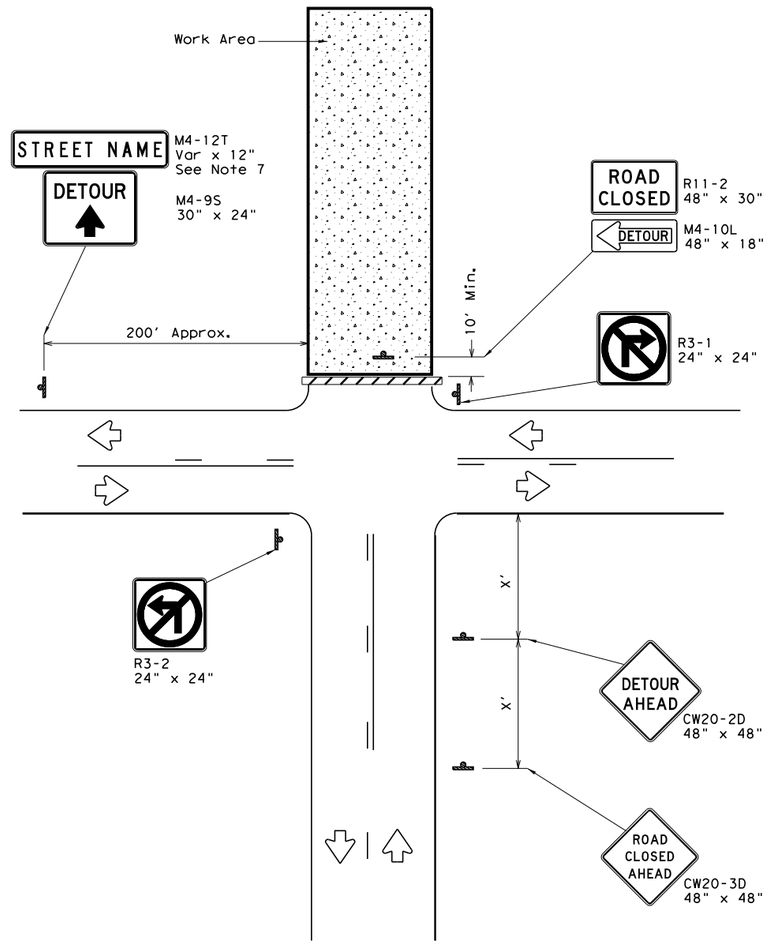


ROAD CLOSURE BEYOND THE INTERSECTION

Signing for a Numbered Route with an Off-Site Detour



ROAD CLOSURE AT THE INTERSECTION

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

LEGEND	
	Type 3 Barricade
	Sign

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

* Conventional Roads Only

GENERAL NOTES

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

Texas Department of Transportation

Traffic Operations Division Standard

WORK ZONE ROAD CLOSURE DETAILS

WZ(RCD)-13

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©TxDOT August 1995	CONT	SECT	JOB	HIGHWAY
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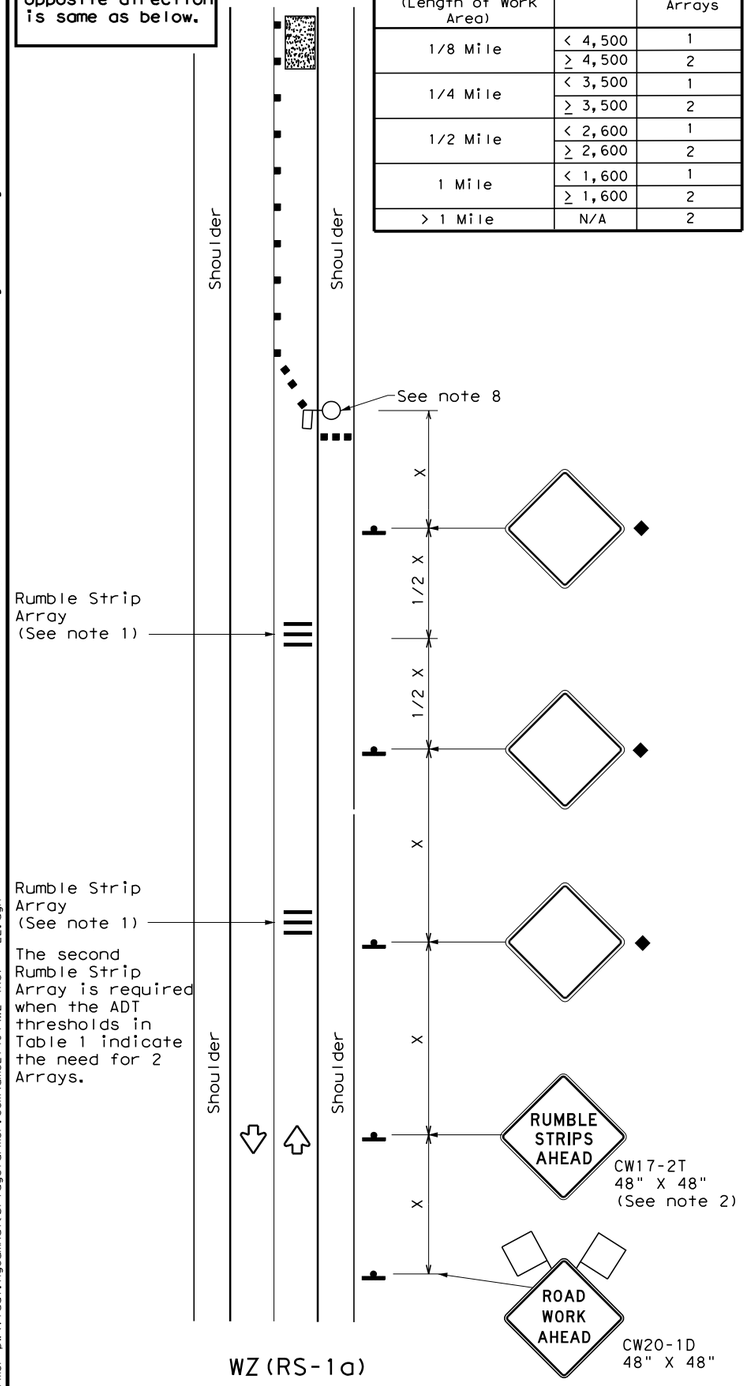
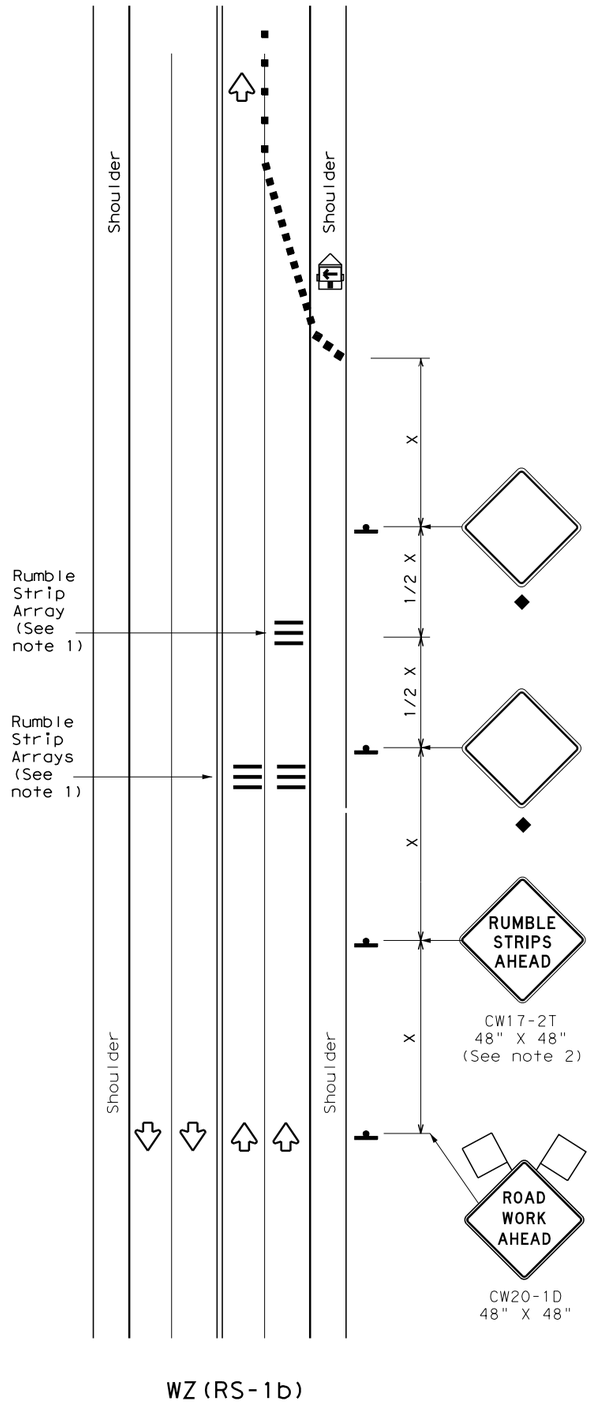
Warning sign and rumble strip sequence in opposite direction is same as below.

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



WZ(RS-1a)

RUMBLE STRIPS ON ONE-LANE TWO-WAY APPLICATION



WZ(RS-1b)

RUMBLE STRIPS FOR LANE CLOSURE ON CONVENTIONAL ROADWAY

GENERAL NOTES

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

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

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

* Conventional Roads Only

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

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

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

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

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

Texas Department of Transportation

Traffic Safety Division Standard

TEMPORARY RUMBLE STRIPS

WZ(RS)-22

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© TxDOT November 2012	CONT	SECT	JOB	HIGHWAY
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117

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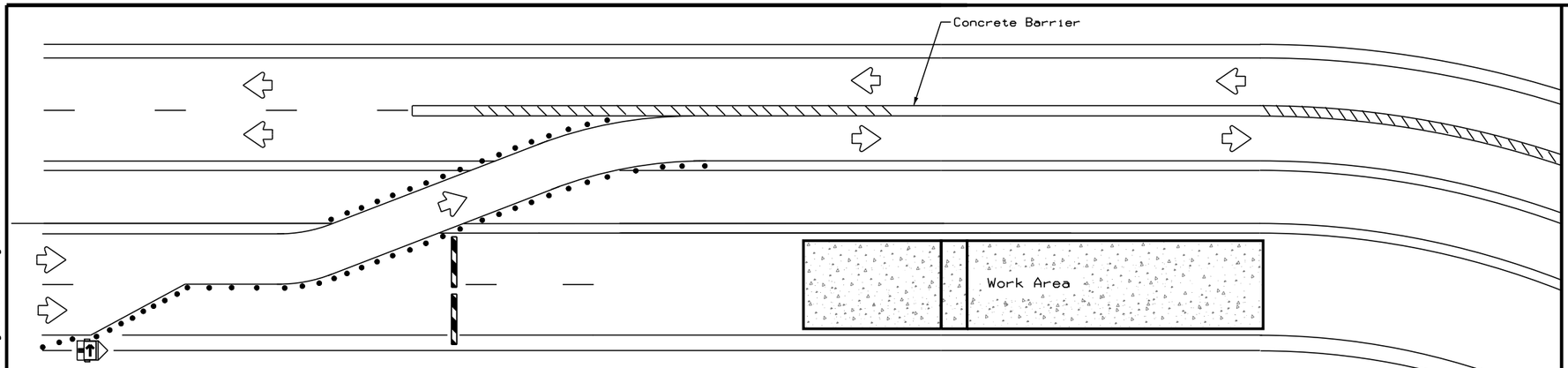


NOTES:

1. Length of Safety Glare screen will be specified elsewhere in the plans.
2. The cumulative nominal length of the modular safety glare screen units shall equal the length of the individual sections of temporary concrete traffic barrier on which they are installed so the joint between barrier sections will not be spanned by any one safety glare screen unit.
3. Screen Panel/blades will be designed such that reflective sheeting conforming with Departmental Material Specification DMS-8300, Sign Face Materials, Type B or C Yellow, minimum size of 2 inches by 12 inches can be attached to the edge of the panel/blade. The sheeting shall be attached to one glare screen panel/blade per section of concrete barrier not to exceed a spacing of 30 feet. Barrier reflectors are not necessary when panel/blades are installed with reflective sheeting as described.
4. Payment for these devices will be under statewide Special Specification "Modular Glare Screens for Headlight Barrier."
5. This detail is only intended to show types of locations where Glare Screens would be appropriate. Required signing and other devices shall be as shown elsewhere in the plans.

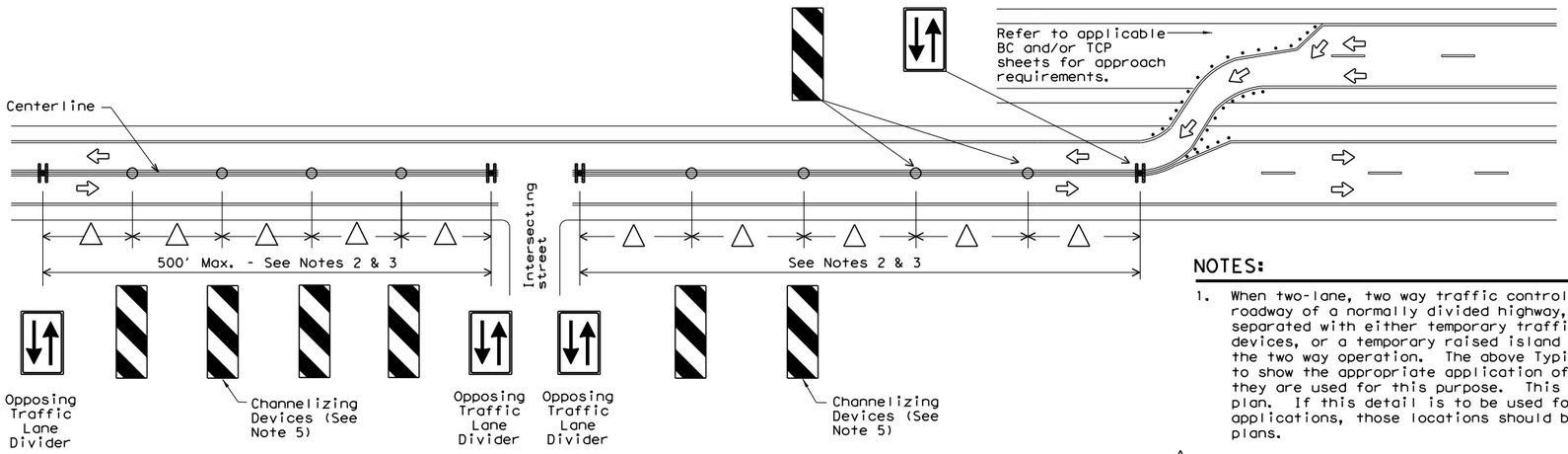
BARRIER DELINEATION WITH MODULAR GLARE SCREENS

LEGEND	
	Type 3 Barricade
• • •	Channelizing Devices
	Trailer Mounted Flashing Arrow Board
	Sign
\\\\	Safety glare screen

DEPARTMENTAL MATERIAL SPECIFICATIONS	
SIGN FACE MATERIALS	DMS-8300
DELINEATORS AND OBJECT MARKERS	DMS-8600
MODULAR GLARE SCREENS FOR HEADLIGHT BARRIER	DMS-8610

Only pre-qualified products shall be used. A copy of the Compliant Work Zone Traffic Control Devices List" CWZTCD)describes pre-qualified products and their sources and may be found at the following web address:

http://www.txdot.gov/business/resources/producer-list.html



VERTICAL PANELS & OPPOSING TRAFFIC LANE DIVIDERS (OTLD) SEPARATING TWO-WAY TRAFFIC ON NORMALLY DIVIDED HIGHWAYS

NOTES:

1. When two-lane, two way traffic control must be maintained on one roadway of a normally divided highway, opposing traffic shall be separated with either temporary traffic barriers, channelizing devices, or a temporary raised island throughout the length of the two way operation. The above Typical Application is intended to show the appropriate application of channelizing devices when they are used for this purpose. This is not a traffic control plan. If this detail is to be used for other types of roads or applications, those locations should be stated elsewhere in the plans.
2. △ Space devices according to the Tangent Spacing shown on the Device Spacing table on BC(9) but not exceeding 100'.
3. Every fifth device should be an OTLD except when spaced closer to accommodate an intersection. An OTLD should be the first device on each side of intersecting streets or roads.
4. Locations where surface mount bases with adhesives or self-righting devices will be required in order to maintain them in their proper position should be noted elsewhere in the plans.
5. Channelizing devices are to be vertical panels, 42" cones or tubular markers that are at least 36" tall. Tubular markers used to separate traffic should have a rubber base weighing at least 30 pounds. Tubular markers that are 42" tall or more shall have four bands of reflective material as detailed for 42" cones on BC(10). Tubular markers less than 42" but at least 36" tall shall have three bands of 3" wide white reflective material spaced 2" apart. Reflective material shall meet DMS-8300, Type A.

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN TYPICAL DETAILS

WZ(TD)-17

FILE: wztd-17.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 1998	CONT	SECT	JOB	HIGHWAY
REVISIONS 4-98 2-17 3-03 7-13	0090	05	107	IH40
	DIST	COUNTY		SHEET NO.
	AMA	POTTER		044

110

DATE: 12/8/2023 8:30:29 AM
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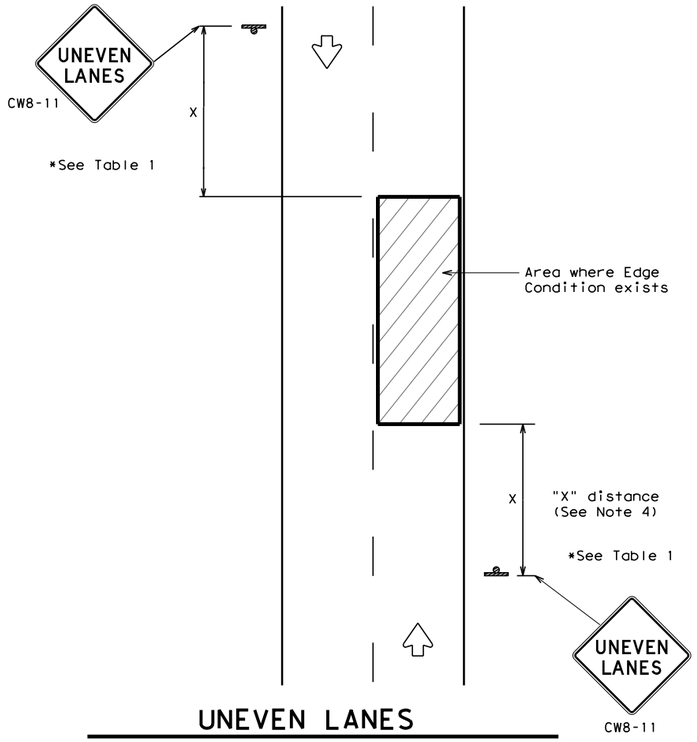
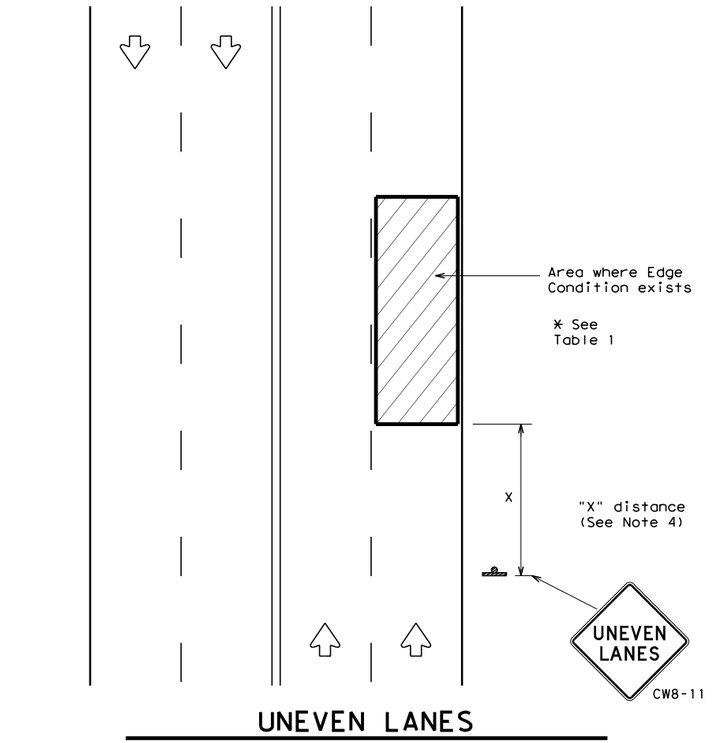
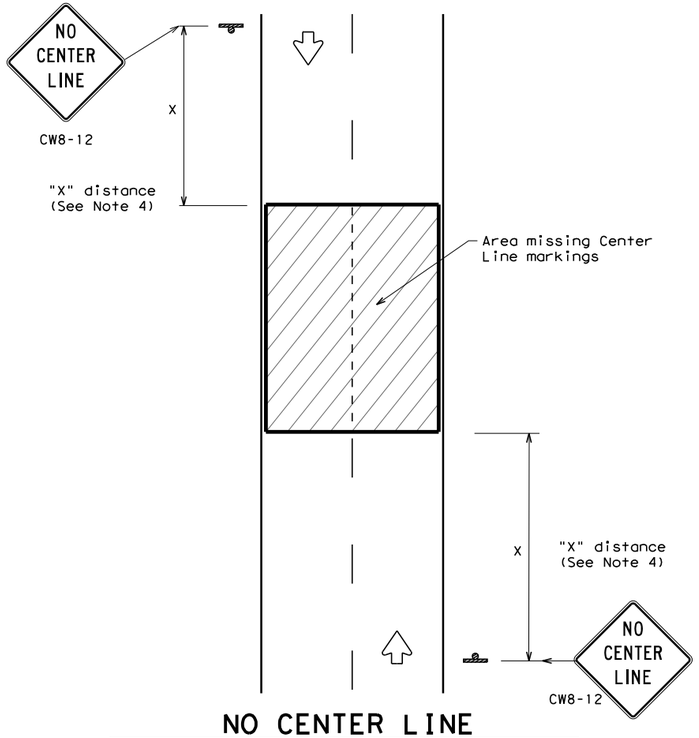
Vidal.Ngoumnai



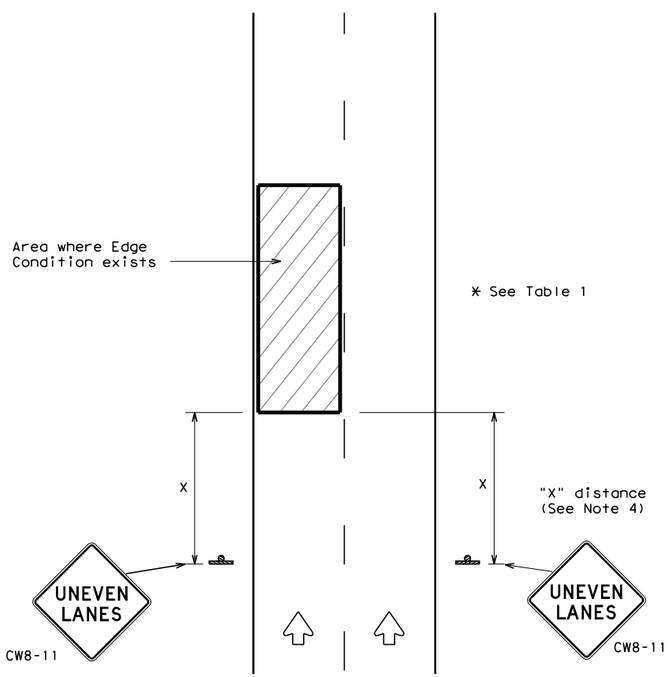
UNEVEN LANES
TWO LANE CONVENTIONAL ROAD



UNEVEN LANES
FOUR LANE CONVENTIONAL ROAD



NO CENTER LINE
TWO LANE CONVENTIONAL ROAD



UNEVEN LANES
DIVIDED ROADWAY

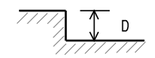
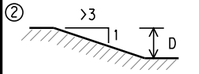
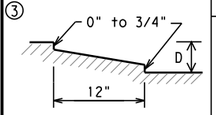
DEPARTMENTAL MATERIAL SPECIFICATIONS	
PERMANENT PREFABRICATED PAVEMENT MARKINGS	DMS-8240
TEMPORARY (REMOVABLE) PREFABRICATED PAVEMENT MARKINGS	DMS-8241
SIGN FACE MATERIALS	DMS-8300

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

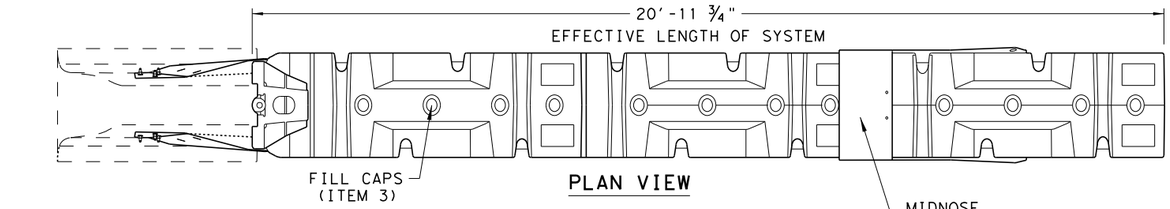
SIGNING FOR UNEVEN LANES

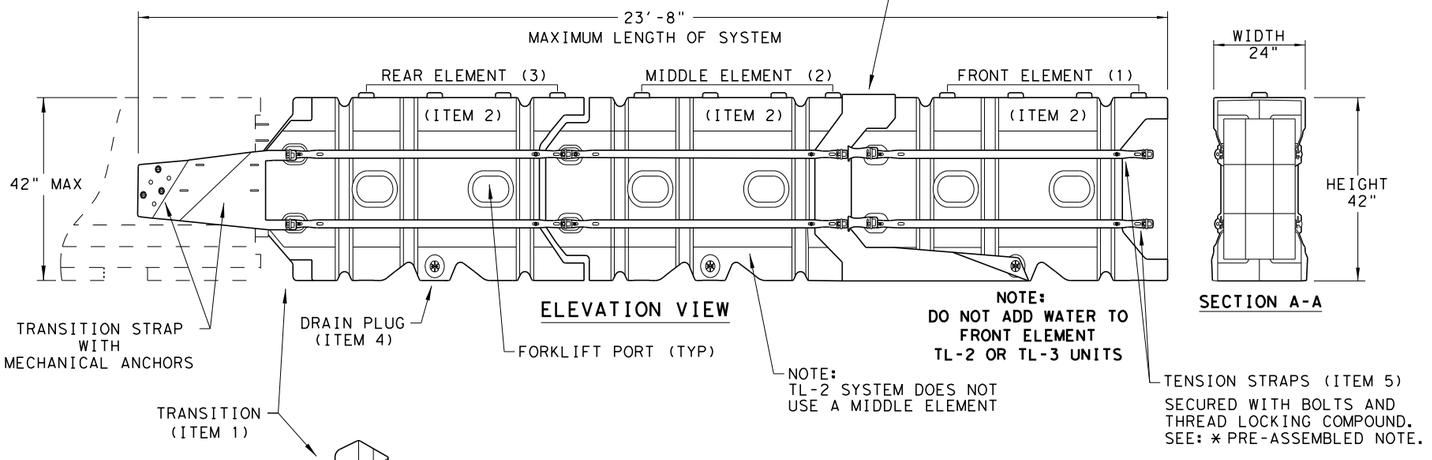
WZ(UL)-13

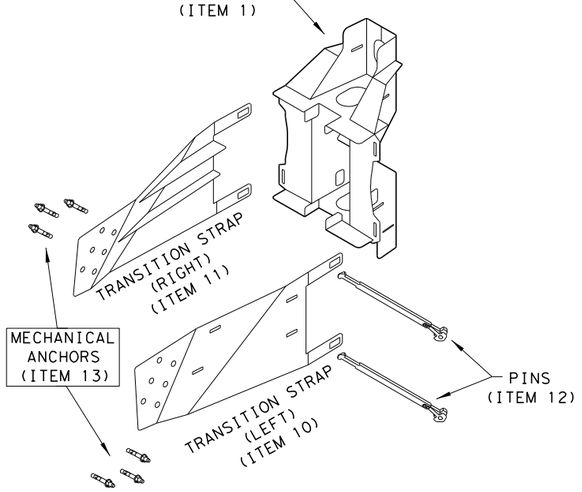
FILE: wzul-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT April 1992	CONT	SECT	JOB	HIGHWAY
REVISIONS	0090	05	107	IH40
8-95 2-98 7-13	DIST	COUNTY		SHEET NO.
1-97 3-03	AMA	POTTER		045

DATE: 12/8/2023 8:30:35 AM
FILE: c:\projects\bridgeformer-pw\vidal.ngoumnai@bridgeformer.com\dms21404\ABSORB(M)-19.dgn
Vidal.Ngoumnai

SYSTEM SHOWN - ABSORB-M TL-3







THE ABSORB-M IS A NON-REDIRECTIVE, GATING, CRASH CUSHION DESIGNED TO MEET THE LATEST TL-3 & TL-2 MASH REQUIREMENTS.

THE SYSTEM IS DESIGNED TO ACCOMMODATE A VARIETY OF F-SHAPE AND SINGLE SLOPE CONCRETE BARRIERS. CONTACT THE MANUFACTURER FOR GUIDANCE REGARDING OTHER ALLOWABLE SHAPES.

TEST LEVEL	NUMBER OF ELEMENTS	EFFECTIVE LENGTH	MAXIMUM LENGTH
TL-2	2	14'- 7 3/4"	17'- 4"
TL-3	3	20'- 11 3/4"	23'- 8"

NOTE:
CROSS SLOPES OF UP TO 8% (OR 1:12 SLOPE) CAN BE ACCOMMODATED WITH STANDARD HARDWARE SHOWN WITHIN THE INSTRUCTIONS MANUAL. FOR SLOPES WITH EXCESS OF 8% (OR 1:12) CONTACT, LINDSAY TRANSPORTATION SOLUTIONS.

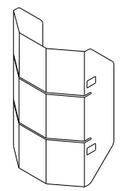
GENERAL NOTES

1. FOR SPECIFIC INFORMATION REGARDING THE INSTALLATION AND TECHNICAL GUIDANCE, CONTACT: LINDSAY TRANSPORTATION SOLUTIONS (LTS) - BARRIER SYSTEMS, INC. AT (707) 374-6800. 180 RIVER ROAD, RIO VISTA, CA 94571
2. THE ABSORB-M SYSTEM IS ONLY APPROVED FOR USE IN (TEMPORARY WORK ZONE) LOCATIONS.
3. THE ABSORB-M IS A WATER FILLED NON-REDIRECTIVE, GATING CRASH CUSHION THAT DOES NOT NEED TO BE ATTACHED TO A FOUNDATION AND CAN BE INSTALLED ON TOP OF CONCRETE, ASPHALT, OR ANY SURFACE CAPABLE OF BEARING THE WEIGHT OF THE SYSTEM.
4. MAXIMUM PERMISSIBLE CROSS-SLOPE IS 8%.
5. THE INSTALLATION AREA SHOULD BE FREE FROM CURBS, ELEVATED OBJECTS, OR DEPRESSIONS.
6. THE ABSORB-M SHOULD BE LOCATED APPROXIMATELY PARALLEL WITH THE BARRIER.
7. THE USE OF THE ABSORB-M IS RESTRICTED TO A BARRIER HEIGHT OF UP TO 42 INCHES.
8. DO NOT ADD WATER TO FRONT ELEMENT (TL-2 OR TL-3 UNIT).

BILL OF MATERIALS (BOM) ABSORB-M TL-3 & TL-2 SYSTEMS			QTY	QTY
ITEM #	PART NUMBER	PART DESCRIPTION	TL-2 SYSTEM	TL-3 SYSTEM
1	BSI-1809036-00	TRANSITION-(GALV)	1	1
* 2	BSI-1808002-00	PRE-ASSEMBLED ABSORBING (ELEMENTS)	2	3
* 3	BSI-4004598	FILL CAPS	8	12
* 4	BSI-4004599	DRAIN PLUGS	2	3
* 5	BSI-1809053-00	TENSION STRAP-(GALV)	8	12
* 6	BSI-2001998	C-SCR FH 3/8-16 X 1 1/2 GR5 PLT	8	12
* 7	BSI-2001999	C-SCR FH 3/8-16 X 1 GR5 PLT	8	12
8	BSI-1809035-00	MIDNOSE-(GALV)	1	1
9	BSI-1808014-00	NOSE PLATE	1	1
10	BSI-1809037-00	TRANSITION STRAP (LEFT-HAND)-(GALV)	1	1
11	BSI-1809038-00	TRANSITION STRAP (RIGHT-HAND)-(GALV)	1	1
12	BSI-1808005-00	PIN ASSEMBLY	8	10
13	BSI-2002001	ANC MECH 5/8-11X5 (GALV)	6	6
14	ABSORB-M	INSTALLATION AND INSTRUCTIONS MANUAL	1	1

*COMPONENTS PRE-ASSEMBLED WITH ELEMENT ASSEMBLY

**APPLY DECAL



NOSE PLATE

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

NOTE:
APPLY A HIGH REFLECTIVE DECAL TO THE NOSE PLATE. DELINEATION DECAL ORIENTATION IS SHOWN ON THE CONSTRUCTION PLAN SET AND SHALL BE IN ACCORDANCE WITH THE TEXAS MUTCD FOR (TRAFFIC CONTROL DEVICES). DECALs ARE AVAILABLE FOR TRAFFIC FLOW ON THE LEFT-SIDE, BOTH -SIDES AND RIGHT-SIDE.

DELINEATION DECAL PLACEMENT GUIDE

TRAFFIC FLOW LEFT-SIDE BARRIER	TRAFFIC FLOW BOTH-SIDE BARRIER	TRAFFIC FLOW RIGHT-SIDE BARRIER

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

SACRIFICIAL

Texas Department of Transportation — Design Division Standard

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

FILE: absorbm19	DN: TxDOT	CK: KM	DW: VP	CK:
© TxDOT: JULY 2019 REVISIONS	CONT	SECT	JOB	HIGHWAY
	0090	05	107	IH40
	DIST	COUNTY		SHEET NO.
	AMA	POTTER		046

DATE: 12/19/2019
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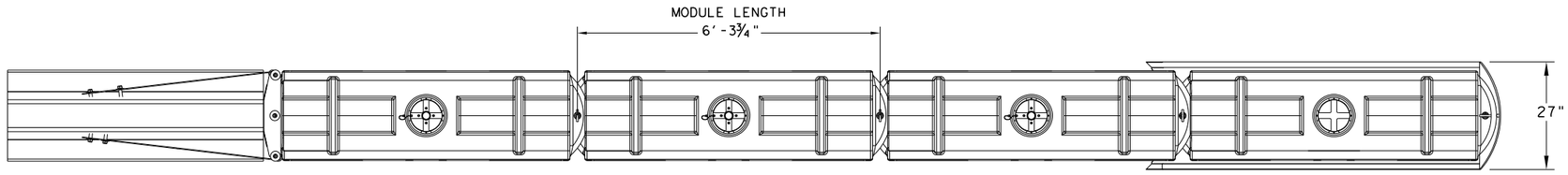
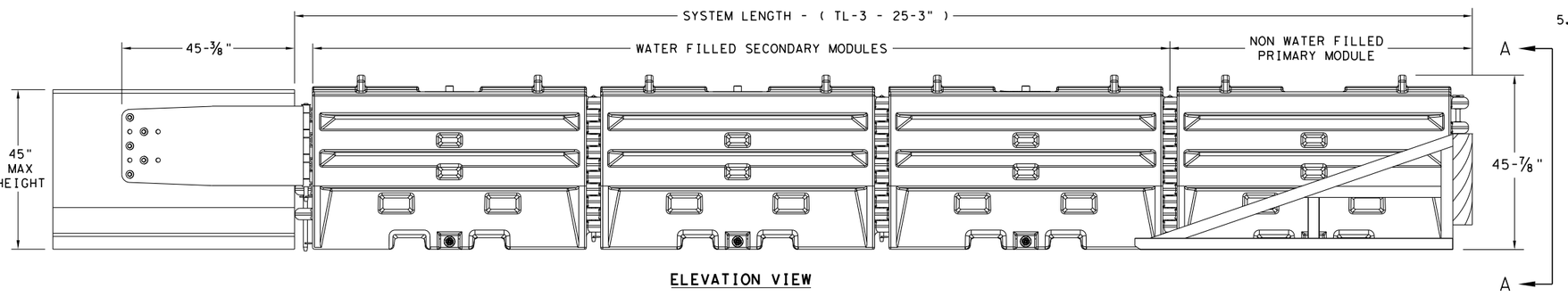


PLAN VIEW



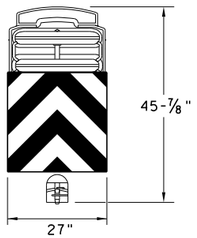
ELEVATION VIEW

GENERAL NOTES

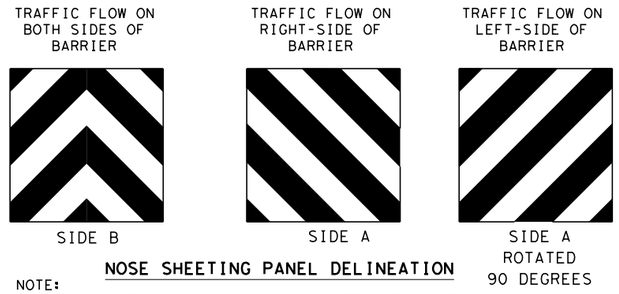
1. REFER TO THE INSTALLATION MANUAL FOR SPECIFIC SYSTEM ASSEMBLY AND MODULE ORIENTATION. FOR ADDITIONAL INFORMATION, CONTACT TRAFFIX, INC. AT (949) 361-5663.
2. THE SLED SYSTEM IS A MASH APPROVED TEST LEVEL 3 (TL-3) CRASH CUSHION APPROVED FOR USE IN TEMPORARY WORK ZONES. THE SLED SYSTEM IS A NON-REDIRECTIVE, GATING CRASH CUSHION THAT DOES NOT NEED TO BE ATTACHED TO THE GROUND AND CAN BE INSTALLED ON CONCRETE, ASPHALT, GRAVEL OR COMPACTED SOIL.
3. MAXIMUM PERMISSIBLE CROSS SLOPE IS 8° (DEGREES) (14%).
4. THE INSTALLATION AREA SHOULD BE FREE FROM CURBS, ELEVATED OBJECTS, OR DEPRESSIONS.
5. THE SLED SYSTEM CAN BE ATTACHED TO:

- CONCRETE BARRIER, TEMPORARY OR PERMANENT, 45" MAXIMUM HEIGHT
- STEEL BARRIER
- PLASTIC BARRIER
- CONCRETE BRIDGE ABUTMENTS
- W-BEAM GUARD RAIL
- THRIE BEAM GUARD RAIL

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

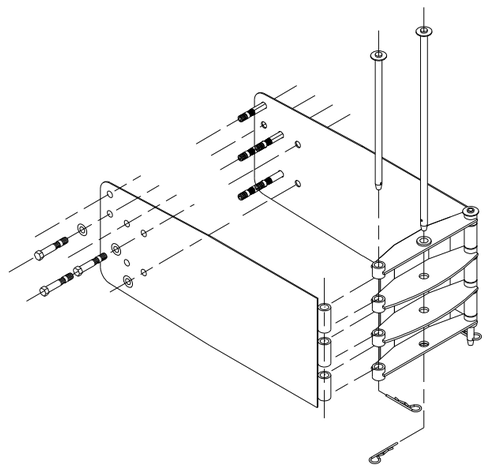


SECTION A-A



NOSE SHEETING PANEL DELINEATION

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



SLED TRANSITION COMPONENTS FOR ATTACHMENT TO CMB

NOTE:
SEE MANUFACTURER'S INSTALLATION MANUAL FOR FURTHER DETAILS.

TRANSITION OPTIONS
SLED TRANSITION TO CONCRETE TRAFFIC BARRIER (TEMPORARY OR PERMANENT)
SLED TRANSITION TO STEEL TRAFFIC BARRIER (CONTACT MFGR FOR PROPER TRANSITION)
SLED TRANSITION TO PLASTIC TRAFFIC BARRIER (CONTACT MFGR FOR PROPER TRANSITION)
SLED TRANSITION TO W-BEAM OR THRIE BEAM GUARD RAIL (CONTACT MFGR FOR PROPER TRANSITION)
SLED TRANSITION TO CONCRETE BRIDGE ABUTMENT

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

SACRIFICIAL

BILL OF MATERIAL

PART NUMBER	DESCRIPTION	QTY: TL-3
45131	TRANSITION FRAME, GALVANIZED	1
45150	TRANSITION PANEL, GALVANIZED	2
45147-CP	TRANSITION SHORT DROP PIN W/ KEEPER PIN, GALVANIZED	2
45148-CP	TRANSITION LONG DROP PIN W/ KEEPER PIN, GALVANIZED	1
45050	ANCHOR BOLTS	9
12060	WASHER, 3/4" ID X 2" OD	9
45044-Y	SLED YELLOW WATER FILLED MODULE	3
45044-YH	SLED YELLOW "NO FILL" MODULE	1
45044-S	CIS (CONTAINMENT IMPACT SLED), GALVANIZED	1
45043-CP	T-PIN W/ KEEPER PIN	4
18009-B-I	FILL CAP W/ "DRIVE BY" FLOAT INDICATOR	3
45033-RC-B	DRAIN PLUG	3
45032-DPT	DRAIN PLUG REMOVAL TOOL	1

Texas Department of Transportation

Design Division Standard

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

FILE: sled19.dgn	DN: TxDOT	CK: KM	DW: VP	CK:
© TxDOT: DECEMBER 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0090	05	107	IH40
	DIST	COUNTY		SHEET NO.
	AMA	POTTER		047

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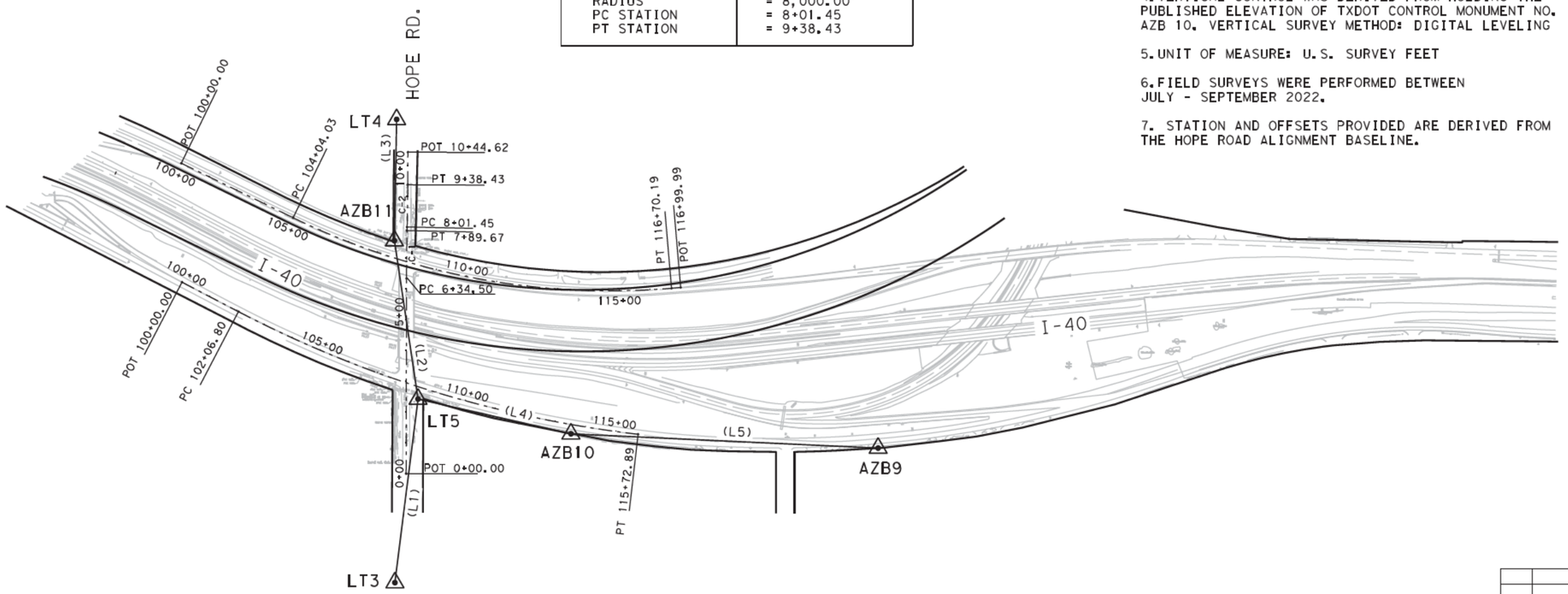
SURVEY CONTROL MONUMENT INVERSE TABLE				
LINE #	FROM POINT	BEARING	DISTANCE	TO POINT
L1	LT-3	N 07°10'52"E	601.03'	LT-5
L2	LT-5	N 08°28'43"W	520.01'	*AZB11
L3	*AZB11	N 01°02'24"E	394.39'	LT4

HOPE ROAD ALIGNMENT TABLE		
STATION	BEARING	DISTANCE
0+00 TO 6+34.50	N 00°07'02" E	634.50'
7+89.67 TO 8+01.45	N 01°13'43" E	11.78'
9+38.43 TO 10+44.62	N 00°14'52" E	106.19'

HOPE ROAD ALIGNMENT CURVE DATA	
C-1	
PI STATION	= 7+12.07
DELTA	= 01°06'41" (RT)
DEGREE OF CURVE	= 00°42'58"
TANGENT	= 77.59'
LENGTH	= 155.17'
RADIUS	= 8,000.00'
PC STATION	= 6+34.50
PT STATION	= 7+89.67
C-2	
PI STATION	= 8+69.94
DELTA	= 00°58'52" (LT)
DEGREE OF CURVE	= 00°42'58"
TANGENT	= 68.49'
LENGTH	= 136.98'
RADIUS	= 8,000.00'
PC STATION	= 8+01.45
PT STATION	= 9+38.43



NOTES:

1. ALL BEARINGS AND COORDINATES ARE BASED ON THE TEXAS COORDINATE SYSTEM, NORTH ZONE, (4201), NORTH AMERICAN DATUM OF 1983 (NAD 83), 2011 ADJUSTMENT, EPOCH 2010.00. ALL DISTANCES AND COORDINATES SHOWN ARE SURFACE VALUES AND MAY BE CONVERTED TO GRID BY DIVIDING BY THE COMBINED ADJUSTMENT FACTOR OF 1.000250413.

2. HORIZONTAL CONTROL WAS DERIVED FROM TXDOT RTN (VRS) GPS OBSERVATIONS BASED ON TXDOT REGIONAL REFERENCE POINT TXN. HORIZONTAL SURVEY METHOD: TXDOT RTN

3. ALL ELEVATIONS HEREON ARE REFERENCED TO THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD 88).

4. VERTICAL CONTROL WAS DERIVED FROM HOLDING THE PUBLISHED ELEVATION OF TXDOT CONTROL MONUMENT NO. AZB 10. VERTICAL SURVEY METHOD: DIGITAL LEVELING

5. UNIT OF MEASURE: U.S. SURVEY FEET

6. FIELD SURVEYS WERE PERFORMED BETWEEN JULY - SEPTEMBER 2022.

7. STATION AND OFFSETS PROVIDED ARE DERIVED FROM THE HOPE ROAD ALIGNMENT BASELINE.

SCALE IN FEET
0 400 800

CONTROL MONUMENT TABLE PUBLISHED VALUES				
POINT	NORTHING (Y)	EASTING (X)	ELEV.	DESCRIPTION
AZB 9	3,713,848.68	516,101.86	3,748.48'	MON TXDOT DISK AZB 9
AZB 10	3,713,895.17	515,103.61	3,755.46'	MON TXDOT DISK AZB 10
AZB 11	3,714,522.47	514,530.13	3,758.74'	MON TXDOT DIAK AZB 11

Δ OBSERVED/PUBLISHED				
POINT	Δ N	Δ E	ΔELEV	DESCRIPTION
AZB 11	-0.0580	-0.0365	-0.1015	MON AZB 11
AZB 10	0.0161	0.0285	-0.0000	MON AZB 10
AZB 9	0.0487	0.0481	-0.0481	MON AZB 9 GPS OBS

CONTROL MONUMENTATION TABLE						
POINT	NORTHING	EASTING	ELEV.	STATION	OFFSET	DESCRIPTION
LT 3	3,713,411.76	514,531.63	3,756.70'	N/A	N/A	SET TXDOT CAP - LT 3
LT 4	3,714,916.74	514,537.25	3,759.91'	N/A	N/A	SET TXDOT CAP - LT 4
LT 5	3,714,008.08	514,606.77	3,758.13'	2+42.43	38.13' RT	SET TXDOT CAP - LT 5
*AZB 9	3,713,848.73	516,101.91	3,748.48'	0+86.14	1,533.59' RT	FND TxDOT DISK AZB 9
*AZB 10	3,713,895.19	515,103.64	3,755.46'	1+30.55	535.23' RT	FND TxDOT DISK AZB 10
*AZB 11	3,714,522.41	514,530.10	3,758.64'	7+55.99	40.52' LT	FND TxDOT DISK AZB 11

NOTE: * INDICATES OBSERVED VALUES OF EXISTING, CONTROL.

LANDTECH
2525 North Loop West, Suite 300,
Houston, Texas 77008
T: 713-861-7068 F: 713-861-4131
TBPELS Registration No. 10019100

THIS SURVEY WAS PERFORMED UNDER MY SUPERVISION.

STATE OF TEXAS REGISTERED JACOB J. LUPHER 6606 PROFESSIONAL LAND SURVEYOR

JACOB J. LUPHER 3/23/2022
REGISTERED PROFESSIONAL LAND SURVEYOR
TEXAS REGISTRATION NO. 6606

NO.	DATE	DESCRIPTION	APPROV.

BRIDGEFARMER & ASSOCIATES, INC.
CONSULTING ENGINEERS
TBPE REGISTRATION NO. 264

IH-40 AT HOPE
SURVEY CONTROL INDEX SHEET

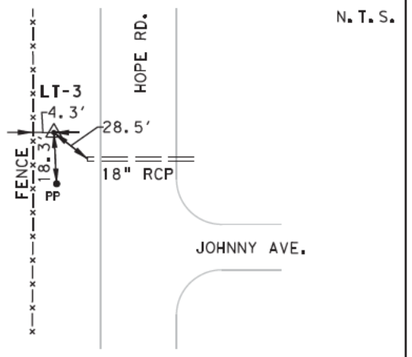
SCALE: AS NOTED SHEET OF

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
GRAPHICS	6	SEE TITLE SHEET		IH-40
	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK	TEXAS	AMA	POTTER	048
CHECK	CONTROL	SECTION	JOB	
	0090	05	107, ETC	

S:\2022\2220119-AMARILLO BRIDGES\CADD\Hope\IH-40 (HOPE) _SCM.dgn

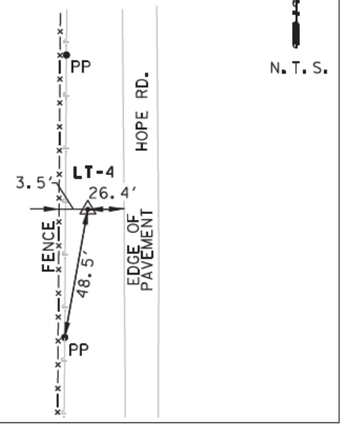
12/11/20238:02:43 AM

LT-3
SET TXDOT CAP
N = 3,713,411.76
E = 514,531.63
ELEV= 3,756.70'



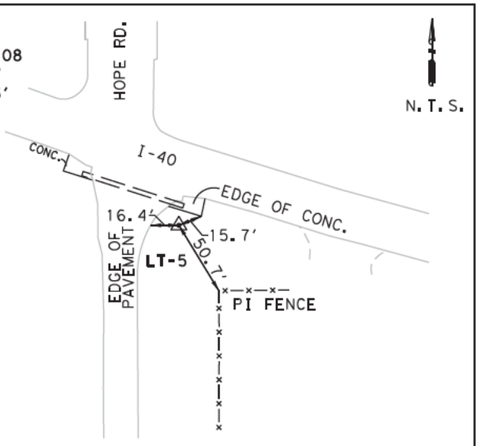
ALONG HOPE ROAD, 0.10 MILE (655 FEET) SOUTH OF THE SOUTHERN INTERSECTION OF HOPE ROAD AND I-40 FRONTAGE RD, 25 FEET WEST OF PAVEMENT.

LT-4
SET TXDOT CAP
N = 3,714,916.74
E = 514,537.25
ELEV= 3,759.91'



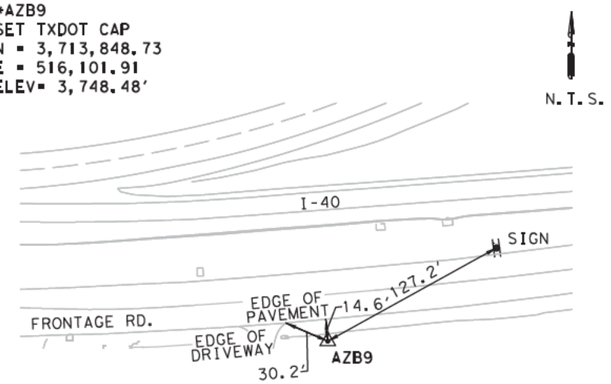
ALONG HOPE ROAD, 0.10 MILE (455 FEET) OF THE NORTHERN INTERSECTION OF HOPE ROAD AND I-40 FRONTAGE RD, 25 FEET WEST OF THE PAVEMENT.

LT-5
SET TXDOT CAP
N = 3,714,008.08
E = 514,606.77
ELEV= 3,758.13'



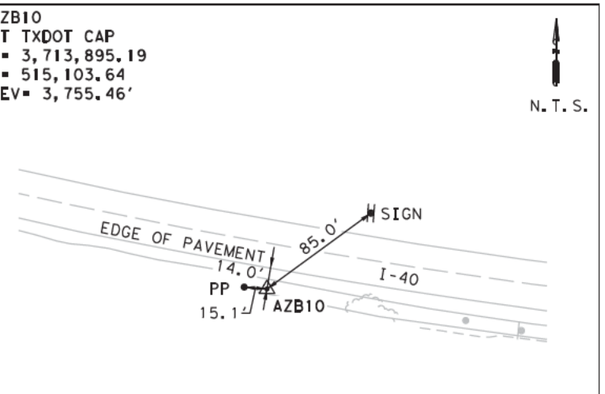
AT THE SOUTHERN INTERSECTION OF HOPE ROAD AND I-40 FRONTAGE RD, 13 FEET SOUTHEAST OF THE PAVEMENT.

*AZB9
SET TXDOT CAP
N = 3,713,848.73
E = 516,101.91
ELEV= 3,748.48'



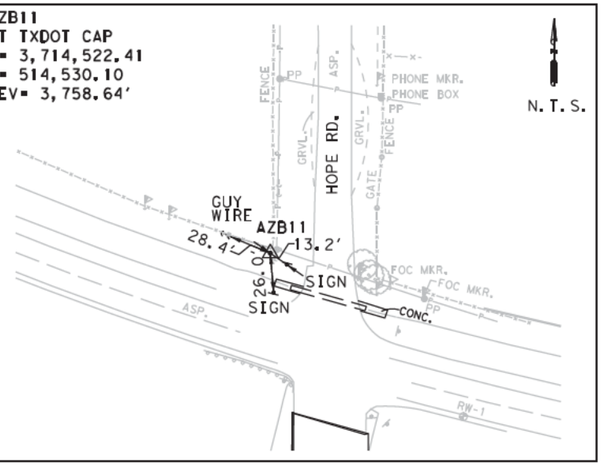
ALONG EASTBOUND I-40 FRONTAGE ROAD, 0.10 MILE (560 FEET) EAST OF ITS SOUTHERN INTERSECTION WITH HOPE ROAD, 15 FEET SOUTH OF THE PAVEMENT.

*AZB10
SET TXDOT CAP
N = 3,713,895.19
E = 515,103.64
ELEV= 3,755.46'



ALONG EASTBOUND I-40 FRONTAGE ROAD, 0.30 MILE (1,560 FEET) EAST OF ITS SOUTHERN INTERSECTION WITH HOPE ROAD, 15 FEET SOUTH OF THE PAVEMENT.

*AZB11
SET TXDOT CAP
N = 3,714,522.41
E = 514,530.10
ELEV= 3,758.64'



AT THE NORTHERN INTERSECTION OF HOPE ROAD AND I-40 FRONTAGE RD, 30 FEET NORTHWEST OF THE PAVEMENT.

NOTES:

1. ALL BEARINGS AND COORDINATES ARE BASED ON THE TEXAS COORDINATE SYSTEM, NORTH ZONE, (4201), NORTH AMERICAN DATUM OF 1983 (NAD 83), 2011 ADJUSTMENT, EPOCH 2010.00. ALL DISTANCES AND COORDINATES SHOWN ARE SURFACE VALUES AND MAY BE CONVERTED TO GRID BY DIVIDING BY THE COMBINED ADJUSTMENT FACTOR OF 1.000250413.

2. HORIZONTAL CONTROL WAS DERIVED FROM TXDOT RTN (VRS) GPS OBSERVATIONS BASED ON TXDOT REGIONAL REFERENCE POINT TXN. HORIZONTAL SURVEY METHOD: TXDOT RTN

3. ALL ELEVATIONS HEREON ARE REFERENCED TO THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD 88).

4. VERTICAL CONTROL WAS DERIVED FROM HOLDING THE PUBLISHED ELEVATION OF TXDOT CONTROL MONUMENT NO. AZB 10. VERTICAL SURVEY METHOD: DIGITAL LEVELING

5. UNIT OF MEASURE: U.S. SURVEY FEET

6. FIELD SURVEYS WERE PERFORMED BETWEEN JULY - SEPTEMBER 2022.

NOTE: * INDICATES OBSERVED VALUES OF EXISTING, CONTROL.

NO.	DATE	DESCRIPTION	APPROV.

LANDTECH
2525 North Loop West, Suite 300,
Houston, Texas 77008
T: 713-861-7068 F: 713-861-4131
TBPELS Registration No. 10019100

THIS SURVEY WAS PERFORMED UNDER MY SUPERVISION.

STATE OF TEXAS · REGISTERED · JACOB J. LUPHER · 6606 · PROFESSIONAL LAND SURVEYOR

JACOB J. LUPHER 3/23/2022
REGISTERED PROFESSIONAL LAND SURVEYOR
TEXAS REGISTRATION NO. 6606

BRIDGEFARMER & ASSOCIATES, INC.
CONSULTING ENGINEERS
TBPE REGISTRATION NO. 264

IH-40 AT HOPE
HORIZONTAL & VERTICAL

SCALE: AS NOTED SHEET OF

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
GRAPHICS	6	SEE TITLE SHEET		IH-40
	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK	TEXAS	AMA	POTTER	049
	CONTROL	SECTION	JOB	
CHECK	0090	05	107, ETC	

S:\2022\2220119-AMARILLO BRIDGES\CADD\Hope\HOPE HorizVert.dgn

HOPE ROAD CENTERLINE

Beginning chain CL_HOPE_EX description

Point 101 N 3,713,765.7318 E 514,568.1424 Sta 0+00.00

Course from 101 to PC CL_HOPE_EX1 N 0° 07′ 02.49" E Dist 634.4977

Curve CL_HOPE_EX1	Curve Data				
P.I. Station	7+12.09	N	3,714,477.8166	E	514,569.6009
Delta =	1° 06′ 40.82" (RT)				
Degree =	0° 42′ 58.31"				
Tangent =	77.5886				
Length =	155.1723				
Radius =	8,000.0000				
External =	0.3762				
Long Chord =	155.1699				
Mid. Ord. =	0.3762				
P.C. Station	6+34.50	N	3,714,400.2282	E	514,569.4420
P.T. Station	7+89.67	N	3,714,555.3874	E	514,571.2647
C.C.		N	3,714,383.8417	E	522,569.4252
Back = N	0° 07′ 02.49" E				
Ahead = N	1° 13′ 43.32" E				
Chord Bear = N	0° 40′ 22.91" E				

Course from PT CL_HOPE_EX1 to PC CL_HOPE_EX2 N 1° 13′ 43.32" E Dist 11.7782

Curve CL_HOPE_EX2	Curve Data				
P.I. Station	8+69.94	N	3,714,635.6387	E	514,572.9859
Delta =	0° 58′ 51.77" (LT)				
Degree =	0° 42′ 58.31"				
Tangent =	68.4916				
Length =	136.9799				
Radius =	8,000.0000				
External =	0.2932				
Long Chord =	136.9782				
Mid. Ord. =	0.2932				
P.C. Station	8+01.45	N	3,714,567.1629	E	514,571.5173
P.T. Station	9+38.43	N	3,714,704.1297	E	514,573.2820
C.C.		N	3,714,738.7085	E	506,573.3567
Back = N	1° 13′ 43.32" E				
Ahead = N	0° 14′ 51.55" E				
Chord Bear = N	0° 44′ 17.43" E				

Course from PT CL_HOPE_EX2 to 102 N 0° 14′ 51.55" E Dist 106.1896

Point 102 N 3,714,810.3183 E 514,573.7410 Sta 10+44.62

Ending chain CL_HOPE_EX description

IH-40 WBFR BASELINE

Beginning chain IH40_WBFR_CL description

Curve IH40_WBFR_CL1	Curve Data				
P.I. Station	98+50.08	N	3,714,840.4987	E	513,702.8857
Delta =	4° 41′ 00.88" (RT)				
Degree =	1° 33′ 40.29"				
Tangent =	150.0836				
Length =	300.0000				
Radius =	3,670.0000				
External =	3.0675				
Long Chord =	299.9164				
Mid. Ord. =	3.0650				
P.C. Station	97+00.00	N	3,714,895.7760	E	513,563.3525
P.T. Station	100+00.00	N	3,714,774.0128	E	513,837.4394
C.C.		N	3,711,483.7658	E	512,211.6549
Back = S	68° 23′ 18.86" E				
Ahead = S	63° 42′ 17.98" E				
Chord Bear = S	66° 02′ 48.42" E				

Course from PT IH40_WBFR_CL1 to PC IH40_WBFR_CL2 S 64° 01′ 56.02" E Dist 404.0261

Curve IH40_WBFR_CL2	Curve Data				
P.I. Station	110+52.85	N	3,714,313.0053	E	514,783.9957
Delta =	30° 50′ 39.25" (LT)				
Degree =	2° 26′ 09.76"				
Tangent =	648.8257				
Length =	1,266.1603				
Radius =	2,352.0000				
External =	87.8522				
Long Chord =	1,250.9266				
Mid. Ord. =	84.6889				
P.C. Station	104+04.03	N	3,714,597.1037	E	514,200.6752
P.T. Station	116+70.19	N	3,714,368.1604	E	515,430.4728
C.C.		N	3,716,711.6469	E	515,230.5349
Back = S	64° 01′ 56.02" E				
Ahead = N	85° 07′ 24.74" E				
Chord Bear = S	79° 27′ 15.64" E				

Course from PT IH40_WBFR_CL2 to WBFR2 N 85° 07′ 24.74" E Dist 29.8015

Point WBFR2 N 3,714,370.6937 E 515,460.1665 Sta 116+99.99

Course from WBFR2 to PC IH40_WBFR_CL3 N 85° 07′ 24.74" E Dist 162.0191

IH-40 WBFR BASELINE (CONTINUED)

Curve IH40_WBFR_CL3	Curve Data				
P.I. Station	120+55.14	N	3,714,400.8847	E	515,814.0364
Delta =	2° 12′ 46.46" (LT)				
Degree =	0° 34′ 22.65"				
Tangent =	193.1364				
Length =	386.2248				
Radius =	10,000.0000				
External =	1.8649				
Long Chord =	386.2008				
Mid. Ord. =	1.8646				
P.C. Station	118+62.01	N	3,714,384.4666	E	515,621.5991
P.T. Station	122+48.23	N	3,714,424.7210	E	516,005.6963
C.C.		N	3,724,348.2696	E	514,771.5230
Back = N	85° 07′ 24.74" E				
Ahead = N	82° 54′ 38.28" E				
Chord Bear = N	84° 01′ 01.51" E				

Curve IH40_WBFR_CL4	Curve Data				
P.I. Station	125+11.12	N	3,714,457.1660	E	516,266.5750
Delta =	0° 22′ 09.59" (RT)				
Degree =	0° 04′ 12.88"				
Tangent =	262.8885				
Length =	525.7753				
Radius =	81,566.0001				
External =	0.4236				
Long Chord =	525.7743				
Mid. Ord. =	0.4236				
P.C. Station	122+48.23	N	3,714,424.7210	E	516,005.6963
P.T. Station	127+74.01	N	3,714,487.9287	E	516,527.6574
C.C.		N	3,633,482.3046	E	526,072.3537
Back = N	82° 54′ 38.28" E				
Ahead = N	83° 16′ 47.86" E				
Chord Bear = N	83° 05′ 43.07" E				

Course from PT IH40_WBFR_CL4 to PC IH40_WBFR_CL5 N 83° 56′ 34.63" E Dist 160.4673

Curve IH40_WBFR_CL5	Curve Data				
P.I. Station	132+68.01	N	3,714,538.7358	E	517,019.0445
Delta =	9° 02′ 19.67" (RT)				
Degree =	1° 21′ 28.06"				
Tangent =	333.5403				
Length =	665.6965				
Radius =	4,219.7652				
External =	13.1614				
Long Chord =	665.0064				
Mid. Ord. =	13.1205				
P.C. Station	129+34.47	N	3,714,504.8610	E	516,687.2289
P.T. Station	136+00.17	N	3,714,520.0606	E	517,352.0615
C.C.		N	3,710,306.9151	E	517,115.7935
Back = N	84° 10′ 15.31" E				
Ahead = S	86° 47′ 25.02" E				
Chord Bear = N	88° 41′ 25.14" E				

Curve IH40_WBFR_CL6	Curve Data				
P.I. Station	140+25.40	N	3,714,496.2517	E	517,776.6229
Delta =	2° 01′ 57.97" (LT)				
Degree =	0° 14′ 20.57"				
Tangent =	425.2284				
Length =	850.3677				
Radius =	23,968.5155				
External =	3.7717				
Long Chord =	850.3231				
Mid. Ord. =	3.7711				
P.C. Station	136+00.17	N	3,714,520.0606	E	517,352.0615
P.T. Station	144+50.54	N	3,714,487.5175	E	518,201.7616
C.C.		N	3,738,450.9763	E	518,694.0781
Back = S	86° 47′ 25.02" E				
Ahead = S	88° 49′ 23.00" E				
Chord Bear = S	87° 48′ 24.01" E				

Ending chain IH40_WBFR_CL description

12/11/23

STATE OF TEXAS · JAMES W. LANGSTON · 73891 · LICENSED · PROFESSIONAL ENGINEER

James W Langston PE

Bridgefarmer & Associates, Inc.
TBPE Registration No. 264

NO.	DATE	DESCRIPTION	APPROV.

BRIDGEFARMER & ASSOCIATES, INC.
CONSULTING ENGINEERS
TBPE REGISTRATION NO. 264

Texas Department of Transportation ©2023

HORIZONTAL ALIGNMENT DATA

SCALE: AS NOTED SHEET 1 OF 2

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
TS	6	SEE TITLE SHEET		IH 40
GRAPHICS TS	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK JL	TEXAS	AMA	POTTER	050
CHECK MS	CONTROL	SECTION	JOB	
	0090	05	107	

c:\bms\bridgefarmer-pw\vidal.ngoumnai@bridgefarmer.com\dms21392\HORIZONTAL ALIGNMENT DATA 01.dgn
Vidal.Ngoumnai 12/8/2023 7:03:41 PM

IH-40 EBFR BASELINE

Beginning chain IH40_EBFR_CL description

Point EBFR1 N 3,714,653.0882 E 513,417.2178 Sta 95+00.00

Course from EBFR1 to PC IH40_EBFR_CL1 S 53° 46' 01.01" E Dist 150.3793

Curve Data

Curve IH40_EBFR_CL1					
P.I. Station	97+64.57	N	3,714,496.7059	E	513,630.6287
Delta =	8° 42' 25.43" (LT)				
Degree =	3° 49' 10.99"				
Tangent =	114.1951				
Length =	227.9504				
Radius =	1,500.0000				
External =	4.3406				
Long Chord =	227.7311				
Mid. Ord. =	4.3280				
P.C. Station	96+50.38	N	3,714,564.2033	E	513,538.5167
P.T. Station	98+78.33	N	3,714,443.9306	E	513,731.8970
C.C.		N	3,715,774.1325	E	514,425.1233
Back = S	53° 46' 01.01" E				
Ahead = S	62° 28' 26.44" E				
Chord Bear = S	58° 07' 13.73" E				

Course from PT IH40_EBFR_CL1 to EBFR2 S 62° 28' 26.44" E Dist 121.6703

Point EBFR2 N 3,714,387.7005 E 513,839.7944 Sta 100+00.00

Course from EBFR2 to PC IH40_EBFR_CL2 S 62° 28' 26.44" E Dist 206.7988

Curve Data

Curve IH40_EBFR_CL2					
P.I. Station	108+97.56	N	3,713,972.8932	E	514,635.7502
Delta =	20° 57' 02.00" (LT)				
Degree =	1° 32' 01.01"				
Tangent =	690.7594				
Length =	1,366.0915				
Radius =	3,736.0000				
External =	63.3216				
Long Chord =	1,358.4937				
Mid. Ord. =	62.2662				
P.C. Station	102+06.80	N	3,714,292.1283	E	514,023.1838
P.T. Station	115+72.89	N	3,713,893.7935	E	515,321.9657
C.C.		N	3,717,605.2180	E	515,749.7796
Back = S	62° 28' 26.44" E				
Ahead = S	83° 25' 28.44" E				
Chord Bear = S	72° 56' 57.44" E				

Curve Data

Curve IH40_EBFR_CL3					
P.I. Station	117+49.65	N	3,713,869.7148	E	515,497.0745
Delta =	6° 44' 53.86" (LT)				
Degree =	1° 54' 40.08"				
Tangent =	176.7566				
Length =	353.1044				
Radius =	2,998.0000				
External =	5.2061				
Long Chord =	352.9003				
Mid. Ord. =	5.1971				
P.C. Station	115+72.89	N	3,713,893.7935	E	515,321.9657
P.T. Station	119+25.99	N	3,713,866.3795	E	515,673.7996
C.C.		N	3,716,863.8457	E	515,730.3701
Back = S	82° 10' 13.81" E				
Ahead = S	88° 55' 07.67" E				
Chord Bear = S	85° 32' 40.74" E				

Curve Data

Curve IH40_EBFR_CL4					
P.I. Station	127+35.39	N	3,713,846.8960	E	516,482.9556
Delta =	24° 04' 22.59" (LT)				
Degree =	1° 30' 33.74"				
Tangent =	809.3905				
Length =	1,594.8973				
Radius =	3,796.0000				
External =	85.3308				
Long Chord =	1,583.1922				
Mid. Ord. =	83.4548				
P.C. Station	119+25.99	N	3,713,866.3795	E	515,673.7996
P.T. Station	135+20.89	N	3,714,159.1612	E	517,229.6841
C.C.		N	3,717,661.2795	E	515,765.1761
Back = S	88° 37' 14.36" E				
Ahead = N	67° 18' 23.05" E				
Chord Bear = N	79° 20' 34.35" E				

Ending chain IH40_EBFR_CL description

RETAINING WALL (RWSOUTH) ALIGNMENT

Beginning chain RWSOUTH description

Curve Data

Curve RWSOUTH1					
P.I. Station	5+93.80	N	3,714,139.8521	E	514,719.8397
Delta =	76° 01' 39.78" (LT)				
Degree =	47° 44' 47.34"				
Tangent =	93.8010				
Length =	159.2321				
Radius =	120.0000				
External =	32.3110				
Long Chord =	147.8045				
Mid. Ord. =	25.4566				
P.C. Station	5+00.00	N	3,714,046.1016	E	514,716.7614
P.T. Station	6+59.23	N	3,714,165.4756	E	514,629.6063
C.C.		N	3,714,050.0397	E	514,596.8260
Back = N	1° 52' 50.33" E				
Ahead = N	74° 08' 49.45" W				
Chord Bear = N	36° 07' 59.56" W				

Curve Data

Curve RWSOUTH2					
P.I. Station	7+40.76	N	3,714,187.7478	E	514,551.1747
Delta =	1° 31' 58.88" (RT)				
Degree =	0° 56' 24.66"				
Tangent =	81.5326				
Length =	163.0555				
Radius =	6,094.1031				
External =	0.5454				
Long Chord =	163.0506				
Mid. Ord. =	0.5453				
P.C. Station	6+59.23	N	3,714,165.4756	E	514,629.6063
P.T. Station	8+22.29	N	3,714,212.1103	E	514,473.3670
C.C.		N	3,720,027.7959	E	516,294.3267
Back = N	74° 08' 49.45" W				
Ahead = N	72° 36' 50.57" W				
Chord Bear = N	73° 22' 50.01" W				

Curve Data

Curve RWSOUTH3					
P.I. Station	9+00.53	N	3,714,235.4894	E	514,398.7000
Delta =	66° 12' 35.23" (LT)				
Degree =	47° 44' 47.34"				
Tangent =	78.2416				
Length =	138.6695				
Radius =	120.0000				
External =	23.2541				
Long Chord =	131.0816				
Mid. Ord. =	19.4794				
P.C. Station	8+22.29	N	3,714,212.1103	E	514,473.3670
P.T. Station	9+60.96	N	3,714,176.5978	E	514,347.1875
C.C.		N	3,714,097.5927	E	514,437.5102
Back = N	72° 36' 50.57" W				
Ahead = S	41° 10' 34.20" W				
Chord Bear = S	74° 16' 51.81" W				

Ending chain RWSOUTH description

RETAINING WALL (RWNORTH) ALIGNMENT

Beginning chain RWNORTH description

Curve Data

Curve RWNORTH1					
P.I. Station	5+75.98	N	3,714,401.1361	E	514,402.1386
Delta =	74° 27' 05.93" (LT)				
Degree =	57° 17' 44.81"				
Tangent =	75.9752				
Length =	129.9426				
Radius =	100.0000				
External =	25.5875				
Long Chord =	120.9916				
Mid. Ord. =	20.3743				
P.C. Station	5+00.00	N	3,714,477.0294	E	514,405.6661
P.T. Station	6+29.94	N	3,714,377.3944	E	514,474.3090
C.C.		N	3,714,472.3864	E	514,505.5582
Back = S	2° 39' 40.23" W				
Ahead = S	71° 47' 25.71" E				
Chord Bear = S	34° 33' 52.74" E				

Curve Data

Curve RWNORTH2					
P.I. Station	7+16.82	N	3,714,350.2467	E	514,556.8329
Delta =	3° 47' 19.16" (LT)				
Degree =	2° 10' 52.77"				
Tangent =	86.8746				
Length =	173.6858				
Radius =	2,626.6489				
External =	1.4363				
Long Chord =	173.6542				
Mid. Ord. =	1.4355				
P.C. Station	6+29.94	N	3,714,377.3944	E	514,474.3090
P.T. Station	8+03.63	N	3,714,328.6112	E	514,640.9702
C.C.		N	3,716,872.5010	E	515,295.1180
Back = S	71° 47' 25.71" E				
Ahead = S	75° 34' 44.86" E				
Chord Bear = S	73° 41' 05.28" E				

Curve Data

Curve RWNORTH3					
P.I. Station	8+80.89	N	3,714,309.3689	E	514,715.8011
Delta =	75° 22' 59.46" (LT)				
Degree =	57° 17' 44.81"				
Tangent =	77.2653				
Length =	131.5685				
Radius =	100.0000				
External =	26.3722				
Long Chord =	122.2822				
Mid. Ord. =	20.8687				
P.C. Station	8+03.63	N	3,714,328.6112	E	514,640.9702
P.T. Station	9+35.20	N	3,714,376.9220	E	514,753.3046
C.C.		N	3,714,425.4605	E	514,665.8745
Back = S	75° 34' 44.86" E				
Ahead = N	29° 02' 15.67" E				
Chord Bear = N	66° 43' 45.41" E				

Ending chain RWNORTH description

NO.	DATE	DESCRIPTION	APPROV.

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HORIZONTAL ALIGNMENT DATA

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JAMES W. LANGSTON
73891
LICENSED
PROFESSIONAL ENGINEER
12/11/23
James W Langston PE
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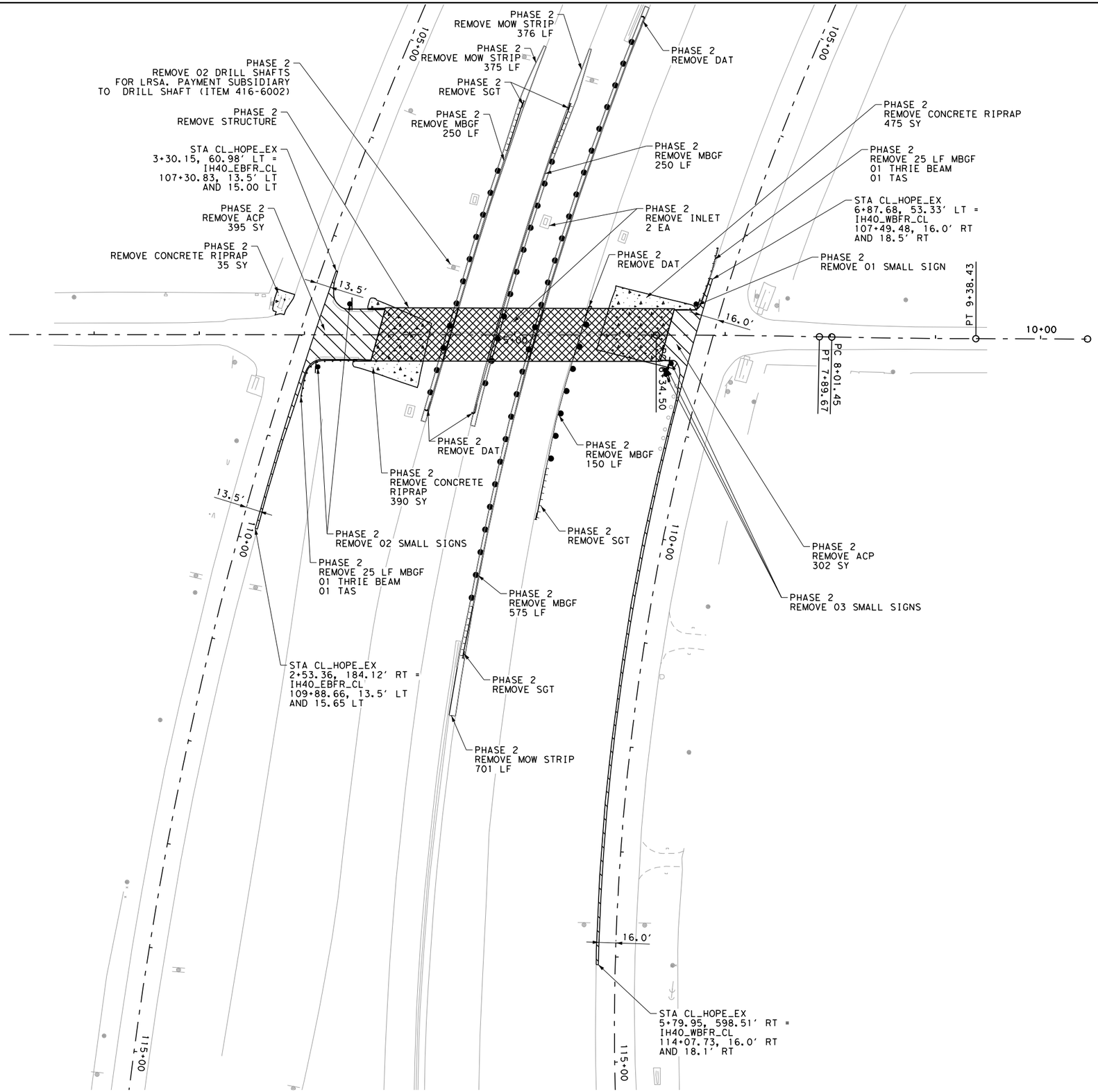
TBPE Registration No. 264

SCALE: AS NOTED SHEET 2 OF 2

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
TS	6	SEE TITLE SHEET		IH 40
GRAPHICS TS	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK JL	TEXAS	AMA	POTTER	051
CHECK MS	CONTROL 0090	SECTION 05	JOB 107	



50 0 50 100
SCALE: 1" = 100' HORIZONTAL

5 0 5 10
SCALE: 1" = 10' VERTICAL

LEGEND

- EXISTING TRAFFIC FLOW
- PROPOSED TRAFFIC FLOW
- EXISTING PAVEMENT
- EXISITNG BRIDGE/SLAB
- EXISITNG CONCRETE RIPRAP
- METAL BEAM GUARD FENCE
- METAL BEAM GUARD FENCE TRANSITION
- GUARDRAIL END TREATMENT

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IH-40 AT HOPE ROAD

REMOVAL PLAN

SHEET 1 OF 1

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
VN	6	SEE TITLE SHEET		IH 40
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
VN	TEXAS	AMA	POTTER	052
CHECK	CONTROL	SECTION	JOB	
JL	0090	05	107	
CHECK				
MS				

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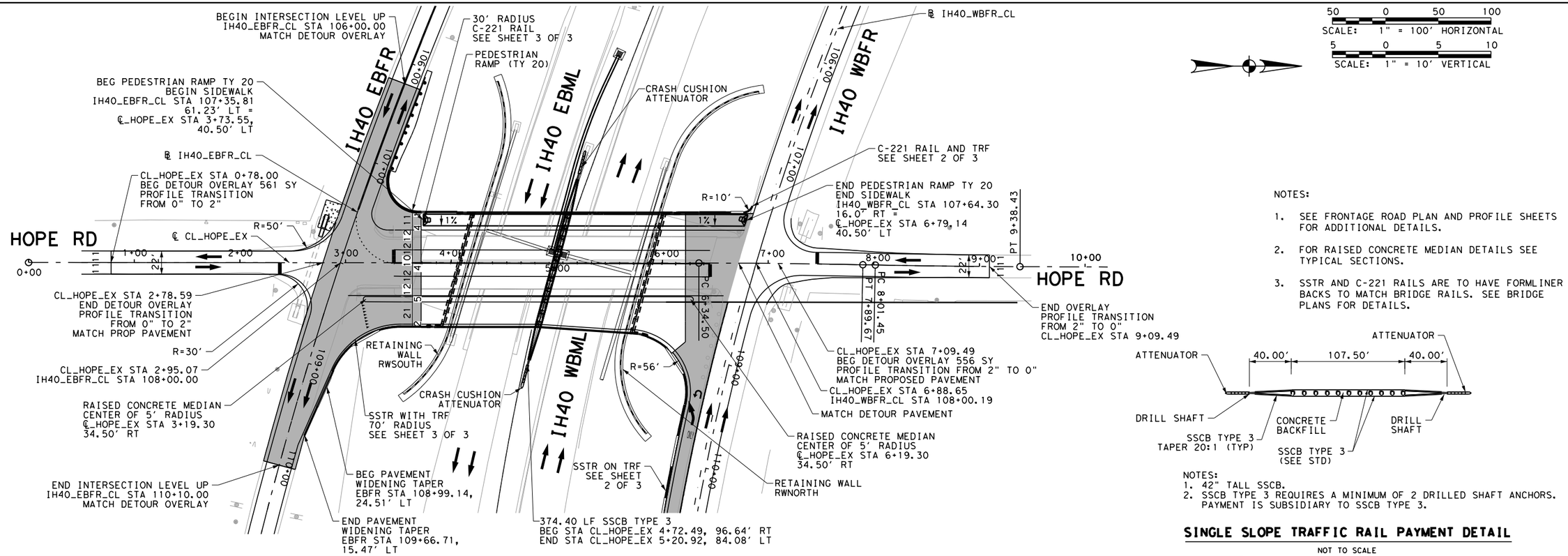


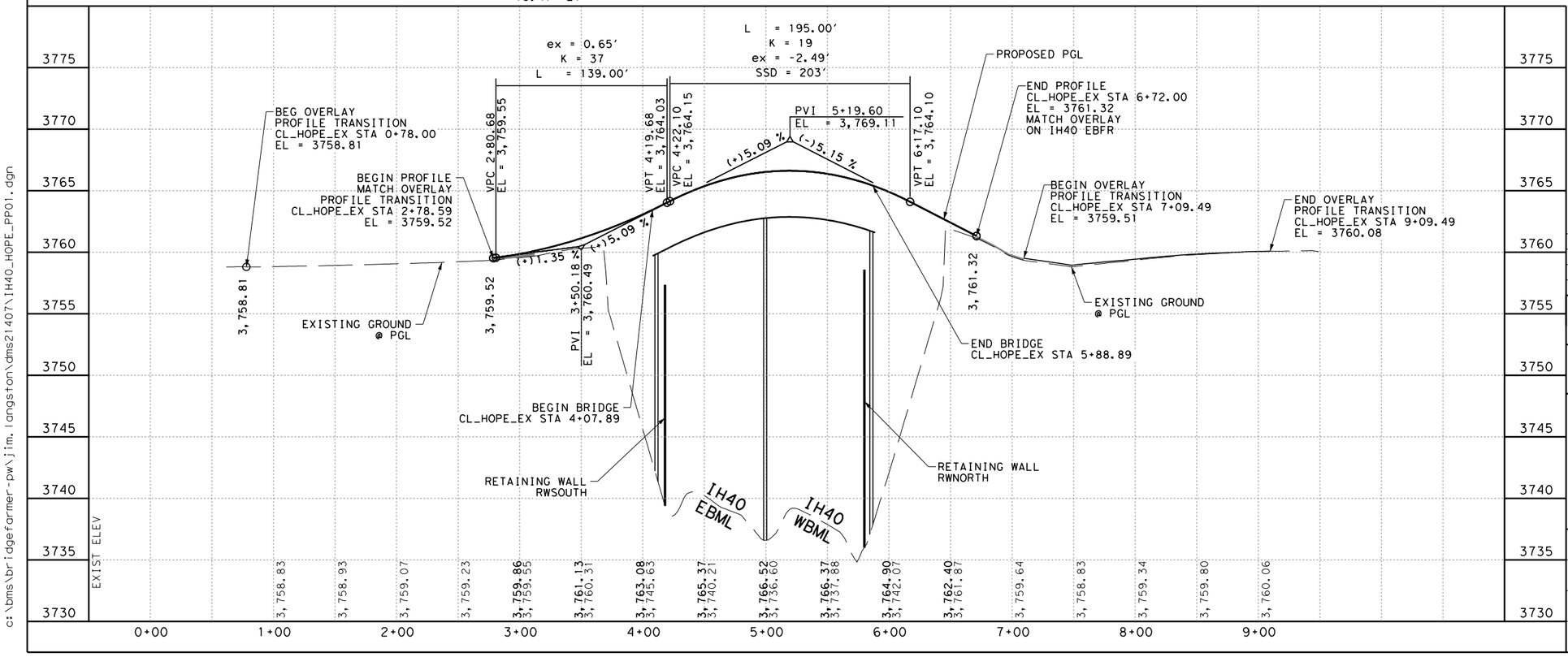
NOTES:

1. SEE FRONTAGE ROAD PLAN AND PROFILE SHEETS FOR ADDITIONAL DETAILS.
2. FOR RAISED CONCRETE MEDIAN DETAILS SEE TYPICAL SECTIONS.
3. SSTR AND C-221 RAILS ARE TO HAVE FORMLINER BACKS TO MATCH BRIDGE RAILS. SEE BRIDGE PLANS FOR DETAILS.

NOTES:
1. 42" TALL SSCB.
2. SSCB TYPE 3 REQUIRES A MINIMUM OF 2 DRILLED SHAFT ANCHORS. PAYMENT IS SUBSIDIARY TO SSCB TYPE 3.

SINGLE SLOPE TRAFFIC RAIL PAYMENT DETAIL

NOT TO SCALE



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NO.	DATE	DESCRIPTION	APPROV.

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IH-40 AT HOPE ROAD
ROADWAY
PLAN AND PROFILE
HOPE RD

SHEET 1 OF 3

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
TS	6	SEE TITLE SHEET		IH 40
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
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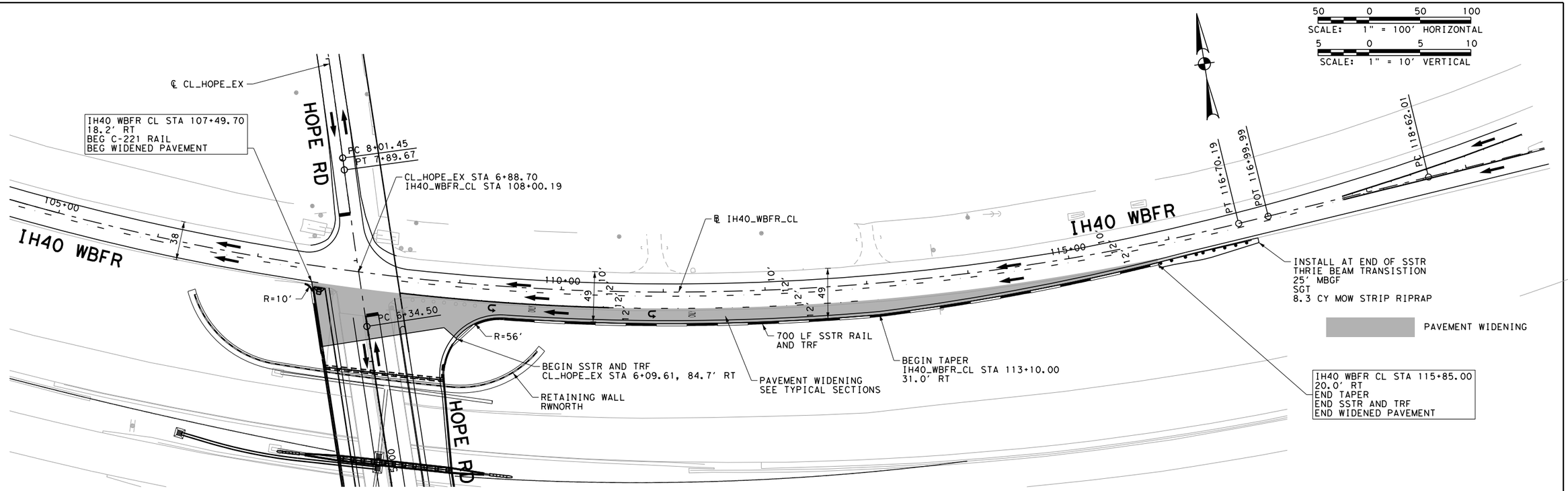
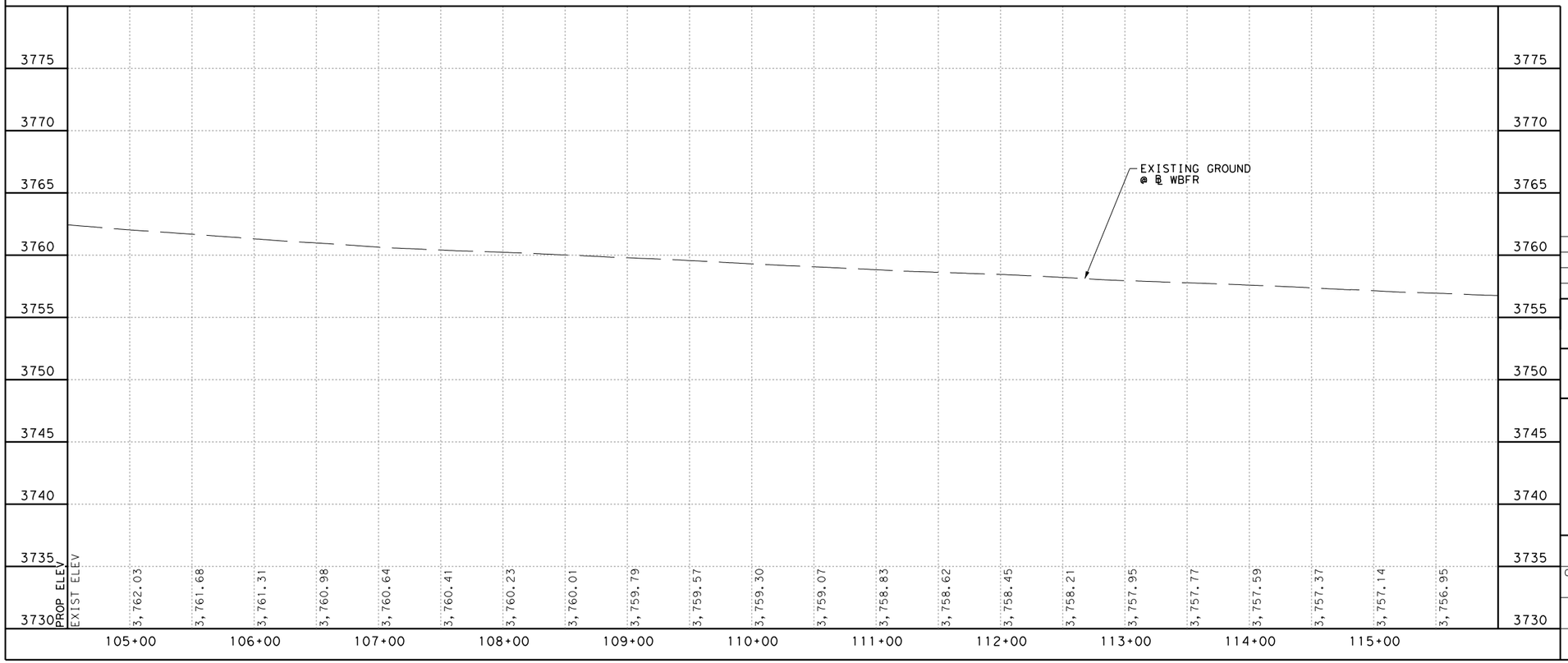
CHECK				
MS				





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IH-40 AT HOPE ROAD
ROADWAY
PLAN & PROFILE
IH-40 WBFR

SHEET 2 OF 3

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
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GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
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CHECK	CONTROL	SECTION	JOB	
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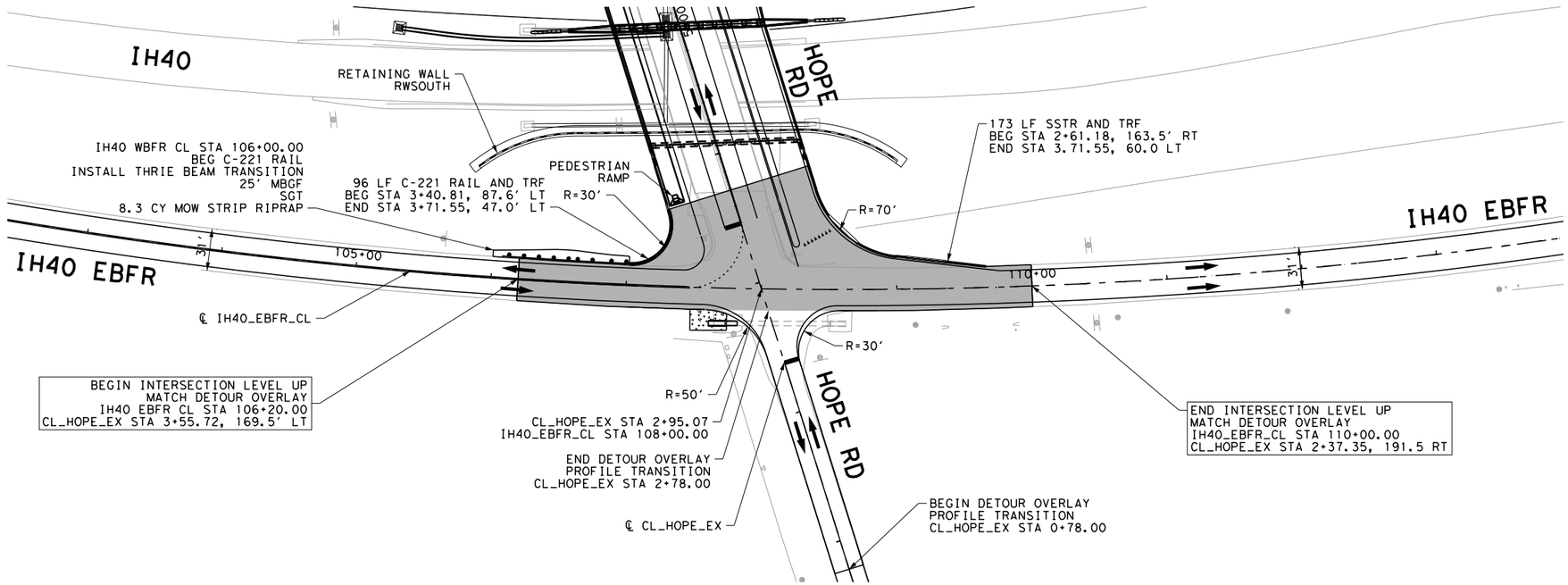

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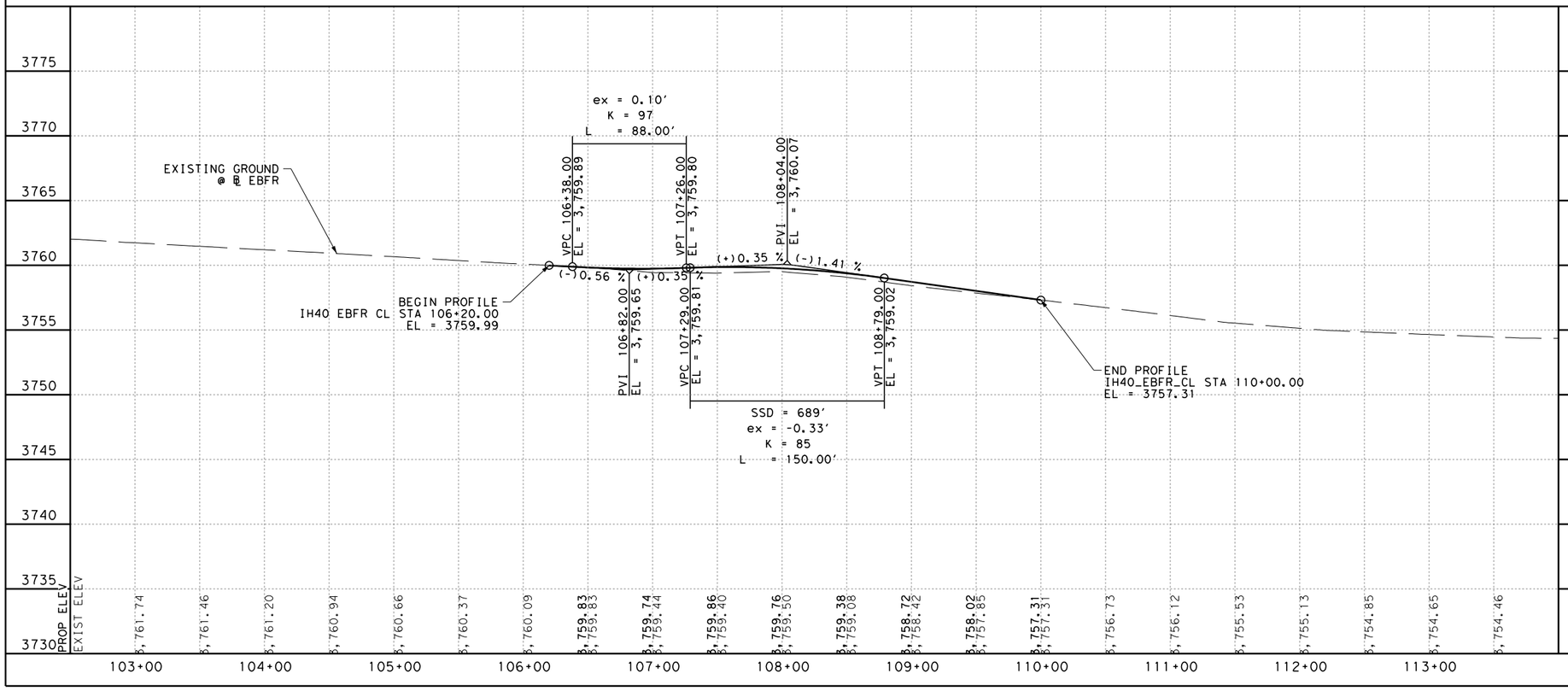
SCALE: 1" = 100' HORIZONTAL
5 0 5 10
SCALE: 1" = 10' VERTICAL

NOTES:

1. FOR INTERSECTION LEVEL-UP DETAILS SEE TCP PHASE 1 (SHEET 1 OF 2)



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NO.	DATE	DESCRIPTION	APPROV.

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IH-40 AT HOPE ROAD
ROADWAY
PLAN & PROFILE
IH-40 EBFR

SHEET 3 OF 3

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
TS	6	SEE TITLE SHEET		IH 40
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
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CHECK	CONTROL	SECTION	JOB	
JL	0090	05	107	
CHECK				
MS				

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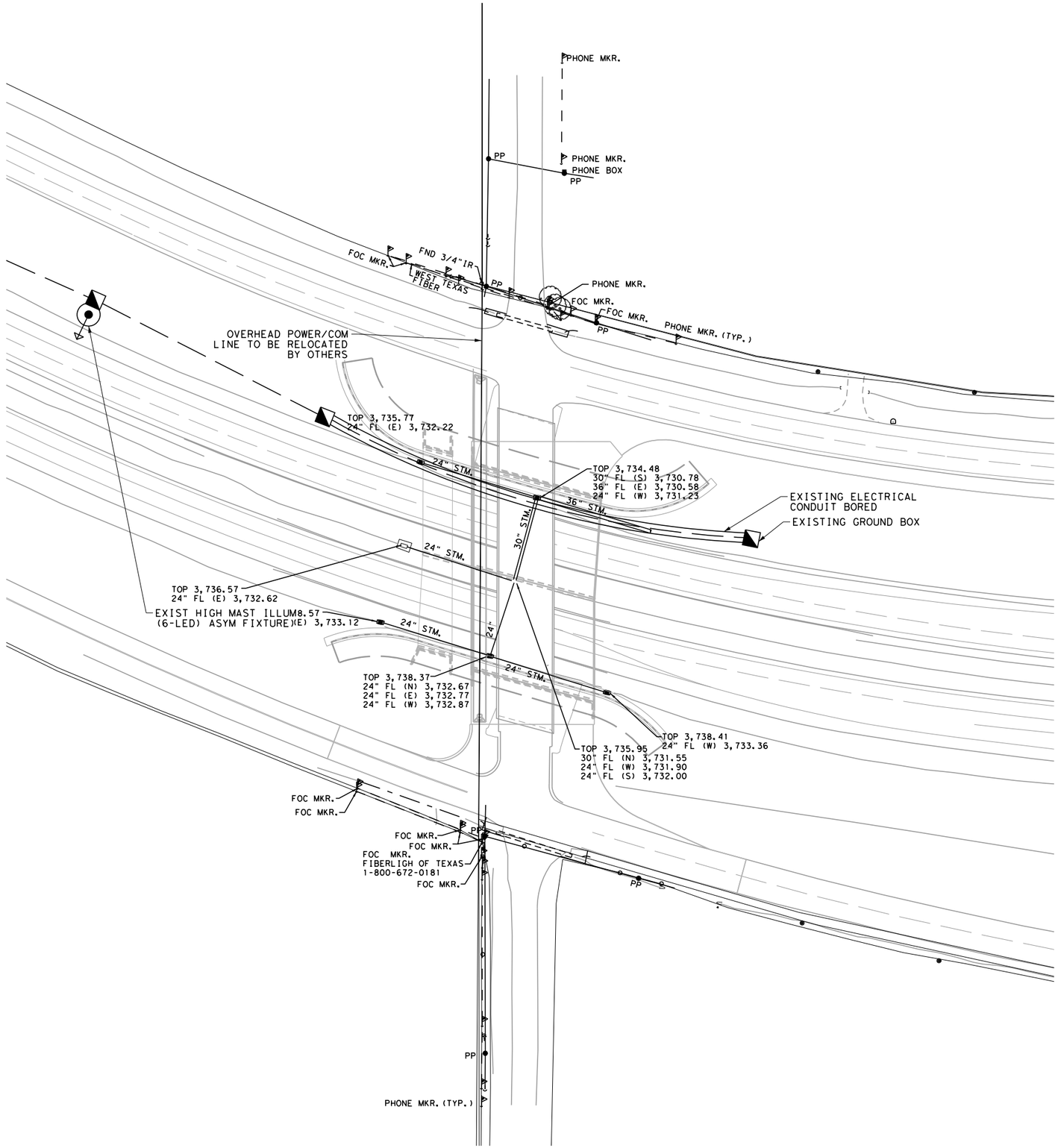

12/11/23

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IH-40 AT HOPE ROAD

EXISTING UTILITIES

SHEET 1 OF 1

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DA	6	SEE TITLE SHEET		IH 40
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
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CHECK	CONTROL	SECTION	JOB	
JL	0090	05	107	
CHECK				

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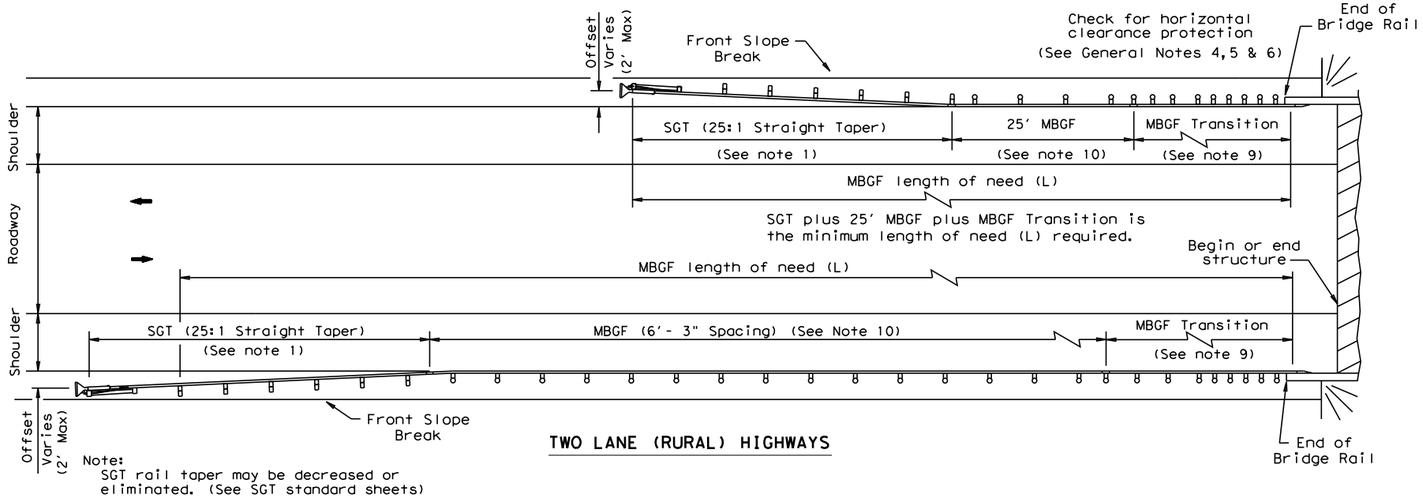
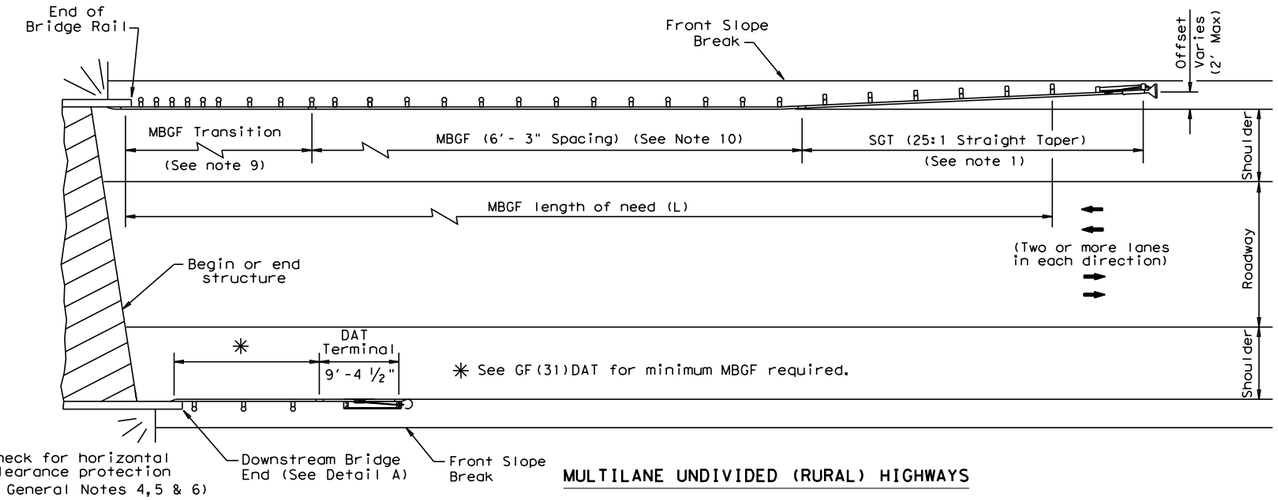
Vidal.Ngoumnai

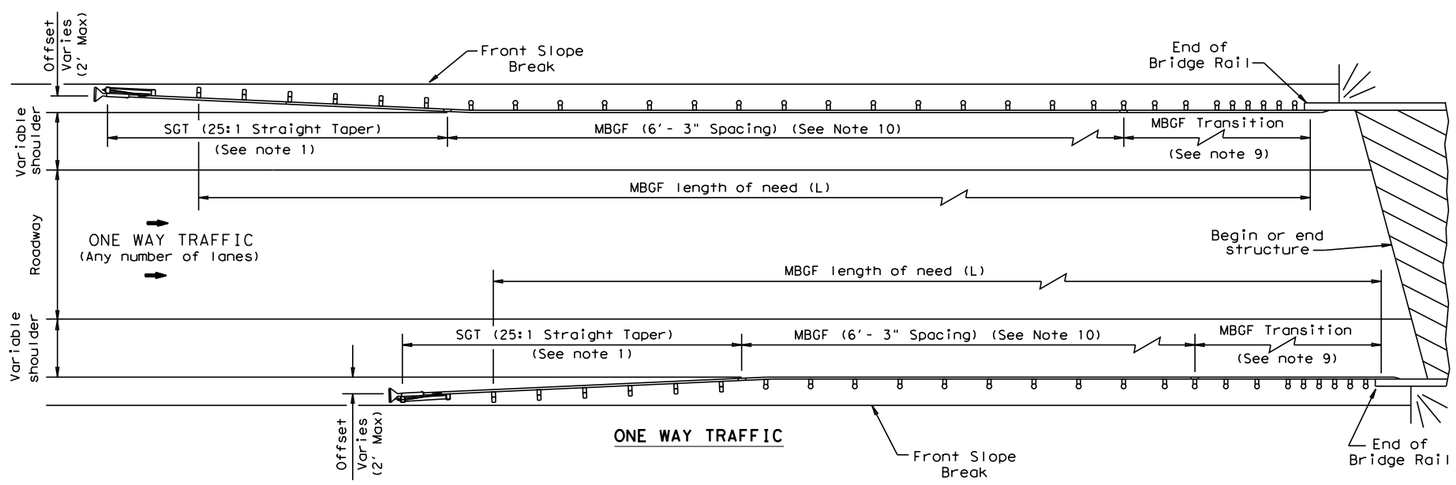


TWO LANE (RURAL) HIGHWAYS

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



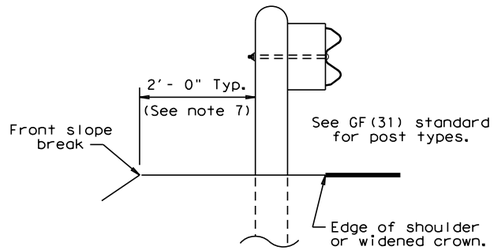
MULTILANE UNDIVIDED (RURAL) HIGHWAYS



ONE WAY TRAFFIC

GENERAL NOTES

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



TYPICAL CROSS SECTION AT MBGF

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

DETAIL A

Showing Downstream Rail Attachment

Texas Department of Transportation

Design Division Standard

BRIDGE END DETAILS

(METAL BEAM GUARD FENCE APPLICATIONS TO RIGID RAILS)

BED-14

FILE: bed14.dgn	DN: TxDOT	CK: AM	DW: BD/VP	CK: CGL
© TxDOT: December 2011	CONT	SECT	JOB	HIGHWAY
REVISIONS REVISED APRIL 2014 SEE (MEMO 0414)	0090	05	107	IH40
	DIST	COUNTY		SHEET NO.
	AMA	POTTER		057

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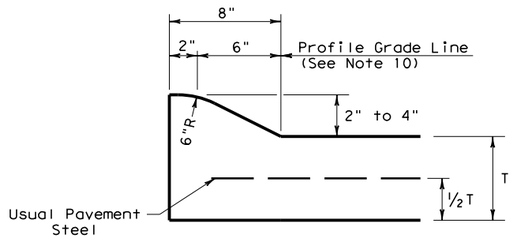
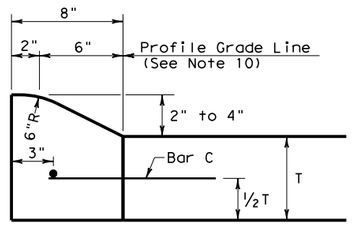


TYPE I CURB (MONOLITHIC)
2" - 4" HEIGHT



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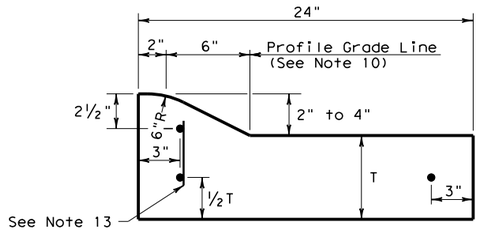
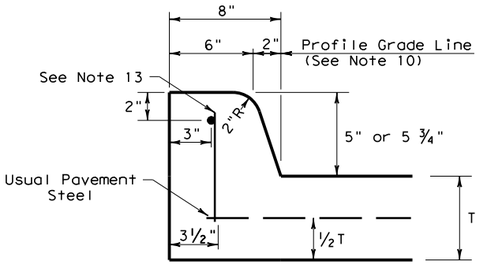
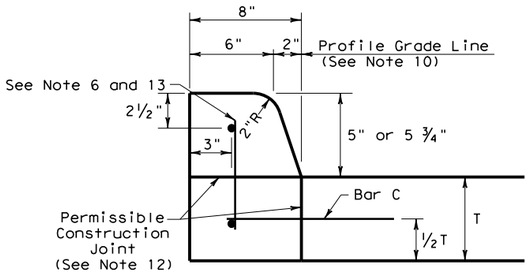
2" - 4" HEIGHT



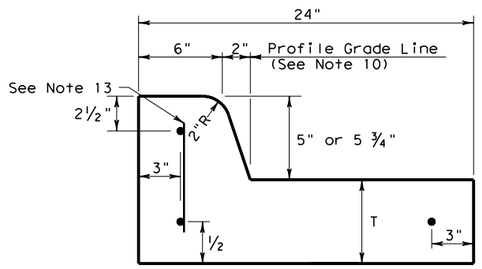
TYPE I CURB AND GUTTER
2" - 4" HEIGHT



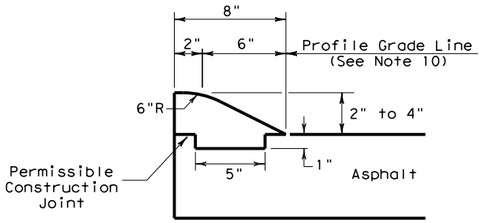
TYPE II CURB (MONOLITHIC)
5" - 5 ¾" HEIGHT



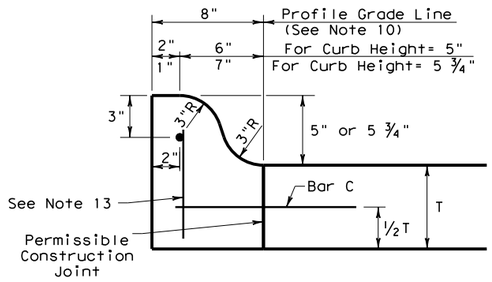
TYPE II CURB
5" - 5 ¾" HEIGHT



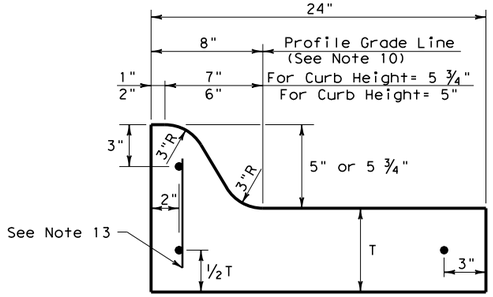
TYPE II CURB AND GUTTER
5" - 5 ¾" HEIGHT



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



TYPE IIa CURB
5" - 5 ¾" HEIGHT



TYPE IIa CURB AND GUTTER
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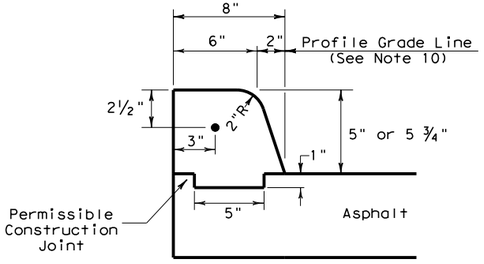
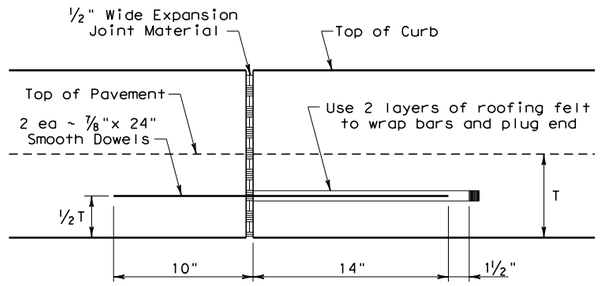
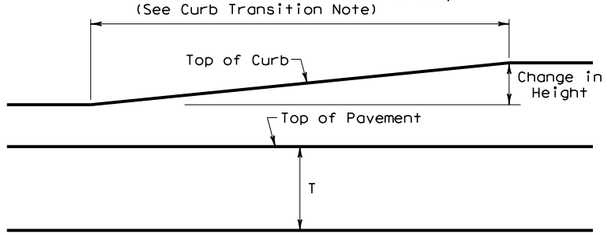


TYPE IV CURB (KEYED)
5" - 5 ¾" HEIGHT



EXPANSION JOINT DETAIL

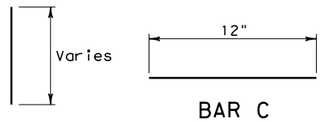
CURB TRANSITION NOTE:
Field conditions may require a longer or shorter transition, and shall be shown elsewhere in the plans, or as directed by the Engineer.



CURB TRANSITION
Note: To be paid for as Highest Curb

GENERAL NOTES

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



BAR B

BAR C

Texas Department of Transportation

Design Division Standard

CONCRETE CURB AND CURB AND GUTTER

CCCG-22

FILE: cccg21.dgn	DN: TXDOT	CK: AN	DW: CS	CK: KM
© TxDOT: JUNE 2022 REVISIONS	CONT	SECT	JOB	HIGHWAY
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	AMA	POTTER		058

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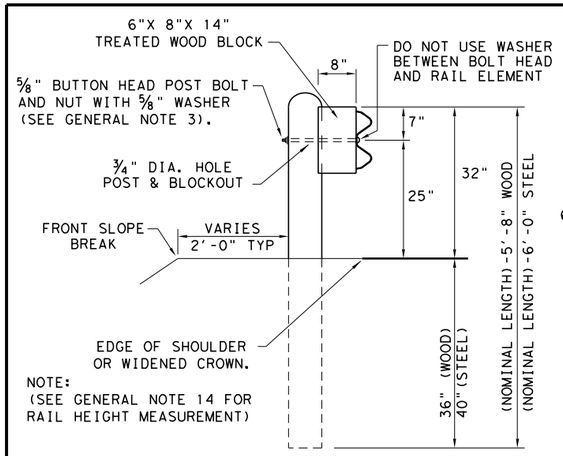
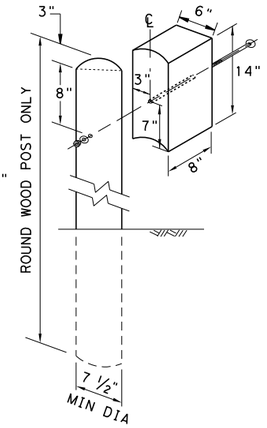
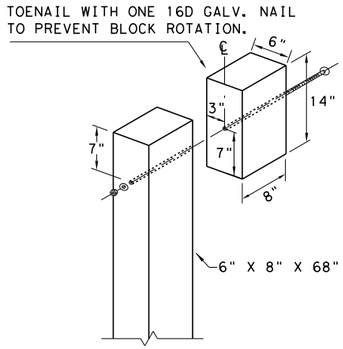


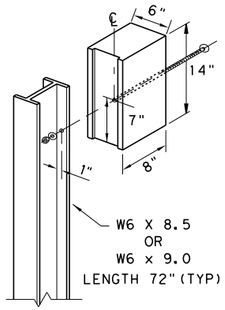
TYPICAL POST PLACEMENT



WOOD BLOCK TO
ROUND WOOD POST

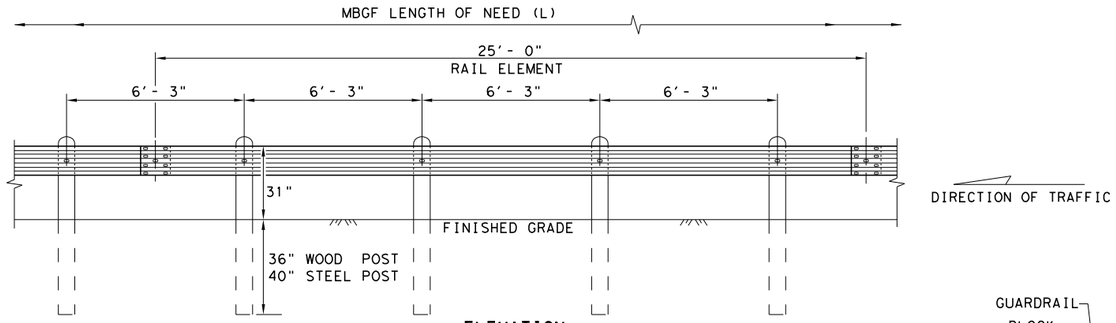


WOOD BLOCK TO
RECTANGULAR WOOD POST



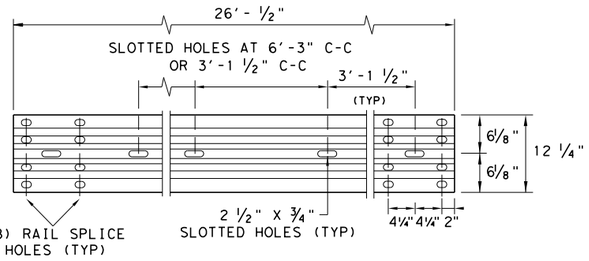
ROUTED WOOD BLOCK
TO I-BEAM STEEL POST

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



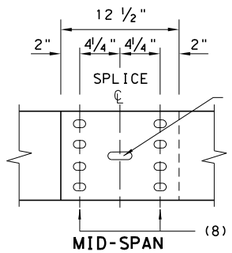
ELEVATION
MID-SPAN RAIL SPLICE

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



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

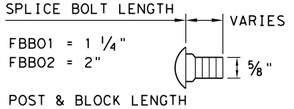
NOTES: SEE GENERAL NOTE 2 FOR ALLOWABLE RAIL TYPES.
SEE RAIL SPLICE DETAIL FOR REQUIRED HARDWARE.



MID-SPAN
RAIL SPLICE DETAIL

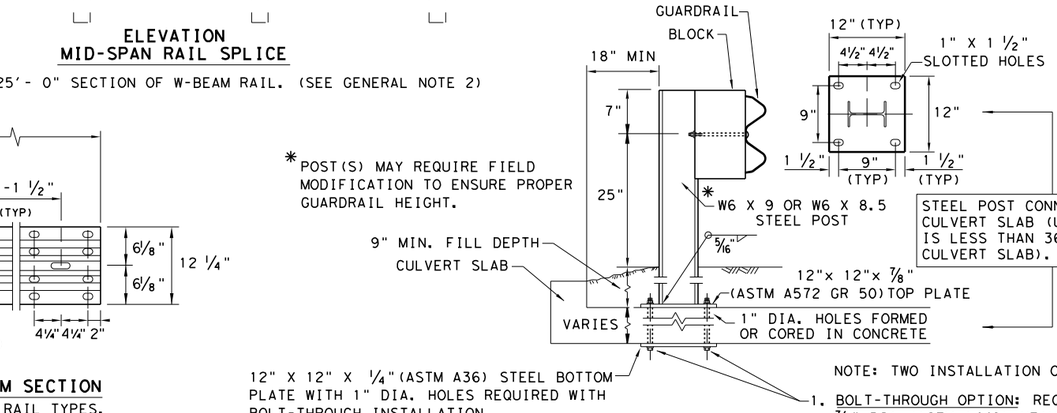
NOTE: GF(31), MID-SPAN RAIL SPLICES ARE REQUIRED WITH 6'-3" POST SPACINGS.

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.



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

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

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
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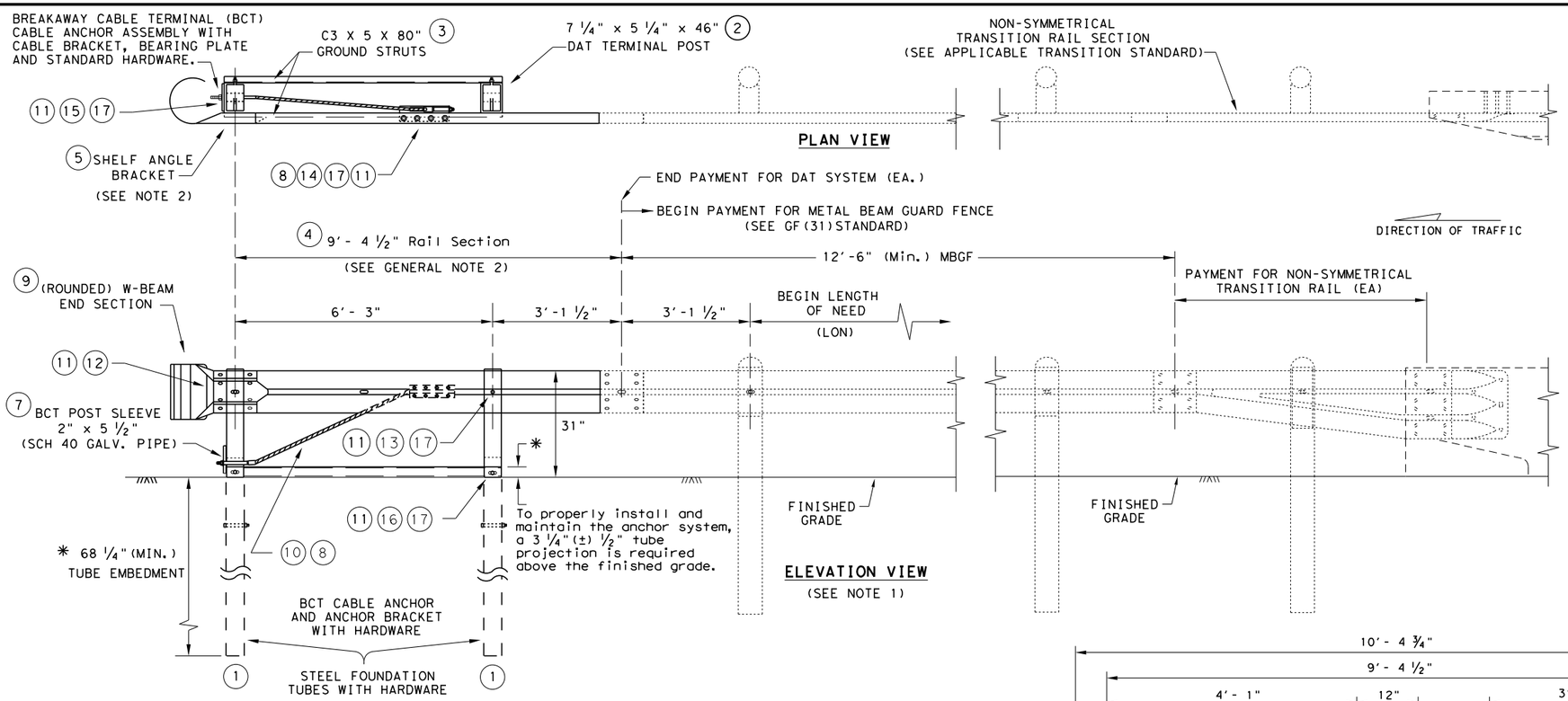


DOWNSTREAM ANCHOR TERMINAL (DAT)

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

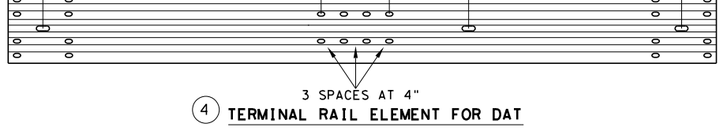
GENERAL NOTES

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.

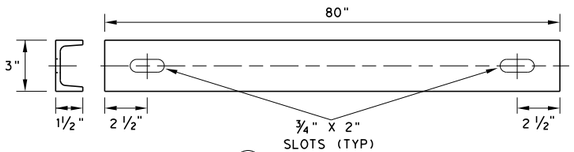
MOW STRIP INSTALLATION

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.

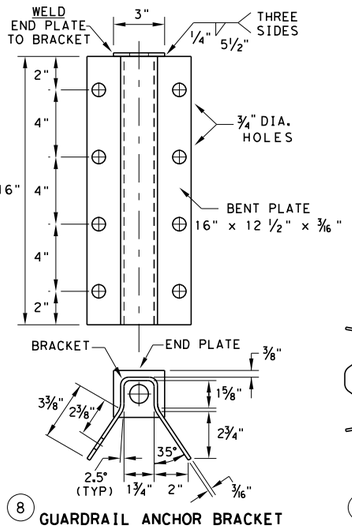
#	(DAT) PARTS LIST	QTY
(1)	STEEL FOUNDATION TUBE	2
(2)	DAT TERMINAL POST	2
(3)	CHANNEL STRUT	2
(4)	TERMINAL RAIL ELEMENT	1
(5)	SHELF ANGLE BRACKET	1
(6)	BCT BEARING PLATE	1
(7)	BCT POST SLEEVE	1
(8)	GUARDRAIL ANCHOR BRACKET	1
(9)	(ROUNDED) W-BEAM END SECTION	1
(10)	BCT CABLE ANCHOR	1
(11)	RECESSED NUT, 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



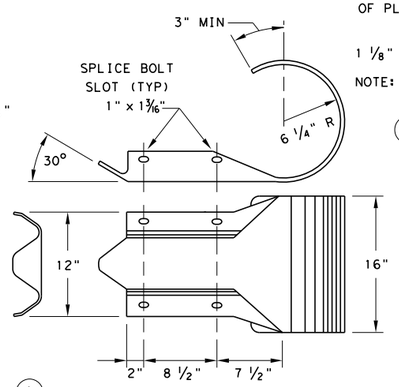
(4) TERMINAL RAIL ELEMENT FOR DAT



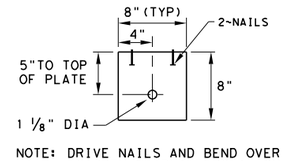
(3) CHANNEL STRUT
C3 X 5 X 80", GRADE A36



(8) GUARDRAIL ANCHOR BRACKET

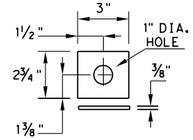


(9) W-BEAM END SECTION (ROUNDED) (12 GA.)

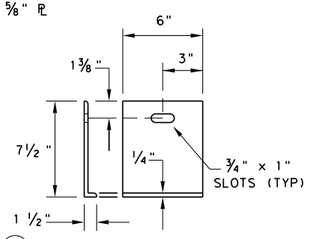


NOTE: DRIVE NAILS AND BEND OVER TO PREVENT PLATE ROTATION

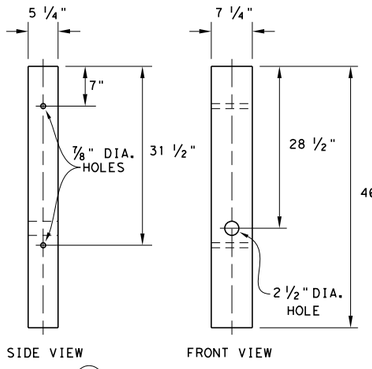
(6) BEARING PLATE
8"x 8"x 5/8" R



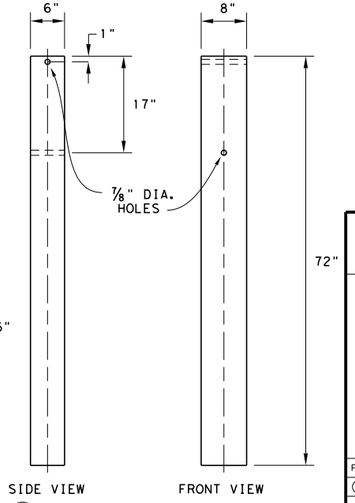
END PLATE



(5) SHELF ANGLE BRACKET



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



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

Texas Department of Transportation — Design Division Standard

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

GF(31)DAT-19

FILE: gf31dat19.dgn	DN: TxDOT	CK: KM	DW: VP	CK: CGL/AG
©TxDOT: NOVEMBER 2019 REVISIONS	CONT	SECT	JOB	HIGHWAY
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	AMA	POTTER		060

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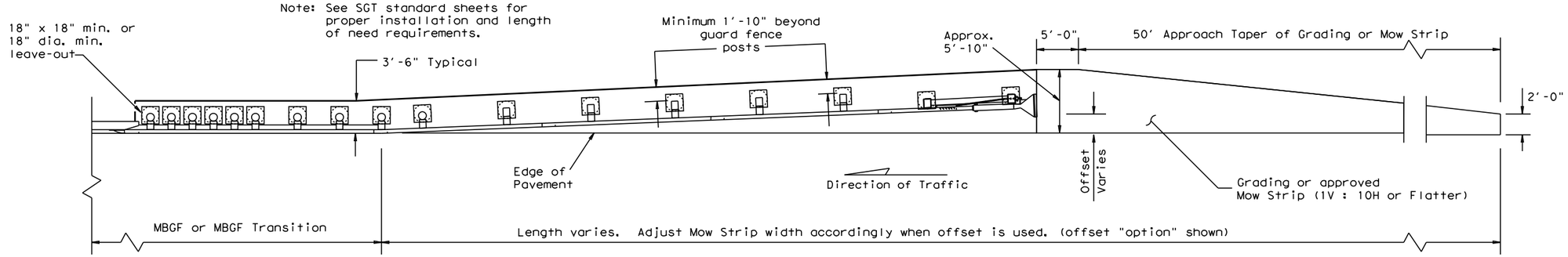
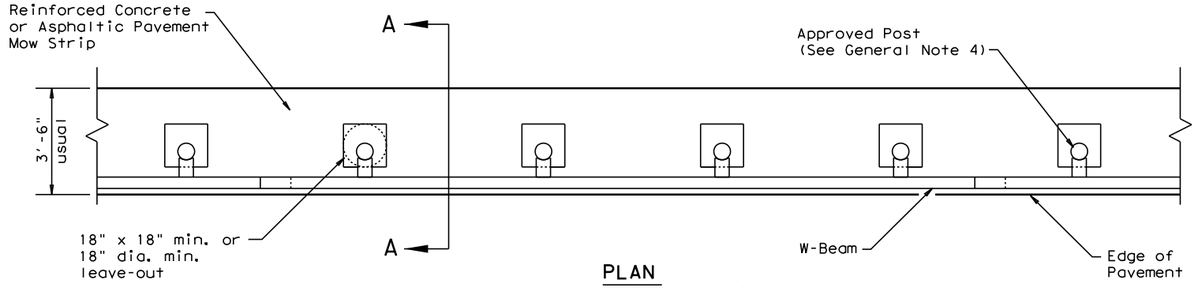
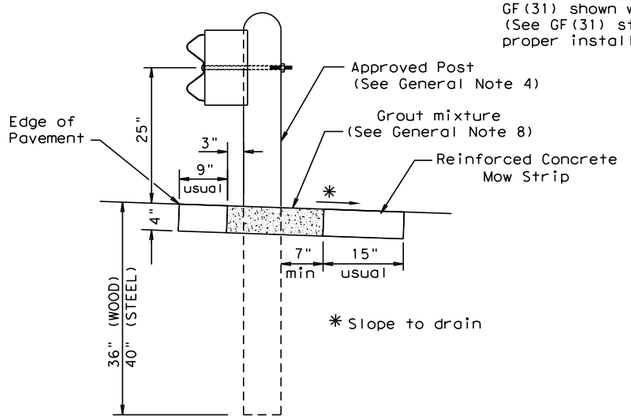


GRADING AND MOW STRIP AT GUARDRAIL END TREATMENTS



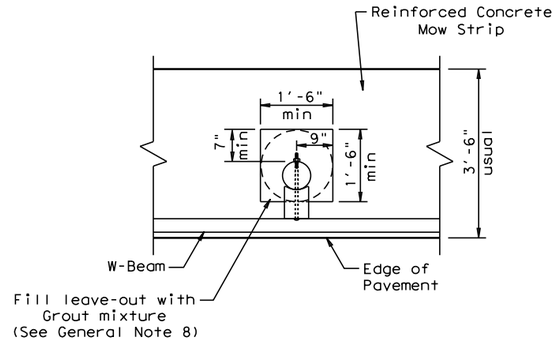
PLAN

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



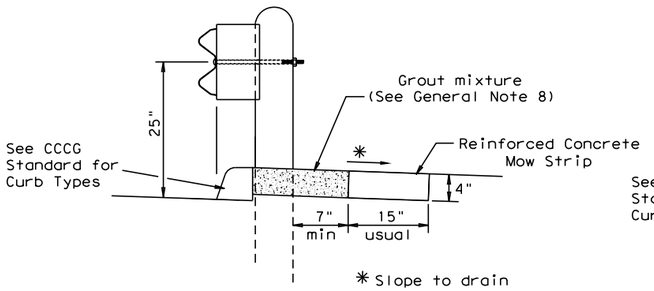
SECTION A-A

Typical



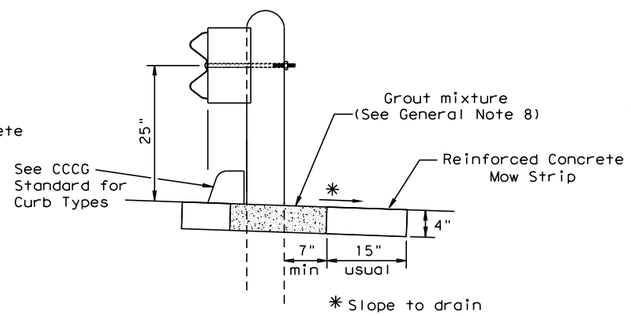
MOW STRIP DETAIL

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



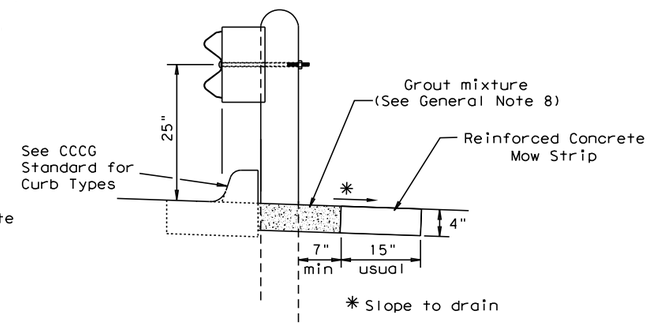
CURB OPTION (1)

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
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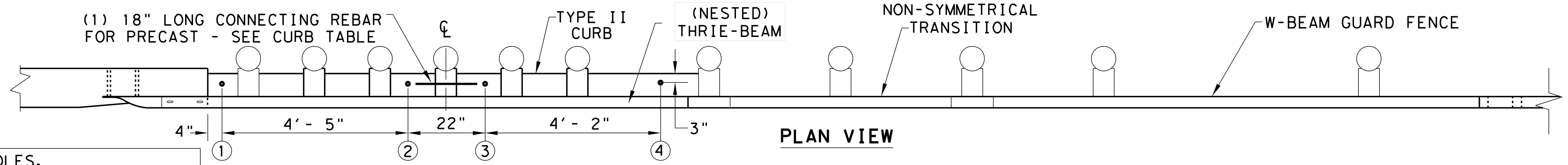
	AMA	POTTER		061



PLAN VIEW

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

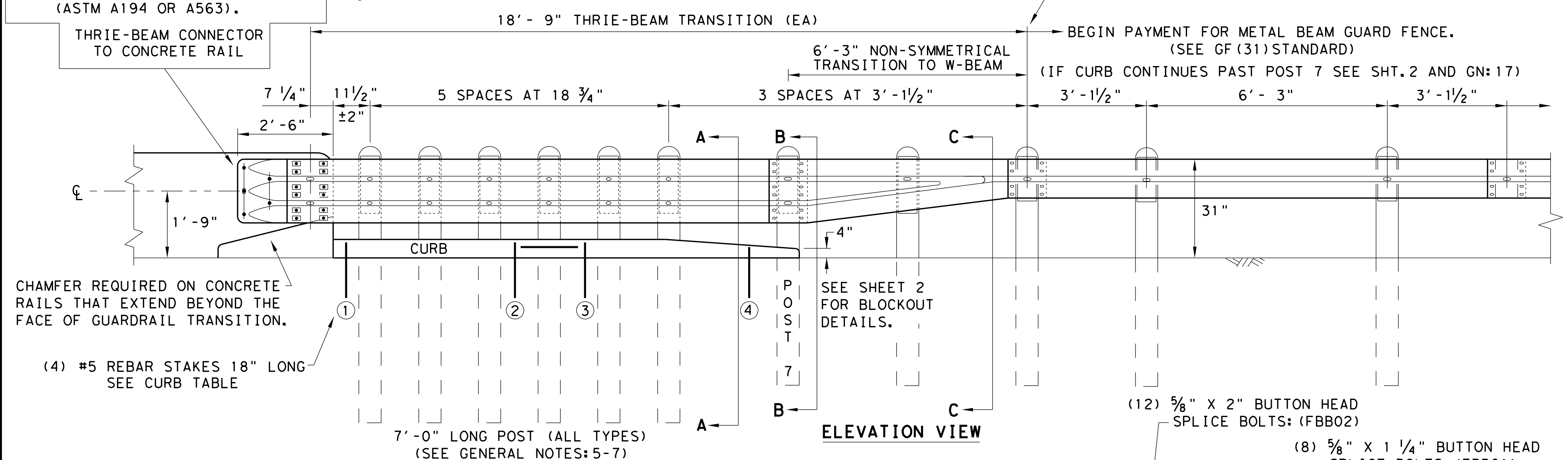
(5)	1" DIA. HOLES.
(5)	⅞" DIA. HEAVY HEX HEAD BOLTS (FACING TRAFFIC SIDE) (ASTM F3125 GR A325 OR A449).
(10)	1 ¾" O.D. WASHER UNDER EACH HEX BOLT HEAD AND NUT.
(5)	⅞" DIA. HEAVY HEX NUTS (ASTM A194 OR A563).

THRIE-BEAM CONNECTOR TO CONCRETE RAIL

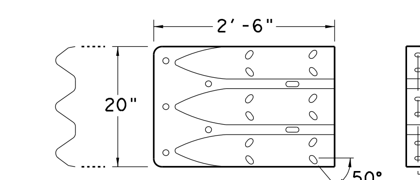
NOTE:
HEAVY HEX BOLT LENGTH WILL VARY DEPENDING ON WIDTH CONCRETE RAIL, LEAVE 1" OF BOLT LENGTH PAST THE ⅞" HEX NUT. TRIM AS REQUIRED.

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

DIRECTION OF TRAFFIC



ELEVATION VIEW

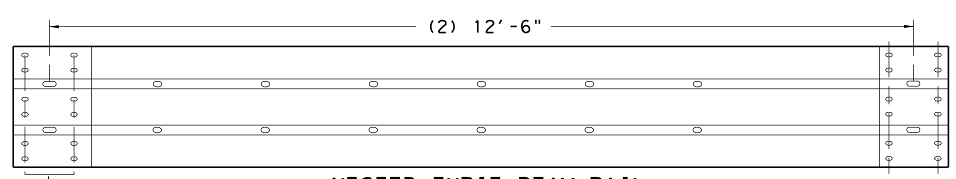


SIDE-VIEW

THRIE-BEAM TERMINAL CONNECTOR 10GA.

PART DESIGNATOR RTE01b

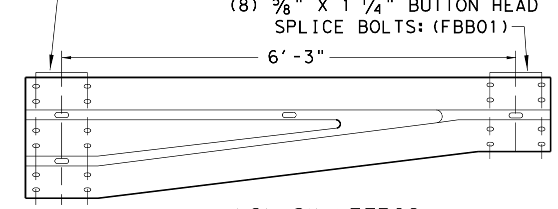
NOTE: SEE GENERAL NOTE: 9



NESTED THRIE-BEAM RAIL

PART DESIGNATOR RTM10a

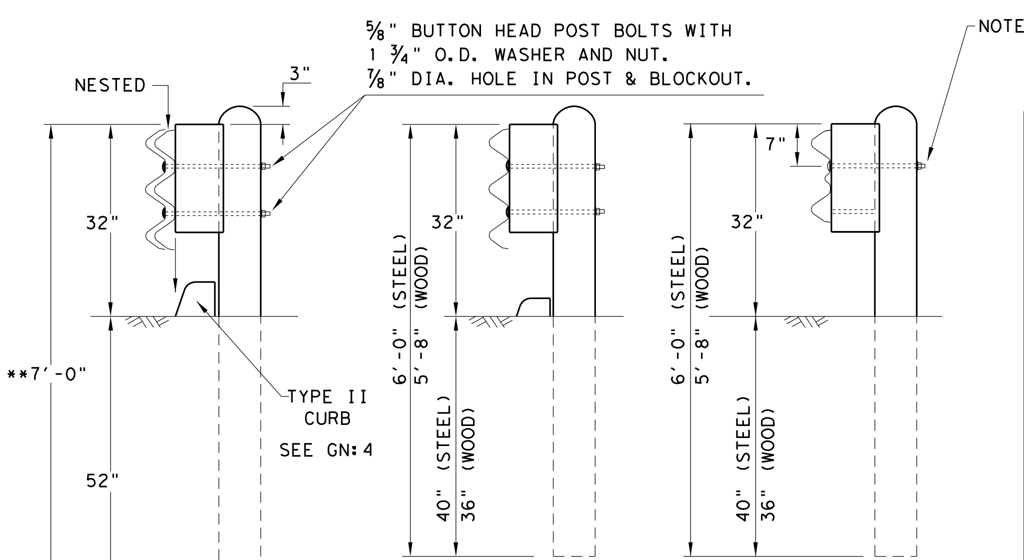
(12) ⅝" X 2" BUTTON HEAD SPLICE BOLTS WITH RECESSED NUTS: (FBB02)
(12) RECTANGULAR GUARDRAIL PLATE WASHERS: (FWR03)



NON-SYMMETRICAL W-BEAM TO THRIE-BEAM TRANSISTION 10GA.

PART DESIGNATOR RWT02a OR RWT02b

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



SECTION A-A

SECTION B-B

SECTION C-C

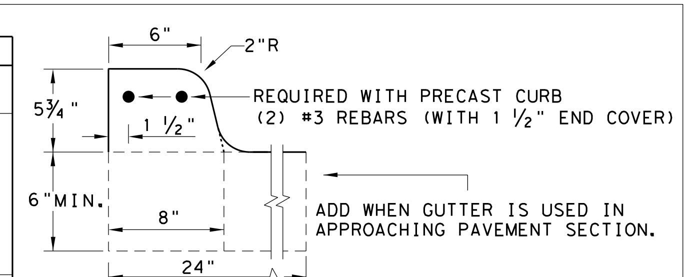
TRANSITION SECTIONS

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

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

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

* 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

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

TYPE II CURB DETAILS

GENERAL NOTES

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

HIGH-SPEED TRANSITION

Texas Department of Transportation — Design Division Standard

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

GF(31)TR TL3-20

FILE: gf31trtl320.dgn	DN: TxDOT	CK: KM	DW: VP	CK: CGL/AG
©TxDOT: NOVEMBER 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0090	05	107	IH40
	DIST		COUNTY	SHEET NO.
	AMA		POTTER	062

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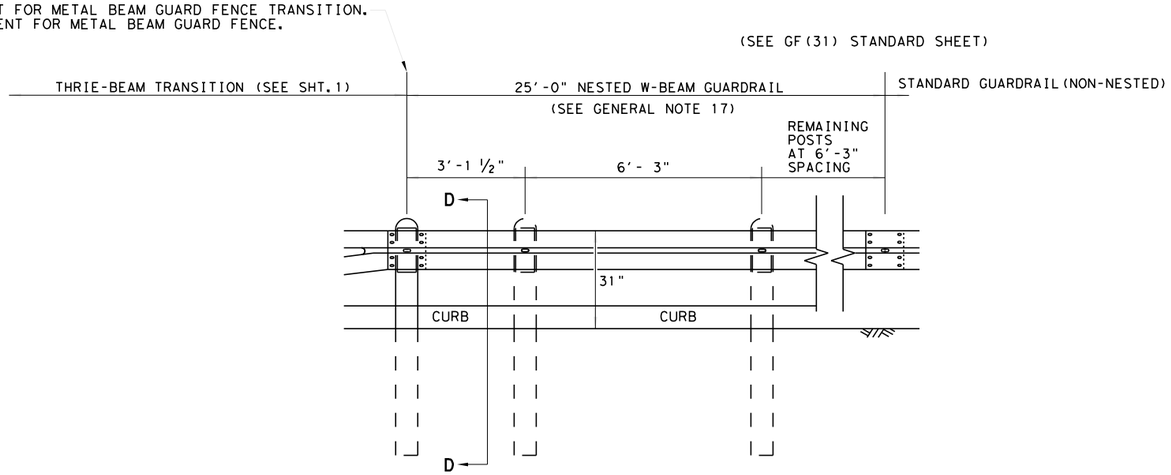
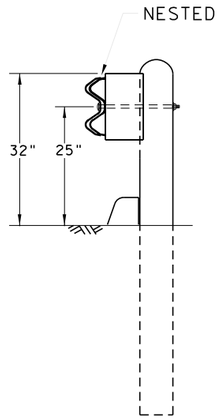
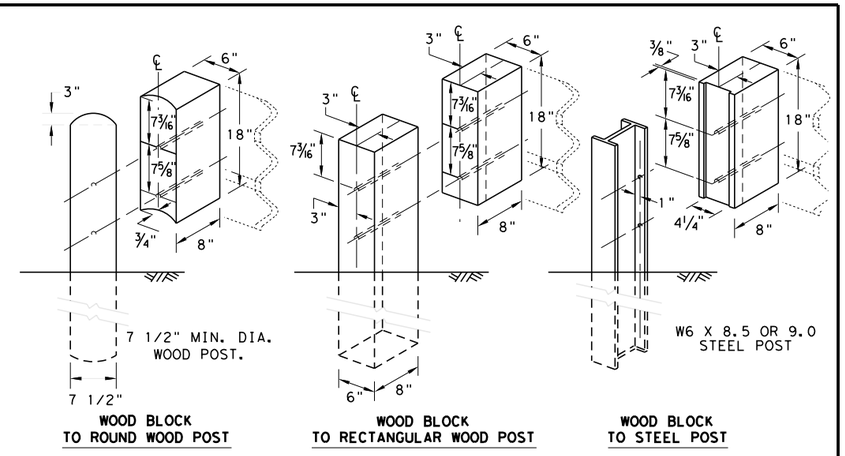
REQUIRED ALTERNATIVE FOR CONTINUOUS CURB EXTENDING PAST POST 7 (SEE SHT. 1 GENERAL NOTE 17)



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: gf31trtl320.dgn	DN: TxDOT	CK: KM	DW: KM	CK: CGL/AG		
©TxDOT: NOVEMBER 2020	CONT	SECT	JOB	HIGHWAY		
REVISIONS	0090	05	107	IH40		
	DIST	COUNTY		SHEET NO.		
	AMA	POTTER		063		

DATE: 12/8/2023 8:32:40 AM
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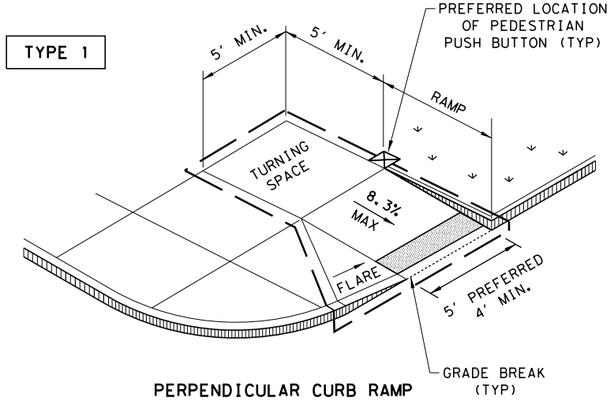
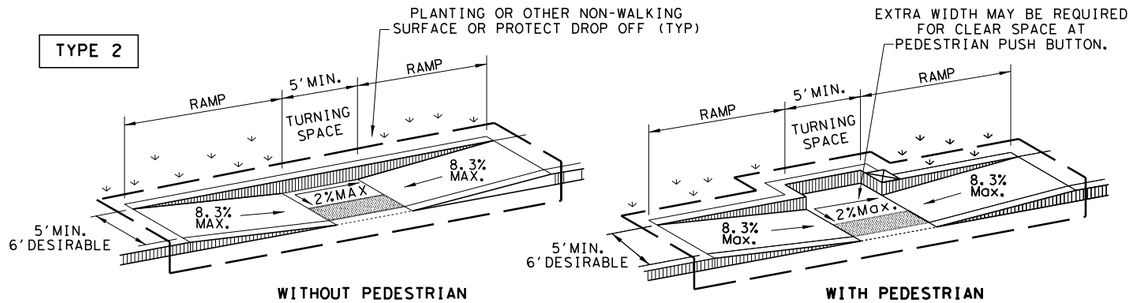
Vidal.Ngoumnai

TYPE 1



PERPENDICULAR CURB RAMP

TYPE 2

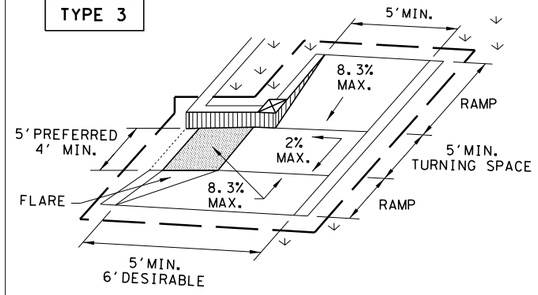


WITHOUT PEDESTRIAN PUSH BUTTON

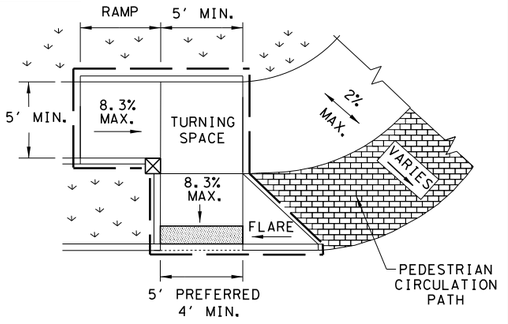
WITH PEDESTRIAN PUSH BUTTON

PARALLEL CURB RAMP

TYPE 3

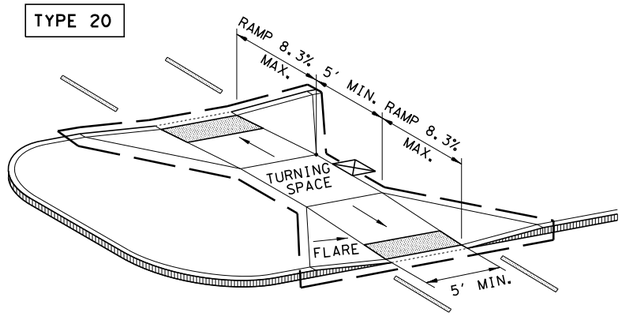


TYPE 6



COMBINATION CURB RAMPS

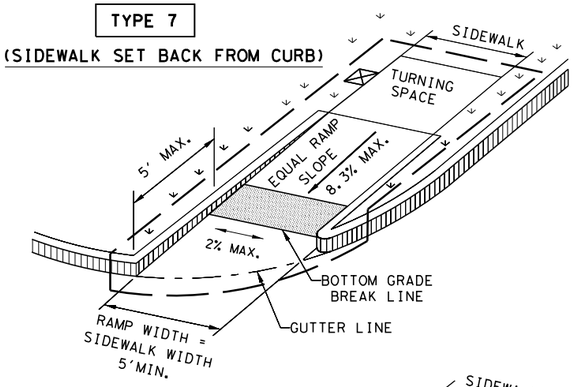
TYPE 20



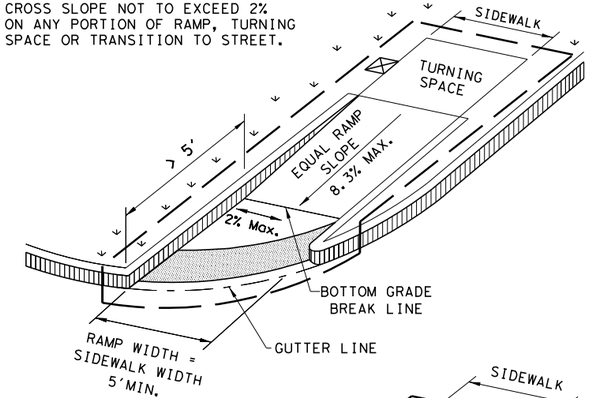
CURB RAMPS AT MEDIAN ISLANDS

TYPE 7

(SIDEWALK SET BACK FROM CURB)

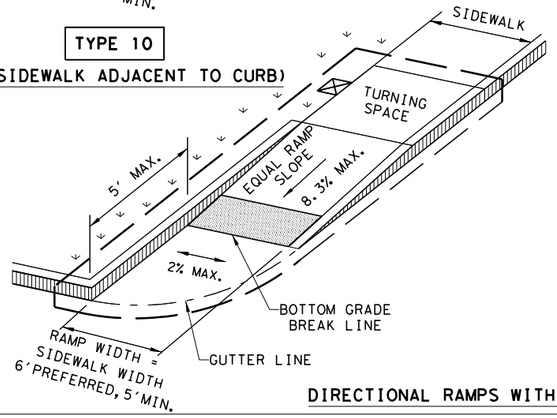


CROSS SLOPE NOT TO EXCEED 2% ON ANY PORTION OF RAMP, TURNING SPACE OR TRANSITION TO STREET.

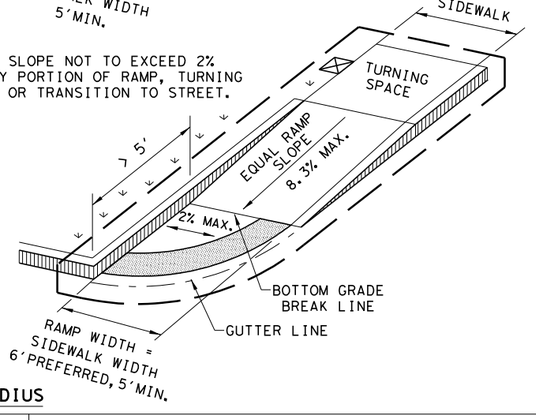


TYPE 10

(SIDEWALK ADJACENT TO CURB)

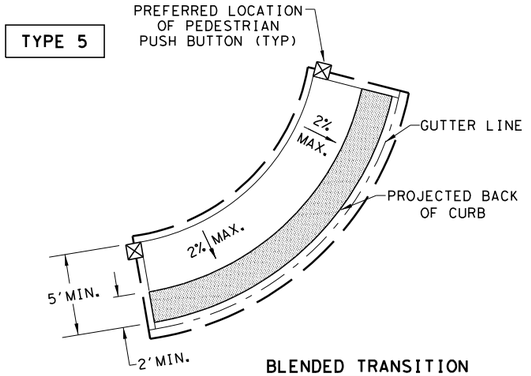


CROSS SLOPE NOT TO EXCEED 2% ON ANY PORTION OF RAMP, TURNING SPACE OR TRANSITION TO STREET.



DIRECTIONAL RAMPS WITHIN RADIUS

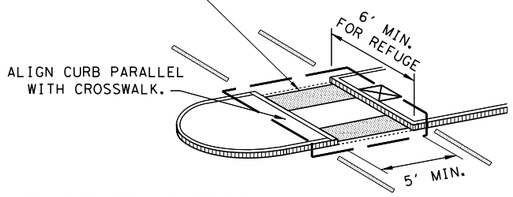
TYPE 5



BLENDED TRANSITION
(FLUSH LANDING)

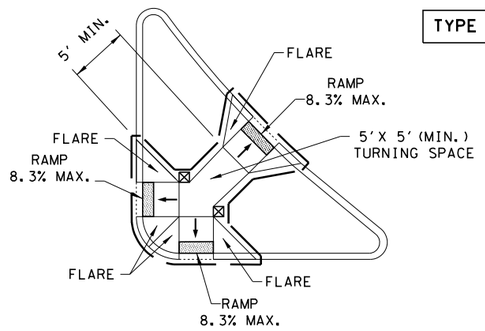
TYPE 21

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



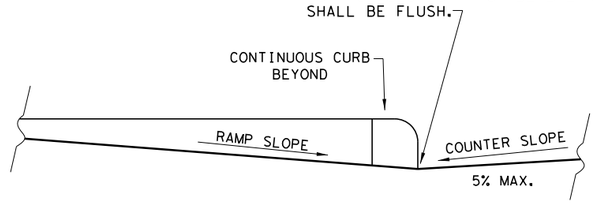
NOTE: CURB DETAILS ARE SHOWN ELSEWHERE IN THE PLANS.

TYPE 22



COMBINATION ISLAND RAMPS

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



TYPICAL SECTION OF PERPENDICULAR CURB RAMP AT CONNECTION TO ROADWAY

NOTES / LEGEND:

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

- DENOTES PLANTING OR NON-WALKING SURFACE NOT PART OF PEDESTRIAN CIRCULATION PATH.
- DETECTABLE WARNING SURFACE
- DENOTES PREFERRED LOCATION OF PEDESTRIAN PUSH BUTTON IF APPLICABLE.
- GUTTER LINE
- GRADE BREAK
- RAMP LIMITS OF PAYMENT

Texas Department of Transportation

Design Division Standard

PEDESTRIAN FACILITIES CURB RAMPS

PED-18

FILE: ped18	DN: TxDOT	DW: VP	CK: KM	CK: PK & JG
© TxDOT: MARCH, 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0090	05	107	IH40
REVISED 08, 2005 REVISED 06, 2012 REVISED 01, 2018	DIST	COUNTY		SHEET NO.
	AMA	POTTER		064

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Vidal.Ngoumnai

GENERAL NOTES

CURB RAMPS

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

DETECTABLE WARNING MATERIAL

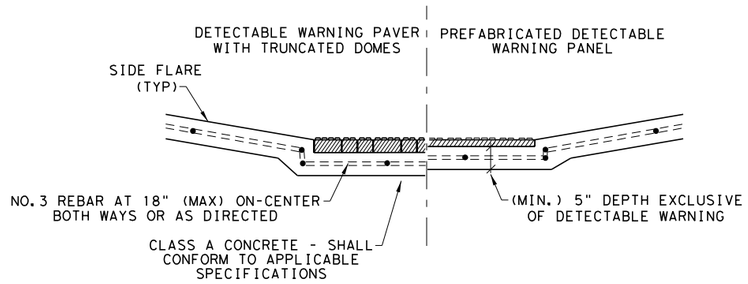
19. Curb ramps must contain a detectable warning surface that consists of raised truncated domes complying with PROWAG. The surface must contrast visually with adjoining surfaces, including side flares. Furnish and install an approved cast-in-place dark brown or dark red detectable warning surface material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

DETECTABLE WARNING PAVERS (IF USED)

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

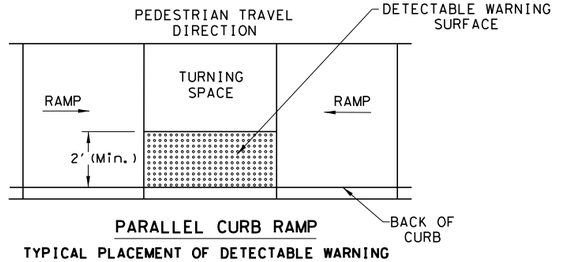
SIDEWALKS

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



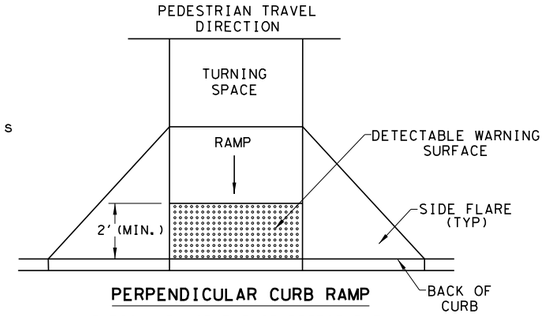
SECTION VIEW DETAIL
CURB RAMP AT DETECTIBLE WARNINGS

DETECTABLE WARNING SURFACE DETAILS



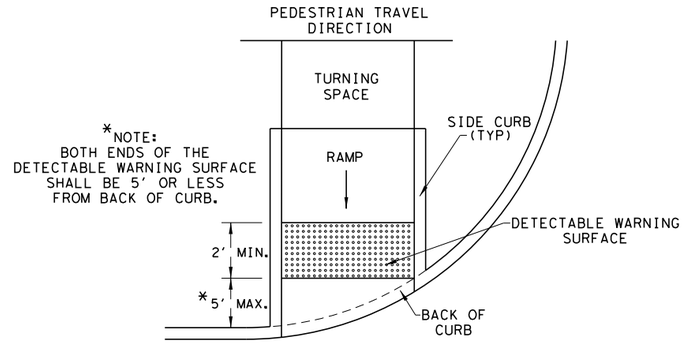
PARALLEL CURB RAMP

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



PERPENDICULAR CURB RAMP

TYPICAL PLACEMENT OF DETECTABLE WARNING SURFACE ON SLOPING RAMP RUN.



DIRECTIONAL CURB RAMP

TYPICAL PLACEMENT OF DETECTABLE WARNING SURFACE ON SLOPING RAMP RUN.

Texas Department of Transportation

Design Division Standard

PEDESTRIAN FACILITIES CURB RAMPS

PED-18

FILE: ped18	DN: TxDOT	DW: VP	CK: KM	CK: PK & JG
© TxDOT: MARCH, 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0090	05	107	IH40
REVISED 08, 2005 REVISED 06, 2012 REVISED 01, 2018	DIST	COUNTY		SHEET NO.
	AMA	POTTER		065

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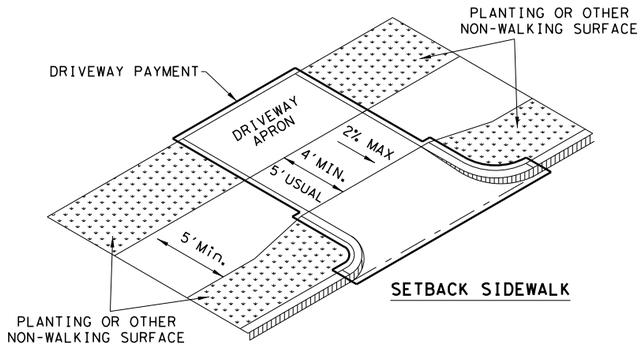
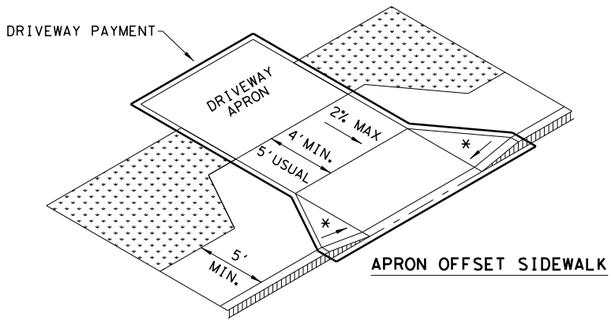
Vidal.Ngoumnai

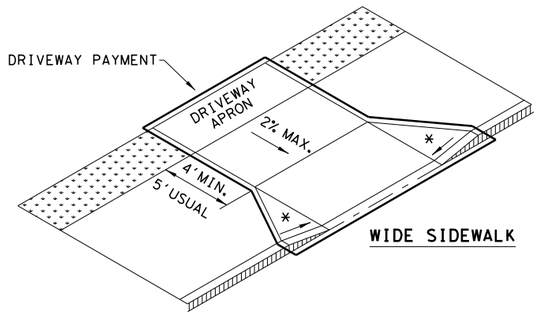
SIDEWALK TREATMENT AT DRIVEWAYS



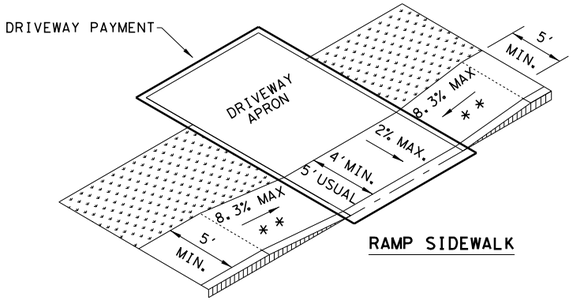
SETBACK SIDEWALK



APRON OFFSET SIDEWALK



WIDE SIDEWALK

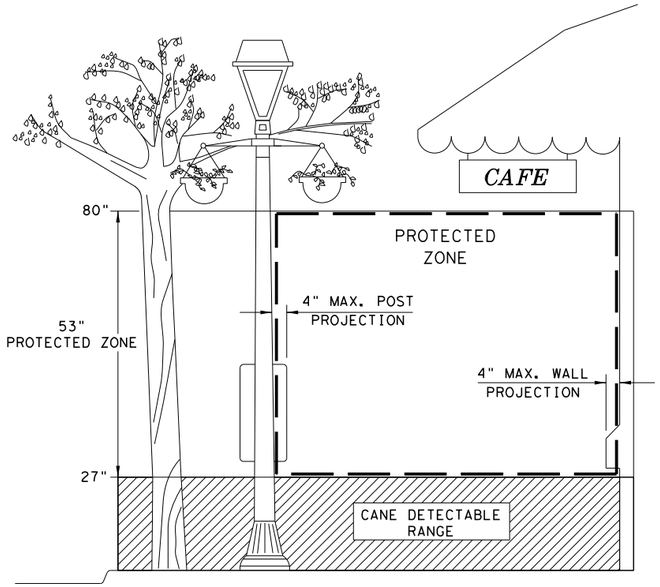


RAMP SIDEWALK

NOTES:

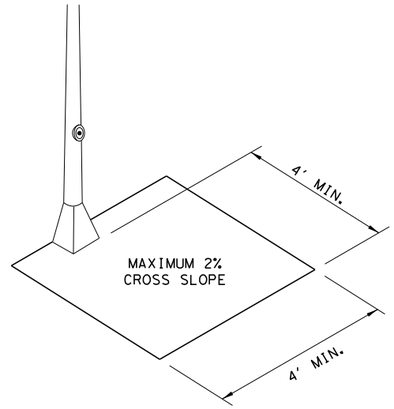
* WHERE DRIVEWAYS CROSS THE PEDESTRIAN ROUTE, SIDES SHALL BE FLARED AT 10% MAX SLOPE.

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

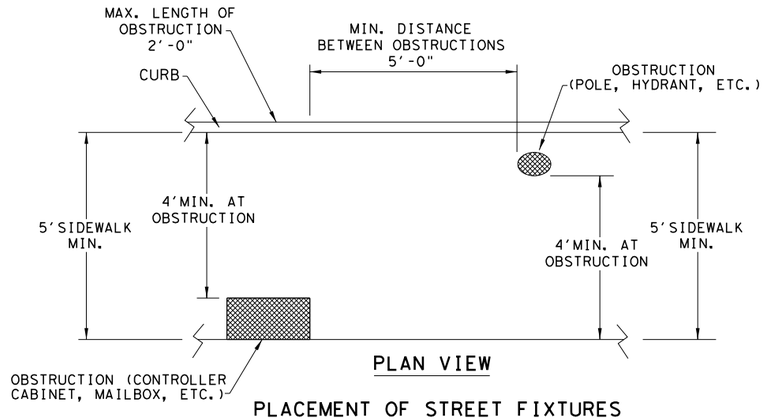


PROTECTED ZONE

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



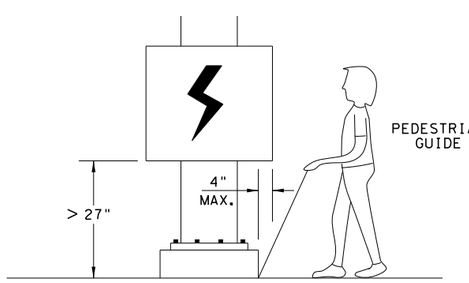
CLEAR SPACE ADJACENT TO PEDESTRIAN PUSH BUTTON



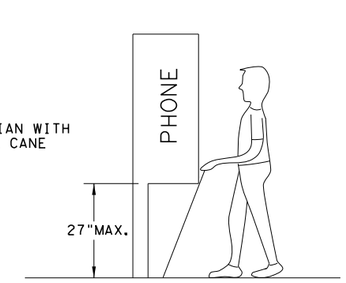
PLAN VIEW

PLACEMENT OF STREET FIXTURES

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



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



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

DETECTION BARRIER FOR VERTICAL CLEARANCE < 80"

Texas Department of Transportation

Design Division Standard

PEDESTRIAN FACILITIES CURB RAMPS

PED-18

FILE: ped18	DN: TxDOT		DW: VP	CK: KM	CK: PK & JG
© TxDOT: MARCH, 2002	CONT	SECT	JOB		HIGHWAY
REVISIONS	0090	05	107		IH40
REVISED 08, 2005 REVISED 06, 2012 REVISED 01, 2018	DIST	COUNTY			SHEET NO.
	AMA	POTTER			066

DATE: 12/8/2023 8:32:58 AM
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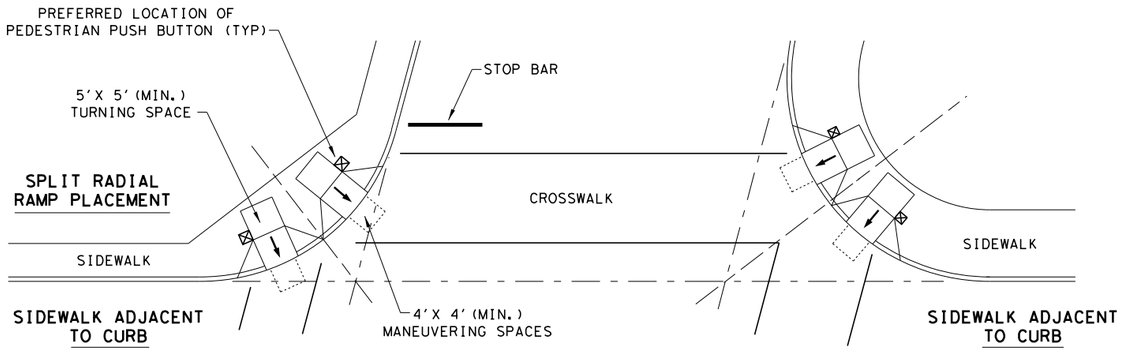
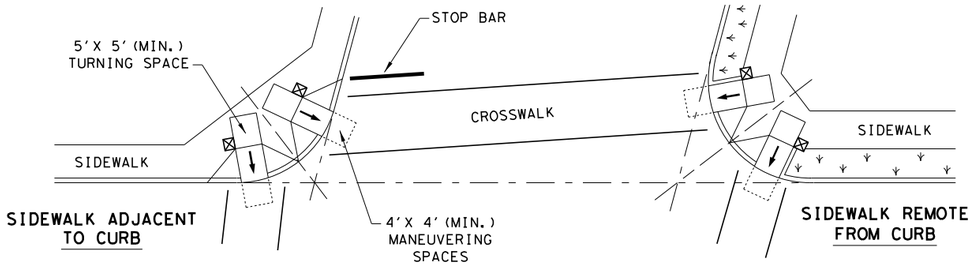
Vidal.Ngoumnai

TYPICAL CROSSING LAYOUTS

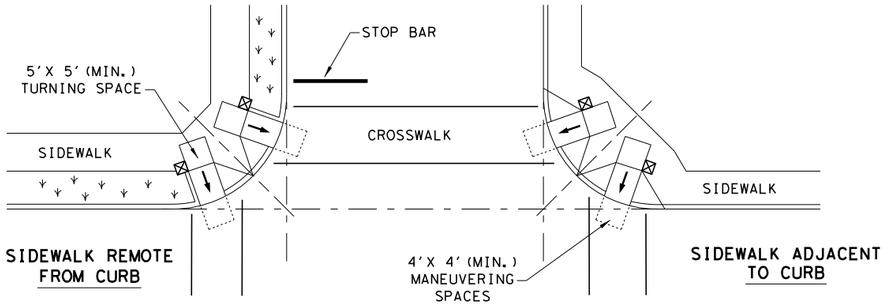
SEE SHEET 1 OF 4 FOR DETAILS AND DIMENSIONS



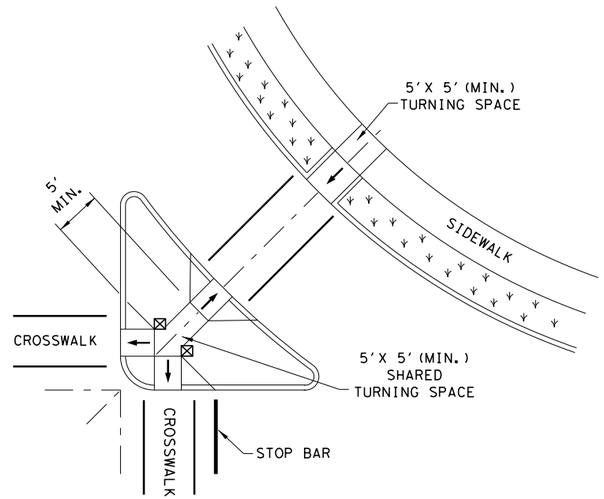
SKEWED INTERSECTION WITH "LARGE" RADIUS



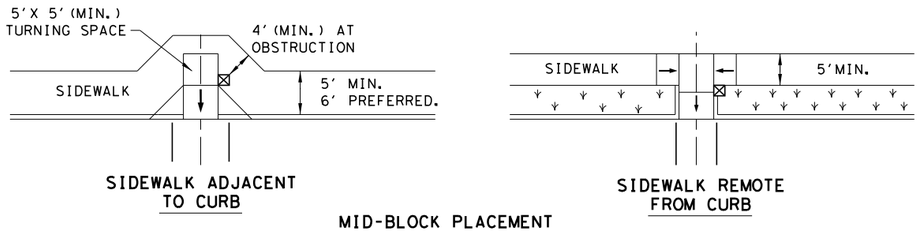
SKEWED INTERSECTION WITH "SMALL" RADIUS



NORMAL INTERSECTION WITH "SMALL" RADIUS



AT INTERSECTION
W/FREE RIGHT TURN & ISLAND



MID-BLOCK PLACEMENT
PERPENDICULAR RAMPS

LEGEND:

SHOWS DOWNWARD SLOPE. →

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

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

SHEET 4 OF 4

Texas Department of Transportation

Design Division Standard

PEDESTRIAN FACILITIES CURB RAMPS

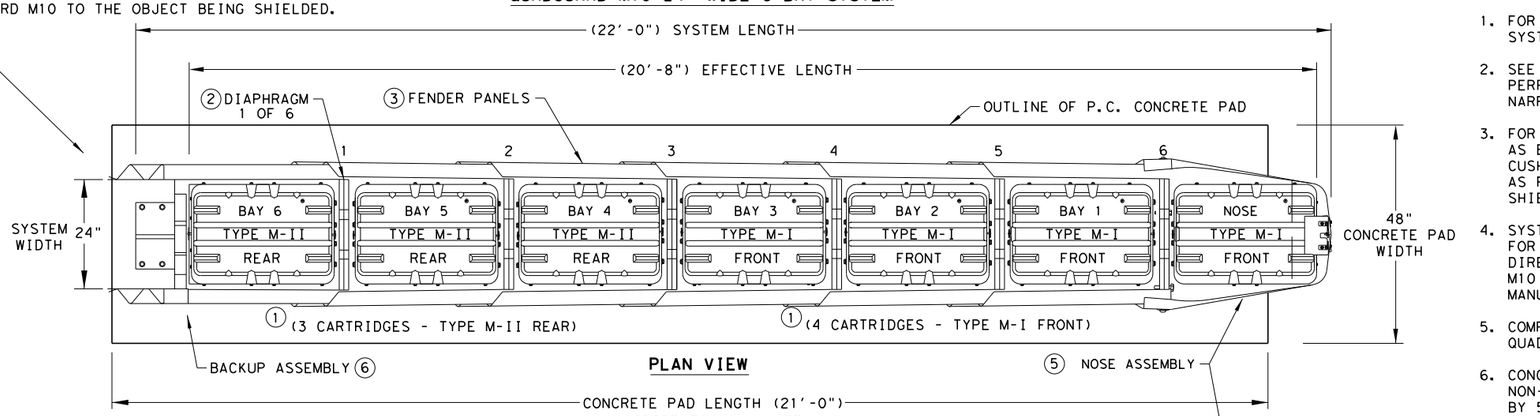
PED-18

FILE: ped18	DN: TxDOT		DW: VP	CK: KM	CK: PK & JG
	CONT	SECT	JOB	HIGHWAY	
REVISIONS	0090	05	107	IH40	
REVISED 08, 2005 REVISED 06, 2012 REVISED 01, 2018	DIST	COUNTY		SHEET NO.	
	AMA	POTTER		067	

DATE: 12/8/2023 8:33:05 AM
FILE: E:\Users\bridgeformer-pw\vidal.ngoumnai@bridgeformer.com\dms21409\qguardm10n20.dgn
Vidal.Ngoumnai

NOTE:
A TRANSITION MAY BE REQUIRED TO INSTALL THE QUADGUARD M10 TO THE OBJECT BEING SHIELDED.

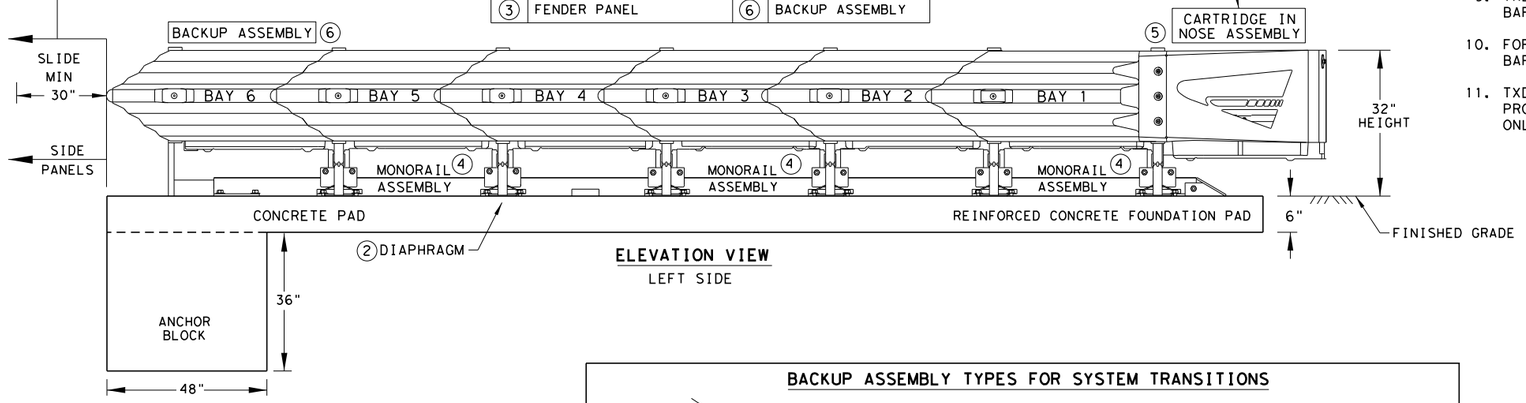
QUADGUARD M10 24" WIDE 6-BAY SYSTEM



PLAN VIEW

KEY		KEY	
(1)	QUADGUARD CARTRIDGE	(4)	MONORAILS
(2)	DIAPHRAGM	(5)	NOSE ASSEMBLY
(3)	FENDER PANEL	(6)	BACKUP ASSEMBLY

NOTE:
PROVISION SHALL BE MADE FOR REAR FENDER SIDE PANELS TO SLIDE REARWARD UPON IMPACT, 30" MIN.



ELEVATION VIEW
LEFT SIDE

NOTES:
CONTACT THE MANUFACTURER WITH SITE SPECIFIC DATA (SSD) FOR CONCRETE PAD AND ANCHOR BLOCK INSTALLATION REQUIREMENTS.

A MANUFACTURER'S DRAWING PACKAGE UNIQUE AND SPECIFIC FOR THE QUADGUARD M10 (N) INSTALATION AND DETAILED INFORMATION REGARDING THE TYPE OF BACKUP ASSEMBLY FOR THE REQUIRED TRANSITION WILL BE PROVIDED TO THE ENGINEER AND INSTALLER.

6" REINFORCED CONCRETE PAD REQUIRES THE INSTALLATION OF AN ANCHOR BLOCK AS SHOWN ON THE MANUFACTURER'S DRAWING PACKAGE.

8" NON-REINFORCED CONCRETE PAD MAY NOT REQUIRE AN ANCHOR BLOCK, IF THE PAD IS INSTALLED AGAINST AN IMMOVABLE CONCRETE BACKUP.

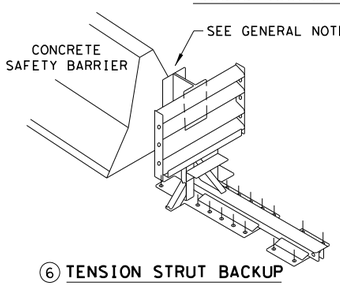
CONCRETE PAD AND ANCHOR BLOCK COMBINATIONS SHALL BE CONFIRMED WITH THE MANUFACTURER BASED UPON SITE SPECIFIC DATA (SSD).

NOTE:
THE QUADGUARD M10 24" WIDE 6-BAY - NARROW SYSTEM HAS BEEN TESTED TO MASH TEST LEVEL 3.

TL-3 MODEL #	QM10024	CARTRIDGE TYPES IN BAYS		
BAYS	6	TYPE-MII	TYPE-MI	TYPE-MI
DIAPHRAGMS	6	3	3	1
WIDTH	24"	REAR	FRONT	NOSE

TL-2 MODEL #	QM7024	CARTRIDGE TYPES IN BAYS		
BAYS	3	TYPE-MII	TYPE-MI	TYPE-MI
DIAPHRAGMS	3	1	2	1
WIDTH	24"	REAR	FRONT	NOSE

BACKUP ASSEMBLY TYPES FOR SYSTEM TRANSITIONS



⑥ TENSION STRUT BACKUP

SYSTEM TRANSITIONS TYPES	
1	QUAD-BEAM TO CONCRETE SAFETY BARRIER
2	QUAD-BEAM TO CONCRETE BRIDGE RAIL
3	QUAD-BEAM TO CONCRETE END SHOE
4	QUAD-BEAM TO THRIE-BEAM RAIL
5	QUAD-BEAM TO W-BEAM RAIL

NOTE:
TRANSITION ASSEMBLIES FOR THE QUADGUARD M10 TO THRIE-BEAM OR W-BEAM FENCE REQUIRES I-BEAM POSTS:

ALL POSTS W6X8.5/9 I-BEAMS (78" LONG).

NOTES:
CONTACT THE MANUFACTURER WITH SITE SPECIFIC DATA (SSD) FOR THE CORRECT BACKUP ASSEMBLY AND TRANSITION PANELS OR SIDE PANELS USED FOR STANDARD AND BI-DIRECTIONAL INSTALLATIONS: AT DIVIDED-HIGHWAY MEDIANS OR UNDIVIDED ROADWAYS WHERE THE SYSTEM IS EXPOSED TO IMPACTS FROM ONE OR TWO DIFFERENT DIRECTIONS OF TRAFFIC FLOW.

GENERAL NOTES

1. FOR SPECIFIC INFORMATION REGARDING INSTALLATION AND TECHNICAL GUIDANCE OF THE SYSTEM, CONTACT: TRINITY HIGHWAY - ENERGY ABSORPTION INC. AT 1(888)323-6374.
2. SEE THE RECENT QUADGUARD M10 PRODUCT DESCRIPTION ASSEMBLY MANAUAL FOR IMPACT PERFORMANCE CHARACTERISTICS AND DESIGN LIMITIONS AND THE DRAWING PACKAGE FOR THE NARROW 24" SYSTEM BEFORE INSTALLING THE QUADGUARD M10 SYSTEM AT ANY GIVEN LOCATION.
3. FOR BI-DIRECTIONAL TRAFFIC: THE PLACEMENT OF THE QUADGUARD M10 IS RESTRICTED. AS BI-DIRECTIONAL TRAFFIC APPROACHES THE REAR OF THE QUADGUARD M10 THE CRASH CUSHION MUST BE PLACED SUCH THAT THE TRAFFIC SIDE OF CRASH CUSHION IS AT LEAST AS FAR FROM ADJACENT TRAVEL LANE LINE AS THE TRAFFIC SIDE OF BARRIER/OBJECT BEING SHIELDED.
4. SYSTEM TRANSITION: APPROPRIATE TRANSITION PANELS OR SIDE PANELS WILL BE REQUIRED FOR PROPER IMPACT PERFORMANCE. THE CORRECT PANEL(S) TO USE WILL DEPEND ON THE DIRECTION OF TRAFFIC FLOW AND WHAT TYPE OF BARRIER OR ROAD FEATURE THE QUADGUARD M10 SYSTEM IS SHIELDING. SEE THE QUADGUARD M10 PRODUCT DESCRIPTION & ASSEMBLY MANUAL FOR FURTHER DETAILS.
5. COMPONENTS FOR THE QUADGUARD M10 BACKUP AND REINFORCING DETAILS ARE SHOWN ON THE QUADGUARD M10 PRODUCT DESCRIPTION & ASSEMBLY MANUAL.
6. CONCRETE PAD SHALL BE 6" MIN. REINFORCED 28MPa [4,000 PSI] (P.C.) OR 8" MIN. NON-REINFORCED 28MPa [4,000 PSI] CONCRETE ROADWAY MEASURING AT LEAST 12'-0" WIDE BY 50'-0" LONG. ANCHOR BLOCK IS NOT REQUIRED WHEN USING 8" CONCRETE PAD INSTALLED AGAINST AN IMMOVABLE STRUCTURE, E.G. CONCRETE WALL.
7. IF THE CROSS-SLOPE VARIES MORE THAN 2% OVER THE LENGTH OF THE SYSTEM, THE CONCRETE PAD WILL REQUIRE LEVELING. MAXIMUM PERMISSIBLE CROSS-SLOPE IS 8%.
8. THE INSTALLATION AREA SHOULD BE FREE OF CURBS, ELEVATED OBJECTS,OR DEPRESSIONS.
9. THE QUADGUARD M10 SYSTEM SHOULD BE INSTALLED APPROXIMATELY PARALLEL WITH THE BARRIER.
10. FOR THE TENSION STRUT BACKUP THE DISTANCE BETWEEN THE BACK OF BACKUP AND THE BARRIER WALL SHOULD NOT EXCEED 7" IN ANY CASE.
11. TXDOT HAS ONLY APPROVED THE 24" WIDE QUADGUARD M10 SYSTEM. THE QUADGUARD M10 PRODUCT DESCRIPTION AND ASSEMBLEY MANUAL INCLUDES SYSTEM WIDTH OF 24". ONLY THE 24" SYSTEM IS ALLOWED TO BE INSTALLED ON TEXAS ROADWAYS.

FOUNDATION & ANCHORING REQUIREMENTS FOUNDATION TYPES: A, B, C, & D	
FOUNDATION TYPE: A	REINFORCED CONCRETE PAD OR ROADWAY
FOUNDATION:	6" MINIMUM DEPTH (P.C.C.)
ANCHORAGE:	7" STUDS EMBEDDED 5 ½" - APPROVED ADHESIVE
FOUNDATION TYPE: B	ASPHALT OVER P.C.C.
FOUNDATION:	3" MIN. (A.C.) OVER 3" MIN. (P.C.C.)
ANCHORAGE:	18" THREADED ROD EMBEDDED 16 ½" - APPROVED ADHESIVE
FOUNDATION TYPE: C	ASPHALT OVER SUBBASE
FOUNDATION:	6" MIN. (A.C.) OVER 6" MIN. (C.S.)
ANCHORAGE:	18" THREADED ROD EMBEDDED 16 ½" - APPROVED ADHESIVE
FOUNDATION TYPE: D	ASPHALT ONLY
FOUNDATION:	8" MIN. (A.C.)
ANCHORAGE:	18" THREADED ROD EMBEDDED 16 ½" - APPROVED ADHESIVE

KEY:
ASPHALT CONCRETE (A.C.)
COMPACTED SUBBASE (C.S.)
PORTLAND CEMENT CONCRETE (P.C.C.)

NOTE: SEE TRINITY'S PRODUCT DESCRIPTION ASSEMBLY MANUAL FOR THE APPROVED ADHESIVE.

IF THE UNIT IS ANCHORED TO ASPHALTIC CONCRETE, IT SHOULD BE RELOCATED TO FRESH, UNDISTURBED ASPHALT AND RE-ANCHORED AFTER EACH IMPACT TO ENSURE ADEQUATE FUTURE PERFORMANCE.

TENSION STRUT BACKUP MAY BE USED IN CONSTRUCTION ZONES ON ASPHALT CONCRETE (A.C.) FOR TEMPORARY USE ONLY.

NOTE:
THIS STANDARD IS A BASIC REPRESENTATION OF THE QUADGUARD M10 SYSTEM AND IS NOT INTENDED TO REPLACE THE PRODUCT DESCRIPTION ASSEMBLY MANUAL.

REUSABLE

Texas Department of Transportation — Design Division Standard

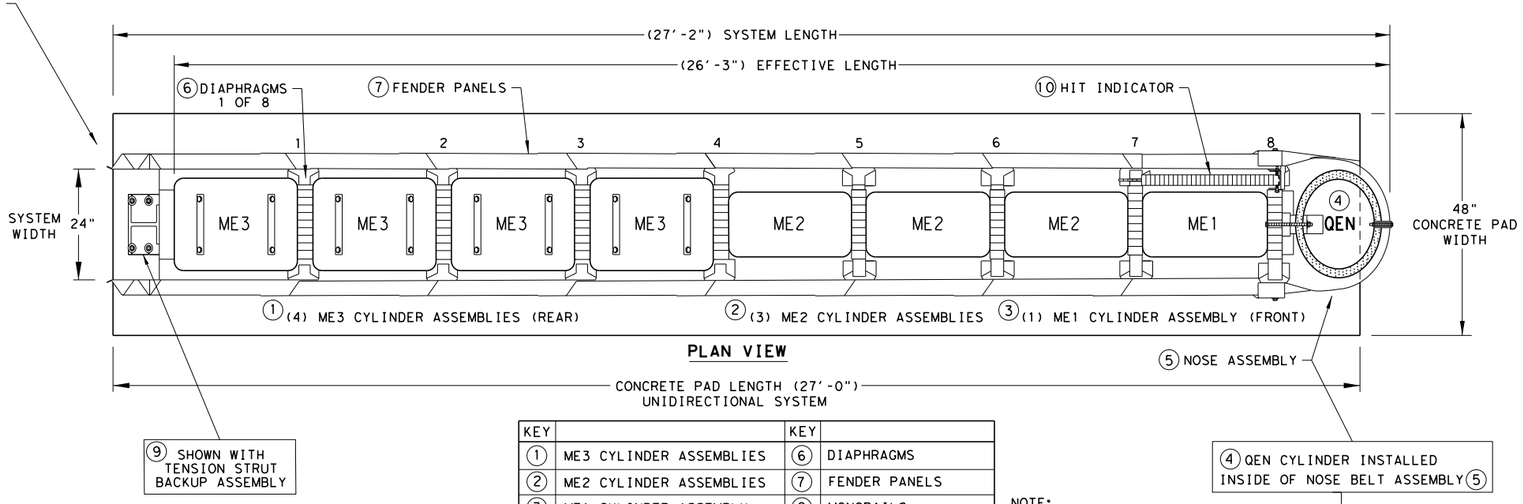
TRINITY HIGHWAY ENERGY ABSORPTION QUADGUARD M10 (MASH TL-3 & TL-2 NARROW-24"ONLY)

QGUARD(M10)(N)-20

FILE: qguardm10n20.dgn	DN:TxDOT	CK:KM	DW:VP	CK:AG
©TxDOT: NOVEMBER 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0090	05	107	IH40
	DIST	COUNTY		SHEET NO.
	AMA	POTTER		068

NOTE:
A TRANSITION MAY BE REQUIRED TO INSTALL THE QUADGUARD ELITE M10 TO THE OBJECT BEING SHIELDED.

QUADGUARD EITE M10 24" WIDE (8 BAY) SYSTEM



PLAN VIEW

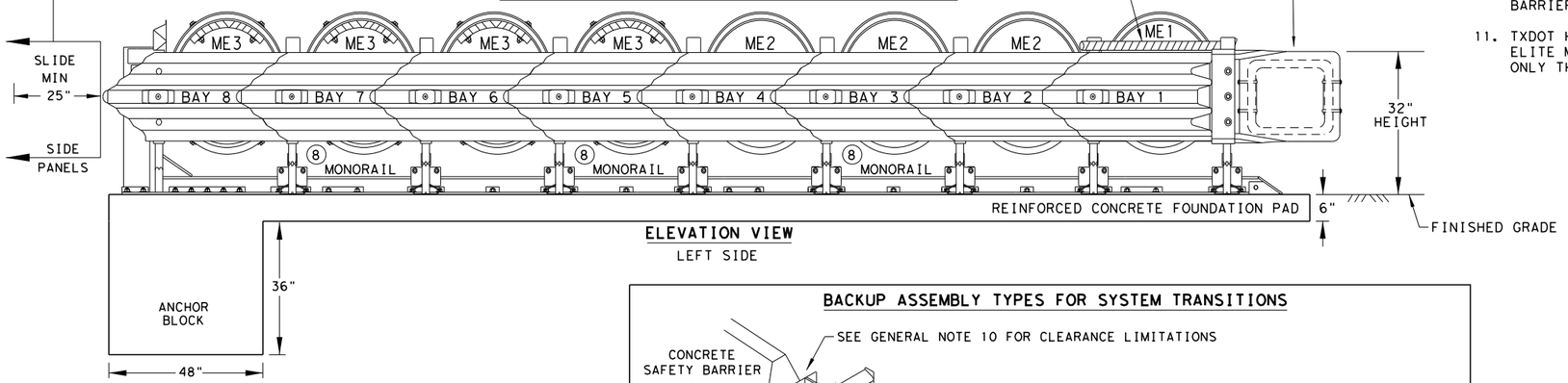
⑨ SHOWN WITH TENSION STRUT BACKUP ASSEMBLY

KEY		KEY	
①	ME3 CYLINDER ASSEMBLIES	⑥	DIAPHRAGMS
②	ME2 CYLINDER ASSEMBLIES	⑦	FENDER PANELS
③	ME1 CYLINDER ASSEMBLY	⑧	MONORAILS
④	QEN CYLINDER	⑨	TYPE OF BACKUP
⑤	NOSE BELT ASSEMBLY	⑩	HIT INDICATOR

④ QEN CYLINDER INSTALLED INSIDE OF NOSE BELT ASSEMBLY ⑤

NOTE:
HIT INDICATOR WILL RAISE UPON IMPACT.

NOTE:
PROVISION SHALL BE MADE FOR REAR FENDER SIDE PANELS TO SLIDE REARWARD UPON IMPACT, 25" MIN.



ELEVATION VIEW
LEFT SIDE

NOTES:
CONTACT THE MANUFACTURER WITH SITE SPECIFIC DATA (SSD) FOR CONCRETE PAD AND ANCHOR BLOCK INSTALLATION REQUIREMENTS.

A MANUFACTURER'S DRAWING PACKAGE UNIQUE AND SPECIFIC FOR THE QUADGUARD ELITE M10 FIELD INSTALATION AND INFORMATION REGARDING THE TYPE OF BACKUP ASSEMBLY REQUIRED FOR THE TRANSITION WILL BE PROVIDED BY THE MANUFACTURER TO THE ENGINEER AND INSTALLER.

6" REINFORCED CONCRETE PAD REQUIRES THE INSTALLATION OF AN ANCHOR BLOCK AS SHOWN ON THE MANUFACTURER'S DRAWING PACKAGE.

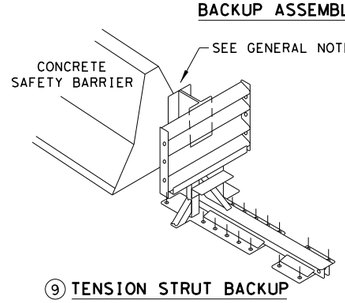
8" NON-REINFORCED CONCRETE PAD MAY NOT REQUIRE AN ANCHOR BLOCK, IF THE PAD IS INSTALLED AGAINST AN IMMOVABLE CONCRETE BACKUP.

CONCRETE PAD AND ANCHOR BLOCK COMBINATIONS SHALL BE CONFIRMED WITH THE MANUFACTURER BASED UPON SITE SPECIFIC DATA (SSD).

NOTE:
THE QUADGUARD ELITE M10 8-BAY, 24" WIDE - NARROW SYSTEM TESTED TO MASH TEST LEVEL 3.

TL-3 MODEL #	QM10024E	CYLINDER TYPES IN BAYS			
BAYS	8	TYPE-ME3	TYPE-ME2	TYPE-ME1	TYPE-QEN
DIAPHRAGMS	8	4	3	1	1
WIDTH	24"	REAR	FRONT		NOSE

BACKUP ASSEMBLY TYPES FOR SYSTEM TRANSITIONS

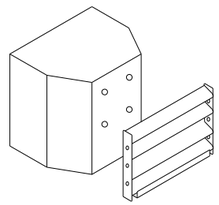


⑨ TENSION STRUT BACKUP

SYSTEM TRANSITIONS TYPES	
1	QUAD-BEAM TO CONCRETE SAFETY BARRIER
2	QUAD-BEAM TO CONCRETE BRIDGE RAIL
3	QUAD-BEAM TO CONCRETE END SHOE
4	QUAD-BEAM TO THRIE-BEAM RAIL
5	QUAD-BEAM TO W-BEAM RAIL

NOTE:
TRANSITION ASSEMBLIES FOR THE QUADGUARD ELITE M10 TO THRIE-BEAM OR W-BEAM FENCE REQUIRES I-BEAM POSTS:

ALL POSTS W6X8.5/9 I-BEAMS (78" LONG).



⑨ CONCRETE BACKUP

NOTES:
CONTACT THE MANUFACTURER WITH SITE SPECIFIC DATA (SSD) FOR THE CORRECT BACKUP ASSEMBLY AND TRANSITION PANELS OR SIDE PANELS USED FOR STANDARD AND BI-DIRECTIONAL INSTALLATIONS: AT DIVIDED-HIGHWAY MEDIANS OR UNDIVIDED ROADWAYS WHERE THE SYSTEM IS EXPOSED TO IMPACTS FROM ONE OR TWO DIFFERENT DIRECTIONS OF TRAFFIC FLOW.

NOTE:
THIS STANDARD IS A BASIC REPRESENTATION OF THE QUADGUARD ELITE M10 SYSTEM AND IS NOT INTENDED TO REPLACE THE PRODUCT DESCRIPTION ASSEMBLY MANUAL.

GENERAL NOTES

1. FOR SPECIFIC INFORMATION REGARDING INSTALLATION AND TECHNICAL GUIDANCE OF THE SYSTEM, CONTACT: TRINITY HIGHWAY - ENERGY ABSORPTION INC. AT 1(888)323-6374.
2. SEE THE RECENT QUADGUARD ELITE M10 PRODUCT DESCRIPTION ASSEMBLY MANUAL FOR IMPACT PERFORMANCE CHARACTERISTICS AND DESIGN LIMITATIONS AND THE DRAWING PACKAGE FOR THE NARROW 24" SYSTEM BEFORE INSTALLING THE QUADGUARD ELITE M10 AT ANY GIVEN LOCATION.
3. FOR BI-DIRECTIONAL TRAFFIC: THE LOCATION AND OR WIDTH OF THE QUADGUARD ELITE M10 IS RESTRICTED. AS BI-DIRECTIONAL TRAFFIC APPROACHES THE REAR OF THE QUADGUARD ELITE M10, THE QUADGUARD ELITE M10 SHOULD NOT EXTEND FURTHER INTO THE TRAFFIC-SIDE OF THE BARRIER THAN THE OBSTACLE. ANY TRANSITION INSTALLED MUST EITHER BE TANGENT TO BOTH QUADGUARD ELITE M10 AND OBSTACLE OR MUST ANGLE TOWARD FIELD SIDE OF THE BARRIER.
4. SYSTEM TRANSITION: APPROPRIATE TRANSITION PANELS OR SIDE PANELS WILL BE REQUIRED FOR PROPER IMPACT PERFORMANCE. THE CORRECT PANEL(S) TO USE WILL DEPEND ON THE DIRECTION OF TRAFFIC FLOW AND WHAT TYPE OF BARRIER OR ROAD FEATURE THE QUADGUARD ELITE M10 SYSTEM IS SHIELDING. SEE THE QUADGUARD ELITE M10 PRODUCT DESCRIPTION & ASSEMBLY MANUAL FOR FURTHER DETAILS.
5. COMPONENTS FOR THE QUADGUARD ELITE (M10) BACKUP AND REINFORCING DETAILS ARE SHOWN ON THE QUADGUARD ELITE M10 PRODUCT DESCRIPTION & ASSEMBLY MANUAL.
6. CONCRETE PAD SHALL BE 6" MIN. REINFORCED 28MPa [4,000 PSI] (P.C.) OR 8" MIN. NON-REINFORCED 28MPa [4,000 PSI] CONCRETE ROADWAY MEASURING AT LEAST 12'-0" WIDE BY 50'-0" LONG. ANCHOR BLOCK IS NOT REQUIRED WHEN USING 8" CONCRETE PAD INSTALLED AGAINST AN IMMOVABLE STRUCTURE, E.G. CONCRETE WALL.
7. IF THE CROSS-SLOPE VARIES MORE THAN 2% OVER THE LENGTH OF THE SYSTEM, THE CONCRETE PAD WILL REQUIRE LEVELING. MAXIMUM PERMISSIBLE CROSS-SLOPE IS 8%.
8. THE INSTALLATION AREA SHOULD BE FREE OF CURBS, ELEVATED OBJECTS,OR DEPRESSIONS.
9. THE QUADGUARD ELITE M10 SYSTEM SHOULD BE INSTALLED APPROXIMATELY PARALLEL WITH THE BARRIER.
10. FOR THE TENSION STRUT BACKUP THE DISTANCE BETWEEN THE BACK OF BACKUP AND THE BARRIER WALL SHOULD NOT EXCEED 7" IN ANY CASE.
11. TXDOT HAS ONLY APPROVED THE 24" WIDE QUADGUARD ELITE M10 SYSTEM. THE QUADGUARD ELITE M10 PRODUCT DESCRIPTION AND ASSEMBLY MANUAL INCLUDES SYSTEM WIDTH OF 24". ONLY THE 24" SYSTEM IS ALLOWED TO BE INSTALLED ON TEXAS ROADWAYS.

FOUNDATION & ANCHORING REQUIREMENTS FOUNDATION TYPES: A, B, C, & D	
FOUNDATION TYPE:A	REINFORCED CONCRETE PAD OR ROADWAY
FOUNDATION:	6" MINIMUM DEPTH (P.C.C.)
ANCHORAGE:	7" STUDS EMBEDDED 5 ½" - APPROVED ADHESIVE
FOUNDATION TYPE:B	ASPHALT OVER P.C.C.
FOUNDATION:	3" MIN. (A.C.) OVER 3" MIN. (P.C.C.)
ANCHORAGE:	18" THREADED ROD EMBEDDED 16 ½" - APPROVED ADHESIVE
FOUNDATION TYPE:C	ASPHALT OVER SUBBASE
FOUNDATION:	6" MIN. (A.C.) OVER 6" MIN. (C.S.)
ANCHORAGE:	18" THREADED ROD EMBEDDED 16 ½" - APPROVED ADHESIVE
FOUNDATION TYPE:D	ASPHALT ONLY
FOUNDATION:	8" MIN. (A.C.)
ANCHORAGE:	18" THREADED ROD EMBEDDED 16 ½" - APPROVED ADHESIVE

KEY:
ASPHALT CONCRETE (A.C.)
COMPACTED SUBBASE (C.S.)
PORTLAND CEMENT CONCRETE (P.C.C.)

NOTE: SEE TRINITY'S PRODUCT DESCRIPTION ASSEMBLY MANUAL FOR THE APPROVED ADHESIVE.

IF THE UNIT IS ANCHORED TO ASPHALTIC CONCRETE, IT SHOULD BE RELOCATED TO FRESH, UNDISTURBED ASPHALT AND RE-ANCHORED AFTER EACH IMPACT TO ENSURE ADEQUATE FUTURE PERFORMANCE.

TENSION STRUT BACKUP MAY BE USED IN CONSTRUCTION ZONES ON ASPHALT CONCRETE (A.C.) FOR TEMPORARY USE ONLY.

LOW MAINTENANCE

Texas Department of Transportation

Design Division Standard

TRINITY HIGHWAY ENERGY ABSORPTION QUADGUARD ELITE M10 (MASH TL-3)

QGELITE(M10)(N)-20

FILE: qgelitem10n20.dgn	DN:TxDOT	CK:KM	DW:VP	CK:AG
©TxDOT: NOVEMBER 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0090	05	107	IH40
	DIST	COUNTY		SHEET NO.
	AMA	POTTER		069

DATE: 12/8/2023 8:33:19 AM
FILE: c:\bridgefarmer-pw\vidal.ngoumnai\bridgefarmer.com\dms21409\SGT(10S)31-16.dgn
Vidal.Ngoumnai

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

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

LINE AT THE BACK OF POST #2 THRU #8

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

ANCHOR PADDLE PN: 15204A

ANGLE STRUT PN: 15202G

16"

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

PLAN VIEW

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

BEGIN LENGTH OF NEED

DO NOT BOLT ANCHOR RAIL TO - POST (2)

SEE DETAIL 1

TRAFFIC FLOW

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

BEGIN STANDARD MBGF

END PAYMENT FOR SGT

6¼" 3'-1 ½" 6'-3" 6'-3"

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

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

OUTSIDE SLOTS CUTOUT (2)1½" X 6'-9 ⅝"

SoftStop FACE SEE GN(3) & NOTE: B

MBGF LAPPED IN DIRECTION OF TRAFFIC FLOW

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

SoftStop ANCHOR RAIL (12GA) PN: 15215G

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

ANCHOR PADDLE PN: 15204A

END OF ANCHOR RAIL PN: 15215G

SEE NOTE: C

POST 32" HEIGHT

31"

RAIL HEIGHT

RAIL 25'-0" PN: 61G

RAIL 25'-0" PN: 15215G

DO NOT BOLT ANCHOR RAIL TO POST(2)

SEE DETAIL 2

SEE NOTE: A

13/16" DIA. YIELDING HOLES

SEE DETAIL 3

6'-1⅜"

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

POST 40" DEPTH (TYP 1-8)

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

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

ELEVATION VIEW

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

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

B B A A

GENERAL NOTES

1. FOR SPECIFIC INFORMATION REGARDING INSTALLATION AND TECHNICAL GUIDANCE OF THE SYSTEM, CONTACT: TRINITY HIGHWAY AT 1(888)323-6374. 2525 N. STEMMONS FREEWAY, DALLAS, TX 75207
2. FOR INSTALLATION, REPAIR AND MAINTENANCE REFER TO THE; SoftStop END TERMINAL, PRODUCT DESCRIPTION ASSEMBLY MANUAL. PN: 620237B
3. APPLY HIGH INTENSITY REFLECTIVE SHEETING, "OBJECT MARKER" ON THE FRONT FACE OF THE DEVICE PER MANUFACTURER'S RECOMMENDATIONS. OBJECT MARKER SHALL CONFORM TO THE STANDARDS REQUIRED IN TEXAS MUTCD.
4. FOR POST (LEAVE-OUT) INSTALLATION AND GUIDANCE SEE TXDOT'S LATEST ROADWAY MOW STRIP STANDARD.
5. HARDWARE (BOLTS, NUTS, & WASHERS) SHALL BE GALVANIZED IN ACCORDANCE WITH ITEM 445, "GALVANIZING". FITTINGS SHALL BE SUBSIDIARY TO THE BID ITEM.
6. A COMPOSITE MATERIAL BLOCKOUT THAT MEETS THE REQUIREMENTS OF DMS-7210, MAY BE SUBSTITUTED FOR BLOCKOUTS OF SIMILAR DIMENSIONS. SEE CONSTRUCTION DIVISION MATERIAL PRODUCER LIST (MPL) FOR CERTIFIED PRODUCERS.
7. IF SOLID ROCK IS ENCOUNTERED SEE THE MANUFACTURER'S INSTALLATION MANUAL AND REFER TO THE LATEST ROADWAY MBGF STANDARD FOR INSTALLATION GUIDANCE.
8. POSTS SHALL NOT BE SET IN CONCRETE.
9. IT IS ACCEPTABLE TO INSTALL THE SoftStop IMPACT HEAD PARALLEL TO THE GRADE LINE OR WITH AN UPWARD TILT.
10. DO NOT ATTACH THE SoftStop SYSTEM DIRECTLY TO A RIGID BARRIER.
11. UNDER NO CIRCUMSTANCES SHALL THE GUARDRAIL WITHIN THE SoftStop SYSTEM BE CURVED.
12. A FLARE RATE OF UP TO 25:1 MAY BE USED TO PREVENT THE TERMINAL HEAD FROM ENCROACHING ON THE SHOULDER. THE FLARE MAY BE DECREASED OR ELIMINATED FOR SPECIFIC INSTALLATIONS, IF DIRECTED BY THE ENGINEER.

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

PART	QTY	MAIN SYSTEM COMPONENTS
620237B	1	PRODUCT DESCRIPTION ASSEMBLY MANUAL (LATEST REV.)
15208A	1	SoftStop HEAD (SEE MANUAL FOR RIGHT-LEFT APPROACH)
15215G	1	SoftStop ANCHOR RAIL (12GA) WITH CUTOUT SLOTS
61G	1	SoftStop DOWNSTREAM W-BEAM RAIL (12GA) (25'- 0")
15205A	1	POST #0 - ANCHOR POST (6'- 5 ⅜")
15203G	1	POST #1 - (SYTP) (4'- 9 ½")
15000G	1	POST #2 - (SYTP) (6'- 0")
533G	6	POST #3 THRU #8 - I-BEAM (W6 x 8.5) (6'- 0")
4076B	7	BLOCKOUT - WOOD (ROUTED) (6" x 8" x 14")
6777B	7	BLOCKOUT - COMPOSITE (4" x 7 ½" x 14")
15204A	1	ANCHOR PADDLE
15207G	1	ANCHOR KEEPER PLATE (24 GA)
15206G	1	ANCHOR PLATE WASHER (½" THICK)
15201G	2	ANCHOR POST ANGLE (10" LONG)
15202G	1	ANGLE STRUT
		HARDWARE
4902G	1	1" ROUND WASHER F436
3908G	1	1" HEAVY HEX NUT A563 GR.DH
3717G	2	¾" x 2 ½" HEX BOLT A325
3701G	4	¾" ROUND WASHER F436
3704G	2	¾" HEAVY HEX NUT A563 GR.DH
3360G	16	⅝" x 1 ¼" W-BEAM RAIL SPLICE BOLTS HGR
3340G	25	⅝" W-BEAM RAIL SPLICE NUTS HGR
3500G	7	⅝" x 10" HGR POST BOLT A307
3391G	1	⅝" x 1 ¾" HEX HD BOLT A325
4489G	1	⅝" x 9" HEX HD BOLT A325
4372G	4	⅝" WASHER F436
105285G	2	⅝" x 2 ½" HEX HD BOLT GR-5
105286G	1	⅝" x 1 ½" HEX HD BOLT GR-5
3240G	6	⅝" ROUND WASHER (WIDE)
3245G	3	⅝" HEX NUT A563 GR.DH
5852B	1	HIGH INTENSITY REFLECTIVE SHEETING - SEE NOTE: B

ALTERNATE BLOCKOUT SEE GENERAL NOTE: 6

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

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

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

8" 6" 14"

⅝" HGR NUT PN: 3340G

⅝" X 10" HGR POST BOLT PN: 3500G

13/16" DIAMETER YIELDING HOLES LOCATED IN FLANGES

FINISHED GRADE

(HOLES APROXIMATELY CENTERED AT FINISHED GRADE)

ISOMETRIC VIEW POST(1 & 2)

W6 X 8.5 I-BEAM POST SHOWING STANDARD WOOD BLOCKOUT

NOTE: NO BLOCKOUT INSTALLED AT POST(1)

W-BEAM RAIL 25'-0"

6" X 8" X 14" BLOCKOUT WOOD

⅝" X 10" HGR POST BOLT PN: 3500G

⅝" HGR NUT PN: 3340G

POST HEIGHT 32"

31" RAIL HEIGHT

40"

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

FINISHED GRADE

SECTION VIEW B-B

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

6" X 8" X 14" BLOCKOUT WOOD

W-BEAM RAIL 25'-0"

⅝" X 10" HGR POST BOLT PN: 3500G

⅝" HGR NUT PN: 3340G

POST HEIGHT 32"

31" RAIL HEIGHT

40"

POST(2)

FINISHED GRADE

SECTION VIEW A-A

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

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

(1) ⅝" x 1 ¾" HEX HD BOLT PN 3391G

ANGLE STRUT PN: 15202G

(2) ⅝" WASHERS PN 4372G

(1) ⅝" HGR HEX NUT PN 3340G

DETAIL 1

SHOWN AT POST(1) NEAR GROUND

(1) ⅝" HEX NUT

(2) ⅝" ROUND WASHERS PN: 3240G

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

DETAIL 2

SHOWN AT POST(1)

POST 17"- ½" HEIGHT

4'- 9 ½"

13/16" DIA. YIELDING HOLES

40"

POST(1)

FRONT VIEW POST(1)

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

NOTE: NO BLOCKOUT INSTALLED AT POST(1)

ANCHOR KEEPER PLATE (24 GA) PN: 15207G

ANCHOR PLATE WASHER ½" THICK PN: 15206G

1" ROUND WASHER F463 PN: 4902G

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

ALTERNATE BLOCKOUT SEE GENERAL NOTE: 6

(2) ⅝" ROUND WASHER (WIDE) PN: 3240G

ANCHOR PADDLE PN: 15204A

(2) ⅝" HEX NUT A563 GR.DH PN: 3245G

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

W-BEAM FLATTENED (4 PLIES)

ANGLE STRUT PN: 15202G

SEE NOTE: A

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

(4) ¾" FLAT WASHER (TYP) PN: 3701G

(2) ¾" HEX NUT (TYP) PN: 3704G

6'- 1 ⅜" POST DEPTH

(2) ANCHOR POST ANGLE PN: 15201G

DETAIL 3 AT POST(0)

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

TRAFFIC FLOW

STANDARD MBGF

APPROX 5'-10"

5'-0"

50' APPROACH GRADING

2'-0"

EDGE OF PAVEMENT

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

2'-0" MAX. RAIL OFFSET

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

APPROACH GRADING AT GUARDRAIL END TREATMENTS

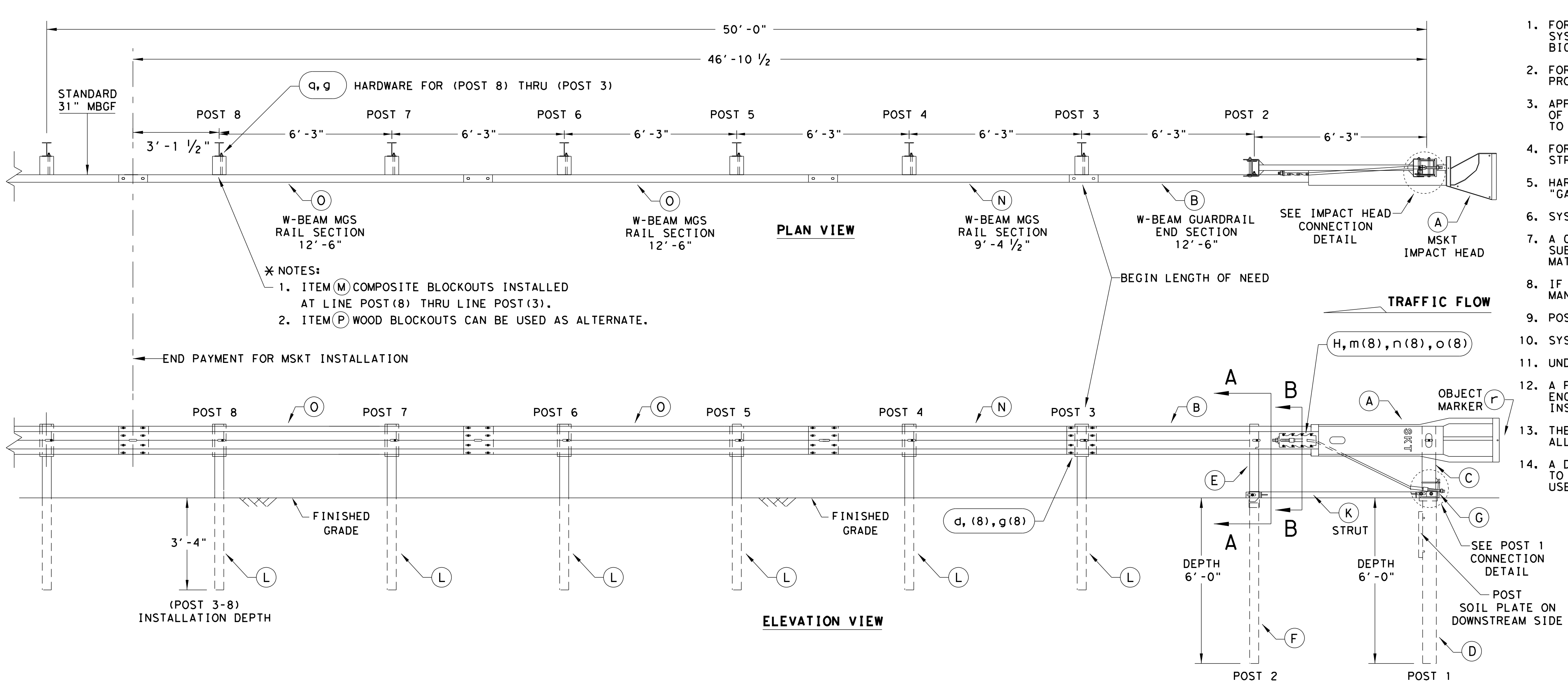
NOTE:
THIS STANDARD IS A BASIC REPRESENTATION OF THE SoftStop END TERMINAL, IT IS NOT INTENDED TO REPLACE THE PRODUCT DESCRIPTION ASSEMBLY MANUAL.

Texas Department of Transportation

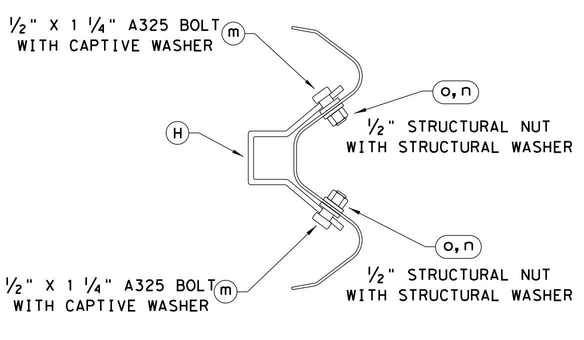
Design Division Standard

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

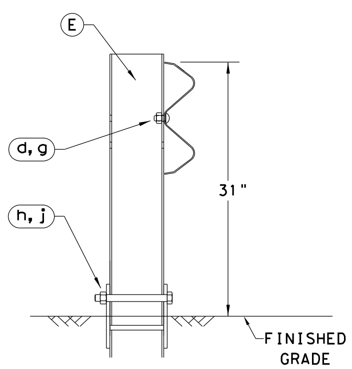
FILE: sgt10s3116	DN: TxDOT	CK: KM	DW: VP	CK: MB/VP
© TxDOT: JULY 2016	CONT	SECT	JOB	HIGHWAY
REVISIONS	0090	05	107	IH40
	DIST	COUNTY		SHEET NO.
	AMA	POTTER		070



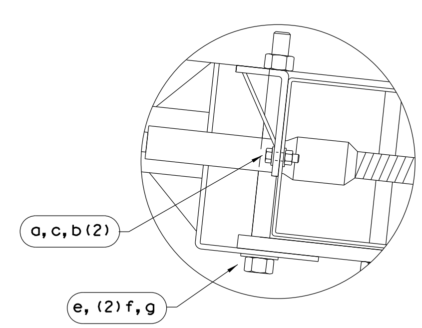
NOTE: SEE (GENERAL NOTE 14) FOR DRIVING CAP INFORMATION.



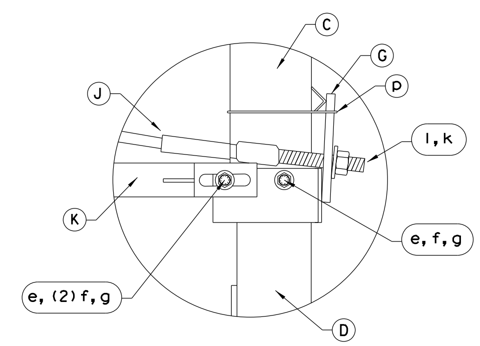
SECTION B-B
ANCHOR BRACKET



POST 2
SECTION A-A



IMPACT HEAD
CONNECTION DETAIL



POST 1
CONNECTION DETAIL

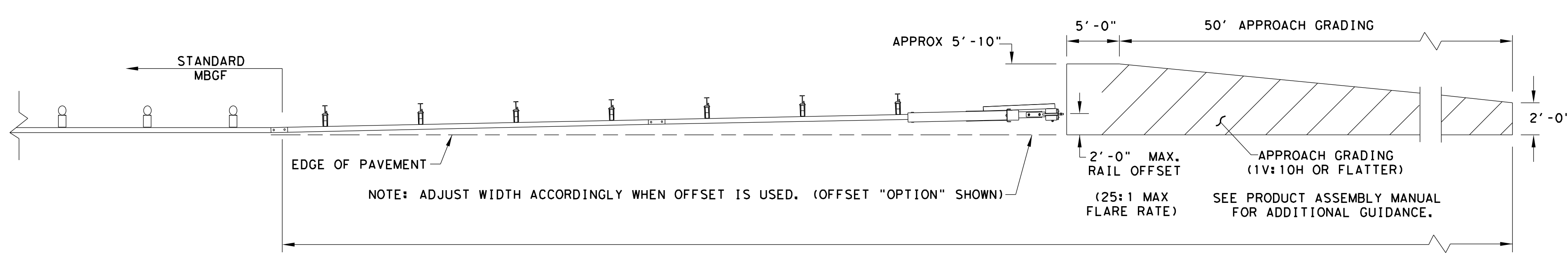
GENERAL NOTES

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

SEE NOTES: ✱

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

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



APPROACH GRADING AT GUARDRAIL END TREATMENTS

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

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

Texas Department of Transportation

Design Division Standard

SINGLE GUARDRAIL TERMINAL
MSKT-MASH-TL-3
SGT(12S)31-18

FILE: sgt12s3118.dgn	DN: TxDOT	CK: KM	DW: VP	CK: CL
© TxDOT: APRIL 2018	CONT	SECT	JOB	HIGHWAY
REVISIONS	0090	05	107	IH40
	DIST	COUNTY		SHEET NO.
	AMA	POTTER		071

DATE:
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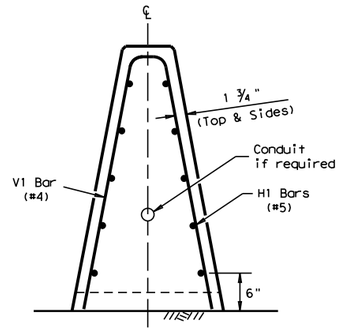
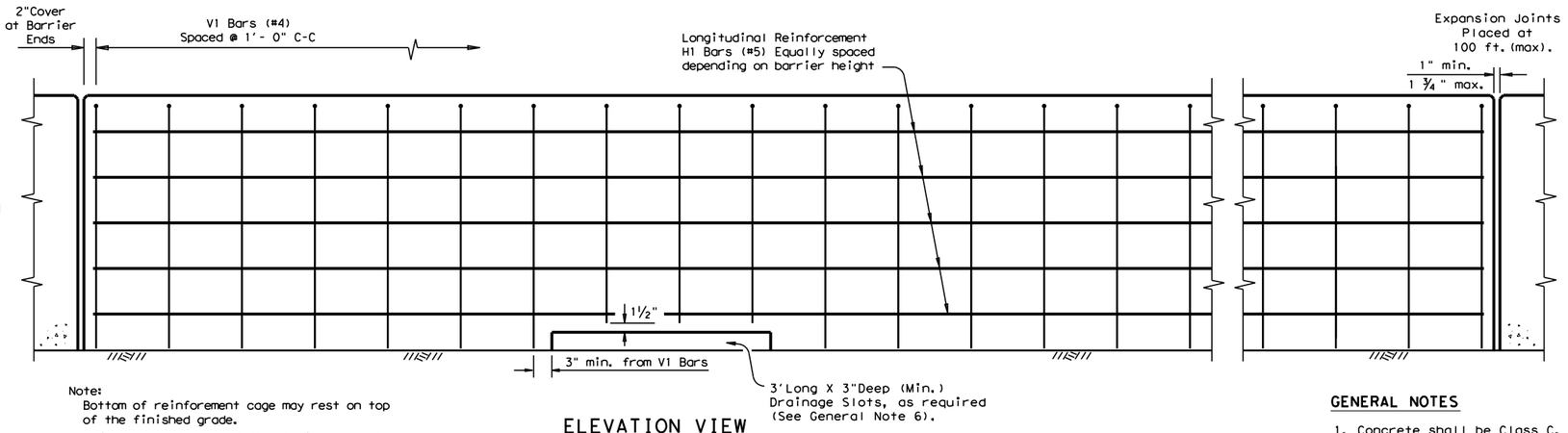


END VIEW

CAST-IN-PLACE (CIP) BARRIER

Barrier is Symmetrical About the Center Line



Note:
Bottom of reinforement cage may rest on top of the finished grade.

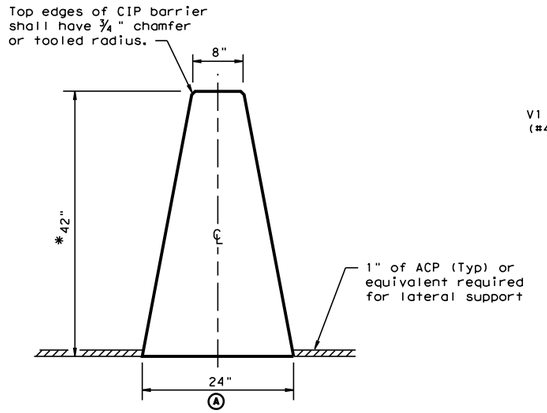
Reinforcement around the drainage slots may be cut or bent to accommodate the edge and top clearances.

ELEVATION VIEW

Cast-in-Place (SSCB)(Type 2)on Roadway

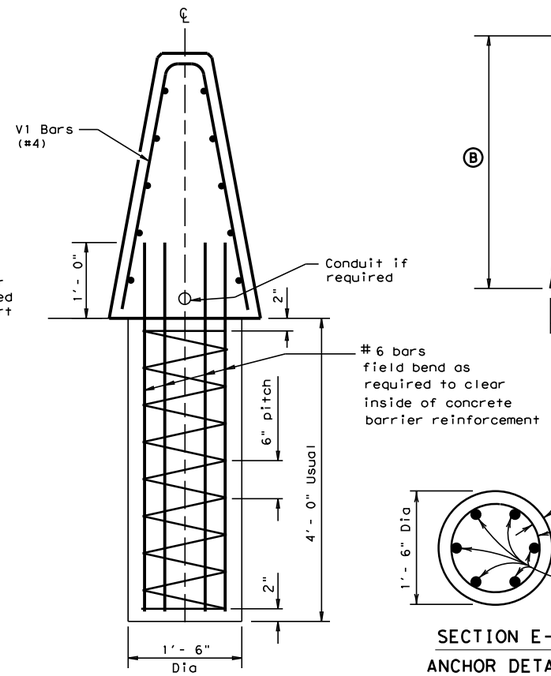
GENERAL NOTES

1. Concrete shall be Class C. Unless otherwise specified in the plans.
2. Where used, rebar reinforcement shall be Grade 60 and conform to ASTM A615.
3. These details cover barrier per Item 514, "Permanent Concrete Traffic Barrier".
4. The Anchorage shown is considered subsidiary to the bid item.
5. Top edges of CIP barrier shall have a ¾ " chamfer or tooled radius.
6. Drainage slot locations (12'- 0", C-C Min. Spacing) are shown elsewhere, or as directed by the Engineer. Drainage slot heights on the SSCB may be increased to a maximum of 5 inches, without geometric changes to the barrier face.
7. Cast-in-place barrier may be slip formed. Bracing may be tied or tack welded to the reinforcement cage to provide cage stability. Do not weld to anchorage.
8. For locations where lighting is required, see the SSCB(4) sheet for the proper reinforcement and anchorage.



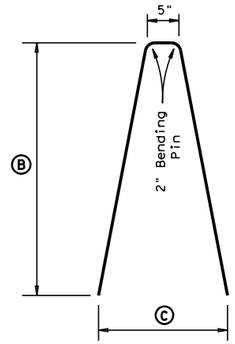
SINGLE SLOPE CONCRETE BARRIER

(SSCB)(42")



SECTION D-D

ANCHOR DETAIL



V1 Bar

#4 Rebar

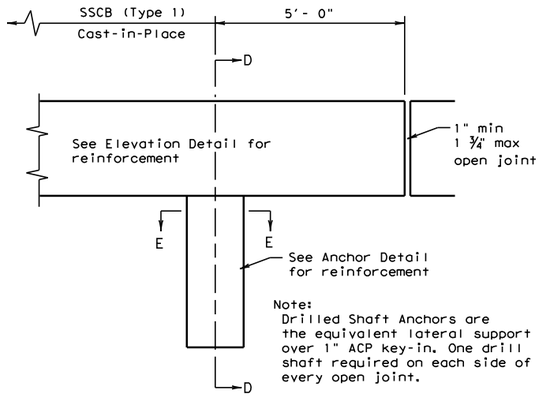
BARRIER HEIGHT (IN.)	* DIMENSIONS (IN.)		
	Ⓐ	Ⓑ	Ⓒ
42	24	40 ¼	20 ½
48	26 ¼	46 ¼	22 ¾
54	28 ½	52 ¼	25 ⁹⁄₁₆

*(SSCB)(42") Barrier height may be increased to 48" or 54". This would increase the barrier and reinforcement dimensions accordingly.

Cast-In-Place (CIP) or Slip-Formed (SSCB)

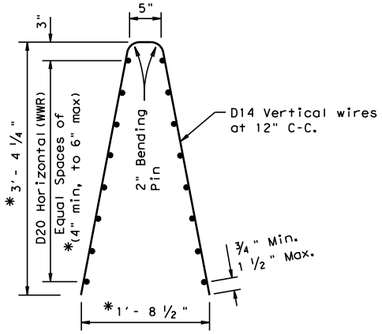
Cast-in-Place barrier may be connected to precast SSCB. Joint connection "Types" may be used in Cast-in-Place barrier, to match the precast barrier connection. (See required connection "Type" elsewhere in the plans)

The weight of Cast-in-Place (SSCB)42" is approx. 717 lbs per ft.



ELEVATION

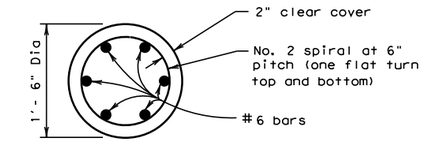
ANCHOR LOCATION



Welded Wire Reinforcement (WWR) Option for Bars V1 and H1

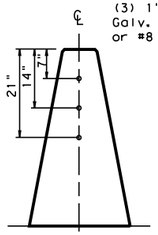
(WWR) General Notes

1. Deformed Welded Wire Reinforcement (WWR) shall conform to ASTM A497.
2. Welded wire cage may be cut and bent to accommodate the drainage slots, as directed by the Engineer.
3. Weled wire spilce locations shall have a "minimum" splice lap length of 12".
4. Combinations of reinforcing steel and WWR will be permitted, as directed by the Engineer. The dimension from the end of the barrier section to the first wire shall not exceed 3".



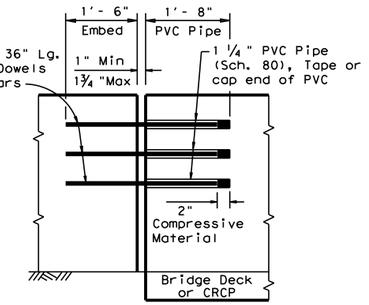
SECTION E-E

ANCHOR DETAIL



END VIEW

Dowel locations



EXPANSION JOINT (Dowel Connection)

Dowels may be used, as directed by the Engineer, in locations where the barrier could be laterally displaced.

Texas Department of Transportation

Design Division Standard

SINGLE SLOPE CONCRETE BARRIER

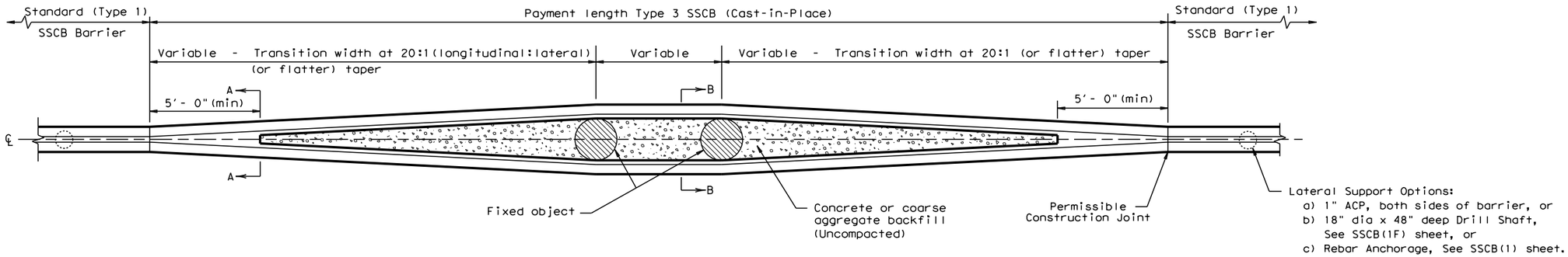
CAST-IN-PLACE

(TYPE 1)

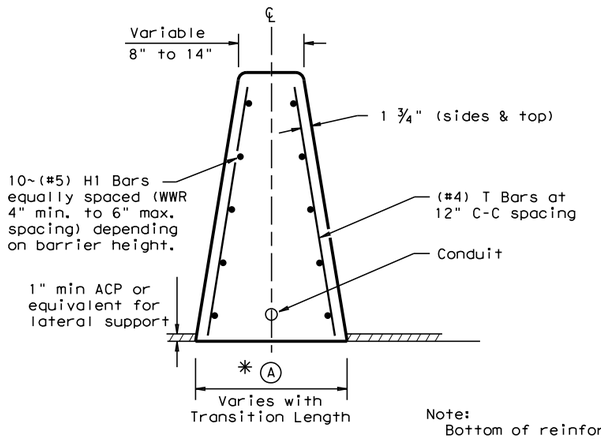
(FLEXIBLE PAVEMENT)

SSCB(1F)-10

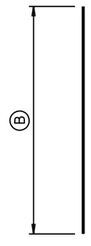
FILE: sscb1f10.dgn	DN: TxDOT	CK: AM	DW: BD	CK:
©TxDOT December 2010	CONT	SECT	JOB	HIGHWAY
REVISIONS	0090	05	107	IH40
	DIST	COUNTY		SHEET NO.
	AMA	POTTER		072



PLAN (TYPE 3) BARRIER

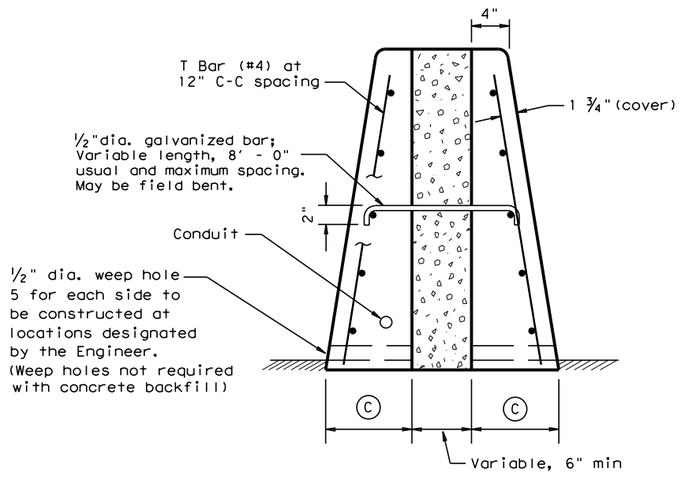


SECTION A-A



T BAR (#4)

Note:
Bottom of reinforcement cage may rest on top of finished grade.



SECTION B-B

GENERAL NOTES

1. Axis of concrete barrier shall be vertical, except where roadway is superelevated, then axis shall be normal to roadway surface.
2. All steel that requires galvanizing shall be in accordance with Item 445, "Galvanizing."
3. Bid price per liner foot of (Type 3) SSCB, including anchor sections, shall include all of the concrete, reinforcement, and aggregate backfill.
4. All concrete shall be Class C.
5. Longitudinal and vertical bars for roadway barrier shall conform to ASTM A615 (Grade 60), unless otherwise specified.
6. At construction joints the longitudinal bars shall extend beyond the joint so that bar splices will be a minimum of two feet from the construction joint.
7. Welded wire reinforcement (WWR) may be used as an option to conventional reinforcement and shall meet requirements shown.
8. Any method devised by the contractor and approved by the Engineer that will assure the longitudinal steel for and (Type 3) SSCB will be positioned ± ½inch as dimensioned will be satisfactory.
9. Conduit to be provided only when called for elsewhere in the plans. Position of conduit may be adjusted to facilitate construction subject to the approval of the Engineer.
10. See SSCB(4) standard for barrier with illumination.

Barrier height (IN.)	✳ Dimensions (IN.)		
	(A)	(B)	(C)
42	24 Plus	40 ¼	12
48	26 ¼ Plus	46 ¼	13 ⅛
54	28 ½ Plus	52 ¼	14 ¼

✳ (SSCB)(42") Barrier height may be increased to 48" or 54". This would increase the barrier and reinforcement dimensions accordingly.

Welded Wire Reinforcement (WWR) Option for Bars T and H1 (Type 3) Barrier

(WWR) General Notes

1. WWR design required for (Type 3) SSCB barrier: D14 vertical (12" C-C) x D20 horizontal wires spaced (4" min. to 6" max.) as height requires.
2. Deformed Welded Wire Reinforcement (WWR) shall conform to ASTM A497.
3. Welded wire cage may be cut and bent to accommodate the drainage slots, as directed by the Engineer.
4. Welded wire splice locations shall have a "minimum" splice lap length of 12".
5. Combinations of reinforcing steel and WWR will be permitted, as directed by the Engineer. The dimension from the end of the barrier section to the first wire shall not exceed 3".

Texas Department of Transportation

Design Division Standard

SINGLE SLOPE CONCRETE BARRIER

CAST-IN-PLACE
(TYPE 3)
AT FIXED OBJECTS

SSCB(3)-10

FILE: sscb310.dgn	DN: TxDOT	CK: AM	DW: BD	CK:
©TxDOT December 2010	CONT	SECT	JOB	HIGHWAY
REVISIONS	0090	05	107	IH40
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	AMA	POTTER		073

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Vidal.Ngoumnai

DATE: 12/8/2023 8:33:53 AM
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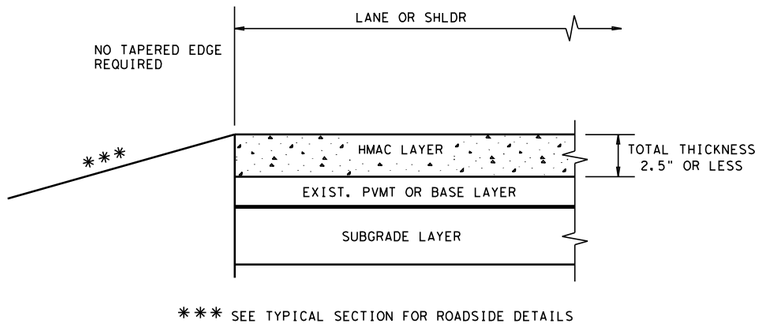
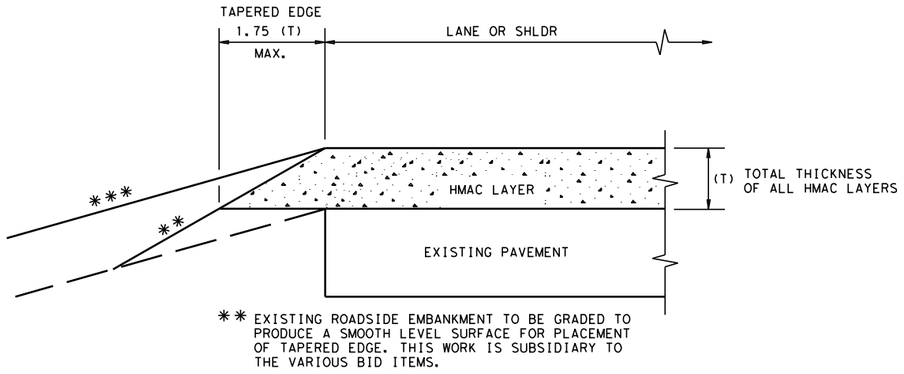


*** SEE TYPICAL SECTION FOR ROADSIDE DETAILS

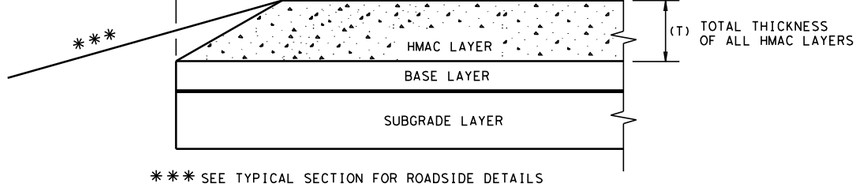
CONDITION - 1
THIN HMAC SURFACES OR HMAC OVERLAY WITH THICKNESS OF 2.5" OR LESS



** 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.

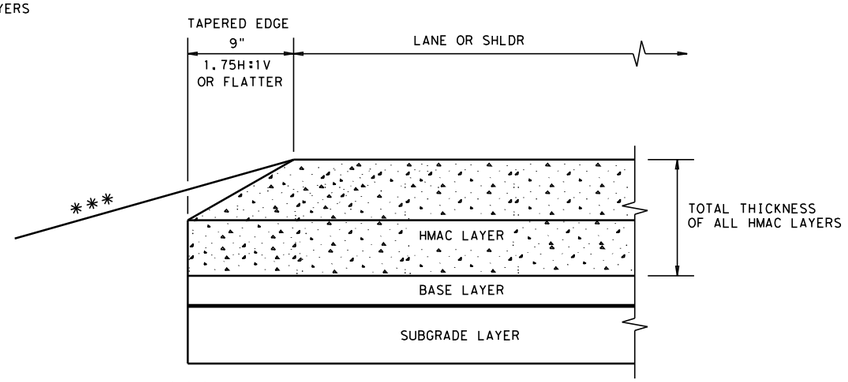
*** SEE TYPICAL SECTION FOR ROADSIDE DETAILS

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:
© TxDOT January 2011	CONT	SECT	JOB	HIGHWAY
REVISIONS	0090	05	107	IH40
	DIST	COUNTY		SHEET NO.
	AMA	POTTER		074

DATE: 12/8/2023 8:33:59 AM
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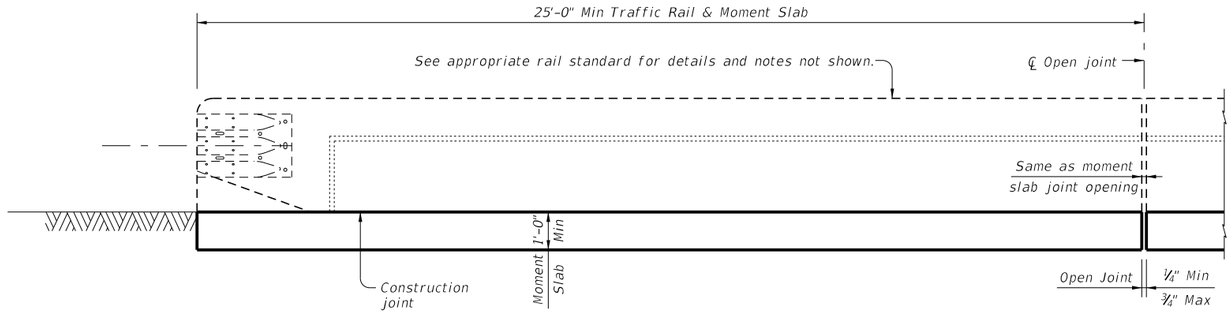
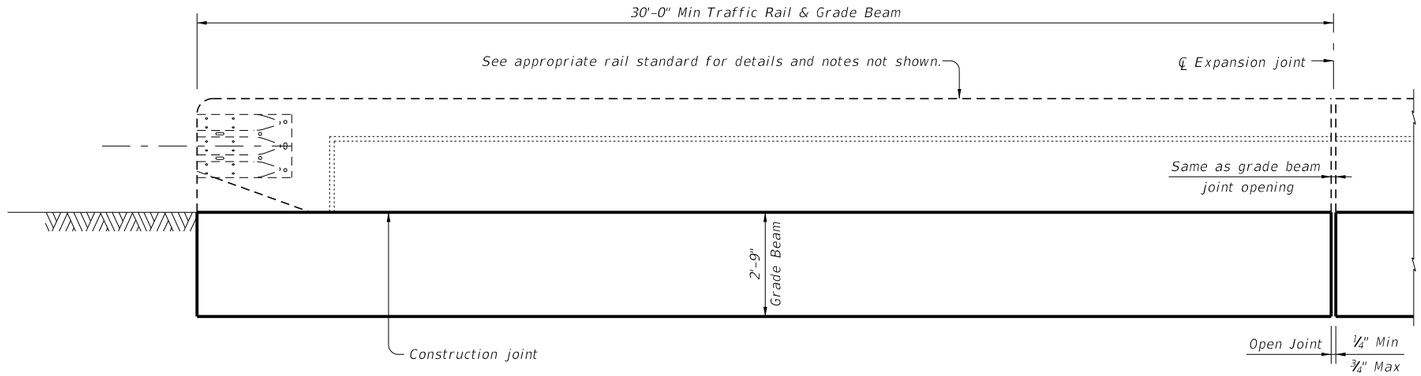
Vidai.Ngoumnai



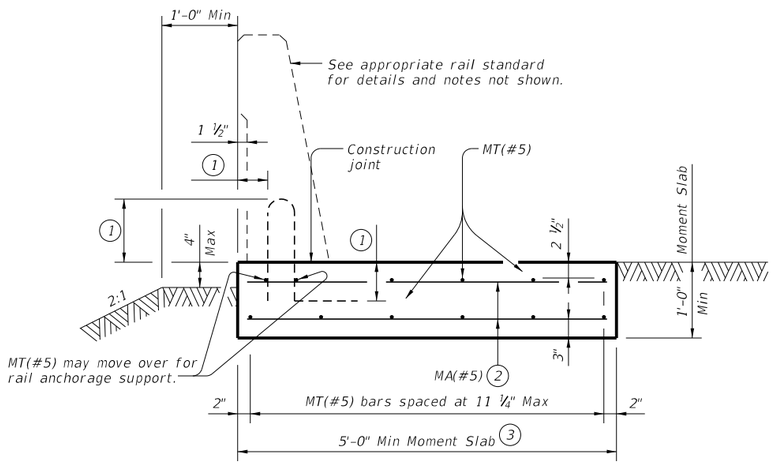
ROADWAY ELEVATION OF TRAFFIC RAIL ON MOMENT SLAB (TRF-MS)

(Showing SSTR rail other rails are similar. Reinforcing not shown for clarity.)



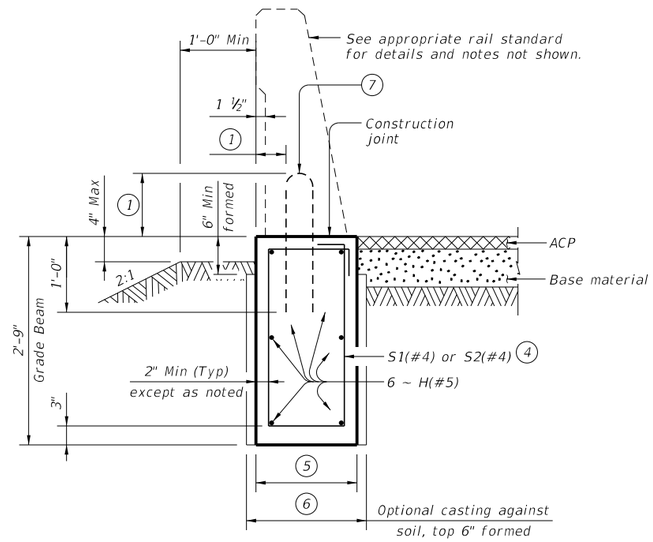
ROADWAY ELEVATION OF TRAFFIC RAIL ON GRADE BEAM (TRF-GB)

(Showing SSTR rail other rails are similar. Reinforcing not shown for clarity.)



SECTION OF TRAFFIC RAIL ON MOMENT SLAB (TRF-MS)

(Showing SSTR rail other rails are similar.)



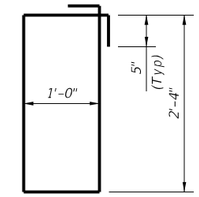
SECTION OF TRAFFIC RAIL ON GRADE BEAM (TRF-GB)

(Showing SSTR rail other rails are similar.)

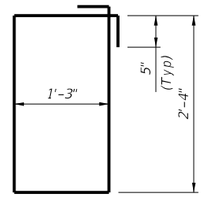
1. See applicable bridge rail standard.
2. MA(#5) space longitudinally along moment slab at 12" Max. (Spaced 2 ½" longitudinally from outside edge of moment slab).
3. Approximate moment slab concrete = 0.19 CY/LF and reinforcement = 22.4 LB/LF.
4. S1(#4) or S2(#4) spaced longitudinally along grade beam at 8" Max. (Spaced 2 ½" longitudinally from outside edge of grade beam).
5. Use bar S1(#4) with 1'-4" grade beam width and bridge rail types: All rails except for T224, C412, T66, C66, T80HT and T80SS. Approximate grade beam concrete = 0.14 CY/LF and reinforcement = 13.8 LB/LF.

   Use bar S2(#4) with 1'-7" grade beam width and bridge rail types: T66 and C66. Approximate grade beam concrete = 0.16 CY/LF and reinforcement = 14.2 LB/LF.
6. 1'-6" for bridge rail types: All rails except for T224, C412, T66, C66, T80HT and T80SS.

   1'-9" bridge rail types: T66 and C66.
7. Modify reinforcing on standard bridge rail anchorage if necessary by extending rail anchorage 12" Min, vertically into traffic rail



BARS S1(#4)



BARS S2(#4)

CONSTRUCTION NOTES:

Align moment slab (TRF-MS) or grade beam (TRF-GB) open joints with rail open joints maintaining no less than minimum rail length. Provide moment slab (TRF-MS) or grade beam (TRF-GB) with open joints at no greater than 100' spacing unless otherwise shown on 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 required elsewhere.

Deformed Welded Wire Reinforcement (WWR) (ASTM A1064) of equal size and spacing may be substituted for bars S1(#4), S2(#4) and H(#5) unless noted otherwise. Provide the same laps as required for reinforcing bars.

Provide bar laps, where required, as follows:

Uncoated or galvanized ~ #5 = 2'-4"
Epoxy coated ~ #5 = 3'-6"

GENERAL NOTES:

Use of these details will result in a moment slab (TRF-MS) or grade beam (TRF-GB) foundation that is acceptable for traffic rails which are MASH TL-2, TL-3, or TL-4 compliant.

See elsewhere in the plans for selected options between moment slab (TRF-MS) and/or grade beam (TRF-GB).

The foundation design resistance is based on the current AASHTO bridge railing requirements with the assumption of fair to good soil support conditions. Poor soil conditions will require suitably deeper and/or wider foundations.

See appropriate rail standard for details and notes not shown.

This detail is intended for use as a guide to unusual railing anchorage situations but may be included in the plans, modified as necessary to apply to specific installations required on the project.

Payment for moment slab (TRF-MS) and/or grade beam (TRF-GB) will be by Class "C" concrete or Class "C" (HPC) concrete for rail foundations.

The associated bridge railing will be paid for by the linear foot which includes the concrete and reinforcement.

Excavation will be subsidiary to other Items.

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

Texas Department of Transportation

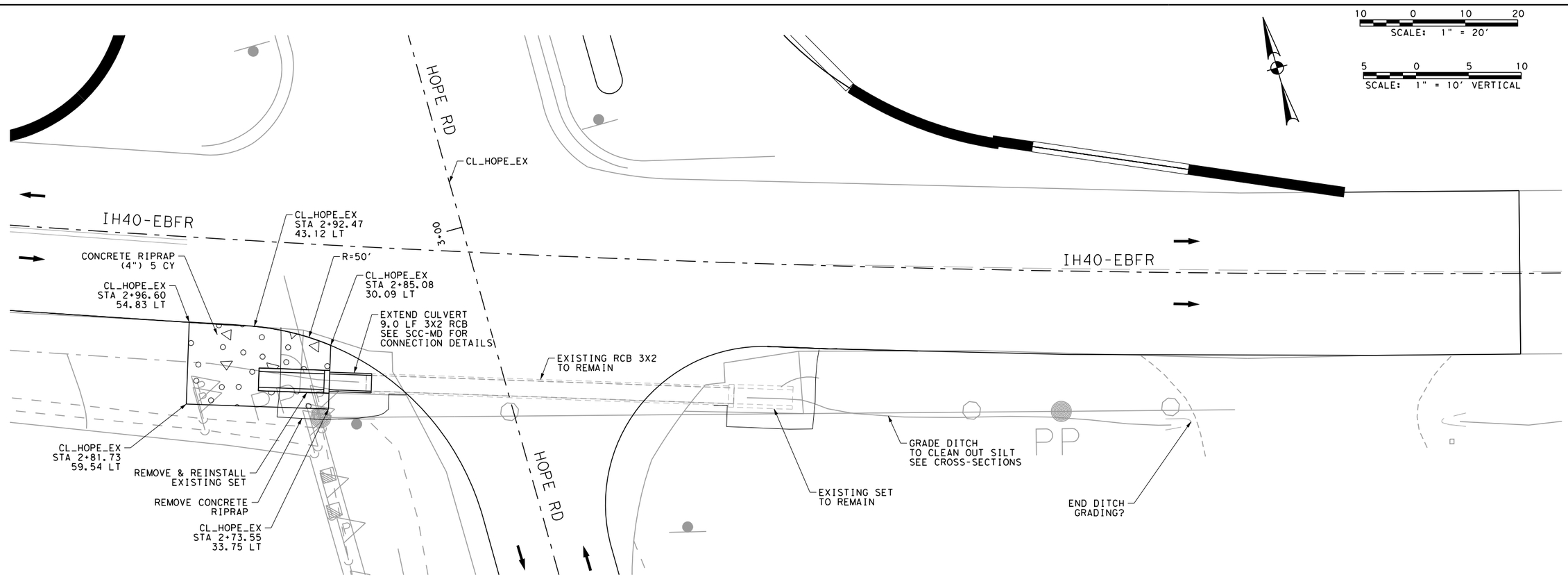
Bridge Division Standard

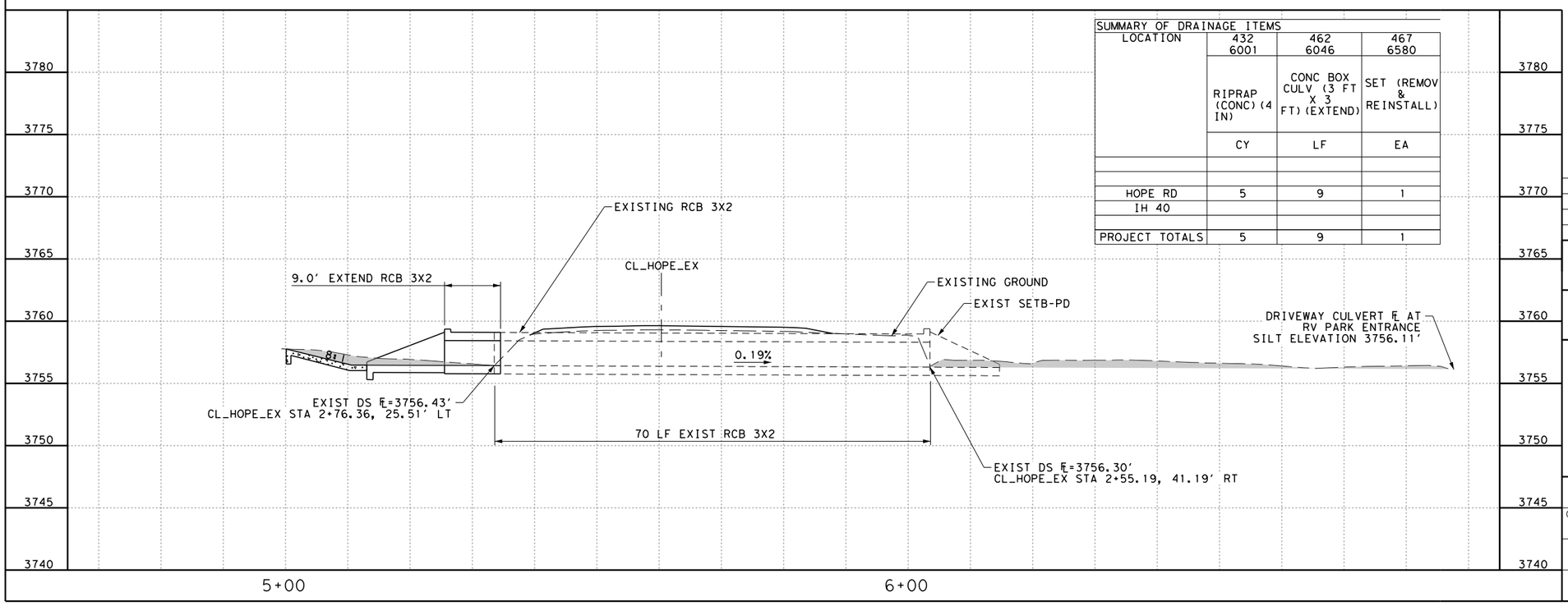
TRAFFIC RAIL FOUNDATIONS

FOR MASH TL-2, TL-3 & TL-4 BRIDGE RAILS

TRF

FILE:	rlstd027-20.dgn	DN: TxDOT	CK: TAR	DW: JTR	CK: TAR
©TxDOT	September 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS		0090	05	107	IH40
07-20: Added moment slab with rail foundation lengths.		DIST	COUNTY		SHEET NO.
		AMA	POTTER		075





SUMMARY OF DRAINAGE ITEMS			
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	RIPRAP (CONC) (4 IN)	CONC BOX CULV (3 FT X 3 FT) (EXTEND)	SET (REMOV & REINSTALL)
	CY	LF	EA
HOPE RD	5	9	1
IH 40			
PROJECT TOTALS	5	9	1

12/11/23

STATE OF TEXAS
JAMES W. LANGSTON
73891
LICENSED
PROFESSIONAL ENGINEER

James W Langston PE

Bridgefarmer & Associates, Inc.
TBPE Registration No. 264

HL 93 LOADING

NO.	DATE	DESCRIPTION	APPROV.

BRIDGEFARMER & ASSOCIATES, INC.
CONSULTING ENGINEERS
TBPE REGISTRATION NO. 264

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CULVERT LAYOUT
CUL-SOUTH

SHEET 1 OF 1

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
VN	6	SEE TITLE SHEET		IH 40
GRAPHICS VN	STATE	DISTRICT	COUNTY	SHEET NO.
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CHECK JWL	CONTROL	SECTION	JOB	
	0090	05	107	

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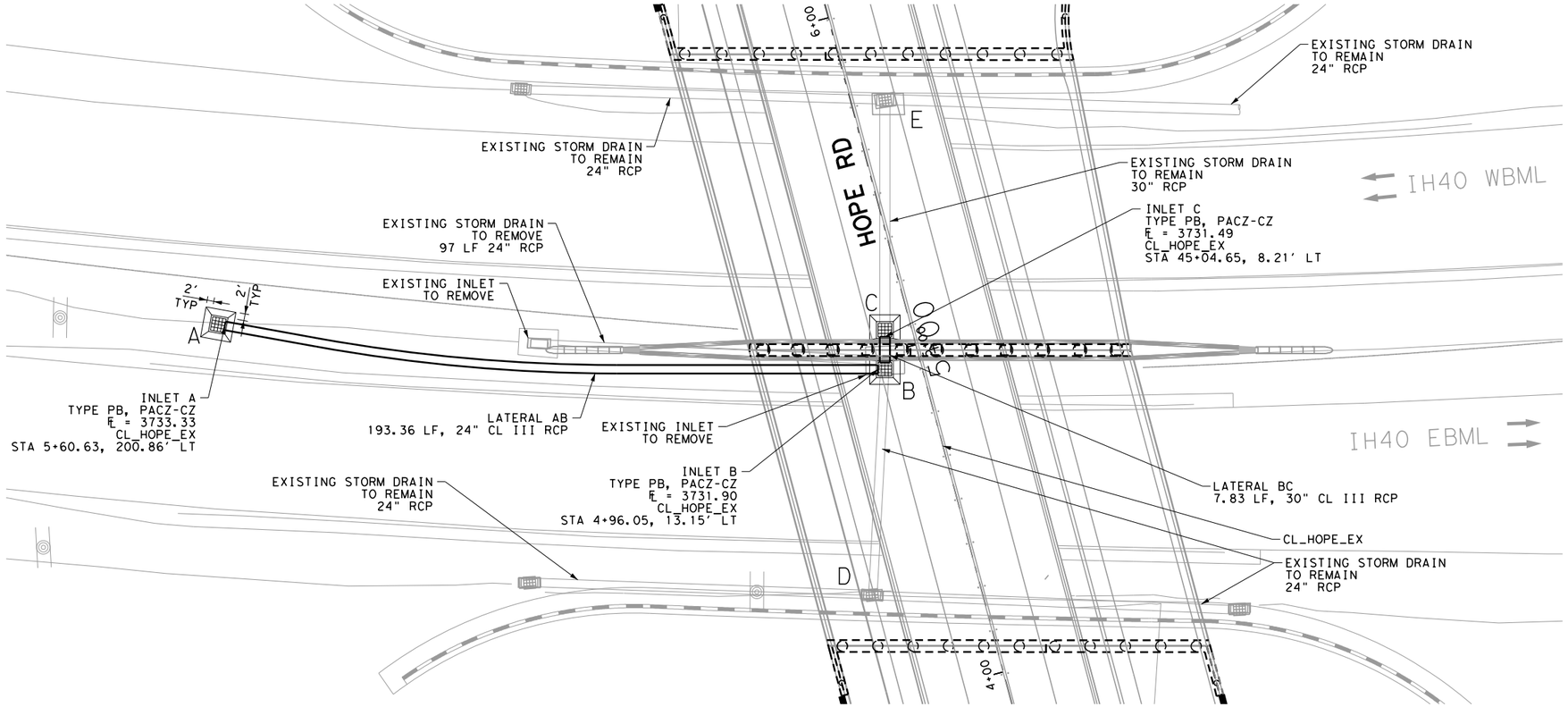

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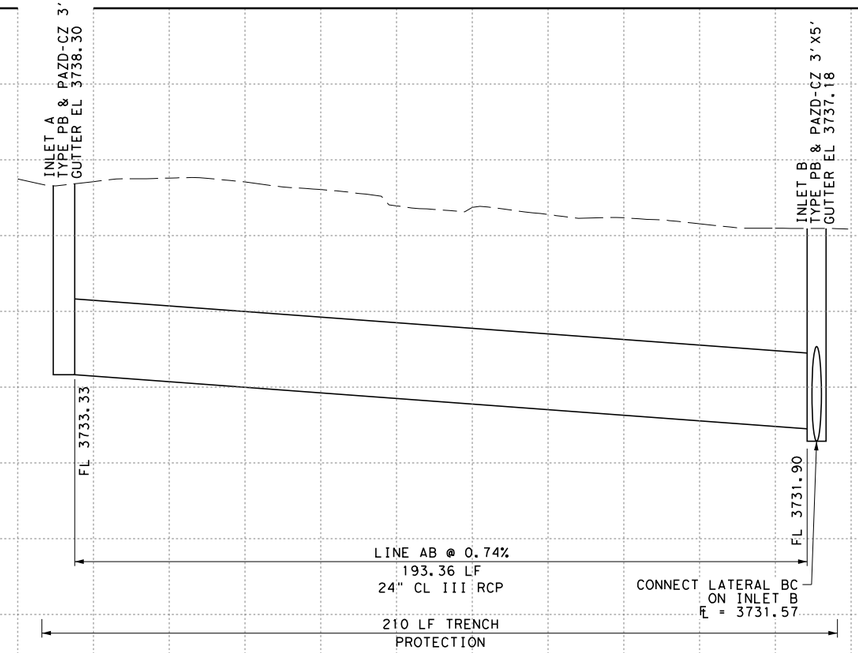
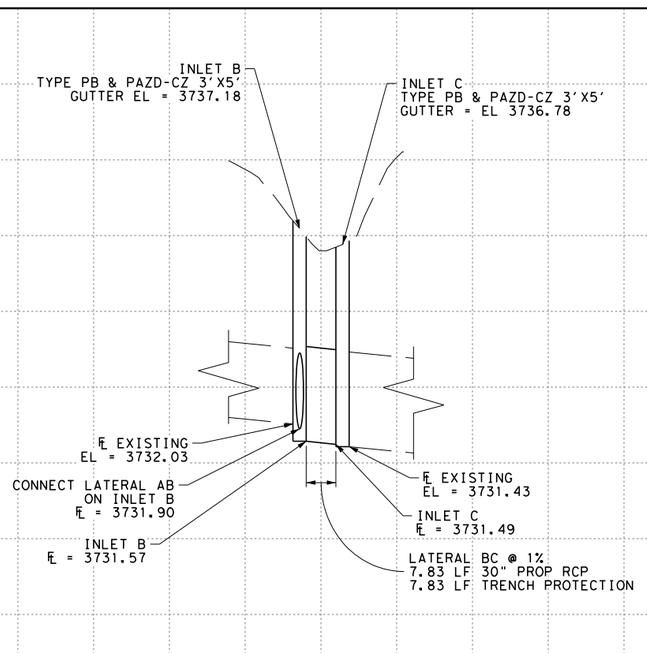


LATERAL AB



LATERAL BC

STATE OF TEXAS
JAMES W. LANGSTON
73891
LICENSED
PROFESSIONAL ENGINEER
12/11/23
James W Langston PE

Bridgefarmer & Associates, Inc.
TBPE Registration No. 264

NO.	DATE	DESCRIPTION	APPROV.

BRIDGEFARMER & ASSOCIATES, INC.
CONSULTING ENGINEERS
TBPE REGISTRATION NO. 264

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IH-40 AT HOPE ROAD

STORM SEWER LAYOUT LATERAL AB & LATERAL BC

SHEET 1 OF 1

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
TS	6	SEE TITLE SHEET		IH 40
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
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CHECK	CONTROL	SECTION	JOB	
JL	0090	05	107	
CHECK				
MS				

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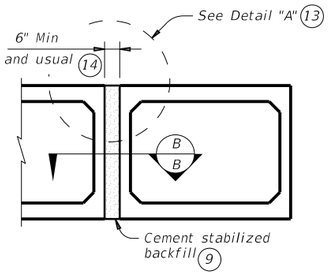
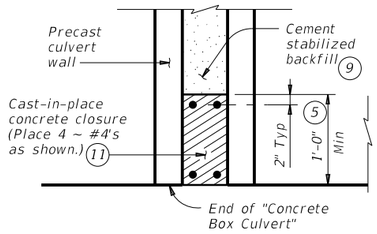
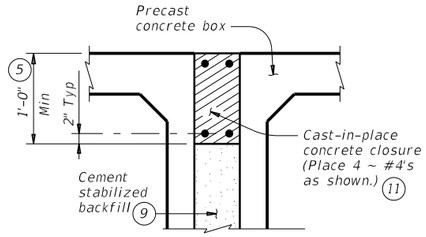


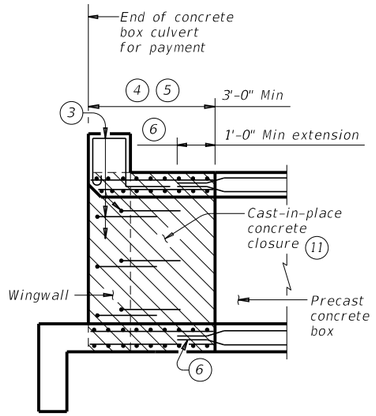
MULTIPLE UNIT PLACEMENT



SECTION B-B

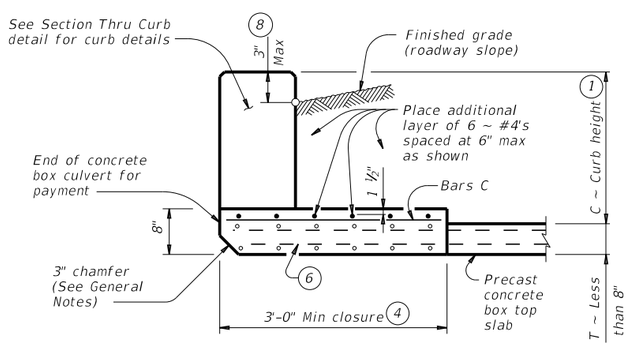


DETAIL "A" (13)

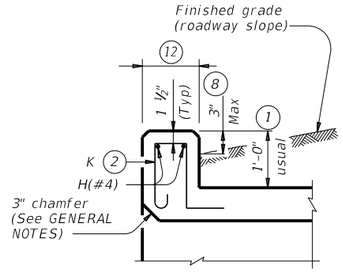


WINGWALL CONNECTION

(Also applies to safety end treatment.)

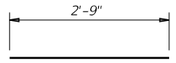


SECTION THRU TOP SLABS LESS THAN 8"

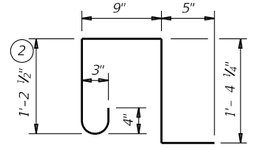


SECTION THRU CURB

QUANTITIES PER FOOT OF CURB (10)	
Reinforcing Steel	4.12 Lb
Concrete	0.037 CY



BARS C (#4)
(Spa = 1'-0" Max)



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

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

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

3 Extend curb, wingwall, or safety end treatment reinforcing into concrete closure. Bend or trim, as necessary, any reinforcing that does not fit into closure area.

4 Provide a 3'-0" Min cast-in-place concrete closure. Break back boxes in the field or cast boxes short. Provide bands of reinforcing in the closure that are the same size and spacing as in the precast box section. Provide #4 longitudinal reinforcement spaced at 12 inches Max within the closure. Except where shown otherwise, construct the cast-in-place closure flush with the inside and outside faces of the precast box section.

5 For multiple unit placements, adjust the length of the closure for the interior walls as necessary. Provide a 3'-0" Min cast-in-place closure in the top slab, bottom slab, and exterior wall. See Section B-B detail when interior walls are cast full length.

6 Extend precast box reinforcing a minimum of 1'-0" into concrete closure (Typ).

7 Place bands of reinforcing matching the inside and outside face reinforcing in the gaps of the top and bottom slabs. Place a band matching the outside face reinforcing of the wall in the gaps of the walls (placed in the outside face only). Tack weld the bands to the exposed reinforcing at each point of contact.

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

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

9 Cement stabilized backfill between boxes is considered part of the box culvert for payment.

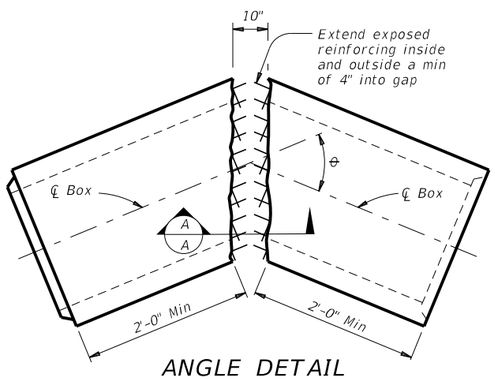
10 All curb concrete and reinforcing is considered part of the box culvert for payment.

11 Any additional concrete and reinforcing required for the closures will be considered subsidiary to the box culvert for payment.

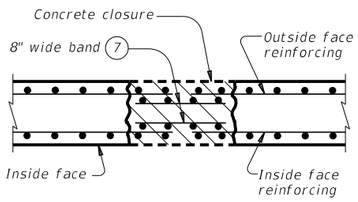
12 1'-0" typical. 2'-3" when the Box Culvert Rail Mounting Details (RAC) standard sheet is referred to elsewhere in the plans.

13 For multiple unit placement with overlay, with 1 to 2 course surface treatment, or with the top slab as the final riding surface, provide wall closure as shown in Detail "A".

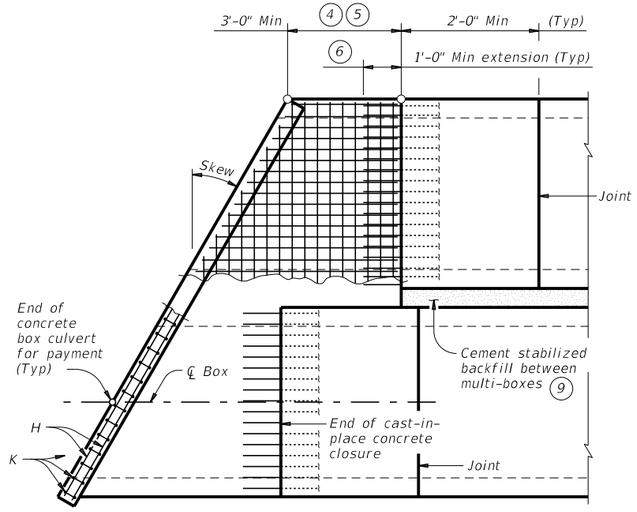
14 This dimension may be increased with approval of the Engineer to allow the precast boxes to be tunneled or jacked in accordance with Item 476, "Jacking, Boring, or Tunneling Pipe or Box". No payment will be made for any additional material in the gap between adjacent boxes.



ANGLE DETAIL



SECTION A-A



PLAN OF SKEWED ENDS

(Showing multi-box placement.)

MATERIAL NOTES:
Provide Grade 60 reinforcing steel.
Provide ASTM A1064 welded wire reinforcement.
Provide Class C concrete (f'c = 3,600 psi) for the closures.
Provide cement stabilized backfill meeting the requirements of Item 400, "Excavation and Backfill for Structures."
Any additional concrete required for the closures will be considered subsidiary to the box culvert.

GENERAL NOTES:
Designed according to AASHTO LRFD Bridge Design Specifications.
Refer to the Single Box Culverts Precast (SCP) standard sheets for details and notes not shown.
Chamfer the bottom edge of the top slab closure 3 inches at culvert closure ends.

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

HL93 LOADING

Texas Department of Transportation

Bridge Division Standard

BOX CULVERTS PRECAST MISCELLANEOUS DETAILS

SCP-MD

FILE: scpmdsts-20.dgn	DN: GAF	CK: LMW	DW: BWH/TxDOT	CK: GAF
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
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	DIST	COUNTY		SHEET NO.
	AMA	POTTER		078

DATE: 12/8/2023 8:34:35 AM
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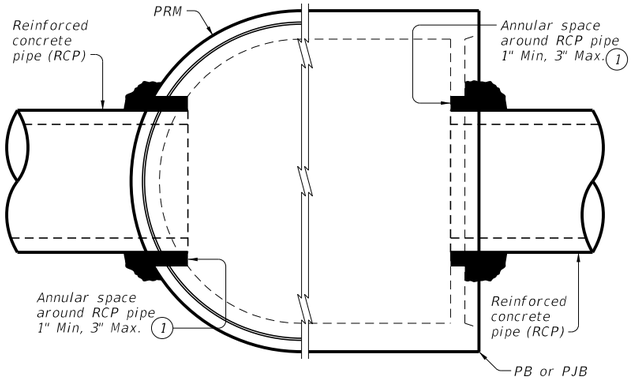
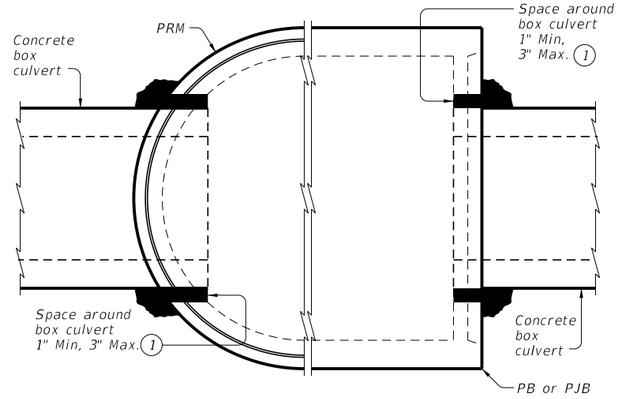
DESIGNED: VNGOUMNAI
CHECKED: TAR
DRAWN: JTR
CHECKED: TAR



PRECAST ROUND MANHOLE (PRM) WITH THROUGH-HOLE

PRECAST BASE (PB) OR PRECAST JUNCTION BOX (PJB) WITH THIN-WALL KNOCK-OUT

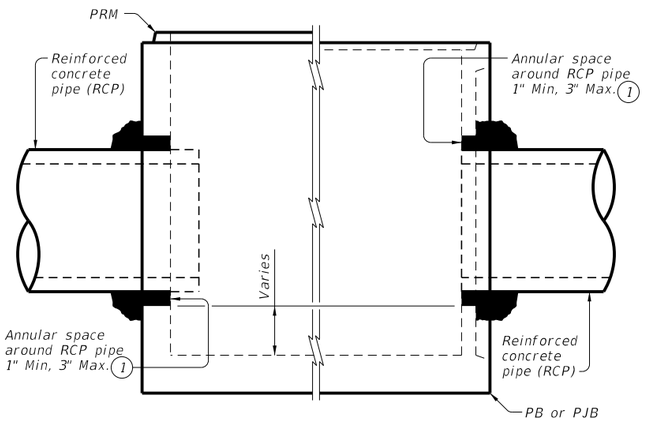
TYPICAL HALF PLAN



PRECAST ROUND MANHOLE (PRM) WITH THROUGH-HOLE

PRECAST BASE (PB) OR PRECAST JUNCTION BOX (PJB) WITH THIN-WALL KNOCK-OUT

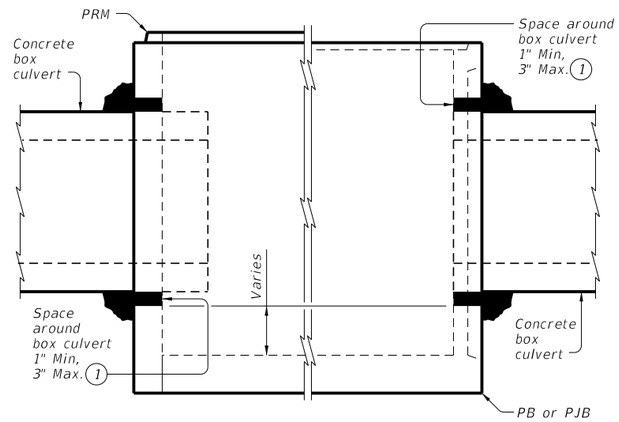
TYPICAL HALF PLAN



PRECAST ROUND MANHOLE (PRM) WITH THROUGH-HOLE

PRECAST BASE (PB) OR PRECAST JUNCTION BOX (PJB) WITH THIN-WALL KNOCK-OUT

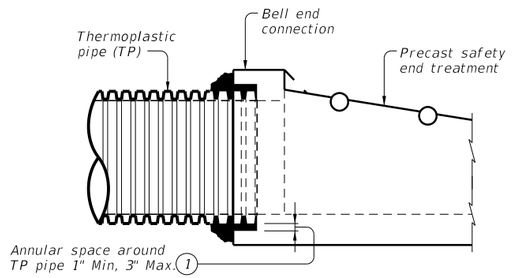
TYPICAL HALF ELEVATION



PRECAST ROUND MANHOLE (PRM) WITH THROUGH-HOLE

PRECAST BASE (PB) OR PRECAST JUNCTION BOX (PJB) WITH THIN-WALL KNOCK-OUT

TYPICAL HALF ELEVATION



TYPICAL PARTIAL ELEVATION OF PRECAST SAFETY END TREATMENTS

Showing square PSET for parallel drainage, cross drainage shown similar.

(1) Completely fill the void between the precast structure and the connecting pipe or box with cementitious grouts and mortars in accordance with DMS-4675 "Cementitious Grouts and Mortars for Miscellaneous Application."

CONSTRUCTION NOTES:

Do not grout rubber gasket joints without Manufacturer's recommendations.

Do not use bricks, masonry blocks, native stone, or similar materials in conjunction with grouted connections when filling void spaces around pipes or box culverts.

MATERIAL NOTES:

Provide grouted connections in accordance with DMS-4675 "Cementitious Grouts and Mortars for Miscellaneous Application."

GENERAL NOTES:

See applicable standards for notes and details not shown:

- Precast Base (PB)
- Precast Junction Box (PJB)
- Precast Round Manhole (PRM)
- Precast Safety End Treatments C/D Square (PSET-SC)
- Precast Safety End Treatments P/D Square (PSET-SP)

Provide Concrete Box Culverts in accordance with Item 462 "Concrete Box Culverts and Drains."

Provide Reinforced Concrete Pipe (RCP) in accordance with Item 464 "Reinforced Concrete Pipe."

Provide Thermoplastic Pipe (TP) in accordance with Special Specification Thermoplastic Pipe.

Payment for grouted connections is considered subsidiary to other bid Items.

Texas Department of Transportation

Bridge Division Standard

PIPE AND BOX GROUTED CONNECTIONS FOR PRECAST STRUCTURES

PBGC

FILE:	DN: TxDOT	CK: TAR	DW: JTR	CK: TAR
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
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	AMA	POTTER		079

DATE: 12/8/2023 8:34:41 AM
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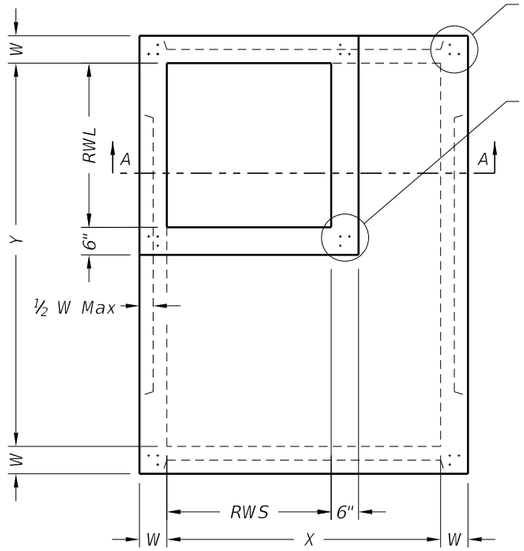
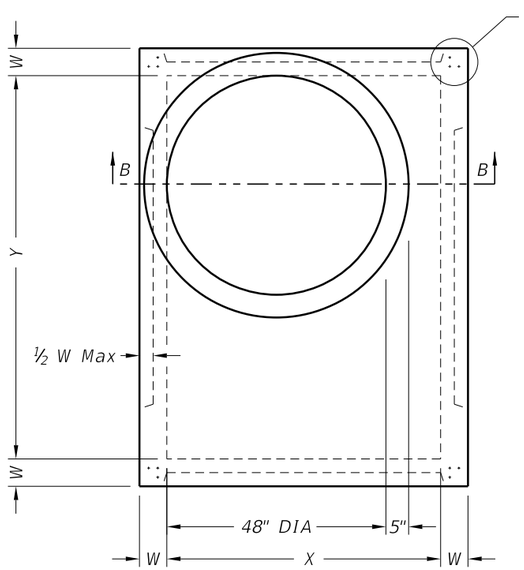
Vidal.Ngoumnai



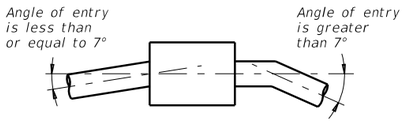
PLAN VIEW "A"

SQUARE REDUCED RISER OPTION



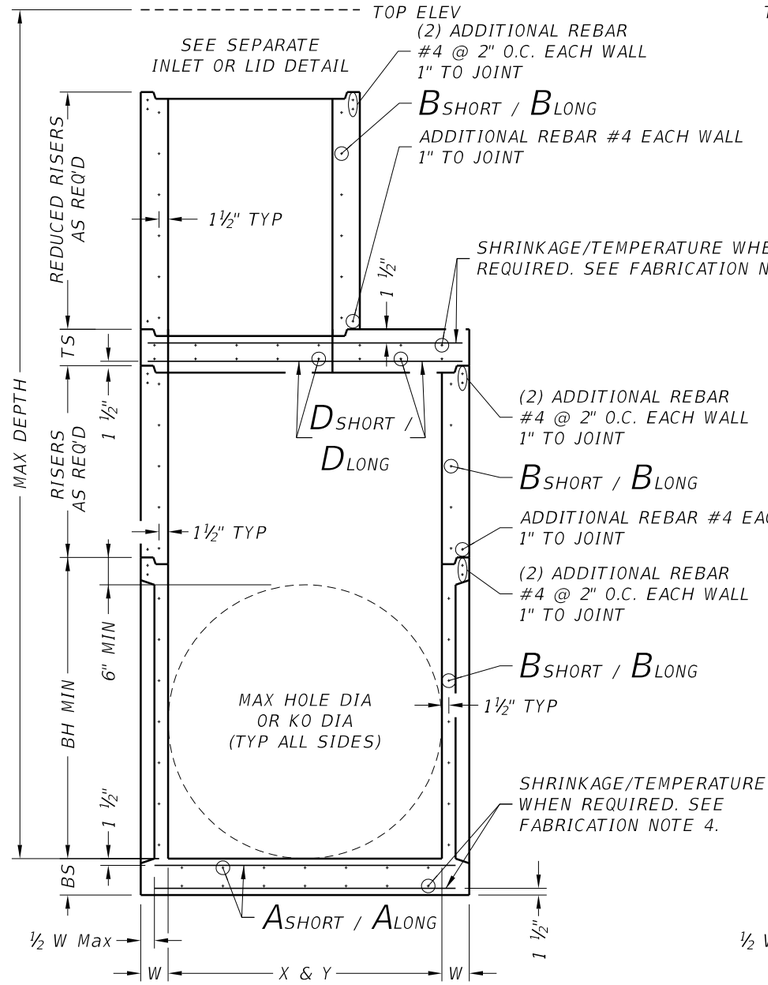
PLAN VIEW "B"

ROUND REDUCED RISER OPTION



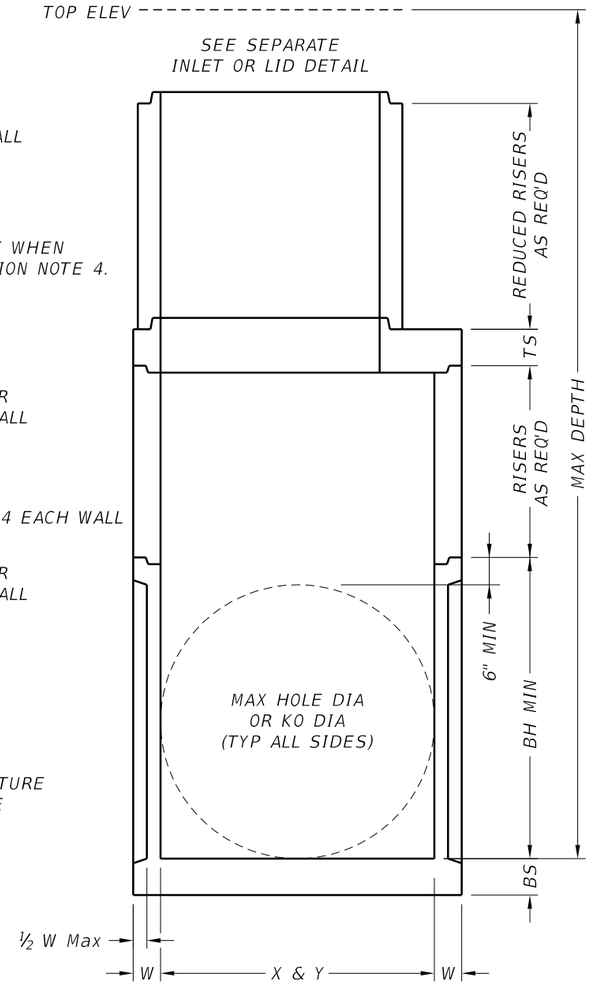
PIPE CONNECTION DETAIL

Connect pipes within 7° of normal to PB wall.
If necessary, use pipe elbow or curved
approach alignment to stay within this limit.



SECTION A-A

SQUARE REDUCED RISER OPTION



SECTION B-B

ROUND REDUCED RISER OPTION

FABRICATION NOTES:

1. Provide Class "H" concrete in accordance with Item 421 and having a minimum compressive strength of 5,000 psi.
2. Provide Grade 60 reinforcing steel or equivalent area of WWR.
3. Provide typical clear cover of 1 ½" to reinforcing steel at interior or exterior walls.
4. Walls or slabs with a thickness of 8" or greater require shrinkage and temperature reinforcing steel. Provide steel area = 0.11 in²/ft each way.
5. No substitution is allowed for vertical and horizontal #4 bars in corners.
6. Manufacture base and risers to nearest 3" increment.
7. Design tongue and groove joints for full closure on both shoulders. Minimum spigot depth is ¾".
8. Provide lifting devices in conformance with Manufacturer's recommendations.
9. See sheet PDD for sizes, dimensions, and reinforcing steel not shown.

INSTALLATION NOTES:

1. If required elsewhere. Inverts (benching) to be provided by Contractor. Concrete or mortar used for invert is subsidiary to specified inlet or manhole.
2. Seal tongue and groove joints with preformed or bulk mastic in conformance with Manufacturer's recommendations. Tongue and groove joints may be grouted no more than 1" between each section, or ½ the joint depth, whichever is greater.
3. Do not grout rubber gasket joints without Manufacturer's recommendation.
4. For rigid pipe, cut hole in thin wall panel (KO) 4" Max, 2" Min larger than pipe OD.
5. For flexible pipe, consult boot/seal Manufacturer's specification for placement tolerance and hole size. Center pipe in hole and install boot/seal per Manufacturer's specification.

GENERAL NOTES:

1. Precast Base consists of base slab, base unit, risers (as required), reducing slab (as required), and reduced risers (as required). See sheet PDD for sizes.
2. Designed according to ASTM C913.
3. Payment for precast base is subsidiary to the specified inlet, per Item 465, "Junction Boxes, Manholes, and Inlets."

Cover dimensions are clear dimensions, unless noted otherwise.

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PRECAST BASE

PB

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©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0090	05	107	IH40
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	AMA	POTTER		080

DATE: 12/8/2023 8:34:49 AM
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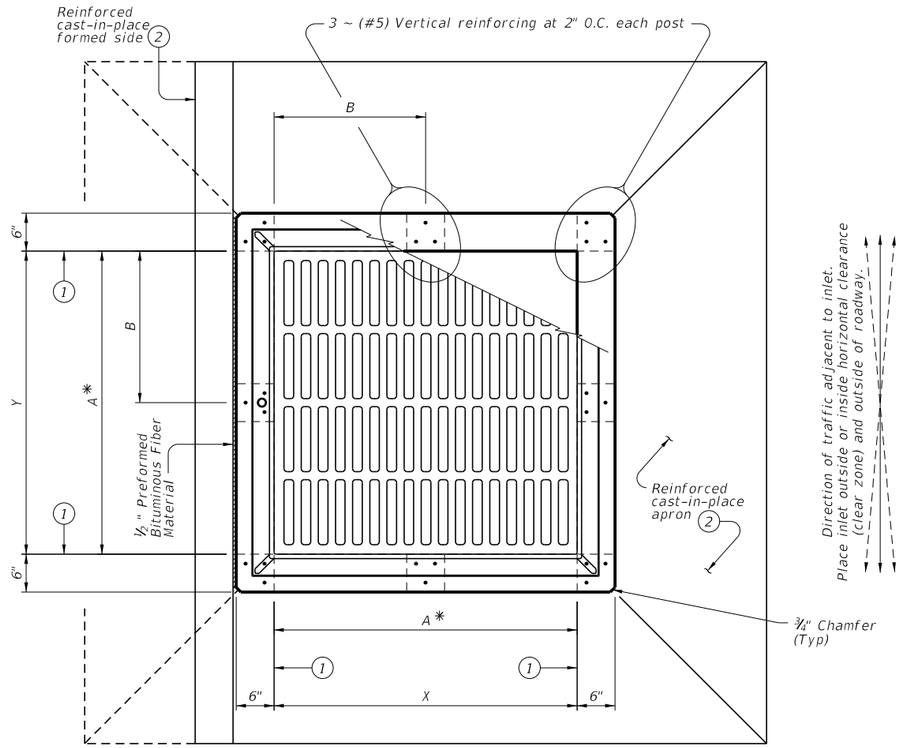
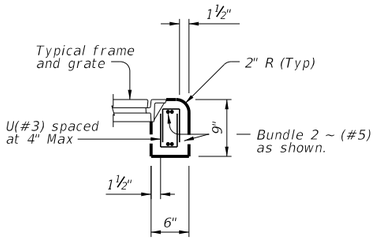
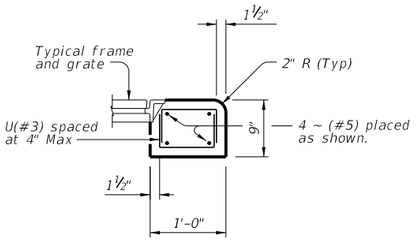
USER: Vidal.Ngoumnai@TxDOT.gov



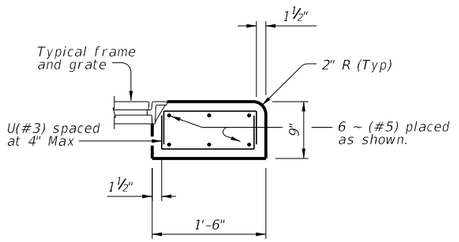
PLAN VIEW ~ STYLE 'FG' (3)



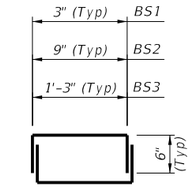
SECTION A-A ~ BS1



SECTION A-A ~ BS2



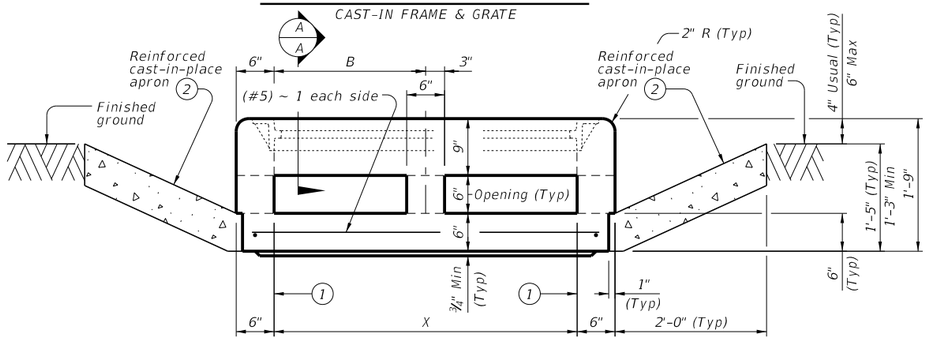
SECTION A-A ~ BS3



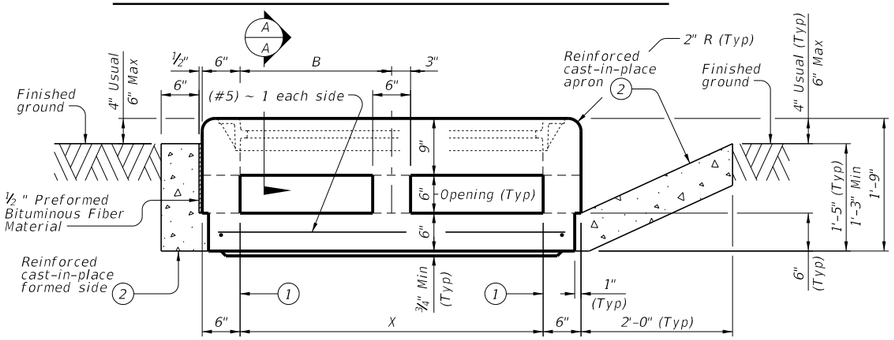
BARS U (#3)
Showing one complete bar.

Style	Size (X x Y)	A x A *	B x B	Beam Section
FG	3'x3'	3'x3'	1.5'x1.5'	BS1
FG	4'x4'	3'x3'	2'x2'	BS2
FG	4'x4'	4'x4'	2'x2'	BS1
FG	5'x5'	3'x3'	2.5'x2.5'	BS3
FG	5'x5'	4'x4'	2.5'x2.5'	BS2

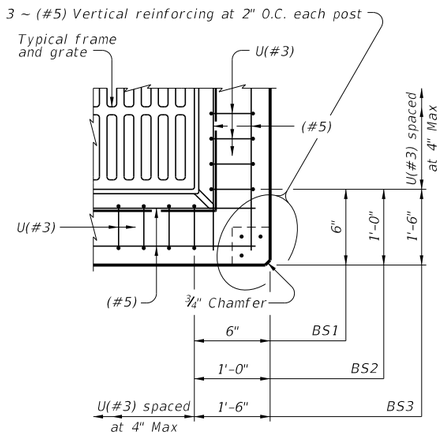
* Nominal frame/grate size.



ELEVATION VIEW WITHOUT FORMED SIDE (4)



ELEVATION VIEW WITH FORMED SIDE (4)



TYPICAL CORNER REINFORCING PLAN DETAIL
Showing BS2 other beam sections similar.

(1) Matches inside face of wall of precast base or riser below inlet.

(2) Construct cast-in-place reinforced concrete with or without formed side. Place formed side/sides as directed elsewhere in the plans. Formed sides may only be used on sides parallel to traffic. Use Class "C" concrete. Apron and formed side reinforcing not shown for clarity. Apron and formed side are subsidiary to PAZD-CZ. Apron is 2'-0" width around precast zone drain, unless an optional formed side is used. For apron and formed side, provide (#4) reinforcing at 12" O.C.

(3) Top slab reinforcing not shown for clarity.

(4) Top slab reinforcing and post reinforcing not shown for clarity.

FABRICATION NOTES:

1. Provide Class "H" concrete in accordance with Item 421 and having a minimum compressive strength of 5,000 psi.
2. Provide Grade 60 reinforcing steel or equivalent area of WWR.
3. Provide clear cover of ¾" to reinforcing from bottom of slab and 2" to reinforcing from top of slab for structural reinforcement.
4. Provide 1 ½" end cover on (#5) reinforcing.
5. Design tongue and groove joints for full closure on both shoulders. Minimum spigot depth is ¾".
6. Provide lifting devices in conformance with Manufacturer's recommendations.

INSTALLATION NOTES:

1. Precast Area Zone Drain within Clear Zone (PAZD-CZ) is for use in ditches and medians outside and inside of the horizontal clearance (clear zone). PAZD-CZ is never placed in the roadway.
2. Seal tongue and groove joints with preformed or bulk mastic in conformance with Manufacturer's recommendations. Tongue and groove joints may be grouted no more than 1" between each section, or ½ the joint depth, whichever is greater.
3. Do not grout rubber gasket joints without Manufacturer's recommendation.

GENERAL NOTES:

1. Designed according to ASTM C913.
2. Payment for inlet is per Item 465, "Junction Boxes, Manholes, and Inlets" by type, style, size, and opening size (when applicable).

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

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Bridge Division Standard

PRECAST AREA ZONE DRAIN WITHIN CLEAR ZONE

PAZD-CZ

FILE:	DN: SDC	CK: TAR	DW: JTR	CK: SDC
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0090	05	107	IH40
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	AMA	POTTER		081

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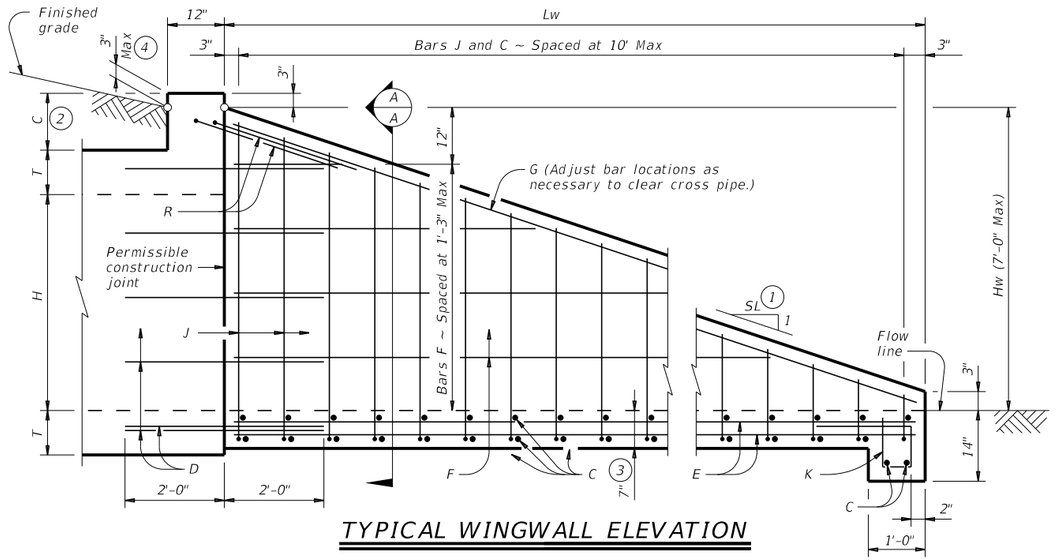
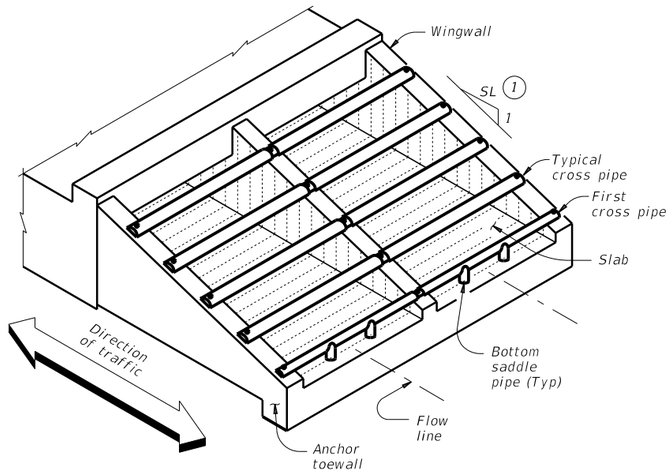


TYPICAL WINGWALL ELEVATION

(Cross pipes not shown for clarity.)



ISOMETRIC VIEW OF TYPICAL INSTALLATION

(Showing bolted anchor option.)

WING DIMENSION CALCULATIONS:

$Hw = H + T + C - 0.250'$

$Lw = (Hw - 0.250')\ (SL)$

For cast-in-place culverts:

$Atw = (N)\ (S) + (N + 1)\ (U)$

For precast culverts:

$Atw = (N)\ (2U + S) + (N - 1)\ (0.500')$

Total Wingwall Area (SF)
$= (0.5)\ (Hw + 0.250')\ (Lw)\ (N - 1)$

Total Concrete Volume (CY)
$= [(\text{Wingwall Area})\ (0.583') +$
$(Lw)\ (Atw)\ (0.583') +$
$(Atw)\ (1.000')\ (1.167' - 0.583')] \div (27)$

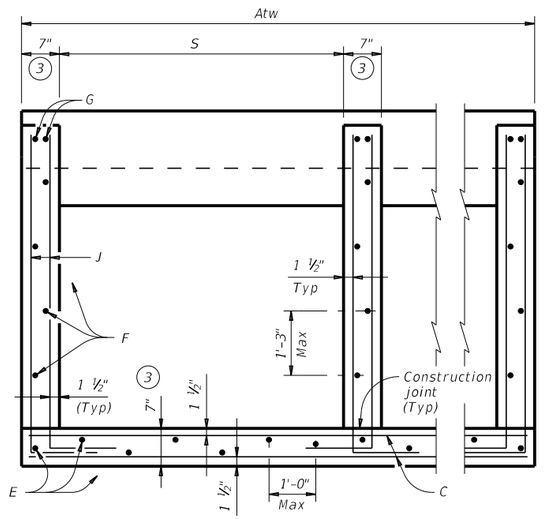
Total Reinforcing (Lb)
$= (1.55)\ (Lw)\ (Atw) +$
$(4.43)\ (Atw) +$
$(K)\ (Hw)\ (N + 1)\ (\sqrt{Lw})$

C = Height of curb above top of top slab (feet)
Hw = Height of wingwall (feet)
K = Constant value for use in formulas

Slope SL:1	K
6:1 ~	10.41

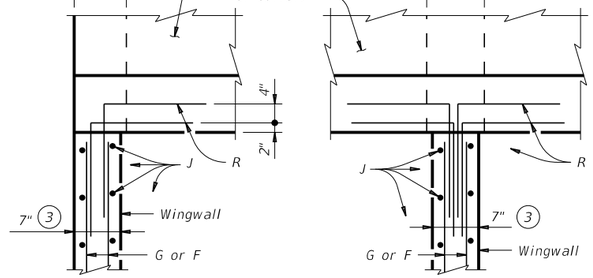
Atw = Anchor toewall length (feet)
Lw = Length of wingwall (feet)
N = Number of culvert barrels
SL:1 = Side slope ratio (horizontal : 1 vertical)

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



SECTION A-A

(Showing typical wingwall and wing slab reinforcing. Pipe runners not shown for clarity.)

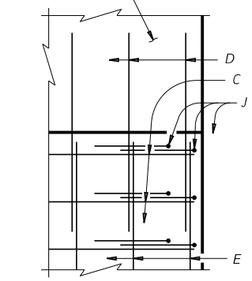


AT TOP OF EXTERIOR WINGWALL

(Cast-in-place culvert)

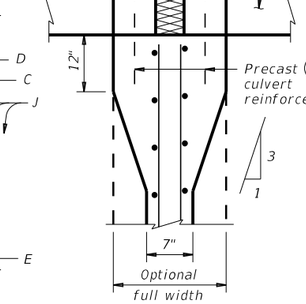
AT TOP OF INTERIOR WINGWALL

(Cast-in-place culvert)



AT OUTSIDE OF BOTTOM SLAB

(Cast-in-place culvert)



AT INTERIOR WINGWALL

(Precast culvert)

PLAN VIEWS OF CORNER DETAILS

MATERIAL NOTES:

Provide Grade 60 reinforcing steel.
Provide galvanized reinforcing steel if required elsewhere in the plans.
Adjust reinforcing as necessary to provide a minimum clear cover of 1½".
Provide Class "C" concrete (f`c = 3,600 psi).
Provide pipe runners, cross pipes, and anchor pipes meeting the requirements of ASTM A53 (Type E or S, Gr B), ASTM A500 Gr B, or API 5LX52.
Provide ASTM A307 bolts.
Galvanize all steel components, except the concrete reinforcing, unless required elsewhere in the plans, after fabrication.
Repair galvanizing damaged during transport or construction in accordance with Item 445, "Galvanizing."

GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications.
The safety end treatments shown herein are intended for use in those installations where out of control vehicles are likely to traverse the openings approximately perpendicular to the cross pipes.
Cross pipes are designed for a traversing load of 10,000 pounds at yield as recommended by Research Report 280-2F, "Safety Treatment of Roadside Parallel-Drainage Structures", Texas Transportation Institute, March 1981.
The quantities for concrete, reinforcing steel, and cross pipes resulting from the formulas given herein are for Contractor's information only.
See the Box Culvert Supplement (BCS) standard sheet for additional dimensions and information.
Alternate design drawings bearing the seal of a professional engineer will be acceptable for precast construction of the safety end treatments.

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

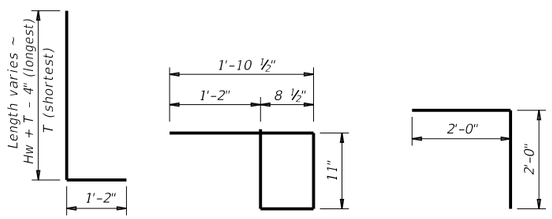


TABLE OF REINFORCING BAR SIZES AND SPACING		
Bar	Size	Spacing
C	#4	10" Max
D	#4	Match F and E
E	#4	1'- 0" Max
F	#4	1'- 3" Max
G	#6	As shown
J	#4	10" Max
K	#4	1'- 0" Max
R	#4	As shown

1. Provide 6:1 or flatter slope.
2. 0" Min to 5'-0" Max. Estimated curb heights are shown elsewhere in the plans. For structures without railing and curbs taller than 1'-0", refer to Extended Curb Details the Extended Curb Details (ECD) standard sheet.
3. Wingwall and slab thicknesses may be the same as the adjacent culvert wall and slab thicknesses (7" Minimum). If thicknesses greater than the minimum (7") are used, no changes will be made in quantities and no additional compensation will be allowed.
4. For vehicle safety, reduce height, if necessary, to provide a maximum 3" projection above finished grade. No changes will be made in quantities and no additional compensation will be allowed for this work.
5. For culverts with C = 0", the precast culvert reinforcing may extend 1'-0" minimum into wingwall. Wingwall bars D and R may be omitted. Otherwise, refer to the Wingwall Connection detail on the Box Culvert Precast Miscellaneous Details (SCP-MD) standard sheet.

SHEET 1 OF 2

Texas Department of Transportation

Bridge Division Standard

SAFETY END TREATMENT

FOR BOX CULVERTS (MAXIMUM Hw = 7'-0") TYPE I ~ PARALLEL DRAINAGE

SETB-PD

FILE: setbpdse-22.dgn	DN: GAF	CK: CAT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS 06-2022 ~ Wing dimesions	0090	05	107	IH40
	DIST	COUNTY		SHEET NO.
	AMA	POTTER		082

REQUIRED PIPE SIZES (8)

Culvert Span Sizes	Cross Pipe Size	Sleeve Pipe Size (9)
First Pipe	3 ½" STD	2 ½" STD
30" to 42"	4" STD	3" STD
48" to 72"	5" STD	4" STD
78" to 120"	6" STD	5" STD

STANDARD PIPE SIZES

Pipe Size	Pipe O.D.	Pipe I.D.
2 ½" STD	2.875"	2.469"
3" STD	3.500"	3.068"
3 ½" STD	4.000"	3.548"
4" STD	4.500"	4.026"
5" STD	5.563"	5.047"
6" STD	6.625"	6.065"

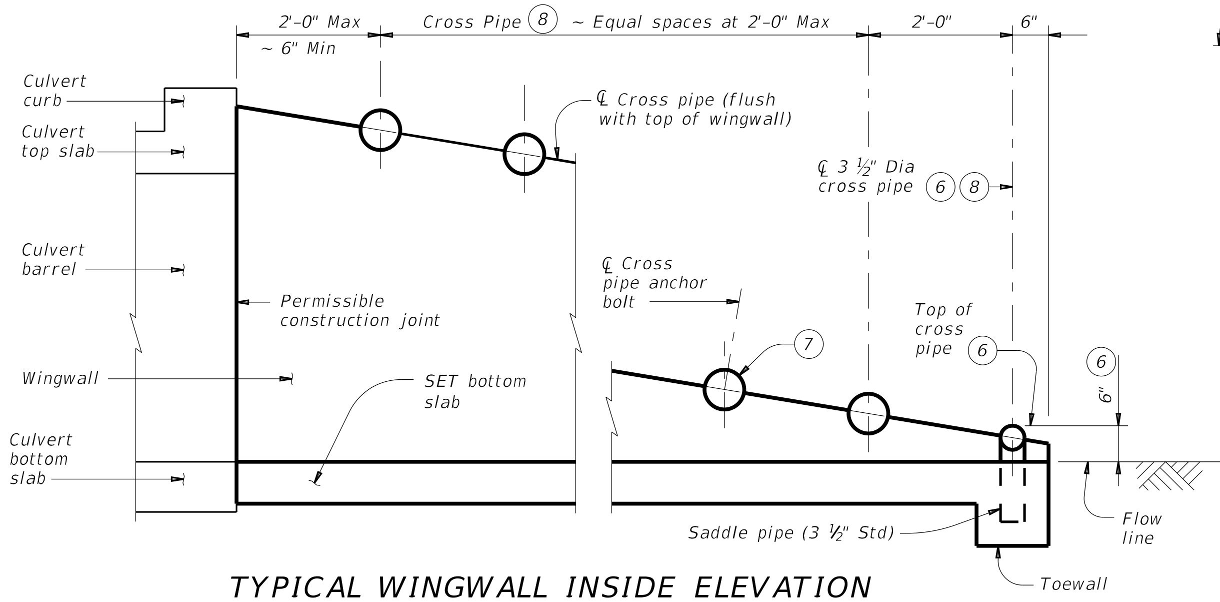
(6) The proper installation of the first cross pipe is critical for vechicle saftey. Place the top of the first cross pipe at no more than 6" above the flow line.

(7) Always install the third cross pipe from the bottom of the culvert using a bolted connection. Take care to ensure that concrete does not flow into this cross pipe so as to permit disassembly of the bolted connection to allow cleanout access.

(8) Provide cross pipes and sleeve pipes (if required) as shown in the Required Pipe Sizes table. Provide 3 1#2" saddle pipes for the 3 1#2" first cross pipe.

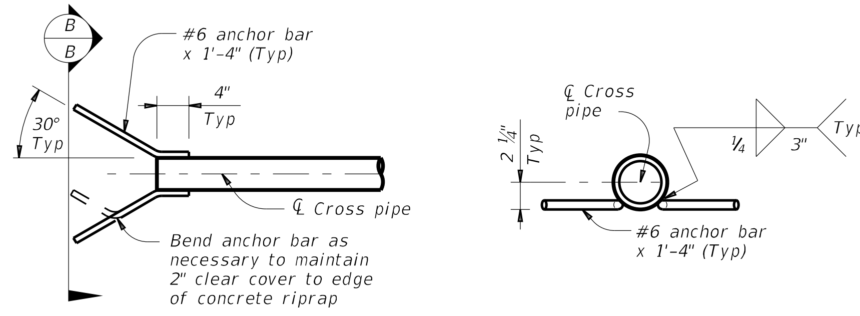
(9) At Contractor's option, make the cross pipe continuous across the inside wingwalls. If this option is selected, omit the sleeve pipe and make a 15#16" diameter throughhole in the cross pipe to accept the anchor bolt at the centerline of each interior wingwall.

(10) Provide riprap when using the Optional Anchor Bar details. Riprap is included in the bid price for Safety End Treatment. Provide riprap in accordance with Item 432, "Riprap".

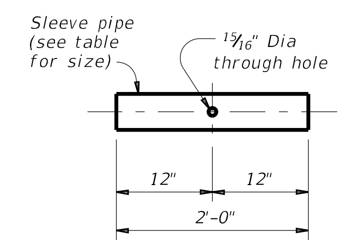


TYPICAL WINGWALL INSIDE ELEVATION

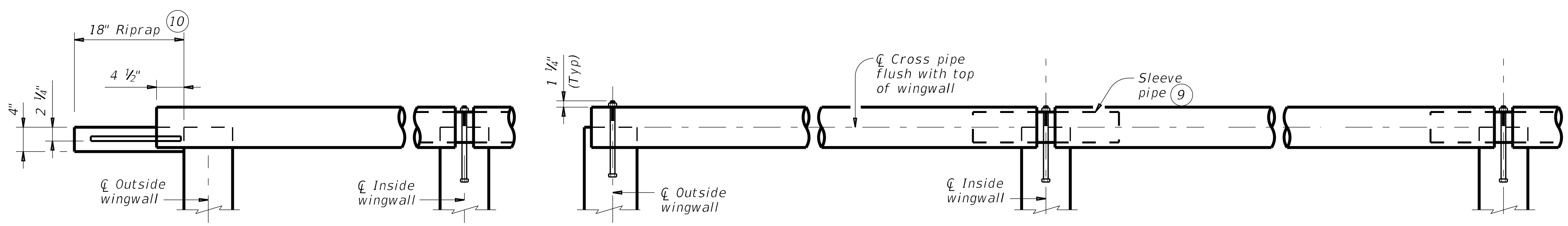
(Showing installation of cross pipes.)



OPTIONAL ANCHOR BAR DETAILS

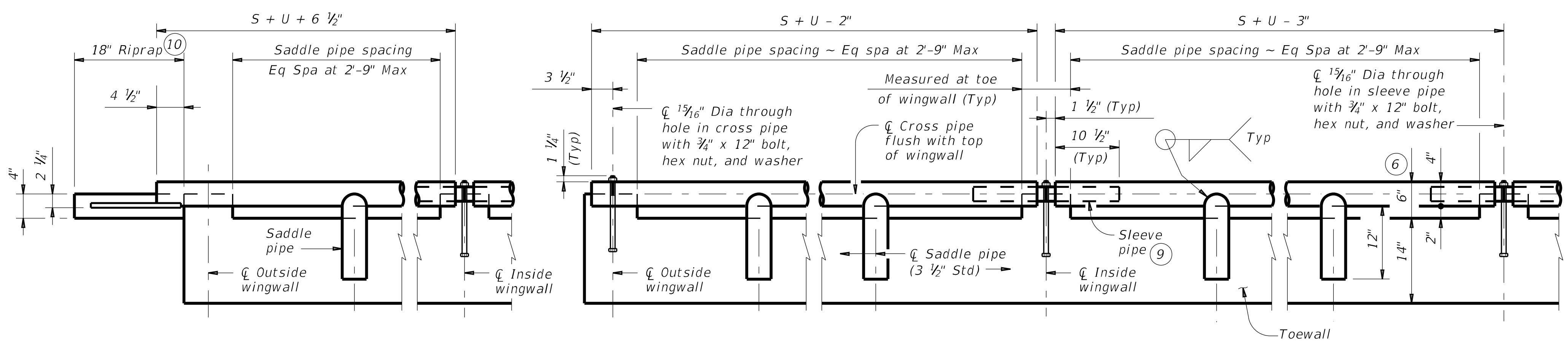


SLEEVE PIPE DETAILS (9)



SECTION THROUGH INSTALLATION OF TYPICAL FULL CROSS PIPE

(Anchor details and dimensions are similar to those shown below in Section Through Installation of 3 ½" First Cross Pipe detail.)



SECTION THROUGH INSTALLATION OF 3 ½" FIRST CROSS PIPE

OUTSIDE CULVERT BARREL WITH OPTIONAL ANCHOR BARS & RIPRAP

OUTSIDE CULVERT BARREL WITH BOLTED ANCHOR

INSIDE CULVERT BARREL

CROSS PIPE INSTALLATION DETAILS

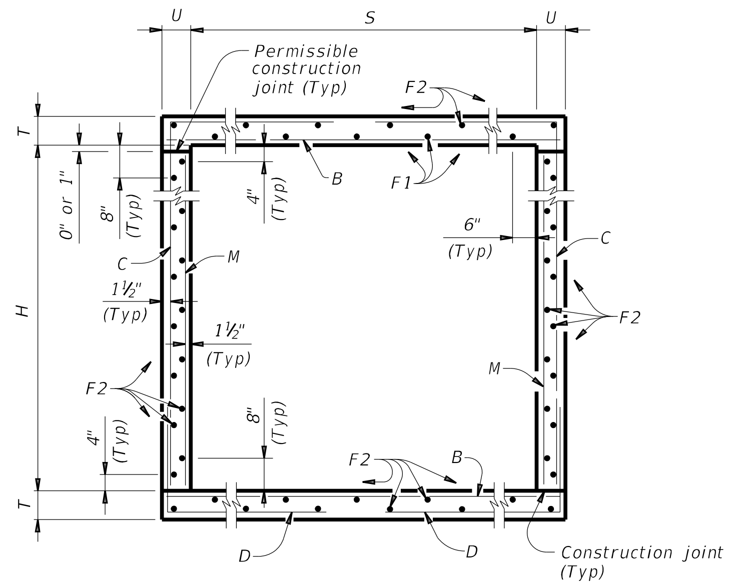
DATE: Vidal.Ngoumnai 12/8/2023 8:35:02 AM
FILE: pw:\vidal.ngoumnai@bridgeformer.com\dms21419\SAFETY END TREATMENT TYPE I SETB-PD 02.dgn

Texas Department of Transportation — Bridge Division Standard

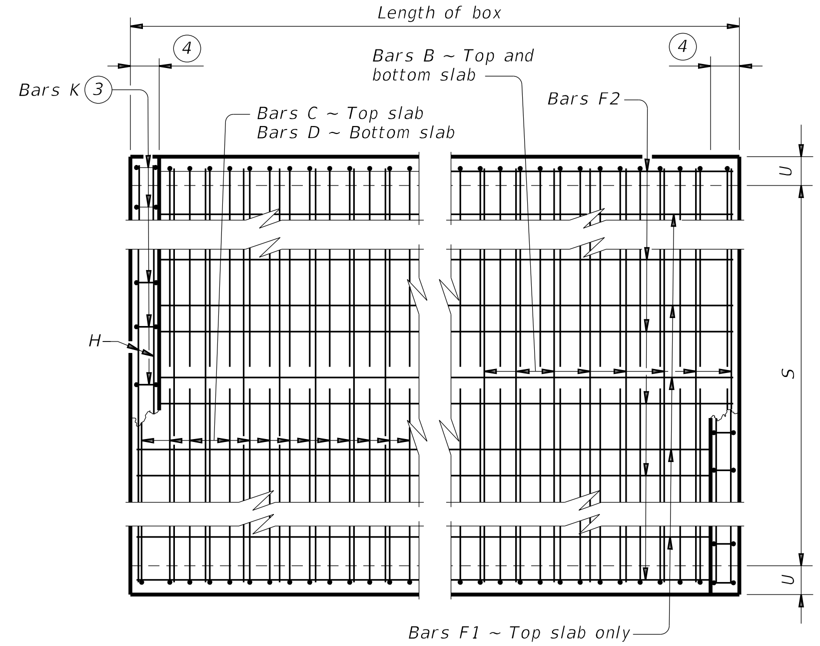
SAFETY END TREATMENT
FOR BOX CULVERTS
(MAXIMUM Hw = 7'-0")
TYPE I ~ PARALLEL DRAINAGE

SETB-PD

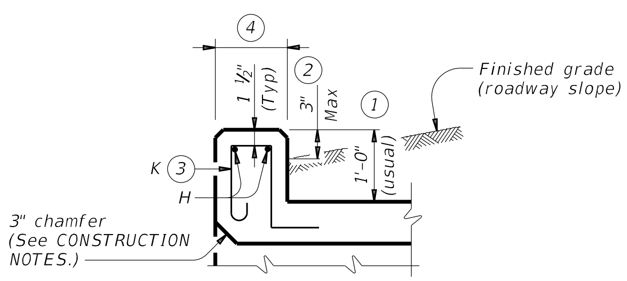
FILE: setbpdse-22.dgn	DN: GAF	CK: CAT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT 0090	SECT 05	JOB 107	HIGHWAY IH40
REVISIONS 06-2022 ~ Wing dimesions	DIST AMA		COUNTY POTTER	SHEET NO. 083



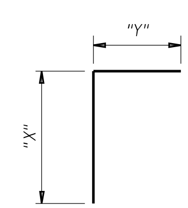
TYPICAL SECTION



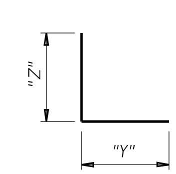
PLAN OF REINF STEEL



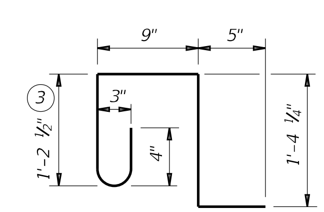
SECTION THRU CURB



BARS C



BARS D



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

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

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

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

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

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

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

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

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

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

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

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

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

DATE: Vidal.Ngoumnai 12/8/2023 8:35:09 AM
FILE: Former FILE: dms21419\SINGLE BOX CULVERTS CAST-IN-PLACE 0' TO 3' FILL SCC-3 & 4 (01).dgn

HL93 LOADING SHEET 1 OF 2

Texas Department of Transportation — Bridge Division Standard

SINGLE BOX CULVERTS CAST-IN-PLACE 0' TO 30' FILL

SCC-3 & 4

FILE: scc34ste-21.dgn	DN: TBE	CK: BMP	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0090	05	107	IH40
04/2021 Updated X values.	DIST		COUNTY	SHEET NO.
	AMA		POTTER	084

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

SECTION DIMENSIONS				FILL HEIGHT (5)	Bars B					Bars C						
S	H	T	U		No.	Size	Spa	Length	Weight	No.	Size	Spa	Length	Weight	" X "	" Y "
3' – 0"	2' – 0"	8"	7"	30'	108	#5	9"	3' – 11"	441	108	#4	9"	5' – 4"	385	2' – 6"	2' – 10"
3' – 0"	3' – 0"	8"	7"	30'	108	#5	9"	3' – 11"	441	108	#4	9"	6' – 4"	457	3' – 6"	2' – 10"
4' – 0"	2' – 0"	8"	7"	30'	108	#5	9"	4' – 11"	554	162	#4	6"	5' – 8"	613	2' – 6"	3' – 2"
4' – 0"	3' – 0"	8"	7"	30'	108	#5	9"	4' – 11"	554	162	#4	6"	6' – 8"	721	3' – 6"	3' – 2"
4' – 0"	4' – 0"	8"	7"	30'	108	#5	9"	4' – 11"	554	162	#4	6"	7' – 8"	830	4' – 6"	3' – 2"

SECTION DIMENSIONS		Bars D							Bars M ~ #4				Bars F1 ~ #4 at 18" Spa		
S	H	No.	Size	Spa	Length	Weight	" Y "	" Z "	No.	Spa	Length	Weight	No.	Length	Wt
3' – 0"	2' – 0"	108	#4	9"	5' – 1"	367	2' – 10"	2' – 3"	108	9"	2' – 0"	144	3	39' – 9"	80
3' – 0"	3' – 0"	108	#4	9"	5' – 1"	367	2' – 10"	2' – 3"	108	9"	3' – 0"	216	3	39' – 9"	80
4' – 0"	2' – 0"	162	#4	6"	5' – 5"	586	3' – 2"	2' – 3"	108	9"	2' – 0"	144	3	39' – 9"	80
4' – 0"	3' – 0"	162	#4	6"	5' – 5"	586	3' – 2"	2' – 3"	108	9"	3' – 0"	216	3	39' – 9"	80
4' – 0"	4' – 0"	162	#4	6"	5' – 5"	586	3' – 2"	2' – 3"	108	9"	4' – 0"	289	3	39' – 9"	80

SECTION DIMENSIONS		Bars F2 ~ #4 at 18" Spa			Bars H 4 ~ #4		Bars K		QUANTITIES: Per Foot of Barrel		Curb		Total	
S	H	No.	Length	Weight	Length	Wt	No.	Wt	Conc (CY)	Reinf (Lb)	Conc (CY)	Reinf (Lb)	Conc (CY)	Reinf (Lb)
3' – 0"	2' – 0"	19	39' – 9"	505	3' – 11"	10	10	28	0.292	48.1	0.3	38	12.0	1,960
3' – 0"	3' – 0"	23	39' – 9"	611	3' – 11"	10	10	28	0.335	54.3	0.3	38	13.7	2,210
4' – 0"	2' – 0"	21	39' – 9"	558	4' – 11"	13	12	33	0.342	63.4	0.4	46	14.1	2,581
4' – 0"	3' – 0"	25	39' – 9"	664	4' – 11"	13	12	33	0.385	70.5	0.4	46	15.8	2,867
4' – 0"	4' – 0"	25	39' – 9"	664	4' – 11"	13	12	33	0.428	75.1	0.4	46	17.5	3,049

(5) For direct traffic culverts (fill height ≤ 2 ft.), identify the required box size and select the option with the minimum fill height.

DATE: Vidal.Ngoumnai 12/8/2023 12:37:47 PM
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HL93 LOADING SHEET 2 OF 2

Texas Department of Transportation — Bridge Division Standard

SINGLE BOX CULVERTS CAST-IN-PLACE 0' TO 30' FILL

SCC-3 & 4

FILE: scc34ste-21.dgn	DN: TBE	CK: BMP	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS: 04/2021 Updated X values.	0090	05	107	IH40
	DIST	COUNTY		SHEET NO.
	AMA	POTTER		085

DATE: 12/8/2023 8:35:22 AM
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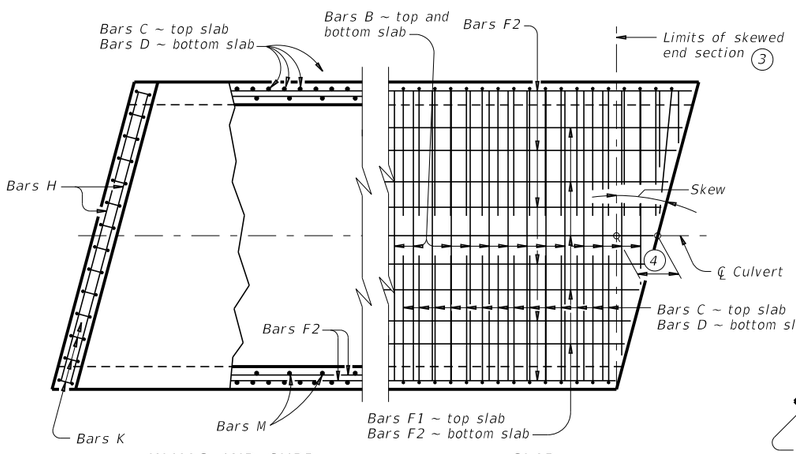
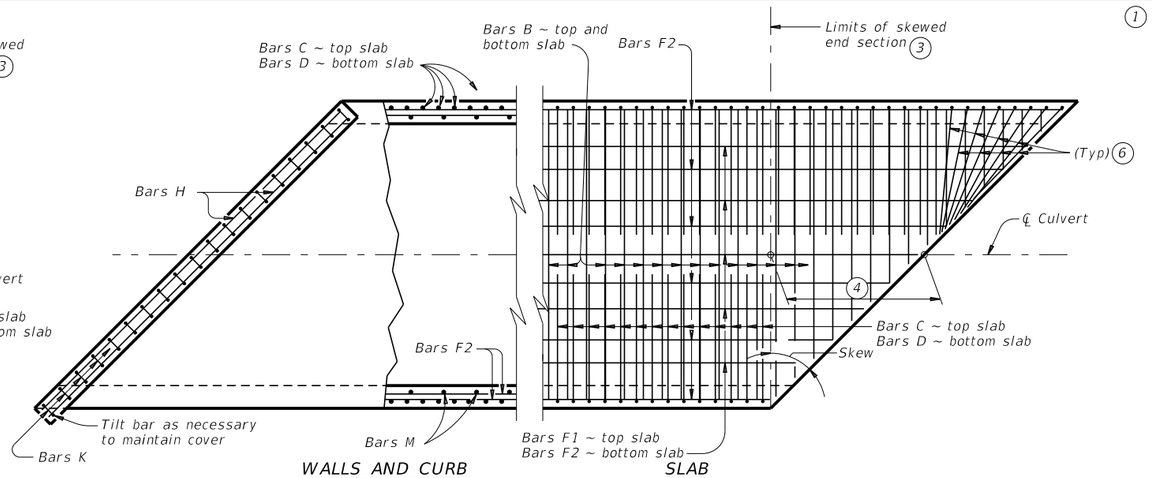
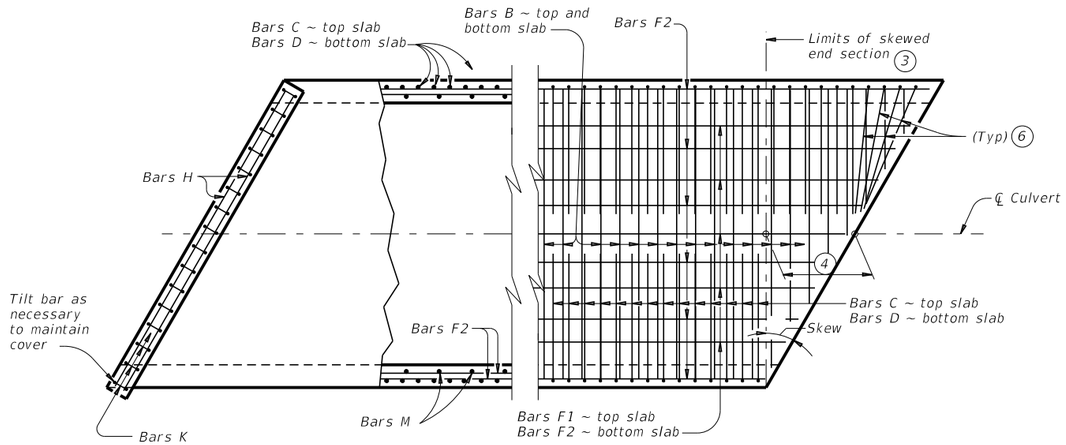
Vidal.Ngoumnai



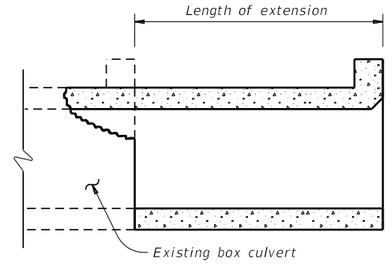
PLAN OF SKEWED ENDS ~ FROM 0° TO 15° (7)



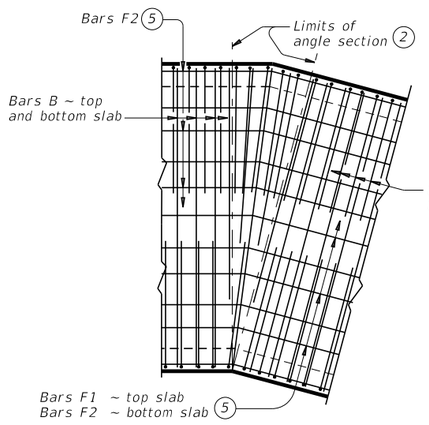
PLAN OF SKEWED ENDS ~ OVER 30° TO 45°



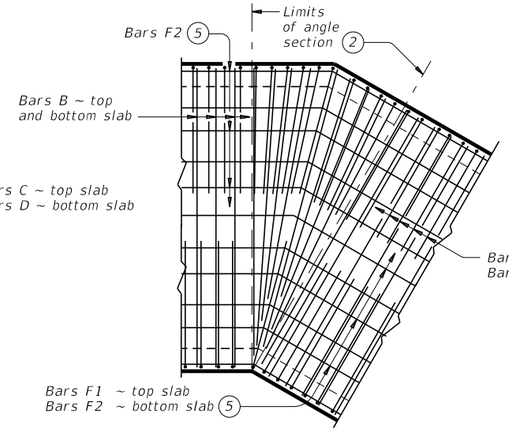
PLAN OF SKEWED ENDS ~ OVER 15° TO 30°



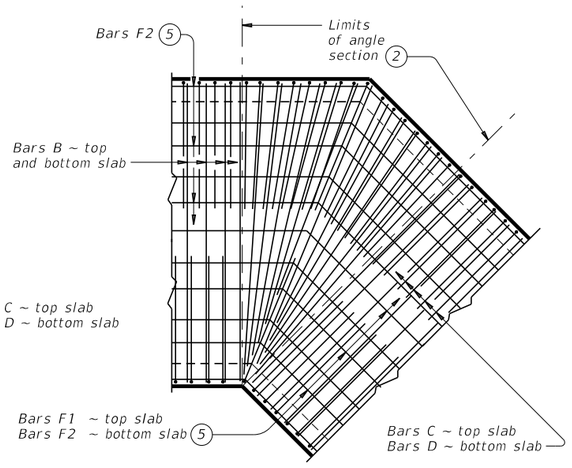
LENGTHENING DETAIL (1)



PLAN OF ANGLE SECTION ~ FROM 0° TO 15°



PLAN OF ANGLE SECTION ~ OVER 15° TO 30°



PLAN OF ANGLE SECTION ~ OVER 30° TO 45°

(1) For skewed box culverts with less than 2'-0" of fill, break back the top slab to provide a 1'-10" minimum lap of the existing longitudinal bars with the longitudinal bars in the extension.

For non-skewed box culverts with less than 2'-0" of fill and for skewed or non-skewed culverts with a fill depth of 2'-0" or greater, break back the top slab to provide a 1'-10" minimum lap of the existing longitudinal bars with the longitudinal bars in the extension. Alternatively, if the box is non-skewed, embed #6 anchor bars with a Type III, C, D , E, or F anchor adhesive into the existing walls, top and bottom slab at 1'-6" center-to-center spacing. Minimum embedment depth is 8". Anchor adhesive chosen must be able to achieve a basic bond strength in tension, Nba, of 26.4 kips. Submit signed and sealed calculations or the manufacturer's published literature showing the proposed anchor adhesive's ability to develop this load to the Engineer for approval prior to use. Anchor installation, including hole size, drilling, and clean out, must be in accordance with Item 450, "Railing." Test adhesive anchors in accordance with Item 450.3.3, "Tests." Test 3 anchors per 100 anchors installed.

Break back wings and apron as necessary to install the extension. Clean and extend the exposed wingwall and apron reinforcing into the extension. When lengthening existing box culverts with dimensions different than current standard dimensions, form horizontal and vertical transitions as directed by the Engineer. Match bottom slabs to maintain an uninterrupted flow line. Field bend existing and new reinforcing into transitions and maintain specified cover requirements. For top slabs of culverts with overlay, with 1-to-2 course surface treatment, or with the top slab as the final riding surface, adjust the "H" dimension to provide a smooth riding surface.

(2) When the spacing between Bars B becomes less than half of the normal spacing, cut bars to avoid conflict.

(3) The length of Bars B vary in the skewed end sections.

(4) [One half of overall width] x [tangent of the skew angle]

(5) Place Bars F1 and F2 continuously through the angle section. Bend Bars F1 and F2 to remain parallel to the walls of the box culvert.

(6) When necessary to avoid conflict in acute corners, shorten the slab extension leg of Bars C and Bars D to a minimum of 1'-6" for skews of 30° thru 45°.

(7) At the Contractor's option, for skews of 15° or less, place Bars B, C, and D parallel to the skewed end while maintaining spacing along centerline of box. Increase lengths of Bars B shown on the Single Box Culverts Cast-In-Place (SCC) standards sheets to accommodate the skew.

CONSTRUCTION NOTES:

Do not use permanent forms.
When required, lap Bars H 1'-8" for uncoated or galvanized bars.
Provide a minimum of 1 ½" clear cover.

MATERIAL NOTES:

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

GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications.

Refer to Single Box Culverts Cast-in-Place (SCC) standard sheets for details of straight sections of culvert.

For skewed sections and angle sections, refer to Single Box Culverts Cast-in-Place (SCC) standard sheets for slab and wall dimensions, bar sizes, maximum bar spacing, and any other details not shown.

For skewed ends with curbs, adjust length of Bars H, number of Bars K, curb concrete volume, and reinforcing steel weight by dividing the values shown on the culvert Single Box Culverts Cast-In-Place (SCC) standard sheets by the cosine of the skew angle.

Cover dimensions are clear dimensions, unless noted otherwise.

HL93 LOADING

Texas Department of Transportation

Bridge Division Standard

SINGLE BOX CULVERTS CAST-IN-PLACE MISCELLANEOUS DETAILS

SCC-MD

FILE: sccmdste-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
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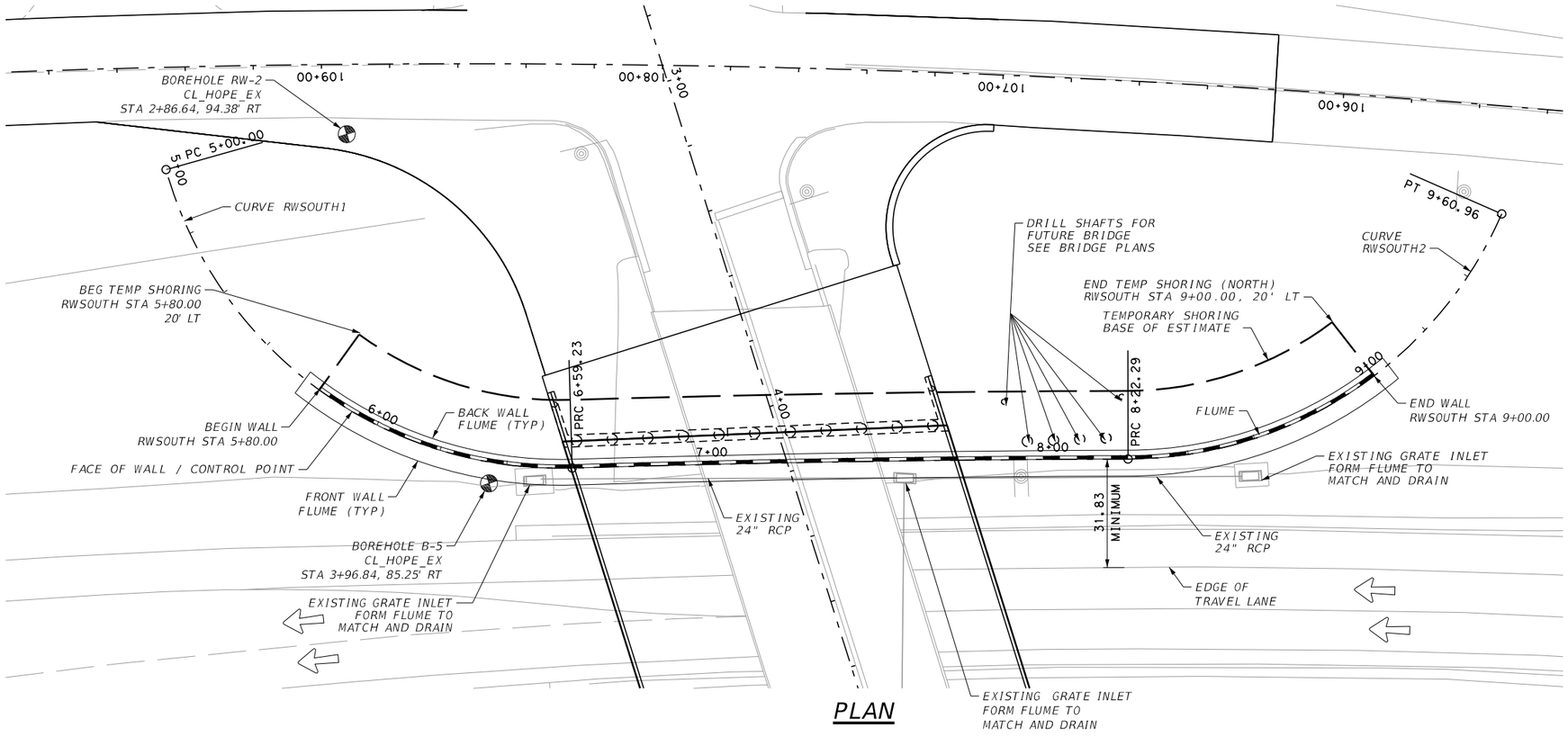
	DIST	COUNTY		SHEET NO.
	AMA	POTTER		086

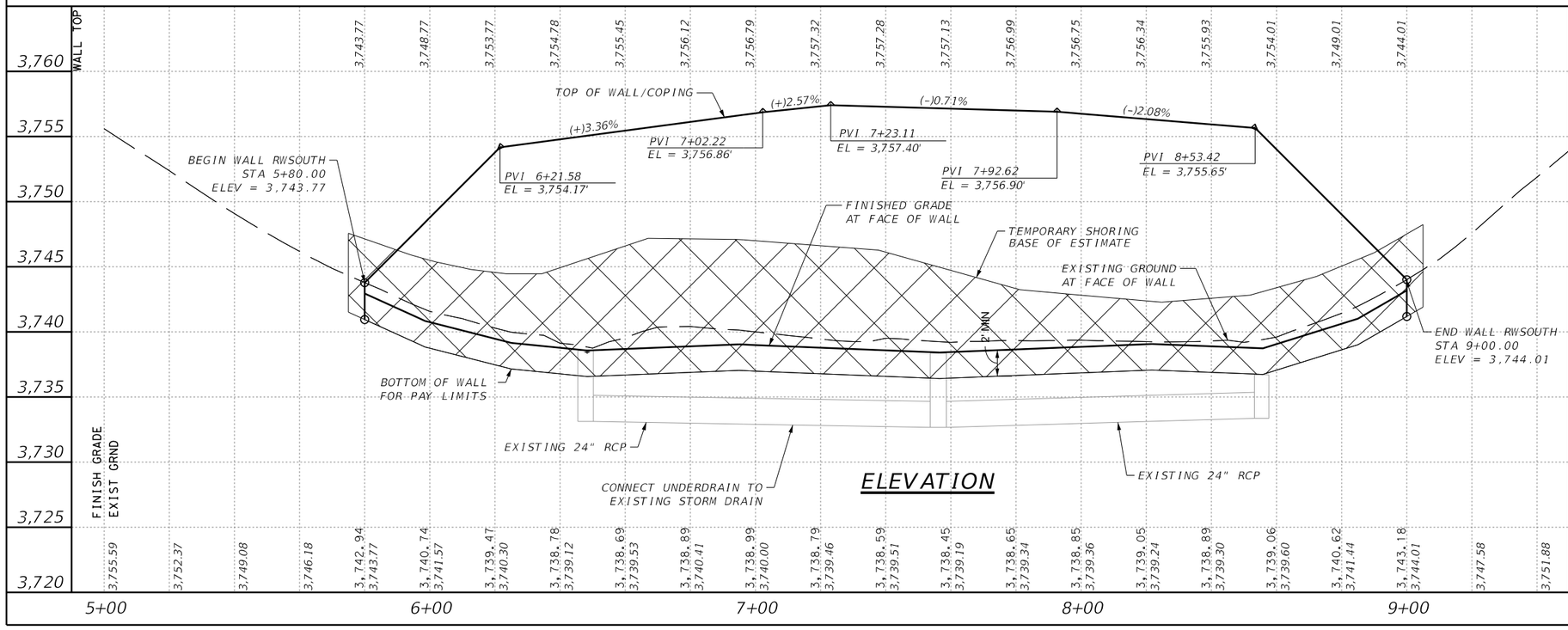


PLAN

20 0 20 40
SCALE: 1" = 40'

NOTES:

1. FOR TYPICAL SECTIONS, SEE RETAINING WALL DETAILS SHEETS.
2. INLETS AND STORM DRAIN PROFILE ARE SHOWN FOR REFERENCE.
3. PAYMENT FOR RETAINING WALL TRAFFIC RAILING FOUNDATIONS RW (TRF) AND COPING ARE SUBSIDIARY TO THE RETAINING WALL.
4. MINIMUM LENGTH OF REINFORCEMENT STRAPS IS THE GREATER OF: 8.0' MEASURED PERPENDICULAR TO THE WALL; OR AS NOTED ON THE RETAINING WALL DESIGN SHEET RW(MSE)DD.
5. MINIMUM STRAP LENGTH IS MEASURED PERPENDICULAR TO THE WALL. ADJUST SKEWED EARTH REINFORCEMENTS AS NECESSARY TO OBTAIN THE REQUIRED LENGTH.
6. WALL EMBEDMENT SHOULD BE NO LESS THAN 2.0 FEET BELOW FINISH GRADE, UNLESS OTHERWISE SHOWN ON THE PLANS.
7. SLOPE THE BASE OF WALL TOWARDS THE UNDERDRAIN. SEE RETAINING WALL DETAILS.
8. WALL SUBGRADE BELOW MSE REINFORCED ZONE IS TO BE PROOFROLLED PRIOR TO PLACING WALL BACKFILL AND REINFORCING. REPEAT SCARIFY AND RECOMPACT UNTIL THE AREA STABILIZES.
9. SQUARE FOOT AREA OF RETAINING WALL IS MEASURED FROM TOP OF RETAINING WALL TO TOP OF LEVELING PAD AS SHOWN. FOOTING ADJUSTMENTS MADE TO ACCOMMODATE OPTIONAL WALL TYPES OR FOR CONSTRUCTION CONVENIENCE WILL NOT BE MEASURED.
10. BACKFILL SHALL BE SELECT MATERIAL WITH GRADATION TYPE A MEETING THE REQUIREMENTS OF ITEM 423.
11. WHEN UNDERDRAIN OUTFALLS PIERCE THE BACK OF AN INLET, DRILL A CLEAN HOLE AND PATCH WITH HIGH STRENGTH GROUT TO SEAL FROM LEAKAGE. PAYMENT FOR THIS IS SUBSIDIARY TO ITEM 423.
12. THE CONTRACTOR MUST PERFORM A SOIL STABILITY ANALYSIS TO SUPPORT THE DESIGN OF THEIR PROPOSED TEMPORARY SPECIAL SHORING SYSTEMS.
13. CONTRACTOR TO PROVIDE SHOP DRAWINGS SHOWING A DETAILED DRAINAGE SYSTEM BEHIND THE WALL FOR ENGINEER'S APPROVAL. ALL COSTS ASSOCIATED WITH MATERIALS FOR THE DRAINAGE SYSTEM AND INSTALLATION IS SUBSIDIARY TO WALL ITEMS. CONTRACTOR SHALL FIELD VERIFY AND DETERMINE THE LOCATION OF THE UNDERDRAIN DURING PREPARATION OF THE SHOP DRAWINGS. THE UNDERDRAIN LOCATION SHALL BE SHOWN AND DETAILS SHALL BE SUBMITTED WITH THE SHOP DRAWINGS.
14. CMP USED FOR FUTURE BRIDGE DRILL SHAFTS IS TO BE FILLED WITH BACKFILL MATERIAL. PAYMENT FOR BACKFILL IS TO BE CONSIDERED SUBSIDIARY TO THE RETAINING WALL. SEE BRIDGE FOUNDATION LAYOUT FOR CMP LOCATIONS.
15. UNDERDRAIN ARE REQUIRED AND ARE CONSIDERED SUBSIDIARY TO THE RETAINING WALL.



ELEVATION

STATE OF TEXAS
KEMGOU NGOUMNAI
150735
LICENSED
PROFESSIONAL ENGINEER
12.11.23
Kemgou Ngoumnai PE

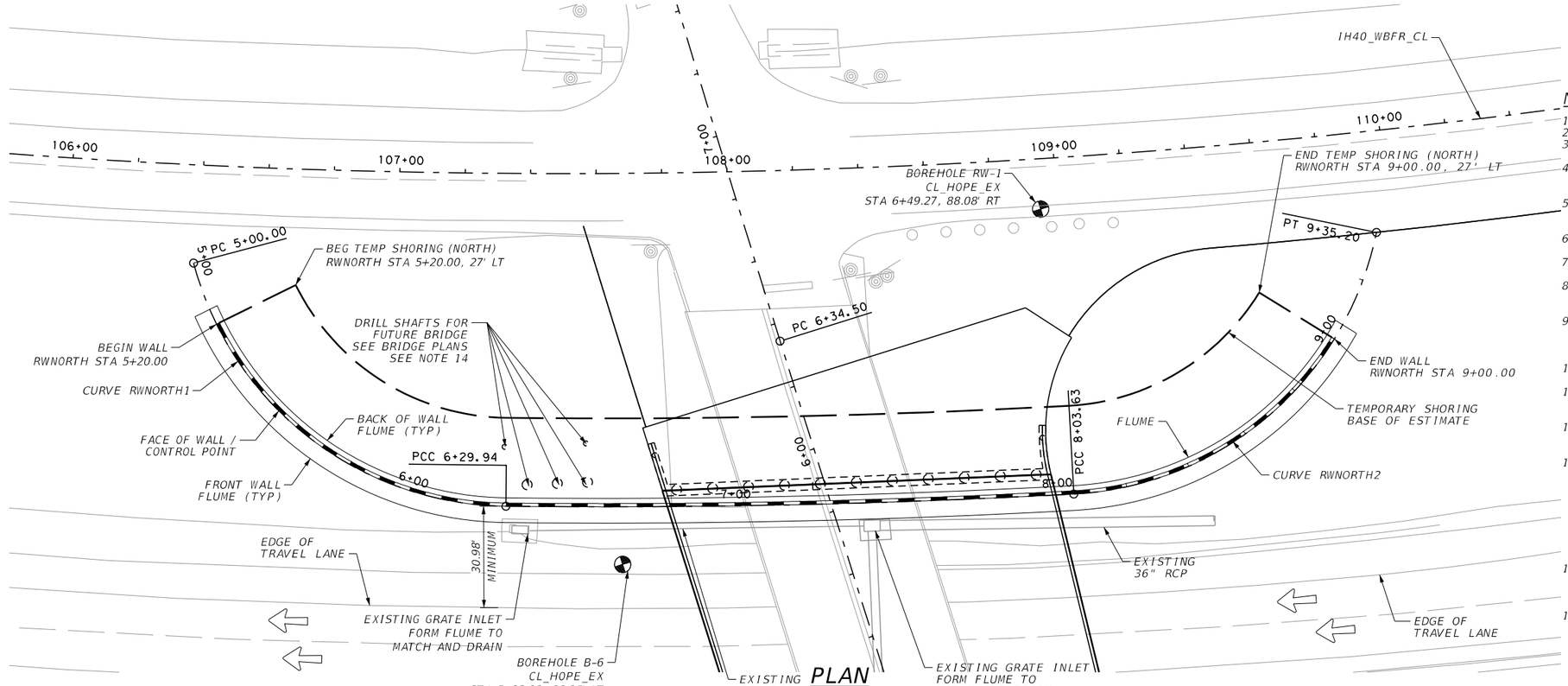
NO.	DATE	DESCRIPTION	APPROV.

BRIDGEFARMER & ASSOCIATES, INC.
CONSULTING ENGINEERS
TBPE REGISTRATION NO. 264

RETAINING WALL LAYOUT RWSOUTH

SHEET 1 OF 2

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DA	6	SEE TITLE SHEET		IH 40
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
JL	TEXAS	AMA	POTTER	087
CHECK	CONTROL	SECTION	JOB	
JL	0090	05	107	
CHECK				

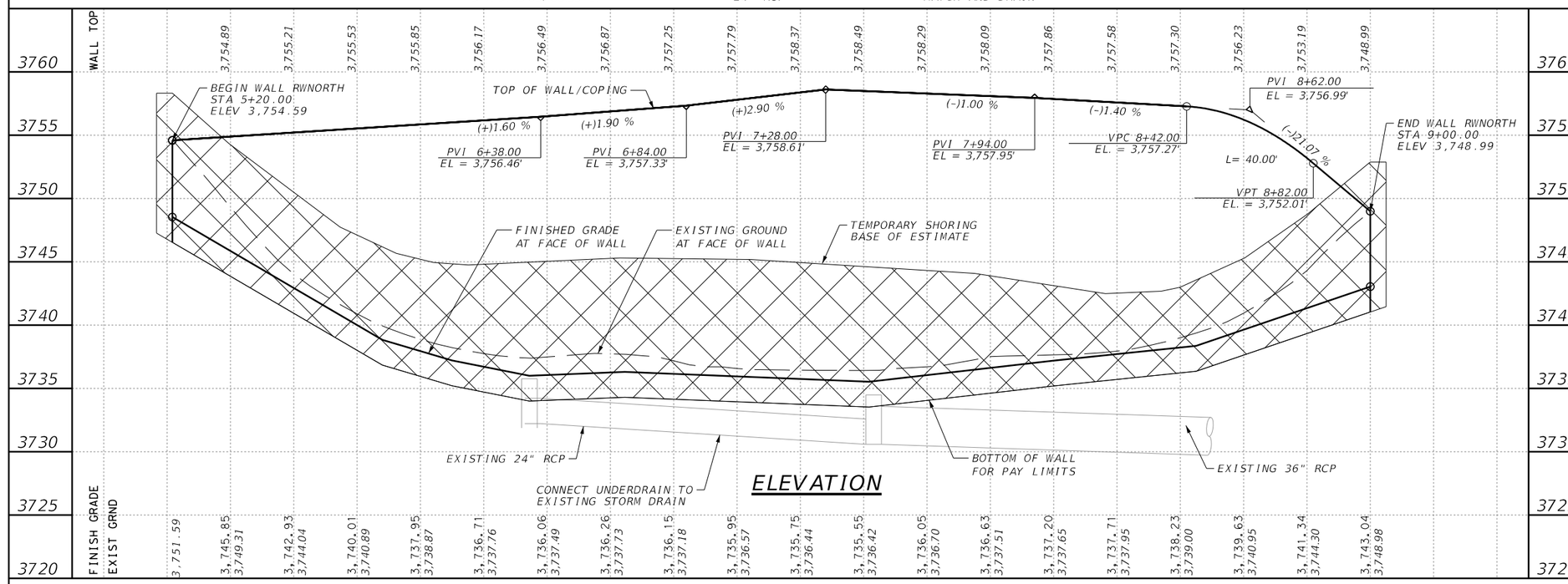


PLAN

20 0 20 40
SCALE: 1" = 40'

NOTES:

1. FOR TYPICAL SECTIONS, SEE RETAINING WALL DETAILS SHEETS.
2. INLETS AND STORM DRAIN PROFILE ARE SHOWN FOR REFERENCE.
3. PAYMENT FOR RETAINING WALL TRAFFIC RAILING FOUNDATIONS RW (TRF) AND COPING ARE SUBSIDIARY TO THE RETAINING WALL.
4. MINIMUM LENGTH OF REINFORCEMENT STRAPS IS THE GREATER OF: 8.0' MEASURED PERPENDICULAR TO THE WALL; OR AS NOTED ON THE RETAINING WALL DESIGN SHEET RW(MSE)DD.
5. MINIMUM STRAP LENGTH IS MEASURED PERPENDICULAR TO THE WALL. ADJUST SKEWED EARTH REINFORCEMENTS AS NECESSARY TO OBTAIN THE REQUIRED LENGTH.
6. WALL EMBEDMENT SHOULD BE NO LESS THAN 2.0 FEET BELOW FINISH GRADE, UNLESS OTHERWISE SHOWN ON THE PLANS.
7. SLOPE THE BASE OF WALL TOWARDS THE UNDERDRAIN. SEE RETAINING WALL DETAILS.
8. WALL SUBGRADE BELOW MSE REINFORCED ZONE IS TO BE PROOFROLLED PRIOR TO PLACING WALL BACKFILL AND REINFORCING. REPEAT SCARIFY AND RECOMPACT UNTIL THE AREA STABILIZES.
9. SQUARE FOOT AREA OF RETAINING WALL IS MEASURED FROM TOP OF RETAINING WALL TO TOP OF LEVELING PAD AS SHOWN. FOOTING ADJUSTMENTS MADE TO ACCOMMODATE OPTIONAL WALL TYPES OR FOR CONSTRUCTION CONVENIENCE WILL NOT BE MEASURED.
10. BACKFILL SHALL BE SELECT MATERIAL WITH GRADATION TYPE A MEETING THE REQUIREMENTS OF ITEM 423.
11. WHEN UNDERDRAIN OUTFALLS PIERCE THE BACK OF AN INLET, DRILL A CLEAN HOLE AND PATCH WITH HIGH STRENGTH GROUT TO SEAL FROM LEAKAGE. PAYMENT FOR THIS IS SUBSIDIARY TO ITEM 423.
12. THE CONTRACTOR MUST PERFORM A SOIL STABILITY ANALYSIS TO SUPPORT THE DESIGN OF THEIR PROPOSED TEMPORARY SPECIAL SHORING SYSTEMS.
13. CONTRACTOR TO PROVIDE SHOP DRAWINGS SHOWING A DETAILED DRAINAGE SYSTEM BEHIND THE WALL FOR ENGINEER'S APPROVAL. ALL COSTS ASSOCIATED WITH MATERIALS FOR THE DRAINAGE SYSTEM AND INSTALLATION IS SUBSIDIARY TO WALL ITEMS. CONTRACTOR SHALL FIELD VERIFY AND DETERMINE THE LOCATION OF THE UNDERDRAIN DURING PREPARATION OF THE SHOP DRAWINGS. THE UNDERDRAIN LOCATION SHALL BE SHOWN AND DETAILS SHALL BE SUBMITTED WITH THE SHOP DRAWINGS.
14. CMP USED FOR FUTURE BRIDGE DRILL SHAFTS IS TO BE FILLED WITH BACKFILL MATERIAL. PAYMENT FOR BACKFILL IS TO BE CONSIDERED SUBSIDIARY TO THE RETAINING WALL. SEE BRIDGE FOUNDATION LAYOUT FOR CMP LOCATIONS.
15. UNDERDRAIN ARE REQUIRED AND ARE CONSIDERED SUBSIDIARY TO THE RETAINING WALL.



ELEVATION

STATE OF TEXAS
KEMGOU NGOUMNAI
150735
LICENSED
PROFESSIONAL ENGINEER
12.11.23
Kemgou Ngoumnai PE

NO.	DATE	DESCRIPTION	APPROV.

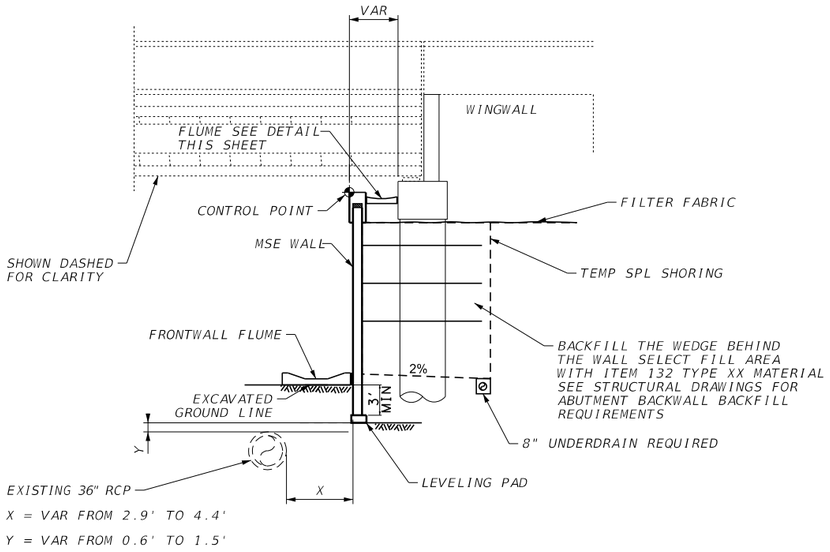
BRIDGEFARMER & ASSOCIATES, INC.
CONSULTING ENGINEERS
TBPE REGISTRATION NO. 264

Texas Department of Transportation ©2023

RETAINING WALL LAYOUT
RWNORTH

SHEET 2 OF 2

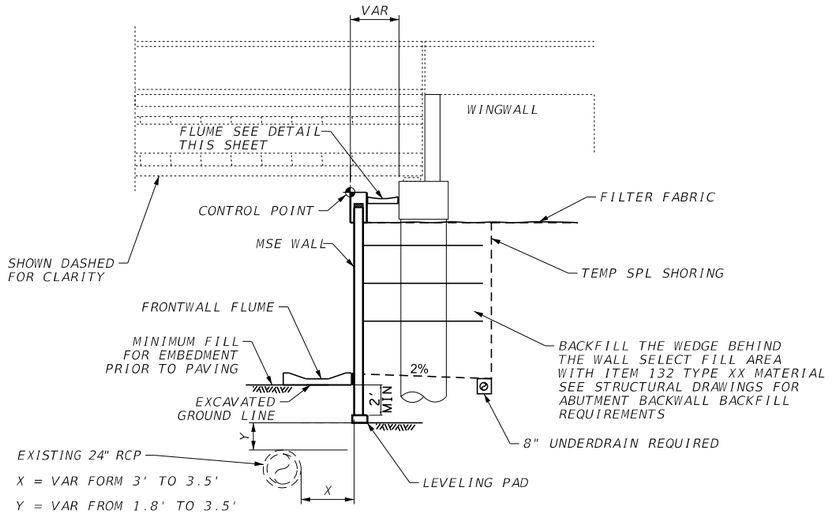
DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DA	6	SEE TITLE SHEET		IH 40
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
JL	TEXAS	AMA	POTTER	088
CHECK	CONTROL	SECTION	JOB	
JL	0090	05	107	
CHECK				



SECTION UNDER HOPE BRIDGE - RWNORTH

ATTACH COPING TO WALL ACCORDING TO MANUFACTURERS RECOMMENDATIONS. PAYMENT FOR THIS ATTACHMENT WILL NOT BE PAID SEPARATELY, BUT IS SUBSIDIARY TO ITEM 423.

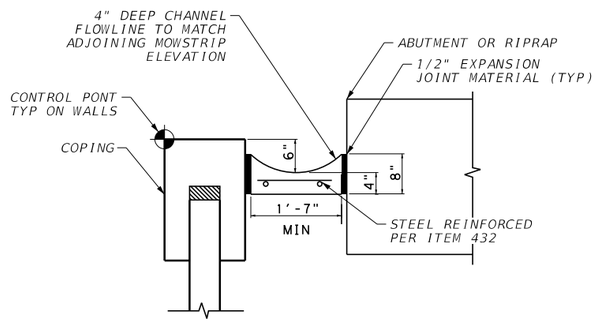
UNDERDRAIN IS REQUIRED.



SECTION UNDER HOPE BRIDGE - RWSOUTH

ATTACH COPING TO WALL ACCORDING TO MANUFACTURERS RECOMMENDATIONS. PAYMENT FOR THIS ATTACHMENT WILL NOT BE PAID SEPARATELY, BUT IS SUBSIDIARY TO ITEM 423.

UNDERDRAIN IS REQUIRED.



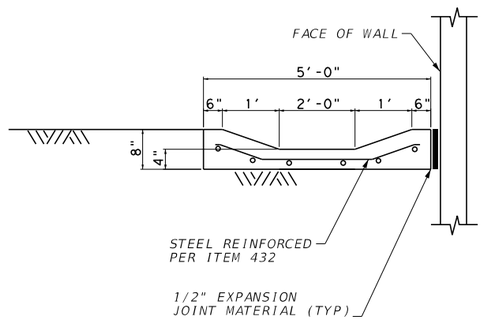
BACKWALL FLUME DETAIL

NOT TO SCALE

TO BE CONSTRUCTED, MEASURED, REINFORCED, AND PAID PER ITEM 432

PLACE 1/2" EXP JOINT MATERIAL WHERE FLUME ABUTS MOW STRIP

ADJUST WIDTH TO FILL THE ACTUAL SPACE BETWEEN THE COPING AND ABUTMENT CAP



FRONTWALL FLUME DETAIL

NOT TO SCALE

TO BE CONSTRUCTED, MEASURED, REINFORCED, AND PAID PER ITEM 432

PLACE 1/2" EXP JOINT MATERIAL WHERE FLUME ABUTS MOW STRIP

STATE OF TEXAS
JAMES W. LANGSTON
73891
LICENSED
PROFESSIONAL ENGINEER
12/11/23
James W. Langston PE
Bridgefarmer & Associates, Inc.
TBPE Registration No. 264

NO.	DATE	DESCRIPTION	APPROV.

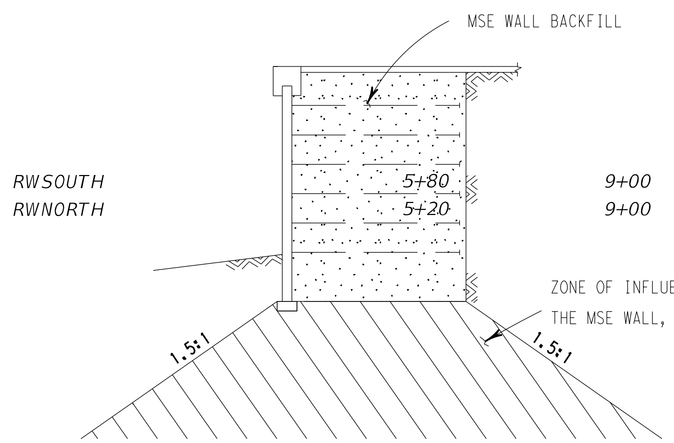
BRIDGEFARMER & ASSOCIATES, INC.
CONSULTING ENGINEERS
TBPE REGISTRATION NO. 264

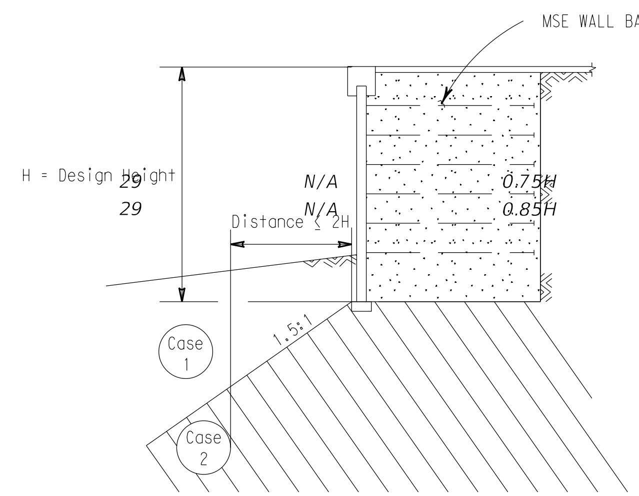
RETAINING WALL SECTIONS AND DETAILS

SCALE: N.T.S. SHEET 1 OF 1

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JL	6	SEE TITLE SHEET		IH 40
GRAPHICS JL	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK	TEXAS	AMA	POTTER	089
CHECK	CONTROL	SECTION	JOB	
	0090	05	107	

RWSOUTH	5+80	9+00	29	29	N/A	0.75H	2 FEET	5'
RWNORTH	5+20	9+00	29	29	N/A	0.85H	2 FEET	5'





PIPES PARALLEL TO PROPOSED OR EXISTING RETAINING WALLS

CASE 1 When the pipe is located above the 1.5:1 line drawn from the corner of the leveling pad downward into the soil, then special backfill is not required around the pipe.

CASE 2 When the following conditions exist:
a) The distance from the edge of leveling pad to the edge of the pipe is less than or equal to 2 times the height of retaining wall.
b) The pipe is located below the 1.5:1 line drawn from the corner of the leveling pad downward into the soil.

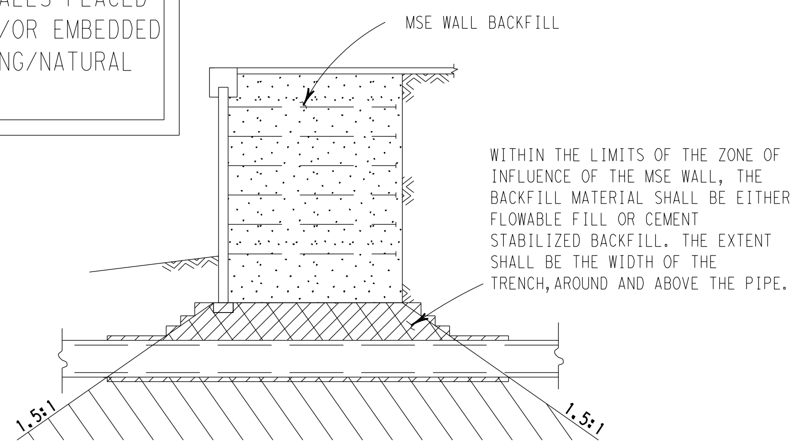
Flowable fill or cement stabilized backfill shall be used as shown in the diagrams below.

When the distance from the edge of leveling pad to the edge of the pipe is greater than 2 times the height of retaining wall, then no special backfill is required around the pipe.

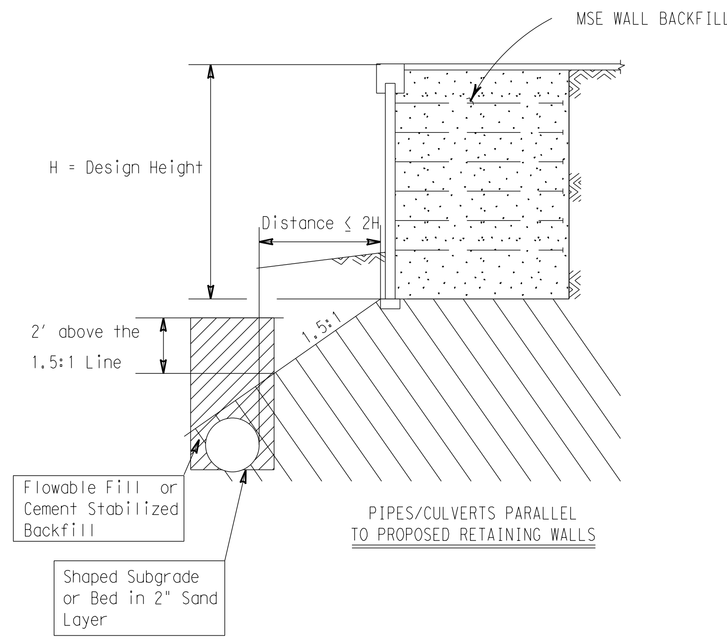
FOR EXCAVATIONS IN FRONT OF EXISTING WALLS UP TO A DISTANCE OF 2H

The contractor shall only excavate the amount of trench necessary for a single day's installation of the pipe. The drainage pipe excavation shall be positively braced with a bracing system designed by a registered Engineer in the State of Texas. Shop drawings for bracing will be submitted to the Engineer for approval. Once installed the pipe shall be backfilled with either flowable fill or cement stabilized backfill.

RETAINING WALLS PLACED IN CUTS AND/OR EMBEDDED INTO EXISTING/NATURAL GROUND



PIPE/CULVERT PERPENDICULAR TO WALL FACE

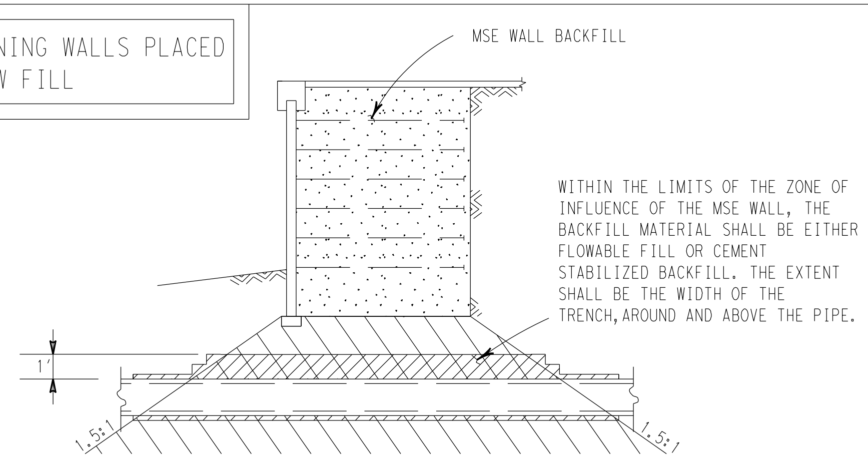


PIPES/CULVERTS PARALLEL TO PROPOSED RETAINING WALLS

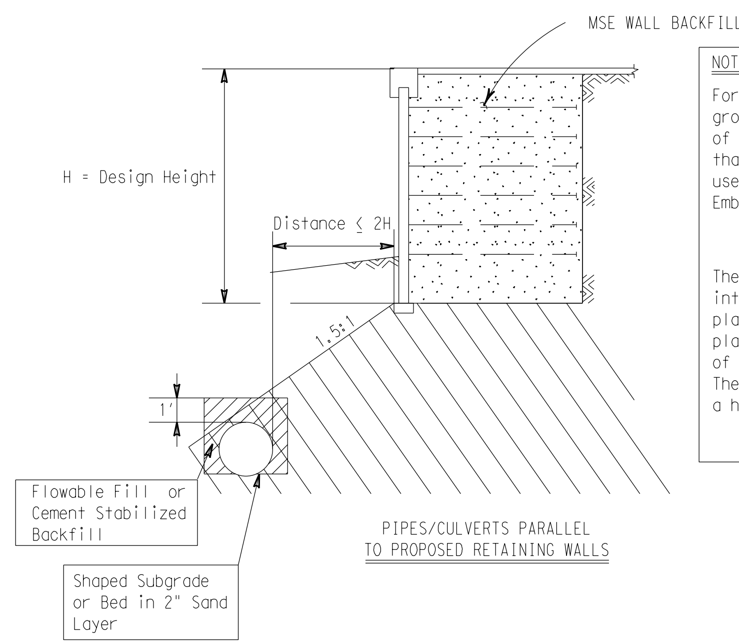
GENERAL NOTES:

This sheet may also be used for backfill around utility lines under the direction of the Engineer.

RETAINING WALLS PLACED ON NEW FILL



PIPE/CULVERT PERPENDICULAR TO WALL FACE



PIPES/CULVERTS PARALLEL TO PROPOSED RETAINING WALLS

NOTES:

For this diagram to be applicable the existing or natural ground line must not be greater than 1' above the top of the pipe. If the existing or natural ground is greater than 1' above the top of the pipe then the Contractor will use the diagram for "Retaining Walls Placed In Cuts And/Or Embedded Into Existing/Natural Ground".

These diagrams are to be used when the pipe is placed into new fill. Prior to placement of pipe the fill shall be placed to 1' above the top of the pipe. The pipe will then be placed into an excavated trench and backfilled to the top of the trench with flowable fill or cement stabilized backfill. The embankment fill shall then be placed over the pipe to a height to begin construction on the retaining wall.

DATE: 12/8/2023 8:11:30 PM JWL
FILE: s\bridgemer-pw\jim.langston\dms21412\MECHANICALLY STABILIZED EARTH PIPE DETAILS.dgn

SHEET 1 OF 1

Texas Department of Transportation | Bridge Division Standard

MECHANICALLY STABILIZED EARTH PIPE DETAILS

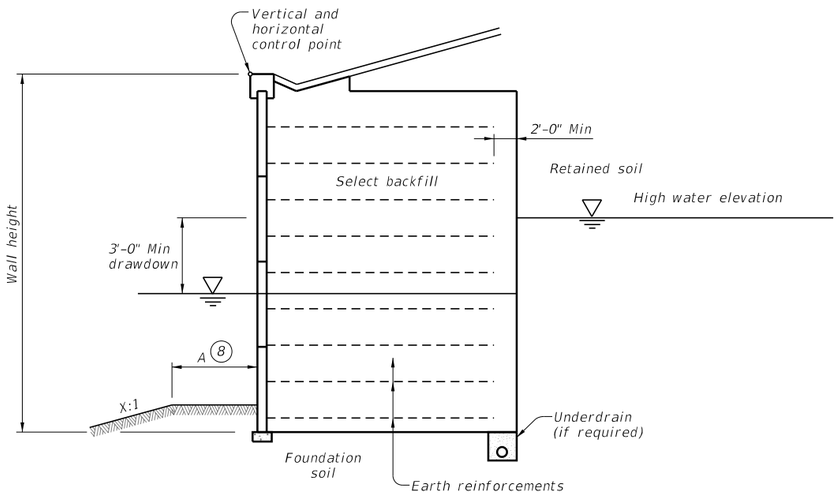
RW(MSE)PIPE

FILE: RW-MSE-22.dgn	DN: TxDOT	CK: TxDOT	DW: JER	CK: RLE
©TxDOT June 2022	CONT	SECT	JOB	HIGHWAY
REVISIONS	0090	05	107	IH40
	DIST	COUNTY		SHEET NO.
	AMA	POTTER		090

DATE: 12/12/2023 2:19:29 AM
FILE: c:\bms\bridgeformer-pw\jim.langston\dms21412\038402-rw-msedd-22.dgn
JWL

WALL SUMMARY

MSE Retaining Wall	Begin Station (1)	End Station (1)	Retained Soil Friction Angle (2)	Foundation Soil Friction Angle (2)	Ground Improvement (3)	Min Earth Reinf. Length (4)	Min Wall Embedment (5)	Underdrain Required (6)	Drawdown Analysis (7)	Bench Width (8)
RWSOUTH	5+80	9+00	29	29	N/A	0.75H	2 FEET	YES	N/A	5'
RWNORTH	5+20	9+00	28	29	N/A	0.85H	2 FEET	YES	N/A	5'



TYPICAL SECTION
(Rapid drawdown condition.)

(1) Indicate limits for which the stated soil design requirements and assumptions are applicable.

(2) Base the listed retained and foundation friction angle on local experience or measured/correlated long term strength values.

(3) Indicate if ground improvement is required or not required. If shown as required, refer to ground improvement detail(s) shown elsewhere in the plans for additional information.

(4) Indicate on table both the minimum length and length ratio required. The minimum default length of earth reinforcements is either 8 feet or 70% of the wall height, whichever is greater. Wall height and design wall height may differ depending on project geometry and loading conditions. Note: Wall height at bridge abutments is equal to the distance between the top of leveling pad and finished grade at the bridge abutment backwall.

(5) Guidance to wall designer of record for determination of minimum wall embedment. Unless noted elsewhere in the plans, provide a minimum embedment from the top of leveling pad to finish grade of
- 1 foot for level ground where there is no potential for erosion or future excavation, or
- 2 feet for sloping ground (4.0H:1.0V or steeper) or where there is potential for removal of soil in front of the wall.

(6) Indicate if underdrain is required or not required.

(7) Indicate if rapid drawdown analysis is required.

(8) Horizontal bench width at base of wall varies. Use the following criteria to establish base width:
A = 2-foot Min for X > 4 or
A = 4-foot Min for X ≤ 4
Applicable to both drawdown and dry condition.

STATE OF TEXAS
MARCUS J. GALVAN
80192
REGISTERED PROFESSIONAL ENGINEER

12/12/2023

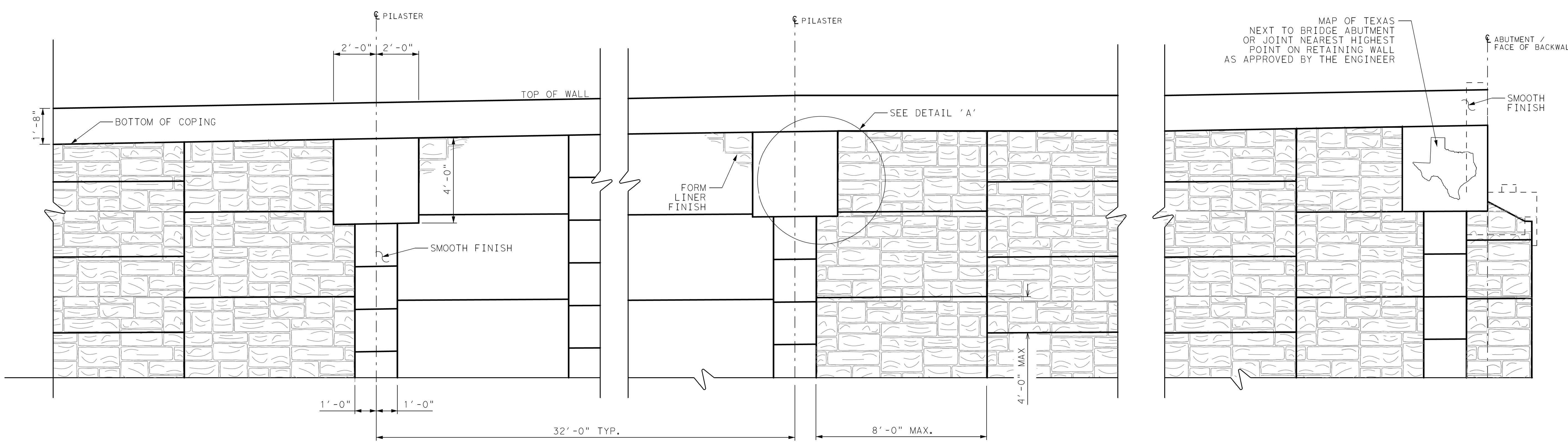
SPECIAL NOTES:
This sheet is to be filled out by the wall designer of record at time of plan preparation to provide soil strength parameters for the design of the specified walls.
The completed sheet must be signed, sealed, and dated by a licensed Professional Engineer.

Texas Department of Transportation
Bridge Division Standard

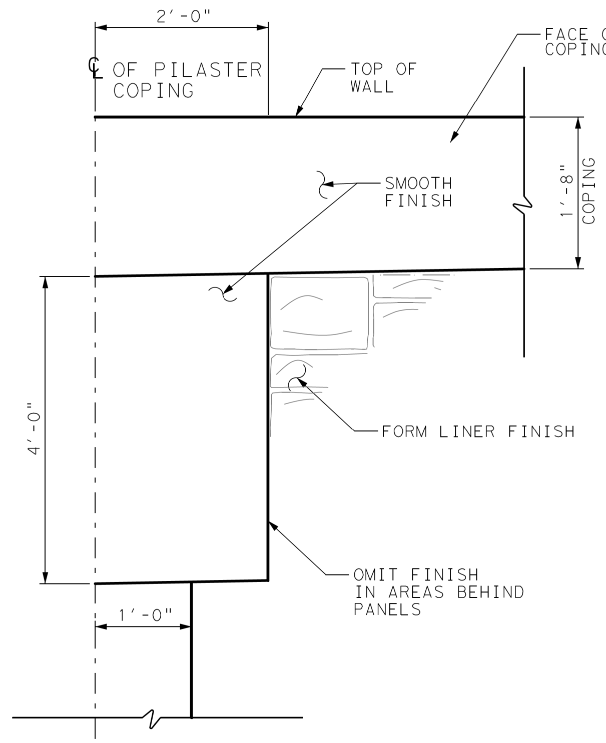
MECHANICALLY STABILIZED EARTH RETAINING WALL DESIGN DATA

RW(MSE)DD

FILE: RW-MSEDD-22.dgn	DN: TxDOT	CK: RLE	DW: JER	CK: RLE
©TxDOT June 2022	CONT	SECT	JOB	HIGHWAY
REVISIONS	0090	05	107	IH40
	DIST	COUNTY		SHEET NO.
	AMA	POTTER		091



ELEVATION



DETAIL 'A'

NOTES:

ARCHITECTURAL CONCRETE TREATMENT / FORM LINER FINISH SHALL BE PLACED AS SHOWN AND SHALL BE SUBSIDIARY TO THE BID ITEM.

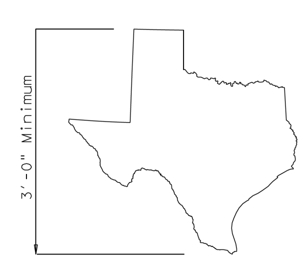
'GEORGETOWN ASHLAR' 16986 BY FITZGERALD OR APPROVED EQUAL WHERE USED, SHALL BE CONTINUOUS WITH NO APPARENT DISCONTINUITIES. VARIATIONS OF FINISH FROM TRUE VERTICAL SHALL NOT EXCEED 1/4" PER 4'-0" OF SECTION HEIGHT.

THE FORM LINERS SHALL RELEASE WITHOUT LEAVING PIECES OF LINER MATERIAL ON THE CONCRETE AND WITHOUT PULLING OR BREAKING CONCRETE FROM THE TEXTURED SURFACE. FORM RELEASE AGENTS SHALL BE AS RECOMMENDED BY THE MANUFACTURER. FORM LINERS THAT HAVE, IN THE OPINION OF THE ENGINEER, BECOME DAMAGED OR WORN SHALL BE REPLACED BY THE CONTRACTOR. REPLACEMENT OF THE FORM LINERS SHALL BE CONSIDERED INCIDENTAL TO THE WORK AND SHALL NOT ENTITLE THE CONTRACTOR TO ADDITIONAL COMPENSATION.

HORIZONTAL SPLICES IN THE FORM LINER SHALL NOT BE PERMITTED. VERTICAL SPLICES SHALL OCCUR ONLY IN VALLEYS BETWEEN STRIATIONS IN THE FINISH.

UTILIZE 0.25'' NEOPREN AND FILTER FABRIC AS PER MANUFACTURE RECOMMENDATIONS

OMIT PILASTERS FOR WALL HEIGHT LESS THAN 8'-0". (PROPOSED GROUND LINE TO TOP OF COPING)



MAP OF TEXAS EMBLEM

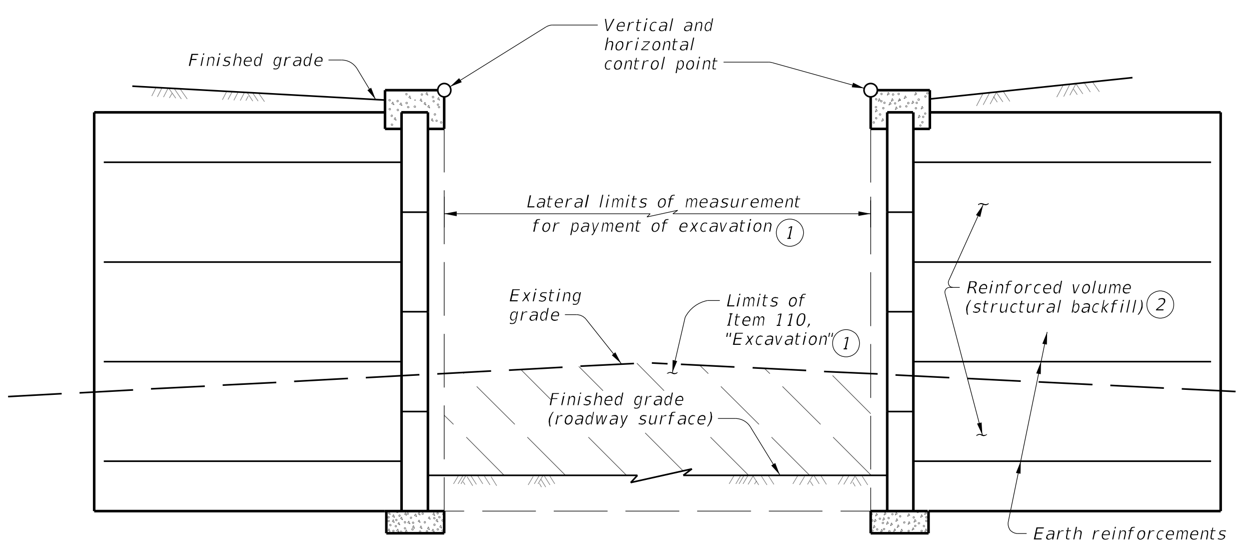
MAP OF TEXAS EMBLEM SHALL BE FORMED INTO THE WALL PANELS AS SHOWN ON THE PLANS. THE EXACT LOCATION OF EACH EMBLEM SHALL BE APPROVED BY THE ENGINEER. THE COST OF FORMING THE EMBLEMS WILL NOT BE PAID FOR DIRECTLY, BUT SHALL BE INCIDENTAL TO THE ITEM "RETAINING WALL". THE MAP OF TEXAS SHALL BE INSET A MINIMUM OF 3/4 " INTO THE FACE OF THE PANEL, AND SHALL RECEIVE A SMOOTH FINISH.

1/22/2024

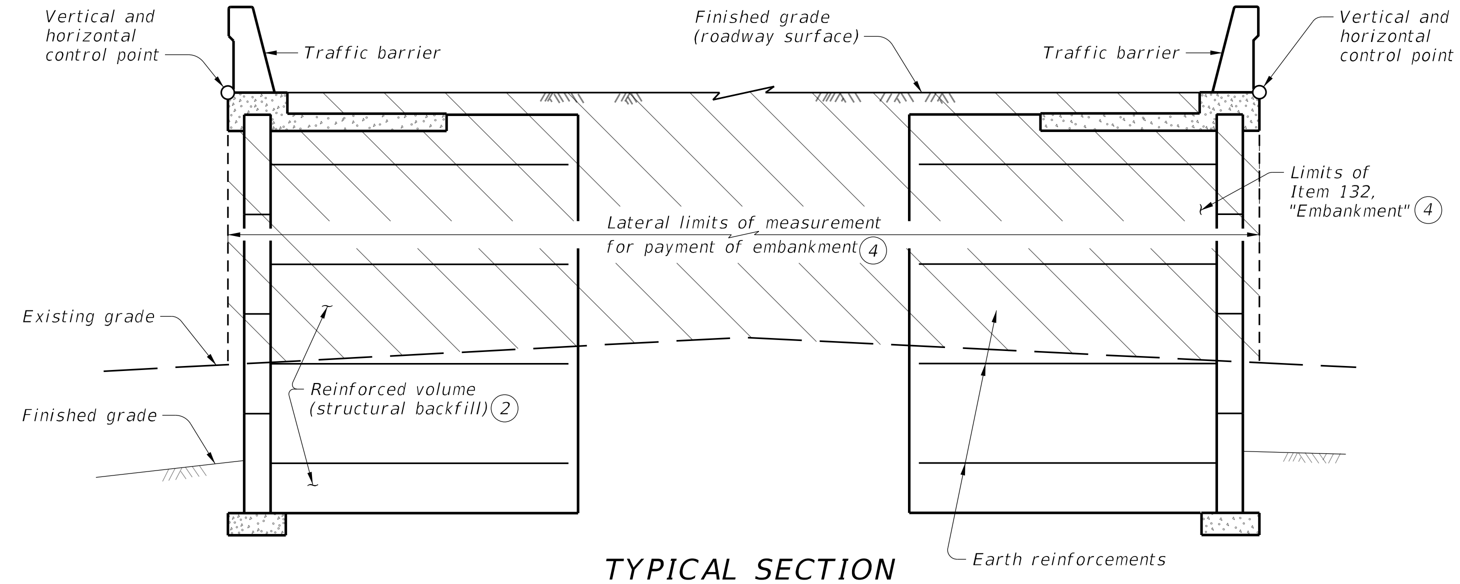
Texas Department of Transportation

AMARILLO DISTRICT MSE RETAINING WALL FINISH DETAIL

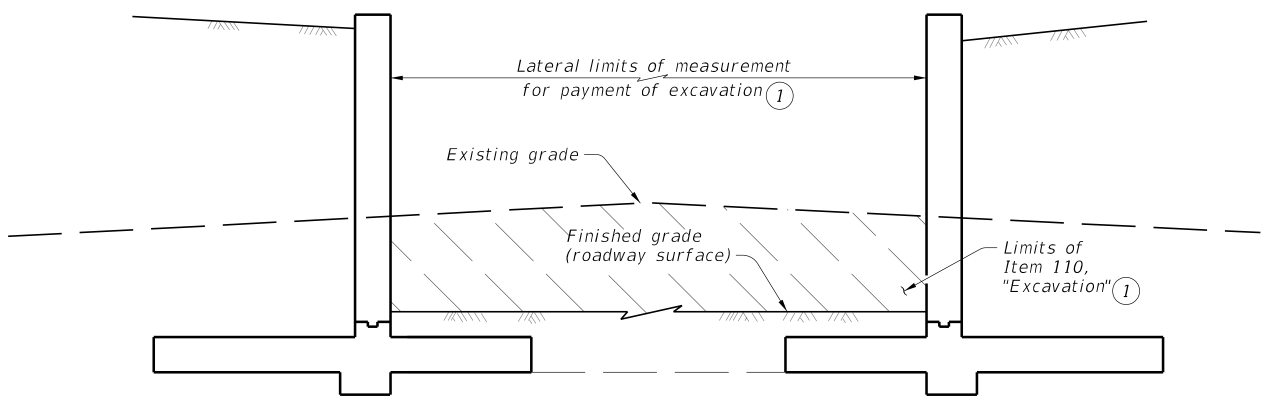
FILE: RW-MSEDD-22.dgn	DN: TxDOT	CK: RLE	DW: JER	CK: RLE
©TxDOT June 2022	CONT	SECT	JOB	HIGHWAY
REVISIONS	0090	05	107	IH40
	DIST		COUNTY	SHEET NO.
	AMA		POTTER	092



TYPICAL SECTION
(Excavation between MSE retaining walls.) (3)

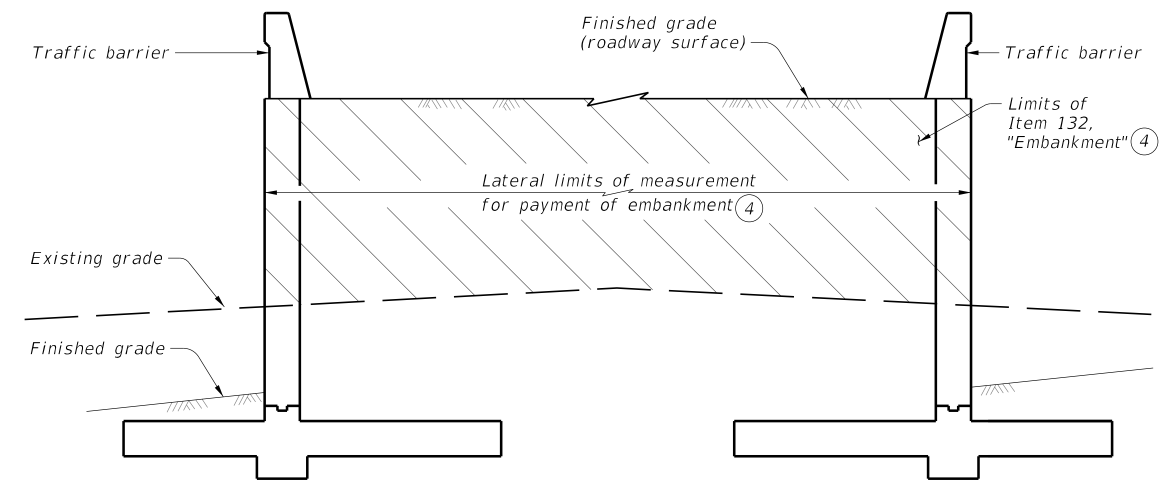


TYPICAL SECTION
(Embankment between MSE retaining walls.) (3)

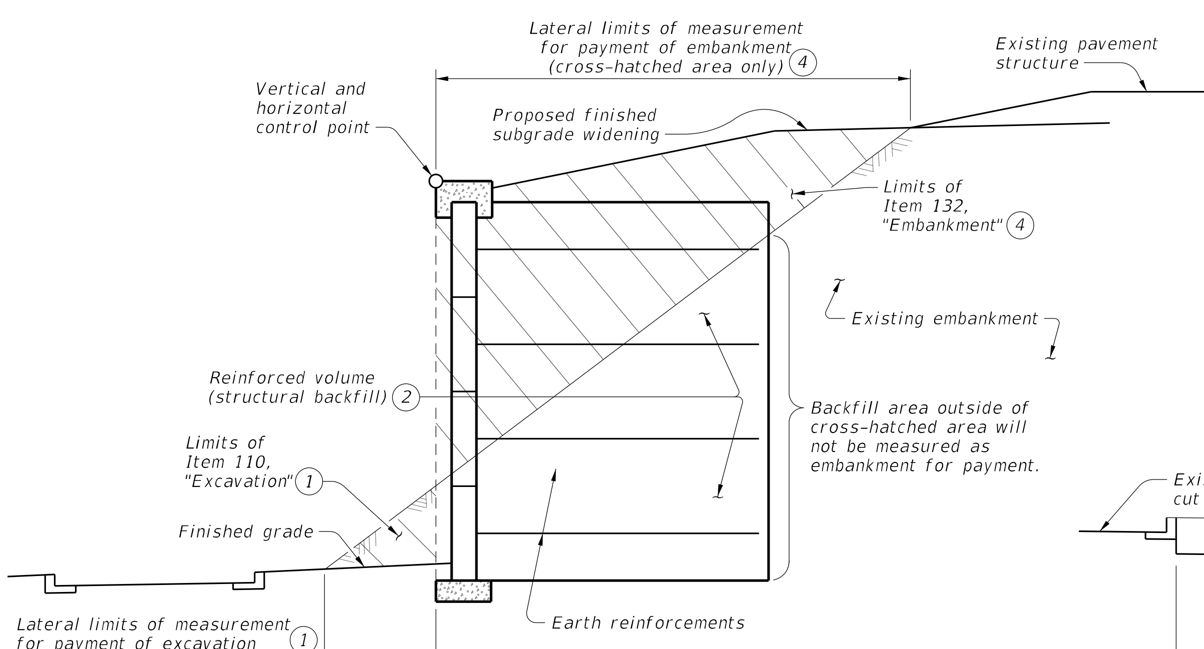


TYPICAL SECTION
(Excavation between conventional retaining walls.)

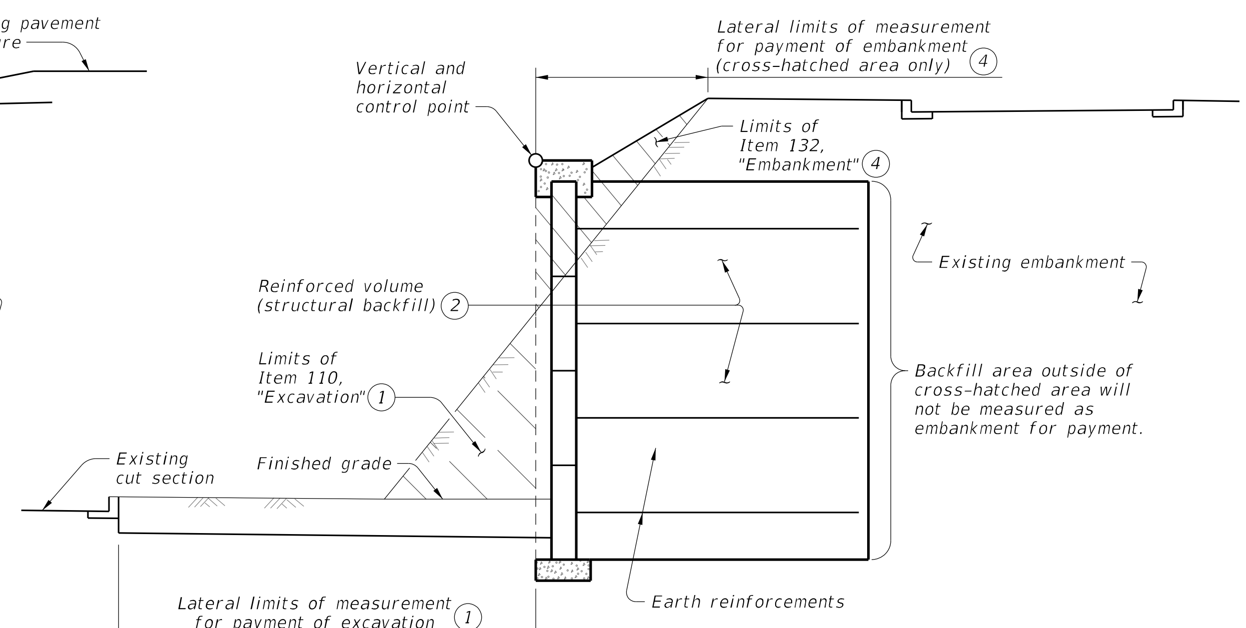
1. Only the excavation above the proposed subgrade elevation will be measured for payment.
2. Meeting requirements for Item 423, "Retaining Walls."
3. Earthwork measurement with other retaining wall types will be made to the outside finished face in the same manner.
4. Only the embankment above the existing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



TYPICAL SECTION
(Embankment between conventional retaining walls.)



TYPICAL SECTION
(Widening embankment with MSE retaining walls.) (3)



TYPICAL SECTION
(Widening cut section with MSE retaining walls.) (3)

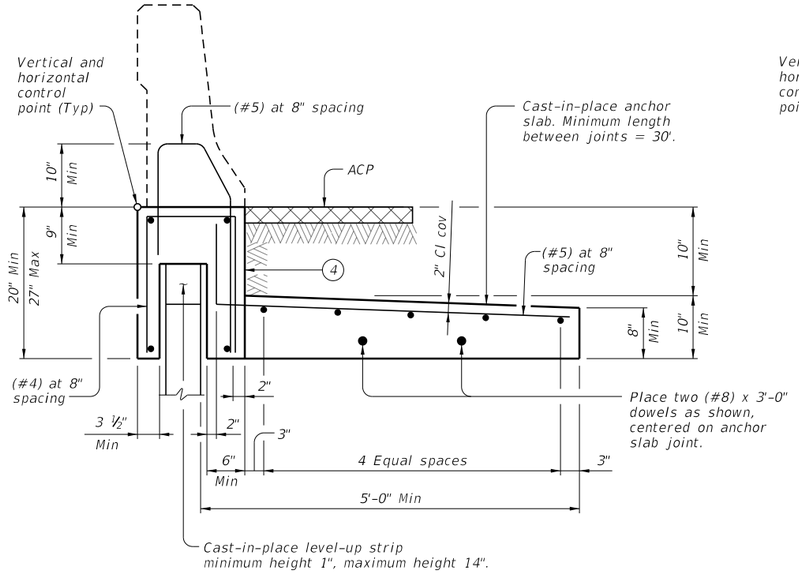
Texas Department of Transportation | Bridge Division Standard

EARTHWORK MEASUREMENT AT RETAINING WALL

RW(EM)

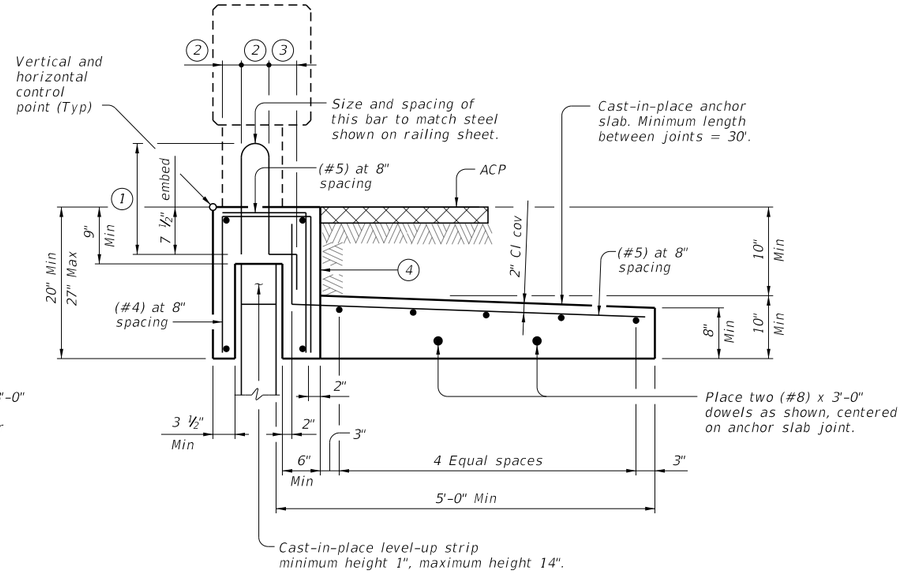
FILE: RW-EM-22.dgn	DN: TxDOT	CK: TxDOT	DW: JER	CK: RLE
©TxDOT June 2022	CONT	SECT	JOB	HIGHWAY
REVISIONS	0090	05	107	IH40
	DIST		COUNTY	SHEET NO.
	AMA		POTTER	093

DATE: 12/8/2023 8:36:45 AM
FILE: c:\pw\vidal.ngoumnai@bridgefarmer.com\d0321413\038402-rw-trf-22.dgn
USER: Vidal.Ngoumnai



"WIDE BASED" ADJACENT TO ACP

(Showing T551 Rail, other rails listed similar.)



"NARROW BASED" ADJACENT TO ACP

(Showing T223 Rail, other rails listed similar.)

1. Reinforcement length equal to length shown on the appropriate rail standard plus 1 inch.
2. Match dimension on the appropriate rail standard.
3. Match dimension on the appropriate rail standard. Bend end of rail anchorage reinforcing as shown as required to maintain clear cover.
4. See "Coping Joint Sealer Details."

Rail Type	Detail	Precasting Rail with Coping Allowed
T1F/T1W/C1W/T2P/C2P	NARROW	NO
T221/C221/T222	NARROW	YES
T223/C223	NARROW	NO
T402/C402	NARROW	NO
T411/C411	NARROW	NO
T551/T552	WIDE	YES
T66	NARROW	NO
SSTR	WIDE	YES

CAST-IN-PLACE COPINGS:

Provide compressible material to isolate precast panel from cast-in-place coping to prevent cracking. Attach compressible material to both sides of precast panel prior to casting concrete for coping.

When cast-in-place coping is anchored to reinforced concrete pavement, provide a smooth level-up strip on the top of the precast panels. The purpose of the level-up is to allow the pavement and coping to move longitudinally relative to the wall without causing damage.

Align coping and railing joints with precast panel joints. Optional rail joints are allowed as approved by Engineer. Provide railing construction joints or expansion joints at 100-foot maximum spacing.

PRECAST COPINGS:

Provide a smooth level-up strip on top of the precast panels prior to installation of the coping. Shims may be used on top of level-up strips to facilitate alignment. Total shim thickness not to exceed 1 inch.

Provide precast coping in 10-foot minimum lengths.

JOINTED CONCRETE PAVEMENT:

When coping is adjacent to and anchored into jointed concrete pavement, align the coping joints with the pavement joints.

JOINT SEALANT:

Seal joints between coping segments in accordance with Item 438, "Cleaning and Sealing Joints." Provide Class 4 joint seal. Place sealant flush with coping surface. The purpose of the joint sealing is to reduce surface drainage infiltration into the retaining wall backfill. Sealing coping joint is considered subsidiary to other items.

MATERIAL NOTES:

Provide Class C concrete (f'c=3,600 psi.)
Provide Grade 60 reinforcing steel.
Provide #4 longitudinal bars, unless otherwise shown.

GENERAL NOTES:

Details on this sheet are to be used in development of specific details for mounting traffic railing on mechanically stabilized earth (MSE) walls.

The specific details proposed must have strengths equivalent to those shown on this sheet and must be submitted for approval. Areas of particular importance are the connection of the coping to the railing, the strength of the vertical coping leg connecting the railing to the anchor slab, and the connection of the coping to the anchor slab or concrete pavement.

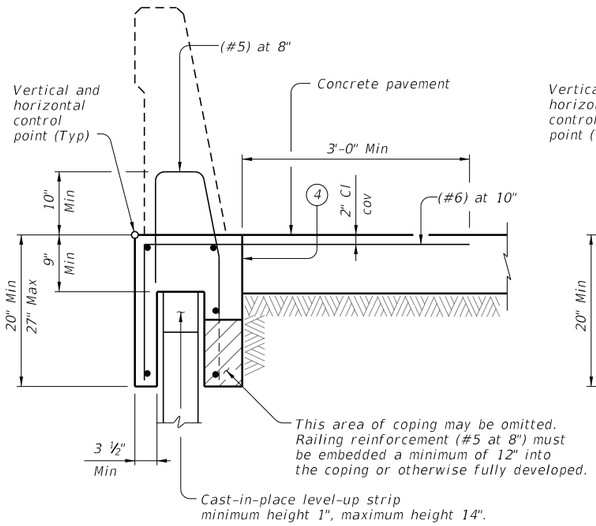
Submit shop drawings for the traffic railing foundations to the Engineer in accordance with Item 423, "Retaining Walls." The shop drawings must include bar bending details.

Precasting of railing with the coping will be allowed as noted in the table on this sheet.

The Contractor's attention is directed to the fact that various configurations of precast coping/railing combinations are covered by patent. The Contractor must provide for use of these systems in accordance with Article 7.5.

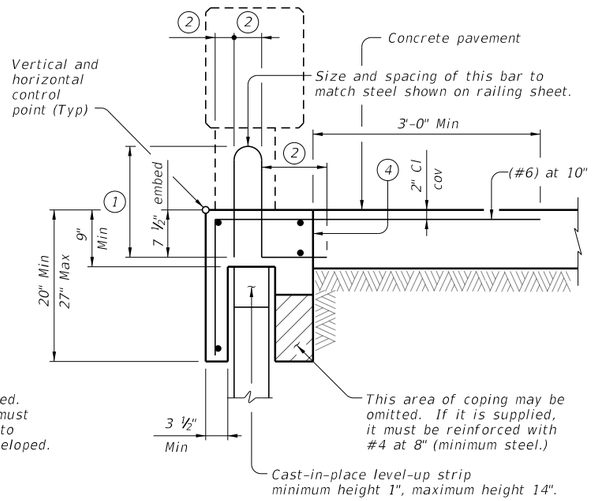
Coping and anchor slabs are considered subsidiary to Item 423, "Retaining Walls." Payment for traffic railing is per the linear foot for the appropriate railing type.

Cover dimensions are clear dimensions, unless noted otherwise.



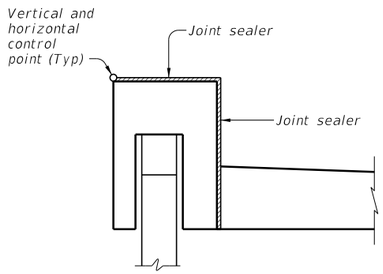
"WIDE BASED" ADJACENT TO CONCRETE PAVEMENT

(Showing SSTR Rail, other rails listed similar.)

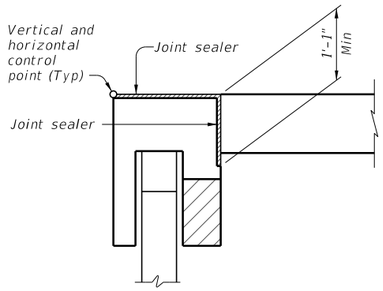


"NARROW BASED" ADJACENT TO CONCRETE PAVEMENT

(Showing T223 Rail, other rails listed similar.)



ADJACENT TO ACP



ADJACENT TO CONCRETE PAVEMENT

COPING JOINT SEALER DETAILS

(Reinforcing steel not shown for clarity.)

Texas Department of Transportation

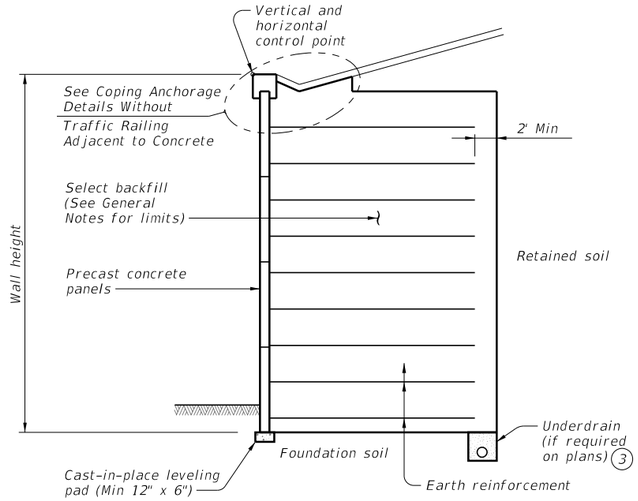
Bridge Division Standard

RETAINING WALL TRAFFIC RAILING FOUNDATIONS

RW(TRF)

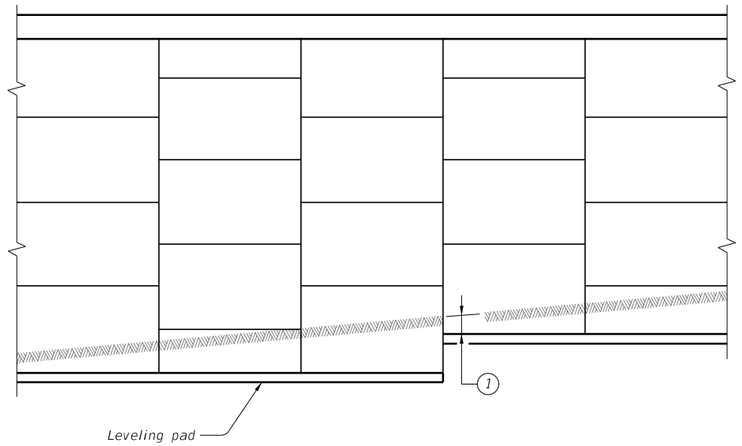
FILE: RW-TRF-22.dgn	DN: TxDOT	CK: TxDOT	DW: JTR	CK: TAR
©TxDOT June 2022	CONT	SECT	JOB	HIGHWAY
REVISIONS	0090	05	107	IH40
	DIST	COUNTY		SHEET NO.
	AMA	POTTER		094

DATE: 12/8/2023 8:37:00 AM
FILE: C:\Users\vngoumnai\Desktop\gefarmer.com\dms21413\MECHANICALLY STABILIZED EARTH RETAINING WALL 01.dgn
Vidal Ngoumnai



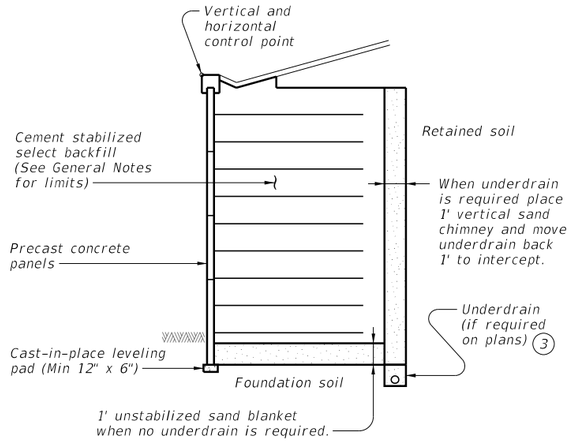
TYPICAL SECTION

(Wall at bottom of slope.)



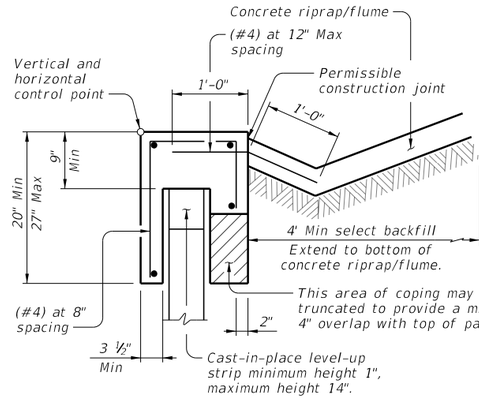
ELEVATION

1. Minimum embedment conforming to values given on the RW(MSE)DD standard.
2. Form map of Texas emblem into a wall panel next to each bridge abutment. Submit the exact location of each emblem to the Engineer for approval. The cost of forming the emblems will not be paid for directly, but is subsidiary to Item 423, "Retaining Walls." Inset the map of Texas a minimum of ¾" into the face of the panel with a smooth finish. Finish the inset area in a contrasting color as approved by the Engineer.
3. Provide underdrain pipe and filter material in accordance with Item 556, "Pipe Underdrains."
4. Anchor precast coping to prevent rotation or displacement. Use these details to develop custom anchorage for precast copings. Provide details that include coping reinforcement. Concrete flume (if required) is paid for separately from Item 423, "Retaining Walls."



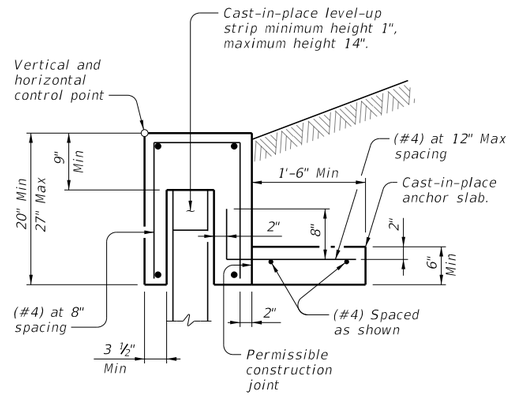
SPECIAL DRAINAGE PROVISIONS

(When cement stabilized backfill is used.)



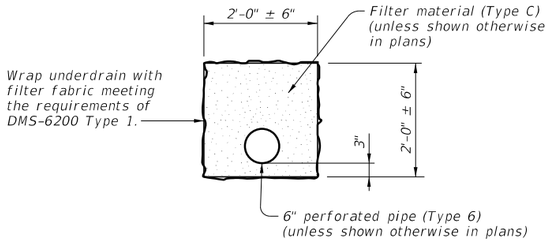
ADJACENT TO CONCRETE

(Excluding concrete pavement)

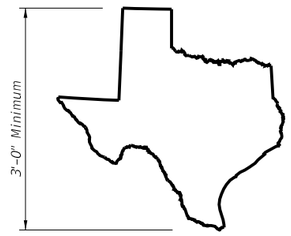


ADJACENT TO SOIL

COPING ANCHORAGE DETAILS WITHOUT TRAFFIC RAILING 4



UNDERDRAIN DETAIL 3



MAP OF TEXAS EMBLEM 2

SHEET 1 OF 2

Texas Department of Transportation

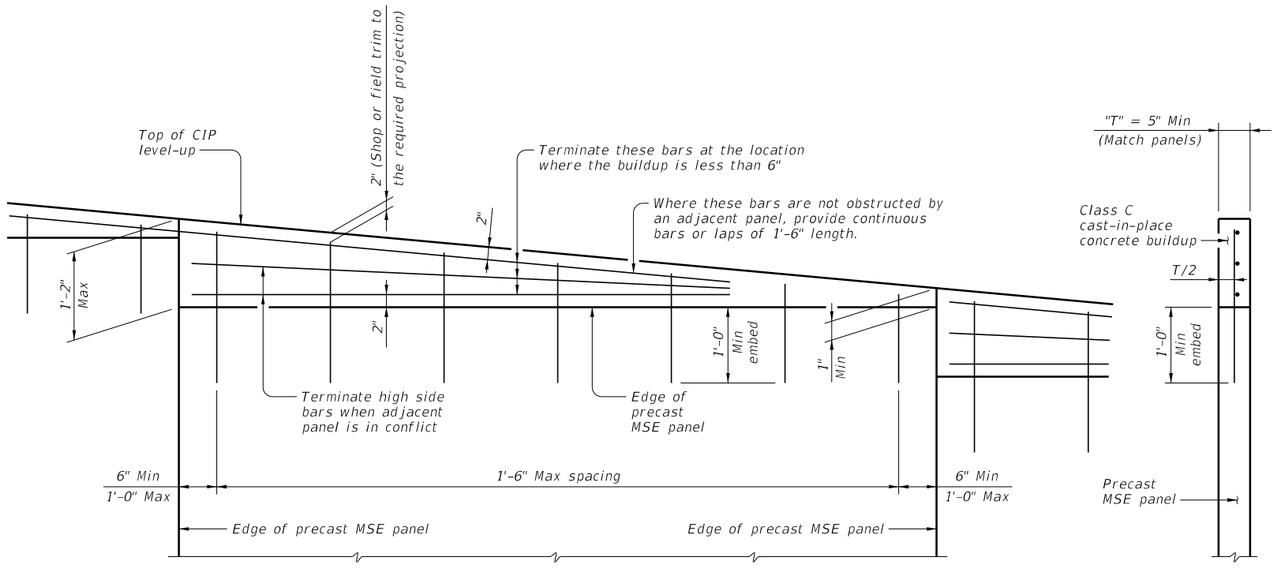
Bridge Division Standard

MECHANICALLY STABILIZED EARTH RETAINING WALL

RW(MSE)

FILE: RW-MSE-22.dgn	DN: TxDOT	CK. TxDOT	DW. JER	CK. RLE
©TxDOT June 2022	CONT	SECT	JOB	HIGHWAY
REVISIONS	0090	05	107	IH40
	DIST	COUNTY		SHEET NO.
	AMA	POTTER		095

DATE: 12/8/2023 8:37:15 AM
FILE: C:\dms\pw\LEdgeFarmer-pw\vidal.ngoumnai\ridgefarmer.com\dms21413\038402-rw-mse-22(2).dgn
Vidal.Ngoumnai



ELEVATION SECTION

LEVEL UP DETAIL (5)

DESIGN CRITERIA NOTES:

Design Parameters:

Base design of retaining walls on the following design parameters unless stated elsewhere in the plans:

Retained Soil	Unit Weight = 125 pcf ϕ = (6) C = 0 psf
Foundation Soil	ϕ = (6) C = 0 psf
Select Backfill	Unit Weight = See Table (7) ϕ = 34° C = 0 psf
Cement Stabilized Select Backfill	Unit Weight = 125 pcf ϕ = 45° C = 0 psf

Limit stress in steel and concrete in accordance with current AASHTO Standard Specifications for Highway Bridges and Interim Specifications.

The minimum length of earth reinforcement are as shown on the Mechanically Stabilized Earth Retaining Wall Design Data (RW[MSE]DD) standard.

Stability Criteria:

Stability criteria applies to both dry and drawdown analysis. Base design on the following factors of safety.

Sliding along the base of the structure	Factor of Safety ≥ 1.5
Overturning	Factor of Safety ≥ 2.0
Pullout of Earth Reinforcement at each level	Factor of Safety ≥ 1.5

Design the wall such that the base pressure resultant falls within the middle third of the retaining wall.

Determine pullout resistance from test data evaluated at ¾ inch strain.

Corrosion Criteria:

Design the earth reinforcement elements to have a minimum design life of 75 years, using current AASHTO corrosion rates.

Perform stress calculations (rupture) on the calculated earth reinforcement section remaining after 75 years. Pullout calculations may be based on non-corroded section.

(5) Cast vertical bars into the top of panels. At Contractor's option vertical bars may be embedded 4 inches with a Type III Class C epoxy anchorage system. Follow manufacturer's directions for installing the epoxy vertical bars.

(6) Soil design parameters must be based on long term soil strength. Design parameters must be listed on the RW(MSE)DD standard.

(7)

SELECT BACKFILL UNIT WEIGHT			
Type AS, BS & DS	Unit Weight	Internal Stability	External Stability
	105 PCF	Pullout	Sliding, Overturning, Eccentricity
	125 PCF	Rupture	Bearing

PRECAST COPINGS:

Wall supplier is to maximize lengths of precast coping. Provide precast coping in 10-foot minimum lengths (typical.) To optimize coping lengths at radiuses, ends of runs, or other wall geometric conditions favorable to shorter coping sections, shorter lengths may be used pending approval by the Engineer. This applies only to coping without railing.

JOINT SEALANT:

Seal joints between coping segments in accordance with Item 438, "Cleaning and Sealing Joints." Provide Class 4 joint seal. Place sealant flush with coping surface. The purpose of the joint sealing is to reduce surface drainage infiltration into the retaining wall backfill. Sealing coping joint is considered subsidiary to other items.

EARTH REINFORCEMENT:

Place the uppermost earth reinforcement no more than 3 feet below the top of wall.

Place the lowest level of earth reinforcement no more than 2 feet above the top of the leveling pad.

Provide earth reinforcement with a minimum wire size of W7.0. If different longitudinal and cross wires are used in an earth reinforcement mesh, the smaller wire must be at least 50% of the cross sectional area of the larger wire.

A maximum of four wire mesh configurations (wire sizes) will be allowed on a project. Provide unique transverse bar spacing for each mesh configuration, differing from other configurations by a minimum of 3 inches. Step earth reinforcement lengths in increments no finer than 12 inches.

PANELS:

Fabricate standard precast concrete panels to a maximum height of 6 feet and a maximum surface area of 50 sq ft. Top and bottom panels may exceed these limitations as necessary to achieve required wall grades. Maximum height of any panel must not exceed 7 ft.-6 in. Provide a minimum panel thickness of 5 inches. Arrange panels to provide offset horizontal joints.

Provide an open joint around the perimeter of the concrete panels. Configure joints such that 1) the filter fabric and/or pad materials are not exposed at the wall face and 2) the design opening is between ⅜" and ¾".

Provide a one-piece corner panel for wall angle changes of greater than 30 degrees. Butting of chamfered panels will be allowed for angle changes of 30 degrees or less.

MATERIAL NOTES:

Provide Class C concrete for reinforced concrete and precast coping.
Provide Class H concrete for precast concrete panels.
Provide Class A concrete for unreinforced concrete.
Provide Grade 60 reinforcing steel.

GENERAL NOTES:

Section and elevation shown is for informational purposes only. Determine specific geometry based on wall layouts and other plan information.

Extend select backfill specified for use within the mechanically stabilized earth volume horizontally from the back of the panels a minimum 2 feet beyond the end of the earth reinforcement. Extend select backfill vertically to the top of the panels from either the top of the leveling pad, or from 4 inches below the lowest earth reinforcement, whichever is lower.

Provide concrete coping along the top of wall, at the vertical steps at bridge backwalls, and at other vertical steps along the top of wall.

Provide details and calculations that establish support for panels that are affected when obstructions (inlets, drilled shafts, piling, etc.) prevent placement of soil reinforcement in their normal locations. Furnish the same earth reinforcement coverage as that required in the absence of the obstruction. For skewed (rotated) earth reinforcement, no adjustment in length is needed for skew angles less than or equal to 10 degrees. Adjust the length of earth reinforcement to provide a cosine length of the reinforcement equivalent to the stated design length for the section of wall when skew angles are greater than 10 degrees. Provide calculations that justify any alterations made to the soil reinforcement or modifications to their normal placement. Do not use panels without any soil reinforcement connected to them unless they are connected with galvanized hardware to adjacent panels which do have supporting soil reinforcement attached to them and as approved by the Engineer.

Coping and anchor slabs are considered subsidiary to the Item 423, "Retaining Walls."

Use these details in conjunction with the retaining wall layout, the Mechanically Stabilized Earth Retaining Wall Design Data (RW[MSE]DD) standard and other applicable standards.

Cover dimensions are clear dimensions, unless noted otherwise.

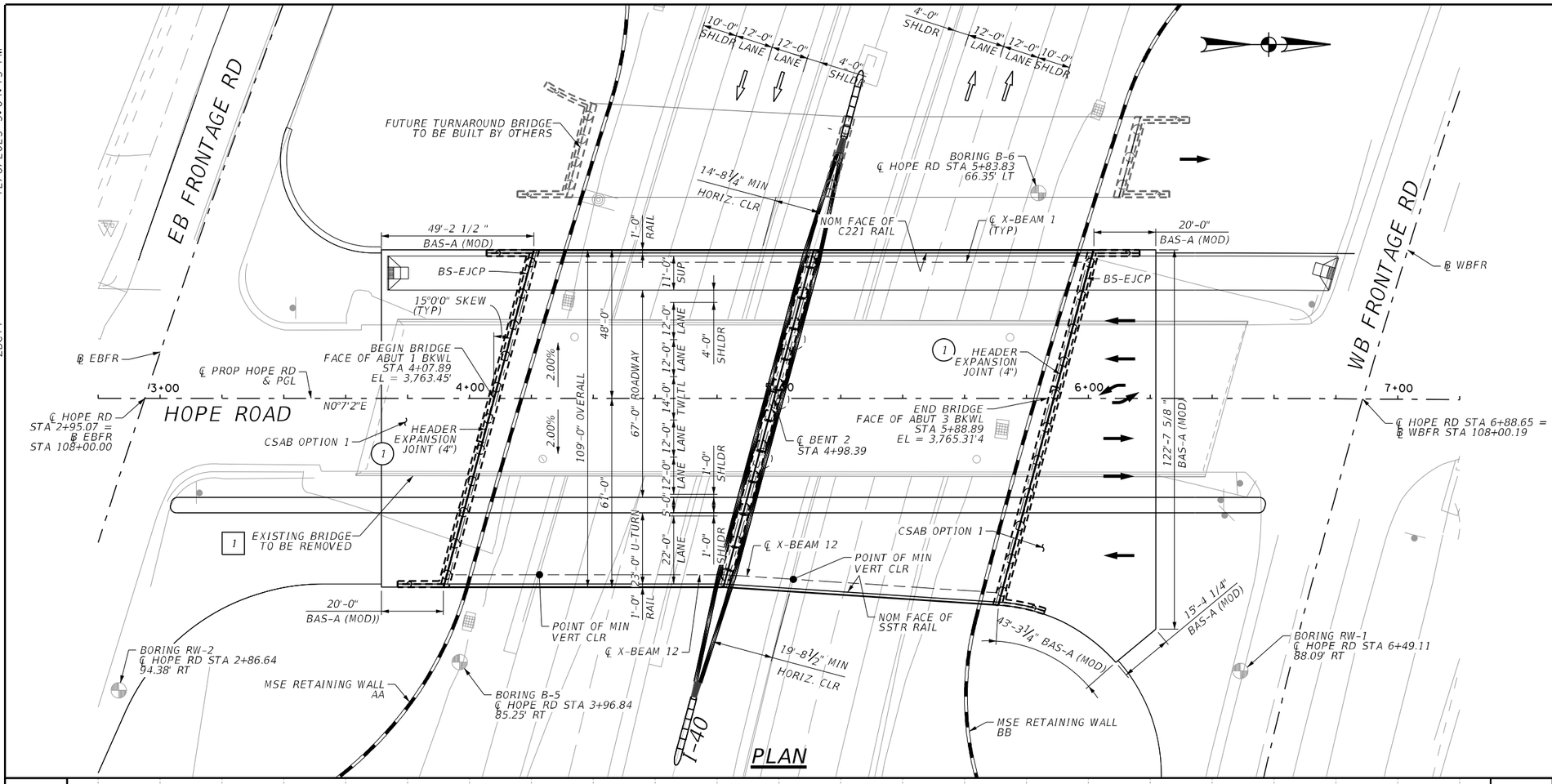
Texas Department of Transportation

Bridge Division Standard

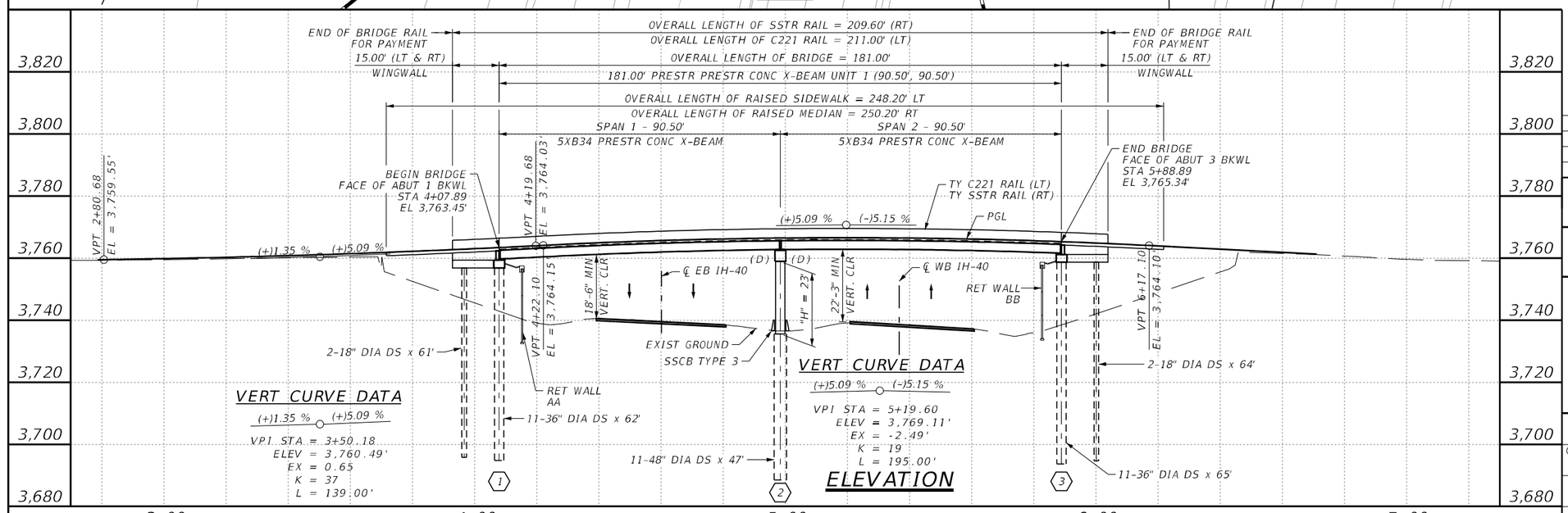
MECHANICALLY STABILIZED EARTH RETAINING WALL

RW(MSE)

FILE: RW-MSE-22.dgn	DN: TxDOT	CK: TxDOT	DW: JER	CK: RLE
©TxDOT June 2022	CONT	SECT	JOB	HIGHWAY
REVISIONS	0090	05	107	IH40
	DIST	COUNTY		SHEET NO.
	AMA	POTTER		096



PLAN



VERT CURVE DATA

(+)1.35 % (+)5.09 %

VPI STA = 3+50.18
ELEV = 3,760.49'
EX = 0.65
K = 37
L = 139.00'

VERT CURVE DATA

(+)5.09 % (-)5.15 %

VPI STA = 5+19.60
ELEV = 3,769.11'
EX = -2.49'
K = 19
L = 195.00'

ELEVATION

20 0 20 40
SCALE: 1" = 40'

GENERAL NOTES:

1. DESIGNED ACCORDING TO AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, 9TH EDITION (2020) AND TxDOT BRIDGE DESIGN MANUAL (NOV 2021).
2. SEE RDWY PLANS FOR LOCATION OF BENCHMARKS FOR HORIZONTAL AND VERTICAL CONTROL.
3. SEE EXISTING UTILITY PLANS FOR IDENTIFICATION OF EXISTING UTILITIES.
4. ENUMERATED GEOTECHNICAL BORING TEST HOLES ARE LABELED AND LOCATED IN PLAN. FOR LOGS OF CORRESPONDING HOLE NUMBER, SEE BORING LOG SHEET.
5. CONTRACTOR SHALL VERIFY LOCATIONS OF ALL UTILITIES PRIOR TO CONSTRUCTION, EXCAVATION, OR DRILLING.
6. ALL DIMENSIONS ARE HORIZONTAL OR VERTICAL AND MUST BE CORRECTED FOR VERTICAL GARDE AND SUPERELEVATION WHERE APPROPRIATE.
7. "D" DENOTES BENTS WITH DOWEL BARS FOR EXTERIOR BEAMS.
8. "H" HEIGHTS SHOWN ARE ESTIMATED COLUMN HEIGHTS. THE CONTRACTOR IS RESPONSIBLE FOR CALCULATING THE ACTUAL COLUMN HEIGHTS BASED ON FIELD CONDITIONS.
9. BRIDGE TO BE CLOSED DURING CONSTRUCTION. SEE TCP FOR ADDITIONAL DETAILS.
10. REMOVE EXISTING STRUCTURE 2 FEET BELOW EXISTING GROUND.

DESIGN DATA

DESIGN SPEED = 30 MPH
ADT (2023) = 1,500
ADT (2043) = 2,100
FUNCTIONAL CLASSIFICATION = URBAN COLLECTOR
EXISTING NBI NO. = 04-188-0090-05-055
PROPOSED NBI NO. = 04-188-0090-05-594

(1) SEE HEADER JOINT EXPANSION JOINT DETAIL SHEET FOR DETAILS AND NOTES NOW SHOWN HEREIN.

[1] EXISTING 277'-0" LONG BRIDGE WITH 4 SPANS (60'-0", 70'-0", 70'-0", 75'-0") TO BE REMOVED. BRIDGE CONSISTS OF PRESTRESSED CONCRETE BEAMS AND HAS A BRIDGE WIDTH OF 50'-3".

ALL ABUTMENTS AND BENTS ARE LOCATED ALONG A BEARING OF N74°52'57.51"W.

SUPERSTRUCTURE INV/OPR RATINGS: 1.25/2.08

STATE OF TEXAS
ZACHARY J. BEIL
139718
LICENSED
PROFESSIONAL ENGINEER
Zachary J. Beil
12-08-2023

HL 93 LOADING

NO.	DATE	DESCRIPTION	APPROV.

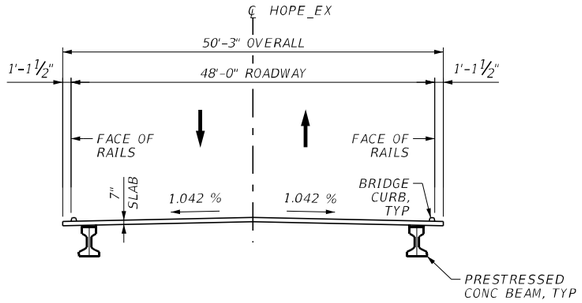
BRIDGEFARMER & ASSOCIATES, INC.
CONSULTING ENGINEERS
TBPE REGISTRATION NO. 264

IH-40 AT HOPE ROAD
IH 40 UNDERPASS AT HOPE ROAD BRIDGE LAYOUT

SHEET 1 OF 1

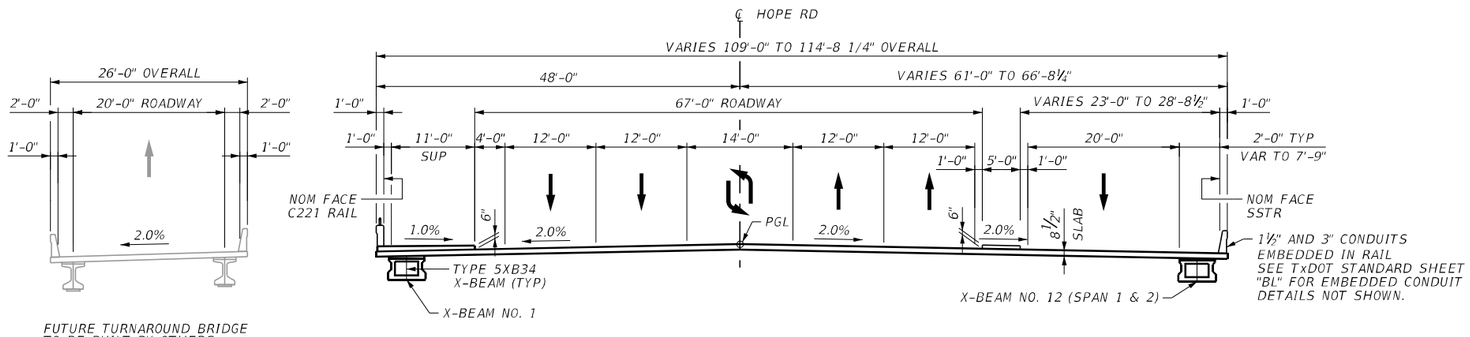
DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
ZJB	6	SEE TITLE SHEET		IH 40
GRAPHICS AKH	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK KDH	TEXAS	AMA	POTTER	097
CHECK ZJB	CONTROL	SECTION	JOB	
	0090	05	107	

10 0 10 20
SCALE: 1" = 20'



EXISTING TYPICAL SECTION

(TYP FOR EXISTING, ACCORDING TO AS-BUILTS)



FUTURE TURNAROUND BRIDGE TO BE BUILT BY OTHERS

PROPOSED TYPICAL SECTION

(SPANS 1-2)

STATE OF TEXAS
ZACHARY J. BEIL
139718
LICENSED
PROFESSIONAL ENGINEER
Zachary J. Beil
12-08-2023

HL 93 LOADING

NO.	DATE	DESCRIPTION	APPROV.

BRIDGEFARMER & ASSOCIATES, INC.
CONSULTING ENGINEERS
TBPE REGISTRATION NO. 264

IH 40 UNDERPASS AT HOPE ROAD BRIDGE TYPICAL SECTIONS

SHEET 1 OF 1

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
ZJB	6	SEE TITLE SHEET		IH 40
GRAPHICS AKH	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK KDH	TEXAS	AMA	POTTER	098
CHECK ZJB	CONTROL	SECTION	JOB	
	0090	05	107	

ESTIMATE OF QUANTITIES

ITEM	400	416	416	416	420	420	420	422	422	422	422
CODE	6005	6001	6004	6006	6013	6029	6037	6001	6011	6013	6015
BID ITEM DESCRIPTION / BRIDGE ELEMENT	CEM STABIL BKFL	DRILL SHAFT (18 IN)	DRILL SHAFT (36 IN)	DRILL SHAFT (48 IN)	CL C CONC (ABUT)	CL C CONC (CAP)	CL C CONC (COLUMN)	REINF CONC SLAB	BRIDGE MEDIAN	BRIDGE SIDEWALK	APPROACH SLAB
	CY	LF	LF	LF	CY	CY	CY	SF	SF	SF	CY
2 ~ ABUTMENTS	422	250	1,397		92.7						330.5
1 ~ INTERIOR BENT				517		51.8	84.3				
1 ~ 181.00' PRESTR CONC X-BEAM UNIT (5XB34)								19,994	1,251	3,253	
HOPE ROAD BRIDGE TOTALS	422	250	1,397	517	92.7	51.8	84.3	19,994	1,251	3,253	330.5

ITEM	425	427		442	450	450	454	460	460	4171
CODE	6024	6007		6007	6023	6030	6007	6003	6006	6001
BID ITEM DESCRIPTION / BRIDGE ELEMENT	PRESTR CONC BOX BEAM (5XB34)	EPOXY WATERPROOF FINISH (TY X)		STR STEEL (MISC NON - BRIDGE) *	RAIL (TY SSTR)	RAIL (TY C221)	HEADER TYPE EXPANSION JOINT	CMP (GAL STL 24 IN)	CMP (GAL STL 42 IN)	INSTALL BRIDGE IDENTIFICATION NUMBERS
	LF	SF		LB	LF	LF	LF	LF	LF	EA
2 ~ ABUTMENTS		991		341	30.0	30.0	232	90	155	
1 ~ INTERIOR BENT										
1 ~ 181.00' PRESTR CONC X-BEAM UNIT (5XB34)	2,157.69				179.6	181.0				2
HOPE ROAD BRIDGE TOTALS	2,157.69	991		341	209.6	211.0	232	90	155	2

* FOR SIDEWALK COVER PLATES (BS-EJCP)

BEARING SEAT ELEVATIONS

			X-BEAM 1		X-BEAM 2		X-BEAM 3		X-BEAM 4		X-BEAM 5		X-BEAM 6		X-BEAM 7		X-BEAM 8		X-BEAM 9		X-BEAM 10		X-BEAM 11		X-BEAM 12	
			LT. SIDE	RT. SIDE	LT. SIDE	RT. SIDE	LT. SIDE	RT. SIDE	LT. SIDE	RT. SIDE	LT. SIDE	RT. SIDE	LT. SIDE	RT. SIDE	LT. SIDE	RT. SIDE	LT. SIDE	RT. SIDE	LT. SIDE	RT. SIDE	LT. SIDE	RT. SIDE	LT. SIDE	RT. SIDE	LT. SIDE	RT. SIDE
ABUT	1	(FWD)	3759.161	3759.281	3759.219	3759.339	3759.280	3759.400	3759.341	3759.461	3759.405	3759.525	3759.514	3759.394	3759.213	3759.093	3758.914	3758.794	3758.617	3758.497	3758.321	3758.201	3758.027	3757.907	3757.735	3757.615
BENT	2	(BK)	3761.674	3761.794	3761.843	3761.963	3762.009	3762.129	3762.172	3762.292	3762.332	3762.452	3762.532	3762.412	3762.318	3762.198	3762.101	3761.981	3761.881	3761.761	3761.657	3761.537	3761.431	3761.311	3761.201	3761.081
		(FWD)	3761.683	3761.803	3761.855	3761.975	3762.024	3762.144	3762.189	3762.309	3762.351	3762.471	3762.554	3762.434	3762.343	3762.223	3762.128	3762.008	3761.911	3761.791	3761.689	3761.569	3761.464	3761.344	3761.236	3761.116
ABUT	3	(BK)	3759.996	3760.116	3760.282	3760.402	3760.565	3760.685	3760.844	3760.964	3761.121	3761.241	3761.438	3761.318	3761.341	3761.221	3761.241	3761.121	3761.137	3761.017	3761.008	3760.888	3760.873	3760.753	3760.734	3760.614

NO.	DATE	DESCRIPTION	APPROV.

BRIDGEFARMER & ASSOCIATES, INC.
CONSULTING ENGINEERS
TBPE REGISTRATION NO. 264

IH-40 AT HOPE ROAD

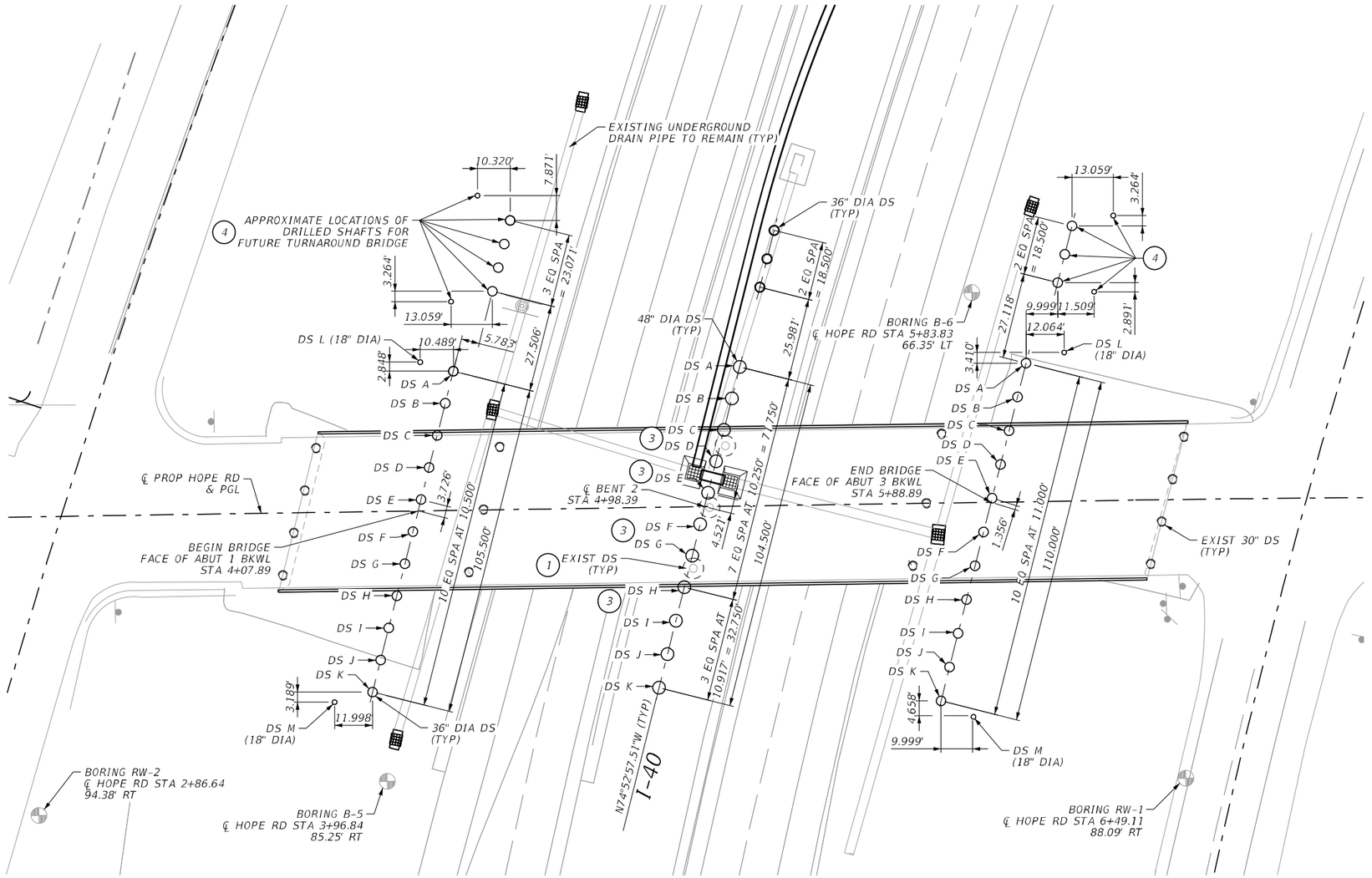
IH-40 UNDERPASS AT HOPE ROAD

ESTIMATED QUANTITIES & BEARING SEAT ELEVATIONS

SHEET 1 OF 1

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
ZJB	6	SEE TITLE SHEET		IH 40
GRAPHICS AKH	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK STS	TEXAS	AMA	POTTER	099
CHECK ZJB	CONTROL	SECTION	JOB	
	0090	05	107	

SCALE: 1" = 40'



PLAN

GENERAL NOTES:

1. FOR SOIL BORING INFORMATION SEE "BORE LOG" SHEET.
2. DRILLED SHAFTS HAVE BEEN DESIGNED FOR BOTH SKIN FRICTION AND END BEARING. ALL DRILLED SHAFTS SHALL BE EXTENDED FOR LENGTH SHOWN ON BRIDGE LAYOUT.
3. CONTRACTOR SHALL VERIFY LOCATIONS OF ALL UTILITIES PRIOR TO CONSTRUCTION, EXCAVATION, OR DRILLING.
4. SEE "TYPICAL COLUMN FOUNDATION DETAILS" SHEET FOR NOTES AND DETAILS NOT SHOWN HEREIN.
5. REINFORCING STEEL & CONCRETE FOR DRILLED SHAFTS SHALL BE PLACED IMMEDIATELY AFTER COMPLETED FOUNDATION EXCAVATION. UNDER NO CIRCUMSTANCES, COMPLETED FOUNDATION EXCAVATION REMAINS OPEN OVERNIGHT.
6. GROUNDWATER SEEPAGE FLOW IS NOT PERMITTED INTO THE SHAFT EXCAVATION AND SHALL BE CONTROLLED PRIOR TO CONCRETE PLACEMENT. A WATER HEAD MAY BE USED TO CONTROL THE SEEPAGE IF NECESSARY.
7. DRILLED SHAFTS LABELED AA THROUGH FF ARE FOR FUTURE TURNAROUND BRIDGE TO BE BUILT BY OTHERS.
8. SEE STORM SEWER LAYOUT FOR DRAINAGE DETAILS NOT SHOWN.

(1) EXISTING DRILLED SHAFT LOCATIONS ARE APPROXIMATE BASED OFF OF AS-BUILTS. CONTRACTOR TO FIELD VERIFY.

(2) EXISTING BELL FOOTINGS ARE UNREINFORCED PERMISSIBLE TO DRILL THROUGH EXISTING BELL FOOTING TO INSTALL PROPOSED DRILL SHAFT.

(3) PROPOSED INTERIOIR BENT SHAFTS C THROUGH H ARE IN CLOSE PROXIMITY OR IN CONFLICT WITH EXISTING BELLED DRILLED SHAFT FOUNDATIONS. CONTRACTOR TO UTILIZE PROPER TOOLING NECESSARY TO ADVANCE THE PROPOSED DRILLED SHAFTS TO THE TARGET DESIGN LENGTH WHILE MAINTAINING VERTICAL AND HORIZONTAL SHAFT ALIGNMENT. CONTRACTOR TO INCLUDE PROPOSED METHODOLOGY AND EQUIPMENT IN THE REQUIRED DRILLED SHAFT INSTALLATION PLAN.

(4) FUTURE FOUNDATION BEHIND PROPOSED RETAINING WALL REQUIRES VERTICAL CMP TO AVOID MSE STRAPS. CUT VERTICAL CMP TO MATCH EXISTING GROUND. CMP USED FOR FUTURE BRIDGE DRILL SHAFTS IS TO BE FILLED WITH BACKFILL MATERIAL. PAYMENT FOR BACKFILL WORK AND MATERIAL IS CONSIDERED SUBSIDIARY TO THE VARIOUS BRIDGE ITEMS. FILL TOP 4 INCHES OF CMP WITH CLASS B f'c = 2,000 PSI CONCRETE PER ITEM 432-6045 "RIPRAP (MOW STRIP)(4 IN)".

HL 93 LOADING

NO.	DATE	DESCRIPTION	APPROV.

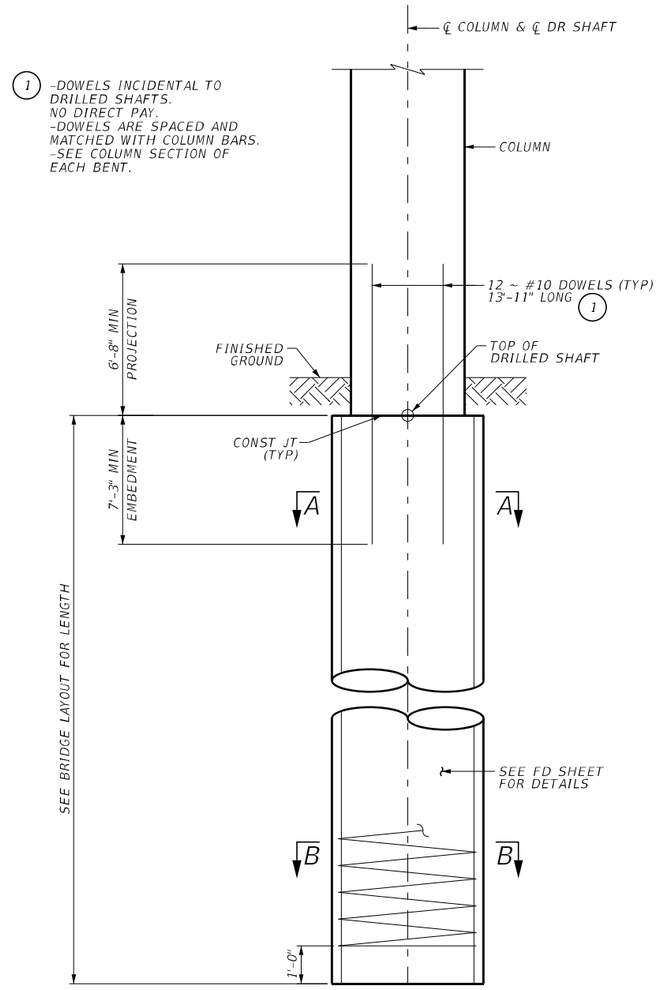
BRIDGEFARMER & ASSOCIATES, INC.
CONSULTING ENGINEERS
TBPE REGISTRATION NO. 264

IH-40 AT HOPE ROAD
IH 40 UNDERPASS AT HOPE ROAD FOUNDATION LAYOUT

SHEET 1 OF 2

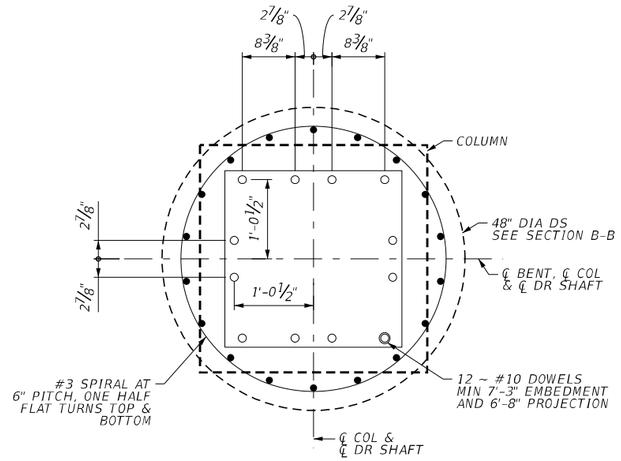
STATE OF TEXAS
ZACHARY J. BEIL
139718
LICENSED
PROFESSIONAL ENGINEER
Zachary J. Beil
12-08-2023

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
ZJB	6	SEE TITLE SHEET		IH 40
GRAPHICS AKH	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK KDH	TEXAS	AMA	POTTER	100
CHECK ZJB	CONTROL	SECTION	JOB	
	0090	05	107	



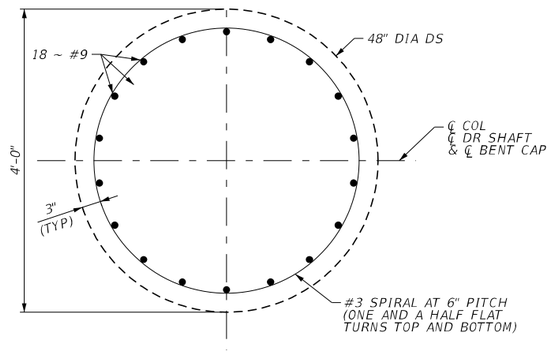
ELEVATION 48" DIA DRILLED SHAFT

SCALE: 1/4" = 1'-0"



SECTION A-A

N.T.S,



SECTION B-B

N.T.S.

GENERAL NOTES:

1. DESIGNED ACCORDING TO AASHTO LRFD BRIDGE DESIGN SPECIFICATION, 9TH EDITION (2020) AND TxDOT BRIDGE DESIGN MANUAL (JAN 2023).
2. SEE "TYPICAL COLUMN DETAILS SHEET FOR ALL COLUMN DETAILS AND NOTES NOT SHOWN.

MATERIAL NOTES:

1. PROVIDE CLASS C CONCRETE (f'c = 3600 PSI)
2. PROVIDE GRADE 60 REINFORCING STEEL.
3. PROVIDE GRADE 60 EPOXY-COATED REINFORCING STEEL FOR DOWEL BARS.

STATE OF TEXAS
ZACHARY J. BEIL
139718
LICENSED
PROFESSIONAL ENGINEER
Zachary J. Beil 12-08-2023

HL 93 LOADING

NO.	DATE	DESCRIPTION	APPROV.

BRIDGEFARMER & ASSOCIATES, INC.
CONSULTING ENGINEERS
TBPE REGISTRATION NO. 264

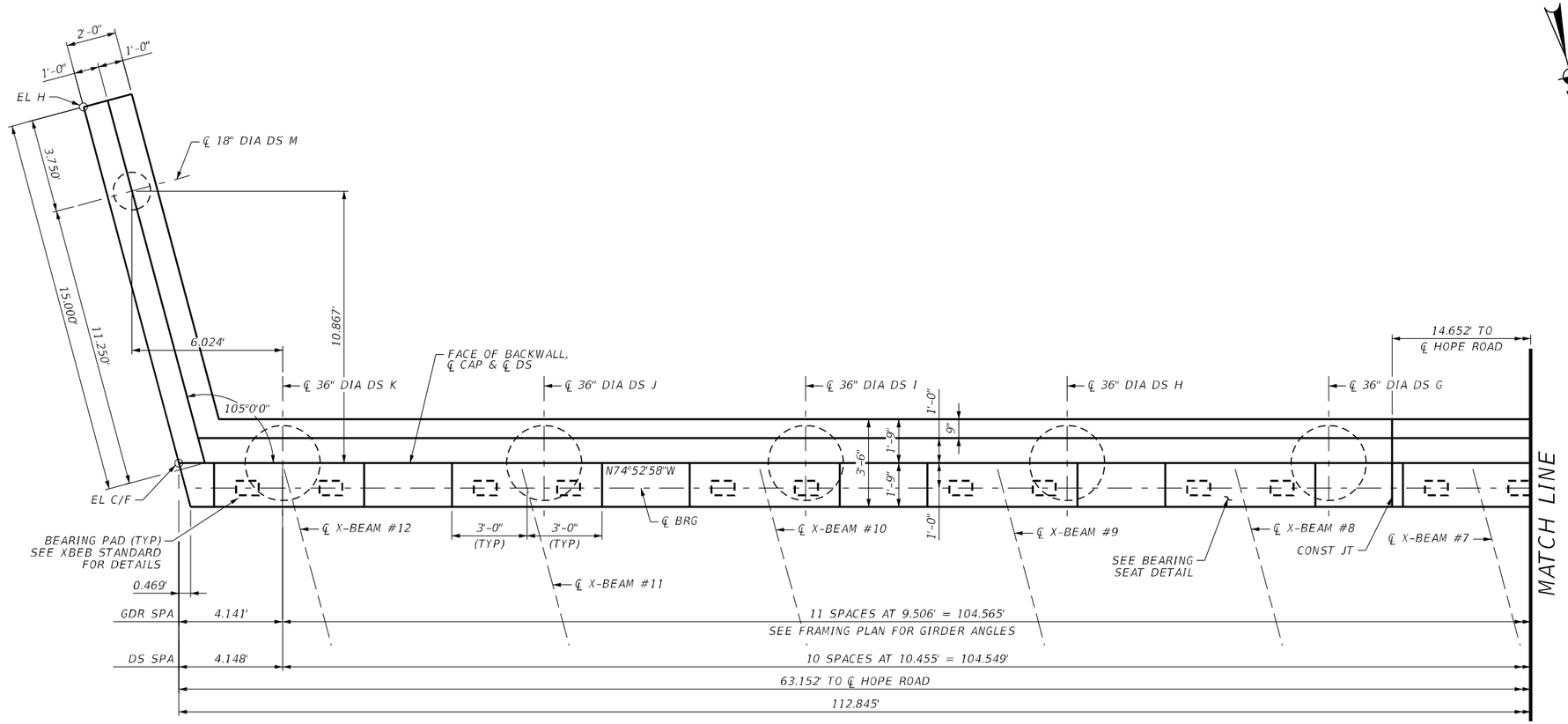
IH-40 AT HOPE ROAD

IH-40 UNDERPASS AT HOPE ROAD

TYPICAL COLUMN FOUNDATION DETAILS

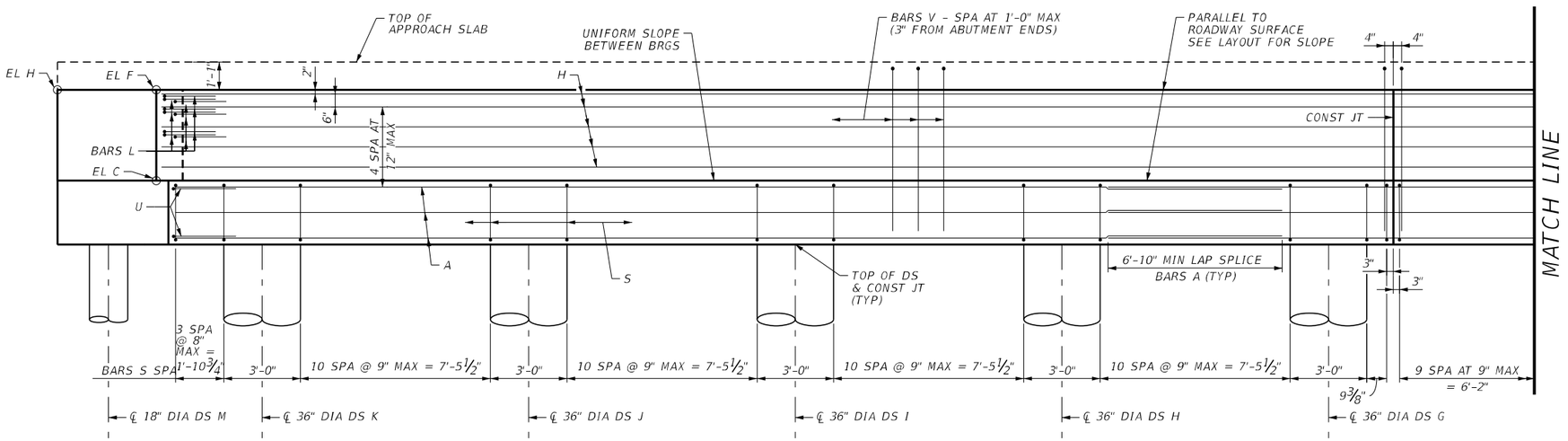
SCALE: AS NOTED SHEET 2 OF 2

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
ZJB	6	SEE TITLE SHEET		IH 40
GRAPHICS AKH	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK KDH	TEXAS	AMA	POTTER	101
CHECK ZJB	CONTROL	SECTION	JOB	
	0090	05	107	



PLAN

SCALE: 3/16" = 1'-0"



ELEVATION

SCALE: 3/16" = 1'-0"

GENERAL NOTES:

1. DESIGN ACCORDING TO AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, 9TH EDITION (2020) AND TxDOT BRIDGE DESIGN MANUAL (NOV 2021).
2. SEE BRIDGE LAYOUT FOR HEADER SLOPE AND FOUNDATION TYPE, SIZE AND LENGTH.
3. SEE COMMON FOUNDATION DETAILS (FD) STANDARD SHEET FOR ALL FOUNDATION DETAILS AND NOTES.
4. SEE TY SSTR AND C221 STANDARD FOR RAIL ANCHORAGE IN APPROACH SLAB.
5. SEE AMARILLO WATERPROOFING DETAIL SHEET FOR WATERPROOFING DETAILS NOT SHOWN.
6. FOR BEARING SEAT ELEVATIONS AND ESTIMATED QUANTITIES, SEE "BRIDGE ESTIMATED QUANTITIES AND BEARING SEAT ELEVATIONS" SHEET.
7. CALCULATED FOUNDATION LOADS = 140 TONS/DS

MATERIAL NOTES:

1. PROVIDE CLASS C CONCRETE (f'c = 3600 PSI)
2. PROVIDE GRADE 60 REINFORCING STEEL.

COVER DIMENSIONS ARE CLEAR DIMENSIONS, UNLESS NOTED OTHERWISE.
REINFORCING BAR DIMENSIONS SHOWN ARE OUT-TO-OUT OF BAR.

STATE OF TEXAS
ZACHARY J. BEIL
139718
LICENSED
PROFESSIONAL ENGINEER
Zachary J Beil
12-08-2023

HL 93 LOADING

NO.	DATE	DESCRIPTION	APPROV.

BRIDGEFARMER & ASSOCIATES, INC.
CONSULTING ENGINEERS
TBPE REGISTRATION NO. 264

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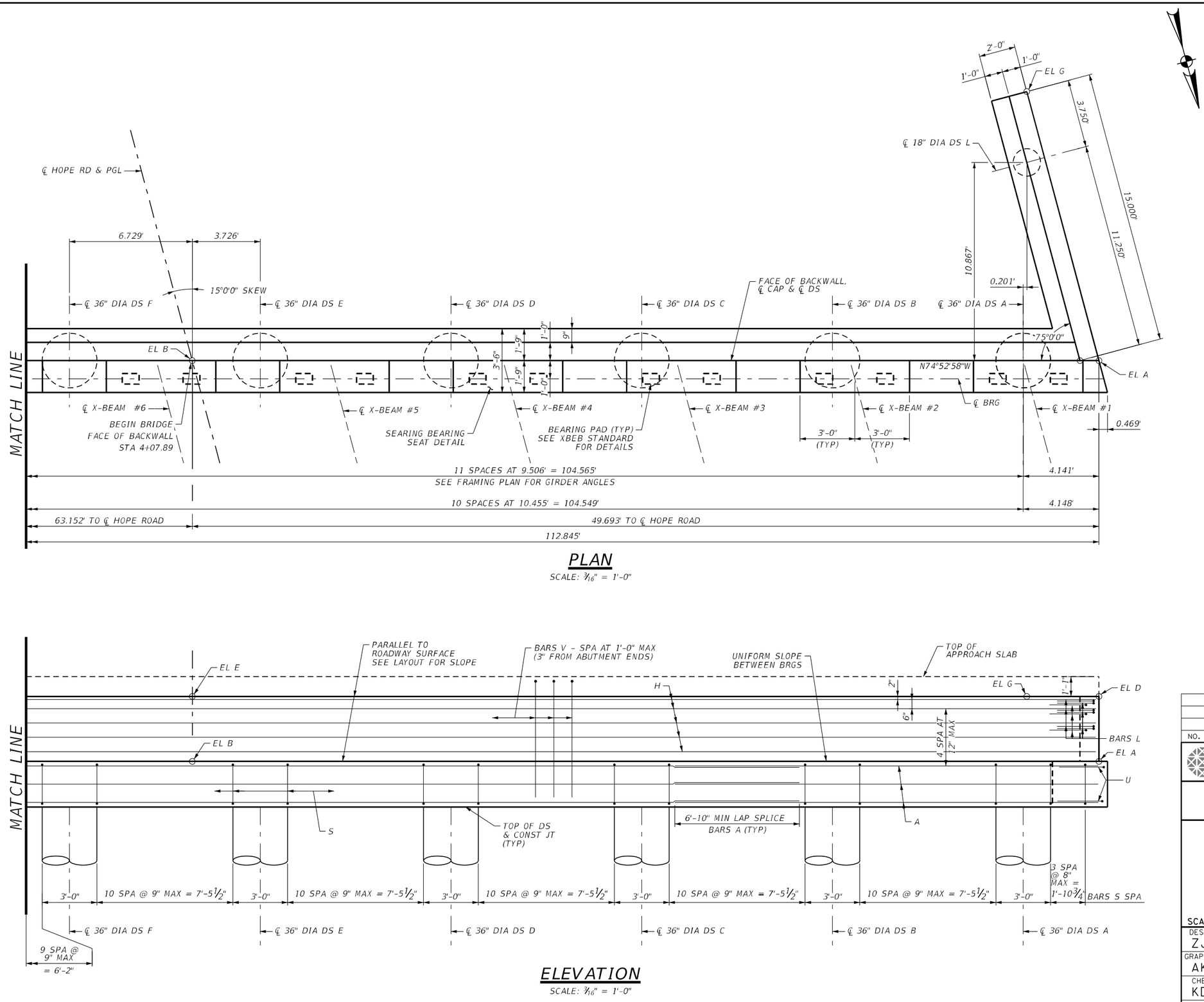
IH-40 AT HOPE ROAD

IH 40 UNDERPASS AT HOPE ROAD ABUTMENT 1 DETAILS

SCALE: AS NOTED — SHEET 1 OF 3

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
ZJB	6	SEE TITLE SHEET		IH 40
GRAPHICS AKH	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK KDH	TEXAS	AMA	POTTER	102
CHECK ZJB	CONTROL	SECTION	JOB	
	0090	05	107	



PLAN

SCALE: 3/16" = 1'-0"

ELEVATION

SCALE: 3/16" = 1'-0"

STATE OF TEXAS
ZACHARY J. BEIL
139718
LICENSED
PROFESSIONAL ENGINEER
Zachary J. Beil
12-08-2023

HL 93 LOADING

NO.	DATE	DESCRIPTION	APPROV.

BRIDGEFARMER & ASSOCIATES, INC.
CONSULTING ENGINEERS
TBPE REGISTRATION NO. 264

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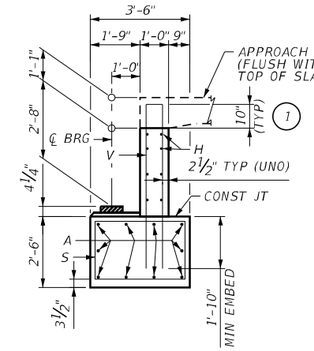
IH-40 AT HOPE ROAD
IH 40 UNDERPASS AT HOPE ROAD ABUTMENT 1 DETAILS

SCALE: AS NOTED — SHEET 2 OF 3

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
ZJB	6	SEE TITLE SHEET		IH 40
GRAPHICS AKH	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK KDH	TEXAS	AMA	POTTER	103
CHECK ZJB	CONTROL	SECTION	JOB	
	0090	05	107	

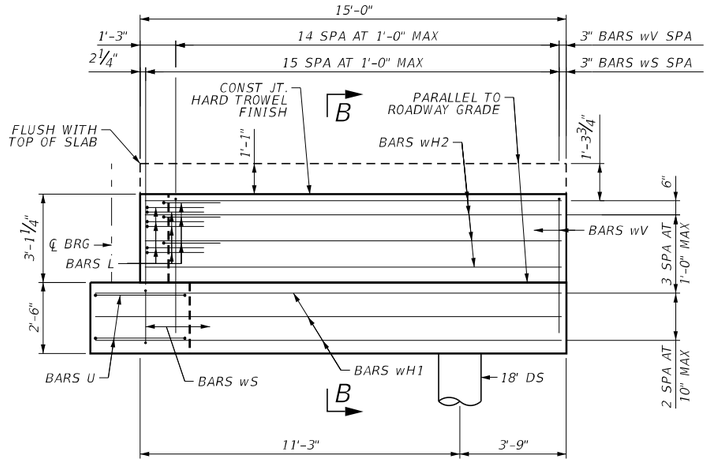
CONTROL ELEVATIONS																				
TOP OF CAP			TOP OF BACKWALL					TOP OF DRILL SHAFT												
ELEV A	ELEV B	ELEV C	ELEV D	ELEV E	ELEV F	ELEV G	ELEV H	D.S. A	D.S. B	D.S. C	D.S. D	D.S. E	D.S. F	D.S. G	D.S. H	D.S. I	D.S. J	D.S. K	D.S. L	D.S. M
3759.018	3758.842	3757.378	3762.039	3762.363	3760.399	3761.288	3759.789	3756.543	3756.608	3756.676	3756.745	3756.816	3756.629	3756.300	3755.974	3755.649	3755.325	3755.004	3755.466	3754.438



SECTION A-A

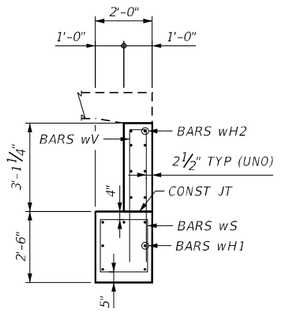
SCALE: 3/16" = 1'-0"

(1) INCREASE AS REQUIRED TO MAINTAIN 3" FROM FINISHED GRADE



WINGWALL ELEVATION

SCALE: 3/16" = 1'-0"



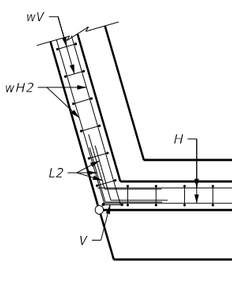
SECTION B-B

SCALE: 3/16" = 1'-0"

TABLE OF CAP QUANTITIES						
BAR SCHEDULE ~ 1 CAP ONLY						
* BAR	TYPE	NO.	SIZE		LENGTH	WEIGHT
A	ST	10	#	11	126'-2"	6,704
H	ST	8	#	6	124'-2"	1,492
L1	BT	18	#	6	4'-0"	108
L2	BT	18	#	6	4'-0"	108
S	BT	119	#	5	11'-2"	1,386
U	BT	4	#	6	8'-1"	49
V	BT	114	#	5	12'-2"	1,442
wH1	ST	14	#	6	16'-4"	343
wH2	ST	16	#	6	14'-6"	348
wS	BT	32	#	4	7'-6"	160
wV	BT	30	#	5	9'-11"	310
~ REINF STEEL					LB	12,450
CL C CONC(ABUT)					CY	45.4

~ FOR CONTRACTOR'S INFORMATION ONLY

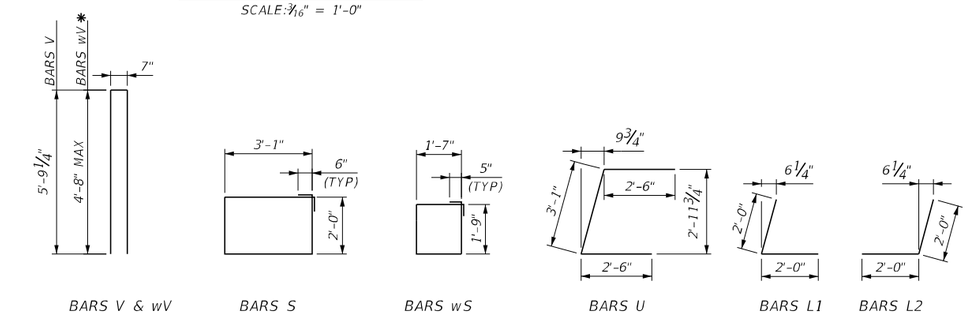
* INCLUDES TWO 6'-10" MIN LAP SPLICES



BACKWALL CAP

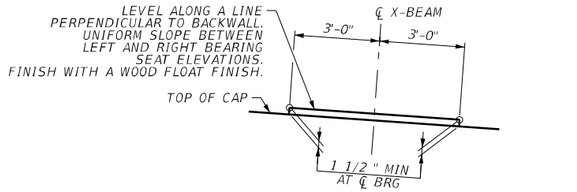
CORNER DETAILS

SCALE: 3/16" = 1'-0"



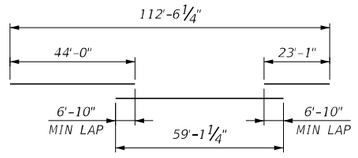
BARS V & wV | BARS S | BARS wS | BARS U | BARS L1 | BARS L2

* FIELD TRIM BARS wV AS REQUIRED TO MAINTAIN 8" FROM BOTTOM OF WINGWALL CAP



BEARING SEAT DETAIL

(REMOVE ALL LOOSE MATERIAL AND CLEAN BEARING SURFACE BEFORE PLACING THE BEARING PAD)



BARS A LAP SPLICE DETAIL

STATE OF TEXAS
ZACHARY J. BEIL
139718
LICENSED
PROFESSIONAL ENGINEER
Zachary J. Beil
12-08-2023

HL 93 LOADING

NO.	DATE	DESCRIPTION	APPROV.

BRIDGEFARMER & ASSOCIATES, INC.
CONSULTING ENGINEERS
TBPE REGISTRATION NO. 264

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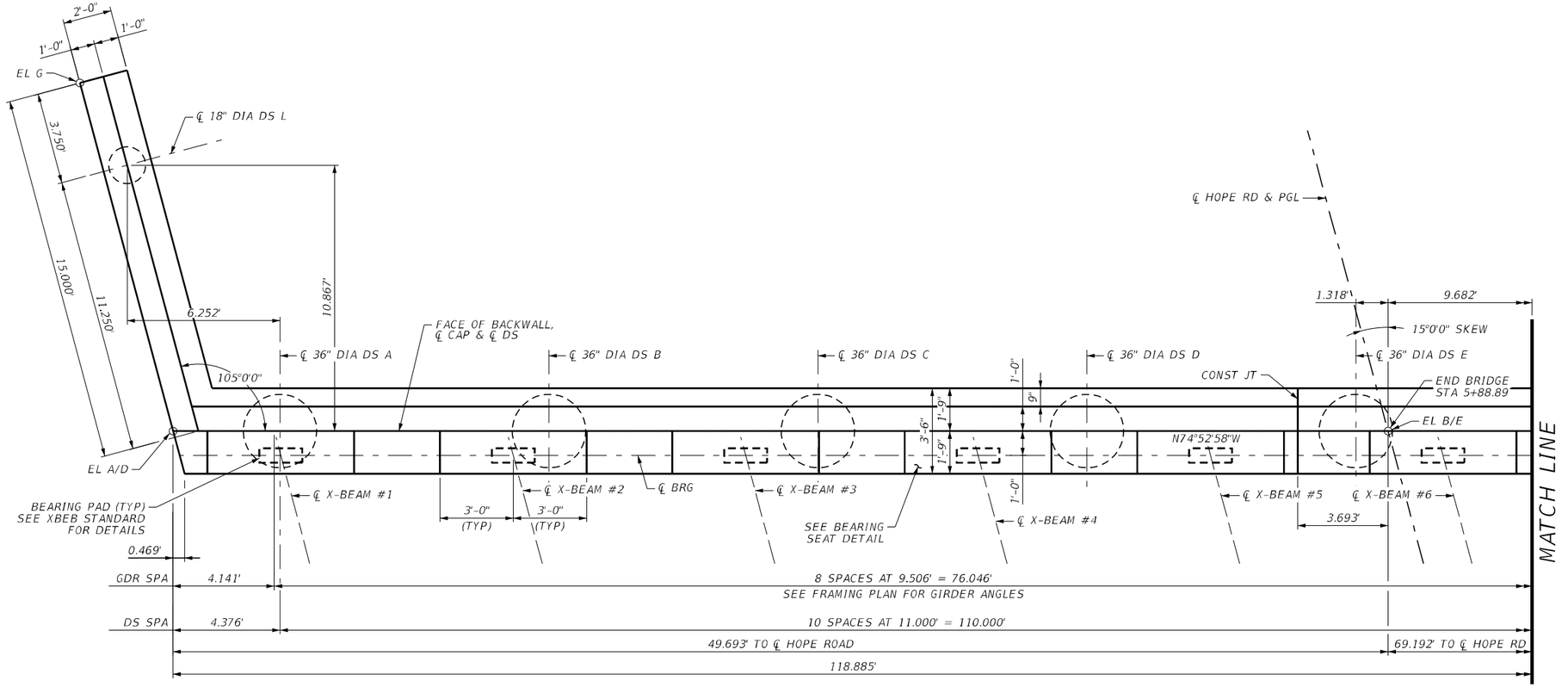
IH-40 AT HOPE ROAD
IH 40 UNDERPASS AT HOPE ROAD ABUTMENT 1 DETAILS

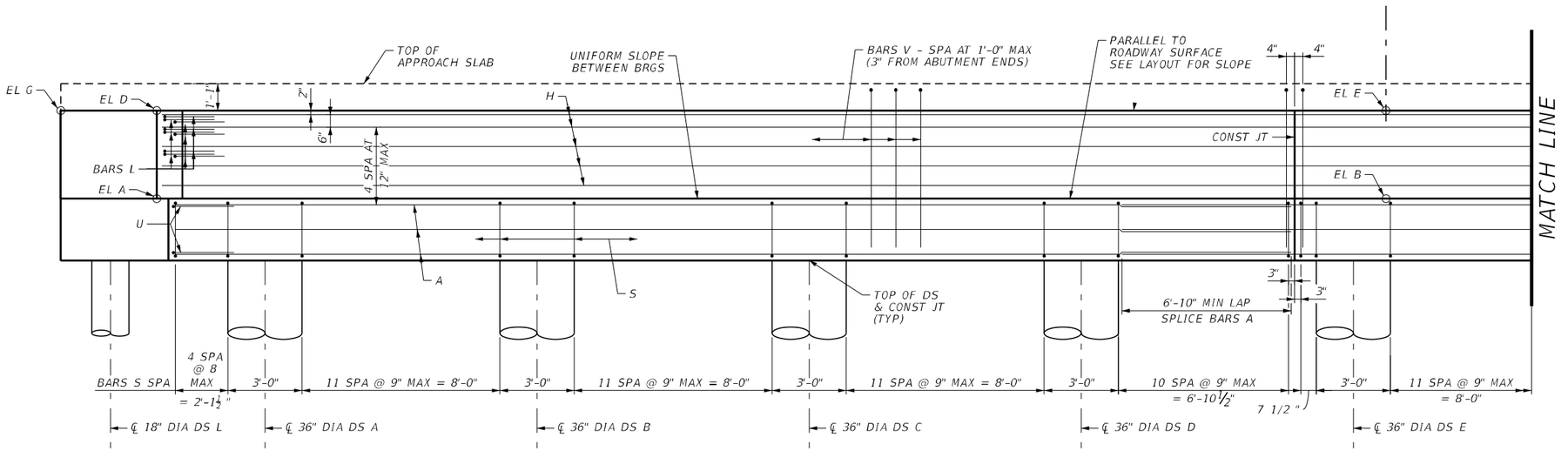
SCALE: AS NOTED SHEET 3 OF 3

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
ZJB	6	SEE TITLE SHEET		IH 40
GRAPHICS AKH	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK KDH	TEXAS	AMA	POTTER	104
CHECK ZJB	CONTROL	SECTION	JOB	
	0090	05	107	



PLAN

SCALE: 3/16" = 1'-0"



ELEVATION

SCALE: 3/8" = 1'-0"

GENERAL NOTES:

1. DESIGN ACCORDING TO AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, 9TH EDITION (2020) AND TxDOT BRIDGE DESIGN MANUAL (NOV 2021).
2. SEE BRIDGE LAYOUT FOR HEADER SLOPE AND FOUNDATION TYPE, SIZE AND LENGTH.
3. SEE COMMON FOUNDATION DETAILS (FD) STANDARD SHEET FOR ALL FOUNDATION DETAILS AND NOTES.
4. SEE TY SSTR AND C221 STANDARD FOR RAIL ANCHORAGE IN APPROACH SLAB.
5. SEE AMARILLO WATERPROOFING DETAIL SHEET FOR WATERPROOFING DETAILS NOT SHOWN.
6. FOR BEARING SEAT ELEVATIONS AND ESTIMATED QUANTITIES, SEE "BRIDGE ESTIMATED QUANTITIES AND BEARING SEAT ELEVATIONS" SHEET.
7. CALCULATED FOUNDATION LOADS = 150 TONS/DS

MATERIAL NOTES:

1. PROVIDE CLASS C CONCRETE (f'c = 3600 PSI)
2. PROVIDE GRADE 60 REINFORCING STEEL.

COVER DIMENSIONS ARE CLEAR DIMENSIONS, UNLESS NOTED OTHERWISE.
REINFORCING BAR DIMENSIONS SHOWN ARE OUT-TO-OUT OF BAR.

STATE OF TEXAS
ZACHARY J. BEIL
139718
LICENSED
PROFESSIONAL ENGINEER
Zachary J. Beil
12-08-2023

HL 93 LOADING

NO.	DATE	DESCRIPTION	APPROV.

BRIDGEFARMER & ASSOCIATES, INC.
CONSULTING ENGINEERS
TBPE REGISTRATION NO. 264

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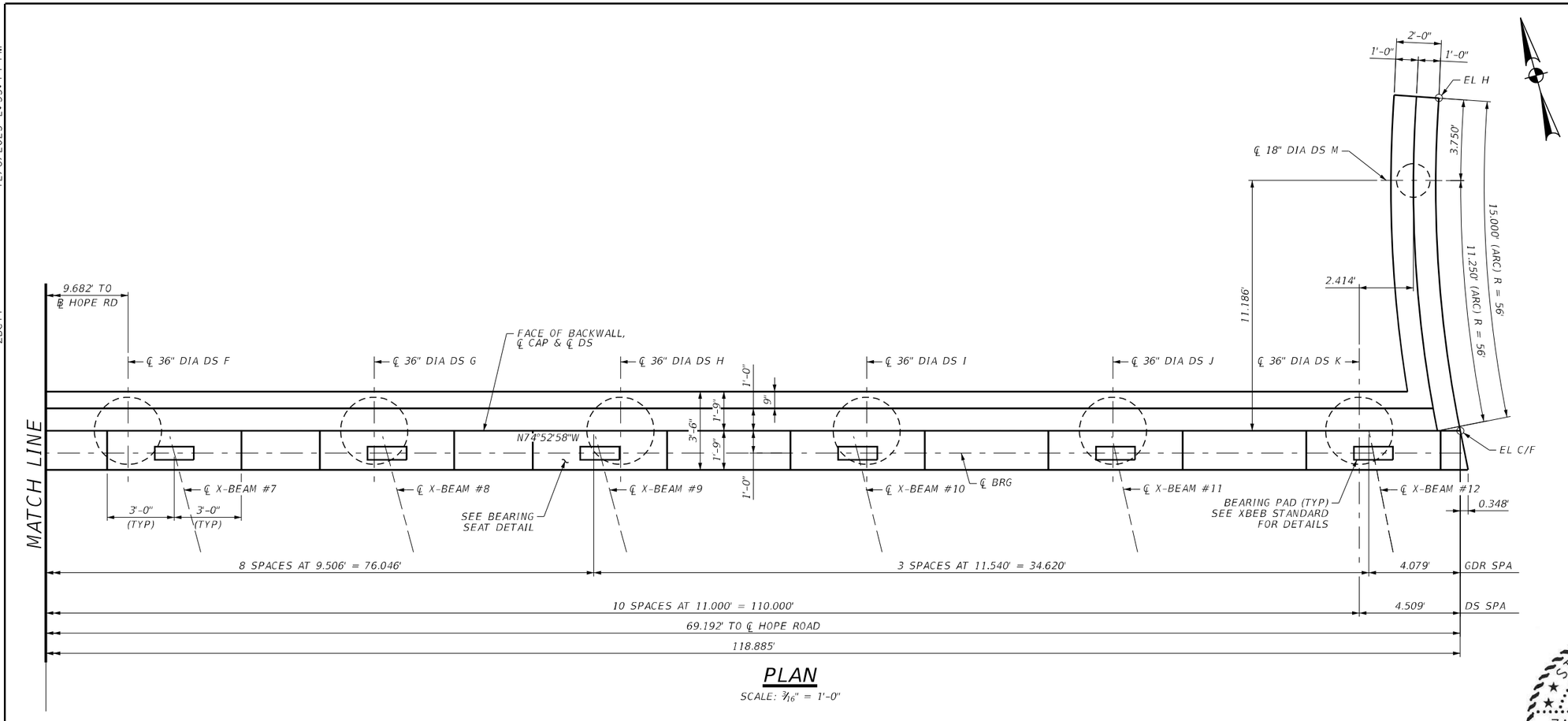
IH-40 AT HOPE ROAD

IH 40 UNDERPASS AT HOPE ROAD ABUTMENT 3 DETAILS

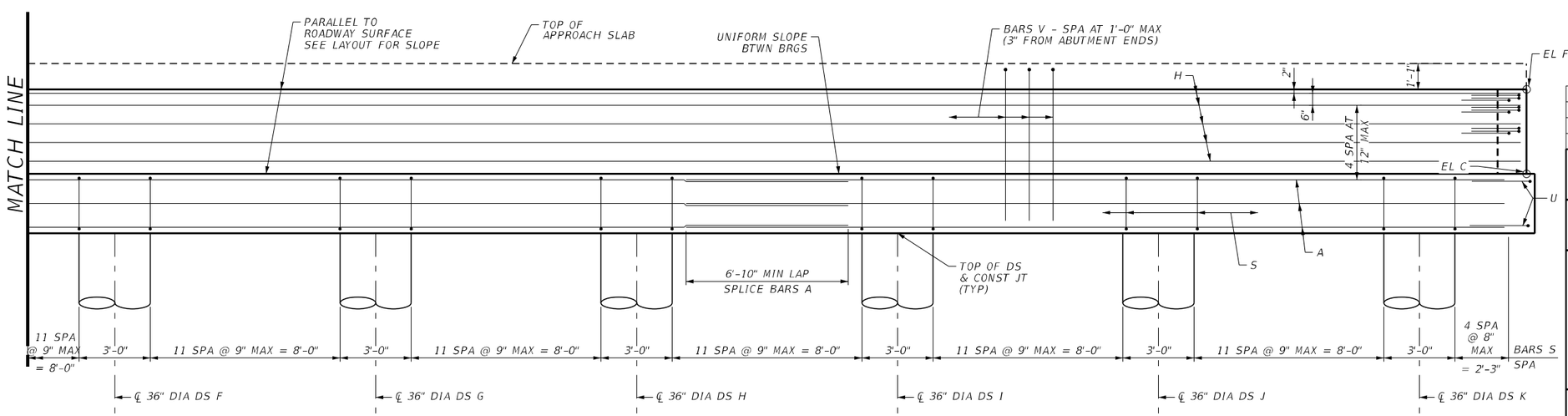
SCALE: AS NOTED — SHEET 1 OF 3

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
ZJB	6	SEE TITLE SHEET		IH 40
GRAPHICS AKH	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK KDH	TEXAS	AMA	POTTER	105
CHECK ZJB	CONTROL 0090	SECTION 05	JOB 107	



PLAN

SCALE: 3/16" = 1'-0"



ELEVATION

SCALE: 3/8" = 1'-0"

STATE OF TEXAS
ZACHARY J. BEIL
139718
LICENSED
PROFESSIONAL ENGINEER
Zachary J Beil
12-08-2023

HL 93 LOADING

NO.	DATE	DESCRIPTION	APPROV.

BRIDGEFARMER & ASSOCIATES, INC.
CONSULTING ENGINEERS
TBPE REGISTRATION NO. 264

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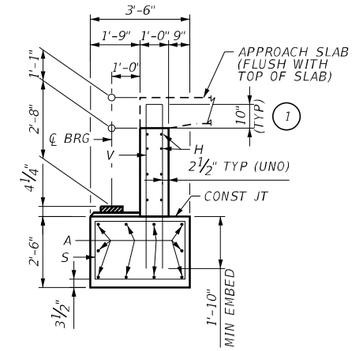
IH-40 AT HOPE ROAD
IH 40 UNDERPASS AT HOPE ROAD ABUTMENT 3 DETAILS

SCALE: AS NOTED — SHEET 2 OF 3

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
ZJB				
GRAPHICS AKH	6	SEE TITLE SHEET		IH 40
	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK KDH	TEXAS	AMA	POTTER	106
	CONTROL	SECTION	JOB	
CHECK ZJB	0090	05	107	

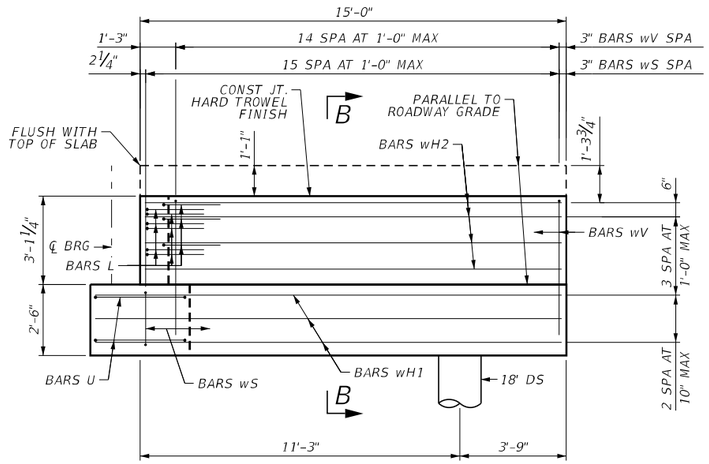
CONTROL ELEVATIONS																				
TOP OF CAP			TOP OF BACKWALL					TOP OF DRILL SHAFT												
ELEV A	ELEV B	ELEV C	ELEV D	ELEV E	ELEV F	ELEV G	ELEV H	D.S. A	D.S. B	D.S. C	D.S. D	D.S. E	D.S. F	D.S. G	D.S. H	D.S. I	D.S. J	D.S. K	D.S. L	D.S. M
3759.760	3760.224	3760.470	3762.781	3764.256	3763.491	3762.085	3762.979	3757.393	3757.726	3758.053	3758.377	3758.697	3758.638	3758.524	3758.406	3758.283	3758.156	3758.025	3755.761	3757.610



SECTION A-A

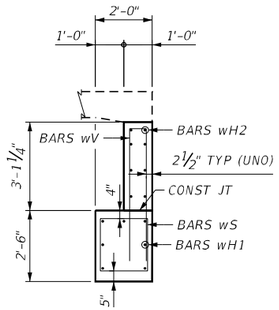
SCALE: 3/16" = 1'-0"

(1) INCREASE AS REQUIRED TO MAINTAIN 3" FROM FINISHED GRADE



WINGWALL ELEVATION

SCALE: 3/16" = 1'-0"



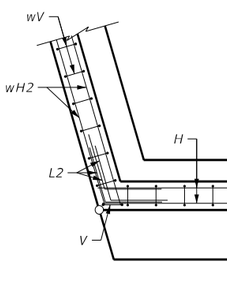
SECTION B-B

SCALE: 3/16" = 1'-0"

TABLE OF CAP QUANTITIES						
BAR SCHEDULE ~ 1 CAP ONLY						
BAR	TYPE	NO.	SIZE		LENGTH	WEIGHT
* A	ST	10	#	11	132'-3"	7,025
H	ST	8	#	6	130'-3"	1,565
L1	BT	18	#	6	4'-0"	108
L2	BT	18	#	6	4'-0"	108
S	BT	131	#	5	11'-2"	1,526
U	BT	4	#	6	8'-1"	49
V	BT	121	#	5	12'-2"	1,530
wH1	ST	14	#	6	16'-4"	343
wH2	ST	16	#	6	14'-6"	348
wS	BT	32	#	4	7'-6"	160
wV	BT	30	#	5	9'-11"	310
~ REINF STEEL					LB	13,072
CL C CONC(ABUT)					CY	47.3

~ FOR CONTRACTOR'S INFORMATION ONLY

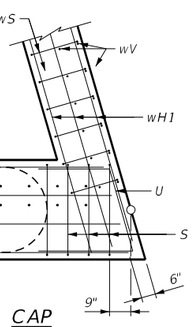
* INCLUDES TWO 6'-10" MIN LAP SPLICES



BACKWALL CAP

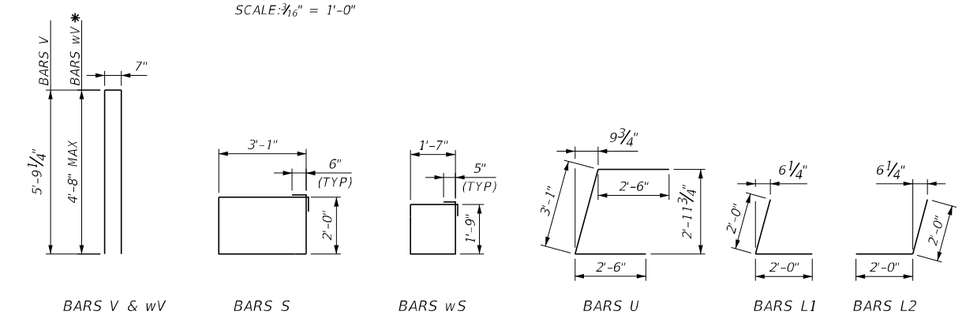
CORNER DETAILS

SCALE: 3/16" = 1'-0"



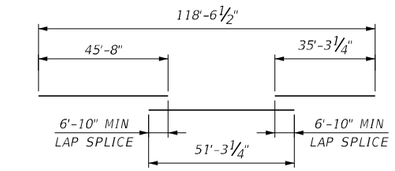
BEARING SEAT DETAIL

(REMOVE ALL LOOSE MATERIAL AND CLEAN BEARING SURFACE BEFORE PLACING THE BEARING PAD)



BARS V & wV BARS S BARS wS BARS U BARS L1 BARS L2

* FIELD TRIM BARS wV AS REQUIRED TO MAINTAIN 8" FROM BOTTOM OF WINGWALL CAP



BARS A LAP SPLICE DETAIL

STATE OF TEXAS
ZACHARY J. BEIL
139718
LICENSED
PROFESSIONAL ENGINEER
Zachary J. Beil
12-08-2023

HL 93 LOADING

NO.	DATE	DESCRIPTION	APPROV.

BRIDGEFARMER & ASSOCIATES, INC.
CONSULTING ENGINEERS
TBPE REGISTRATION NO. 264

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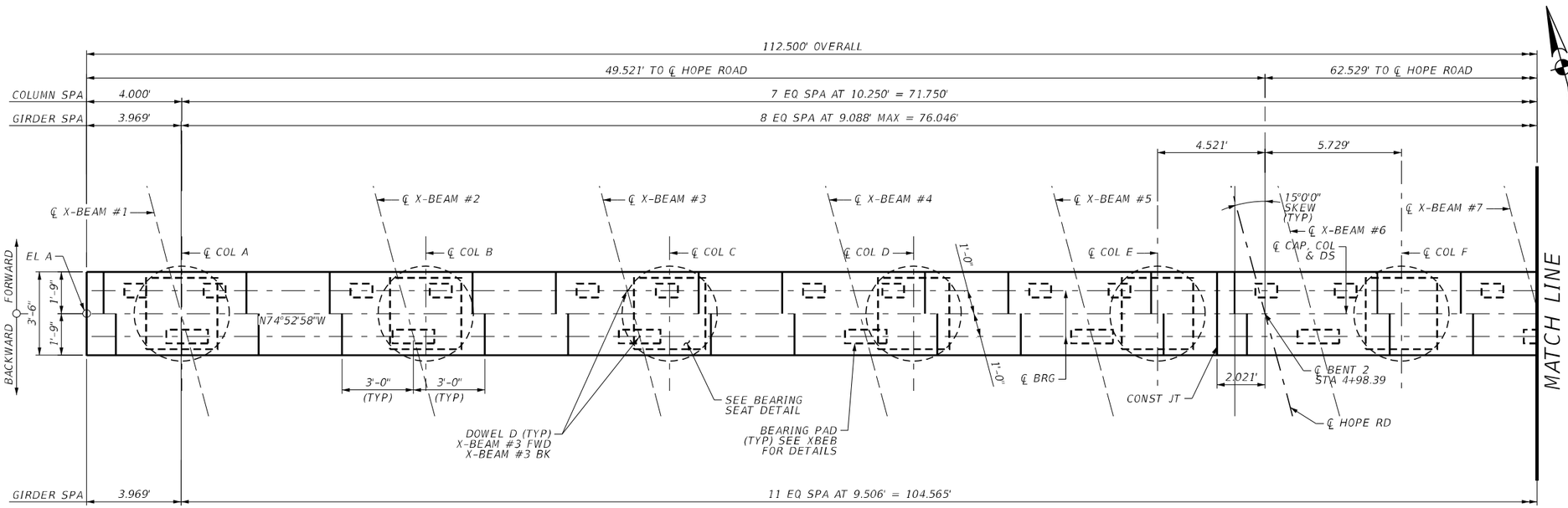
IH-40 AT HOPE ROAD
IH 40 UNDERPASS AT HOPE ROAD ABUTMENT 3 DETAILS

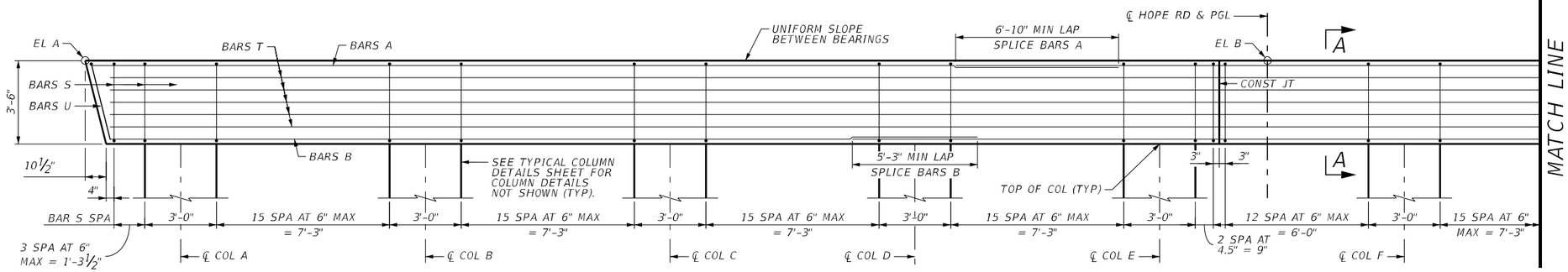
SCALE: AS NOTED SHEET 3 OF 3

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
ZJB	6	SEE TITLE SHEET		IH 40
GRAPHICS AKH	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK KDH	TEXAS	AMA	POTTER	107
CHECK ZJB	CONTROL	SECTION	JOB	
	0090	05	107	



PLAN

SCALE: $\frac{3}{16}$" = 1'-0"



ELEVATION

SCALE: $\frac{3}{16}$" = 1'-0"

GENERAL NOTES:

1. DESIGNED ACCORDING TO AASHTO LRFD BRIDGE DESIGN SPCIFICATIONS, 9TH EDITION (2020) AND TxDOT BRIDGE DESIGN MANUAL (NOV 2021).
2. SEE BRIDGE LAYOUT FOR FOUNDATION TYPE, SIZE AND LENGTH.
3. SEE TYPICAL COLUMN FOUNDATION DETAILS SHEET FOR ALL FOUNDATION DETAILS AND NOTES NOT SHOWN.
4. SEE BRIDGE COLUMN FINISH DETAILS FOR AESTHETIC DETAILS.
5. FOR FRAMING DETAILS NOT SHOWN, SEE "FRAMING PLAN".
6. LEAVE CAP FROM SUPPORTS IN PLACE UNTIL ENTIRE CAP IS READY FOR FORM REMOVAL.
7. SEE ESTIMATED QUANTITIES AND BEARING SEAT ELEVATIONS SHEET FOR BEARING SEAT ELEVATIONS.
8. USING PRECAST CONC. BENT CAP OPTION IS PERMITTED. SEE PBC-RC(MOD) SHEET FOR NOTES AND DETAILS.
9. CALCULATED FOUNDATION LOADS = 250 TONS/DS

MATERIAL NOTES

1. PROVIDE CLASS C CONCRETE (f'c = 3600 PSI)
2. PROVIDE GRADE 60 REINFORCING STEEL
3. GALVANIZE DOWEL BARS D

COVER DIMENSIONS ARE CLEAR DIMENSIONS, UNLESS NOTED OTHERWISE. REINFORCING BAR DIMENSIONS SHOWN ARE OUT-TO-OUT OF BAR.

STATE OF TEXAS
ZACHARY J. BEIL
139718
LICENSED
PROFESSIONAL ENGINEER
Zachary J Beil
12-08-2023

HL 93 LOADING

NO.	DATE	DESCRIPTION	APPROV.

BRIDGEFARMER & ASSOCIATES, INC.
CONSULTING ENGINEERS
TBPE REGISTRATION NO. 264

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IH-40 AT HOPE ROAD

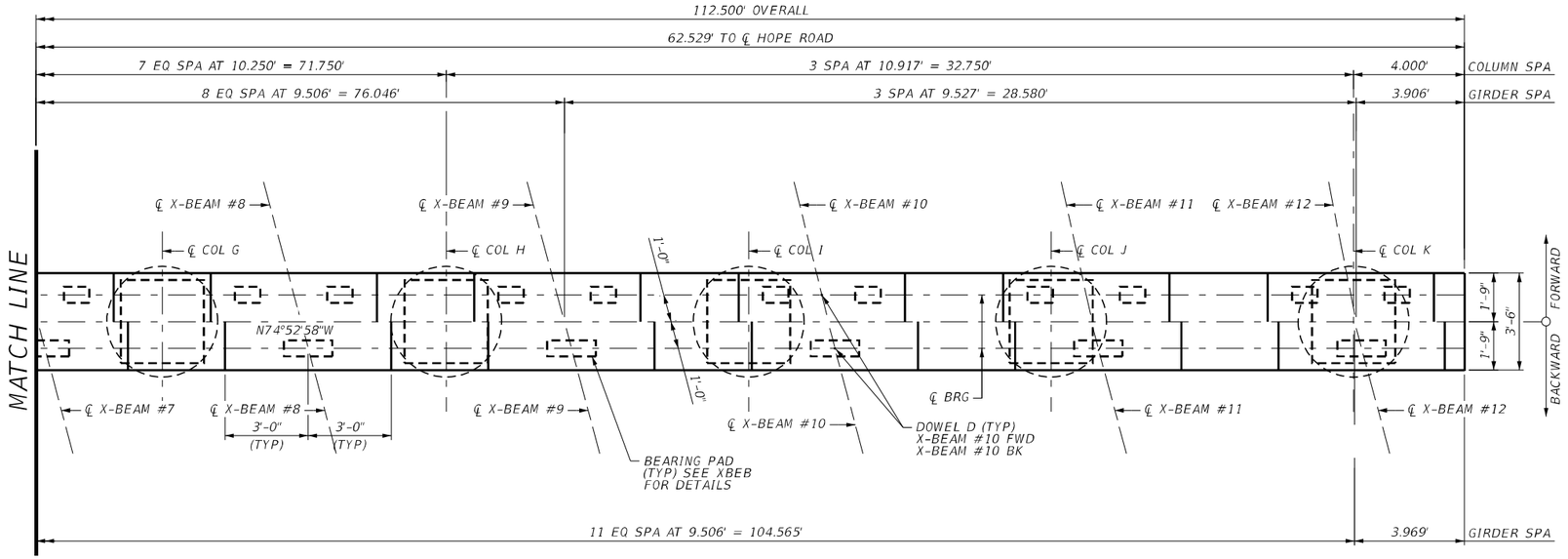
IH 40 UNDERPASS AT HOPE ROAD BENT 2 DETAILS

SCALE: AS NOTED — SHEET 1 OF 3

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
ZJB				
GRAPHICS AKH	6	SEE TITLE SHEET		IH 40
	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK KDH	TEXAS	AMA	POTTER	108
	CONTROL	SECTION	JOB	
CHECK ZJB	0090	05	107	

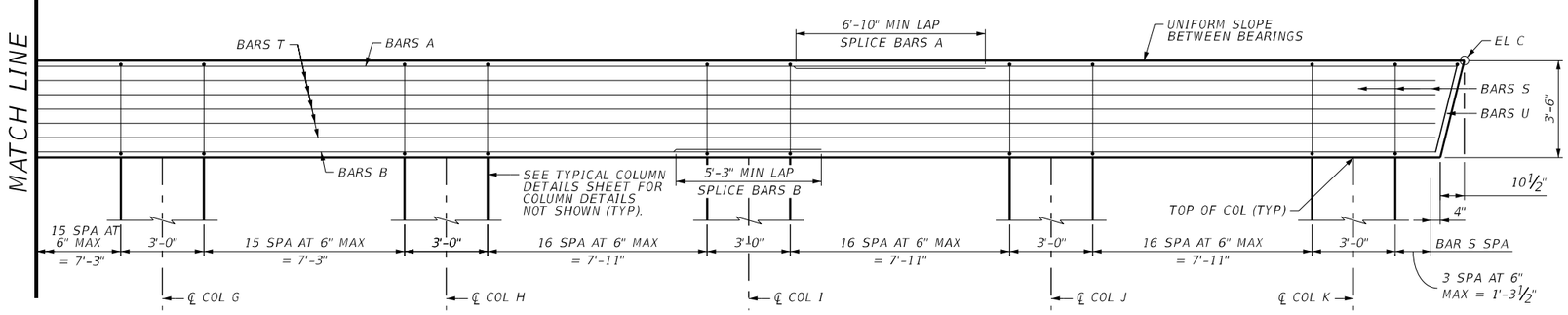
12/8/2023 2:54:11 PM zBeil

c:\bms\bridgefarmer-pw\zach.beil\dms21428\IH-40 UNDERPASS AT HOPE ROAD BENT 02 DETAILS 01.dgn



PLAN

SCALE: 3/16" = 1'-0"



ELEVATION

SCALE: 3/16" = 1'-0"

STATE OF TEXAS
ZACHARY J. BEIL
139718
LICENSED
PROFESSIONAL ENGINEER
Zachary J Beil
12-08-2023

HL 93 LOADING

NO.	DATE	DESCRIPTION	APPROV.

BRIDGEFARMER & ASSOCIATES, INC.
CONSULTING ENGINEERS
TBPE REGISTRATION NO. 264

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IH-40 AT HOPE ROAD

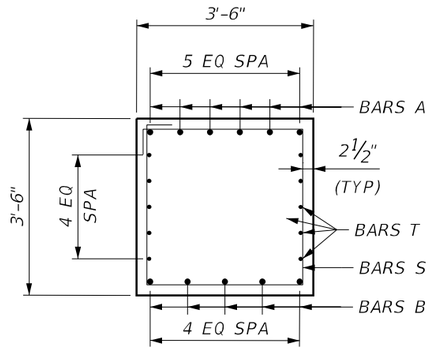
IH 40 UNDERPASS AT HOPE ROAD BENT 2 DETAILS

SCALE: AS NOTED — SHEET 2 OF 3

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
ZJB	6	SEE TITLE SHEET		IH 40
GRAPHICS AKH	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK KDH	TEXAS	AMA	POTTER	109
CHECK ZJB	CONTROL	SECTION	JOB	
	0090	05	107	

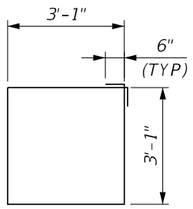
c:\dms\bridgefarmer-pw\vidal.ngoumnai@bridgefarmer.com\dms21428\IH-40 UNDERPASS AT HOPE ROAD BENT 02 DETAILS 02.dgn Vidal.Ngoumnai 12/8/2023 8:39:25 AM

CONTROL ELEVATIONS												
TOP OF CAP			TOP OF COLUMN									
ELEV A	ELEV B	ELEV C	COL A	COL B	COL C	COL D	COL E	COL F	COL G	COL H	COL I	COL J	COL K
3762.542	3763.402	3760.928	3759.114	3758.287	3758.467	3758.643	3758.816	3758.764	3758.533	3758.298	3758.045	3757.787	3757.525

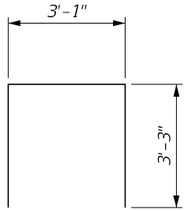


SECTION A-A

SCALE: ¼" = 1'-0"



BARS S



BARS U

BAR SCHEDULE ~ 1 CAP ONLY

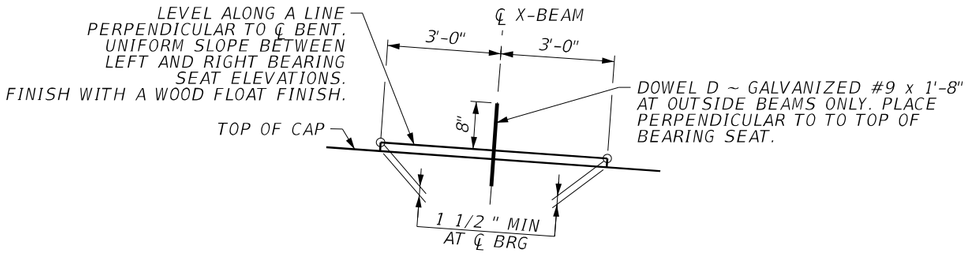
	BAR	TYPE	NO.	SIZE	LENGTH	WEIGHT
*	A	ST	6	# 11	125'-8"	4,006
**	B	ST	5	# 11	120'-11"	3,212
	D	ST	4	# 9	1'-8"	23
	S	BT	171	# 5	13'-4"	2,378
	T	ST	10	# 5	110'-0"	1,147
	U	BT	2	# 5	9'-7"	20
~	REINF STEEL				LB	10,786
	CL C CONC(CAP)				CY	51.8

~ FOR CONTRACTOR'S INFORMATION ONLY
* INCLUDES TWO 6'-10" MIN LAP SPLICE
** INCLUDES TWO 5'-3" MIN LAP SPLICE

TABLE OF ESTIMATED QUANTITIES

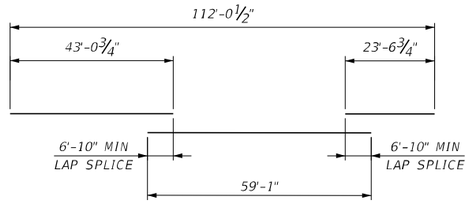
	ITEM	UNIT	BENT 02
~	REINF STEEL	LB	26,120
	DRILL SHAFT (48")	LF	517
	CL C CONC(CAP)	CY	51.8
	CL C CONC(COLUMN)	CY	84.3

~ FOR CONTRACTOR'S INFORMATION ONLY

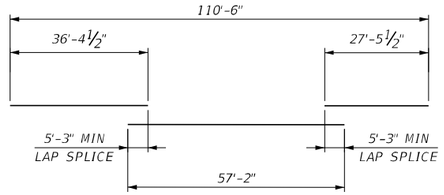


BEARING SEAT DETAIL

(REMOVE ALL LOOSE MATERIAL AND CLEAN BEARING SURFACE BEFORE PLACING THE BEARING PAD)



BARS A LAP SPLICE DETAIL



BARS B LAP SPLICE DETAIL

HL 93 LOADING

NO.	DATE	DESCRIPTION	APPROV.

BRIDGEFARMER & ASSOCIATES, INC.
CONSULTING ENGINEERS
TBPE REGISTRATION NO. 264

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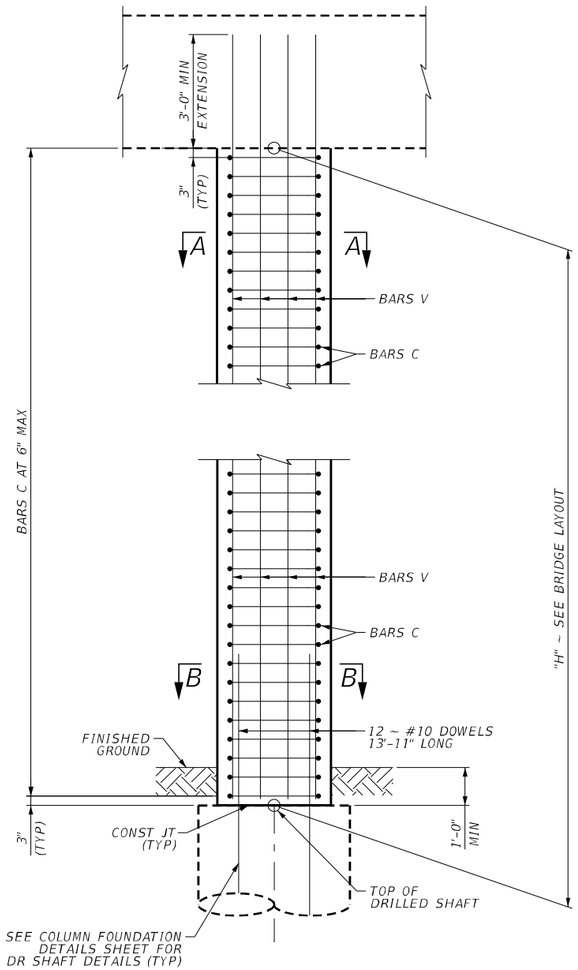
IH-40 AT HOPE ROAD

IH-40 UNDERPASS AT HOPE ROAD BENT 02 DETAILS

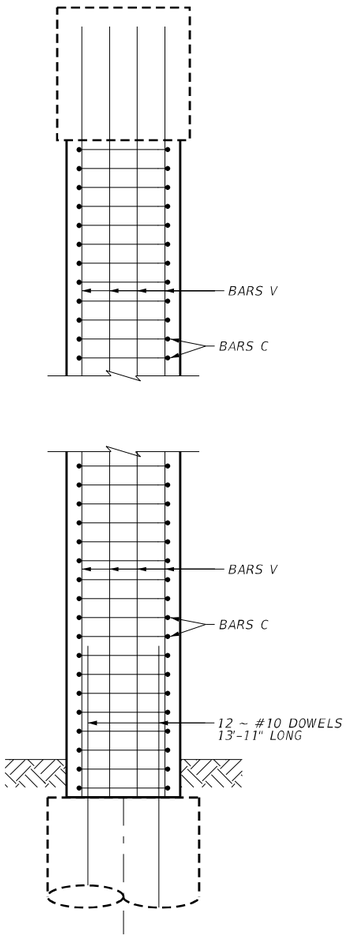
SCALE: AS NOTED — SHEET 3 OF 3

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
ZJB	6	SEE TITLE SHEET		IH 40
GRAPHICS AKH	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK CK1	TEXAS	AMA	POTTER	110
CHECK CK2	CONTROL	SECTION	JOB	
	0090	05	107	



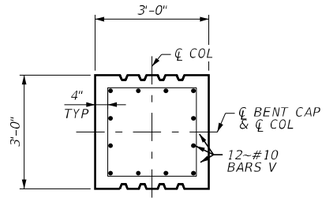
FRONT ELEVATION

SCALE: 1/4" = 1'-0"



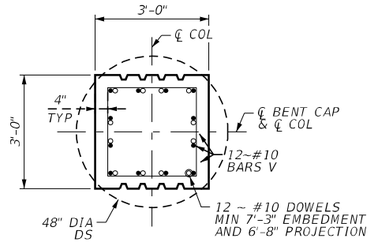
SIDE ELEVATION

SCALE: 1/4" = 1'-0"



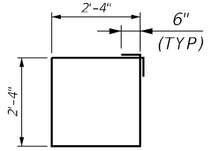
SECTION A-A

SCALE: 1/4" = 1'-0"



SECTION B-B

SCALE: 1/4" = 1'-0"



BARS C

GENERAL NOTES:

1. DESIGNED ACCORDING TO AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, 9TH EDITION (2020) AND TxDOT BRIDGE DESIGN MANUAL (NOV 2021).
2. SEE TYPICAL COLUMN FOUNDATION DETAILS FOR ALL FOUNDATION DETAILS AND NOTES NOT SHOWN.
3. SEE BRIDGE COLUMN FINISH DETAILS SHEET FOR COLUMN AESTHETIC DETAILS NOT SHOWN.

MATERIAL NOTES:

1. PROVIDE CLASS C CONCRETE (f'c = 3600 PSI)
2. PROVIDE GRADE 60 REINFORCING STEEL

COLUMN SCHEDULE ~ ONE COLUMN					EST.QUANT.~11 COL. REINF. STEEL LBS	EST.QUANT.~11 COL. CLASS C CONC. CY
"H"	12 BARS V-#10		BARS C-#5			
FT	LENGTH	WEIGHT	LENGTH	WEIGHT		
23	26'-0"	1,238	416'	156	15,334	84.3

ADJUST ESTIMATED QUANTITY OF CONCRETE FOR EACH COLUMN BY 0.178 CY FOR EACH 0.5' VARIATION IN "H" VALUE.
ADJUST ESTIMATED QUANTITY OF REINFORCING STEEL FOR EACH COLUMN BY 27.1 LB FOR EACH 0.5' VARIATION IN "H" VALUE.

STATE OF TEXAS
ZACHARY J. BEIL
139718
LICENSED
PROFESSIONAL ENGINEER
Zachary J. Beil 12-08-2023

HL 93 LOADING

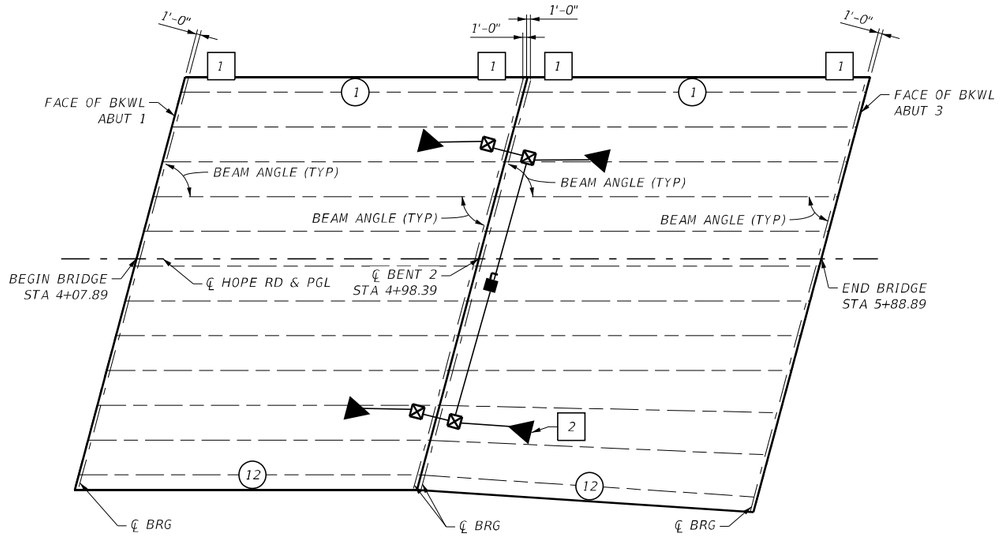
NO.	DATE	DESCRIPTION	APPROV.

BRIDGEFARMER & ASSOCIATES, INC.
CONSULTING ENGINEERS
TBPE REGISTRATION NO. 264

IH-40 AT HOPE ROAD
IH 40 UNDERPASS AT HOPE ROAD TYPICAL COLUMN DETAILS

SCALE: AS NOTED SHEET 1 OF 1

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
ZJB	6	SEE TITLE SHEET		IH 40
GRAPHICS AKH	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK KDH	TEXAS	AMA	POTTER	111
CHECK ZJB	CONTROL	SECTION	JOB	
	0090	05	107	



SPAN 1
(TYPE 5XB34 X-BEAMS)

SPAN 2
(TYPE 5XB34 X-BEAMS)

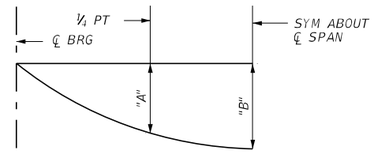
20 0 20 40
SCALE: 1" = 40'

(#) DENOTES BEAM NUMBER

[1] SEE ELASTOMERIC BEARING AND BEAM END DETAILS (XBEB) STANDARD SHEET FOR ORIENTATION OF DIMENSION.

[2] SEE ILLUMINATION LAYOUT SHEET FOR ILLUMINATION DETAILS NOT SHOWN.

* ALL BEAM LENGTHS SHOWN ARE HORIZONTAL DISTANCES, WITHOUT ANY ADJUSTMENT MADE FOR LONGITUDINAL SLOPE. THE EXCEPTION IS THE 'TRUE LENGTH', WHERE THE LENGTHS SHOWN ARE BOTTOM BEAM FLANGE LENGTHS WITH ADJUSTMENT MADE FOR THE BEAM SLOPE. ALL DIMENSIONS ARE IN FEET UNLESS OTHERWISE SHOWN.



NOTE:
DEFLECTIONS SHOWN ARE DUE TO PRESTRESSED CONCRETE PANELS AND CAST-IN-PLACE CONCRETE SLAB ONLY (Ec = 5000 KSI). ADJUST SCREED FOR DELFECTIONS BASED ON FIELD OBSERVATIONS AS NEEDED.

BENT REPORT

ABUT NO.1 (N 74 52 58 W)
DISTANCE BETWEEN STATION LINE AND GIRDER 1 45.552 L

			GIRDER SPAC. (ABUT BKWL)	GIRDER ANGLE D M S
SPAN 1	BEAM	1	0.000	75 00 00
	BEAM	2	9.506	75 00 00
	BEAM	3	9.506	75 00 00
	BEAM	4	9.506	75 00 00
	BEAM	5	9.506	75 00 00
	BEAM	6	9.506	75 00 00
	BEAM	7	9.506	75 00 00
	BEAM	8	9.506	75 00 00
	BEAM	9	9.506	75 00 00
	BEAM	10	9.506	75 00 00
	BEAM	11	9.506	75 00 00
	BEAM	12	9.506	75 00 00
	TOTAL		104.563	

BENT NO.2 (N 74 52 58 W)
DISTANCE BETWEEN STATION LINE AND GIRDER 1 45.552 L

			GIRDER SPAC. (C.L. BENT)	GIRDER ANGLE D M S
SPAN 1	BEAM	1	0.000	75 00 00
	BEAM	2	9.506	75 00 00
	BEAM	3	9.506	75 00 00
	BEAM	4	9.506	75 00 00
	BEAM	5	9.506	75 00 00
	BEAM	6	9.506	75 00 00
	BEAM	7	9.506	75 00 00
	BEAM	8	9.506	75 00 00
	BEAM	9	9.506	75 00 00
	BEAM	10	9.506	75 00 00
	BEAM	11	9.506	75 00 00
	BEAM	12	9.506	75 00 00
	TOTAL		104.563	

BENT NO.2 (N 74 52 58 W)
DISTANCE BETWEEN STATION LINE AND GIRDER 1 45.552 L

			GIRDER SPAC. (C.L. BENT)	GIRDER ANGLE D M S
SPAN 2	BEAM	1	0.000	75 00 00
	BEAM	2	9.506	75 00 00
	BEAM	3	9.506	75 00 00
	BEAM	4	9.506	75 00 00
	BEAM	5	9.506	75 00 00
	BEAM	6	9.506	75 00 00
	BEAM	7	9.506	75 00 00
	BEAM	8	9.506	75 00 00
	BEAM	9	9.506	75 00 00
	BEAM	10	9.527	76 14 17
	BEAM	11	9.527	77 29 22
	BEAM	12	9.527	78 45 11
	TOTAL		104.626	

ABUT NO.3 (N 74 52 58 W)
DISTANCE BETWEEN STATION LINE AND GIRDER 1 45.552 L

			GIRDER SPAC. (ABUT BKWL)	GIRDER ANGLE D M S
SPAN 2	BEAM	1	0.000	75 00 00
	BEAM	2	9.506	75 00 00
	BEAM	3	9.506	75 00 00
	BEAM	4	9.506	75 00 00
	BEAM	5	9.506	75 00 00
	BEAM	6	9.506	75 00 00
	BEAM	7	9.506	75 00 00
	BEAM	8	9.506	75 00 00
	BEAM	9	9.506	75 00 00
	BEAM	10	11.540	76 14 17
	BEAM	11	11.540	77 29 22
	BEAM	12	11.540	78 45 11
	TOTAL		110.665	

BEAM REPORT

GIRDER REPORT, SPAN 1

			HORIZONTAL DISTANCE * C-C BENT	E-E BM.	C-C BRG.	TRUE LENGTH BOT.BM.FLG.	GIRDER SLOPE	DEFLECTIONS A	B
BEAM	1		90.500	89.99	88.465	90.03	0.0284	0.145	0.204
BEAM	2		90.500	89.99	88.465	90.03	0.0297	0.153	0.215
BEAM	3		90.500	89.99	88.465	90.03	0.0309	0.152	0.214
BEAM	4		90.500	89.99	88.465	90.04	0.0320	0.155	0.217
BEAM	5		90.500	89.99	88.465	90.04	0.0331	0.154	0.216
BEAM	6		90.500	89.99	88.465	90.04	0.0341	0.153	0.215
BEAM	7		90.500	89.99	88.465	90.05	0.0351	0.152	0.214
BEAM	8		90.500	89.99	88.465	90.05	0.0360	0.152	0.213
BEAM	9		90.500	89.99	88.465	90.05	0.0369	0.150	0.211
BEAM	10		90.500	89.99	88.465	90.05	0.0377	0.156	0.219
BEAM	11		90.500	89.99	88.465	90.06	0.0385	0.155	0.217
BEAM	12		90.500	89.99	88.465	90.06	0.0392	0.137	0.193
TOTAL						1,080.53			

GIRDER REPORT, SPAN 2

			HORIZONTAL DISTANCE * C-C BENT	E-E BM.	C-C BRG.	TRUE LENGTH BOT.BM.FLG.	GIRDER SLOPE	DEFLECTIONS A	B
BEAM	1		90.500	89.99	88.465	90.01	-0.0191	0.145	0.204
BEAM	2		90.500	89.99	88.465	90.01	-0.0178	0.153	0.215
BEAM	3		90.500	89.99	88.465	90.00	-0.0165	0.153	0.215
BEAM	4		90.500	89.99	88.465	90.00	-0.0152	0.155	0.218
BEAM	5		90.500	89.99	88.465	90.00	-0.0139	0.155	0.218
BEAM	6		90.500	89.99	88.465	90.00	-0.0126	0.155	0.218
BEAM	7		90.500	89.99	88.465	90.00	-0.0113	0.155	0.218
BEAM	8		90.500	89.99	88.465	90.00	-0.0100	0.155	0.218
BEAM	9		90.500	89.99	88.465	89.99	-0.0087	0.159	0.223
BEAM	10		90.000	89.49	87.970	89.50	-0.0077	0.169	0.237
BEAM	11		89.542	89.04	87.518	89.04	-0.0068	0.165	0.232
BEAM	12		89.128	88.62	87.108	88.62	-0.0058	0.142	0.199
TOTAL						1,077.16			

STATE OF TEXAS
ZACHARY J. BEIL
139718
LICENSED
PROFESSIONAL ENGINEER
Zachary J. Beil
12-08-2023

HL 93 LOADING

NO.	DATE	DESCRIPTION	APPROV.

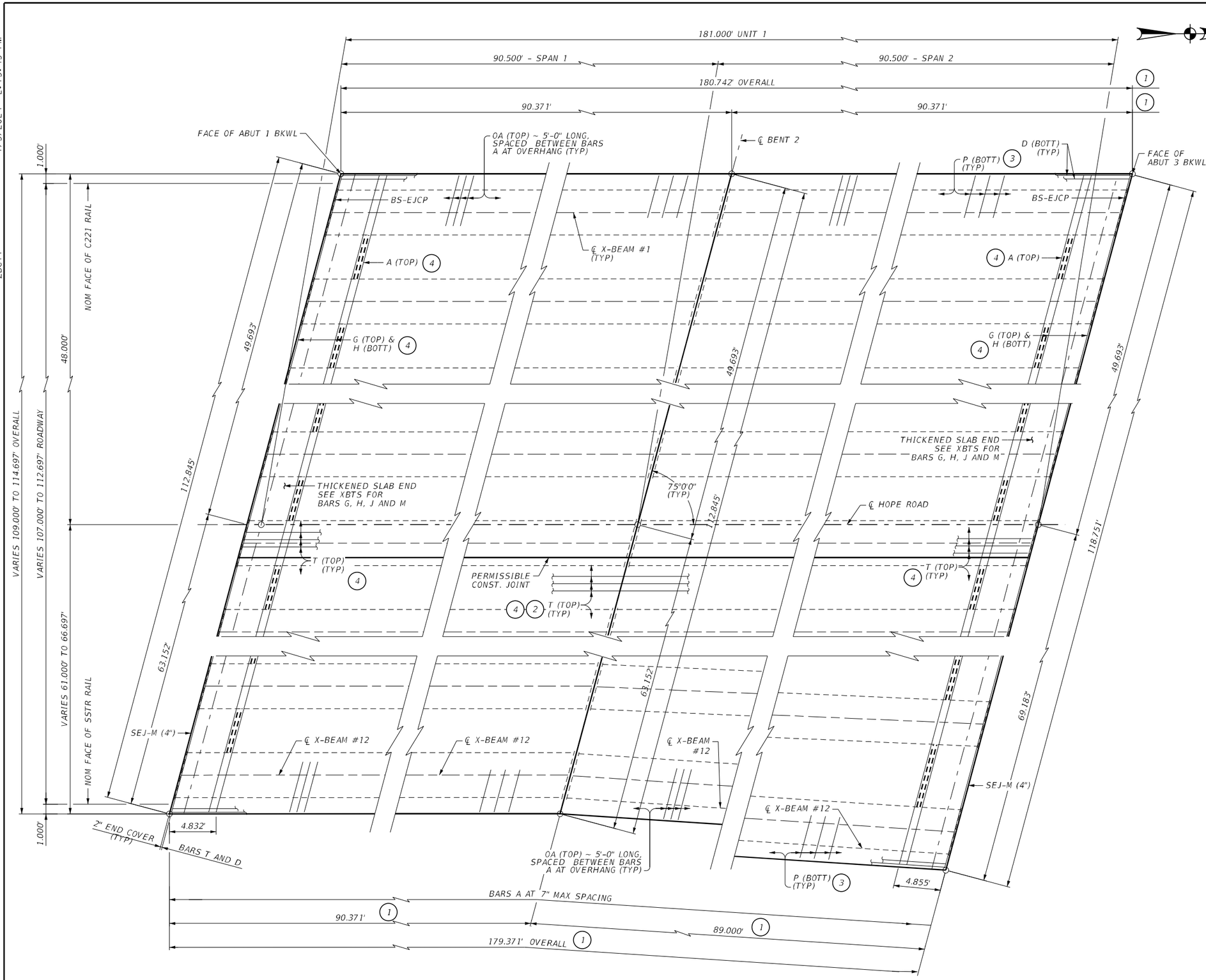
BRIDGEFARMER & ASSOCIATES, INC.
CONSULTING ENGINEERS
TBPE REGISTRATION NO. 264

Texas Department of Transportation ©2023

IH-40 AT HOPE ROAD
IH 40 UNDERPASS AT HOPE ROAD FRAMING PLAN

SHEET 1 OF 1

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
ZJB	6	SEE TITLE SHEET		IH 40
GRAPHICS AKH	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK KDH	TEXAS	AMA	POTTER	112
CHECK ZJB	CONTROL	SECTION	JOB	
	0090	05	107	



PLAN

5 0 5 10
SCALE: 1" = 10'

GENERAL NOTES:

1. PROVIDE CLASS S CONCRETE, F'c = 4 KSI. PROVIDE CLASS C CONCRETE FOR BRIDGE RAILS.
2. FOR ALL TOP MAT REINFORCEMENT, PROVIDE GFRP BARS CONFORMING TO ASTM D7957/7957M, EXCEPT PROVIDE A MINIMUM MODULUS OF ELASTICITY OF 75,000 KSI. FOR ALL BOTTOM MAT REINFORCEMENT, GRADE 60 EPOXY COATED REINFORCING STEEL OR GALVANIZED STEEL ARE PERMITTED. GFRP BARS ARE PERMITTED IN THE BOTTOM MAT IF AN ALTERNATIVE GFRP SLAB DESIGN WITH CALCULATIONS SIGNED AND SEALED BY A PROFESSIONAL ENGINEER ARE PROVIDED. PROVIDE BAR LAPS, WHERE REQUIRED, AS FOLLOWS:
   GFRP #5 = 2'-9"
   UNCOATED #4 = 1'-7"
3. FOR BEAM, BEARING PAD, MISC. SLAB, CONTINUOUS SLAB OVER INTERIOR BENTS AND THICKENED SLAB END DETAILS NOT SHOWN, SEE XB34 AND XBND, XBEB, XBBR-MS, XBCS, AND XBTS.
4. FOR GLASS FIBER REINFORCED POLYMER DETAILS NOT SHOWN, SEE IGFRP.
5. FOR HEADER JOINT DETAILS AND NOTES NOT SHOWN, SEE HEJ DETAIL SHEET.
6. FOR HEADER JOINT QUANTITIES NOT SHOWN, SEE SUMMARY OF ESTIMATED QUANTITIES.
7. PLACE AND FINISH NOT LESS THAN 30 FEET OF BRIDGE DECK CONCRETE PER HOUR.
8. FOR REINFORCING STEEL TO BE WELDED, PROVIDE BARS CONFORMING TO ASTM DESIGNATION A706 OR HAVING A CARBON EQUIVALENCY PER SPECIFICATION ITEM 440.
9. FOR FRAMING DETAILS NOT SHOWN, SEE FRAMING PLAN.
10. FOR DETAILS AND QUANTITIES NOT SHOWN SEE PRESTRESSED CONC X-BEAM UNIT SECTION SHEET.
11. SEE PCP AND PCP-FAB STANDARDS FOR PANEL DETAILS AND NOTES NOT SHOWN.
12. SEE BRIDGE LAYOUT FOR SURFACE TEXTURE REQUIREMENTS.
13. FOR RAIL DETAILS AND ANCHORAGE IN SLAB, SEE TRAFFIC RAIL TYPE SSTR AND TYPE C221. SEE BRIDGE LAYOUT FOR LIMITS.
14. FOR BRIDGE RAISED SIDEWALK AND MEDIAN DETAILS, SEE BRSM STANDARD.
15. FOR BRIDGE SIDEWALK EXPANSION JOINT COVER PLATES, SEE BS-EJCP.

(1) MEASURED ALONG EDGE OF SLAB

(2) REINFORCING MUST BE CONTINUOUS THROUGH THE JOINT.

(3) SEE PCP STANDARD SHEETS FOR DETAILS NOT SHOWN.

(4) SEE IGFRP STANDARD FOR TOP MAT REINFORCING DETAILS ONLY.

STATE OF TEXAS
ZACHARY J. BEIL
139718
LICENSED
PROFESSIONAL ENGINEER
Zachary J Beil
01-05-2024

HL 93 LOADING

NO.	DATE	DESCRIPTION	APPROV.

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CONSULTING ENGINEERS
TBPE REGISTRATION NO. 264

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IH-40 AT HOPE ROAD

IH 40 UNDERPASS AT HOPE RD 181.00' PRSTR CONC X-BEAM UNIT

SHEET 1 OF 3

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
ZJB	6	SEE TITLE SHEET		IH 40
GRAPHICS AKH	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK KDH	TEXAS	AMA	POTTER	113
CHECK ZJB	CONTROL	SECTION	JOB	
	0090	05	107	

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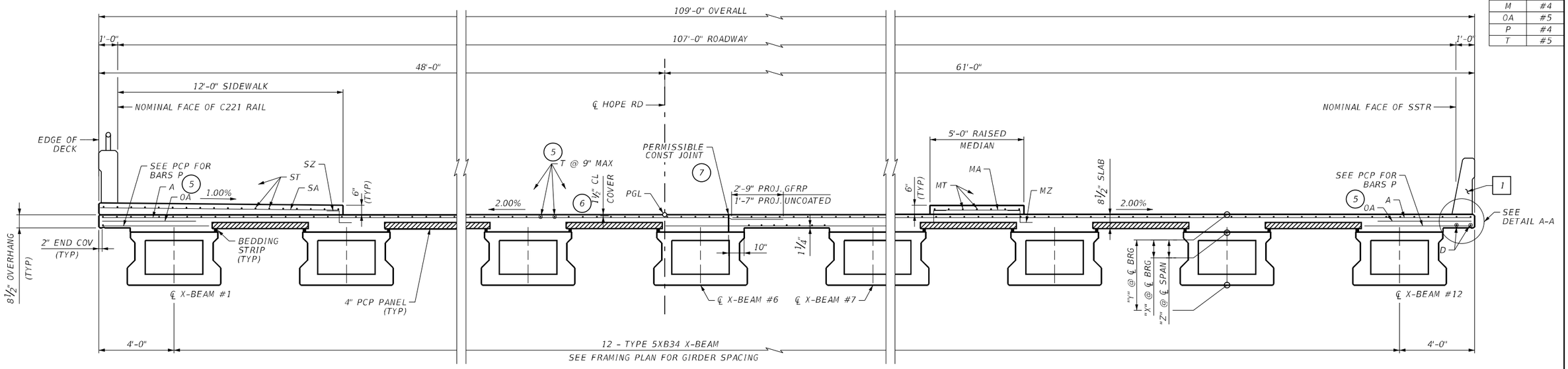
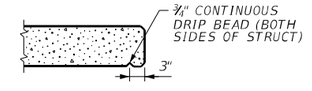
BAR TABLE	
BAR	SIZE
A	#5
D	#4
G	#5
H	#4
J	#4
M	#4
OA	#5
P	#4
T	#5



TYPICAL TRANSVERSE SECTION

(SPAN 1) SCALE: 3/16" = 1'-0"



DETAIL A-A

NOT TO SCALE

[1] SEE TxDOT STANDARD SHEET "BL" FOR EMBEDDED CONDUIT DETAILS NOT SHOWN.

HL 93 LOADING

TABLE OF ESTIMATED QUANTITIES

UNIT	SPAN	REINF CONC SLAB	PRESTRESSED CONC X-BEAM (5XB34) (3)	◥ CLASS "S" CONC (4)	◥ TOTAL REINFORCING STEEL (2)
		SF	LF	CY	LB
UNIT 1	1	9,865	1,080.53	329.9	22,690
	2	10,129	1,077.16	343.0	23,297
TOTAL		19,994	2,157.69	672.9	45,987

◥ FOR CONTRACTOR'S INFORMATION ONLY

TABLE OF SECTION DEPTHS

SPAN NO.	"X" @ C/L BRG	"Y" @ C/L BRG	"Z" @ MIDSPAN
1	11"	3'-9"	1'-0 3/4"
2	11"	3'-9"	1'-2 1/8"

STATE OF TEXAS
ZACHARY J. BEIL
139718
LICENSED
PROFESSIONAL ENGINEER
Zachary J Beil
01-05-2024

(1) THEORETICAL DIMENSION.

(2) REINFORCING STEEL WEIGHT IS CALCULATED USING AN APPROXIMATE FACTOR OF 2.3 psf.

(3) QUANTITIES SHOWN ARE BOTTOM BEAM FLANGE LENGTHS WITH ADJUSTMENTS MADE FOR BEAM SLOPE. SEE FRAMING PLAN SHEET FOR BEAM LENGTHS.

(4) QUANTITIES INCLUDE THICKENED SLAB END AND HAUNCH.

(5) SEE IGFRP STANDARD SHEETS FOR TOP MAT REINFORCING DETAILS ONLY.

GENERAL NOTES:

1. FOR DECK FORMS, SEE PCP STANDARDS FOR DETAILS.
2. THE DECK DESIGN IS BASED ON 8.5" SLAB THICKNESS. WHEN USING PCP OPTION, THE 8.5" SLAB THICKNESS SHALL BE MAINTAINED BY VARYING HEIGHT OF BEDDING STRIP ALONG THE GIRDER.
3. SEE HAUNCH REINFORCING DETAILS ON XBBR-MS AND PCP STANDARDS FOR REQUIRED U BARS WHEN HAUNCH IS GREATER THAN 3½".
4. FOR PREDICTED DEFLECTIONS, SEE CORRESPONDING FRAMING PLAN.
5. SEE TRAFFIC RAIL TYPE SSTR AND TYPE C221 STANDARD SHEET FOR RAIL ANCHORAGE DETAILS AND NOTES NOT SHOWN HERE.
6. SEE BRIDGE RAISED SIDEWALK AND MEDIAN DETAILS STANDARD SHEET BRSM FOR DETAILS NOT SHOWN.
7. SEE BRIDGE SIDEWALK EXPANSION JOINT COVER PLATE STANDARD SHEET BS-EJCP FOR DETAILS NOT SHOWN.
8. SEE SHEET "FORM LINER APPLICATION FOR NON-TRAFFIC SIDE OF STANDARD SSTR RAIL" AND "FORM LINER APPLICATION FOR NON-TRAFFIC SIDE OF STANDARD C-221 RAIL" FOR DETAILS NOT SHOWN.

(6) COVER TO BAR T IS 1-1/2" IF GFRP REINFORCEMENT IS USED AND 2" FOR STEEL REINFORCEMENT.

(7) IF AND ONLY IF THE PERMISSIBLE CONSTRUCTION JOINT IS IMPLEMENTED THEN;
   1. PRESTRESSED CONCRETE PANELS ARE PROHIBITED BETWEEN X-BEAM 6 & 7.
   2. DEFLECTIONS SHOWN ON FRAMING PLAN FOR X-BEAM 6 SHALL BE MULTIPLIED BY 0.66.
   3. CONTRACTOR SHALL PROVIDE MEANS OF FORMING FULL DECK POUR FOR APPROVAL.
   4. TEMPORARY PORTABLE BARRIER WILL BE REQUIRED WITH A 2'-0" MIN DISTANCE FROM THE PERMISSIBLE CONSTRUCTION JOINT TO THE TOE OF BARRIER.
   5. REFER TO XBBR-MS AND PMDF STANDARD FOR SECTION BETWEEN X-BEAM #6 AND #7 ONLY.

NO.	DATE	DESCRIPTION	APPROV.

BRIDGEFARMER & ASSOCIATES, INC.
CONSULTING ENGINEERS
TBPE REGISTRATION NO. 264

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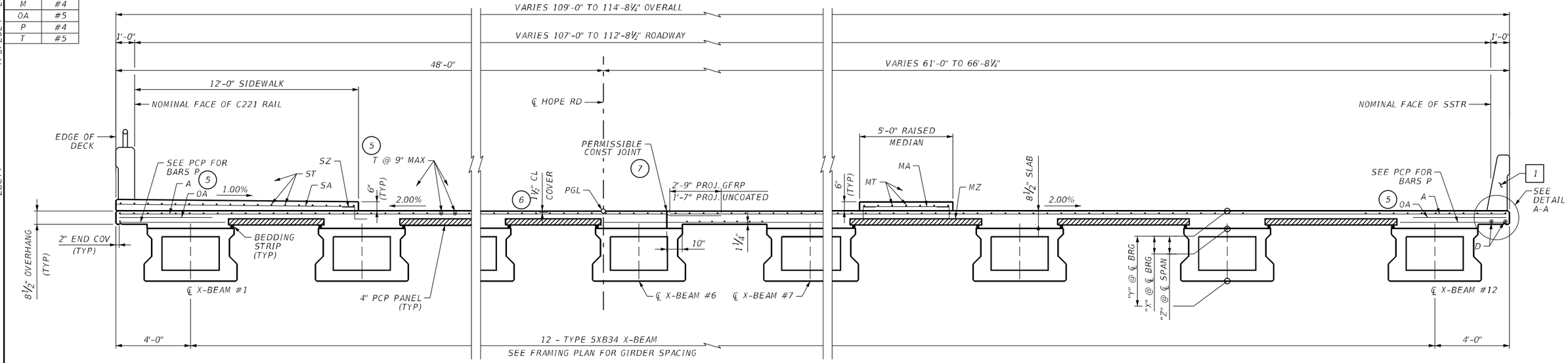
IH-40 AT HOPE ROAD

IH 40 UNDERPASS AT HOPE RD PRSTR CONC GIRDER UNIT SECTION

SCALE: AS NOTED SHEET 2 OF 3

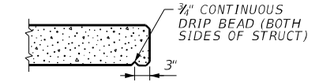
DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
ZJB	6	SEE TITLE SHEET		IH 40
GRAPHICS AKH	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK JWL	TEXAS	AMA	POTTER	114
CHECK ZJB	CONTROL	SECTION	JOB	
	0090	05	107	

BAR TABLE	
BAR	SIZE
A	#5
D	#4
G	#5
H	#4
J	#4
M	#4
OA	#5
P	#4
T	#5



TYPICAL TRANSVERSE SECTION

(SPAN 1) SCALE: 3/16" = 1'-0"



DETAIL A-A

NOT TO SCALE

[1] SEE TxDOT STANDARD SHEET "BL" FOR EMBEDDED CONDUIT DETAILS NOT SHOWN.

HL 93 LOADING

NO.	DATE	DESCRIPTION	APPROV.

BRIDGEFARMER & ASSOCIATES, INC.
CONSULTING ENGINEERS
TBPE REGISTRATION NO. 264

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IH-40 AT HOPE ROAD

IH 40 UNDERPASS AT HOPE RD PRSTR CONC GIRDER UNIT SECTION

SCALE: AS NOTED

SHEET 3 OF 3

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
ZJB	6	SEE TITLE SHEET		IH 40
GRAPHICS AKH	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK JWL	TEXAS	AMA	POTTER	115
	CONTROL	SECTION	JOB	
CHECK ZJB	0090	05	107	

STATE OF TEXAS
ZACHARY J. BEIL
139718
LICENSED
PROFESSIONAL ENGINEER
Zachary J. Beil
01-05-2024

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DATE: 12/8/2023 8:39:55 AM
FILE: bms\bridgefarmer-pw\vidal.ngoumnai@bridgefarmer.com\dms38648\XB-XBND-22.dgn
Vidal.Ngoumnai

DESIGNED BEAMS (STRAIGHT STRANDS)

OPTIONAL DESIGN

LOAD RATING FACTORS

STRUCTURE	SPAN NUMBER	BEAM NO.	BEAM TYPE	PRESTRESSING STRANDS: NON-STD STRAND PATTERN	PRESTRESSING STRANDS: TOTAL NO.	PRESTRESSING STRANDS: SIZE (in)	PRESTRESSING STRANDS: STRGTH fpu (ksi)	PRESTRESSING STRANDS: "e" ℄ (in)	PRESTRESSING STRANDS: "e" END (in)	PRESTRESSING STRANDS: TOT NO. DEB	DEBONDED STRAND PATTERN PER ROW: DIST FROM BOTTOM (in)	DEBONDED STRAND PATTERN PER ROW: NO. OF STRANDS: TOTAL	DEBONDED STRAND PATTERN PER ROW: NO. OF STRANDS: DE-BONDED	DEBONDED STRAND PATTERN PER ROW: NUMBER OF STRANDS DEBONDED TO (ft from end): 3	6	9	12	15	CONCRETE: RELEASE STRENGTH (1) f'ci (ksi)	CONCRETE: MINIMUM 28 DAY COMP STRGTH f'c (ksi)	OPTIONAL DESIGN: DESIGN LOAD COMP STRESS (TOP ℄) (SERVICE I) fct(ksi)	OPTIONAL DESIGN: DESIGN LOAD TENSILE STRESS (BOTT ℄) (SERVICE III) fcb(ksi)	OPTIONAL DESIGN: REQUIRED MINIMUM ULTIMATE MOMENT CAPACITY (STRENGTH I) (ft-kips)	OPTIONAL DESIGN: LIVE LOAD DISTRIBUTION FACTOR (2) Moment	OPTIONAL DESIGN: LIVE LOAD DISTRIBUTION FACTOR (2) Shear	LOAD RATING FACTORS: STRENGTH I Inv	LOAD RATING FACTORS: STRENGTH I Opr	LOAD RATING FACTORS: SERVICE III Inv
IH-40 UNDERPASS AT HOPE ROAD	1	1-3	5XB34		56	0.6	270	12.11	11.81	16	2.50	28	14	2	6	2	2	2	6.000	7.500	4.117	-4.464	6515	0.604	0.907	1.65	2.17	1.30
											4.50	28	2	2	0	0	0	0										
	1	4-12	5XB34		52	0.6	270	12.18	11.84	14	2.50	28	14	2	6	2	2	2	5.500	7.000	4.038	-4.322	6307	0.604	0.842	1.67	2.20	1.25
	2	1-3	5XB34		56	0.6	270	12.11	11.81	16	2.50	28	14	2	6	2	2	2	6.000	7.500	4.141	-4.541	6667	0.611	0.907	1.65	2.18	1.30
											4.50	28	2	2	0	0	0	0										
	2	4-9	5XB34		52	0.6	270	12.18	11.84	14	2.50	28	14	2	6	2	2	2	5.500	7.000	4.184	-4.517	6677	0.654	0.919	1.65	2.36	1.31
	2	10-12	5XB34		56	0.6	270	12.11	11.81	16	2.50	28	14	2	6	2	2	2	6.000	7.500	4.184	-4.517	6677	0.667	0.987	1.58	2.08	1.32
											4.50	28	2	2	0	0	0	0										

(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 in accordance with AASHTO LRFD Bridge Design Specifications.

Load rated using Load and Resistance Factor Rating according to AASHTO Manual for Bridge Evaluation.

Prestress losses for the designed beams 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.

When shown on this sheet, the Fabricator has the option of furnishing either the designed beam or an approved optional beam design. All optional design submittals and shop drawings must be signed, sealed and dated by a Professional Engineer registered in the State of Texas.

Locate strands for the designed beam 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. Place strands within a row as follows:

1) Locate a strand in each "1" position.

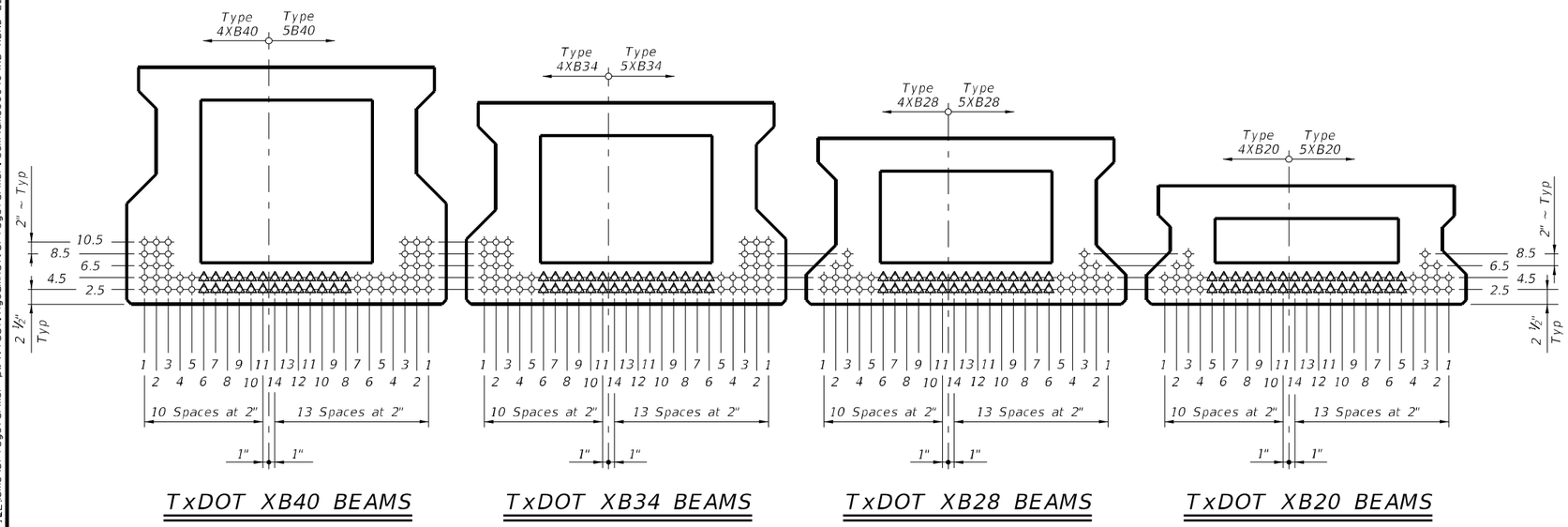
2) Place strand symmetrically about vertical centerline of box.

3) Space strands as equally as possible across the entire width.

Strand debonding must comply with Item 424.4.2.2.2.4.

Do not debond strands in position "1". Distribute debonded strands equally about the vertical centerline. Decrease debonded lengths working inward, with debonding staggered in each row.

Full-length debonded strands are only permitted in positions marked Δ. Double wrap full-length debonded strands.



TxDOT XB40 BEAMS | TxDOT XB34 BEAMS | TxDOT XB28 BEAMS | TxDOT XB20 BEAMS

HL93 LOADING

Texas Department of Transportation

Bridge Division Standard

PRESTRESSED CONCRETE X-BEAM DESIGNS (NON-STANDARD SPANS)

XBND

FILE: XB-XBND-22.dgn	DN: TxDOT	CK: TxDOT	DW: JER	CK: TAR
©TxDOT August 2022	CONT	SECT	JOB	HIGHWAY
REVISIONS	0090	05	107	IH40
	DIST	COUNTY		SHEET NO.
	AMA	POTTER		116

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DRILLING LOG

WinCore
Version 3.3

County Potter
Highway IH 40
CSJ 0090-05-107

Hole B-5
Structure Bridge
Station ℄ HOPE RD 3+96.84
Offset 85.25' RT

District Amarillo
Date 6/7/2022
Grnd. Elev. 3738.89 ft
GW Elev. N/A

Elev. (ft)	LOG	Texas Cone Penetrometer	Strata Description	Triaxial Test Lateral Press. (psi)	Triaxial Test Deviator Stress (psi)	Properties MC	LL	PI	Wet Den. (pcf)	Additional Remarks
			CLAY, Lean with Sand, stiff to very stiff, dry to moist, light reddish-brown to brown, trace calcareous deposits; trace to few roots to 5'; trace fine Gravel below 5'; trace SM deposits below 10' (CL)			8	37	19		SSS@0', N=16, -200=82.3%
						9				SSS@1.5', N=11
5		30 (6) 31 (6)								
						13				SSS@6.4', N=18
						14	36	23		SSS@8.5', N=18, -200=81.3%
10		15 (6) 16 (6)								
						19				SSS@11.5', N=18
3725.9			CLAY, Sandy Lean, stiff, moist, reddish-brown, few fine-grained Sand deposits (CL)							
15		11 (6) 9 (6)								
						21	32	15		SSS@16.5', N=10, -200=69.4%
3720.9			CLAY, Lean with Sand, stiff, moist, reddish-brown, trace calcareous deposits and fine Gravel pieces (CL)							
20		13 (6) 22 (6)								
						16				SSS@21.5', N=34
3714.9			CLAY, Lean with Sand, very stiff to hard, moist, reddish-brown, trace to few calcareous deposits, trace Gravel deposits to 30'; few reddish-brown SC pockets below 35' (CL)							
25		27 (6) 38 (6)								
						16	46	30		SSS@26.3', N=41, -200=79.3%
30		24 (6) 22 (6)								SSS@31.3', N=24
35		50 (3.5) 50 (2.75)								
						15				SSS@35.7', N=53, SC<100ppm
3700.9			SAND, Silty, compact, moist, reddish-brown (SM)							
40		31 (6) 38 (6)								

Remarks: LAT: 35.187093, LONG: -101.974046. Drill Rig: CME 55 with TxDOT 170-pound Automatic Hammer; SSS: Split Spoon Sample; SC: Sulfate Content; Drilling Method: Continuous Flight Auger.

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

Driller: Beyond Engineering and Testing, LLC Logger: LC Organization: Foresight PES, LLC

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DRILLING LOG

WinCore
Version 3.3

County Potter
Highway IH 40
CSJ 0090-05-107

Hole B-5
Structure Bridge
Station ℄ HOPE RD 3+96.84
Offset 85.25' RT

District Amarillo
Date 6/7/2022
Grnd. Elev. 3738.89 ft
GW Elev. N/A

Elev. (ft)	LOG	Texas Cone Penetrometer	Strata Description	Triaxial Test Lateral Press. (psi)	Triaxial Test Deviator Stress (psi)	Properties MC	LL	PI	Wet Den. (pcf)	Additional Remarks
			SAND, Silty, compact, moist, reddish-brown (SM)							SSS@41.3', N=23
3694.9										
45		10 (6) 9 (6)	SAND, Silty, loose, moist, light reddish-brown to reddish brown (SM)							
						16				SSS@46.5', N=19, -200=35.0%
3689.9										
50		41 (6) 30 (6)	SAND, Silty, compact, moist, light reddish-brown to reddish-brown, trace calcareous deposits (SM)							SSS@51.2', N=15
3684.9										
55		21 (6) 23 (6)	SAND, Silty with Gravel, compact, moist, light-reddish brown to reddish-brown, trace calcareous deposits, few fine to coarse Gravel deposits (SM)							
						14				SSS@56.5', N=54, -200=26.3%
3679.9										
60		25 (6) 50 (4)	SAND, Silty, compact to dense, dry to moist, light reddish-brown, few calcareous deposits, trace Gravel pieces (SM)							SSS@61', N=50/2.25"
65		50 (4.5) 50 (3)								
						9				SSS@65.8', N=41
70		33 (6) 42 (6)								
3667.6										Boring terminated at 71.3'
75										
80										

Remarks: LAT: 35.187093, LONG: -101.974046. Drill Rig: CME 55 with TxDOT 170-pound Automatic Hammer; SSS: Split Spoon Sample; SC: Sulfate Content; Drilling Method: Continuous Flight Auger.

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

Driller: Beyond Engineering and Testing, LLC Logger: LC Organization: Foresight PES, LLC

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STATE OF TEXAS
MARCUS J. GALVAN
80192
REGISTERED
PROFESSIONAL ENGINEER

12/07/2023

NO.	DATE	DESCRIPTION	APPROV.

BRIDGEFARMER & ASSOCIATES, INC.
CONSULTING ENGINEERS
TBPE REGISTRATION NO. 264

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IH-40 AT HOPE ROAD
BORING LOGS

SHEET 1 OF 3

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
ZJB	6	SEE TITLE SHEET		IH 40
GRAPHICS AKH	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK KDH	TEXAS	AMA	POTTER	117
CHECK ZJB	CONTROL	SECTION	JOB	
	0090	05	107	

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DRILLING LOG

WinCore Version 3.3

County	Potter	Hole	B-6	District	Amarillo
Highway	IH 40	Structure	Bridge	Date	6/8/2022
CSJ	0090-05-107	Station	5+83.83	Grnd. Elev.	3736.76 ft
		Offset	66.35' 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	LL	PI	Wet Den. (pcf)	Additional Remarks
3736.1			OTHER, HMAC: 8"			20	37	20		SSS@0', N=3, -200=67.6%
			CLAY, Sandy Lean, soft, moist, brown and reddish-brown, trace calcareous deposits, fine Gravel and Gypsum, blocky below 2' (CL)			18				SSS@2.0', N=8
3732.8										
5		7 (6) 8 (6)	CLAY, Lean with Sand, soft, moist, reddish-brown, trace to few calcareous deposits, trace Gypsum and blocky (CL)			18	40	22		SSS@6.5', N=21, -200=82.4%
										SSS@8.0', N=7
10		6 (6) 13 (6)								
						22				SSS@11.5', N=16
3722.8										
15		19 (6) 18 (6)	CLAY, Lean with Sand, stiff to very stiff, moist, reddish-brown, few calcareous deposits, trace organics, blocky (CL)							SSS@16.5', N=19
20		19 (6) 32 (6)				17	44	24		SSS@21.5', N=38, -200=79.9%
25		16 (6) 13 (6)								
						14				SSS@26.4', N=19
30		18 (6) 12 (6)								SSS@31.4', N=22
3702.8										
35		27 (6) 21 (6)	SAND, Clayey, compact, reddish-brown and light reddish-brown, few calcareous deposits, blocky (SC)			15	31	18		SSS@36.3', N=29, -200=40.6%
3698.8			SAND, Clayey, dense, moist, light reddish-brown, trace fine Gravel and calcareous deposits (SC)							
40		50 (4) 50 (4)								

Remarks: LAT: 35.187605, LONG: -101.974555. Drill Rig: CME-75 with TxDOT 170-pound Automatic Hammer; SSS: Split Spoon Sample, Drilling Method: Continuous Flight Auger to 25'; Mud Rotary thereafter.

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

Driller: Beyond Engineering and Testing, LLC **Logger:** LC **Organization:** Foresight PES, LLC

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DRILLING LOG

WinCore Version 3.3

County	Potter	Hole	B-6	District	Amarillo
Highway	IH 40	Structure	Bridge	Date	6/8/2022
CSJ	0090-05-107	Station	5+83.83	Grnd. Elev.	3736.76 ft
		Offset	66.35' 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	LL	PI	Wet Den. (pcf)	Additional Remarks
			SAND, Clayey, dense, moist, light reddish-brown, trace fine Gravel and calcareous deposits (SC)							SSS@40.8', N=51
3692.8										
45		41 (6) 50 (5.75)	SAND, Silty, dense, moist, reddish-brown, 1" calcareous deposit below 47' (SM)			8				SSS@46.3', N=16,50/3"
50		50 (1.5) 50 (0.75)								SSS@50.3', N=50/4.5"
3682.8										
55		50 (0.75) 50 (0.5)	SAND, Clayey, very dense, dry to moist, light reddish-brown, trace calcareous deposits (SC)			13	24	11		SSS@55.2', N=50/2.5", -200=47.5%
3677.8										
60		21 (6) 23 (6)	SAND, Clayey, compact, dry to moist, light reddish-brown (SC)							SSS@61.3', N=17
3672.8										
65		42 (6) 50 (5)	SAND, Silty, dense to very dense, reddish-brown (SM)			6				SSS@66.2', N=50, -200=20.4%
3666.5		50 (1.5) 50 (1.25)								Boring terminated at 70.3'
70										
75										
80										

Remarks: LAT: 35.187605, LONG: -101.974555. Drill Rig: CME-75 with TxDOT 170-pound Automatic Hammer; SSS: Split Spoon Sample, Drilling Method: Continuous Flight Auger to 25'; Mud Rotary thereafter.

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

Driller: Beyond Engineering and Testing, LLC **Logger:** LC **Organization:** Foresight PES, LLC

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STATE OF TEXAS
MARCUS J. GALVAN
80192
REGISTERED
PROFESSIONAL ENGINEER

12/07/2023

NO.	DATE	DESCRIPTION	APPROV.

BRIDGEFARMER & ASSOCIATES, INC.
CONSULTING ENGINEERS
TBPE REGISTRATION NO. 264

Texas Department of Transportation ©2023

IH-40 AT HOPE ROAD
BORING LOGS

SHEET 2 OF 3

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
ZJB	6	SEE TITLE SHEET		IH 40
GRAPHICS AKH	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK KDH	TEXAS	AMA	POTTER	118
CHECK ZJB	CONTROL 0090	SECTION 05	JOB 107	

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DRILLING LOG

WinCore Version 3.3

County Potter
Highway IH 40
CSJ 0090-05-107

Hole RW-1
Structure Retaining Wall
Station ℄ HOPE RD 6+49.11
Offset 88.09' RT

District Amarillo
Date 6/6/2022
Grnd. Elev. 3760.66 ft
GW Elev. 3710.86 ft

Elev. (ft)	LOG	Texas Cone Penetrometer	Strata Description	Triaxial Test Lateral Press. (psi)	Triaxial Test Deviator Stress (psi)	Properties MC	LL	PI	Wet Den. (pcf)	Additional Remarks
3759.1			OTHER, HMAC: 5.5"; BASE: 14"			18				SSS@1.0', N=5
			CLAY, Lean, stiff, moist, dark brown to 4', light reddish-brown below 4', few calcareous deposits, trace organics (CL)							
5		10 (6) 11 (6)								
				0	91.8	16	47	32	131.6	PTS@7.0', PP=3.5, -200=92.7%
10		10 (6) 10 (6)								
						14	37	21		PTS@12.0', PP=4.5, -200=93.7%
15		15 (6) 15 (6)								
						15				SSS@16.4', N=12
3741.7			CLAY, Lean with Sand, very stiff, dry to moist, light reddish-brown to 21', light tan below 21', trace calcareous deposits and fine Gravel pieces (CL)							
20		19 (6) 22 (6)				13				SSS@21.3', N=29
						11				
3736.7			CLAY, Lean with Sand, stiff, moist, reddish-brown, trace calcareous deposits and fine-grained Sand pockets (CL)							
25		12 (6) 12 (6)				12	28	13		SSS@26.5', N=18, -200=83.8%
3731.7			CLAY, Lean with Sand, very stiff, moist, light reddish-brown to reddish-brown, trace fine Gravel deposits, few ML pockets (CL)							
30		39 (6) 35 (6)				13				SSS@31.3', N=41
3726.7			CLAY, Lean, stiff, moist, reddish-brown, trace calcareous deposits, blocky (CL)							
35		17 (6) 17 (6)				18	35	17		SSS@36.4', N=24, -200=86.0%
3722.8										Boring Terminated at 37.9'
40										

Remarks: LAT: 35.187786, LONG: -101.974038. Drill Rig: CME 55 with TxDOT 170-pound Automatic Hammer; SSS: Split Spoon Sample; PTS: Push Tube Sample; PP: Pocket Penetrometer Reading (tsf); Drilling Method: Continuous Flight Auger.

Any ground water elevation information provided on this boring log is representative of conditions existing on the day and for the specific location where this information was collected. The actual groundwater elevation may fluctuate due to time, climatic conditions, and/or construction activity.

Driller: Beyond Engineering and Testing, LLC Logger: LC **Organization: Foresight PES, LLC**

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DRILLING LOG

WinCore Version 3.3

County Potter
Highway IH 40
CSJ 0090-05-107

Hole RW-2
Structure Retaining Wall
Station ℄ HOPE RD 2+86.64
Offset 94.38' RT

District Amarillo
Date 6/7/2022
Grnd. Elev. 3757.99 ft
GW Elev. N/A

Elev. (ft)	LOG	Texas Cone Penetrometer	Strata Description	Triaxial Test Lateral Press. (psi)	Triaxial Test Deviator Stress (psi)	Properties MC	LL	PI	Wet Den. (pcf)	Additional Remarks
3756.9			OTHER, HMAC: 5.375"; BASE: 6.75"			19				PTS@1.0', PP=4.25
			CLAY, Lean, stiff, moist, dark brown to 3', dark reddish-brown from 3' to 6', light reddish-brown below 6', trace calcareous deposits; trace organics to 3'; trace SM pockets below 4' (CL)							
5		9 (6) 12 (6)		0	98.1	16	44	28	131.7	PTS@4.0', PP=4.5, -200=93.1%
						16				SSS@6.5', N=20, SC<100ppm
						14	30	18		PTS@8.0', PP=4.5, -200=92.2%
10		11 (6) 11 (6)								
						13				SSS@11.5', N=13
						15	34	20		PTS@13.0', PP=3.0, -200=89.1%
15		12 (6) 17 (6)								
3741.			CLAY, Lean with Sand, very stiff, moist, light reddish-brown, trace SM pockets and calcareous deposits (CL)							
20		24 (6) 22 (6)				14	32	19		PTS@18.0', PP=4.5, -200=78.8%
						18				SSS@21.3', N=19
3734.			CLAY, Lean, hard, moist, light reddish-brown, trace SM pockets and calcareous deposits (CL)							
25		37 (6) 46 (6)				17	43	27		SSS@26.3', N=39, -200=88.1%
3729.			CLAY, Lean, very stiff, moist, light reddish-brown, trace SM pockets and calcareous deposits (CL)							
30		27 (6) 25 (6)				17				SSS@31.3', N=27
						21				SSS@36.3', N=28
35		21 (6) 25 (6)								
3720.2										Boring Terminated at 37.8'
40										

Remarks: LAT: 35.186790, LONG: -101.974014. Drill Rig: CME 55 with TxDOT 170-pound Automatic Hammer; SSS: Split Spoon Sample; PTS: Push Tube Sample; PP: Pocket Penetrometer Reading (tsf); Drilling Method: Continuous Flight Auger; SC: Sulfate Content.

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

Driller: Beyond Engineering and Testing, LLC Logger: LC **Organization: Foresight PES, LLC**

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STATE OF TEXAS
MARCUS J. GALVAN
80192
REGISTERED PROFESSIONAL ENGINEER

12/07/2023

NO.	DATE	DESCRIPTION	APPROV.

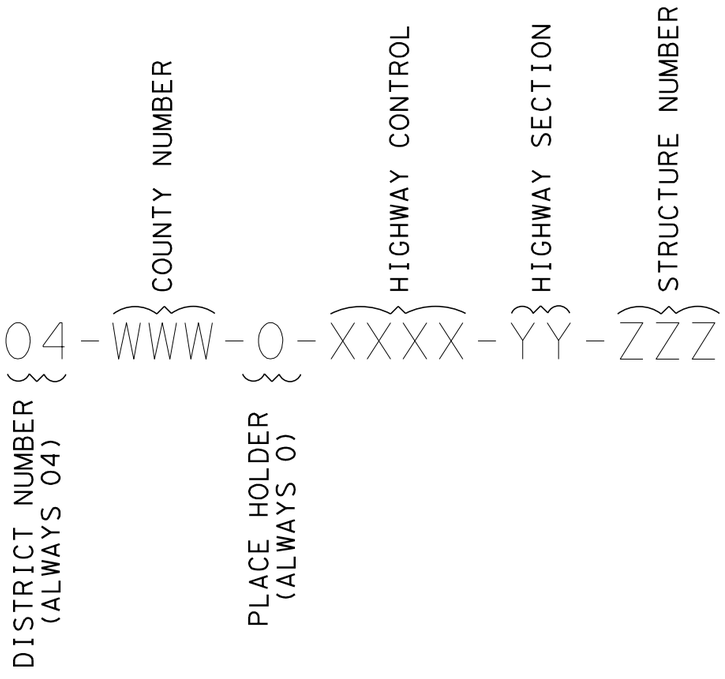
BRIDGEFARMER & ASSOCIATES, INC.
CONSULTING ENGINEERS
TBPE REGISTRATION NO. 264

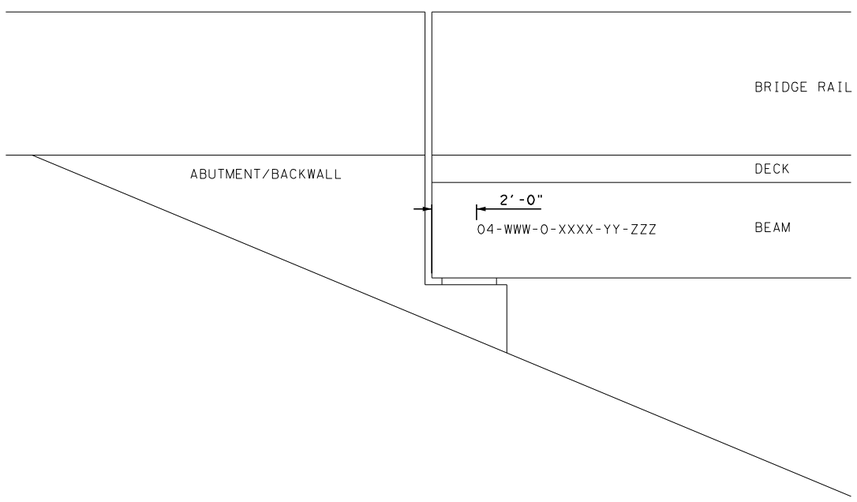
Texas Department of Transportation ©2023

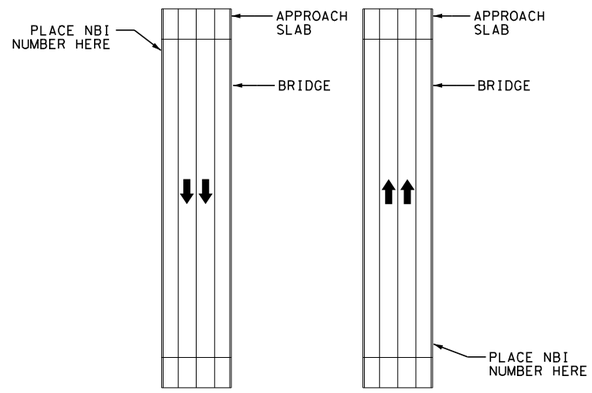
IH-40 AT HOPE ROAD
BORING LOGS

SHEET 3 OF 3

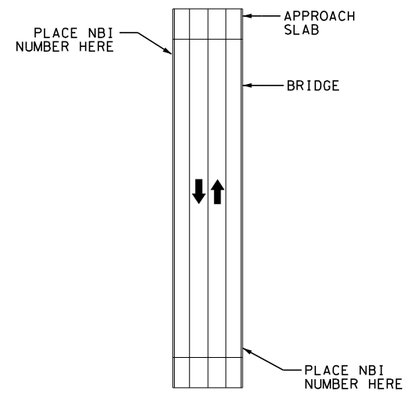
DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
ZJB	6	SEE TITLE SHEET		IH 40
GRAPHICS AKH	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK KDH	TEXAS	AMA	POTTER	119
CHECK ZJB	CONTROL	SECTION	JOB	
	0090	05	107	







DIVIDED HIGHWAY
NBI PLACEMENT



UNDIVIDED HIGHWAY
NBI PLACEMENT

NOTE:

LETTER HEIGHT WILL BE 3"

PAINT COLOR WILL BE BLACK, UNLESS THE BRIDGE BEAMS ARE UNPAINTED STEEL AND THEN THE PAINT COLOR WILL BE WHITE.

PAINT WILL BE OIL BASED.

NBI WILL VERTICALLY BE PLACED IN THE CENTER OF THE BEAM.

STENCILING WILL NOT BE PAID FOR DIRECTLY, BUT WILL BE CONSIDERED SUBSIDIARY TO PLACEMENT OF THE BEAMS.

COUNTY NUMBERS:

ARMSTRONG	006
CARSON	033
DALLAM	056
DONLEY	065
DEAF SMITH	059
GRAY	091
HANSFORD	099
HARTLEY	104
HEMPHILL	107
HUTCHINSON	118
LIPSCOMB	148
MOORE	171
OCHILTREE	179
OLDHAM	180
POTTER	188
RANDALL	191
ROBERTS	197
SHERMAN	211
WHEELER	242

AMARILLO DISTRICT BRIDGE NBI GUIDANCE

2023 Texas Department of Transportation

SHEET 1 OF 1

DSN	CK	CONT	SECT	JOB	HIGHWAY
CS	JR	0090	05	107	IH40
DRWN	CK	DIST	COUNTY		SHEET NO.
CS	JR	AMA	POTTER		120

SUBSTRUCTURE WATERPROOFING PROCEDURE - COATED STRUCTURES

1. Use "Substructure Waterproofing – Coated Structures" for structures that have a surface finish. If structures do not have a surface finish, proceed with "Substructure Waterproofing – Uncoated Structures".

2. Perform all concrete repairs on substructures prior to waterproofing. Engineer shall approve all repairs.

3. Clean exposed surfaces of existing substructures using water blasting in accordance with Item 427, "Surface Finishes for Concrete".

4. Seal exposed surfaces with a waterproof finish as indicated on the plans and in accordance with Item 427, "Surface Finishes for Concrete". See detail for limits. Submit color to Engineer for approval.

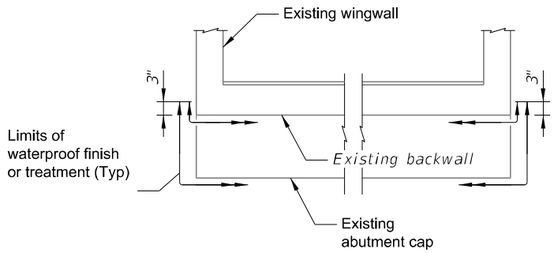
SUBSTRUCTURE WATERPROOFING PROCEDURE - UNCOATED STRUCTURES

5. Use "Substructure Waterproofing – Uncoated Structures" for structures that do not have a surface finish. If structures have a surface finish, proceed with "Substructure Waterproofing – Coated Structures".

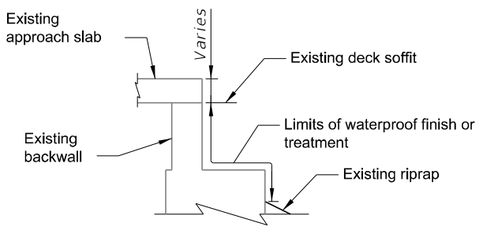
6. Perform all concrete repairs on substructures prior to waterproofing. Engineer shall approve all repairs.

7. Clean exposed surfaces of existing substructures using abrasive blasting in accordance with Item 428, "Penetrating Concrete Surface Treatment".

8. Seal exposed surfaces with a waterproof treatment as indicated on the plans and in accordance with Item 428, "Penetrating Concrete Surface Treatment". See detail for limits.



PLAN



SECTION

TYPICAL ABUTMENT WATERPROOFING LIMITS

Scale: N.T.S.

STATE OF TEXAS
ZACHARY J. BEIL
139718
LICENSED
PROFESSIONAL ENGINEER
Zachary J. Beil
12-08-2023

AMA FY 23 BPM

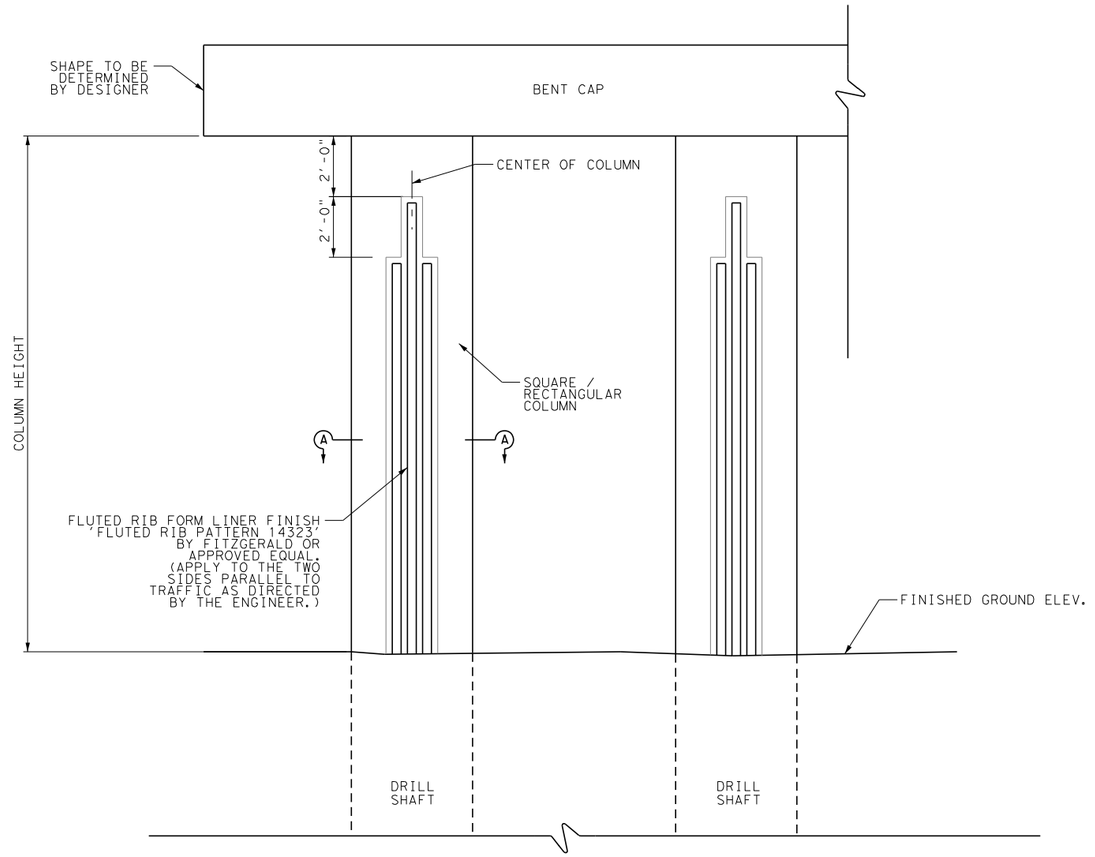
WATERPROOFING DETAILS

SCALE: NTS

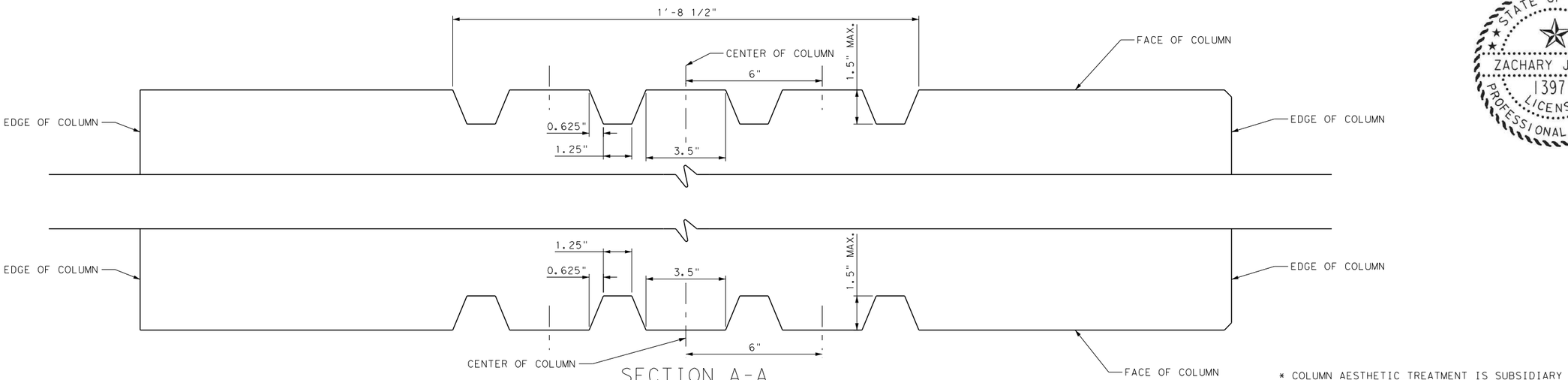
Texas Department of Transportation

SHEET 1 OF 1

DSN	CK	CONT	SECT	JOB	HIGHWAY
ZJB	KDH	0090	05	107	IH40
DRWN	CK	DIST	COUNTY		SHEET NO.
AKH	ZJB	AMA	POTTER		121



TYPICAL STANDARD BENT
AESTHETIC DETAIL



SECTION A-A
FLUTED RIB
FORM LINER DETAIL

* COLUMN AESTHETIC TREATMENT IS SUBSIDIARY TO THE VARIOUS BID ITEMS

STATE OF TEXAS
ZACHARY J. BEIL
139718
LICENSED
PROFESSIONAL ENGINEER
Zachary J. Beil
12-08-2023

BRIDGE COLUMN FINISH DETAILS

SCALE: N.T.S.

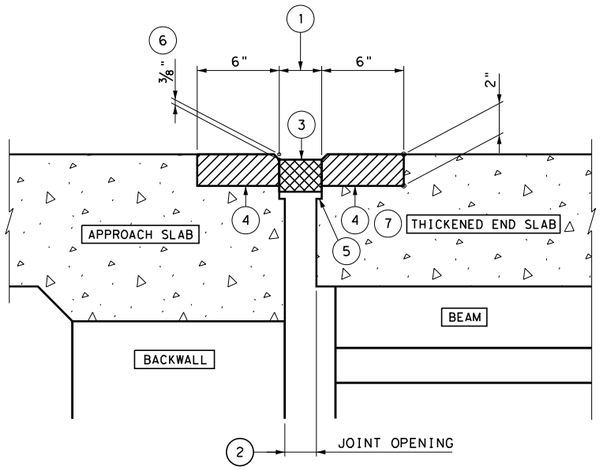
Texas Department of Transportation

SHEET 1 OF 1

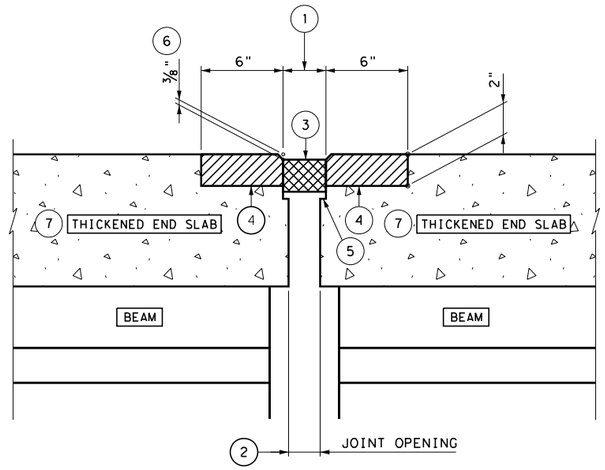
DN: CH	CK: GK	DW: CH	CK: GK
FEDERAL REGION	PROJECT NO.		STATE
6	SEE TITLE SHEET		TEXAS

CONT	SECT	JOB	HIGHWAY
0090	05	107	IH40
DIST	COUNTY		SHEET NO.
AMA	POTTER		122

DATE:
FILE: vidal.ngoumnai@bridgeformer.com\dms38648\038402-BRIDGECOLUMN+FINISHDETAILS.dgn
Vidal.Ngoumnai 12/8/2023 8:40:34 AM



SECTION THROUGH EXPANSION JOINT AT ABUTMENT



SECTION THROUGH EXPANSION JOINT AT INTERIOR BENT

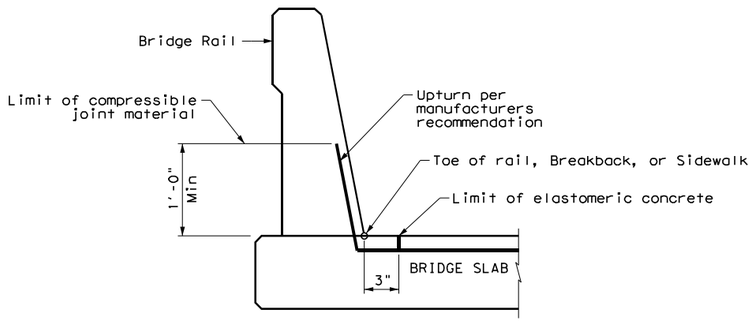
1. Adjust width for actual temperature at installation:
   (2½" at 55° for length of expansion up to 160')
   (3" at 55° for length of expansion up to 300')
2. Adjust width for actual temperature at installation:
   (1½" at 55° for length of expansion up to 160')
   (2" at 55° for length of expansion up to 300')
3. Premolded preformed compressible joint material shall be 25% larger than joint opening:
   (3⁄16" for 2½" opening)
   (3¾" for 3" opening).
4. Approved materials listed in the materials producer list for DMS-6140, "Elastomeric concrete for bridge joint systems". Install per manufacturer's recommendation.
5. Form as necessary to accommodate depth of premolded joint material plus ¼".
6. Recess ⅜". Chamfer each side of header joint ⅜".
7. Precast concrete panel option 2 will not be allowed. a thickened slab end will be required.

Joint openings are based on an installation temperature of 55°F (Midpoint Temperature with a range of -10°F to 120°F). For an installation temperature below 55°F increase the joint openings using the calculation shown below. For an installation temperature above 55°F decrease the joint openings using the calculation shown below.

Change in opening width (in) = C_{exp} * $(\frac{12\ in}{1\ ft})$ * (L_{exp}) * ΔT

C_{exp} = for Concrete Beams = 0.000006 in/in/°F

C_{exp} = for Concrete Beams = 0.0000065 in/in/°F



JOINT SEALANT TERMINATION DETAIL

GENERAL NOTES:

Place the elastomeric concrete at locations shown on the plans and in the manner prescribed in the application procedures published by the manufacturer of the Binder.

Arrange for a technical service representative of the Binder manufacturer to be present on the project during the placement of the Elastomeric Concrete.

The elastomeric concrete shall be subsidiary to the bid item, "Header Type Expansion Joint" and will not be measured for payment.

Payment is based on length of premolded preformed compressible joint material.

This detail shall not be used for joints with a length of expansion (L_{exp}) greater than 300'. For an Abutment, the length of expansion is half the Unit length adjacent to the Abutment. For an Interior Bent, the length is the average of the Unit length on each side of the Bent.

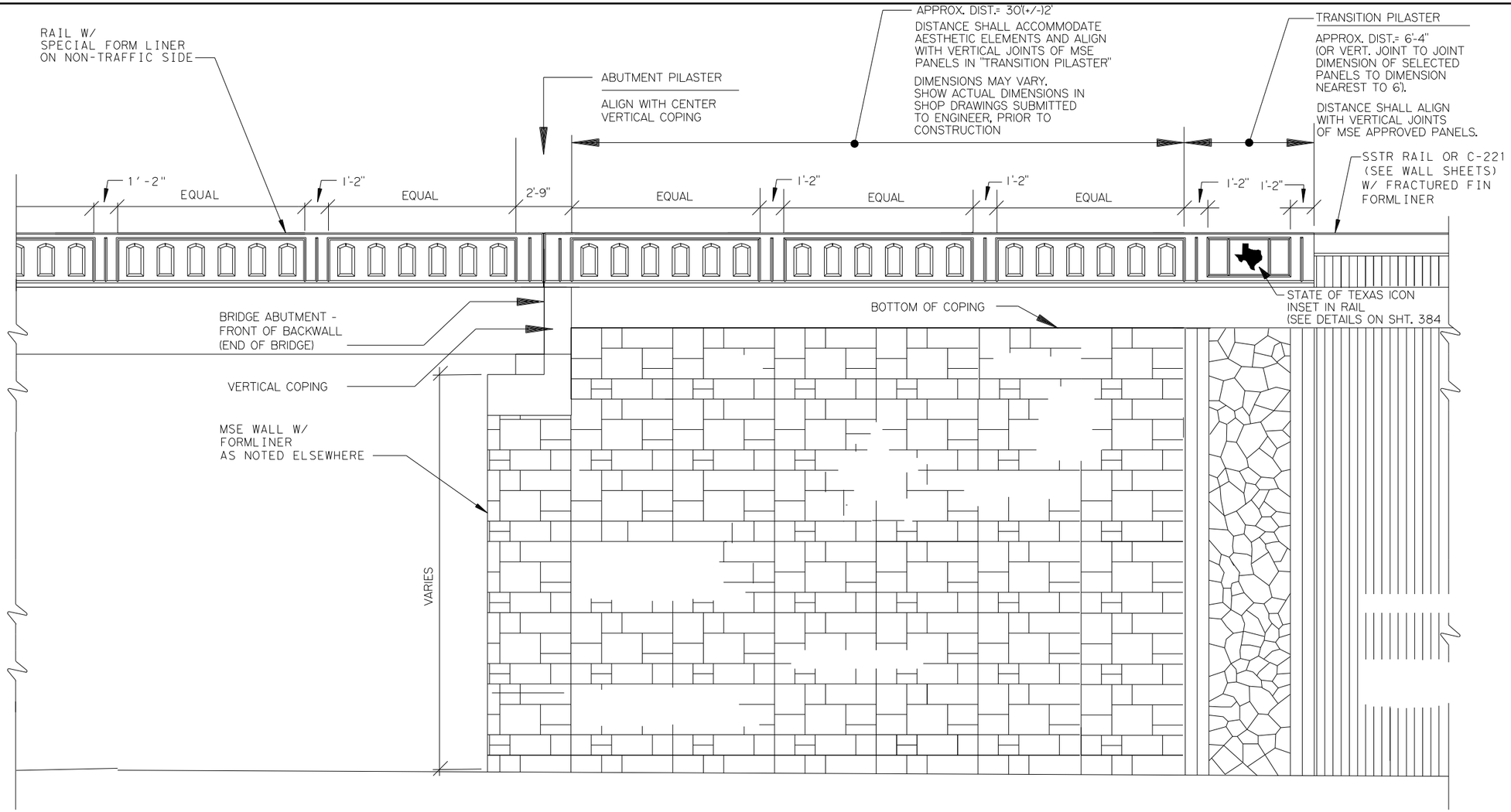
STATE OF TEXAS
ZACHARY J. BEIL
139718
LICENSED
PROFESSIONAL ENGINEER

Zachary J Beil
12-08-2023

Texas Department of Transportation
Amarillo District

HEADER TYPE EXPANSION JOINT DETAIL

FILE: Header Jt-Amarillo District Standard	DN: RJH		CK:	DW:		CK:
© TxDOT January 2012	CONT	SECT	JOB		HIGHWAY	
REVISIONS	0090	05	108		IH 40	
	DIST	COUNTY			SHEET NO.	
	AMA	POTTER			123	



WALL NOTES:

1. PROPOSED PANEL DIMENSIONS SHALL BE SUBMITTED TO ENGINEER FOR APPROVAL, PRIOR TO PRODUCTION OF SHOP DRAWINGS.
2. DIMENSIONS FOR ARRANGEMENT OF AESTHETIC ELEMENTS SHALL BE INCLUDED IN SHOP DRAWINGS PROVIDED BY THE CONTRACTOR AND SUBMITTED TO ENGINEER FOR APPROVAL, PRIOR TO FABRICATION OR MANUFACTURING.
3. SEE SHEET "AMARILLO DISTRICT MSE RETAINING WALL FINISH DETAIL" FOR FINISH DETAILS NOT SHOWN.

AESTHETIC RAIL ELEMENTS

ELEVATION

N.T.S.

NOTES:

THE IMAGE SHOWN IS ONLY A PORTION OF THE INTERSECTION. THIS IMAGE WILL BE REPEATED AT ALL FOUR CORNER WALLS OF THE BRIDGES FACING THE FRONTAGE ROADS (ONLY), FOR A TOTAL OF 4 APPLICATIONS.

MIRROR THIS IMAGE ON THE BRIDGE WALLS ON THE OPPOSITE SIDE OF THE CROSS STREETS.

PAYMENT FOR WALL FACE TEXTURING OR FORMLINER WILL NOT BE PAID SEPARATELY, BUT WILL BE SUBSIDIARY TO THE PERTINENT WALL.

SPECIAL RAIL FORMLINER WILL BE CONTINUOUS ACROSS BRIDGES AND WALLS, BUT ONLY ON EXTERIOR SIDES FACING THE FRONTAGE ROADS.

PAYMENT FOR RAIL FORMLINER WORK WILL NOT BE PAID SEPARATELY, BUT WILL BE SUBSIDIARY TO THE PERTINENT RAIL.

AESTHETIC LAYOUT

ELEVATION

N.T.S.

STATE OF TEXAS
ZACHARY J. BEIL
139718
LICENSED
PROFESSIONAL ENGINEER
Zachary J Beil
12-08-2023

NO.	DATE	DESCRIPTION	APPROV.

BRIDGEFARMER & ASSOCIATES, INC.
CONSULTING ENGINEERS
TBPE REGISTRATION NO. 264

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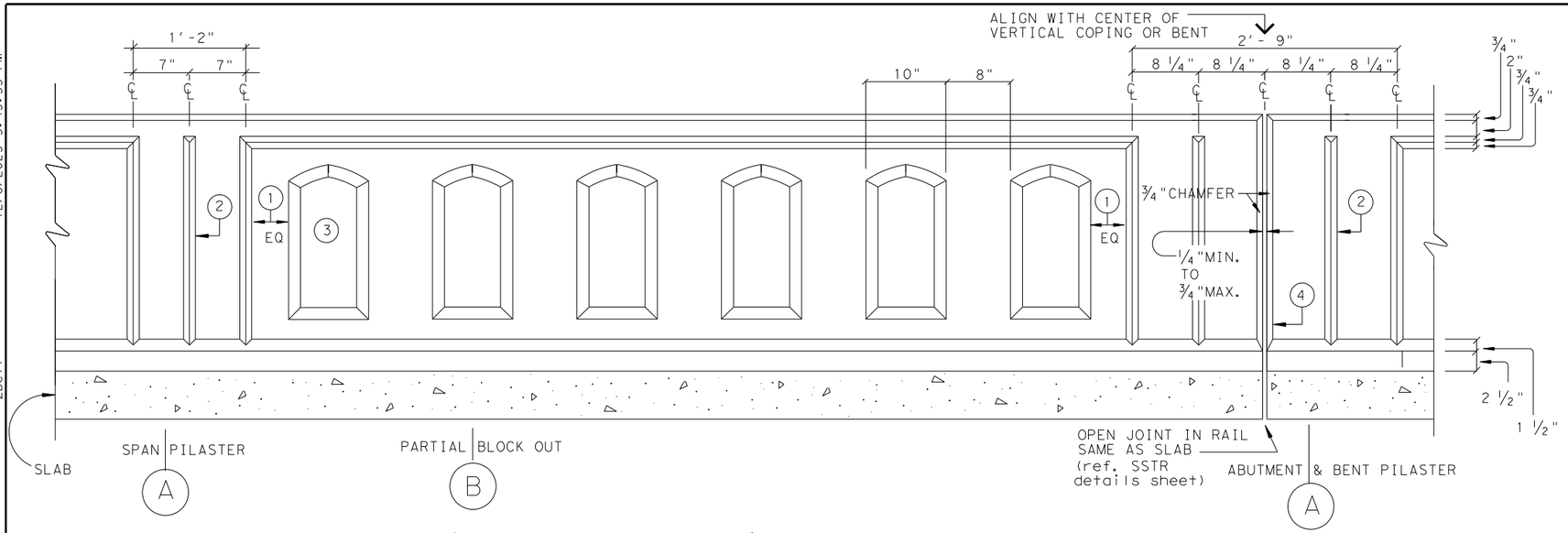
IH-40 AT HOPE ROAD

BRIDGE WALL & RAIL AESTHETICS LAYOUT

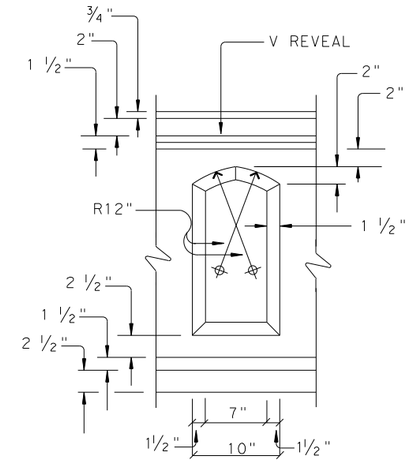
SHEET 1 OF 1

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
ZJB	6	SEE TITLE SHEET		IH 40
GRAPHICS AKH	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK KDH	TEXAS	AMA	POTTER	124
CHECK ZJB	CONTROL 0090	SECTION 05	JOB 107	



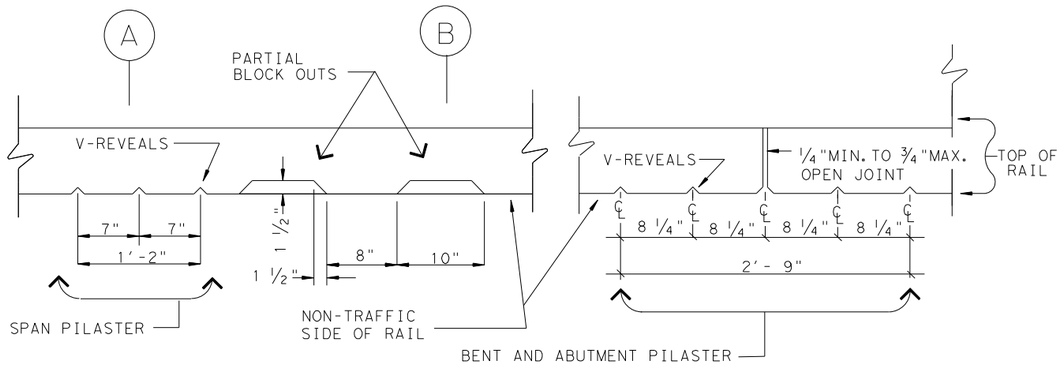
FORM LINER FOR SSTR RAIL (NON-ROADWAY FACE)

ELEVATION NTS



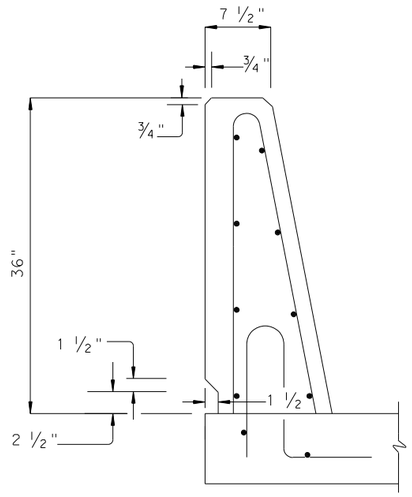
PARTIAL BLOCK OUT

ELEVATION NTS



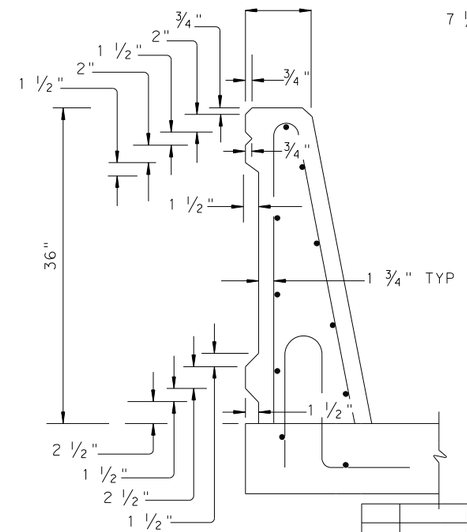
FORM LINER FOR SSTR RAIL(NON-ROADWAY FACE)

PLAN NTS



A ABUTMENT/BENT & SPAN PILASTERS

SECTION NTS



B PARTIAL BLOCK OUT

SECTION NTS

SPECIAL RAIL FORM-LINER NOTES:

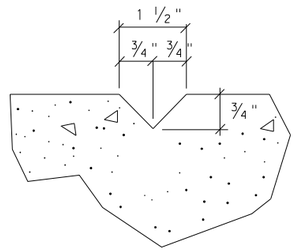
1. THIS DIMENSION SHALL BE EQUAL IN EACH SECTION BETWEEN BENT/ABUTMENT PILASTERS, BUT MAY VARY FROM SECTION TO SECTION ACCORDING TO VARYING DISTANCES BETWEEN BENT/ABUTMENT PILASTERS. DIMENSION SHALL NOT EXCEED LIMITS OF 2" MIN. TO 10" MAX.

2. PILASTER REVEAL. SEE REVEAL DETAILS.

3. THE PARTIAL BLOCKOUT STOPS 1¾" FROM CENTER OF NEAREST STEEL BAR IN THE STANDARD SSTR RAIL. (REF. TO SSTR RAIL STANDARD SHEET).

4. LOCATE JOINTS TO COMPLY WITH 33' MAX. AND 15' MIN. INTERVALS, AS SHOWN ON THE SSTR RAIL STANDARD SHEETS. APPLY THIS FORM LINER TO NON-TRAFFIC SIDE OF SSTR RAIL AS SHOWN IN THE PLANS.

ALL FORMED CONCRETE ELEMENTS SHALL RECEIVE A CLASS C - ONE RUB FINISH. THIS SHALL BE CONSIDERED SUBSIDIARY TO THE CONCRETE WORK.



V-REVEAL DETAIL

PLAN NTS

STATE OF TEXAS
ZACHARY J. BELL
139718
LICENSED
PROFESSIONAL ENGINEER
Zachary J. Bell
12-08-2023

NO.	DATE	DESCRIPTION	APPROV.

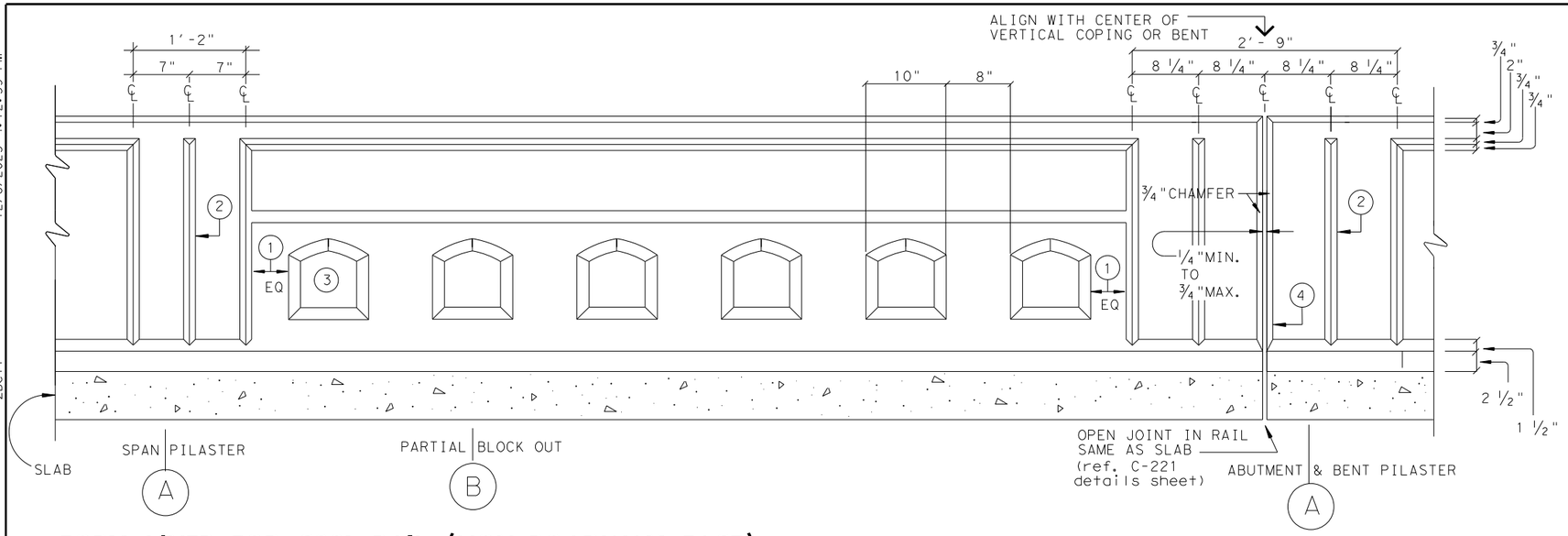
BRIDGEFARMER & ASSOCIATES, INC.
CONSULTING ENGINEERS
TBPE REGISTRATION NO. 264

IH-40 AT HOPE ROAD

FORM LINER APPLICATION FOR NON-TRAFFIC SIDE OF STANDARD SSTR RAIL

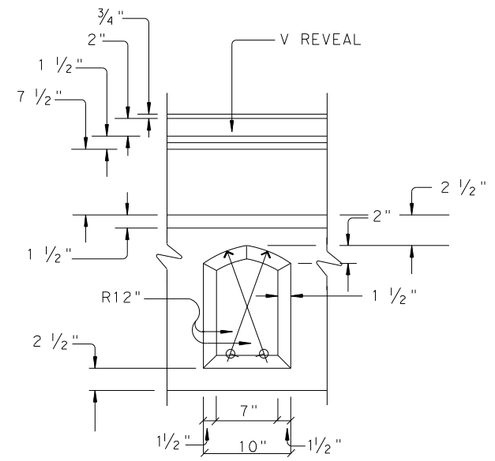
SHEET 1 OF 1

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
ZJB	6	SEE TITLE SHEET		IH 40
GRAPHICS AKH	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK KDH	TEXAS	AMA	POTTER	125
CHECK ZJB	CONTROL	SECTION	JOB	
	0090	05	107	



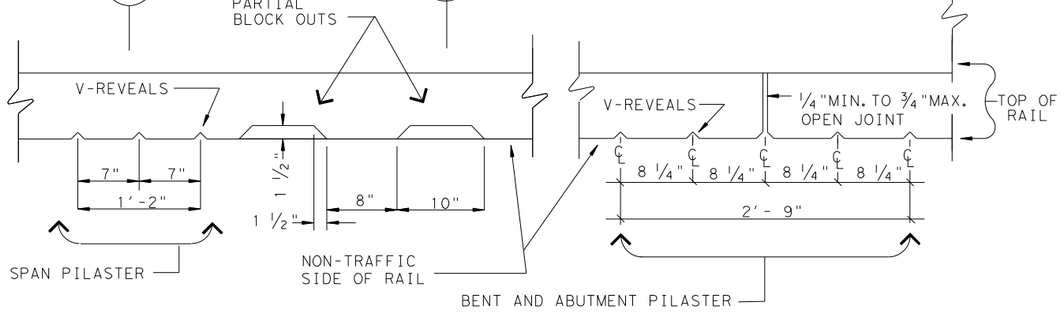
FORM LINER FOR C221 RAIL (NON-ROADWAY FACE)

ELEVATION NTS



PARTIAL BLOCK OUT

ELEVATION NTS



FORM LINER FOR C-221 RAIL(NON-ROADWAY FACE)

PLAN NTS

SPECIAL RAIL FORM-LINER NOTES:

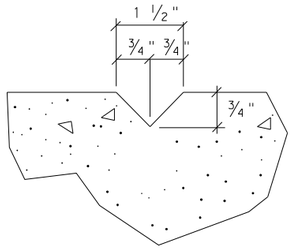
1. THIS DIMENSION SHALL BE EQUAL IN EACH SECTION BETWEEN BENT/ABUTMENT PILASTERS, BUT MAY VARY FROM SECTION TO SECTION ACCORDING TO VARYING DISTANCES BETWEEN BENT/ABUTMENT PILASTERS. DIMENSION SHALL NOT EXCEED LIMITS OF 2" MIN. TO 10" MAX.

2. PILASTER REVEAL. SEE REVEAL DETAILS.

3. THE PARTIAL BLOCKOUT STOPS 1 3/4" FROM CENTER OF NEAREST STEEL BAR IN THE STANDARD C-221 RAIL. (REF. TO C-221 RAIL STANDARD SHEET).

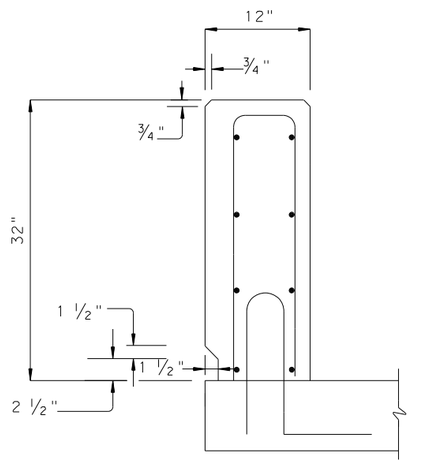
4. LOCATE JOINTS TO COMPLY WITH 33' MAX. AND 15' MIN. INTERVALS, AS SHOWN ON THE C-221 RAIL STANDARD SHEETS. APPLY THIS FORM LINER TO NON-TRAFFIC SIDE OF C221 RAIL AS SHOWN IN THE PLANS.

ALL FORMED CONCRETE ELEMENTS SHALL RECEIVE A CLASS C - ONE RUB FINISH. THIS SHALL BE CONSIDERED SUBSIDIARY TO THE CONCRETE WORK.



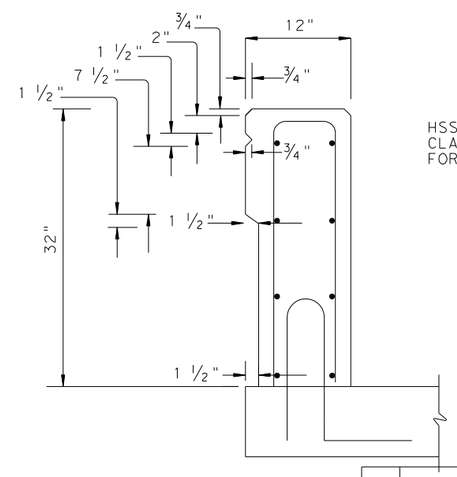
V-REVEAL DETAIL

PLAN NTS



A ABUTMENT/BENT & SPAN PILASTERS

SECTION NTS



B PARTIAL BLOCK OUT

SECTION NTS

HSS RAIL DETAILS NOT SHOWN FOR CLARITY. SEE C-221 STANDARD SHEET FOR DETAILS NOT SHOWN.

STATE OF TEXAS
ZACHARY J. BEIL
139718
LICENSED
PROFESSIONAL ENGINEER

Zachary J. Beil 12-08-2023

NO.	DATE	DESCRIPTION	APPROV.

BRIDGEFARMER & ASSOCIATES, INC.
CONSULTING ENGINEERS
TBPE REGISTRATION NO. 264

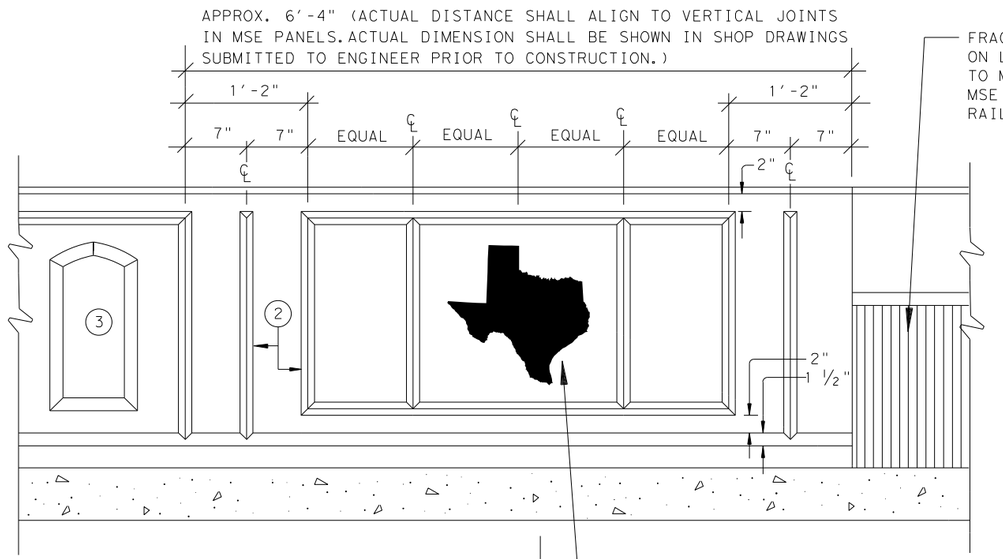
Texas Department of Transportation ©2023

IH-40 AT HOPE ROAD

FORM LINER APPLICATION FOR NON-TRAFFIC SIDE OF C-221 RAIL

SHEET 1 OF 1

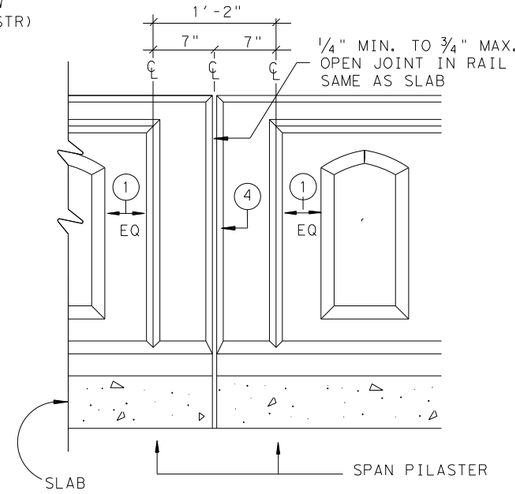
DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
ZJB	6	SEE TITLE SHEET		IH 40
GRAPHICS AKH	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK KDH	TEXAS	AMA	POTTER	126
CHECK ZJB	CONTROL	SECTION	JOB	
	0090	05	107	



TRANSITION PILASTER

ELEVATION

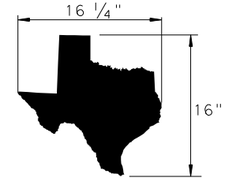
NTS



TYPICAL JOINT IN SPAN PILASTER

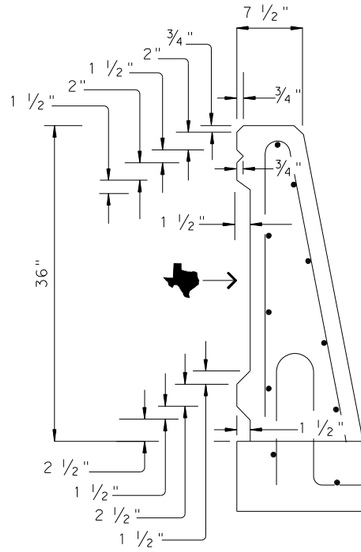
NTS

ELEVATION



STATE ICON

NTS



TRANSITION PILASTER

SECTION

C

NTS

SPECIAL RAIL FORM-LINER NOTES:

1. THIS DIMENSION SHALL BE EQUAL IN EACH SECTION BETWEEN BENT/ABUTMENT PILASTERS, BUT MAY VARY FROM SECTION TO SECTION ACCORDING TO VARYING DISTANCES BETWEEN BENT/ABUTMENT PILASTERS. DIMENSION SHALL NOT EXCEED LIMITS OF 2" MIN. TO 10" MAX.
2. V-REVEAL. SEE REVEAL DETAIL.
3. THE PARTIAL BLOCKOUT STOPS 1¾" FROM CENTER OF NEAREST STEEL BAR IN THE STANDARD SSTR RAIL. (REF. TO SSTR RAIL STANDARD SHEET).
4. LOCATE JOINTS TO COMPLY WITH 33' MAX. AND 15' MIN. INTERVALS, AS SHOWN ON THE SSTR RAIL STANDARD SHEETS. FOLLOW ALL CONSTRUCTION DETAILS FOR SSTR EXCEPT ON NON-TRAFFIC SIDE ONLY WHERE THIS FORM LINER IS LOCATED AS SHOWN IN THE PLANS.

ALL FORMED CONCRETE ELEMENTS SHALL RECEIVE A CLASS C - ONE RUB FINISH. THIS SHALL BE CONSIDERED SUBSIDIARY TO THE CONCRETE WORK.

PAINTING NOTES FOR STATE ICON:

1. SEE DETAIL FOR STATE ICON DIMENSIONS.
2. INTERIOR OF DEPRESSED ICON SHALL BE PAINTED WITH SOLVENT-BASED SEALER (SHERWIN WILLIAMS H&C SILICONE ACRYLIC SEALER OR APPROVED EQUAL - MUST BE EPA APPROVED).
3. COLOR SHALL BE BROWN, MATCHING COLOR OF WALL MOUNTED METAL STAR. SUBMIT COLOR SAMPLE(S) TO ENGINEER FOR APPROVAL PRIOR TO USE.
4. PAINTING SHALL FOLLOW SPECIFICATIONS FOR ITEM 427- SURFACE FINISHES FOR CONCRETE, CLASS B, TYPE I, BUT SHALL BE CONSIDERED SUBSIDIARY TO THE VARIOUS BID ITEMS AND SHALL NOT BE PAID FOR SEPARATELY.
5. ICON AREA SHALL BE BLAST CLEANED PRIOR TO SEALER APPLICATION.
6. DO NOT ALLOW PAINT TO EXTEND BEYOND EDGE OF DEPRESSED ICON AREA. ANY PAINT ON SURFACES OTHER THAN ICON SHALL BE REMOVED BY THE CONTRACTOR.

NO.	DATE	DESCRIPTION	APPROV.

BRIDGEFARMER & ASSOCIATES, INC.
CONSULTING ENGINEERS
TBPE REGISTRATION NO. 264

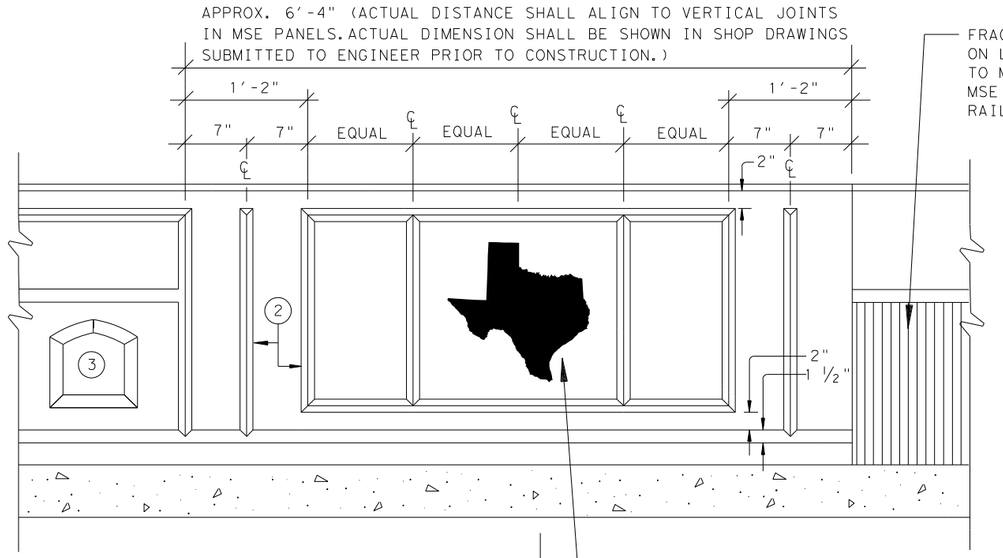
Texas Department of Transportation ©2023

IH-40 AT HOPE ROAD

FORM LINER TRANSITION PILASTER DETAIL SSTR

SHEET 1 OF 1

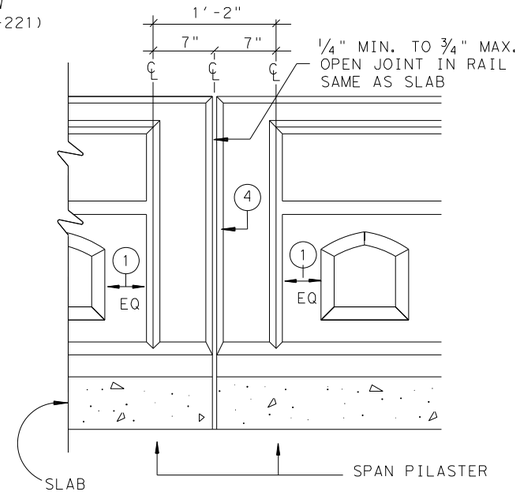
DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
ZJB	6	SEE TITLE SHEET		IH 40
GRAPHICS AKH	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK KDH	TEXAS	AMA	POTTER	127
CHECK ZJB	CONTROL	SECTION	JOB	
	0090	05	107	



TRANSITION PILASTER

ELEVATION

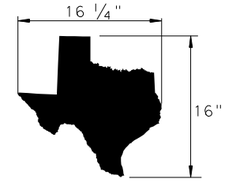
NTS



TYPICAL JOINT IN SPAN PILASTER

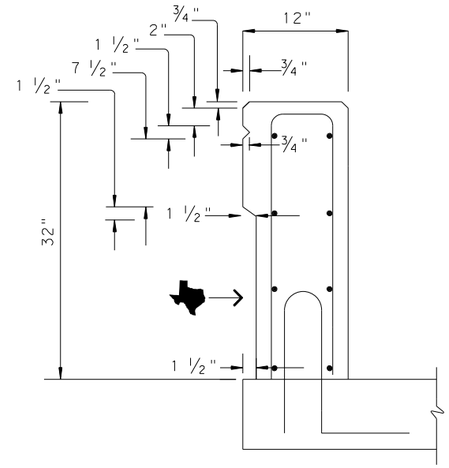
ELEVATION

NTS



STATE ICON

NTS



TRANSITION PILASTER

SECTION

NTS

HSS RAIL DETAILS NOT SHOWN FOR CLARITY. SEE C-221 STANDARD SHEET FOR DETAILS NOT SHOWN.

SPECIAL RAIL FORM-LINER NOTES:

1. THIS DIMENSION SHALL BE EQUAL IN EACH SECTION BETWEEN BENT/ABUTMENT PILASTERS, BUT MAY VARY FROM SECTION TO SECTION ACCORDING TO VARYING DISTANCES BETWEEN BENT/ABUTMENT PILASTERS. DIMENSION SHALL NOT EXCEED LIMITS OF 2" MIN. TO 10" MAX.
2. V-REVEAL. SEE REVEAL DETAIL.
3. THE PARTIAL BLOCKOUT STOPS 1¾" FROM CENTER OF NEAREST STEEL BAR IN THE STANDARD TSSTRRAIL. (REF. TO C-221 RAIL STANDARD SHEET).
4. LOCATE JOINTS TO COMPLY WITH 33' MAX. AND 15' MIN. INTERVALS, AS SHOWN ON THE C-221 RAIL STANDARD SHEETS. FOLLOW ALL CONSTRUCTION DETAILS FOR C-221 EXCEPT ON NON-TRAFFIC SIDE ONLY WHERE THIS FORM LINER IS LOCATED AS SHOWN IN THE PLANS.

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NO.	DATE	DESCRIPTION	APPROV.

BRIDGEFARMER & ASSOCIATES, INC.
CONSULTING ENGINEERS
TBPE REGISTRATION NO. 264

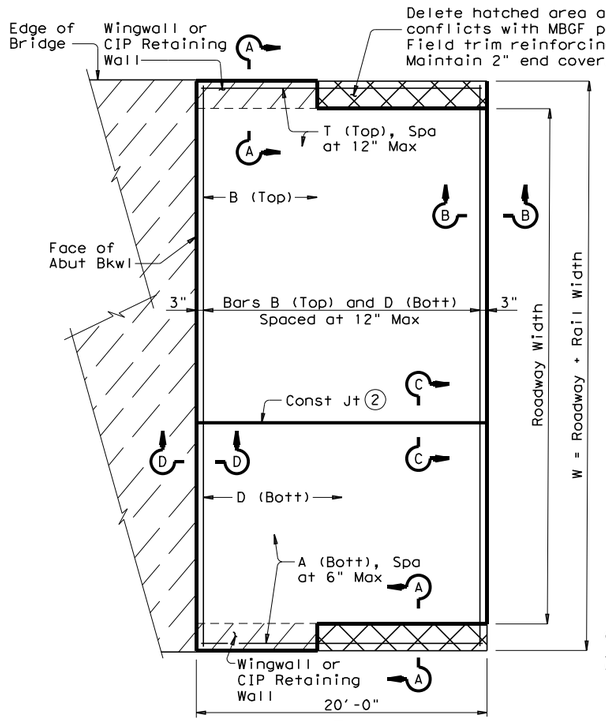
Texas Department of Transportation

IH-40 AT HOPE ROAD

FORM LINER TRANSITION PILASTER DETAIL C-221

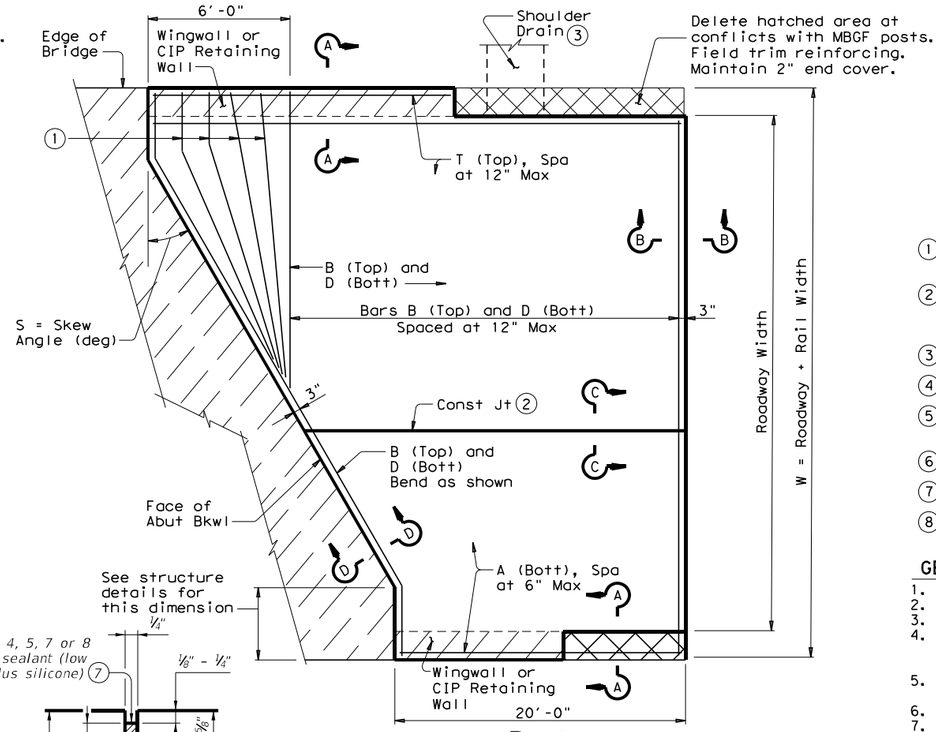
SHEET 1 OF 1

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
ZJB	6	SEE TITLE SHEET		IH 40
GRAPHICS AKH	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK KDH	TEXAS	AMA	POTTER	128
CHECK ZJB	CONTROL	SECTION	JOB	
	0090	05	107	



PLAN

(Showing Non-Skewed Approach Slab)



PLAN

(Showing Skewed Approach Slab)

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) = $0.802W + 0.02W^2 \tan S$

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 only.

(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.

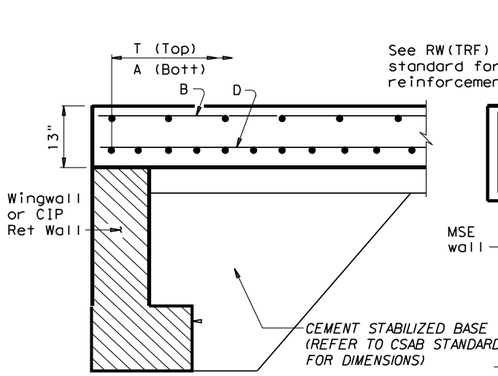
(8) OMITTED

GENERAL NOTES:

1. Construct approach slab in accordance with Item 422.
2. Concrete shall be Class "S" with a minimum compressive strength of 4,000 psi.
3. All reinforcing steel shall be Grade 60.
4. Construct the subgrade or subbase from the bridge for a minimum distance of 100 feet prior to the approach slab, unless otherwise indicated on the plans.
5. 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.
6. Cure for 4 days using water or membranE curing per Item 422.
7. All details shown herein are subsidiary to bridge approach slab.

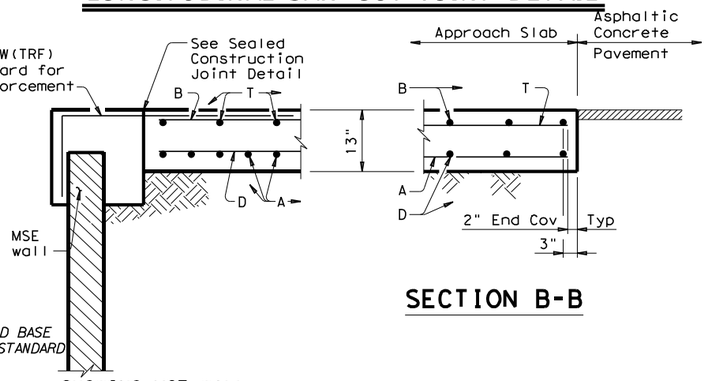
Cover dimensions are clear dimensions, unless noted otherwise.

LONGITUDINAL SAW CUT JOINT DETAIL



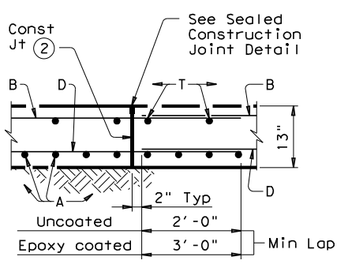
SHOWING WINGWALL OR CIP RETAINING WALL

SECTION A-A

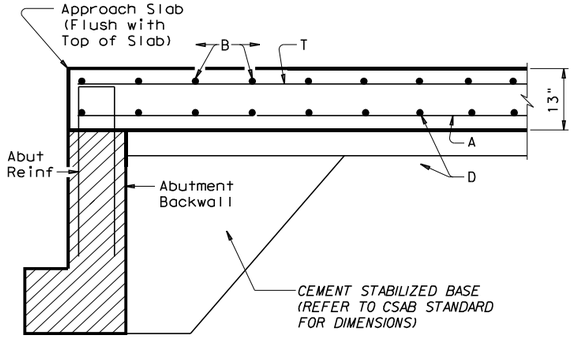


SHOWING MSE WALL

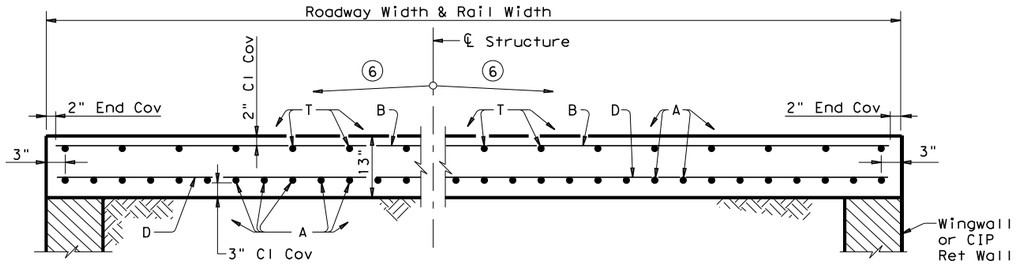
SECTION B-B



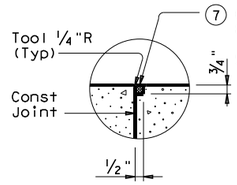
SECTION C-C (5)



SECTION D-D



TYPICAL TRANSVERSE SECTION



SEALED CONSTRUCTION JOINT DETAIL

STATE OF TEXAS
ZACHARY J. BELL
139718
LICENSED
PROFESSIONAL ENGINEER
Zachary J. Bell
12-08-2023

Texas Department of Transportation

BRIDGE APPROACH SLAB

ASPHALTIC CONCRETE PAVEMENT

BAS-A (MOD)

FILE: STDB10A.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT September 2006	DISTRICT	FEDERAL AID PROJECT		SHEET
REVISIONS 7/19/2021 Revised for Statewide Standard 9-28-2022 Revised for Statewide Standard	AMA	SEE TITLE SHEET		129
	COUNTY	CONTROL	SECT	JOB	HIGHWAY
	POTTER	0090	05	108	IH-40

STDB10A

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

PATH:

DATE: 12/7/2023
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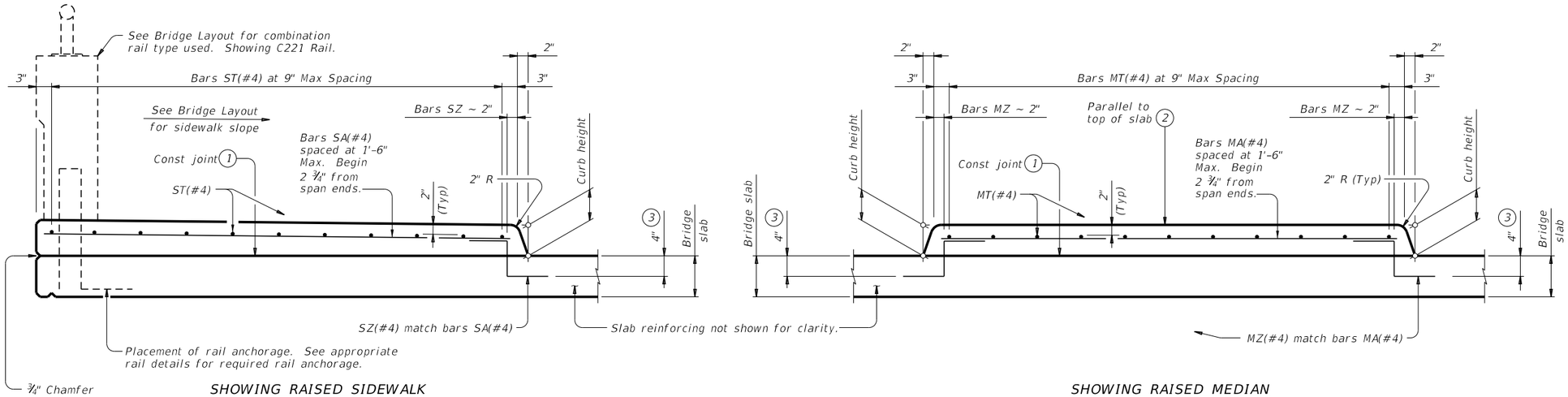


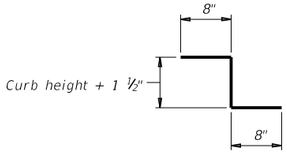
TYPICAL TRANSVERSE SECTIONS

See Span Details for dimensions not shown.

(1) Provide broom finish to top of bridge slab where raised sidewalk or raised median area is defined.

(2) Unless noted otherwise on the span details.

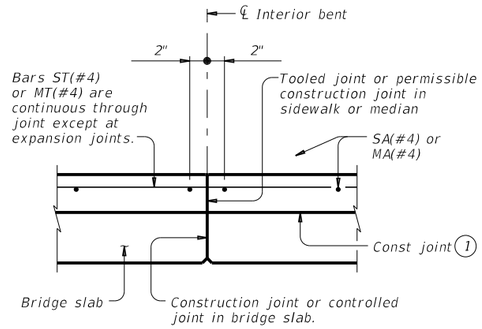
(3) Bars may rest on top of PCPs.



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

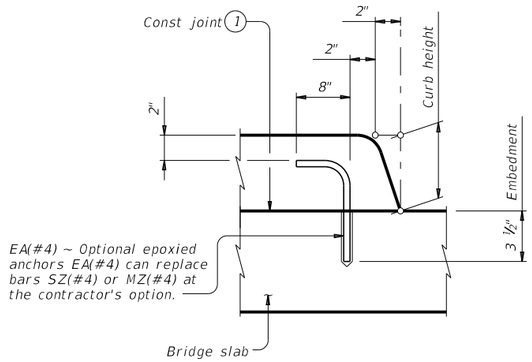
APPROVED SLIP RESISTANT PLATE	
Product	Manufacturer Website
Algrip™, Steel	www.algrip.com
Mebac® #3, Steel	www.harscoikg.com
SlipNOT® Grade 2, Steel	www.slipnot.com

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



LONGITUDINAL SECTION AT INTERIOR BENT

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



OPTIONAL EPOXY ANCHORS

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

MATERIAL NOTES:

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

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

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

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

Chamfer or round edges approximately 1/16" prior to galvanizing.

GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications.

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

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

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

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

DESIGNER NOTES:

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

Cover dimensions are clear dimensions, unless noted otherwise.

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

SHEET 1 OF 2

Texas Department of Transportation

Bridge Division Standard

BRIDGE RAISED SIDEWALK AND MEDIAN DETAILS

BRSM

FILE:	DN: JMH	CK: TxDOT	DW: JTR	CK: TxDOT
©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
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	DIST	COUNTY		SHEET NO.
	AMA	POTTER		130

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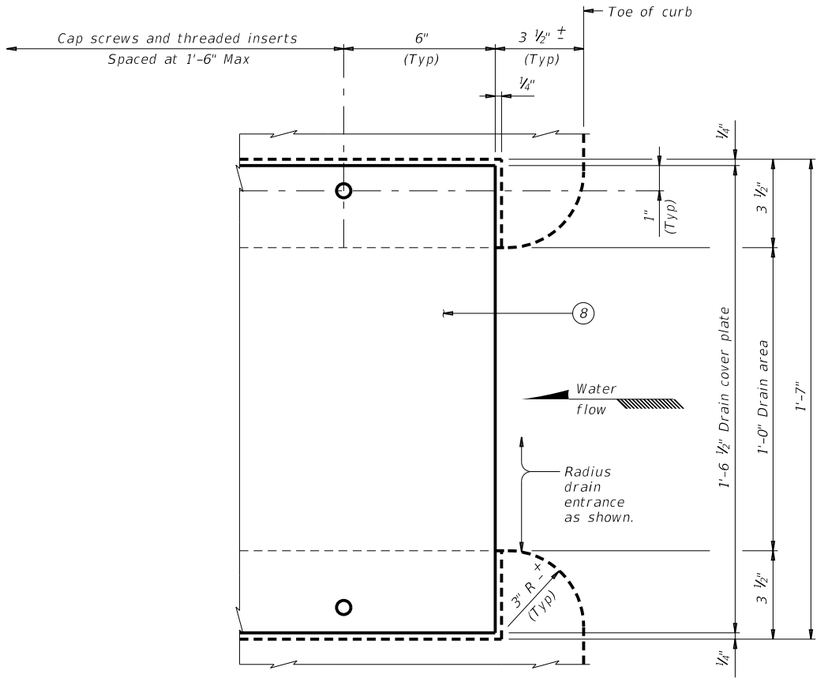
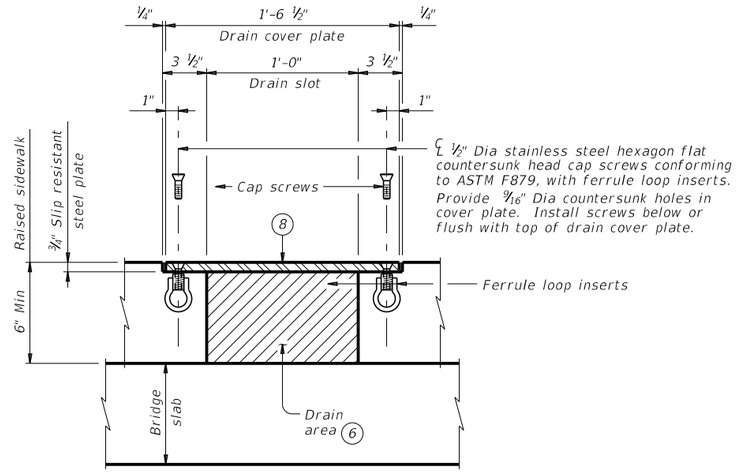
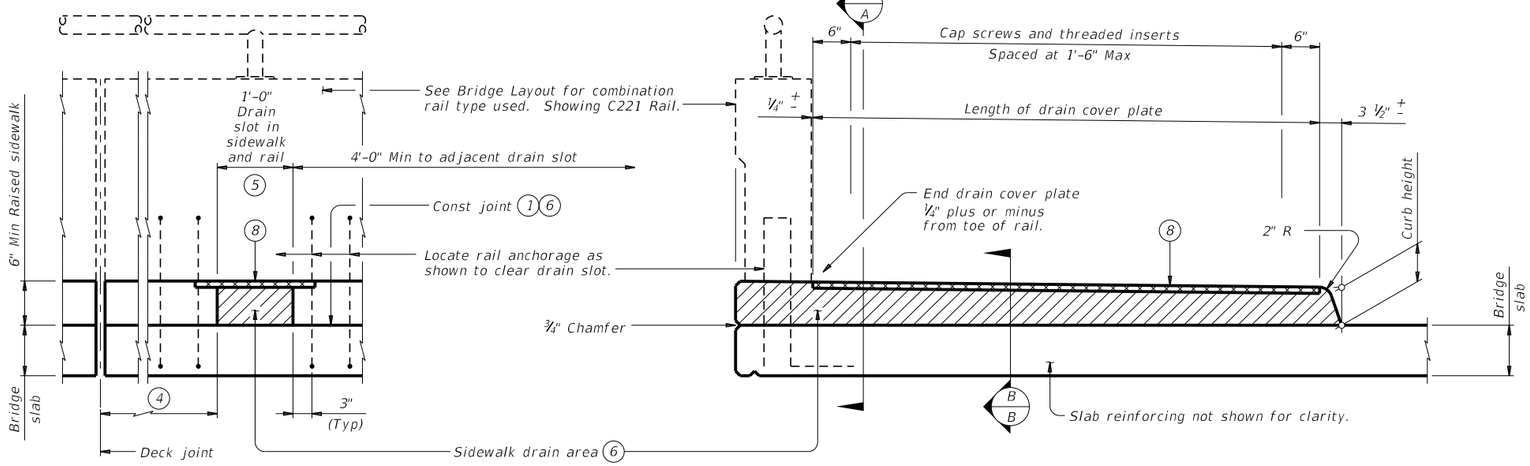


PARTIAL PLAN CURB DRAIN



SECTION B-B

Reinforcing not shown for clarity.



SECTION A-A

SHOWING RAISED SIDEWALK WITH DRAIN SLOT

OPTIONAL DRAIN DETAILS (7)

(1) Provide broom finish to top of bridge slab where raised sidewalk or raised median area is defined.

(4) 3'-0" Min at deck expansion joints, deck construction joints or controlled joints, rail intermediate wall joints or from face of substructure.

(5) For rail Type C1W, center drain slots between posts.

(6) Steel trowel top surface of bridge deck in drain locations.

(7) Provide sidewalk drains where shown elsewhere on the plans or as directed by the Engineer. Do not place drains over railroad tracks, lower roadways, or sidewalks. Place drain and cover plate perpendicular to toe of rail.

(8) Drain cover plate (PL ⅜ x 18 ½ slip resistant steel plate). Install flush with top of sidewalk.

Texas Department of Transportation

Bridge Division Standard

BRIDGE RAISED SIDEWALK AND MEDIAN DETAILS

BRSM

FILE:	DN: JMH	CK: TxDOT	DW: JTR	CK: TxDOT
©TxDOT April 2019 REVISIONS	CONT	SECT	JOB	HIGHWAY
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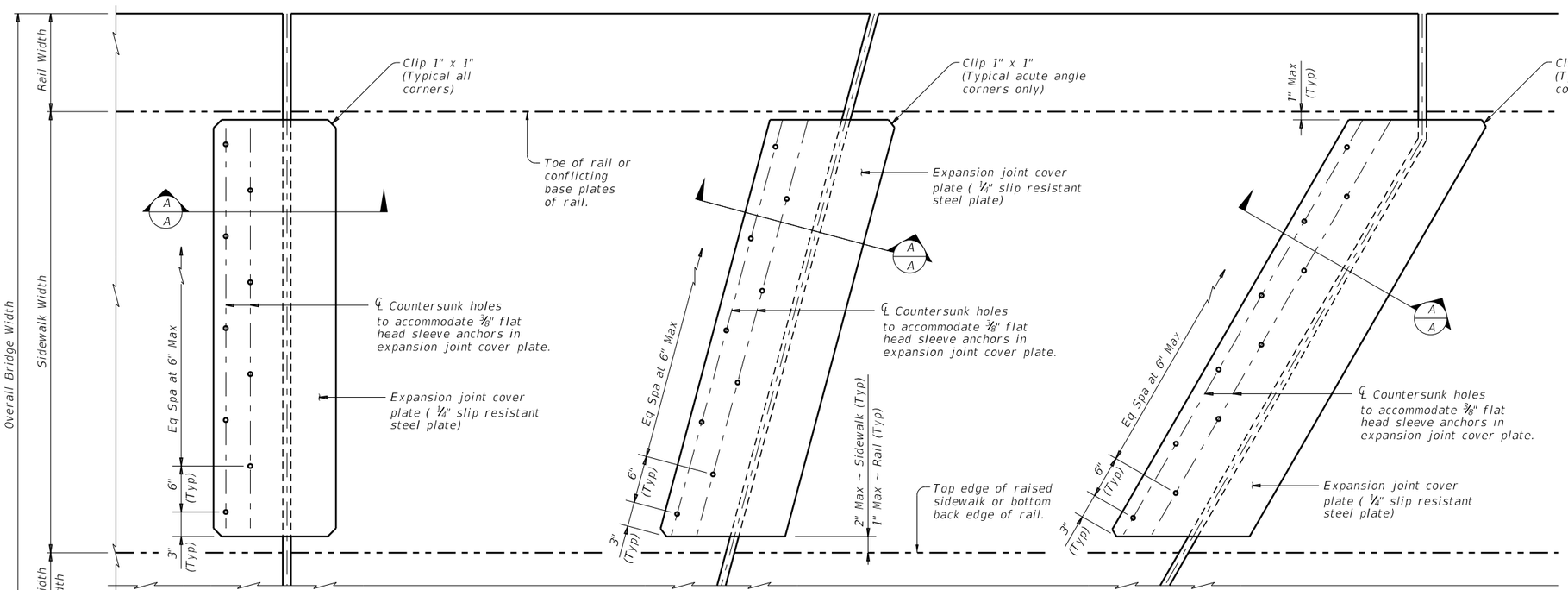
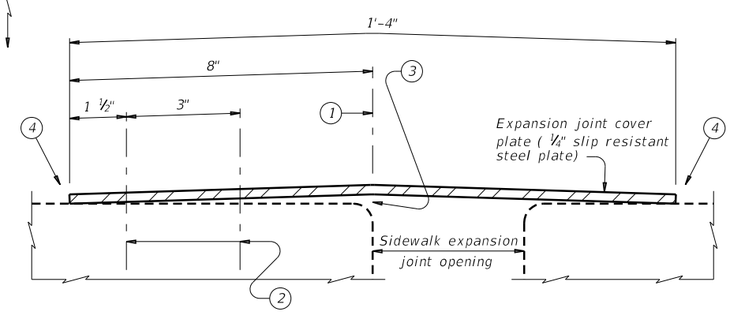
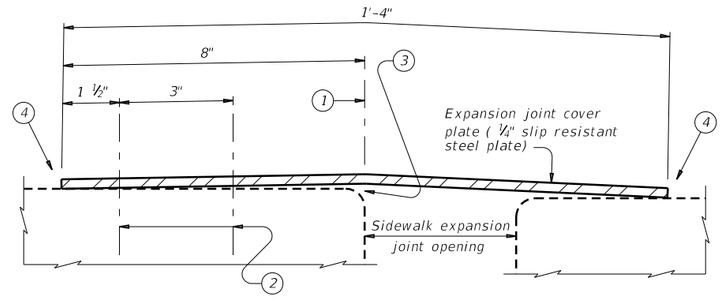


NO SKEW | SKEW WITHOUT SLAB BREAKBACK | SKEW WITH SLAB BREAKBACK

PLAN



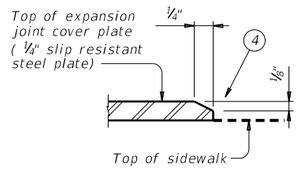
SHOWING LEVEL EXP JOINT



SHOWING UNLEVEL EXP JOINT
(Install sleeve anchors on high side of expansion joint)

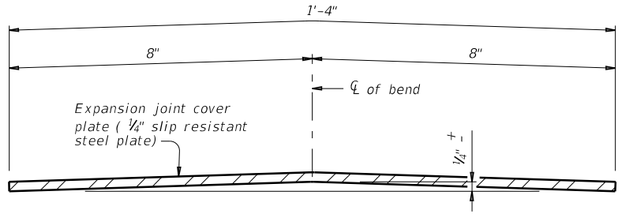
SECTION A-A

1. ℄ Expansion joint cover plate and edge of expansion joint.
2. ℄ ⅜" x 2 ½" Min, Flat Head Sleeve Anchors, Stainless Steel. Countersink Flat Head Sleeve Anchors in ¼" Slip Resistant Steel Plate.
3. It is not necessary to remove plate crown provided the plate is firmly secured to the sidewalk.
4. Transverse edges must be in contact with sidewalk surface after installation.



EXP JOINT COVER PLATE BEVEL DETAIL

Bevel all plate edges as shown.



BENDING DIAGRAM OF EXP JOINT COVER PLATE

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

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

FABRICATION NOTES:

Shop drawings for the fabrication of Bridge Sidewalk Expansion Joint Cover Plate will not require the Engineer's approval if fabrication is in accordance with the details shown on this standard.

A Bridge Sidewalk Expansion Joint Cover Plate Layout which identifies location side of sleeve anchors and orientation of all cover plate sections must be developed by the fabricator. Mark each steel section in accordance with the Bridge Sidewalk Expansion Joint Cover Plate Layout. A copy of the Bridge Sidewalk Expansion Joint Cover Plate Layout is to be provided to the Engineer.

Sidewalk expansion joint cover plates must be hot-dipped galvanized ¼" slip resistant steel plate. Checker plate or diamond plate is not allowed nor are slip resistant tapes, films and non-metallic coatings.

Minimum required yield strength of steel plate is 36 ksi.

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

Provide stainless steel flat head sleeve anchors meeting the requirements of ASTM F 593, Group I, Alloy 304. Countersink holes in slip-resistant plate for sleeve anchors. Drill holes in sidewalk as per sleeve anchor manufacturer's recommendations. Install sleeve anchors flush with, or slightly recessed below, top surface of sidewalk expansion joint cover plate.

GENERAL NOTES:

Sidewalk expansion joint cover plates can only accommodate up to a 7" maximum expansion joint opening.

Details provided are applicable to concrete walkway surfaces only.

Payment for sidewalk expansion joint cover plates are by the pound of "Structural Steel (Misc Non-Bridge)" as per Item 442, "Metal for Structures".

Estimated weight of one sidewalk expansion joint cover plate is 14 plf.

Texas Department of Transportation

Bridge Division Standard

BRIDGE SIDEWALK EXPANSION JOINT COVER PLATE (ALL SKEWS)

BS-EJCP

FILE:	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
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8-20: Closer tolerances on cover plate.	DIST	COUNTY		SHEET NO.
	AMA	POTTER		132

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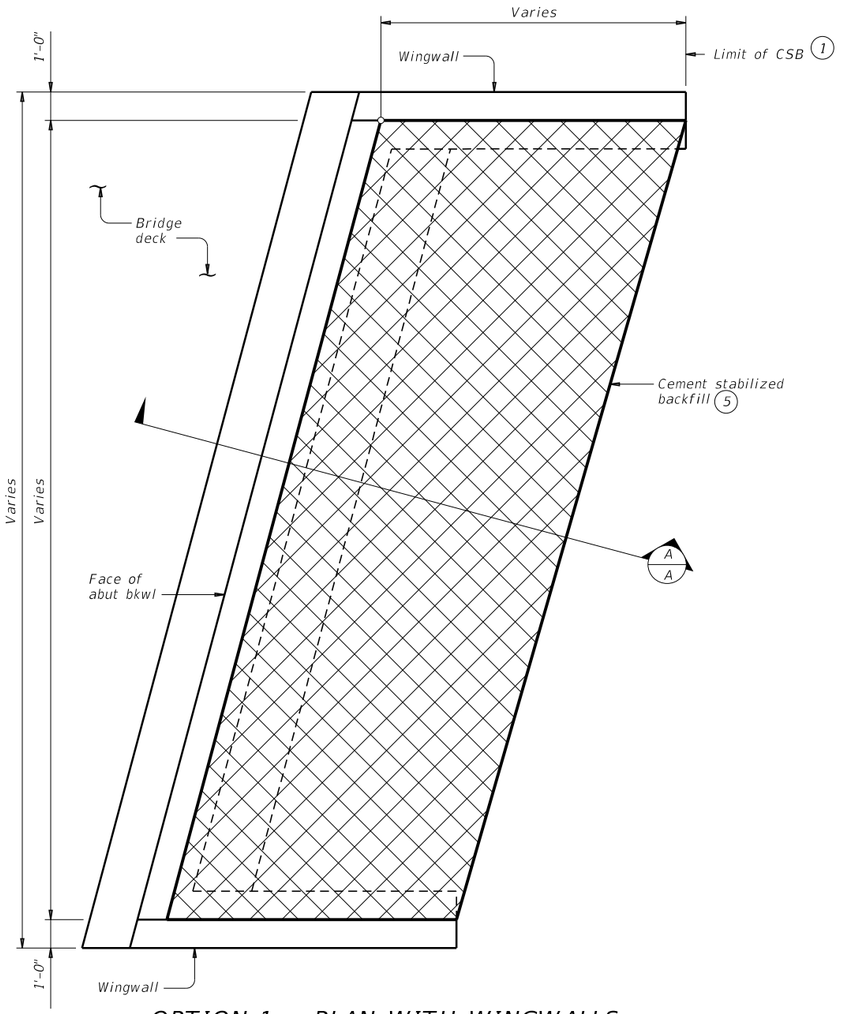
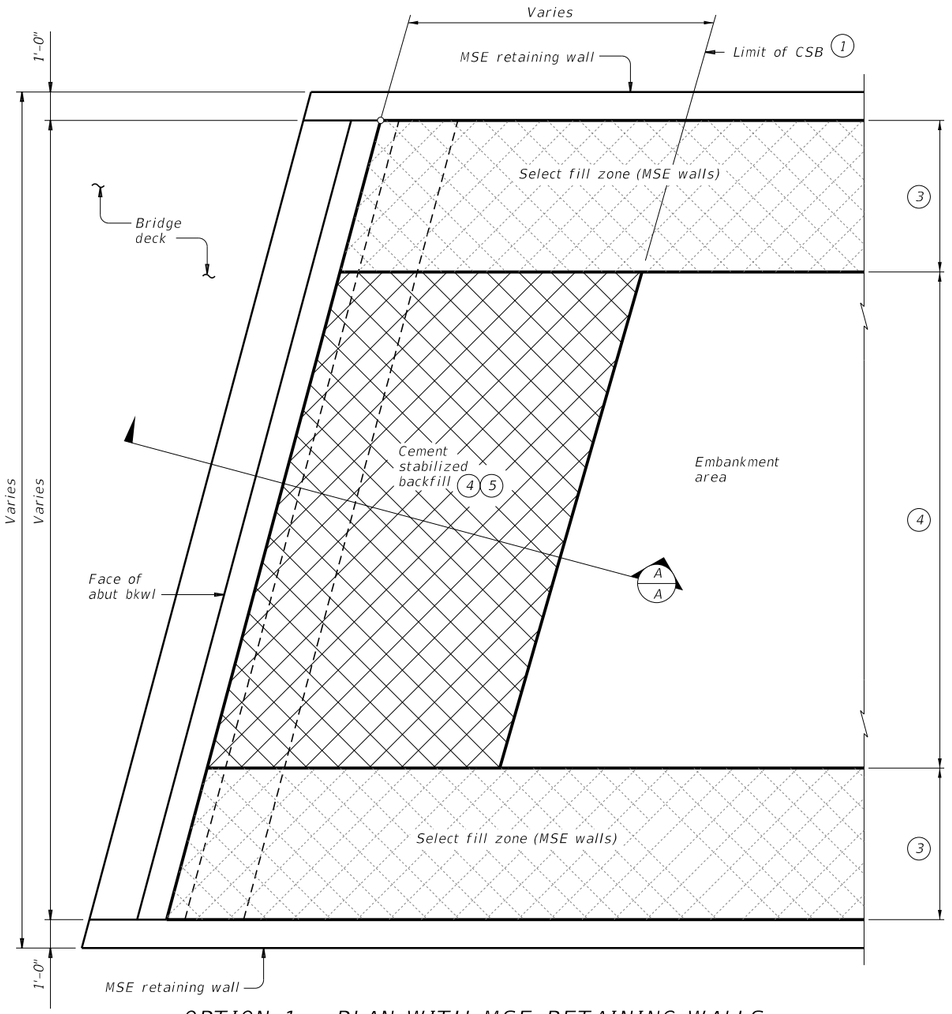
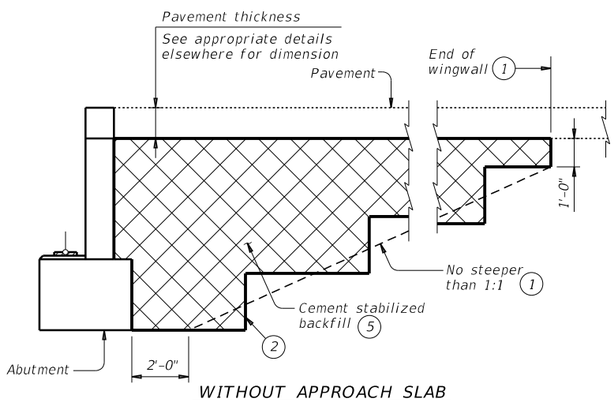


OPTION 1 ~ PLAN WITH WINGWALLS

Cast-in-place retaining walls similar.



OPTION 1 ~ PLAN WITH MSE RETAINING WALLS



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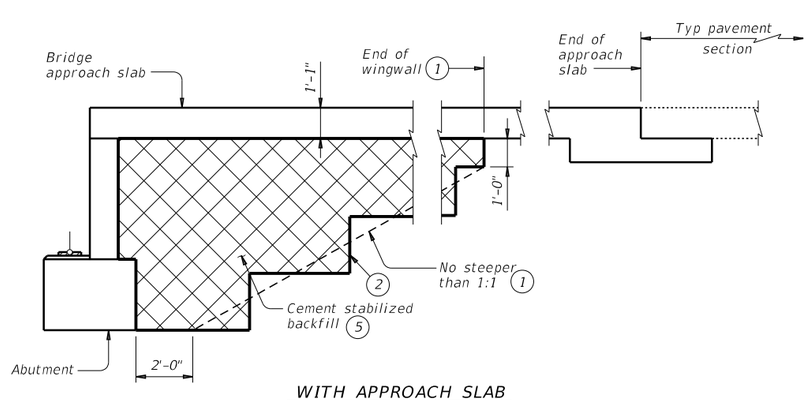

WITH APPROACH SLAB

(Showing BAS-C, BAS-A similar.)

SECTION A-A

(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 1 is intended for construction only requiring plasticity index (PI) controlled embankment fill or excavation in competent soils/rocks in order to construct the abutment. Option 2 is intended for new construction requiring high plasticity embankment fill with a PI greater than 30 or pavement built in poor native soil. Poor soils are defined as high plasticity clays or expansive clays.

Construct abutment backfill in accordance with Item 400, "Excavation and Backfill for Structures".

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.

Texas Department of Transportation

Bridge Division Standard

CEMENT STABILIZED ABUTMENT BACKFILL

BRIDGE ABUTMENT

CSAB

FILE: MS-CSAB-23.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0090	05	107	IH40
02-20: Added Option 2. 03-23: Updated General Notes.	DIST	COUNTY		SHEET NO.
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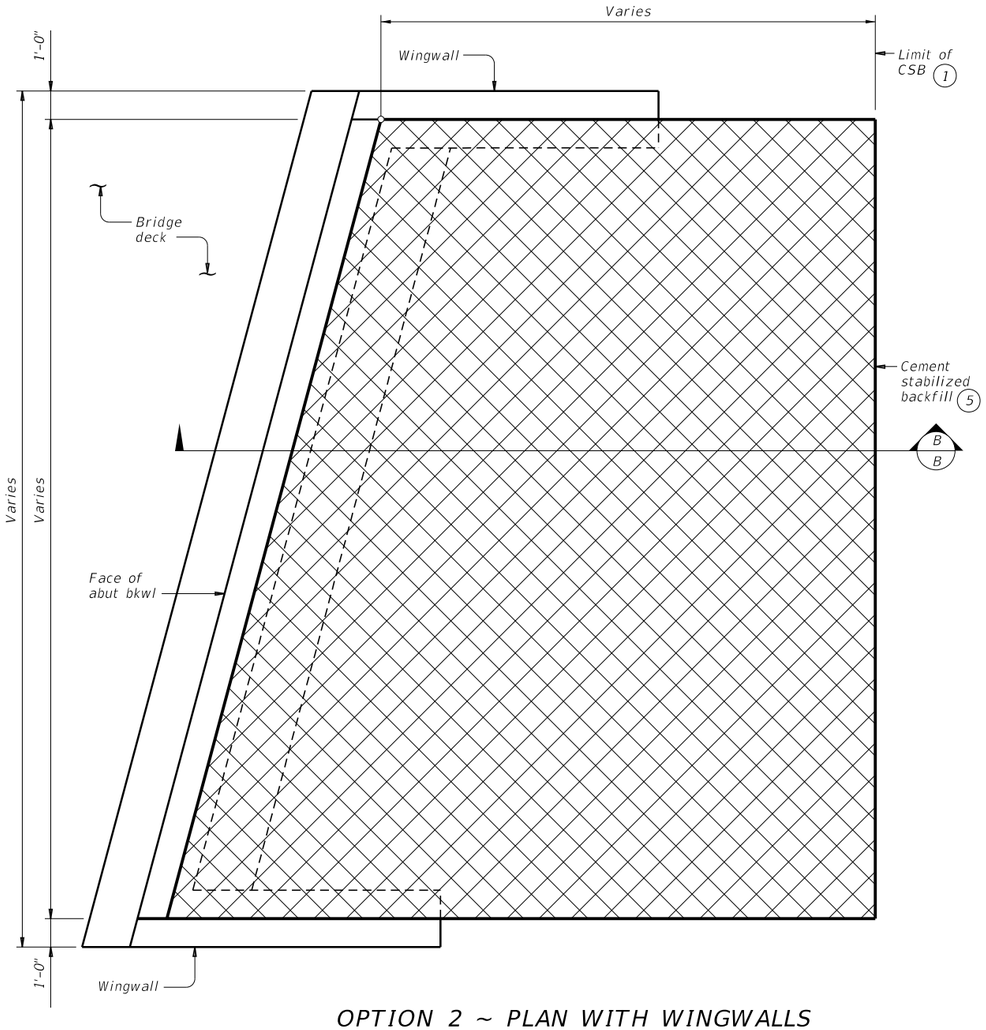
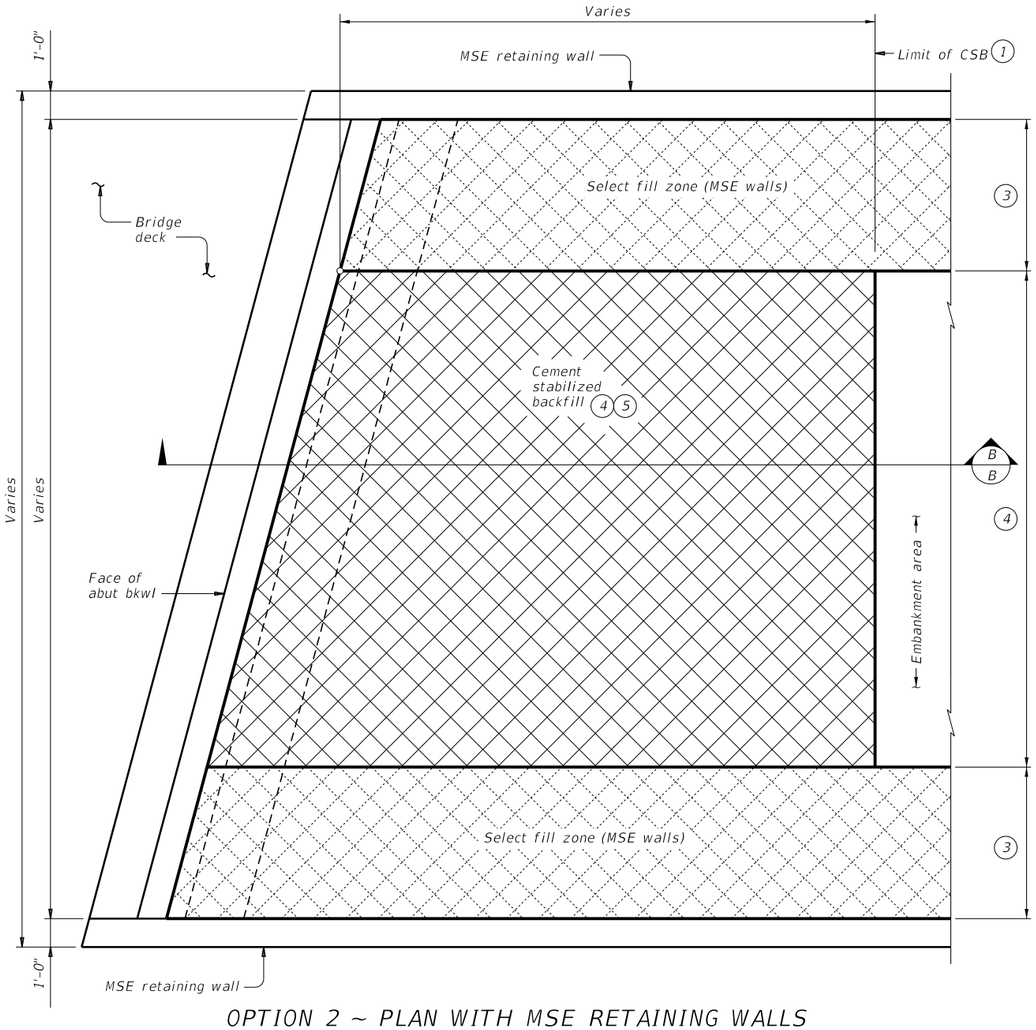


OPTION 2 ~ PLAN WITH WINGWALLS

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.

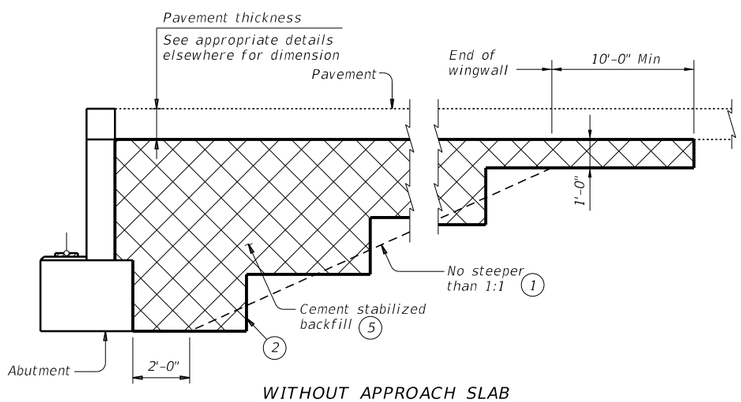
(2) Bench backfill as shown with 12" (approximate) bench depths.

(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).

(6) 1'-0" for BAS-A
1'-10" for BAS-C



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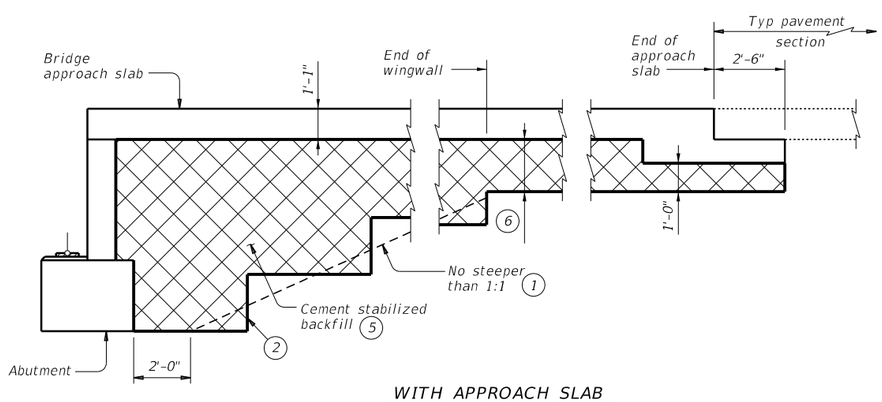

WITH APPROACH SLAB

(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: MS-CSAB-23.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0090	05	107	IH40
02-20: Added Option 2. 03-23: Updated General Notes.	DIST	COUNTY		SHEET NO.
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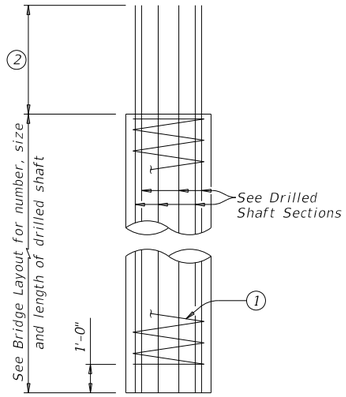
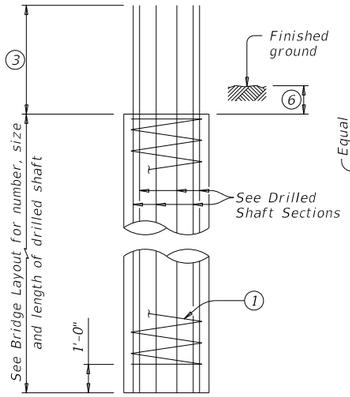
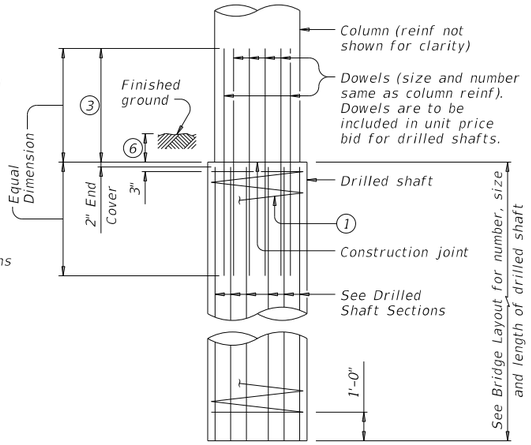


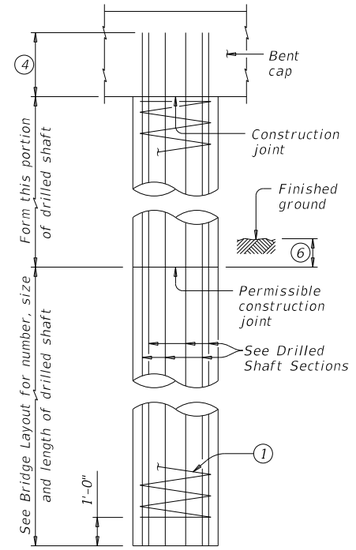
ABUTMENTS, WINGWALLS AND MULTI-DRILLED SHAFT FOOTINGS



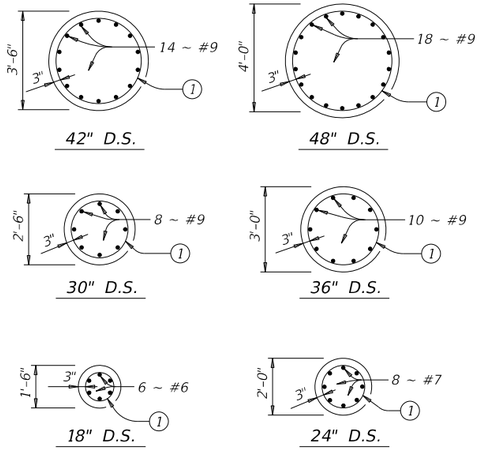
INTERIOR BENTS DRILLED SHAFT DIA EQUAL TO COLUMN DIA



INTERIOR BENTS DRILLED SHAFT DIA GREATER THAN COLUMN DIA



OPTIONAL INTERIOR BENT DRILLED SHAFT DETAIL (5)

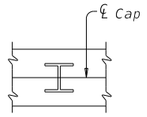


DRILLED SHAFT SECTIONS

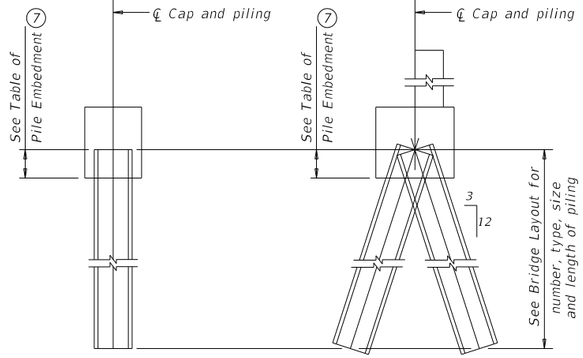
DRILLED SHAFT DETAILS

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.



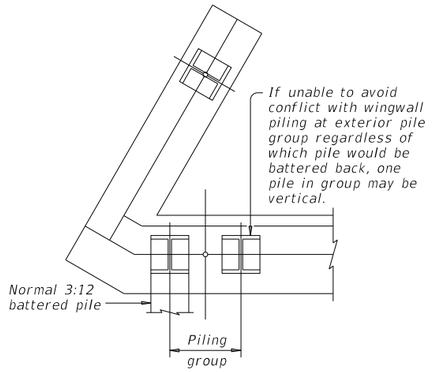
ORIENTATION OF STEEL H-PILING



VERTICAL PILE BATTERED PILE

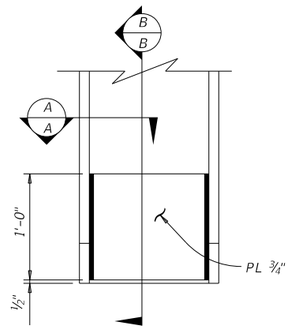
PILING DETAILS

(Concrete or steel H)

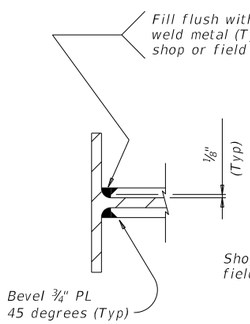


DETAIL "A"

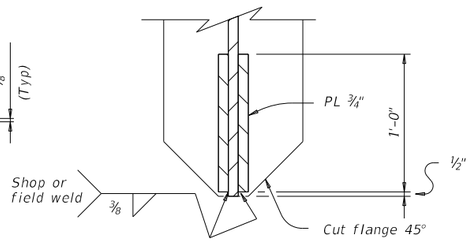
(Showing plan view of a 30° skewed abutment)



ELEVATION



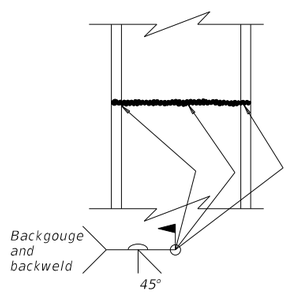
SECTION A-A

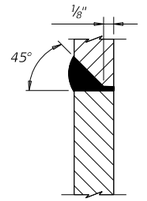


SECTION B-B

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.

(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.

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
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01-20: Added #11 bars to the FD bars.	DIST	COUNTY		SHEET NO.
	AMA	POTTER		135

DATE: 12/7/2023 11:15:57 AM
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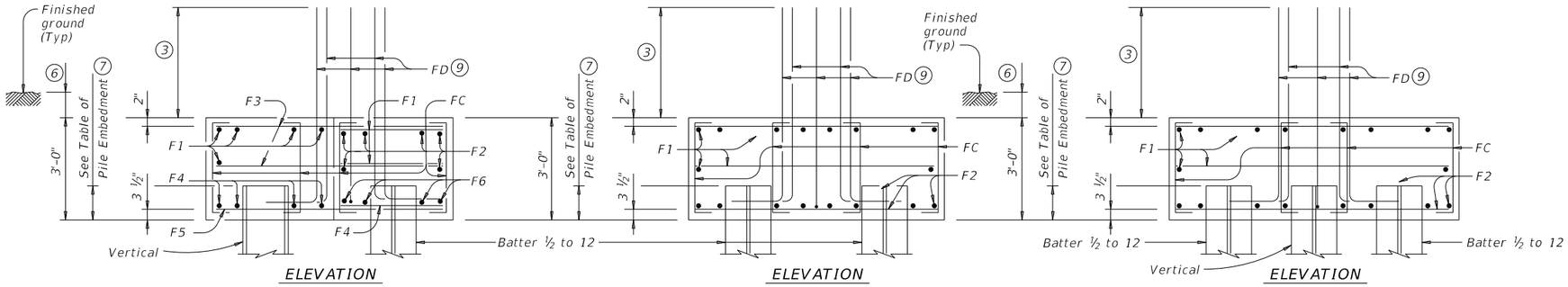
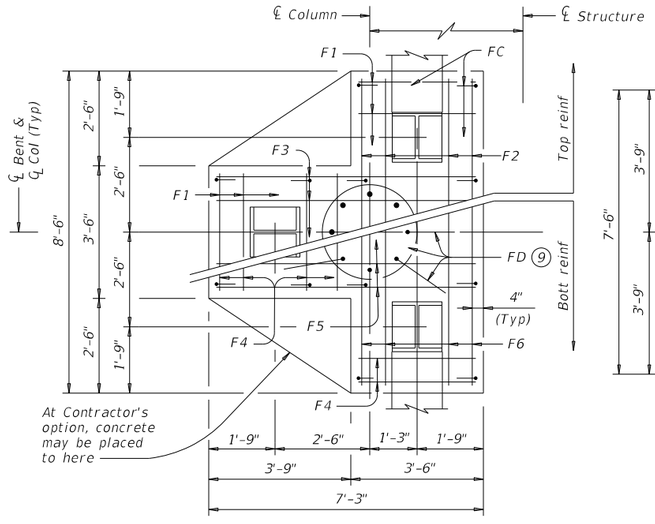


ELEVATION

ELEVATION

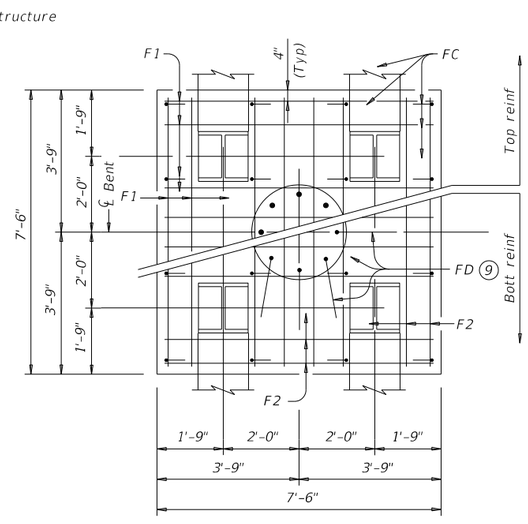
ELEVATION



PLAN

THREE PILE FOOTING (8)

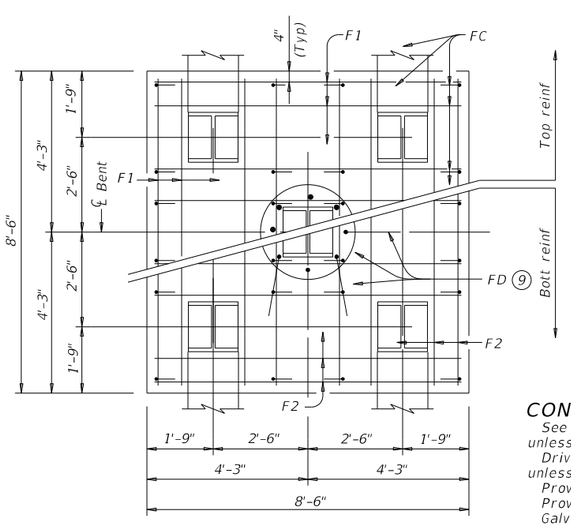
For 36" Dia and smaller columns.



PLAN

FOUR PILE FOOTING (8)

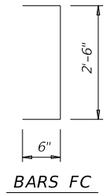
For 42" Dia and smaller columns.



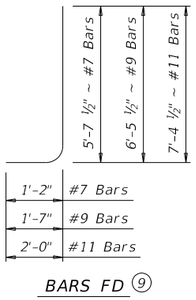
PLAN

FIVE PILE FOOTING (8)

For 42" Dia and smaller columns.



BARS FC



BARS FD (9)

(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	0090	05	107	IH40
01-20: Added #11 bars to the FD bars.	DIST	COUNTY		SHEET NO.
	AMA	POTTER		136

DATE: 12/7/2023 11:16:02 AM
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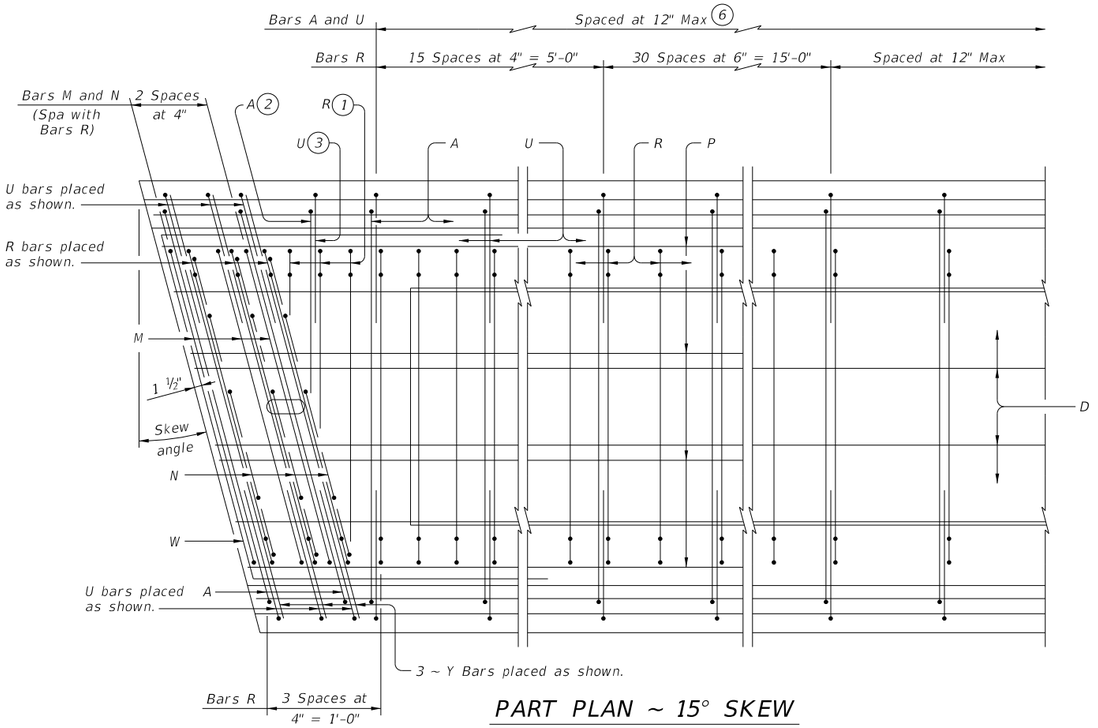
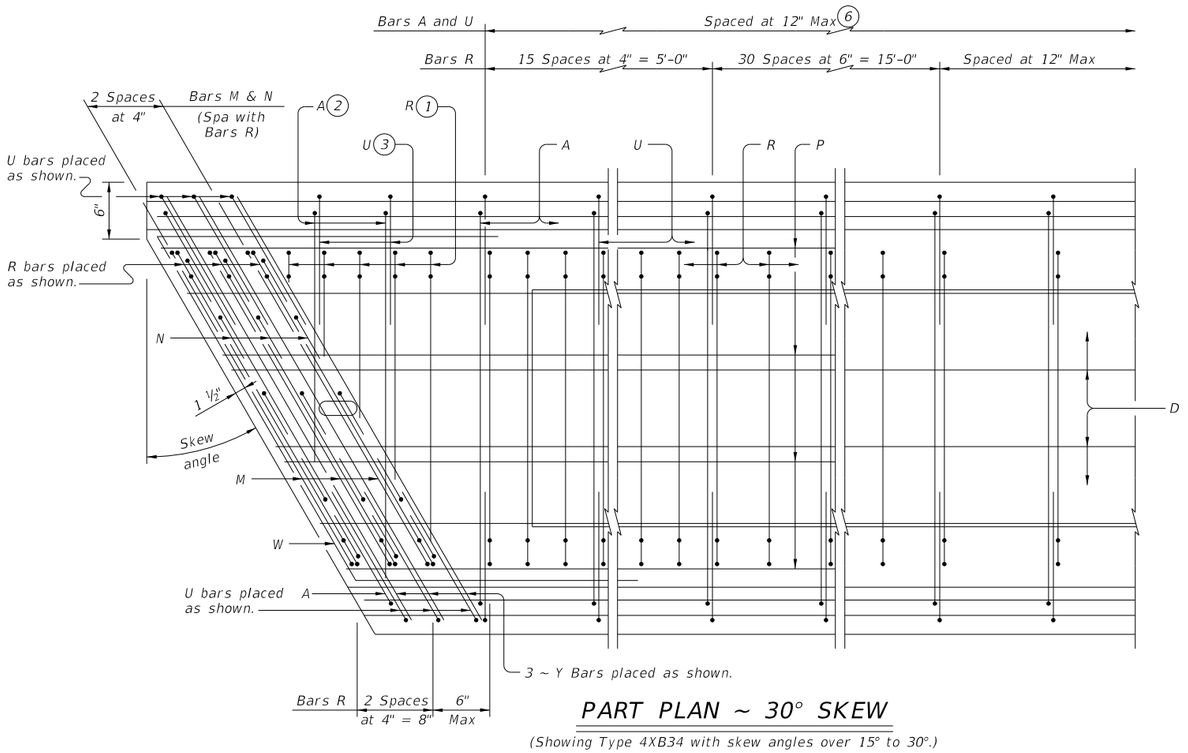
zBeil



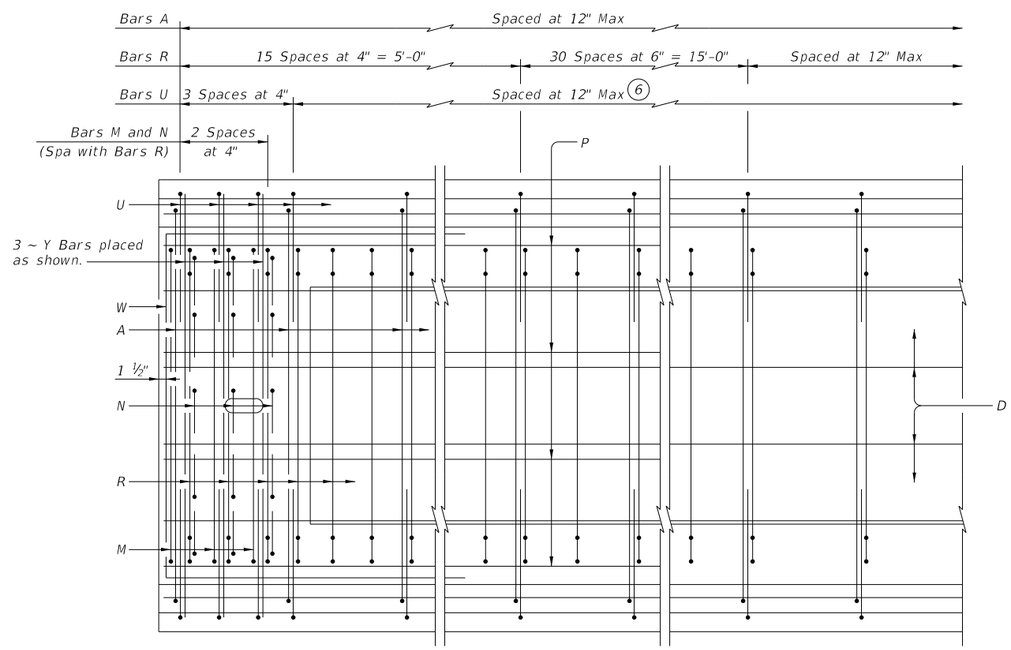
PART PLAN ~ 15° SKEW

(Showing Type 4XB34 with skew angles over 0° to 15°.)



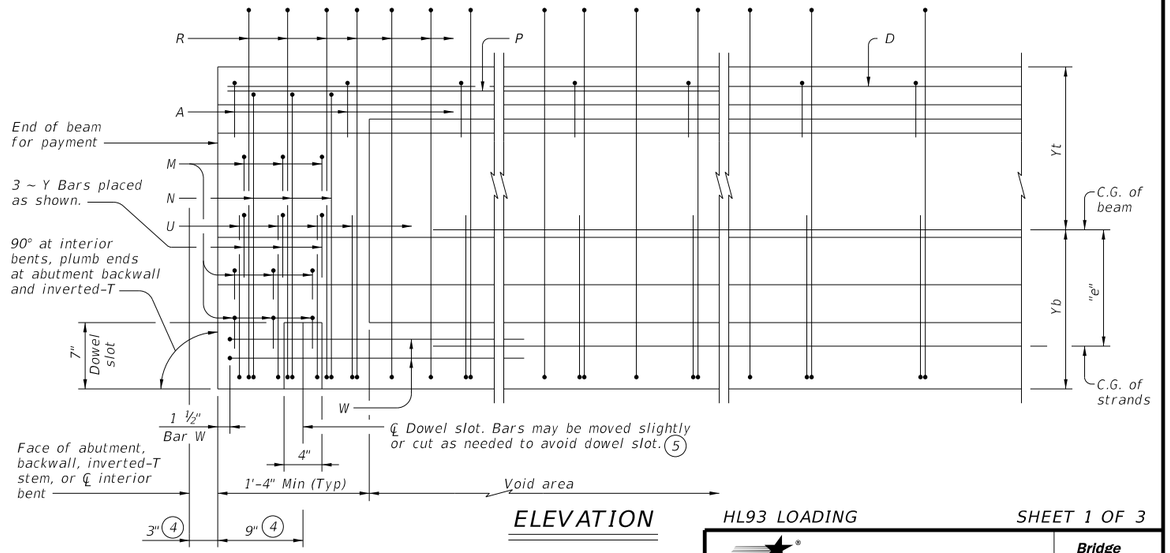
PART PLAN ~ 30° SKEW

(Showing Type 4XB34 with skew angles over 15° to 30°.)



PART PLAN

(Showing Type 4XB34.)



ELEVATION

HL93 LOADING

SHEET 1 OF 3

(1) Bars R spaced at 4" Max. Cut Bars R as necessary to provide 2" clear between adjacent bars as shown.

(2) Bars A spaced with Bars U. Cut Bars A as necessary to provide 2" clear between adjacent bars as shown.

(3) Bars U spaced at 8" Max as shown.

(4) Measured perpendicular to ℄ interior bents, abutment backwall, or inverted-T stem.

(5) ℄ 4" x 1 ½" Vertical slotted hole at doweled beam end (labeled [D] on Bridge Layout.) Required for outside beam 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.

(6) Terminate Bars U 5' from beam ends or 3' beyond the last debonded strands, whichever is greater.

Texas Department of Transportation

Bridge Division Standard

PRESTRESSED CONCRETE X-BEAM DETAILS

(TYPE XB34)

XB34

FILE:	DN: JMH	CK: TAR	DW: JER	CK: TAR
©TxDOT August 2022 REVISIONS	CONT	SECT	JOB	HIGHWAY
	0090	05	107	IH40
	DIST	COUNTY		SHEET NO.
	AMA	POTTER		137

DATE: 12/7/2023 11:16:06 AM
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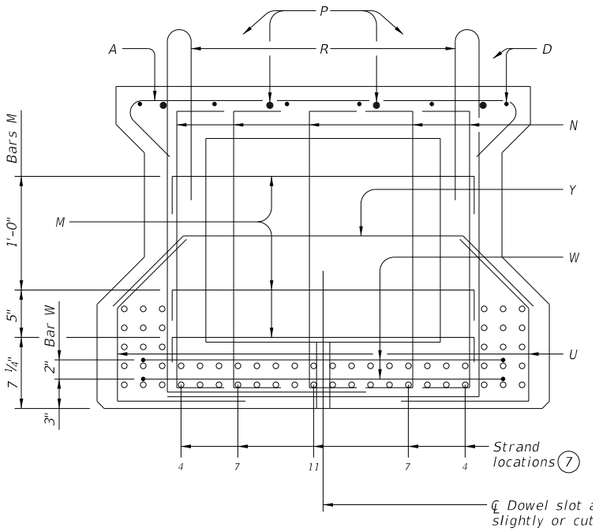
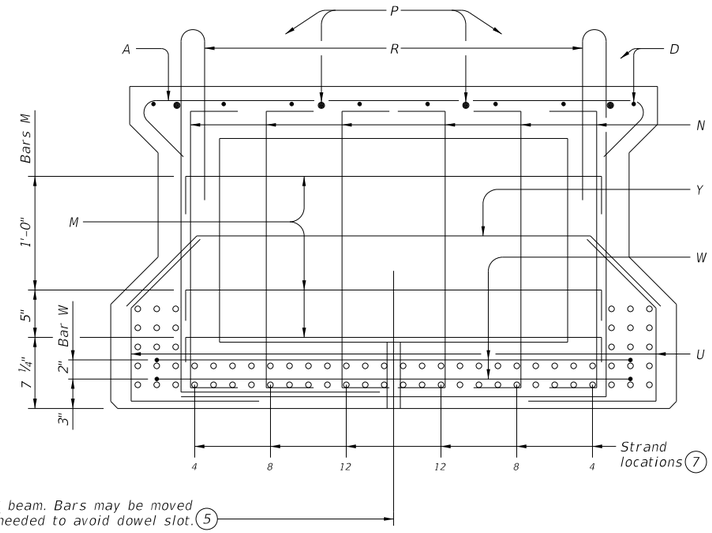
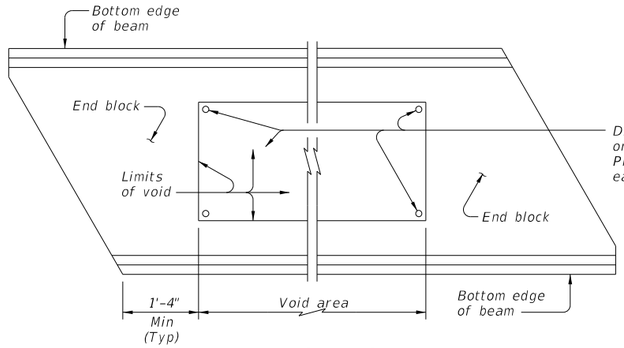


END BLOCK SECTION ~ TYPE 4XB34



END BLOCK SECTION ~ TYPE 5XB34



PLAN OF VOID

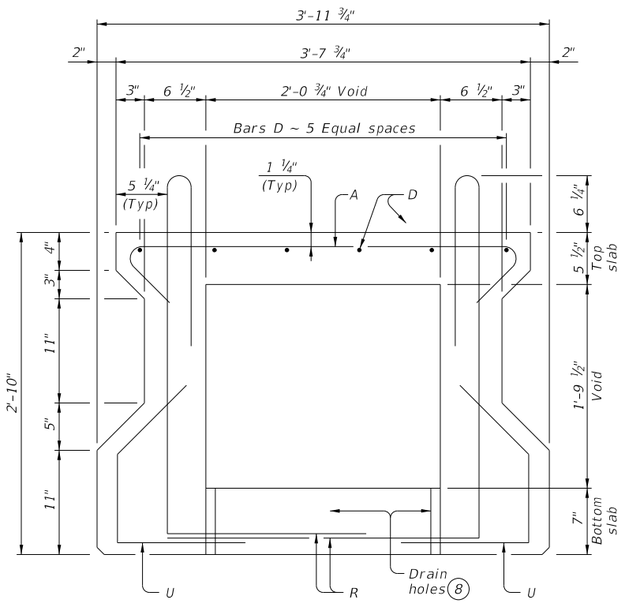
(Showing 30° skew.)

(5) ℄ 4" x 1 ½" Vertical slotted hole at doweled beam end (labeled [D] on Bridge Layout.) Required for outside beam only or as shown on substructure details. Anchorage hole may be tapered (4 ¾" x 1 ⅝") at base. If holes are formed with sheet metal, forms may be left in place.

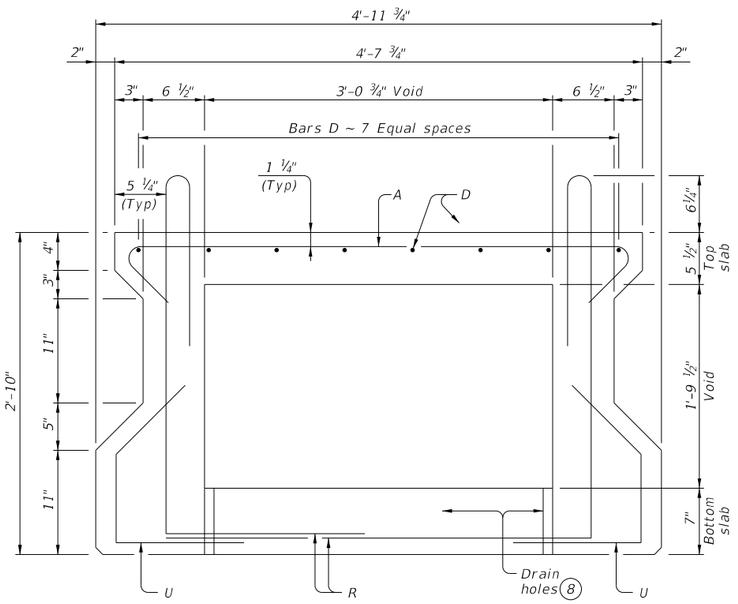
(7) See Prestressed Concrete X-Beam Designs (Non-Standard Spans) (XBND) standard or the appropriate Prestressed Concrete X-Beam Standard Designs (XBSD-##) standard sheet for locations of pretensioning strands.

(8) Drain holes 1" diameter PVC schedule 40 pipe as shown between strands in all beam void corners. See "Plan of Void."

(9) Based on 155 pcf weight density of concrete. Weight of end blocks is not included.



TYPICAL SECTION ~ TYPE 4XB34



TYPICAL SECTION ~ TYPE 5XB34

BEAM PROPERTIES			
		Type 4XB34	Type 5XB34
Area	in^2	919	1,069
Y Top	in	18.41	18.39
Y Bottom	in	15.59	15.61
I	in^4	123,757	152,730
Weight (9)	lb/ft	989	1,151

HL93 LOADING

Texas Department of Transportation

Bridge Division Standard

PRESTRESSED CONCRETE X-BEAM DETAILS

(TYPE XB34)

XB34

FILE:	DN: JMH	CK: TAR	DW: JER	CK: TAR
©TxDOT August 2022	CONT	SECT	JOB	HIGHWAY
REVISIONS	0090	05	107	IH40
	DIST	COUNTY		SHEET NO.
	AMA	POTTER		138

DATE: 12/7/2023 11:16:10 AM
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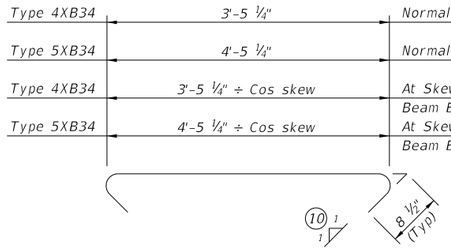
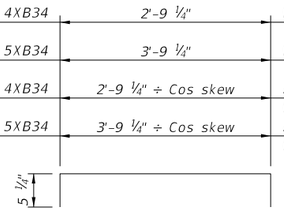
zBeil

Type 4XB34	3'-5 ¼"	Normal
Type 5XB34	4'-5 ¼"	Normal
Type 4XB34	3'-5 ¼" ÷ Cos skew	At Skewed Beam Ends
Type 5XB34	4'-5 ¼" ÷ Cos skew	At Skewed Beam Ends



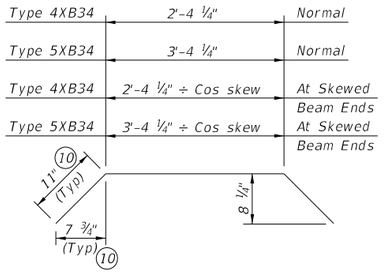
BARS A (#4)

Type 4XB34	2'-9 ¼"	Normal
Type 5XB34	3'-9 ¼"	Normal
Type 4XB34	2'-9 ¼" ÷ Cos skew	At Skewed Beam Ends
Type 5XB34	3'-9 ¼" ÷ Cos skew	At Skewed Beam Ends

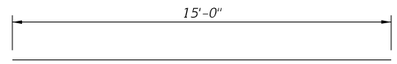


BARS M (#5)

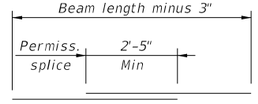
Type 4XB34	2'-4 ¼"	Normal
Type 5XB34	3'-4 ¼"	Normal
Type 4XB34	2'-4 ¼" ÷ Cos skew	At Skewed Beam Ends
Type 5XB34	3'-4 ¼" ÷ Cos skew	At Skewed Beam Ends



BARS Y (#5)

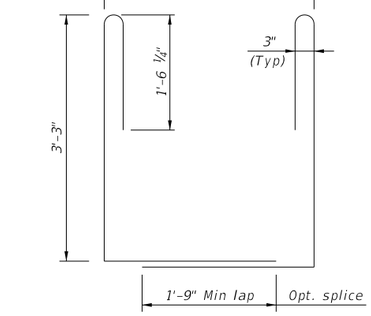


BARS P (#6)
(Place at beam ends)

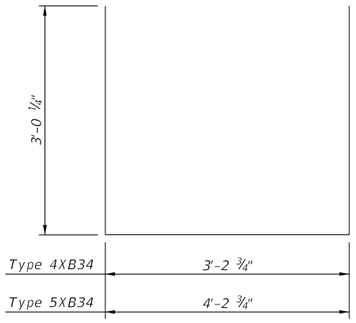


BARS D (#5)
(Place splices in middle third of span.)

Type 4XB34	2'-9 ¼"	Normal
Type 5XB34	3'-9 ¼"	Normal
Type 4XB34	2'-9 ¼" ÷ Cos skew	At Skewed Beam Ends
Type 5XB34	3'-9 ¼" ÷ Cos skew	At Skewed Beam Ends

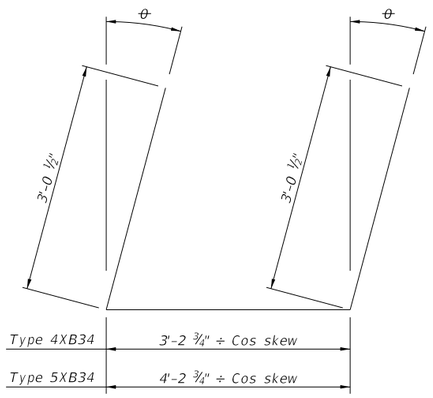


BARS R (#4)



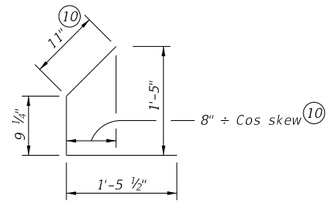
Type 4XB34	3'-2 ¾"
Type 5XB34	4'-2 ¾"

BARS W (#5)
(For square beam ends)

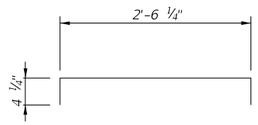


Type 4XB34	3'-2 ¾" ÷ Cos skew
Type 5XB34	4'-2 ¾" ÷ Cos skew

BARS W (#5)
(For skewed beam ends)



BARS U (#4)



BARS N (#4)

10 Dimension will vary slightly with skew. Adjust as necessary.

MATERIAL NOTES:

Provide Class H concrete.
Provide Grade 60 reinforcing steel.
An equal area of deformed welded wire reinforcement (WWR) (ASTM A1064) may be substituted for all or some of Bars A, D, R, and U.

GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications.
Two-stage monolithic casting is required when conventional concrete is used. The concrete in the first stage cast (bottom beam flange) must remain plastic until the second stage cast (webs and top beam flange) is placed. Vibrate as required to ensure consolidation between the two casts.
When approved by the Engineer, self-consolidating concrete may be placed in a one-stage monolithic casting.
1 ¼" clear cover to reinforcement is required unless noted otherwise.
These details are applicable for skews up to 30 degrees only.
Chamfer bottom beam corners ¾" or round to a ¾" radius.
Punch through all drain holes, removing any blockage, before beams are shipped.

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

HL93 LOADING SHEET 3 OF 3

Texas Department of Transportation — Bridge Division Standard

PRESTRESSED CONCRETE X-BEAM DETAILS
(TYPE XB34)

XB34

FILE:	DN: JMH	CK: TAR	DW: JER	CK: TAR
©TxDOT August 2022 REVISIONS	CONT	SECT	JOB	HIGHWAY
	0090	05	107	IH40
	DIST	COUNTY		SHEET NO.
	AMA	POTTER		139

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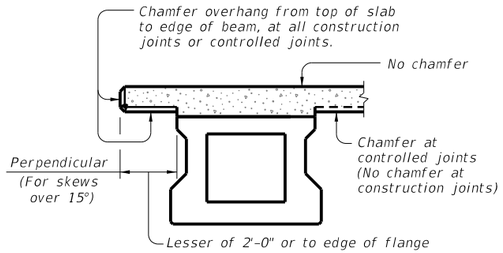
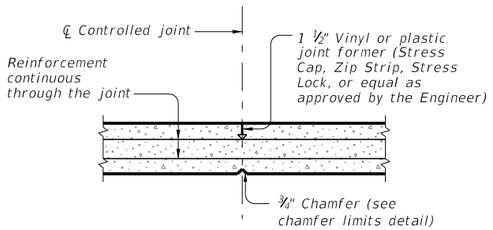
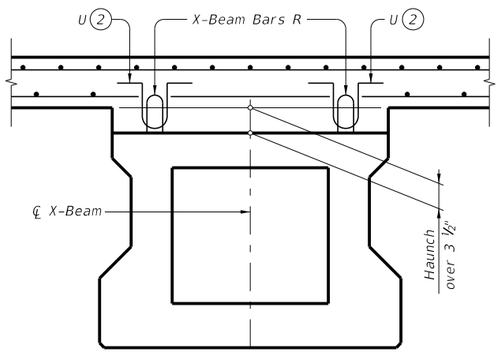


CHAMFER LIMITS DETAIL (1)

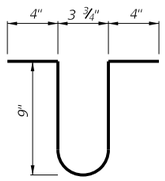


CONTROLLED JOINT DETAIL

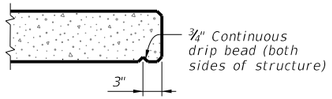
(Saw-cutting is not allowed)



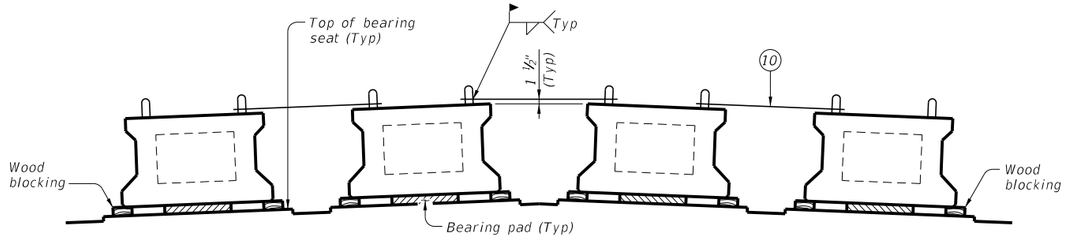
HAUNCH REINFORCING DETAIL



BARS U (#4)

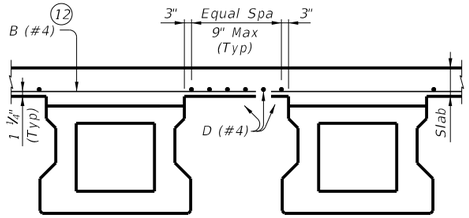


DRIP BEAD DETAIL



MINIMUM BEAM BLOCKING & BRACING DETAIL

Provide blocking at both sides of all beam ends supported by one bearing pad. Leave blocking in place for at least 4 days after slab is cast and afterwards remove at the Contractor's convenience.



TYPICAL TRANSVERSE SLAB SECTION WITHOUT PCP (11)

Top reinforcing steel not shown for clarity.

(1) See span details for type of joint and joint locations.

(2) Space Bars U with beam Bars R in all areas where measured haunch exceeds 3 ½".

(3) Roughen outside of PVC with coarse rasp or equal to ensure bond with cast-in-place concrete.

(4) Water may not be discharged onto beams.

(5) Drain entrance formed in rail or sidewalk.

(6) 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 beam 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.

(7) 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.

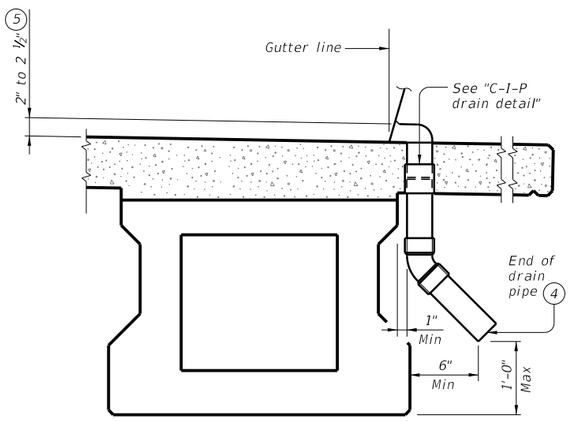
(8) 1 ¼" backer rod must be compatible with joint sealant. Use of multiple pieces to create a backer rod cross section is not permitted. Top of backer rod must be convex as shown.

(9) The maximum distance between Type A expansion joints is 100'. See Bridge Layout for location of joints.

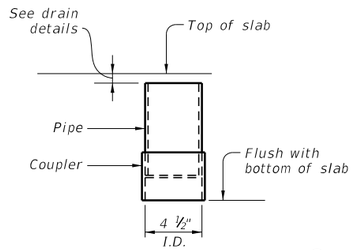
(10) Weld a (#5) bar at each beam end as shown immediately after erection and prior to PCP placement. These bars are in addition to slab reinforcement.

(11) Provide Grade 60 reinforcing steel. Provide laps, where required, as follows:
Uncoated ~ #4 = 1'-7"
Epoxy coated ~ #4 = 2'-5"

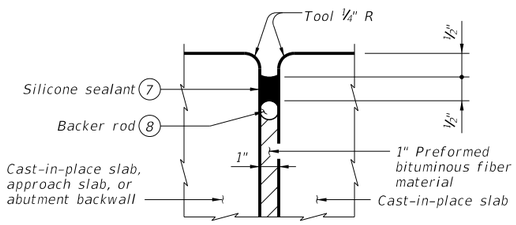
(12) Bars B (#4) spaced at 9" Max with 2" end cover. Overhang option, Contractor may end alternating Bars B (#4) at centerline outside girder.



DRAIN DETAIL (6)



C-I-P DRAIN DETAIL (3)



TYPE A JOINT DETAIL (9)

GENERAL NOTES:

Designed in accordance with AASHTO LRFD Specifications.

Payment for Type A joint will be as per Item 454, "Bridge Expansion Joints."

All other items (reinforcing steel, drains, joint formers, etc.) shown on this sheet are subsidiary to other bid items.

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 and/or details does not relieve the Contractor of the responsibility for the adequacy of the bracing and the safety of the structure.

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

MINIMUM ERECTION AND BRACING REQUIREMENTS WITH MISC. SLAB DETAILS

PRESTRESSED CONCRETE X-BEAMS

XBBR-MS

FILE:	DN: JMH	CK: TAR	DW: JER	CK: TAR
©TxDOT August 2022	CONT	SECT	JOB	HIGHWAY
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	DIST	COUNTY		SHEET NO.
	AMA	POTTER		140

DATE: 12/7/2023 11:16:18 AM
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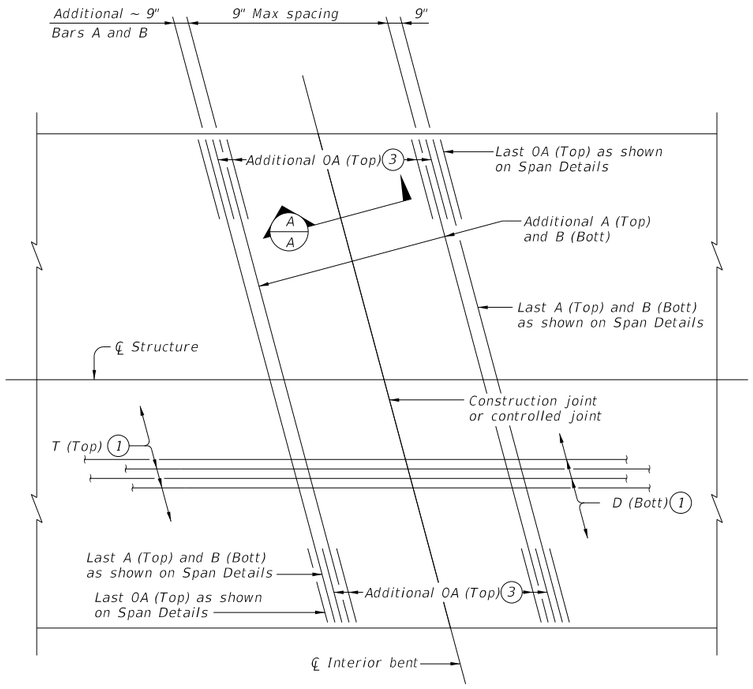
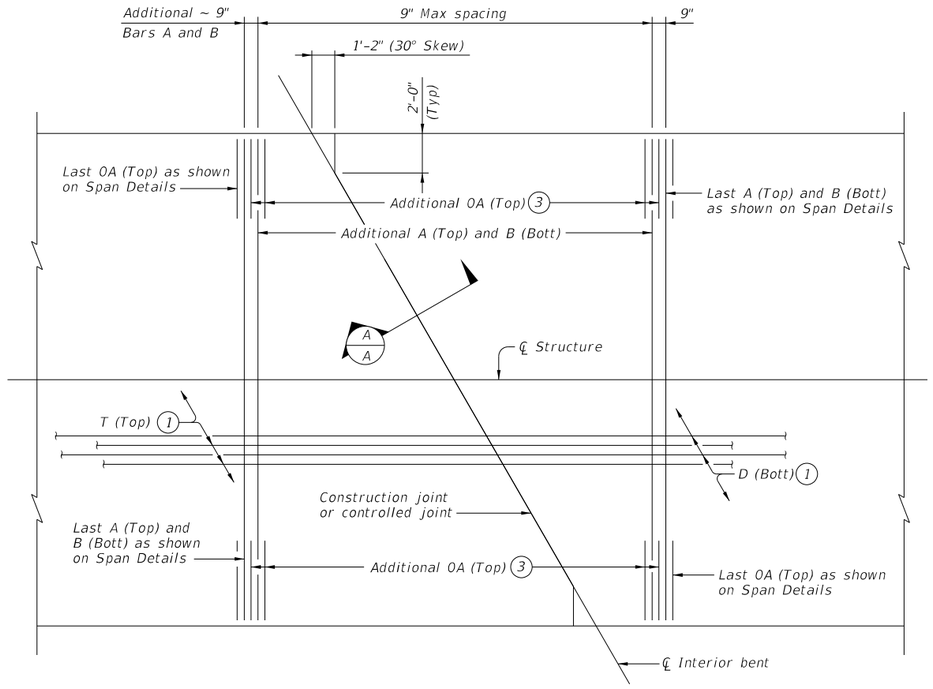
zBeil



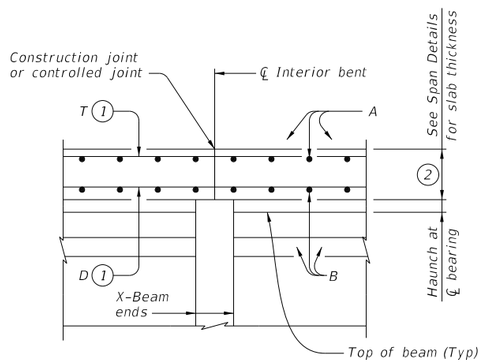
PLAN FOR SKEW ANGLES 0° TO 15°

(Showing 15° skew)



PLAN FOR SKEW ANGLES OVER 15° TO 30°

(Showing 30° skew)



SECTION A-A

Bars 0A (Top) not shown for clarity.

1. Top and bottom mats must be continuous through joint.
2. Maintain a constant 8½" slab thickness over the bent.
3. Bars 0A (Top) at 9" Max spacing between Bars A (Top.)
4. Values in table assume a temperature change of 70°F after erection when calculating thermal movement in one direction (not total.)

TABLE OF ④ ALLOWABLE UNIT LENGTH

Max. Rdwy Grade, Percent	Unit Length Factor
0.00	4.4
1.00	4.3
2.00	4.1
3.00	3.8
4.00	3.5
5.00	3.2

Unit length must not exceed the length of the shortest end span times the Unit Length Factor shown in table or 370', whichever is less.

BAR TABLE

BAR	SIZE
A	#4
B	#4
D	#4
T	#4
0A	#5

CONSTRUCTION NOTES:

Where multi-span units are indicated on the Bridge Layout, the thickened slab end details and reinforcement shown on XBTS 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 Prestressed Concrete Panels (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 plans.
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.

This standard is drawn showing right forward skew. See Bridge Layout for actual skew direction.

The details shown on this sheet are only applicable for use with the Prestressed Concrete X-Beam Standard Designs shown on standards XBSD-32, XBSD-38, XBSD-40, and XBSD-44.

The details shown on this sheet are applicable for two and three span units comprised of the same x-beam type. Units may be comprised of different span lengths. See "Table of Allowable Unit Length."

HL93 LOADING

Texas Department of Transportation

Bridge Division Standard

CONTINUOUS SLAB DETAILS
PRESTRESSED CONCRETE X-BEAM SPANS
XBCS

FILE:	DN: JMH	CK: TAR	DW: JER	CK: TAR
©TxDOT August 2022 REVISIONS	CONT	SECT	JOB	HIGHWAY
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	AMA	POTTER		141

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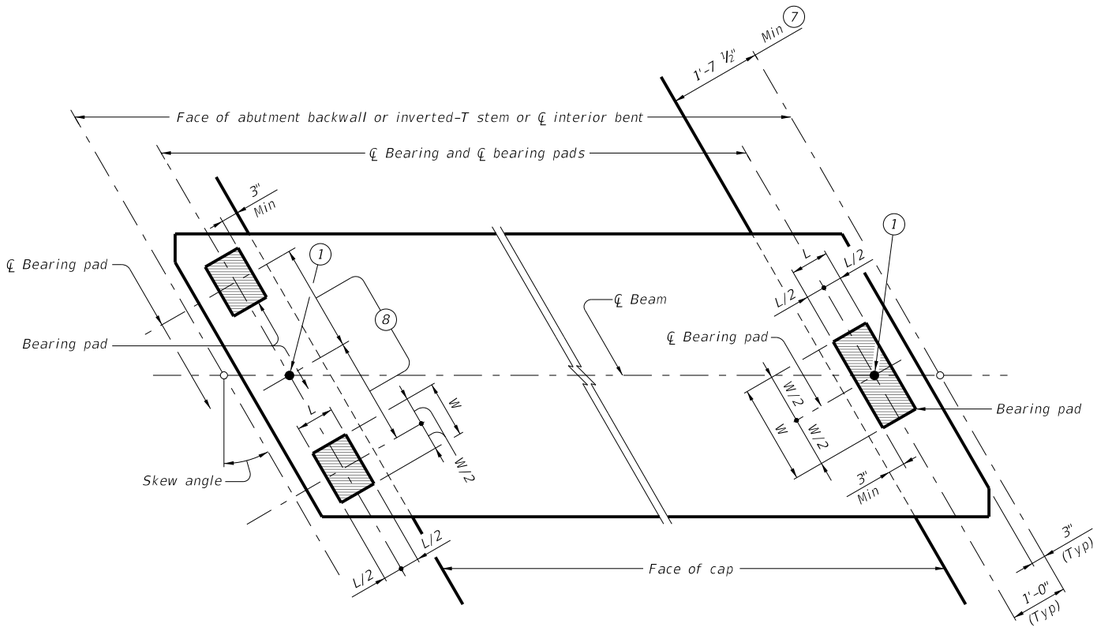
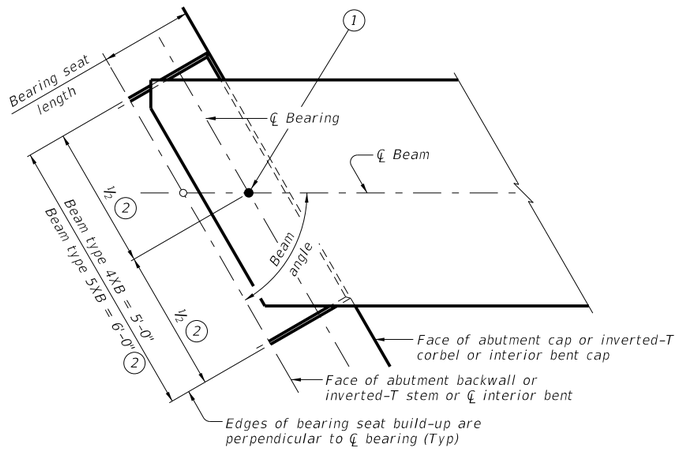


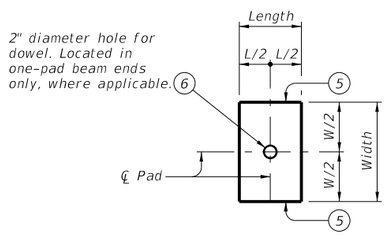
BEARING PAD PLACEMENT AND BEAM END DIAGRAMS

Place one bearing pad at forward station beam end.
Place two bearing pads at back station beam end.

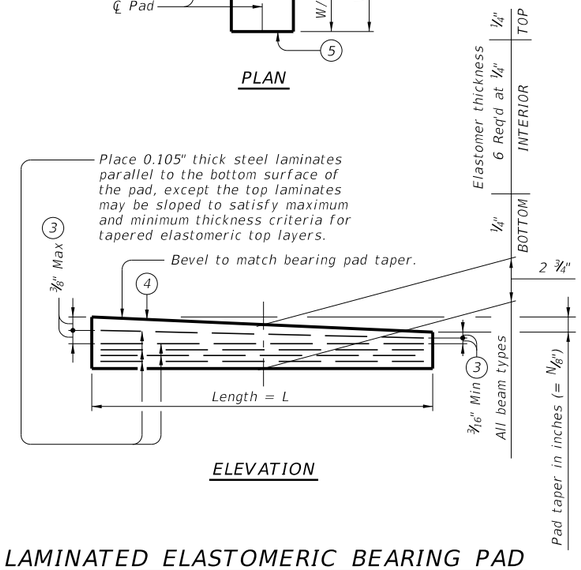


BEARING SEAT DIMENSIONS

Used when shown on abutment and/or bent details.



PLAN



ELEVATION

LAMINATED ELASTOMERIC BEARING PAD

(50 DUROMETER)

TABLE OF BEARING PAD DIMENSIONS

BEARING TYPE (4)	BEAM TYPE	ONE PAD		TWO PADS	
		L	W	L	W
XB20-"N"	4XB20	7"	18"	7"	9"
	5XB20	7"	18"	7"	9"
XB28-"N"	4XB28	7"	18"	7"	10"
	5XB28	7"	18"	7"	10"
XB34-"N"	4XB34	7"	21"	7"	11"
	5XB34	7"	21"	7"	11"
XB40-"N"	4XB40	7"	21"	7"	12"
	5XB40	7"	21"	7"	12"

(1) Dowel at doweled beam end [labeled (D) on Bridge Layout.] Required for outside beam only or as shown on substructure details.

(2) Measured along ℄ of bearing.

(3) Maximum and minimum layer thicknesses shown are for elastomer only, on tapered layers.

(4) Indicate BEARING TYPE on all pads. For tapered pads, locate BEARING TYPE on the high side. 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 beam slope by more than $\left(\frac{0.0625"}{Length}\right)$ IN/IN.

(5) Locate permanent mark here.

(6) Provide 2" diameter hole only at locations required. See substructure details for location.

(7) Minimum dimension required for the bearings shown on this standard.

(8) 4XB beams = 1'-2" along ℄ bearing (Typ.)
5XB beams = 1'-8" along ℄ bearing (Typ.)

GENERAL NOTES:

Set beams on elastomeric bearings of the dimensions shown. Center bearings as near nominal ℄ bearing as possible within limits shown.

Constant thickness bearings may be used for moderate pad tapers up to 0.008 ft/ft.

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. Provide copy of the bearing layout to the Engineer.

See Bearing Pad Taper Report sheet for Fabricator's Report of bearing pad taper.

Cost of furnishing and installing elastomeric bearings is to be included in unit price bid for "Prestressed Concrete X-Beams."

Details are drawn showing right forward skew. See Bridge Layout for actual direction.

These details are applicable for skews up to 30 degrees only.

HL93 LOADING

Texas Department of Transportation

Bridge Division Standard

ELASTOMERIC BEARING AND BEAM END DETAILS
PRESTRESSED CONCRETE X-BEAMS

XBEB

FILE:	DN: JMH	CK: TAR	DW: JER	CK: TAR
©TxDOT August 2022 REVISIONS	CONT	SECT	JOB	HIGHWAY
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	AMA	POTTER		142

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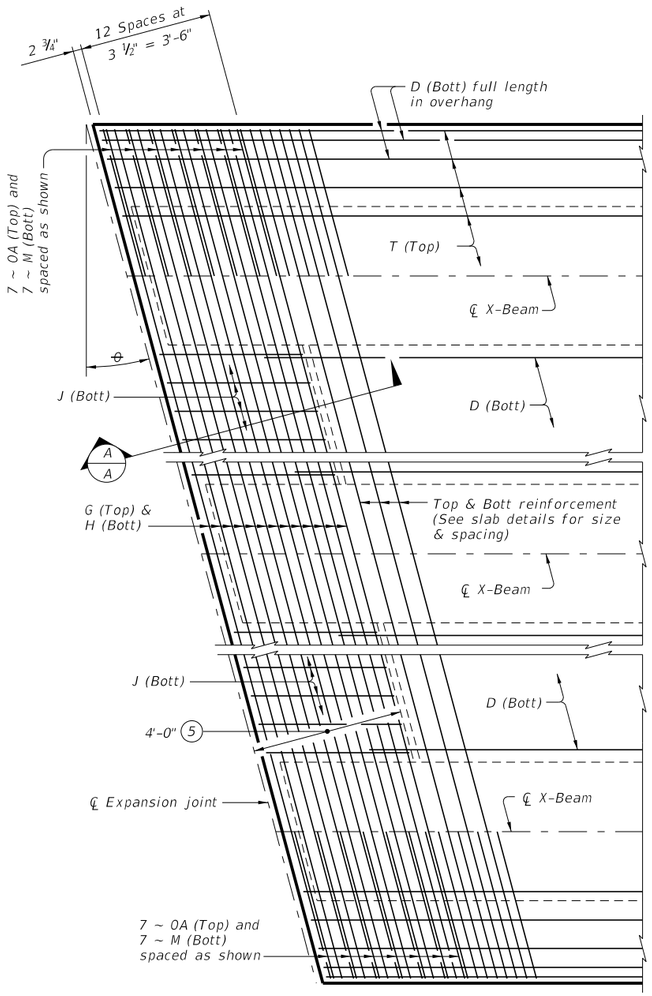
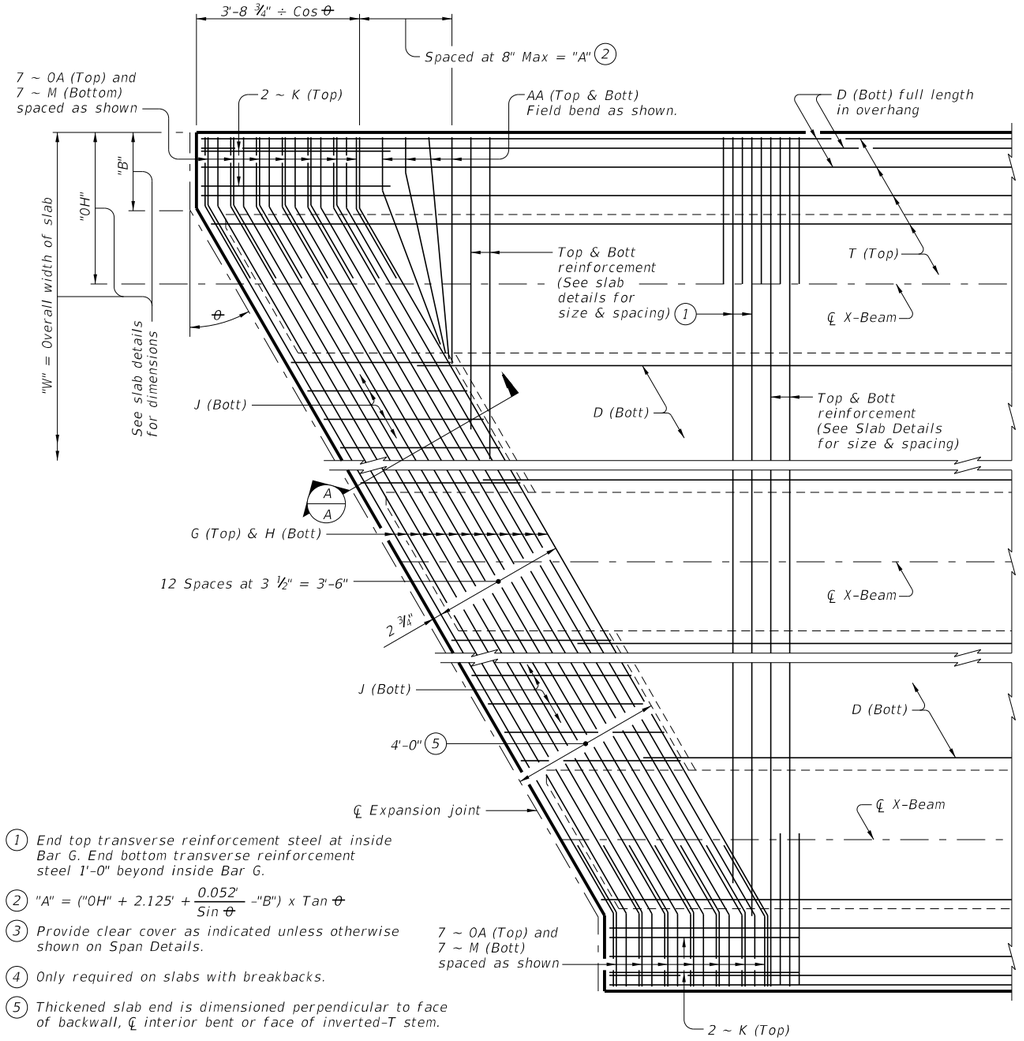




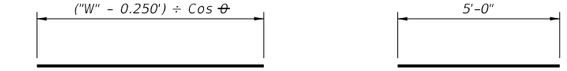
(1) End top transverse reinforcement steel at inside Bar G. End bottom transverse reinforcement steel 1'-0" beyond inside Bar G.

(2) "A" = ("0H" + 2.125' + $\frac{0.052'}{\text{Sin } \theta}$ -"B") x Tan θ

(3) Provide clear cover as indicated unless otherwise shown on Span Details.

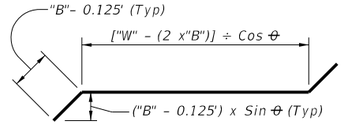
(4) Only required on slabs with breakbacks.

(5) Thickened slab end is dimensioned perpendicular to face of backwall, ℄ interior bent or face of inverted-T stem.

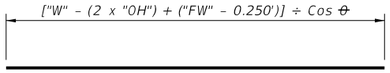


BARS G (#4)
(For slabs without breakbacks)

BARS K (#4) (4)

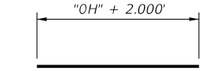


BARS G (#4)
(For slabs with breakbacks)

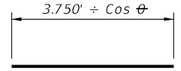


"FW" = beam top flange width (ft)

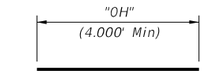
BARS H (#4)



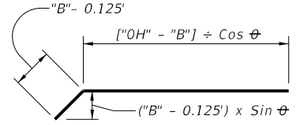
BARS AA (#5) (4)



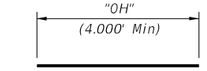
BARS J (#4)



BARS OA (#5)
(For slabs without breakbacks)



BARS OA (#5)
(For slabs with breakbacks)



BARS M (#4)
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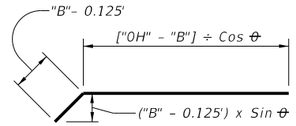


BARS M (#4)
(For slabs with breakbacks)

MATERIAL NOTES:

Provide Grade 60 reinforcing steel.
If slab reinforcing steel on the slab details is shown 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"

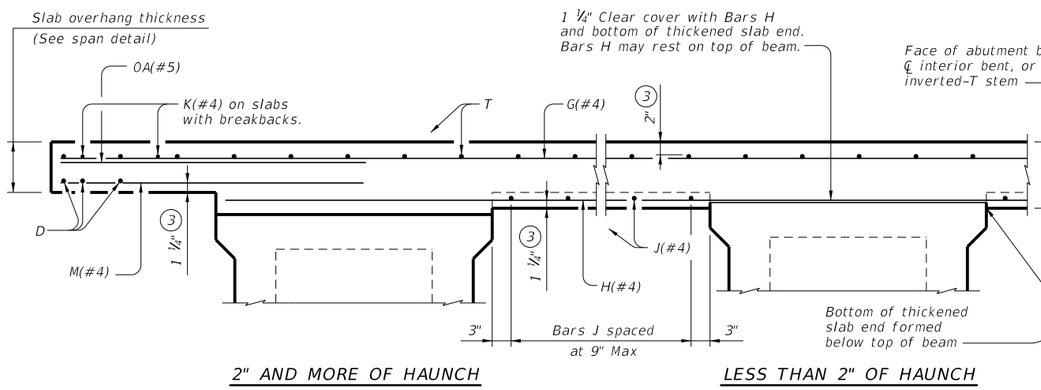
GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications.
These details are restricted to Prestressed Concrete X-Beam Spans.
Use these details in conjunction with the span details and Prestressed Concrete Panels (PCP) standard (if prestressed conc. panels are used).

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

HL93 LOADING

PARTIAL PLAN FOR SLABS WITHOUT BREAKBACK



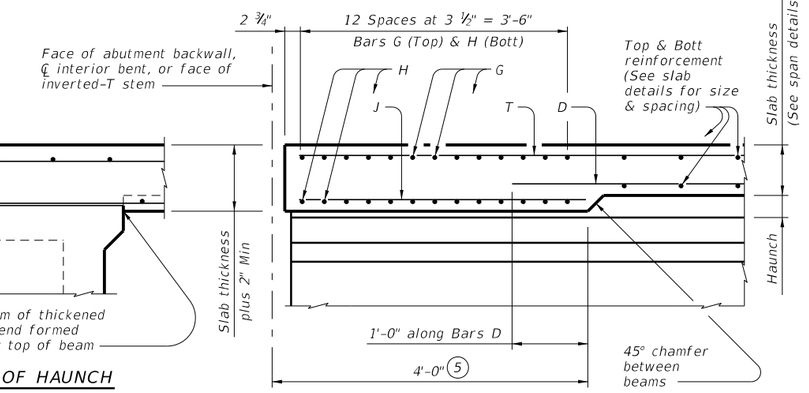
2" AND MORE OF HAUNCH

LESS THAN 2" OF HAUNCH

TYPICAL TRANSVERSE SECTION

(Showing prestressed concrete X-Beams at ℄ bearing)

PARTIAL PLAN FOR SLABS WITH BREAKBACK



SECTION A-A

(Showing with 2" and more of haunch)

Texas Department of Transportation

Bridge Division Standard

THICKENED SLAB END DETAILS
PRESTRESSED CONCRETE X-BEAM SPANS
XBTS

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©TxDOT August 2022	CONT	SECT	JOB	HIGHWAY
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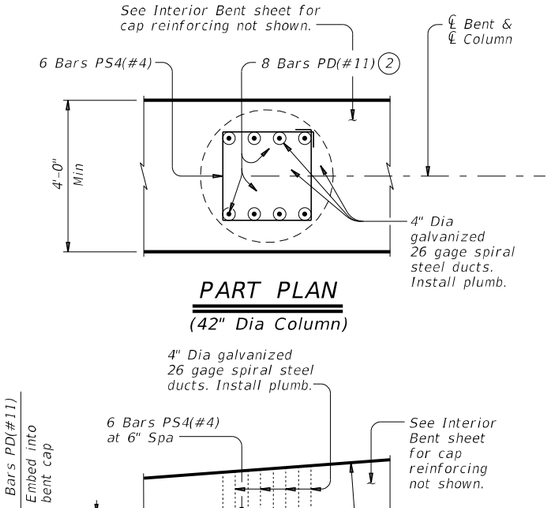
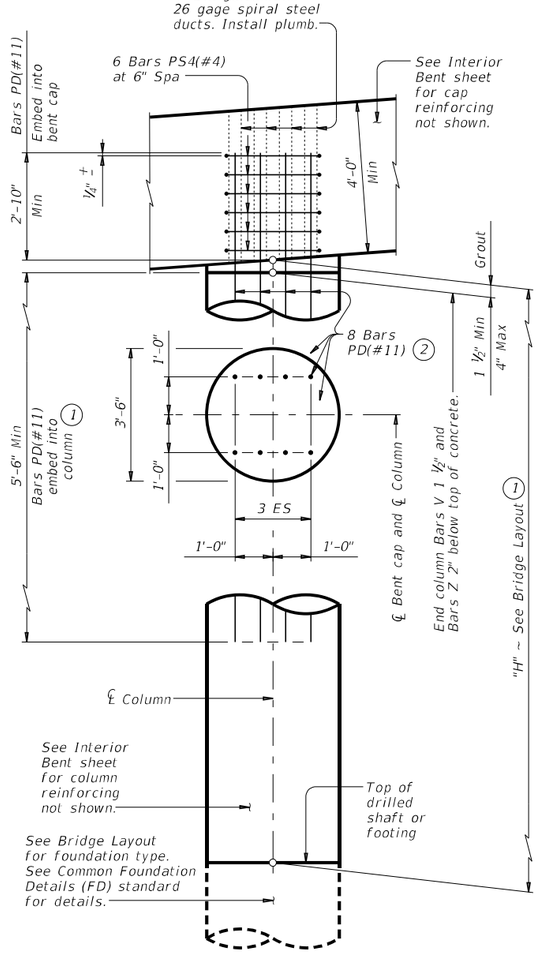
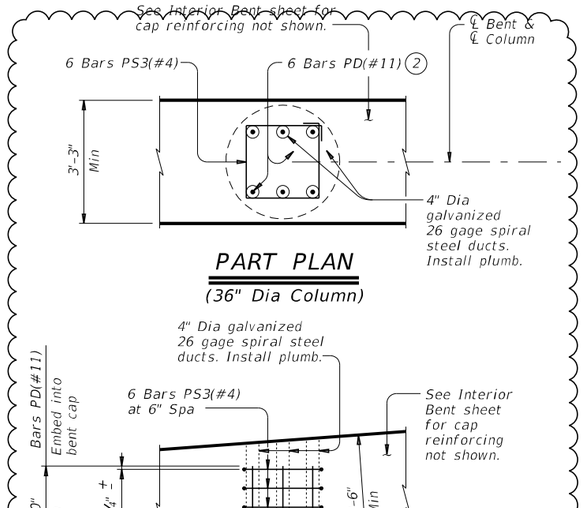


PART PLAN
(42" Dia Column)



PART ELEVATION
(42" Dia Column)



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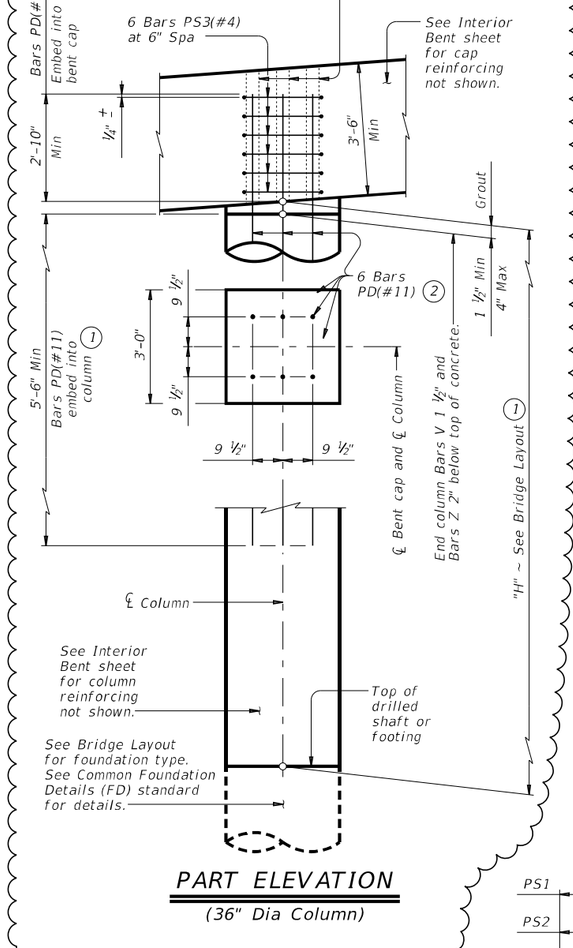

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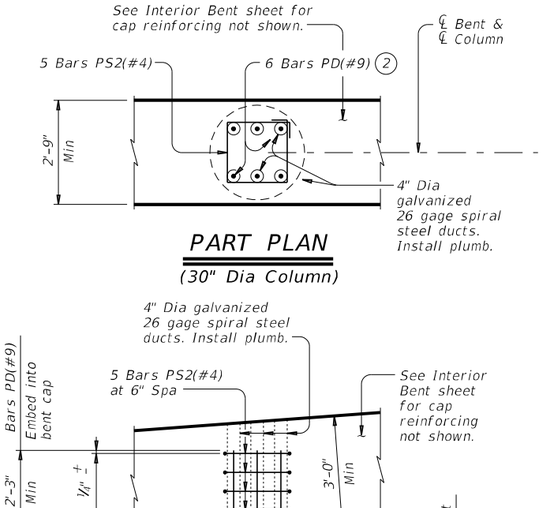
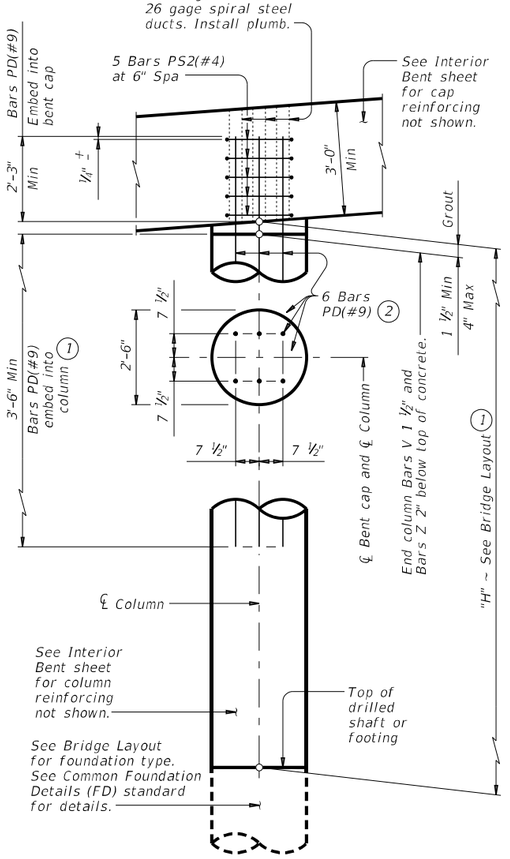


PART PLAN
(30" Dia Column)



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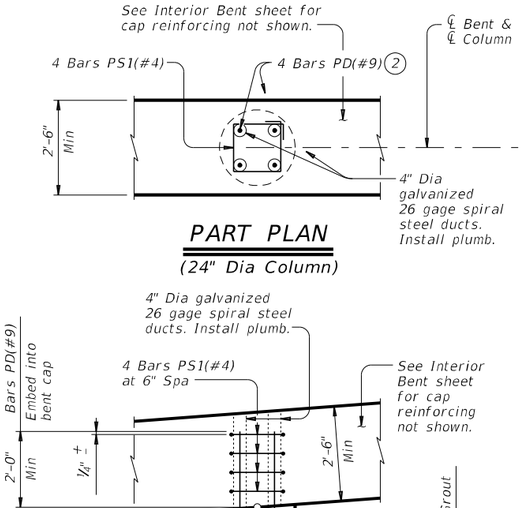

PART PLAN
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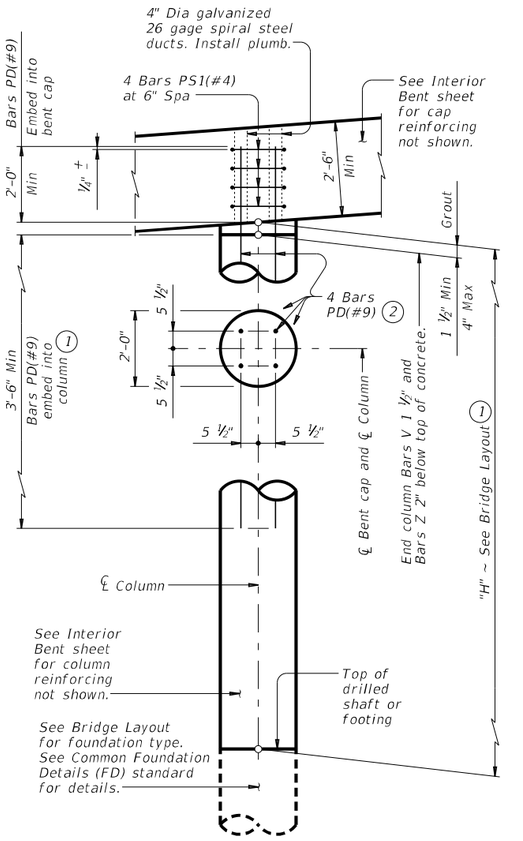
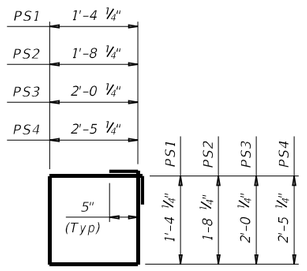


PART ELEVATION
(24" Dia Column)

HL93 LOADING

SHEET 1 OF 2

PS1	1'-4 ¼"
PS2	1'-8 ¼"
PS3	2'-0 ¼"
PS4	2'-5 ¼"



BARS PS (#4)

1 MOD 12/08/2023 Modified 36" dia. column to 3'-0" square column.

SIGNING ENGINEER RESPONSIBLE FOR MODIFICATIONS AS NOTES. ALL OTHER DETAILS INT HE UNMODIFIED CONDITION ARE SHOWN IDENTICAL TO THE UNMODIFIED STANDARD.

(1) Bars PD may need to be embedded in footing or drilled shaft for short columns.

(2) Location tolerance of dowels in columns/drilled shafts is ¼" from plan location, transversely and longitudinally.

STATE OF TEXAS
ZACHARY J. BEIL
139718
LICENSED
PROFESSIONAL ENGINEER
Zachary J Beil
12-08-2023

Texas Department of Transportation

Bridge Division Standard

PRECAST CONCRETE BENT CAP OPTION FOR ROUND COLUMNS

PBC-RC (MOD)

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©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
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	AMA	POTTER		144

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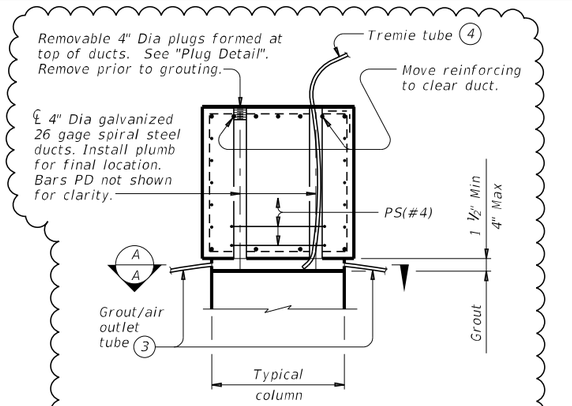
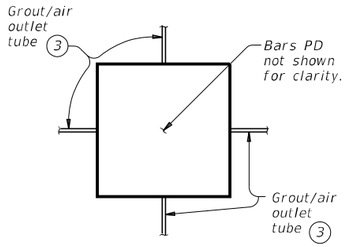


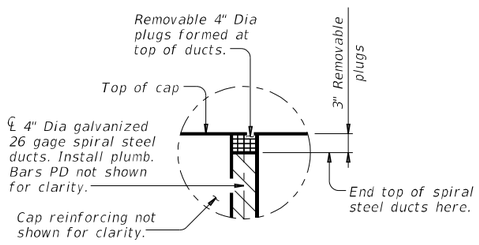
TYPICAL SECTION THRU CAP

(Showing example of ducts and cap reinforcing.)



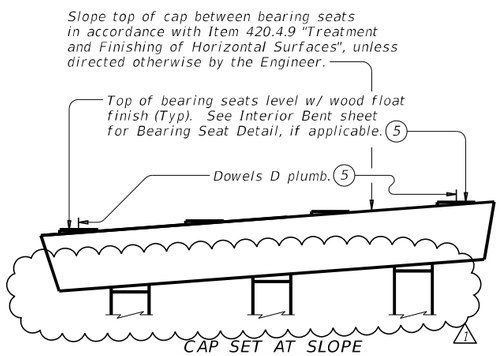
SECTION A-A

1

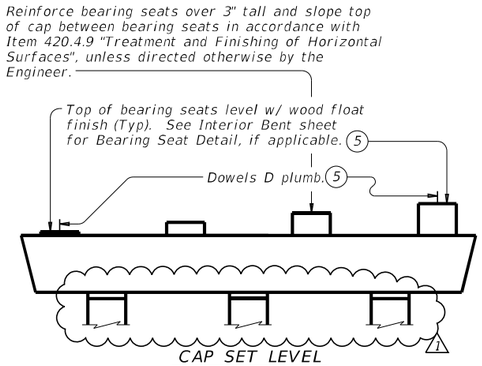


PLUG DETAIL

(Plug is used to keep concrete out of ducts during concrete placement. Remove prior to grouting)



CAP SET AT SLOPE 1



CAP SET LEVEL 1

EXAMPLES OF PRECAST BENTS WITH DOWELS D

(3) Provide at least 4 grout/air outlet tubes equally spaced around the perimeter of the column. Install at bottom of cap to avoid air entrapment. Seal off tubes sequentially when a steady flow of grout without air occurs. Secondary tubes to help drain water, located at top of column, may also be installed.

(4) Continuous gravity-flow grouting through a tremie tube is recommended. With this method, lower a flexible tremie tube through one of the vertical ducts to the bottom of the bedding layer and fill the connection from the bottom upward with a continuous flow of grout. This method requires a sufficient amount of grout to be mixed prior to grouting and that the funnel connected to the tremie tube have adequate volume capacity (4 quarts Min is recommended). A valve may be used to stop the flow during grouting to allow refilling the funnel or to tamp the grout. The tube should remain within the grout and gradually withdrawn as the level of the grout rises in the ducts. It is critical to ensure a continuous flow of grout to avoid air entrapment. Alternative methods, including pressure grouting with low pressure pumps, may be used provided they are proved effective in providing void-free connections during the mock-up phase.

(5) Unless otherwise shown.

CONSTRUCTION NOTES:

Cap Fabrication:

Construct and cure cap in accordance with Item 420, "Concrete Substructures". If fabricated at an offsite location, construct and cure cap in accordance with Item 424, "Precast Concrete Structural Members (Fabrication)". Secure ducts to prevent their movement during concrete placement. Location tolerance of ducts is ¼" from plan location, transversely and longitudinally. Seal ducts to prevent intrusion of concrete.

Bearing seats may be precast with the cap. Bearing seats over 3" in height must be reinforced as per Item 420.4.9. Do not locate lift points at bearing seats if bearing seats are precast.

Cap concrete must achieve a compressive strength of 2,500 psi prior to lifting. Limit flexural stress in cap to 250 psi during handling and storage. Store and handle caps in accordance with Item 424, "Precast Concrete Structural Members (Fabrication)". Do not stack caps. Caps that become cracked or otherwise damaged may be rejected.

Cap-to-Column Connection:

Make a trial batch of grout using the same material, equipment and personnel to be used for actual grouting operations and grout a mock-up of the connection at least one week before grouting and in the presence of the Engineer. This mock-up test must demonstrate the reliability of the Contractor's grouting procedures to provide a connection free of voids. Field test the trial batch grout to the same level required for the actual grouting.

Caps may be placed on columns/drilled shafts after column/drilled shaft concrete has achieved a flexural stress of 355 psi (or 2,500 psi compressive strength). Use plastic shims or friction collars to support the cap at the proper elevation prior to grouting. Total area of plastic shims used on top of each column may not exceed 6 percent of the column area. Column/drilled shaft curing may be interrupted a maximum of 2 hours for placement of plastic shims or friction collars and cap placement.

Surfaces in contact with grout must be clean and in a saturated, surface-dry condition, immediately prior to grouting. Provide water tight forms. Fill the forms with water and drain just prior to grouting. Ponding or free-standing water is not permitted. Use compressed air to blow out excess water.

Mix grout in accordance with the manufacturer's directions. Evidence of frothing, foaming, or segregation is cause for rejection. Transport grout from mixer to final location by wheel barrow, bucket or pumping.

Perform sampling and testing of grout by trained personnel at the Contractor's expense and while witnessed by the Engineer. Grouted connections must be free of voids.

Trowel finish top surface of cap anchorage ducts flush with top of cap. Wet mat cure these locations for at least 48 hours. Recess lifting loops 1-inch minimum using exothermic cutting rods. Do not overheat or damage the surrounding concrete. Abrade the concrete surfaces of excavation and end of the lifting loop to remove all slag with a needle gun, steel brush, or other suitable means. Coat the inside of the recessed area, including the lifting loops, with 10 mils (minimum) of neat, Type VIII epoxy and patch the recess with epoxy mortar.

Friction collars may be removed, if used, and beams placed on the cap after the grout obtains a compressive strength of 2,500 psi. Subsequent loading can occur when the grout reaches its final required 28 day compressive strength.

MATERIAL NOTES:

Provide a pre-qualified grout from TxDOT's Material Producer List "Cementitious Grouts and Mortars for Miscellaneous Applications", conforming to DMS-4675.

Provide semi-rigid spirally crimped, corrugated duct of galvanized, cold rolled steel conforming to ASTM A653. Corrugations must have a minimum amplitude of 0.094".

Grout tubes and forms must be approved prior to grouting.

Provide Grade 60 reinforcing steel. Epoxy coat or galvanize all reinforcement if column reinforcement is epoxy coated or galvanized.

GENERAL NOTES:

Designed in accordance with AASHTO LRFD Bridge Design Specifications.

The Contractor has the option to provide precast bent caps in accordance with the details shown. No additional payment will be made if the Contractor uses precast caps.

Submit shop drawings of precast caps for approval prior to construction. Indicate lifting attachments and locations on the shop drawings.

Precast Concrete Bent Cap Option shown on this standard may require modification for select structure types. See appropriate details elsewhere in plans for these modifications.

See Interior Bent sheet for details and notes not shown.

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

1 MOD 12/08/2023 Modified 36" dia. column to 3'-0" square column.

SIGNING ENGINEER RESPONSIBLE FOR MODIFICATIONS AS NOTES. ALL OTHER DETAILS INT HE UNMODIFIED CONDITION ARE SHOWN IDENTICAL TO THE UNMODIFIED STANDARD.

STATE OF TEXAS
ZACHARY J. BEIL
139718
LICENSED
PROFESSIONAL ENGINEER
Zachary J. Beil
12-08-2023

HL93 LOADING SHEET 2 OF 2

Texas Department of Transportation

Bridge Division Standard

PRECAST CONCRETE BENT CAP OPTION FOR ROUND COLUMNS

PBC-RC (MOD)

FILE:	DN: TxDOT	CK: JMH	DW: JTR	CK: TxDOT
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	AMA	POTTER		145

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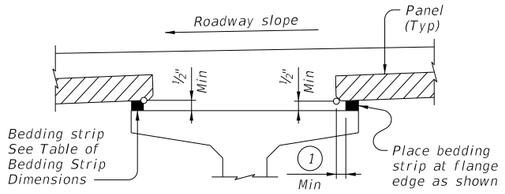
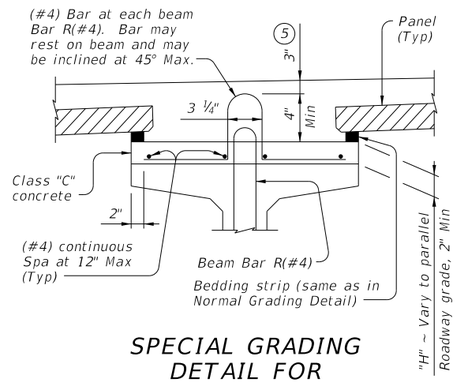


NORMAL GRADING DETAIL (3)

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-girders, 1 ½" Min for all other beam types.

(2) Allowed for prestressed concrete 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.

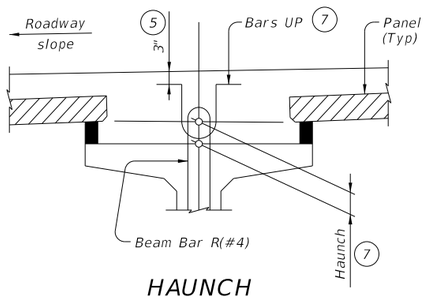
These details are to be used in conjunction with the Span Details, PCP-FAB and other applicable standard drawings.

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".

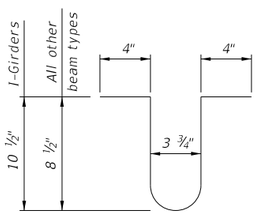
Cover dimensions are clear dimensions, unless noted otherwise.

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

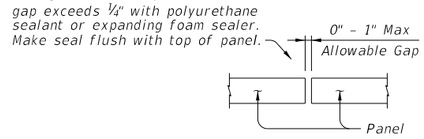


HAUNCH REINFORCING DETAIL

Showing prestressed concrete I-girders. (Other beam types similar)

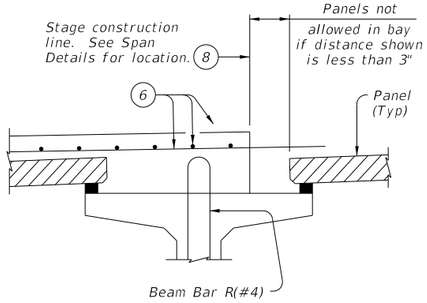


BARS UP (#4) (7)

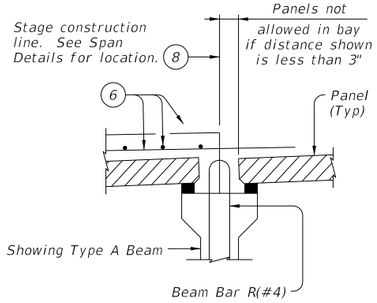


PANEL JOINTS

(Panel reinforcing not shown for clarity. The gap cannot be considered as a panel fabrication tolerance. Adjust panel placement to minimize joint openings.)



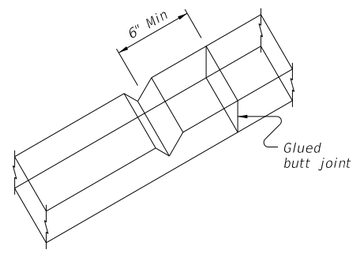
PRESTR CONC I-GIRDERS



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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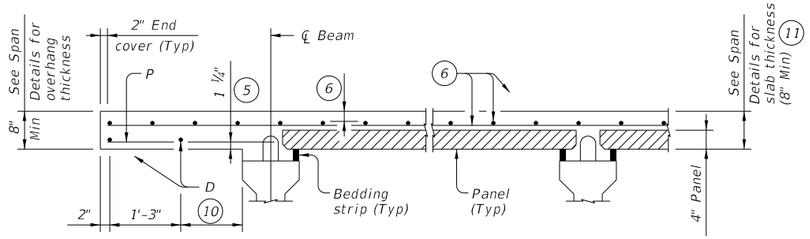
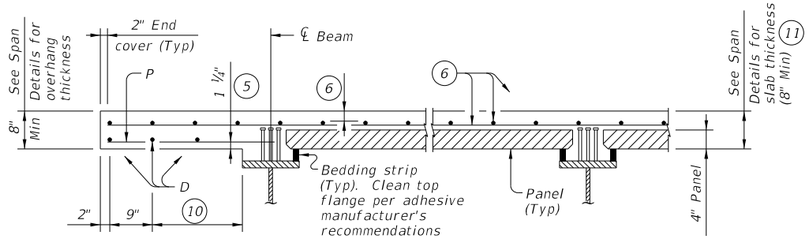
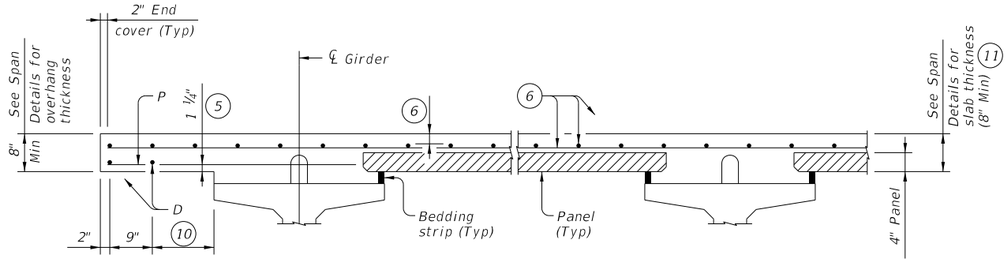


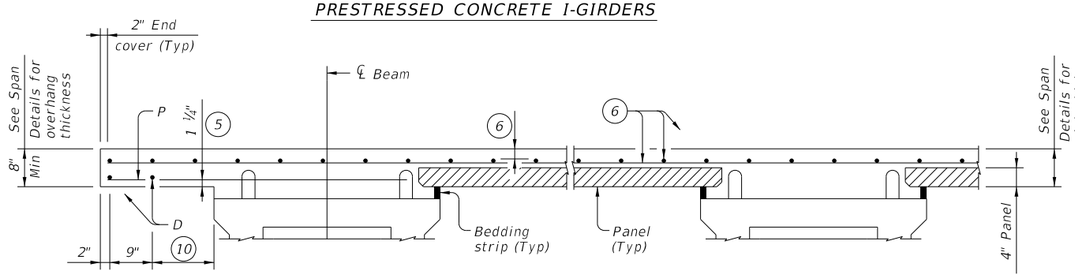
PRESTRESSED CONCRETE I-BEAMS



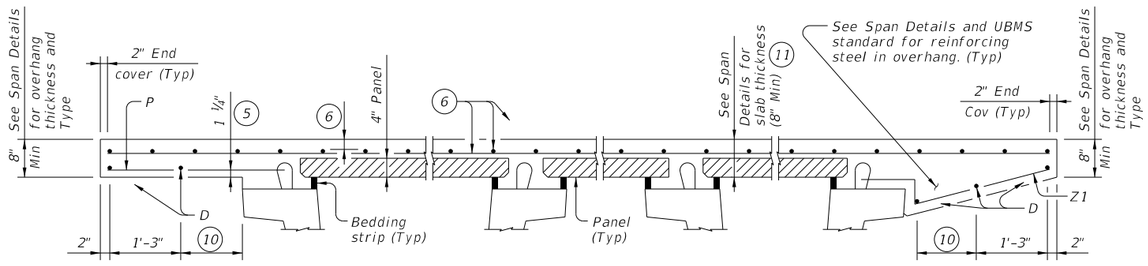
STEEL BEAMS (13)



PRESTRESSED CONCRETE I-GIRDERS



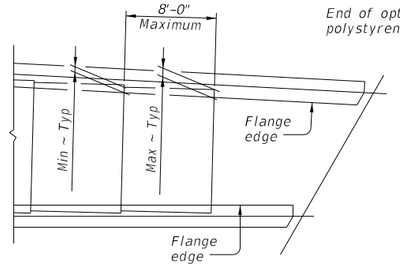
PRESTRESSED CONCRETE X-BEAMS



NORMAL OVERHANG WITH PRESTR CONC U-BEAMS

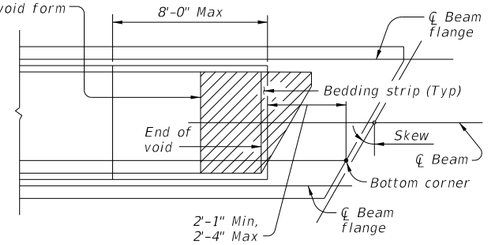
SLOPED OVERHANG WITH PRESTR CONC U-BEAMS

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

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.

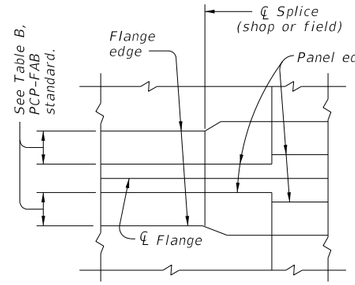
(9) Butt adjacent bedding strips together with adhesive. Cut v-notches, approx ¼" deep, in the top of the bedding strips at 8' o.c..

(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.

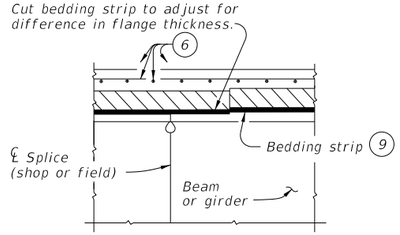
(12) Field adjust Bars Z1(#4) to match actual slope of slab overhangs. Width of slab overhang will vary along span with curved slab edges. Adjust Bar Z1(#4) dimensions to maintain proper cover. Bars Z2(#4) are located at Inverted-Tee stems only.

(13) Panels are allowed over top tension flanges, as approved by the Engineer. See Span Details for additional top mat reinforcement required in tension zones. Location of concrete placement sequence boundaries and bolted field splices should be considered by the contractor in determining panel limits.



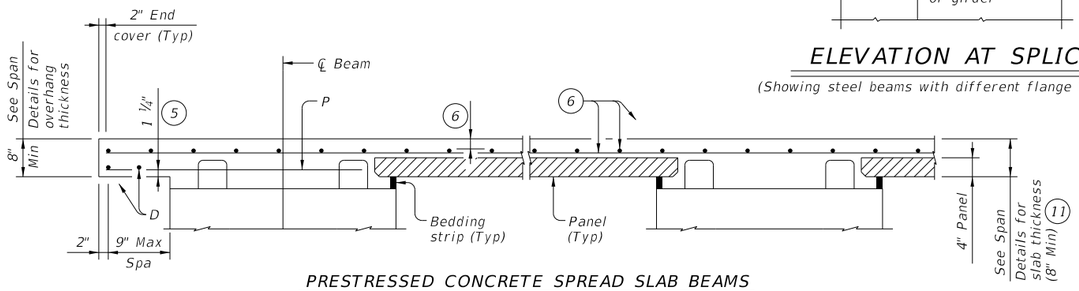
PLAN AT SPLICE

(Showing steel beams with flange width transition)



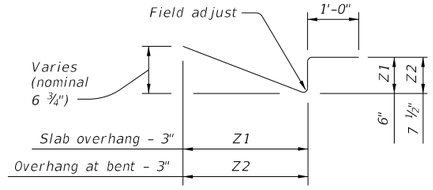
ELEVATION AT SPLICE

(Showing steel beams with different flange thickness)



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.



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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©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
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3/2023: Removed top flange tension limit.	DIST	COUNTY		SHEET NO.
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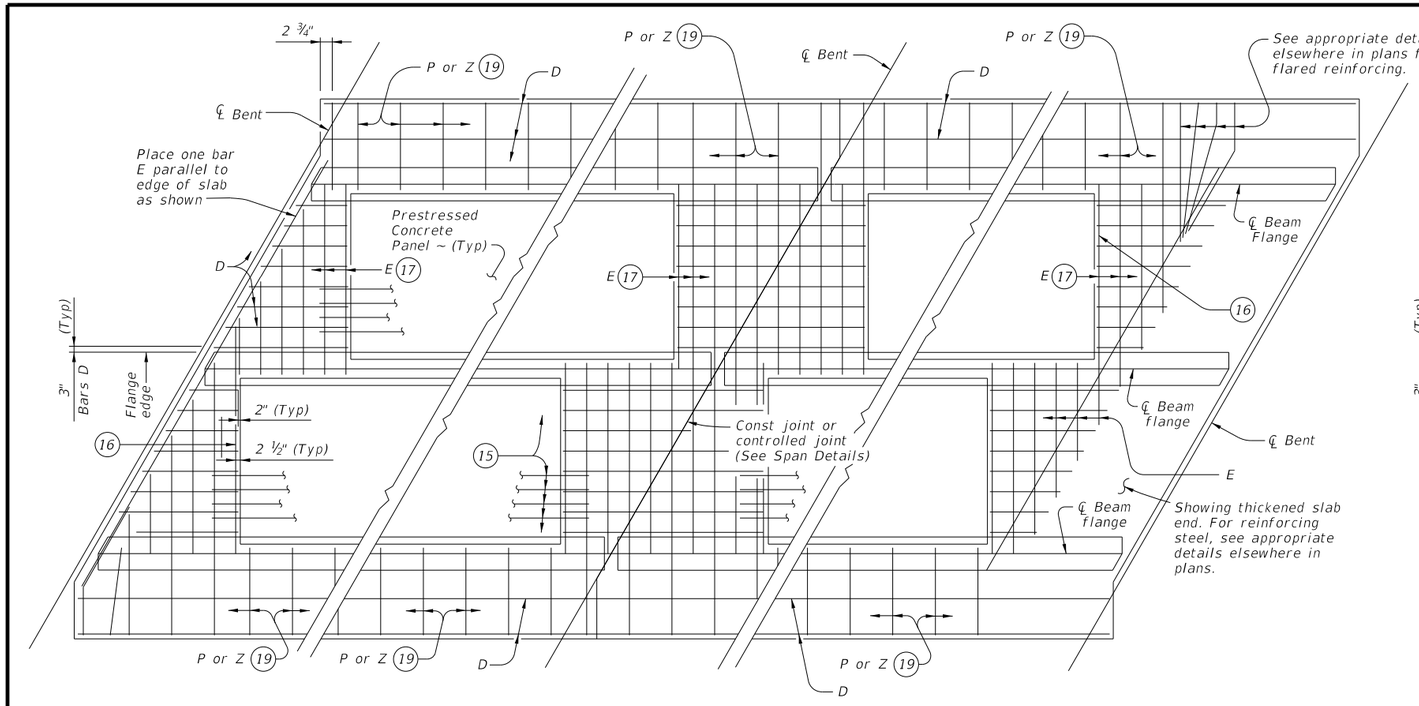
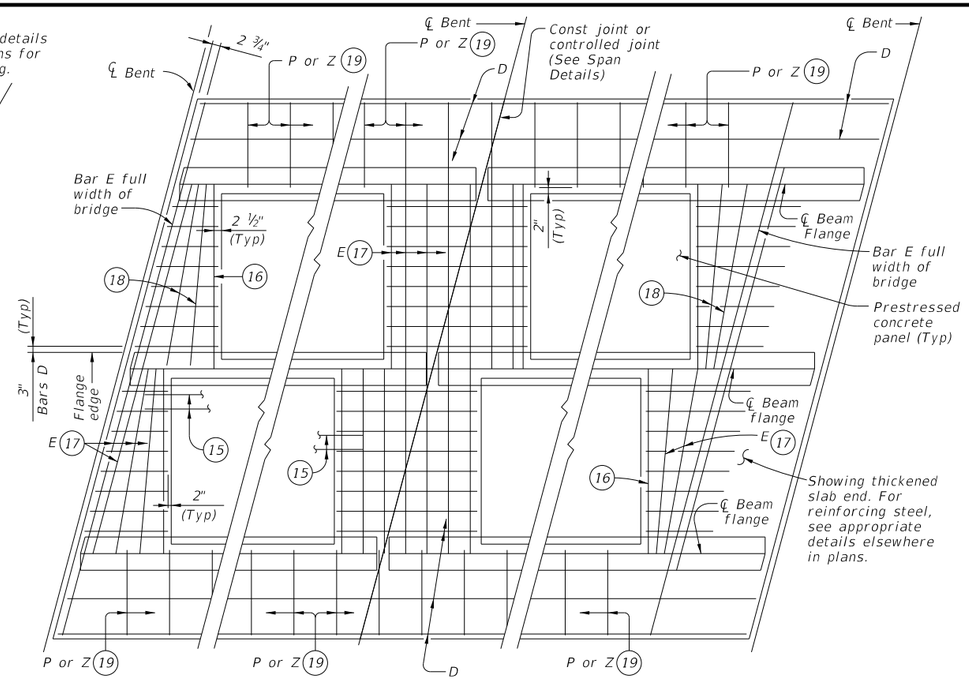


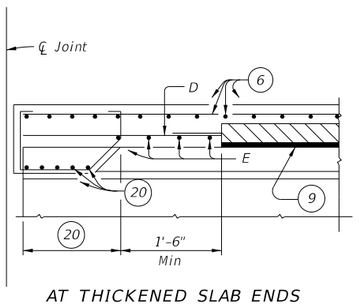
AT ALL SPAN ENDS UNLESS NOTED OTHERWISE | AT INTERIOR BENTS | AT THICKENED END SLABS

OPTION 1 ~ PLAN OF SLABS WITH NORMAL REINFORCEMENT

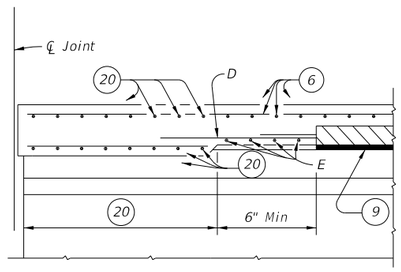


AT ALL SPAN ENDS UNLESS NOTED OTHERWISE | AT INTERIOR BENTS | AT THICKENED END SLABS

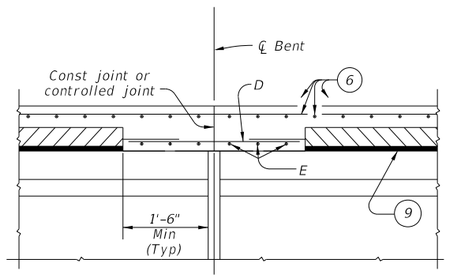
OPTION 1 ~ PLAN OF SLABS WITH SKEWED REINFORCEMENT



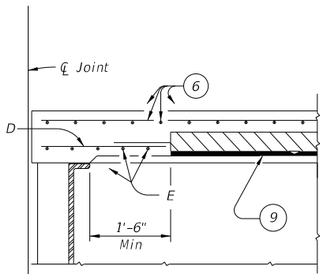
AT THICKENED SLAB ENDS FOR PRESTR CONC U-BMS



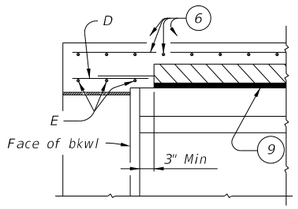
AT THICKENED SLAB ENDS FOR PRESTR CONC I-BMS AND STEEL BMS



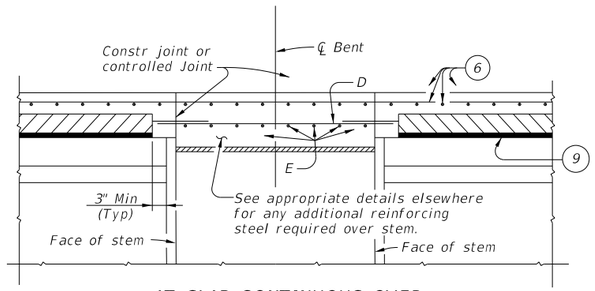
AT SLAB CONTINUOUS OVER CONVENTIONAL INTERIOR BENTS FOR ALL SIMPLE SPAN BMS



AT CONVENTIONAL END DIAPHRAGMS FOR STEEL BMS



AT SLAB OVER ABUTMENT BACKWALL FOR ALL BMS



AT SLAB CONTINUOUS OVER INVERTED-T BENTS FOR ALL BMS

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

SHEET 3 OF 4

Texas Department of Transportation

Bridge Division Standard

PRESTRESSED CONCRETE PANELS
DECK DETAILS

PCP

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©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0090	05	107	IH40
3/2023: Removed top flange tension limit.	DIST	COUNTY		SHEET NO.
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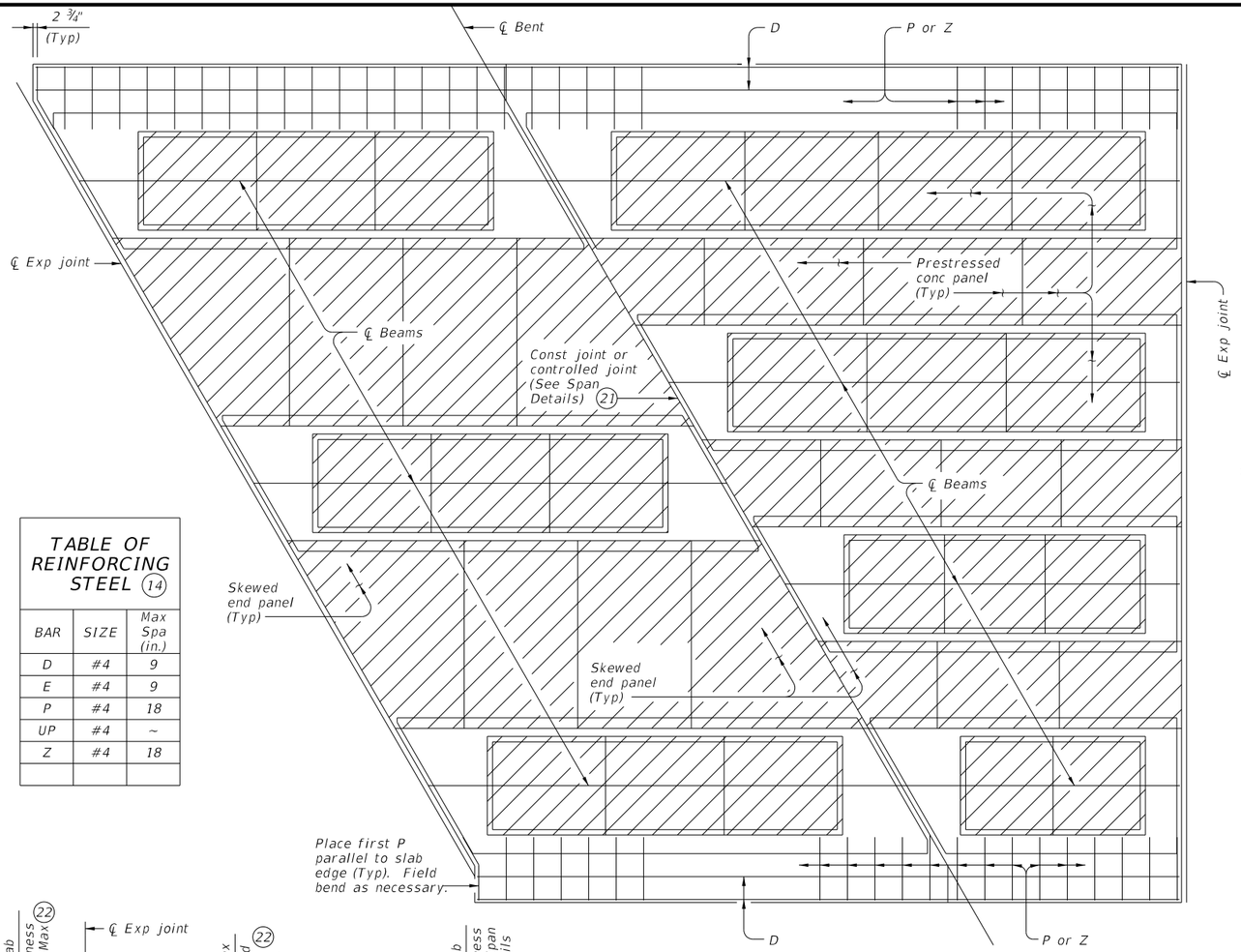
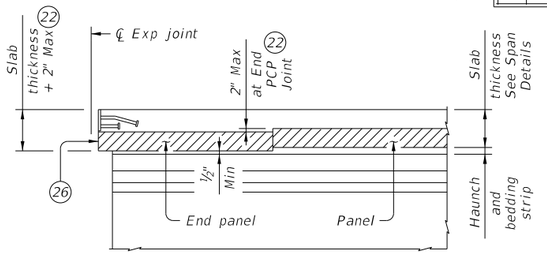


OPTION 2 ~ PLAN OF SLAB

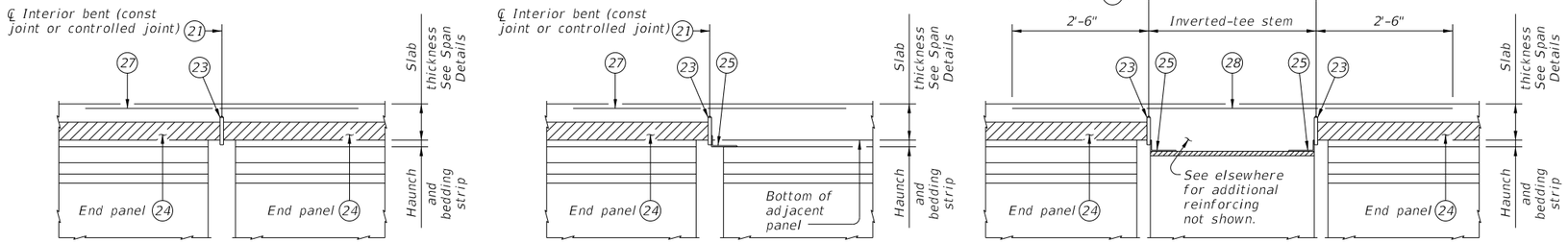
(Showing U-Beams; other beams similar)

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-B, SEJ-M, SEJ-S(0), AJ, and Type A expansion joints only.

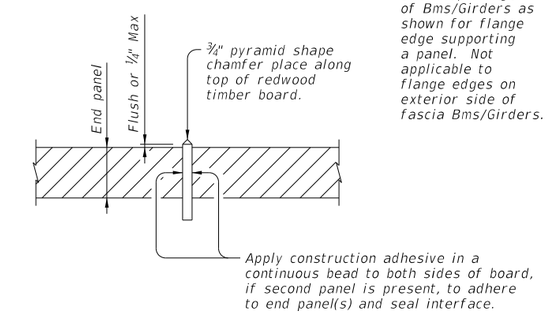


CONVENTIONAL INTERIOR BENT
Panel against panel between beams/girders.

CONVENTIONAL INTERIOR BENT
Panel against beam/girder end in adjacent span.

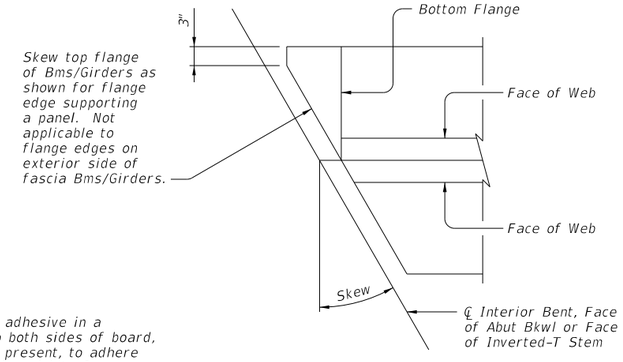
INVERTED-T BENT
Panels against inverted-tee stem

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-Beam/I-Girder, U-Beams and Steel Beams 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-B, SEJ-M, 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 OA from standard IGTS in the slab.

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Texas Department of Transportation — Bridge Division Standard

PRESTRESSED CONCRETE PANELS
DECK DETAILS

PCP

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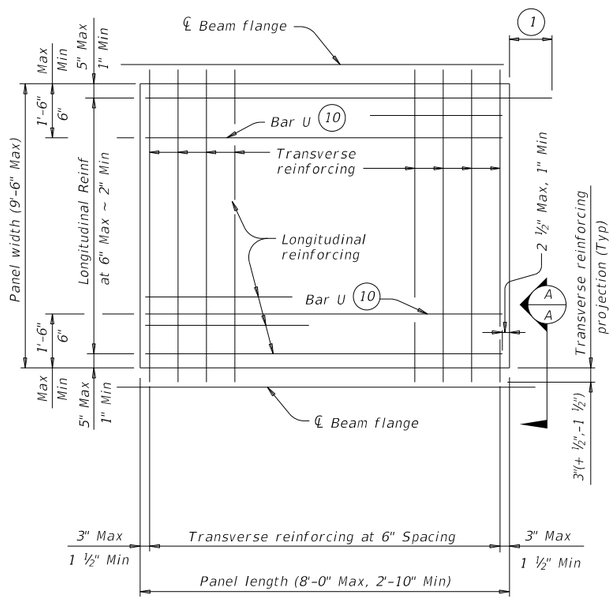
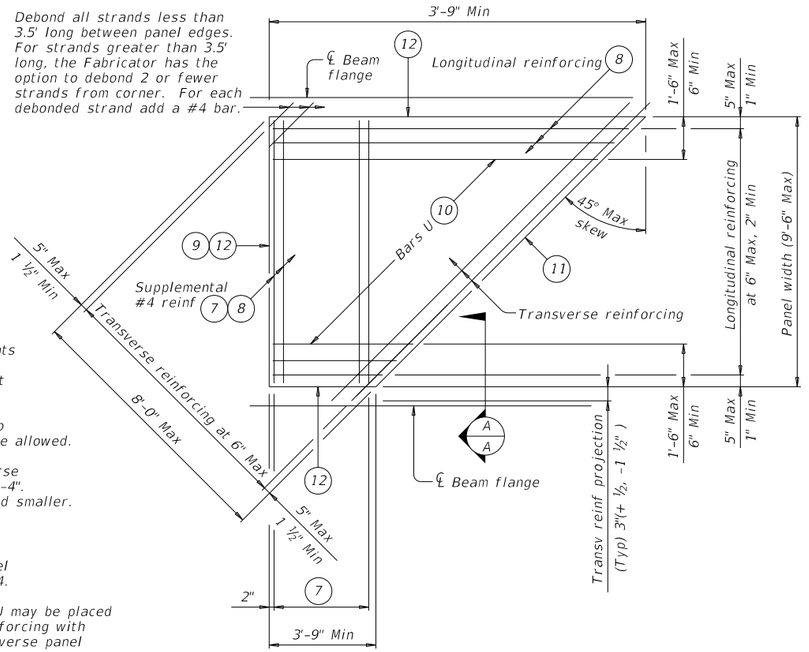


TYPICAL NON-SKEWED PANEL PLAN



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.

Debond all strands less than 3.5' long between panel edges. For strands greater than 3.5' long, the Fabricator has the option to debond 2 or fewer strands from corner. For each debonded strand add a #4 bar.

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.

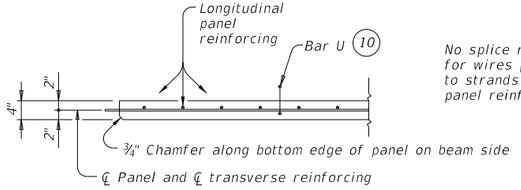
LONGITUDINAL PANEL REINFORCEMENT:

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.

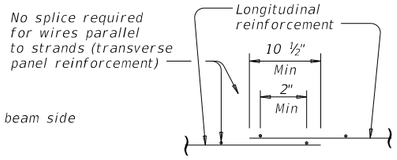
No combination of longitudinal reinforcement options in a panel is allowed.

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.

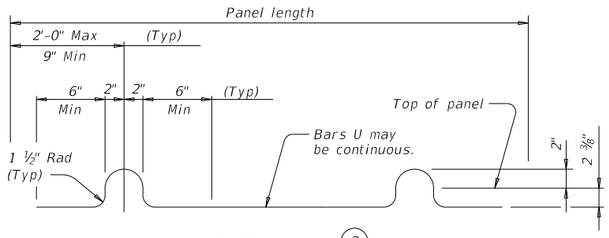


SECTION A-A

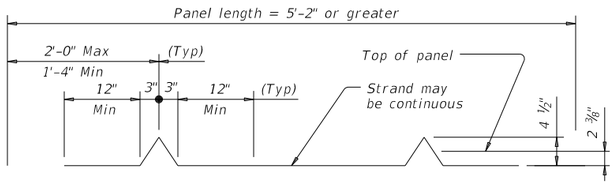
(Not showing supplemental #4 bars for skewed end panels.)



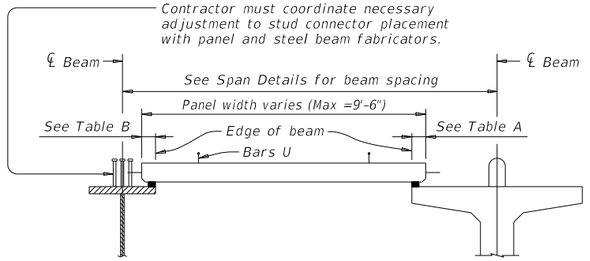
WELDED WIRE REINFORCEMENT (WWR) SPLICE DETAIL (6)



BARS U (#3) (2)



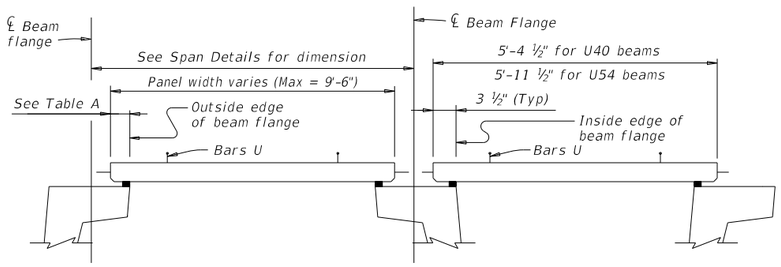
OPTIONAL STRAND FOR BARS U (3)



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

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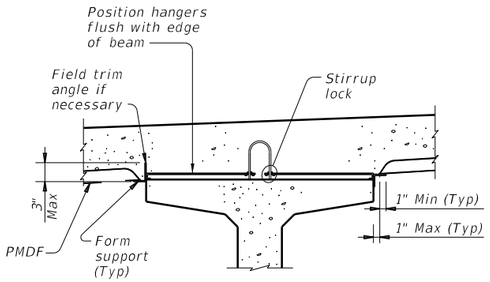
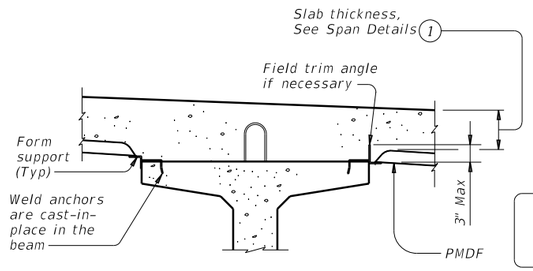
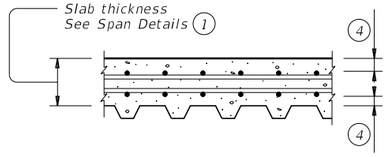


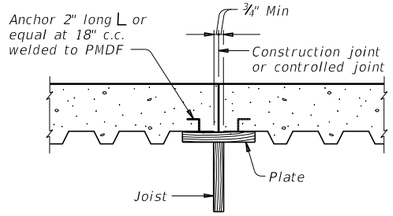
PRESTR CONC I-BEAMS AND I-GIRDERS WITH STIRRUP LOCKS



PRESTR CONC I-BEAMS AND I-GIRDERS WITH WELD ANCHORS

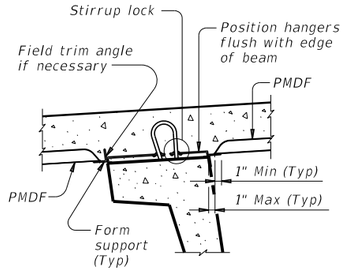


TYP LONGITUDINAL SLAB SECTION

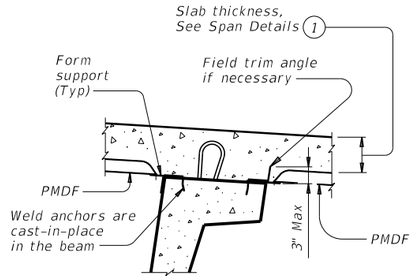


Note: In spans where PMD forms are used, timber forms must be used at construction joints. Adequate provision must be made to support edge of metal form and to provide anchorage of metal form to slab concrete where joined to wood forms.

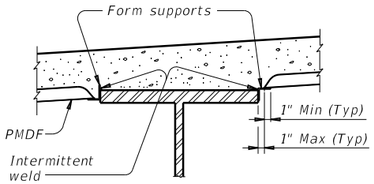
SECTION THRU CONSTRUCTION JOINT



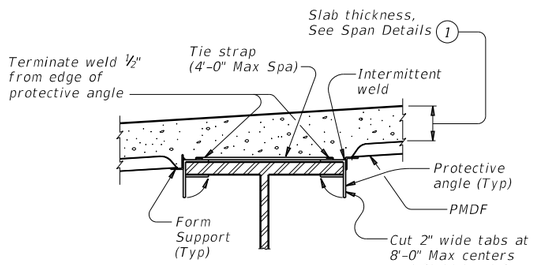
U-BEAMS WITH STIRRUP LOCKS



U-BEAMS WITH WELD ANCHORS

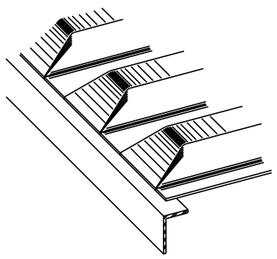


STEEL BEAMS AT COMPRESSION FLANGES



STEEL BEAMS AT TENSION FLANGES (2)

TYPICAL TRANSVERSE SECTIONS



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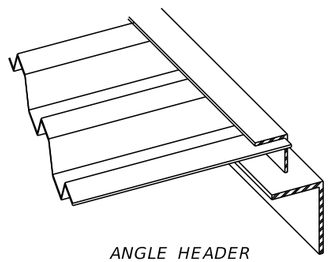

ANGLE HEADER

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.

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.

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".

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 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.

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Bridge Division Standard

PERMANENT METAL DECK FORMS

PMDF

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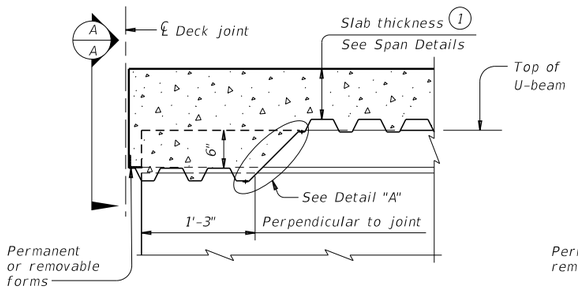
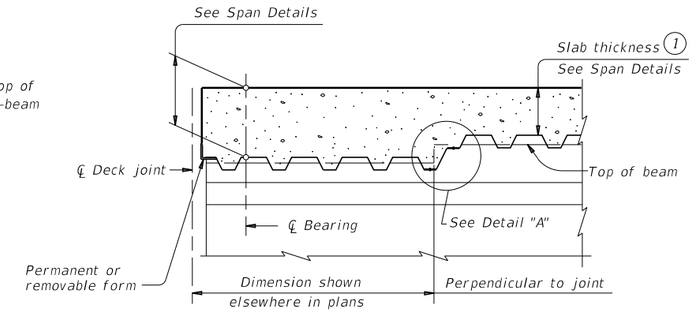
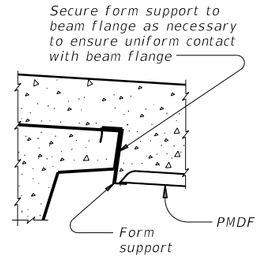


AT THICKENED SLAB END FOR U-BEAMS

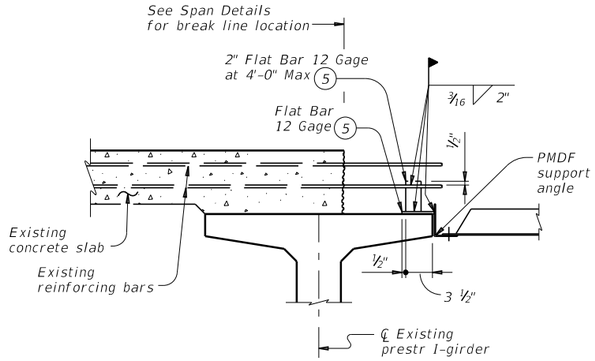


AT THICKENED SLAB END FOR PRESTRESSED I-BEAMS, I-GIRDERS AND STEEL BEAMS

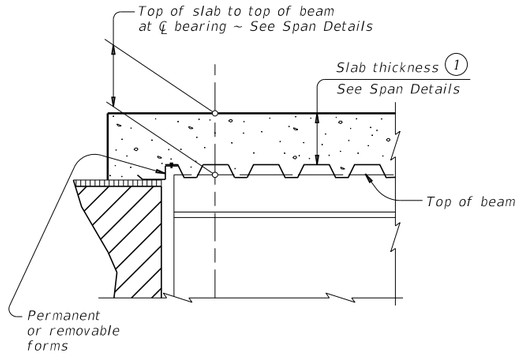
Showing I-beam block-out. No block-out for I-girders or steel beams.



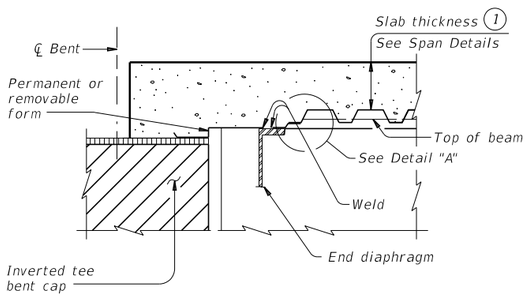
SECTION A-A



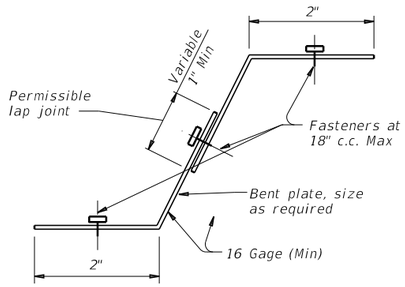
SHOWING PRESTRESSED CONCRETE I-BEAMS, I-GIRDERS AND U-BEAMS



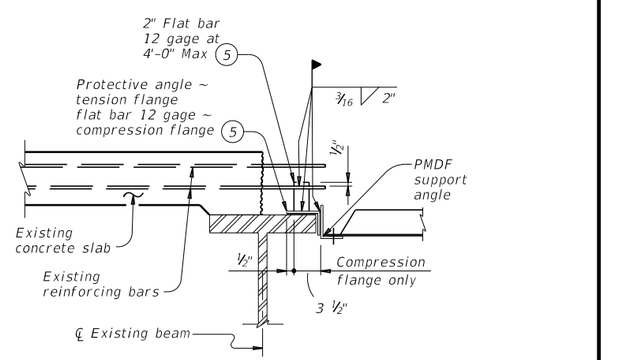
AT SLAB OVER ABUTMENT BACKWALL OR INVERTED-T STEM FOR CONCRETE BEAMS WITHOUT THICKENED SLAB END



AT SLAB OVER INVERTED-T STEM FOR STEEL BEAMS WITHOUT THICKENED SLAB END

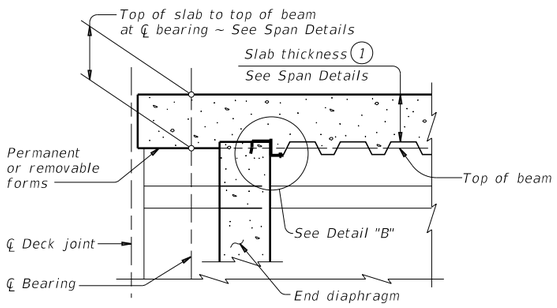


DETAIL "A"

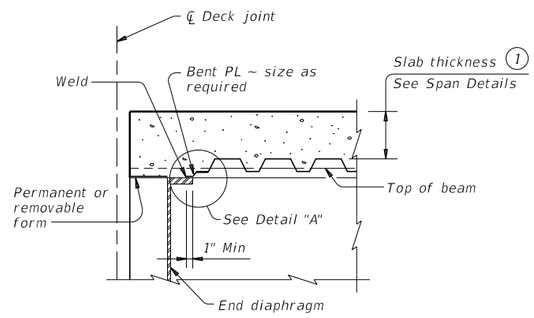


SHOWING STEEL BEAMS

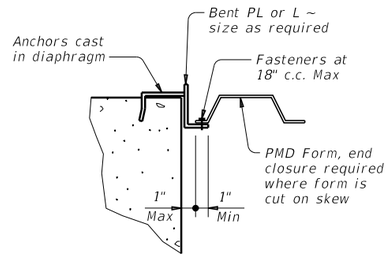
WIDENING DETAILS



AT CONCRETE END DIAPHRAGM FOR PRESTRESSED I-BEAMS AND STEEL BEAMS



AT END DIAPHRAGM FOR STEEL BEAMS WITHOUT THICKENED SLAB END



DETAIL "B"

(1) Slab thickness minus 5/8" if corrugations match reinforcing bars

(5) Minimum yield stress of 12 gage bars shall be 40 ksi

DETAILS AT ENDS OF BEAMS

SHEET 2 OF 2

Texas Department of Transportation

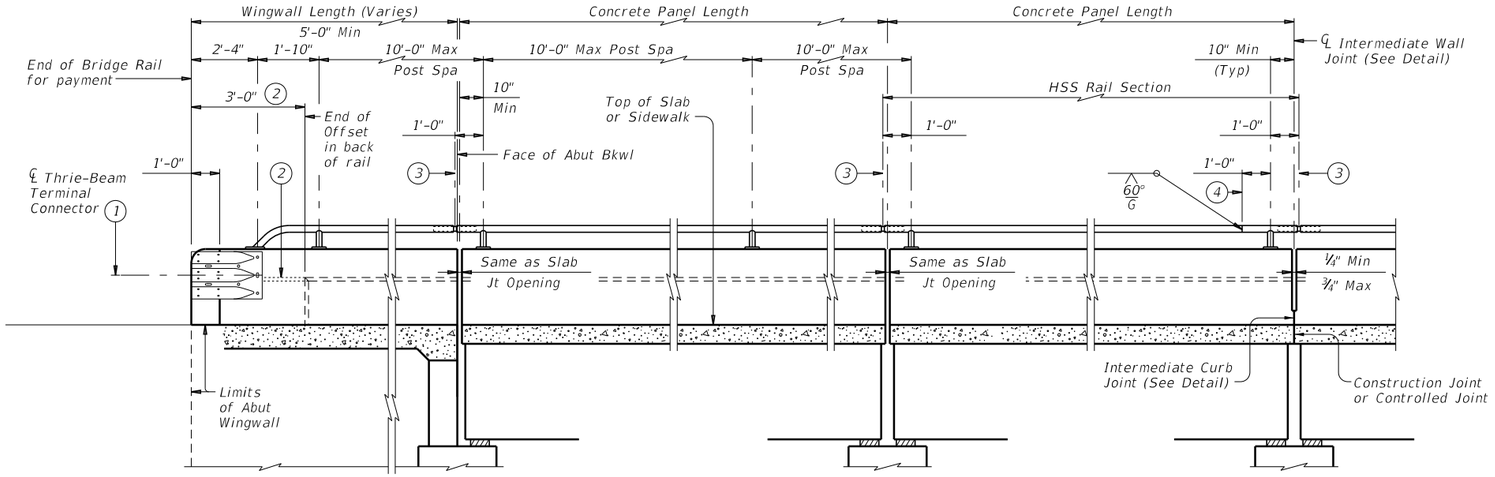
Bridge Division Standard

PERMANENT METAL DECK FORMS

PMDF

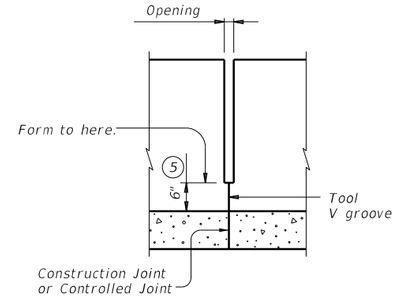
FILE:	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0090	05	107	1H40
02-20: Modified box note by adding steel beams/girders and subsidiary.	DIST	COUNTY		SHEET NO.
12-21: Updated max deflection for RR.	AMA	POTTER		152

DATE: 12/1/2023 11:17:13 AM
FILE: c:\dms\bridgefarmer-pw\zach.beil\dms21433\RL-C221-19-01.dgn
zBeil



AT ABUTMENTS | AT BENTS WITH SLAB EXP JOINTS | AT BENTS WITHOUT SLAB EXP JOINTS

ROADWAY ELEVATION OF RAIL



INTERMEDIATE WALL JOINT DETAIL

Provide at all interior bents without slab expansion joints.

(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) Back of rail offset may, with Engineer's approval, be continued to the end of the railing.

(3) ℄ Expansion joint or splice joint as required.

(4) One shop splice per HSS rail section is permitted with minimum 85 percent penetration. The weld may be square groove, or single V groove. Grind smooth.

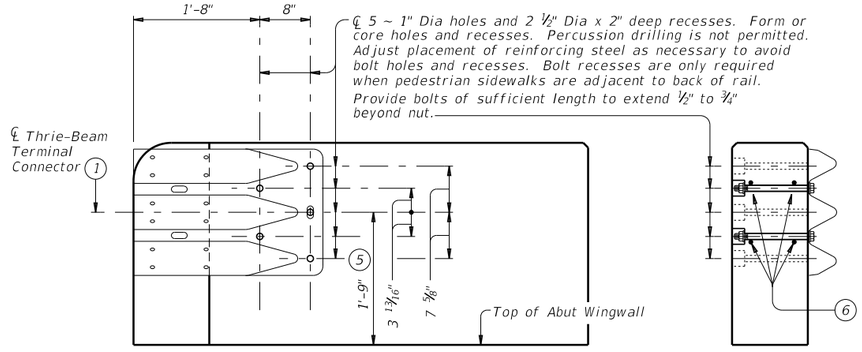
(5) Increase 2" for structures with overlay.

(6) 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. Field bend as needed.

(7) HSS 2.875 x 0.203

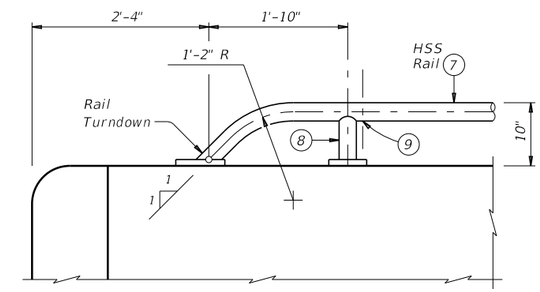
(8) HSS 2.375 x 0.154

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

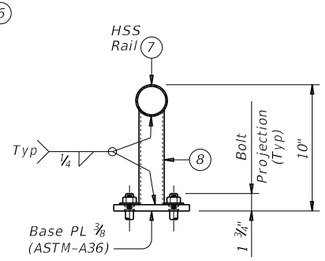


ELEVATION | SECTION

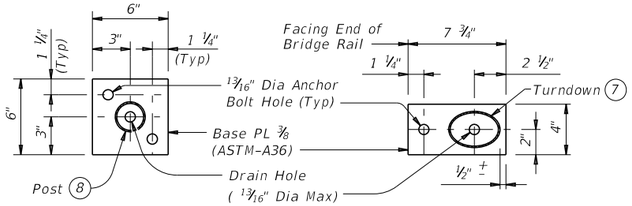
TERMINAL CONNECTION DETAILS



HSS RAIL TERMINAL DETAIL

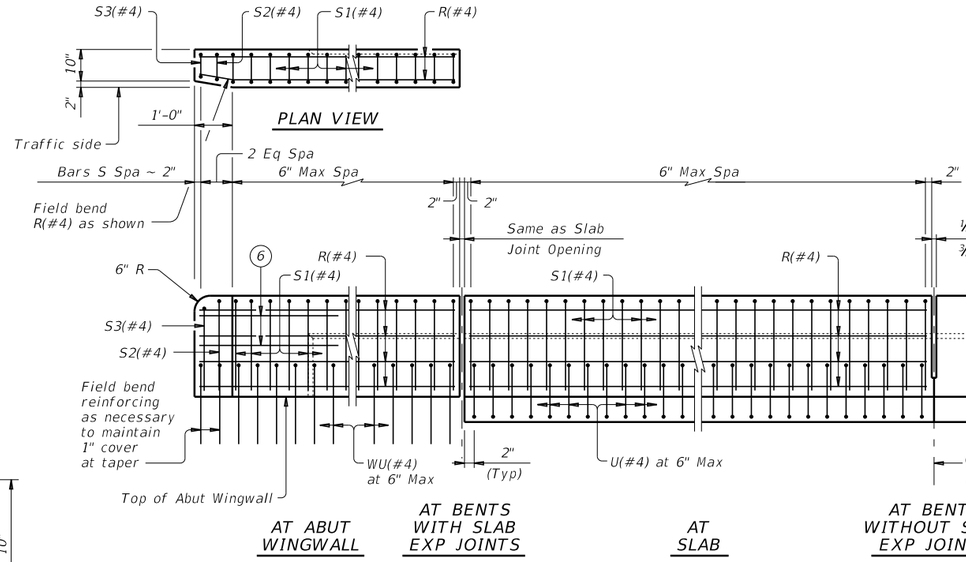


TRANSVERSE SECTION



POST BASE PLATE PLAN | RAIL TURNDOWN BASE PLATE PLAN

HSS RAIL DETAILS



ELEVATION SHOWING TYPICAL REINFORCING PLACEMENT

(Showing without raised sidewalk)

SHEET 1 OF 3

Texas Department of Transportation | Bridge Division Standard

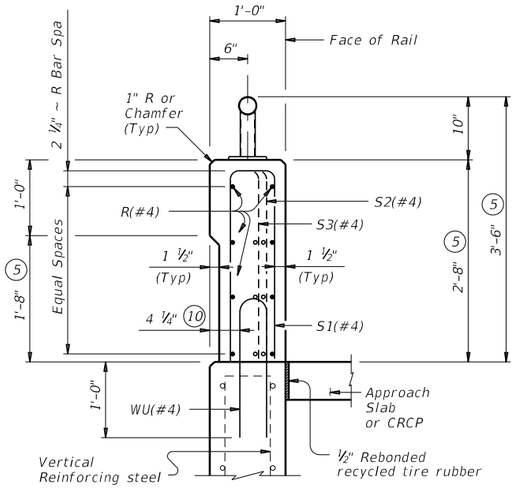
COMBINATION RAIL

TYPE C221

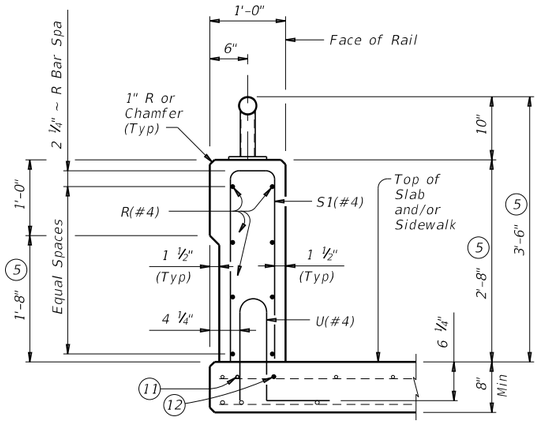
FILE:	DN: TxDOT	CK: TxDOT	DW: JTR	CK: JMH
©TxDOT September 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0090	05	107	IH40
	DIST	COUNTY		SHEET NO.
	AMA	POTTER		153

DATE:
FILE: c:\dms\bridgefarmer-pw\zach.bei\dms21433\RL-C221-19-02.dgn

zBei i 12/7/2023 11:17:17 AM

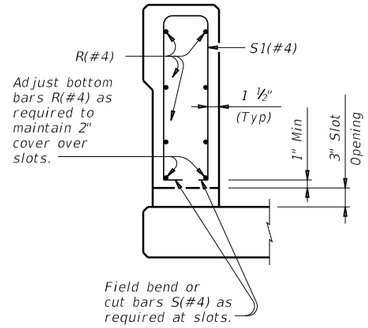


ON ABUTMENT WINGWALLS OR CIP RETAINING WALLS

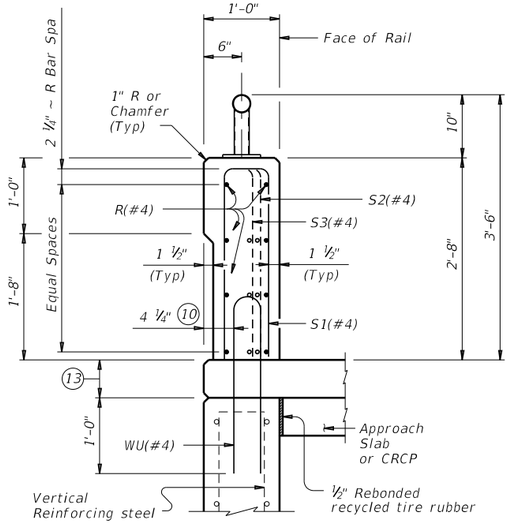


ON BRIDGE SLAB

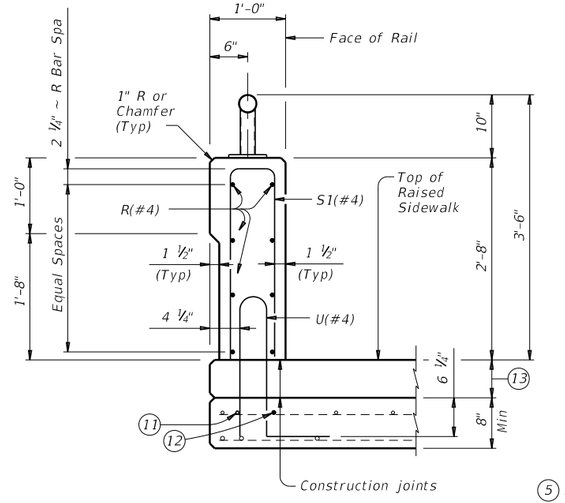
SECTIONS THRU RAIL WITHOUT RAISED SIDEWALK



SECTION THRU OPTIONAL SIDE SLOT DRAIN

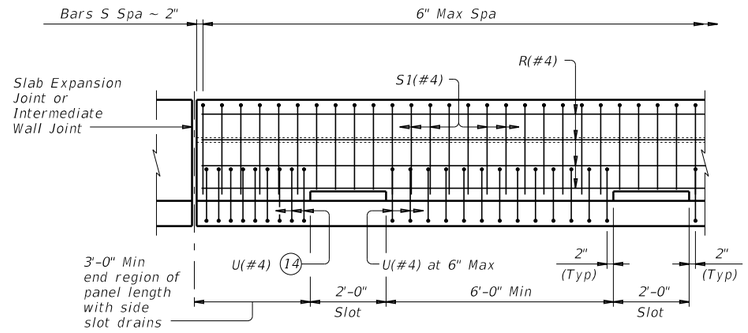


ON ABUTMENT WINGWALLS OR CIP RETAINING WALLS



ON BRIDGE SLAB

SECTIONS THRU RAIL WITH RAISED SIDEWALK



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.

(5) Increase 2" for structures with overlay.

(10) 5 ¼" when vertical reinforcing has closer clear cover over horizontal reinforcing in abutment wingwalls or retaining walls on traffic side of wall.

(11) 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 Contractors expense.

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

(13) Raised Sidewalk

(14) 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 greater to side slot drain.

Texas Department of Transportation

Bridge Division Standard

COMBINATION RAIL

TYPE C221

FILE:	DN: TxDOT	CK: TxDOT	DW: JTR	CK: JMH
©TxDOT September 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0090	05	107	IH40
	DIST	COUNTY		SHEET NO.
	AMA	POTTER		154

DATE: 12/7/2023 11:17:21 AM zBeil
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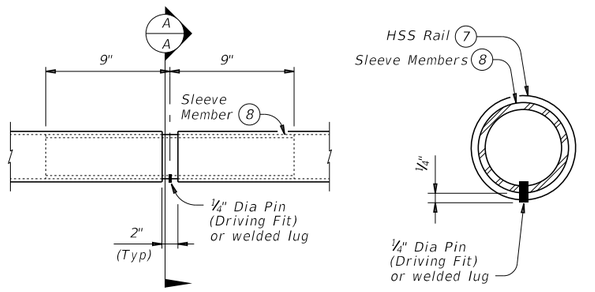
RAIL DATA FOR HORIZONTAL CURVES

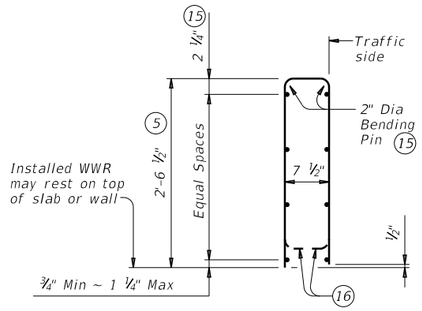
	RADIUS TO FACE OF RAIL	MAX CHORD LENGTH	CONSTRUCT OR FABRICATE
HSS Rail	Over 2800'	29'-0"	Straight rail panels
	Over 1400' thru 2800'	14'-6"	To required radius or to chords shown
	Over 700' thru 1400'	7'-3"	
	Thru 700'	Zero	To required radius



AT SPLICE OR EXP JTS

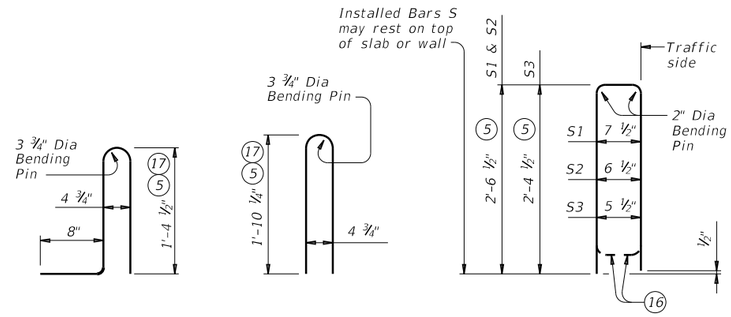
SECTION A-A

PIPE SPLICE DETAILS

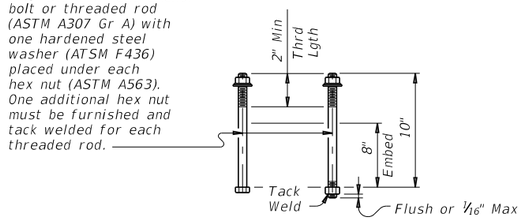


OPTIONAL WELDED WIRE REINFORCEMENT (WWR)

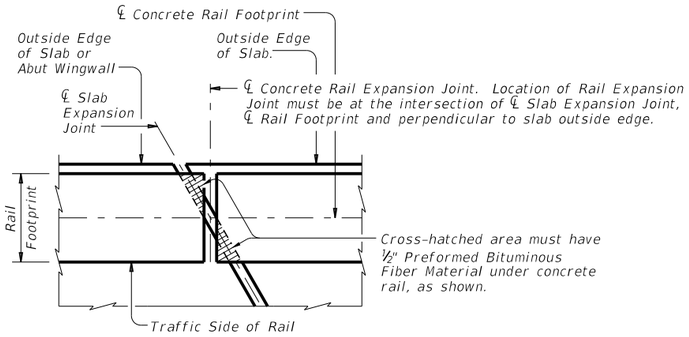
DESCRIPTION	LONGITUDINAL WIRES	VERTICAL WIRES
Minimum (Cumulative Total) Wire Area	1.067 Sq In.	0.267 Sq In. per Ft
	No. of Wires	Spacing
Minimum	8	4"
Maximum	10	8"
Maximum Wire Size Differential	The smaller wire must have an area of 40% or more of the larger wire.	



BARS U (#4) BARS WU (#4) BARS S (#4)



CAST-IN-PLACE ANCHOR BOLT OPTIONS (18)



PLAN OF RAIL AT EXPANSION JOINTS

Example showing Slab Expansion Joints without breakbacks.

(5) Increase 2" for structures with overlay.

(7) HSS 2.875 x 0.203

(8) HSS 2.375 x 0.154

(15) No longitudinal wires may be in top center of cage.

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

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

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

CONSTRUCTION NOTES:

This railing may be constructed by the slipform process when approved by the Engineer, with equipment approved by the Engineer and when adhesive anchor bolts are used. Slipforming parapet is not allowed if anchor bolts are cast with parapet wall. 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.

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

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

Face of rail, parapet must be plumb unless otherwise approved by the Engineer. HSS rail posts must be square to the top of parapet. Use epoxy mortar under post base plates if gaps larger than 1/16" exist.

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

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

Chamfer all parapet exposed corners.

MATERIAL NOTES:

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

Provide Grade 60 reinforcing steel.

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

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

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

Deformed Welded Wire Reinforcement (WWR) (ASTM A1064) of equal size and spacing may be substituted for Bars U and WU unless noted otherwise. Deformed WWR (ASTM 1064) may be substituted for Bars R and S, as shown. Combinations of reinforcing steel and WWR or configurations of WWR other that shown are permitted if conditions in the table are satisfied. Provide the same laps as required for reinforcing bars.

Anchor bolts must be ⅝" Dia ASTM A307 Gr A fully threaded rods with one hex nut and one hardened steel washer (ASTM F436) each. Nuts must conform to ASTM A563 requirements. Embed fully threaded rods into parapet wall with a Type III, Class C, D, E, or F anchor adhesive. Minimum adhesive anchor embedment depth is 3". Anchor adhesive chosen must be able to achieve a nominal bond strength in tension of a single anchor, Na, of 5 kips (edge distance must be accounted for). Submit signed and sealed calculations or the manufacturer's published literature showing the proposed anchor adhesive's ability to develop this load to the Engineer for approval prior to use. Anchor installation, including hole size, drilling, and clean out, must be in accordance with Item 450, "Railing".

Optional cast-in-place anchor bolts must be ⅝" Dia ASTM A307 Gr A bolts (or threaded rods with one tack welded hex nut each) with one hex nut and one hardened steel washer (ASTM F436) at each bolt. Nuts must conform to ASTM A563 requirements.

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

GENERAL NOTES:

This rail has been evaluated and accepted to be of equal strength to railings with like geometry, which have been crash tested to meet MASH TL-3 criteria. This rail can be used for speeds of 50 mph and greater when a TL-3 rated guard fence transition is used. When a TL-2 rated guard fence transition is used, this rail can only be used for speeds of 45 mph and less.

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

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

Average weight of railing with no overlay: 380 plf (total)
370 plf (Conc)
10 plf (Steel)

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

COMBINATION RAIL

TYPE C221

FILE:	DN: TxDOT	CK: TxDOT	DW: JTR	CK: JMH
©TxDOT September 2019 REVISIONS	CONT	SECT	JOB	HIGHWAY
	0090	05	107	IH40
	DIST	COUNTY		SHEET NO.
	AMA	POTTER		155

DATE: 12/7/2023 11:17:26 AM
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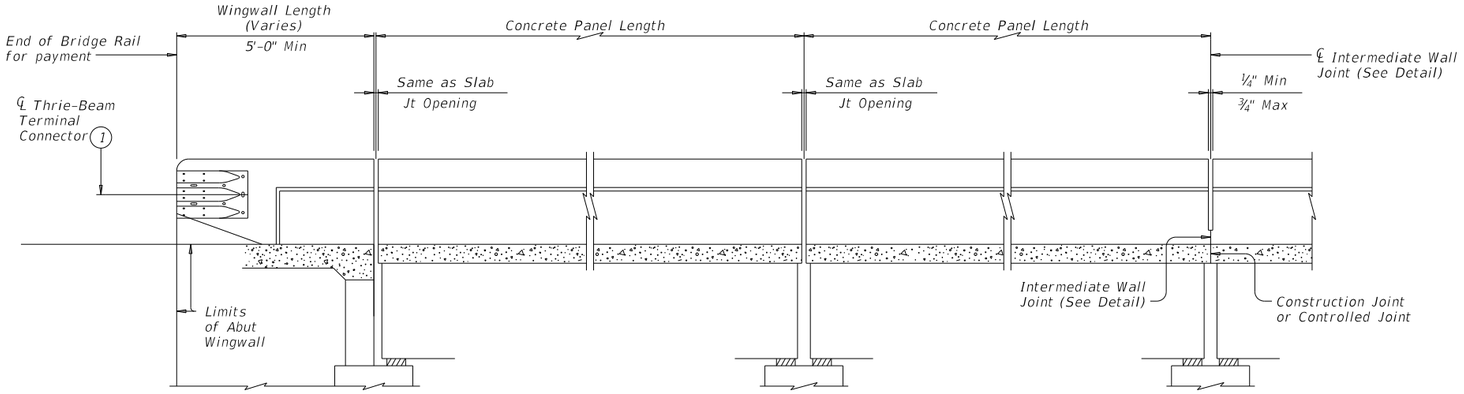
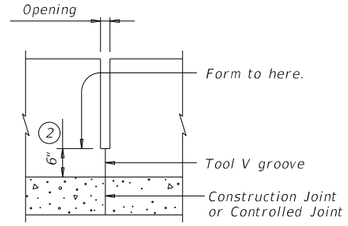


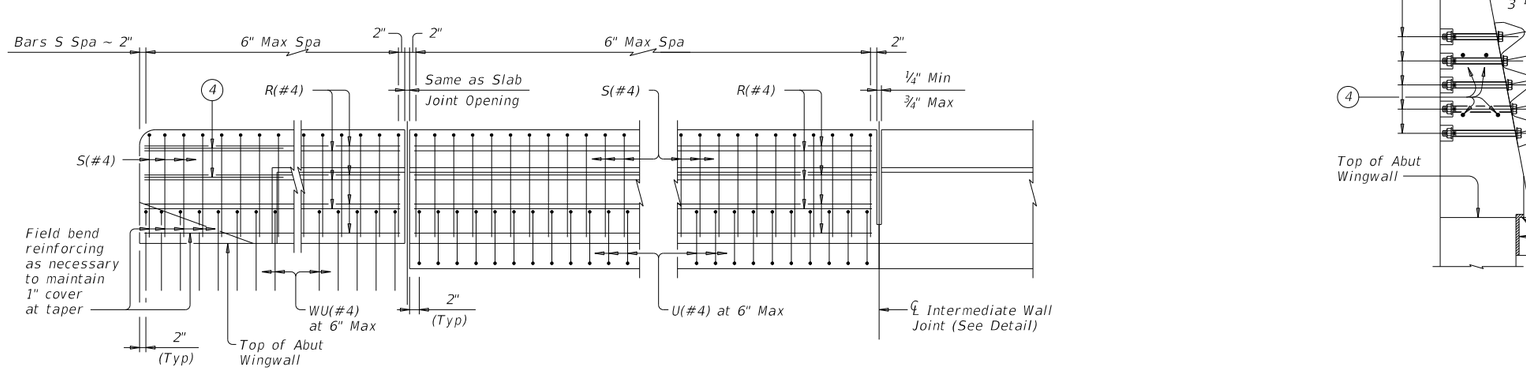
AT ABUTMENTS | AT BENTS WITH SLAB EXP JOINTS | AT BENTS WITHOUT SLAB EXP JOINTS

ROADWAY ELEVATION OF RAIL

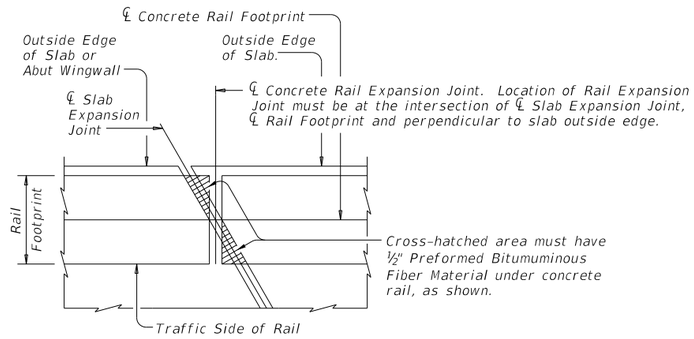


INTERMEDIATE WALL JOINT DETAIL

Provide at all interior bents without slab expansion joints.



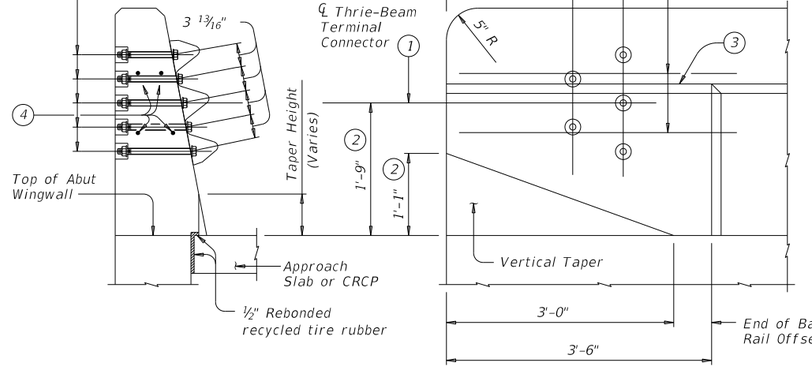
ELEVATION SHOWING TYPICAL REINFORCING PLACEMENT



PLAN OF RAIL AT EXPANSION JOINTS

Example showing Slab Expansion Joints without breakbacks.

℄ 5 ~ 1" Dia holes and 2 ½" Dia x 2" deep recesses. Form or core holes and recesses. Percussion drilling is not permitted. Adjust placement of reinforcing steel as necessary to avoid bolt holes and recesses. Bolt recesses are only required when pedestrian sidewalks are adjacent to back of rail. Tighten the 5 Terminal Connection Bolts in a well distributed pattern so to prevent damage or distortion of the Thrie-Beam Connection and the MBGF Transition. Cut bolts off after installation so as to extend no more than ¾" beyond nut. Paint ends of cut-off bolts with Zinc-rich paint.



SECTION | ELEVATION

TERMINAL CONNECTION DETAILS

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	0090	05	107	IH40
	DIST	COUNTY		SHEET NO.
	AMA	POTTER		156

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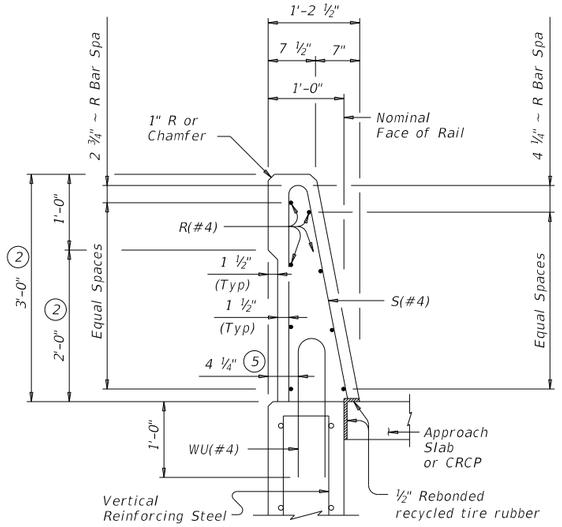
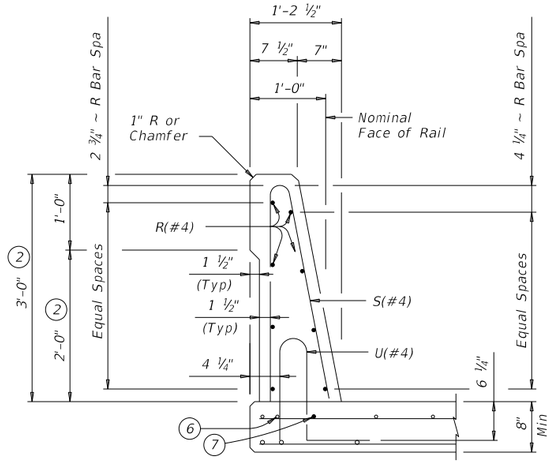


ON ABUTMENT WINGWALLS OR CIP RETAINING WALLS



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.

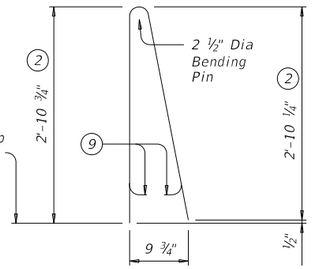
Rail anchorage details shown on this standard may require modification for select structure types. See appropriate details elsewhere in plans for these modifications.

Shop drawings will not be required for this rail.

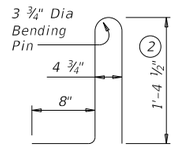
Average weight of railing with no overlay is 376 plf.

Cover dimensions are clear dimensions, unless noted otherwise.

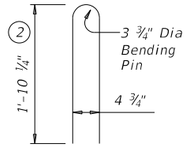
Reinforcing bar dimensions shown are out-to-out of bar.



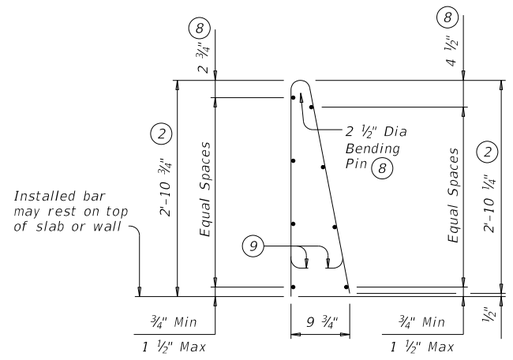
BARS S (#4)



BARS U (#4)

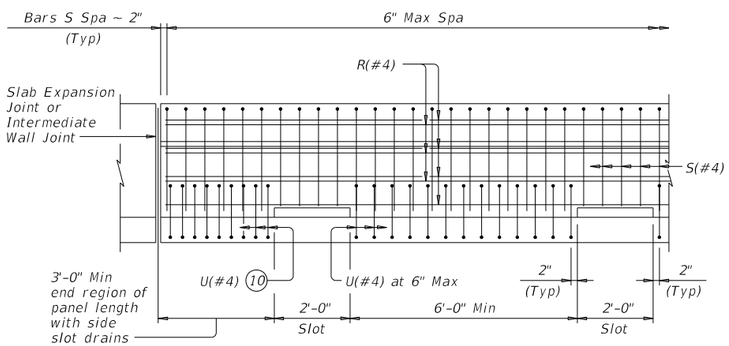


BARS WU (#4)



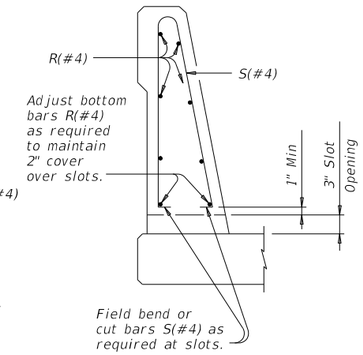
OPTIONAL WELDED WIRE REINFORCEMENT (WWR)

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

SHEET 2 OF 2

Texas Department of Transportation

Bridge Division Standard

TRAFFIC RAIL SINGLE SLOPE

TYPE SSTR

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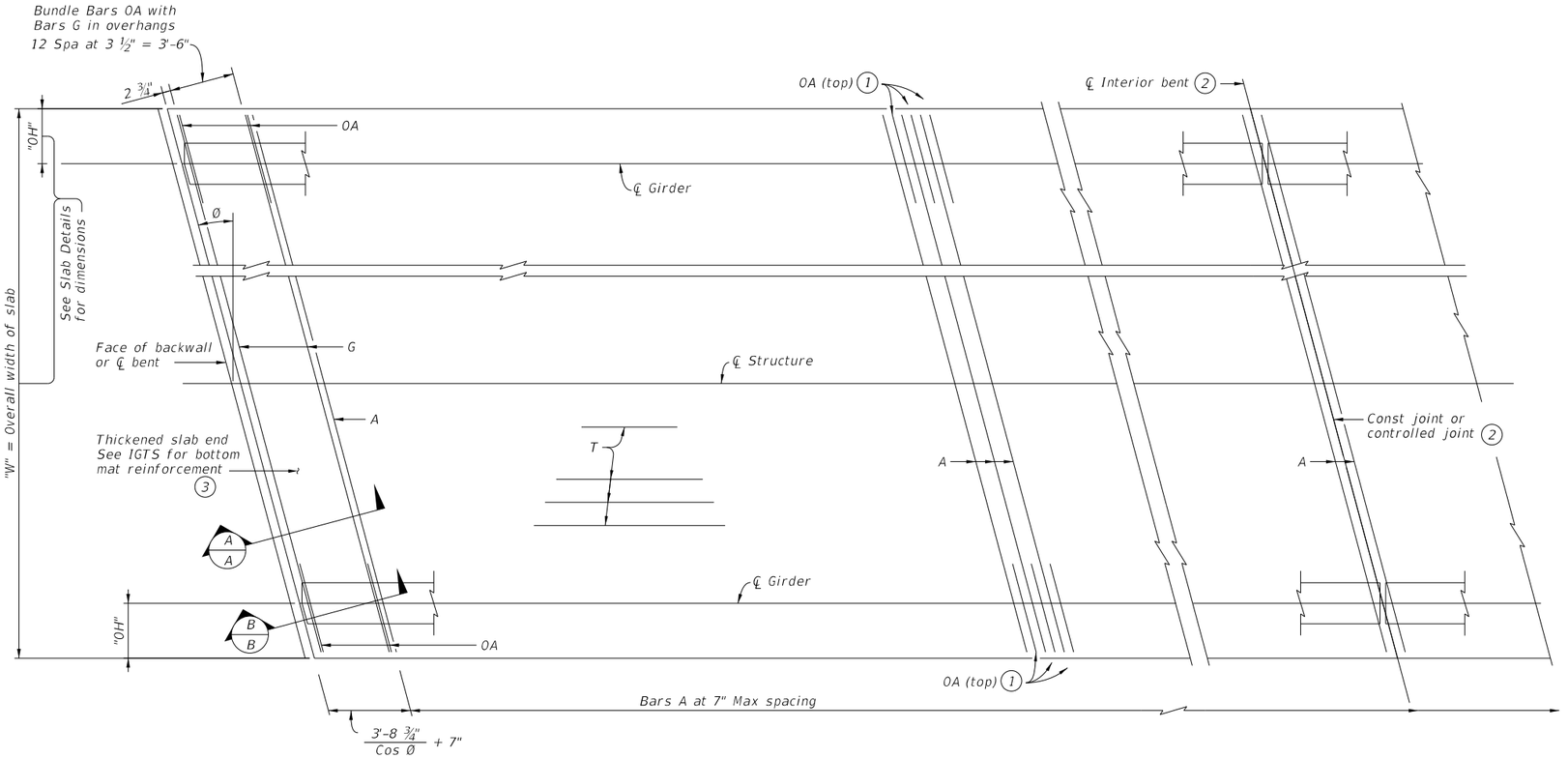
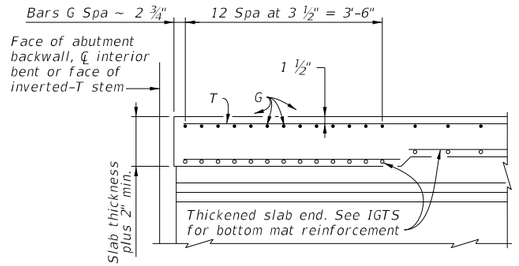


AT THICKENED SLAB END

AT SLAB CONTINUOUS OVER INTERIOR BENTS

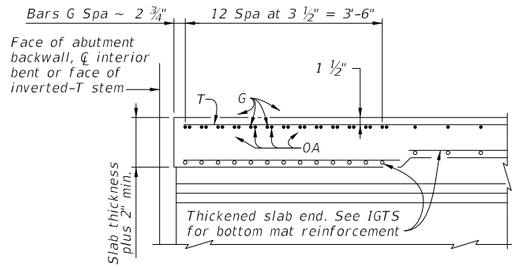
PLAN FOR SLABS WITHOUT BREAKBACKS

Showing top mat reinforcement only.



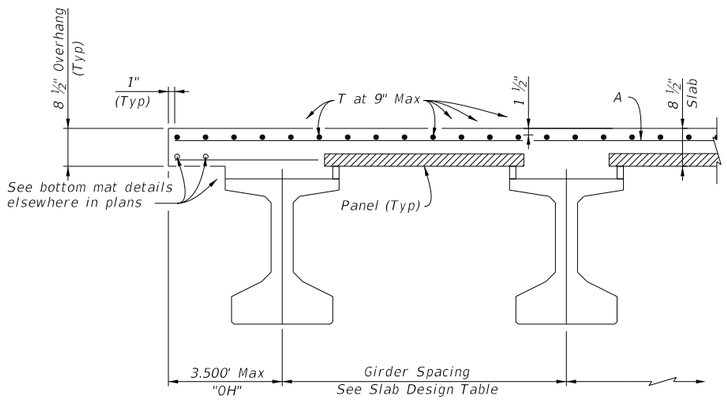
SECTION A-A

Showing Thickened Slab End with PCP Option 1. Option 2 similar.

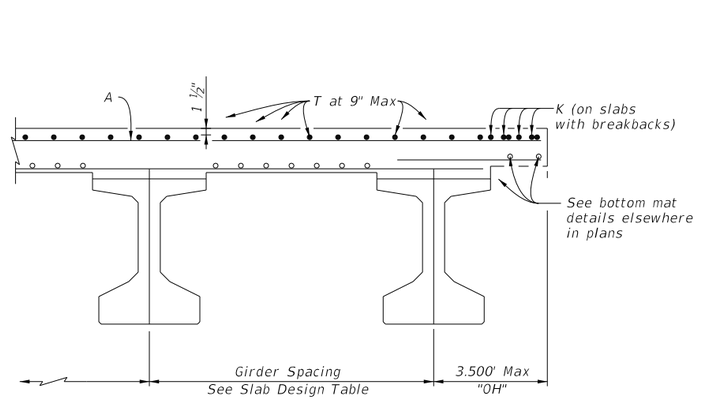


SECTION B-B

Showing Thickened Slab End with PCP Option 1. Option 2 similar.



PARTIAL TYPICAL TRANSVERSE SECTION



SECTION OF THICKENED SLAB END

Showing PCP Option 1. Option 2 similar.

1. Place Bars 0A midway between Bars A at overhang.
2. Bars are continuous through joint.
3. Thickened slab end dimensioned perpendicular to face of bkwl, centerline interior bent or face of inverted-T stem.

HL93 LOADING SHEET 1 OF 2

Texas Department of Transportation — Bridge Division Standard

GFRP SLAB TOP MAT REINFORCEMENT

PRESTRESSED CONC I-GIRDER SPANS

IGFRP

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©TxDOT August 2017	CONT	SECT	JOB	HIGHWAY
REVISIONS 10-19: Updated to latest design specification.	0090	05	107	IH40
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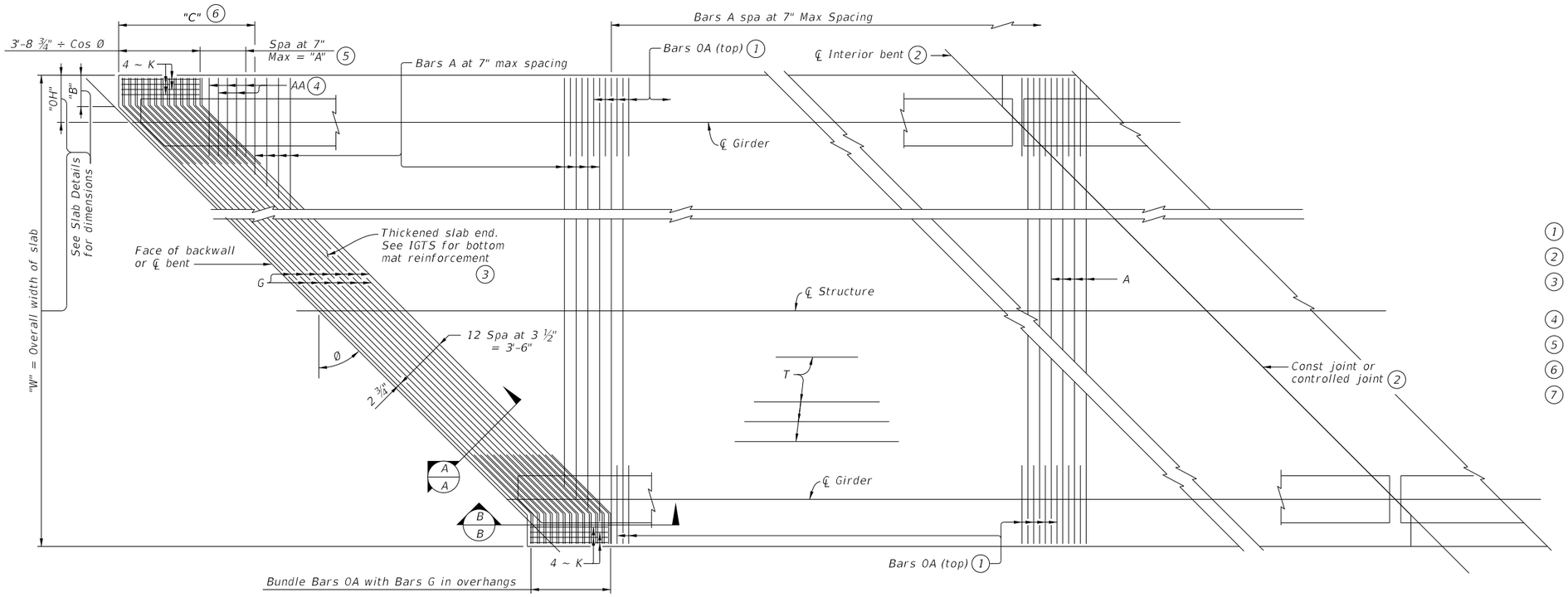
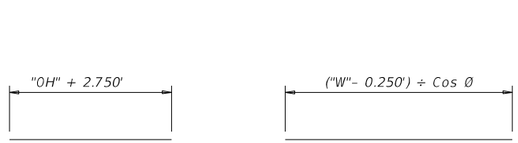


AT THICKENED SLAB END

PLAN FOR SLABS WITH BREAKBACKS

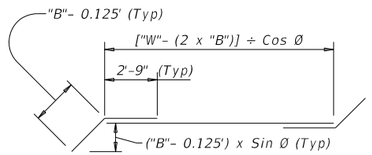
Showing top mat reinforcement only.

AT SLAB CONTINUOUS OVER INTERIOR BENTS

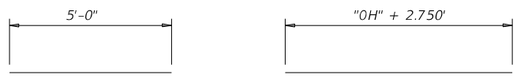


BARS AA (#5) (7)

BARS G (#5)
(For slabs without breakbacks)

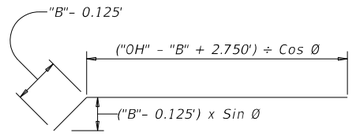


BARS G (#5)
(For slabs with breakbacks)



BARS K (#5) (7)

BARS OA (#5)



BARS OA (#5)
(For slabs with breakbacks)

BAR TABLE

BAR	SIZE
A	#5
AA	#5
G	#5
K	#5
0A	#5
T	#5

(1) Place Bars 0A midway between Bars A at overhang.

(2) Bars are continuous through joint.

(3) Thickened slab end dimensioned perpendicular to face of bkwl, centerline interior bent or face of inverted-T stem.

(4) Tie Bars AA to bottom of Bars G in this location.

(5) A = ("0H" + 2.333' - "B") x Tan Ø

(6) $C = \frac{3.729'}{\cos \emptyset} + \text{"A"} + \text{Bar A spacing}$

(7) Only required on slabs with breakbacks.

GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications and AASHTO LRFD Bridge Design Guide Specifications for GFRP-Reinforced Concrete, 2nd Edition.

These details are restricted to Prestressed Concrete I-Girder spans with an 8 ½" slab and up to a 10'-0" girder spacing.

These details are to be used in conjunction with the Span Details and PCP Standard (if prestressed concrete panels are used).

This standard provides Glass Fiber Reinforced Polymer (GFRP) reinforcement details for the top mat of slab reinforcement. The bottom mat reinforcement and other slab details are as shown elsewhere in the plans.

The Contractor has the option to provide GFRP reinforcement, in accordance with the details shown, when epoxy-coated steel bars are specified for the deck slab. The Contractor may provide an alternate GFRP slab design with calculations signed and sealed by a Professional Engineer.

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

MATERIAL NOTES:

Provide GFRP bars, conforming to ASTM D7957/7957M, except provide a minimum modulus of elasticity of 7,500 ksi.

Provide Grade 60 steel bars for all bottom mat reinforcement as shown elsewhere in plans.

Provide bar laps, where required, as follows:
#5 GFRP bar = 2'-9"

HL93 LOADING

Texas Department of Transportation

Bridge Division Standard

GFRP SLAB TOP MAT REINFORCEMENT

PRESTRESSED CONC I-GIRDER SPANS

IGFRP

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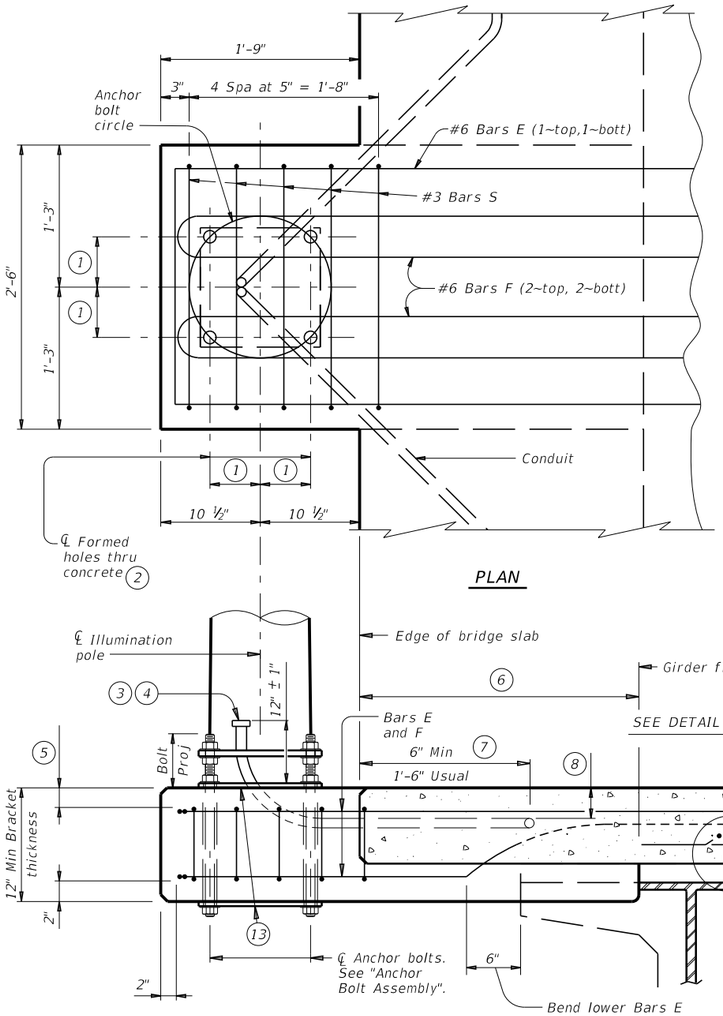
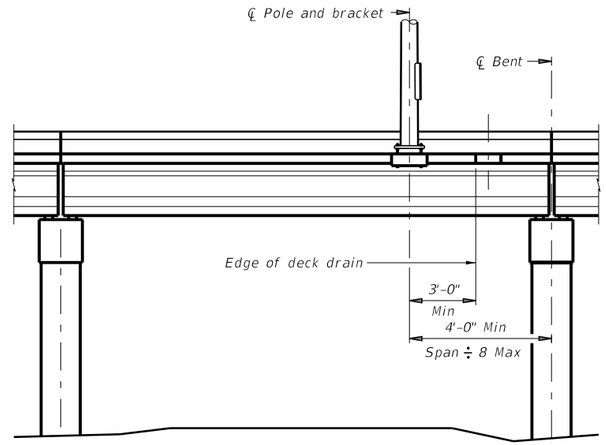


PLAN

ELEVATION
(Structures with overhanging slabs)

ILLUMINATION POLE BRACKET LOCATION AND REINFORCING



TYPICAL BRIDGE ELEVATION

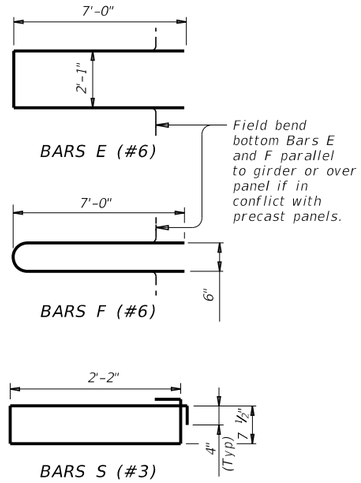


TABLE OF ANCHOR BOLT AND ANCHOR BOLT PLATE INFORMATION

ANCHOR BOLT CIRCLE DIAMETER	ANCHOR BOLT OFFSET	ANCHOR BOLT DIAMETER	ANCHOR BOLT HOLE SIZE		TOP AND BOTTOM ANCHOR BOLT PLATE SIZE	CENTER HOLE DIAMETER IN TOP ANCHOR BOLT PLATE
			CONCRETE	STEEL		
IN	IN	IN	IN	IN	IN	IN
13	4 ⅝	1	1 ¼	1 ¼	PL ½ X 13 X 1'-1"	9 ½
15	5 5/16	1 ¼	1 ½	1 ½	PL ½ X 15 ½ X 1'-3 ½"	10 ½

ESTIMATED QUANTITIES~ONE BRACKET

ITEM	UNIT	QUANTITY
CONCRETE (9) (10)	CY	0.2
REINFORCING STEEL (10)	LB	146
STRUCTURAL STEEL (10) (11)	LB	112
CONDUIT (12)	LF	4

(1) See table for anchor bolt offset dimension.
(2) See table for hole diameter size.
(3) If lighting is to be placed on future contract, extend conduit only 6" and provide water tight cap.
(4) Ream burrs and install bell ends or bushings on all conduit ends.
(5) Provide same clear cover required for bridge slab. Place Bars E and F beneath top slab reinforcing only if necessary to provide this cover.
(6) If slab edge to girder flange edge exceeds 3'-11", lengthen Bars E and F proportionally to ensure Bars E and F extend 1'-6" Min beyond girder flange edge.
(7) Clear rail anchors, drains, etc 1 ½" Min.
(8) 1 ½" Min cover and always beneath top layer slab reinforcing.
(9) Variation due to slab thickness is insignificant.
(10) For Contractor's information only.
(11) Anchor bolts, nuts, washers, and 2 plates. Verify anchor bolt lengths prior to ordering.
(12) Additional to main run (size and type as shown elsewhere on the plans).
(13) See "Anchor Bolt Assembly", "Anchor Bolt Plate", and table for anchor bolt, and anchor bolt plate information.

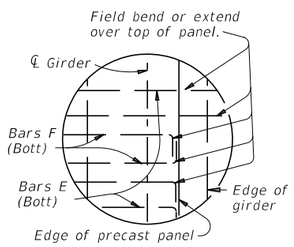
MATERIAL NOTES:

Galvanize anchor bolts, nuts, washers, and anchor bolt plates. Repair galvanizing damage from tack welding per Item 445, "Galvanizing".
Provide Grade 60 reinforcing steel.
Epoxy coat or galvanize all reinforcing steel if slab bars are epoxy coated or galvanized.
Concrete for Illumination Pole Brackets must be of the same type and placed monolithically with the bridge slab. The bracket quantity is considered subsidiary to the Item "Reinforced Concrete Slab".

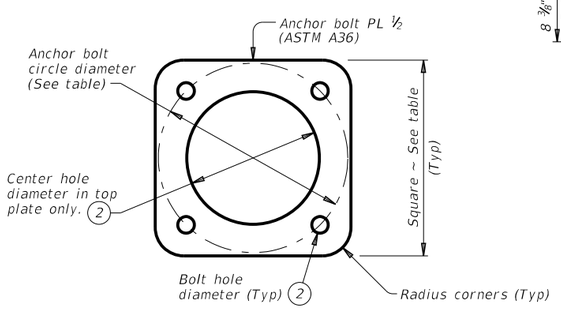
GENERAL NOTES:

Designed for up to 50 ft light pole with one 12 ft arm, 60 lb luminaire with 1.6 sq ft EPA at maximum design wind speed of 110 mph (3 second gusts). A special design is required if luminaire mounting height exceeds 100 ft above average surrounding terrain.
The anchor bolts, nuts, washers, and anchor bolt plates are subsidiary to the Item "Roadway Illumination Assemblies".
The type and size of conduit, the anchor bolt circle diameter, and the number and location of brackets is shown elsewhere on the plans. Brackets found to conflict with other components of the bridge may be relocated as necessary.
See Roadway Illumination Poles standard for details and notes not shown.

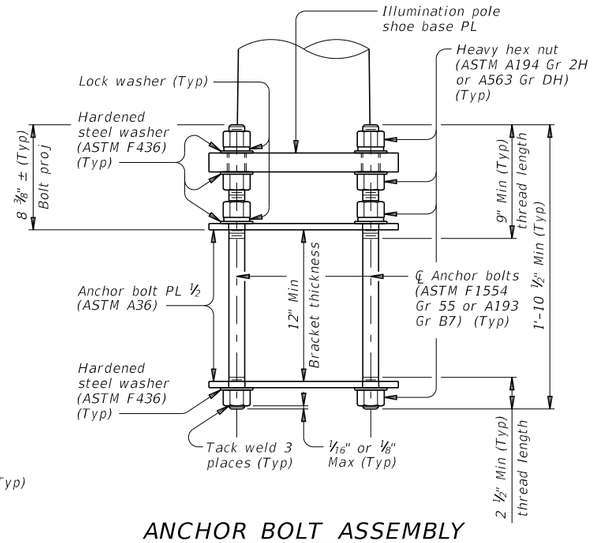
Cover dimensions are clear dimensions, unless noted otherwise.
Reinforcing bar dimensions shown are out-to-out of bar.



DETAIL "A"



ANCHOR BOLT PLATE



ANCHOR BOLT ASSEMBLY

(See table for anchor bolt diameter)

Texas Department of Transportation
Bridge Division Standard

BRIDGE LIGHTING DETAILS

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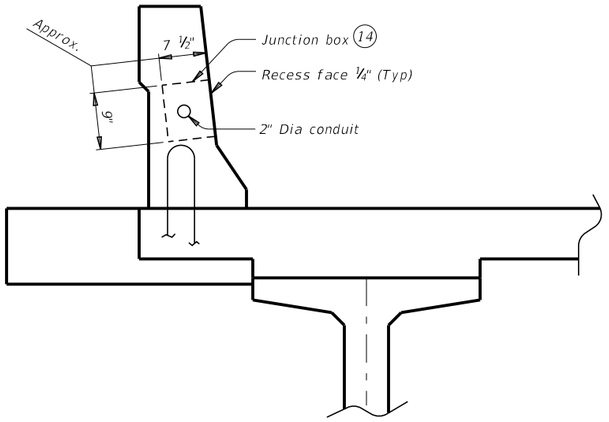
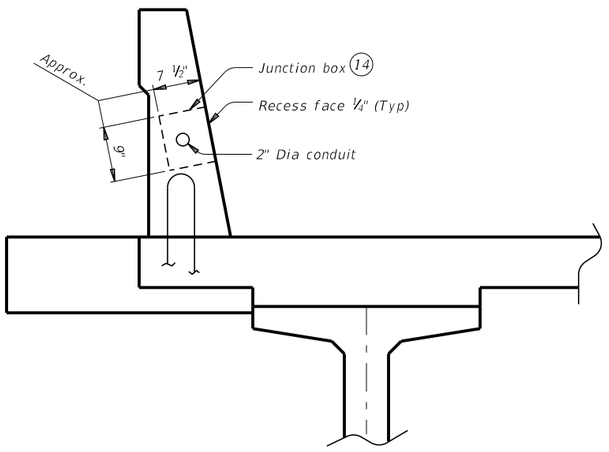


SHOWING T551, T552, AND T80HT



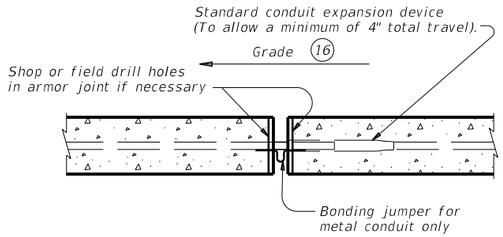
SHOWING SSTR AND T80SS

(4) Ream burrs and install bell ends or bushings on all conduit ends.

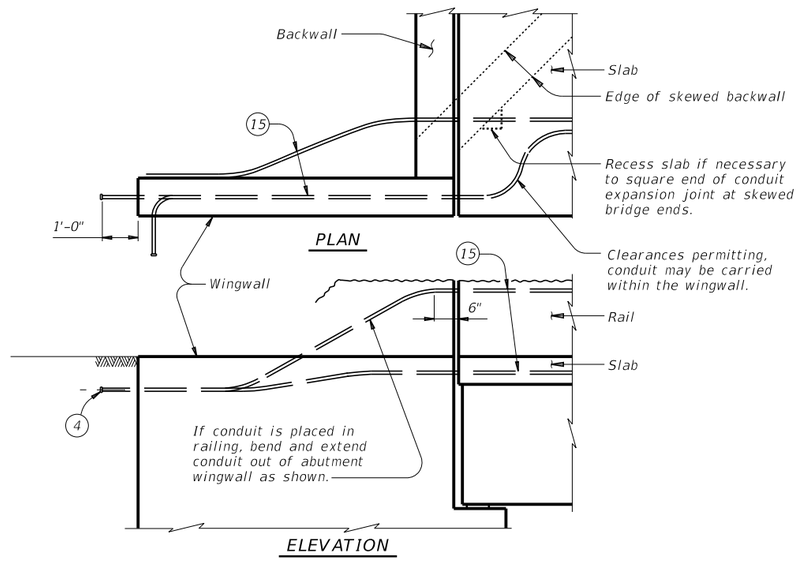
(14) Provide polymer concrete junction boxes meeting the requirements of DMS 11030.

(15) Position of conduit shown elsewhere on the plans or as directed by the Engineer.

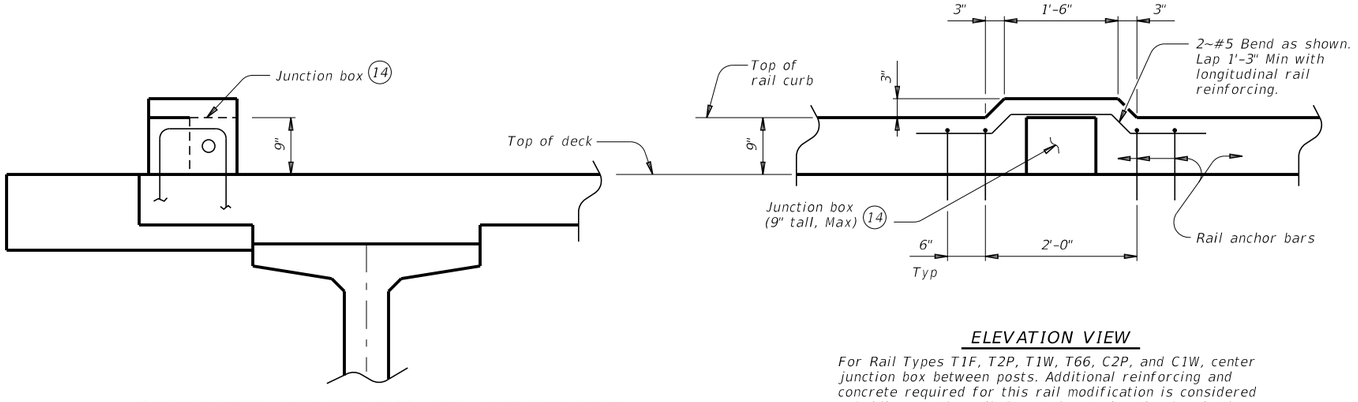
(16) Place conduit expansion device on high side of expansion joint.



CONDUIT EXPANSION JOINT



TREATMENT AT END OF BRIDGE



SHOWING T1F, T2P, T1W, T66, C2P, AND C1W CURB

See Elevation View for curb modifications

ELEVATION VIEW

For Rail Types T1F, T2P, T1W, T66, C2P, and C1W, center junction box between posts. Additional reinforcing and concrete required for this rail modification is considered subsidiary to the rail. Do not locate junction box in the same bay as a drain slot in rail curb.

JUNCTION BOX LOCATION

Use these details as a guide in locating junction boxes in rail types not shown.

Texas Department of Transportation

Bridge Division Standard

BRIDGE LIGHTING DETAILS

BL

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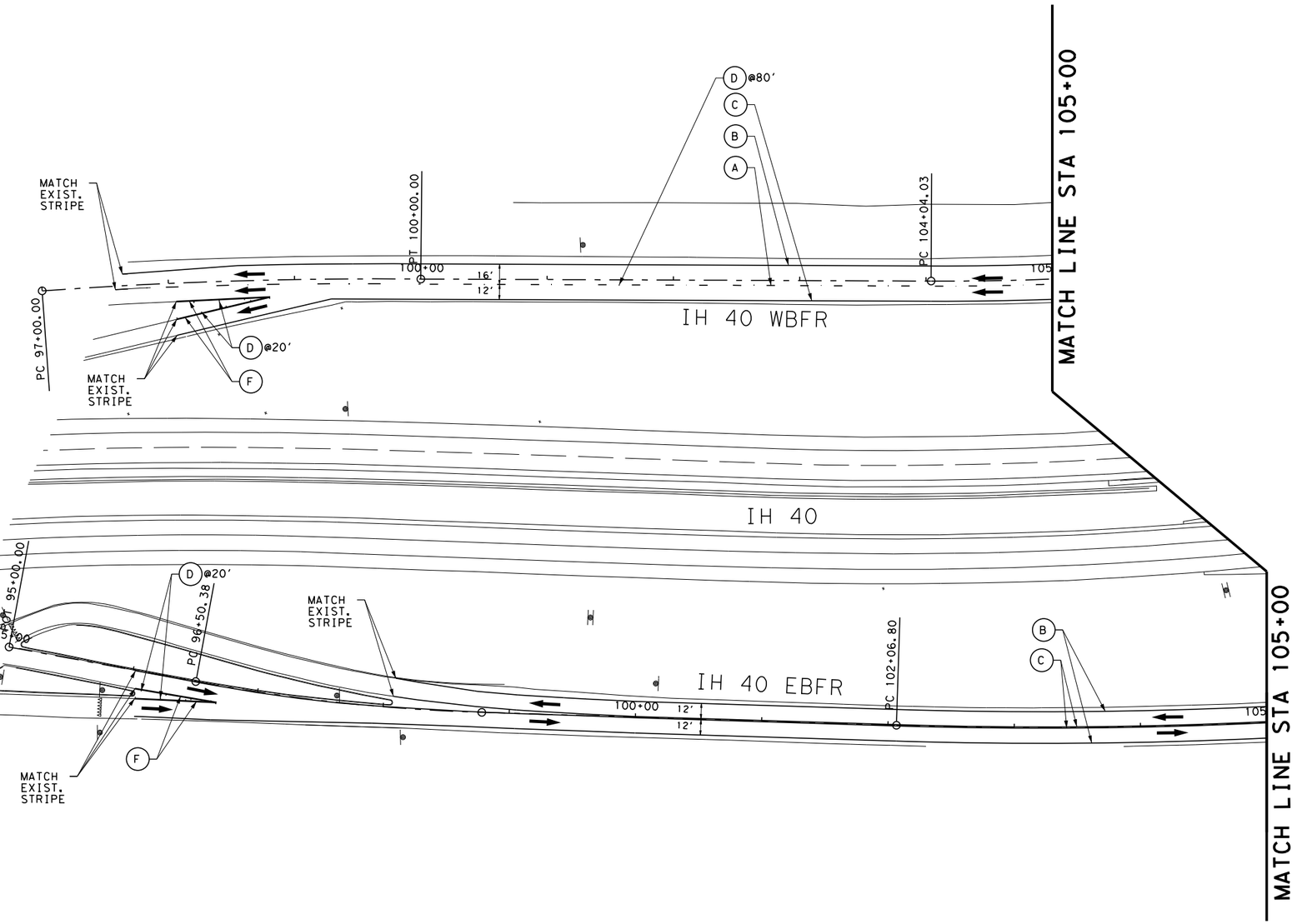


50 0 50 100
SCALE: 1" = 100'

LEGEND

- (A) HPPM W/RET REQ TY I(W)(6")(BRK)(90MIL)
- (B) HPPM W/RET REQ TY I(W)(6")(SLD)(90MIL)
- (C) HPPM W/RET REQ TY I(Y)(6")(SLD)(90MIL)
- (D) RAIS PAV MRK (REFL) TY II-C-R
- (E) PREFAB PAV MRK TY C (W) (24") (SLD)
- (F) HPPM W/RET REQ TY I(W)(8")(SLD)(90MIL)
- (G) REFL PAV MRK TY I (W) (4") (DOT)
  3' MRK - 3' GAP PATTERN
- (I) PREFAB PAV. MRK. TY C (W) (U- TURN ARROW)
- (J) PREFAB PAV. MRK. TY C (W) (WORD)
- (K) PREFAB PAV MRK TY I (W) 18" (YIELD TRIANGLE)
- (L) RELOCATE EXISTING ROADSIDE SIGN ASSEMBLY AWAY FROM RETAINING WALL PER TXDOT STANDARD DETAILS. APPROXIMATE 150' WEST SUBJECT TO ENGINEERS APPROVAL.

DEL ASSEM (D-SW)SZ I (BRF) GF2 (BI)
DEL ASSM (D-SY) SZ (BRF) CTB (BI)

STATE OF TEXAS
DAVID ALLEN HOWARD
69370
LICENSED
PROFESSIONAL ENGINEER
12-11-2023

NO.	DATE	DESCRIPTION	APPROV.

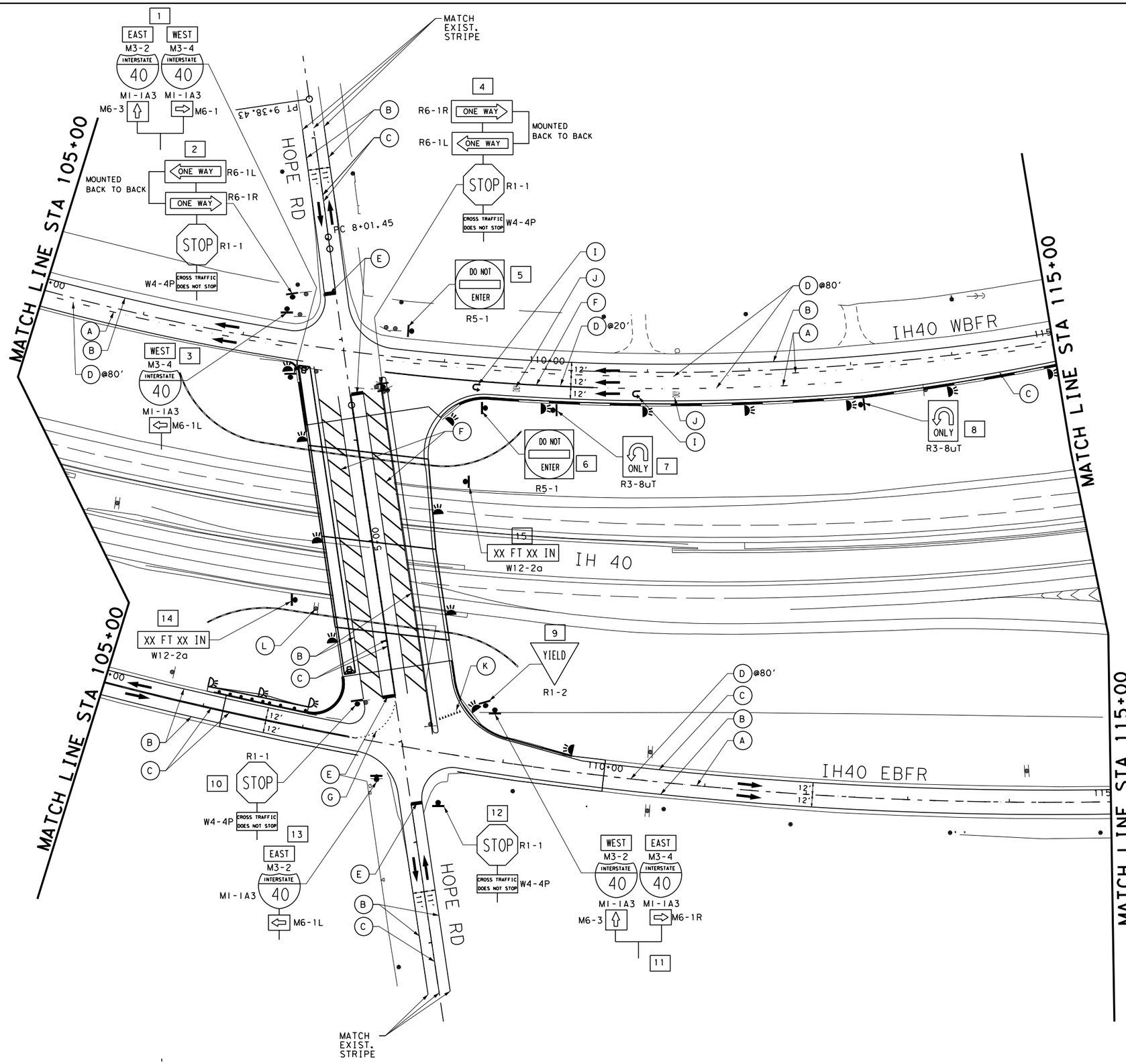
2M ASSOCIATES
2M ASSOCIATES, LLC
5930 PRESTON VIEW BLVD., SUITE A
DALLAS, TEXAS 75240
TBPE REGISTRATION NO.12158
PH. 214.663-1377
FAX 888-528-9180

HOPE ROAD

PAVEMENT MARKING AND SIGNAGE STA BEGIN TO STA 105+00

SHEET 1 OF 5

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DH	6	SEE TITLE SHEET		IH 40
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
MK	TEXAS	AMA	POTTER	162
CHECK	CONTROL	SECTION	JOB	
AM	0090	05	107	
CHECK				
DH				



LEGEND

- (A) HPPM W/RET REQ TY I(W)(6")(BRK)(90MIL)
- (B) HPPM W/RET REQ TY I(W)(6")(SLD)(90MIL)
- (C) HPPM W/RET REQ TY I(Y)(6")(SLD)(90MIL)
- (D) RAIS PAV MRK (REFL) TY II-C-R
- (E) PREFAB PAV MRK TY C (W) (24") (SLD)
- (F) HPPM W/RET REQ TY I(W)(8")(SLD)(90MIL)
- (G) REFL PAV MRK TY I (W) (4") (DOT)
  3' MRK - 3' GAP PATTERN
- (I) PREFAB PAV. MRK. TY C (W) (U- TURN ARROW)
- (J) PREFAB PAV. MRK. TY C (W) (WORD)
- (K) PREFAB PAV MRK TY I (W) 18" (YIELD TRIANGLE)
- (L) RELOCATE EXISTING ROADSIDE SIGN ASSEMBLY AWAY FROM RETAINING WALL PER TXDOT STANDARD DETAILS. APPROXIMATE 150' WEST SUBJECT TO ENGINEERS APPROVAL.

DEL ASSEM (D-SW)SZ I (BRF) GF2 (BI)
DEL ASSM (D-SY) SZ (BRF) CTB (BI)

[#] SIGN NUMBER

STATE OF TEXAS
DAVID ALLEN HOWARD
69370
LICENSED PROFESSIONAL ENGINEER
12-11-2023

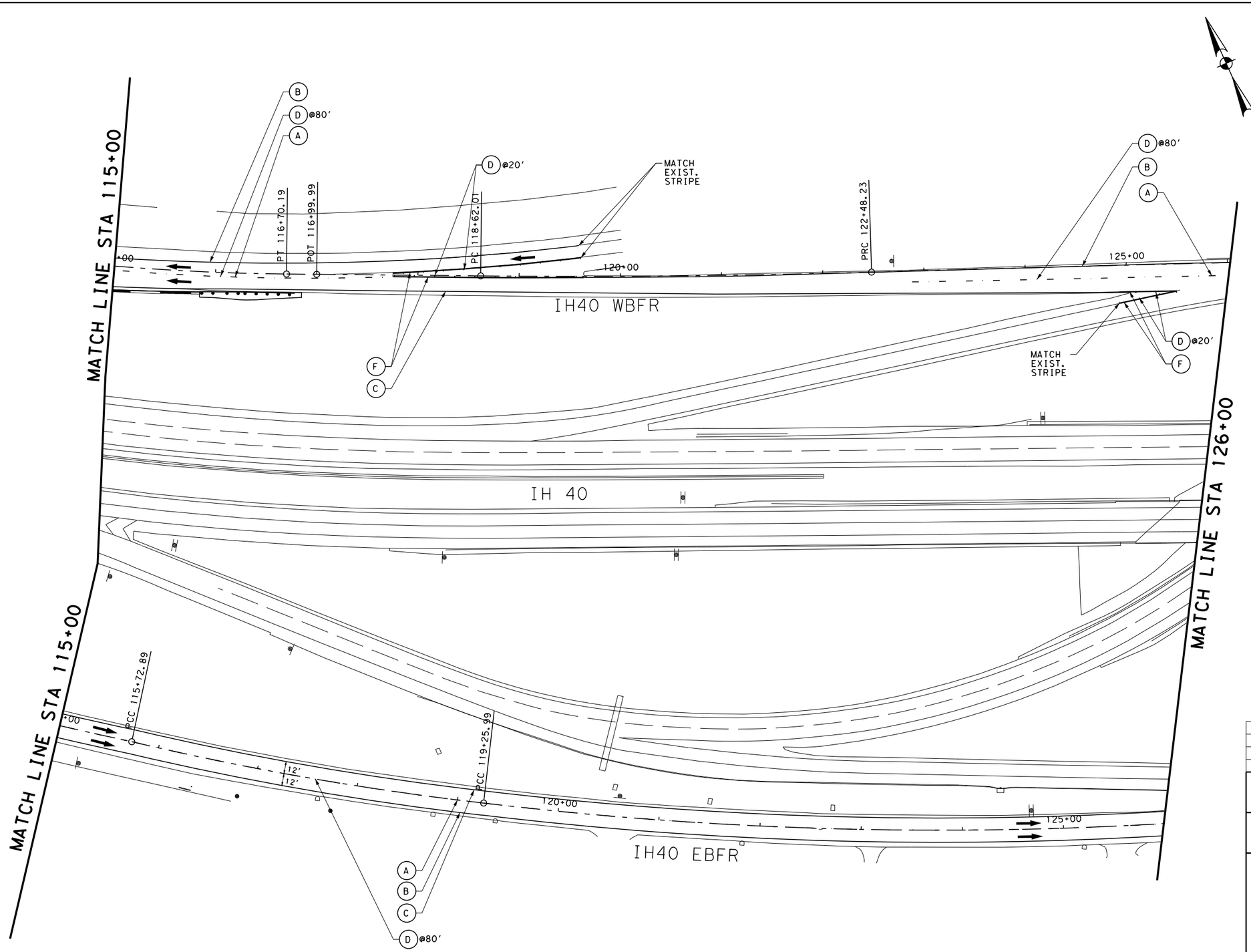
NO.	DATE	DESCRIPTION	APPROV.

2M ASSOCIATES
2M ASSOCIATES, LLC
5930 PRESTON VIEW BLVD., SUITE A
DALLAS, TEXAS 75240
TBPE REGISTRATION NO.12158
PH. 214.693-1377
FAX 888-528-0180

HOPE ROAD
PAVEMENT MARKING AND SIGNAGE STA 105+00 TO 115+00

SHEET 2 OF 5

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DH	6	SEE TITLE SHEET		IH 40
GRAPHICS MK	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK AM	TEXAS	AMA	POTTER	163
CHECK DH	CONTROL	SECTION	JOB	
	0090	05	107	



50 0 50 100
SCALE: 1" = 100'

LEGEND

- (A) HPPM W/RET REQ TY I(W)(6")(BRK)(90MIL)
- (B) HPPM W/RET REQ TY I(W)(6")(SLD)(90MIL)
- (C) HPPM W/RET REQ TY I(Y)(6")(SLD)(90MIL)
- (D) RAIS PAV MRK (REFL) TY II-C-R
- (E) PREFAB PAV MRK TY C (W) (24") (SLD)
- (F) HPPM W/RET REQ TY I(W)(8")(SLD)(90MIL)
- (G) REFL PAV MRK TY I (W) (4") (DOT)
  3' MRK - 3' GAP PATTERN
- (I) PREFAB PAV. MRK. TY C (W) (U- TURN ARROW)
- (J) PREFAB PAV. MRK. TY C (W) (WORD)
- (K) PREFAB PAV MRK TY I (W) 18" (YIELD TRIANGLE)
- (L) RELOCATE EXISTING ROADSIDE SIGN ASSEMBLY AWAY FROM RETAINING WALL PER TXDOT STANDARD DETAILS. APPROXIMATE 150' WEST SUBJECT TO ENGINEERS APPROVAL.

DEL ASSEM (D-SW)SZ I (BRF) GF2 (BI)
DEL ASSM (D-SY) SZ (BRF) CTB (BI)

STATE OF TEXAS
DAVID ALLEN HOWARD
69370
LICENSED
PROFESSIONAL ENGINEER
12-11-2023

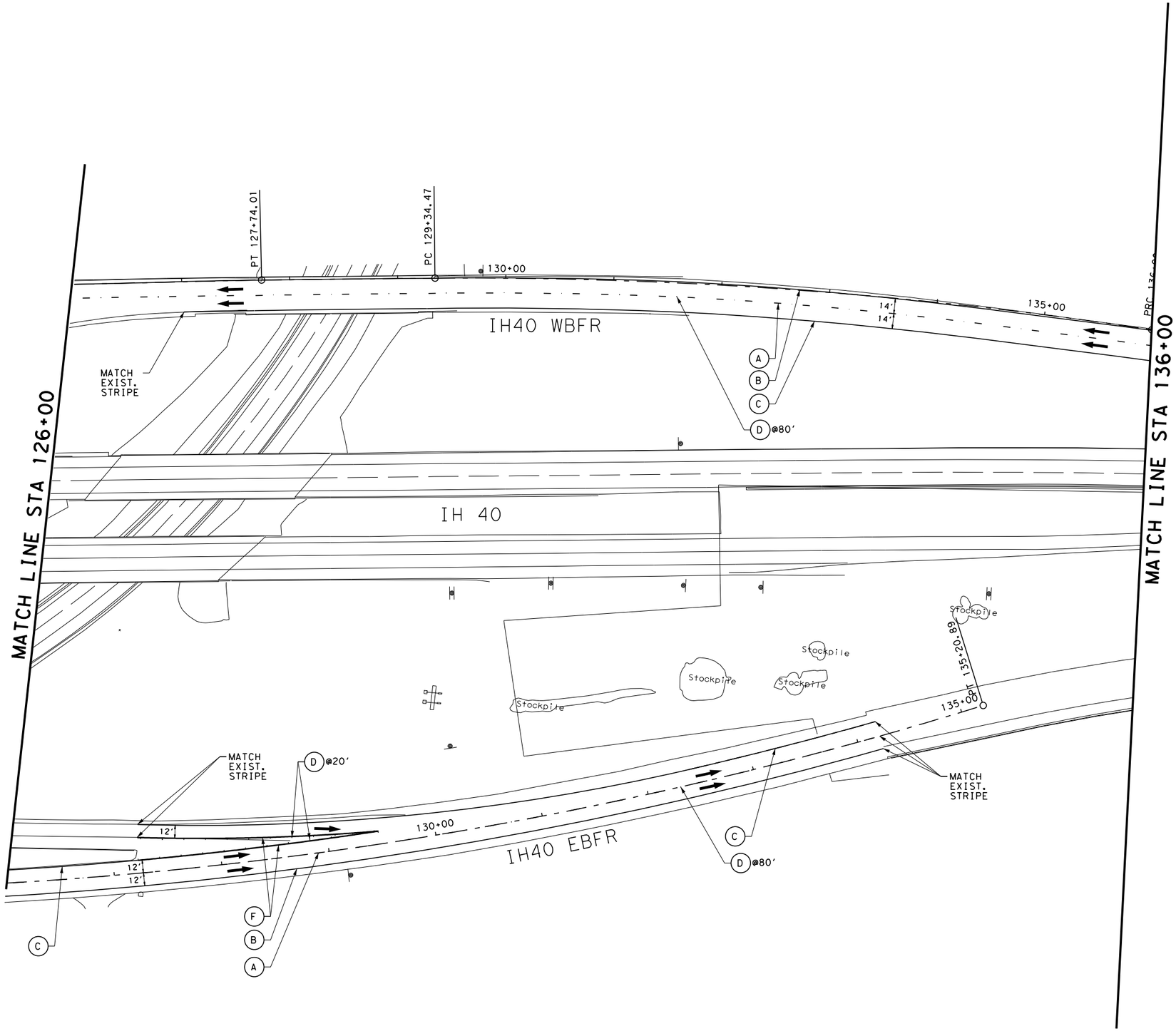
NO.	DATE	DESCRIPTION	APPROV.

2M ASSOCIATES, LLC
5930 PRESTON VIEW BLVD., SUITE A
DALLAS, TEXAS 75240
TBPE REGISTRATION NO.12158
PH. 214.683-1377
FAX 888-528-9180

HOPE ROAD
PAVEMENT MARKING AND SIGNAGE
STA 115+00 TO 126+00

SHEET 3 OF 5

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DH	6	SEE TITLE SHEET		IH 40
GRAPHICS MK	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK AM	TEXAS	AMA	POTTER	164
CHECK DH	CONTROL	SECTION	JOB	
	0090	05	107	



50 0 50 100
SCALE: 1" = 100'

LEGEND

- (A) HPPM W/RET REQ TY I(W)(6")(BRK)(90MIL)
- (B) HPPM W/RET REQ TY I(W)(6")(SLD)(90MIL)
- (C) HPPM W/RET REQ TY I(Y)(6")(SLD)(90MIL)
- (D) RAIS PAV MRK (REFL) TY II-C-R
- (E) PREFAB PAV MRK TY C (W) (24") (SLD)
- (F) HPPM W/RET REQ TY I(W)(8")(SLD)(90MIL)
- (G) REFL PAV MRK TY I (W) (4") (DOT)
  3' MRK - 3' GAP PATTERN
- (I) PREFAB PAV. MRK. TY C (W) (U- TURN ARROW)
- (J) PREFAB PAV. MRK. TY C (W) (WORD)
- (K) PREFAB PAV MRK TY I (W) 18" (YIELD TRIANGLE)
- (L) RELOCATE EXISTING ROADSIDE SIGN ASSEMBLY AWAY FROM RETAINING WALL PER TXDOT STANDARD DETAILS. APPROXIMATE 150' WEST SUBJECT TO ENGINEERS APPROVAL.

DEL ASSEM (D-SW)SZ I (BRF) GF2 (BI)
DEL ASSM (D-SY) SZ (BRF) CTB (BI)

STATE OF TEXAS
DAVID ALLEN HOWARD
69370
LICENSED
PROFESSIONAL ENGINEER
12-11-2023

NO.	DATE	DESCRIPTION	APPROV.

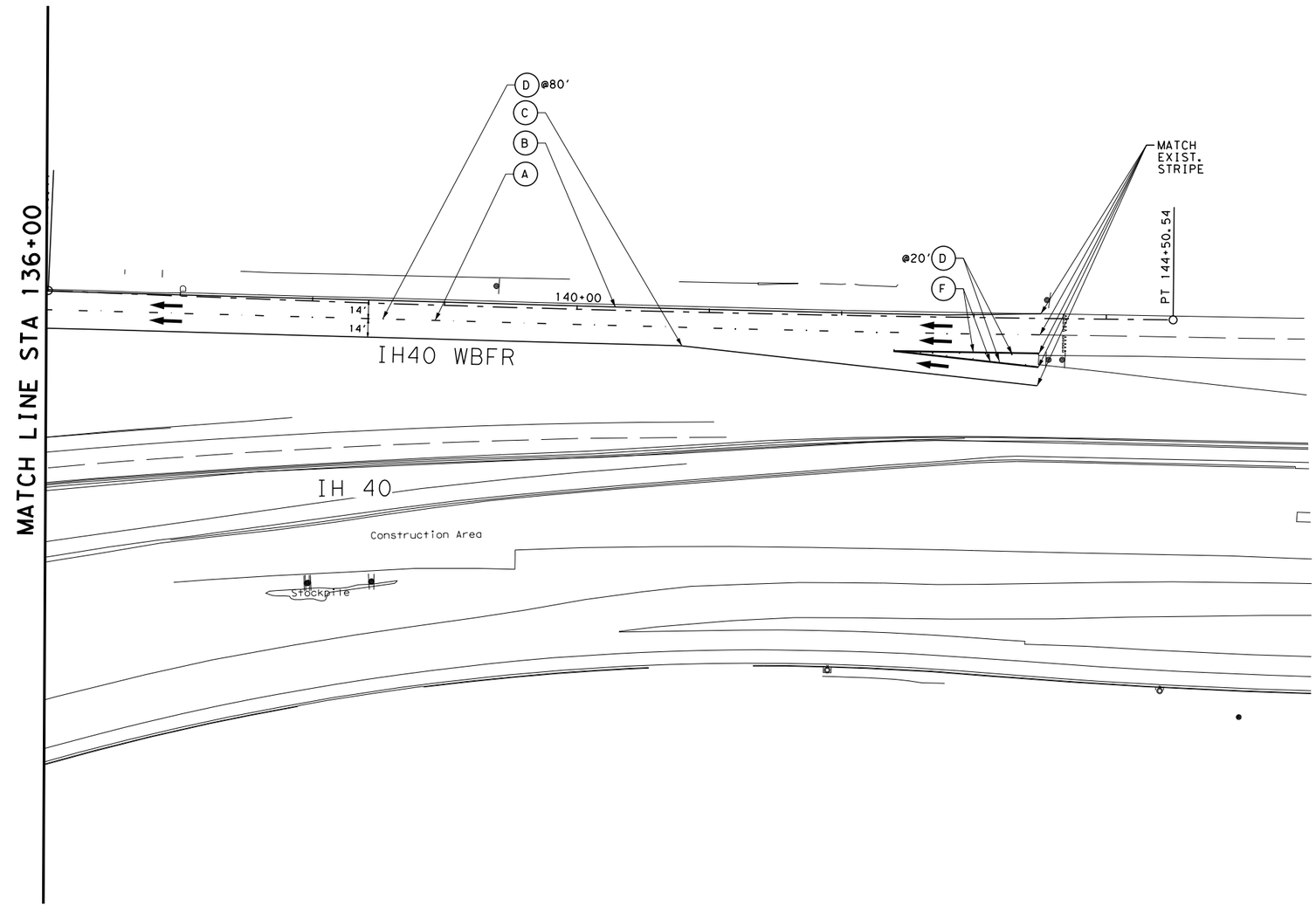
2M ASSOCIATES, LLC
5930 PRESTON VIEW BLVD., SUITE A
DALLAS, TEXAS 75240
TBPE REGISTRATION NO.12158
PH. 214.693-1377
FAX 888-528-0180

HOPE ROAD

PAVEMENT MARKING AND SIGNAGE STA 126+00 TO STA 136+00

SHEET 4 OF 5

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DH	6	SEE TITLE SHEET		IH 40
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
MK	TEXAS	AMA	POTTER	165
CHECK	CONTROL	SECTION	JOB	
AM	0090	05	107	
CHECK				
DH				



50 0 50 100
SCALE: 1" = 100'

LEGEND

- (A) HPPM W/RET REQ TY I(W)(6")(BRK)(90MIL)
- (B) HPPM W/RET REQ TY I(W)(6")(SLD)(90MIL)
- (C) HPPM W/RET REQ TY I(Y)(6")(SLD)(90MIL)
- (D) RAIS PAV MRK (REFL) TY II-C-R
- (E) PREFAB PAV MRK TY C (W) (24") (SLD)
- (F) HPPM W/RET REQ TY I(W)(8")(SLD)(90MIL)
- (G) REFL PAV MRK TY I (W) (4") (DOT)
  3' MRK - 3' GAP PATTERN
- (I) PREFAB PAV. MRK. TY C (W) (U- TURN ARROW)
- (J) PREFAB PAV. MRK. TY C (W) (WORD)
- (K) PREFAB PAV MRK TY I (W) 18" (YIELD TRIANGLE)
- (L) RELOCATE EXISTING ROADSIDE SIGN ASSEMBLY AWAY FROM RETAINING WALL PER TXDOT STANDARD DETAILS. APPROXIMATE 150' WEST SUBJECT TO ENGINEERS APPROVAL.

DEL ASSEM (D-SW)SZ I (BRF) GF2 (BI)
DEL ASSM (D-SY) SZ (BRF) CTB (BI)

STATE OF TEXAS
DAVID ALLEN HOWARD
69370
LICENSED
PROFESSIONAL ENGINEER
12-11-2023

NO.	DATE	DESCRIPTION	APPROV.

2M ASSOCIATES, LLC
5930 PRESTON VIEW BLVD., SUITE A
DALLAS, TEXAS 75240
TBPE REGISTRATION NO.12158
PH. 214.883-1377
FAX 888-528-9180

HOPE ROAD
PAVEMENT MARKING AND SIGNAGE STA 136+00 TO END

SHEET 5 OF 5

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DH	6	SEE TITLE SHEET		IH 40
GRAPHICS MK	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK AM	TEXAS	AMA	POTTER	166
CHECK DH	CONTROL 0090	SECTION 05	JOB 107	

SUMMARY OF SMALL SIGNS

SM RD SGN ASSM TY XXXXX (X) XX (X-XXXX)

PLAN SHEET NO.	SIGN NO.	SIGN NOMENCLATURE	SIGN	DIMENSIONS	FLAT ALUMINUM (TYPE A)	EXAL ALUMINUM (TYPE G)	POST TYPE FRP = Fiberglass TWT = Thin-Wall 10BWG = 10 BWG S80 = Sch 80	POSTS 1 or 2	ANCHOR TYPE UA=Universal Conc UB=Universal Bolt SA=Slipbase-Conc SB=Slipbase-Bolt WS=Wedge Steel WP=Wedge Plastic	MOUNTING DESIGNATION PREFABRICATED P = "Plain" T = "T" U = "U"	MOUNTING DESIGNATION 1EXT or 2EXT = # of Ext BM = Extruded Wind Beam WC = 1.12 #/ft Wing Channel EXAL= Extruded Alum Sign Panels	BRIDGE MOUNT CLEARANCE SIGNS (See Note 2) TY = TYPE TY N TY S
2	1	M3-2	EAST	24X12	X		10BWG	1	SA	U		
		M1-1A3	INTERSTATE 40	24X24	X							
		M6-3		21X15	X							
		M3-4	WEST	24X12	X							
		M1-1A3	INTERSTATE 40	24X24	X							
		M6-1		21X15	X							
2	2	R6-1L	ONE WAY (MOUNTED BACK TO BACK)	54X18	X		S80	1	SA	P	BM	
		R6-1R	ONE WAY	54X18	X							
		R1-1	STOP	36X36	X							
		W4-4P	CROSS TRAFFIC DOES NOT STOP	24X12	X							
2	3	M3-4	WEST	24X12	X		S80	1	SA	P		
		M1-1A3	INTERSTATE 40	24X24	X							
		M6-1L		21X15	X							
2	4	R6-1R	ONE WAY (MOUNTED BACK TO BACK)	54X18	X		S80	1	SA	P	BM	
		R6-1L	ONE WAY	54X18	X							
		R1-1	STOP	36X36	X							
		W4-4P	CROSS TRAFFIC DOES NOT STOP	24X12	X							
2	5	R5-1	DO NOT ENTER	48X48	X		S80	1	SA	T		
2	6	R5-1	DO NOT ENTER	48X48	X		S80	1	SA	T		
2	7	R3-8uT	ONLY	30X36	X		10BWG	1	SA	T		
2	8	R3-8uT	ONLY	30X36	X		10BWG	1	SA	T		
2	9	R1-2	YIELD	48X48X48	X		S80	1	SA	T		
2	10	R1-1	STOP	36X36	X		10BWG	1	SA	P	BM	
		W4-4P	CROSS TRAFFIC DOES NOT STOP	24X12	X							

ALUMINUM SIGN BLANKS THICKNESS	
Square Feet	Minimum Thickness
Less than 7.5	0.100"
7.5 or Greater	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).

2M ASSOCIATES, LLC
5930 PRESTON VIEW BLVD, SUITE A
DALLAS, TEXAS 75240
TBPE REGISTRATION NO.12158
PH. 214.663-1377
FAX 888-528-9180

Texas Department of Transportation

Traffic Operations Division Standard

HOPE ROAD
SUMMARY OF SMALL SIGNS

SOSS

SHEET 1 OF 2

FILE: XXXX	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT SEPT. 2022	CONT	SECT	JOB	HIGHWAY
REVISIONS	0090	05	107	IH40
4-16	DIST	COUNTY		SHEET NO.
8-16	AMA	POTTER		167

SUMMARY OF SMALL SIGNS

SM RD SGN ASSM TY XXXXX (X) XX (X-XXXX)

PLAN SHEET NO.	SIGN NO.	SIGN NOMENCLATURE	SIGN	DIMENSIONS	FLAT ALUMINUM (TYPE A)	EXAL ALUMINUM (TYPE G)	POST TYPE FRP = Fiberglass TWT = Thin-Wall 10BWG = 10 BWG S80 = Sch 80	POSTS 1 or 2	ANCHOR TYPE UA=Universal Conc UB=Universal Bolt SA=Slipbase-Conc SB=Slipbase-Bolt WS=Wedge Steel WP=Wedge Plastic	MOUNTING DESIGNATION PREFABRICATED P = "Plain" T = "T" U = "U"	MOUNTING DESIGNATION 1EXT or 2EXT = # of Ext BM = Extruded Wind Beam WC = 1.12 #/ft Wing Channel EXAL= Extruded Alum Sign Panels	BRIDGE MOUNT CLEARANCE SIGNS (See Note 2) TY = TYPE TY N TY S
2	11	M3-2	WEST	24X12	X		S80	1	SA	U		
		M1-1A3	INTERSTATE 40	24X24	X							
		M6-3	⇧	21X15	X							
		M3-4	EAST	24X12	X							
		M1-1A3	INTERSTATE 40	24X24	X							
		M6-1	⇨	21X15	X							
2	12	R1-1	STOP	36X36	X		S80	1	SA	P	BM	
		W4-4P	CROSS TRAFFIC DOES NOT STOP	24X12	X							
2	13	M3-2	EAST	24X12	X		S80	1	SA	P		
		M1-1A3	INTERSTATE 40	24X24	X							
		M6-1L	⇦	21X15	X							
2	14	W12-2a	XX FT XX IN	84X24	X		S80	1	SA	T		
2	15	W12-2a	XX FT XX IN	84X24	X		S80	1	SA	T		

ALUMINUM SIGN BLANKS THICKNESS	
Square Feet	Minimum Thickness
Less than 7.5	0.100"
7.5 or Greater	0.125"

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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).

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DALLAS, TEXAS 75240
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PH. 214.663-1377
FAX 888-528-9180

Texas Department of Transportation

Traffic Operations Division Standard

HOPE ROAD
SUMMARY OF SMALL SIGNS

SOSS

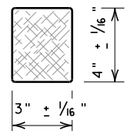
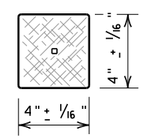
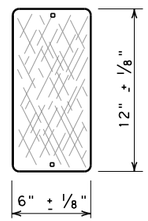
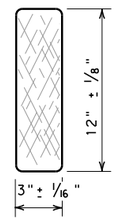
SHEET 2 OF 2

FILE: XXXX	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT SEPT. 2022	CONT	SECT	JOB	HIGHWAY
REVISIONS	0090	05	107	IH40
4-16	DIST	COUNTY		SHEET NO.
8-16	AMA	POTTER		168

c:\bms\bridgefarmer-pw\mkhan@two-rnm.com\dms214781\168 - 038402107-SIGN*SUM*02 .dgn
mkhan 12/7/2023 1:28:08 PM

DATE: 12/7/2023 1:29:06 PM
FILE: c:\dms\bridgefarmer-pw\mknan@two-mm.com\dms21478\169 - D & OM (1) - 20.dgn
mknan

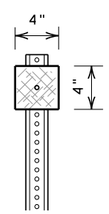
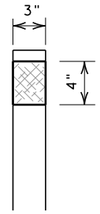
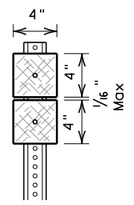
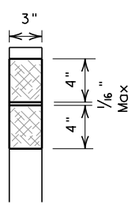
REFLECTOR UNIT SIZES FOR DELINEATORS AND OBJECT MARKERS

	SIZE 1	SIZE 2	SIZE 3	SIZE 4
DEVICE				
SHEETING	Yellow, White or Red Type B or C reflective sheeting			

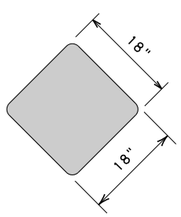
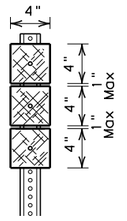
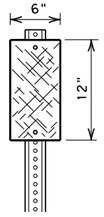
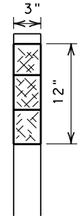
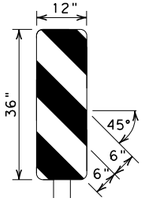
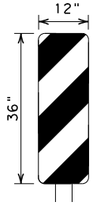
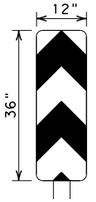
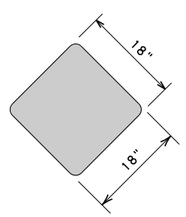
NOTE

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

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)

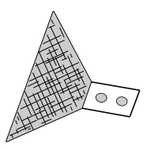
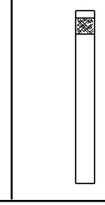
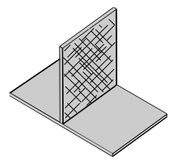
TYPE OF POST
WC = Wing Channel Post
WFLX = White Flexible Post
TWT = Thin Walled Tubing

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

BARRIER REFLECTORS (BRF)

	GF1	GF2	CTB
DEVICE			

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

SHEETING: Yellow, White, Red

NOTE
1. Reflective sheeting shall have a minimum dimension of 3 inches and minimum surface area of 9 square inches.

CHEVRONS

DEVICE:  W1-8

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

NOTE
1. CHEVRON (W1-8) signs and ONE DIRECTION LARGE ARROW (W1-6) Signs shall be installed per Sign Mounting Details (SMD) Standard Sheets and paid under Item 644 (Small Roadside Sign Assemblies).
2. When there is a need to increase conspicuity, the Texas version of the ONE DIRECTION LARGE ARROW sign (W1-9T) may be used instead of the ONE DIRECTION LARGE ARROW (W1-6).

ONE DIRECTION LARGE ARROW

DEVICE:  W1-6

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

NOTE:

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

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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	0090	05	107	IH40
10-09 3-15	DIST	COUNTY		SHEET NO.
4-10 7-20	AMA	POTTER		169

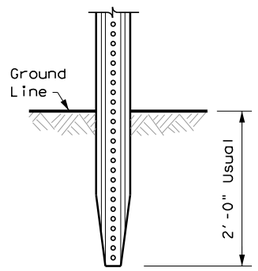
20A

DATE: 12/7/2023 1:30:07 PM
FILE: c:\bms\bridgefarmer-pw\mkhan@two-mm.com\dms21478\170 - D & OM (2) - 20.dgn
mkhan

POST TYPE AND SUPPORT FOUNDATION DETAILS

WING CHANNEL (WC)

GND

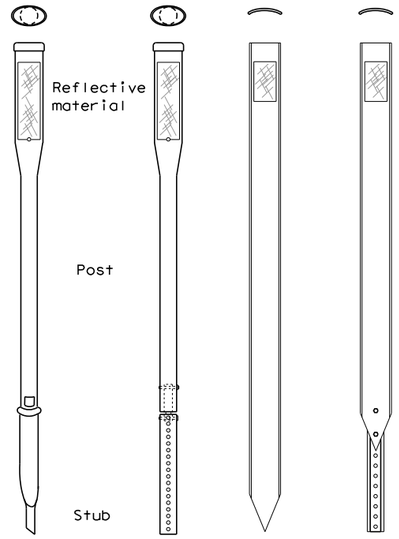


NOTES

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.

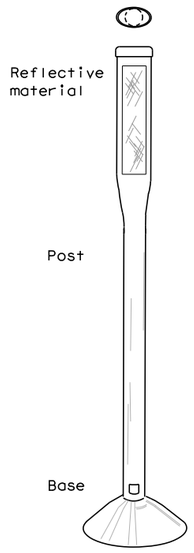
FLEXIBLE POSTS (YFLX, WFLX)

GND



EMBEDDED

SRF



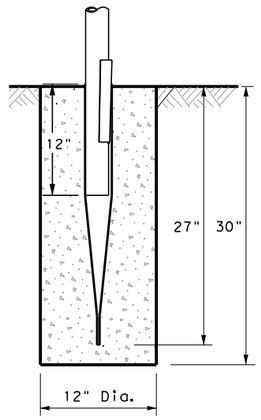
SURFACE MOUNT

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.

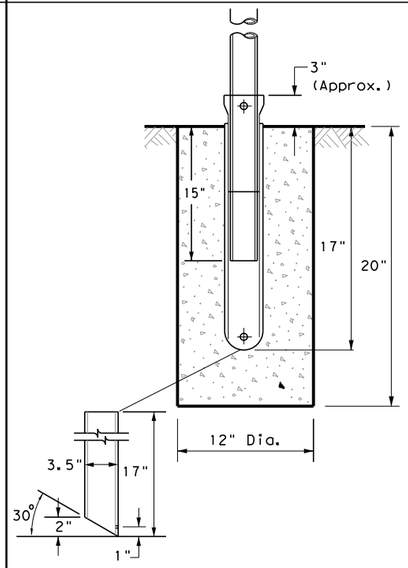
WEDGE ANCHOR SYSTEMS

WAS



STEEL

WAP



PLASTIC

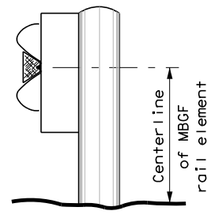
NOTE

1. Install per manufacturer's recommendations.

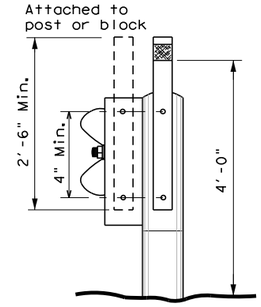
TYPE OF BARRIER MOUNTS

GUARD FENCE ATTACHMENT

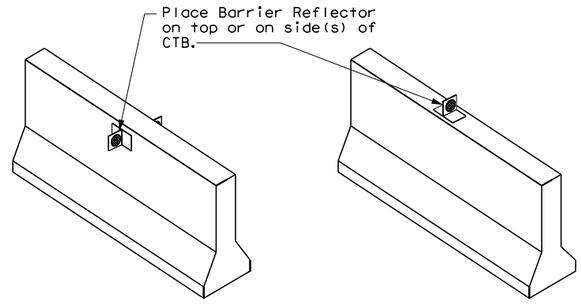
GF1



GF2



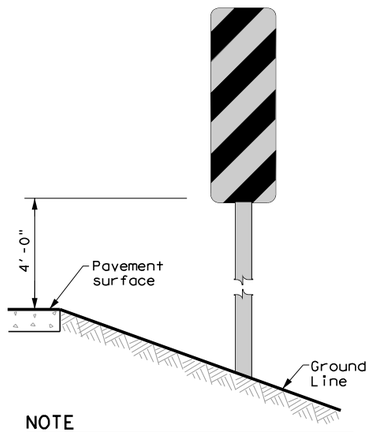
CONCRETE TRAFFIC BARRIER (CTB)



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.

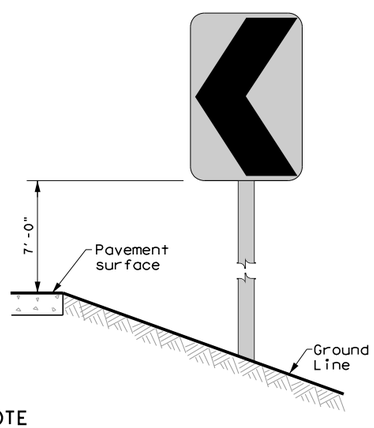
TYPES 1, 3, AND 4 OBJECT MARKERS AND CHEVRONS



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)

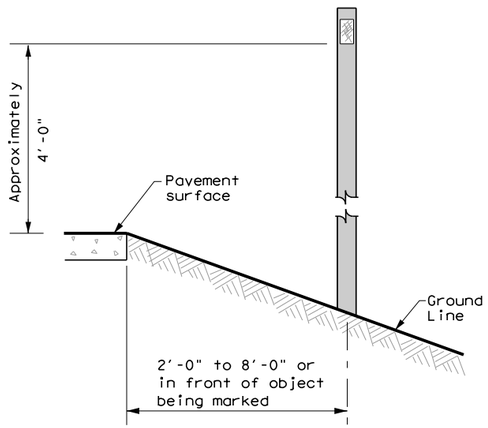
CHEVRONS AND ONE DIRECTION LARGE ARROW SIGN



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

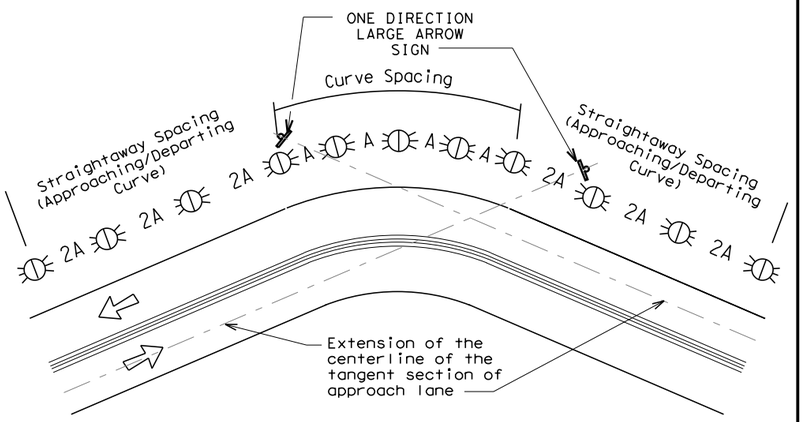
FILE: dom2-20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
©TxDOT August 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS	0090	05	107	IH40
10-09 3-15	DIST	COUNTY		SHEET NO.
4-10 7-20	AMA	POTTER		170

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 (35 MPH or more)
5 MPH & 10 MPH	• RPMs	• RPMs
15 MPH & 20 MPH	• RPMs and One Direction Large Arrow sign	• RPMs and Chevrons; or • RPMs and One Direction Large Arrow sign where geometric conditions or roadside obstacles prevent the installation of chevrons.
25 MPH & more	• RPMs and Chevrons; or • RPMs and One Direction Large Arrow sign where geometric conditions or roadside obstacles prevent the installation of chevrons	• RPMs and Chevrons

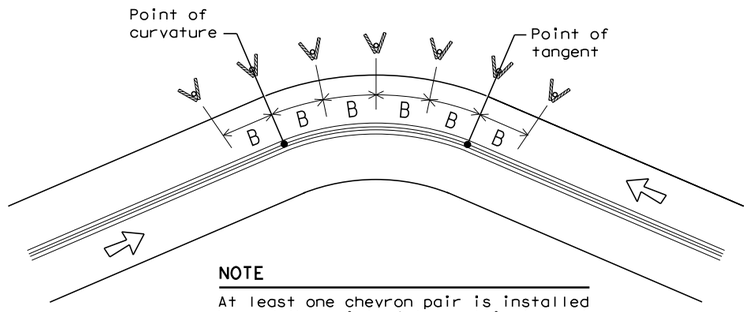
SUGGESTED SPACING FOR DELINEATORS ON HORIZONTAL CURVES



NOTE

ONE DIRECTION LARGE ARROW (W1-6) sign should be located at approximately and perpendicular to the extension of the centerline of the tangent section of approach lane.

SUGGESTED SPACING FOR CHEVRONS ON HORIZONTAL CURVES



NOTE

At least one chevron pair is installed beyond the point of tangent in tangent section.

DELINEATOR AND CHEVRON SPACING

WHEN DEGREE OF CURVE OR RADIUS IS KNOWN

Degree of Curve	FEET			
	Radius of Curve	Spacing in Curve	Spacing in Straightaway	Chevron Spacing in Curve
		A	2A	B
1	5730	225	450	——
2	2865	160	320	——
3	1910	130	260	200
4	1433	110	220	160
5	1146	100	200	160
6	955	90	180	160
7	819	85	170	160
8	716	75	150	160
9	637	75	150	120
10	573	70	140	120
11	521	65	130	120
12	478	60	120	120
13	441	60	120	120
14	409	55	110	80
15	382	55	110	80
16	358	55	110	80
19	302	50	100	80
23	249	40	80	80
29	198	35	70	40
38	151	30	60	40
57	101	20	40	40

Curve delineator approach and departure spacing should include 3 delineators spaced at 2A. This spacing should be used during design preparation or when the degree of curve is known.

DELINEATOR AND CHEVRON SPACING

WHEN DEGREE OF CURVE OR RADIUS IS NOT KNOWN

Advisory Speed (MPH)	Spacing in Curve	Spacing in Straightaway	Chevron Spacing in Curve
	A	2xA	B
65	130	260	200
60	110	220	160
55	100	200	160
50	85	170	160
45	75	150	120
40	70	140	120
35	60	120	120
30	55	110	80
25	50	100	80
20	40	80	80
15	35	70	40

If the degree of curve is not known, delineator spacing may be determined based on the Advisory Speed of the curve. Use the delineator curve spacing for each Advisory Speed (MPH).

DELINEATOR AND OBJECT MARKER APPLICATION AND SPACING

CONDITION	REQUIRED TREATMENT	MINIMUM SPACING
Frwy./Exp. Tangent	RPMs	See PM-series and FPM-series standard sheets
Frwy./Exp. Curve	Single delineators on right side	See delineator spacing table
Frwy/Exp.Ramp	Single delineators on at least one side of ramp (should be on outside of curves) (see Detail 3 on D&OM(4))	100 feet on ramp tangents Use delineator spacing table for ramp curves ("straightway spacing" does not apply to ramp curves)
Acceleration/Deceleration Lane	Double delineators (see Detail 3 on D&OM(4))	100 feet (See Detail 3 on D & OM (4))
Truck Escape Ramp	Single red delineators on both sides	50 feet
Bridge Rail (steel or concrete)and Metal Beam Guard Fence	Bi-Directional Delineators when undivided with one lane each direction Single Delineators when multiple lanes each direction	Equal spacing (100'max) but not less than 3 delineators
Concrete Traffic Barrier (CTB) or Steel Traffic Barrier	Barrier reflectors matching the color of the edge line	Equal spacing 100' max
Cable Barrier	Reflectors matching the color of the edge line	Every 5th cable barrier post (up to 100'max)
Guard Rail Terminus/Impact Head	Divided highway - Object marker on approach end Undivided 2-lane highways - Object marker on approach and departure end	Requires reflective sheeting provided by manufacturer per D & OM (VIA) or a Type 3 Object Marker (OM-3) in front of the terminal end See D & OM (5) and D & OM (6)
Bridges with no Approach Rail	Type 3 Object Marker (OM-3) at end of rail and 3 single delineators approaching rail	See D & OM(5)
Reduced Width Approaches to Bridge Rail	Type 2 and Type 3 Object Markers (OM-3) and 3 single delineators approaching bridge	Requires reflective sheeting provided by manufacturer per D & OM (VIA) or a Type 3 Object Marker (OM-3) in front of the terminal end See D & OM (5)
Culverts without MBGF	Type 2 Object Markers	See Detail 2 on D & OM(4)
Crossovers	Double yellow delineators and RPMs	See Detail 1 on D & OM (4)
Pavement Narrowing (lane merge) on Freeways/Expressway	Single delineators adjacent to affected lane for full length of transition	100 feet

NOTES

1. Unless indicated otherwise, the delineator or barrier reflector color shall conform to the color of the pavement edge line on the side of the road where the delineators or barrier reflectors are placed.
2. Barrier reflectors may be used to replace required delineators.
3. Single red delineators may be mounted on the back side of delineator posts for wrong way driver applications

LEGEND

	Bi-directional Delineator
	Delineator
	Sign

Texas Department of Transportation — Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER PLACEMENT DETAILS

D & OM(3)-20

FILE: dom3-20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
©TxDOT August 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS	0090	05	107	IH40
3-15 8-15	DIST	COUNTY		SHEET NO.
8-15 7-20	AMA	POTTER		171

20C

DATE: 12/7/2023 1:31:49 PM
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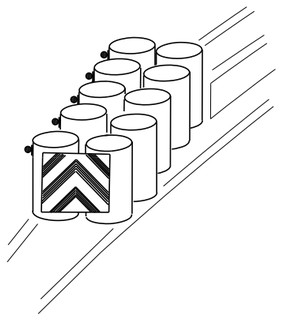
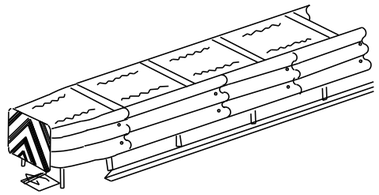
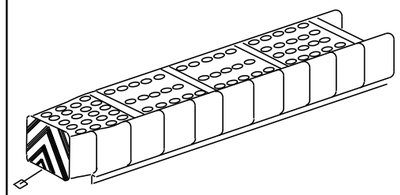
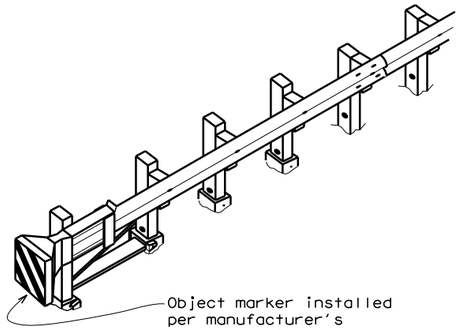
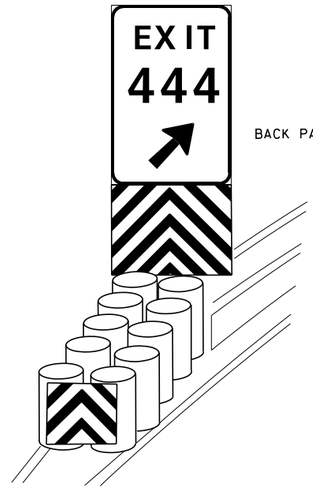
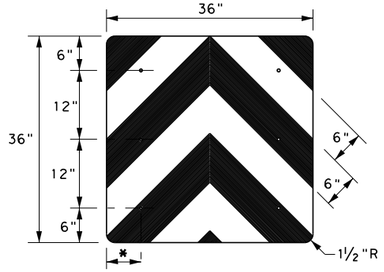


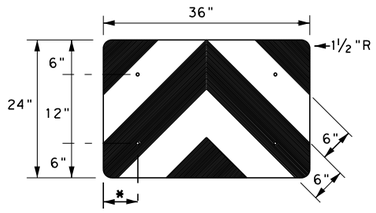




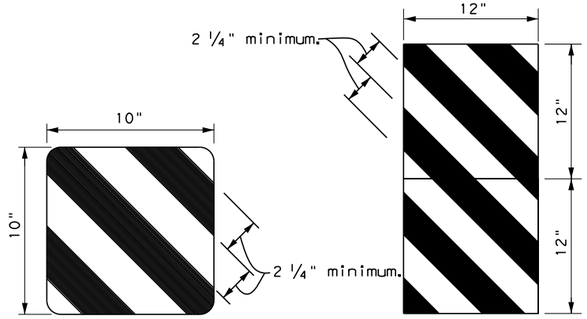




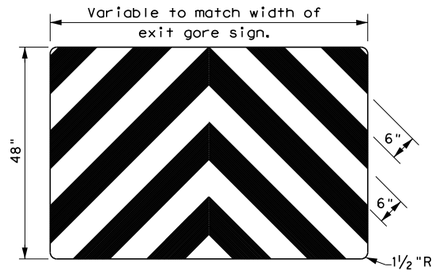


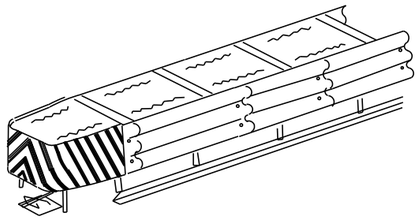


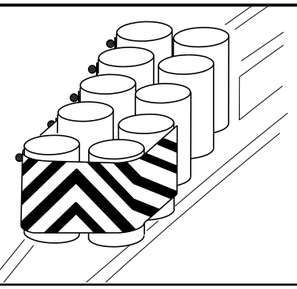
* Adjust to fit attenuator per manufacturer's recommendation, or as directed by the Engineer

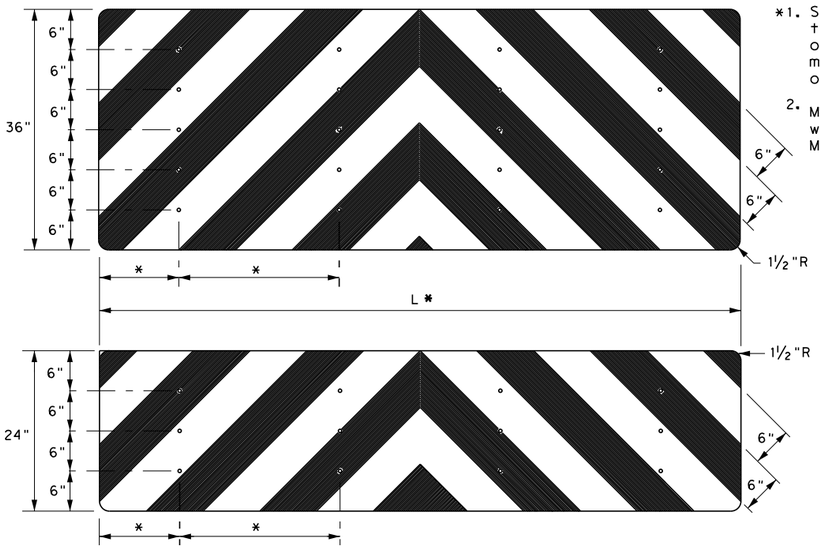


OBJECT MARKERS SMALLER THAN 3 FT^2









NOTES

*1. Spacing should be adjusted to attach through centerline of drum, per attenuator manufacturers recommendation, or as directed by the Engineer.

2. Mounting should be flush with top of attenuator. Minimum size 96" x 24".

NOTES

1. Object Markers shall conform to the Texas MUTCD and meet the color and reflectivity requirement of Department Material Specification DMS 8300. Background shall be yellow reflective sheeting (Type B or C) and Chevron shall be black.

2. Object Markers may be fabricated from adhesive backed reflective sheeting applied directly to guardrail end treatment, or applied directly to an "end cap" as per the manufacturer's recommendation. Direct applied sheeting shall provide a smooth surface and have no wrinkles, air bubbles, cuts or tears. A radius at the corners is not required for direct applied sheeting.

3. Object Marker size may be reduced to fit smaller devices. Width of alternating black and yellow stripes are typically 6". Object Markers smaller than 3ft may have reduced width stripes of a minimum of 2 ¼".

4. Pop rivets, screws, or nuts and bolts may be used to attach object markers and reflectors. Holes, slots or other openings may be cut or drilled through object markers to allow cable or other attachments.

5. Object Marker at nose of attenuator is subsidiary to the attenuator.

6. See D & OM (1-4) for required barrier reflectors.

Texas Department of Transportation

Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER FOR VEHICLE IMPACT ATTENUATORS

D & OM(VIA)-20

FILE: domvia20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
©TxDOT December 1989	CONT	SECT	JOB	HIGHWAY
REVISIONS	0090	05	107	IH40
4-92 8-04	DIST	COUNTY		SHEET NO.
8-95 3-15	AMA	POTTER		172
4-98 7-20				

20G

DATE: 12/7/2023 1:32:42 PM
FILE: c:\dms\bridgefarmer-pw\mkhan@two-nm.com\dms214781\72 - D & OM (VIA) - 20.dgn
mkhan

SIGN SUPPORT DESCRIPTIVE CODES

(Descriptive Codes correspond to project estimate and quantities sheets)

SM RD SGN ASSM TY XXXXX(X)XX(X-XXXX)

Post Type

FRP = Fiberglass Reinforced Plastic Pipe (see SMD(FRP))
TWT = Thin-Walled Tubing (see SMD(TWT))
10BWG = 10 BWG Tubing (see SMD(SLIP-1) to (SLIP-3))
S80 = Schedule 80 Pipe (see SMD(SLIP-1) to (SLIP-3))

Number of Posts (1 or 2)

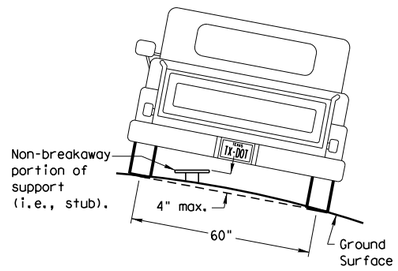
Anchor Type

UA = Universal Anchor - Concreted (see SMD(FRP) and (TWT))
UB = Universal Anchor - Bolted down (see SMD(FRP) and (TWT))
WS = Wedge Anchor Steel - (see SMD(TWT))
WP = Wedge Anchor Plastic (see SMD(TWT))
SA = Slipbase - Concreted (see SMD(SLIP-1) to (SLIP-3))
SB = Slipbase - Bolted Down (see SMD(SLIP-1) to (SLIP-3))

Sign Mounting Designation

P = Prefab. "Plain" (see SMD(SLIP-1) to (SLIP-3), (TWT), (FRP))
T = Prefab. "T" (see SMD(SLIP-1) to (SLIP-3), (TWT))
U = Prefab. "U" (see SMD(SLIP-1) to (SLIP-3))
IF REQUIRED
1EXT or 2EXT = Number of Extensions (see SMD(SLIP-1) to (SLIP-3), (TWT))
BM = Extruded Wind Beam (see SMD(SLIP-1) to (SLIP-3))
WC = 1.12 #/ft Wing Channel (see SMD(SLIP-1) to (SLIP-3))
EXAL = Extruded Aluminum Sign Panels (see SMD(SLIP-1))

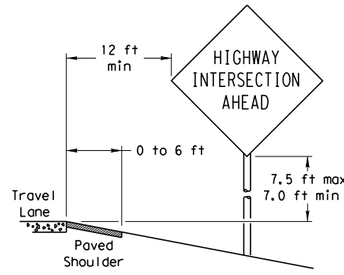
REQUIRED CLEARANCE FOR BREAKAWAY SUPPORT



To avoid vehicle undercarriage snagging, any substantial remains of a breakaway support, when it is broken away, should not project more than 4 inches above a 60-inch chord (i.e., typical space between wheel paths).

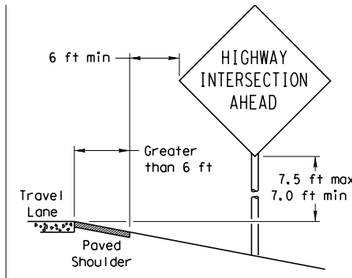
SIGN LOCATION

PAVED SHOULDERS



LESS THAN 6 FT. WIDE

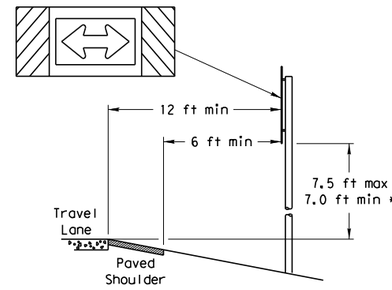
When the shoulder is 6 ft. or less in width, the sign must be placed at least 12 ft. from the edge of the travel lane.



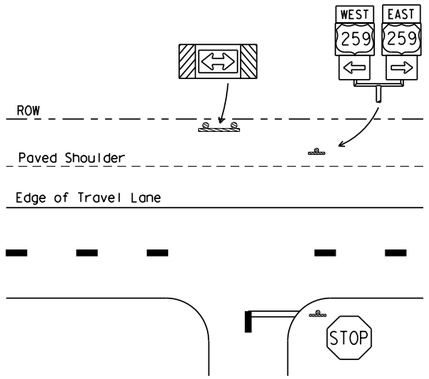
GREATER THAN 6 FT. WIDE

When the shoulder is greater than 6 ft in width, the sign must be placed at least 6 ft. from the edge of the shoulder.

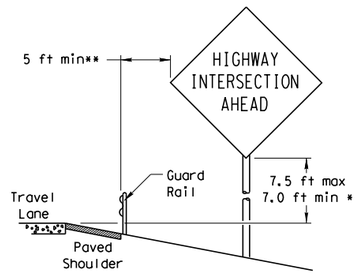
T-INTERSECTION



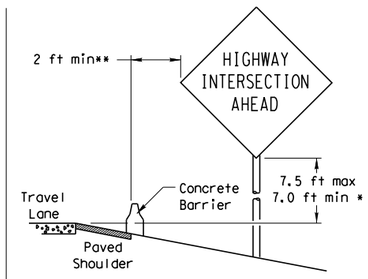
When this sign is needed at the end of a two-lane, two way roadway, the right edge of the sign should be in line with the centerline of the roadway. Place as close to ROW as practical.



BEHIND BARRIER



BEHIND GUARDRAIL



BEHIND CONCRETE BARRIER

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

* Signs shall be mounted using the following condition that results in the greatest sign elevation:

(1) a minimum of 7 to a maximum of 7.5 feet above the edge of the travel lane or

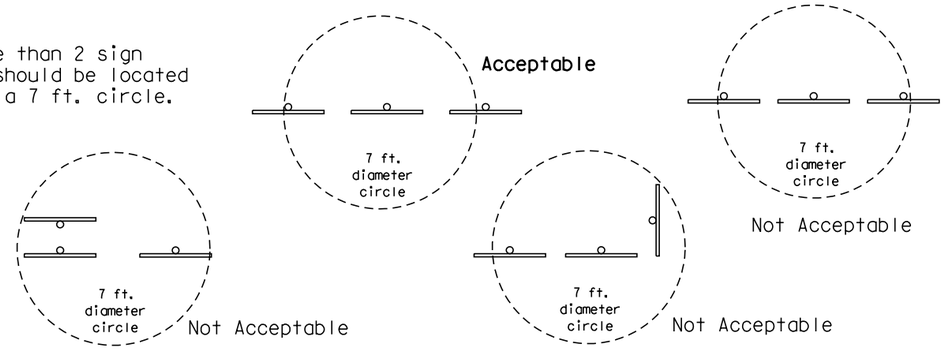
(2) a minimum of 7 to a maximum of 7.5 feet above the grade at the base of the support when sign is installed on the backslope.

The maximum values may be increased when directed by the Engineer.

See the Traffic Operations Division website for detailed drawings of sign clamps, Triangular Slipbase System components and Wedge Anchor System components.

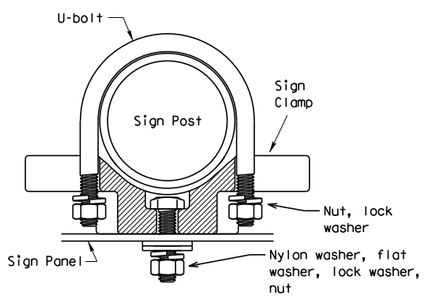
The website address is:
http://www.txdot.gov/publications/traffic.htm

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



TYPICAL SIGN ATTACHMENT DETAIL

Single Signs

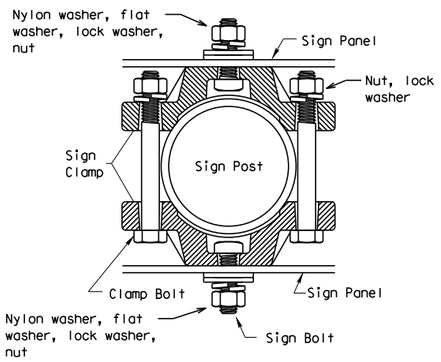


Bolts used to mount sign panels to the clamp are 5/16-18 UNC galvanized square head with nut, nylon washer, flat washer and lock washer. The bolt length is 1 inch for aluminum.

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

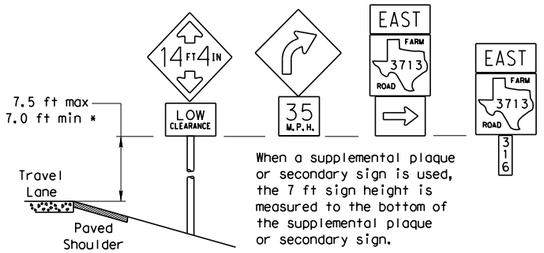
Sign clamps may be either the specific size clamp or the universal clamp.

Back-to-Back Signs



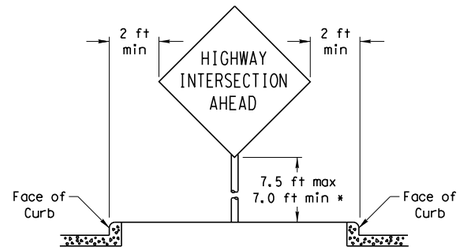
Pipe Diameter	Approximate Bolt Length	
	Specific Clamp	Universal Clamp
2" nominal	3"	3 or 3 1/2"
2 1/2" nominal	3 or 3 1/2"	3 1/2 or 4"
3" nominal	3 1/2 or 4"	4 1/2"

SIGNS WITH PLAQUES



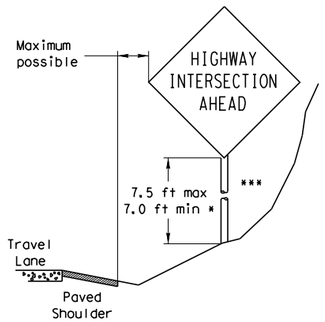
When a supplemental plaque or secondary sign is used, the 7 ft sign height is measured to the bottom of the supplemental plaque or secondary sign.

CURB & GUTTER OR RAISED ISLAND



RESTRICTED RIGHT-OF-WAY

(When 6 ft min. is not possible.)



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

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

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

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS GENERAL NOTES & DETAILS

SMD(GEN)-08

9-08 REVISIONS

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

CONT	SECT	JOB	HIGHWAY
0090	05	107	IH40

DIST	COUNTY	SHEET NO.
AMA	POTTER	173

26A

DATE: 12/7/2023 1:33:42 PM
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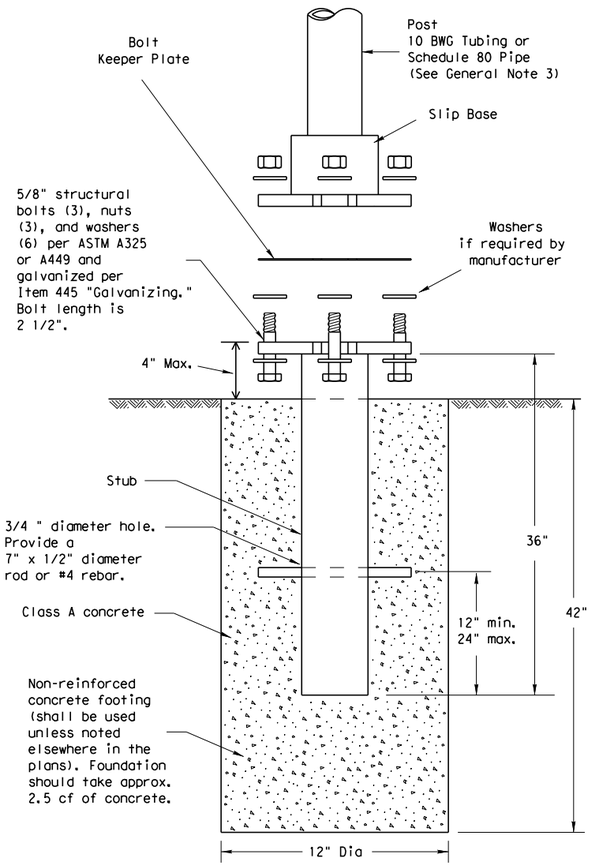
mkhan

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.

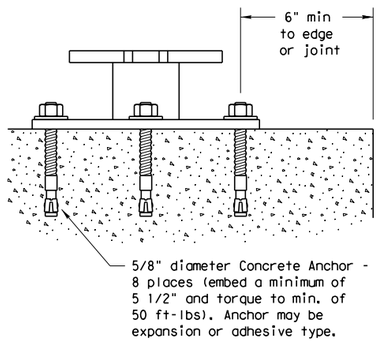
   Schedule 80 Pipe (2.875" outside diameter)
   - 0.276" nominal wall thickness
   - Steel tubing per ASTM A500 Gr C
   - Other seamless or electric-resistance welded steel tubing or pipe with equivalent outside diameter and wall thickness may be used if they meet the following:
     - 46,000 PSI minimum 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
0090	05	107	IH40

DIST	COUNTY	SHEET NO.
AMA	POTTER	174

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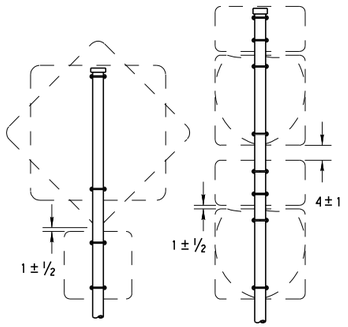
mknahn



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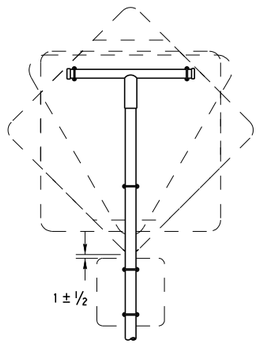

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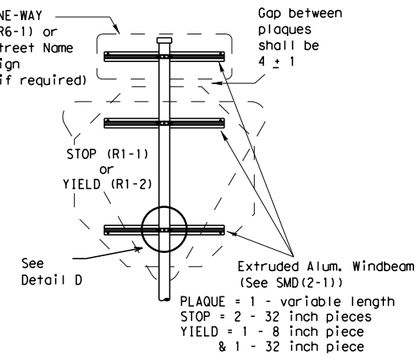

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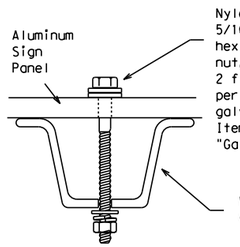
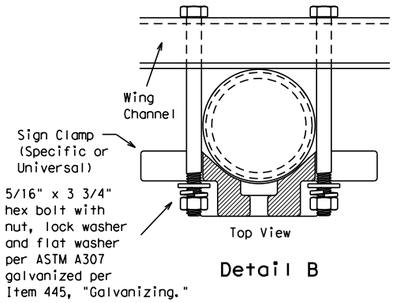
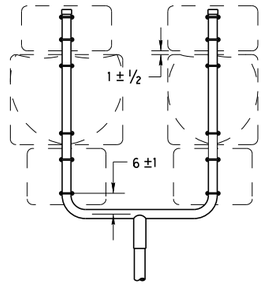


Detail A



Detail B



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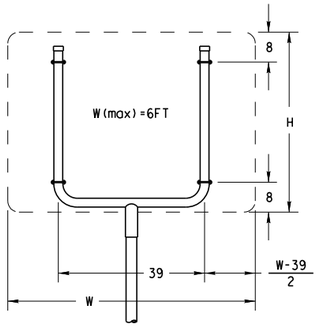

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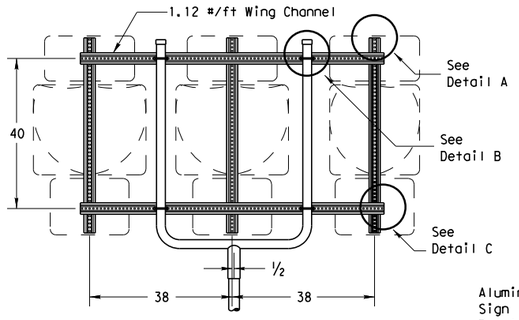
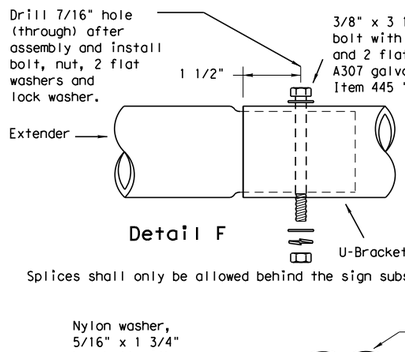
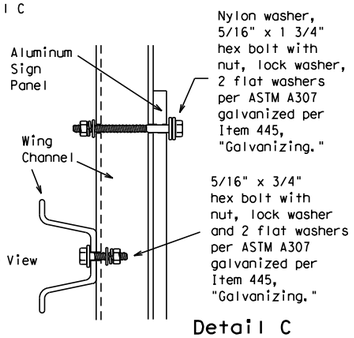


SM RD SGN ASSM TY XXXXX(1)XX(U-WC)
(See Note 11)

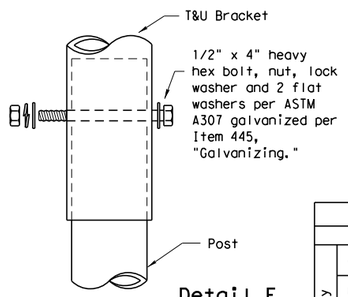


Detail F

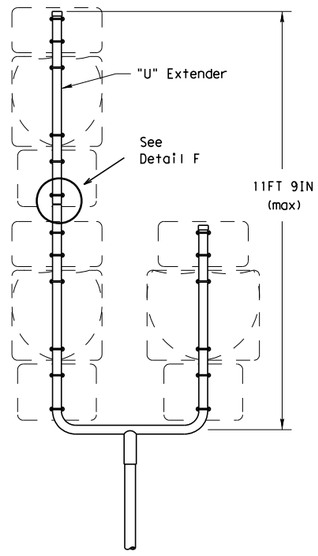
Splices shall only be allowed behind the sign substrate.



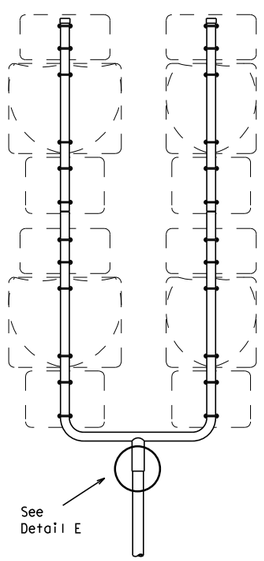
Detail C



Detail E



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



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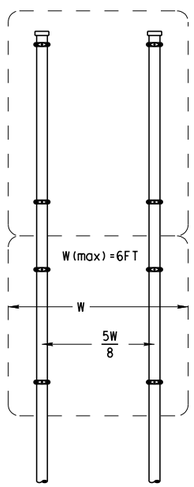
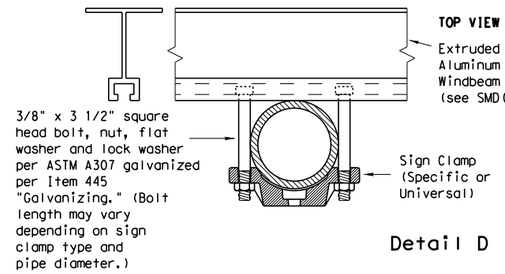
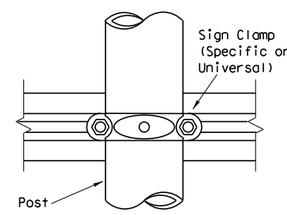


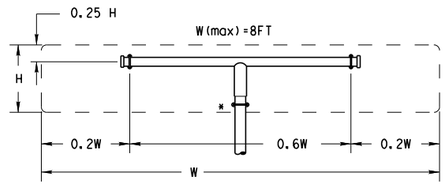
SM RD SGN ASSYM TY XXXXX(2)XX(P)

SIDE VIEW



Detail D

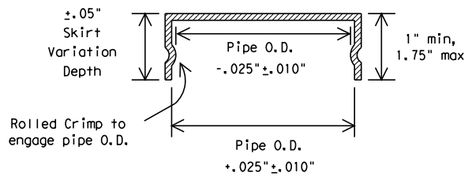




SM RD SGN ASSM TY XXXXX(1)XX(T)
(* - See Note 12)

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
0090	05	107	IH40
DIST	COUNTY		SHEET NO.
AMA	POTTER		175

9-08 REVISIONS

26C

DATE: 12/7/2023 1:35:22 PM
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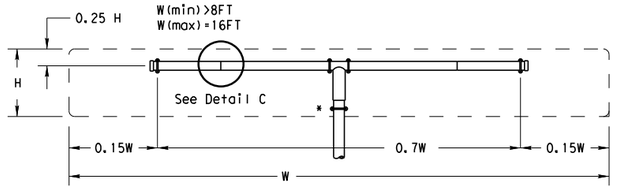
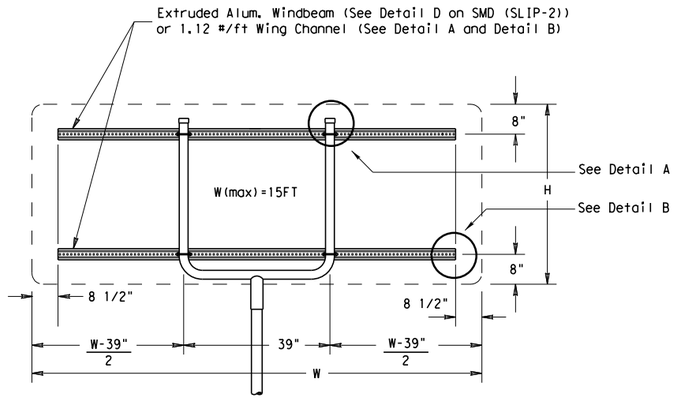
mkhan

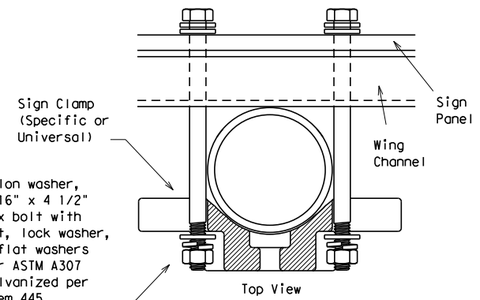


SM RD SGN ASSM TY XXXXX(1)XX(T-2EXT)

(* - See Note 12)

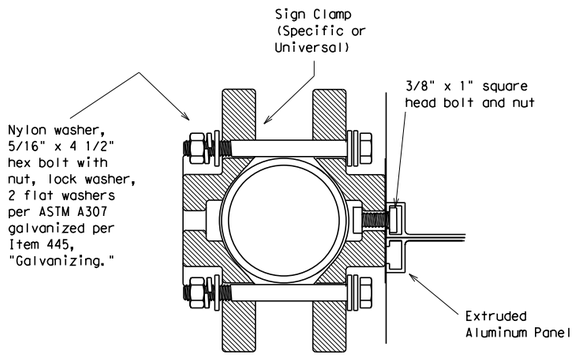


SM RD SGN ASSM TY XXXXX(1)XX(U-XX)



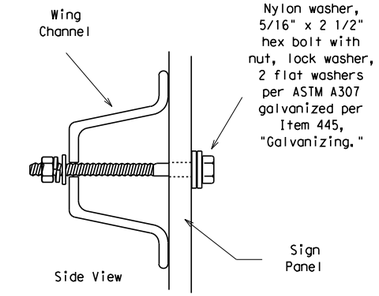
Top View

Detail A

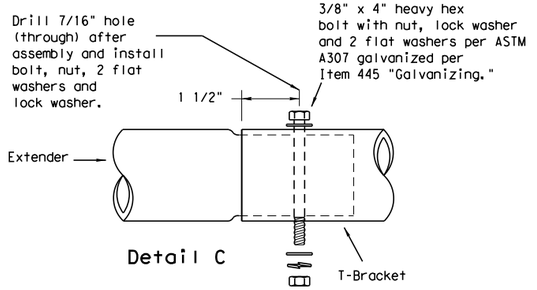


Detail D

EXTRUDED ALUMINUM SIGN WITH T BRACKET

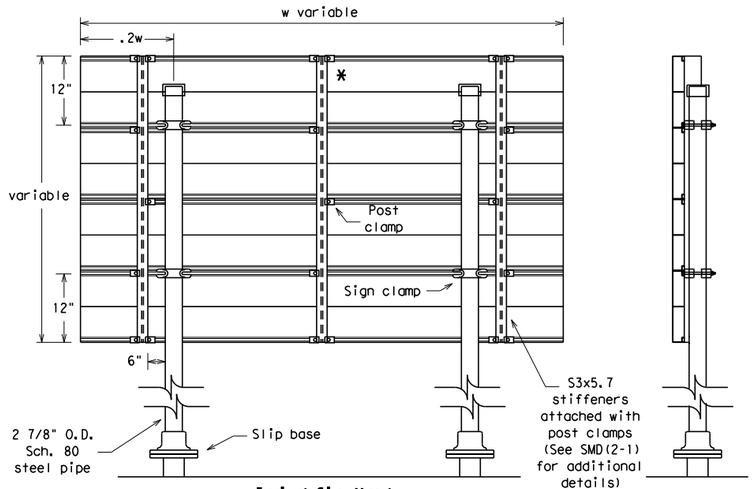


Detail B



Detail C

Splices shall only be allowed behind the sign substrate.

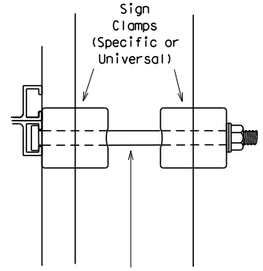


Typical Sign Mount

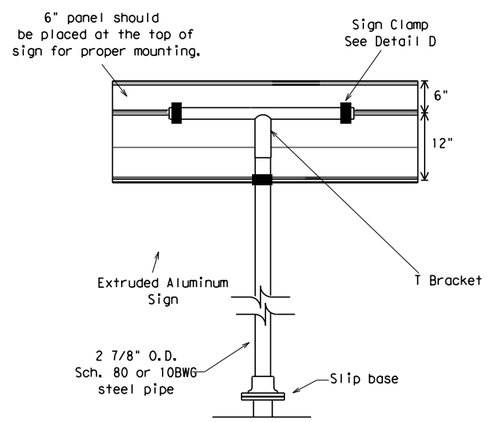
SM RD SGN ASSM TY S80(2)XX(P-EXAL)

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

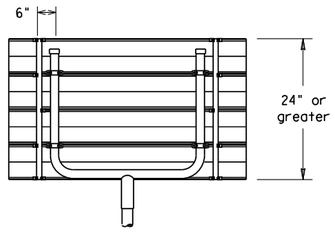
See Detail E
for clamp installation



Detail E



Extruded Aluminum Sign
With T Bracket



Use Extruded Alum. Windbeam as stiffeners
See SMD (2-1) for additional details

See Detail E
for clamp installation

GENERAL NOTES:

SIGN SUPPORT	# OF POSTS	MAX. SIGN AREA
10 BWG	1	16 SF
10 BWG	2	32 SF
Sch 80	1	32 SF
Sch 80	2	64 SF

1. The Engineer may require that a Schedule 80 post be used in place of a 10 BWG where a sign height is abnormally high due to a fill slope.
2. Sign supports shall not be spliced except where shown. Sign support posts shall not be spliced.
3. Aluminum sign blanks shall conform to Departmental Material Specifications DMS-7110 and shall have the following minimum thicknesses: 0.080 for signs less than 7.5 sq. ft., 0.100 for signs 7.5 to 15 sq. ft., and 0.125 for signs greater than 15 sq. ft.
4. Signs that require specific supports due to reasons in addition to windloading are indicated on the "REQUIRED SUPPORT" table on this sheet.
5. For horizontal rectangular signs fabricated from flat aluminum, T-brackets are used for signs 24 inches or less in height. U-brackets are used for signs of greater height.
6. When two triangular slipbase supports are used to support a single sign, they shall not be "rigidly" connected to each other except through the sign panel. This will allow each support to act independently when impacted by an errant vehicle.
7. Wing channel shall meet ASTM A 1011 SS Gr 50 and be galvanized per ASTM A 123.
8. Excess pipe, wing channel, or windbeam shall be cut off so that it does not extend beyond the sign panel (i.e., excess support shall not be visible when the sign is viewed from the front.) Repair galvanized coating at cut support ends per Item 445, "Galvanizing."
9. Sign blanks shall be the sizes and shapes shown on the plans.
10. Additional sign clamp required on the "T-bracket" post for 24 inch high signs. Place the clamp 3 inches above bottom of sign when possible.
11. Post open ends shall be fitted with Friction Caps.

REQUIRED SUPPORT		
	SIGN DESCRIPTION	SUPPORT
Regulatory	48-inch STOP sign (R1-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	60-inch YIELD sign (R1-2)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	48x16-inch ONE-WAY sign (R6-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	36x48, 48x36, and 48x48-inch signs	TY 10BWG(1)XX(T)
	48x60-inch signs	TY S80(1)XX(T)
Warning	48x48-inch signs (diamond or square)	TY 10BWG(1)XX(T)
	48x60-inch signs	TY S80(1)XX(T)
	48-inch Advance School X-ing sign (S1-1)	TY 10BWG(1)XX(T)
	48-inch School X-ing sign (S2-1)	TY 10BWG(1)XX(T)
	Large Arrow sign (W1-6 & W1-7)	TY 10BWG(1)XX(T)

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS
SMALL ROADSIDE SIGNS
TRIANGULAR SLIPBASE SYSTEM

SMD(SLIP-3)-08

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

REVISIONS
9-08

CONT	SECT	JOB	HIGHWAY
0090	05	107	IH40

DIST	COUNTY	SHEET NO.
AMA	POTTER	176

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mkhan

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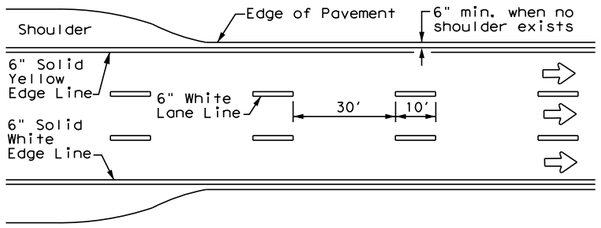
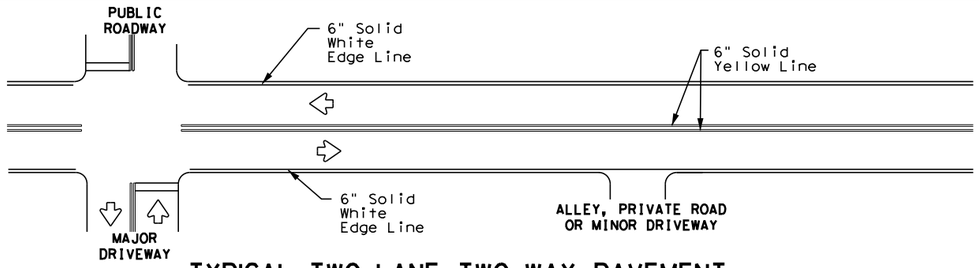
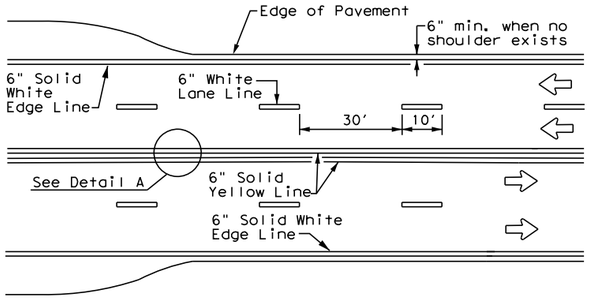
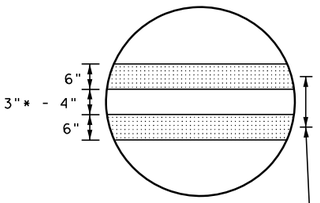


EDGE LINE AND LANE LINES ONE-WAY ROADWAY WITH OR WITHOUT SHOULDERS



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





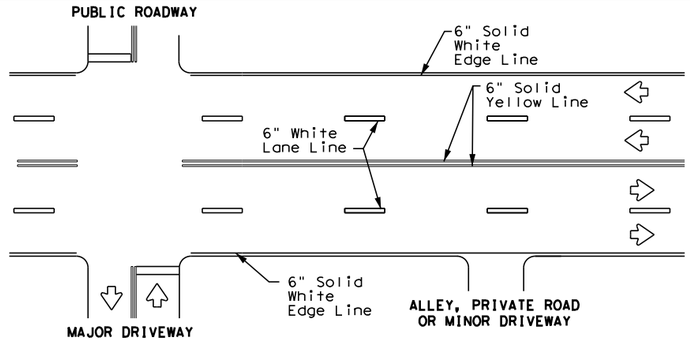
DETAIL "A"

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

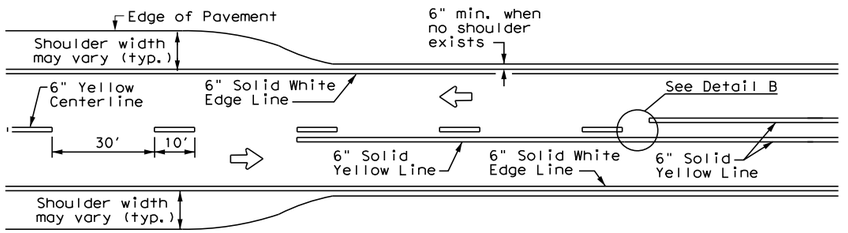
CENTERLINE AND LANE LINES FOUR LANE TWO-WAY ROADWAY WITH OR WITHOUT SHOULDERS

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

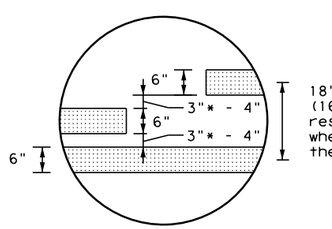
** 8" minimum for restripe projects when approved by the Engineer.



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

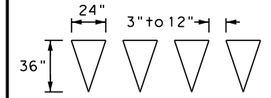


TWO LANE TWO-WAY ROADWAY WITH OR WITHOUT SHOULDERS



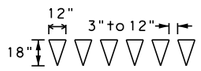
DETAIL "B"

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

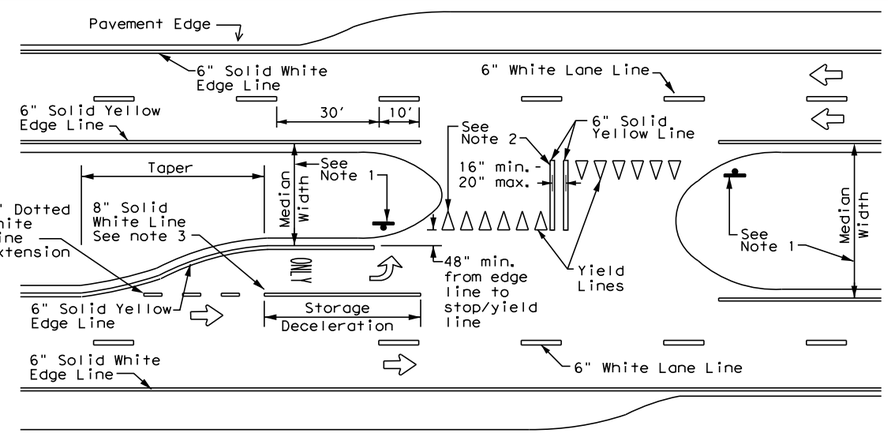


For posted speed on road being marked equal to or greater than 45 MPH.

YIELD LINES



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



FOUR LANE DIVIDED ROADWAY CROSSOVERS

NOTES

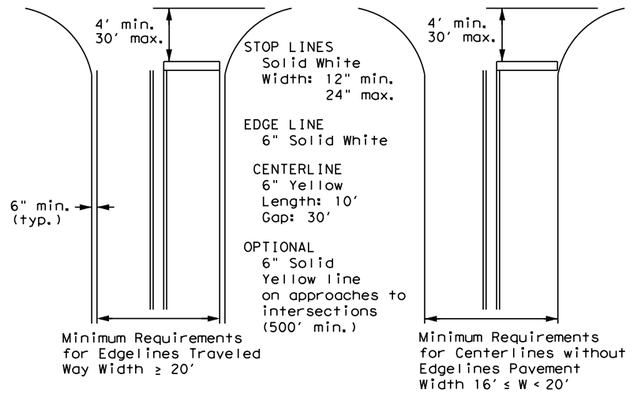
1. Where divided highways are separated by median widths at the median opening itself of 30 feet or more, median openings shall be signed as two separate intersections.
   Each median opening has two width measurements, with one measurement for each approach. The narrow median width will be the controlling width to determine if signs are required. Yield signs are the typical intersection control. Stop signs and stop bars are optional as determined by the Engineer.
2. Install median striping (double yellow centerlines and stop lines/yield lines) when a 50' or greater median centerline can be placed. Stop lines shall only be used with stop signs. Yield lines shall only be used with yield signs.
3. Length of turn bays, including taper, deceleration, and storage lengths shall be as shown on the plans or as directed by the Engineer.

GENERAL NOTES

1. Edge line striping shall be as shown in the plans or as directed by the Engineer. The edge line should not be placed less than 6 inches from the edge of pavement. This distance may vary due to pavement raveling or other conditions. Edge lines are not required in curb and gutter sections of roadways.
2. The traveled way includes only that portion of the roadway used for vehicular travel. It does not include the parking lanes, sidewalks, berms and shoulders. The traveled ways shall be measured from the center of edge line to the center of edge line of a two lane roadway.

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

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



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

GUIDE FOR PLACEMENT OF STOP LINES, EDGE LINE & CENTERLINE

Based on Traveled Way and Pavement Widths for Undivided Roadways

Texas Department of Transportation

Traffic Safety Division Standard

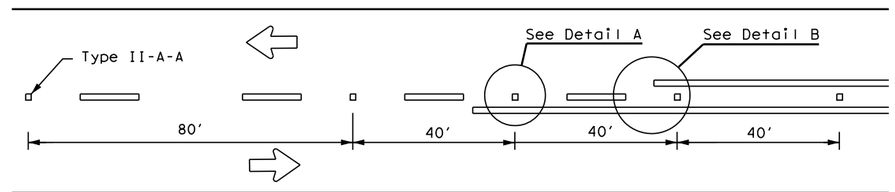
TYPICAL STANDARD PAVEMENT MARKINGS

PM(1)-22

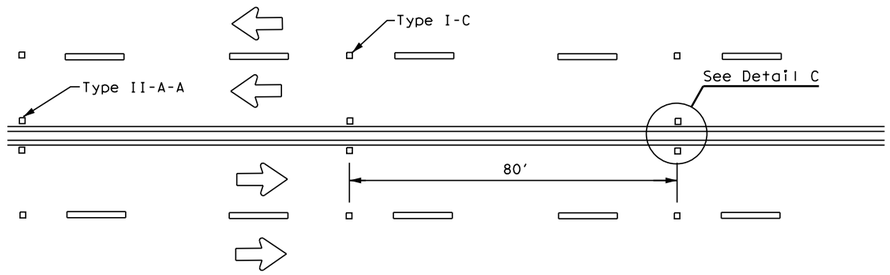
FILE: pm1-22.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
© TxDOT December 2022	CONT	SECT	JOB	HIGHWAY
REVISIONS 11-78 8-00 6-20	0090	05	107	IH40
8-95 3-03 12-22	DIST	COUNTY		SHEET NO.
5-00 2-12	AMA	POTTER		177

22A

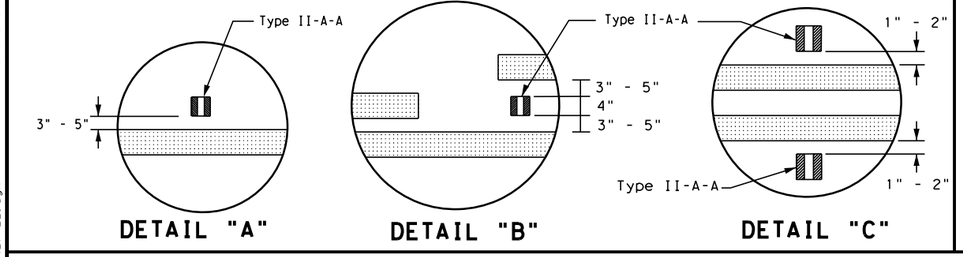
REFLECTIVE RAISED PAVEMENT MARKERS FOR VEHICLE POSITIONING GUIDANCE

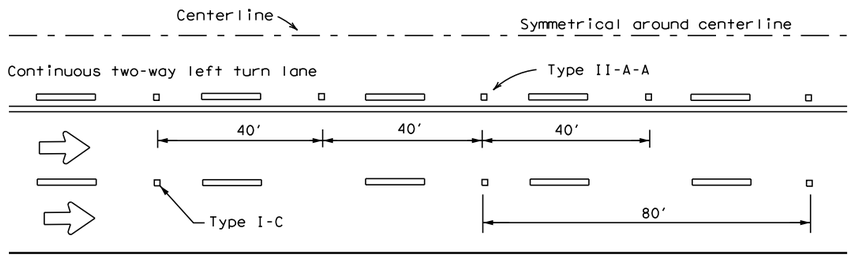


CENTERLINE FOR ALL TWO LANE TWO-WAY ROADWAYS

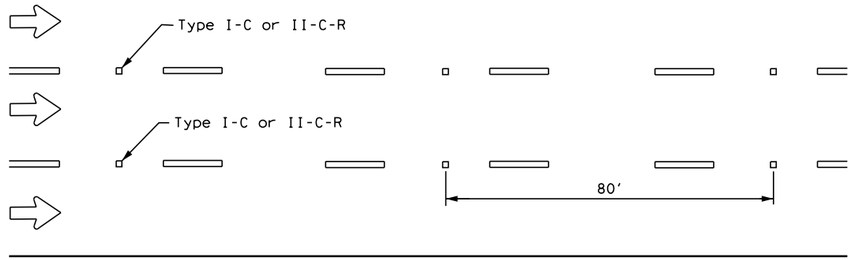


CENTERLINE & LANE LINES FOR FOUR LANE TWO-WAY ROADWAYS





CENTERLINE AND LANE LINES FOR TWO-WAY LEFT TURN LANE



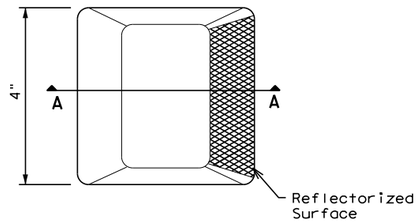
LANE LINES FOR ONE-WAY ROADWAY (NON-FREEWAY FACILITIES)

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

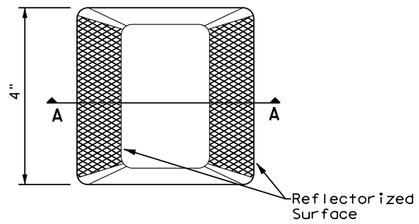
See Note 3.

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

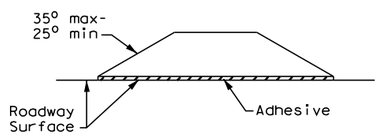
All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.



Type I (Top View)

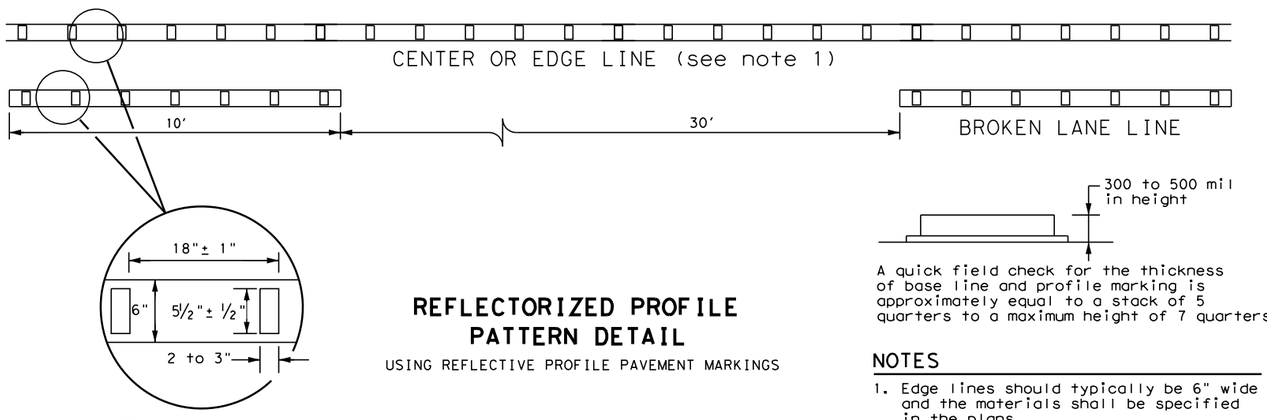


Type II (Top View)



SECTION A

RAISED PAVEMENT MARKERS



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

REFLECTORIZED PROFILE PATTERN DETAIL

USING REFLECTIVE PROFILE PAVEMENT MARKINGS

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

NOTES

1. Edge lines should typically be 6" wide and the materials shall be specified in the plans.
2. Profile markings shall not be placed on roadways with a posted speed limit of 45 MPH or less.

GENERAL NOTES

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

Texas Department of Transportation

Traffic Safety Division Standard

POSITION GUIDANCE USING RAISED MARKERS RELECTORIZED PROFILE MARKINGS PM(2)-22

FILE: pm2-22.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
© TxDOT December 2022	CONT	SECT	JOB	HIGHWAY
REVISIONS	0090	05	107	IH40
4-77 8-00 6-20	DIST	COUNTY		SHEET NO.
4-92 2-10 12-22	AMA	POTTER		178
5-00 2-12				

22B

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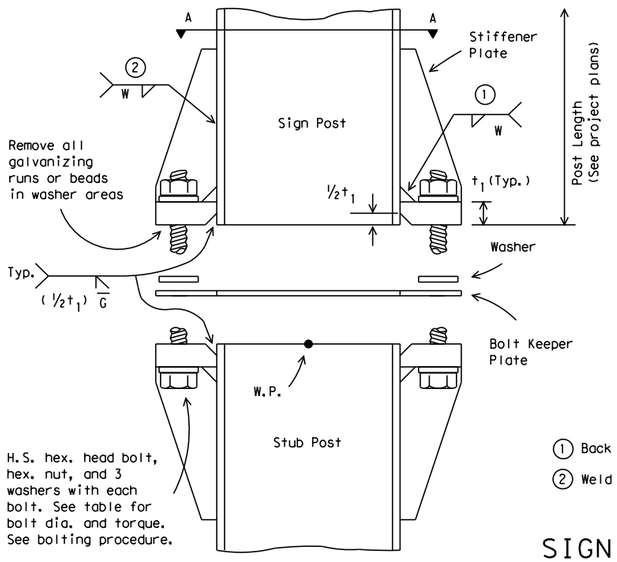
mkhan



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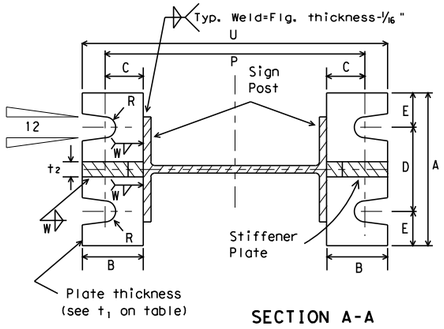
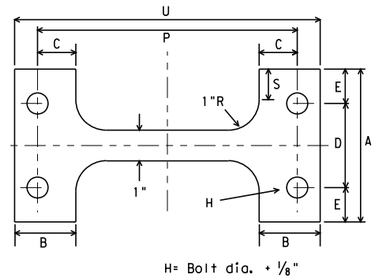


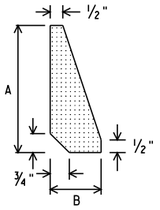
SECTION A-A



H= Bolt dia. + ⅛"

BOLT KEEPER PLATE

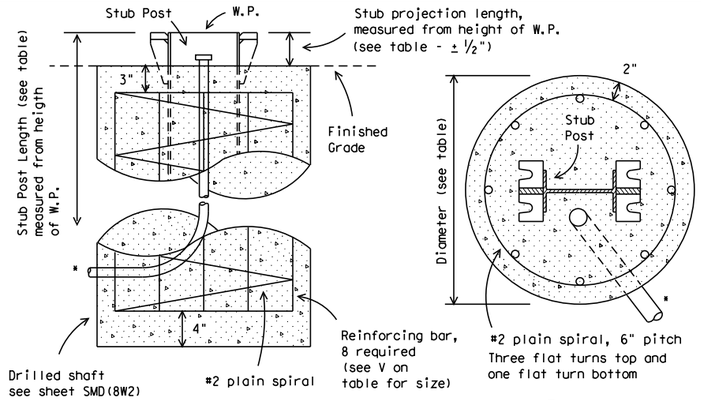
30 Ga galv. sheet steel



STIFFENER PLATE DETAIL

Steel Plate (thickness = t_2)

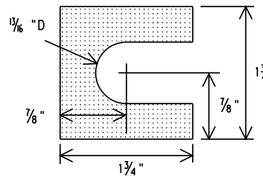
(See table for dimensions)



ELEVATION PLAN

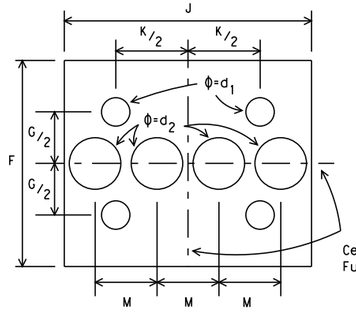
FOUNDATION DETAIL

*Note: For signs with electrical apparatus, see ED(10) for conduit required in founation.



SHIM DETAIL

Furnish two .012"+ thick and two .032"+ thick shims per post. Shims shall be fabricated from brass shim stock or strip conforming to ASTM B36.



PERFORATED FUSE PLATE DETAIL

Use H.S. hex head bolts, hex head nut and bevel or flat washer (where req'd) under nut. All holes shall be drilled, sub-punched and reamed. All plate cuts shall preferably be saw cuts. However, flame cutting will be permitted provided all edges are ground. Metal projecting beyond the plane of the plate face will not be permitted. Steel fuse plates shall conform to the requirements of ASTM A36. ASTM A572 Grade 50 or ASTM A588 may be substituted for A36 at the option of the fabricator. Mill test reports shall be submitted for Fuse Plates. Steel used shall have an ultimate tensile strength not to exceed 80 KSI. For alternative Fuse Plate contact Traffic Operations Division.

① Back up weld to be made before installing stiffener plate

② Weld W may be continued across clips to seal joint

SIGN POST AND STUB POST

(For W Shapes)

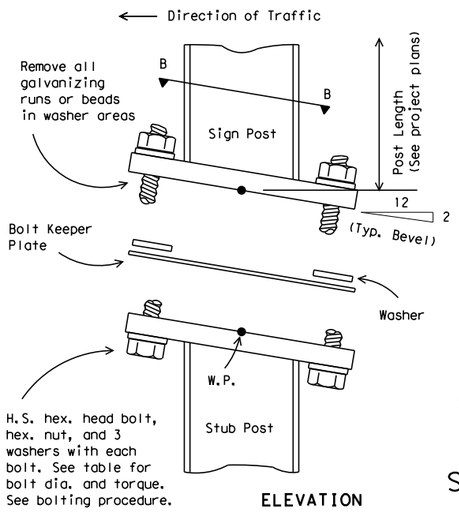
BOLTING PROCEDURE FOR ASSEMBLY OF BASE CONNECTION:

1. Assemble sign post, BOLT KEEPER PLATE and stub post with bolts and three flat washers per bolt as shown.
2. Shim as required to plumb post.
3. Tighten all bolts the maximum possible with a 12 to 15 inch wrench to clean bolt threads and to bed washers and shims.
4. Loosen each bolt in sequence and retighten bolts in a systematic order to the prescribed torque. Do not overtighten.
5. To prevent nut loosening, burr threads of bolt at junction with nut using a center punch.

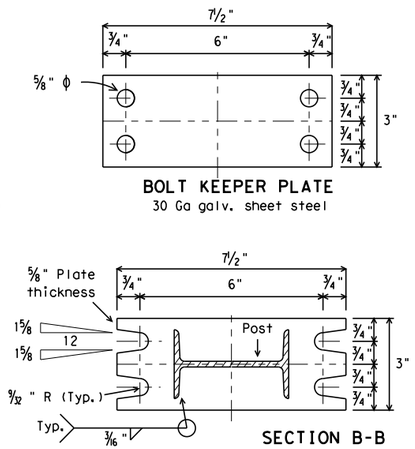
Dimensions / Post Size	Base Connection Data Table: Bolt Size & Torque	A	B	C	D	E	t_1	t_2	W	R
W6x9	⅝"ϕ x 2¾" 440-450 inch pounds 36-38 foot pounds	5"	2"	1¼"	2¾"	1⅛"	¾"	½"	¼"	11/32"
W6x12										
W6x15										
W8x18										
W8x21	¾"ϕ x 3½" 740-750 inch pounds 62-63 foot pounds	6"	2¼"	1⅜"	3½"	1¼"	1"	¾"	5/16"	13/32"
W10x22										
W10x26										
W12x26										
S3x5.7	½"ϕ x 2½" 440-450 inch pounds 36-38 foot pounds	See Detail Below								
S4x7.7										

Perforated Fuse Plate Data Table												Bolt Keeper Data			Foundation Data			
F	G	J	K	M	d_1	d_2	t_3	Bolt Dia.	Wt. (ea.) (lbs.)	Bolt length	P	S	U	Stub length	Stub projection	Dr. Shaft diameter	Bar V Size
4¼"	2"	4"	2¼"	1"	9/16"	¾"	¼"	½"	1.01	1½"	8⅜"	1"	9⅞"	2'-0"	3"	24"	#5
											8½"		10"				#5
5"	2½"	6"	3½"	1½"	11/16"	1¼"	⅜"	⅝"	2.51	2¼"	8½"		10"	2'-6"			#6
5"	2½"	5¼"	2¾"	1¼"	11/16"	1 1/16"	⅜"	⅝"	2.26	2¼"	10⅝"		12⅛"	2'-6"			#7
5½"	2½"	5¼"	2¾"	1¼"	13/16"	1"	½"	¾"	3.35	2¼"	11"	1½"	12¾"	3'-0"	2½"		#8
6"	3"	5¾"	2¾"	1⅜"	13/16"	1⅛"	½"	¾"	4.03	2¼"	12⅞"		14⅝"	3'-0"	2½"		#9
											13⅛"		14⅞"	3'-0"	2½"		#10
6"	3"	6½"	3½"	1⅝"	13/16"	1 5/16"	½"	¾"	4.47	2¼"	15"		16¾"	3'-0"	2½"		#11
3¾"	1½"	2⅝"	1½"	⅝"	9/16"	⅜"	¼"	½"	0.60	1½"	See Detail Below			3'-3½"	3½"	12"	Non-reinforced ③

③ Foundation design shall be Type G Mount, see SMD (TY G).



ELEVATION



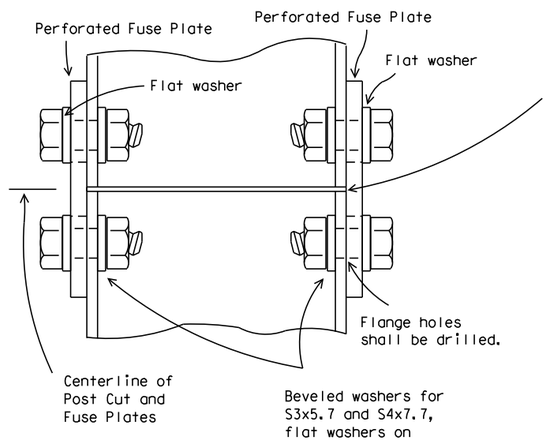
BOLT KEEPER PLATE

30 Ga galv. sheet steel

SECTION B-B

SIGN POST AND STUB POST

(For S4x7.7 and S3x5.7)



DETAIL "A"

Parts shall be saw cut either before galvanizing and the galvanized cut cleaned of zinc build-up, or saw cut after galvanizing and the cut surface repaired per Item 445, "Galvanizing."

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS- LARGE ROADSIDE SIGNS FOUNDATION & STUB

SMD(2-2)-08

©TxDOT August 1995	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
REVISIONS 4-98 9-08	CONT	SECT	JOB	HIGHWAY
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	DIST	COUNTY		SHEET NO.
	AMA	POTTER		179

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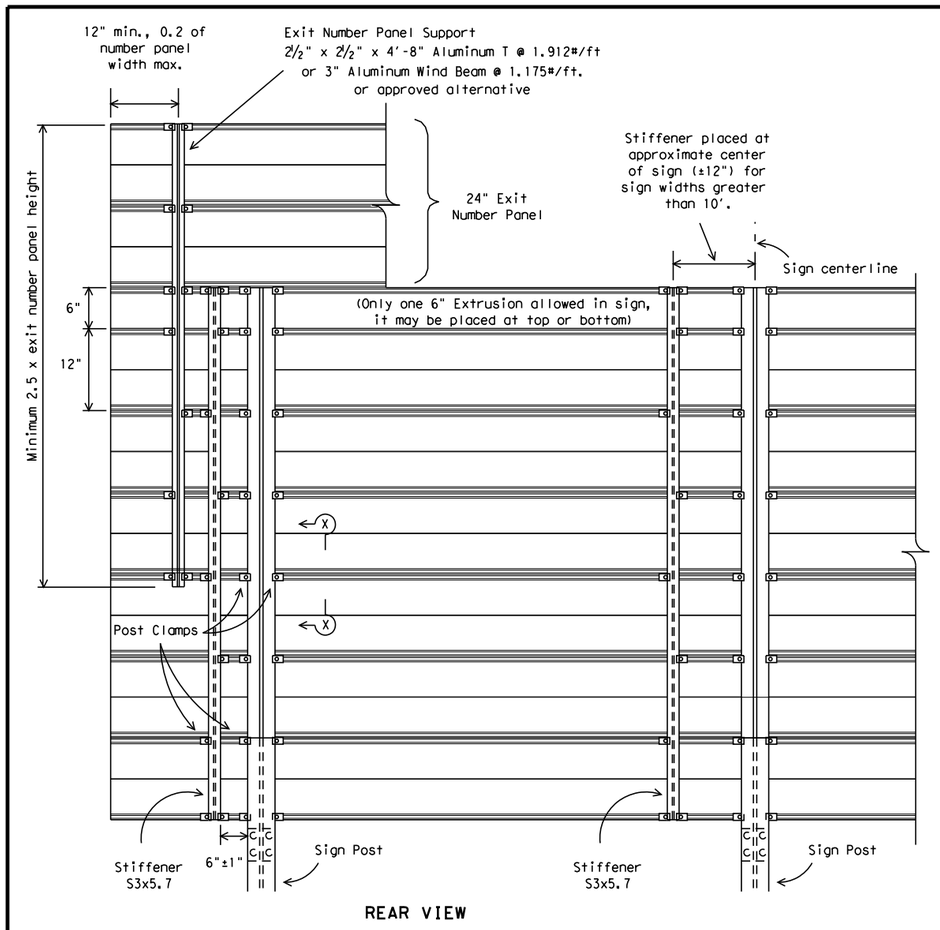
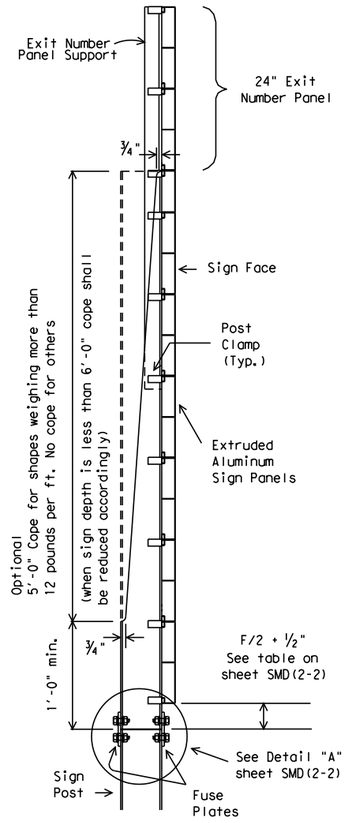
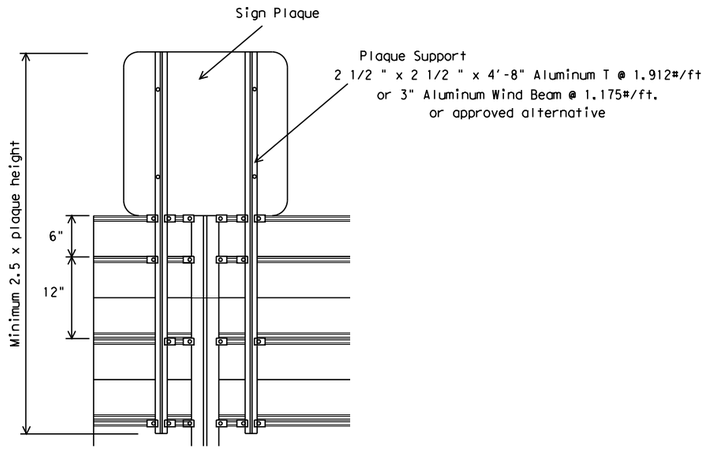


REAR VIEW



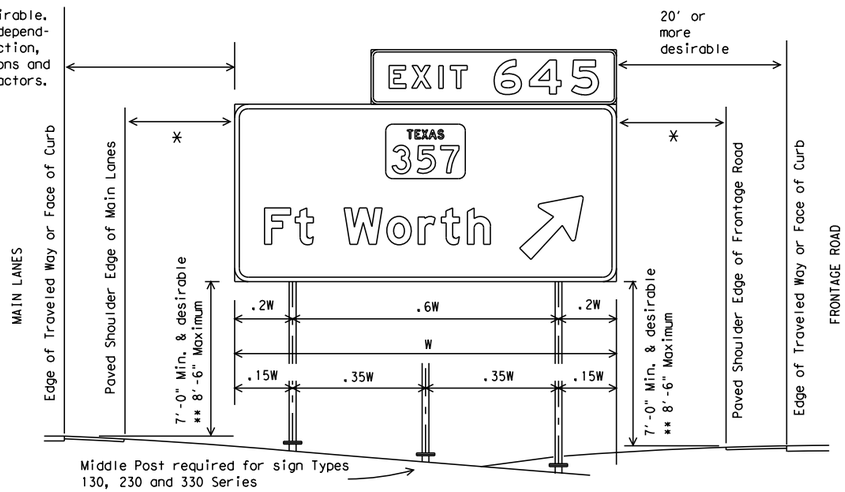
SIDE VIEW

ALUMINUM PARENT SIGN & EXIT NUMBER PANEL MOUNTING DETAILS



SIGN PLAQUE MOUNTING DETAIL TO ALUMINUM PARENT SIGN

30' or more desirable. May be reduced depending on cross section, viewing conditions and other related factors.



TYPICAL SIGN INSTALLATION AND LOCATION

LATERAL CLEARANCE NOTES:

Lateral clearances of signs mounted on median side of main lanes are the same as shown above where space will permit.

Where a sign is to be located behind guardrail, an allowable minimum clearance of five feet may be used, measured from the face of the guardrail to the near edge of sign.

* - 6' minimum and desirable may be used only in areas of limited lateral clearance and when approved by the Engineer.

POST SPACING NOTES:

Post spacing on a two post sign may vary a maximum of plus or minus 10% of total sign width to fit field conditions.

Post spacing on a three post sign may vary a maximum of plus or minus 5% of total sign width to fit field conditions.

SIGN HEIGHT NOTES:

** The 8' 6" maximum may be exceeded when placing signs on extreme slopes. In these conditions, a 7' minimum from natural ground to bottom of sign must be maintained.

DEPARTMENTAL MATERIAL SPECIFICATIONS	
ALUMINUM SIGN BLANKS	DMS-7110
SIGN HARDWARE	DMS-7120

GENERAL NOTES:

1. Exit number panel shall be mounted to the right hand side of the parent sign for right exits and to the left hand side for left exits. The number panel shall be mounted with two uprights so its right edge is even with the right edge of the parent sign or vice-versa for left hand exits.
2. Exit number panel support shall be symmetrical about number panel centerline.
3. Exit number panel support shall be ASTM A36 structural steel galvanized after fabrication, or ASTM B221 aluminum alloy 6061-T6 or approved alternative.
4. All bolts, nuts and washers shall be galvanized per ASTM Designation: B695 Class 50, or A153 Class C or D.
5. Posts, parent sign panels, and exit number panels shall comply with notes on sheets SMD(2-1) and SMD(2-2).
6. Signs (such as exit number panels) attached above a parent sign shall be made of the same type material as the parent sign. General Service and Routing signs may be fabricated from flat sheet aluminum.
7. Exit number panel support and other connection hardware required to fasten exit number panel to parent sign shall be subsidiary to "Aluminum Signs" or "Fiberglass Signs."
8. For fiberglass sign installation details, see manufacturer's recommendations.

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS-LARGE ROADSIDE SIGNS

SMD(2-3)-08

REVISIONS	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
9-08	CONT	SECT	JOB	HIGHWAY
	0090	05	107	IH40
	DIST	COUNTY		SHEET NO.
	AMA	POTTER		180

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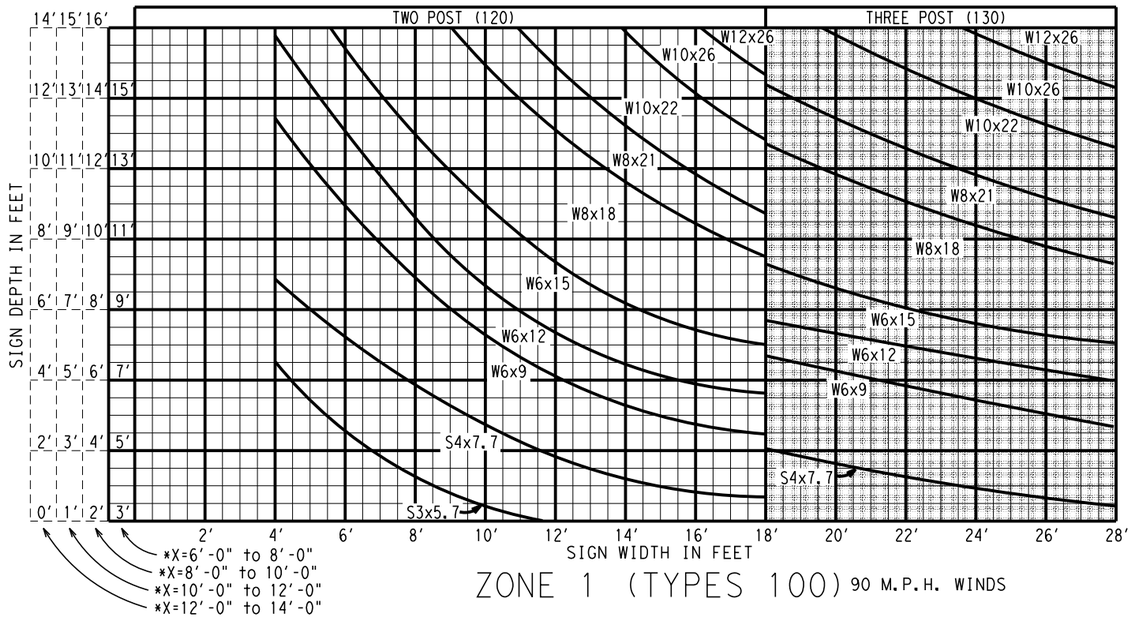
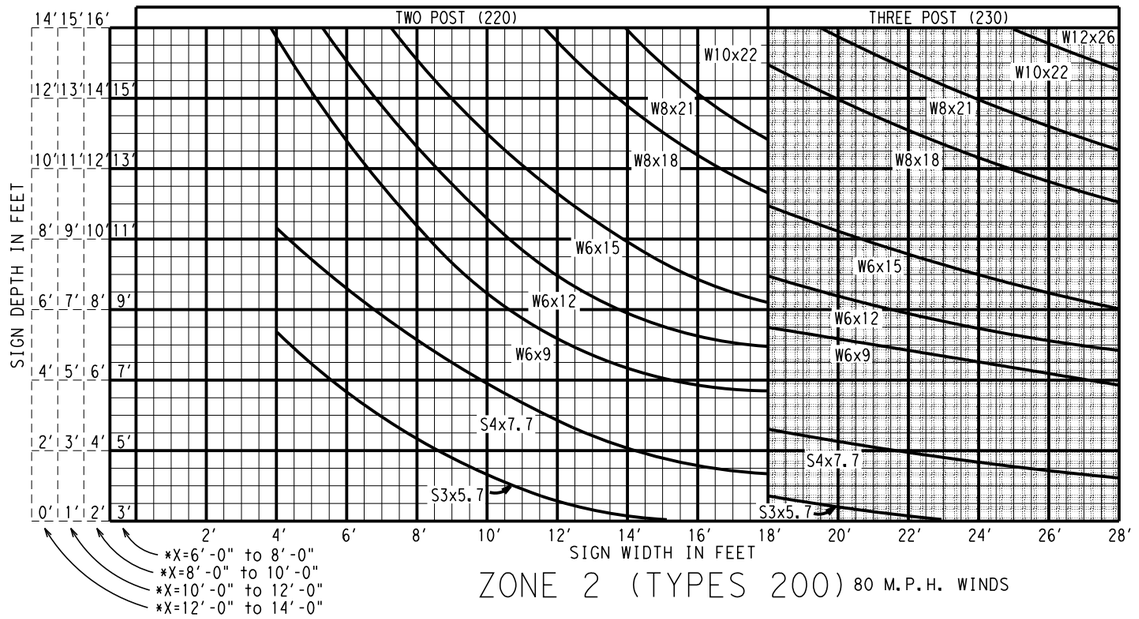
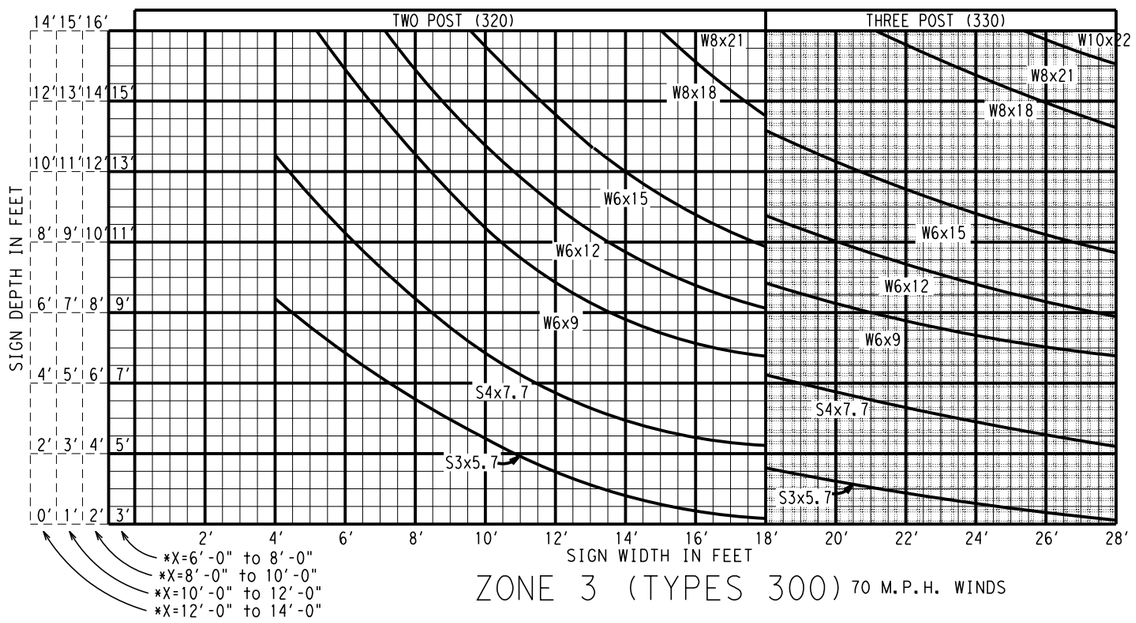


ZONE 1 (TYPES 100) 90 M.P.H. WINDS



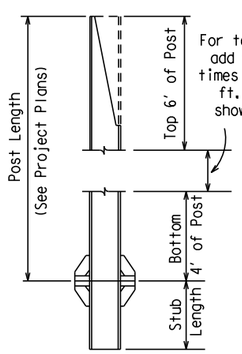
ZONE 2 (TYPES 200) 80 M.P.H. WINDS



ZONE 3 (TYPES 300) 70 M.P.H. WINDS

* NOTE: "X" EQUALS THE AVERAGE HEIGHT FROM THE GROUND LINE TO THE BOTTOM EDGE OF THE SIGN.

SHADED AREA DENOTES 3 POST SUPPORTS



POST WEIGHT DATA

POST SIZE	WEIGHT OF ONE POST (#)	WEIGHT OF TWO POSTS (#)	WEIGHT OF THREE POSTS (#)
W6x9*	123.2	246.4	369.6
W6x12*	160.3	320.6	480.9
W6x15*	167.8	335.6	503.4
W8x18*	201.8	403.6	605.4
W8x21*	254.7	509.4	764.1
W10x22*	266.0	532.0	798.0
W10x26*	308.0	616.0	924.0
W12x26*	308.6	617.2	925.8
S3x5.7*	85.9	171.8	257.7
S4x7.7*	112.2	224.4	336.6

*LAST FIGURES=POST WT. PER FT.

Weight Data is the weight of items shown for one, two or three posts - (includes top 6' of post, bottom 4' of post, post foundation stub, related base connection plates and stiffeners, friction fuse plate and all high strength bolts, nuts and washers).

SIGN TYPE

SIGN TYPE 1 3 0

- 1 — Wind Design Zone
- 3 — Series No.
- 0 — No. of Posts

Series No.: 0 Aluminum/Fiberglass; 1 Aluminum; 2 Fiberglass

Note: Footings for S3x5.7 and S4x7.7 post sizes shall be non-reinforced with Class A concrete, while footing for all other post sizes shall be reinforced with Class C concrete.

Texas Department of Transportation
Traffic Operations Division

LARGE ROADSIDE SIGN SUPPORTS POST SELECTION WORKSHEET

SMD(8W1)-08

REVISIONS
1-82
5-01
9-08

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

CONT	SECT	JOB	HIGHWAY
0090	05	107	IH40

DIST	COUNTY	SHEET NO.
AMA	POTTER	181

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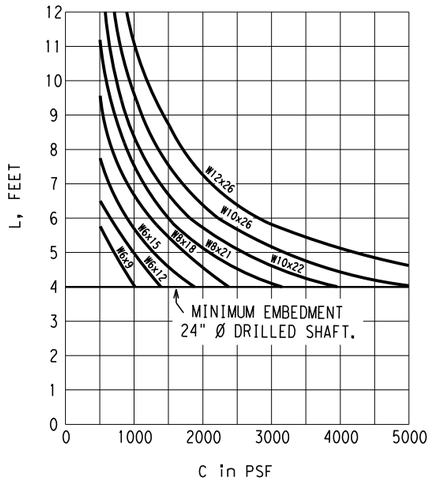
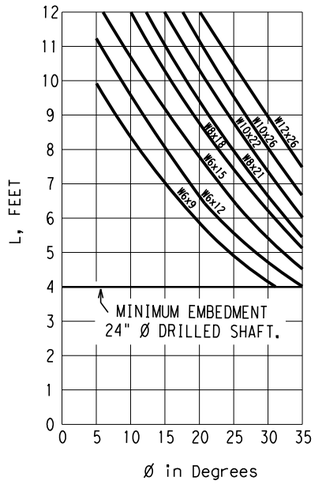


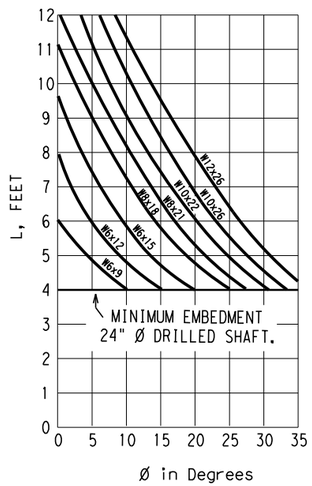
Ø = 0 Degrees

II



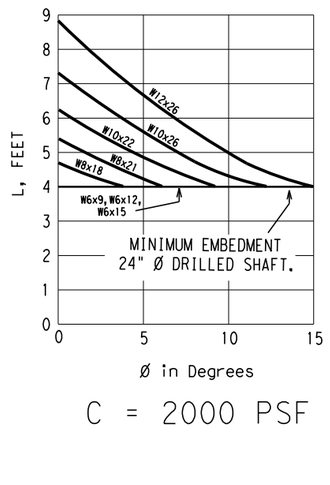
C = 0 PSF

III



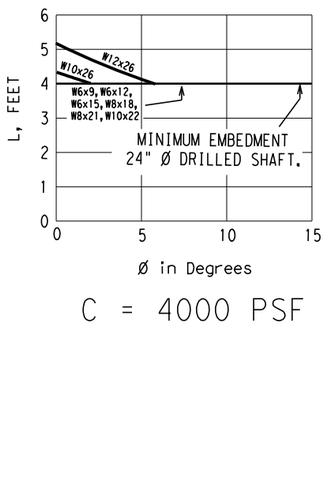
C = 500 PSF

IV



C = 2000 PSF

V



C = 4000 PSF

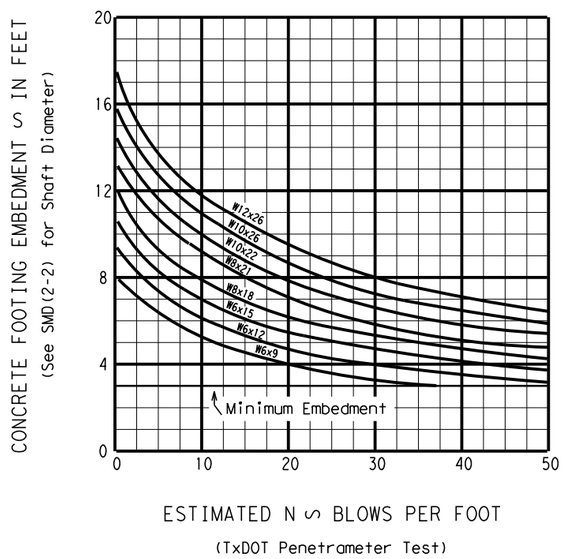
DRILLED CONCRETE FOOTING DEPTH CHART
(COHFRIC DESIGN)

NOTE: THESE CHARTS MAY BE USED AS AN ALTERNATE TO THE CHART BELOW, PROVIDED THAT SOIL COHESION AND INTERNAL FRICTION (COHFRIC) DATA ARE AVAILABLE.

LEGEND:

L = Required embedment of concrete drilled shaft, in feet
C = Cohesive shear strength of soil, in psf
Ø = Angle of internal friction of soil, in degrees

For values of C and Ø which are intermediate to those on the charts, embedments may be determined by straight - line interpolation.



DRILLED CONCRETE FOOTING DEPTH CHART
(TxDOT PENETROMETER DESIGN)

NOTE: ESTIMATED N SHOULD BE BASED AT APPROXIMATELY THE UPPER ONE-THIRD POINT OF THE DRILLED CONCRETE FOOTING BELOW THE GROUND LINE

Note:
1. Curves shown on this sheet are applicable for reinforced concrete footings only.

Texas Department of Transportation
Traffic Operations Division

LARGE ROADSIDE SIGN SUPPORTS FOUNDATION WORKSHEET
SMD(8W2)-08

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

REVISIONS
5-74
4-78
9-08

CONT	SECT	JOB	HIGHWAY
0090	05	107	IH40

DIST	COUNTY	SHEET NO.
AMA	POTTER	182

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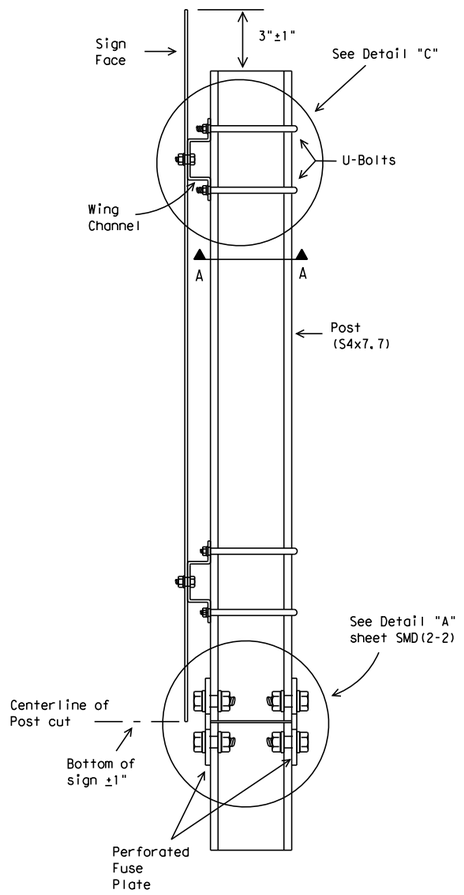
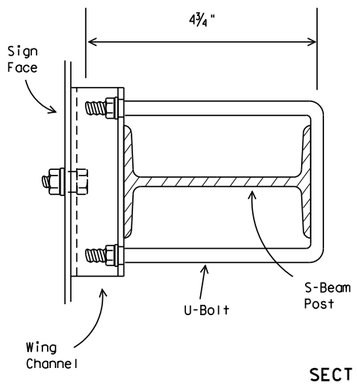
mkhan

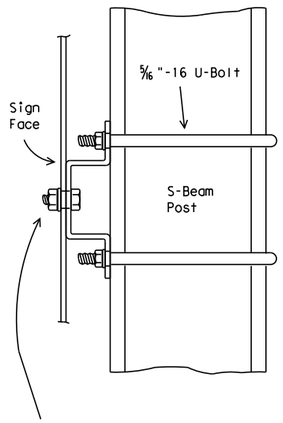
WING CHANNEL CLAMP DETAIL FOR TYPE G MOUNT



SIDE VIEW

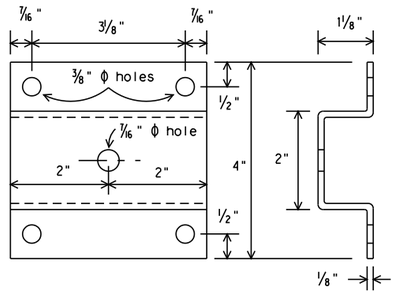


SECTION A-A



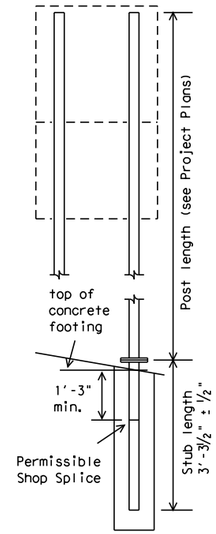
Galvanized steel or aluminum self-locking hex. head nut. 3/8 " - 16 x 3/4 " hex. head bolt for sheet metal. 3/8 " - 16 x 1 1/4 " hex. head bolt for plywood. 3/8 " galvanized medium washer.

DETAIL "C"

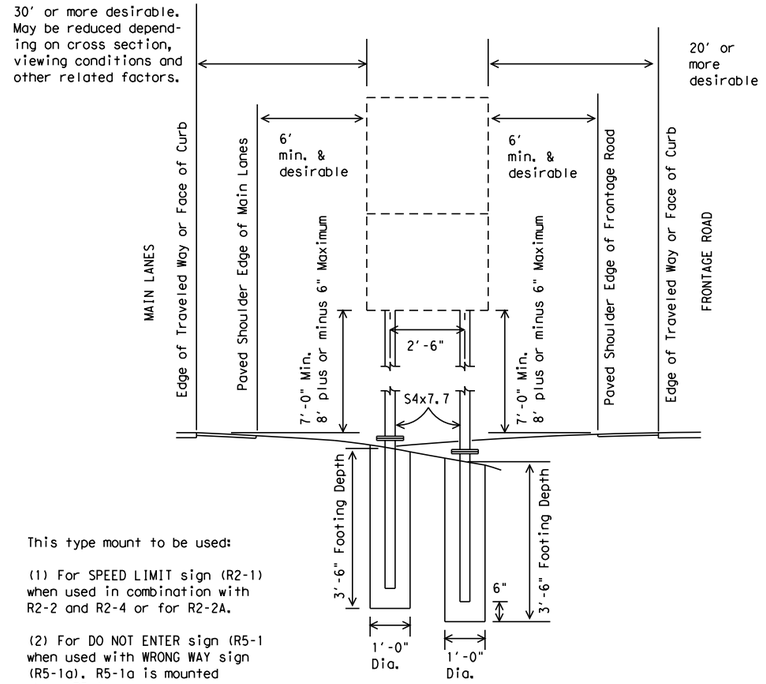


WING CHANNEL

Wing channel, 4" width x 1⅛" depth x ⅛" thickness, shall be aluminum (ASTM B221 6061-T6 or B308 6061-T6), galvanized steel (ASTM A36) or stainless steel (ASTM A167 type 304, No. 2B finish).



The weight of one S4x7.7 post is equal to 112.2 lbs. plus 7.7 lbs./ft x (post length in feet minus 10 ft). The weight of 112.2 lbs. includes 10 feet of post length, post foundation stub, related connection plates, friction fuse plate, and all high strength bolts, nuts and washers.



This type mount to be used:

(1) For SPEED LIMIT sign (R2-1) when used in combination with R2-2 and R2-4 or for R2-2A.

(2) For DO NOT ENTER sign (R5-1 when used with WRONG WAY sign (R5-1a). R5-1a is mounted above R5-1.

DEPARTMENTAL MATERIAL SPECIFICATIONS
SIGN HARDWARE DMS-7120

GENERAL NOTES:

1. Design conforms with AASHTO Specifications for the design and construction of structural supports for highway signs.
2. Materials and fabrication shall conform to the requirements of the Department material specifications.
3. Structural steel shall be "Low-Alloy Steel" for non-bridge structures per Item 442, "Metal For Structures."
4. Parts shall be saw cut either before galvanizing and the galvanized cut cleaned of zinc build-up, or saw cut after galvanizing and the cut surface repaired per Item 445, "Galvanizing." (Cut surface will not be treated until plate is installed and all bolts fully tightened.)

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS, TYPE G SUPPORT

SMD(TY G)-08

REVISIONS
1-97
9-08

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

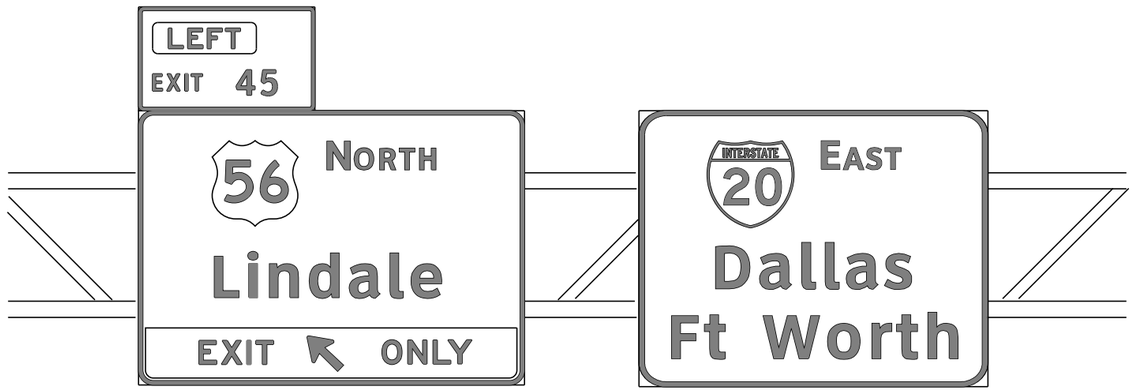
CONT	SECT	JOB	HIGHWAY
0090	05	107	IH40

DIST	COUNTY	SHEET NO.
AMA	POTTER	183

DATE: 12/7/2023 1:44:43 PM
FILE: c:\bms\bridgefarmer-pw\mkhan@two-mm.com\dms21478\184 - TSR-01.dgn
mkhan

REQUIREMENTS FOR OVERHEAD AND LARGE GROUND-MOUNTED SIGNS

TYPICAL EXAMPLES



GENERAL NOTES

1. Signs to be furnished shall be as detailed elsewhere in the plans and/or as shown on sign summary sheet. Standard sign designs and arrow dimensions can be found in the "Standard Highway Sign Designs for Texas" (SHSD).
2. Black legend shall use the Federal Highway Administration (FHWA) Standard Highway Alphabets (B, C, D, E, Emod, or F).
   White legend shall use the Clearview Alphabet.
   The following Clearview fonts shall be used to replace the existing white FHWA lettering, 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. 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 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 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 need not be trimmed or rounded if fabricated from an extruded material.
7. Sign substrate for ground-mounted signs shall be any material that meets the Departmental Material Specification requirements of DMS-7110 or approved alternative. Sign substrate for overhead signs shall be any material that meets DMS-7110. Exit Number Panels attached above the parent sign shall be made with the same substrate and sheeting as the parent sign.
8. Mounting details of attachments to parent sign face are shown on Standard Plan Sheet TSR(5). Mounting details of exit number panels above parent sign are shown in the "SMD series" Standard Plan Sheets.
9. Background sheeting shall be applied to the substrate per sheeting manufacturer's recommendations. Sheeting will not be allowed to bridge the horizontal gap between panels.
10. Cut all legend, symbols, borders, and direct applied sign attachments at panel joints.

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/

SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	WHITE	TYPE B OR C SHEETING
BACKGROUND	ALL OTHERS	TYPE B OR C SHEETING
LEGEND & BORDERS	WHITE	TYPE D SHEETING
LEGEND & BORDERS	BLACK	ACRYLIC NON-REFLECTIVE FILM

Texas Department of Transportation

Traffic Operations Division Standard

TYPICAL SIGN REQUIREMENTS

TSR(1)-13

FILE: tsr1-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT October 2003	CONT	SECT	JOB	HIGHWAY
REVISIONS	0090	05	107	IH40
12-03 7-13	DIST	COUNTY		SHEET NO.
9-08	AMA	POTTER		184

DATE: 12/7/2023 1:45:25 PM
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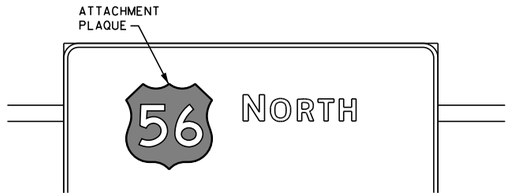
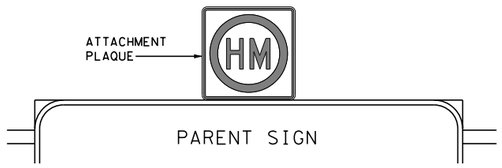
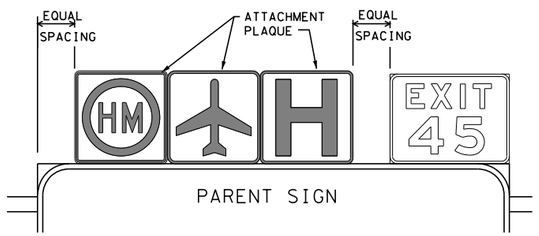
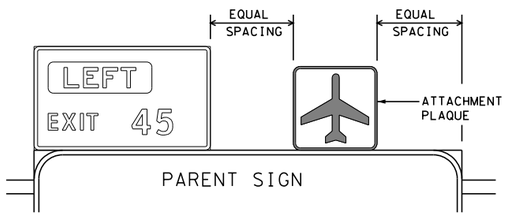
mkhan

REQUIREMENTS FOR ATTACHMENTS TO OVERHEAD AND LARGE GROUND MOUNTED SIGNS









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

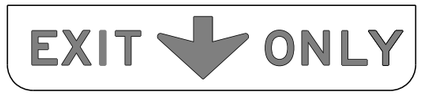
SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	ALL	TYPE B OR C SHEETING
LEGEND & BORDERS	BLACK	ACRYLIC NON-REFLECTIVE FILM
LEGEND & BORDERS	ALL OTHERS	TYPE B OR C SHEETING

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. Route Marker legends (ie. IH, US, SH and FM shields) 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 and borders shall be applied by screening process with transparent colored ink, transparent colored overlay film or colored sheeting to white background sheeting, or combination thereof.
7. Route markers and other attachments within the parent sign face shall be direct applied unless otherwise specified in the plans. Attachments not direct applied shall use 0.063 inch thick one piece sheet aluminum signs (Type A).
8. General Service Plaques shall be 0.080 inch thick and Routing Plaques shall be 0.100 inch thick.
9. The priority for Routing Plaques shall be (left to right) Hazardous Material, Airport then Hospital. See examples for mounting location.
10. Mounting details of attachments to parent signs face are shown on Standard Plan Sheet TSR(5). Mounting details of sign plaque attachments above and below parent sign are shown in the "SMD series" Standard Plan Sheets.
11. Plaques shall be horizontally centered at the top of the parent sign. If an exit number panel exists, the plaque shall be centered between the edge of the parent sign and the edge of the exit number panel. The plaque may be placed above the exit number panel when there is insufficient space.

TYPICAL EXAMPLES

REQUIREMENTS FOR EXIT ONLY AND LEFT EXIT PANELS



TYPICAL EXAMPLES

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

SHEETING REQUIREMENTS FOR OVERHEAD EXIT PANELS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	FLUORESCENT YELLOW	TYPE B_{FL} OR C_{FL} SHEETING
LEGEND	BLACK	ACRYLIC NON-REFLECTIVE FILM

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). Individual panel sizes shown in the plans may be adjusted to fit actual parent sign sizes if necessary.
2. Exit Panel legend shall use the Federal Highway Administration (FHWA)Standard Highway Alphabets E Series.
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 shall be applied by screening process or cut-out acrylic non-reflective black film to yellow background sheeting, or combination thereof.
5. Exit Only and Left Exit panels within the parent sign face shall be direct applied unless otherwise specified in the plans. Panels not direct applied shall use 0.063 inch thick one piece sheet aluminum signs (Type A).
6. Mounting details of Exit Only and Left Exit panel attachments to parent signs face are shown on Standard Plan Sheet TSR(5).

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(2)-13

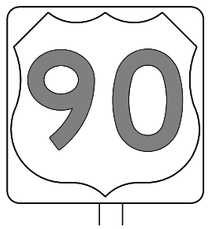
FILE: tsr2-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT October 2003	CONT	SECT	JOB	HIGHWAY
REVISIONS	0090	05	107	IH40
12-03 7-13	DIST	COUNTY		SHEET NO.
9-08	AMA	POTTER		185

2

DATE: 12/7/2023 1:47:14 PM
FILE: c:\tms\bridgefarmer-pw\mkhan@two-mm.com\dms21478\186 - TSR-03.dgn
mkhan

REQUIREMENTS FOR INDEPENDENT MOUNTED ROUTE SIGNS

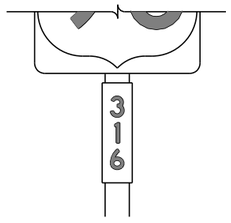
SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	WHITE	TYPE A SHEETING
BACKGROUND	ALL OTHERS	TYPE B OR C SHEETING
LEGEND & BORDERS	WHITE	TYPE A SHEETING
LEGEND & BORDERS	BLACK	ACRYLIC NON-REFLECTIVE FILM
LEGEND & BORDERS	ALL OTHERS	TYPE B or C SHEETING

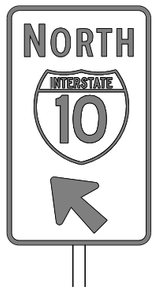


TYPICAL EXAMPLES

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	0090	05	107	IH40
12-03 7-13	DIST	COUNTY		SHEET NO.
9-08	AMA	POTTER		186

3

DATE: 12/7/2023
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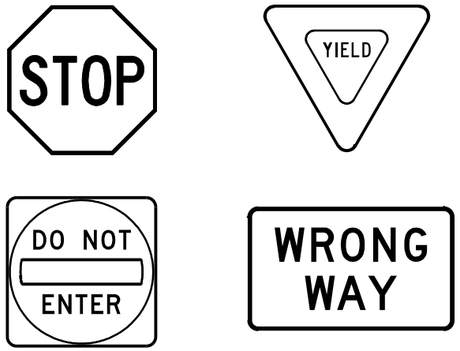
mkhan 1:47:59 PM

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

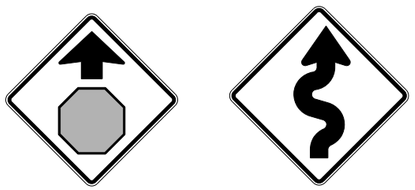
REQUIREMENTS FOR WHITE BACKGROUND REGULATORY SIGNS

(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	0090	05	107	IH40
12-03 7-13	DIST	COUNTY		SHEET NO.
9-08	AMA	POTTER		187

4

DATE: 12/7/2023 1:48:40 PM
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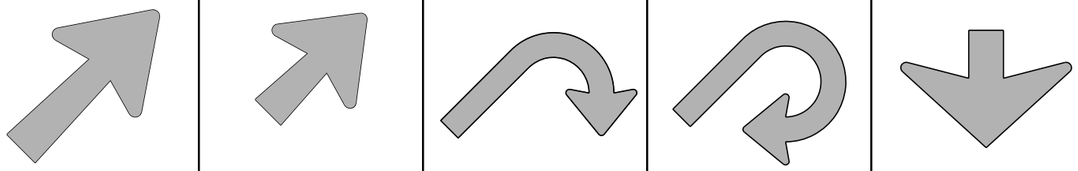
mkhan

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

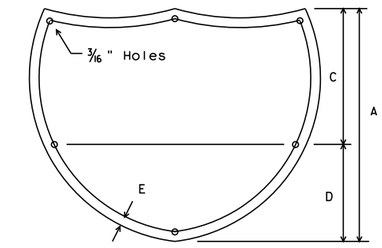
NOTE

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.

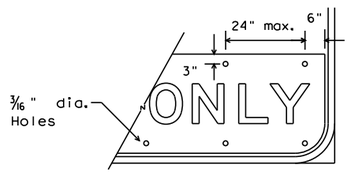
http://www.txdot.gov/

SIGN BLANK PUNCHING DETAILS FOR ATTACHMENTS WHEN SPECIFIED TO BE TYPE A ALUMINUM SIGNS (FOR MOUNTING TO GUIDE SIGN FACE)

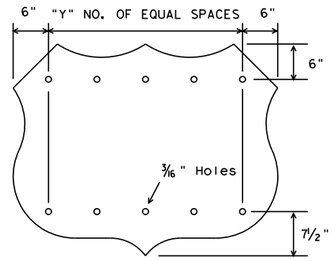


INTERSTATE ROUTE MARKERS

A	C	D	E
36	21	15	1 1/2
48	28	20	1 3/4

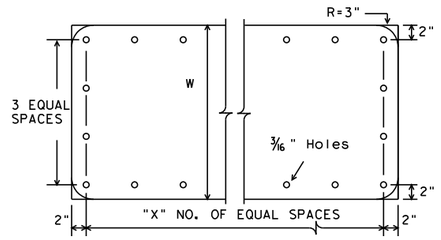


EXIT ONLY PANEL



U.S. ROUTE MARKERS

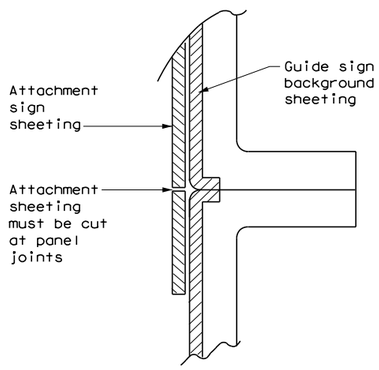
Sign Size	"Y"
24x24	2
30x24	3
36x36	3
45x36	4
48x48	4
60x48	5



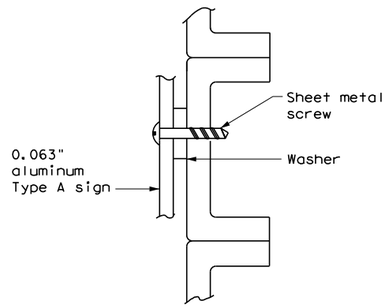
STATE ROUTE MARKERS

No. of Digits	W	X
4	24	4
4	36	5
4	48	6
3	24	3
3	36	4
3	48	5

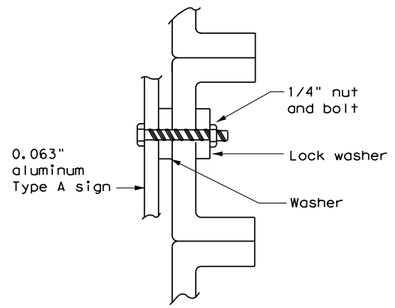
MOUNTING DETAILS OF ATTACHMENTS TO GUIDE SIGN FACE ("EXIT ONLY" AND "LEFT EXIT" PANELS, ROUTE MARKERS AND OTHER ATTACHMENTS)



DIRECT APPLIED ATTACHMENT



SCREW ATTACHMENT



NUT/BOLT ATTACHMENT

NOTE:

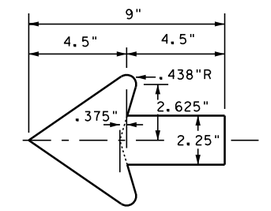
1. Sheeting for legend, symbols, and borders must be cut at panel joints.
2. Direct applied attachment signs will be subsidiary to "Aluminum Signs" or "Fiberglass Signs".

NOTE:

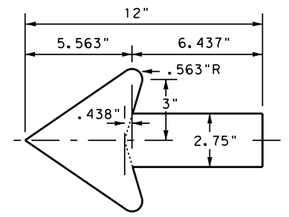
Furnish Type A aluminum sign attachments only when specified in the plans. These signs will be paid for under "Aluminum Signs".

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	0090	05	107	IH40
12-03 7-13	DIST	COUNTY		SHEET NO.
9-08	AMA	POTTER		188

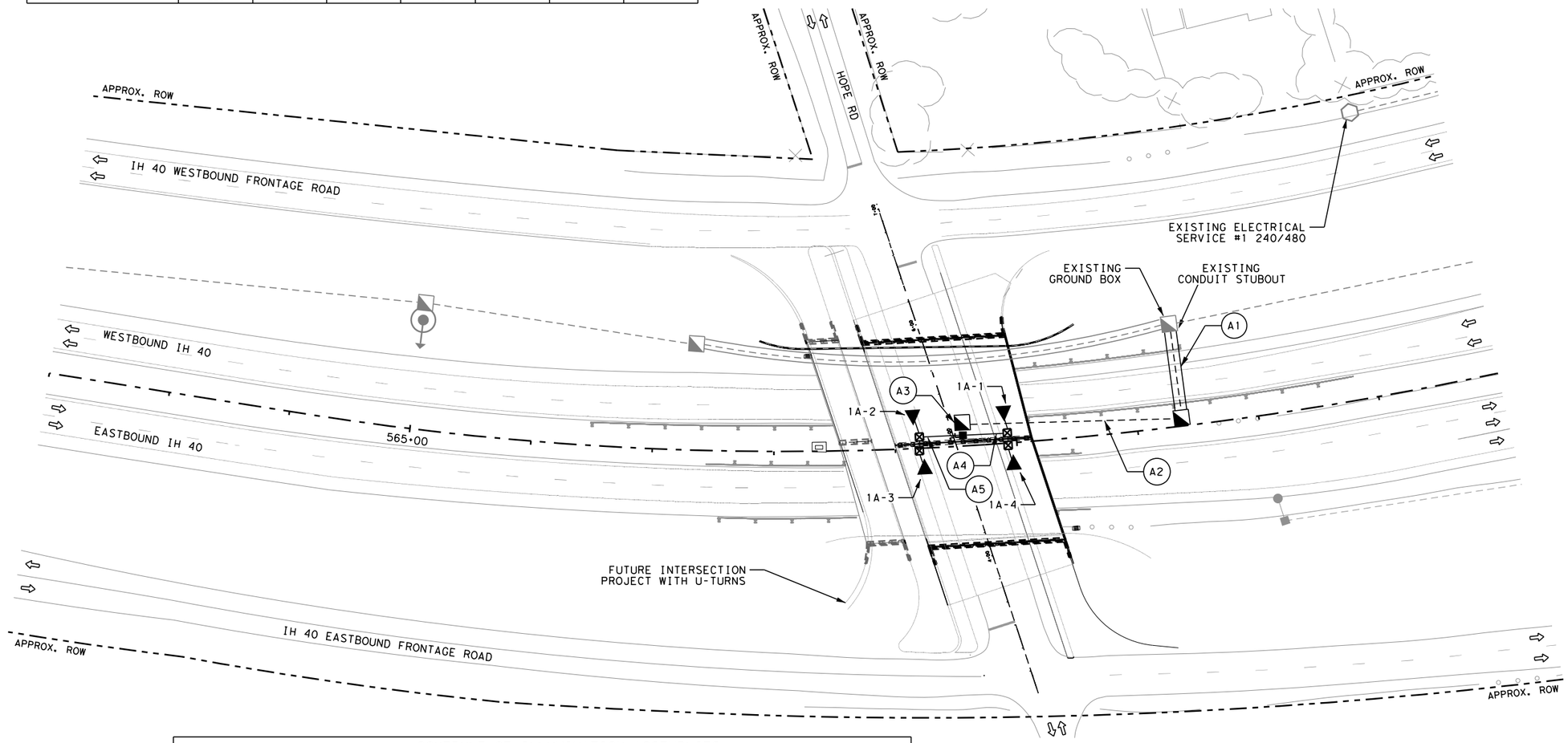
5

PLOTDRIVER: $PLTDRVS$
PENTABLE: $PENTBLS$

DATE:12/13/2023 10:12:09 AM USER:Daryoush.Arian
FILE:c:\bms\bridgefarmer-pw\daryoush.arian@bridgefarmer.com\dms21443\189_HOPE UNDERPASS ILLUM_01.dgn

SCHEDULE OF CONDUIT AND CONDUCTORS																
CIRCUIT LETTER	RUN NO.	LENGTH (LF)	CONDUIT (NO & LENGTH IN FEET)						CONDUCTOR (NO & LENGTH IN FEET)							
			618 6046		618 6062		618 6047		620 6003		620 6004		620 6007		620 6008	
			2" PVC		3/4" RM		2" PVC (BORE)		#12 AWG (BARE)		#12 AWG (INSULATED)		#8 AWG (BARE)		#8 AWG (INSULATED	
A	1	80					1	80					1	90	2	180
A	2	200	1	200									1	210	2	420
A	3	20	1	20									1	25	2	50
A	4	50			1	110			1	120	2	240				
A	5	50			1	110			1	120	2	240				
TOTAL			220		220		80		240		480		325		650	

SUMMARY OF QUANTITIES			
ITEM	DESCRIPTION	UNIT	QUANTITY
610 6106	IN RD IL (U/P)(TY 2)(150W EQ)LED	EA	4
618 6046	COND(PVC)(SCH 80)(2")	LF	220
618 6047	COND(PVC)(SCH 80)(2")(BORE)	LF	80
618 6062	CONDT(RM)(3/4")	LF	220
620 6003	ELEC CONDR(NO.12)BARE	LF	240
620 6004	ELEC CONDR(NO.12)INSULATED	LF	480
620 6007	ELEC CONDR(NO.8)BARE	LF	325
620 6008	ELEC CONDR(NO.8)INSULATED	LF	650
624 6002	GROUND BOX TY A(122311)W/APRON	EA	2



0' 25' 50' 100'

SCALE: 1" = 100'

LEGEND:

- APPROX. ROW
- EXIST. STANDARD ILLUM.
- EXIST. CONDUIT
- XX-X EXIST. HIGH MAST ILLUM. (6-LED ASYM FIXTURE)
- EXIST. ELECTRIC SERVICE POINT
- EXIST. TYPE A GROUND BOX WITH APRON
- PROP. TYPE A GROUND BOX WITH APRON
- PROP. ELECTRICAL CONDUIT
- PROP. ELECTRICAL CONDUIT BORED
- PROP. ELECTRICAL CONDUIT RIGID METAL
- XX-X PROP. UNDERPASS LIGHT FIX. (150 W. EQ LED) (TY 2)
- PROP. DISCONNECT SWITCH
- PROP. JUNCTION BOX
- XX-X LUMINARE ID
  - LUMINAIRE NUMBER
  - CIRCUIT LETTER
  - SERVICE NUMBER

SCHEDULE OF ILLUMINATION ASSEMBLIES				
FIXTURE NO.	DESCRIPTION	CENTERLINE	STATION	OFFSET
1A-1	IN RD IL (U/P)(TY 2)(150W EQ)LED	HOPE RD.	5+20.00	30.00 RT
1A-2	IN RD IL (U/P)(TY 2)(150W EQ)LED	HOPE RD.	5+20.00	40.00 LT
1A-3	IN RD IL (U/P)(TY 2)(150W EQ)LED	HOPE RD.	4+80.00	40.00 LT
1A-4	IN RD IL (U/P)(TY 2)(150W EQ)LED	HOPE RD.	4+80.00	30.00 RT

EXISTING ELECTRICAL SERVICE DATA											
ELEC. SERVICE ID.	ELECTRIC SERVICE DESCRIPTION	SERVICE CONDUIT SIZE	SERVICE CONDUCTORS NO./SIZE	SAFETY SWITCH AMPS	MAIN CIRCUIT BREAKER POLE/AMPS	TWO POLE CONTACTOR AMPS	PANEL BED/LOAD CENTER AMP RATING	BRANCH CIRCUIT ID	BRANCH CIRCUIT BREAKER POLE/AMPS	BRANCH CIRCUIT AMPS	KVA LOAD
1	ELC SRV TY A 240/480 060(NS)SS(E)SP(O)	1 1/2"	3/#6	N/A	2P/60	60	N/A	A-HMLP+UP	2P/20	15.84	14.8
								B-HMLP	2P/20	15	

NO.	DATE	REVISION	APPROVED

STATE OF TEXAS
L. CLINT HARMS
124794
LICENSED
PROFESSIONAL ENGINEER

1/22/2024

Texas Department of Transportation

IH 40
ILLUMINATION LAYOUT

SHEET 1 OF 1

FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
6	SEE TITLE SHEET		IH 40
STATE	DIST.	COUNTY	SHEET NO.
TEXAS	AMA	POTTER	189
CONT.	SECT.	JOB	
0090	05	107	

SUPPORT TYPE STEEL POLE (SP) AND STEEL FRAME (SF)

1. Provide steel pole and steel frame supports as per TxDOT Departmental Material Specification (DMS)11080 "Electrical Services." Mount all equipment and conduit on 12 gauge galvanized steel or stainless steel channel strut, 1 ½ in. or 1 ⅝ in. wide by 1 in. up to 3 ¾ in. deep Unistrut, Kindorf, B-line or equal. Bolt or weld all channel and hardware to vertical members as approved. Do not stack channel. File smooth and paint field cut ends of all channel with zinc-rich paint before installing.

2. Provide poles for overhead service with an eyebolt or similar fitting for attachment of the service drop to the pole in conformance with the electric utility provider's specifications.

3. Provide and install galvanized ¾ in. x 18 in. x 4 in. (dia. x length x hook length) anchor bolts for underground service supports. Provide and install galvanized ¾ in. x 56 in. x 4 in. anchor bolts for overhead service supports. Ensure anchor bolts have 3 in of thread, with 3 ¼ in. to 3 ½ in. of the exposed anchor bolt projecting above finished foundation. Provide and install leveling nuts for all anchor bolts.

4. Bond one of the anchor bolts to the rebar cage with 6 AWG bare stranded copper conductor. Use listed mechanical connectors rated for embedment in concrete. See Inset B.

5. Furnish and install rigid metallic ells in all steel pole and steel frame foundations for all conduits entering the service from underground.

6. Use class C concrete for foundations. Ensure reinforcing steel is Grade 60 with 3" of unobstructed concrete cover.

7. Drill and tap steel poles and frames for ½ in. X 13 UNC tank ground fitting. For steel pole service supports, provide and install tank ground fitting 4 in. to 6 in. below electrical service enclosure. Provide properly sized hole through the bottom of the enclosure for the service grounding electrode conductor. Ensure electrical service grounding electrode conductor is as short and straight as possible from the enclosure to the tank ground fitting. For steel frame service supports, provide and install tank ground fitting on steel frame post. Install service grounding electrode conductor in a non-metallic conduit or tubing from the enclosure to the steel frame post. Connect electrical service grounding electrode conductor to the tank ground fitting. See steel frame and steel pole details and Inset A for more information. Size service entrance conduit and branch circuit conduit as shown in the plans. For underground conduit runs from the electrical service, extend RMC from the service enclosure to an RMC elbow, and then connect the schedule type and size of conduit shown in the plans. Provide and install grounding bushings where RMC terminates in the enclosure. Grounding bushings are not required when RMC is fitted into a sealing hub or threaded boss.

8. If Steel pole or frame is painted, bond each separate painted piece with a bonding jumper attached to a tapped hole.

9. Provide ¼" - 20 machine screws for bonding. Do not use sheet metal screws. Remove all non-conductive material at contact points. Terminate bonding jumpers with listed devices. Install minimum size 6 AWG stranded copper bonding jumpers. Make up all threaded bonding connections wrench tight.

10. Avoid contact of the service drop and service entrance conductors with the metal pole to prevent abrasion of the insulated conductors.

11. Shop drawings are not required for service support structure unless specifically stated elsewhere or directed by the Engineer.

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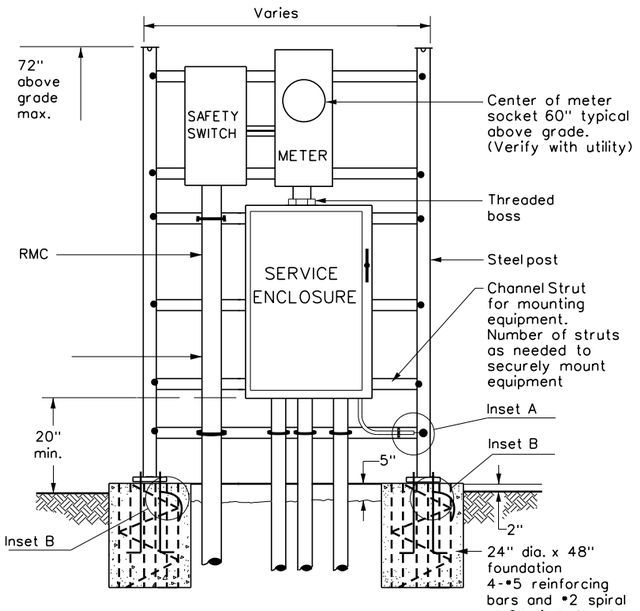
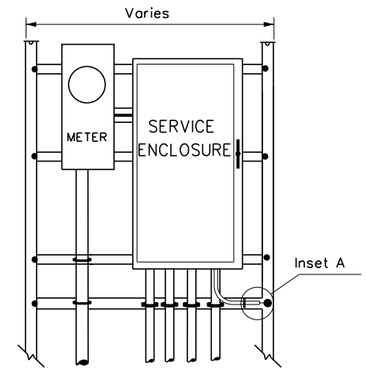
Daryoush.Arian

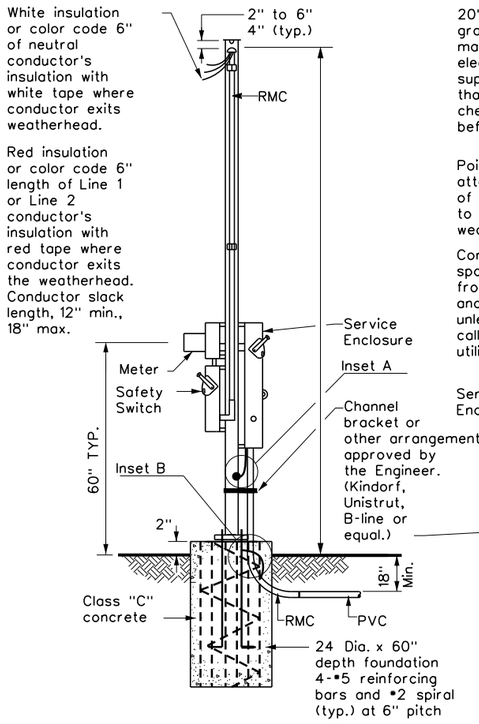


WITH SAFETY SWITCH
FRONT VIEW

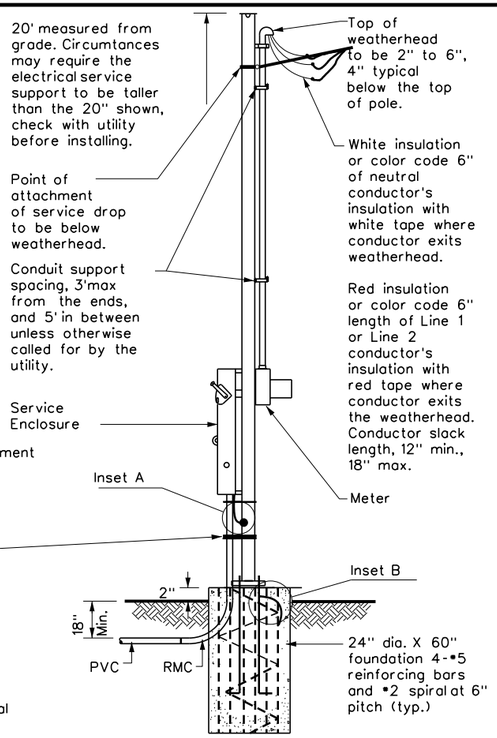


WITHOUT SAFETY SWITCH

SERVICE SUPPORT TYPE SF(U) - UNDERGROUND SERVICE

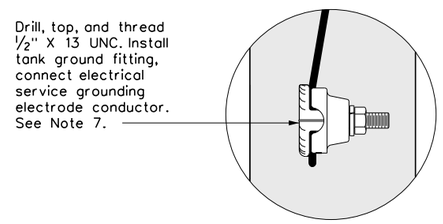


WITH SAFETY SWITCH

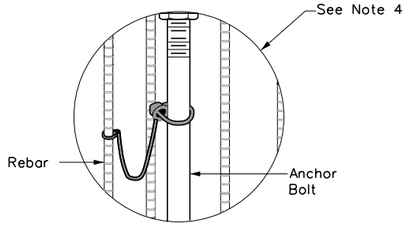


WITHOUT SAFETY SWITCH

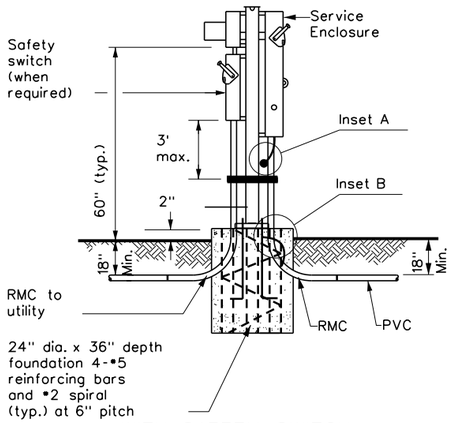
SERVICE SUPPORT TYPE SP (O) - OVERHEAD SERVICE



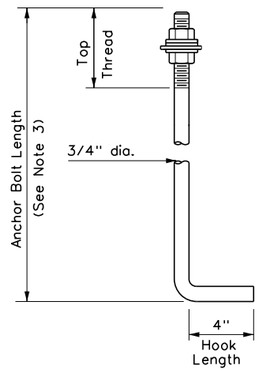
FRONT VIEW
INSET A



INSET B

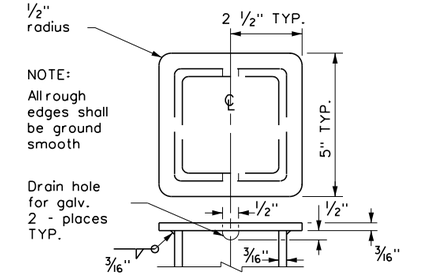


WITH SAFETY SWITCH

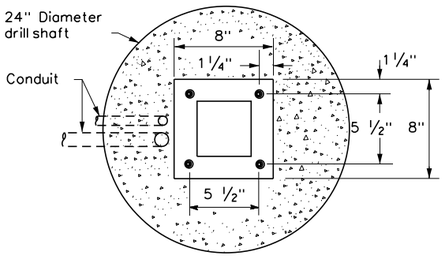


HOOKED ANCHOR DETAIL

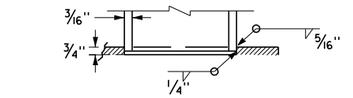
SERVICE SUPPORT TYPE SP(U) - UNDERGROUND SERVICE



POLE TOP PLATE

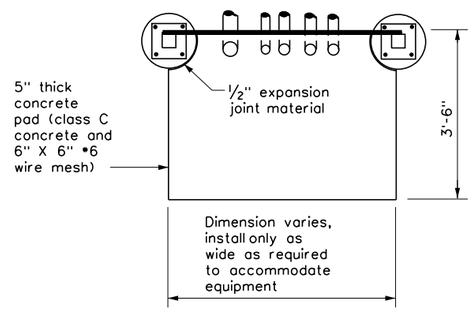


BASE PLATE DETAIL



BOTTOM OF POLE

SERVICE SUPPORT TYPE SF & SP



TOP VIEW

SERVICE SUPPORT TY SF (O) & SF (U)

Texas Department of Transportation

Traffic Operations Division Standard

ELECTRICAL DETAILS SERVICE SUPPORT TYPES SF & SP

ED(7)-14

FILE: ed7-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT October 2014	CONT	SECT	JOB	HIGHWAY
REVISIONS	0090	05	107	IH40
	DIST	COUNTY		SHEET NO.
	AMA	POTTER		190

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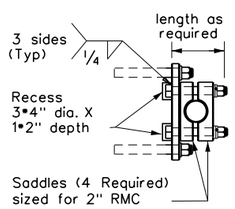
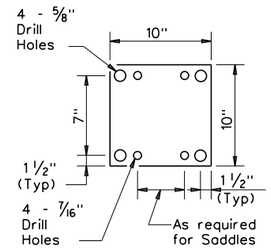
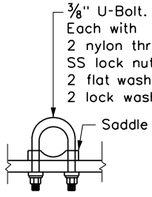
Daryoush.Arian



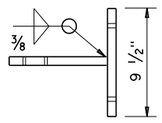
SECTION A-A



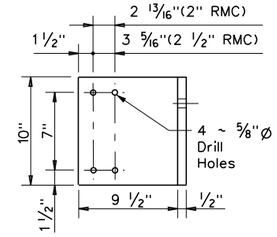
MOUNTING PLATE
(ASTM A-36 or better)



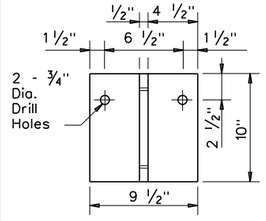
CLAMP DETAIL
(2 Req'd)



PLAN VIEW



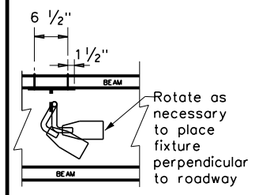
FRONT



SIDE

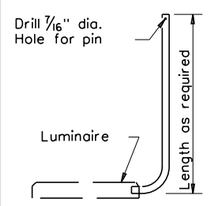
BRACKET DETAIL

Make from 1/2" plate (ASTM A-36 or better)

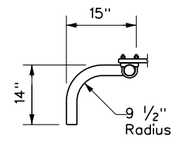


PLAN VIEW

FIXTURE ORIENTATION

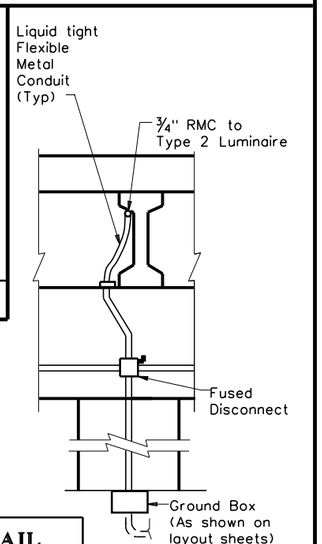


SIDE



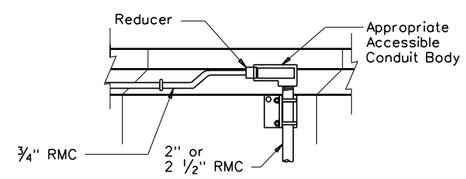
PLAN VIEW

ARM DETAIL



3 - No. 12 XHHW in 3/4" RMC for Branch Circuit runs from fused disconnect to underpass Luminaires

CONDUIT DETAIL



CONDUIT CONNECTION PROFILE

GENERAL NOTES:

A. ALL 150 watt HPS and 150 watt equivalent LED Luminaires

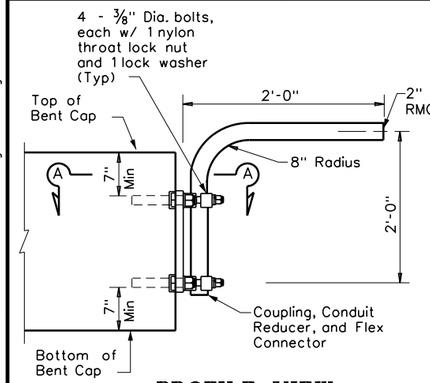
1. Luminaire locations, conduit and conductor sizes and routing are typical and diagrammatic only. See project layout sheets for specific details.
2. Conduit will be paid for under Item 618, "Conduit" and conductors will be paid for under Item 620, "Electrical Conductors," unless otherwise shown on the plans.
3. Adjust conduit in saddles to place fixture height and orientation as required. See fixture orientation detail and plans. Where practicable, place luminaires so the bottom of luminaire is above the bottom of the beam, maximum of 3 in. (See detail UNDERPASS LIGHTING ARM TYPE 2)
4. Except as noted, galvanize all structural steel and exposed bolts, nuts, and washers in accordance with Item 445 "Galvanizing".
5. Fabrication of brackets and support arms will not be paid for directly but is subsidiary to Item 610, "Roadway Illumination Assemblies."
6. Install a heavy duty NEMA 3R fused disconnect or breaker enclosure rated at 30 amps and 480 volts to switch underpass luminaires as shown on plans, with at least one per bridge circuit. Install 20 amp time-delay fuses or inverse-time circuit breakers. Mount disconnect or breaker enclosure 10 ft.(min) above grade on columns or bent caps as approved by the Department. Modify disconnect to allow padlocking in the "ON" and "OFF" positions. Padlocks and disconnect switches or circuit breakers for underpass fixtures will not be paid for directly but are subsidiary to the various bid items of the contract.
7. Conduit on columns, caps, and slab is shown surface mounted. For new columns and caps, embed PVC conduit in concrete. Bond and ground metal junction boxes and conduit.

B. TYPE 1

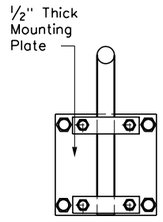
1. Provide 2 in. rigid metal conduit (2.375" O.D., 0.146" wall) for Type 1 arm shaft.
2. Use 3/8 in. stainless steel bolt or stud non-epoxy type expansion anchors for concrete for Type 1 mounting. Except as noted, provide an allowable 2650 lbs minimum pull-out force (after consideration of adjustment factors for edge distance and bolt spacing) for each anchor. Install each anchor to the embedment depth recommended by the manufacturer.
3. Attach conduit to plate with 4 saddles, four - 3/8 in. diameter bolts, nylon throat lock nuts, and lock washers.

C. TYPE 2

1. Provide 2 in. rigid metal conduit (2.375" O.D., 0.146" wall) or provide a combination of 2 1/2 in. (2.875" O.D., 0.193" wall) and 2 in. (2.375" O.D., 0.146" wall) rigid metal conduits with a reducing bushing as beam height stipulated for Type 2 arm shaft. Field cutting and threading will be permitted. Paint cut and threaded areas with zinc rich paint after conduit is connected to adjacent fitting.
2. Connecting conduit may be strapped to tapered section only of precast beams as shown. Anchor as approved by the Engineer. Maximum anchor depth is 1 in.
3. Indiscriminate drilling into precast concrete beams may result in reduced beam strength. Use drilling location and method as directed by the Engineer. See Location of Underpass Lighting Mounting Bracket detail. The locations shown in the table are such that reinforcing strands will not be damaged.

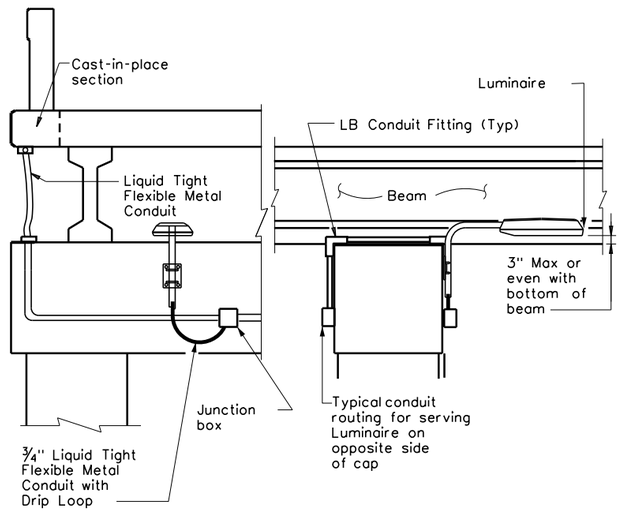


PROFILE VIEW
Or as Required
(See Note A.3)



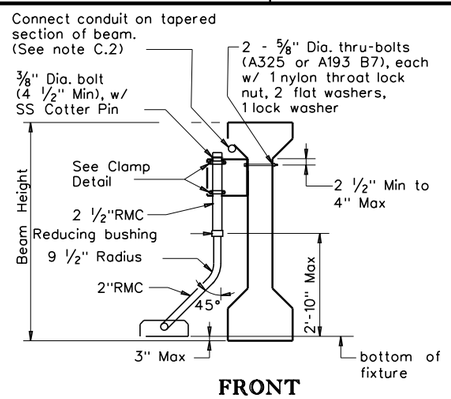
END VIEW

UNDERPASS LIGHTING ARM

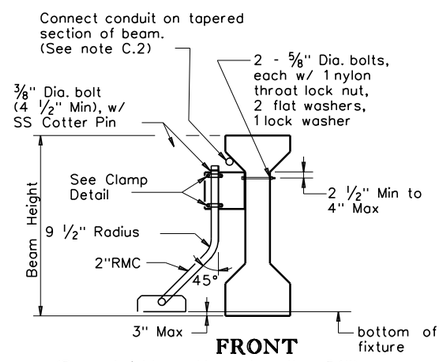


IN RD IL AM (U/ P) (TY 1)
If bridge has pre-cast panels under deck, run circuit under deck edge.

UNDERPASS LIGHTING TYPE 1



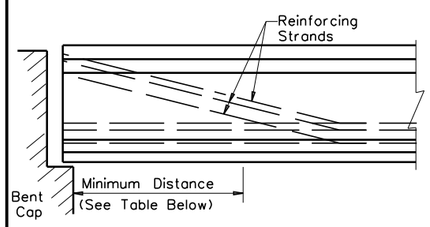
FRONT
(Beam height greater than 54")



FRONT
(Beam height equal to or less than 54")

IN RD IL AM (U/ P) (TY 2)

UNDERPASS LIGHTING TYPE 2



LOCATION OF UNDERPASS LIGHT MOUNTING BRACKET

TABLE 5

LOCATION OF UNDERPASS LIGHT MOUNTING BRACKET TABLE

SPAN LENGTH	MINIMUM DISTANCE
≤ 50'	10'-0"
50'- 70'	15'-0"
70'- 90'	20'-0"
> 90'	25'-0"

Texas Department of Transportation

Traffic Safety Division Standard

ROADWAY ILLUMINATION DETAILS

(UNDERPASS LIGHT FIXTURES)

RID(3)-20

FILE: rid3-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT May 2013	CONT	SECT	JOB	HIGHWAY
REVISIONS	0090	05	107	IH40
2-14	DIST	COUNTY		SHEET NO.
7-17	AMA	POTTER		191
12-20				

72C

DATE: 12/11/2023 1:19:45 PM
FILE: c:\tbms\bridgefarmer-pw\jim.langston\dms21439\038402113-EPIC.dgn
JWL

I. STORMWATER POLLUTION PREVENTION-CLEAN WATER ACT SECTION 402

TPDES TXR 150000: Stormwater Discharge Permit or Construction General Permit required for projects with 1 or more acres disturbed soil. Projects with any disturbed soil must protect for erosion and sedimentation in accordance with Item 506.

List MS4 Operator(s) that may receive discharges from this project. They may need to be notified prior to construction activities.

1. CITY OF AMARILLO

☐ No Action Required ☒ Required Action

Action No.

1. Comply with Construction General Permit and implement project SW3P's.
2. (If there are 1-<5 acres of disturbance) Post the TxDOT and Contractor's small construction site notice (CSN) with SW3P information on or near the site, accessible to the public, TCEQ, EPA, and other inspectors. The versions of the notice with the original signatures are also required to be in the binder.
3. Prevent stormwater pollution by controlling erosion and sedimentation in accordance with TPDES Permit TXR 150000.
4. Comply with the SW3P and revise when necessary to control pollution as required by 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

In the event that unanticipated archeological deposits are encountered during construction, work in the immediate area will cease and TxDOT archeological staff will be contacted to initiate post-review discovery procedures.

☒ No Action Required ☐ Required Action

IV. VEGETATION RESOURCES

Comply with Executive Order 13112 on Invasive Species and the intent of the Executive Order Memorandum on Beneficial Landscapes for re-vegetating the project area. The proposed seed mixture (both grasses and forbs) would be in accordance with Item 164, Seeding for Erosion Control in TxDOT's Standard Specifications for the construction of Highways, Streets, and Bridges.

☒ No Action Required ☐ Required Action

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. If any species on the Potter County Threatened & Endangered List is sighted in the project area during construction, stop construction and notify the Area Engineer.

2. Eastern Spotted Skunk, Swift Fox: Contractors will be advised of potential occurrence in the project area, and to avoid harming the species if encountered, and to avoid unnecessary impacts to dens.

3. Woodhouse's Toad, Texas Horned Lizard, Western Box Turtle, Western Hognose Snake, Western Massasauga, Prairie Rattlesnake:
a) Contractors will be advised of potential occurrence in the project area, and to avoid harming the species if encountered. If reptiles are found on project site, contractors are to allow them to leave the project site safely.
b) For the Texas Horned Lizard, avoid harvester ant beds in the selection of Project Specific Locations (PSL's)
c) If erosion control blankets or soil retention blankets are needed, 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.

4. Bird BMP's: a) Do not disturb, destroy, or remove active nests, including ground nesting birds, during the nesting season; b) avoid the removal of unoccupied, inactive nests, as practicable; c) do not collect, capture, relocate, or transport birds, eggs, young, or active nests without a permit.

5. The Migratory Bird Treaty Act of 1918 states that it is unlawful to kill, capture, collect, possess, buy, sell, trade, or transport any migratory bird, nest, young, feather, egg in part or in whole, without a Federal permit issued in accordance within the Act's policies and regulations. In the event that migratory birds are encountered on-site during project construction, adverse impacts on protected birds, active nests, eggs, and/or young would be avoided.

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.

STATE OF TEXAS
JAMES W. LANGSTON
73891
LICENSED
PROFESSIONAL ENGINEER
12/11/23
James W. Langston PE

Bridgefarmer & Associates, Inc.
TBPE Registration No. 264

Texas Department of Transportation

Design Division Standard

ENVIRONMENTAL PERMITS, ISSUES AND COMMITMENTS

EPIC

FILE: 038402113-EPIC.dgn	DN: TxDOT	CK: CG	DW: JL	CK: MS
© TxDOT: January 2023	CONT	SECT	JOB	HIGHWAY
REVISIONS	0090	05	107	IH40
	DIST	COUNTY		SHEET NO.
	AMA	POTTER		192

12/8/2023 11:28:52 AM

mkhan

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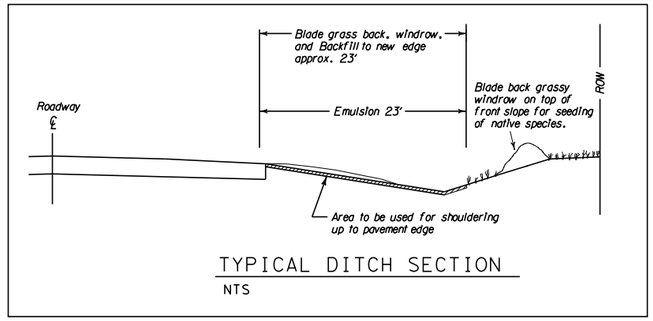

TYPICAL DITCH SECTION

NTS

50 0 50 100

SCALE: 1" = 100'

DATE DISTURBED: _____

DATE STABILIZED: _____

I.D #	INSTALL DATE:	REMOVE DATE:
A101		
A102		
A103		
A104		
A105		
B101		
B102		
B103		
B104		
B105		
B106		
B107		
C101		
C102		

LEGEND

- SCF — SEDIMENT CONTROL FENCE
- ECL — INLET PROTECTION (EROSION CONTROL LOG)
- CE — CONSTRUCTION ENTRANCE AND EXIT
- TRAFFIC FLOW
- SURFACE FLOW
- CELL FIBER HYDROMULCH
- SOIL RETENTION BLANKET

1. LOCATIONS OF EROSION CONTROL DEVICES ARE APPROXIMATIONS. ACTUAL LOCATIONS TO BE DETERMINED IN THE FIELD BY THE ENGINEER.

2. EROSION CONTROL DEVICES SHALL BE INSTALLED PRIOR TO THE START OF ANY CONSTRUCTION ACTIVITY AND SHALL REMAIN IN PLACE UNTIL CONSTRUCTION IS COMPLETE.

3. EROSION CONTROL DEVICE INSTALLATION, MAINTENANCE, AND REMOVAL SHALL BE IN ACCORDANCE WITH TXDOT STANDARDS FOR EROSION CONTROL.

4. ALL INLETS AND JUNCTION BOXES WITHIN THE PROJECT LIMITS OR AFFECTED BY CONSTRUCTION DEBRIS SHALL BE PROTECTED AT ALL TIME.

STATE OF TEXAS
MAHYAR RAZAZ
146001
LICENSED
PROFESSIONAL ENGINEER

12/11/23

NO.	DATE	DESCRIPTION	APPROV.

2M ASSOCIATES, LLC
5930 PRESTON VIEW BLVD., SUITE A
DALLAS, TEXAS 75240
TBPE REGISTRATION NO.12158
PH: 214-683-1377
FAX 888-525-9180

Texas Department of Transportation

IH-40 AT HOPE ROAD
SW3P

SCALE: 1" = 100' SHEET 1 OF 1

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
MR	6	SEE TITLE SHEET		IH 40
GRAPHICS MR	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK DH	TEXAS	AMA	POTTER	193
CHECK AM	CONTROL 0090	SECTION 05	JOB 107	

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mkhan

STORMWATER POLLUTION PREVENTION PLAN (SWP3):

This SWP3 has been developed in accordance with the TPDES Construction General Permit TXR150000 (CGP). The Texas Department of Transportation (TxDOT) ensures that project specifications include adequate best management practices (BMPs) for this project.

For all projects with any soil disturbing activities, TxDOT will maintain a SWP3 with all pertinent records, correspondence, environmental documents, etc. at the project field office. If no field office is available, then this SWP3 shall be kept in the appropriate TxDOT Area Office.

This SWP3 is consistent with requirements specified in applicable stormwater plans and the projects environmental permits, issues, and commitments (EPICs). A copy of the CGP is included in Attachment 2.12 of the SWP3 binder.

1.0 SITE/PROJECT DESCRIPTION

1.1 PROJECT CONTROL SECTION JOB (CSJ):

090-05-107

1.2 PROJECT LIMITS:

1.3 PROJECT COORDINATES:

BEGIN: (Lat) 35.189231, (Long) 101.979892

END: (Lat) 35.187109, (Long) 101.971867

1.4 TOTAL PROJECT AREA (Acres): 3.5

1.5 TOTAL AREA TO BE DISTURBED (Acres): 2.0

1.6 NATURE OF CONSTRUCTION ACTIVITY:

1.7 MAJOR SOIL TYPES:

Soil Type	Description
PANTEX SILTY CLAY LOAM	0-7" SILTY CLAY LOAM, 7-34" SILTY CLAY
AfU (AMARILLO URBAN LAND COMPLEX)	0-9": FINE SANDY LOAM 9"-38":SANDY CLAY LOAM 38"-80":CLAY LOAM

1.8 PROJECT SPECIFIC LOCATIONS (PSLs):

PSLs must be depicted on the Environmental Layout Sheets in Attachment 1.2 of this SWP3. PSLs may be identified during preconstruction meetings or during the construction process. Please choose from the options below:

☒ PSLs determined during preconstruction meeting
☐ PSLs determined during construction
☐ No PSLs planned for construction

Type	Sheet #s

All off-ROW PSLs required by the Contractor are the Contractor's responsibility. The Contractor shall secure all permits required by local, state, federal laws for off-ROW PSLs. The contractor shall provide diagrams, areas of disturbance, acreage, and BMPs for all off-ROW PSLs within one mile of the project.

1.9 CONSTRUCTION ACTIVITIES:

(Use the following list as a starting point when developing the Construction Activity Schedule and Ceasing Record in Attachment 2.5.)

☒ Mobilization
☒ Install sediment and erosion controls
☐ Blade existing topsoil into windrows, prep ROW, clear and grub
☐ Remove existing pavement
☐ Grading operations, excavation, and embankment
☐ Excavate and prepare subgrade for proposed pavement widening
☐ Remove existing culverts, safety end treatments (SETs)
☐ Remove existing metal beam guard fence (MBGF), bridge rail
☒ Install proposed pavement per plans
☐ Install culverts, culvert extensions, SETs
☐ Install mow strip, MBGF, bridge rail
☐ Place flex base
☐ Rework slopes, grade ditches
☐ Blade windrowed material back across slopes
☐ Revegetation of unpaved areas
☐ Achieve site stabilization and remove sediment and erosion control measures
☐ Other: _____
☐ Other: _____
☐ Other: _____

1.10 POTENTIAL POLLUTANTS AND SOURCES:

☒ Sediment laden stormwater from stormwater conveyance over disturbed area
☒ Fuels, oils, and lubricants from construction vehicles, equipment, and storage
☐ Solvents, paints, adhesives, etc. from various construction activities
☐ Transported soils from offsite vehicle tracking
☒ Construction debris and waste from various construction activities
☐ Contaminated water from excavation or dewatering pump-out water
☐ Sanitary waste from onsite restroom facilities
☐ Trash from various construction activities/receptacles
☐ Long-term stockpiles of material and waste
☐ Other: _____
☐ Other: _____
☐ Other: _____

1.11 RECEIVING WATERS:

Receiving waters must be depicted on the Environmental Layout Sheets in Attachment 1.2 of this SWP3. Include Segment # for receiving waters.

Tributaries	Classified Waterbody
WEST AMARILLO CREEK	UNCALSSIFIED, SEGMENT 0103C
EAST AMARILLO CREEK	CALSSIFIED, SEGMENT 0103A IMPARED BY BACTERIA IN WATER
CANADIAN RIVER	CLASSIFIED, *SEGMENT 0103-01 IMPAIRED FOR CHLORIDE

* Add (*) for impaired waterbodies with pollutant in ().

1.12 ROLES AND RESPONSIBILITIES: TxDOT

☒ Development of plans and specifications
☒ Submit Notice of Intent (NOI) to TCEQ (≥5 acres)
☒ Post Construction Site Notice
☒ Submit NOI/CSN to local MS4
☒ Perform SWP3 inspections
☒ Maintain SWP3 records and update to reflect daily operations
☒ Complete and submit Notice of Termination to TCEQ
☒ Maintain SWP3 records for 3 years
☐ Other: _____
☐ Other: _____
☐ Other: _____

1.13 ROLES AND RESPONSIBILITIES: CONTRACTOR

☒ Day To Day Operational Control
☒ Submit Notice of Intent (NOI) to TCEQ (≥5 acres)
☒ Post Construction Site Notice
☒ Submit NOI/CSN to local MS4
☒ Maintain schedule of major construction activities
☒ Install, maintain and modify BMPs
☒ Complete and submit Notice of Termination to TCEQ
☒ Maintain SWP3 records for 3 years
☐ Other: _____
☐ Other: _____
☐ Other: _____

1.14 LOCAL MUNICIPAL SEPARATE STORM SEWER SYSTEM (MS4) OPERATOR COORDINATION:

MS4 Entity

STATE OF TEXAS
MAHYAR RAZAZ
146001
LICENSED
PROFESSIONAL ENGINEER
12/11/23

NO.	DATE	DESCRIPTION	APPROV.

2M ASSOCIATES, LLC
5930 PRESTON VIEW BLVD., SUITE A
DALLAS, TEXAS 75240
TBPE REGISTRATION NO.12158
PH. 214.663-1377
FAX 888-528-9180

Texas Department of Transportation

STORMWATER POLLUTION PREVENTION PLAN (SWP3)

SHEET 1 OF 2

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
MR	6	SEE TITLE SHEET		IH 40
GRAPHICS MR	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK DH	TEXAS	AMA	POTTER	194
CHECK AM	CONTROL	SECTION	JOB	
	0090	05	107	

c:\bms\bridgefarmer-pw\mkhan@two-mm.com\dms21478\194 - SWP3 01.dgn

STORMWATER POLLUTION PREVENTION PLAN (SWP3):

2.0 BEST MANAGEMENT PRACTICES (BMPs) AND CONTROLS, INSPECTION, AND MAINTENANCE

The Contractor shall be the responsible party for implementing the BMPs described herein and for complying with the SWP3 for control of erosion and sedimentation during day-to-day operations. The Contractor shall implement changes to this SWP3 approved by TxDOT within the times specified in this SWP3 or the CGP.

2.1 EROSION CONTROL AND SOIL STABILIZATION BMPs:

T / P

- ☐ ☐ Protection of Existing Vegetation
- ☐ ☐ Vegetated Buffer Zones
- ☐ ☐ Soil Retention Blankets
- ☐ ☐ Geotextiles
- ☐ ☐ Mulching/ Hydromulching
- ☐ ☐ Soil Surface Treatments
- ☐ ☐ Temporary Seeding
- ☐ ☒ Permanent Planting, Sodding or Seeding
- ☒ ☐ Biodegradable Erosion Control Logs
- ☐ ☐ Rock Filter Dams/ Rock Check Dams
- ☐ ☐ Vertical Tracking
- ☐ ☐ Interceptor Swale
- ☐ ☒ Riprap
- ☐ ☐ Diversion Dike
- ☐ ☐ Temporary Pipe Slope Drain
- ☐ ☐ Embankment for Erosion Control
- ☐ ☐ Paved Flumes
- ☐ ☐ Other: _____
- ☐ ☐ Other: _____
- ☐ ☐ Other: _____
- ☐ ☐ Other: _____

2.2 SEDIMENT CONTROL BMPs:

T / P

- ☐ ☐ Biodegradable Erosion Control Logs
- ☐ ☐ Dewatering Controls
- ☒ ☐ Inlet Protection
- ☐ ☐ Rock Filter Dams/ Rock Check Dams
- ☐ ☐ Sandbag Berms
- ☒ ☐ Sediment Control Fence
- ☒ ☐ Stabilized Construction Exit
- ☐ ☐ Floating Turbidity Barrier
- ☐ ☐ Vegetated Buffer Zones
- ☐ ☐ Vegetated Filter Strips
- ☐ ☐ Other: _____
- ☐ ☐ Other: _____
- ☐ ☐ Other: _____
- ☐ ☐ Other: _____

Refer to the Environmental Layout Sheets/ SWP3 Layout Sheets located in Attachment 1.2 of this SWP3

Sediment control BMPs requiring design capacity calculations (See SWP3 Attachment 1.3.):

T / P

- ☐ ☐ Sediment Trap
  - ☐ Calculated volume runoff from 2-year, 24-hour storm for each acre of disturbed area
  - ☐ 3,600 cubic feet of storage per acre drained
- ☐ ☐ Sedimentation Basin
  - ☒ Not required (<10 acres disturbed)
  - ☐ Required (>10 acres) and implemented.
    - ☐ Calculated volume runoff from 2-year, 24-hour storm for each acre of disturbed area
    - ☐ 3,600 cubic feet of storage per acre drained
  - ☐ Required (>10 acres), but not feasible due to:
    - ☐ Available area/Site geometry
    - ☐ Site slope/Drainage patterns
    - ☐ Site soils/Geotechnical factors
    - ☐ Public safety
    - ☐ Other: _____

2.3 PERMANENT CONTROLS:

(Coordinate post-construction BMPs with appropriate TxDOT maintenance sections.)

BMPs To Be Left In Place Post Construction:

Type	Stationing	
	From	To
RIP/RAP		

Refer to the Environmental Layout Sheets/ SWP3 Layout Sheets located in Attachment 1.2 of this SWP3

2.4 OFFSITE VEHICLE TRACKING CONTROLS:

- ☒ Excess dirt/mud on road removed daily
- ☐ Haul roads dampened for dust control
- ☒ Loaded haul trucks to be covered with tarpaulin
- ☒ Stabilized construction exit
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____

2.5 POLLUTION PREVENTION MEASURES:

- ☐ Chemical Management
- ☐ Concrete and Materials Waste Management
- ☐ Debris and Trash Management
- ☐ Dust Control
- ☐ Sanitary Facilities
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____

2.6 VEGETATED BUFFER ZONES:

Natural vegetated buffers shall be maintained as feasible to protect adjacent surface waters. If vegetated natural buffer zones are not feasible due to site geometry, the appropriate additional sediment control measures have been incorporated into this SWP3.

Type	Stationing	
	From	To

Refer to the Environmental Layout Sheets/ SWP3 Layout Sheets located in Attachment 1.2 of this SWP3

2.7 ALLOWABLE NON-STORMWATER DISCHARGES:

- ☒ Fire hydrant flushings
- ☒ Irrigation drainage
- ☒ Pavement washwater (where spills or leaks have not occurred, and detergents are not used)
- ☒ Potable water sources
- ☒ Springs
- ☒ Uncontaminated groundwater
- ☒ Water used to wash vehicles or control dust
- ☒ Other allowable non-stormwater discharges as allowed by TPDES GP TXR150000.

2.8 INSPECTIONS:

All disturbed areas and erosion and sediment control devices shall be inspected at least once every seven (7) days. Inspections shall be performed by TxDOT as indicated on the Field Inspection and Maintenance Report Form 2118 and retained in Attachment 2.5 of this SWP3 .

2.9 MAINTENANCE:

Control measures shall be properly installed according to specifications. If it is determined that a BMP or control measure is not operating effectively, maintenance must be accomplished as soon as possible and before the next anticipated rain event, but in no case later than 7 calendar days after being able to access the site. Maintenance shall be performed by the Contractor as indicated on the Field Inspection and Maintenance Report Form 2118 and retained in Attachment 2.5 of this SWP3.

NO.	DATE	DESCRIPTION	APPROV.

2M ASSOCIATES, LLC
5930 PRESTON VIEW BLVD, SUITE A
DALLAS, TEXAS 75240
TBPE REGISTRATION NO.12158
PH: 214.663-1377
FAX 888-528-9180

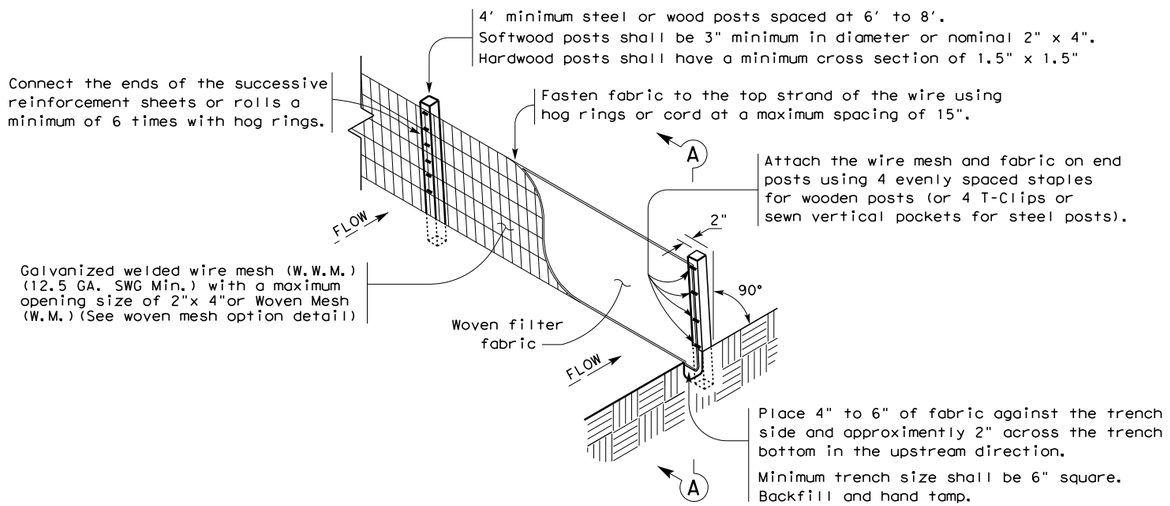
Texas Department of Transportation

STORMWATER POLLUTION PREVENTION PLAN (SWP3)

SHEET 2 OF 2

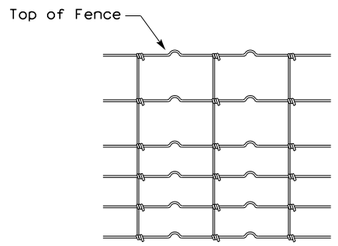
DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
MR				
GRAPHICS	6	SEE TITLE SHEET		IH 40
MR	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK	TEXAS	AMA	POTTER	195
DH	CONTROL	SECTION	JOB	
CHECK	0090	05	107	
AM				

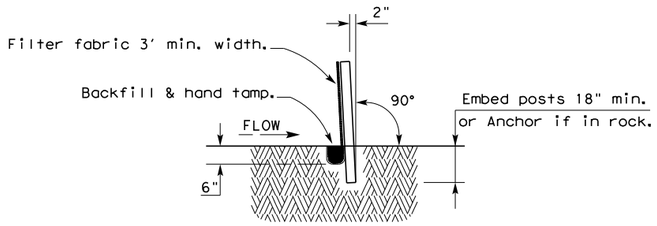
DATE: 12/7/2016
FILE: c:\Users\bridgefarmer-pw\mkhan@two-rnm.com\dms2147819196 - 038402108-Fence Detail.dgn
mkhan



TEMPORARY SEDIMENT CONTROL FENCE

SCF





SECTION A-A

HINGE JOINT KNOT WOVEN MESH (OPTION) DETAIL

Galvanized hinge joint knot woven mesh (12.5 GA.SWG Min.) requires a minimum of five horizontal wires spaced at a maximum of 12 inches apart and all vertical wires spaced at a maximum of 12 inches apart.

SEDIMENT CONTROL FENCE USAGE GUIDELINES

A sediment control fence may be constructed near the downstream perimeter of a disturbed area along a contour to intercept sediment from overland runoff. A 2 year storm frequency may be used to calculate the flow rate to be filtered.

Sediment control fence should be sized to filter a maximum flow through rate of 100 GPM/FT^2. Sediment control fence is not recommended to control erosion from a drainage area larger than 2 acres.

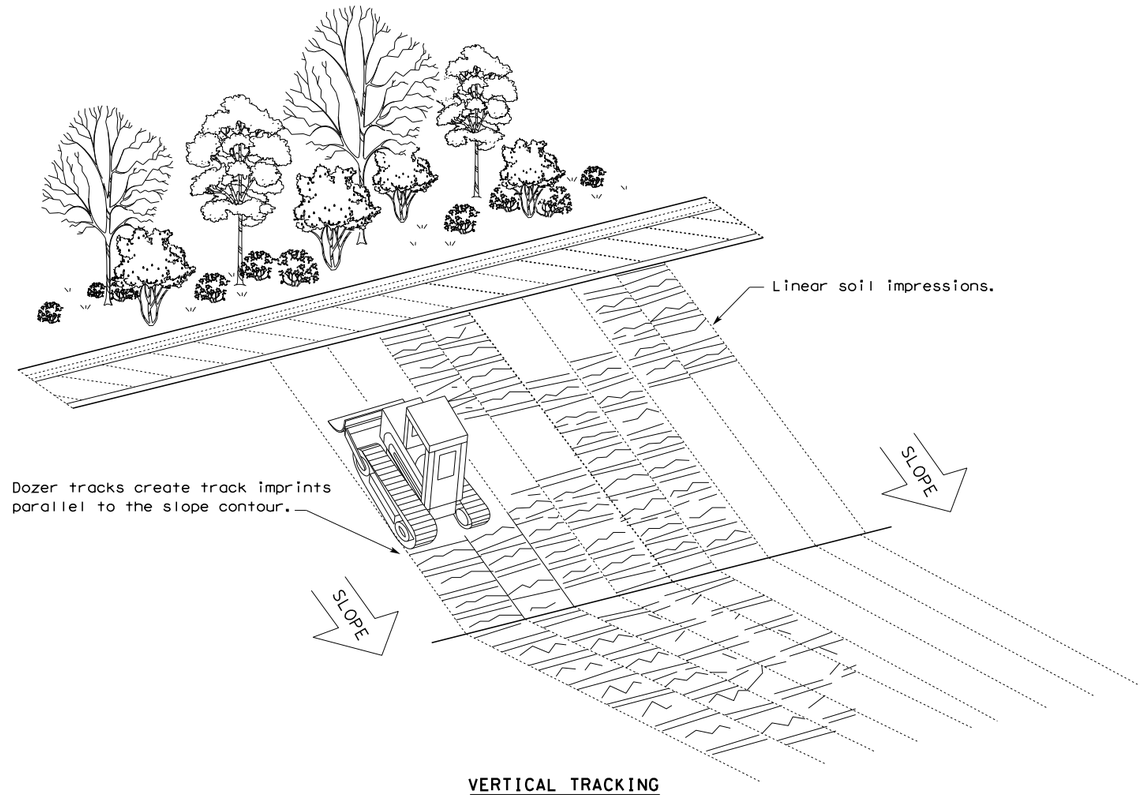
LEGEND

Sediment Control Fence

SCF

GENERAL NOTES

1. Vertical tracking is required on projects where soil distributing activities have occurred unless otherwise approved.
2. Perform vertical tracking on slopes to temporarily stabilize soil.
3. Provide equipment with a track undercarriage capable of producing linear soil impressions measuring a minimum of 12" in length by 2" to 4" in width by 1/2" to 2" in depth.
4. Do not exceed 12" between track impressions.
5. Install continous linear track impressions where the minimum 12" length impressions are perpendicular to the slope or direction of water flow.



VERTICAL TRACKING

Texas Department of Transportation

Design Division Standard

TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

FENCE & VERTICAL TRACKING

EC(1)-16

FILE: ec116	DN: TxDOT		CK: KM		DW: VP		DN/CK: LS
© TxDOT: JULY 2016	CONT	SECT	JOB		HIGHWAY		
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	AMA	POTTER					196

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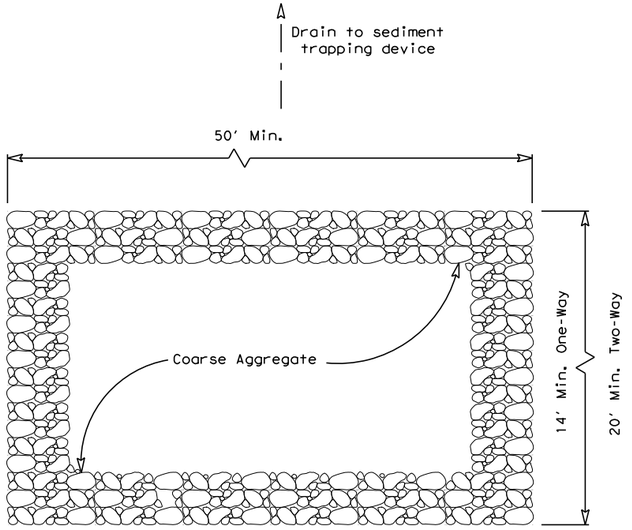
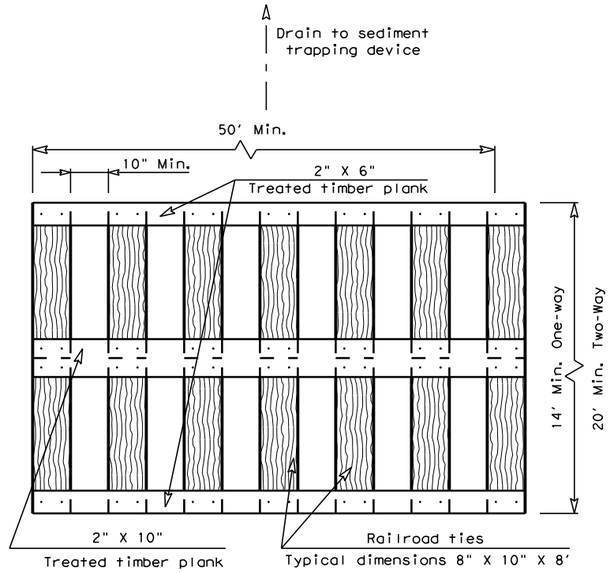


PLAN VIEW



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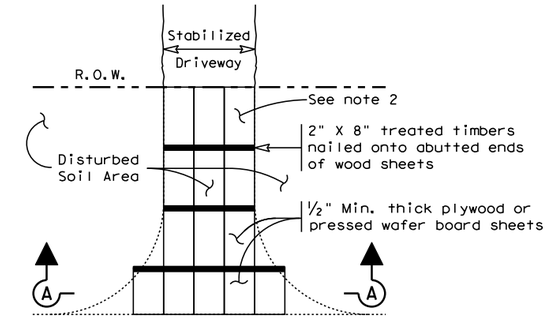
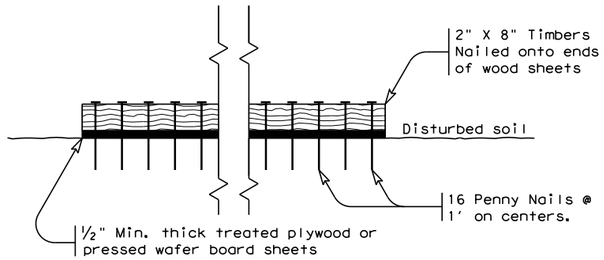


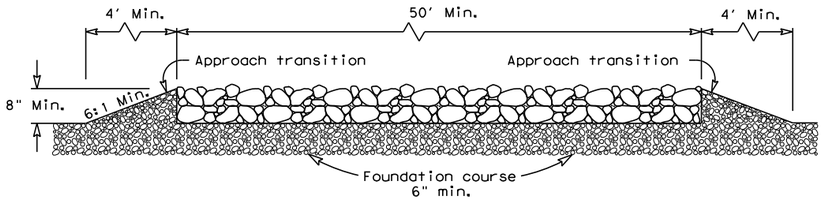
PLAN VIEW



SECTION A-A

CONSTRUCTION EXIT (TYPE 3)

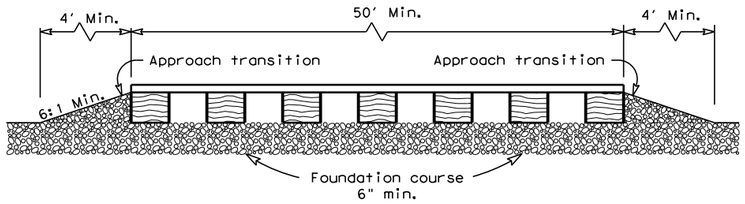
SHORT TERM



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
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	AMA	POTTER		197

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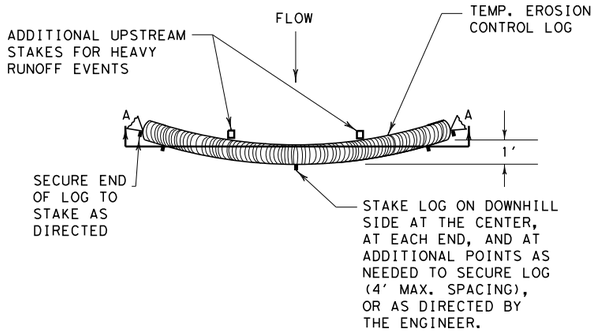
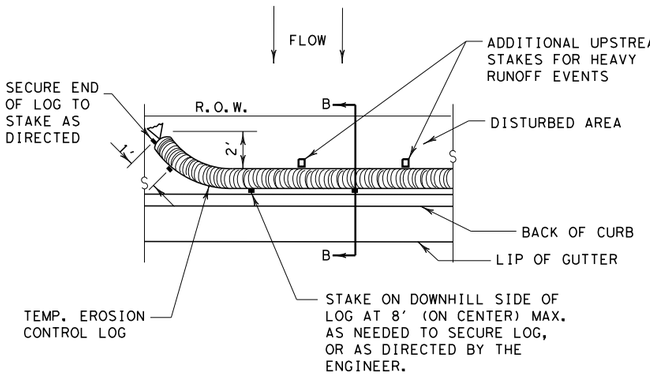


PLAN VIEW



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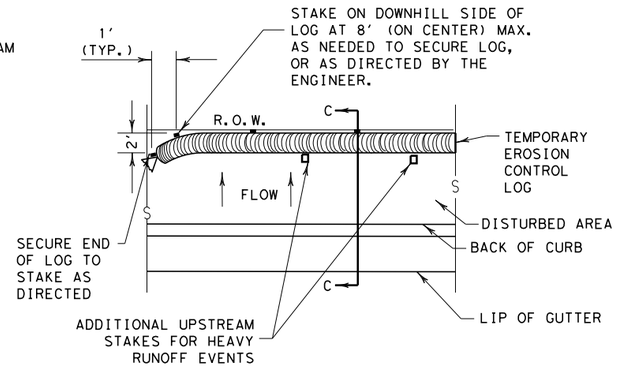

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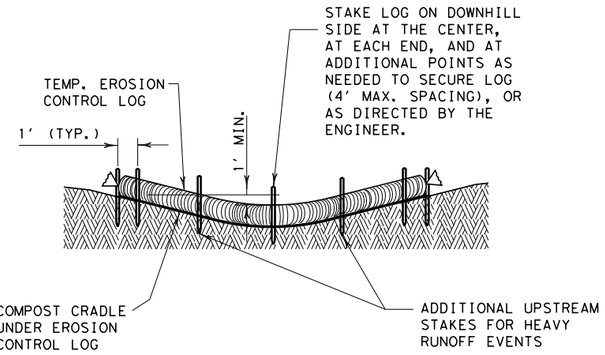
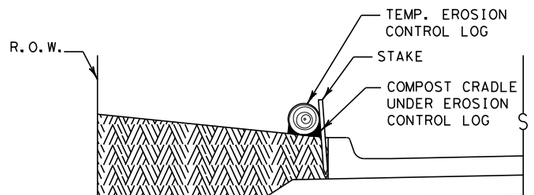


SECTION A-A

EROSION CONTROL LOG DAM

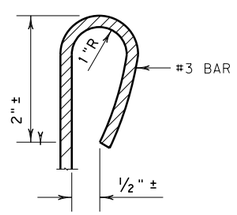
CL-D



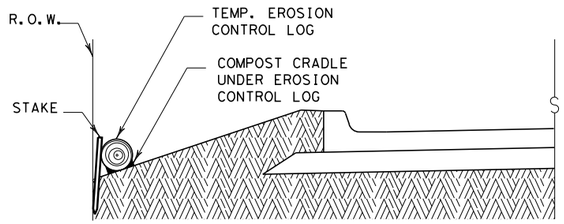
SECTION B-B

EROSION CONTROL LOG AT BACK OF CURB

CL-BOC



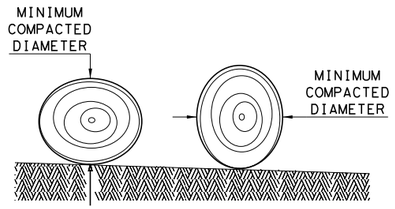
REBAR STAKE DETAIL



SECTION C-C

EROSION CONTROL LOG AT EDGE OF RIGHT-OF-WAY

CL-ROW



DIAMETER MEASUREMENTS OF EROSION CONTROL LOGS SPECIFIED IN PLANS

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.

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

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.

SHEET 1 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
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	AMA	POTTER		198

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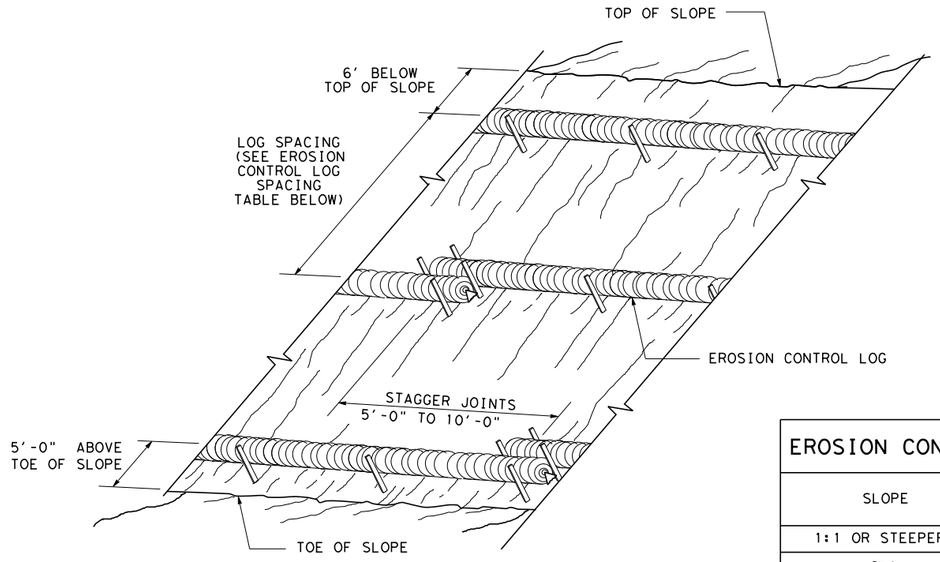
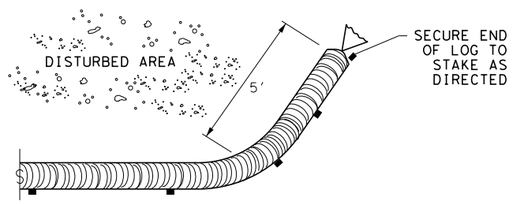


EROSION CONTROL LOGS ON SLOPES
STAKE AND TRENCHING ANCHORING

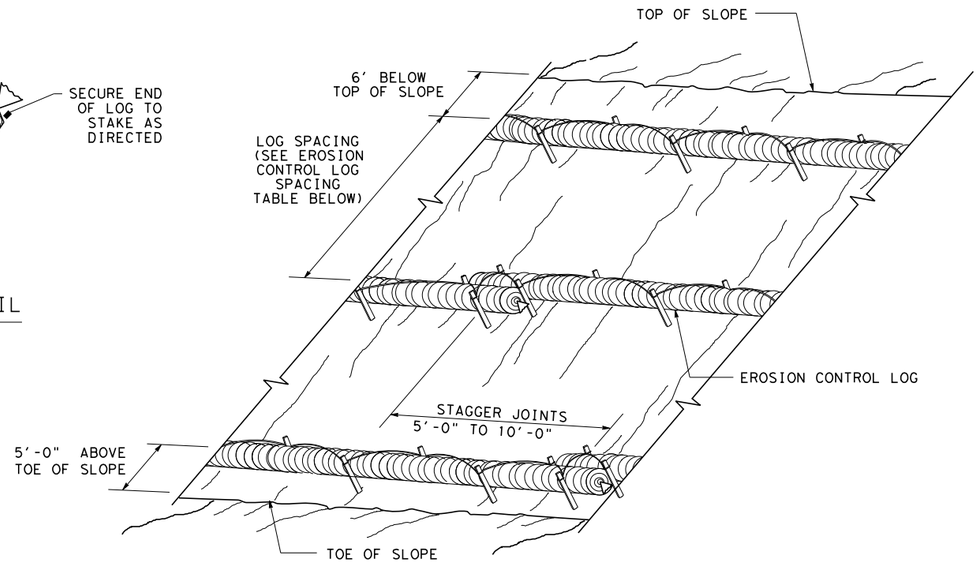
CL-SST



END SECTION RAP DETAIL

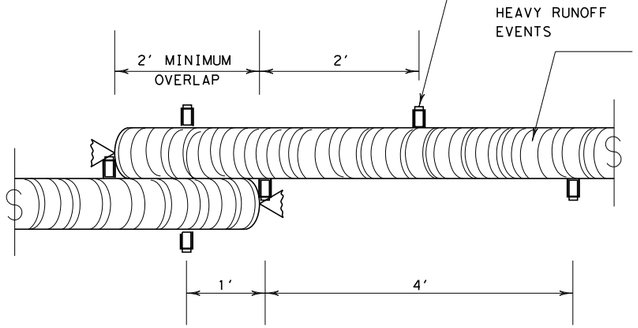
EROSION CONTROL LOG SPACING TABLE				
SLOPE	LOG DIAMETER			
	6"	8"	12"	18"
1:1 OR STEEPER	5'	10'	15'	20'
2:1	10'	20'	30'	40'
3:1	15'	30'	45'	60'
4:1 OR FLATTER	20'	40'	60'	80'

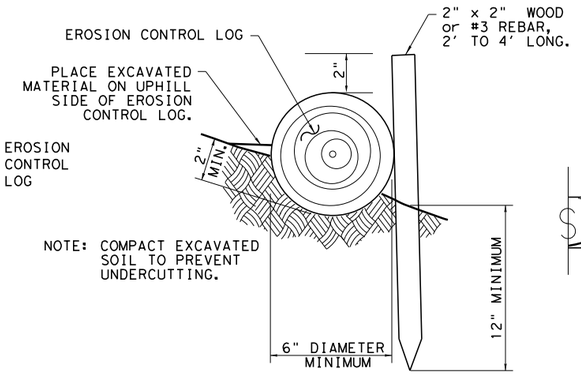
* ADJUSTMENTS CAN BE MADE FOR SOIL TYPE:
SOFT, LOAMY SOILS-ADJUST ROWS CLOSER TOGETHER;
HARD, ROCKY SOILS- ADJUST ROWS FARTHER APART



EROSION CONTROL LOGS ON SLOPES
STAKE AND LASHING ANCHORING

CL-SSL

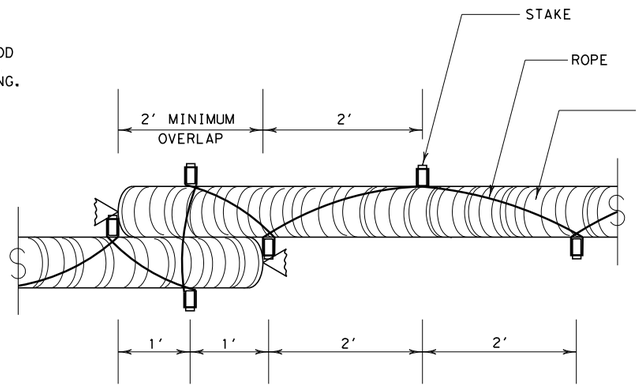




STAKE AND TRENCHING ANCHORING DETAIL

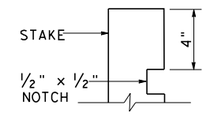
CL-SST

TRENCH DEPTH TABLE	
LOG DIAMETER	DEPTH
6"	2"
8"	3"
12"	4"
18"	5"

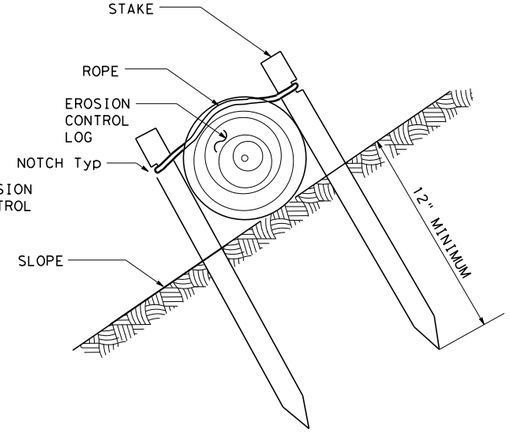


STAKE AND LASHING ANCHORING DETAIL

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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	AMA	POTTER		199

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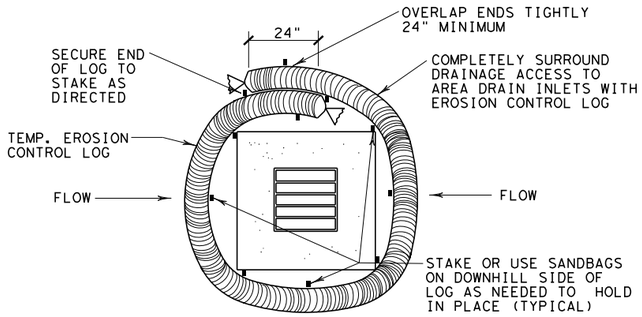
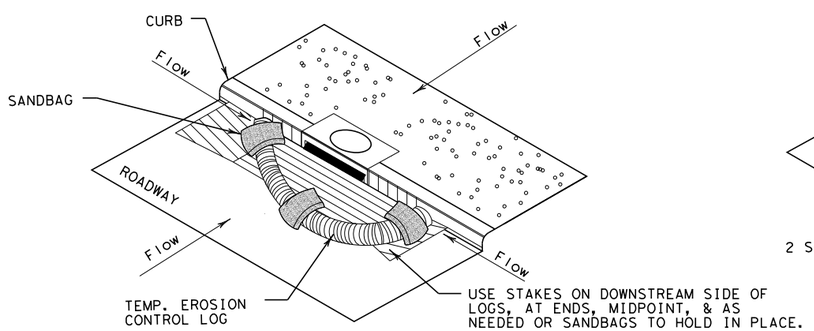


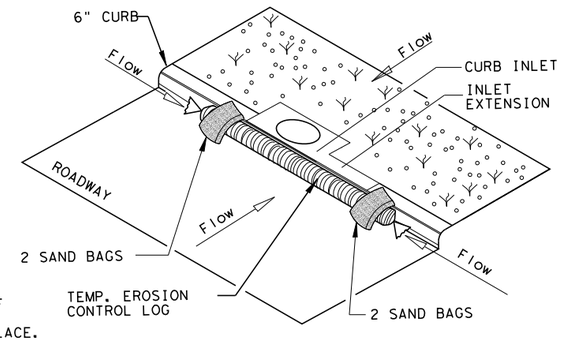
EROSION CONTROL LOG AT DROP INLET

CL-DI



EROSION CONTROL LOG AT CURB INLET

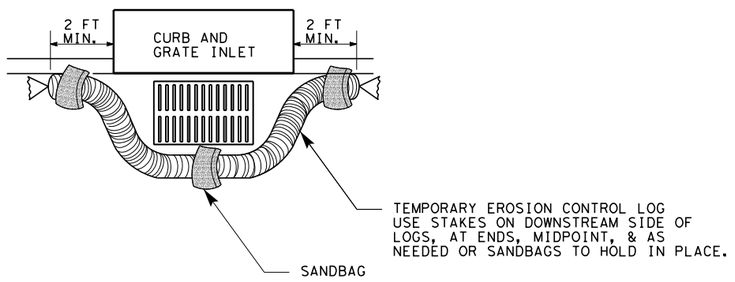
CL-CI



EROSION CONTROL LOG AT CURB INLET

CL-CI

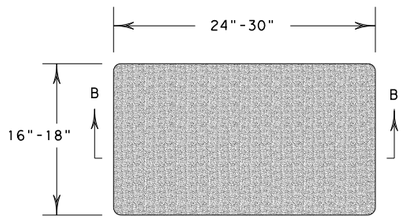
NOTE:
EROSION CONTROL LOGS USED AT CURB INLETS SHOULD ONLY BE USED IF THEY WILL NOT IMPEDE TRAFFIC OR FLOOD THE ROADWAY OR WHEN THE STORM SEWER SYSTEM IS NOT FULLY FUNCTIONAL.



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
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	AMA	POTTER		200

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ITEM 164 SEEDING FOR EROSION CONTROL

SEED (PERM) (RURAL or URBAN) (SAND or CLAY)

"WARM SEASON" PLANTING DATES	SEED MIXTURE	PURE LIVE SEED RATE & PLANT DEPTH
PERMANENT: EARLY SPRING SEED FROM FEBRUARY 15th THROUGH May 15th. AS AREAS OF THE ROW ARE PREPARED AND DETERMINED READY FOR DRILL SEEDING.	NEW CROP SEED: TYPE: BUFFALO GRASS (Texoka) "Fluffy" WESTERN WHEATGRASS (ARRIBA) "Hard" BERMUDA GRASS (BLACK JACK) "Hard Tiny Seed" 100% "Unhulled"	 3.0 LBS PLS / ACRE 6.0 LBS PLS / ACRE 5.0 LBS PLS / ACRE @ ¼"-½" SOIL DEPTH
PERMANENT and TEMP. LATE SPRING SEED FROM MAY 15th THROUGH AUGUST 1st AS AREAS OF THE ROW THAT ARE LAID BY BUT DETERMINED TO BE OUT OF SEASON FOR PERMANENT DRILL SEEDING.	TYPE: MILLET (BROWN TOP) "Hard Shell, "Small Seed" - Nurse crop BERMUDA GRASS (BLACK JACK) "Hard Tiny Seed" 100% "Unhulled"	30. LBS PLS / ACRE @ ¼" SOIL DEPTH 5.0 LBS PLS / ACRE
SOIL PREPARATION EQUIPMENT AND PRACTICES: RIPPER --- DISK --- HARROW --- CULTI-PACKER.		

NOTES:

1. ALL SEED MIXTURE TYPES SHALL BE PURCHASED IN PRE- MIXED BAGS, "BY TYPE" BLENDED BY THE GROWER SHIPPER.
2. SOILS THAT ARE COMPACTED, HAVE CLODS, SHALL BE REWORKED UNTIL READY FOR SEEDING. AS DIRECTED.
3. ALL SOIL SURFACES SHALL BE LEVEL WITH NATURAL FLOWING SMOOTH GRADES. NO TIRE RUTS OR FURTHER TRAFFIC ALLOWED.
4. SOIL SURFACE SHALL BE FIRM BUT NOT COMPACTED, ALLOWING 1/4" DEPRESSION UNDER NORMAL FOOT TRAFFIC.
5. SEED 100% OF THE BED AREA. NO SKIPS OR VOID AREAS ALLOWED. EXAMPLE: AREAS AROUND SIGN POSTS AND INLETS.
6. SEED UP TO THE FIRST 6" OF THE EDGE OF PAVEMENT. AS DIRECTED, HAND RAKE ISOLATED SEEDED AREAS.
7. WEIGH ALL CALIBRATED SEED SAMPLES FOR ACCURACY AND PRESENT DOCUMENTATION TO ENGINEER.

FOR DRILL SEEDING

1. USE ONLY PROFESSIONAL NATIVE GRASS OR TURF GRASS (MULTI- 3 BIN) DRILL SEEDERS.
2. CALIBRATE DRILL SEEDER FOR SPECIFIED (PLS) PER ACRE BEFORE DRILL SEEDING.
3. DRILL SEEDER MUST BE EQUIPPED WITH THE LARGE FRONT CUTTING COULTERS DURING THE INSPECTION OF DRILL SEEDER.

FOR BROADCAST SEEDING

1. USE ONLY COMMERCIAL TYPE CYCLONE TYPE SPREADERS.
2. CALIBRATE CYCLONE SPREADER FOR 1000 Sq. Ft. (PLS) PER ACRE BEFORE SEEDING.
3. TO PREVENT SEED SEPARATION IN SPREADERS, SPREAD ALL SEED TYPES INDEPENDENTLY IN A SEPARATE APPLICATION.
4. IMMEDIATELY AFTER SEEDING, IN ONE OR TWO OPERATIONS, CULTI-PACK THE SEEDED SOILS AND FIRM SEED INTO SURFACE.
5. DISCONTINUE SEEDING IF WIND EXCEEDS 10 MPH.

ITEM 164 SEEDING FOR EROSION CONTROL

SEED (TEMPORARY) COOL SEASON SEEDING

"COOL SEASON" PLANTING DATES	SEED MIXTURE	PURE LIVE SEED RATE & PLANT DEPTH
TEMPORARY: EARLY FALL SEED FROM AUGUST 1st THROUGH DECEMBER 1st. AS AREAS OF THE ROW ARE PREPARED AND DETERMINED READY FOR DRILL SEEDING.	NEW CROP SEED: TYPE: WESTERN WHEATGRASS "Hard Shell" RED WINTER WHEAT, VAR: TAM III "Hard Shell"	6.0 LBS PLS / ACRE 34. LBS PLS / ACRE @ 1" SOIL DEPTH
TEMPORARY: LATE FALL SEED FROM DECEMBER 1st THROUGH DECEMBER 31ST. AS AREAS OF THE ROW ARE PREPARED AND DETERMINED READY FOR DRILL SEEDING.	NEW CROP SEED: TYPE: RED WINTER WHEAT, VAR: TAM III "Hard Shell"	34. LBS ACRE / PLS @ 1" SOIL DEPTH
SOIL PREPARATION EQUIPMENT AND PRACTICES: RIPPER --- DISK --- HARROW --- CULTI-PACKER.		

ITEM 314 EMULSIFIED ASPHALT TREATMENT

TIME SCHEDULE:

IMMEDIATELY AFTER SOIL PREPARATION OR WITHIN 24 HOURS AFTER SEEDING, APPLY THE TACK COAT TO DESIGNATED SOIL SURFACES.

FUNCTIONAL USE:
SOIL EROSION CONTROL, OR MOISTURE RETENTION BARRIER.

NOTES:

1. ALL TRUCK APPLICATIONS SHALL BE COMPLETED IN ONE PASS OF THE DISTRIBUTOR. ALL TOUCH UP WORK WILL BE FINISHED BY HAND AND HOSE PROCEDURES. APPLY FROM EDGE OF PAVEMENT THROUGH THE FULL SPECIFIED AREAS.
2. ENGINEER WILL INSPECT FOR ACCURACY THE OVERALL DEPTH OF THE APPLIED TACK COAT MATERIALS.
3. FURTHER VEHICULAR TRAFFIC IS NOT ALLOWED ON LAID BY TACK COAT SURFACES. AT THE CONTRACTORS EXPENSE ALL DAMAGES TO TACK COAT SURFACES WILL BE RE -SHOT AS DIRECTED BY THE ENGINEER.

ITEM 166 FERTILIZER

TIME SCHEDULE:

AFTER TOPSOIL PLOWING PEPARATIONS ARE COMPLETED, FERTILIZE R.O.W. SOIL SURFACES AND HARROW 2" TO 4" DEEP INTO PLACE.

FUNCTIONAL USE:
PLANT NUTRIENTS FOR PLANT AND ROOT DEVELOPMENT.

FERTILIZER SHALL BE EVENLY DISTRIBUTED AT A RATE OF 28 LBS OF NITROGEN PER ACRE.
THE BREAK DOWN OF THE NITROGEN ELEMENT SHALL BE IN A 50% SLOW RELEASE FORM.
ANALYSIS OF THE (NPK) IS: 1-5-0 A HIGH PHOSPHATE BLEND.
AS DIRECTED BY THE VEGETATION MANAGER.

ITEM 166 NOTES:

1. BROADCAST SPECIFIED FERTILIZER FROM THE EDGE OF PAVEMENT, THROUGH THE ENTIRE ROW SEED BED AREA. APPLICATIONS FOR EDGE OF PAVEMENT, CULVERTS, SIGN POST AREAS, GUARD RAILS AND ISOLATED AREAS SHALL BE APPLIED BY WALK BEHIND SPREADERS AND BY HAND. NO FERTILIZER ALLOWED ON PAVEMENT SURFACES.
2. ALL SPREADERS SHALL BE CALIBRATED BY THE CONTRACTOR AND THE ENGINEER FOR ACCURACY AND PERFORMANCE. SHALL USE UNOPENED 50# BAGS OF SPECIFIED FERTILIZER FOR DAILY CALIBRATIONS. APPLICATION SHALL BE AN EVEN DISTRIBUTION OF PRODUCT ON DESIGNATED SOIL SURFACES.
3. FERTILIZER SHALL BE DELIVERED IN 50# BAGS UNLESS OTHERWISE SPECIFIED OR APPROVED PRIOR TO DELIVERY. BAGS SHALL BE CLEARLY LABELED SHOWING CONTENTS. IF BULK FERTILIZER IS APPROVED, DOCUMENTATION WILL BE REQUIRED FOR EACH LOAD OF MATERIAL DELIVERED VERIFYING AUTHENTICITY OF THE MATERIAL. CULTURAL PROCEDURES ARE UNDER THE DIRECTION OF THE TXDOT VEGETATION MANAGER.

STATE OF TEXAS
JAMES W. LANGSTON
73891
LICENSED
PROFESSIONAL ENGINEER
12/11/23
James W. Langston PE
Bridgefarmer & Associates, Inc.
TBPE Registration No. 264

Texas Department of Transportation

AMARILLO DISTRICT STANDARD

VEGETATION SPECIFICATION SHEET

FEDERAL AID PROJECT	DN: TxDOT	CK: AM	DW: BD/VP	CK: CGL
	CONT	SECT	JOB	HIGHWAY
REVISIONS	0041	07	113, ETC	US 87
03/27/20	DIST	COUNTY		SHEET NO.
	AMA	POTTER		201