

FED. RD. DIV. NO.	PROJECT NO.	SHEET NO.	
6	BR 2022 (961)	1	
STATE	STATE DIST.	COUNTY	
TEXAS	YKM	COLORADO	
CONTROL	SECTION	JOB	HIGHWAY NO.
0913	26	066	CR

INDEX OF SHEETS

SEE SHEET 2

# STATE OF TEXAS TEXAS DEPARTMENT OF TRANSPORTATION

## PLANS OF PROPOSED STATE HIGHWAY IMPROVEMENT

FEDERAL PROJECT NO. BR 2022(961)

FOR THE CONSTRUCTION OF BRIDGE REPLACEMENT  
CONSISTING OF REPLACE BRIDGE AND APPROACHES

VOLUME 2  
CCSJ: 0913-26-064

PROJECT NO.: BR 2022(961)  
COUNTY: COLORADO  
CSJ: 0913-26-066  
HIGHWAY: CR 112  
LIMITS: CR 112 AT BUCKSNAG CREEK  
FUNCTIONAL CLASS: RURAL LOCAL ROAD  
DESIGN SPEED: MEETS OR IMPROVES EXISTING  
ADT: 33 VPD (2022), 75 VPD (2042)  
ROADWAY = 282.00 LF = 0.053 MI  
BRIDGE = 90.00 LF = 0.017 MI  
TOTAL = 372.00 LF = 0.070 MI

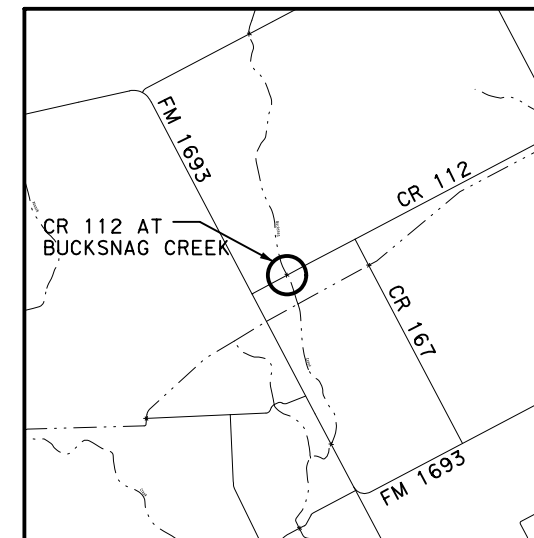
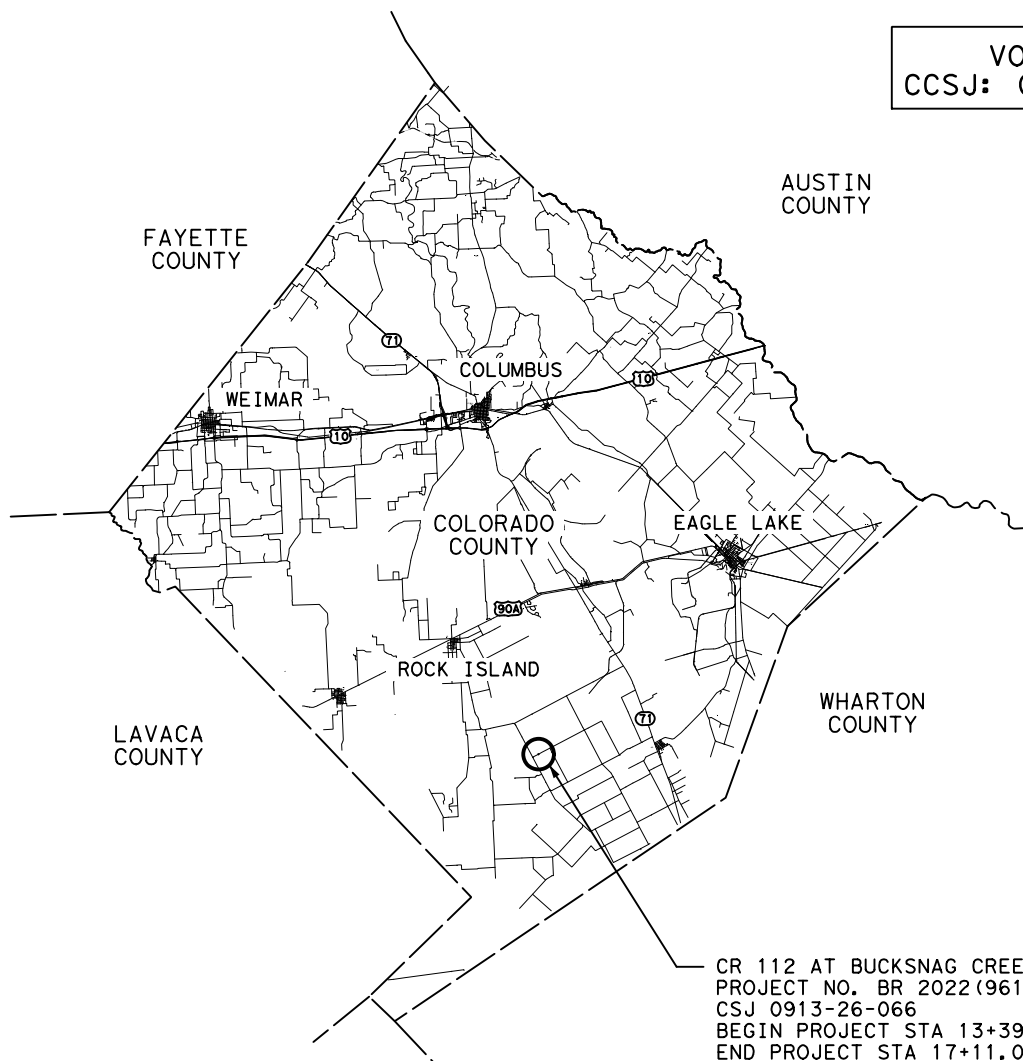
CONTRACTOR: \_\_\_\_\_  
DATE OF LETTING: \_\_\_\_\_  
DATE WORK BEGAN: \_\_\_\_\_  
DATE WORK COMPLETED: \_\_\_\_\_  
DATE WORK ACCEPTED: \_\_\_\_\_  
FINAL CONTRACT COST: \$ \_\_\_\_\_

LIST OF APPROVED FIELD CHANGES:

THIS IS TO CERTIFY THAT THE CONSTRUCTION WORK WAS PERFORMED IN ACCORDANCE WITH THE PLANS, CONTRACT, AND LISTED FIELD CHANGES.

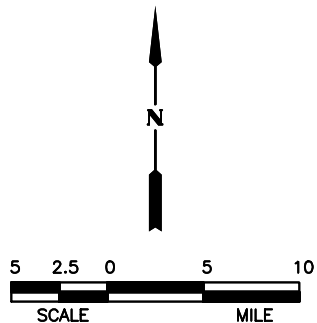
AREA ENGINEER \_\_\_\_\_ P. E. \_\_\_\_\_ DATE \_\_\_\_\_

VOLUME 2  
CCSJ: 0913-26-064



INSET MAP (NOT TO SCALE)

CR 112 AT BUCKSNAG CREEK  
PROJECT NO. BR 2022(961)  
CSJ 0913-26-066  
BEGIN PROJECT STA 13+39.00  
END PROJECT STA 17+11.00

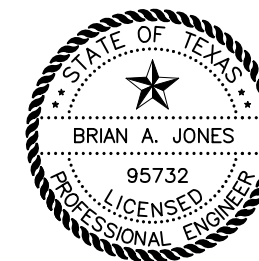


COLORADO COUNTY  
YOAKUM DISTRICT

EXCEPTIONS: NONE  
RAILROAD CROSSINGS: NONE  
EQUATIONS: NONE



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RECOMMENDED FOR LETTING 12/19/2023

DocuSigned by: *Jeffery Vinklarck, P.E.*

DIRECTOR OF TRANSPORTATION  
PLANNING & DEVELOPMENT

SUBMITTED FOR LETTING 12/15/2023

*Brian A. Jones*

PROJECT MANAGER  
STV

CONCURRENCE 12/18/2023

DocuSigned by: *Ty. Pranse*

COUNTY JUDGE, COLORADO COUNTY

APPROVED FOR LETTING 12/19/2023

DocuSigned by: *Martin C. Horst PE*

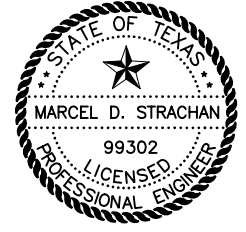
DISTRICT ENGINEER

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

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SHEET NO.	DESCRIPTION
<b>GENERAL</b>	
1	TITLE SHEET
2	INDEX OF SHEETS
3	TYPICAL SECTIONS
4,4A-4D	GENERAL NOTES
5,5A	ESTIMATE & QUANTITY SHEET
6	SUMMARY OF QUANTITIES
7	CRASH CUSHION SUMMARY SHEET
<b>TRAFFIC CONTROL PLAN</b>	
8	TRAFFIC CONTROL PLAN
<b>STANDARD SHEETS</b>	
9 - 20	* BC(1)-21 TO BC(12)-21
<b>ROADWAY DETAILS</b>	
21	HORIZONTAL/VERTICAL CONTROL INDEX SHEET
22 - 23	HORIZONTAL AND VERTICAL CONTROL SHEET
24	PLAN AND PROFILE
<b>STANDARD SHEETS</b>	
25	* GF(31)-19
26 - 27	* GF(31)TRL3-20
28	* SETP-PD
29	* SGT(15)31-20
30	* SGT(12S)31-18
31	* SMTC(N)-16
32	* TAU-II-R(N)-16
<b>DRAINAGE</b>	
33	DRAINAGE AREA MAP
34	HYDRAULIC DATA SHEET
35	SCOUR DATA SHEET
<b>BRIDGES</b>	
36	BRIDGE LAYOUT
37	BORING LOGS
38	ESTIMATED QUANTITIES AND CAP ELEVATIONS
39 - 40	SHEET PILING DETAILS
<b>STANDARD SHEETS</b>	
41	* APSB-28
42	* BPSB-28
43	* SPSB-28
44	* AJ
45 - 46	* CSAB
47 - 48	* FD
49	* NBIS
50	* PSB-5SB15
51	* PSBEB
52	* PSBRA
53	* PSBSD
54 - 55	* SRR
56 - 58	* T223
<b>TRAFFIC ITEMS</b>	
<b>STANDARD SHEETS</b>	
59 - 63	* D & OM(1)-20 TO D & OM(5)-20
64	* D & OM(VIA)-20
<b>ENVIRONMENTAL ISSUES</b>	
65 - 66	TXDOT STORM WATER POLLUTION PREVENTION PLAN (SWP3)
67	SWP3 LAYOUT
68	ENVIRONMENTAL PERMITS, ISSUES & COMMITMENTS
<b>STANDARD SHEETS</b>	
69	* EC(1)-16



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

*Marcel D. Strachan* 8/30/2023  
 MARCEL D. STRACHAN, P.E.



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

*Kelly Ho* 8/30/2023  
 KELLY HO, P.E.

NO.	REVISION	BY	DATE

TEXAS REGISTERED ENGINEERING FIRM  
F-1741

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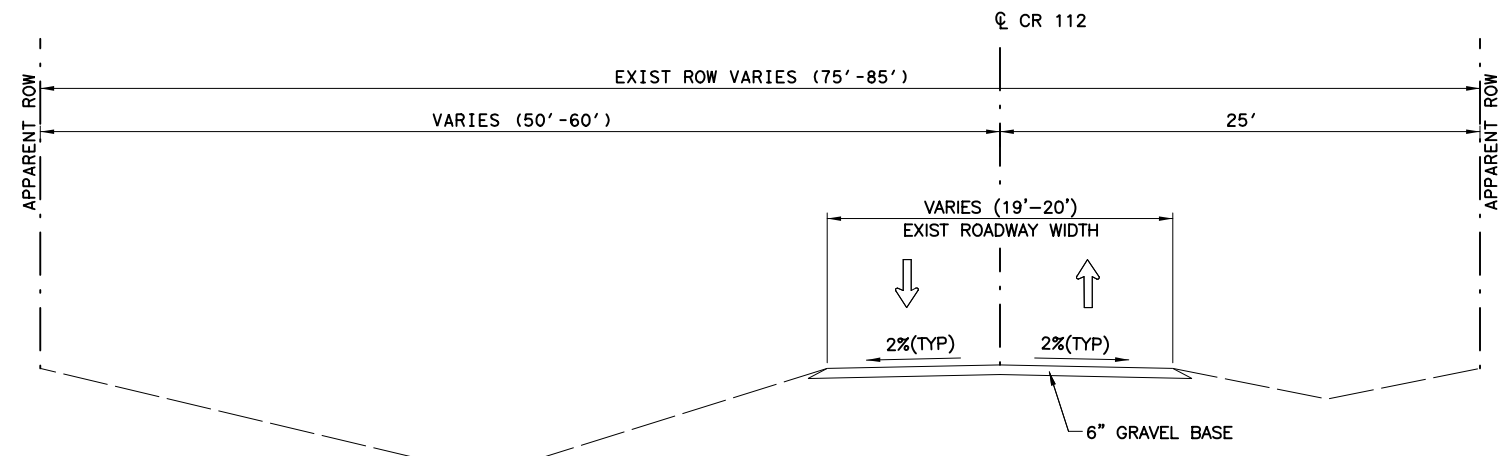
©2023 Texas Department of Transportation  
CR 112 AT BUCKSNAG CREEK

INDEX OF SHEETS

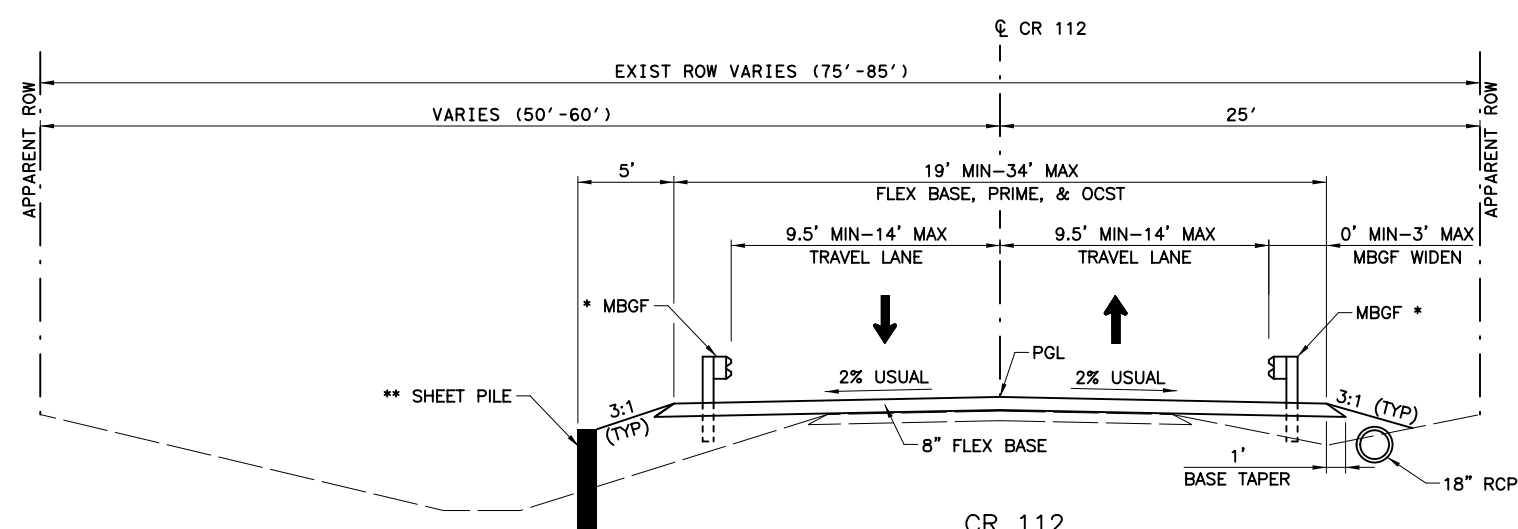
CSJ 0913-26-066 SHEET 1 OF 1

Designed: NB	FED. RD. DIV. NO. 6	STATE TEXAS	FEDERAL AID PROJECT NO.	HIGHWAY NO.
Checked: MDS				CR
Drawn: NB	DIST. YKM	COUNTY COLORADO	CONTROL NO. 0913	SECTION NO. 26
Checked: MDS			JOB NO. 066	SHEET NO. 2

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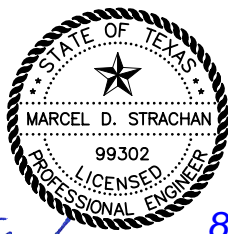



CR 112  
 EXISTING ROADWAY TYPICAL SECTION  
 NOT TO SCALE  
 STA 13+39.00 TO STA 17+11.00



CR 112  
 PROPOSED ROADWAY TYPICAL SECTION  
 NOT TO SCALE  
 STA 13+39.00 TO STA 13+89.00 20'-34'  
 STA 13+89.00 TO STA 14+80.00 34'  
 STA 14+80.00 TO STA 15+70.00 BRIDGE  
 STA 15+70.00 TO STA 15+89.52 34'  
 STA 15+89.52 TO STA 16+19.53 34'-31'  
 STA 16+19.53 TO STA 16+61.00 31'  
 STA 16+61.00 TO STA 17+11.00 31'-19'

\* SEE PLAN AND PROFILE FOR LIMITS OF MBGF  
 \*\* SEE PLAN AND PROFILE FOR LIMITS OF SHEET PILE

  
*Marcel D. Strachan*  
 8/30/2023

NO.	REVISION	BY	DATE
<b>stv</b>		TEXAS REGISTERED ENGINEERING FIRM F-1741	
 Texas Department of Transportation CR 112 AT BUCKSNAG CREEK			
TYPICAL SECTIONS			
CSJ 0913-26-066 SHEET 1 OF 1			
Designed:	NB	FED. RD. DIV. NO. 6	STATE TEXAS
Checked:	MDS	DIST. YKM	COUNTY COLORADO
Drawn:	NB	CONTROL NO. 0913	SECTION NO. 26
Checked:	MDS	JOB NO. 066	SHEET NO. 3

**Project Number:**

**Sheet:4**

**County: Colorado**

**Control: 0913-26-066**

**Highway: CR**

**GENERAL NOTES:**

**GENERAL:**

The Contractor is to take note that this project has Milestones for substantial completion. See Item 8 below for details.

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

Ryan Simper [Ryan.Simper@txdot.gov](mailto:Ryan.Simper@txdot.gov)

Paul Rodriguez Jr. [Paul.Rodriguez@txdot.gov](mailto:Paul.Rodriguez@txdot.gov)

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

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

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

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

The Contractor may need to make necessary accommodations to facilitate the delivery of materials and equipment to the project due to tight horizontal curves. This work is subsidiary to the pertinent bid items.

Provide a minimum two week advance notice to TxDOT prior to closing County Roads. TxDOT will notify local officials at least one week in advance.

Remove and replace right-of-way fences at particular work sites, where necessary, at contractor's entire expense except as shown on plans. Replace fences in a condition comparable to that at removal.

Furnish a certified copy of the legal gross weight of each vehicle hauling materials by weight and certified measurements for all trucks hauling material by volume.

The Department will provide the cylinder testing machine for this project. Deliver the test specimens to the engineer's curing facilities as directed.

**Project Number:**

**Sheet:4**

**County: Colorado**

**Control: 0913-26-066**

**Highway: CR**

Do not clean out concrete trucks within the right of way.

The contractor's attention is directed to the overhead and buried powerline near the project location. Prior to the pre-construction meeting, the contractor is required to initiate and conduct a coordination meeting with the Engineer and the power company representative listed below. Construction clearance limitations and advanced notice requirements will need to be determined and agreed upon prior to starting any work on the project.

Vance Jaks, [vjaks@mywcec.coop](mailto:vjaks@mywcec.coop), (979) 543-6271

**ITEM 5: CONTROL OF THE WORK**

Where a precast or cast-in-place concrete bridge element is shown in the plans, Contractor may submit a precast concrete alternate 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 Department. Contractor is responsible for impacts to the project schedule and cost resulting from the denial or use of alternates.

**ITEM 6: CONTROL OF MATERIALS**

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

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

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

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

**ITEM 7: LEGAL RELATIONS AND RESPONSIBILITIES**

The Contractor's attention is directed to the fact that discharge of permanent or temporary fill material into the waters of the United States (U.S.) including jurisdictional wetlands, as necessary for construction, will require specific approval of the U.S. Army Corps of Engineers (USACE) under Section 404 of the Clean Water Act.

**Project Number:**

**Sheet: 4A**

**County: Colorado**

**Control: 0913-26-066**

**Highway: CR**

The Department will obtain the appropriate permit(s), Nationwide or Individual, when necessary as dictated by the proposed actions for the project and its potential to affect USACE jurisdictional areas. The Contractor may review the permitted plans at the office of the Area Engineer in charge of construction. The Department will hold the Contractor responsible for following all conditions of the approved permit. If the Contractor cannot work within the limits of this permit(s), then it becomes the Contractor's entire responsibility to consult with the USACE pertaining to the need for changes or amendments to the conditions of the existing permit(s) as originally obtained by the Department.

Particular importance is stressed on the fact that any impacts to USACE jurisdictional waters of the U.S., including jurisdictional wetlands, be the minimum necessary to complete the proposed work. The Contractor shall maintain near normal flow of any jurisdictional waters of the U.S. at all times during construction. If the Contractor needs further explanation of the conditions of the permit, including means of compliance, they may contact the TXDOT Yoakum District Environmental Coordinator.

If the Contractor elects to work on a structure when the stream is flowing, near normal flow shall be maintained by a method approved by the Engineer. Labor and materials involved in this work will not be paid for directly, but will be considered subsidiary to the various bid items of the contract.

No significant traffic generator events identified.

If the contractor proposes work beyond the TxDOT obtained permit limitations, the contractor is responsible for additional costs, delays, and obtaining new or revised permits prior to construction.

All temporary construction access work and materials will not be measured or paid for directly but will be subsidiary to pertinent items. Prior to the scheduling of a Pre-Construction Meeting, submit a Temporary Construction Access Plan to the Area Engineer and to District Environmental Staff for their approval. The Construction Plan should contain a description of the equipment, such as barges, structures, etc., which may occupy waters of the US including jurisdictional wetlands, and a detailed work schedule. No work of any kind will be allowed until the pre-construction meeting has been held.

Temporary construction waterway crossings have been environmental cleared/permitted within Right of Way. Restrict construction operations in any water body to the necessary areas as shown on the plans or applicable permit, or as directed. Use temporary bridges, timber mats, or other structurally sound and non-eroding material for stream crossings. All temporary construction access materials shall be completely removed as soon as possible once temporary access is no longer required and affected areas shall be returned to preconstruction elevations and contours and revegetated in accordance with the SW3P. All work must comply with the General Conditions of the appropriate USACE permit.

**Project Number:**

**Sheet: 4A**

**County: Colorado**

**Control: 0913-26-066**

**Highway: CR**

### **ITEM 8: PROSECUTION AND PROGRESS**

Time charges for Milestone 1 begin when CR 112 (CSJ: 0913-26-066) is closed to traffic. The time charges for Milestone 1 shall end when traffic is following the lane arrangement as shown on the plans for the constructed roadway and the final lane configuration. All pavement construction, traffic control devices, and safety devices shall be in their final position (or as called for in the plans for the specified phase of work) at this time.

The contractor shall have 75 working days to complete Milestone 1.

The daily road user cost for each Milestone shall be five times the project liquidated damage rate based on the contract schedule of liquidated damages.

Failure to complete the above Milestone within the established number of working days will result in the daily road user cost being assessed for every working day in excess of the stated number.

After the milestone is substantially complete, the liquidated damages become those based on the contract schedule of liquidated damages.

TxDOT will supply bidders, upon written request, one electronic copy of the time determination schedule. The time determination schedule provided is for informational use only and is not intended for bidding or construction purposes.

Provide progress schedule as a Bar Chart.

This is for a convenience delay, allowing the contractor additional time for mobilizing crews and equipment to start a new project

### **ITEM 100: PREPARING RIGHT-OF-WAY**

Dispose of trees from the right-of-way within 24 hours of removal.

### **ITEM 110: EXCAVATION**

Remove existing vegetation, including roots and topsoil, within the grading limits to a depth of approximately 2 inches immediately before grading operations begin within any section. Place the material in a windrow on each side of the roadbed, and replace as directed on the completed slopes as soon as practicable. All topsoil excavation and the work involved in replacing the topsoil will not be paid for directly but will be subsidiary to the pertinent items.

**Project Number:**

**Sheet:4B**

**County: Colorado**

**Control: 0913-26-066**

**Highway: CR**

**ITEMS 110 & 132: EXCAVATION AND EMBANKMENT**

Grading quantities required to construct side road intersections and entrances will not be measured or paid for directly, but will be subsidiary to pertinent items.

Furnish Type C embankment consisting of suitable earth material such as loam, clay or other such material that will form a stable embankment and has a plasticity index of at least 15 but not more than 40. Requirements may vary for material excavated under Item 110, "Excavation", as directed.

Removal/Reworking of existing pavement is included in the excavation and embankment items.

**ITEM 150: BLADING**

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

**ITEM 247: FLEXIBLE BASE**

Unless otherwise approved, the delivered material's moisture content at most will be two percent above optimum moisture content, determined by TEX-113-E.

For Type E material, furnish crushed limestone produced and graded from oversize quarried aggregate that originates from a single, naturally occurring source. Do not use caliche, iron ore, gravel, or multiple sources.

Compact the Type E flex base by ordinary compaction.

**ITEM 302: AGGREGATES FOR SURFACE TREATMENTS**

Furnish Type PE and Type E aggregate consisting of crushed slag, crushed stone or natural limestone rock asphalt.

Furnish precoated aggregate that has a residual bitumen coating target value of 1.0% by weight.

**ITEM 316: SEAL COAT**

Use an Emulsion instead of an Asphalt Cement as approved when the surface treatment is placed between September 15 and May 1.

**Project Number:**

**Sheet:4B**

**County: Colorado**

**Control: 0913-26-066**

**Highway: CR**

The asphalt application rate shown in the plans is an average between an Asphalt Cement and an Emulsion. The type of asphalt and application rate to be used will be as directed. The approximate application rate for Asphalt Cement with a Grade 3 aggregate is 0.32 Gal/SY and with a Grade 4 aggregate is 0.27 Gal/SY. The approximate application rate for an Emulsion with a Grade 3 aggregate is 0.48 Gal/SY and with a Grade 4 aggregate is 0.40 Gal/SY.

Cure the RC-250 a minimum of seven (7) days prior to placement of the one course surface treatment. Place one course surface treatment no later than fourteen (14) days after placement of the RC-250, unless otherwise directed.

In lieu of the prime coat & final seal coat, the contractor may place 2" ACP (meeting TxDOT specifications). There will be no additional compensation for related material costs, excavation/embankment adjustments, etc. The flexible base depth shall be maintained as shown on the proposed typical section.

**ITEM 400: EXCAVATION AND BACKFILL FOR STRUCTURES**

Flexible base (Ty D) may be used for cement stabilized backfill aggregate, as approved.

**ITEM 420: CONCRETE SUBSTRUCTURES**

Concrete for pier and bent structure elements, when paid for by the cubic yard, will be measured for plans quantity payment in accordance with Article 420.5.2 of Item 420, "Concrete Substructures".

**ITEM 427: SURFACE FINISHES FOR CONCRETE**

Provide Surface Area II, railing, and wingwalls with a Slurry Coat Finish per 427.4.3.2 for cast-in-place concrete surfaces.

**ITEM 432: RIPRAP**

The dimension as shown in the stone protection bid item description is the stone size as described in the specification. The required thickness will be as shown elsewhere in the plans.

**Project Number:**

**Sheet:4C**

**County: Colorado**

**Control: 0913-26-066**

**Highway: CR**

**ITEMS 464 & 467: REINFORCED CONCRETE PIPE & SAFETY END TREATMENT**

If required, concrete collars, as approved, will be used at pipe joints. Collars will be reinforced as directed. No direct compensation will be made for concrete collars and they will be subsidiary to the pertinent items.

**ITEM 467: SAFETY END TREATMENT**

Precast safety end treatment sections will not be allowed.

Provide reinforced concrete riprap for all pipe safety end treatments. Round corners on safety end treatment riprap to a minimum 12 inch radius as directed. The riprap will not be paid for directly but will be subsidiary to Item 467.

Provide and use a form along the cut end of the pipe when placing the adjacent reinforced concrete riprap for pipe safety end treatment sections.

Riprap cross slope above the working point may need to be flatter than 6:1 slope to improve driveway tie-in as directed by the engineer.

**ITEM 496: REMOVING STRUCTURES**

Material removed under this item will not be deemed salvageable.

The removal of the existing concrete riprap or stone riprap protecting the existing bridge, is subsidiary to Item 496 Removing Structures, except as shown in the plans. .

**ITEM 502: BARRICADES, SIGNS, AND TRAFFIC HANDLING**

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

**Project Number:**

**Sheet:4C**

**County: Colorado**

**Control: 0913-26-066**

**Highway: CR**

Provide suitable warning lights mounted high enough to be visible from all directions on all construction equipment, including pilot vehicles, and operate warning lights when the equipment is within the right of way. Equip other equipment such as trucks, trailers, autos, etc., with emergency flashers and use emergency flashers while within the work area. No additional payment will be made for relocating existing sign assemblies to temporary mounts.

County Road 112 will be closed to through traffic until substantial completion as approved by the Area Engineer. Once the roadway is open to traffic, project limit signing as shown on BC(2) will be required. This will be subsidiary to Item 502.

**ITEM 506: TEMPORARY EROSION, SEDIMENTATION, AND ENVIRONMENTAL CONTROLS**

1. See SWP3 plan sheet for total disturbed acreage.
2. The disturbed area in this project, all project locations in the contract, and contractor project specific locations (PSLs), within one (1) mile of the project limits, for the contract will further establish the authorization requirements for storm water discharges.
3. 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.
4. Obtain any required authorization from the TCEQ for any contractor PSLs for construction activities on or off right-of-way (ROW).
5. When the total disturbed area for all projects in the contract and PSLs within one (1) mile of the project limits exceeds five (5) acres, provide a copy of the contractor NOI.
6. Provide a signed sketch detailing the location of any contractor's PSLs on ROW or within one (1) mile of the project.

**ITEM 540: METAL BEAM GUARD FENCE**

Furnish and install only one type of timber post at each location.

Furnish Type II rail elements at all locations.

**Project Number:**

**Sheet:4D**

**County: Colorado**

**Control: 0913-26-066**

**Highway: CR**

**ITEM 545: CRASH CUSHION ATTENUATORS**

Use either the SMTC (N) or TAU-II-R(N) mesh compliant crash cushion attenuators to protect the ends of the permanent concrete traffic barrier. The test level for this attenuator is TL-2.

Crash cushion attenuator foundations shall be reinforced concrete as shown on applicable standards.





# Estimate & Quantity Sheet

CONTROLLING PROJECT ID 0913-26-064

DISTRICT Yoakum  
HIGHWAY CR 112, CR 2222, CR 5308

COUNTY Austin, Colorado

CONTROL SECTION JOB				0913-20-098		0913-26-064		0913-26-066		TOTAL EST.	TOTAL FINAL
PROJECT ID				A00188282		A00128584		A00138699			
COUNTY				Austin		Colorado		Colorado			
HIGHWAY				CR 5308		CR 2222		CR 112			
ALT	BID CODE	DESCRIPTION	UNIT	EST.	FINAL	EST.	FINAL	EST.	FINAL		
	100-6002	PREPARING ROW	STA	4.100		3.500		2.800		10.400	
	110-6001	EXCAVATION (ROADWAY)	CY	70.000		377.000		29.000		476.000	
	110-6002	EXCAVATION (CHANNEL)	CY	504.000		82.000		458.000		1,044.000	
	132-6005	EMBANKMENT (FINAL)(ORD COMP)(TY C)	CY	548.000		204.000		664.000		1,416.000	
	150-6002	BLADING	HR	16.000		16.000		16.000		48.000	
	164-6003	BROADCAST SEED (PERM) (RURAL) (CLAY)	SY	1,592.000		668.000		376.000		2,636.000	
	164-6009	BROADCAST SEED (TEMP) (WARM)	SY	398.000		168.000		94.000		660.000	
	164-6011	BROADCAST SEED (TEMP) (COOL)	SY	398.000		168.000		94.000		660.000	
	168-6001	VEGETATIVE WATERING	MG	22.400		7.700		3.100		33.200	
	247-6370	FL BS (CMP IN PLC)(TY E GR 5)(FNL POS)	CY	248.000		200.000		262.000		710.000	
	316-6029	ASPH (RC-250)	GAL	216.000		174.000		211.000		601.000	
	316-6202	AGGR(TY-E GR-5 SAC-B)	CY	8.000		8.000		11.000		27.000	
	316-6249	AGGR(TY-PE GR-4 SAC-B)	CY	9.000		8.000		12.000		29.000	
	316-6400	ASPH (AC-15P OR AC-10-2TR OR CRS-2P)	GAL	366.000		294.000		356.000		1,016.000	
	400-6005	CEM STABIL BKFL	CY	136.000		35.000		29.000		200.000	
	402-6001	TRENCH EXCAVATION PROTECTION	LF	126.000						126.000	
	407-6004	SHEET PILING (PZ - 35)	SF					4,275.000		4,275.000	
	416-6002	DRILL SHAFT (24 IN)	LF	405.000		192.000		492.000		1,089.000	
	420-6013	CL C CONC (ABUT)	CY	23.600		20.400		22.800		66.800	
	420-6029	CL C CONC (CAP)	CY	7.900				15.200		23.100	
	420-6037	CL C CONC (COLUMN)	CY	2.100				5.600		7.700	
	420-6066	CL C CONC (RAIL FOUNDATION)	CY	1.400						1.400	
	422-6007	REINF CONC SLAB (SLAB BEAM)	SF	2,707.000		1,300.000		2,707.000		6,714.000	
	425-6012	PRESTR CONC SLAB BEAM (5SB15)	LF	533.900		247.500		531.000		1,312.400	
	432-6033	RIPRAP (STONE PROTECTION)(18 IN)	CY	192.000		494.000		483.000		1,169.000	
	450-6006	RAIL (TY T223)	LF	214.000		124.000		204.000		542.000	
	454-6004	ARMOR JOINT (SEALED)	LF	56.000		44.000		54.000		154.000	
	464-6003	RC PIPE (CL III)(18 IN)	LF			24.000		308.000		332.000	
	464-6005	RC PIPE (CL III)(24 IN)	LF	172.000						172.000	
	464-6007	RC PIPE (CL III)(30 IN)	LF	116.000						116.000	
	467-6356	SET (TY II) (18 IN) (RCP) (3: 1) (C)	EA			2.000				2.000	
	467-6363	SET (TY II) (18 IN) (RCP) (6: 1) (P)	EA					2.000		2.000	
	467-6395	SET (TY II) (24 IN) (RCP) (6: 1) (P)	EA	1.000						1.000	
	467-6423	SET (TY II) (30 IN) (RCP) (6: 1) (P)	EA	1.000						1.000	
	496-6009	REMOV STR (BRIDGE 0 - 99 FT LENGTH)	EA	1.000		1.000		1.000		3.000	
	496-6042	REMOV STR (SMALL)	EA	3.000				2.000		5.000	
	496-6043	REMOV STR (SMALL FENCE)	LF	530.000						530.000	



# Estimate & Quantity Sheet

CONTROLLING PROJECT ID 0913-26-064

DISTRICT Yoakum  
HIGHWAY CR 112, CR 2222, CR 5308

COUNTY Austin, Colorado

CONTROL SECTION JOB				0913-20-098		0913-26-064		0913-26-066		TOTAL EST.	TOTAL FINAL
PROJECT ID				A00188282		A00128584		A00138699			
COUNTY				Austin		Colorado		Colorado			
HIGHWAY				CR 5308		CR 2222		CR 112			
ALT	BID CODE	DESCRIPTION	UNIT	EST.	FINAL	EST.	FINAL	EST.	FINAL		
	500-6001	MOBILIZATION	LS			1.000				1.000	
	502-6001	BARRICADES, SIGNS AND TRAFFIC HANDLING	MO	5.000		5.000		5.000		15.000	
	506-6038	TEMP SEDMT CONT FENCE (INSTALL)	LF	498.000		460.000		448.000		1,406.000	
	506-6039	TEMP SEDMT CONT FENCE (REMOVE)	LF	498.000		460.000		448.000		1,406.000	
	530-6006	DRIVEWAYS (SURF TREAT)	SY	71.000						71.000	
	540-6001	MTL W-BEAM GD FEN (TIM POST)	LF	50.000		12.500		37.500		100.000	
	540-6006	MTL BEAM GD FEN TRANS (THRIE-BEAM)	EA	3.000		3.000		3.000		9.000	
	540-6007	MTL BEAM GD FEN TRANS (TL2)	EA			1.000				1.000	
	540-6016	DOWNSTREAM ANCHOR TERMINAL SECTION	EA			2.000				2.000	
	544-6001	GUARDRAIL END TREATMENT (INSTALL)	EA	3.000		2.000		3.000		8.000	
	545-6006	CRASH CUSH ATTEN (INSTL)(L)(N)(TL2)	EA					1.000		1.000	
	545-6007	CRASH CUSH ATTEN (INSTL)(L)(N)(TL3)	EA	1.000						1.000	
	552-6001	WIRE FENCE (TY A)	LF	530.000						530.000	
	552-6003	WIRE FENCE (TY C)	LF	530.000						530.000	
	552-6008	WIRE FENCE (WATER GAP)	LF	30.000						30.000	
	560-6007	MAILBOX INSTALL-S (WC-POST) TY 3	EA	1.000						1.000	
	658-6014	INSTL DEL ASSM (D-SW)SZ (BRF)CTB (BI)	EA	4.000		4.000		4.000		12.000	
	658-6062	INSTL DEL ASSM (D-SW)SZ 1(BRF)GF2(BI)	EA	5.000		6.000		6.000		17.000	
	5116-6001	AMPHIBIAN/REPTILE EXCLUSION FENCE INST	LF			1,500.000				1,500.000	
	5116-6002	AMPHIBIAN/REPTILE EXCLUSION FENCE REM	LF			1,500.000				1,500.000	
	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																
LOCATION	LENGTH	FLEX BASE			0100	0150	0247	SURFACE		0316				0407	0432	0496
		BEGIN WIDTH	END WIDTH	AVG. DEPTH	PREPARING ROW	BLADING	FL BS (CMP IN PLC) (TY E GR 5) (FNL POS)	BEGIN WIDTH	END WIDTH	PRIME COAT		SEAL COAT		SHEET PILING (PZ - 35)	RIPRAP (STONE PROTECTION) (18 IN)	REMOV STR (BRIDGE 0-99 FT LENGTH)
		FT	FT	FT	IN	STA	HR	8" CY	FT	FT	ASPH (RC-250) GAL/SY	AGGR(TY-E GR-5 SAC-B) 1 CY/140 SY	AGGR(TY-PE GR-4 SAC-B) 1 CY/130 SY			
<b>CSJ: 0913-26-066</b>																
STA 13+39.00 TO STA 13+89.00	50	21	35	8	0.5		59	20	34	38	2	2	65			
STA 13+89.00 TO STA 14+80.00	91	35	35	8	0.9		79	34	34	71	3	3	120	1360	88	
BRIDGE					0.9									1041		1
STA 15+70.00 TO STA 15+89.52	20	35	35	8	0.2		18	34	34	16	1	1	26	827	14	
STA 15+89.52 TO STA 16+19.53	30	35	32	8	0.3		39	34	31	27	1	2	45	547	13	
STA 16+19.53 TO STA 16+61.00	42	32	32	8			34	31	31	30	2	2	51	500	36	
STA 16+61.00 TO STA 17+11.00	50	32	20	8			33	31	19	29	2	2	49			
<b>PROJECT TOTAL</b>	<b>283</b>				<b>2.8</b>		<b>16.0</b>			<b>262</b>			<b>356</b>	<b>4275</b>	<b>150</b>	<b>1</b>

\* TREE REMOVAL SUBSIDIARY TO PREP ROW  
 \*\* ESTIMATED QUANTITY  
 \*\*\*\* DRIVEWAY QUANTITY INCLUDED

SUMMARY OF SWP3 QUANTITIES							
LOCATION	0164	0164	0164	166	0168	0506	0506
	BROADCAST SEED (PERM) (RURAL) (CLAY)	BROADCAST SEED (TEMP) (WARM)	BROADCAST SEED (TEMP) (COOL)	FERTILIZER	VEGETATIVE WATERING	TEMP SEDMT CONT FENCE (INSTALL)	TEMP SEDMT CONT FENCE (REMOVE)
	SY	SY	SY	500 LBS/AC TON	13.6 MG/AC/MO MG	LF	LF
<b>CSJ: 0913-26-066</b>							
STA 13+39.00 TO STA 14+80.00	136	34	34	0.01	1.1		
BRIDGE							
STA 15+70.00 TO STA 17+11.00	240	60	60	0.01	2.0		
BMP #1						13	13
BMP #2						23	23
BMP #3						203	203
BMP #4						118	118
BMP #5						68	68
BMP #6						23	23
<b>PROJECT TOTAL</b>	<b>376</b>	<b>94</b>	<b>94</b>	<b>0.02</b>	<b>3.1</b>	<b>448</b>	<b>448</b>



\*\*\* FOR CONTRACTORS INFORMATION ONLY

SUMMARY OF DRAINAGE QUANTITIES			
LOCATION	0464	0467	0496
	RC PIPE (CL III) (18 IN)	SET (TY II) (18 IN) (RCP) (6: 1) (P)	REMOV STR (SMALL)
	LF	EA	EA
<b>CSJ: 0913-26-066</b>			
STA 13+39.00 17.50' RT TO STA 15+07.00 22.50' RT	164	1	1
STA 15+57.00 20.00' RT TO STA 17+01.00 14.50' RT	144	1	1
<b>PROJECT TOTAL</b>	<b>308</b>	<b>2</b>	<b>2</b>

SUMMARY OF PAVEMENT MARKINGS, DELINEATOR AND OBJECT MARKER QUANTITIES		
LOCATION	0658	0658
	INSTL DEL ASSM (D-SW)SZ (BRF)CTB (BI)	INSTL DEL ASSM (D-SW)SZ 1 (BRF)GF2(BI)
	EA	EA
<b>CSJ: 0913-26-066</b>		
STA 13+39.00 TO STA 14+80.00		4
BRIDGE	4	
STA 15+70.00 TO STA 17+11.00		2
<b>PROJECT TOTAL</b>	<b>4</b>	<b>6</b>

SUMMARY OF GUARDRAIL QUANTITIES				
LOCATION	0540	0540	0544	0545
	MTL W-BEAM GD FEN (TIM POST)	MTL BEAM GD FEN TRANS (THRIE-BEAM)	GUARDRAIL END TREATMENT (INSTALL)	CRASH CUSH ATTN (INSTL)(L)(N) (TL2)
	LF	EA	EA	EA
<b>CSJ: 0913-26-066</b>				
STA 13+39.00 TO STA 14+80.00	25	2	2	
BRIDGE				
STA 15+70.00 TO STA 17+11.00	12.5	1	1	1
<b>PROJECT TOTAL</b>	<b>37.5</b>	<b>3</b>	<b>3</b>	<b>1</b>

SUMMARY OF EARTHWORK QUANTITIES			
LOCATION	0110	0110	0132
	EXCAVATION (ROADWAY)	EXCAVATION (CHANNEL)	EMBANKMENT (FINAL) (ORD COMP) (TY C)
	CY	CY	CY
<b>CSJ: 0913-26-066</b>			
STA 13+39.00	0		0
STA 13+50.00	3		1
STA 13+55.00	0		0
STA 13+75.00	4		16
STA 14+00.00	5		44
STA 14+25.00	4		67
STA 14+50.00	0		80
STA 14+75.00	0		79
STA 14+80.00	0		15
BRIDGE	0	458	29
STA 15+75.00	0		20
STA 16+00.00	0		88
STA 16+25.00	0		72
STA 16+50.00	0		70
STA 16+75.00	2		55
STA 17+00.00	7		26
STA 17+11.00	4		2
<b>PROJECT TOTAL</b>	<b>29</b>	<b>458</b>	<b>664</b>

NO.	REVISION	BY	DATE
			
TEXAS REGISTERED ENGINEERING FIRM F-1741			
			
CR 112 AT BUCKSNAG CREEK			
<b>SUMMARY OF QUANTITIES</b>			
<b>CSJ 0913-26-066 SHEET 1 OF 1</b>			
Designed:	NB	FED. RD. DIV. NO. 6	STATE TEXAS
Checked:	MDS		
Drawn:	NB	DIST. COUNTY	CONTROL NO. SECTION NO. JOB NO. SHEET NO.
Checked:	MDS	YKM	COLORADO 0913 26 066 6

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LOC NO.	TCP PHASE	PLAN SHEET NUMBER	LOCATION	STA	TEST LEVEL	DIRECTION OF TRAFFIC (UNI/BI)	FOUNDATION PAD		BACKUP SUPPORT			AVAILABLE SITE LENGTH	CRASH CUSHION													
							PROPOSED MATERIAL	PROPOSED THICKNESS	DESCRIPTION	WIDTH	HEIGHT		INSTALL	REMOVE	MOVE / RESET		L	L	R	R	S	S				
															MOVE/ RESET	FROM LOC. #	N	W	N	W	N	W				
1	PERMANENT		CR 112 RT	STA 15+76.00	TL-2	BI	CONCRETE	8"	T223	1'-3 1/2"	2'-8"	16'	1													
												TOTALS	1													

LEGEND:  
 L=LOW MAINTENANCE  
 R=REUSABLE  
 S=SACRIFICIAL  
 N=NARROW  
 W=WIDE

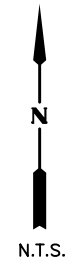
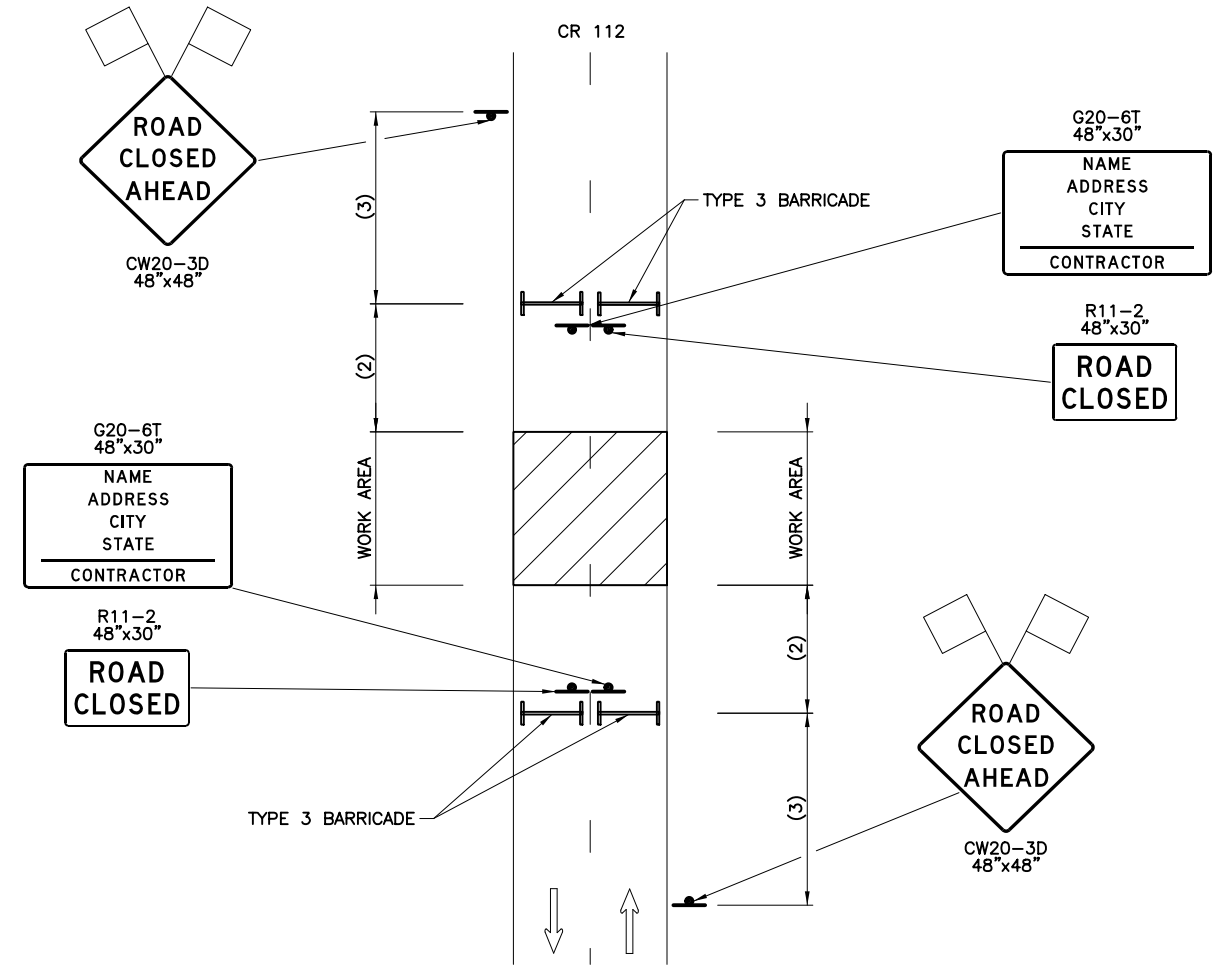
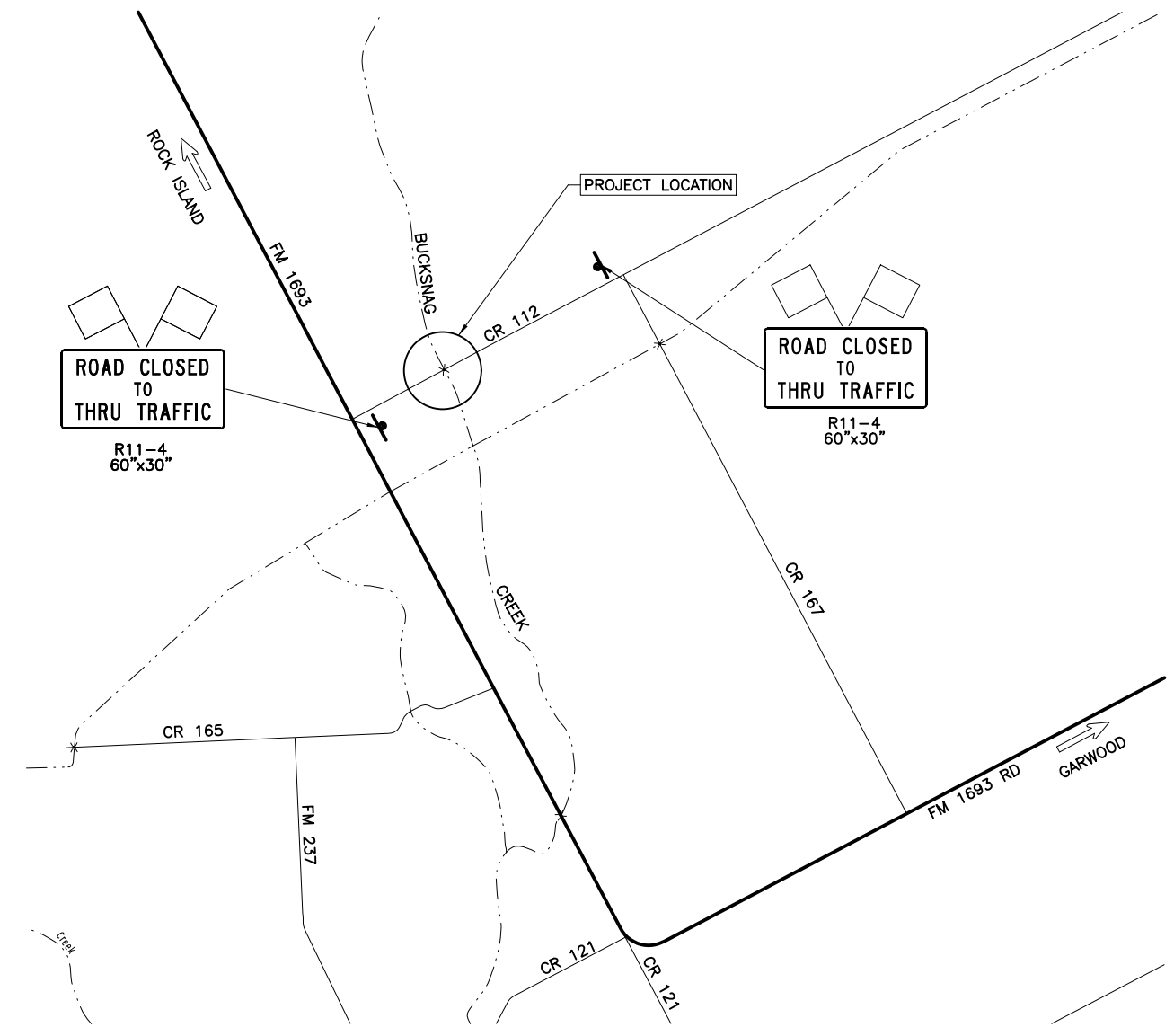
FOR DEFINITIONS SEE THE "CRASH CUSHION CATEGORIZATION CHART.PDF" AT THE DESIGN DIVISION (ROADWAY STANDARDS) WEBSITE. USE QUICK LINKS TO ACCESS ATTENUATORS / CRASH CUSHIONS SECTION.  
<http://www.dot.state.tx.us/insdtot/orgchart/cmd/cserve/standard/rdwylse.htm>

8/30/2023

CRASH CUSHION SUMMARY SHEET

FILE: CCSS.dgn	DN: TxDOT	CK: NCB	CK: MDS
© TxDOT	CONT 0913	SECT 26	JOB 066
REVISIONS	DIST YKM		COUNTY COLORADO
FEDERAL AID PROJECT			SHEET NO. 7

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**CONSTRUCTION SIGNING AT PROJECT LOCATION**

- NOTES:
- (1.) CR 112 RD WILL BE CLOSED TO THROUGH TRAFFIC UNTIL SUBSTANTIAL COMPLETION AS APPROVED BY THE AREA ENGINEER.
  - (2.) TYPE 3 BARRICADES TO BE PLACED IN A LOCATION THAT IS SATISFACTORY TO THE ENGINEER TO ALLOW EGRESS AND INGRESS FOR LOCAL PROPERTY OWNERS.
  - (3.) SEE BC SHEETS FOR SIGN SPACING.
  - (4.) SEE ITEM 8 GENERAL NOTES REGARDING CLOSURE.

NO.	REVISION	BY	DATE
<span style="float: right;">TEXAS REGISTERED ENGINEERING FIRM F-1741</span>			
CR 112 AT BUCKSNAG CREEK <b>TRAFFIC CONTROL PLAN</b>			
<b>CSJ 0913-26-066 SHEET 1 OF 1</b>			
Designed:	NB	FED. RD. DIV. NO. 6	STATE TEXAS
Checked:	MDS	FEDERAL AID PROJECT NO.	
Drawn:	NB	DIST.	COUNTY
Checked:	MDS	YKM	COLORADO
		CONTROL NO. 0913	SECTION NO. 26
		JOB NO. 066	SHEET NO. 8

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DATE:  
 FILE:

**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**

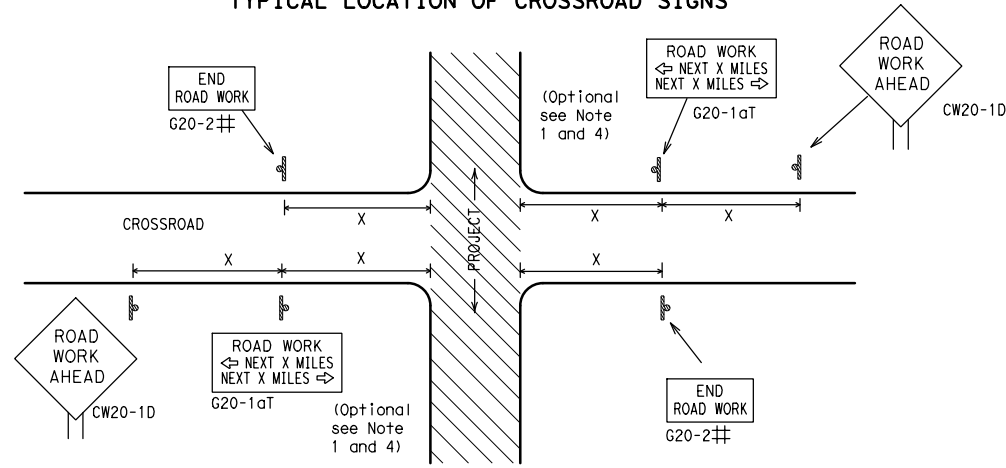
1. Only pre-qualified products shall be used. The "Compliant Work Zone Traffic Control Devices List" (CWZTCD) describes pre-qualified products and their sources.
2. Work zone traffic control devices shall be compliant with the Manual for Assessing safety Hardware (MASH).

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

 Texas Department of Transportation		 Traffic Safety Division Standard	
<p><b>BARRICADE AND CONSTRUCTION          GENERAL NOTES          AND REQUIREMENTS</b></p> <p><b>BC (1) -21</b></p>			
FILE:	bc-21.dgn	DN: TxDOT	ck: TxDOT
© TxDOT	November 2002	CONT	SECT
4-03	7-13	0913	26
9-07	8-14	DIST	COUNTY
5-10	5-21	YKM	COLORADO
REVISIONS	JOB	HIGHWAY	SHEET NO.
	066	CR	9

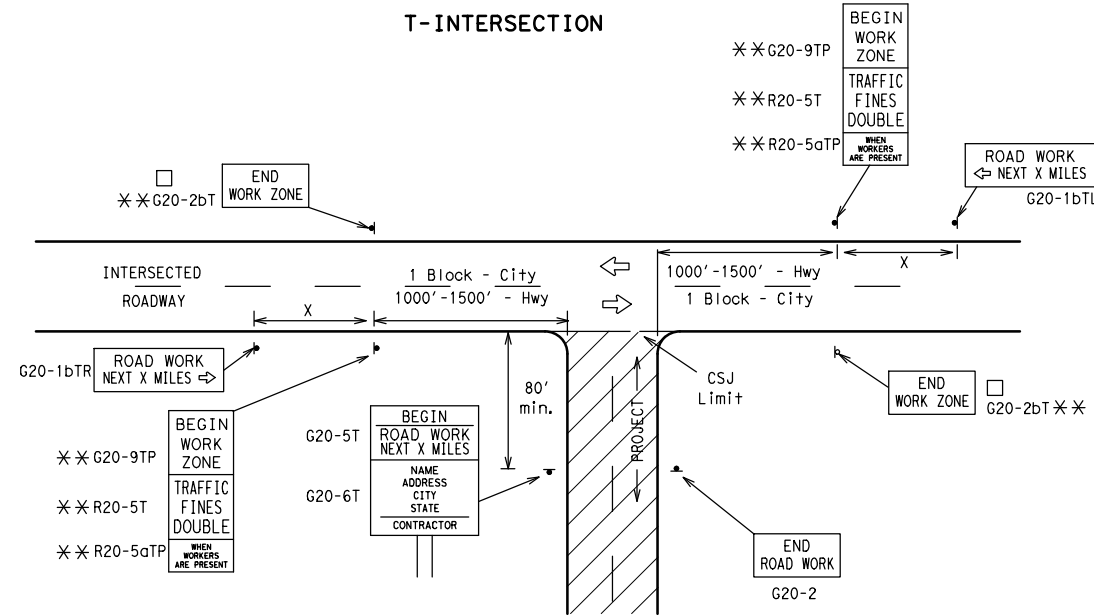
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**TYPICAL LOCATION OF CROSSROAD SIGNS**



- ## 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
CW1, CW2, CW7, CW8, CW9, CW11, CW14	36" x 36"	48" x 48"	50	400
CW3, CW4, CW5, CW6, CW8-3, CW10, CW12	48" x 48"	48" x 48"	60	600 <sup>2</sup>
			65	700 <sup>2</sup>
			70	800 <sup>2</sup>
			80	1000 <sup>2</sup>
*			*	* <sup>3</sup>

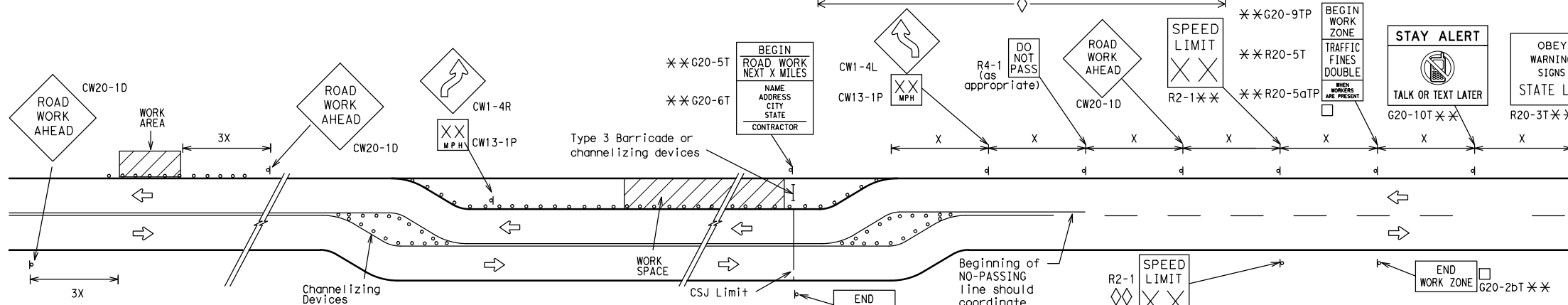
\* For typical sign spacings on divided highways, expressways and freeways, see Part 6 of the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD) typical application diagrams or TCP Standard Sheets.

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

**GENERAL NOTES**

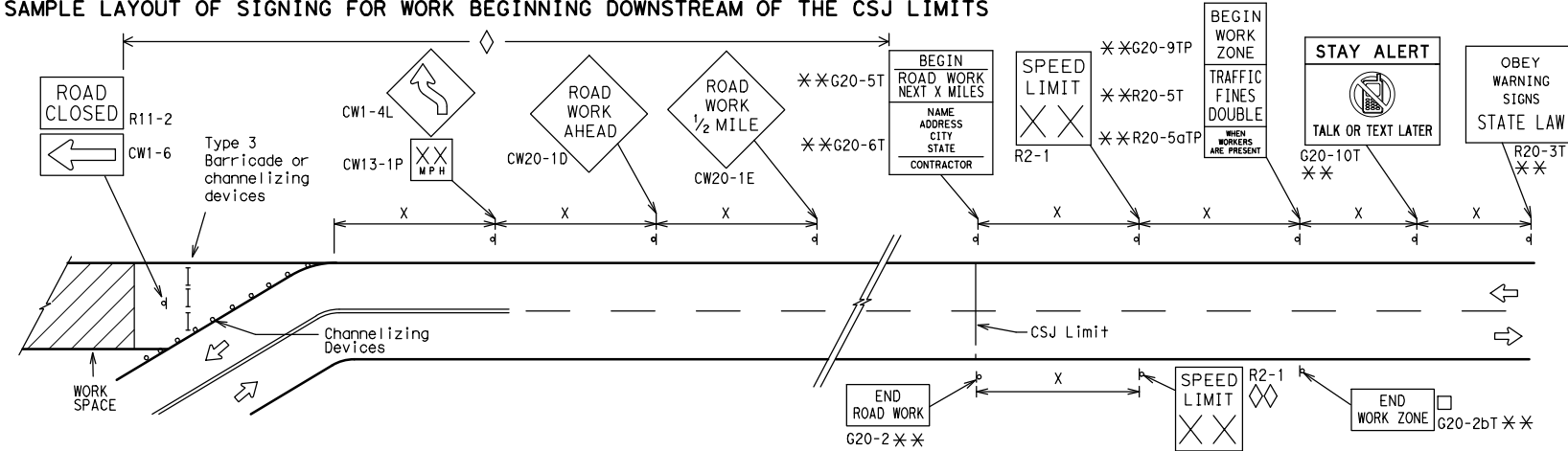
- Special or larger size signs may be used as necessary.
- Distance between signs should be increased as required to have 1500 feet advance warning.
- Distance between signs should be increased as required to have 1/2 mile or more advance warning.
- 36" x 36" "ROAD WORK AHEAD" (CW20-1D) signs may be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

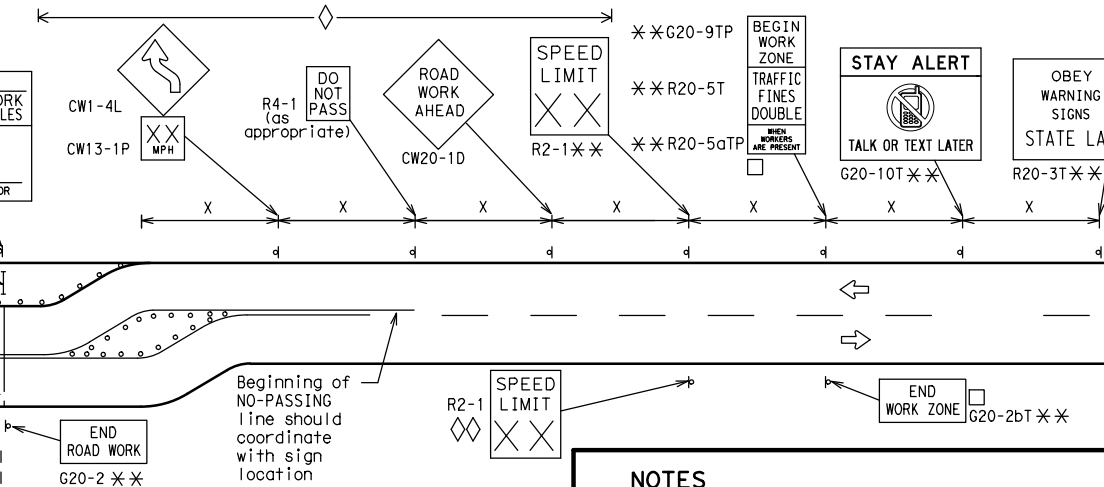


When extended distances occur between minimal work spaces, the Engineer/Inspector should ensure additional "ROAD WORK AHEAD" (CW20-1D) signs are placed in advance of these work areas to remind drivers they are still within the project limits. See the applicable TCP sheets for exact location and spacing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

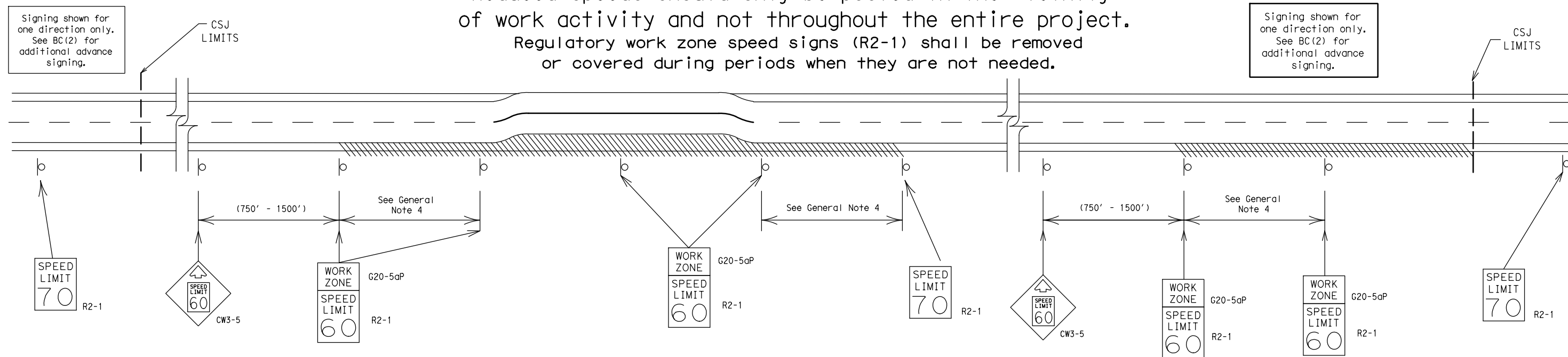
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© TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
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# TYPICAL APPLICATION OF WORK ZONE SPEED LIMIT SIGNS

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.

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SHEET 3 OF 12



## BARRICADE AND CONSTRUCTION WORK ZONE SPEED LIMIT

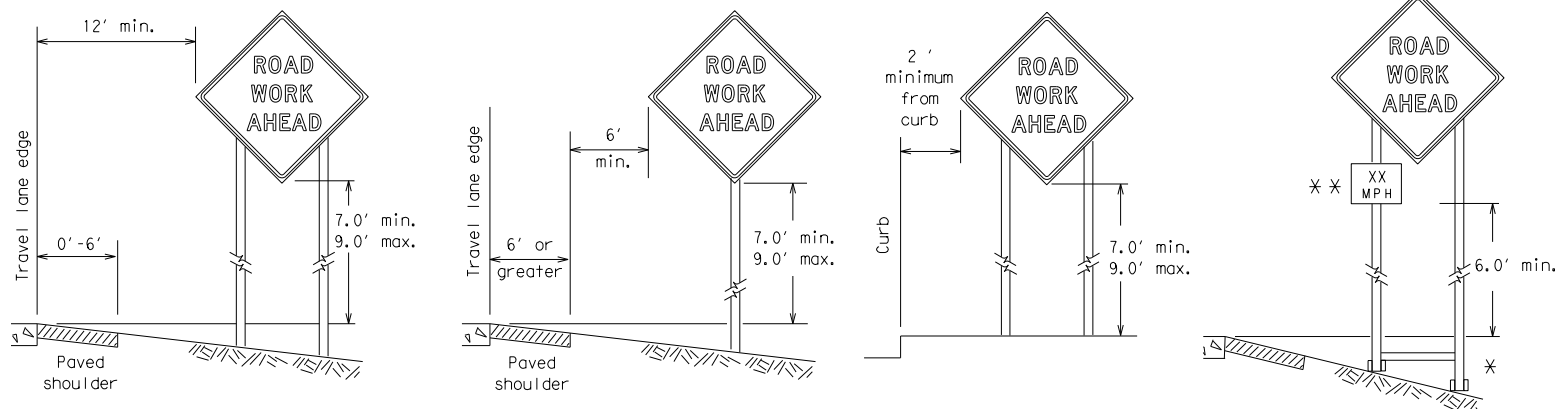
BC (3) -21

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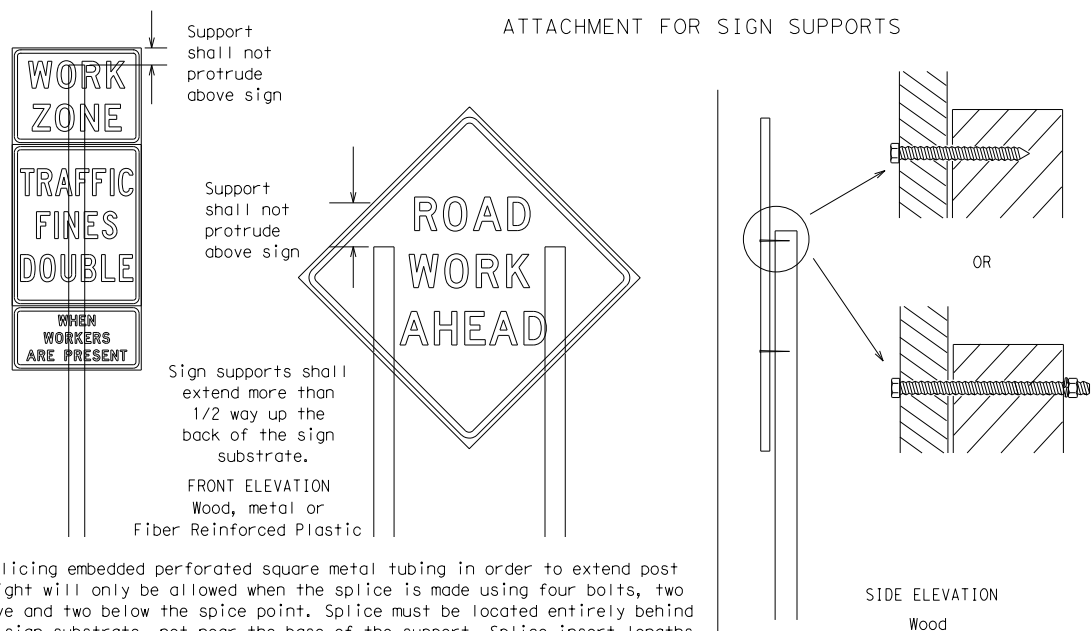
TYPICAL MINIMUM CLEARANCES FOR LONG TERM AND INTERMEDIATE TERM SIGNS



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

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

ATTACHMENT FOR SIGN SUPPORTS



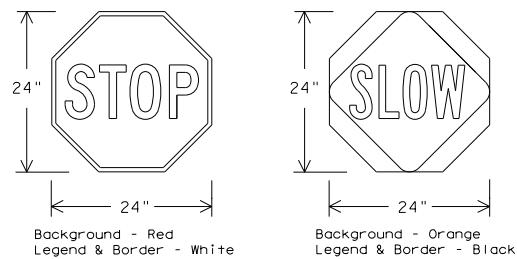
Attachment to wooden supports will be by bolts and nuts or screws. Use TxDOT's or manufacturer's recommended procedures for attaching sign substrates to other types of sign supports

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

Splicing embedded perforated square metal tubing in order to extend post height will only be allowed when the splice is made using four bolts, two above and two below the 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

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



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

1. Permanent signs are used to give notice of traffic laws or regulations, call attention to conditions that are potentially hazardous to traffic operations, show route designations, destinations, directions, distances, services, points of interest, and other geographical, recreational, specific service (LOGO), or cultural information. Drivers proceeding through a work zone need the same, if not better route guidance as normally installed on a roadway without construction.
2. When permanent regulatory or warning signs conflict with work zone conditions, remove or cover the permanent signs until the permanent sign message matches the roadway condition. For details for covering large guide signs see the TS-CD standard.
3. When existing permanent signs are moved and relocated due to construction purposes, they shall be visible to motorists at all times.
4. If existing signs are to be relocated on their original supports, they shall be installed on crashworthy bases as shown on the SMD Standard sheets. The signs shall meet the required mounting heights shown on the BC Sheets or the SMD Standards. This work should be paid for under the appropriate pay item for relocating existing signs.
5. If permanent signs are to be removed and relocated using temporary supports, the Contractor shall use crashworthy supports as shown on the BC standard sheets, TLRs standard sheets or the CWZTCD list. The signs shall meet the required mounting heights shown on the BC, or the SMD standard sheets during construction. This work should be paid for under the appropriate pay item for relocating existing signs.
6. Any sign or traffic control device that is struck or damaged by the Contractor or his/her construction equipment shall be replaced as soon as possible by the Contractor to ensure proper guidance for the motorists. This will be subsidiary to Item 502.

GENERAL NOTES FOR WORK ZONE SIGNS

1. Contractor shall install and maintain signs in a straight and plumb condition and/or as directed by the Engineer.
2. Wooden sign posts shall be painted white.
3. Barricades shall NOT be used as sign supports.
4. All signs shall be installed in accordance with the plans or as directed by the Engineer. Signs shall be used to regulate, warn, and guide the traveling public safely through the work zone.
5. The Contractor may furnish either the sign design shown in the plans or in the "Standard Highway Sign Designs for Texas" (SHSD). The Engineer/Inspector may require the Contractor to furnish other work zone signs that are shown in the TMUTCD but may have been omitted from the plans. Any variation in the plans shall be documented by written agreement between the Engineer and the Contractor's Responsible Person. All changes must be documented in writing before being implemented. This can include documenting the changes in the Inspector's TxDOT diary and having both the Inspector and Contractor initial and date the agreed upon changes.
6. The Contractor shall furnish sign supports listed in the "Compliant Work Zone Traffic Control Device List" (CWZTCD) for small roadside signs. Supports for temporary large roadside signs shall meet the requirements detailed on the Temporary Large Roadside Signs (TLRS) standard sheets. The Contractor shall install the sign support in accordance with the manufacturer's recommendations. If there is a question regarding installation procedures, the Contractor shall furnish the Engineer a copy of the manufacturer's installation recommendations so the Engineer can verify the correct procedures are being followed.
7. The Contractor is responsible for installing signs on approved supports and replacing signs with damaged or cracked substrates and/or damaged or marred reflective sheeting as directed by the Engineer/Inspector.
8. Identification markings may be shown only on the back of the sign substrate. The maximum height of letters and/or company logos used for identification shall be 1 inch.
9. The Contractor shall replace damaged wood posts. New or damaged wood sign posts shall not be spliced.

DURATION OF WORK (as defined by the "Texas Manual on Uniform Traffic Control Devices" Part 6)

1. The types of sign supports, sign mounting height, the size of signs, and the type of sign substrates can vary based on the type of work being performed. The Engineer is responsible for selecting the appropriate size sign for the type of work being performed. The Contractor is responsible for ensuring the sign support, sign mounting height and substrate meets manufacturer's recommendations in regard to crashworthiness and duration of work requirements.
  - a. Long-term stationary - work that occupies a location more than 3 days.
  - b. Intermediate-term stationary - work that occupies a location more than one daylight period up to 3 days, or nighttime work lasting more than one hour.
  - c. Short-term stationary - daytime work that occupies a location for more than 1 hour in a single daylight period.
  - d. Short, duration - work that occupies a location up to 1 hour.
  - e. Mobile - work that moves continuously or intermittently (stopping for up to approximately 15 minutes.)

SIGN MOUNTING HEIGHT

1. The bottom of Long-term/Intermediate-term signs shall be at least 7 feet, but not more than 9 feet, above the paved surface, except as shown for supplemental plaques mounted below other signs.
2. The bottom of Short-term/Short Duration signs shall be a minimum of 1 foot above the pavement surface but no more than 2 feet above the ground.
3. Long-term/Intermediate-term Signs may be used in lieu of Short-term/Short Duration signing.
4. Short-term/Short Duration signs shall be used only during daylight and shall be removed at the end of the workday or raised to appropriate Long-term/Intermediate sign height.
5. Regulatory signs shall be mounted at least 7 feet, but not more than 9 feet, above the paved surface regardless of work duration.

SIZE OF SIGNS

1. The Contractor shall furnish the sign sizes shown on BC (2) unless otherwise shown in the plans or as directed by the Engineer.

SIGN SUBSTRATES

1. The Contractor shall ensure the sign substrate is installed in accordance with the manufacturer's recommendations for the type of sign support that is being used. The CWZTCD lists each substrate that can be used on the different types and models of sign supports.
2. "Mesh" type materials are NOT an approved sign substrate, regardless of the tightness of the weave.
3. All wooden individual sign panels fabricated from 2 or more pieces shall have one or more plywood cleat, 1/2" thick by 6" wide, fastened to the back of the sign and extending fully across the sign. The cleat shall be attached to the back of the sign using wood screws that do not penetrate the face of the sign panel. The screws shall be placed on both sides of the splice and spaced at 6" centers. The Engineer may approve other methods of splicing the sign face.

REFLECTIVE SHEETING

1. All signs shall be retroreflective and constructed of sheeting meeting the color and retro-reflectivity requirements of DMS-8300 for rigid signs or DMS-8310 for roll-up signs. The web address for DMS specifications is shown on BC(1).
2. White sheeting, meeting the requirements of DMS-8300 Type A, shall be used for signs with a white background.
3. Orange sheeting, meeting the requirements of DMS-8300 Type B<sub>FL</sub> or Type C<sub>FL</sub>, shall be used for rigid signs with orange backgrounds.

SIGN LETTERS

1. All sign letters and numbers shall be clear, and open rounded type uppercase alphabet letters as approved by the Federal Highway Administration (FHWA) and as published in the "Standard Highway Sign Design for Texas" manual. Signs, letters and numbers shall be of first class workmanship in accordance with Department Standards and Specifications.

REMOVING OR COVERING

1. When sign messages may be confusing or do not apply, the signs shall be removed or completely covered.
2. Long-term stationary or intermediate stationary signs installed on square metal tubing may be turned away from traffic 90 degrees when the sign message is not applicable. This technique may not be used for signs installed in the median of divided highways or near any intersections where the sign may be seen from approaching traffic.
3. Signs installed on wooden skids shall not be turned at 90 degree angles to the roadway. These signs should be removed or completely covered when not required.
4. When signs are covered, the material used shall be opaque, such as heavy mil black plastic, or other materials which will cover the entire sign face and maintain their opaque properties under automobile headlights at night, without damaging the sign sheeting.
5. Burlap shall NOT be used to cover signs.
6. Duct tape or other adhesive material shall NOT be affixed to a sign face.
7. Signs and anchor stubs shall be removed and holes backfilled upon completion of work.

SIGN SUPPORT WEIGHTS

1. Where sign supports require the use of weights to keep from turning over, the use of sandbags with dry, cohesionless sand should be used.
2. The sandbags will be tied shut to keep the sand from spilling and to maintain a constant weight.
3. Rock, concrete, iron, steel or other solid objects shall not be permitted for use as sign support weights.
4. Sandbags should weigh a minimum of 35 lbs and a maximum of 50 lbs.
5. Sandbags shall be made of a durable material that tears upon vehicular impact. Rubber (such as tire inner tubes) shall NOT be used.
6. Rubber ballasts designed for channelizing devices should not be used for ballast on portable sign supports. Sign supports designed and manufactured with rubber bases may be used when shown on the CWZTCD list.
7. Sandbags shall only be placed along or laid over the base supports of the traffic control device and shall not be suspended above ground level or hung with rope, wire, chains or other fasteners. Sandbags shall be placed along the length of the skids to weigh down the sign support.
8. Sandbags shall NOT be placed under the skid and shall not be used to level sign supports placed on slopes.

FLAGS ON SIGNS

1. Flags may be used to draw attention to warning signs. When used, the flag shall be 16 inches square or larger and shall be orange or fluorescent red-orange in color. Flags shall not be allowed to cover any portion of the sign face.

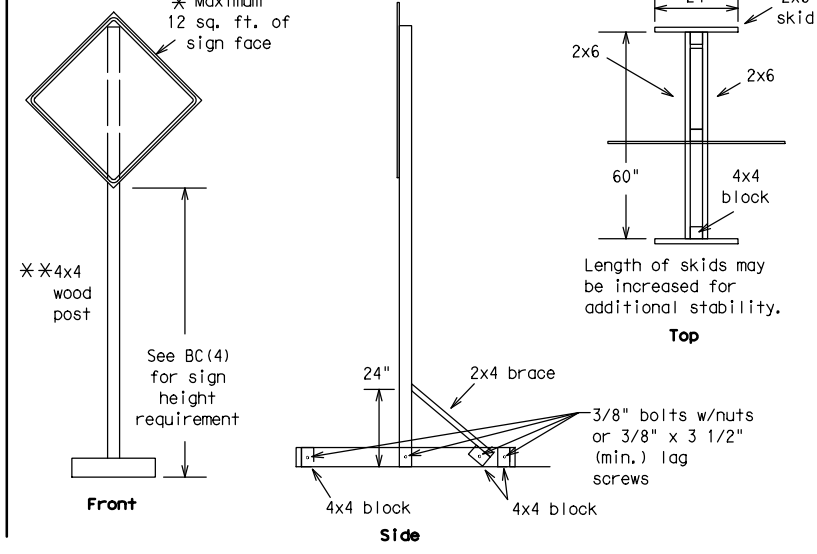
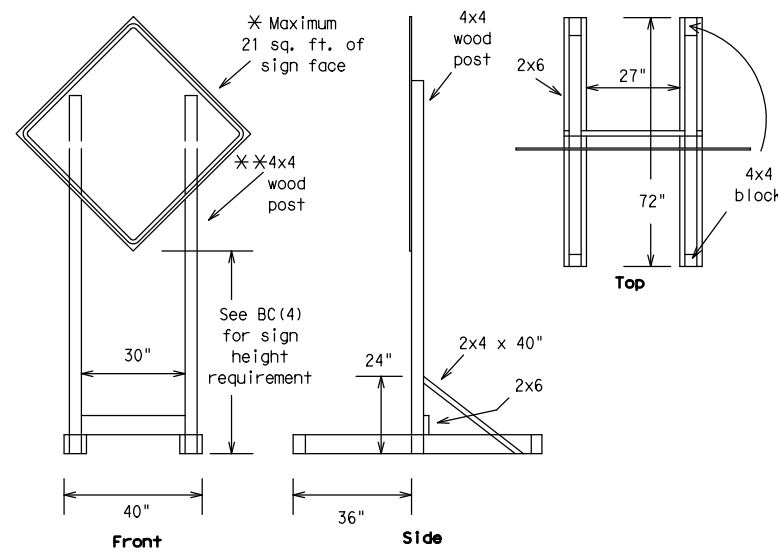


BARRICADE AND CONSTRUCTION TEMPORARY SIGN NOTES

BC(4)-21

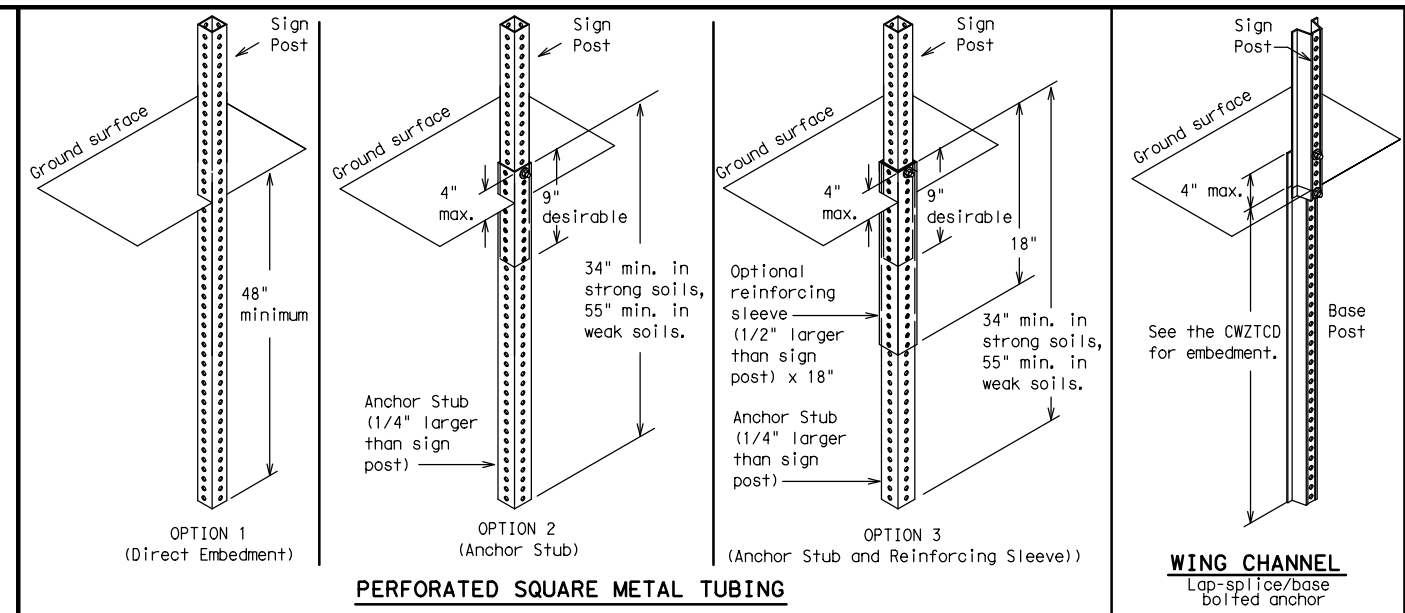
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© TxDOT	November 2002	CONT	SECT	JOB	HIGHWAY				
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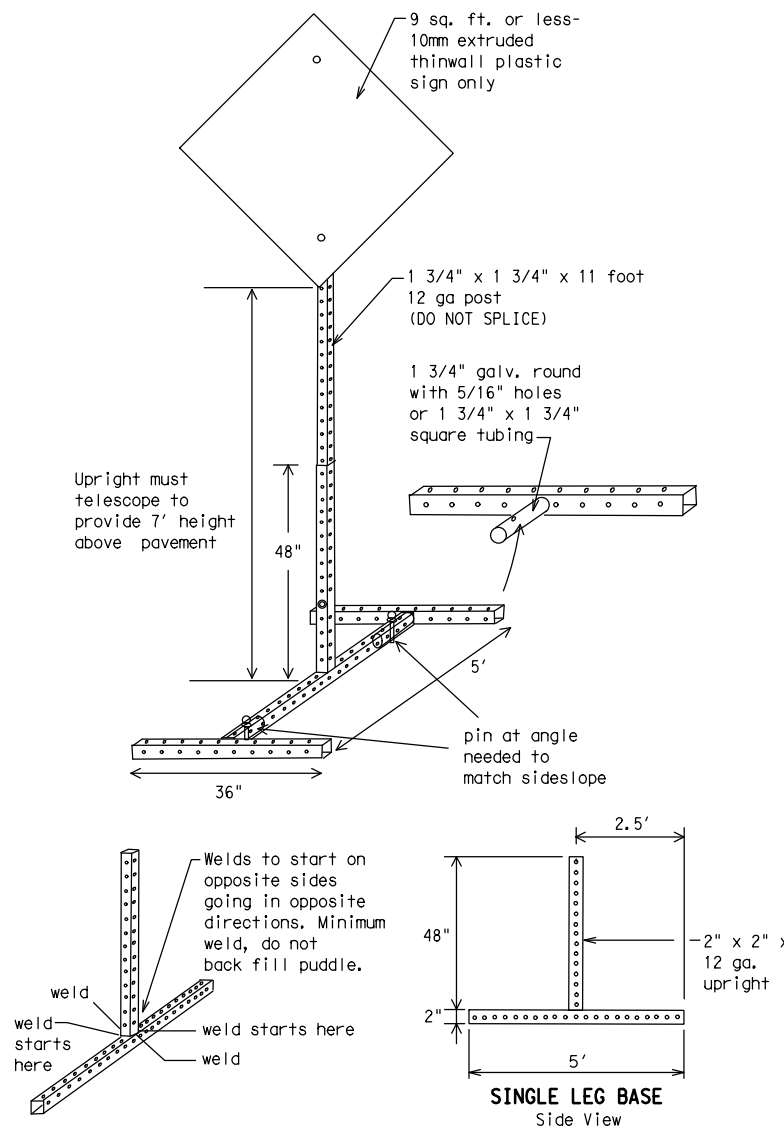
**SKID MOUNTED WOOD SIGN SUPPORTS**

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



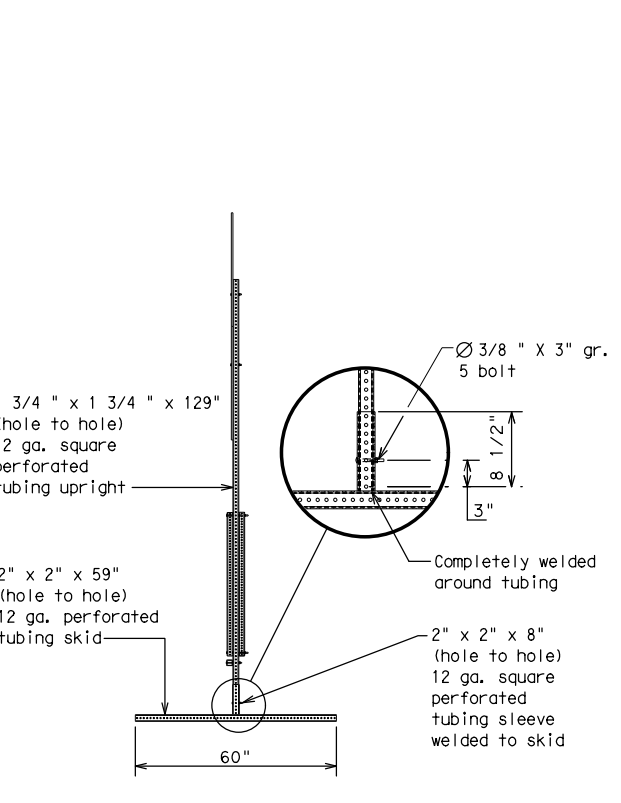
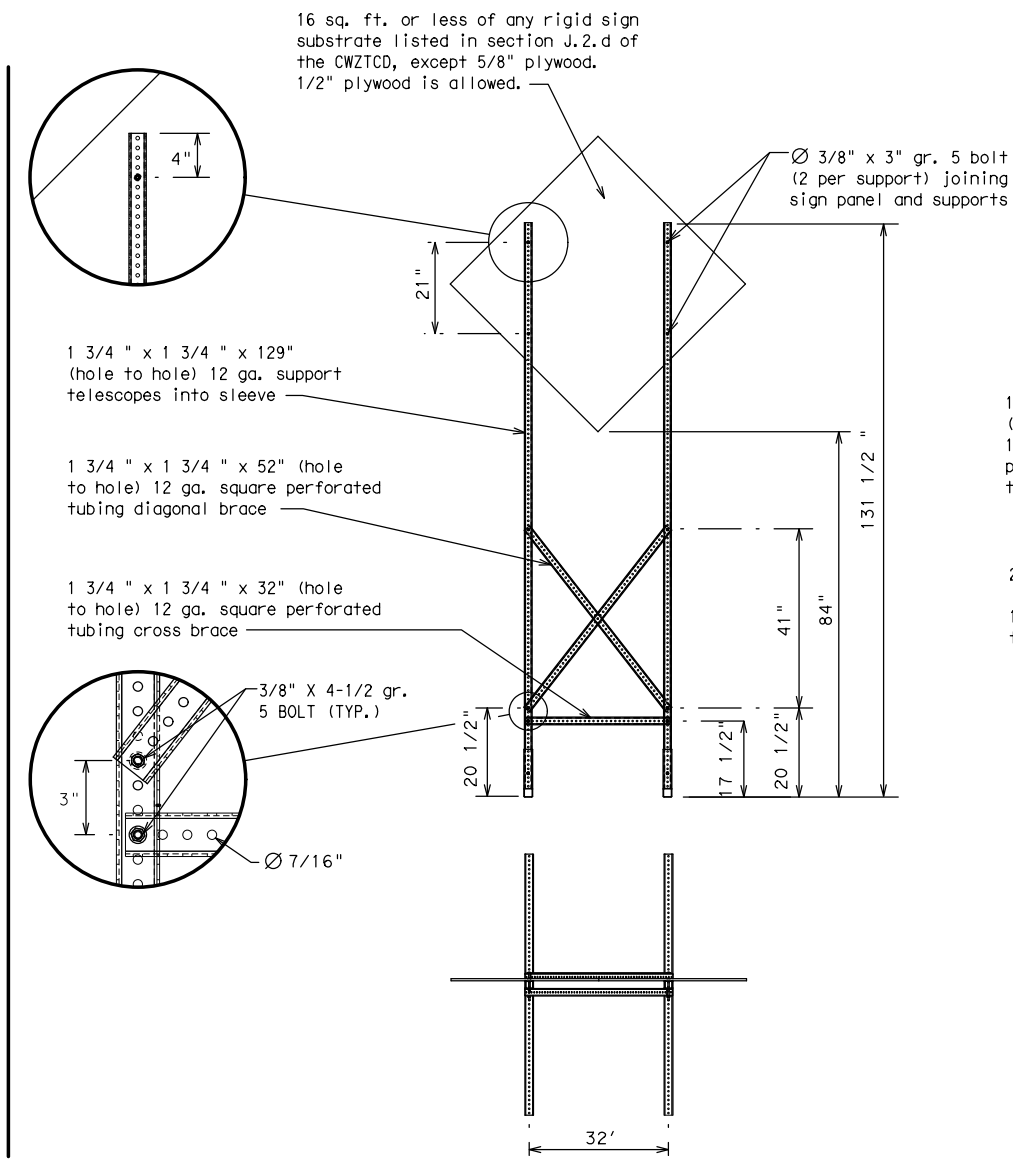
**GROUND MOUNTED SIGN SUPPORTS**

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.

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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
Cannot	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

## Phase 1: Condition Lists

Road/Lane/Ramp Closure List		Other Condition List	
FREEWAY CLOSED X MILE	FRONTAGE ROAD CLOSED	ROADWORK XXX FT	ROAD REPAIRS XXXX FT
ROAD CLOSED AT SH XXX	SHOULDER CLOSED XXX FT	FLAGGER XXXX FT	LANE NARROWS XXXX FT
ROAD CLSD AT FM XXXX	RIGHT LN CLOSED XXX FT	RIGHT LN NARROWS XXXX FT	TWO-WAY TRAFFIC XX MILE
RIGHT X LANES CLOSED	RIGHT X LANES OPEN	MERGING TRAFFIC XXXX FT	CONST TRAFFIC XXX FT
CENTER LANE CLOSED	DAYTIME LANE CLOSURES	LOOSE GRAVEL XXXX FT	UNEVEN LANES XXXX FT
NIGHT LANE CLOSURES	I-XX SOUTH EXIT CLOSED	DETOUR X MILE	ROUGH ROAD XXXX FT
VARIOUS LANES CLOSED	EXIT XXX CLOSED X MILE	ROADWORK PAST SH XXXX	ROADWORK NEXT FRI-SUN
EXIT CLOSED	RIGHT LN TO BE CLOSED	BUMP XXXX FT	US XXX EXIT X MILES
MALL DRIVEWAY CLOSED	X LANES CLOSED TUE - FRI	TRAFFIC SIGNAL XXXX FT	LANES SHIFT *
XXXXXXXX BLVD CLOSED			

\* 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	Location List	Warning List	** Advance Notice List
MERGE RIGHT	AT FM XXXX	SPEED LIMIT XX MPH	TUE-FRI XX AM-X PM
DETOUR NEXT X EXITS	BEFORE RAILROAD CROSSING	MAXIMUM SPEED XX MPH	APR XX-XX X PM-X AM
USE EXIT XXX	NEXT X MILES	MINIMUM SPEED XX MPH	BEGINS MONDAY
STAY ON US XXX SOUTH	PAST US XXX EXIT	ADVISORY SPEED XX MPH	BEGINS MAY XX
TRUCKS USE US XXX N	XXXXXXXX TO XXXXXXX	RIGHT LANE EXIT	MAY X-X XX PM - XX AM
WATCH FOR TRUCKS	US XXX TO FM XXXX	USE CAUTION	NEXT FRI-SUN
EXPECT DELAYS		DRIVE SAFELY	XX AM TO XX PM
REDUCE SPEED XXX FT		DRIVE WITH CARE	NEXT TUE AUG XX
USE OTHER ROUTES			TONIGHT XX PM-XX AM
STAY IN LANE *			

\*\* 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.

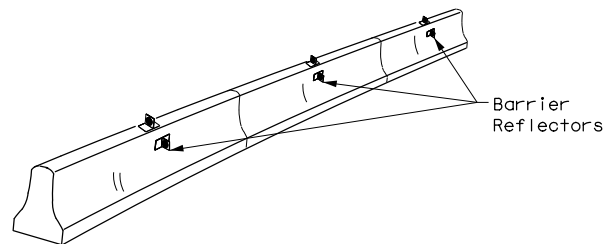
SHEET 6 OF 12

<h3>BARRICADE AND CONSTRUCTION PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)</h3> <h2>BC (6) -21</h2>			
FILE:	bc-21.dgn	DN:	TxDOT
© TxDOT	November 2002	CONT:	SECT:
REVISIONS	0913	26	066
9-07	8-14	DIST:	COUNTY:
7-13	5-21	YKM	COLORADO
			SHEET NO. 14

DATE: FILE:

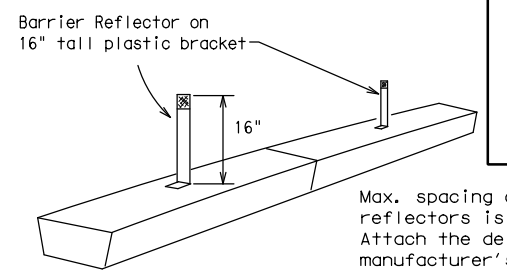
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- Barrier Reflectors shall be pre-qualified, and conform to the color and reflectivity requirements of DMS-8600. A list of prequalified Barrier Reflectors can be found at the Material Producer List web address shown on BC(1).
- Color of Barrier Reflectors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



**CONCRETE TRAFFIC BARRIER (CTB)**

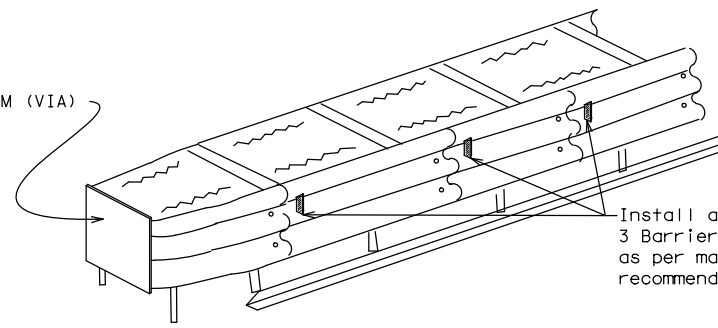
- Where traffic is on one side of the CTB, two (2) Barrier Reflectors shall be mounted in approximately the midsection of each section of CTB. An alternate mounting location is uniformly spaced at one end of each CTB. This will allow for attachment of a barrier grapple without damaging the reflector. 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.



**LOW PROFILE CONCRETE BARRIER (LPCB) USED IN WORK ZONES**  
LPCB is approved for use in work zone locations, where the posted speed is 45mph, or less. See Roadway Standard Sheet LPCB.

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

**LOW PROFILE CONCRETE BARRIER (LPCB)**



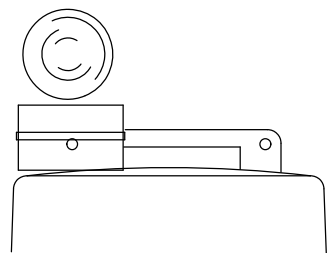
**DELINEATION OF END TREATMENTS**

**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**

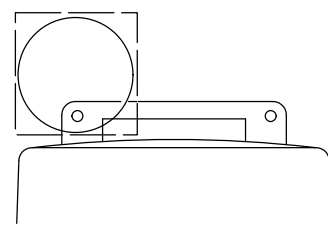
- Warning lights shall meet the requirements of the TMUTCD.
- Warning lights shall NOT be installed on barricades.
- Type A-Low Intensity Flashing Warning Lights are commonly used with drums. They are intended to warn of or mark a potentially hazardous area. Their use shall be as indicated on this sheet 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.



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

**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.



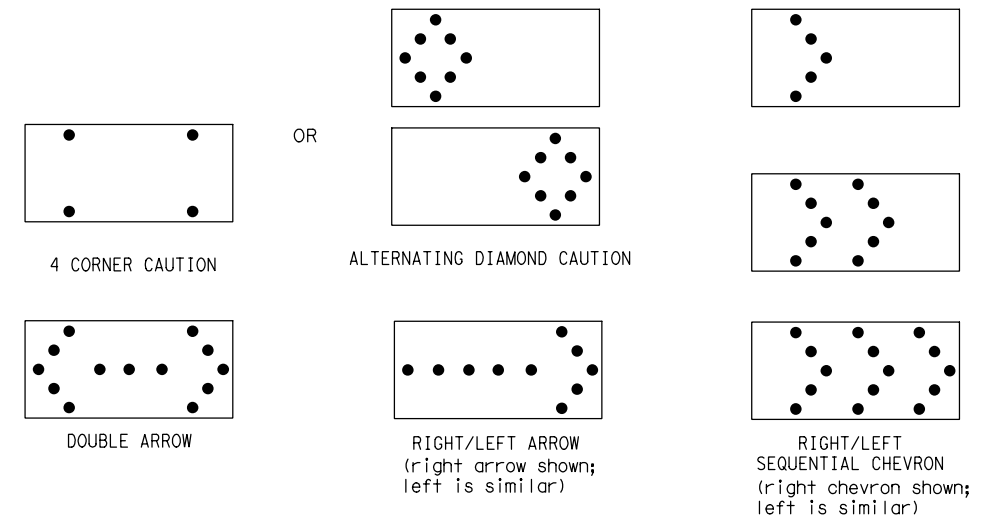
Warning reflector may be round or square. Must have a yellow reflective surface area of at least 30 square inches

**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**

FILE:	bc-21.dgn	DN:	TxDOT	CK:	TxDOT	DW:	TxDOT	CK:	TxDOT
©TxDOT	November 2002	CONT	SECT	JOB	HIGHWAY				
REVISIONS		0913	26	066	CR				
9-07	8-14	DIST	COUNTY		SHEET NO.				
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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:

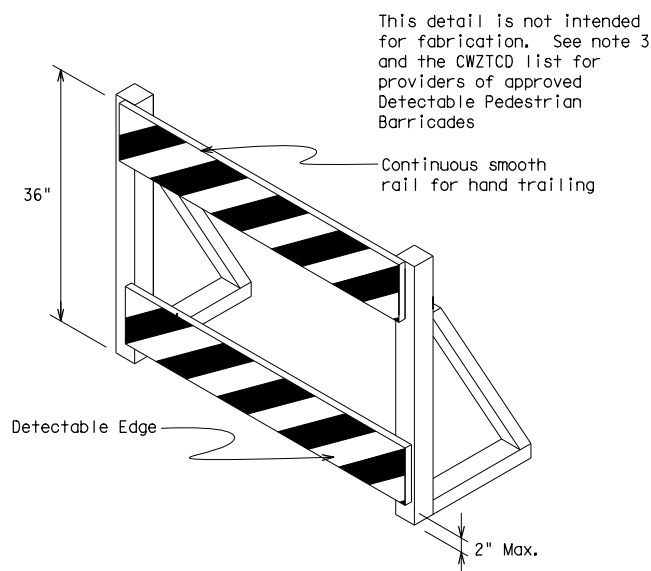
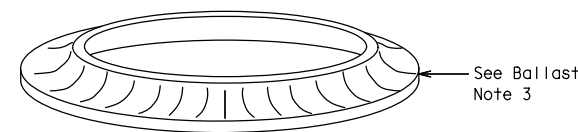
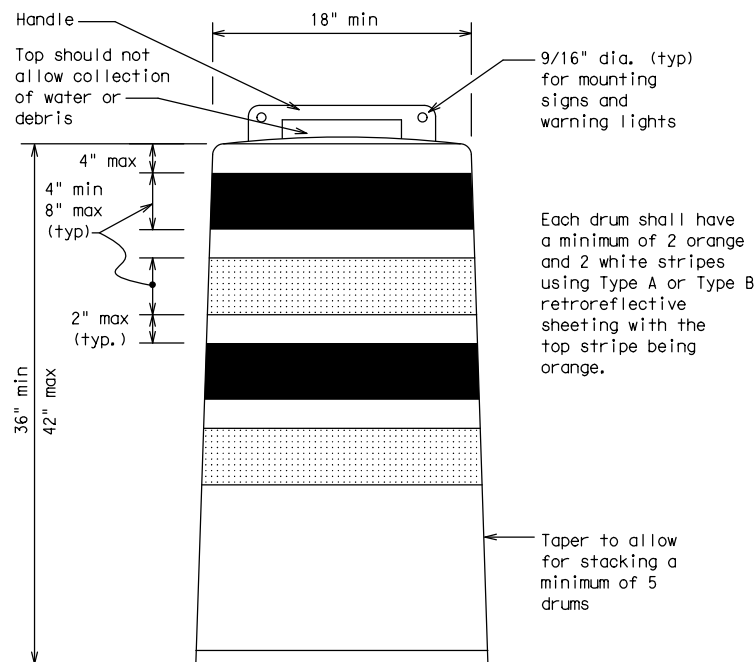
- Plastic drums shall be a two-piece design; the "body" of the drum shall be the top portion and the "base" shall be the bottom.
- The body and base shall lock together in such a manner that the body separates from the base when impacted by a vehicle traveling at a speed of 20 MPH or greater but prevents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

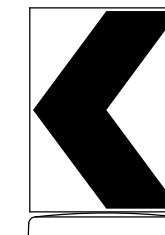
## BALLAST

- 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.

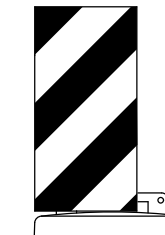


## DETECTABLE PEDESTRIAN BARRICADES

- 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.



Chevron CW1-8, Opposing Traffic Lane Divider, Driveway sign D70a, Keep Right R4 series or other signs as approved by Engineer



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

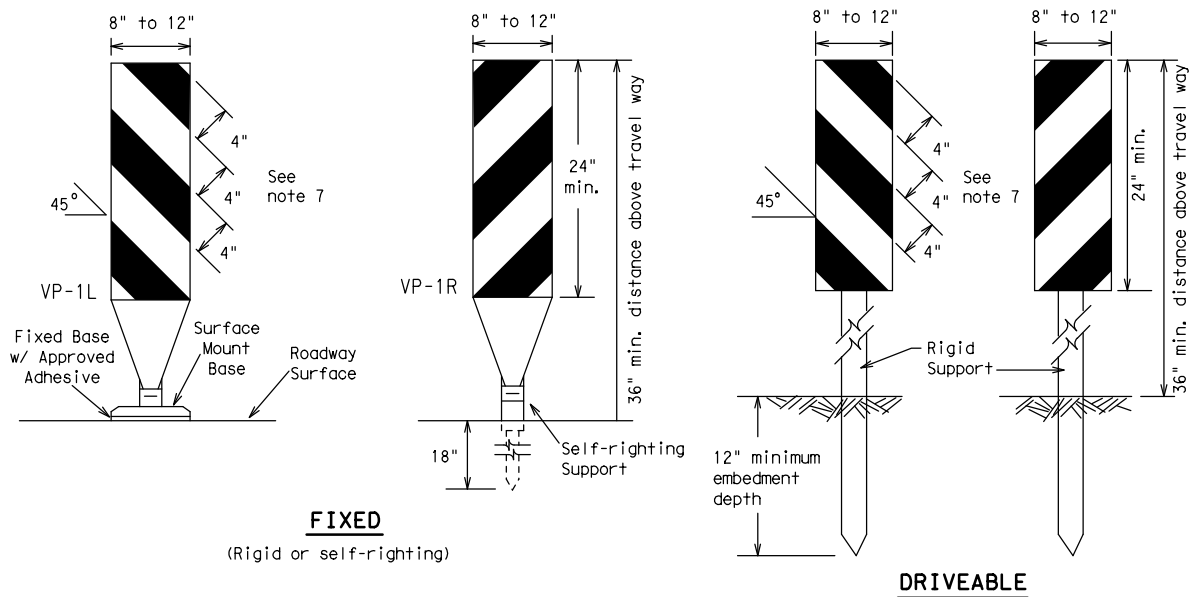


## BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(8)-21

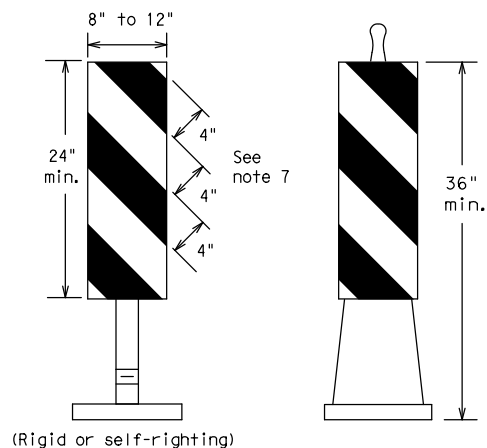
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© TxDOT	November 2002	CONT	SECT	JOB	HIGHWAY				
REVISIONS		0913	26	066	CR				
4-03	8-14								
9-07	5-21	DIST	COUNTY	SHEET NO.					
7-13		YKM	COLORADO	16					

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

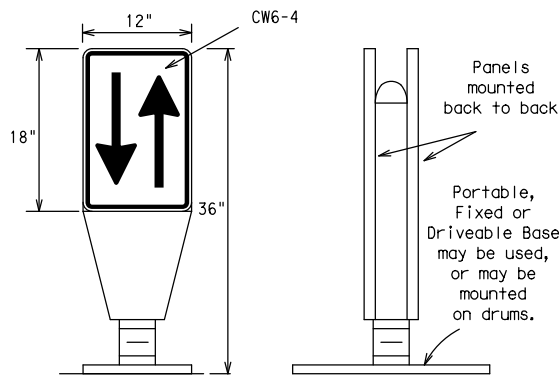
**DRIVEABLE**



**PORTABLE**

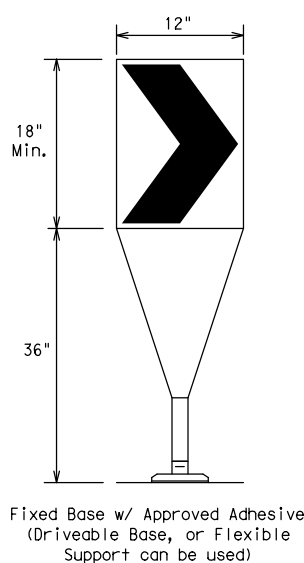
**VERTICAL PANELS (VPs)**

- 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.



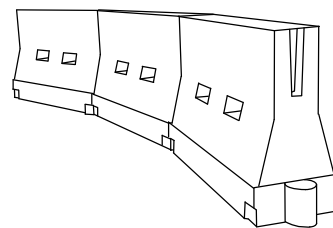
**OPPOSING TRAFFIC LANE DIVIDERS (OTLD)**

- 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.



- 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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© TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
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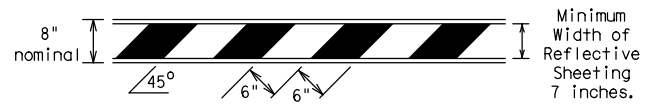
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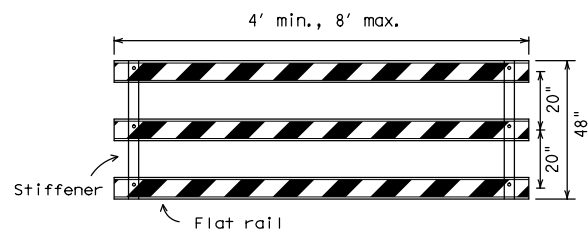
**TYPE 3 BARRICADES**

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

Barricades shall NOT be used as a sign support.



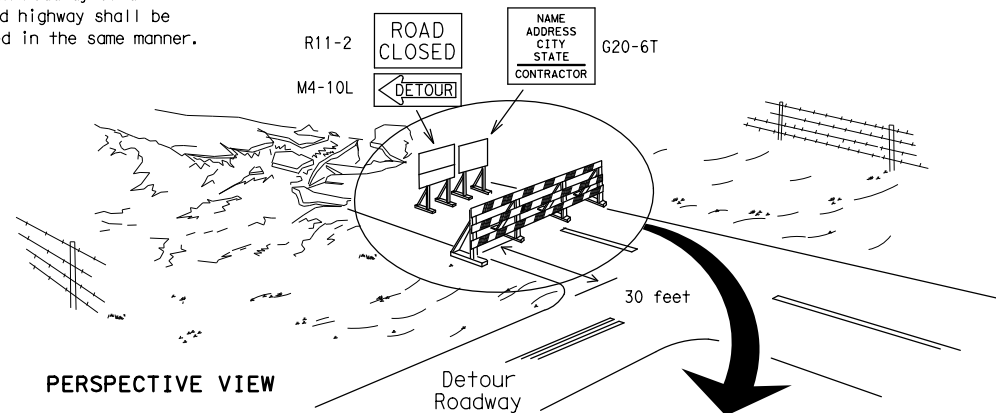
**TYPICAL STRIPING DETAIL FOR BARRICADE RAIL**



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

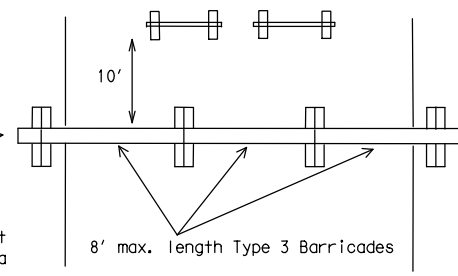
**TYPICAL PANEL DETAIL FOR SKID OR POST TYPE BARRICADES**

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



PERSPECTIVE VIEW

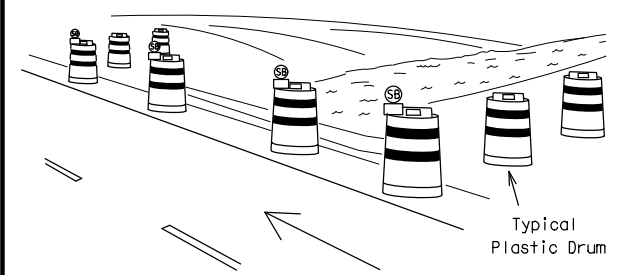
The three rails on Type 3 barricades shall be reflectorized orange and reflective white stripes on one side facing one-way traffic and both sides for two-way traffic. Barricade striping should slant downward in the direction of detour.



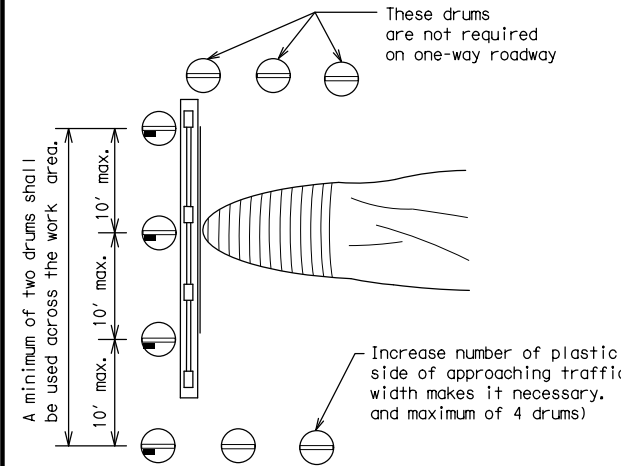
PLAN VIEW

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

**TYPE 3 BARRICADE (POST AND SKID) TYPICAL APPLICATION**



PERSPECTIVE VIEW

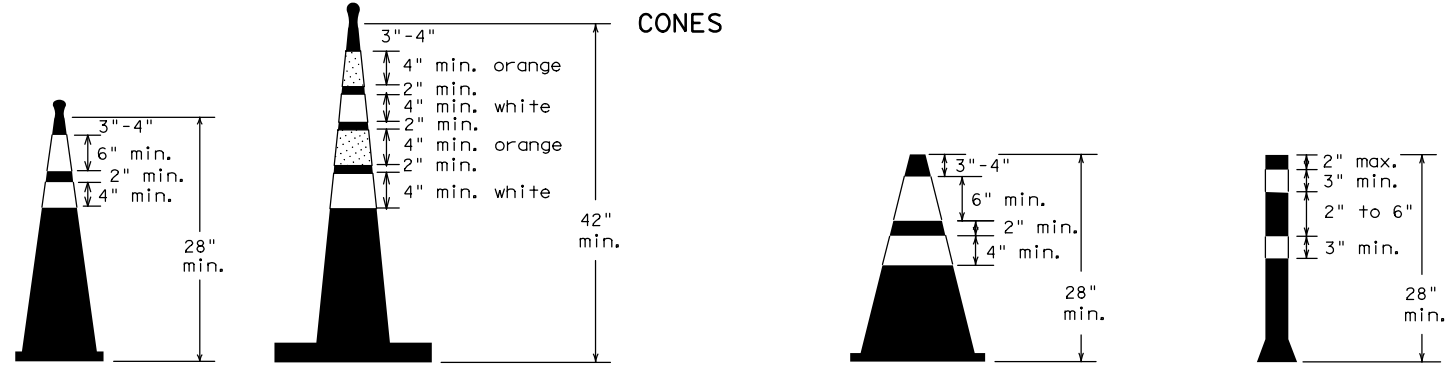


PLAN VIEW

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**

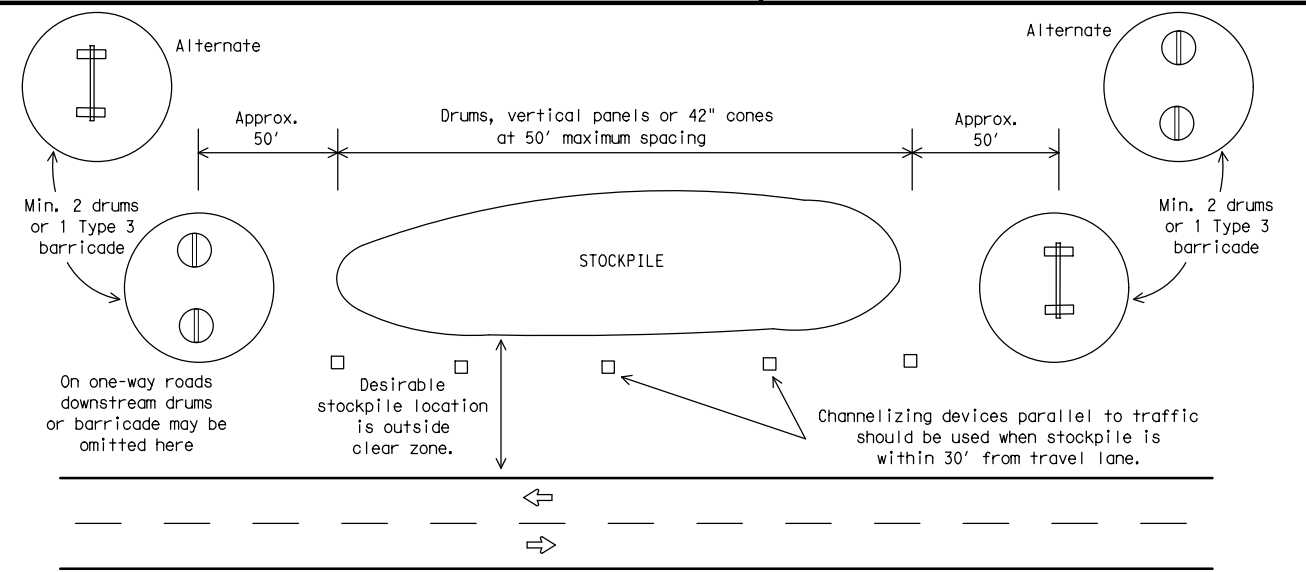


Two-Piece cones

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.



**TRAFFIC CONTROL FOR MATERIAL STOCKPILES**

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.



**BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES**

**BC(10)-21**

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## 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.

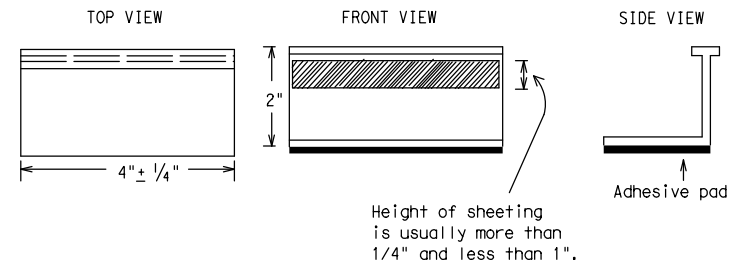
### MAINTAINING WORK ZONE PAVEMENT MARKINGS

- 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).

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## BARRICADE AND CONSTRUCTION PAVEMENT MARKINGS

**BC(11)-21**

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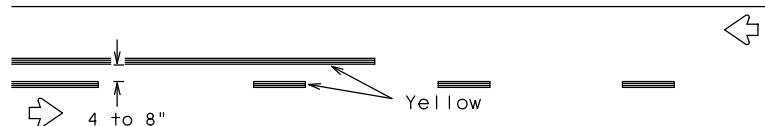
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## PAVEMENT MARKING PATTERNS

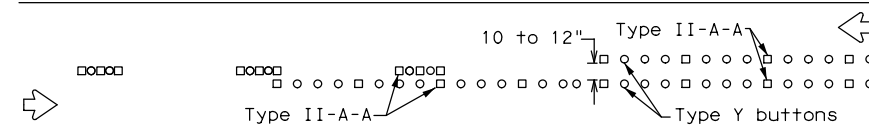


REFLECTORIZED PAVEMENT MARKINGS - PATTERN A

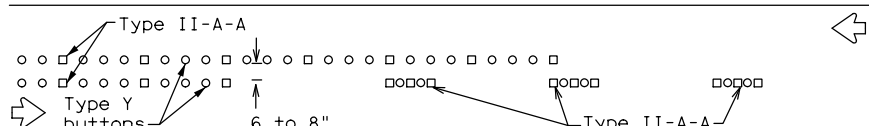


REFLECTORIZED PAVEMENT MARKINGS - PATTERN B

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.

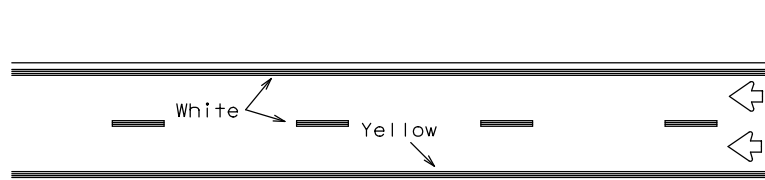


RAISED PAVEMENT MARKERS - PATTERN A



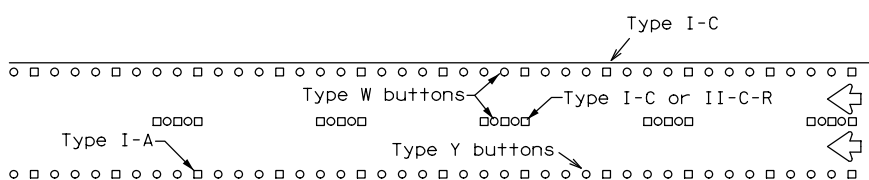
RAISED PAVEMENT MARKERS - PATTERN B

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



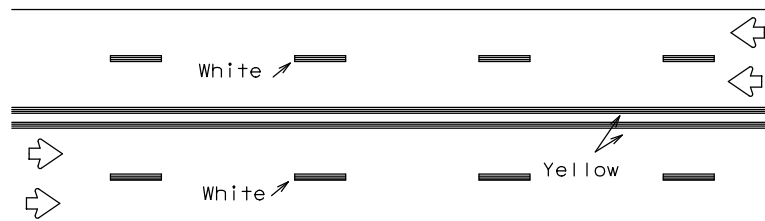
REFLECTORIZED PAVEMENT MARKINGS

Prefabricated markings may be substituted for reflectORIZED pavement markings.



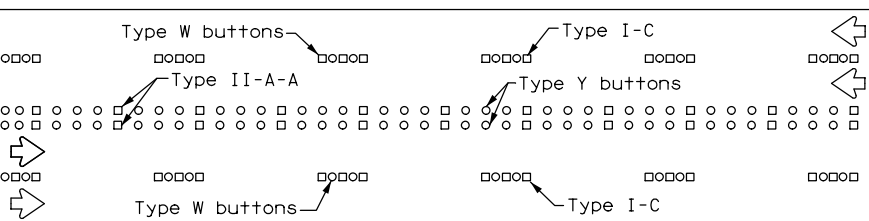
RAISED PAVEMENT MARKERS

## EDGE & LANE LINES FOR DIVIDED HIGHWAY



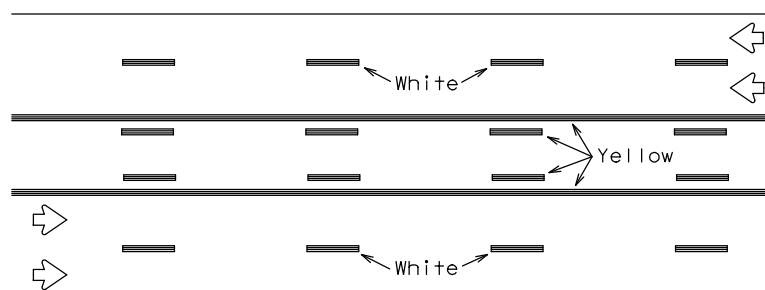
REFLECTORIZED PAVEMENT MARKINGS

Prefabricated markings may be substituted for reflectORIZED pavement markings.



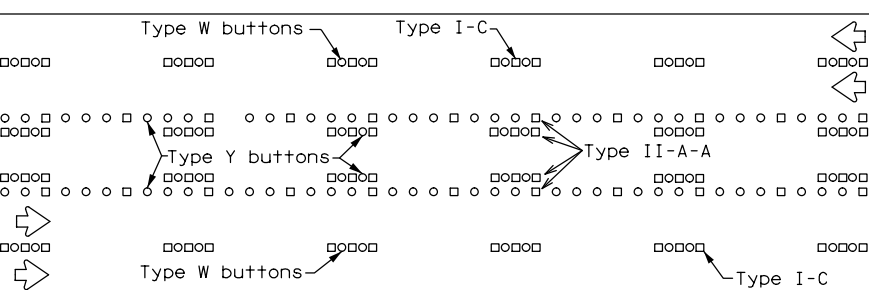
RAISED PAVEMENT MARKERS

## LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS



REFLECTORIZED PAVEMENT MARKINGS

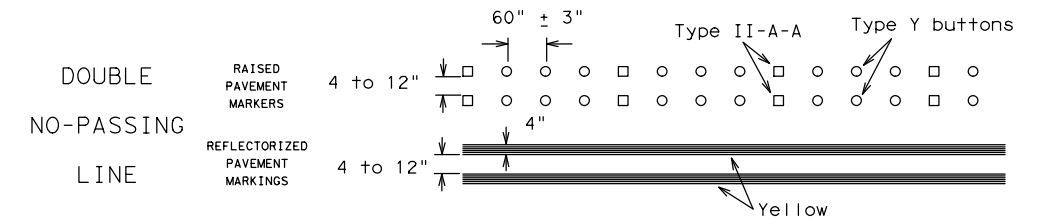
Prefabricated markings may be substituted for reflectORIZED pavement markings.



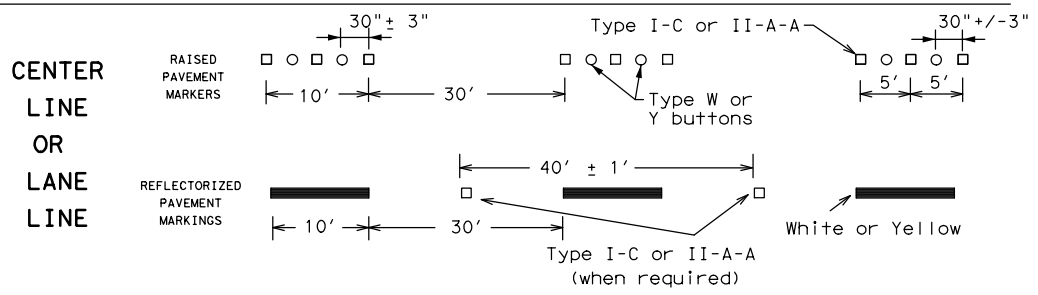
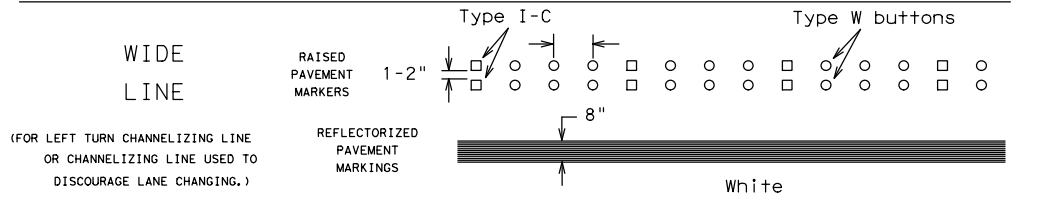
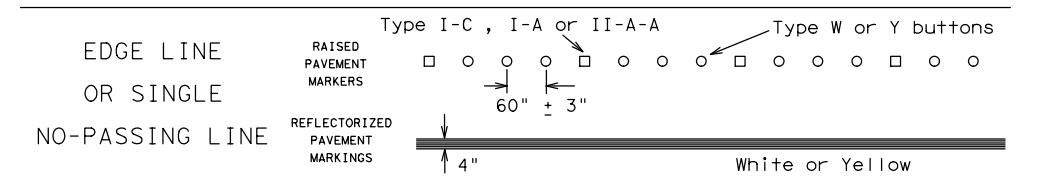
RAISED PAVEMENT MARKERS

## TWO-WAY LEFT TURN LANE

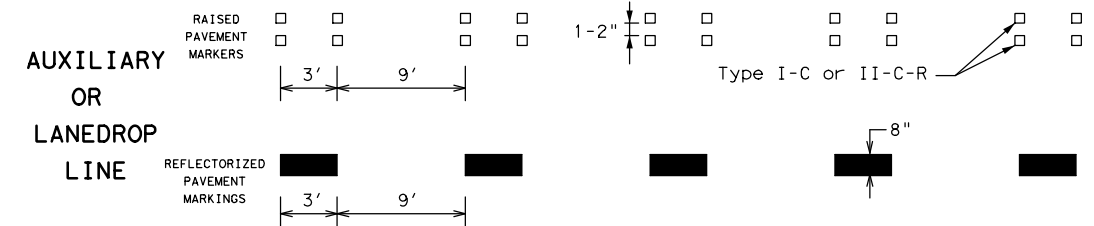
## STANDARD WORK ZONE PAVEMENT MARKINGS DETAILS



### SOLID LINES

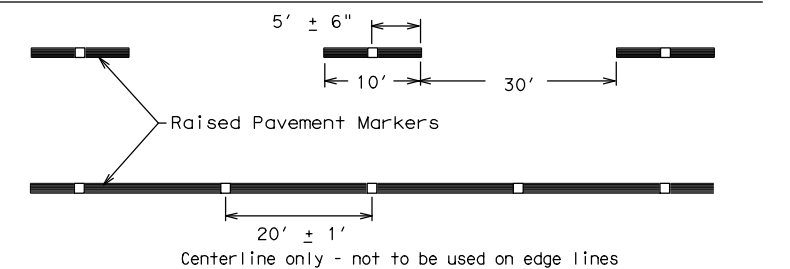


### BROKEN LINES



### 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

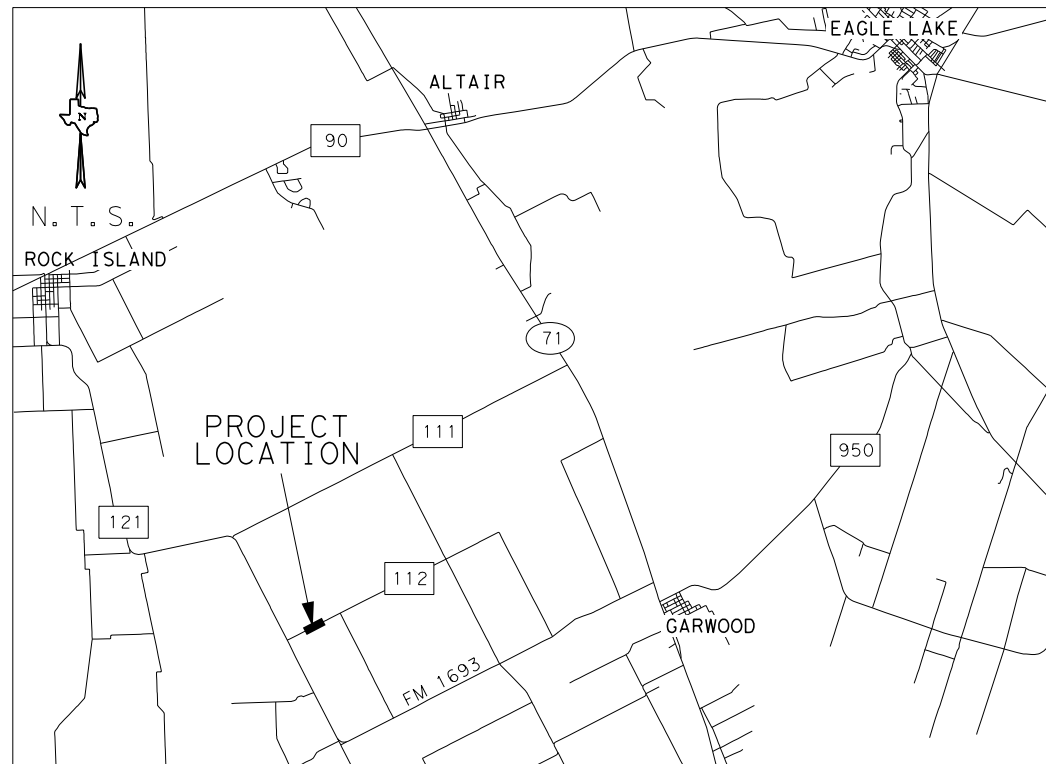
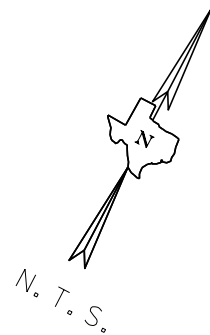
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	YKM	COLORADO	20	

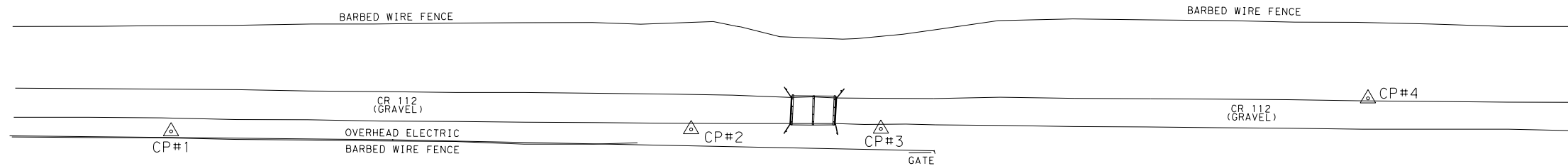
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Raised pavement markers used as standard pavement markings shall be from the approved products list and meet the requirements of Item 672 "RAISED PAVEMENT MARKERS."



LOCATION MAP



CONTROL POINT	SURFACE COORDINATES		NAVD 88 ELEVATION	GRID COORDINATES		DESCRIPTION
	NORTHING	EASTING		NORTHING	EASTING	
CP#1	13, 719, 284.165	2, 762, 917.922	172.340	13, 717, 500.890	2, 762, 558.789	5/8-IR W/ RED CAP STAMPED "CP&Y TRAV. POINT"
CP#2	13, 719, 452.157	2, 763, 233.998	172.510	13, 717, 668.860	2, 762, 874.824	5/8-IR W/ RED CAP STAMPED "CP&Y TRAV. POINT"
CP#3	13, 719, 513.295	2, 763, 349.430	172.430	13, 717, 729.990	2, 762, 990.241	5/8-IR W/ RED CAP STAMPED "CP&Y TRAV. POINT"
CP#4	13, 719, 687.998	2, 763, 636.349	171.960	13, 717, 904.670	2, 763, 277.123	5/8-IR W/ RED CAP STAMPED "CP&Y TRAV. POINT"

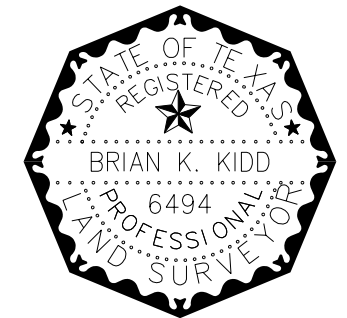
NOTES:  
 HORIZONTAL COORDINATES SHOWN ARE IN U.S. SURVEY FEET, AND ARE BASED UPON THE TEXAS COORDINATE SYSTEM OF NAD '83 (HARN '93) TEXAS SOUTH CENTRAL ZONE 4204, WITH A SURFACE ADJUSTMENT FACTOR OF 1.00013. VALUES WERE DERIVED UTILIZING THE TXDOT STATE VIRTUAL REFERENCE STATION NETWORK IN DECEMBER, 2022.

ELEVATIONS ARE BASED UPON NAVD '88 DATUM (GEOID 18) DERIVED FROM UTILIZING THE TXDOT STATE VIRTUAL REFERENCE STATION NETWORK IN DECEMBER, 2022.

LEGEND

△ 5/8" IRON ROD W/ RED PLASTIC CAP SET "CP&Y TRAV. POINT"

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



*Brian Kidd*  
 BRIAN K. KIDD  
 RPLS NO. 6494

8/29/2023  
 DATE

NO.	REVISION	BY	DATE

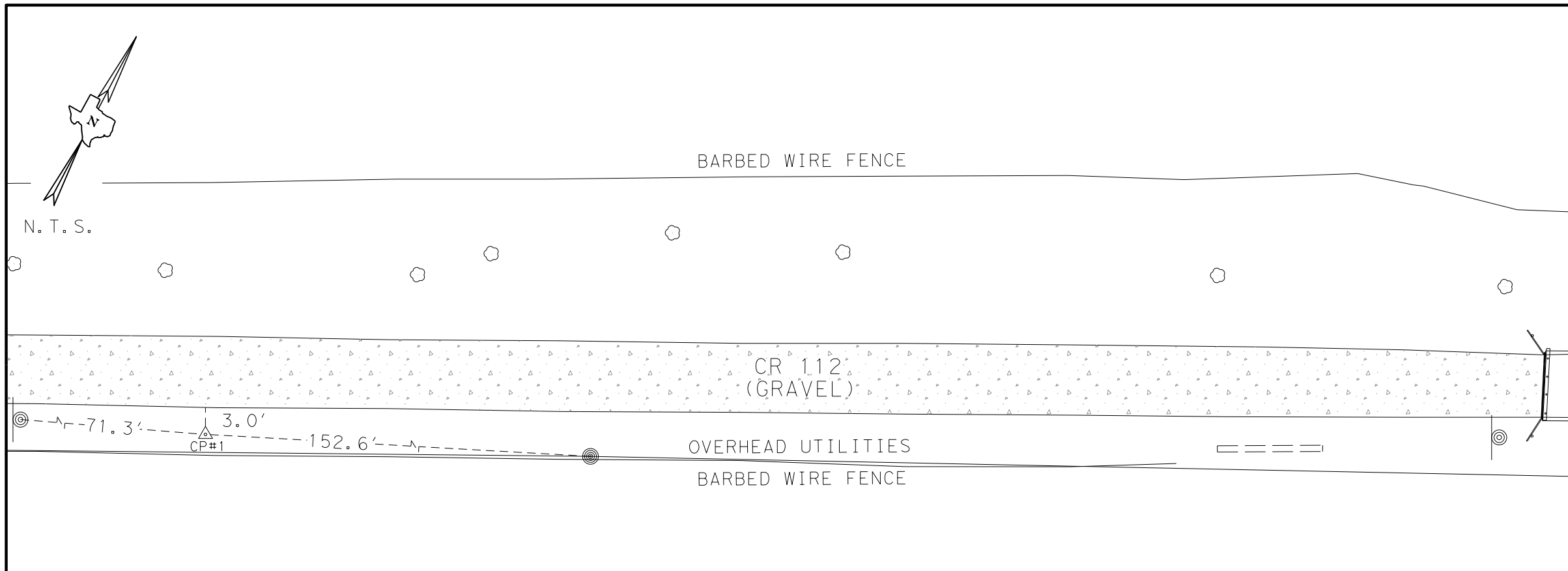


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CR 112 AT BUCKSNAG CREEK  
**HORIZONTAL AND VERTICAL CONTROL INDEX SHEET**

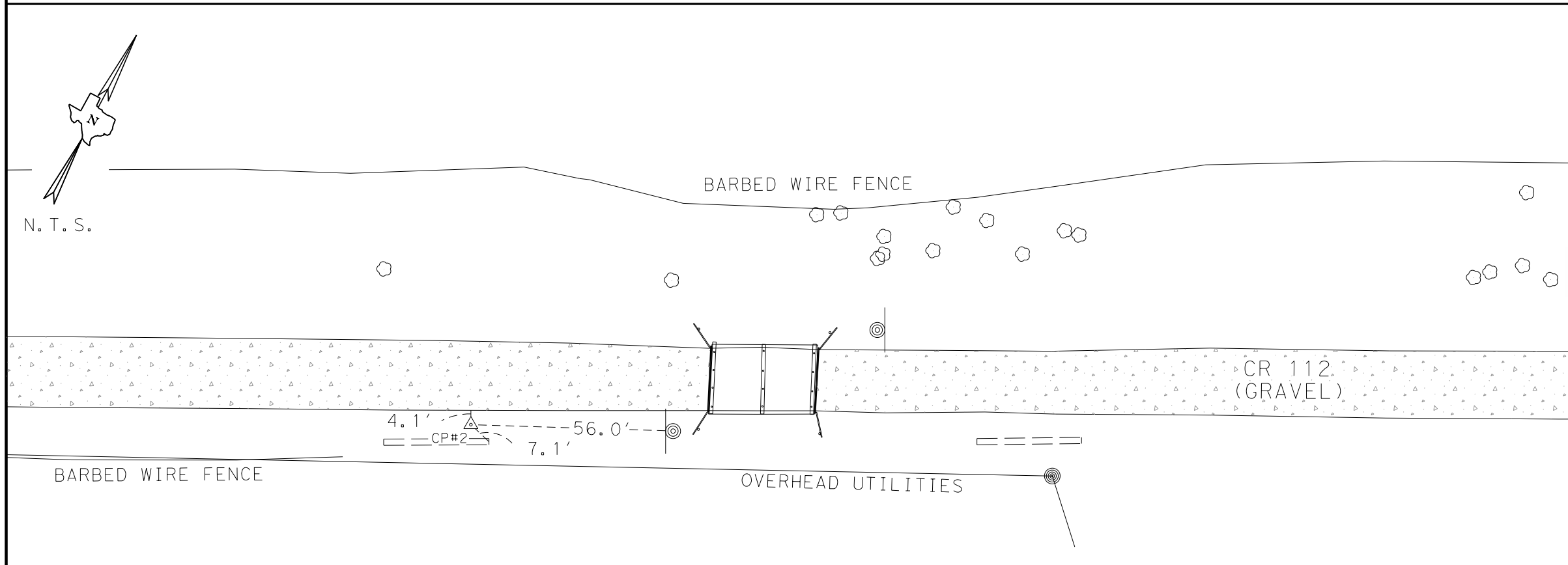
CSJ 0913-26-066 SHEET 1 OF 1

DESIGNED: STV	FED. NO. 6	STATE TEXAS	FEDERAL AID PROJECT NO.	HIGHWAY NO. CR
CHECKED: STV	DIST. YKM	COUNTY COLORADO	CONTROL NO. 0913	SECTION NO. 26
DRAFTED: STV	JOB NO. 066	SHEET NO. 21		



CP# 1 IS A 5/8-INCH IRON ROD WITH RED PLASTIC CAP STAMPED "CP&Y TRAV. POINT" LOCATED IN COLORADO COUNTY, TX., LOCATED ON THE SOUTH SIDE OF CR 112, +/- 71.3' NORTHEAST OF A ONE LANE BRIDGE SIGN LOCATED ON THE SOUTH SIDE OF CR 112, +/- 152.6' SOUTHWEST OF A POWERPOLE LOCATED ON THE SOUTH SIDE OF CR 112, AND +/- 3.0' SOUTHEAST OF THE SOUTH EDGE OF PAVMENT FOR CR 112.

US SURVEY FEET  
 DATA SET: DECEMBER 2022  
 MONUMENT: 5/8"-IR W/ RED PLASTIC CAP STAMPED "CP&Y TRAV. POINT"  
 SURFACE ADJUSTMENT FACTOR 1.00013  
 ELEVATIONS ARE NAVD 88 BASED UPON GEOID 18  
 TXDOT VRS NETWORK



CP# 2 IS A 5/8-INCH IRON ROD WITH RED PLASTIC CAP STAMPED "CP&Y TRAV. POINT" LOCATED IN COLORADO COUNTY, TX., LOCATED ON THE SOUTH SIDE OF CR 112, +/- 56.0' SOUTHWEST OF A WEIGHT LIMIT SIGN LOCATED ON THE SOUTH SIDE OF CR 112, +/- 7.1' WEST OF THE NORTH END OF A 18" CMP LOCATED ON THE SOUTH SIDE OF CR 112, AND +/- 4.1' SOUTHEAST OF THE SOUTH EDGE OF PAVMENT FOR CR 112.

US SURVEY FEET  
 DATA SET: DECEMBER 2022  
 MONUMENT: 5/8"-IR W/ RED PLASTIC CAP STAMPED "CP&Y TRAV. POINT"  
 SURFACE ADJUSTMENT FACTOR 1.00013  
 ELEVATIONS ARE NAVD 88 BASED UPON GEOID 18  
 TXDOT VRS NETWORK

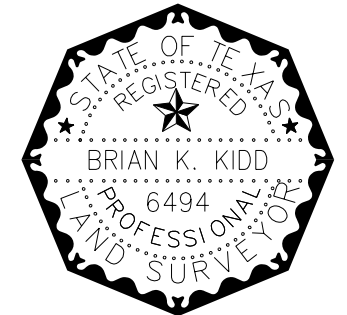
NOTES:  
 HORIZONTAL COORDINATES SHOWN ARE IN U.S. SURVEY FEET, AND ARE BASED UPON THE TEXAS COORDINATE SYSTEM OF NAD '83 (HARN '93) TEXAS SOUTH CENTRAL ZONE 4204, WITH A SURFACE ADJUSTMENT FACTOR OF 1.00013. VALUES WERE DERIVED UTILIZING THE TXDOT STATE VIRTUAL REFERENCE STATION NETWORK IN DECEMBER, 2022.

ELEVATIONS ARE BASED UPON NAVD '88 DATUM (GEOID 18) DERIVED FROM UTILIZING THE TXDOT STATE VIRTUAL REFERENCE STATION NETWORK IN DECEMBER, 2022.

LEGEND

- TREE
- SIGN
- PP
- 5/8" IRON ROD W/ RED PLASTIC CAP SET "CP&Y TRAV. POINT"

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



*Brian Kidd*  
 BRIAN K. KIDD  
 RPLS NO. 6494

8/29/2023  
 DATE

NO.	REVISION	BY	DATE



TBPELS FIRM  
 REGISTRATION NUMBER  
 10194305

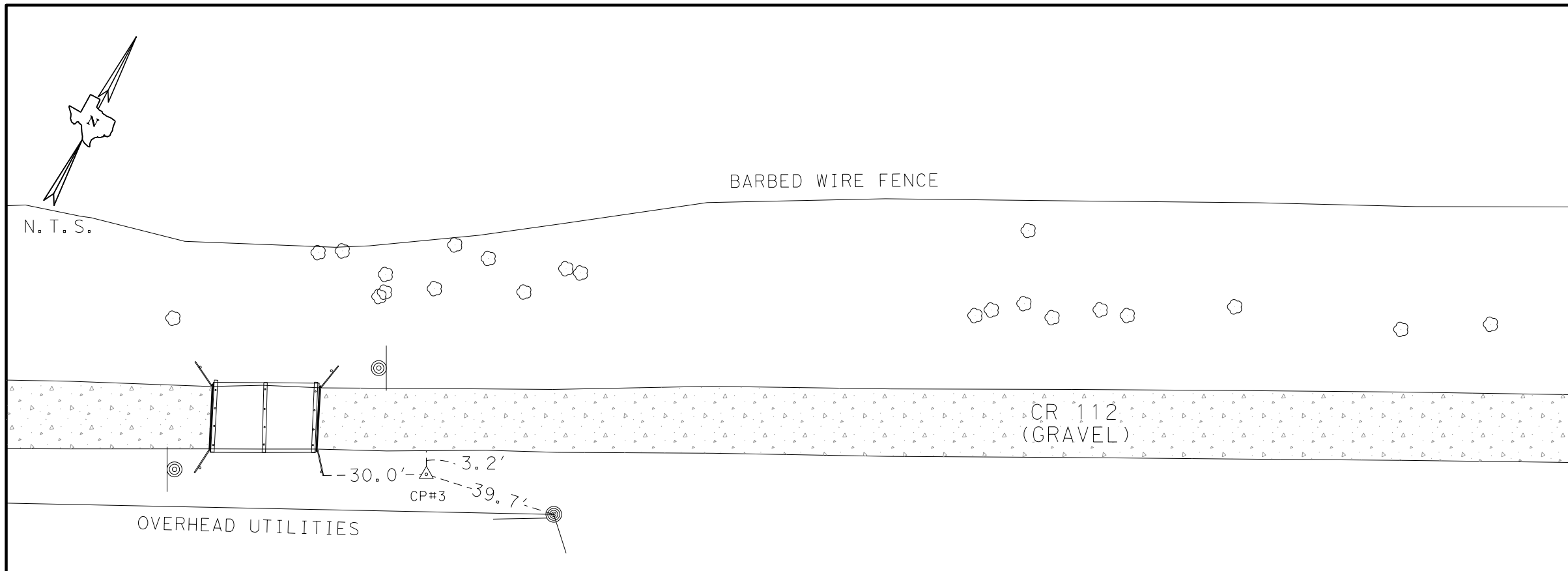
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CR 112 AT BUCKSNAG CREEK

HORIZONTAL AND VERTICAL  
 CONTROL SHEET

CSJ 0913-26-066 SHEET 1 OF 2

DESIGNED:	STV	FED. NO.	STATE	FEDERAL AID PROJECT NO.	HIGHWAY NO.		
CHECKED:	STV	6	TEXAS		CR		
DRAFTED:	STV	DIST.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
CHECKED:	STV	YKM	COLORADO	0913	26	066	22



CP# 3 IS A 5/8-INCH IRON ROD WITH RED PLASTIC CAP STAMPED "CP&Y TRAV. POINT" LOCATED IN COLORADO COUNTY, TX., LOCATED ON THE SOUTH SIDE OF CR 112, +/- 30.0' NORTHEAST OF THE NORTHEAST END OF A WINGWALL LOCATED ON THE SOUTH SIDE OF CR 112, +/- 39.7' WEST OF A POWERPOLE LOCATED ON THE SOUTH SIDE OF CR 112, AND +/- 3.2' SOUTHEAST OF THE SOUTH EDGE OF PAVMENT FOR CR 112.

US SURVEY FEET  
 DATA SET: DECEMBER 2022  
 MONUMENT: 5/8"-IR W/ RED PLASTIC CAP STAMPED "CP&Y TRAV. POINT"  
 SURFACE ADJUSTMENT FACTOR 1.00013  
 ELEVATIONS ARE NAVD 88 BASED UPON GEOID 18  
 TXDOT VRS NETWORK

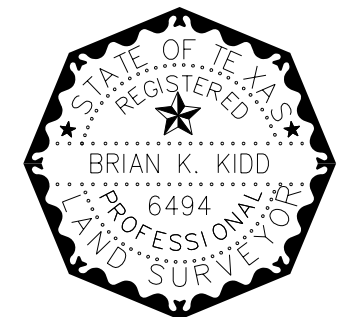
NOTES:  
 HORIZONTAL COORDINATES SHOWN ARE IN U.S. SURVEY FEET, AND ARE BASED UPON THE TEXAS COORDINATE SYSTEM OF NAD '83 (HARN '93) TEXAS SOUTH CENTRAL ZONE 4204, WITH A SURFACE ADJUSTMENT FACTOR OF 1.00013. VALUES WERE DERIVED UTILIZING THE TXDOT STATE VIRTUAL REFERENCE STATION NETWORK IN DECEMBER, 2022.

ELEVATIONS ARE BASED UPON NAVD '88 DATUM (GEOID 18) DERIVED FROM UTILIZING THE TXDOT STATE VIRTUAL REFERENCE STATION NETWORK IN DECEMBER, 2022.

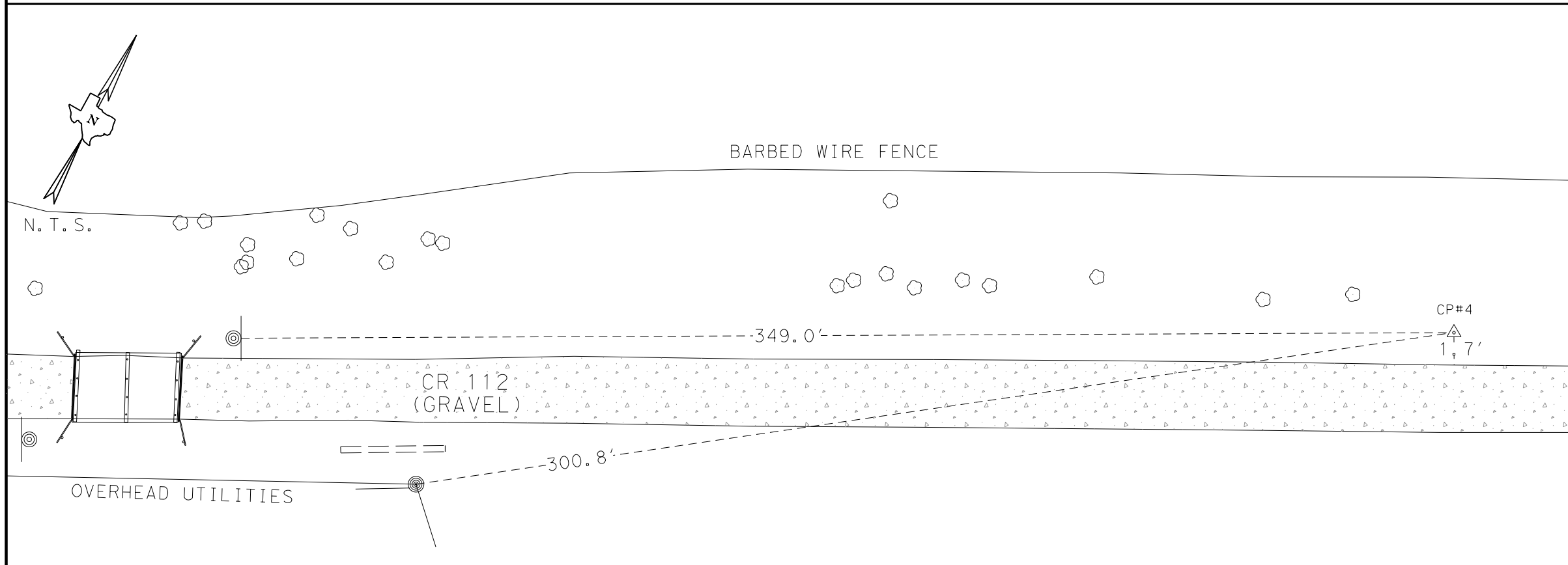
LEGEND

- TREE
- SIGN
- PP
- 5/8" IRON ROD W/ RED PLASTIC CAP SET "CP&Y TRAV. POINT"

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



*Brian Kidd*  
 BRIAN K. KIDD  
 RPLS NO. 6494  
 8/29/2023  
 DATE



CP# 4 IS A 5/8-INCH IRON ROD WITH RED PLASTIC CAP STAMPED "CP&Y TRAV. POINT" LOCATED IN COLORADO COUNTY, TX., LOCATED ON THE NORTH SIDE OF CR 112, +/- 349.0' NORTHEAST OF A WEIGHT LIMIT SIGN LOCATED ON THE NORTH SIDE OF CR 112, +/- 300.8' NORTHEAST OF A POWERPOLE LOCATED ON THE SOUTH SIDE OF CR 112, AND +/- 1.7' NORTHWEST OF THE NORTH EDGE OF PAVMENT FOR CR 112.

US SURVEY FEET  
 DATA SET: DECEMBER 2022  
 MONUMENT: 5/8"-IR W/ RED PLASTIC CAP STAMPED "CP&Y TRAV. POINT"  
 SURFACE ADJUSTMENT FACTOR 1.00013  
 ELEVATIONS ARE NAVD 88 BASED UPON GEOID 18  
 TXDOT VRS NETWORK

NO.	REVISION	BY	DATE

**stv** TBPELS FIRM  
 REGISTRATION NUMBER  
 10194305

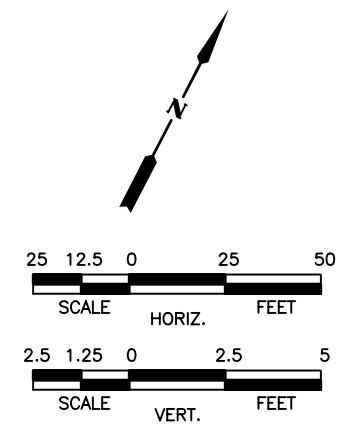
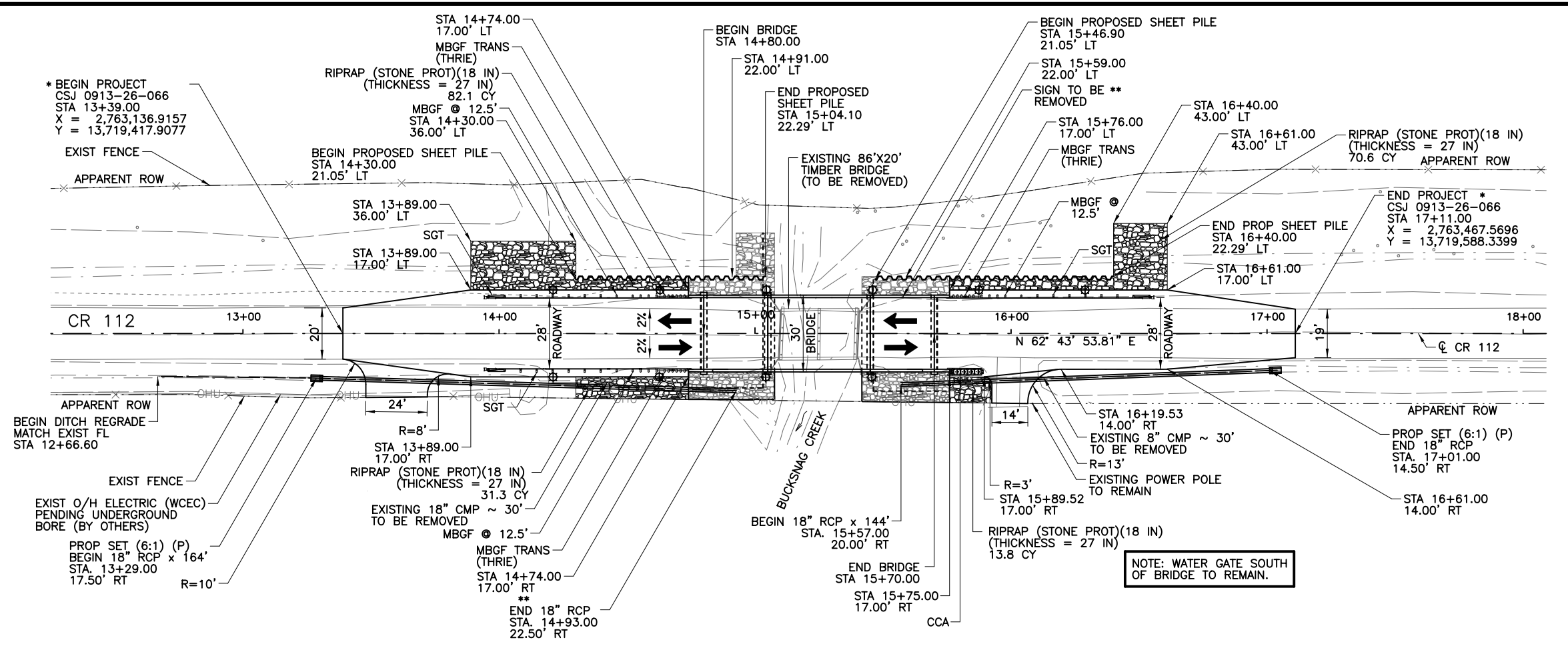
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CR 112 AT BUCKSNAG CREEK  
**HORIZONTAL AND VERTICAL CONTROL SHEET**

CSJ 0913-26-066 SHEET 2 OF 2

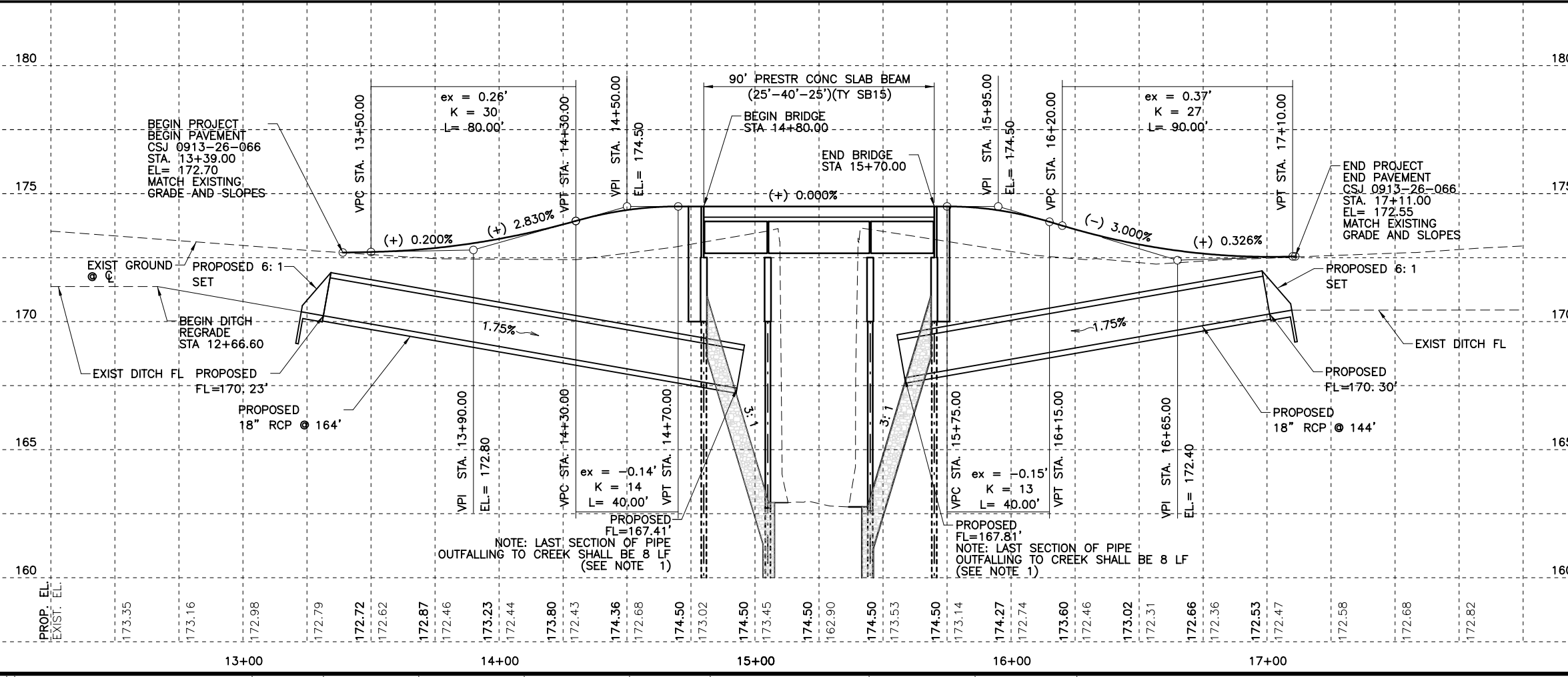
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CHECKED:	STV	6	TEXAS		CR		
DRAFTED:	STV	DIST.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
CHECKED:	STV	YKM	COLORADO	0913	26	066	23

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- LEGEND**
- OHU — OVERHEAD UTILITY
  - X — EXISTING FENCE
  - ⊕ BI-DIRECTIONAL DELINEATORS

- NOTES**
- \* MATCH EXISTING GRADE AND ROADWAY CROSS SLOPE.
  - \*\* FOR CONTRACTOR'S INFORMATION ONLY. SIGN REMOVAL SHALL BE SUBSIDIARY TO BRIDGE REMOVAL.
  - 1. LAST TWO JOINTS SHALL HAVE CONCRETE COLLARS. FURNISHING AND INSTALLATION OF CONCRETE COLLAR SHALL BE CONSIDERED INCIDENTAL TO COST OF PIPE.



**MARCEL D. STRACHAN**  
99302  
LICENSED PROFESSIONAL ENGINEER

*Marcel D. Strachan* 10/06/2023

NO.	REVISION	BY	DATE

TEXAS REGISTERED ENGINEERING FIRM F-1741

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CR 112 AT BUCKSNAG CREEK

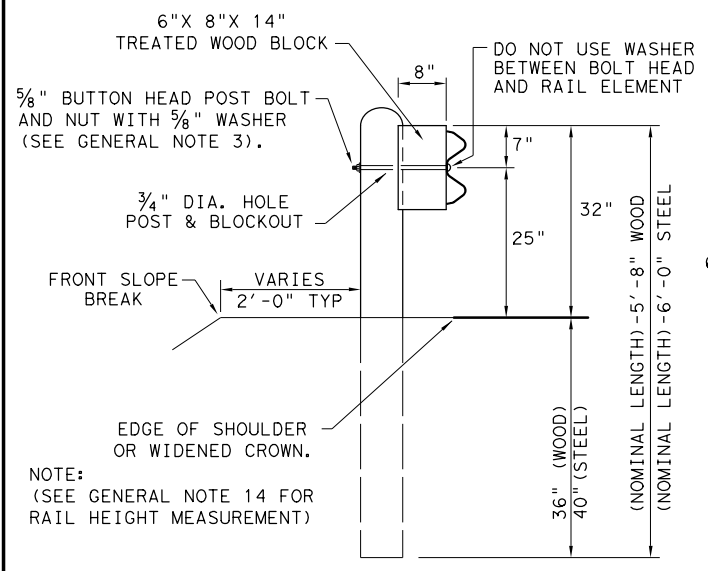
**PLAN AND PROFILE**

**CSJ 0913-26-066**

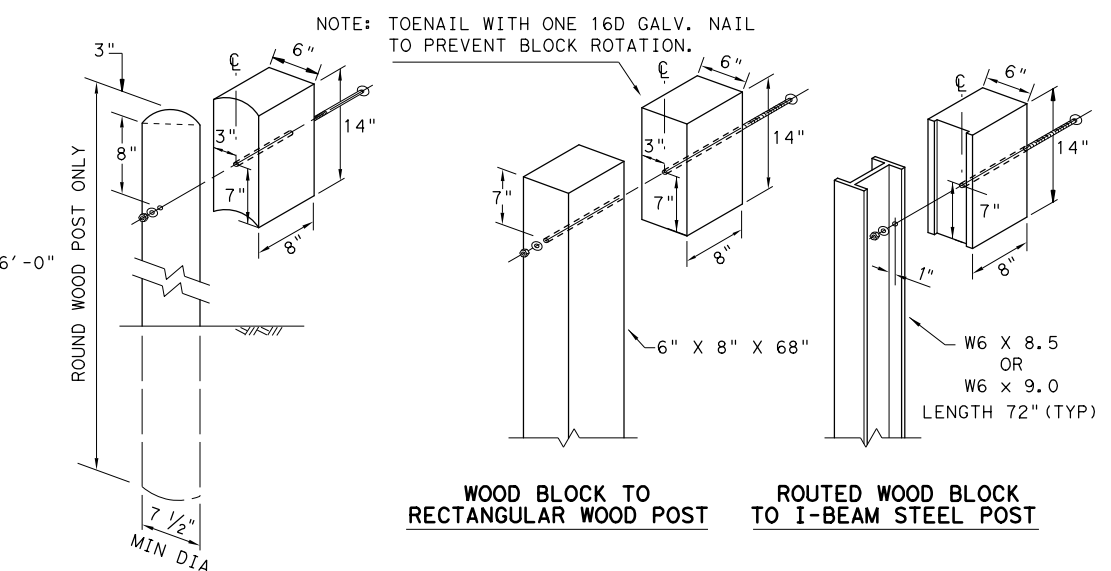
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Checked: MDS				
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Checked: MDS				JOB NO. 066
				SHEET NO. 24

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

DATE: FILE:

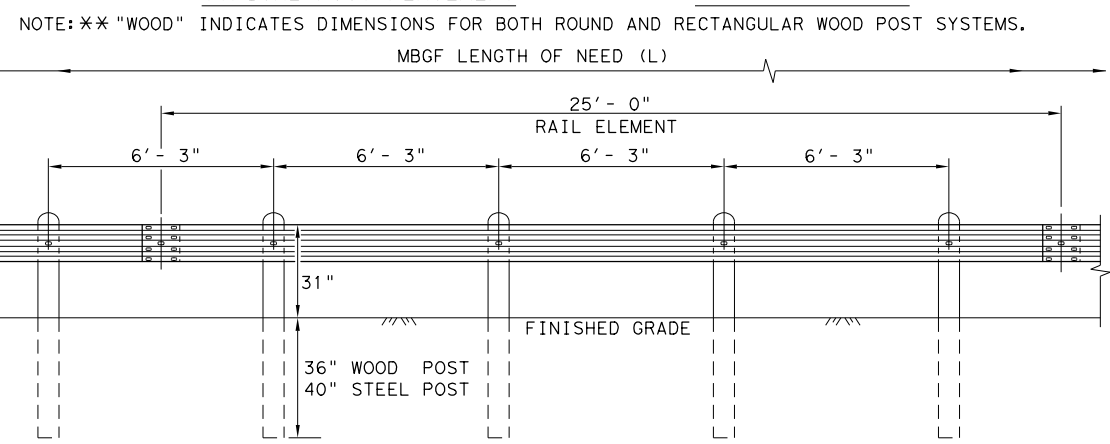


**TYPICAL POST PLACEMENT**



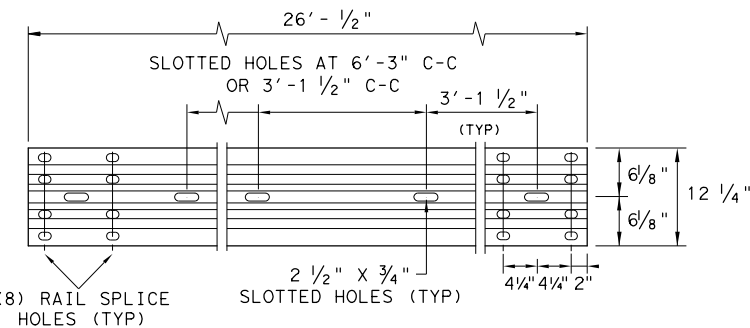
**WOOD BLOCK TO ROUND WOOD POST**      **ROUTED WOOD BLOCK TO I-BEAM STEEL POST**

- GENERAL NOTES**
1. THE TYPE OF POST (ROUND WOOD POST, RECTANGULAR WOOD POST, OR STEEL POST) WILL BE AS SHOWN IN THE PLANS. THE EXACT POSITION OF MBGF SHALL BE SHOWN IN THE PLANS OR AS DIRECTED BY THE ENGINEER. STEEL POSTS TO BE GALVANIZED IN ACCORDANCE WITH ITEM 445, "GALVANIZING."
  2. RAIL ELEMENTS SHALL MEET THE REQUIREMENTS OF ITEM 540, "METAL BEAM GUARD FENCE" EXCEPT AS MODIFIED IN THE PLANS. THE CONTRACTOR MAY FURNISH RAIL ELEMENTS OF 25'-0", OR 12'-6" (NOM.) LENGTHS. RAIL ELEMENTS MAY HAVE SLOTTED HOLES AT 3'-1 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.
  3. BUTTON HEAD "POST BOLTS & NUTS" SHALL MEET THE REQUIREMENTS OF (ASTM A307), AND SHALL BE OF SUFFICIENT LENGTH TO EXTEND THROUGH THE FULL THICKNESS OF THE NUT AND 5/8" WASHER (FWC16d) AND NOT MORE THAN 1" BEYOND IT. TRIM REMAINING BOLT LENGTH TO MEET REQUIRED LENGTH.
  4. FITTINGS (BOLTS, NUTS, AND WASHERS) SHALL BE GALVANIZED IN ACCORDANCE WITH ITEM 445, "GALVANIZING." FITTINGS SHALL BE SUBSIDIARY TO THE BID ITEM.
  5. CROWN SHALL BE WIDENED TO ACCOMMODATE THE METAL BEAM GUARD FENCE.
  6. THE LATERAL APPROACH TO THE GUARD FENCE, SHALL HAVE A MAXIMUM SLOPE OF 1V:10H.
  7. IF SHOWN ELSEWHERE IN THE PLANS OR AS DIRECTED BY THE ENGINEER, THE GUARD FENCE MAY BE FLARED AT A RATE OF 25:1 OR FLATTER.
  8. UNLESS OTHERWISE SHOWN IN THE PLANS, GUARD FENCE PLACED IN THE VICINITY OF CURBS SHALL BE POSITIONED SO THAT THE FACE OF CURB IS LOCATED DIRECTLY BELOW OR BEHIND THE FACE OF THE RAIL. RAIL PLACED OVER CURBS SHALL BE INSTALLED SO THAT THE POST BOLT IS LOCATED APPROXIMATELY 25 INCHES ABOVE THE GUTTER PAN OR EDGE OF SHOULDER.
  9. APPLICATIONS IN SOLID ROCK ARE ONLY ALLOWED WITH STEEL POSTS. IF SOLID ROCK IS ENCOUNTERED WITHIN 0 TO 18" OF THE FINISHED GRADE, DRILL A 24" DIA. HOLE, 24" INTO THE ROCK. IF SOLID ROCK IS ENCOUNTERED BELOW 18", DRILL A 12" DIA. HOLE, 12" INTO THE ROCK OR TO THE STANDARD EMBEDMENT DEPTH, WHICHEVER MAYBE LESS. ANY EXCESS POST LENGTH, AFTER MEETING THESE DEPTHS, MAY BE FIELD CUT TO ENSURE PROPER GUARDRAIL MOUNTING HEIGHT. BACKFILL WITH COARSE AGGREGATE MATERIAL.
  10. POSTS SHALL NOT BE SET IN CONCRETE, OF ANY DEPTH.
  11. SPECIAL FABRICATION WILL BE REQUIRED AT INSTALLATION LOCATIONS HAVING A CURVATURE OF LESS THAN 150 FT. RADIUS.
  12. UNLESS OTHERWISE SHOWN IN THE PLANS, A COMPOSITE MATERIAL BLOCK THAT MEETS THE REQUIREMENTS OF DMS-7210, "COMPOSITE MATERIAL POSTS AND BLOCKS FOR METAL BEAM GUARD FENCE" MAY BE SUBSTITUTED FOR BLOCKS OF SIMILAR DIMENSIONS. THE CONSTRUCTION DIVISION, TXDOT MAINTAINS A MATERIAL PRODUCER LIST (MPL) FOR PRODUCERS OF MATERIALS CONFORMING TO DMS-7210 ONLY PRODUCERS ON THE MPL MAY FURNISH COMPOSITE MATERIAL BLOCKS.
  13. FOR THE LOW FILL CULVERT OPTION, POSTS LOCATED PARTIALLY OR WHOLLY BETWEEN PRECAST BOX CULVERT UNITS, THE USE OF A CAST-IN-PLACE CONCRETE CLOSURE BETWEEN BOXES IS REQUIRED. THE LENGTH OF THE CAST-IN-PLACE CONCRETE CLOSURE SHALL ACCOMMODATE THE PLACEMENT OF THE LOW FILL CULVERT OPTION. SEE CONCRETE CLOSURE DETAILS ON BRIDGE STANDARD SCP-MD.
  14. GUARDRAIL HEIGHT MEASUREMENT: WHEN THE GUARDRAIL IS LOCATED ABOVE PAVEMENT, MEASURE THE HEIGHT FROM THE PAVEMENT TO THE TOP OF THE W-BEAM RAIL. WHEN THE GUARDRAIL IS LOCATED UP TO 2 FT. OFF OF THE EDGE OF PAVEMENT OR FOR A PAVEMENT OVERLAY, USE A 10-FOOT STRAIGHTEDGE TO EXTEND THE PAVEMENT/SHOULDER SLOPE TO THE BACK OF RAIL, MEASURE FROM THE BOTTOM OF STRAIGHTEDGE TO THE TOP OF RAIL. FOR GUARDRAIL LOCATED DOWN A 10:1 SLOPE, MEASURE FROM THE NOMINAL TERRAIN.



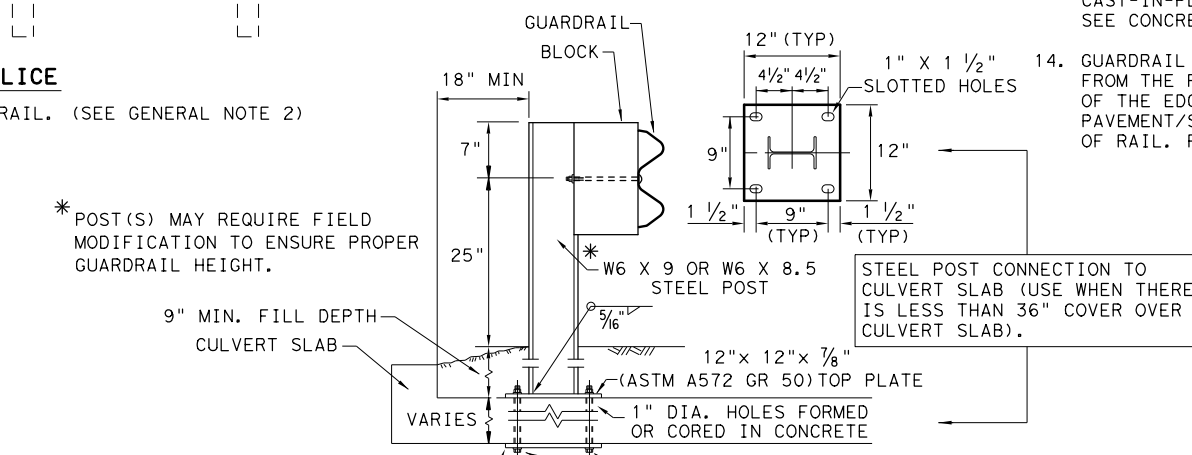
**ELEVATION MID-SPAN RAIL SPLICE**

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



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

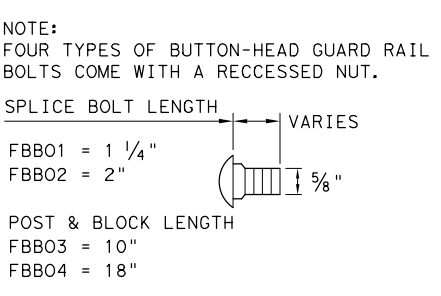
NOTES: SEE GENERAL NOTE 2 FOR ALLOWABLE RAIL TYPES. SEE RAIL SPLICE DETAIL FOR REQUIRED HARDWARE.



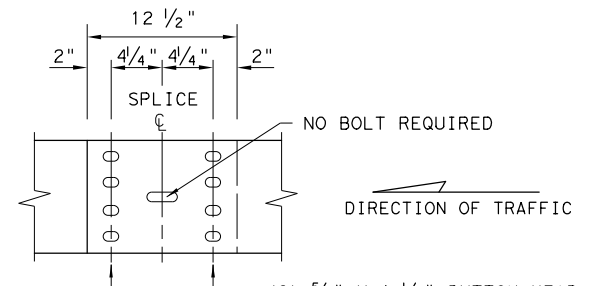
**LOW FILL CULVERT POST**

- NOTE: TWO INSTALLATION OPTIONS.
1. **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.
  2. **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.



**BUTTON HEAD BOLT**

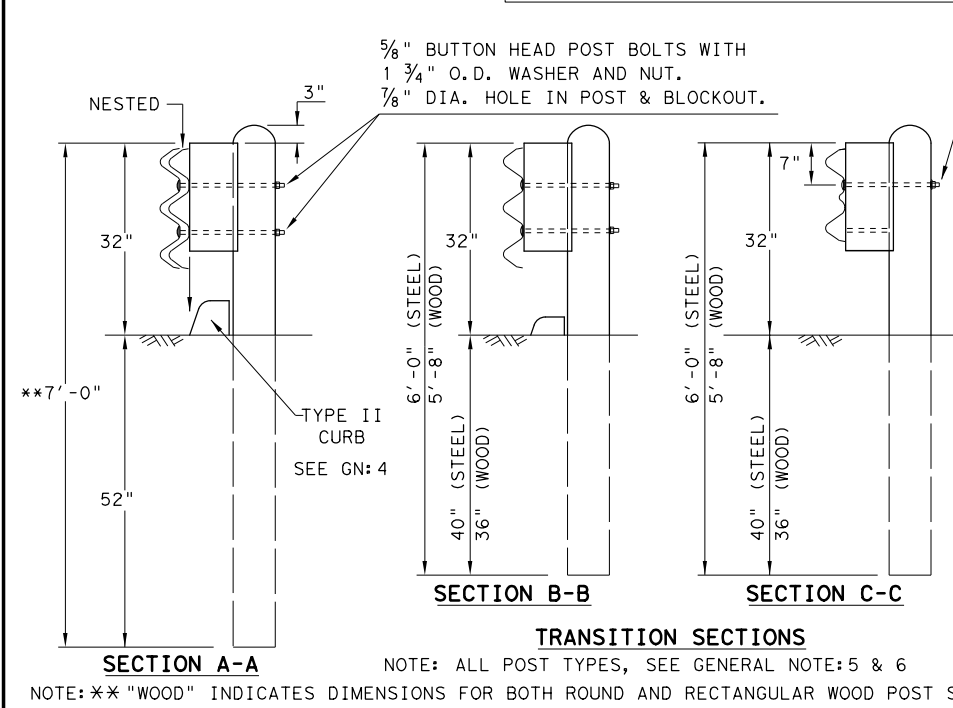
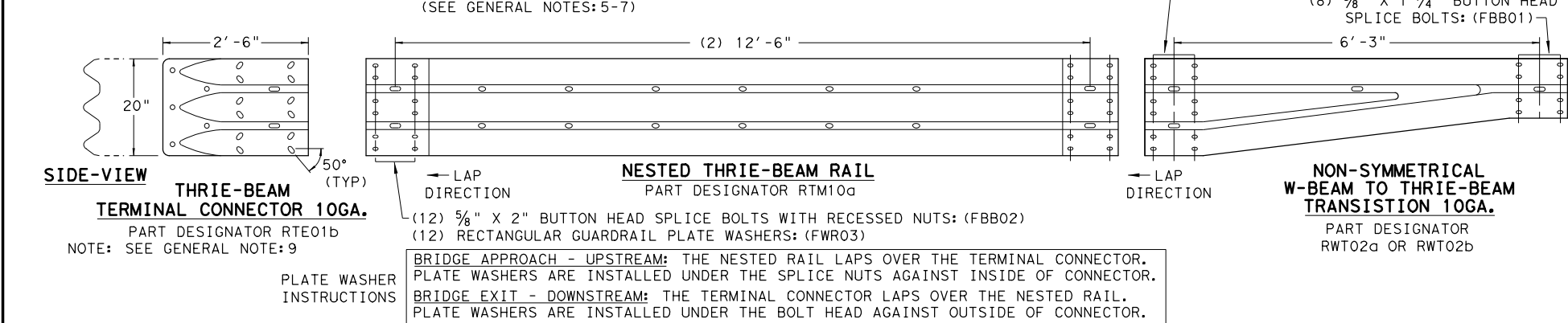
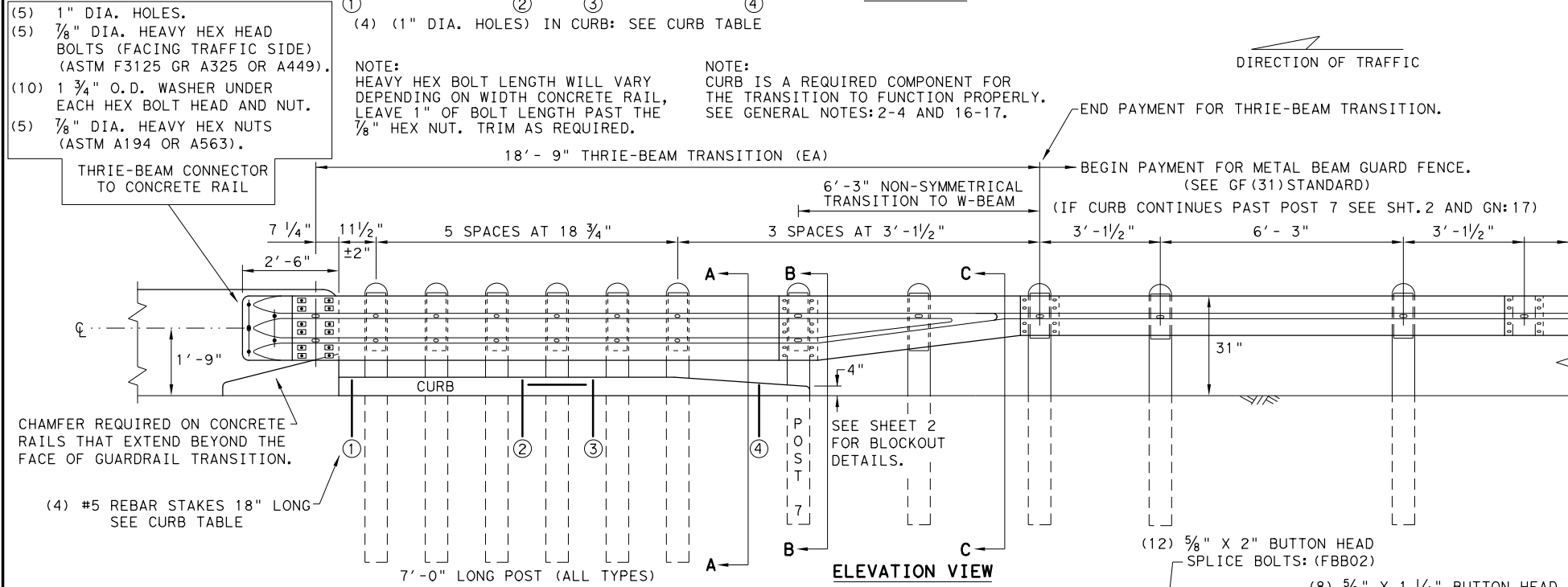
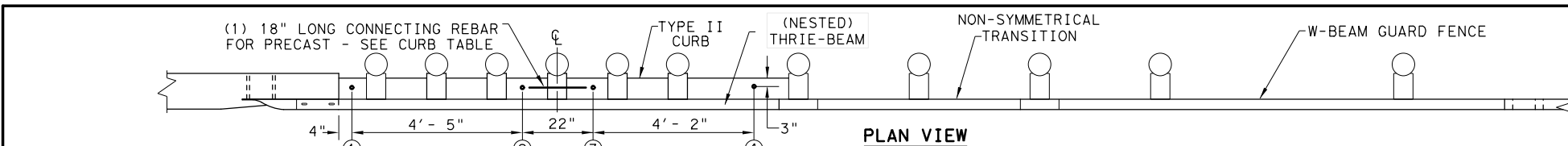


**MID-SPAN RAIL SPLICE DETAIL**

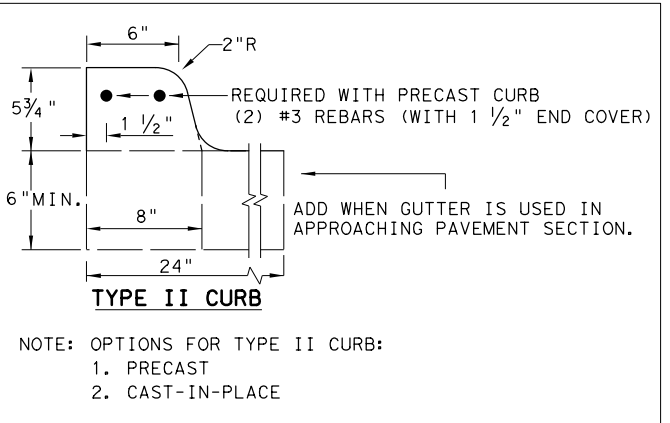
NOTE: SEE GENERAL NOTE 3 FOR SPLICE & POST BOLT DETAILS.

		<b>Design Division Standard</b>		
				<b>METAL BEAM GUARD FENCE</b> <b>TL-3 MASH COMPLIANT</b> <b>GF(31)-19</b>
FILE: gf3119.dgn	DN: TXDOT	CK: KM	DW: VP	CK: CGL/AG
© TXDOT: NOVEMBER 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0913	26	066	CR
	DIST	COUNTY	SHEET NO.	
	YKM	COLORADO	25	

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.



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.

**GENERAL NOTES**

- CONTACT THE DESIGN DIVISION FOR DRAINAGE CUT OUT OPTIONS NEEDED WITHIN THE CURB SECTION OF THE THRIE-BEAM TRANSITION. (512) 416-2678
- 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.
- 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.
- 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.
- FOR ROUND WOOD POST SYSTEMS, ALL ROUND WOOD POSTS SHALL BE 7 1/2" DIA. MINIMUM THROUGHOUT THE THRIE-BEAM TRANSITION.
- 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.
- 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.
- POSTS SHALL NOT BE SET IN CONCRETE, OF ANY DEPTH.
- 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.
- 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.
- 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 TRANSITIONS.
- WHERE SOLID ROCK IS ENCOUNTERED, CONTACT THE DESIGN DIVISION FOR ADDITIONAL GUIDANCE. (512) 416-2678
- 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.
- REFER TO GF(31) STANDARD SHEET & BRIDGE RAILING DETAILS FOR ADDITIONAL DETAILS.
- 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.
- 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**

Design Division Standard

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

### GF(31)TR TL3-20

FILE: gf31tr+1320.dgn	DN: TxDOT	CK: KM	DW: VP	CK: CGL/AG
© TxDOT: NOVEMBER 2020	CONT	SECT	JOB	HIGHWAY
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	DIST	COUNTY	SHEET NO.	
	YKM	COLORADO	26	

DATE: FILE:

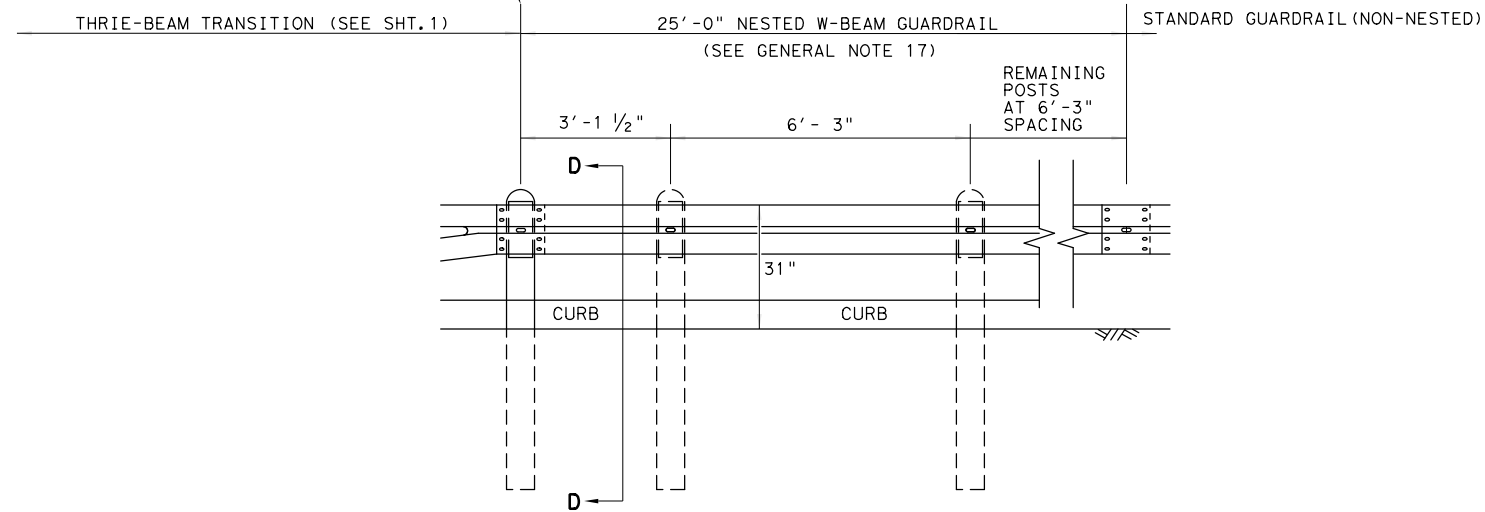
DISCLAIMER: THIS STANDARD IS GOVERNED BY THE "TEXAS ENGINEERING PRACTICE ACT". NO WARRANTY OF ANY KIND IS MADE BY TXDOT FOR ANY PURPOSE WHATSOEVER. THE USE OF THIS STANDARD FOR THE CONVERSION OF THIS STANDARD TO OTHER FORMATS OR FOR INCORRECT RESULTS OR DAMAGES RESULTING FROM ITS USE.

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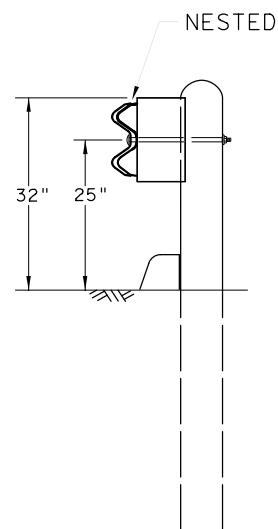
REQUIRED ALTERNATIVE FOR CONTINUOUS CURB EXTENDING PAST POST 7 (SEE SHT. 1 GENERAL NOTE 17)

END PAYMENT FOR METAL BEAM GUARD FENCE TRANSITION.  
 BEGIN PAYMENT FOR METAL BEAM GUARD FENCE.

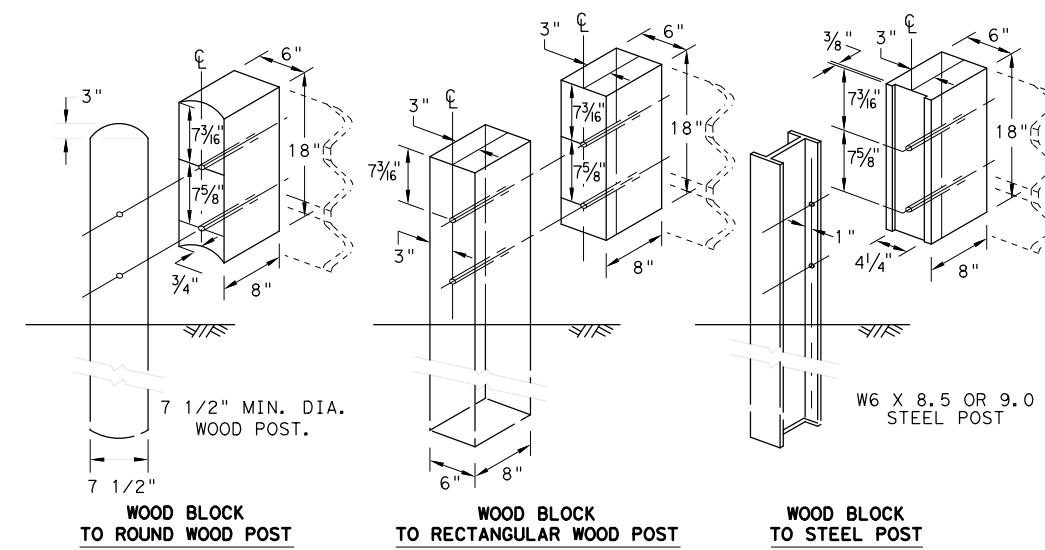
(SEE GF (31) STANDARD SHEET)



**ELEVATION VIEW**



**SECTION D-D**



**THREE BEAM TRANSITION BLOCKOUT DETAILS**

HIGH-SPEED TRANSITION

SHEET 2 OF 2



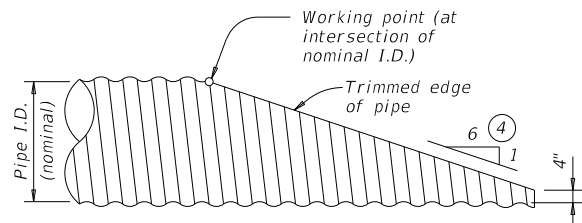
METAL BEAM GUARD FENCE  
 THREE-BEAM TRANSITION  
 TL-3 MASH COMPLIANT

GF (31) TR TL3-20

FILE: gf31+r+1320.dgn	DN: TXDOT	CK: KM	DW: KM	CK: CGL/AG
©TXDOT: NOVEMBER 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0913	26	066	CR
	DIST	COUNTY	SHEET NO.	
	YKM	COLORADO	27	



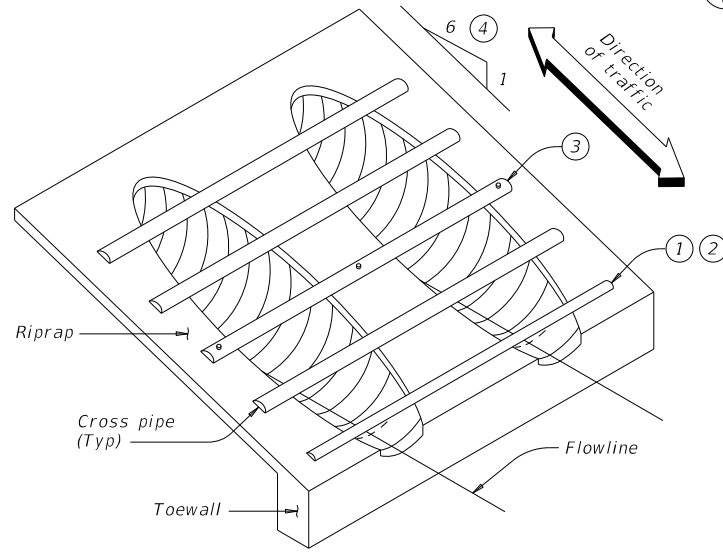
DISCLAIMER: The use of this standard is governed by the "Texas Engineering Practice Act". No warranty of any kind is made by TxDOT for any purpose whatsoever. TxDOT assumes no responsibility for the conversion of this standard to other formats or for incorrect results or damages resulting from its use.



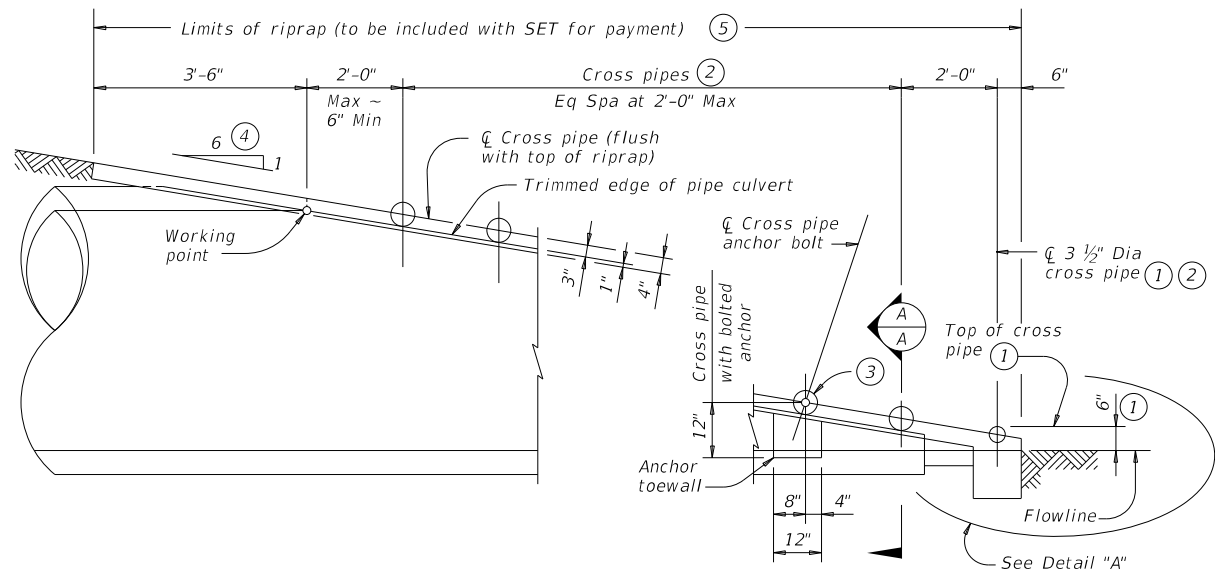
NOTE: All cross pipes, calculations, and dimensions are based on the pipe culverts mitered as shown in this detail. Alternate styles of mitered ends will require that appropriate adjustments be made to the values presented on this standard.

### SIDE ELEVATION OF TYPICAL PIPE CULVERT MITER

(Showing corrugated metal pipe (CMP) culvert. Details at reinforced concrete pipe (RCP) culvert are similar.)

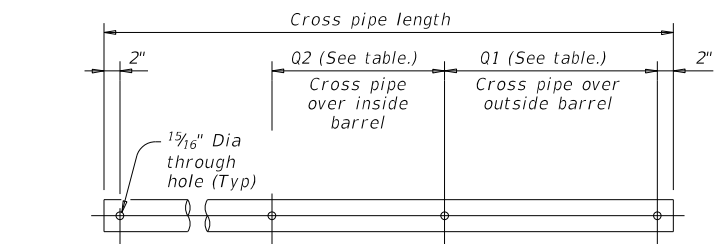


### ISOMETRIC VIEW OF TYPICAL INSTALLATION

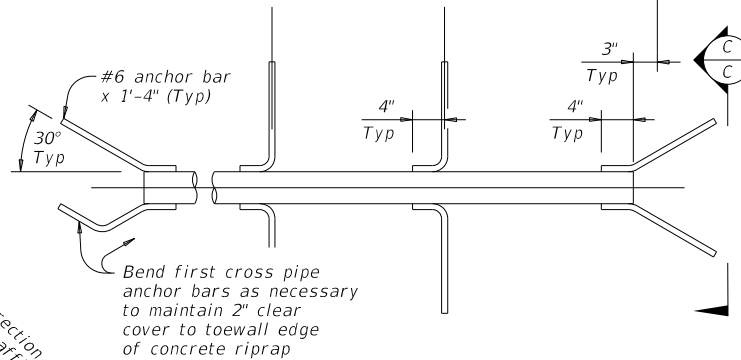


### SIDE ELEVATION OF CAST-IN-PLACE CONCRETE

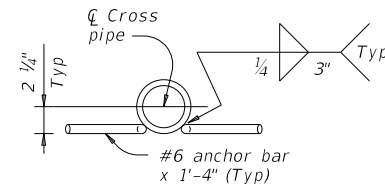
(Showing reinforced concrete pipe (RCP) culvert. Details at corrugated metal pipe (CMP) culvert are similar.)



### PIPE WITH BOLTED ANCHOR

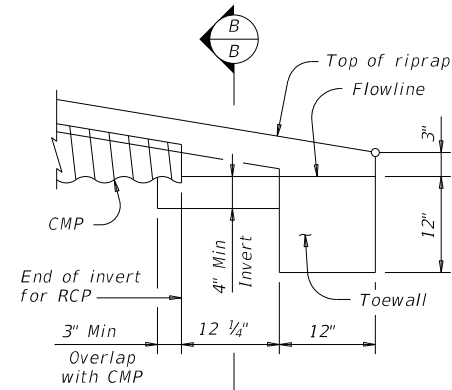


### PIPE WITH ANCHOR BARS



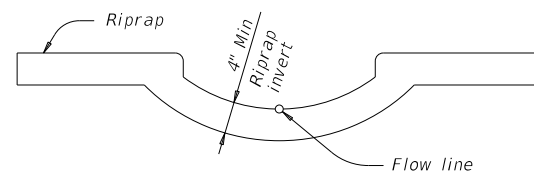
### SECTION C-C

### CROSS PIPE DETAILS



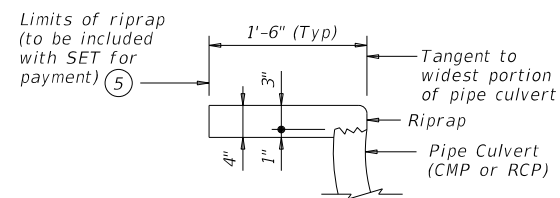
### DETAIL "A"

(Showing invert with corrugated metal pipe (CMP) culvert. Reinforced concrete pipe (RCP) culvert details are similar. Cross pipes not shown for clarity.)

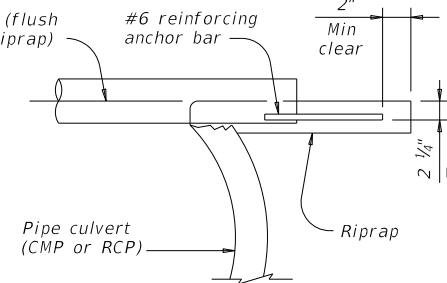


### SECTION B-B

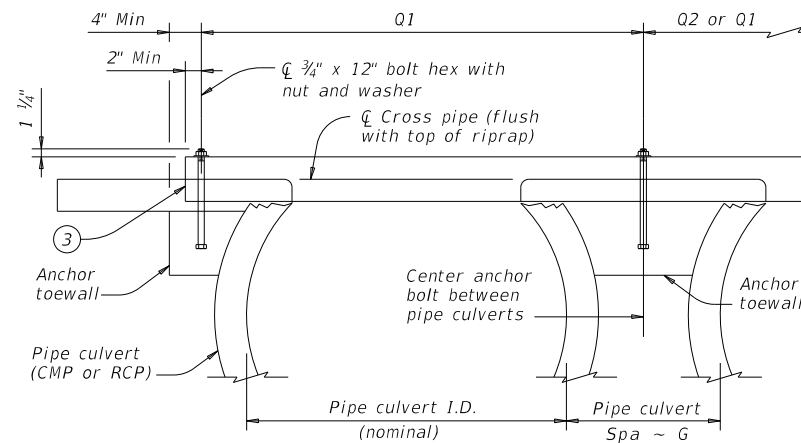
(Cross pipes not shown for clarity.)



### SHOWING TYPICAL PIPE CULVERT AND RIPRAP



### SHOWING CROSS PIPE WITH ANCHOR BAR



### SHOWING CROSS PIPE WITH BOLTED ANCHOR

### SECTION A-A

## CROSS PIPE LENGTHS, REQUIRED PIPE SIZES, AND RIPRAP QUANTITIES

Nominal Culvert I.D.	Conc Riprap (CY) (6)	Pipe Culvert Spa ~ G	Single Barrel ~ Q1	Multi-Barrel ~ Q1	Q2	Conditions for Use of Cross Pipes	Cross Pipe Sizes
12"	0.6	0' - 9"	N/A	2' - 1"	1' - 9"	3 or more pipe culverts	3" Std (3.500" O.D.)
15"	0.7	0' - 11"	N/A	2' - 5"	2' - 2"		
18"	0.8	1' - 2"	N/A	2' - 10"	2' - 8"		
21"	0.9	1' - 4"	N/A	3' - 2"	3' - 1"		
24"	0.9	1' - 7"	N/A	3' - 6"	3' - 7"	3 or more pipe culverts	3 1/2" Std (4.000" O.D.)
27"	1.0	1' - 8"	N/A	3' - 10"	3' - 11"		
30"	1.1	1' - 10"	N/A	4' - 2"	4' - 4"	2 or more pipe culverts	4" Std (4.500" O.D.)
33"	1.2	1' - 11"	4' - 2"	4' - 5"	4' - 8"	All pipe culverts	
36"	1.3	2' - 1"	4' - 5"	4' - 9"	5' - 1"	All pipe culverts	4" Std (4.500" O.D.)
42"	1.5	2' - 4"	4' - 11"	5' - 5"	5' - 10"		
48"	1.7	2' - 7"	5' - 5"	6' - 0"	6' - 7"	All pipe culverts	5" Std (5.563" O.D.)
54"	2.0	3' - 0"	5' - 11"	6' - 9"	7' - 6"		
60"	2.2	3' - 3"	6' - 5"	7' - 4"	8' - 3"		
66"	2.4	3' - 3"	6' - 11"	7' - 10"	8' - 9"		
72"	2.7	3' - 4"	7' - 5"	8' - 5"	9' - 4"		

- The proper installation of the first cross pipe is critical for vehicle safety. Place the top of the first cross pipe no more than 6" above the flow line.
- Provide cross pipes, except the first bottom pipe, of the size shown in the table. Provide a 3 1/2" standard pipe (4" O.D.) for the first bottom pipe.
- Install the third cross pipe from the bottom of the culvert using a bolted connection. Ensure that riprap concrete does not flow into the cross pipe so as to permit disassembly of the bolted connection to allow cleanout access. At the Contractor's option, install all other cross pipes using the bolted connection details.
- Match cross slope as shown elsewhere in the plans. Cross slope of 6:1 or flatter is required for vehicle safety.
- Riprap placed beyond the limits shown will be paid for as concrete riprap in accordance with Item 432, "Riprap".
- Quantities shown are for one end of one reinforced concrete pipe (RCP) culvert. For multiple pipe culverts or for corrugated metal pipe (CMP) culverts, quantities will need to be adjusted. Riprap quantities are for contractor's information only.

#### MATERIAL NOTES:

Synthetic fibers listed on the "Fibers for Concrete" Material Producer List (MPL) may be used in lieu of steel reinforcing in riprap concrete unless noted otherwise. Provide cross pipes that meet the requirements of ASTM A53 (Type E or S, Gr B), ASTM A500 (Gr B), or API 5LX52. Provide ASTM A307 bolts and nuts. Galvanize all steel components, except concrete reinforcing, after fabrication. Repair galvanizing damaged during transport or construction in accordance with the specifications.

#### GENERAL NOTES:

Cross pipes are designed for a traversing load of 10,000 pounds at yield as recommended by Research Report 280-2F, "Safety Treatment of Roadside Parallel-Drainage Structures", Texas Transportation Institute, March 1981. Safety end treatments (SET) shown herein are intended for use in those installations where out of control vehicles are likely to traverse the openings approximately perpendicular to the cross pipes. Construct concrete riprap and all necessary inverts in accordance with the requirements of Item 432, "Riprap". Payment for riprap and toewall is included in the Price Bid for each Safety End Treatment.

Bridge Division Standard

## SAFETY END TREATMENT

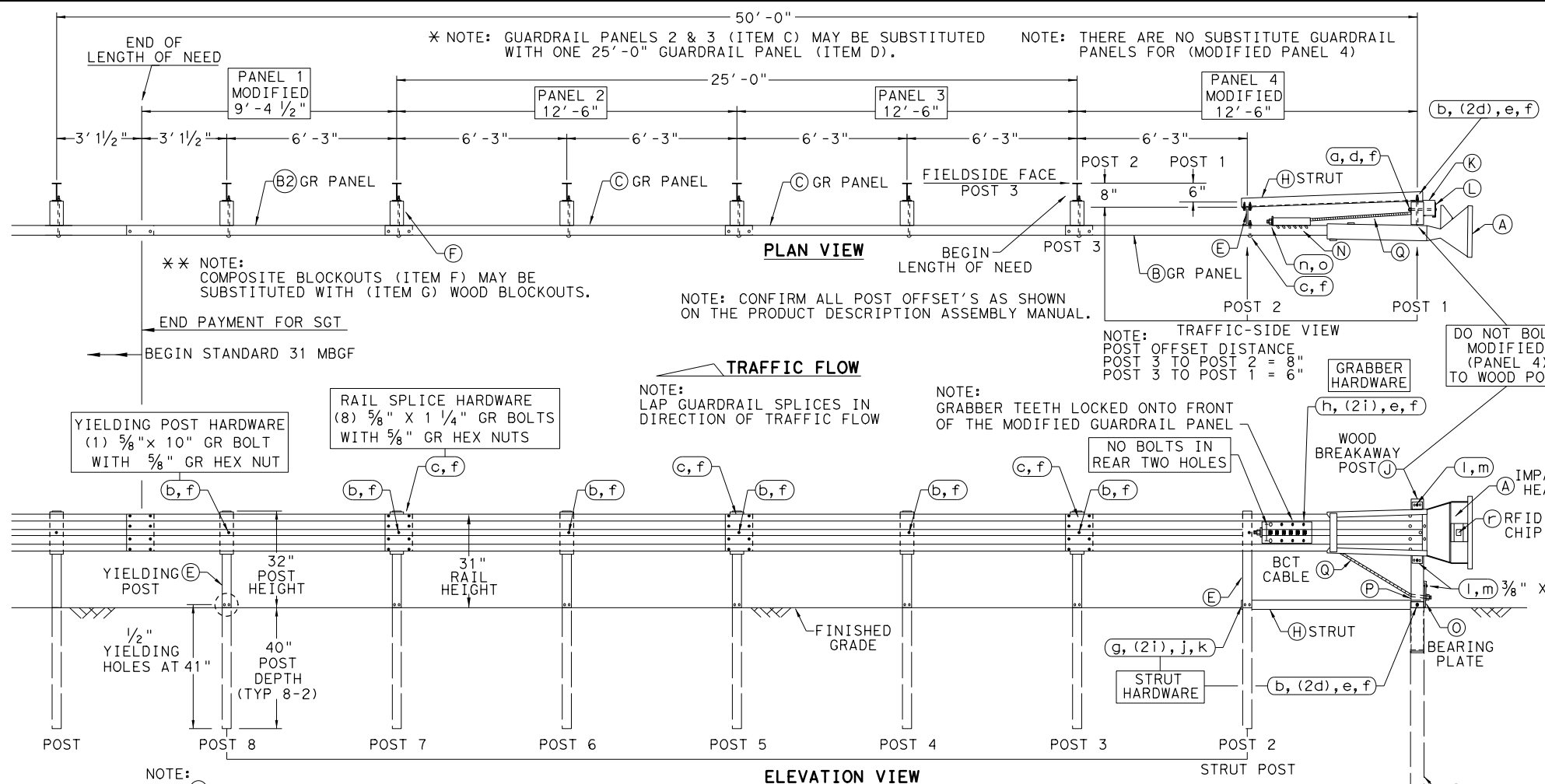
FOR 12" DIA TO 72" DIA  
PIPE CULVERTS  
TYPE II ~ PARALLEL DRAINAGE

### SETP-PD

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©TxDOT February 2020	CONTRACT NO: 0913	SECTION: 26	JOB NO: 066	HIGHWAY: CR
	DIST: YKM	COUNTY: COLORADO	SHEET NO: 28	

DATE: FILE:

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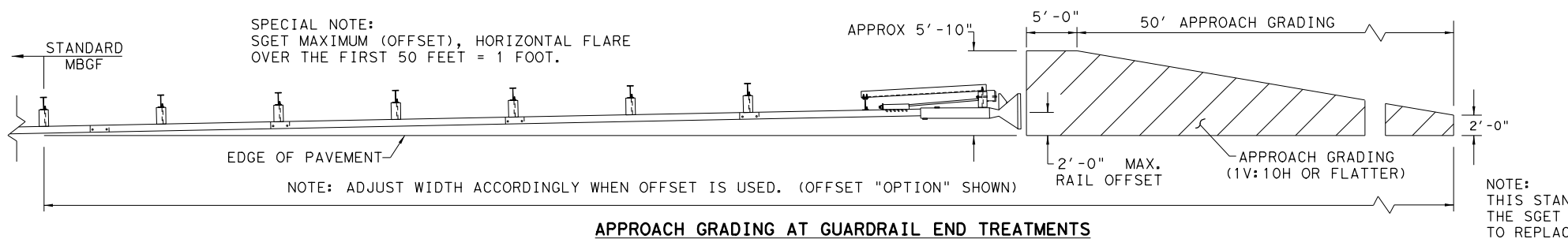
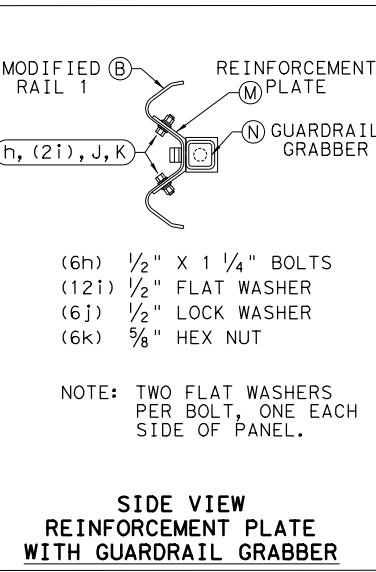
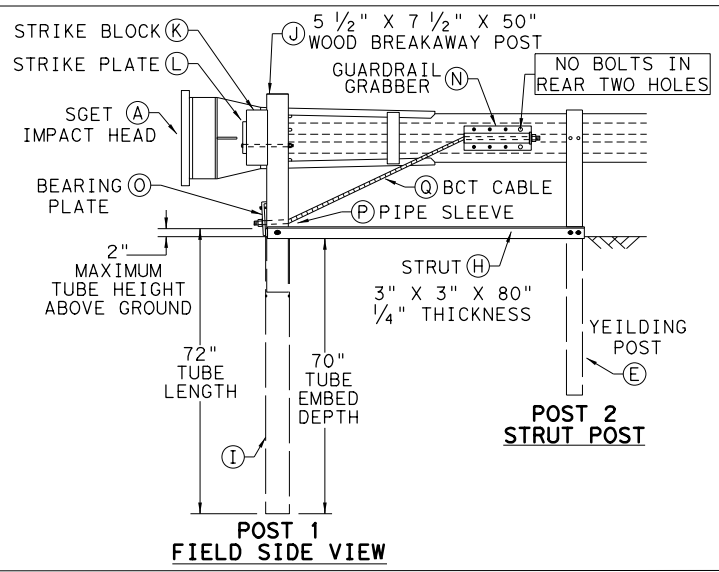
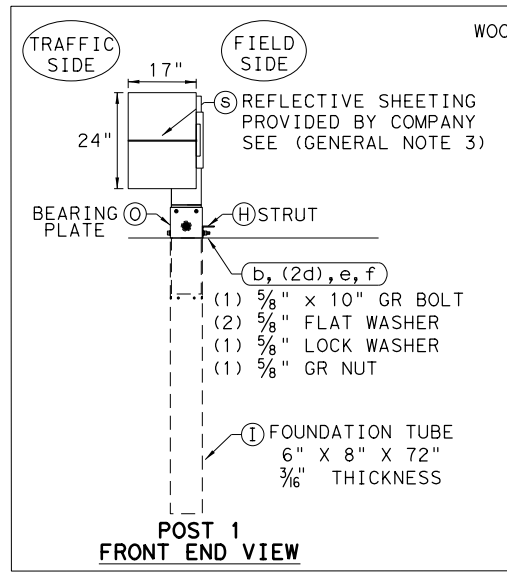
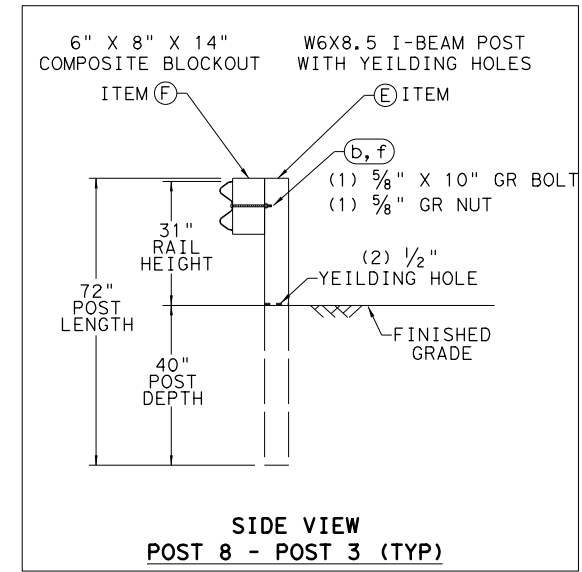
- ### GENERAL NOTES
- FOR SPECIFIC INFORMATION REGARDING INSTALLATION AND TECHNICAL GUIDANCE OF THE SYSTEM, CONTACT: SPIG INDUSTRY, INC. AT 1(267) 644-9510. 14675 INDUSTRIAL PARK RD; BRISTOL, VA 24202
  - FOR INSTALLATION, REPAIR AND MAINTENANCE REFER TO THE MANUFACTURER'S; SGET END TERMINAL, PRODUCT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

ITEM	QTY	MAIN SYSTEM COMPONENTS	ITEM #
A	1	SGET IMPACT HEAD	SIH1A
B	1	MODIFIED GUARDRAIL PANEL 12'-6" 12GA	126SPZGP
B2	1	MODIFIED GUARDRAIL PANEL 9'-4 1/2" 12GA	GP94
C	2	STANDARD GUARDRAIL PANEL 12'-6" 12GA	GP126
D	1	STANDARD GUARDRAIL PANEL 25'-0" 12GA	GP25
E	7	MODIFIED YIELDING I-BEAM POST W6x8.5	YP6MOD
F	6	COMPOSITE BLOCKOUT 6" X 8" X 14"	CBO8
G	6	WOOD BLOCKOUT 6" X 8" X 14"	WB08
H	1	STRUT 3" X 3" X 80" X 1/4" A36 ANGLE	STR80
I	1	FOUNDATION TUBE 6" X 8" X 72" X 3/16"	FNDT6
J	1	WOOD BREAKAWAY POST 5 1/2" X 7 1/2" X 50"	WBRK50
K	1	WOOD STRIKE BLOCK	WSBLK14
L	1	STRIKE PLATE 1/4" A36 BENT PLATE	SPLT8
M	1	REINFORCEMENT PLATE 12 GA. GR55	REPLT17
N	1	GUARDRAIL GRABBER 2 1/2" X 2 1/2" X 16 1/2"	GR17
O	1	BEARING PLATE 8" X 8 5/8" X 5/8" A36	BPLT8
P	1	PIPE SLEEVE 4 1/4" X 2 3/8" O.D. (2 1/8" I.D.)	PSLV4
Q	1	BCT CABLE 3/4" X 81" LENGTH	CBL81

ITEM	QTY	SMALL HARDWARE	ITEM #
a	1	5/8" X 12" GUARDRAIL BOLT 307A HDG	12GRBLT
b	7	5/8" X 10" GUARDRAIL BOLT 307A HDG	10GRBLT
c	33	5/8" X 1 1/4" GR SPLICE BOLTS 307A HDG	1GRBLT
d	3	5/8" FLAT WASHER F436 A325 HDG	58FW436
e	1	5/8" LOCK WASHER HDG	58LW
f	39	5/8" GUARDRAIL HEX NUT HDG	58HN563
g	2	1/2" X 2" STRUT BOLT A325 HDG	2BLT
h	6	1/2" X 1 1/4" PLATE BOLT A325 HDG	125BLT
i	16	1/2" FLAT WASHER F436 A325 HDG	12FWF436
j	8	1/2" LOCK WASHER HDG	12LW
k	8	1/2" HEX NUT A563 HDG	12HN563
l	4	3/8" X 3" HEX LAG SCREW GR5 HDG	38LS
m	4	3/8" FLAT WASHER F436 A325 HDG	38FW844
n	2	1" FLAT WASHER F436 A325 HDG	1FWF436
o	2	1" HEX NUT A563HD HDG	1HN563
p	1	18" TO 24" LONG ZIP TIE RATED 175-200LB	ZPT18
q	1	1 1/2" X 4" SCH-40 PVC PIPE	PSPCR4
r	1	RFID CHIP RATED MIL-STD-810F	RFID810F
s	1	IMPACT HEAD REFLECTIVE SHEETING	RS30M

ALTERNATIVE ITEMS  
 NOTE: SEE PLAN VIEW



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

**Texas Department of Transportation**

**Design Division Standard**

## SPIG INDUSTRY, LLC

### SINGLE GUARDRAIL TERMINAL

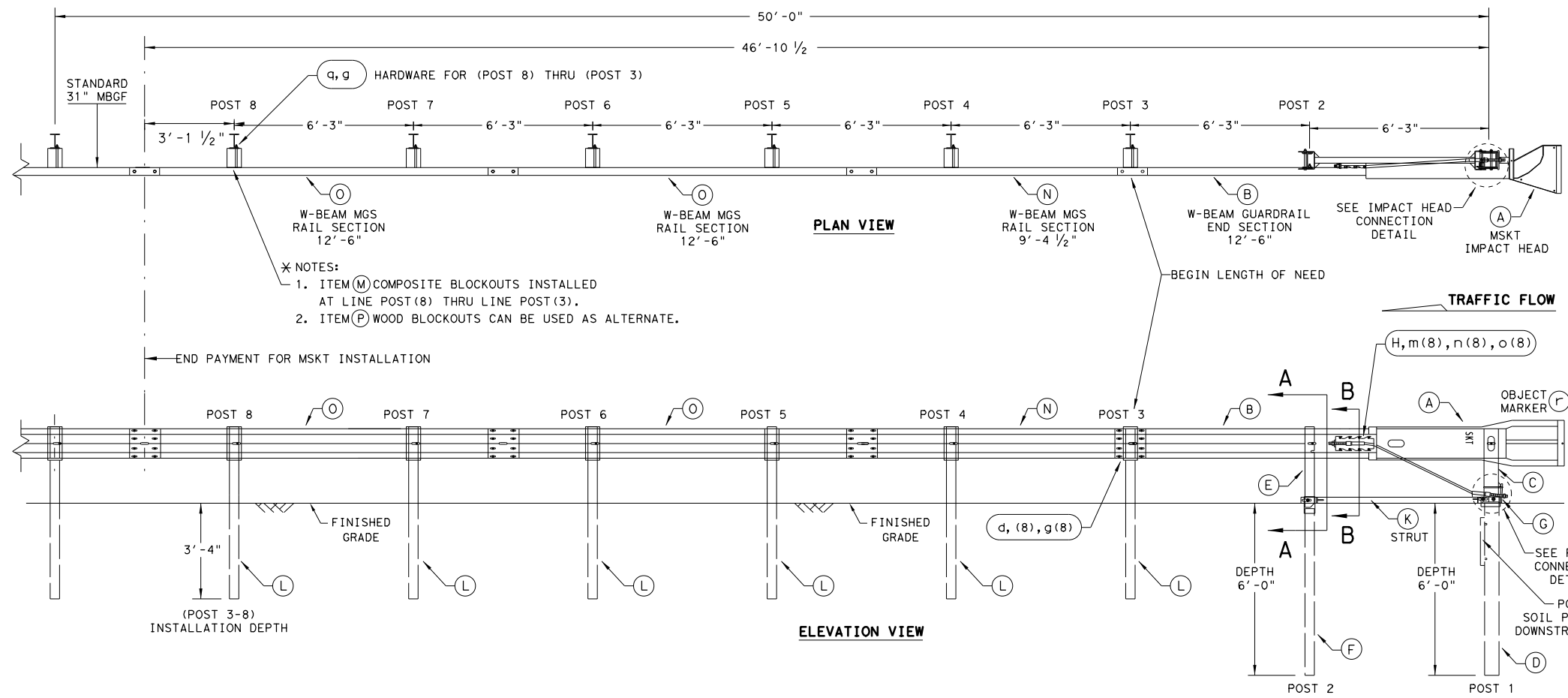
### SGET - TL-3 - MASH

### SGT (15) 31-20

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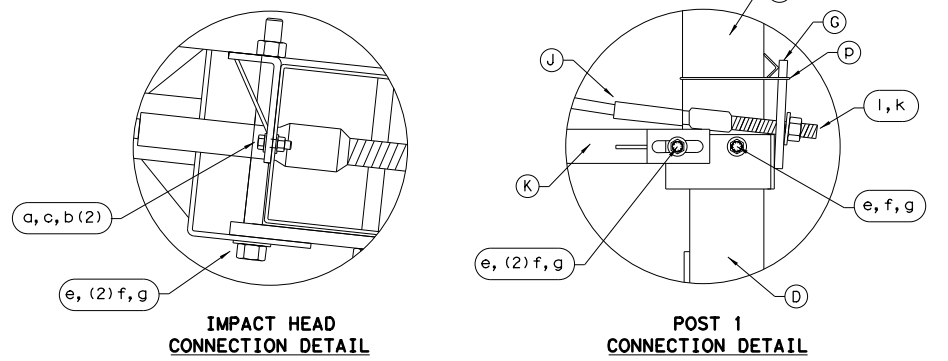
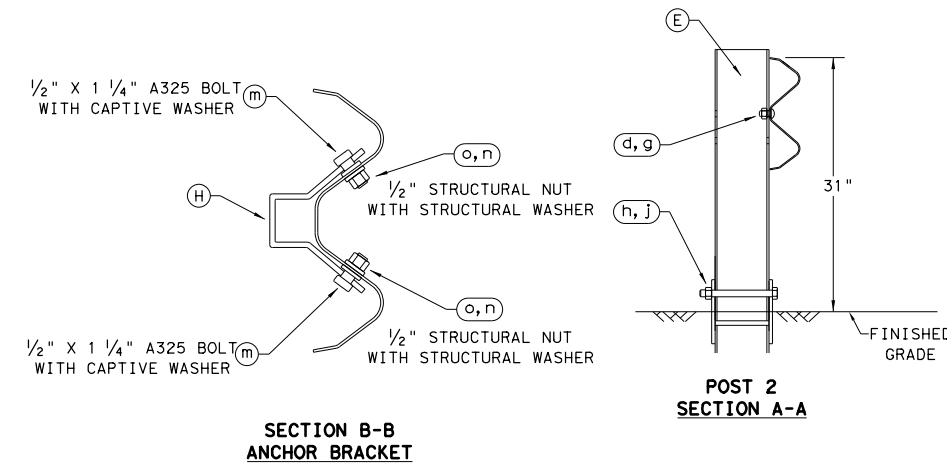
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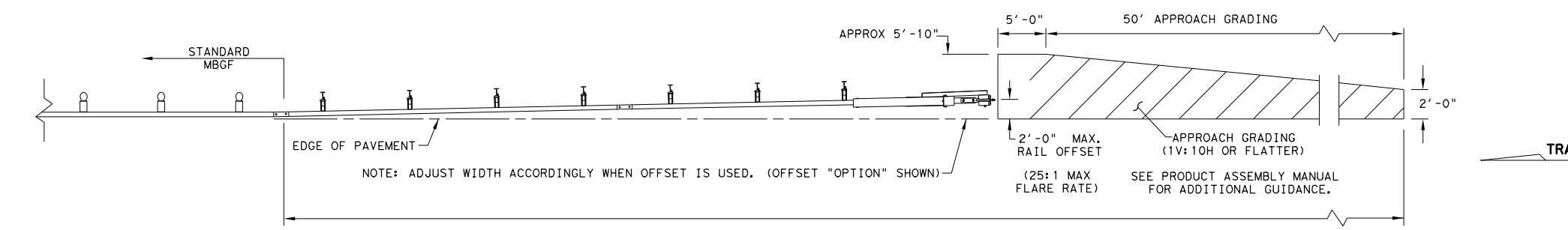
- NOTES:
- ITEM (M) COMPOSITE BLOCKOUTS INSTALLED AT LINE POST (8) THRU LINE POST (3).
  - ITEM (P) WOOD BLOCKOUTS CAN BE USED AS ALTERNATE.

- 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 MBSGF STANDARD FOR INSTALLATION GUIDANCE.
  - POSTS SHALL NOT BE SET IN CONCRETE.
  - SYSTEM MUST BE ATTACHED TO STANDARD 31" MBSGF.
  - 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 ENCROACHING 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" MBSGF PANELS, ONE 25'-0" MBSGF 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

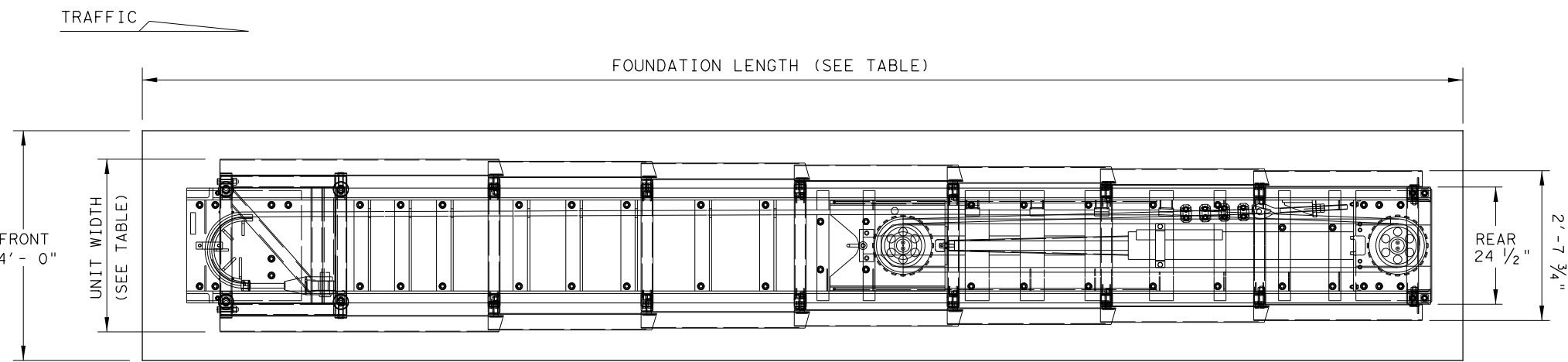
### SGT (12S) 31-18

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© TxDOT: APRIL 2018	CONT: SECT	JOB: HIGHWAY		
REVISIONS		0913	26	066
DIST: YKM	COUNTY: COLORADO	SHEET NO.: 30		

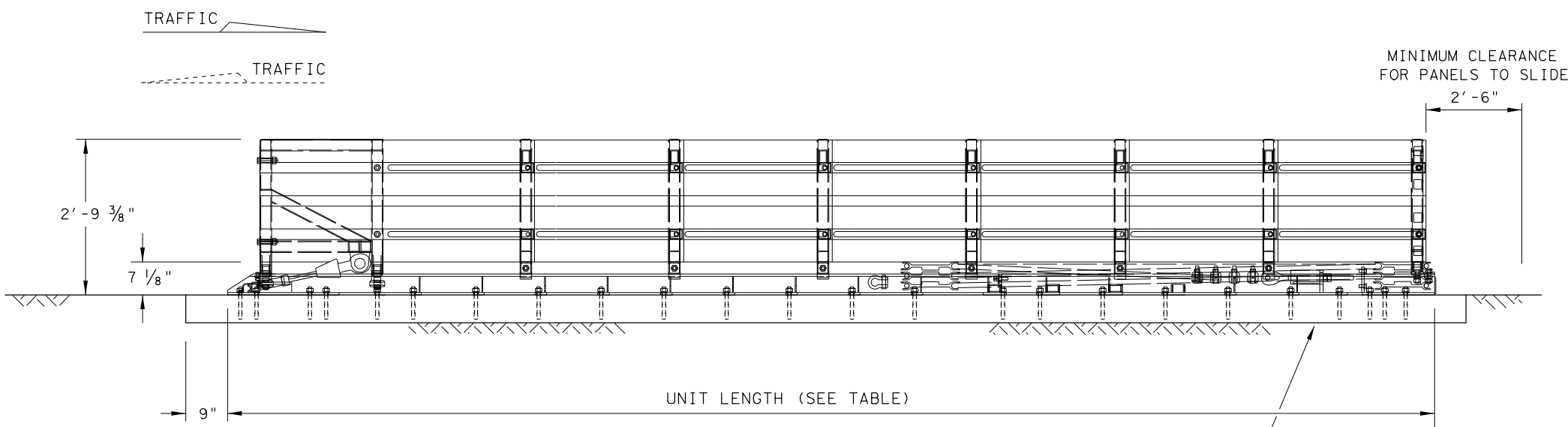
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DATE: FILE:



**PLAN VIEW**



**ELEVATION VIEW**

6" REINFORCED PAD SHOWN  
(SEE FOUNDATION OPTIONS)

MODEL	TEST LEVEL	UNIT LENGTH (approx.)	UNIT WIDTH	FOUNDATION LENGTH	OBSTACLE WIDTH
SCI70GM	TL-2	13'-6"	2'-10 5/8"	15'- 6 1/4"	24" to 36"
SCI100GM	TL-3	21'-6"	3'-1 1/2"	23'- 0"	24" to 36"

SYSTEM AND PAD LENGTHS VARY DEPENDING ON BACKUP TYPE.

**FOUNDATION OPTIONS**

6" REINFORCED CONCRETE (5 1/2" ANCHOR EMBEDMENT)
8" UNREINFORCED CONCRETE (5 1/2" ANCHOR EMBEDMENT)
3" MIN. ASPHALT OVER 3" MIN. CONCRETE (16 1/2" ANCHOR EMBED.)
6" ASPHALT OVER 6" COMPACT SUBBASE (16 1/2" ANCHOR EMBED.)
8" MINIMUM ASPHALT (16 1/2" ANCHOR EMBEDMENT)

FOR STEEL PLACEMENT IN CONCRETE FOUNDATIONS, SEE MANUFACTURER'S PRODUCT MANUAL.

**TRANSITION OPTIONS**

CONCRETE VERTICAL WALL
CONCRETE TRAFFIC BARRIERS
GUARDRAIL (W-BEAM)
GUARDRAIL (THRIE-BEAM)

TRANSITION TYPES ARE SHOWN ELSEWHERE ON THE PLANS (I.E. ATTENUATOR LOCATION DETAILS OR IN THE GENERAL NOTES).

FOR BI-DIRECTIONAL TRANSITION PANEL AND END SHOE DETAILS, SEE MANUFACTURER'S PRODUCT MANUAL.

**GENERAL NOTES**

- FOR SPECIFIC INFORMATION REGARDING INSTALLATION AND TECHNICAL GUIDANCE OF THE SYSTEM, CONTACT: WORK AREA PROTECTION, CORP. AT (800) 327-4417, OR (630) 377-9100.
- FOR BI-DIRECTIONAL TRAFFIC, APPROPRIATE TRANSITION PANELS WILL BE REQUIRED.
- ADDITIONAL DETAILS FOR THE TRANSITION OPTION AND FOUNDATION OPTION WILL BE SHOWN ON THE MANUFACTURER'S SHOP DRAWINGS FURNISHED TO THE ENGINEER.
- CONCRETE SHALL BE CLASS "S" WITH A MINIMUM COMPRESSIVE STRENGTH OF 4,000 PSI.
- MAXIMUM PERMISSIBLE CROSS-SLOPE IS 8%.
- THE INSTALLATION AREA SHOULD BE FREE FROM CURBS, ELEVATED OBJECTS, OR DEPRESSIONS.
- THE SCI100GM & SCI70GM SYSTEMS SHOULD BE APPROXIMATELY PARALLEL WITH THE BARRIER OR CENTERLINE OF MERGING BARRIERS.

NOTE:  
FOR ATTACHMENT AND TRANSITIONS TO OTHER SHAPES, BARRIERS, RAILINGS AND BI-DIRECTIONAL TRAFFIC FLOWS ARE AVAILABLE. (SEE MANUFACTURER'S PRODUCT MANUAL)

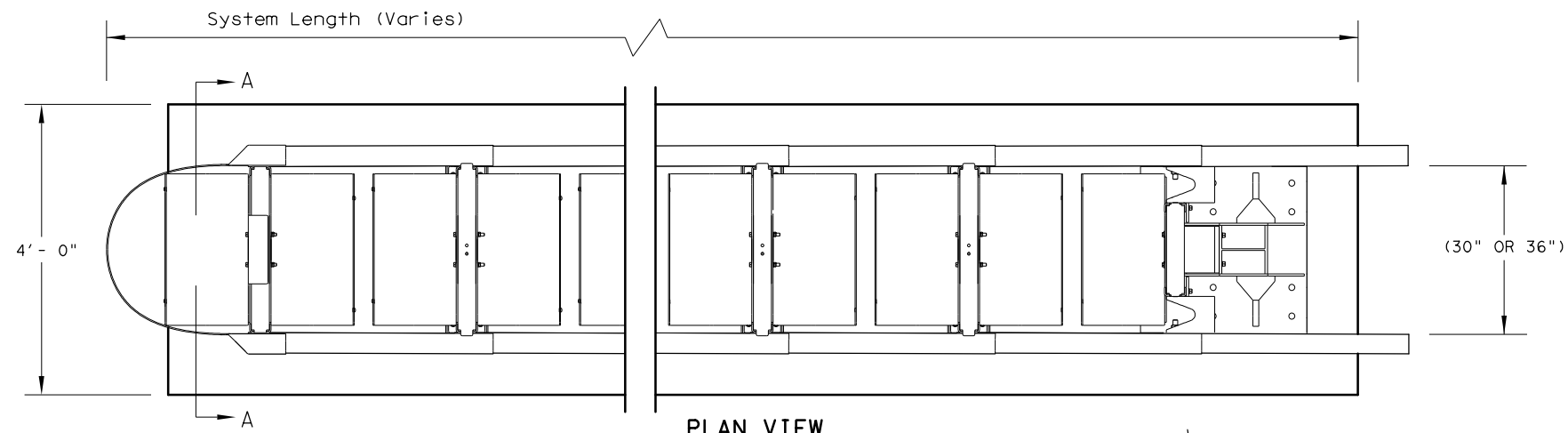
NOTE:  
SIDE PANELS CAN TRAVEL 30" BEYOND THE LAST TERMINAL BRACE AT THE REAR OF THE CUSHION. ALL OBJECTS THAT MAY INTERFERE WITH THIS MOTION CAN AFFECT PERFORMANCE OF AND MAY CAUSE UNDUE DAMAGE TO THE CRASH CUSHION.

**LOW MAINTENANCE**

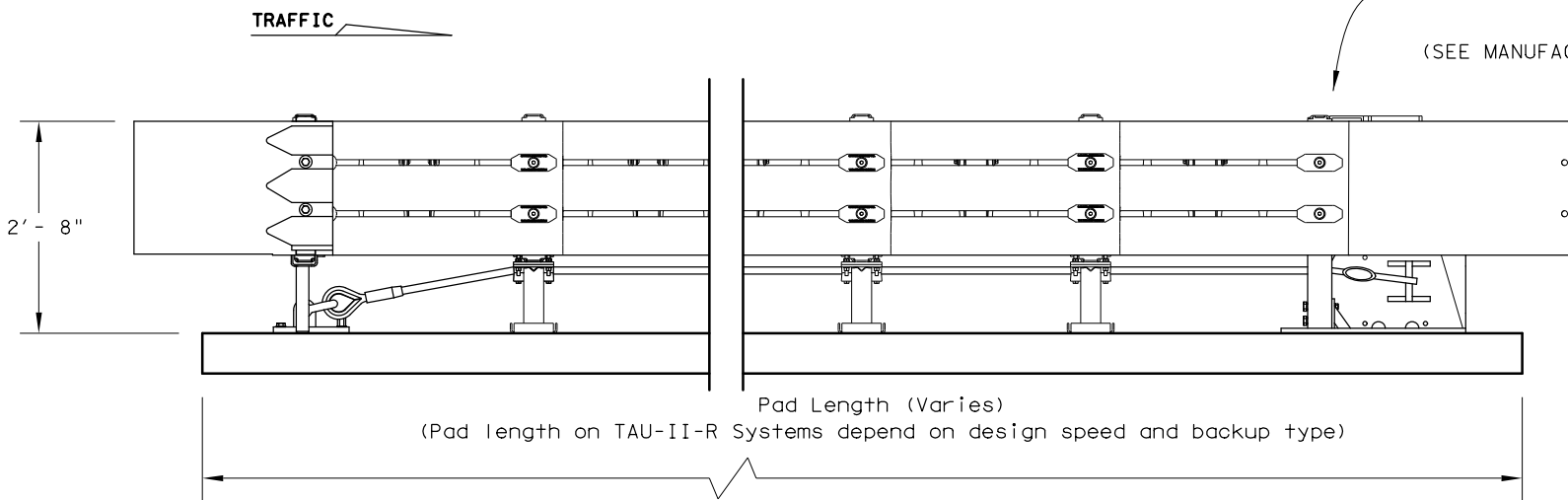
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<b>SMTC (N) - 16</b>					
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REVISED 06, 2013 (VP)	DIST	COUNTY	SHEET NO.		
REVISED 03, 2016 (VP)	YKM	COLORADO	31		

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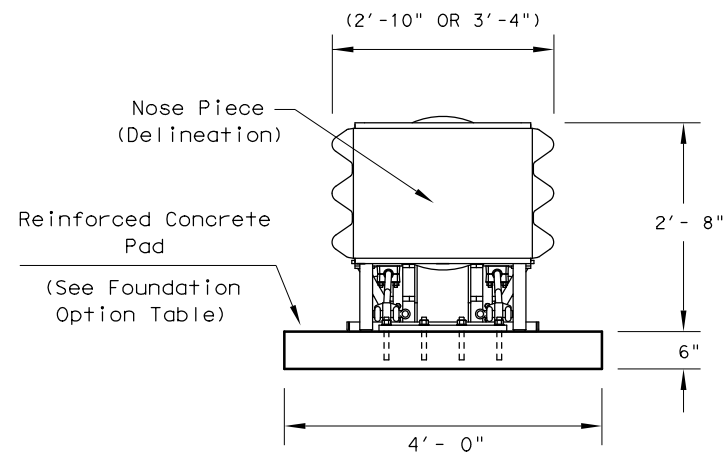
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PLAN VIEW



ELEVATION VIEW



SECTION A-A

Nose Piece delineation orientation, is shown elsewhere on the plans.

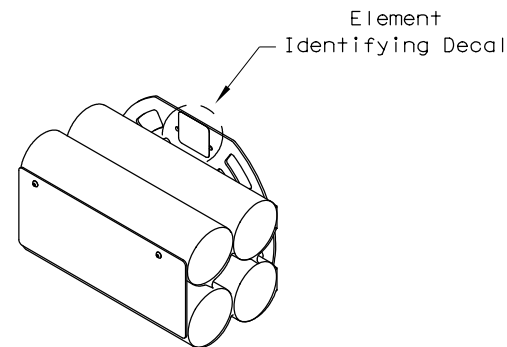
TRANSITION OPTIONS
Vertical Wall
Concrete Traffic Barriers
W-Beam Guardrail
Thrie Beam Guardrail

For bi-directional transition panel and end shoe details. (See manufacturer's product manual.)

FOUNDATION OPTIONS
6" Reinforced Concrete
8" Unreinforced Concrete
Asphalt over Concrete with Minimum 6" Embedment in Concrete
6" Asphalt over 6" Compact Subbase
8" Minimum Asphalt

For steel placement in concrete foundations. (See manufacturer's product manual)

Attachments and transitions to various barrier shapes, barrier railings and bi-directional traffic flows are available. (SEE MANUFACTURER'S PRODUCT MANUAL)



ENERGY ABSORBING ELEMENTS (EAE)

BACKUP SUPPORT OPTIONS
Compact (Stand Alone)
Flush Mount
PCB (Concrete Barrier)

TAU-II-R (NARROW) SYSTEM LENGTHS			
BACKSTOP	TL-2	TL-3	70 mph
PCB	13'-7"	27'-10"	30'-7"
Flush Mount	14'-0"	28'-3"	31'-0"
Compact	15'-3"	29'-6"	32'-3"

Backup and Transition types are shown elsewhere on the plans, (i.e. Attenuator location details or in the general notes).

Note: System lengths are ± 2"

**GENERAL NOTES**

- For specific information regarding installation and technical guidance of the system, contact: Lindsay Transportation Solutions - Barrier Systems, Inc. at (707) 374-6800. 180 River Road, Rio Vista, CA 94571
- For bi-directional traffic, appropriate transition panels will be required.
- Additional details for the backup support option, transition options and foundation option will be shown on the manufacturer's shop drawings furnished to the Engineer.
- Concrete shall be class "S" with a minimum compressive strength of 4,000 psi.
- Maximum permissible cross-slope is 8%.
- The installation area should be free from curbs, elevated objects, or depressions.
- The TAU-II-R system should be approximately parallel with the barrier or center of merging barriers.
- Refer to Universal TAU-II-R configuration chart for specific systems configuration number and location of each type of energy absorbing element.
- 30-inch (30") model shown, also available in 36-inch (36") configuration.

**BILL OF MATERIAL**

PRODUCT CODE	QTY	DESCRIPTION
B030704	1	Front Support
B030703	TBD	Mid Support
TBD	1	Backstop Assembly (See Table)
TBD	1	Front Cable Anchor
TBD	1	Nose Assembly
B010202	TBD	Sliding Panel
B010659	2	End Panel
K001003	1	Slider Assembly Kit
BSI-1202006-KT	TBD	TAU-II-R Slider Kit
BSI-1107131-KT	TBD	TAU-II-R EAE Mounting Hw Kit
BSI-1012069-00	TBD	Energy Absorbing Element, Type 1
BSI-1012070-00	TBD	Energy Absorbing Element, Type 2
BSI-1012071-00	TBD	Energy Absorbing Element, Type 3
BSI-1110009-00	TBD	Energy Absorbing Element, Type 3N
TBD	TBD	Cable Assembly
K001004	TBD	Cable Guide Kit
K001005	2	Front Support Leg Kit
B010651	4	Pipe Panel Mount
TBD	1	Anchoring Package

(TBD) = To Be Determined, depending on Backup Type and System Length.

(See manufacturer's product manual for details)



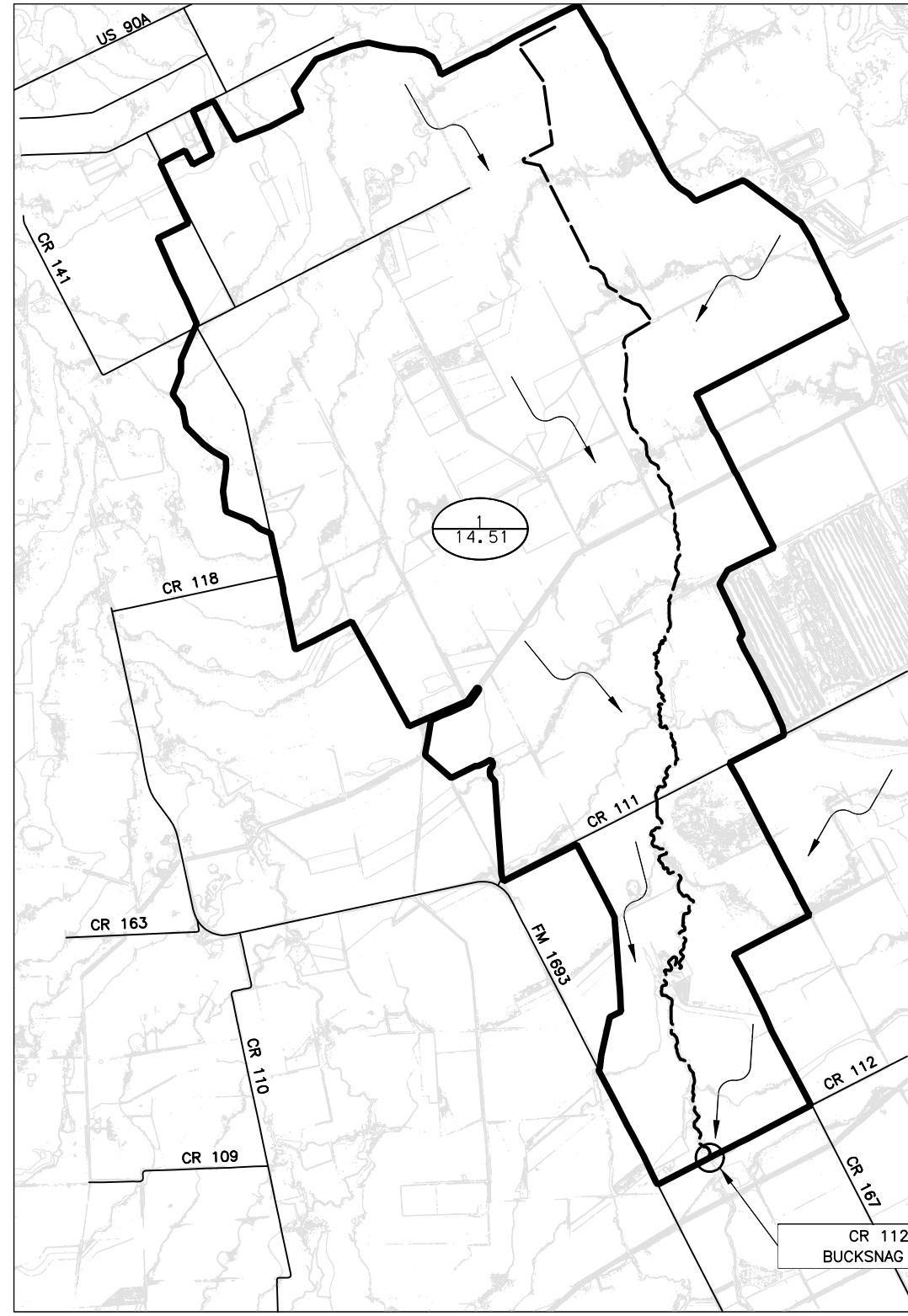
**LTS-BARRIER SYSTEMS  
CRASH CUSHION  
(R-NARROW)**

**TAU-II-R(N)-16**

**LOW MAINTENANCE**

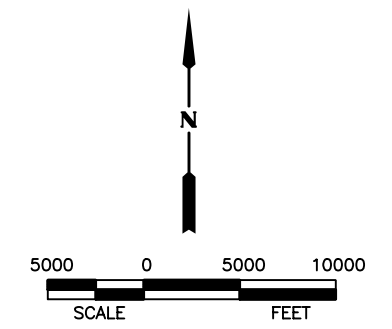
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REVISED 03, 2016 (VP)	YKM	COLORADO	32	

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CR 112 AT  
BUCKSNAG CREEK

Basin Name	Parameters		Q(cfs)   50%	Q(cfs)   20%	Q(cfs)   10%	Q(cfs)   4%	Q(cfs)   2%	Q(cfs)   1%
	A (mi <sup>2</sup> )	Tc (hr)						
CR112 at Bucksrag Creek	A (mi <sup>2</sup> )	14.51	1457	2357	3275	4727	6026	7490
	C	82						
	Tc (hr)	12.77						



**LEGEND**

- DRAINAGE AREA BOUNDARY
- TIME OF CONCENTRATION
- FLOW DIRECTION
- AREA I. D.
- AREA IN SQ. MI

- NOTES:
- THE DRAINAGE AREA WAS DELINEATED USING LIDAR ELEVATION DATA (2018) SOURCED FROM TEXAS NATURAL RESOURCES INFORMATION SYSTEM (TNRIS). CONTOUR INTERVAL = 5-FT
  - PEAK FLOWS WERE CALCULATED IN HEC-HMS V.4.9 USING THE NRCS CURVE NUMBER METHOD PER TXDOT'S HYDRAULIC DESIGN MANUAL (SEPTEMBER 2019).
  - REGRESSION FLOWS WERE CALCULATED AND CHECKED WITH THE FLOWS CALCULATED BY HEC-HMS. HEC-HMS FLOWS WERE CHOSEN AND USED FOR THE PROPOSED BRIDGE DESIGN.
  - RAINFALL DATA WAS SOURCED FROM NOAA ATLAS 14 FOR GARWOOD, TX.



*Kristi Guerrero* 08/29/2023

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CR 112 AT BUCKSNAG CREEK

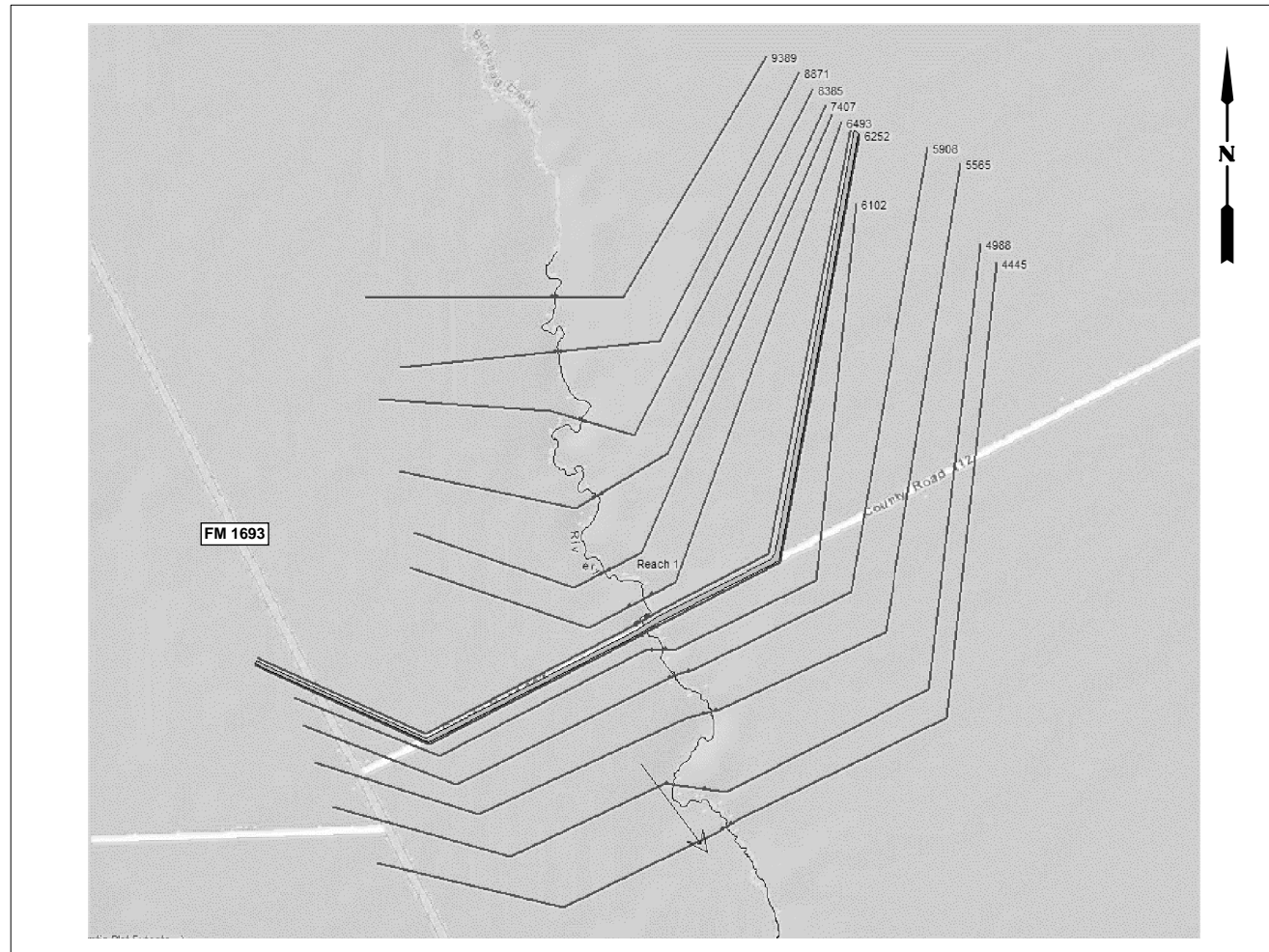
**DRAINAGE AREA MAP**

CSJ 0913-26-066

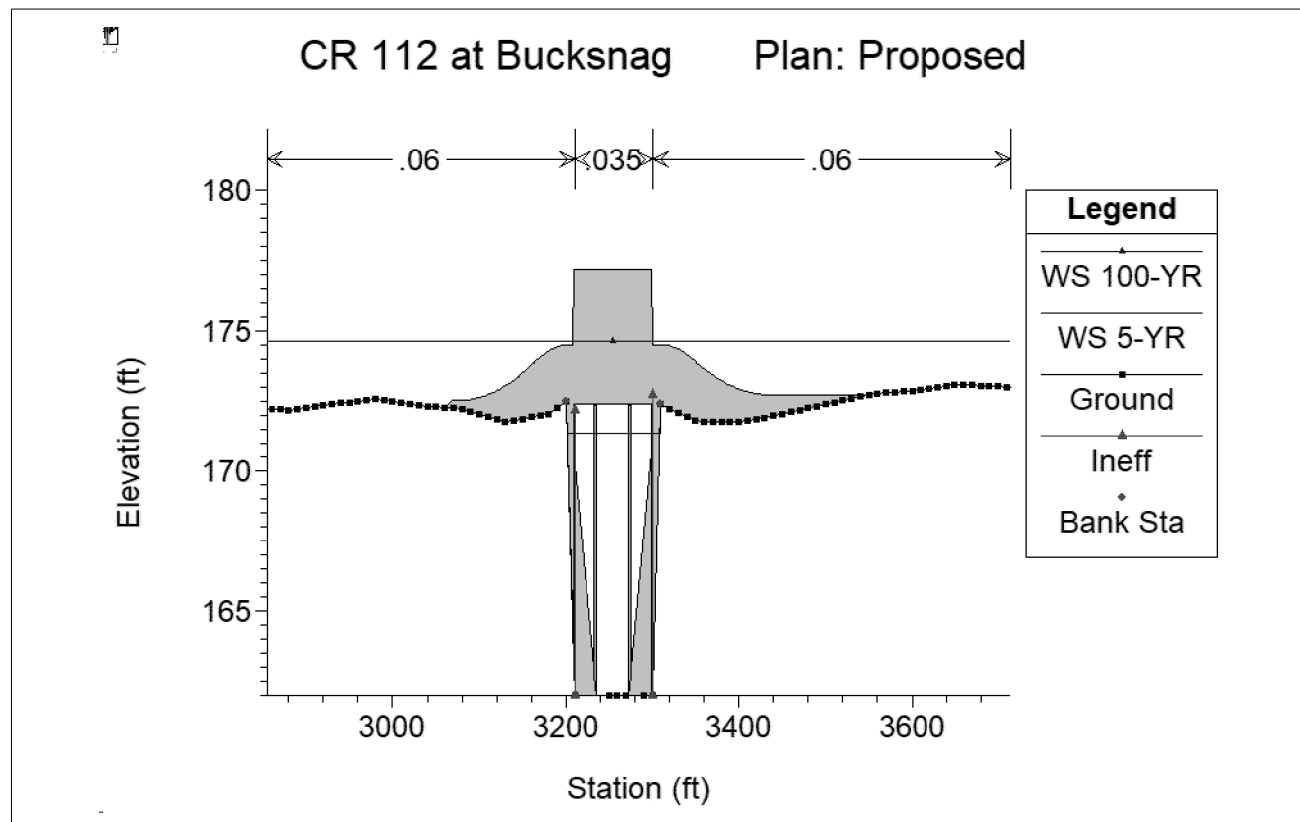
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CROSS SECTION LOCATION MAP



STREAM CROSS SECTION AT ROAD PROFILE



20% AEP HYDRAULIC DATA

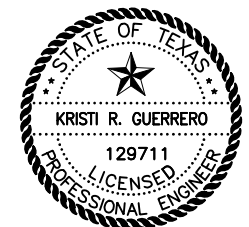
RIVER STATION	EXISTING			PROPOSED			PR-EX WSEL (ft)
	Q (cfs)	WSEL (ft)	VEL (fps)	Q (cfs)	WSEL (ft)	VEL (fps)	
9389	2357.00	175.32	2.73	2357.00	175.32	2.74	0.00
8871	2357.00	174.80	4.77	2357.00	174.79	4.80	-0.01
8385	2357.00	174.44	2.78	2357.00	174.43	2.81	-0.01
7407	2357.00	173.58	3.75	2357.00	173.43	4.17	-0.15
6838	2357.00	172.66	4.95	2357.00	171.46	7.74	-1.20
6493	2357.00	172.72	1.82	2357.00	171.75	2.10	-0.97
6324	2357.00	172.66	2.84	2357.00	171.31	4.83	-1.35
6266	EXISTING BRIDGE			PROPOSED BRIDGE			
6252	2357.00	171.05	7.00	2357.00	171.26	4.18	0.21
6102	2357.00	171.15	4.23	2357.00	171.15	4.23	0.00
5908	2357.00	171.12	3.12	2357.00	171.12	3.12	0.00
5565	2357.00	170.81	4.17	2357.00	170.81	4.17	0.00
4988	2357.00	170.56	2.38	2357.00	170.56	2.38	0.00
4445	2357.00	170.16	3.88	2357.00	170.16	3.88	0.00

1% AEP HYDRAULIC DATA

RIVER STATION	EXISTING			PROPOSED			PR-EX WSEL (ft)
	Q (cfs)	WSEL (ft)	VEL (fps)	Q (cfs)	WSEL (ft)	VEL (fps)	
9389	7490.00	176.98	3.72	7490.00	176.98	3.72	0.00
8871	7490.00	176.53	4.73	7490.00	176.53	4.74	0.00
8385	7490.00	176.15	3.62	7490.00	176.14	3.62	-0.01
7407	7490.00	175.29	4.17	7490.00	175.29	4.18	0.00
6838	7490.00	174.80	4.21	7490.00	174.78	4.25	-0.02
6493	7490.00	174.67	3.12	7490.00	174.65	3.13	-0.02
6324	7490.00	174.63	4.36	7490.00	174.61	4.40	-0.02
6266	EXISTING BRIDGE			PROPOSED BRIDGE			
6252	7490.00	173.26	9.89	7490.00	173.26	9.90	0.00
6102	7490.00	173.05	8.82	7490.00	173.07	8.75	0.02
5908	7490.00	173.14	5.81	7490.00	173.14	5.81	0.00
5565	7490.00	172.80	6.14	7490.00	172.80	6.14	0.00
4988	7490.00	172.47	3.26	7490.00	172.47	3.26	0.00
4445	7490.00	172.12	4.55	7490.00	172.12	4.55	0.00

NOTES:

- HEC-RAS VERSION 6.2 WAS USED FOR THE EXISTING AND PROPOSED BRIDGE ANALYSES.
- DRAINAGE AREA WAS DELINEATED AND PEAK FLOWS WERE CALCULATED USING LIDAR ELEVATION DATA (2018) SOURCED FROM TEXAS NATURAL RESOURCES INFORMATION SYSTEM (TNRIS). HYDRAULIC CROSS SECTIONS WERE OBTAINED BY TOPOGRAPHIC SURVEY.
- THE PROJECT LOCATION IS IN A ZONE A SPECIAL FLOOD HAZARD AREA PER FEMA FIRM PANEL NUMBER 48089C0550D. EFFECTIVE DATE: FEBRUARY 4, 2011.
- UPSTREAM NORMAL DEPTH TAILWATER CONDITION OF 0.00063 FT/FT WAS USED IN THE HYDRAULIC MODEL.
- THE PROPOSED THREE-SPAN BRIDGE HAS A 20% AEP LEVEL OF SERVICE BASED ON THE WSEL NOT IMPINGING ON THE BRIDGE.
- COORDINATION WITH THE COLORADO COUNTY FLOODPLAIN ADMINISTRATOR OCCURRED ON AUGUST 16, 2023.



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CR 112 AT BUCKSNAG CREEK

HYDRAULIC DATA SHEET

CSJ 0913-26-066 SHEET 1 OF 1

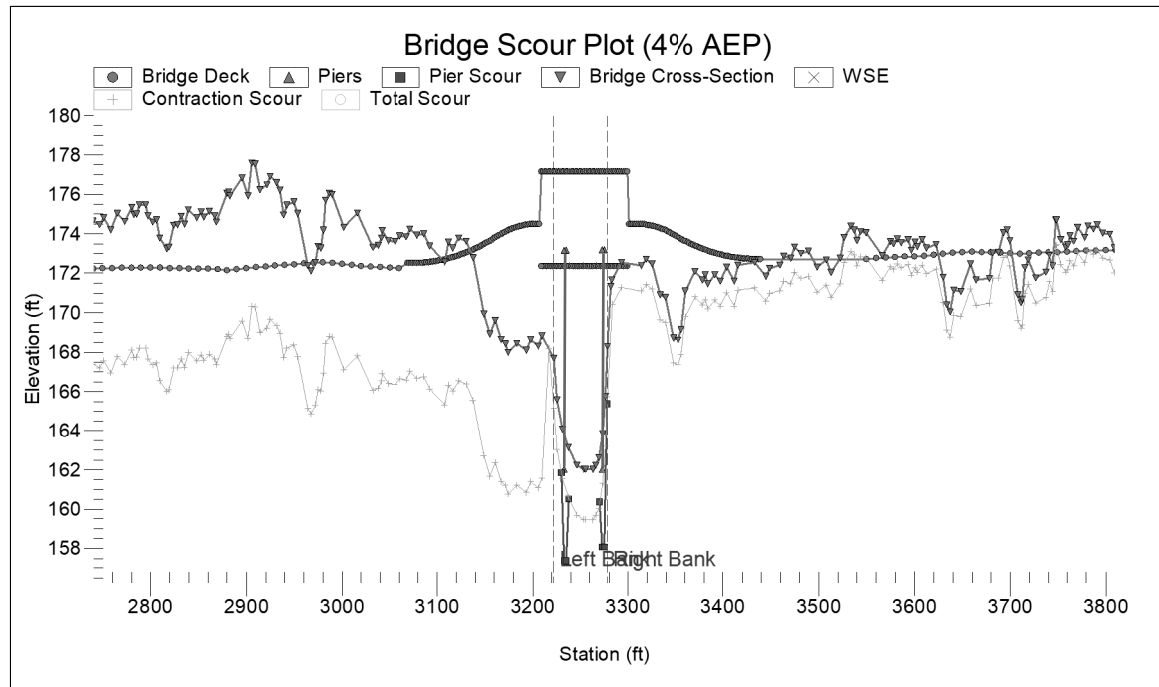
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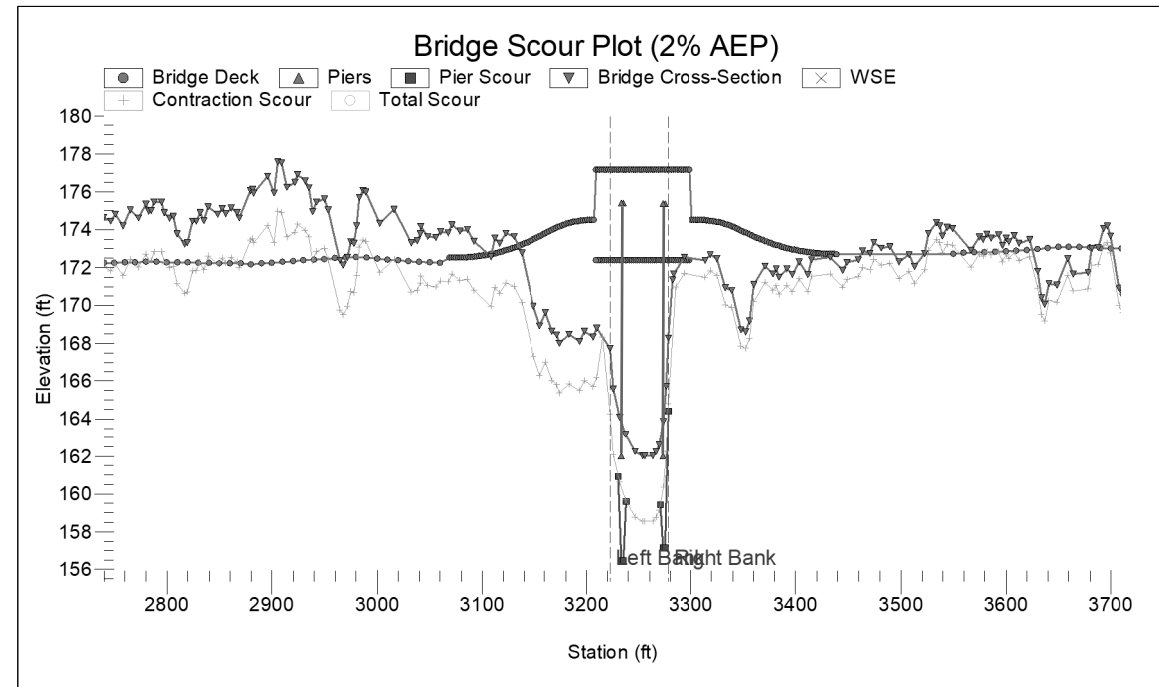
FHWA HYDRAULIC TOOLBOX 5.1				
Scenario	4% AEP	2% AEP	Units	Method
Contraction Scour				
Clear Water Contraction Scour Depth	87.64	95.6	FT	Clear-Water and Live-Bed Scour
Live Bed Contraction Scour Depth	2.54	3.47	FT	Clear-Water and Live-Bed Scour
Applied Contraction Scour Elevation with LTD	159.47	158.54	FT-MSL	Clear-Water and Live-Bed Scour
Piers				
Pier Name	Pier 1	Pier 1		
Pier Scour Depth	3.72	3.71	FT	Computation Method: Pier 4%: HEC-18 2%: HEC-18
Total Scour at Pier	3.72	3.71	FT	
Total Scour Elevation at Pier	157.39	156.48	FT-MSL	
Piers				
Pier Name	Pier 2	Pier 2		
Pier Scour Depth	3.72	3.71	FT	Computation Method: Pier 4%: HEC-18 2%: HEC-18
Total Scour at Pier	3.72	3.71	FT	
Total Scour Elevation at Pier	158.08	157.16	FT-MSL	
Total Scour				
Total Scour	6.26	7.18	FT	

**NOTES:**

1. FHWA HYDRAULIC TOOLBOX VERSION 5.1 WAS USED FOR THE SCOUR ANALYSIS.
2. A GRAIN SIZE OF 1.33MM WAS USED FOR THE D50 PER TXDOT'S SCOUR EVALUATION GUIDE (AUGUST 2020).
3. THE 4% AEP STORM EVENT WAS USED FOR THE ANALYSIS AND THE 2% AEP STORM EVENT WAS USED AS A CHECK BASED ON CRITERIA LISTED IN TXDOT'S SCOUR EVALUATION GUIDE (AUGUST 2020).
4. CRITICAL VELOCITY WAS DETERMINED TO BE LESS THAN MEAN VELOCITY UPSTREAM OF THE BRIDGE OPENING, THEREFORE, LIVE BED RESULTS WERE USED.



SCOUR ENVELOPE AT BRIDGE - 4% AEP



SCOUR ENVELOPE AT BRIDGE - 2% AEP

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CR 112 AT BUCKSNAG CREEK

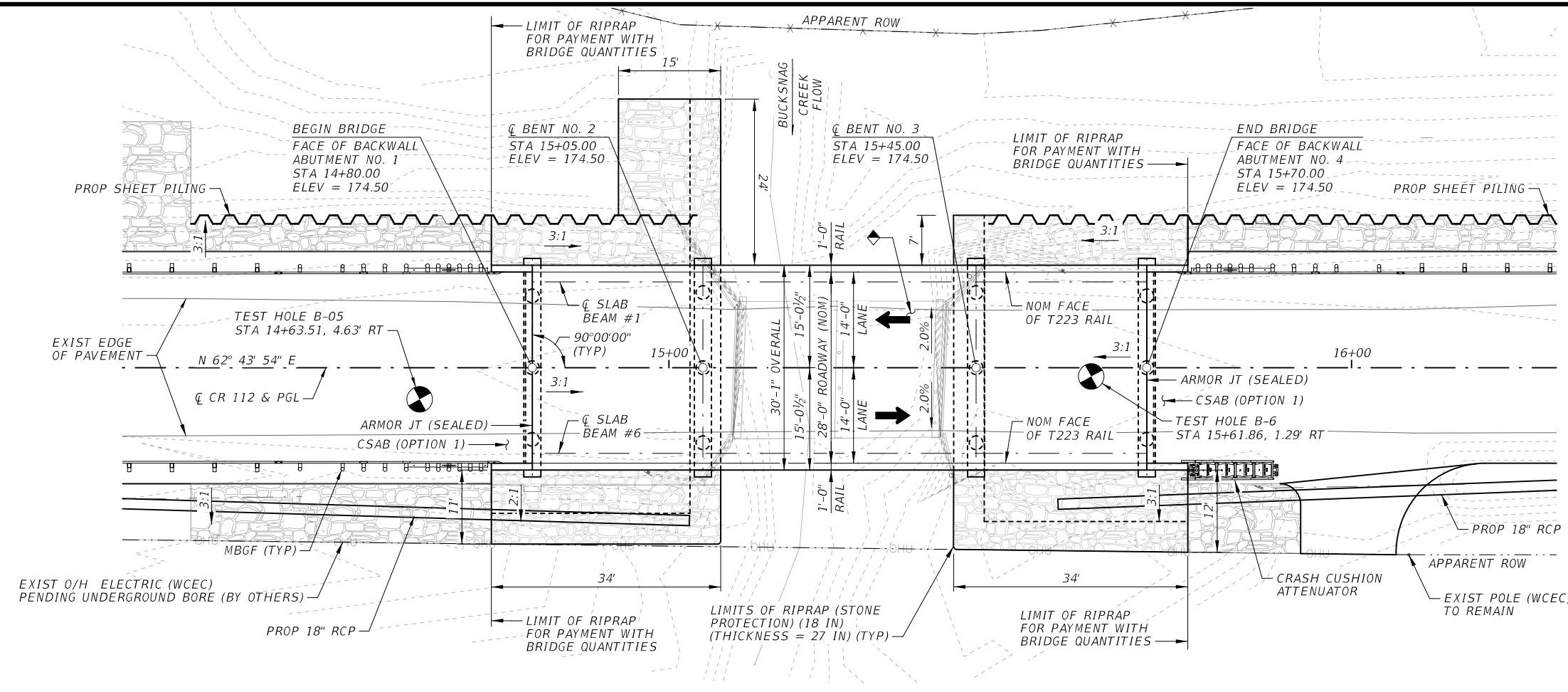
**SCOUR DATA SHEET**

CSJ 0913-26-066 SHEET 1 OF 1

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Checked: KRG			JOB NO. 066	SHEET NO. 35



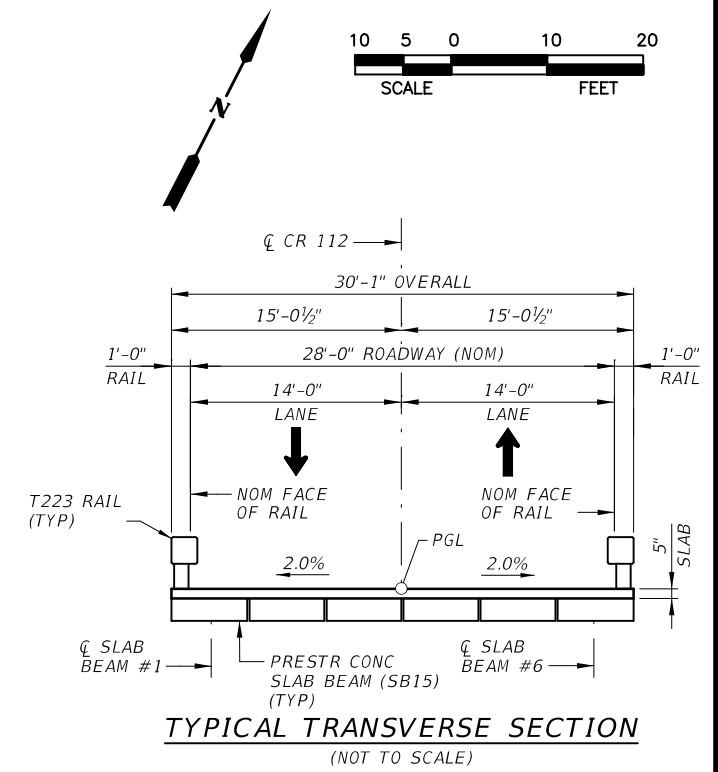
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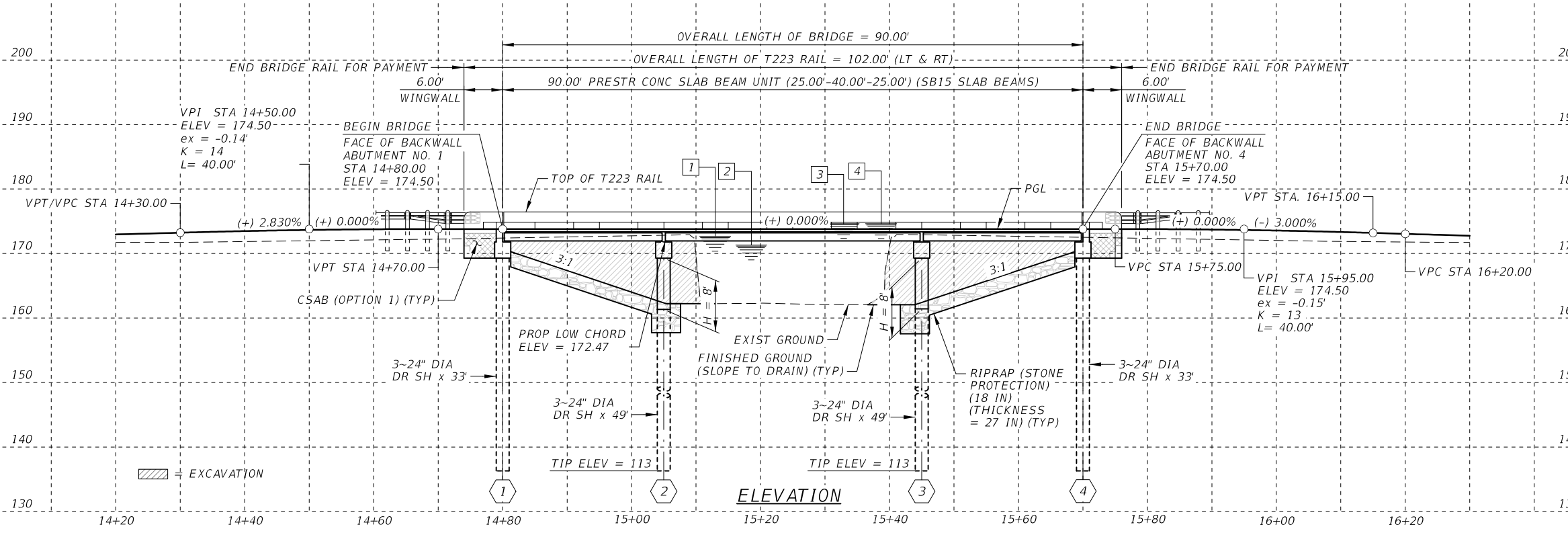
**HYDRAULIC DATA TABLE**

EXIST HW5 = 172.66	1	PROP HW5 = 171.31	2
EXIST Q5 = 2,357 cfs		PROP Q5 = 2,357 cfs	
EXIST V5 = 2.84 ft/s		PROP V5 = 4.83 ft/s	
EXIST HW100 = 174.63	3	PROP HW100 = 174.61	4
EXIST Q100 = 7,490 cfs		PROP Q100 = 7,490 cfs	
EXIST V100 = 4.36 ft/s		PROP V100 = 4.40 ft/s	

ALL ABUTMENTS AND INTERIOR BENTS ON BEARING N 27°16'06" W SUPERSTRUCTURE INV/OPR RATINGS: 1.24/1.76



- GENERAL NOTES:**
- DESIGNED ACCORDING TO AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, 9TH EDITION (2020) AND TXDOT BRIDGE DESIGN MANUAL (JAN 2023).
  - USE OPTION 1 FOR CONFIGURATION OF CEMENT STABILIZED BACKFILL BEHIND ABUTMENTS. SEE CSAB STANDARD FOR DETAILS.
  - SEE BORING LOGS SHEET FOR GEOTECHNICAL INFORMATION.
  - SEE PSBEB STANDARD FOR BEAM END AND BEARING DETAILS.
  - THE "H" VALUES SHOWN ARE ESTIMATED COLUMN HEIGHTS. CONTRACTOR IS RESPONSIBLE FOR CALCULATING ACTUAL COLUMN HEIGHTS BASED ON FIELD CONDITIONS.



**HL93 LOADING**

**KELLY HO**  
 112947  
 LICENSED PROFESSIONAL ENGINEER  
 08/30/2023

NO.	REVISION	BY	DATE

TEXAS REGISTERED ENGINEERING FIRM  
 F-EDM

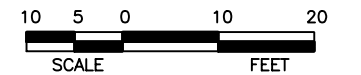
©2023 Texas Department of Transportation  
 CR 112 AT BUCKSNAG CREEK

**BRIDGE LAYOUT  
 BUCKSNAG CREEK BRIDGE**

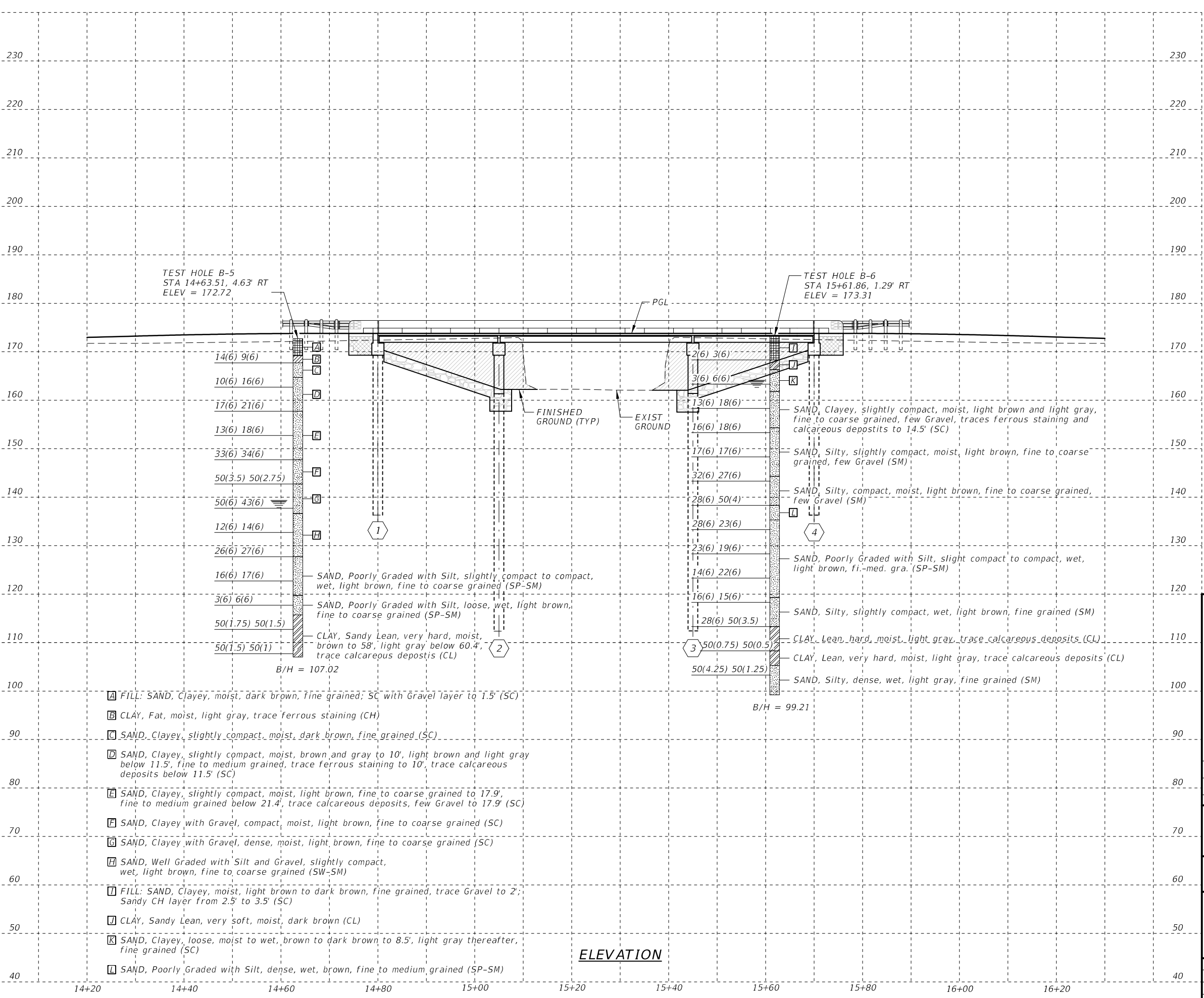
CSJ 0913-26-066 SHEET 1 OF 1

Designed: KAD	FED. RD. DIV. NO. 6	STATE TEXAS	FEDERAL AID PROJECT NO.	HIGHWAY NO. CR
Checked: KH	DIST.	COUNTY	CONTROL NO. 0913	SECTION NO. 26
Drawn: BT	JOB NO. 066	SHEET NO. 36		
Checked: KAD	YKM	COLORADO	0913	26

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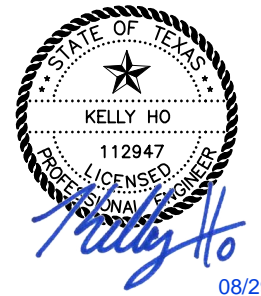


- GENERAL NOTES:**
- BORING LOGS REPLICATED FROM CORSAIR CONSULTING, LLC. BORING TAKEN ON JANUARY 19-20, 2023.
  - GROUND WATER ENCOUNTERED AT DEPTHS OF 33.70 FEET FOR B-5 AND 8.50 FEET FOR B-6.
- ANY GROUND WATER ELEVATION INFORMATION IS REPRESENTATIVE OF CONDITIONS EXISTING ON THE DAY AND FOR THE SPECIFIC LOCATION WHERE THIS INFORMATION WAS COLLECTED.
- ACTUAL GROUND WATER ELEVATION MAY FLUCTUATE DUE TO TIME, CLIMATE CONDITIONS, AND/OR CONSTRUCTION ACTIVITY.
- CONTRACTOR'S ATTENTION IS BROUGHT TO WATER BEARING SANDY SOILS SHOWN IN BORING LOGS. THE USE OF TEMPORARY CASING AND/OR DRILLING SLURRY MAY BE NECESSARY TO INSTALL DRILLED SHAFT TO REQUIRED LENGTH AS SHOWN.



- ▲ FILL: SAND, Clayey, moist, dark brown, fine grained, SC with Gravel layer to 1.5' (SC)
- CLAY, Fat, moist, light gray, trace ferrous staining (CH)
- SAND, Clayey, slightly compact, moist, dark brown, fine grained (SC)
- ▣ SAND, Clayey, slightly compact, moist, brown and gray to 10', light brown and light gray below 11.5', fine to medium grained, trace ferrous staining to 10', trace calcareous deposits below 11.5' (SC)
- ▤ SAND, Clayey, slightly compact, moist, light brown, fine to coarse grained to 17.9', fine to medium grained below 21.4', trace calcareous deposits, few Gravel to 17.9' (SC)
- ▥ SAND, Clayey with Gravel, compact, moist, light brown, fine to coarse grained (SC)
- ▧ SAND, Clayey with Gravel, dense, moist, light brown, fine to coarse grained (SC)
- ▨ SAND, Well Graded with Silt and Gravel, slightly compact, wet, light brown, fine to coarse grained (SW-SM)
- ▩ FILL: SAND, Clayey, moist, light brown to dark brown, fine grained, trace Gravel to 2', Sandy CH layer from 2.5' to 3.5' (SC)
- CLAY, Sandy Lean, very soft, moist, dark brown (CL)
- ▬ SAND, Clayey, loose, moist to wet, brown to dark brown to 8.5', light gray thereafter, fine grained (SC)
- ▭ SAND, Poorly Graded with Silt, dense, wet, brown, fine to medium grained (SP-SM)

**HL93 LOADING**



NO.	REVISION	BY	DATE

**stv** TEXAS REGISTERED ENGINEERING FIRM F-EDM

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 CR 112 AT BUCKSNAG CREEK

**BORING LOGS  
 BUCKSNAG CREEK BRIDGE**

CSJ 0913-26-066 SHEET 1 OF 1

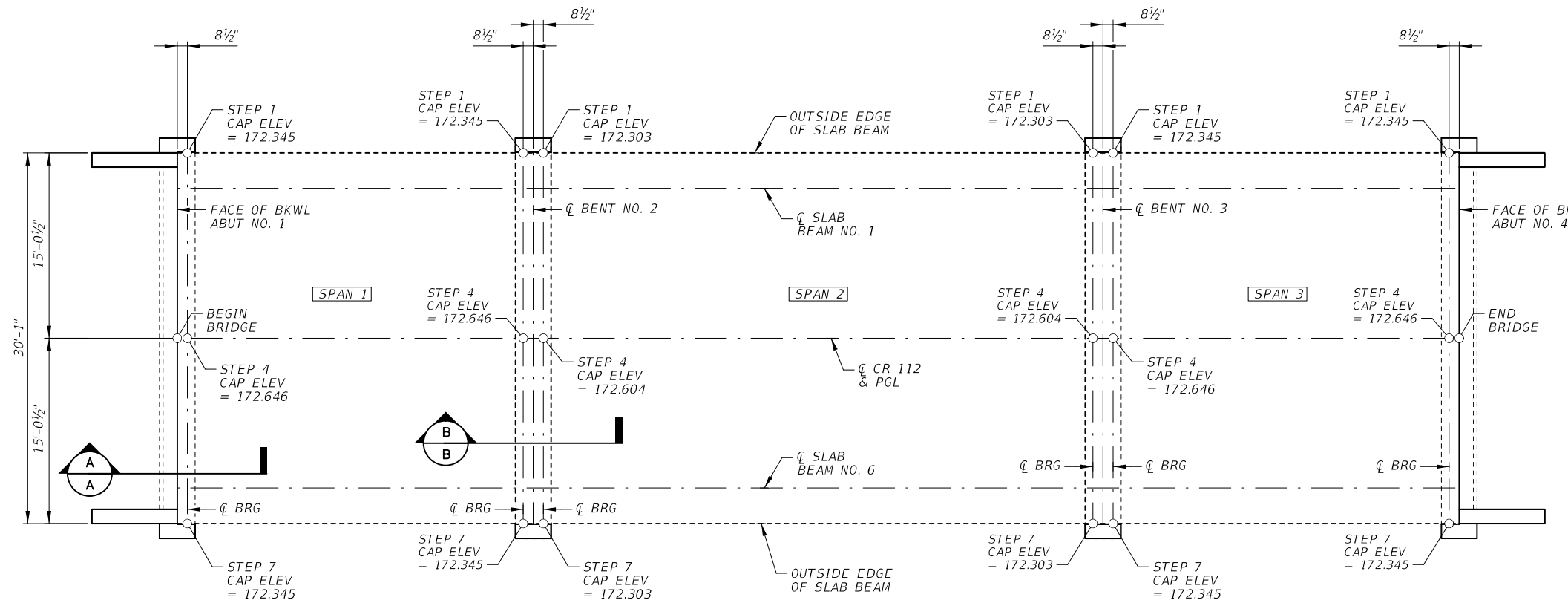
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Checked:	KH	BT	YKM	DIST.	COLORADO	CONTROL NO.	0913	SECTION NO.	26	JOB NO.	066	SHEET NO.	37

**ELEVATION**

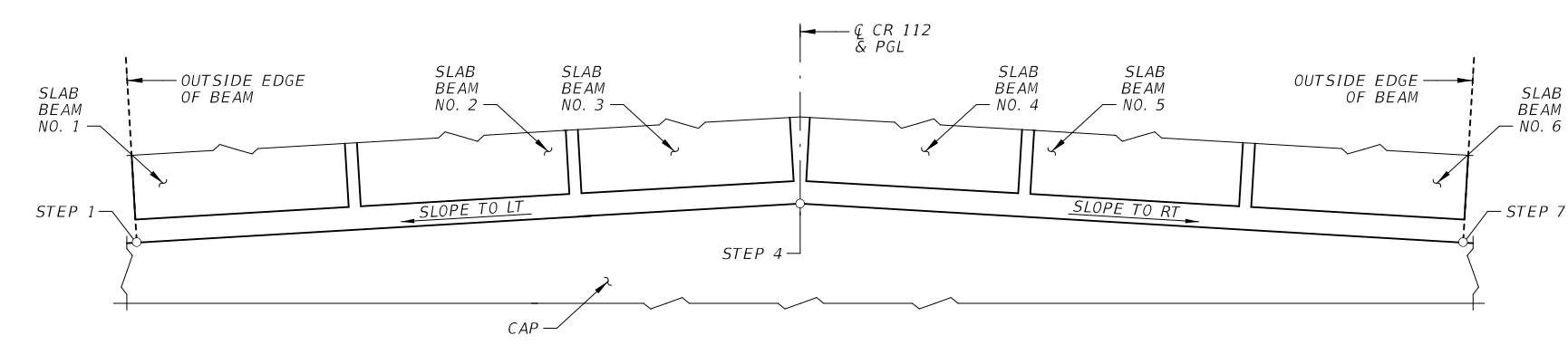
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### SUMMARY OF ESTIMATED QUANTITIES - BUCKSNAG CREEK BRIDGE

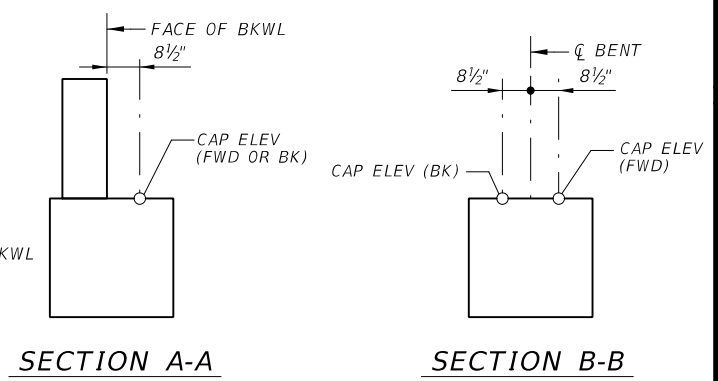
BID ITEM	400 6005	416 6002	420 6013	420 6029	420 6037	422 6007	425 6012	432 6033	450 6006	454 6004
BID ITEM DESCRIPTION	CEM STABIL BKFL	DRILL SHAFT (24 IN)	CL C CONC (ABUT)	CL C CONC (CAP)	CL C CONC (COLUMN)	REINF CONC SLAB (SLAB BEAM)	PRESTR CONC SLAB BEAM (SSB15)	RIPRAP (STONE PROTECTION) (18 IN)	RAIL (TY T223)	ARMOR JOINT (SEALED)
BRIDGE ELEMENT	CY	LF	CY	CY	CY	SF	LF	CY	LF	LF
2 - ABUTMENTS	29	198	22.8					333	24.0	54
2 - INTERIOR BENTS		294		15.2	5.6					
1 - 90.00' PRESTRESSED SLAB BEAM UNIT						2,707	531.00		180.0	
<b>TOTAL</b>	<b>29</b>	<b>492</b>	<b>22.8</b>	<b>15.2</b>	<b>5.6</b>	<b>2,707</b>	<b>531.00</b>	<b>333</b>	<b>204.0</b>	<b>54</b>



PLAN OF STEP LOCATIONS



COMMON TRANSVERSE SECTIONS AT STEP LOCATIONS



### HL93 LOADING



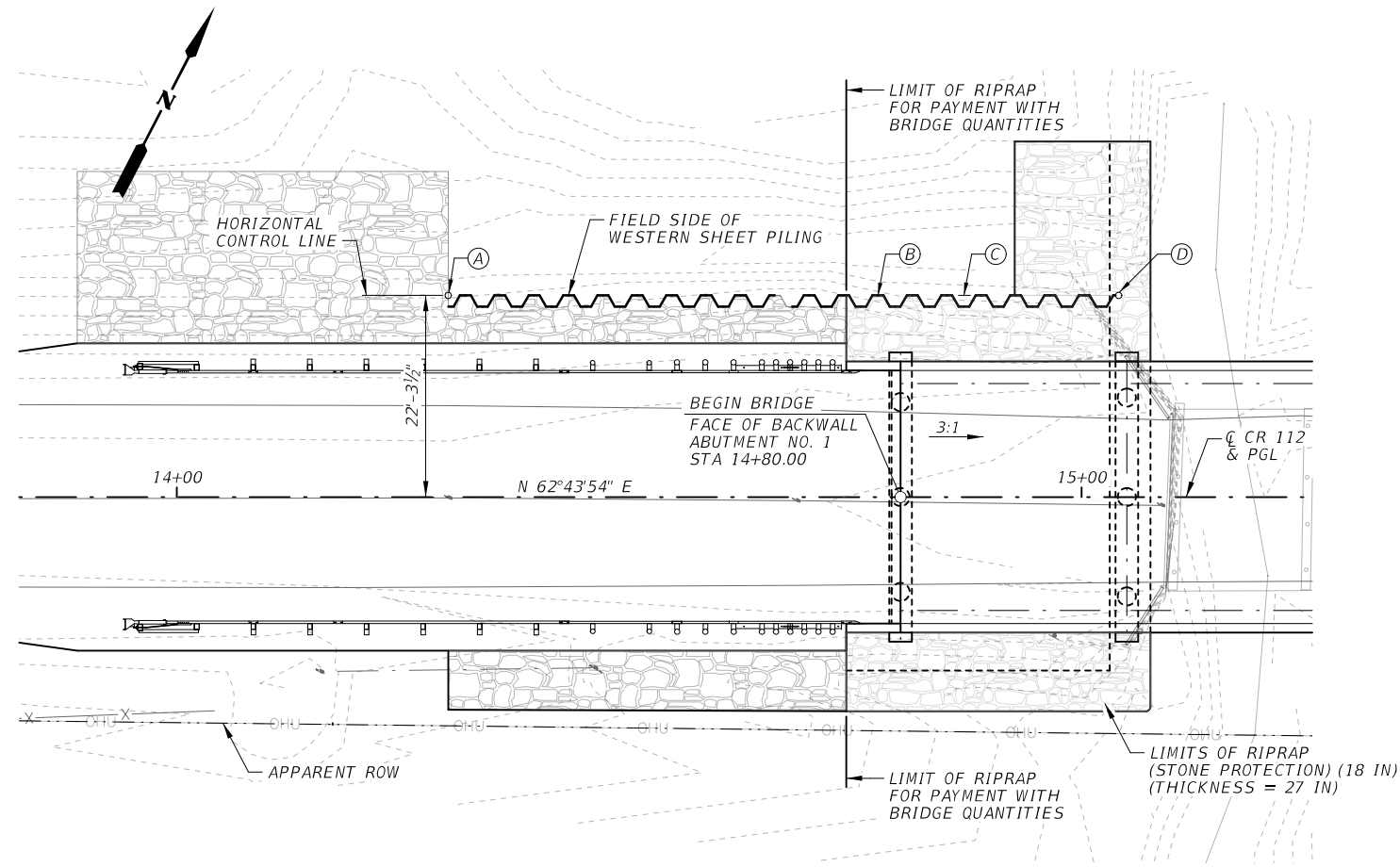
08/30/2023

NO.	REVISION	BY	DATE

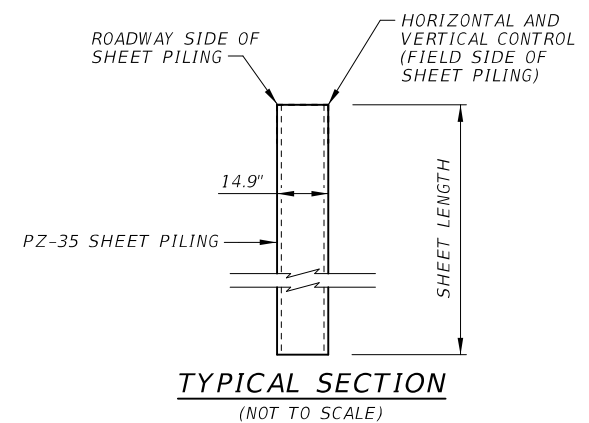
**stv** TEXAS REGISTERED ENGINEERING FIRM F-EDM  
 ©2023 Texas Department of Transportation  
 CR 112 AT BUCKSNAG CREEK  
 ESTIMATED QUANTITIES AND CAP ELEVATIONS  
 BUCKSNAG CREEK BRIDGE  
 CSJ 0913-26-066 SHEET 1 OF 1

Designed:	KAD	FED. RD. DIV. NO.	STATE	FEDERAL AID PROJECT NO.	HIGHWAY NO.
Checked:	KH	6	TEXAS		CR
Drawn:	KAD	DIST.	COUNTY	CONTROL NO.	SECTION NO.
Checked:	KH	YKM	COLORADO	0913	26
				JOB NO.	SHEET NO.
				066	38

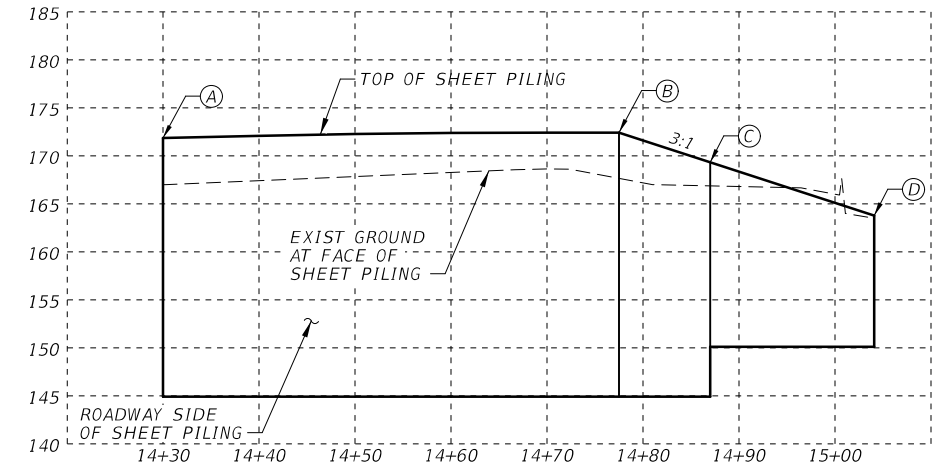
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**PLAN OF WESTERN SHEET PILING**



**TYPICAL SECTION**  
(NOT TO SCALE)



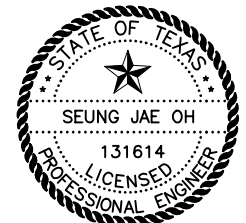
**ELEVATION OF WESTERN SHEET PILE WALL**



FOR STRUCTURAL SHEET PILING DESIGN ONLY

**GENERAL NOTES:**

1. SHEET PILING ADJACENT TO ROADWAY TO BE PLACED AT THE ELEVATIONS LISTED IN THE SHEET PILING TABLE.
2. CONTRACTOR TO FIELD VERIFY DIMENSIONS PRIOR TO CONSTRUCTION.
3. ALL SHEET PILING TO BE PZ-35 GRADE 50.
4. SHEET PILING QUANTITY (SF) BASED ON SINGLE SHEET WIDTH OF 1.9'.



*Seung Jae Oh*  
08/29/2023



*Kelly Ho*  
08/29/2023

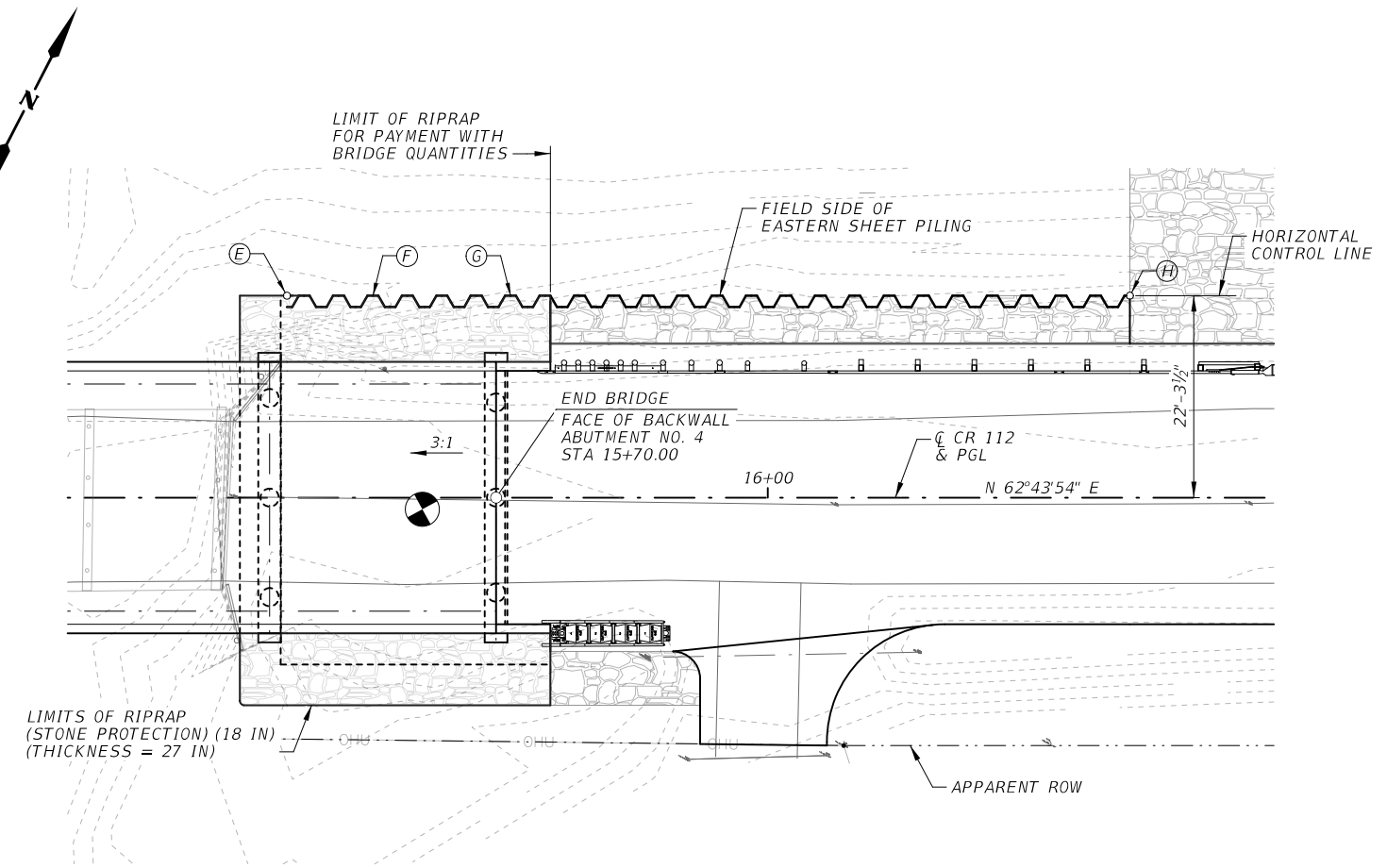
HL93 LOADING

WESTERN SHEET PILING DATA TABLE									
POINT	STATION	OFFSET	TOP ELEVATION	DESCRIPTION	SHEET LENGTH (HEIGHT)	SEGMENT	SINGLE SHEETS (1.9' WIDTH)	SHEET PILING (PZ-35)	SEGMENT LENGTH
		FT	FT		FT	POINT TO POINT	EA	SF	FT
A	14+30.00	22.29 (LT)	171.85	BEGIN SHEET PILING	27.00	A TO B	25	1,283	47.50
B	14+77.50	22.29 (LT)	172.42	PROFILE BREAK POINT	27.00	B TO C	5	257	9.50
C	14+87.00	22.29 (LT)	169.33	SHEET PILING LENGTH CHANGE	18.00	C TO D	9	308	17.10
D	15+04.10	22.29 (LT)	163.78	END SHEET PILING					
					TOTAL		39	1,847	74.10

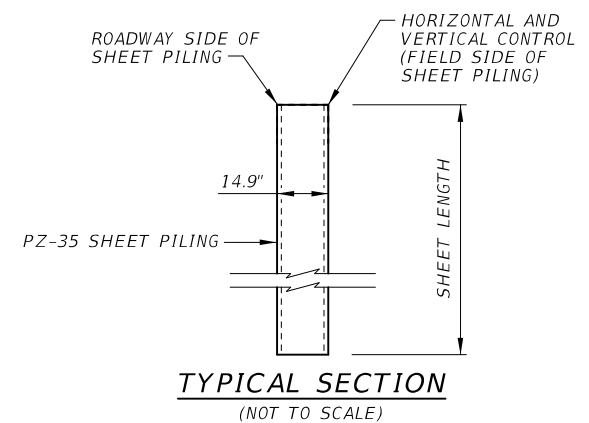
① CONTRACTOR TO FIELD CUT TOP OF SHEET PILING AS NECESSARY TO ACHIEVE TOP ELEVATION LISTED IN THE SHEET PILING TABLE.

NO.	REVISION	BY	DATE
TEXAS REGISTERED ENGINEERING FIRM F-ED#			
©2023 Texas Department of Transportation CR 112 AT BUCKSNAG CREEK			
<b>SHEET PILING DETAILS</b> <b>BUCKSNAG CREEK BRIDGE</b> CSJ 0913-26-066 SHEET 1 OF 2			
Designed: KAD	FED. RD. DIV. NO. 6	STATE TEXAS	FEDERAL AID PROJECT NO.
Checked: KH			CR
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Checked: KH			SECTION NO. 26
			JOB NO. 066
			SHEET NO. 39

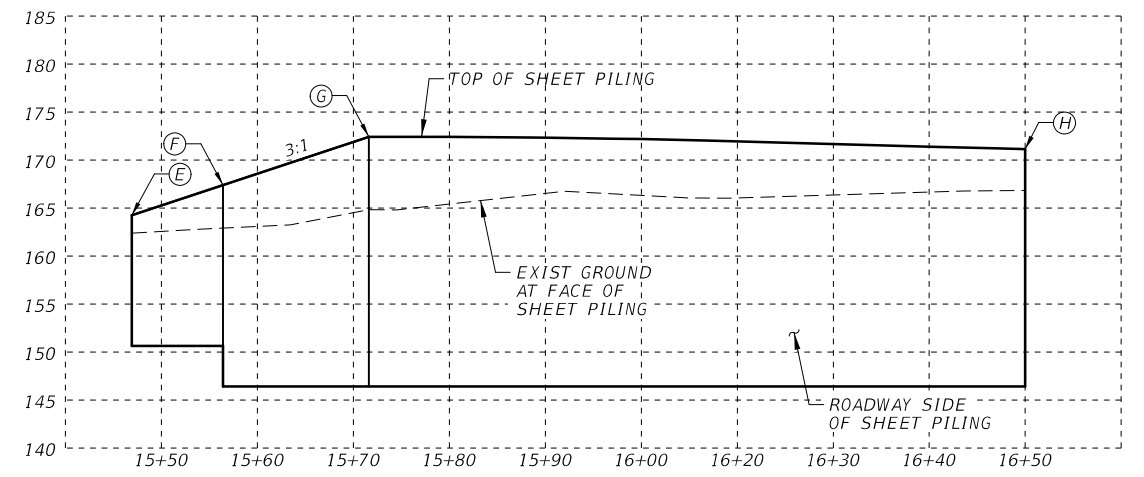
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**PLAN OF EASTERN SHEET PILING**

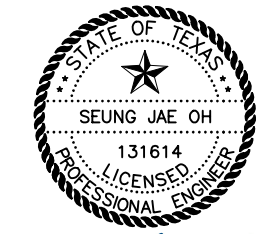


**TYPICAL SECTION (NOT TO SCALE)**

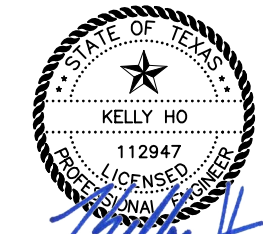


**ELEVATION OF EASTERN SHEET PILE WALL**

FOR STRUCTURAL SHEET PILING DESIGN ONLY



*Seung Jae Oh*  
08/29/2023



*Kelly Ho*  
08/29/2023

**HL93 LOADING**

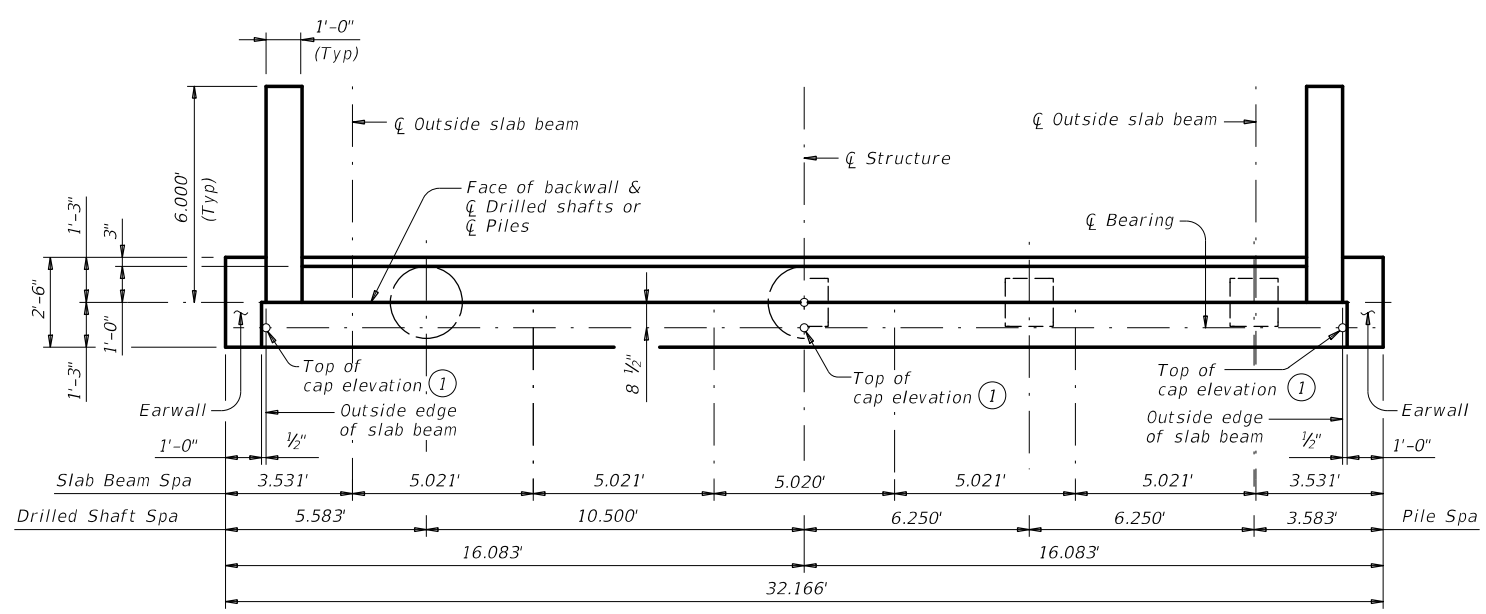
EASTERN SHEET PILING DATA TABLE									
POINT	STATION	OFFSET	TOP ELEVATION	DESCRIPTION	SHEET LENGTH (HEIGHT)	SEGMENT	SINGLE SHEETS (1.9' WIDTH)	SHEET PILING (PZ-35)	SEGMENT LENGTH
		FT	FT		FT	POINT TO POINT	EA	SF	FT
E	15+46.90	22.29 (LT)	164.24	BEGIN SHEET PILING	18.00	E TO F	5	171	9.50
F	15+56.40	22.29 (LT)	167.39	SHEET PILING LENGTH CHANGE	27.00	F TO G	8	410	15.20
G	15+71.60	22.29 (LT)	172.42	PROFILE BREAK POINT	27.00	G TO H	36	1,847	68.40
H	16+40.00	22.29 (LT)	171.14	END SHEET PILING					
					TOTAL		49	2,428	93.10

① CONTRACTOR TO FIELD CUT TOP OF SHEET PILING AS NECESSARY TO ACHIEVE TOP ELEVATION LISTED IN THE SHEET PILING TABLE.

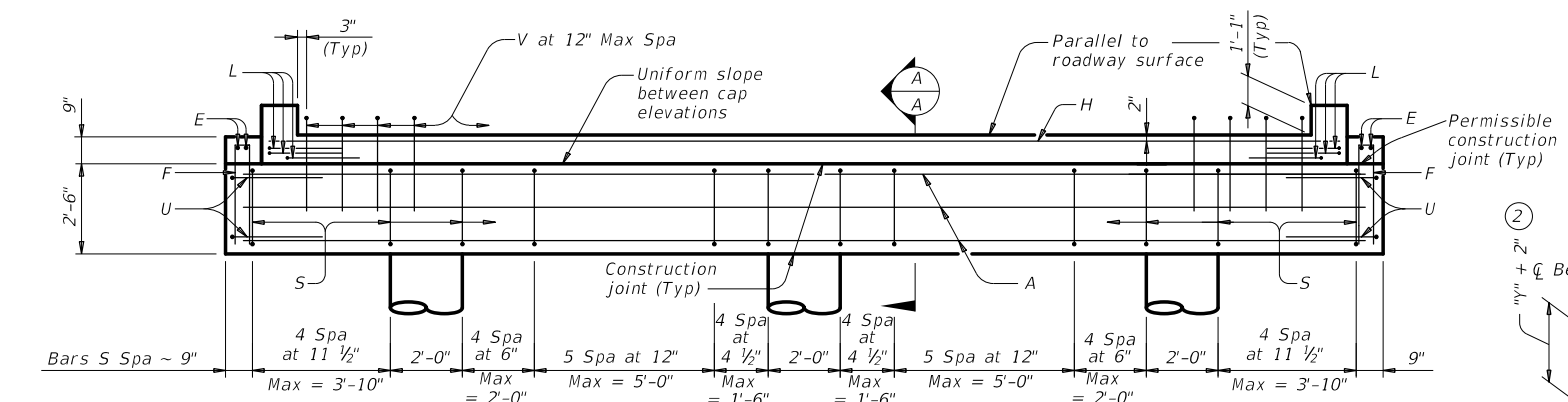
NO.	REVISION	BY	DATE
TEXAS REGISTERED ENGINEERING FIRM F-ED#			
CR 112 AT BUCKSNAG CREEK			
<b>SHEET PILING DETAILS</b> <b>BUCKSNAG CREEK BRIDGE</b> <b>CSJ 0913-26-066 SHEET 2 OF 2</b>			
Designed: KAD	FED. RD. DIV. NO. 6	STATE TEXAS	FEDERAL AID PROJECT NO.
Checked: KH			CR
Drawn: KAD	DIST. YKM	COUNTY COLORADO	CONTROL NO. 0913
Checked: KH			SECTION NO. 26
			JOB NO. 066
			SHEET NO. 40

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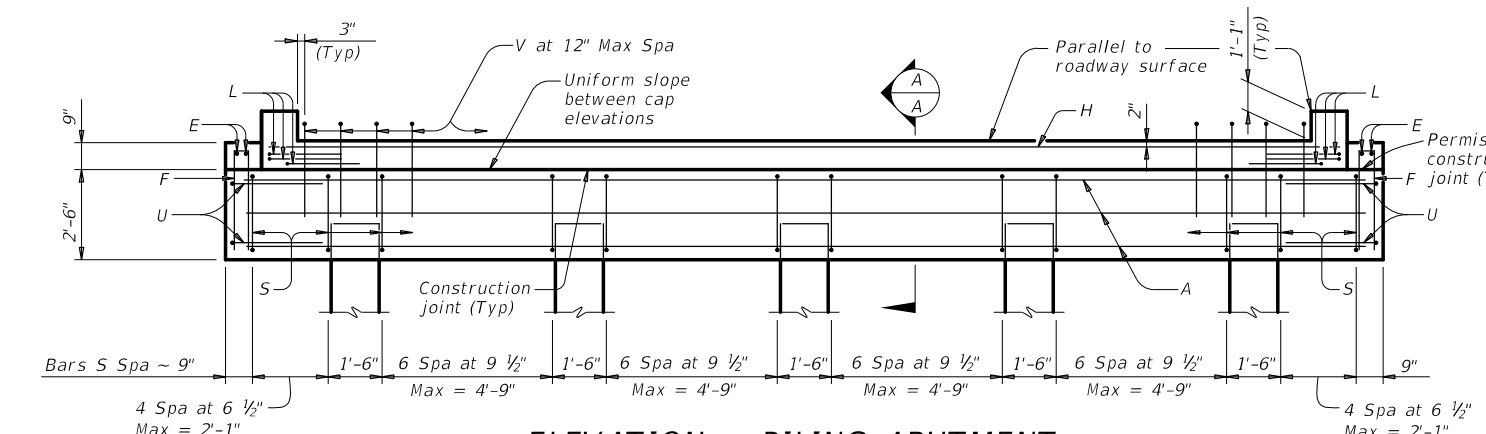
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SHOWING DRILLED SHAFTS PLAN SHOWING PILES

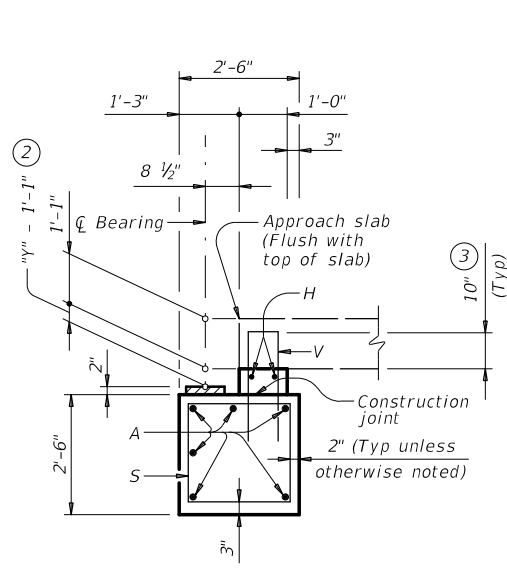
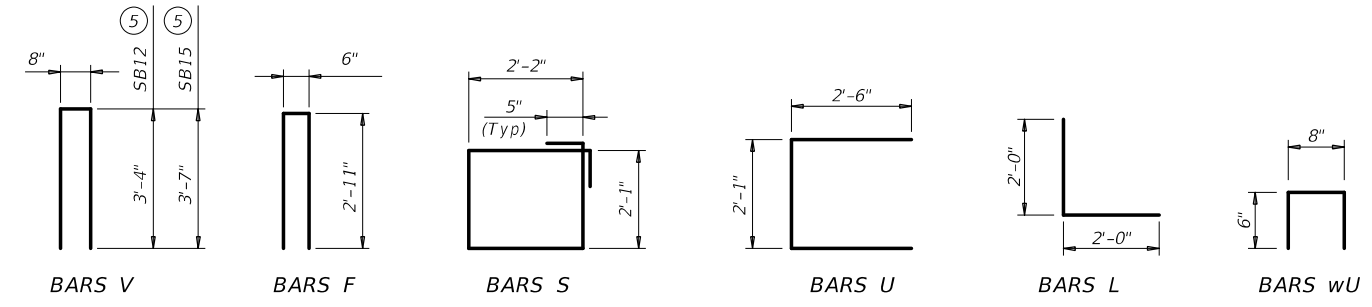


ELEVATION ~ DRILLED SHAFT ABUTMENT



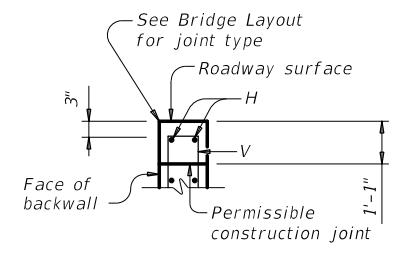
ELEVATION ~ PILING ABUTMENT

Note: For piles larger than 16", adjust Bars S spacing as required to avoid piles.



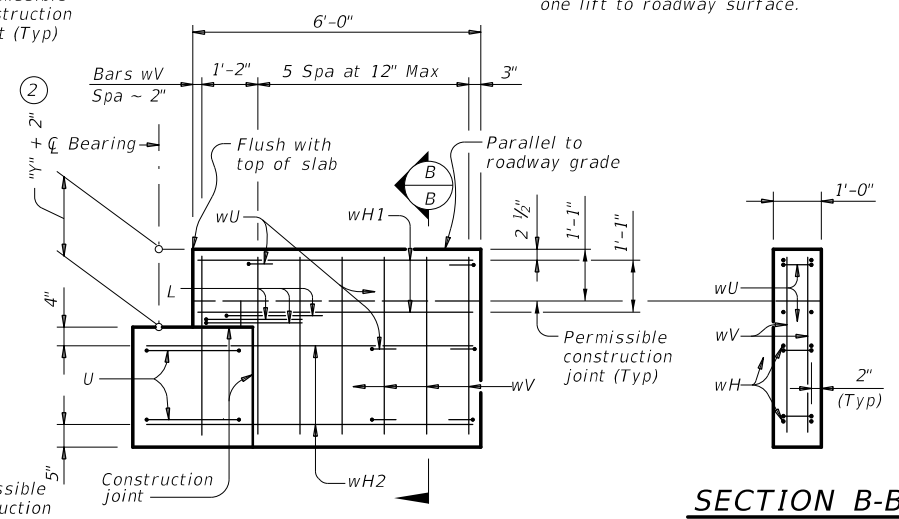
SECTION A-A (With Approach Slab)

Note: At Contractor's option, backwall may be cast with approach slab.

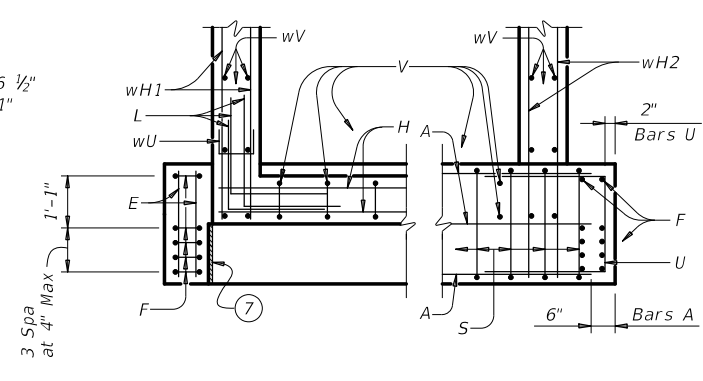


BACKWALL DETAIL (Without Approach Slab)

Note: At Contractor's option, backwall may be cast in one lift to roadway surface.



WINGWALL ELEVATION (Earwall not shown for clarity.)



BACKWALL CAP CORNER DETAILS

Span Length	FOUNDATION LOADS			
	Drilled Shaft Loads		Vertical Pile Loads	
	5SB12	5SB15	5SB12	5SB15
Ft	Tons/DS	Tons/Pile		
25	42	44	25	27
30	46	50	28	30
35	51	55	31	33
40	55	60	33	36
45		64		39
50		69		42

TABLE OF ESTIMATED QUANTITIES							
Bar	No.	Size	Length (5)		Weight (5)		
			5SB12	5SB15	5SB12	5SB15	
A	6	#11	31'-2"	31'-2"	994	994	
E	4	#4	2'-2"	2'-2"	6	6	
F	10	#4	6'-4"	6'-4"	43	43	
H	2	#5	29'-9"	29'-9"	62	62	
L	6	#6	4'-0"	4'-0"	36	36	
S	38	#4	9'-4"	9'-4"	237	237	
U	4	#6	7'-1"	7'-1"	43	43	
V	29	#5	7'-4"	7'-10"	222	237	
wH1	8	#6	5'-8"	5'-8"	68	68	
wH2	8	#6	6'-11"	6'-11"	83	83	
wU	12	#4	1'-8"	1'-8"	14	14	
wV	28	#5	3'-10"	4'-1"	112	119	
Reinforcing Steel					Lb	1,920	1,942
CI "C" Conc (Abut)					CY	9.9	10.3

- Top of cap elevations are based on section depths shown on Span Details.
- See Span Details for "γ".
- Increase as required to maintain 3" from finished grade.
- See Bridge Layout to determine if approach slab is present.
- See Bridge Layout for beam type used in the superstructure.
- Quantities shown are for one abutment only (with approach slab). Without approach slab, add 1.1 CY Class "C" concrete and 62 Lb reinforcing steel for 2 additional Bars H.
- 1/2" preformed bituminous fiber material between slab beam and earwall. Bond to earwall with an approved adhesive. Cast inside face of earwall perpendicular to cap. (Typ)

**GENERAL NOTES:**  
 Designed according to AASHTO LRFD Bridge Design Specifications.  
 Designed for a normal embankment header slope of 3:1 and a maximum span length of 50 feet.  
 See Bridge Layout for header slope and foundation type, size, and length.  
 See Common Foundation Details (FD) standard sheet for all foundation details and notes.  
 See Concrete Riprap (CRR) standard sheet or Stone Riprap (SRR) standard sheet for riprap attachment details, if applicable.  
 See applicable rail details for rail anchorage in wingwalls.  
 These abutment details may be used with standard SPSB-28 only.

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

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

HL93 LOADING

Texas Department of Transportation

Bridge Division Standard

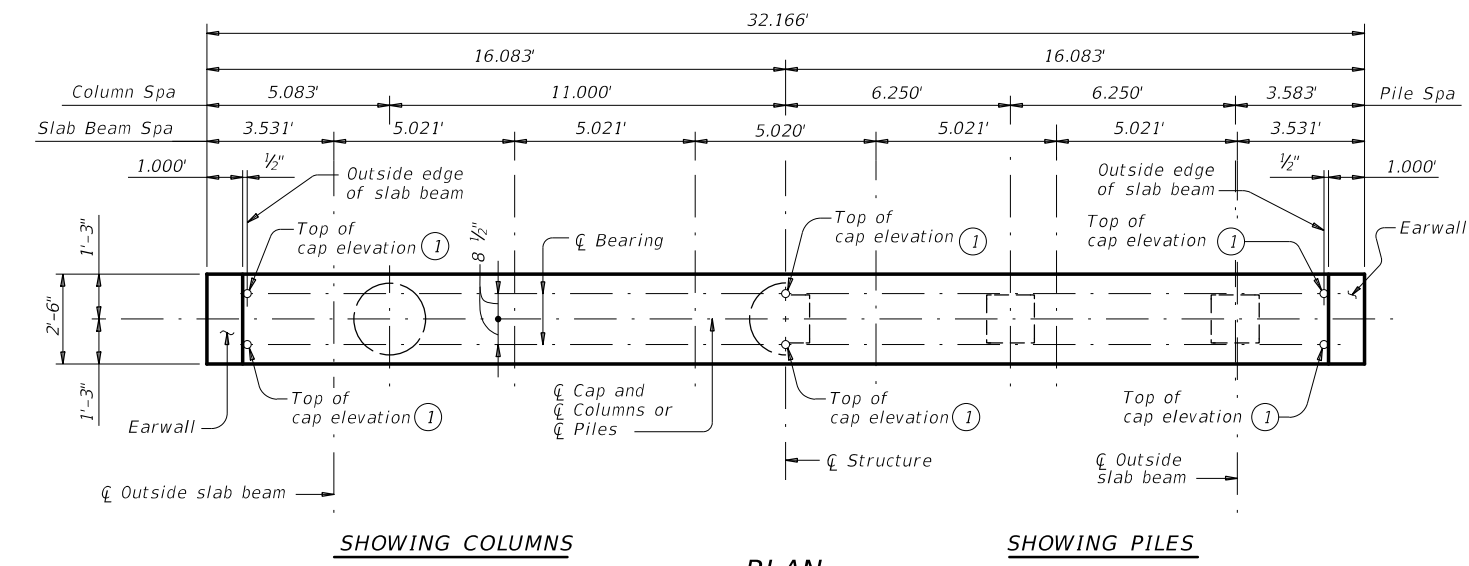
**ABUTMENTS**  
**PRESTR CONCRETE SLAB BEAM**  
**28' ROADWAY**

**APSB-28**

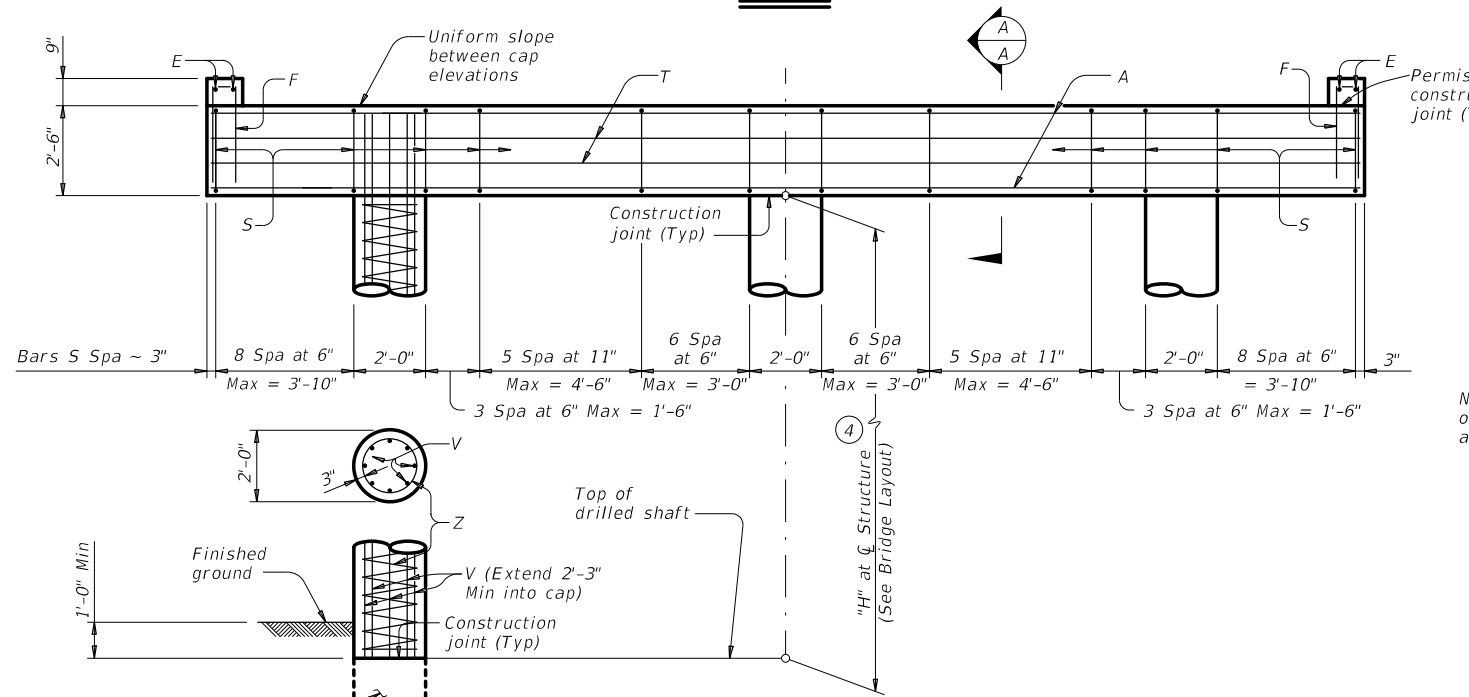
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0913	26	066		CR
DIST	COUNTY	SHEET NO.		
YKM	COLORADO	41		

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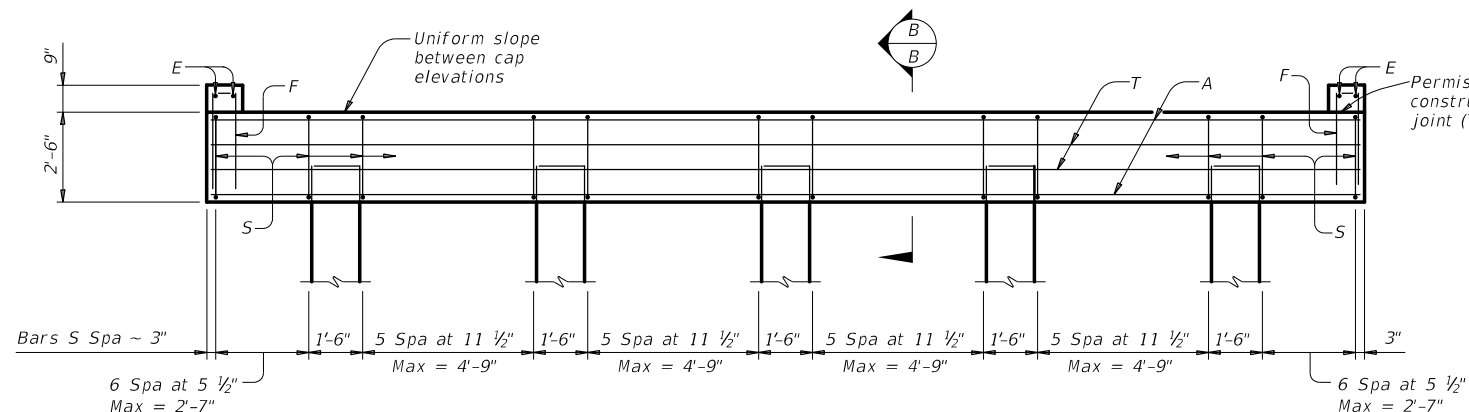
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SHOWING COLUMNS      SHOWING PILES



ELEVATION ~ 3 COLUMN BENT



ELEVATION ~ 5 PILE BENT

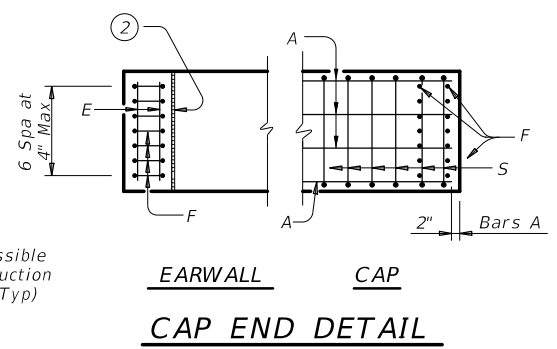
Note: For piles larger than 16", adjust Bars S spacing as required to avoid piles.

FOUNDATION LOADS				
Average Span Length	Drilled Shaft Loads (5)		Vertical Pile Loads	
	5SB12	5SB15	5SB12	5SB15
Ft				
25	62	67	37	40
30	72	78	43	47
35	80	87	48	52
40	88	96	53	57
45		104		63
50		113		68

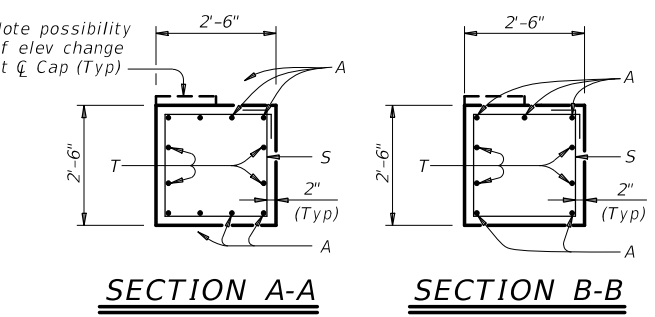
TABLE OF ESTIMATED QUANTITIES (3)					
3 COLUMN BENT					
Bar	No.	Size	Length	Weight	
A	8	#11	31'-10"	1,353	
E	4	#4	2'-2"	6	
F	14	#4	6'-6"	61	
S	48	#5	9'-8"	484	
T	4	#5	31'-10"	133	
V	24	#7	26'-3"	1,288	
Z	3	#3	242'-2"	273	
Reinforcing Steel				Lb	3,598
Cl "C" Conc (Cap)				CY	7.6
Cl "C" Conc (Col)				CY	8.4

TABLE OF ESTIMATED QUANTITIES					
5 PILE BENT					
Bar	No.	Size	Length	Weight	
A	5	#11	31'-10"	846	
E	4	#4	2'-2"	6	
F	14	#4	6'-6"	61	
S	38	#5	9'-8"	383	
T	4	#5	31'-10"	133	
Reinforcing Steel				Lb	1,429
Cl "C" Conc (Cap)				CY	7.6

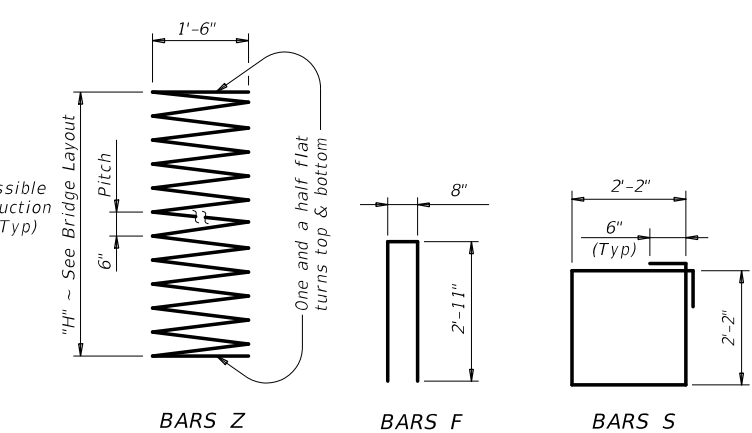
TABLE OF MAXIMUM ALLOWABLE EXPOSED PILE HEIGHTS AND PILE LOADS (4)			
Pile Type		Max Ht	Max Load
Concrete	Steel	Ft	Tons/Pile
16" Sq	HP14x73	16	75
18" Sq	HP14x117 (6)	20	90



EARWALL      CAP  
CAP END DETAIL



SECTION A-A      SECTION B-B



BARS Z      BARS F      BARS S

- Top of cap elevations are based on section depths shown on Span Details.
- 1/2" preformed bituminous fiber material between slab beam and earwall. Bond to earwall with an approved adhesive. Cast inside face of earwall perpendicular to cap. (Typ)
- Quantities shown are based on an "H" value of 24 feet. For each linear foot variation in "H" value, make the following adjustments:  
Bars V length, 1'-0"  
Bars Z length, 9'-6"  
Reinforcing Steel, 60 Lb  
Class "C" conc (column), 0.35 CY
- This standard may not be used for "H" heights exceeding 24 feet or exposed pile heights exceeding the values shown in the table. In areas of very soft soil or where scour is anticipated, allowable "H" heights or exposed pile heights must be evaluated by the Engineer prior to the use of this standard.
- Foundation Loads based on "H" = 24 feet.
- When HP14x117 steel piling is specified in the plans, the Contractor has the option of furnishing either HP14x117 or HP16x101 steel piling.

**GENERAL NOTES:**  
Designed according to AASHTO LRFD Bridge Design Specifications. Bent selected must be based on the average span length rounded up to the next 5-foot increment.  
For pile bents supporting unequal spans, the shorter span cannot be less than 80 percent of the longer span.  
See Bridge Layout for foundation type, size, and length.  
See Common Foundation Details (FD) standard sheet for all foundation details and notes.  
These bent details do not support the use of multi-pile footings shown on the FD standard.  
These bent details may be used with standard SPSB-28 only.

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

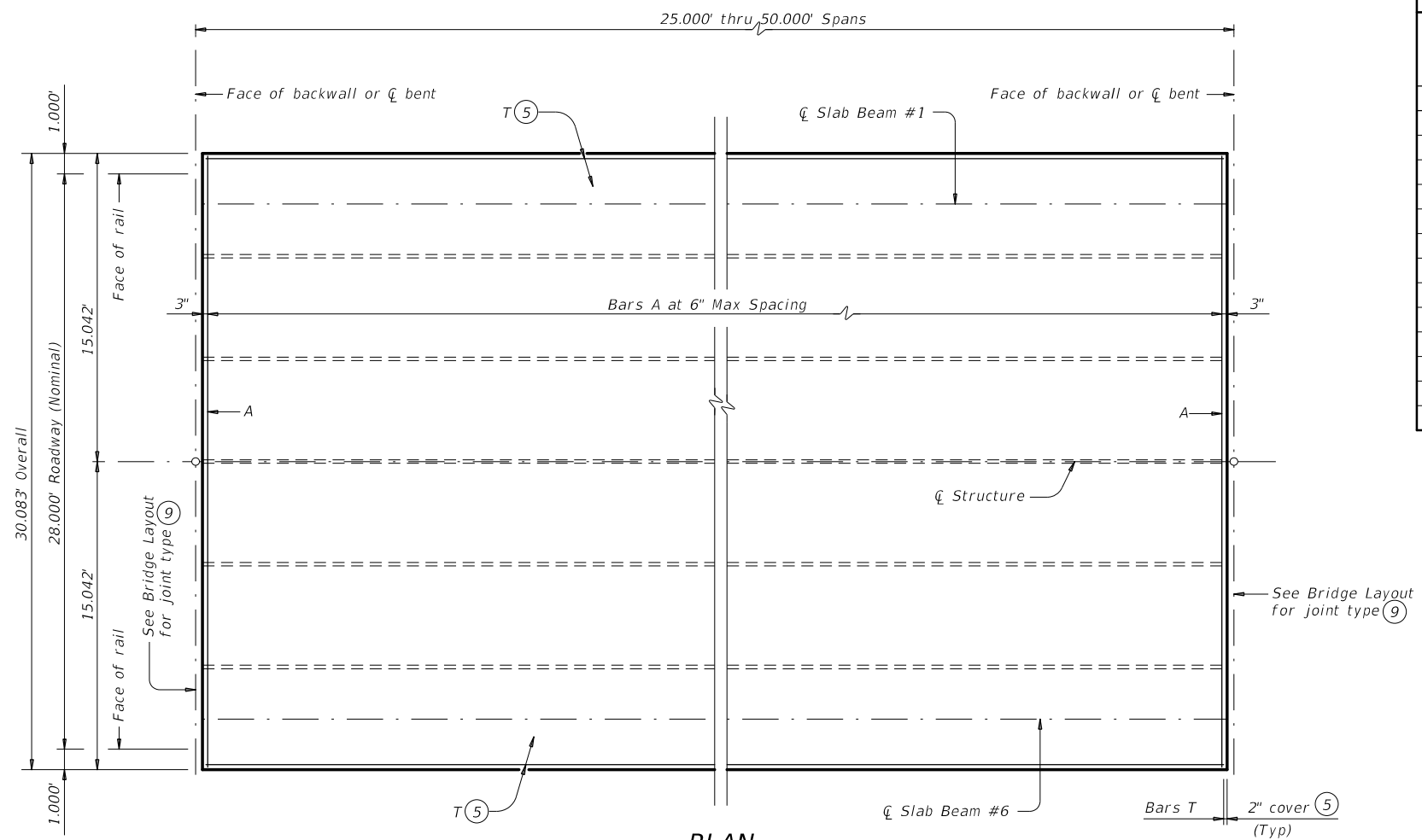
**MATERIAL NOTES:**  
Provide Class C concrete (f'c = 3,600 psi).  
Provide Class C (HPC) concrete if shown elsewhere in the plans.  
Provide Grade 60 reinforcing steel.

HL93 LOADING

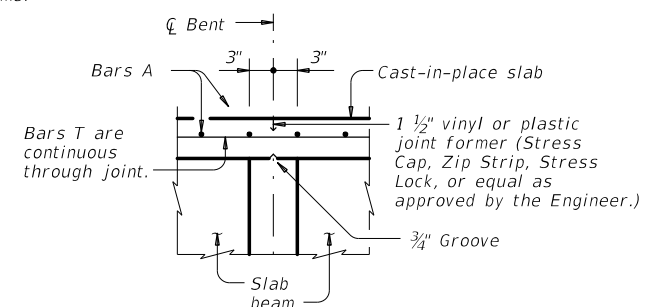
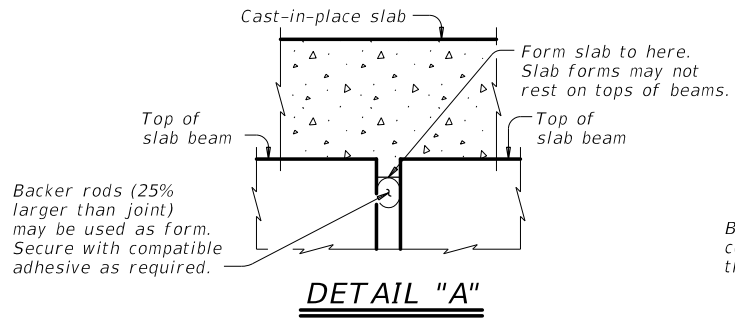
Texas Department of Transportation		Bridge Division Standard	
<b>INTERIOR BENTS</b>			
<b>PRESTR CONCRETE SLAB BEAM</b>			
<b>28' ROADWAY</b>			
<b>BPSB-28</b>			
FILE: psbste24-17.dgn	DN: TxDOT	CK: TxDOT	OW: TxDOT
©TxDOT January 2017	CONTRACT	SECTION	JOB
REVISIONS	0913	26	066
DIST	COUNTY	SHEET NO.	
YKM	COLORADO	42	

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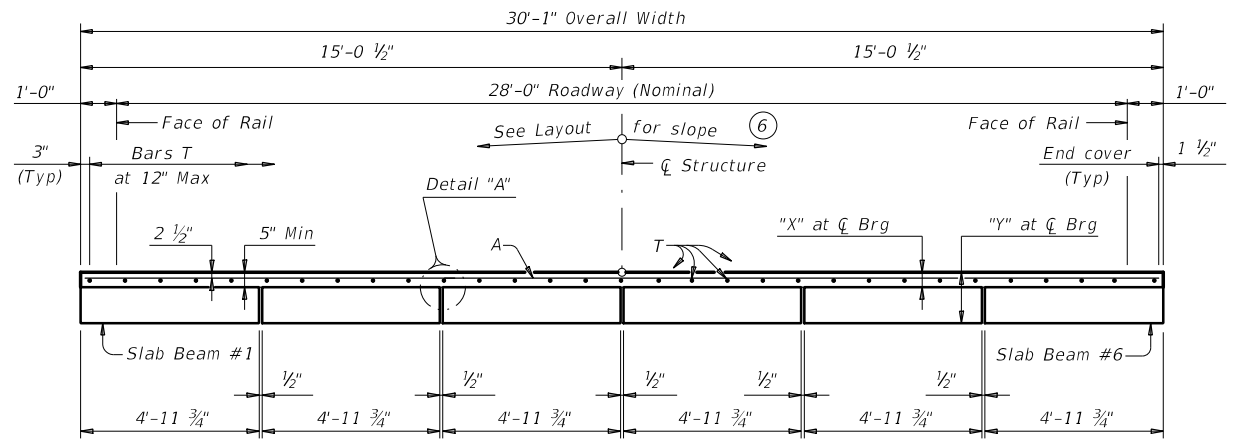
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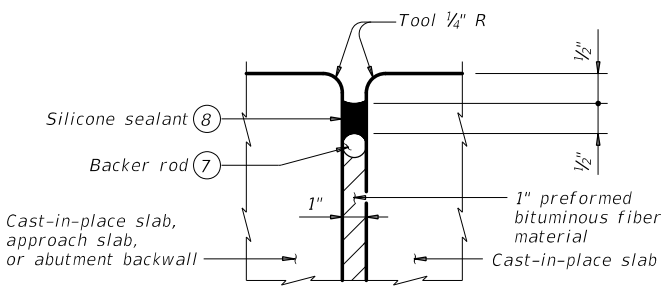
**PLAN**



**CONTINUOUS SLAB DETAIL**



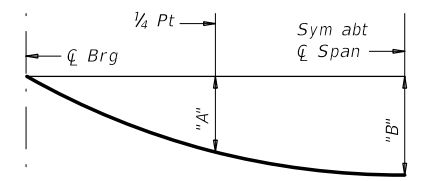
**TYPICAL TRANSVERSE SECTION**



**TYPE A JOINT DETAIL ⑨**

**TABLE OF VARIABLE VALUES**

Span Length	Beam Type	Dead Load Deflection		Section Depths ③	
		"A"	"B"	"X"	"Y"
Ft	①	Ft	Ft	In	Ft/In
25	5SB12	0.003	0.005	5 1/4"	1'-5 1/4"
30	5SB12	0.007	0.010	5 1/2"	1'-5 1/2"
35	5SB12	0.014	0.020	6"	1'-6"
40	5SB12	0.025	0.035	6 1/2"	1'-6 1/2"
25	5SB15	0.002	0.003	5 1/4"	1'-8 1/4"
30	5SB15	0.004	0.005	5 1/2"	1'-8 1/2"
35	5SB15	0.007	0.010	5 1/2"	1'-8 1/2"
40	5SB15	0.013	0.018	5 3/4"	1'-8 3/4"
45	5SB15	0.021	0.029	6 1/4"	1'-9 1/4"
50	5SB15	0.032	0.045	6 3/4"	1'-9 3/4"



**DEAD LOAD DEFLECTION DIAGRAM**

NOTE: Deflections shown are due to concrete slab only ( $E_c = 5,000$  ksi). Calculated deflections shown are theoretical and actual dimensions may vary. Adjust based on field verification.

**BAR TABLE**

BAR	SIZE
A	#5
T	#4

**TABLE OF ESTIMATED QUANTITIES**

SPAN LENGTH	REINF CONCRETE SLAB (SLAB BEAM)	PRESTR CONC SLAB BEAM (5SB12 OR 5SB15) ①			TOTAL REINF STEEL ②
		ABUT TO INT BT	INT BT TO INT BT	ABUT TO ABUT	
Ft	SF	LF ④	LF ④	LF ④	Lb
25	752	147.00	147.00	147.00	2,110
30	903	177.00	177.00	177.00	2,530
35	1,053	207.00	207.00	207.00	2,950
40	1,203	237.00	237.00	237.00	3,370
45	1,354	267.00	267.00	267.00	3,790
50	1,504	297.00	297.00	297.00	4,210

- ① See Bridge Layout for beam type used in the superstructure. These standards do not provide for the use of both SB12 and SB15 beams within the same structure.
- ② Reinforcing steel weight is calculated using an approximate factor of 2.8 Lbs/SF.
- ③ Based on theoretical beam camber, dead load deflections of 5" cast-in-place concrete slab and a constant grade. The Contractor will adjust these values for any vertical curve.
- ④ Fabricator will adjust beam lengths for beam slopes as required.
- ⑤ Where slab is continuous over Interior Bents, Bars T are continuous through Joint. See "Continuous Slab Detail".
- ⑥ This standard does not provide for changes in roadway cross-slopes within the structure.
- ⑦ 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.
- ⑧ 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.
- ⑨ See Bridge Layout for expansion joint locations. If using Type A expansion joints, the maximum distance between joints is 100 feet. Type A joints are subsidiary to Item 422, "Concrete Superstructures".

**GENERAL NOTES:**

Designed according to AASHTO LRFD Bridge Design Specifications. Two- or three-span units, with slab continuous over interior bents, may be formed with the details shown on this sheet. See applicable rail details for rail anchorage in slab. This standard does not support the use of transition bents.

Cover dimensions are clear dimensions, unless noted otherwise.

**MATERIAL NOTES:**

Provide Class S concrete ( $f'_c = 4,000$  psi).  
Provide Class S (HPC) concrete if shown elsewhere in the plans.  
Provide Grade 60 reinforcing steel.  
Provide bar laps, where required, as follows:  
Uncoated ~ #4 = 1'-7"  
~ #5 = 2'-0"  
Epoxy coated ~ #4 = 2'-5"  
~ #5 = 3'-0"  
Deformed welded wire reinforcement (WWR) (ASTM A1064) of equal size and spacing may be substituted for Bars A or T unless noted otherwise.

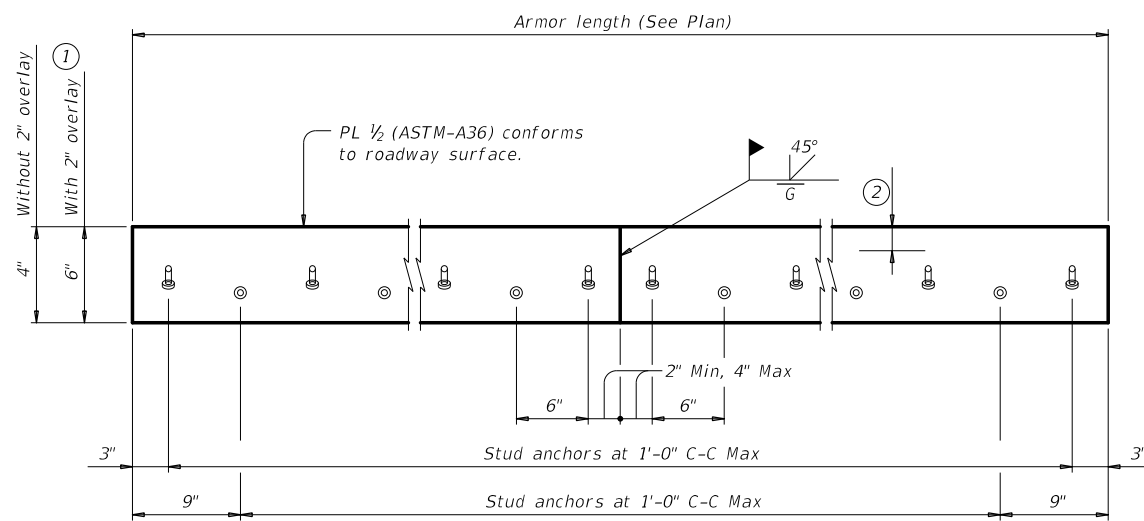
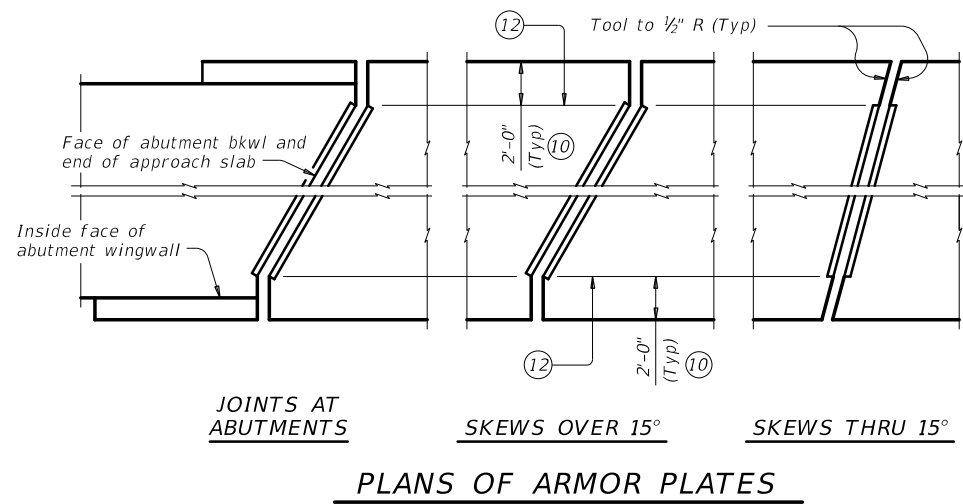
**HL93 LOADING**

				<b>Bridge Division Standard</b>	
<b>PRESTRESSED CONCRETE SLAB BEAM SPANS (TY SB12 OR SB15) 28' ROADWAY</b>					
<b>SPSB-28</b>					
FILE: pbsbte33-17.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT	
©TxDOT January 2017	CONT	SECT	JOB	HIGHWAY	
REVISIONS	0913	26	066	CR	
	DIST	COUNTY	SHEET NO.		
	YKM	COLORADO	43		

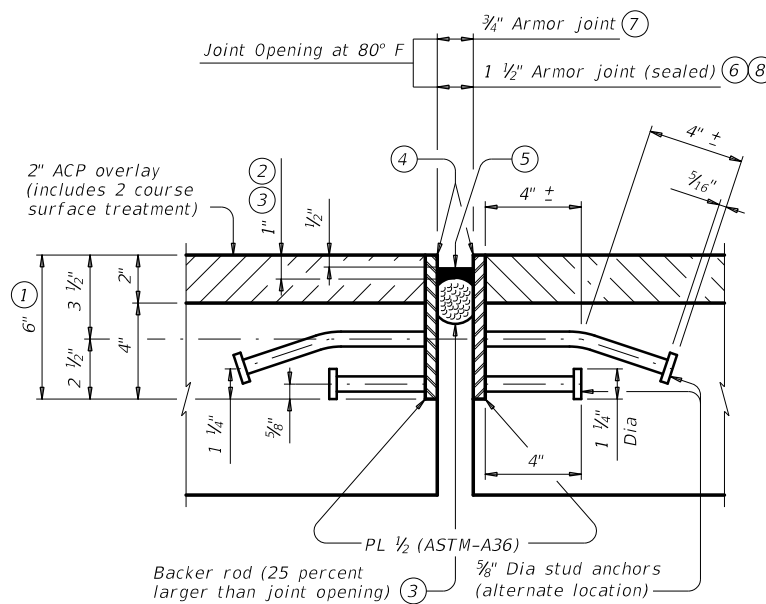
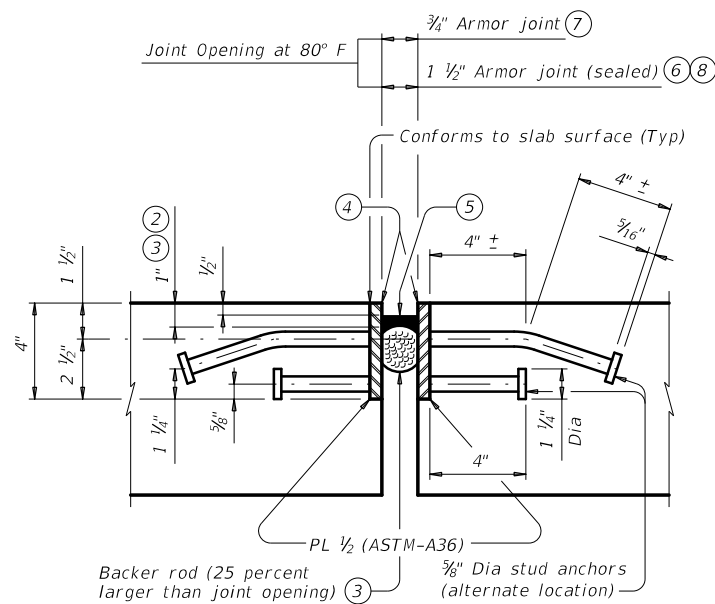


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- ① Adjust 6" plate height for overlay thicknesses other than the 2" shown. Adjust weight by 1.70 plf for each 1/2" variation in thickness.
- ② Do not paint top 1/2" of plate if using sealed armor joint.
- ③ Set top of backer rod 1" below top of armor plate. 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.
- ④ Blast clean entire contact area between sealant and plate (SSPC-SP10) before installing sealant. Light brush blast and thoroughly clean all dust and debris from concrete surfaces in contact with joint sealant before application of silicone seal.
- ⑤ Use Class 7 joint sealant that conforms to DMS-6310.
- ⑥ Place sealant while ambient temperature is between 55°F and 80°F and is rising.
- ⑦ Armor joint does not include joint sealant or backer rod.
- ⑧ Armor joint (sealed) includes Class 7 joint sealant and backer rod.
- ⑨ Form vertical leg of seal as per the Manufacturer's recommendations. Use Class 4 joint sealant if Class 7 cannot be installed correctly. Install according to Manufacturer's recommendations.
- ⑩ Unless shown otherwise, terminate armor plate at slab break point if break is more than 2'-0" from slab edge.
- ⑪ See "Plans of Armor Plates".
- ⑫ At Fabricator's option, armor plate may extend up to 6" beyond this point for skews through 15°.
- ⑬ Align shipping angle perpendicular to joint.



**FABRICATION NOTES:**

Match mark corresponding plate sections and secure together for shipment with shipping angle. Do not use erection bolts. Ship armor joints in convenient lengths of 10'-0" Min and 24'-0" Max unless necessary for stage 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. Use groove welds for all shop and field butt splices. Grind smooth areas in contact with seal. Make all necessary field splice joint preparations in the shop. Paint the entire steel section, except as stated in Note 2, with System II or IV primer in accordance with Item 446 "Field Cleaning and Painting Steel." Provide paints in accordance with Item 446.2. Prepare steel and apply paint in accordance with Items 446.4.7.3 and 446.4.7.4. Shop drawings for the fabrication of armor joints will not require the Engineer's approval if fabrication is in accordance with the details shown on this standard.

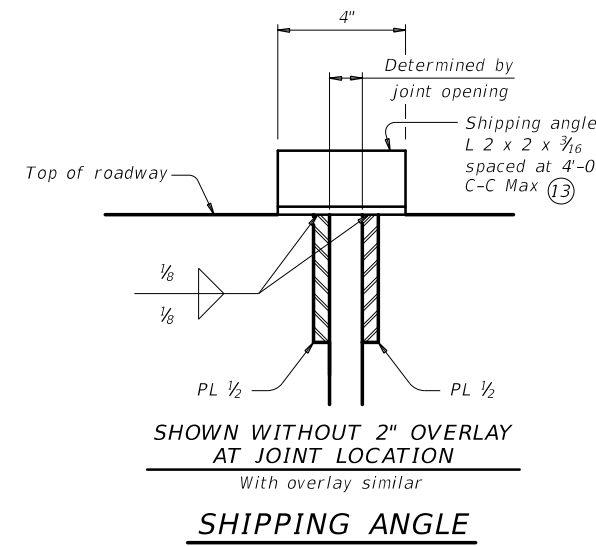
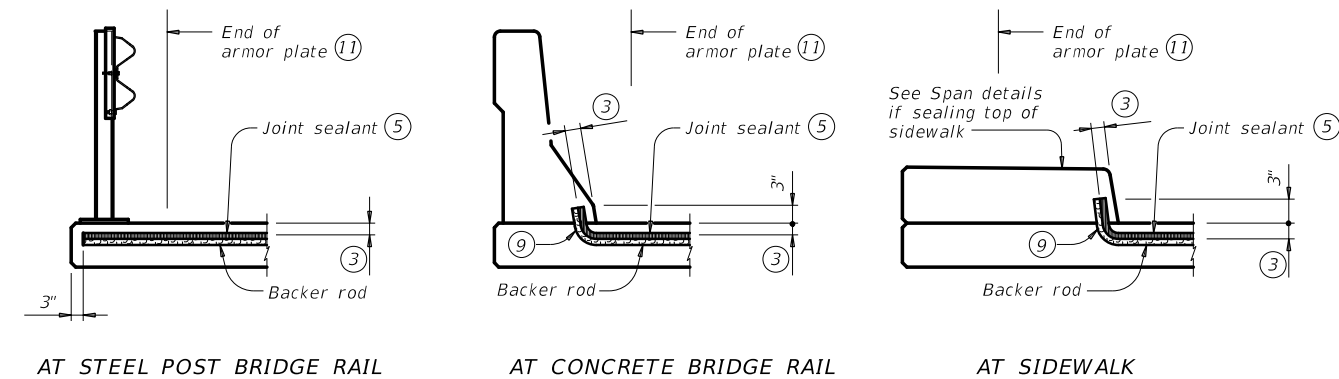
**CONSTRUCTION NOTES:**

Secure armor joints in position and place to 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 Armor Joint. Remove shipping angle immediately after each joint half is secured in place. Grind smooth, and touch up with organic zinc-rich paint.

**GENERAL NOTES:**

Provide armor joints at locations shown on the plans. Provide the seal when "Armor Joint (Sealed)" is noted on the plans. These joint details accommodate a joint movement range of 1 3/8" ( 3/4" opening movement and 5/8" closure movement). Payment for armor joint, with or without seal, is based on length of armor plate.

WEIGHTS FOR ONE ARMOR JOINT (2 PLATES)	
WITHOUT OVERLAY	16.10 plf
WITH 2" OVERLAY ①	22.90 plf



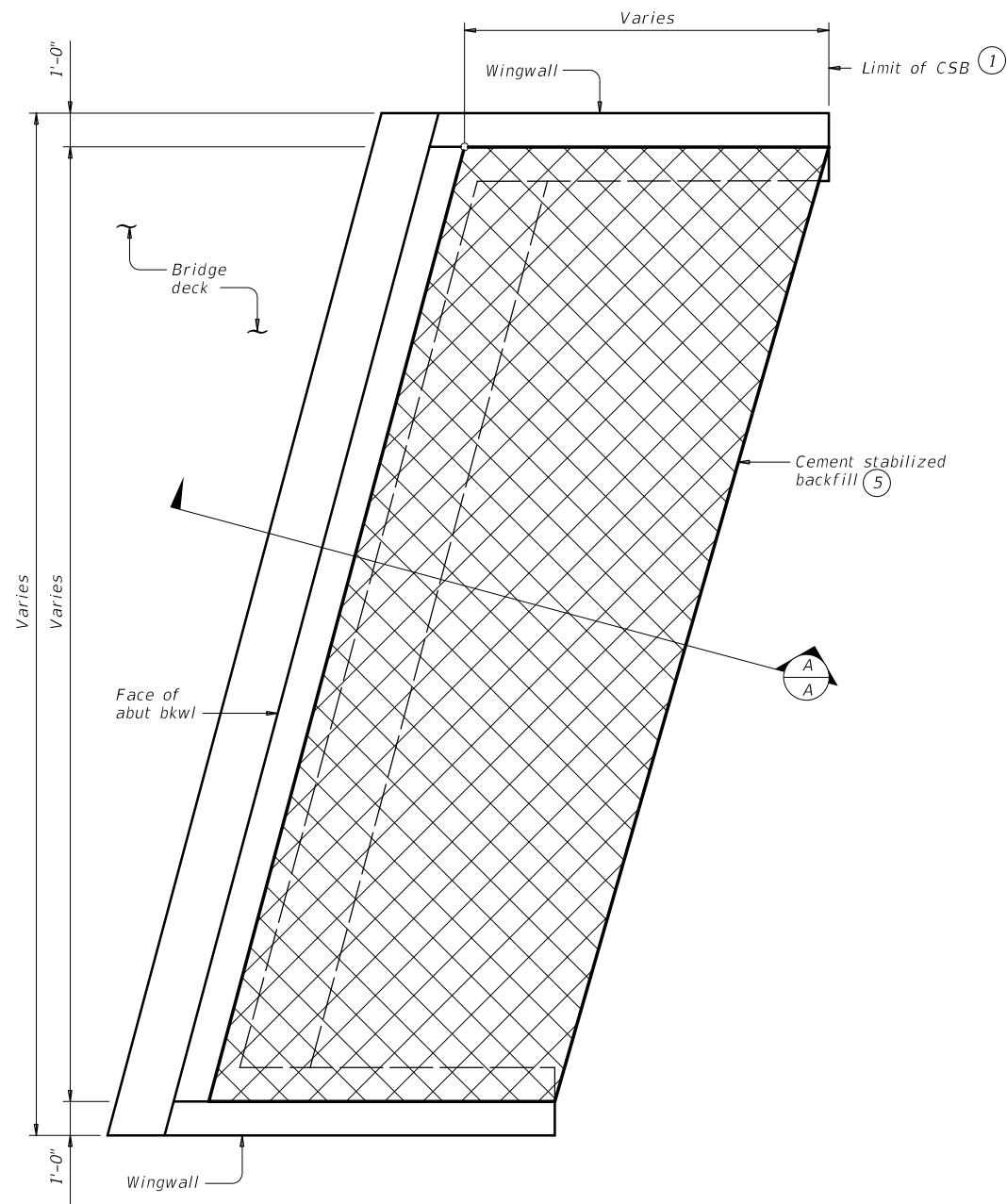
**Texas Department of Transportation** Bridge Division Standard

**ARMOR JOINT DETAILS**

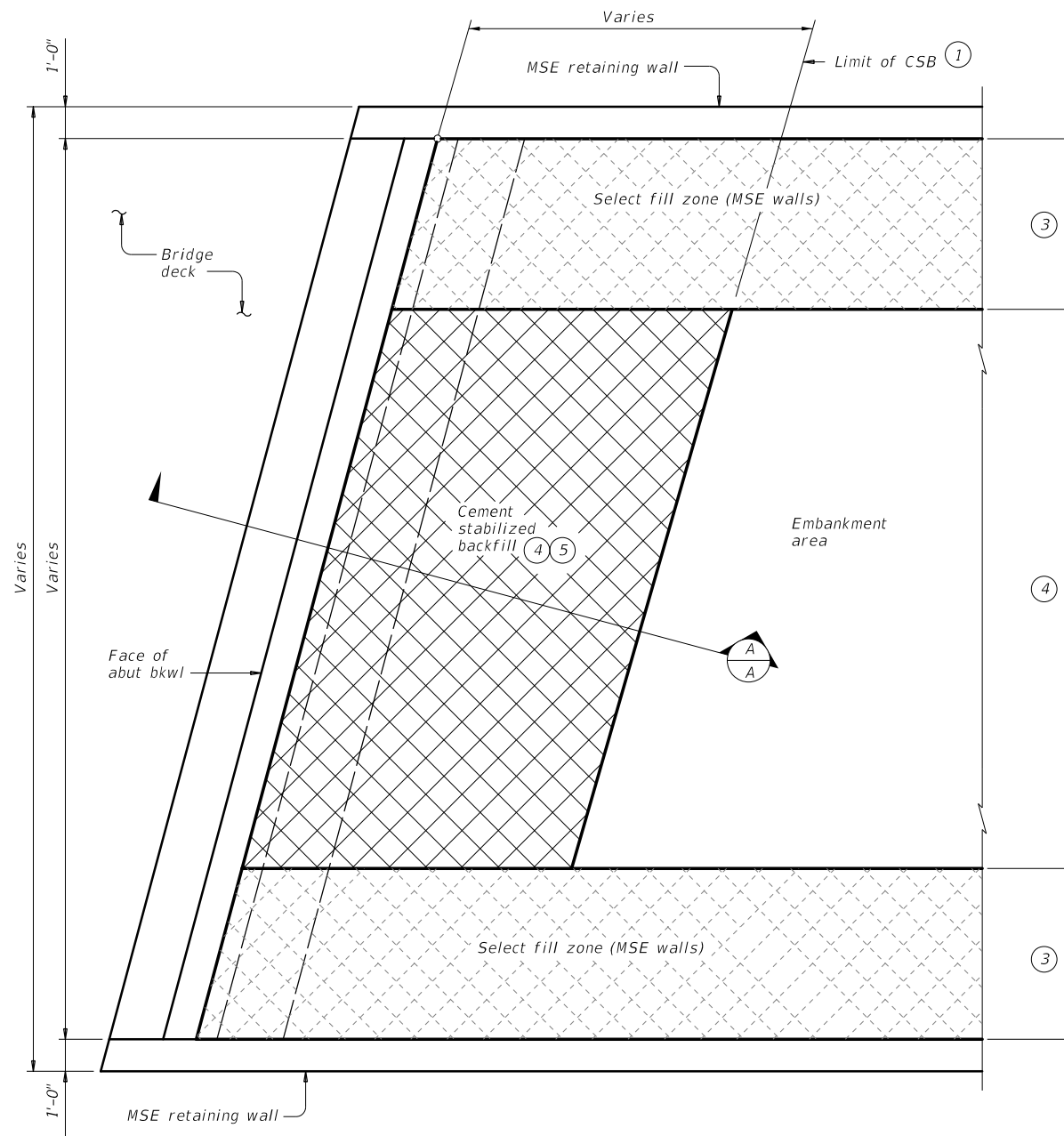
**AJ**

FILE: ajstd01-19.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0913	26	066	CR
	DIST	COUNTY	SHEET NO.	
	YKM	COLORADO	44	

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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 1 is intended for construction only requiring plasticity index (PI) controlled embankment fill or excavation in competent soils/rocks in order to construct the abutment. Option 2 is intended for new construction requiring high plasticity embankment fill with a PI greater than 30 or pavement built in poor native soil. Poor soils are defined as high plasticity clays or expansive clays.

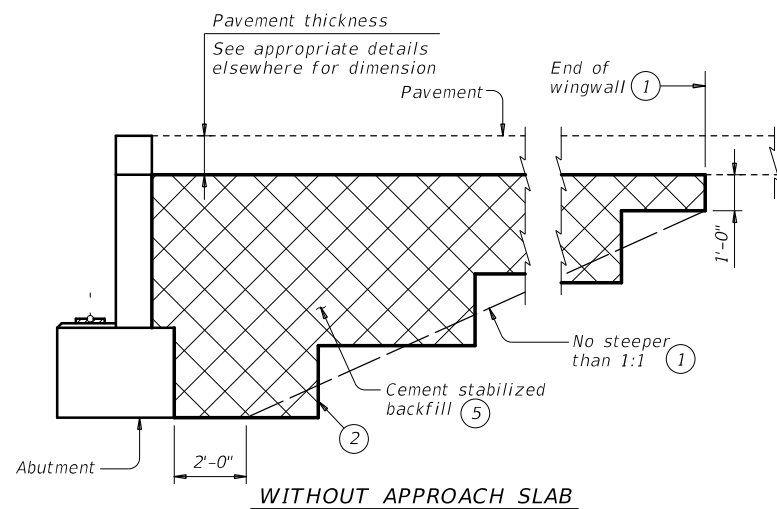
Construct abutment backfill in accordance with Item 400, "Excavation and Backfill for Structures".

Provide Cement Stabilized Backfill (CSB) meeting the requirements of Item 400, "Excavation and Backfill for Structures", to the limits shown at bridge abutments.

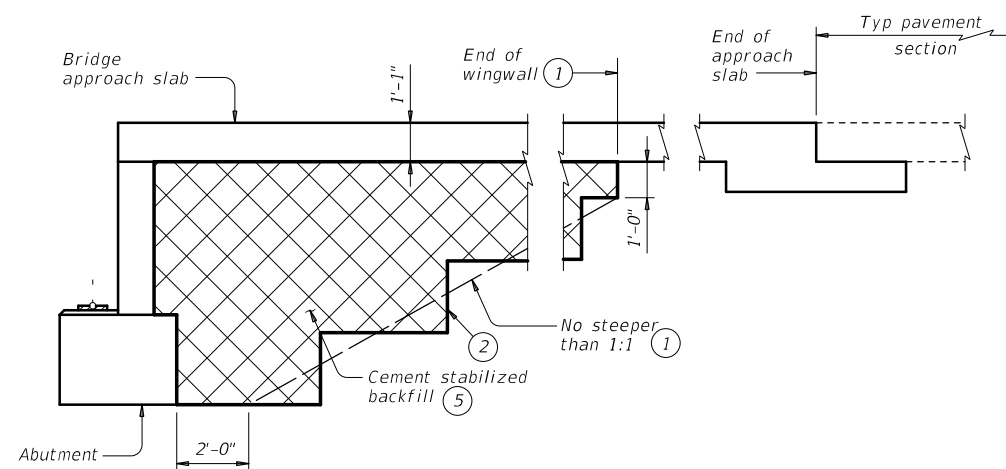
If required elsewhere in the plans, provide Flowable Backfill meeting the requirements of Item 401, "Flowable Backfill", to the limits shown at bridge abutments.

Details are drawn showing left forward skew. See Bridge Layout for actual skew direction.

These details do not apply when Concrete Block retaining walls are used in lieu of wingwalls.



**WITHOUT APPROACH SLAB**



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

**SECTION A-A**

SHEET 1 OF 2



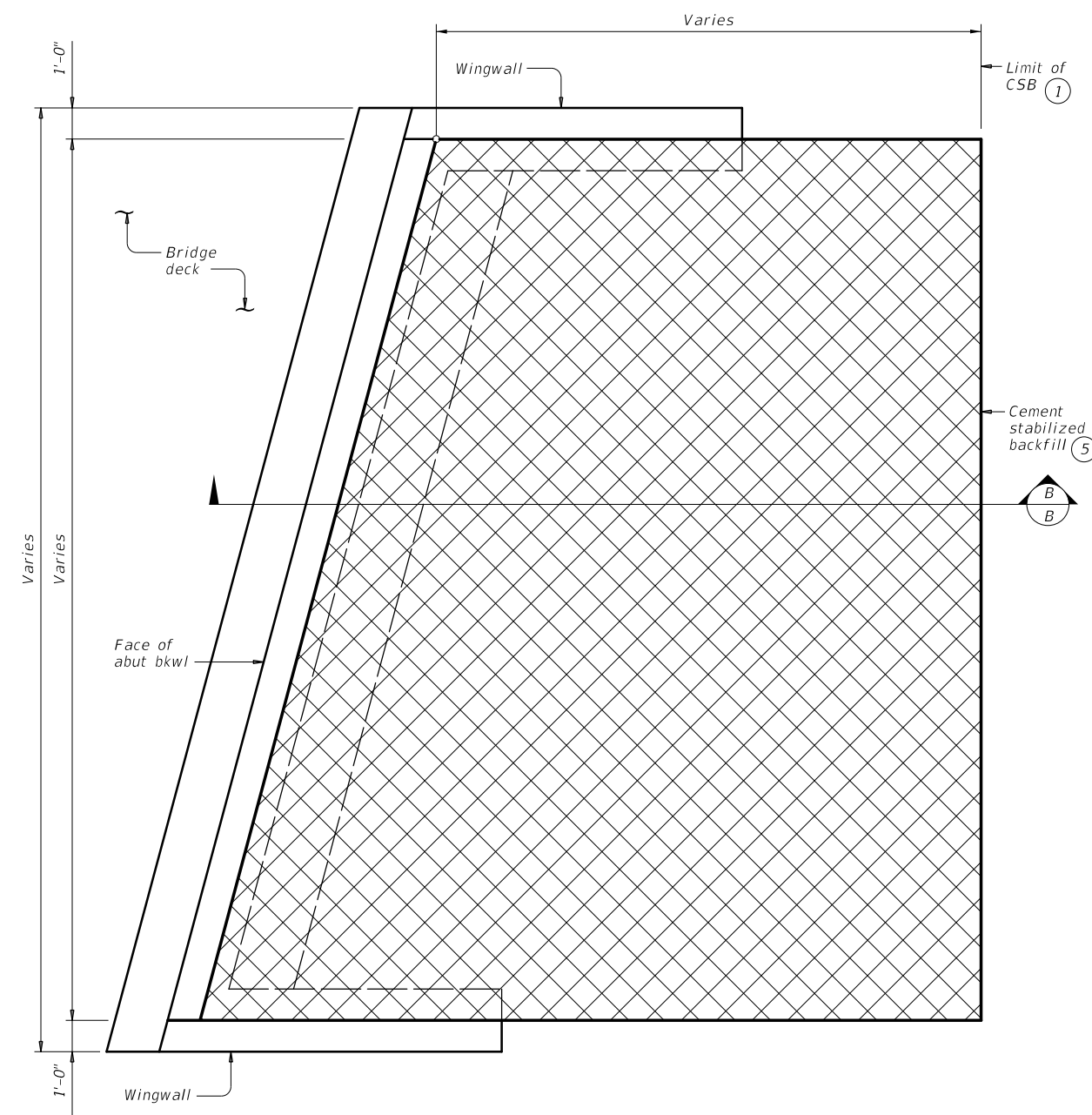
**CEMENT STABILIZED  
ABUTMENT BACKFILL  
BRIDGE ABUTMENT**

**CSAB**

FILE: MS-CSAB-23.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT April 2019	CONV	SECT	JOB	HIGHWAY
REVISIONS	0913	26	066	CR
02-20: Added Option 2. 03-23: Updated General Notes.	DIST	COUNTY	SHEET NO.	
	YKM	COLORADO	45	

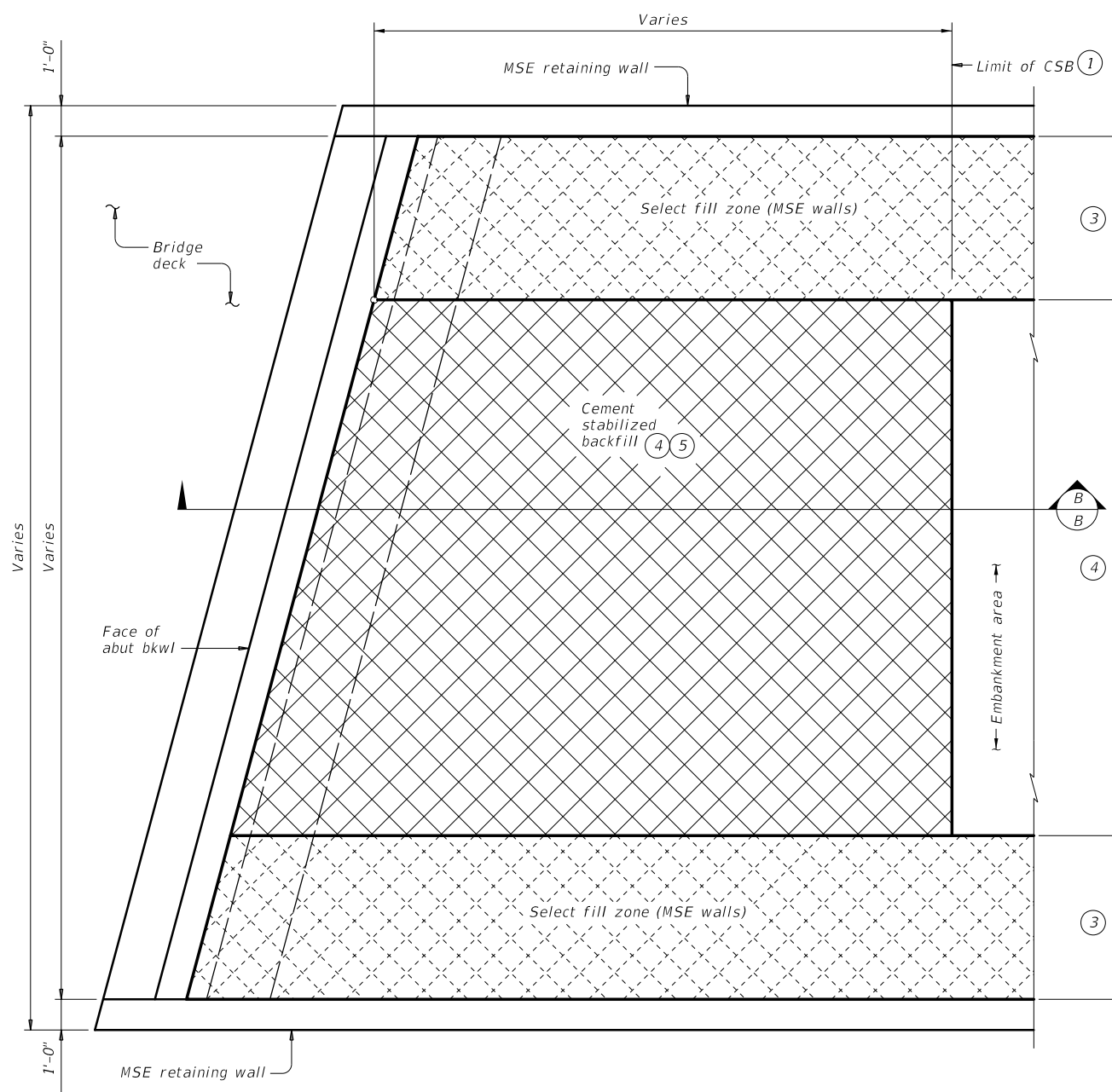
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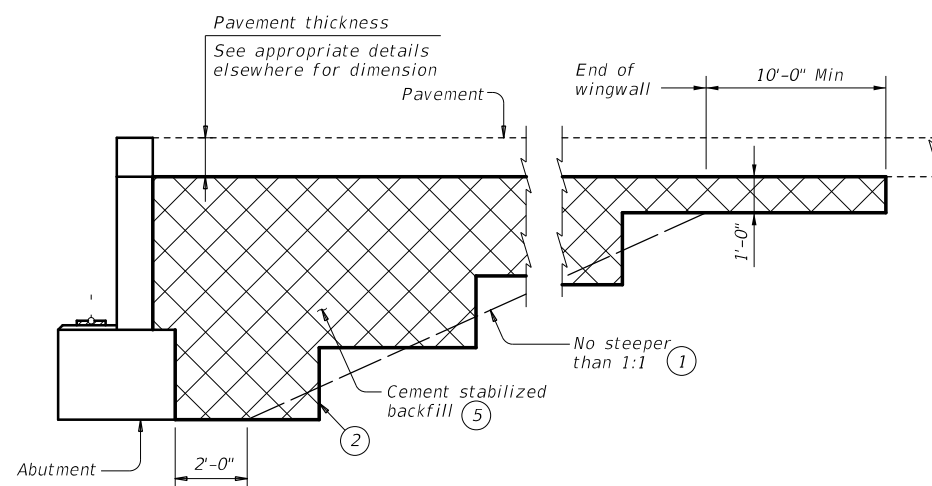
**OPTION 2 ~ PLAN WITH WINGWALLS**

Cast-in-place retaining walls similar.

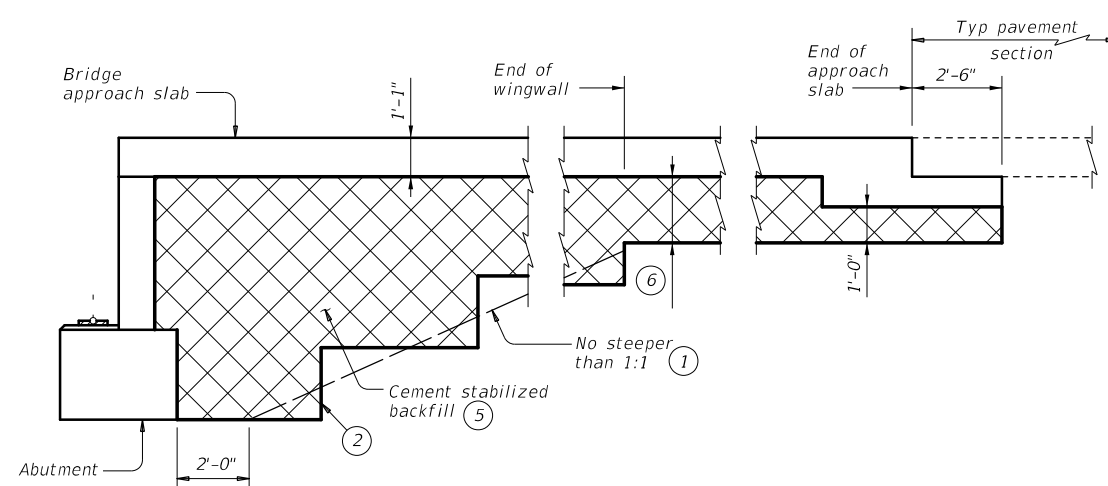


**OPTION 2 ~ PLAN WITH MSE RETAINING WALLS**

- ① Usual limit of Cement Stabilized Backfill is at end of wingwall. Extend CSB limits as required to maintain a slope no steeper than 1:1 at bottom of backfill.
- ② Bench backfill as shown with 12" (approximate) bench depths.
- ③ Where MSE retaining walls are present, adjust CSB limits to accommodate the select fill zone. See retaining wall details for additional information.
- ④ When distance between select fill zones is less than 5'-0", MSE select fill may be substituted for cement stabilized backfill with approval from the Engineer.
- ⑤ If shown in the plans, flowable backfill can be used as a substitute for cement stabilized backfill with the following constraints:
  - a). If flowable backfill is to be placed over MSE backfill, then a filter fabric will be placed over the MSE backfill prior to placement of the flowable fill; and
  - b). Place flowable fill in lifts not exceeding 2 feet in height. Place each successive lift when the previous lift has stiffened/hardened (i.e. has lost its flowability).
- ⑥ 1'-0" for BAS-A  
1'-10" for BAS-C



**WITHOUT APPROACH SLAB**



**SECTION B-B**

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

SHEET 2 OF 2



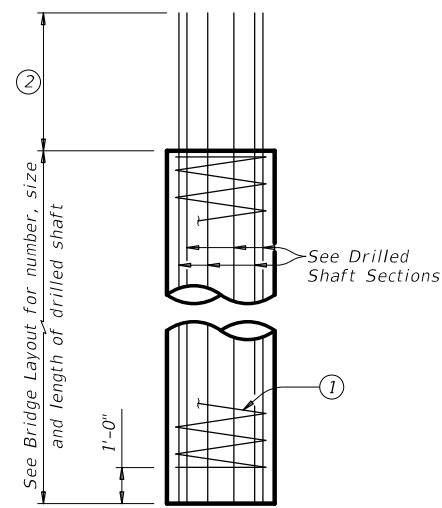
**CEMENT STABILIZED  
ABUTMENT BACKFILL  
BRIDGE ABUTMENT**

**CSAB**

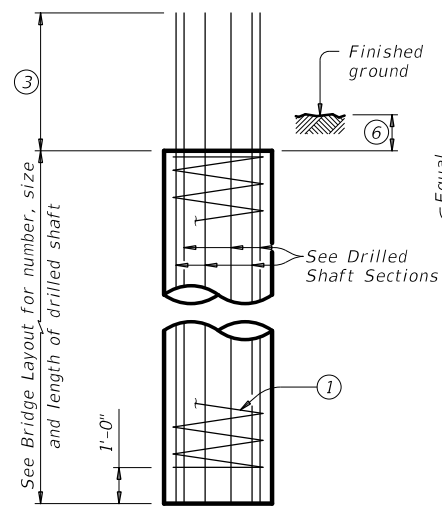
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©TxDOT April 2019	CONV	SECT	JOB	HIGHWAY
REVISIONS	0913	26	066	CR
02-20: Added Option 2. 03-23: Updated General Notes.	DIST	COUNTY	SHEET NO.	
	YKM	COLORADO	46	

DATE:  
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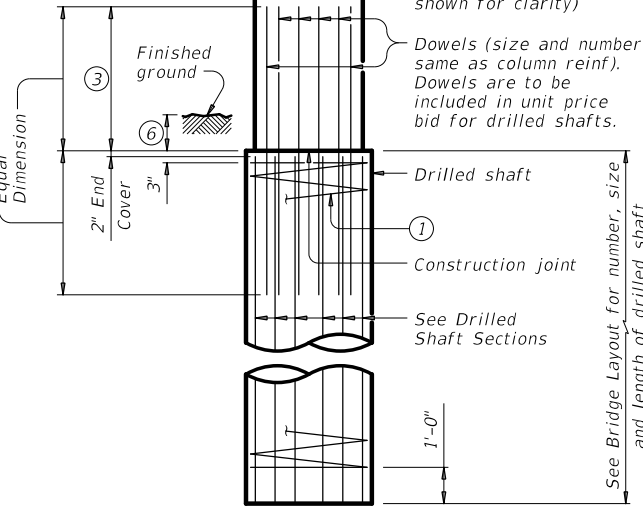
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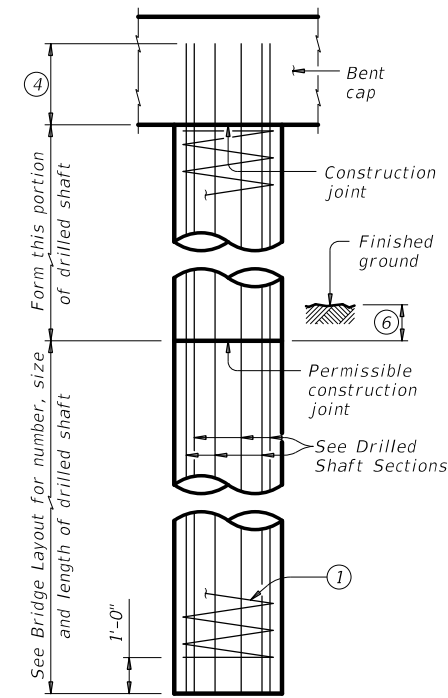
ABUTMENTS, WINGWALLS AND MULTI-DRILLED SHAFT FOOTINGS



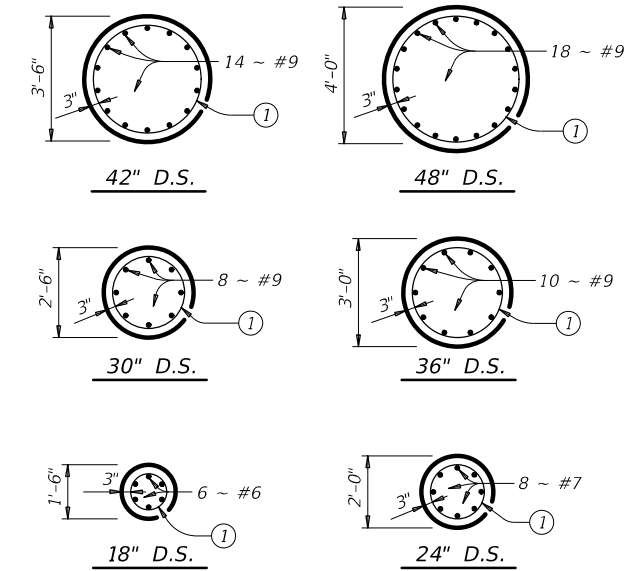
INTERIOR BENTS DRILLED SHAFT DIA EQUAL TO COLUMN DIA



INTERIOR BENTS DRILLED SHAFT DIA GREATER THAN COLUMN DIA



OPTIONAL INTERIOR BENT DRILLED SHAFT DETAIL ⑤



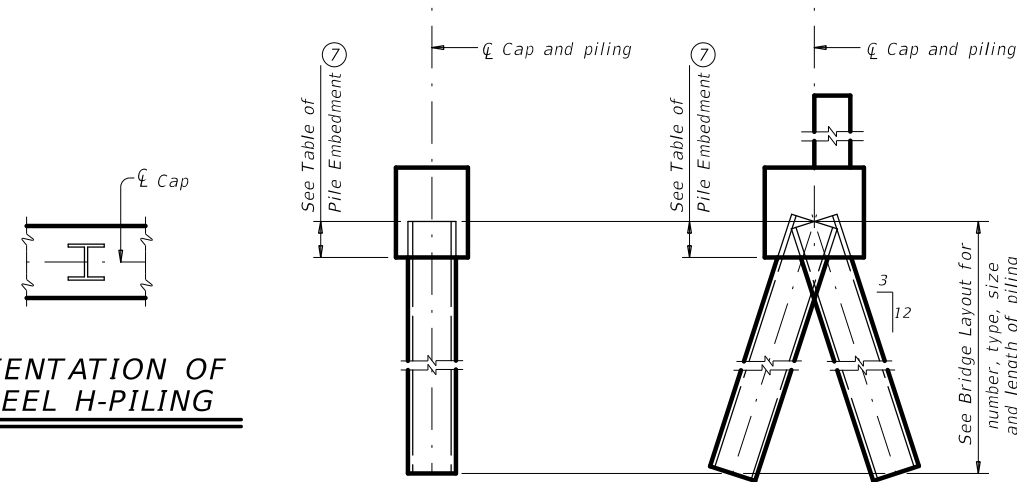
DRILLED SHAFT SECTIONS

**DRILLED SHAFT DETAILS**

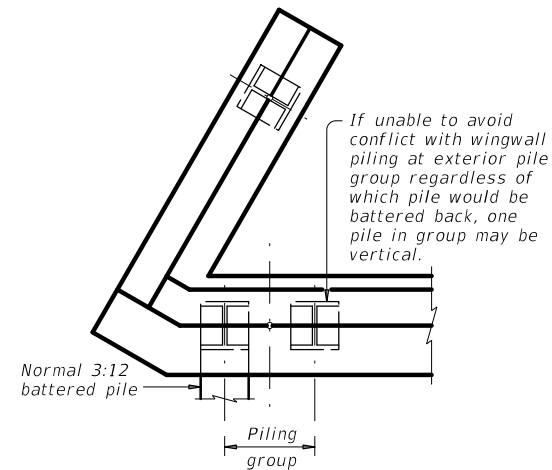
TABLE OF PILE EMBEDMENT	
Pile Type	Embedment Depth (Ft)
16" Sq Concrete 18" Sq Concrete HP14 Steel HP16 Steel	1'-0"
20" Sq Concrete 24" Sq Concrete HP18 Steel	1'-6"

See Prestressed Concrete Piling (CP) standard for additional details on concrete pile embedment.

**ORIENTATION OF STEEL H-PIILING**



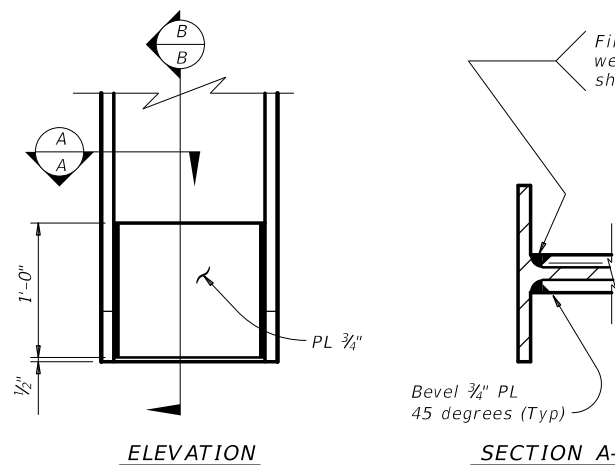
**PILING DETAILS**  
(Concrete or steel H)



**DETAIL "A"**

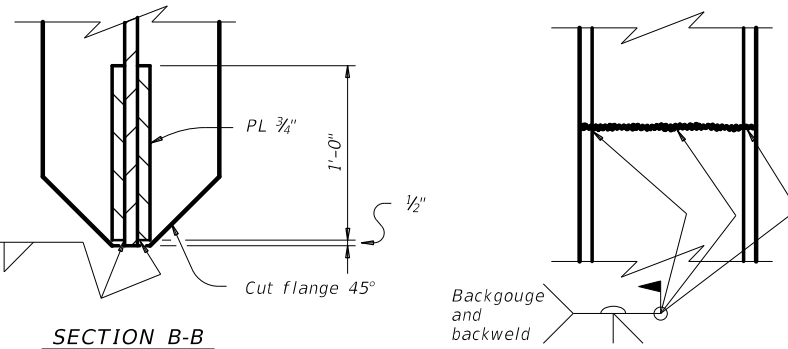
(Showing plan view of a 30° skewed abutment)

- ① #3 spiral at 6" pitch (one and a half flat turns top and bottom).
- ② Min extension into supported element:  
#6 Bars = 1'-11"  
#7 Bars = 2'-0"  
#9 Bars = 2'-3"
- ③ Min lap with column reinf:  
#7 Bars = 2'-11"  
#9 Bars = 3'-9"  
#11 Bars = 4'-8"
- ④ Min extension into supported element:  
#6 Bars = 1'-11"  
#7 Bars = 2'-3"  
#9 Bars = 2'-9"
- ⑤ Drilled shafts may extend to the bottom of bent caps for "H" heights of 6 ft and less (as shown on the Bridge Layout), if approved. This option can only be used when the drilled shaft diameter equals the column diameter. Obtain approval of the forming method above the ground line prior to construction. No adjustments in payment will be made if this option is used.
- ⑥ 1'-0" Min, unless shown otherwise on plans.
- ⑦ Or as shown on plans.



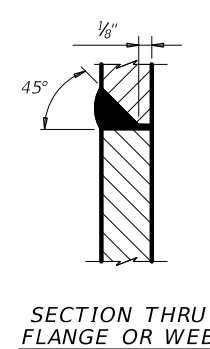
**STEEL H-PILE TIP REINFORCEMENT**

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.



**SECTION THRU FLANGE OR WEB**

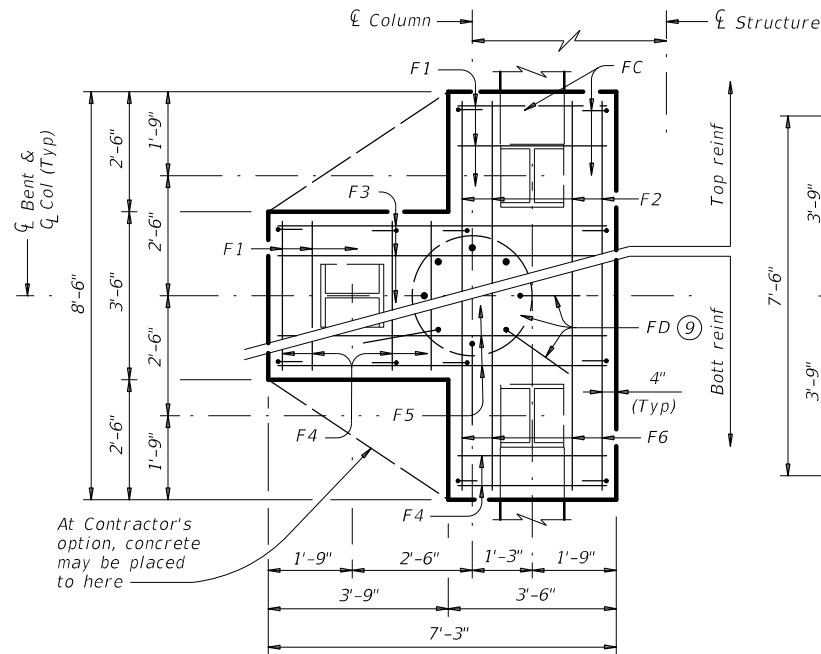
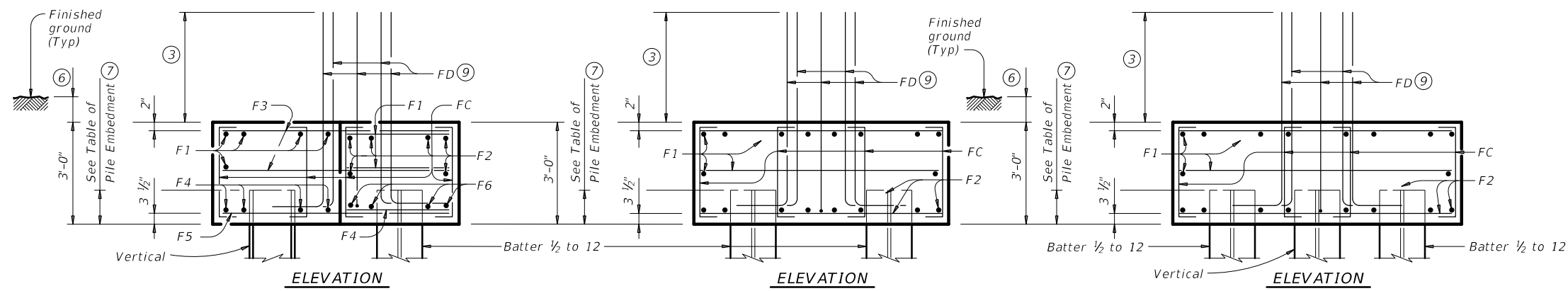
SHEET 1 OF 2

		<b>Bridge Division Standard</b>	
<b>COMMON FOUNDATION DETAILS</b>			
<b>FD</b>			
FILE: fdstoe01-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT
©TxDOT April 2019	CONTRACT	SECTION	HIGHWAY
REVISIONS	0913	26	066
01-20: Added #11 bars to the FD bars.	DIST	COUNTY	SHEET NO.
	YKM	COLORADO	47

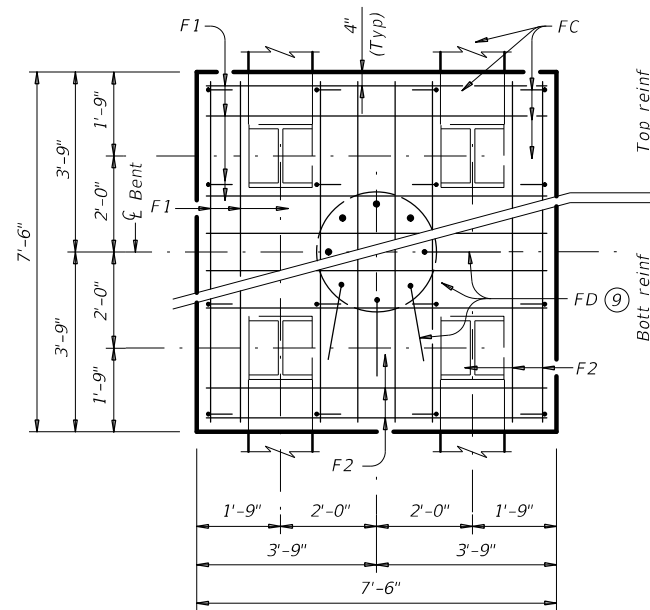
DATE: FILE:

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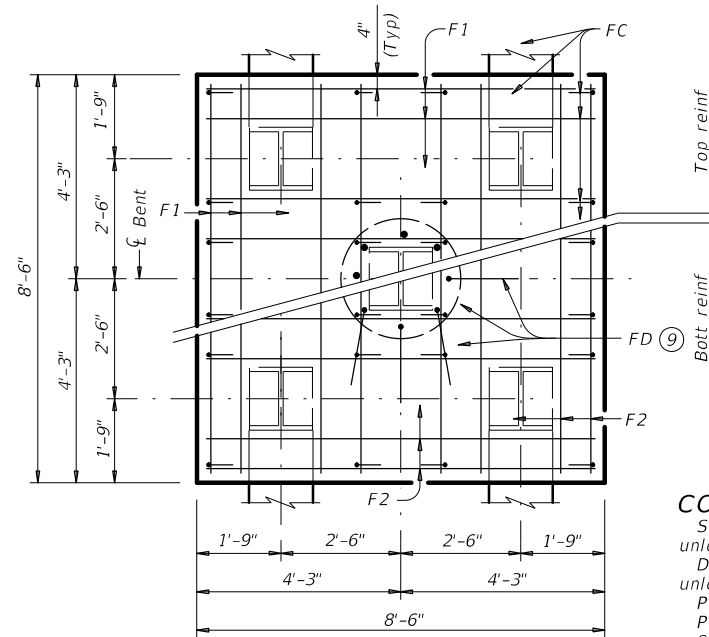
DATE: FILE:



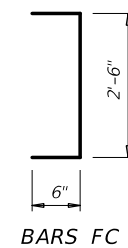
**THREE PILE FOOTING**<sup>⑧</sup>  
For 36" Dia and smaller columns.



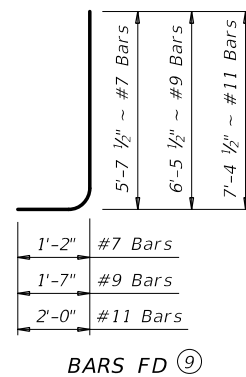
**FOUR PILE FOOTING**<sup>⑧</sup>  
For 42" Dia and smaller columns.



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



**BARS FC**



**BARS FD**<sup>⑨</sup>

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

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

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

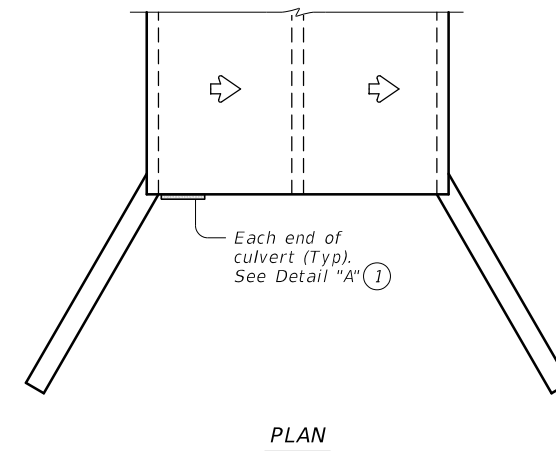
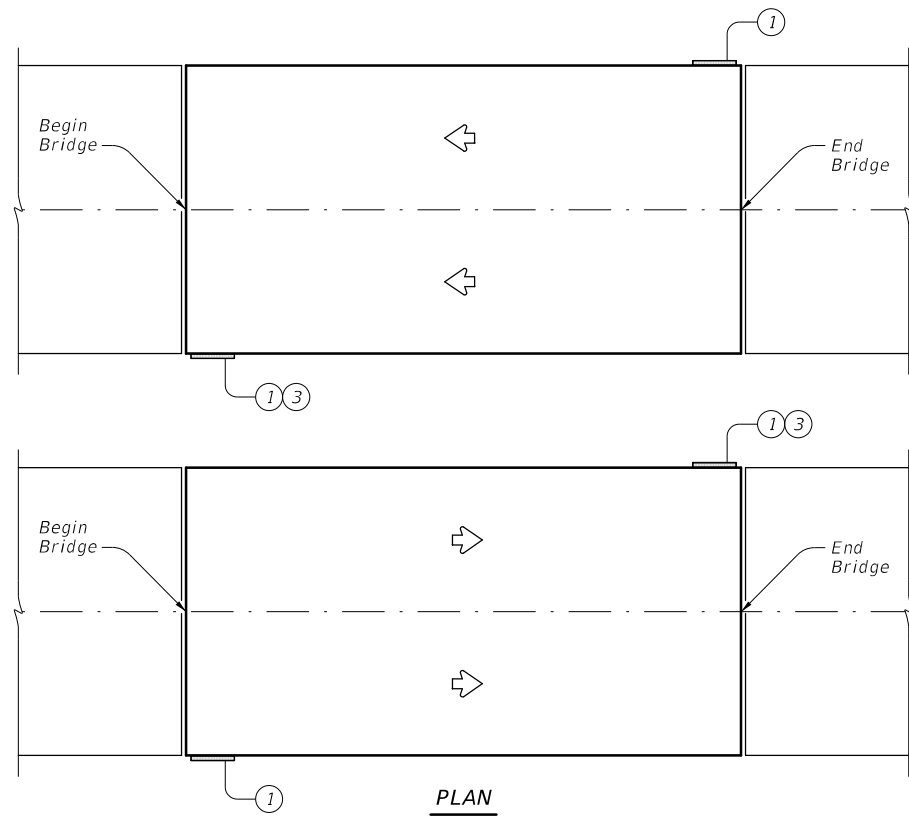
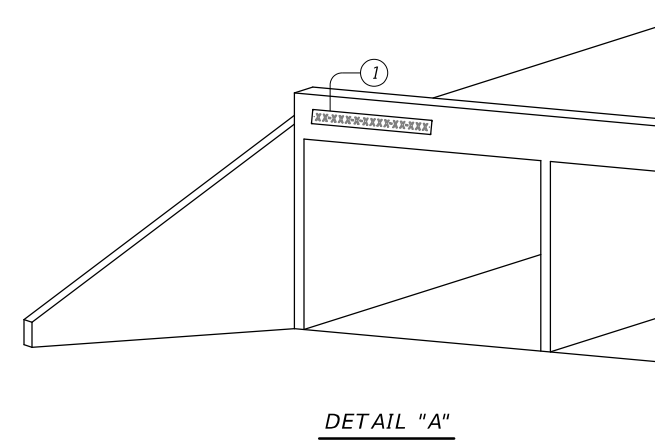
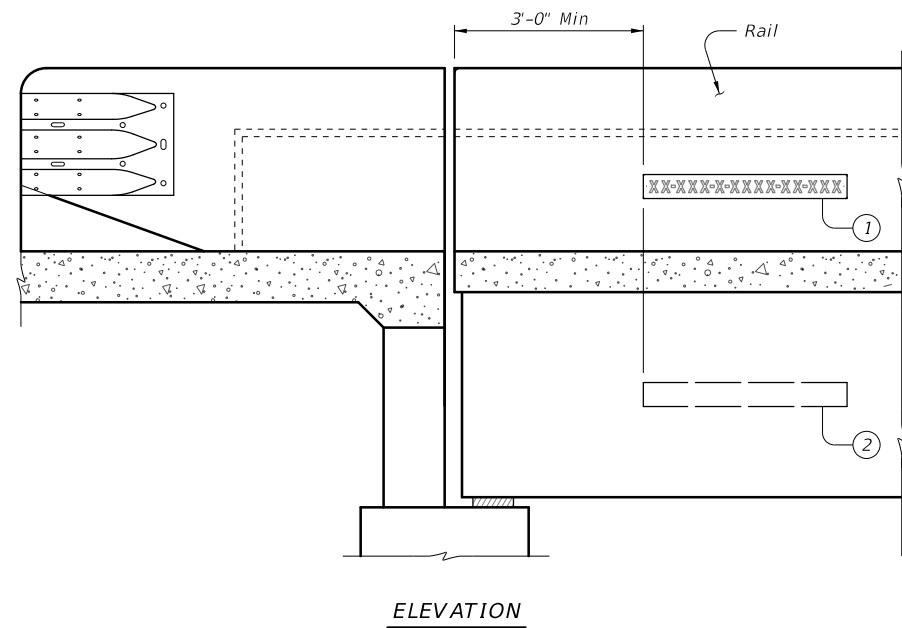
Do not use the drilled shaft details shown on this standard for retaining wall, noise wall, barrier, or sign foundations without structural evaluation.  
 Do not use the footings shown on this standard in direct contact with salt water or exposed to salt water spray.  
 Maximum allowable pile loads for 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

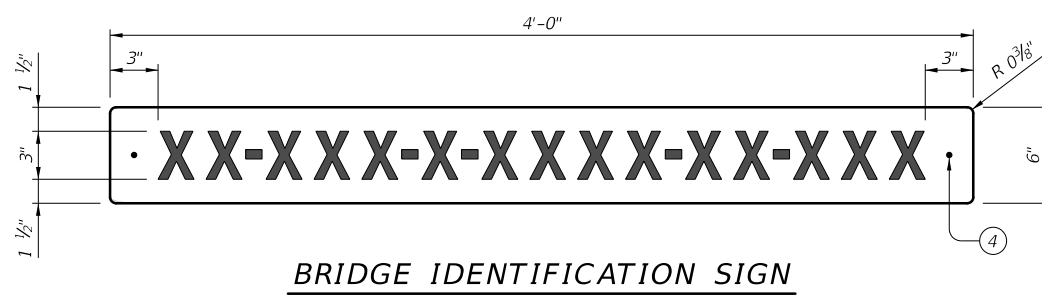
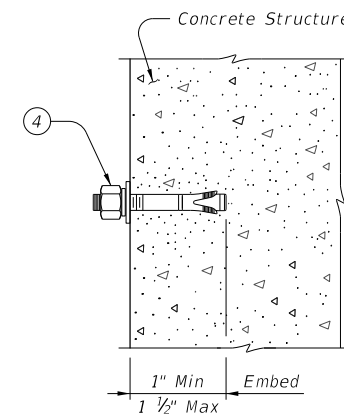
				<b>Bridge Division Standard</b>	
<b>COMMON FOUNDATION DETAILS</b>					
<b>FD</b>					
FILE: fdstoe01-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CR: TxDOT	
©TxDOT April 2019	CONTRACT	SECTION	JOB	HIGHWAY	
01-20: Added #11 bars to the FD bars.	0913	26	066		CR
	DIST	COUNTY	SHEET NO.		
	YKM	COLORADO	48		

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DATE:  
FILE:



**BRIDGE CLASS CULVERT SIGN PLACEMENT**



**SHEETING REQUIREMENTS**

Usage	Color	Sign Face Material
Background	White	Type B or C Sheeting
Letters and Symbols	Black	Type B or C Sheeting

- ① Bridge identification sign location
- ② Alternate sign placement location for exterior concrete beams.
- ③ If adjacent bridges are less than 2 feet apart, these signs may be omitted.
- ④ 1/4" Diameter stainless steel expansion anchor with hex nut, washer, and spring-lock washer.

**SIGN NOTES:**

Standard sign designs can be found in the Standard Highway Sign Designs for Texas (SHSD).

Use the Clearview Alphabet CV-2W for the letters and symbols.

**MATERIAL NOTES:**

Provide lateral spacing between letters and numerals conforming with the SHSD, and any approved changes thereto. Provide a balanced appearance when spacing is not shown.

Provide aluminum sign blanks with a minimum thickness of 0.080" that meet the requirements of DMS-7110.

Provide sign face materials that meet the requirements of DMS-8300 and the sheeting requirements shown in the table.

Provide 1/4" diameter stainless steel expansion anchors with one hex head nut, one flat washer, and one helical spring-lock washer each.

Use torque controlled mechanical expansion anchors that are approved for use in cracked concrete by the International Code Council, Evaluation Service (ICC-ES). Provide anchor products that have a designated ICC-ES Evaluation Report number. The approval status must be maintained on the ICC-ES website under Division 031600 for Concrete Anchors.

Unless otherwise approved by the Engineer: do not use adhesive anchors; do not use expansion anchors that are not included in the ICC-ES approval list; and do not use expansion anchors that are only approved for use in uncracked concrete.

Use anchors manufactured with stainless steel expansion wedges. Anchors manufactured with carbon steel expansion wedges are not allowed. Anchor bodies can be either zinc-plated carbon steel or stainless steel. For application in marine environments, provide both stainless steel anchor bodies and expansion wedges.

**GENERAL NOTES:**

Prior to hole drilling, locate rebar to ensure clearing of existing reinforcement and/or strands.

Prior to installation, obtain approval of sign locations from the Engineer. Avoid placement of sign over travel lanes and pedestrian walkways. Submit proposed installation method to Engineer prior to beginning work. Install anchors as shown on plans and in accordance with the anchor manufacturer's published installation instructions.

Do not install anchors sections of members under tension.

For new construction, the signs and anchors are subsidiary to the bridge. For installations on existing structures, the signs and anchors are paid under Item 442, "Metal for Structures." Each sign weighs 28 lbs.

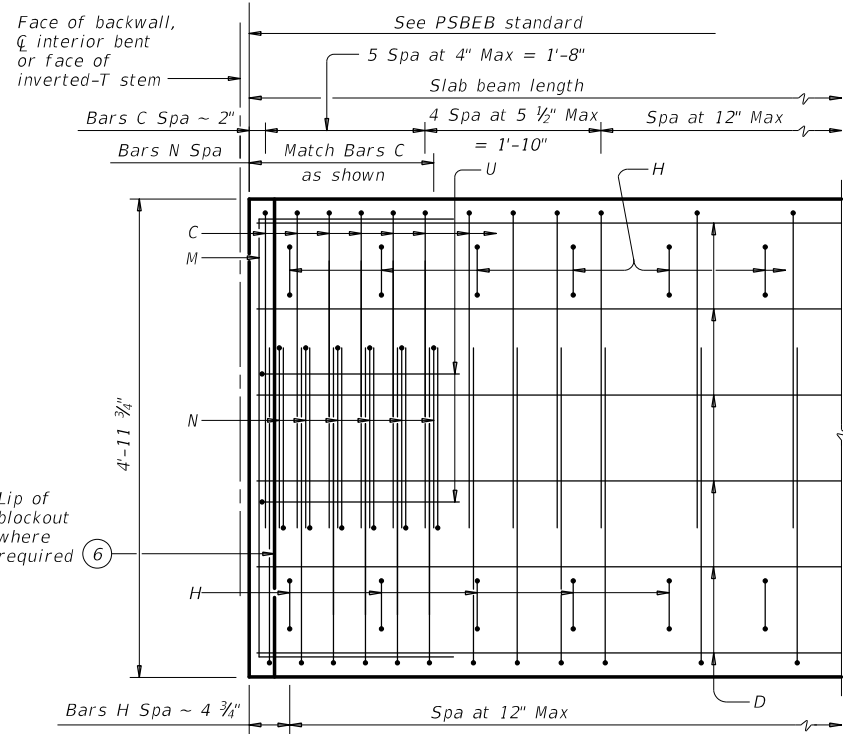


**NBI  
BRIDGE IDENTIFICATION  
SIGN STANDARD**

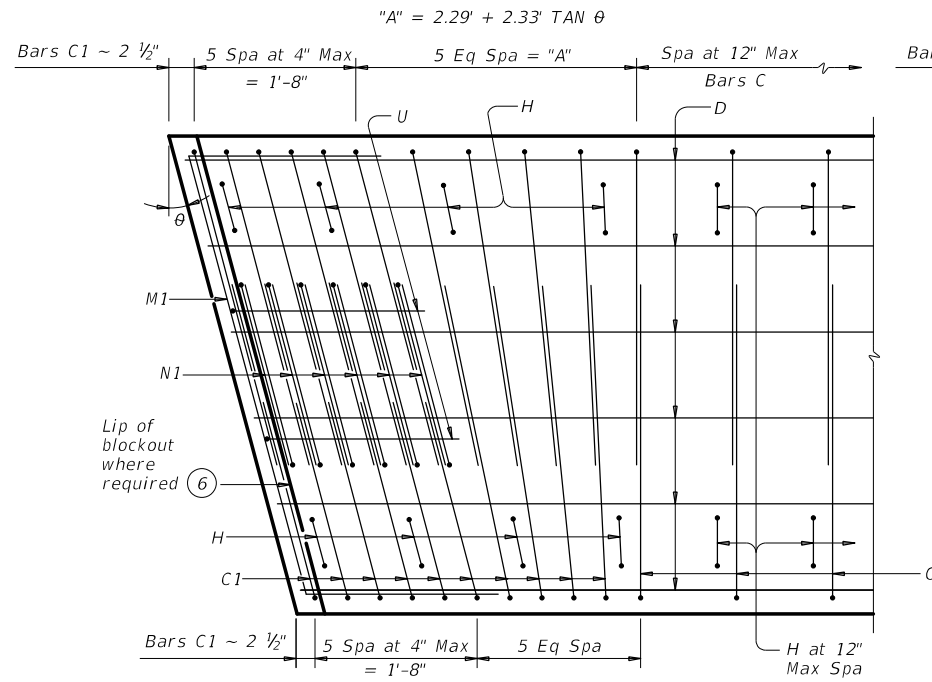
**NBIS**

FILE: MS-NBIS-23.dgn	DN: TAR	CK: TxDOT	DW: JER	CK: TAR
©TxDOT March 2023	CONT	SECT	JOB	HIGHWAY
REVISIONS	0913	26	066	CR
	DIST	COUNTY	SHEET NO.	
	YKM	COLORADO	49	

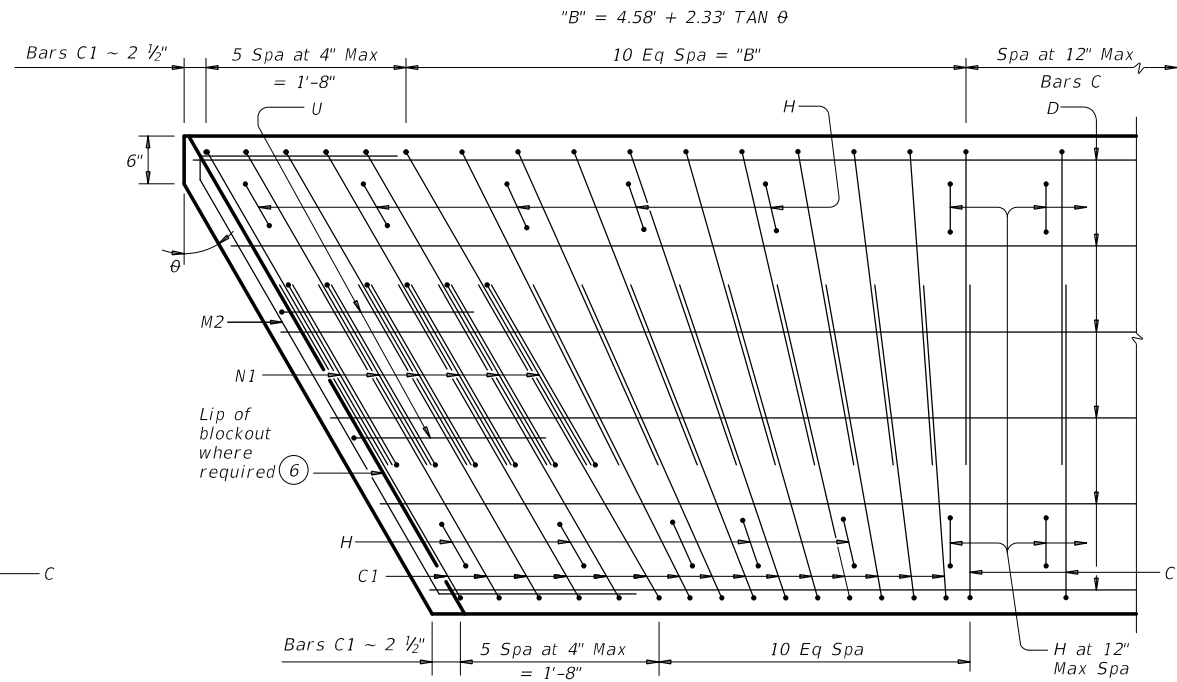
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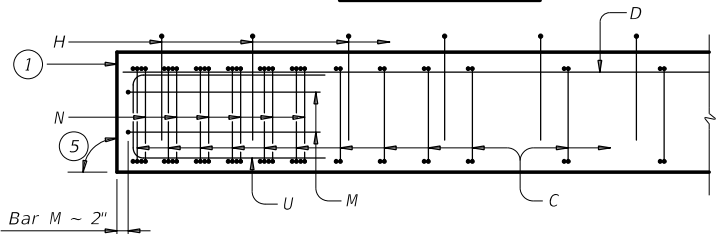
**PART PLAN**



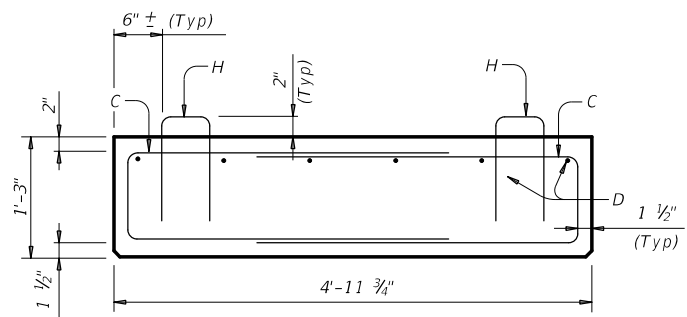
**PART SKEW PLAN**  
(Showing θ over 0° to 15° skew)



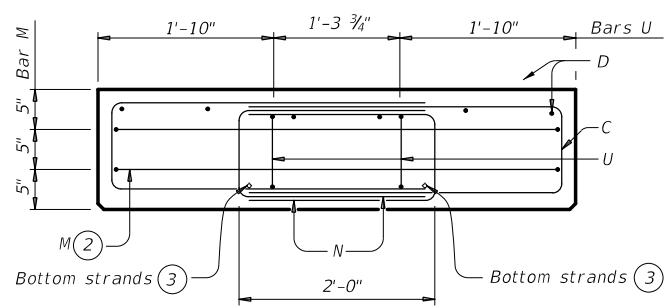
**PART SKEW PLAN**  
(Showing θ over 15° to 30° skew)



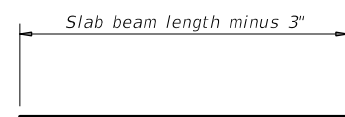
**ELEVATION**



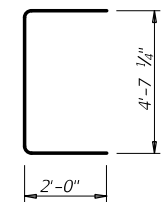
**SECTION**



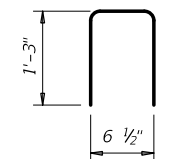
**END MAT REINFORCING**  
Bars H not shown for clarity.



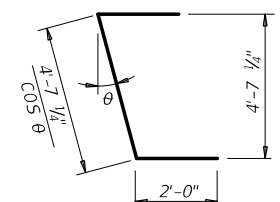
**BARS D(#6)**



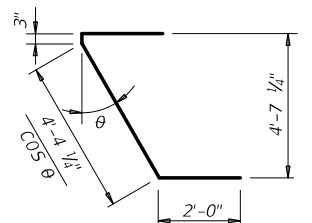
**BARS M(#4)**



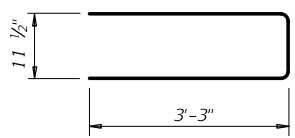
**BARS H(#4)**



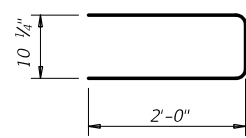
**BARS M1(#4)**



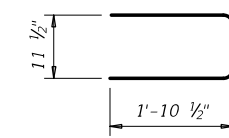
**BARS M2(#4)**



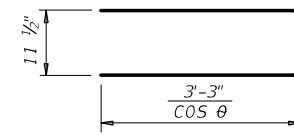
**BARS C(#4)**



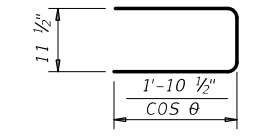
**BARS U(#5)**



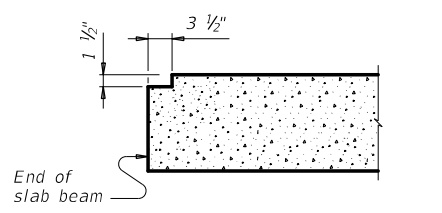
**BARS N(#4)**



**BARS C1(#4)**



**BARS N1(#4)**



**ELEVATION OF BLOCKOUT**

BEAM PROPERTIES		
Area	in <sup>2</sup>	896.2
Y top	in	7.50
Y bott	in	7.50
I	in <sup>4</sup>	16,805
Weight	lb/ft	934

**GENERAL NOTES:**  
 Designed according to AASHTO LRFD Bridge Design Specifications.  
 Provide Class H concrete. Provide Class H (HPC) if shown elsewhere in the plans.  
 Provide Grade 60 reinforcing steel.  
 An equal area of welded wire reinforcement (WWR) (ASTM 1064) may be substituted for bars C and D if approved by the Engineer.  
 These details can be used for any skew angle up to a maximum of 30 degrees.  
 Chamfer all exposed corners 3/4" or round to a 3/4" radius.  
 Details are drawn showing right forward skew. See Bridge Layout for actual direction.

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

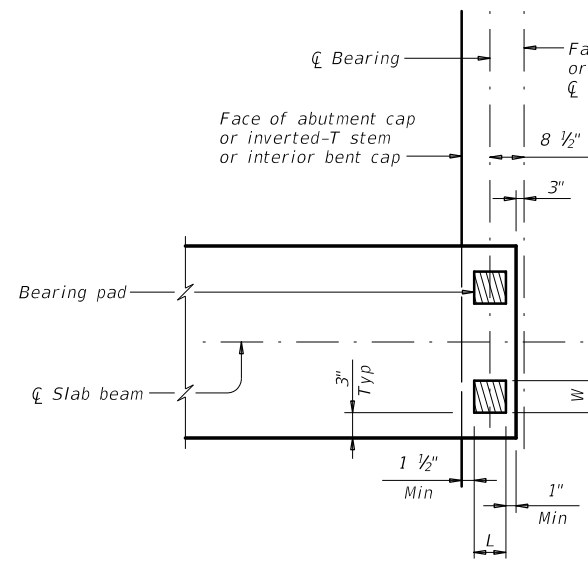
- ① See End Mat Reinforcing detail.
- ② Adjust bars M vertically to avoid strands.
- ③ See sheet PSBND or PSBSD for strand locations.
- ④ Assumes 150 pcf weight density of concrete.
- ⑤ 90° at conventional interior bents. End of beam must be vertical at abutment backwall and inverted-T stem.
- ⑥ Blockout required at armor joint (AJ) and sealed expansion joint (SEJ) locations to accommodate joint anchorage.

HL93 LOADING

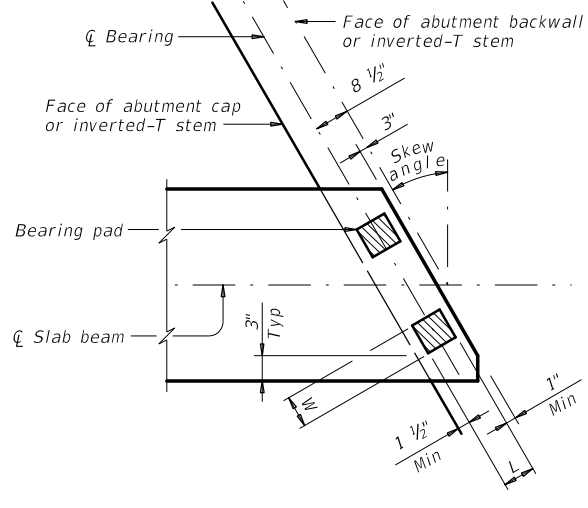
		<b>Bridge Division Standard</b>	
<b>PRESTRESSED CONCRETE SLAB BEAM DETAILS</b> (TYPE 5SB15)			
<b>PSB-5SB15</b>			
FILE: psbsts04-17.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT
REV: 0913	SECT: 26	JOB: 066	HIGHWAY: CR
DIST: YKM	COUNTY: COLORADO	SHEET NO. 50	

DATE: FILE:

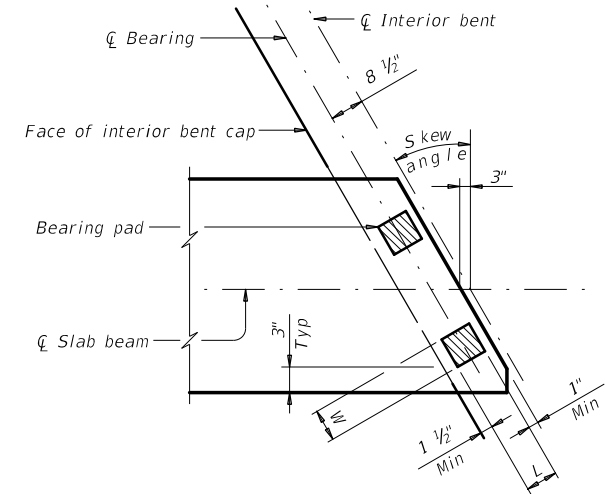
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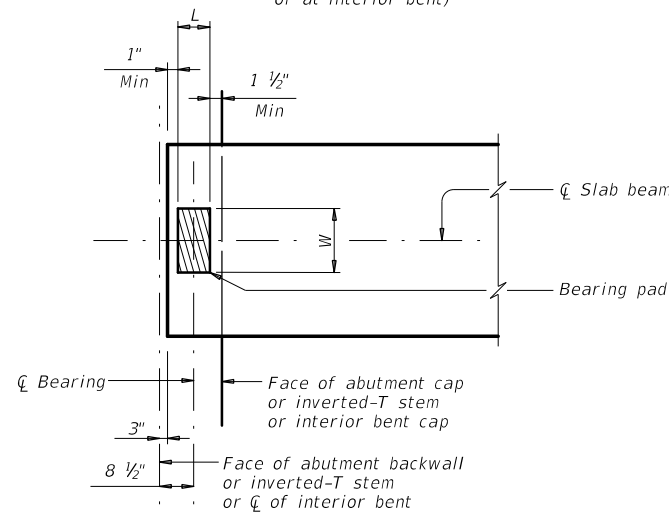
**TWO-PAD DETAIL PLAN**  
(At abutment or inverted-T cap or at interior bent)



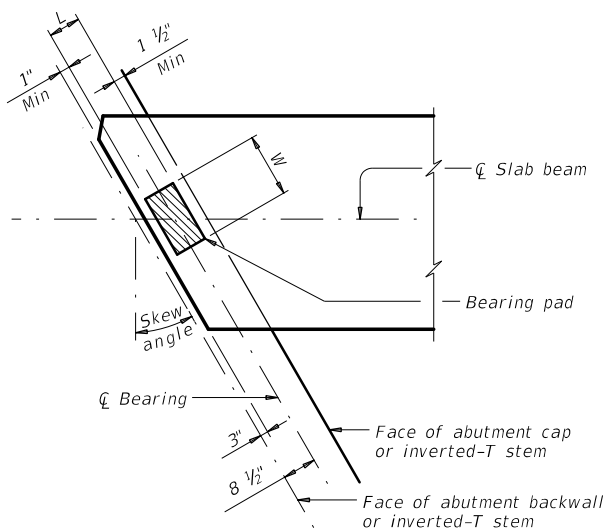
**TWO-PAD DETAIL SKEW PLAN**  
(At abutment or inverted-T cap)



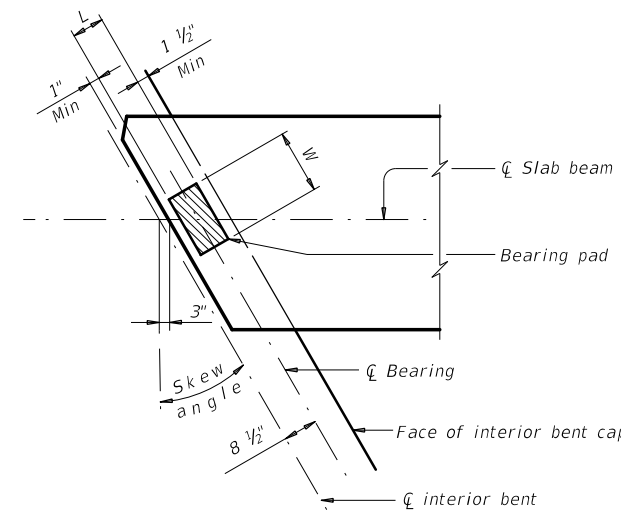
**TWO-PAD DETAIL SKEW PLAN**  
(At interior bent)



**ONE-PAD DETAIL PLAN**  
(At abutment or inverted-T cap or at interior bent)



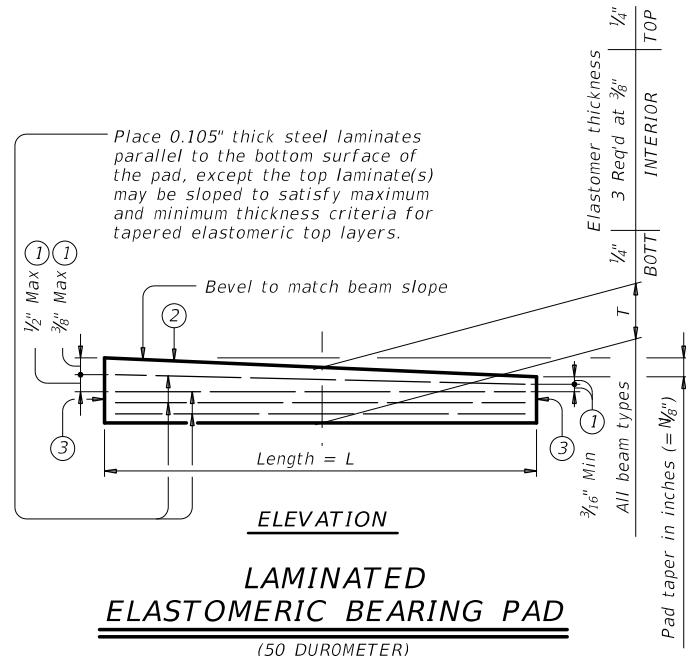
**ONE-PAD DETAIL SKEW PLAN**  
(At abutment or inverted-T cap)



**ONE-PAD DETAIL SKEW PLAN**  
(At interior bent)

**ELASTOMERIC BEARING PAD PLACEMENT AND BEAM END DIAGRAMS**

Place one bearing pad at forward station beam end.  
Place two bearing pads at back station beam end.



**LAMINATED ELASTOMERIC BEARING PAD**  
(50 DUROMETER)

- Maximum and minimum layer thicknesses shown are for elastomer only, on tapered layers.
- 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 beam slope by more than  $(\frac{0.0625}{\text{Length}})$  IN/IN.
- Locate permanent mark here.

**TABLE OF BEARING PAD DIMENSIONS (ALL PRESTR CONC SLAB BM TYPES)**

One-Pad (Ty SB1-"N") (2)			Two-Pad (Ty SB2-"N") (2)		
W	L	T	W	L	T
14"	7"	2"	7"	7"	2"

Pad sizes shown are applicable for the following conditions:

- All one, two and three span units where the minimum span length is not less than 25' and the maximum span is not more than 50'.
- Skews less than or equal to 30°.

**GENERAL NOTES:**

These details accommodate skew angles up to 30°. 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 must be included in unit price bid for "Prestressed Concrete Slab Beams".

HL93 LOADING

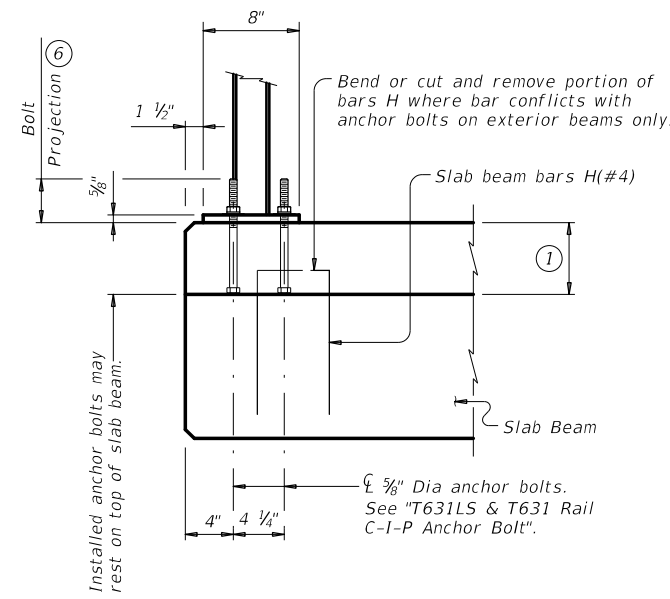
		<b>Bridge Division Standard</b>	
<b>ELASTOMERIC BEARING AND BEAM END DETAILS</b>			
<b>PRESTR CONCRETE SLAB BEAM</b>			
<b>PSBEB</b>			
FILE: psbste06-17.dgn	DN: TxDOT	CK: TxDOT	OW: TxDOT
©TxDOT January 2017	CONTRACT: 0913	SECTION: 26	JOB: 066
REVISIONS			HIGHWAY: CR
	DIST: YKM	COUNTY: COLORADO	SHEET NO: 51

DATE: FILE:

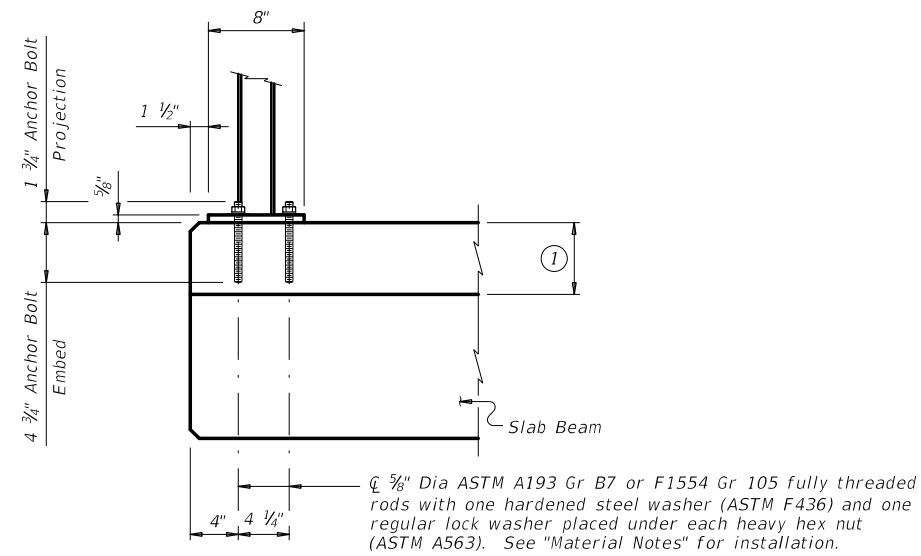


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DATE: FILE:

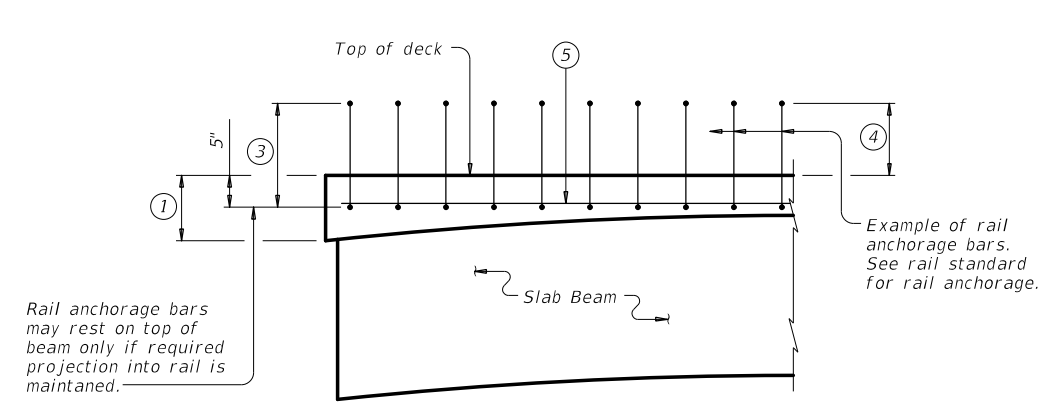


CAST-IN-PLACE ANCHORAGE OPTION

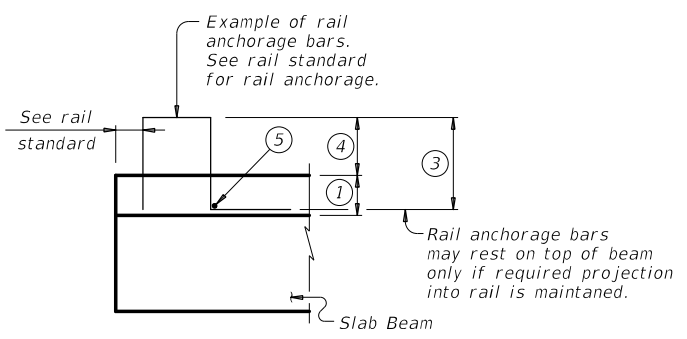


ADHESIVE ANCHORAGE OPTION

**T631LS & T631 RAIL ANCHORAGE PLACEMENT (2) (7)**



PART SPAN ELEVATION

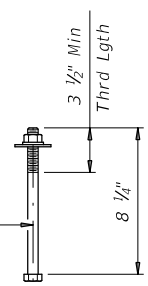


SECTION

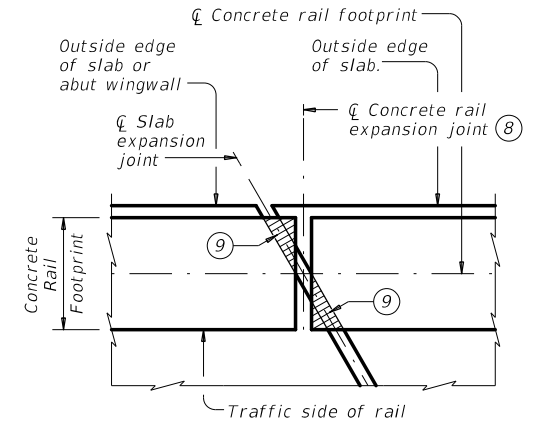
**TYPICAL CONCRETE RAIL ANCHORAGE**

(Showing typical concrete rail anchorage)

5/8" Dia heavy hex head anchor bolt (ASTM F3125 Gr A325 or A449) with one hardened steel washer (ASTM F436) and one regular lock washer placed under heavy hex nut (ASTM A563).



**T631LS & T631 RAIL C-I-P ANCHOR BOLT**



**PLAN OF CONCRETE RAILS AT EXPANSION JOINTS**

- ① Cast-in-place slab thickness varies due to beam camber (5" minimum).
- ② Replace cast-in-place anchor bolts shown on T631LS and T631 Rail standard with an adhesive anchor system or cast-in-place anchor bolts shown on this sheet.
- ③ Bar length shown on rail standard, minus 1 1/4". Adjust bar length for a raised sidewalk.
- ④ See rail standard for projection from finished grade or top of sidewalk.
- ⑤ Place additional (#5) longitudinal bar.
- ⑥ Excess bolt length has been provided to accommodate a variable slab thickness due to beam camber. If slab thickness on span details exceed 7", bolt length must be increased accordingly. After posts have been set and bolts tightened, bolt projection above nuts of more than 1/2" must be cut off and painted with two coats of zinc-rich paint conforming to the Item 445 "Galvanizing".
- ⑦ Distance from end of top outside edge of slab to center of first bolt group can not be less than 9", except: 15° Skew: 1'-0" (acute corner only) 30° Skew: 1'-3" (acute corner only)
- ⑧ Location of rail expansion joint must be at the intersection of centerline of slab expansion joint, centerline of rail footprint and perpendicular to slab outside edge.
- ⑨ Cross-hatched area must have 1/2" preformed bituminous fiber material under concrete rail, as shown.

**CONSTRUCTION NOTES:**

Rail anchorage bars may be field bent as required to clear rail reinforcing or provide minimum cover shown on standard rail detail sheets.  
 Test adhesive anchors in accordance with Item 450.3.3, "Tests". Test 3 anchors per 100 anchors installed. Perform corrective measures to provide adequate capacity if any of the tests do not meet the required test load. Repair damage from testing as directed.

**MATERIAL NOTES:**

Galvanize all steel components of steel rail system.  
 Provide Grade 60 reinforcing steel.  
 Cast-in-place anchorage system for T631LS and T631 Rail must be 5/8" Dia heavy hex head anchor bolts (ASTM F3125 Gr 325 or A449) with one hardened steel washer (ASTM F436) and one regular lock washer placed under heavy hex nut. Nuts must conform to ASTM A563 requirements. Embed anchor bolts 4 1/2" minimum.  
 Adhesive anchors for T631LS and T631 Rail must be 5/8" Dia ASTM A193 Gr B7 or F1554 Gr 105 fully threaded rods with one hardened steel washer (ASTM F436) and one regular lock washer placed under each heavy hex nut. Nuts must conform to ASTM A563 requirements. Embed fully threaded rod into slab and/or abutment wingwall using a Type III, Class C, D, E, or F anchor adhesive. Minimum adhesive anchor embedment depth is 4 3/4". Anchor adhesive chosen must be able to achieve a nominal bond strength in tension of a single anchor, Na, of 8 kips (edge distance must be accounted for). Submit signed and sealed calculations or the manufacturer's published literature showing the proposed anchor adhesive's ability to develop this load to the Engineer for approval prior to use. Anchor installation, including hole size, drilling, and clean out, must be in accordance with Item 450, "Railing."  
 Epoxy coat or galvanize reinforcing steel shown on this standard if rail reinforcement is epoxy coated or galvanized.

**GENERAL NOTES:**

Designed in accordance with AASHTO LRFD Bridge Design Specifications.  
 This standard is for use with structures with a 5" minimum cast-in-place concrete slab.  
 This standard may require modification for interior rails. This standard does not apply to median barriers.  
 This standard does not provide details for Type T221P, T224, T80HT, T80SS, C412, PR11, PR22 and PR3 rails on slab beam bridges.  
 See rail standards for approved speed restrictions, notes and details not shown.

Cover dimensions are clear dimensions, unless noted otherwise.

		<b>Bridge Division Standard</b>	
<h2>RAIL ANCHORAGE DETAILS</h2>			
<h3>PRESTR CONCRETE SLAB BEAMS</h3>			
<h4>PSBRA</h4>			
FILE: pbsste07-18.dgn	DN: TxDOT	CK: TxDOT	DW: JTR
©TxDOT January 2017	CONTRACT	SECTION	HIGHWAY
REVISIONS	0913	26	066
03-18: Updated adhesive anchor notes.	DIST	COUNTY	SHEET NO.
	YKM	COLORADO	52

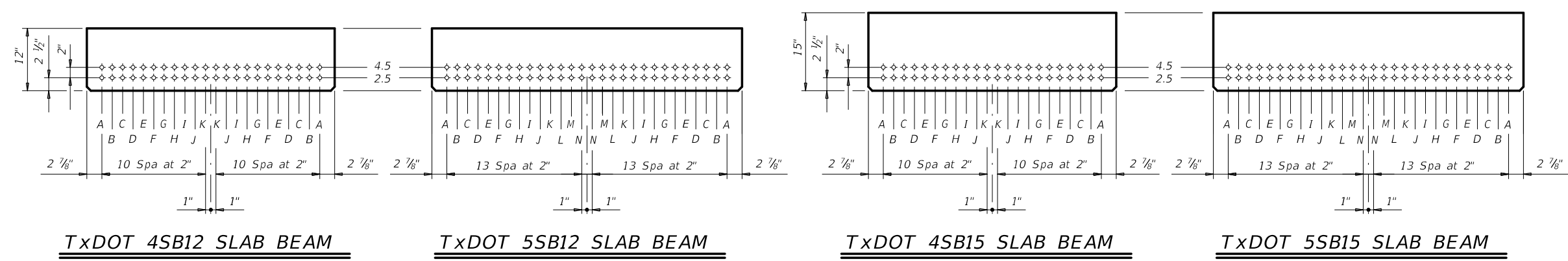
DISCLAIMER: The use of this standard is governed by the "Texas Engineering Practice Act". No warranty of any kind is made by TxDOT for any purpose whatsoever. TxDOT assumes no responsibility for the conversion of this standard to other formats or for incorrect results or damages resulting from its use.

STRUCTURE	DESIGNED BEAMS (STRAIGHT STRANDS)																			OPTIONAL DESIGN					LOAD RATING FACTORS			
	SPAN LENGTH (ft)	BEAM NO.	BEAM TYPE	PRESTRESSING STRANDS							DEBONDED STRANDS PER ROW					CONCRETE		DESIGN LOAD COMP STRESS (TOP $\epsilon$ ) (SERVICE I) fct (ksi)	DESIGN LOAD TENSILE STRESS (BOT $\epsilon$ ) (SERVICE III) fcb (ksi)	REQUIRED MINIMUM ULTIMATE MOMENT CAPACITY (STRENGTH I) (kip-ft)	LIVE LOAD DISTRIBUTION FACTOR		STRENGTH I			SERVICE III		
				NON-STD STRAND PATTERN	TOTAL NO.	SIZE (in)	STRGTH fpu (ksi)	"e" $\bar{c}$ (in)	"e" END (in)	TOT NO. DEB	DIST FROM BOTTOM (in)	NO. OF STRANDS		NUMBER OF STRANDS DEBONDED TO (ft from end)							RELEASE STRGTH $f'_{ci}$ (ksi)	MINIMUM 28 DAY COMP STRGTH $f'_c$ (ksi)	②		Inv	Opr	Inv	
												TOTAL	DE-BONDED	3	6	9	12						15	Moment				Shear
24' ROADWAY SB12 BEAM	25	ALL	5SB12		8	0.6	270	3.50	3.50	0	2.5	8	0	0	0	0	0	4.000	5.000	0.914	-1.217	448	0.450	0.450	1.40	1.82	1.71	
	30	ALL	5SB12		10	0.6	270	3.50	3.50	0	2.5	10	0	0	0	0	0	4.000	5.000	1.292	-1.685	530	0.450	0.450	1.25	1.62	1.29	
	35	ALL	5SB12		14	0.6	270	3.50	3.50	0	2.5	14	0	0	0	0	0	4.000	5.000	1.730	-2.219	675	0.450	0.450	1.33	1.73	1.23	
	40	ALL	5SB12		18	0.6	270	3.50	3.50	0	2.5	18	0	0	0	0	0	4.000	5.000	2.218	-2.796	820	0.440	0.440	1.34	1.74	1.12	
24' ROADWAY SB15 BEAM	25	ALL	5SB15		8	0.6	270	5.00	5.00	0	2.5	8	0	0	0	0	0	4.000	5.000	0.725	-0.897	551	0.450	0.450	1.77	2.29	2.41	
	30	ALL	5SB15		8	0.6	270	5.00	5.00	0	2.5	8	0	0	0	0	0	4.000	5.000	1.020	-1.244	574	0.450	0.450	1.23	1.59	1.45	
	35	ALL	5SB15		10	0.6	270	5.00	5.00	0	2.5	10	0	0	0	0	0	4.000	5.000	1.361	-1.640	708	0.450	0.450	1.15	1.49	1.14	
	40	ALL	5SB15		14	0.6	270	5.00	5.00	0	2.5	14	0	0	0	0	0	4.000	5.000	1.739	-2.068	864	0.440	0.440	1.32	1.71	1.19	
	45	ALL	5SB15		18	0.6	270	5.00	5.00	2	2.5	18	2	2	0	0	0	4.000	5.000	2.179	-2.574	1054	0.440	0.440	1.34	1.73	1.08	
50	ALL	5SB15		24	0.6	270	5.00	5.00	8	2.5	24	8	4	4	0	0	0	4.000	5.000	2.680	-3.153	1276	0.440	0.440	1.33	1.72	1.11	
28' ROADWAY SB12 BEAM	25	ALL	5SB12		8	0.6	270	3.50	3.50	0	2.5	8	0	0	0	0	0	4.000	5.000	0.903	-1.184	444	0.430	0.430	1.47	1.91	1.80	
	30	ALL	5SB12		10	0.6	270	3.50	3.50	0	2.5	10	0	0	0	0	0	4.000	5.000	1.276	-1.639	508	0.430	0.430	1.32	1.71	1.37	
	35	ALL	5SB12		12	0.6	270	3.50	3.50	0	2.5	12	0	0	0	0	0	4.000	5.000	1.708	-2.159	647	0.430	0.430	1.18	1.53	1.02	
	40	ALL	5SB12		18	0.6	270	3.50	3.50	0	2.5	18	0	0	0	0	0	4.000	5.000	2.200	-2.744	799	0.430	0.430	1.37	1.78	1.17	
28' ROADWAY SB15 BEAM	25	ALL	5SB15		8	0.6	270	5.00	5.00	0	2.5	8	0	0	0	0	0	4.000	5.000	0.716	-0.874	529	0.430	0.430	1.85	2.40	2.53	
	30	ALL	5SB15		8	0.6	270	5.00	5.00	0	2.5	8	0	0	0	0	0	4.000	5.000	1.007	-1.212	570	0.430	0.430	1.29	1.67	1.53	
	35	ALL	5SB15		10	0.6	270	5.00	5.00	0	2.5	10	0	0	0	0	0	4.000	5.000	1.343	-1.598	680	0.430	0.430	1.21	1.57	1.22	
	40	ALL	5SB15		14	0.6	270	5.00	5.00	0	2.5	14	0	0	0	0	0	4.000	5.000	1.725	-2.032	842	0.430	0.430	1.36	1.76	1.24	
	45	ALL	5SB15		18	0.6	270	5.00	5.00	2	2.5	18	2	2	0	0	0	4.000	5.000	2.149	-2.508	1013	0.420	0.420	1.41	1.82	1.16	
50	ALL	5SB15		22	0.6	270	5.00	5.00	6	2.5	22	6	4	2	0	0	0	4.000	5.000	2.643	-3.073	1227	0.420	0.420	1.33	1.72	1.01	
30' ROADWAY SB12 BEAM	25	ALL	4SB12		6	0.6	270	3.50	3.50	0	2.5	6	0	0	0	0	0	4.000	5.000	0.904	-1.187	341	0.340	0.340	1.38	1.79	1.67	
	30	ALL	4SB12		8	0.6	270	3.50	3.50	0	2.5	8	0	0	0	0	0	4.000	5.000	1.277	-1.646	407	0.340	0.340	1.32	1.71	1.37	
	35	ALL	4SB12		10	0.6	270	3.50	3.50	0	2.5	10	0	0	0	0	0	4.000	5.000	1.711	-2.169	518	0.340	0.340	1.24	1.60	1.08	
	40	ALL	4SB12		14	0.6	270	3.50	3.50	0	2.5	14	0	0	0	0	0	4.000	5.000	2.205	-2.758	640	0.340	0.340	1.34	1.73	1.11	
30' ROADWAY SB15 BEAM	25	ALL	4SB15		6	0.6	270	5.00	5.00	0	2.5	6	0	0	0	0	0	4.000	5.000	0.723	-0.888	431	0.350	0.350	1.69	2.19	2.32	
	30	ALL	4SB15		6	0.6	270	5.00	5.00	0	2.5	6	0	0	0	0	0	4.000	5.000	1.017	-1.231	438	0.350	0.350	1.16	1.50	1.37	
	35	ALL	4SB15		8	0.6	270	5.00	5.00	0	2.5	8	0	0	0	0	0	4.000	5.000	1.346	-1.605	545	0.340	0.340	1.21	1.57	1.21	
	40	ALL	4SB15		12	0.6	270	5.00	5.00	0	2.5	12	0	0	0	0	0	4.000	5.000	1.729	-2.043	675	0.340	0.340	1.47	1.91	1.38	
	45	ALL	4SB15		14	0.6	270	5.00	5.00	2	2.5	14	2	2	0	0	0	4.000	5.000	2.166	-2.542	823	0.340	0.340	1.33	1.73	1.06	
50	ALL	4SB15		18	0.6	270	5.00	5.00	4	2.5	18	4	2	2	0	0	0	4.000	5.000	2.665	-3.115	998	0.340	0.340	1.32	1.71	1.02	

① Based on the following allowable stresses (ksi):  
 Compression = 0.65  $f'_{ci}$   
 Tension = 0.24  $\sqrt{f'_{ci}}$   
 Optional designs must likewise conform.  
 ② Portion of full HL93.

**DESIGN NOTES:**  
 Designed according to AASHTO LRFD Bridge Design Specifications. Load rated using Load and Resistance Factor Rating according to AASHTO Manual for Bridge Evaluation. Prestress losses for the designed beams have been calculated for a relative humidity of 60 percent. Optional designs must likewise conform.

**FABRICATION NOTES:**  
 Provide Class H concrete. Provide Grade 60 reinforcing steel. Use low relaxation strands, each pretensioned to 75 percent of fpu. Full-length debonded strands are not permitted in positions "A" and "B". Strand debonding must comply with Item 424.4.2.2.4. When shown on this sheet, the Fabricator has the option of furnishing either the designed beam or an approved optional beam design. All optional design submittals and shop drawings must be signed, sealed and dated by a Professional Engineer registered in the State of Texas. Locate strands for the designed beam as low as possible on the 2" grid system unless a non-standard strand pattern is indicated. Fill row "2.5", then row "4.5". Place strands within a row as follows:  
 1) Locate a strand in each "A" position.  
 2) Place strand symmetrically about vertical centerline of beam.  
 3) Space strands as equally as possible across the entire width. Do not debond strands in position "A". Distribute debonded strands symmetrically about the vertical centerline. Increase debonded lengths working outward, with debonding staggered in each row.



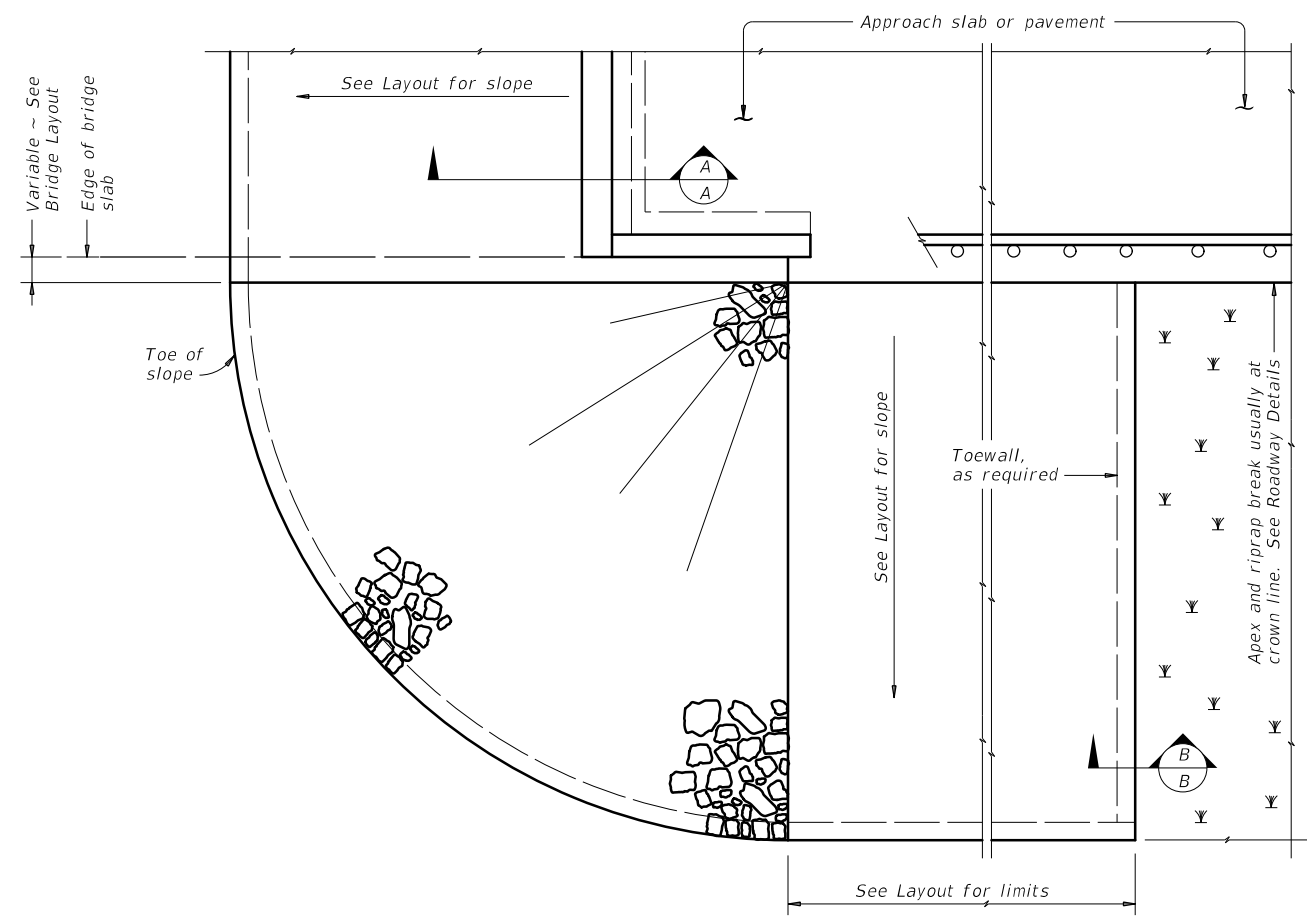
HL93 LOADING

		<b>Bridge Division Standard</b>	
<b>PRESTRESSED CONCRETE SLAB BEAM STD DESIGNS (TY SB12 OR SB15)</b> <b>24', 28' &amp; 30' ROADWAY</b> <b>PSBSD</b>			
FILE: psbstd08-21.dgn	DN: SRW	CK: BMP	DW: SFS
©TxDOT January 2017	CONT	SECT	JOB
REVISIONS	0913	26	066
1-21: Added load rating.	DIST	COUNTY	SHEET NO.
	YKM	COLORADO	53

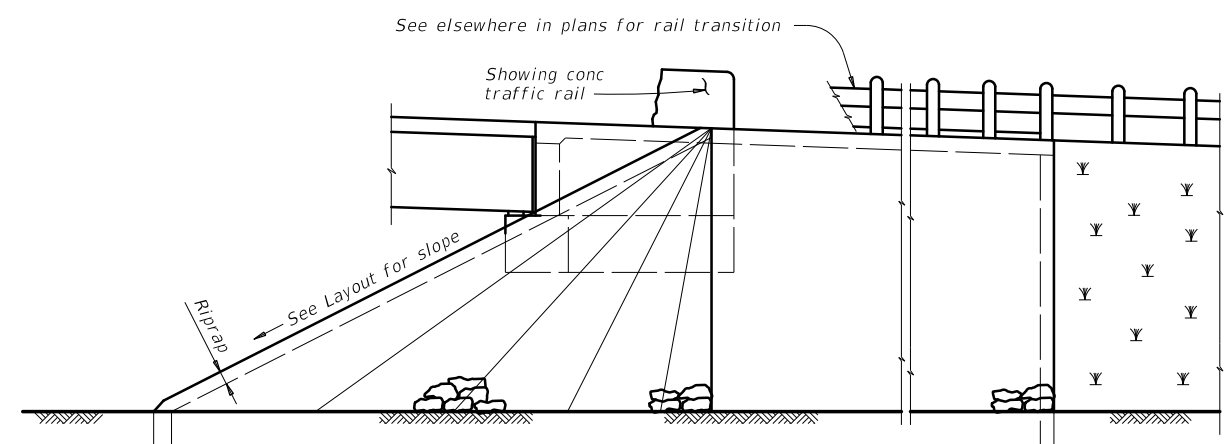
DATE: FILE:

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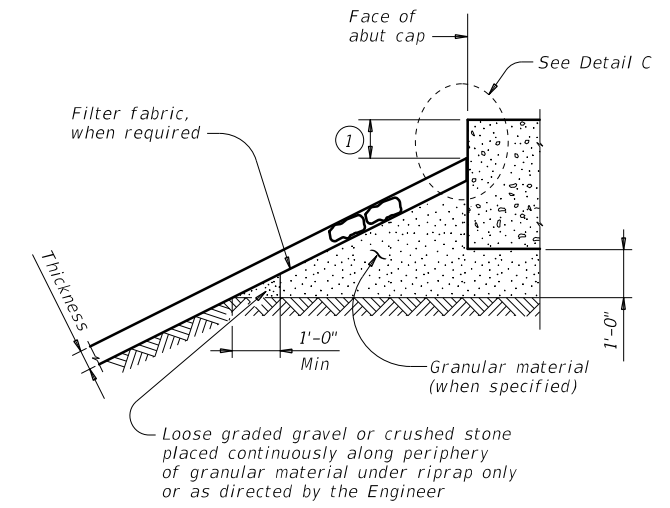
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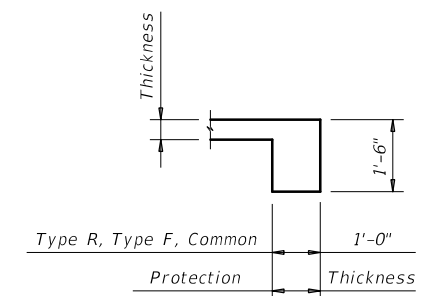
**PLAN**



**ELEVATION**

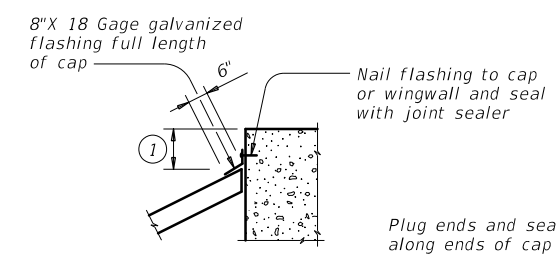


**SECTION A-A AT CAP**

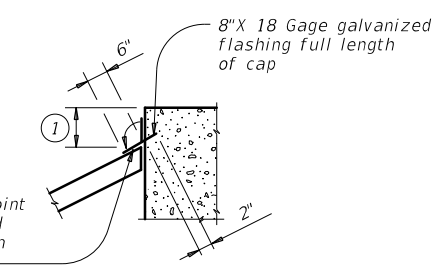


**SECTION B-B**

Provide toewall when shoulder drain is located adjacent to limits of stone riprap. Omit toewall when thickness of protection riprap is greater than 18".



**CAP OPTION A**



**CAP OPTION B**

**DETAIL C**

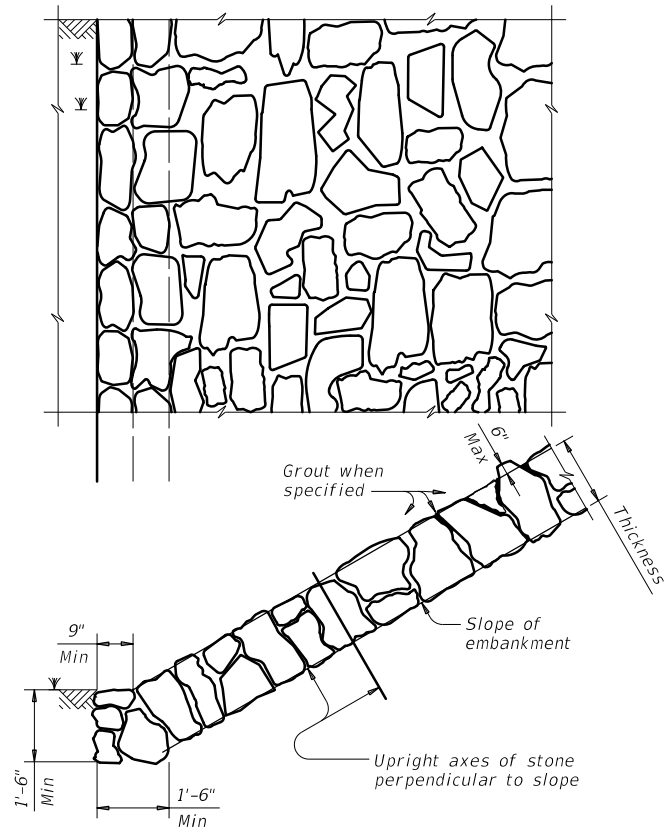
① Top of cap to top of riprap dimension varies as directed by the Engineer. Provide 9" Min for beam/slab type bridges and 1'-6" for slab span, box beam, or slab beam bridges.

**GENERAL NOTES:**  
Refer to Item 432, "Riprap" for stone size and gradation, and construction details. See Layout for limits and thickness of riprap specified.  
See elsewhere in plans for locations and details of shoulder drains.

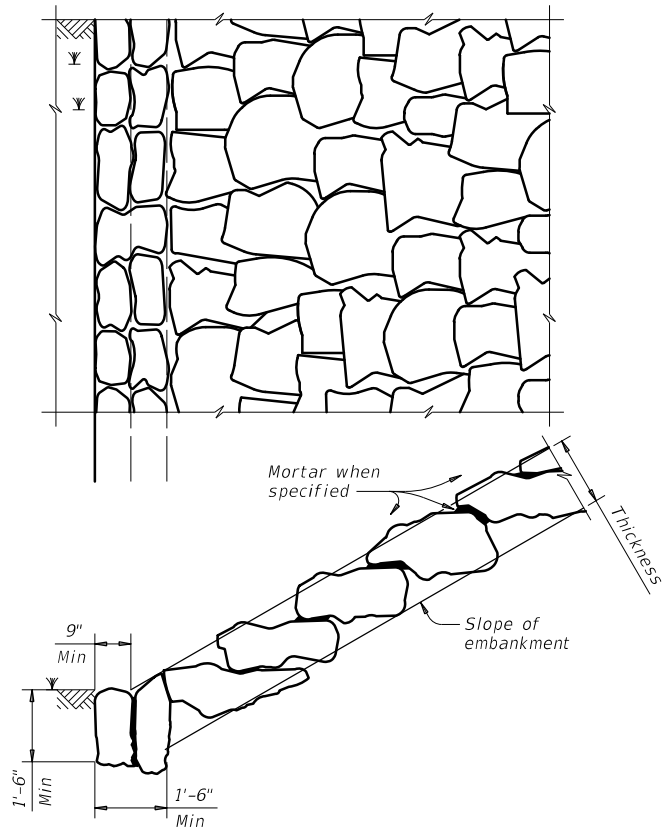
SHEET 1 OF 2

					<b>Bridge Division Standard</b>	
<h2>STONE RIPRAP</h2>						
<h3>SRR</h3>						
FILE: srrstde1-19.dgn	DN: AES	CK: JGD	DW: BWH	CK: AES		
©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY		
REVISIONS	0913	26	066	CR		
	DIST	COUNTY		SHEET NO.		
	YKM	COLORADO		54		

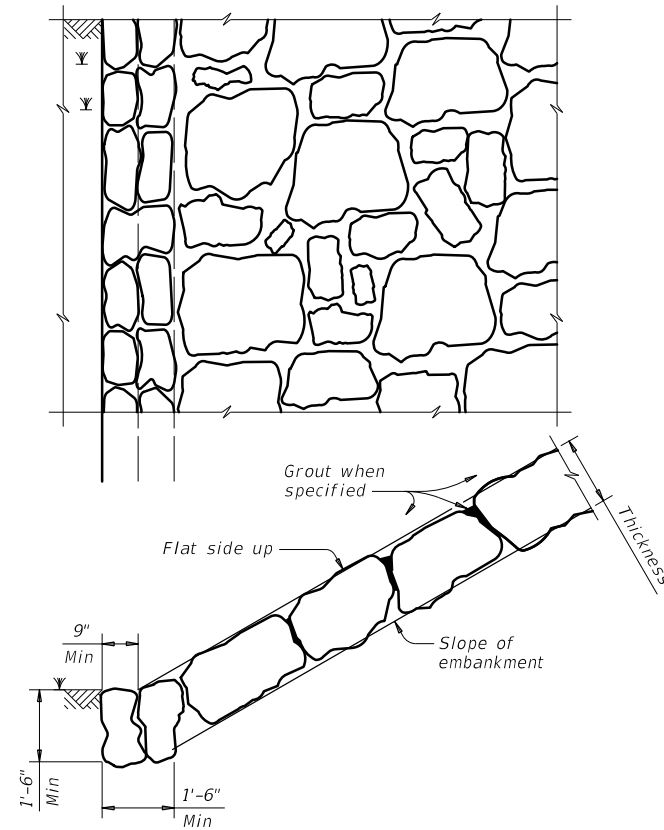
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**FIGURE 1 ~ TYPE R STONE RIPRAP**  
dry or grouted

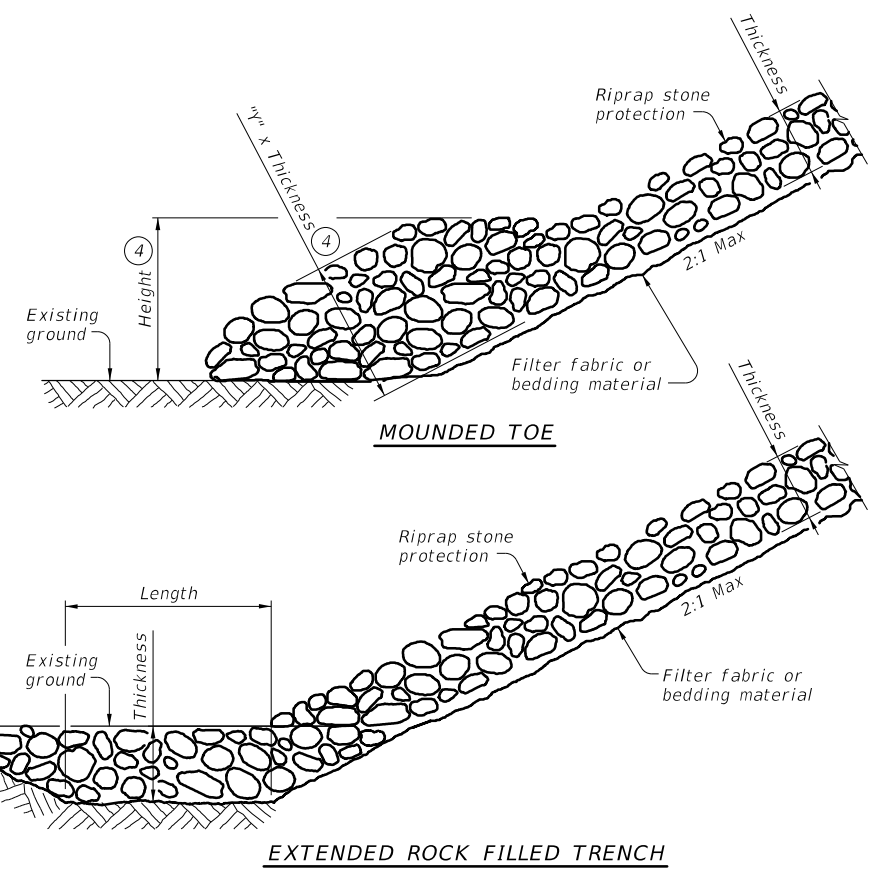


**FIGURE 2 ~ TYPE F STONE RIPRAP**  
dry or mortared

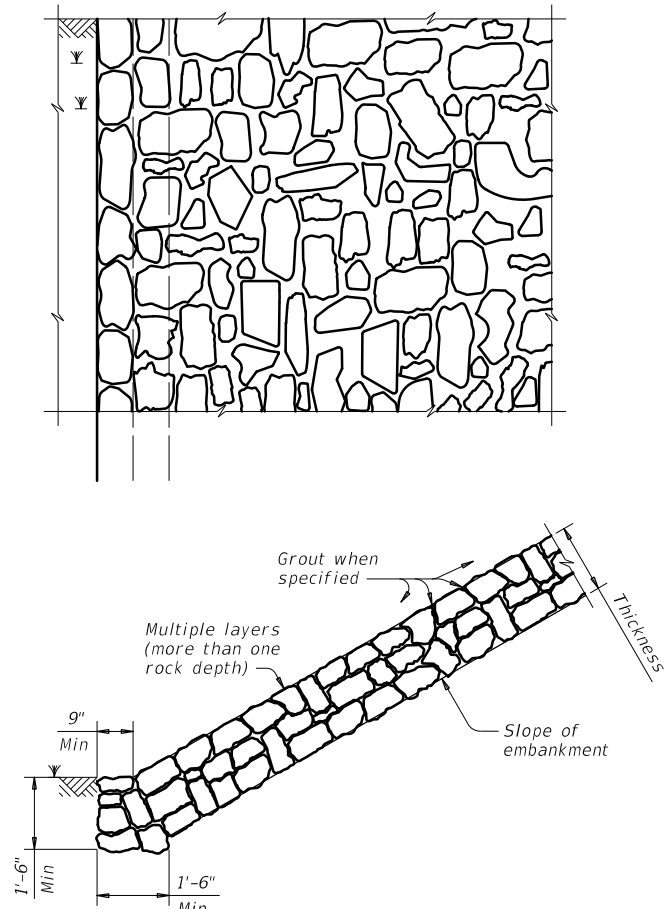


**FIGURE 3 ~ TYPE F STONE RIPRAP**  
grouted

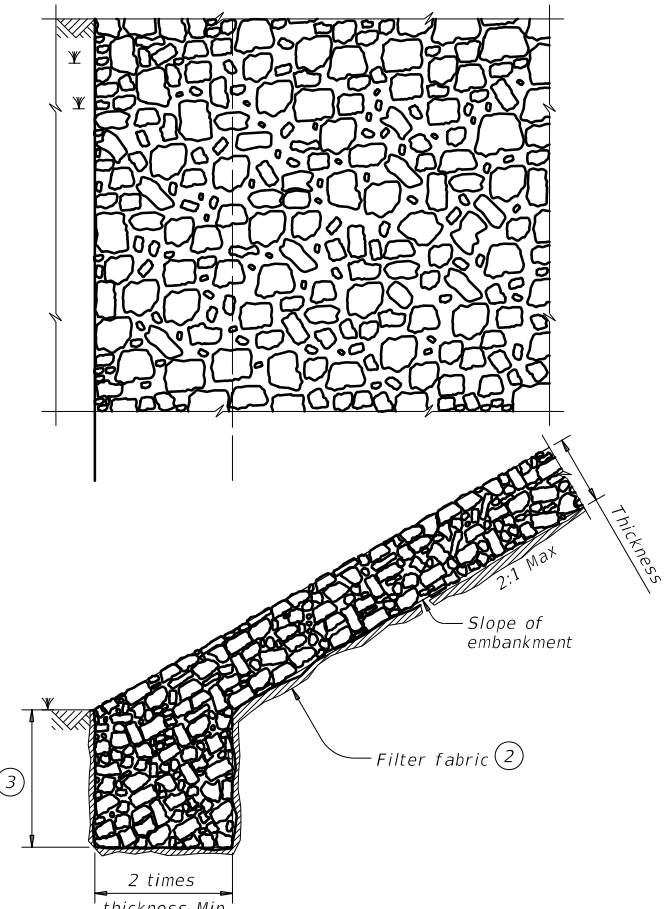
- ② Provide bedding material instead of filter fabric if shown elsewhere in plans. See Layout for thickness of bedding material.
- ③ Minimum toe depth is the larger of the maximum scour depth or 2 times the riprap thickness.
- ④ "Y" and Height need to be defined. See layout or detail sheet for values if this option is used.
- ⑤ List Stone Protection as size (XX inch) and thickness (YY inch) on the layout.  
Example: Riprap (Stone Protection) XX inch, Thickness = YY inch.



**PROTECTION STONE RIPRAP TOE OPTIONS ⑤**



**FIGURE 4 ~ COMMON STONE RIPRAP**  
dry or grouted



**FIGURE 5 ~ PROTECTION STONE RIPRAP ⑤**

**STONE RIPRAP**

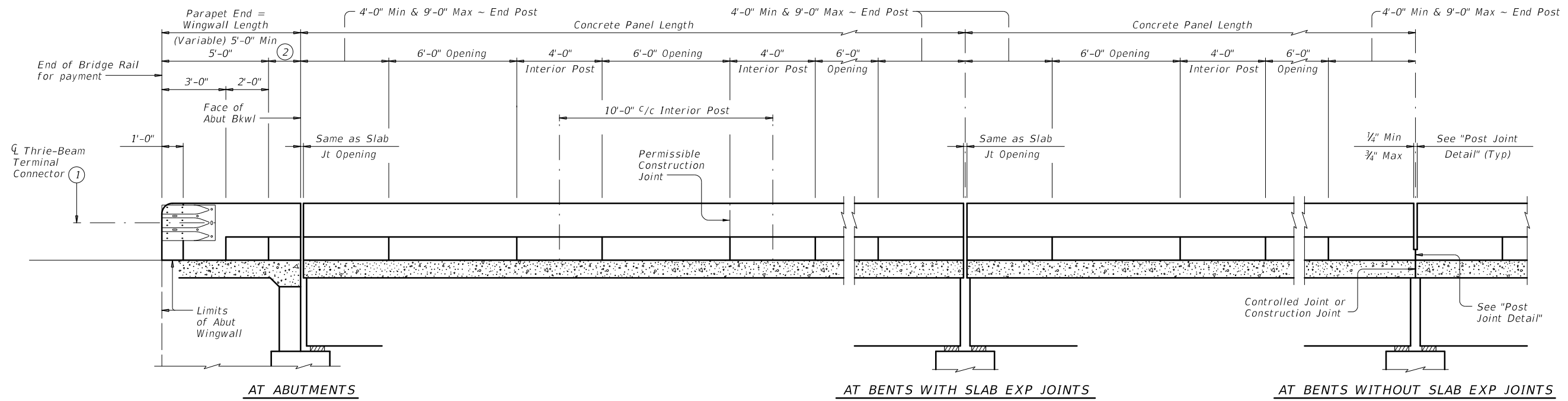
**SRR**

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©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0913	26	066	CR
	DIST	COUNTY	SHEET NO.	
	YKM	COLORADO	55	

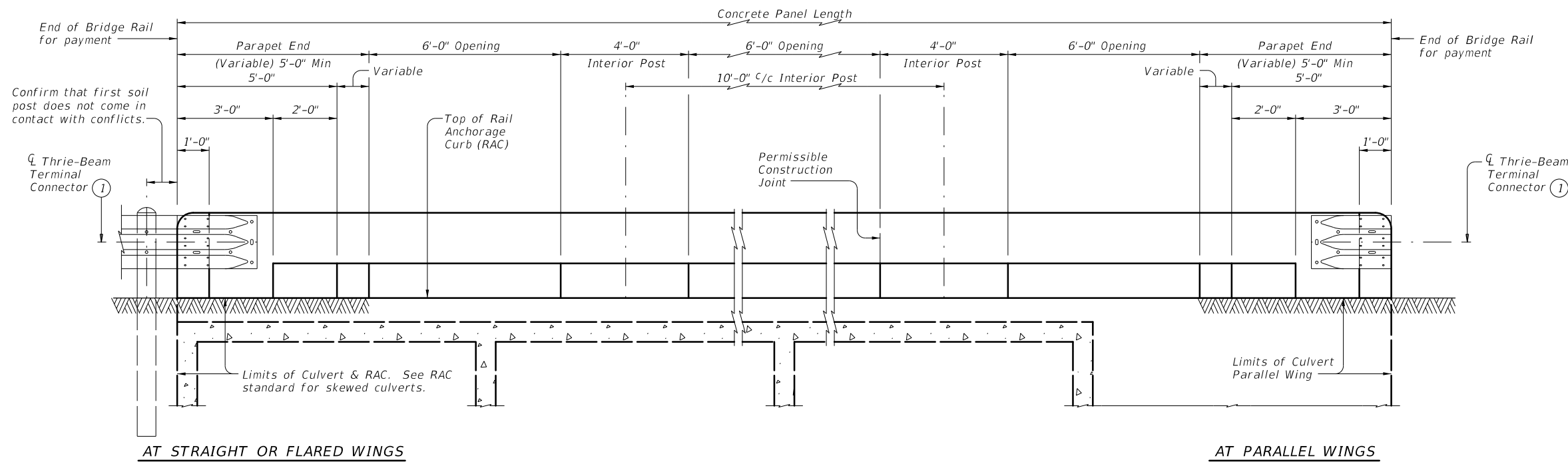
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DATE:  
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**ROADWAY ELEVATION OF RAIL ON BRIDGE**



**ROADWAY ELEVATION OF RAIL ON BOX CULVERTS**

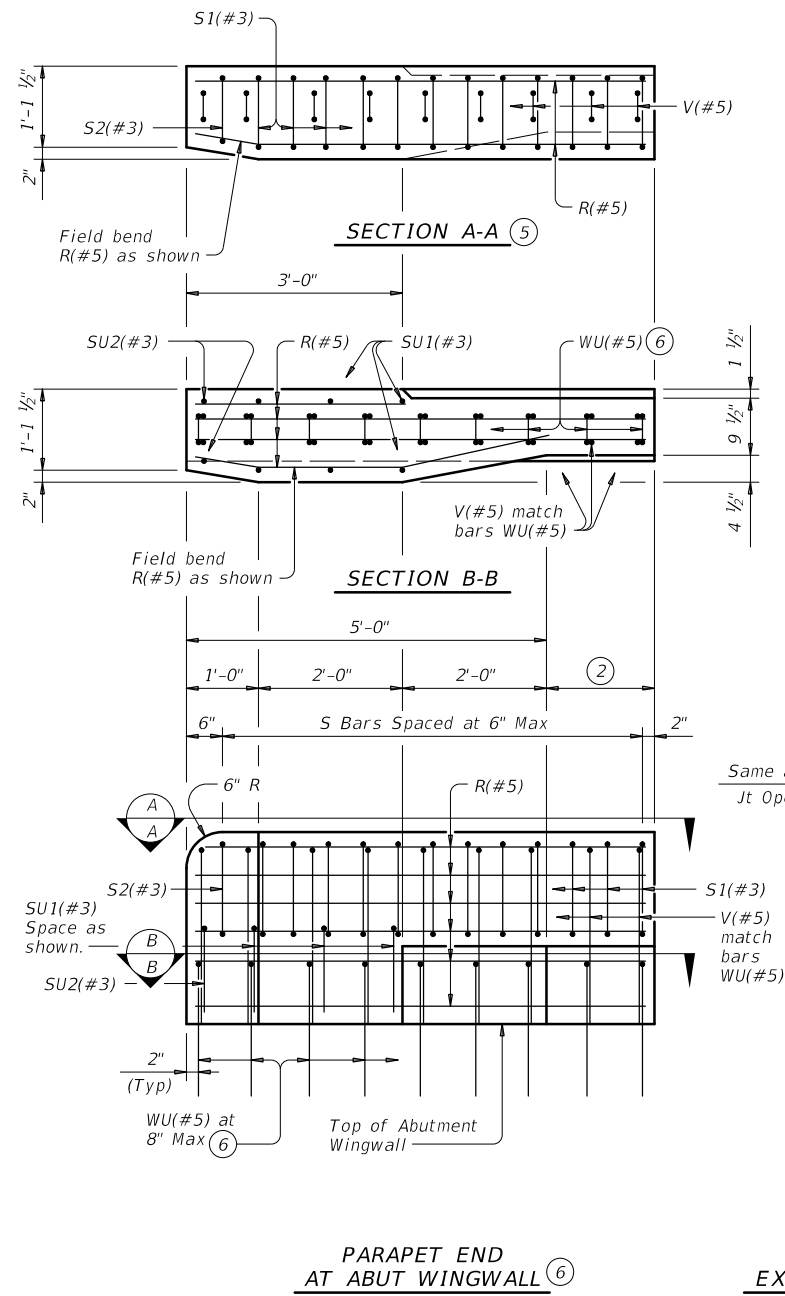
Showing 0° skew culvert. Skewed culverts similar. See RAC standard for details not shown. Vertical joints in concrete rail are not required, unless shown elsewhere.

- ① Terminal Connectors and associated hardware are to be paid for under the Item "Metal Beam Guard Fence". Attach Metal Beam Guard Fence Transitions to the bridge rail and extend along the embankment unless otherwise shown in the plans.
- ② Wingwall Length minus 5'-0" (Varies)

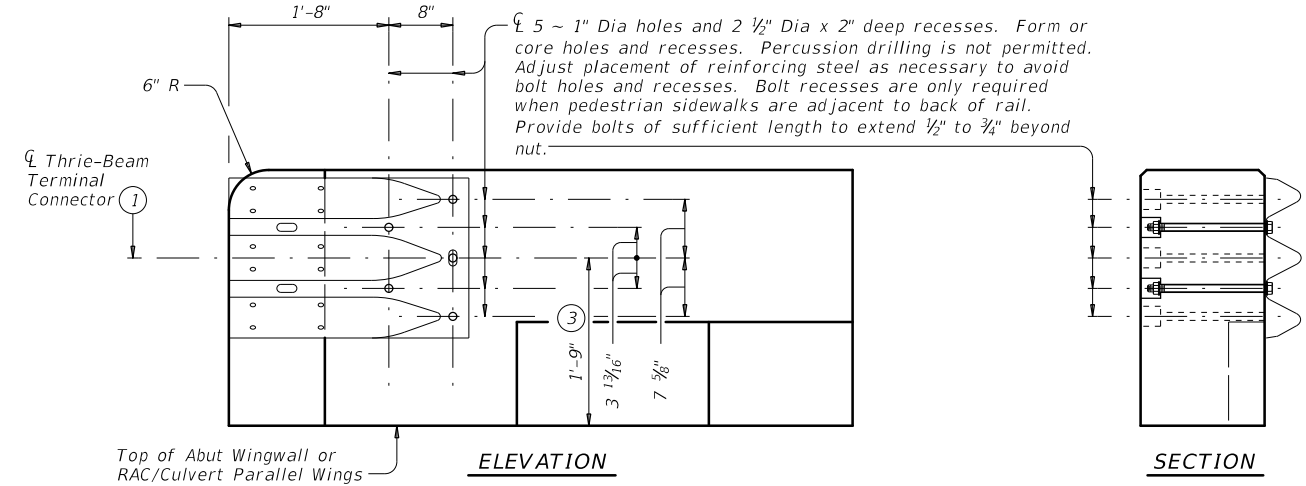
				<b>Bridge Division Standard</b>	
<h2>TRAFFIC RAIL</h2>					
<h3>TYPE T223</h3>					
FILE: r1std005-19.dgn	DN: TxDOT	CK: TxDOT	DW: JTR	CK: AES	
©TxDOT September 2019	CONT	SECT	JOB	HIGHWAY	
REVISIONS	0913	26	066	CR	
	DIST	COUNTY	SHEET NO.		
	YKM	COLORADO	56		

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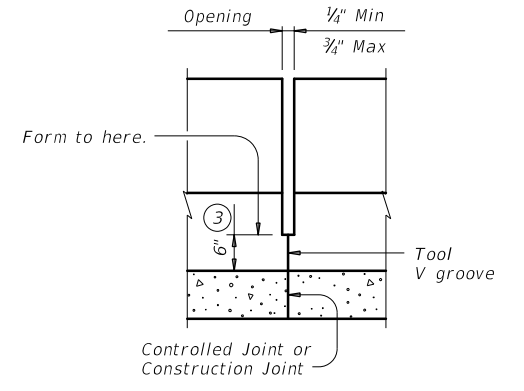
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PARAPET END AT ABUT WINGWALL ⑥

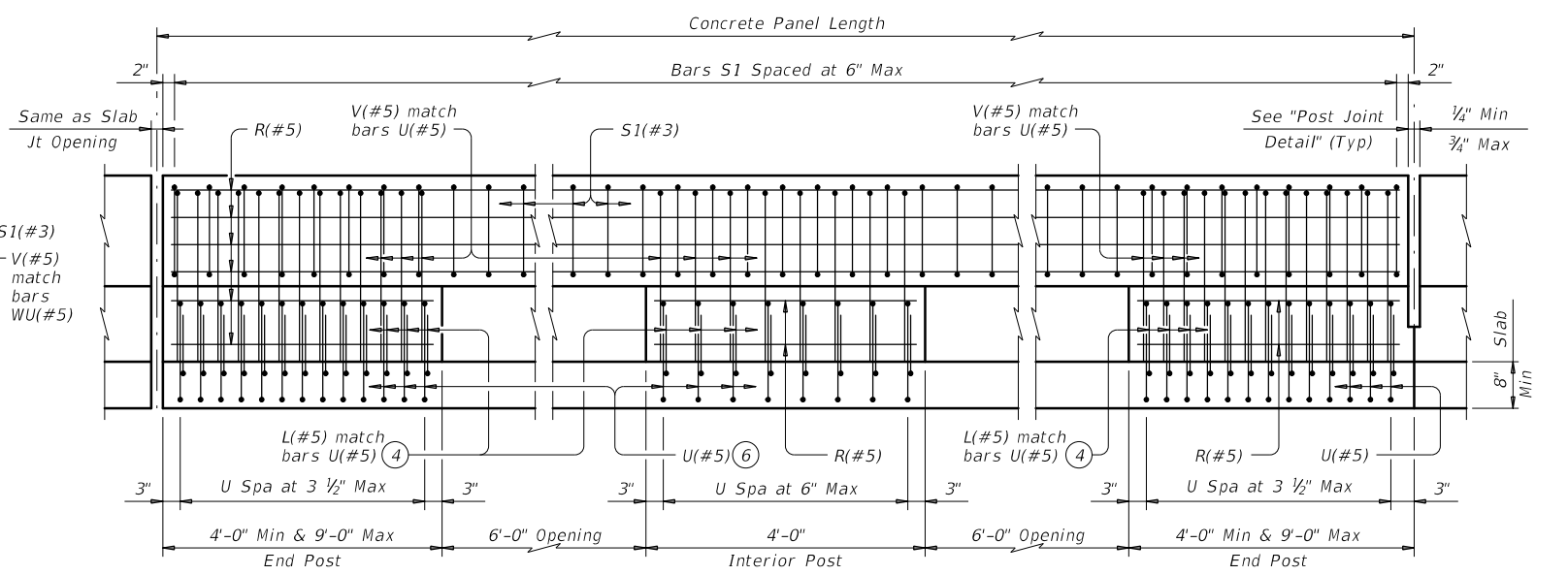


TERMINAL CONNECTION DETAILS



POST JOINT DETAIL

Provide at all interior bents without slab expansion joints.



ELEVATION SHOWING TYPICAL REINFORCING PLACEMENT

Showing rail on slab. Rail on box culvert similar.

- ① Terminal Connectors and associated hardware are to be paid for under the Item "Metal Beam Guard Fence". Attach Metal Beam Guard Fence Transitions to the bridge rail and extend along the embankment unless otherwise shown in the plans.
- ② Wingwall Length minus 5'-0" (Varies)
- ③ Increase 2" for structures with overlay.
- ④ Bars L(#5) are part of rail reinforcing and are included in unit price bid for railing. Space with Bars U. Bars L match slab bar cover. Bars L may be bundled with top slab reinforcing if spacing is equivalent.
- ⑤ Bars SU1(#3), SU2(#3) and WU(#5) not shown for clarity.
- ⑥ Substitute Bars U(#5) for Bars WU(#5) when parapet end is located on anchorage curb over culvert top slab. Use Bars WU(#5) in culvert parallel wings.

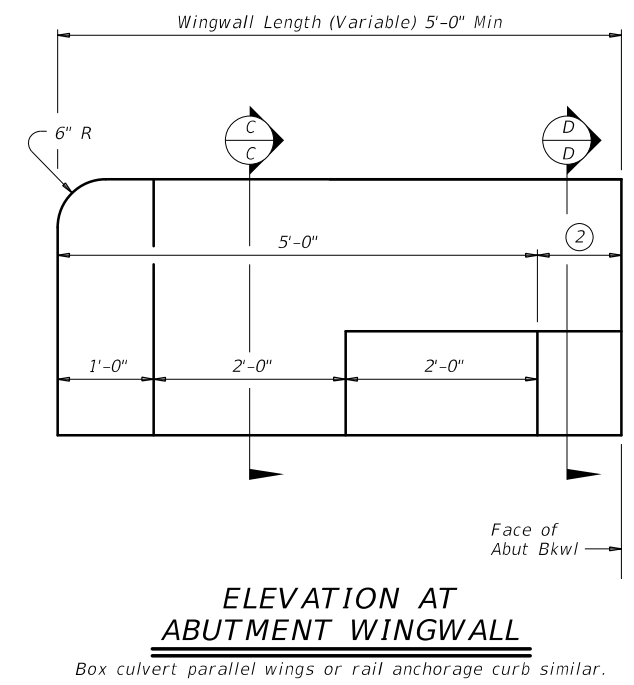
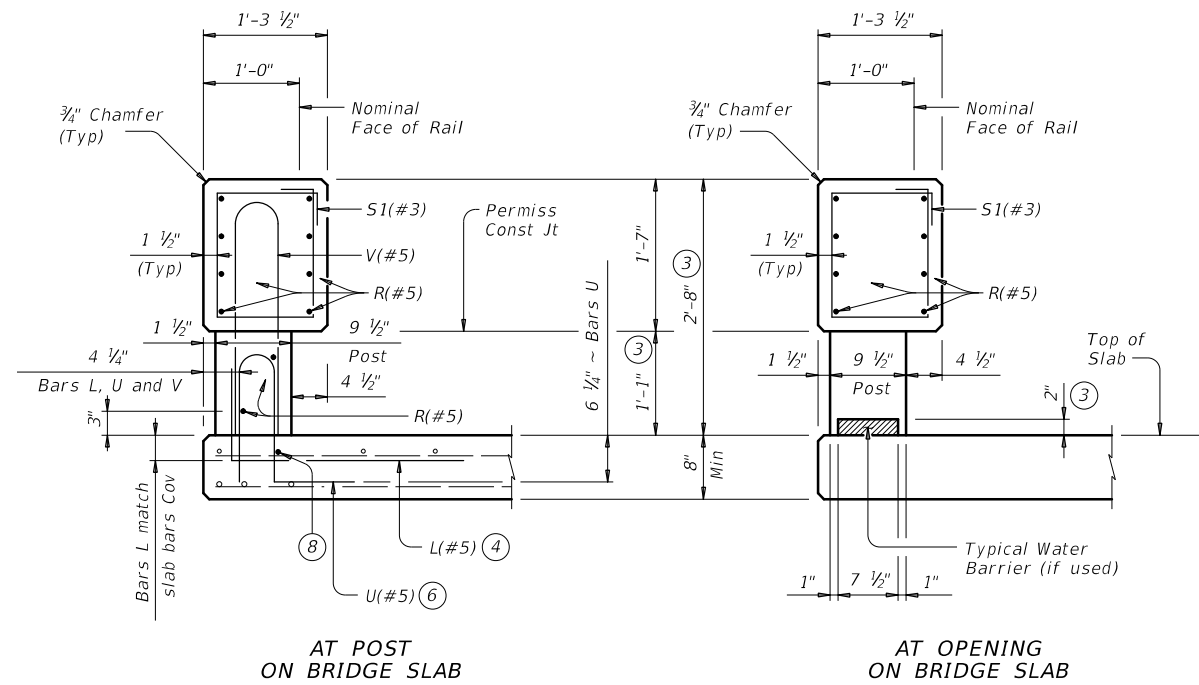
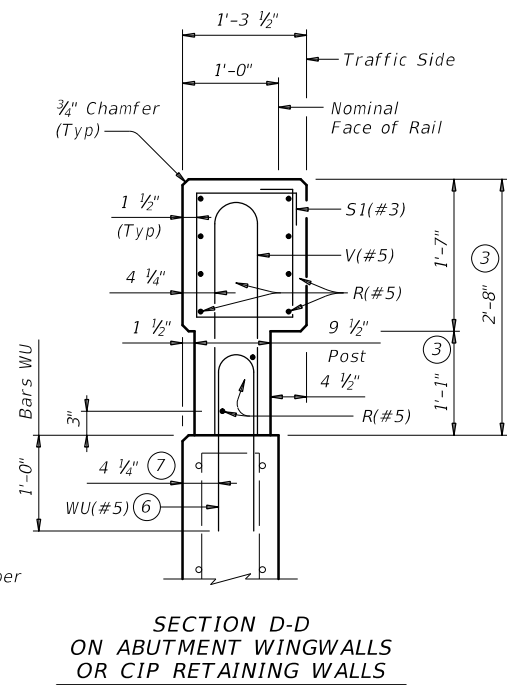
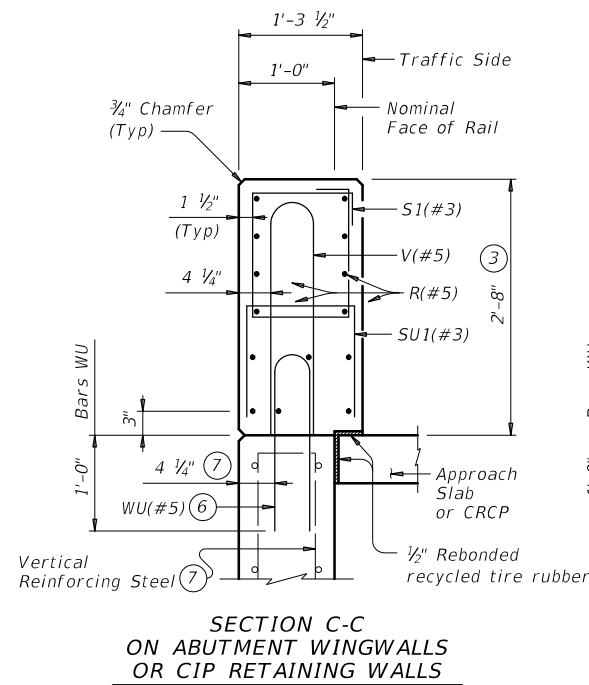
TRAFFIC RAIL

TYPE T223

FILE: r1std005-19.dgn	DN: TxDOT	CK: TxDOT	DW: JTR	CK: AES
©TxDOT September 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0913	26	066	CR
	DIST	COUNTY	SHEET NO.	
	YKM	COLORADO	57	

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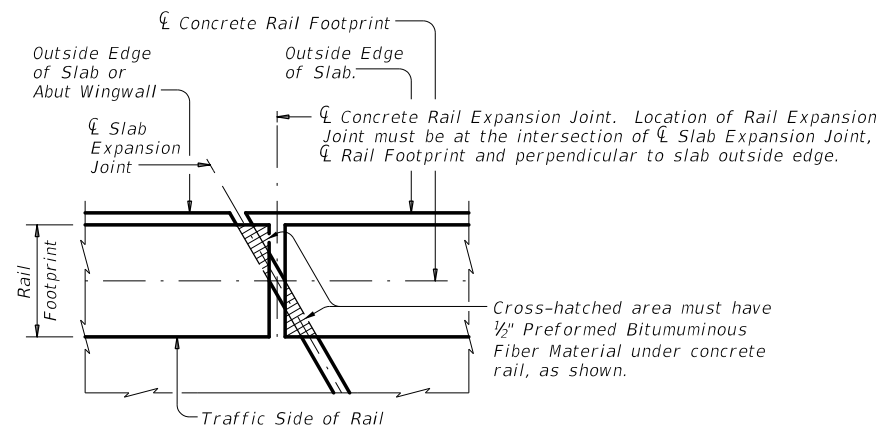
DATE: FILE:



**SECTIONS THRU RAIL**

Sections on box culverts similar.

- ② Wingwall Length minus 5'-0" (Varies)
- ③ Increase 2" for structures with overlay.
- ④ Bars L(#5) are part of rail reinforcing and are included in unit price bid for railing. Space with Bars U. Bars L match slab bar cover. Bars L may be bundled with top slab reinforcing if spacing is equivalent.
- ⑥ Substitute Bars U(#5) for Bars WU(#5) when parapet end is located on anchorage curb over culvert top slab. Use Bars WU(#5) in culvert parallel wings.
- ⑦ When vertical reinforcing has closer clear cover over horizontal reinforcing in abutment wingwalls on traffic side of wall, move the horizontal wingwall/retaining wall reinforcing to the inside of Bars WU where bars conflict.
- ⑧ Top longitudinal slab bar may be adjusted laterally 3" plus or minus to tie reinforcing.
- ⑨ At the Contractor's option, Bars V may be replaced by extending Bars U to 2'-5 1/4" above the roadway surface without overlay.



**PLAN OF RAIL AT EXPANSION JOINTS**

Example showing Slab Expansion Joints without breakbacks.

**CONSTRUCTION NOTES:**

Face of rail and parapet must be vertical transversely unless otherwise shown in the plans or approved by the Engineer.  
Provide water barriers at openings draining onto undercrossing roadways and sidewalks. They may be cast-in-place or precast in convenient lengths and bonded to the bridge deck with an approved epoxy cement.  
Chamfer all exposed corners.

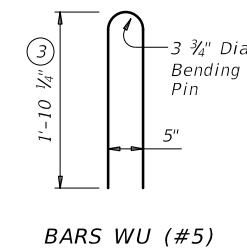
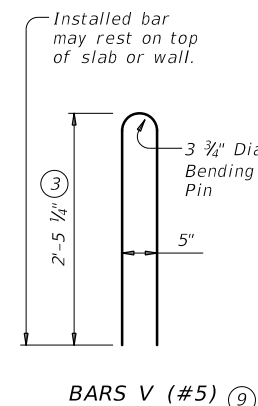
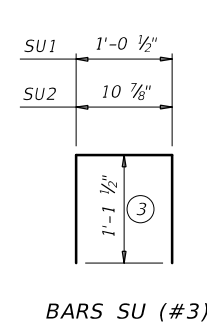
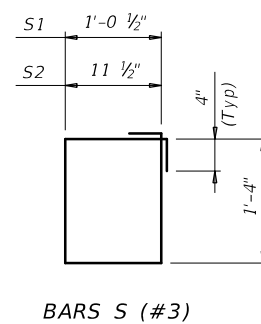
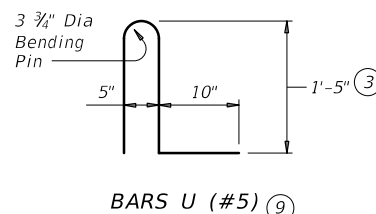
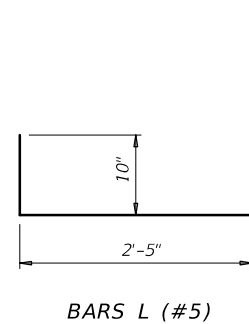
**MATERIAL NOTES:**

Provide Class "C" concrete. Provide Class "C" (HPC) if required elsewhere.  
Provide Grade 60 reinforcing steel.  
Epoxy coat or galvanize all reinforcing steel if slab bars are epoxy coated or galvanized.  
Deformed Welded Wire Reinforcing (WWR) (ASTM A1064) of equal size and spacing may be substituted for Bars U, V, and WU unless noted otherwise. Provide the same laps as required for reinforcing bars.  
Provide bar laps, where required, as follows:  
Uncoated or galvanized ~ #5 = 2'-0"  
Epoxy coated ~ #5 = 3'-0"

**GENERAL NOTES:**

This rail has been evaluated by full-scale crash test to meet MASH TL-3 criteria. This rail can be used for speeds of 50 mph and greater when a TL-3 rated guard fence transition is used. When a TL-2 rated guard fence transition is used, this rail can 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 are not required for this rail.  
Average weight of railing with no overlay is 358 plf.

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



		<b>Bridge Division Standard</b>	
<h1>TRAFFIC RAIL</h1>			
<h2>TYPE T223</h2>			
FILE: r1std005-19.dgn	DN: TxDOT	CK: TxDOT	DW: JTR
REV: 0913 26	CONTRACT: 0913	SECTION: 26	JOB: 066
REVISIONS	COUNTY: YKM	COUNTY: COLORADO	SHEET NO.: 58

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DATE: FILE:

REFLECTOR UNIT SIZES FOR DELINEATORS AND OBJECT MARKERS				DELINEATORS				D & OM DESCRIPTIVE CODES		
DEVICE	SIZE 1	SIZE 2	SIZE 3	SIZE 4	SINGLE		DOUBLE			
SHEETING	Yellow, White or Red Type B or C reflective sheeting				Yellow, White or Red Type B or C Reflective Sheeting				<b>INSTL DEL ASSM</b> (D-XX)SZ X (XXXX)XXX (XX) <b>NUMBER OF REFLECTORS</b> S = Single D = Double <b>COLOR OF REFLECTORS</b> W = White Y = Yellow R = Red <b>REFLECTOR UNIT SIZE</b> 1 or 2 <b>TYPE OF POST OR DELINEATOR</b> WC = Wing Channel Post YFLX = Yellow Flexible Post WFLX = White Flexible Post BRFL = Barrier Reflector <b>TYPE OF MOUNT</b> GND = Embedded (drivable or set in concrete) CTB = Concrete Barrier Mount GF1 or GF2 = Guard Fence Attachment SRF = Surface Mount <b>DIRECTION</b> If Required BI = Bi-Directional BR = Bi-Directional with red on back	
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
					MOUNT TYPE	GND	GND, SRF	GND		GND, SRF

OBJECT MARKERS								D & OM DESCRIPTIVE CODES	
DEVICE	Type 1 (OM-1)	Type 2 (OM-2)			Type 3 (OM-3)			Type 4 (OM-4)	<b>INSTL OM ASSM</b> (OM-XX) (XXXX)XXX (XX) <b>TYPE OF OBJECT MARKER</b> 1, 2, 3, or 4 <b>NUMBER OF REFLECTORS OR DIRECTION</b> X = 3-Size 2 reflector units (Type 2 only) Y = 1-Size 3 reflector unit (Type 2 only) Z = 3-Size 1 or 1-Size 4 reflector unit(s) (Type 2 only) L = Left Side (Type 3 Object Marker only) R = Right Side (Type 3 Object Marker only) C = Center (Type 3 Object Marker only) <b>TYPE OF POST</b> WC = Wing Channel Post WFLX = White Flexible Post TWT = Thin Walled Tubing <b>TYPE OF MOUNT</b> GND = Embedded (drivable) SRF = Surface Mount WAS = Wedge Anchor Steel WAP = Wedge Anchor Plastic <b>DIRECTION</b> If Required BI = Bi-Directional
		OM-1	OM-2X	OM-2Y	OM-2Z	OM-3L	OM-3R	OM-3C	
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	
POST TYPE	TWT	WC	WC	WFLX	TWT			TWT	
MOUNT TYPE	WAS, WAP	GND	GND	GND, SRF	WAS, WAP			WAS, WAP	

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

BARRIER REFLECTORS (BRF)			CHEVRONS				ONE DIRECTION LARGE ARROW		<b>NOTE:</b> 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.		
DEVICE	GF1	GF2	CTB	 <b>W1-8</b>				 <b>W1-6</b>			
	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.			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)
				MOUNTING HEIGHT	4'-0" or 7'-0"		7'-0" Only		MOUNTING HEIGHT	7'-0"	
				NOTE	1. CHEVRON (W1-8) signs and ONE DIRECTION LARGE ARROW (W1-6) Signs shall be installed per Sign Mounting Details (SMD) Standard Sheets and paid under Item 644 (Small Roadside Sign Assemblies). 2. When there is a need to increase conspicuity, the Texas version of the ONE DIRECTION LARGE ARROW sign (W1-9T) may be used instead of the ONE DIRECTION LARGE ARROW (W1-6).						
SHEETING	Yellow, White, Red										
NOTE	1. Reflective sheeting shall have a minimum dimension of 3 inches and minimum surface area of 9 square inches.										

**DELINEATOR & OBJECT MARKER MATERIAL DESCRIPTION**  
**D & OM(1)-20**

FILE: dom1-20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
© TXDOT August 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS	0913	26	066	CR
10-09 3-15	DIST	COUNTY		SHEET NO.
4-10 7-20	YKM	COLORADO		59

20A



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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	GF1
	<p align="center"><b>EMBEDDED</b></p>		<p align="center"><b>STEEL</b></p>		
<p><b>NOTES</b></p> <ol style="list-style-type: none"> <li>1. Embedded Wing Channel (WC) post option may be used for Type 2 Object Markers and Delineators only.</li> <li>2. 1.12 lbs/ft steel per ASTM A 1011 SS Gr. 50, or ASTM A499.</li> </ol>	<p><b>NOTES</b></p> <ol style="list-style-type: none"> <li>1. See "Flexible Delineator and Object Marker Posts" Material Producer List for approved devices.</li> <li>2. Install per manufacturer's recommendations.</li> <li>3. Post length may vary to meet field conditions.</li> <li>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.</li> </ol>		<p><b>NOTE</b></p> <ol style="list-style-type: none"> <li>1. Install per manufacturer's recommendations.</li> </ol>		<p align="center"><b>CONCRETE TRAFFIC BARRIER (CTB)</b></p>
				<p><b>GENERAL NOTES</b></p> <ol style="list-style-type: none"> <li>1. Place delineators on a section of roadway at a consistent distance from the edge of pavement.</li> <li>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.</li> <li>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.</li> <li>4. Install all delineators, object markers and barrier reflectors in accordance with the manufacturer's recommendation.</li> <li>5. Barrier reflectors should be installed a minimum of 18 inches above the edge of the pavement surface.</li> <li>6. Diagonal stripes on Type 3 object markers shall slope down toward the intended travel lane.</li> </ol>	

**TYPES 1,3, AND 4 OBJECT MARKERS AND CHEVRONS**

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

**CHEVRONS AND ONE DIRECTION LARGE ARROW SIGN**

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

**DELINEATORS AND TYPE 2 OBJECT MARKERS**

See general notes 1, 2 and 3.

TYPE OF BARRIER MOUNTS	
GUARD FENCE ATTACHMENT	
GF1	GF2

**CONCRETE TRAFFIC BARRIER (CTB)**

Place Barrier Reflector on top or on side(s) of CTB.

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

Texas Department of Transportation

Traffic Safety Division Standard

**DELINEATOR & OBJECT MARKER INSTALLATION**  
**D & OM(2)-20**

FILE: dom2-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT August 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS	0913	26	066	CR
10-09 3-15	DIST	COUNTY	SHEET NO.	
4-10 7-20	YKM	COLORADO	60	

20B

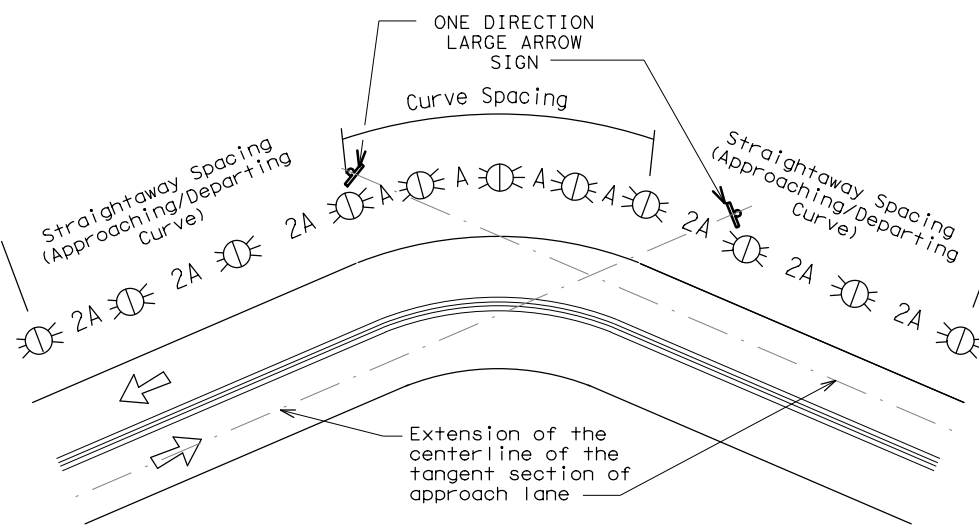
DATE: FILE:

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### MINIMUM WARNING DEVICES AT CURVES WITH ADVISORY SPEEDS

Amount by which Advisory Speed is less than Posted Speed	Curve Advisory Speed	
	Turn (30 MPH or less)	Curve (35 MPH or more)
5 MPH & 10 MPH	• RPMs	• RPMs
15 MPH & 20 MPH	• RPMs and One Direction Large Arrow sign	• RPMs and Chevrons; or • RPMs and One Direction Large Arrow sign where geometric conditions or roadside obstacles prevent the installation of chevrons.
25 MPH & more	• RPMs and Chevrons; or • RPMs and One Direction Large Arrow sign where geometric conditions or roadside obstacles prevent the installation of chevrons	• RPMs and Chevrons

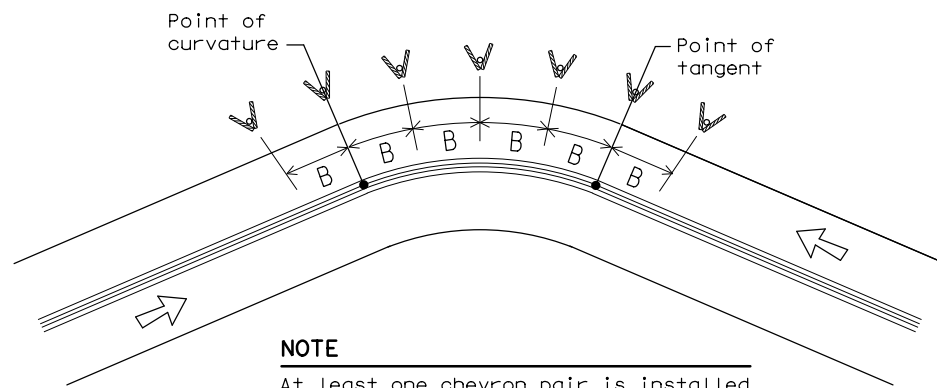
### SUGGESTED SPACING FOR DELINEATORS ON HORIZONTAL CURVES



**NOTE**

ONE DIRECTION LARGE ARROW (W1-6) sign should be located at approximately and perpendicular to the extension of the centerline of the tangent section of approach lane.

### SUGGESTED SPACING FOR CHEVRONS ON HORIZONTAL CURVES



**NOTE**

At least one chevron pair is installed beyond the point of tangent in tangent section.

### 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

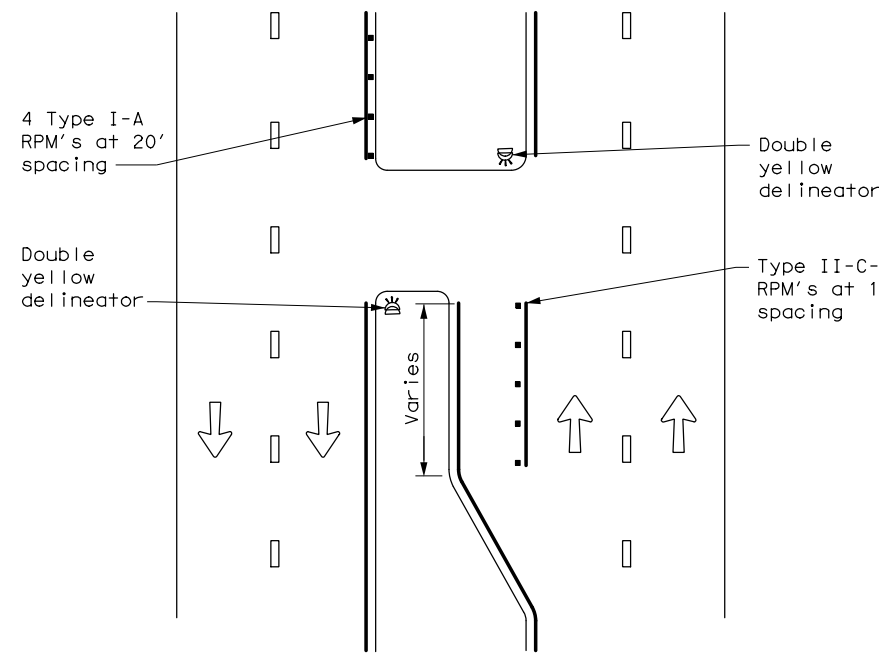
FILE: dom3-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CR: TxDOT
© TxDOT August 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS	0913	26	066	CR
3-15 8-15	DIST	COUNTY	SHEET NO.	
8-15 7-20	YKM	COLORADO	61	

DATE:  
FILE:

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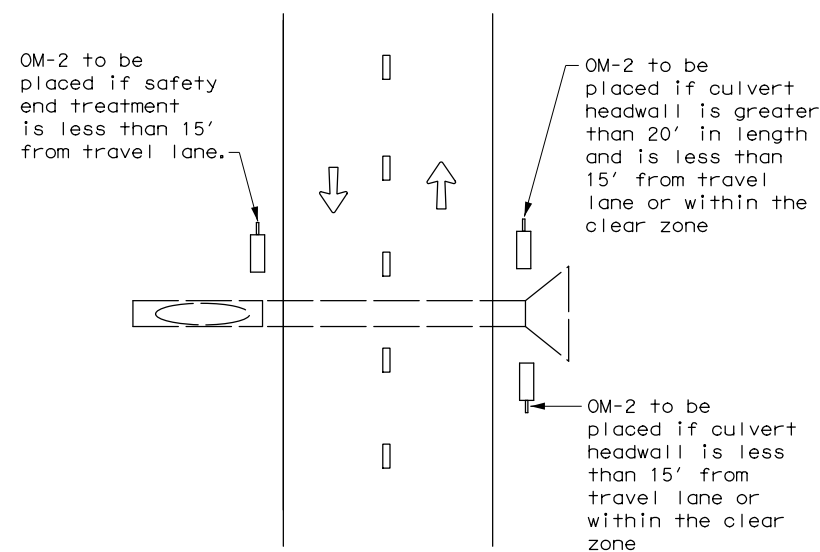
DATE:  
FILE:

**CROSSOVERS**



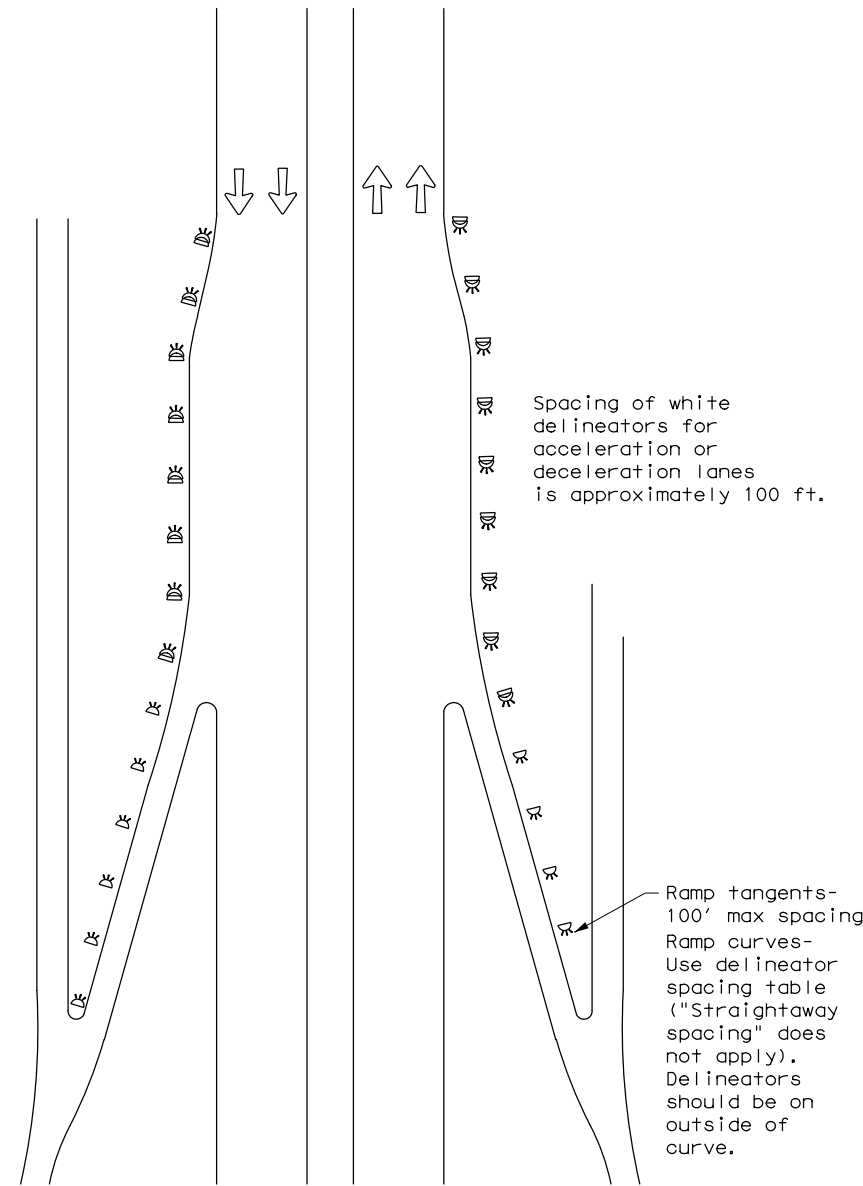
**DETAIL 1**

**FOR CULVERTS WITHOUT MBGF**



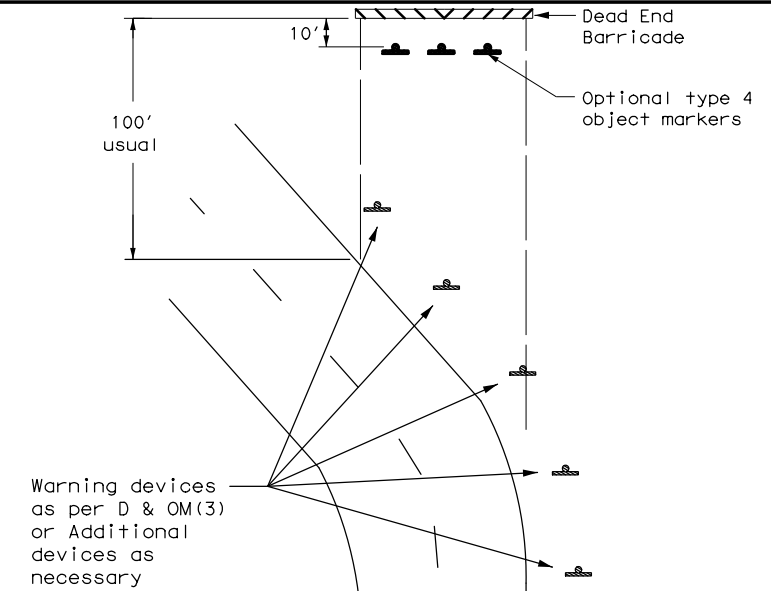
**DETAIL 2**

**FREEWAY DELINEATION FOR RAMPS AND ACCELERATION/DECELERATION LANES**



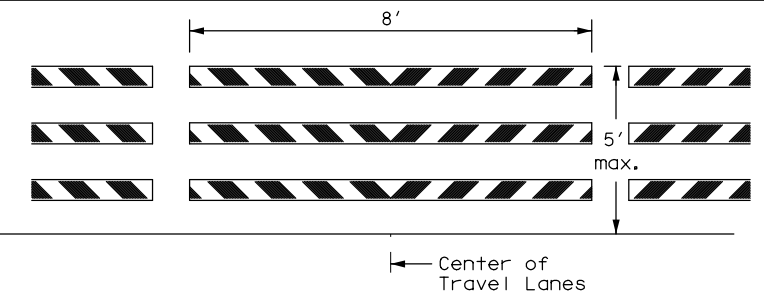
**DETAIL 3**

**TYPICAL APPLICATION OF DEAD END BARRICADE**



**DETAIL 4**

**TYPICAL DEAD END BARRICADE INSTALLATION**



**NOTES**

1. Barricade striping shall be red and white reflective sheeting for all permanent road closures.
2. Barricade striping is red and white sloping toward the center of the roadway.
3. Type 3 Barricade Supports should be anchored to soil or pavement as described in compliant Work Zone Traffic Control Devices List, section D.2.f and D.2.g.

**DETAIL 5**

LEGEND	
	Bidirectional Delineator
	Delineator
	OM-3
	Barricade
	Sign
	OM-2
	Double Delineator

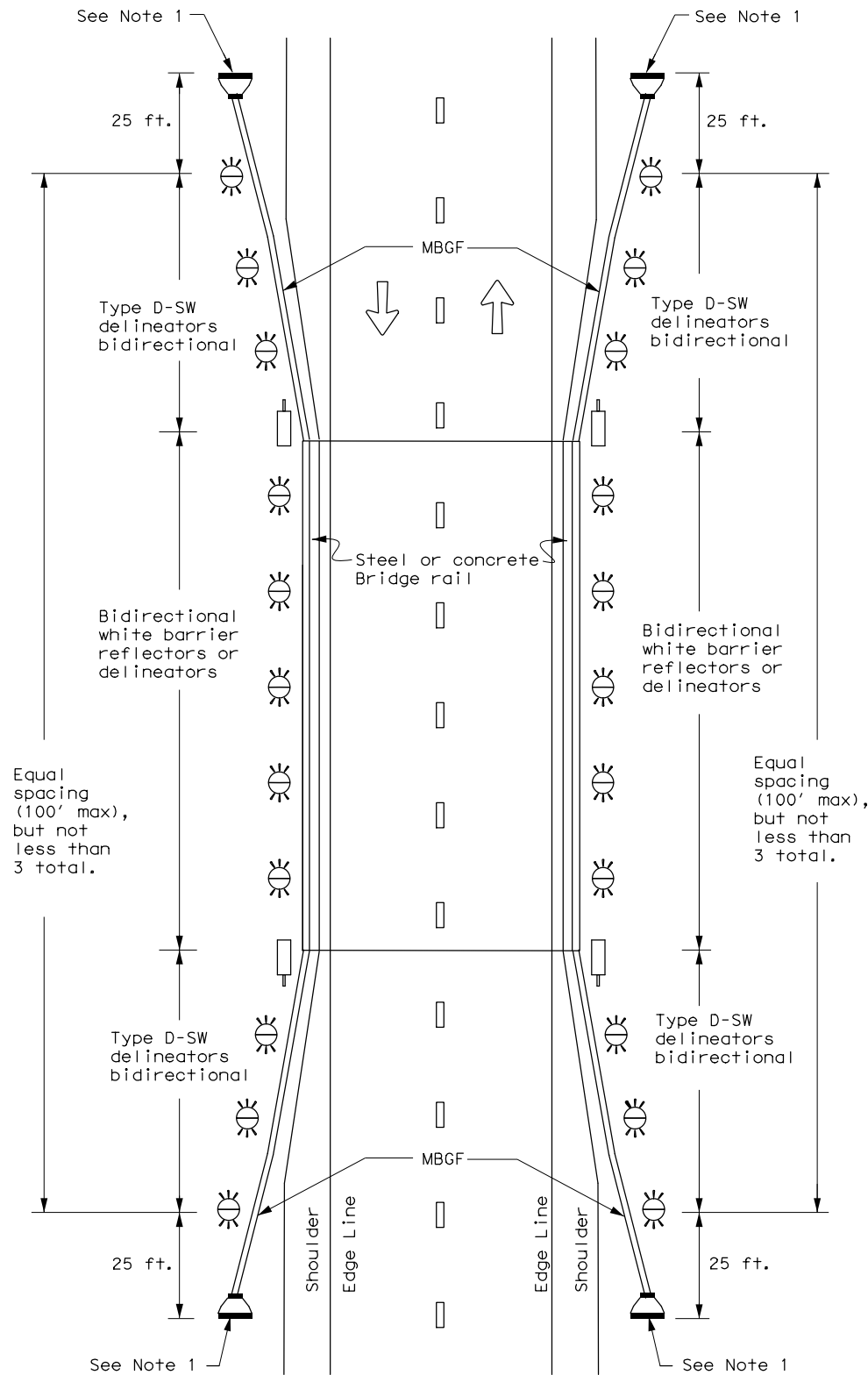


**DELINEATOR & OBJECT MARKER PLACEMENT DETAILS**

**D & OM(4)-20**

FILE: dom4-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT August 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS	0913	26	066	CR
3-15	DIST	COUNTY	SHEET NO.	
7-20	YKM	COLORADO	62	

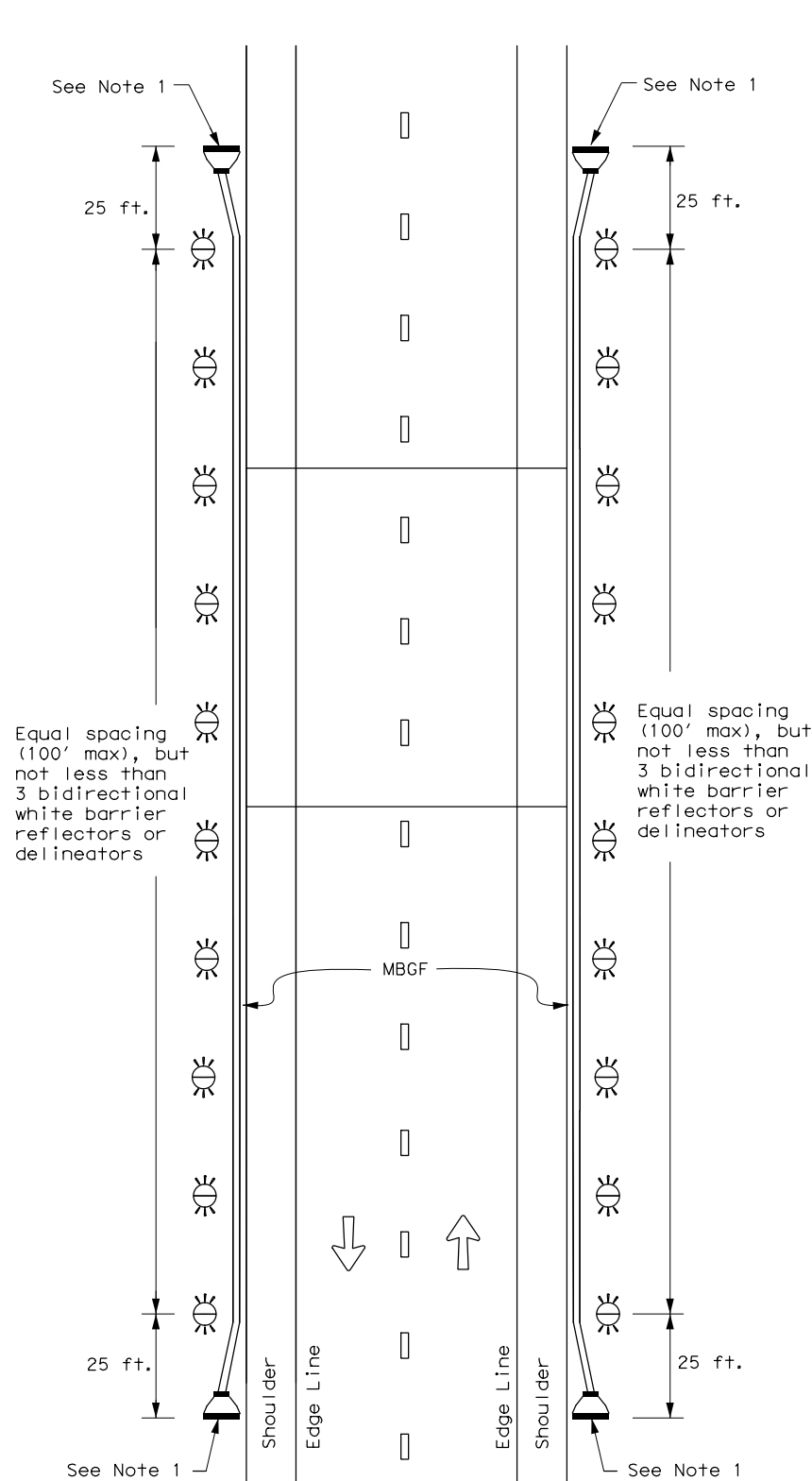
**TWO-WAY, TWO LANE ROADWAY  
WITH REDUCED WIDTH APPROACH RAIL**



**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.

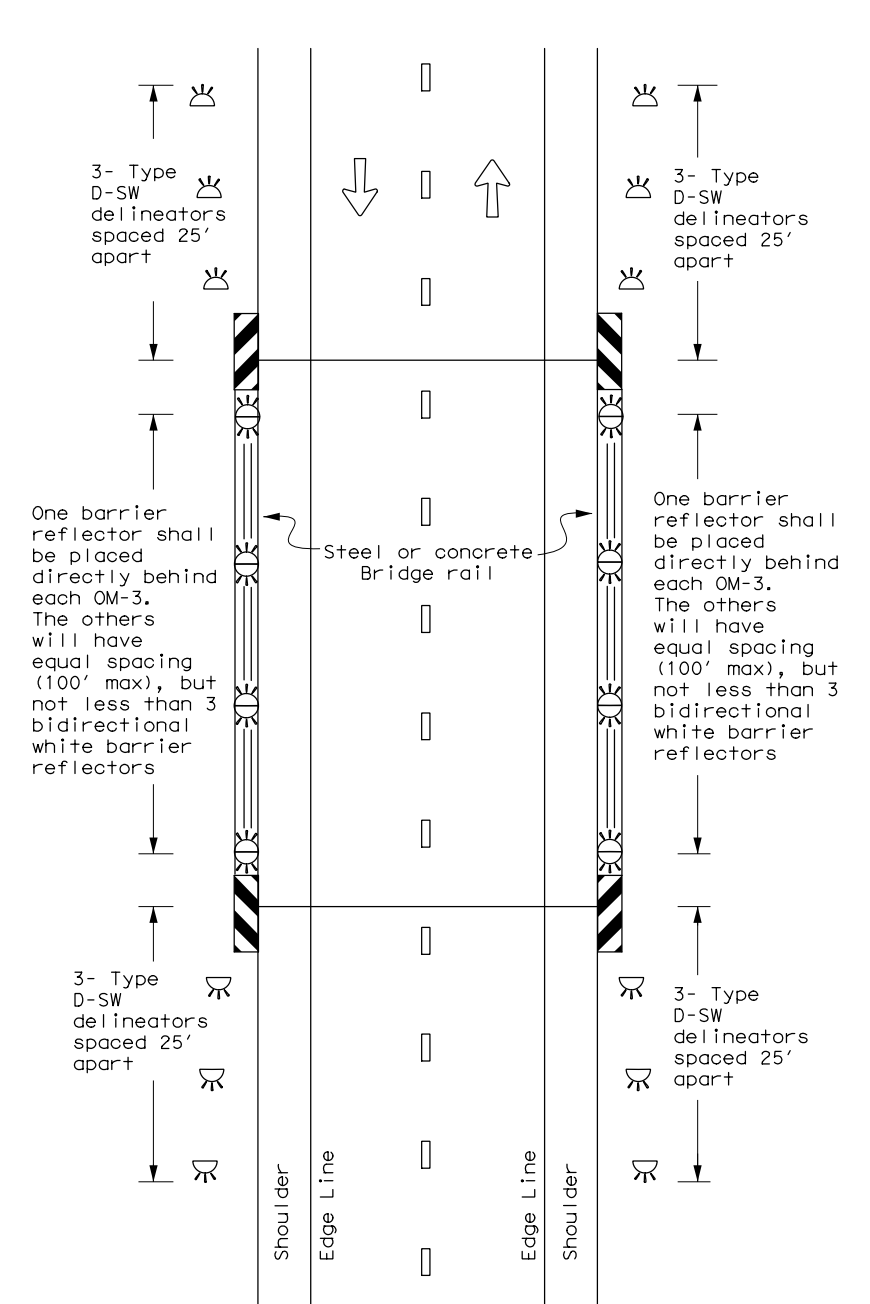
**TWO-WAY, TWO LANE ROADWAY  
WITH METAL BEAM GUARD FENCE (MBGF)**



**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**

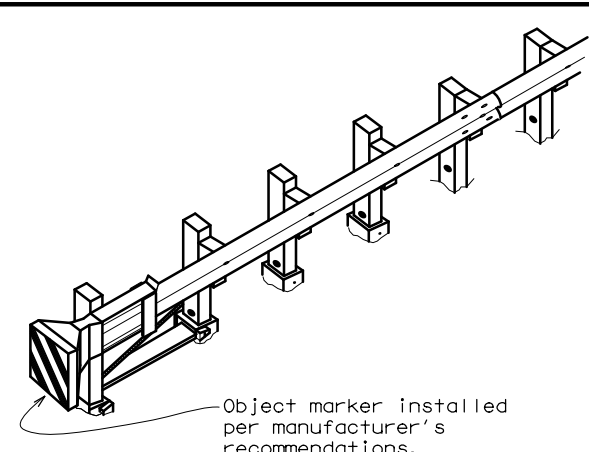
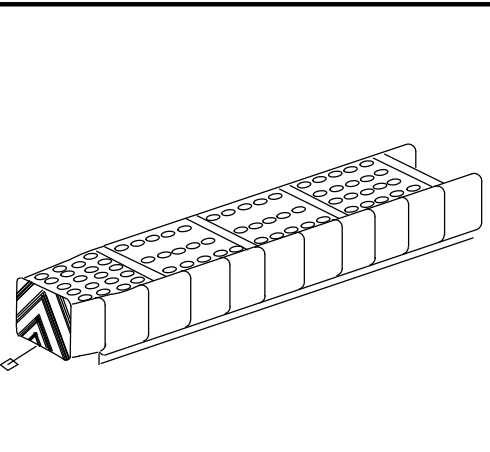
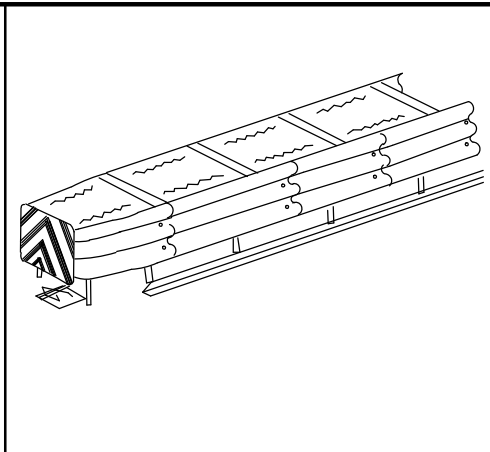
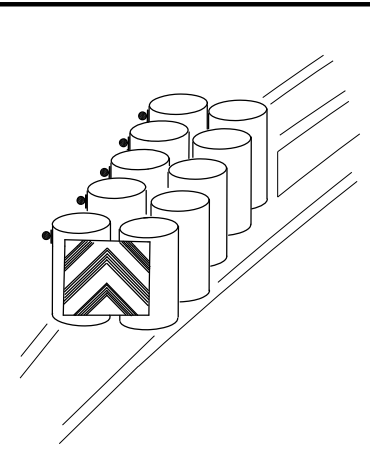
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© TxDOT August 2015	CON: 0913	SECT: 26	JOB: 066	HIGHWAY: CR
7-20	DIST: YKM	COUNTY: COLORADO	SHEET NO. 63	

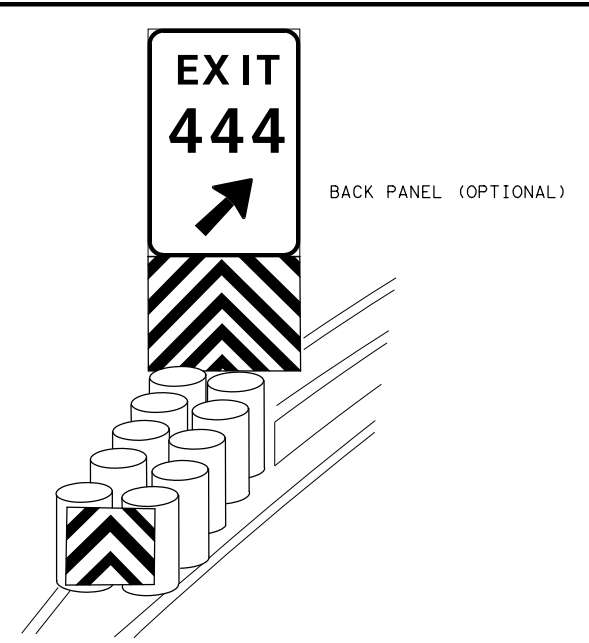
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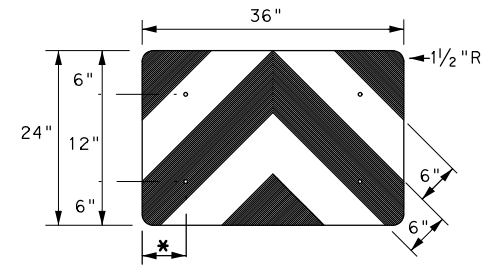
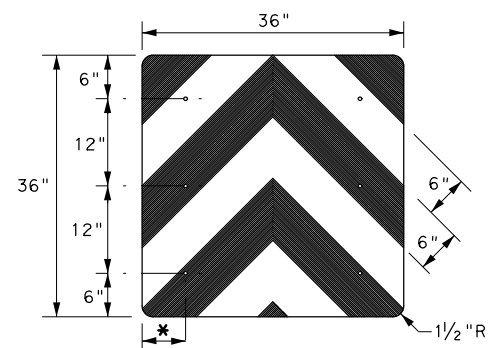
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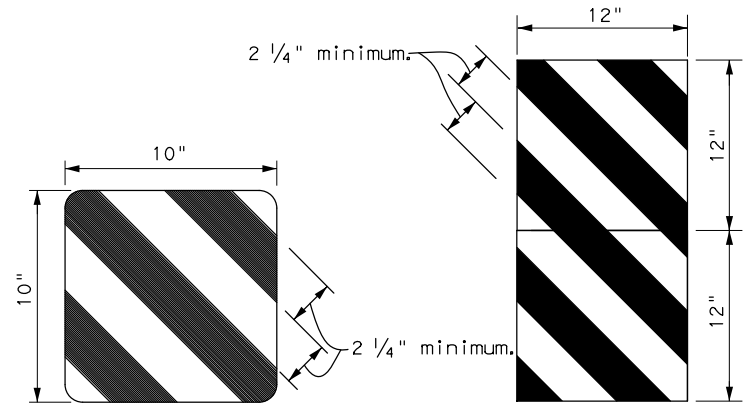
Object marker installed per manufacturer's recommendations.



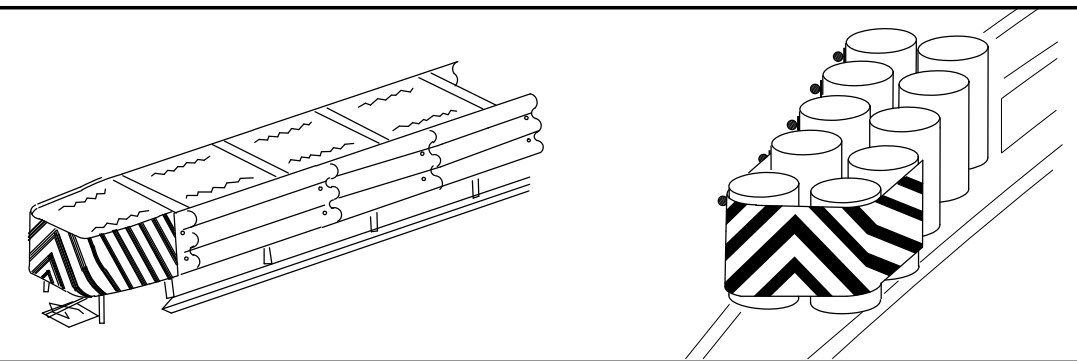
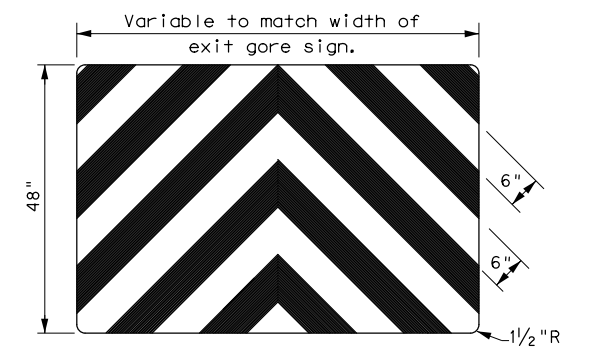
BACK PANEL (OPTIONAL)



\* Adjust to fit attenuator per manufacturer's recommendation, or as directed by the Engineer



OBJECT MARKERS SMALLER THAN 3 FT<sup>2</sup>

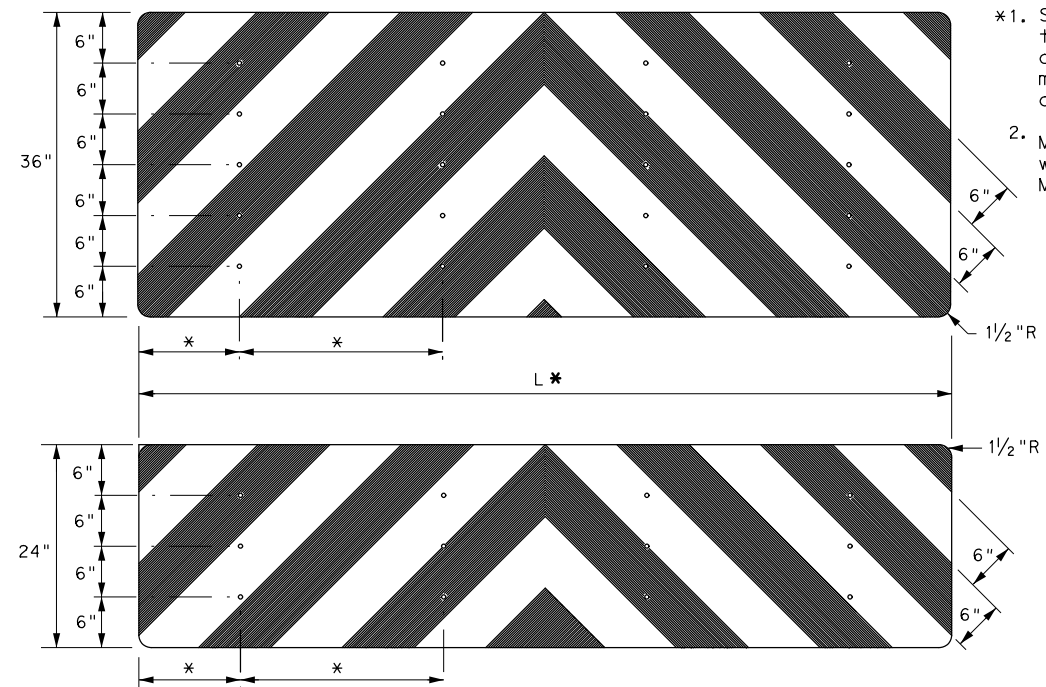


**NOTES**

- 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.
- 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.
- 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".
- 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.
- Object Marker at nose of attenuator is subsidiary to the attenuator.
- See D & OM (1-4) for required barrier reflectors.

**NOTES**

- Spacing should be adjusted to attach through centerline of drum, per attenuator manufacturer's recommendation, or as directed by the Engineer.
- Mounting should be flush with top of attenuator. Minimum size 96" x 24".



DATE:  
FILE:

<p><b>DELINEATOR &amp; OBJECT MARKER FOR VEHICLE IMPACT ATTENUATORS</b></p> <p><b>D &amp; OM(VIA)-20</b></p>			
FILE: domvia20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT
© TxDOT December 1989	CONT	SECT	JOB
REVISIONS		0913	26
4-92 8-04		066	CR
8-95 3-15			
4-98 7-20			
DIST	COUNTY	SHEET NO.	
YKM	COLORADO	64	
20G			

**STORMWATER POLLUTION PREVENTION PLAN (SWP3):**

This SWP3 has been developed in accordance with TxDOT policy for projects disturbing less than 1 acre of soil, and not part of a larger common plan of development.

This SWP3 is consistent with requirements specified in applicable stormwater plans, and the project's environmental permits, issues, and commitments (EPICs).

**1.0 SITE/PROJECT DESCRIPTION**

**1.1 PROJECT CONTROL SECTION JOB (CSJ):**

0913-26-066

**1.2 PROJECT LIMITS:**

From: AT BUCKSNAG CREEK

To: STR# AA02-83-001

**1.3 PROJECT COORDINATES:**

BEGIN: (Lat) 29.4447° (N), (Long) 96.5038° (W)

END: (Lat) 29.4447° (N), (Long) 96.5038° (W)

**1.4 TOTAL PROJECT AREA (Acres):** 0.71

**1.5 TOTAL AREA TO BE DISTURBED (Acres):** 0.37

**1.6 NATURE OF CONSTRUCTION ACTIVITY:**

CONSTRUCTION OF BRIDGE REPLACEMENT CONSISTING OF REPLACING BRIDGE AND APPROACHES

**1.7 MAJOR SOIL TYPES:**

Soil Type	Description
Snakecreek fine sandy loam	0 to 1 percent slopes, occasionally flooded

**1.8 PROJECT SPECIFIC LOCATIONS (PSLs):**

PSLs must be depicted on the Environmental Layout Sheets in Attachment 1.2 of this SWP3. PSLs may be identified during preconstruction meetings or during the construction process. Please choose from the options below:

- PSLs determined during preconstruction meeting
- PSLs determined during construction
- No PSLs planned for construction

Type	Sheet #s

All off-ROW PSLs required by the Contractor are the Contractor's responsibility. The Contractor shall secure all permits required by local, state, federal laws for off-ROW PSLs. The contractor shall provide diagrams, areas of disturbance, acreage, and BMPs for all off-ROW PSLs within one mile of the project.

**1.9 CONSTRUCTION ACTIVITIES:**

(Use the following list as a starting point when developing the Construction Activity Schedule and Ceasing Record in Attachment 2.3.)

- Mobilization
- Install sediment and erosion controls
- Blade existing topsoil into windrows, prep ROW, clear and grub
- Remove existing pavement
- Grading operations, excavation, and embankment
- Excavate and prepare subgrade for proposed pavement widening
- Remove existing culverts, safety end treatments (SETs)
- Remove existing metal beam guard fence (MBGF), bridge rail
- Install proposed pavement per plans
- Install culverts, culvert extensions, SETs
- Install mow strip, MBGF, bridge rail
- Place flex base
- Rework slopes, grade ditches
- Blade windrowed material back across slopes
- Revegetation of unpaved areas
- Achieve site stabilization and remove sediment and erosion control measures

- Other: \_\_\_\_\_
- Other: \_\_\_\_\_
- Other: \_\_\_\_\_

**1.10 POTENTIAL POLLUTANTS AND SOURCES:**

- Sediment laden stormwater from stormwater conveyance over disturbed area
- Fuels, oils, and lubricants from construction vehicles, equipment, and storage
- Solvents, paints, adhesives, etc. from various construction activities
- Transported soils from offsite vehicle tracking
- Construction debris and waste from various construction activities
- Contaminated water from excavation or dewatering pump-out water
- Sanitary waste from onsite restroom facilities
- Trash from various construction activities/receptacles
- Long-term stockpiles of material and waste

- Other: \_\_\_\_\_
- Other: \_\_\_\_\_
- Other: \_\_\_\_\_

**1.11 RECEIVING WATERS:**

Receiving waters must be depicted on the Environmental Layout Sheets in Attachment 1.2 of this SWP3. Include Segment # for receiving waters.

Tributaries	Classified Waterbody
Bucksnag Creek	Sandy Creek (1604C), Lake Texana
<b>NO TMDLs or I-PLANS WERE IDENTIFIED</b>	

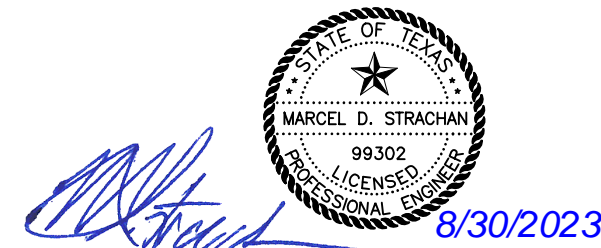
\* Add (\*) for impaired waterbodies with pollutant in ( ).

**1.12 ROLES AND RESPONSIBILITIES: TxDOT**

- Development of plans and specifications
- Perform SWP3 inspections
- Maintain SWP3 records and update to reflect daily operations
- Other: \_\_\_\_\_
- Other: \_\_\_\_\_

**1.13 ROLES AND RESPONSIBILITIES: CONTRACTOR**

- Day To Day Operational Control
- Maintain schedule of major construction activities
- Install, maintain and modify BMPs
- Other: \_\_\_\_\_
- Other: \_\_\_\_\_



**STORMWATER POLLUTION PREVENTION PLAN (SWP3) (Less Than 1 Acre)**

FED. RD. DIV. NO.	PROJECT NO.			SHEET NO.
				65
STATE	STATE DIST.	COUNTY		
TEXAS	YKM	COLORADO		
CONT.	SECT.	JOB	HIGHWAY NO.	
0913	26	066	CR	

**STORMWATER POLLUTION PREVENTION PLAN (SWP3):**

**2.0 BEST MANAGEMENT PRACTICES (BMPs) AND CONTROLS, INSPECTION, AND MAINTENANCE**

The Contractor shall be the responsible party for implementing the BMPs described herein and for complying with the SWP3 for control of erosion and sedimentation during day-to-day operations. The Contractor shall implement changes to this SWP3 approved by TxDOT within the times specified in this SWP3 or the CGP.

**2.1 EROSION CONTROL AND SOIL STABILIZATION BMPs:**

**T / P**

- Protection of Existing Vegetation
- Vegetated Buffer Zones
- Soil Retention Blankets
- Geotextiles
- Mulching/ Hydromulching
- Soil Surface Treatments
- Temporary Seeding
- Permanent Planting, Sodding or Seeding
- Biodegradable Erosion Control Logs
- Rock Filter Dams/ Rock Check Dams
- Vertical Tracking
- Interceptor Swale
- Riprap
- Diversion Dike
- Temporary Pipe Slope Drain
- Embankment for Erosion Control
- Paved Flumes
- Other: \_\_\_\_\_
- Other: \_\_\_\_\_
- Other: \_\_\_\_\_
- Other: \_\_\_\_\_

**2.2 SEDIMENT CONTROL BMPs:**

**T / P**

- Biodegradable Erosion Control Logs
- Dewatering Controls
- Inlet Protection
- Rock Filter Dams/ Rock Check Dams
- Sandbag Berms
- Sediment Control Fence
- Stabilized Construction Exit
- Floating Turbidity Barrier
- Vegetated Buffer Zones
- Vegetated Filter Strips
- Other: \_\_\_\_\_
- Other: \_\_\_\_\_
- Other: \_\_\_\_\_
- Other: \_\_\_\_\_

Refer to the Environmental Layout Sheets/ SWP3 Layout Sheets located in Attachment 1.2 of this SWP3

Sediment control BMPs requiring design capacity calculations (See SWP3 Attachment 1.3.):

**T / P**

- Sediment Trap
  - Calculated volume runoff from 2-year, 24-hour storm for each acre of disturbed area
  - 3,600 cubic feet of storage per acre drained
- Sedimentation Basin
  - Not required (<10 acres disturbed)
  - Required (>10 acres) and implemented.
    - Calculated volume runoff from 2-year, 24-hour storm for each acre of disturbed area
    - 3,600 cubic feet of storage per acre drained
  - Required (>10 acres), but not feasible due to:
    - Available area/Site geometry
    - Site slope/Drainage patterns
    - Site soils/Geotechnical factors
    - Public safety
    - Other: \_\_\_\_\_

**2.3 PERMANENT CONTROLS:**

(Coordinate post-construction BMPs with appropriate TxDOT maintenance sections.)

BMPs To Be Left In Place Post Construction:

Type	Stationing	
	From	To

Refer to the Environmental Layout Sheets/ SWP3 Layout Sheets located in Attachment 1.2 of this SWP3

**2.4 OFFSITE VEHICLE TRACKING CONTROLS:**

- Excess dirt/mud on road removed daily
- Haul roads dampened for dust control
- Loaded haul trucks to be covered with tarpaulin
- Stabilized construction exit
- Daily street sweeping
- Other: \_\_\_\_\_
- Other: \_\_\_\_\_
- Other: \_\_\_\_\_
- Other: \_\_\_\_\_

**2.5 POLLUTION PREVENTION MEASURES:**

- Chemical Management
- Concrete and Materials Waste Management
- Debris and Trash Management
- Dust Control
- Sanitary Facilities
- Other: \_\_\_\_\_
- Other: \_\_\_\_\_
- Other: \_\_\_\_\_
- Other: \_\_\_\_\_

**2.6 VEGETATED BUFFER ZONES:**

Natural vegetated buffers shall be maintained as feasible to protect adjacent surface waters. If vegetated natural buffer zones are not feasible due to site geometry, the appropriate additional sediment control measures have been incorporated into this SWP3.

Type	Stationing	
	From	To
No surface waters present, vegetated buffer zones are not planned.		

Refer to the Environmental Layout Sheets/ SWP3 Layout Sheets located in Attachment 1.2 of this SWP3

**2.7 ALLOWABLE NON-STORMWATER DISCHARGES:**

- Fire hydrant flushings
- Irrigation drainage
- Pavement washwater (where spills or leaks have not occurred, and detergents are not used)
- Potable water sources
- Springs
- Uncontaminated groundwater
- Water used to wash vehicles or control dust
- Other allowable non-stormwater discharges as allowed by TPDES GP TXR150000.

**2.8 DEWATERING:**

**2.9 INSPECTIONS:**

**2.10 MAINTENANCE:**

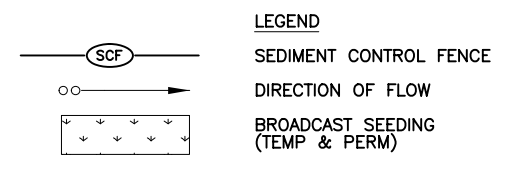
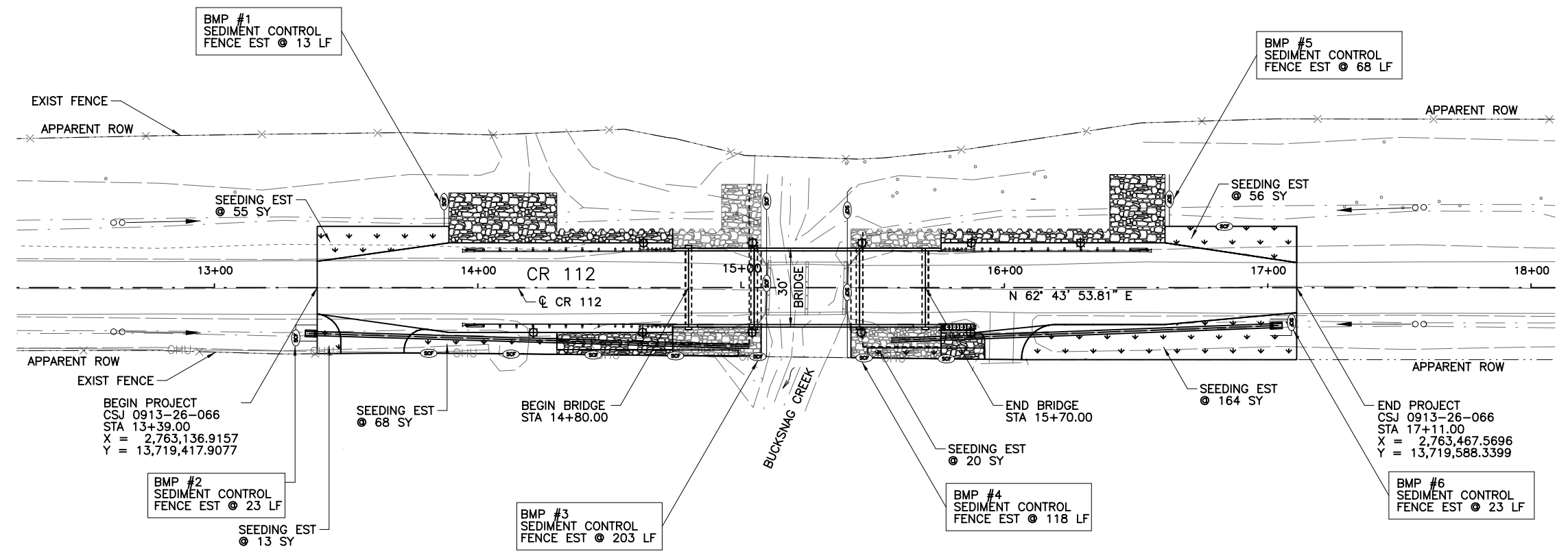
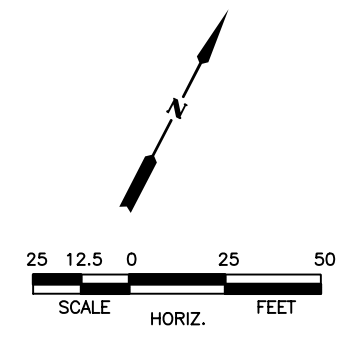
Control measures shall be properly installed according to specifications. If it is determined that a BMP or control measure is not operating effectively, maintenance must be accomplished as soon as possible and before the next anticipated rain event, but in no case later than 7 calendar days after being able to access the site. Maintenance shall be performed by the Contractor as indicated on the Field Inspection and Maintenance Report Form 2118 and retained in Attachment 2.5 of this SWP3.



**STORMWATER POLLUTION PREVENTION PLAN (SWP3)**

FED. RD. DIV. NO.	PROJECT NO.			SHEET NO.
				66
STATE	STATE DIST.	COUNTY		
TEXAS	YKM	COLORADO		
CONT.	SECT.	JOB	HIGHWAY NO.	
0913	26	066	CR	

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*Marcel D. Strachan*  
 STATE OF TEXAS  
 MARCEL D. STRACHAN  
 99302  
 LICENSED PROFESSIONAL ENGINEER  
 8/30/2023

NO.	REVISION	BY	DATE

**stv** TEXAS REGISTERED ENGINEERING FIRM F-1741

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 CR 112 AT BUCKSNAG CREEK

**SWP3 LAYOUT**  
 CSJ 0913-26-066 SHEET 1 OF 1

Designed:	NB	FED. RD. DIV. NO.	6	STATE	TEXAS	FEDERAL AID PROJECT NO.	0913 26 066	HIGHWAY NO.	CR
Checked:	MDS	DIST.	YKM	COUNTY	COLORADO	CONTROL NO.	0913	SECTION NO.	26
Drawn:	NB	JOB NO.	066	SHEET NO.	67				



**I. STORMWATER POLLUTION PREVENTION**

Texas Pollutant Discharge Elimination System (TPDES) TXR 150000: Stormwater Discharge Permit or Construction General Permit is 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. If applicable list MS4 operator that may receive discharges from this project. MS4 operator should be notified prior to construction activities.

Prevent stormwater pollution erosion and sedimentation in accordance with TPDES Permit TXR 150000.

Comply with the SW3P and revise when necessary to control pollution or as 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) increase disturbed soil area to 5 acres or more, submit Notice of Intent (NOI) to TCEQ and Engineer.

MS4 Operator(s):

No Additional Comments

**II. WORK IN OR NEAR STREAMS, WATERBODIES AND WETLANDS**

United States Army Corps of Engineers (USACE) Permit is required for filling, dredging, excavating or other work in water bodies, rivers, creeks, streams, wetlands or wet areas. The Contractor must adhere to all of the terms and general conditions associated with the following permit(s). If additional work not represented in the plans is required, contact the Engineer immediately.

No USACE Permit Required

Work is authorized by the USACE under a Nationwide Permit 14 without a Pre-Construction Notification (PCN). Project specific permit was not issued by USACE, therefore is not in the plan set.

Work is authorized by the USACE under a Nationwide Permit \_\_\_\_\_ with a Pre-Construction Notification (PCN). The project specific permit issued by the USACE is included in the plan set.

Work is authorized by the USACE under a Individual Permit (IP). The project specific permit issued by the USACE is included in the plan set.

Work would be authorized by the USACE. The project specific permit issued by the USACE or Nationwide Permit will be provided to the contractor.

United States Coast Guard (USCG) Permit is required for projects that involve the construction or modification (including changes to lighting) of a bridge or causeway across a water body determined to be navigable by the United States Coast Guard (USCG) under Section 9 of the Rivers and Harbors Act. If additional work not represented in the plans is required, contact the Engineer immediately.

No United States Coast Guard (USCG) Coordination Required

United States Coast Guard (USCG) Permit

United States Coast Guard (USCG) Exemption

---

Best Management Practices

<b>Erosion</b>	<b>Sedimentation</b>	<b>Post Construction TSS</b>
<input checked="" type="checkbox"/> Temporary Vegetation	<input checked="" type="checkbox"/> Silt Fence	<input checked="" type="checkbox"/> Vegetative Filter Strips
<input type="checkbox"/> Vegetation Lined Ditches	<input type="checkbox"/> Rock Filter Dam	<input type="checkbox"/> Vegetation Lined Ditches
<input type="checkbox"/> Sodding	<input type="checkbox"/> Sand Bag Berm	<input type="checkbox"/> Grassy Swales

No Additional Comments

**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 area and contact the Engineer immediately.

No Additional Comments

**IV. VEGETATION RESOURCES**

Preserve native vegetation to the extent practical. Refer to TxDOT Standard Specifications 162, 164, 192, 193, 506, 730, 751, and 752 in order to comply with requirements for invasive species, beneficial landscaping and tree/brush removal.

No Additional Comments

**V. FEDERAL LISTED, PROPOSED THREATENED, ENDANGERED SPECIES, CRITICAL HABITAT, STATE LISTED SPECIES, CANDIDATE SPECIES AND MIGRATORY BIRDS**

If any of the listed species below are observed, cease work in the area, do not disturb species or habitat and contact the Engineer immediately.

The work may not remove active nests (from bridges, structures, or vegetation adjacent to the roadway, etc.) during nesting season (February 15 to October 1). If removal of structures or vegetation is necessary during the nesting season, the Contractor shall conduct a bird survey no more than 3 days in advance of the clearing/demolish start date. All bird surveys shall be conducted by a Field Biologist and adhere to the guidance document "Avoiding Migratory Birds and Handling Potential Violations" found in the TxDOT Environmental Compliance Toolkits at the time of the survey. (See below for Field Biologist and Ornithologist qualifications)

No Additional Comments

Field Biologist, Ornithologist – a field biologist is defined as an individual qualified to perform field investigations, presence/absence surveys and habitat surveys for protected avian species or species of concern. A mandatory bachelor's degree in biology or a related science is required. At a minimum, the Field Biologist, Ornithologist, shall have completed and reported a minimum of three presence/absence and habitat surveys for protected avian species in the past five years. A minimum of three projects must have been conducted in Texas. Surveys shall have been performed for documentation of species in accordance with a protocol approved by USFWS or TPWD, or following generally accepted methodologies.

Field Biologist, Ornithologist – a field biologist is defined as an individual qualified to perform field investigations, presence/absence surveys and habitat surveys for protected avian species or species of concern. A mandatory bachelor's degree in biology or a related science is required. At a minimum, the Field Biologist, Ornithologist, shall have completed and reported a minimum of three presence/absence and habitat surveys for protected avian species in the past five years. A minimum of three projects must have been conducted in Texas. Surveys shall have been performed for documentation of species in accordance with a protocol approved by USFWS or TPWD, or following generally accepted methodologies.

**VI. HAZARDOUS MATERIALS OR CONTAMINATION ISSUES**

Refer to TxDOT Standard Specifications in the event potentially contaminated materials are observed, such as dead or distressed vegetation, trash disposal areas, drums, canisters, barrels, leaching or seepage of substances, unusual smells or odors, or stained soil, cease work in the area and contact the Engineer immediately.

Does the project involve any bridge class structure rehabilitation or replacements (bridge class structures not including box culverts)? Yes  No

Are results of the asbestos inspection positive (is asbestos present)? Yes  No

TxDOT is still required to notify DSHS 14 working days prior to any scheduled demolition.

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.


No Additional Comments

**VII. GENERAL NOTES**

The contractor's attention is directed to the fact that discharges of permanent or temporary fill material into the waters of the United States, including jurisdictional wetlands, as necessary for construction, will require specific approval of the USACE under Section 404 of the Clean Water Act.

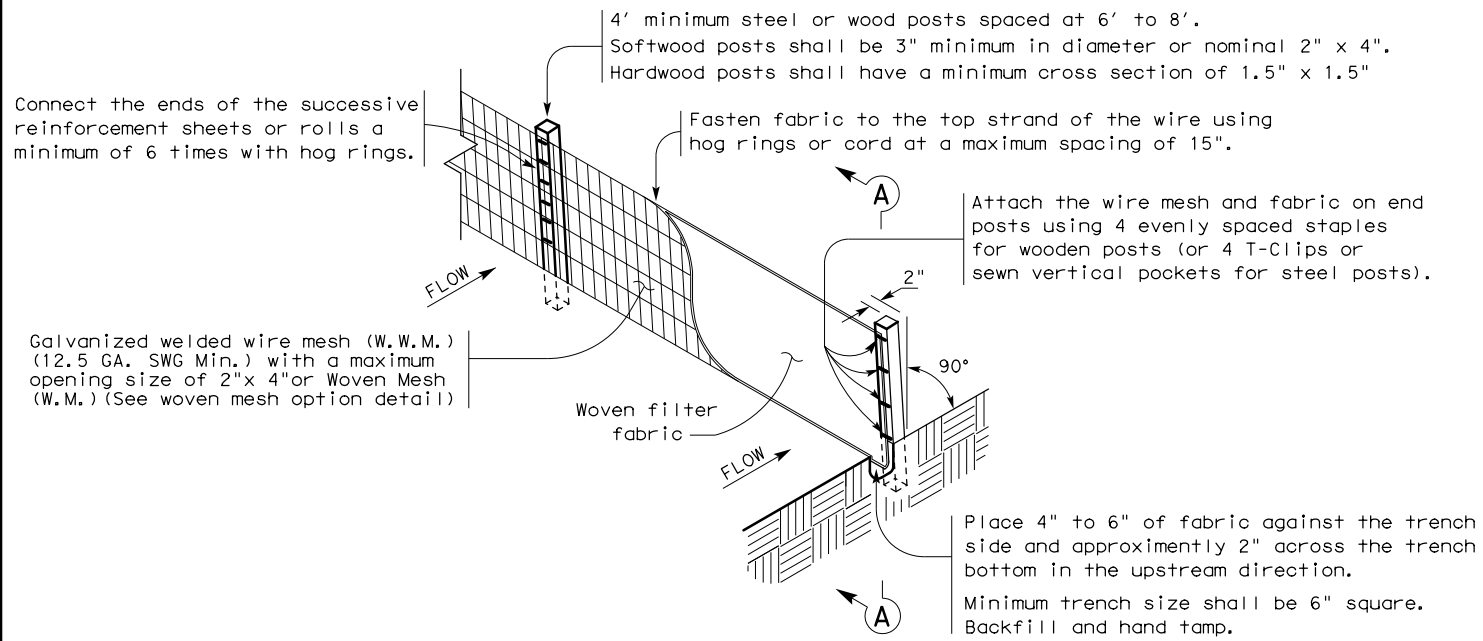
TxDOT will obtain the appropriate permit(s), Nationwide or Individual, when necessary as dictated by the proposed actions for the project and it's potential to affect USACE jurisdictional areas. The contractor may review the permitted plans at the office of the Area Engineer in charge of construction. TxDOT will hold the contractor responsible for following all conditions of the approved permit. If the contractor cannot work within the limits of the permit(s), then it becomes the contractor's entire responsibility to consult with the USACE pertaining to the need for changes or amendments to the conditions of the exiting permit(s) as originally obtained by the department.

Particular importance is stressed on the fact that any impacts to USACE jurisdictional waters of the United States, including jurisdictional wetlands, be the minimum necessary to complete the proposed work. The contractor shall maintain near normal flow of any jurisdictional waters of the United States at all times during construction. If the contractor needs further explanation of the conditions of the permit, including means of compliance, they may contact the Yoakum District Environmental Coordinator.

				TxDOT Yoakum District
<p><b>ENVIRONMENTAL PERMITS, ISSUES AND COMMITMENTS</b></p> <p><b>EPIC</b></p>				
FILE: EPIC Sheet.dgn	DN:	CK:	DW:	CK:
© TxDOT: March 2017	CONT	SECT	JOB	HIGHWAY
REVISIONS		0913	26	066
		DIST	COUNTY	SHEET NO.
		YKM	Colorado Co.	68

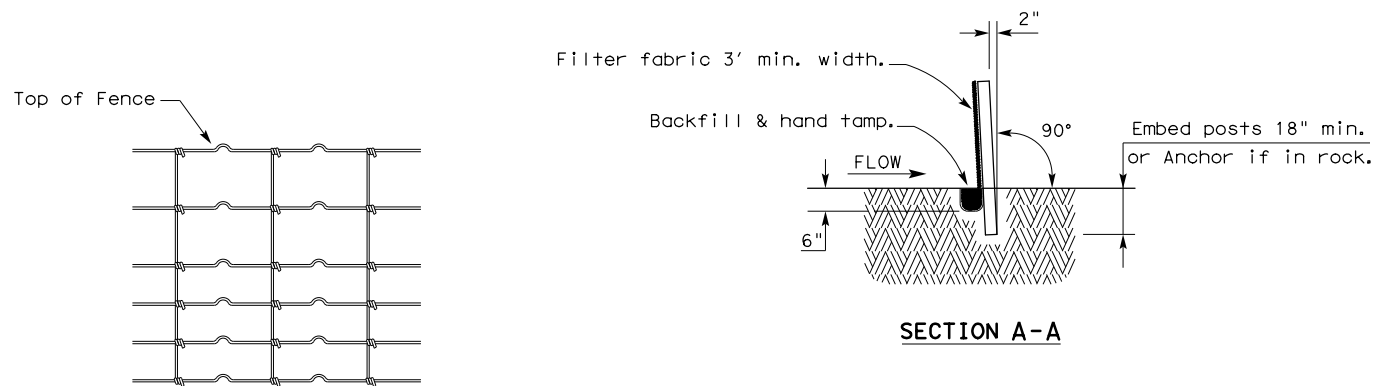
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DATE  
FILE



**TEMPORARY SEDIMENT CONTROL FENCE**

SCF



**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.

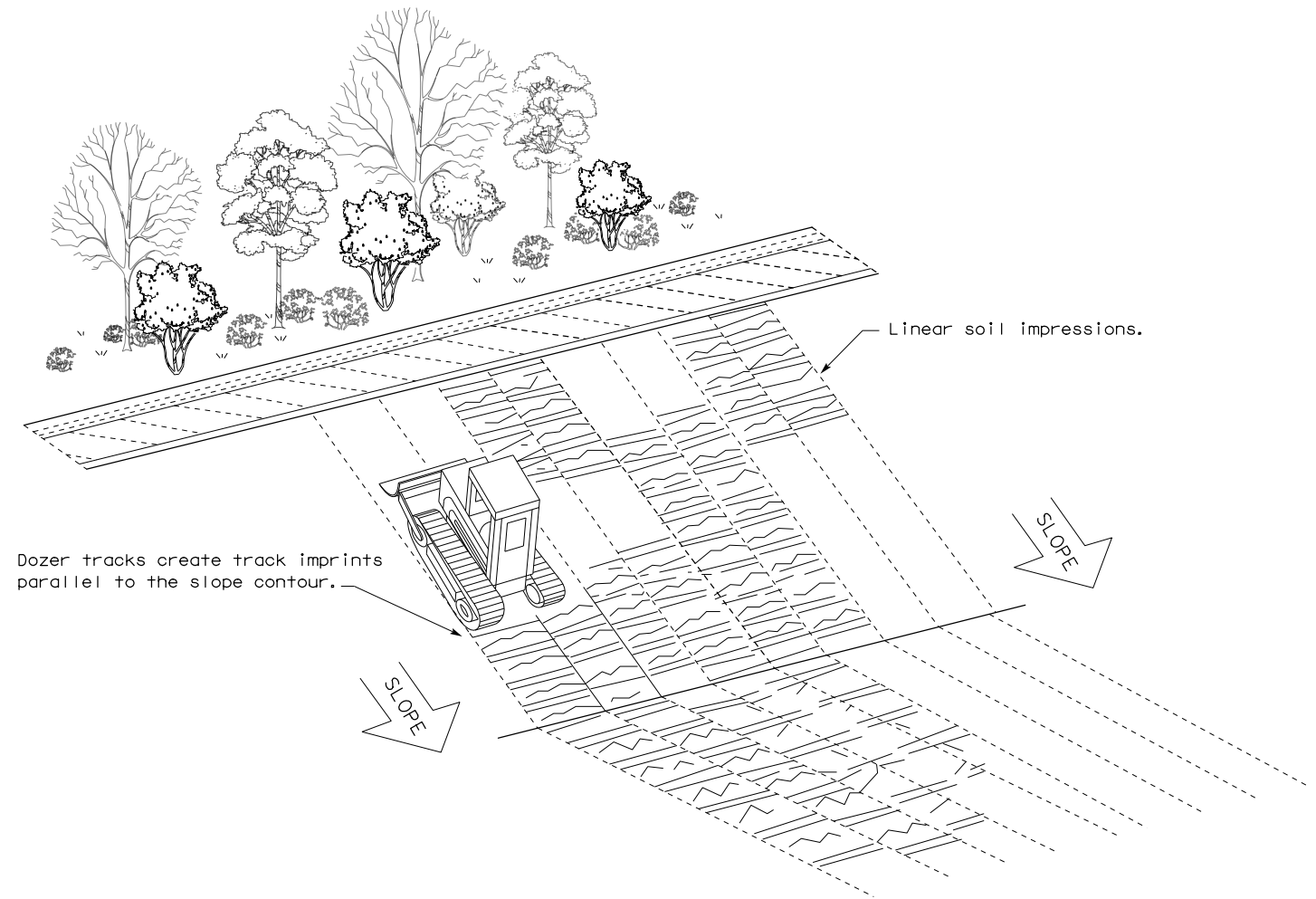
**LEGEND**

Sediment Control Fence

SCF

**GENERAL NOTES**

1. Vertical tracking is required on projects where soil distributing activities have occurred unless otherwise approved.
2. Perform vertical tracking on slopes to temporarily stabilize soil.
3. Provide equipment with a track undercarriage capable of producing linear soil impressions measuring a minimum of 12" in length by 2" to 4" in width by 1/2" to 2" in depth.
4. Do not exceed 12" between track impressions.
5. Install continuous linear track impressions where the minimum 12" length impressions are perpendicular to the slope or direction of water flow.



**VERTICAL TRACKING**

				<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	0913	26	066	CR	
	DIST	COUNTY		SHEET NO.	
	YKM	COLORADO		69	