

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.	SHEET NO.	
6	F 2022 (031)	1	
STATE	STATE DIST.	COUNTY	
TEXAS	ODA	LOVING	
CONT.	SECT.	JOB	HIGHWAY NO.
0493	02	021	RM 652

# STATE OF TEXAS

## DEPARTMENT OF TRANSPORTATION

### INDEX OF SHEETS

SHEET NO.	DESCRIPTION
1	TITLE SHEET
2	INDEX OF SHEETS

### PLANS OF PROPOSED STATE HIGHWAY IMPROVEMENT

FEDERAL AID PROJECT  
F 2022 (031)

### LOVING COUNTY RM 652

NET LENGTH OF PROJECT = ROADWAY: 585 FT = 0.111 MI  
 BRIDGE: 215 FT = 0.041 MI  
 PROJECT: 800 FT = 0.152 MI  
 LIMITS: RM 652 AT THE PECOS RIVER

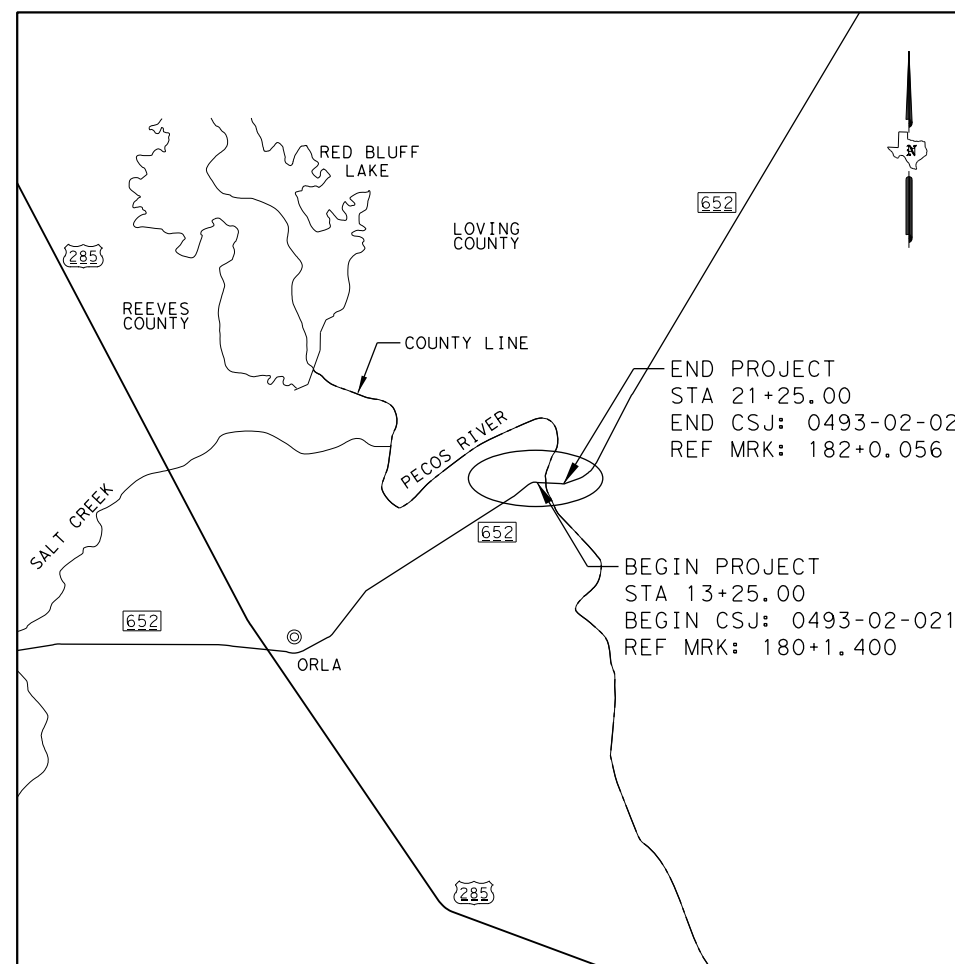
FOR THE CONSTRUCTION OF BRIDGE REPLACEMENT  
 CONSISTING OF REPLACING BRIDGE AND APPROACHES, RAIL, MBGF,  
 EMBANKMENT, HOT MIX, SIGNS, AND PAVEMENT MARKINGS

FUNCTIONAL CLASS = MAJOR COLLECTOR  
 DESIGN SPEED = 70 MPH  
 ADT = 5173 (2019)  
 ADT = 6208 (2039)

FINAL PLANS AND QUANTITIES  
AS CONSTRUCTED

CONTRACTORS NAME: \_\_\_\_\_  
 CONTRACTORS ADDRESS: \_\_\_\_\_  
 DATE CONTRACTOR BEGAN WORK: \_\_\_\_\_  
 DATE WORK WAS COMPLETED & ACCEPTED: \_\_\_\_\_  
 FINAL CONTRACT COST: \$ \_\_\_\_\_

\_\_\_\_\_, PE \_\_\_\_\_ DATE \_\_\_\_\_  
 AREA ENGINEER



**TranSystems**  
 500 W. 7th ST. SUITE 1100  
 FORT WORTH, TX 76102  
 (817) 339-8950  
 FIRM REG. #3557



EXCEPTIONS:  
NONE

RAILROADS:  
NONE

EQUATIONS:  
NONE

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, MAY 2012).

RECOMMENDED FOR LETTING: DATE: 7/29/2021

DocuSigned by: **Adriana Geizer, P.E.**  
 SD27AB2475A943F AREA ENGINEER

RECOMMENDED FOR LETTING: DATE: 7/29/2021

DocuSigned by: \_\_\_\_\_  
 DIRECTOR OF TRANSPORTATION PLANNING AND DEVELOPMENT

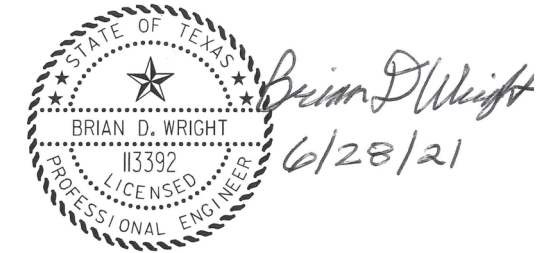
APPROVED FOR LETTING: DATE: 8/3/2021

DocuSigned by: **John R. Spaul, PE**  
 39AB22B3767E4... DISTRICT ENGINEER

# INDEX OF SHEETS

\*\* THE STANDARD SHEETS SPECIFICALLY IDENTIFIED ABOVE HAVE BEEN SELECTED BY ME OR UNDER MY RESPONSIBLE SUPERVISION AS BEING APPLICABLE TO THIS PROJECT.

BRIAN WRIGHT 6/28/2021  
DATE



\*\*\* THE STANDARD SHEETS SPECIFICALLY IDENTIFIED ABOVE HAVE BEEN SELECTED BY ME OR UNDER MY RESPONSIBLE SUPERVISION AS BEING APPLICABLE TO THIS PROJECT.

KEVIN ARFT 6/28/2021  
DATE



SHEET NO. DESCRIPTION

## I. GENERAL

- 1 TITLE SHEET
- 2 INDEX OF SHEETS
- 3 EXISTING TYPICAL SECTIONS
- 4 PROPOSED TYPICAL SECTIONS
- 5A-5D GENERAL NOTES
- 6A-6C ESTIMATE & QUANTITIES
- 7 QUANTITY SUMMARY SHEET

## II. TRAFFIC CONTROL PLAN

- 8 ADVANCE WARNING SIGNS
- 9 TCP NARRATIVE
- 10-11 TCP TYPICAL SECTIONS PHASE 1
- 12-13 TCP TYPICAL SECTIONS PHASE 2
- 14 CRASH CUSHION SUMMARY SHEET
- 15-16 TRAFFIC CONTROL PLAN PHASE 1
- 17-18 TRAFFIC CONTROL PLAN PHASE 2
  
- STANDARDS:
- 19-30 \*\*BC(1)-21 - BC(12)-21
- 31 \*\*TCP(2-1)-18
- 32 \*\*TCP(2-2)-18
- 33 \*\*TCP(2-3)-18
- 34 \*\*TCP(2-8)-18
- 35 \*\*TCP(3-1)-13
- 36 \*\*TCP(3-3)-14
- 37 \*\*TCP(7-1)-13
- 38-39 \*\*SSCB(2)-10
- 40 \*\*ABSORB(M)-19
- 41 \*\*SLED-19
- 42 \*\*WZ(BRK)-13
- 43 \*\*WZ(RS)-16
- 44 \*\*WZ(STPM)-13
- 45 \*\*WZ(UL)-13
- 46 \*\*TREATMENT FOR VARIOUS EDGE CONDITIONS

## III. ROADWAY DETAILS

- 47 SURVEY CONTROL INDEX
- 48 HORIZONTAL ALIGNMENT DATA
- 49 REMOVAL PLAN
- 50-51 PLAN AND PROFILE
  
- STANDARDS:
- 52 \*GF(31)-19
- 53-54 \*GF(31)TRTL3-20
- 55 \*GF(31)MS-19
- 56 \*BED-14
- 57 \*SGT(10S)31-16
- 58 \*SGT(11S)31-18
- 59 \*SGT(12S)31-18
- 60 \*TE(HMAC)-11
- 61 \*WF(1)-10

## IV. DRAINAGE DETAILS

- 62 DRAINAGE AREA MAP
- 63 BRIDGE SCOUR ENVELOPE DATA SHEET
- 64 HYDRAULIC DATA

SHEET NO. DESCRIPTION

## V. BRIDGE

- 65 BRIDGE LAYOUT
- 66 BRIDGE TYPICAL SECTIONS
- 67 BRIDGE ESTIMATED QUANTITIES & BEARING SEAT ELEVATIONS
- 68 FOUNDATION LAYOUT
- 69 BORING LOGS
- 70-71 ABUTMENT 1 & 4 DETAILS
- 72 BENT 2 & 3 DETAILS
- 73 FRAMING PLAN
- 74-75 PRESTRESSED CONCRETE I-GIRDER UNIT
- 76 PRESTRESSED CONCRETE I-GIRDER DESIGNS (NON-STANDARD SPANS)

- STANDARDS:
- 77 \*\*BAS-A
  - 78 \*\*CRR
  - 79-80 \*\*CSAB
  - 81-82 \*\*FD
  - 83-84 \*\*MEBR(C)
  - 85-86 \*\*PBC-RC
  - 87-88 \*\*IGD
  - 89-91 \*\*IGEB
  - 92-93 \*\*IGMS
  - 94 \*\*IGSK
  - 95 \*\*IGTS
  - 96-97 \*\*PMD
  - 98-99 \*\*SSTR
  - 100-103 \*\*PCP
  - 104 \*\*PCP-FAB
  - 105-106 \*\*PCP(O)
  - 107-108 \*\*PCP(O)FAB
  - 109 \*\*SEJ-M

## VI. TRAFFIC ITEMS

- 110 SUMMARY OF SMALL SIGNS (SOSS)
- 111-112 SIGNING & PAVEMENT MARKING
  
- STANDARDS:
- 113-115 \*\*TSR(3)-13 - TSR(5)-13
- 116-121 \*\*D&OM(1)-20 - D&OM(6)-20
- 122 \*\*D&OM(VIA)-20
- 123-124 \*\*PM(1)-20 - PM(2)-20
- 125 \*\*SMD(GEN)-08
- 126-128 \*\*SMD(SLIP-1)-08 - SMD(SLIP-3)-08
- 129-130 \*\*RS(3)-13 - RS(4)-13

## VII. ENVIRONMENTAL ISSUES

- 131 ENVIROMENTAL PERMITS, ISSUES, AND COMMITMENTS (EPIC)
- 132 TXDOT STORM WATER POLLUTION PREVENTION PLANS (SW3P)
- 133 EROSION CONTROL PLAN
  
- STANDARDS:
- 134 \*EC(1)-16
- 135 \*EC(3)-16
- 136-138 \*EC(9)-16

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BRENT SHIMANEK 6/28/2021  
DATE



6/28/2021

TEXAS REGISTERED ENGINEERING FIRM F-3557

500 W. 7th ST. SUITE 1100  
FORT WORTH, TX 76102  
(817) 339-8950  
FIRM REG. #: 3557

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## RM 652

# INDEX OF SHEETS

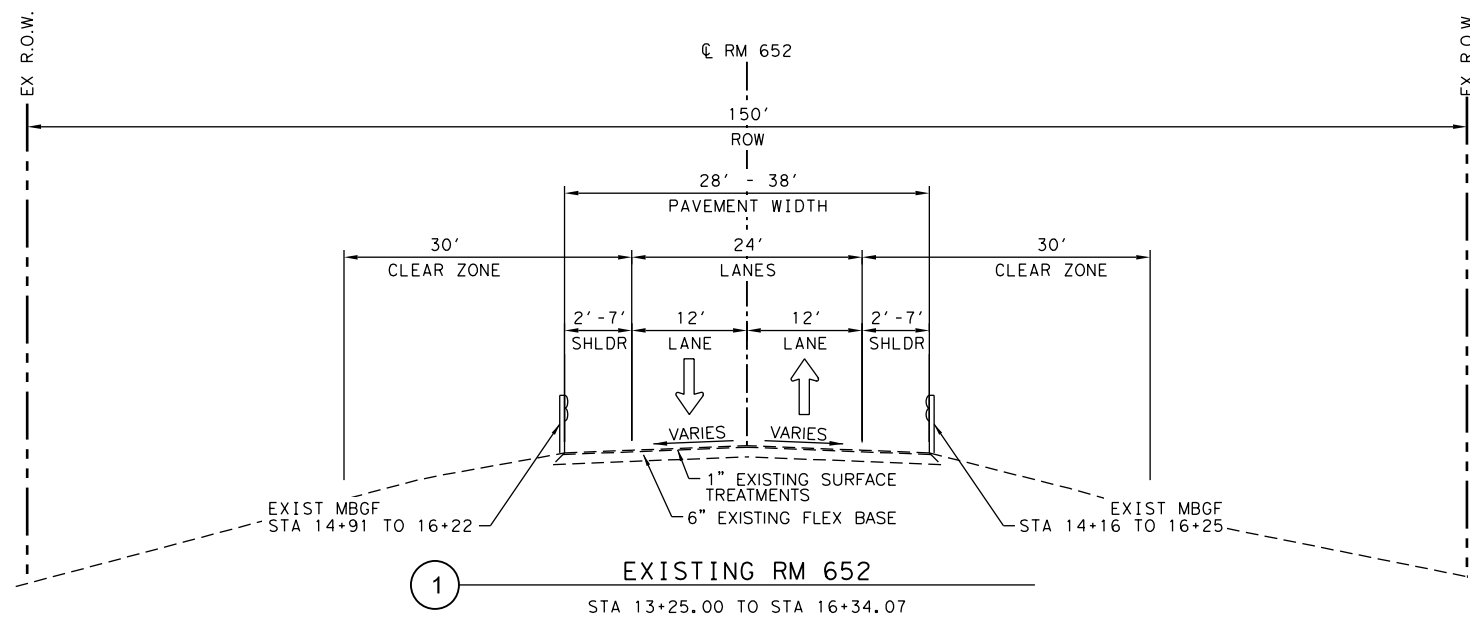
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SHEET 1 OF 1

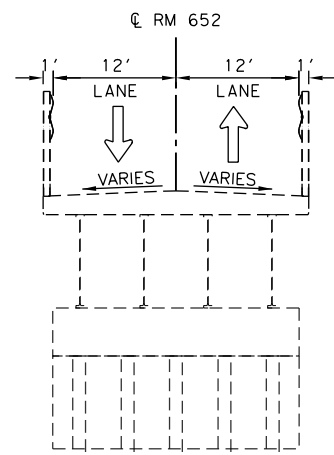
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BES	6	SEE TITLE SHEET	RM 652
GRAPHICS	STATE	DISTRICT	COUNTY
BES	TEXAS	ODA	LOVING
CHECK	KMA	CONTROL	SECTION
CHECK	RR	0493	02
			JOB
			021

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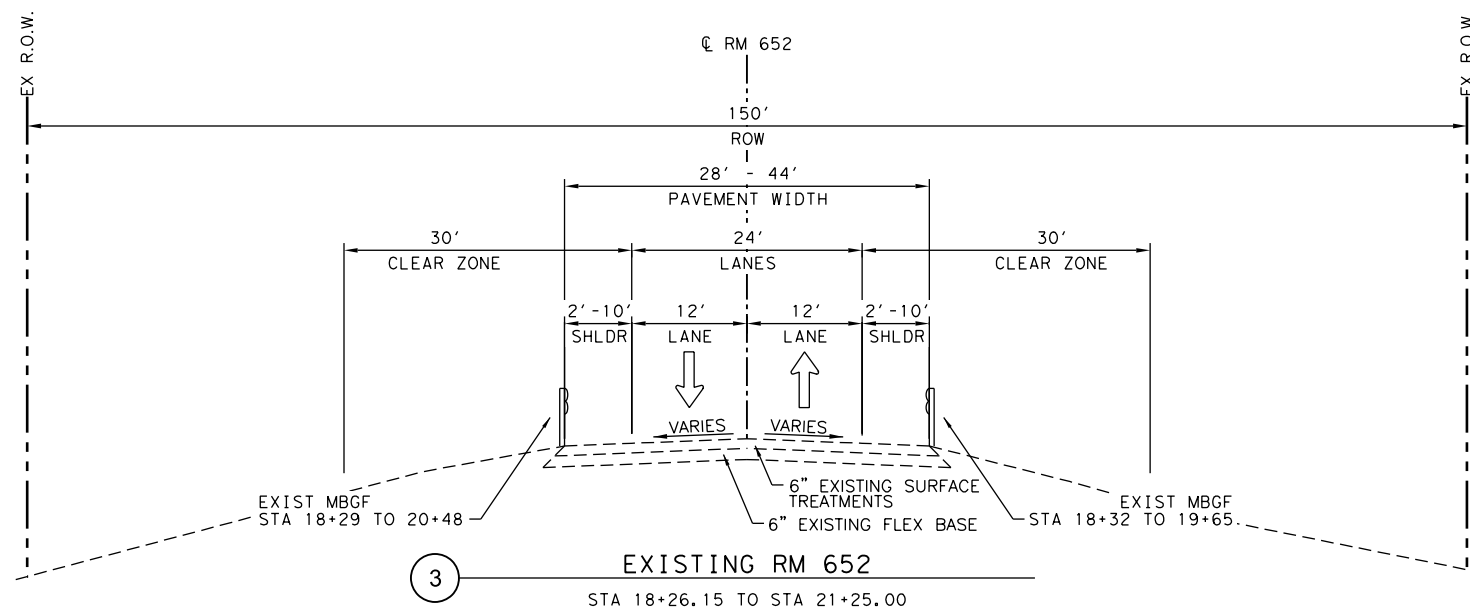
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1  
EXISTING RM 652  
STA 13+25.00 TO STA 16+34.07



2  
EXISTING RM 652 BRIDGE  
STA 16+34.07 TO 18+26.15



3  
EXISTING RM 652  
STA 18+26.15 TO STA 21+25.00



6/25/2021  
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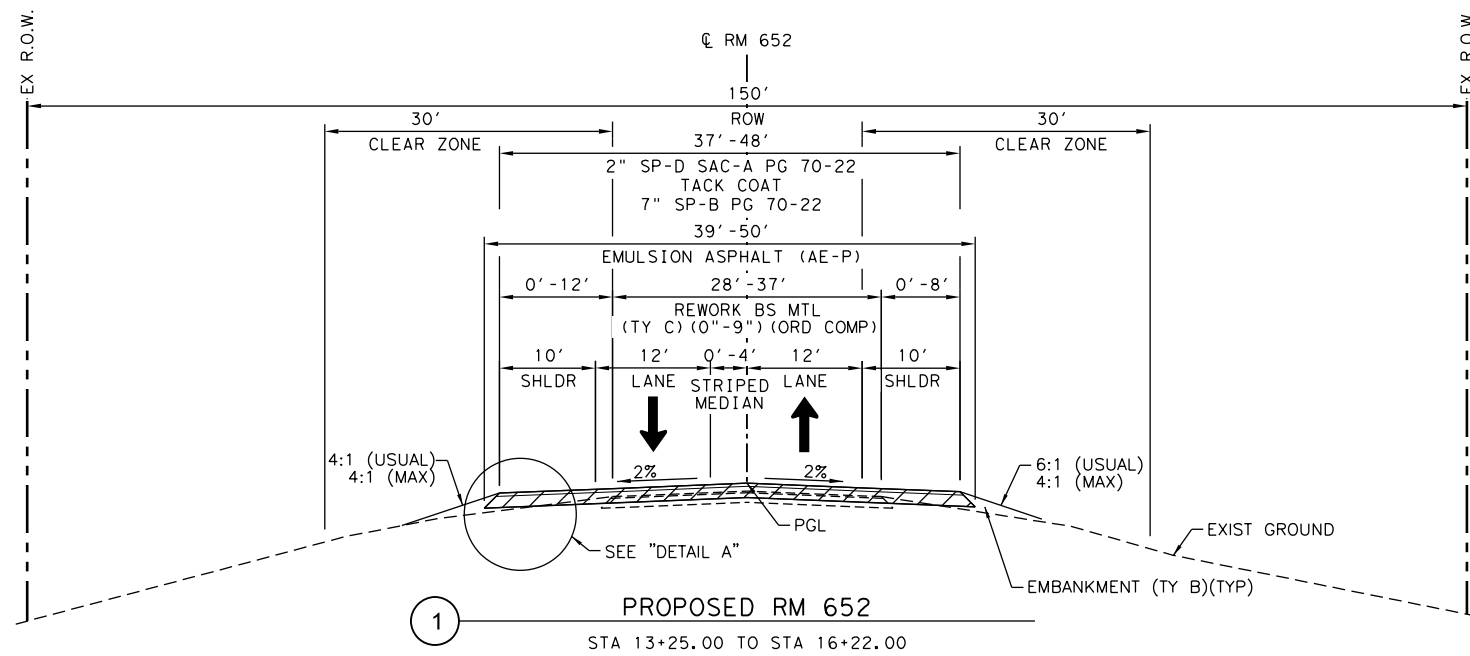
RM 652  
EXISTING TYPICAL  
SECTIONS

SCALE: N. T. S. SHEET 1 OF 1

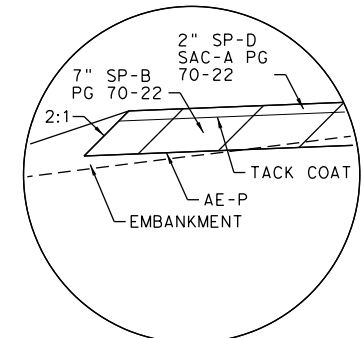
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BES	6	SEE TITLE SHEET		RM 652
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
BES	TEXAS	ODA	LOVING	3
CHECK	KMA CONTROL	SECTION	JOB	
CHECK	RR	0493	02 021	

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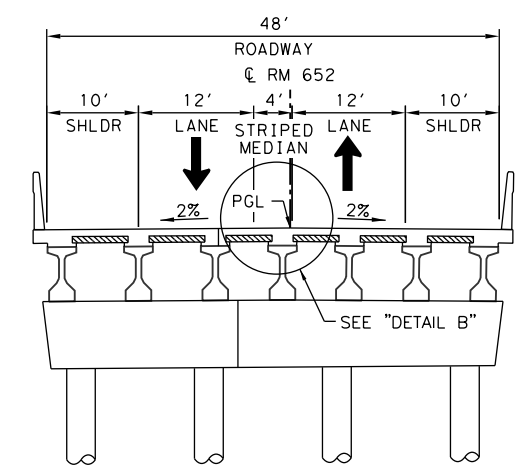
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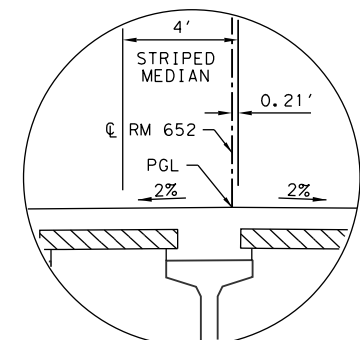
1  
PROPOSED RM 652  
STA 13+25.00 TO STA 16+22.00



DETAIL A



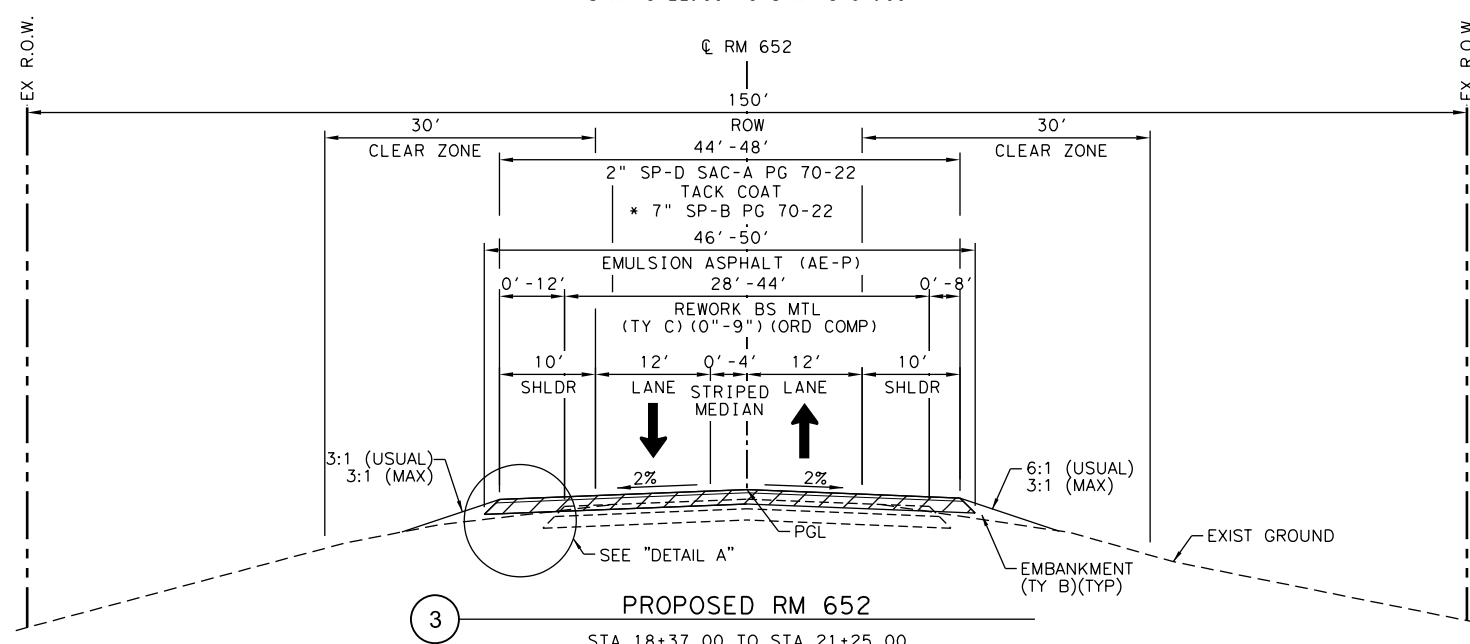
2  
PROPOSED RM 652 BRIDGE  
STA 16+22.00 TO STA 18+37.00



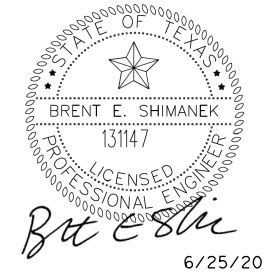
DETAIL B

NOTES:

1. SEE "ROADWAY PLAN AND PROFILE" SHEETS FOR ROADWAY & LANE WIDTH TRANSITION DETAILS.
2. TYPICAL SECTIONS ARE APPROXIMATE. REFER TO PLAN SHEETS FOR STATIONING AND LIMITS.
3. ADDITIONAL PROOF ROLLING MAY BE REQUIRED ON THE EXISTING BASE AND SUBGRADE TO MEET COMPACTION SPECIFICATIONS. COST IS INCIDENTAL TO THE PAVEMENT ITEMS.



3  
PROPOSED RM 652  
STA 18+37.00 TO STA 21+25.00  
\* INCREASE THICKNESS AS REQUIRED



6/25/2021  
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RM 652  
PROPOSED TYPICAL  
SECTIONS

SCALE: N. T. S. SHEET 1 OF 1

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
BES	6	SEE TITLE SHEET		RM 652
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
BES	TEXAS	ODA	LOVING	4
CHECK	KMA	CONTROL	SECTION	
CHECK	RR	0493	02	
			JOB	
			021	

**County: Loving**  
**Highway: RM 652**

**Control: 0493-02-021**

Contractor questions on this project will be accepted through email at the following address:

- [ODA-PreLettingQuestions@txdot.gov](mailto:ODA-PreLettingQuestions@txdot.gov)

All contractor questions will be reviewed by the Engineer. All questions and/or responses will be posted to TxDOT's Public FTP at the following Address:

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

The site is organized by District, Project Type (Construction or Maintenance), Letting Date, CCSJ/Project Name.

#### **Item 5: Control of the Work**

Demolition of the existing structures shall follow the environmental regulations identified on these plans.

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

Use Method C for construction surveying.

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

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

#### **Item 6: Control of Materials**

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

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

#### **Item 7: Legal Relations and Responsibilities**

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

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

No significant traffic generator events identified.

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

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

#### **Item 8: Prosecution and Progress**

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

-Traffic Control Plan

-Storm Water Pollution Prevention Plan

-Environmental Permit, Issues And Commitments (EPIC)

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

Working day charges will start April 4<sup>th</sup>, 2022

Start roadway work by April 4<sup>th</sup>, 2022

Working days will be computed and charged in accordance with Article 8. 3.1.1. "Five-Day Workweek."

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

#### **Item 110: Excavation**

Broom the existing base or subgrade to remove any loose material dropped during excavation operations. This work is considered subsidiary to this item.

Before excavation and embankment operations begin, windrow all topsoil (approx. 4 inches) to be reused on side slopes or behind the proposed curb and gutter. This work is subsidiary to Item 110, "Excavation" and Item 132, "Embankment".

Start excavation when a mix design for hot mix asphalt Type x has been accepted.

Excavate only the volume of material that can reasonably be replaced with new HMA within 24 hours of removal based on anticipated production rates. The Engineer may halt further excavation if any excavated volumes have not been replaced with HMA within 48 hours of excavation.

#### **Item 132: Embankment**

For all material with a plasticity index of less than 20, use test method Tex-113-E in lieu of test method Tex-114-E for determining the percent of density.

**County: Loving**  
**Highway: RM 652**

**Control: 0493-02-021**

Material quality test requirements will be waived for material excavated from the right of way on this project and utilized in embankment.

Type B embankment material shall meet testing requirements of Type A with the exception that the specification limit for PI is between 6 and 15, and no more than 15% of the total aggregate may be field sand or other uncrushed fine aggregate.

**Item 310: Prime Coat**

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

**Item 400: Excavation and Backfill for Structures**

Aggregate for cement stabilized backfill will be an approved material.

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

**Item 421: Hydraulic Cement Concrete**

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

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

The Engineer will provide strength testing equipment for acceptance testing.

Within seven (7) days after concrete has been placed for foundations for traffic signals, roadway illumination assemblies, or high mast illumination assemblies, provide a rub finish for exposed surfaces in accordance with Item 427, Surface Finishes for Concrete, Article 4.3.3.

Furnish Type II or IP cement.

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

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

**Item 422: Concrete Superstructures**

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

Provide a non-restricting safety support system in order for elevations to be taken by the Engineer on the top of the beams when in place and prior to forms or panels being set.

**Item 432: Riprap**

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

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

Broom finish all riprap on this project unless otherwise directed.

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

In addition to reinforcing steel, polypropylene fiber is required at a rate of 1.5 lbs. /cy.

**Item 496: Removing Structures**

Submit a demolition plan for approval by the Engineer in accordance with Item 496.

Demolition plans will require each span to be removed in sections.

**Item 502: Barricades, Signs, and Traffic Handling**

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

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

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

This project has a regulatory work zone speed reduction within the project limits. The work zone speed limit is reduced from 70 mph to 45 mph. Placement of speed reduction zone signs shall comply with BC (3)-14. Speed resumption sign(s) is required at the end of a speed reduction zone.

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

Vertical panels shall be self-righting.

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

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

**Item 506: Temporary Erosion, Sedimentation, and Environmental Controls**

In accordance with the Construction General Permit (CGP), erosion control and stabilization measures should be initiated as soon as practicable to include soil retention blankets, silt fence, and erosion control logs,

**County: Loving**  
**Highway: RM 652**

**Control: 0493-02-021**

The total disturbed area for this project is 2.0 Acres. The disturbed area in this project, all project locations in the contract, and Contractor Project Specific Locations (PSLS), within 1 mile of the project limits, for the contract will further establish the authorization requirements for storm water discharges. The department will obtain an authorization to discharge storm water from the Texas Commission On Environmental Quality (TCEQ) for the construction activities shown on the plans. The Contractor is to obtain any required authorization from the TCEQ for any Contractor PSLS for construction support activities on or off the right of way. When the total area disturbed for all projects in the contract and PSLS within 1 mile of the project limits exceeds 5 acres, provide a copy of the Contractor NOI for PSLS on the right of way, to the Engineer (or to the appropriate MS4 operator when on an off-state system route).

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

When applying cement for emulsion, asphalt treatment, or any other soil stabilization, sprinkle water as needed to control cement from blowing and contaminating adjacent vegetation and waters.

#### **Item 540: Metal Beam Guard Fence**

Provide steel post for this project.

#### **Item 542: Removing Metal Beam Guard Fence**

Do not salvage any existing metal beam guard fence as State property; retain ownership of all material requiring removal including steel posts, metal rail, and hardware, and remove from the project.

For removal of posts embedded in concrete, remove the posts and the concrete footings; payment for removal of concrete footings is subsidiary to Item 542.

#### **Item 644: Small Roadside Sign Assemblies**

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

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

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

#### **Item 658: Delineator and Object Marker Assemblies**

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

#### **Item 662: Work Zone Pavement Markings**

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

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

#### **Item 666 Retroreflectorized Pavement Markings**

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

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

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

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

#### **Item 677: Eliminating Existing Pavement Markings and Markers**

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

#### **Item 3077: Superpave Mixtures**

##### Binder:

Provide a binder that has a Performance Grade of 70 -22 (PG 70 -22) for the B/D mix.

##### Aggregate quality:

Furnish Class A aggregate for the Type D mix. Blending of SAC A and SAC B material will not be allowed for coarse aggregates.

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

##### Mixture design:

Design a mixture with a gradation that has stone on stone contact and passes below the reference zone.

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

##### Placement:

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

No RAP will be allowed in the surface course.

No more than 10% RAP will be allowed in non-surface courses.

No RAS will be allowed.

Mineral filler will not be allowed.

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

Field sand will not be allowed.

#### **Item 6001: Portable Changeable Message Sign**

**County: Loving**  
**Highway: RM 652**

**Control: 0493-02-021**

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

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

General Note 5 of TCP (2-1)-18 provides for additional shadow vehicle(s) with truck mounted attenuator (TMA); one (1) additional shadow vehicle with TMA is included in the basis of estimate for this operation. The shadow vehicle(s) with TMA specified on the traffic control plan as “required” plus the ‘additional shadow vehicle’ is the quantity that has been estimated for this operation.

General Note 7 of TCP (2-2)-18 provides for additional shadow vehicle(s) with truck mounted attenuator (TMA); one (1) additional shadow vehicle with TMA is included in the basis of estimate for this operation. The shadow vehicle(s) with TMA specified on the traffic control plan as “required” plus the ‘additional shadow vehicle’ is the quantity that has been estimated for this operation.

General Note 8 of TCP (2-3)-18 provides for additional shadow vehicle(s) with truck mounted attenuator (TMA); one (1) additional shadow vehicle with TMA is included in the basis of estimate for this operation. The shadow vehicle(s) with TMA specified on the traffic control plan as “required” plus the ‘additional shadow vehicle’ is the quantity that has been estimated for this operation.

Basis of Estimate for Stationary TMAs			
	TMA (Stationary)		
Standard	Required	Optional	TOTAL
TCP(2-1)-18	1	1	2
TCP(2-2)-18	1	1	2
TCP(2-3)-18	1	1	2

The estimated number of days for install SW3P items is 3 days, using 2 TMAs per standard TCP (2-1)-18, totals 6 TMAs (Stationary).

The estimated number of days for removing temporary pavement is 1 day, using 2 TMAs per standard TCP (2-1)-18 or TCP (2-3)-18, totals 2 TMAs (Stationary).

The estimated number of days to install asphalt paving is 1 day, using 2 TMAs per standard TCP (2-2)-18, totals 2 TMAs (Stationary).

The estimated number of days to remove SW3P items is 4 days, using 2 TMAs per standard TCP (2-1)-18, totals 8 TMAs (Stationary).

The total estimated number of TMAs for stationary operations is 18 days.

There are no General Notes for additional shadow vehicle(s) with truck mounted attenuator (TMA) on TCP (3-1)-13; the shadow vehicle(s) with TMA specified on the traffic control plan as “required” is the quantity that has been estimated for this operation.

There are no General Notes for additional shadow vehicle(s) with truck mounted attenuator (TMA) on TCP (3-3)-14; the shadow vehicle(s) with TMA specified on the traffic control plan as “required” is the quantity that has been estimated for this operation.

Basis of Estimate for Mobile TMAs			
	TMA (Mobile)		
Standard	Required	Optional	TOTAL
TCP(3-1)-13	2	0	2
TCP(3-3)-14	2	0	2

The estimated number of days for install advance warning signs is 1 day, using 2 TMAs per standard TCP (3-1)-13, totals 2 TMAs (Mobile).

The estimated number of days for remove or relocate existing signs is 1 day, using 2 TMAs per standard TCP (3-1)-13, totals 2 TMAs (Mobile).

The estimated number of days for install final pavement markings is 3 days, using 2 TMAs per standard TCP (3-3)-14, totals 6 TMAs (Mobile).

The estimated number of days for install signs is 1 days, using 2 TMAs per standard TCP (3-3)-14, totals 2 TMAs (Mobile).

The total estimated number of TMAs for mobile operations is 12 days.

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





# Estimate & Quantity Sheet

CONTROLLING PROJECT ID 0493-02-021

DISTRICT Odessa  
HIGHWAY RM 652

COUNTY Loving

CONTROL SECTION JOB				0493-02-021		TOTAL EST.	TOTAL FINAL
PROJECT ID				A00132597			
COUNTY				Loving			
HIGHWAY				RM 652			
ALT	BID CODE	DESCRIPTION	UNIT	EST.	FINAL		
	110-6001	EXCAVATION (ROADWAY)	CY	50.000		50.000	
	110-6002	EXCAVATION (CHANNEL)	CY	650.000		650.000	
	132-6004	EMBANKMENT (FINAL)(DENS CONT)(TY B)	CY	450.000		450.000	
	169-6002	SOIL RETENTION BLANKETS (CL 1) (TY B)	SY	4,465.000		4,465.000	
	251-6470	REWORK BS MTL (TY C)(0"-9")(ORD COMP)	SY	2,339.000		2,339.000	
	310-6005	PRIME COAT (AE-P)	GAL	636.000		636.000	
	400-6005	CEM STABIL BKFL	CY	142.400		142.400	
	403-6001	TEMPORARY SPL SHORING	SF	774.000		774.000	
	416-6093	DRILL SHAFT (36 IN)(HPC)	LF	945.000		945.000	
	420-6018	CL C CONC (ABUT)(HPC)(SRC)	CY	58.400		58.400	
	420-6030	CL C CONC (CAP)(HPC)	CY	46.100		46.100	
	420-6042	CL C CONC (COLUMN)(HPC)(SRC)	CY	33.600		33.600	
	422-6002	REINF CONC SLAB (HPC)	SF	10,750.000		10,750.000	
	422-6016	APPROACH SLAB (HPC)	CY	80.400		80.400	
	425-6036	PRESTR CONC GIRDER (TX34)	LF	1,494.500		1,494.500	
	432-6002	RIPRAP (CONC)(5 IN)	CY	100.700		100.700	
	432-6045	RIPRAP (MOW STRIP)(4 IN)	CY	39.000		39.000	
	450-6024	RAIL (TY SSTR)(HPC)	LF	466.000		466.000	
	454-6018	SEALED EXPANSION JOINT (4 IN) (SEJ - M)	LF	99.000		99.000	
	496-6010	REMOV STR (BRIDGE 100 - 499 FT LENGTH)	EA	1.000		1.000	
	496-6043	REMOV STR (SMALL FENCE)	LF	228.000		228.000	
	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	1,000.000		1,000.000	
	506-6024	CONSTRUCTION EXITS (REMOVE)	SY	1,000.000		1,000.000	
	506-6038	TEMP SEDMT CONT FENCE (INSTALL)	LF	1,862.000		1,862.000	
	506-6039	TEMP SEDMT CONT FENCE (REMOVE)	LF	1,862.000		1,862.000	
	506-6042	BIODEG EROSN CONT LOGS (INSTL) (18")	LF	288.000		288.000	
	506-6043	BIODEG EROSN CONT LOGS (REMOVE)	LF	288.000		288.000	
	510-6003	ONE-WAY TRAF CONT (PORT TRAF SIG)	MO	9.000		9.000	
	512-6001	PORT CTB (FUR & INST)(SGL SLOPE)(TY 1)	LF	960.000		960.000	
	512-6025	PORT CTB (MOVE)(SGL SLP)(TY 1)	LF	960.000		960.000	
	512-6049	PORT CTB (REMOVE)(SGL SLP)(TY 1)	LF	960.000		960.000	
	540-6002	MTL W-BEAM GD FEN (STEEL POST)	LF	275.000		275.000	
	540-6006	MTL BEAM GD FEN TRANS (THRIE-BEAM)	EA	4.000		4.000	
	542-6001	REMOVE METAL BEAM GUARD FENCE	LF	533.000		533.000	
	542-6004	RM MTL BM GD FENCE TRANS (THRIE-BEAM)	EA	4.000		4.000	

DISTRICT	COUNTY	CCSJ	SHEET
Odessa	Loving	0493-02-021	6A



CONTROLLING PROJECT ID 0493-02-021

DISTRICT Odessa  
HIGHWAY RM 652

COUNTY Loving

# Estimate & Quantity Sheet

CONTROL SECTION JOB				0493-02-021		TOTAL EST.	TOTAL FINAL
PROJECT ID				A00132597			
COUNTY				Loving			
HIGHWAY				RM 652			
ALT	BID CODE	DESCRIPTION	UNIT	EST.	FINAL		
	544-6001	GUARDRAIL END TREATMENT (INSTALL)	EA	4.000		4.000	
	544-6003	GUARDRAIL END TREATMENT (REMOVE)	EA	4.000		4.000	
	545-6003	CRASH CUSH ATTEN (MOVE & RESET)	EA	2.000		2.000	
	545-6005	CRASH CUSH ATTEN (REMOVE)	EA	2.000		2.000	
	545-6019	CRASH CUSH ATTEN (INSTL)(S)(N)(TL3)	EA	2.000		2.000	
	552-6001	WIRE FENCE (TY A)	LF	221.000		221.000	
	644-6001	IN SM RD SN SUP&AM TY10BWG(1)SA(P)	EA	1.000		1.000	
	644-6068	RELOCATE SM RD SN SUP&AM TY 10BWG	EA	5.000		5.000	
	644-6076	REMOVE SM RD SN SUP&AM	EA	1.000		1.000	
	658-6014	INSTL DEL ASSM (D-SW)SZ (BRF)CTB (BI)	EA	10.000		10.000	
	658-6062	INSTL DEL ASSM (D-SW)SZ 1(BRF)GF2(BI)	EA	11.000		11.000	
	658-6103	INSTL OM ASSM (OM-3L)(WFLX)GND)GND	EA	2.000		2.000	
	658-6106	INSTL OM ASSM (OM-3R)(WFLX)GND)GND	EA	2.000		2.000	
	662-6050	WK ZN PAV MRK REMOV (REFL) TY II-A-A	EA	640.000		640.000	
	662-6063	WK ZN PAV MRK REMOV (W)4"(SLD)	LF	11,790.000		11,790.000	
	662-6075	WK ZN PAV MRK REMOV (W)24"(SLD)	LF	48.000		48.000	
	662-6095	WK ZN PAV MRK REMOV (Y)4"(SLD)	LF	25,600.000		25,600.000	
	662-6111	WK ZN PAV MRK SHT TERM (TAB)TY Y-2	EA	380.000		380.000	
	666-6141	REFL PAV MRK TY I (Y)12"(SLD)(100MIL)	LF	214.000		214.000	
	666-6224	PAVEMENT SEALER 4"	LF	1,290.000		1,290.000	
	666-6228	PAVEMENT SEALER 12"	LF	95.000		95.000	
	666-6303	RE PM W/RET REQ TY I (W)4"(SLD)(100MIL)	LF	7,156.000		7,156.000	
	666-6312	RE PM W/RET REQ TY I (Y)4"(BRK)(100MIL)	LF	890.000		890.000	
	666-6315	RE PM W/RET REQ TY I (Y)4"(SLD)(100MIL)	LF	6,832.000		6,832.000	
	666-6342	REF PROF PAV MRK TY I(W)4"(SLD)(100MIL)	LF	8,700.000		8,700.000	
	666-6345	REF PROF PAV MRK TY I(Y)4"(SLD)(100MIL)	LF	7,094.000		7,094.000	
	672-6009	REFL PAV MRKR TY II-A-A	EA	402.000		402.000	
	677-6001	ELIM EXT PAV MRK & MRKS (4")	LF	66,968.000		66,968.000	
	677-6007	ELIM EXT PAV MRK & MRKS (24")	LF	24.000		24.000	
	678-6001	PAV SURF PREP FOR MRK (4")	LF	1,290.000		1,290.000	
	678-6006	PAV SURF PREP FOR MRK (12")	LF	95.000		95.000	
	3077-6005	SP MIXESSP-BPG70-22	TON	1,220.000		1,220.000	
	3077-6052	SP MIXESSP-DSAC-A PG70-22	TON	313.000		313.000	
	3077-6075	TACK COAT	GAL	284.000		284.000	
	6001-6002	PORTABLE CHANGEABLE MESSAGE SIGN	EA	2.000		2.000	
	6158-6001	TMSP RADAR SPEED CONTROL MONITOR	EA	2.000		2.000	
	6185-6002	TMA (STATIONARY)	DAY	18.000		18.000	



DISTRICT	COUNTY	CCSJ	SHEET
Odessa	Loving	0493-02-021	6B



# Estimate & Quantity Sheet

CONTROLLING PROJECT ID 0493-02-021

DISTRICT Odessa

COUNTY Loving

HIGHWAY RM 652

CONTROL SECTION JOB				0493-02-021		TOTAL EST.	TOTAL FINAL
PROJECT ID				A00132597			
COUNTY				Loving			
HIGHWAY				RM 652			
ALT	BID CODE	DESCRIPTION	UNIT	EST.	FINAL		
	6185-6005	TMA (MOBILE OPERATION)	DAY	12.000		12.000	
	18	EROSION CONTROL MAINTENANCE: CONTRACTOR FORCE ACCOUNT WORK (PART)	LS	1.000		1.000	
		SAFETY CONTINGENCY: CONTRACTOR FORCE ACCOUNT WORK (PARTICIPATING)	LS	1.000		1.000	

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SUMMARY OF ROADWAY QUANTITIES																							
ITEM	LENGTH (FT)	BEGIN WIDTH (FT)	END WIDTH (FT)	AVERAGE WIDTH (FT)	AREA (SY)	110	110	132	251	310	432	496	540	540	542	542	544	544	552	3077	3077	3077	
ITEM DESCRIPTION						EXCAVATION (ROADWAY)	EXCAVATION (CHANNEL)	EMBANKMENT (FINAL) (DENS CONT) (TY B)	REWORK BS MTL (TY C)(0'-9")(ORD COMP)	PRIME COAT (AE-P)	RIPRAP (MOW STRIP) (4 IN)	REMOV STR (SMALL FENCE)	MTL W-BEAM GD FEN (STEEL POST)	MTL BEAM GD FENC TRANS (THRIE-BEAM)	REMOVE METAL BEAM GUARD FENCE	RM MTL BM GD FENC TRANS (THRIE -BEAM)	GUARDRAIL END TREATMENT (INSTALL)	GUARDRAIL END TREATMENT (REMOVE)	WIRE FENCE (TY A)	SP MIXES SP-B PG70-22	SP MIXES SP-D SAC-A PG70-22	TACK COAT	
RATE									0.2 GAL/SY											110 LB/SY*IN (7IN)	110 LB/SY*IN (2IN)	0.1 GAL/SY	
						CY	CY	CY	SY	GAL	CY	LF	LF	EA	LF	EA	EA	EA	EA	LF	TON	TON	GAL
CSJ: 0493-02-021 RM 652 AT PECOS RIVER																							
BEGIN PROJECT TO STA 17+25	277	37	48	45	1432				1151	290	20	148	150	2	263	2	2	2	2	120	551	157	143
STA 17+25 TO END PROJECT	268	48	44	47	1413				1188	287	19	80	125	2	270	2	2	2	2	101	544	155	141
PROJECT WIDE						50	650	450															
PROJECT TOTAL						50	650	450	2339	577	39.0	228	275	4	533	4	4	4	4	221	1095	313	284


TRAFFIC CONTROL QUANTITIES																					
LOCATION	310	510	512	512	512	545	545	545	662	662	662	662	662	662	677	677	3077	6001	6158	6185	6185
	6005	6003	6001	6025	6049	6003	6005	6019	6050	6063	6075	6095	6111	6001	6007	6005	6002	6002	6001	6002	6005
	PRIME COAT (AE-P)	ONE-WAY TRAF CONT (PORT TRAF SIG)	PORT CTB (FUR & INST)(SGL SLOPE)(TY 1)	PORT CTB (MOVE)(SGL SLP)(TY 1)	PORT CTB (REMOVE)(SGL SLP)(TY 1)	CRASH CUSH ATTEN (MOVE & RESET)	CRASH CUSH ATTEN (REMOVE)	CRASH CUSH ATTEN (INSTL)(S)(N)(T)	WK ZN PAV MRK REMOV (REFL) TY II-A	WK ZN PAV MRK REMOV (W)4"(SLD)	WK ZN PAV MRK REMOV (W)24"(SLD)	WK ZN PAV MRK REMOV (Y)4"(SLD)	WK ZN PAV MRK SHT TERM (TAB)TY Y-2	ELIM EXT PAV MRK & MRKS (4")	ELIM EXT PAV MRK & MRKS (24")	SP MIXES SP-B PG70-22	PORTABLE CHANGEABLE MESSAGE SIGN	TMSP RADAR SPEED CONTROL MONITOR	TMA (STATIONARY)	TMA (MOBILE OPERATION)	
	GAL	MO	LF	LF	EA	EA	EA	EA	EA	LF	LF	EA	EA	LF	TON	EA	EA	EA	DAY	DAY	
PHASE 1	59	5	960	0	0	0	0	2	640	5834	48	25600	0	32434	113	2	2				
PHASE 2		4	0	960	0	2	0	0	0	5956		0	380	5956	12	0	0				
PHASE 3					960		2												18	12	
PROJECT TOTAL	59	9	960	960	960	2	2	2	640	11,790	48	25,600	380	38,390	24	125	2	2	18	12	

SIGNING AND PAVEMENT MARKING QUANTITIES																				
LOCATION	644	644	644	658	658	658	658	666	666	666	666	666	666	666	666	666	672	677	678	678
	6001	6068	6076	6014	6062	6103	6106	6141	6224	6228	6303	6312	6315	6342	6345	6009	6001	6001	6006	
	IN SM RD SN SUP&AM TY10BWG(1)SA(P)	RELOCATE SM RD SN SUP&AM TY 10BWG	REMOVE SM RD SN SUP&AM	INSTL DEL ASSM (D-SW)SZ (BRF)CTB (B)	INSTL DEL ASSM (D-SW)SZ 1(BRF)GF2(B)	INSTL OM ASSM (OM-3L)(WFLX)GND	INSTL OM ASSM (OM-3R)(WFLX)GND	REFL PAV MRK TY I (Y)12"(SLD)(100ML)	PAVEMENT SEALER 4"	PAVEMENT SEALER 12"	RE PM W/RET REQ TY I (W)4"(SLD)(100ML)	RE PM W/RET REQ TY I (Y)4"(BRK)(100ML)	RE PM W/RET REQ TY I (Y)4"(SLD)(100ML)	REF PROF PAV MRK TY (W)4"(SLD)(100ML)	REF PROF PAV MRK TY (Y)4"(SLD)(100ML)	REFL PAV MRKR TY II-A-A	ELIM EXT PAV MRK & MRKS (4")	PAV SURF PREP FOR MRK (4")	PAV SURF PREP FOR MRK (12")	
	EA	EA	EA	EA	EA	EA	EA	LF	LF	LF	LF	LF	LF	LF	EA	LF	LF	LF		
PROJECT WIDE	1	5	1	10	11	2	2	214	1290	95	7156	890	6832	8700	7094	402	28578	1290	95	
PROJECT TOTAL	1	5	1	10	11	2	2	214	1290	95	7156	890	6832	8700	7094	402	28578	1290	95	

EROSION CONTROL QUANTITIES							
LOCATION	169	506	506	506	506	506	506
	6002	6020	6024	6038	6039	6042	6043
	SOIL RETENTION BLANKETS (CL 1) (TY B)	CONSTRUCTION EXITS (INSTALL)(TY 1)	CONSTRUCTION EXITS (REMOVE)	TEMP SEDMT CONT FENCE (INSTALL)	TEMP SEDMT CONT FENCE (REMOVE)	BIODEG EROSN CONT LOGS (INSTL)(18")	BIODEG EROSN CONT LOGS (REMOVE)
	SY	SY	SY	LF	LF	LF	LF
CSJ: 0493-02-021 RM 652 AT PECOS RIVER							
BEGIN PROJECT TO STA 17+25		2250	500	500	792	144	144
STA 17+25 TO END PROJECT		2215	500	500	1070	144	144
PROJECT WIDE							
PROJECT TOTAL		4465	1000	1000	1862	288	288

TEXAS REGISTERED ENGINEERING FIRM F-3557

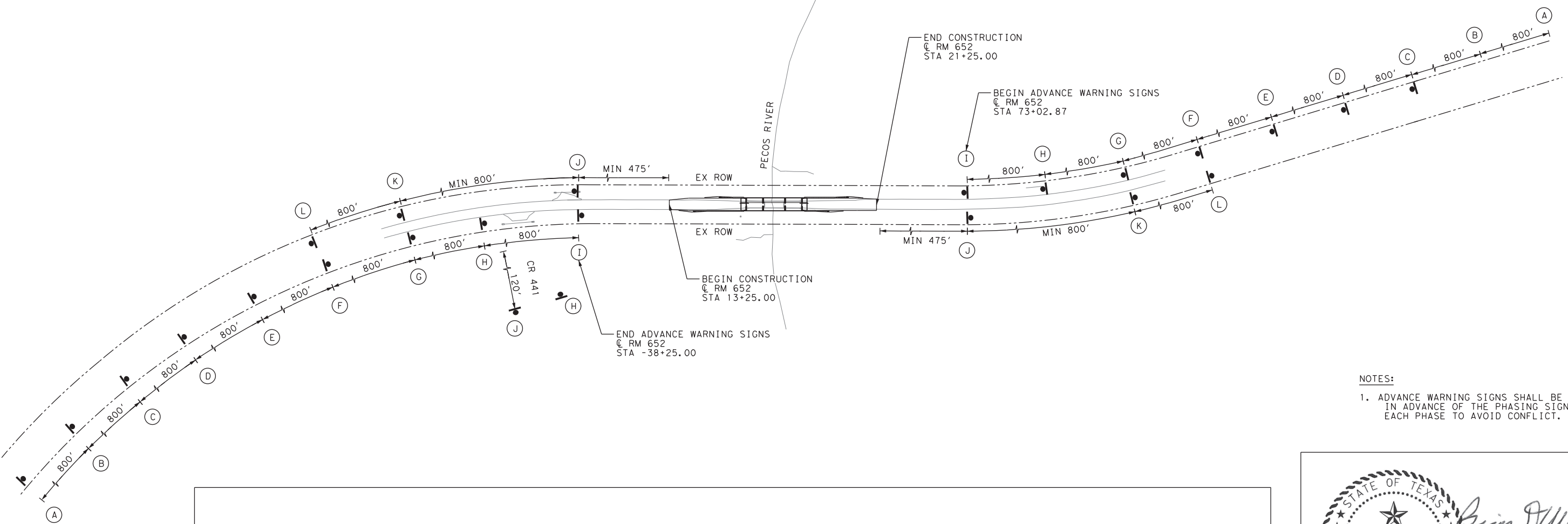

 500 W. 7th ST. SUITE 1100  
 FORT WORTH, TX 76102  
 (817) 339-8950  
 FIRM REG. #: 3557

  
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RM 652  
 QUANTITY SUMMARY SHEET

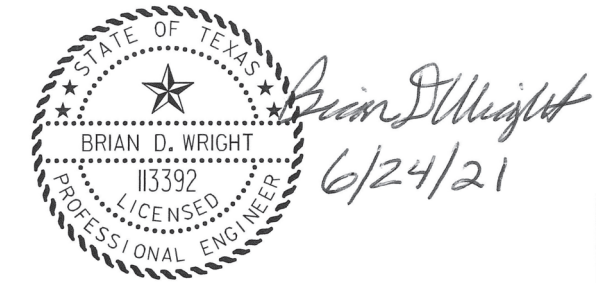
SCALE: N/A SHEET 1 OF 1

DESIGN BES	FED. RD. DIV. NO. 6	FEDERAL AID PROJECT NO. SEE TITLE SHEET		HIGHWAY NO. RM 652
GRAPHICS BES	STATE TEXAS	DISTRICT ODA	COUNTY LOVING	SHEET NO. 7
CHECK KMA	CONTROL	SECTION	JOB	
CHECK RR	0493	02	021	



**NOTES:**  
 1. ADVANCE WARNING SIGNS SHALL BE PLACED IN ADVANCE OF THE PHASING SIGNS IN EACH PHASE TO AVOID CONFLICT.

 R20-3T (48"X42")	 R20-10T (60"X48")	 G20-9TP (24"X24") R20-5T (24"X30") R20-5aTP (24"X12")	 CW3-5 (36"X36")	 G20-5aP (24"X18") R2-1 (24"X30")	 CW3-5 (36"X36")
 G20-5aP (24"X18") R2-1 (24"X30")	 CW20-1D (48"X48")	 G20-5T (48"X24") G20-6T (48"X30")	 G20-2 (36"X18")	 R2-1 (24"X30")	 G20-2bT (36"X18")



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

Texas Department of Transportation  
 © 2021

**RM 652  
 ADVANCE WARNING  
 SIGNS**

SCALE: N. T. S. SHEET 1 OF 1

DESIGN SM	FED. RD. DIV. NO. 6	FEDERAL AID PROJECT NO. SEE TITLE SHEET	HIGHWAY NO. RM 652
GRAPHICS SM	STATE TEXAS	DISTRICT ODA	COUNTY LOVING
CHECK BDW	CONTROL	SECTION	JOB
CHECK BDW	0493	02	021

SHEET NO. 8

GENERAL NOTES

1. INSTALL PORTABLE CHANGEABLE MESSAGE SIGNS (PCMS) ONE WEEK PRIOR TO ONE-LANE, TWO-WAY TRAFFIC SWITCH TO INFORM THE PUBLIC OF THE DATE AND TIME OF THE TRAFFIC SWITCH.
2. CONTRACTOR SHALL PROVIDE 2 SPEED CONTROL MONITORS TO BE LOCATED WITHIN THE PROJECT LIMITS AS DIRECTED BY THE ENGINEER.
3. ALL TCP SHALL FOLLOW APPLICABLE TRAFFIC CONTROL STANDARDS FOR TAPER LENGTHS, CHANNELIZING DEVICE SPACING, AND SIGN SIZES AND SPACING.
4. EXISTING PAVEMENT MARKINGS THAT CONFLICT WITH WORKZONE PAVEMENT MARKINGS SHALL BE REMOVED AND REPLACED WITH WORKZONE PAVEMENT MARKINGS AS SHOWN IN THE PLANS.
5. PAVEMENT MARKING REMOVAL SHALL COMPLETED PER BC (11)-21 STANDARD. OBLITERATED MARKINGS MUST NOT STAND OUT OR CAUSE CONFUSION TO MOTORISTS.
6. MAINTAIN ACCESS TO EACH PROPERTY AT ALL TIMES.
7. MAINTAIN AND ADJUST TEMPORARY DRAINAGE AND SW3P DURING EACH PHASE.
8. TEMPORARY DRAINAGE IS SUBSIDIARY TO THE VARIOUS PAY ITEMS. NO SEPARATE PAY ITEM IS PROVIDED.
9. SEE ROADWAY, DRAINAGE, BRIDGE, AND SIGNING AND PAVEMENT MARKING PLANS FOR PERMANENT FEATURES.
10. EXISTING FEATURES SUCH AS UTILITIES, DRAINAGE, ROADWAY AND BRIDGE DECK WIDTHS SHALL BE FIELD VERIFIED PRIOR TO CONSTRUCTION. ANY DISCREPANCIES SHALL BE BROUGHT TO THE ATTENTION OF THE ENGINEER IN WRITING.

SEQUENCE OF CONSTRUCTION

PHASE 1

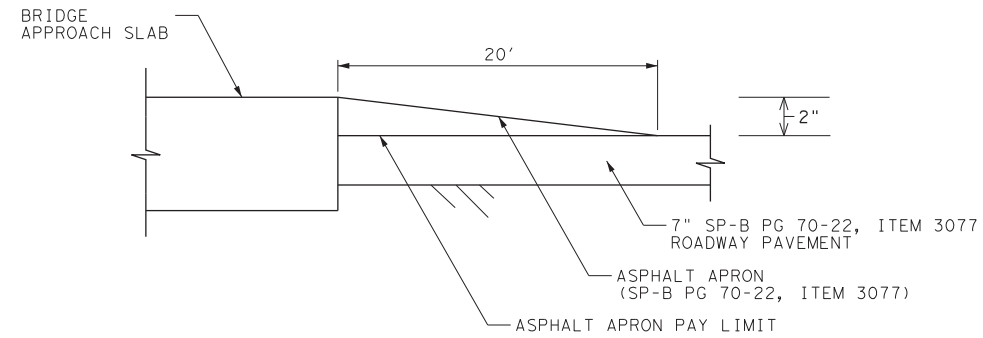
1. PLACE ADVANCE WARNING SIGNS AS SHOWN AND IN ACCORDANCE WITH BC STANDARDS. UTILIZE TCP STANDARD (3-1)-13.
2. PLACE PORTABLE CHANGEABLE MESSAGE SIGNS AT PROJECT LIMITS. UTILIZE TCP STANDARD (3-1)-13.
3. INSTALL STORM WATER POLLUTION PREVENTION DEVICES AS SHOWN IN THE EROSION CONTROL PLANS. UTILIZE TCP STANDARD (2-1)-18.
4. PLACE TRAFFIC CONTROL DEVICES INCLUDING CHANNELIZING DEVICES, PCTB, ATTENUATORS, AND PORTABLE TRAFFIC SIGNALS AS SHOWN AND IN ACCORDANCE WITH BC AND TCP (2-8)-18 STANDARDS.
5. SHIFT TRAFFIC TO ONE-LANE TWO-WAY OPERATION ON EXISTING PAVEMENT ON THE EASTBOUND SIDE AS SHOWN.
6. CONSTRUCT PERMANENT WESTBOUND ROADWAY PAVEMENT AND BRIDGE AS SHOWN. LEAVE OUT FINAL 2" ASPHALT PAVEMENT SURFACE COURSE. CONSTRUCT ASPHALT APRON AT BRIDGE APPROACH SLAB TO MATCH GRADE AT BRIDGE ENDS.
7. CONSTRUCT TEMPORARY PAVEMENT ADJACENT TO EXISTING AND PERMANENT PAVEMENT IN THE WESTBOUND DIRECTION AS SHOWN.

PHASE 2

1. PLACE TRAFFIC CONTROL DEVICES INCLUDING CHANNELIZING DEVICES, PCTB, ATTENUATORS, AND PORTABLE TRAFFIC SIGNALS AS SHOWN AND IN ACCORDANCE WITH BC AND TCP (2-8)-18 STANDARDS.
2. SHIFT TRAFFIC TO ONE-LANE TWO-WAY OPERATION ON TEMPORARY AND PERMANENT PAVEMENT ON THE WESTBOUND SIDE AS SHOWN.
3. CONSTRUCT REMAINING PERMANENT ROADWAY PAVEMENT AND BRIDGE AS SHOWN. LEAVE OUT FINAL 2" ASPHALT PAVEMENT SURFACE COURSE. CONSTRUCT ASPHALT APRON AT BRIDGE APPROACH SLAB TO MATCH GRADE AT BRIDGE ENDS.

PHASE 3 (NOT SHOWN IN PLANS)

1. REMOVE TEMPORARY PAVEMENT WIDENING PLACED IN PHASE 1. UTILIZE TCP STANDARD (2-1)-18 OR (2-3)-18.
2. REMOVE ASPHALT APRONS AT BRIDGE ENDS. CONSTRUCT FINAL 2" ASPHALT PAVEMENT SURFACE COURSE UTILIZING ONE-LANE, TWO-WAY TRAFFIC CONTROL WITH FLAGGERS. UTILIZE TCP STANDARD (2-2)-18.
3. PLACE FINAL PAVEMENT MARKINGS AND INSTALL SIGNS. UTILIZE TCP STANDARDS (3-3)-14 AND (7-1)-13.
4. PERFORM FINAL CLEAN UP AND COMPLETE ALL PUNCH LIST ITEMS. LEAVE ADVANCE WARNING SIGNS IN PLACE UNTIL SIGN REMOVAL IS APPROVED BY THE ENGINEER.



ASPHALT APRON DETAIL

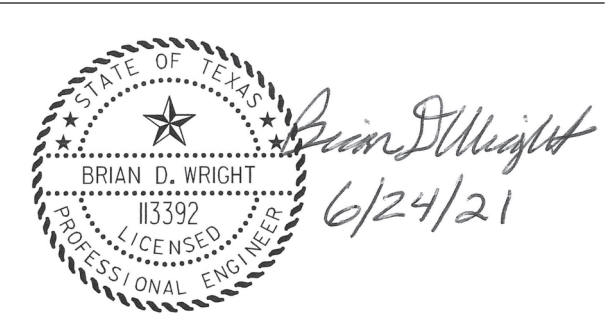
N. T. S.

NOTES:

1. CONSTRUCT TEMPORARY ASPHALT APRON AT BRIDGE APPROACH SLABS IN PHASE 1 AND 2.
2. ASPHALT APRON (SP-B PG 70-22, ITEM 3077) ESTIMATED QUANTITY EQUALS 12 TONS.

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TBPE REGISTRATION NO. 264



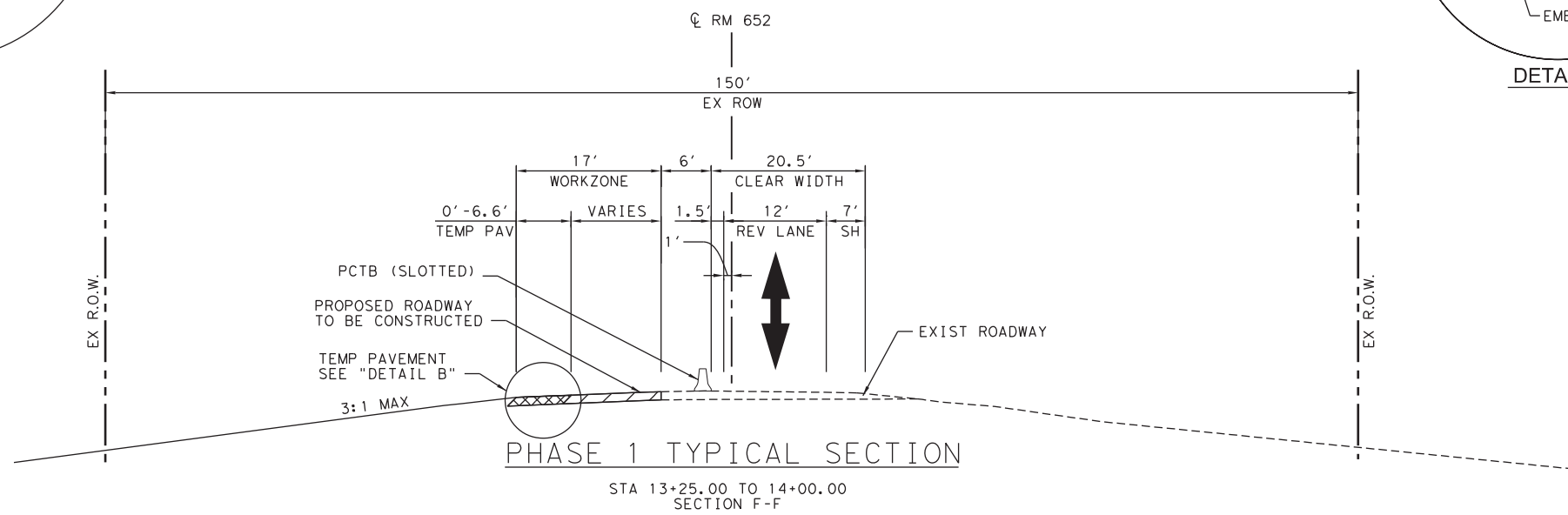
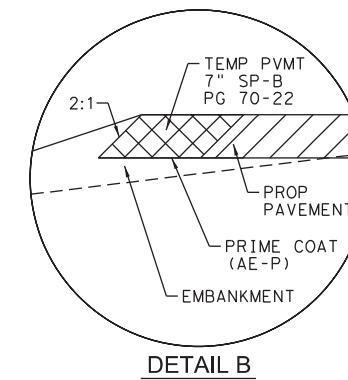
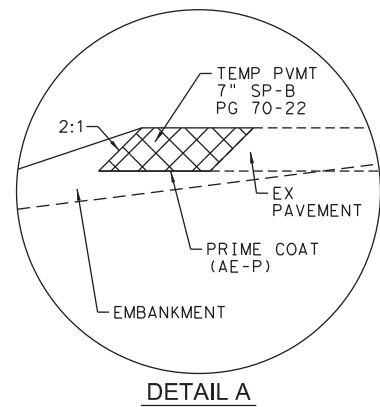
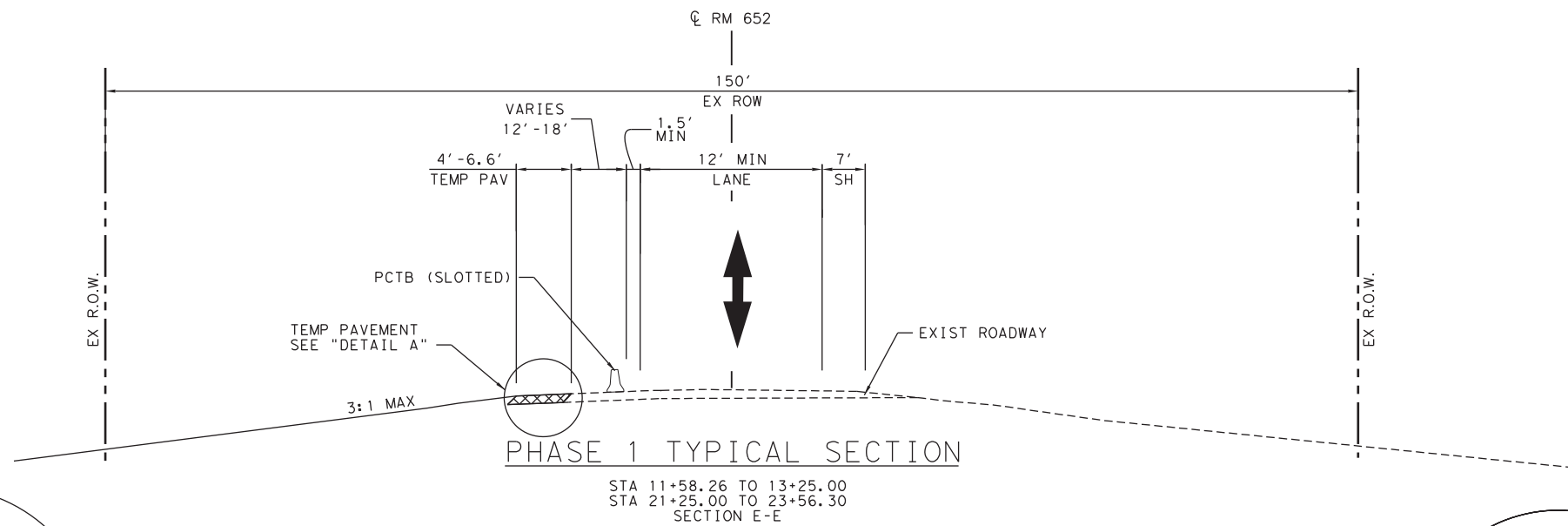
RM 652  
TCP NARRATIVE

SHEET 1 OF 1

DESIGN SM	FED. RD. DIV. NO. 6	FEDERAL AID PROJECT NO. SEE TITLE SHEET		HIGHWAY NO. RM 652
GRAPHICS SM	STATE TEXAS	DISTRICT ODA	COUNTY LOVING	SHEET NO. 9
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CHECK BDW	0493	02	021	

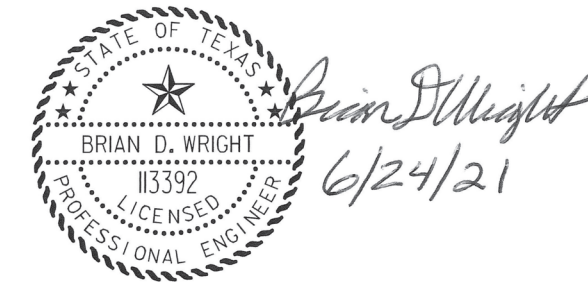
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NOTES:

- EXCAVATION AND EMBANKMENT REQUIRED TO CONSTRUCT TEMPORARY PAVEMENT SHALL BE CONSIDERED SUBSIDIARY TO THE TEMPORARY PAVEMENT PAY ITEMS.



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CONSULTING ENGINEERS  
TBPE REGISTRATION NO. 264

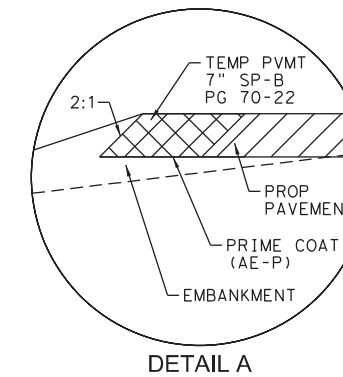
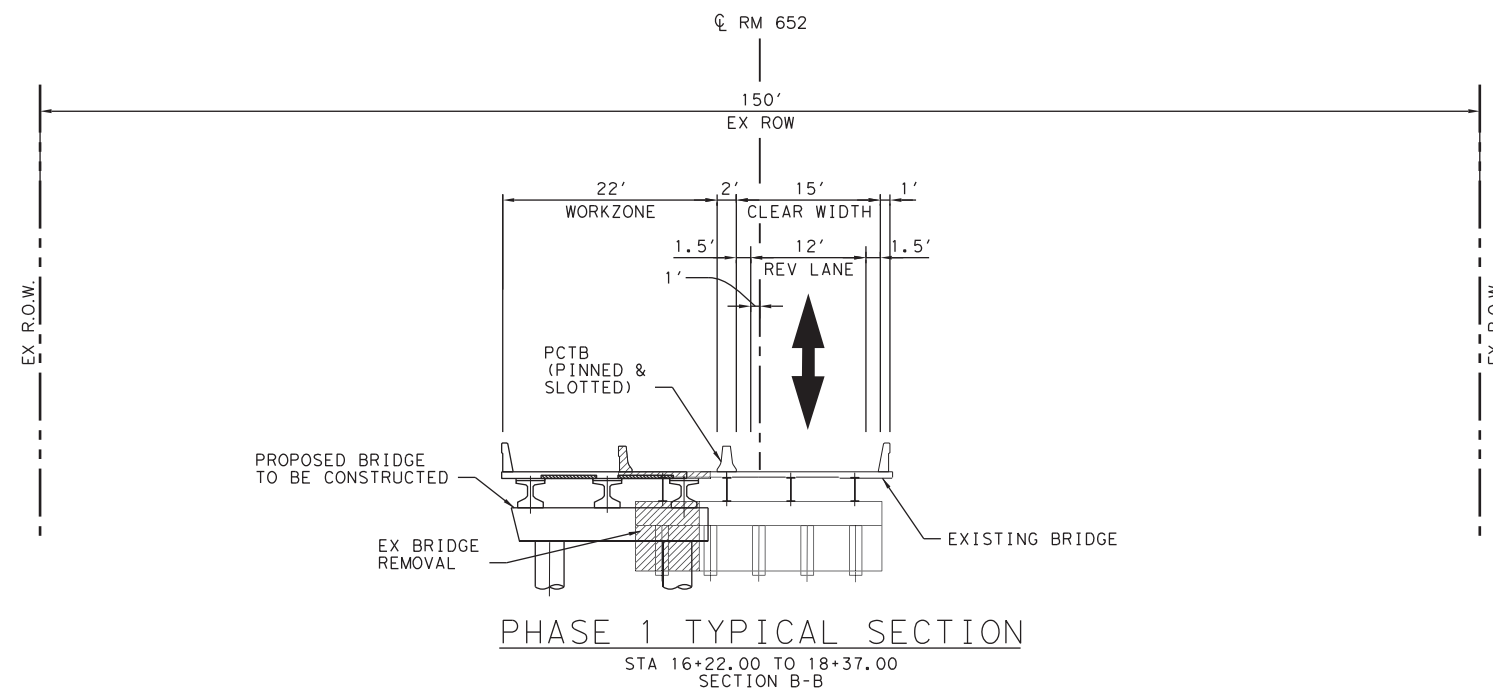
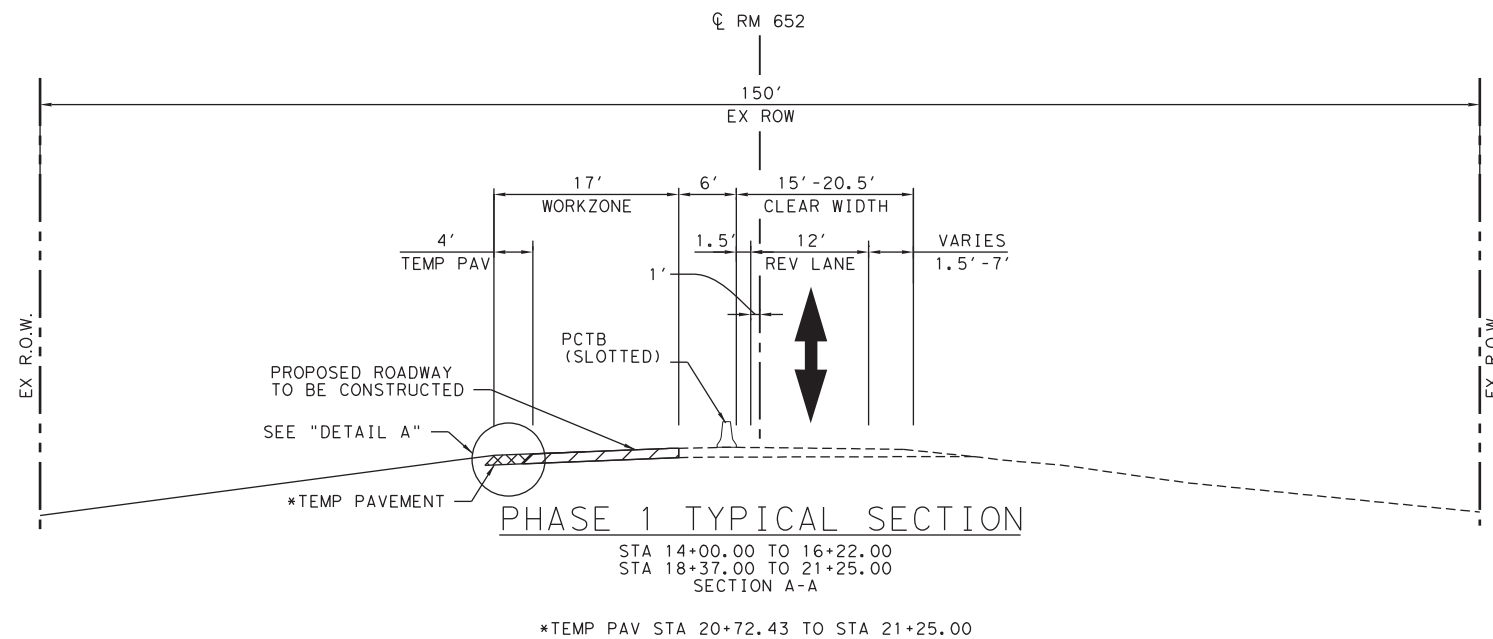


RM 652  
TCP TYPICAL SECTIONS  
PHASE 1

SCALE: N. T. S.			SHEET 1 OF 2	
DESIGN SM	FED. RD. DIV. NO. 6	FEDERAL AID PROJECT NO. SEE TITLE SHEET		HIGHWAY NO. RM 652
GRAPHICS SM	STATE TEXAS	DISTRICT ODA	COUNTY LOVING	SHEET NO. 10
CHECK BDW	CONTROL	SECTION	JOB	
CHECK BDW	0493	02	021	

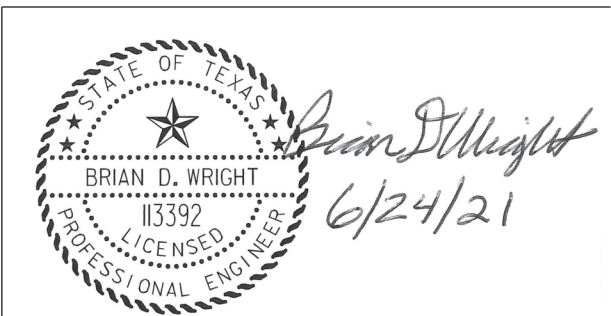
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**NOTES:**

1. SEE BRIDGE PLANS AND BRIDGE TYPICAL SECTIONS FOR STAGE CONSTRUCTION DETAILS.
2. EXCAVATION AND EMBANKMENT REQUIRED TO CONSTRUCT TEMPORARY PAVEMENT SHALL BE CONSIDERED SUBSIDIARY TO THE TEMPORARY PAVEMENT PAY ITEMS.



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TBPE REGISTRATION NO. 264



**RM 652**  
**TCP TYPICAL SECTIONS**  
PHASE 1

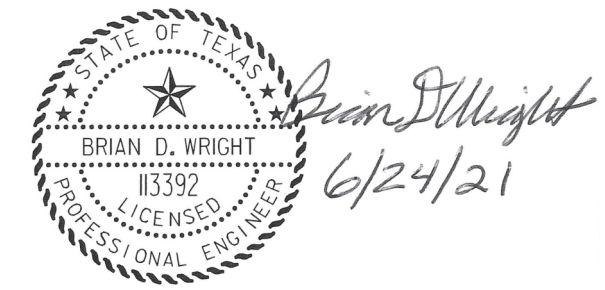
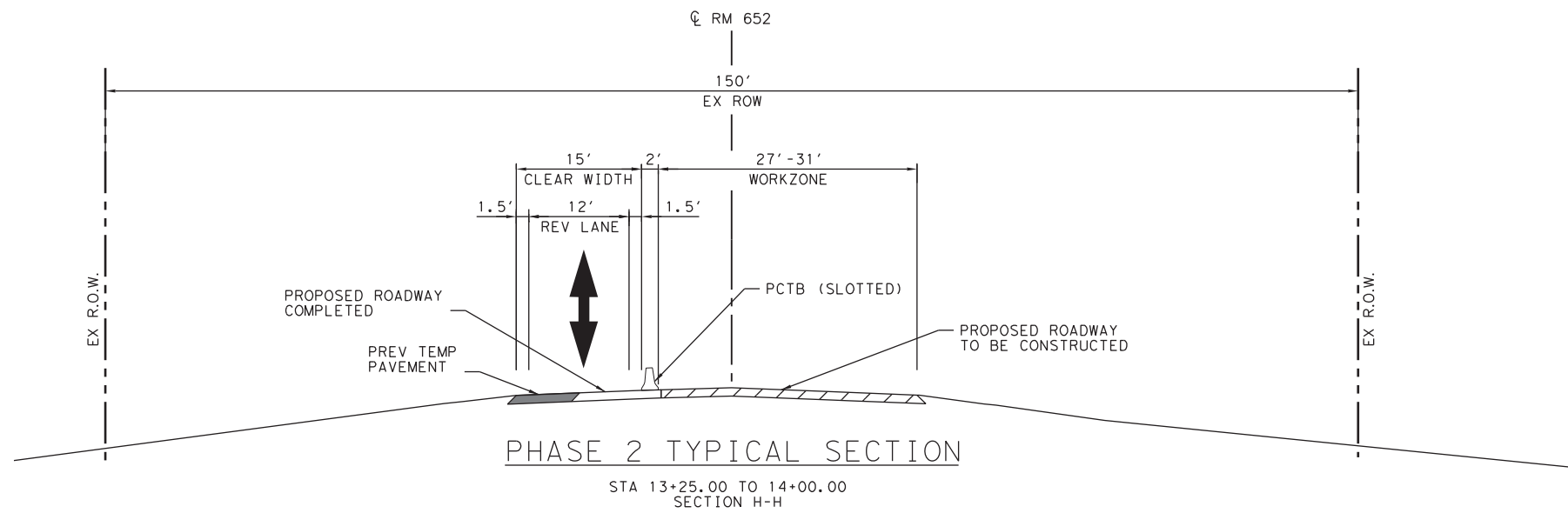
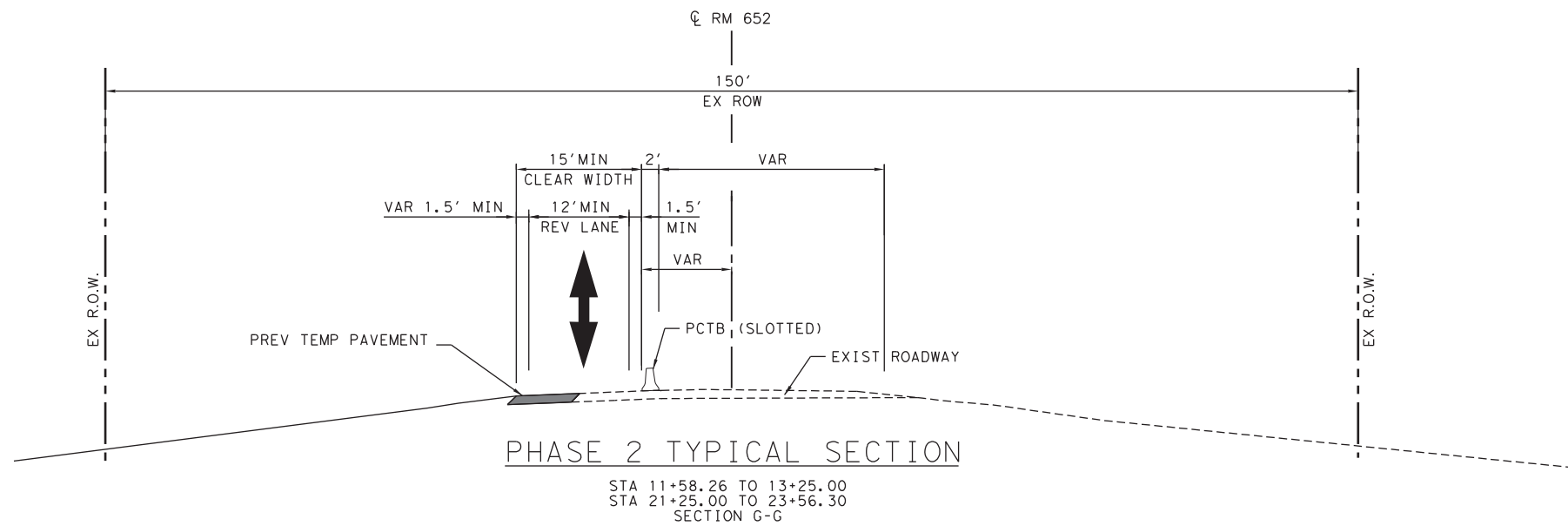
SCALE: N. T. S. SHEET 2 OF 2

DESIGN SM	FED. RD. DIV. NO. 6	FEDERAL AID PROJECT NO. SEE TITLE SHEET		HIGHWAY NO. RM 652
GRAPHICS SM	STATE TEXAS	DISTRICT ODA	COUNTY LOVING	SHEET NO. 11
CHECK BDW	CONTROL	SECTION	JOB	
CHECK BDW	0493	02	021	



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CONSULTING ENGINEERS  
TBPE REGISTRATION NO. 264



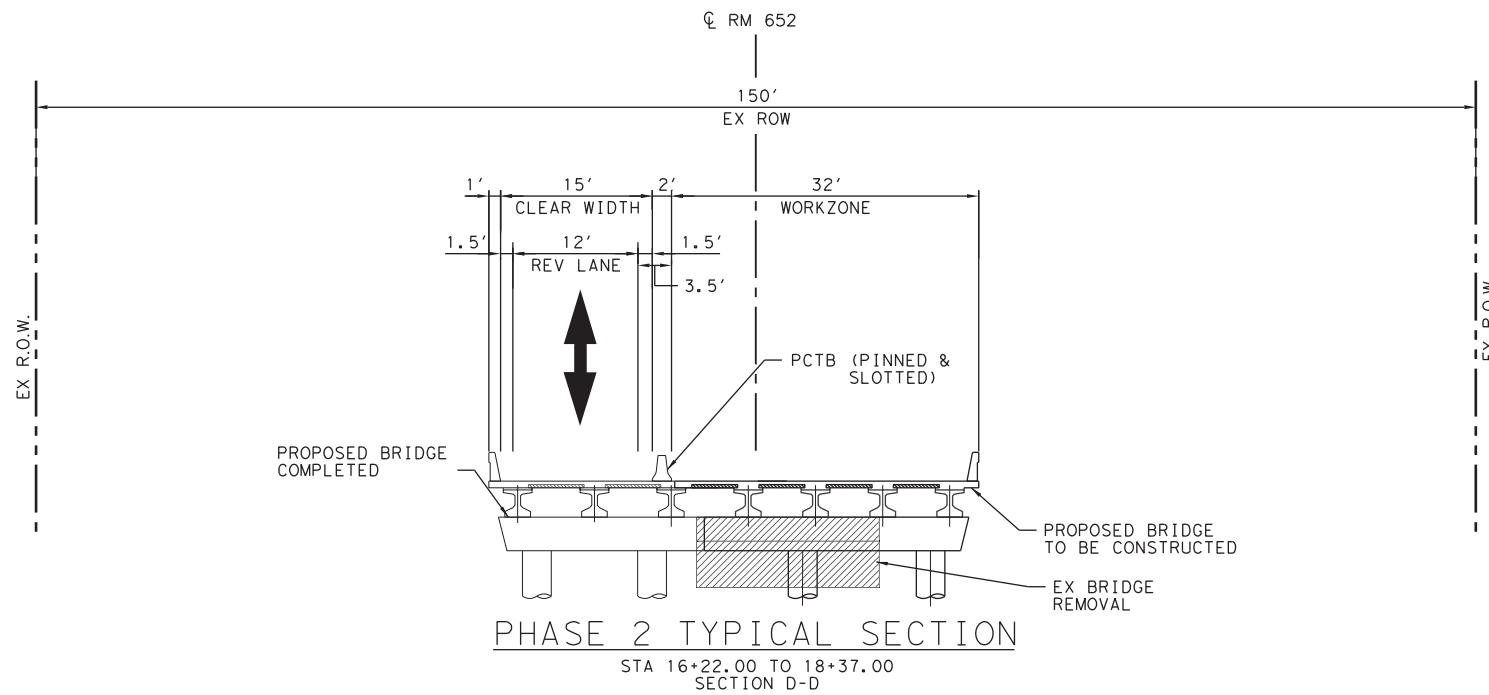
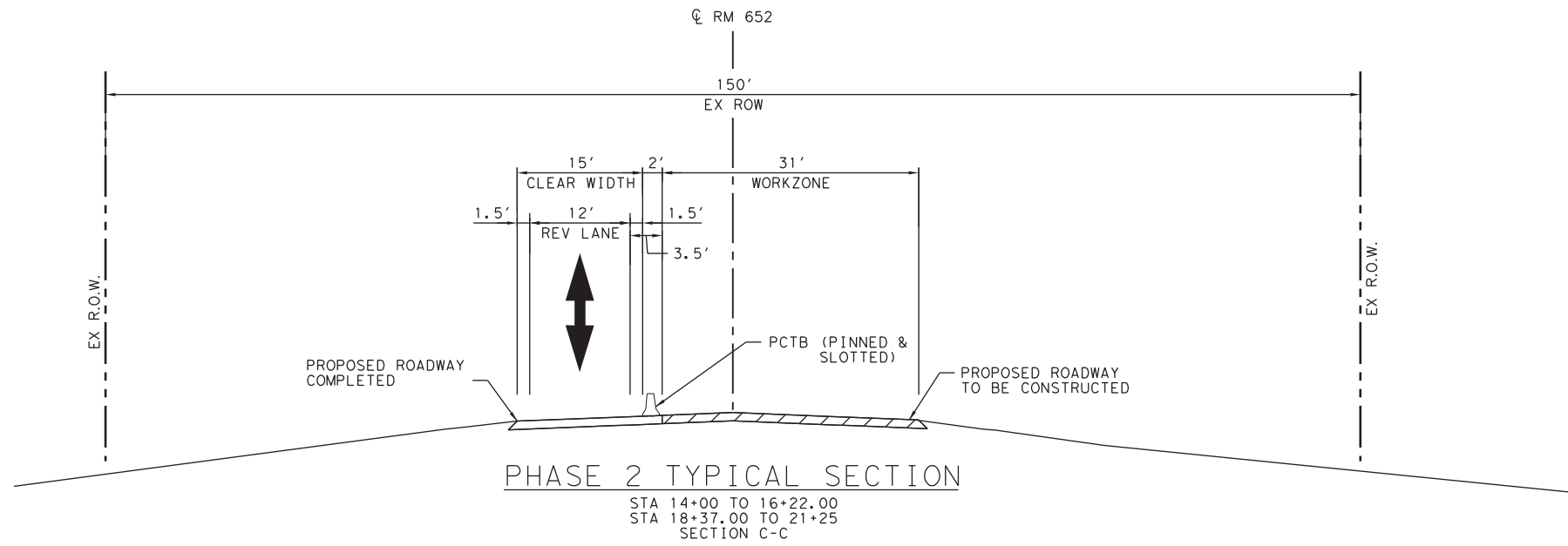
RM 652  
TCP TYPICAL SECTIONS  
PHASE 2

SCALE: N. T. S. SHEET 1 OF 2

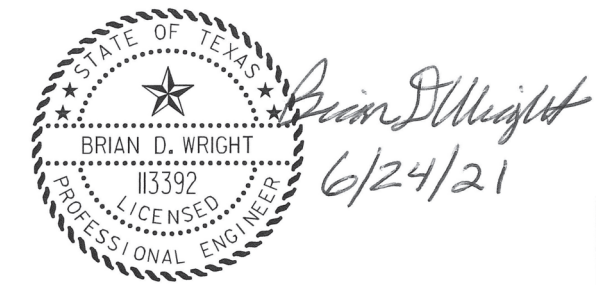
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CHECK BDW	CONTROL	SECTION	JOB	
CHECK BDW	0493	02	021	

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- NOTES:
1. SEE BRIDGE PLANS AND BRIDGE TYPICAL SECTIONS FOR STAGE CONSTRUCTION DETAILS.



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**RM 652**  
**TCP TYPICAL SECTIONS**  
 PHASE 2

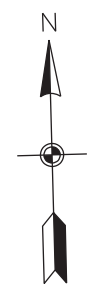
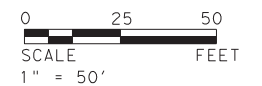
SCALE: N. T. S. SHEET 2 OF 2

DESIGN SM	FED. RD. DIV. NO. 6	FEDERAL AID PROJECT NO. SEE TITLE SHEET		HIGHWAY NO. RM 652
GRAPHICS SM	STATE TEXAS	DISTRICT ODA	COUNTY LOVING	SHEET NO. 13
CHECK BDW	CONTROL	SECTION	JOB	
CHECK BDW	0493	02	021	



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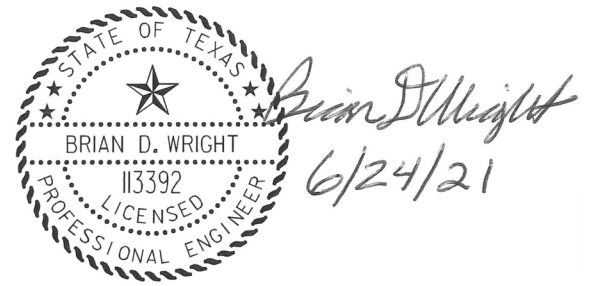


**LEGEND**

- PERM CONSTRUCTION
- TEMP PAVEMENT
- PREV TEMP PAVEMENT
- WK ZN PAV MRK REM (W) (24") (SLD)
- WK ZN PAV MRK REM (W) (4") (SLD)
- EXISTING PVMT MRK
- TRAVEL LANE
- ONE LANE TWO WAY TRAFFIC
- RAISED PAV MRK REFL TY II-A-A
- WK ZN PAV MRK REM (Y) (4") (SLD)
- CHANNELIZING DEVICE
- TYPE III BARRICADE
- CONSTRUCTION SIGN
- PORTABLE TRAFFIC SIGNAL
- PRECAST CONCRETE TRAFFIC BARRIER (PCTB)
- CRASH CUSHION
- TEMP SHORING

**NOTES:**

1. PCTB CALL-OUTS ARE TO THE NOMINAL FACE OF PCTB UNLESS OTHERWISE NOTED.
2. REFER TO TCP(2-8)-18 FOR ADDITIONAL INFORMATION REGARDING ONE-LANE, TWO WAY TRAFFIC CONTROL.
3. DIMENSION SHOWN DOES NOT REPRESENT ACTUAL LOCATION IN PLAN.
4. LOCATION SHOWN DOES NOT REPRESENT ACTUAL LOCATION IN PLAN.



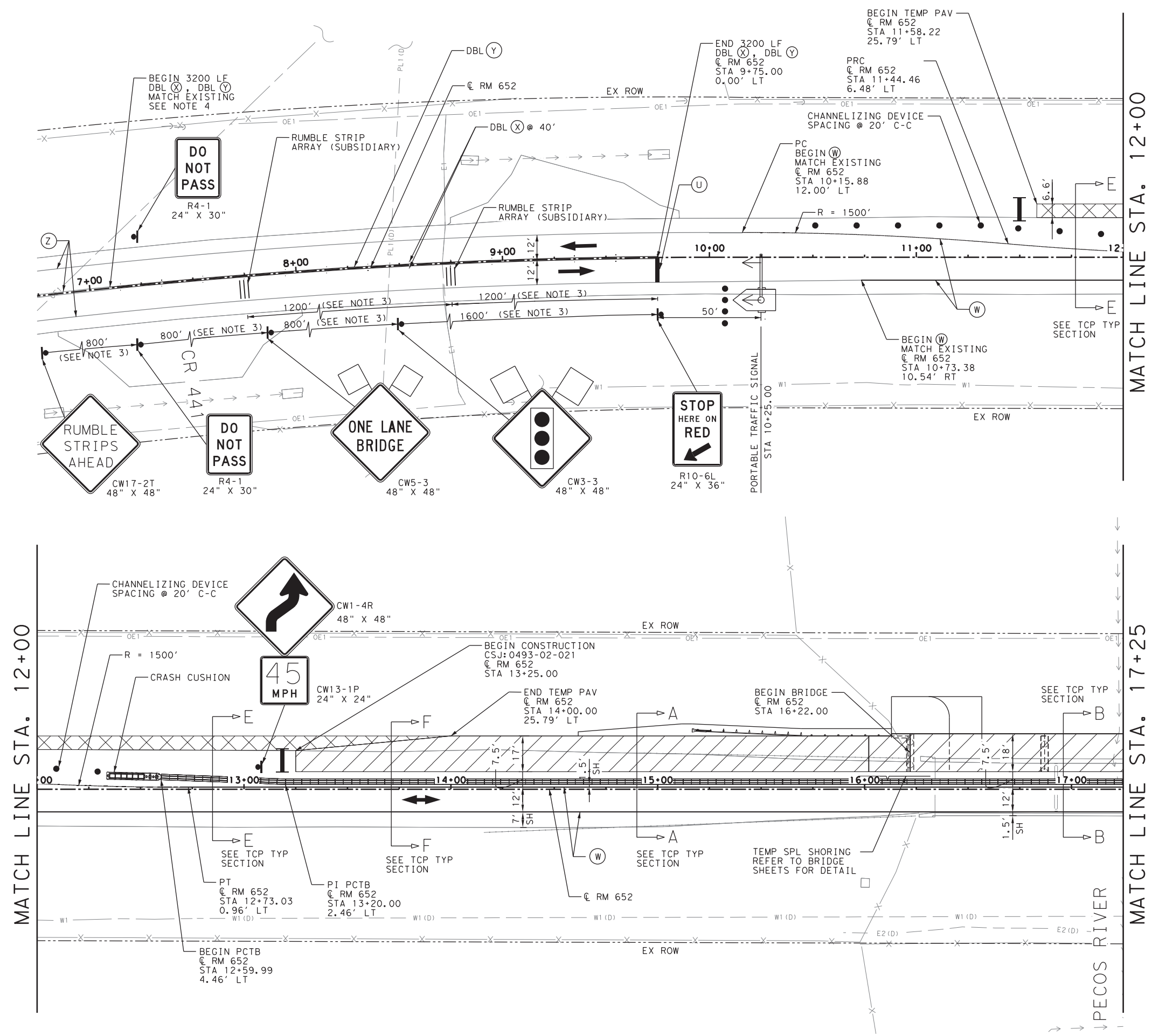
**BRIDGEFARMER & ASSOCIATES, INC.**  
CONSULTING ENGINEERS  
TBPE REGISTRATION NO. 264



**RM 652**  
**TRAFFIC CONTROL PLAN**  
PHASE 1

SCALE: 1" = 50' SHEET 1 OF 2

DESIGN SM	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
GRAPHICS SM	6	SEE TITLE SHEET		RM 652
CHECK BDW	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK	TEXAS	ODA	LOVING	15
	CONTROL	SECTION	JOB	
BDW	0493	02	021	



MATCH LINE STA. 12+00

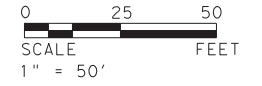
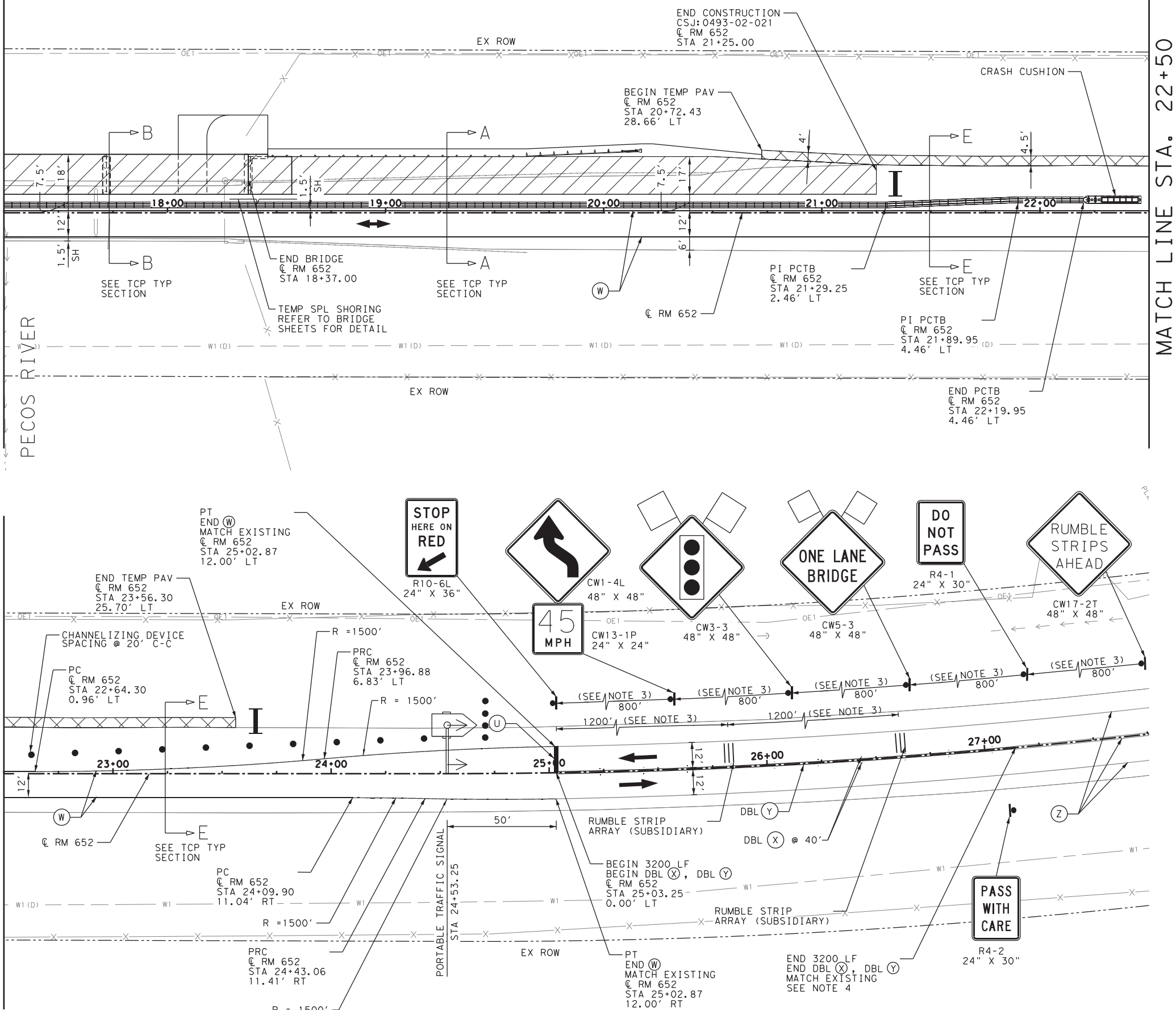
MATCH LINE STA. 17+25

PECOS RIVER

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MATCH LINE STA. 17+25

MATCH LINE STA. 22+50

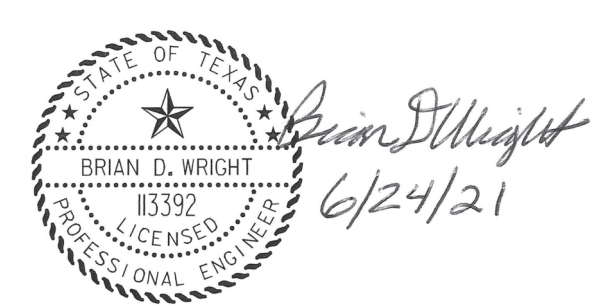
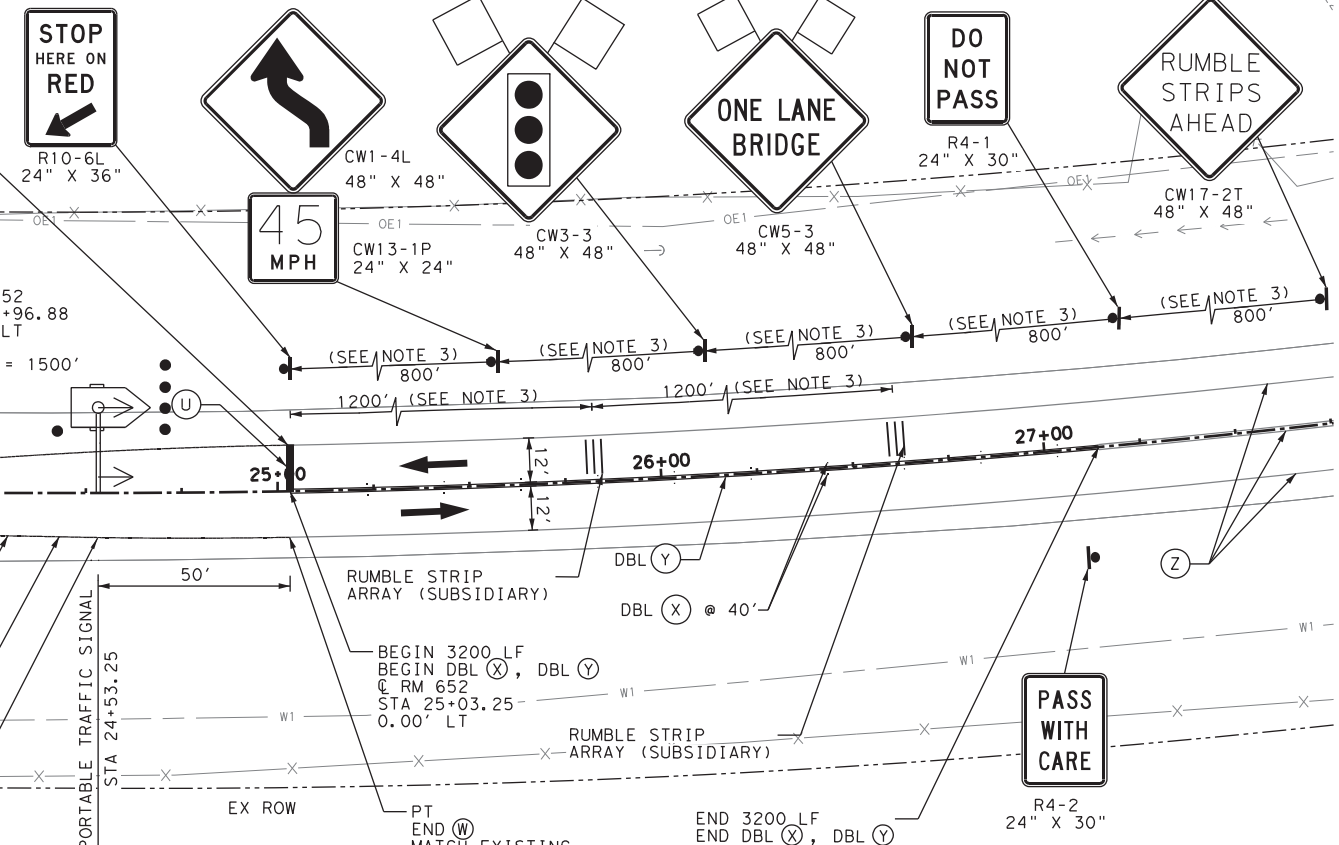


**LEGEND**

- PERM CONSTRUCTION
- TEMP PAVEMENT
- PREV TEMP PAVEMENT
- WK ZN PAV MKR REM (W) (24") (SLD)
- WK ZN PAV MKR REM (W) (4") (SLD)
- EXISTING PVMT MKR
- RAISED PAV MKR REFL TY II-A-A
- WK ZN PAV MKR REM (Y) (4") (SLD)
- TRAVEL LANE
- ONE LANE TWO WAY TRAFFIC
- CHANNELIZING DEVICE
- TYPE III BARRICADE
- CONSTRUCTION SIGN
- PORTABLE TRAFFIC SIGNAL
- PRECAST CONCRETE TRAFFIC BARRIER (PCTB)
- CRASH CUSHION
- TEMP SHORING

**NOTES:**

1. PCTB CALL-OUTS ARE TO THE NOMINAL FACE OF PCTB UNLESS OTHERWISE NOTED.
2. REFER TO TCP(2-8)-18 FOR ADDITIONAL INFORMATION REGARDING ONE-LANE, TWO WAY TRAFFIC CONTROL.
3. DIMENSION SHOWN DOES NOT REPRESENT ACTUAL LOCATION IN PLAN.
4. LOCATION SHOWN DOES NOT REPRESENT ACTUAL LOCATION IN PLAN.



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**RM 652**  
**TRAFFIC CONTROL PLAN**  
PHASE 1

SCALE: 1" = 50' SHEET 2 OF 2

DESIGN SM	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
GRAPHICS SM	6	SEE TITLE SHEET		RM 652
CHECK BDW	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK BDW	TEXAS	ODA	LOVING	16
	CONTROL	SECTION	JOB	
BDW	0493	02	021	

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0 25 50  
SCALE FEET  
1" = 50'

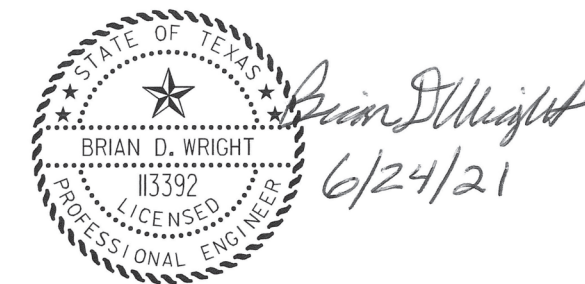


### LEGEND

- PERM CONSTRUCTION
- TEMP PAVEMENT
- PREV TEMP PAVEMENT
- WK ZN PAV MRK REM (W) (24") (SLD)
- WK ZN PAV MRK REM (W) (4") (SLD)
- EXISTING PVMT MRK
- RAISED PAV MRK REFL TY II-A-A
- WK ZN PAV MRK REM (Y) (4") (SLD)
- TRAVEL LANE
- ONE LANE TWO WAY TRAFFIC
- CHANNELIZING DEVICE
- TYPE III BARRICADE
- CONSTRUCTION SIGN
- PORTABLE TRAFFIC SIGNAL
- PRECAST CONCRETE TRAFFIC BARRIER (PCTB)
- CRASH CUSHION
- TEMP SHORING

### NOTES:

1. PCTB CALL-OUTS ARE TO THE NOMINAL FACE OF PCTB UNLESS OTHERWISE NOTED.
2. REFER TO TCP(2-8)-18 FOR ADDITIONAL INFORMATION REGARDING ONE-LANE, TWO WAY TRAFFIC CONTROL.
3. DIMENSION SHOWN DOES NOT REPRESENT ACTUAL LOCATION IN PLAN.
4. LOCATION SHOWN DOES NOT REPRESENT ACTUAL LOCATION IN PLAN.



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

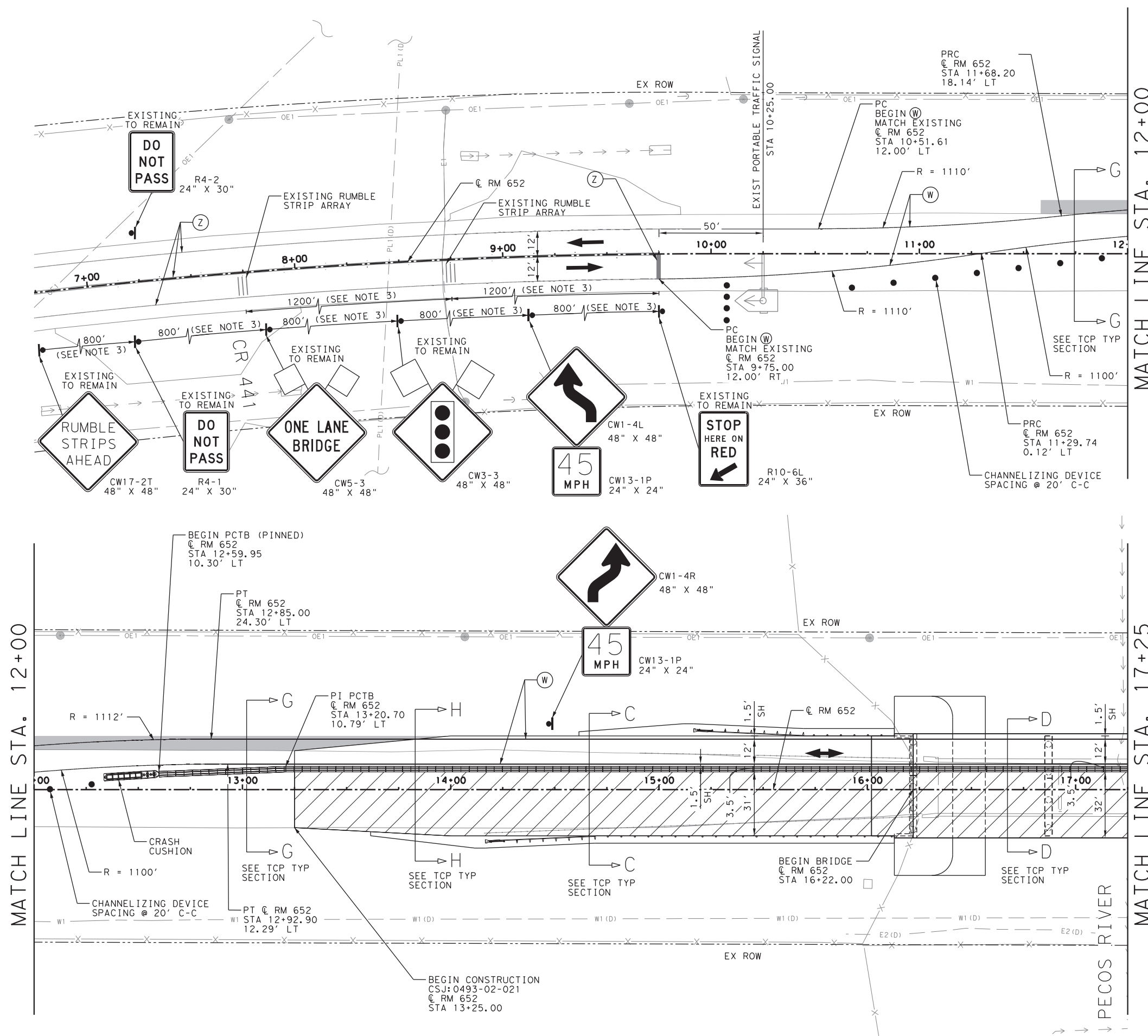


## RM 652 TRAFFIC CONTROL PLAN PHASE 2

DESIGN SM		FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.	HIGHWAY NO.
GRAPHICS SM		6	SEE TITLE SHEET	RM 652
CHECK BDW	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK	TEXAS	ODA	LOVING	17
	CONTROL	SECTION	JOB	
BDW	0493	02	021	

MATCH LINE STA. 12+00

MATCH LINE STA. 17+25



BEGIN CONSTRUCTION  
CSJ: 0493-02-021  
RM 652  
STA 13+25.00

BEGIN BRIDGE  
RM 652  
STA 16+22.00

BEGIN PCTB (PINNED)  
RM 652  
STA 12+59.95  
10.30' LT

PT  
RM 652  
STA 12+85.00  
24.30' LT

PI PCTB  
RM 652  
STA 13+20.70  
10.79' LT

PT  
RM 652  
STA 12+92.90  
12.29' LT

PRC  
RM 652  
STA 11+68.20  
18.14' LT

PC BEGIN  
MATCH EXISTING  
RM 652  
STA 10+51.61  
12.00' LT

PC BEGIN  
MATCH EXISTING  
RM 652  
STA 9+75.00  
12.00' RT

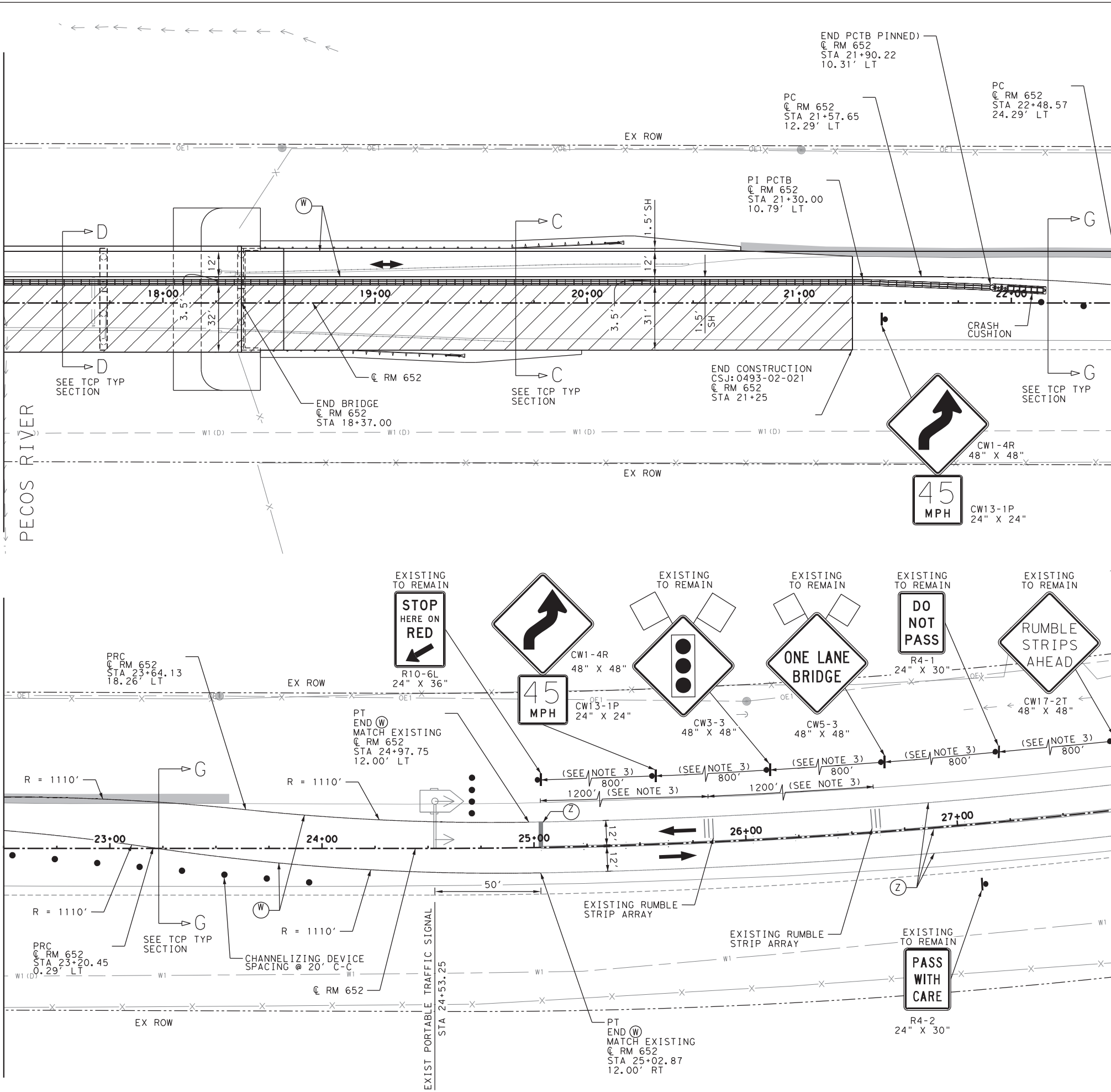
PRC  
RM 652  
STA 11+29.74  
0.12' LT

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MATCH LINE STA. 17+25

MATCH LINE STA. 22+50



0 25 50  
SCALE FEET  
1" = 50'

N

### LEGEND

	PERM CONSTRUCTION		TEMP PAVEMENT		PREV TEMP PAVEMENT
	WK ZN PAV MRK REM (W) (24") (SLD)		RAISED PAV MRK REFL) TY II-A-A		WK ZN PAV MRK REM (Y) (4") (SLD)
	WK ZN PAV MRK REM (W) (4") (SLD)		EXISTING PVMT MRK		
	TRAVEL LANE				
	ONE LANE TWO WAY TRAFFIC				
	CHANNELIZING DEVICE				
	TYPE III BARRICADE				
	CONSTRUCTION SIGN				
	PORTABLE TRAFFIC SIGNAL				
	PRECAST CONCRETE TRAFFIC BARRIER (PCTB)				
	CRASH CUSHION				
	TEMP SHORING				

- NOTES:**
- PCTB CALL-OUTS ARE TO THE NOMINAL FACE OF PCTB UNLESS OTHERWISE NOTED.
  - REFER TO TCP(2-8)-18 FOR ADDITIONAL INFORMATION REGARDING ONE-LANE, TWO WAY TRAFFIC CONTROL.
  - DIMENSION SHOWN DOES NOT REPRESENT ACTUAL LOCATION IN PLAN.
  - LOCATION SHOWN DOES NOT REPRESENT ACTUAL LOCATION IN PLAN.

*Brian D. Wright*  
6/24/21

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## RM 652 TRAFFIC CONTROL PLAN PHASE 2

SCALE: 1" = 50'      SHEET 2 OF 2

DESIGN SM	FED. RD. DIV. NO. 6	FEDERAL AID PROJECT NO. SEE TITLE SHEET		HIGHWAY NO. RM 652
GRAPHICS SM	STATE TEXAS	DISTRICT ODA	COUNTY LOVING	SHEET NO. 18
CHECK BDW	CONTROL	SECTION	JOB	
CHECK BDW	0493	02	021	

DATE: 6/25/2021  
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 DISCLAIMER: This standard is governed by the "Texas Engineering Practice Act". No warranty of any kind is made by TxDOT for any purpose whatsoever. TxDOT assumes no responsibility for the conversion of this standard to other formats or for incorrect results or damages resulting from its use.

**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 <a href="http://www.txdot.gov">http://www.txdot.gov</a>
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



**BARRICADE AND CONSTRUCTION  
 GENERAL NOTES  
 AND REQUIREMENTS**

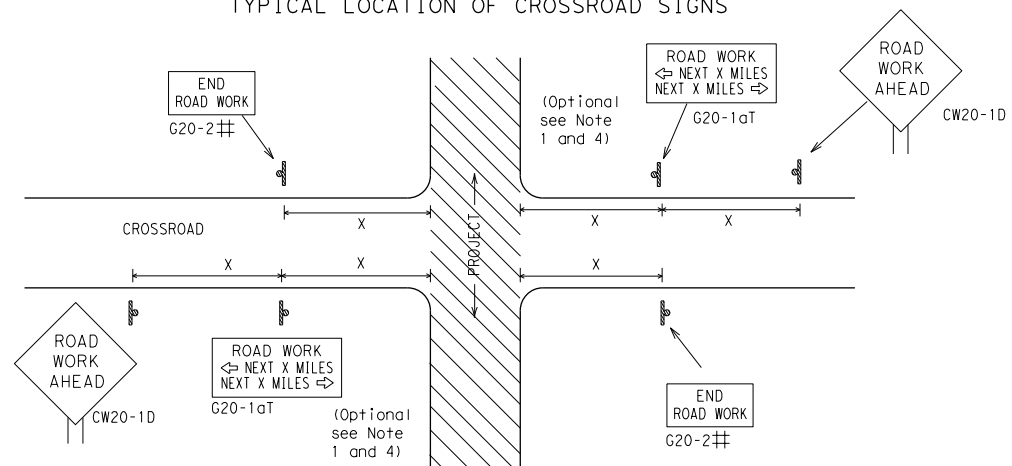
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© TxDOT	November 2002	CONT	SECT	JOB	HIGHWAY				
REVISIONS		0493	02	021	RM 652				
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9-07	8-14	ODA	LOVING		19				
5-10	5-21								



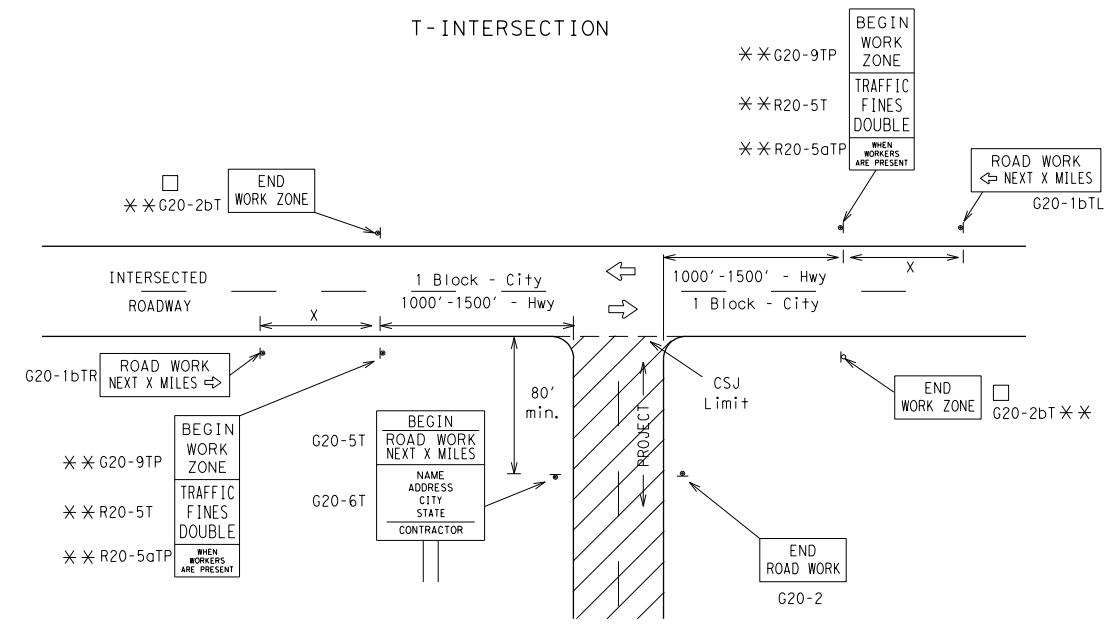
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TYPICAL LOCATION OF CROSSROAD SIGNS



- ## May be mounted on back of "ROAD WORK AHEAD" (CW20-1D) sign with approval of Engineer. (See note 2 below)
- 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.
  - 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.
  - 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.
  - 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.
  - Additional traffic control devices may be shown elsewhere in the plans for higher volume crossroads.
  - 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

- 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.
- 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<sup>1,5,6</sup>

Sign Number or Series	SIZE		SPACING	
	Conventional Road	Expressway/Freeway	Posted Speed MPH	Sign Δ Spacing "x" Feet (Apprx.)
CW20 <sup>4</sup>	48" x 48"	48" x 48"	30	120
CW21			35	160
CW22			40	240
CW23			45	320
CW25	36" x 36"	48" x 48"	50	400
CW1, CW2, CW7, CW8, CW9, CW11, CW14			55	500 <sup>2</sup>
CW3, CW4, CW5, CW6, CW8-3, CW10, CW12			60	600 <sup>2</sup>
			65	700 <sup>2</sup>
	48" x 48"	48" x 48"	70	800 <sup>2</sup>
			75	900 <sup>2</sup>
			80	1000 <sup>2</sup>
			*	* <sup>3</sup>

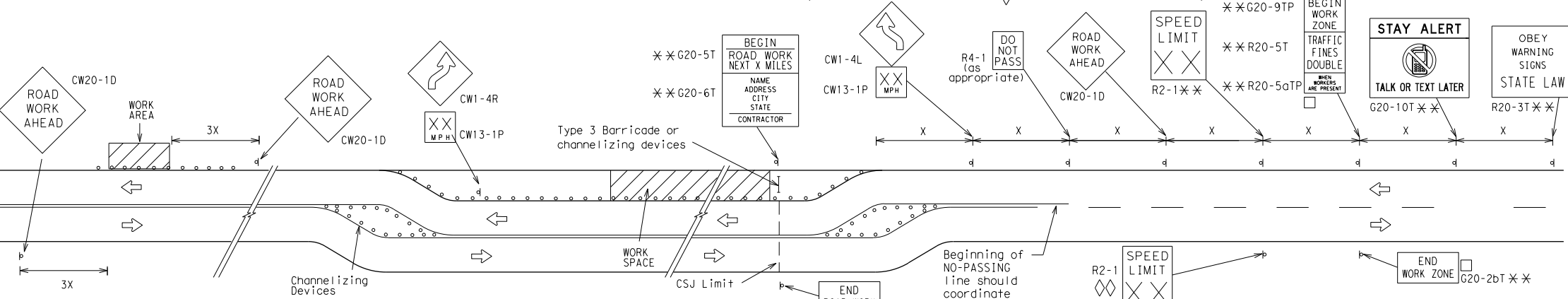
\* For typical sign spacings on divided highways, expressways and freeways, see Part 6 of the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD) typical application diagrams or TCP Standard Sheets.

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

GENERAL NOTES

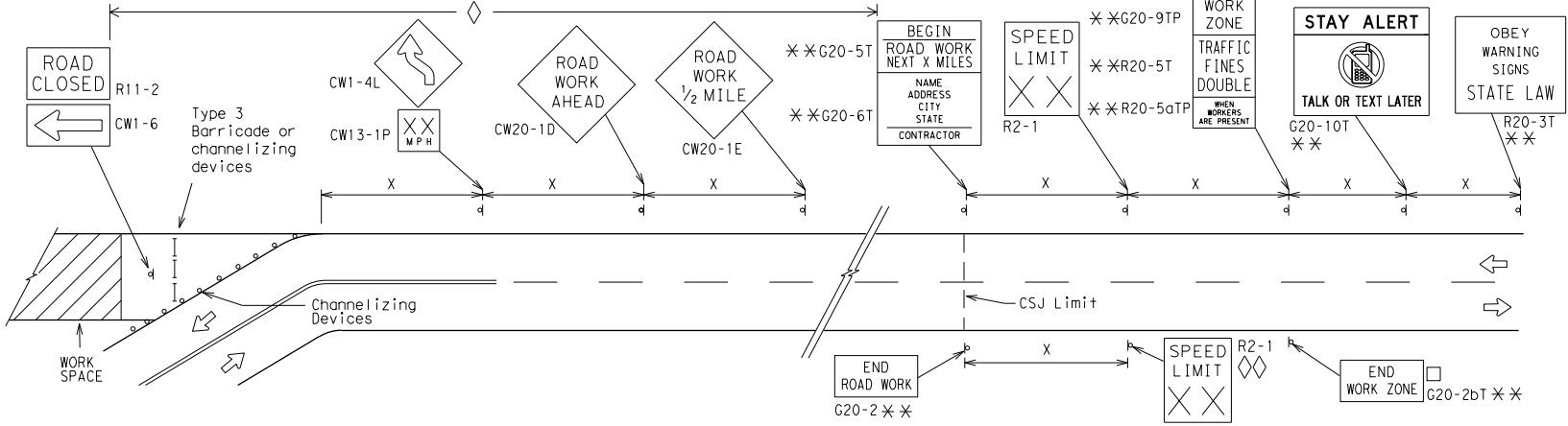
- Special or larger size signs may be used as necessary.
- Distance between signs should be increased as required to have 1500 feet advance warning.
- Distance between signs should be increased as required to have 1/2 mile or more advance warning.
- 36" x 36" "ROAD WORK AHEAD" (CW20-1D) signs may be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

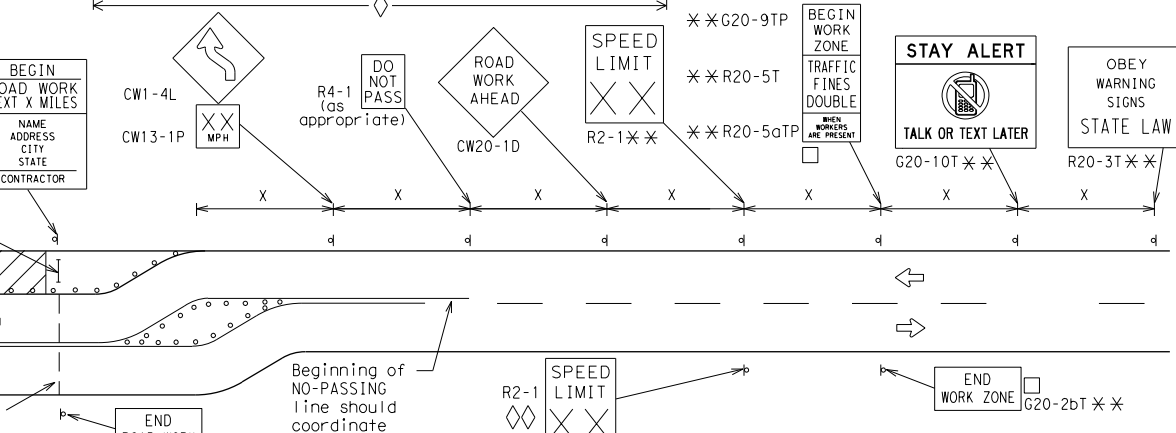


When extended distances occur between minimal work spaces, the Engineer/Inspector should ensure additional "ROAD WORK AHEAD" (CW20-1D) signs are placed in advance of these work areas to remind drivers they are still within the project limits. See the applicable TCP sheets for exact location and spacing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

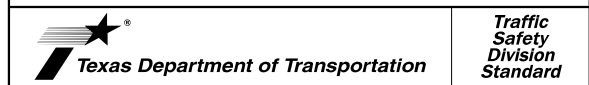


NOTES

- 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.

SHEET 2 OF 12



BARRICADE AND CONSTRUCTION PROJECT LIMIT

BC(2)-21

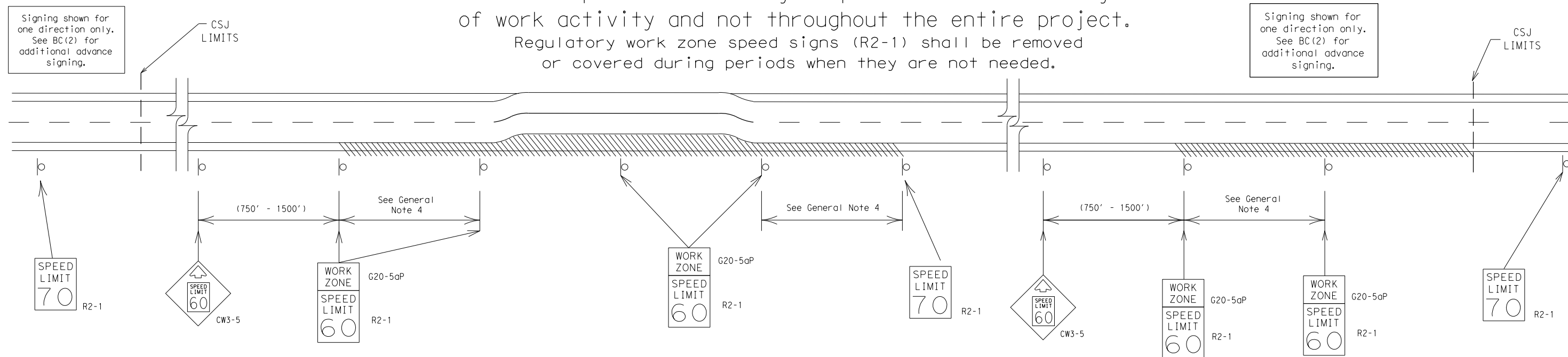
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© TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
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# TYPICAL APPLICATION OF WORK ZONE SPEED LIMIT SIGNS

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

Reduced speeds should only be posted in the vicinity of work activity and not throughout the entire project. Regulatory work zone speed signs (R2-1) shall be removed or covered during periods when they are not needed.



## GUIDANCE FOR USE:

### LONG/INTERMEDIATE TERM WORK ZONE SPEED LIMITS

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

Long/Intermediate Term Work Zone Speed Limit signs, when approved as described above, should be posted and visible to the motorist when work activity is present.

Work activity may also be defined as a change in the roadway that requires a reduced speed for motorists to safely negotiate the work area, including:

- rough road or damaged pavement surface
- substantial alteration of roadway geometrics (diversions)
- construction detours
- grade
- width
- 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

- Regulatory work zone speed limits should be used only for sections of construction projects where speed control is of major importance.
- Regulatory work zone speed limit signs shall be placed on supports at a 7 foot minimum mounting height.
- Speed zone signs are illustrated for one direction of travel and are normally posted for each direction of travel.
- 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
- Regulatory speed limit signs shall have black legend and border on a white reflective background (See "Reflective Sheeting" on BC(4)).
- 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.
- Turning signs from view, laying signs over or down will not be allowed, unless as otherwise noted under "REMOVING OR COVERING" on BC(4).
- Techniques that may help reduce traffic speeds include but are not limited to:
  - Law enforcement.
  - Flagger stationed next to sign.
  - Portable changeable message sign (PCMS).
  - Low-power (drone) radar transmitter.
  - Speed monitor trailers or signs.
- Speeds shown on details above are for illustration only. Work Zone Speed Limits should only be posted as approved for each project.
- 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.

SHEET 3 OF 12



## BARRICADE AND CONSTRUCTION WORK ZONE SPEED LIMIT

BC (3) - 21

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© TxDOT	November 2002	CONT	SECT	JOB	HIGHWAY				
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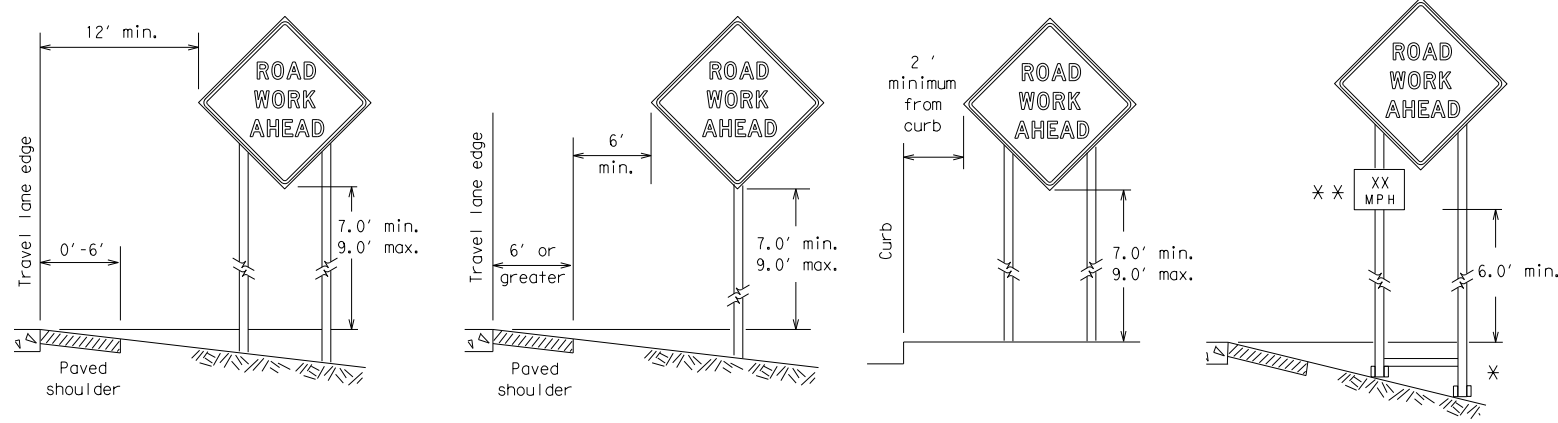
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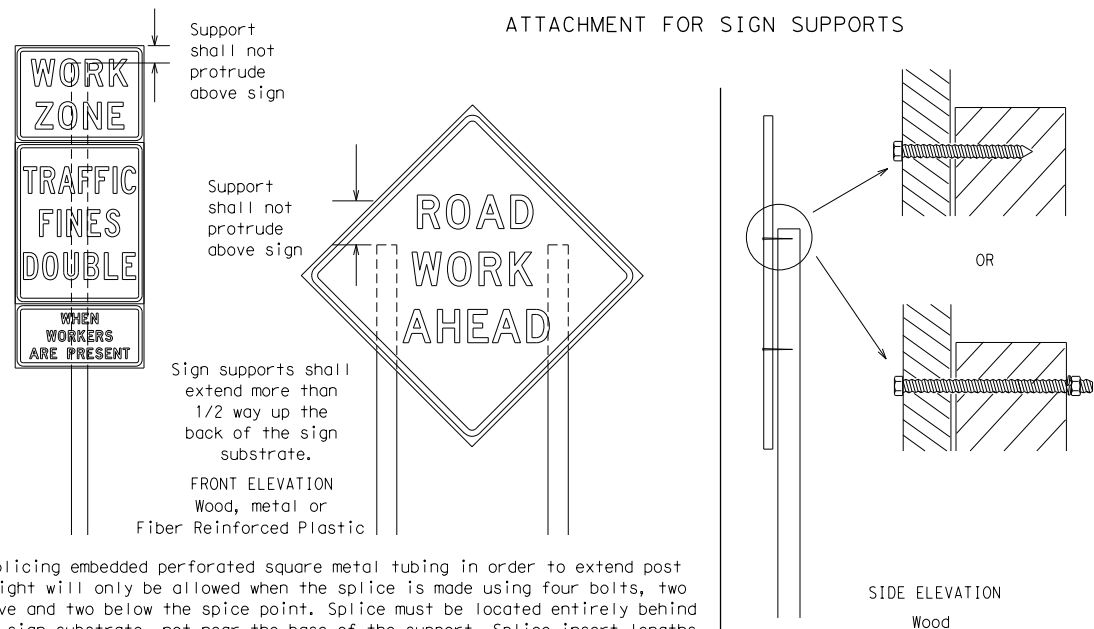
TYPICAL MINIMUM CLEARANCES FOR LONG TERM AND INTERMEDIATE TERM SIGNS



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

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

ATTACHMENT FOR SIGN SUPPORTS

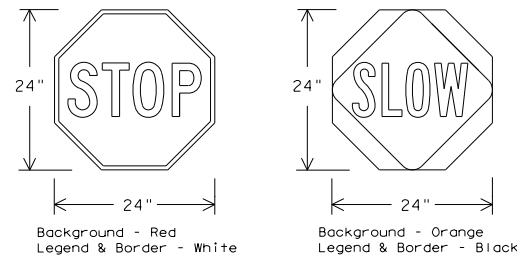


Nails shall NOT be allowed. Each sign shall be attached directly to the sign support. Multiple signs shall not be joined or spliced by any means. Wood supports shall not be extended or repaired by splicing or other means.

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 splice 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

- STOP/SLOW paddles are the primary method to control traffic by flaggers. The STOP/SLOW paddle size should be 24" x 24".
- STOP/SLOW paddles shall be retroreflective when used at night.
- STOP/SLOW paddles may be attached to a staff with a minimum length of 6' to the bottom of the sign.
- Any lights incorporated into the STOP or SLOW paddle faces shall only be as specifically described in Section 6E.03 Hand Signaling Devices in the TMUTCD.



SHEETING REQUIREMENTS (WHEN USED AT NIGHT)		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	RED	TYPE B OR C SHEETING
BACKGROUND	ORANGE	TYPE B <sub>FL</sub> OR C <sub>FL</sub> 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

- 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.
- 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.
- When existing permanent signs are moved and relocated due to construction purposes, they shall be visible to motorists at all times.
- 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.
- 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.
- 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

- Contractor shall install and maintain signs in a straight and plumb condition and/or as directed by the Engineer.
- Wooden sign posts shall be painted white.
- Barricades shall NOT be used as sign supports.
- 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.
- 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.
- 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.
- 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.
- 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.
- 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)

- 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.
  - Long-term stationary - work that occupies a location more than 3 days.
  - 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.
  - Short-term stationary - daytime work that occupies a location for more than 1 hour in a single daylight period.
  - Short, duration - work that occupies a location up to 1 hour.
  - Mobile - work that moves continuously or intermittently (stopping for up to approximately 15 minutes.)

SIGN MOUNTING HEIGHT

- 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.
- 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.
- Long-term/Intermediate-term Signs may be used in lieu of Short-term/Short Duration signing.
- 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.
- 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

- 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

- 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.
- "Mesh" type materials are NOT an approved sign substrate, regardless of the tightness of the weave.
- 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

- 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).
- White sheeting, meeting the requirements of DMS-8300 Type A, shall be used for signs with a white background.
- Orange sheeting, meeting the requirements of DMS-8300 Type B<sub>FL</sub> or Type C<sub>FL</sub>, shall be used for rigid signs with orange backgrounds.

SIGN LETTERS

- 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

- When sign messages may be confusing or do not apply, the signs shall be removed or completely covered.
- 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.
- 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.
- 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.
- Burlap shall NOT be used to cover signs.
- Duct tape or other adhesive material shall NOT be affixed to a sign face.
- Signs and anchor stubs shall be removed and holes backfilled upon completion of work.

SIGN SUPPORT WEIGHTS

- Where sign supports require the use of weights to keep from turning over, the use of sandbags with dry, cohesionless sand should be used.
- The sandbags will be tied shut to keep the sand from spilling and to maintain a constant weight.
- Rock, concrete, iron, steel or other solid objects shall not be permitted for use as sign support weights.
- 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 fire inner tubes) shall NOT be used.
- 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.
- 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.
- Sandbags shall NOT be placed under the skid and shall not be used to level sign supports placed on slopes.

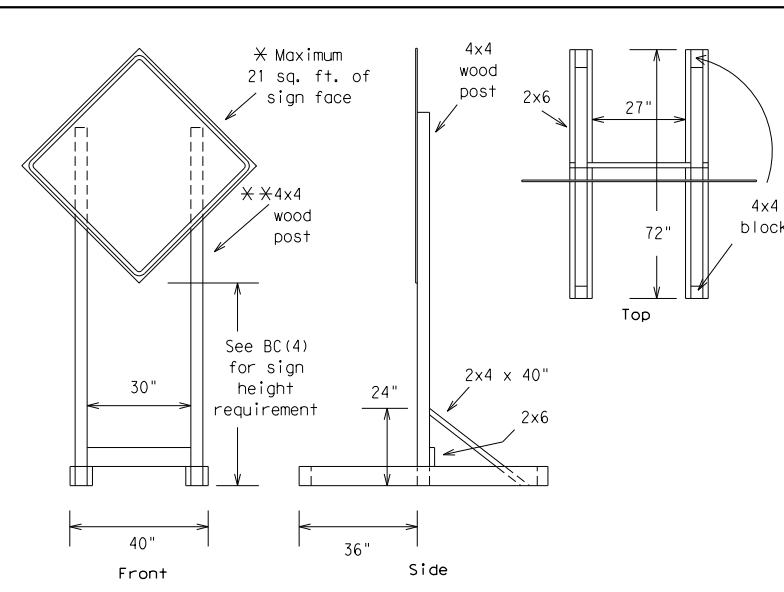
FLAGS ON SIGNS

- 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.

SHEET 4 OF 12

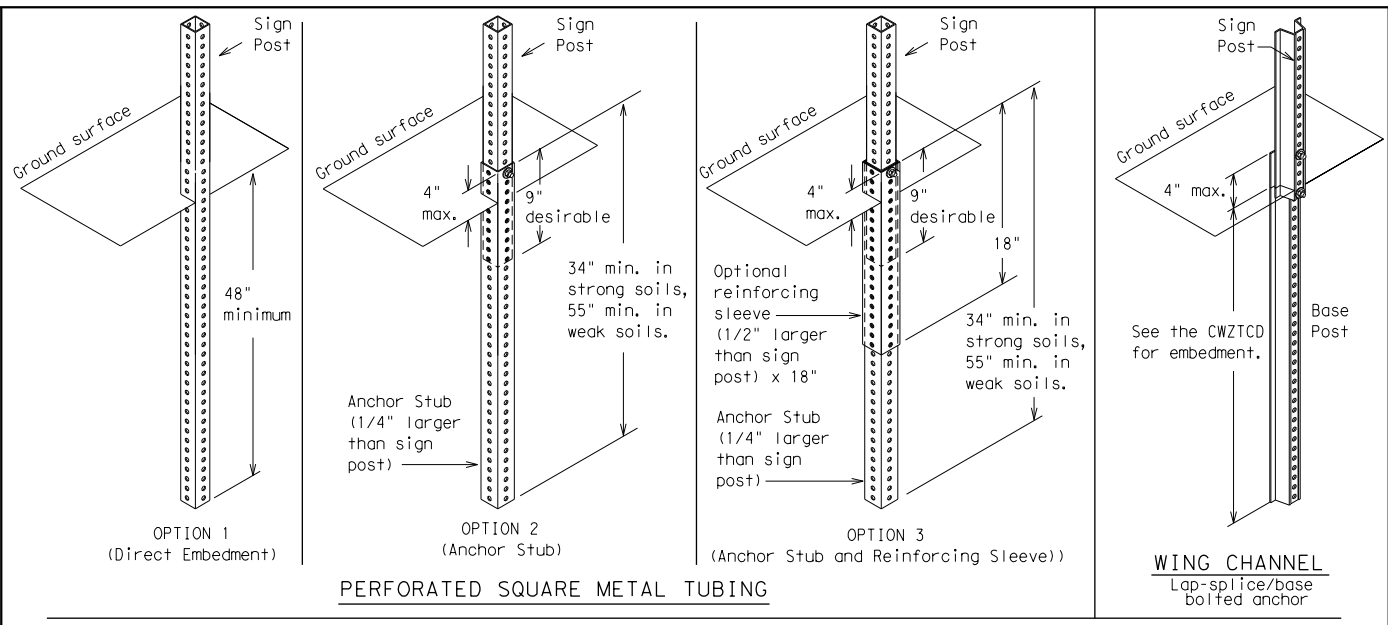
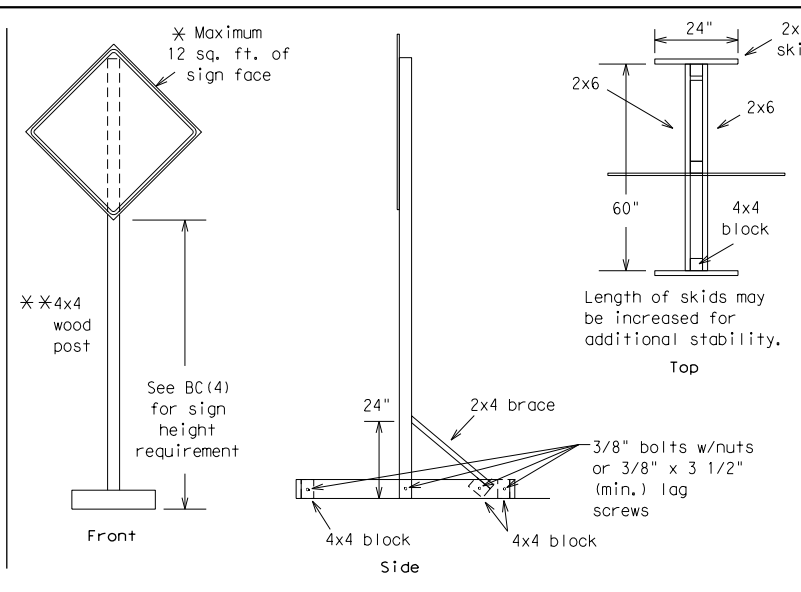
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<h3>BC (4) - 21</h3>			
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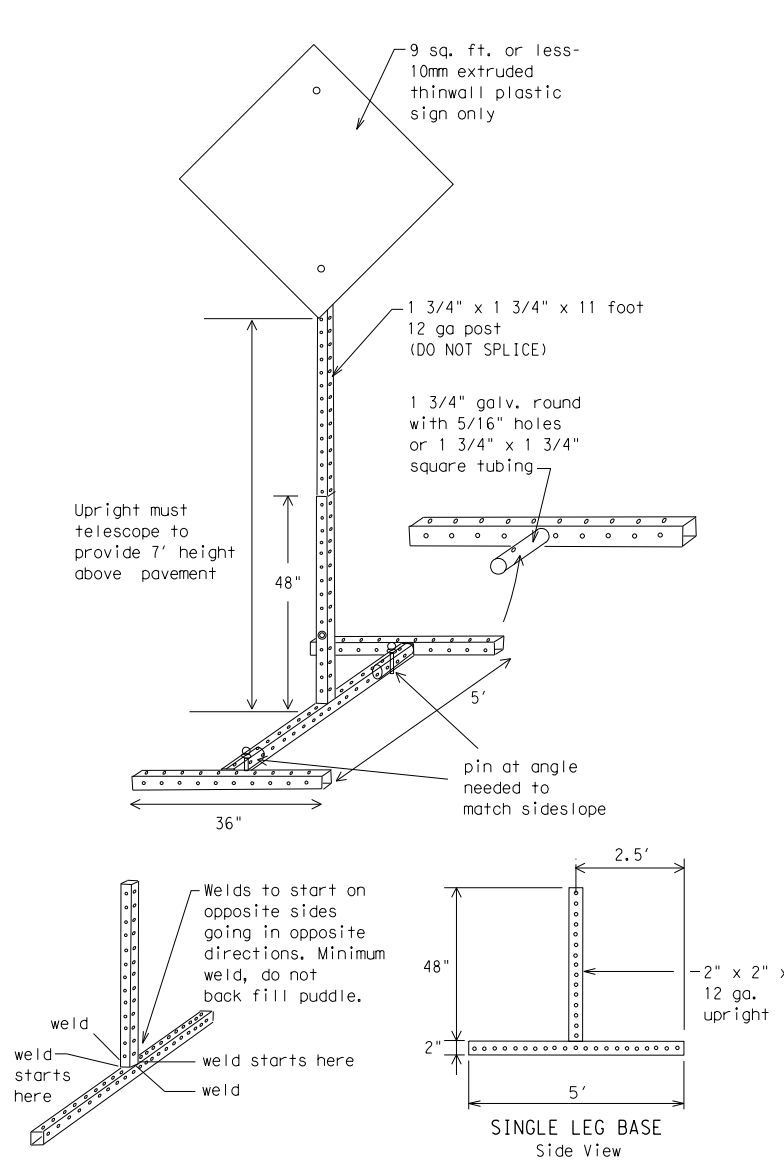
**SKID MOUNTED WOOD SIGN SUPPORTS**

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



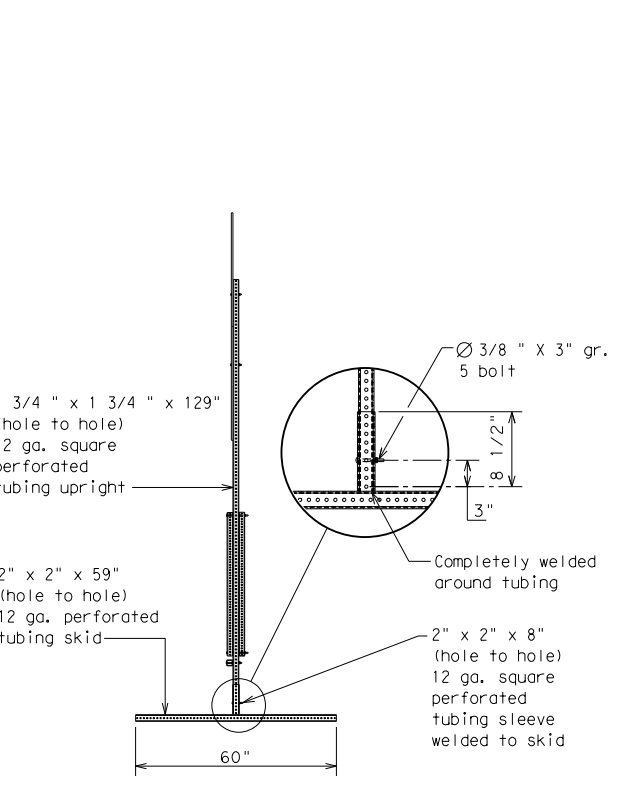
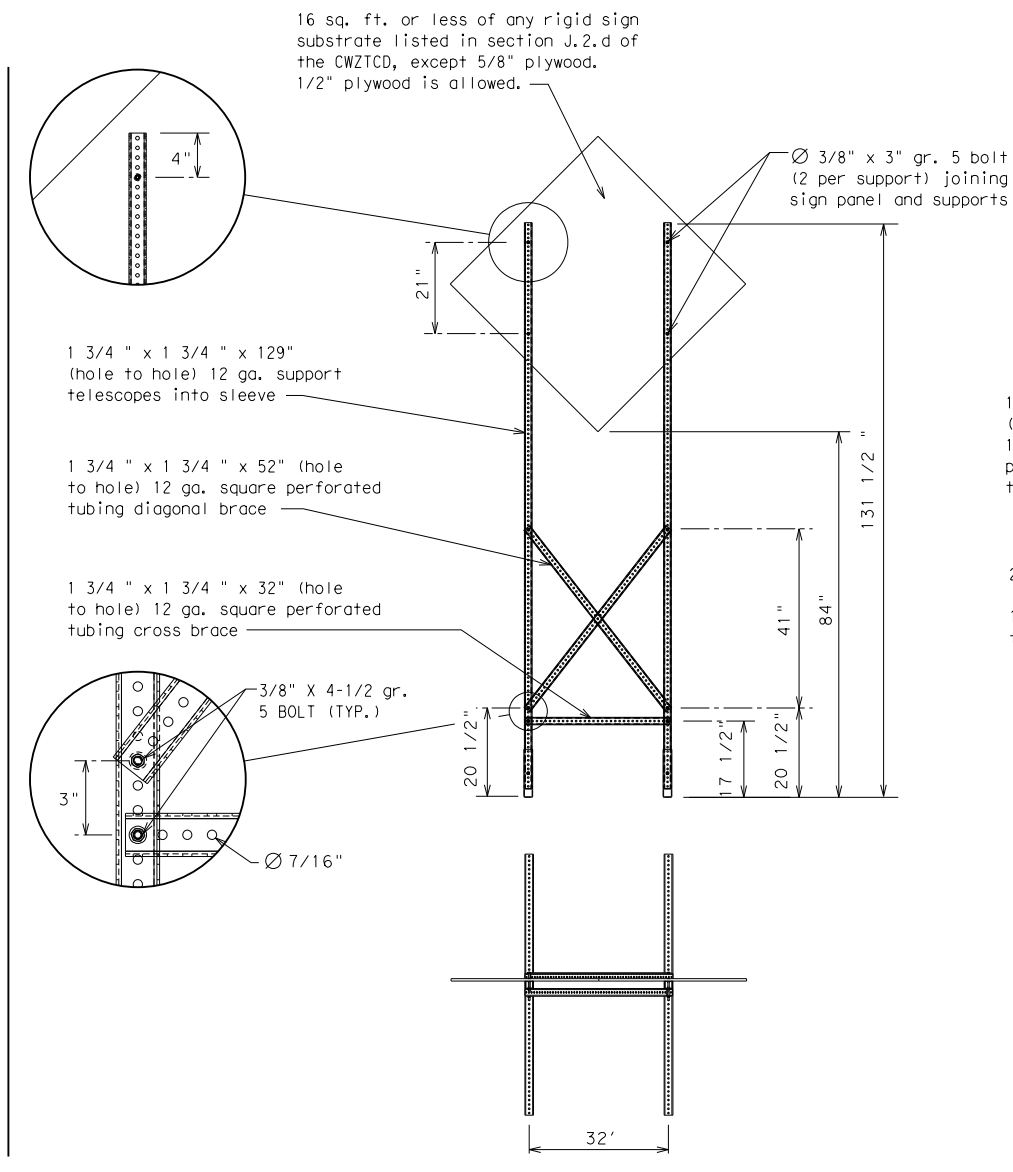
**GROUND MOUNTED SIGN SUPPORTS**

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



**SKID MOUNTED PERFORATED SQUARE STEEL TUBING SIGN SUPPORTS**

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



**WEDGE ANCHORS**

Both steel and plastic Wedge Anchor Systems as shown on the SMD Standard Sheets may be used as temporary sign supports for signs up to 10 square feet of sign face. They may be set in concrete or in sturdy soils if approved by the Engineer. (See web address for "Traffic Engineering Standard Sheets" on BC(1)).

**OTHER DESIGNS**

MORE DETAILS OF APPROVED LONG/INTERMEDIATE AND SHORT TERM SUPPORTS CAN BE FOUND ON THE CWZTCD LIST. SEE BC(1) FOR WEBSITE LOCATION.

**GENERAL NOTES**

- 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.
- No more than 2 sign posts shall be placed within a 7 ft. circle, except for specific materials noted on the CWZTCD List.
- When project is completed, all sign supports and foundations shall be removed from the project site. This will be considered subsidiary to Item 502.

- \* See BC(4) for definition of "Work Duration."
- \*\* Wood sign posts MUST be one piece. Splicing will NOT be allowed. Posts shall be painted white.
- See the CWZTCD for the type of sign substrate that can be used for each approved sign support.

SHEET 5 OF 12



**BARRICADE AND CONSTRUCTION TYPICAL SIGN SUPPORT**

BC(5) - 21

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

# RECOMMENDED PHASES AND FORMATS FOR PCMS MESSAGES DURING ROADWORK ACTIVITIES

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

## PORTABLE CHANGEABLE MESSAGE SIGNS

- The Engineer/Inspector shall approve all messages used on portable changeable message signs (PCMS).
- 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.
- 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.
- Use the word "EXIT" to refer to an exit ramp on a freeway; i.e., "EXIT CLOSED." Do not use the term "RAMP."
- Always use the route or interstate designation (IH, US, SH, FM) along with the number when referring to a roadway.
- When in use, the bottom of a stationary PCMS message panel should be a minimum 7 feet above the roadway, where possible.
- 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.
- 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.
- Do not "flash" messages or words included in a message. The message should be steady burn or continuous while displayed.
- 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.
- Do not use the word "Danger" in message.
- Do not display the message "LANES SHIFT LEFT" or "LANES SHIFT RIGHT" on a PCMS. Drivers do not understand the message.
- Do not display messages that scroll horizontally or vertically across the face of the sign.
- 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.
- 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.
- Each line of text should be centered on the message board rather than left or right justified.
- 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.

## Phase 1: Condition Lists

### Road/Lane/Ramp Closure List

FREEWAY CLOSED X MILE
ROAD CLOSED AT SH XXX
ROAD CLSD AT FM XXXX
RIGHT X LANES CLOSED
CENTER LANE CLOSED
NIGHT LANE CLOSURES
VARIOUS LANES CLOSED
EXIT CLOSED
MALL DRIVEWAY CLOSED
XXXXXXXX BLVD CLOSED

### Other Condition List

FRONTAGE ROAD CLOSED
SHOULDER CLOSED XXX FT
RIGHT LN CLOSED XXX FT
RIGHT X LANES OPEN
DAYTIME LANE CLOSURES
I-XX SOUTH EXIT CLOSED
EXIT XXX CLOSED X MILE
RIGHT LN TO BE CLOSED
X LANES CLOSED TUE - FRI
ROADWORK XXX FT
FLAGGER XXXX FT
RIGHT LN NARROWS XXXX FT
MERGING TRAFFIC XXXX FT
LOOSE GRAVEL XXXX FT
DETOUR X MILE
ROADWORK PAST SH XXXX
BUMP XXXX FT
TRAFFIC SIGNAL XXXX FT
ROAD REPAIRS XXXX FT
LANE NARROWS XXXX FT
TWO-WAY TRAFFIC XX MILE
CONST TRAFFIC XXX FT
UNEVEN LANES XXXX FT
ROUGH ROAD XXXX FT
ROADWORK NEXT FRI-SUN
US XXX EXIT X MILES
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
DETOUR NEXT X EXITS
USE EXIT XXX
STAY ON US XXX SOUTH
TRUCKS USE US XXX N
WATCH FOR TRUCKS
EXPECT DELAYS
REDUCE SPEED XXX FT
USE OTHER ROUTES
STAY IN LANE *

### Location List

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

### Warning List

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

### \*\* Advance Notice List

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

\*\* See Application Guidelines Note 6.

## APPLICATION GUIDELINES

- Only 1 or 2 phases are to be used on a PCMS.
- The 1st phase (or both) should be selected from the "Road/Lane/Ramp Closure List" and the "Other Condition List".
- A 2nd phase can be selected from the "Action to Take/Effect on Travel, Location, General Warning, or Advance Notice Phase Lists".
- A Location Phase is necessary only if a distance or location is not included in the first phase selected.
- 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.
- 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

- The words RIGHT, LEFT and ALL can be interchanged as appropriate.
- Roadway designations IH, US, SH, FM and LP can be interchanged as appropriate.
- EAST, WEST, NORTH and SOUTH (or abbreviations E, W, N and S) can be interchanged as appropriate.
- Highway names and numbers replaced as appropriate.
- ROAD, HIGHWAY and FREEWAY can be interchanged as needed.
- AHEAD may be used instead of distances if necessary.
- FT and MI, MILE and MILES interchanged as appropriate.
- AT, BEFORE and PAST interchanged as needed.
- 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

- 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.
- 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.
- 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.
- 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.

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WORD OR PHRASE	ABBREVIATION	WORD OR PHRASE	ABBREVIATION
Access Road	ACCS RD	Major	MAJ
Alternate	ALT	Miles	MI
Avenue	AVE	Miles Per Hour	MPH
Best Route	BEST RTE	Minor	MNR
Boulevard	BLVD	Monday	MON
Bridge	BRDG	Normal	NORM
Canal	CANT	North	N
Center	CTR	Northbound	(route) N
Construction Ahead	CONST AHD	Parking	PKING
CROSSING	XING	Road	RD
Detour Route	DETOUR RTE	Right Lane	RT LN
Do Not	DONT	Saturday	SAT
East	E	Service Road	SERV RD
Eastbound	(route) E	Shoulder	SHLDR
Emergency	EMER	Slippery	SLIP
Emergency Vehicle	EMER VEH	South	S
Entrance, Enter	ENT	Southbound	(route) S
Express Lane	EXP LN	Speed	SPD
Expressway	EXPWY	Street	ST
XXXX Feet	XXXX FT	Sunday	SUN
Fog Ahead	FOG AHD	Telephone	PHONE
Freeway	FRWY, FWY	Temporary	TEMP
Freeway Blocked	FWY BLKD	Thursday	THURS
Friday	FRI	To Downtown	TO DWNTN
Hazardous Driving	HAZ DRIVING	Traffic	TRAF
Hazardous Material	HAZMAT	Travelers	TRVLR
High-Occupancy Vehicle	HOV	Tuesday	TUES
Highway	HWY	Time Minutes	TIME MIN
Hour(s)	HR, HRS	Upper Level	UPR LEVEL
Information	INFO	Vehicles (s)	VEH, VEHS
It Is	ITS	Warning	WARN
Junction	JCT	Wednesday	WED
Left	LFT	Weight Limit	WT LIMIT
Left Lane	LFT LN	West	W
Lane Closed	LN CLOSED	Westbound	(route) W
Lower Level	LWR LEVEL	Wet Pavement	WET PVMT
Maintenance	MAINT	Will Not	WONT

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



## BARRICADE AND CONSTRUCTION PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)

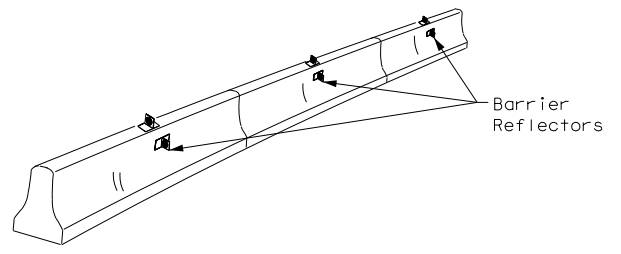
BC (6) - 21

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© TxDOT	November 2002	CONT	SECT	JOB	HIGHWAY				
REVISIONS		0493	02	021	RM 652				
9-07	8-14	DIST	COUNTY	SHEET NO.					
7-13	5-21	ODA	LOVING	24					

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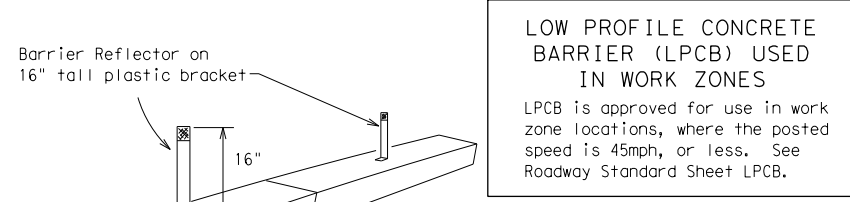
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- Barrier Reflectors shall be pre-qualified, and conform to the color and reflectivity requirements of DMS-8600. A list of prequalified Barrier Reflectors can be found at the Material Producer List web address shown on BC(1).
- Color of Barrier Reflectors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



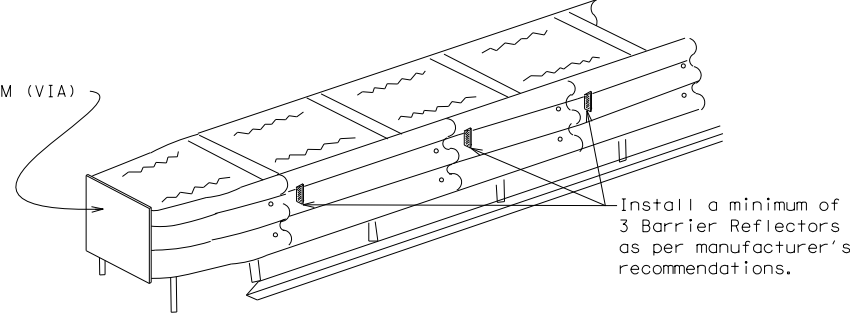
**CONCRETE TRAFFIC BARRIER (CTB)**

- 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.
- 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.
- When CTB separates traffic traveling in the same direction, no barrier reflectors will be required on top of the CTB.
- Barrier Reflector units shall be yellow or white in color to match the edgeline being supplemented.
- Maximum spacing of Barrier Reflectors is forty (40) feet.
- Pavement markers or temporary flexible-reflective roadway marker tabs shall NOT be used as CTB delineation.
- Attachment of Barrier Reflectors to CTB shall be per manufacturer's recommendations.
- Missing or damaged Barrier Reflectors shall be replaced as directed by the Engineer.
- Single slope barriers shall be delineated as shown on the above detail.



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

**LOW PROFILE CONCRETE BARRIER (LPCB)**



**DELINEATION OF END TREATMENTS**

**END TREATMENTS FOR CTB'S USED IN WORK ZONES**

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

**BARRIER REFLECTORS FOR CONCRETE TRAFFIC BARRIER AND ATTENUATORS**

**WARNING LIGHTS**

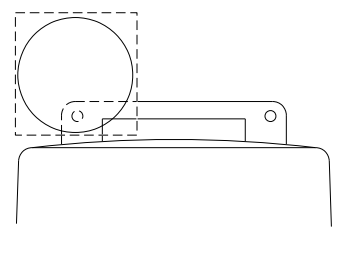
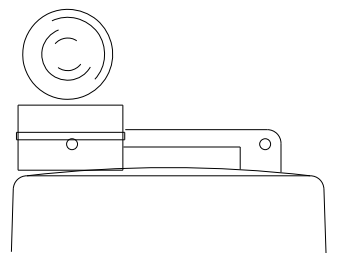
- Warning lights shall meet the requirements of the TMUTCD.
- Warning lights shall NOT be installed on barricades.
- Type A-Low Intensity Flashing Warning Lights are commonly used with drums. They are intended to warn of or mark a potentially hazardous area. Their use shall be as indicated on this sheet 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<sub>FL</sub> or C<sub>FL</sub> Sheeting meeting the requirements of Departmental Material Specification DMS-8300.
- 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".
- The Engineer/Inspector or the plans shall specify the location and type of warning lights to be installed on the traffic control devices.
- 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.
- 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.
- The location of warning lights and warning reflectors on drums shall be as shown elsewhere in the plans.

**WARNING LIGHTS MOUNTED ON PLASTIC DRUMS**

- Type A flashing warning lights are intended to warn drivers that they are approaching or are in a potentially hazardous area.
- Type A random flashing warning lights are not intended for delineation and shall not be used in a series.
- 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.
- 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.
- Type A, Type C and Type D warning lights shall be installed at locations as detailed on other sheets in the plans.
- Warning lights shall not be installed on a drum that has a sign, chevron or vertical panel.
- The maximum spacing for warning lights on drums should be identical to the channelizing device spacing.

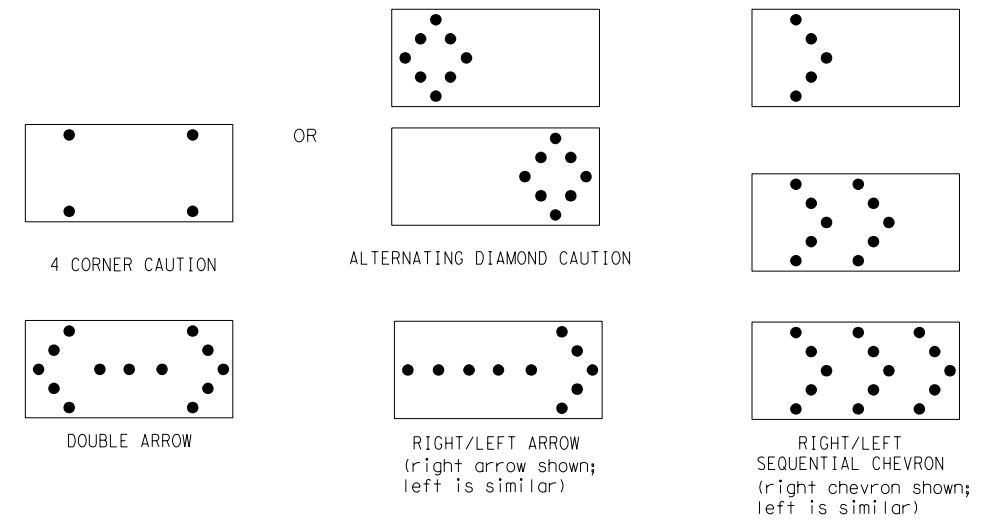
**WARNING REFLECTORS MOUNTED ON PLASTIC DRUMS AS A SUBSTITUTE FOR TYPE C (STEADY BURN) WARNING LIGHTS**

- 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.
- 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.
- The warning reflector shall have a minimum retroreflective surface area (one-side) of 30 square inches.
- Round reflectors shall be fully reflectorized, including the area where attached to the drum.
- 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.
- 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.
- When used near two-way traffic, both sides of the warning reflector shall be reflectorized.
- The warning reflector should be mounted on the side of the handle nearest approaching traffic.
- 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.

- 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.
- 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.
- 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.
- The Flashing Arrow Board should be able to display the following symbols:



- The "CAUTION" display consists of four corner lamps flashing simultaneously, or the Alternating Diamond Caution mode as shown.
- The straight line caution display is NOT ALLOWED.
- 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.
- 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.
- The sequential arrow display is NOT ALLOWED.
- The flashing arrow display is the TxDOT standard; however, the sequential chevron display may be used during daylight operations.
- The Flashing Arrow Board shall be mounted on a vehicle, trailer or other suitable support.
- A Flashing Arrow Board SHALL NOT BE USED to laterally shift traffic.
- 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.
- 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**

SHEET 7 OF 12

**TRUCK-MOUNTED ATTENUATORS**

- Truck-mounted attenuators (TMA) used on TxDOT facilities must meet the requirements outlined in the Manual for Assessing Safety Hardware (MASH).
- Refer to the CWZTCD for the requirements of Level 2 or Level 3 TMAs.
- Refer to the CWZTCD for a list of approved TMAs.
- TMAs are required on freeways unless otherwise noted in the plans.
- 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.
- 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.



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

**BC (7) - 21**

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©TxDOT	November 2002	CONT	SECT	JOB	HIGHWAY				
REVISIONS		0493	02	021	RM 652				
9-07	8-14	DIST	COUNTY		SHEET NO.				
7-13	5-21	ODA	LOVING		25				

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**GENERAL NOTES**

- For long term stationary work zones on freeways, drums shall be used as the primary channelizing device.
- 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.
- 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.
- 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).
- 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.
- 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**

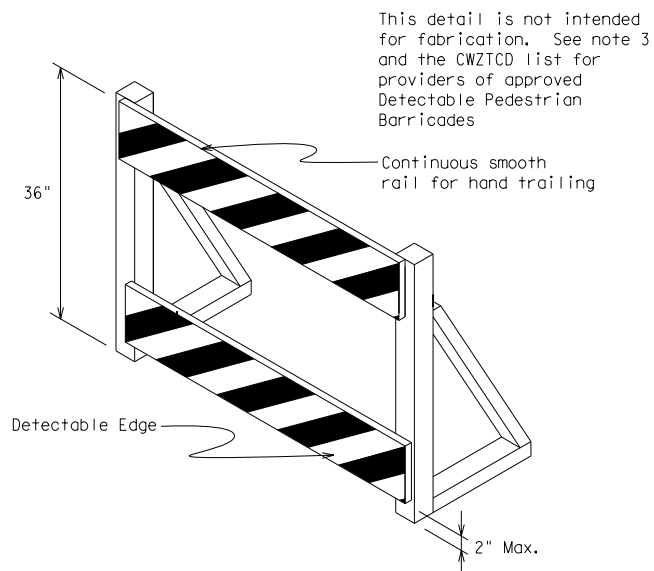
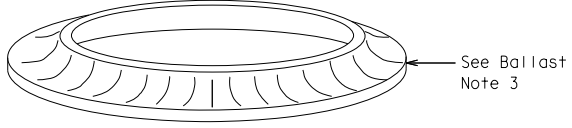
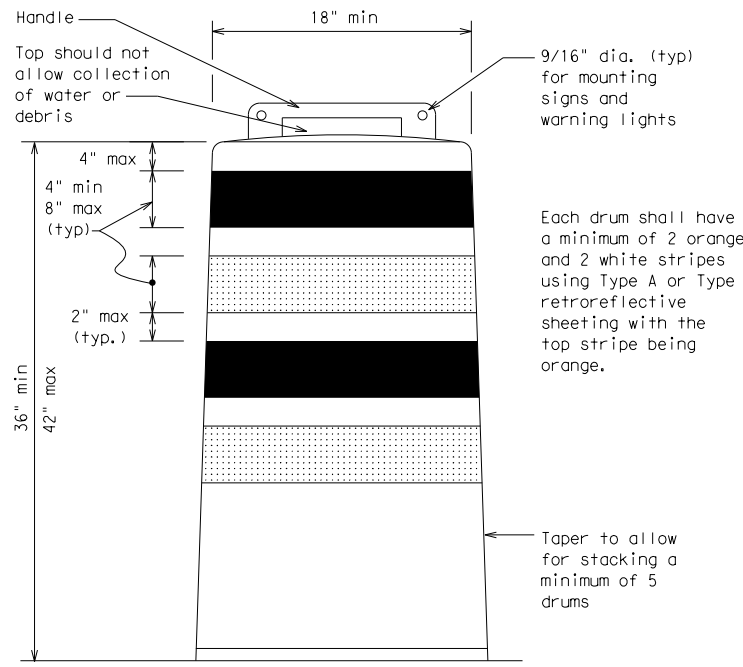
- Pre-qualified plastic drums shall meet the following requirements:
- Plastic drums shall be a two-piece design; the "body" of the drum shall be the top portion and the "base" shall be the bottom.
  - The body and base shall lock together in such a manner that the body separates from the base when impacted 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.
  - 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.
  - 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.
  - 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.
  - 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.
  - 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.
  - Plastic drums shall be constructed of ultra-violet stabilized, orange, high-density polyethylene (HDPE) or other approved material.
  - Drum body shall have a maximum unballasted weight of 11 lbs.
  - Drum and base shall be marked with manufacturer's name and model number.

**RETROREFLECTIVE SHEETING**

- 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.
- 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.

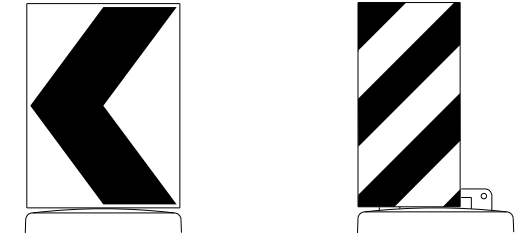
**BALLAST**

- 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.
- 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.
- Recycled truck tire sidewalls may be used for ballast on drums approved for this type of ballast on the CWZTCD list.
- 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.
- 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.
- Ballast shall not be placed on top of drums.
- Adhesives may be used to secure base of drums to pavement.



**DETECTABLE PEDESTRIAN BARRICADES**

- 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.
- 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.
- 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.
- 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.
- Warning lights shall not be attached to detectable pedestrian barricades.
- 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**

- Signs used on plastic drums shall be manufactured using substrates listed on the CWZTCD.
- Chevrons and other work zone signs with an orange background shall be manufactured with Type B<sub>FL</sub> or Type C<sub>FL</sub> Orange sheeting meeting the color and retroreflectivity requirements of DMS-8300, "Sign Face Material," unless otherwise specified in the plans.
- 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.
- 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.
- Signs shall be installed using a 1/2 inch bolt (nominal) and nut, two washers, and one locking washer for each connection.
- Mounting bolts and nuts shall be fully engaged and adequately torqued. Bolts should not extend more than 1/2 inch beyond nuts.
- 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.
- 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.

SHEET 8 OF 12



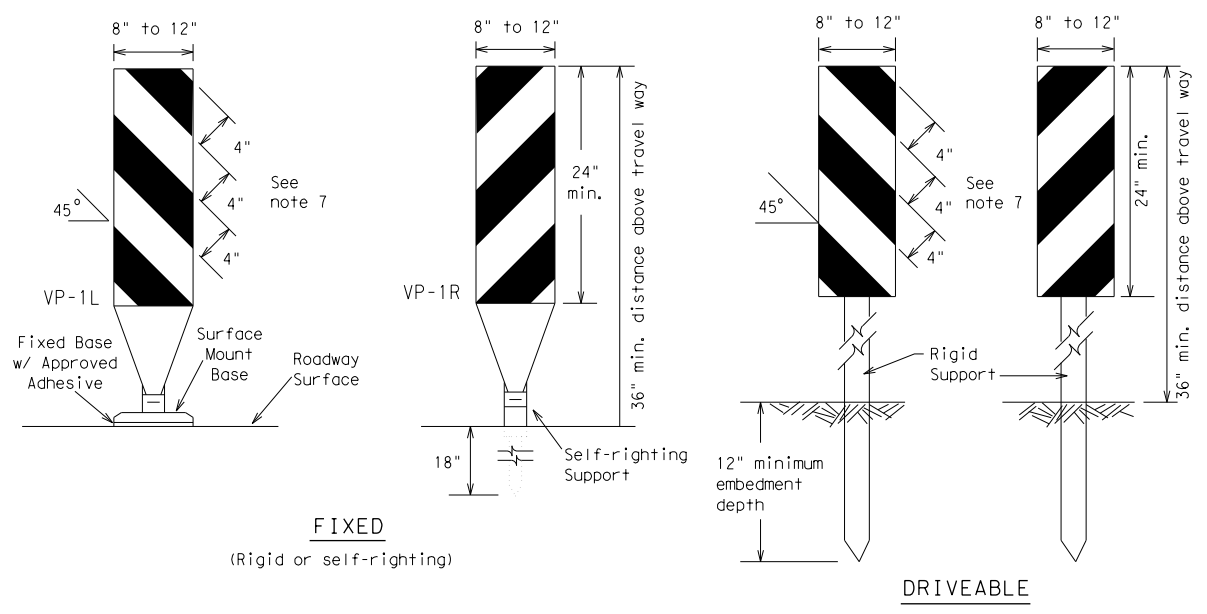
**BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES**

BC (8) - 21

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4-03	8-14	DIST	COUNTY		SHEET NO.				
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7-13									

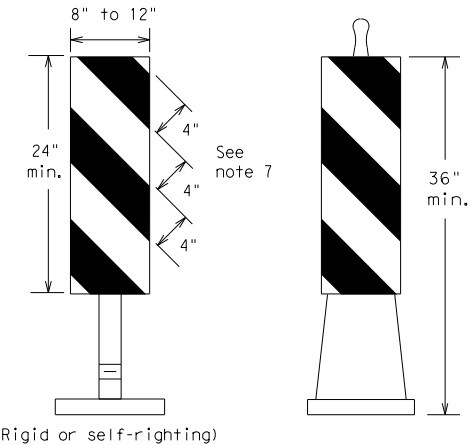
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**FIXED**  
(Rigid or self-righting)

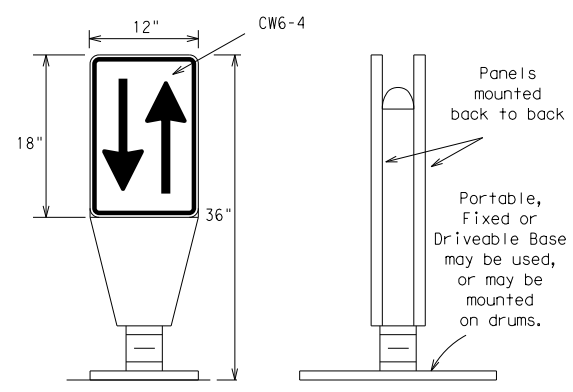
**DRIVEABLE**



**PORTABLE**

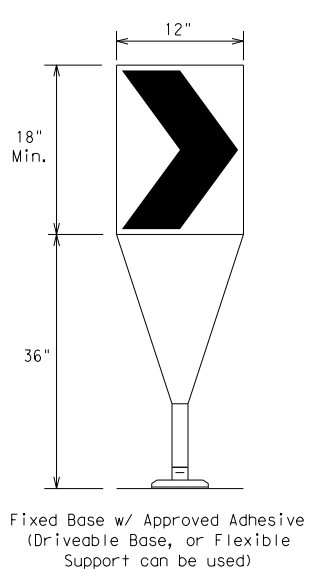
**VERTICAL PANELS (VPs)**

- Vertical Panels (VP's) are normally used to channelize traffic or divide opposing lanes of traffic.
- 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.
- 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.
- VP's used on expressways and freeways or other high speed roadways, may have more than 270 square inches of retroreflective area facing traffic.
- Self-righting supports are available with portable base. See "Compliant Work Zone Traffic Control Devices List" (CWZTCD).
- Sheeting for the VP's shall be retroreflective Type A or Type B conforming to Departmental Material Specification DMS-8300, unless noted otherwise.
- Where the height of reflective material on the vertical panel is 36 inches or greater, a panel stripe of 6 inches shall be used.



**OPPOSING TRAFFIC LANE DIVIDERS (OTLD)**

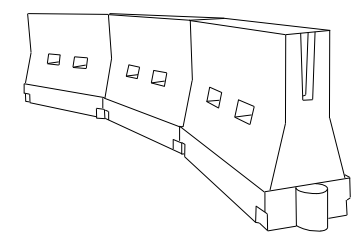
- Opposing Traffic Lane Dividers (OTLD) are delineation devices designed to convert a normal one-way roadway section to two-way operation. OTLD's are used on temporary centerlines. The upward and downward arrows on the sign's face indicate the direction of traffic on either side of the divider. The base is secured to the pavement with an adhesive or rubber weight to minimize movement caused by a vehicle impact or wind gust.
- The OTLD may be used in combination with 42" cones or VPs.
- Spacing between the OTLD shall not exceed 500 feet. 42" cones or VPs placed between the OTLD's should not exceed 100 foot spacing.
- The OTLD shall be orange with a black non-reflective legend. Sheeting for the OTLD shall be retroreflective Type B<sub>FL</sub> or Type C<sub>FL</sub> conforming to Departmental Material Specification DMS-8300, unless noted otherwise. The legend shall meet the requirements of DMS-8300.



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

- The chevron shall be a vertical rectangle with a minimum size of 12 by 18 inches.
- 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.
- Chevrons, when used, shall be erected on the outside of a sharp curve or turn, or on the far side of an intersection. They shall be in line with and at right angles to approaching traffic. Spacing should be such that the motorist always has three in view, until the change in alignment eliminates its need.
- To be effective, the chevron should be visible for at least 500 feet.
- Chevrons shall be orange with a black nonreflective legend. Sheeting for the chevron shall be retroreflective Type B<sub>FL</sub> or Type C<sub>FL</sub> conforming to Departmental Material Specification DMS-8300, unless noted otherwise. The legend shall meet the requirements of DMS-8300.
- 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**



**LONGITUDINAL CHANNELIZING DEVICES (LCD)**

- 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.
- LCDs may be used instead of a line of cones or drums.
- LCDs shall be placed in accordance to application and installation requirements specific to the device, and used only when shown on the CWZTCD list.
- LCDs should not be used to provide positive protection for obstacles, pedestrians or workers.
- LCDs shall be supplemented with retroreflective delineation as required for temporary barriers on BC(7) when placed roughly parallel to the travel lanes.
- 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**

- 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.
- 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.
- 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.
- 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.
- 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**

**GENERAL NOTES**

- 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).
- 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.
- Channelizing devices on self-righting supports should be used in work zone areas where channelizing devices are frequently impacted by errant vehicles or vehicle related wind gusts making alignment of the channelizing devices difficult to maintain. Locations of these devices shall be detailed elsewhere in the plans. These devices shall conform to the TMUTCD and the "Compliant Work Zone Traffic Control Devices List" (CWZTCD).
- 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.
- Portable bases shall be fabricated from virgin and/or recycled rubber. The portable bases shall weigh a minimum of 30 lbs.
- 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.
- 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.

Posted Speed	Formula	Minimum Desirable Taper Lengths * X			Suggested Maximum Spacing of Channelizing Devices	
		10' Offset	11' Offset	12' Offset	On a Taper	On a Tangent
30	L = WS <sup>2</sup> / 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'	

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

**SUGGESTED MAXIMUM SPACING OF CHANNELIZING DEVICES AND MINIMUM DESIRABLE TAPER LENGTHS**

SHEET 9 OF 12



**BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES**

BC (9) - 21

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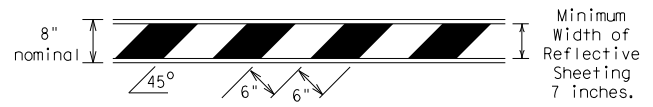
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DATE: 6/25/2021

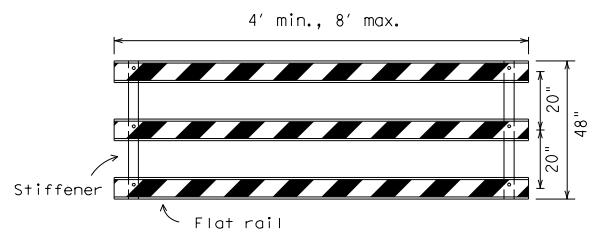
**TYPE 3 BARRICADES**

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.

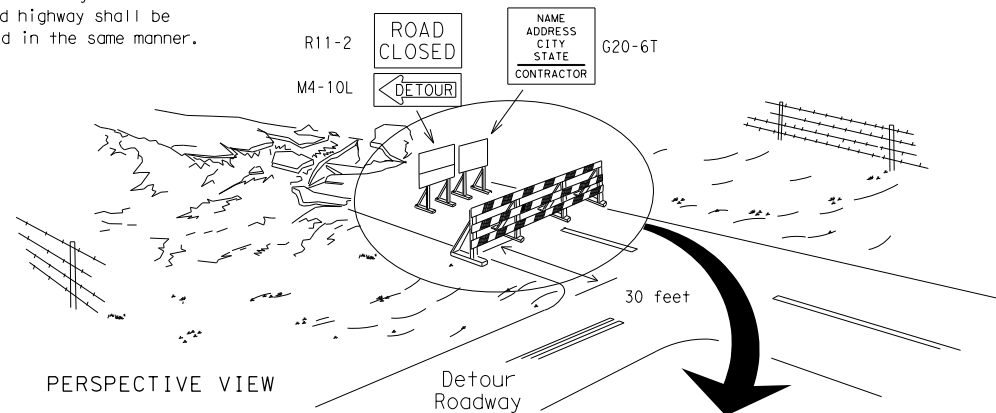


**TYPICAL STRIPING DETAIL FOR BARRICADE RAIL**



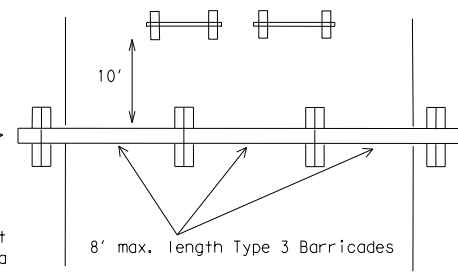
**TYPICAL PANEL DETAIL FOR SKID OR POST TYPE BARRICADES**

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



PERSPECTIVE VIEW

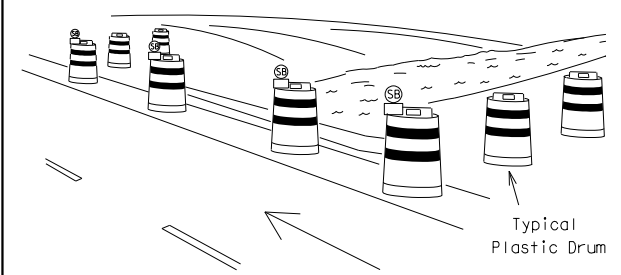
The three rails on Type 3 barricades shall be reflectorized orange and reflective white stripes on one side facing one-way traffic and both sides for two-way traffic. Barricade striping should slant downward in the direction of detour.



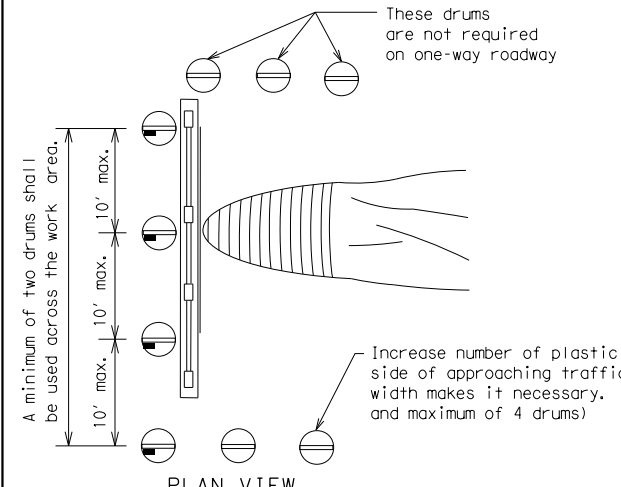
PLAN VIEW

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

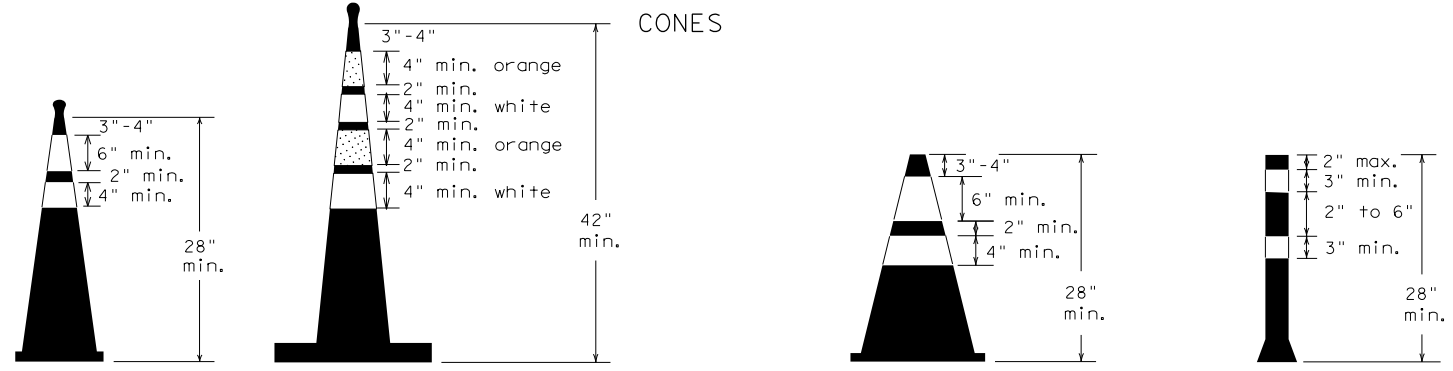


PLAN VIEW

1. Where positive redirection capability is provided, drums may be omitted.
2. Plastic construction fencing may be used with drums for safety as required in the plans.
3. Vertical Panels on flexible support may be substituted for drums when the shoulder width is less than 4 feet.
4. When the shoulder width is greater than 12 feet, steady-burn lights may be omitted if drums are used.
5. Drums must extend the length of the culvert widening.

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

**CULVERT WIDENING OR OTHER ISOLATED WORK WITHIN THE PROJECT LIMITS**



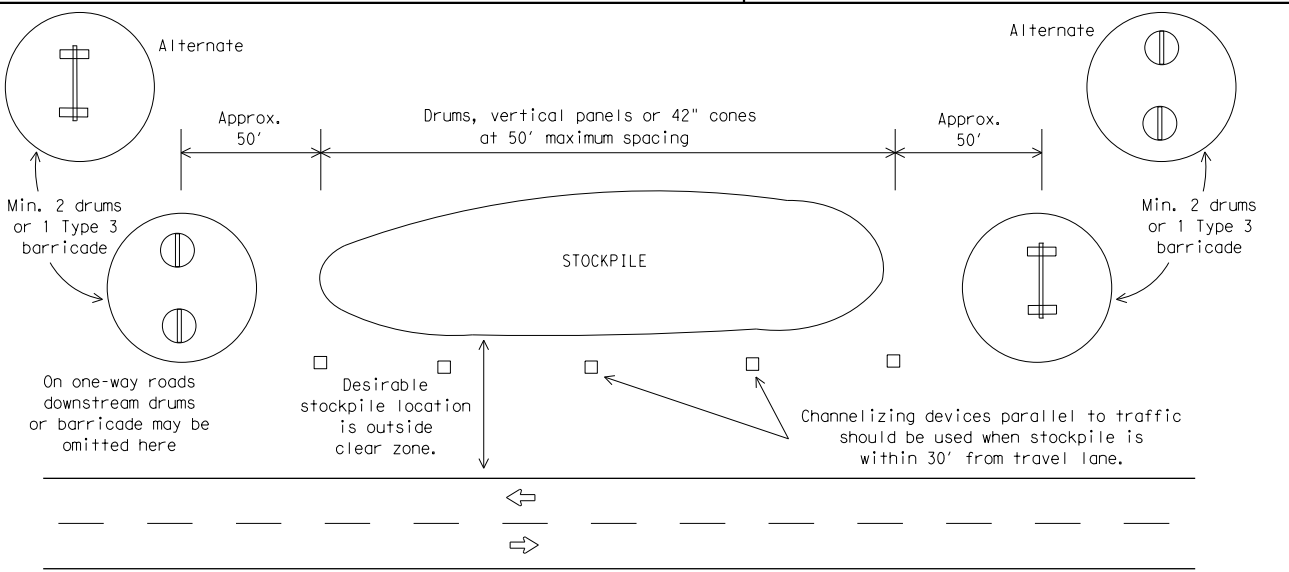
Two-Piece cones

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**



**BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES**

BC(10)-21

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7-13 5-21	ODA	LOVING	28	

## WORK ZONE PAVEMENT MARKINGS

### GENERAL

- 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.
- Color, patterns and dimensions shall be in conformance with the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD).
- Additional supplemental pavement marking details may be found in the plans or specifications.
- Pavement markings shall be installed in accordance with the TMUTCD and as shown on the plans.
- 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).
- 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.
- All work zone pavement markings shall be installed in accordance with Item 662, "Work Zone Pavement Markings."

### RAISED PAVEMENT MARKERS

- Raised pavement markers are to be placed according to the patterns on BC(12).
- 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

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

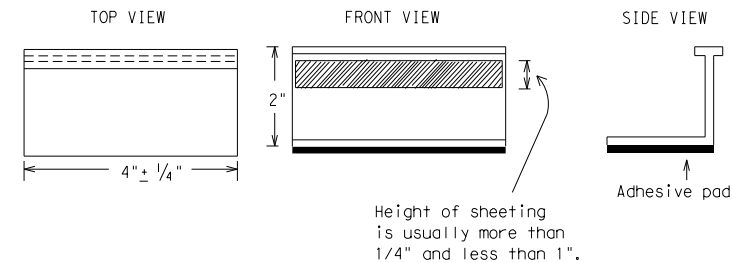
### MAINTAINING WORK ZONE PAVEMENT MARKINGS

- The Contractor will be responsible for maintaining work zone pavement markings within the work limits.
- 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.
- 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.
- 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

- 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.
- 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.
- 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".
- The removal of pavement markings may require resurfacing or seal coating portions of the roadway as described in Item 677.
- Subject to the approval of the Engineer, any method that proves to be successful on a particular type pavement may be used.
- Blast cleaning may be used but will not be required unless specifically shown in the plans.
- Over-painting of the markings SHALL NOT BE permitted.
- Removal of raised pavement markers shall be as directed by the Engineer.
- 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.
- 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

- Temporary flexible-reflective roadway marker tabs used as guidemarks shall meet the requirements of DMS-8242.
- 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.
  - 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.
  - 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.
- Small design variances may be noted between tab manufacturers.
- 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

- Raised pavement markers used as guidemarks shall be from the approved product list, and meet the requirements of DMS-4200.
- All temporary construction raised pavement markers provided on a project shall be of the same manufacturer.
- 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).

SHEET 11 OF 12



## BARRICADE AND CONSTRUCTION PAVEMENT MARKINGS

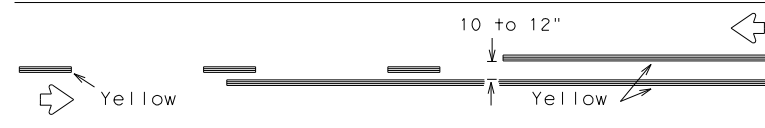
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11-02 8-14				

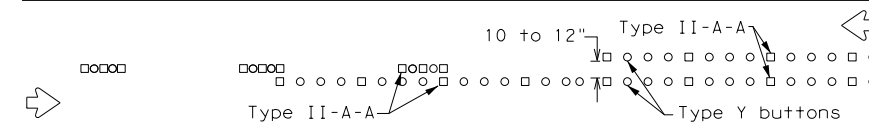
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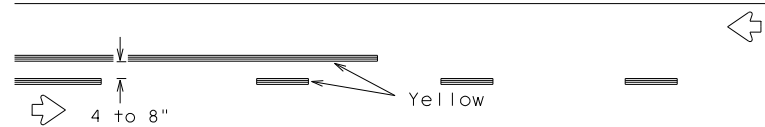
## PAVEMENT MARKING PATTERNS



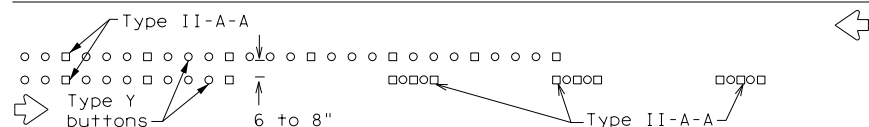
REFLECTORIZED PAVEMENT MARKINGS - PATTERN A



RAISED PAVEMENT MARKERS - PATTERN A



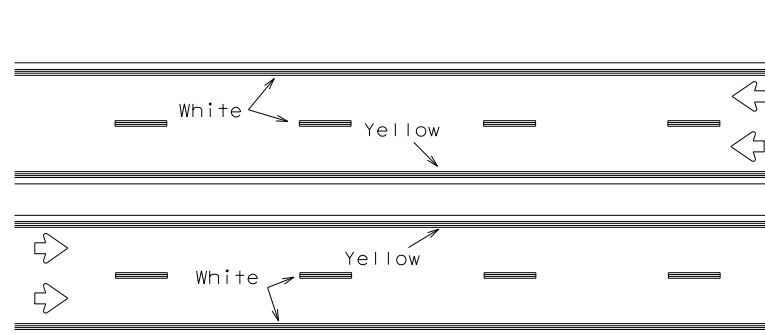
REFLECTORIZED PAVEMENT MARKINGS - PATTERN B



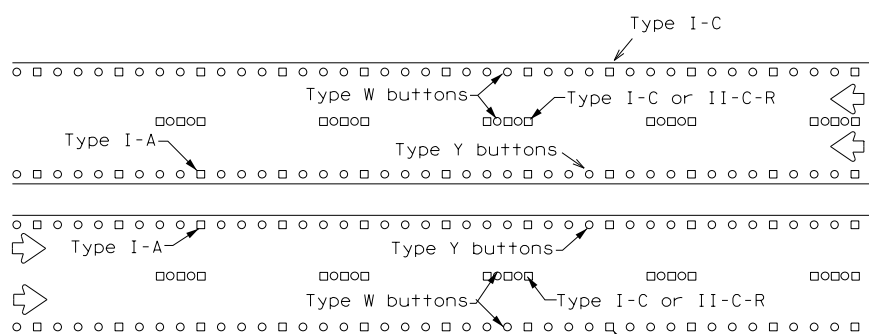
RAISED PAVEMENT MARKERS - PATTERN B

Pattern A is the TXDOT Standard, however Pattern B may be used if approved by the Engineer. Prefabricated markings may be substituted for reflectorized pavement markings.

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



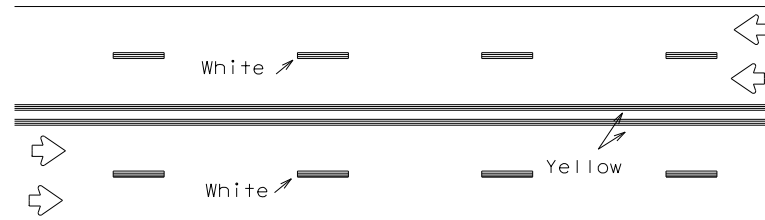
REFLECTORIZED PAVEMENT MARKINGS



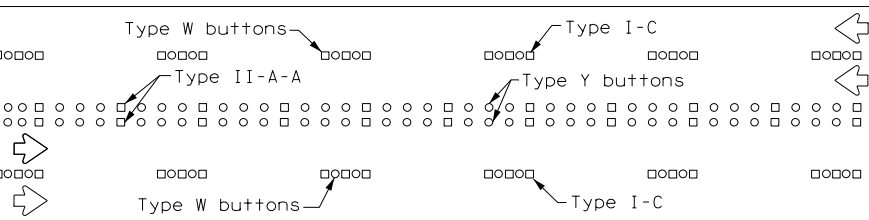
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

## EDGE & LANE LINES FOR DIVIDED HIGHWAY



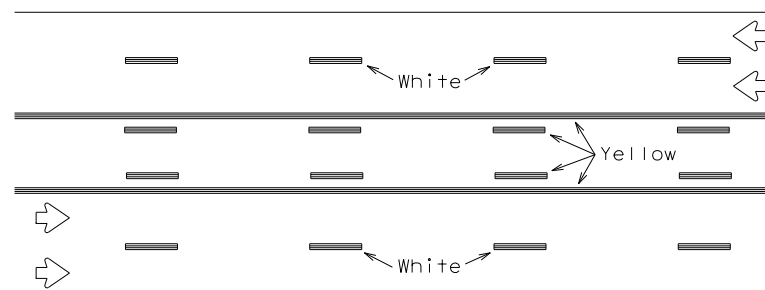
REFLECTORIZED PAVEMENT MARKINGS



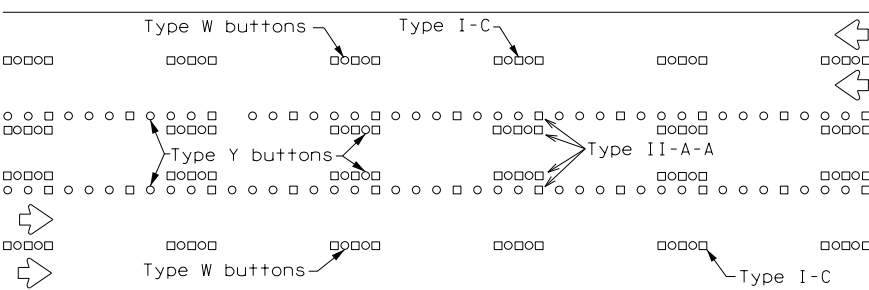
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

## LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS



REFLECTORIZED PAVEMENT MARKINGS

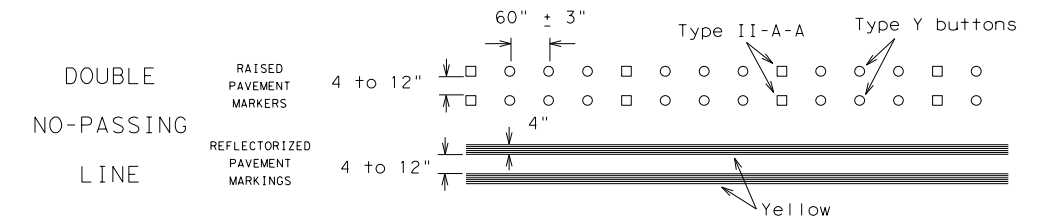


RAISED PAVEMENT MARKERS

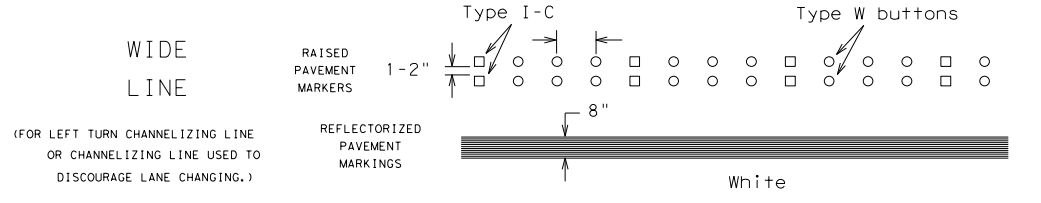
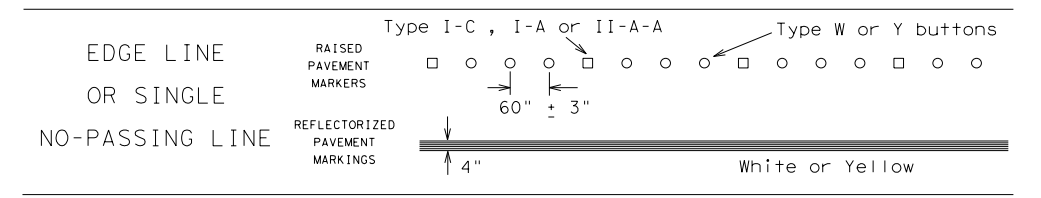
Prefabricated markings may be substituted for reflectorized pavement markings.

## TWO-WAY LEFT TURN LANE

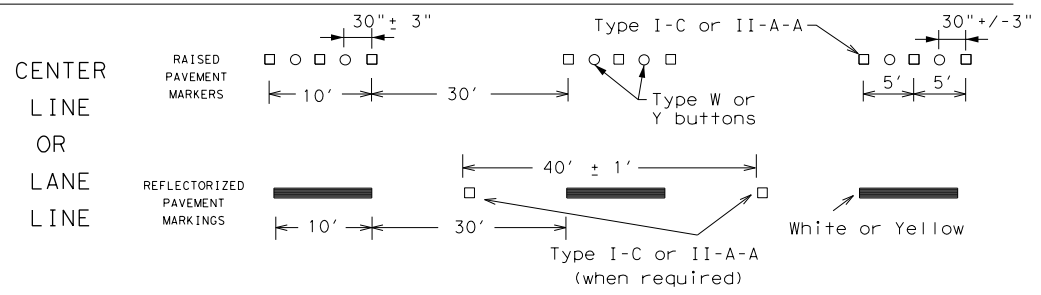
## STANDARD WORK ZONE PAVEMENT MARKINGS DETAILS



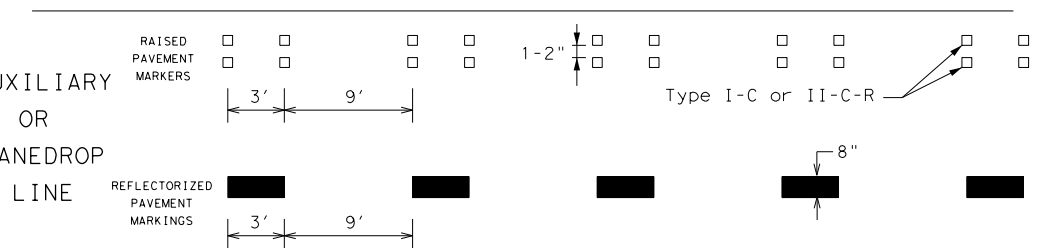
SOLID LINES



BROKEN LINES

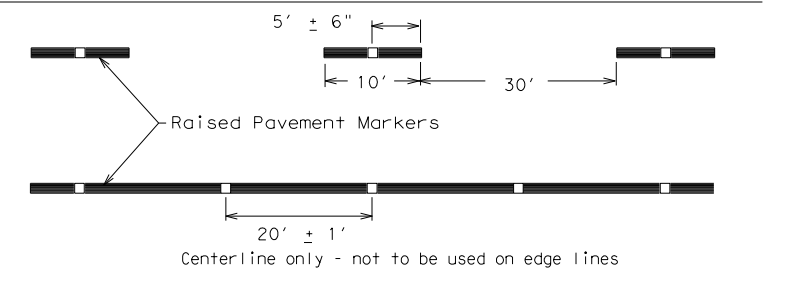


AUXILIARY OR LANEDROP LINE



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.



SHEET 12 OF 12



## BARRICADE AND CONSTRUCTION PAVEMENT MARKING PATTERNS

BC(12)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DN: TxDOT	CK: TxDOT
©TxDOT February 1998	CONT	SECT	JOB	HIGHWAY
REVISIONS	0493	02	021	RM 652
1-97 9-07 5-21	DIST	COUNTY	SHEET NO.	
2-98 7-13	ODA	LOVING	30	
11-02 8-14				

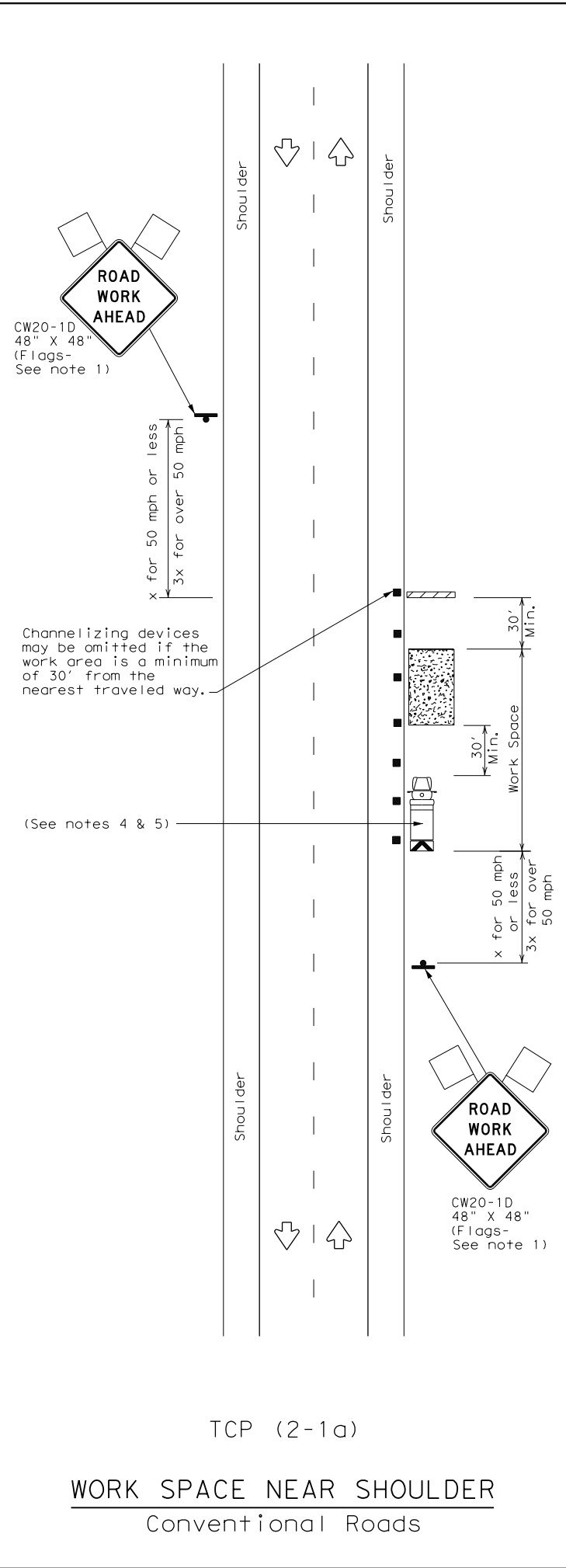
Raised pavement markers used as standard pavement markings shall be from the approved products list and meet the requirements of Item 672 "RAISED PAVEMENT MARKERS."

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DATE: 6/25/2021  
FILE: c:\transystems\pw\_local\transyscorp-pw1\esh\manek\d0940080\BC(12)-21.dgn

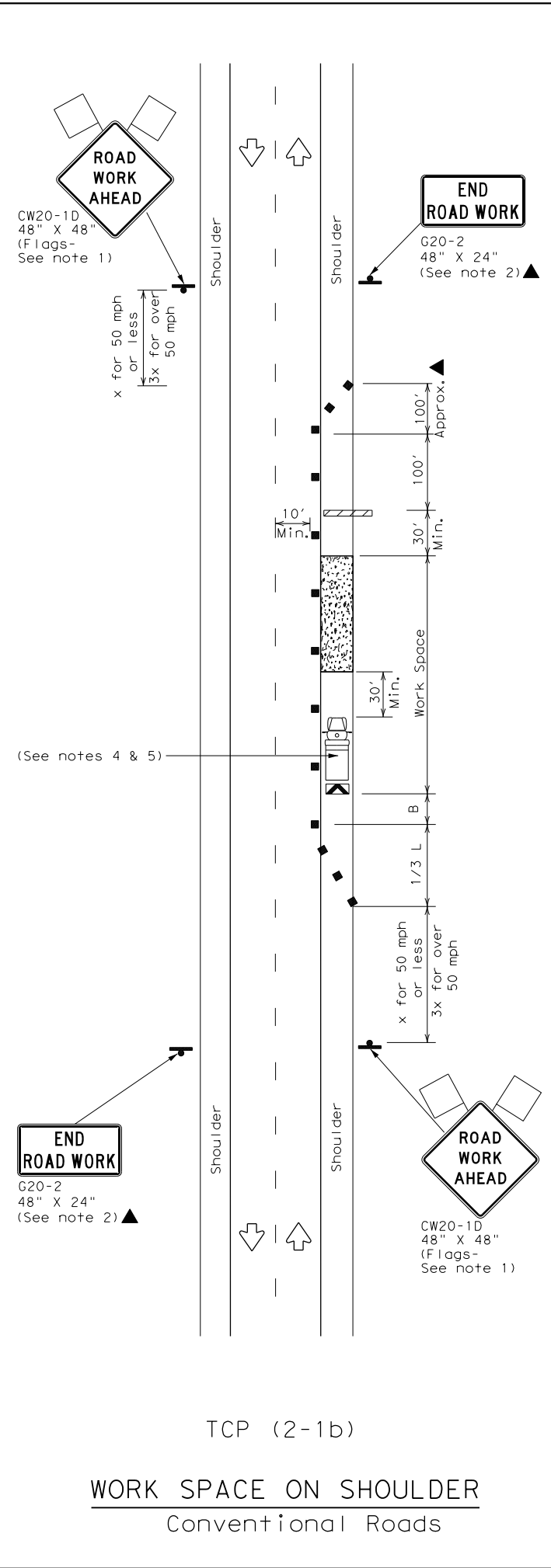
DISCLAIMER: The use of this standard is governed by the "Texas Engineering Practice Act". No warranty of any kind is made by TxDOT for any purpose whatsoever. TxDOT assumes no responsibility for the conversion of this standard to other formats or for incorrect results or damages resulting from its use.

DATE: 6/25/2021  
 FILE: c:\transystems\pw\_local\transyscorp-pw1\esh\manek\d0940080.TCP (2-1).dgn



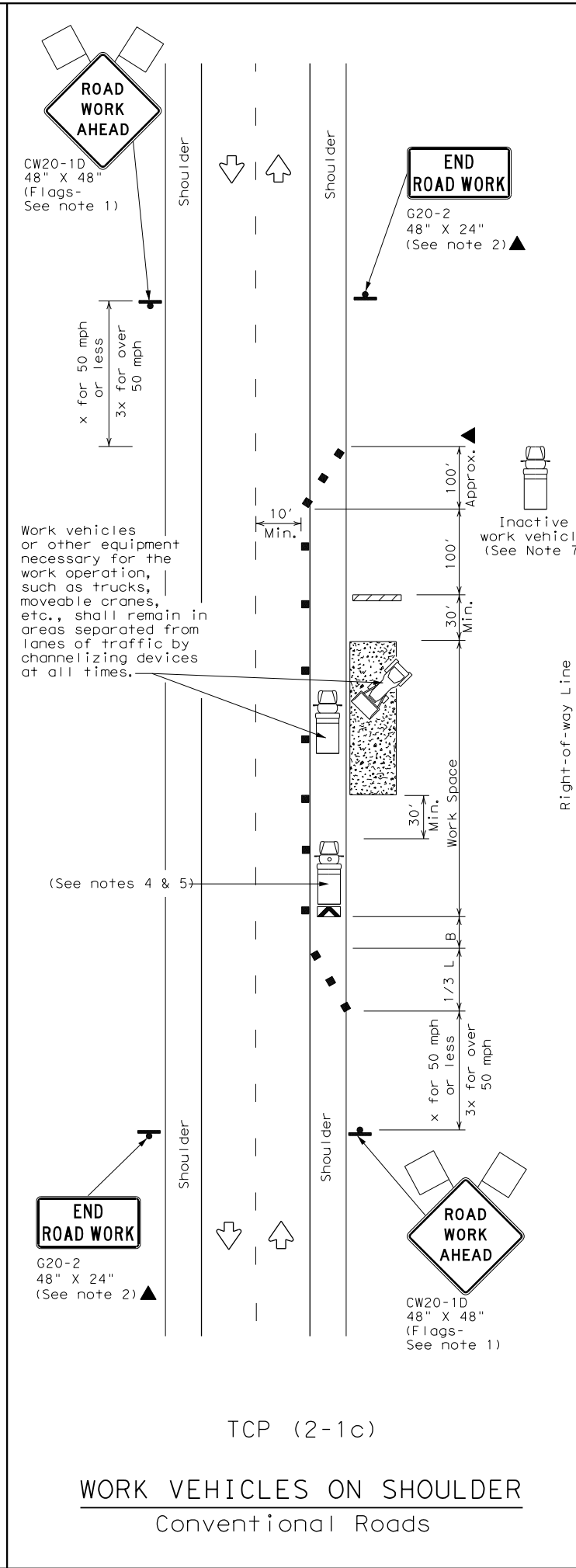
TCP (2-1a)

**WORK SPACE NEAR SHOULDER**  
 Conventional Roads



TCP (2-1b)

**WORK SPACE ON SHOULDER**  
 Conventional Roads



TCP (2-1c)

**WORK VEHICLES ON SHOULDER**  
 Conventional Roads

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

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

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

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

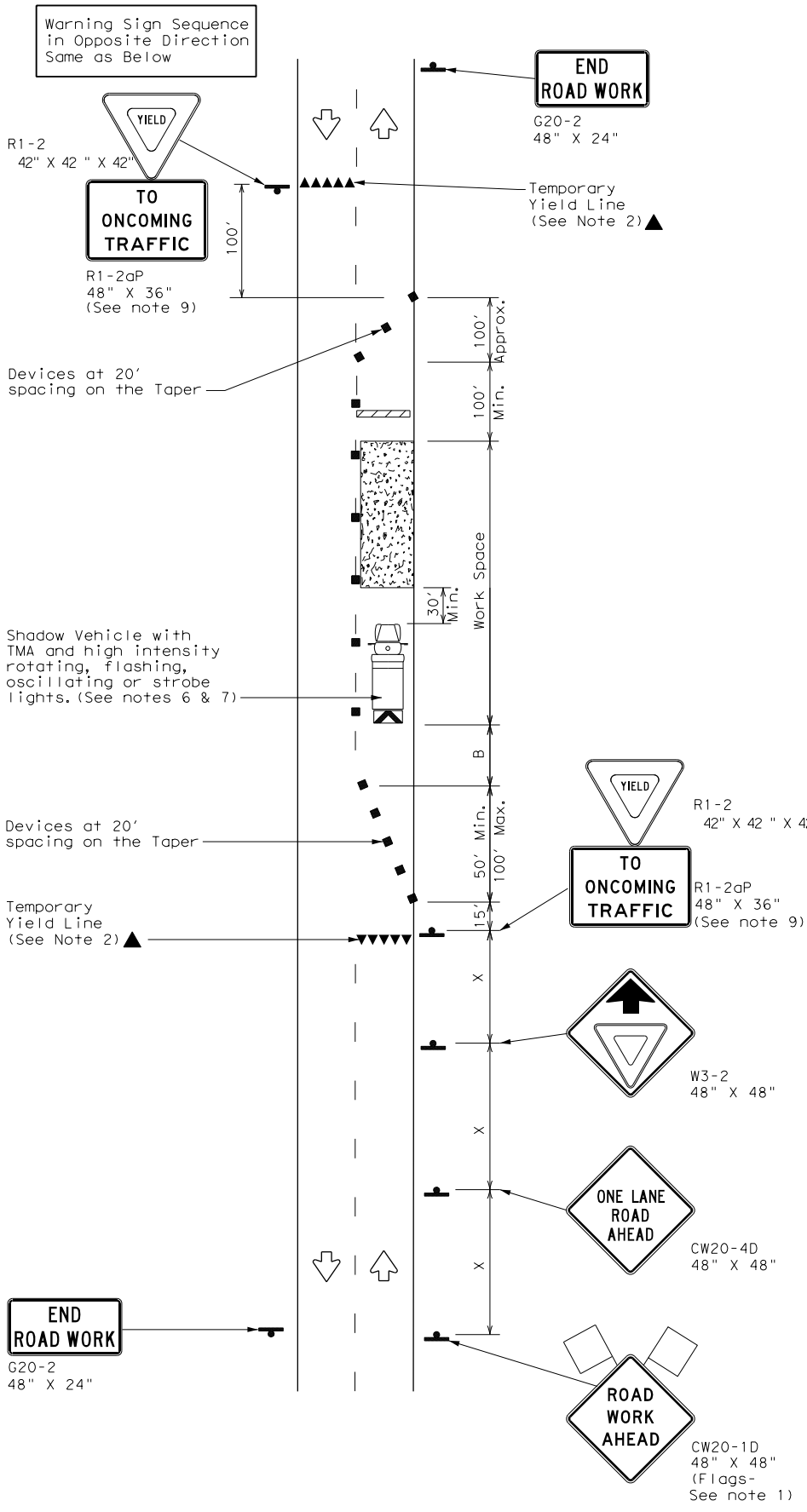
- GENERAL NOTES**
- Flags attached to signs where shown, are REQUIRED.
  - All traffic control devices illustrated are REQUIRED, except those denoted with the triangle symbol may be omitted when stated in the plans, or for routine maintenance work, when approved by the Engineer.
  - Stockpiled material should be placed a minimum of 30 feet from nearest traveled way.
  - 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.
  - Additional Shadow Vehicles with TMAs may be positioned off the paved surface, next to those shown in order to protect a wider work space.
  - See TCP (5-1) for shoulder work on divided highways, expressways and freeways.
  - Inactive work vehicles or other equipment should be parked near the right-of-way line and not parked on the paved shoulder.
  - CW21-5 "SHOULDER WORK" signs may be used in place of CW20-1D "ROAD WORK AHEAD" signs for shoulder work on conventional roadways.



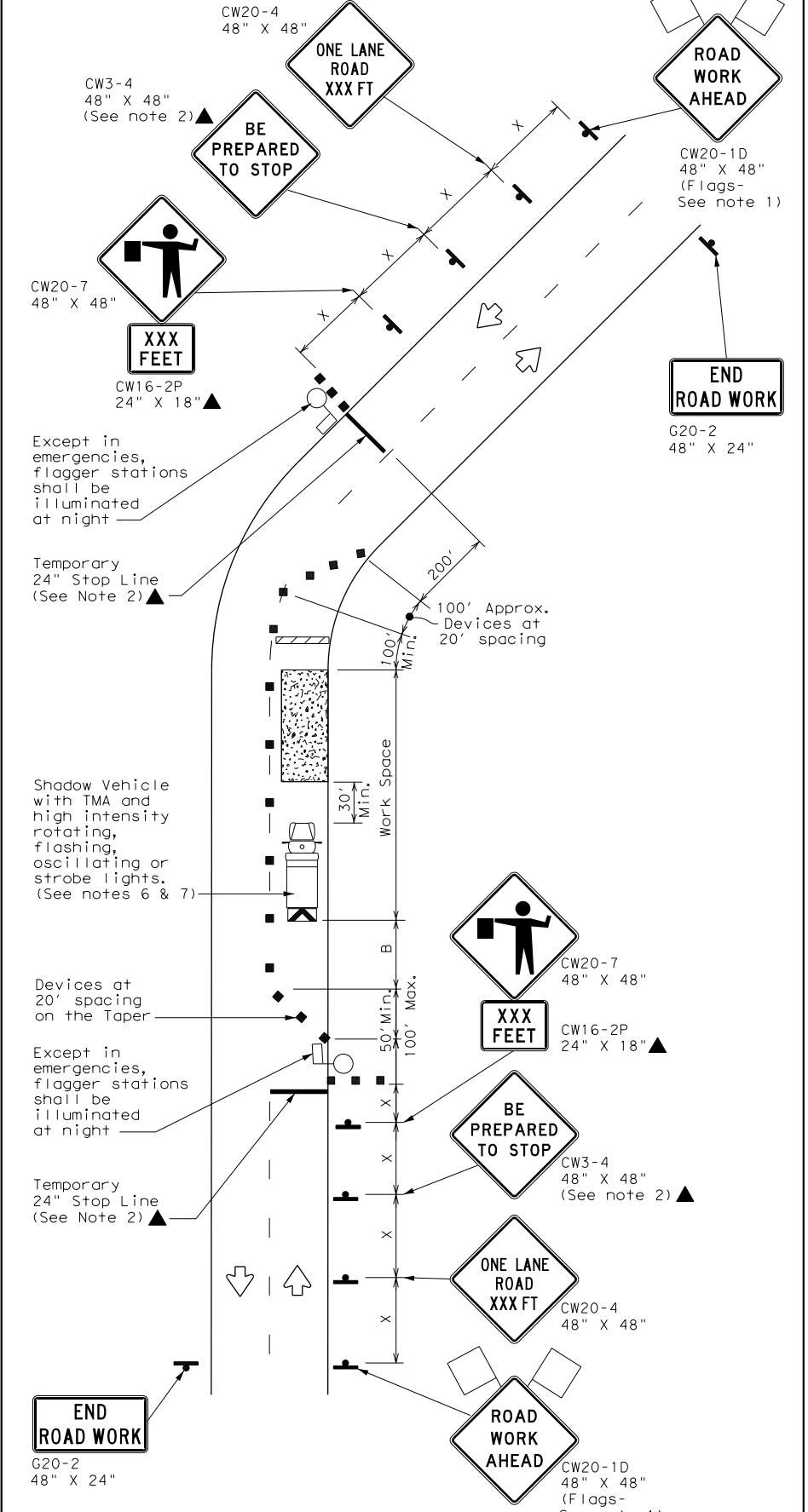
<b>TRAFFIC CONTROL PLAN</b>				
<b>CONVENTIONAL ROAD</b>				
<b>SHOULDER WORK</b>				
<b>TCP (2-1) - 18</b>				
FILE:	tcp2-1-18.dgn	DN:	CK:	DW:
© TxDOT	December 1985	CON:	SECT:	JOB:
REVISIONS		0493	02	021
2-94	4-98	DIST:		COUNTY:
8-95	2-12	ODA		LOVING
1-97	2-18	SHEET NO.		31

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DATE: 6/25/2021  
 FILE: c:\transystems\pw\_local\transyscorp-pw1\besn\manek\d0940080\TCP (2-2).dgn



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



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

LEGEND

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

Posted Speed *	Formula	Minimum Desirable Taper Lengths **			Suggested Maximum Spacing of Channelizing Devices		Minimum Sign Spacing "x" Distance	Suggested Longitudinal Buffer Space "B"	Stopping Sight Distance
		10' Offset	11' Offset	12' Offset	On a Taper	On a Tangent			
30	L = WS <sup>2</sup> / 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

- Flags attached to signs where shown, are REQUIRED.
  - 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.
  - 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.
  - Flaggers should use two-way radios or other methods of communication to control traffic.
  - Length of work space should be based on the ability of flaggers to communicate.
  - 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.
  - 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)
- 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.
  - The R1-2aP "YIELD TO ONCOMING TRAFFIC" sign shall be placed on a support at a 7 foot minimum mounting height.
- TCP (2-2b)
- Channelizing devices on the center line may be omitted when a pilot car is leading traffic and approved by the Engineer.
  - 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).
  - 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

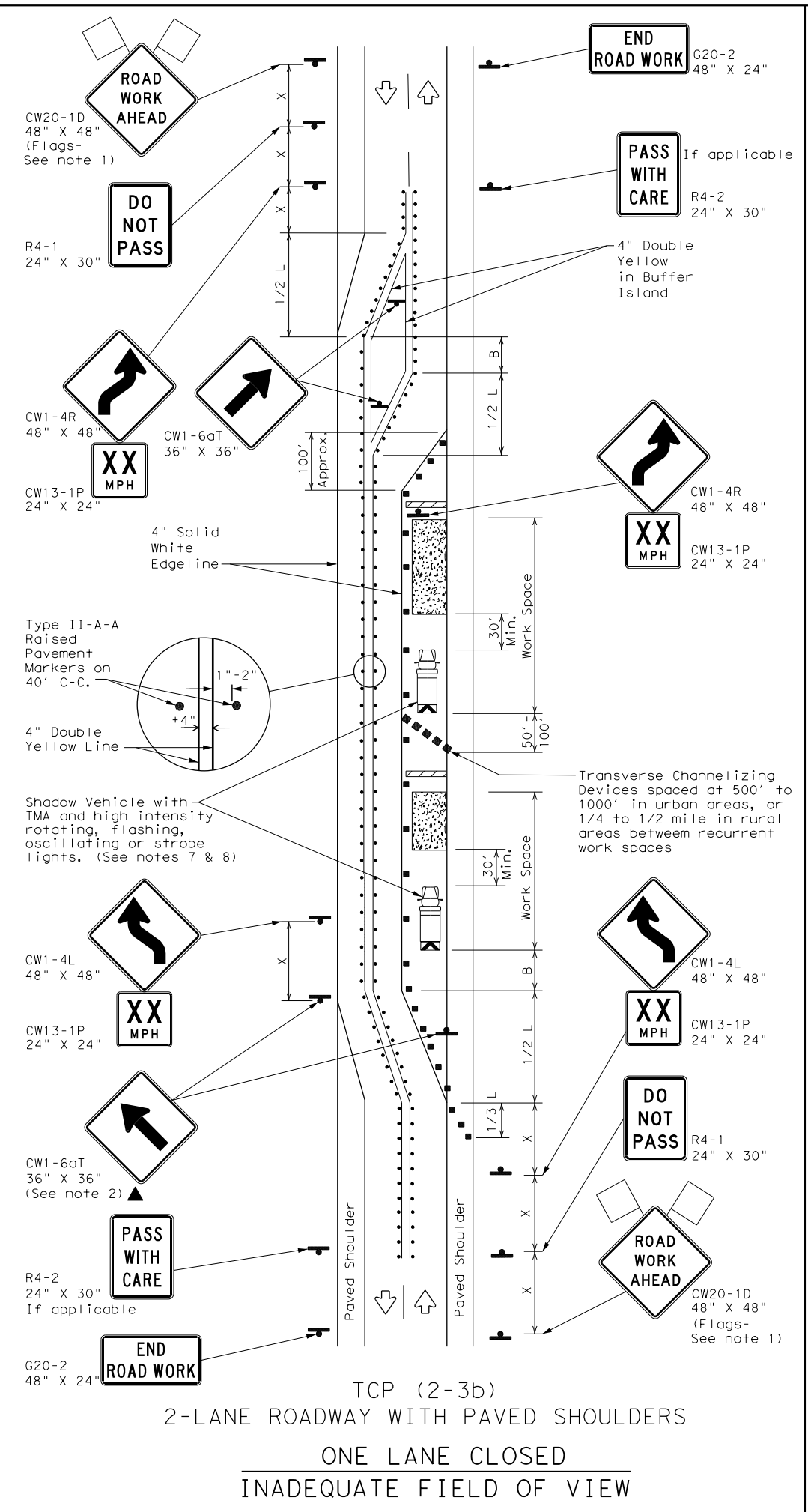
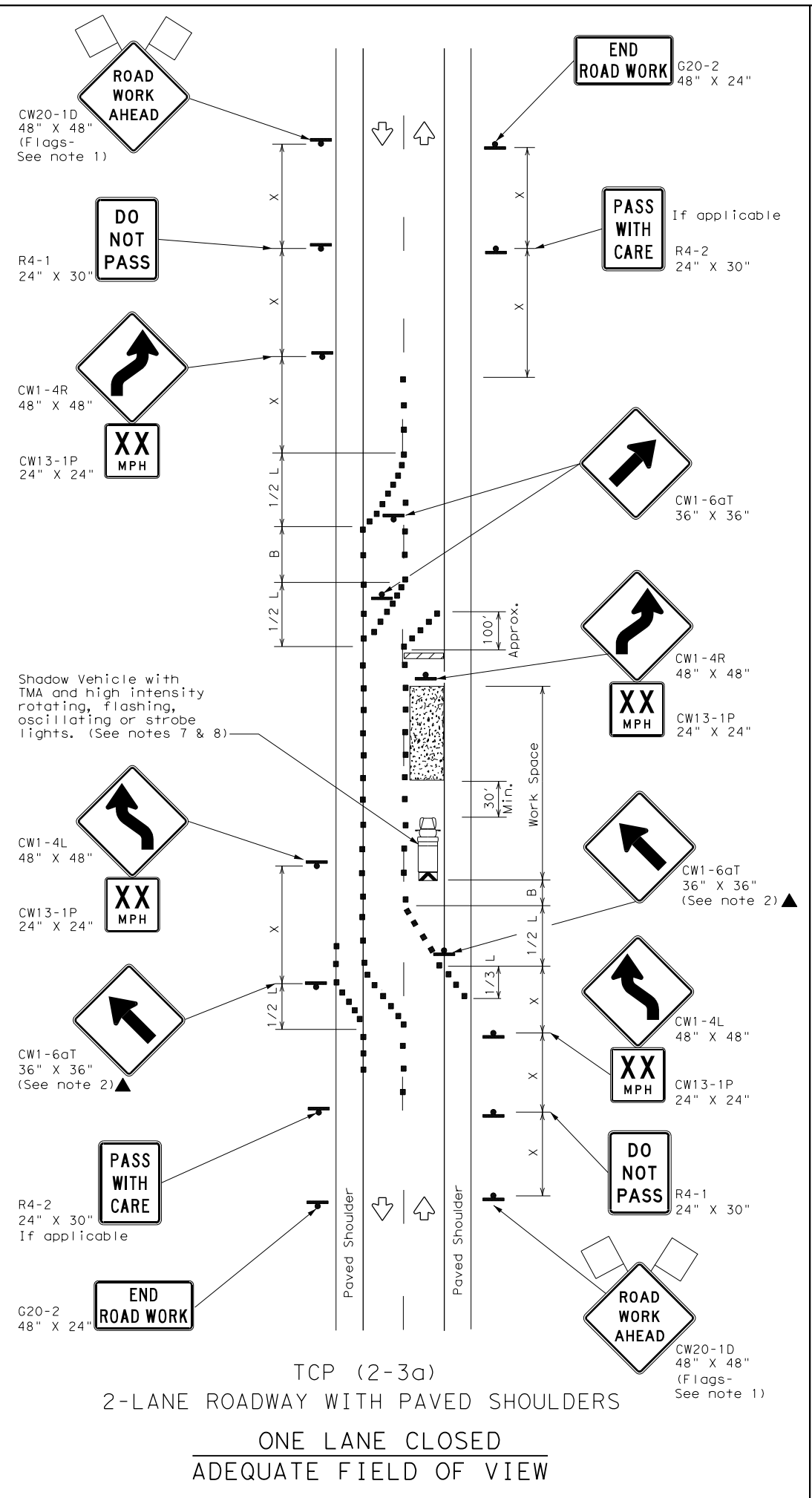
TRAFFIC CONTROL PLAN  
 ONE-LANE TWO-WAY  
 TRAFFIC CONTROL  
 TCP (2-2) - 18

FILE:	tcp2-2-18.dgn	DN:	CK:	DW:	CK:
© TxDOT	December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS		0493	02	021	RM 652
8-95	3-03	DIST		COUNTY	SHEET NO.
1-97	2-12	ODA		LOVING	32
4-98	2-18				

162

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DATE: 6/25/2021  
 FILE: c:\transystems\pw\_local\transyscorp-pw1\besn\manek\d0940080\TCP (2-3) off8.dgn



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

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

**TYPICAL USAGE**

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

- GENERAL NOTES**
- Flags attached to signs where shown, are REQUIRED.
  - 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.
  - 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.
  - 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.
  - 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.
  - Conflicting pavement marking shall be removed for long term projects.
  - 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.
  - 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)**
- 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 Operations Division Standard

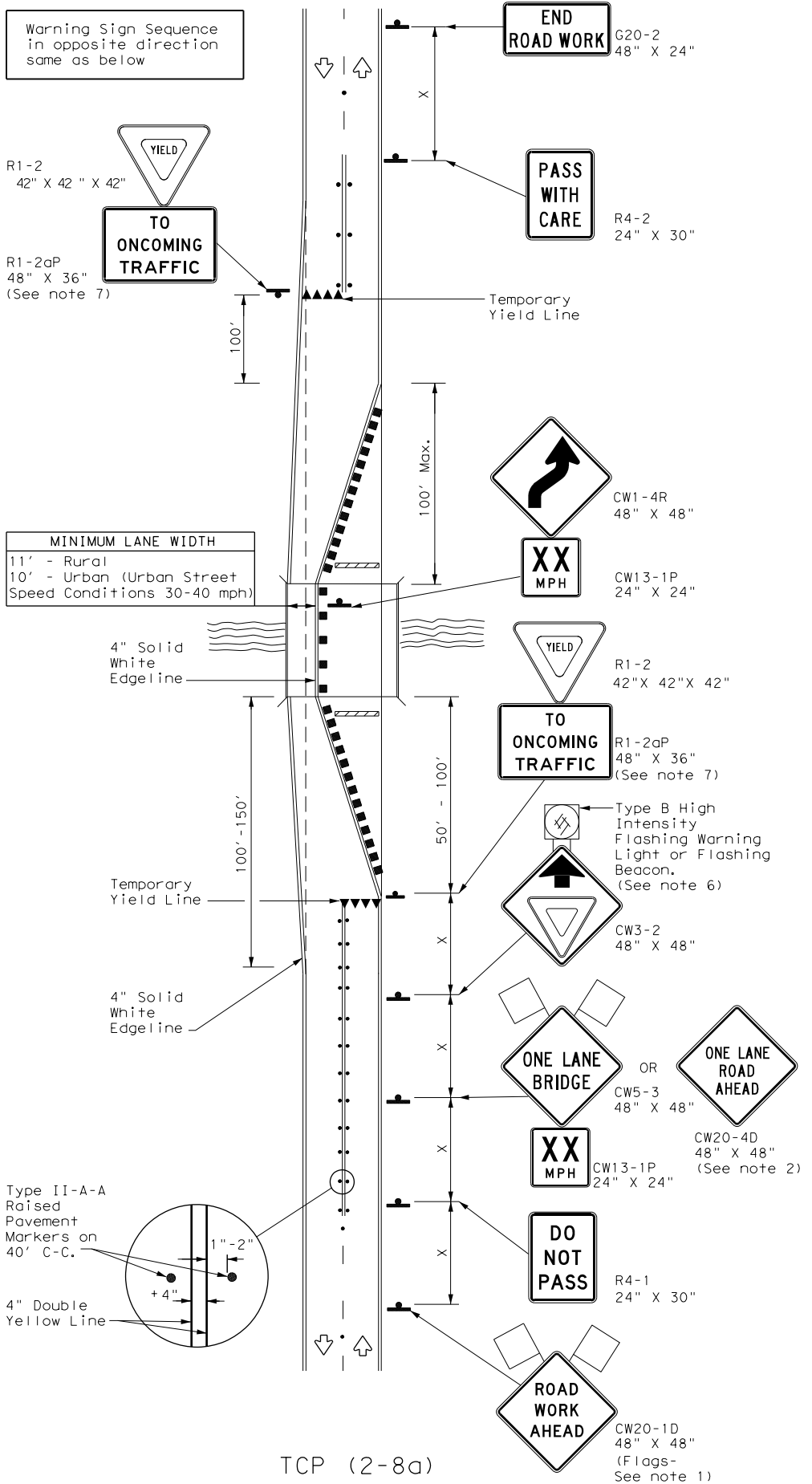
**TRAFFIC CONTROL PLAN**  
**TRAFFIC SHIFTS ON**  
**TWO-LANE ROADS**

**TCP (2-3) - 18**

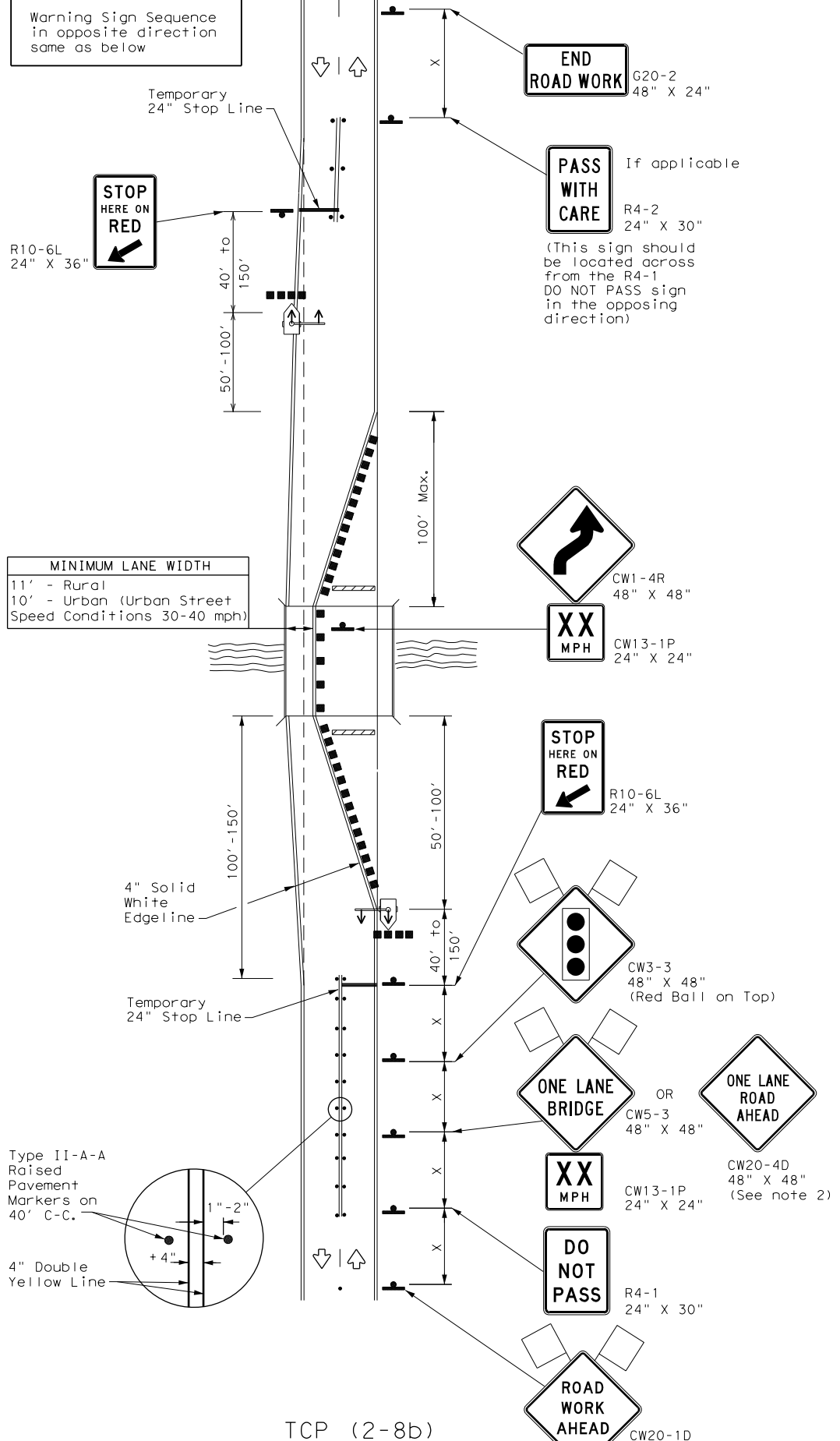
FILE: tcp(2-3)-18.dgn	DN:	CK:	DW:	CK:
© TxDOT December 1985	CON: 0493	SECT: 02	JOB: 021	HIGHWAY: RM 652
8-95 3-03	REVISIONS		DIST: ODA	COUNTY: LOVING
1-97 2-12				SHEET NO. 33
4-98 2-18				

163

DATE: 6/25/2021  
 FILE: c:\transystems\pw\_local\transyscorp-pw1\besn\manek\d0940080\TCP (2-8) -0818.dgn  
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TCP (2-8a)  
 ONE LANE TWO-WAY  
 TRAFFIC CONTROL WITH YIELD SIGNS  
 (Less Than 2000 ADT-See Note 5)



TCP (2-8b)  
 ONE LANE TWO-WAY  
 TRAFFIC CONTROL WITH TRAFFIC SIGNAL

LEGEND

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

Posted Speed *	Formula	Minimum Desirable Taper Lengths **			Suggested Maximum Spacing of Channelizing Devices		Minimum Sign Spacing "X" Distance	Suggested Longitudinal Buffer Space "B"	Stopping Sight Distance
		10' Offset	11' Offset	12' Offset	On a Taper	On a Tangent			
30	L = WS <sup>2</sup> / 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
- Flags attached to signs where shown are REQUIRED.
  - When this TCP is used at a location which does not involve a bridge, a 48" x 48" CW20-4D "ONE LANE ROAD AHEAD" signs should be used in lieu of the CW5-3 "ONE LANE BRIDGE" signs. The CW13-1P Advisory Speed Plaque is required with either warning sign.
  - Raised pavement markers shall be placed 40 feet c-c on centerline between DO NOT PASS signs and stop or yield lines.
  - For intermediate term situations, when it is not feasible to remove and restore pavement markings, the channelization must be made dominant by using a very close spacing. This is especially important in locations of conflicting information, such as where traffic is directed over a double yellow centerline. In such locations a maximum channelizing device spacing of 20 feet is recommended. The 20 foot channelizing device spacing recommendation is intended for the area of conflicting information and not the entire work zone.
- TCP (2-8a)
- Traffic control by CW3-2 "YIELD AHEAD" symbol signs for one lane two-way traffic control operations should be limited to work spaces less than 400 feet long and roadways with less than 2000 ADT. Otherwise, portable traffic signals should be used.
  - If power is available, a flashing beacon should be attached to the CW3-2 "YIELD AHEAD" symbol sign for emphasis.
  - The R1-2 "YIELD" and R1-2aP "TO ONCOMING TRAFFIC" signs and other regulatory signs shall be installed at 7 foot minimum mounting height.
- TCP (2-8b)
- A list of approved Portable Traffic Signals can be found in the "Compliant Work Zone Traffic Control Devices" list.
  - Portable traffic signals should be located to provide adequate stopping sight distance for approaching motorist (See table above).

**Texas Department of Transportation**  
 Traffic Operations Division Standard

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

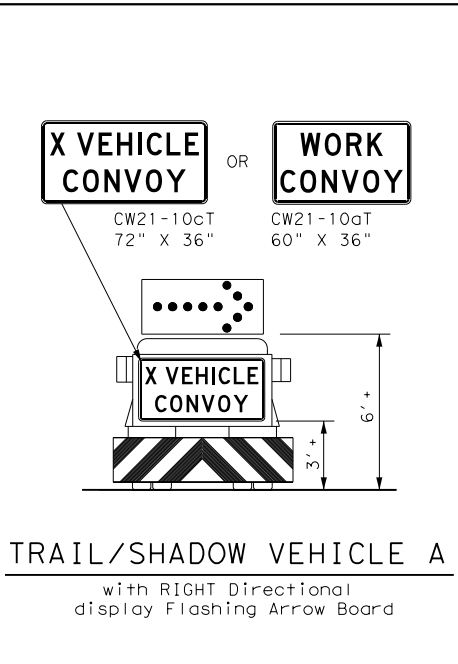
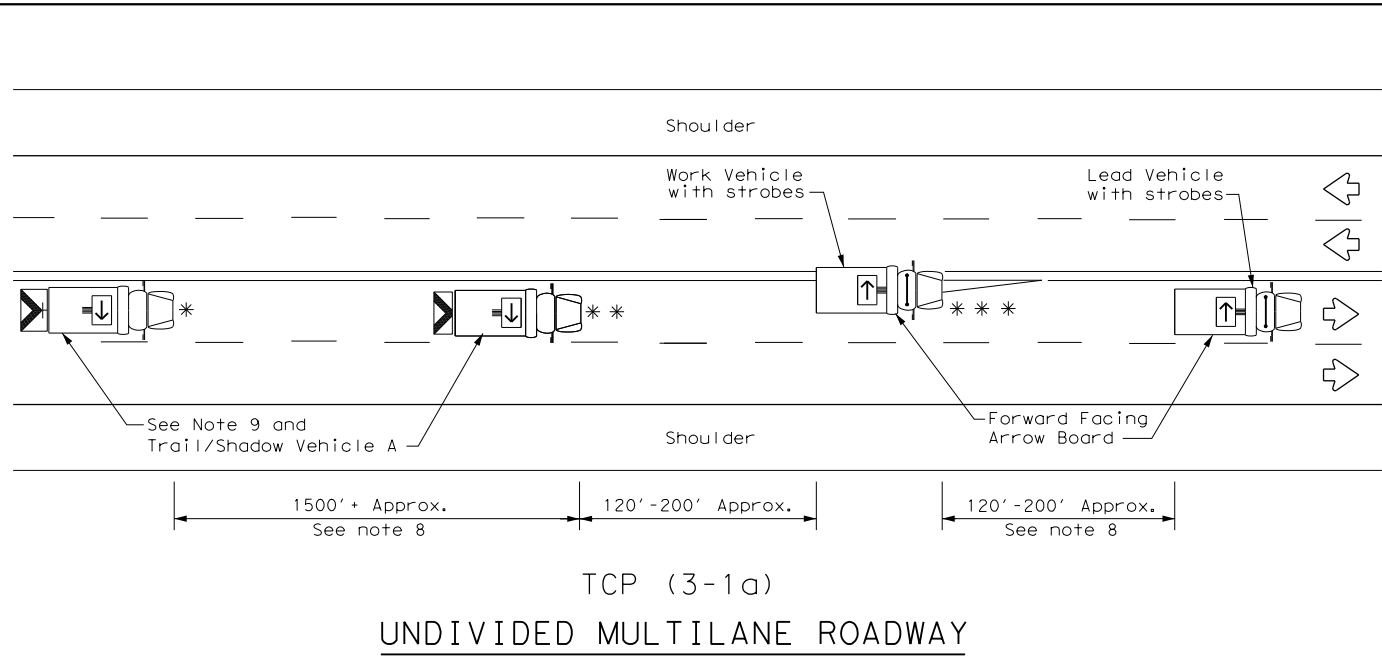
**TCP (2-8) - 18**

FILE: tcp2-8-18.dgn	DN:	CK:	DW:	CK:
© TxDOT December 1985	CON:	SECT:	JOB:	HIGHWAY:
REVISIONS	0493	02	021	RM 652
8-95 3-03	DIST:	COUNTY:	SHEET NO.	
1-97 2-12	ODA	LOVING	34	
4-98 2-18				

168

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DATE: 6/25/2021  
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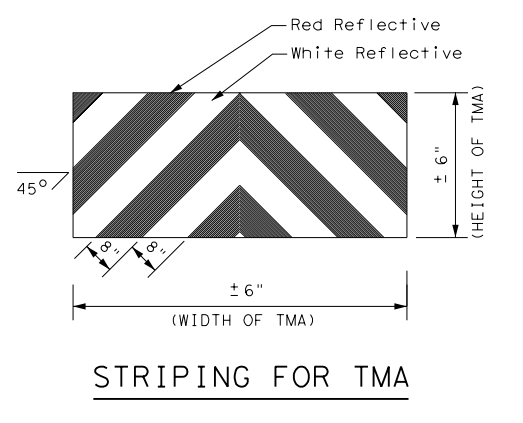
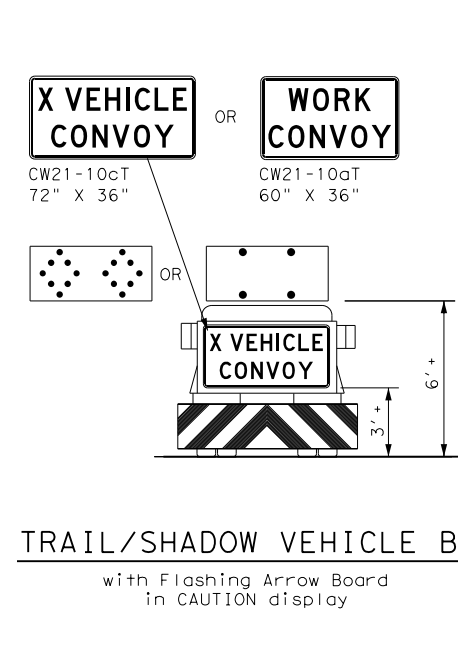
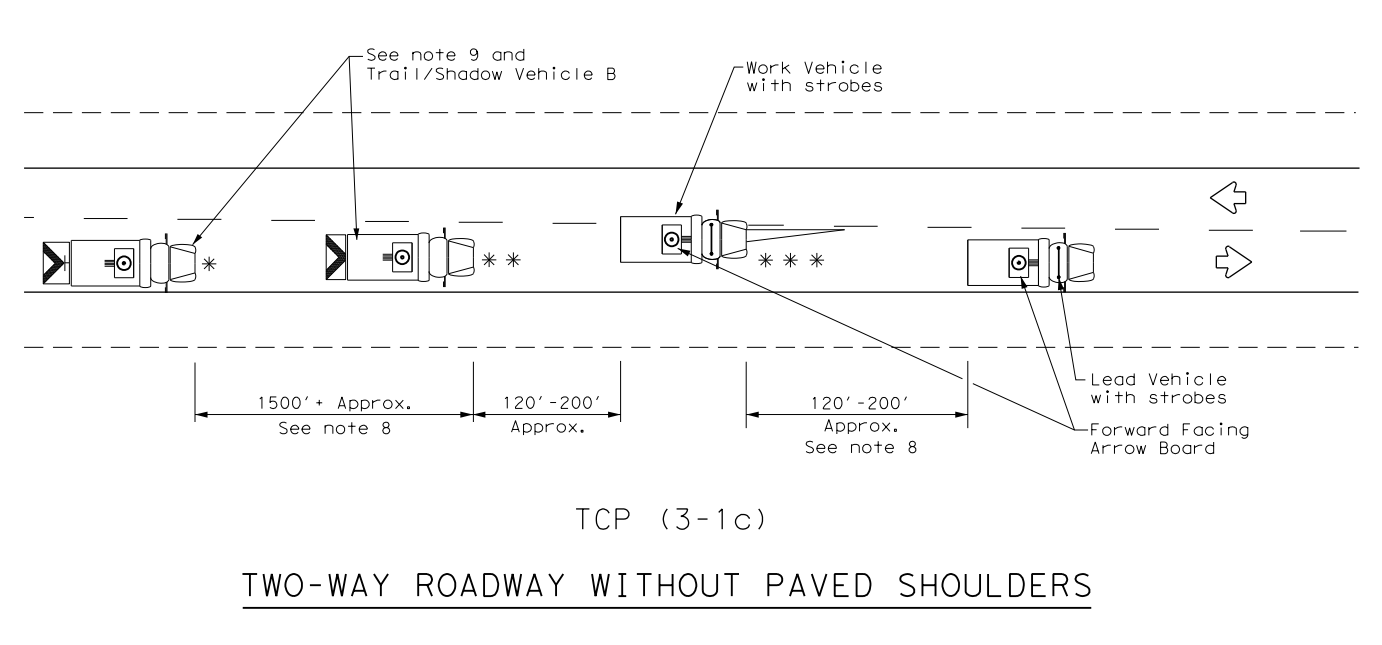
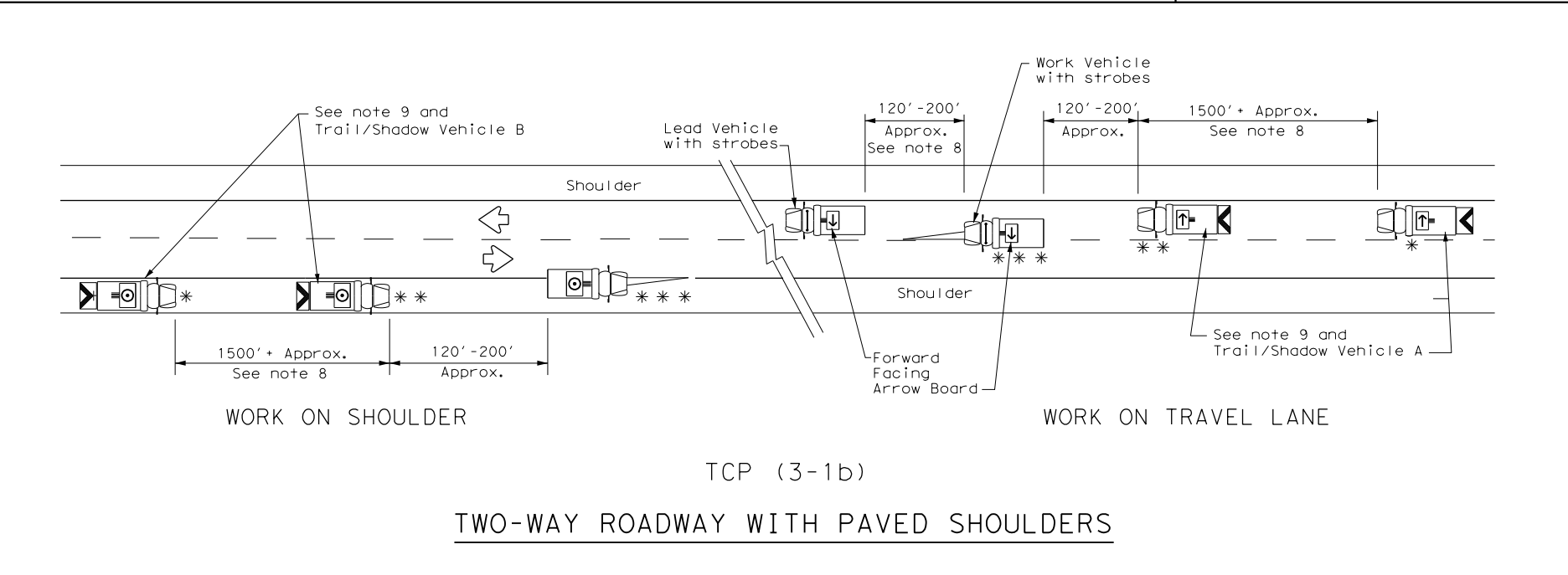
LEGEND				
*	Trail Vehicle	ARROW BOARD DISPLAY		
**	Shadow Vehicle			
***	Work Vehicle		RIGHT Directional	
	Heavy Work Vehicle	LEFT Directional		
	Truck Mounted Attenuator (TMA)	Double Arrow		
	Traffic Flow	CAUTION (Alternating Diamond or 4 Corner Flash)		

TYPICAL USAGE				
MOBILE	SHORT DURATION	SHORT TERM STATIONARY	INTERMEDIATE TERM STATIONARY	LONG TERM STATIONARY
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

GENERAL NOTES

1. TRAIL, SHADOW, and LEAD vehicles shall be equipped with arrow boards as illustrated. When a LEAD vehicle is not used the WORK vehicle must be equipped with an arrow board. The Engineer will determine if the LEAD VEHICLE and/or TRAIL VEHICLE are required based on prevailing roadway conditions, traffic volume, and sight distance restrictions.
2. The use of amber high intensity rotating, flashing, oscillating, or strobe lights on vehicles are required. Blue high intensity rotating, flashing, oscillating or strobe lights when mounted on the driver's side of the vehicle may be operated simultaneously with the amber beacons or strobe lights.
3. The use of truck mounted attenuators (TMA) on the SHADOW VEHICLE and TRAIL VEHICLE are required.
4. Reflective sheeting on the rear of the TMA shall meet or exceed the reflectivity and color requirements of DEPARTMENTAL MATERIAL SPECIFICATION DMS 8300, Type A.
5. Flashing arrow boards shall be Type B or Type C as per the Barricade and Construction (BC) standards. The board shall be controlled from inside the vehicle.
6. Each vehicle shall have two-way radio communication capability.
7. When work convoys must change lanes, the TRAIL VEHICLE should change lanes first to shadow the other convoy vehicles.
8. Vehicle spacing between the TRAIL VEHICLE and the SHADOW VEHICLE will vary depending on sight distance restrictions. Motorists approaching the work convoy should be able to see the TRAIL VEHICLE in time to slow down and/or change lanes as they approach the TRAIL VEHICLE. Vehicle spacing between the WORK VEHICLE and SHADOW VEHICLE and vehicle spacing between WORK VEHICLE and LEAD VEHICLE may vary according to terrain, work activity and other factors.
9. "X VEHICLE CONVOY" (CW21-10cT) or "WORK CONVOY" (CW21-10aT) signs shall be used on TRAIL VEHICLES and SHADOW VEHICLES as shown. As an option 48" X 48" diamond shaped "WORK CONVOY" (CW21-10T) or "X VEHICLE CONVOY" (CW21-10bT) signs may be used where adequate mounting space exists. When used, the X VEHICLE CONVOY sign shall have the number of the convoy vehicles displayed on the sign in the number designation "X" location. The "X VEHICLE CONVOY" sign shall not be used on the SHADOW VEHICLE if a TRAIL VEHICLE is used.
10. On two-lane two-way roadways, the work and protection vehicles should pull over periodically to allow motor vehicle traffic to pass. If motorists are not allowed to pass the work convoy, a "DO NOT PASS" (R4-1) sign should be placed on the back of the rearmost protection vehicle.



Texas Department of Transportation  
 Traffic Operations Division Standard

TRAFFIC CONTROL PLAN  
 MOBILE OPERATIONS  
 UNDIVIDED HIGHWAYS

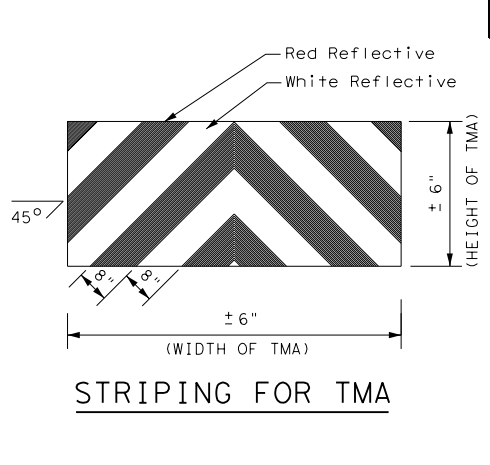
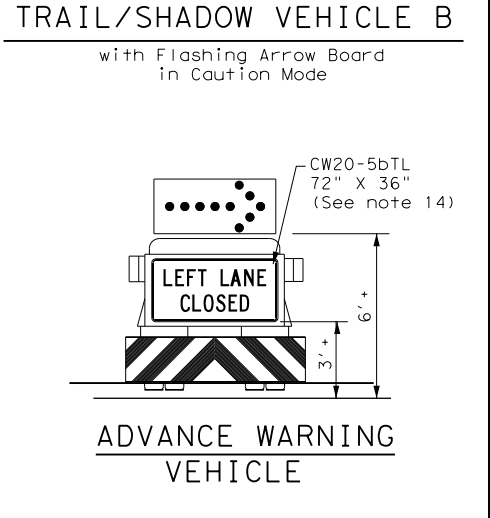
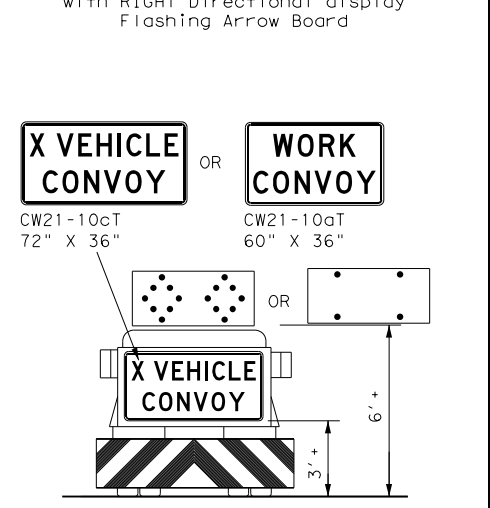
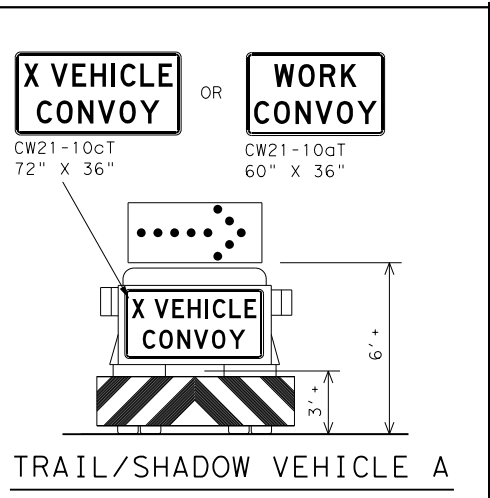
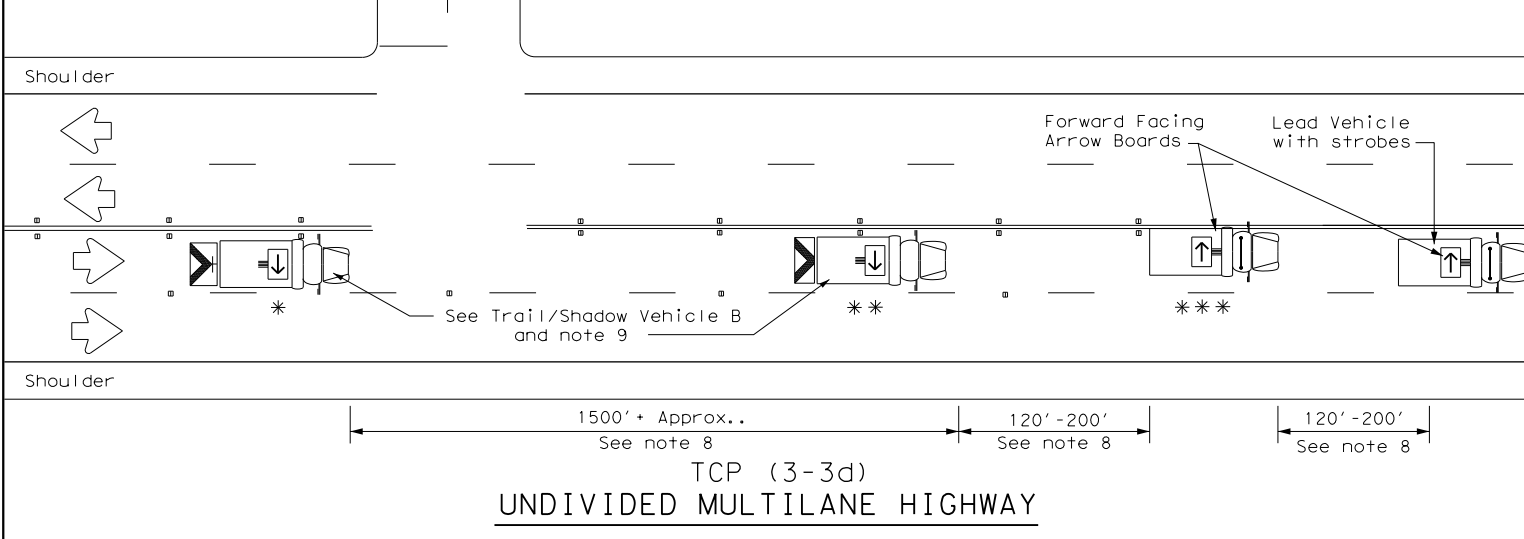
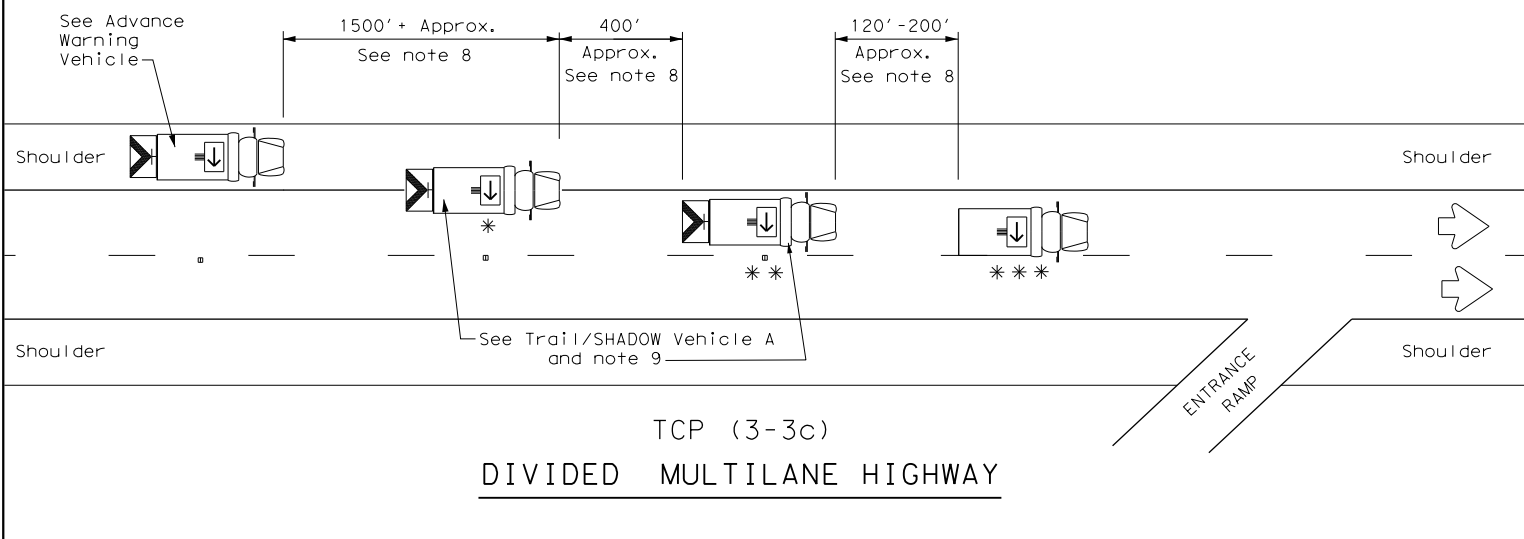
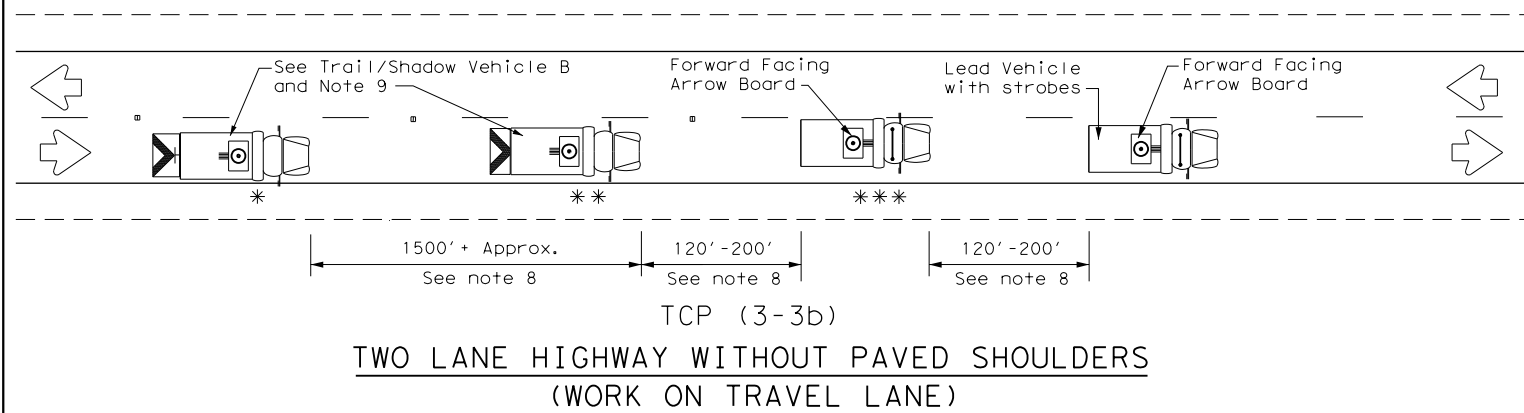
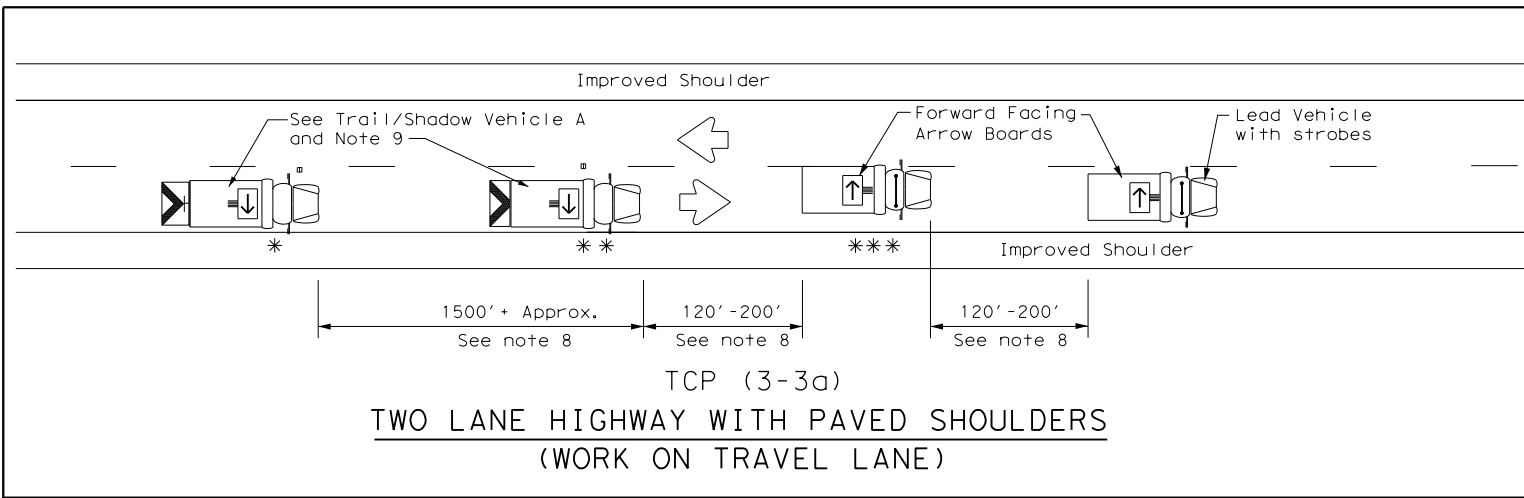
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2-94	4-98	DIST	COUNTY		SHEET NO.				
8-95	7-13	ODA	LOVING		35				
1-97									



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

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

GENERAL NOTES

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

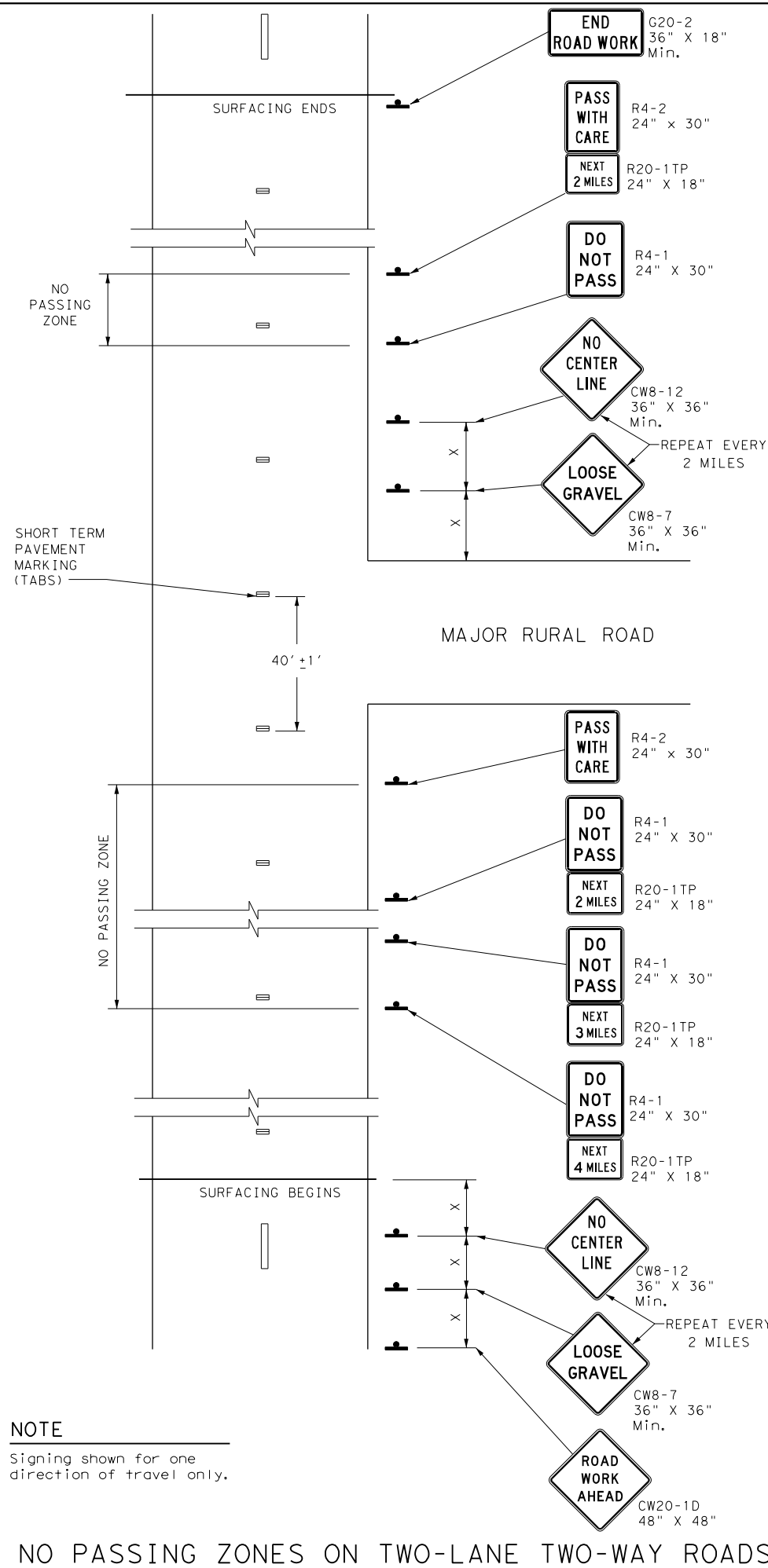


TRAFFIC CONTROL PLAN  
 MOBILE OPERATIONS  
 RAISED PAVEMENT  
 MARKER INSTALLATION/  
 REMOVAL  
 TCP (3-3) - 14

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1-97	7-14								
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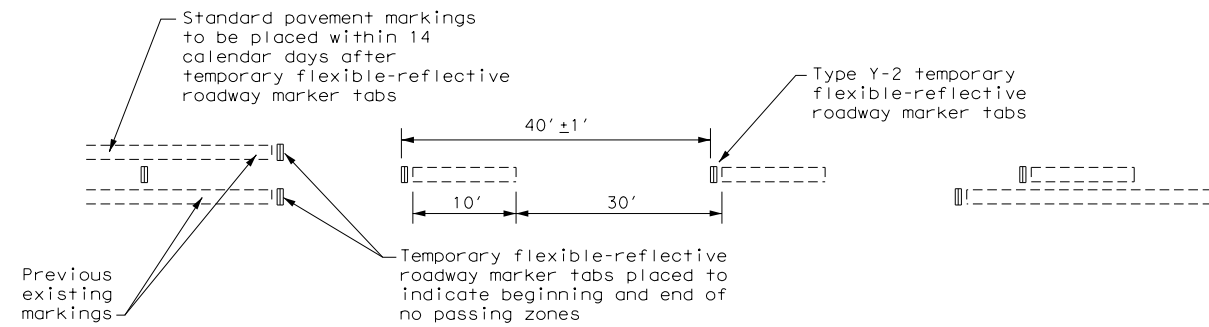
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**NOTE**  
 Signing shown for one direction of travel only.

**NO PASSING ZONES ON TWO-LANE TWO-WAY ROADS**



**TABS ON CENTERLINES OF TWO-LANE TWO-WAY ROADS**

For seal coat, micro-surface or similar operations

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

- A. Prior to the beginning of construction, all currently striped no-passing zones shall be signed with the DO NOT PASS (R4-1) signs and PASS WITH CARE (R4-2) signs placed at the beginning and end of each zone for each direction of travel except as otherwise provided herein. Signs marking these individual no-passing zones need not be covered prior to construction if the signs supplement the existing pavement markings.
- B. At the discretion of the Engineer, in areas of numerous no-passing zones, several zones may be combined as a single zone. If passing is to be prohibited over one or more lengthy sections, a DO NOT PASS sign and a NEXT XX MILES (R20-1TP) plaque may be used at the beginning of such zones. The DO NOT PASS sign and the NEXT XX MILES plaque should be repeated every mile to the end of the no-passing zone. In areas where there is considerable distance between no-passing zones, the end of the no-passing zone may be signed with a PASS WITH CARE sign and a NEXT XX MILES plaque.
- C. Depending on traffic volumes and length of sections, it may be desirable to prohibit passing throughout the project to prevent damage to windshield and lights. The DO NOT PASS sign and NEXT XX MILES plaque should be used and repeated as often as necessary for this purpose. Where several existing zones are to be combined into one individual no-passing zone, the sign at the beginning of the zone should be covered until the surfacing operation has passed this location so as not to have the DO NOT PASS sign conflict with the existing pavement markings. Also, unless one days operation completes the entire length of such combined zones, appropriate DO NOT PASS and PASS WITH CARE signs should be placed at the beginning and end of the no-passing zones where the surfacing operation has stopped for the day.
- D. R4-1 and R4-2 are to remain in place until standard pavement markings are installed.

**"NO CENTER LINE" SIGN (CW8-12)**

- A. Center line markings are yellow pavement markings that delineate the separation of travel lanes that have opposite directions of travel on a roadway. Divided highways do not typically have center line markings.
- B. At the time construction activity obliterates the existing center line markings (low volume roads may not have an existing centerline), a NO CENTER LINE (CW8-12) sign should be erected at the beginning of the work area, at approximately 2 mile intervals within the work area, beyond major intersections and other locations deemed necessary by the Engineer.
- C. The NO CENTER LINE signs are to remain in place until standard pavement markings are installed.

**"LOOSE GRAVEL" SIGN (CW8-7)**

- A. When construction begins, a LOOSE GRAVEL (CW8-7) sign should be erected at each end of the work area and repeated at intervals of approximately 2 miles in rural areas and closer in urban areas.
- B. The LOOSE GRAVEL signs are to remain in place until the condition no longer exists.

**PAVEMENT MARKINGS**

- A. Temporary markings for surfacing projects shall be Temporary Flexible-reflective Roadway Marker Tabs unless otherwise approved by the Engineer. Tabs are to be installed to provide true alignment for striping crews or as directed by the Engineer. Tabs will be placed at the spacing indicated. Tabs should be applied to the pavement no more than two (2) days before the surfacing is applied. After the surfacing is rolled and swept, the cover over the reflective strip shall be removed.
- B. Tabs shall not be used to simulate edge lines.
- C. Tab placement for overlay/inlay operations shall be as shown on the WZ(STPM) standard sheet.

**COORDINATION OF SIGN LOCATIONS**

- A. The location of warning signs at the beginning and end of a work area are to be coordinated with other signing typically shown on the Barricade and Construction Standards for project limits to ensure adequate sign spacing.
- B. Where possible the ROAD WORK AHEAD (CW20-1D), LOOSE GRAVEL (CW8-7), and NO CENTER LINE (CW8-12) signs should be placed in the sequence shown following the OBEY WARNING SIGNS STATE LAW (R20-3T) and the TRAFFIC FINES DOUBLE (R20-5T) sign, and one "X" sign spacing prior to the CONTRACTOR (G20-6T) sign typically located at or near the limits of surfacing. LOOSE GRAVEL and NO CENTER LINE signs will then be repeated as described above.

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

\* Conventional Roads Only

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

**GENERAL NOTES**

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



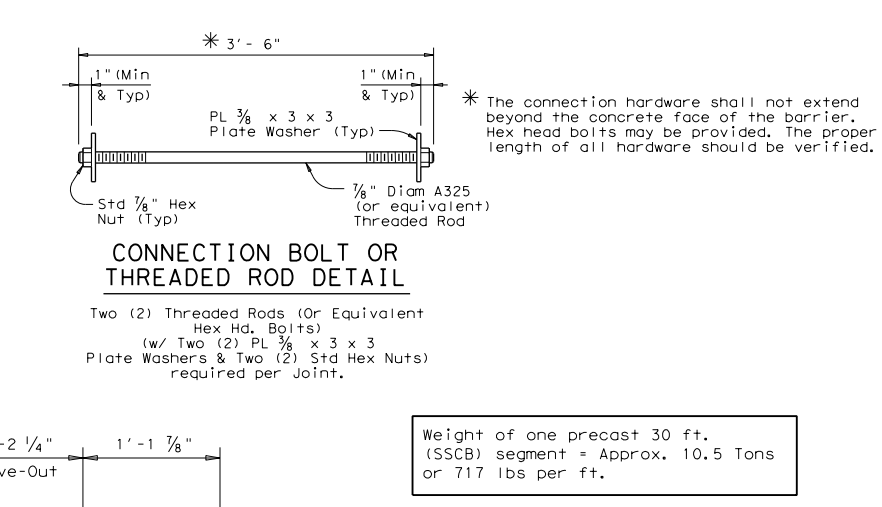
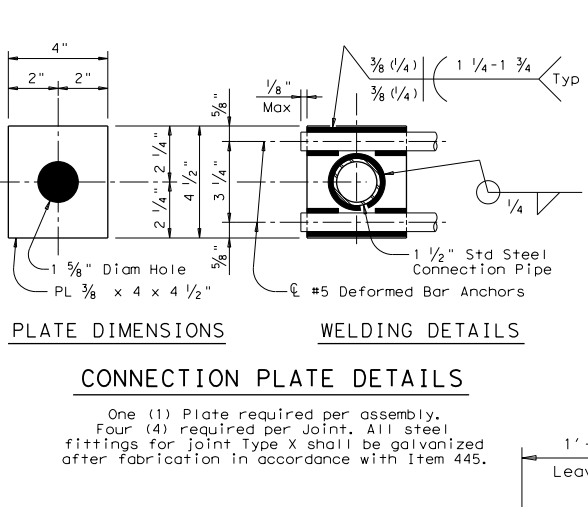
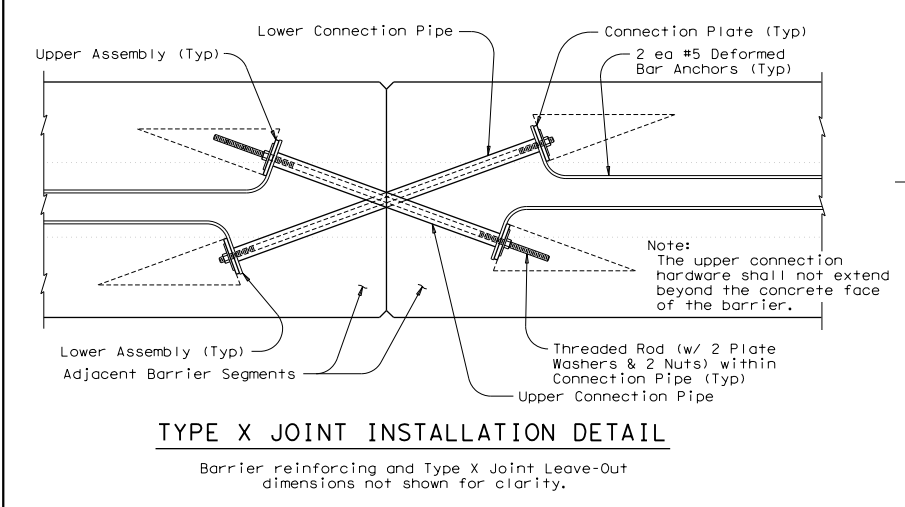
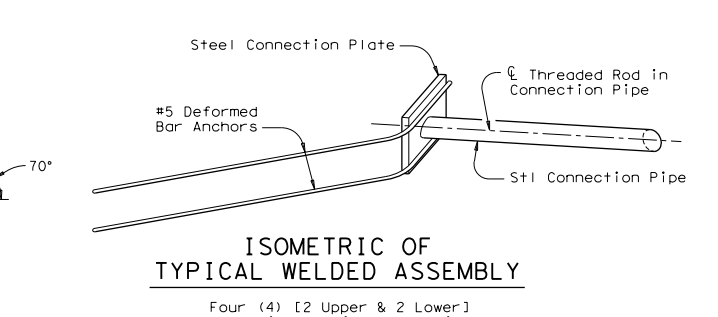
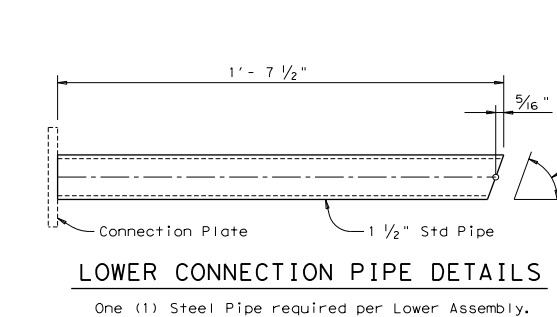
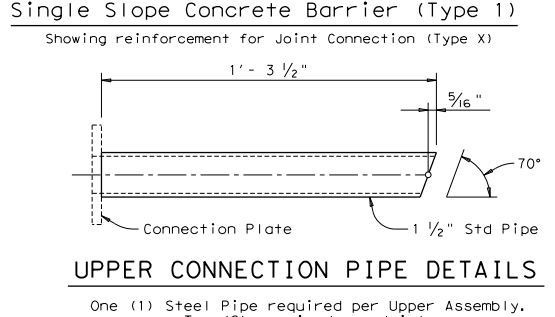
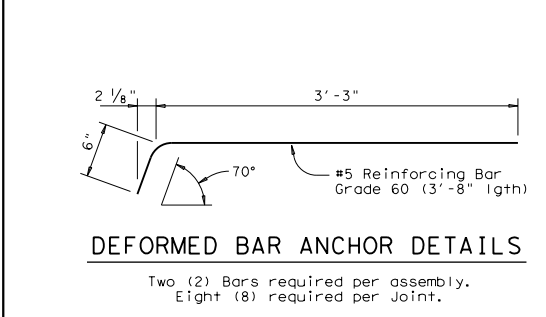
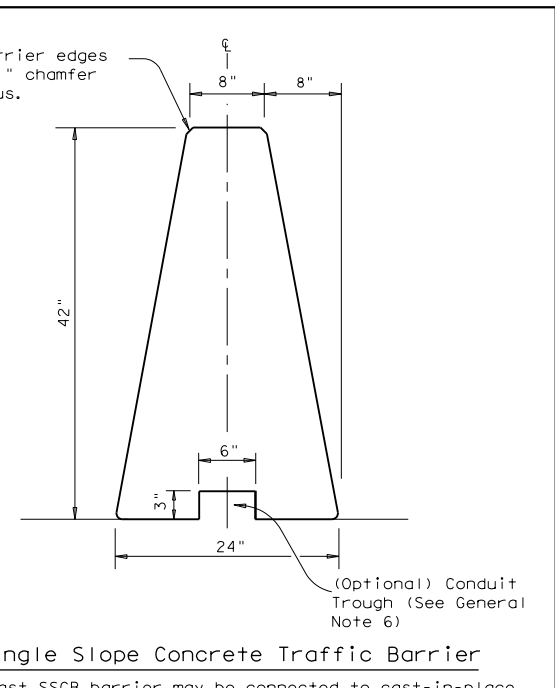
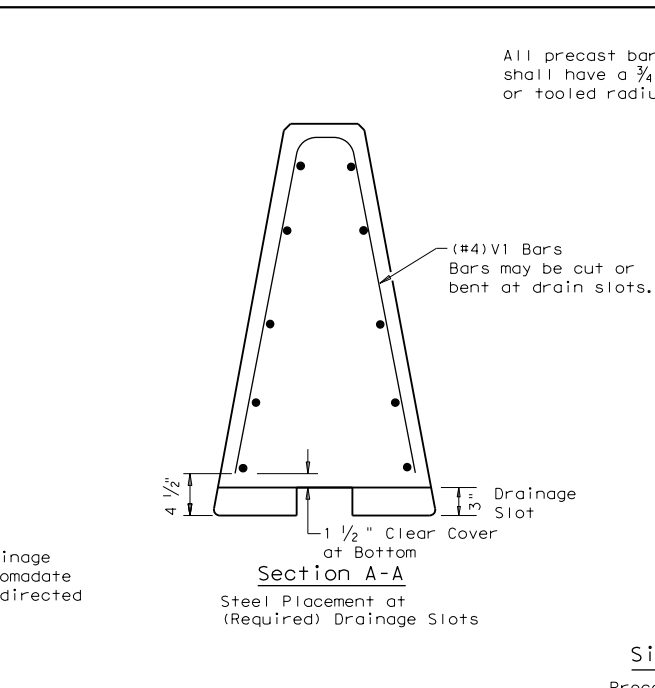
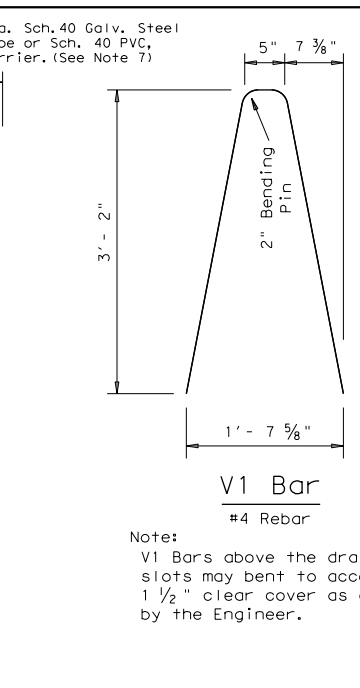
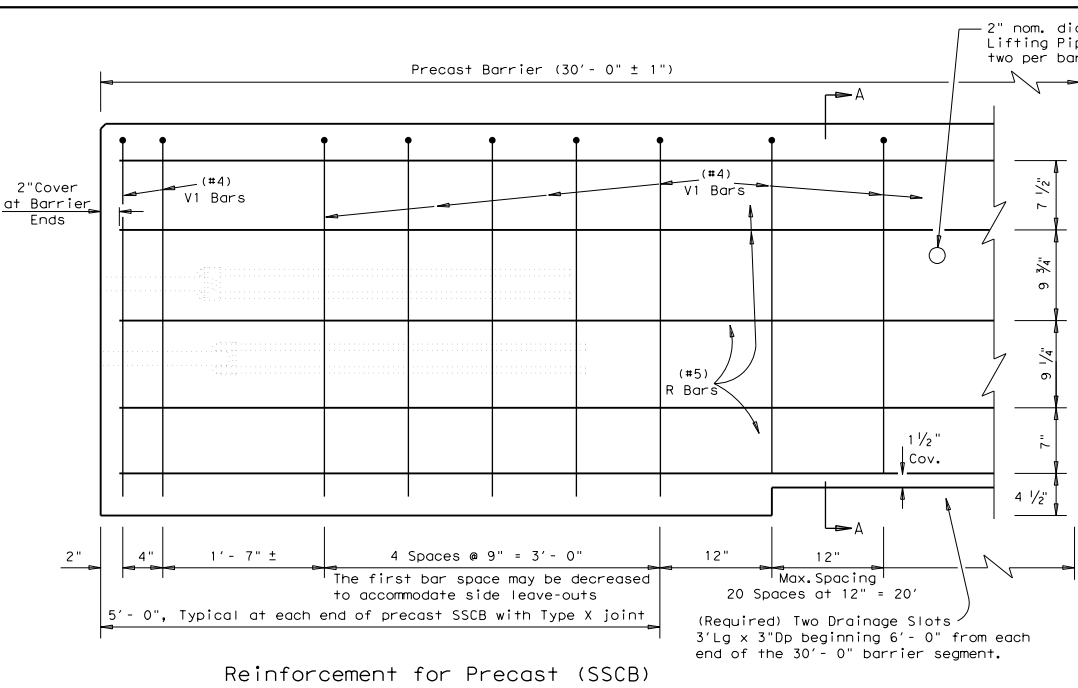
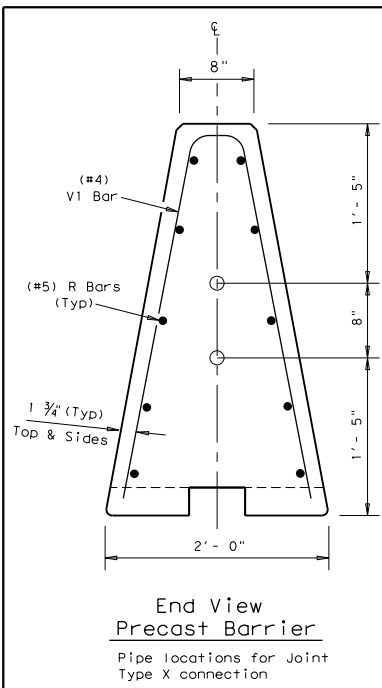
**TRAFFIC CONTROL DETAILS FOR SURFACING OPERATIONS**

TCP (7-1) - 13

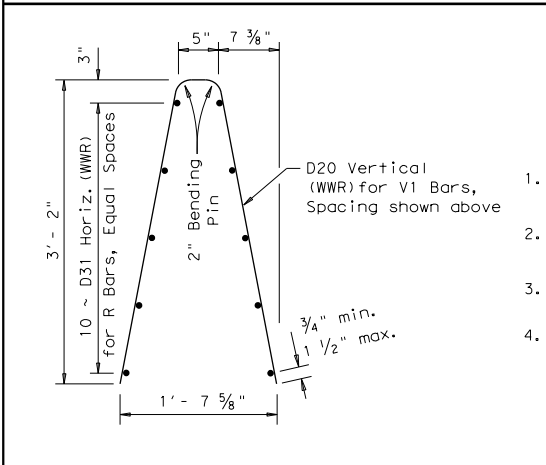
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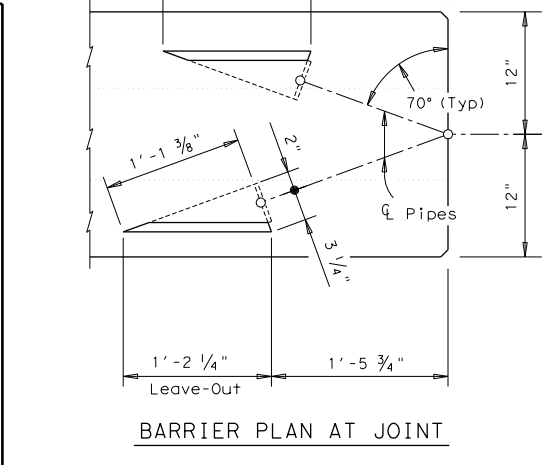
Weight of one precast 30 ft. (SSCB) segment = Approx. 10.5 Tons or 717 lbs per ft.



**Welded Wire Reinforcement (WWR) Option for Bars R and V1**

(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".



- 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 3/4 inch chamfer or a tooled radius.
  5. All concrete, reinforcement, joint connection systems, grout etc. as shown, are considered as part of the barrier payment.
  6. Conduit trough when required shall be shown elsewhere on the plans, or as directed by the Engineer.
  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 and 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.
  9. All steel assemblies shall be galvanized after fabrication in accordance with Item 445, "Galvanizing."

SHEET 1 OF 2

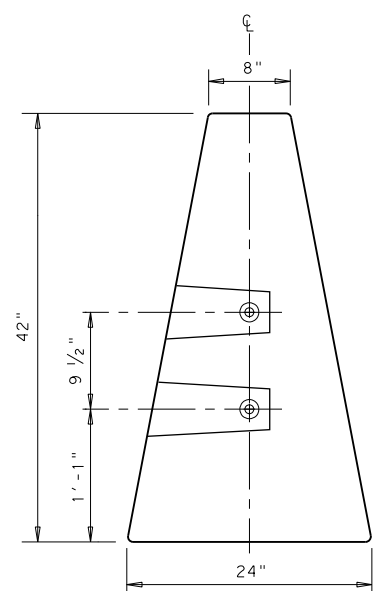
**Texas Department of Transportation**  
 Design Division Standard

**SINGLE SLOPE CONCRETE BARRIER**  
 PRECAST BARRIER (TYPE 1)  
 SSCB(2)-10

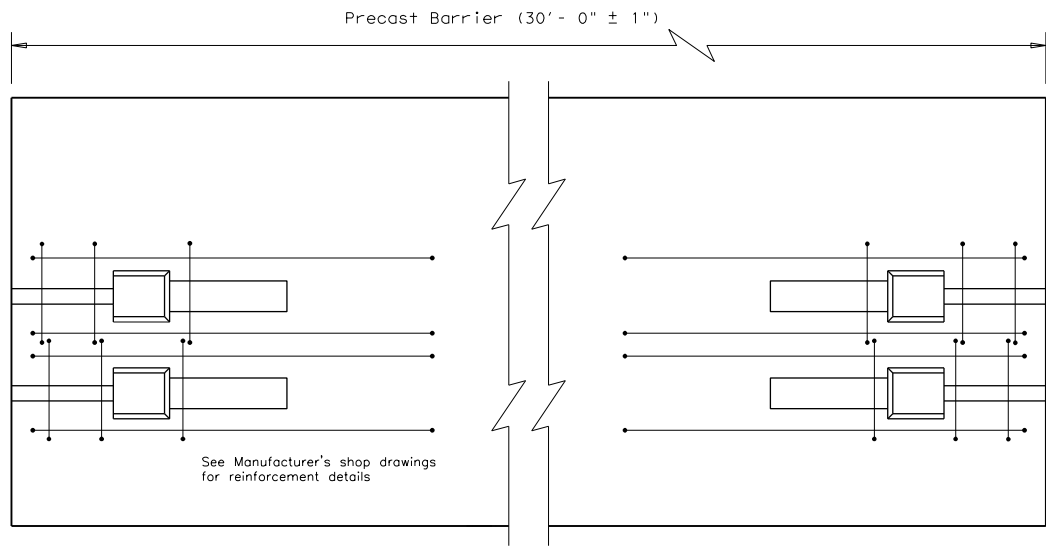
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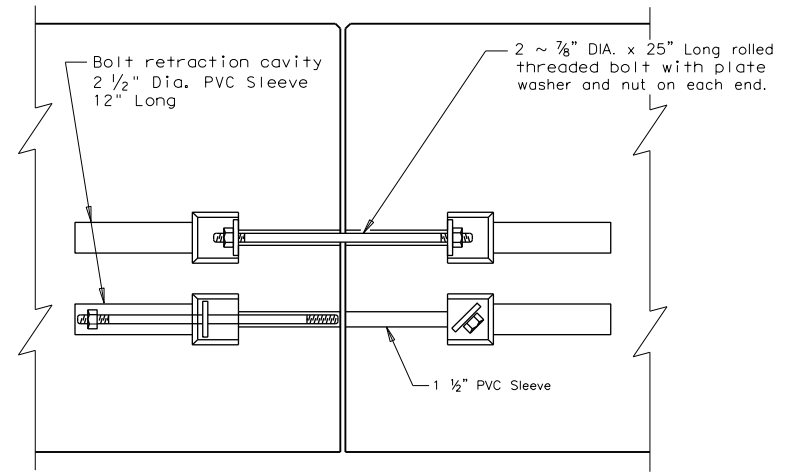
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END VIEW  
 "QUICK-BOLT" POCKET LOCATIONS

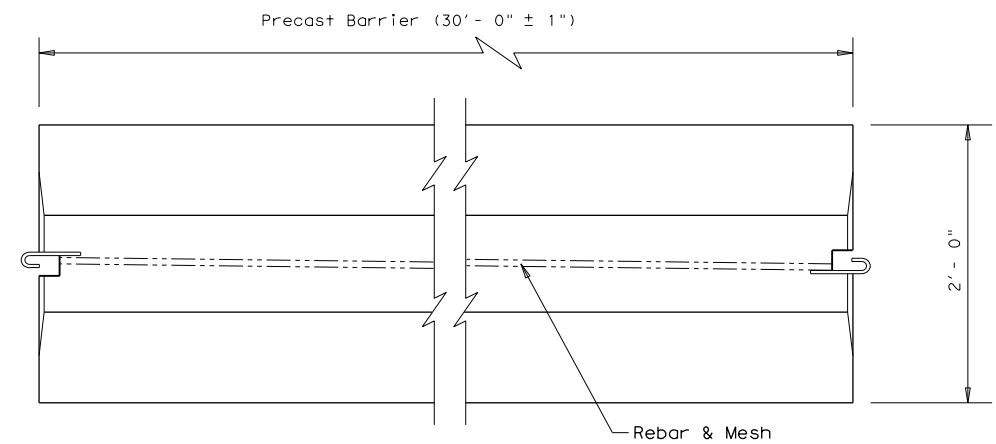


ELEVATION VIEW  
 "QUICK-BOLT" (SSCB)  
 See Manufacturer's shop drawing for additional details

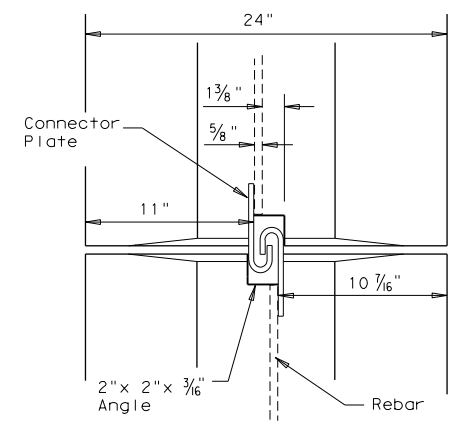


ELEVATION VIEW SHOWING JOINT CONNECTION  
 "QUICK-BOLT"

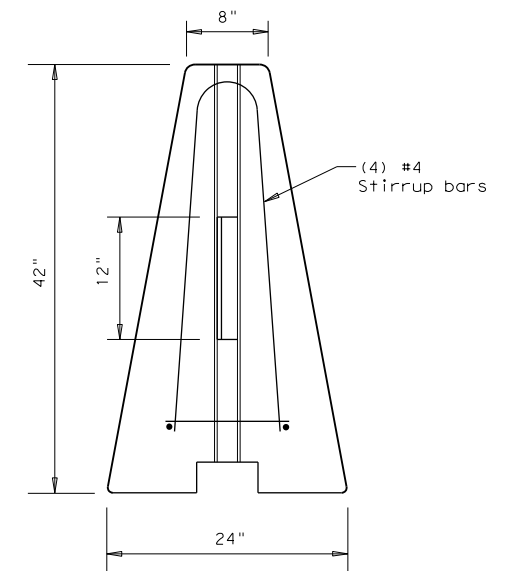
Joint Connection (Type Q)



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



VIEW FROM ABOVE  
 J-J HOOK CONNECTION



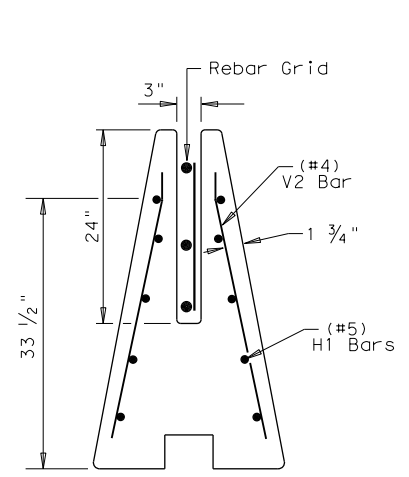
END VIEW

**Proprietary Joint Connections (SSCB)**

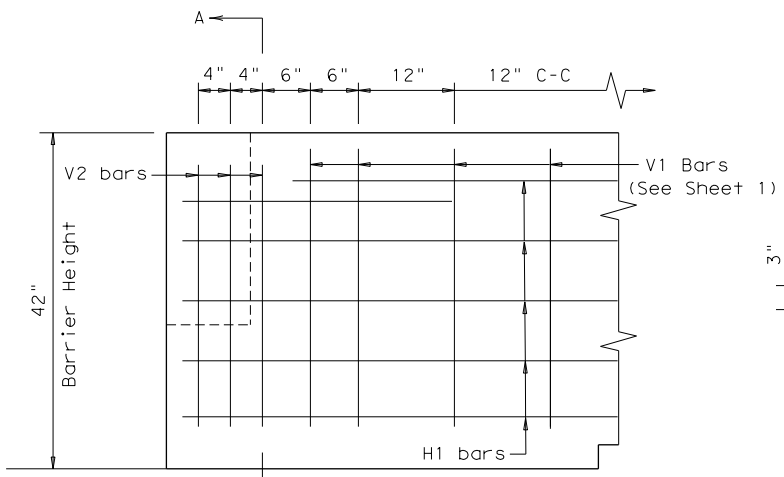
Two proprietary joint connections are acceptable as alternates to the (Type X) connection shown, here on. These joint connections types are:

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

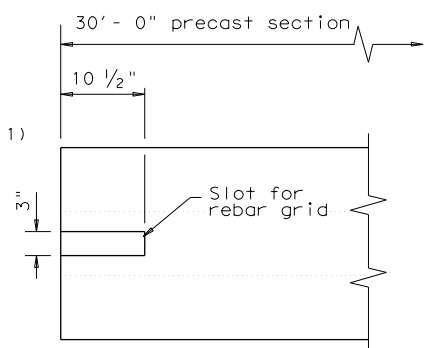
If one of these connection systems are exclusively specified in the plans, prior approval for sole source use must be obtained. Details of the connection components and barrier reinforcement for these systems, will be shown on the manufacturer's shop drawing(s) furnished to the Engineer.



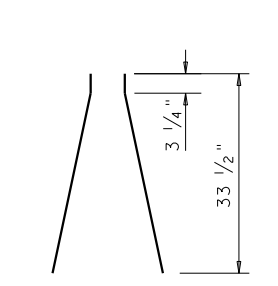
SECTION A-A  
 Showing (Type R)  
 Rebar Grid



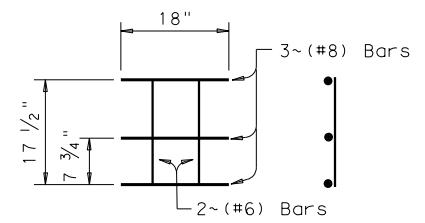
ELEVATION  
 V1 Bars (See Sheet 1)



TOP VIEW  
 JOINT CONNECTION  
 Typical at both ends of barrier segment



(#4) V2 BARS  
 6 ~ two piece bars per barrier segment



WELDED REBAR GRID

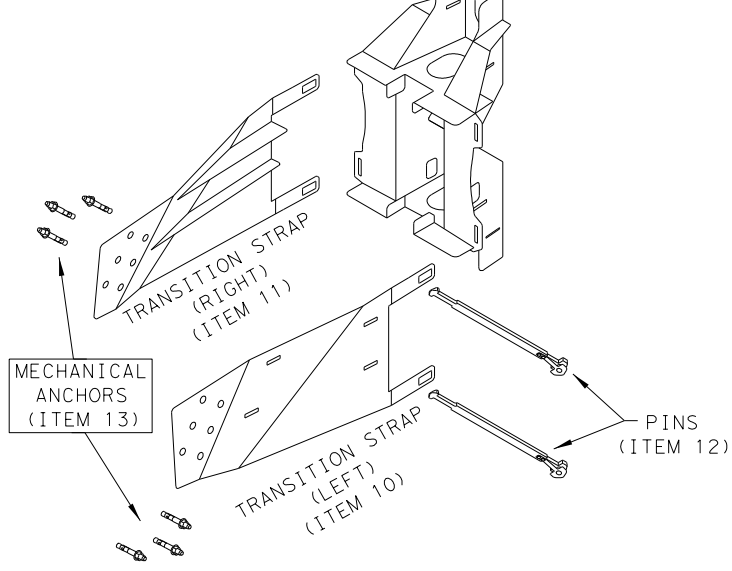
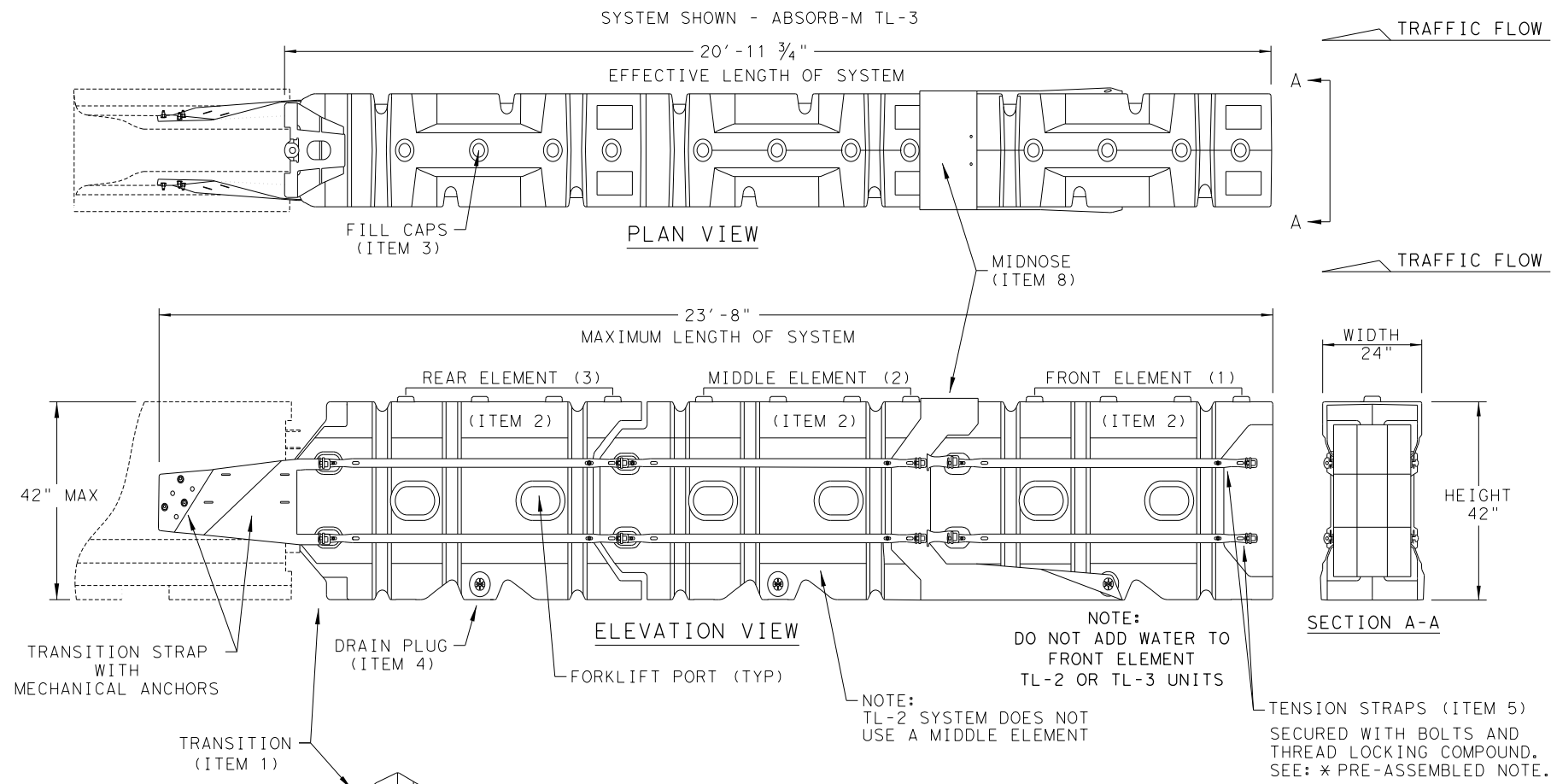


**SINGLE SLOPE CONCRETE BARRIER**  
 PRECAST BARRIER (TYPE 1)  
 SSCB(2)-10

FILE: sscb210.dgn	DN: TxDOT	CK: AM	DW: VP	CK:
©TxDOT December 2010	CONT	SECT	JOB	HIGHWAY
REVISIONS	0493	02	021	RM 652
	DIST	COUNTY	SHEET NO.	
	ODA	LOVING	39	

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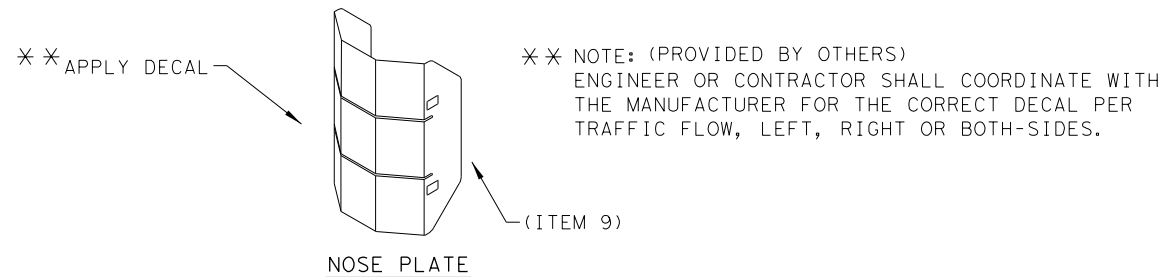


THE ABSORB-M IS A NON-REDIRECTIVE, GATING, CRASH CUSHION DESIGNED TO MEET THE LATEST TL-3 & TL-2 MASH REQUIREMENTS.

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.



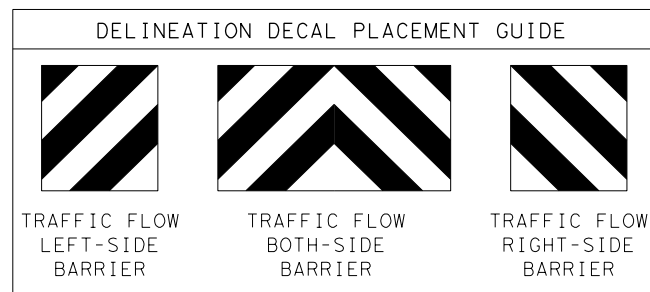
NOTE: APPLY A HIGH REFLECTIVE DECAL TO THE NOSE PLATE. DELINEATION DECAL ORIENTATION IS SHOWN ON THE CONSTRUCTION PLAN SET AND SHALL BE IN ACCORDANCE WITH THE TEXAS MUTCD FOR (TRAFFIC CONTROL DEVICES). DECALS ARE AVAILABLE FOR TRAFFIC FLOW ON THE LEFT-SIDE, BOTH -SIDES AND RIGHT-SIDE.

**GENERAL NOTES**

- 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
- THE ABSORB-M SYSTEM IS ONLY APPROVED FOR USE IN (TEMPORARY WORK ZONE) LOCATIONS.
- 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.
- MAXIMUM PERMISSIBLE CROSS-SLOPE IS 8%.
- THE INSTALLATION AREA SHOULD BE FREE FROM CURBS, ELEVATED OBJECTS, OR DEPRESSIONS.
- THE ABSORB-M SHOULD BE LOCATED APPROXIMATELY PARALLEL WITH THE BARRIER.
- THE USE OF THE ABSORB-M IS RESTRICTED TO A BARRIER HEIGHT OF UP TO 42 INCHES.
- DO NOT ADD WATER TO FRONT ELEMENT (TL-2 OR TL-3 UNIT).

ITEM #	PART NUMBER	PART DESCRIPTION	QTY	
			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

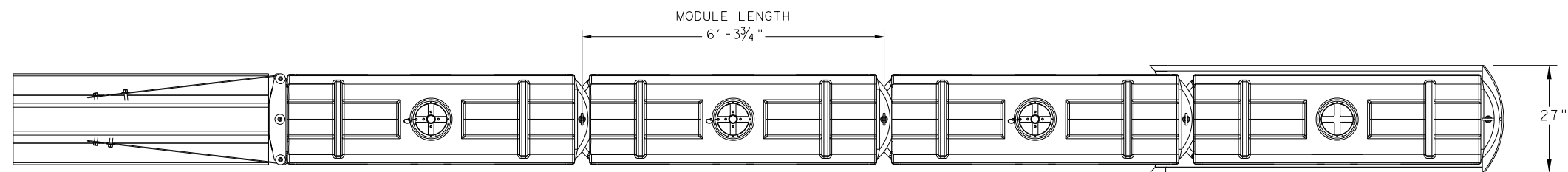
\* COMPONENTS PRE-ASSEMBLED WITH ELEMENT ASSEMBLY



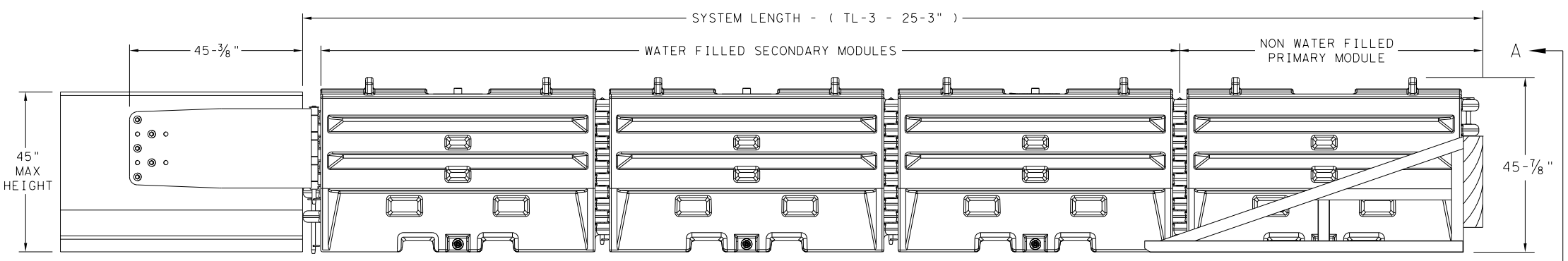
SACRIFICIAL

		<b>Design Division Standard</b>	
<b>LINDSAY TRANSPORTATION SOLUTIONS          CRASH CUSHION          (MASH TL-3 &amp; TL-2)          TEMPORARY - WORK ZONE          ABSORB (M) - 19</b>			
FILE: absorbm19	DN: TxDOT	CK: KM	DW: VP
© TxDOT: JULY 2019	CONT SECT	JOB	HIGHWAY
REVISIONS	0493 02	021	RM 652
	DIST	COUNTY	SHEET NO.
	ODA	LOVING	40

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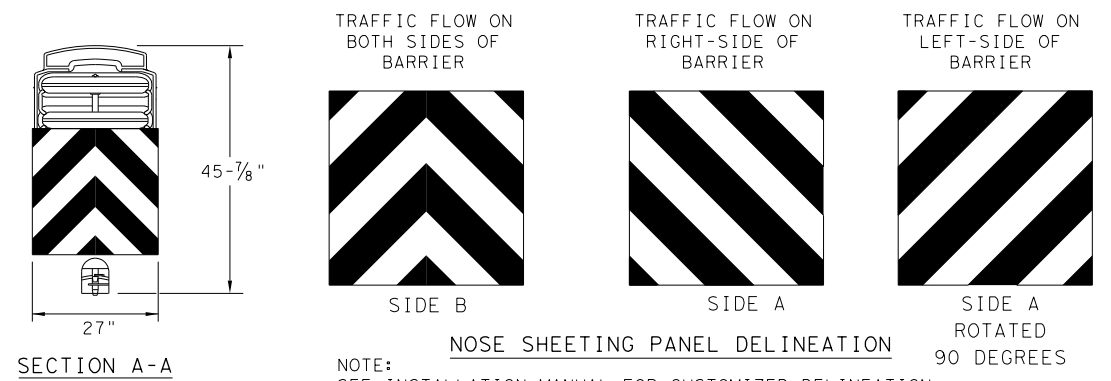
PLAN VIEW



ELEVATION VIEW

**GENERAL NOTES**

- REFER TO THE INSTALLATION MANUAL FOR SPECIFIC SYSTEM ASSEMBLY AND MODULE ORIENTATION. FOR ADDITIONAL INFORMATION, CONTACT TRAFFIX, INC. AT (949) 361-5663.
- 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.
- MAXIMUM PERMISSIBLE CROSS SLOPE IS 8° (DEGREES) (14%).
- THE INSTALLATION AREA SHOULD BE FREE FROM CURBS, ELEVATED OBJECTS, OR DEPRESSIONS.
- 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

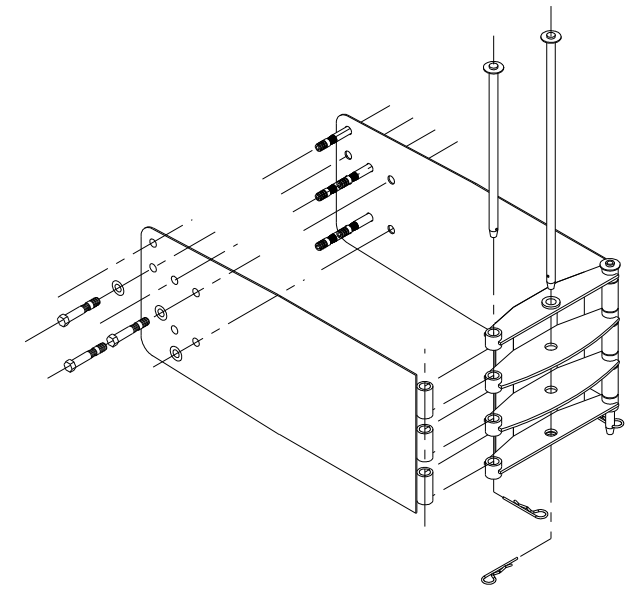


SECTION A-A

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

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

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



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

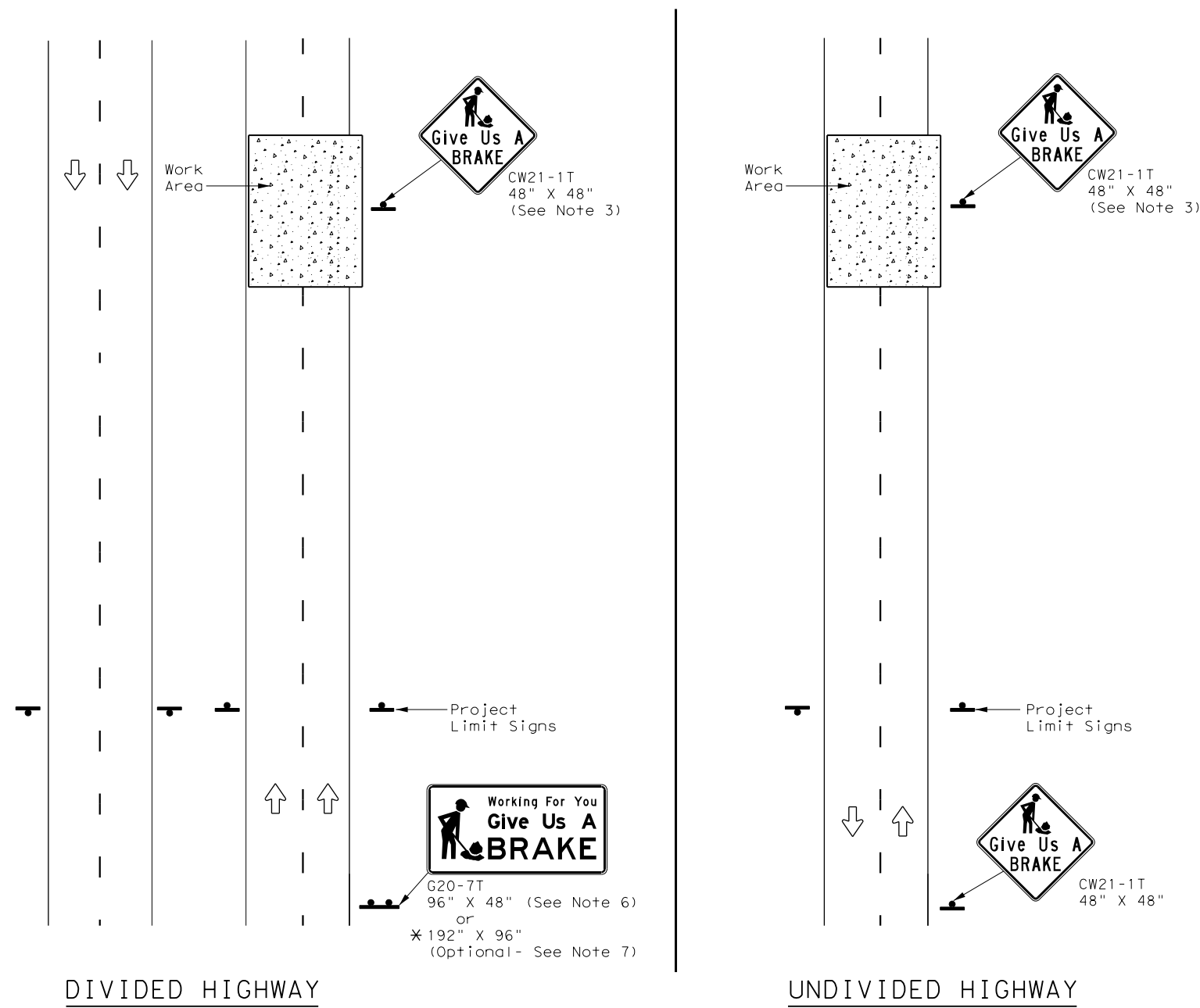
Design Division Standard

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

FILE: sled19.dgn	DN: TxDOT	CK: KM	DW: VP	CK:
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DIST	COUNTY	SHEET NO.		
ODA	LOVING	41		

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SIGNS ARE SHOWN FOR ONE DIRECTION OF TRAVEL

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

SUMMARY OF LARGE SIGNS

BACKGROUND COLOR	SIGN DESIGNATION	SIGN	SIGN DIMENSIONS	REFLECTIVE SHEETING	SQ FT	GALVANIZED STRUCTURAL STEEL		DRILLED SHAFT
						Size	(LF)	
							① ②	24" DIA. (LF)
Orange	G20-7T		96" X 48"	Type B <sub>FL</sub> or C <sub>FL</sub>	32	▲	▲ ▲	▲
Orange	G20-7T		192" X 96"	Type B <sub>FL</sub> or C <sub>FL</sub>	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 <sub>FL</sub> OR TYPE C <sub>FL</sub>
BLACK	LEGEND & BORDERS	NON-REFLECTIVE ACRYLIC FILM

GENERAL NOTES

- See BC and SMD sheets for additional sign support details.
- Sign locations shall be approved by the Engineer.
- 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.
- 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.
- Give Us a Brake (CW21-1T) signs and supports shall be considered subsidiary to Item 502, "Barricades, Signs and Traffic Handling."
- 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.
- 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
- 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.



WORK ZONE  
 "GIVE US A BRAKE"  
 SIGNS

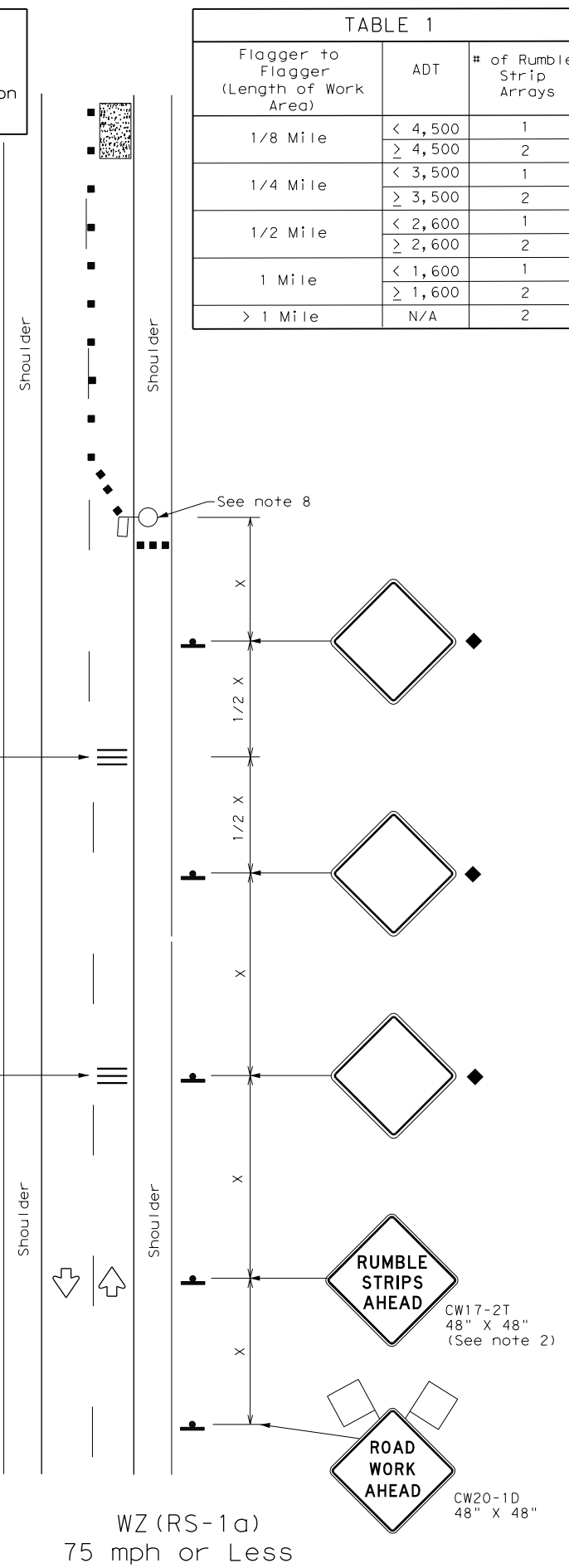
WZ (BRK) - 13

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6-96 5-98 7-13	DIST	COUNTY	SHEET NO.	
8-96 3-03	ODA	LOVING	42	

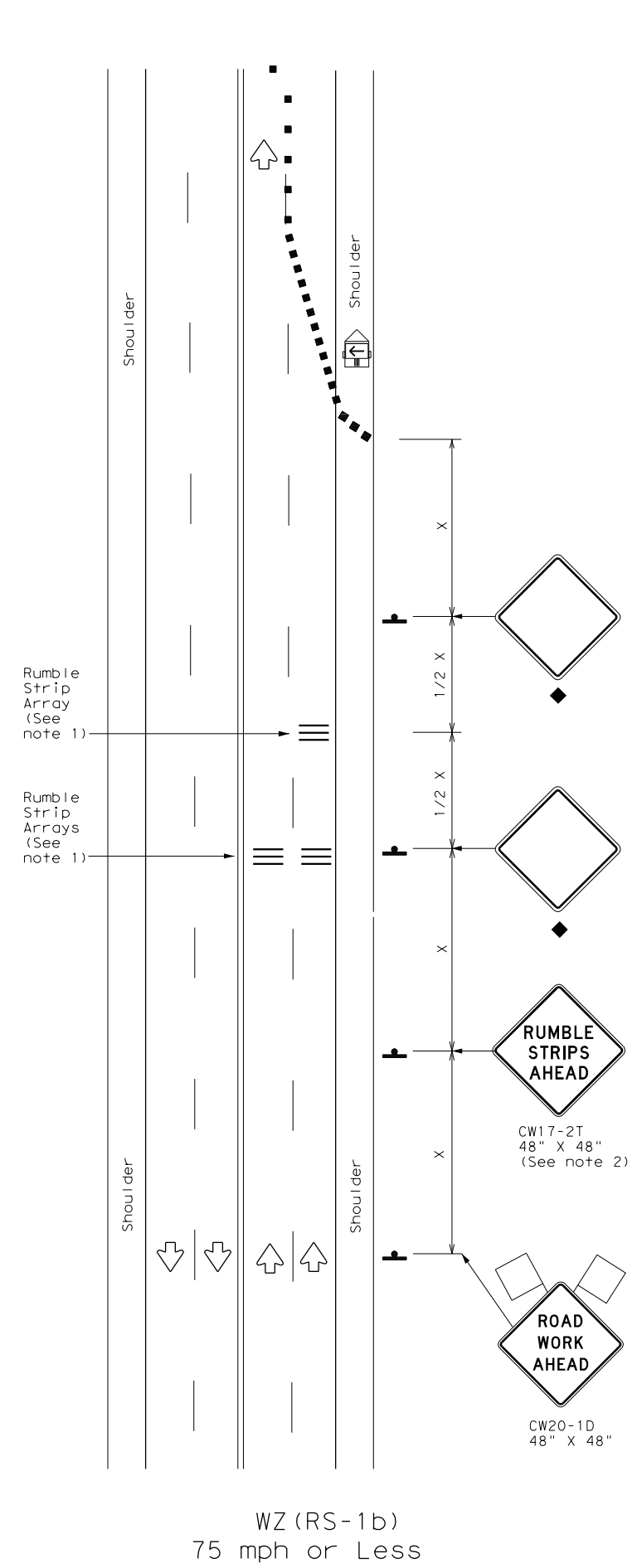
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Warning sign and rumble strip sequence in opposite direction is same as below

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)  
 75 mph or Less  
 RUMBLE STRIPS ON ONE-LANE TWO-WAY APPLICATION



WZ (RS-1b)  
 75 mph or Less  
 RUMBLE STRIPS FOR LANE CLOSURE ON CONVENTIONAL ROADWAY

GENERAL NOTES

- 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.
- 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.
- Temporary Rumble Strips will be considered subsidiary to Item 502, and shall be a product listed on the Compliant Work Zone Traffic Control Devices.
- Removal of the Temporary Rumble Strips should be accomplished before removing the advance warning signs.
- Temporary Rumble Strips should not be used on horizontal curves, loose gravel, soft or bleeding asphalt, heavily rutted pavements or unpaved surfaces.
- Temporary Rumble Strips shall be installed and maintained as per manufacturer's recommendations.
- This standard sheet shall be used in conjunction with other appropriate TCP standard, TMUTCD typical application or project specific detail for the project.
- The one-lane two-way application may utilize a flagger, an AFAD or a portable traffic signal.
- Temporary Rumble Strips may be used on freeways or expressways based on engineering judgment.

Speed	Approximate distance between strips in an Array
≤ 40 MPH	10'
> 40 MPH & ≤ 55 MPH	15'
> 55 MPH	20'

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

Posted Speed *	Formula	Minimum Desirable Taper Lengths **			Suggested Maximum Spacing of Channelizing Devices		Minimum Sign Spacing "x" Distance	Suggested Longitudinal Buffer Space "B"
		10' Offset	11' Offset	12' Offset	On a Taper	On a Tangent		
30	L = WS <sup>2</sup> / 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)

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.

Texas Department of Transportation  
 Traffic Operations Division Standard

## TEMPORARY RUMBLE STRIPS

### WZ (RS) - 16

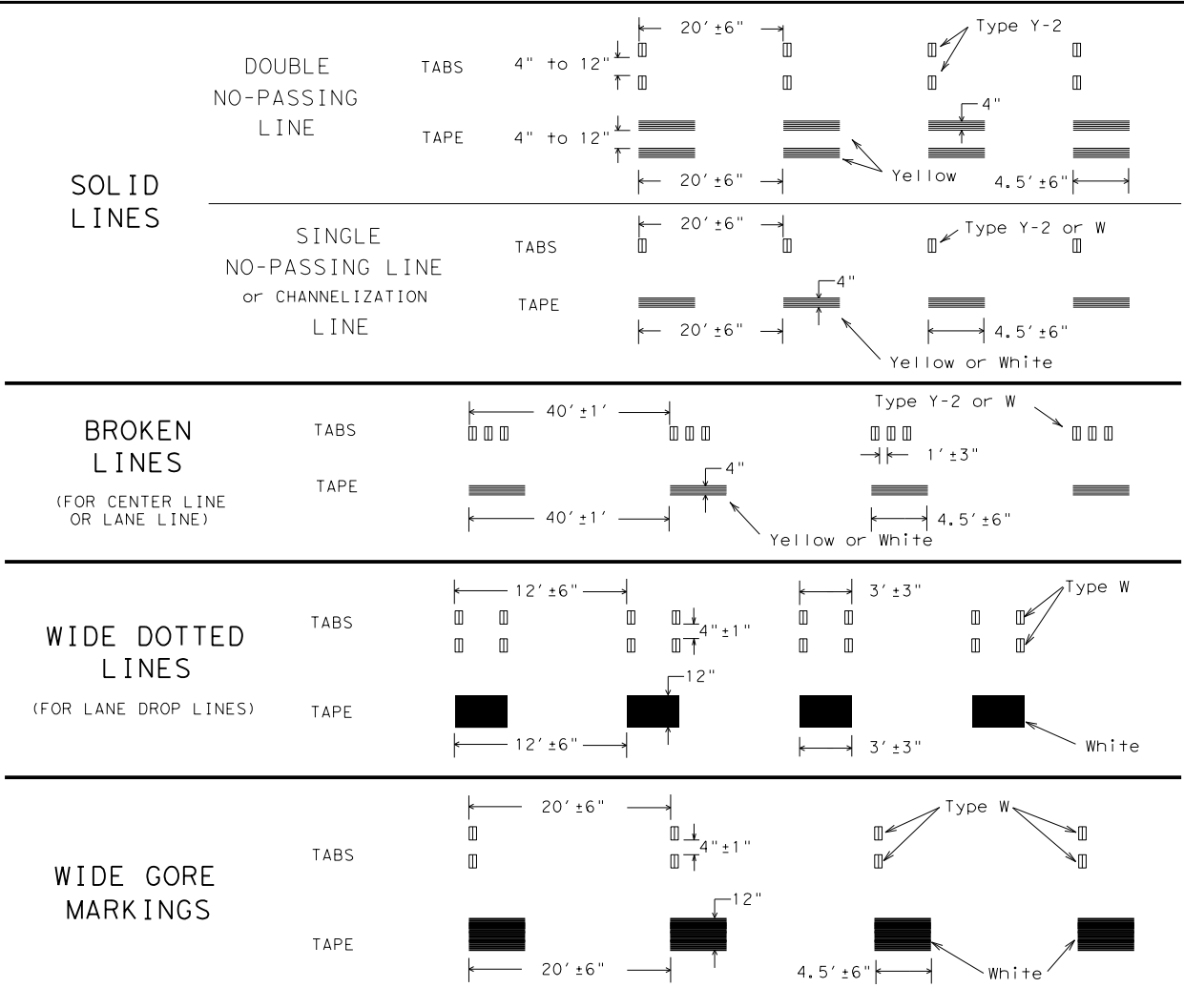
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© TxDOT November 2012	CONT	SECT	JOB	HIGHWAY
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2-14	DIST	COUNTY	SHEET NO.	
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## WORK ZONE SHORT TERM PAVEMENT MARKINGS DETAILS



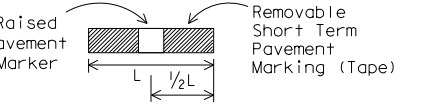
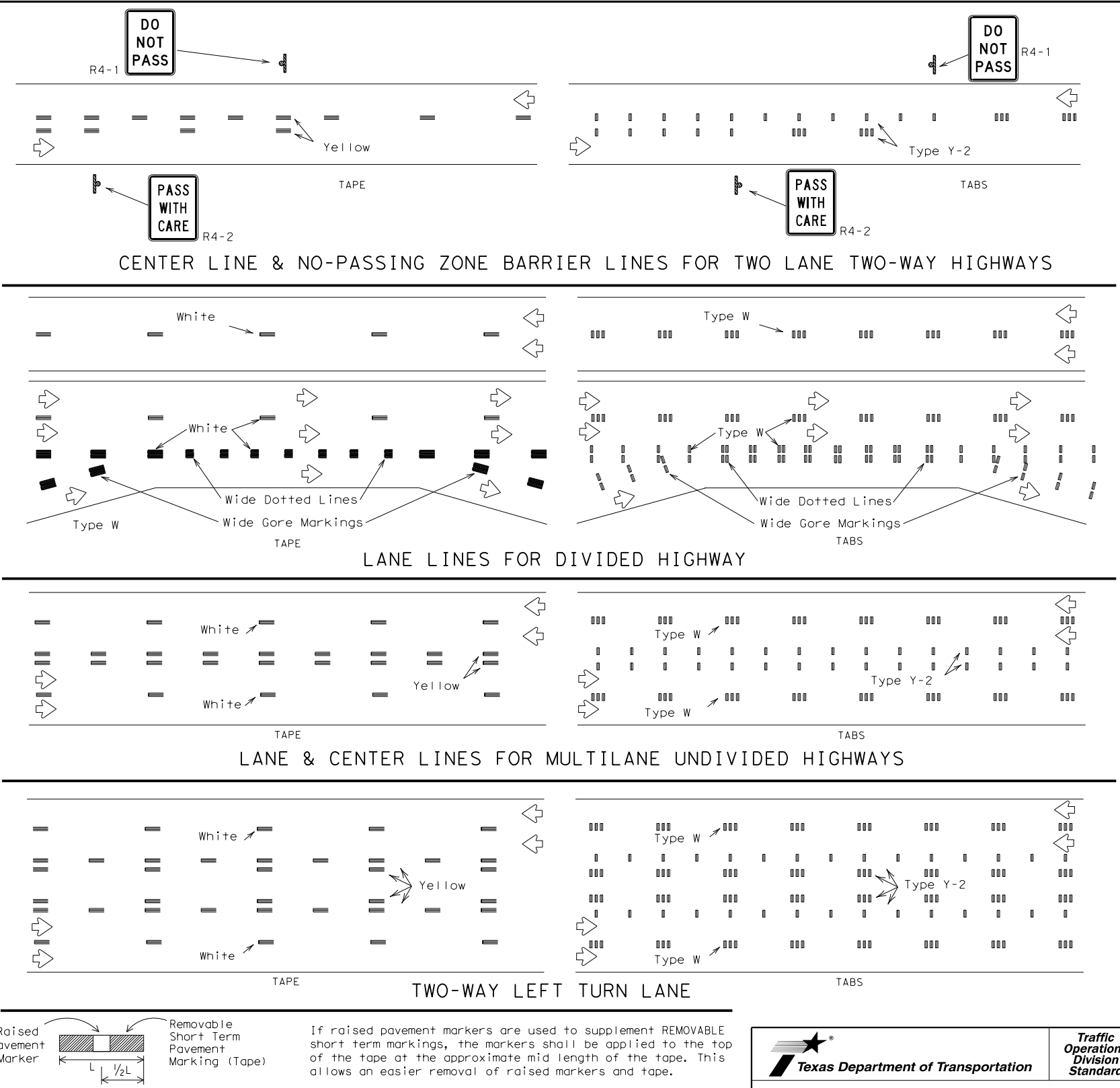
### NOTES:

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

### TEMPORARY FLEXIBLE, REFLECTIVE ROADWAY MARKER TABS (TABS)

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

## WORK ZONE SHORT TERM PAVEMENT MARKINGS PATTERNS



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

### PREFABRICATED PAVEMENT MARKINGS

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

### RAISED PAVEMENT MARKERS

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

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

- DMSs referenced above can be found along with embedded links to their respective MPLs at the following website:  
[http://www.txdot.gov/business/contractors\\_consultants/material\\_specifications/default.htm](http://www.txdot.gov/business/contractors_consultants/material_specifications/default.htm)



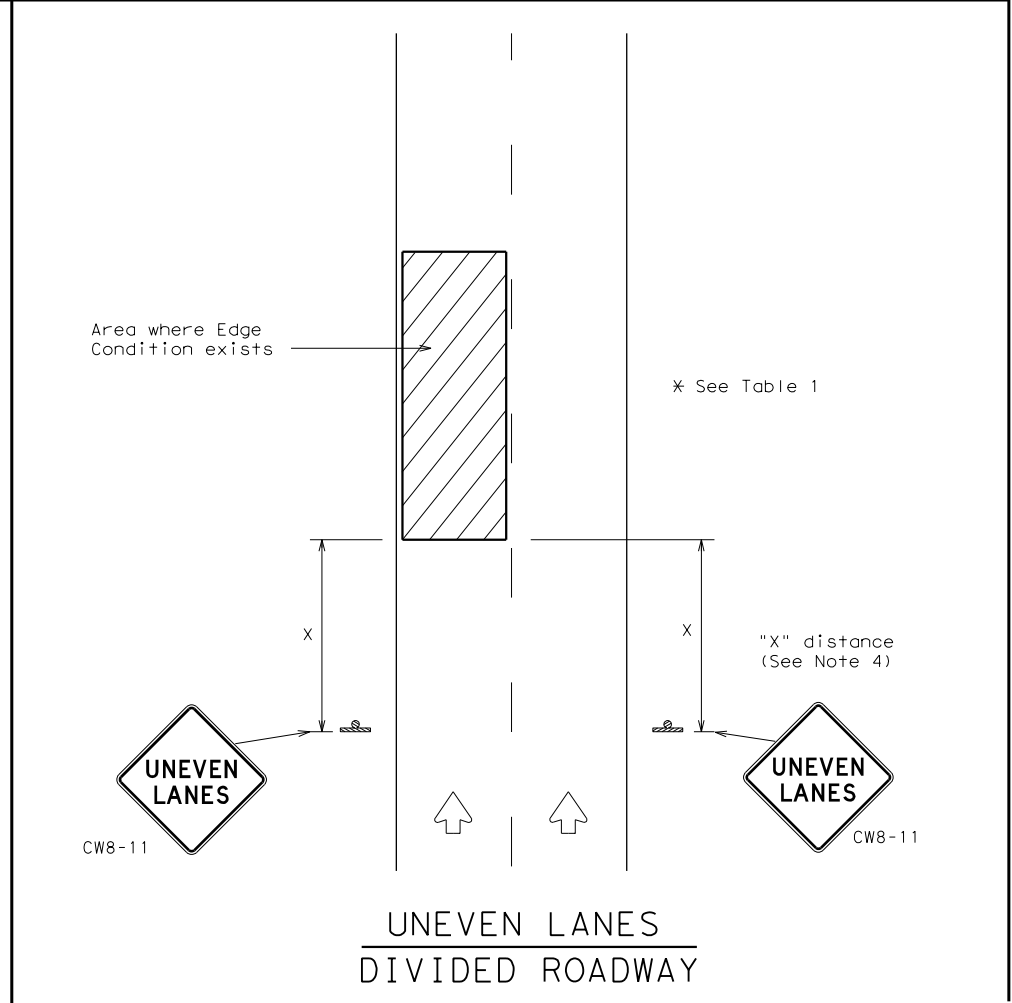
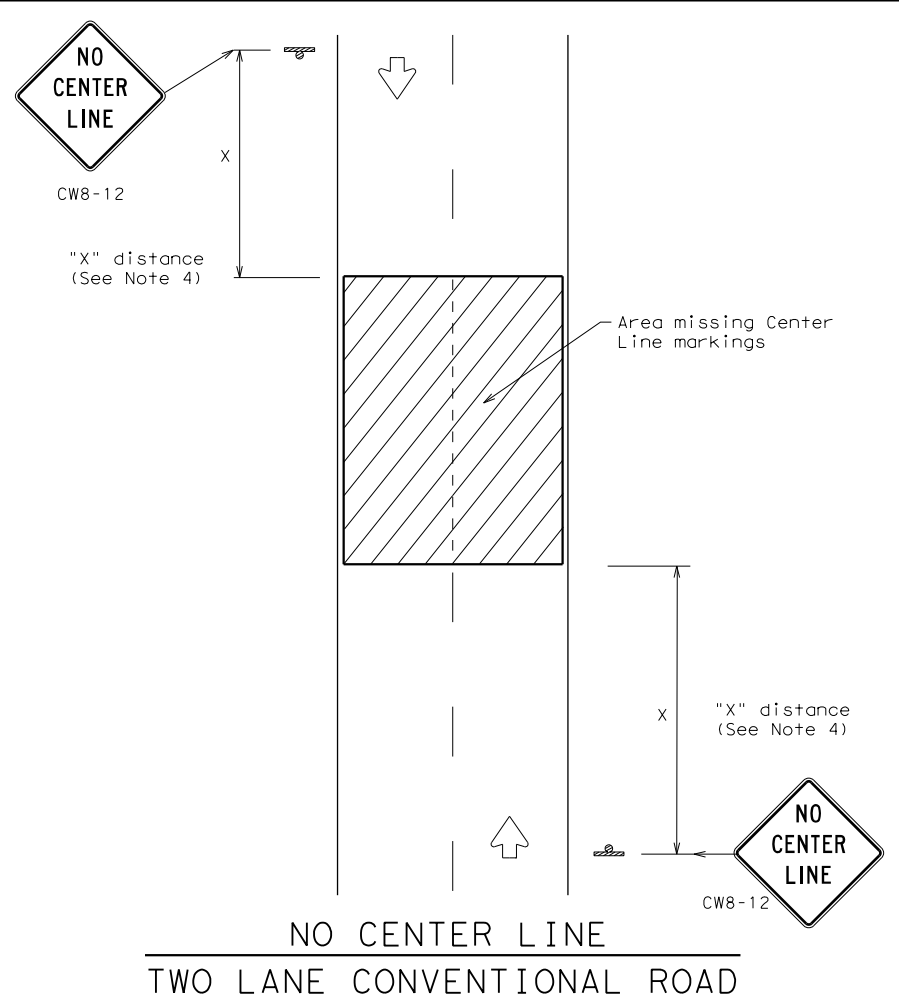
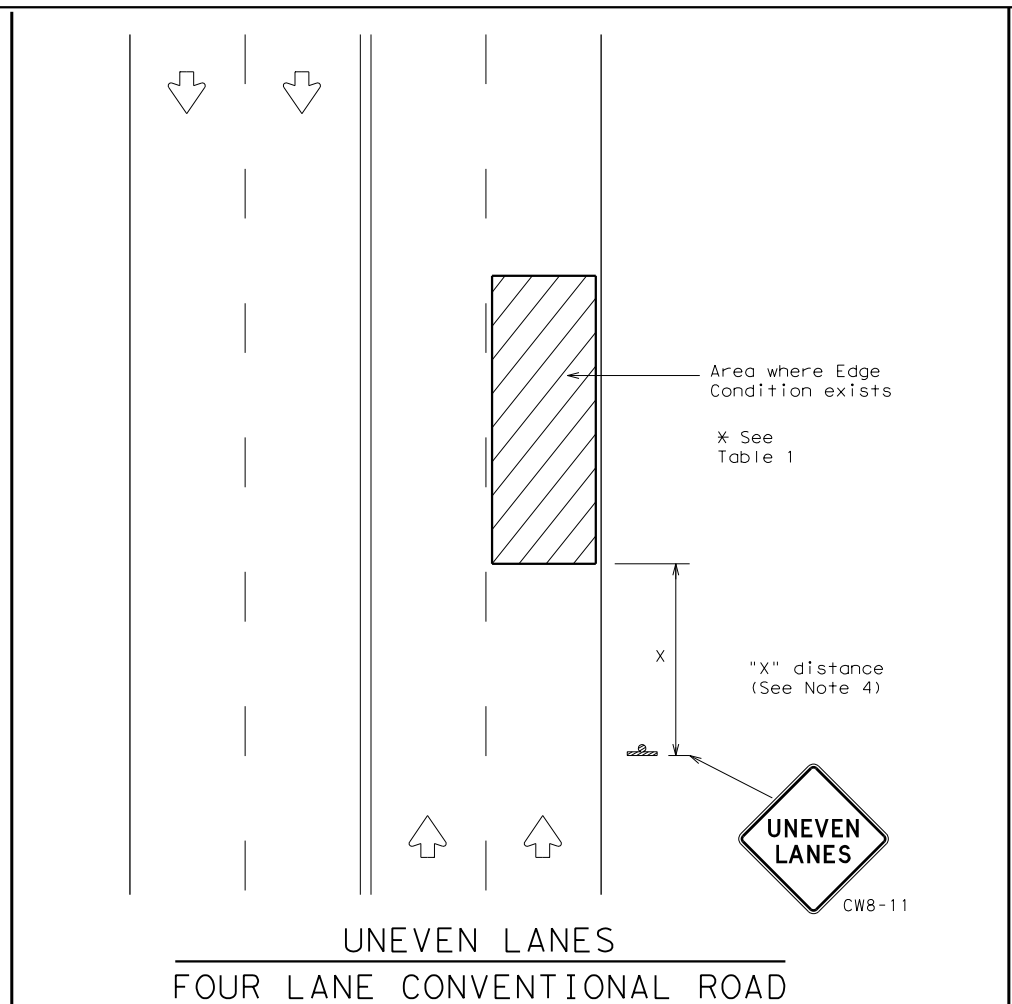
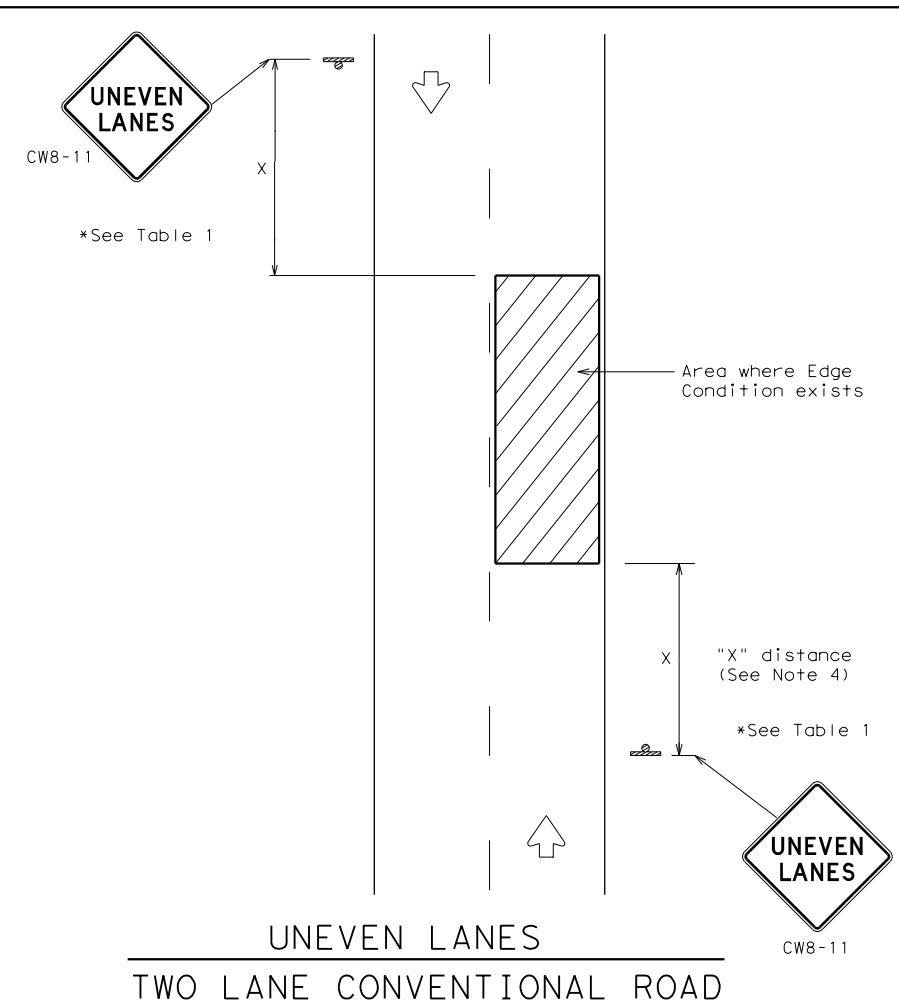
## WORK ZONE SHORT TERM PAVEMENT MARKINGS

### WZ (STPM) - 13

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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 <sub>FL</sub> OR TYPE C <sub>FL</sub> SHEETING
BLACK	LEGEND & BORDERS	ACRYLIC NON-REFLECTIVE SHEETING

**GENERAL NOTES**

- 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.
- 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.
- 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.
- Signs shall be spaced at the distances recommended as per BC standards.
- 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."
- 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.
- Short term markings shall not be used to simulate edge lines.
- 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: 1/4" (maximum-planing) 1/2" (typical-overlay)	Sign: CW8-11
②	Less than or equal to 3"	Sign: CW8-11
③	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"



SIGNING FOR UNEVEN LANES

WZ (UL) - 13

FILE: WZUL-13.dgn	DN: TxDOT	CK: TxDOT	DN: TxDOT	CK: TxDOT
© TxDOT April 1992	CONT	SECT	JOB	HIGHWAY
REVISIONS	0493	02	021	RM 652
8-95 2-98 7-13	DIST	COUNTY	SHEET NO.	
1-97 3-03	ODA	LOVING	45	

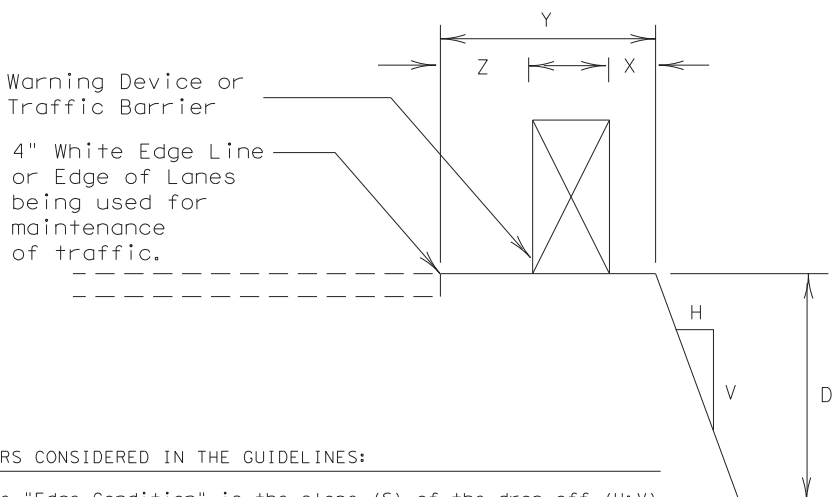
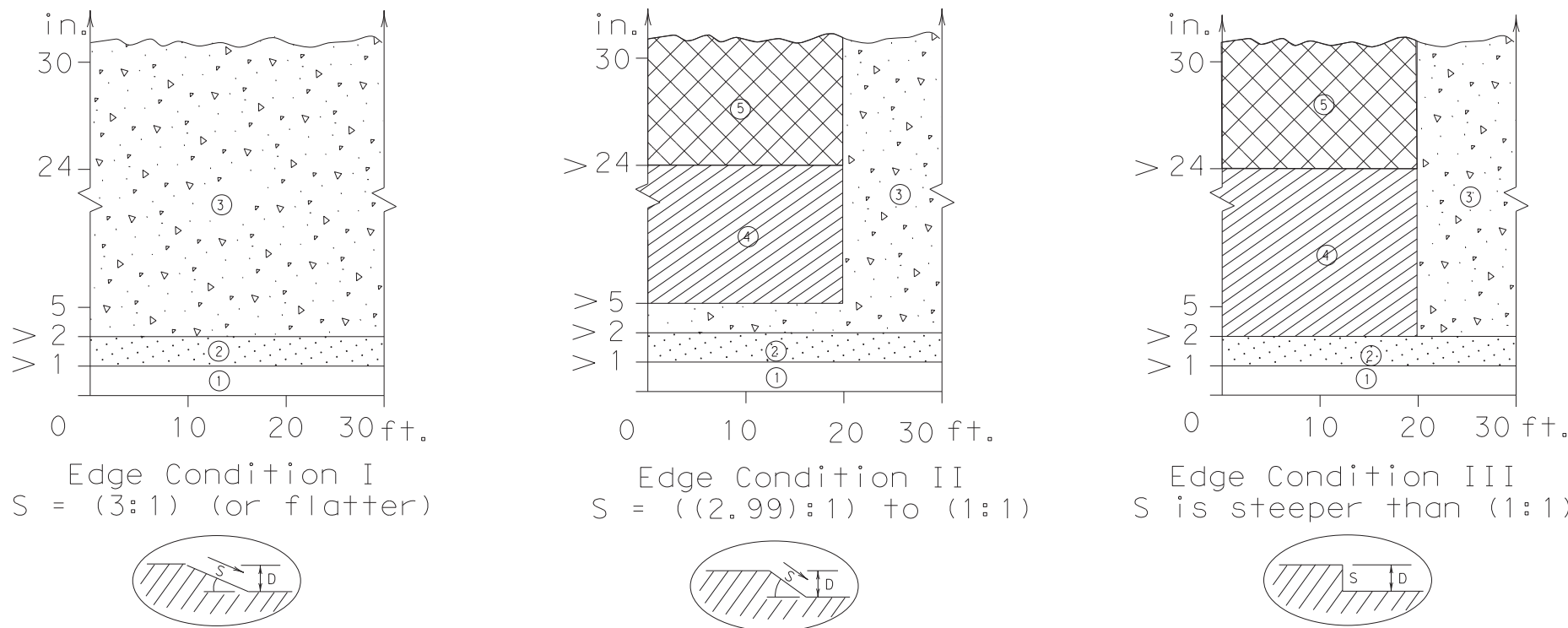
DISCLAIMER: The use of this standard is governed by the "Texas Engineering Practice Act". No warranty of any kind is made by TxDOT for any purpose whatsoever. TxDOT assumes no responsibility for the conversion of this standard to other formats or for incorrect results or damages resulting from its use.

DISCLAIMER:

DATE: 6/24/2021  
FILE: c:\trainsystems\pw\_local\transyscorp-pw1\beshimane\k\0940080\EDGECON.dgn

**DEFINITION OF TREATMENT ZONES  
FOR VARIOUS EDGE CONDITIONS**

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

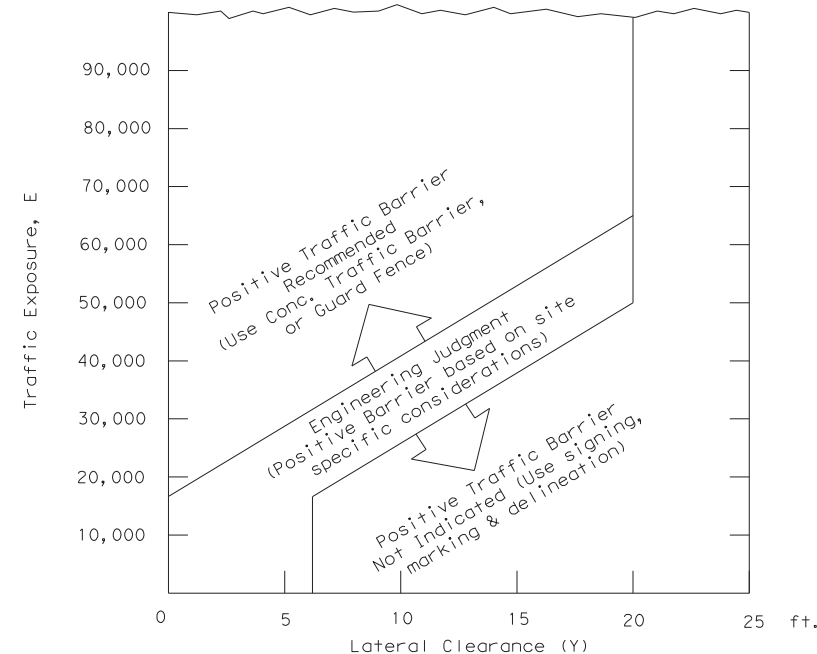


Zone	Treatment Types Guidelines:
①	No treatment.
②	CW 8-11 "Uneven Lanes" signs.
③	CW 8-9a "Shoulder Drop-Off" or CW 8-11 signs plus vertical panels.
④	CW 8-9a or CW 8-11, signs plus drums. Where restricted space precludes the use of drums, use vertical panels. An edge fill may be provided to change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

**Edge Condition Notes:**

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

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



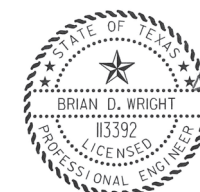
- E = ADT x T  
Where ADT is that portion of the average daily traffic volume traveling within 20 feet (generally two adjacent lanes) of the edge dropoff condition; and, T is the duration time in years of the dropoff condition.
- Figure-1 provides a practical approach to the use of positive barriers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

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

**FACTORS CONSIDERED IN THE GUIDELINES:**

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

Engineer's Seal



*Brian D. Wright*  
6/24/21

Date \_\_\_\_\_

Texas Department of Transportation  
Traffic Operations Division

**TREATMENT FOR VARIOUS  
EDGE CONDITIONS**

© TxDOT August 2000 REVISIONS 03-01 08-01 correct typos	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
	CONT	SECT	JOB	HIGHWAY
	0493	02	021	RM 652
	DIST	COUNTY		SHEET NO.
	ODA	LOVING		46

6/25/2021 7:49:50 AM

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REEVES COUNTY

LOVING COUNTY

CONTROL POINT # 101  
 APPROXIMATE LOCATION:  
 ON THE NORTH SIDE OF RM 652.  
 APPROXIMATELY 115' WEST OF THE  
 BRIDGE AT THE PECOS RIVER  
 APPROXIMATELY 70' NORTH OF THE  
 CENTERLINE OF RM 652.

US SURVEY FEET  
 NAVD 88 ELEVATION: 2,756.35  
 DATE SET: OCTOBER, 2020  
 MONUMENT: 5/8" CAPPED IRON  
 ROD STAMPED "TRANSYSTEMS"  
 SURFACE ENGLISH CO-ORDS  
 PROJECT SCALE FACTOR:  
 1.00017372, WITH ALL POINTS SCALED  
 FROM CONTROL POINT 3 (TXDOT MONUMENT)  
 NORTHING: 10,661,991.08  
 EASTING: 1,210,529.02

CONTROL POINT # 100  
 APPROXIMATE LOCATION:  
 ON THE NORTH SIDE OF RM 652.  
 APPROXIMATELY 370' EAST OF THE  
 BRIDGE AT THE PECOS RIVER  
 APPROXIMATELY 25' NORTH OF THE  
 CENTERLINE OF RM 652.

US SURVEY FEET  
 NAVD 88 ELEVATION: 2,758.88  
 DATE SET: OCTOBER, 2020  
 MONUMENT: 5/8" CAPPED IRON ROD  
 STAMPED "TRANSYSTEMS"  
 SURFACE ENGLISH CO-ORDS  
 PROJECT SCALE FACTOR:  
 1.00017372, WITH ALL POINTS SCALED  
 FROM CONTROL POINT 3 (TXDOT MONUMENT)  
 NORTHING: 10,661,925.09  
 EASTING: 1,211,195.82

CP-101

CP-102

CP-100

RM 652

CONTROL POINT # 102

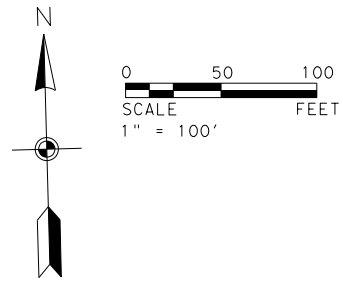
APPROXIMATE LOCATION:  
 ON THE NORTH SIDE OF  
 RM 652. APPROXIMATELY 20'  
 WEST OF THE BRIDGE AT THE  
 PECOS RIVER  
 APPROXIMATELY 30' NORTH  
 OF THE CENTERLINE OF  
 RM 652.

US SURVEY FEET  
 NAVD 88 ELEVATION: 2,761.24  
 DATE SET: OCTOBER, 2020  
 MONUMENT: 5/8" CAPPED IRON  
 ROD STAMPED "TRANSYSTEMS"  
 SURFACE ENGLISH CO-ORDS  
 PROJECT SCALE FACTOR:  
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 POINTS SCALED FROM CONTROL  
 POINT 3 (TXDOT MONUMENT)  
 NORTHING: 10,661,945.31  
 EASTING: 1,210,611.67

AERIAL UTILITY CROSSING

RIVER FLOWLINE/COUNTY LINE

PECOS RIVER



DATUM NOTE:

HORIZONTAL COORDINATES SHOWN ARE IN U.S. SURVEY FEET AND ARE BASED UPON THE TEXAS COORDINATE SYSTEM OF 1983, CENTRAL ZONE (4203), AND ADJUSTED TO SURFACE USING A SURFACE ADJUSTMENT FACTOR OF 1.00017372 WITH ALL POINTS SCALED FROM CONTROL POINT 3 (NORTHING 10670891.98, EASTING 1219378.23) PER SURVEY CONTROL INDEX SHEET DATED 12/17/2015 AND SIGNED 3/14/17. VALUES WERE DERIVED FROM BASE/ROVER SETUP ON KNOWN CONTROL IN OCTOBER 2020.

VERTICAL IS NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD 88) AND BASED ON THREE (3) NGS FIRST ORDER BENCHMARKS (S 1391, T 1391 & U 1391), COMPUTED USING GEOID 12A. VALUES WERE DERIVED FROM BASE/ROVER SETUP ON KNOWN CONTROL IN OCTOBER 2020.

KENNETH D. ERWIN  
 REGISTERED PROFESSIONAL LAND SURVEYOR  
 TEXAS REGISTRATION #5554  
 TRANSYSTEMS CORPORATION  
 500 W. SEVENTH ST., STE. 1100  
 FORT WORTH, TX 76102  
 TX SURVEY FIRM NO. 10038300

THE CONTROL POINTS SHOWN HEREIN WERE DETERMINED BY A SURVEY MADE ON THE GROUND UNDER MY SUPERVISION IN OCTOBER OF 2020.

TEXAS REGISTERED ENGINEERING FIRM F-3557



500 W. 7th ST. SUITE 1100  
 FORT WORTH, TX 76102  
 (817) 339-8950  
 FIRM REG. #: 3557



RM 652  
 SURVEY CONTROL INDEX

SCALE: 1" = 100' SHEET 1 OF 1

POINT NO.	NORTHING	EASTING	ELEVATION	DESCRIPTION
CP-100	10,661,925.09	1,211,195.82	2,758.88	5/8" CAPPED IRON ROD STAMPED "TRANSYSTEMS"
CP-101	10,661,991.08	1,210,529.02	2,756.35	5/8" CAPPED IRON ROD STAMPED "TRANSYSTEMS"
CP-102	10,661,945.31	1,210,611.67	2,761.24	5/8" CAPPED IRON ROD STAMPED "TRANSYSTEMS"

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.			HIGHWAY NO.
BMR	6	SEE TITLE SHEET			RM 652
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.	
BMR	TEXAS	ODA	LOVING	47	
CHECK	KMA	CHECK	CONTROL	SECTION	JOB
RR	0493	02	021		

RM 652  
CHAIN "RM652\_PR"

Chain RM652\_PR contains:  
CUR RM652\_PR1 CUR RM652\_PR2

Beginning chain RM652\_PR description

```

Curve Data
*-----*
Curve RM652_PR1
P.I. Station      6+07.59  N      10,661,944.28  E      1,209,603.64
Delta            = 16° 01' 21.13" (RT)
Degree           =  2° 01' 41.41"
Tangent          = 397.59
Length           = 790.00
Radius           = 2,825.00
External         = 27.84
Long Chord       = 787.43
Mid. Ord.        = 27.57
P.C. Station     2+10.00  N      10,661,844.75  E      1,209,218.70
P.T. Station     10+00.00  N      10,661,933.69  E      1,210,001.09
C.C.             = N      10,659,109.69  E      1,209,925.86
Back             = N 75° 30' 12.39" E
Ahead            = S 88° 28' 26.47" E
Chord Bear       = N 83° 30' 52.96" E

```

Course from PT RM652\_PR1 to PC RM652\_PR2 S 88° 28' 26.47" E Dist 1,451.21

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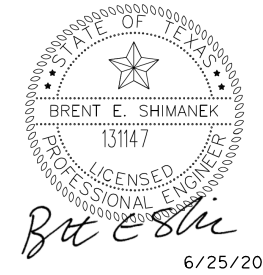
Curve Data
*-----*
Curve RM652_PR2
P.I. Station      28+50.62  N      10,661,884.41  E      1,211,851.05
Delta            = 15° 44' 14.19" (LT)
Degree           =  1° 58' 57.19"
Tangent          = 399.41
Length           = 793.79
Radius           = 2,890.00
External         = 27.47
Long Chord       = 791.30
Mid. Ord.        = 27.21
P.C. Station     24+51.21  N      10,661,895.04  E      1,211,451.79
P.T. Station     32+45.00  N      10,661,982.46  E      1,212,238.24
C.C.             = N      10,664,784.02  E      1,211,528.75
Back             = S 88° 28' 26.47" E
Ahead            = N 75° 47' 19.34" E
Chord Bear       = N 83° 39' 26.43" E

```

Ending chain RM652\_PR description

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6/25/2021  
TEXAS REGISTERED ENGINEERING FIRM F-3557

**TranSystems**  
500 W. 7th ST. SUITE 1100  
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(817) 339-8950  
FIRM REG. #: 3557

Texas Department of Transportation  
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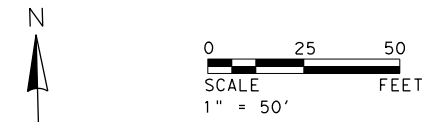
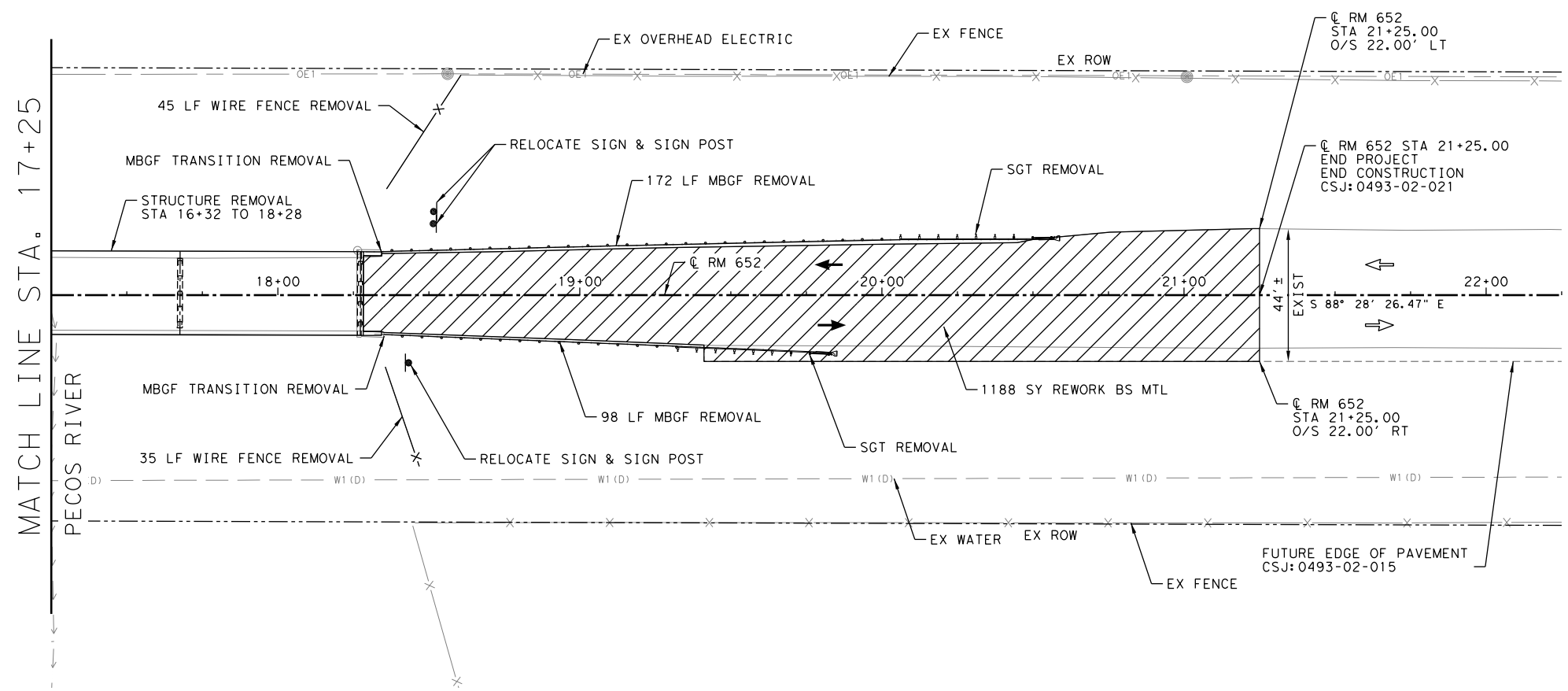
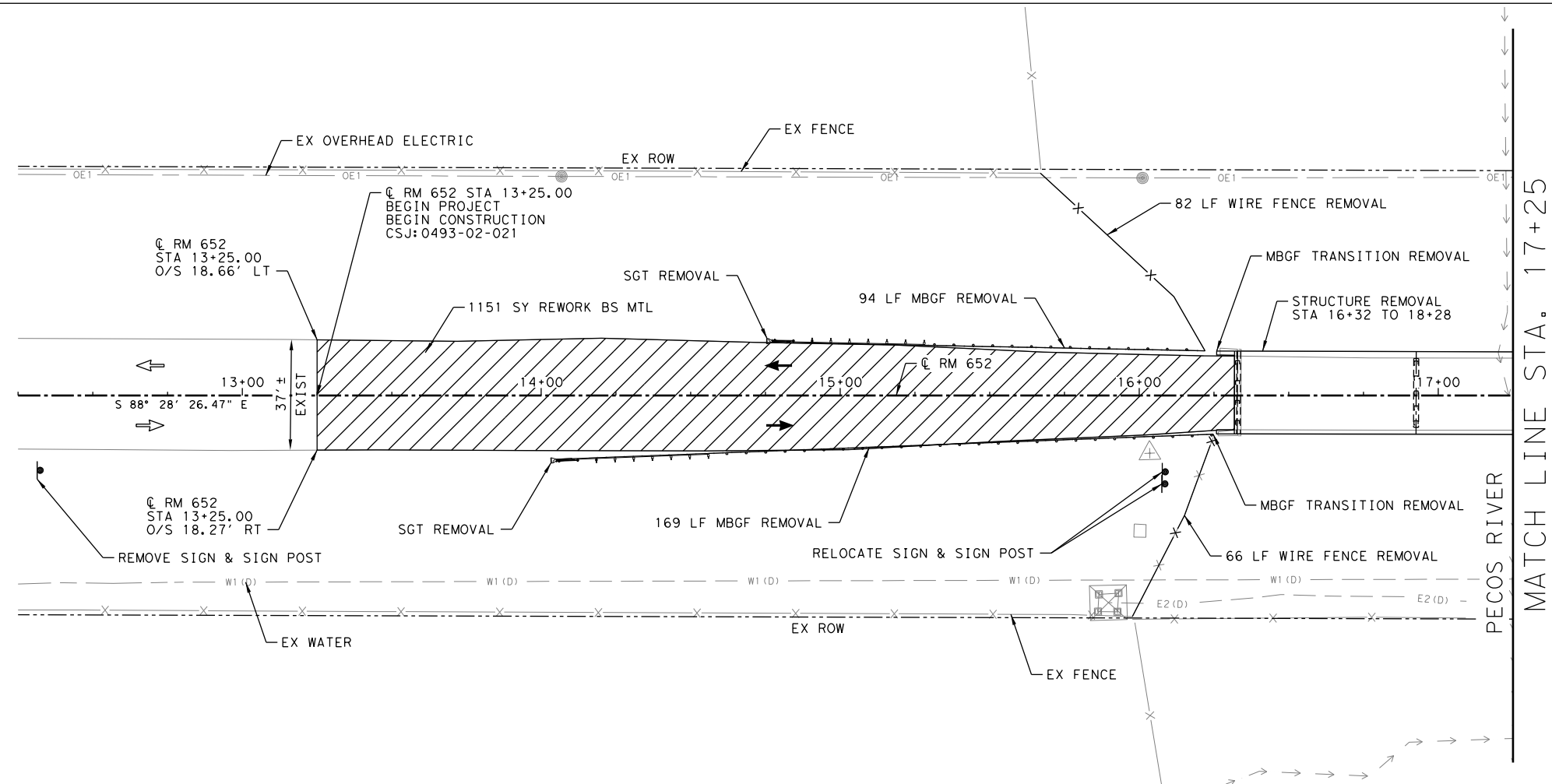
RM 652  
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ALIGNMENT DATA

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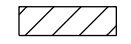






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CHECK	CONTROL	SECTION	JOB	
KMA	RR	0493	02 021	

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**LEGEND**

-  REWORK BS MTL (TY C) (0"-9") (ORD COMP)
-  REMOVE MBGF
-  REMOVE SGT
-  REMOVE WIRE FENCE
-  REMOVE SIGN & SIGN POST
-  PROPOSED LANE DIRECTION
-  EXISTING LANE DIRECTION



**TranSystems**  
 TEXAS REGISTERED ENGINEERING FIRM F-3557  
 500 W. 7th ST. SUITE 1100  
 FORT WORTH, TX 76102  
 (817) 339-8950  
 FIRM REG. #: 3557



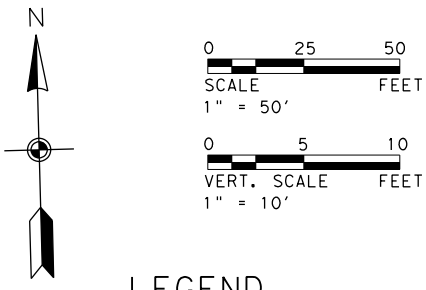
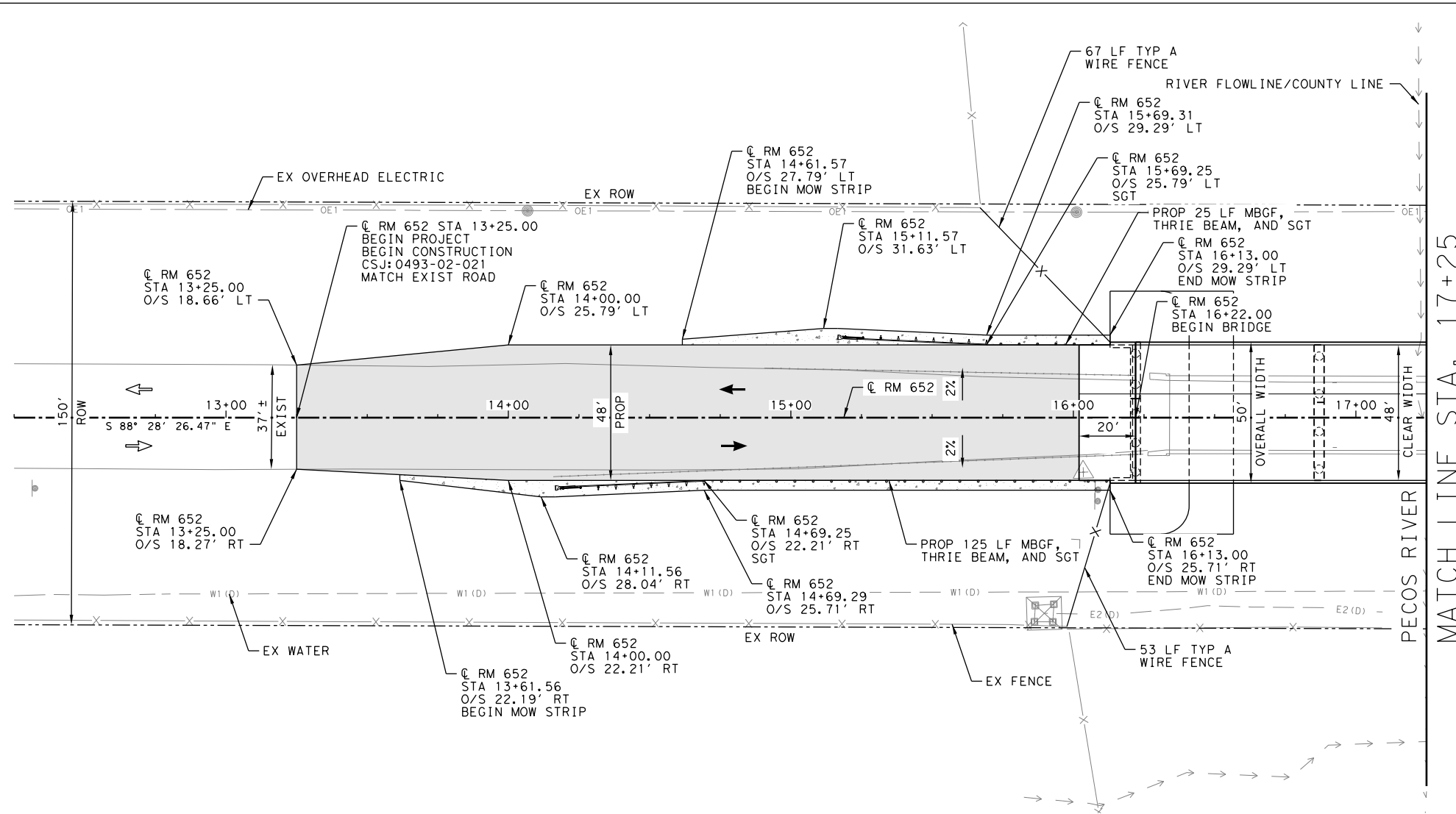
**RM 652  
REMOVAL PLAN**

SCALE: 1" = 50' PLAN SHEET 1 OF 1

DESIGN BES	FED. RD. DIV. NO. 6	FEDERAL AID PROJECT NO. SEE TITLE SHEET		HIGHWAY NO. RM 652
GRAPHICS BES	STATE TEXAS	DISTRICT ODA	COUNTY LOVING	SHEET NO. 49
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CHECK RR	0493	02	021	

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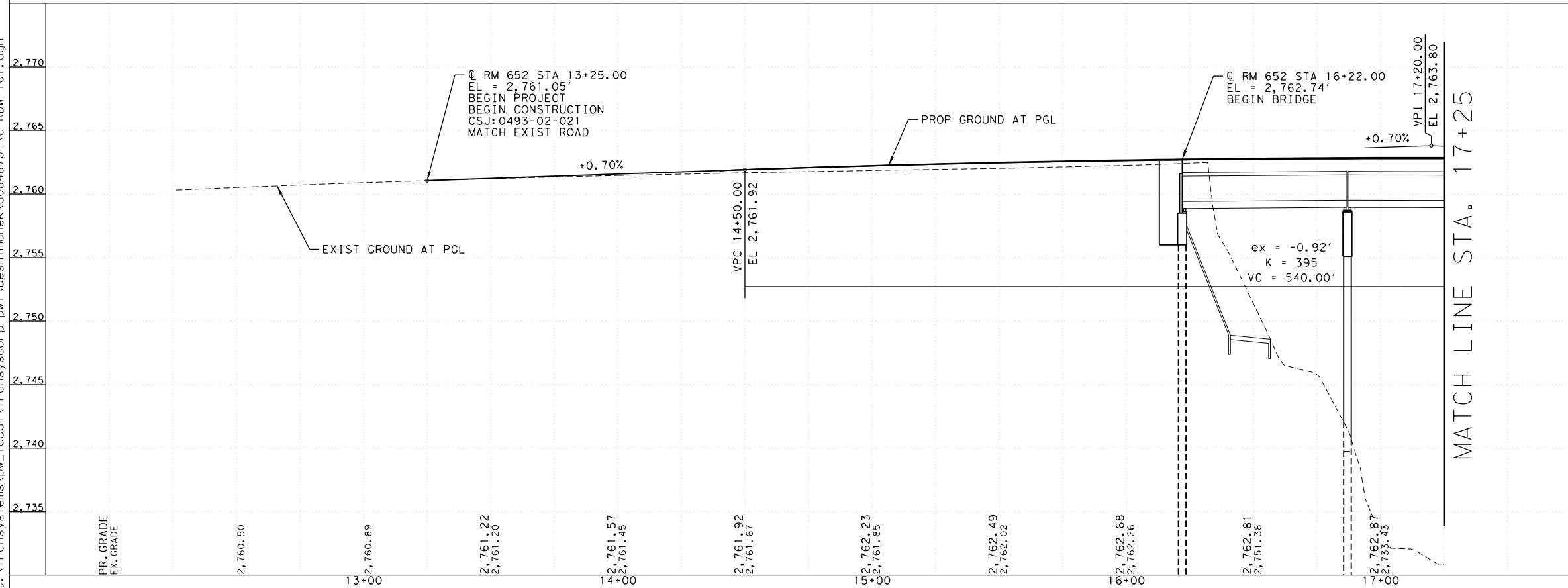
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**LEGEND**

	PROPOSED ASPHALT
	PROPOSED CONCRETE
	PROPOSED GUARD FENCE
	PROPOSED WIRE FENCE
	PROPOSED LANE DIRECTION
	EXISTING LANE DIRECTION
	EXISTING FENCE
	EXISTING FLOW ARROW

- NOTES:**
- REFER TO HORIZONTAL ALIGNMENT SHEET FOR ADDITIONAL INFORMATION.
  - THE CONTRACTOR SHALL NOTIFY UTILITY OWNERS AND VERIFY THE EXACT LOCATIONS OF ALL UTILITIES PRIOR TO CONSTRUCTION.
  - REFER TO BRIDGE LAYOUT FOR ADDITIONAL INFORMATION.



MATCH LINE STA. 17+25

**Brent E. Shimane**  
7/23/2021  
TEXAS REGISTERED ENGINEERING FIRM F-3557

500 W. 7th ST. SUITE 1100  
FORT WORTH, TX 76102  
(817) 339-8950  
FIRM REG. #: 3557

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**RM 652  
PLAN & PROFILE**  
BEGIN PROJECT TO STA 17+25

1" = 50' PLAN  
SCALE: 1" = 10' PROFILE

SHEET 1 OF 2

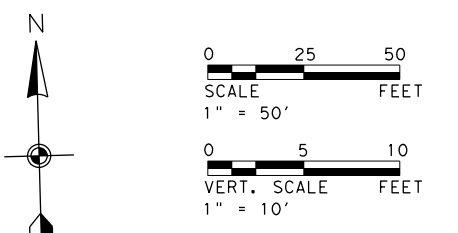
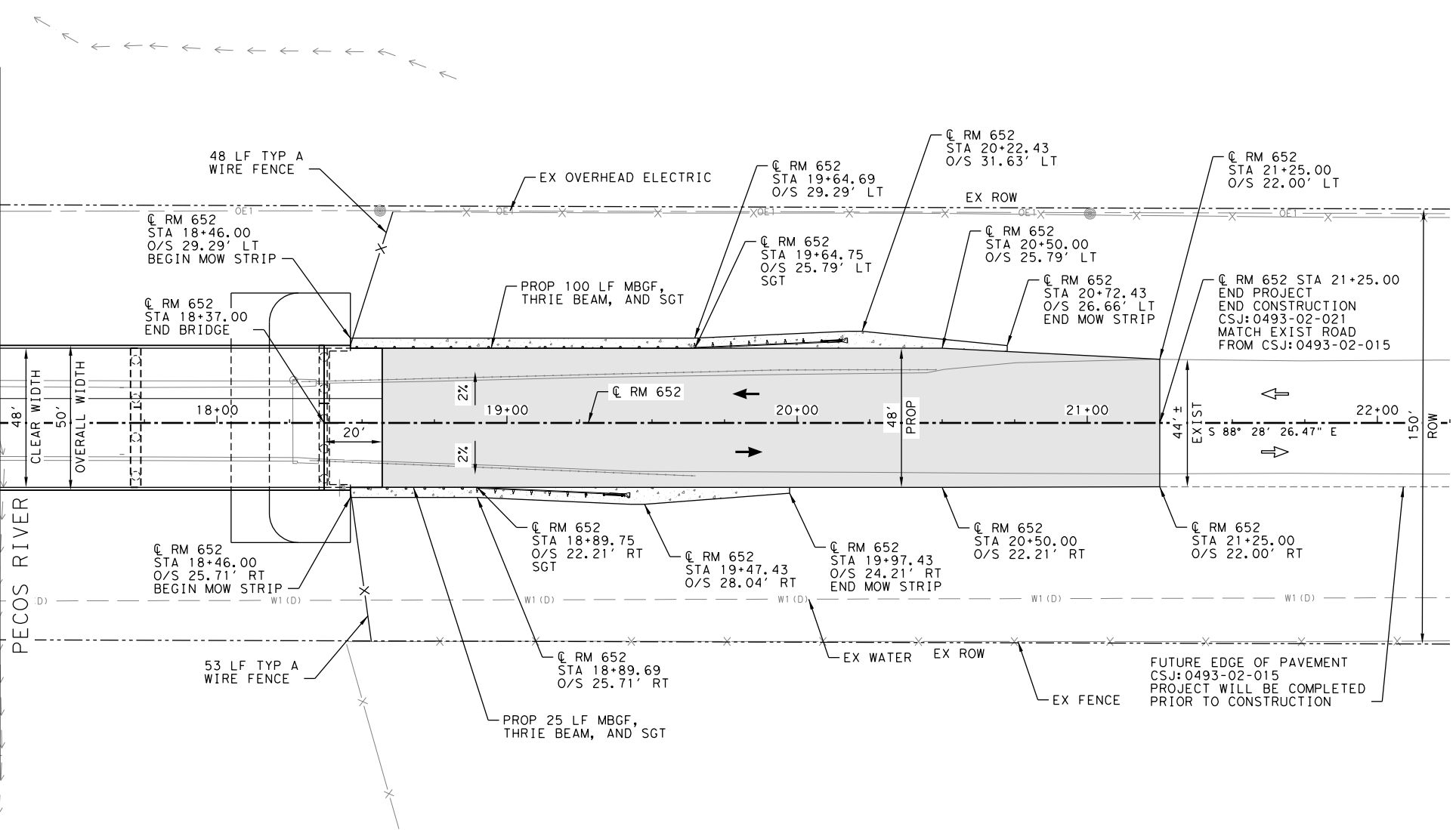
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CHECK RR	CONTROL	SECTION	JOB	50
	0493	02	021	

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MATCH LINE STA. 17+25

MATCH LINE STA. 17+25

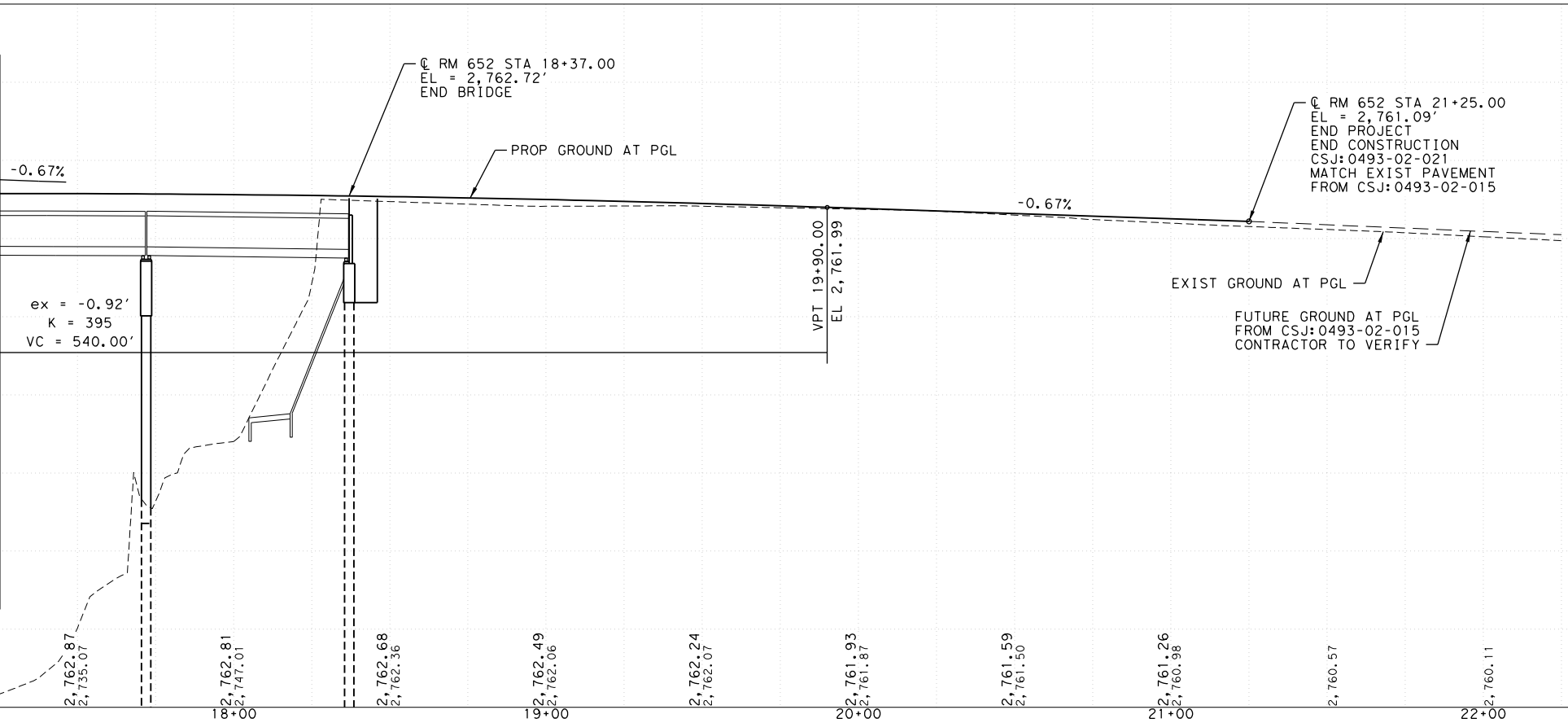


**LEGEND**

- PROPOSED ASPHALT
- PROPOSED CONCRETE
- PROPOSED GUARD FENCE
- PROPOSED WIRE FENCE
- PROPOSED LANE DIRECTION
- EXISTING LANE DIRECTION
- EXISTING FENCE
- EXISTING FLOW ARROW

**NOTES:**

1. REFER TO HORIZONTAL ALIGNMENT SHEET FOR ADDITIONAL INFORMATION.
2. THE CONTRACTOR SHALL NOTIFY UTILITY OWNERS AND VERIFY THE EXACT LOCATIONS OF ALL UTILITIES PRIOR TO CONSTRUCTION.
3. REFER TO BRIDGE LAYOUT FOR ADDITIONAL INFORMATION.



**TranSystems**  
 TEXAS REGISTERED ENGINEERING FIRM F-3557  
 500 W. 7th ST. SUITE 1100  
 FORT WORTH, TX 76102  
 (817) 339-8950  
 FIRM REG. #: 3557



**RM 652  
 PLAN & PROFILE  
 STA 17+25 TO END PROJECT**

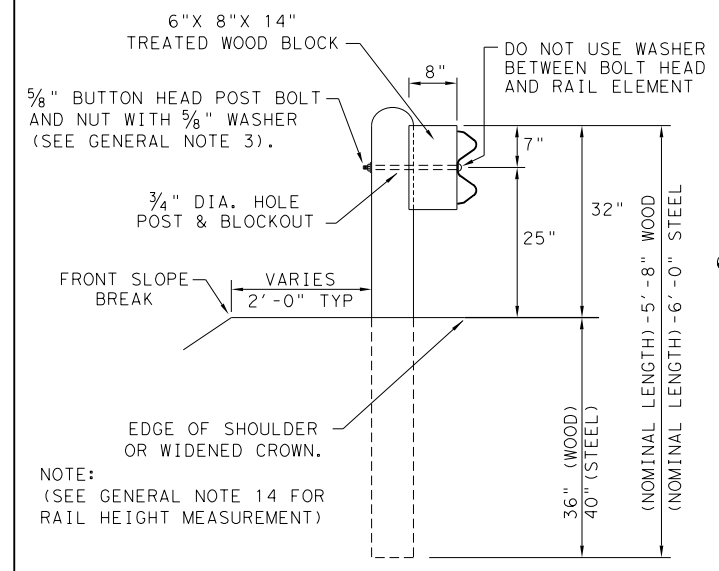
SCALE: 1" = 50' PLAN, 1" = 10' PROFILE SHEET 2 OF 2

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
BES	6	SEE TITLE SHEET		RM 652
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
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CHECK	KMA	CONTROL	SECTION	
CHECK	RR	0493	02	
			JOB	
			021	



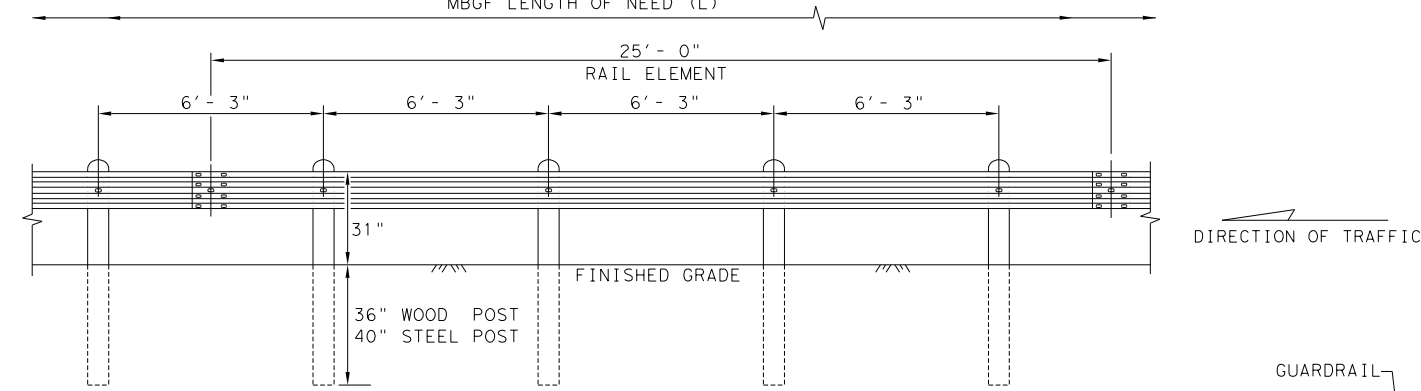
DISCLAIMER: THE USE OF THIS STANDARD IS GOVERNED BY THE "TEXAS ENGINEERING PRACTICE ACT". NO WARRANTY OF ANY KIND IS MADE BY TXDOT FOR ANY PURPOSE WHATSOEVER. TXDOT ASSUMES NO RESPONSIBILITY FOR THE CONVERSION OF THIS STANDARD TO OTHER FORMATS OR FOR INCORRECT RESULTS OR DAMAGES RESULTING FROM ITS USE.

DATE: 7/23/2021  
 FILE: c:\transys\pww\local\transys\scor-p\pw1\besn\imonek\d0848702\gf3119.dgn



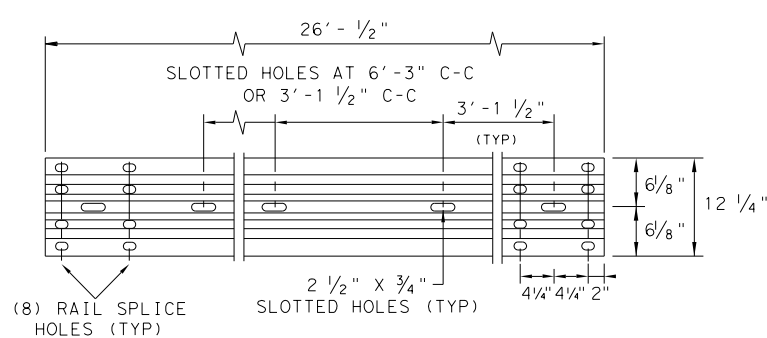
**TYPICAL POST PLACEMENT**

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



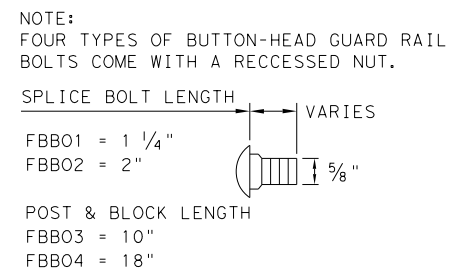
**ELEVATION MID-SPAN RAIL SPLICE**

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



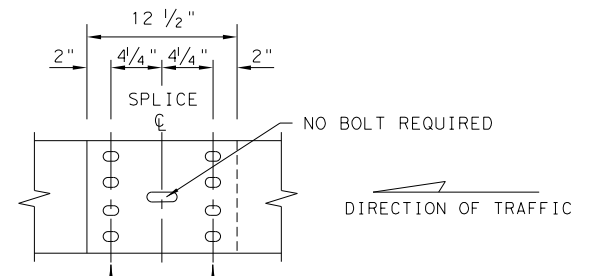
**ELEVATION 25' - 0" (NOM.) W-BEAM SECTION**

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



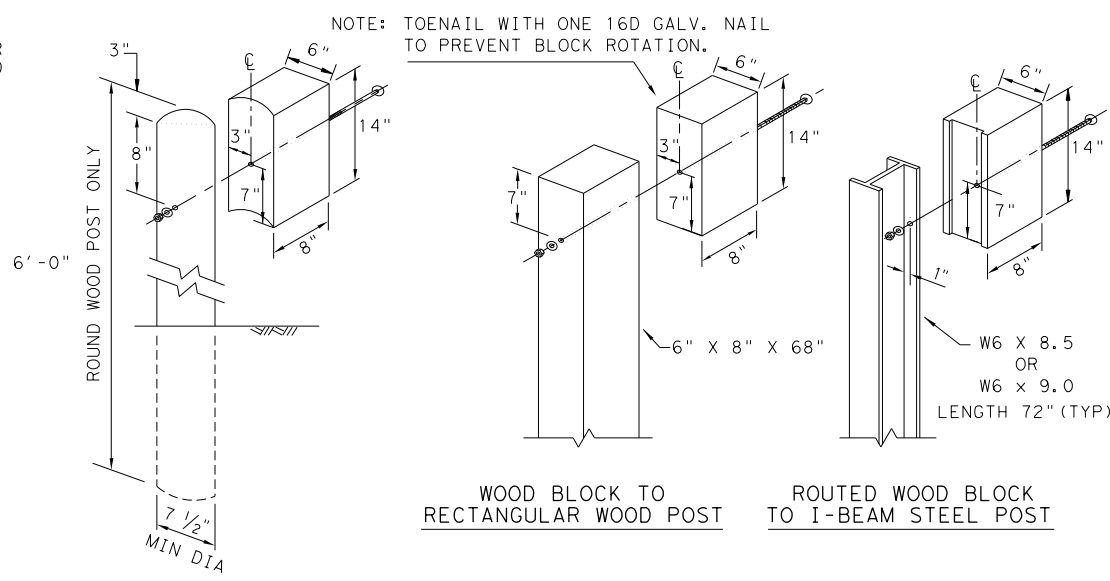
**BUTTON HEAD BOLT**

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



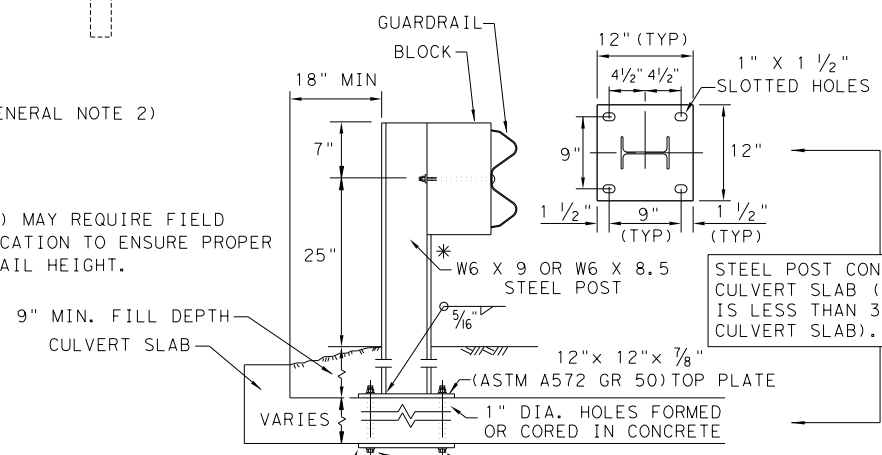
**MID-SPAN RAIL SPLICE DETAIL**

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



**WOOD BLOCK TO ROUND WOOD POST**      **ROUTED WOOD BLOCK TO I-BEAM STEEL POST**

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



**LOW FILL CULVERT POST**

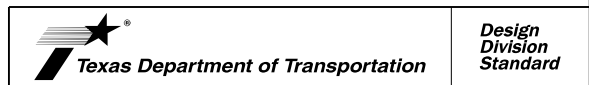
- NOTE: TWO INSTALLATION OPTIONS.
- BOLT-THROUGH OPTION:** REQUIRES A 6" MIN. SLAB THICKNESS. 7/8" DIA (ASTM A449) HEAVY HEX BOLTS WITH TWO HARDENED WASHER EACH AND HEAVY HEX NUTS. NOTE: BOLT LENGTH = SLAB PLUS 2 1/4" MIN.
  - EPOXY ANCHOR OPTION:** THIS OPTION MAY ONLY BE USED IF THE CULVERT SLAB IS 9" MIN. THICK. THREADED ANCHOR RODS MUST BE 7/8" 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 1/4" MIN. BEYOND NUT.

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

**GENERAL NOTES**

- 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."
- 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 1/2" 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.
- 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 5/8" WASHER (FWC160) AND NOT MORE THAN 1" BEYOND IT. TRIM REMAINING BOLT LENGTH TO MEET REQUIRED LENGTH.
- FITTINGS (BOLTS, NUTS, AND WASHERS) SHALL BE GALVANIZED IN ACCORDANCE WITH ITEM 445, "GALVANIZING." FITTINGS SHALL BE SUBSIDIARY TO THE BID ITEM.
- CROWN SHALL BE WIDENED TO ACCOMMODATE THE METAL BEAM GUARD FENCE.
- THE LATERAL APPROACH TO THE GUARD FENCE, SHALL HAVE A MAXIMUM SLOPE OF 1V:10H.
- 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.
- 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.
- 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.
- POSTS SHALL NOT BE SET IN CONCRETE, OF ANY DEPTH.
- SPECIAL FABRICATION WILL BE REQUIRED AT INSTALLATION LOCATIONS HAVING A CURVATURE OF LESS THAN 150 FT. RADIUS.
- 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.
- 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.
- 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.

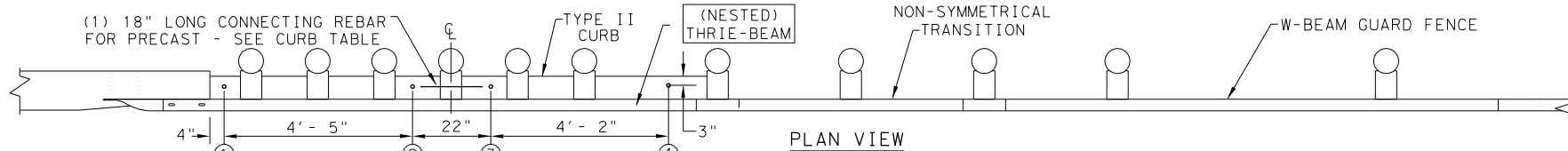
NOTE: TRANSITIONS TO BRIDGE RAILS OR TRAFFIC BARRIERS. SEE GF(31)TL3 TR STANDARD FOR HIGH-SPEED TL-3 TRANSITIONS. SEE GF(31)TL2 TR STANDARD FOR LOW-SPEED TL-2 TRANSITIONS.



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

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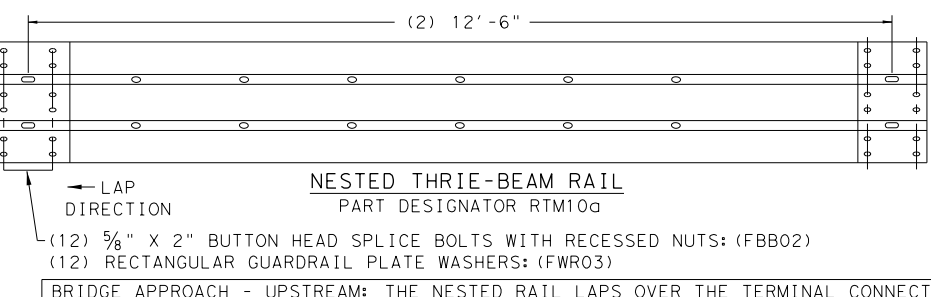
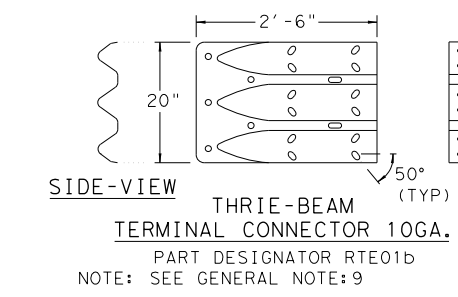
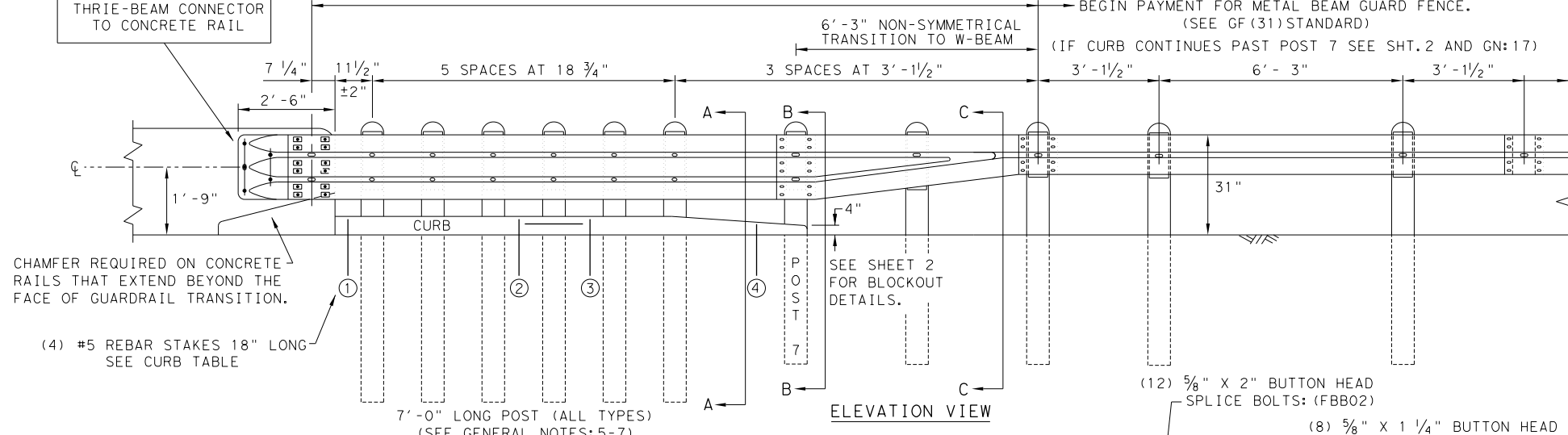
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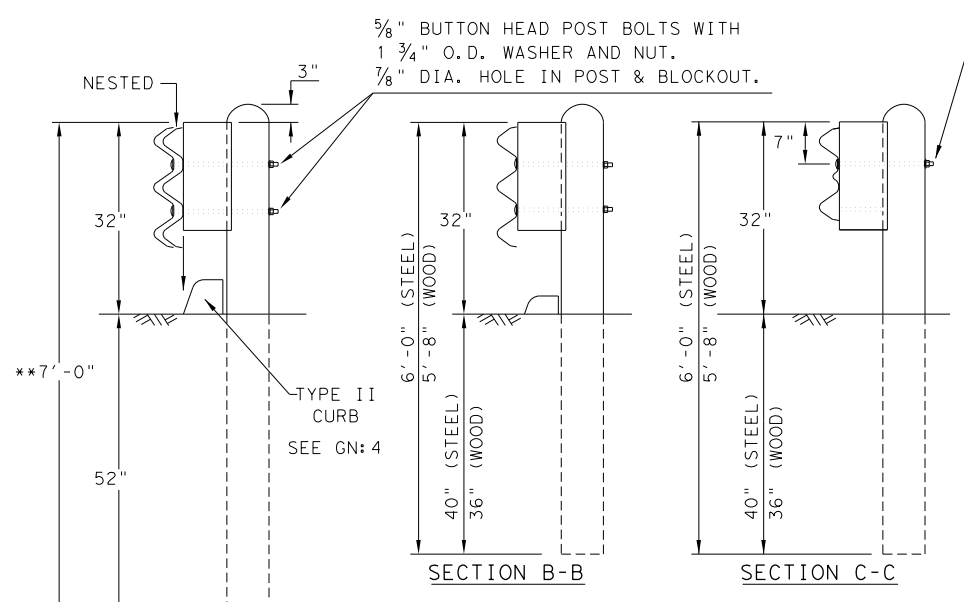
- (5) 1" DIA. HOLES.
- (5) 7/8" DIA. HEAVY HEX HEAD BOLTS (FACING TRAFFIC SIDE) (ASTM F3125 GR A325 OR A449).
- (10) 1 3/4" O.D. WASHER UNDER EACH HEX BOLT HEAD AND NUT.
- (5) 7/8" DIA. HEAVY HEX NUTS (ASTM A194 OR A563).

NOTE:  
 HEAVY HEX BOLT LENGTH WILL VARY DEPENDING ON WIDTH CONCRETE RAIL, LEAVE 1" OF BOLT LENGTH PAST THE 7/8" 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.

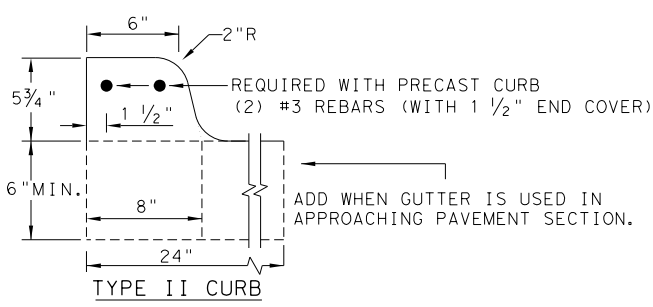


BRIDGE APPROACH - UPSTREAM: THE NESTED RAIL LAPS OVER THE TERMINAL CONNECTOR. PLATE WASHERS ARE INSTALLED UNDER THE SPLICE NUTS AGAINST INSIDE OF CONNECTOR.  
 BRIDGE EXIT - DOWNSTREAM: THE TERMINAL CONNECTOR LAPS OVER THE NESTED RAIL. PLATE WASHERS ARE INSTALLED UNDER THE BOLT HEAD AGAINST OUTSIDE OF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



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 1/2" 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.



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

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 (5-3/4" HEIGHT); SEE CURRENT CCG 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 1/2" 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 5/8" 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 5/8" WASHER (FWC16a) AND NOT MORE THAN 1" BEYOND IT. TRIM REMAINING BOLT LENGTH TO MEET REQUIRED LENGTH.
11. FITTINGS (BOLTS, NUTS, AND WASHERS) SHALL BE GALVANIZED IN ACCORDANCE WITH ITEM 445, "GALVANIZING". FITTINGS SHALL BE SUBSIDIARY TO THE BID ITEM.
12. CROWN SHALL BE WIDENED TO ACCOMMODATE TRANSITIONS.
13. WHERE SOLID ROCK IS ENCOUNTERED, CONTACT THE DESIGN DIVISION FOR ADDITIONAL GUIDANCE. (512) 416-2678
14. UNLESS OTHERWISE SHOWN IN THE PLANS, A COMPOSITE MATERIAL BLOCK THAT MEETS THE REQUIREMENTS OF DMS-7210, "COMPOSITE MATERIAL POSTS AND BLOCKS FOR METAL BEAM GUARD FENCE" MAY BE SUBSTITUTED FOR BLOCKS OF SIMILAR DIMENSIONS. TXDOT'S MATERIALS AND TESTS DIVISION MAINTAINS A MATERIAL PRODUCER LIST (MPL) FOR PRODUCERS OF MATERIALS CONFORMING TO DMS-7210. ONLY PRODUCERS ON THE MPL CAN FURNISH COMPOSITE MATERIAL BLOCKS.
15. REFER TO GF(31) STANDARD SHEET & BRIDGE RAILING DETAILS FOR ADDITIONAL DETAILS.
16. THE INSTALLATION OF THE TYPE II CURB IS CRITICAL FOR THE PERFORMANCE OF THE THRIE-BEAM TRANSITION SYSTEM. THE CURB PREVENTS (VEHICLE WHEEL SNAGGING) AT THE CONCRETE RAIL AND IS REQUIRED TO MEET MASH CRASH TEST CRITERIA.
17. IF CURB EXTENDS BEYOND POST 7, 25' OF NESTED W-BEAM GUARDRAIL SHALL BE INSTALLED BEYOND THE PAY LIMITS OF THRIE-BEAM TRANSITION SECTION, (SEE SHT.2). PAYMENT FOR THIS 25' SECTION WILL BE BY LINEAR FOOT, PAY ITEM "0540 6XXX MTL W-BEAM GD FEN (NESTED) (TIM POST)" OR "540 6XXX MTL W-BEAM GD FEN (NESTED) (STEEL POST)" AS APPLICABLE FOR POST TYPE. SEE SHT.2 FOR ADDITIONAL INFORMATION.

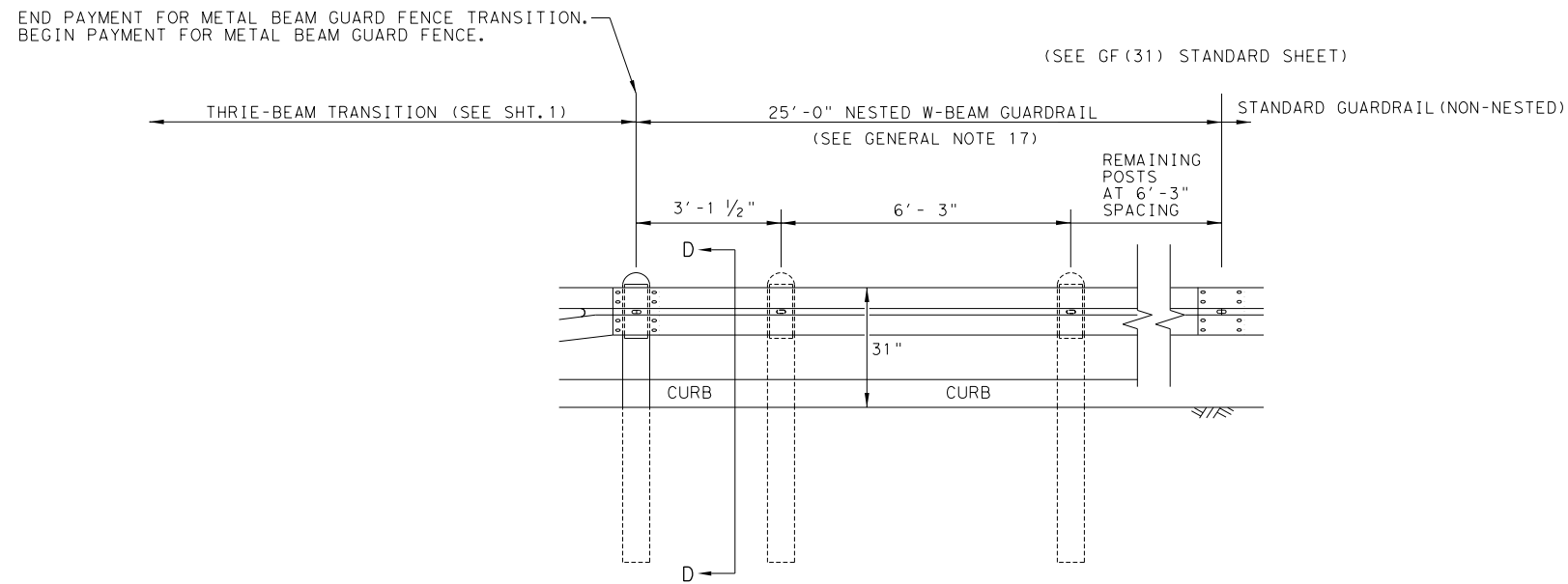
HIGH-SPEED TRANSITION  
SHEET 1 OF 2

		<b>Design Division Standard</b>	
<b>METAL BEAM GUARD FENCE THRIE-BEAM TRANSITION TL-3 MASH COMPLIANT GF(31) TR TL3-20</b>			
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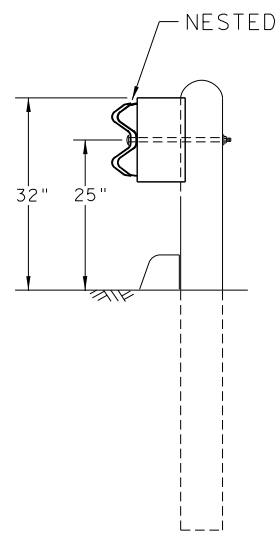
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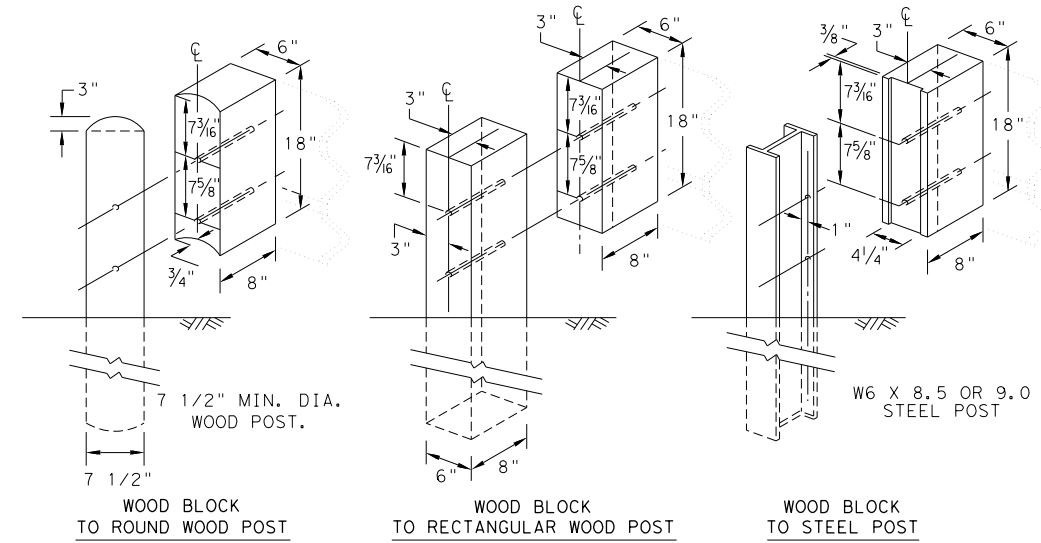
REQUIRED ALTERNATIVE FOR CONTINUOUS CURB EXTENDING PAST POST 7 (SEE SHT. 1 GENERAL NOTE 17)



ELEVATION VIEW



SECTION D-D



THREE BEAM TRANSITION BLOCKOUT DETAILS

HIGH-SPEED TRANSITION

SHEET 2 OF 2

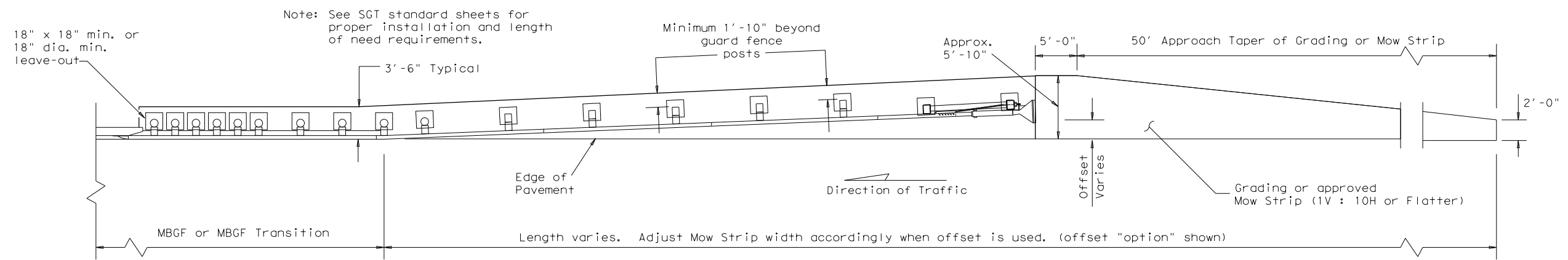


METAL BEAM GUARD FENCE  
 THREE-BEAM TRANSITION  
 TL-3 MASH COMPLIANT  
 GF (31) TR TL3-20

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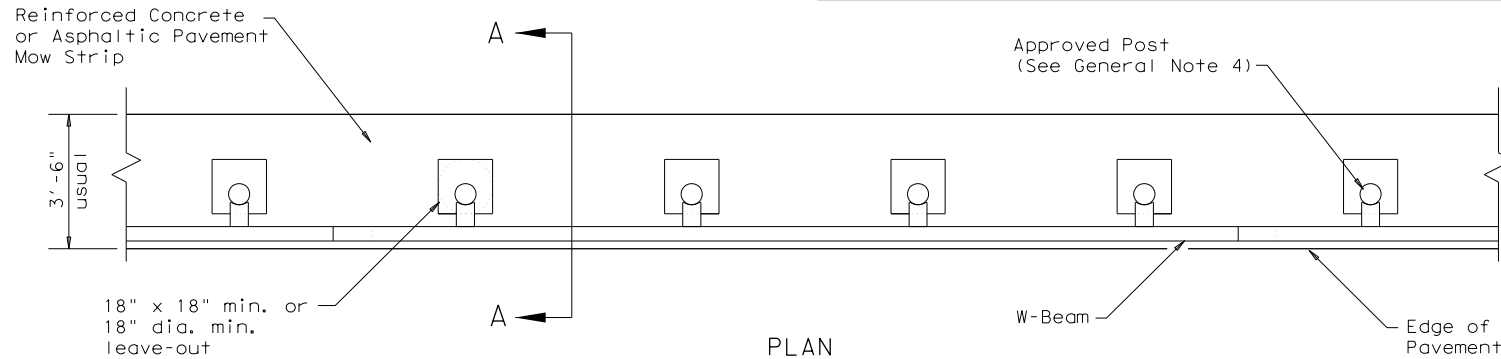
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Note: See SGT standard sheets for proper installation and length of need requirements.

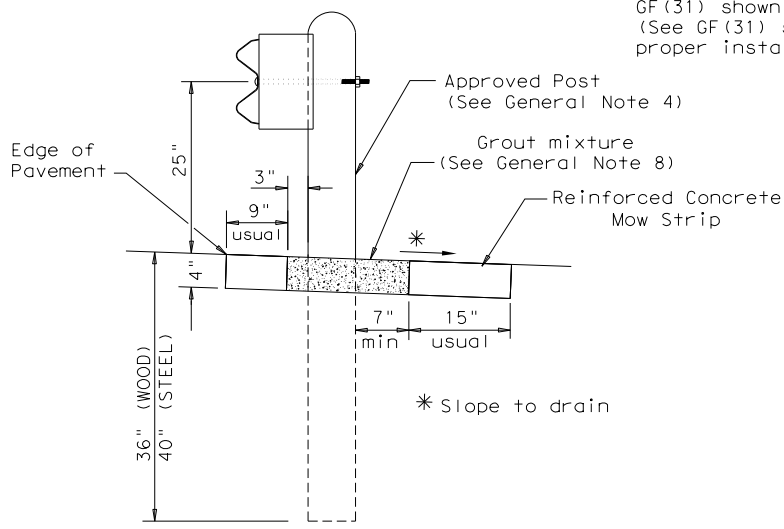
**GRADING AND MOW STRIP AT GUARDRAIL END TREATMENTS**

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.



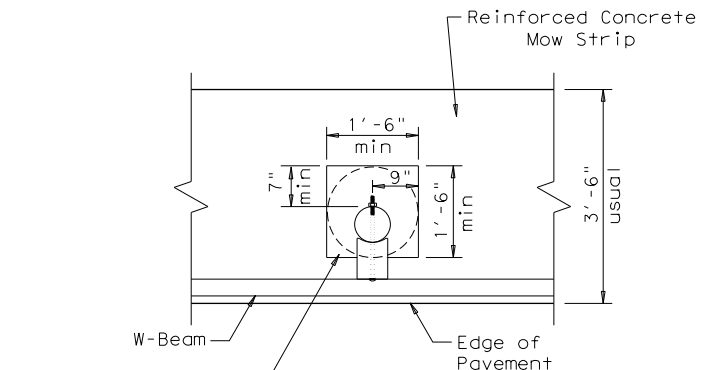
**PLAN**

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



**SECTION A-A**

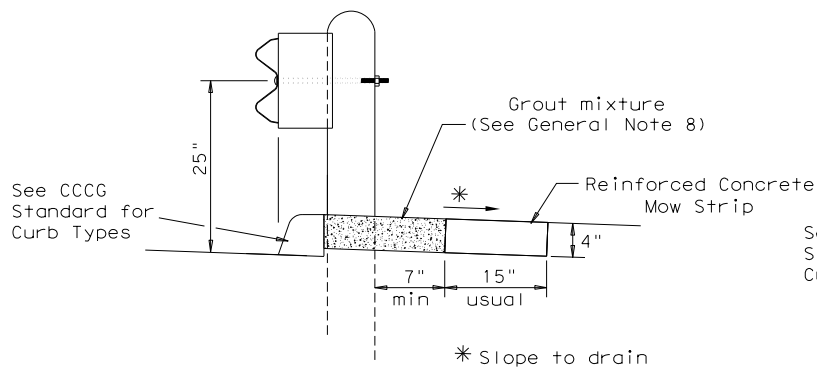
Typical



**MOW STRIP DETAIL**

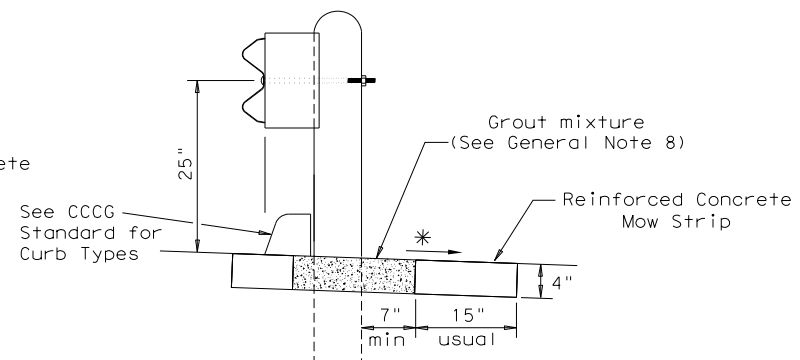
Reinforced Concrete Mow Strip with 18\"/>

- 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 1/2" Dia. round wood posts are acceptable for use in the mow strip. See GF(31) Standard for additional details.
  5. Other curb placement options may be used. Curbs are not considered part of the mow strip and will be paid for under other pertinent bid item.
  6. Thickness of the mow strip will be 4".
  7. The limits of payment for reinforced concrete will include leave-outs for the posts.
  8. The leave-outs shall be filled with a Grout mixture consisting of: 2719 pounds sand, 188 pounds Type 1 or II cement, and 550 pounds of water per cubic yard, with a 28-day compressive strength of approximately 230 psi or less. Provide grout with a consistency that will flow into and completely fill all voids. Due to auger size, larger leave-out dimensions are acceptable from both an impact performance and maintenance repair standpoint (Suggested Maximum leave-out of 20"). Payment for furnishing and placing the grout mixture will be subsidiary to the pay item of riprap mow strip.



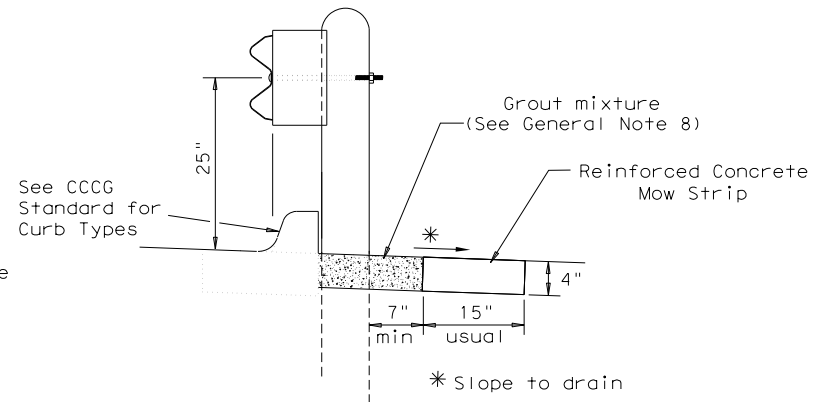
**CURB OPTION (1)**

This option will increase the post embedment throughout the system.



**CURB OPTION (2)**

Curb shown on top of mow strip



**CURB OPTION (3)**

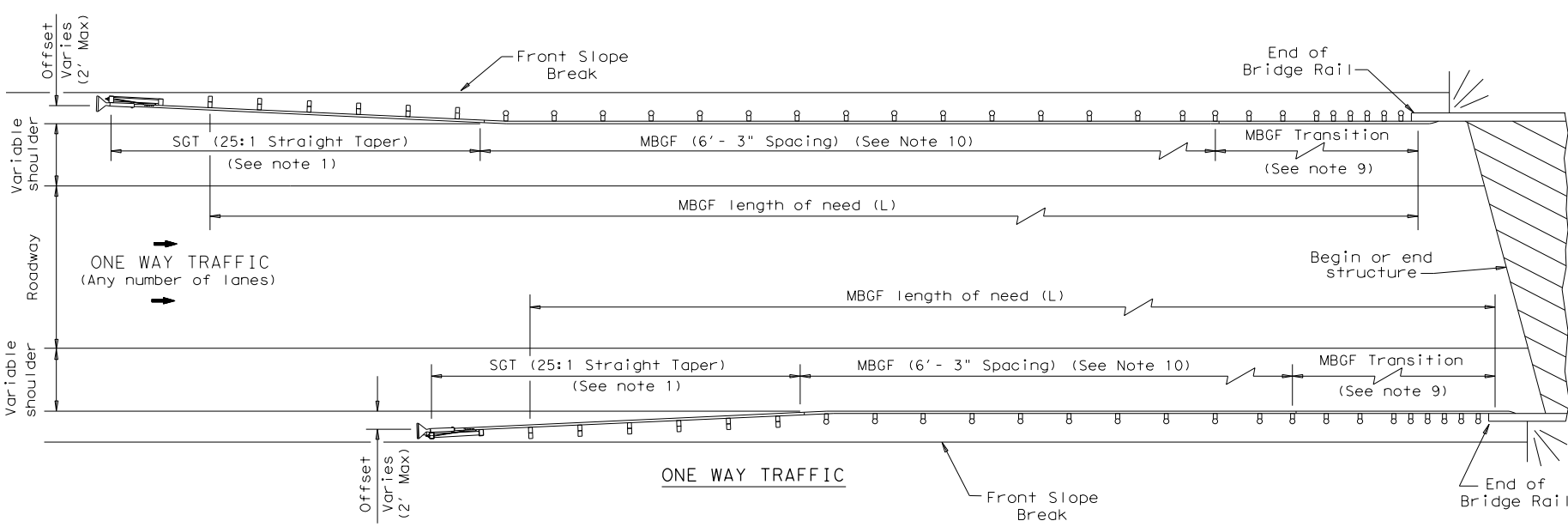
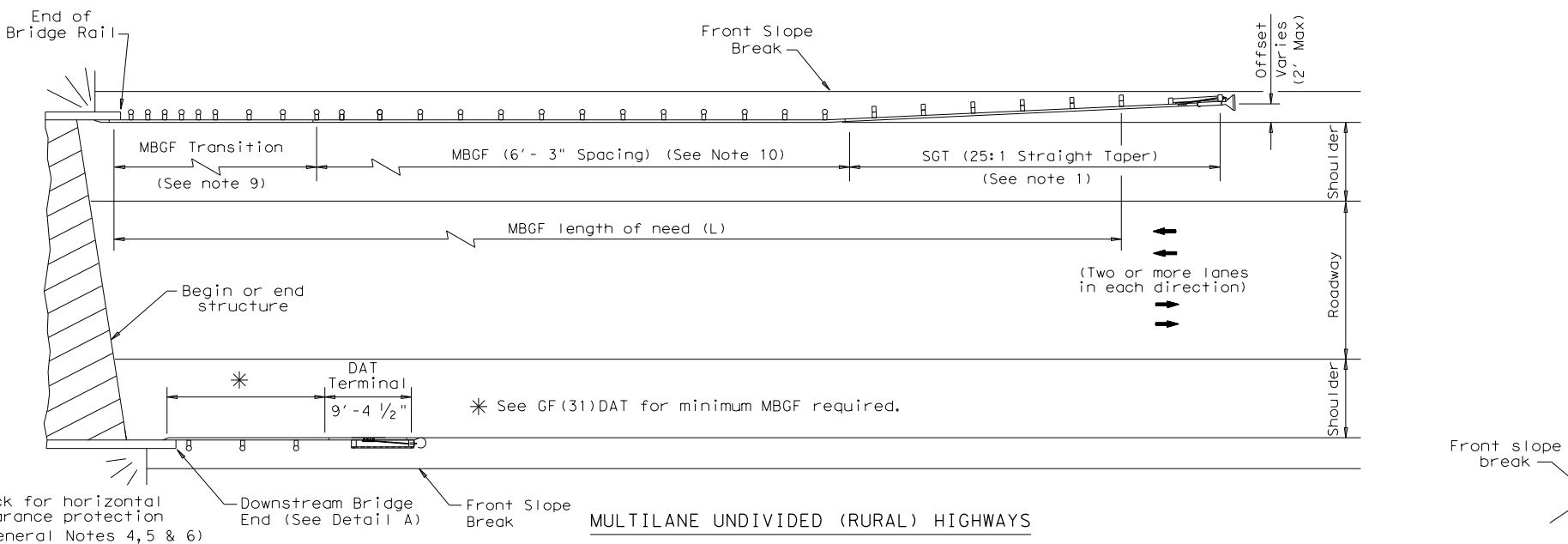
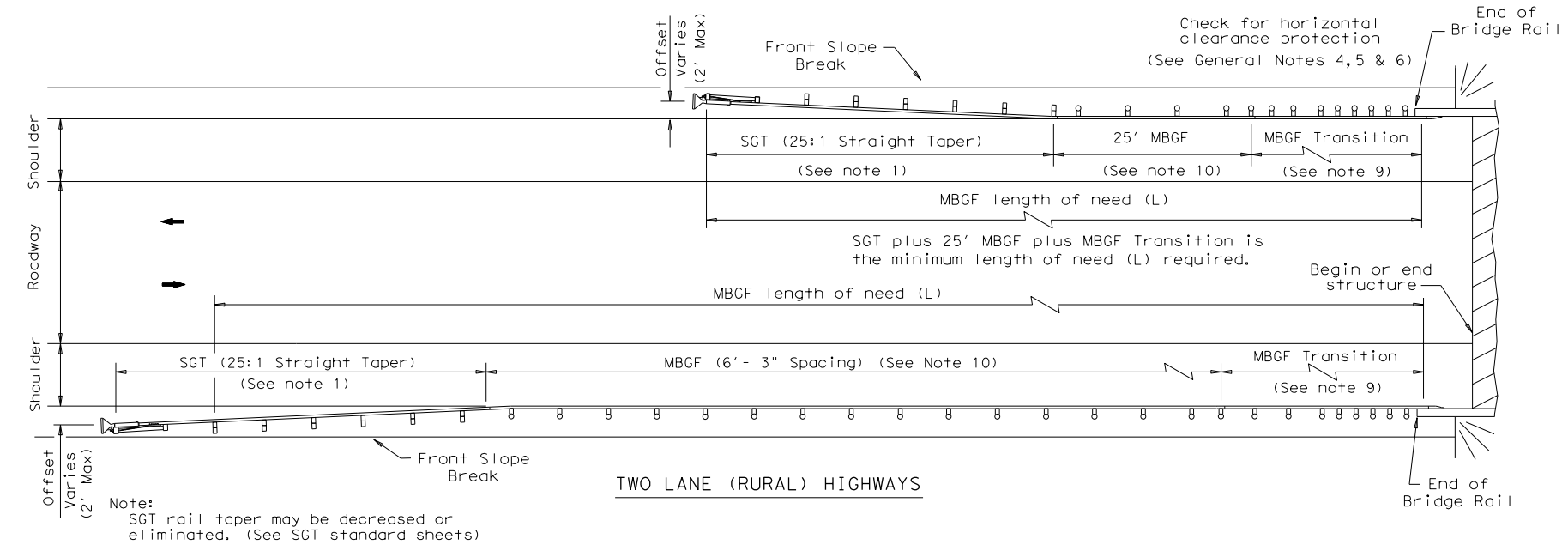
**Texas Department of Transportation**  
 Design Division Standard

**METAL BEAM GUARD FENCE (MOW STRIP)**  
**TL-3 MASH COMPLIANT**  
**GF(31)MS-19**

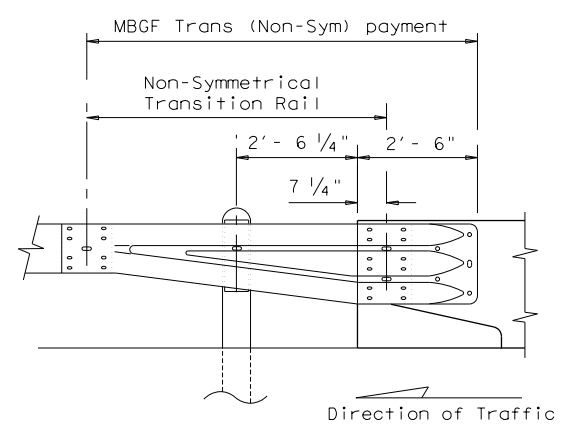
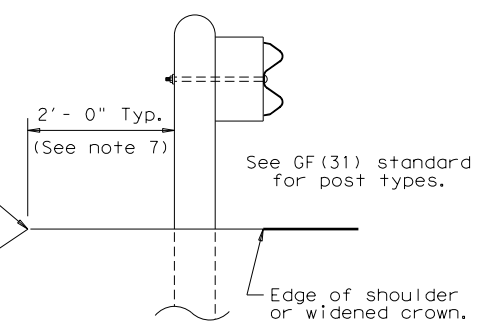
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- GENERAL NOTES**
- For more detail: See GF(31), SGT( )31, GF(31)TR, and GF(31)TL2 standard sheets.
  - Quantities of metal beam guard fence (MBSG) at individual bridge ends are as shown in the plans.
  - Use average daily traffic (ADT) for the current year to determine MBSG 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.
  - MBSG may not be required to shield departure end of bridge unless other obstacles within the horizontal clearance limits or opposing traffic indicate a MBSG consideration.
  - Downstream anchor terminals (DAT) are only for downstream end anchorage use, outside the horizontal clearance area of opposing traffic.
  - Direct connection of MBSG 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)
  - The crown shall be widened to accommodate MBSG. Typically the "front slope" break should be 2'-0" from the back of the MBSG 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 MBSG).
  - For restrictive bridge widths: The MBSG should be properly transitioned from the existing bridge rail to the adjoining MBSG (See MBSG 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.
  - Transition length and post spacing will vary depending on the transition type. Transition type will be shown elsewhere in the plans.
  - A minimum 25' length of MBSG will be required.



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

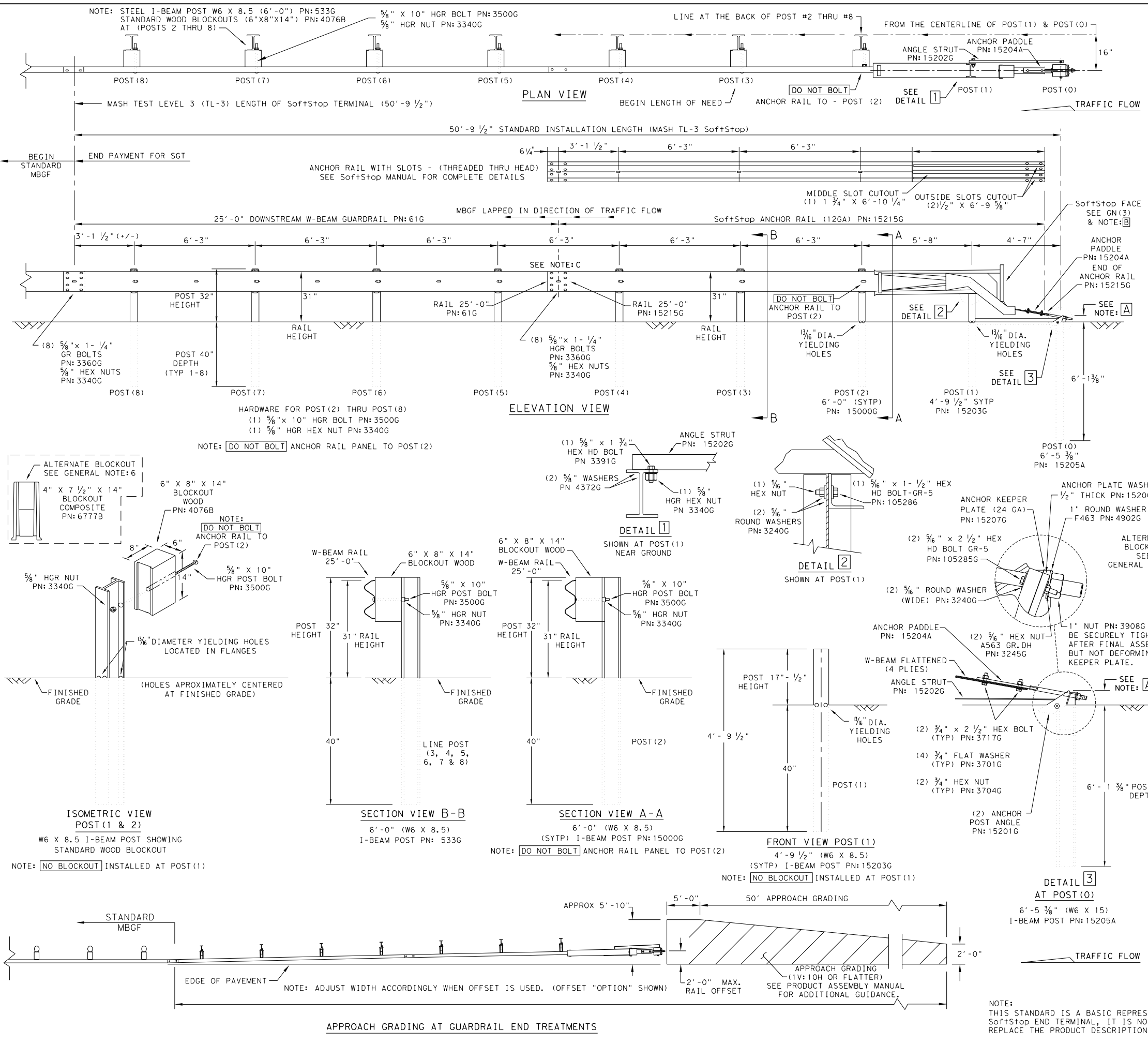


**BRIDGE END DETAILS**  
(METAL BEAM GUARD FENCE APPLICATIONS TO RIGID RAILS)

**BED-14**

FILE: bed14.dgn	DN: TxDOT	CK: AM	DW: BD/VP	CK: CGL
© TxDOT: December 2011	CONT	SECT	JOB	HIGHWAY
REVISIONS	0493	02	021	RM 652
REVISED APRIL 2014 SEE (MEMO 0414)	DIST	COUNTY	SHEET NO.	
	ODA	LOVING	56	

DATE: 7/23/2021  
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- GENERAL NOTES**
- 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
  - FOR INSTALLATION, REPAIR AND MAINTENANCE REFER TO THE; SoftStop END TERMINAL, PRODUCT DESCRIPTION ASSEMBLY MANUAL. PN: 620237B
  - 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.
  - FOR POST (LEAVE-OUT) INSTALLATION AND GUIDANCE SEE TXDOT'S LATEST ROADWAY MOW STRIP STANDARD.
  - HARDWARE (BOLTS, NUTS, & WASHERS) SHALL BE GALVANIZED IN ACCORDANCE WITH ITEM 445, "GALVANIZING". FITTINGS SHALL BE SUBSIDIARY TO THE BID ITEM.
  - 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.
  - IF SOLID ROCK IS ENCOUNTERED SEE THE MANUFACTURER'S INSTALLATION MANUAL AND REFER TO THE LATEST ROADWAY MBBF STANDARD FOR INSTALLATION GUIDANCE.
  - POSTS SHALL NOT BE SET IN CONCRETE.
  - IT IS ACCEPTABLE TO INSTALL THE SoftStop IMPACT HEAD PARALLEL TO THE GRADE LINE OR WITH AN UPWARD TILT.
  - DO NOT ATTACH THE SoftStop SYSTEM DIRECTLY TO A RIGID BARRIER.
  - UNDER NO CIRCUMSTANCES SHALL THE GUARDRAIL WITHIN THE SoftStop SYSTEM BE CURVED.
  - 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 3-3/4" 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 3/8")
15203G	1	POST #1 - (SYTP) (4'-9 1/2")
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 1/2" X 14")
15204A	1	ANCHOR PADDLE
15207G	1	ANCHOR KEEPER PLATE (24 GA)
15206G	1	ANCHOR PLATE WASHER (1/2" 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	3/4" X 2 1/2" HEX BOLT A325
3701G	4	3/4" ROUND WASHER F436
3704G	2	3/4" HEAVY HEX NUT A563 GR.DH
3360G	16	5/8" X 1 1/4" W-BEAM RAIL SPLICE BOLTS HGR
3340G	25	5/8" W-BEAM RAIL SPLICE NUTS HGR
3500G	7	5/8" X 10" HGR POST BOLT A307
3391G	1	5/8" X 1 3/4" HEX HD BOLT A325
4489G	1	5/8" X 9" HEX HD BOLT A325
4372G	4	5/8" WASHER F436
105285G	2	5/8" X 2 1/2" HEX HD BOLT GR-5
105286G	1	5/8" X 1 1/2" HEX HD BOLT GR-5
3240G	6	5/8" ROUND WASHER (WIDE)
3245G	3	5/8" HEX NUT A563 GR.DH
5852B	1	HIGH INTENSITY REFLECTIVE SHEETING - SEE NOTE: B

**Texas Department of Transportation**  
 Design Division Standard

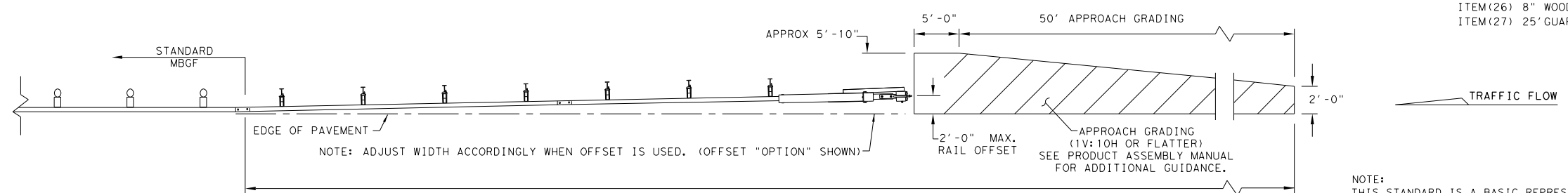
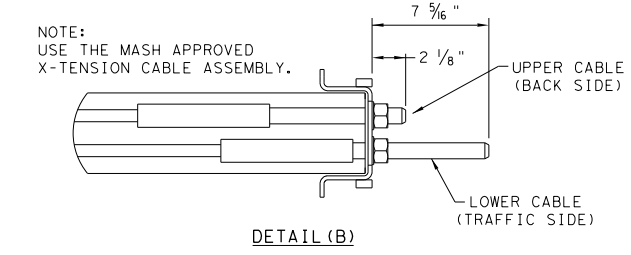
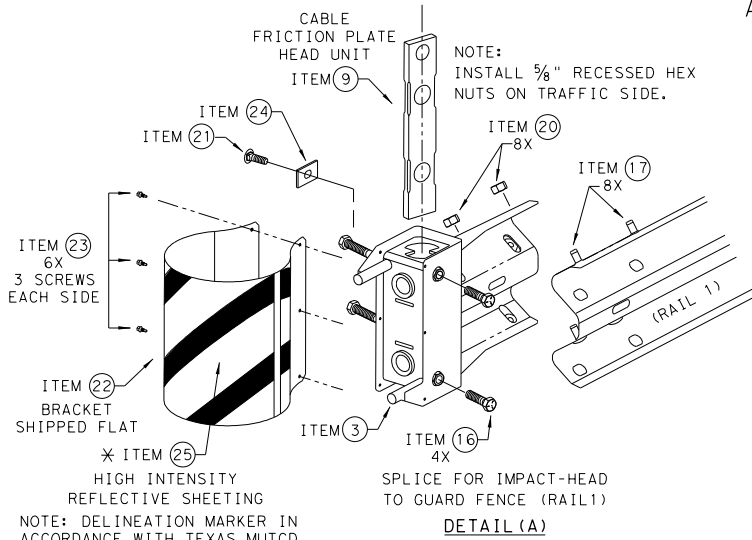
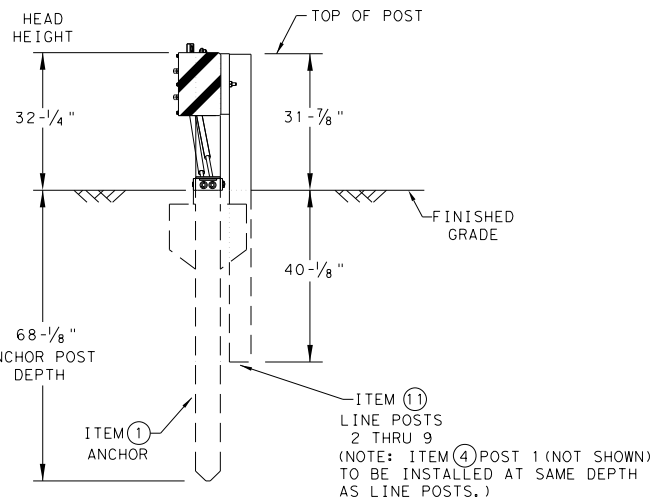
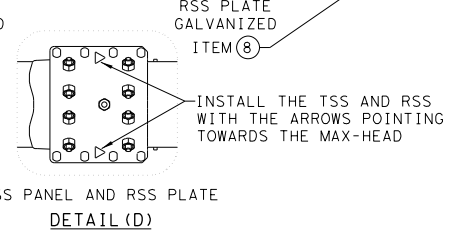
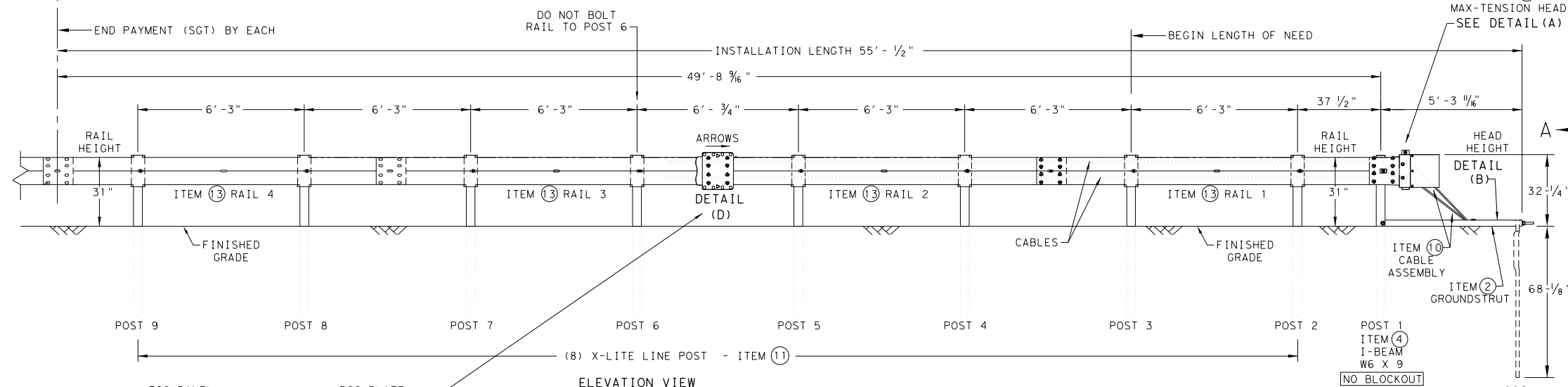
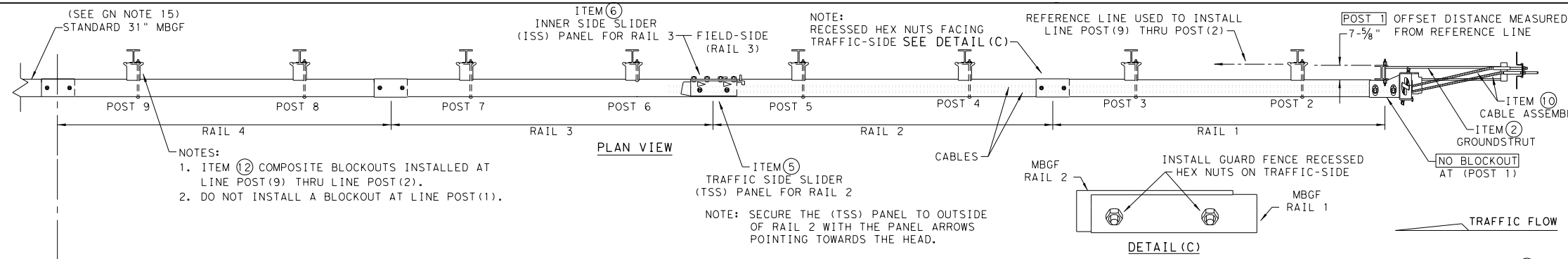
**TRINITY HIGHWAY  
 SOFTSTOP END TERMINAL  
 MASH - TL-3  
 SGT (10S) 31-16**

FILE: sgt10s3116	DN: TxDOT	CK: KM	DN: VP	CK: MB/VP
©TxDOT: JULY 2016	CONT	SECT	JOB	HIGHWAY
REVISIONS	0493	02	021	RM 652
	DIST	COUNTY	SHEET NO.	
	ODA	LOVING	57	

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

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**GENERAL NOTES**

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

ITEM #	PART NUMBER	DESCRIPTION	QTY
1	BSI-1610060-00	SOIL ANCHOR - GALVANIZED	1
2	BSI-1610061-00	GROUND STRUT - GALVANIZED	1
3	BSI-1610062-00	MAX-TENSION IMPACT HEAD	1
4	BSI-1610063-00	W6x9 I-BEAM POST 6FT. -GALVANIZED	1
5	BSI-1610064-00	TSS PANEL - TRAFFIC SIDE SLIDER	1
6	BSI-1610065-00	ISS PANEL - INNER SIDE SLIDER	1
7	BSI-1610066-00	TOOTH - GEOMET	1
8	BSI-1610067-00	RSS PLATE - REAR SIDE SLIDER	1
9	B061058	CABLE FRICTION PLATE - HEAD UNIT	1
10	BSI-1610069-00	CABLE ASSEMBLY - MASH X-TENSION	2
11	BSI-1012078-00	X-LITE LINE POST-GALVANIZED	8
12	B090534	8" W-BEAM COMPOSITE-BLOCKOUT XT110	8
13	BSI-4004386	12'-6" W-BEAM GUARD FENCE PANELS 12GA.	4
14	BSI-1102027-00	X-LITE SQUARE WASHER	1
15	BSI-2001886	5/8" X 7" THREAD BOLT HH (GR.5)GEOMET	1
16	BSI-2001885	3/4" X 3" ALL-THREAD BOLT HH (GR.5)GEOMET	4
17	4001115	5/8" X 1 1/4" GUARD FENCE BOLTS (GR.2)MGAL	48
18	2001840	5/8" X 10" GUARD FENCE BOLTS MGAL	8
19	2001636	5/8" WASHER F436 STRUCTURAL MGAL	2
20	4001116	5/8" RECESSED GUARD FENCE NUT (GR.2)MGAL	59
21	BSI-2001888	5/8" X 2" ALL THREAD BOLT (GR.5)GEOMET	1
22	BSI-1701063-00	DELINEATION MOUNTING (BRACKET)	1
23	BSI-2001887	1/4" X 3/4" SCREW SD HH 410SS	7
24	4002051	GUARDRAIL WASHER RECT AASHTO FWRO3	1
25	SEE NOTE BELOW	HIGH INTENSITY REFLECTIVE SHEETING	1
26	4002337	8" W-BEAM TIMBER-BLOCKOUT, PDB01B	8
27	BSI-4004431	25' W-BEAM GUARDRAIL PANEL, 8-SPACE, 12GA.	2
28	MANMAX Rev-(D)	MAX-TENSION INSTALLATION INSTRUCTIONS	1

\* TO BE PROVIDED BY DISTRIBUTOR OR CONTRACTOR.  
 \*\* ALTERNATIVE ITEMS NOT SHOWN. ITEM(26) 8" WOOD-BLOCKOUTS ITEM(27) 25' GUARD FENCE PANELS

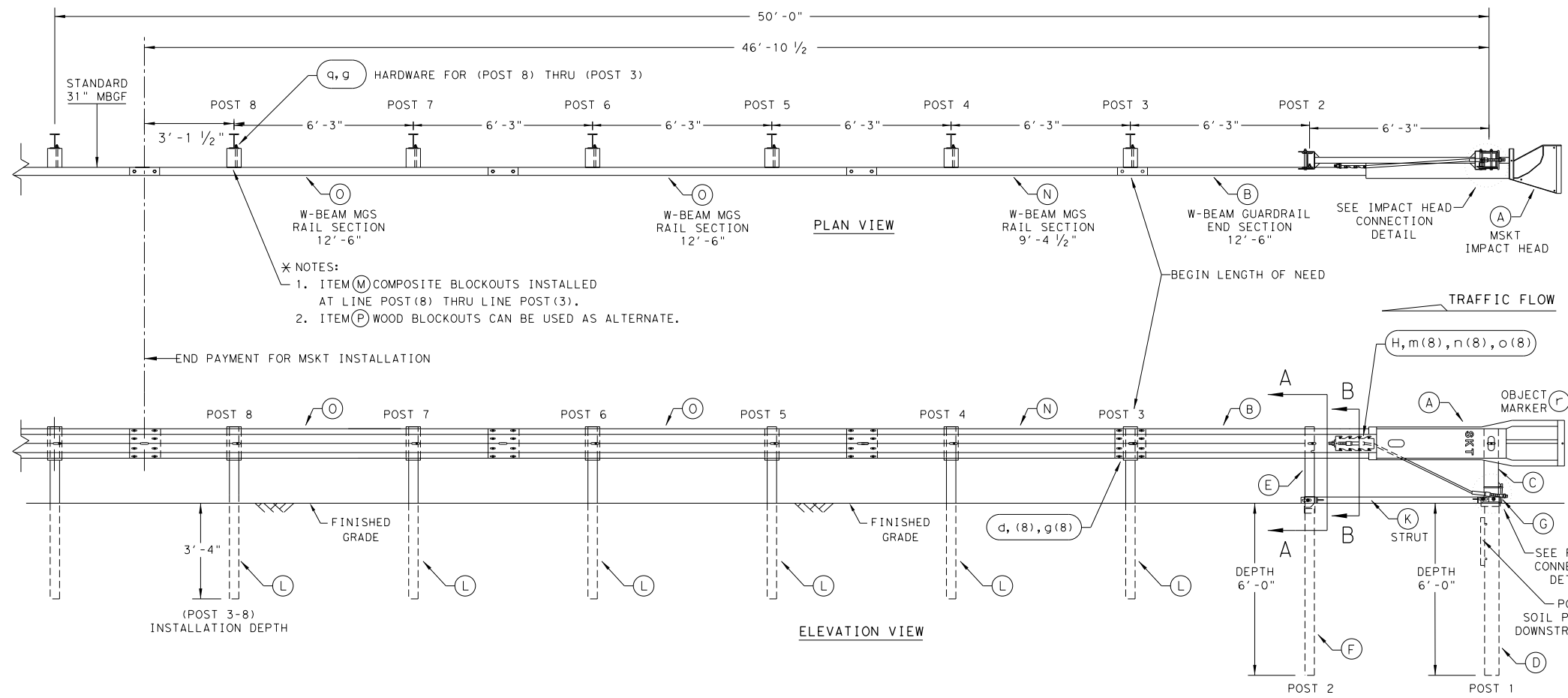
**Texas Department of Transportation**  
**Design Division Standard**

**MAX-TENSION END TERMINAL**  
**MASH - TL-3**  
**SGT (11S) 31-18**

FILE: sgt11s3118.dgn	DN: TxDOT	CK: KM	DW: TxDOT	CK: CL
© TxDOT: FEBRUARY 2018	CONT	SECT	JOB	HIGHWAY
REVISIONS	0493	02	021	RM 652
	DIST	COUNTY	SHEET NO.	
	ODA	LOVING	58	

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

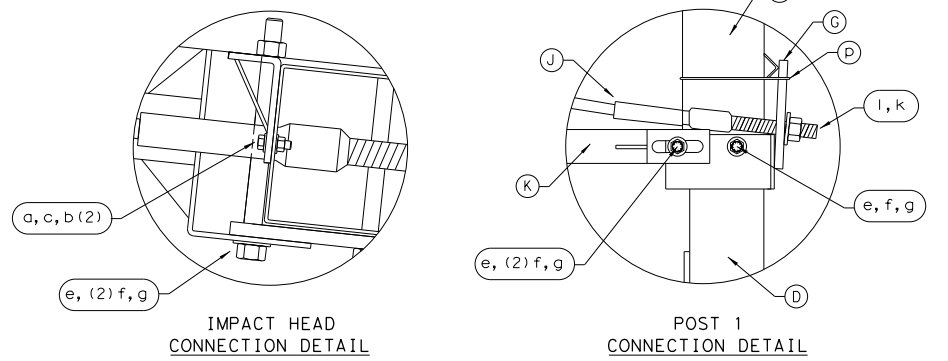
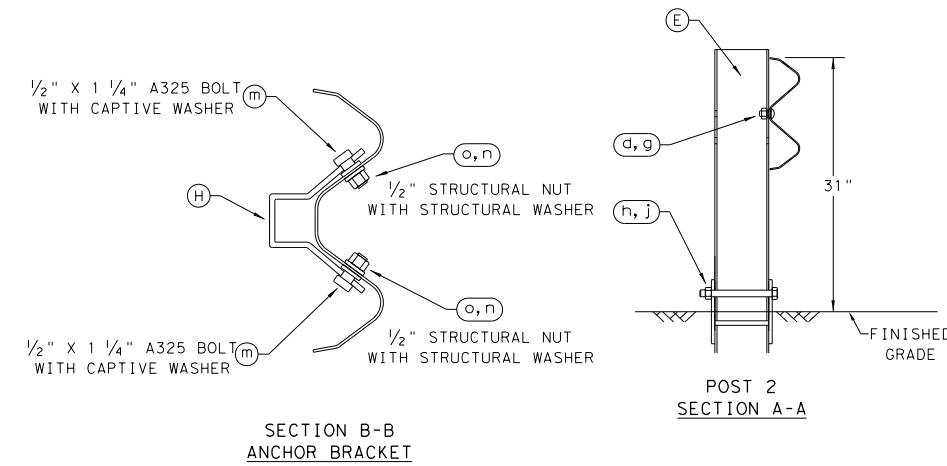
DISCLAIMER: THIS STANDARD IS GOVERNED BY THE "TEXAS ENGINEERING PRACTICE ACT". NO WARRANTY OF ANY KIND IS MADE BY TXDOT FOR ANY PURPOSE WHATSOEVER. TXDOT ASSUMES NO RESPONSIBILITY FOR THE CONVERSION OF THIS STANDARD TO OTHER FORMATS OR FOR INCORRECT RESULTS OR DAMAGES RESULTING FROM ITS USE.  
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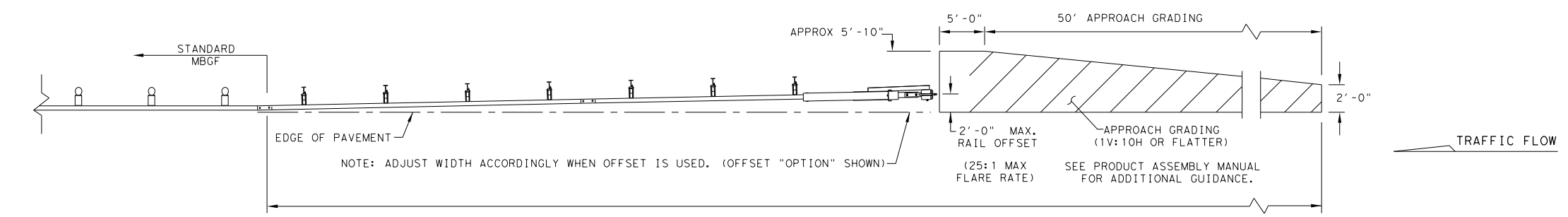
- NOTES:
- ITEM (M) COMPOSITE BLOCKOUTS INSTALLED AT LINE POST (8) THRU LINE POST (3).
  - ITEM (P) WOOD BLOCKOUTS CAN BE USED AS ALTERNATE.

- GENERAL NOTES
- 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
  - FOR INSTALLATION, REPAIR AND MAINTENANCE REFER TO THE: MSKT END TERMINAL, PRODUCT DESCRIPTION ASSEMBLY MANUAL (PUBLICATION-062717).
  - 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.
  - FOR POST (LEAVE-OUT) INSTALLATION AND GUIDANCE SEE TXDOT'S LATEST ROADWAY MOW STRIP STANDARD.
  - HARDWARE (BOLTS, NUTS, & WASHERS) SHALL BE GALVANIZED IN ACCORDANCE WITH ITEM 445, "GALVANIZING". FITTINGS SHALL BE SUBSIDIARY TO THE BID ITEM.
  - SYSTEM SHOWN USING STEEL WIDE FLANGE POSTS WITH COMPOSITE BLOCKOUTS.
  - 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.
  - 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.
  - POSTS SHALL NOT BE SET IN CONCRETE.
  - SYSTEM MUST BE ATTACHED TO STANDARD 31" MBGF.
  - UNDER NO CIRCUMSTANCES SHALL THE GUARDRAIL WITHIN THE MSKT SYSTEM BE CURVED.
  - A FLARE RATE OF UP TO 25:1 MAY BE USED TO PREVENT THE TERMINAL HEAD FROM ENCRANCHING ON THE SHOULDER. THE FLARE MAY BE DECREASED OR ELIMINATED FOR SPECIFIC INSTALLATIONS, IF DIRECTED BY THE ENGINEER.
  - THE SYSTEM IS SHOWN WITH TWO 12'-6" MBGF PANELS, ONE 25'-0" MBGF PANEL IS ALSO ALLOWED IN ITS PLACE.
  - A DRIVING CAP WITH A TIMBER OR PLASTIC INSERT SHALL BE USED WHEN DRIVING POSTS 3-8 TO PREVENT DAMAGE TO THE GALVANIZING ON TOP OF THE POST. SPECIAL DRIVING CAP TO BE USED ON LOWER POSTS 1 & 2 TO PREVENT DAMAGE TO THE WELDED PLATES.

ITEM	QTY	MAIN SYSTEM COMPONENTS	ITEM NUMBERS
A	1	MSKT IMPACT HEAD	MS3000
B	1	W-BEAM GUARDRAIL END SECTION, 12 Ga.	SF1303
C	1	POST 1 - TOP (6" X 6" X 1/8" TUBE)	MTPHP1A
D	1	POST 1 - BOTTOM (6' W6X15)	MTPHP1B
E	1	POST 2 - ASSEMBLY TOP	UHP2A
F	1	POST 2 - ASSEMBLY BOTTOM (6' W6X9)	HP2B
G	1	BEARING PLATE	E750
H	1	CABLE ANCHOR BOX	S760
J	1	BCT CABLE ANCHOR ASSEMBLY	E770
K	1	GROUND STRUT	MS785
L	6	W6X9 OR W6X8.5 STEEL POST	P621
M	6	COMPOSITE BLOCKOUTS	CBSP-14
N	1	W-BEAM MGS RAIL SECTION (9'-4 1/2")	G12025
O	2	W-BEAM MGS RAIL SECTION (12'-6")	G1203A
P	6	WOOD BLOCKOUT 6" X 8" X 14"	P675
Q	1	W-BEAM MGS RAIL SECTION (25'-0")	G1209
SMALL HARDWARE			
a	2	5/8" X 1" HEX BOLT (GRD 5)	B5160104A
b	4	5/8" WASHER	W0516
c	2	5/8" 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 1/8" O.D. X 3/8" 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



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



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.

Design Division Standard

SINGLE GUARDRAIL TERMINAL

MSKT-MASH-TL-3

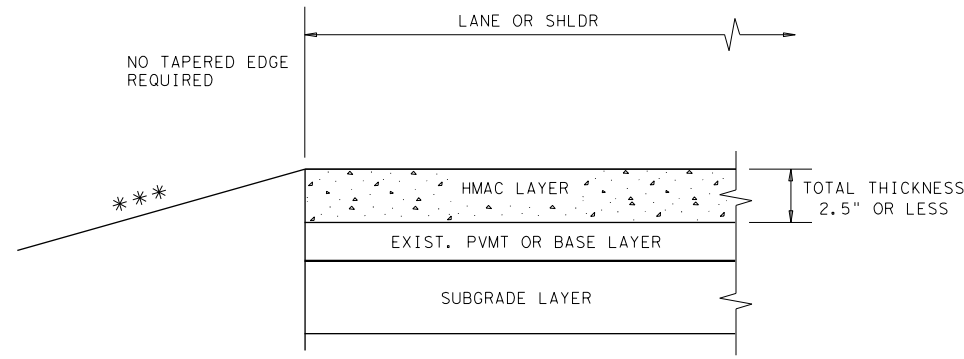
SGT (12S) 31-18

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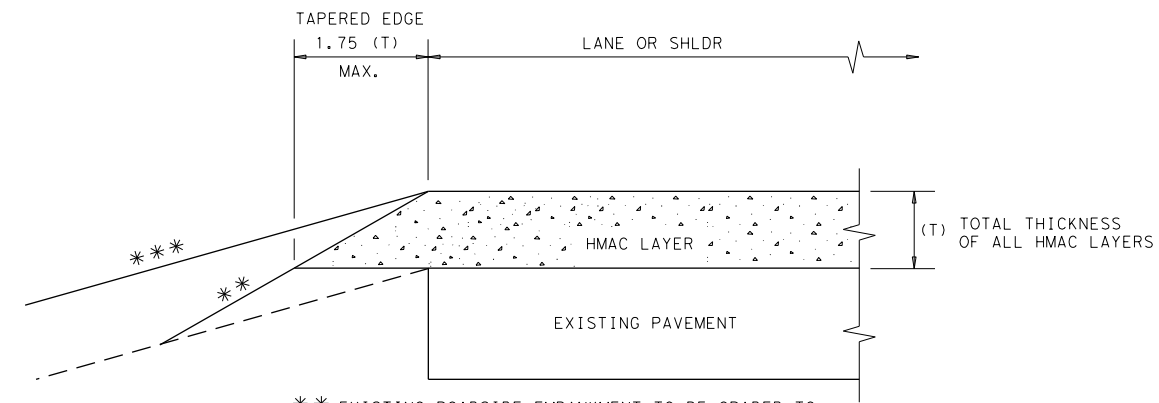
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\*\*\* SEE TYPICAL SECTION FOR ROADSIDE DETAILS

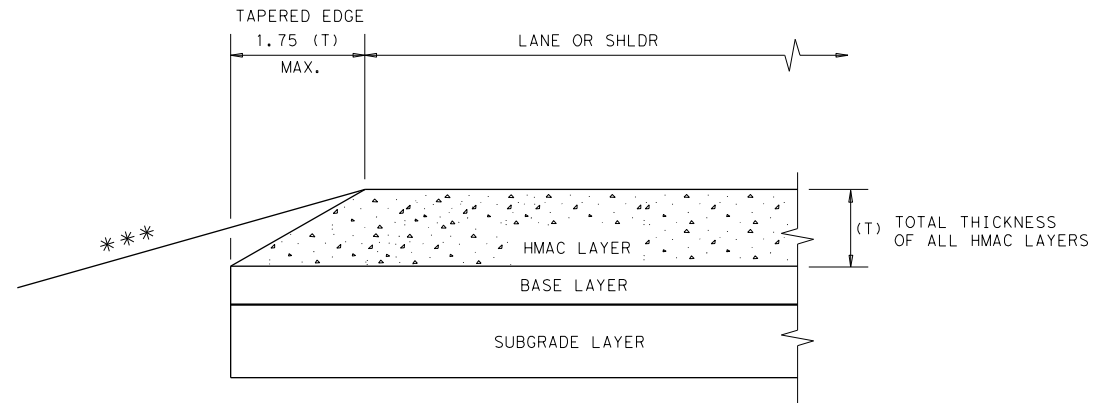
**CONDITION - 1**  
 THIN HMAC SURFACES OR HMAC OVERLAY  
 WITH THICKNESS OF 2.5" OR LESS



\*\* 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.

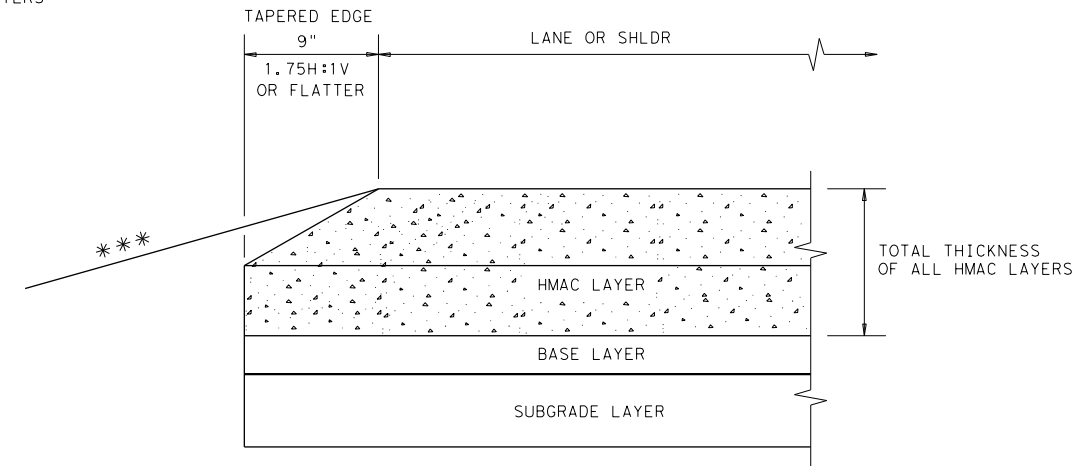
\*\*\* SEE TYPICAL SECTION FOR ROADSIDE DETAILS

**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.

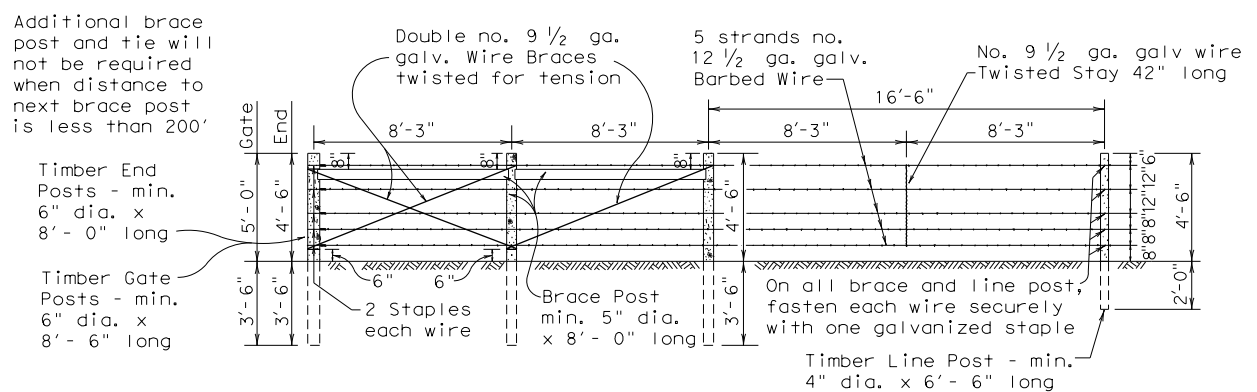
 **Texas Department of Transportation** **Design Division Standard**

**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	0493	02	021	RM 652
	DIST	COUNTY	SHEET NO.	
	ODA	LOVING	60	

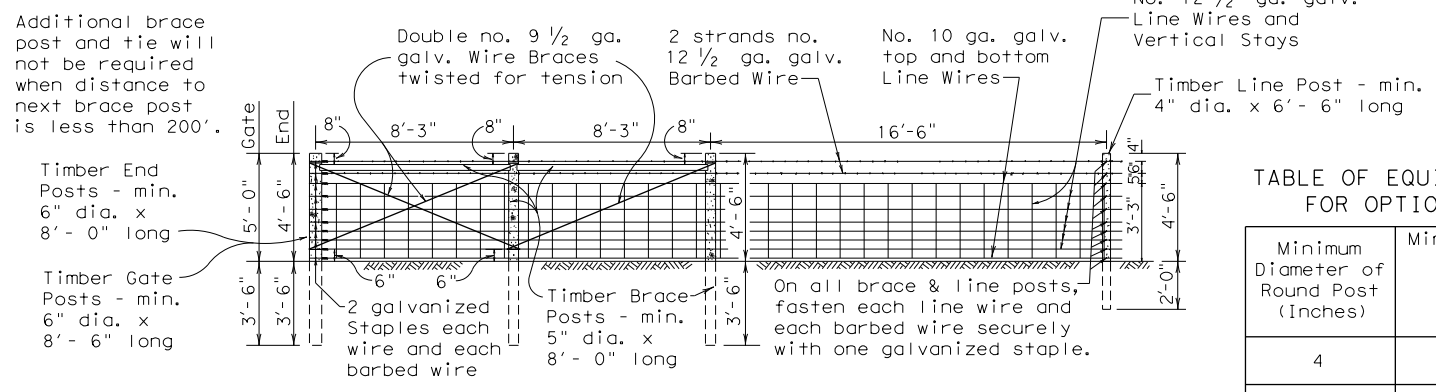
DISCLAIMER: The use of this standard is governed by the "Texas Engineering Practice Act". No warranty of any kind is made by TxDOT for any purpose whatsoever. TxDOT assumes no responsibility for the conversion of this standard to other formats or for incorrect results or damages resulting from its use.

DATE: 6/25/2021  
 FILE: c:\transys\pw\_loc\transys\scorp-p\pw1\besn\manek\d0848702\wf110.dgn



SECTION GALVANIZED BARBED WIRE FENCE WITH WOOD POSTS  
 Bracing Detail Used at Ends and Gates

TYPE "A" FENCE  
 (See General Note 6)



SECTION GALVANIZED WOVEN WIRE FENCE WITH WOOD POSTS  
 Bracing Detail Used at Ends and Gates

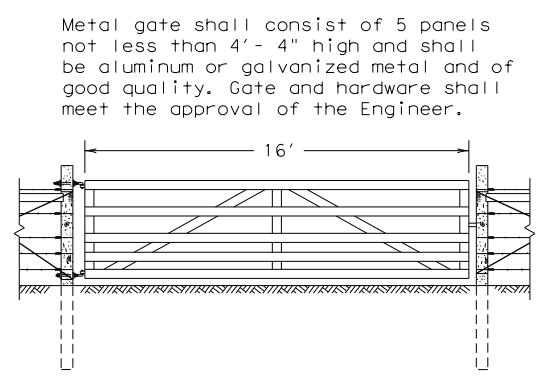
TYPE "B" FENCE  
 (See General Note 6)

TABLE OF EQUIVALENT SIZES FOR OPTIONAL SHAPE

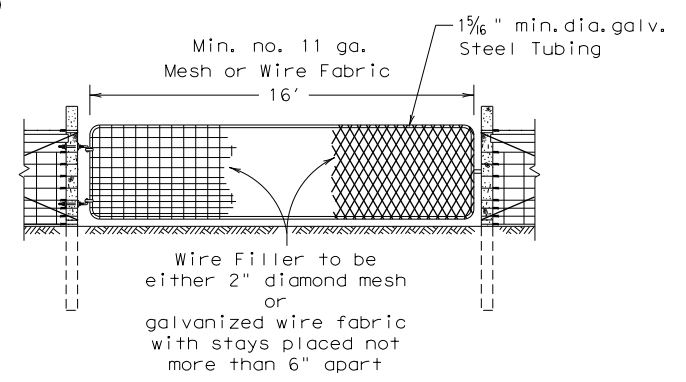
Minimum Diameter of Round Post (Inches)	Minimum Equivalent Dimension for Each Side of Square Post (Inches)
4	3 1/2
5	4 1/2
6	5 1/4

GENERAL NOTES

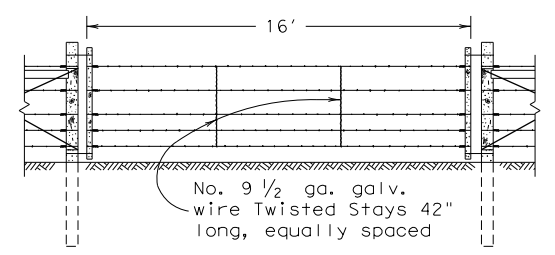
- Any high point which interferes with the placing of wire mesh shall be excavated to provide 2" clearance.
  - Latches for Type 1 and Type 2 gates shall be good commercial quality and design latches of the spring, fork or chain type. All latches shall be suitable for the gate and shall be approved by the Engineer.
  - Hinges for Type 2 gates shall be commercial design approved by the Engineer suitable for post and gate.
  - Concrete shall be of the design and consistency approved by the Engineer and shall contain not less than 4 sacks of cement per cubic yard. Concrete footings are to be crowned at the top to shed water.
  - If rock is encountered at a depth less than the embedded depth required, a 15" or larger diameter hole shall be drilled for the post and the post shall be set in concrete. If rock is encountered at a depth of 1'-6" or more below the ground surface, the hole shall be drilled to the required depth. If rock is encountered at a depth less than 1'-6" below the ground surface, the holes shall be drilled a minimum of 2'-0" into the rock or to the depth whichever is the lesser depth.
  - Barbed wire shall be in accordance with ASTM A 121 (Class 1) Design designation 12-2-4-1 4R or 12-2-5-1 4R, or as approved by the Engineer.
- Woven Wire Fence (Type B) shall be in accordance with ASTM A 116 (Class 1) No. 12-1/2 Grade 60 (See Table 1 ASTM A 116) to the height and design shown on the plans, or as approved by the Engineer.
- The location of gates and corner posts will be as indicated elsewhere on these plans.
  - Square wood posts may be used in lieu of round posts provided minimum equivalent size requirements, as shown are met. All wood posts shall be in accordance with Item 552, "Wire Fence."



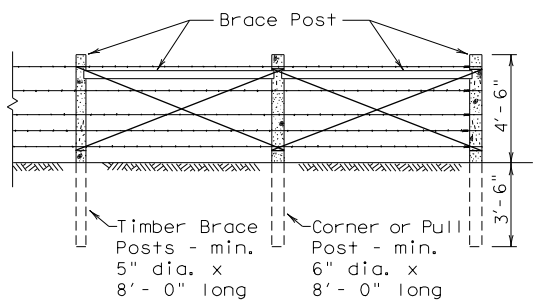
DETAIL TYPE 1 GATE



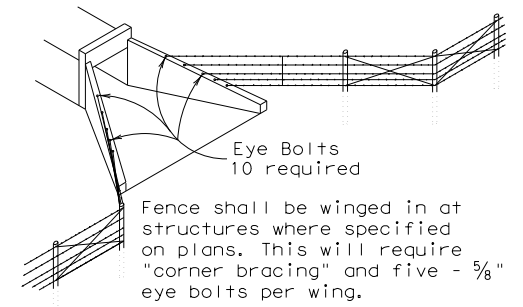
DETAIL TYPE 2 GATE



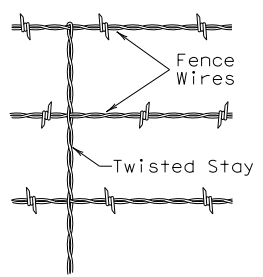
DETAIL TYPE 3 GATE



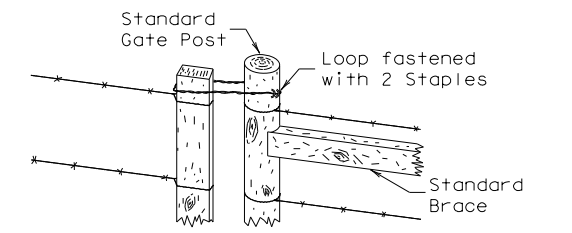
CORNER OR PULL POST ASSEMBLY



DETAIL OF FENCE TREATMENT AT STRUCTURES

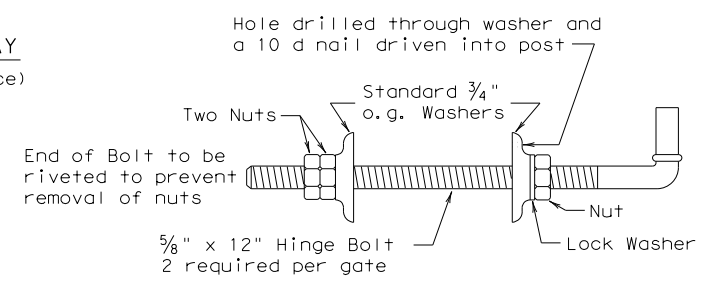


DETAIL OF STAY (Barbed wire fence)

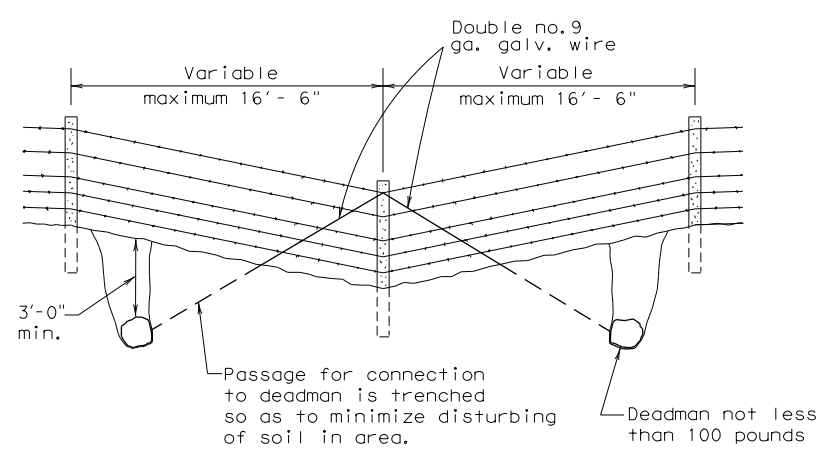


Loop to be made from two strands twisted no. 9 1/2 ga. galv. smooth wire, and to be securely fastened to gate post with two galv. staples.

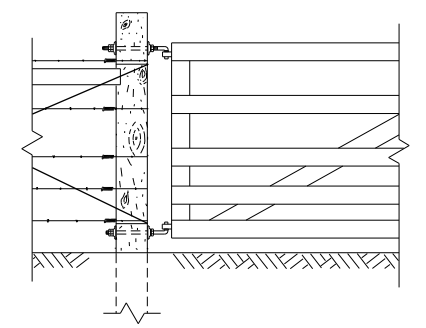
DETAIL FASTENER TYPE 3 GATE



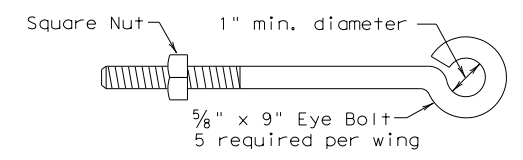
DETAIL OF GATE HINGE BOLT ASSEMBLY



DETAIL OF FENCE SAG (Single Line Connection)



DETAIL SHOWING INSTALLATION OF HINGES OF TYPE 1 & 2 GATE



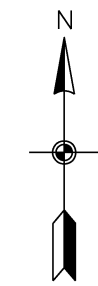
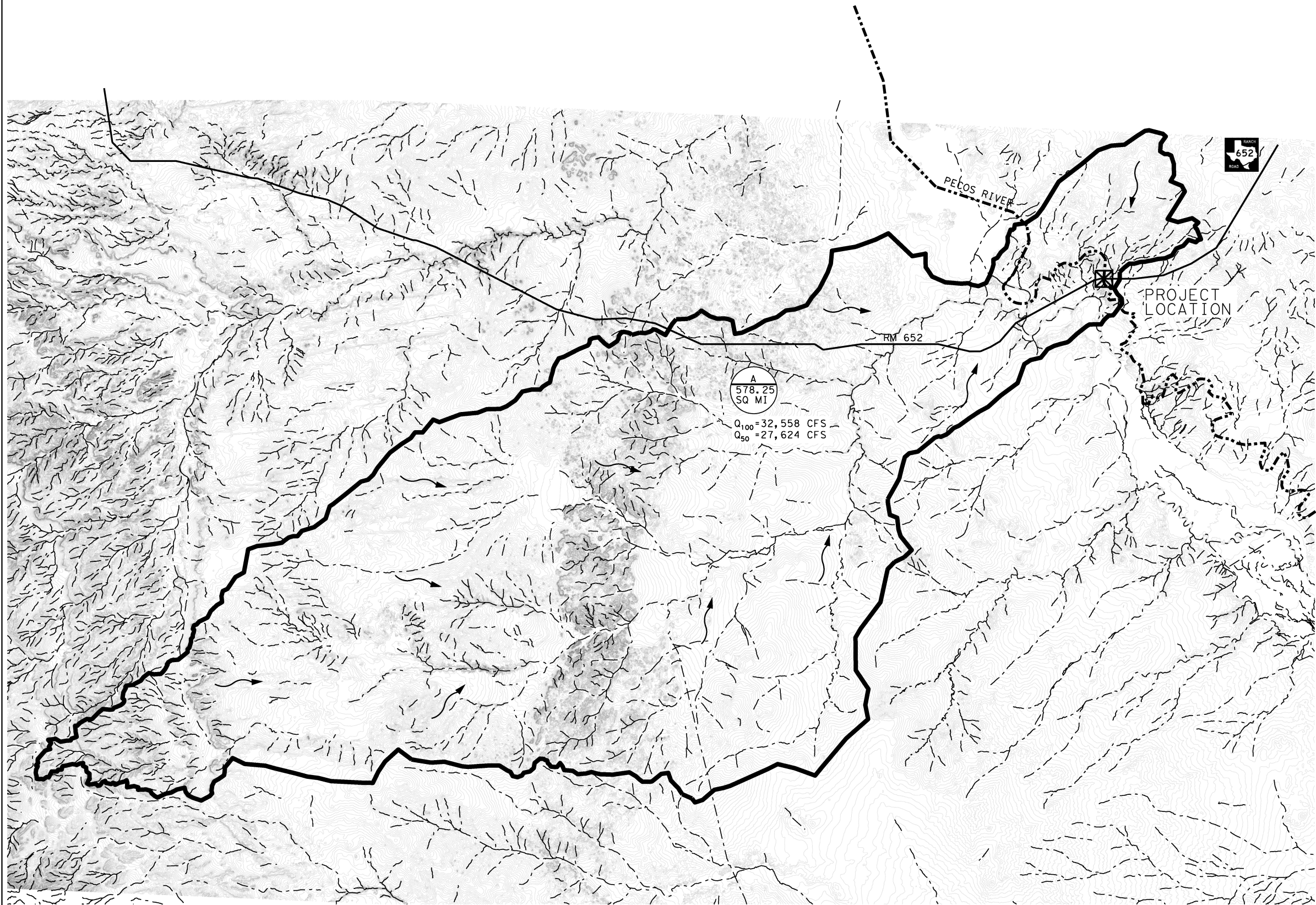
DETAIL OF EYE BOLT

**Texas Department of Transportation** Design Division Standard

## BARBED WIRE AND WOVEN WIRE FENCE (WOOD POSTS)








### WF (1) - 10

FILE: wf110.dgn	DN: TxDOT	CK: AM	DW: VP	CK:
© TxDOT 1994	CONT	SECT	JOB	HIGHWAY
REVISIONS	0493	02	021	RM 652
	DIST	COUNTY		SHEET NO.
	ODA	LOVING		61



0 12000 24000  
SCALE FEET  
1" = 24000'

**LEGEND**

-  (ROADWAY)
-  DRAINAGE AREA BOUNDARY
-  STREAM CENTERLINE
-  PECOS RIVER
-  DRAINAGE AREA SQUARE MILE
-  BRIDGE/STRUCTURE LOCATION
-  FLOW DIRECTION



PLANNING ENGINEERING PROJECT MANAGEMENT

**MCI** Moreno  
Cardenas Inc.

TBPE Firm  
Registration  
No. F-000554



**DRAINAGE AREA MAP**

SCALE: 1" = 24000' SHEET 1 OF 1

DESIGN	FED. RD. DIV. NO. 6	FEDERAL AID PROJECT NO. SEE TITLE SHEET		HIGHWAY NO. RM 652
GRAPHICS	STATE TEXAS	DISTRICT ODA	COUNTY LOVING	SHEET NO. 62
CHECK	CONTROL 0493	SECTION 02	JOB 021	

6/22/2021 4:36:20 PM

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**SCOUR ANALYSIS - 100YR (SCOUR DESIGN)**

SCOUR ANALYSIS DETERMINED BY UTILIZING EQUATIONS FROM HEC-18 MANUAL, 5TH EDITION

**CONTRACTION SCOUR:**

LIVE-BED CONTRACTION SCOUR EQUATIONS (EQNS. 6.1 & 6.2)  
D50 = 0.2 MM (SEE NOTE 4)  
K1 = 0.69

SCOUR DEPTH  $\frac{1}{2}$  (CONTRACTION) = 19.81 FT

**PIER SCOUR:**

PIER SCOUR EQUATIONS (EQNS. 7.1)  
D50 = 0.2 MM

SCOUR DEPTH  $\frac{1}{2}$  (PIER) = 2.95 FT

TOTAL SCOUR = 22.76 FT

**SCOUR ANALYSIS - 200 YR (CHECK)**

SCOUR ANALYSIS DETERMINED BY UTILIZING EQUATIONS FROM HEC-18 MANUAL, 5TH EDITION

**CONTRACTION SCOUR:**

LIVE-BED CONTRACTION SCOUR EQUATIONS (EQNS. 6.1 & 6.2)  
D50 = 0.2 MM (SEE NOTE 4)  
K1 = 0.69

SCOUR DEPTH  $\frac{1}{2}$  (CONTRACTION) = 29.03 FT

**PIER SCOUR:**

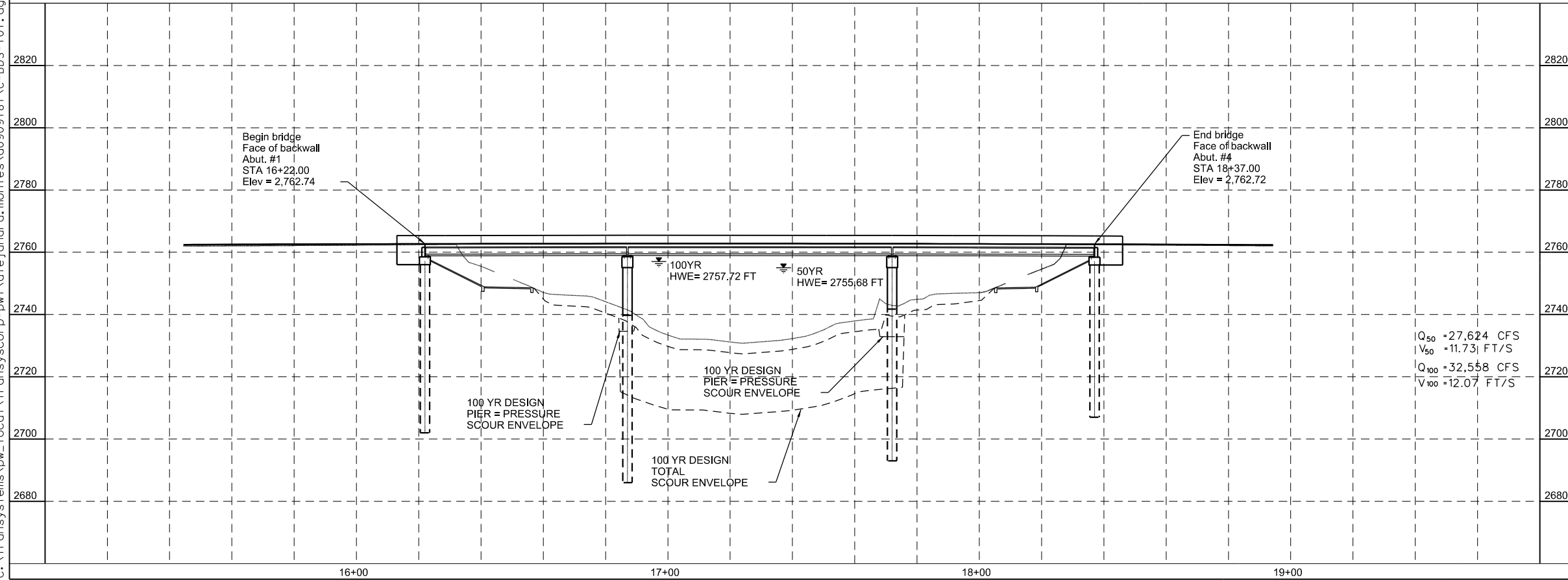
PIER SCOUR EQUATIONS (EQNS. 7.1)  
D50 = 0.2 MM

SCOUR DEPTH  $\frac{1}{2}$  (PIER) = 5.86 FT

TOTAL SCOUR = 34.89 FT

**NOTES:**

1. REFER TO RM 652 HYDRAULIC DATA SHEET FOR CALCULATION NOTES.
2. HYDRAULIC TOOLBOX VERSION 5.0.7 UTILIZED FOR THE ANALYSIS.
3. SCOUR DEPTHS SHOWN ABOVE WERE CALCULATED WITH HEC-18 EQUATIONS AND DO NOT ACCOUNT FOR POTENTIAL REDUCTIONS IN SCOUR DEPTHS ASSOCIATED WITH SHALLOW BEDROCK.
4. D50=0.2MM (FROM TXDOT MINIMUM).



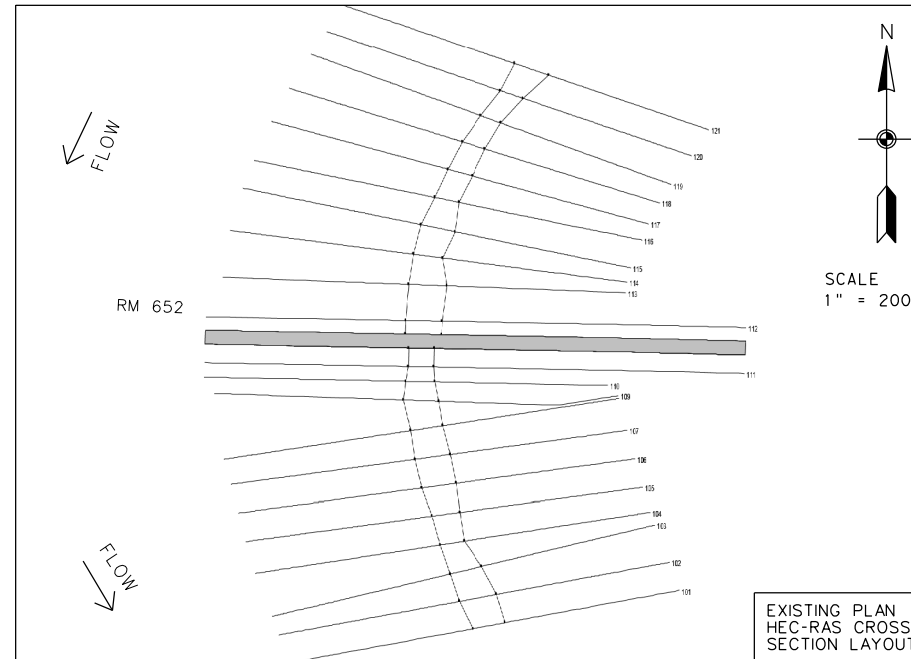
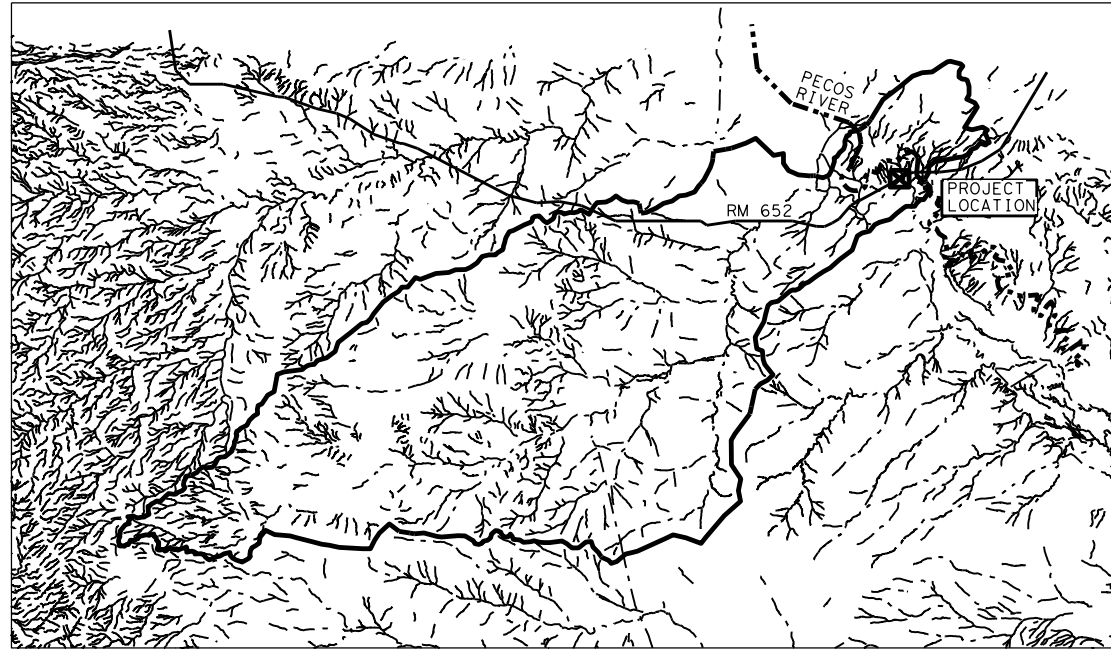
PLANNING ENGINEERING PROJECT MANAGEMENT  
**MCI** Moreno Cardenas Inc. TBPE Firm Registration No. F-000554  
 EL PASO SAN ANTONIO



**BRIDGE SCOUR ENVELOPE DATA SHEET**

SCALE: 1" = 40' PLAN 1" = 40' PROFILE SHEET 1 OF 1

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
GRAPHICS	6	SEE TITLE SHEET		RM 652
CHECK	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK	TEXAS	ODA	LOVING	63
	CONTROL	SECTION	JOB	
	0493	02	021	



RM 652 PECOS BRIDGE								
STATION	DOWNSTREAM REACH LENGTH (FT)	STORM FREQUENCY	DISCHARGE FLOW (Q) (CFS)	COMPUTED WS ELEVATION			VELOCITIES	
				EXISTING (FT)	PROPOSED (FT)	DIFFERENCE (FT)	EXISTING (FPS)	PROPOSED (FPS)
121	100	50	27624	2757.91	2757.91	0	4.39	4.39
		100	32558	2759.97	2759.97	0	4.26	4.26
120	100	50	27624	2757.91	2757.91	0	4.42	4.42
		100	32558	2759.97	2759.97	0	4.28	4.28
119	100	50	27624	2757.89	2757.89	0	4.49	4.49
		100	32558	2759.95	2759.95	0	4.32	4.32
118	100	50	27624	2757.79	2757.79	0	5.47	5.47
		100	32558	2759.88	2759.88	0	5.12	5.12
117	100	50	27624	2757.75	2757.75	0	5.58	5.58
		100	32558	2759.85	2759.85	0	5.21	5.21
116	100	50	27624	2757.71	2757.71	0	5.79	5.79
		100	32558	2759.81	2759.81	0	5.44	5.44
115	100	50	27624	2757.57	2757.57	0	6.16	6.16
		100	32558	2759.72	2759.72	0	5.72	5.72
114	100	50	27624	2757.46	2757.46	0	6.86	6.86
		100	32558	2759.63	2759.63	0	6.34	6.34
113	100	50	27624	2757.44	2757.44	0	6.24	6.24
		100	32558	2759.62	2759.62	0	5.86	5.86
112	100	50	27624	2757.58	2757.58	0	4.12	4.12
		100	32558	2759.72	2759.72	0	3.89	3.89
US CROSS SECTION	-	50	27624	2755.68	2755.68	0	11.73	11.73
		100	32558	2757.72	2757.72	0	12.07	12.07
DS CROSS SECTION	-	50	27624	2750.82	2750.82	0	21.27	21.27
		100	32558	2752.43	2752.43	0	22.33	22.33
111	100	50	27624	2752.99	2752.99	0	8.61	8.61
		100	32558	2754.00	2754.00	0	8.84	8.84
110	100	50	27624	2753.00	2753.00	0	7.86	7.86
		100	32558	2754.00	2754.00	0	8.10	8.10
109	100	50	27624	2752.39	2752.39	0	10.06	10.06
		100	32558	2753.35	2753.35	0	10.50	10.50
108	100	50	27624	2752.03	2752.03	0	11.01	11.01
		100	32558	2753.00	2753.00	0	11.43	11.43
107	100	50	27624	2751.25	2751.25	0	12.46	12.46
		100	32558	2752.10	2752.10	0	13.27	13.27
106	100	50	27624	2750.56	2750.56	0	13.60	13.60
		100	32558	2751.37	2751.37	0	14.44	14.44
105	100	50	27624	2750.40	2750.40	0	14.00	14.00
		100	32558	2751.36	2751.36	0	14.22	14.22
104	100	50	27624	2750.54	2750.54	0	12.70	12.70
		100	32558	2751.46	2751.46	0	13.03	13.03
103	100	50	27624	2750.33	2750.33	0	11.88	11.88
		100	32558	2751.28	2751.28	0	12.15	12.15
102	100	50	27624	2749.77	2749.77	0	12.45	12.45
		100	32558	2750.64	2750.64	0	12.99	12.99
101	100	50	27624	2748.35	2748.35	0	15.48	15.48
		100	32558	2748.99	2748.99	0	16.56	16.56

### HYDRAULIC METHOD

PROJECT HEC-RAS MODEL WAS DEVELOPED USING SURVEYED TOPOGRAPHIC AND CROSS SECTION DATA. PROJECT HEC-RAS MODEL (v.5.0.7) FILE NAME "ORLA BRIDGE CAD.prj"

### HYDROLOGIC METHOD

FLows FOR 50%, 20%, 10%, 4%, 2%, AND 1% AEP STORM EVENTS WERE COMPUTED USING THE TXDOT REGRESSION EQUATIONS DRAINAGE AREA = 578.25 SQ. MI (370051.5 ACRES), TIME OF CONCENTRATION = 149.78 MIN.

### BOUNDARY EQUATIONS

THE DOWNSTREAM AND UPSTREAM BOUNDARY CONDITIONS WAS CALCULATED USING NORMAL DEPTH BASED ON THE SLOPE FOR THE LOWER PORTION OF THE CHANNEL (0.0012 FT/FT).

### FEMA COORDINATION

COORDINATION WITH LOVING COUNTY FLOODPLAIN ADMINISTRATOR REGINA WILKERSON AND OTHER RED BLUFF DAM OFFICIALS WAS CONDUCTED. AFTER ANALYSIS OF CURRENT CRITERIA AND COORDINATION, THE PROPOSED BRIDGE STRUCTURE DOES NOT RESIDE WITHIN THE EXISTING FLOODPLAIN.

### NOTES:

1. PROPOSED ROADWAY IS LOCATED AT HEC-RAS RIVER STATION 111.5, BETWEEN STA 112 (UPSTREAM) AND STA 111 (DOWNSTREAM).
2. ELEVATIONS PRESENTED ARE REFERENCED TO THE NAVD88 DATUM.
3. THE MAXIMUM 500-YEAR DISCHARGE OF RED BLUFF DAM WAS ESTABLISHED AS 309,001 CFS AND PROVIDED BY THE NATIONAL INVENTORY OF DAMS FROM THE USACE. FLOW RATE VALUE PROVIDED FOR INFORMATION ONLY, AND WILL BE NOT USED FOR CALCULATION OF LIVE BED OR CONTRACTOR SCOUR FOR PROPOSED BRIDGE CROSSING.



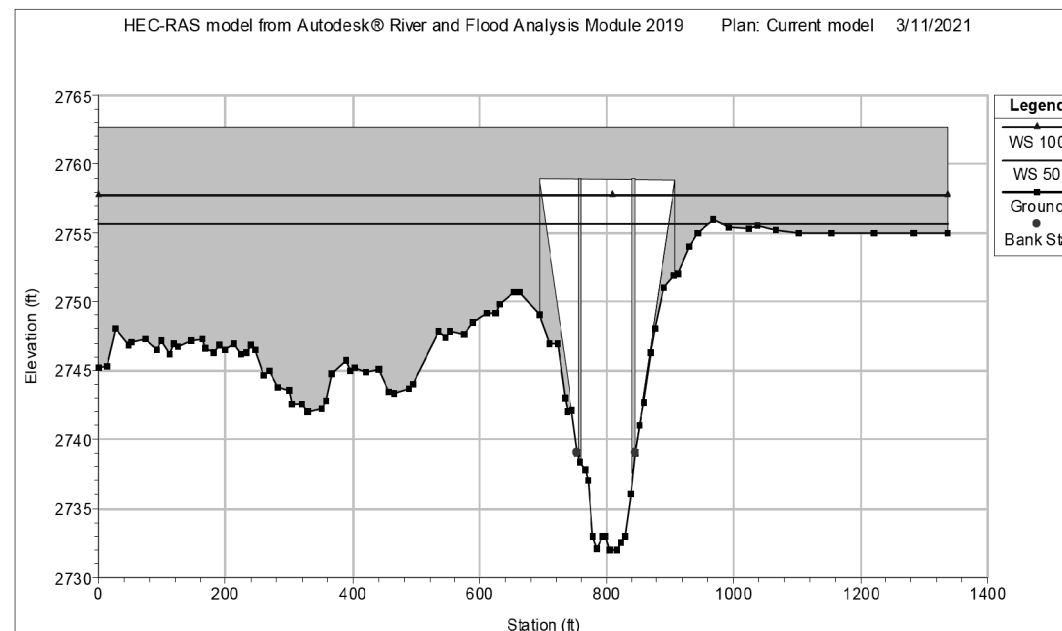
PLANNING ENGINEERING PROJECT MANAGEMENT  
**MCi** Moreno Cardenas Inc.  
 EL PASO SAN ANTONIO  
 TBPE Firm Registration No. F-000554

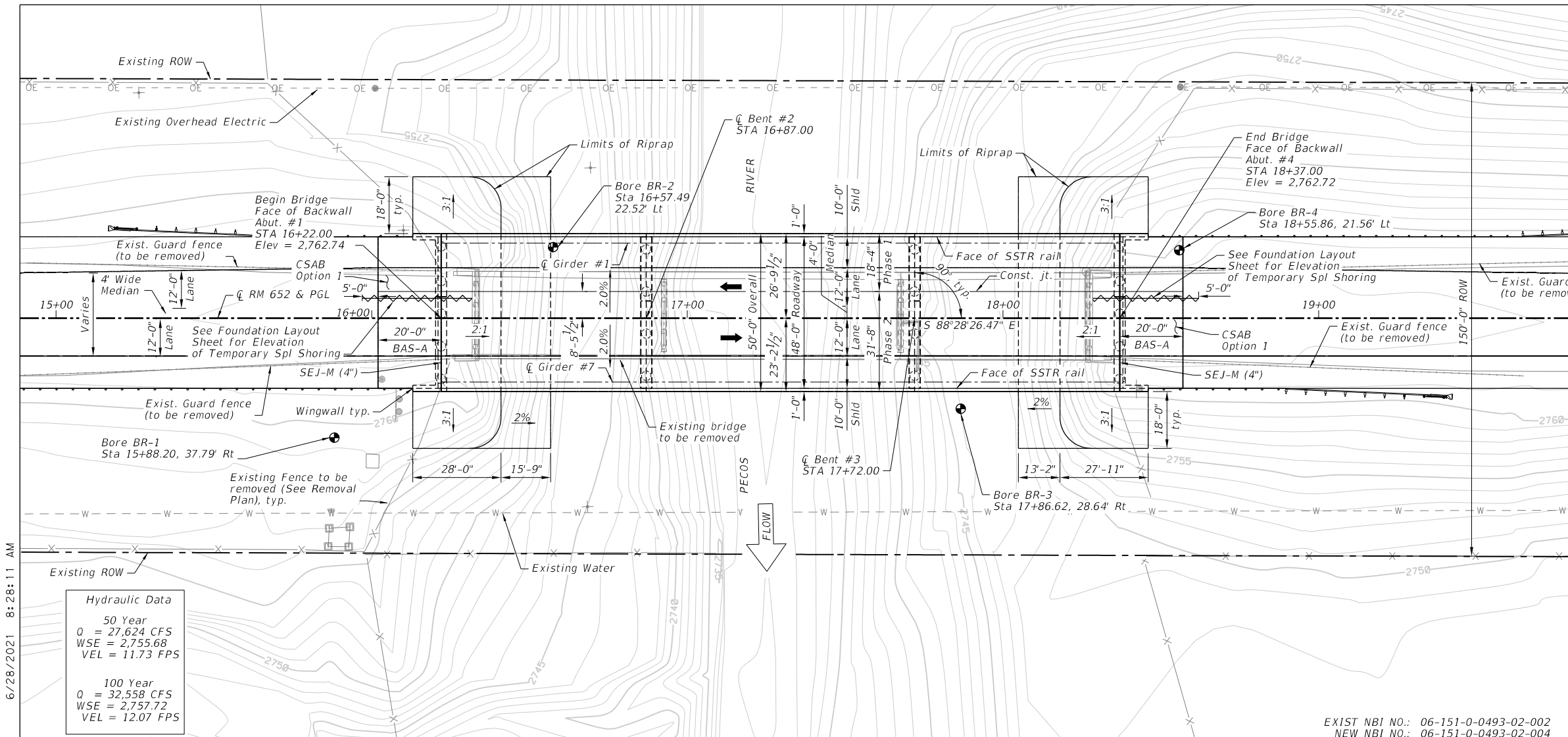
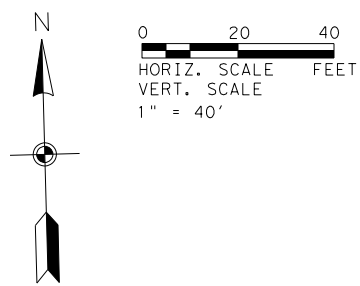


## HYDRAULIC DATA

SHEET 1 OF 1

DESIGN	FED. RD. DIV. NO. 6	FEDERAL AID PROJECT NO. SEE TITLE SHEET		HIGHWAY NO. RM 652
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK	TEXAS	ODA	LOVING	64
CHECK	CONTROL	SECTION	JOB	
	0493	02	021	





**Hydraulic Data**  
 50 Year  
 Q = 27,624 CFS  
 WSE = 2,755.68  
 VEL = 11.73 FPS  
 100 Year  
 Q = 32,558 CFS  
 WSE = 2,757.72  
 VEL = 12.07 FPS

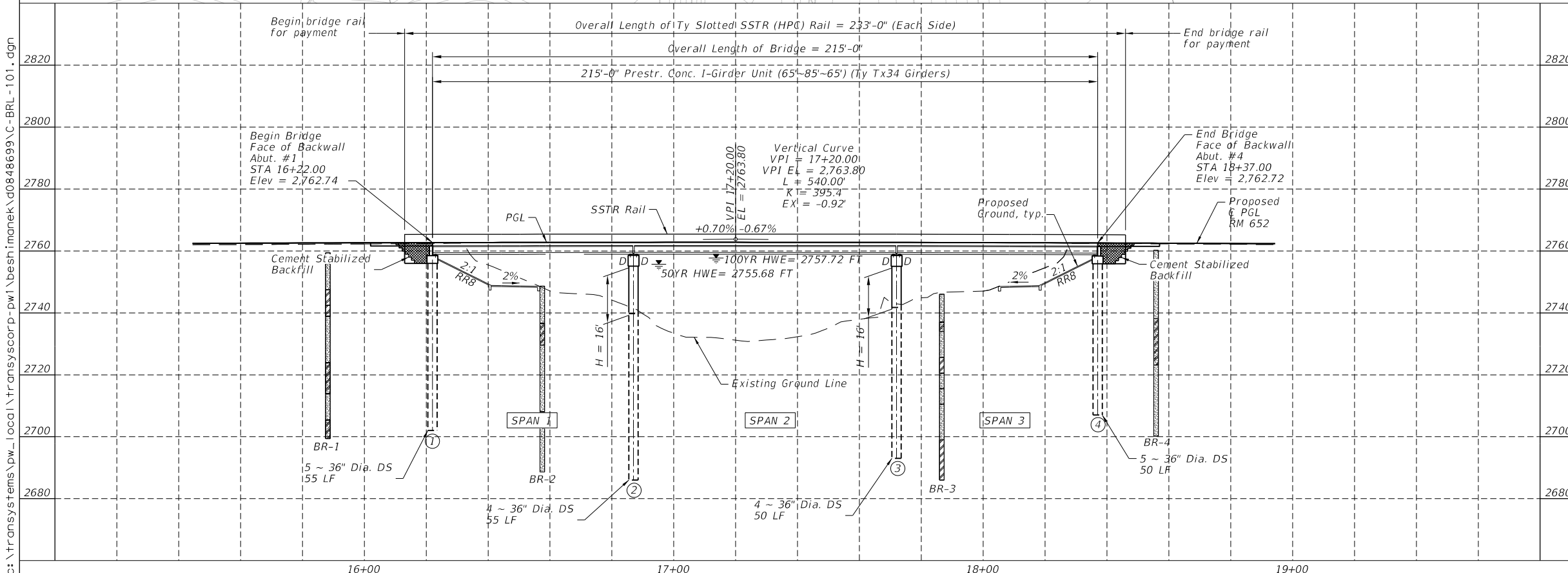
- General Notes:**
1. Designed for HL-93 live load in accordance with the AASHTO LRFD Bridge Design Specifications, 8th Edition as modified by TxDOT Design Manual-LRFD, January 2020.
  2. See Bridge Typical Transverse Sections for phased construction sequence details.
  3. Contractor shall field verify locations of all structures and utilities and notify Engineer of any conflicts and discrepancies.
  4. "D" denotes bents with dowel bars for exterior girders with slotted holes.
  5. The "H" values shown are estimated column heights. the Contractor is responsible for calculating the actual column heights based on field conditions.
  6. See Boring Logs sheet for drilling log information.
  7. Contractor's attention is drawn to the water bearing sand and gravel material shown in the boring logs. Hole stability is the responsibility of the Contractor.

**FUNCTIONAL CLASSIFICATION: MAJOR COLLECTOR**  
 DESIGN SPEED: 70 MPH  
 ADT (2019): 5,173  
 ADT (2039): 6,208

All Bents are on Bearing N 1°31'33.53" E

EXIST NBI NO.: 06-151-0-0493-02-002  
 NEW NBI NO.: 06-151-0-0493-02-004

**HL93 LOADING**



**TranSystems**  
 TEXAS REGISTERED ENGINEERING FIRM F-3557  
 500 W. 7th ST, SUITE 1100  
 FORT WORTH, TX 76102  
 (817) 339-8950  
 FIRM REG. #: 3557

**Texas Department of Transportation**  
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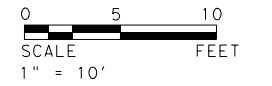
**RM 652  
 PECOS RIVER BRIDGE  
 BRIDGE LAYOUT**

SCALE: 1" = 40' PLAN 1" = 40' PROFILE SHEET 1 OF 1

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
RNW	6	SEE TITLE SHEET		RM 652
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
JEM	TEXAS	ODA	LOVING	65
CHECK	KMA	CONTROL	SECTION	
CHECK	PGN	0493	02	

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7/23/2021 5:19:06 PM  
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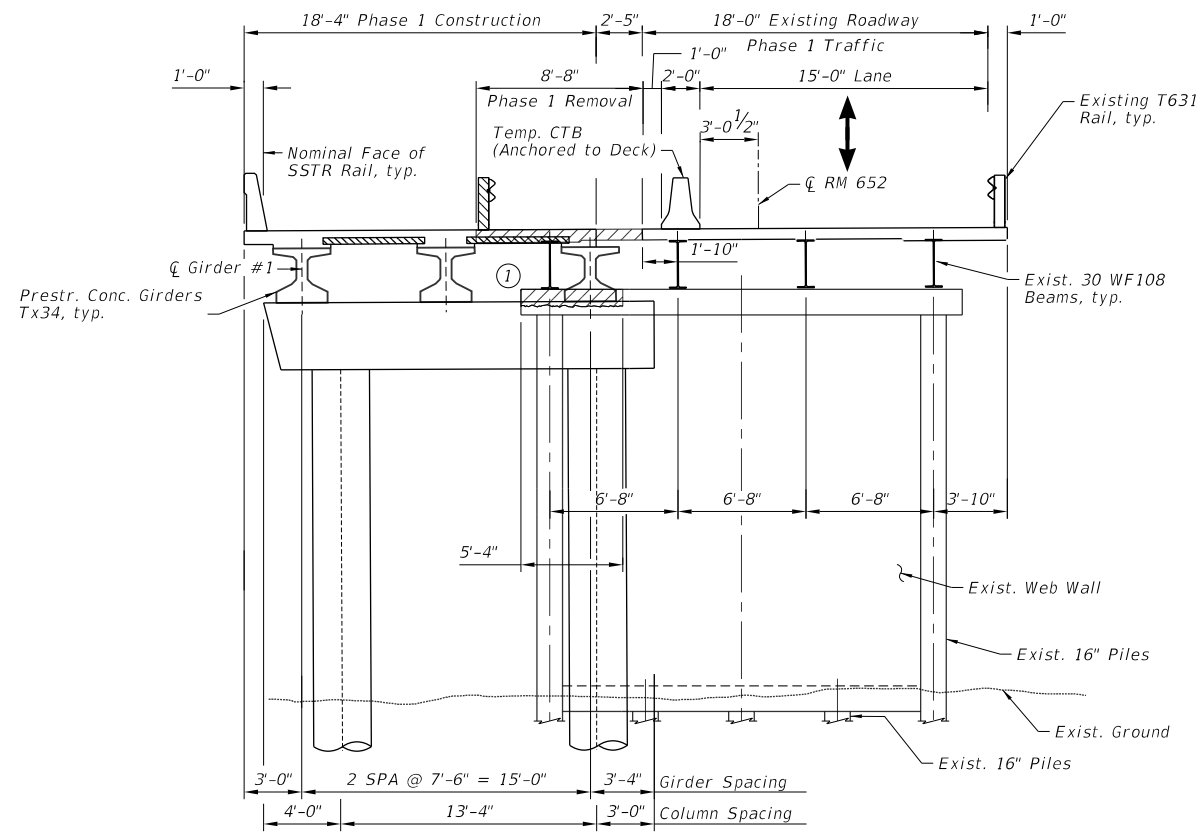


Notes  
 1. Typical sections shown represent phased construction at proposed bent location.

**LEGEND**

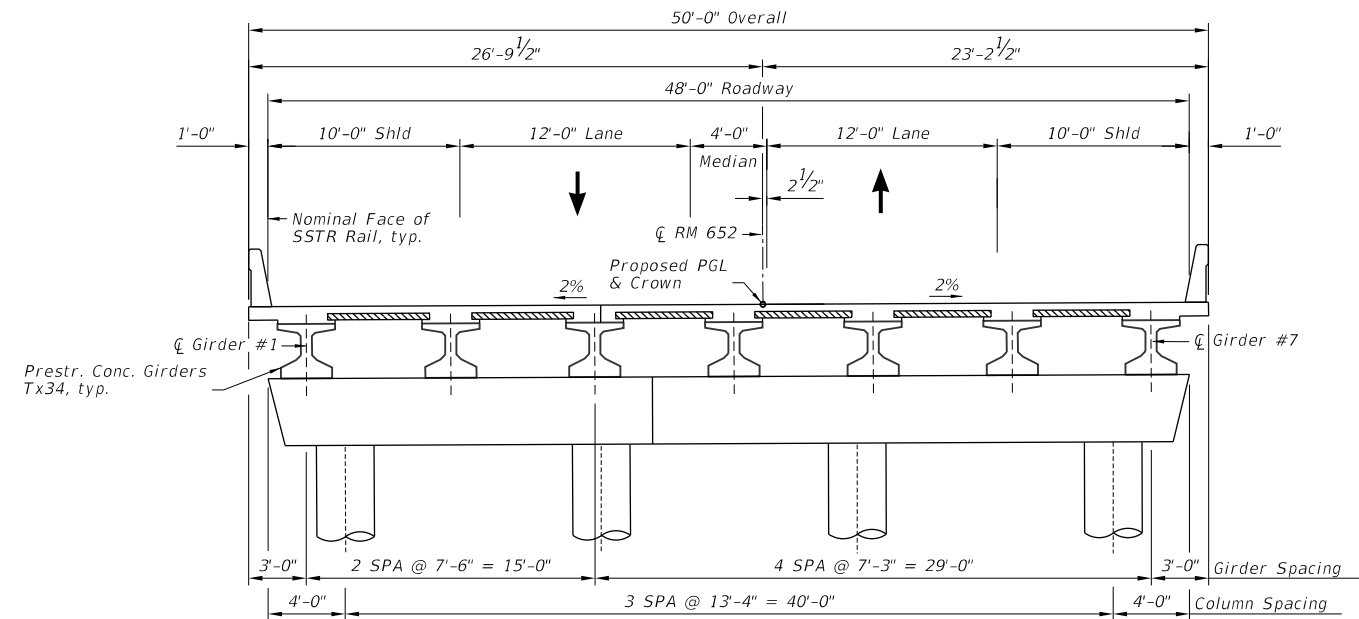


Existing Bridge Removal

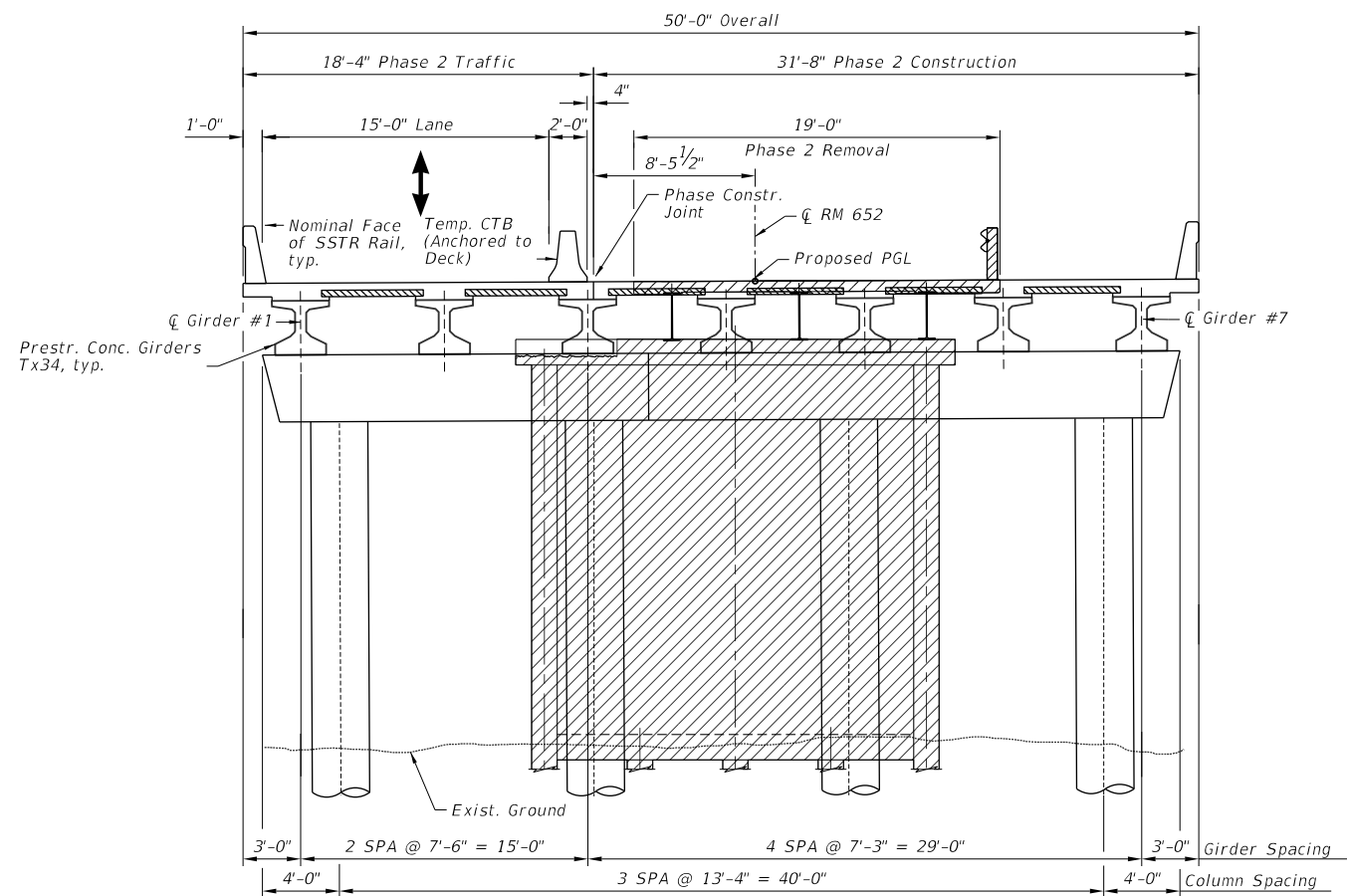


**PHASE 1 TYPICAL TRANSVERSE SECTION**

① Remove existing cap only as required for phase 1 construction.



**FINAL TYPICAL TRANSVERSE SECTION**



**PHASE 2 TYPICAL TRANSVERSE SECTION**

HL93 LOADING



TEXAS REGISTERED ENGINEERING FIRM F-3557



500 W. 7th ST. SUITE 1100  
 FORT WORTH, TX 76102  
 (817) 339-8950  
 TX ENG FIRM NO. 3557



RM 652  
 PECOS RIVER BRIDGE  
 BRIDGE TYPICAL SECTIONS

SCALE: 1" = 10'		SHEET 1 OF 1	
DESIGN RNW	FED. RD. DIV. NO. 6	FEDERAL AID PROJECT NO. SEE TITLE SHEET	
GRAPHICS JEM	STATE TEXAS	DISTRICT ODA	COUNTY LOVING
CHECK KMA	CONTROL	SECTION 02	JOB 021
CHECK PCN	0493	02	021
			HIGHWAY NO. RM 652 SHEET NO. 66

SUMMARY OF BRIDGE ESTIMATED QUANTITIES

SUMMARY OF BRIDGE ITEMS													
ITEM	400	403	416	420	420	420	422	422	425	432	450	454	496
DESC. CODE	6005	6001	6093	6018	6030	6042	6002	6016	6036	6002	6024	6018	6010
DESCRIPTION	CEM STABIL BKFL	TEMPORARY SPL SHORING	DRILL SHAFT (36 IN) (HPC)	CL C CONC (ABUT) (HPC)(SRC)	CL C CONC (CAP) (HPC)	CL C CONC (COLUMN) (HPC)(SRC)	REINF CONC SLAB (HPC)	APPROACH SLAB (HPC)	PRESTR CONC GIRDER (TX34)	RIPRAP (CONC)(5 IN)	RAIL (TY SSTR) (HPC)	SEALED EXPANSION JOINT(4 IN) (SEJ-M)	REMOV STR (BRIDGE 100 -499 FT LENGTH)
	UNITS	CY	SF	LF	CY	CY	CY	SF	CY	LF	CY	LF	EA
2 ~ ABUTMENTS	PHASE 1	52.2	387	210	21.4			3,942	29.5		36.9	18	
	PHASE 2	90.2	387	315	37.0			6,808	50.9		63.8	18	
2 ~ INTERIOR BENTS	PHASE 1			210				17.6	16.8				
	PHASE 2			210				28.5	16.8				
1 ~ 215.00' PRESTRESSED CONC GIRDER UNIT	PHASE 1									640.5		215	36
	PHASE 2									854.0		215	63
EXISTING 195.00' BRIDGE													1
PROJECT TOTALS		142.4	774	945	58.4	46.1	33.6	10,750	80.4	1,494.5	100.7	466	99

BEARING SEAT ELEVATIONS							
	GIRDER 1	GIRDER 2	GIRDER 3	GIRDER 4	GIRDER 5	GIRDER 6	GIRDER 7
ABUT 1 (FD)	2758.312	2758.462	2758.612	2758.757	2758.673	2758.528	2758.384
BENT 2 (BK)	2758.424	2758.574	2758.724	2758.869	2758.786	2758.641	2758.496
BENT 2 (FD)	2758.343	2758.493	2758.643	2758.788	2758.705	2758.560	2758.415
BENT 3 (BK)	2758.334	2758.484	2758.634	2758.779	2758.695	2758.550	2758.405
BENT 3 (FD)	2758.415	2758.565	2758.715	2758.860	2758.776	2758.631	2758.486
ABUT 4 (BK)	2758.288	2758.438	2758.588	2758.733	2758.650	2758.505	2758.360

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TX ENG FIRM NO. 3557



RM 652  
PECOS RIVER BRIDGE  
BRIDGE ESTIMATED QUANTITIES  
AND BEARING SEAT ELEVATIONS

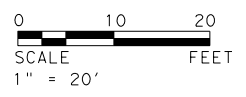
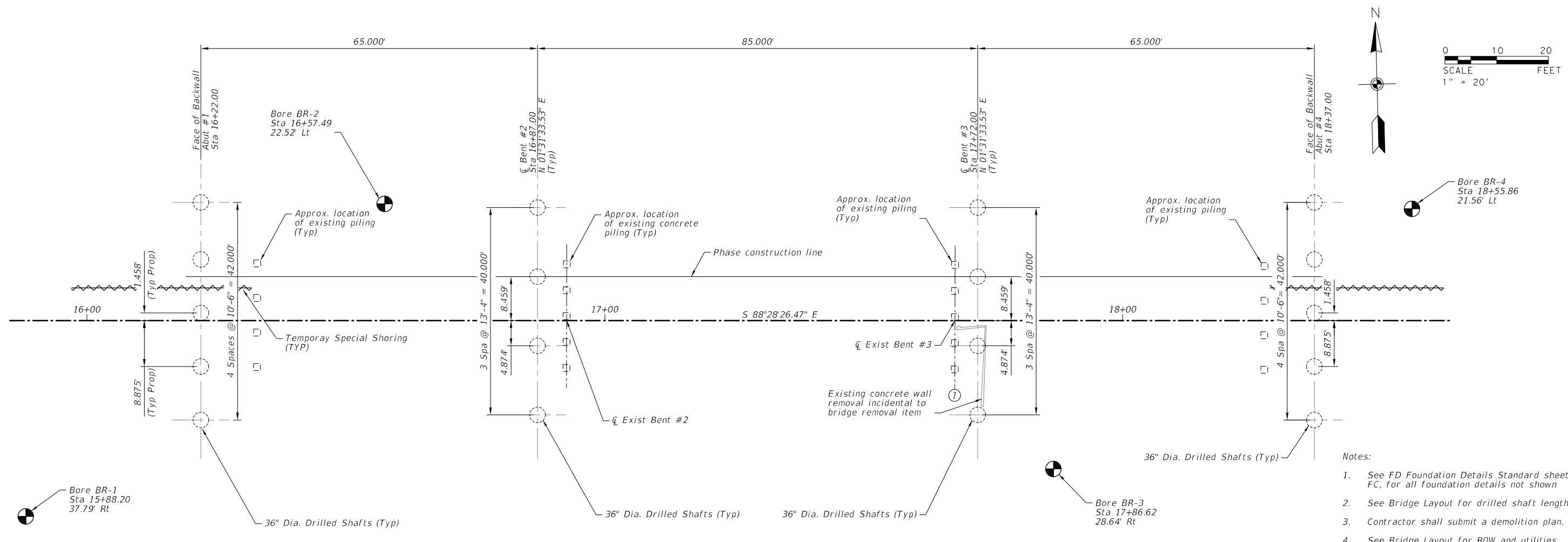
SHEET 1 OF 1

DESIGN RNW	FED. RD. DIV. NO. 6	FEDERAL AID PROJECT NO. SEE TITLE SHEET		HIGHWAY NO. RM 652
GRAPHICS JEM	STATE TEXAS	DISTRICT ODA	COUNTY LOVING	SHEET NO. 67
CHECK KMA	CONTROL	SECTION	JOB	
CHECK PCN	0493	02	021	



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- Notes:
1. See FD Foundation Details Standard sheet, FC, for all foundation details not shown
  2. See Bridge Layout for drilled shaft lengths.
  3. Contractor shall submit a demolition plan.
  4. See Bridge Layout for ROW and utilities.
  5. Provide Class C (HPC) (SRC) concrete (f'c = 3,600 psi) for all drilled shafts.

① Abandoned USGS facility conduit at south face of bent to be removed. Cost incidental to bridge removal item.

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TEXAS REGISTERED ENGINEERING FIRM F-3557

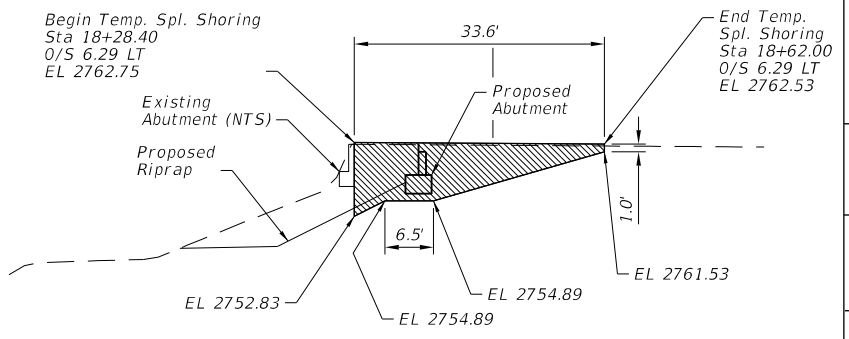
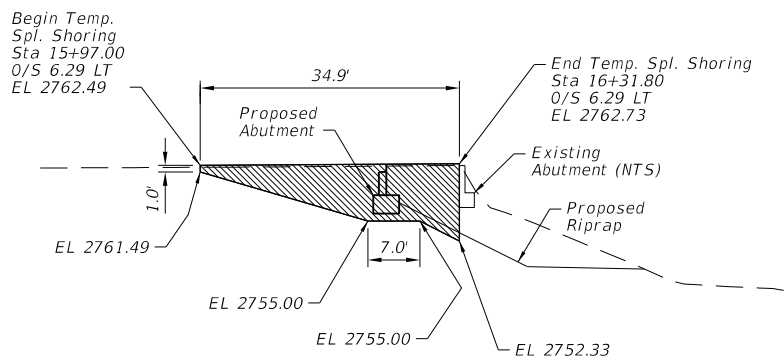
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FIRM REG. #: 3557



RM 652  
PECOS RIVER BRIDGE  
FOUNDATION LAYOUT

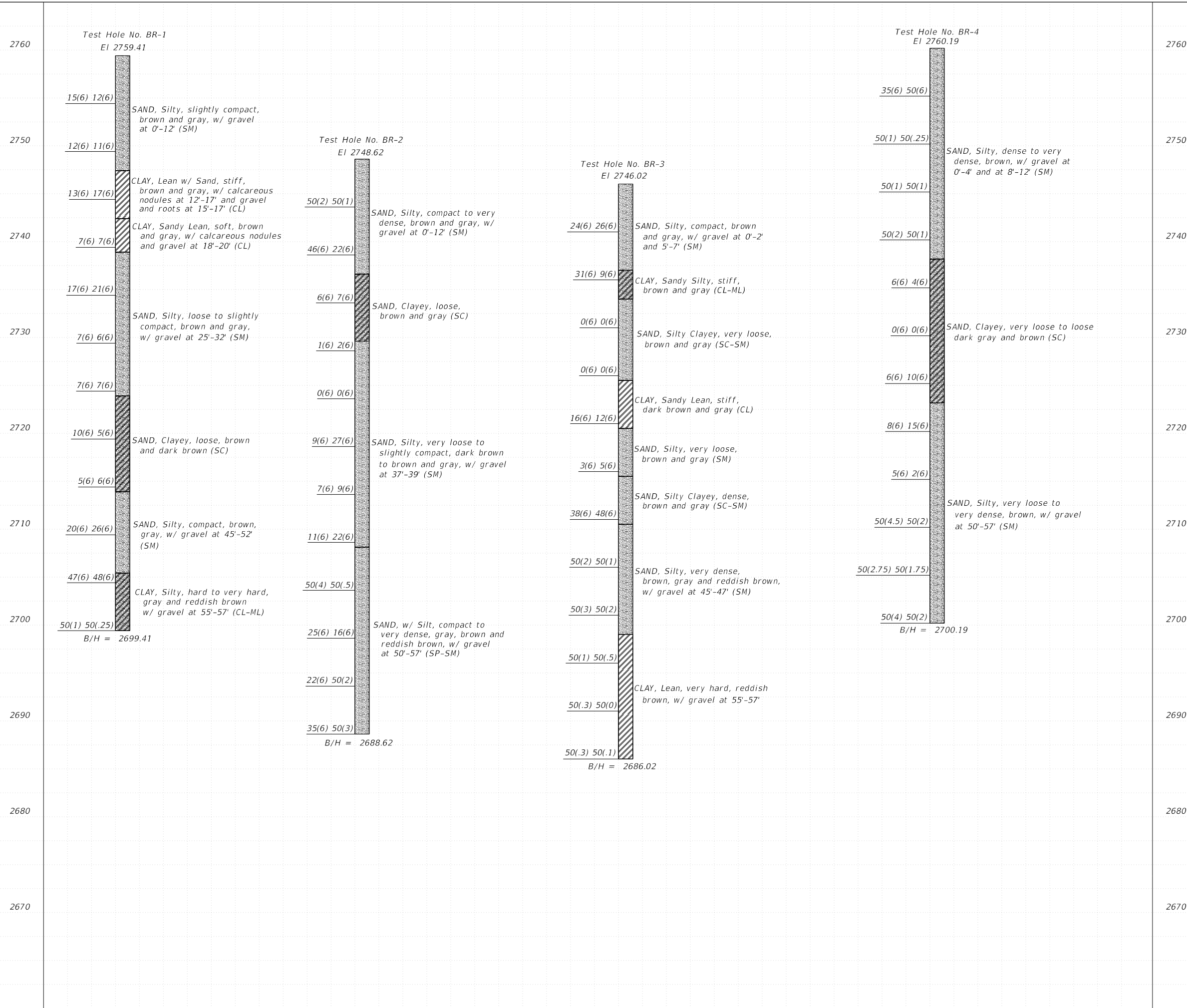
SCALE: N/A SHEET 1 OF 1

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
RNW	6	SEE TITLE SHEET		RM 652
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
JEM	TEXAS	ODA	LOVING	68
CHECK	KMA	CONTROL	SECTION	
CHECK	PGN	0493	02	
			JOB	
			021	



Existing ground

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Notes:  
 See Bridge Layout for location of test holes.  
 Refer to the geotechnical report for additional test hole information.

HL93 LOADING



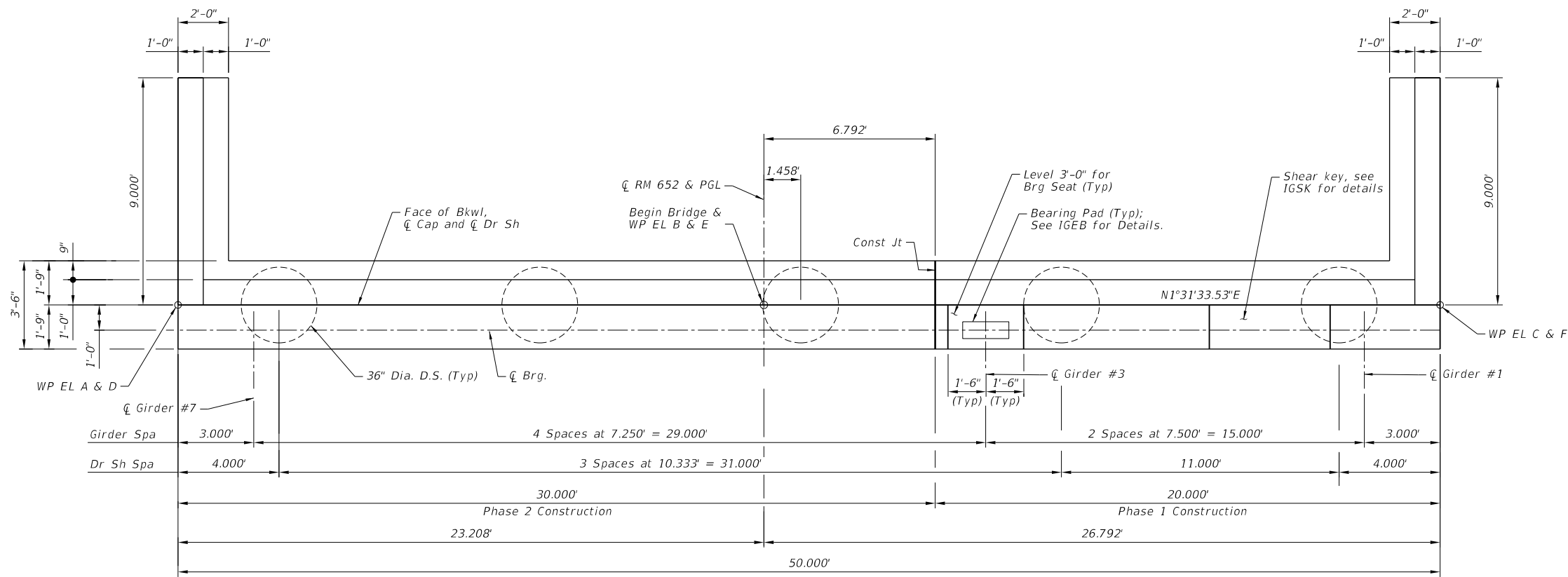
TEXAS REGISTERED ENGINEERING FIRM F-3557

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RM 652  
 PECOS RIVER BRIDGE  
 BORING LOGS

SCALE:		SHEET 1 OF 1		
DESIGN RNW	FED. RD. DIV. NO. 6	FEDERAL AID PROJECT NO. SEE TITLE SHEET		HIGHWAY NO. RM 652
GRAPHICS JEM	STATE TEXAS	DISTRICT ODA	COUNTY LOVING	SHEET NO. 69
CHECK KMA	CONTROL	SECTION 02	JOB 021	
CHECK PGN	0493			



**PLAN**  
ABUTMENT 1 SHOWN, ABUTMENT 4 BY OPPOSITE HAND

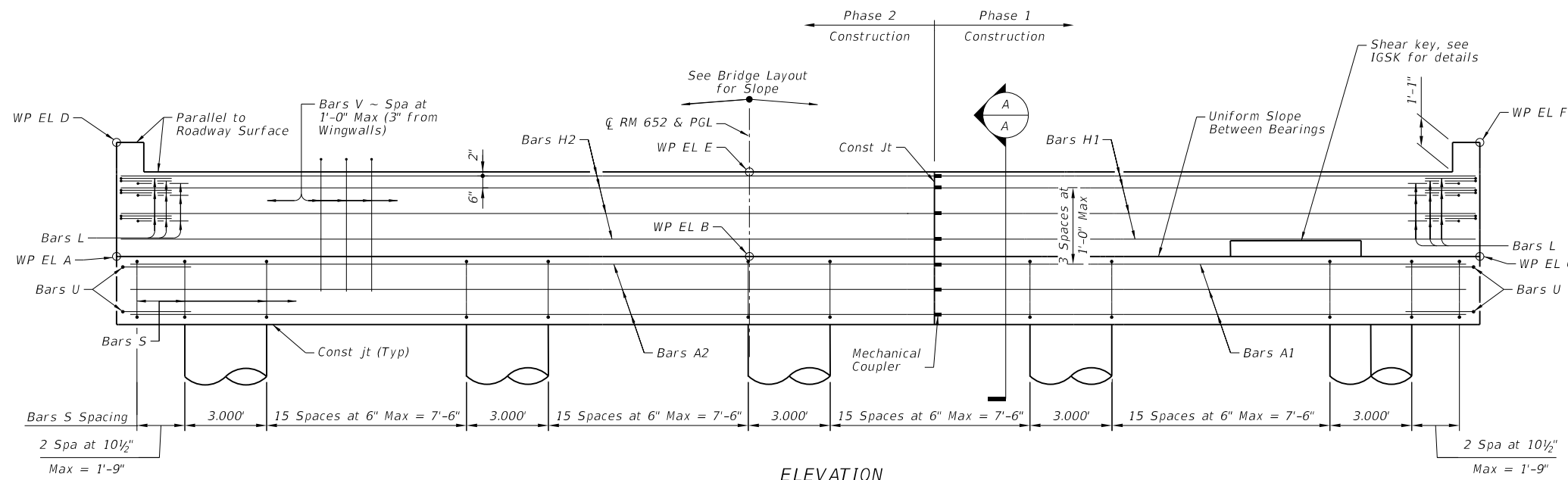
Working Point	Abut 1 Elevation	Abut 4 Elevation
A	2758.193	2758.101
B	2758.657	2758.637
C	2758.121	2758.173
D	2762.276	2762.184
E	2761.657	2761.637
F	2762.204	2762.256

**General Notes:**

1. Designed according to AASHTO LRFD Bridge Design Specifications.
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 Shear Key (IGSK) standard sheet for all shear key details and notes.
5. See Concrete Riprap (CRR) standard sheet for riprap attachment details.
6. See applicable rail details for rail anchorage in wingwalls.
7. For bearing seat elevations and estimated quantities, see Bridge Estimated Quantities and Bearing Seat Elevations sheet.
8. Cover dimensions are clear dimensions, unless noted otherwise.
9. Reinforcing bar dimensions shown are out-to-out of bar.
10. Calculated foundation loads = 120 Tons/D. S.

**Material Notes:**

1. Provide Class C (HPC) (SRC) concrete ( $f'c = 3,600$  psi).
2. Provide Grade 60 reinforcing steel.



**ELEVATION**

**HL93 LOADING**



TEXAS REGISTERED ENGINEERING FIRM F-3557



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FORT WORTH, TX 76102  
(817) 339-8950  
TX ENG FIRM NO. 3557

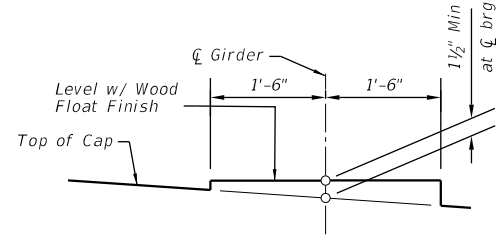


**RM 652  
PECOS RIVER BRIDGE  
ABUTMENT 1 & 4 DETAILS**

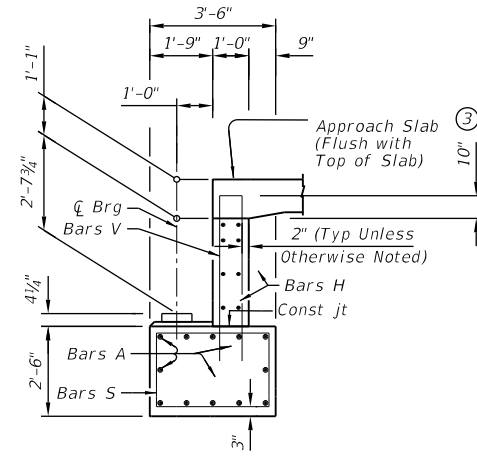
SCALE: 3/16" = 1'-0" SHEET 1 OF 2

DESIGN RNW	FED. RD. DIV. NO. 6	FEDERAL AID PROJECT NO. SEE TITLE SHEET		HIGHWAY NO. RM 652
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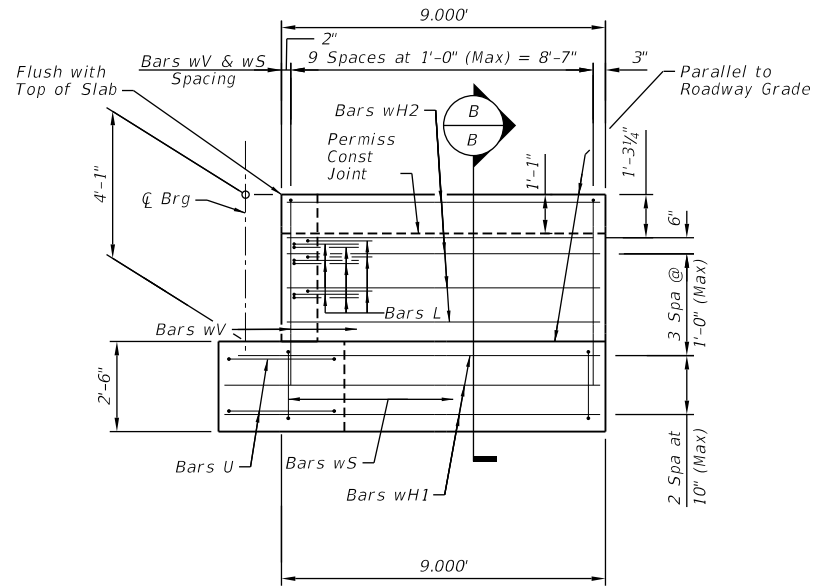
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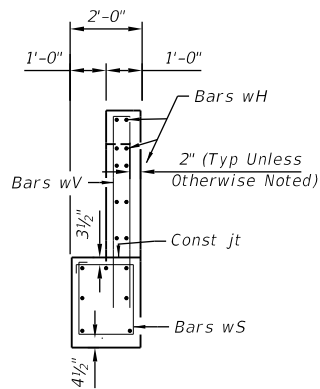
**BEARING SEAT DETAIL**  
 (N.T.S.)  
 (Bearing surface must be clean and free of all loose material before placing bearing pad.)



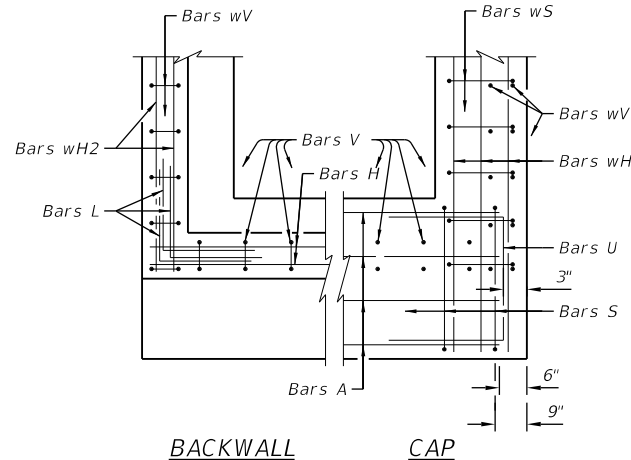
**SECTION A-A**



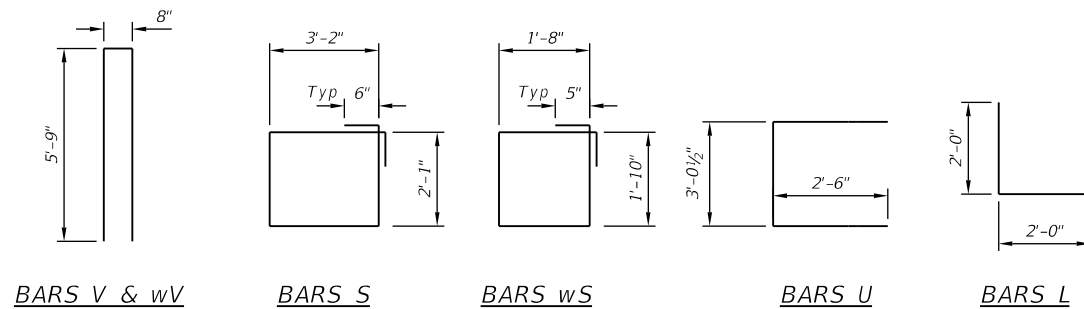
**WINGWALL ELEVATION**



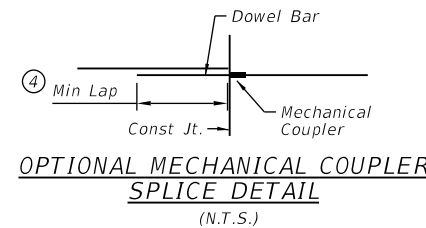
**SECTION B-B**



**BACKWALL CORNER DETAILS**  
 (N.T.S.)



**BARS V & wV BARS S BARS wS BARS U BARS L**



**OPTIONAL MECHANICAL COUPLER SPLICE DETAIL**  
 (N.T.S.)

**TABLE OF ESTIMATED QUANTITIES ①**

BARS	No.	SIZE	LENGTH	WEIGHT
A1	12	#11	19'-8"	1,254
A2	12	#11	29'-8"	1,892
H1	8	#6	19'-8"	237
H2	8	#6	29'-8"	357
L	18	#6	4'-0"	109
S	70	#5	11'-6"	840
U	4	#6	8'-1"	49
V	50	#5	12'-2"	635
wH1	14	#6	10'-5"	220
wH2	20	#6	8'-8"	261
wS	20	#4	7'-10"	105
wV	20	#5	12'-2"	254
Reinforcing Steel ②			LB	6,213
CL "C" Concrete (HPC)			CY	29.2

- ① Quantities for one abutment only.
- ② Reinforcing steel is for Contractor's information only.
- ③ Increase as required to maintain 3" from finished grade.
- ④ If mechanical splices are used, make the following adjustments to bar lengths:  
 Minimum lap on A1/A2 Bar = 6'-10"  
 Minimum lap on H1/H2 Bars = 3'-8"

HL93 LOADING



TEXAS REGISTERED ENGINEERING FIRM F-3557



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RM 652  
 PECOS RIVER BRIDGE  
 ABUTMENT 1 & 4 DETAILS

SCALE: 3/16" = 1'-0" SHEET 2 OF 2

DESIGN RNW	FED. RD. DIV. NO. 6	FEDERAL AID PROJECT NO. SEE TITLE SHEET		HIGHWAY NO. RM 652
GRAPHICS JEM	STATE TEXAS	DISTRICT ODA	COUNTY LOVING	SHEET NO. 71
CHECK KMA	CONTROL	SECTION	JOB	
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**BENT 2 & 3 TABLE OF ESTIMATED QUANTITIES**

BARS	No.	SIZE	LENGTH	WEIGHT
A1	6	#11	27'-0"	861
A2	6	#11	27'-4"	872
B1	6	#11	26'-2"	834
B2	6	#11	26'-8"	850
D	4	#9	1'-8"	23
S	59	#5	13'-8"	842
T1	10	#5	22'-5"	234
T2	10	#5	26'-8"	279
U	2	#5	9'-8"	21
V	40	#9	19'-0"	2,584
Z	4	#4	526'-6"	1,407
Reinforcing Steel (1)				LB 8,811
CL "C" Concrete (Cap)				CY 23.1
CL "C" Concrete (Col)				CY 16.8

(1) Reinforcing steel is for Contractor's information only.

**General Notes:**

1. Designed according to AASHTO LRFD Bridge Design Specifications.
2. See Bridge Layout for foundation type, size and length.
3. See Common Foundation Details (FD) standard sheet for all foundation details and notes.
4. See Shear Key (IGSK) standard sheet for all shear key details and notes.
5. For bearing seat elevations and estimated quantities, see Bridge Estimated Quantities and Bearing Seat Elevations sheet.
6. Cover dimensions are clear dimensions, unless noted otherwise.
7. Calculated foundation loads = 200 Tons/D.S.

**Material Notes:**

1. Provide Class C (HPC) concrete ( $f'_c = 3,600$  psi).
2. Provide Class C (HPC) (SRC) concrete on columns and drilled shafts.
3. Provide Grade 60 reinforcing steel.
4. Galvanize dowel bars D.

**HL93 LOADING**



TEXAS REGISTERED ENGINEERING FIRM F-3557

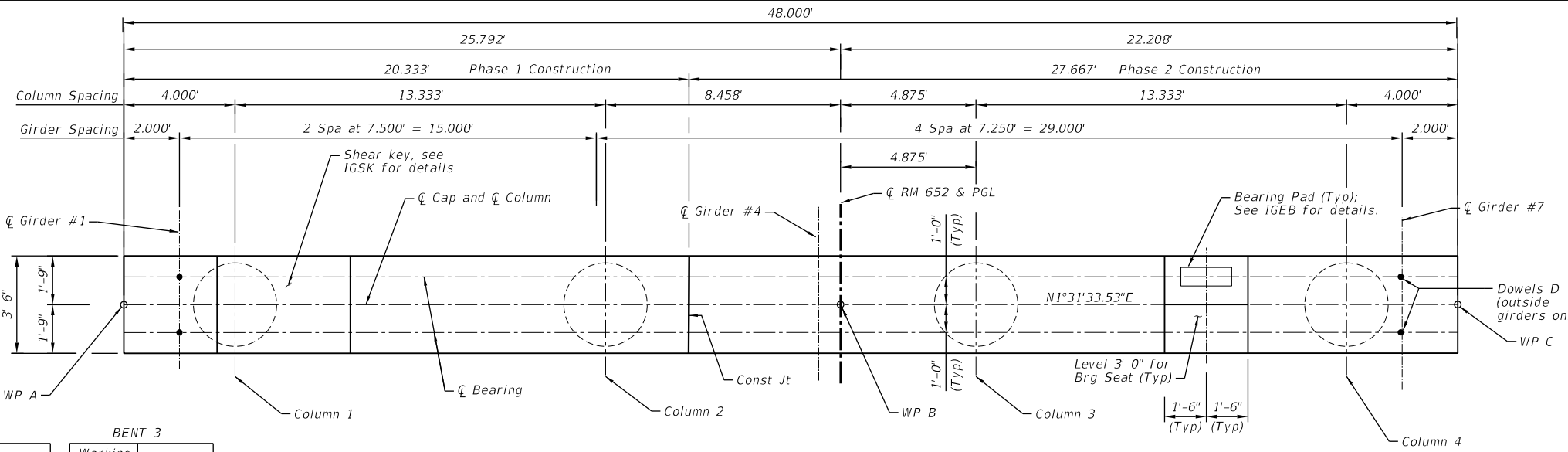
**TranSystems**  
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**RM 652  
 PECOS RIVER BRIDGE  
 BENT 2 & 3 DETAILS**

SCALE: 3/16" = 1' SHEET 1 OF 1

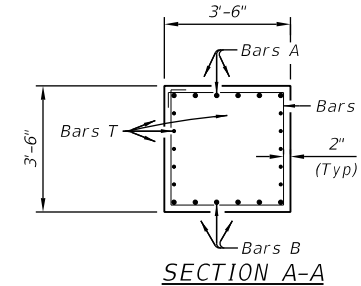
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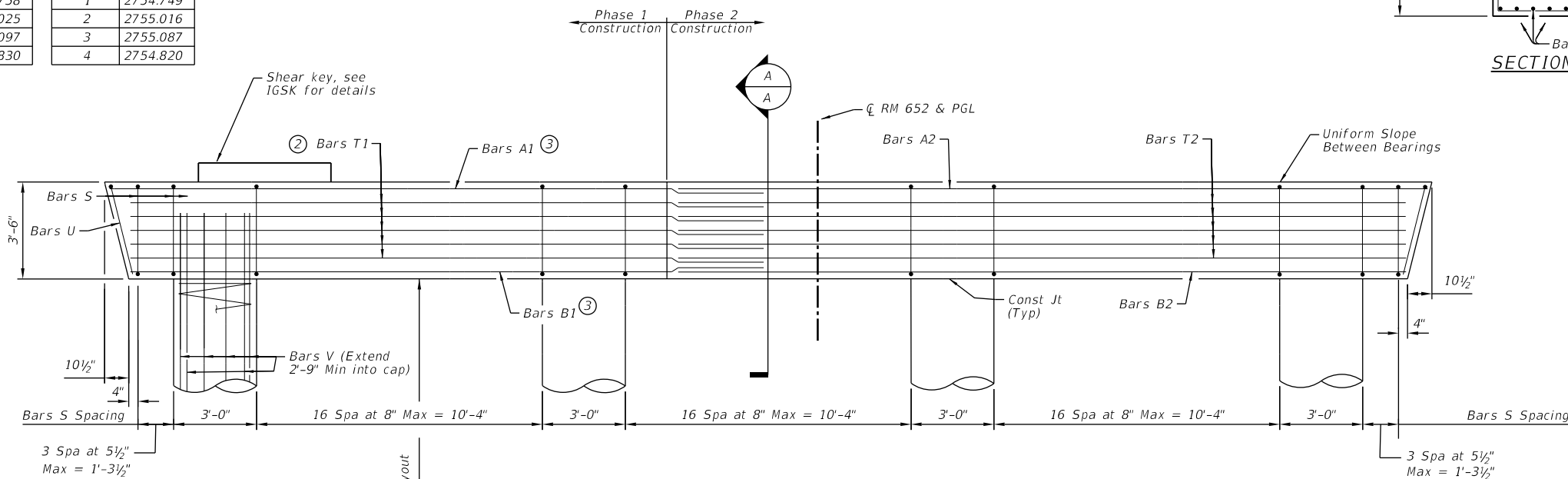
**PLAN**

BENT 2		BENT 3	
Working Point	Elevation	Working Point	Elevation
A	2758.178	A	2758.169
B	2758.694	B	2758.685
C	2758.250	C	2758.240

Top of Column	Elevation	Top of Column	Elevation
1	2754.758	1	2754.749
2	2755.025	2	2755.016
3	2755.097	3	2755.087
4	2754.830	4	2754.820

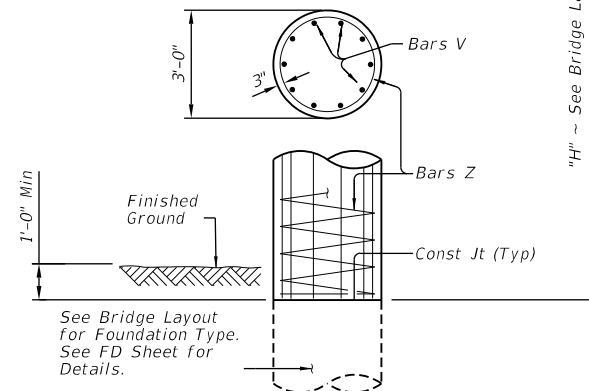


**SECTION A-A**

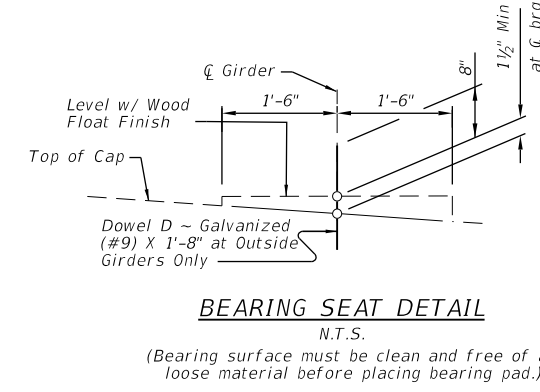
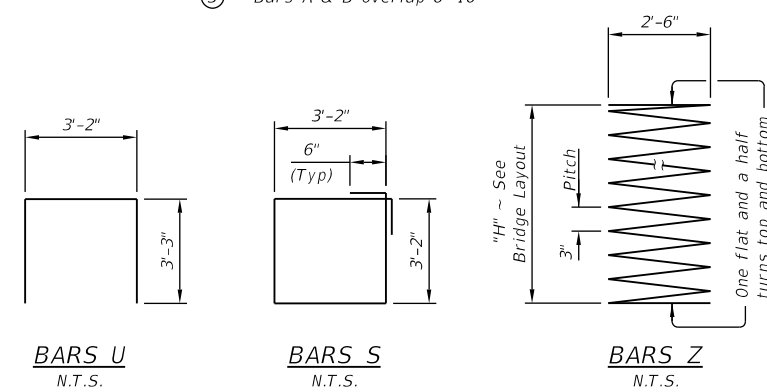


**ELEVATION**

- (2) Bars T Overlap 3'-1"
- (3) Bars A & B Overlap 6'-10"



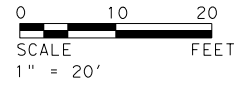
See Bridge Layout for Foundation Type. See FD Sheet for Details.



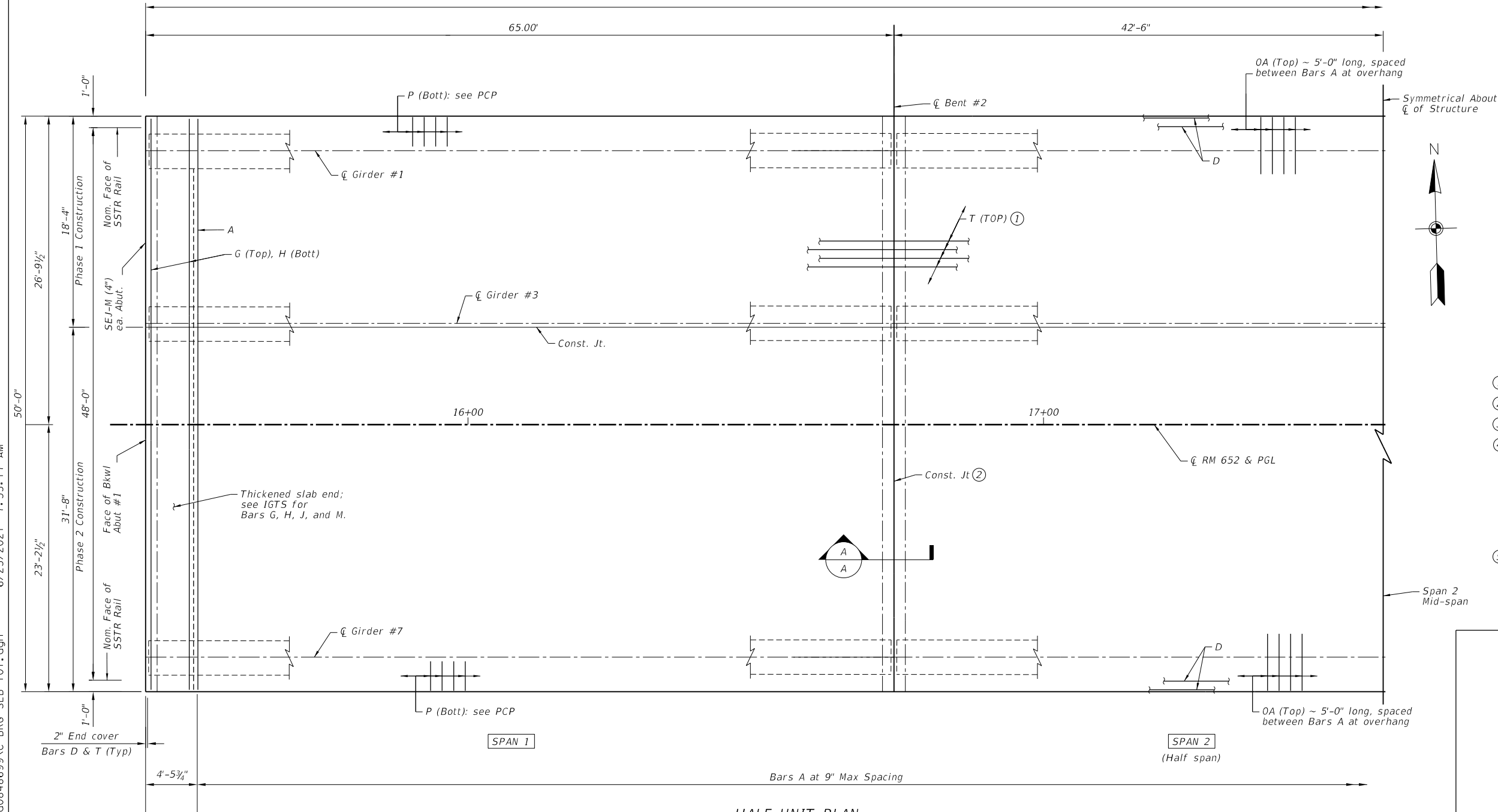
**BEARING SEAT DETAIL**

N.T.S.  
 (Bearing surface must be clean and free of all loose material before placing bearing pad.)

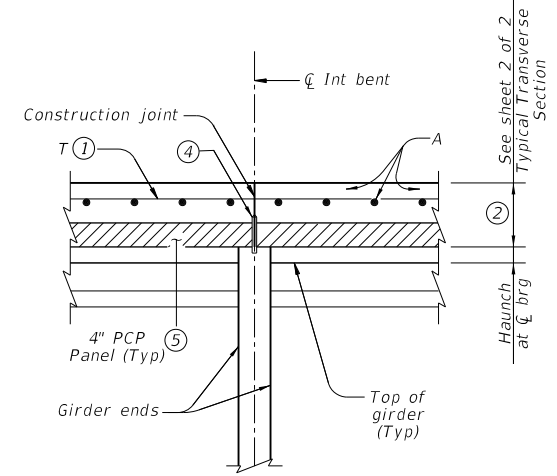




215.00' ~ Prestressed Concrete I-Girder Unit (65'-85'-65')



**HALF UNIT PLAN**  
(Remaining similar)



**SECTION A-A**  
Bars OA (Top) not shown for clarity.

**NOTES:**

- Provide class S (HPC) concrete,  $F'_c = 4$  ksi. for girder, bearing pad, misc. slab and thickened slab end details not shown, see IGB, IGEB, IGMS, IGTS and IGND.
- Place and finish not less than 30 feet of bridge deck concrete per hour.
- For reinforcing steel to be welded, provide bars conforming to ASTM designation A706 or having a carbon equivalency per specification item 440.
- For framing details not shown, see Bridge Framing Plan.
- For details and quantities not shown, see Slab Details sheet 2 of 2.
- Provide epoxy coated, grade 60 reinforcing.
- Where required, provide bar laps as follows: epoxy coated #4 = 2'-5"
- Laps in bars shall be staggered and alternated to maximize the distance between adjacent splices. See PCP or PMDF standards for details and quantity adjustments if either of these options are used.

- ① Reinforcing mats must be continuous through joint.
- ② Maintain a constant slab thickness over the bent.
- ③ Bars OA (Top) at 9" Max spacing between Bars A (Top).
- ④  $\frac{3}{4}$ " thick redwood timber board, leave in place. Redwood timber board placed flush with top of panel or within  $\frac{1}{4}$ " Max above panel. Place  $\frac{3}{4}$ " pyramid shape chamfer along top of timber board. See "Elevation Example of End Panel and Timber Board". Place straight, within  $\frac{1}{4}$ " 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.
- ⑤ Place panel within  $\frac{1}{2}$ " of  $\frac{3}{4}$ " thick board.

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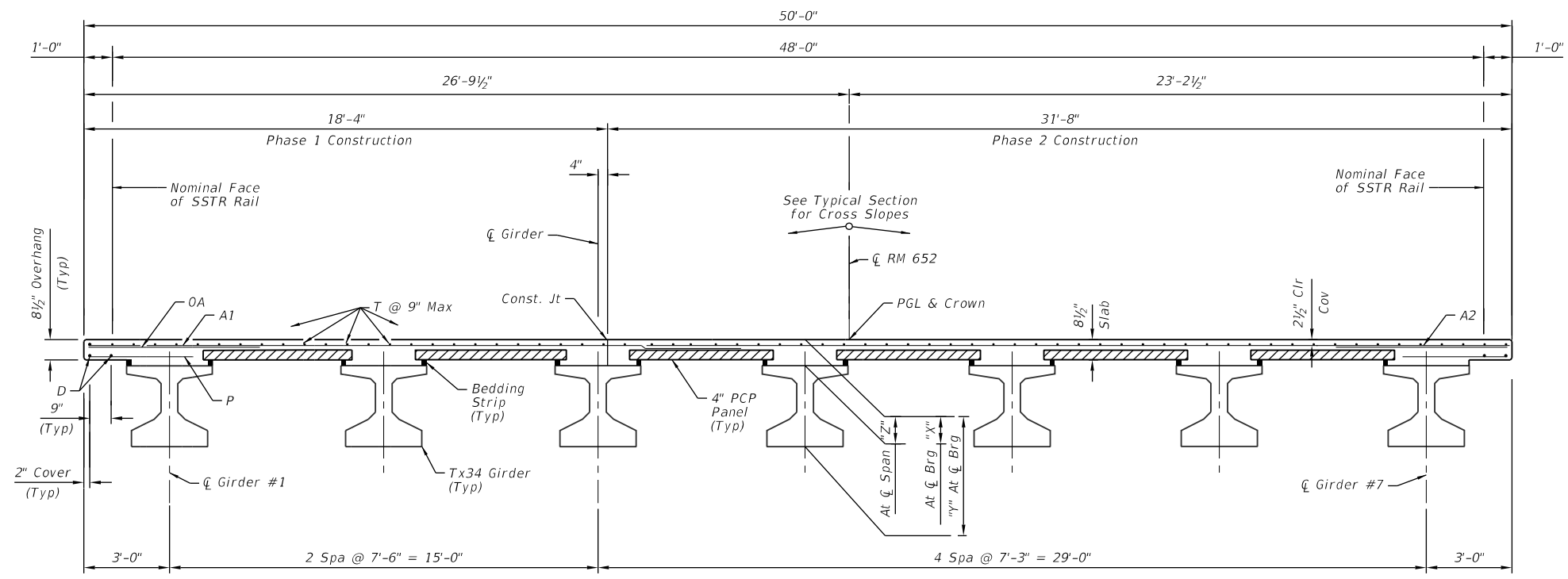
**RM 652  
PECOS RIVER BRIDGE  
PRESTRESSED CONCRETE I-GIRDER UNIT**

SCALE: 1" = 20' SHEET 1 OF 2

DESIGN RNW	FED. RD. DIV. NO. 6	FEDERAL AID PROJECT NO. SEE TITLE SHEET		HIGHWAY NO. RM 652
GRAPHICS JEM	STATE TEXAS	DISTRICT ODA	COUNTY LOVING	SHEET NO. 74
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TYPICAL TRANSVERSE SECTION

TABLE OF EST. QUANTITIES			
SPAN	REINF CONC SLAB	PRESTRESSED CONC GIRDERS	REINFORCING STEEL
		(Ty Tx34) (3)	LB
-	SF	LF	LB
1	3,250	451.5	7,475
2	4,250	591.5	9,775
3	3,250	451.5	7,475
TOTAL	10,750	1,494.5	24,725 (2)

- (2) Reinforcing steel weight is calculated using an approximate factor of 2.3 psf.
- (3) Quantities shown are bottom girder flange lengths with adjustments made for girder slope. See Framing Plan sheet for girder lengths.

Notes:  
 For deck forms, see PCP standards for details.  
 The deck design is based on 8.5" slab thickness. When using prestressed concrete panel option, the 8.5" slab thickness shall be maintained by varying height of bedding strip along the girder.  
 See Haunch Reinforcing Details on IGMS and PCP standards for required U bars when haunch is greater than 3 1/2".  
 For predicted girders deflection, see corresponding framing plan.  
 See traffic rail type SSTR standard sheet for rail anchorage in slab.

TABLE OF SECTION DEPTHS				
SPAN NO.	GIRDER NO.	"X" @ Q BRG	"Y" @ Q BRG	"Z" @ Q SPAN (1)
1	1	10 3/4"	44 3/4"	9 5/8"
	2	10 3/4"	44 3/4"	9 5/8"
	3	10 3/4"	44 3/4"	9 5/8"
	4	10 3/4"	44 3/4"	9 5/8"
	5	10 3/4"	44 3/4"	9 5/8"
	6	10 3/4"	44 3/4"	9 5/8"
	7	10 3/4"	44 3/4"	9 5/8"
2	1	11 3/4"	45 3/4"	9 3/4"
	2	11 3/4"	45 3/4"	9 3/4"
	3	11 3/4"	45 3/4"	9 3/4"
	4	11 3/4"	45 3/4"	9 3/4"
	5	11 3/4"	45 3/4"	9 3/4"
	6	11 3/4"	45 3/4"	9 3/4"
	7	11 3/4"	45 3/4"	9 3/4"
3	1	10 3/4"	44 3/4"	9 5/8"
	2	10 3/4"	44 3/4"	9 5/8"
	3	10 3/4"	44 3/4"	9 5/8"
	4	10 3/4"	44 3/4"	9 5/8"
	5	10 3/4"	44 3/4"	9 5/8"
	6	10 3/4"	44 3/4"	9 5/8"
	7	10 3/4"	44 3/4"	9 5/8"

(1) Theoretical dimension

BAR TABLE	
BAR	SIZE
A1	#4
A2	#4
D	#4
G	#4
H	#4
J	#4
M	#4
P	#4
T	#4
OA	#5

HL93 LOADING

KEVIN M. ARFT  
 100912  
 REGISTERED PROFESSIONAL ENGINEER  
 6/25/2021

TEXAS REGISTERED ENGINEERING FIRM F-3557

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 FORT WORTH, TX 76102  
 (817) 339-8950  
 TX ENG FIRM NO. 3557

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RM 652  
 PECOS RIVER BRIDGE  
 PRESTRESSED CONCRETE I-GIRDER UNIT

SCALE: 3/16" = 1'-0" SHEET 2 OF 2

DESIGN RNW	FED. RD. DIV. NO. 6	FEDERAL AID PROJECT NO. SEE TITLE SHEET	HIGHWAY NO. RM 652
GRAPHICS JEM	STATE TEXAS	DISTRICT ODA	COUNTY LOVING
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CHECK PCN	0493	02	021

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STRUCTURE	DESIGNED GIRDERS									DEPRESSED STRAND PATTERN		CONCRETE		OPTIONAL DESIGN				
	SPAN NO.	GIRDER NO.	GIRDER TYPE	PRESTRESSING STRANDS					NO.	TO END	RELEASE STRGTH ① f'ci (ksi)	MINIMUM 28 DAY COMP STRGTH f'c (ksi)	DESIGN LOAD COMP STRESS (TOP Ⓞ) (SERVICE I) fct(ksi)	DESIGN LOAD TENSILE STRESS (BOTT Ⓞ) (SERVICE III) fcb(ksi)	REQUIRED MINIMUM ULTIMATE MOMENT CAPACITY (STRENGTH I) (kip-ft)	LIVE LOAD DISTRIBUTION FACTOR ②		
				NON-STD STRAND PATTERN	TOTAL NO.	SIZE (in)	STRGTH fpu (ksi)	"e" Ⓞ (in)								"e" END (in)	Moment	Shear
PECOS RIVER	1&3	1-7	Tx34		18	0.6	270	12.57	11.23	4	10.5	4.5	5.0	2.161	-2.586	2639	0.635	0.779
	2	1-7	Tx34		34	0.6	270	11.48	7.25	6	30.5	6.0	7.0	3.704	-4.201	4035	0.591	0.779

① Based on the following allowable stresses (ksi):

Compression = 0.65 f'ci

Tension = 0.24 √ f'ci

Optional designs must likewise conform.

② Portion of full HL93.

**DESIGN NOTES:**

Designed according to AASHTO LRFD Bridge Design Specifications. Optional designs for girders 120 feet or longer must have a calculated residual camber equal to or greater than that of the designed girder.

Prestress losses for the designed girders have been calculated for a relative humidity of 60 percent. Optional designs must likewise conform.

**FABRICATION NOTES:**

Provide Class H concrete.

Provide Grade 60 reinforcing steel bars.

Use low relaxation strands, each pretensioned to 75 percent of fpu.

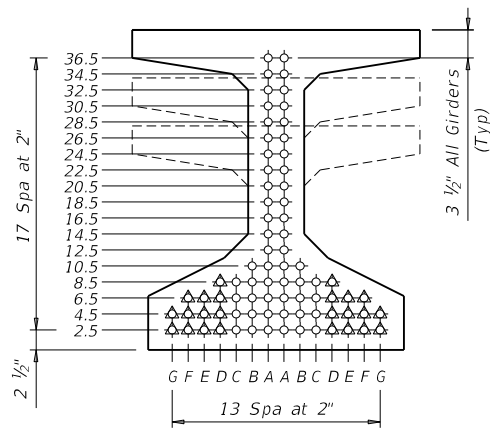
Strand debonding must comply with Item 424.4.2.2.4. Full-length debonded strands are only permitted in positions marked Δ. Double wrap full-length debonded strands in outer most position of each row.

When shown on this sheet, the Fabricator has the option of furnishing either the designed girder or an approved optional design. All optional design submittals must be signed, sealed and dated by a Professional Engineer registered in the State of Texas.

Seal cracks in girder ends exceeding 0.005" in width as directed by the Engineer. The fabricator is permitted to decrease the spacing of Bars R and S by providing additional bars to help limit crack width provided the decreased spacing results in no less than 1" clear between bars. The fabricator must take an approved corrective action if cracks greater than 0.005" form on a repetitive basis.

**DEPRESSED STRAND DESIGNS:**

Locate strands for the designed girder as low as possible on the 2" grid system unless a non-standard strand pattern is indicated. Fill row "2.5", then row "4.5", then row "6.5", etc., beginning each row in the "A" position and working outward until the required number of strands is reached. All strands in the "A" position must be depressed, maintaining the 2" spacing so that, at the girder ends, the upper two strands are in the position shown in the table.



**TYPE Tx28, Tx34 & Tx40**

**HL93 LOADING**



TEXAS REGISTERED ENGINEERING FIRM F-3557



500 W. 7th ST. SUITE 1100  
FORT WORTH, TX 76102  
(817) 339-8950  
TX ENG FIRM NO. 3557



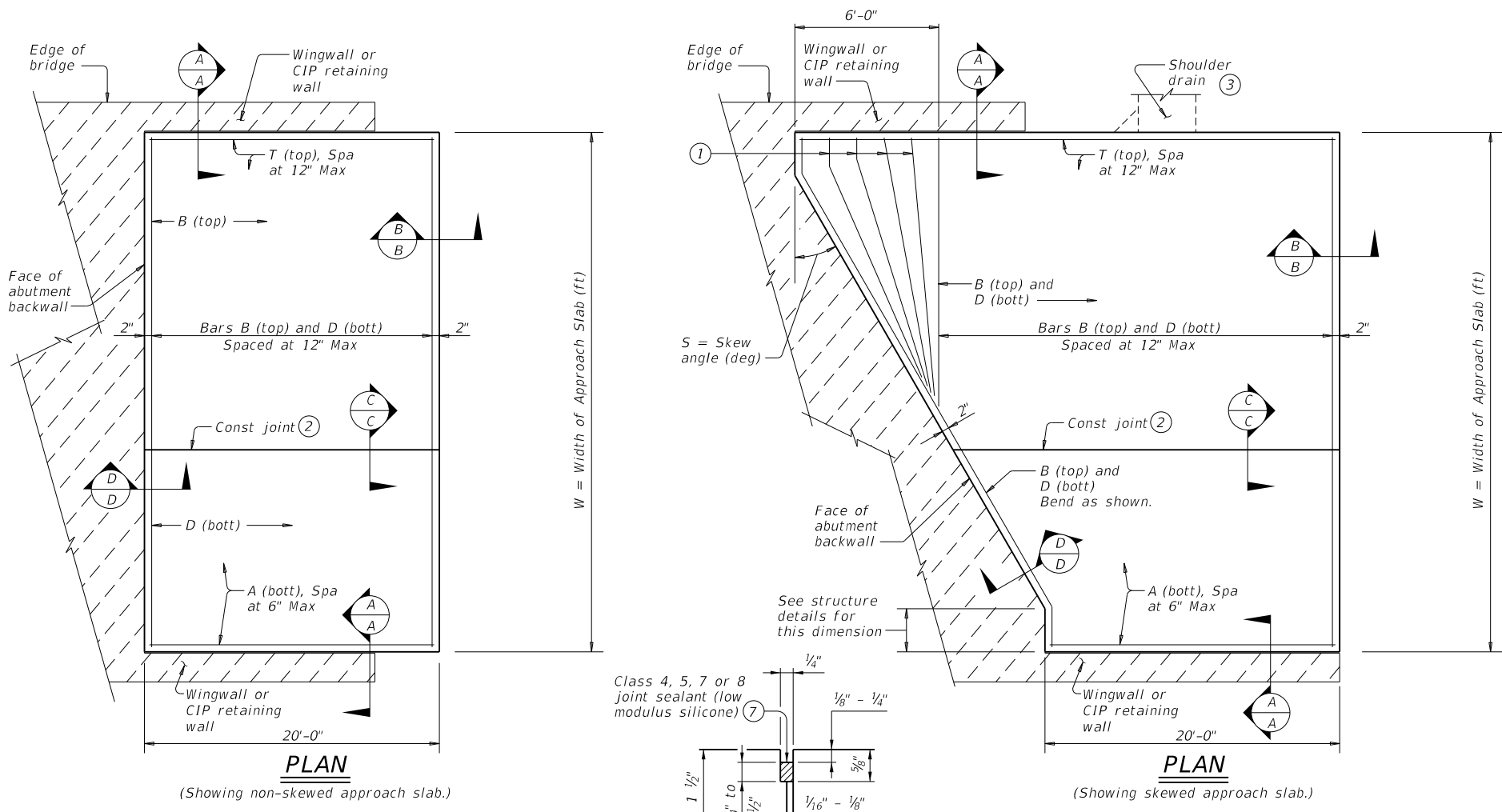
RM 652  
PECOS RIVER BRIDGE  
PRESTRESSED CONCRETE I-GIRDER  
DESIGNS (NON-STANDARD SPANS)

SHEET 1 OF 1

DESIGN RNW	FED. RD. DIV. NO. 6	FEDERAL AID PROJECT NO. SEE TITLE SHEET		HIGHWAY NO. RM 652
GRAPHICS JEM	STATE TEXAS	DISTRICT ODA	COUNTY LOVING	SHEET NO. 76
CHECK KMA	CONTROL	SECTION	JOB	
CHECK PCN	0493	02	021	

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BAR TABLE	
BAR	SIZE
A	#8
B	#5
D	#5
T	#5

**APPROXIMATE QUANTITIES** <sup>(4)</sup>

Reinf steel weight = 8.5 Lbs/SF of Approach Slab

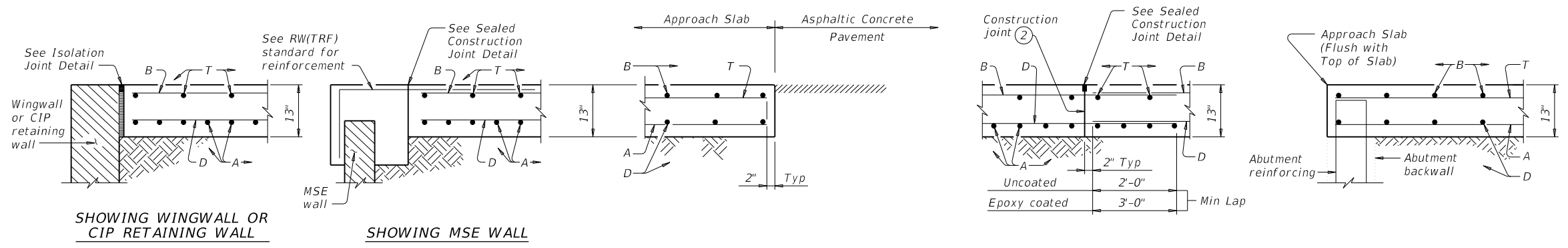
Volume of Appr Slab Conc (CY) =  $0.802W + 0.02W^2 \tan S$

W = Width of Approach Slab (ft)

S = Skew Angle (deg)

- 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.
- 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.
- See details elsewhere in plans for shoulder drain location and details.
- For Contractor's information only. Quantities shown are for one approach slab.
- Multiple piece tie bars are acceptable at longitudinal construction joints provided minimum laps shown are achieved.
- See details elsewhere in plans for required cross-slope.
- Place in accordance with Item 438.
- Provide backer rod that is 25% larger than joint opening and compatible with the sealant.
- If bridge rail is present at the wingwall or CIP retaining wall, place 1/2" rebonded recycled tire rubber between concrete railing and top of approach slab as shown when concrete railing projects over the approach slab.

**LONGITUDINAL SAW CUT JOINT DETAIL**



**GENERAL NOTES:**

Construct approach slab in accordance with Item 422.

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

Provide Grade 60 reinforcing steel.

Provide longitudinal joints as shown on the Longitudinal Saw Cut Joint Detail at lane lines and shoulders when width between longitudinal construction joints or edges of approach slab exceeds 16 feet. Saw cut joints within 24 hours of concrete placement to a depth of 1 1/2" and seal in accordance with Item 438. Alternately, provide a controlled joint consisting of 1 1/2" vinyl or plastic joint former (Stress Cap, Zip Strip, Stress Lock, or equal as approved by the Engineer.)

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

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

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

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

All details shown herein are subsidiary to bridge approach slab.

Cover dimensions are clear dimensions, unless noted otherwise.

**SECTION A-A**

**SECTION B-B**

**SECTION C-C** <sup>(5)</sup>

**SECTION D-D**

**TYPICAL TRANSVERSE SECTION**

**ISOLATION JOINT DETAIL**

**SEALED CONSTRUCTION JOINT DETAIL**

**Texas Department of Transportation** Bridge Division Standard

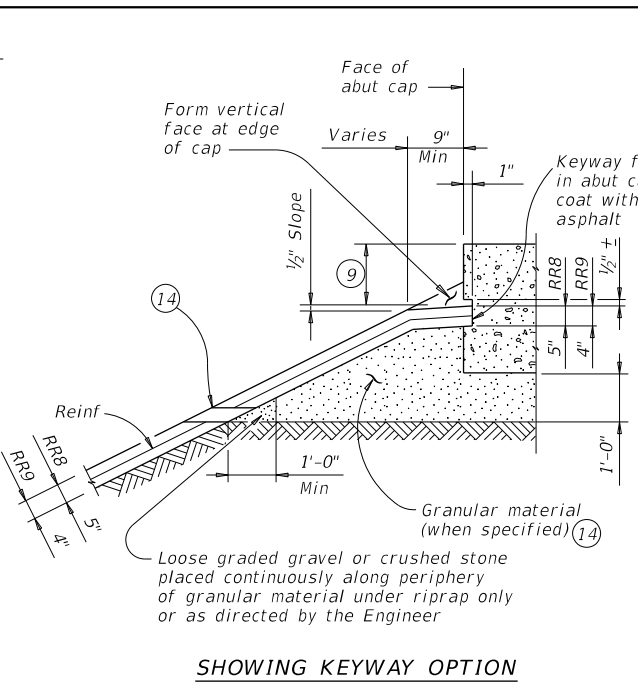
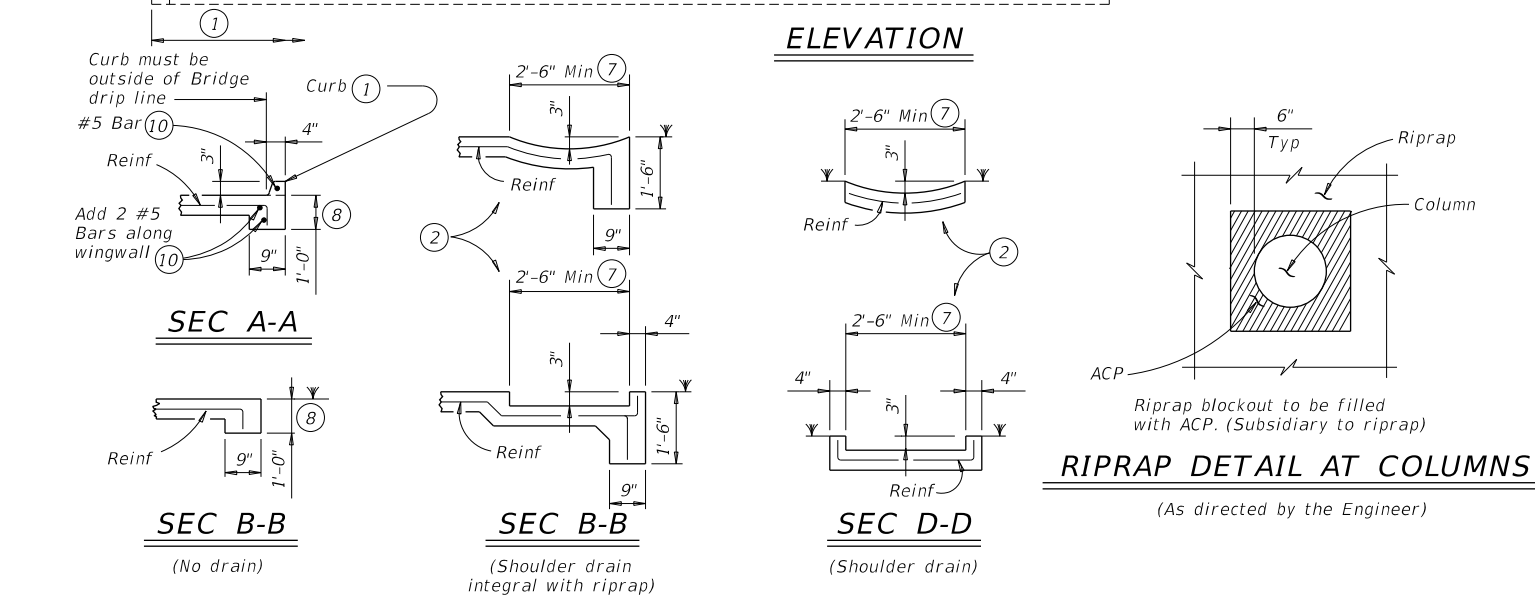
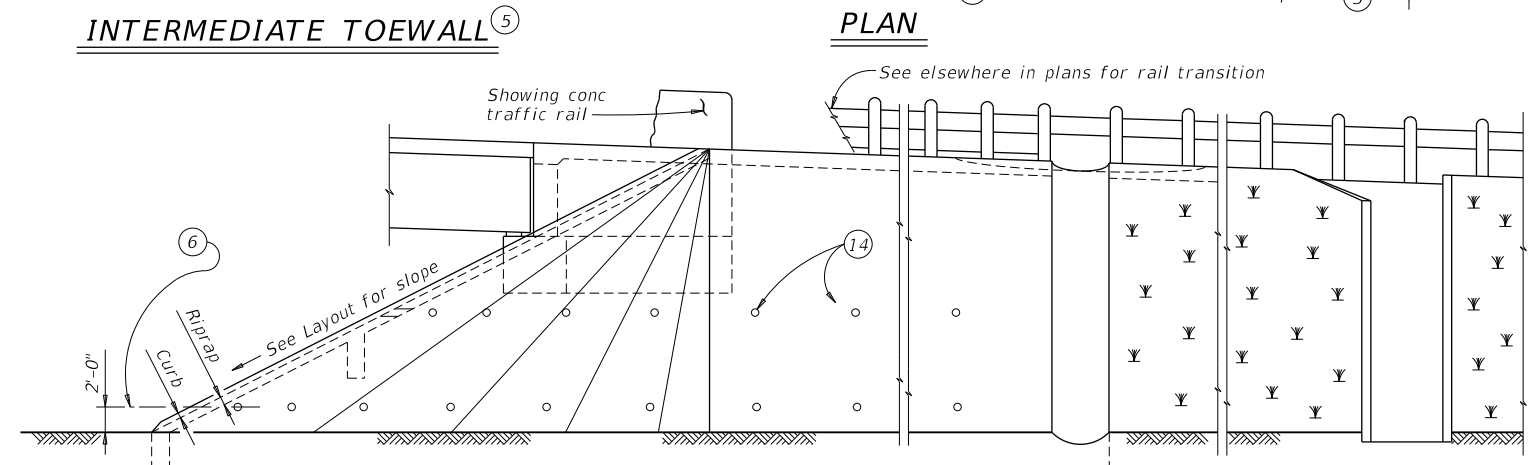
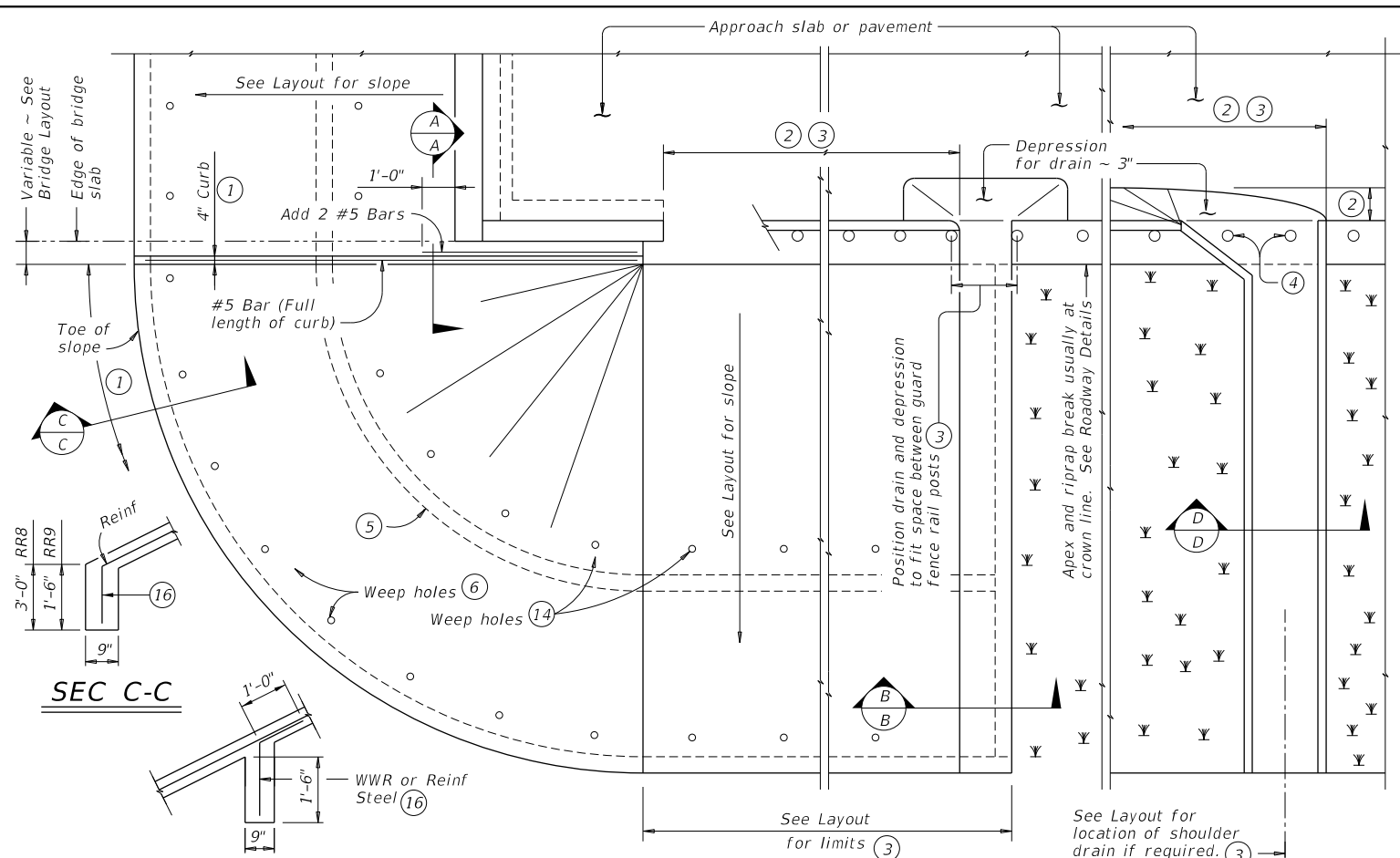
**BRIDGE APPROACH SLAB ASPHALTIC CONCRETE PAVEMENT**

**BAS-A**

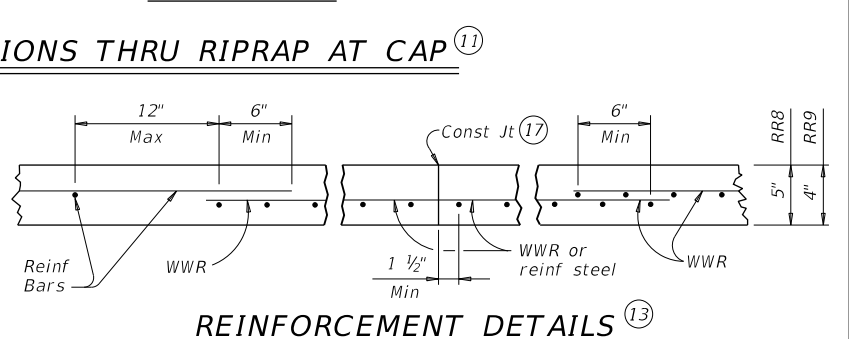
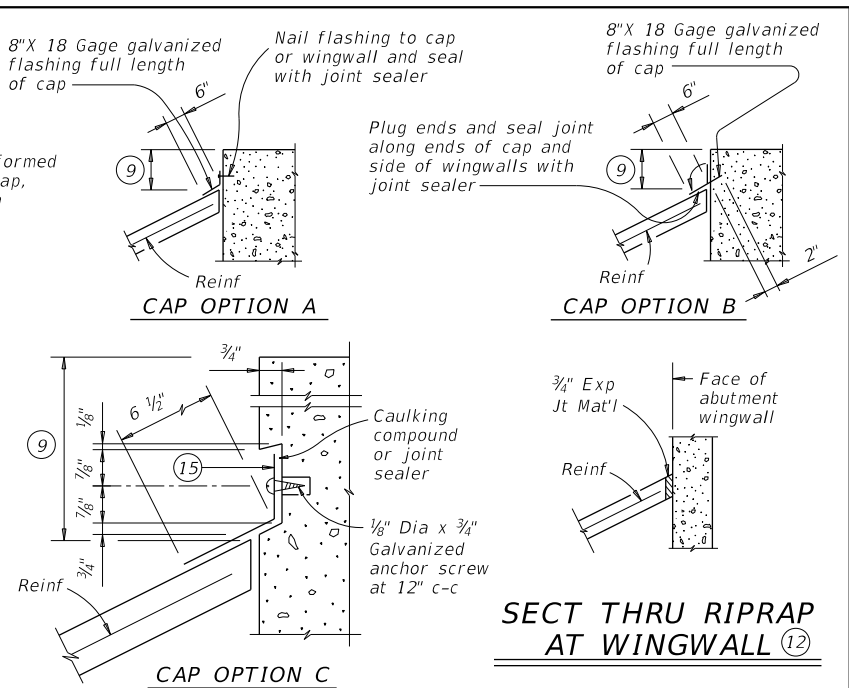
FILE: basaste1-20.dgn	DN: TxDOT	CK: TxDOT	OW: TxDOT	CK: TxDOT
©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0493	02	021	RM 652
02-20: Removed stress relieving pad.	DIST	COUNTY	SHEET NO.	
	ODA	LOVING	77	

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



**REINFORCEMENT DETAILS**

See General Notes for optional synthetic fiber reinforcement.

**GENERAL NOTES:**

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

Provide Grade 60 reinforcing steel.

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

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

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

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

Hardware cloth, loose grade stone behind weep holes, flashing, or other sealing material are subsidiary to the bid item "Riprap". See Layout for limits of riprap.

RR8 is to be used on stream crossings.

RR9 is to be used on other embankments.

**FOR CONTRACTOR'S INFORMATION ONLY:**

5" of RR8	= 0.015 CY/SF
4" of RR9	= 0.012 CY/SF
#3 Reinf at 18" c-c	= 0.501 Lbs/SF
6x6-D3xD3	= 0.408 Lbs/SF

**Texas Department of Transportation**

**Bridge Division Standard**

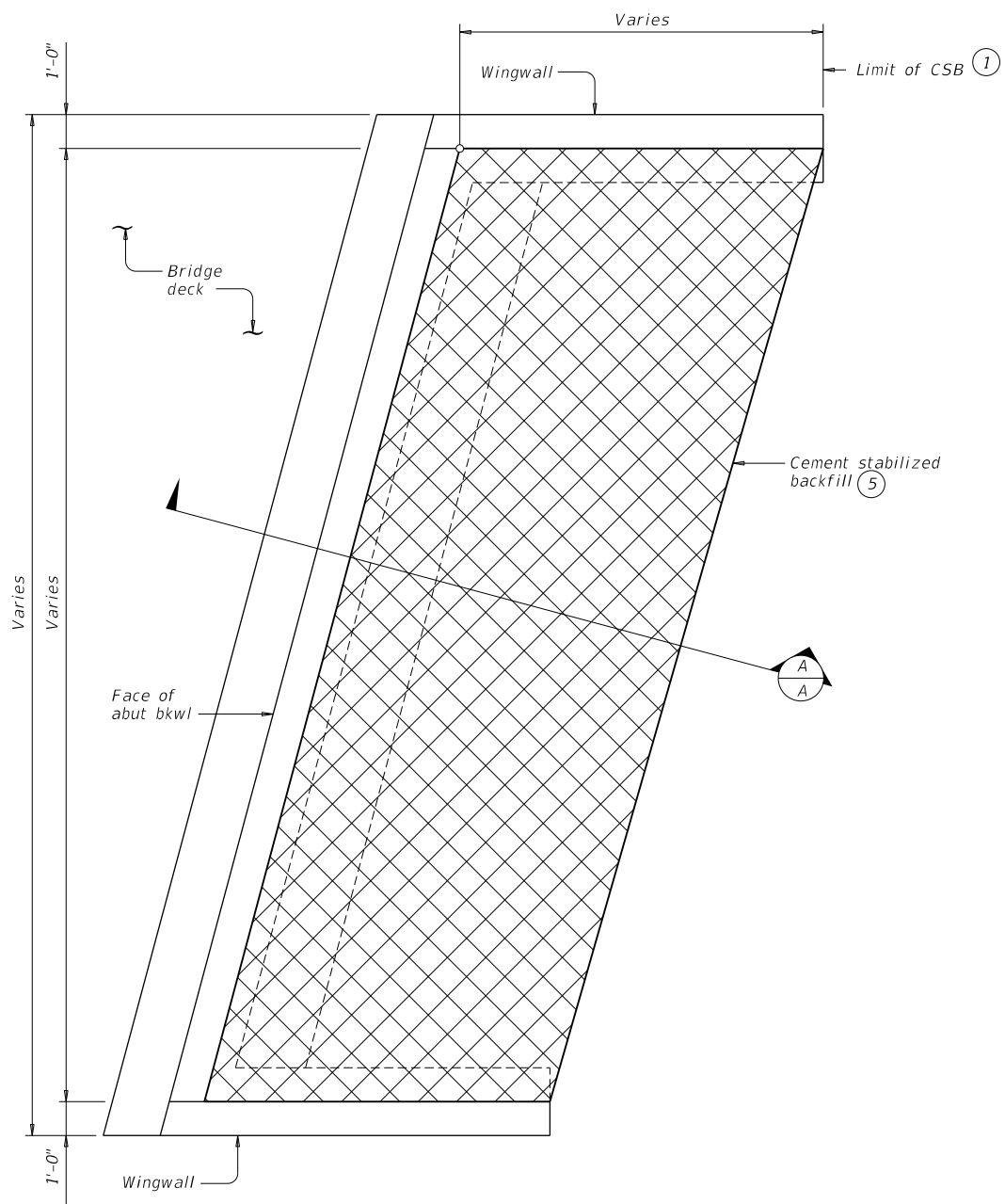
**CONCRETE RIPRAP AND SHOULDER DRAINS EMBANKMENTS AT BRIDGE ENDS (TYPES RR8 & RR9)**

**CRR**

FILE: crrstd1-19.dgn	DN: TxDOT	CK: TxDOT	OW: TxDOT	CK: TxDOT
©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0493	02	021	RM 652
	DIST	COUNTY	SHEET NO.	
	ODA	LOVING	78	

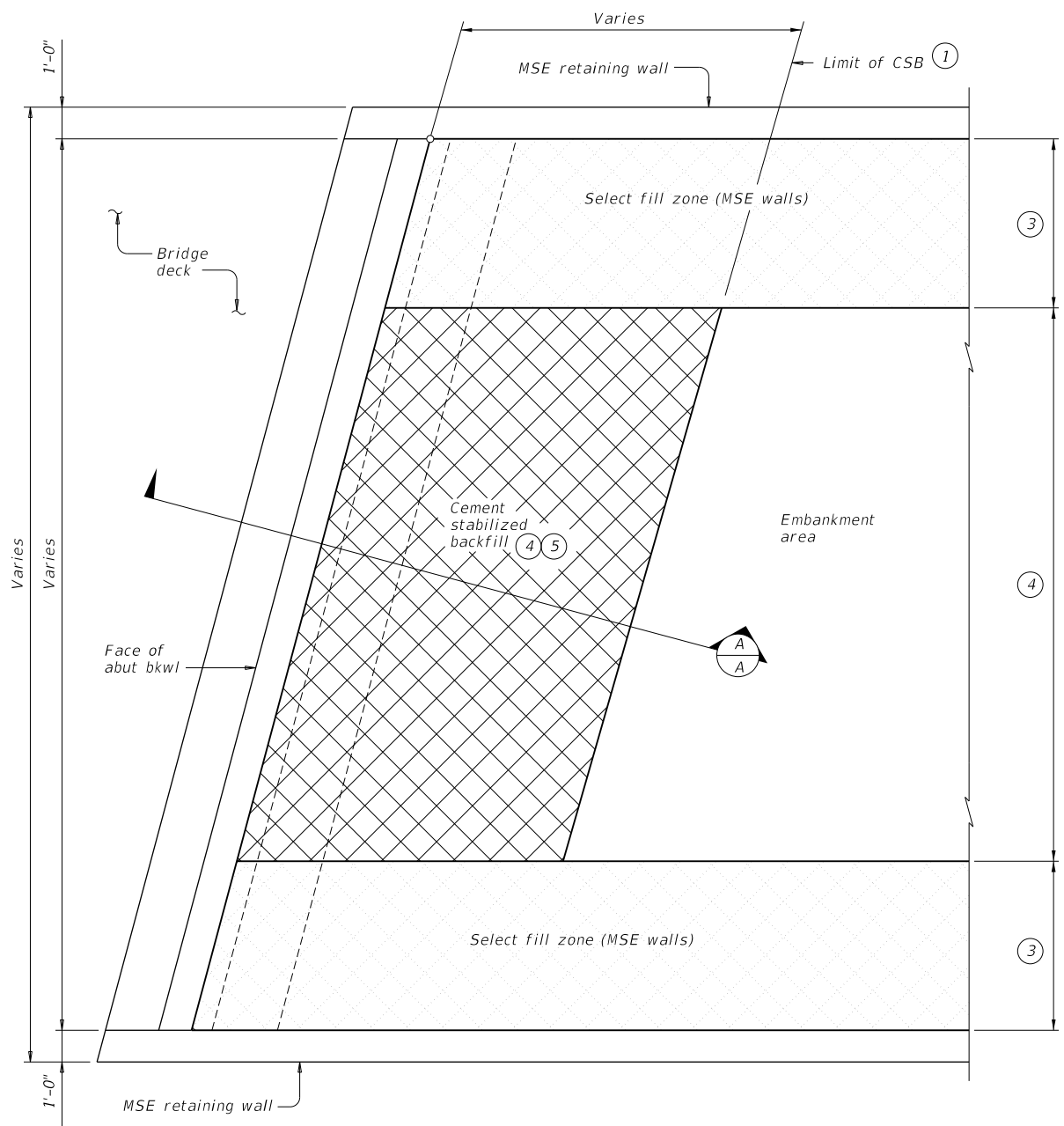
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**OPTION 1 ~ PLAN WITH WINGWALLS**

Cast-in-place retaining walls similar.

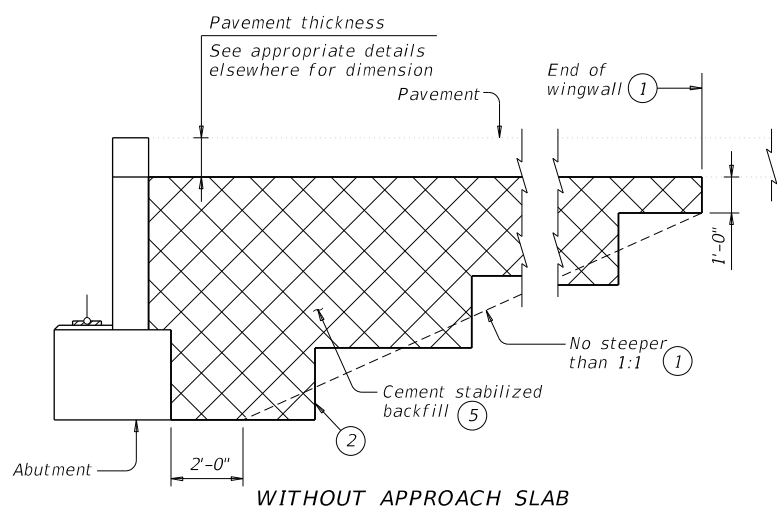


**OPTION 1 ~ PLAN WITH MSE RETAINING WALLS**

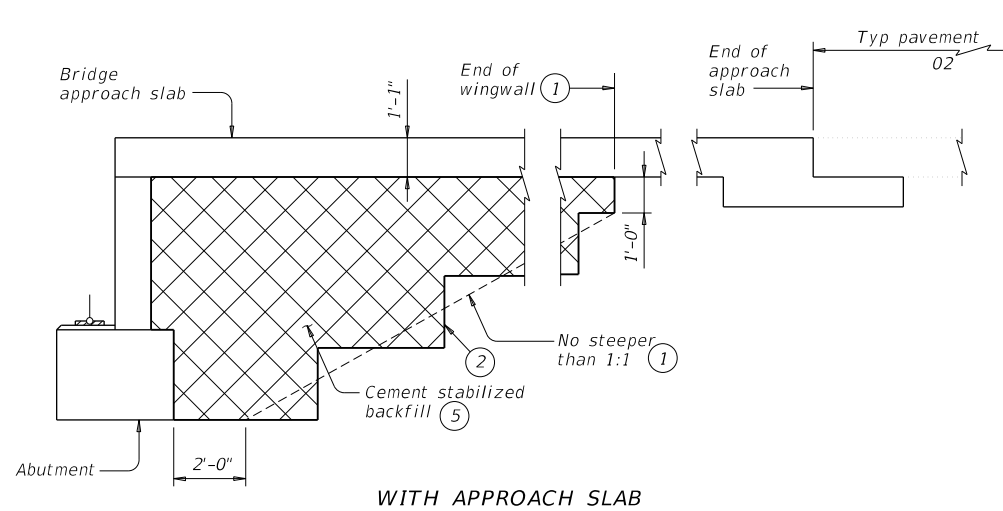
- ① Usual limit of Cement Stabilized Backfill is at end of wingwall. Extend CSB limits as required to maintain a slope no steeper than 1:1 at bottom of backfill.
- ② Bench backfill as shown with 12" (approximate) bench depths.
- ③ Where MSE retaining walls are present, adjust CSB limits to accommodate the select fill zone. See retaining wall details for additional information.
- ④ When distance between select fill zones is less than 5'-0", MSE select fill may be substituted for cement stabilized backfill with approval from the Engineer.
- ⑤ If shown in the plans flowable backfill can be used as a substitute for cement stabilized backfill with the following constraints:
  - a) If flowable backfill is to be placed over MSE backfill then a filter fabric will be placed over the MSE backfill prior to placement of the flowable fill; and
  - b) Place flowable fill in lifts not exceeding 2 feet in height, place each successive lift when the previous lift has stiffened/hardened (i.e. has lost its flowability).

**GENERAL NOTES:**

See the Bridge Layout for selected Option. Option 2 is intended for new construction requiring high plasticity embankment fill with a plasticity index (PI) greater than 30 or pavement built in poor native soil. Poor soils are defined as high plasticity clays or expansive clays. Option 1 is intended for construction only requiring PI controlled embankment fill or excavation in competent soils/rocks in order to construct the abutment. Provide Cement Stabilized Backfill (CSB) meeting the requirements of Item 400, "Excavation and Backfill for Structures", to the limits shown at bridge abutments. If required elsewhere in the plans, provide Flowable Backfill meeting the requirements of Item 401, "Flowable Backfill", to the limits shown at bridge abutments. Details are drawn showing left forward skew. See Bridge Layout for actual skew direction. These details do not apply when Concrete Block retaining walls are used in lieu of wingwalls.



**WITHOUT APPROACH SLAB**



**WITH APPROACH SLAB**  
 (Showing BAS-C, BAS-A similar.)

**SECTION A-A**



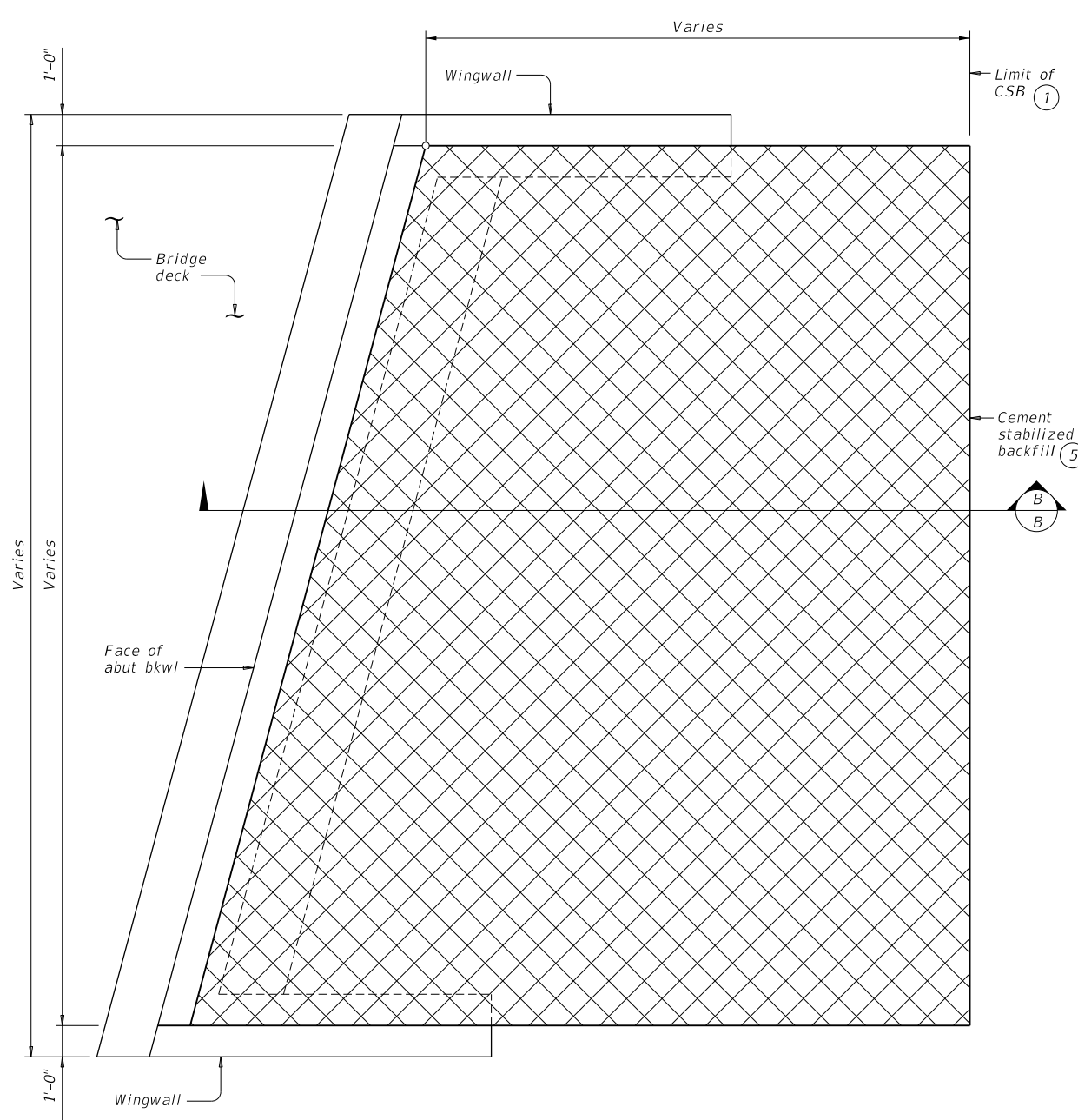
**CEMENT STABILIZED ABUTMENT BACKFILL BRIDGE ABUTMENT**

**CSAB**

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©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0493	02	021	RM 652
02-20: Added Option 2.	DIST	COUNTY	SHEET NO.	
	ODA	LOVING	79	

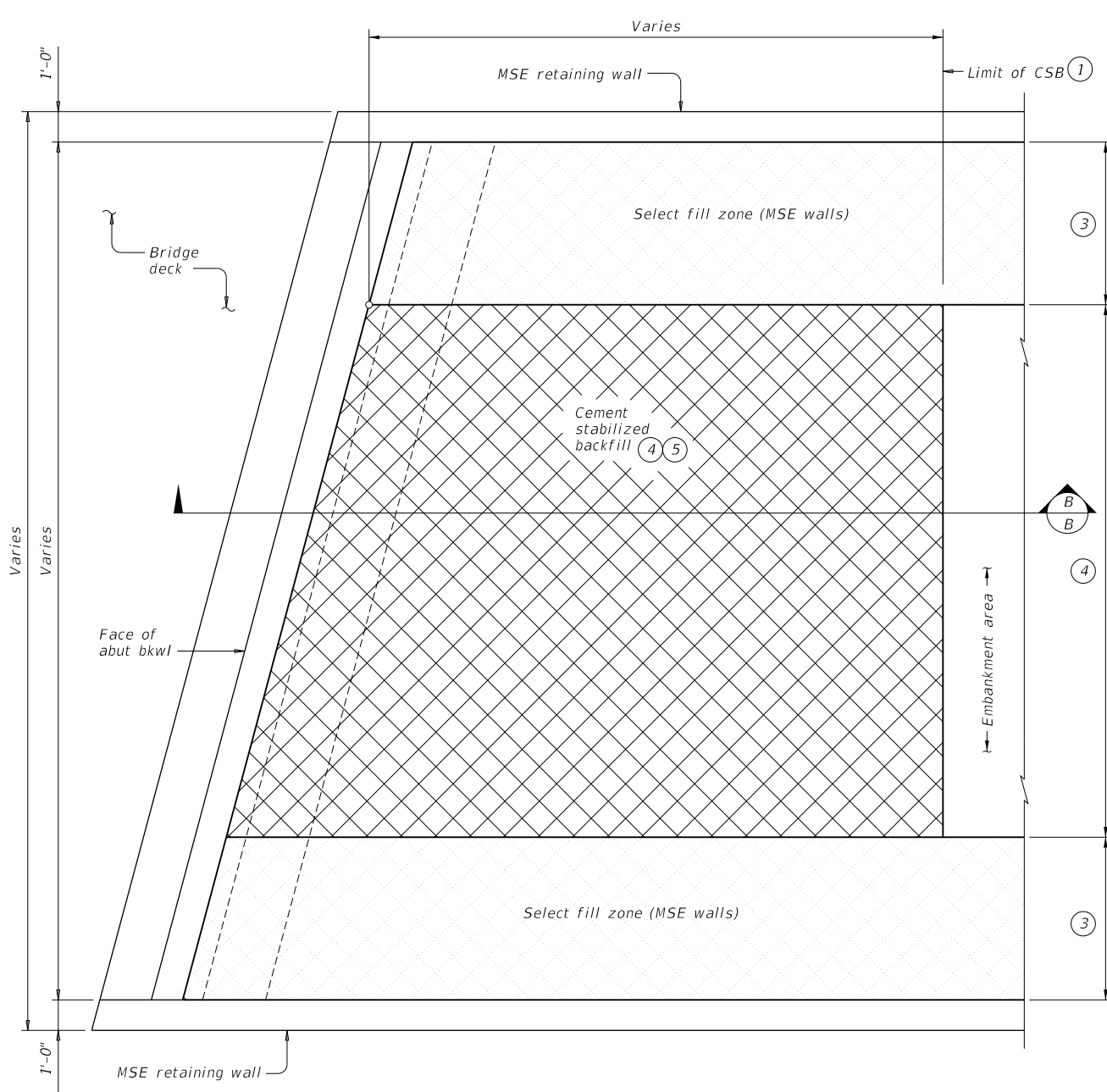
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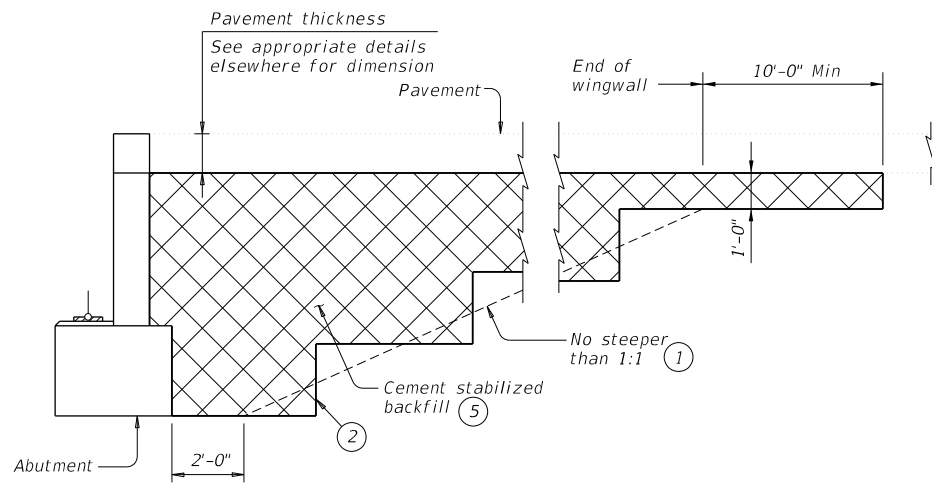
**OPTION 2 ~ PLAN WITH WINGWALLS**

Cast-in-place retaining walls similar.

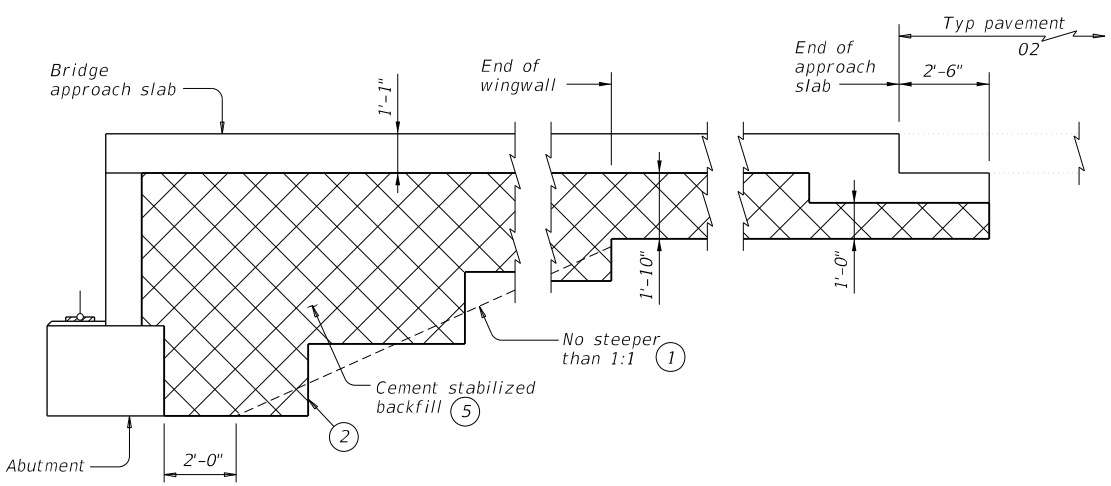


**OPTION 2 ~ PLAN WITH MSE RETAINING WALLS**

- 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).



**WITHOUT APPROACH SLAB**



**SECTION B-B**

**WITH APPROACH SLAB**  
(Showing BAS-C, BAS-A similar.)

SHEET 2 OF 2



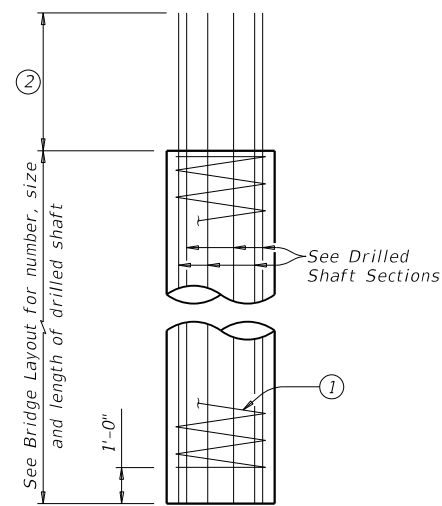
**CEMENT STABILIZED  
ABUTMENT BACKFILL  
BRIDGE ABUTMENT**

**CSAB**

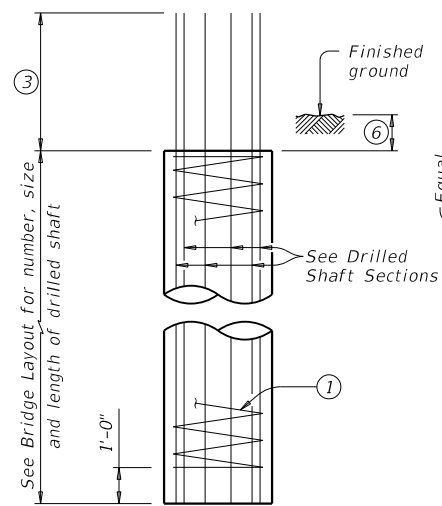
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©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0493	02	021	RM 652
02-20: Added Option 2.	DIST	COUNTY	SHEET NO.	
	ODA	LOVING	80	

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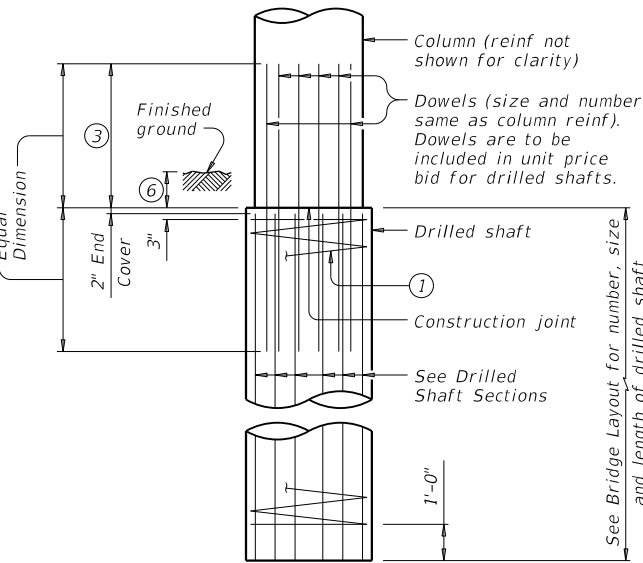
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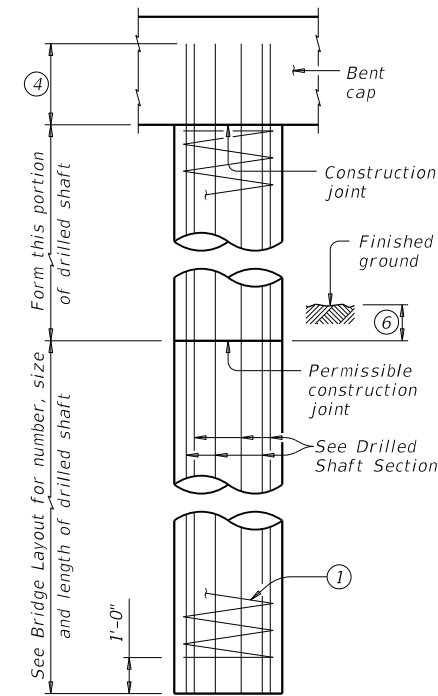
ABUTMENTS, WINGWALLS AND MULTI-DRILLED SHAFT FOOTINGS



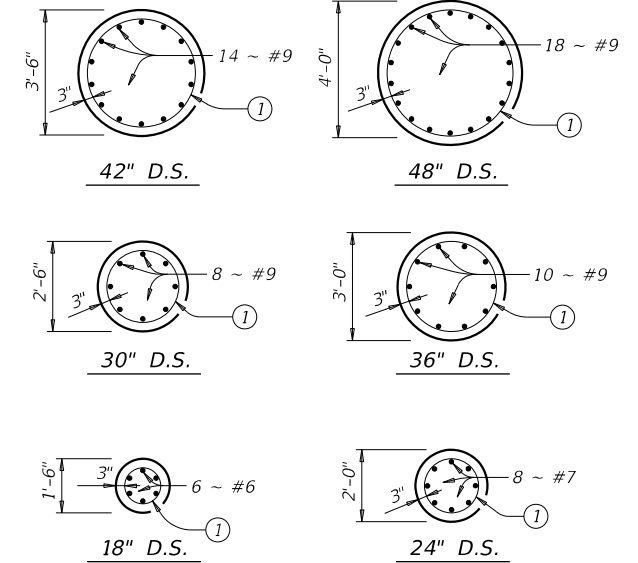
INTERIOR BENTS DRILLED SHAFT DIA EQUAL TO COLUMN DIA



INTERIOR BENTS DRILLED SHAFT DIA GREATER THAN COLUMN DIA



OPTIONAL INTERIOR BENT DRILLED SHAFT DETAIL 5



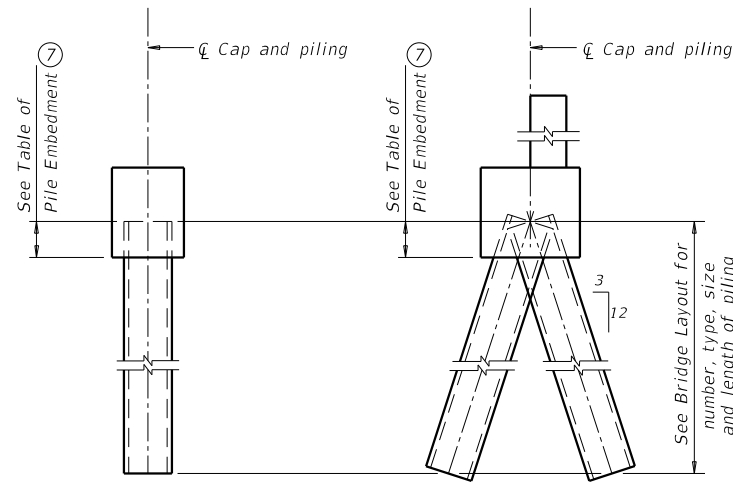
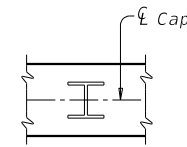
DRILLED SHAFT SECTIONS

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

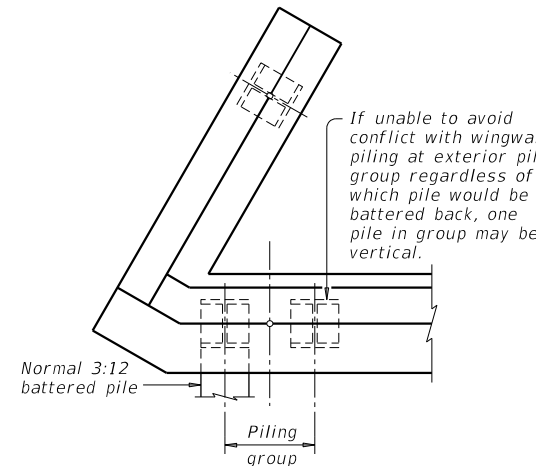


VERTICAL PILE

BATTERED PILE

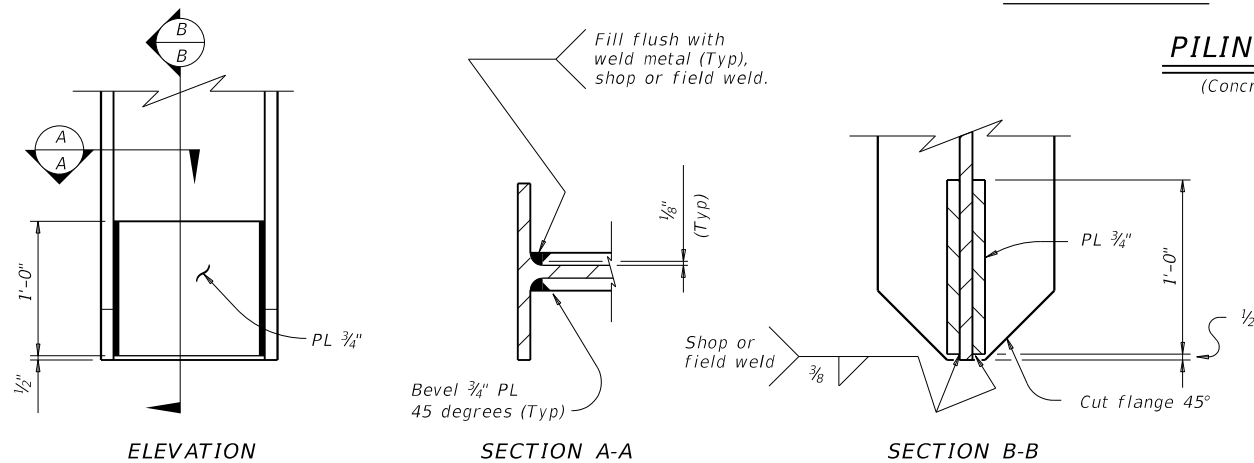
PILING DETAILS

(Concrete or steel H)



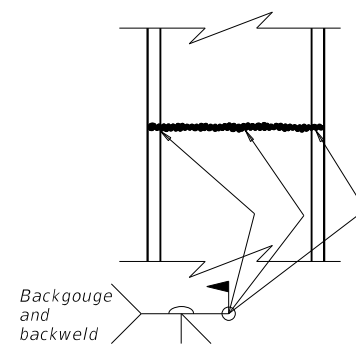
DETAIL "A"

(Showing plan view of a 30° skewed abutment)



STEEL H-PILE TIP REINFORCEMENT

See Item 407 "Steel Piling" to determine when tip reinforcement is required and for options to the details shown.



STEEL H-PILE SPLICE DETAIL

Use when required.

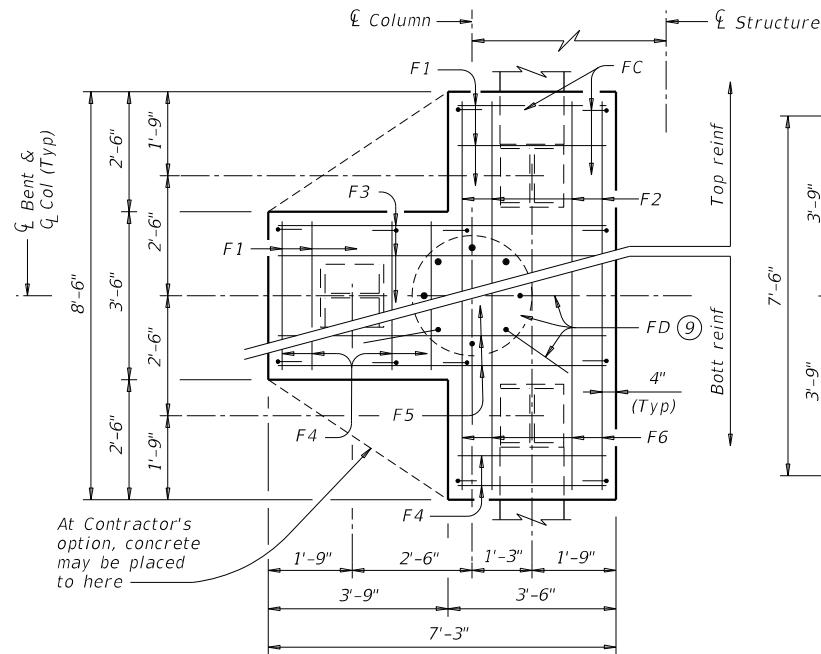
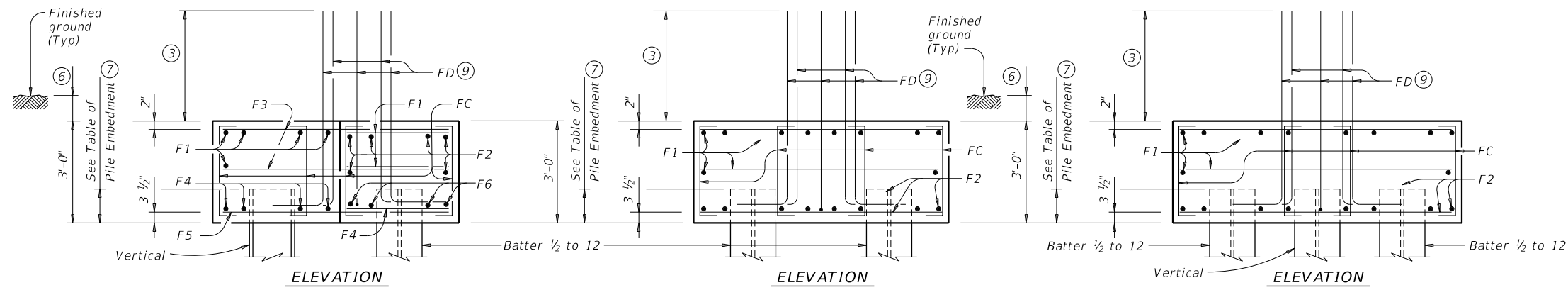
- 1 #3 spiral at 6" pitch (one and a half flat turns top and bottom).
- 2 Min extension into supported element:  
#6 Bars = 1'-11"  
#7 Bars = 2'-0"  
#9 Bars = 2'-3"
- 3 Min lap with column reinf:  
#7 Bars = 2'-11"  
#9 Bars = 3'-9"  
#11 Bars = 4'-8"
- 4 Min extension into supported element:  
#6 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.

SHEET 1 OF 2

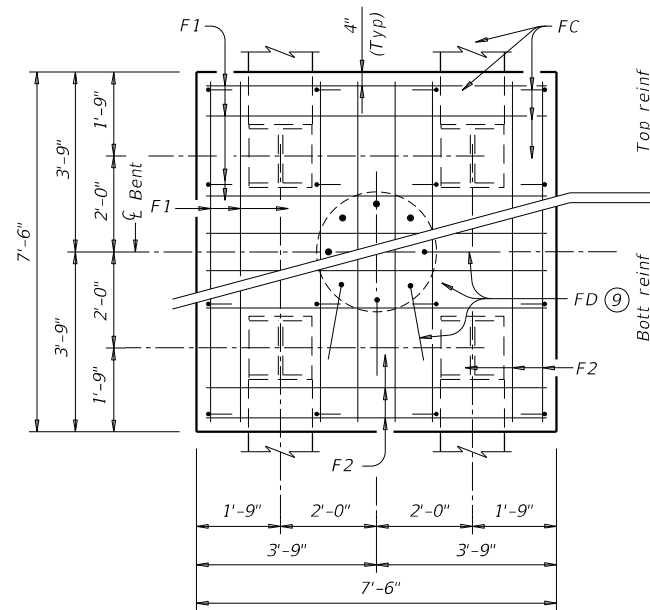
		<b>Bridge Division Standard</b>	
<h2>COMMON FOUNDATION DETAILS</h2>			
<b>FD</b>			
FILE: fdstd01-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT
©TxDOT April 2019	CONT	SECT	JOB
0493	02	021	RM 652
01-20: Added #11 bars to the FD bars.	DIST	COUNTY	SHEET NO.
	ODA	LOVING	81

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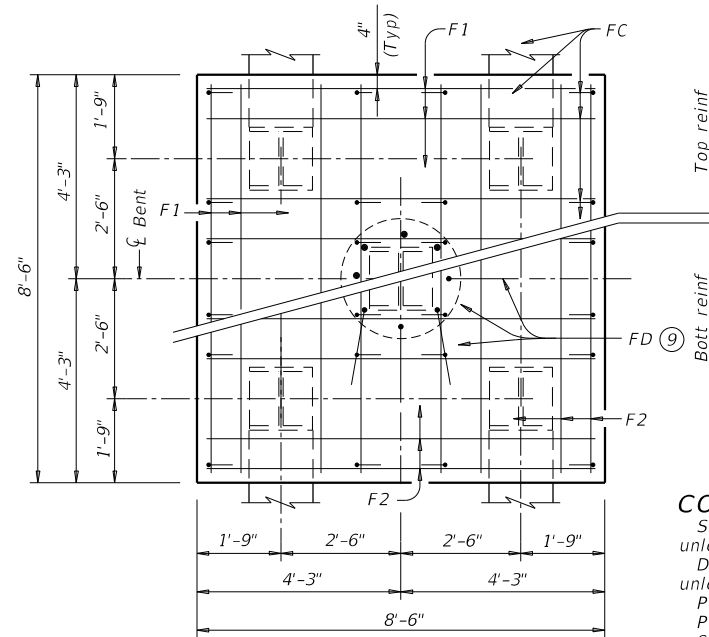
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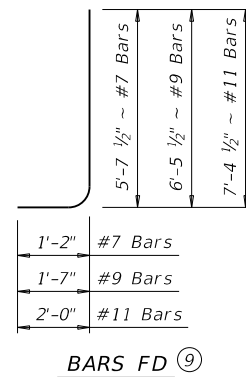
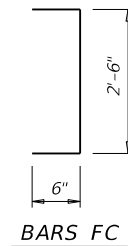
**THREE PILE FOOTING**<sup>⑧</sup>  
 For 36" Dia and smaller columns.



**FOUR PILE FOOTING**<sup>⑧</sup>  
 For 42" Dia and smaller columns.



**FIVE PILE FOOTING**<sup>⑧</sup>  
 For 42" Dia and smaller columns.



- ③ Min lap with column reinforcing:  
 #7 Bars = 2'-11"  
 #9 Bars = 3'-9"  
 #11 Bars = 4'-8"
- ⑥ 1'-0" Min, unless shown otherwise on plans.
- ⑦ Or as shown on plans.
- ⑧ See Bridge Layout for type, size and length of piling.
- ⑨ Number and size of FD bars must match column reinforcing. Tie FD bars to the top of the bottom reinforcing mat.
- ⑩ Adjust FD quantity, size and weight as needed to match column reinforcing.

**TABLE OF FOOTING QUANTITIES FOR 30" COLUMNS**

ONE 3 PILE FOOTING					
Bar	No.	Size	Length	Weight	
F1	11	#4	3'- 2"	23	
F2	6	#4	8'- 2"	33	
F3	6	#4	6'- 11"	28	
F4	8	#9	3'- 2"	86	
F5	4	#9	6'- 11"	94	
F6	4	#9	8'- 2"	111	
FC	12	#4	3'- 2"	28	
FD <sup>⑩</sup>	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 <sup>⑩</sup>	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 <sup>⑩</sup>	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

SHEET 2 OF 2



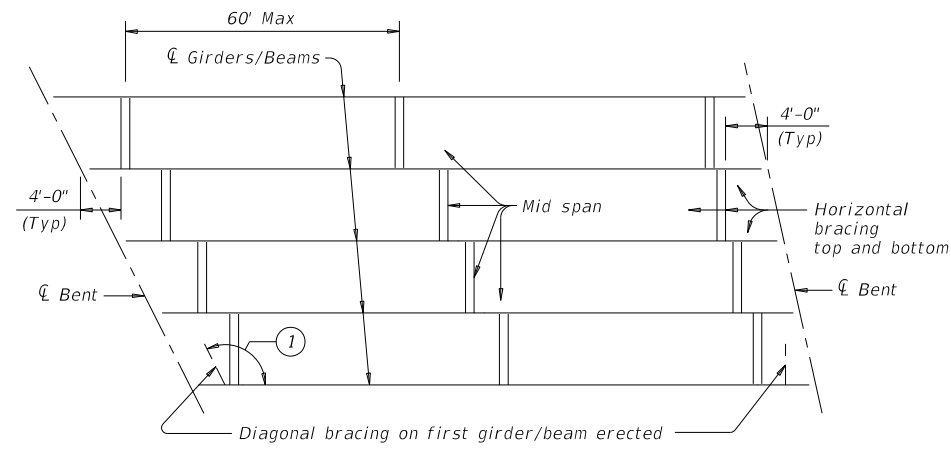
**COMMON FOUNDATION DETAILS**

FD

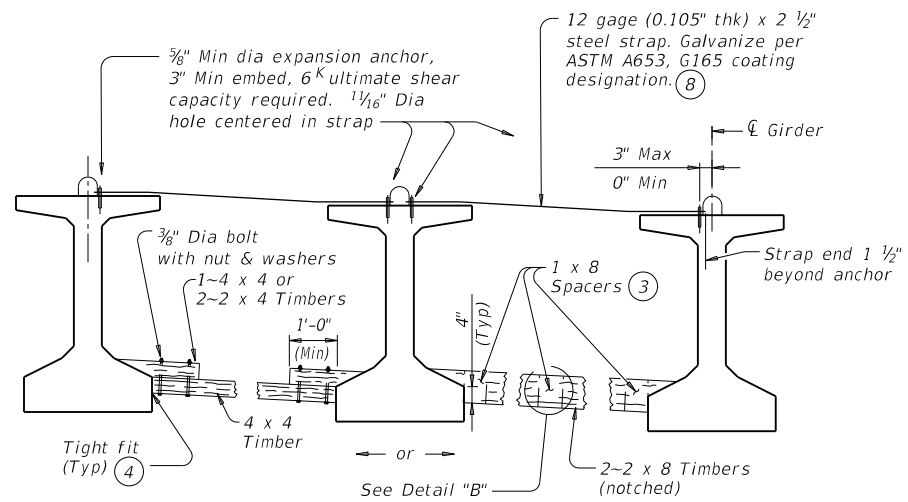
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©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0493	02	021	RM 652
01-20: Added #11 bars to the FD bars.	DIST	COUNTY	SHEET NO.	
	ODA	LOVING	82	

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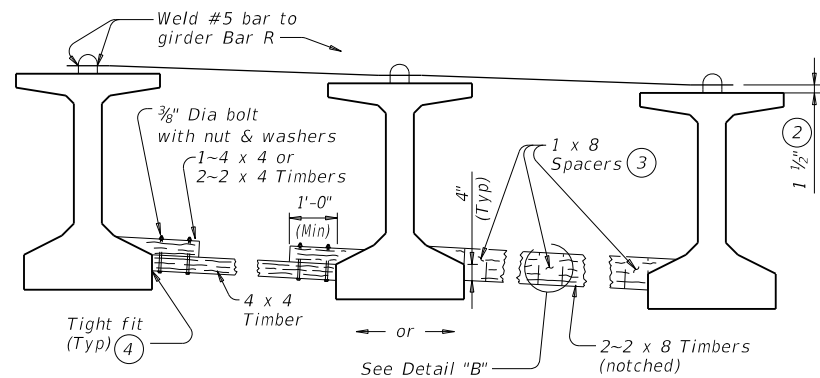


**ERECTION BRACING**



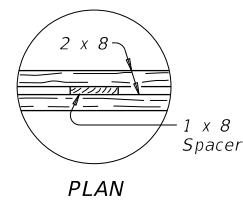
**FOR ERECTION BRACING, OPTION 1**

(This option is not allowed when slab is formed with PMDF or plywood.)

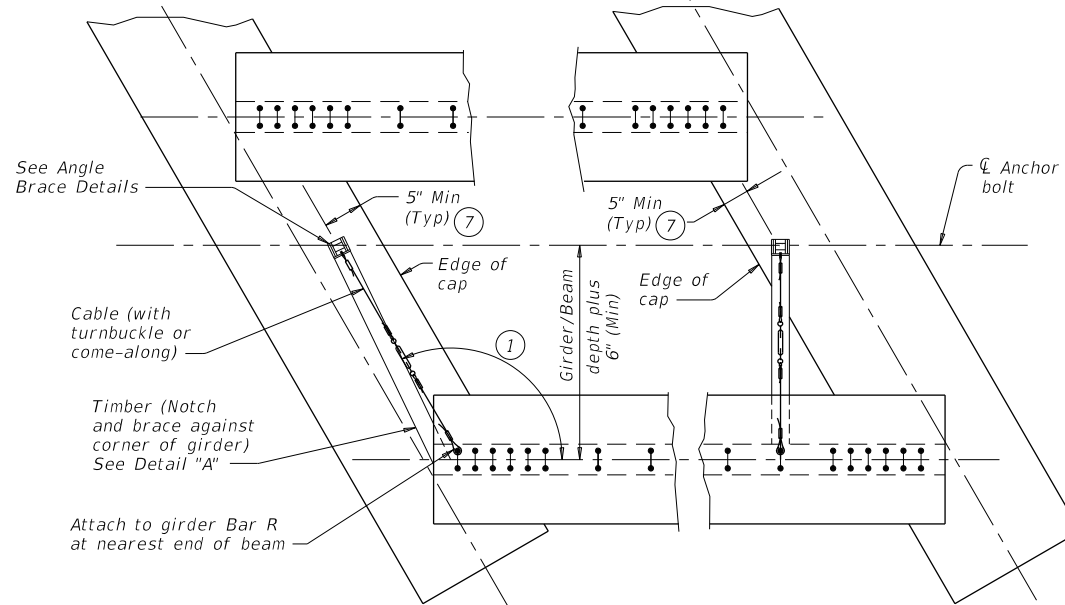


**FOR ERECTION BRACING, OPTION 2**

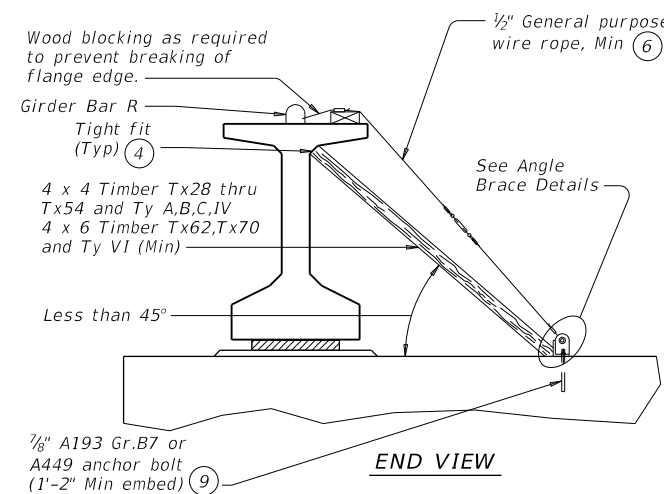
**HORIZONTAL BRACING DETAILS**



**DETAIL "B"**

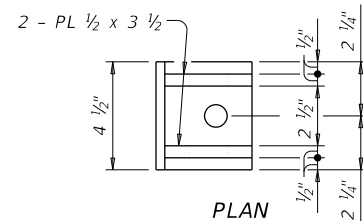
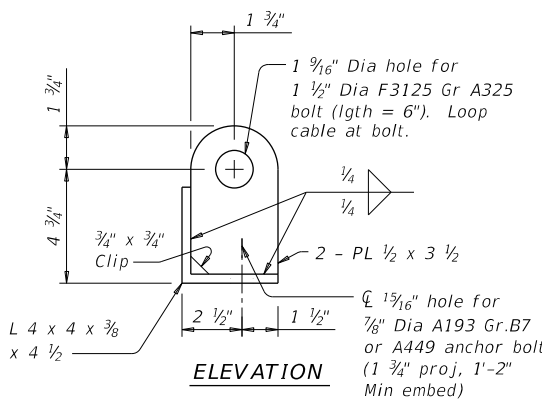


**PLAN**



**DIAGONAL BRACING DETAILS**

(To be used on both ends of the first girder/beam erected in the span in each phase.)



**ANGLE BRACE DETAILS**

**HAULING & ERECTION:**

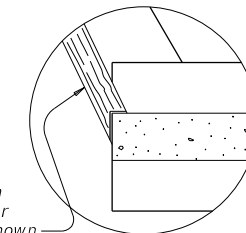
The Contractor's attention is directed to the possible lateral instability of prestressed concrete girders and beams over 130' long, especially during hauling and erection. The use of the following methods to improve stability is encouraged: Locate lifting devices at the maximum practical distance from girder ends; use external lateral stiffening devices during hauling and erection; lift with vertical lines using two machines; and take care in handling to minimize inertial and impact forces.

**ERECTION BRACING:**

Erection bracing details shown are considered the minimum for fulfilling the bracing requirements of Item 425. Required erection bracing must be placed immediately after erection of each girder and remain in place until additional bracing as required for slab placement is in place. This standard is needed in all cases to meet requirements for Slab Placement Bracing.

**PHASED CONSTRUCTION:**

Place erection and slab placement bracing for all girders in a phase as shown in these details. For phases after first, also place erection and slab placement bracing between outer girder of completed phase and adjacent girder of current phase. When the phase construction joint is between girders, top bracing can be omitted.



**DETAIL "A"**

- 1 If angle shown exceeds 120 degrees, move diagonal brace to other side of girder/beam and place square to girder/beam. This may prevent exterior girder from being erected first.
- 2 Place and weld #5 bars as shown during erection. If forming deck with prestressed panels, bars can be temporarily removed, one at a time, during panel erection. Re-install bar prior to additional panel erection. Bars can rest on panels and be bent down and welded to girder Bars R (See Sheet 2 of 2).
- 3 Clear distance between spacers must not exceed 3'. Nail together with 16d nails.
- 4 Use wedges as necessary to obtain tight fit. Nail wedges to timbers.
- 5 Pressure treated landscape timbers can not be used.
- 6 All hardware used with cable must be able to develop a minimum 25 kips breaking strength. Use thimbles at all loops in cable. Install cable clamps with saddles bearing against the live end and U-bolts bearing against the dead end.
- 7 It is acceptable to tie anchor bolts to cap reinforcement.
- 8 Prior to installing, field bend strap to lay flush on both girders' top flange and slope between flange tips.
- 9 Anchor bolt may be drilled and epoxied in place. Provide 25k minimum pullout. Core drill hole.

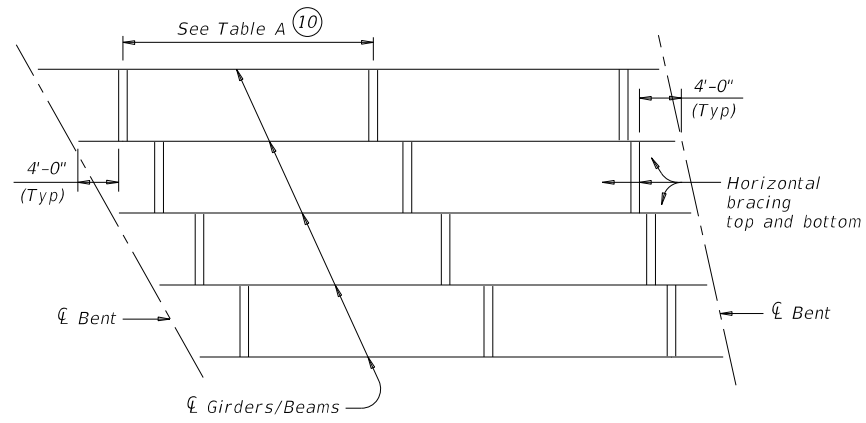
SHEET 1 OF 2

		<b>Bridge Division Standard</b>	
<b>MINIMUM ERECTION AND BRACING REQUIREMENTS PRESTRESSED CONCRETE I-GIRDERS AND I-BEAMS</b>			
<b>MEBR(C)</b>			
FILE: mebcsts1-17.dgn	DN: TxDOT	CK: TxDOT	OW: TxDOT
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REVISIONS	0493	02	021
	DIST	COUNTY	SHEET NO.
	ODA	LOVING	83



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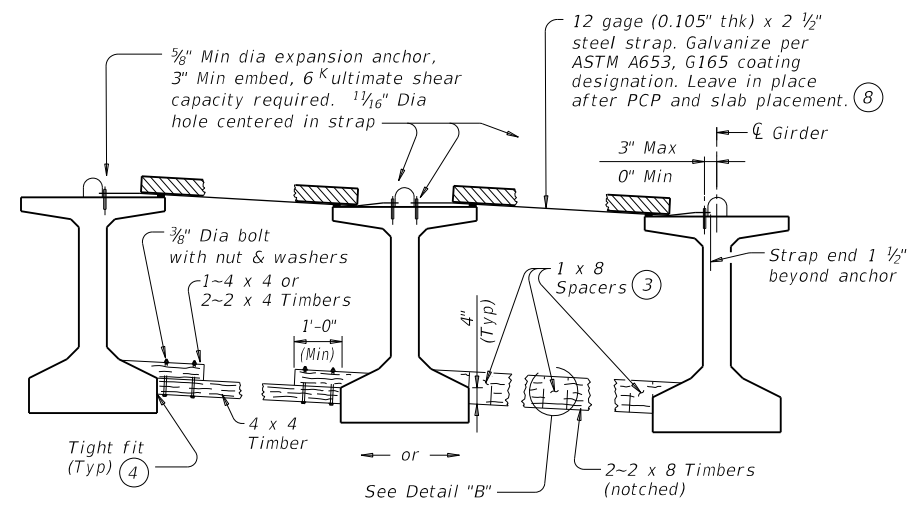


**SLAB PLACEMENT BRACING**

TABLE A		
OPTION 1-RIGID BRACING (STEEL STRAP)		
Girder or Beam Type	Maximum Bracing Spacing	
	Slab Overhang less than 4'-0" (11)	Slab Overhang 4'-0" and greater (11)
Tx28	1/4 points	1/4 points
Tx34	1/4 points	1/4 points
Tx40	1/4 points	1/8 points
Tx46	1/4 points	1/8 points
Tx54	1/4 points	1/8 points
Tx62	1/4 points	1/8 points
Tx70	1/4 points	1/8 points
A	1/8 points	1/8 points
B	1/8 points	1/8 points
C	1/8 points	1/8 points
IV	1/4 points	1/8 points
VI	1/4 points	1/8 points

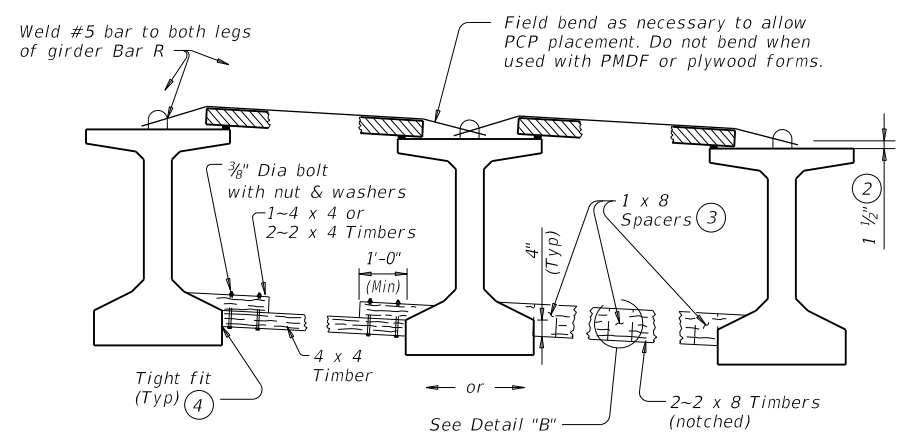
  

OPTION 2-FLEXIBLE BRACING (NO. 5 OVER PCP)		
Girder or Beam Type	Maximum Bracing Spacing	
	Slab Overhang less than 4'-0" (11)	Slab Overhang 4'-0" and greater (11)
Tx28	1/4 points	1/8 points
Tx34	1/4 points	1/8 points
Tx40	1/4 points	1/8 points
Tx46	1/4 points	1/8 points
Tx54	1/4 points	1/8 points
Tx62	1/4 points	1/8 points
Tx70	1/4 points	1/8 points
A	2.0 ft	1.5 ft
B	3.0 ft	2.0 ft
C	4.5 ft	2.0 ft
IV	1/4 points	4.0 ft
VI	1/4 points	4.0 ft



**FOR SLAB PLACEMENT BRACING, OPTION 1 - RIGID**

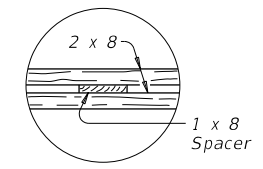
(Showing slab formed with PCP. This option is not allowed when slab is formed with PMDF or plywood.)



**FOR SLAB PLACEMENT BRACING, OPTION 2 - FLEXIBLE**

(Showing slab formed with PCP.)

**HORIZONTAL BRACING DETAILS (5)**



PLAN  
**DETAIL "B"**

- (2) Place and weld #5 bars as shown during erection. If forming deck with prestressed panels, bars can be temporarily removed, one at a time, during panel erection. Re-install bar prior to additional panel erection. Bars can rest on panels and be bent down and welded to girder Bars R.
- (3) Clear distance between spacers must not exceed 3'. Nail together with 16d nails.
- (4) Use wedges as necessary to obtain tight fit. Nail wedges to timbers.
- (5) Pressure treated landscape timbers can not be used.
- (8) Prior to installing, field bend strap to lay flush on both girders' top flange and slope between flange tips.
- (10) Bracing spacing (1/4 and 1/8 points) measured between first and last typical brace location.
- (11) Measure slab overhang from centerline of girder or beam. When overhang varies in span, determine bracing spacing based on largest overhang.

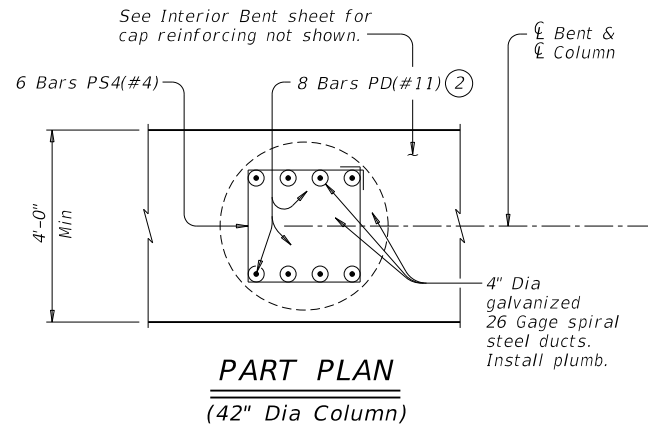
**SLAB PLACEMENT BRACING:**  
 The details for slab placement bracing are considered minimum for fulfilling the requirements of Specification Items 422 and 425. Required slab placement bracing must remain in place until slab concrete has attained a compressive strength of 3000 psi.

**GENERAL NOTES:**  
 Bracing details for spans longer than 150' are not provided. The Contractor must submit proposed bracing details for such conditions to the Engineer for approval prior to erection. Systems equal to or better than those shown may be used provided details of such systems are submitted to and approved by the Engineer prior to erection. Use of these systems or details does not relieve the Contractor of the responsibility for the adequacy of the bracing and the safety of the structure. Removal of bracing for short periods of time to align girders and beams is permissible. All turn-buckles, come-alongs, anchors and other connections must be capable of developing the full strength of the cable shown. Furnish anchor bolts and nuts in accordance with Item 449, "Anchor Bolts".

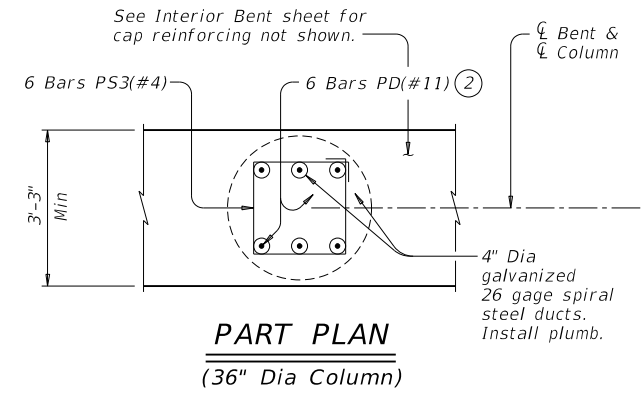
		<b>Bridge Division Standard</b>	
<b>MINIMUM ERECTION AND BRACING REQUIREMENTS</b> <b>PRESTRESSED CONCRETE I-GIRDERS AND I-BEAMS</b>			
<b>MEBR(C)</b>			
FILE: mbcsts1-17.dgn	DN: TxDOT	CK: TxDOT	OW: TxDOT
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REVISIONS	0493	02	021 RM 652
	DIST	COUNTY	SHEET NO.
	ODA	LOVING	84

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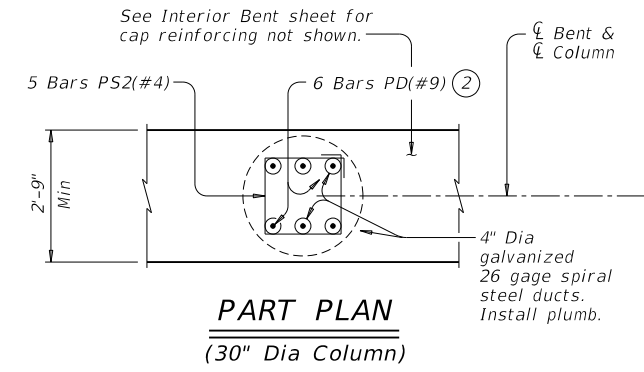
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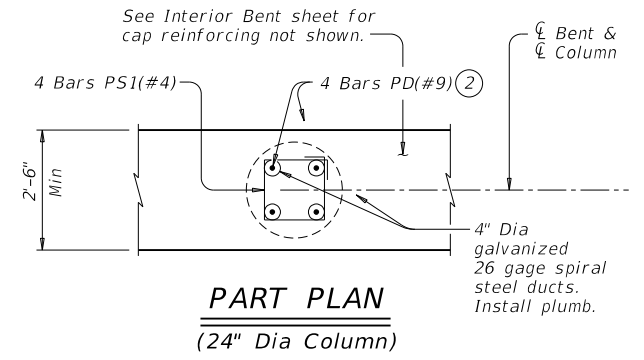
**PART PLAN**  
(42" Dia Column)



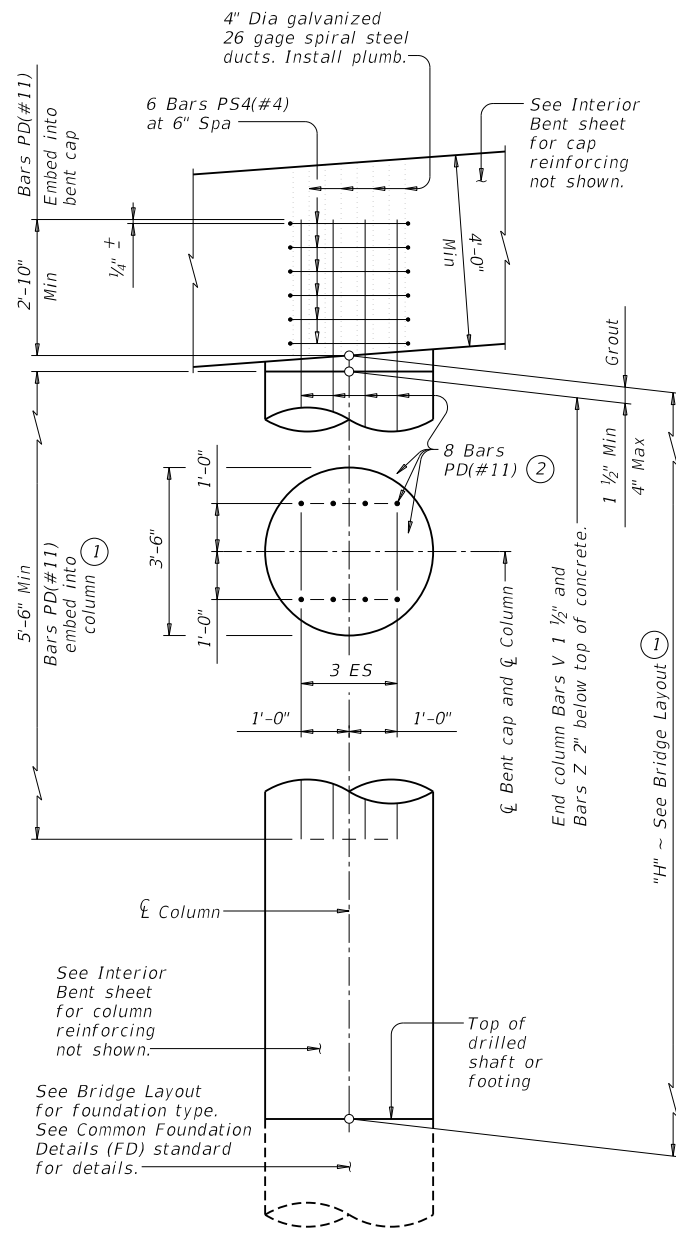
**PART PLAN**  
(36" Dia Column)



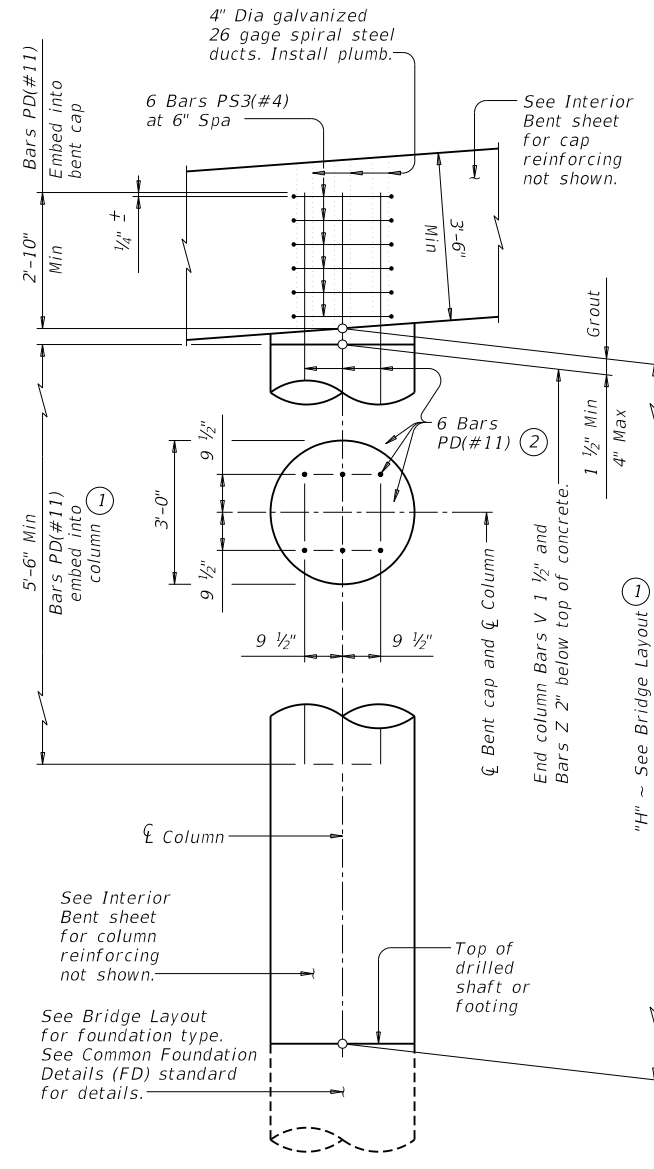
**PART PLAN**  
(30" Dia Column)



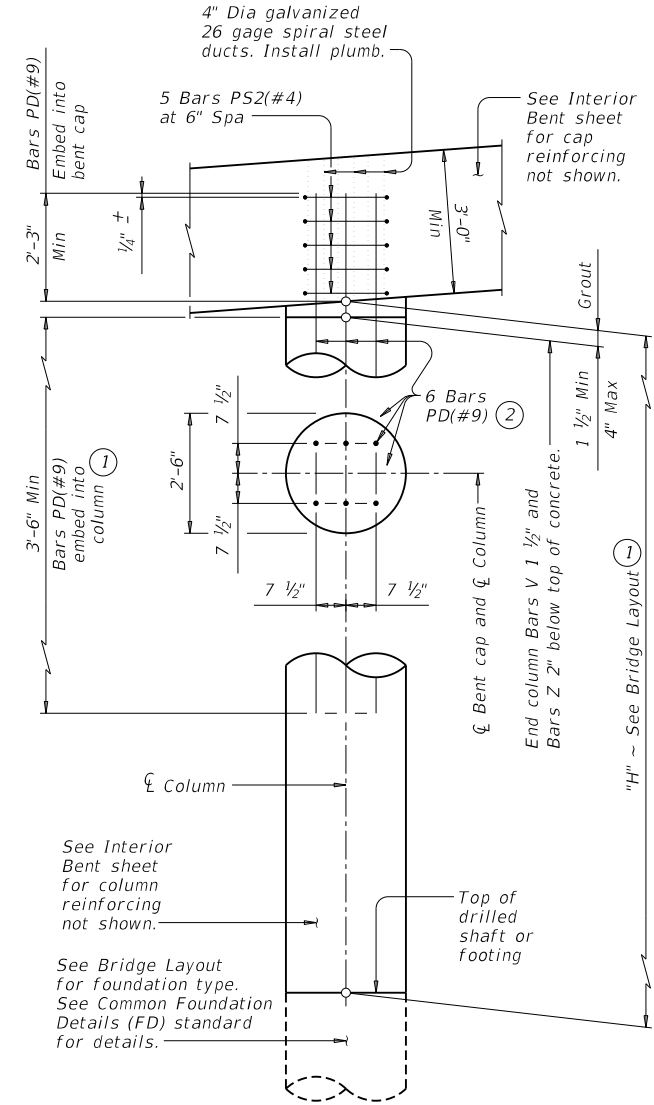
**PART PLAN**  
(24" Dia Column)



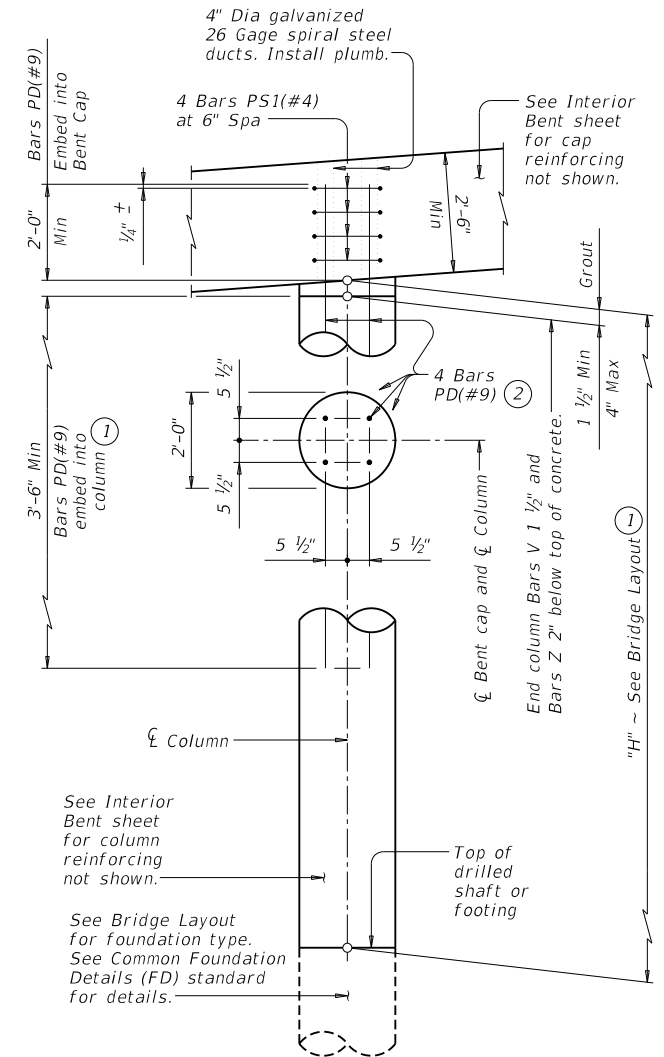
**PART ELEVATION**  
(42" Dia Column)



**PART ELEVATION**  
(36" Dia Column)



**PART ELEVATION**  
(30" Dia Column)



**PART ELEVATION**  
(24" Dia Column)

PS1	1'-4 1/4"
PS2	1'-8 1/4"
PS3	2'-0 1/4"
PS4	2'-5 1/4"

PS1	PS2	PS3	PS4
1'-4 1/4"	1'-8 1/4"	2'-0 1/4"	2'-5 1/4"

**BARS PS (#4)**

- 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 1/4" from plan location, transversely and longitudinally.

HL93 LOADING SHEET 1 OF 2



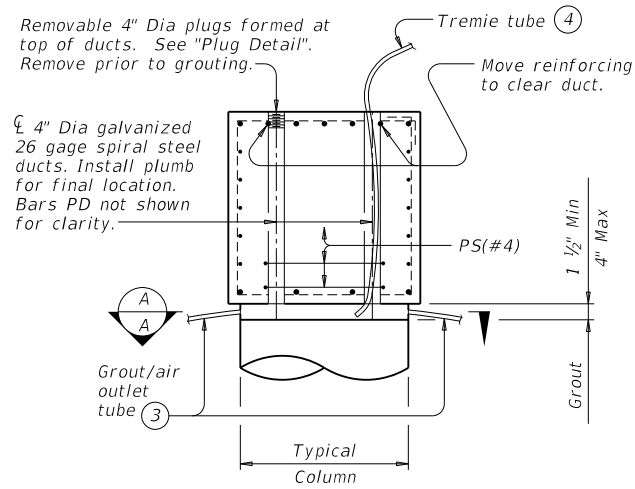
**PRECAST CONCRETE BENT CAP OPTION FOR ROUND COLUMNS**

**PBC-RC**

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©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0493	02	021	RM 652
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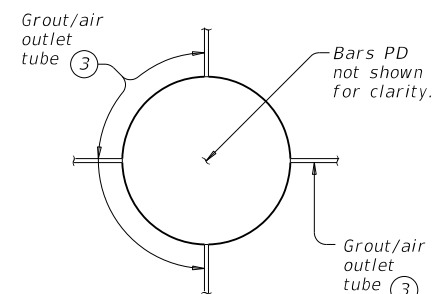
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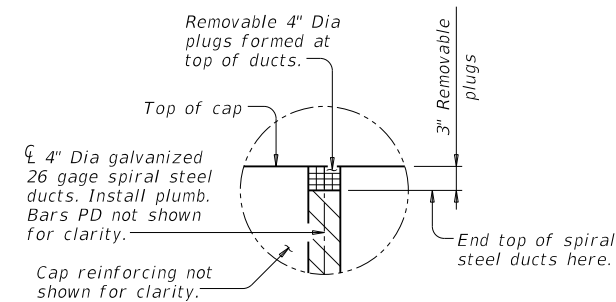


**TYPICAL SECTION THRU CAP**

(Showing example of ducts and cap reinforcing.)



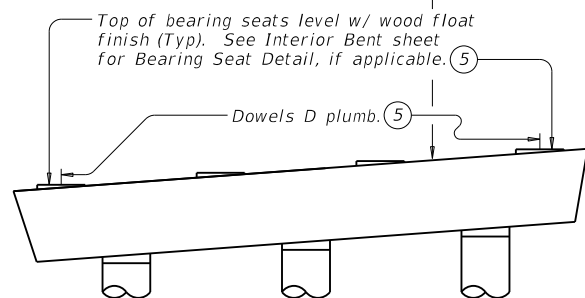
**SECTION A-A**



**PLUG DETAIL**

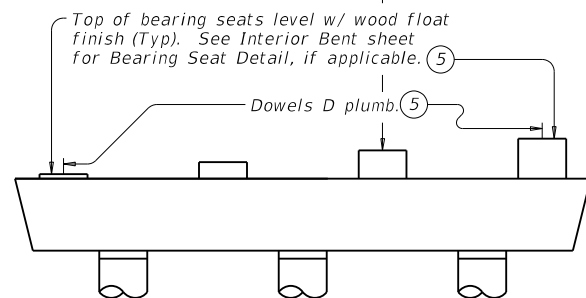
(To keep concrete out of ducts during concrete placement. Remove prior to grouting)

Slope top of cap between bearing seats in accordance with Item 420.4.9 "Treatment and Finishing of Horizontal Surfaces", unless directed otherwise by the Engineer.



**CAP SET AT SLOPE**

Reinforce bearing seats over 3" tall and slope top of cap between bearing seats in accordance with Item 420.4.9 "Treatment and Finishing of Horizontal Surfaces", unless directed otherwise by the Engineer.



**CAP SET LEVEL**

**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 withdraw 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". Secure ducts to prevent their movement during concrete placement. Location tolerance of ducts is 1/4" 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.



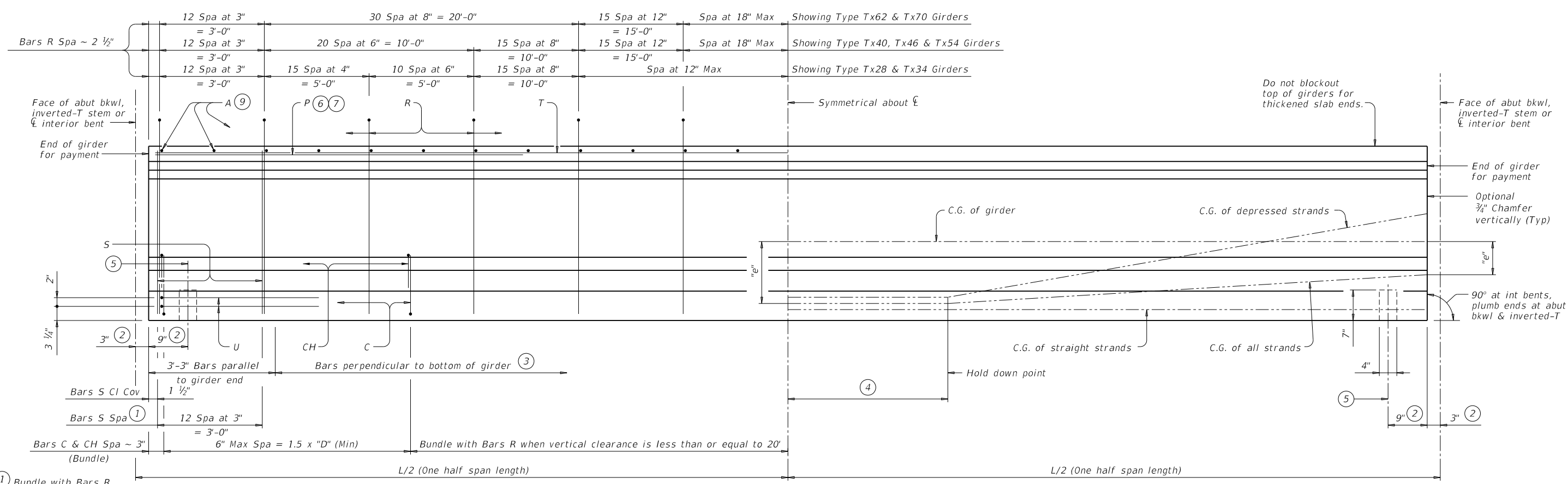
**PRECAST CONCRETE BENT CAP OPTION FOR ROUND COLUMNS**

**PBC-RC**

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REVISIONS	0493	02	021	RM 652
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	ODA	LOVING		86

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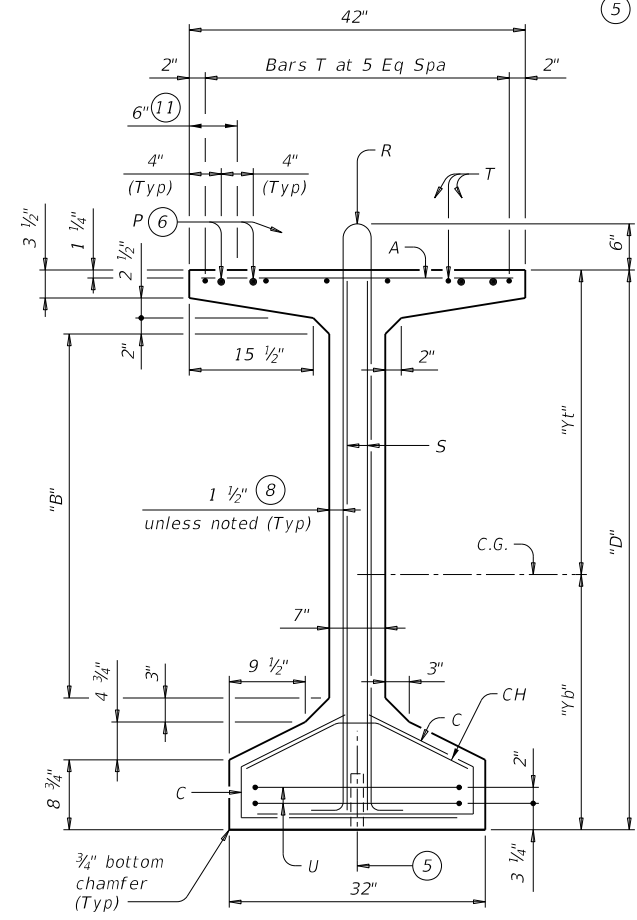
- ① Bundle with Bars R.
- ② Measured along  $\bar{\epsilon}$  Girder at interior bents; perpendicular to abutment bkwl or inverted-T stem.
- ③ The average of the top and bottom spacing of Bars R cannot exceed the required spacing.
- ④ L/20, but not less than 5'-0" (-0,+2).

### GIRDER ELEVATION

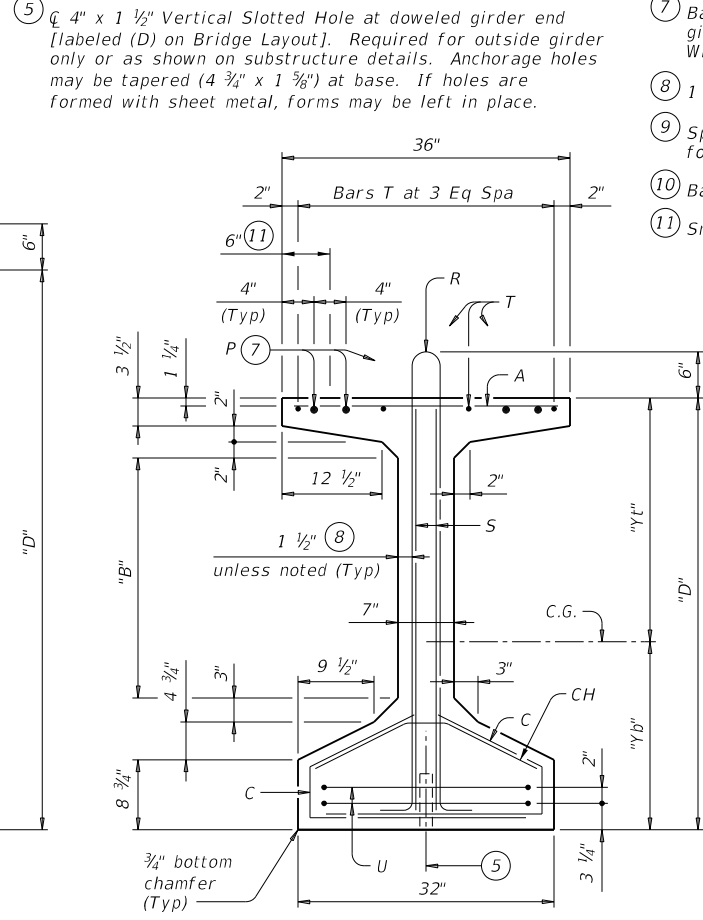
- ⑥ Bars P (#6 x 15'-0") required in Tx62 and Tx70 girders. At the fabricator's option bars larger than #6 may be used. When L is less than 50 ft, Bars P are to be the same length as Bars T.
- ⑦ Bars P (#6 x 15'-0") are only required in Tx28, Tx34, Tx40, Tx46, and Tx54 girders when "e" at girder ends exceeds 0.25 x "D". At the fabricator's option bars larger than #6 may be used. When L is less than 50 ft, Bars P are to be the same length as Bars T.
- ⑧ 1 3/8" Clear Cover to Bars S.
- ⑨ Space Bars A at 6" Max for girders requiring overhang bracket hangers. Space at 12" Max for all other girders. Tie to Bars R as necessary. See standard IGMS for "Deck Forming Notes".
- ⑩ Based on 155 pcf total weight of concrete and reinforcing steel.
- ⑪ Smooth trowel finish on the slab overhang side of exterior girder.

GIRDER DIMENSIONS AND SECTION PROPERTIES								
Girder Type	"D"	"B"	"yt"	"yb"	Area	"Ix"	"Iy"	Weight (10)
	(in.)	(in.)	(in.)	(in.)	(in. <sup>2</sup> )	(in. <sup>4</sup> )	(in. <sup>4</sup> )	(plf)
Tx28	28	6	15.02	12.98	585	52,772	40,559	630
Tx34	34	12	18.49	15.51	627	88,355	40,731	675
Tx40	40	18	21.90	18.10	669	134,990	40,902	720
Tx46	46	22	25.90	20.10	761	198,089	46,478	819
Tx54	54	30	30.49	23.51	817	299,740	46,707	880
Tx62	62	37 1/2"	33.72	28.28	910	463,072	57,351	980
Tx70	70	45 1/2"	38.09	31.91	966	628,747	57,579	1,040

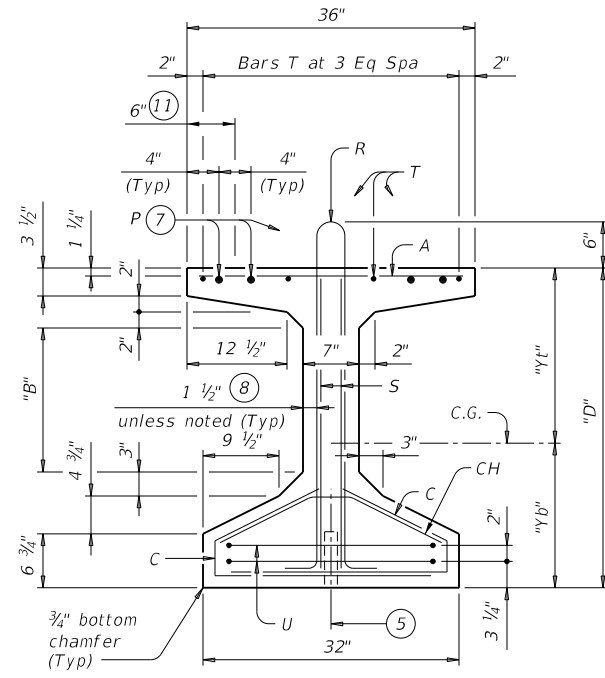
**GENERAL NOTES:**  
 Designed according to AASHTO LRFD Bridge Design Specifications. Provide Class H concrete. Provide Grade 60 reinforcing steel. An equal area of deformed Welded Wire Reinforcement (WWR) (ASTM A1064) may be substituted for Bars A, C, R or T unless otherwise noted. It is permissible for bars or strands to come in contact with materials used in forming anchor holes.  
 Cover dimensions are clear dimensions, unless noted otherwise. Reinforcing bar dimensions shown are out-to-out of bar.



**TYPE Tx62 & Tx70**



**TYPE Tx46 & Tx54**



**TYPE Tx28, Tx34 & Tx40**



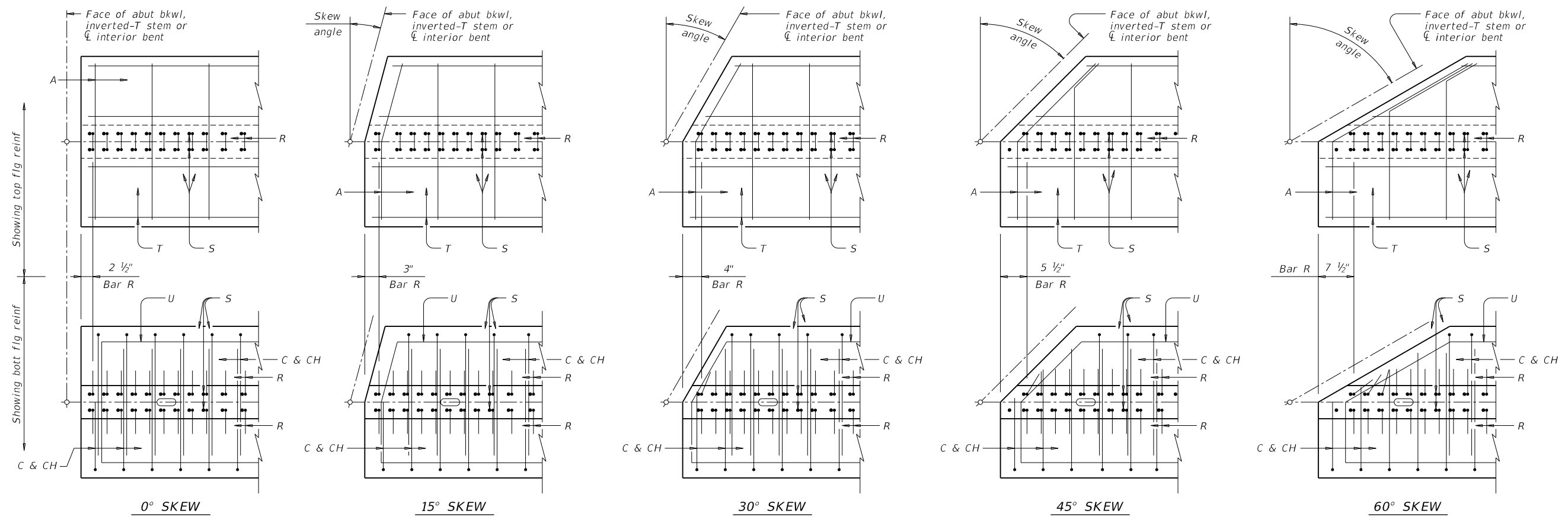
## PRESTRESSED CONCRETE I-GIRDER DETAILS

IGD

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©TxDOT August 2017	CONT	SECT	JOB	HIGHWAY
REVISIONS	0493	02	021	RM 652
10-19: Added Bars C and CH full length for VC <= 20'	DIST	COUNTY	SHEET NO.	
	ODA	LOVING	87	

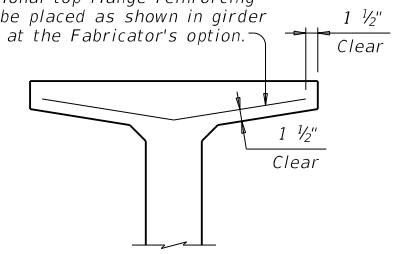
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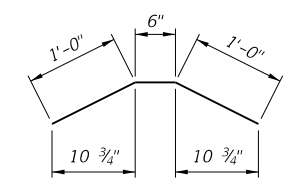


**PLAN OF GIRDER ENDS** <sup>(12)</sup>

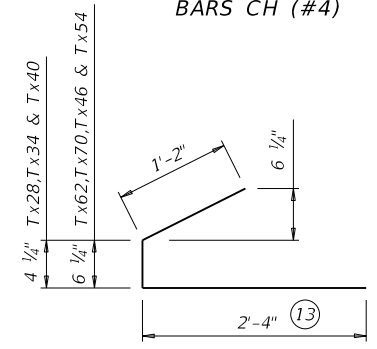
To control top flange cracking that may occur during form removal, additional top flange reinforcing may be placed as shown in girder ends at the Fabricator's option.



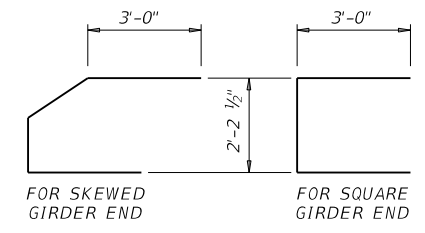
**OPTIONAL TOP FLANGE REINFORCING DETAIL**



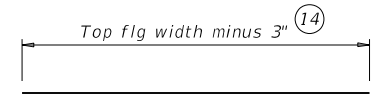
**BARS CH (#4)**



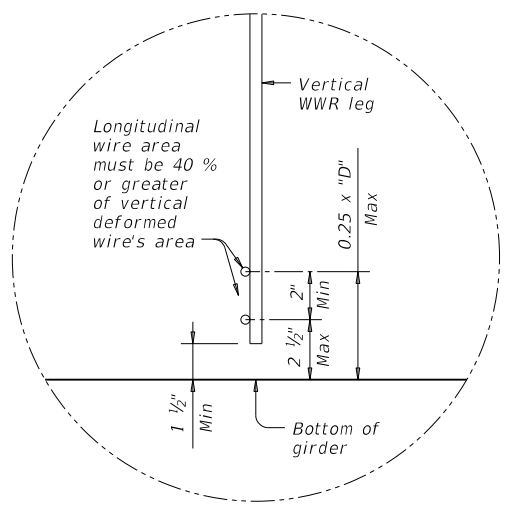
**BARS C (#4)**



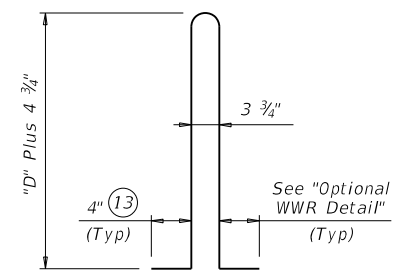
**BARS U (#5)**



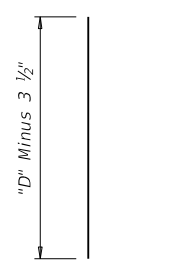
**BARS A (#3)**



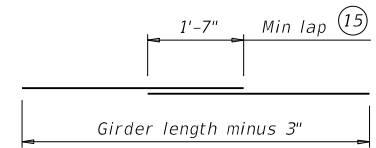
**OPTIONAL WELDED WIRE REINFORCEMENT (WWR) DETAIL**



**BARS R (#4) <sup>(16)</sup>**



**BARS S (#6)**



**BARS T (#4)**

- <sup>(12)</sup> Reinforcing patterns shown are provided as guides to determine reinforcement placement in skewed ends. Place Bars S as close to girder end as cover requirements permit, which may prevent them to be bundled with Bars R.
- <sup>(13)</sup> Bars may be cut or bent at skewed end as required.
- <sup>(14)</sup> Increase as necessary for bars at skewed end.
- <sup>(15)</sup> No portion of bar less than 10 ft.
- <sup>(16)</sup> For Welded Wire Reinforcement (WWR) option, area of Bars R may be reduced in proportion to the increase in reinforcement yield strength over 60 ksi. Yield strength of WWR is limited to 75 ksi.



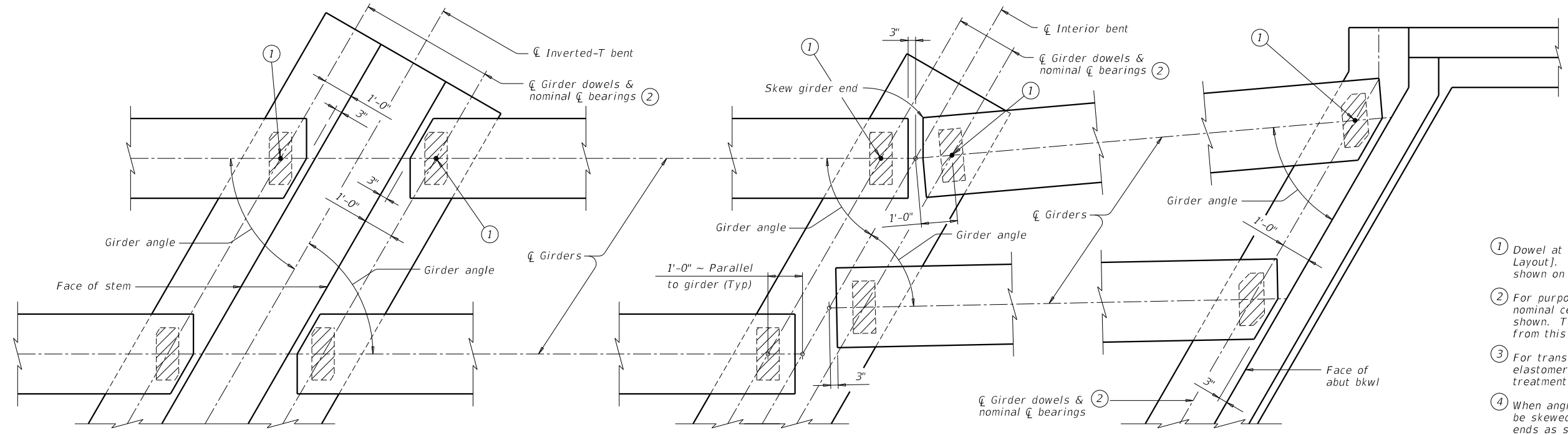
**PRESTRESSED CONCRETE I-GIRDER DETAILS**

**IGD**

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©TxDOT August 2017	CONT	SECT	JOB	HIGHWAY
REVISIONS	0493	02	021	RM 652
10-19: Added Bars C and CH full length for VC <= 20'	DIST	COUNTY	SHEET NO.	
	ODA	LOVING	88	

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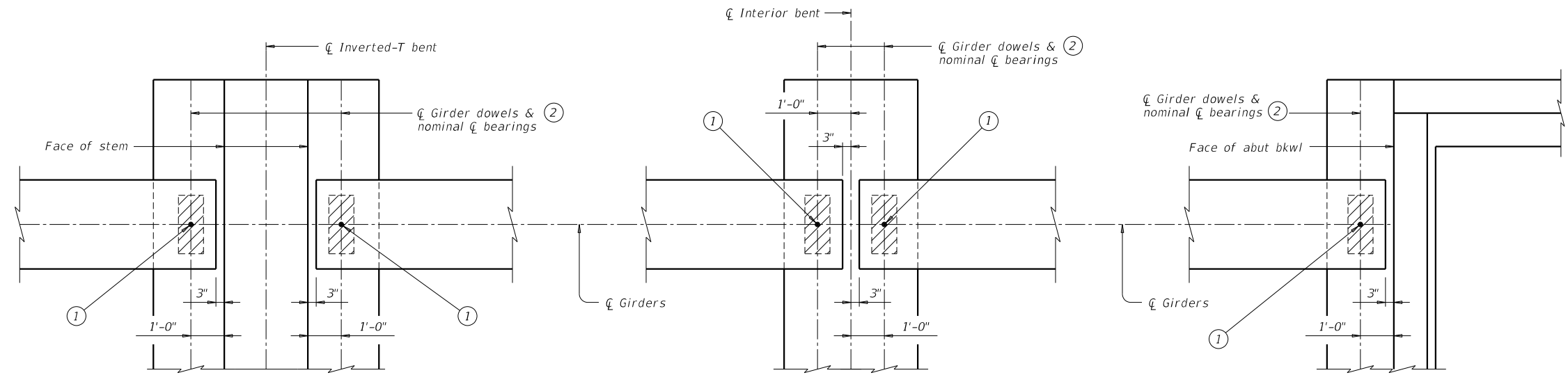


AT INVERTED-T BENT W/SKEW

AT CONVENTIONAL INTERIOR BENT W/SKEW

AT ABUTMENT W/SKEW<sup>③</sup>

- ① Dowel at doweled girder end [labeled (D) on Bridge Layout]. Required for outside girder only or as shown on substructure details.
- ② For purposes of computing bearing seat elevations, nominal centerline of bearing must be defined as shown. The actual center of bearing pad may vary from this line.
- ③ For transition bents with backwall, girder and elastomeric bearings must receive the same treatment as shown for abutments.
- ④ When angle exceeds 0°, one or both girder ends must be skewed to maintain the clearance between girder ends as shown in view.
- ⑤ See Table of Bearing Pad Dimensions for bearing size. Girder end skew angles in Table not applicable for this situation. Table reflects girder conflicts of this type on radial bents only.



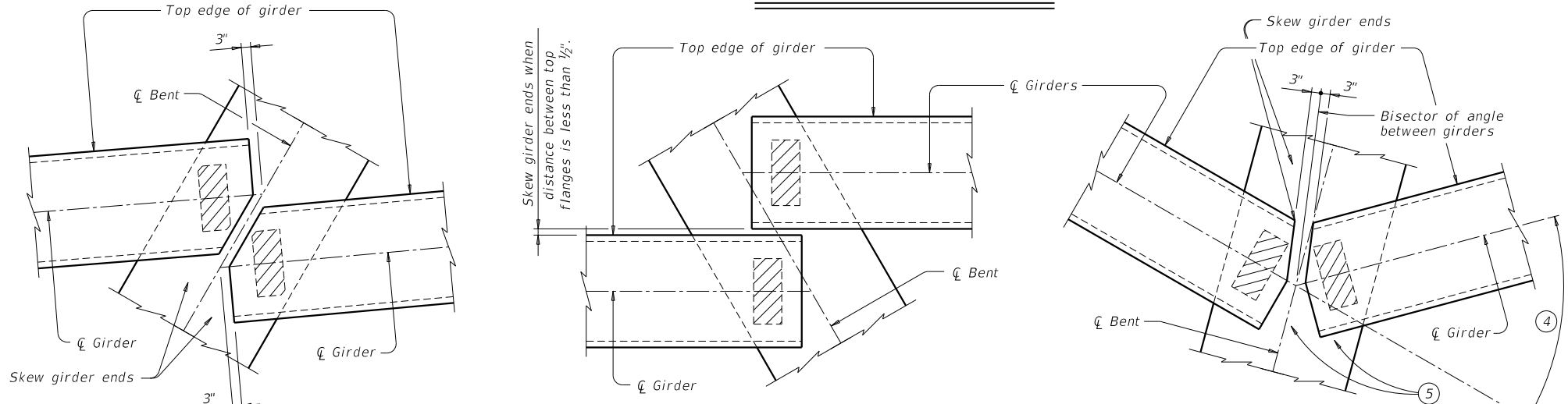
AT INVERTED-T BENT

AT CONVENTIONAL INTERIOR BENT

AT ABUTMENT<sup>③</sup>

**GENERAL NOTES:**  
These details accommodate skew angles up to 60°. Shop drawings for approval are required. A bearing layout which identifies location and orientation of all bearings must be developed by the bearing fabricator. Permanently mark each bearing in accordance with the bearing layout. A copy of the bearing layout is to be provided to the Engineer. Cost of furnishing and installing elastomeric bearings, including beveled and embedded steel plates, must be included in unit price bid for "Prestressed Concrete Girders".

**GIRDER END DETAILS**



GIRDER CONFLICT DETAILS

HL93 LOADING SHEET 1 OF 3

**Texas Department of Transportation**  
Bridge Division Standard

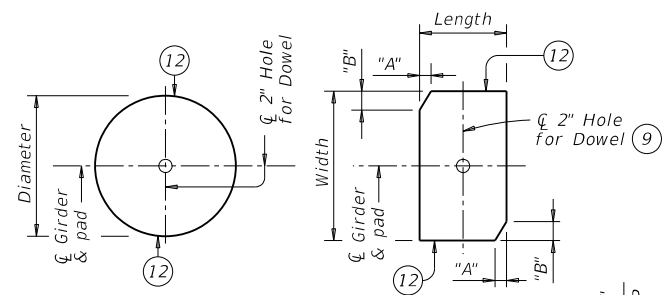
**ELASTOMERIC BEARING AND GIRDER END DETAILS  
PRESTR CONCRETE I-GIRDERS**

**IGEB**

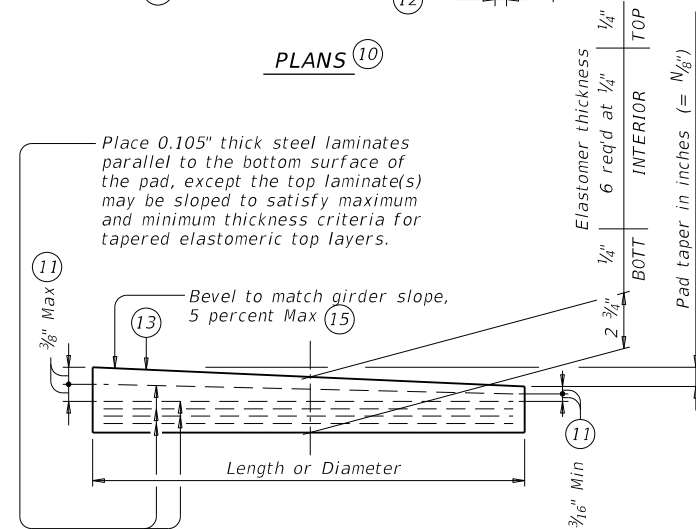
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©TxDOT August 2017	CONT	SECT	JOB	HIGHWAY
REVISIONS	0493	02	021	RM 652
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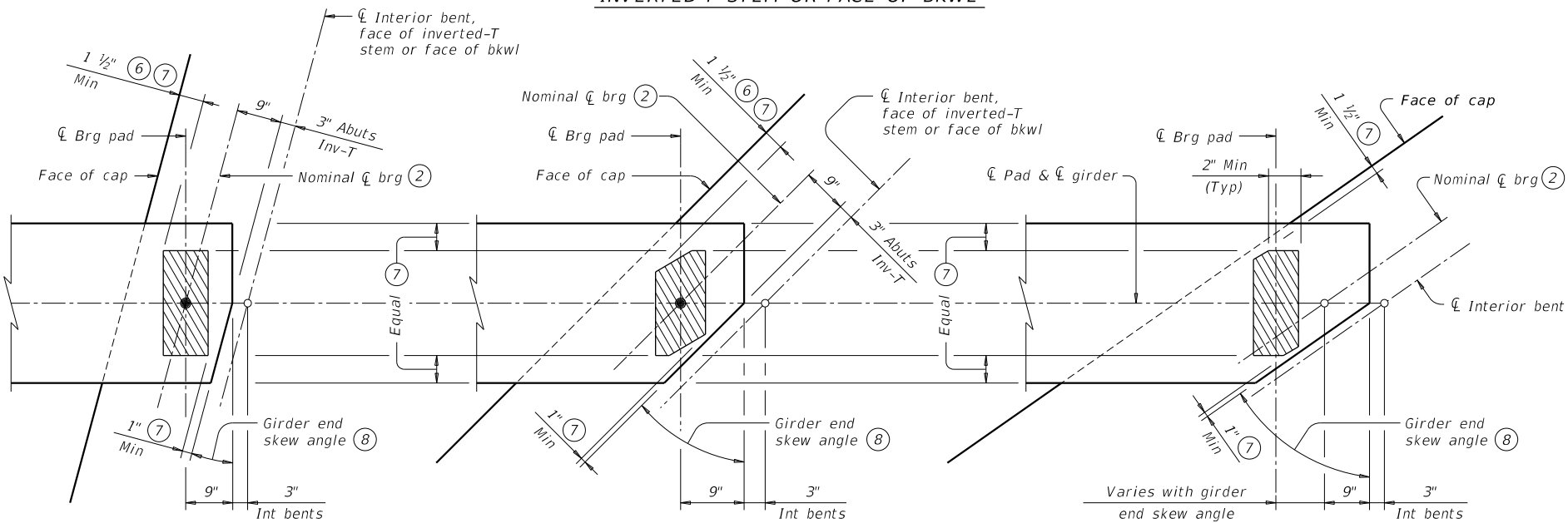
PLANS (10)



ELEVATION

**LAMINATED ELASTOMERIC BEARING PAD**

(50 DUROMETER)



SKewed GIRDER ENDS AT INT BENTS, FACE OF INVERTED-T STEM OR FACE OF BKWL

SKewed GIRDER ENDS AT CONVENTIONAL INTERIOR BENTS (NO GIRDER DOWELS)

**BEARING PAD PLACEMENT DIAGRAMS**

Girder Type	Abutments	Int Bents	Inv-T Bents
	Face of Bkwl to Face of Cap	Overall Cap Width	Corbel Width
Tx28 thru Tx54	1'-9"	3'-6"	1'-10 1/2"
Tx62 & Tx70	2'-0"	4'-0"	2'-1 1/2"

Bent Type	Girder Type	Bearing Type (13)	Girder End Skew Angle Range	Pad Size Lgth x Wdth	Pad Clip Dimensions	
					"A"	"B"
ABUTMENTS, INVERTED-T AND TRANSITION BENTS WITH BACKWALLS	Tx28, Tx34, Tx40, Tx46 & Tx54	G-1-"N"	0° thru 21°	8" x 21"	---	---
		G-2-"N"	21°+ thru 30°	8" x 21"	1 1/2"	2 1/2"
		G-3-"N"	30°+ thru 45°	9" x 21"	4 1/2"	4 1/2"
		G-4-"N"	45°+ thru 60°	15" Dia	---	---
	Tx62 & Tx70	G-5-"N"	0° thru 21°	9" x 21"	---	---
		G-6-"N"	21°+ thru 30°	9" x 21"	1 1/2"	2 1/2"
		G-7-"N"	30°+ thru 45°	10" x 21"	4 1/2"	4 1/2"
		G-8-"N"	45°+ thru 60°	10" x 21"	7 1/4"	4 1/4"
CONVENTIONAL INTERIOR BENTS	Tx28, Tx34, Tx40, Tx46 & Tx54	---	---	---	---	---
	Tx62 & Tx70	G-5-"N"	0° thru 60°	9" x 21"	---	---
CONVENTIONAL INTERIOR BENTS WITH SKEWED GIRDER ENDS (GIRDER CONFLICTS)	Tx28, Tx34, Tx40, Tx46 & Tx54	G-1-"N"	0° thru 18°	8" x 21"	---	---
		G-2-"N"	18°+ thru 30°	8" x 21"	1 1/2"	2 1/2"
		G-9-"N"	30°+ thru 45°	8" x 21"	3"	3"
		G-10-"N"	45°+ thru 60°	9" x 21"	6"	3 1/2"
	Tx62 & Tx70	G-5-"N"	0° thru 18°	9" x 21"	---	---
		G-5-"N"	18°+ thru 30°	9" x 21"	---	---
		G-11-"N"	30°+ thru 45°	9" x 21"	1 1/2"	1 1/2"
		G-12-"N"	45°+ thru 60°	9" x 21"	3"	1 3/4"

- (2) For purposes of computing bearing seat elevations, nominal centerline of bearing must be defined as shown. The actual center of bearing pad may vary from this line.
- (6) 3" for inverted-T.
- (7) Place centerline pad as near nominal centerline bearing as possible between limits shown.
- (8) Girder end skew angle is equal to 90° minus the girder angle except at some conflicting girders.
- (9) Provide 2" dia hole only at locations required. See Substructure details for location.
- (10) See Table of Bearing Pad Dimensions for dimensions.
- (11) Maximum and minimum layer thicknesses shown are for elastomer only, on tapered layers.
- (12) Locate Permanent Mark here.
- (13) Indicate BEARING TYPE on all pads. For tapered pads, locate BEARING TYPE on the high side. The Fabricator must include the value of "N" (amount of taper in 1/8" increments) in this mark.  
 Examples: N=0, (for 0° taper)  
 N=1, (for 1/8" taper)  
 N=2, (for 1/4" taper)  
 (etc.)  
 Fabricated pad top surface slope must not vary from plan girder slope by more than  $(\frac{0.0625}{\text{Length or Dia}})$  IN/IN.
- (14) Substructure dimensions must satisfy the minimums provided to accommodate the elastomeric bearings shown on this standard.
- (15) See sheet 3 of 3 for beveled plate use when slopes exceed 5 percent.
- (16) If girder end is skewed for a girder conflict at an interior bent and a beveled sole plate is required, use bearing type for abutments at this location. Location of bearing centerline is to be set as for abutments in this case.

HL93 LOADING SHEET 2 OF 3



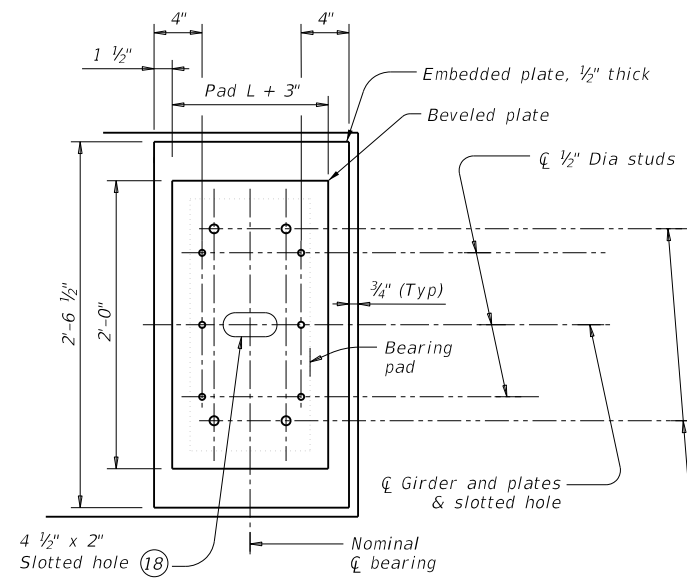
**ELASTOMERIC BEARING AND GIRDER END DETAILS PRESTR CONCRETE I-GIRDERS**

IGEB

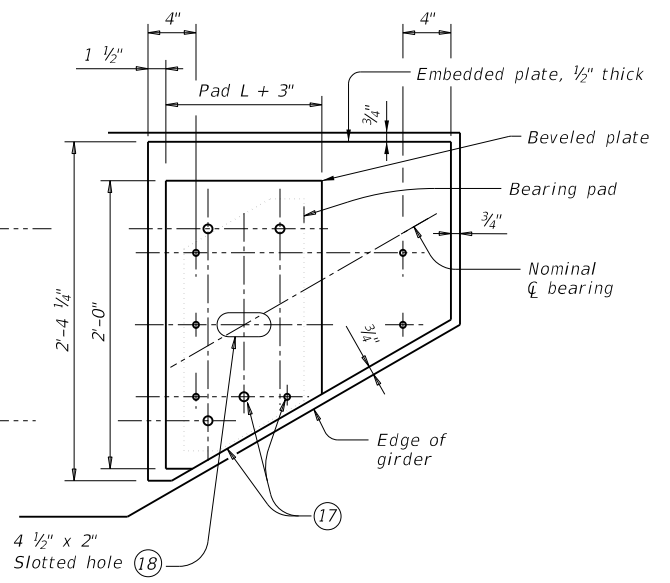
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REVISIONS	0493	02	021	RM 652
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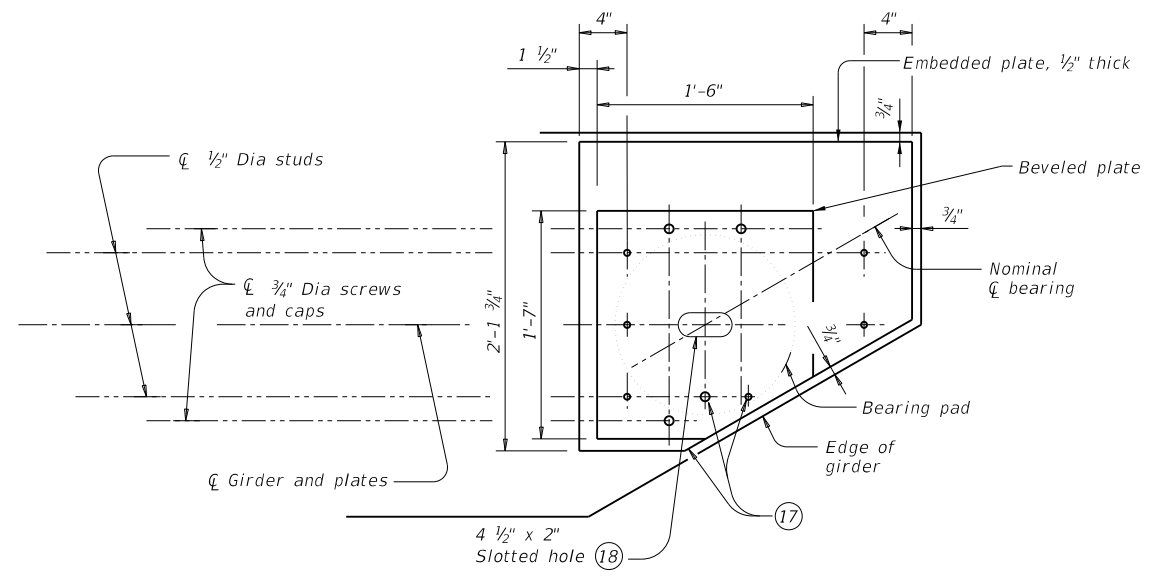
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**NORMAL GIRDER END  
 RECTANGULAR BEARING PAD**

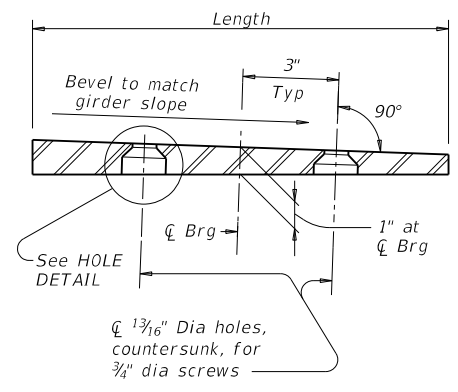


**SKewed GIRDER END  
 CLIPPED RECTANGULAR BEARING PAD**

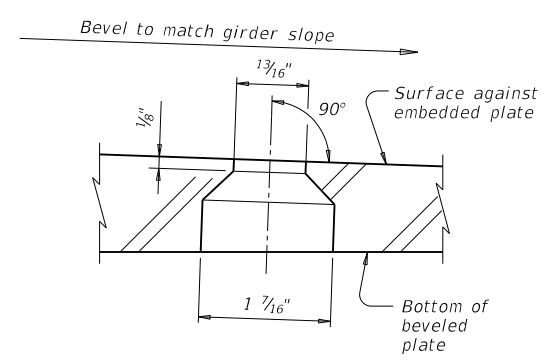


**SKewed GIRDER END  
 15" DIA BEARING PAD**

**PLAN VIEW OF SOLE PLATE DETAILS**



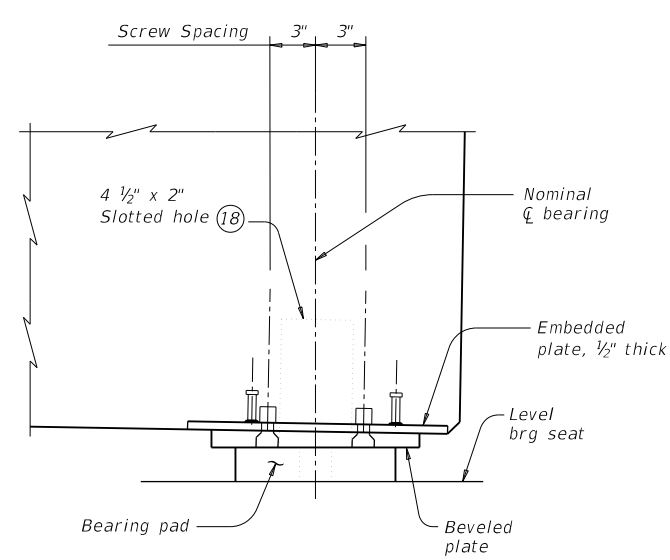
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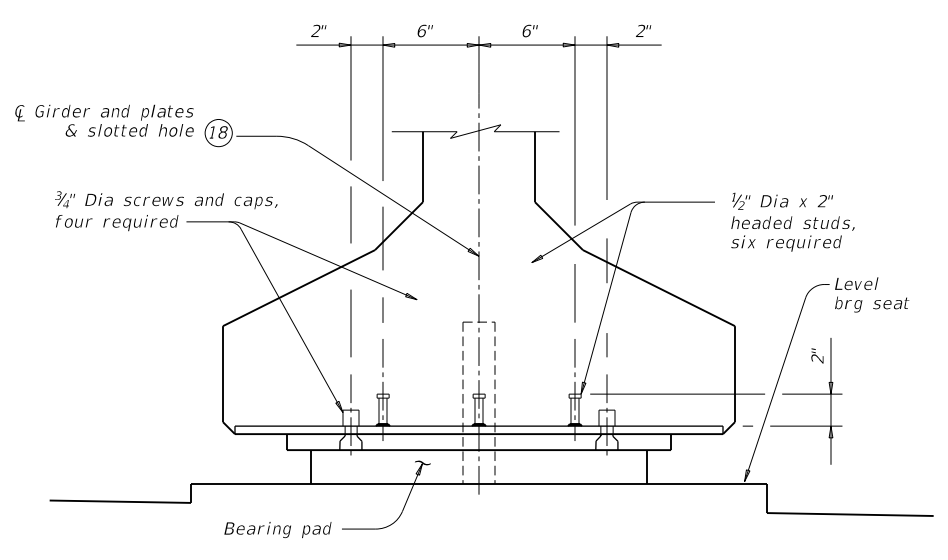
**HOLE DETAIL**

- (17) Cut beveled and embedded plates to match girder end skew. Adjust location of screw and stud as shown when necessary.
- (18) Slotted hole is required at doweled girder end locations.

**BEVELED PLATE DETAILS**



**SIDE ELEVATION**



**END ELEVATION  
 Showing normal girder end.**

**GIRDER DETAILS**

**SOLE PLATE NOTES:**

Provide constant thickness elastomeric bearings with beveled and embedded steel sole plates in accordance with these details when the girder slope exceeds 5 percent or if otherwise required in the plans. Provide for all girders in the span.

On the shop drawings, dimension sole plates to the nearest 1/16" based on required thickness at centerline of bearing and slope of girder. Thickness tolerance variation from the approved shop drawings is 1/16" +/-, except variation from a plane parallel to the theoretical top surface can not exceed 1/16" total. Bearing surface tolerances listed in Item 424 apply to embedded and beveled plates.

Steel plate must conform to ASTM A36, A572 Gr 50, or A709 Gr 36 or Gr 50. Hot dip galvanize both the embedded plate and beveled sole plate after fabrication. Seal weld caps to embedded plate before galvanizing.

When determining if relocation of screw holes and studs are necessary for skewed girder ends, minimum clearance from screw or stud centerline to plate edge is 1.25".

Tap threads in the embedded plate only. Drill and tap prior to galvanizing.

3/4" Dia screws must be electroplated, socket flat head countersunk cap screws conforming to ASTM F835. Electroplating must conform to ASTM B633, SC 2, Type 1. Provide screws long enough to maintain a 3/4" minimum embedment into the embedded plate and galvanized cap. Provide galvanized steel caps (16 ga Min) with a nominal 1" inside diameter and deep enough to accommodate the screws, but not less than 1/2" deep or deeper than 1".

Install beveled sole plates prior to shipping girders. Installed screw heads must not protrude below the bottom of the beveled plate.



**ELASTOMERIC BEARING  
 AND GIRDER END DETAILS  
 PRESTR CONCRETE I-GIRDERS**

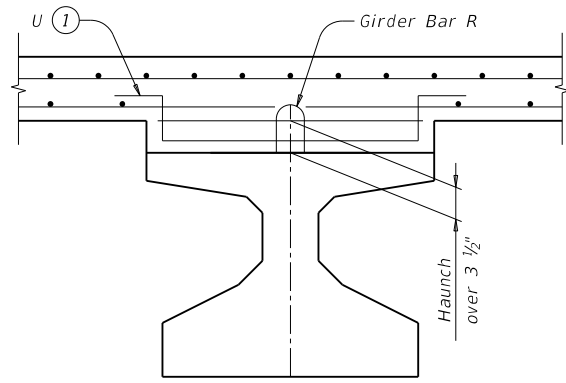
**IGEB**

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©TxDOT August 2017	CONT	SECT	JOB	HIGHWAY
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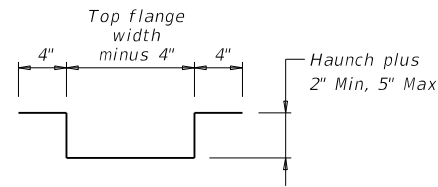


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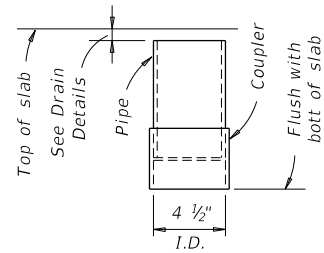
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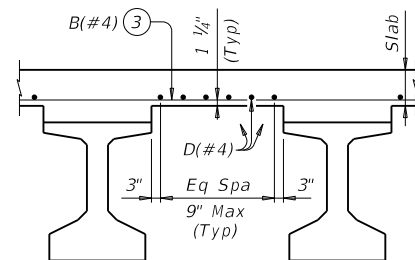
**HAUNCH REINFORCING DETAIL**



**BARS U (#4)**

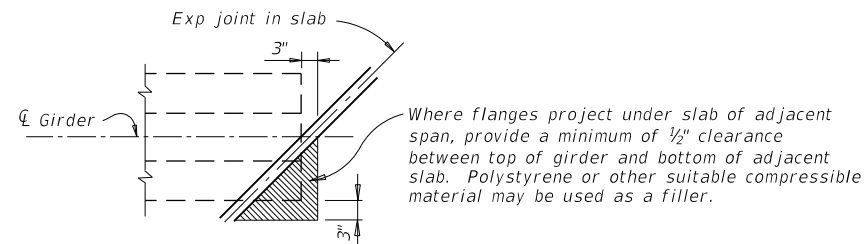


**C-I-P DRAIN DETAIL**

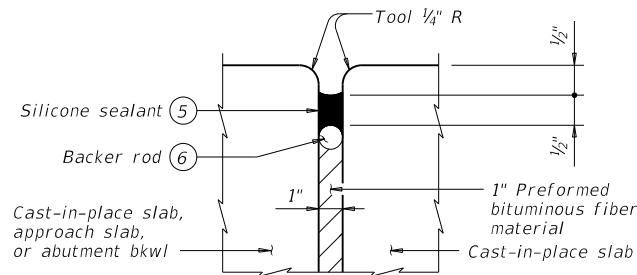


**TYPICAL PART TRANSVERSE SLAB SECTION WITHOUT PCP**

Top reinforcing steel not shown for clarity.

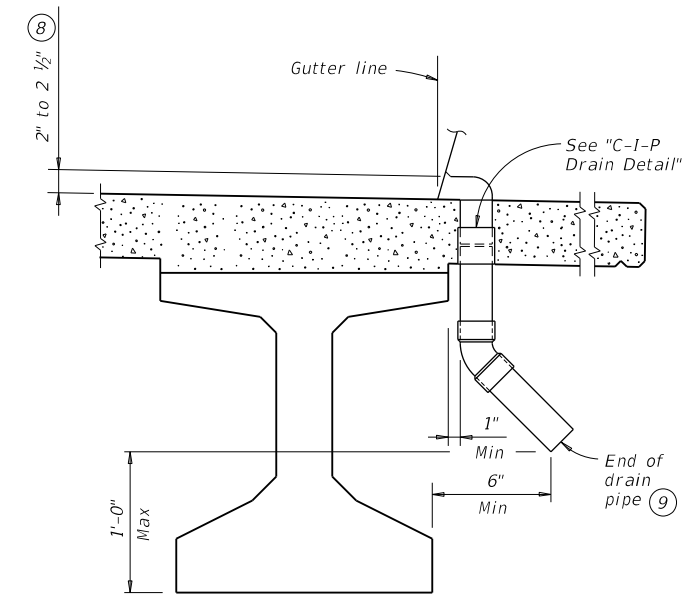


**TREATMENT AT GIRDER END FOR SKEWED SPANS**



**TYPE A JOINT DETAIL**

- ① Space Bars U with girder Bars R in all areas where measured haunch exceeds 3 1/2".
- ② Roughen outside of PVC with coarse rasp or equal to ensure bond with cast-in-place concrete.
- ③ Bars B(#4) spaced at 9" Max with 2" end cover. Overhang option, Contractor's may end alternating bars B(#4) at centerline outside girder.
- ④ Provide Grade 60 reinforcing steel. Provide bar laps, where required, as follows:  
 Uncoated ~ #4 = 1'-7"  
 Epoxy coated ~ #4 = 2'-5"
- ⑤ Class 7 silicone sealant that conforms to DMS-6310. Install when ambient temperature is between 55°F and 85°F and rising. Engineer to determine allowable hours for sealant application.
- ⑥ 1 1/4" backer rod must be compatible with joint sealant. Use of multiple pieces to create a backer rod cross section is not permitted. Top of backer rod must be convex as shown.
- ⑦ The maximum distance between Type A expansion joints is 100'. See Bridge Layout for location of joints.
- ⑧ Drain entrance formed in rail or sidewalk.
- ⑨ Water may not be discharged onto girders.
- ⑩ All drain pipe and fittings to be 4" diameter (Sch 40) PVC. See Item 481 "Pipe for Drains" for pipe, connections and solvent welding. Bend reinforcing steel to clear PVC 1". Drain length and location is as directed by the Engineer. Drains are not permitted over roadways or railroads, or within 10'-0" of bent caps. Degrease outside of exposed PVC, apply acrylic water base primer, then coat with same surface finishing material as used for outside girder face. Variations of the above designs, as required for the type of rail used and its location on the structure, may be installed with the approval and direction of the Engineer.



**DRAIN DETAIL**

**GENERAL NOTES:**  
 Designed according to AASHTO LRFD Bridge Design Specifications.  
 Payment for Type A joint will be as per Item 454, "Bridge Expansion Joints."  
 All other items (reinforcing steel, drains, etc.) shown on this sheet are subsidiary to other bid items.

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

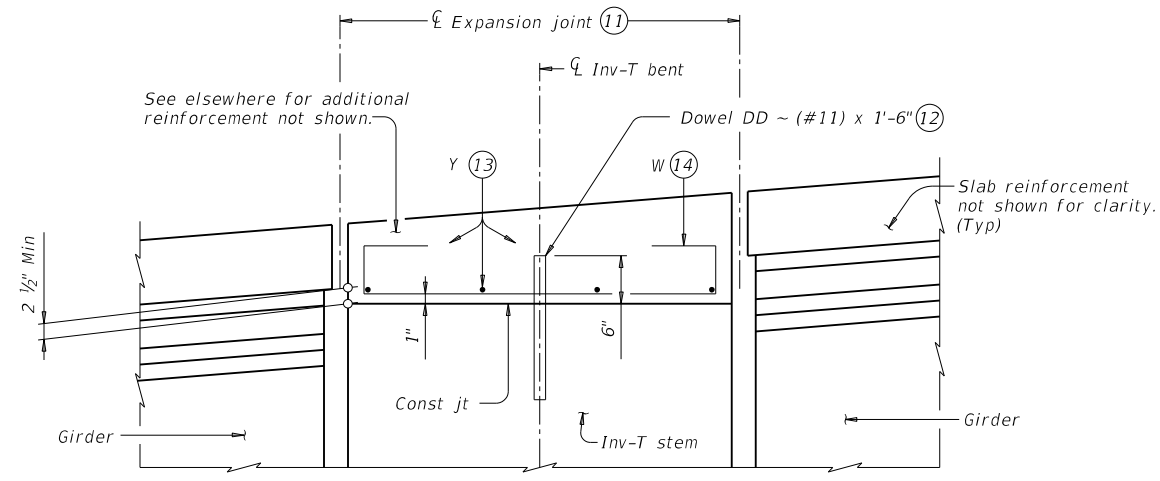
**DECK FORMWORK NOTES:**  
 Overhang bracket hangers are limited to a safe working load of 3,600 lbs, applied to and along the axis of a coil rod at 45 degrees from vertical, regardless of higher loads permitted by hanger manufacturers. Do not place a hanger less than 12" from girder end. Space hangers accordingly.

SHEET 1 OF 2

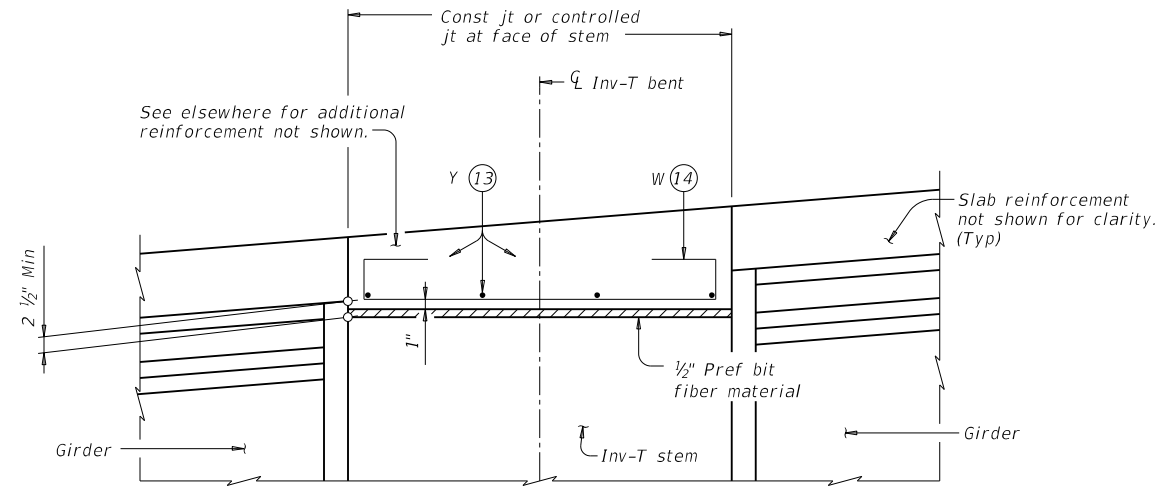
		<b>Bridge Division Standard</b>	
<b>MISCELLANEOUS SLAB DETAILS</b> <b>PRESTR CONCRETE I-GIRDERS</b>			
<b>IGMS</b>			
FILE: igmssts1-19.dgn	DN: TxDOT	CK: TxDOT	DW: JTR
©TxDOT August 2017	CONT	SECT	JOB
REVISIONS	0493	02	021
10-19: Modified Note 7. Type A now a pay item.	DIST	COUNTY	SHEET NO.
	ODA	LOVING	92

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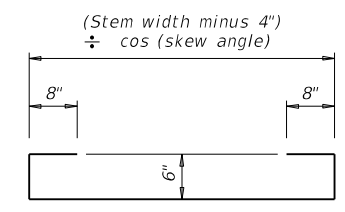
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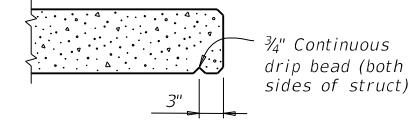
**SHOWING EXPANSION JOINTS**



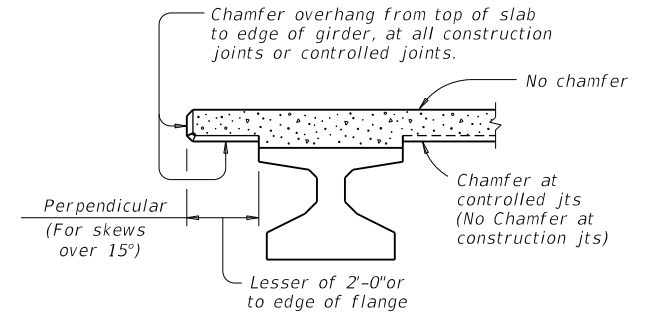
**SHOWING CONST JTS OR CONTROLLED JTS  
 REINFORCEMENT OVER INV-T BENTS**



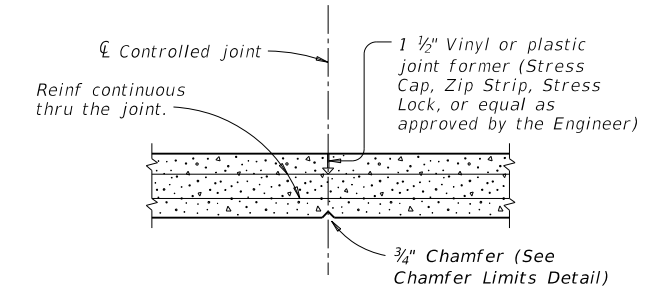
**BARS W (#4)**



**DRIP BEAD DETAIL**



**CHAMFER LIMITS DETAIL (15)**



**CONTROLLED JOINT DETAIL**

(Saw-cutting is not allowed)

- (11) See Layout for joint type.
- (12) Dowels DD (#11) spaced at 5 Ft Max. See Inv-T bents for quantity and location.
- (13) Space Bars Y (#4) at 12" Max. Use 2" end cover. Number of Bars Y must satisfy spacing limit. Place parallel to bent.
- (14) Space Bars W at 12" Max (3" from end of cap). Tilt if necessary to maintain cover requirements. Place parallel to longitudinal slab reinforcement.
- (15) See Span details for type of joint and joint locations.

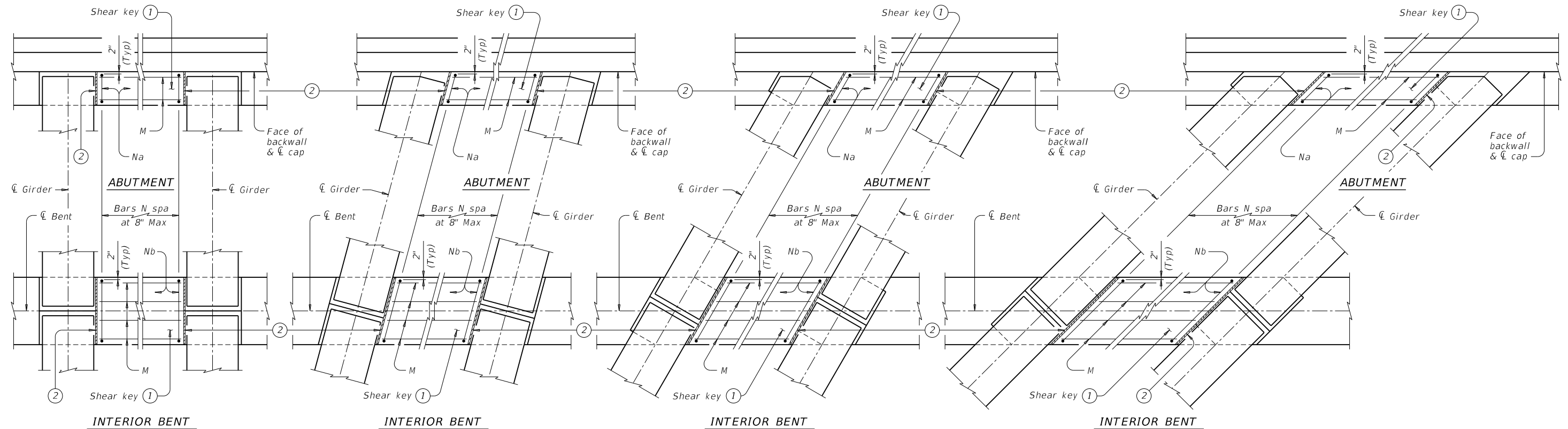
**MISCELLANEOUS  
 SLAB DETAILS  
 PRESTR CONCRETE I-GIRDERS**

**IGMS**

FILE: igmssts1-19.dgn	DN: TxDOT	CK: TxDOT	DW: JTR	CK: TxDOT
©TxDOT August 2017	CONT	SECT	JOB	HIGHWAY
REVISIONS	0493	02	021	RM 652
10-19: Modified Note 7. Type A now a pay item.	DIST	COUNTY	SHEET NO.	
	ODA	LOVING	93	

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**PARTIAL PLANS WITH NO SKEW**

Showing shear keys on 3'-6" wide caps. 4'-0" caps similar.

**PARTIAL PLANS WITH 15° SKEW**

Showing shear keys on 3'-6" wide caps. 4'-0" caps similar.

**PARTIAL PLANS WITH 30° SKEW**

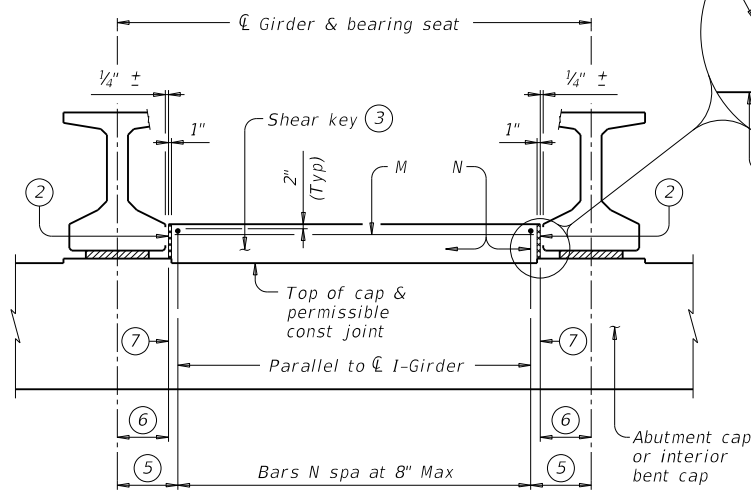
Showing shear keys on 3'-6" wide caps. 4'-0" caps similar.

**PARTIAL PLANS WITH 45° SKEW**

Showing shear keys on 3'-6" wide caps. 4'-0" caps similar.

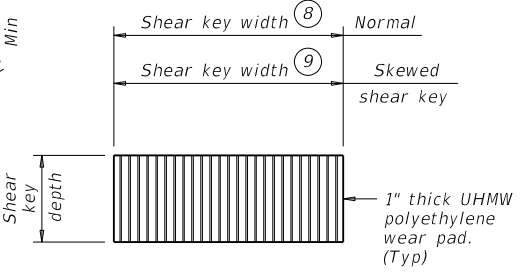
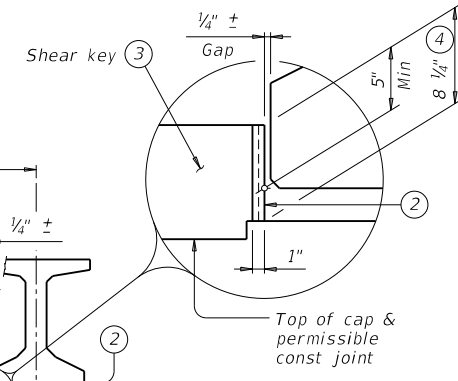
- ① Place shear keys on the upstream side of structure between outside girder and next adjacent girder, unless shown otherwise on plans.
- ② UHMW polyethylene wear pad. (Typ)
- ③ Leave a 1/4" gap plus or minus between girder and face of wear pad. Cast wear pad with shear key, smooth side facing girder. Care must be taken to keep concrete from flowing under girder. Slope top of shear keys in accordance with Item 420.4.9, "Treatment and Finishing of Horizontal Surfaces."
- ④ Measure at higher bearing seat elevation forward or back. Dimension based on typical bearing pad and bearing seat. Increase as necessary to maintain 5" overlap.
- ⑤ With No Skew = 1'-8 1/4", measured along  $\bar{\ell}$  cap. With Skew =  $1'-8 \frac{1}{4} \div \cos \text{Skew}$ , measured along  $\bar{\ell}$  cap.

- ⑥ With No Skew = 1'-4 1/4", measured along  $\bar{\ell}$  cap. With Skew =  $1'-4 \frac{1}{4} \div \cos \text{Skew}$ , measured along  $\bar{\ell}$  cap.
- ⑦ Face of UHMW polyethylene wear pad. Smooth side of pad facing girder.
- ⑧ Abutments = 1/2 Cap width. Interior bents = Cap width.
- ⑨ Abutments = 1/2 Cap width  $\div \cos \text{Skew}$ . Interior bents = Cap width  $\div \cos \text{Skew}$ .

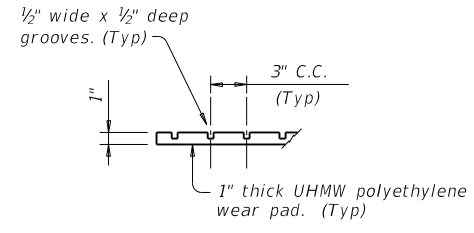


**PARTIAL ELEVATION OF ABUTMENT OR INTERIOR BENT CAP**

Showing shear key with girder Type Tx46. Other I-Girder types similar.

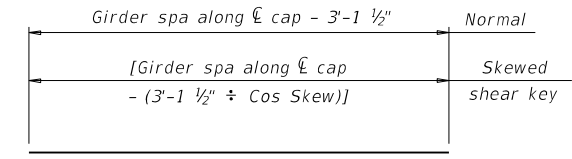


**ELEVATION**

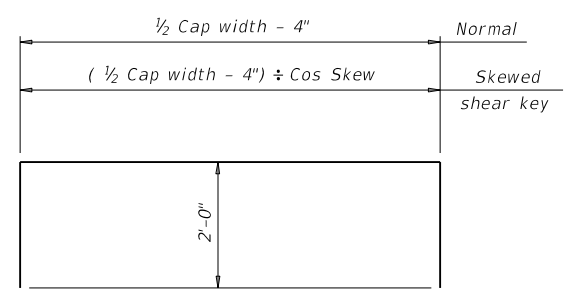


**PART SECTION**

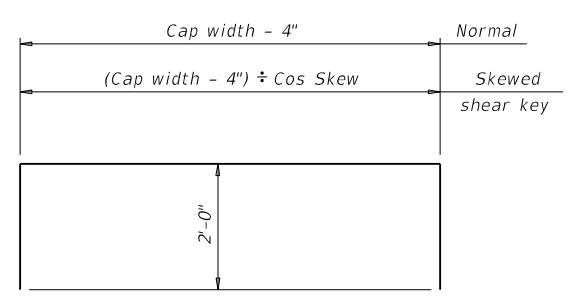
**ULTRA HIGH MOLECULAR WEIGHT (UHMW) POLYETHYLENE WEAR PAD DETAILS**



**BARS M (#5)**



**BARS Na (#5) (For abutments)**



**BARS Nb (#5) (For interior bents)**

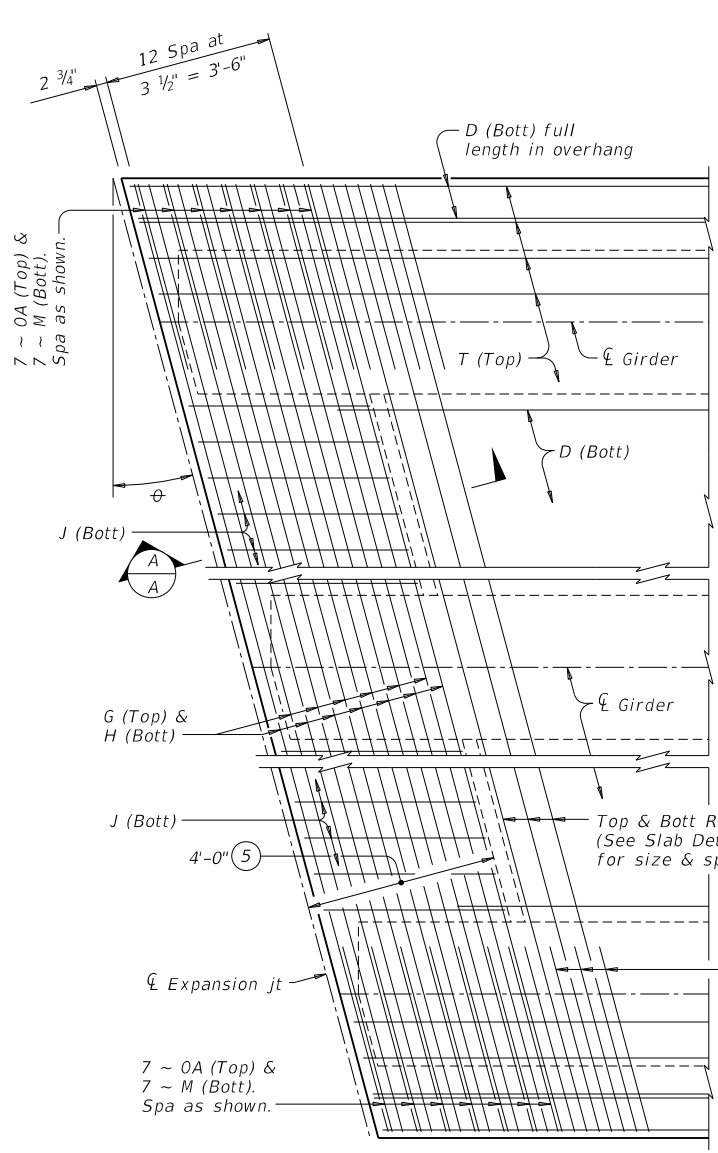
**CONSTRUCTION NOTES:**  
 Provide Class "C" concrete ( $f'_c = 3,600$  psi). Provide Class "C" (HPC) if shown elsewhere on the plans.  
 Provide Grade 60 reinforcing steel.  
 Provide epoxy coated reinforcing steel for shear key if abutment or interior bent reinforcing steel is epoxy coated.  
 Provide Ultra High Molecular Weight (UHMW) polyethylene wear pads in accordance with ASTM D6712.

**GENERAL NOTES:**  
 Designed according to AASHTO LRFD Bridge Design Specifications. Details showing skew are drawn showing right forward skew. See Bridge Layout for actual skew direction.  
 These details are limited to bridges skewed 45 degrees and less. This standard is only applicable for I-Girders.  
 Modify details for bearing conditions, and girder spacing not shown on this standard. Details do not account for sole plate or pedestal bearing seat.  
 Include shear key concrete in abutment or bent concrete for payment.  
 UHMW polyethylene wear pads are subsidiary to Class "C" concrete.  
 Cover dimensions are clear dimensions, unless noted otherwise. Reinforcing bar dimensions shown are out-to-out of bar.

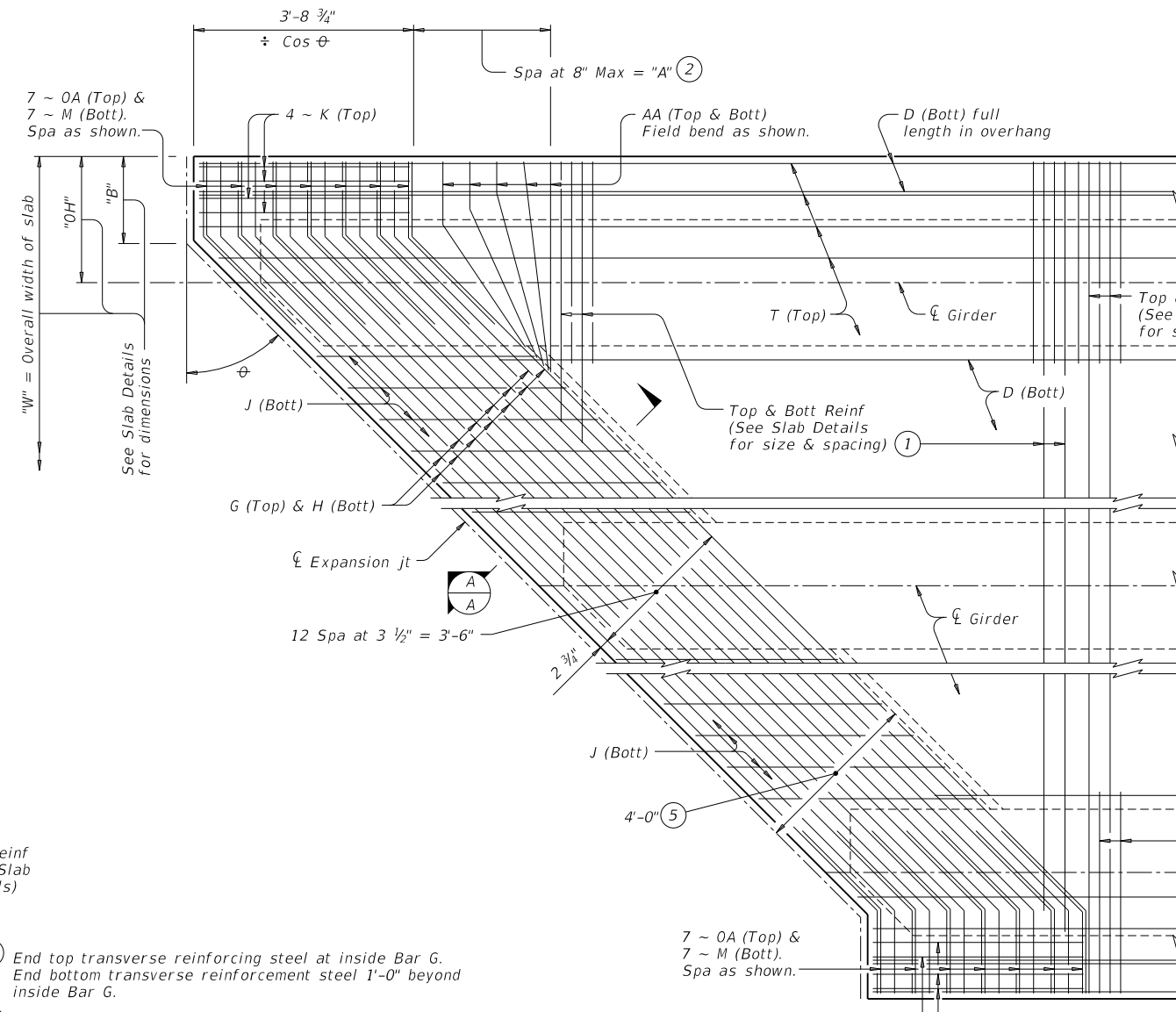
		<b>Bridge Division Standard</b>	
<b>SHEAR KEY DETAILS</b> <b>PRESTR CONCRETE I-GIRDERS</b>			
<b>IGSK</b>			
FILE: igsks\stds-17.dgn	DN: TxDOT	CK: TxDOT	DW: JTR
©TxDOT August 2017	CONT	SECT	JOB
REVISIONS	0493	02	021
	DIST	COUNTY	SHEET NO.
	ODA	LOVING	94

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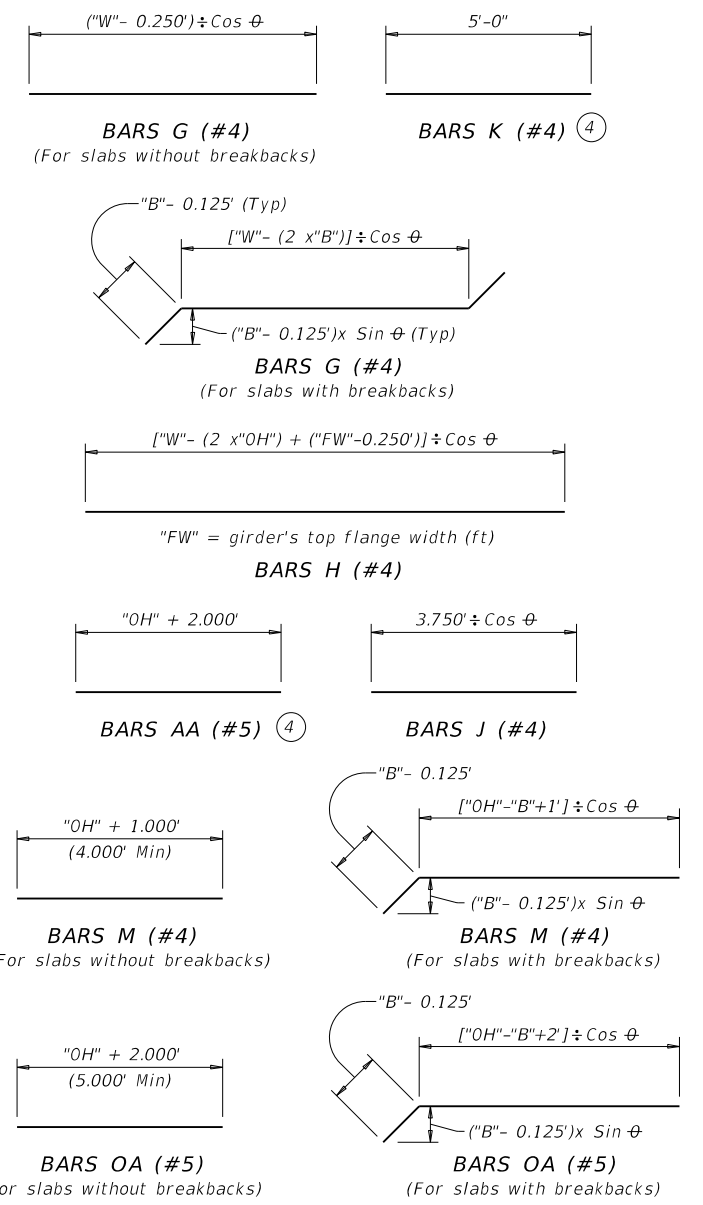


**PARTIAL PLAN FOR SLABS WITHOUT BREAKBACK**



**PARTIAL PLAN FOR SLABS WITH BREAKBACK**

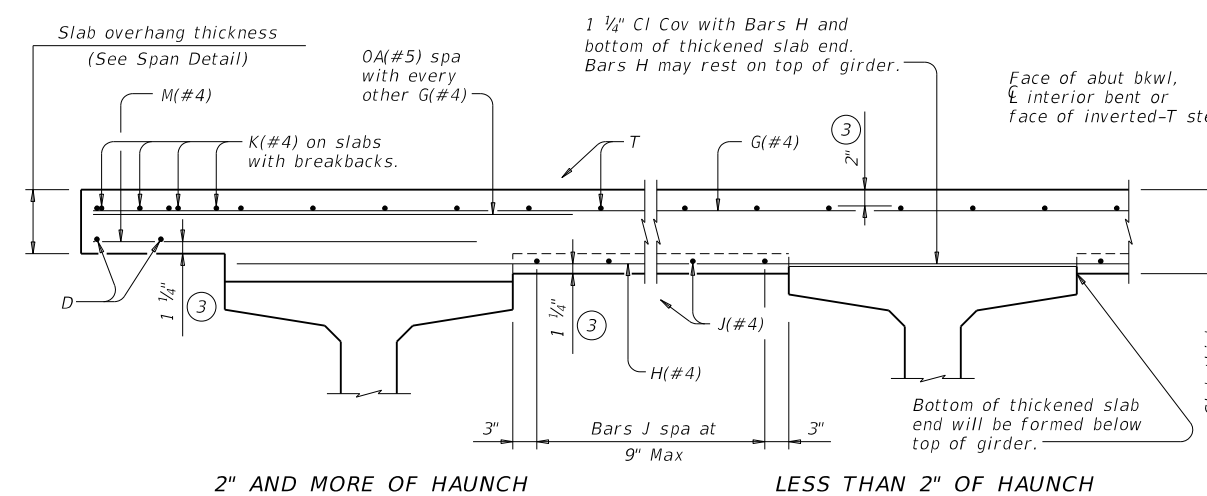
- ① End top transverse reinforcing steel at inside Bar G. End bottom transverse reinforcement steel 1'-0" beyond inside Bar G.
- ② "A" = ("OH" + 2.333' - "B") x Tan  $\theta$
- ③ Provide clear cover as indicated unless otherwise shown on Span Details.
- ④ Only required on slabs with breakbacks.
- ⑤ Thickened slab end dimensioned perpendicular to face of bkwl, centerline interior bent or face of inverted-T stem.



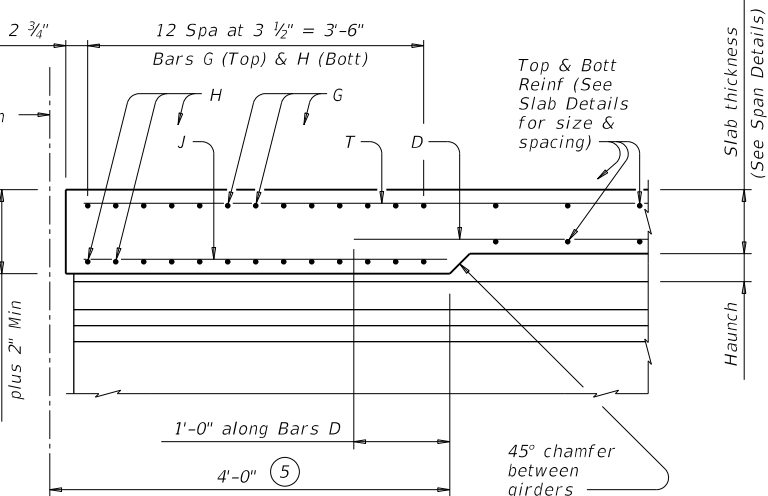
**GENERAL NOTES:**  
 Designed according to AASHTO LRFD Bridge Design Specifications. These details are restricted to Prestressed Concrete I-Girder Spans. These details are to be used in conjunction with the Span Details and PCP standard (if prestressed concrete panels are used). When Option 2 from PCP standard is used, provide Bars AA, G, K and OA in the slab.

**MATERIAL NOTES:**  
 Provide Grade 60 reinforcing steel. If slab reinforcing steel is shown on the Slab Details to be epoxy coated, then Bars AA, G, K, H, J, M and OA must be epoxy coated. Provide bar laps, where required, as follows:  
 Uncoated ~ #4 = 1'-7"  
 Epoxy Coated ~ #4 = 2'-5"

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



**TYPICAL TRANSVERSE SECTION**  
 (Showing Prestressed Conc I-Girders at  $\bar{\bar{C}}$  Brg)

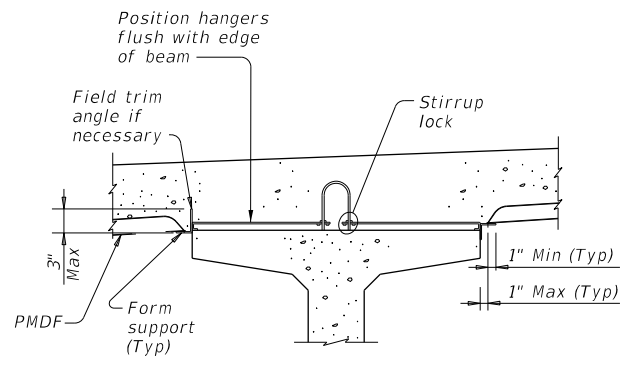


**SECTION A-A**  
 (Showing with 2" and more of haunch)

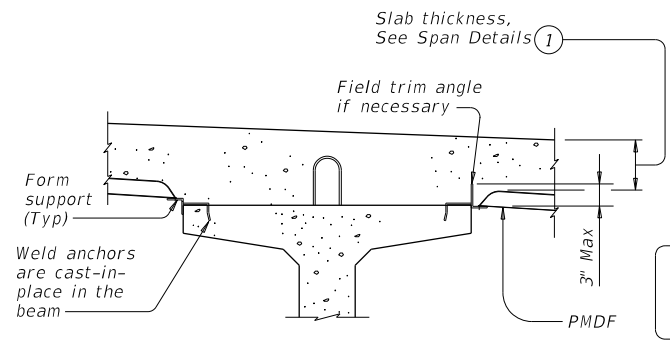
		<b>Bridge Division Standard</b>	
<b>THICKENED SLAB END DETAILS</b> <b>PRESTRESSED CONCRETE I-GIRDER SPANS</b>			
<b>IGTS</b>			
FILE: igtss1-17.dgn	DN: TxDOT	CK: TxDOT	DW: JTR
©TxDOT August 2017	CONT	SECT	JOB
REVISIONS	0493	02	021
	DIST	COUNTY	SHEET NO.
	ODA	LOVING	95

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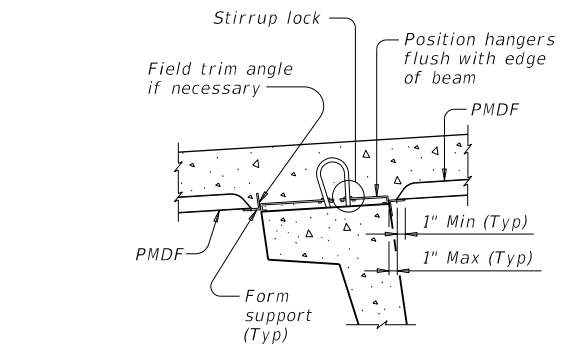
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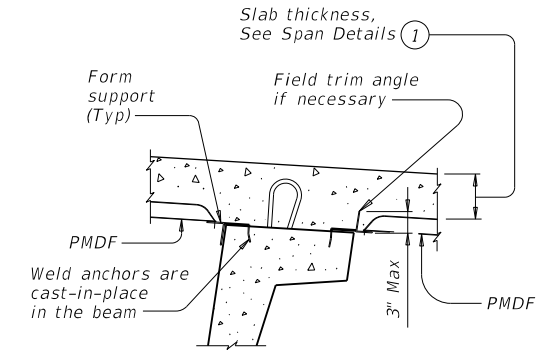
**PRESTR CONC I-BEAMS AND I-GIRDERS WITH STIRRUP LOCKS**



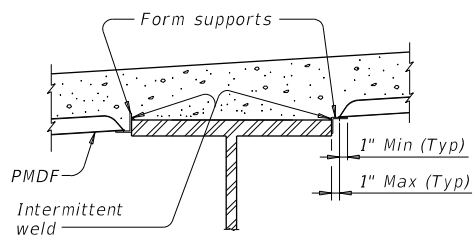
**PRESTR CONC I-BEAMS AND I-GIRDERS WITH WELD ANCHORS**



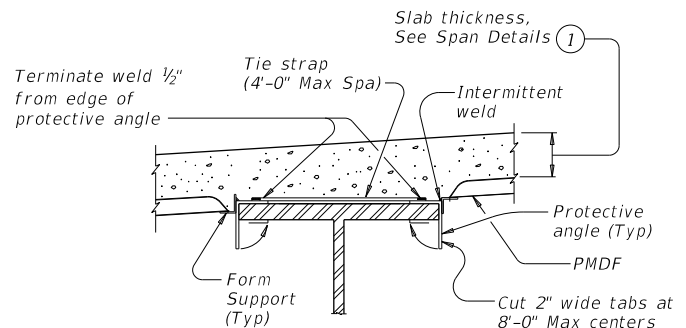
**U-BEAMS WITH STIRRUP LOCKS**



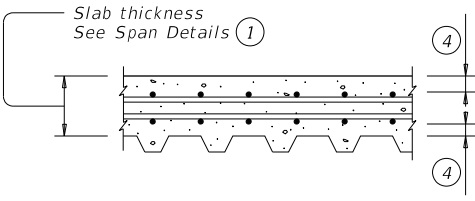
**U-BEAMS WITH WELD ANCHORS**



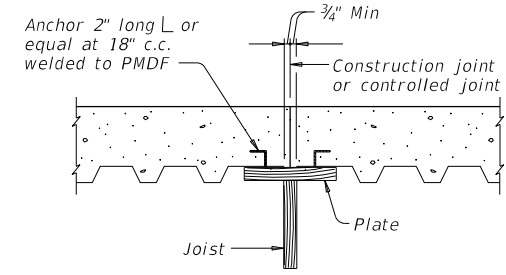
**STEEL BEAMS AT COMPRESSION FLANGES**



**STEEL BEAMS AT TENSION FLANGES ②**



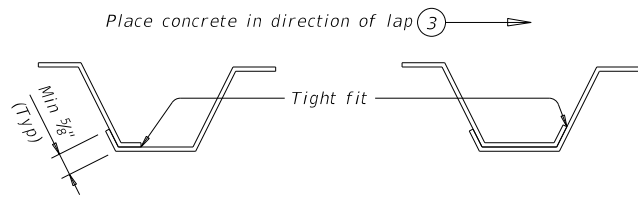
**TYP LONGITUDINAL SLAB SECTION**



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**

**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.



**SIDE LAP DETAILS**

- ① Slab thickness minus 5/8" if corrugations match reinforcing bars.
- ② Welding of form supports to tension flanges will not be permitted. Other methods of providing wind hold down resistance for PMDF in tension flange zones will be considered. At least one layer of sheet metal must be provided between the flange and the weld joint.
- ③ The direction of concrete placement will be such that the upper layer of the form overlap is loaded first.
- ④ See Span details for cover requirements.

**GENERAL NOTES:**  
 Steel for Permanent Metal Deck Forms (PMDF) and support angles shall conform to ASTM A653, structural steel (SS), with coating designation G165. Steel must have a minimum yield strength of 33 ksi. Minimum thickness of PMDF is 20 gage and that of support angles and protective angles is 12 gage.  
 Submit two copies of forming plans for PMDF to the Engineer. These plans must show all essential details of proposed form sheets, closures, fasteners, supports, connectors, special conditions and size and location of welds. These plans must clearly show areas of tension flanges for steel beams and provisions for protecting the tension flanges from welding notch effects by inclusion of separating sheet metal or other positive method. These plans must be designed, signed, and sealed by a licensed professional engineer. Department approval of these plans is not required, but the Department reserves the right to require modifications to the plans. The Contractor is responsible for the adequacy of these plans. The details and notes shown on this standard are to be used as a guide in preparation of the forming plans.  
 All material, labor, tools and incidentals necessary to form a bridge deck with Permanent Metal Deck Forms is considered subsidiary to Item 422, "Concrete Superstructures".

**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'.
- The form design span must not be less than the clear distance between beam flanges, measured parallel to the form flutes, minus 2".

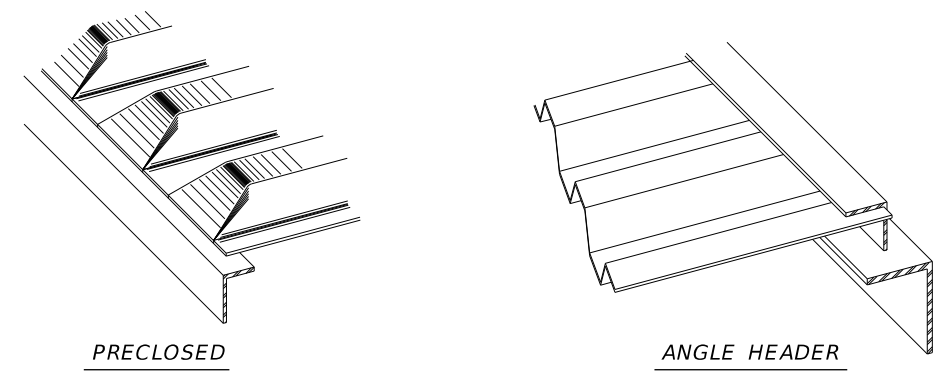
**CONSTRUCTION NOTES:**  
 Form sheets must not be permitted to rest directly on the top of beam flanges. Form sheets must be securely fastened to form supports and must have a minimum bearing length of one inch at each end. Form supports must be placed in direct contact with beam flanges.  
 All attachments must be made by permissible welds, screws, bolts, clips or other means shown on the the forming plans. All sheet metal assembly screws must be installed with torque-limiting devices to prevent stripping. Only welds or bolts must be used to support vertical loads.  
 Welding and welds must be in accordance with the provisions of Item 448, "Structural Field Welding", pertaining to fillet welds. All welds must be made by a qualified welder in accordance with Item 448.  
 All permanently exposed form metal, where the galvanized coating has been damaged, must be thoroughly cleaned and repaired in accordance with Item 445, "Galvanizing". Minor heat discoloration in areas of welds need not be touched up.  
 Flutes must line up uniformly across the entire width of the structure where main reinforcing steel is located in the flute.  
 Construction joints will not be permitted unless shown on the plans. The location of and forming details for any construction joint used must be shown on the forming plans. Forms below a construction joint must be removed after curing of the slab.  
 A sequence for uniform vibration of concrete must be approved by the Engineer prior to concrete placement. Attention must be given to prevent damage to the forms, yet provide proper vibration to prevent voids or honeycomb in the flutes and at headers and/or construction joints.



**PERMANENT METAL DECK FORMS**

**PMDF**

FILE: pmdfste1-20.dgn	DN: TxDOT	CK: TxDOT	OW: TxDOT	CK: TxDOT
©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0493	02	021	RM 652
02-20: Modified box note by adding steel beams/girders and subsidiary.	DIST	COUNTY	SHEET NO.	
	ODA	LOVING	96	

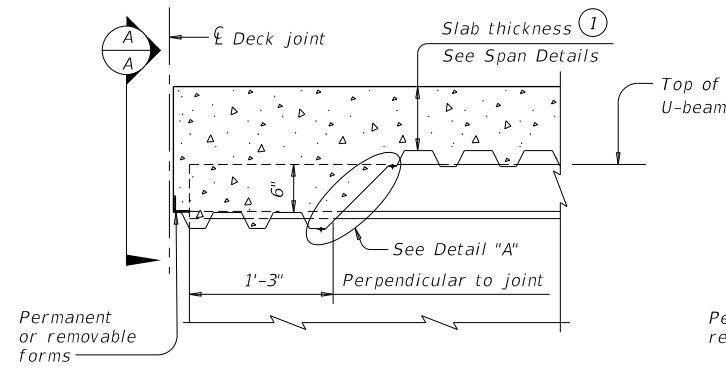


**TYPES OF END CLOSURES**

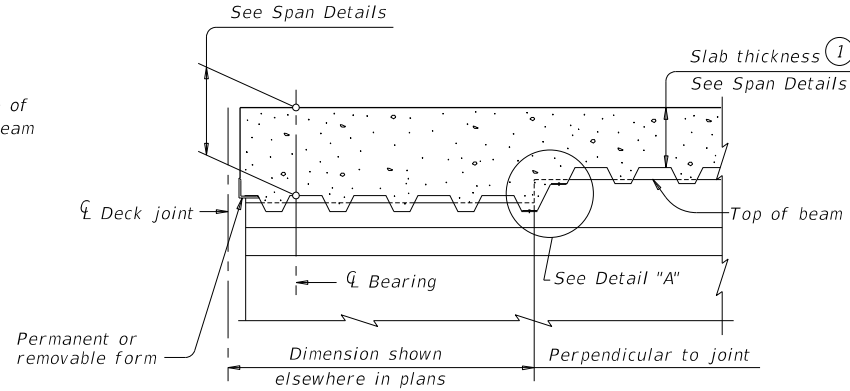
NOTE: This type is to be used for skewed ends only.

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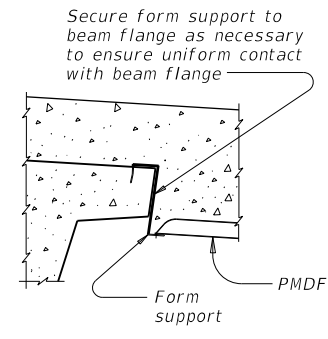
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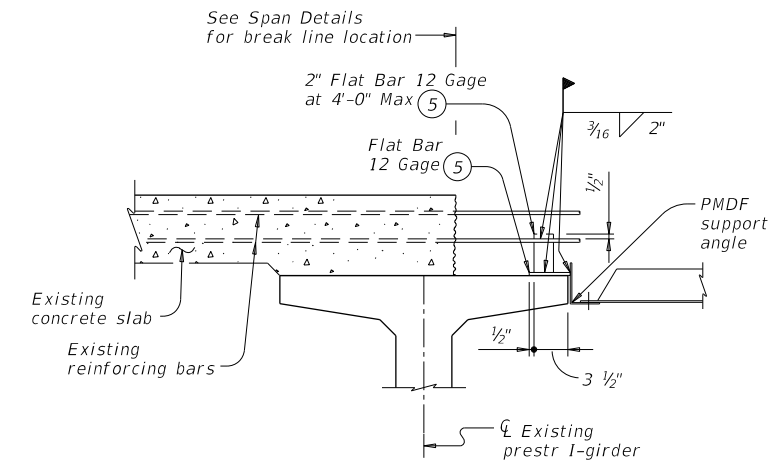
**AT THICKENED SLAB END FOR U-BEAMS**



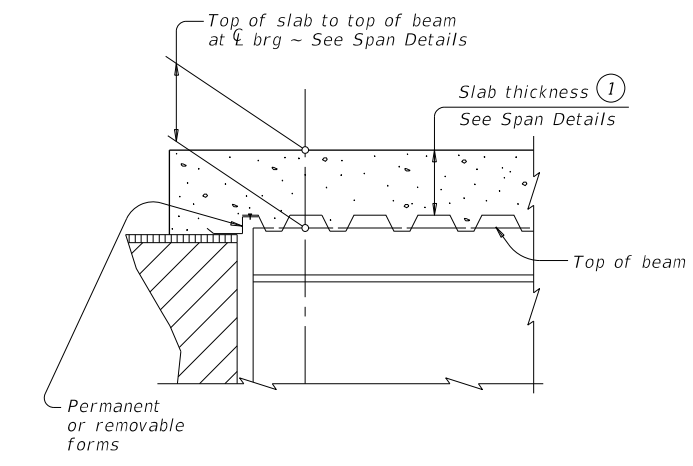
**AT THICKENED SLAB END FOR PRESTRESSED I-BEAMS, I-GIRDERS AND STEEL BEAMS**  
 Showing I-beam block-out. No block-out for I-girders or steel beams.



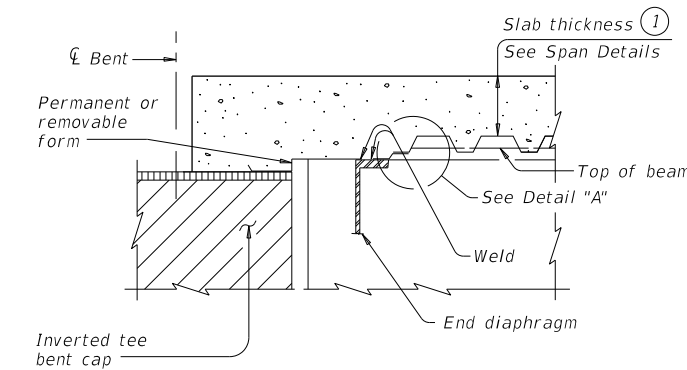
**SECTION A-A**



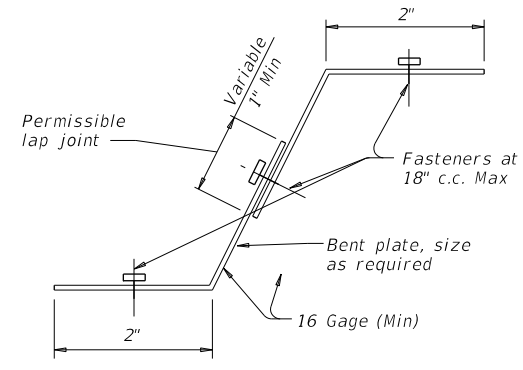
**SHOWING PRESTRESSED CONCRETE I-BEAMS, I-GIRDERS AND U-BEAMS**



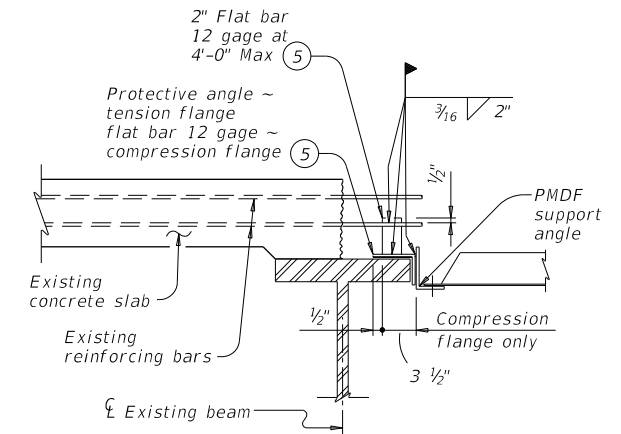
**AT SLAB OVER ABUT BKWL OR INV TEE STEM FOR CONC BEAMS WITHOUT THICKENED SLAB END**



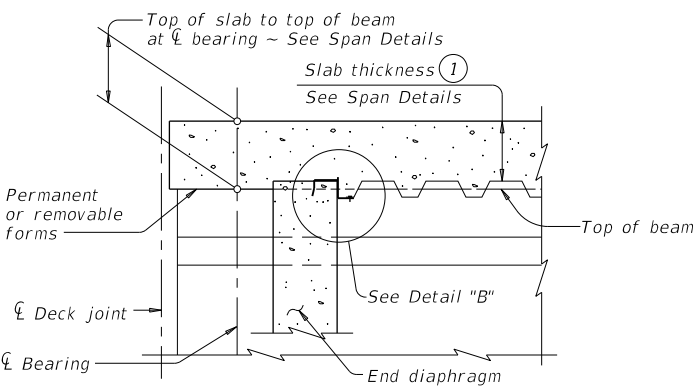
**AT SLAB OVER INV TEE STEM FOR STEEL BEAMS WITHOUT THICKENED SLAB END**



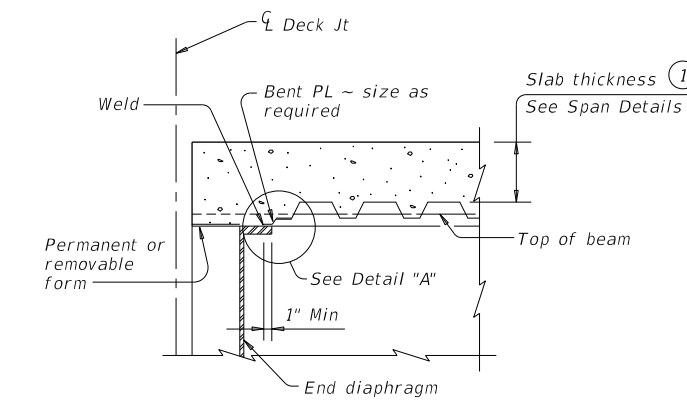
**DETAIL "A"**



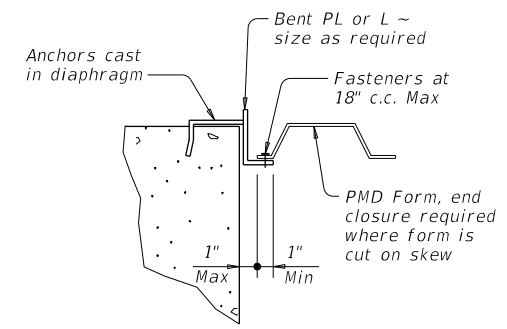
**SHOWING STEEL BEAMS**



**AT CONC END DIAPHRAGM FOR PRESTRESSED I-BEAMS AND STEEL BEAMS**



**AT END DIAPHRAGM FOR STEEL BEAMS WITHOUT THICKENED SLAB END**



**DETAIL "B"**

**WIDENING DETAILS**

**DETAILS AT ENDS OF BEAMS**

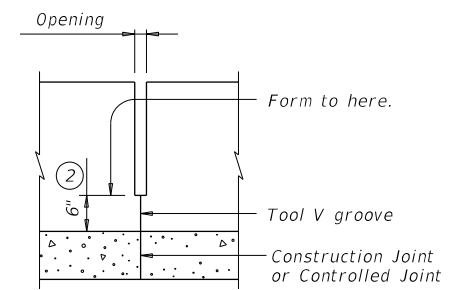
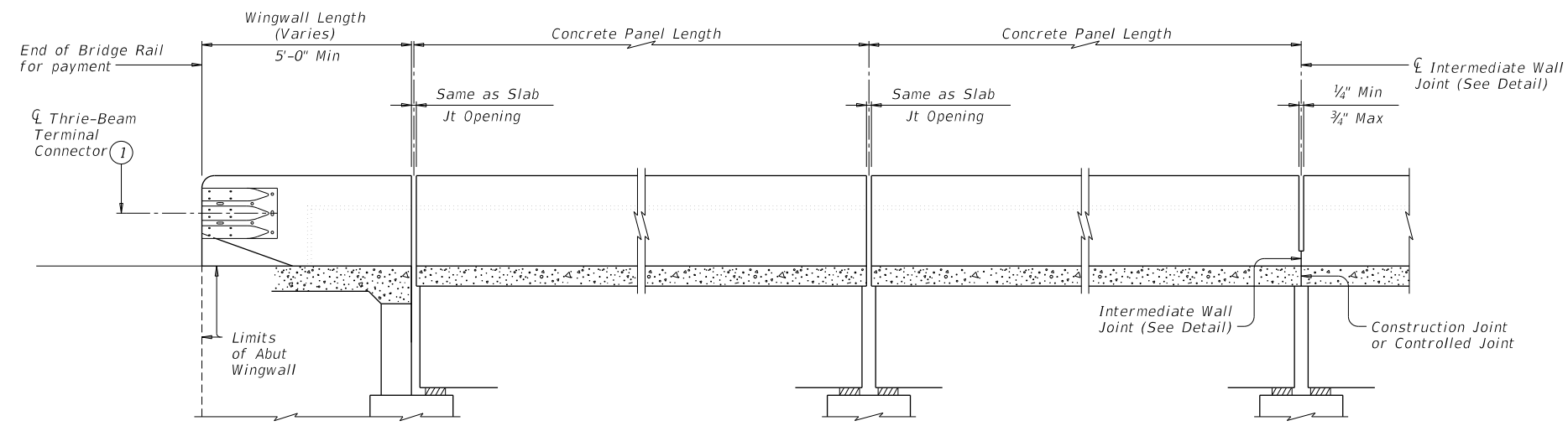
- (1) Slab thickness minus 5/8" if corrugations match reinforcing bars
- (5) Minimum yield stress of 12 gage bars shall be 40 ksi

SHEET 2 OF 2

		<b>Bridge Division Standard</b>	
<b>PERMANENT METAL DECK FORMS</b>			
<b>PMDF</b>			
FILE: pmdfste1-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT
©TxDOT April 2019	CONT	SECT	JOB
REVISIONS	0493	02	021
02-20: Modified box note by adding steel beams/girders and subsidiary.	DIST	COUNTY	SHEET NO.
	ODA	LOVING	97

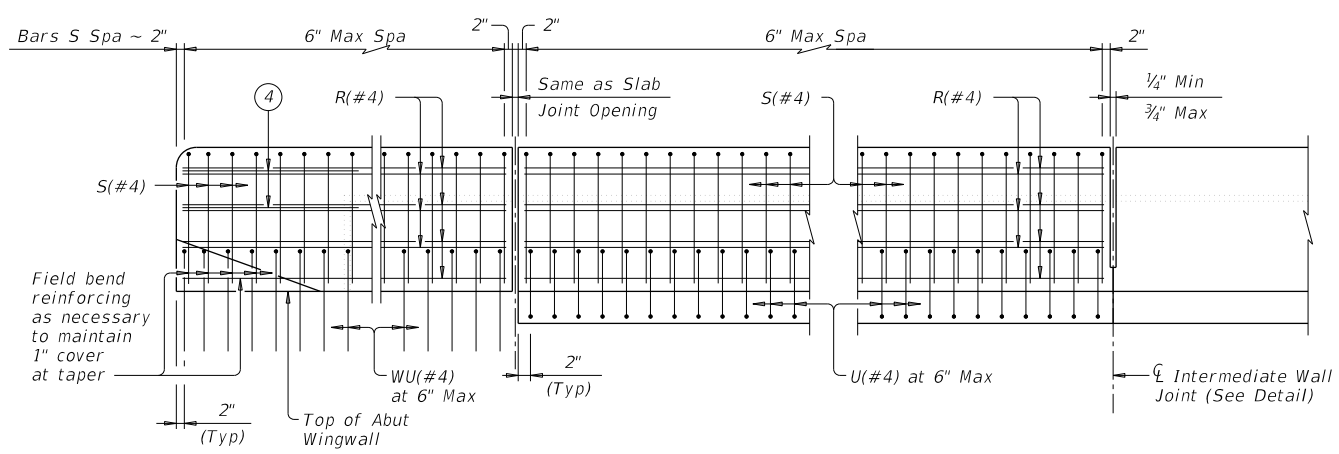
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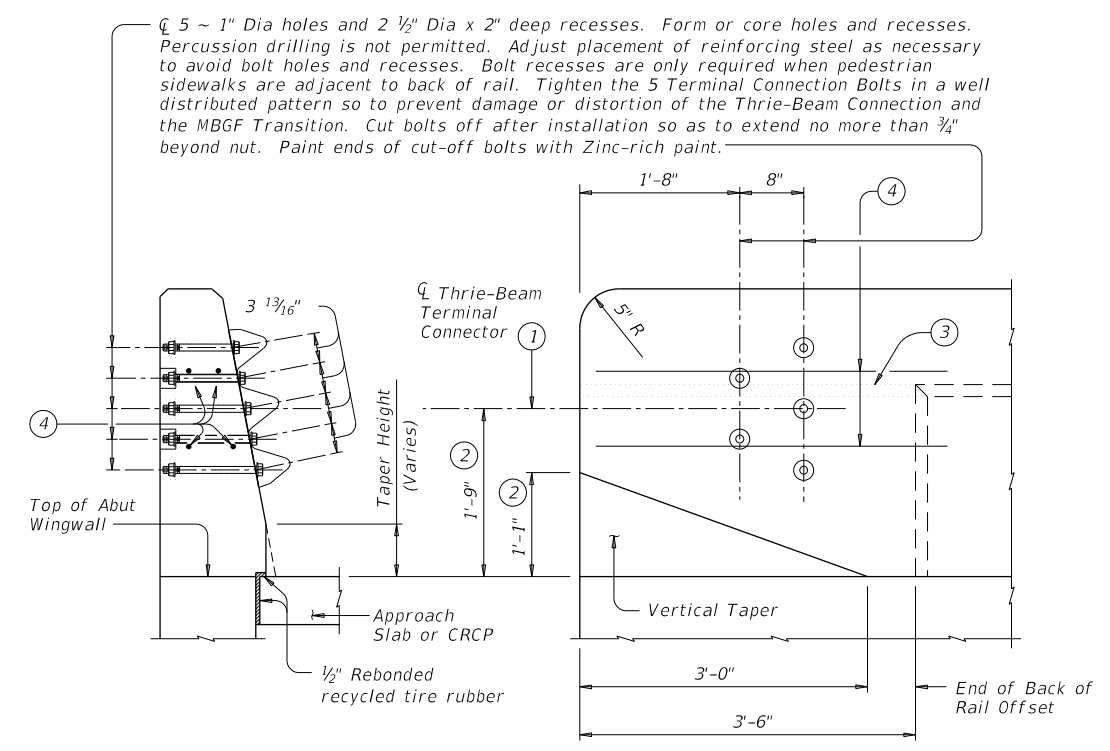


**INTERMEDIATE WALL JOINT DETAIL**  
 Provide at all interior bents without slab expansion joints.

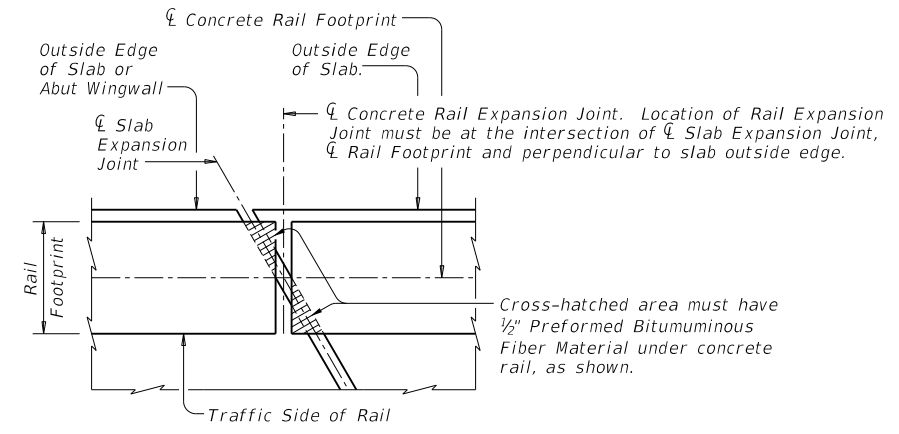
**ROADWAY ELEVATION OF RAIL**



**ELEVATION SHOWING TYPICAL REINFORCING PLACEMENT**



**SECTION**  
**ELEVATION**  
**TERMINAL CONNECTION DETAILS**



**PLAN OF RAIL AT EXPANSION JOINTS**  
 Example showing Slab Expansion Joints without breakbacks.

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



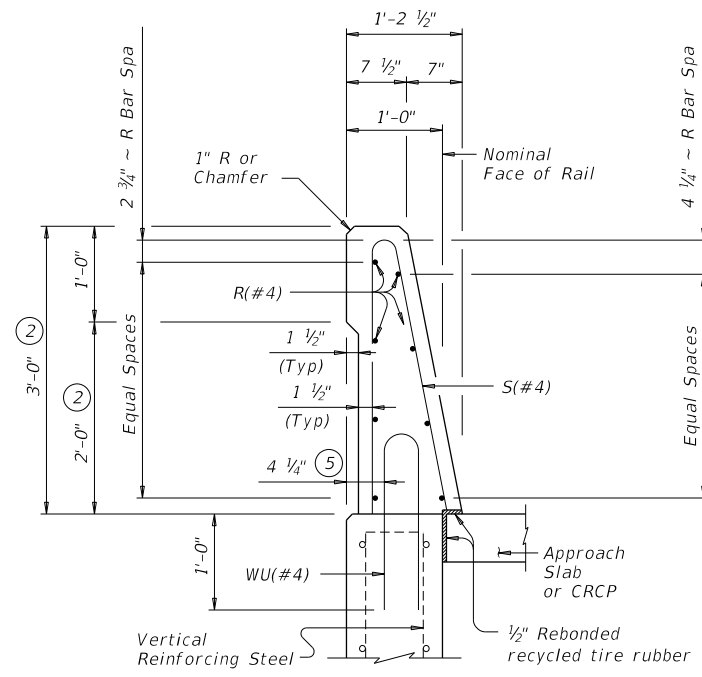
**TRAFFIC RAIL  
 SINGLE SLOPE**

**TYPE SSTR**

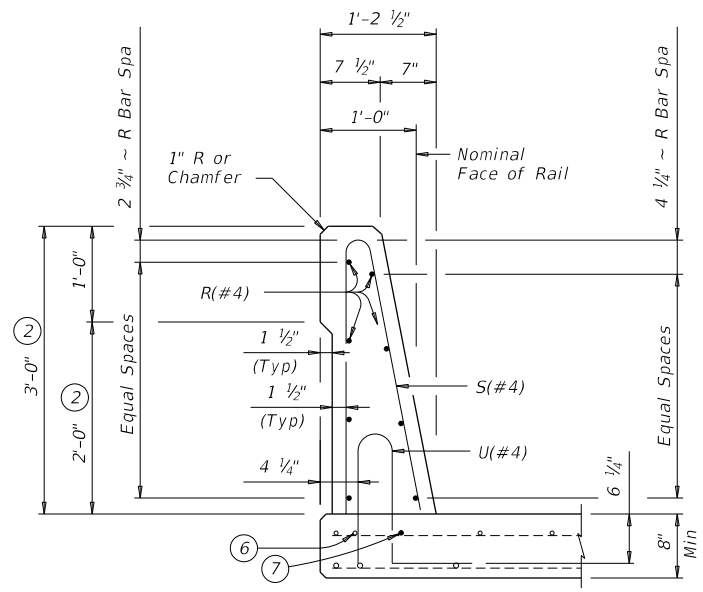
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©TxDOT September 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0493	02	021	RM 652
	DIST	COUNTY	SHEET NO.	
	ODA	LOVING	98	

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ON ABUTMENT WINGWALLS OR CIP RETAINING WALLS



ON BRIDGE SLAB

**SECTIONS THRU RAIL**

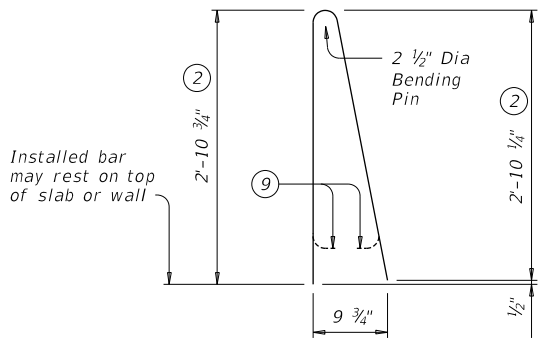
- ② Increase 2" for structures with Overlay.
- ⑤ 5/4" when vertical reinforcing has closer clear cover over horizontal reinforcing in abutment wingwalls or retaining walls on traffic side of wall.
- ⑥ As an aid in supporting reinforcement, additional longitudinal bars may be used in the slab with the 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 greater 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 a heavy epoxy bead 1" behind toe of traffic side of rail to concrete deck just prior to slip forming. Provide a 3/8" width x 1/4" 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.

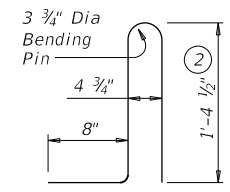
**MATERIAL NOTES:**  
 Provide Class "C" concrete. Provide Class "C" (HPC) if required elsewhere.  
 Provide Grade 60 reinforcing steel.  
 Epoxy coat or galvanize all reinforcing steel if slab bars are epoxy coated or galvanized.  
 Deformed Welded Wire Reinforcement (WWR) (ASTM A1064) of equal size 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.

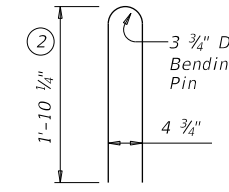
Cover dimensions are clear dimensions, unless noted otherwise.  
 Reinforcing bar dimensions shown are out-to-out of bar.



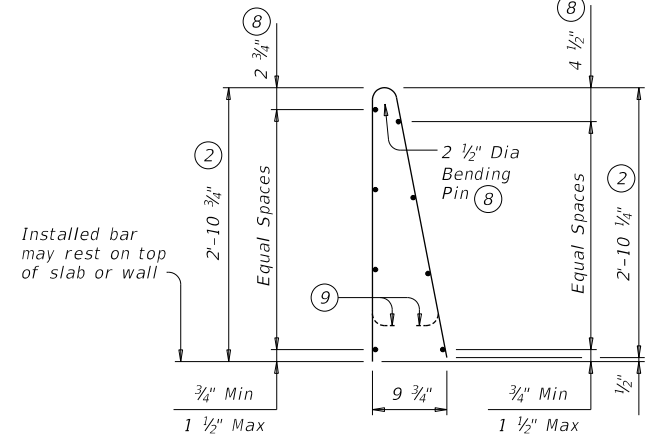
BARS S (#4)



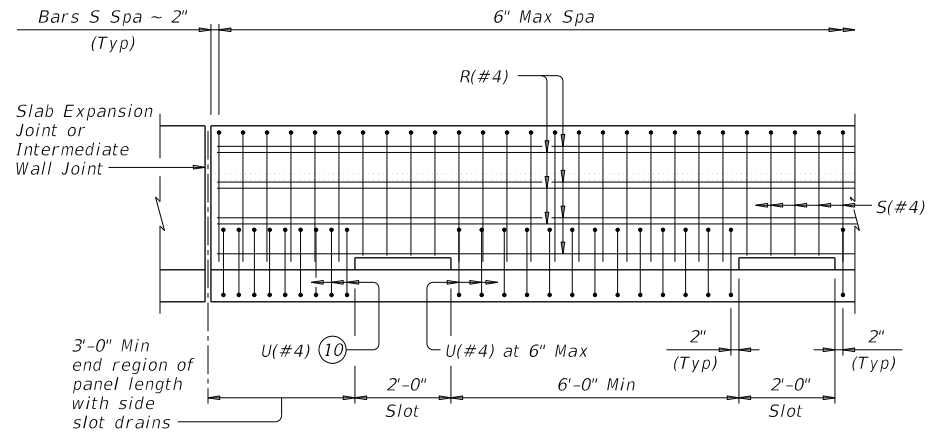
BARS U (#4)



BARS WU (#4)

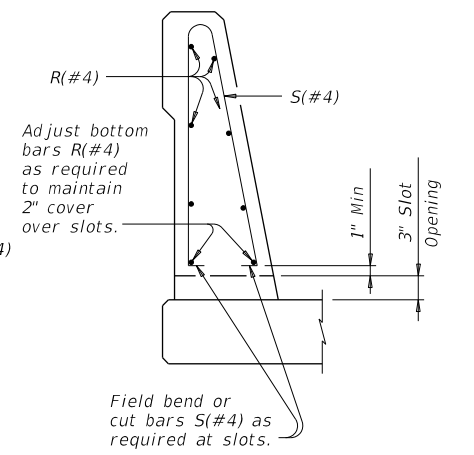


OPTIONAL WELDED WIRE REINFORCEMENT (WWR)



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

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

**TRAFFIC RAIL SINGLE SLOPE**

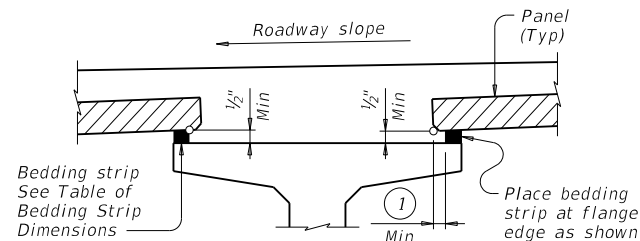
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©TxDOT September 2019	CONT	SECT	JOB	HIGHWAY
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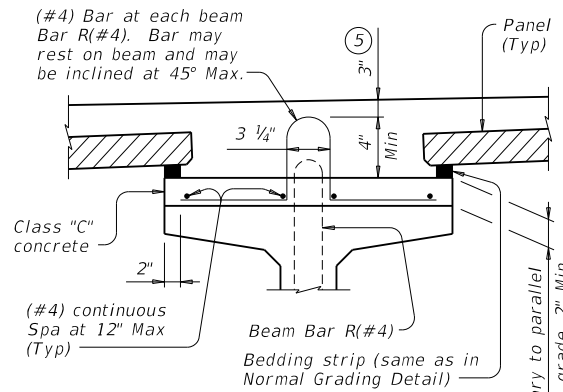
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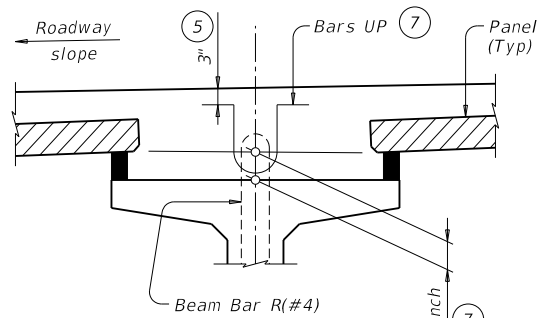
**NORMAL GRADING DETAIL** ③

Showing prestressed concrete I-girders.  
 (Other beam types similar)



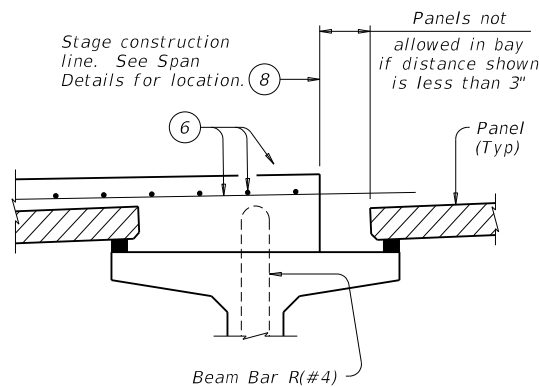
**SPECIAL GRADING DETAIL FOR CONCRETE BEAMS**

Showing prestressed concrete I-girders.  
 (Other beam types similar)



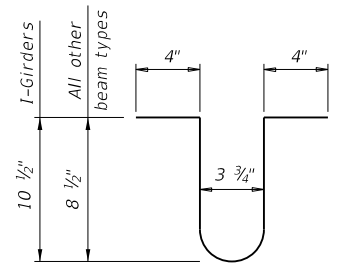
**HAUNCH REINFORCING DETAIL**

Showing prestressed concrete I-girders.  
 (Other beam types similar)

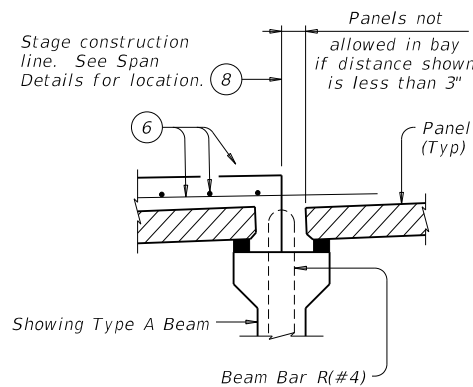


**PRESTR CONC I-GIRDERS**

WIDTH	HEIGHT ④	
	Min	Max
1" (Min)	1/2"	2"
1 1/4"	1/2"	2 1/2"
1 1/2"	1/2"	3"
1 3/4"	1/2"	3 1/2"
2"	1/2"	4"
2 1/4"	1/2"	4 1/2" ②
2 1/2"	1/2"	5" ②
2 3/4"	1/2"	5 1/2" ②
3" (Max)	1/2"	6" ②



**BARS UP (#4) ⑦**



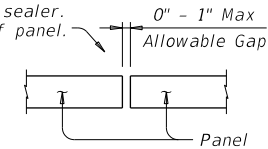
**PRESTR CONC I-BEAMS**

**STAGE CONSTRUCTION LIMITATIONS**

(Other beam types similar)

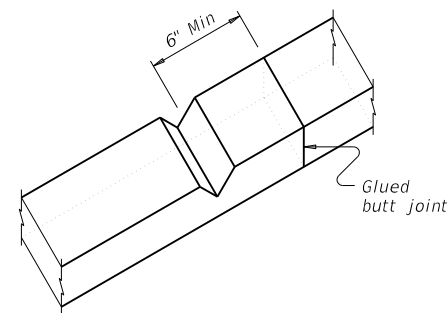
- ① 2" Min for I-girders, 1 1/2" Min for all other beam types.
- ② Allowed for I-girders, not allowed on other beam types.
- ③ To reduce the quantity of cast-in-place concrete, bedding strip thickness may be increased in 1/4" increments. Bedding strips must be comprised of one layer. Bond bedding strips 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 1/4". 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 1/2" 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 1/4" deep, in the top of the bedding strips at 8' o.c..

Seal joint between panels when gap exceeds 1/4" with polyurethane sealant or expanding foam sealer. Make seal flush with top of panel.



**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.)



**BEDDING STRIP DETAIL** ⑨

**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 1/2" 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 1/2". 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"

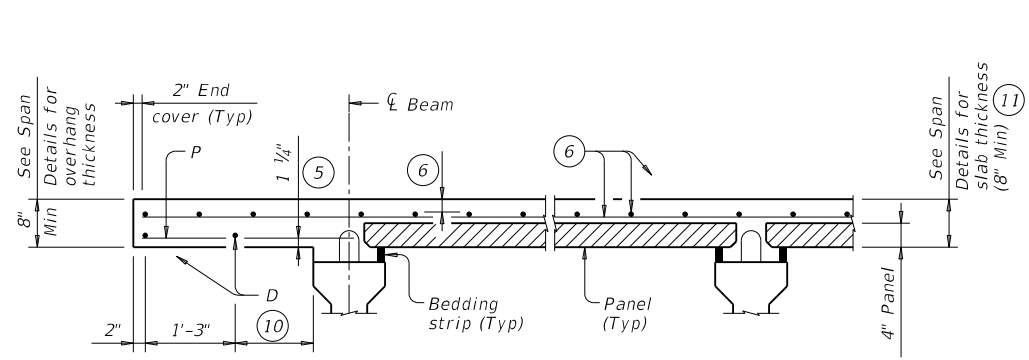
**GENERAL NOTES:**  
 Designed according to AASHTO LRFD Bridge Design Specifications. Panel placement may follow either Option 1 or Option 2 except Option 1 must be used if the skew exceeds 45 degrees. Use of Prestressed Concrete Panels is not permitted for horizontally curved steel plate or tub girders. 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 reinforcing 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.

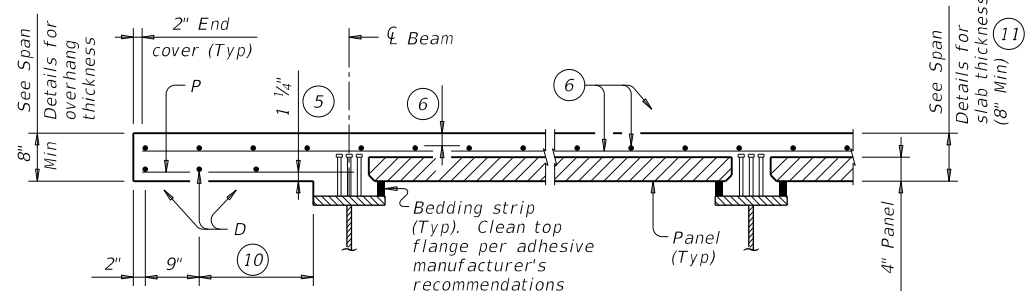
HL93 LOADING SHEET 1 OF 4

		<b>Bridge Division Standard</b>	
<b>PRESTRESSED CONCRETE PANELS DECK DETAILS</b>			
<b>PCP</b>			
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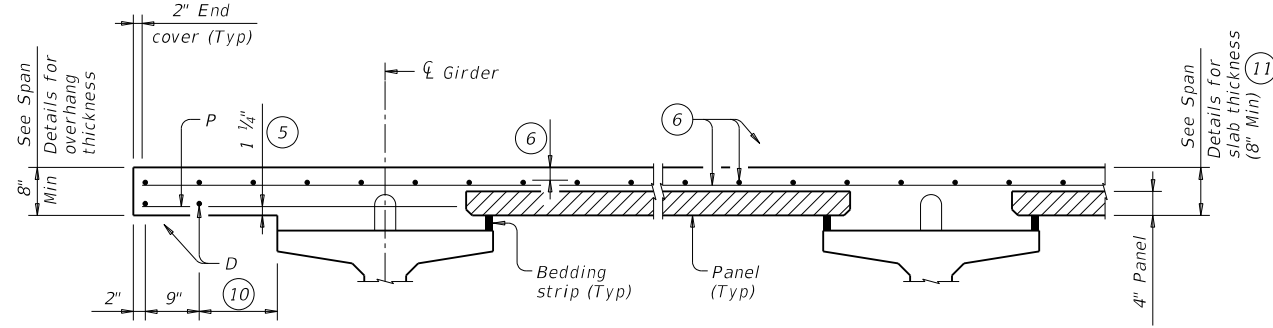
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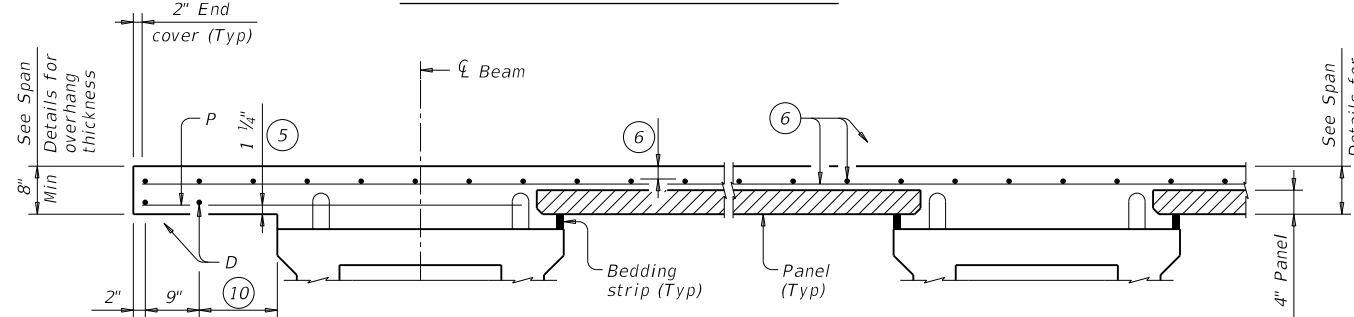
**PRESTRESSED CONCRETE I-BEAMS**



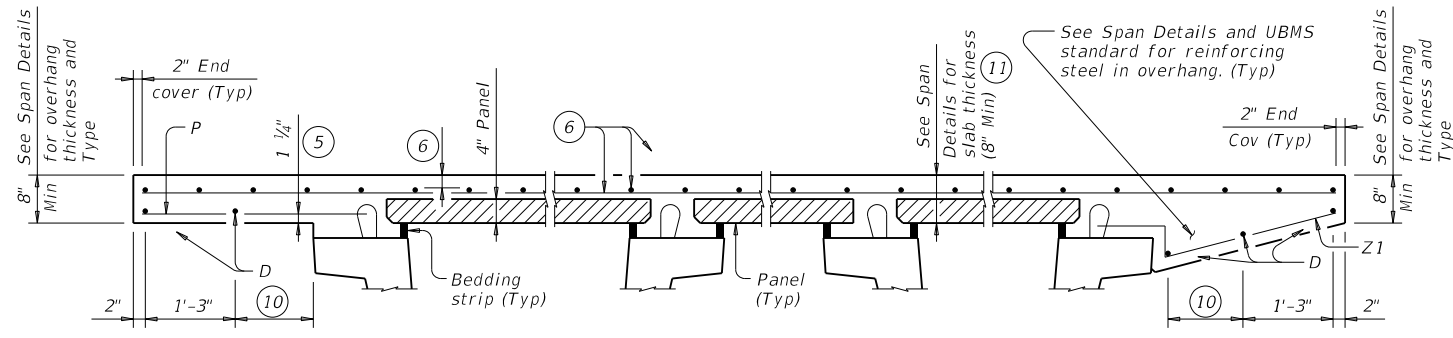
**STEEL BEAMS**



**PRESTRESSED CONCRETE I-GIRDERS**

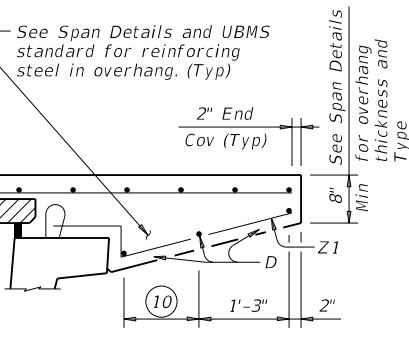


**PRESTRESSED CONCRETE X-BEAMS**

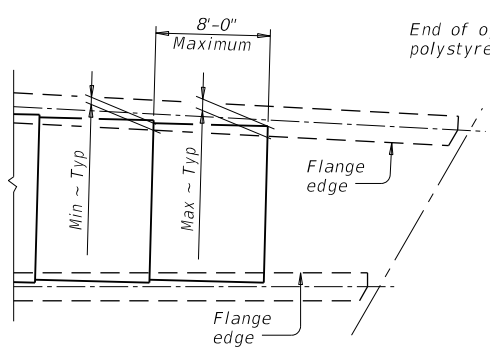


**NORMAL OVERHANG WITH PRESTR CONC U-BEAMS**

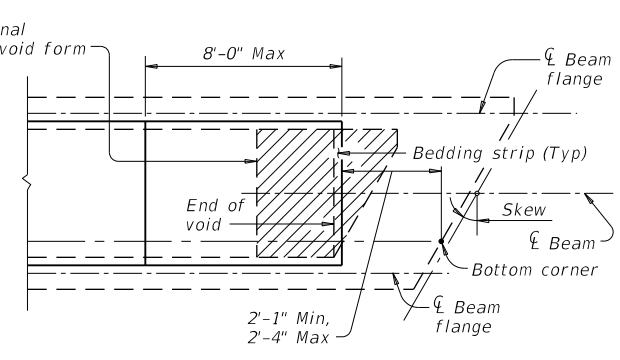
**TYPICAL PART TRANSVERSE SECTIONS**



**SLOPED OVERHANG WITH PRESTR CONC U-BEAMS**



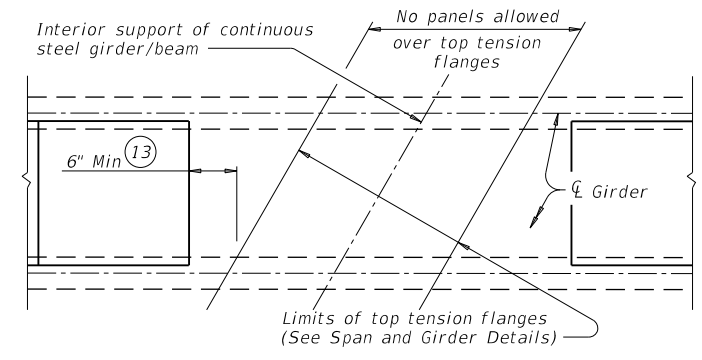
**AT FLARED BEAMS OR GIRDERS**  
 See PCP-FAB standard for Min and Max dimensions based on beam/girder type.



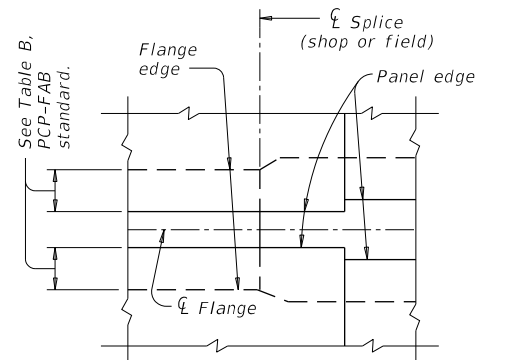
**OVER CONC U-BEAMS**

**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 1/4" deep, in the top of the bedding strips at 8' o.c..
- 10 Equally space additional bar if more than 1'-3" Max.
- 11 The actual thickness constructed may exceed the slab thickness shown on the Span Details but the extra thickness may be no more than 2" (1" for prestressed concrete U-beams and steel beams). Bearing seat elevations or finished grade may be adjusted.
- 12 Field adjust Bars Z1(#4) to match actual slope of slab overhangs. Width of slab overhang will vary along span with curved slab edges. Adjust Bar Z1(#4) dimensions to maintain proper cover. Bars Z2(#4) are located at Inverted-Tee stems only.
- 13 Location of concrete placement sequence boundaries and bolted field splices should be considered by the contractor in determining panel limits.



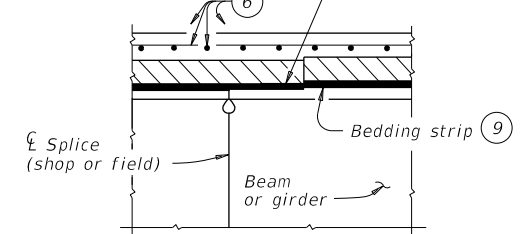
**AT INT SUPPORTS OF CONTINUOUS STEEL GIRDERS**



**PLAN AT SPLICE**

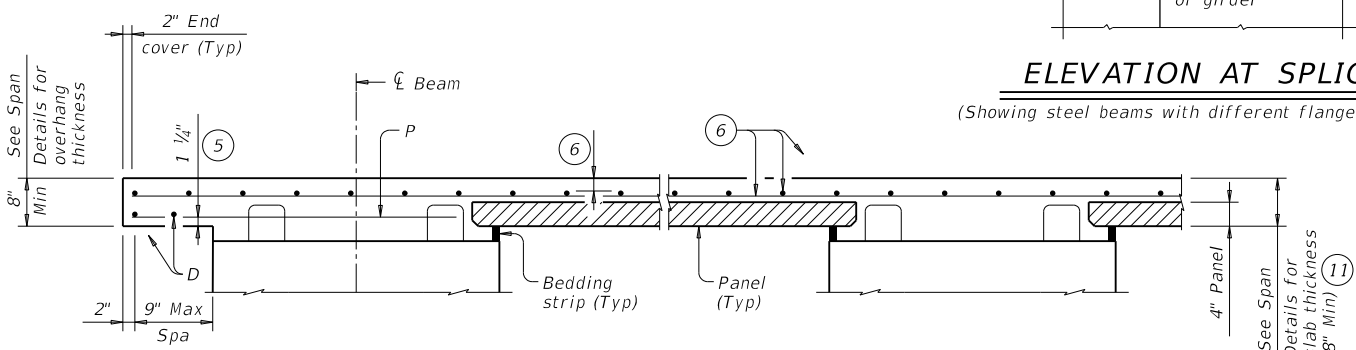
(Showing steel beams with flange width transition)

Cut bedding strip to adjust for difference in flange thickness.



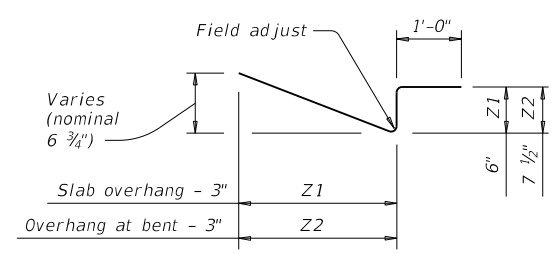
**ELEVATION AT SPLICE**

(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)**



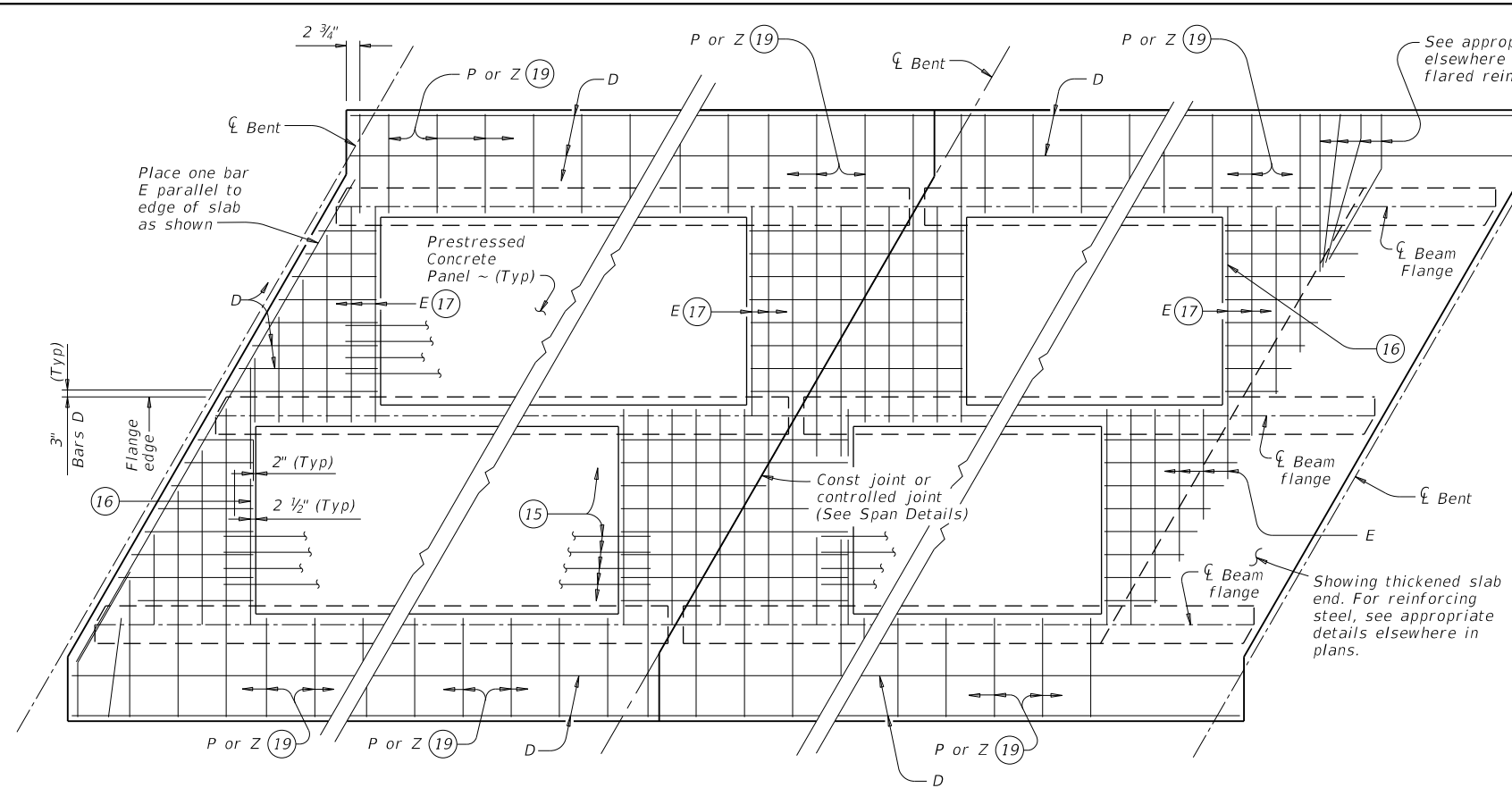
**PRESTRESSED CONCRETE PANELS DECK DETAILS**

PCP

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REVISIONS	0493	02	021	RM 652
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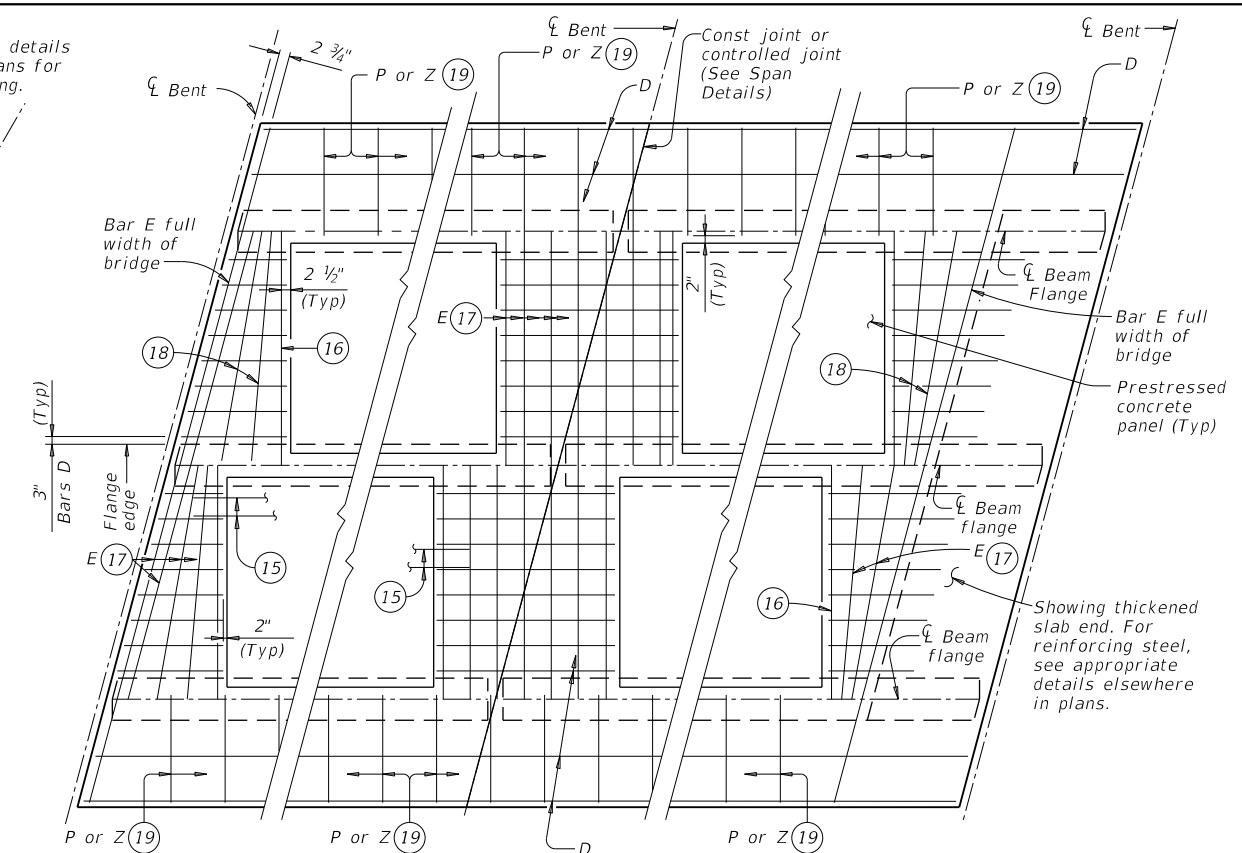
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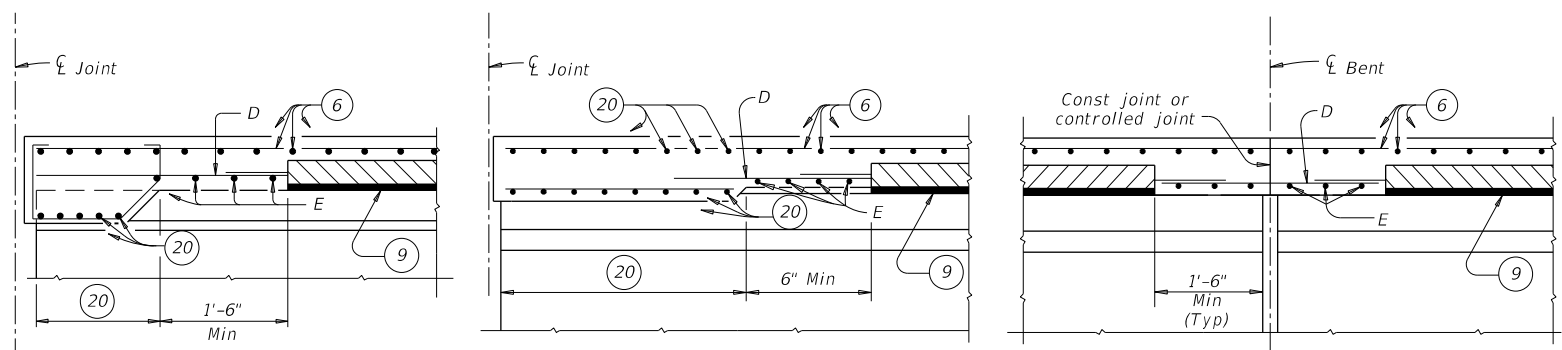
AT ALL SPAN ENDS UNLESS NOTED OTHERWISE  
 AT INTERIOR BENTS  
 AT THICKENED END SLABS

**OPTION 1 ~ PLAN OF SLABS WITH NORMAL REINFORCEMENT**

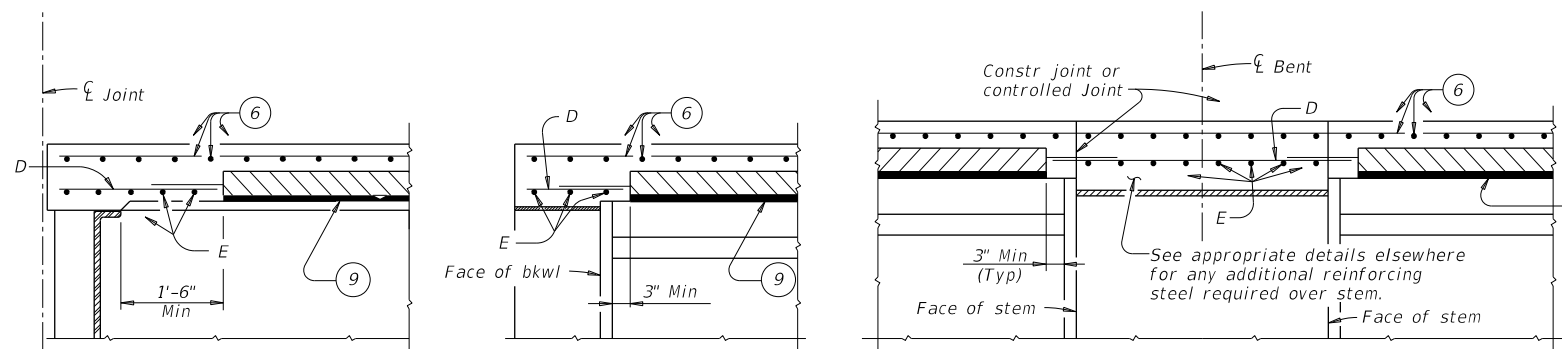


AT ALL SPAN ENDS UNLESS NOTED OTHERWISE  
 AT INTERIOR BENTS  
 AT THICKENED END SLABS

**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 1/4" 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



**PRESTRESSED CONCRETE PANELS DECK DETAILS**

PCP

FILE: pcpstde1-19.dgn	DN: TxDOT	CK: TxDOT	DW: JTR	CK: JMH
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REVISIONS	0493	02	021	RM 652
	DIST	COUNTY	SHEET NO.	
	ODA	LOVING	102	

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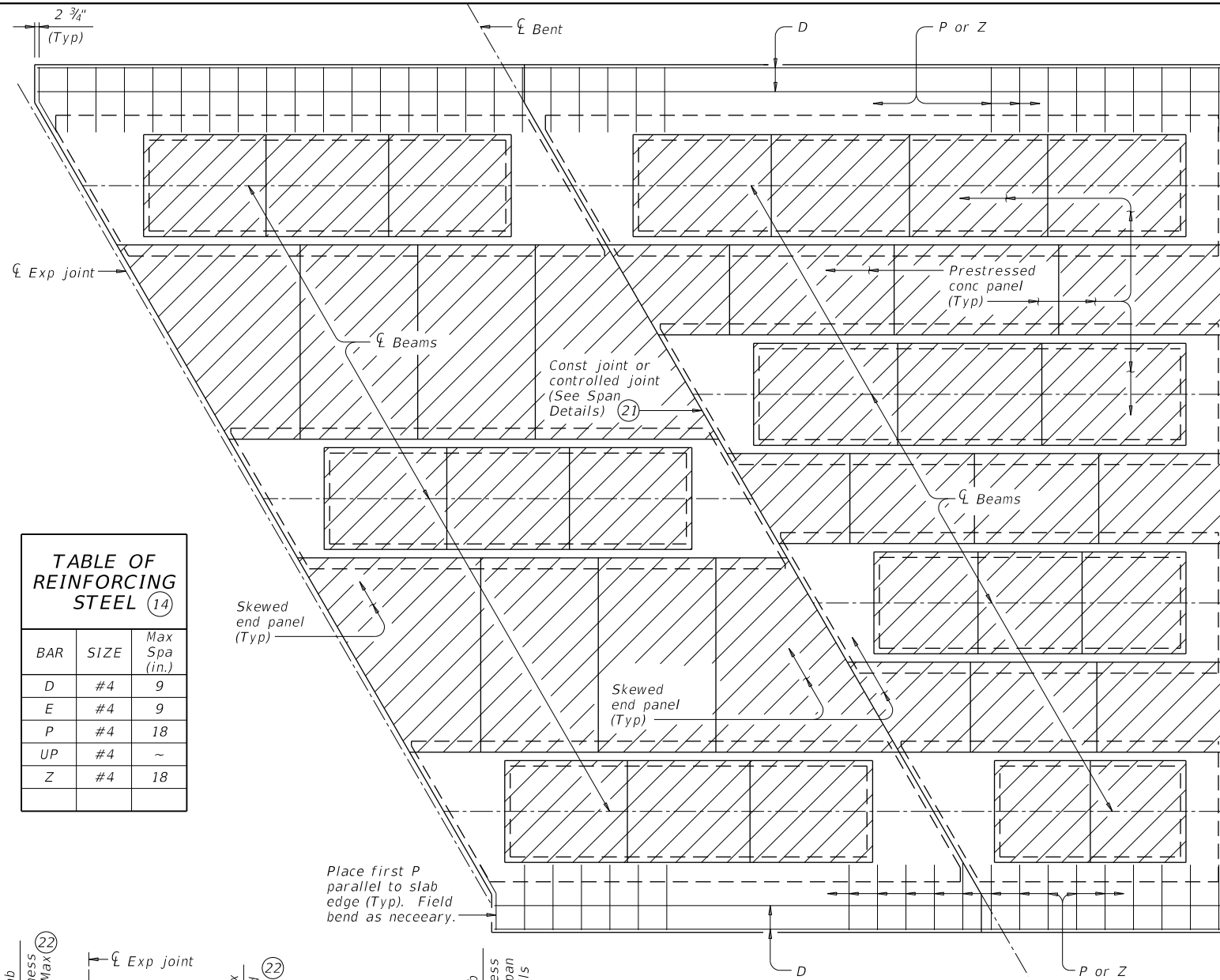
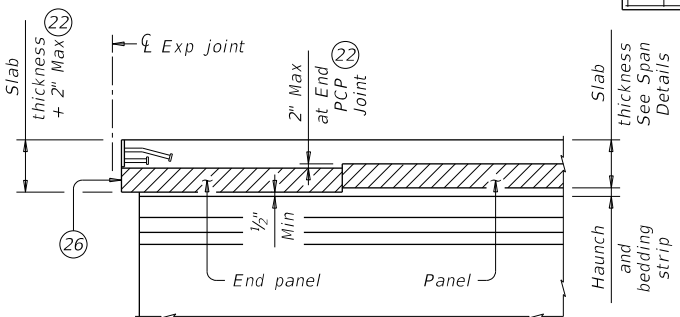
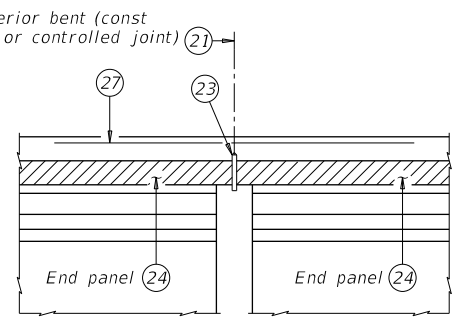


TABLE OF REINFORCING STEEL (14)		
BAR	SIZE	Max Spa (in.)
D	#4	9
E	#4	9
P	#4	18
UP	#4	~
Z	#4	18

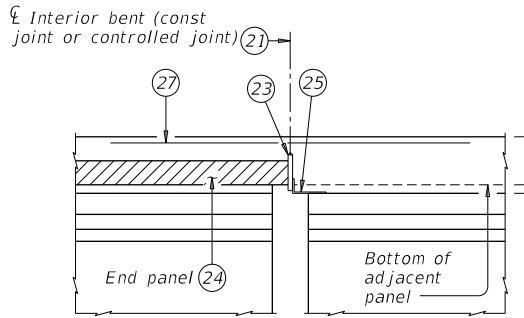
**OPTION 2 ~ PLAN OF SLAB**  
 (Showing U-Beams; other beams similar)



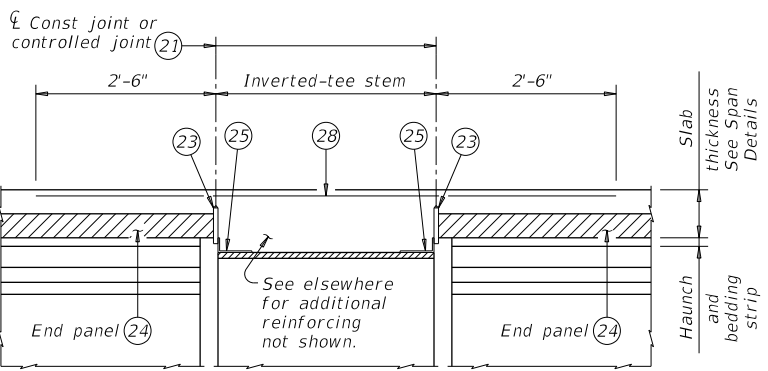
**JOINTS (BETWEEN BEAMS/GIRDERS OR AT INV-T STEM)**  
 For SEJ-A, SEJ-S(0), AJ, and Type A expansion joints only.



**CONVENTIONAL INTERIOR BENT**  
 Panel against panel between beams/girders.



**CONVENTIONAL INTERIOR BENT**  
 Panel against beam/girder end in adjacent span.



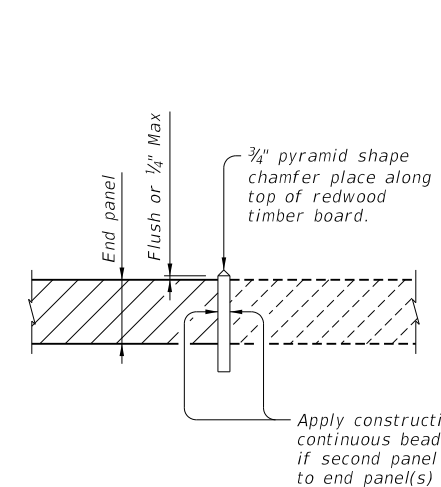
**INVERTED-T BENT**  
 Panels against inverted-tee stem

**OPTION 2 ~ ELEVATIONS AT BEAM ENDS (6)**

**ELEVATION EXAMPLE OF END PANEL AND TIMBER BOARD (23)**

See "Option 2 ~ Elevation At Beam Ends".

- (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 1/2" 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 1/2" thick.
- (23) 3/4" thick redwood timber board, leave in place. Redwood timber board placed flush with top of panel or within 1/4" Max above panel. Place 3/4" pyramid shape chamfer along top of timber board. See "Elevation Example of End Panel and Timber Board". Place straight, within 1/4" 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 1/2" of 3/4" thick board.
- (25) Permanent galvanized steel sheet form. Removable formwork is acceptable.
- (26) Place end panel within 1/2" 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.

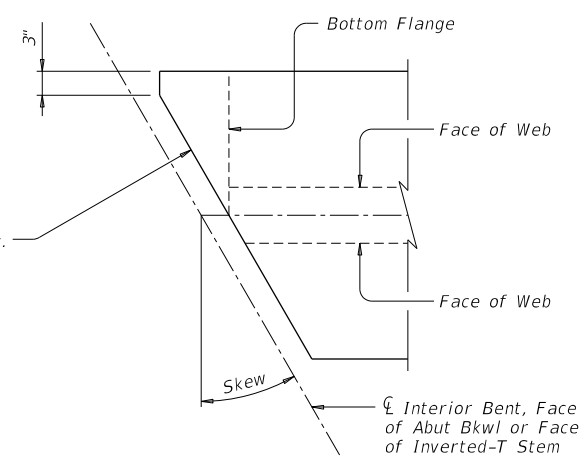


Skew top flange of Bms/Girders as shown for flange edge supporting a panel. Not applicable to flange edges on exterior side of fascia Bms/Girders.

Apply construction adhesive in a continuous bead to both sides of board, if second panel is present, to adhere to end panel(s) and seal interface.

**OPTION 2 ~ SHOWING MODIFICATION TO BEAM/GIRDER TOP FLANGE FOR SKEWS OVER 5°**

Showing I-Bm/I-Girder, U-Bms and Steel Bms similar.



**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 1/2".

Do not extend the longitudinal panel reinforcement into the cast-in-place slab.

Top flanges of beams and girders on skewed bridges must be modified as shown on this drawing. The Contractor is responsible for coordinating this modification with the beam fabricator prior to submitting shop drawings for approval.

Fabricator may optionally skew the whole end. When electing to skew whole end, girder end details and bearing type at conventional interior bent must be changed to use condition at abutment. Fabricator must coordinate change in bearing type, bearing centerline location, and dowel location with Engineer and Contractor. Show appropriate changes on girder and bearing shop drawings.

Bending of anchor studs of expansion joints shown on standards AJ, SEJ-A and SEJ-S(0) is permissible if necessary to clear top of end panels. The Contractor is responsible for coordinating modifications with the joint fabricator. Submit shop drawings for approval when modifications to expansion joint hardware are made.

Bedding strips under skewed end panels must conform to the requirements of Item 422 except their minimum compressive strength must be 60 psi.

Provide Bars AA, G, K and OA from standard IGTS in the slab.



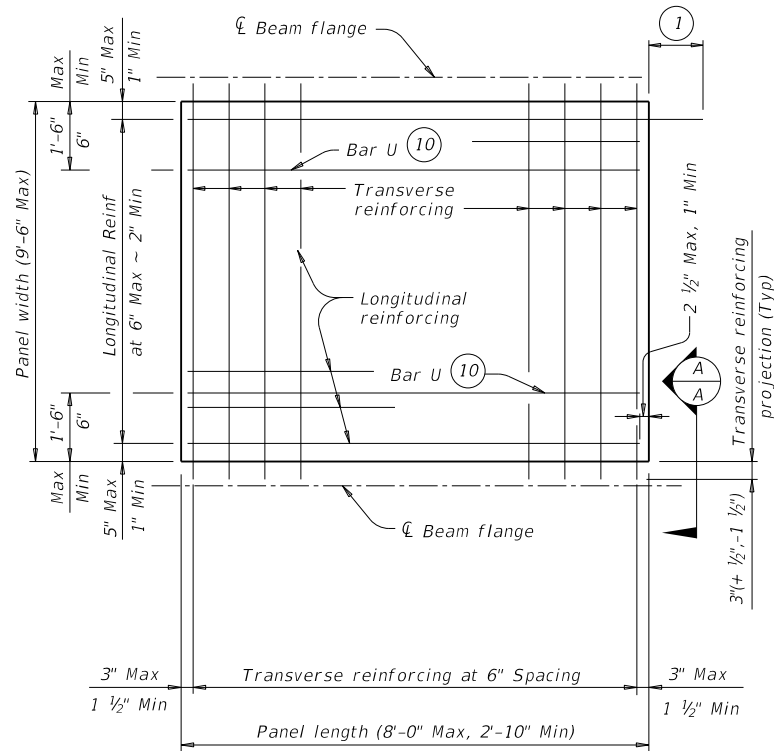
**PRESTRESSED CONCRETE PANELS DECK DETAILS**

**PCP**

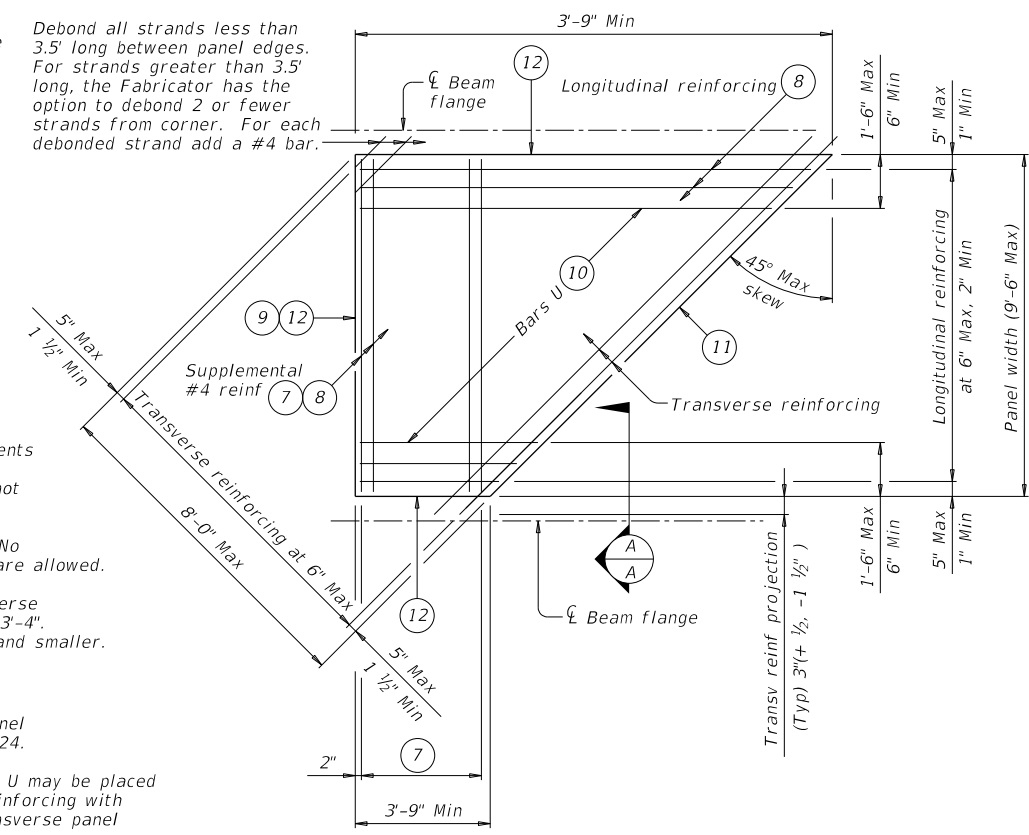
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©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
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**TYPICAL NON-SKEWED PANEL PLAN**



**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. 3/8" or 1/2" 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 1/2" Max, 1" Min.
- 9 Recess strands on indicated panel edge in accordance with Item 424.
- 10 At the fabricator's option, Bars U may be placed parallel to transverse panel reinforcing with horizontal legs in plane of transverse panel reinforcing.
- 11 Use length of indicated panel edge as panel width for purpose of determining type of transverse reinforcing.
- 12 Timber form work permissible this edge.

TABLE A				TABLE B			
Beam Type	Normal (In.)	Min (In.)	Max (In.)	Top Flange Width	Normal (In.)	Min (In.)	Max (In.)
A	3	2 1/2	3 1/2	11" to 12"	2 3/4	2 1/2	2 3/4
B	3	2 1/2	3 1/2	Over 12" to 15"	3 1/4	3	3 1/4
C	4	3	4 1/2	Over 15" to 18"	4	3	4 3/4
IV	6	4	7 1/2	Over 18"	5	3 1/2	6 1/4
VI	6 1/2	4 1/2	8 1/2				
U40 - 54	5 1/2	5 1/2	7				
Tx28-70	6	5	7 1/2				
XB20 - 40	4	3	4 1/2				
XSB12 - 15	4	3	4 1/2				

**GENERAL NOTES:**

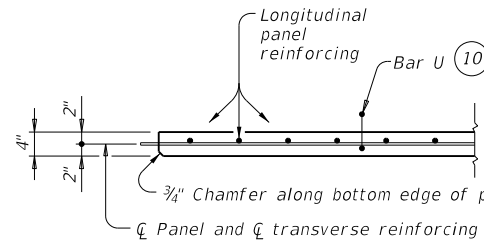
Provide Class H concrete for panels. Release strength  $f'c=3,500$  psi. Minimum 28 day strength  $f'c=5,000$  psi.  
 Provide 3/4" chamfer along bottom edge of panel on beam side. Do not use epoxy-coated reinforcing steel bar or strand in panels. Remove laitance from top panel surface. Finish top of 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 3/8" or 1/2" 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 3/8" or 1/2" 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:**

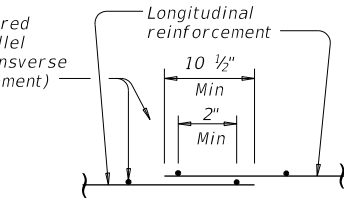
Any of the following options may be used for longitudinal panel reinforcement:  
 1. (#3) Grade 60 reinforcing steel at 6" Max Spacing. No splices allowed.  
 2. 3/8" Dia prestressing strands at 4 1/2" Max Spacing (unstressed). No splices allowed.  
 3. 1/2" Dia prestressing strands at 6" Max Spacing (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.



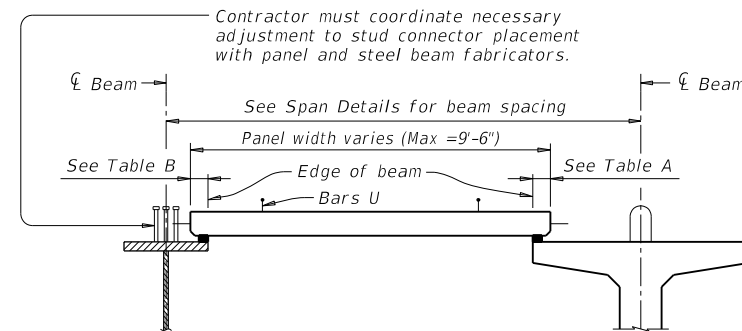
**SECTION A-A**

(Not showing supplemental #4 bars for skewed end panels.)

No splice required for wires parallel to strands (transverse panel reinforcement)

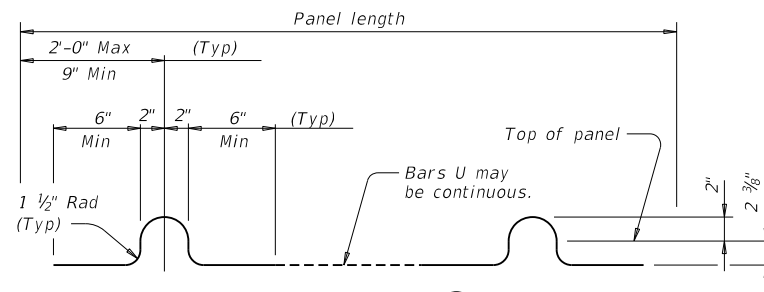


**WELDED WIRE REINFORCEMENT (WWR) SPLICE DETAIL**

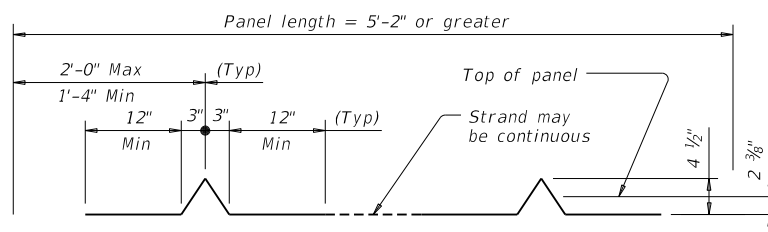


**STEEL BEAMS**

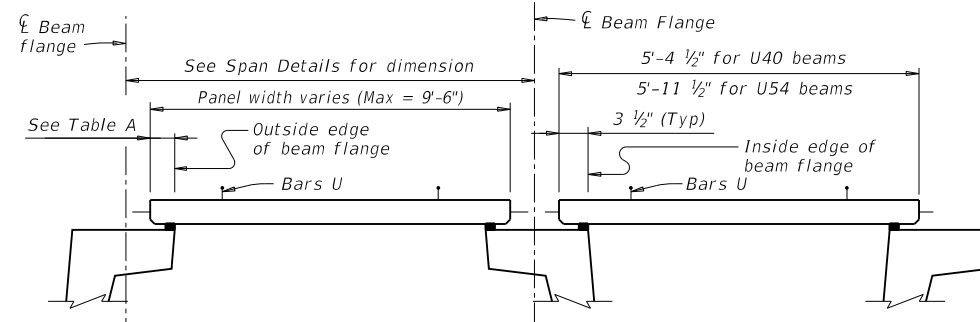
**PRESTRESSED CONCRETE BEAMS OR GIRDERS**  
 Typ unless noted otherwise



**BARS U (#3)**



**OPTIONAL STRAND FOR BARS U**



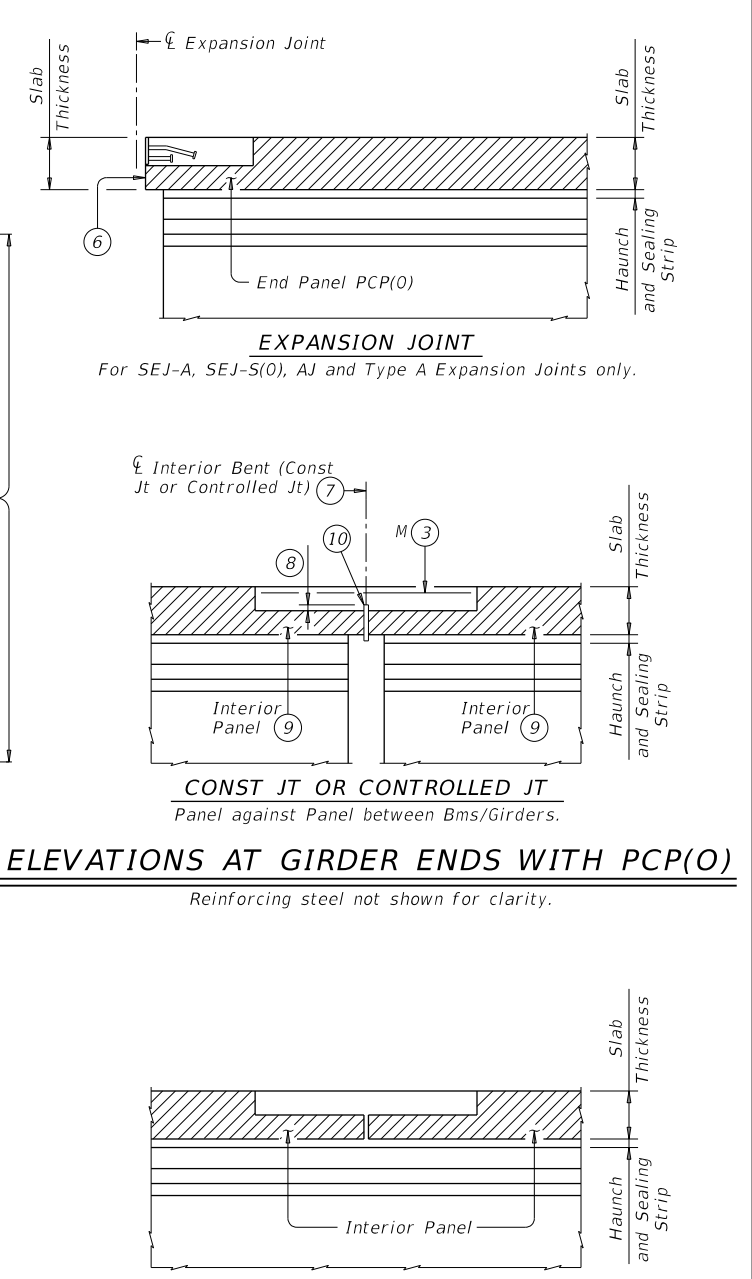
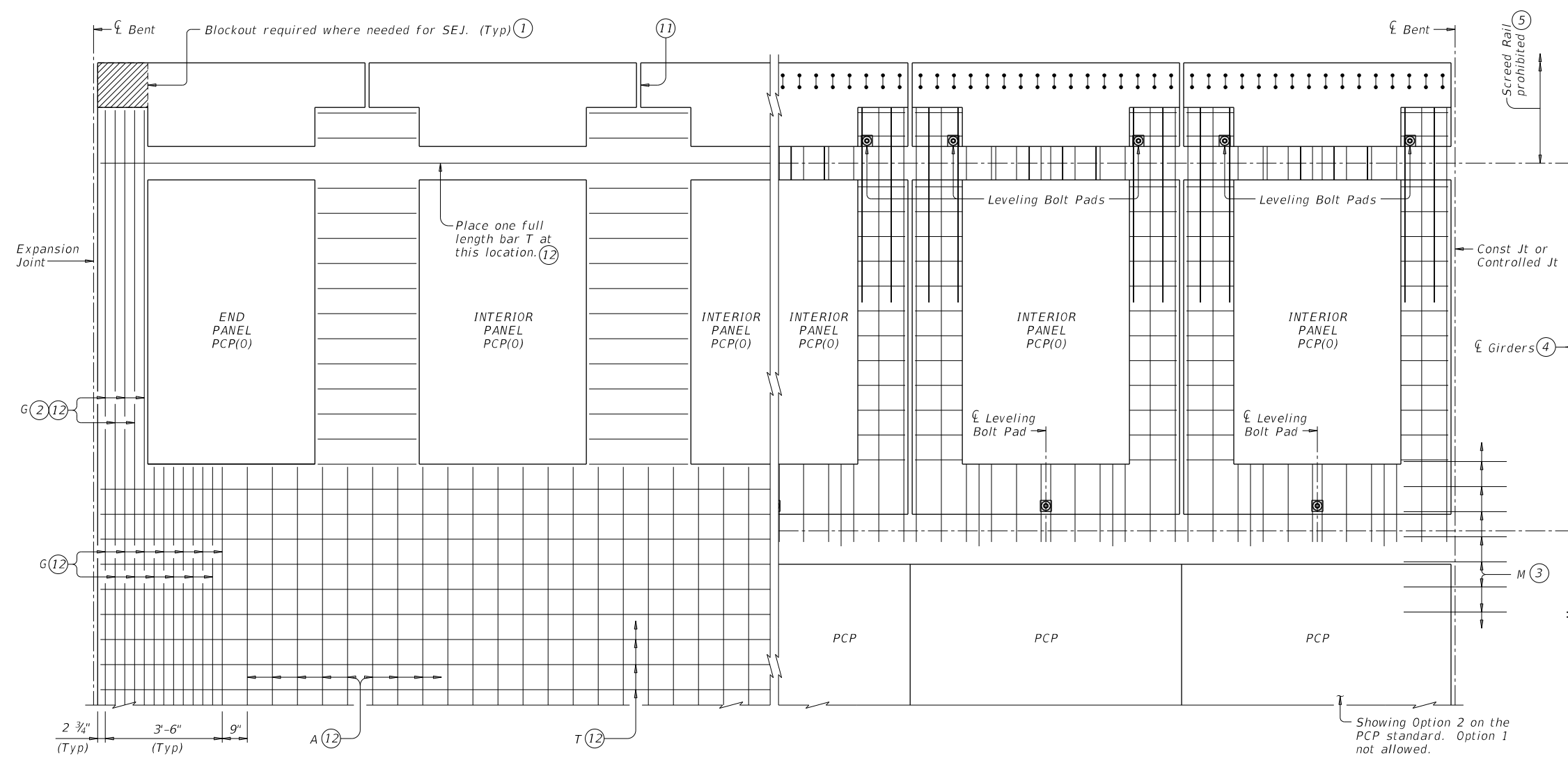
**PRESTRESSED CONCRETE U-BEAMS**

**TYPICAL SECTIONS FOR DETERMINING PANEL WIDTH**

HL93 LOADING

		<b>Bridge Division Standard</b>	
<b>PRESTRESSED CONCRETE PANEL FABRICATION DETAILS</b>			
<b>PCP-FAB</b>			
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SHOWING FIELD PLACEMENT OF TOP REINFORCING STEEL

SHOWING PCP(O) EXPOSED REINFORCING STEEL  
 Field placed bars M shown for clarity.

**PANEL LAYOUT**

PCP(O) shown with gaps between panels for clarity.  
 The gap cannot be considered as a panel fabrication tolerance.

- ① 1'-4" x 1'-6" x 4 1/2" blockout to accommodate SEJ that require an upturn. Contractor to communicate with fabricator the location and type of SEJ to be utilized.
- ② When blockout is required, extend bars G into blockout.
- ③ Place additional bars M 2'-11" in length on top of bars A and between every bar T. Center bars M at center of bent. Located at bents with construction joints or controlled joints only. Bars M may replace additional (#4) bars 5'-0" in length as shown on PCP standard in Option 2 - Elevations At Beam Ends. Option 1 not allowed.
- ④ It is recommended to profile every 4 ft by surveying each girder under PCP(O) for proper grading of panels.
- ⑤ Screed rail used to set grade for paving machine is not allowed past exterior girder as shown.
- ⑥ Place end panel PCP(O) within 1/2" of expansion joint opening. Do not encroach on required expansion joint opening.
- ⑦ Top Plastic Joint Former at Controlled Joints (Stress Cap, Zip Strip, Stress Lock, etc.) is not required with these Details.
- ⑧ 0" Min, 3/4" Max, support as necessary.
- ⑨ Place panel within 1/2" of 3/4" thick board.
- ⑩ 3/4" thick wood/timber board, leave in place. Place straight, within 1/4" of Centerline of Bent, across bridge width and end board at exterior flange edge of fascia girders. Do not extend into overhang.
- ⑪ Seal top of panel only, with a Class 4 sealant prior to rail construction. Typical between panels. Do not seal at Expansion Joints.
- ⑫ 1 1/2" End Cover. (Typ)

HL93 LOADING SHEET 1 OF 2



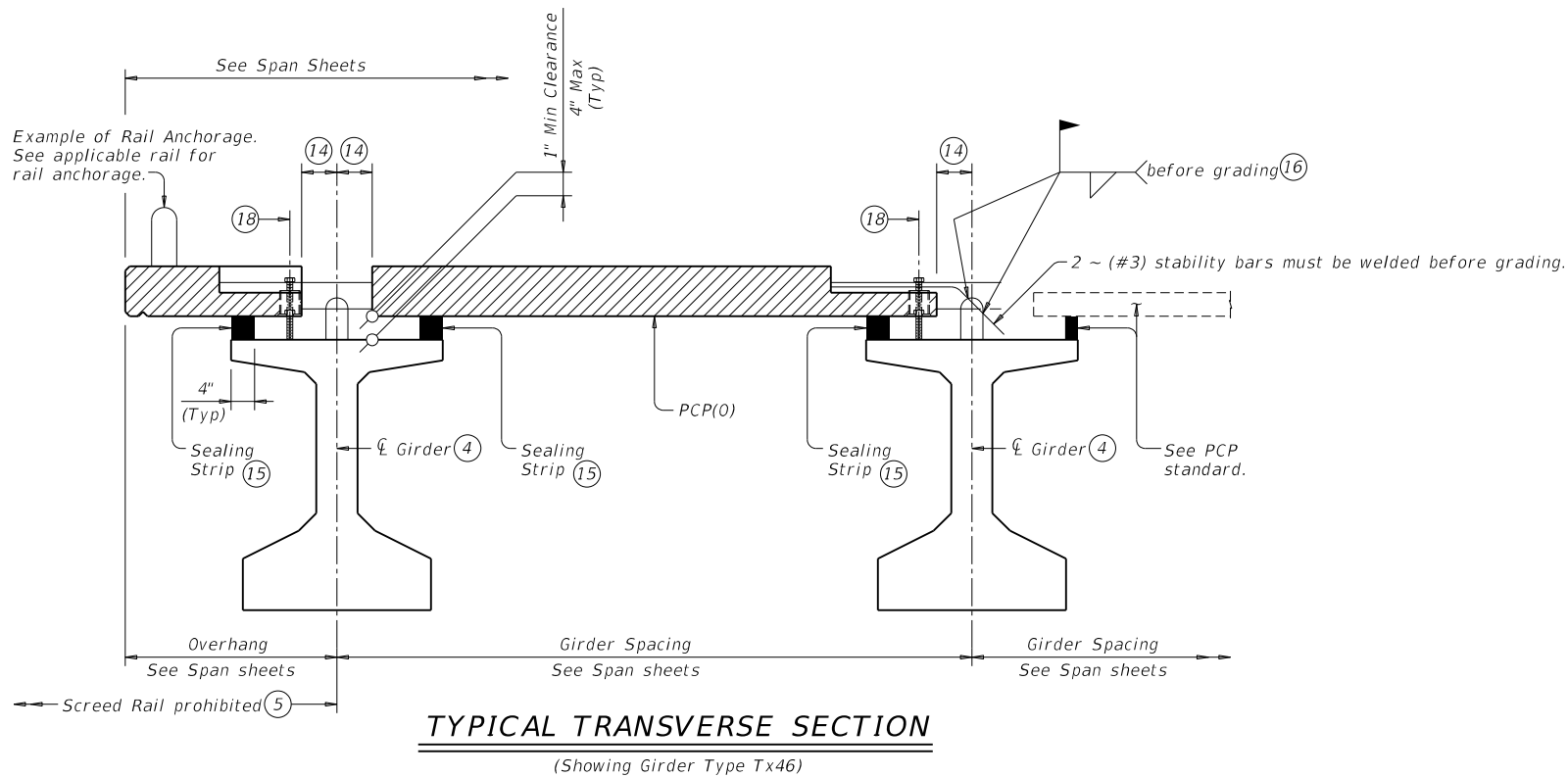
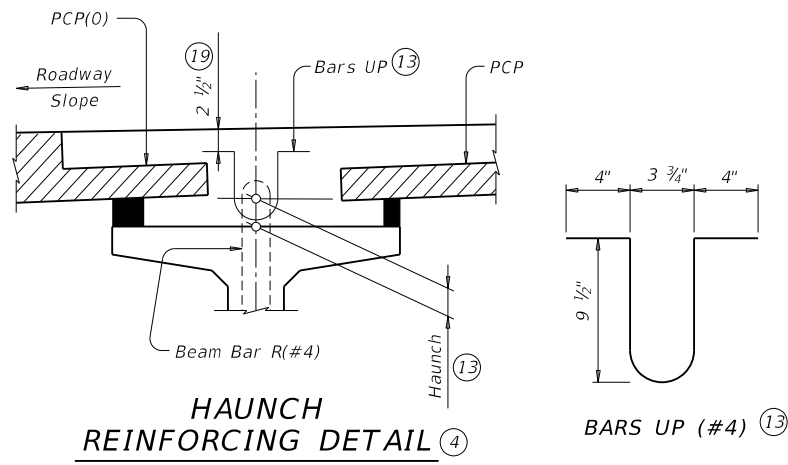
**PRECAST CONCRETE PANELS FOR OVERHANGS**

**PCP(O)**

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BAR TABLE		
BAR	SIZE	MAX SPA (IN)
A (12/17)	#4	9"
G (12/17)	#4	3 1/2"
M	#4	9"
T (12/17)	#4	9"

- ④ It is recommended to profile every 4 ft by surveying each girder under PCP(0) for proper grading of panels.
- ⑤ Screed rail used to set grade for paving machine is not allowed past exterior girder as shown.
- ⑫ 1 1/2" End Cover on bars. (Typ)
- ⑬ Space bars UP(#4) with girder bars R(#4) in all areas where measured haunch exceeds 3 1/2" with Prestressed Concrete I-Girders. Epoxy coating for Bars UP is not required.
- ⑭ 6" plus or minus.
- ⑮ Place sealing strip at flange edge as shown. Butt adjacent sealing strips longitudinally together with adhesive. Use pencil vibrators with concrete placement over girder and between sealing strips to avoid rupturing sealing strips. Cut sealing strips 2" higher than anticipated haunch thickness and compress to grade.
- ⑯ (#3) Panel bars F must be field bent and welded to the R bars in girder. Two bars F per panel.
- ⑰ Field placed bars that are allowed to be lapped. Reinforcing steel that protrudes from panels are not considered bars to be lapped. See "Material Notes" for applicable bar laps.
- ⑱ Leveling Bolt Pad. 1" Dia Coil Rod or 1" Dia Coil Bolt shown, are furnished by the contractor. After grading each PCP(0) panel with the 1" Dia coil rods or coil bolts, secure each panel in its final resting position (plastic shims, welding, etc) and remove all 1" Dia coil rods or coil bolts for the cast-in-place concrete. Coil rods/bolts may be left in place at contractor's option. If coil rods/bolts are left in place, coil rods/bolts must have at least 2 1/2" of cover to top of finish grade. Grading bolts are inadequate to carry all conceivable screed/construction loads. Panel support method must be calculated, location identified, and placed on shop drawings. Method chosen to support panels must be adequate for all construction loads. Panel support method must be placed/constructed after final grading and before screed rail placement.
- ⑲ Unless shown otherwise on Span Details.



**CONSTRUCTION NOTES:**

Placing panels adjacent to expansion joints and bent centerlines prior to completing interior panel placement is recommended. Ensure proper cleaning of construction debris and consolidation of concrete mortar under the edges of the panels. Place sealing strips at girder flange edges so that adequate space is provided for the mortar to flow a minimum of 8" transversely under the panels as the slab concrete is placed. Panel placement with Option 1 on the PCP standard is not allowed. It is recommended to profile every 4 ft by surveying each girder under PCP(0) for proper grading of panels. To allow the proper amount of mortar to flow between girder and panel, maintain a minimum vertical opening of 1". Roadway cross-slope reduces the opening available for entry of the mortar. Sealing strips vary in thickness along girder are therefore required. Seal the top panel with a Class 4 sealant as shown in the Panel Layout.

**MATERIAL NOTES:**

Provide Grade 60 reinforcing steel in cast-in-place slab. See Table of Reinforcing Steel for size and spacing of reinforcement. If the reinforcing steel is shown on the Span Details to be epoxy coated, then epoxy coat bars A, G, M, & T. Provide bar laps, where required, as follows:  
 Uncoated ~ #4 = 1'-7"  
 Epoxy Coated ~ #4 = 2'-5"  
 Provide sealing strips comprised of one layer low density polyurethane (1.0 Lbs density) foam sealing strips or equivalent. Oversize the height of sealing strips by 2". Bond sealing strips to the girder with 3M Scotch® 4693 or equivalent adhesive compatible with sealing strips.

**GENERAL NOTES:**

Designed according to AASHTO LRFD Specifications. These details can be used as an option to construct the deck overhang when noted on the Span details and in conjunction with the PCP(0)-FAB, PCP and applicable Standard sheets. These details are only applicable for Prestr Conc I-Girders. Any additional reinforcement or concrete required on these details is subsidiary to the bid Item "Reinforced Concrete Slab".

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

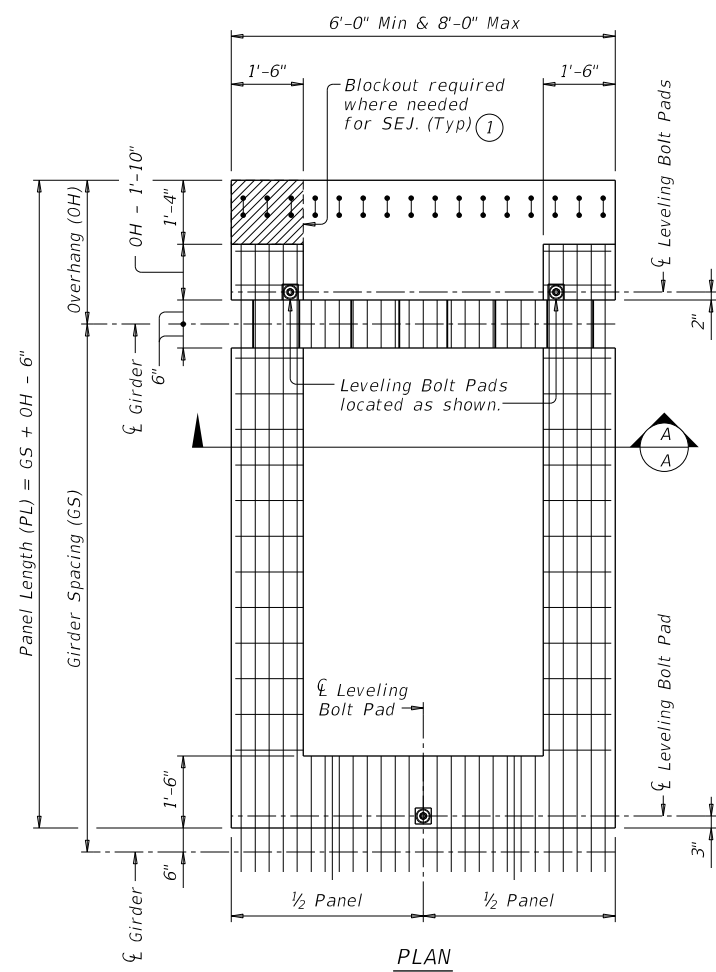


**PRECAST CONCRETE PANELS FOR OVERHANGS**

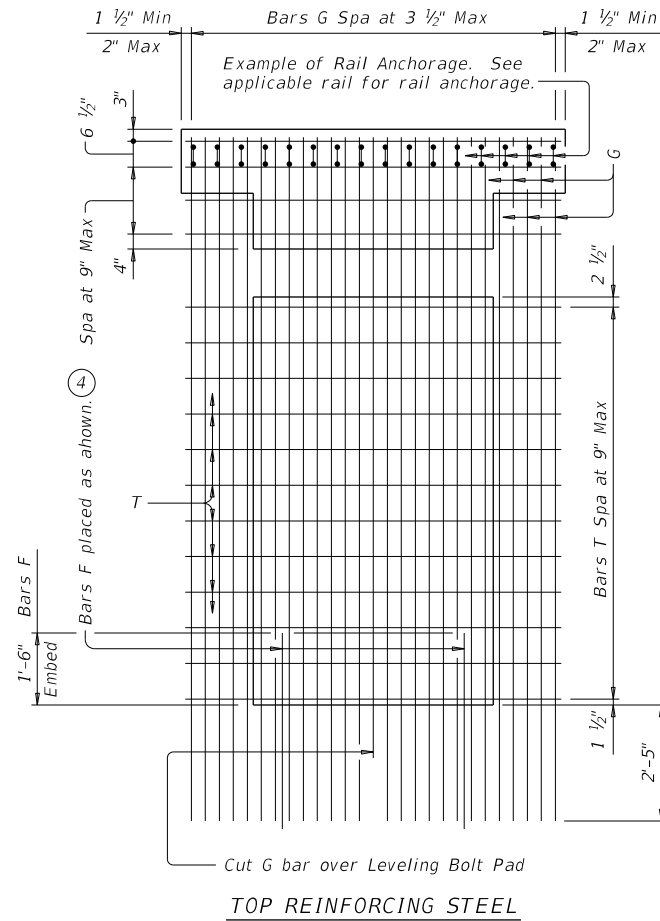
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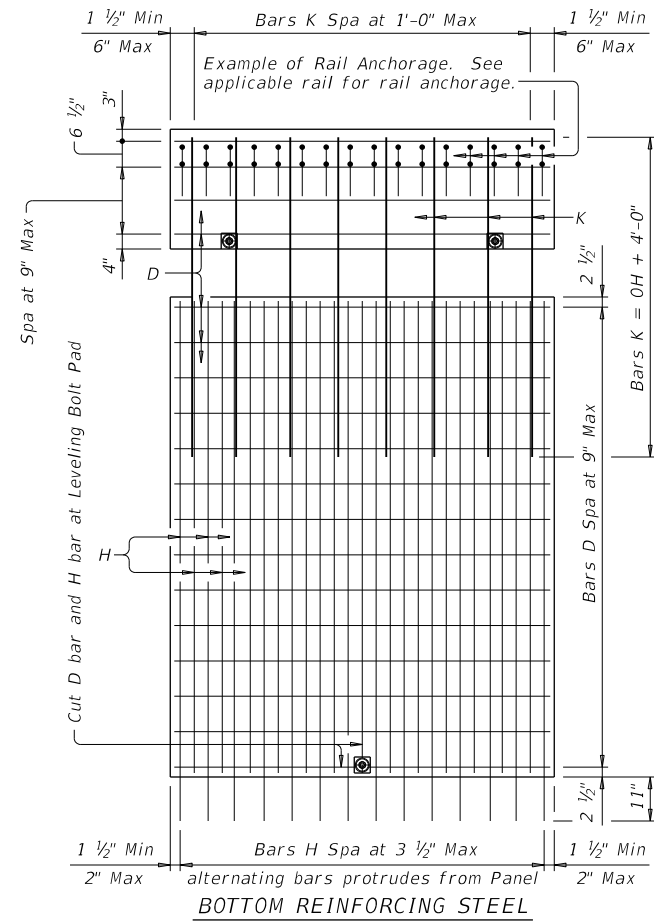


PLAN

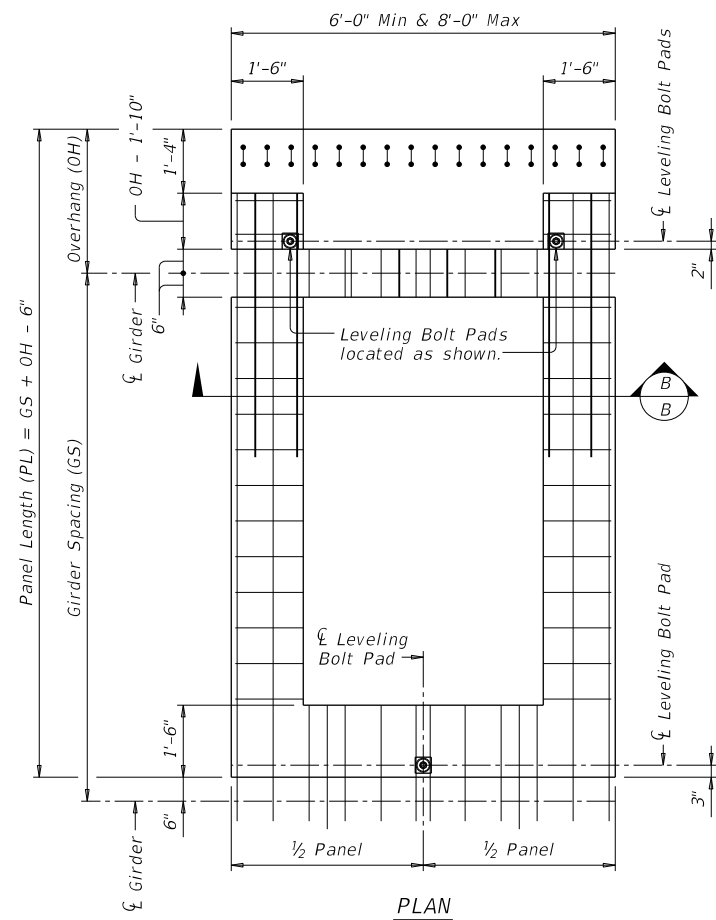


TOP REINFORCING STEEL

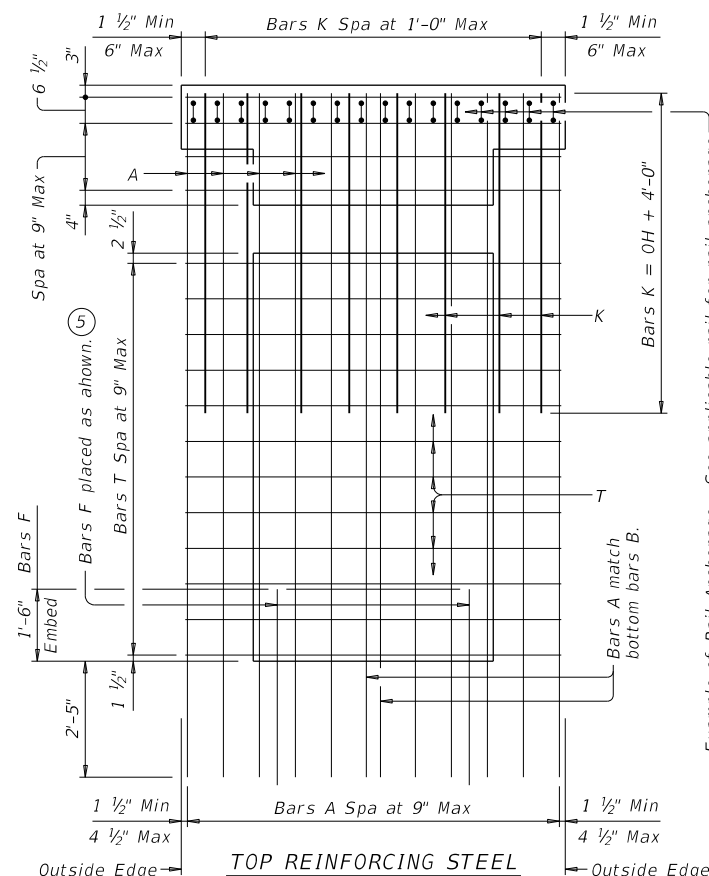
END PANEL



BOTTOM REINFORCING STEEL

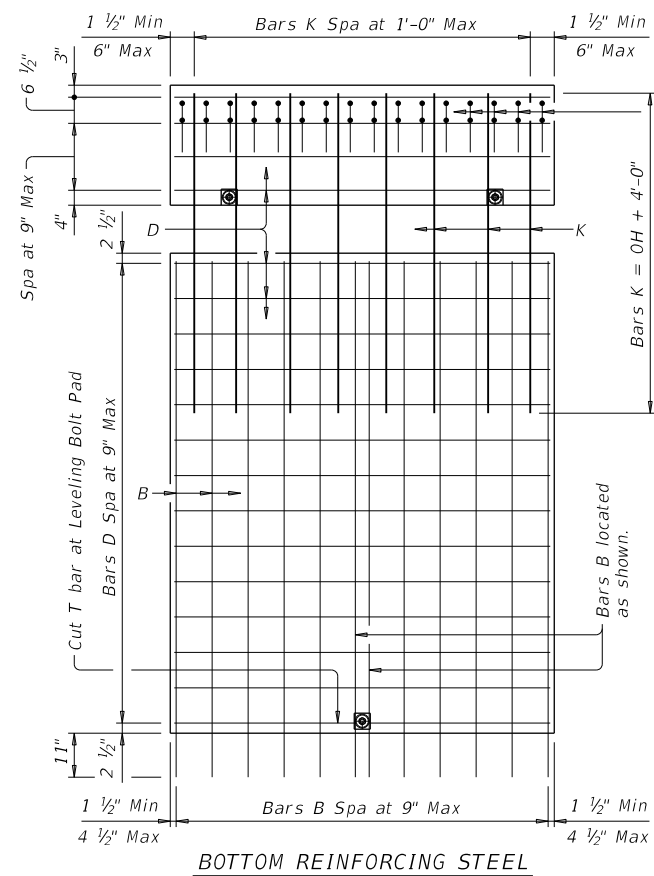


PLAN



TOP REINFORCING STEEL

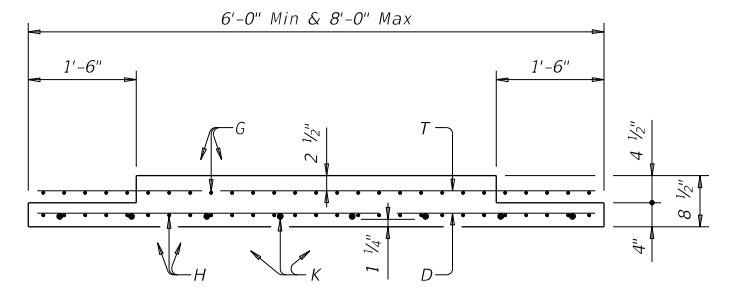
INTERIOR PANEL



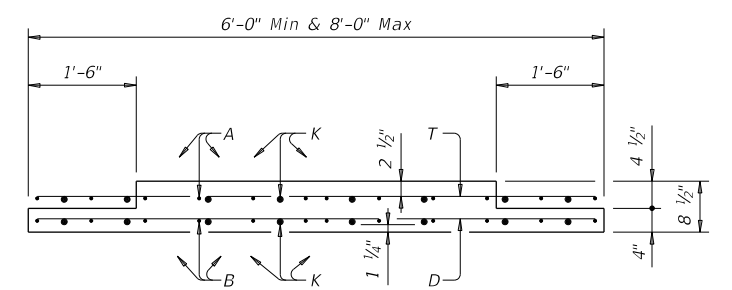
BOTTOM REINFORCING STEEL

- 1 1'-4" x 1'-6" x 4 1/2" blockout to accommodate SEJ that require an upturn. Contractor to communicate with fabricator the location and type of SEJ to be utilized.
- 2 1 1/2" End Cover on bars. (Typ)
- 3 Bars that are not allowed to have lap splices.
- 4 Place F bars under bars T and against bars G.
- 5 Place F bars under bars T and between bars A.

BAR	SIZE
A (2)	#4
B (2)	#4
D (2,3)	#4
F (3)	#3
G (2)	#4
H (2)	#4
K (2,3)	#8
T (2,3)	#4



SECTION A-A



SECTION B-B

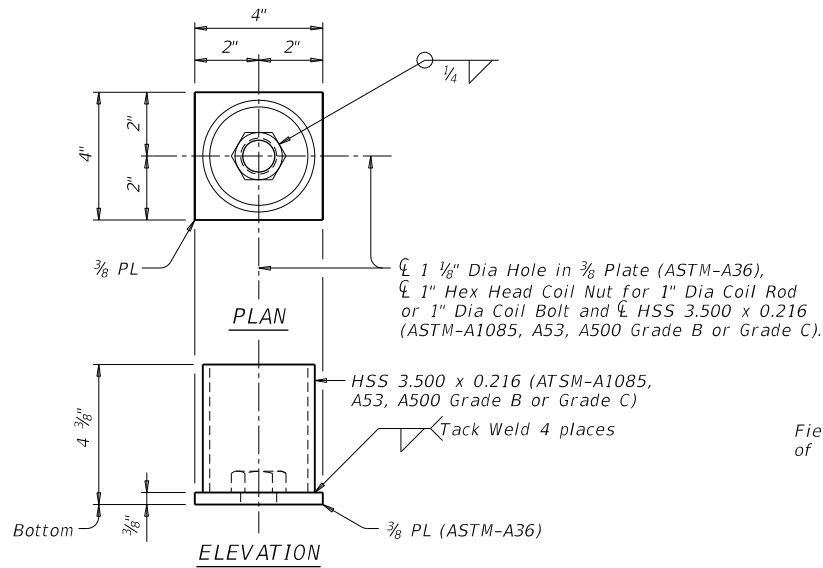
PRECAST CONCRETE PANELS FOR OVERHANGS FABRICATION DETAILS

PCP(O)-FAB

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©TxDOT August 2017	CONT	SECT	JOB	HIGHWAY
REVISIONS	0493	02	021	RM 652
	DIST	COUNTY	SHEET NO.	
	ODA	LOVING	107	

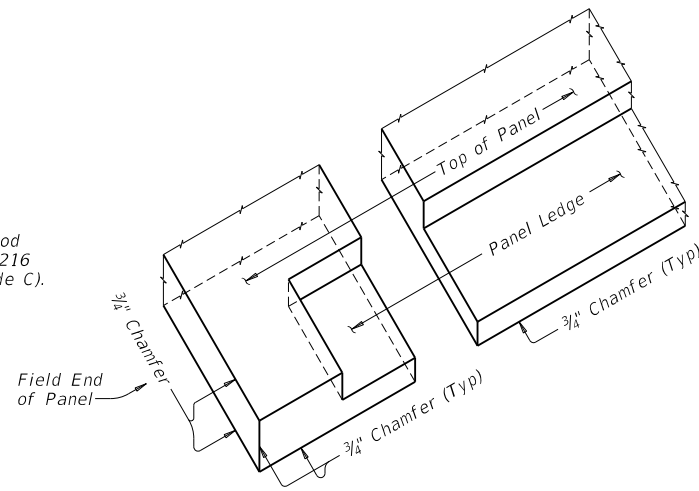


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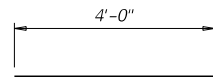
**LEVELING BOLT PAD DETAILS**

Galvanize if epoxy coated reinforcing steel is used in slab. Do not oil this assembly.

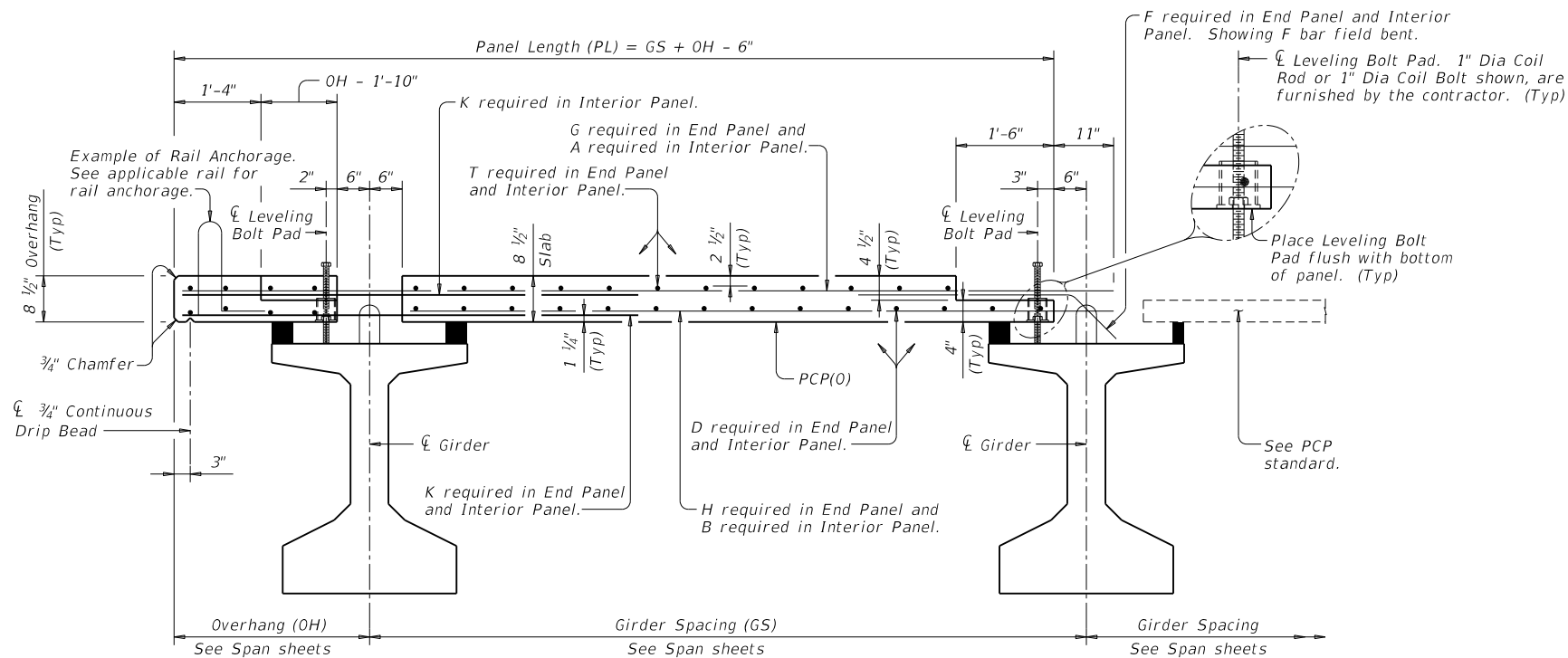


**ISOMETRIC VIEW AT CORNER OF PANEL**

Showing Typical Chamfers on Panel. Drip Bead and reinforcing steel not shown for clarity.



**BARS F**



**TYPICAL TRANSVERSE SECTION**

(Showing Girder Type Tx46)

**CONSTRUCTION/FABRICATION NOTES:**

Remove laitance from top panel surface.  
 Finish top surface area of panel with a broom finish.  
 Finish top ledge of panel to a roughness between a No. 6 and No. 9 concrete surface profile, inclusive, as specified by the International Concrete Repair Institute (ICRI).  
 Provide 3/4" concrete chamfers as shown on these details.  
 Do not lap splice bars D, F, K & T. Bars A, B, G & H, may be spliced with only one lap splice allowed on each bar.  
 Panels must be fabricated by a fabricator meeting the requirements of DMS 7300 for Multi-Project Nonstressed Member Fabrication Plant.

**MATERIAL NOTES:**

Provide Class H concrete (f'c=4000 psi) in panels. Provide Class H (HPC) concrete for panels if required elsewhere in plans. Maximum large aggregate size is 1".  
 Provide material as shown on this standard for the Leveling Bolt Pad.  
 Provide Grade 60 conventional reinforcing steel.  
 Provide epoxy coated reinforcement for bars A, B, D, G, H, K & T if slab reinforcement is epoxy coated.  
 An equal area and spacing of deformed Welded Wire Reinforcement (WWR) ASTM-A1064 may be substituted for bars A, B, D, G, H & T, unless otherwise noted. Bars F and K can not be replaced with WWR.  
 Galvanize leveling bolt pad assembly if epoxy-coated reinforcing steel is used in slab.

**GENERAL NOTES:**

Designed according to AASHTO LRFD Specifications.  
 These details are only applicable for Prestr Conc I-Girders.  
 Any additional reinforcement, lifting devices or epoxy coated reinforcement required on these details are subsidiary to the bid Item "Reinforced Concrete Slab".  
 See railing details for rail anchorage in panel overhang.  
 A panel layout which identifies location of each panel must be developed by the fabricator. Permanently mark each panel in accordance with the panel layout. A copy of the layout is to be provided to the Engineer.  
 Submit stable lifting methods and devices to the Engineer for approval.  
 Shop drawings for the fabrication of panels will require the Engineer's approval.

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

HL93 LOADING SHEET 2 OF 2



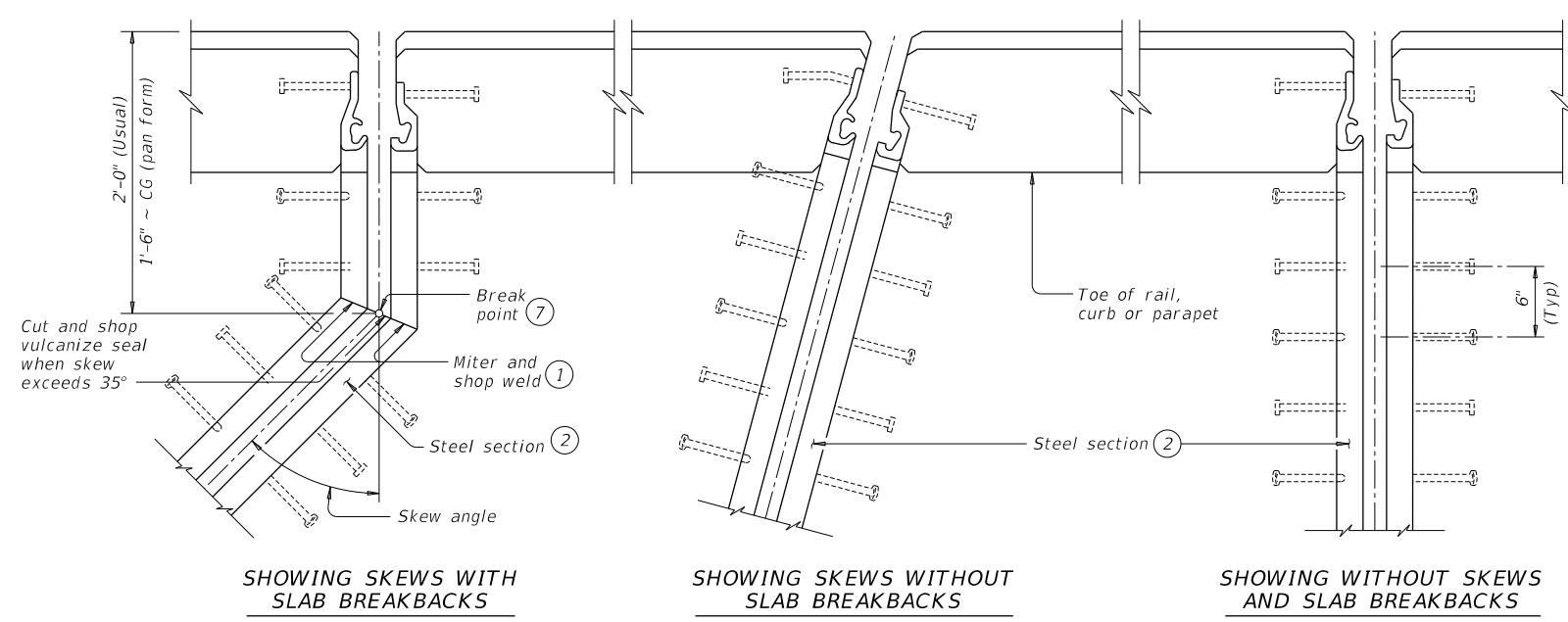
**PRECAST CONCRETE PANELS FOR OVERHANGS FABRICATION DETAILS**

**PCP(O)-FAB**

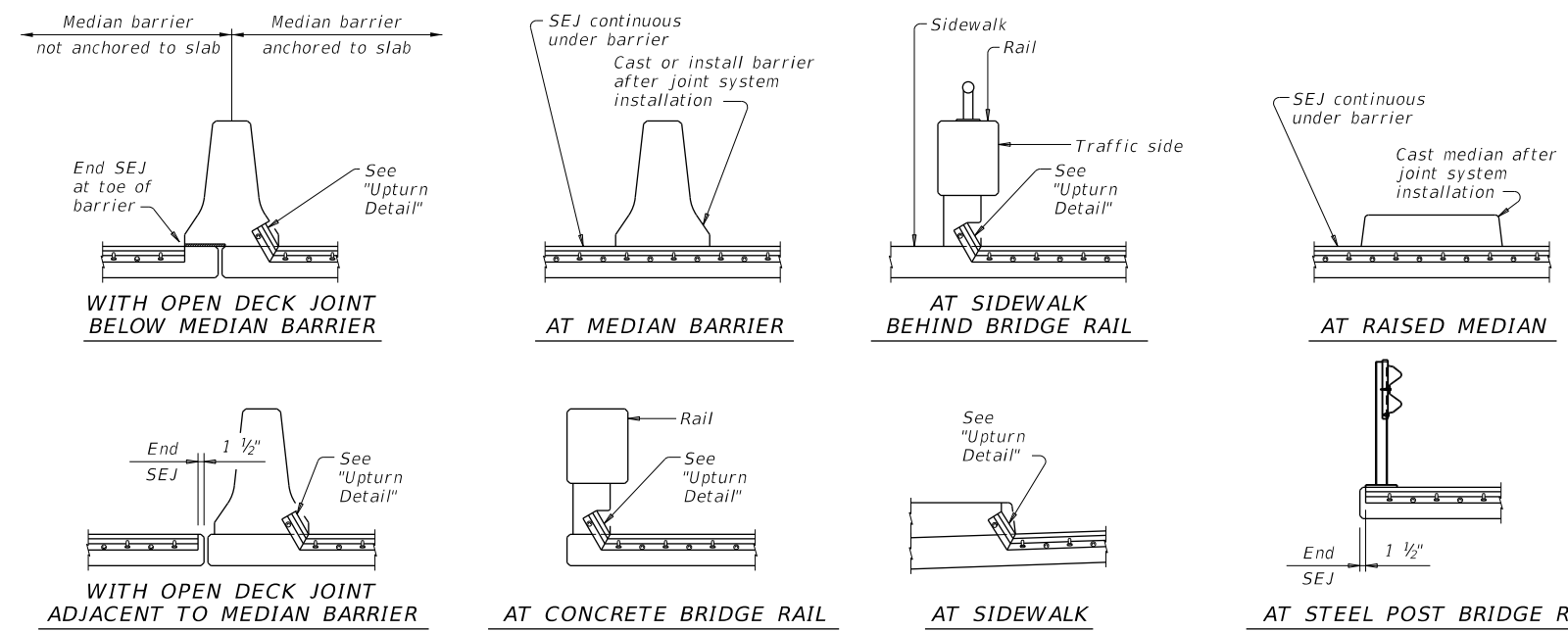
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©TxDOT August 2017	CONT	SECT	JOB	HIGHWAY
REVISIONS	0493	02	021	RM 652
	DIST	COUNTY	SHEET NO.	
	ODA	LOVING	108	

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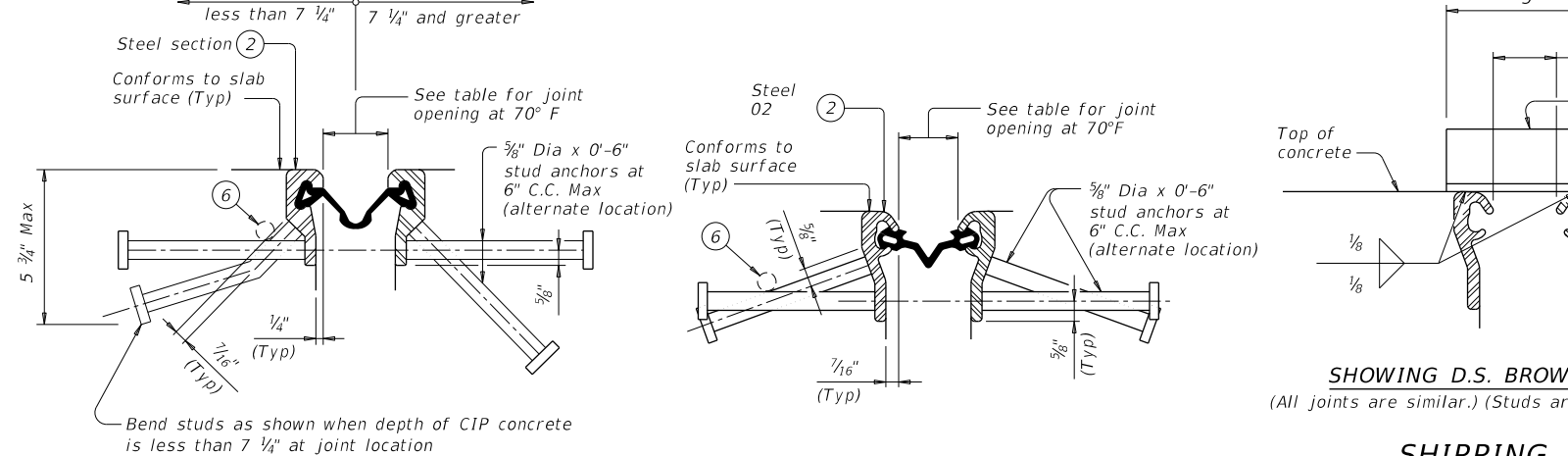
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**PLANS OF END CONDITIONS**



**TYPICAL SECTIONS**



**SECTION THRU WATSON BOWMAN ACME (SE-400 OR SE-500) JOINTS**

**SECTION THRU D.S. BROWN (A2R-400 OR A2R-XTRA) JOINTS**

**SHIPPING ANGLE**  
 An alternate method of securing joint sections may be used if approved by the Bridge Division. Erection bolts are not allowed.

**TABLE OF SEALED EXPANSION JOINT INFORMATION**

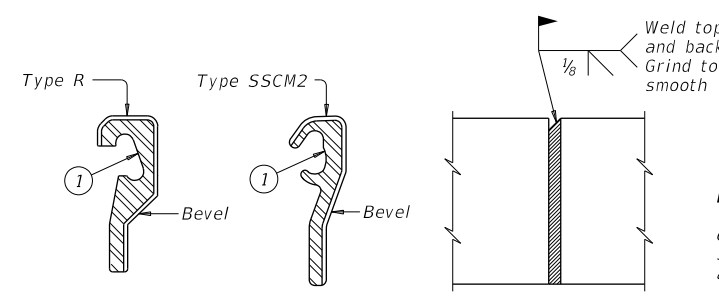
MANUFACTURER	STEEL SECTION ②	STRIP SEAL			
		4" JOINT		5" JOINT	
		Seal Type	Joint Opening ③	Seal Type	Joint Opening ③
D.S. Brown	Type SSCM2	A2R-400	1 3/4"	A2R-XTRA	2"
Watson Bowman Acme	Type R	SE-400	1 3/4"	SE-500	2"

**REDUCED LONGITUDINAL MOVEMENT RANGE**

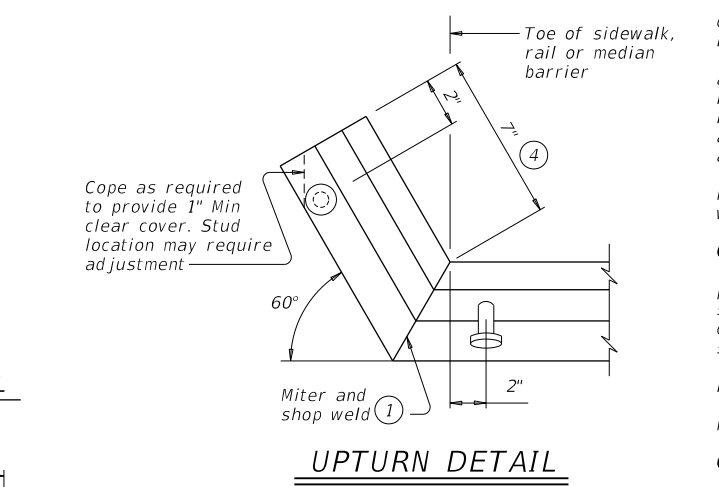
SKEW (deg)	JOINT SIZE	
	4"	5"
0	4.0"	5.0"
15	4.0"	5.0"
30	3.5"	4.3"
45	2.8"	3.5"

**DESIGN NOTES:**  
 Joints installed on a skew have reduced ability to accommodate longitudinal movement. Use table values to determine the correct joint size for skewed installations. For other skews over 25 degrees, calculate reduced movement range by multiplying joint size by cosine (skew).

- Remove all burrs which will be in contact with seal prior to making splice.
- Shape of steel section shown is typical. Variations in sections must be approved by the Engineer.
- These openings are also the recommended minimum installation openings.
- Reduce for sidewalk or parapet heights less than 6".
- Other conditions affecting the joint profile should be noted elsewhere.
- Move transverse bars that are in conflict with SEJ studs, in either the bridge slab or approach slab, to rest at the junction of the studs.
- See Span details for location of break point.
- Align shipping angle perpendicular to joint.



**FIELD SPLICE DETAIL**



**UPTURN DETAIL**

**FABRICATION NOTES:**  
 Temporarily shop assemble corresponding sections of sealed expansion joints (SEJ), check for fit, and match mark for shipment. Secure corresponding sections together for shipment with shipping angle. Do not use erection bolts.

The seal must be continuous and included in the price bid for sealed expansion joint. Ship steel sections in convenient lengths of 10'-0" Min and 24'-0" Max unless necessary for staged construction or widenings. One shop splice is permitted in each shipping length provided no piece is less than 2'-0" long and sufficient studs are added to limit the stud to shop splice distance to 2" Min and 4" Max.

Weld studs in accordance with AWS D1.1. Butt weld all shop and field splices and grind smooth areas in contact with seal. Make all necessary field splice joint preparations in the shop.

Paint the entire steel section with System II or IV primer in accordance with Item 446, "Feild Cleaning and Painting Steel", unless required to galvanize when shown in the plans. Provide galvanizing in accordance with Item 445, "Galvanizing". Provide paints in accordance with Item 446.2. Prepare steel and apply paint in accordance with Item 446.7.3 and 446.7.4.

Shop drawings for the fabrication of sealed expansion joints will not require the Engineer's approval if fabrication is in accordance with the details shown on this standard.

**CONSTRUCTION NOTES:**  
 Secure the sealed expansion joint in position and place to the proper grade and alignment by welding braces to adjacent reinforcing steel, to prestressed beam stirrups, or to anchors cast in concrete diaphragms. Include cost of temporary bracing in the price bid for sealed expansion joint. Remove shipping angle immediately after each joint half is secured in place. Grind smooth, and touch up with organic zinc-rich paint. Clean and prepare seal cavity for seal installation as per the Manufacturer's installation procedures.

**GENERAL NOTES:**  
 Provide sealed expansion joints in the size and at locations shown on the plans. Minimum slab and overhang thickness required for the use of SEJ-M is 6 1/2".

**Texas Department of Transportation** Bridge Division Standard

**SEALED EXPANSION JOINT TYPE M WITHOUT OVERLAY**

**SEJ-M**

FILE: sejmste1-19.dgn	DN: TxDOT	CK: TxDOT	DW: JTR	CK: JMH
©TxDOT April 2019	CONT: 0493	SECT: 02	JOB: 021	HIGHWAY: RM 652
REVISIONS	DIST: ODA	COUNTY: LOVING	SHEET NO. 109	

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DATE: DATE TIME  
FILE: DOCUMENT NAME

### SUMMARY OF SMALL SIGNS

PLAN SHEET NO.	SIGN NO.	SIGN NOMENCLATURE	SIGN	DIMENSIONS (in X in)		ALUMINUM SIGNS (TY A)	ALUMINUM SIGNS (TY G)	POST TYPE	POSTS	ANCHOR TYPE	MOUNTING DESTINATION		BRIDGE MOUNT CLEARANCE SIGNS (See Note 2)
								FRP = Fiberglass TWT = Thin-Wall 10BWG = 10BWG S80 = Sch 80	1 or 2	UA = Universal Conc UB = Universal Bolt SA = Slipbase-Conc SB = Slipbase-Bolt WS = Wedge Steel WP = Wedge Plastic	PREFABRICATED	1EXT or 2EXT = # of Ext. BM = Extruded Wind Beam WC = 1.12 #/ft Wing Channel EXAL = Extruded Alum Sign Panels	
1 of 2	1	W8-13aT		36	X	36	X	10BWG	1	SA	P		

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

The Standard Highway Sign Designs for Texas (SHSD) can be found at the following website:  
<http://www.txdot.gov/>

- NOTE:
- 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.
  - For installation of bridge mount clearance signs, see Bridge Mounted Clearance Sign Assembly (BMCS) Standard Sheet.
  - For Sign Support Descriptive Codes, see Sign Mounting Details Small Roadside Signs General Notes & Details SMD (GEN).



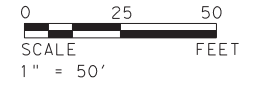
### SUMMARY OF SMALL SIGNS

SOSS

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© TxDOT May 1987	CONT	SECT	JOB	HIGHWAY
REVISIONS	0493	02	021	RM 652
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8-16	ODA	LOVING	110	

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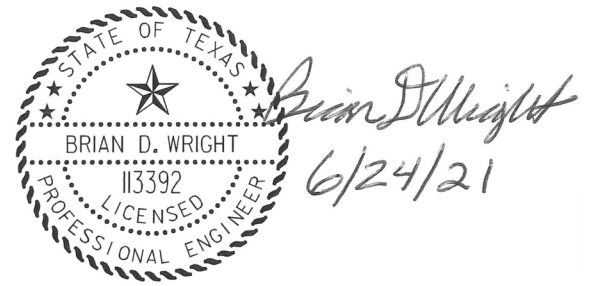


**LEGEND**

- (A) PAV MRK TY I (W 4" SLD)
- (B) PAV MRK TY I (Y 12" SLD)
- (C) PAV MRK TY I (Y 4" SLD)
- (D) PAV MRK TY I (Y 4" BRK)
- (E) RAISED PAV MRK (REFL) TY II A-A
- (F) PROF MRK TY I (W 4" SLD)
- (G) PROF MRK TY I (Y 4" SLD)
- (Z) EXISTING PVMT MRK
- ☉ DEL ASSEM (D-SW) SZ (GF2) (BI)
- ☉ DEL ASSEM (D-SW) SZ (CTB) (BI)
- ▨ OM ASSM (OM-3R) (FLX) (GND)
- ▨ OM ASSM (OM-3L) (FLX) (GND)
- ← TRAVEL LANE
- △ PROPOSED SMALL SIGN AND NUMBER
- POST MOUNTED SIGN

**NOTES:**

1. ALL DIMENSIONS ARE TO CENTERLINE OF PAVEMENT MARKINGS.
2. REFER TO REMOVAL PLAN FOR SIGN REMOVAL LOCATIONS.
3. SIGNS TO BE RELOCATED SHALL BE REMOVED, TEMPORARILY STORED AND REINSTALLED.
4. LOCATION SHOWN BY THIS CALLOUT DOES NOT REPRESENT ACTUAL LOCATION IN PLAN.



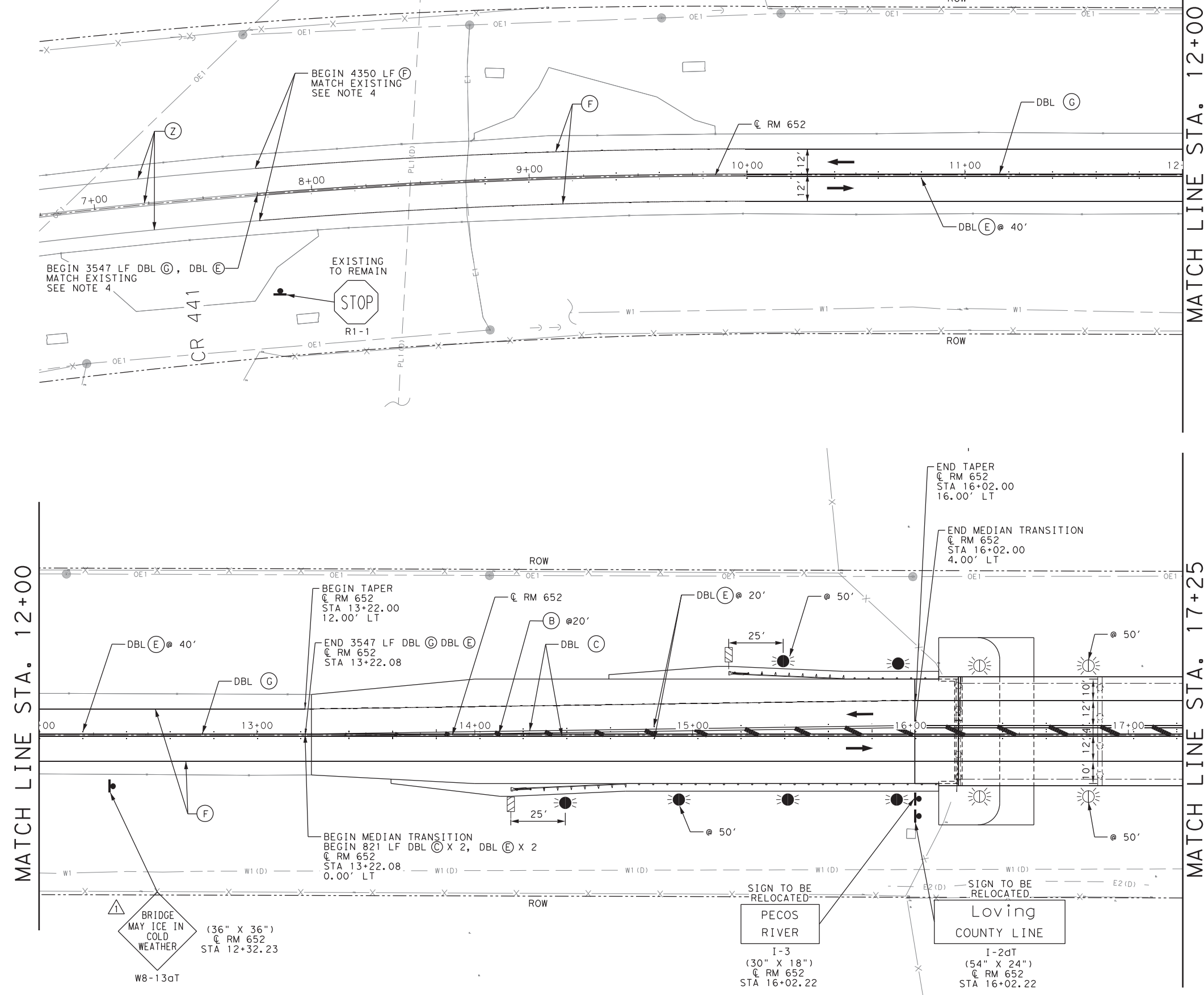
**BRIDGEFARMER & ASSOCIATES, INC.**  
CONSULTING ENGINEERS  
TBPE REGISTRATION NO. 264



**RM 652  
SIGNING & PAVEMENT  
MARKING**

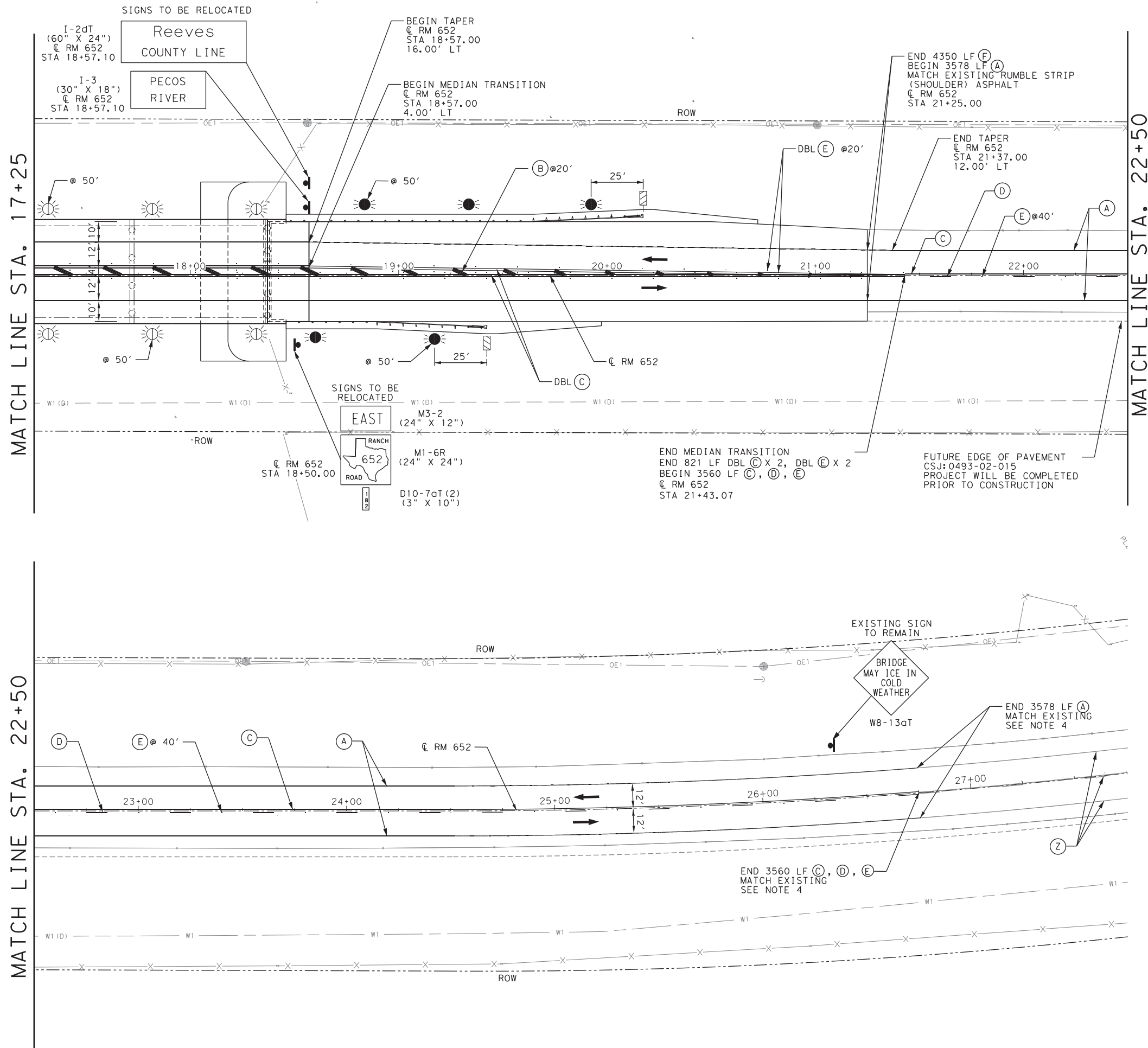
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CHECK BDW	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK BDW	TEXAS	ODA	LOVING	111
	CONTROL	SECTION	JOB	
BDW	0493	02	021	



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MATCH LINE STA. 17+25

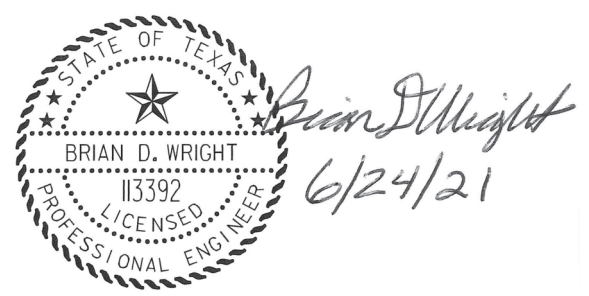
MATCH LINE STA. 22+50

MATCH LINE STA. 22+50



- LEGEND**
- (A) PAV MRK TY I (W 4" SLD)
  - (B) PAV MRK TY I (Y 12" SLD)
  - (C) PAV MRK TY I (Y 4" SLD)
  - (D) PAV MRK TY I (Y 4" BRK)
  - (E) RAISED PAV MRK (REFL) TY II A-A
  - (F) PROF MRK TY I (W 4" SLD)
  - (G) PROF MRK TY I (Y 4" SLD)
  - (Z) EXISTING PVMT MRK
  - ☉ DEL ASSEM (D-SW) SZ (GF2) (BI)
  - ☉ DEL ASSEM (D-SW) SZ (CTB) (BI)
  - ▨ OM ASSM (OM-3R) (FLX) (GND)
  - ▨ OM ASSM (OM-3L) (FLX) (GND)
  - ← TRAVEL LANE
  - △ PROPOSED SMALL SIGN AND NUMBER
  - POST MOUNTED SIGN

- NOTES:**
1. ALL DIMENSIONS ARE TO CENTERLINE OF PAVEMENT MARKINGS.
  2. REFER TO REMOVAL PLAN FOR SIGN REMOVAL LOCATIONS.
  3. SIGNS TO BE RELOCATED SHALL BE REMOVED, TEMPORARILY STORED AND REINSTALLED.
  4. LOCATION SHOWN BY THIS CALLOUT DOES NOT REPRESENT ACTUAL LOCATION IN PLAN.



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



**RM 652  
SIGNING & PAVEMENT  
MARKING**

SCALE: 1" = 50' SHEET 2 OF 2

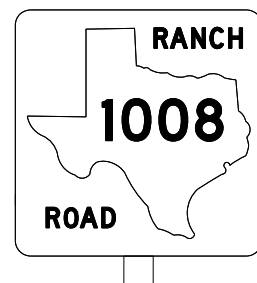
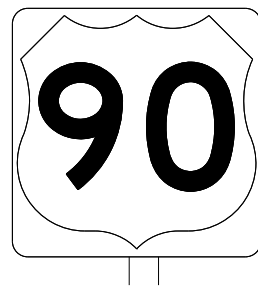
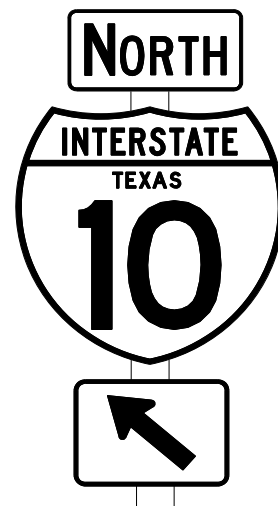
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CHECK	CONTROL	SECTION	JOB	
BDW	0493	02	021	

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DATE: 6/25/2021  
 FILE: c:\transystems\pw\_local\transyscorp-pw1\besn\manek\d0940080\TSR(3)-13.dgn

## REQUIREMENTS FOR INDEPENDENT MOUNTED ROUTE SIGNS

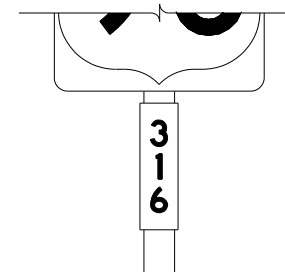
SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	WHITE	TYPE A SHEETING
BACKGROUND	ALL OTHERS	TYPE B OR C SHEETING
LEGEND & BORDERS	WHITE	TYPE A SHEETING
LEGEND & BORDERS	BLACK	ACRYLIC NON-REFLECTIVE FILM
LEGEND & BORDERS	ALL OTHERS	TYPE B or C SHEETING



TYPICAL EXAMPLES

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

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



TYPICAL EXAMPLES

## GENERAL NOTES

- 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).
- 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

- 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).
- 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.
- 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.
- 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.
- Sign substrate shall be any material that meets the Departmental Material Specification requirements of DMS-7110 or approved alternative.
- 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/>



## TYPICAL SIGN REQUIREMENTS

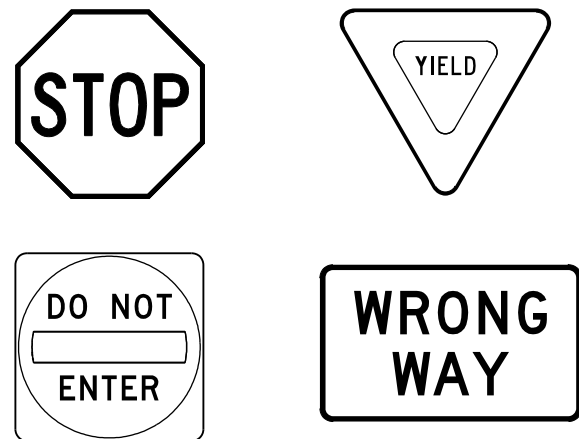
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©TxDOT	October 2003	CONT	SECT	JOB	HIGHWAY				
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12-03	7-13	DIST	COUNTY	SHEET NO.					
9-08		ODA	LOVING	113					

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### REQUIREMENTS FOR RED BACKGROUND REGULATORY SIGNS

(STOP, YIELD, DO NOT ENTER AND WRONG WAY SIGNS)



REQUIREMENTS FOR FOUR SPECIFIC SIGNS ONLY

SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	RED	TYPE B OR C SHEETING
BACKGROUND	WHITE	TYPE B OR C SHEETING
LEGEND & BORDERS	WHITE	TYPE B OR C SHEETING
LEGEND	RED	TYPE B OR C SHEETING

### REQUIREMENTS FOR WHITE BACKGROUND REGULATORY SIGNS

(EXCLUDING STOP, YIELD, DO NOT ENTER AND WRONG WAY SIGNS)



TYPICAL EXAMPLES

SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	WHITE	TYPE A SHEETING
BACKGROUND	ALL OTHERS	TYPE B OR C SHEETING
LEGEND, BORDERS AND SYMBOLS	BLACK	ACRYLIC NON-REFLECTIVE FILM
LEGEND, BORDERS AND SYMBOLS	ALL OTHER	TYPE B OR C SHEETING

### GENERAL NOTES

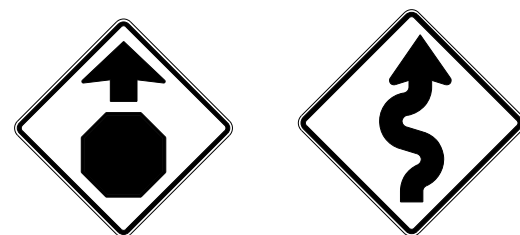
- Signs to be furnished shall be as detailed elsewhere in the plans and/or as shown on sign tabulation sheet. Standard sign designs and arrow dimensions can be found in the "Standard Highway Sign Designs for Texas" (SHSD).
- Sign legend shall use the Federal Highway Administration (FHWA) Standard Highway Alphabets (B, C, D, E, Emod or F).
- 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.
- Black legend and borders shall be applied by screening process or cut-out acrylic non-reflective black film to background sheeting, or combination thereof.
- 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.
- 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.
- Sign substrate shall be any material that meets the Departmental Material Specification requirements of DMS-7110 or approved alternative.
- 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/>

### REQUIREMENTS FOR WARNING SIGNS



TYPICAL EXAMPLES

SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	FLOURESCENT YELLOW	TYPE B <sub>FL</sub> OR C <sub>FL</sub> 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 <sub>FL</sub> OR C <sub>FL</sub> SHEETING
LEGEND, BORDERS AND SYMBOLS	BLACK	ACRYLIC NON-REFLECTIVE FILM
SYMBOLS	RED	TYPE B OR C SHEETING



## TYPICAL SIGN REQUIREMENTS

TSR(4) - 13

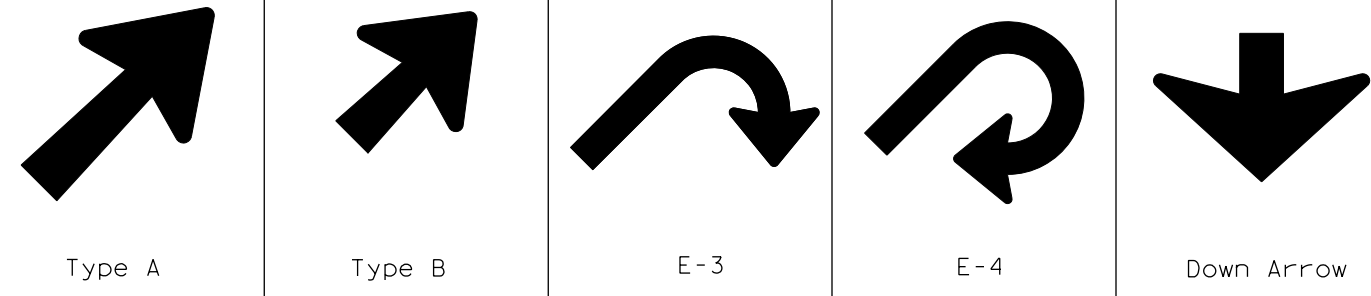
FILE:	tsr4-13.dgn	DN:	TxDOT	CK:	TxDOT	DW:	TxDOT	CK:	TxDOT
© TxDOT	October 2003	CONT	SECT	JOB	HIGHWAY				
REVISIONS		0493	02	021	RM 652				
12-03	7-13	DIST	COUNTY	SHEET NO.					
9-08		ODA	LOVING	114					

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DATE: 6/25/2021  
 FILE: c:\transystems\pw\_local\transyscorp-pw1\bes\manek\d0940080\TSR(5)-13.dgn

### ARROW DETAILS

for Large Ground-Mounted and Overhead Guide Signs



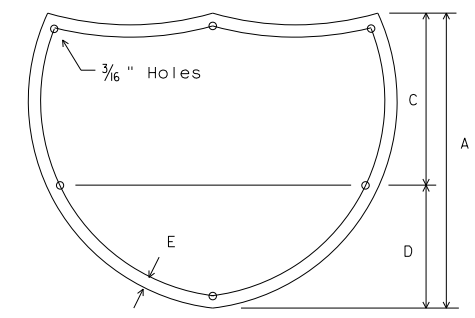
TYPE	LETTER SIZE	USE
A-1	10.67" U/L and 10" Caps	Single Lane Exits
A-2	13.33" U/L and 12" Caps	
A-3	16" & 20" U/L	
B-1	10.67" U/L and 10" Caps	Multiple Lane Exits
B-2	13.33" U/L and 12" Caps	
B-3	16" & 20" U/L	

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.

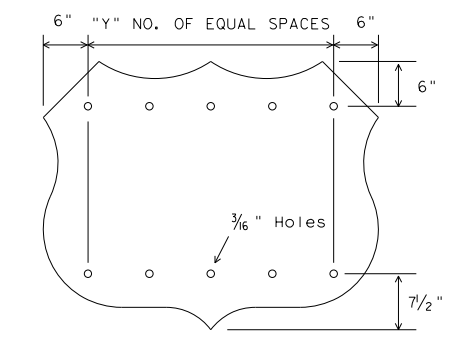
The Standard Highway Sign Designs for Texas (SHSD) can be found at the following website:  
<http://www.txdot.gov/>

### SIGN BLANK PUNCHING DETAILS FOR ATTACHMENTS WHEN SPECIFIED TO BE TYPE A ALUMINUM SIGNS (FOR MOUNTING TO GUIDE SIGN FACE)



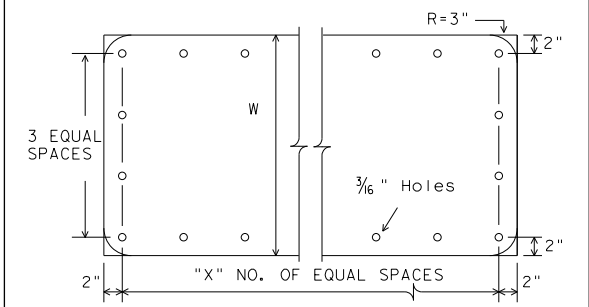
INTERSTATE ROUTE MARKERS

A	C	D	E
36	21	15	1 1/2
48	28	20	1 3/4



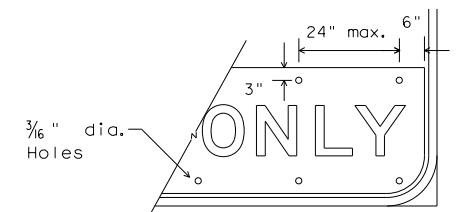
U.S. ROUTE MARKERS

Sign Size	"Y"
24x24	2
30x24	3
36x36	3
45x36	4
48x48	4
60x48	5



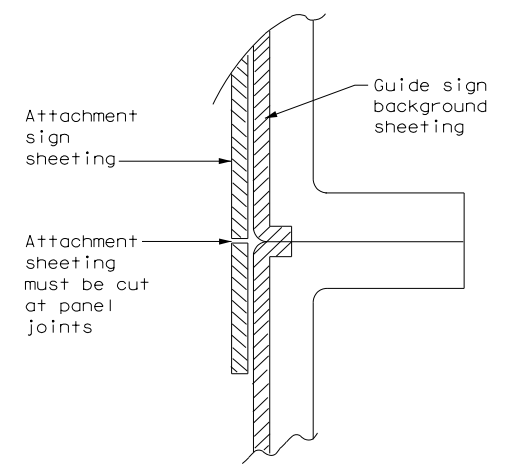
STATE ROUTE MARKERS

No. of Digits	W	X
4	24	4
4	36	5
4	48	6
3	24	3
3	36	4
3	48	5

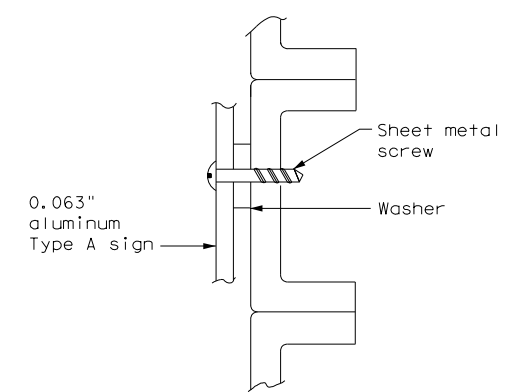


EXIT ONLY PANEL

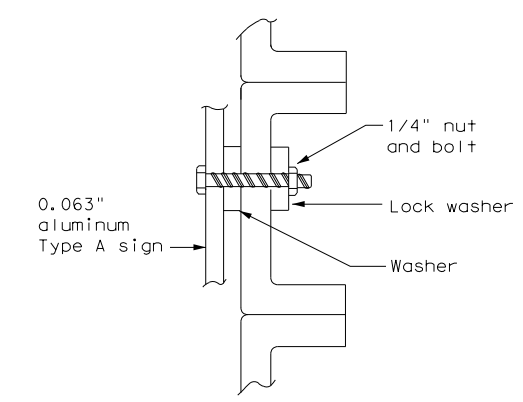
### MOUNTING DETAILS OF ATTACHMENTS TO GUIDE SIGN FACE ("EXIT ONLY" AND "LEFT EXIT" PANELS, ROUTE MARKERS AND OTHER ATTACHMENTS)



DIRECT APPLIED ATTACHMENT



SCREW ATTACHMENT

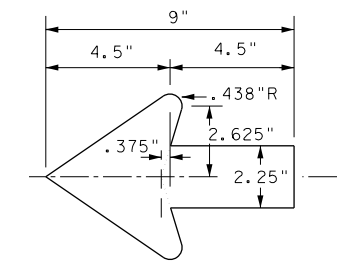


NUT/BOLT ATTACHMENT

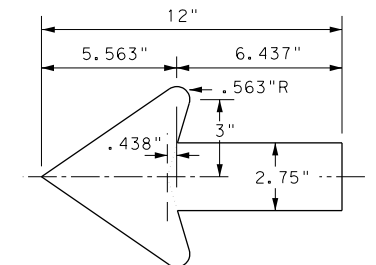
**NOTE:**  
 1. Sheeting for legend, symbols, and borders must be cut at panel joints.  
 2. Direct applied attachment signs will be subsidiary to "Aluminum Signs" or "Fiberglass Signs".

**NOTE:**  
 Furnish Type A aluminum sign attachments only when specified in the plans. These signs will be paid for under "Aluminum Signs".

### ARROW DETAILS for Destination Signs (Type D)



Standard arrow to be used with 6 inch letters.



Standard arrow to be used with 8 inch letters.



## TYPICAL SIGN REQUIREMENTS

### TSR(5) - 13

FILE: tsr5-13.dgn	DN: TxDOT	CK: TxDOT	DN: TxDOT	CK: TxDOT
©TxDOT October 2003	CONT	SECT	JOB	HIGHWAY
REVISIONS	0493	02	021	RM 652
12-03 7-13	DIST	COUNTY	SHEET NO.	
9-08	ODA	LOVING	115	



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DATE: 6/25/2021  
 FILE: c:\transystems\pw\_local\transyscorp-pw1\bes\manek\d0940080\VD&OM(1)-20.dgn

REFLECTOR UNIT SIZES FOR DELINEATORS AND OBJECT MARKERS					DELINEATORS				D & OM DESCRIPTIVE CODES				
DEVICE	SIZE 1	SIZE 2	SIZE 3	SIZE 4	SINGLE		DOUBLE		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 BRFL = 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			
SHEETING	Yellow, White or Red Type B or C reflective sheeting				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.				POST TYPE	WC	YFLX, WFLX	WC	YFLX, WFLX	DIRECTION			
					MOUNT TYPE	GND	GND, SRF	GND	GND, SRF	INSTL OM ASSM (OM-XX) (XXXX)XXX (XX)			
OBJECT MARKERS													
DEVICE	Type 1 (OM-1)	Type 2 (OM-2)			Type 3 (OM-3)			Type 4 (OM-4)		TYPE OF OBJECT MARKER 1, 2, 3, or 4 NUMBER OF REFLECTORS OR DIRECTION X = 3-Size 2 reflector unit (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			
		OM-1	OM-2X	OM-2Y	OM-2Z	OM-3L	OM-3R	OM-3C	OM-4		TYPE OF MOUNT GND = Embedded (drivable) SRF = Surface Mount WAS = Wedge Anchor Steel WAP = Wedge Anchor Plastic DIRECTION If Required BI = Bi-Directional		
SHEETING	Yellow-Type B <sub>FL</sub> or C <sub>FL</sub> Sheeting	Yellow - Type B or C Sheeting			Alternating acrylic black and retroreflective yellow - Type B <sub>FL</sub> or C <sub>FL</sub> Sheeting			Red -Type B <sub>FL</sub> or C <sub>FL</sub> Sheeting		DEPARTMENTAL MATERIAL SPECIFICATIONS			
POST TYPE	TWT	WC	WC	WFLX	TWT			TWT	FLEXIBLE DELINEATOR & OBJECT MARKER POSTS (EMBEDDED & SURFACE MOUNT TYPES)		DMS-4400		
MOUNT TYPE	WAS, WAP	GND	GND	GND, SRF	WAS, WAP			WAS, WAP	SIGN FACE MATERIALS		DMS-8300		
									DELINEATORS, OBJECT MARKERS AND BARRIER REFLECTORS		DMS-8600		
BARRIER REFLECTORS (BRF)			CHEVRONS				ONE DIRECTION LARGE ARROW						
DEVICE	GF1	GF2	CTB	W1-8				W1-6					
SHEETING	Yellow, White, Red			NOTE				NOTE:					
NOTE	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.			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).				DELINEATOR & OBJECT MARKER MATERIAL DESCRIPTION D & OM(1)-20					
				SIZE (W x L)	18" x 24" (Conventional)	24" x 30" (Conventional Oversize)	30" x 36" (Expressway)	36" x 48" (Freeway)	SIZE (W x L)	48" x 24" (Conventional)	60" x 30" (Expressway & Freeway)	FILE: dcm1-20.dgn © TxDOT August 2004 REVISIONS 10-09 3-15 4-10 7-20	DN: TxDOT CK: TxDOT DW: TxDOT CK: TxDOT CONT SECT 0493 02 DIST COUNTY SHEET NO. ODA LOVING 116
				MOUNTING HEIGHT	4'-0" or 7'-0"		7'-0" Only		MOUNTING HEIGHT	7'-0"		20A	

**NOTE:**  
 Delineator and object marker substrates and sign substrates shall be 0.080" Aluminum sign blank to conform to ASTM B-209 Alloy 6061-T6 or approved alternative.

**Texas Department of Transportation**  
 Traffic Safety Division Standard

**DELINEATOR & OBJECT MARKER MATERIAL DESCRIPTION**  
 D & OM(1)-20

FILE: dcm1-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT August 2004	CONT SECT	JOB	HIGHWAY	
REVISIONS	0493 02	021	RM 652	
10-09 3-15	DIST	COUNTY	SHEET NO.	
4-10 7-20	ODA	LOVING	116	

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DATE: 6/25/2021  
 FILE: c:\transystems\pw\_local\transyscorp-pw1\besn.imanek\d0940080.VD&OM(2)-20.dwg

POST TYPE AND SUPPORT FOUNDATION DETAILS				TYPE OF BARRIER MOUNTS	
WING CHANNEL (WC)	FLEXIBLE POSTS (YFLX, WFLX)		WEDGE ANCHOR SYSTEMS		GUARD FENCE ATTACHMENT
GND	GND	SRF	WAS	WAP	GF 1
	EMBEDDED	SURFACE MOUNT	STEEL	PLASTIC	GF 2
<b>NOTES</b> 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.			<b>NOTE</b> 1. Install per manufacturer's recommendations.		
<b>NOTES</b> 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.					<b>CONCRETE TRAFFIC BARRIER (CTB)</b> 
<b>TYPES 1, 3, AND 4 OBJECT MARKERS AND CHEVRONS</b>		<b>CHEVRONS AND ONE DIRECTION LARGE ARROW SIGN</b>		<b>DELINEATORS AND TYPE 2 OBJECT MARKERS</b>	
<b>NOTE</b> 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)		<b>NOTE</b> 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.		<b>NOTE</b> See general notes 1, 2 and 3.	
<b>GENERAL NOTES</b> 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.					
<b>DELINATOR &amp; OBJECT MARKER INSTALLATION</b> <b>D &amp; OM(2)-20</b>					
FILE: dom2-20.dgn © TxDOT August 2004 10-09 3-15 4-10 7-20		DN: TxDOT CONT 0493 SECT 02 DIST ODA		CK: TxDOT JOB 021 COUNTY LOVING SHEET NO. 117	
20B					

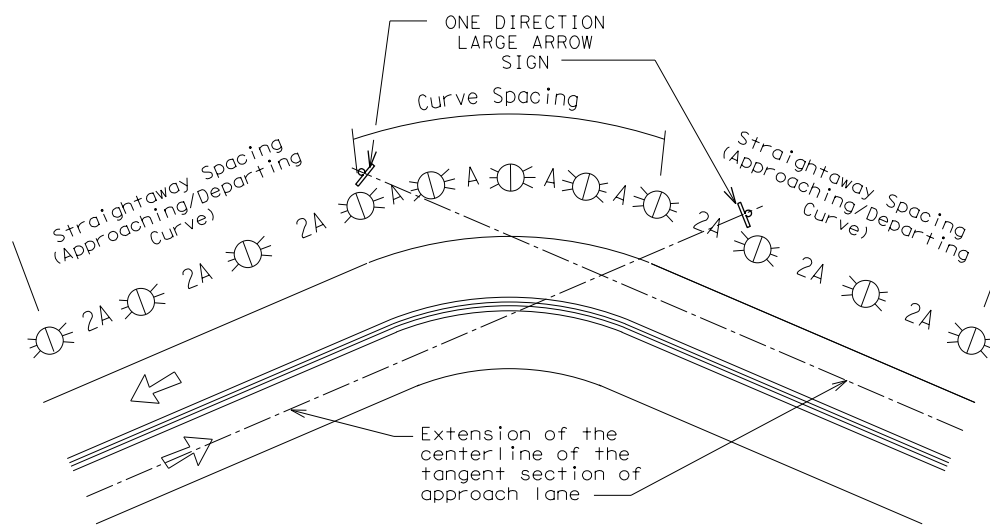
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 FILE: c:\transystems\pw\_local\transyscorp-pw1\besn\manek\d0940080\VD&OM(3)-20.dgn

### MINIMUM WARNING DEVICES AT CURVES WITH ADVISORY SPEEDS

Amount by which Advisory Speed is less than Posted Speed	Curve Advisory Speed	
	Turn (30 MPH or less)	Curve (35 MPH or more)
5 MPH & 10 MPH	● RPMs	● RPMs
15 MPH & 20 MPH	● RPMs and One Direction Large Arrow sign	● RPMs and Chevrons; or ● RPMs and One Direction Large Arrow sign where geometric conditions or roadside obstacles prevent the installation of chevrons.
25 MPH & more	● RPMs and Chevrons; or ● RPMs and One Direction Large Arrow sign where geometric conditions or roadside obstacles prevent the installation of chevrons	● RPMs and Chevrons

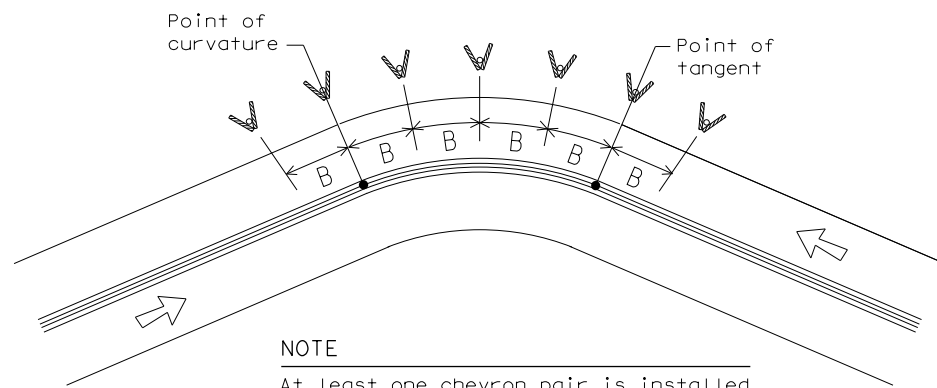
### SUGGESTED SPACING FOR DELINEATORS ON HORIZONTAL CURVES



**NOTE**

ONE DIRECTION LARGE ARROW (W1-6) sign should be located at approximately and perpendicular to the extension of the centerline of the tangent section of approach lane.

### SUGGESTED SPACING FOR CHEVRONS ON HORIZONTAL CURVES



**NOTE**

At least one chevron pair is installed beyond the point of tangent in tangent section.

### DELINEATOR AND CHEVRON SPACING

WHEN DEGREE OF CURVE OR RADIUS IS KNOWN				
Degree of Curve	FEET			
	Radius of Curve	Spacing in Curve	Spacing in Straightaway	Chevron Spacing in Curve
		A	2A	B
1	5730	225	450	—
2	2865	160	320	—
3	1910	130	260	200
4	1433	110	220	160
5	1146	100	200	160
6	955	90	180	160
7	819	85	170	160
8	716	75	150	160
9	637	75	150	120
10	573	70	140	120
11	521	65	130	120
12	478	60	120	120
13	441	60	120	120
14	409	55	110	80
15	382	55	110	80
16	358	55	110	80
19	302	50	100	80
23	249	40	80	80
29	198	35	70	40
38	151	30	60	40
57	101	20	40	40

Curve delineator approach and departure spacing should include 3 delineators spaced at 2A. This spacing should be used during design preparation or when the degree of curve is known.

### DELINEATOR AND CHEVRON SPACING

WHEN DEGREE OF CURVE OR RADIUS IS NOT KNOWN			
Advisory Speed (MPH)	Spacing in Curve	Spacing in Straightaway	Chevron Spacing in Curve
	A	2xA	B
65	130	260	200
60	110	220	160
55	100	200	160
50	85	170	160
45	75	150	120
40	70	140	120
35	60	120	120
30	55	110	80
25	50	100	80
20	40	80	80
15	35	70	40

If the degree of curve is not known, delineator spacing may be determined based on the Advisory Speed of the curve. Use the delineator curve spacing for each Advisory Speed (MPH).

### DELINEATOR AND OBJECT MARKER APPLICATION AND SPACING

CONDITION	REQUIRED TREATMENT	MINIMUM SPACING
Frwy./Exp. Tangent	RPMs	See PM-series and FPM-series standard sheets
Frwy./Exp. Curve	Single delineators on right side	See delineator spacing table
Frwy/Exp. Ramp	Single delineators on at least one side of ramp (should be on outside of curves) (see Detail 3 on D&OM(4))	100 feet on ramp tangents Use delineator spacing table for ramp curves ("straightway spacing" does not apply to ramp curves)
Acceleration/Deceleration Lane	Double delineators (see Detail 3 on D&OM(4))	100 feet (See Detail 3 on D & OM (4))
Truck Escape Ramp	Single red delineators on both sides	50 feet
Bridge Rail (steel or concrete) and Metal Beam Guard Fence	Bi-Directional Delineators when undivided with one lane each direction Single Delineators when multiple lanes each direction	Equal spacing (100' max) but not less than 3 delineators
Concrete Traffic Barrier (CTB) or Steel Traffic Barrier	Barrier reflectors matching the color of the edge line	Equal spacing 100' max
Cable Barrier	Reflectors matching the color of the edge line	Every 5th cable barrier post (up to 100' max)
Guard Rail Terminus/Impact Head	Divided highway - Object marker on approach end Undivided 2-lane highways - Object marker on approach and departure end	Requires reflective sheeting provided by manufacturer per D & OM (VIA) or a Type 3 Object Marker (OM-3) in front of the terminal end See D & OM (5) and D & OM (6)
Bridges with no Approach Rail	Type 3 Object Marker (OM-3) at end of rail and 3 single delineators approaching rail	See D & OM(5)
Reduced Width Approaches to Bridge Rail	Type 2 and Type 3 Object Markers (OM-3) and 3 single delineators approaching bridge	Requires reflective sheeting provided by manufacturer per D & OM (VIA) or a Type 3 Object Marker (OM-3) in front of the terminal end See D & OM (5)
Culverts without MBGF	Type 2 Object Markers	See Detail 2 on D & OM(4)
Crossovers	Double yellow delineators and RPMs	See Detail 1 on D & OM (4)
Pavement Narrowing (lane merge) on Freeways/Expressway	Single delineators adjacent to affected lane for full length of transition	100 feet

**NOTES**

- 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.
- Barrier reflectors may be used to replace required delineators.
- Single red delineators may be mounted on the back side of delineator posts for wrong way driver applications

LEGEND	
	Bi-directional Delineator
	Delineator
	Sign



## DELINEATOR & OBJECT MARKER PLACEMENT DETAILS

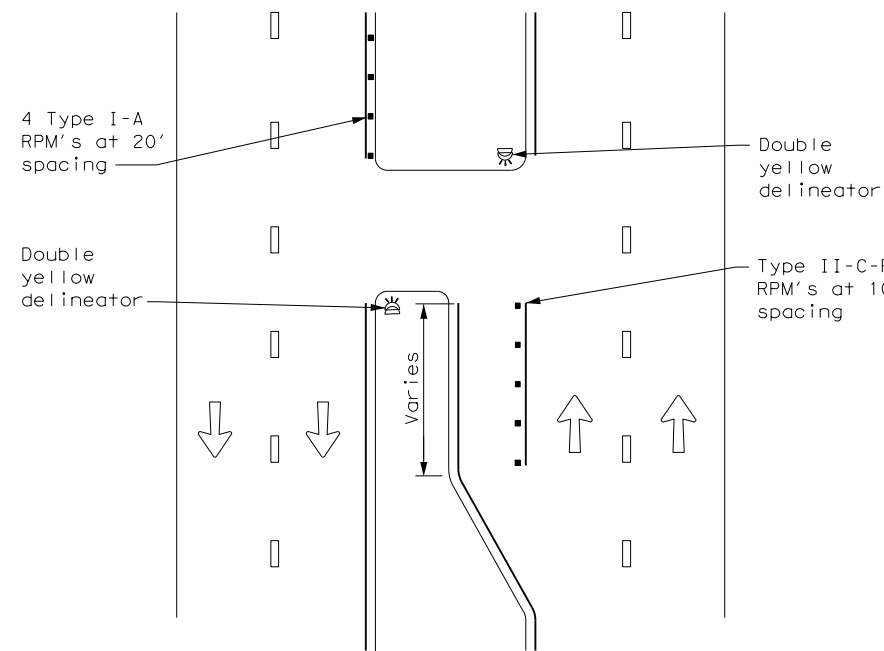
### D & OM(3)-20

FILE: dom3-20.dgn	DN: TxDOT	CK: TxDOT	DN: TxDOT	CK: TxDOT
© TxDOT August 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS	0493	02	021	RM 652
3-15 8-15	DIST	COUNTY	SHEET NO.	
8-15 7-20	ODA	LOVING	118	

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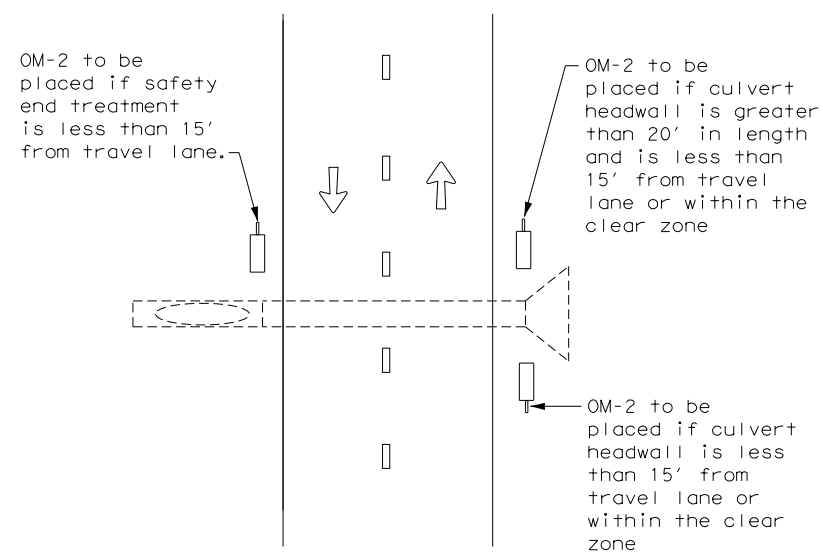
DATE: 6/25/2021  
 FILE: c:\transystems\pw\_local\transyscorp-pw1\besn\manek\d0940080.VD&OM(4)-20.dwg

**CROSSOVERS**



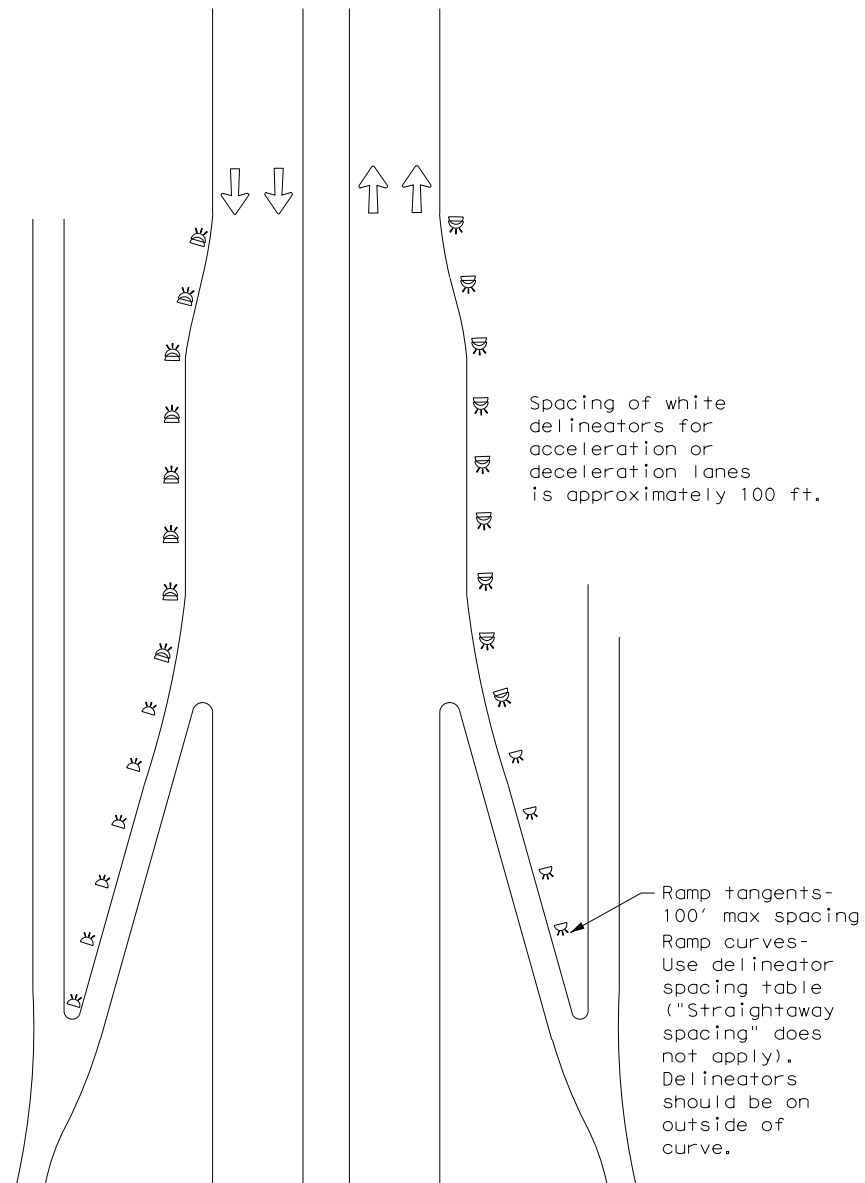
**DETAIL 1**

**FOR CULVERTS WITHOUT MBGF**



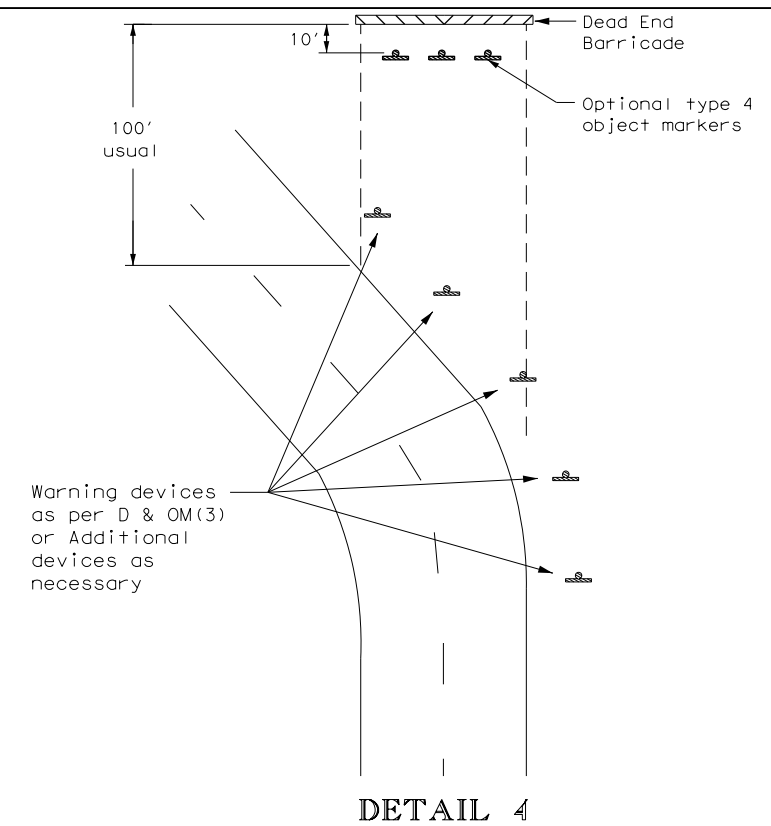
**DETAIL 2**

**FREEWAY DELINEATION FOR RAMPS AND ACCELERATION/DECELERATION LANES**



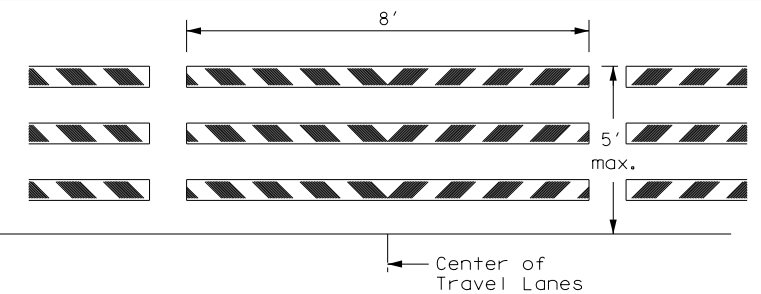
**DETAIL 3**

**TYPICAL APPLICATION OF DEAD END BARRICADE**



**DETAIL 4**

**TYPICAL DEAD END BARRICADE INSTALLATION**



**NOTES**

- Barricade striping shall be red and white reflective sheeting for all permanent road closures.
- Barricade striping is red and white sloping toward the center of the roadway.
- Type 3 Barricade Supports should be anchored to soil or pavement as described in compliant Work Zone Traffic Control Devices List, section D.2.f and D.2.g.

**DETAIL 5**

LEGEND	
	Bidirectional Delineator
	Delineator
	OM-3
	Barricade
	Sign
	OM-2
	Double Delineator

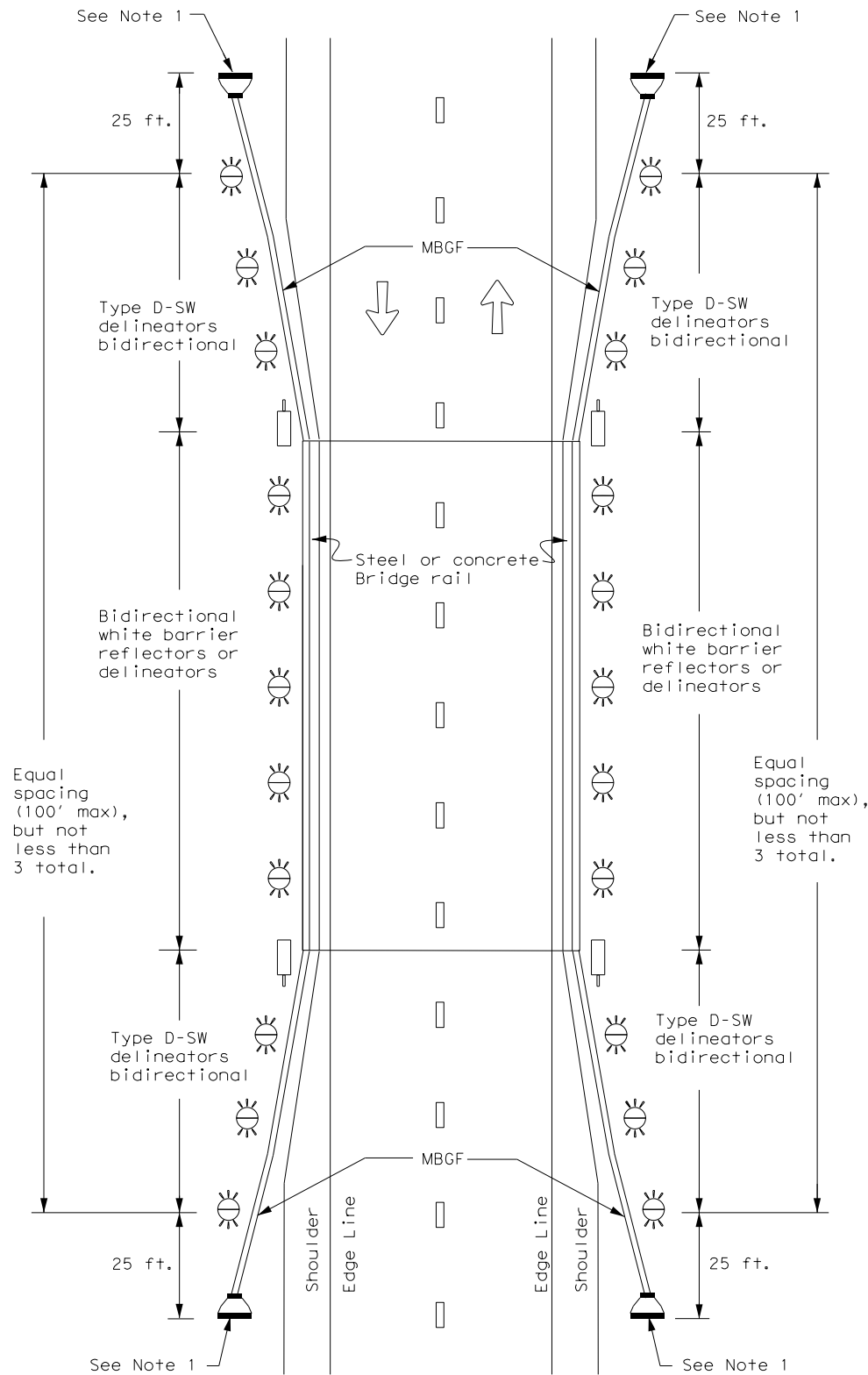


**DELINEATOR & OBJECT MARKER PLACEMENT DETAILS**

**D & OM(4)-20**

FILE: dom4-20.dgn	DN: TxDOT	CK: TxDOT	DN: TxDOT	CK: TxDOT
© TxDOT August 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS	0493	02	021	RM 652
3-15	DIST	COUNTY	SHEET NO.	
7-20	ODA	LOVING	119	

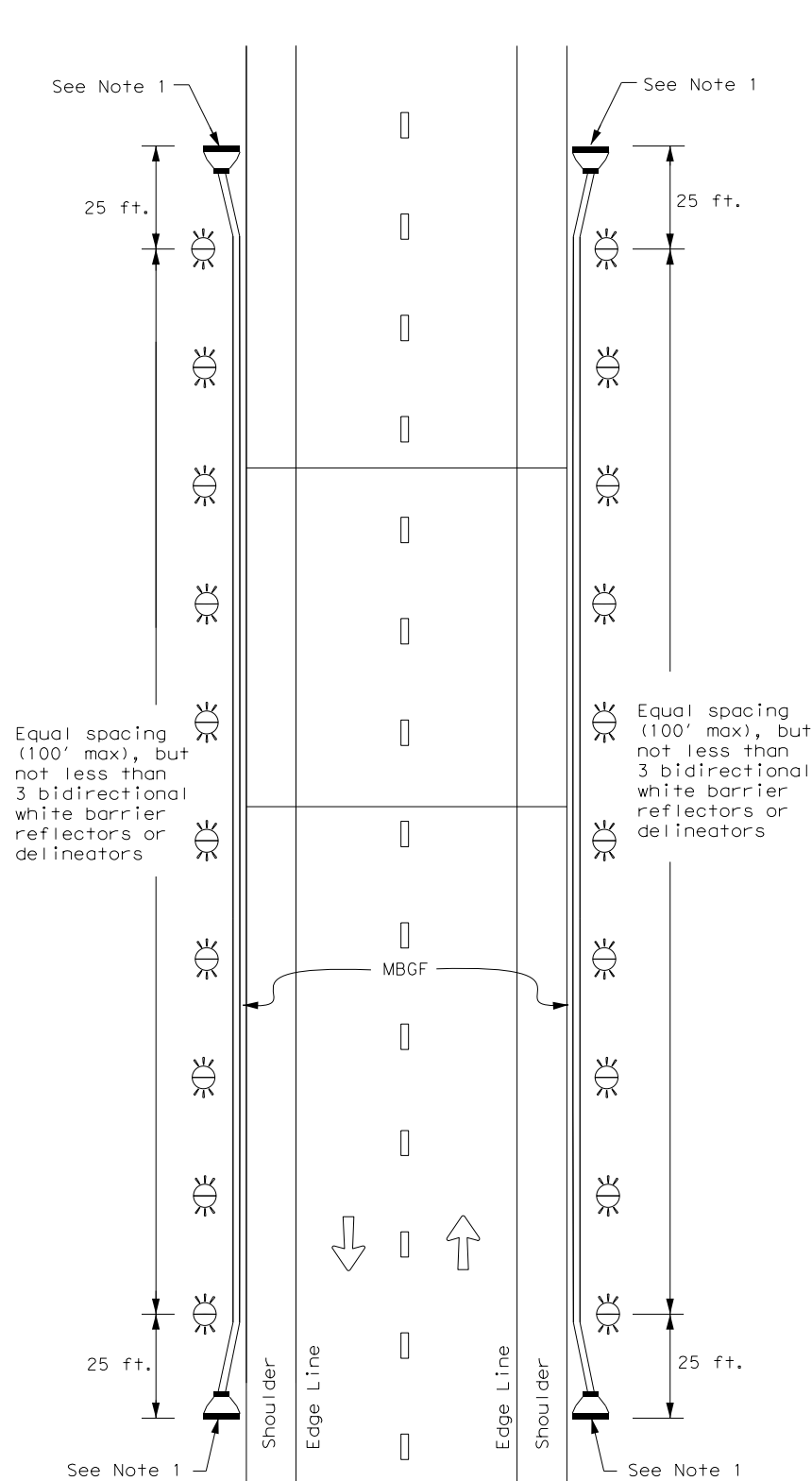
**TWO-WAY, TWO LANE ROADWAY  
WITH REDUCED WIDTH APPROACH RAIL**



**NOTE:**

1. Terminal ends require reflective sheeting provided by manufacturer per D & OM (VIA) or a Type 3 Object Marker (OM-3) in front of the terminal end.

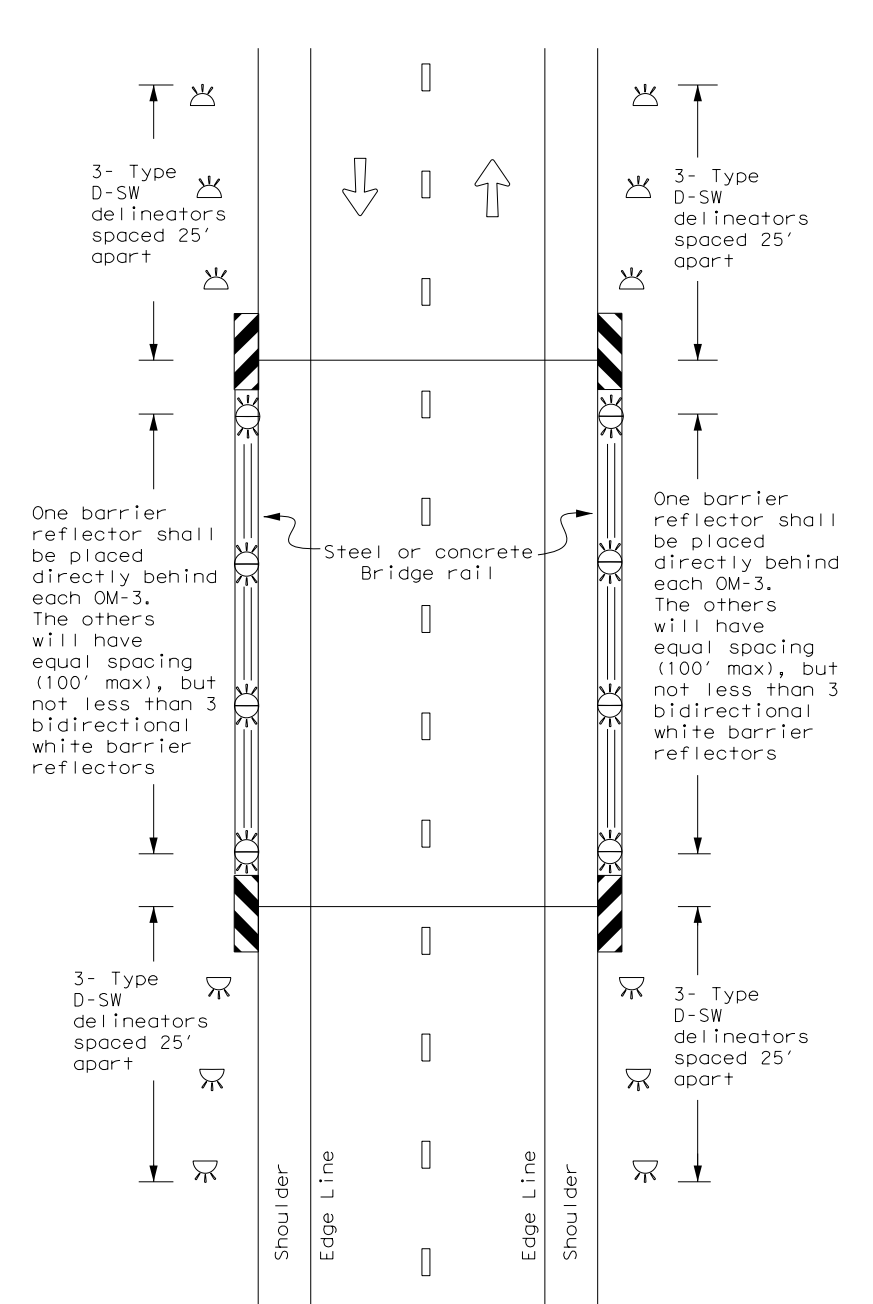
**TWO-WAY, TWO LANE ROADWAY  
WITH METAL BEAM GUARD FENCE (MBGF)**



**NOTE:**

1. Terminal ends require reflective sheeting provided by manufacturer per D & OM (VIA) or a Type 3 Object Marker (OM-3) in front of the terminal end.

**TWO-WAY, TWO LANE ROADWAY  
BRIDGE WITH NO APPROACH RAIL**



**LEGEND**

	Bidirectional Delineator
	Delineator
	OM-3
	OM-2
	Terminal End
	Traffic Flow



**DELINEATOR &  
OBJECT MARKER  
PLACEMENT DETAILS**

**D & OM(5) - 20**

FILE: dom5-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT August 2015	CONT	SECT	JOB	HIGHWAY
REVISIONS	0493	02	021	RM 652
7-20	DIST	COUNTY	SHEET NO.	
	ODA	LOVING	120	

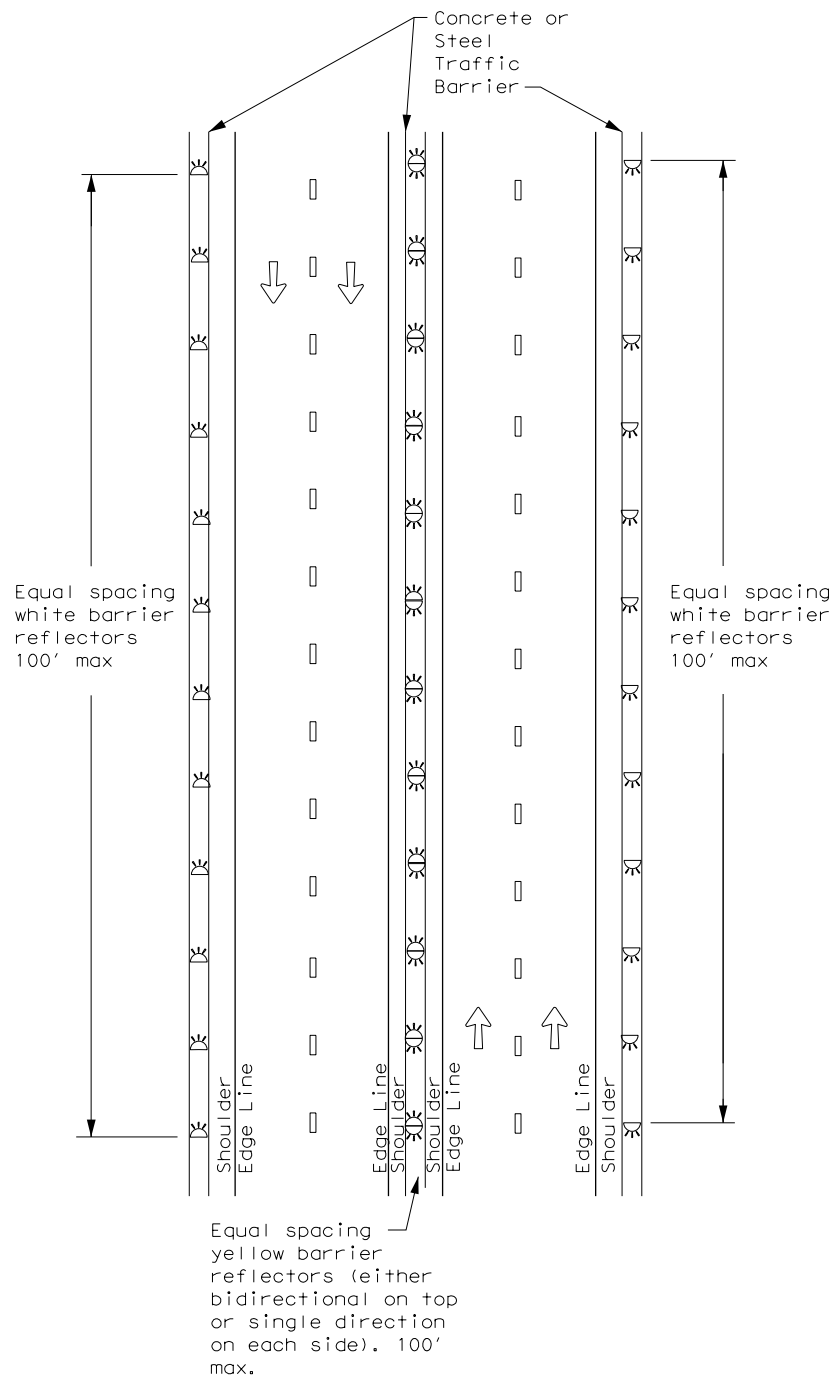
DISCLAIMER: The use of this standard is governed by the "Texas Engineering Practice Act". No warranty of any kind is made by TxDOT for any purpose whatsoever. TxDOT assumes no responsibility for the conversion of any kind to other formats or for incorrect results or damages resulting from its use.

DATE: 6/25/2021  
FILE: c:\transystems\pw\_local\transyscorp-pw1\besn\manek\d0940080\VD&OM(5) - 20.dgn

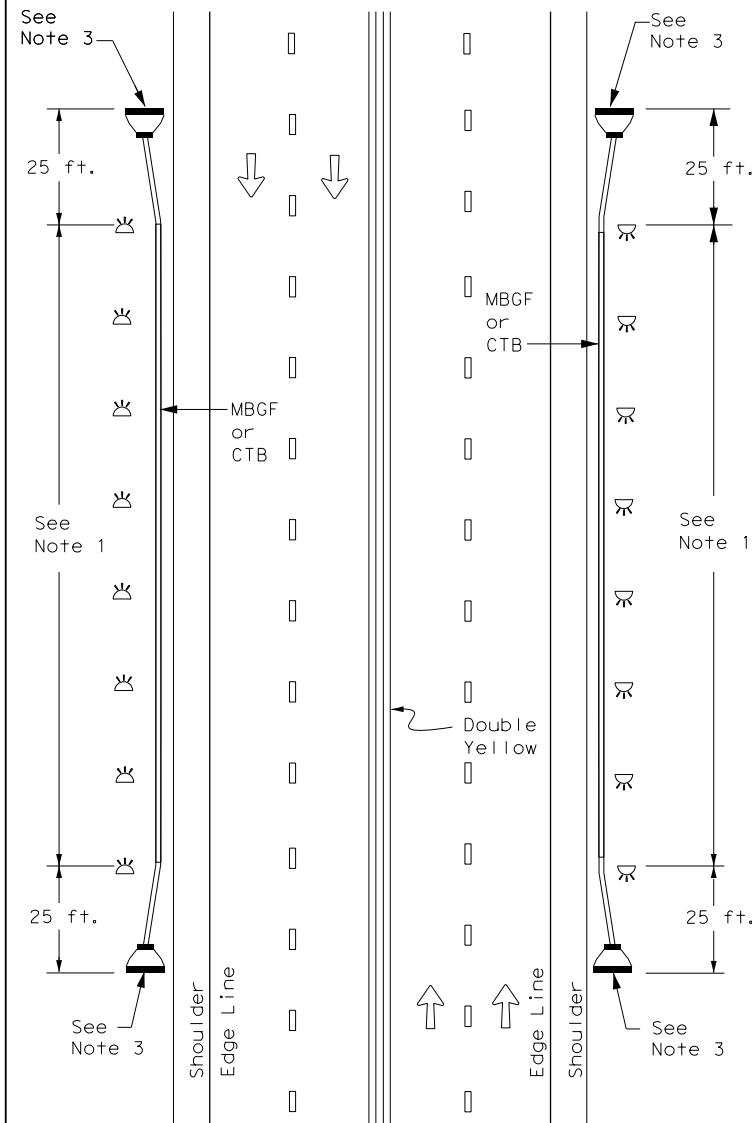
DISCLAIMER: The use of this standard is governed by the "Texas Engineering Practice Act". No warranty of any kind is made by TxDOT for any purpose whatsoever. TxDOT assumes no responsibility for the conversion of this standard to other formats or for incorrect results or damages resulting from its use.

DATE: 6/25/2021  
 FILE: c:\transystems\pw\_local\transyscorp-pw1\besn\manek\d0940080\VD&OM(6)-20.dwg

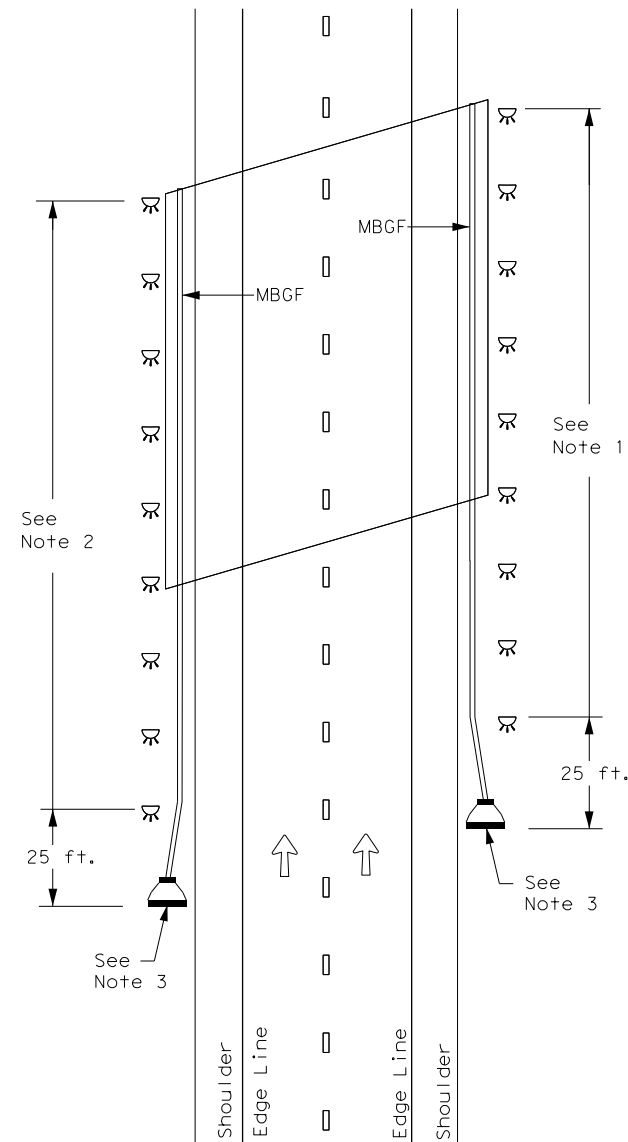
### CONTINUOUS CONCRETE OR STEEL BARRIER



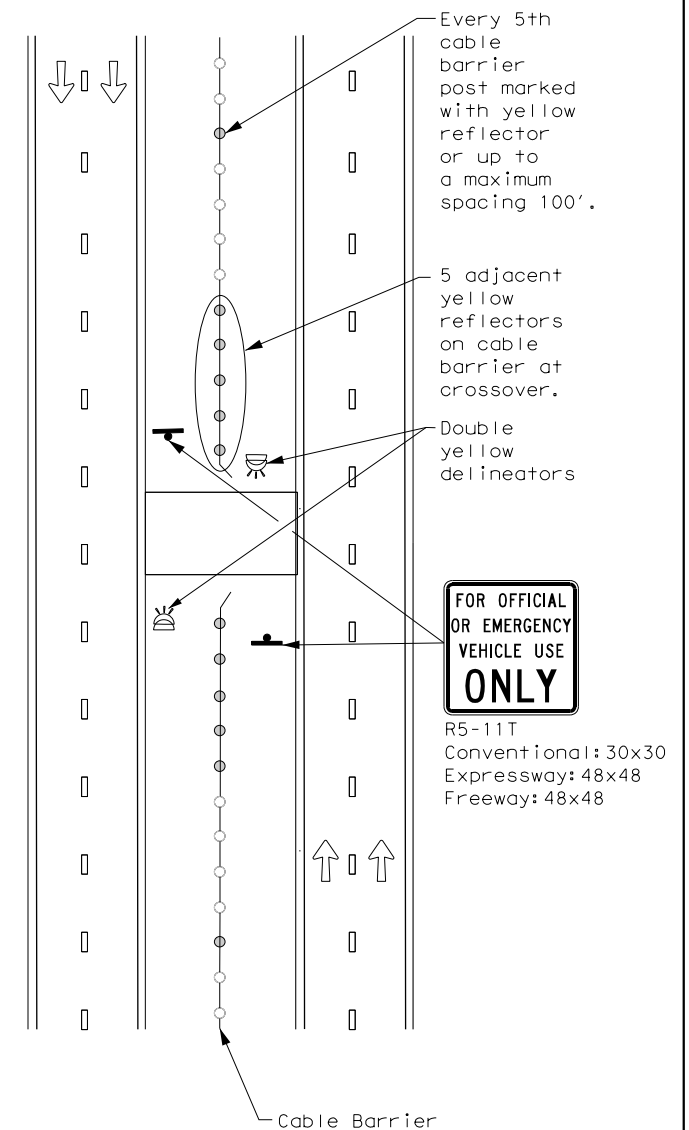
### MULTI-LANE UNDIVIDED, TWO-WAY ROADWAY WITH METAL BEAM GUARD FENCE (MBGF)



### DIVIDED ROADWAY WITH METAL BEAM GUARD FENCE (MBGF)



### EMERGENCY CROSSOVER



#### NOTES

1. Equal spacing (100' max), but not less than 3 single directional white barrier reflectors or delineators. On Continuous Barrier, equal spacing (100' max.)
2. Equal spacing (100' max), but not less than 3 single directional yellow barrier reflectors or delineators.
3. Terminal ends require reflective sheeting provided by manufacturer per D & OM (VIA) or a Type 3 Object Marker (OM-3) in front of the terminal end.

#### LEGEND

	Bidirectional Delineator
	Delineator
	OM-3
	OM-2
	Terminal End
	Traffic Flow



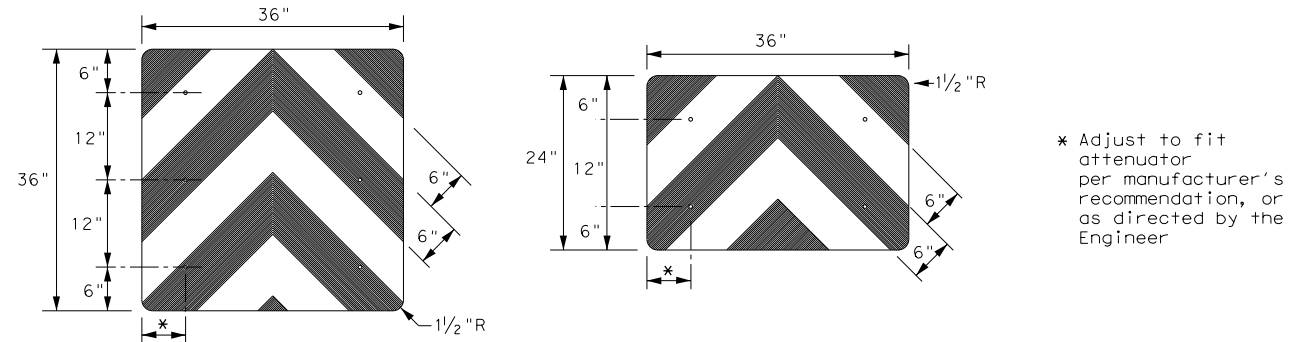
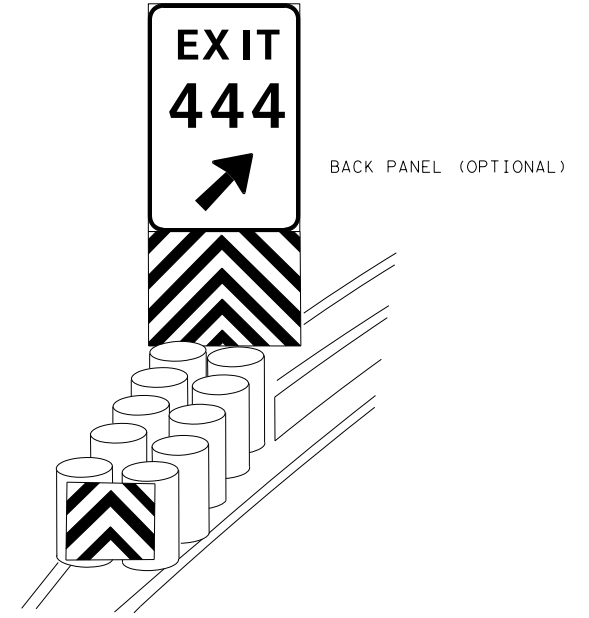
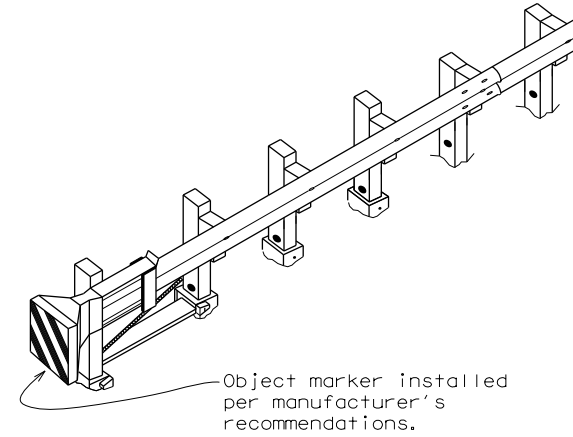
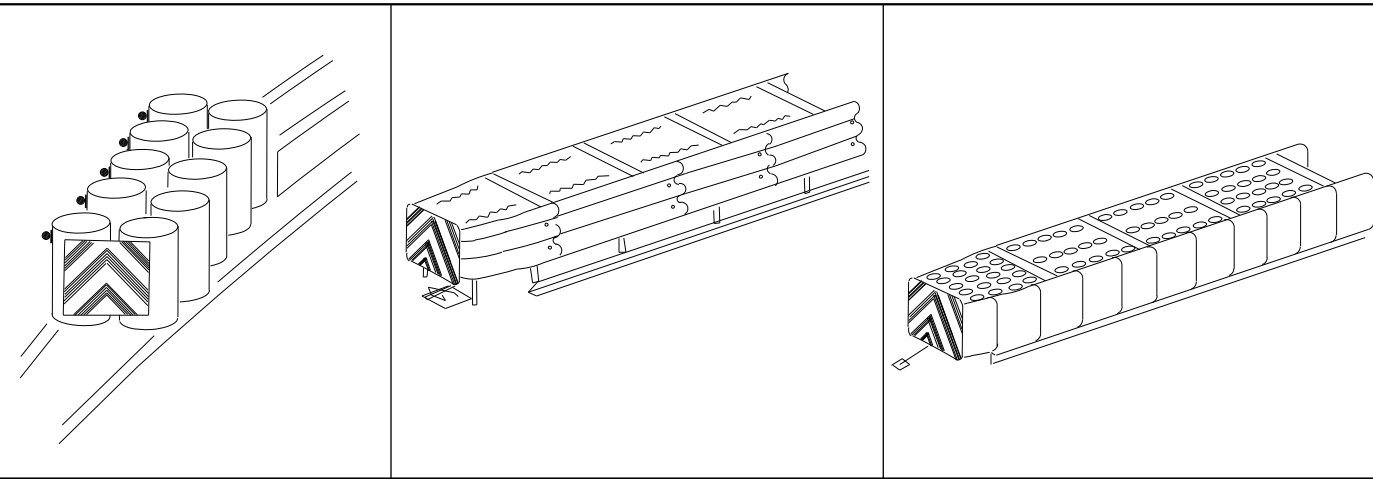
## DELINEATOR & OBJECT MARKER PLACEMENT DETAILS

### D & OM(6)-20

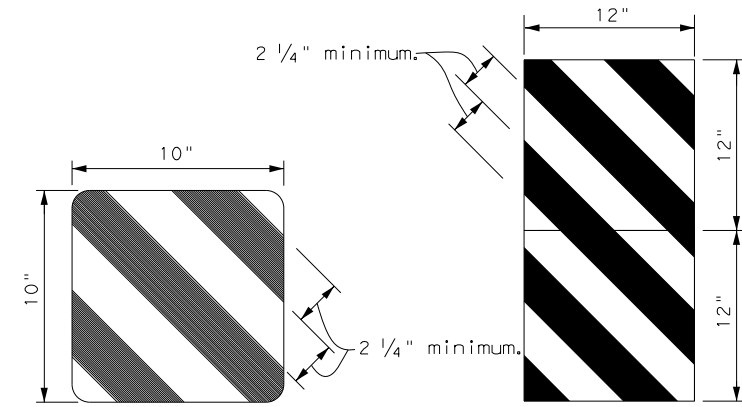
FILE: dom6-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT August 2015	CONT	SECT	JOB	HIGHWAY
7-20	0493	02	021	RM 652
	DIST	COUNTY	SHEET NO.	
	ODA	LOVING	121	

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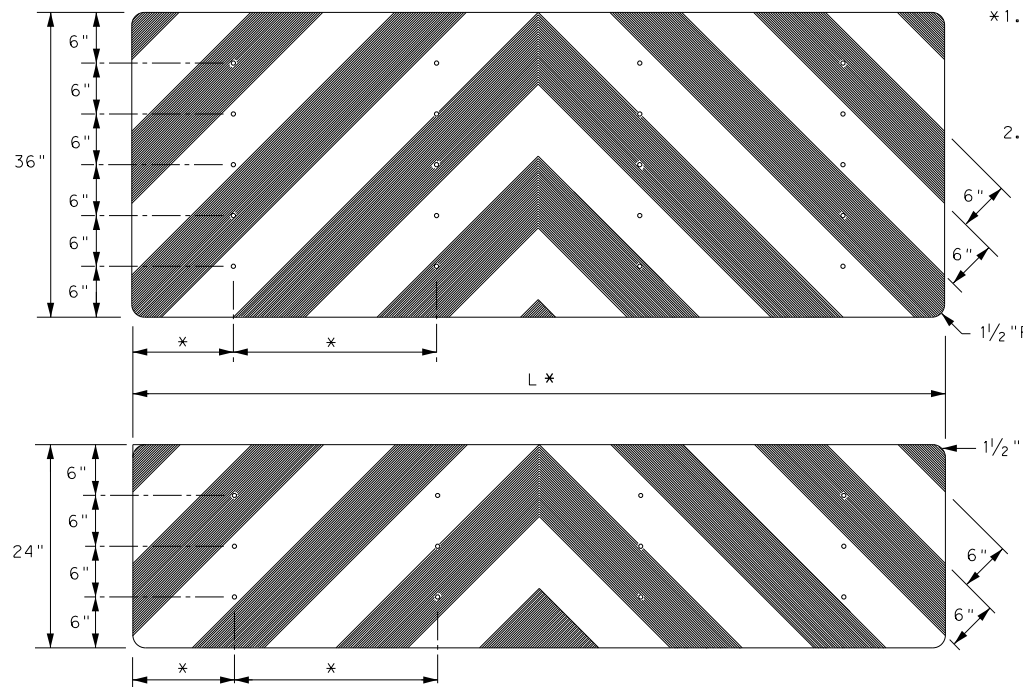
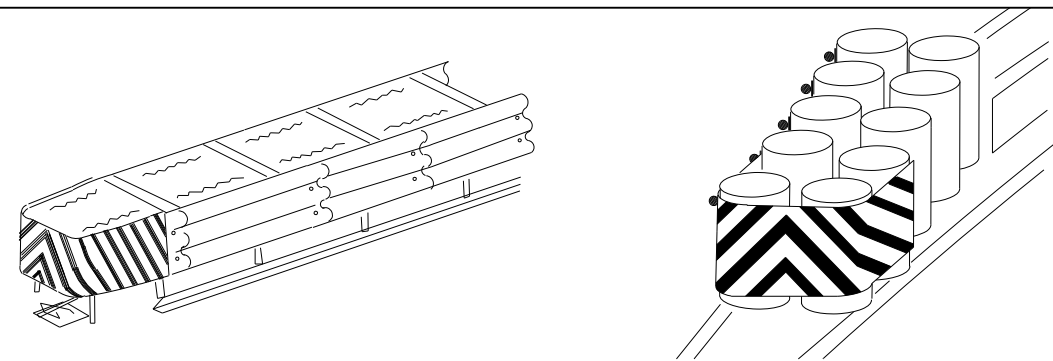
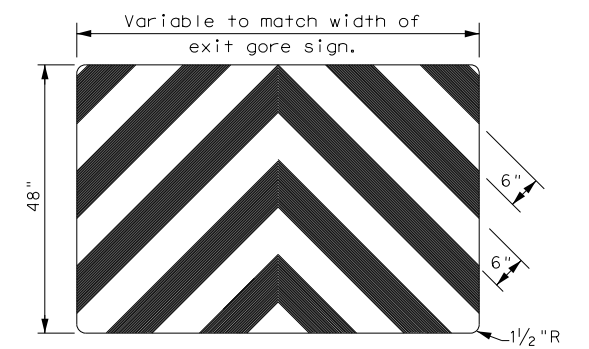
DATE: 6/25/2021  
 FILE: c:\transystems\pw\_locall\transyscorp-pw1\besn\manek\d0940080.VD&OM(VIA)af201.dgn



\* Adjust to fit attenuator per manufacturer's recommendation, or as directed by the Engineer



OBJECT MARKERS SMALLER THAN 3 FT<sup>2</sup>



- NOTES**
1. Spacing should be adjusted to attach through centerline of drum, per attenuator manufacturer's recommendation, or as directed by the Engineer.
  2. Mounting should be flush with top of attenuator. Minimum size 96" x 24".

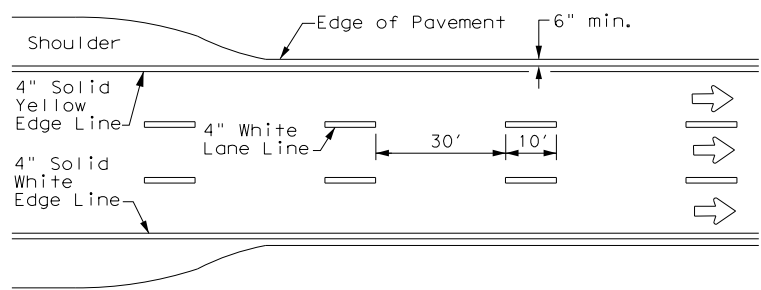
**NOTES**

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 1/4".
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.

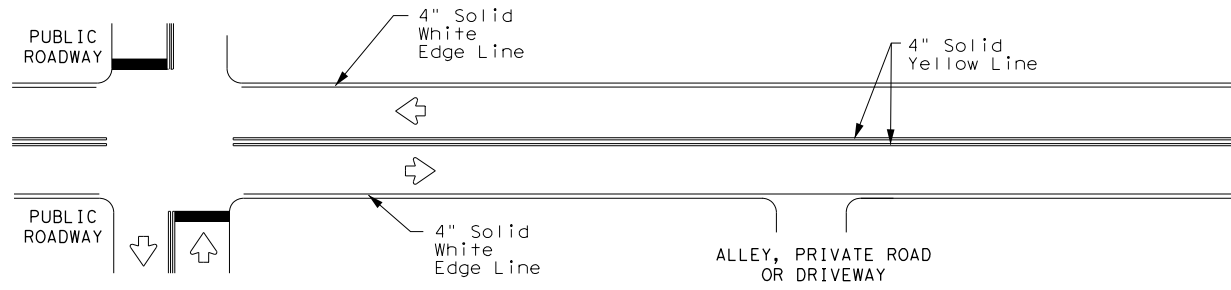
<b>DELINEATOR &amp; OBJECT MARKER FOR VEHICLE IMPACT ATTENUATORS</b> <b>D &amp; OM(VIA) - 20</b>			
FILE: domvia20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT
© TxDOT December 1989	CONT	SECT	JOB
REVISIONS		0493	02
4-92 8-04		021	RM 652
8-95 3-15			
4-98 7-20			
	DIST	COUNTY	SHEET NO.
	ODA	LOVING	122
20G			

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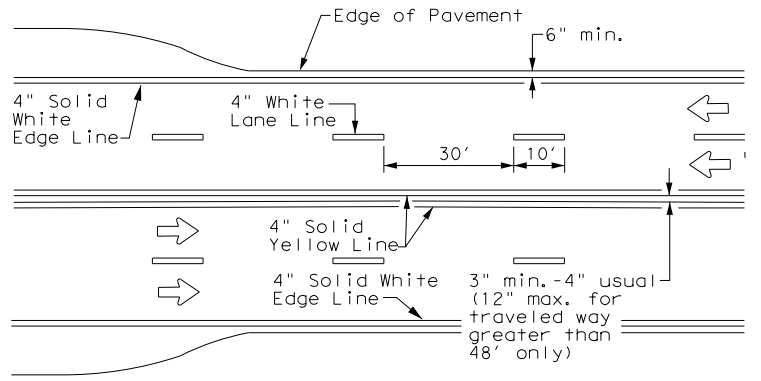
DATE: 6/25/2021  
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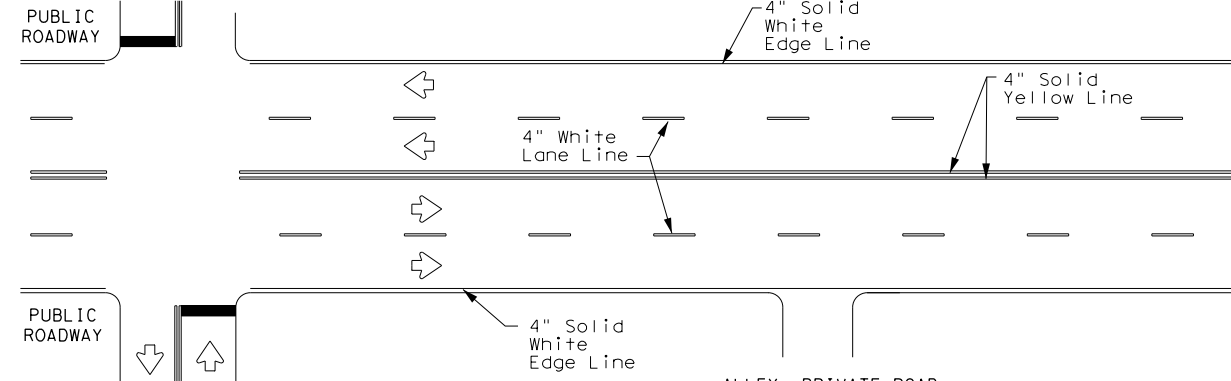
EDGE LINE AND LANE LINES  
 ONE-WAY ROADWAY  
 WITH OR WITHOUT SHOULDERS



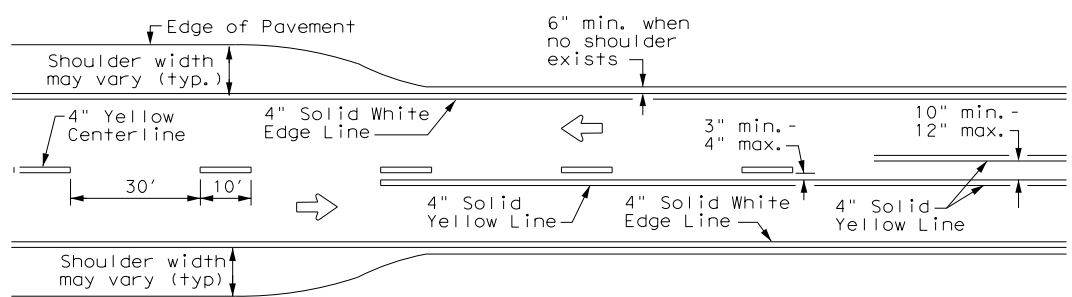
TYPICAL TWO-LANE, TWO-WAY PAVEMENT  
 MARKINGS THROUGH INTERSECTIONS



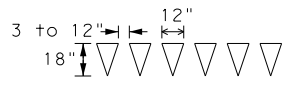
CENTERLINE AND LANE LINES  
 FOUR LANE TWO-WAY ROADWAY  
 WITH OR WITHOUT SHOULDERS



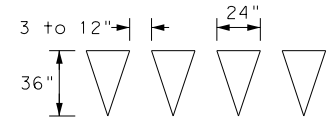
TYPICAL MULTI-LANE, TWO-WAY PAVEMENT  
 MARKINGS THROUGH INTERSECTIONS



TWO LANE TWO-WAY ROADWAY  
 WITH OR WITHOUT SHOULDERS

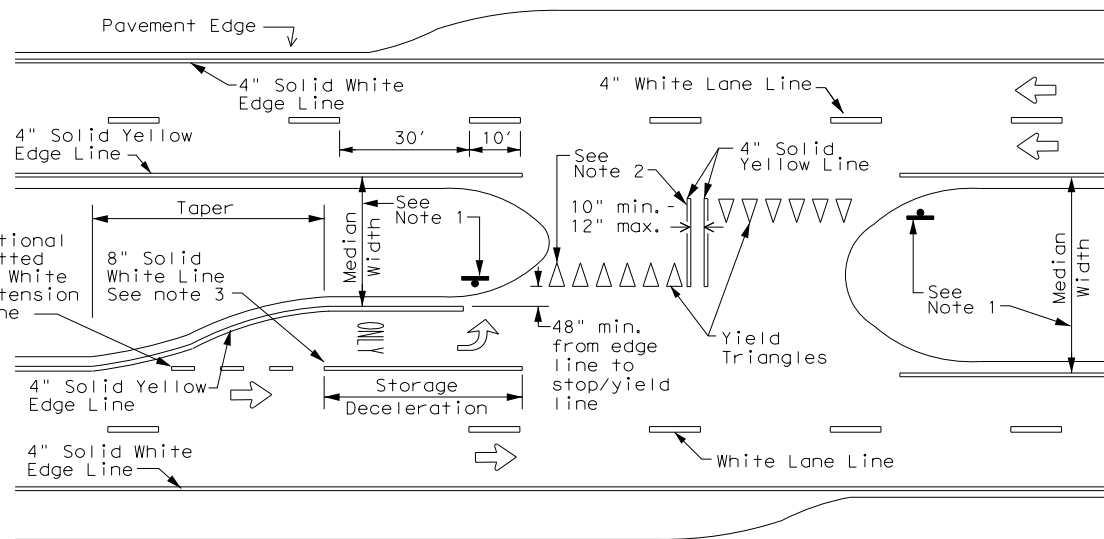


For posted speed on road being marked equal to or less than 40 MPH.



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

YIELD LINES



FOUR LANE DIVIDED ROADWAY CROSSOVERS

NOTES

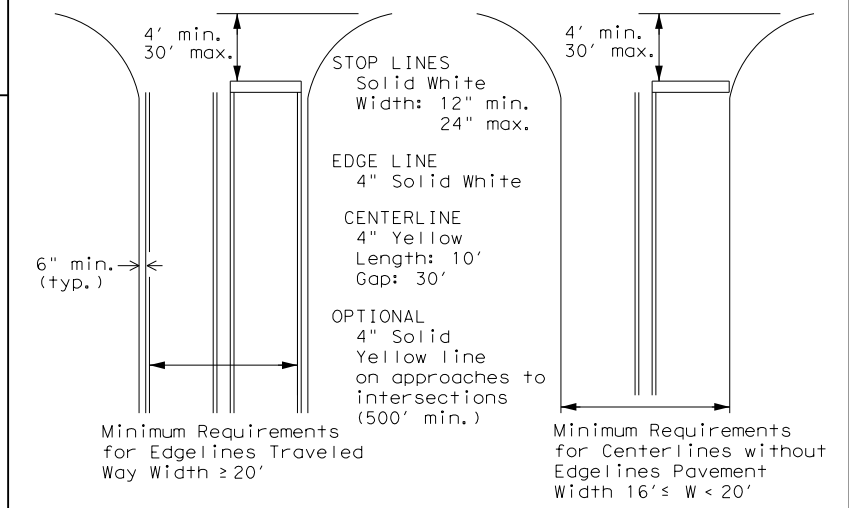
- Where divided highways are separated by median widths at the median opening itself of 30 feet or more, median openings shall be signed as two separate intersections. Each median opening has two width measurements, with one measurement for each approach. The narrow median width will be the controlling width to determine if signs are required. Yield signs are the typical intersection control. Stop signs are optional as determined by the Engineer.
- Install median striping (double yellow centerlines and stop bars/yield triangles) when a 50' or greater median centerline can be placed. Stop bars shall only be used with stop signs. Yield triangles shall only be used with yield signs.
- 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

- Edgeline striping shall be as shown in the plans or as directed by the Engineer. The edgeline should not be placed less than 6 inches from the edge of pavement. This distance may vary due to pavement raveling or other conditions. Edgelines are not required in curb and gutter sections of roadways.
- The traveled way includes only that portion of the roadway used for vehicular travel. It does not include the parking lanes, sidewalks, berms and shoulders. The traveled ways shall be measured from the inside of edgeline to the inside of edgeline of a two lane roadway.

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

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



GUIDE FOR PLACEMENT OF STOP LINES,  
 EDGE LINE & CENTERLINE  
 Based on Traveled Way and Pavement Widths  
 for Undivided Highways



TYPICAL STANDARD  
 PAVEMENT MARKINGS

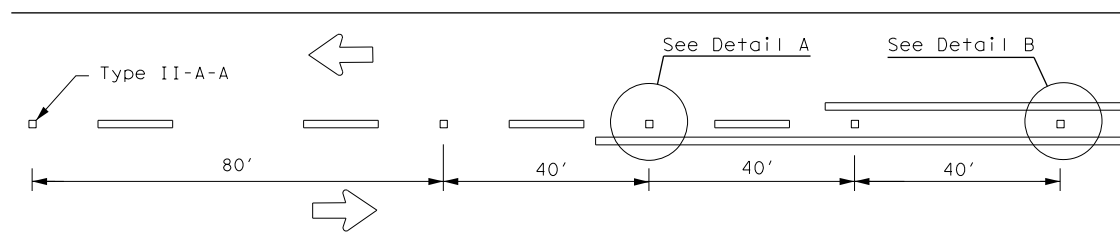
PM(1)-20

FILE: pml-20.dgn	DN:	CK:	DW:	CK:
© TxDOT November 1978	CONT	SECT	JOB	HIGHWAY
8-95 3-03 REVISIONS	0493	02	021	RM 652
5-00 2-12	DIST	COUNTY	SHEET NO.	
8-00 6-20	ODA	LOVING	123	

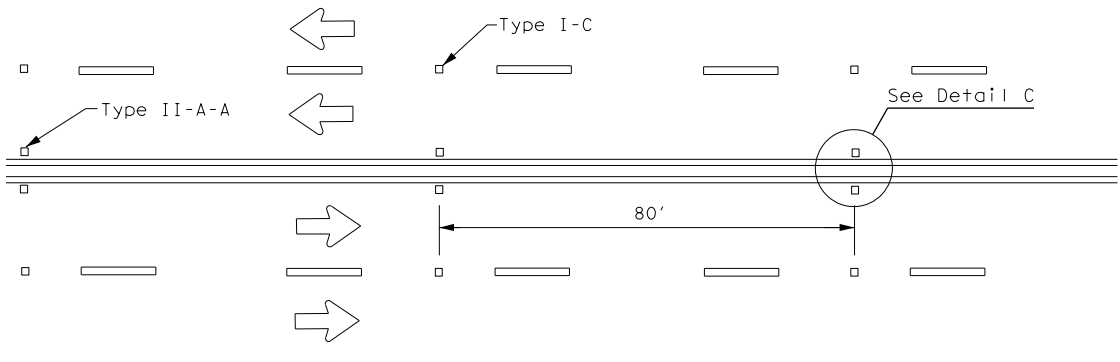


# REFLECTIVE RAISED PAVEMENT MARKERS FOR VEHICLE POSITIONING GUIDANCE

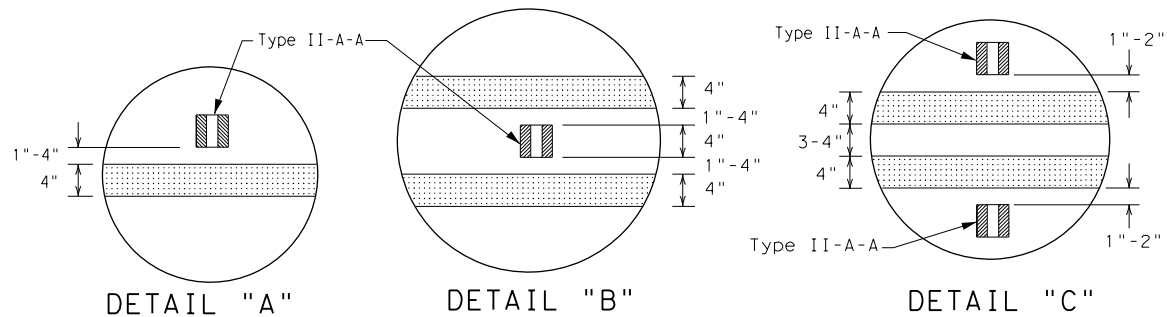
DISCLAIMER: The use of this standard is governed by the "Texas Engineering Practice Act". No warranty of any kind is made by TxDOT for any purpose whatsoever. TxDOT assumes no responsibility for the conversion of this standard to other formats or for incorrect results or damages resulting from its use.



CENTERLINE FOR ALL TWO LANE ROADWAYS



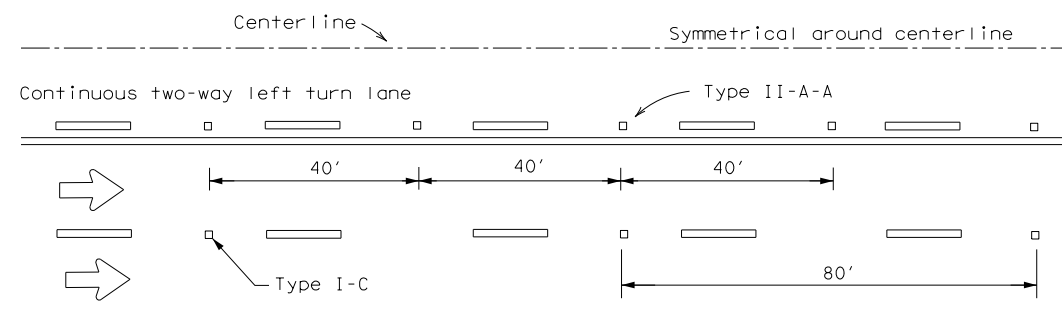
CENTERLINE & LANE LINES  
FOR FOUR LANE TWO-WAY HIGHWAYS



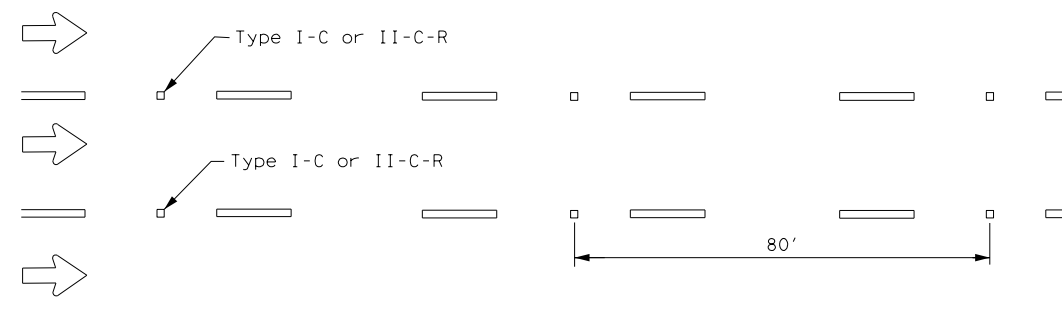
DETAIL "A"

DETAIL "B"

DETAIL "C"



CENTERLINE AND LANE LINES FOR TWO-WAY LEFT TURN LANE

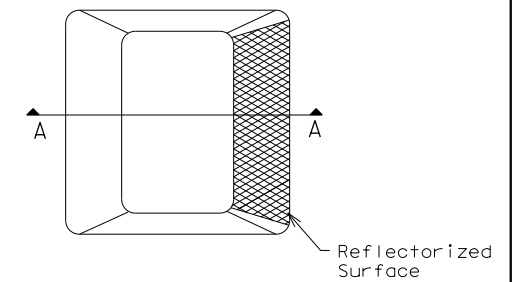


LANE LINES FOR ONE-WAY ROADWAY (NON-FREEWAY FACILITIES)

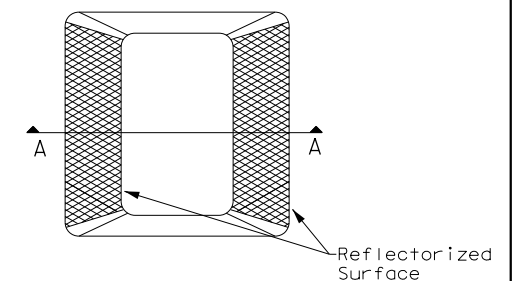
Raised pavement markers Type II-C-R shall have clear face toward normal traffic and red face toward wrong-way traffic.

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

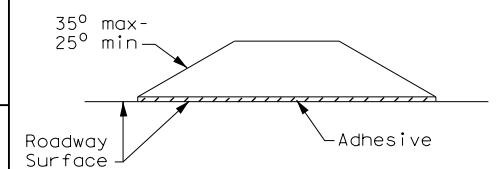
All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.



Type I (Top View)



Type II (Top View)



SECTION A

RAISED PAVEMENT MARKERS

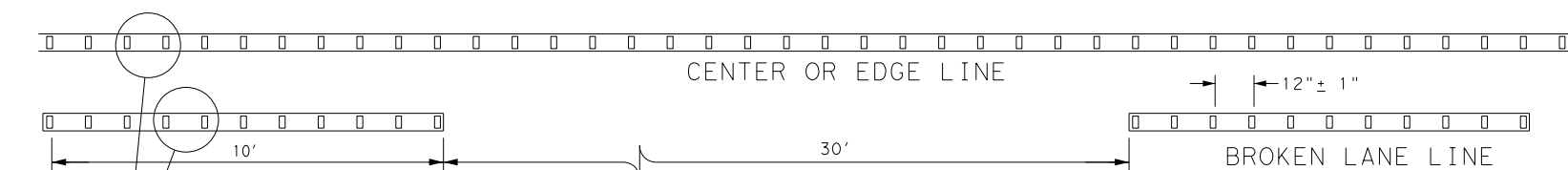


## POSITION GUIDANCE USING RAISED MARKERS REFLECTORIZED PROFILE MARKINGS PM(2) - 20

FILE: pm2-20.dgn	DN:	CK:	DW:	CK:
© TxDOT April 1977	CONT	SECT	JOB	HIGHWAY
4-92 2-10 REVISIONS	0493	02	021	RM 652
5-00 2-12	DIST	COUNTY		SHEET NO.
8-00 6-20	ODA	LOVING		124

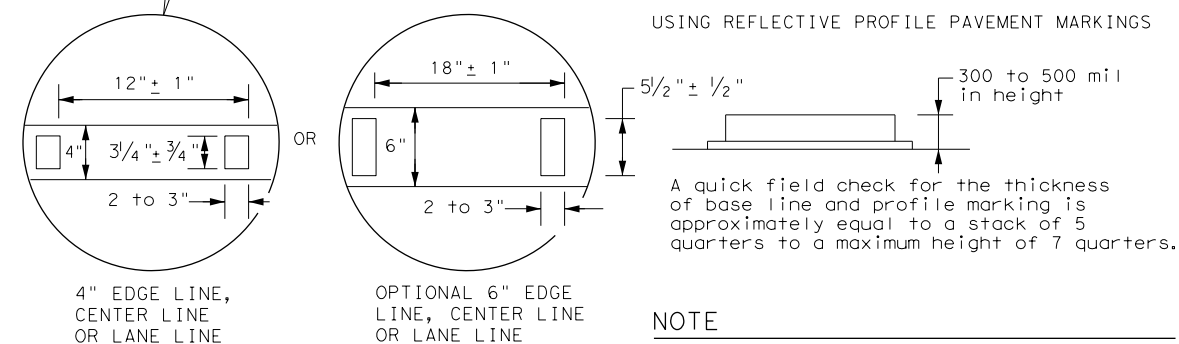
### GENERAL NOTES

- All raised pavement markers placed in broken lines shall be placed in line with and midway between the stripes.
- On concrete pavements the raised pavement markers should be placed to one side of the longitudinal joints.



### REFLECTORIZED PROFILE PATTERN DETAIL

USING REFLECTIVE PROFILE PAVEMENT MARKINGS



### NOTE

Profile markings shall not be placed on roadways with a posted speed limit of 45 MPH or less.

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DATE: 6/25/2021  
 FILE: c:\transystems\pw\local\transyscorp-pw1\besn\manek\0940080\SMD (GEN) -08.dgn

### SIGN SUPPORT DESCRIPTIVE CODES

(Descriptive Codes correspond to project estimate and quantities sheets)

SM RD SGN ASSM TY XXXXX (X) XX (X-XXXX)

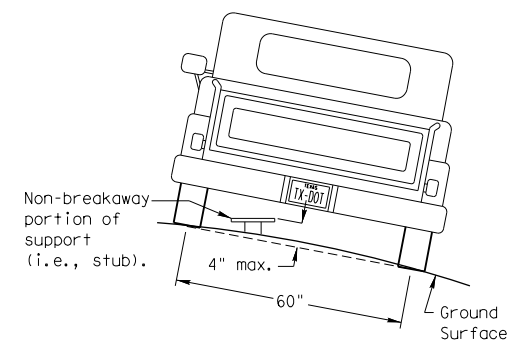
Post Type \_\_\_\_\_  
 FRP = Fiberglass Reinforced Plastic Pipe (see SMD (FRP))  
 TWT = Thin-Walled Tubing (see SMD (TWT))  
 10BWG = 10 BWG Tubing (see SMD (SLIP-1) to (SLIP-3))  
 S80 = Schedule 80 Pipe (see SMD (SLIP-1) to (SLIP-3))

Number of Posts (1 or 2) \_\_\_\_\_

Anchor Type \_\_\_\_\_  
 UA = Universal Anchor - Concreted (see SMD (FRP) and (TWT))  
 UB = Universal Anchor - Bolted down (see SMD (FRP) and (TWT))  
 WS = Wedge Anchor Steel - (see SMD (TWT))  
 WP = Wedge Anchor Plastic (see SMD (TWT))  
 SA = Slipbase - Concreted (see SMD (SLIP-1) to (SLIP-3))  
 SB = Slipbase - Bolted Down (see SMD (SLIP-1) to (SLIP-3))

Sign Mounting Designation  
 P = Prefab. "Plain" (see SMD (SLIP-1) to (SLIP-3), (TWT), (FRP))  
 T = Prefab. "T" (see SMD (SLIP-1) to (SLIP-3), (TWT))  
 U = Prefab. "U" (see SMD (SLIP-1) to (SLIP-3))  
 IF REQUIRED  
 1EXT or 2EXT = Number of Extensions (see SMD (SLIP-1) to (SLIP-3), (TWT))  
 BM = Extruded Wind Beam (see SMD (SLIP-1) to (SLIP-3))  
 WC = 1.12 #/ft Wing Channel (see SMD (SLIP-1) to (SLIP-3))  
 EXAL = Extruded Aluminum Sign Panels (see SMD (SLIP-3))

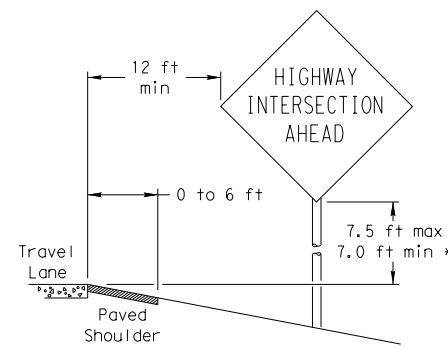
### REQUIRED CLEARANCE FOR BREAKAWAY SUPPORT



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).

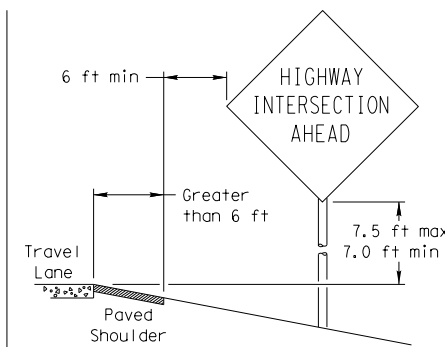
### SIGN LOCATION

#### PAVED SHOULDERS



LESS THAN 6 FT. WIDE

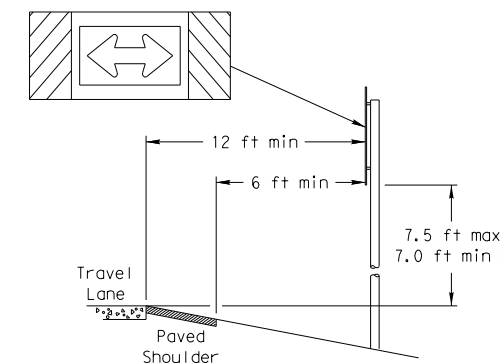
When the shoulder is 6 ft. or less in width, the sign must be placed at least 12 ft. from the edge of the travel lane.



GREATER THAN 6 FT. WIDE

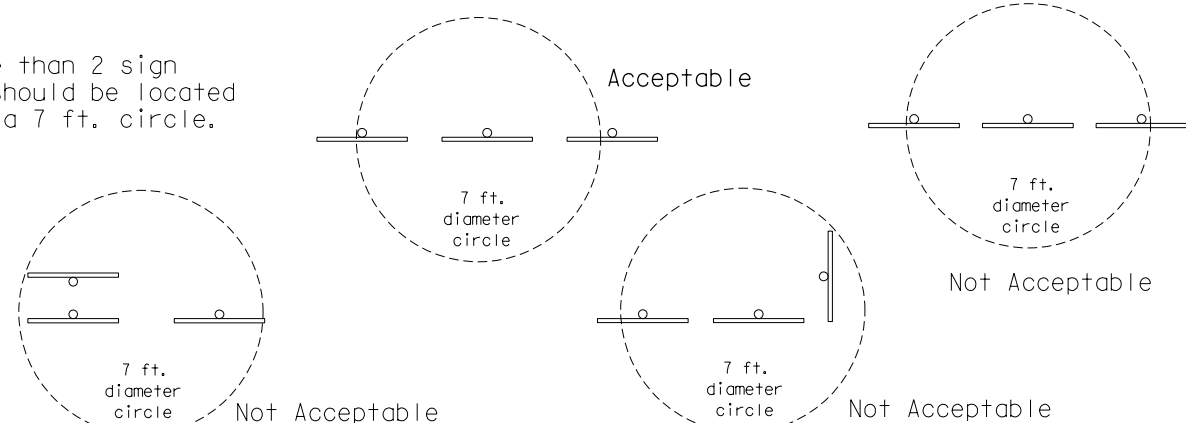
When the shoulder is greater than 6 ft in width, the sign must be placed at least 6 ft. from the edge of the shoulder.

#### T-INTERSECTION

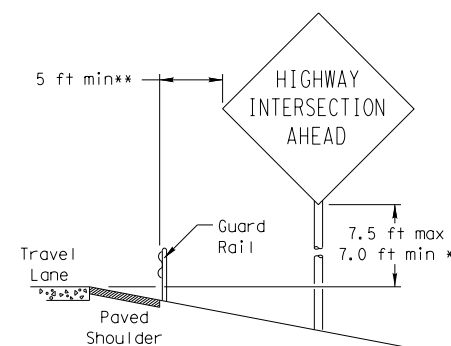


When this sign is needed at the end of a two-lane, two way roadway, the right edge of the sign should be in line with the centerline of the roadway. Place as close to ROW as practical.

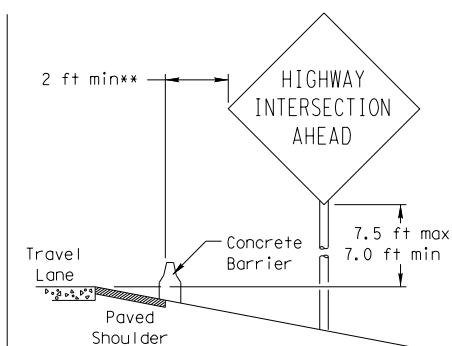
No more than 2 sign posts should be located within a 7 ft. circle.



#### BEHIND BARRIER



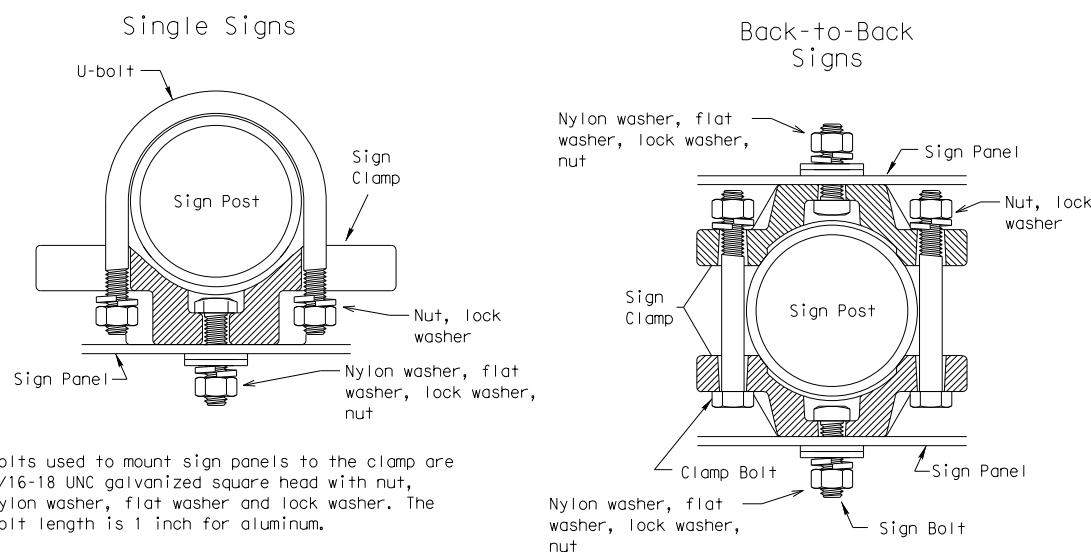
BEHIND GUARDRAIL



BEHIND CONCRETE BARRIER

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

### TYPICAL SIGN ATTACHMENT DETAIL



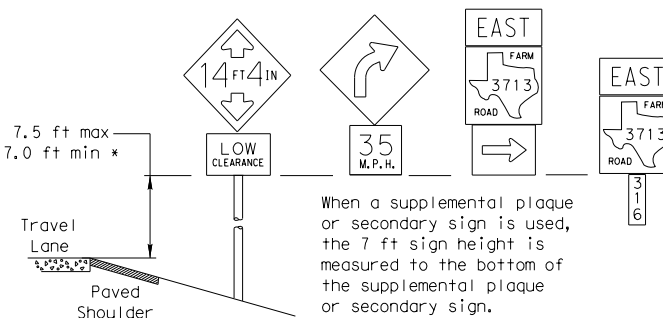
Bolts used to mount sign panels to the clamp are 5/16-18 UNC galvanized square head with nut, nylon washer, flat washer and lock washer. The bolt length is 1 inch for aluminum.

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

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

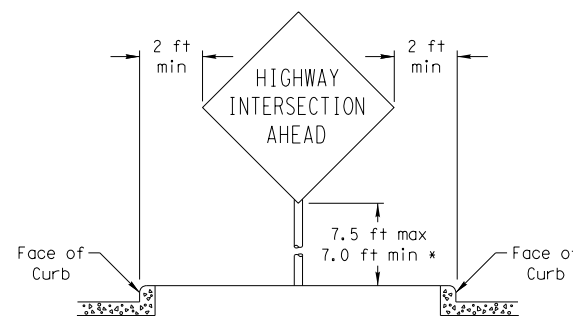
Pipe Diameter	Approximate Bolt Length	
	Specific Clamp	Universal Clamp
2" nominal	3"	3 or 3 1/2"
2 1/2" nominal	3 or 3 1/2"	3 1/2 or 4"
3" nominal	3 1/2 or 4"	4 1/2"

### SIGNS WITH PLAQUES

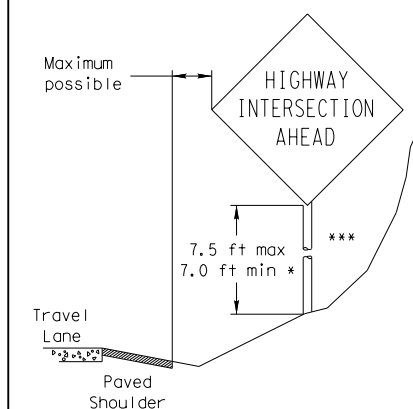


When a supplemental plaque or secondary sign is used, the 7 ft sign height is measured to the bottom of the supplemental plaque or secondary sign.

### CURB & GUTTER OR RAISED ISLAND



### RESTRICTED RIGHT-OF-WAY (When 6 ft min. is not possible.)



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

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

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

\* 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>



## SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS GENERAL NOTES & DETAILS

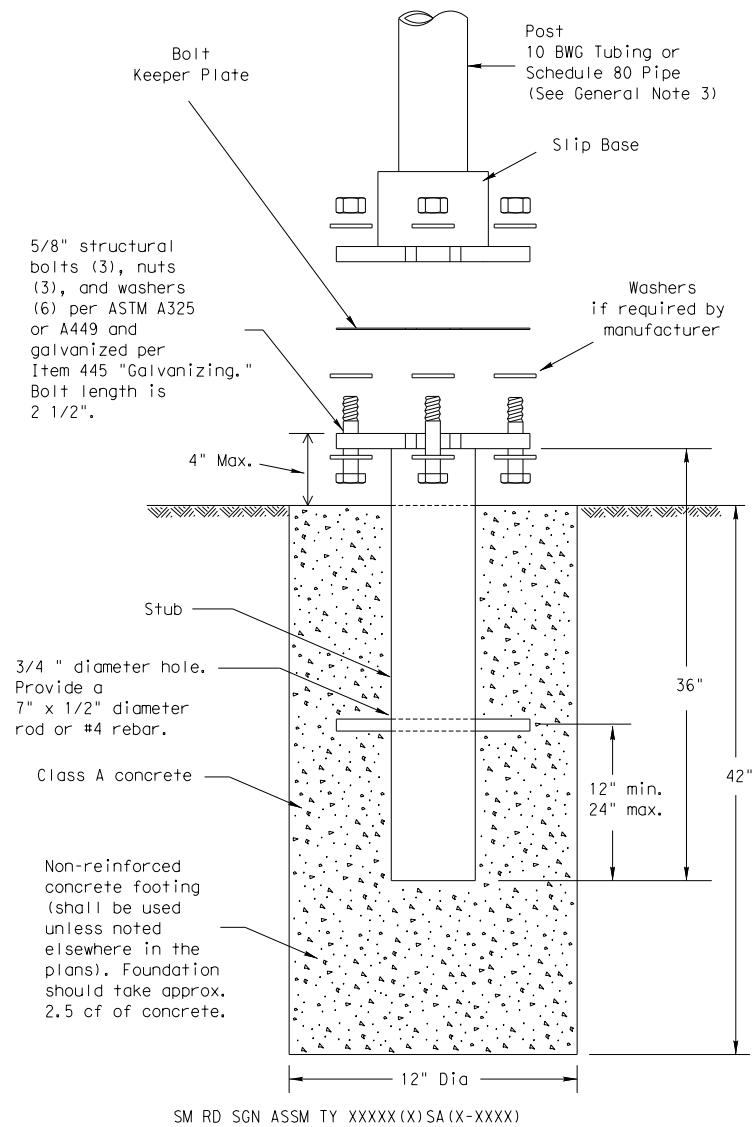
SMD (GEN) -08

© TxDOT July 2002	DN: TxDOT	CK: TxDOT	DN: TxDOT	CK: TxDOT
9-08	REVISIONS	CONT	SECT	JOB
		0493	02	021
		DIST	COUNTY	RM
		ODA	LOVING	652
				SHEET NO.
				125

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## TRIANGULAR SLIPBASE INSTALLATION GENERAL REQUIREMENTS



### 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](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:

- 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.
- 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
- 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>
- Sign supports shall not be spliced except where shown. Sign support posts shall not be spliced.

### ASSEMBLY PROCEDURE

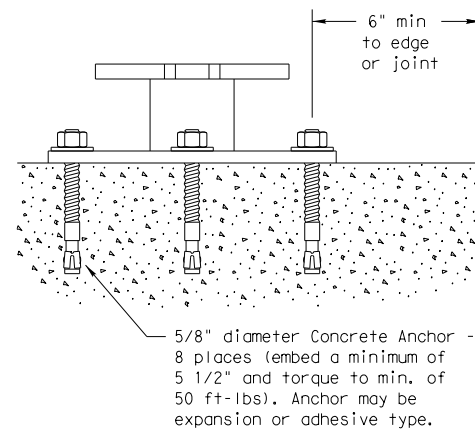
#### Foundation

- 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.
- 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.
- 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.
- Plumb the stub. Allow a minimum of 4 days to set, unless otherwise directed by the Engineer.
- The triangular slipbase system is multidirectional and is designed to release when struck from any direction.

#### Support

- 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.
- 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



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, "Epoxyes 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.



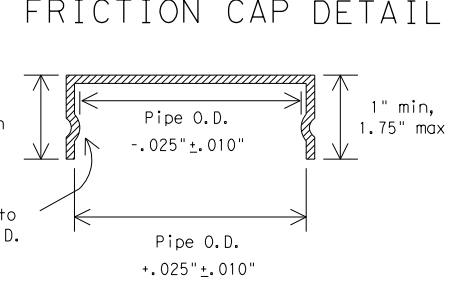
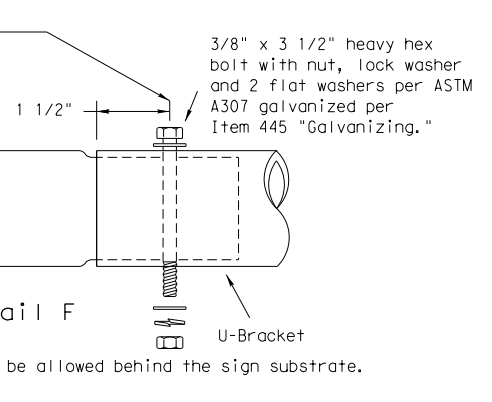
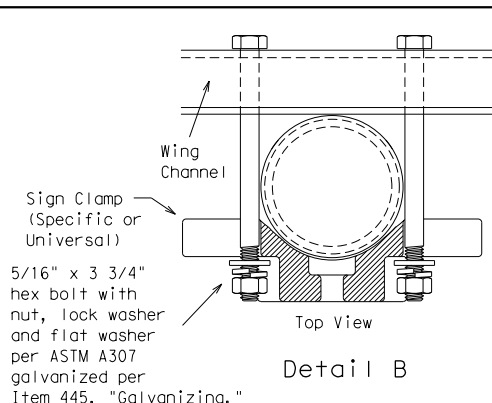
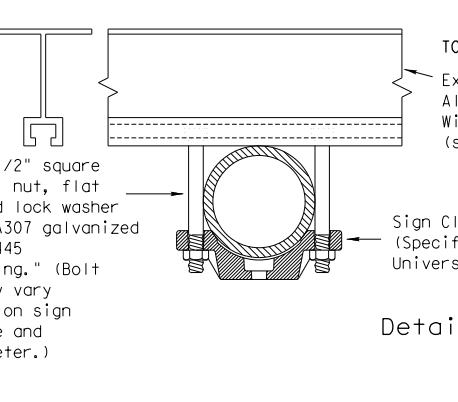
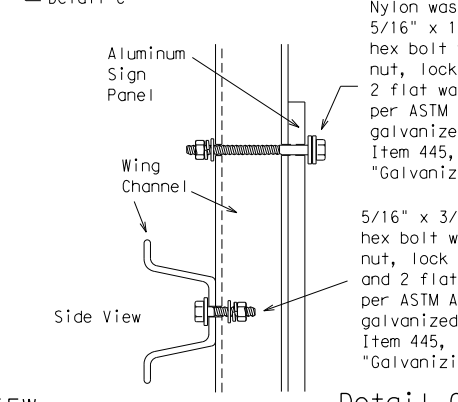
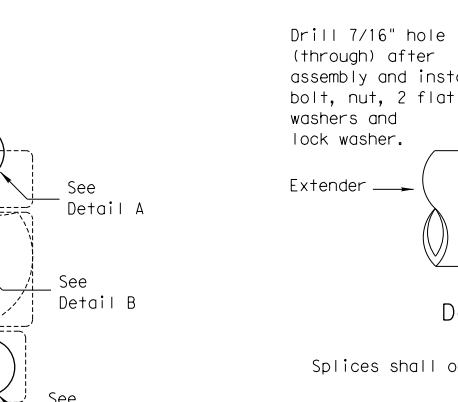
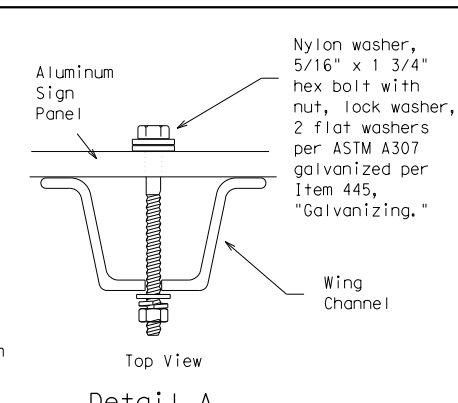
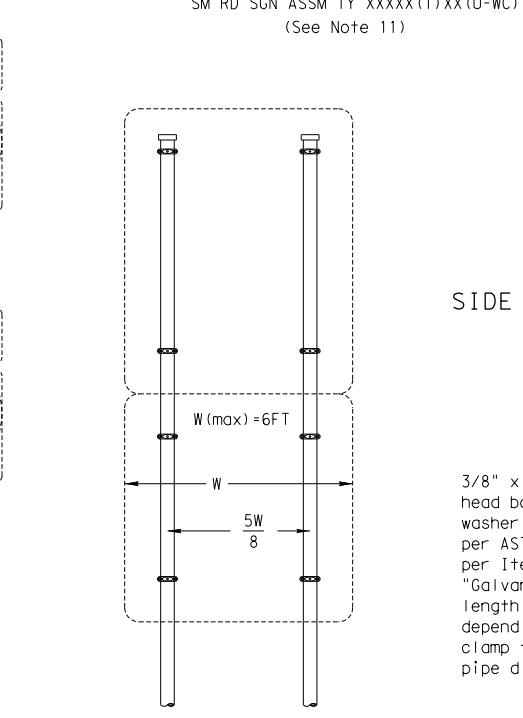
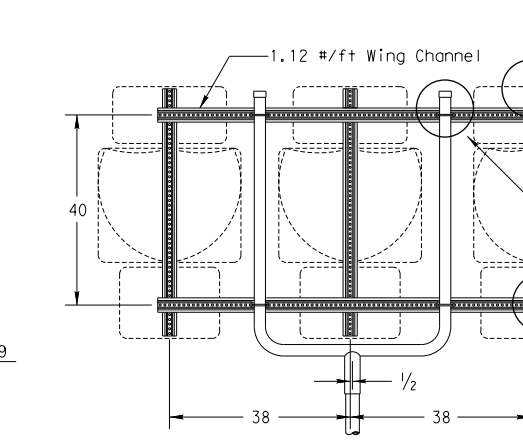
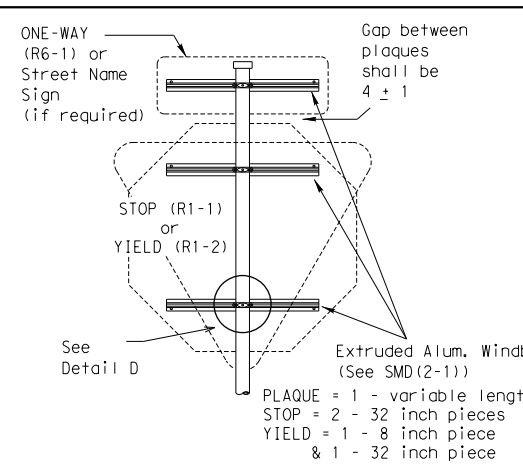
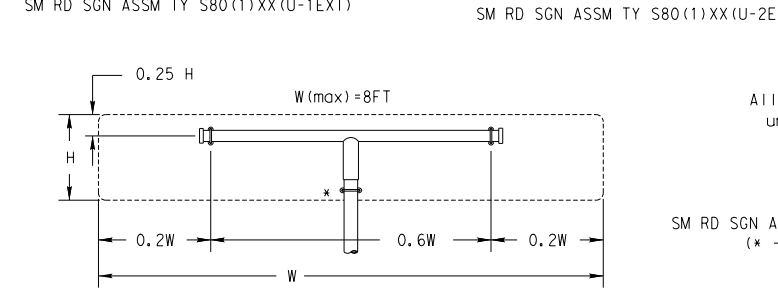
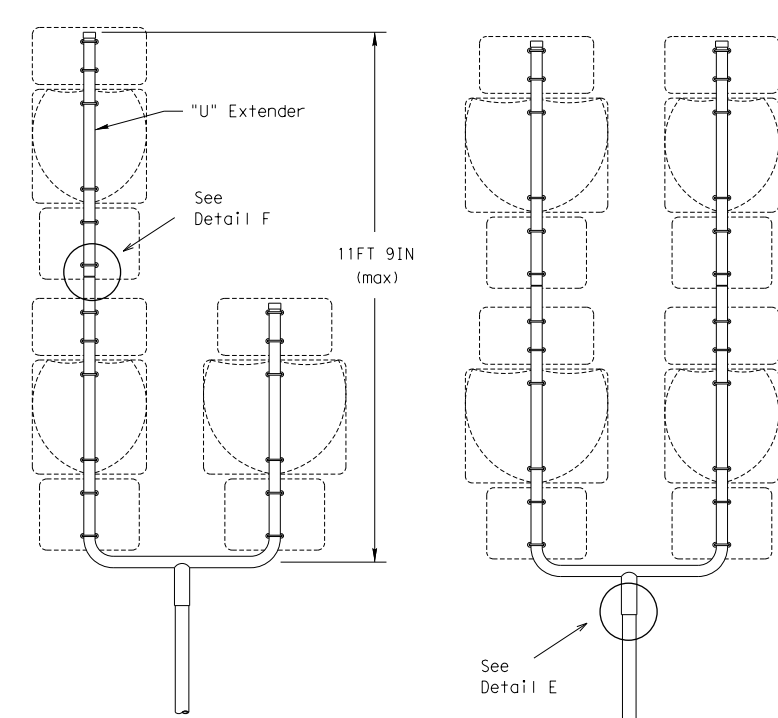
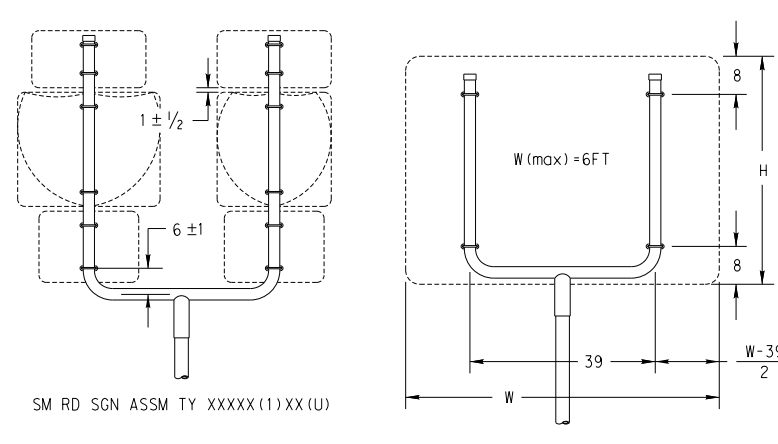
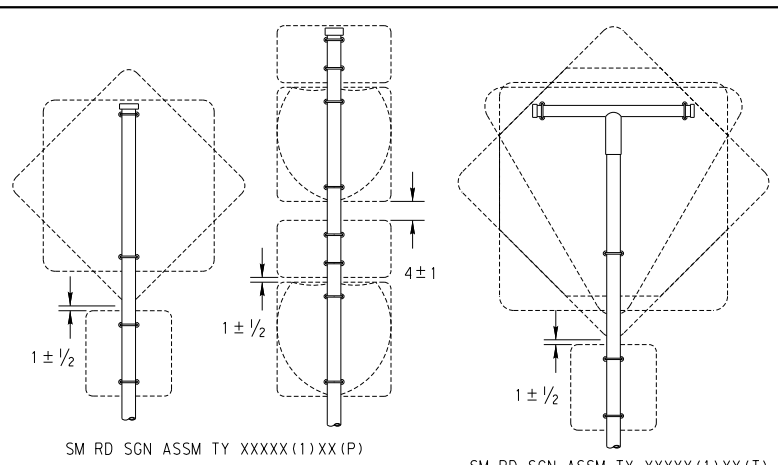
## SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS TRIANGULAR SLIPBASE SYSTEM

SMD(SLIP-1)-08

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9-08	REVISIONS		CONT	SECT	JOB	HIGHWAY
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All dimensions are in english unless detailed otherwise.

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

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
- 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.
- Sign supports shall not be spliced except where shown. Sign support posts shall not be spliced.
- 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.
- Signs that require specific supports due to reasons in addition to windloading are indicated on the "REQUIRED SUPPORT" table on this sheet.
- 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.
- 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.
- Wing channel shall meet ASTM A 1011 SS Gr 50 and be galvanized per ASTM A 123.
- 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."
- Additional route markers may be added vertically, provided the total sign area does not exceed the maximum allowable amount per Note 1.
- 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.
- Post open ends shall be fitted with Friction Caps.
- Sign blanks shall be the sizes and shapes shown on the plans.

REQUIRED SUPPORT	
SIGN DESCRIPTION	SUPPORT
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)
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)

Friction caps may be manufactured from hot rolled or cold rolled steel sheets. The minimum sheet metal thickness shall be 24 gauge for all cap sizes. The rim edges shall be reasonably straight and smooth. Caps shall be sized and formed in such a manner as to produce a drive-on friction fit and have no tendency to rock when seated on the pipe. The depth shall be sufficient to give positive protection against entrance of rainwater. They shall be free of sharp creases or indentations and show no evidence of metal fracture. Caps shall have an electrodeposited coating of zinc in accordance with the requirements of ASTM B633 Class FE/ZN 8.

Texas Department of Transportation  
 Traffic Operations Division

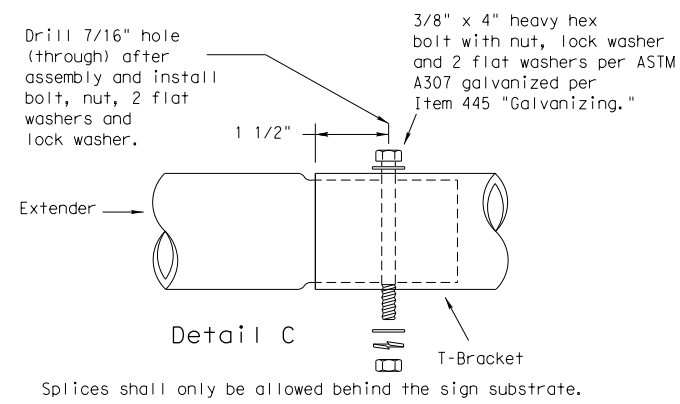
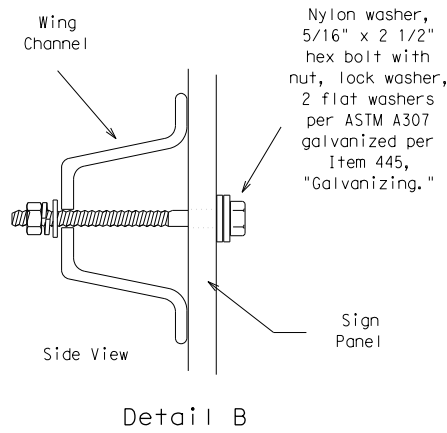
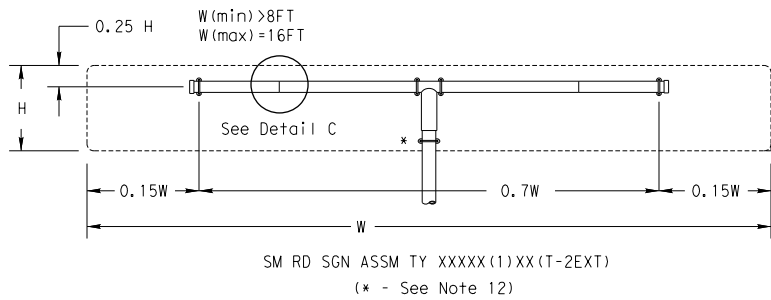
## SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS TRIANGULAR SLIPBASE SYSTEM

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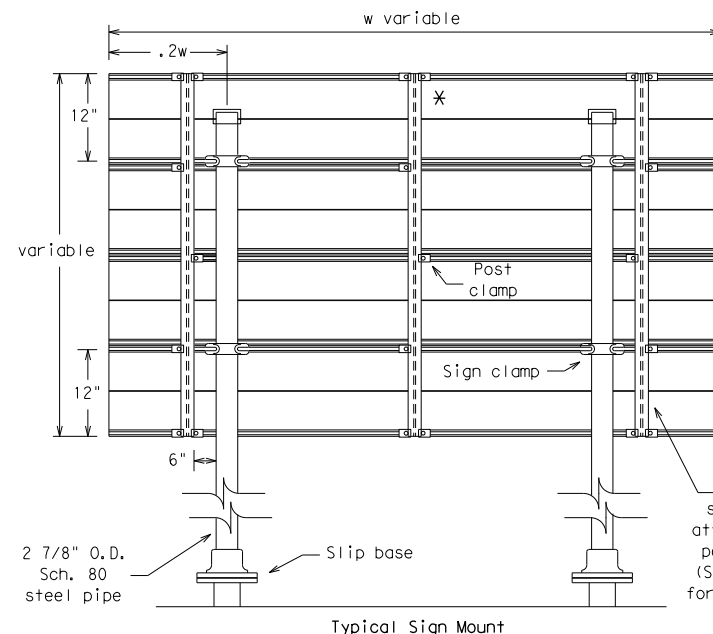
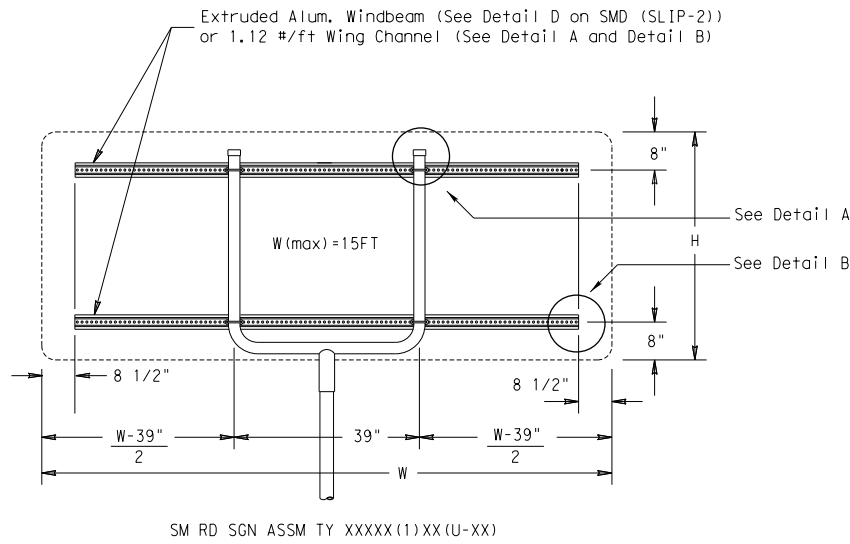
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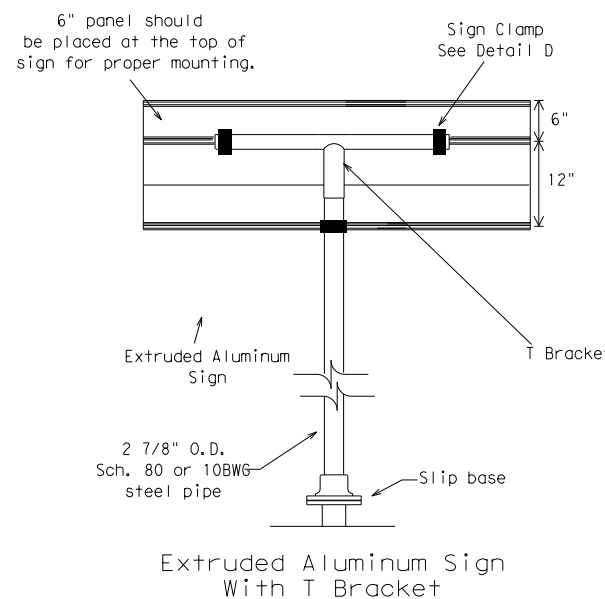
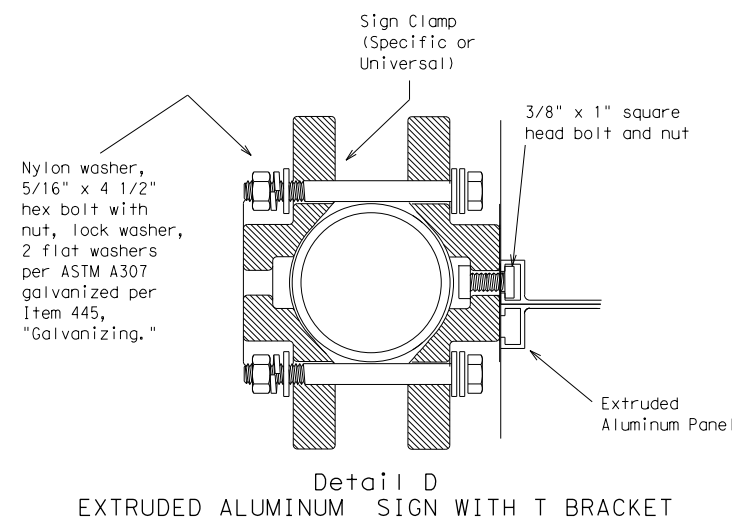
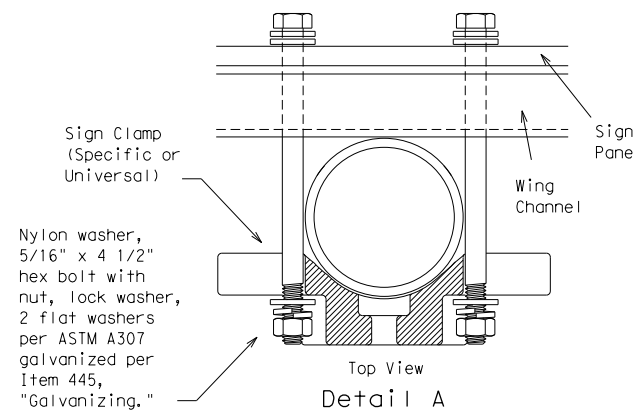
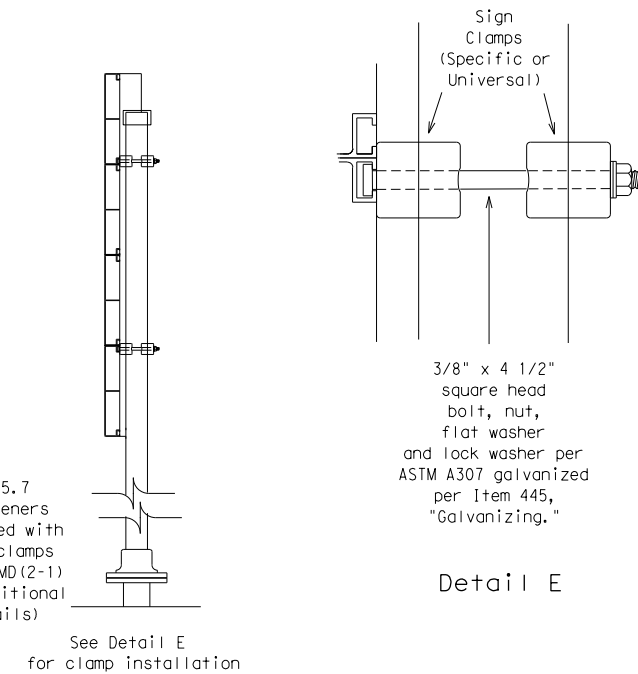


GENERAL NOTES:

- | 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          |
- 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.
- Sign supports shall not be spliced except where shown. Sign support posts shall not be spliced.
- 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.
- Signs that require specific supports due to reasons in addition to windloading are indicated on the "REQUIRED SUPPORT" table on this sheet.
- 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.
- 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.
- Wing channel shall meet ASTM A 1011 SS Gr 50 and be galvanized per ASTM A 123.
- 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."
- Sign blanks shall be the sizes and shapes shown on the plans.
- 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.
- Post open ends shall be fitted with Friction Caps.



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



Use Extruded Alum. Windbeam as stiffeners See SMD (2-1) for additional details  
 See Detail E for clamp installation

REQUIRED SUPPORT		
	SIGN DESCRIPTION	SUPPORT
Regulatory	48-inch STOP sign (R1-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	60-inch YIELD sign (R1-2)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	48x16-inch ONE-WAY sign (R6-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	36x48, 48x36, and 48x48-inch signs	TY 10BWG(1)XX(T)
Warning	48x60-inch signs	TY S80(1)XX(T)
	48x48-inch signs (diamond or square)	TY 10BWG(1)XX(T)
	48x60-inch signs	TY S80(1)XX(T)
	48-inch Advance School X-ing sign (S1-1)	TY 10BWG(1)XX(T)
	48-inch School X-ing sign (S2-1)	TY 10BWG(1)XX(T)
	Large Arrow sign (W1-6 & W1-7)	TY 10BWG(1)XX(T)

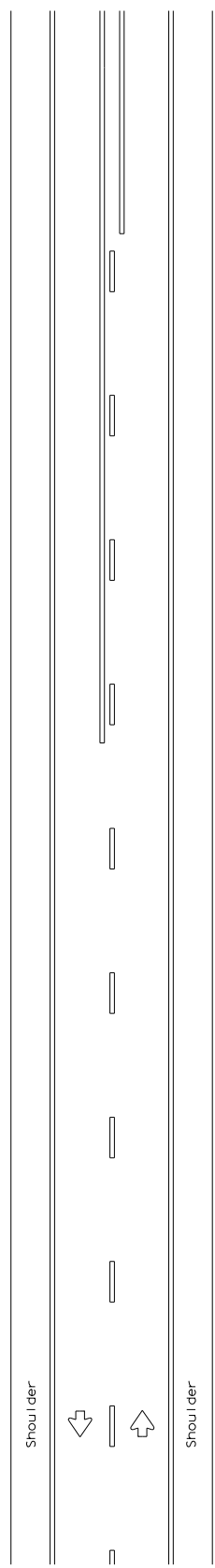
Texas Department of Transportation  
 Traffic Operations Division

SIGN MOUNTING DETAILS  
 SMALL ROADSIDE SIGNS  
 TRIANGULAR SLIPBASE SYSTEM  
 SMD(SLIP-3)-08

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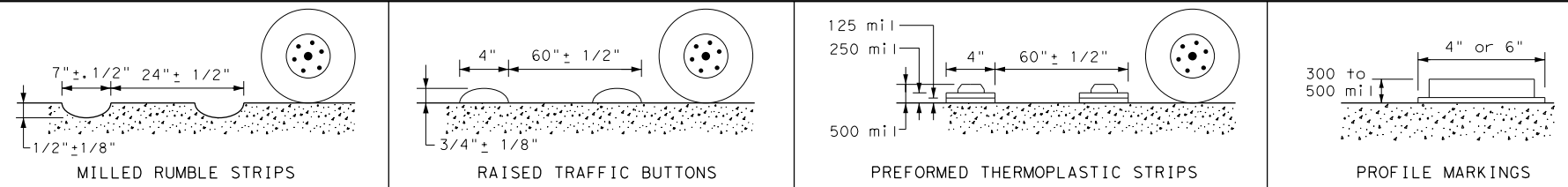
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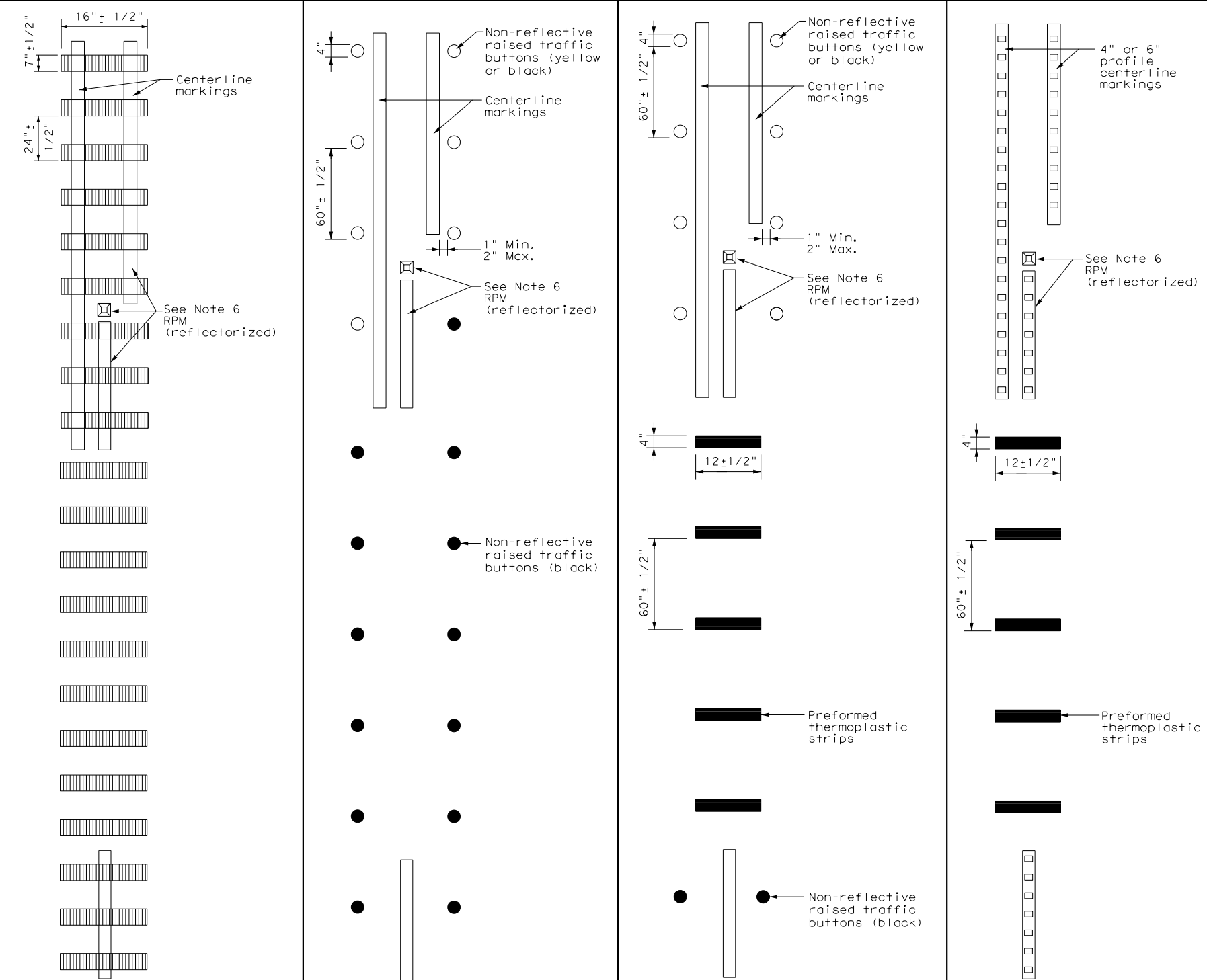


TWO LANE TWO-WAY ROADWAYS

CENTERLINE RUMBLE STRIPS



PROFILE VIEW



PLAN VIEW  
 OPTION 1

MILLED CENTERLINE RUMBLE STRIPS

PLAN VIEW  
 OPTION 2

RAISED CENTERLINE RUMBLE STRIPS

PLAN VIEW  
 OPTION 3

RAISED CENTERLINE RUMBLE STRIPS AND PREFORMED THERMOPLASTIC STRIPS

PLAN VIEW  
 OPTION 4

PROFILE CENTERLINE MARKINGS AND PREFORMED THERMOPLASTIC STRIPS

GENERAL NOTES

- This standard sheet provides guidelines for installing centerline rumble strips on two-lane highways with or without shoulders.
  - Centerline and edgeline rumble strips or profile markings shall not be placed on roadways with a posted speed limit of 45 MPH or less.
  - Milled rumble strips are preferred when adequate pavement depth is available. If pavement thickness is less than 2 inches, milled rumble strips shall not be used. Rumble strips shall not be milled or depressed into bridge decks.
  - See dimensions for milled rumble strips. Other shapes and dimensions may be used if approved by the Traffic Operations Division.
  - Breaks in milled centerline rumble strips shall occur at least 50 feet and no more than 150 feet in advance of bridges, railroad crossings, intersections and driveways with high usage of large trucks.
  - Use Standard Sheet PM(2) for positioning, dimensioning, and spacing of all reflective raised pavement markers, and dimensions pavement markings and profile markings.
  - Consideration should be given to noise levels when centerline rumble strips are installed near residential areas, schools, churches, etc. A minimum of 3/8 inch depth of milled rumble strip may be considered in these areas.
  - Pavement markings must be applied over milled centerline rumble strips.
- WHEN INSTALLING CENTERLINE RUMBLE STRIPS:
- Raised rumble strips consisting of non-reflective raised traffic buttons may be used. Non-reflective raised traffic buttons can be affixed to asphalt or concrete with bitumen or adhesives, as per manufacturer's recommendations.
  - When using non-reflective raised traffic buttons as a centerline rumble strip, the button shall be placed adjacent to the pavement marking delineating the centerline. The buttons will be paid for under Item 672, "Raised Pavement Markers." Non-reflective traffic buttons must meet the requirements of DMS-4300.
  - The color of the button should be yellow for a continuous no passing roadway. Black buttons should be used in areas where passing is allowed.
- WHEN INSTALLING EDGELINE RUMBLE STRIPS WITH OR WITHOUT CENTERLINE RUMBLE STRIPS ON UNDIVIDED HIGHWAYS:
- See standard sheet RS(4).



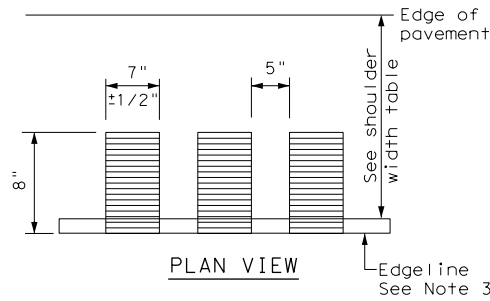
CENTERLINE RUMBLE STRIPS ON TWO LANE TWO-WAY HIGHWAYS

RS(3) - 13

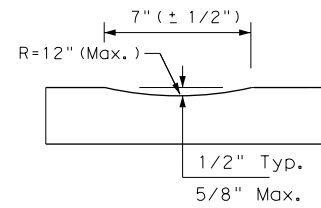
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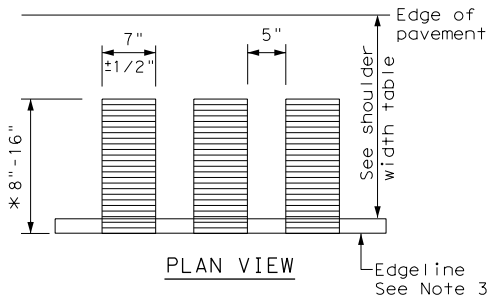


PLAN VIEW

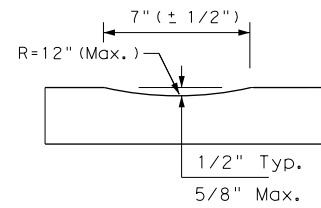


PROFILE VIEW  
OPTION 1

CONTINUOUS MILLED DEPRESSIONS (Rumble Strips)

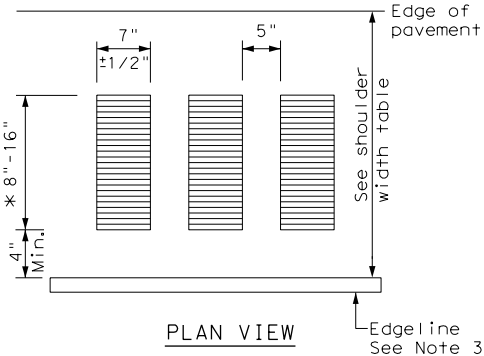


PLAN VIEW



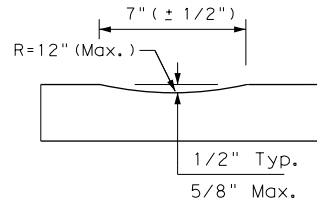
PROFILE VIEW  
OPTION 2

CONTINUOUS MILLED DEPRESSIONS (Rumble Strips)



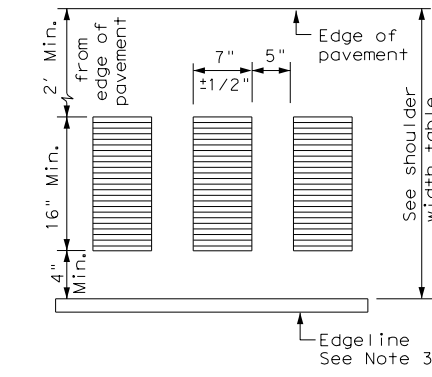
PLAN VIEW

\* This distance may vary based on width of shoulder

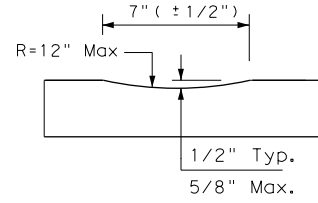


PROFILE VIEW  
OPTION 3

CONTINUOUS MILLED DEPRESSIONS (Rumble Strips)



PLAN VIEW



PROFILE VIEW  
OPTION 4

CONTINUOUS MILLED DEPRESSIONS (Rumble Strips)

GENERAL NOTES

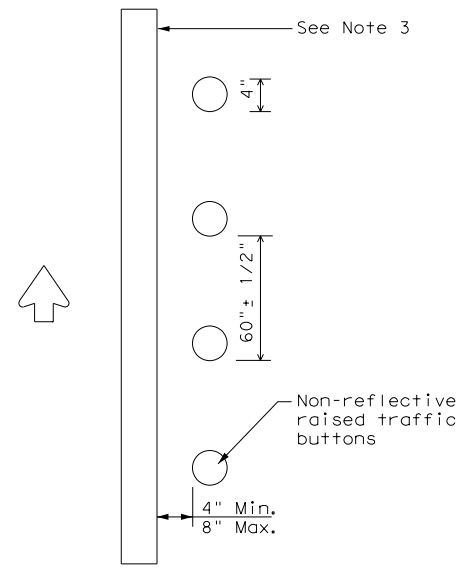
- Rumble strips and profile markings shall not be placed on roadways with a posted speed limit of 45 MPH or less.
- Milled rumble strips are preferred when adequate pavement depth is available. If pavement thickness is less than 2 inches, milled rumble strips shall not be used. Rumble strips shall not be milled or depressed into bridge decks.
- Use Standard Sheet PM(2) for positioning, dimensioning, and spacing of all reflective raised pavement markers, pavement markings, and profile markings.
- See the table below for determining what options may be used for edgeline rumble strips.

WHEN INSTALLING MILLED DEPRESSION EDGELINE RUMBLE STRIPS:

- See dimensions for milled rumble strips. Other shapes and dimensions may be used if approved by the Traffic Operations Division.
- Pavement markings can be applied over milled shoulder rumble strips to create an edgeline rumble stripe.
- Breaks in edgeline rumble strips shall occur at least 50 feet and no more than 150 feet in advance of bridges, railroad crossings, intersections and driveways with high usage of large trucks when installed on conventional highways.
- Rumble strips shall not be placed across exit or entrance ramps, acceleration and deceleration lanes, crossovers, gore areas or intersections with other roadways.
- Consideration should be given to noise levels when edgeline rumble strips are installed near residential areas, schools, churches, etc. A minimum of 3/8 inches depth of milled rumble strip may be considered in these areas.
- On roadways with high bicycle activity, consideration should be given before the installation of edgeline rumble strips. Things to consider include size of rumble strips, rumble strip material and location of rumble strips on the shoulder. If the designer determines that gaps are needed in the rumble strips due to bicycle use of the road, then follow the requirement shown in FHWA Technical Advisory T5040.39, or latest version. A detail of the spacing shall be included in the plans.

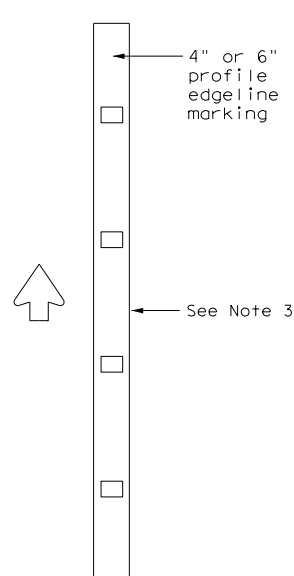
WHEN INSTALLING RAISED OR PROFILE EDGELINE RUMBLE STRIPS:

- Raised rumble strips consisting of non-reflective raised traffic buttons may be used. Non-reflective raised traffic buttons can be affixed to asphalt or concrete with bitumen or adhesives, as per the manufacturer's recommendations.
- Non-reflective traffic buttons shall be placed adjacent to the pavement marking delineating the edgeline when used as a rumble strip. The color of the button should match the color of the adjacent edgeline marking (white or yellow). The buttons will be paid for under Item 672, "Raised Pavement Markers." Non-reflective traffic buttons must meet the requirements of DMS-4300.
- Non-reflective traffic buttons shall not be placed across exit or entrance ramps, acceleration and deceleration lanes, crossovers, gore areas or intersections with other roadways.
- Breaks in edgeline rumble strips using raised traffic buttons shall occur at least 50 feet and no more than 150 feet in advance of bridges, railroad crossing, intersections and driveways with high usage of large trucks when installed on conventional highways.
- The minimum distance between the edgeline and the buttons should be used if the shoulder is less than 8 feet in width.
- Raised profile thermoplastic markings used as edgelines may substitute for buttons.



PLAN VIEW  
OPTION 5

RAISED EDGELINE RUMBLE STRIPS



PLAN VIEW  
OPTION 6

PROFILE EDGELINE MARKINGS

SHOULDER WIDTH TABLE		
EQUAL TO OR LESS THAN 2 FEET	GREATER THAN 2 FEET LESS THAN 4 FEET	EQUAL TO OR GREATER THAN 4 FEET
Option 1, 5 OR 6	Option 1, 2, 3 5 OR 6	Option 2, 4, 5 OR 6

		<b>Texas Department of Transportation</b>		<b>Traffic Operations Division Standard</b>	
<b>EDGELINE RUMBLE STRIPS ON UNDIVIDED OR TWO LANE HIGHWAYS RS(4) - 13</b>					
FILE:	rs(4) -13.dgn	DN:	TxDOT	CK:	TxDOT
©TxDOT	October 2013	CON:	0493	SECT:	02
REVISIONS		JOB:	021	HIGHWAY:	RM 652
		DIST:	COUNTY	SHEET NO.	
		ODA:	LOVING	130	

DATE: 6/25/2021  
 FILE: c:\transystems\pw\_local\transyscorrp-pw1\besnimanek\d0894390\epic.dgn  
 DISCLAIMER:  
 The use of this standard is governed by the "Texas Engineering Practice Act". No warranty of any kind is made by TxDOT for any purpose whatsoever. TxDOT assumes no responsibility for the conversion of this standard to other formats or for incorrect results or damages resulting from its use.

**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.  
 No Action Required     Required Action

Action No.

- Prevent stormwater pollution by controlling erosion and sedimentation in accordance with TPDES Permit TXR 150000
- Comply with the SW3P and revise when necessary to control pollution or required by the Engineer.
- Post Construction Site Notice (CSN) with SW3P information on or near the site, accessible to the public and TCEQ, EPA or other inspectors.
- When Contractor project specific locations (PSL's) increase disturbed soil area to 5 acres or more, submit NOI to TCEQ and the Engineer.

**II. WORK IN OR NEAR STREAMS, WATERBODIES AND WETLANDS CLEAN WATER ACT SECTIONS 401 AND 404**

USACE Permit required for filling, dredging, excavating or other work in any water bodies, rivers, creeks, streams, wetlands or wet areas.

The Contractor must adhere to all of the terms and conditions associated with the following permit(s):

- No Permit Required
- Nationwide Permit 14 - PCN not Required (less than 1/10th acre waters or wetlands affected)
- Nationwide Permit 14 - PCN Required (1/10 to <1/2 acre, 1/3 in tidal waters)
- Individual 404 Permit Required
- Other Nationwide Permit Required: NWP# 3(a)(c)

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. PECOS RIVER**

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:**

<b>Erosion</b>	<b>Sedimentation</b>	<b>Post-Construction TSS</b>
<input type="checkbox"/> Temporary Vegetation	<input checked="" type="checkbox"/> Silt Fence	<input type="checkbox"/> Vegetative Filter Strips
<input checked="" type="checkbox"/> Blankets/Matting	<input type="checkbox"/> Rock Berm	<input type="checkbox"/> Retention/Irrigation Systems
<input type="checkbox"/> Mulch	<input type="checkbox"/> Triangular Filter Dike	<input type="checkbox"/> Extended Detention Basin
<input type="checkbox"/> Sodding	<input type="checkbox"/> Sand Bag Berm	<input type="checkbox"/> Constructed Wetlands
<input type="checkbox"/> Interceptor Swale	<input type="checkbox"/> Straw Bale Dike	<input type="checkbox"/> Wet Basin
<input type="checkbox"/> Diversion Dike	<input type="checkbox"/> Brush Berms	<input type="checkbox"/> Erosion Control Compost
<input type="checkbox"/> Erosion Control Compost	<input type="checkbox"/> Erosion Control Compost	<input type="checkbox"/> Mulch Filter Berm and Socks
<input type="checkbox"/> Mulch Filter Berm and Socks	<input type="checkbox"/> Mulch Filter Berm and Socks	<input type="checkbox"/> Compost Filter Berm and Socks
<input type="checkbox"/> Compost Filter Berm and Socks	<input type="checkbox"/> Compost Filter Berm and Socks	<input type="checkbox"/> Vegetation Lined Ditches
	<input type="checkbox"/> Stone Outlet Sediment Traps	<input type="checkbox"/> Sand Filter Systems
	<input type="checkbox"/> Sediment Basins	<input type="checkbox"/> Grassy Swales

**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
NMP: Nationwide Permit	USACE: U.S. Army Corps of Engineers
NOI: Notice of Intent	USFWS: U.S. Fish and Wildlife Service

**III. CULTURAL RESOURCES**

Refer to TxDOT Standard Specifications in the event historical issues or archeological artifacts are found during construction. Upon discovery of archeological artifacts (bones, burnt rock, flint, pottery, etc.) cease work in the immediate area and contact the Engineer immediately.

- No Action Required     Required Action

Action No.

- 1.

**IV. VEGETATION RESOURCES**

Preserve native vegetation to the extent practical. Contractor must adhere to Construction Specification Requirements Specs 162, 164, 192, 193, 506, 730, 751, 752 in order to comply with requirements for invasive species, beneficial landscaping, and tree/brush removal commitments.

- No Action Required     Required Action

Action No.

- 1.

**V. FEDERAL LISTED, PROPOSED THREATENED, ENDANGERED SPECIES, CRITICAL HABITAT, STATE LISTED SPECIES, CANDIDATE SPECIES AND MIGRATORY BIRDS.**

- No Action Required     Required Action

Action No.

- Fish BMPs for headwater catfish and Pecos pupfish:
  - Limit construction activities within the Pecos River to outside of the spawning season, where feasible. Spawning season is typically from May 1 through September 30.
- Terrestrial reptile BMPs for the Texas horned lizard, western hognose snake, western box turtle, and Woodhouse's toad:
  - Avoid harvester ant mounds in the selection of PSLs.
  - Apply hydromulching and/or hydroseeding in areas for soil stabilization and/or revegetation of disturbed areas where feasible. If hydromulching and/or hydroseeding are not feasible due to site conditions, utilize erosion control blankets or mats that contain no netting or contain loosely woven, natural fiber netting is preferred.
  - For open trenches and excavated pits, install escape ramps at an angle of less than 45 degrees (1:1) in areas left uncovered. Visually inspect excavation areas for trapped wildlife prior to backfilling.
  - Inform contractors that if reptiles are found on project site allow species to safely leave the project area.
  - Avoid or minimize disturbing or removing downed trees, rotting stumps, and leaf litter where feasible.
  - Contractors will be advised of potential occurrence in the project area, and to avoid harming the species if encountered.
- Migratory Bird BMPs:
  - Avoid harm to migratory birds, eggs, and active nests;
  - Do not disturb, destroy, or remove active nests, including ground nesting birds, during the nesting season.
  - Inactive nests and/or vegetation suspected to contain nests should be removed outside of nesting season (nesting season is typically March 15 to September 15).
  - Complete bridge demolition activities outside of nesting season, where feasible.
  - If any demolition activities are to occur during nesting season, then preventative measures need to be put into place prior to nesting season to prevent birds from nesting during construction. If active nests are present on the bridge, demolition activities cannot be completed until nesting season has ended and the nests are no longer occupied.

If any of the listed species are observed, cease work in the immediate area, do not disturb species or habitat and contact the Engineer immediately. The work may not remove active nests from bridges and other structures during nesting season of the birds associated with the nests. If caves or sinkholes are discovered, cease work in the immediate area, and contact the Engineer immediately.

**VI. HAZARDOUS MATERIALS OR CONTAMINATION ISSUES**

General (applies to all projects):

Comply with the Hazard Communication Act (the Act) for personnel who will be working with hazardous materials by conducting safety meetings prior to beginning construction and making workers aware of potential hazards in the workplace. Ensure that all workers are provided with personal protective equipment appropriate for any hazardous materials used. Obtain and keep on-site Material Safety Data Sheets (MSDS) for all hazardous products used on the project, which may include, but are not limited to the following categories: Paints, acids, solvents, asphalt products, chemical additives, fuels and concrete curing compounds or additives. Provide protected storage, off bare ground and covered, for products which may be hazardous. Maintain product labelling as required by the Act. Maintain an adequate supply of on-site spill response materials, as indicated in the MSDS. In the event of a spill, take actions to mitigate the spill as indicated in the MSDS, in accordance with safe work practices, and contact the District Spill Coordinator immediately. The Contractor shall be responsible for the proper containment and cleanup of all product spills.

Contact the Engineer if any of the following are detected:

- \* Dead or distressed vegetation (not identified as normal)
- \* Trash piles, drums, canister, barrels, etc.
- \* Undesirable smells or odors
- \* Evidence of leaching or seepage of substances

Does the project involve any bridge class structure rehabilitation or replacements (bridge class structures not including box culverts)?

- Yes     No

If "No", then no further action is required. If "Yes", then TxDOT is responsible for completing asbestos assessment/inspection.

Are the results of the asbestos inspection positive (is asbestos present)?

- Yes     No

If "Yes", then TxDOT must retain a DSHS licensed asbestos consultant to assist with the notification, develop abatement/mitigation procedures, and perform management activities as necessary. The notification form to DSHS must be postmarked at least 15 working days prior to scheduled demolition.

If "No", then TxDOT is still required to notify DSHS 15 working days prior to any scheduled demolition.

In either case, the Contractor is responsible for providing the date(s) for abatement activities and/or demolition with careful coordination between the Engineer and asbestos consultant in order to minimize construction delays and subsequent claims.

Any other evidence indicating possible hazardous materials or contamination discovered on site. Hazardous Materials or Contamination Issues Specific to this Project:

- No Action Required     Required Action

Action No.

- The following bridge (NBI #061510049302002) contains coatings/paint or other items that contain lead; the Lead Inspection Report completed on November 15, 2018 indicated concentrations of lead at 44,600 ppm in the silver paint over green paint on steel I-beams and cross supports below bridge and throughout guardrails. Approximately 920 square feet of painted material was observed. The location of lead-containing paint (LCP) shall be identified in the project plans. For tasks which might expose an employee to lead above the permissible exposure limit (PEL), the Contractor shall be responsible for providing exposure assessment and worker protection as required under OSHA 1926.62 (Lead in Construction). Where stripping back of lead paint is performed as a protective measure, strip back sufficient LCP to facilitate the project work, as outlined in the project plans. A Lead-Containing Paint Inspection Report dated November 15, 2018 was performed by TRC Solutions and is available for reference at the Odessa District Office.

**VII. OTHER ENVIRONMENTAL ISSUES**

(includes regional issues such as Edwards Aquifer District, etc.)

- No Action Required     Required Action

Action No.

- Any bridge removal with lead paint will be carried out with a mechanism that does not produce fumes or dust to avoid potential LBP mitigation. If cutting is planned, LBP mitigation will be at contractor's expense.



**TranSystems**  
 500 W. 7th ST. SUITE 1100  
 FORT WORTH, TX 76137  
 (817) 339-8950  
 FIRM REG. # 3557

6/25/2021



**ENVIRONMENTAL PERMITS, ISSUES AND COMMITMENTS EPIC**

FILE: epic.dgn	DN: TxDOT	CK: RG	DN: VP	CK: AR
©TxDOT: February 2015	CONT	SECT	JOB	HIGHWAY
12-12-2011 (DS) REVISIONS	0493	02	021	RM 652
05-07-14 ADDED NOTE SECTION IV.	DIST	COUNTY	SHEET NO.	
01-23-2015 SECTION I CHANGED ITEM 1122 TO ITEM 506, ADDED GRASSY SWALES.	ODA	LOVING	131	



**STORM WATER POLLUTION PREVENTION PLAN (SW3P):**

This SW3P has been developed in accordance with TPDES General Permit TXR150000. The operator, The Texas Department of Transportation ensures that: Project specifications provide that adequate BMPs have been developed for this project. The contractor shall be the party responsible for implementing the BMPs described herein. The contractor shall implement changes approved by the Project Engineer to the SW3P within the times specified in the SW3P or the TPDES General Permit. Operators affected by modifications to specifications will be notified in a timely manner.

**1. SITE OR PROJECT DESCRIPTION:**

NATURE OF THE CONSTRUCTION ACTIVITY: SEE TITLE SHEET

POTENTIAL POLLUTANTS AND SOURCES:	
<i>Sediment laden storm water</i>	<i>Storm water conveyance over disturbed areas</i>
<i>Fuels, oils, and lubricants</i>	<i>Construction vehicles and storage areas</i>
<i>Transported soil</i>	<i>Off site vehicle tracking</i>
<i>Construction debris and waste</i>	<i>Various construction activities</i>
<i>Sanitary waste</i>	<i>Restroom facilities</i>
<i>Trash</i>	<i>Construction site and Receptacles</i>
<i>Other</i>	<i>None</i>
<i>Other</i>	<i>None</i>

**SEQUENCE OF ACTIVITIES THAT WILL DISTURB SOILS:**

1. REMOVAL OF EXISTING BRIDGE
2. CONSTRUCTION OF NEW BRIDGE
3. CONSTRUCTION OF NEW PAVEMENT & GRADING
4. \_\_\_\_\_
5. \_\_\_\_\_
6. \_\_\_\_\_
7. \_\_\_\_\_
8. \_\_\_\_\_

**AREAS:**

TOTAL AREA OF PROJECT:	2.8	ACRES
TOTAL AREA OF SOIL DISTURBANCE:	2.0	ACRES
TOTAL AREA OFF-SITE:	Acreage and Description to be Attached	

DATA DESCRIBING THE SOIL: *Delnorte-Chillicoata association, rolling - Well drained with high runoff Very low available water capacity (about 0.9 inches)*

GENERAL LOCATION MAP: SEE TITLE SHEET

DETAILED SITE MAP: SEE SW3P SITE MAP/S SHEET/S

**THE LOCATION AND DESCRIPTION OF CONCRETE AND ASPHALT PLANTS:**

*Supporting Concrete Plant Facilities shall be located off site. See note DEDICATED CONCRETE PLANTS.*

*Supporting Asphalt Plant Facilities shall be located off site. See note DEDICATED ASPHALT PLANTS.*

NAME OF RECEIVING WATERS: PECOS RIVER

A COPY OF TPDES CGP TXR150000 IS INCLUDED IN THE SW3P FILE.

**REMARKS:**

- Care shall be taken to disturb as little of the natural area as possible.*
- Storm water drainage will be provided by existing and proposed grading.*
- Storm water shall be filtered through sediment control devices before leaving the project.*

401 WATER QUALITY CERTIFICATION: YES X NO \_\_\_\_\_

**2. BEST MANAGEMENT PRACTICES (BMPs):**

**EROSION AND SEDIMENT CONTROLS:** Erosion and sediment controls have been designed to retain sediment on-site. Controls shall be utilized to reduce off site transport of suspended sediments and pollutants if it is necessary to pump water from the site. Control measures shall be installed per specifications or as directed. Sediment must be removed from controls per the plan requirements or manufacturers recommendations, but no later than the time that design capacity has been reduced by 50%. If sediment escapes the site, accumulations will be removed to minimize further negative effects. Controls will be developed to limit the off site transportation of litter, construction debris, and construction materials.

INTERIM (INT), PERMANENT (PER), AND 401 CERTIFICATION BMP'S:							
EROSION CONTROLS:	401	INT	PER	SEDIMENT CONTROLS:	401	INT	PER
<input checked="" type="checkbox"/> Blankets and Matting	—	X	—	<input checked="" type="checkbox"/> Silt Fence	—	X	—
<input type="checkbox"/> Sod	—	—	—	<input type="checkbox"/> Rock Berm	—	—	—
<input type="checkbox"/> Preserve Existing Vegetation	—	—	—	<input type="checkbox"/> Buffer Zones	—	—	—
<input type="checkbox"/> Soil Stabilization	—	—	—	<input type="checkbox"/> Vegetative Filter Strips	—	—	—
<input type="checkbox"/> Permanent Vegetation	—	—	—	<input type="checkbox"/> Ditch Block	—	—	—
<input type="checkbox"/> No Erosion Controls are Required.	—	—	—	<input checked="" type="checkbox"/> Erosion Control Logs	—	X	—
				<input type="checkbox"/> No Sediment Controls are Required.			

**POST CONSTRUCTION TSS CONTROL (401 CERTIFICATION ONLY):**

- |  |  |
|--|--|
| <input type="checkbox"/> Vegetation Lined Drainage Ditch | <input type="checkbox"/> Grassy Swales   |
| <input type="checkbox"/> Retention/Irrigation            | <input type="checkbox"/> Vegetative Filter Strips                              |
| <input type="checkbox"/> Erosion Control Compost         | <input checked="" type="checkbox"/> No Post Construction TSS Control Required. |

**SEQUENCE OR SCHEDULE OF IMPLEMENTATION:**

1. INSTALL CONTROL DEVICES AS SHOWN ON PLANS AND AS DIRECTED BY THE ENGINEER.
2. MAINTAIN AND UPGRADE DEVICES AS NEEDED.
3. WHEN CONSTRUCTION ACTIVITY IS COMPLETE, TEMPORARY CONTROLS SHALL BE REMOVED AS APPROVED BY THE ENGINEER.
4. \_\_\_\_\_
5. \_\_\_\_\_
6. \_\_\_\_\_
7. \_\_\_\_\_

The dates of major grading activities, when construction activities temporarily or permanently cease on a portion of the site, and when stabilization practices are initiated, are available in the project diary or SW3P. Stabilization measures must be initiated as soon as practicable in portions of the site where construction has temporarily or permanently ceased. The Odessa District is located in a semi-arid area and the 14 and 21 day requirements are not applicable except, as directed by the Engineer.

**3. STRUCTURAL CONTROL PRACTICES:** Structural control practices for this project are listed elsewhere herein.

**4. PERMANENT STORM WATER CONTROLS:** Structural control practices installed during construction will be maintained and inspected after construction has ceased on the site and until final stabilization is attained. Unless specified in the plans, after project acceptance TxDOT will assume maintenance responsibilities for the controls and measures. Other permanent controls include existing and proposed riprap at culvert inlets and outlets, diversion dikes, swales, retaining walls, and other similar devices.

**5. OTHER CONTROLS:** OFF-SITE VEHICLE TRACKING OF SEDIMENTS AND THE GENERATION OF DUST: The off site vehicle tracking of sediments shall be minimized by removal of excess dirt from the road and at entrances to the work site. Stabilized Construction Entrances and Exits shall be constructed per the plans or as directed by the Project Engineer. The generation of dust will be minimized as directed by the Project Engineer by dampening haul roads and covering haul trucks with a tarpaulin.

**CONSTRUCTION AND WASTE MATERIALS:** The contractor will maintain a clean, orderly construction site. Construction waste including trash, rubble, scrap and vegetation shall be disposed of in lidded dumpsters or in a manner approved by the Project Engineer. Disposal methods must meet Federal, State, and Local waste management guidelines. No construction waste will be buried or burned on site. Spoils disposal, material storage, and materials resulting from the destruction of existing roads and structures shall be stored in areas designated by the Project Engineer and protected from run-off. All waterways shall be cleared of temporary embankment, temporary bridges, matting, false work, piling, debris, or other obstructions placed during construction operations, that are not part of the finished work, as soon as practicable. All excess soil generated by the construction will be collected and disposed of by the contractor. Disposal areas, stockpiles, and haul roads shall be constructed in a manner that will minimize and control the amount of sediment that may enter receiving waters. Disposal areas shall not be located in any wetland, water body, or stream bed.

**POLLUTANT SOURCES FROM AREAS OTHER THAN CONSTRUCTION:** Staging areas and vehicle maintenance areas shall be located and constructed in a manner to minimize the runoff of pollutants. If potential pollutant sources are identified after the start of construction, controls and measures shall be implemented as directed by the Project Engineer.

**5. OTHER CONTROLS (CONT):**

**DEDICATED ASPHALT PLANTS:** Asphalt or asphaltic material for this project will be produced off site. If the project requires a dedicated asphalt plant and the plant within 1 mile of the project limits it will be considered an off site PSL. Consideration shall be given to on site plant and storage facilities and measures implemented as directed by the Project Engineer.

**DEDICATED CONCRETE PLANTS:** Cement or Concrete material for this project will be produced off site. If the project requires a dedicated concrete plant and the plant is within 1 mile of the project limits it will be considered an off site PSL. Consideration shall be given to on site plant and storage facilities and measures implemented as directed by the Project Engineer. Concrete trucks shall be washed or washed out in locations designated by the Project Engineer. The locations shall be protected by a berm sufficient to contain all waste and wash water. Wash water shall not be allowed to enter any storm drainage system or waterway. The residual material and contaminated soil shall be collected and disposed of in accordance with Federal, State, and Local guidelines. Staging areas and vehicle maintenance areas shall be located and constructed in a manner to minimize the runoff of pollutants.

**HAZARDOUS MATERIALS AND SPILL REPORTING:** The contractor shall take appropriate measures to prevent, minimize, and control the spillage or leakage of hazardous materials and any associated wastes on site and in maintenance and staging areas. Hazardous materials shall include but are not limited to paints, acids, solvents, asphalt products, chemical additives, curing compounds, oils, fuels, and lubricants. Hazardous materials shall not be stored, accumulated, or transported in open containers subject to precipitation or spillage, but shall be stored, accumulated, or transported in closed containers of the type recommended by the manufacturer. In the event of a spill the Project Engineer should be contacted immediately. All spills shall be immediately cleaned and any contaminated soil removed and disposed of in accordance with Local, State, and Federal laws. Fuel tanks shall be protected by a secondary containment, such as a lined berm, capable of containing 1.5 times the capacity of the tank, or as approved by the Project Engineer.

**OFF SITE PSLs:** All off site project specific locations including dedicated asphalt plants, concrete plants, or utility installations, required by the contractor, are the contractor's responsibility. The contractor shall secure all permits required by local, state, or federal laws for off site PSLs. The contractor shall provide diagrams and areas of disturbance for all PSL's within 1 mile of the project.

**SANITARY FACILITIES:** All sanitary or septic wastes that are generated onsite shall be treated and disposed of in accordance with state and local regulations. Raw sewage or septage shall not be discharged or buried on site. Precaution shall be taken to prevent illicit discharges to storm water. Licensed waste management contractors shall be required to dispose of sanitary waste. Porta johns will be required for the laboratory and construction site or as directed by the Project Engineer.

**VELOCITY DISSIPATION DEVICES:** Velocity dissipation devices shall be placed at discharge locations and along the length of any outfall channel as shown in the plans or as directed by the Project Engineer to provide a non-erosive flow velocity from the structure to a watercourse so that the natural physical and biological characteristics and functions are maintained and protected.

**6. APPROVED STATE AND LOCAL PLANS:** This SW3P is consistent with requirements specified in applicable sediment and erosion site plans or site permits, or storm water management site plans or permits approved by federal, state, or local officials.

**7. MAINTENANCE:** Control measures shall be properly installed according to specifications. If inspections or other information indicates a control has been installed, used, or is performing inadequately, the contractor must replace or modify the control as soon as practicable after discovery. Control measures shall be maintained in effective operating condition. If inspections determine that BMPs are not operating effectively maintenance will be performed as necessary to continue the effectiveness of the controls. Maintenance must be accomplished as soon as practicable. Controls adjacent to creeks, culverts, bridges, and water crossings shall have priority. Controls that have been disabled, run over, removed, or otherwise rendered ineffective must be corrected immediately upon discovery.

**8. INSPECTION OF CONTROLS:** A TxDOT inspector will inspect disturbed areas of the site that have not been finally stabilized, areas used for storage of materials that are exposed to precipitation, and structural controls for evidence of, or the potential for, pollutants entering the drainage system. Sediment and erosion controls measures identified in the SW3P will be inspected to ensure that they are operating correctly. Locations where vehicles enter or exit the site will be inspected for evidence of off-site vehicle tracking. Inspections will be conducted every month and within 24 hours after the end of a storm event of 0.5 inches or greater. The SW3P will be modified based on the result of these inspections. Revisions will be completed within 7 Calendar days following the inspection. Revised implementation schedules will be described in the SW3P and implemented as soon as practicable. Rain gages will be maintained on site for the duration of the project. Reports summarizing the scope of the inspections are included in the SW3P file.

**9. NON-STORM WATER COMPONENTS:** The contractor shall be required to implement appropriate pollution prevention controls and measures for all eligible non-storm water components of the discharge as approved and directed by the Project Engineer.



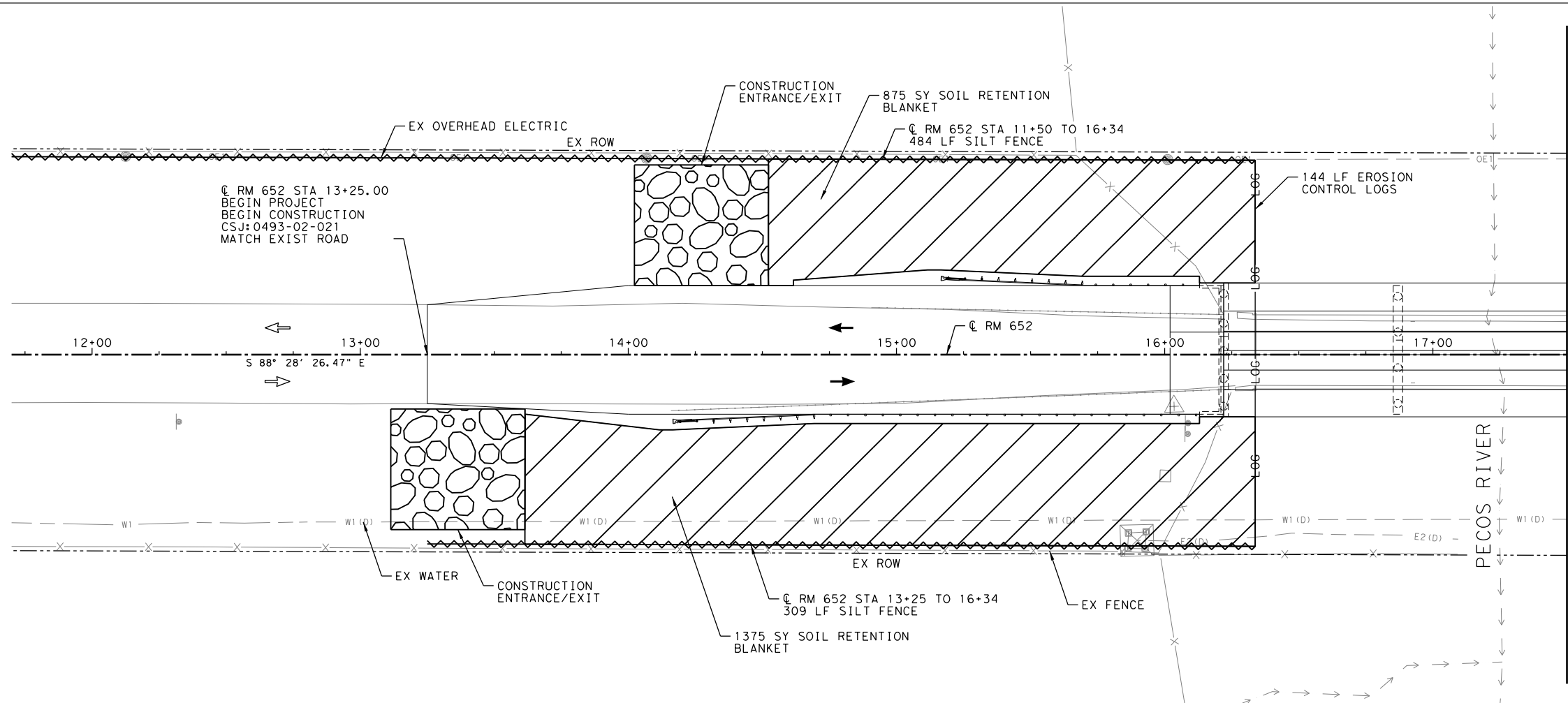
6/25/2021  
500 W. 7th ST., SUITE 1100  
FORT WORTH, TX 76137  
(817) 339-8950  
FIRM REG. # 3557

**SW3P NOTES**  
Texas Department of Transportation  
SW3P NOTES  
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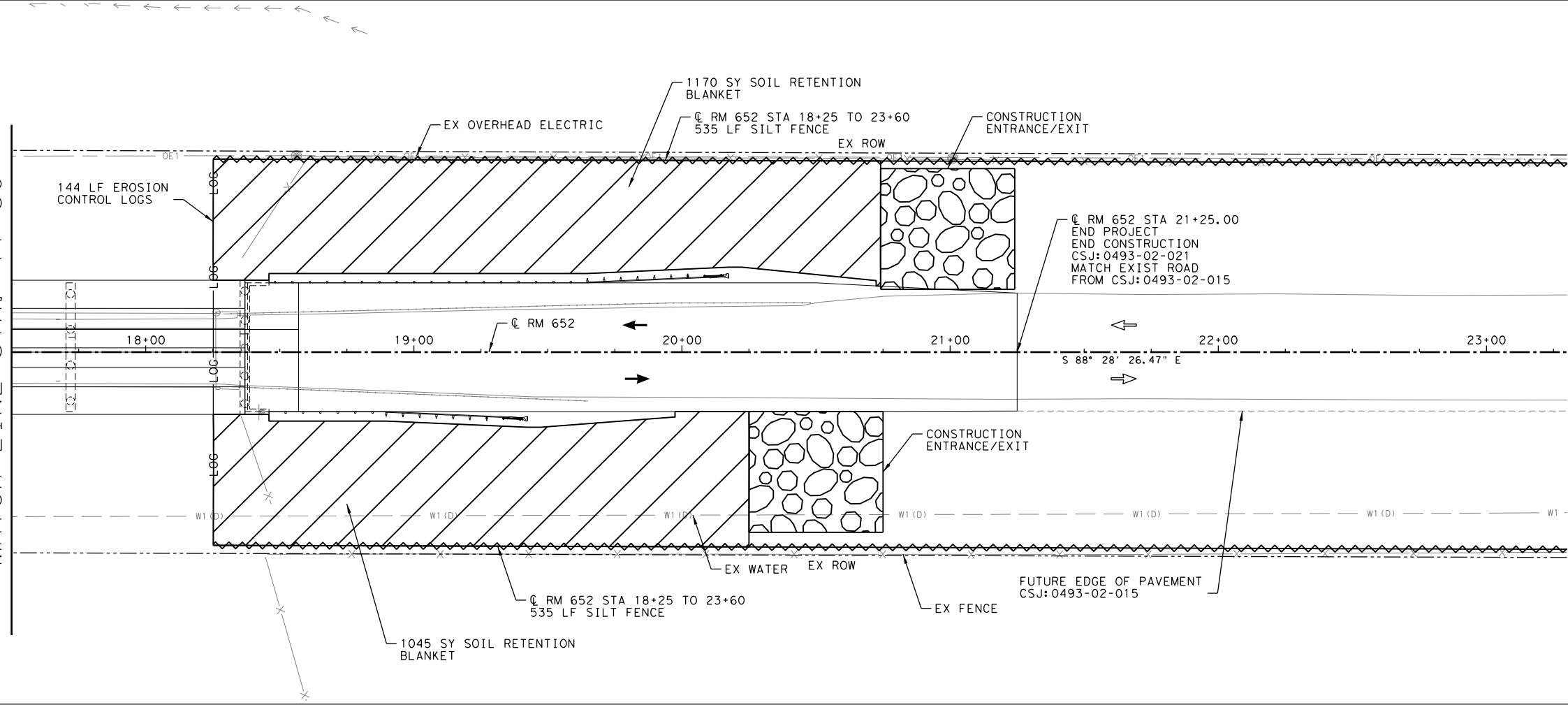
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6	SEE TITLE SHEET		132
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TEXAS	ODA	LOVING	
CONT.	SECT.	JOB	HIGHWAY NO.
0493	02	021	RM 652

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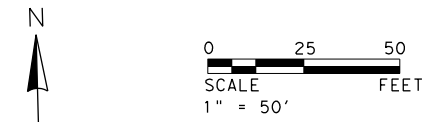
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MATCH LINE STA. 17+50



MATCH LINE STA. 17+50

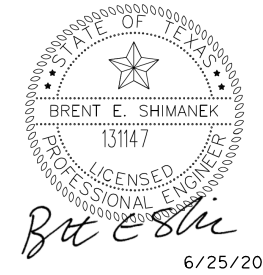


**LEGEND**

- SILT FENCE
- EROSION CONTROL LOGS
- CONSTRUCTION ENTRANCE/EXIT
- SOIL RETENTION BLANKET

**NOTES:**

1. THE CONTRACTOR SHALL SUBMIT A BRIDGE DEMOLITION PLAN, INCLUDING ANY POTENTIAL HAUL ROADS, TO THE ENGINEER FOR APPROVAL BEFORE BEGAINNING WORK. HAUL ROADS SHALL CONFORM TO ITEM 7 OF THE STANDARD SPECIFICATIONS. CONSTRUCTION DEBRIS IS NOT PERMITTED TO BE DROPPED IN THE RIVER. ANY WORK WITHIN THE PECOS RIVER SHOULD BE AVOIDED FROM MAY TO SEPTEMBER, DUE TO STATE-LISTED THREATENED FISH SPECIES. THIS INCLUDES INSTALLATION OR REMOVAL OF ANY TEMPORARY HAUL ROADS OR EQUIPMENT THAT MAY NEED TO BE IN THE WATER. ANY TEMPORARY HAUL ROADS SHOULD BE INSTALLED PRIOR TO MAY AND REMOVED AFTER SEPTEMBER. ANY TEMPORARY HAUL ROADS MUST BE INSTALLED IN SUCH A WAY THAT MAINTAINS EXISTING WATER FLOW.



TEXAS REGISTERED ENGINEERING FIRM F-3557  
**TranSystems** 500 W. 7th ST. SUITE 1100  
 FORT WORTH, TX 76102  
 (817) 339-8950  
 FIRM REG. #: 3557



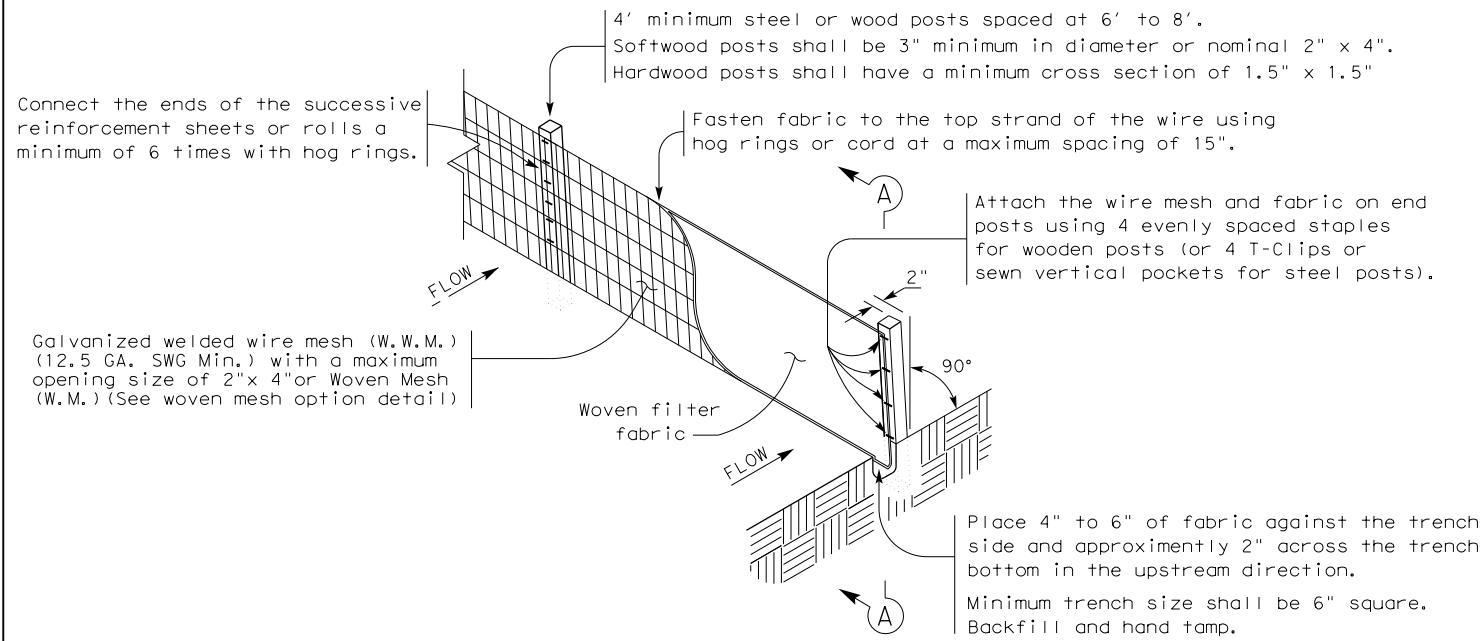
**RM 652  
EROSION CONTROL PLAN**

SCALE: 1" = 50' PLAN SHEET 1 OF 1

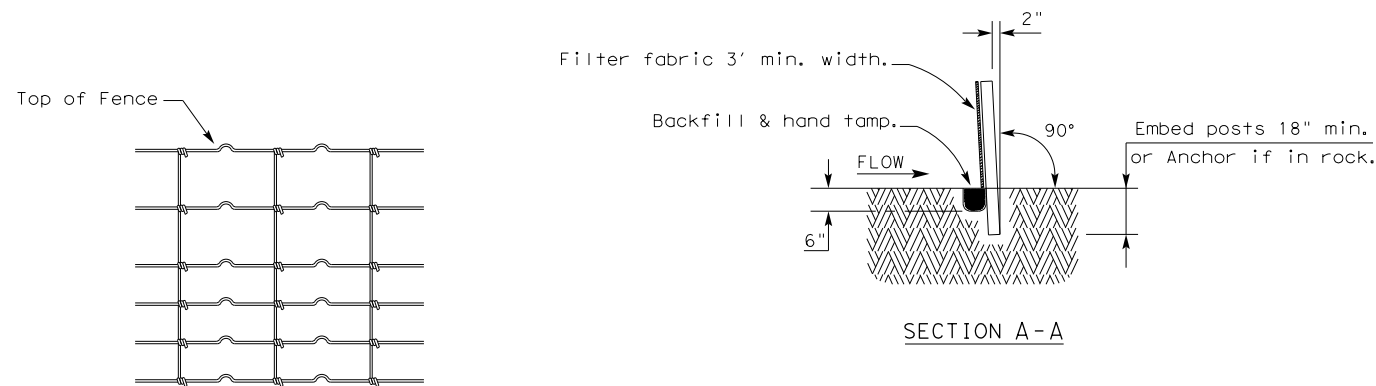
DESIGN BES	FED. RD. DIV. NO. 6	FEDERAL AID PROJECT NO. SEE TITLE SHEET		HIGHWAY NO. RM 652
GRAPHICS BES	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK KMA	TEXAS	ODA	LOVING	<b>133</b>
CHECK RR	CONTROL	SECTION	JOB	
	0493	02	021	

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TEMPORARY SEDIMENT CONTROL FENCE



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<sup>2</sup>. Sediment control fence is not recommended to control erosion from a drainage area larger than 2 acres.

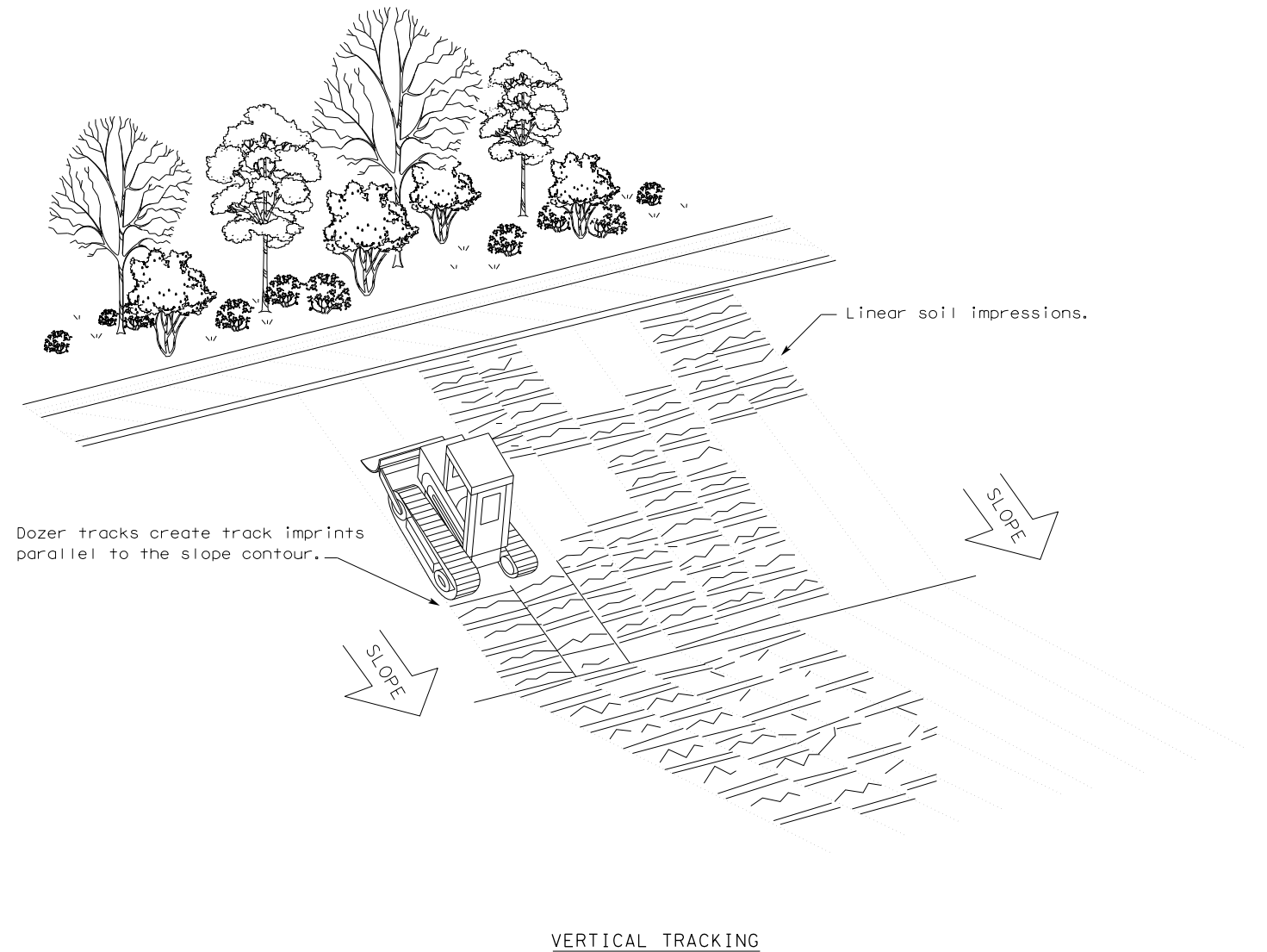
LEGEND

Sediment Control Fence



GENERAL NOTES

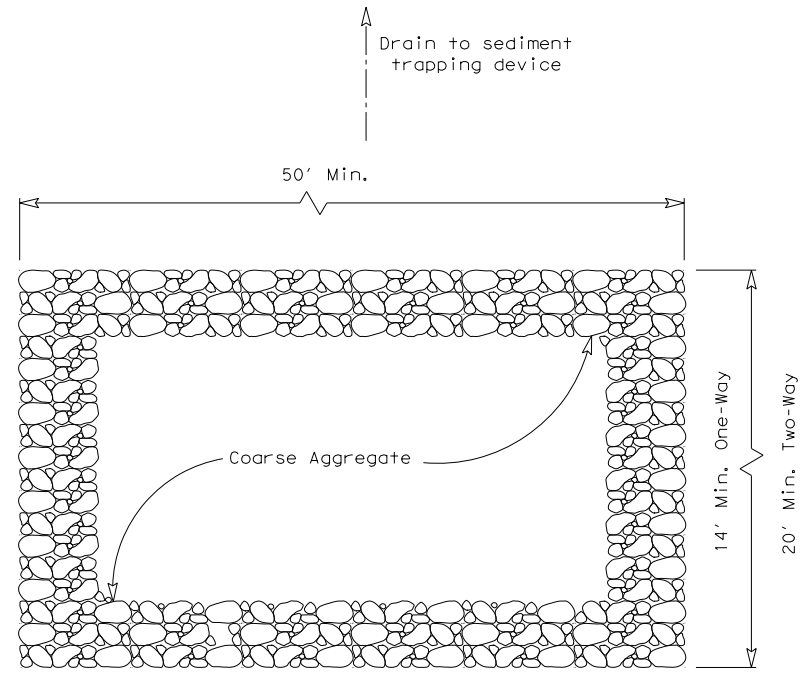
1. Vertical tracking is required on projects where soil distributing activities have occurred unless otherwise approved.
2. Perform vertical tracking on slopes to temporarily stabilize soil.
3. Provide equipment with a track undercarriage capable of producing linear soil impressions measuring a minimum 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 continuous linear track impressions where the minimum 12" length impressions are perpendicular to the slope or direction of water flow.



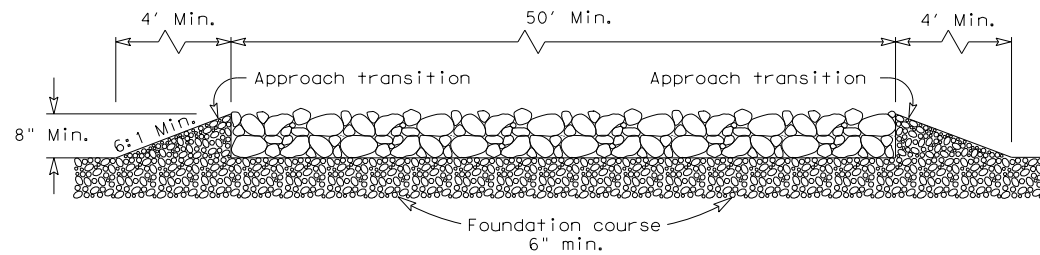
				<b>Design Division Standard</b>	
<b>TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES FENCE &amp; VERTICAL TRACKING</b> <b>EC(1) - 16</b>					
FILE: ec116	DN: TxDOT	CK: KM	DW: VP	DN/CK: LS	
© TxDOT: JULY 2016	CONT	SECT	JOB	HIGHWAY	
REVISIONS		0493	02	021	RM 652
		DIST	COUNTY	SHEET NO.	
		ODA	LOVING	134	

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PLAN VIEW

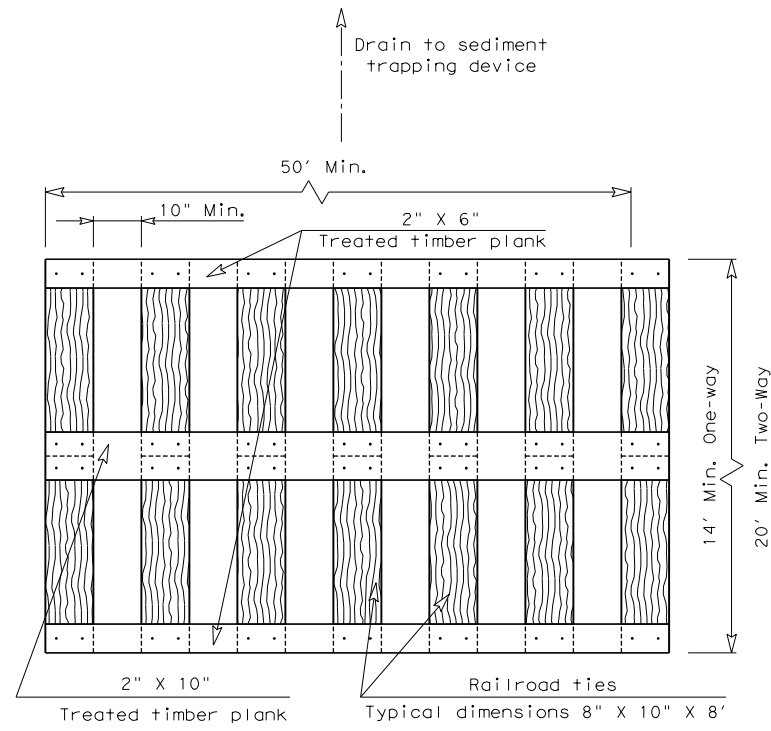


ELEVATION VIEW

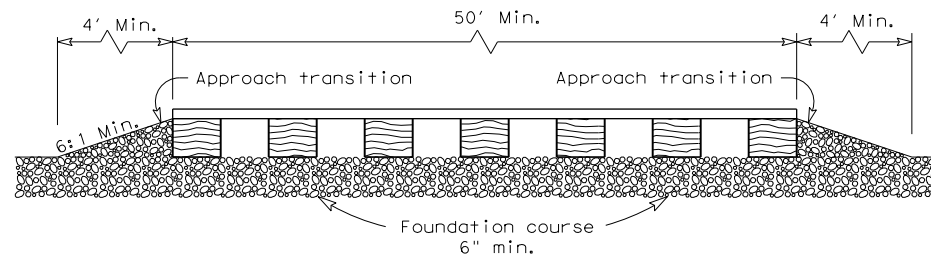
CONSTRUCTION EXIT (TYPE 1)  
 ROCK CONSTRUCTION (LONG TERM)

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 materials 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.



PLAN VIEW

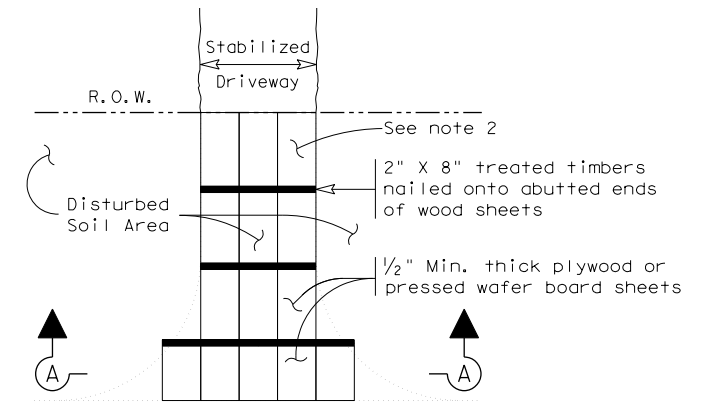


ELEVATION VIEW

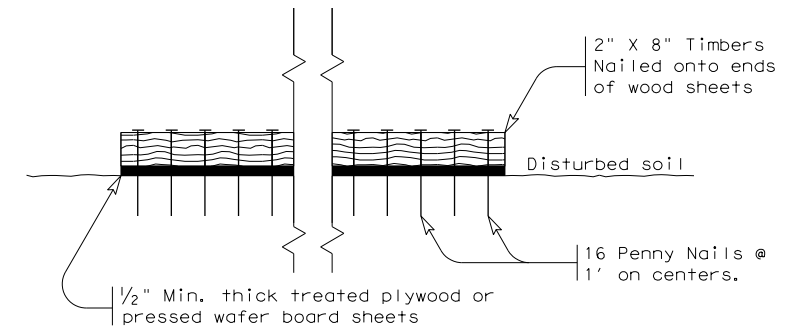
CONSTRUCTION EXIT (TYPE 2)  
 TIMBER CONSTRUCTION (LONG TERM)

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 1/2" 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.



PLAN VIEW



SECTION A-A  
 CONSTRUCTION EXIT (TYPE 3)  
 SHORT TERM

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.

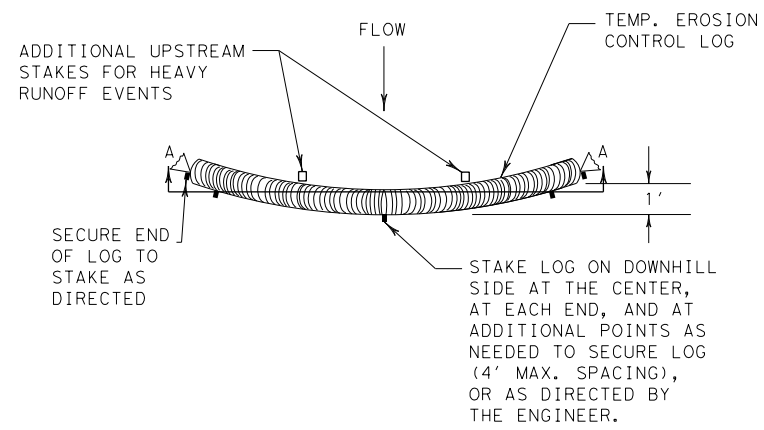


TEMPORARY EROSION,  
 SEDIMENT AND WATER  
 POLLUTION CONTROL MEASURES  
 CONSTRUCTION EXITS  
 EC(3)-16

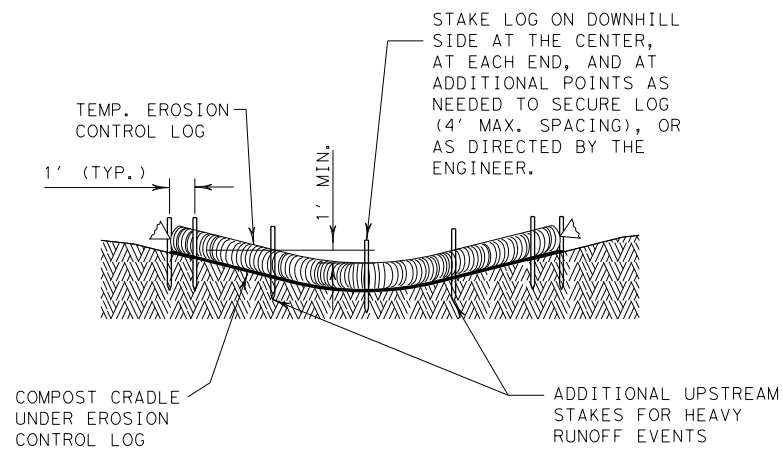
FILE: ec316	DN: I&DQI	CK: KM	DW: VP	DN/CK: LS
© TxDOT: JULY 2016	CONT SECT	JOB	HIGHWAY	
REVISIONS	0493 02	021	RM 652	
	DIST	COUNTY	SHEET NO.	
	ODA	LOVING	135	

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PLAN VIEW



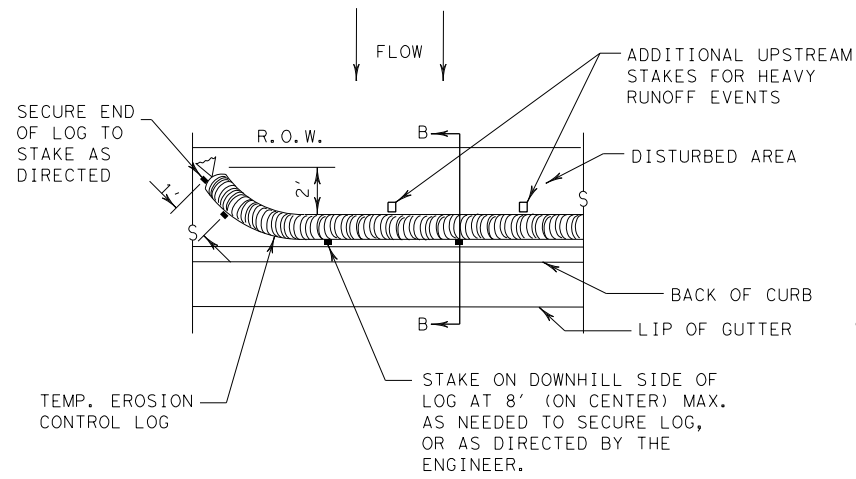
SECTION A-A

EROSION CONTROL LOG DAM

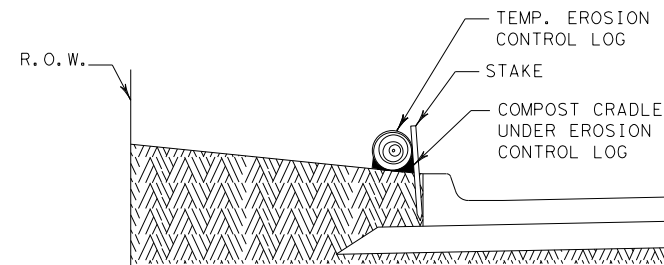
CL-D

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



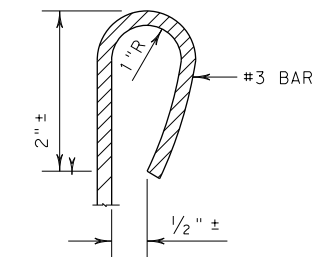
PLAN VIEW



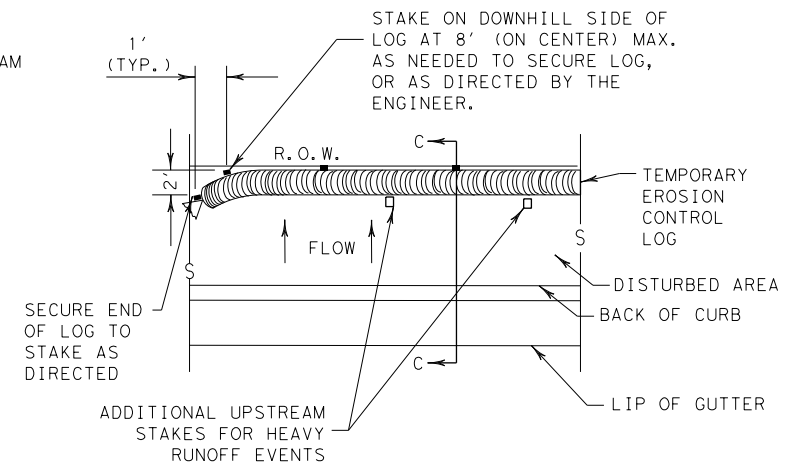
SECTION B-B

EROSION CONTROL LOG AT BACK OF CURB

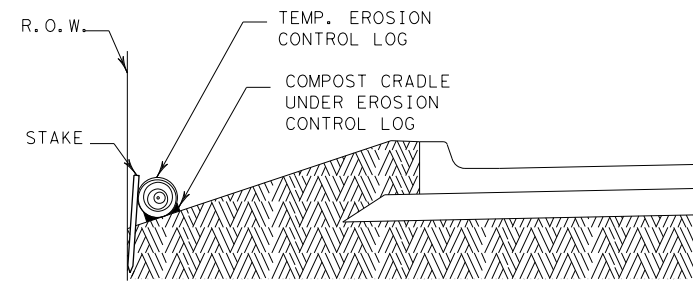
CL-BOC



REBAR STAKE DETAIL



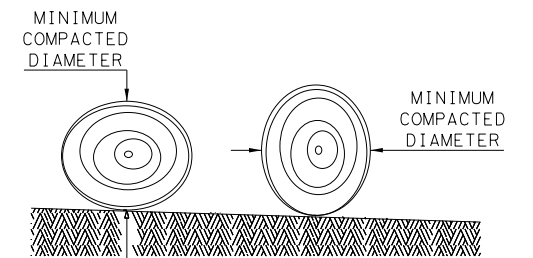
PLAN VIEW



SECTION C-C

EROSION CONTROL LOG AT EDGE OF RIGHT-OF-WAY

CL-ROW



DIAMETER MEASUREMENTS OF EROSION CONTROL LOGS SPECIFIED IN PLANS

SEDIMENT BASIN & TRAP USAGE GUIDELINES

An erosion control log sediment trap may be used to filter sediment out of runoff draining from an unstabilized area.

**Log Traps:** The drainage area for a sediment trap should not exceed 5 acres. The trap capacity should be 1800 CF/Acre (0.5" over the drainage area).

- Control logs should be placed in the following locations:
1. Within drainage ditches spaced as needed or min. 500' on center
  2. Immediately preceding ditch inlets or drain inlets
  3. Just before the drainage enters a water course
  4. Just before the drainage leaves the right of way
  5. Just before the drainage leaves the construction limits where drainage flows away from the project.

The logs should be cleaned when the sediment has accumulated to a depth of 1/2 the log diameter.

Cleaning and removal of accumulated sediment deposits is incidental and will not be paid for separately.

GENERAL NOTES:

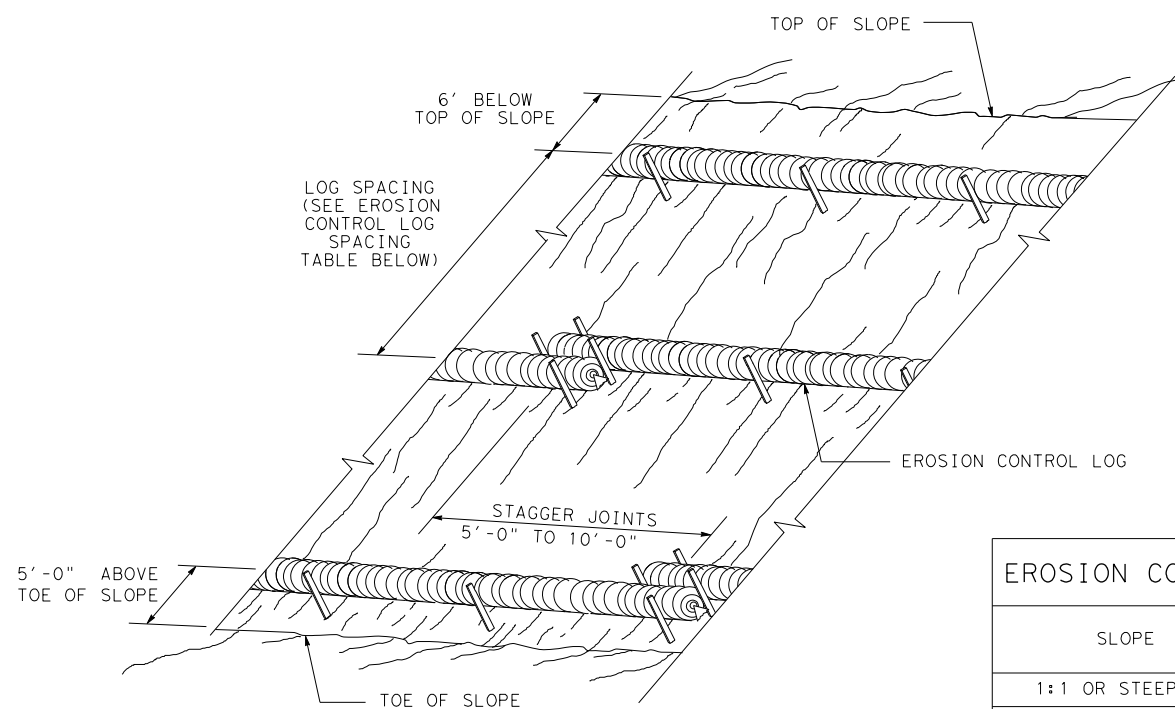
1. EROSION CONTROL LOGS SHALL BE INSTALLED IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS, OR AS DIRECTED BY THE ENGINEER.
2. LENGTHS OF EROSION CONTROL LOGS SHALL BE IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS AND AS REQUIRED FOR THE PURPOSE INTENDED.
3. UNLESS OTHERWISE DIRECTED, USE BIODEGRADABLE 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.

SHEET 1 OF 3

		<b>Design Division Standard</b>	
<b>TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES</b> <b>EROSION CONTROL LOG</b> <b>EC (9) - 16</b>			
FILE: ec916	DN: TxDOT	CK: KM	DW: LS/PT
© TxDOT: JULY 2016	CONT	SECT	JOB
REVISIONS	0493	02	021
	DIST	COUNTY	SHEET NO.
	ODA	LOVING	136

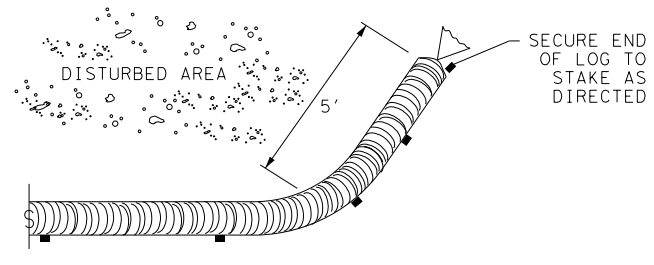
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EROSION CONTROL LOGS ON SLOPES  
 STAKE AND TRENCHING ANCHORING

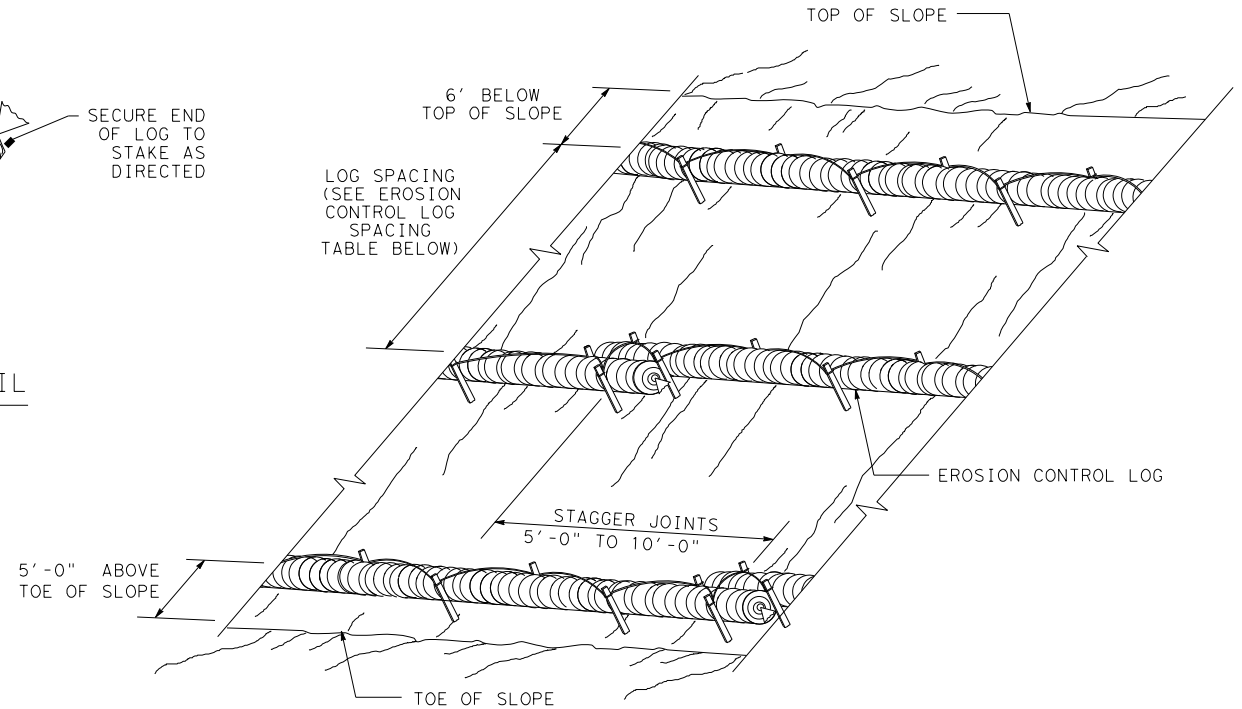
CL-SST



END SECTION RAP DETAIL

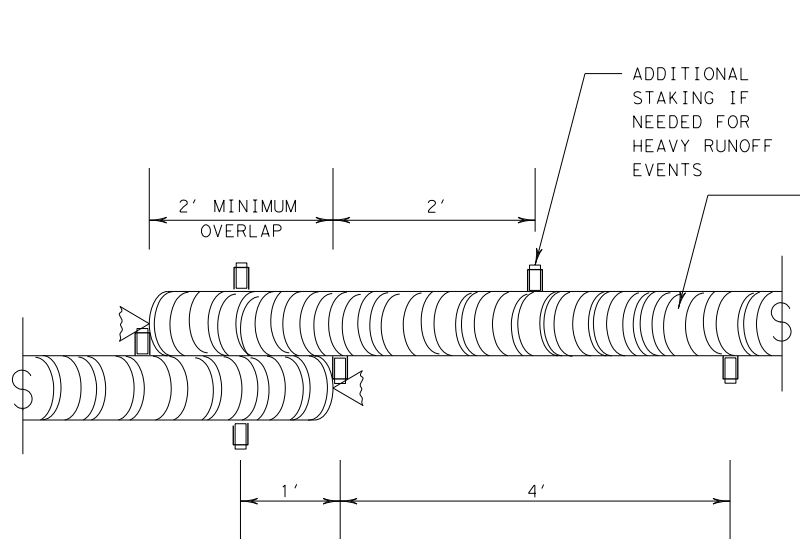
SLOPE	LOG DIAMETER			
	6"	8"	12"	18"
1:1 OR STEEPER	5'	10'	15'	20'
2:1	10'	20'	30'	40'
3:1	15'	30'	45'	60'
4:1 OR FLATTER	20'	40'	60'	80'

\* ADJUSTMENTS CAN BE MADE FOR SOIL TYPE:  
 SOFT, LOAMY SOILS-ADJUST ROWS CLOSER TOGETHER;  
 HARD, ROCKY SOILS- ADJUST ROWS FARTHER APART



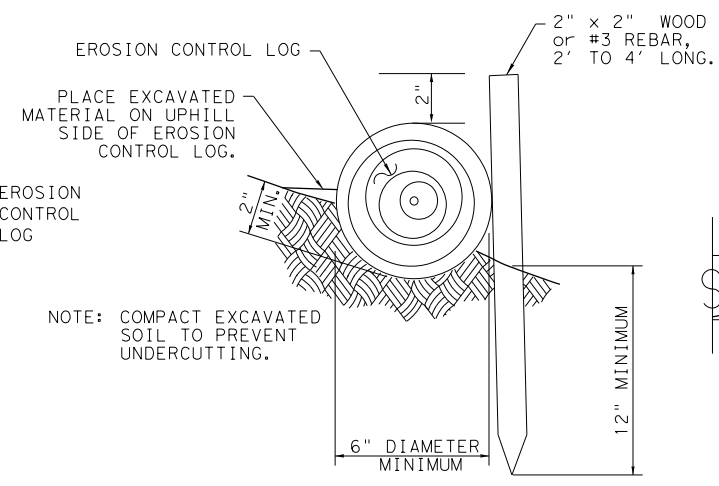
EROSION CONTROL LOGS ON SLOPES  
 STAKE AND LASHING ANCHORING

CL-SSL



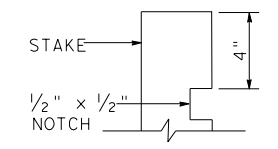
STAKE AND TRENCHING ANCHORING DETAIL

CL-SST



STAKE AND LASHING ANCHORING DETAIL

CL-SSL



STAKE NOTCH DETAIL

LOG DIAMETER	DEPTH
6"	2"
8"	3"
12"	4"
18"	5"

SHEET 2 OF 3

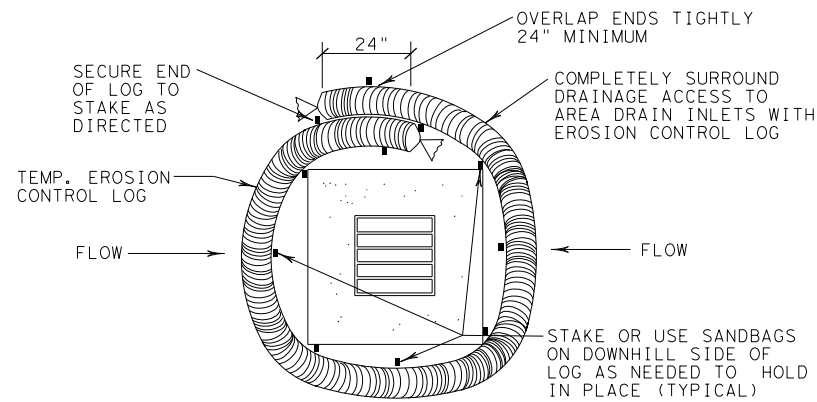
**Texas Department of Transportation** Design Division Standard

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
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REVISIONS	0493	02	021	RM 652
	DIST	COUNTY	SHEET NO.	
	ODA	LOVING	137	

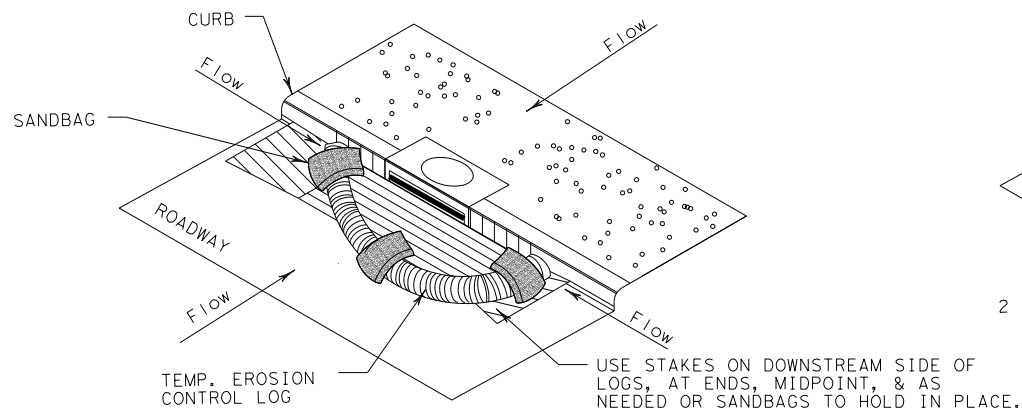
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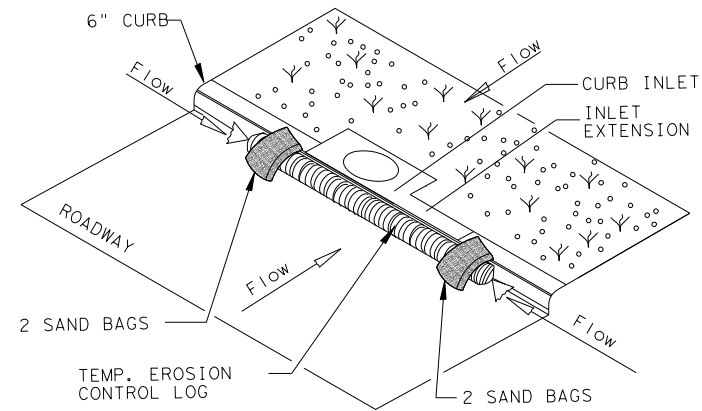
EROSION CONTROL LOG AT DROP INLET

CL-DI



EROSION CONTROL LOG AT CURB INLET

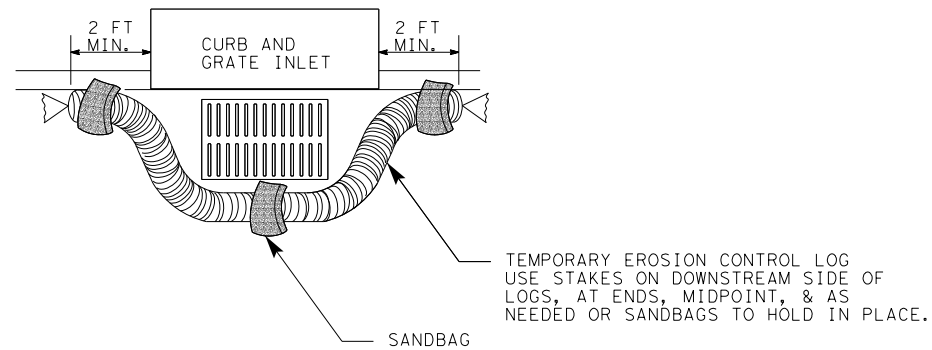
CL-CI



EROSION CONTROL LOG AT CURB INLET

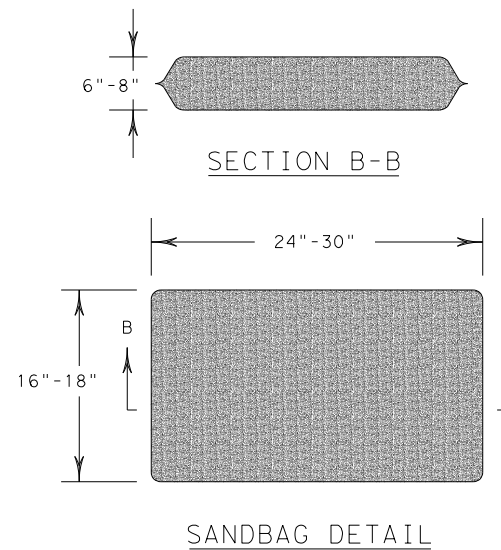
CL-CI

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



SHEET 3 OF 3

				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	
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REVISIONS	0493	02	021	RM 652	
	DIST	COUNTY	SHEET NO.		
	ODA	LOVING	138		