

STATE OF TEXAS  
DEPARTMENT OF TRANSPORTATION

FED. RD. DIV. NO.	STATE PROJECT NO.	HIGHWAY NO.
6	BR 2023(408), ETC.	FM 27
STATE	STATE DIST.	COUNTY
TEXAS	BRY	FREESTONE
CONT.	SECT.	JOB SHEET NO.
0456	02	028, ETC. 1

SEE SHEET 2  
PROJECT LOCATION MAP  
AND SHEET 3 FOR  
INDEX OF SHEETS

PLANS OF PROPOSED  
STATE HIGHWAY IMPROVEMENT

PROJECT NO. BR 2023(408), ETC.

FM 27  
FREESTONE COUNTY

FINAL PLANS

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

FM 27 AT GRINDSTONE CREEK: NET LENGTH OF PROJECT: 711.00 FT = 0.134 MI  
FM 27 AT CANEY CREEK RELIEF: NET LENGTH OF PROJECT: 650.00 FT = 0.123 MI  
FM 27 AT CANEY CREEK: NET LENGTH OF PROJECT: 740.00 FT = 0.140 MI

FOR THE CONSTRUCTION OF BRIDGE REPLACEMENT  
CONSISTING OF REPLACING BRIDGE AND APPROACHES & GRADING.

LOCATION NO.	HIGHWAY	CSJ	LIMITS	ADT	DESIGN SPEED (MPH)	STATION		ROADWAY LENGTH (FT)	BRIDGE LENGTH (FT)	TOTAL LENGTH (FT)
						FROM	TO			
1	FM 27	0456-02-028	FM 27 AT GRINDSTONE CREEK STR: 17-082-0-0456-02-196	2020: 522 2040: 731	50	1501+09.00	1508+20.00	591.00	120.00	711.00
2	FM 27	0456-02-029	FM 27 AT CANEY CREEK RELIEF STR: 17-082-0-0456-02-197	2020: 522 2040: 731	50	1670+00.00	1676+50.00	420.00	230.00	650.00
3	FM 27	0456-02-030	FM 27 AT CANEY CREEK STR: 17-082-0-0456-02-198	2020: 522 2040: 731	50	1676+50.00	1683+90.00	585.00	155.00	740.00

THESE DOCUMENTS WERE PREPARED BY OR UNDER  
THE SUPERVISION OF:

*William A. Shekarchi* 4/26/2023  
WILLIAM A. SHEKARCHI, P.E. DATE

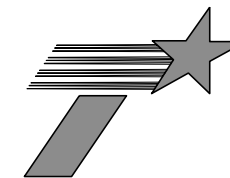
**Jacobs.**

JACOBS ENGINEERING GROUP INC. FIRM #2966  
2705 BEE CAVE ROAD, SUITE 300  
AUSTIN, TEXAS 78746  
(512) 314-3100 FAX (512) 314-3135

SPECIFICATIONS ADOPTED BY THE TEXAS DEPARTMENT  
OF TRANSPORTATION, NOVEMBER 1, 2014 AND SPECIFICATION  
ITEMS INCLUDED IN THE CONTRACT, SHALL GOVERN ON THIS  
PROJECT: REQUIRED CONTRACT PROVISIONS FOR ALL FEDERAL  
AID CONSTRUCTION CONTRACTS (FORM FHWA 1273, JUL 05, 2022)

NO EXCEPTIONS  
NO EQUATIONS  
NO RAILROAD CROSSINGS

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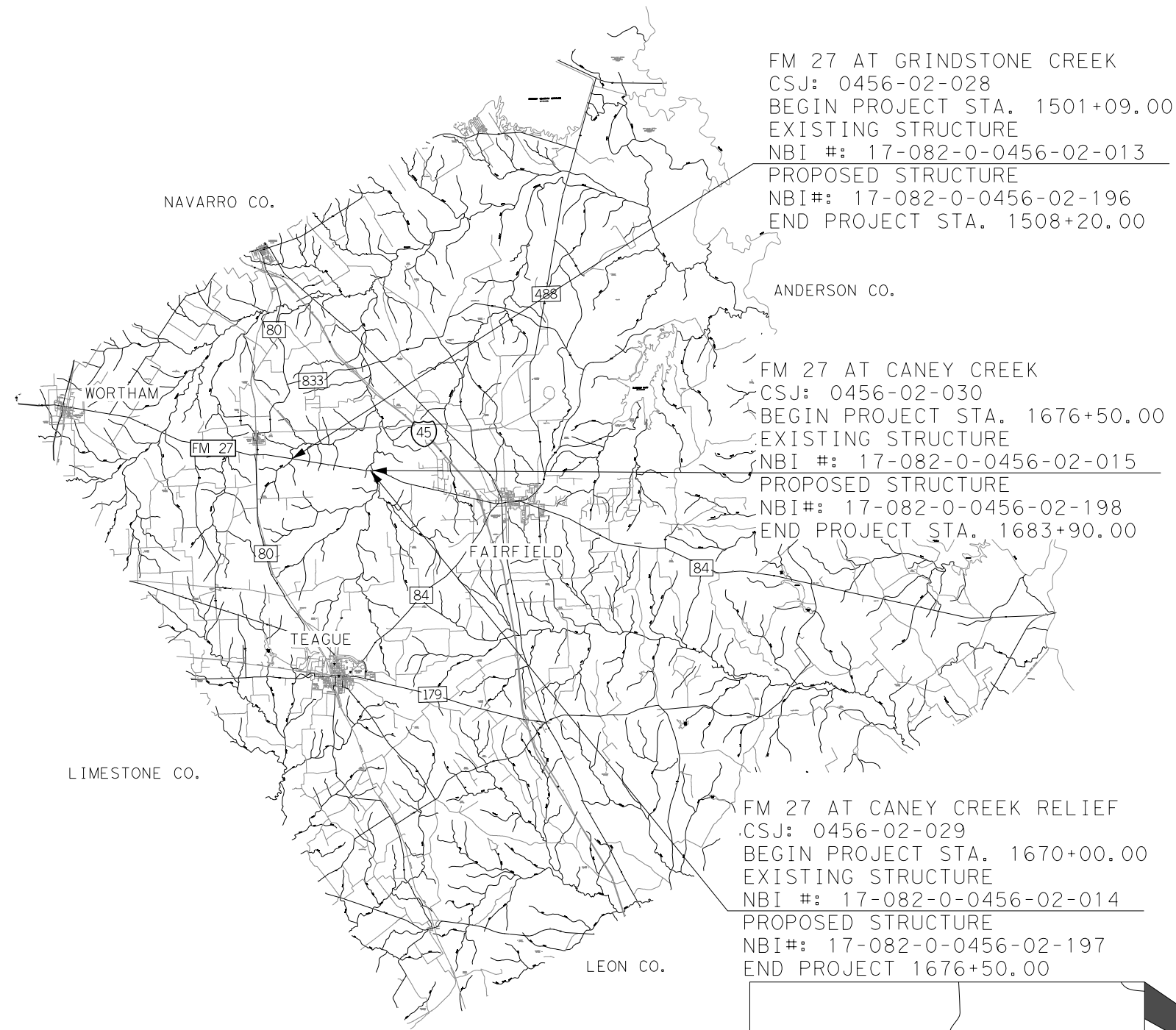


TEXAS DEPARTMENT OF TRANSPORTATION

SUBMITTED FOR LETTING: 4/28/2023  
Designed by:  
*Chad Bolone*  
01EBC5C65E334CE  
BRIDGE ENGINEER

RECOMMENDED FOR LETTING: 4/28/2023  
Reviewed by:  
*Doug Main*, P.E.  
DAA3B0624EE3419  
DIRECTOR OF TRANSPORTATION  
PLANNING AND DEVELOPMENT

APPROVED FOR LETTING: 4/28/2023  
Approved by:  
*Chad Bolone*  
60E5537745D24EA  
DISTRICT ENGINEER

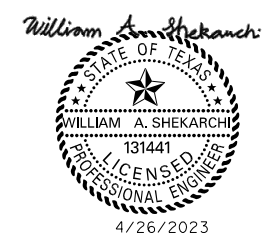


FM 27 AT GRINDSTONE CREEK  
 CSJ: 0456-02-028  
 BEGIN PROJECT STA. 1501+09.00  
 EXISTING STRUCTURE  
 NBI #: 17-082-0-0456-02-013  
 PROPOSED STRUCTURE  
 NBI#: 17-082-0-0456-02-196  
 END PROJECT STA. 1508+20.00

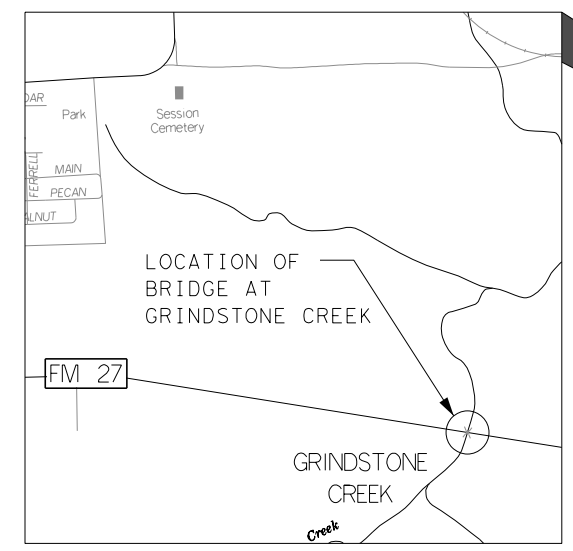
FM 27 AT CANEY CREEK  
 CSJ: 0456-02-030  
 BEGIN PROJECT STA. 1676+50.00  
 EXISTING STRUCTURE  
 NBI #: 17-082-0-0456-02-015  
 PROPOSED STRUCTURE  
 NBI#: 17-082-0-0456-02-198  
 END PROJECT STA. 1683+90.00

FM 27 AT CANEY CREEK RELIEF  
 CSJ: 0456-02-029  
 BEGIN PROJECT STA. 1670+00.00  
 EXISTING STRUCTURE  
 NBI #: 17-082-0-0456-02-014  
 PROPOSED STRUCTURE  
 NBI#: 17-082-0-0456-02-197  
 END PROJECT 1676+50.00

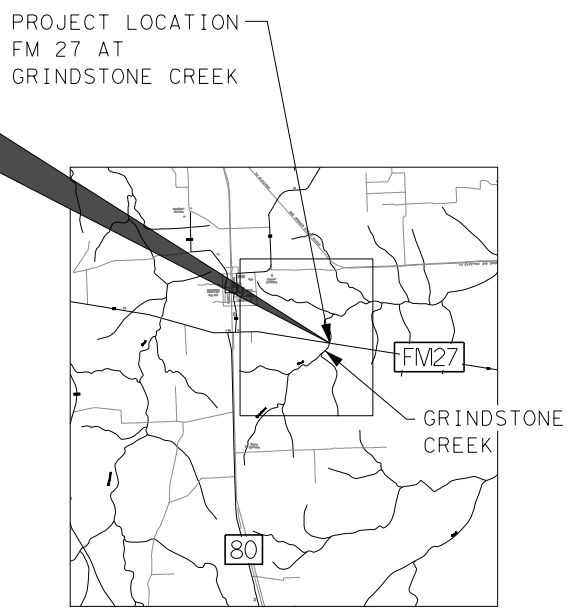
FREESTONE COUNTY  
 SCALE N. T. S.



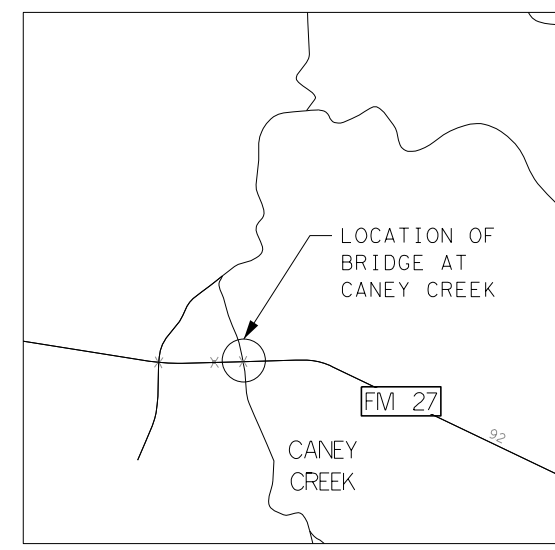
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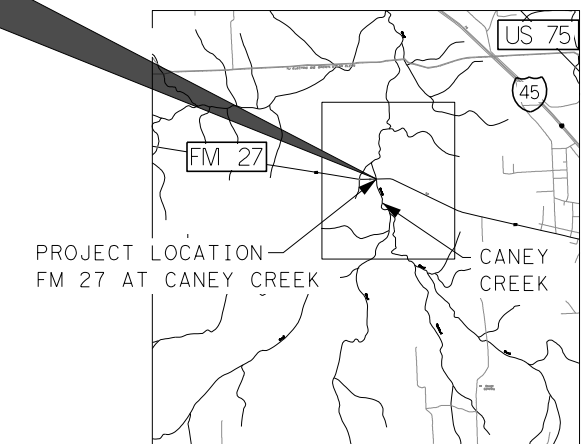
FM 27 AT GRINDSTONE CREEK  
 LOCATION DETAIL  
 SCALE N. T. S.



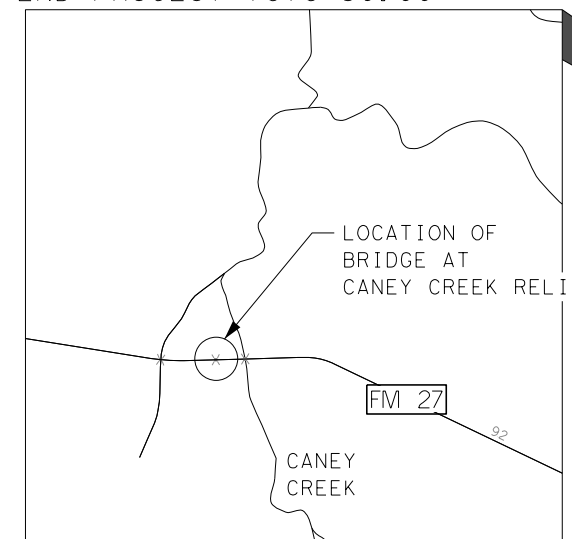
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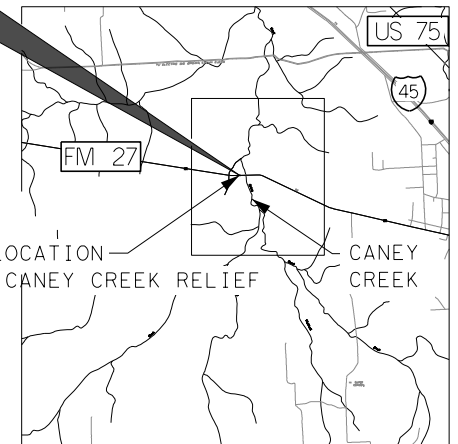
FM 27 AT CANEY CREEK  
 LOCATION DETAIL  
 SCALE N. T. S.



FREESTONE COUNTY PROJECT  
 FM 27 AT CANEY CREEK LOCATION  
 SCALE N. T. S.



FM 27 AT CANEY CREEK RELIEF  
 LOCATION DETAIL  
 SCALE N. T. S.



FREESTONE COUNTY PROJECT  
 FM 27 AT CANEY CREEK RELIEF  
 SCALE N. T. S.

PRINT DATE	REVISION DATE
4/26/2023	

**Jacobs** 2705 BEE CAVE RD, SUITE 300  
 AUSTIN TX 78746  
 FIRM REGISTRATION F-2966



PROJECT LOCATION MAP

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER	
6	BR 2023(408),ETC.	FM 27	
STATE	DISTRICT	COUNTY	
TEXAS	BRY	FREESTONE	
CONTROL	SECTION	JOB	SHEET NO.
0456	02	028,ETC	2



**SHEET DESCRIPTION**

**GENERAL**  
 1 TITLE SHEET  
 2 PROJECT LOCATION MAP  
 3 INDEX OF SHEETS  
 4 EXISTING TYPICAL SECTIONS  
 5 PROPOSED TYPICAL SECTIONS  
 6, 6 - 6D GENERAL NOTES  
 7, 7A ESTIMATE AND QUANTITIES

**QUANTITY SUMMARY SHEETS**  
 8 SUMMARY OF ROADWAY & TCP QUANTITIES  
 9 SUMMARY OF SMALL SIGNS  
 10 SUMMARY OF SW3P QUANTITIES

**TRAFFIC CONTROL PLAN**  
 11 ADVANCED WARNING SIGNS - FM 27 AT GRINDSTONE CREEK  
 12 ADVANCED WARNING SIGNS - FM 27 AT CANEY CREEK RELIEF, CANEY CREEK  
 13 SEQUENCE OF CONSTRUCTION  
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 15 TRAFFIC CONTROL PLAN - FM 27 AT CANEY CREEK RELIEF, CANEY CREEK

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 \* 28 WZ(RCD)-13  
 29 TREATMENT FOR VARIOUS EDGE CONDITIONS

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 44 DRIVEWAY PLAN AND PROFILE

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 \* 46 - 47 GF(31)TRL3-20  
 \* 48 GF(31)MS-19  
 \* 49 SGT(10S)31-16  
 \* 50 SGT(11S)31-18  
 \* 51 SGT(12S)31-18  
 \* 52 SGT(15)31-20

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**GRINDSTONE CREEK**  
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 61 TYPICAL TRANSVERSE SECTION  
 62 TEST HOLE DATA  
 63 ESTIMATED QUANTITIES AND BEARING SEAT ELEVATIONS  
**CANEY CREEK RELIEF BRIDGE**  
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 66 TYPICAL TRANSVERSE SECTION  
 67 - 68 TEST HOLE DATA  
 69 ESTIMATED QUANTITIES AND BEARING SEAT ELEVATIONS  
**CANEY CREEK BRIDGE**  
 70 BRIDGE LAYOUT  
 71 TYPICAL TRANSVERSE SECTION  
 72 TEST HOLE DATA  
 73 ESTIMATED QUANTITIES AND BEARING SEAT ELEVATIONS

**SHEET DESCRIPTION**

**BRIDGE STANDARDS**  
 74 NBI NUMBER LABELS  
 75 RIPRAP CONTROL POINT NUMBERING  
 > 76 - 78 AIG-34  
 > 79 - 81 AIG-34-15  
 > 82 BAS-A  
 > 83 BIG-34  
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 > 101 - 102 MEBR( C )  
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 & 128 PM(1)-22  
 & 129 PM(2)-22  
 & 130 D&OM(1)-20  
 & 131 D&OM(2)-20  
 & 132 D&OM(3)-20  
 & 133 D&OM(5)-20  
 & 134 D&OM(VIA)-20  
 & 135 SMD(GEN)-08  
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 147 - 149 SW3P LAYOUT - FM 27 AT CANEY CREEK RELIEF, CANEY CREEK  
 150 EPIC - FM 27 AT GRINDSTONE CREEK  
 151 EPIC - FM 27 AT CANEY CREEK RELIEF, CANEY CREEK


**SW3P STANDARDS**  
 > 152 EC(1)-16  
 > 153 EC(2)-16

*J. Alchevsky*




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

*William A. Shekarchi*



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


*Emily Weigand*



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

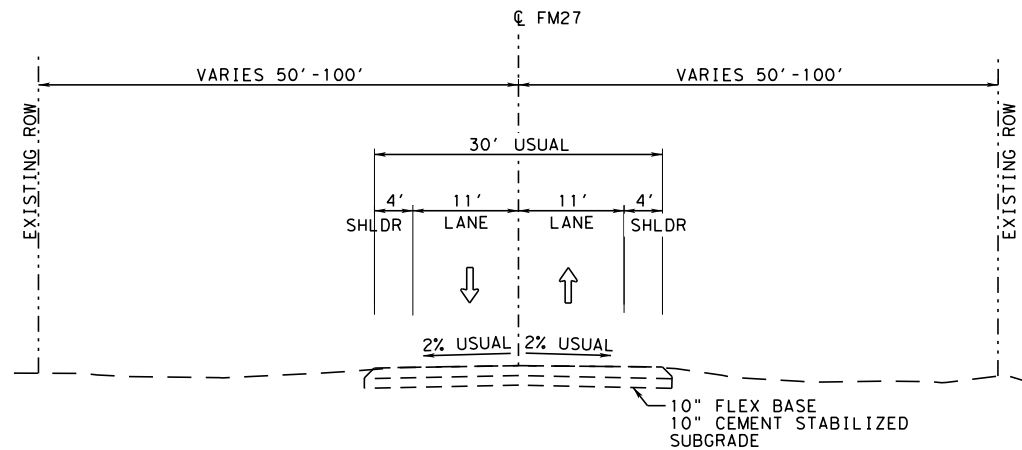
PRINT DATE	REVISION DATE
4/26/2023	

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 AUSTIN TX 78746  
 FIRM REGISTRATION F-2966

 **Texas Department of Transportation** ©2023  
 Bryan District

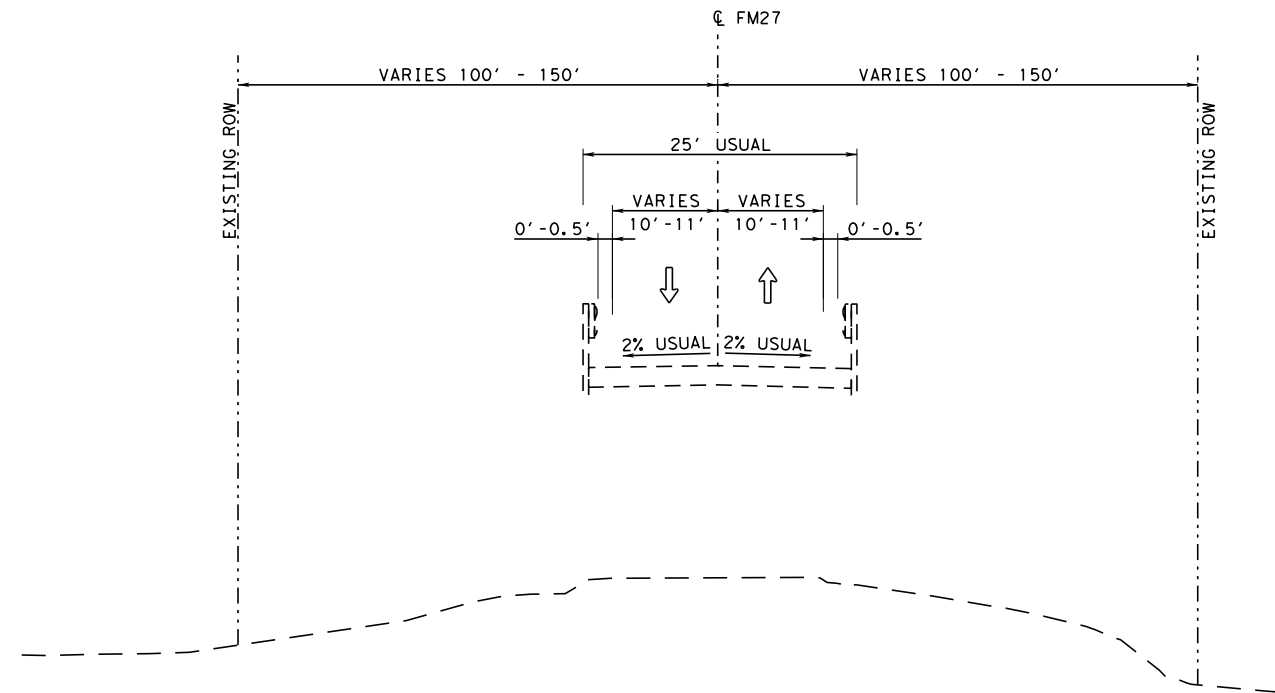
**INDEX OF SHEETS**

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER	
6	BR 2023(408),ETC.	FM 27	
STATE	DISTRICT	COUNTY	
TEXAS	BRY	FREESTONE	
CONTROL	SECTION	JOB	SHEET NO.
0456	02	028,ETC	3



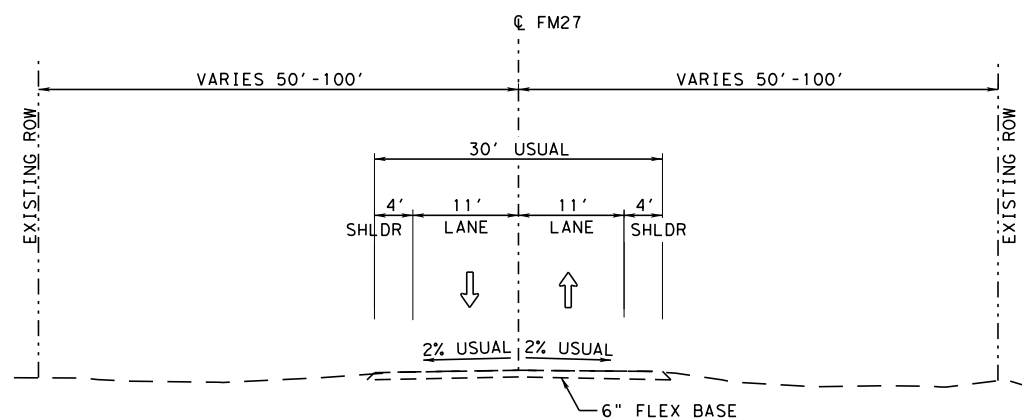
**EXISTING FM 27 TYPICAL**

STA 1501+09.00 TO 1503+74.73  
 STA 1504+49.76 TO 1508+20.00  
 STA 1670+00.00 TO 1673+20.16  
 N. T. S.



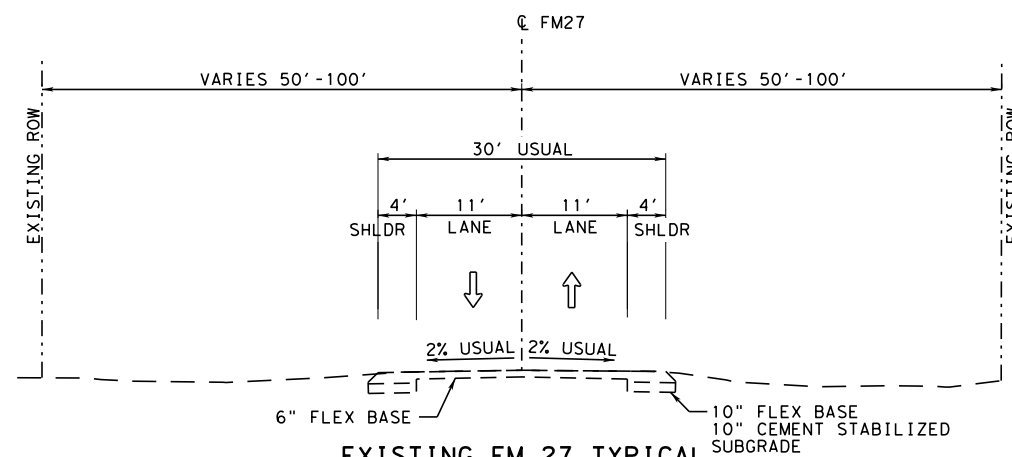
**EXISTING FM 27 (BRIDGE) TYPICAL**

STA 1503+74.73 TO 1504+49.76  
 STA 1673+20.16 TO 1675+18.78  
 STA 1677+77.92 TO 1678+79.23  
 N. T. S.



**EXISTING FM 27 TYPICAL**

STA 1675+18.78 TO 1677+77.92  
 N. T. S.



**EXISTING FM 27 TYPICAL**

STA 1678+79.23 TO 1683+90.00  
 N. T. S.



*Jenna Alchevsky*  
 Drawings Not To Scale

PRINT DATE	REVISION DATE
4/26/2023	

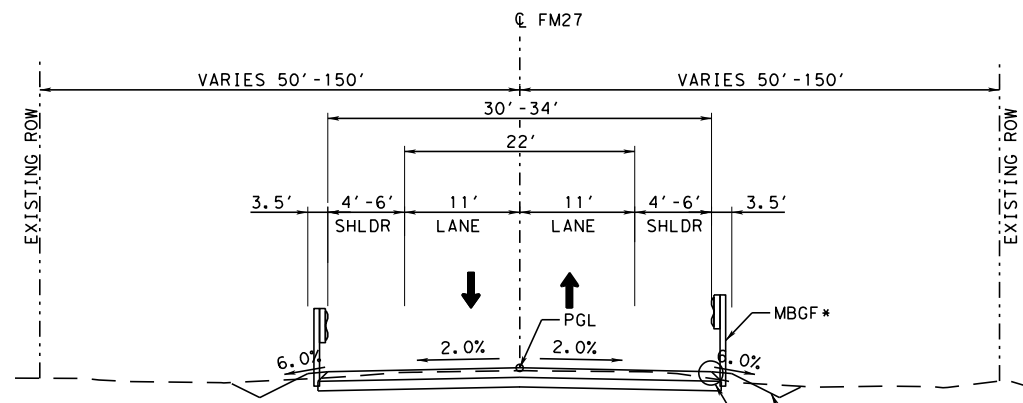
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 AUSTIN TX 78746  
 FIRM REGISTRATION F-2966



**EXISTING TYPICAL SECTIONS**

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER	
6	BR 2023(408),ETC.	FM 27	
STATE	DISTRICT	COUNTY	
TEXAS	BRY	FREESTONE	
CONTROL	SECTION	JOB	SHEET NO.
0456	02	028,ETC	4

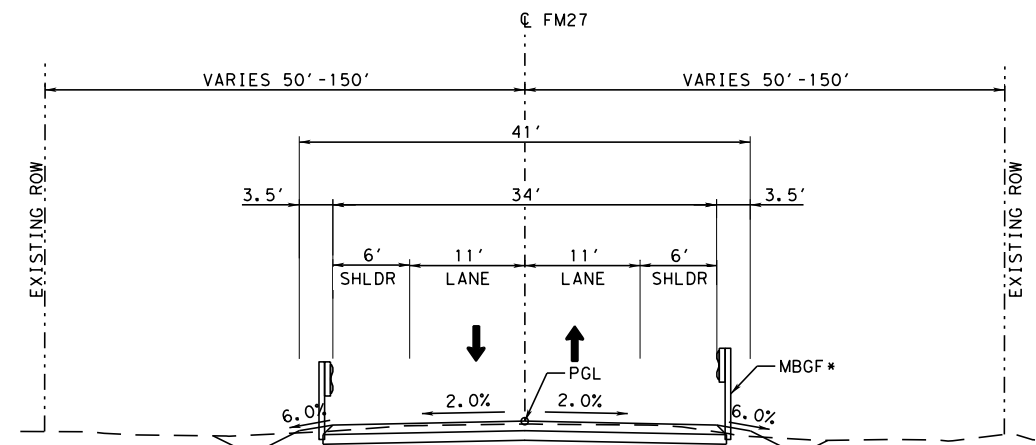
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**PROPOSED FM 27 TYPICAL**

STA 1501+09.00 TO 1502+09.00  
 STA 1507+20.00 TO 1508+20.00  
 STA 1670+00.00 TO 1671+00.00  
 STA 1682+90.00 TO 1683+90.00  
 \*SEE PLAN AND PROFILE SHEET  
 FOR MBGF LIMITS  
 N. T. S.

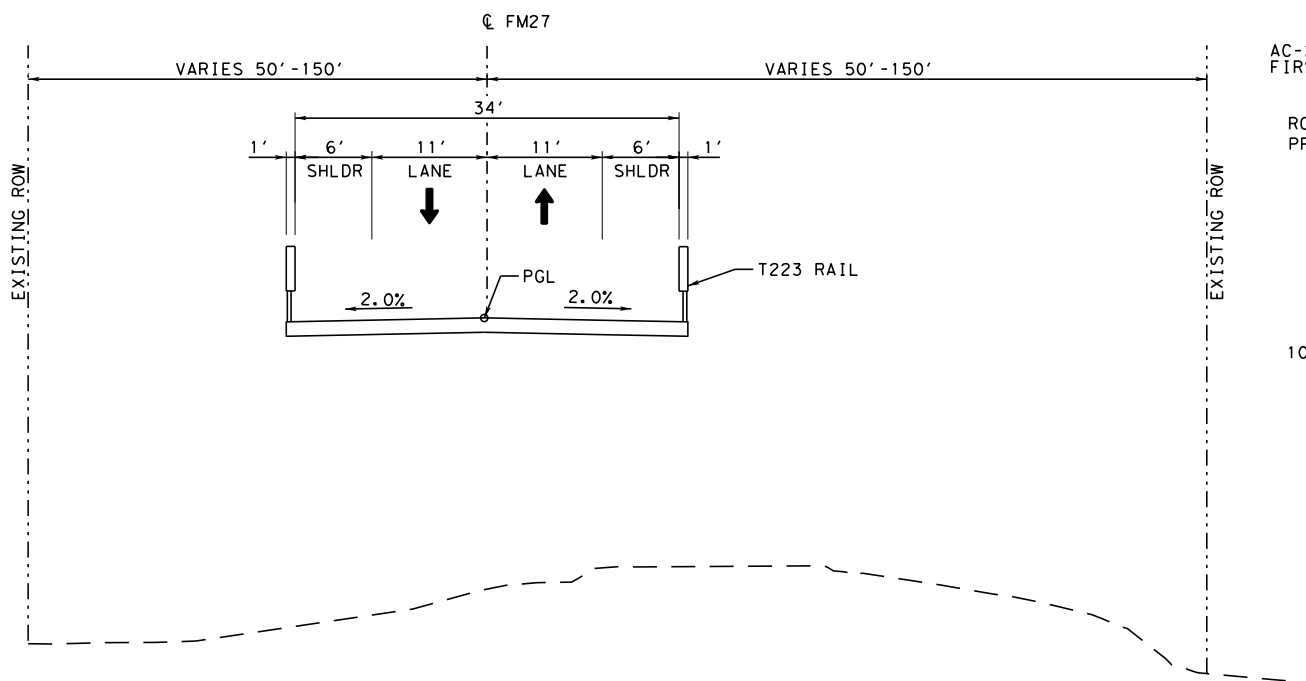
SEE DETAIL A



**PROPOSED FM 27 TYPICAL**

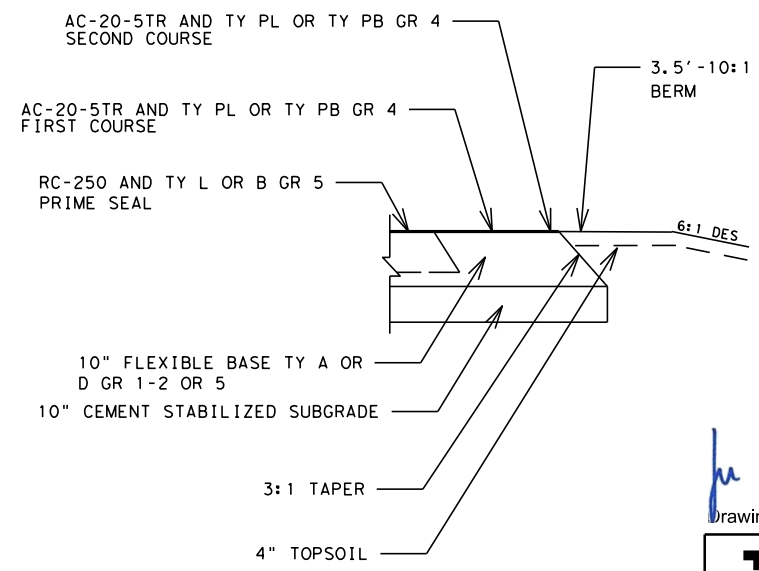
STA 1502+09.00 TO 1503+52.00  
 STA 1504+72.00 TO 1507+20.00  
 STA 1671+00.00 TO 1672+96.36  
 STA 1675+26.36 TO 1677+51.60  
 STA 1679+06.60 TO 1682+90.00  
 \*SEE PLAN AND PROFILE SHEET  
 FOR MBGF LIMITS  
 N. T. S.

6:1 USUAL  
3:1 MAX



**PROPOSED FM 27 (BRIDGE) TYPICAL**

STA 1503+52.00 TO 1504+72.00  
 STA 1672+96.36 TO 1675+26.36  
 STA 1677+51.60 TO 1679+06.60  
 N. T. S.



**DETAIL "A"**  
N. T. S.



*Jenna Alchevsky*  
 Drawings Not To Scale

PRINT DATE	REVISION DATE
4/27/2023	

**Jacobs** 2705 BEE CAVE RD, SUITE 300  
 AUSTIN TX 78746  
 FIRM REGISTRATION F-2966



**PROPOSED TYPICAL SECTIONS**

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER	
6	BR 2023(408),ETC.	FM 27	
STATE	DISTRICT	COUNTY	
TEXAS	BRY	FREESTONE	
CONTROL	SECTION	JOB	SHEET NO.
0456	02	028,ETC	5

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Project Number: See Title Sheet  
 Highway: FM 27  
 County: Freestone

Sheet: 6  
 Control: 0456-02-028, Etc.

BASIS OF ESTIMATE (CSJ 0456-02-028)					
ITEM	DESCRIPTION	COURSE	RATE	AMOUNT	QUANTITY
168	Vegetative Watering		10 GAL/SY	1,815 SY	18.2 MG
316	ASPH (RC-250)	PRIME SEAL	0.25 GAL/SY	2,188 SY	547 GAL
316	AGGR (TY-B GR-5 OR TY-L GR-5)	PRIME SEAL	1 CY/135 SY	2,188 SY	16 CY
316	ASPH (AC-20-5TR)	1 <sup>ST</sup> & 2 <sup>ND</sup> COURSE	0.38 GAL/SY	4,376 SY	1,663 GAL
316	AGGR (TY-PB GR-4 OR TY-PL GR-4 SAC-A)	1 <sup>ST</sup> & 2 <sup>ND</sup> COURSE	1 CY/125 SY	4,376 SY	35 CY

BASIS OF ESTIMATE (CSJ 0456-02-029)					
ITEM	DESCRIPTION	COURSE	RATE	AMOUNT	QUANTITY
168	Vegetative Watering		10 GAL/SY	3,060 SY	30.6 MG
316	ASPH (RC-250)	PRIME SEAL	0.25 GAL/SY	1,576 SY	394 GAL
316	AGGR (TY-B GR-5 OR TY-L GR-5)	PRIME SEAL	1 CY/135 SY	1,576 SY	12 CY
316	ASPH (AC-20-5TR)	1 <sup>ST</sup> & 2 <sup>ND</sup> COURSE	0.38 GAL/SY	3,152 SY	1,198 GAL
316	AGGR (TY-PB GR-4 OR TY-PL GR-4 SAC-A)	1 <sup>ST</sup> & 2 <sup>ND</sup> COURSE	1 CY/125 SY	3,152 SY	25 CY

BASIS OF ESTIMATE (CSJ 0456-02-030)					
ITEM	DESCRIPTION	COURSE	RATE	AMOUNT	QUANTITY
168	Vegetative Watering		10 GAL/SY	2,824 SY	28.2 MG
316	ASPH (RC-250)	PRIME SEAL	0.25 GAL/SY	2,187 SY	547 GAL
316	AGGR (TY-B GR-5 OR TY-L GR-5)	PRIME SEAL	1 CY/135 SY	2,187 SY	16 CY
316	ASPH (AC-20-5TR)	1 <sup>ST</sup> & 2 <sup>ND</sup> COURSE	0.38 GAL/SY	4,374 SY	1,662 GAL
316	AGGR (TY-PB GR-4 OR TY-PL GR-4 SAC-A)	1 <sup>ST</sup> & 2 <sup>ND</sup> COURSE	1 CY/125 SY	4,374 SY	35 CY

Project Number: See Title Sheet  
 Highway: FM 27  
 County: Freestone

Sheet: 6  
 Control: 0456-02-028, Etc.

BASIS OF ESTIMATE (CSJ 0456-02-028)					
* for contractor's information only					
ITEM	DESCRIPTION	COURSE	RATE	AMOUNT	QUANTITY
166*	FERTILIZER **		60 LBS/AC	1,815 SY	0.011 TON

Note: Rates are for estimating purposes only. Actual Rates will be determined in the field.  
 \*\* Tonnage represents Nitrogen content only.

BASIS OF ESTIMATE (CSJ 0456-02-029)					
* for contractor's information only					
ITEM	DESCRIPTION	COURSE	RATE	AMOUNT	QUANTITY
166*	FERTILIZER **		60 LBS/AC	3,060 SY	0.019 TON

Note: Rates are for estimating purposes only. Actual Rates will be determined in the field.  
 \*\* Tonnage represents Nitrogen content only.

BASIS OF ESTIMATE (CSJ 0456-02-030)					
* for contractor's information only					
ITEM	DESCRIPTION	COURSE	RATE	AMOUNT	QUANTITY
166*	FERTILIZER **		60 LBS/AC	2,824 SY	0.018 TON

Note: Rates are for estimating purposes only. Actual Rates will be determined in the field.  
 \*\* Tonnage represents Nitrogen content only.

**GENERAL:**

Contractor questions on this project are to be addressed to the following individuals:  
 Delmy Reyes, P.E., A.E., [Delmy.Reyes@txdot.gov](mailto:Delmy.Reyes@txdot.gov)  
 Matt Hensarling, P.E., A.A.E., [Matt.Hensarling@txdot.gov](mailto:Matt.Hensarling@txdot.gov)

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

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

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

For non-bridge items, send eligible shop plan submittals with PDF attachments directly to the reviewing office. Submit bridge, retaining wall, and structural item shop drawings following the directions described at  
<http://www.txdot.gov/business/resources/specifications/shop-drawings.html>

**Project Number:** See Title Sheet  
**Highway:** FM 27  
**County:** Freestone

**Sheet:** 6A  
**Control:** 0456-02-028, Etc.

#### ITEM 5 “CONTROL OF THE WORK”

Prior to letting, earthwork construction cross-section data is available at the Area Engineer’s office in *Huntsville* for inspection by prospective bidders. In addition, bidders may request electronic earthwork construction cross-section data by sending an email to: [Delmy.Reyes@txdot.gov](mailto:Delmy.Reyes@txdot.gov) or [Matt.Hensarling@txdot.gov](mailto:Matt.Hensarling@txdot.gov)

Earthwork files will be provided by email or by using TxDOT’s Dropbox FTP Service. These cross-sections are for non-construction purposes only, and it is the responsibility of the prospective bidder to validate the data for this project.

After letting, the Engineer will provide final earthwork construction cross-section data necessary for the contractor to establish and control the work.

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

#### ITEM 6 “CONTROL OF MATERIALS”

To comply with the latest provisions of Build America, Buy America Act (BABA Act) of the Bipartisan Infrastructure Law, the contractor must submit a notarized 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”

In the event of the declaration of a hurricane watch, warning, other severe weather warning or national or state emergency that requires the roadways in the vicinity be used as evacuation routes, cease all work that requires the Contractor’s, sub-contractors’ or material suppliers’

**Project Number:** See Title Sheet  
**Highway:** FM 27  
**County:** Freestone

**Sheet:** 6A  
**Control:** 0456-02-028, Etc.

vehicles to enter the stream of traffic on these primary or secondary evacuation routes. This work includes material hauling and delivery, and mobilization or demobilization of equipment.

The following roadways are recognized evacuation routes in the Bryan District:

Primary Evacuation Routes: IH 45, US 290, SH 6, SH 36.

Secondary Evacuation Routes: US 79, US 84, SH 7, SH 30, SH 21, SH 105.

Other routes may be designated.

- No significant traffic generator events identified.

#### ITEM 8 “PROSECUTION AND PROGRESS”

By noon of each Wednesday, provide the Engineer a written outline of the daily work schedule for the following week. Include in the outline the times and places for proposed traffic control changes, lane and shoulder closures, and moving operations or other operations that affect traffic on the roadway. Unless otherwise authorized by the Engineer, prosecute the work on this project in accordance with the following sequence of work:

##### FM 27 at Grindstone Creek:

- 1) Place advanced signing and barricades. Set up detour and place temporary SW3P devices.
- 2) Close roadway, prepare right of way, demolish existing bridge and remove existing asphalt pavement including stabilized and treated base. Construct bridge and roadway.
- 3) Install metal beam guard fence and end treatments. Place pavement markings, permanent signs, and object markers. Remove temporary SW3P devices and install permanent SW3P components. Stabilize disturbed soil (permanent).
- 4) Return right of way to previous condition and complete final site cleanup.
- 5) Open to thru traffic.

##### FM 27 at Caney Relief Creek and Caney Creek:

- 1) Place advanced signing and barricades. Set up detour and place temporary SW3P devices.
- 2) Close roadway, prepare right of way, demolish existing bridge and remove existing asphalt pavement including stabilized and treated base. Construct bridge and roadway.
- 3) Install metal beam guard fence and end treatments. Place pavement markings, permanent signs, and object markers. Remove temporary SW3P devices and install permanent SW3P components. Stabilize disturbed soil (permanent).
- 4) Return right of way to previous condition and complete final site cleanup.
- 5) Open to thru traffic.



**Project Number:** See Title Sheet  
**Highway:** FM 27  
**County:** Freestone

**Sheet:** 6B  
**Control:** 0456-02-028, Etc.

Some of these operations may be performed simultaneously. However, FM 27 at Caney Creek Relief (CSJ 0456-02-029) and FM 27 at Caney Creek (CSJ 0456-02-030) must be constructed and open to traffic prior to starting work at FM 27 at Grindstone Creek (CSJ 0456-02-028) or vice-versa.

A minimum clear distance of 10ft must be maintained from overhead utility lines when they are energized.

Prepare Progress Schedule Bar Chart.

Equipment and material may be pre-staged at approved locations.

The 90-day delayed start allowed after authorization under SP008-003 is for Contractor time for material acquisition.

Additional Project-Specific Liquidated Damages (APSLD) will be assessed at a rate of \$5,542 per day.

APSLD will be assessed in addition to the Schedule of Liquidated Damages (SP 000--1243).

#### **ITEM 100 “PREPARING RIGHT OF WAY”**

During burn bans obtain written approval from the Commissioners Court prior to burning brush.

Prevent ashes from burned vegetation to be transported into any stream.

If burning is not allowed, all trees and brush will be disposed of by shredding, logging or other methods approved by the Engineer. Create a windrow, stockpile, or topdress biomass on disturbed areas along the project at locations approved by necessary permits and the Engineer.

#### **ITEM 132 “EMBANKMENT”**

Provide Embankment material for areas within the limits of the Pavement Structure that meet one of the following requirements:

- Sources outside the ROW provide material with a plasticity index between 10 and 25 and with less than 10% silt.
- Sources within the ROW provide material with a plasticity index between 10 and 25 and with less than 10% silt.

Provide clayey sand Embankment material for areas outside the limits of the Pavement Structure with a plasticity index between 10 and 20.

**Project Number:** See Title Sheet  
**Highway:** FM 27  
**County:** Freestone

**Sheet:** 6B  
**Control:** 0456-02-028, Etc.

#### **ITEM 160 “TOPSOIL”**

All slopes requiring topsoil will be tracked immediately upon final grading to prevent erosion per standard sheet EC(1)-16. Tracking slopes to prevent erosion will not be measured or paid for directly, but will be subsidiary to pertinent Items.

Topsoil may be obtained from the right of way at sites of proposed excavation and embankment.

#### **ITEM 166 “FERTILIZER”**

Fertilize all areas of project that are being seeded or sodded.

#### **ITEM 168 “VEGETATIVE WATERING”**

Vegetative watering is required for all areas of the project that are being seeded or sodded.

#### **ITEM 247 “FLEXIBLE BASE”**

Place flexible base in equal lifts of 4 to 8 in. in depth unless otherwise approved by the Engineer.

#### **ITEM 301 “ASPHALT ANTISTRIPPING AGENT”**

When the Contractor adds lime as an anti-stripping agent (or an equivalent anti-stripping agent) the lime or equivalent shall be added to the asphaltic concrete in the methods specified in this item unless otherwise approved by the Engineer. If an alternate method is proposed, the Engineer’s approval will be based on test method Tex-242-F performed on the asphaltic concrete produced through the plant.

#### **ITEM 316 “SEAL COAT”**

When placing surface treatment on base material, prepare surface by sweeping or other approved methods. Before applying bituminous material, lightly sprinkle the surface with water. When directed, sweep the surface after sprinkling with water. Do not apply bituminous material when water is puddling on the surface.

Sweep excess aggregate no sooner than 2 hours after rolling or as directed.

Vehicles used to haul aggregate from the stockpile to the chip spreader will not be overloaded. Any damage to the roadway caused by the vehicles will be repaired by the Contractor at his expense and subsequent loads will be reduced so as not to cause further damage.



**Project Number:** See Title Sheet  
**Highway:** FM 27  
**County:** Freestone

**Sheet:** 6C  
**Control:** 0456-02-028, Etc.

Transverse variance rates shall be used as directed. The nozzles outside the wheel paths will output up to 20% more asphalt by volume than the nozzles over the wheel paths.

The Contractor may be required to furnish and set string line to insure straight and uniform alignment as directed by the Engineer. The Contractor may use other methods subject to approval of the Engineer.

Air and surface temperature for asphalt material application will be in accordance with the specification and the manufacturer's recommendation. However, the engineer may limit the use of an asphalt material due to the time of year.

#### **ITEM 320 "EQUIPMENT FOR ASPHALT CONCRETE PAVEMENT"**

Unless otherwise approved by the Engineer, provide a Material Transfer Device with remixing capabilities as specified in Item 320.2.3.3 Placement and Compaction Equipment for all asphaltic concrete pavement.

#### **ITEM 416 "DRILLED SHAFT FOUNDATIONS"**

Stake foundation locations and have them approved by the Engineer before installation.

#### **ITEM 432 "RIPRAP"**

The 50' approach taper to the MBGF end treatment will be concrete Mow Strip unless otherwise shown in the plans or otherwise directed by the Engineer.

#### **ITEM 454 "BRIDGE EXPANSION JOINTS"**

The list of approved Header Type Expansion Joints can be found at:

<http://www.txdot.gov/inside-txdot/division/bridge/approved-systems/expansion-joints.html>

#### **ITEM 496 "REMOVING STRUCTURES"**

Notify the Engineer of the exact date of bridge removal at least twenty (20) working days prior to the removal of the existing structure to allow for compliance with the Texas Department of State Health Services requirements for structural demolition. Bridge removal will not be allowed to take place until this notice is given.

**Project Number:** See Title Sheet  
**Highway:** FM 27  
**County:** Freestone

**Sheet:** 6C  
**Control:** 0456-02-028, Etc.

Store the following items to be salvaged at a location designated by the Engineer: all steel material.

#### **ITEM 502 "BARRICADES, SIGNS AND TRAFFIC HANDLING"**

Removal of ground mounted temporary signs and supports as specified on standard sheet BC(5), shall include the immediate backfilling of support holes with Type B embankment material and the compaction of the backfill material.

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.

#### **ITEM 540 "METAL BEAM GUARD FENCE"**

Furnish and Install only one type of timber post.

#### **ITEM 544 "GUARDRAIL END TREATMENTS"**

Furnish and install only MASH compliant guardrail end treatments.

#### **ITEM 644 "SMALL ROADSIDE SIGN ASSEMBLIES"**

Salvage and deliver all aluminum sign faces to the local TxDOT maintenance office.

#### **ITEM 666 "REFLECTORIZED PAVEMENT MARKINGS"**

Unless authorized by the Engineer, the Contractor will not place the pavement markings on the resurfaced roadway until it has cured for 3 days.

All striping limits must be approved by the Engineer before striping operations may begin.

Use an acrylic sealer on concrete pavement.

**Project Number:** See Title Sheet

**Sheet:** 6D

**Highway:** FM 27

**Control:** 0456-02-028, Etc.

**County:** Freestone

**ITEM 672 “RAISED PAVEMENT MARKERS”**

Use flexible bituminous adhesive for applications on all pavement types.

**ITEM 3077 “SUPERPAVE MIXTURES”**

<b>Hamburg Wheel Test Requirements</b>			
<b>High-Temperature Binder Grade</b>	<b>Test Method</b>	<b>Laboratory Mixture Design or Trial Batch</b>	<b>Production and Placement Test<sup>1</sup></b>
		<b>Minimum # of Passes @ 0.5" Rut Depth, Tested @122°F</b>	<b>Minimum # of Passes @ 0.5" Rut Depth, Tested @122°F</b>
PG 64 or lower	Tex-242-F	7,000	7,000

<sup>1</sup>. The Engineer may accept if no more than 1 of the 5 most recent Hamburg Wheel tests is below the specified number of passes and the failing test is no more than 2,000 passes below the specified number of passes.

Add one (1.0) percent hydrated lime, commercial lime slurry, or an equivalent anti-stripping agent, based on the total aggregate weight, as mix enhancer for all mixture types unless otherwise approved by the Engineer. Provide hydrated lime or commercial lime slurry in accordance with DMS-6350, “Lime and Lime Slurry”. Add hydrated lime, commercial lime slurry, or an equivalent anti-stripping agent in accordance with Section 301.4.2.

Apply tack coat through a distributor spray bar in accordance with Section 316.3.1. Distributor. If residual from emulsion tack is not tacky, then the Engineer can require the use of PG binder.

RAS is not permitted in thin level-up courses.

**ITEM 6001 “PORTABLE CHANGEABLE MESSAGE SIGN”**

Furnish, install, and operate up to two (2) Portable Changeable Message Signs (PCMS) for this project. The signs can be used both on the project and within a ten (10) mile radius of the project. Locations, messages, and durations of use will be specified by the Engineer. The primary uses will be to inform the public of special events, lane and road closures, and changes in traffic control. Signs will be paid for only when used as directed by the Engineer.



# Estimate & Quantity Sheet

CONTROLLING PROJECT ID 0456-02-028

DISTRICT Bryan  
HIGHWAY FM 27

COUNTY Freestone

CONTROL SECTION JOB				0456-02-028		0456-02-029		0456-02-030		TOTAL EST.	TOTAL FINAL
PROJECT ID				A00124690		A00124693		A00124694			
COUNTY				Freestone		Freestone		Freestone			
HIGHWAY				FM 27		FM 27		FM 27			
ALT	BID CODE	DESCRIPTION	UNIT	EST.	FINAL	EST.	FINAL	EST.	FINAL		
	100-6002	PREPARING ROW	STA	7.100		6.500		7.400		21.000	
	104-6017	REMOVING CONC (DRIVEWAYS)	SY			106.000				106.000	
	105-6008	REMOVING STAB BASE AND ASPH PAV (6")	SY			321.000		1,562.000		1,883.000	
	105-6137	REMOVE TRT BASE & ASPH PAV (12"-20")	SY	1,964.000		966.000		361.000		3,291.000	
	110-6001	EXCAVATION (ROADWAY)	CY	156.000		13.000		85.000		254.000	
	110-6002	EXCAVATION (CHANNEL)	CY	392.000		672.000		1,450.000		2,514.000	
	132-6005	EMBANKMENT (FINAL)(ORD COMP)(TY C)	CY	1,580.000		1,250.000		3,300.000		6,130.000	
	160-6003	FURNISHING AND PLACING TOPSOIL (4")	SY	1,815.000		3,060.000		2,824.000		7,699.000	
	164-6023	CELL FBR MLCH SEED(PERM)(RURAL)(CLAY)	SY	1,815.000		3,060.000		2,824.000		7,699.000	
	164-6029	CELL FBR MLCH SEED(TEMP)(WARM)	SY	908.000		1,530.000		1,412.000		3,850.000	
	164-6031	CELL FBR MLCH SEED(TEMP)(COOL)	SY	908.000		1,530.000		1,412.000		3,850.000	
	168-6001	VEGETATIVE WATERING	MG	18.200		30.600		28.200		77.000	
	247-6304	FL BS (CMP IN PLACE) (TY D GR 1-2)(10")	SY	2,373.000		1,704.000		2,366.000		6,443.000	
	275-6006	CEMENT TREAT (EXIST MATL) (10")	SY	2,558.000		1,832.000		2,544.000		6,934.000	
	316-6017	ASPH (AC-20-5TR)	GAL	1,663.000		1,198.000		1,662.000		4,523.000	
	316-6029	ASPH (RC-250)	GAL	547.000		394.000		547.000		1,488.000	
	316-6403	AGGR (TY-B GR-5 OR TY-L GR-5)	CY	16.000		12.000		16.000		44.000	
	316-6404	AGGR (TY-PB GR-4 OR TY-PL GR-4 SAC-A)	CY	35.000		25.000		35.000		95.000	
	400-6005	CEM STABIL BKFL	CY	173.000		151.000		151.000		475.000	
	402-6001	TRENCH EXCAVATION PROTECTION	LF	215.000						215.000	
	416-6004	DRILL SHAFT (36 IN)	LF	630.000		890.000		740.000		2,260.000	
	420-6013	CL C CONC (ABUT)	CY	46.000		44.800		44.800		135.600	
	420-6029	CL C CONC (CAP)	CY	33.000		47.400		31.600		112.000	
	420-6037	CL C CONC (COLUMN)	CY	13.400		18.900		11.000		43.300	
	422-6001	REINF CONC SLAB	SF	4,320.000		8,280.000		5,580.000		18,180.000	
	422-6015	APPROACH SLAB	CY	66.900		54.500		54.500		175.900	
	425-6035	PRESTR CONC GIRDER (TX28)	LF	592.450		1,140.020		767.510		2,499.980	
	432-6033	RIPRAP (STONE PROTECTION)(18 IN)	CY	368.000		1,209.000		714.000		2,291.000	
	432-6045	RIPRAP (MOW STRIP)(4 IN)	CY	50.000		35.000		38.000		123.000	
	450-6006	RAIL (TY T223)	LF	288.000		508.000		358.000		1,154.000	
	454-6020	SEALED EXPANSION JOINT (4 IN) (SEJ - B)	LF	74.000		108.000		72.000		254.000	
	496-6009	REMOV STR (BRIDGE 0 - 99 FT LENGTH)	EA	1.000						1.000	
	496-6010	REMOV STR (BRIDGE 100 - 499 FT LENGTH)	EA			1.000		1.000		2.000	
	496-6043	REMOV STR (SMALL FENCE)	LF					115.000		115.000	
	500-6001	MOBILIZATION	LS	1.000						1.000	
	502-6001	BARRICADES, SIGNS AND TRAFFIC HANDLING	MO	7.000		7.000		6.000		20.000	
	506-6002	ROCK FILTER DAMS (INSTALL) (TY 2)	LF	153.000		308.000		255.000		716.000	



# Estimate & Quantity Sheet

CONTROLLING PROJECT ID 0456-02-028

DISTRICT Bryan  
HIGHWAY FM 27

COUNTY Freestone

CONTROL SECTION JOB				0456-02-028		0456-02-029		0456-02-030		TOTAL EST.	TOTAL FINAL
PROJECT ID				A00124690		A00124693		A00124694			
COUNTY				Freestone		Freestone		Freestone			
HIGHWAY				FM 27		FM 27		FM 27			
ALT	BID CODE	DESCRIPTION	UNIT	EST.	FINAL	EST.	FINAL	EST.	FINAL		
	506-6011	ROCK FILTER DAMS (REMOVE)	LF	153.000		308.000		255.000		716.000	
	506-6038	TEMP SEDMT CONT FENCE (INSTALL)	LF	1,248.000		617.000		1,937.000		3,802.000	
	506-6039	TEMP SEDMT CONT FENCE (REMOVE)	LF	1,248.000		617.000		1,937.000		3,802.000	
	530-6005	DRIVEWAYS (ACP)	SY			115.000				115.000	
	533-6002	RUMBLE STRIPS (CENTERLINE)	LF	1,727.000		1,189.000		1,060.000		3,976.000	
	540-6001	MTL W-BEAM GD FEN (TIM POST)	LF	585.000		325.000		325.000		1,235.000	
	540-6006	MTL BEAM GD FEN TRANS (THRIE-BEAM)	EA	4.000		4.000		4.000		12.000	
	542-6001	REMOVE METAL BEAM GUARD FENCE	LF	600.000		375.000		375.000		1,350.000	
	542-6005	RM MTL BM GD FEN TRANS (T101)	EA	4.000		4.000		4.000		12.000	
	544-6001	GUARDRAIL END TREATMENT (INSTALL)	EA	4.000		4.000		4.000		12.000	
	544-6003	GUARDRAIL END TREATMENT (REMOVE)	EA	4.000		4.000		4.000		12.000	
	644-6004	IN SM RD SN SUP&AM TY10BWG(1)SA(T)	EA	2.000		1.000		1.000		4.000	
	658-6014	INSTL DEL ASSM (D-SW)SZ (BRF)CTB (BI)	EA	2.000		6.000		3.000		11.000	
	658-6062	INSTL DEL ASSM (D-SW)SZ 1(BRF)GF2(BI)	EA	12.000		8.000		7.000		27.000	
	666-6343	REF PROF PAV MRK TY I(W)6"(SLD)(100MIL)	LF	3,454.000		2,376.000		2,122.000		7,952.000	
	666-6347	REF PROF PAV MRK TY I(Y)6"(SLD)(100MIL)	LF	1,915.000		1,176.000		1,327.000		4,418.000	
	672-6009	REFL PAV MRKR TY II-A-A	EA	40.000		27.000		27.000		94.000	
	678-6002	PAV SURF PREP FOR MRK (6")	LF	5,369.000		3,552.000		3,449.000		12,370.000	
	4171-6001	INSTALL BRIDGE IDENTIFICATION NUMBERS	EA	2.000		2.000		2.000		6.000	
	6001-6001	PORTABLE CHANGEABLE MESSAGE SIGN	DAY	14.000		14.000				28.000	
	18	SAFETY CONTINGENCY: CONTRACTOR FORCE ACCOUNT WORK (PARTICIPATING)	LS	1.000						1.000	
		EROSION CONTROL MAINTENANCE: CONTRACTOR FORCE ACCOUNT WORK (PART)	LS	1.000						1.000	

SUMMARY OF ROADWAY ITEMS															
LOCATION	100	104	105	105	110	110	132	247	275	1ST COURSE		2ND COURSE		PRIME SEAL	
	6002	6017	6008	6137	6001	6002	6005	6304	6006	316	316	316	316	316	316
	PREPARING ROW	REMOVING CONC (DRIVEWAYS)	REMOVING STAB BASE AND ASPH PAV (6")	REMOVE TRT BASE & ASPH PAV (12"-20")	EXCAVATION (ROADWAY)	EXCAVATION (CHANNEL)	EMBANKMENT (FINAL) (ORD COMP) (TY C)	FL BS (CMP IN PLACE) (TY D GR 1-2) (10")	CEMENT TREAT (EXIST MATL) (10")	ASPH (AC-20-5TR)	AGGR (TY-PB GR-4 OR TY-PL GR-4) (SAC-A)	ASPH (AC-20-5TR)	AGGR (TY-PB GR-4 OR TY-PL GR-4) (SAC-A)	ASPH (RC-250)	AGGR (TY-B GR-5 OR TY-L GR-5)
	STA	SY	SY	SY	CY	CY	CY	SY	SY	SY*	SY*	SY*	SY*	SY*	SY*
456-02-028 GRINDSTONE CREEK	7.1			1964	156	392	1580	2373	2558	2188	2188	2188	2188	2188	2188
456-02-029 CANEY CREEK RELIEF	6.5	106.0	321	966	13	672	1250	1704	1832	1576	1576	1576	1576	1576	1576
456-02-030 CANEY CREEK	7.4		1562	361	85	1450	3300	2366	2544	2187	2187	2187	2187	2187	2187
PROJECT TOTAL	21.01	106	1883	3291	254	2514	6130	6442.5	6934	5951	5951	5951	5951	5951	5951

\* CONTRACTOR INFO ONLY. SEE BASIS OF ESTIMATE FOR RATES

LOCATION	432	496	496	496	530	540	540	542	542	544	544
	6045	6009	6010	6043	6005	6001	6006	6001	6005	6001	6003
	RIPRAP (MOW STRIP) (4 IN)	REMOV STR (BRIDGE 0 - 99 FT LENGTH)	REMOV STR (BRIDGE 100-499 FT LENGTH)	REMOV STR (SMALL FENCE)	DRIVEWAYS (ACP)	MTL W-BEAM GD FEN (TIM POST)	MTL BEAM GD FEN TRANS (THRIE-BEAM)	REMOVE METAL BEAM GUARD FENCE	RM MTL BM GD FEN TRANS (T101)	GUARDRAIL END TREATMENT (INSTALL)	GUARDRAIL END TREATMENT (REMOVE)
	CY	EA	EA	LF	SY	LF	EA	LF	EA	EA	EA
456-02-028 GRINDSTONE CREEK	50	1				585	4	600	4	4	4
456-02-029 CANEY CREEK RELIEF	35		1		115.0	325	4	375	4	4	4
456-02-030 CANEY CREEK	38		1	115		325	4	375	4	4	4
PROJECT TOTAL	123	1	2	115	115	1235	12	1350	12	12	12

SUMMARY OF SIGNING & PAVEMENT MARKING ITEMS								
LOCATION	533	644	658	658	666	666	672	678
	6002	6004	6014	6062	6343	6347	6009	6002
	RUMBLE STRIPS (CENTERLINE)	IN SM RD SN SUP&AM TY10BWG (1)SA(T)	INSTR DEL ASSM (D-SW)SZ (BRF)CTB (BI)	INSTR DEL ASSM (D-SW)SZ 1(BRF)GF2(BI)	REF PROF PAV MRK TY I (W) 6" (SLD) (100MIL)	REF PROF PAV MRK TY I (Y) 6" (SLD) (100MIL)	REFL PAV MRKR TY II-A-A	PAV SURF PREP FOR MRK (6")
	LF	EA	EA	EA	LF	LF	EA	LF
456-02-028 GRINDSTONE CREEK	1727	2	2	12	3454	1915	40	5369
456-02-029 CANEY CREEK RELIEF	1189	1	6	8	2376	1176	27	3552
456-02-030 CANEY CREEK	1060	1	3	7	2122	1327	27	3449
PROJECT TOTAL	3976	4	11	27	7952	4418	94	12370

SUMMARY OF TCP ITEMS		
LOCATION	502	6001
	6001	6001
	BARRICADES, SIGNS AND TRAFFIC HANDLING	PORTABLE CHANGEABLE MESSAGE SIGN
	MO	DAY
456-02-028 GRINDSTONE CREEK	7	14
456-02-029 CANEY CREEK RELIEF	7	14
456-02-030 CANEY CREEK	6	
PROJECT TOTAL	20	28

PRINT DATE	REVISION DATE
4/27/2023	

**Jacobs** 2705 BEE CAVE RD, SUITE 300  
AUSTIN TX 78746  
FIRM REGISTRATION F-2966



**ROADWAY & TCP SUMMARY**

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER	
6	BR 2023(408),ETC.	FM 27	
STATE	DISTRICT	COUNTY	
TEXAS	BRY	FREESTONE	
CONTROL	SECTION	JOB	SHEET NO.
0456	02	028,ETC	8





SUMMARY OF SW3P ITEMS									
	160 6003	164 6023	164 6029	164 6031	* 168 6001	506 6002	506 6011	506 6038	506 6039
	FURNISHING AND PLACING TOPSOIL (4")	CELL FBR MLCHSEED (PERM) (RURAL) (CLAY)	CELL FBR MLCHSEED (TEMP) (WARM)	CELL FBR MLCH SEED (TEMP)	VEGETATIVE WATERING	ROCK FILTER DAMS (INSTALL) (TY 2)	ROCK FILTER DAMS (REMOVE)	TEMP SEDMT CONT FENCE (INSTALL)	TEMP SEDMT CONT FENCE (REMOVE)
LOCATION	SY	SY	SY	SY	SY	LF	LF	LF	LF
456-02-028 (GRINDSTONE)	1815	1815	908	908	1815	153	153	1248	1248
456-02-029 (CANEY RELIEF)	3060	3060	1530	1530	3060	308	308	617	617
456-02-030 (CANEY)	2824	2824	1412	1412	2824	255	255	1937	1937
PROJECT TOTALS	7699	7699	3850	3850	7699	716	716	3802	3802

\* FOR CONTRACTOR USE ONLY, SEE BASIS OF ESTIMATE FOR RATE

PRINT DATE	REVISION DATE
4/27/2023	

**Jacobs** 2705 BEE CAVE RD, SUITE 300  
AUSTIN TX 78746  
FIRM REGISTRATION F-2966





**SUMMARY OF SW3P  
QUANTITIES**

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER	
6	BR 2023(408),ETC.	FM 27	
STATE	DISTRICT	COUNTY	
TEXAS	BRY	FREESTONE	
CONTROL	SECTION	JOB	SHEET NO.
0456	02	028,ETC	10



- NOTES:
1. PLACE SIGNS IN ACCORDANCE WITH TXDOT STANDARDS BC(1)-BC(12)-21, WZ(RCD)-13 AND TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES.
  2. ADJUST SIGNING AS NECESSARY TO FIT FIELD CONDITIONS.
  3. SEE TRAFFIC CONTROL PLAN FOR PLACEMENT OF ADDITIONAL SIGNS

LEGEND

-  TYPE III BARRICADE
-  DETOUR SIGN



*Jenna Alchevsky*  
 Drawings Not To Scale

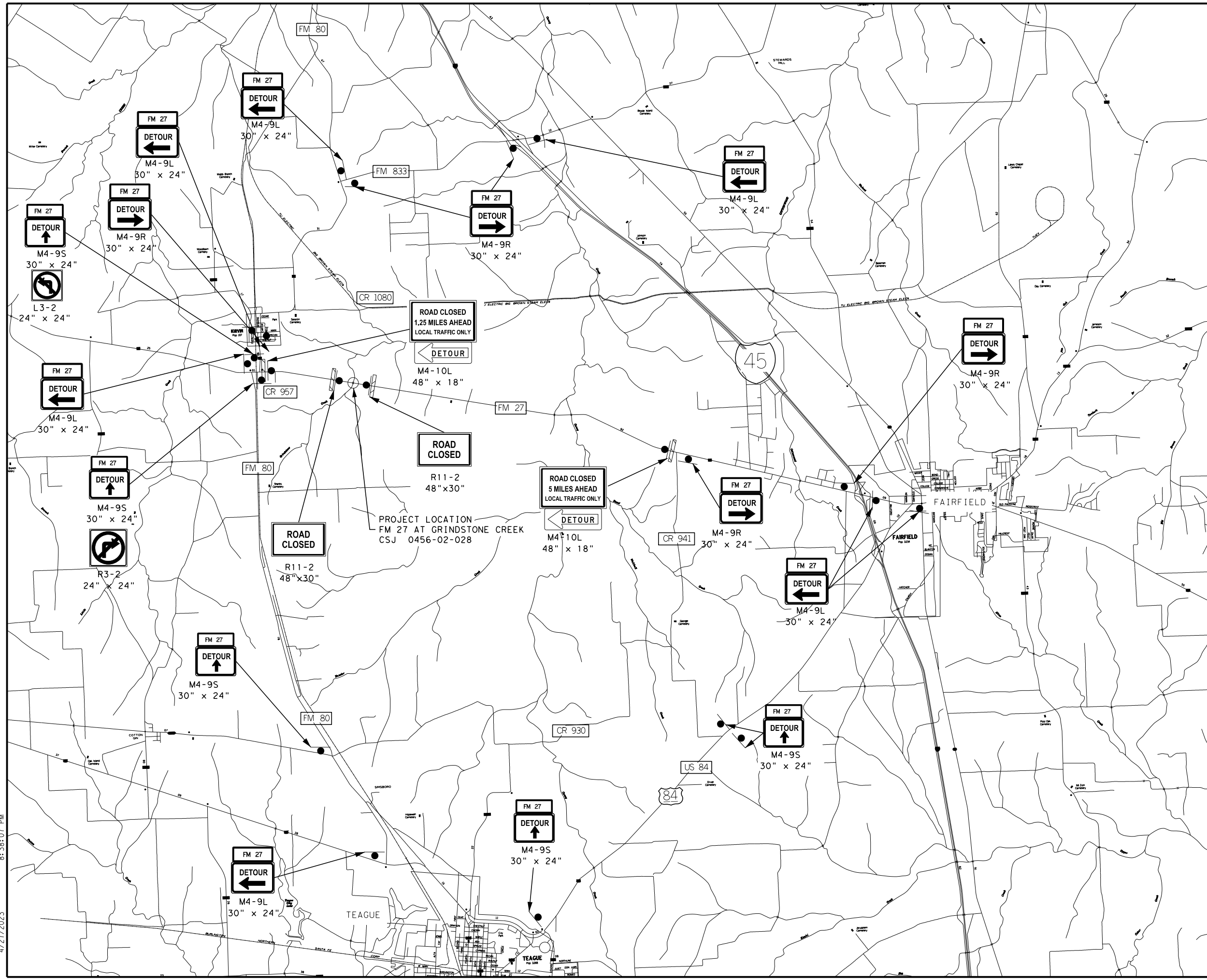
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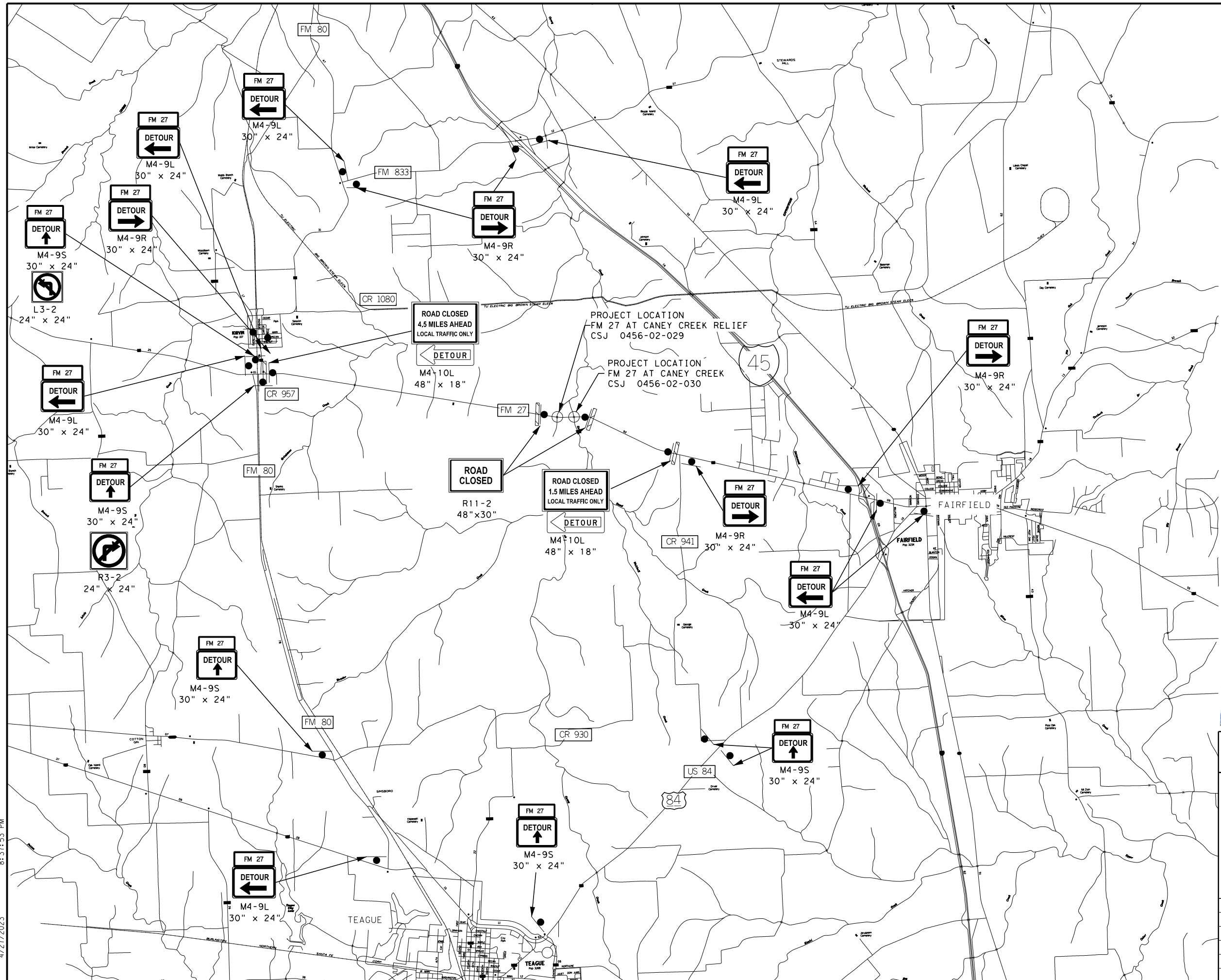


ADVANCED WARNING SIGNS  
 FM 27 AT GRINDSTONE CREEK

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER	
6	BR 2023(408),ETC.	FM 27	
STATE	DISTRICT	COUNTY	
TEXAS	BRY	FREESTONE	
CONTROL	SECTION	JOB	SHEET NO.
0456	02	028,ETC	11



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- NOTES:
1. PLACE SIGNS IN ACCORDANCE WITH TXDOT STANDARDS BC(1)-BC(12)-21, WZ(RCD)-13 AND TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES.
  2. ADJUST SIGNING AS NECESSARY TO FIT FIELD CONDITIONS.
  3. SEE TRAFFIC CONTROL PLAN FOR PLACEMENT OF ADDITIONAL SIGNS

LEGEND

- TYPE III BARRICADE
- DETOUR SIGN



*Jenna Alchevsky*  
Drawings Not To Scale

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**ADVANCED WARNING SIGNS  
FM 27 AT CANEY CREEK RELIEF,  
CANEY CREEK**

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER	
6	BR 2023(408),ETC.	FM 27	
STATE	DISTRICT	COUNTY	
TEXAS	BRY	FREESTONE	
CONTROL	SECTION	JOB	SHEET NO.
0456	02	028,ETC	12

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**FM 27 SEQUENCE OF CONSTRUCTION**

BRIDGES SHALL BE CONSTRUCTED IN TWO PHASES. FM 27 AT CANEY CREEK RELIEF AND CANEY CREEK SHALL BE CONSTRUCTED IN PHASE 1, THEN FM 27 AT GRINDSTONE CREEK SHALL BE CONSTRUCTED IN PHASE 2.

MAINTAIN TEMPORARY DRAINAGE AT ALL TIMES. TEMPORARY DRAINAGE SHALL BE CONSIDERED SUBSIDIARY TO THE OTHER BID ITEMS.

EXISTING SIGNS THAT CONFLICT WITH THE TEMPORARY TRAFFIC CONTROL PLAN SHALL BE REMOVED OR COVERED AS DIRECTED BY THE ENGINEER.

LOCAL ACCESS SHALL BE MAINTAINED AT ALL TIMES TO THE EXISTING ROADS, CROSS STREETS AND DRIVEWAYS.

STEP 1:  
ONE WEEK PRIOR TO CONSTRUCTION, SET UP ONE PORTABLE CHANGEABLE MESSAGE SIGN (PCMS) AT THE INTERSECTION OF FM 27 & FM 80 AND FM 27 & CR 941 TO ALERT PUBLIC TO UPCOMING CONSTRUCTION. INSTALL ADVANCED WARNING SIGNS IN ACCORDANCE WITH STANDARD BC(2)-21 AND ROAD CLOSURE SIGNS IN ACCORDANCE WITH STANDARD WZ(RCD)-13.

STEP 2:  
CLOSE FM 27 TO THRU TRAFFIC, SET UP DETOUR, AND INSTALL TEMPORARY SW3P DEVICES.

STEP 3:  
DEMOLISH EXISTING BRIDGE(S), CONSTRUCT NEW ROADWAY, GRADING, AND BRIDGE(S). TIE TO EXISTING PAVEMENT.

STEP 4:  
INSTALL METAL BEAM GUARD FENCE, GUARDRAIL END TREATMENTS, AND DELINEATORS/OBJECT MARKERS, AND PLACE PAVEMENT MARKINGS. REMOVE ADVANCED WARNING SIGNS AND BARRICADES AND OPEN ROADWAY.

STEP 5:  
COMPLETE PERMANENT SEEDING AND PLACE SIGNING.  
RESTORE ROW BACK TO PRE-CONSTRUCTION CONDITIONS AND COMPLETE FINAL SITE CLEAN UP.



*J. Alchevsky*

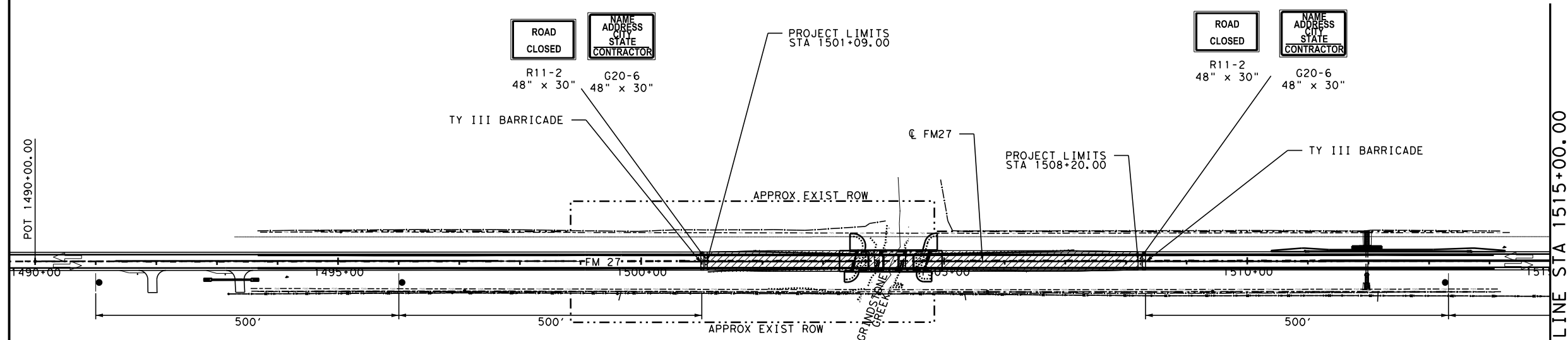
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**SEQUENCE OF CONSTRUCTION**

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER	
6	BR 2023(408),ETC.	FM 27	
STATE	DISTRICT	COUNTY	
TEXAS	BRY	FREESTONE	
CONTROL	SECTION	JOB	SHEET NO.
0456	02	028,ETC	13



- NOTES:
1. LOCAL ACCESS SHALL BE MAINTAINED FOR THE EXISTING COUNTY ROADS, CROSS STREETS, AND DRIVEWAYS.
  2. CONTRACTOR SHALL BE RESPONSIBLE FOR TEMPORARY DRAINAGE AT ALL TIMES, TO BE SUBSIDIARY TO OTHER BID ITEMS.
  3. INSTALL ADVANCED WARNING SIGNS IN ACCORDANCE WITH TXDOT STANDARD BC(2)-21.
  4. UTILIZE CHANNELIZING DEVICES TO CLOSE DRIVEWAYS UNDER CONSTRUCTION, WHEN ALTERNATE ACCESS IS PROVIDED.
  5. SPACE CHANNELIZING DEVICES IN ACCORDANCE WITH TXDOT STANDARDS BC(9)-21 AND TCP(2-8)-18.

**LEGEND**

- TRAFFIC SIGN
- TY II OR TY III BARRICADE
- AREA UNDER CONSTRUCTION
- TRAFFIC FLOW



*Jenna Alchovsky*

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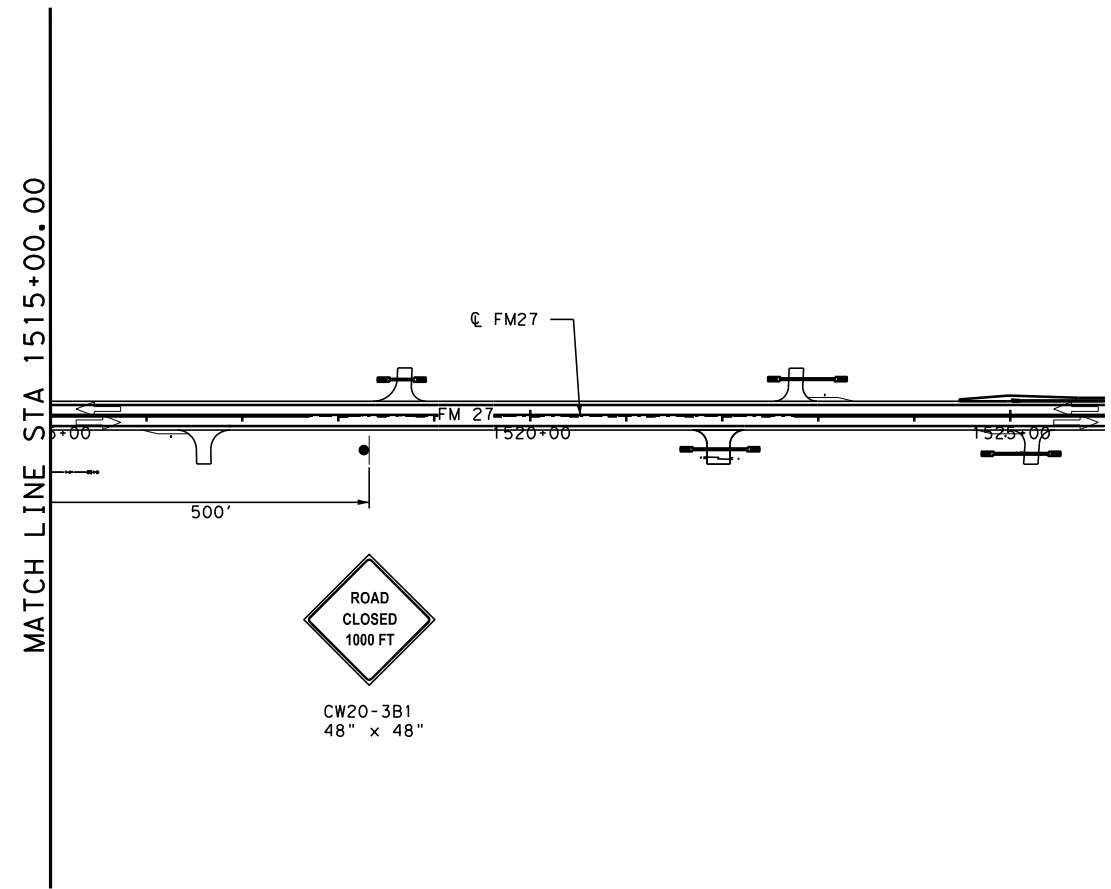
**TRAFFIC CONTROL PLAN  
FM 27 AT GRINDSTONE CREEK**

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER	
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STATE	DISTRICT	COUNTY	
TEXAS	BRY	FREESTONE	
CONTROL	SECTION	JOB	SHEET NO.
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**NOTES:**

1. LOCAL ACCESS SHALL BE MAINTAINED FOR THE EXISTING COUNTY ROADS, CROSS STREETS, AND DRIVEWAYS.
2. CONTRACTOR SHALL BE RESPONSIBLE FOR TEMPORARY DRAINAGE AT ALL TIMES, TO BE SUBSIDIARY TO OTHER BID ITEMS.
3. INSTALL ADVANCED WARNING SIGNS IN ACCORDANCE WITH TXDOT STANDARD BC(2)-21.
4. UTILIZE CHANNELIZING DEVICES TO CLOSE DRIVEWAYS UNDER CONSTRUCTION, WHEN ALTERNATE ACCESS IS PROVIDED.
5. SPACE CHANNELIZING DEVICES IN ACCORDANCE WITH TXDOT STANDARDS BC(9)-21 AND TCP(2-8)-18.

**LEGEND**

- TRAFFIC SIGN
- TY II OR TY III BARRICADE
- AREA UNDER CONSTRUCTION
- TRAFFIC FLOW



*Jenna Alchevsky*

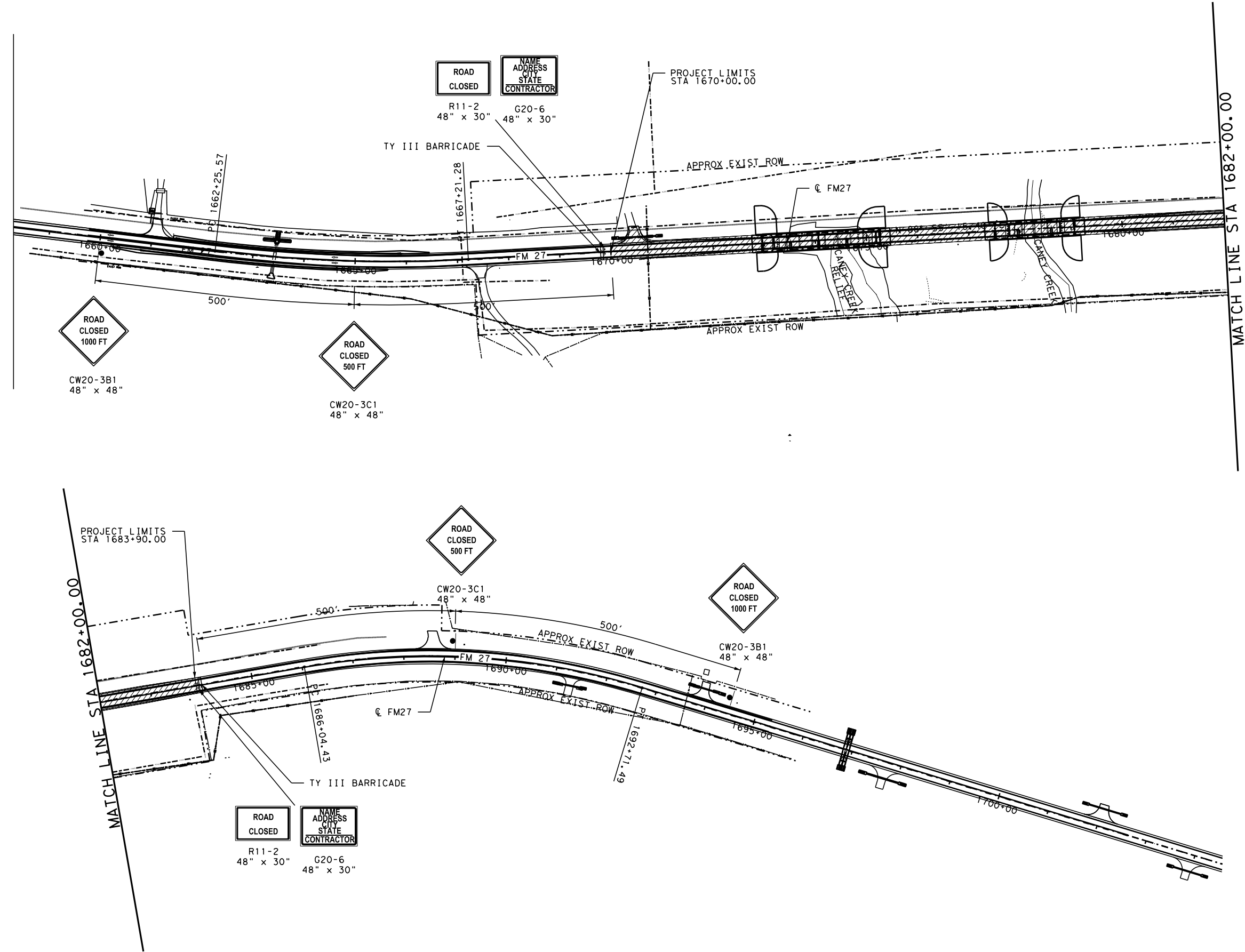
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**TRAFFIC CONTROL PLAN  
FM 27 AT CANEY CREEK RELIEF,  
CANEY CREEK**

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER	
6	BR 2023(408),ETC.	FM 27	
STATE	DISTRICT	COUNTY	
TEXAS	BRY	FREESTONE	
CONTROL	SECTION	JOB	SHEET NO.
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**BARRICADE AND CONSTRUCTION (BC) STANDARD SHEETS GENERAL NOTES:**

- 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).
- The development and design of the Traffic Control Plan (TCP) is the responsibility of the Engineer.
- 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.
- 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.
- 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.
- 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.
- 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.
- 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.
- 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.
- 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.
- Traffic control devices should be in place only while work is actually in progress or a definite need exists.
- The Engineer has the final decision on the location of all traffic control devices.
- 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:**



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

**COMPLIANT WORKZONE TRAFFIC CONTROL DEVICES**

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

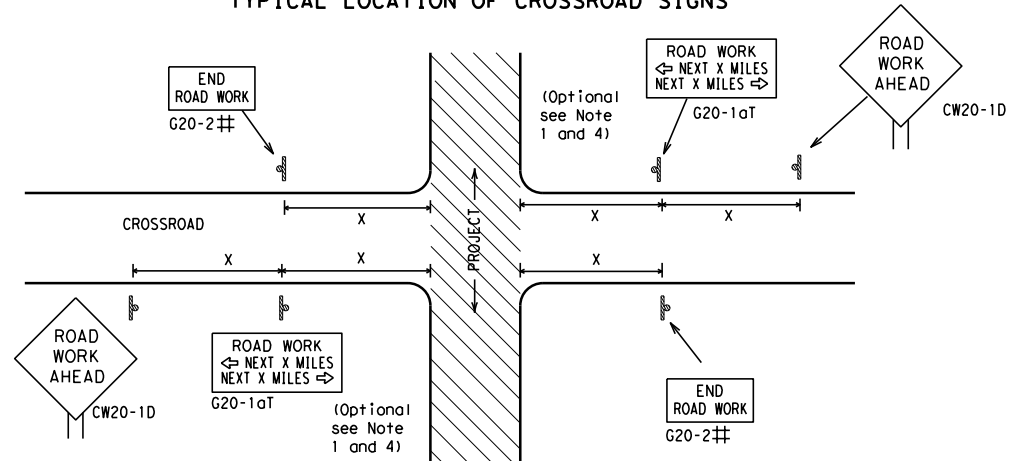
<b>THE DOCUMENTS BELOW CAN BE FOUND ON-LINE AT</b> <a href="http://www.txdot.gov">http://www.txdot.gov</a>
COMPLIANT WORK ZONE TRAFFIC CONTROL DEVICES LIST (CWZTCD)
DEPARTMENTAL MATERIAL SPECIFICATIONS (DMS)
MATERIAL PRODUCER LIST (MPL)
ROADWAY DESIGN MANUAL - SEE "MANUALS (ONLINE MANUALS)"
STANDARD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

SHEET 1 OF 12

			
<b>BARRICADE AND CONSTRUCTION GENERAL NOTES AND REQUIREMENTS</b>			
<b>BC (1) - 21</b>			
FILE:	bc-21.dgn	DN:	TxDOT
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	BRY	FREESTONE	16

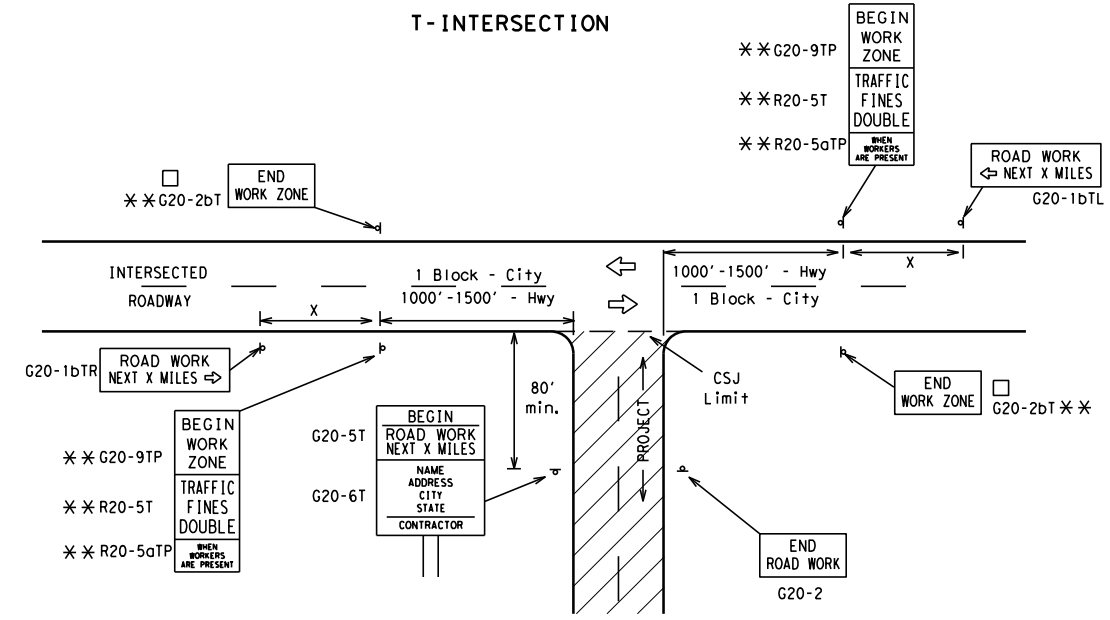
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**TYPICAL LOCATION OF CROSSROAD SIGNS**



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

**T-INTERSECTION**



**CSJ LIMITS AT T-INTERSECTION**

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

**TYPICAL CONSTRUCTION WARNING SIGN SIZE AND SPACING<sup>1,5,6</sup>**

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

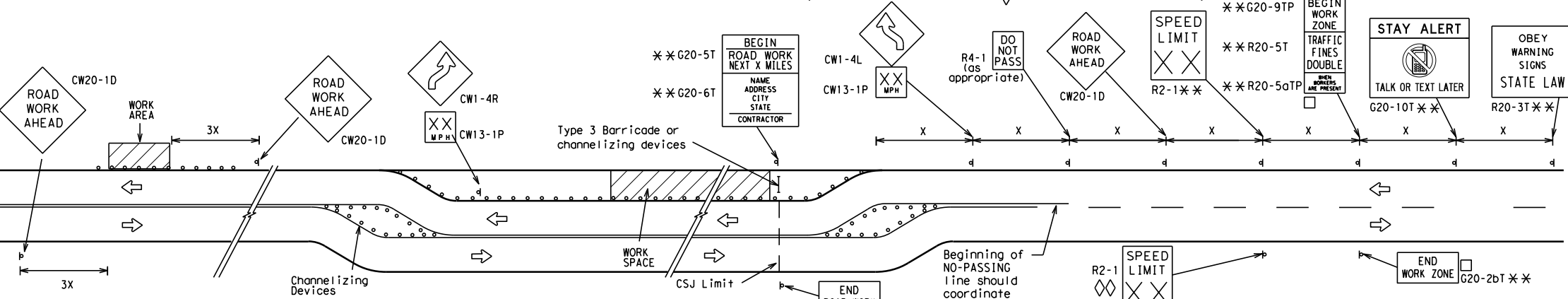
\* For typical sign spacings on divided highways, expressways and freeways, see Part 6 of the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD) typical application diagrams or TCP Standard Sheets.

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

**GENERAL NOTES**

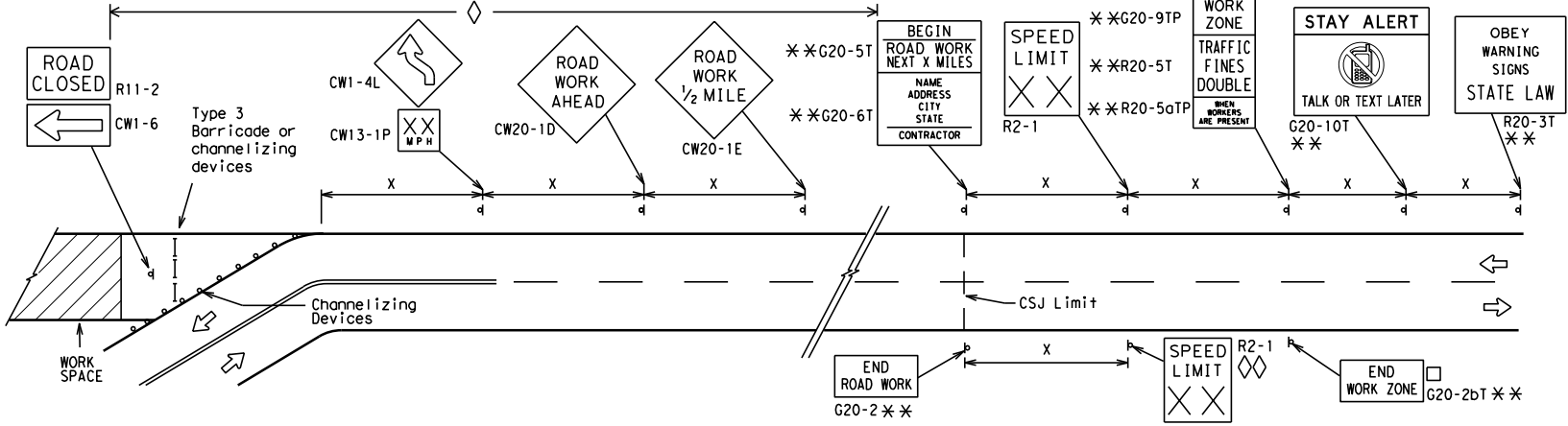
- Special or larger size signs may be used as necessary.
- Distance between signs should be increased as required to have 1500 feet advance warning.
- Distance between signs should be increased as required to have 1/2 mile or more advance warning.
- 36" x 36" "ROAD WORK AHEAD" (CW20-1D) signs may be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

**WORK AREAS IN MULTIPLE LOCATIONS WITHIN CSJ LIMITS**

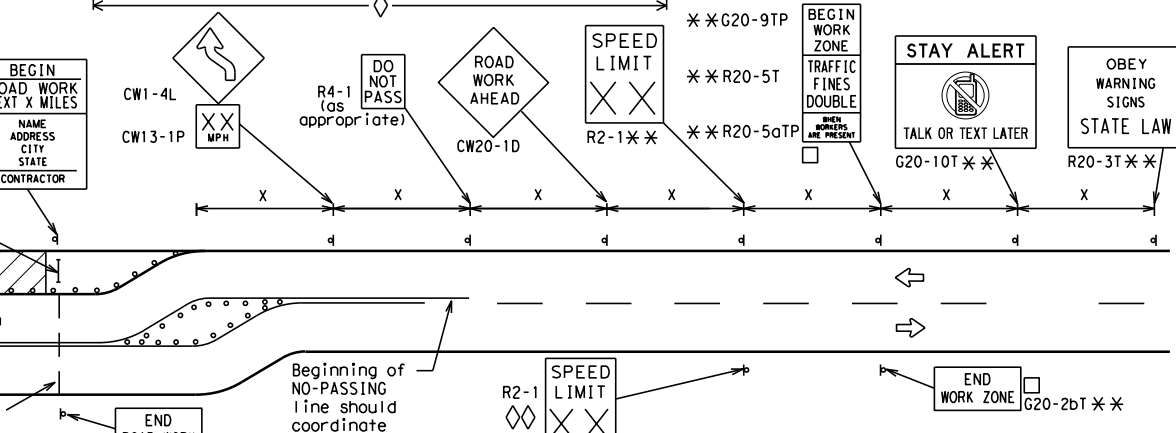


When extended distances occur between minimal work spaces, the Engineer/Inspector should ensure additional "ROAD WORK AHEAD" (CW20-1D) signs are placed in advance of these work areas to remind drivers they are still within the project limits. See the applicable TCP sheets for exact location and spacing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

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



**SAMPLE LAYOUT OF SIGNING FOR WORK BEGINNING AT THE CSJ LIMITS**



**NOTES**

- The Contractor shall determine the appropriate distance to be placed on the G20-1 series signs and "BEGIN ROAD WORK NEXT X MILES" (G20-5T) sign for each specific project. This distance shall replace the "x" and shall be rounded to the nearest whole mile with the approval of the Engineer. No decimals shall be used.
- The "BEGIN WORK ZONE" (G20-9TP) and "END WORK ZONE" (G20-2bT) shall be used as shown on the sample layout when advance signs are required outside the CSJ Limits. They inform the motorist of entering or leaving a part of the work zone lying outside the CSJ Limits where traffic fines may double if workers are present.
- CSJ limit signing is required for highway construction and maintenance work, with the exception of mobile operations.
- Area for placement of "ROAD WORK AHEAD" (CW20-1D) sign and other signs or devices as called for on the Traffic Control Plan.
- Contractor will install a regulatory speed limit sign at the end of the work zone.

**LEGEND**

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

SHEET 2 OF 12



**BARRICADE AND CONSTRUCTION PROJECT LIMIT**

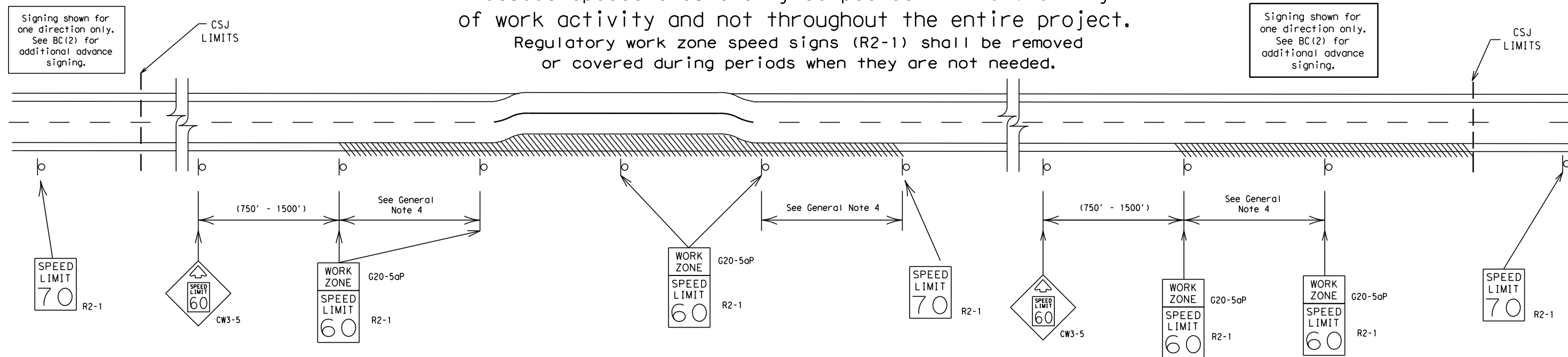
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© TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0456	02	028, ETC	FM 27
9-07 8-14	DIST	COUNTY	SHEET NO.	
7-13 5-21	BRY	FREESTONE	17	

# 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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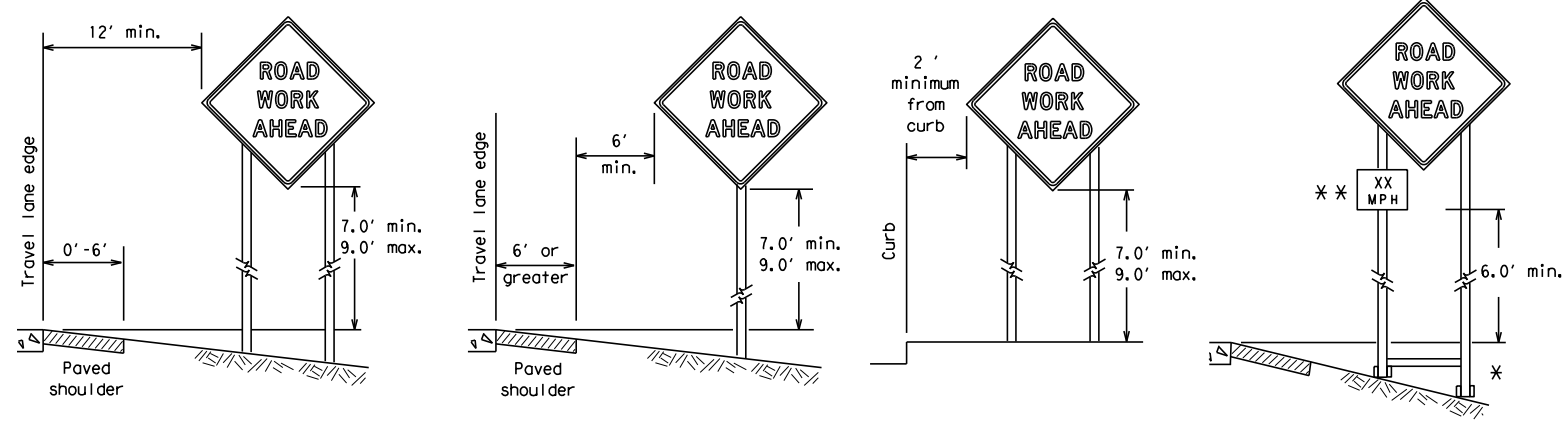
SHEET 3 OF 12

		Traffic Safety Division Standard	
BARRICADE AND CONSTRUCTION WORK ZONE SPEED LIMIT			
BC (3) - 21			
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© TxDOT	November 2002	CON: 0456	SECT: 02
REVISIONS		JOB: 028, ETC	HIGHWAY: FM 27
9-07	8-14	DIST: BRY	COUNTY: FREESTONE
7-13	5-21	SHEET NO. 18	

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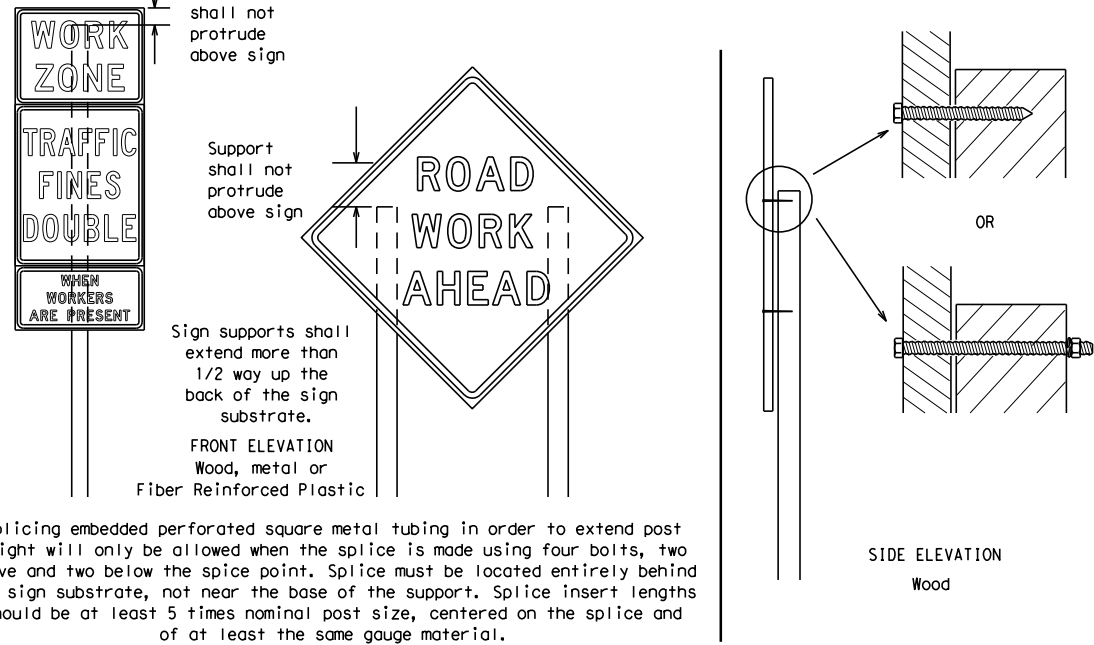
**TYPICAL MINIMUM CLEARANCES FOR LONG TERM AND INTERMEDIATE TERM SIGNS**



\* 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**



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.

**GENERAL NOTES FOR WORK ZONE SIGNS**

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

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

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

**SIGN MOUNTING HEIGHT**

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

**SIZE OF SIGNS**

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

**SIGN SUBSTRATES**

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

**REFLECTIVE SHEETING**

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

**SIGN LETTERS**

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

**REMOVING OR COVERING**

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

**SIGN SUPPORT WEIGHTS**

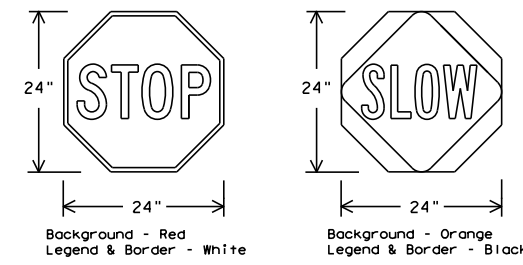
- Where sign supports require the use of weights to keep from turning over, the use of sandbags with dry, cohesionless sand should be used.
- The sandbags will be tied shut to keep the sand from spilling and to maintain a constant weight.
- Rock, concrete, iron, steel or other solid objects shall not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

**FLAGS ON SIGNS**

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

**STOP/SLOW PADDLES**

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



SHEETING REQUIREMENTS (WHEN USED AT NIGHT)		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	RED	TYPE B OR C SHEETING
BACKGROUND	ORANGE	TYPE B <sub>FL</sub> OR C <sub>FL</sub> SHEETING
LEGEND & BORDER	WHITE	TYPE B OR C SHEETING
LEGEND & BORDER	BLACK	ACRYLIC NON-REFLECTIVE FILM

**CONTRACTOR REQUIREMENTS FOR MAINTAINING PERMANENT SIGNS WITHIN THE PROJECT LIMITS**

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

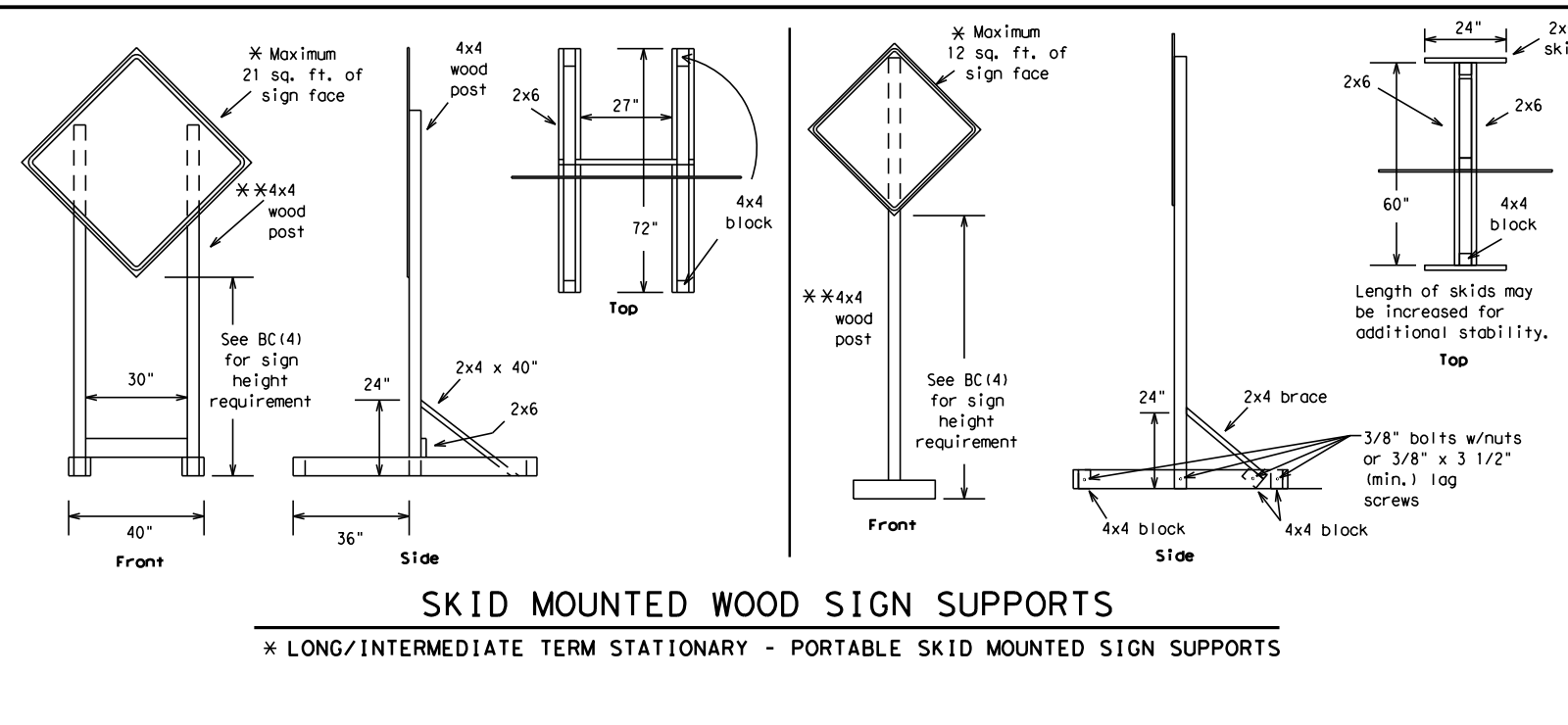


**BARRICADE AND CONSTRUCTION TEMPORARY SIGN NOTES**

**BC (4) - 21**

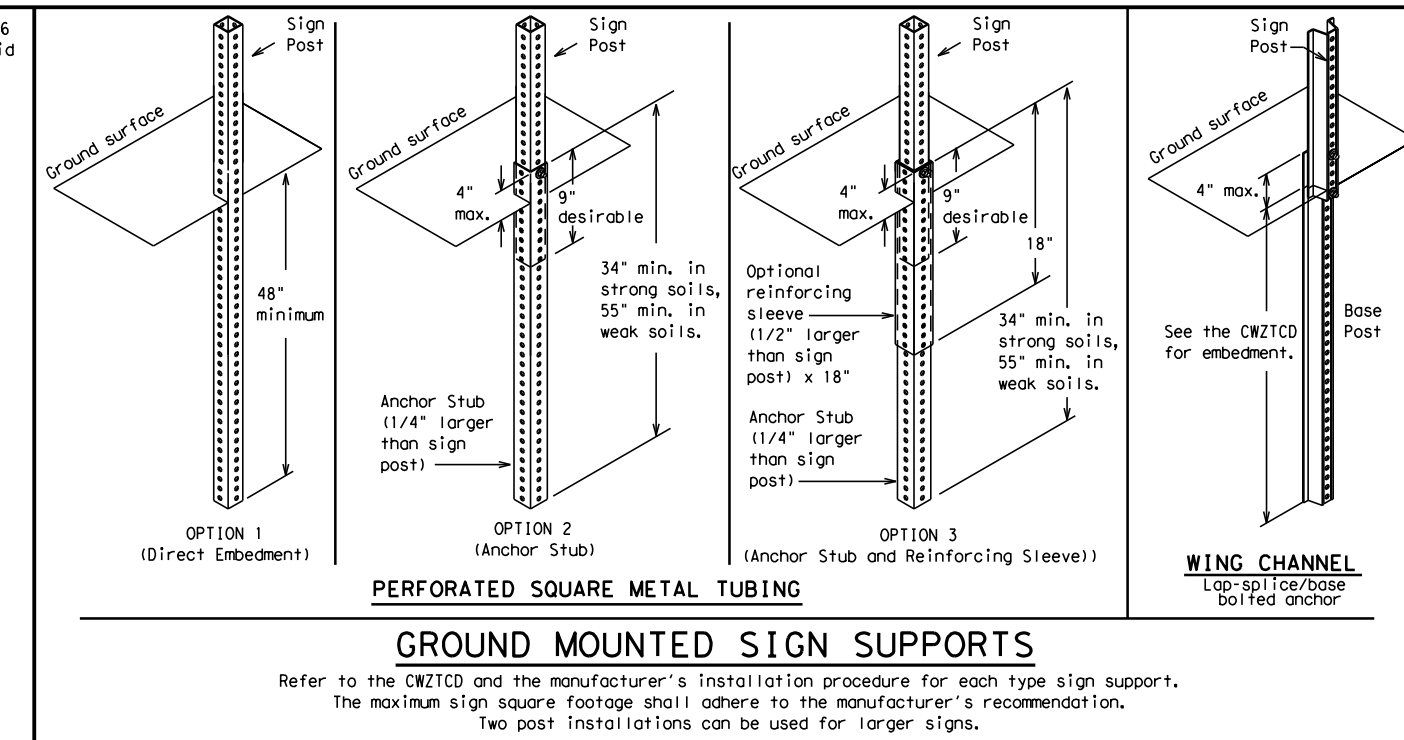
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7-13	5-21	BRY	FREESTONE	19					

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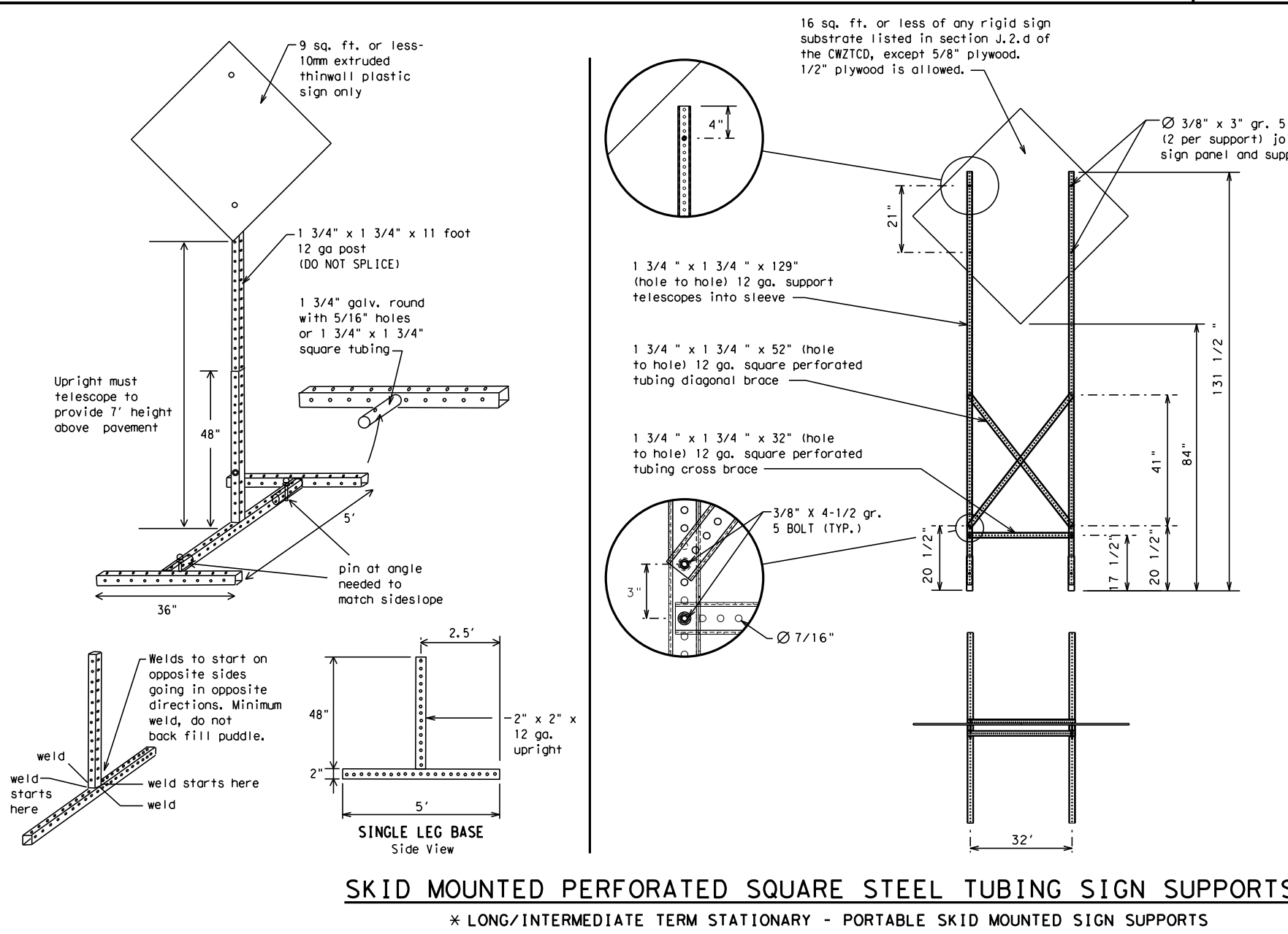
**SKID MOUNTED WOOD SIGN SUPPORTS**

\* 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.

**BARRICADE AND CONSTRUCTION TYPICAL SIGN SUPPORT**

**BC (5) - 21**

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7-13 5-21	BRY	FREESTONE	20	

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

# RECOMMENDED PHASES AND FORMATS FOR PCMS MESSAGES DURING ROADWORK ACTIVITIES

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

## PORTABLE CHANGEABLE MESSAGE SIGNS

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

## Phase 1: Condition Lists

### Road/Lane/Ramp Closure List

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

### Other Condition List

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

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

## Phase 2: Possible Component Lists

### Action to Take/Effect on Travel List

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

### Location List

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

### Warning List

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

### \*\* Advance Notice List

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

\*\* See Application Guidelines Note 6.

## APPLICATION GUIDELINES

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

## WORDING ALTERNATIVES

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

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

## FULL MATRIX PCMS SIGNS

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

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

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



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

BC (6) - 21

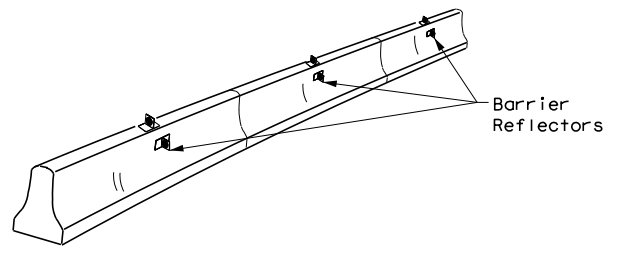
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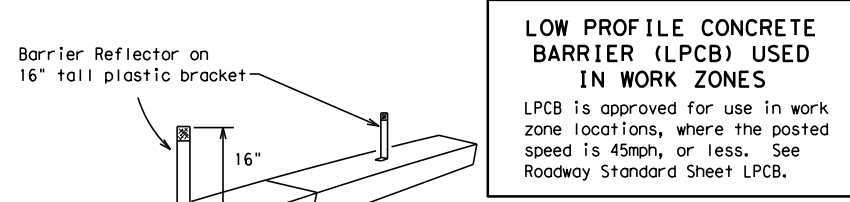
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- Barrier Reflectors shall be pre-qualified, and conform to the color and reflectivity requirements of DMS-8600. A list of prequalified Barrier Reflectors can be found at the Material Producer List web address shown on BC(1).
- Color of Barrier Reflectors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



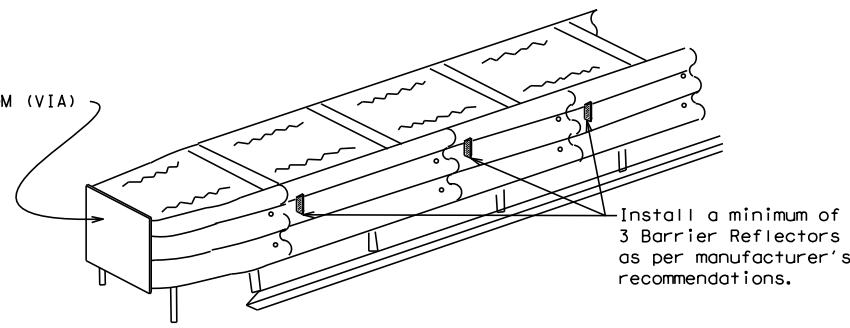
CONCRETE TRAFFIC BARRIER (CTB)

- 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.

LOW PROFILE CONCRETE BARRIER (LPCB)



DELINEATION OF END TREATMENTS

**END TREATMENTS FOR CTB'S USED IN WORK ZONES**  
 End treatments used on CTB's in work zones shall meet the appropriate crashworthy standards as defined in the Manual for Assessing Safety Hardware (MASH). Refer to the CWZTCD List for approved end treatments and manufacturers.

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

**WARNING LIGHTS**

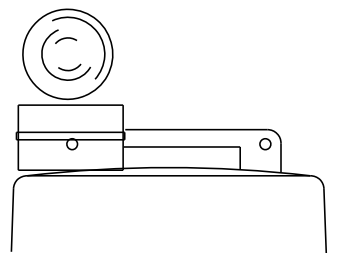
- Warning lights shall meet the requirements of the TMUTCD.
- Warning lights shall NOT be installed on barricades.
- Type A-Low Intensity Flashing Warning Lights are commonly used with drums. They are intended to warn of or mark a potentially hazardous area. Their use shall be as indicated on this sheet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

**WARNING LIGHTS MOUNTED ON PLASTIC DRUMS**

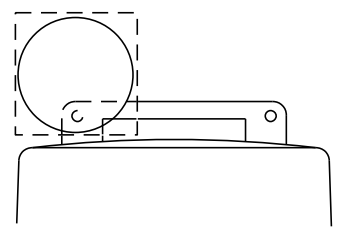
- Type A flashing warning lights are intended to warn drivers that they are approaching or are in a potentially hazardous area.
- Type A random flashing warning lights are not intended for delineation and shall not be used in a series.
- A series of sequential flashing warning lights placed on channelizing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

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

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



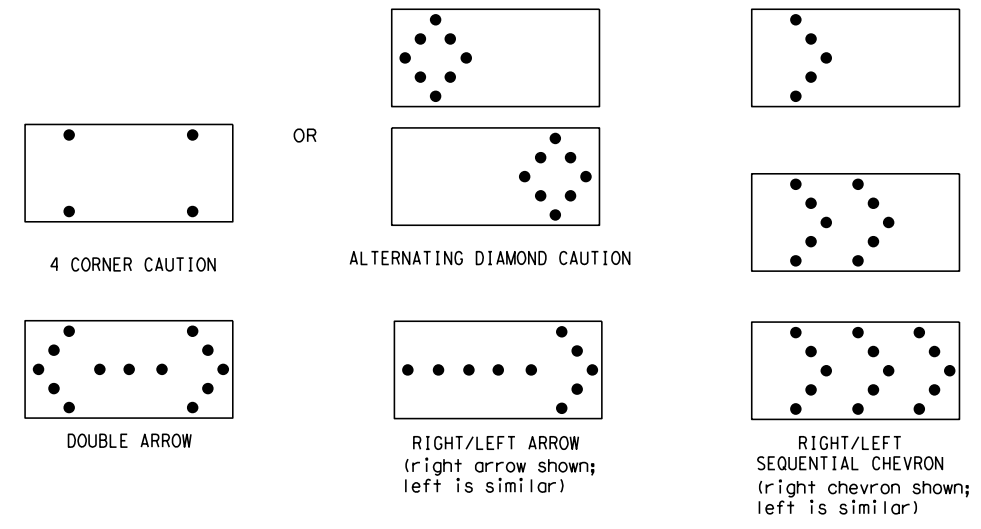
Type C Warning Light or approved substitute mounted on a drum adjacent to the travel way.



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

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

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



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

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

**ATTENTION**  
 Flashing Arrow Boards shall be equipped with automatic dimming devices.

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

**FLASHING ARROW BOARDS**

SHEET 7 OF 12

**TRUCK-MOUNTED ATTENUATORS**

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



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

BC (7) - 21

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7-13	5-21	BRY	FREESTONE	22					

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**GENERAL NOTES**

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

**GENERAL DESIGN REQUIREMENTS**

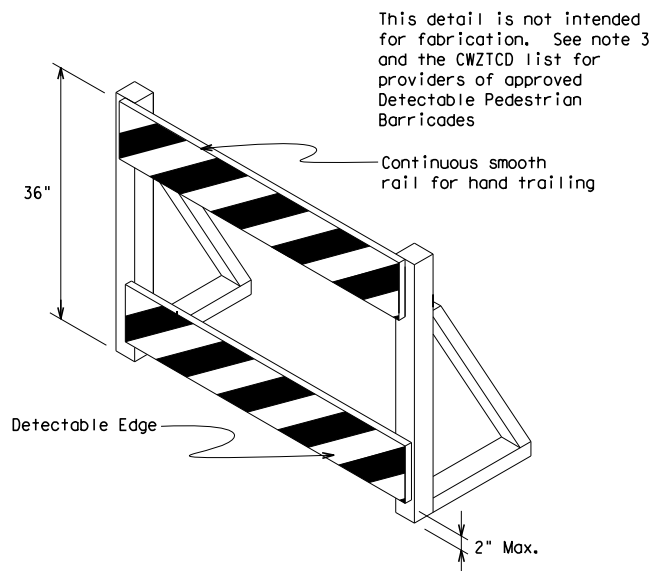
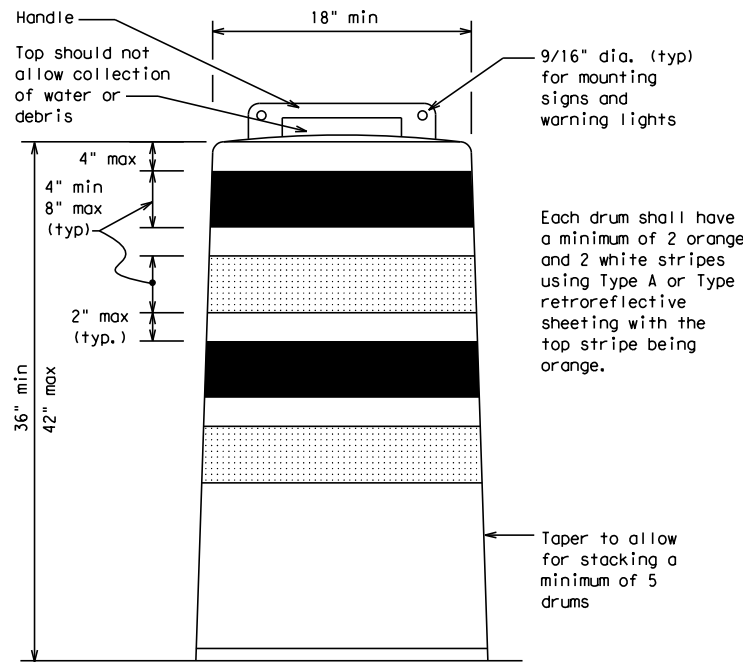
- Pre-qualified plastic drums shall meet the following requirements:
- Plastic drums shall be a two-piece design; the "body" of the drum shall be the top portion and the "base" shall be the bottom.
  - The body and base shall lock together in such a manner that the body separates from the base when impacted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

**RETROREFLECTIVE SHEETING**

- The stripes used on drums shall be constructed of sheeting meeting the color and retroreflectivity requirements of Departmental Materials Specification DMS-8300, "Sign Face Materials." Type A or Type B reflective sheeting shall be supplied unless otherwise specified in the plans.
- The sheeting shall be suitable for use on and shall adhere to the drum surface such that, upon vehicular impact, the sheeting shall remain adhered in-place and exhibit no delaminating, cracking, or loss of retroreflectivity other than that loss due to abrasion of the sheeting surface.

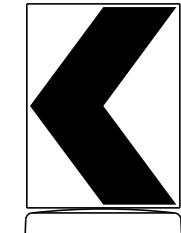
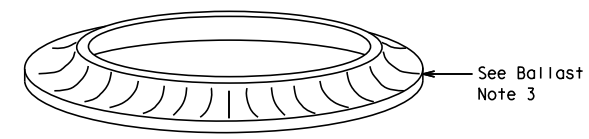
**BALLAST**

- Unballasted bases shall be large enough to hold up to 50 lbs. of sand. This base, when filled with the ballast material, should weigh between 35 lbs (minimum) and 50 lbs (maximum). The ballast may be sand in one to three sandbags separate from the base, sand in a sand-filled plastic base, or other ballasting devices as approved by the Engineer. Stacking of sandbags will be allowed, however height of sandbags above pavement surface may not exceed 12 inches.
- Bases with built-in ballast shall weigh between 40 lbs. and 50 lbs. Built-in ballast can be constructed of an integral crumb rubber base or a solid rubber base.
- Recycled truck tire sidewalls may be used for ballast on drums approved for this type of ballast on the CWZTCD list.
- The ballast shall not be heavy objects, water, or any material that would become hazardous to motorists, pedestrians, or workers when the drum is struck by a vehicle.
- When used in regions susceptible to freezing, drums shall have drainage holes in the bottoms so that water will not collect and freeze becoming a hazard when struck by a vehicle.
- Ballast shall not be placed on top of drums.
- Adhesives may be used to secure base of drums to pavement.

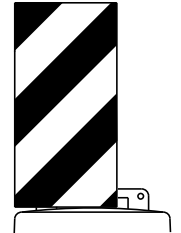


**DETECTABLE PEDESTRIAN BARRICADES**

- When existing pedestrian facilities are disrupted, closed, or relocated in a TTC zone, the temporary facilities shall be detectable and include accessibility features consistent with the features present in the existing pedestrian facility. Refer to WZ(BTS-2) for Pedestrian Control requirements for Sidewalk Diversions, Sidewalk Detours and Crosswalk Closures.
- Where pedestrians with visual disabilities normally use the closed sidewalk, a Detectable Pedestrian Barricade shall be placed across the full width of the closed sidewalk instead of a Type 3 Barricade.
- Detectable pedestrian barricades similar to the one pictured above, longitudinal channelizing devices, some concrete barriers, and wood or chain link fencing with a continuous detectable edging can satisfactorily delineate a pedestrian path.
- Tape, rope, or plastic chain strung between devices are not detectable, do not comply with the design standards in the "Americans with Disabilities Act Accessibility Guidelines (ADAAG)" and should not be used as a control for pedestrian movements.
- Warning lights shall not be attached to detectable pedestrian barricades.
- Detectable pedestrian barricades should use 8" nominal barricade rails as shown on BC(10) provided that the top rail provides a smooth continuous rail suitable for hand trailing with no splinters, burrs, or sharp edges.



18" x 24" Sign  
(Maximum Sign Dimension)  
Chevron CW1-8, Opposing Traffic Lane Divider, Driveway sign D70a, Keep Right R4 series or other signs as approved by Engineer



12" x 24" Vertical Panel  
mount with diagonals sloping down towards travel way

Plywood, Aluminum or Metal sign substrates shall NOT be used on plastic drums

**SIGNS, CHEVRONS, AND VERTICAL PANELS MOUNTED ON PLASTIC DRUMS**

- Signs used on plastic drums shall be manufactured using substrates listed on the CWZTCD.
- Chevrons and other work zone signs with an orange background shall be manufactured with Type B<sub>FL</sub> or Type C<sub>FL</sub> Orange sheeting meeting the color and retroreflectivity requirements of DMS-8300, "Sign Face Material," unless otherwise specified in the plans.
- Vertical Panels shall be manufactured with orange and white sheeting meeting the requirements of DMS-8300 Type A or Type B. Diagonal stripes on Vertical Panels shall slope down toward the intended traveled lane.
- Other sign messages (text or symbolic) may be used as approved by the Engineer. Sign dimensions shall not exceed 18 inches in width or 24 inches in height, except for the R9 series signs discussed in note 8 below.
- Signs shall be installed using a 1/2 inch bolt (nominal) and nut, two washers, and one locking washer for each connection.
- Mounting bolts and nuts shall be fully engaged and adequately torqued. Bolts should not extend more than 1/2 inch beyond nuts.
- Chevrons may be placed on drums on the outside of curves, on merging tapers or on shifting tapers. When used in these locations, they may be placed on every drum or spaced not more than on every third drum. A minimum of three (3) should be used at each location called for in the plans.
- R9-9, R9-10, R9-11 and R9-11a Sidewalk Closed signs which are 24 inches wide may be mounted on plastic drums, with approval of the Engineer.

SHEET 8 OF 12



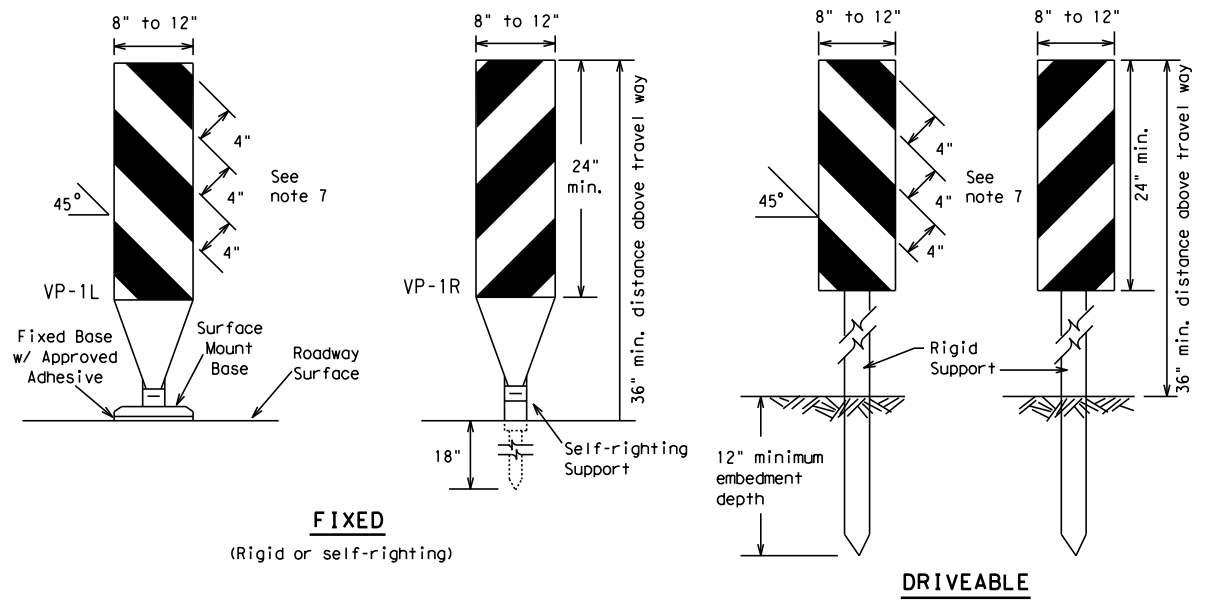
**BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES**

**BC (8) - 21**

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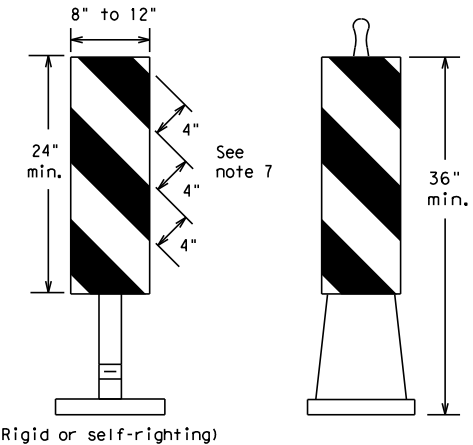
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**FIXED**  
(Rigid or self-righting)

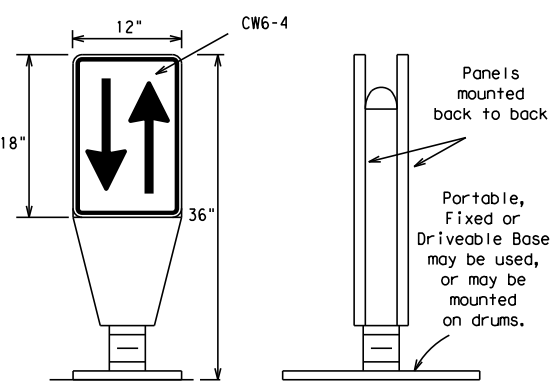
**DRIVEABLE**



**PORTABLE**

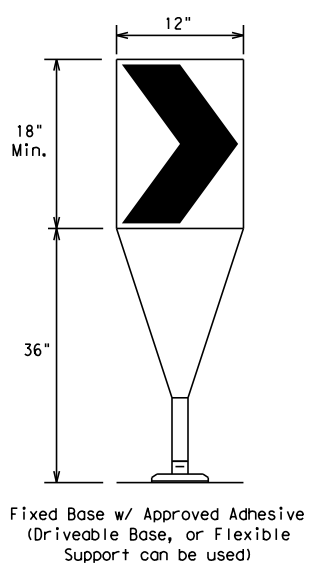
**VERTICAL PANELS (VPs)**

- 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.



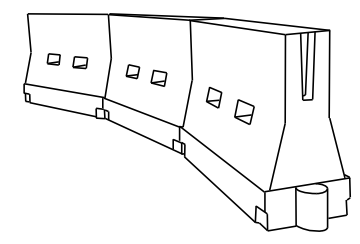
**OPPOSING TRAFFIC LANE DIVIDERS (OTLD)**

- 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.



**CHEVRONS**

- 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.



**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 * *			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'

\* \* \* 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

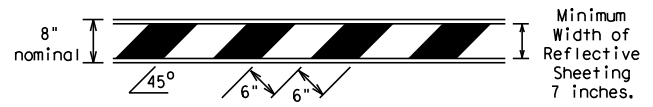
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7-13	5-21	BRY	FREESTONE		24				

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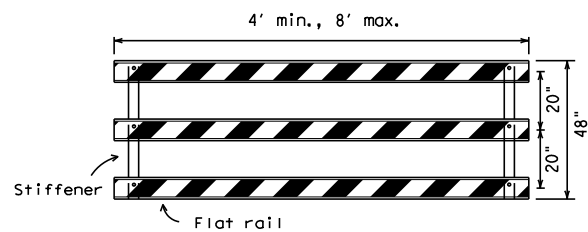
**TYPE 3 BARRICADES**

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.



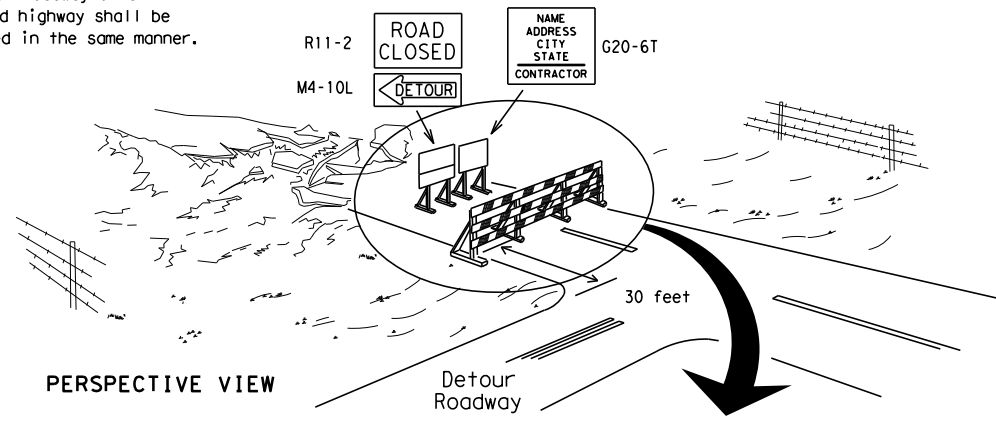
**TYPICAL STRIPING DETAIL FOR BARRICADE RAIL**



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

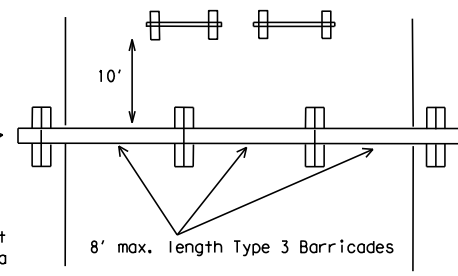
**TYPICAL PANEL DETAIL FOR SKID OR POST TYPE BARRICADES**

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



PERSPECTIVE VIEW

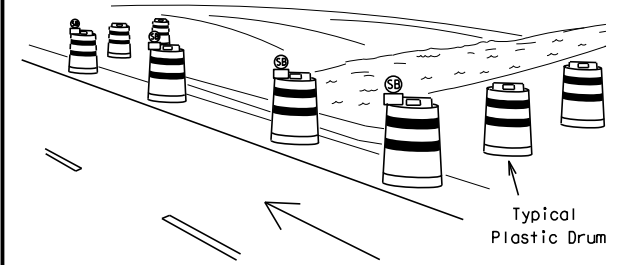
The three rails on Type 3 barricades shall be reflectorized orange and reflective white stripes on one side facing one-way traffic and both sides for two-way traffic. Barricade striping should slant downward in the direction of detour.



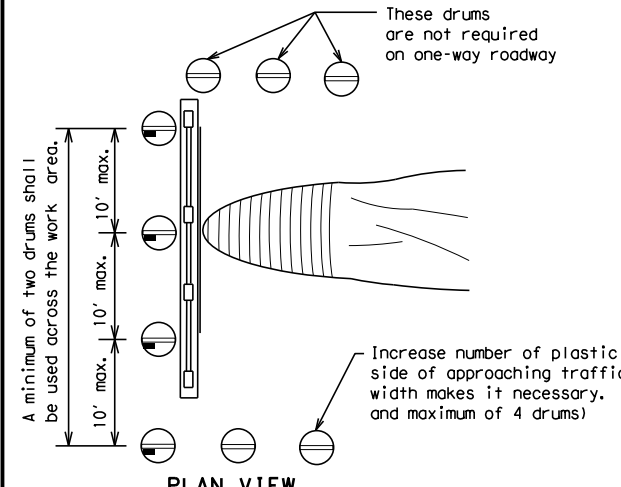
PLAN VIEW

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

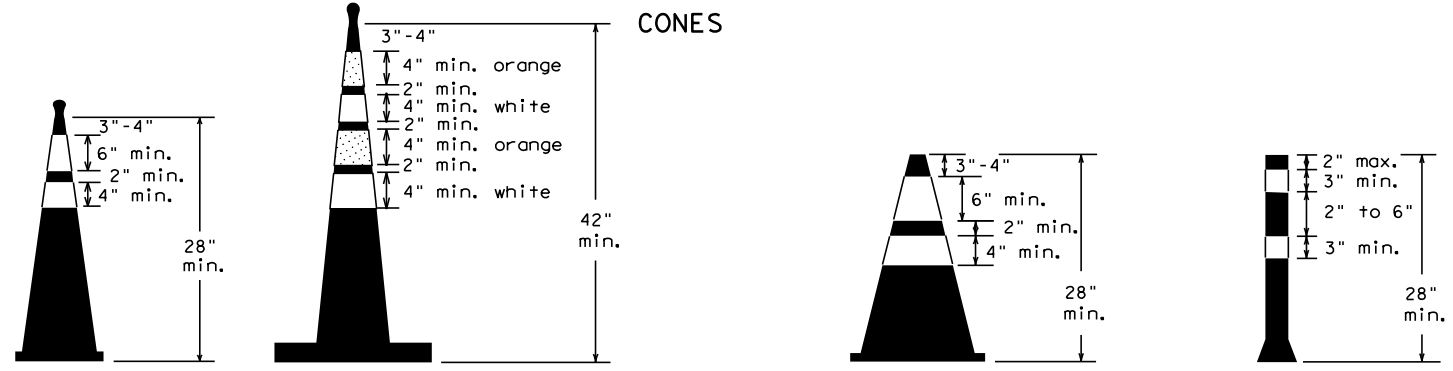


PLAN VIEW

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**



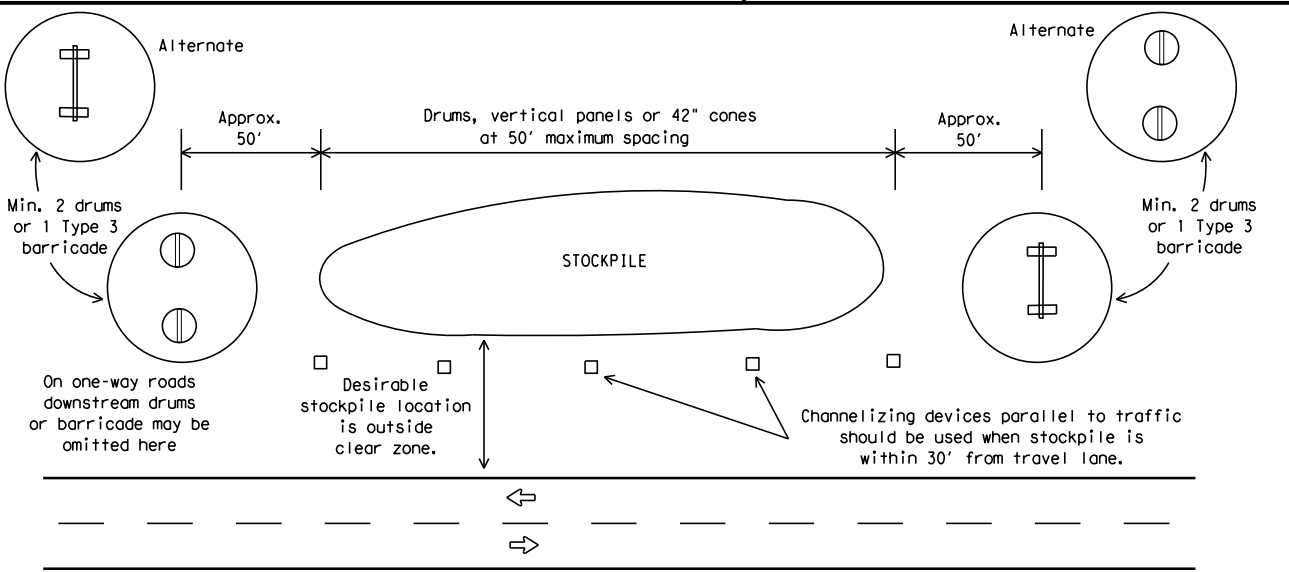
Two-Piece cones

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.

1. Traffic cones and tubular markers shall be predominantly orange, and meet the height and weight requirements shown above.
2. One-piece cones have the body and base of the cone molded in one consolidated unit. Two-piece cones have a cone shaped body and a separate rubber base, or ballast, that is added to keep the device upright and in place.
3. Two-piece cones may have a handle or loop extending up to 8" above the minimum height shown, in order to aid in retrieving the device.
4. Cones or tubular markers shall have white or white and orange reflective bands as shown above. The reflective bands shall have a smooth, sealed outer surface and meet the requirements of Departmental Material Specification DMS-8300 Type A or Type B.
5. 28" cones and tubular markers are generally suitable for short duration and short-term stationary work as defined on BC(4). These should not be used for intermediate-term or long-term stationary work unless personnel is on-site to maintain them in their proper upright position.
6. 42" two-piece cones, vertical panels or drums are suitable for all work zone durations.
7. Cones or tubular markers used on each project should be of the same size and shape.



**TRAFFIC CONTROL FOR MATERIAL STOCKPILES**



**BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES**

**BC (10) - 21**

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0456	02	028, ETC	FM 27
9-07 8-14	DIST	COUNTY	SHEET NO.	
7-13 5-21	BRY	FREESTONE	25	

## WORK ZONE PAVEMENT MARKINGS

### GENERAL

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

### RAISED PAVEMENT MARKERS

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

### PREFABRICATED PAVEMENT MARKINGS

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

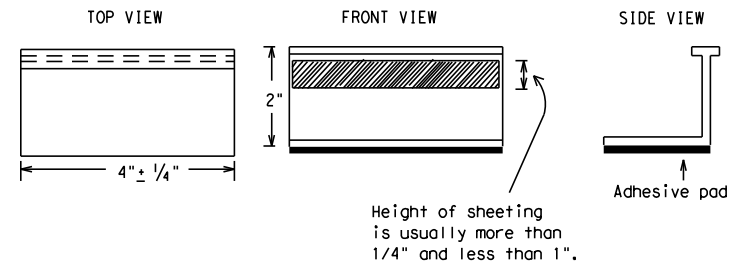
### MAINTAINING WORK ZONE PAVEMENT MARKINGS

- The Contractor will be responsible for maintaining work zone pavement markings within the work limits.
- Work zone pavement markings shall be inspected in accordance with the frequency and reporting requirements of work zone traffic control device inspections as required by Form 599.
- The markings should provide a visible reference for a minimum distance of 300 feet during normal daylight hours and 160 feet when illuminated by automobile low-beam headlights at night, unless sight distance is restricted by roadway geometrics.
- Markings failing to meet this criteria within the first 30 days after placement shall be replaced at the expense of the Contractor as per Specification Item 662.

### REMOVAL OF PAVEMENT MARKINGS

- Pavement markings that are no longer applicable, could create confusion or direct a motorist toward or into the closed portion of the roadway shall be removed or obliterated before the roadway is opened to traffic.
- The above shall not apply to detours in place for less than three days, where flaggers and/or sufficient channelizing devices are used in lieu of markings to outline the detour route.
- Pavement markings shall be removed to the fullest extent possible, so as not to leave a discernable marking. This shall be by any method approved by TxDOT Specification Item 677 for "Eliminating Existing Pavement Markings and Markers".
- The removal of pavement markings may require resurfacing or seal coating portions of the roadway as described in Item 677.
- Subject to the approval of the Engineer, any method that proves to be successful on a particular type pavement may be used.
- Blast cleaning may be used but will not be required unless specifically shown in the plans.
- Over-painting of the markings SHALL NOT BE permitted.
- Removal of raised pavement markers shall be as directed by the Engineer.
- Removal of existing pavement markings and markers will be paid for directly in accordance with Item 677, "ELIMINATING EXISTING PAVEMENT MARKINGS AND MARKERS," unless otherwise stated in the plans.
- Black-out marking tape may be used to cover conflicting existing markings for periods less than two weeks when approved by the Engineer.

## Temporary Flexible-Reflective Roadway Marker Tabs



**STAPLES OR NAILS SHALL NOT BE USED TO SECURE  
TEMPORARY FLEXIBLE-REFLECTIVE ROADWAY MARKER  
TABS TO THE PAVEMENT SURFACE**

- Temporary flexible-reflective roadway marker tabs used as guidemarks shall meet the requirements of DMS-8242.
- Tabs detailed on this sheet are to be inspected and accepted by the Engineer or designated representative. Sampling and testing is not normally required, however at the option of the Engineer, either "A" or "B" below may be imposed to assure quality before placement on the roadway.
  - Select five (5) or more tabs at random from each lot or shipment and submit to the Construction Division, Materials and Pavement Section to determine specification compliance.
  - Select five (5) tabs and perform the following test. Affix five (5) tabs at 24 inch intervals on an asphaltic pavement in a straight line. Using a medium size passenger vehicle or pickup, run over the markers with the front and rear tires at a speed of 35 to 40 miles per hour, four (4) times in each direction. No more than one (1) out of the five (5) reflective surfaces shall be lost or displaced as a result of this test.
- Small design variances may be noted between tab manufacturers.
- See Standard Sheet WZ(STPM) for tab placement on new pavements. See Standard Sheet TCP(7-1) for tab placement on seal coat work.

### RAISED PAVEMENT MARKERS USED AS GUIDEMARKS

- Raised pavement markers used as guidemarks shall be from the approved product list, and meet the requirements of DMS-4200.
- All temporary construction raised pavement markers provided on a project shall be of the same manufacturer.
- Adhesive for guidemarks shall be bituminous material hot applied or butyl rubber pad for all surfaces, or thermoplastic for concrete surfaces.

Guidemarks shall be designated as:  
 YELLOW - (two amber reflective surfaces with yellow body).  
 WHITE - (one silver reflective surface with white body).

DEPARTMENTAL MATERIAL SPECIFICATIONS	
PAVEMENT MARKERS (REFLECTORIZED)	DMS-4200
TRAFFIC BUTTONS	DMS-4300
EPOXY AND ADHESIVES	DMS-6100
BITUMINOUS ADHESIVE FOR PAVEMENT MARKERS	DMS-6130
PERMANENT PREFABRICATED PAVEMENT MARKINGS	DMS-8240
TEMPORARY REMOVABLE, PREFABRICATED PAVEMENT MARKINGS	DMS-8241
TEMPORARY FLEXIBLE, REFLECTIVE ROADWAY MARKER TABS	DMS-8242

A list of prequalified reflective raised pavement markers, non-reflective traffic buttons, roadway marker tabs and other pavement markings can be found at the Material Producer List web address shown on BC(1).

SHEET 11 OF 12



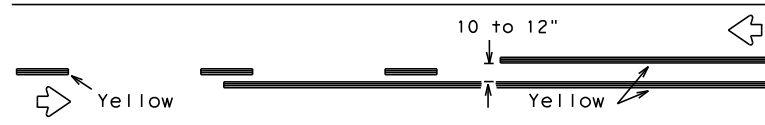
## BARRICADE AND CONSTRUCTION PAVEMENT MARKINGS

BC(11)-21

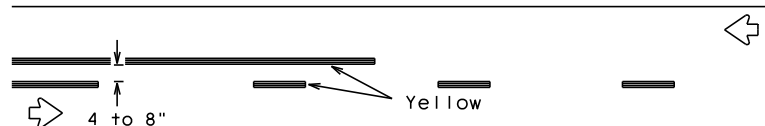
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© TxDOT February 1998	CONT	SECT	JOB	HIGHWAY
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2-98 9-07 5-21	DIST	COUNTY	SHEET NO.	
1-02 7-13	BRY	FREESTONE	26	
11-02 8-14				

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## PAVEMENT MARKING PATTERNS

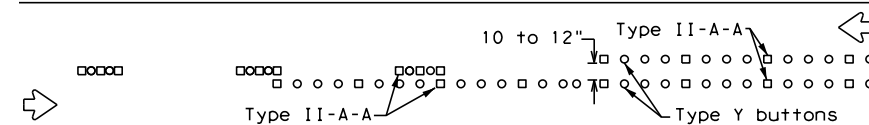


REFLECTORIZED PAVEMENT MARKINGS - PATTERN A

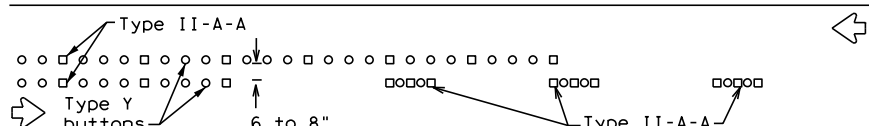


REFLECTORIZED PAVEMENT MARKINGS - PATTERN B

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.

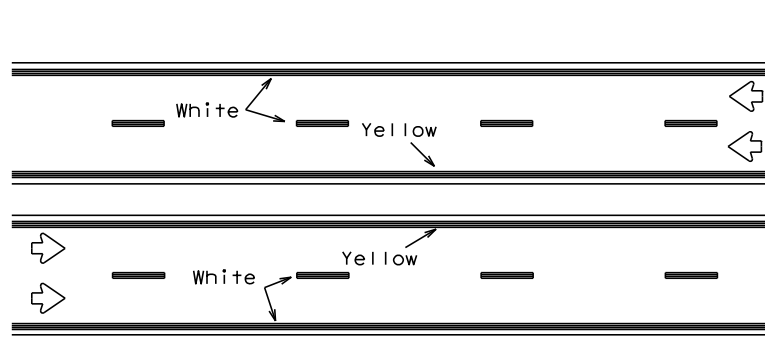


RAISED PAVEMENT MARKERS - PATTERN A



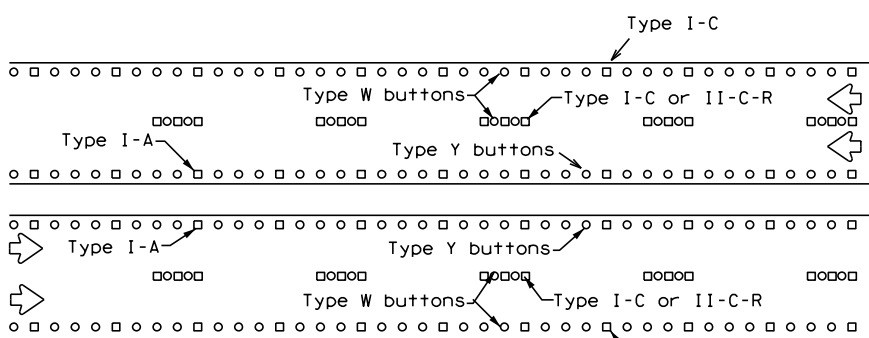
RAISED PAVEMENT MARKERS - PATTERN B

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



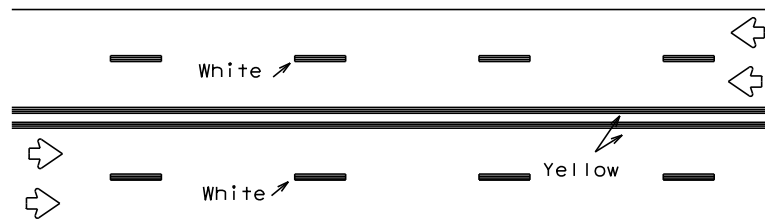
REFLECTORIZED PAVEMENT MARKINGS

Prefabricated markings may be substituted for reflectORIZED pavement markings.



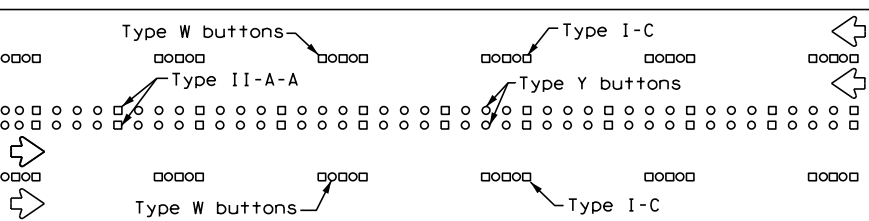
RAISED PAVEMENT MARKERS

## EDGE & LANE LINES FOR DIVIDED HIGHWAY



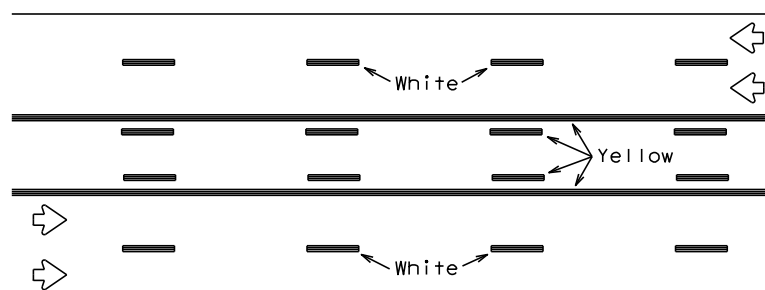
REFLECTORIZED PAVEMENT MARKINGS

Prefabricated markings may be substituted for reflectORIZED pavement markings.



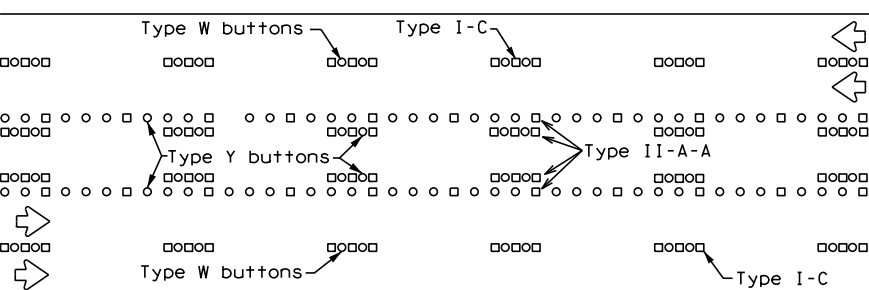
RAISED PAVEMENT MARKERS

## LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS



REFLECTORIZED PAVEMENT MARKINGS

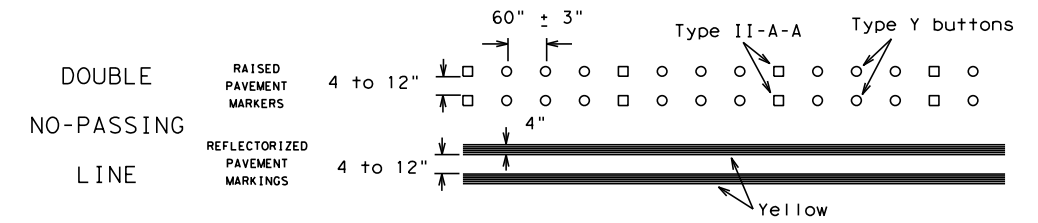
Prefabricated markings may be substituted for reflectORIZED pavement markings.



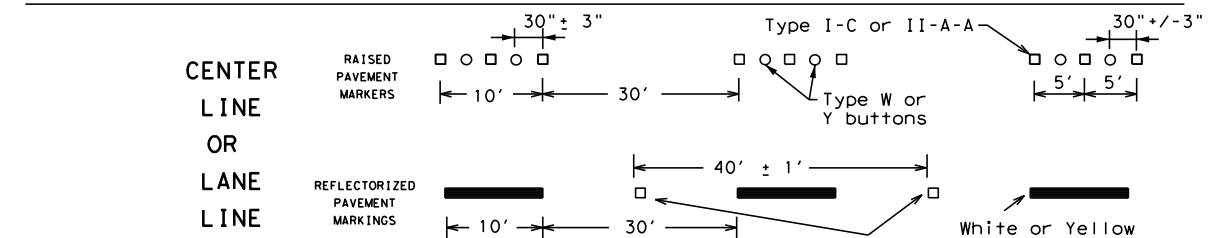
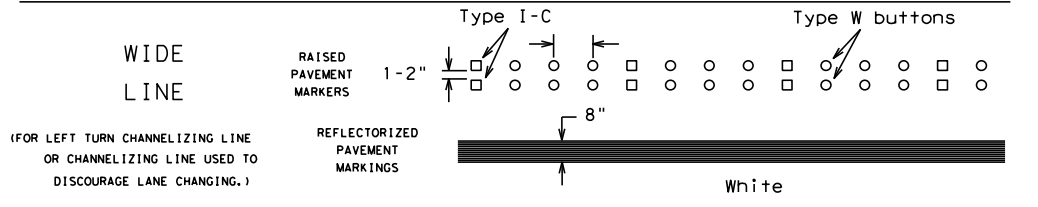
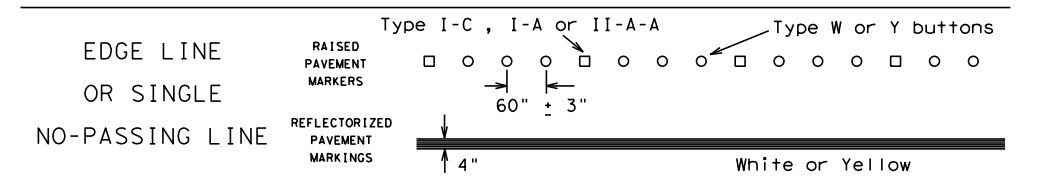
RAISED PAVEMENT MARKERS

## TWO-WAY LEFT TURN LANE

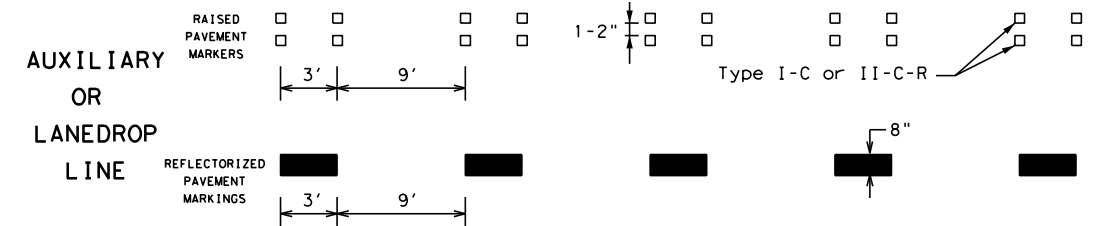
## STANDARD WORK ZONE PAVEMENT MARKINGS DETAILS



### SOLID LINES

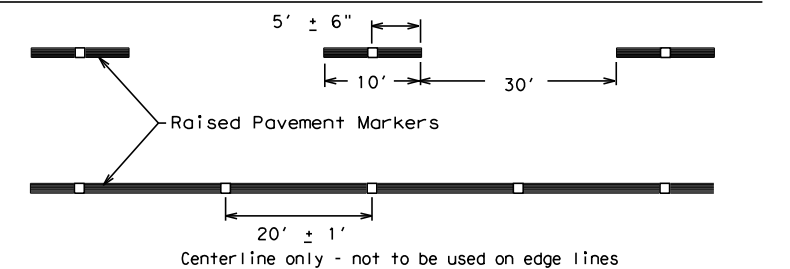


### BROKEN LINES



### 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

BC (12) - 21

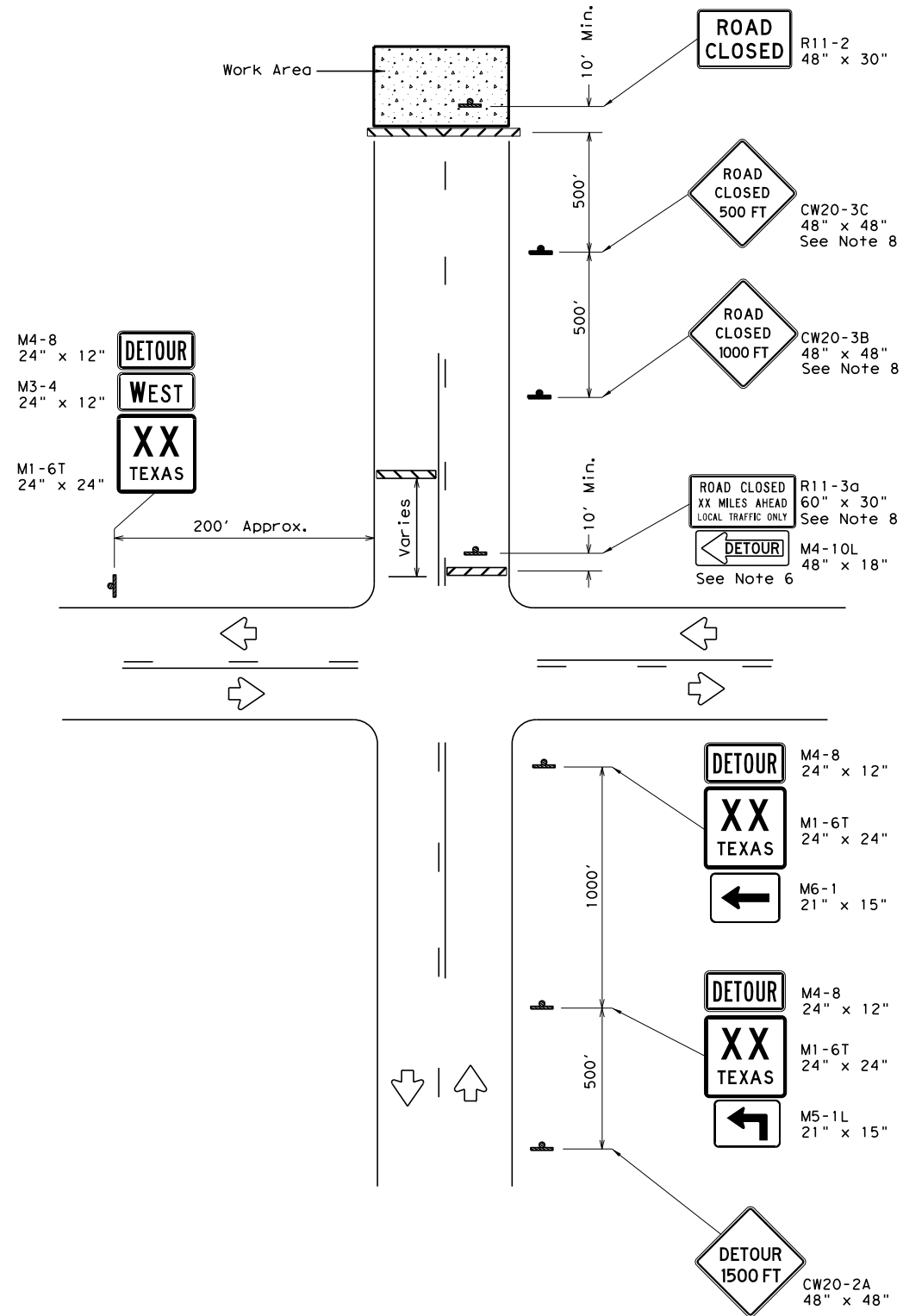
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©TxDOT February 1998	CONT	SECT	JOB	HIGHWAY
REVISIONS	0456	02	028, ETC	FM 27
1-97 9-07 5-21	DIST	COUNTY	SHEET NO.	
2-98 7-13	BRY	FREESTONE	27	
11-02 8-14				

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

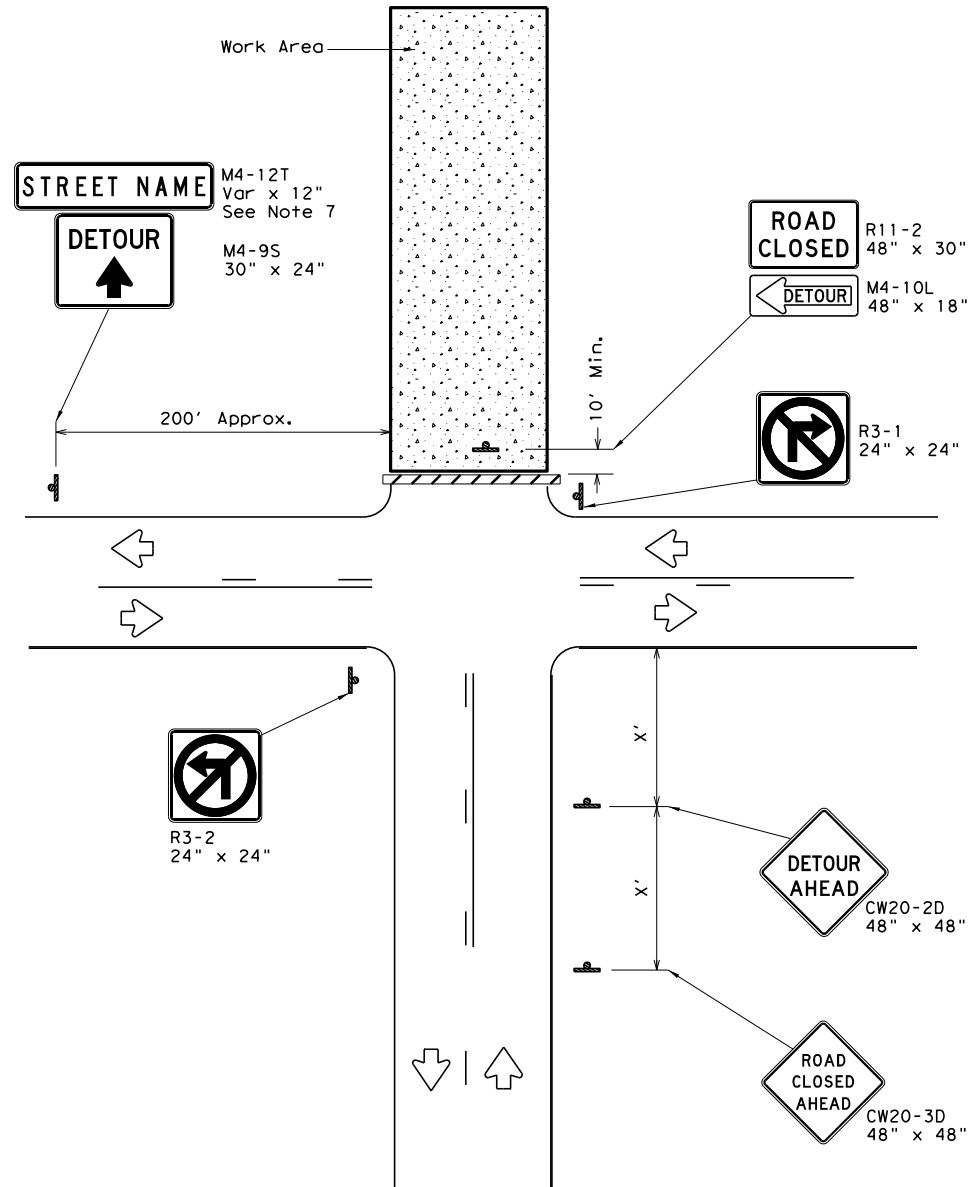
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**ROAD CLOSURE BEYOND THE INTERSECTION**  
 Signing for a Numbered Route with an Off-Site Detour



**ROAD CLOSURE AT THE INTERSECTION**  
 Signing for an Un-numbered Route with an Off-Site Detour

LEGEND	
	Type 3 Barricade
	Sign

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

\* Conventional Roads Only

**GENERAL NOTES**

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

		Traffic Operations Division Standard	
<b>WORK ZONE ROAD CLOSURE DETAILS</b>			
<b>WZ (RCD) - 13</b>			
FILE: wzrcd-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT
© TxDOT August 1995	CONT	SECT	JOB
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2-98 3-03	BRY	FREESTONE	28

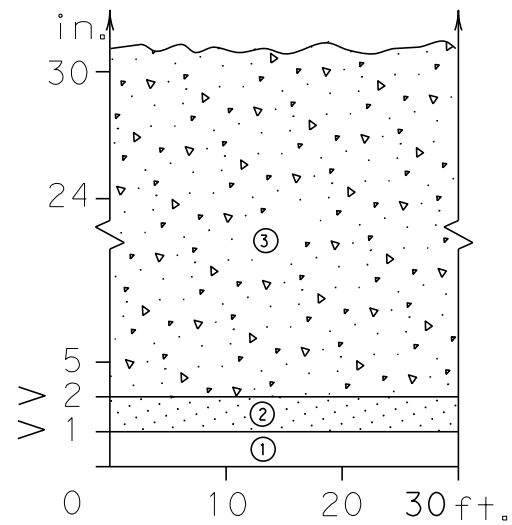


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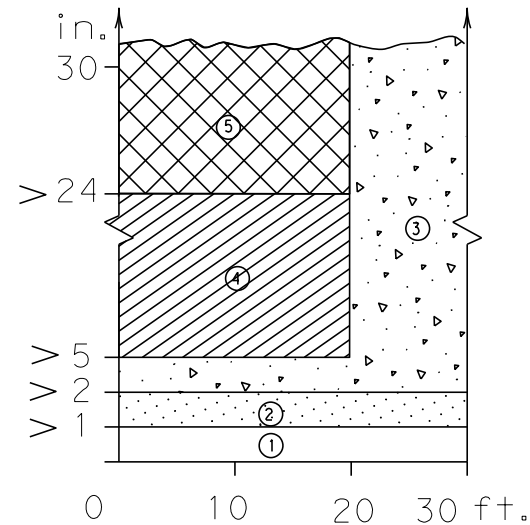
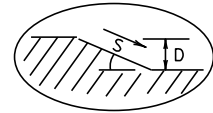
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## DEFINITION OF TREATMENT ZONES FOR VARIOUS EDGE CONDITIONS

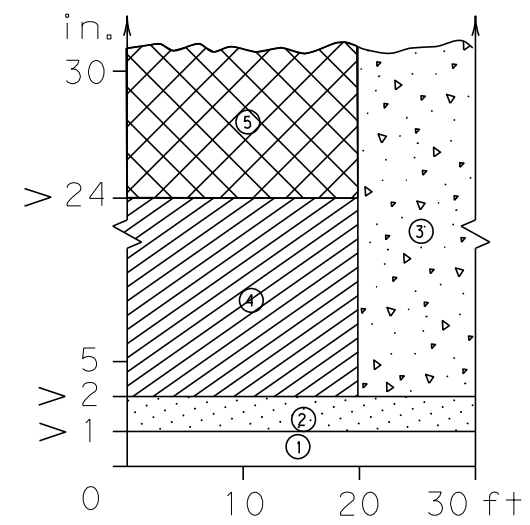
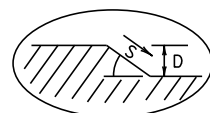
Edge Height (D) in Inches versus Lateral Clearance (Y) in Feet



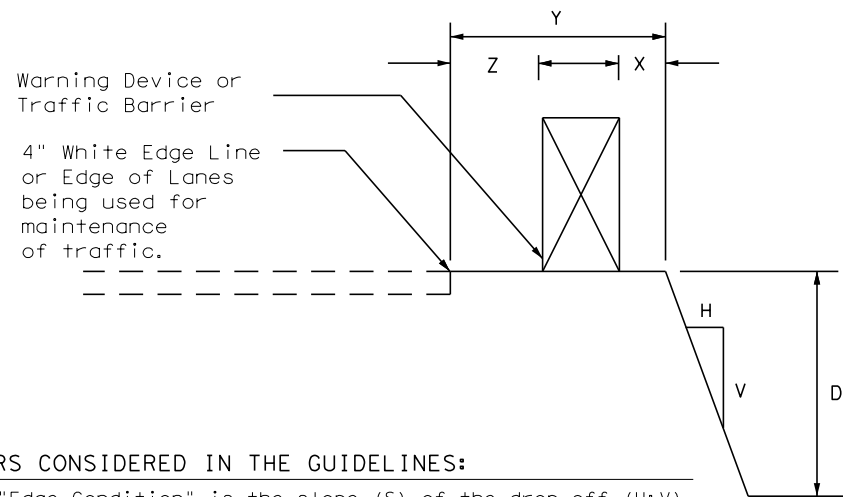
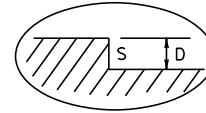
Edge Condition I  
 S = (3:1) (or flatter)



Edge Condition II  
 S = ((2.99):1) to (1:1)



Edge Condition III  
 S is steeper than (1:1)



### FACTORS CONSIDERED IN THE GUIDELINES:

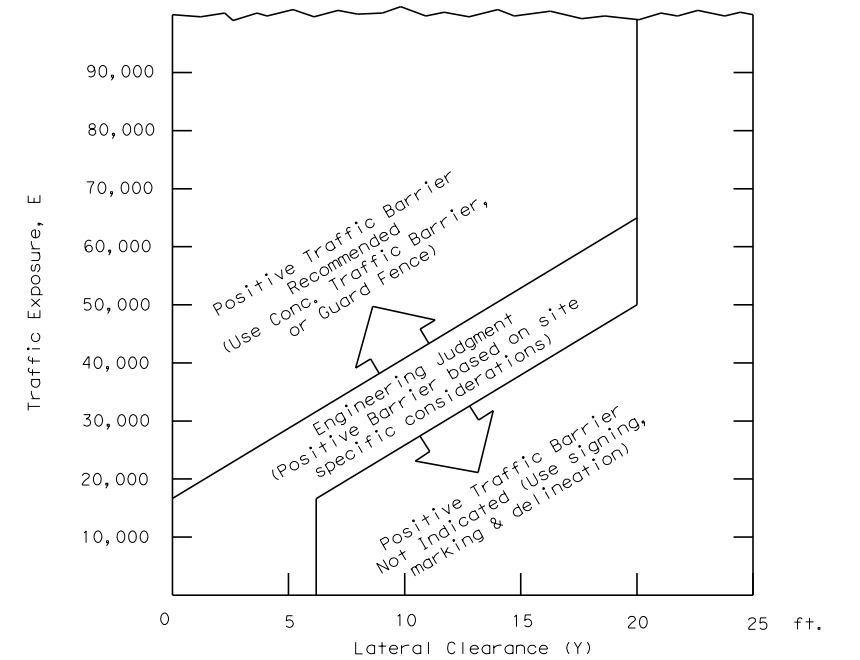
- The "Edge Condition" is the slope (S) of the drop-off (H:V). The "Edge Height" is the depth of the drop-off "D".
- Distance "X" is to be the maximum practical under job conditions. Two feet minimum for high speed conditions. Distance "Y" is the lateral clearance from edge of travel lane to edge of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

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

### Edge Condition Notes:

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

FIGURE-1: CONDITIONS INDICATING USE OF POSITIVE BARRIER FOR ZONE 5 ( [cross-hatch] )



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

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

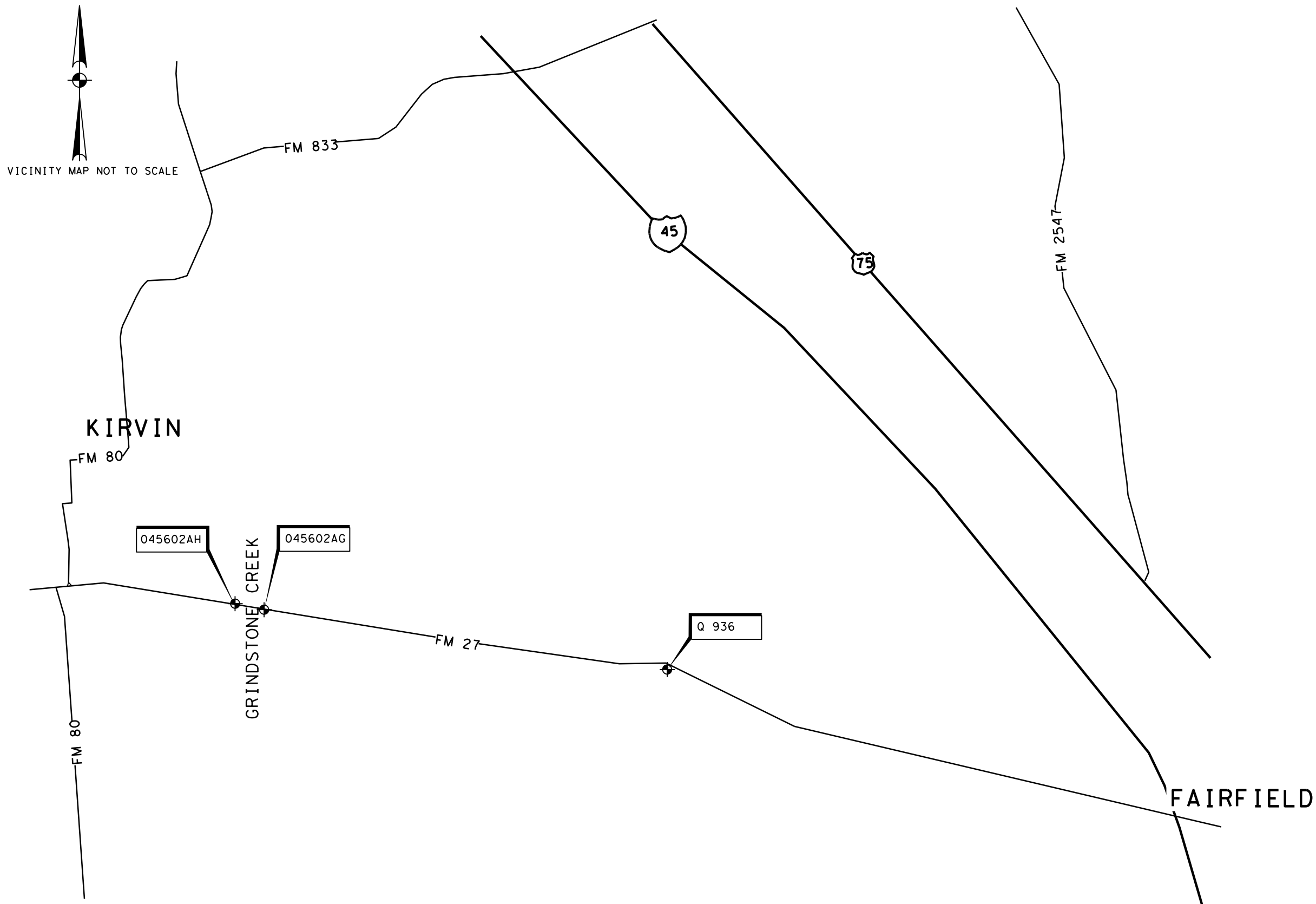
Engineer's Seal  
  
 Date 4/26/2023  
*J. Alchevsky*

Texas Department of Transportation  
 Traffic Safety Division Standard

## TREATMENT FOR VARIOUS EDGE CONDITIONS

FILE: edgecon.dgn	DN:	CK:	DW:	CK:
©TxDOT August 2000	CONT	SECT	JOB	HIGHWAY
03-01 08-01 9-21	REVISIONS	0456	02	028, ETC
	DIST	COUNTY		SHEET NO.
	BRY	FREESTONE		29

4/12/2023 11:55:03 AM RETANAP I:\SURV\WJN4001-Bryon Bridges P38E\700 CADD\713 Survey\713.4 Control Surveys\WJN4001 0456028-0456029-045602029-045602030 CONTROL.dgn



Point ID	Latitude (Global)	Longitude (Global)	Northing (Grid)	Easting (Grid)	Northing (Surface)	Easting (Surface)	Elevation	Ellipsoid Height (Global)	Feature Code
045602AG	31d45'15.95224"	-96d18'20.97668"	10,624,499.905	3,548,178.483	10,624,818.640	3,548,284.928	424.382'	341.379'	3-1/2 INCH ALUM DISK STAMPED TEXAS DEPT OF TRANSPORTATION
045602AH	31d45'18.97872"	-96d18'35.40267"	10,624,760.464	3,546,922.676	10,625,079.207	3,547,029.084	369.372'	316.382'	3-1/2 INCH ALUM DISK STAMPED TEXAS DEPT OF TRANSPORTATION

NOTES:

ALL COORDINATES ARE BASED ON THE TEXAS COORDINATE SYSTEM, TEXAS CENTRAL ZONE 4203, NAD83 (2011 ADJ) EPOCH 2010.00 GEOID 12A DETERMINED BY GPS OBSERVATIONS CALCULATED FROM TXDOTVRS NETWORK (CORS PIDs "TXMX D08873", "TXPI DN5858", "TXNA DF8992") ALL DISTANCES AND COORDINATES ARE SURFACE WITH A GRID TO GROUND SCALE FACTOR OF 1.000030000

PROJECT BENCHMARK: USCGS Q 936 (BZ0052)

A STANDARD DISK STAMPED "Q 936 1948" IN THE TOWN OF KIRVIN, SET IN A CONCRETE MONUMENT, 5.1 MILES WEST ALONG FARM HIGHWAY NO. 27 FROM THE JUNCTION WITH U.S. HIGHWAY NO. 84 AT FAIRFIELD, 0.1 MILE EAST OF THE MOST EASTERLY OF TWO BRIDGES OVER CANEY CREEK, 49.3 FEET SOUTH AND ABOUT 2.0 FEET ABOVE THE CENTER OF THE HIGHWAY, 10.3 FEET EAST OF A FENCE CORNER POST, 1.8 FEET WEST OF A WITNESS POST, 1.0 FOOT NORTH OF A BARB WIRE FENCE AND SET IN THE TOP OF A CONCRETE POST WHICH PROJECTS 0.4 FOOT ABOVE GROUND.

SURFACE  
 NORTHING 10,622,461.126 (MEASURED)  
 EASTING 3,565,441.548 (MEASURED)  
 ELEV: 355.660 (PUBLISHED)

GRID  
 NORTHING 10,622,142.462 (CALCULATED)  
 EASTING 3,565,334.588 (CALCULATED)  
 ELEV: 355.660 (PUBLISHED)



*Mark E. Keeton* 4/12/2023  
 MARK E. KEETON DATE  
 RPLS NO. 6790

NO.	REVISIONS	BY	DATE
1	CITY NAME CHANGE	PR	04/12/2023



SURVEY CONTROL

SHEET 1 OF 2

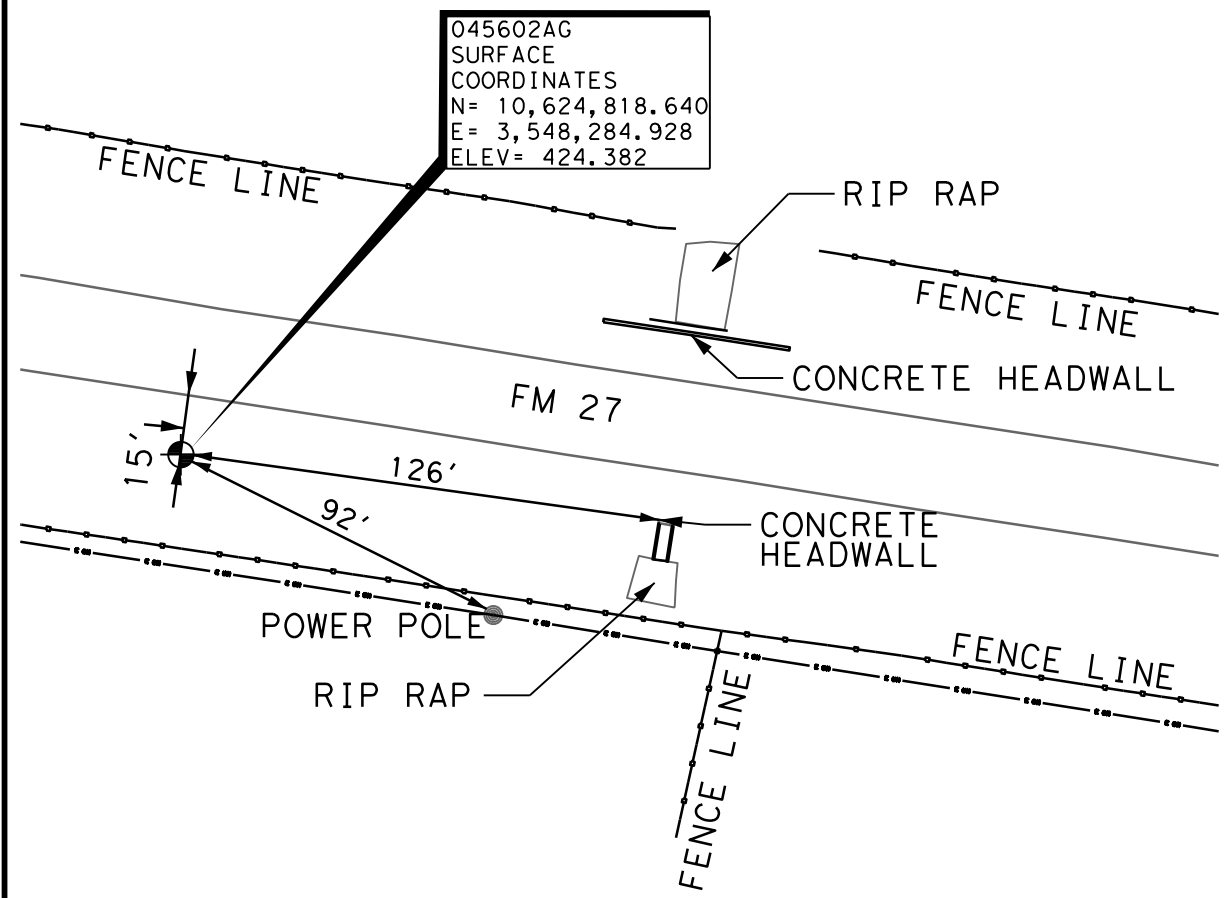
FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.	SHEET NO.	
		30	
STATE	DISTRICT	COUNTY	
TEXAS	17	FREESTONE	
CONTROL	SECTION	JOB	HIGHWAY NO.
0456	02	028	FM 27

4/12/2023 11:56:21 AM RETANAP I:\SURV\JXN4001-Bryon Bridges P88\700 CADD\713 Survey\713.4 Control Surveys\JXN4001 0456028-0456029-045602030 CONTROL.dgn



**CONTROL MONUMENT DESCRIPTION:**  
 A 3 1/2" ALUMINUM DISK SET IN CONCRETE STAMPED "045602AG".

SKETCH  
 (NOT TO SCALE)

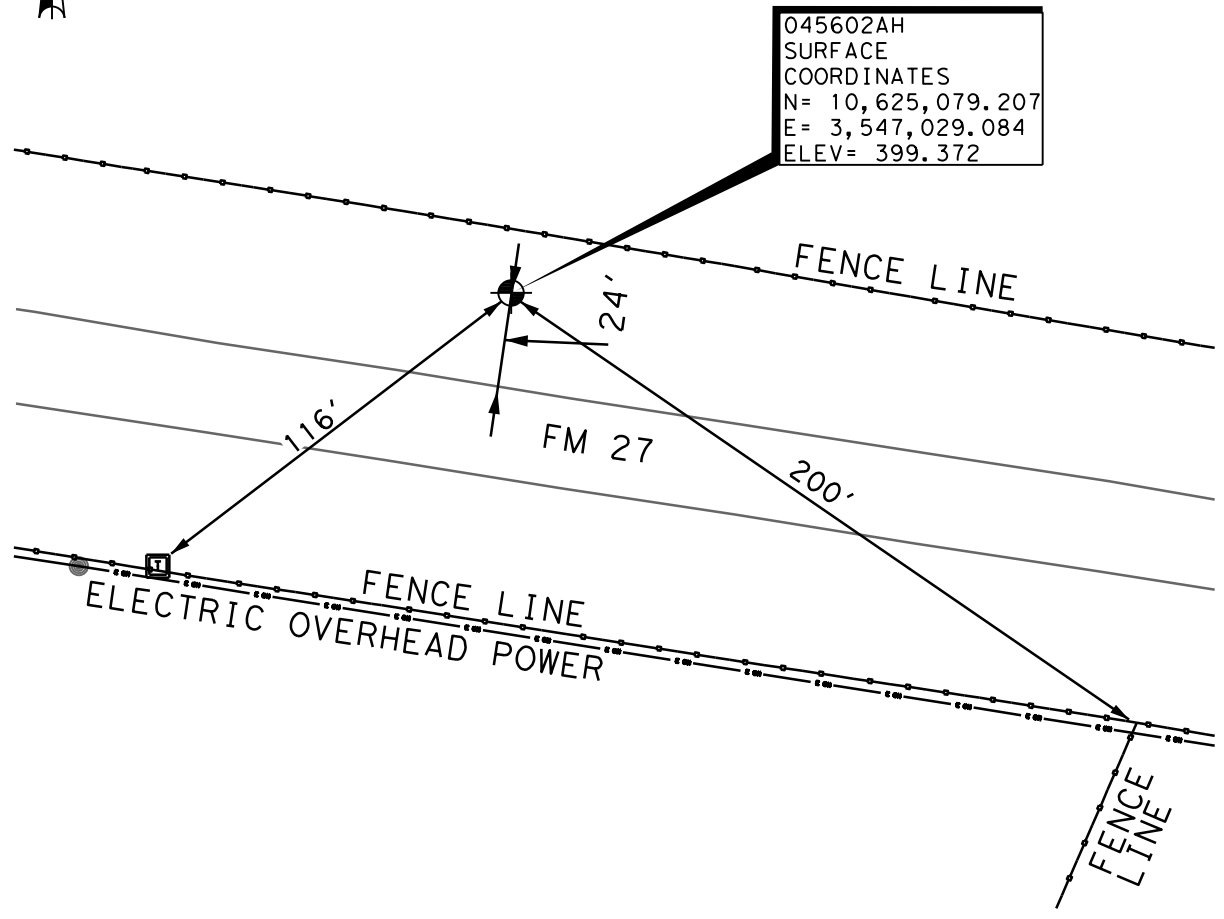


045602AG  
 SURFACE  
 COORDINATES  
 N= 10,624,818.640  
 E= 3,548,284.928  
 ELEV= 424.382



**CONTROL MONUMENT DESCRIPTION:**  
 A 3 1/2" ALUMINUM DISK SET IN CONCRETE STAMPED "045602AH".

SKETCH  
 (NOT TO SCALE)



045602AH  
 SURFACE  
 COORDINATES  
 N= 10,625,079.207  
 E= 3,547,029.084  
 ELEV= 399.372

**NOTES:**

ALL COORDINATES ARE BASED ON THE TEXAS COORDINATE SYSTEM, TEXAS CENTRAL ZONE 4203, NAD83 (2011 ADJ) EPOCH 2010.00 GEOID 12A DETERMINED BY GPS OBSERVATIONS CALCULATED FROM TXDOT VRS NETWORK (CORS PIDs "TXMX D08873", "TXPI DN5858", "TXNA DF8992") ALL DISTANCES AND COORDINATES ARE SURFACE WITH A GRID TO GROUND SCALE FACTOR OF 1.000030000

PROJECT BENCHMARK: USCGS Q 936 (BZ0052)

A STANDARD DISK STAMPED "Q 936 1948" IN THE TOWN OF KIRVIN, SET IN A CONCRETE MONUMENT, 5.1 MILES WEST ALONG FARM HIGHWAY NO. 27 FROM THE JUNCTION WITH U.S. HIGHWAY NO. 84 AT FAIRFIELD, 0.1 MILE EAST OF THE MOST EASTERLY OF TWO BRIDGES OVER CANEY CREEK, 49.3 FEET SOUTH AND ABOUT 2.0 FEET ABOVE THE CENTER OF THE HIGHWAY, 10.3 FEET EAST OF A FENCE CORNER POST, 1.8 FEET WEST OF A WITNESS POST, 1.0 FOOT NORTH OF A BARB WIRE FENCE AND SET IN THE TOP OF A CONCRETE POST WHICH PROJECTS 0.4 FOOT ABOVE GROUND.

SURFACE  
 NORTHING 10,622,461.126 (MEASURED)  
 EASTING 3,565,441.548 (MEASURED)  
 ELEV: 355.660 (PUBLISHED)

GRID  
 NORTHING 10,622,142.462 (CALCULATED)  
 EASTING 3,565,334.588 (CALCULATED)  
 ELEV: 355.660 (PUBLISHED)



*Mark E. Keeton* 4/12/2023  
 MARK E. KEETON DATE  
 RPLS NO. 6790

NO.	REVISIONS	BY	DATE
1	CITY NAME CHANGE	PR	04/12/2023



**SURVEY CONTROL**

SHEET 2 OF 2

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.	SHEET NO.	
		31	
STATE	DISTRICT	COUNTY	
TEXAS	17	FREESTONE	
CONTROL	SECTION	JOB	HIGHWAY NO.
0456	02	028	FM 27

045602AG

**APPROXIMATE LOCATION:**

A 3-1/2" ALUMINUM DISK SET IN CONCRETE STAMPED "045602AG" LOCATED ON FM 27, APPROXIMATELY 1.5 MILES EAST OF THE INTERSECTION AT FM 80 AND FM 27, APPROXIMATELY 15 FEET SOUTH OF THE SOUTH EDGE OF PAVEMENT, APPROXIMATELY 126 FEET WEST OF THE NORTHWEST CORNER OF A CONCRETE CULVERT HEADWALL, AND BEING APPROXIMATELY 92 FEET NORTHWEST OF POWER POLE.

US SURVEY FEET  
 TEXAS CENTRAL ZONE 4203  
 NORTH AMERICAN DATUM OF 1983 (NAD83)  
 GEOID 12A MODEL  
 DATE SET: JANUARY 14, 2021  
 TXDOT SURFACE ADJUSTMENT FACTOR: 1.000030000

GRID NORTHING: 10,624,499.905  
 GRID EASTING: 3,548,178.483  
 SURFACE NORTHING: 10,624,818.640  
 SURFACE EASTING: 3,548,284.928  
 NAVD88 ELEVATION: 424.382'

045602AH

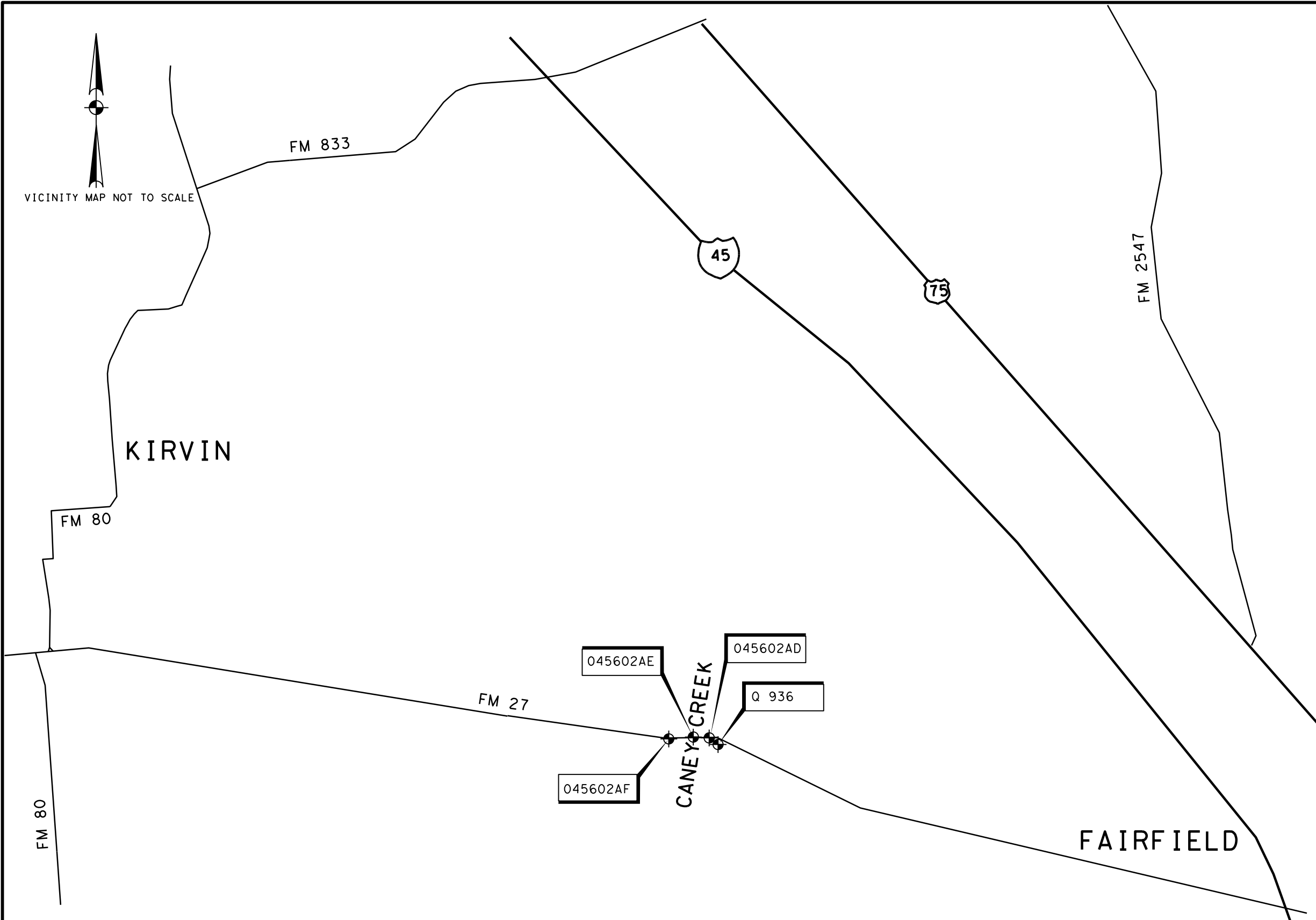
**APPROXIMATE LOCATION:**

A 3-1/2" ALUMINUM DISK SET IN CONCRETE STAMPED "045602AH" LOCATED ON FM 27, APPROXIMATELY 1.3 MILES EAST OF THE INTERSECTION AT FM 80 AND FM 27, APPROXIMATELY 24 FEET NORTH OF THE NORTH EDGE OF PAVEMENT, APPROXIMATELY 116 FEET NORTHEAST OF A TELEPHONE PEDESTAL, AND APPROXIMATELY 200 FEET NORTHWEST OF A BARBED WIRE FENCE CORNER POST.

US SURVEY FEET  
 TEXAS CENTRAL ZONE 4203  
 NORTH AMERICAN DATUM OF 1983 (NAD83)  
 GEOID 12A MODEL  
 DATE SET: JANUARY 14, 2021  
 TXDOT SURFACE ADJUSTMENT FACTOR: 1.000030000

GRID NORTHING: 10,624,760.464  
 GRID EASTING: 3,546,922.676  
 SURFACE NORTHING: 10,625,079.207  
 SURFACE EASTING: 3,547,029.084  
 NAVD88 ELEVATION: 399.372'

4/12/2023 12:13:06 PM RETANAP I:\SUR\WJXN001-Bryon Bridges P38E\700 CADD\713 Survey\713.4 Control Surveys\WJXN001 0456028-0456029-045602030 CONTROL.dgn



NOTES:  
 ALL COORDINATES ARE BASED ON THE TEXAS COORDINATE SYSTEM, TEXAS CENTRAL ZONE 4203, NAD83 (2011 ADJ) EPOCH 2010.00 GEOID 12A DETERMINED BY GPS OBSERVATIONS CALCULATED FROM TXDOT VRS NETWORK (CORS PIDs "TXMX D08873", "TXPI DN5858", "TXNA DF8992") ALL DISTANCES AND COORDINATES ARE SURFACE WITH A GRID TO GROUND SCALE FACTOR OF 1.000030000

PROJECT BENCHMARK: USCGS Q 936 (BZ0052)

A STANDARD DISK STAMPED "Q 936 1948" IN THE TOWN OF KIRVIN, SET IN A CONCRETE MONUMENT, 5.1 MILES WEST ALONG FARM HIGHWAY NO. 27 FROM THE JUNCTION WITH U.S. HIGHWAY NO. 84 AT FAIRFIELD, 0.1 MILE EAST OF THE MOST EASTERLY OF TWO BRIDGES OVER CANEY CREEK, 49.3 FEET SOUTH AND ABOUT 2.0 FEET ABOVE THE CENTER OF THE HIGHWAY, 10.3 FEET EAST OF A FENCE CORNER POST, 1.8 FEET WEST OF A WITNESS POST, 1.0 FOOT NORTH OF A BARB WIRE FENCE AND SET IN THE TOP OF A CONCRETE POST WHICH PROJECTS 0.4 FOOT ABOVE GROUND.

SURFACE  
 NORTHING 10,622,461.126 (MEASURED)  
 EASTING 3,565,441.548 (MEASURED)  
 ELEV: 355.660 (PUBLISHED)

GRID  
 NORTHING 10,622,142.462 (CALCULATED)  
 EASTING 3,565,334.588 (CALCULATED)  
 ELEV: 355.660 (PUBLISHED)



*Mark E. Keeton* 4/12/2023  
 MARK E. KEETON DATE  
 PLS NO. 6790

NO.	REVISIONS	BY	DATE
1	CITY NAME CHANGE	PR	04/12/2023



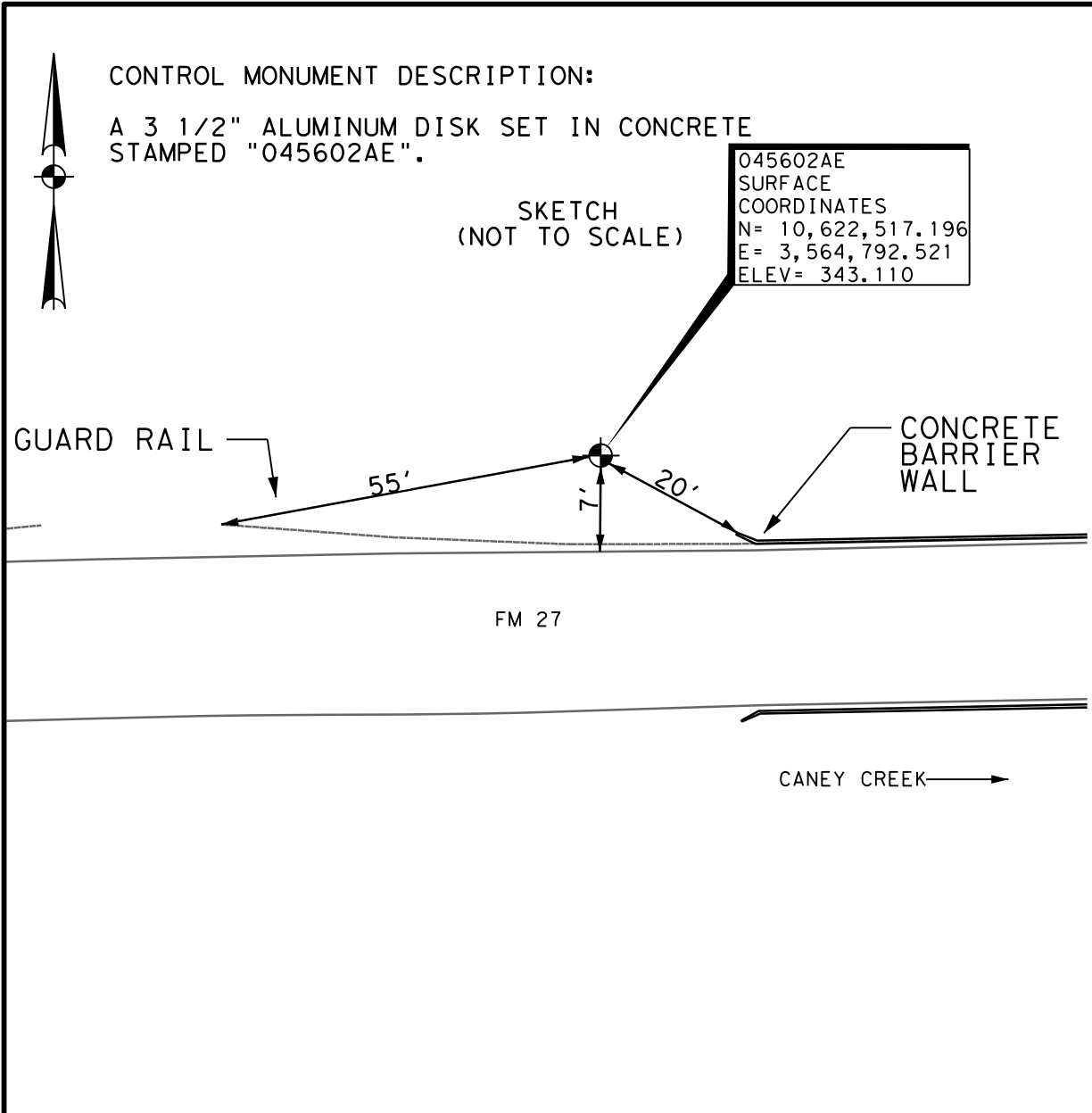
**SURVEY CONTROL**

Point ID	Latitude (Global)	Longitude (Global)	Northing (Grid)	Easting (Grid)	Northing (Surface)	Easting (Surface)	Elevation	Ellipsoid Height (Global)	Feature Code
045602AD	31d44'46.69519"	-96d15'03.76024"	10,622,166.069	3,565,303.618	10,622,484.734	3,565,410.577	353.548'	270.319'	3-1/2 INCH ALUM DISK STAMPED TEXAS DEPT OF TRANSPORTATION
045602AE	31d44'47.24057"	-96d15'10.89909"	10,622,198.530	3,564,685.580	10,622,517.196	3,564,792.521	343.110'	259.890'	3-1/2 INCH ALUM DISK STAMPED TEXAS DEPT OF TRANSPORTATION
045602AF	31d44'46.87054"	-96d15'21.96783"	10,622,126.128	3,563,731.820	10,622,444.792	3,563,838.732	350.128'	266.923'	3-1/2 INCH ALUM DISK STAMPED TEXAS DEPT OF TRANSPORTATION

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.	SHEET NO.	
		32	
STATE	DISTRICT	COUNTY	
TEXAS	17	FREESTONE	
CONTROL	SECTION	JOB	HIGHWAY NO.
0456	02	029/030	FM 27



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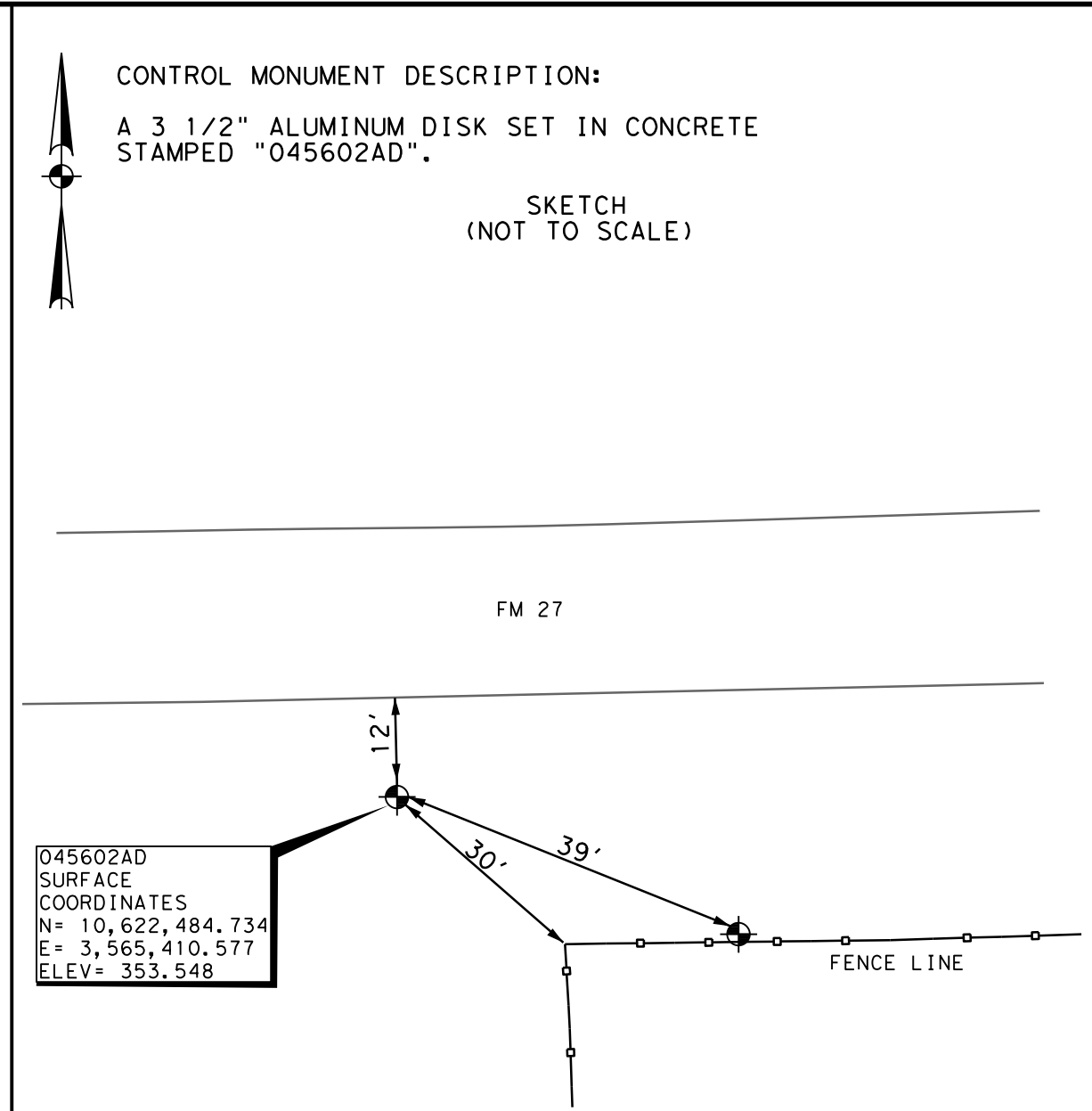
045602AE

**APPROXIMATE LOCATION:**

A 3-1/2" ALUMINUM DISK SET IN CONCRETE STAMPED "045602AE" LOCATED ON FM 27, APPROXIMATELY 4.7 MILES EAST OF THE INTERSECTION AT FM 80 AND FM 27, APPROXIMATELY 7 FEET NORTH OF THE NORTH EDGE OF PAVEMENT, APPROXIMATELY 55 FEET EAST OF THE END OF A METAL GUARD RAIL FENCE, AND APPROXIMATELY 20 FEET NORTHWEST OF THE CORNER OF THE WEST END OF A CONCRETE BARRIER WALL THAT RUNS ALONG THE NORTH SIDE OF THE BRIDGE OVER CANEY CREEK.

US SURVEY FEET  
TEXAS CENTRAL ZONE 4203  
NORTH AMERICAN DATUM OF 1983 (NAD83)  
GEOID 12A MODEL  
DATE SET: JANUARY 14, 2021  
TXDOT SURFACE ADJUSTMENT FACTOR: 1.000030000

GRID NORTHING:	10,622,198.530
GRID EASTING:	3,564,685.580
SURFACE NORTHING:	10,622,517.196
SURFACE EASTING:	3,564,792.521
NAVD88 ELEVATION:	343.110'



045602AD

**APPROXIMATE LOCATION:**

A 3-1/2" ALUMINUM DISK SET IN CONCRETE STAMPED "045602AD" LOCATED ON FM 27, APPROXIMATELY 4.8 MILES EAST OF THE INTERSECTION AT FM 80 AND FM 27, APPROXIMATELY 12 FEET SOUTH OF THE SOUTH EDGE OF PAVEMENT, APPROXIMATELY 30 FEET NORTHWEST OF A 3" METAL CORNER FENCE POST AND 39 FEET NORTHWEST OF NGS MONUMENT STAMPED "Q 936 1948"

US SURVEY FEET  
TEXAS CENTRAL ZONE 4203  
NORTH AMERICAN DATUM OF 1983 (NAD83)  
GEOID 12A MODEL  
DATE SET: JANUARY 14, 2021  
TXDOT SURFACE ADJUSTMENT FACTOR: 1.000030000

GRID NORTHING:	10,622,166.069
GRID EASTING:	3,565,303.618
SURFACE NORTHING:	10,622,484.734
SURFACE EASTING:	3,565,410.577
NAVD88 ELEVATION:	353.548'

**NOTES:**

ALL COORDINATES ARE BASED ON THE TEXAS COORDINATE SYSTEM, TEXAS CENTRAL ZONE 4203, NAD83 (2011 ADJ) EPOCH 2010.00 GEOID 12A DETERMINED BY GPS OBSERVATIONS CALCULATED FROM TXDOT VRS NETWORK (CORS PIDS "TXMX D08873", "TXPI DN5858", "TXNA DF8992") ALL DISTANCES AND COORDINATES ARE SURFACE WITH A GRID TO GROUND SCALE FACTOR OF 1.000030000

PROJECT BENCHMARK: USCGS Q 936 (BZ0052)

A STANDARD DISK STAMPED "Q 936 1948" IN THE TOWN OF KIRVIN, SET IN A CONCRETE MONUMENT, 5.1 MILES WEST ALONG FARM HIGHWAY NO. 27 FROM THE JUNCTION WITH U.S. HIGHWAY NO. 84 AT FAIRFIELD, 0.1 MILE EAST OF THE MOST EASTERLY OF TWO BRIDGES OVER CANEY CREEK, 49.3 FEET SOUTH AND ABOUT 2.0 FEET ABOVE THE CENTER OF THE HIGHWAY, 10.3 FEET EAST OF A FENCE CORNER POST, 1.8 FEET WEST OF A WITNESS POST, 1.0 FOOT NORTH OF A BARB WIRE FENCE AND SET IN THE TOP OF A CONCRETE POST WHICH PROJECTS 0.4 FOOT ABOVE GROUND.

SURFACE	
NORTHING	10,622,461.126 (MEASURED)
EASTING	3,565,441.548 (MEASURED)
ELEV:	355.660 (PUBLISHED)

GRID	
NORTHING	10,622,142.462 (CALCULATED)
EASTING	3,565,334.588 (CALCULATED)
ELEV:	355.660 (PUBLISHED)

*Mark E. Keeton* 4/12/2023  
MARK E. KEETON DATE  
PLS NO. 6790

NO.	REVISIONS	BY	DATE
1	CITY NAME CHANGE	PR	04/12/2023

© 2021  
Texas Department of Transportation

**SURVEY CONTROL**

SHEET 2 OF 3

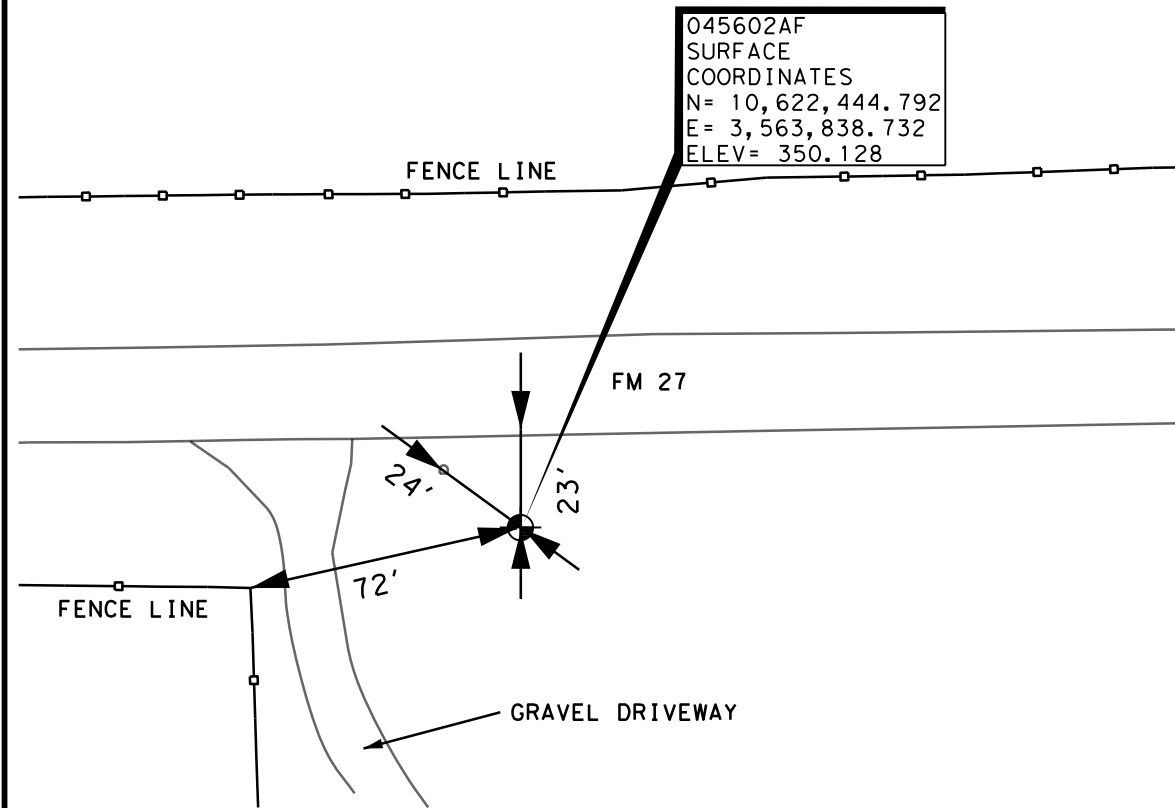
FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.	SHEET NO.	
		33	
STATE	DISTRICT	COUNTY	
TEXAS	17	FREESTONE	
CONTROL	SECTION	JOB	HIGHWAY NO.
0456	02	029/030	FM 27



**CONTROL MONUMENT DESCRIPTION:**

A 3 1/2" ALUMINUM DISK SET IN CONCRETE STAMPED "045602AF".

SKETCH  
(NOT TO SCALE)



045602AF

**APPROXIMATE LOCATION:**

A 3-1/2" ALUMINUM DISK SET IN CONCRETE STAMPED "045602AF" LOCATED ON FM 27, APPROXIMATELY 4.5 MILES EAST OF THE INTERSECTION AT FM 80 AND FM 27, APPROXIMATELY 23 FEET SOUTH OF THE SOUTH EDGE OF PAVEMENT, APPROXIMATELY 72 FEET EAST OF A 3" METAL FENCE CORNER POST, AND APPROXIMATELY 24 FEET SOUTHEAST OF A MAILBOX LOCATED ON THE EAST SIDE OF A 15' GRAVEL DRIVEWAY.

US SURVEY FEET  
TEXAS CENTRAL ZONE 4203  
NORTH AMERICAN DATUM OF 1983 (NAD83)  
GEOID 12A MODEL  
DATE SET: JANUARY 14, 2021  
TXDOT SURFACE ADJUSTMENT FACTOR: 1.000030000

GRID NORTHING: 10,622,126.128  
GRID EASTING: 3,563,731.820  
SURFACE NORTHING: 10,622,444.792  
SURFACE EASTING: 3,563,838.732  
NAVD88 ELEVATION: 350.128'

**NOTES:**

ALL COORDINATES ARE BASED ON THE TEXAS COORDINATE SYSTEM, TEXAS CENTRAL ZONE 4203, NAD83 (2011 ADJ) EPOCH 2010.00 GEOID 12A DETERMINED BY GPS OBSERVATIONS CALCULATED FROM TXDOT VRS NETWORK (CORS PIDS "TXMX D08873", "TXPI DN5858", "TXNA DF8992") ALL DISTANCES AND COORDINATES ARE SURFACE WITH A GRID TO GROUND SCALE FACTOR OF 1.000030000

PROJECT BENCHMARK: USCGS Q 936 (BZ0052)

A STANDARD DISK STAMPED "Q 936 1948" IN THE TOWN OF KIRVIN, SET IN A CONCRETE MONUMENT, 5.1 MILES WEST ALONG FARM HIGHWAY NO. 27 FROM THE JUNCTION WITH U.S. HIGHWAY NO. 84 AT FAIRFIELD, 0.1 MILE EAST OF THE MOST EASTERLY OF TWO BRIDGES OVER CANEY CREEK, 49.3 FEET SOUTH AND ABOUT 2.0 FEET ABOVE THE CENTER OF THE HIGHWAY, 10.3 FEET EAST OF A FENCE CORNER POST, 1.8 FEET WEST OF A WITNESS POST, 1.0 FOOT NORTH OF A BARB WIRE FENCE AND SET IN THE TOP OF A CONCRETE POST WHICH PROJECTS 0.4 FOOT ABOVE GROUND.

SURFACE  
NORTHING 10,622,461.126 (MEASURED)  
EASTING 3,565,441.548 (MEASURED)  
ELEV: 355.660 (PUBLISHED)

GRID  
NORTHING 10,622,142.462 (CALCULATED)  
EASTING 3,565,334.588 (CALCULATED)  
ELEV: 355.660 (PUBLISHED)



*Mark E. Keeton* 4/12/2023  
MARK E. KEETON DATE  
PLS NO. 6790

NO.	REVISIONS	BY	DATE
1	CITY NAME CHANGE	PR	04/12/2023



**SURVEY CONTROL**

SHEET 3 OF 3

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.	SHEET NO.	
		34	
STATE	DISTRICT	COUNTY	HIGHWAY NO.
TEXAS	17	FREESTONE	
CONTROL	SECTION	JOB	
0456	02	029/030	FM 27

4/12/2023 12:10:52 PM RETANAP I:\SUR\MJKM001-Bryon Bridges P88E\700 CADD\713 Survey\713.4 Control Surveys\MJKM001 0456028-0456029-045602030 CONTROL.dgn



Beginning chain FM27 description  
 Feature: Geom\_Centerline

Point FM271 X 3,546,244.4054 Y 10,625,165.9458 Sta 1490+00.00

Course from FM271 to FM273 S 81° 08' 02.1242" E Dist 15,100.1351

Point FM273 X 3,561,164.1135 Y 10,622,838.6312 Sta 1641+00.14

Course from FM273 to PC FM27\_5 S 81° 09' 53.3207" E Dist 2,125.4308

Curve Data  
 \*-----\*

Curve FM27\_5

P.I. Station 1664+74.04 X 3,563,509.8534 Y 10,622,474.0162  
 Delta = 9° 54' 51.2813" (LT)  
 Degree = 1° 59' 59.9723"  
 Tangent = 248.4774  
 Length = 495.7141  
 Radius = 2,864.8000  
 External = 10.7556  
 Long Chord = 495.0959  
 Mid. Ord. = 10.7154  
 P.C. Station 1662+25.57 X 3,563,264.3244 Y 10,622,512.1805  
 P.T. Station 1667+21.28 X 3,563,758.2867 Y 10,622,478.6955  
 C.C. X 3,563,704.3369 Y 10,625,342.9875  
 Back = S 81° 09' 53.3207" E  
 Ahead = N 88° 55' 15.3980" E  
 Chord Bear = S 86° 07' 18.9613" E

Course from PT FM27\_5 to PC FM27\_8 N 88° 55' 15.3981" E Dist 1,883.1487

Curve Data  
 \*-----\*

Curve FM27\_8

P.I. Station 1689+44.12 X 3,565,980.7324 Y 10,622,520.5560  
 Delta = 26° 40' 56.1982" (RT)  
 Degree = 3° 59' 59.9446"  
 Tangent = 339.6911  
 Length = 667.0595  
 Radius = 1,432.4000  
 External = 39.7277  
 Long Chord = 661.0481  
 Mid. Ord. = 38.6555  
 P.C. Station 1686+04.43 X 3,565,641.1015 Y 10,622,514.1589  
 P.T. Station 1692+71.49 X 3,566,287.0686 Y 10,622,373.7630  
 C.C. X 3,565,668.0764 Y 10,621,082.0129  
 Back = N 88° 55' 15.3980" E  
 Ahead = S 64° 23' 48.4038" E  
 Chord Bear = S 77° 44' 16.5029" E

Course from PT FM27\_8 to FM2710 S 64° 23' 48.4038" E Dist 5,217.5978

Point FM2710 X 3,570,992.3413 Y 10,620,119.0488 Sta 1744+89.09

Ending chain FM27 description

Beginning chain FM27\_DWY description  
 Feature: Geom\_Centerline

Point 35 X 3,564,083.03 Y 10,622,532.26 Sta 10+00.00

Course from 35 to 36 S 1° 04' 44.60" E Dist 47.23

Point 36 X 3,564,083.92 Y 10,622,485.04 Sta 10+47.23

Course from 36 to 37 S 1° 04' 44.64" E Dist 0.21

Point 37 X 3,564,083.92 Y 10,622,484.83 Sta 10+47.44

Ending chain FM27\_DWY description

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*J. Alchevsky*

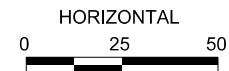
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4/26/2023	

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 AUSTIN TX 78746  
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

**HORIZONTAL ALIGNMENT DATA**

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER	
6	BR 2023(408),ETC.	FM 27	
STATE	DISTRICT	COUNTY	
TEXAS	BRY	FREESTONE	
CONTROL	SECTION	JOB	SHEET NO.
0456	02	028,ETC	35



NOTES:  
 1. CONTRACTOR SHALL BE RESPONSIBLE FOR LOCATING ALL EXISTING UTILITIES IN THE FIELD PRIOR TO BEGINNING ANY TYPE OF WORK.

LEGEND

-  REMOVE TRT BASE & ASPH PAV (12"-20")
-  REMOVE TRT BASE & ASPH PAV (6")
-  REMOVE DRIVEWAYS



*J. Alchevsky*

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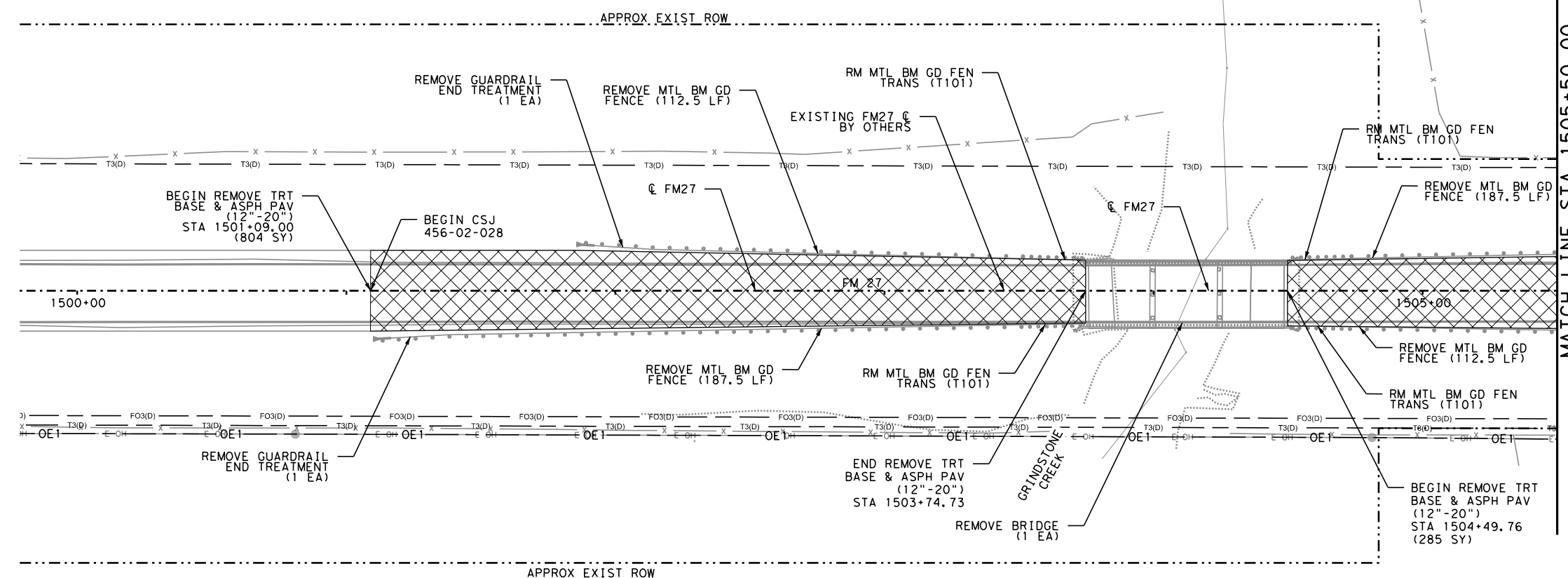
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REMOVAL LAYOUT

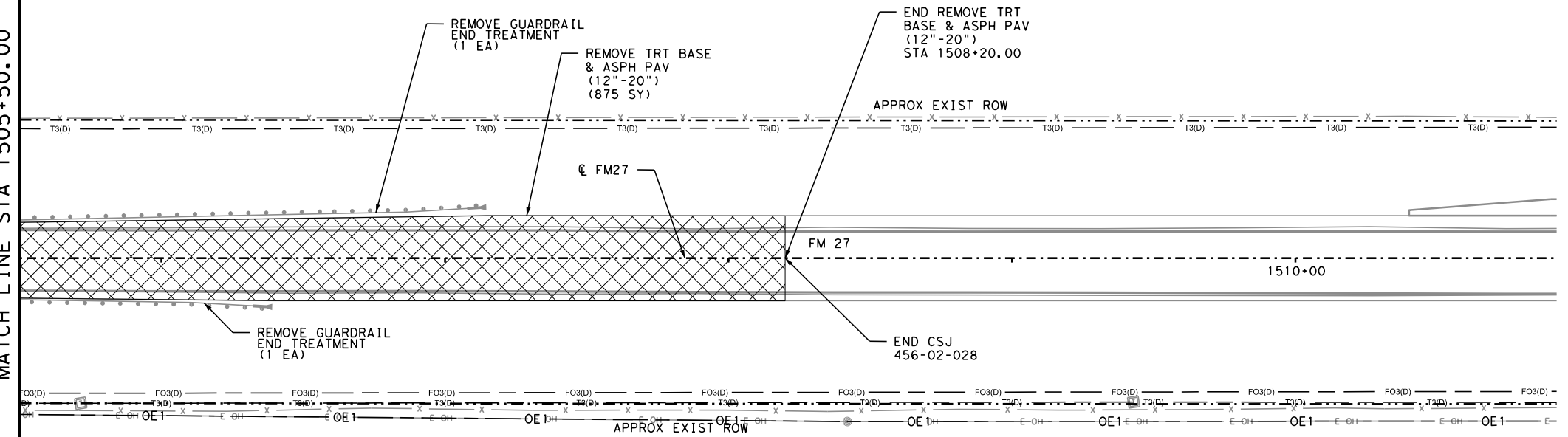
SHEET 1 OF 3 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER	
6	BR 2023(408),ETC.	FM 27	
STATE	DISTRICT	COUNTY	
TEXAS	BRY	FREESTONE	
CONTROL	SECTION	JOB	SHEET NO.
0456	02	028,ETC	36

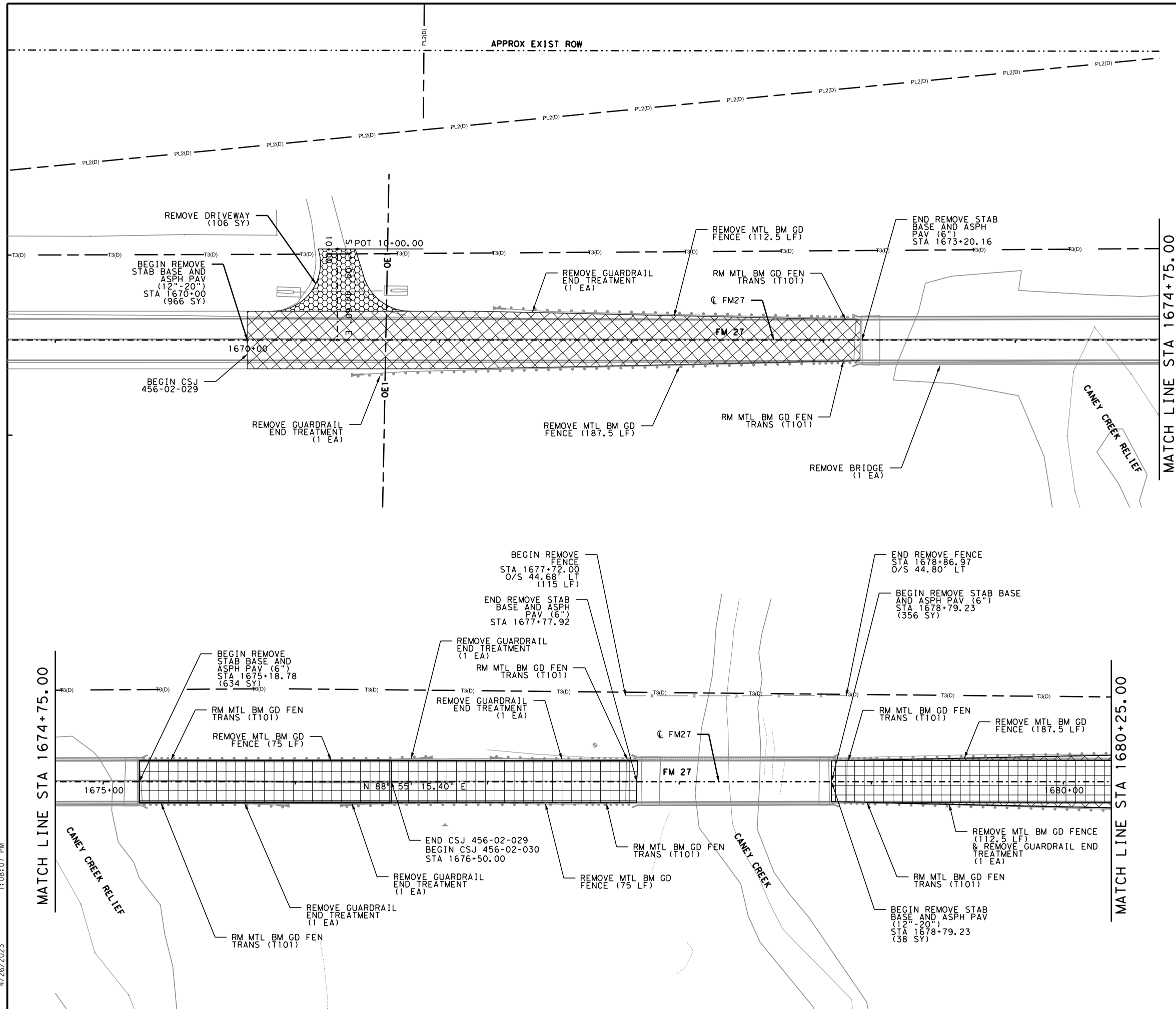
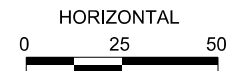


MATCH LINE STA 1505+50.00

MATCH LINE STA 1505+50.00



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NOTES:  
 1. CONTRACTOR SHALL BE RESPONSIBLE FOR LOCATING ALL EXISTING UTILITIES IN THE FIELD PRIOR TO BEGINNING ANY TYPE OF WORK.

LEGEND

- REMOVE TRT BASE & ASPH PAV (12"-20")
- REMOVE TRT BASE & ASPH PAV (6")
- REMOVE DRIVEWAYS



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 4/26/2023

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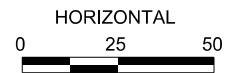
REMOVAL LAYOUT

SHEET 2 OF 3 SHEETS

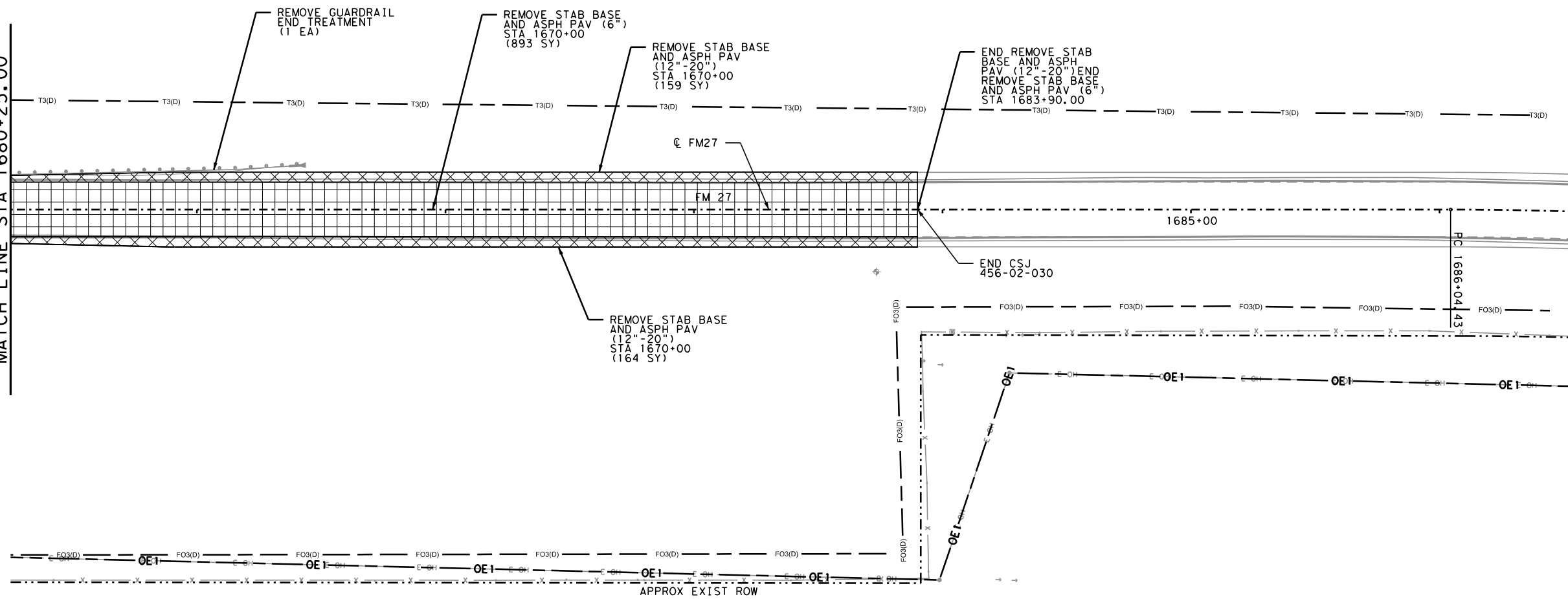
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6	BR 2023(408),ETC.	FM 27	
STATE	DISTRICT	COUNTY	
TEXAS	BRY	FREESTONE	
CONTROL	SECTION	JOB	SHEET NO.
0456	02	028,ETC	37

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APPROX EXIST ROW






MATCH LINE STA 1680+25.00



NOTES:  
1. CONTRACTOR SHALL BE RESPONSIBLE FOR LOCATING ALL EXISTING UTILITIES IN THE FIELD PRIOR TO BEGINNING ANY TYPE OF WORK.

LEGEND

-  REMOVE TRT BASE & ASPH PAV (12"-20")
-  REMOVE TRT BASE & ASPH PAV (6")
-  REMOVE DRIVEWAYS



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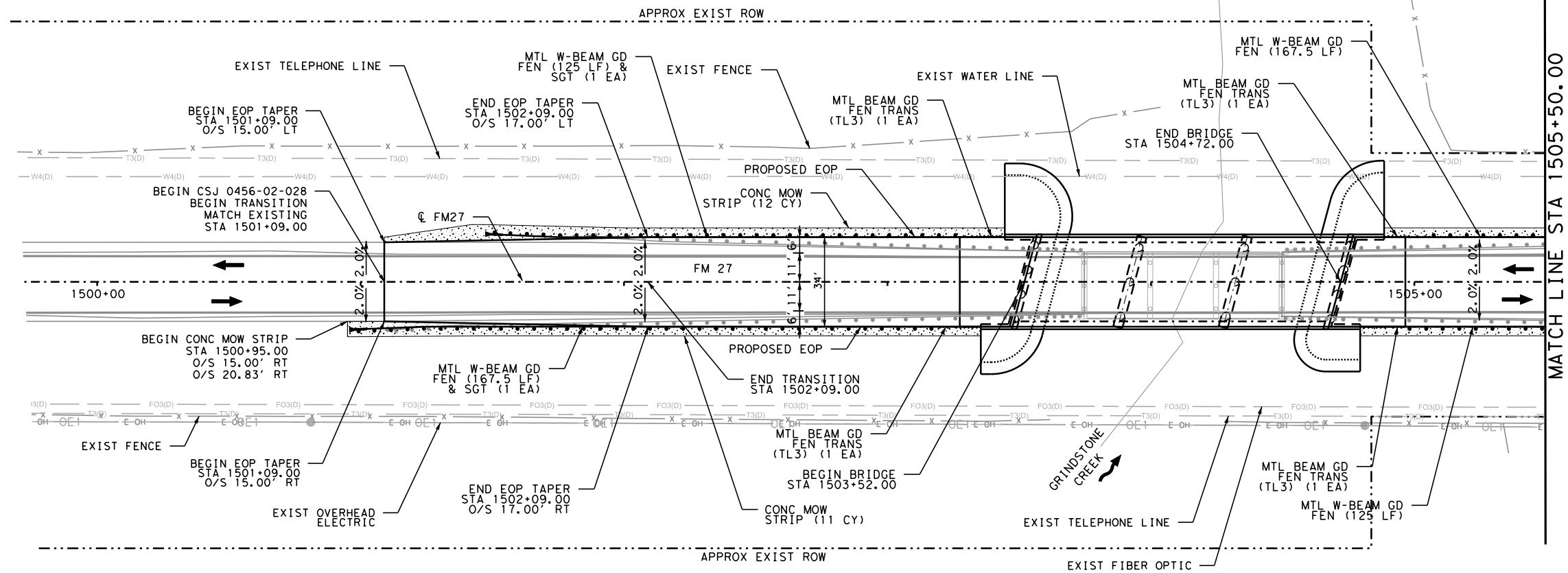
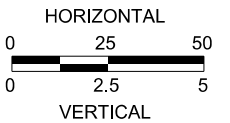


REMOVAL LAYOUT

SHEET 3 OF 3 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER	
6	BR 2023(408),ETC.	FM 27	
STATE	DISTRICT	COUNTY	
TEXAS	BRY	FREESTONE	
CONTROL	SECTION	JOB	SHEET NO.
0456	02	028,ETC	38

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4/26/2023 1:08:19 PM



- NOTES:
1. CONTRACTOR SHALL BE RESPONSIBLE FOR LOCATING ALL EXISTING UTILITIES IN THE FIELD PRIOR TO BEGINNING ANY TYPE OF WORK.
  2. SEE REMOVAL LAYOUTS, HORIZONTAL DATA SHEETS, DRIVEWAY PLAN AND PROFILE SHEET, AND BRIDGE LAYOUTS FOR ADDITIONAL INFORMATION.
  3. ALL DIMENSIONS AND CALLOUTS REFERENCE CL FM27 UNLESS OTHERWISE SPECIFIED.

LEGEND

- DIRECTION OF TRAFFIC (EXISTING)
- DIRECTION OF TRAFFIC (PROPOSED)
- DIRECTION OF CREEK FLOW
- DITCH FLOW LINE
- CURVE ID



*J. Alchovsky*

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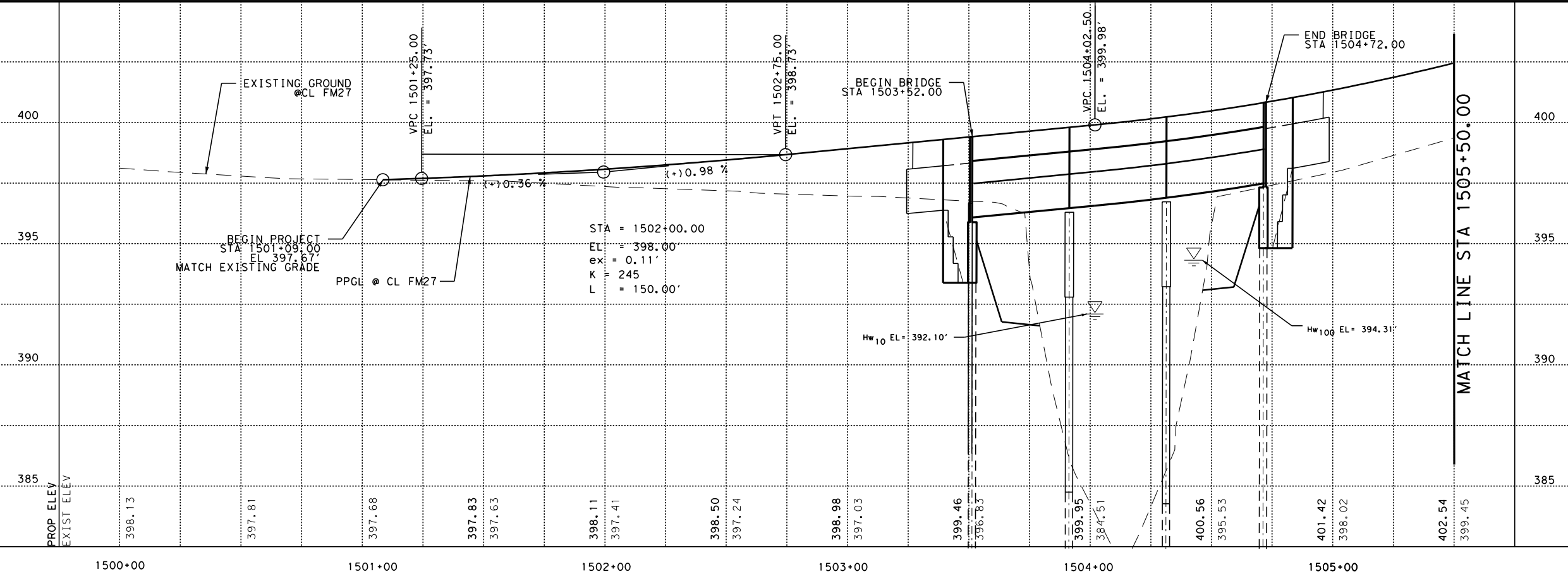
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PLAN AND PROFILE

SHEET 1 OF 5 SHEETS

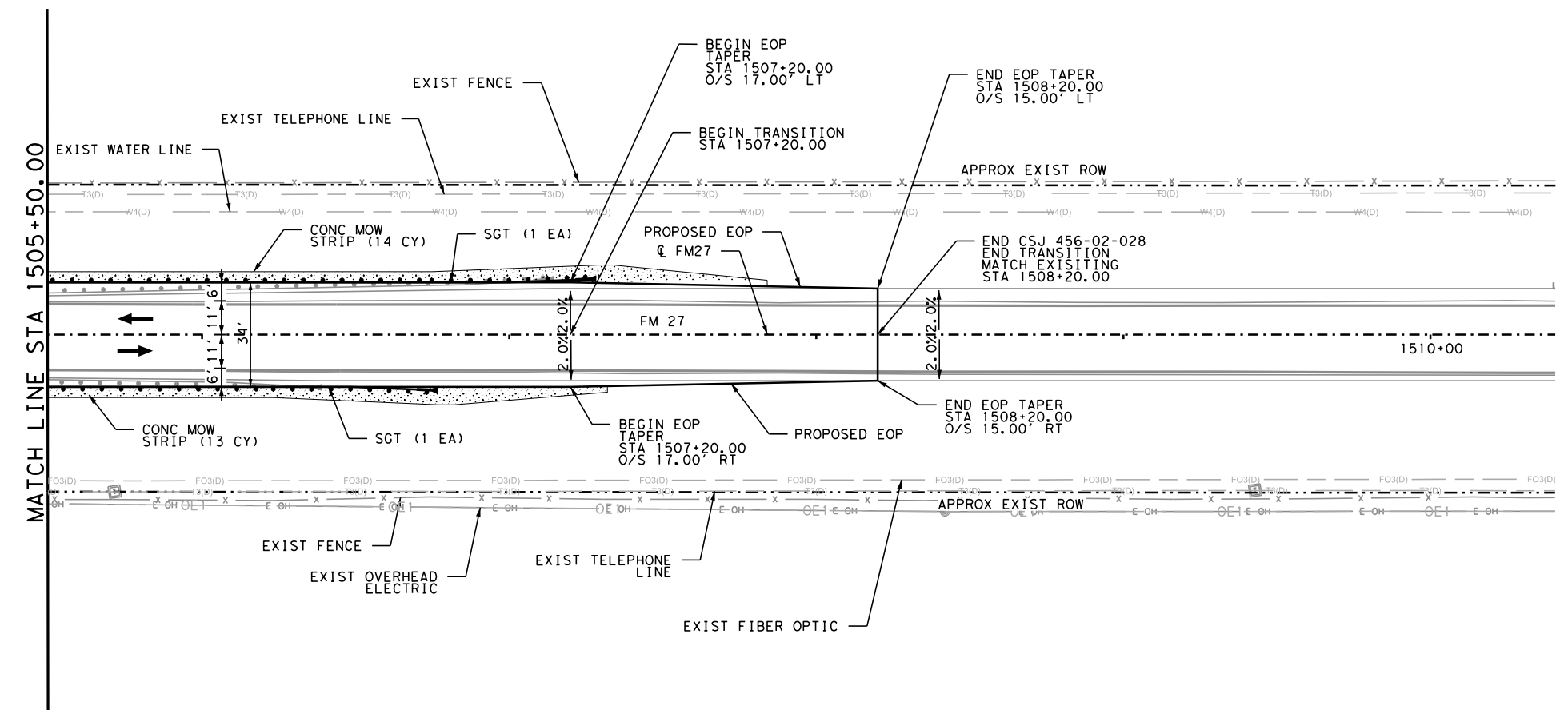
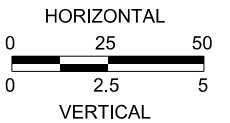
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6	BR 2023(408),ETC.	FM 27	
STATE	DISTRICT	COUNTY	
TEXAS	BRY	FREESTONE	
CONTROL	SECTION	JOB	SHEET NO.
0456	02	028,ETC	39

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1500+00      1501+00      1502+00      1503+00      1504+00      1505+00





- NOTES:
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  3. ALL DIMENSIONS AND CALLOUTS REFERENCE @ FM27 UNLESS OTHERWISE SPECIFIED.

LEGEND

- DIRECTION OF TRAFFIC (EXISTING)
- DIRECTION OF TRAFFIC (PROPOSED)
- DIRECTION OF CREEK FLOW
- DITCH FLOW LINE
- CURVE ID



*Jenna Alchovsky*

PRINT DATE	REVISION DATE
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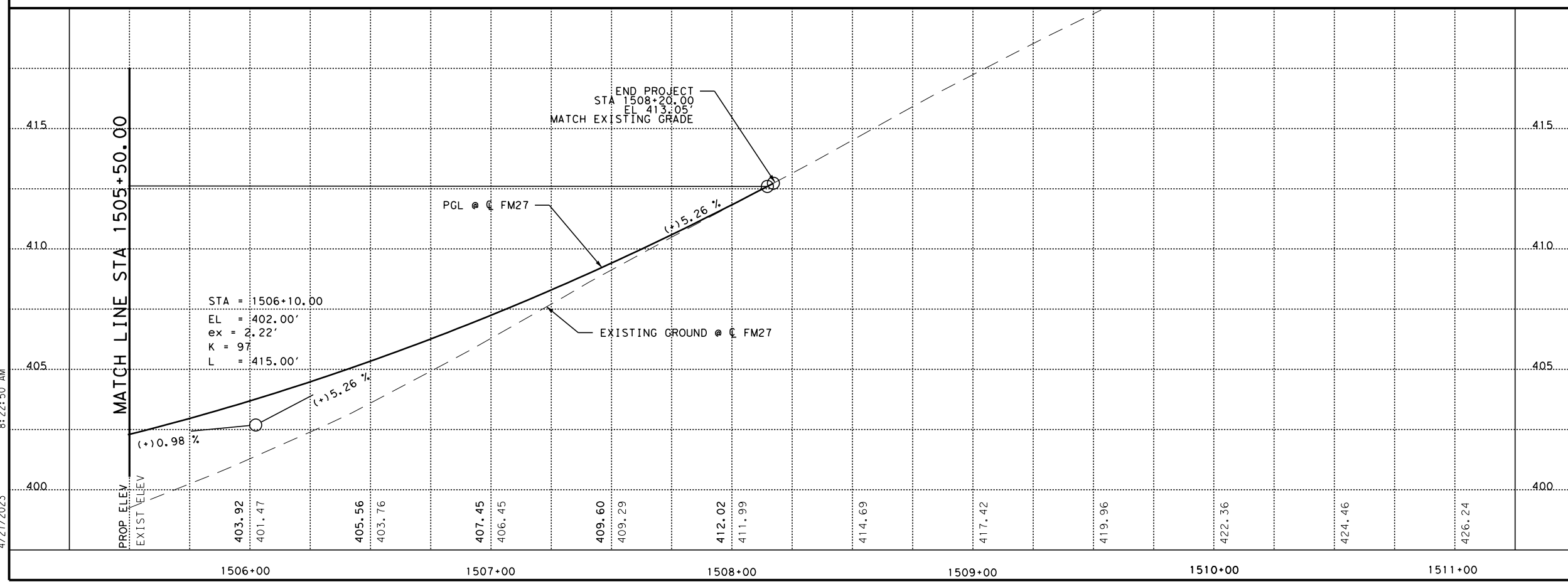
**Jacobs** 2705 BEE CAVE RD, SUITE 300  
AUSTIN TX 78746  
FIRM REGISTRATION F-2966



PLAN AND PROFILE

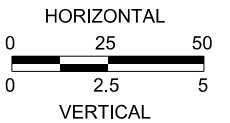
SHEET 2 OF 5 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER	
6	BR 2023(408),ETC.	FM 27	
STATE	DISTRICT	COUNTY	
TEXAS	BRY	FREESTONE	
CONTROL	SECTION	JOB	SHEET NO.
0456	02	028,ETC	40



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**NOTES:**

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3. ALL DIMENSIONS AND CALLOUTS REFERENCE  $\text{CL FM27}$  UNLESS OTHERWISE SPECIFIED.

**LEGEND**

- DIRECTION OF TRAFFIC (EXISTING)
- DIRECTION OF TRAFFIC (PROPOSED)
- DIRECTION OF CREEK FLOW
- DITCH FLOW LINE
- CURVE ID



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PRINT DATE	REVISION DATE
4/27/2023	

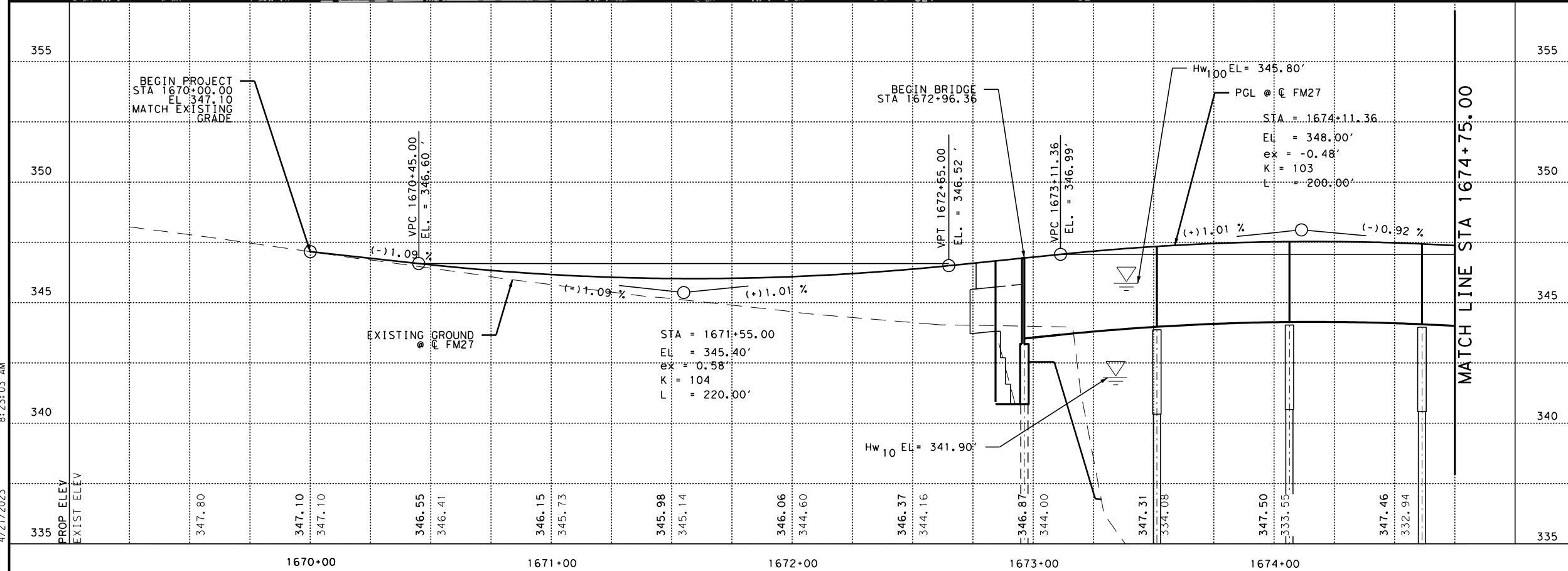
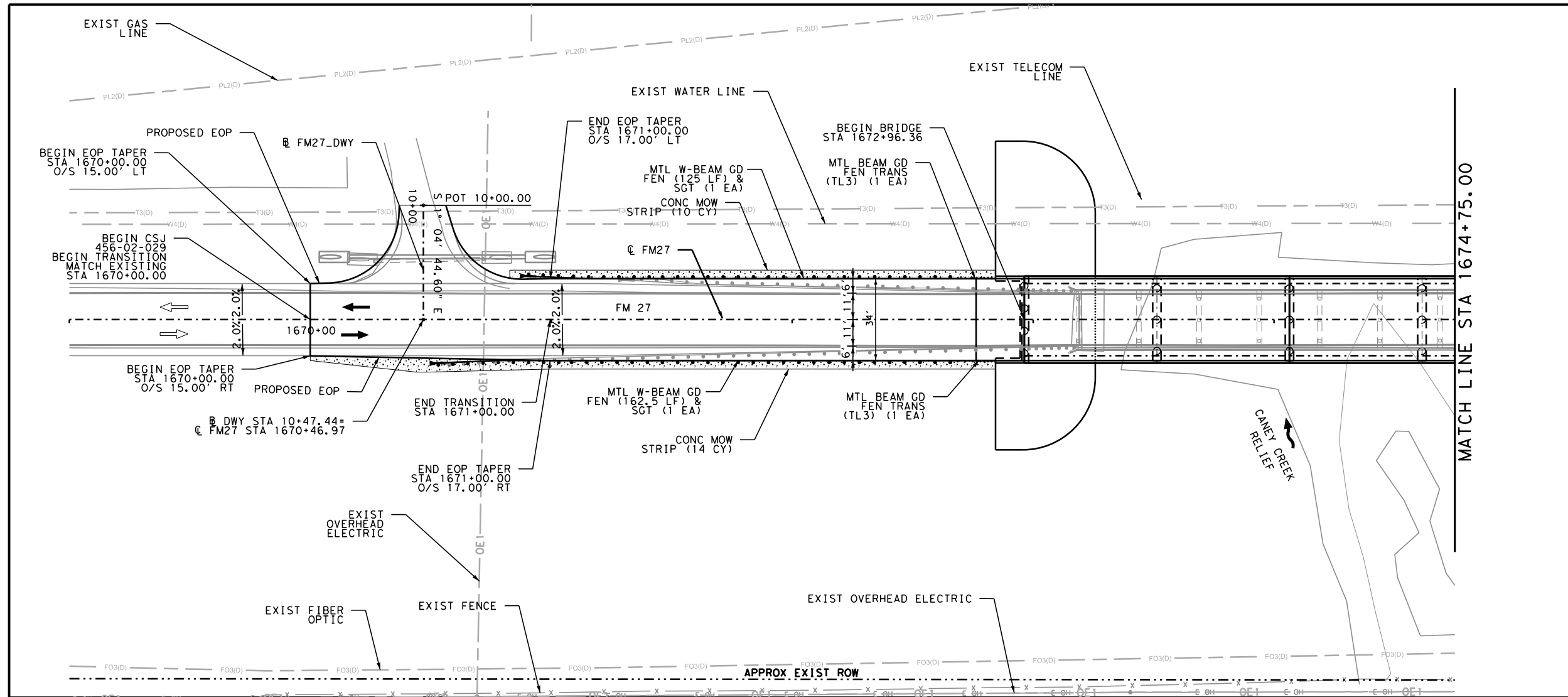
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**PLAN AND PROFILE**

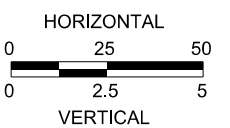
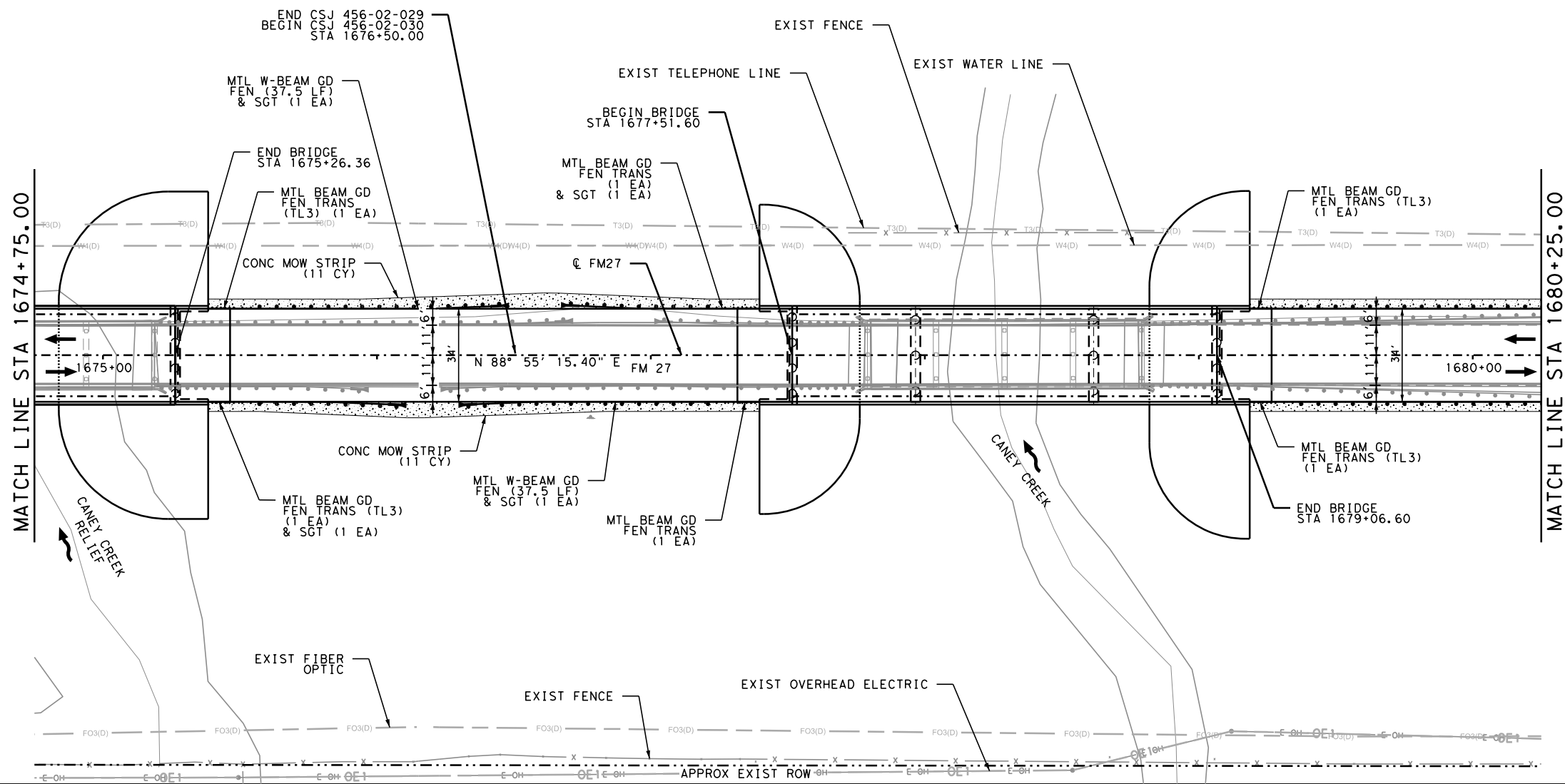
SHEET 3 OF 5 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER	
6	BR 2023(408),ETC.	FM 27	
STATE	DISTRICT	COUNTY	
TEXAS	BRY	FREESTONE	
CONTROL	SECTION	JOB	SHEET NO.
0456	02	028,ETC	41



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- NOTES:
1. CONTRACTOR SHALL BE RESPONSIBLE FOR LOCATING ALL EXISTING UTILITIES IN THE FIELD PRIOR TO BEGINNING ANY TYPE OF WORK.
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LEGEND

- DIRECTION OF TRAFFIC (EXISTING)
- DIRECTION OF TRAFFIC (PROPOSED)
- DIRECTION OF CREEK FLOW
- DITCH FLOW LINE
- CURVE ID



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4/27/2023	

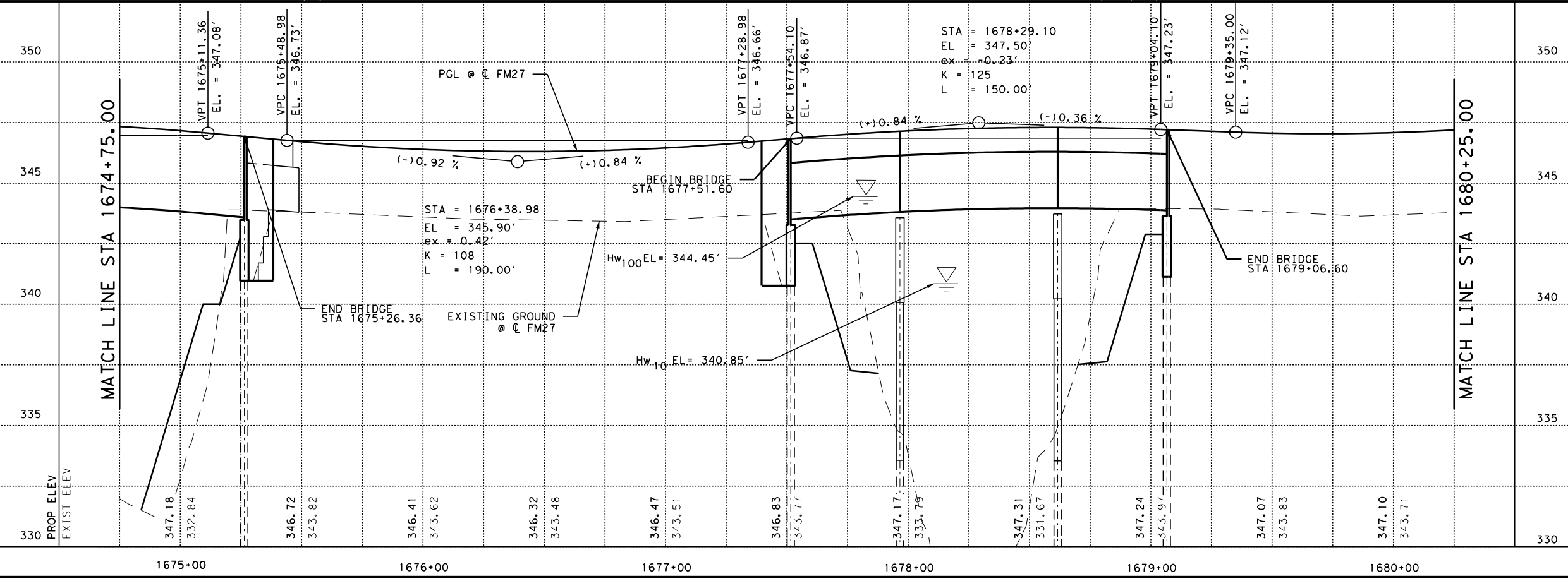
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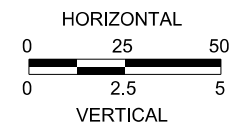
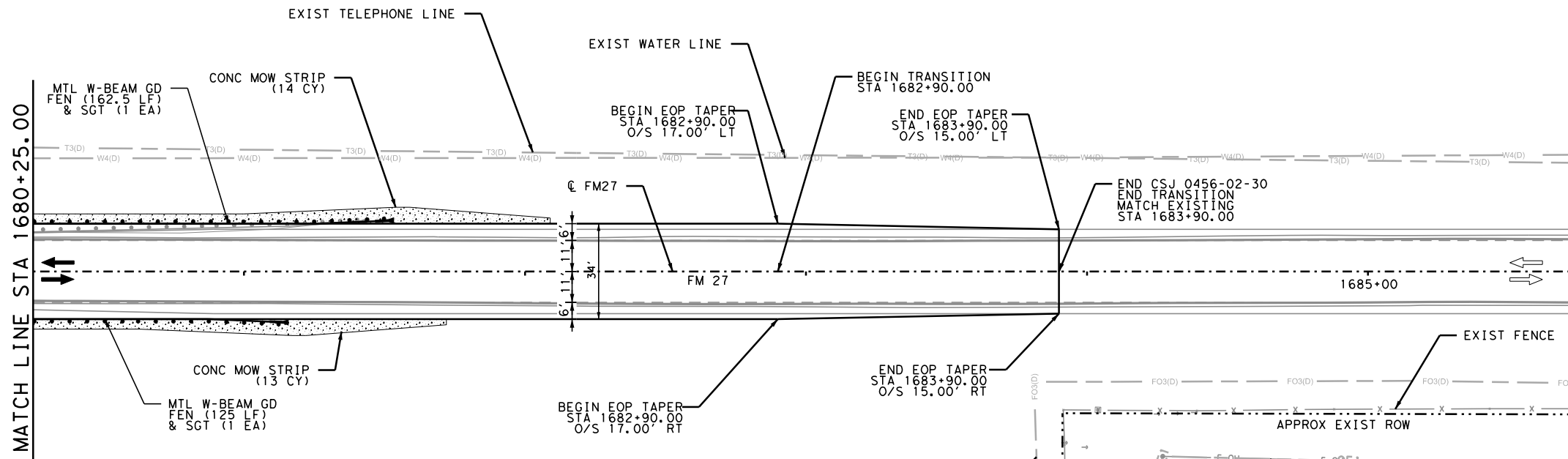
PLAN AND PROFILE

SHEET 4 OF 5 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER	
6	BR 2023(408),ETC.	FM 27	
STATE	DISTRICT	COUNTY	
TEXAS	BRY	FREESTONE	
CONTROL	SECTION	JOB	SHEET NO.
0456	02	028,ETC	42



APPROX EXIST ROW



NOTES:

1. CONTRACTOR SHALL BE RESPONSIBLE FOR LOCATING ALL EXISTING UTILITIES IN THE FIELD PRIOR TO BEGINNING ANY TYPE OF WORK.
2. SEE REMOVAL LAYOUTS, HORIZONTAL DATA SHEETS, DRIVEWAY PLAN AND PROFILE SHEET, AND BRIDGE LAYOUTS FOR ADDITIONAL INFORMATION.
3. ALL DIMENSIONS AND CALLOUTS REFERENCE C FM27 UNLESS OTHERWISE SPECIFIED.

LEGEND

- DIRECTION OF TRAFFIC (EXISTING)
- DIRECTION OF TRAFFIC (PROPOSED)
- DIRECTION OF CREEK FLOW
- DITCH FLOW LINE
- CURVE ID



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4/27/2023	

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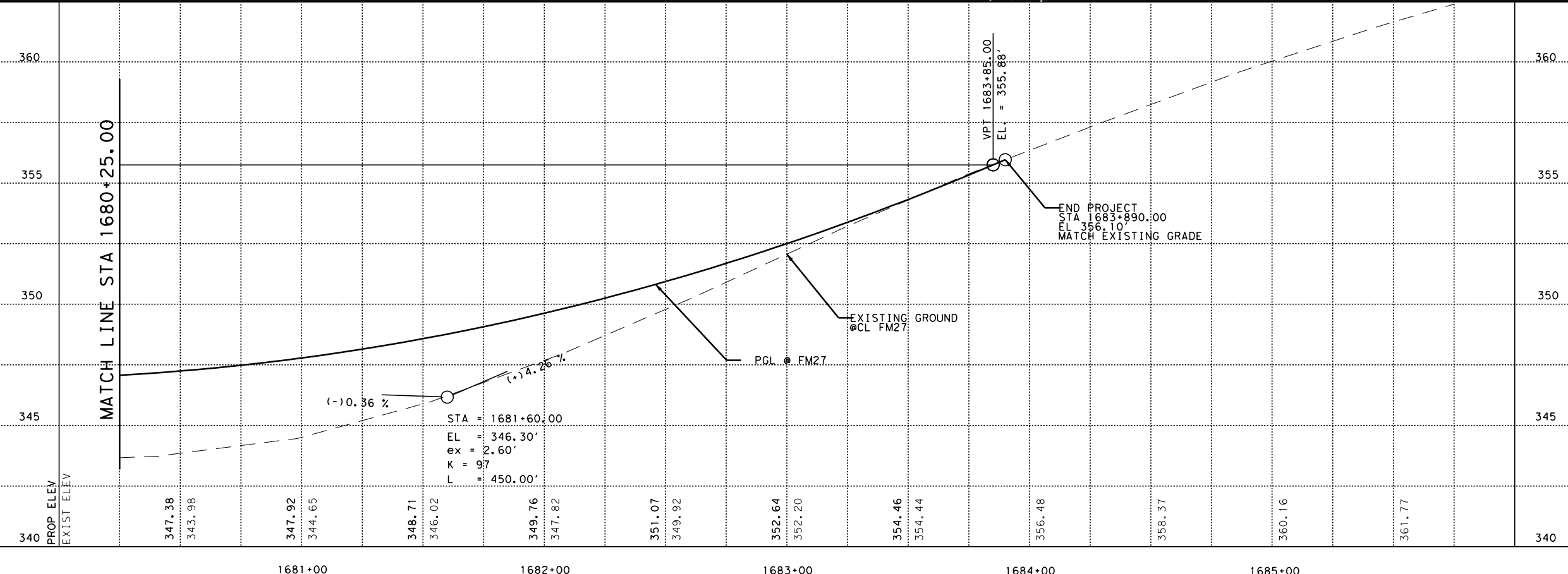
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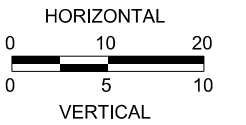
PLAN AND PROFILE

SHEET 5 OF 5 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER	
6	BR 2023(408),ETC.	FM 27	
STATE	DISTRICT	COUNTY	
TEXAS	BRY	FREESTONE	
CONTROL	SECTION	JOB	SHEET NO.
0456	02	028,ETC	43

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NOTES:

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3. ALL DIMENSIONS AND CALLOUTS REFERENCE **FM27\_DWY** UNLESS OTHERWISE SPECIFIED.

LEGEND

- DIRECTION OF TRAFFIC (EXISTING)
- DIRECTION OF TRAFFIC (PROPOSED)
- DIRECTION OF CREEK FLOW
- DITCH FLOW LINE
- CURVE ID



*Jenna Alchovsky*

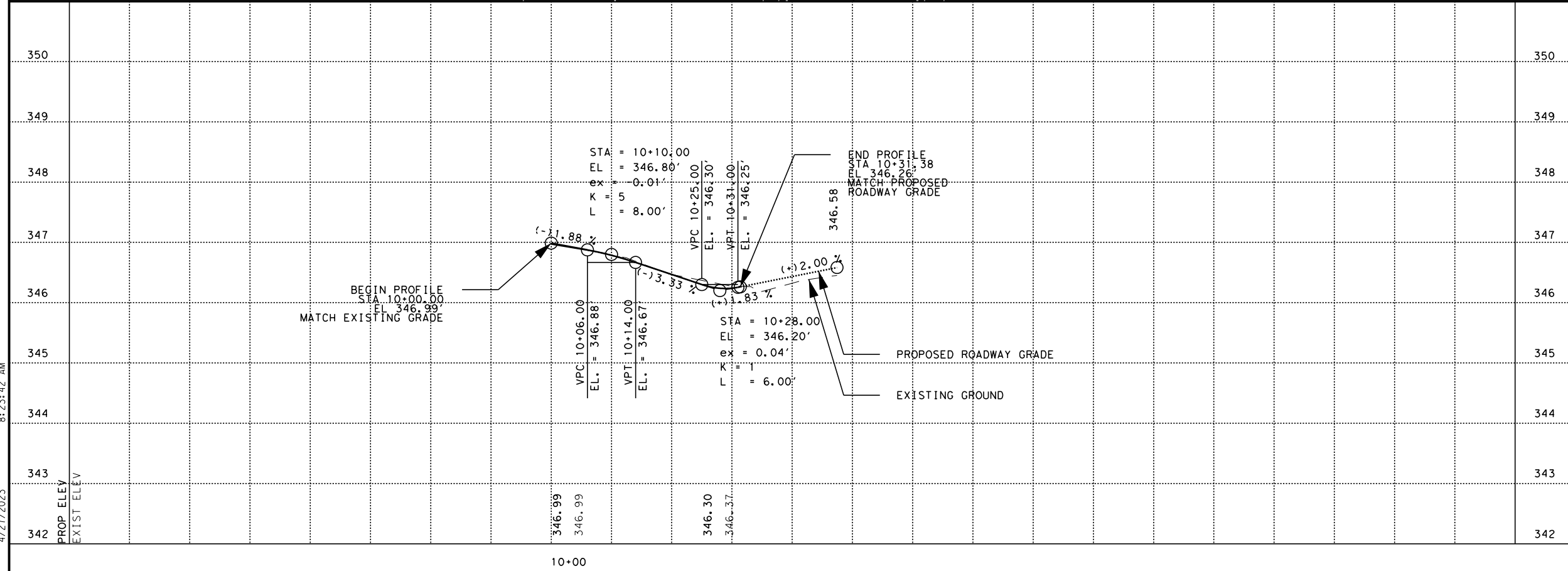
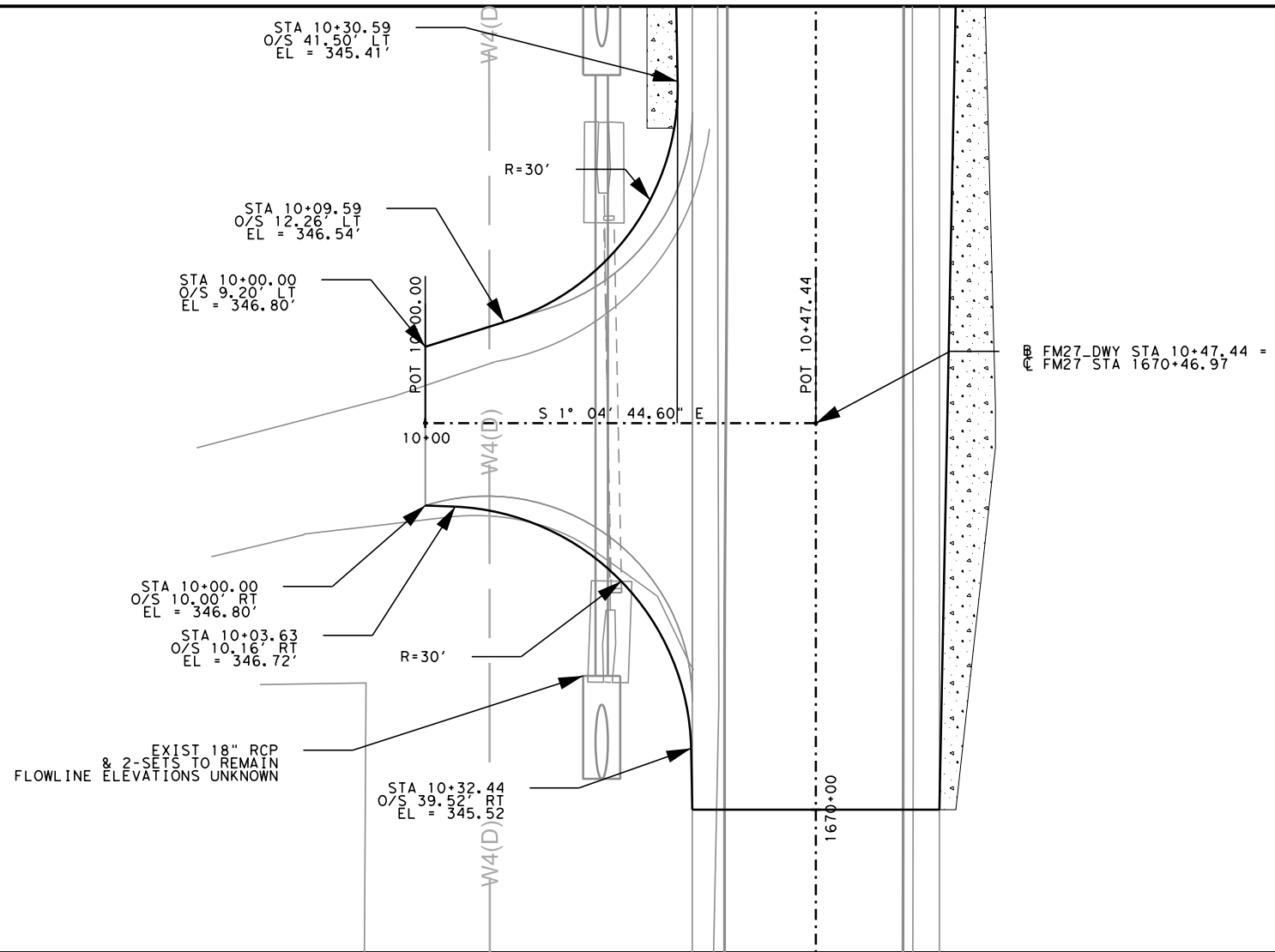
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DRIVEWAY PLAN AND PROFILE

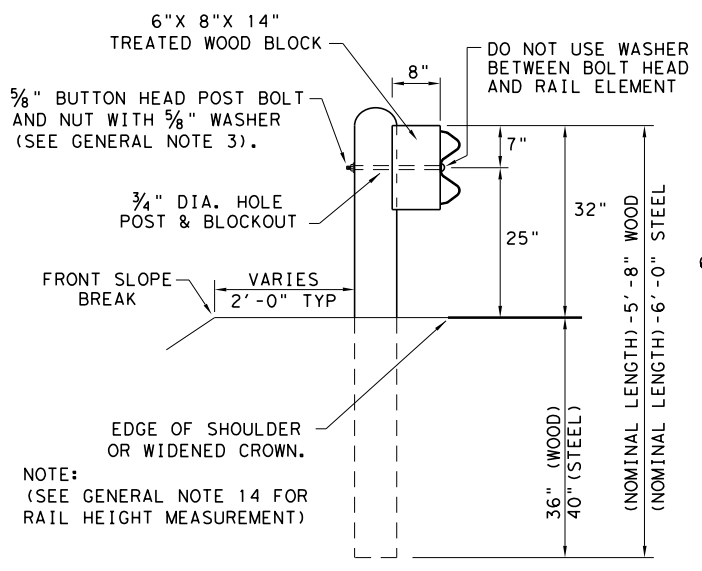
FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER	
6	BR 2023(408),ETC.	FM 27	
STATE	DISTRICT	COUNTY	
TEXAS	BRY	FREESTONE	
CONTROL	SECTION	JOB	SHEET NO.
0456	02	028,ETC	44



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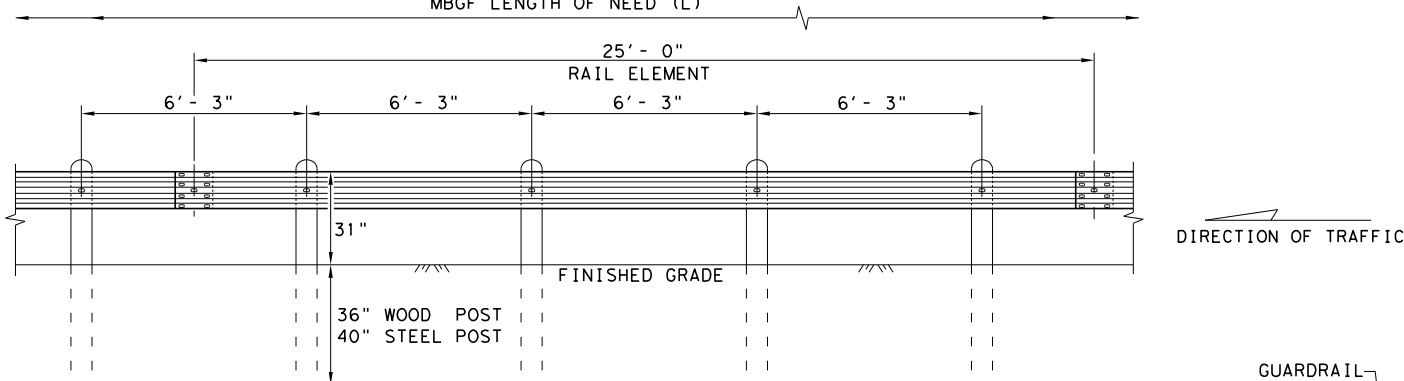
DISCLAIMER: THE USE OF THIS STANDARD IS GOVERNED BY THE "TEXAS ENGINEERING PRACTICE ACT". NO WARRANTY OF ANY KIND IS MADE BY TXDOT FOR ANY PURPOSE WHATSOEVER. TXDOT ASSUMES NO RESPONSIBILITY FOR THE CONVERSION OF THIS STANDARD TO OTHER FORMATS OR FOR INCORRECT RESULTS OR DAMAGES RESULTING FROM ITS USE.

DATE: 4/26/2023  
 FILE: \\Project\wisem\jacobson\US\_B\_I\_SS4\Documents\WJXN4000\_BRY\_Bridge\_Program\WJXN4000\_45602XX\_FM27.700\_CADD\STND\RDW\GF3119.dgn



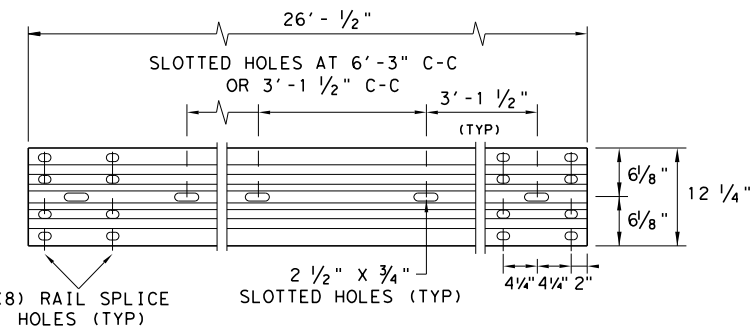
**TYPICAL POST PLACEMENT**

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



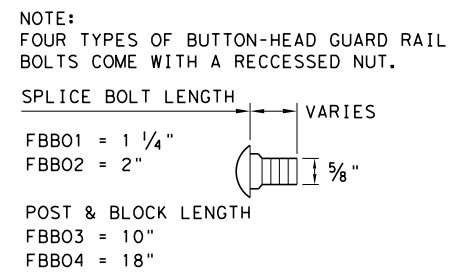
**ELEVATION MID-SPAN RAIL SPLICE**

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



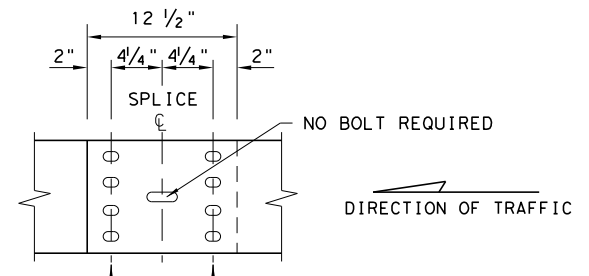
**ELEVATION 25' - 0" (NOM.) W-BEAM SECTION**

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



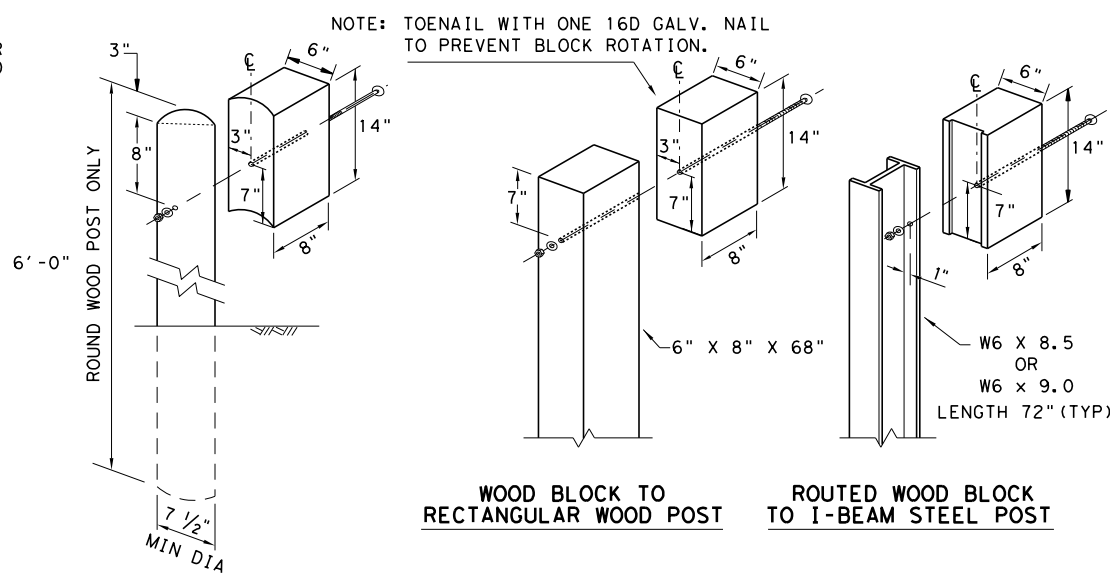
**BUTTON HEAD BOLT**

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



**MID-SPAN RAIL SPLICE DETAIL**

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



**WOOD BLOCK TO RECTANGULAR WOOD POST**

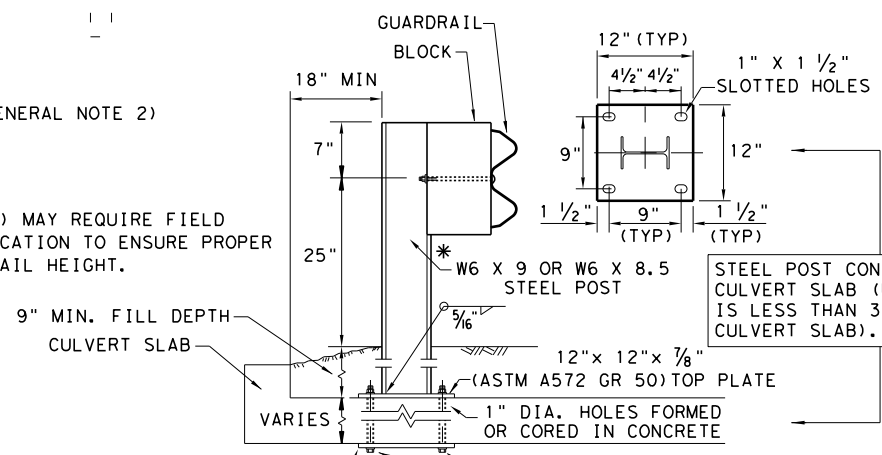
**ROUTED WOOD BLOCK TO I-BEAM STEEL POST**

**WOOD BLOCK TO ROUND WOOD POST**

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

- 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 3/8" WASHER (FWC160) 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.

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



**LOW FILL CULVERT POST**

12" x 12" x 7/8" (ASTM A36) STEEL BOTTOM PLATE WITH 1" DIA. HOLES REQUIRED WITH BOLT-THROUGH INSTALLATION.

NOTE: TWO INSTALLATION OPTIONS.

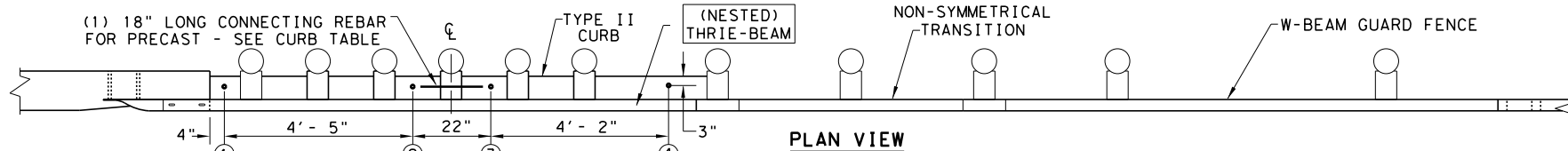
1. **BOLT-THROUGH OPTION:** REQUIRES A 6" MIN. SLAB THICKNESS. 7/8" DIA (ASTM A449) HEAVY HEX BOLTS WITH TWO HARDENED WASHER EACH AND HEAVY HEX NUTS. NOTE: BOLT LENGTH = SLAB PLUS 2 1/4" MIN.
2. **EPOXY ANCHOR OPTION:** THIS OPTION MAY ONLY BE USED IF THE CULVERT SLAB IS 9" MIN. THICK. THREADED ANCHOR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

		<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
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	DIST	COUNTY	SHEET NO.
	BRY	FREESTONE	45



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 DATE: 4/26/2023  
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- (5) 1" DIA. HOLES.
- (5) 7/8" DIA. HEAVY HEX HEAD BOLTS (FACING TRAFFIC SIDE) (ASTM F3125 GR A325 OR A449).
- (10) 1 3/4" O.D. WASHER UNDER EACH HEX BOLT HEAD AND NUT.
- (5) 7/8" DIA. HEAVY HEX NUTS (ASTM A194 OR A563).

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

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

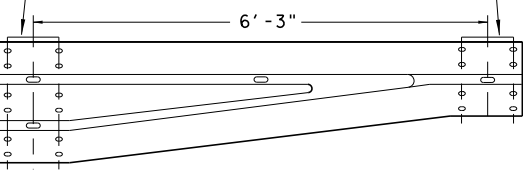
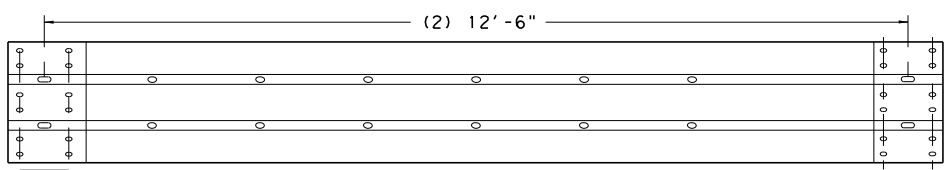
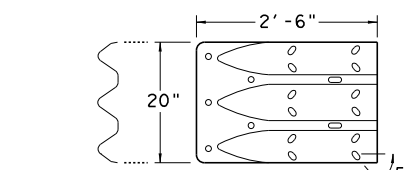
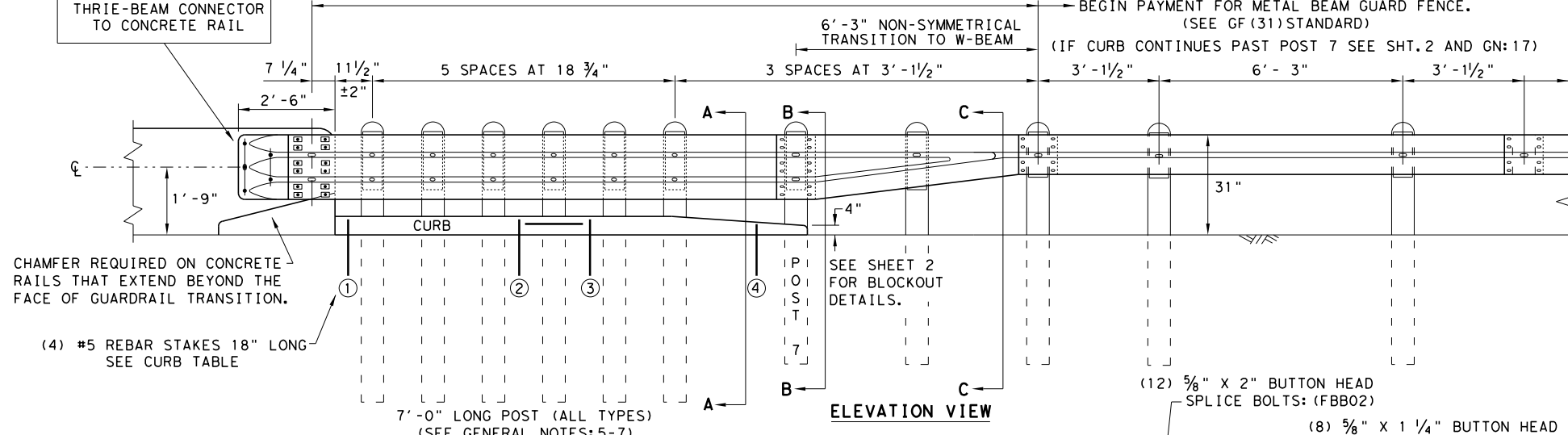
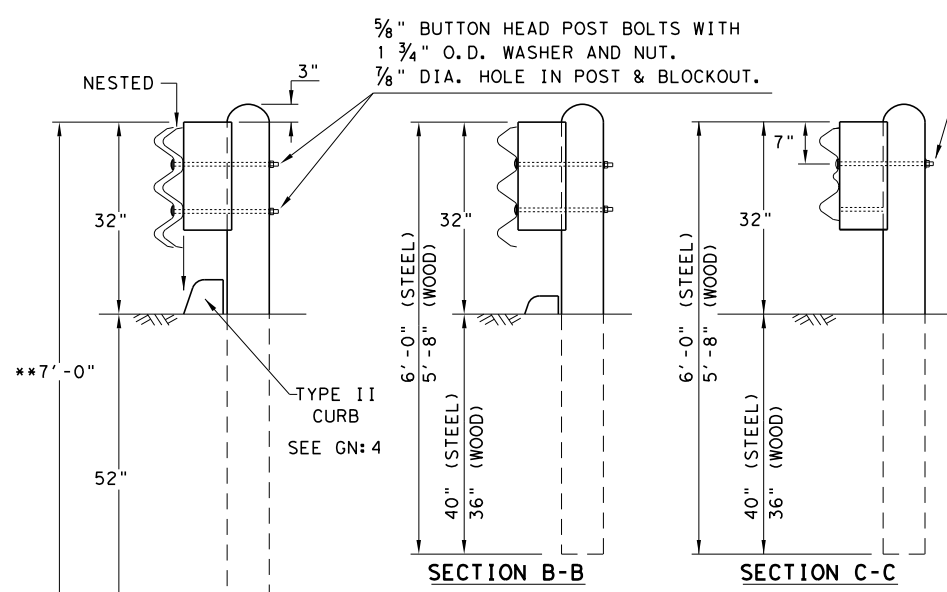


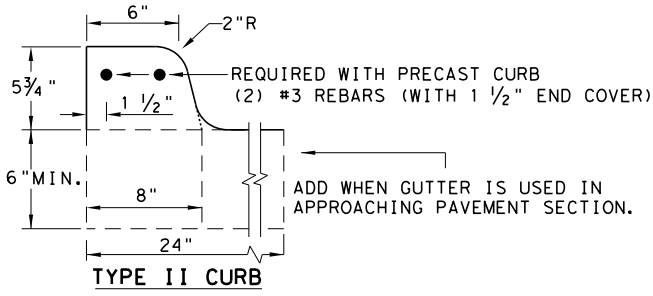
PLATE WASHER INSTRUCTIONS

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

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



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



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

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

**GENERAL NOTES**

1. CONTACT THE DESIGN DIVISION FOR DRAINAGE CUT OUT OPTIONS NEEDED WITHIN THE CURB SECTION OF THE THRIE-BEAM TRANSITION. (512) 416-2678
2. CONCRETE CURB MAY BE CAST-IN-PLACE OR PRECAST AS SHOWN ON THIS SHEET. WHEN USED IN CONJUNCTION WITH THE THRIE-BEAM TRANSITIONS, CURB SHALL BE TYPE II (5-3/4" HEIGHT); SEE CURRENT CCG STANDARD SHEET FOR FURTHER DETAILS. IF OTHER CURB HEIGHTS ARE SHOWN IN THE PLANS IN CONJUNCTION WITH THE TRANSITION, THE CURB HEIGHT MAY BE FROM 4" TO 8" WITH A RELATIVELY VERTICAL FACE. CONCRETE CURB SHALL BE CONTINUOUS TO THE SEVENTH POST UNLESS OTHERWISE SHOWN IN THE PLANS. SEE GENERAL NOTE:17 FOR CIRCUMSTANCES WHERE CURB CONTINUES PAST POST 7.
3. CONCRETE CURB TYPE II SUBSIDIARY TO "METAL BEAM GUARD FENCE TRANSITION". IF NO ADDITIONAL CURB IS INDICATED BEYOND THE TRANSITION, THEN ANY CURB HEIGHT GREATER THAN 4" WILL BE TAPERED DOWN BEGINNING AT THE LAST 7 FT. POST TO A MAXIMUM HEIGHT OF 4" AT POST 7. IF SHOWN ELSEWHERE IN THE PLANS, ADDITIONAL CURB UNDERNEATH GUARDRAIL WILL BE PAID FOR BY THE LINEAR FOOT.
4. UNLESS OTHERWISE SHOWN IN THE PLANS, TRANSITIONS SHALL BE PLACED WITH THE BLOCKOUT FACE IN FRONT OF OR DIRECTLY ABOVE THE CURB FACE. SEE SECTION A-A.
5. FOR ROUND WOOD POST SYSTEMS, ALL ROUND WOOD POSTS SHALL BE 7 1/2" DIA. MINIMUM THROUGHOUT THE THRIE-BEAM TRANSITION.
6. THE TYPE OF POST (ROUND WOOD POST, RECTANGULAR WOOD POST OR STEEL POST) WILL BE AS SHOWN IN THE PLANS. REFER TO GF (31) STANDARD SHEET.
7. THE POST LENGTH SHALL BE MARKED ON ALL 7'-0" LONG POSTS BY THE MANUFACTURER. THE MARK SHALL BE LOCATED WITHIN THE TOP 1 FT. REGION OF THE POST, AT LEAST 5/8" IN HEIGHT, AND VISIBLE AFTER INSTALLATION. WOODEN POSTS SHALL BE MARKED WITH A BRAND, AND STEEL POSTS WITH A STENCIL BEFORE GALVANIZING.
8. POSTS SHALL NOT BE SET IN CONCRETE, OF ANY DEPTH.
9. RAIL ELEMENTS SHALL MEET THE REQUIREMENTS OF ITEM 540, "METAL BEAM GUARD FENCE" EXCEPT AS MODIFIED ON THE PLANS. THE THRIE-BEAM TERMINAL CONNECTOR AND THE THRIE-BEAM TRANSITION TO W-BEAM SHALL BE OF THE SAME MATERIAL, BUT SHALL NOT BE LESS THAN 10 GAUGE. CONTRACTOR SHALL VERIFY THAT THE LOCATIONS OF BOLT HOLES MATCH THOSE IN THE THRIE-BEAM TERMINAL CONNECTOR PRIOR TO ORDERING MATERIALS.
10. BUTTON HEAD "POST BOLTS & NUTS" SHALL MEET THE REQUIREMENTS OF (ASTM A307), AND SHALL BE OF SUFFICIENT LENGTH TO EXTEND THROUGH THE FULL THICKNESS OF THE NUT AND 5/8" WASHER (FWC16G) AND NOT MORE THAN 1" BEYOND IT. TRIM REMAINING BOLT LENGTH TO MEET REQUIRED LENGTH.
11. FITTINGS (BOLTS, NUTS, AND WASHERS) SHALL BE GALVANIZED IN ACCORDANCE WITH ITEM 445, "GALVANIZING". FITTINGS SHALL BE SUBSIDIARY TO THE BID ITEM.
12. CROWN SHALL BE WIDENED TO ACCOMMODATE TRANSITIONS.
13. WHERE SOLID ROCK IS ENCOUNTERED, CONTACT THE DESIGN DIVISION FOR ADDITIONAL GUIDANCE. (512) 416-2678
14. UNLESS OTHERWISE SHOWN IN THE PLANS, A COMPOSITE MATERIAL BLOCK THAT MEETS THE REQUIREMENTS OF DMS-7210, "COMPOSITE MATERIAL POSTS AND BLOCKS FOR METAL BEAM GUARD FENCE" MAY BE SUBSTITUTED FOR BLOCKS OF SIMILAR DIMENSIONS. TXDOT'S MATERIALS AND TESTS DIVISION MAINTAINS A MATERIAL PRODUCER LIST (MPL) FOR PRODUCERS OF MATERIALS CONFORMING TO DMS-7210. ONLY PRODUCERS ON THE MPL CAN FURNISH COMPOSITE MATERIAL BLOCKS.
15. REFER TO GF (31) STANDARD SHEET & BRIDGE RAILING DETAILS FOR ADDITIONAL DETAILS.
16. THE INSTALLATION OF THE TYPE II CURB IS CRITICAL FOR THE PERFORMANCE OF THE THRIE-BEAM TRANSITION SYSTEM. THE CURB PREVENTS (VEHICLE WHEEL SNAGGING) AT THE CONCRETE RAIL AND IS REQUIRED TO MEET MASH CRASH TEST CRITERIA.
17. IF CURB EXTENDS BEYOND POST 7, 25' OF NESTED W-BEAM GUARDRAIL SHALL BE INSTALLED BEYOND THE PAY LIMITS OF THRIE-BEAM TRANSITION SECTION, (SEE SHT.2). PAYMENT FOR THIS 25' SECTION WILL BE BY LINEAR FOOT, PAY ITEM "0540 6XXX MTL W-BEAM GD FEN (NESTED) (TIM POST)" OR "540 6XXX MTL W-BEAM GD FEN (NESTED) (STEEL POST)" AS APPLICABLE FOR POST TYPE. SEE SHT.2 FOR ADDITIONAL INFORMATION.

**HIGH-SPEED TRANSITION**  
SHEET 1 OF 2

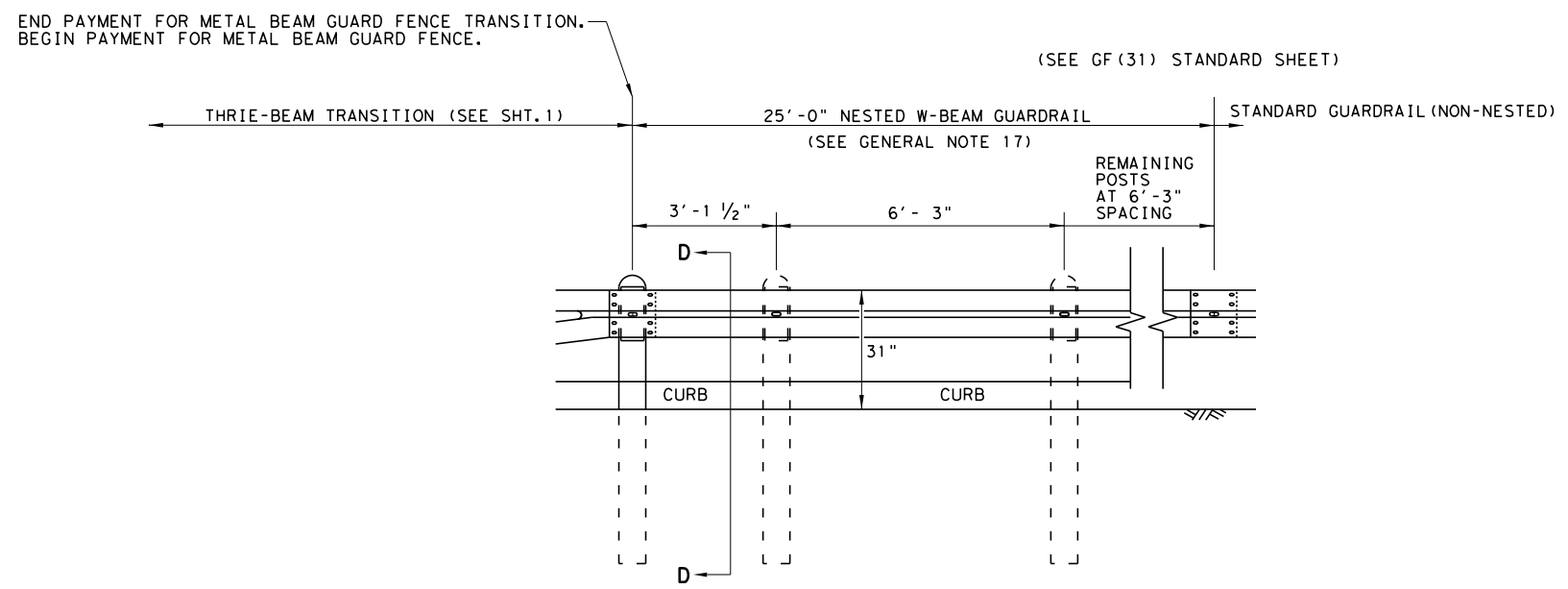
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<b>GF (31) TR TL3-20</b>		
FILE: gf31tr+1320.dgn	DN: TxDOT	CK: KM
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REVISIONS	DIST: BRY	COUNTY: FREESTONE
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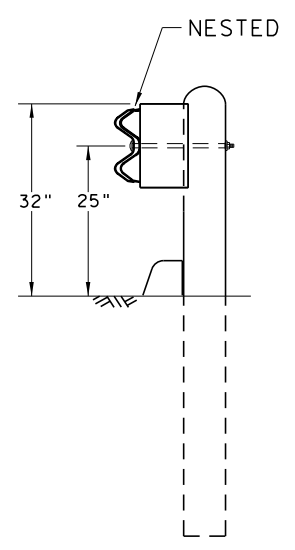
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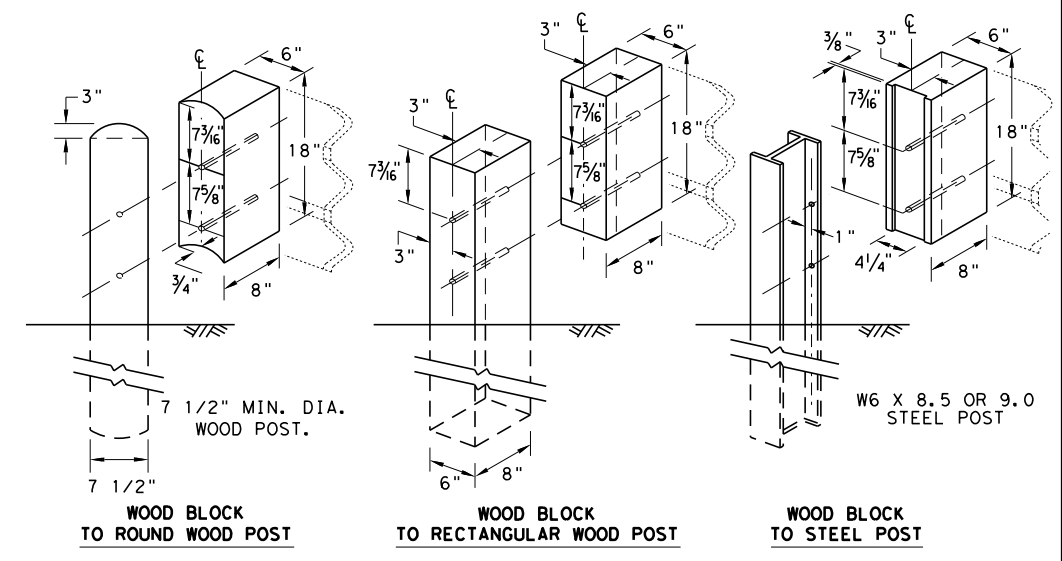
REQUIRED ALTERNATIVE FOR CONTINUOUS CURB EXTENDING PAST POST 7 (SEE SHT. 1 GENERAL NOTE 17)



ELEVATION VIEW



SECTION D-D



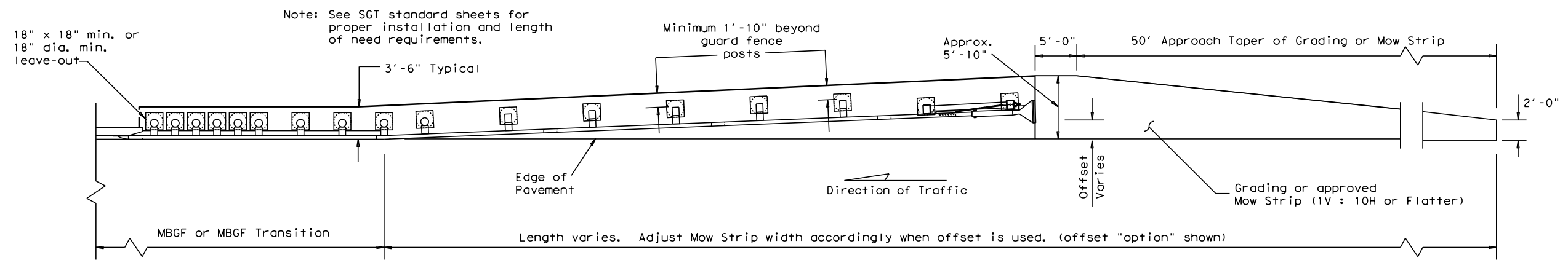
THREE BEAM TRANSITION BLOCKOUT DETAILS

HIGH-SPEED TRANSITION

SHEET 2 OF 2

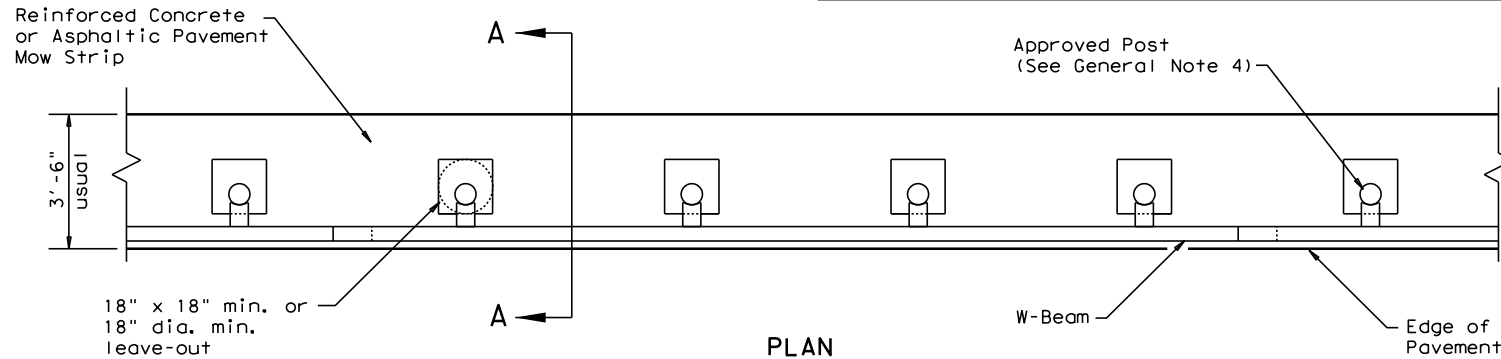
				Design Division Standard	
<b>METAL BEAM GUARD FENCE          THREE-BEAM TRANSITION          TL-3 MASH COMPLIANT          GF (31) TR TL3-20</b>					
FILE: gf31tr+1320.dgn	DN: TXDOT	CK: KM	DW: KM	CK: CGL/AG	
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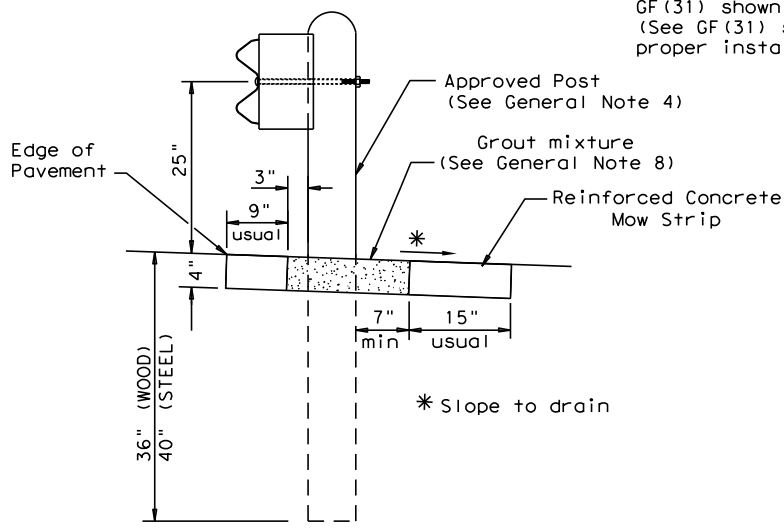
**GRADING AND MOW STRIP AT GUARDRAIL END TREATMENTS**

Note: Site Condition(s)  
 Site conditions may exist where grading is required for the proper installation of metal guard fence and end treatments.  
 Approach grading or mow strip may be decreased or eliminated, as directed by the Engineer.



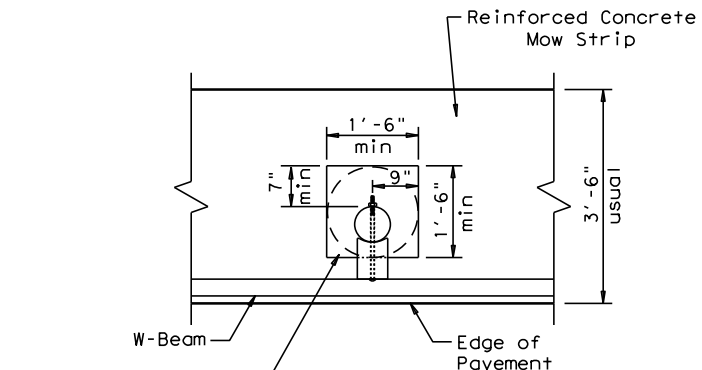
**PLAN**

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



**SECTION A-A**

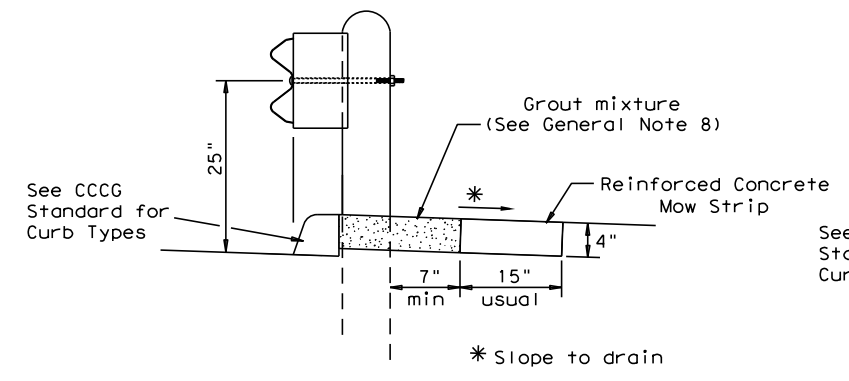
Typical



**MOW STRIP DETAIL**

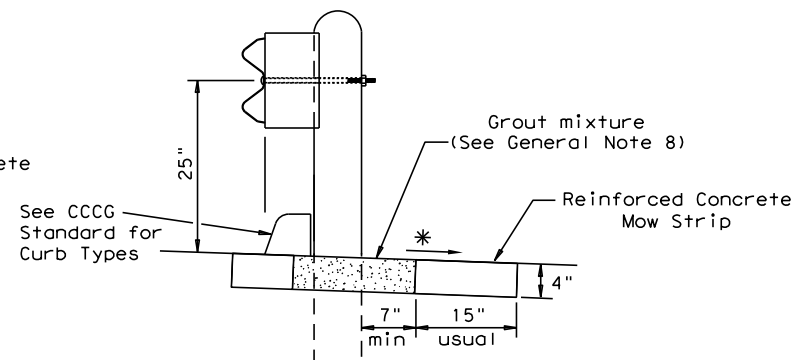
Reinforced Concrete Mow Strip with 18" x 18" Square or 18" Dia. minimum leave-out.

Fill leave-out with Grout mixture  
 (See General Note 8)



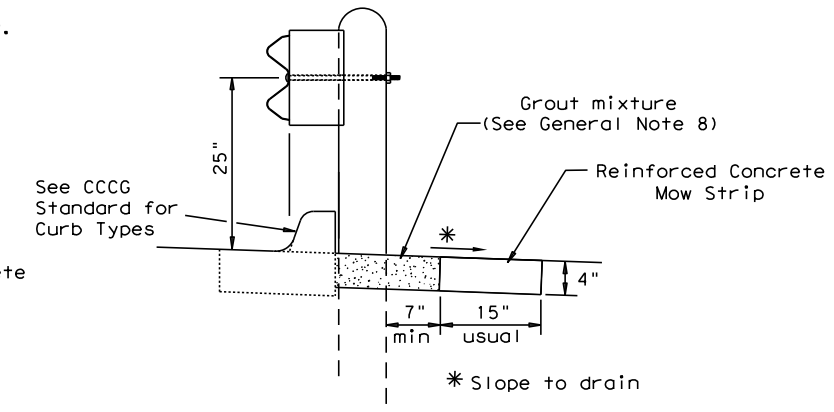
**CURB OPTION (1)**

This option will increase the post embedment throughout the system.



**CURB OPTION (2)**

Curb shown on top of mow strip



**CURB OPTION (3)**

**GENERAL NOTES**

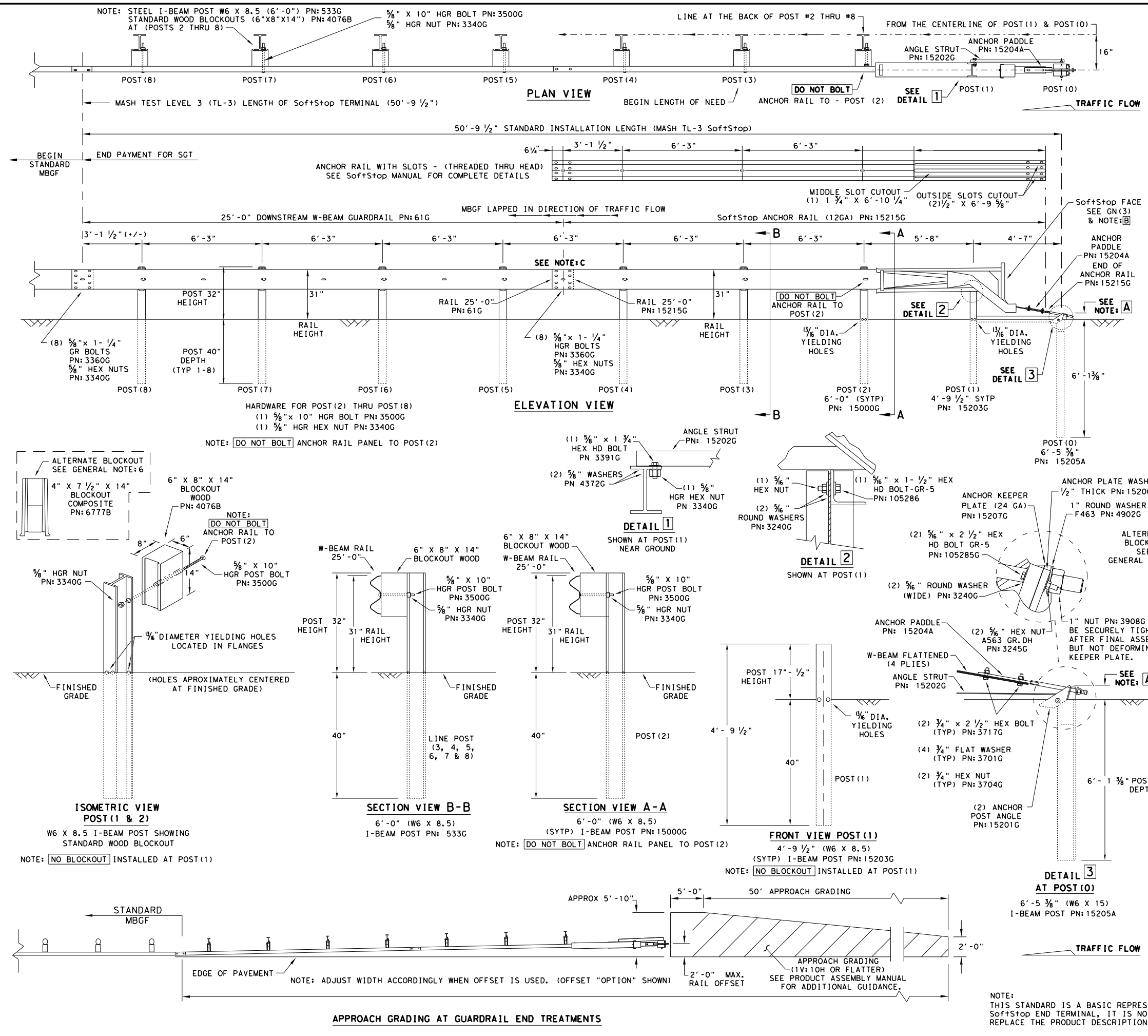
1. This mow strip design is for use with metal beam guard fence, guard fence transitions, and guard fence end treatments. See applicable GF(31) MBGF or GF(31) Transition Standard sheet for additional information.
2. Mow strips shall be reinforced concrete with (wire mesh or synthetic fiber), as shown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



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

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	DIST	COUNTY	SHEET NO.	
	BRY	FREESTONE	48	

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

**NOTE: A** THE INSTALLATION HEIGHT OF FULLY ASSEMBLED ANCHOR POST WILL VARY FROM 3-3/4" MIN. TO 4" MAX. ABOVE FINISHED GRADE.

**NOTE: B** PART PN: 5852B RIGHT-SIDE (HIGH INTENSITY REFLECTIVE SHEETING) PART PN: 5851B LEFT-SIDE (HIGH INTENSITY REFLECTIVE SHEETING)

**NOTE: C** W-BEAM SPLICE LOCATED BETWEEN LINE POST (4) AND LINE POST (5) GUARDRAIL PANEL 25'-0" PN: 61G ANCHOR RAIL 25'-0" PN: 15215G LAP GUARDRAIL IN DIRECTION OF TRAFFIC FLOW.

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

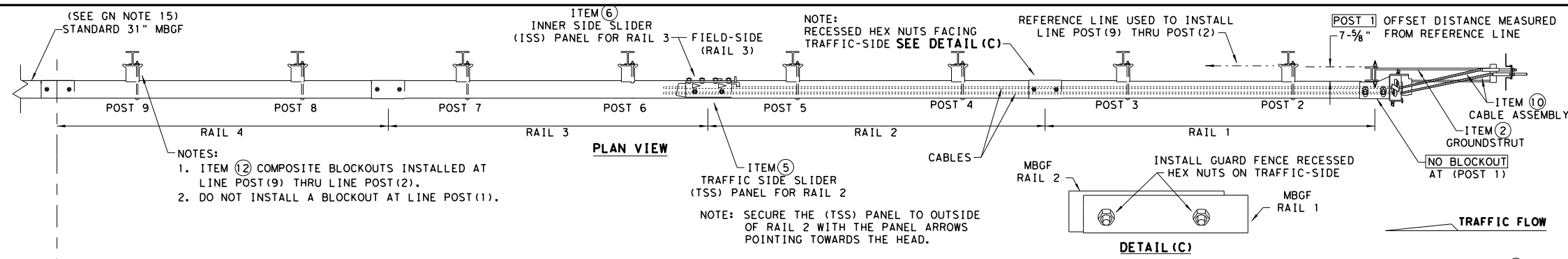
Texas Department of Transportation  
 Design Division Standard

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

FILE: sgt10s3116	DN: TxDOT	CK: KM	DW: VP	CK: MB/VP
© TxDOT: JULY 2016	CONT	SECT	JOB	HIGHWAY
REVISIONS	0456	02	028, ETC	FM 27
	DIST	COUNTY		SHEET NO.
	BRY	FREESTONE		49

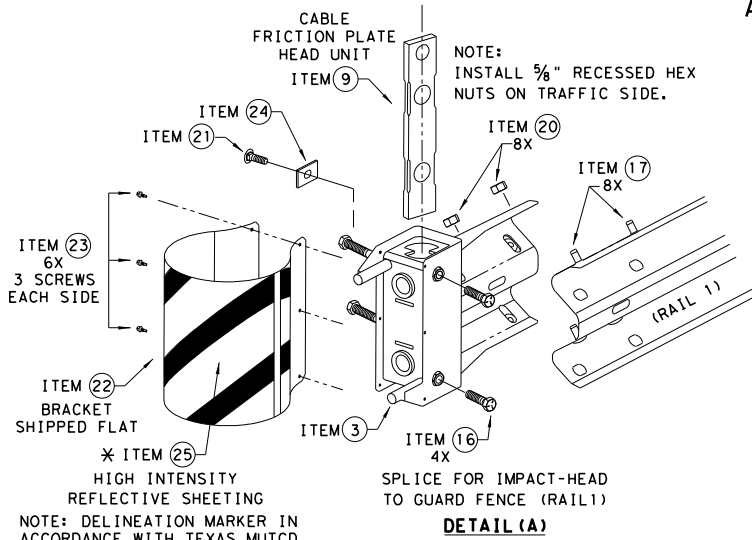
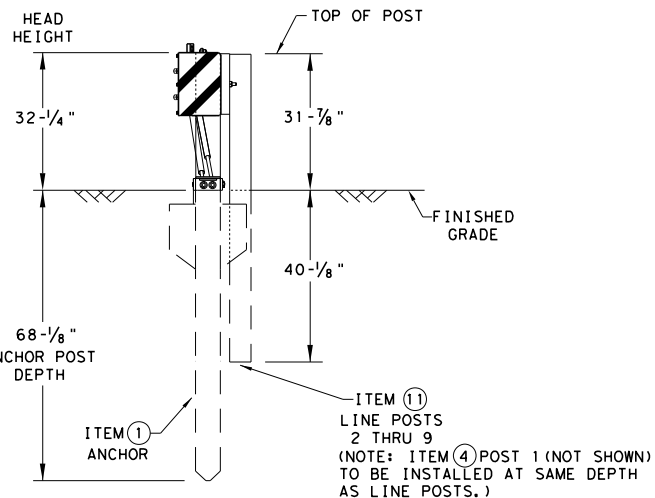
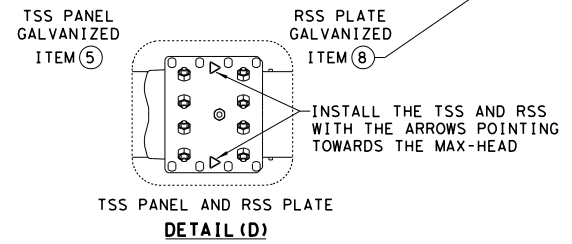
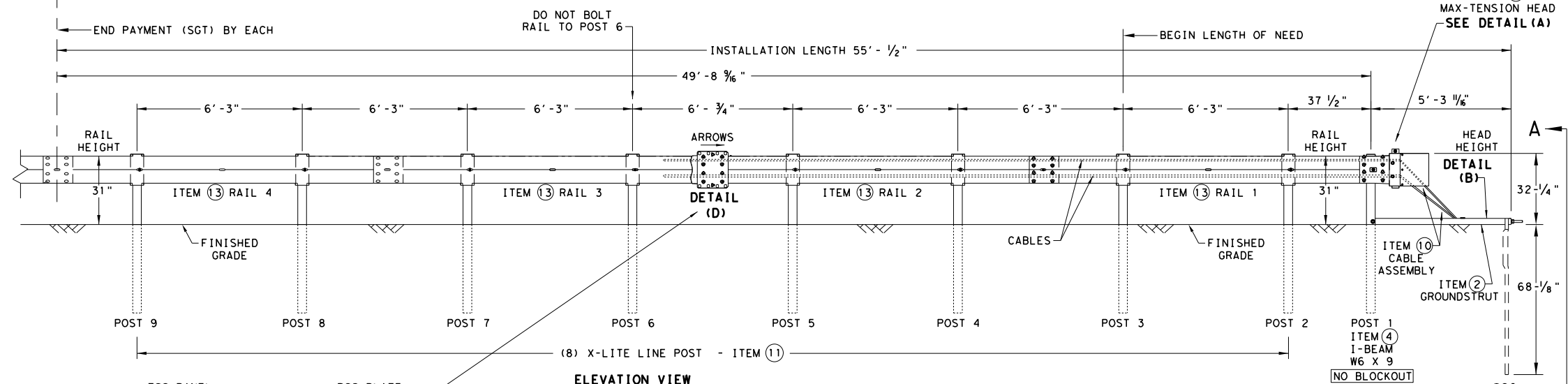
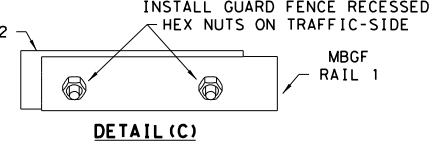
DISCLAIMER: The use of this standard is governed by the "Texas Engineering Practice Act". No warranty of any kind is made by TxDOT for any purpose whatsoever. TxDOT assumes no responsibility for the conversion of units or the accuracy of the information contained herein.

DATE: 4/26/2023  
 FILE: \\Project\wisem\jacobson\I\_SS4\Documents\WJXN4000\_SGT\_TL-3\MAX-TENSION END TREATMENT.dgn



- NOTES:
- ITEM 12 COMPOSITE BLOCKOUTS INSTALLED AT LINE POST (9) THRU LINE POST (2).
  - DO NOT INSTALL A BLOCKOUT AT LINE POST (1).

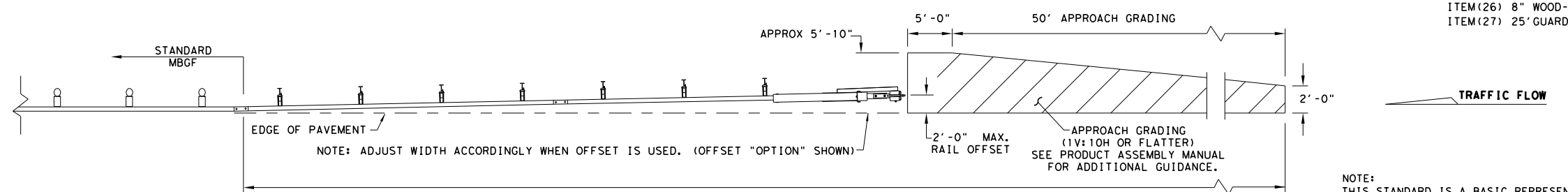
NOTE: SECURE THE (TSS) PANEL TO OUTSIDE OF RAIL 2 WITH THE PANEL ARROWS POINTING TOWARDS THE HEAD.



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

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

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



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

APPROACH GRADING AT GUARDRAIL END TREATMENTS

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

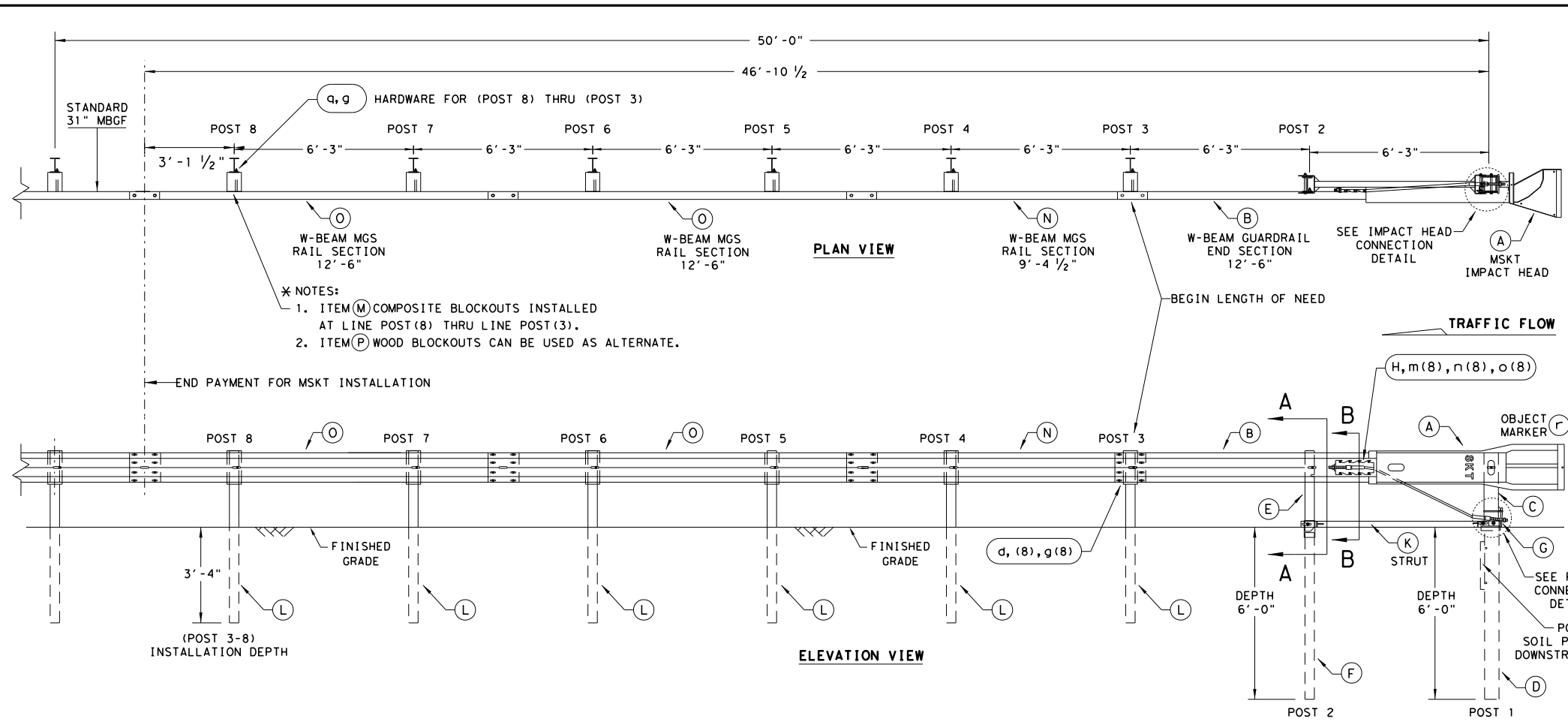
**Texas Department of Transportation**  
 Design Division Standard

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

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REVISIONS	0456	02	028, ETC	FM 27
	DIST	COUNTY		SHEET NO.
	BRY	FREESTONE		50

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 ASSUMES NO RESPONSIBILITY FOR THE CONVERSION OF THIS STANDARD TO OTHER FORMATS OR FOR INCORRECT RESULTS OR DAMAGES RESULTING FROM ITS USE.

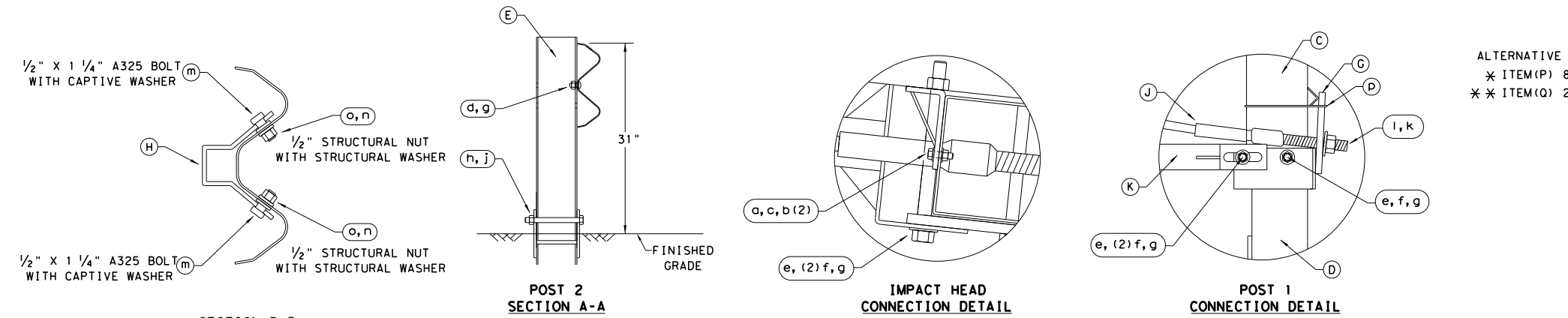
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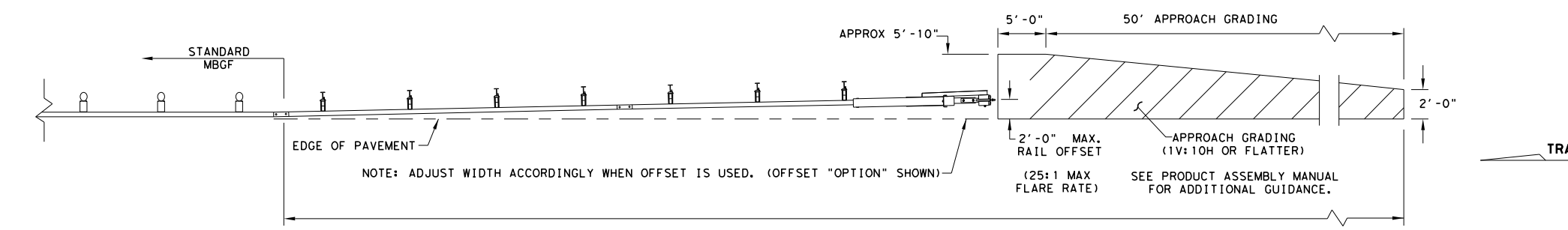
- \* NOTES:
- ITEM (M) COMPOSITE BLOCKOUTS INSTALLED AT LINE POST (8) THRU LINE POST (3).
  - ITEM (P) WOOD BLOCKOUTS CAN BE USED AS ALTERNATE.

- GENERAL NOTES**
- FOR SPECIFIC INFORMATION REGARDING INSTALLATION AND TECHNICAL GUIDANCE OF THE SYSTEM, CONTACT: ROAD SYSTEMS, INC. (432)263-2435. 3616 OLD HOWARD COUNTY AIRPORT, BIG SPRING, TX 79720
  - FOR INSTALLATION, REPAIR AND MAINTENANCE REFER TO THE: MSKT END TERMINAL, PRODUCT DESCRIPTION ASSEMBLY MANUAL (PUBLICATION-062717).
  - APPLY HIGH INTENSITY REFLECTIVE SHEETING, "OBJECT MARKER" ON THE FRONT FACE OF THE DEVICE PER MANUFACTURER'S RECOMMENDATIONS. OBJECT MARKER SHALL CONFORM TO THE STANDARDS REQUIRED IN TEXAS MUTCD.
  - FOR POST (LEAVE-OUT) INSTALLATION AND GUIDANCE SEE TXDOT'S LATEST ROADWAY MOW STRIP STANDARD.
  - HARDWARE (BOLTS, NUTS, & WASHERS) SHALL BE GALVANIZED IN ACCORDANCE WITH ITEM 445, "GALVANIZING". FITTINGS SHALL BE SUBSIDIARY TO THE BID ITEM.
  - SYSTEM SHOWN USING STEEL WIDE FLANGE POSTS WITH COMPOSITE BLOCKOUTS.
  - A COMPOSITE MATERIAL BLOCKOUTS THAT MEETS THE REQUIREMENTS OF DMS-7210, MAY BE SUBSTITUTED FOR BLOCKOUTS OF SIMILAR DIMENSIONS. SEE CONSTRUCTION DIVISION MATERIAL PRODUCER LIST (MPL) FOR CERTIFIED PRODUCERS.
  - IF SOLID ROCK IS ENCOUNTERED IN THE AREA OF (POST 1) AND / OR (POST 2) CONTACT THE MANUFACTURER, & REFER TO THE LATEST ROADWAY 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 ENCRANCHING ON THE SHOULDER. THE FLARE MAY BE DECREASED OR ELIMINATED FOR SPECIFIC INSTALLATIONS, IF DIRECTED BY THE ENGINEER.
  - THE SYSTEM IS SHOWN WITH TWO 12'-6" 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 Go.	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.

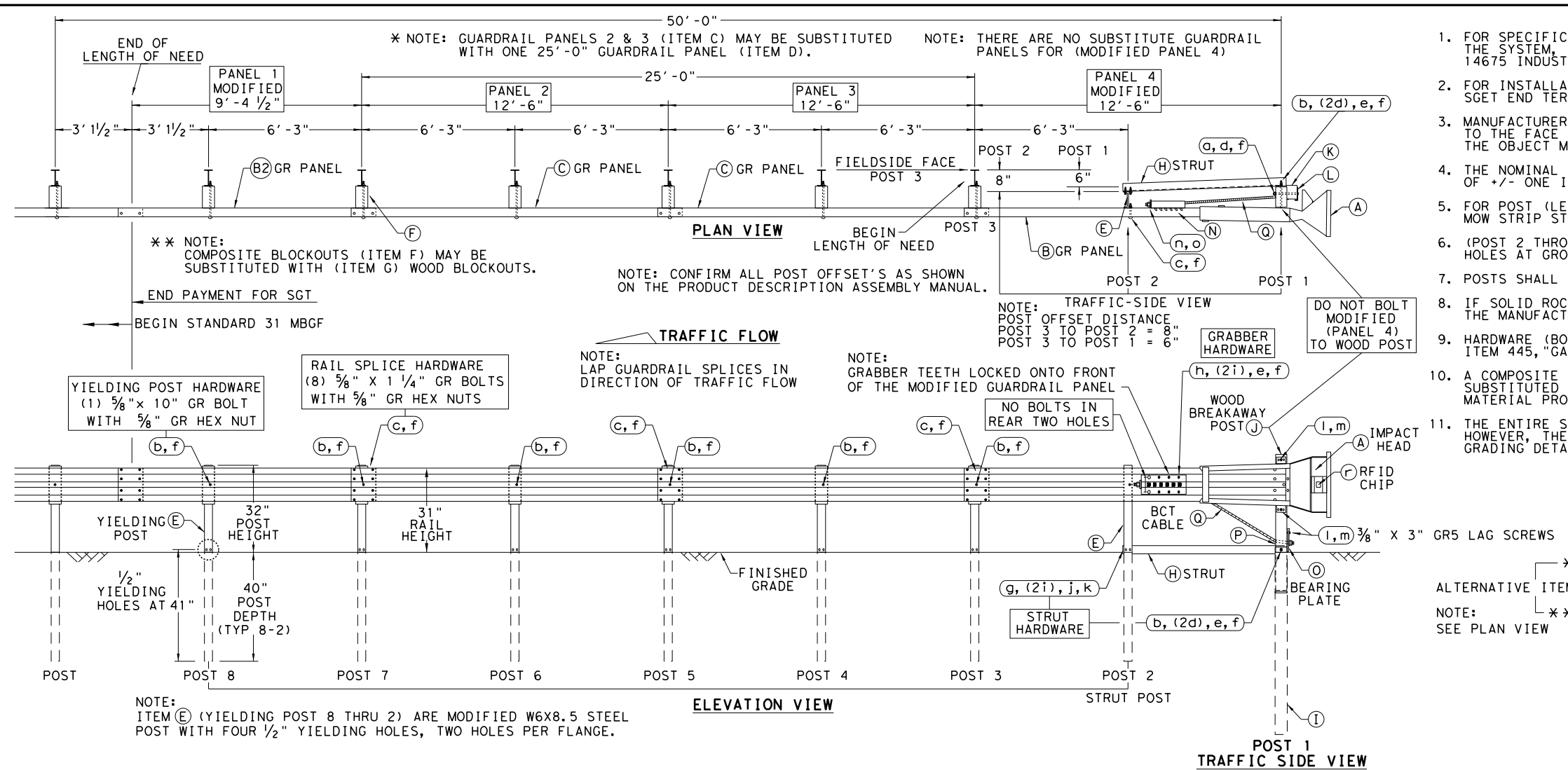
**Texas Department of Transportation**  
 Design Division Standard

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

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© TXDOT: APRIL 2018	CONT SECT	JOB	HIGHWAY	
REVISIONS	0456	02	028, ETC	FM 27
	DIST	COUNTY	SHEET NO.	
	BRY	FREESTONE		51

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: 4/26/2023  
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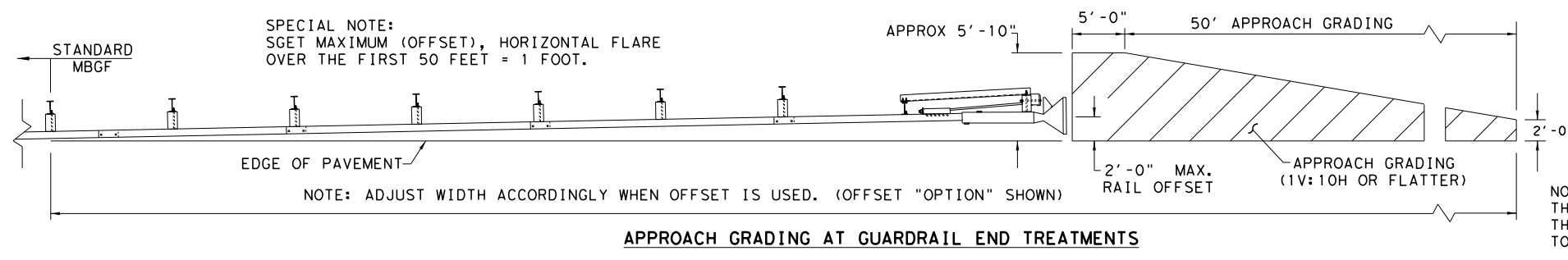
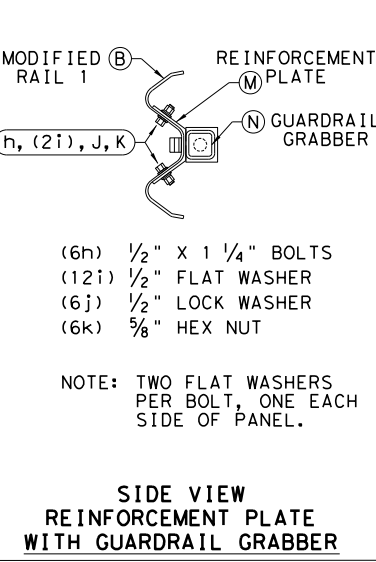
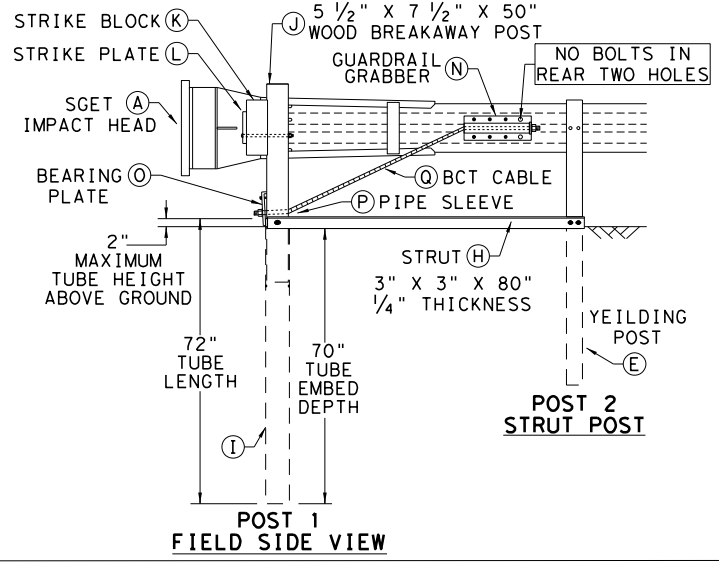
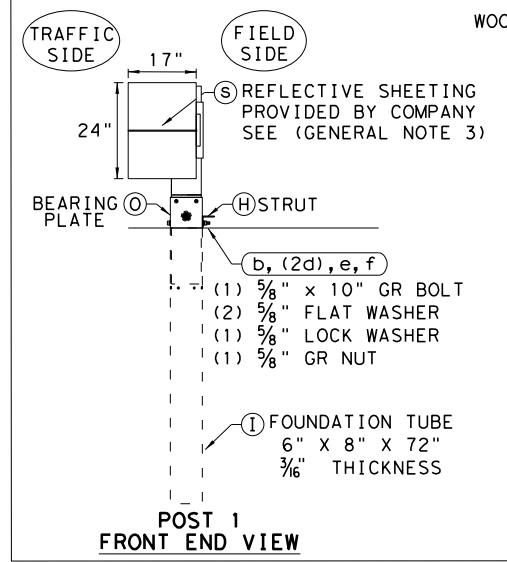
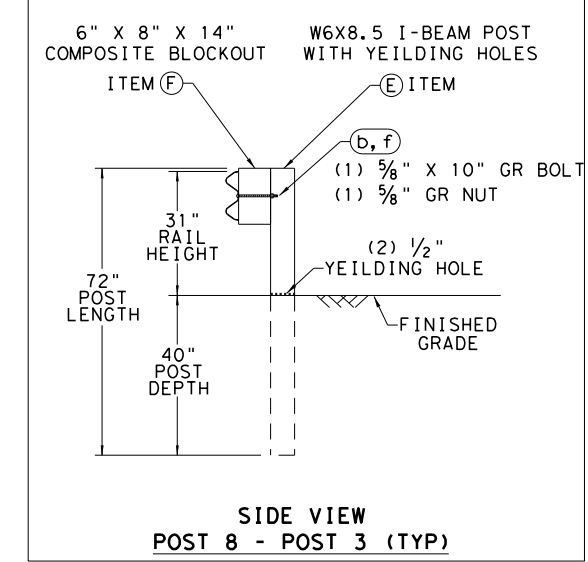


- ### GENERAL NOTES
- FOR SPECIFIC INFORMATION REGARDING INSTALLATION AND TECHNICAL GUIDANCE OF THE SYSTEM, CONTACT: SPIG INDUSTRY, INC. AT 1(267) 644-9510. 14675 INDUSTRIAL PARK RD; BRISTOL, VA 24202
  - FOR INSTALLATION, REPAIR AND MAINTENANCE REFER TO THE MANUFACTURER'S; SGET END TERMINAL, PRODUCT 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	WSBK14
L	1	STRIKE PLATE 1/4" A36 BENT PLATE	SPLT8
M	1	REINFORCEMENT PLATE 12 GA. GR55	REPLT17
N	1	GUARDRAIL GRABBER 2 1/2" X 2 1/2" X 16 1/2"	GGR17
O	1	BEARING PLATE 8" X 8 5/8" X 5/8" A36	BPLT8
P	1	PIPE SLEEVE 4 1/4" X 2 3/8" O.D. (2 1/8" I.D.)	PSLV4
Q	1	BCT CABLE 3/4" X 81" LENGTH	CBL81

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



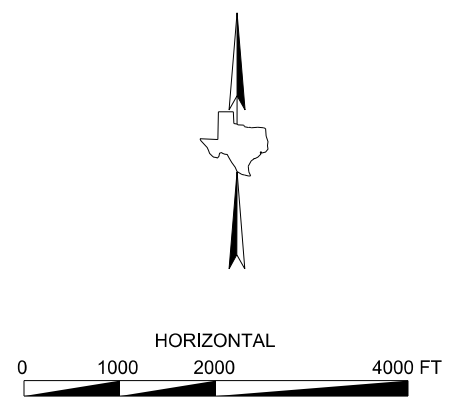
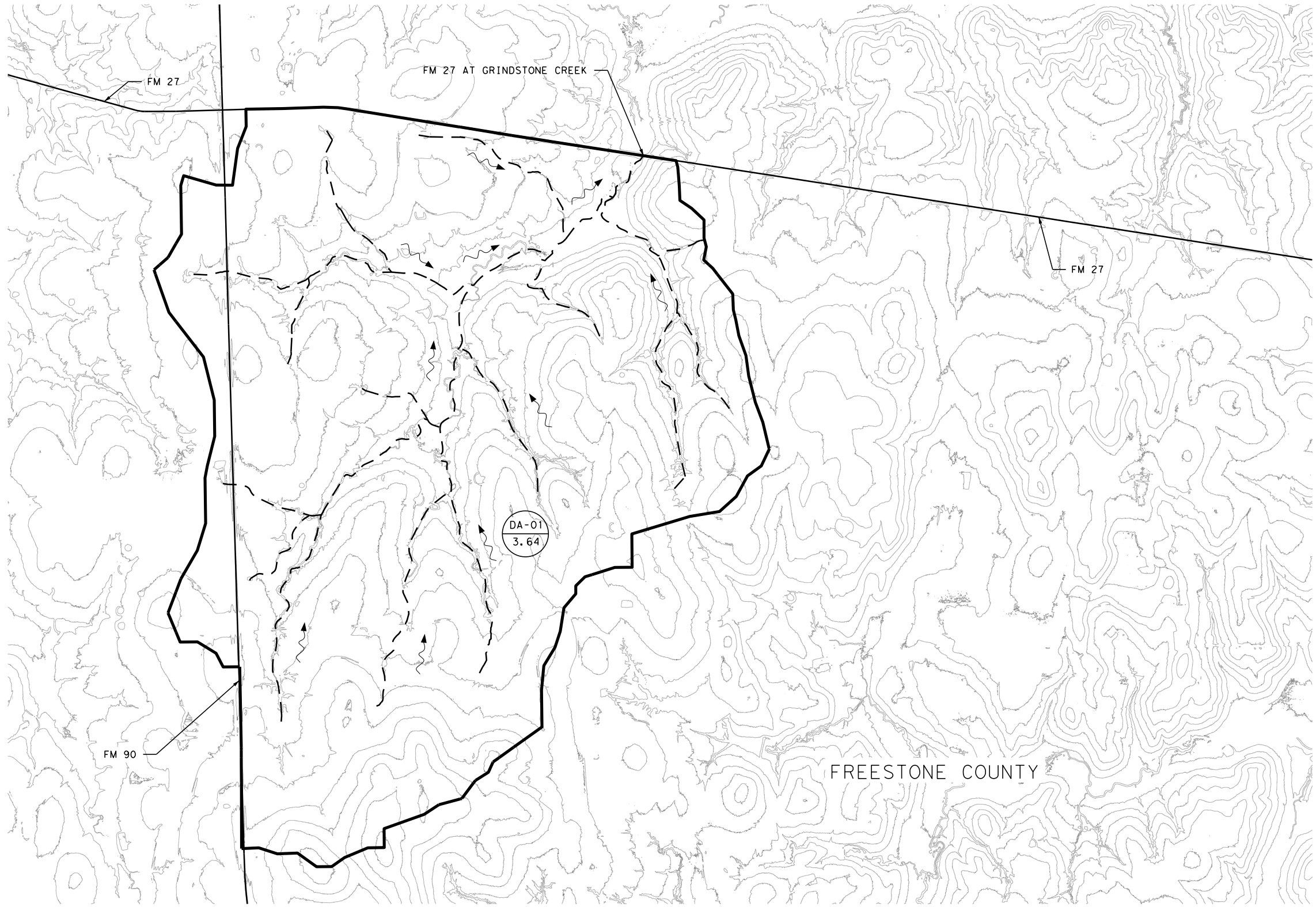
NOTE: THIS STANDARD IS A BASIC REPRESENTATION OF THE SGET TERMINAL SYSTEM AND IS NOT INTENDED TO REPLACE THE MANUFACTURER'S ASSEMBLY MANUAL.

**Texas Department of Transportation**  
 Design Division Standard

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

FILE: sgt153120.dgn	DN: TXDOT	CK: KM	DW: VP	CK: VP
© TXDOT: APRIL 2020	CONT: 0456	SECT: 02	JOB: 028, ETC	HIGHWAY: FM 27
REVISIONS	DIST: BRY	COUNTY: FREESTONE	SHEET NO. 52	



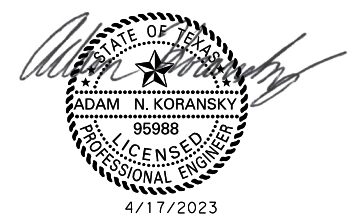


**LEGEND**

- DRAINAGE AREA I. D.
- DRAINAGE AREA
- EXISTING CONTOUR
- FLOW ARROW
- STREAM

**NOTES:**

1. DRAINAGE AREA DELINEATED BASED ON USGS TOPOGRAPHIC DATA.
2. NRCS-CN METHOD WAS USED TO CALCULATE PEAK FLOWS PER USDA TR-55 MANUAL (JUNE, 1986)
3. FEMA ZONE A, MAP NO 4808220004 A, EFFECTIVE SEPTEMBER 1, 2007.



PRINT DATE	REVISION DATE
4/25/2023	

**Jacobs** 2705 BEE CAVE RD, SUITE 300  
AUSTIN TX 78746  
FIRM REGISTRATION F-2966



**DRAINAGE AREA MAP**  
FM 27 AT GRINDSTONE CREEK

**NRCS-CN METHOD PARAMETERS AND PEAK FLOWS (CFS)**

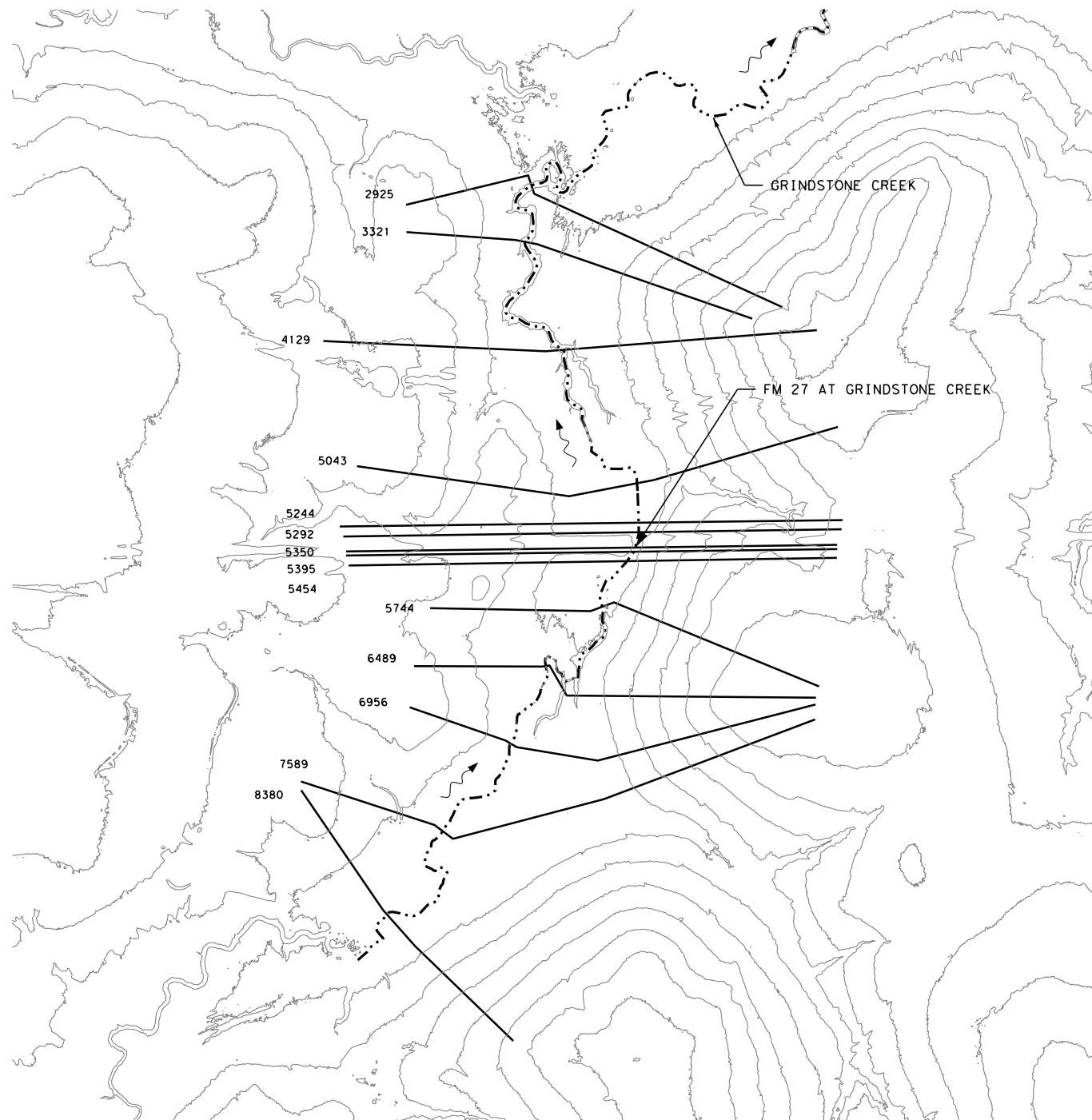
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FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER	
6	BR 2023(408),ETC.	FM 27	
STATE	DISTRICT	COUNTY	
TEXAS	BRY	FREESTONE	
CONTROL	SECTION	JOB	SHEET NO.
0456	02	028,ETC	53



FM 27 AT GRINDSTONE CREEK CROSS SECTION LOCATION MAP



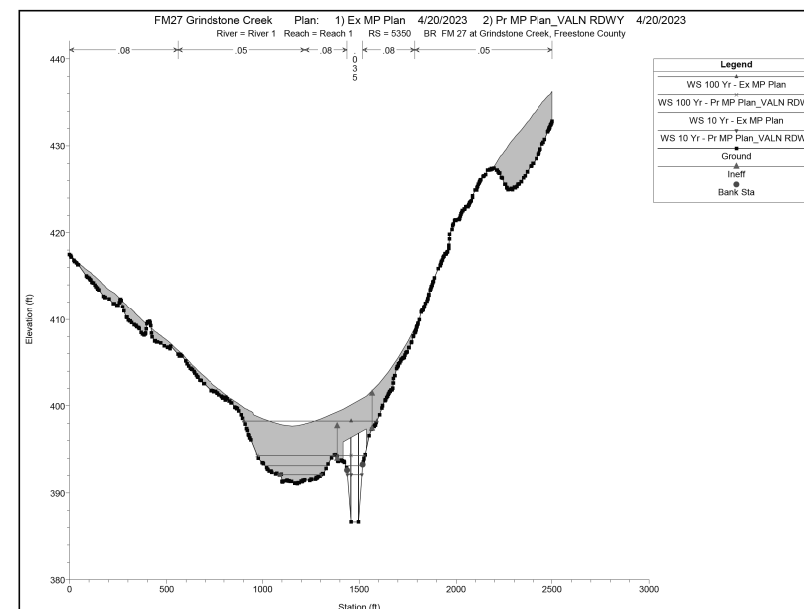
HEC-RAS 10-YEAR COMPARISON

RIVER STATION (FT)	LOCATION	PROPOSED STRUCTURE			RIVER STATION (FT)	EXISTING STRUCTURE		
		10 YR				10 YR		
		Q	V (CHAN)	WSEL		Q	V (CHAN)	WSEL
CFS	FPS	FT	CFS	FPS	FT			
8380		1975	9.36	399.03	8380	1975	9.19	399.06
7589		1975	3.03	395.61	7589	1975	2.87	395.69
6956		1975	4.51	394.57	6956	1975	3.79	394.92
6489		1975	2.57	394.08	6489	1975	2.16	394.64
5744		1975	1.58	393.94	5744	1975	1.35	394.56
5454		1975	3.28	393.73	5454	1975	3.08	394.39
5395	BR U/S XS	1975	5.95	393.14	5395	1975	4.87	394.03
5350	FM 27 Bridge	1975	7.13	392.10	5350	Bridge	6.67	393.11
5292	BR D/S XS	1975	8.97	390.98	5292	1975	9.67	390.92
5244		1975	8.60	390.63	5244	1975	8.69	390.64
5043		1975	8.14	388.24	5043	1975	8.14	388.24
4129		1975	5.38	383.48	4129	1975	5.38	383.48
3321		1975	4.86	382.31	3321	1975	4.86	382.31
2925		1975	5.37	381.73	2925	1975	5.37	381.73

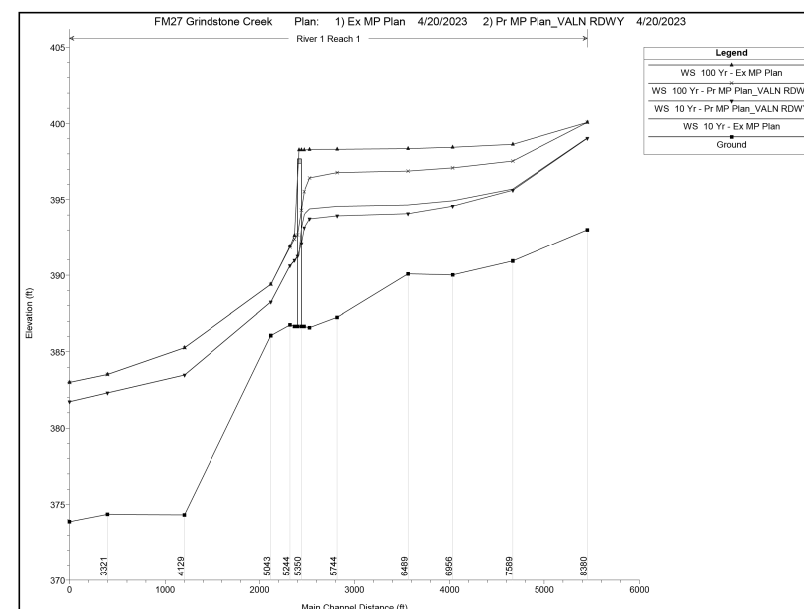
HEC-RAS 100-YEAR COMPARISON

RIVER STATION (FT)	LOCATION	PROPOSED STRUCTURE			RIVER STATION (FT)	EXISTING STRUCTURE		
		100 YR				100 YR		
		Q	V (CHAN)	WSEL		Q	V (CHAN)	WSEL
CFS	FPS	FT	CFS	FPS	FT			
8380		4310	12.45	393.03	8380	4310	12.45	393.01
7589		4310	2.85	397.53	7589	4310	2.10	398.64
6956		4310	4.02	397.09	6956	4310	3.00	398.45
6489		4310	2.73	396.88	6489	4310	2.09	398.36
5744		4310	1.87	396.78	5744	4310	1.48	398.31
5454		4310	4.83	396.43	5454	4310	1.45	398.30
5395	BR U/S XS	4310	7.87	395.53	5395	4310	2.19	398.26
5350	FM 27 Bridge	4310	9.26	394.31	5350	Bridge	6.16	398.26
5292	BR D/S XS	4310	12.50	392.41	5292	4310	12.85	392.64
5244		4310	12.21	391.85	5244	4310	12.23	391.91
5043		4310	7.21	389.39	5043	4310	7.21	389.39
4129		4310	8.26	385.27	4129	4310	8.26	385.27
3321		4310	6.85	383.51	3321	4310	6.85	383.51
2925		4310	6.21	382.99	2925	4310	6.21	382.99

FM 27 AT GRINDSTONE CREEK HEC-RAS CROSS SECTION COMPUTATION

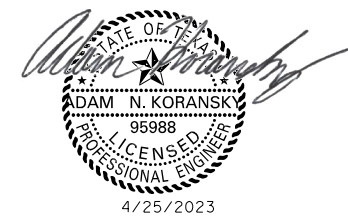


FM 27 AT GRINDSTONE CREEK HEC-RAS PROFILE COMPUTATION



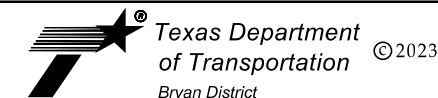
NOTES:

- HEC-RAS VER 5.0.7 WAS USED FOR THE HYDRAULIC ANALYSIS AND DESIGN OF THE BRIDGE. NORMAL DEPTH COMPUTATION USED FOR THE DOWNSTREAM BOUNDARY CONDITION SLOPE = 0.002122 FT/FT FOR EXISTING AND PROPOSED CONDITIONS.
- FREESTONE COUNTY FLOODPLAIN ADMINISTRATOR, LEONARD SMITH, WAS INFORMED OF THE PROPOSED PROJECT AND PROVIDED WITH A SUMMARY OF HYDRAULIC IMPACTS ON 4-27-2023.



PRINT DATE	REVISION DATE
4/25/2023	

**Jacobs** 2705 BEE CAVE RD, SUITE 300  
AUSTIN TX 78746  
FIRM REGISTRATION F-2966



HYDRAULIC DATA SHEET  
FM 27 AT GRINDSTONE CREEK

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER	
6	BR 2023(408),ETC.	FM 27	
STATE	DISTRICT	COUNTY	
TEXAS	BRY	FREESTONE	
CONTROL	SECTION	JOB	SHEET NO.
0456	02	028,ETC	54

PIER SCOUR CALCULATIONS 25-YEAR

Parameter	Value	Unit
L	9	ft
a	3.0	ft
L/a(1)	3.0	ft/ft
Angle of Attack	0.0	Degrees
K1	1.0	
K2	1.0	
K3	1.1	
Y1	6.33	ft
V1	8.29	fps
Fr	0.58	
Ys	6.80	ft

PIER SCOUR CALCULATIONS 100-YEAR

Parameter	Value	Unit
L	9	ft
a	3.0	ft
L/a(1)	3.0	ft/ft
Angle of Attack	0.0	Degrees
K1	1.0	
K2	1.0	
K3	1.1	
Y1	7.66	ft
V1	9.26	fps
Fr	0.59	
Ys	7.30	ft

NOTES:

1. UNITED STATES DEPARTMENT OF AGRICULTURE (USDA) WEB SOIL SURVEY INDICATES SILTY SAND AS THE DOMINATE SOIL TYPE.

2. D50 VALUES: MINIMUM D50 OF 0.20 MM USED AS RECOMMENDED IN THE TXDOT GEOTECHNICAL MANUAL, CHAPTER 5, SECTION 6.

CONTRACTION SCOUR CALCULATIONS 25-YEAR

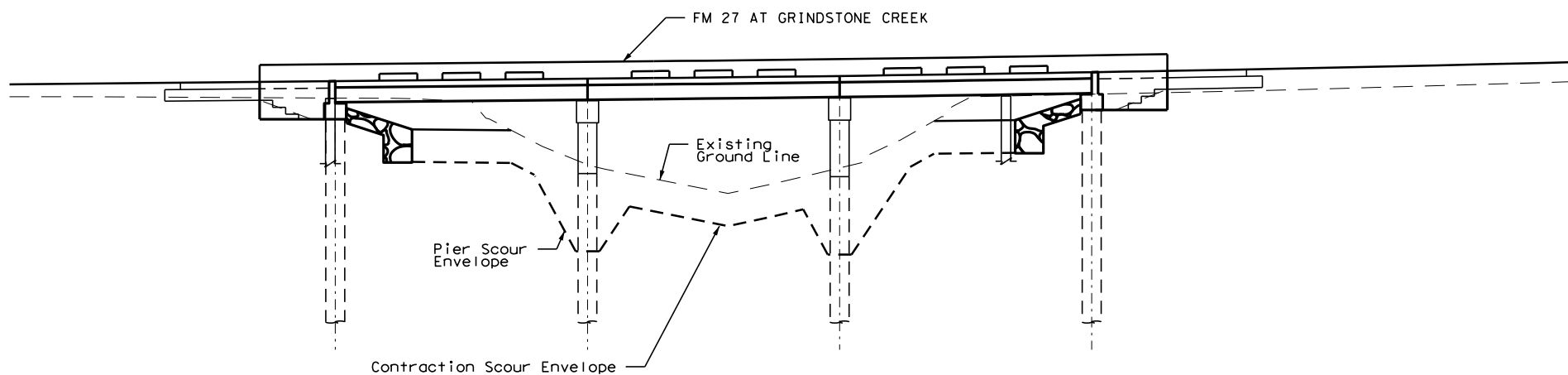
PARAMETER	LOB	CHANNEL	ROB	UNIT
AVERAGE DEPTH OF FLOW IN U/S CHANNEL (Y1)		8.31		FT
APPROACH VELOCITY (V1)		3.90		FPS
DEPTH IN CONTRACTED SECTION BEFORE SCOUR (Y0)		1.82		FT
FLOW IN CONTRACTED SECTION (Q2)		2826.00		CFS
BOTTOM WIDTH OF CONTRACTED SECTION (W2)		114.00		FT
GRAIN SIZE (D50)		0.2000		MM
FLOW IN UPSTREAM CHANNEL (Q1)		2826.00		CFS
BOTTOM WIDTH OF MAIN CHANNEL (W1)		69.80		FT
CHANNEL SLOPE		0.004		FT/FT
SHEAR VELOCITY (V*) = (g.y.S)0.5		1.06		FPS
WATER TEMPERATURE		60.0		°F
MEDIAN BED MATERIALS FALL VELOCITY(1)		0.06		FPS
V*/T		17.87		-
K1(2)		0.69		-
AVERAGE FLOW DEPTH IN CONTRACTED SECTION (Y2)	N/A	5.92	N/A	FT
CONTRACTION SCOUR (Ys = Y2 - Y0)	N/A	4.10	N/A	FT
CRITICAL VELOCITY FOR INCEPTION MOTION (Vc)	0.0	1.4	0.0	FPS
EQUATION	N/A	LIVE	N/A	-

CONTRACTION SCOUR CALCULATIONS 100-YEAR

PARAMETER	LOB	CHANNEL	ROB	UNIT
AVERAGE DEPTH OF FLOW IN U/S CHANNEL (Y1)		9.85		FT
APPROACH VELOCITY (V1)		4.83		FPS
DEPTH IN CONTRACTED SECTION BEFORE SCOUR (Y0)		1.82		FT
FLOW IN CONTRACTED SECTION (Q2)		4310.00		CFS
BOTTOM WIDTH OF CONTRACTED SECTION (W2)		114.00		FT
GRAIN SIZE (D50)		0.2000		MM
FLOW IN UPSTREAM CHANNEL (Q1)		4310.00		CFS
BOTTOM WIDTH OF MAIN CHANNEL (W1)		69.80		FT
CHANNEL SLOPE		0.004		FT/FT
SHEAR VELOCITY (V*) = (g.y.S)0.5		1.15		FPS
WATER TEMPERATURE		60.0		°F
MEDIAN BED MATERIALS FALL VELOCITY(1)		0.06		FPS
V*/T		19.45		-
K1(2)		0.69		-
AVERAGE FLOW DEPTH IN CONTRACTED SECTION (Y2)	N/A	7.02	N/A	FT
CONTRACTION SCOUR (Ys = Y2 - Y0)	N/A	5.20	N/A	FT
CRITICAL VELOCITY FOR INCEPTION MOTION (Vc)	0.0	1.4	0.0	FPS
EQUATION	N/A	LIVE	N/A	-

TOTAL SCOUR

25-YR	10.89'
100-YR	12.50'



PRINT DATE	REVISION DATE
4/21/2023	

**Jacobs** 2705 BEE CAVE RD, SUITE 300  
AUSTIN TX 78746  
FIRM REGISTRATION F-2966

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Bryan District

SCOUR DATA SHEET

FM 27 AT GRINDSTONE CREEK

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER	
6	BR 2023(408)	FM 27	
STATE	DISTRICT	COUNTY	
TEXAS	BRY	FREESTONE	
CONTROL	SECTION	JOB	SHEET NO.
0456	02	028,ETC	55





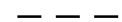


BASIN NAME	PARAMETERS	2YR	5YR	10YR	25YR	50YR	100YR
DA-01	A (SQ MI)	43.70					
	S	0.00362					
	P (IN)	42	3805	8677	12407	18625	24212
	OMEGA EM	0.258					30828

OMEGA EM REGRESSION PARAMETERS AND PEAK FLOWS (CFS)



LEGEND

-  DRAINAGE AREA I. D.
-  DRAINAGE AREA
-  EXISTING CONTOUR
-  FLOW ARROW
-  STREAM

NOTES:

1. DRAINAGE AREA DELINEATED BASED ON USGS TOPOGRAPHIC DATA.
2. REGRESSION METHOD WAS USED TO CALCULATE PEAK FLOWS PER TXDOT HYDRAULIC DESIGN MANUAL (SEPT 2019)
3. FEMA ZONE A, MAP NO 4808220005 A, EFFECTIVE SEPTEMBER 1, 2007.



PRINT DATE	REVISION DATE
4/17/2023	

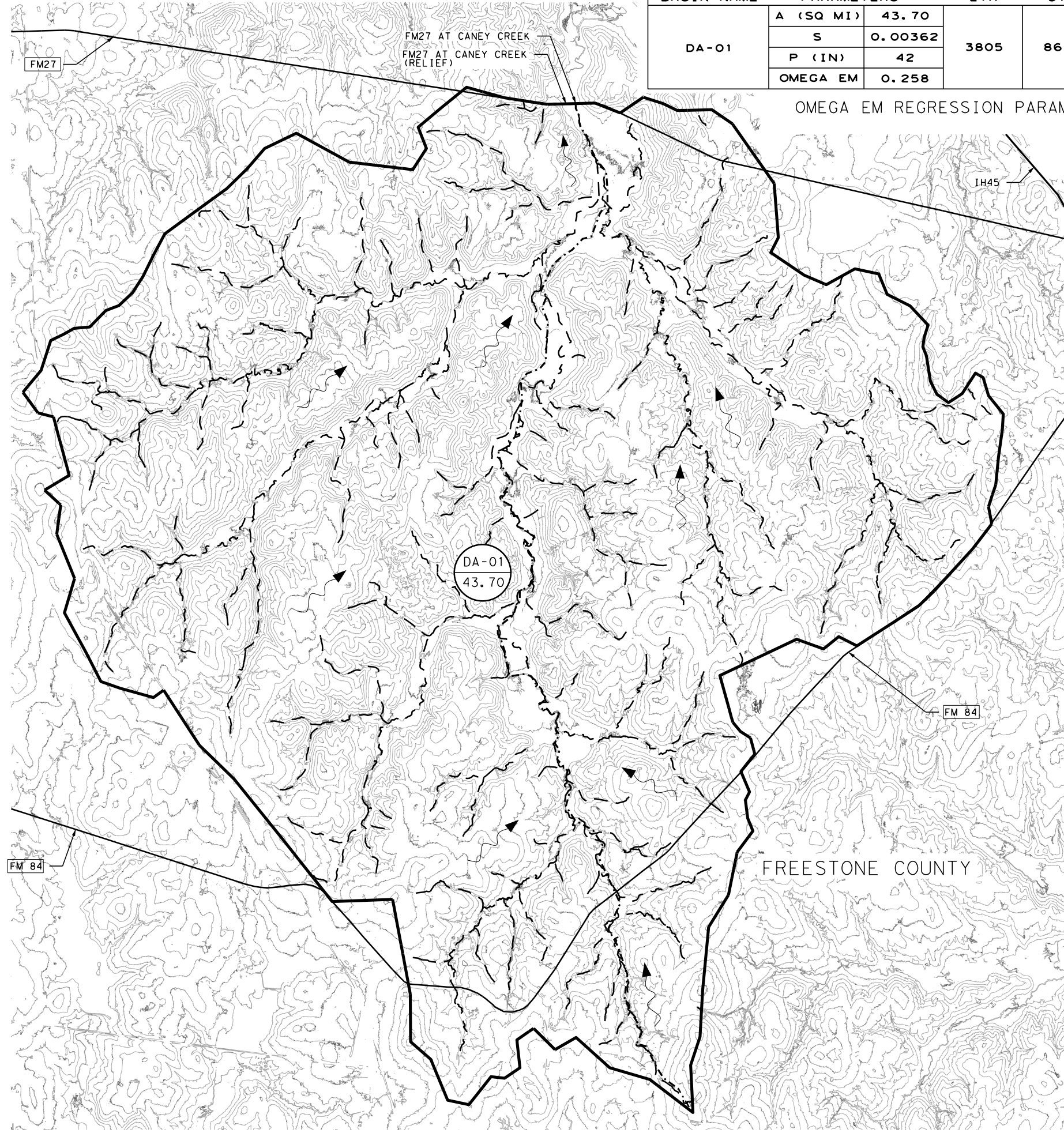
**Jacobs** 2705 BEE CAVE RD, SUITE 300  
AUSTIN TX 78746  
FIRM REGISTRATION F-2966



DRAINAGE AREA MAP  
FM 27 AT CANEY CREEK AND  
CANEY CREEK RELIEF

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER	
6	BR 2023(408)	FM 27	
STATE	DISTRICT	COUNTY	
TEXAS	BRY	FREESTONE	
CONTROL	SECTION	JOB	SHEET NO.
0456	02	028,ETC	56

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**HEC-RAS 10-YEAR BRIDGE DATA**

LOCATION	PROPOSED STRUCTURE			EXISTING STRUCTURE		
	10 YR			10 YR		
	Q	V (CHAN)	WSEL	Q	V (CHAN)	WSEL
	CFS	FPS	FT	CFS	FPS	FT
CANEY RELIEF	7417.45	6.83	341.90	7483.27	6.54	341.89
CANEY MAIN	4989.55	9.18	340.85	4923.73	6.40	341.94

**HEC-RAS 100-YEAR BRIDGE DATA**

LOCATION	PROPOSED STRUCTURE			EXISTING STRUCTURE		
	100 YR			100 YR		
	Q	V (CHAN)	WSEL	Q	V (CHAN)	WSEL
	CFS	FPS	FT	CFS	FPS	FT
CANEY RELIEF	19033.00	12.95	345.80	19903.42	2.56	347.41
CANEY MAIN	11795.00	14.15	344.45	10924.58	2.26	347.53

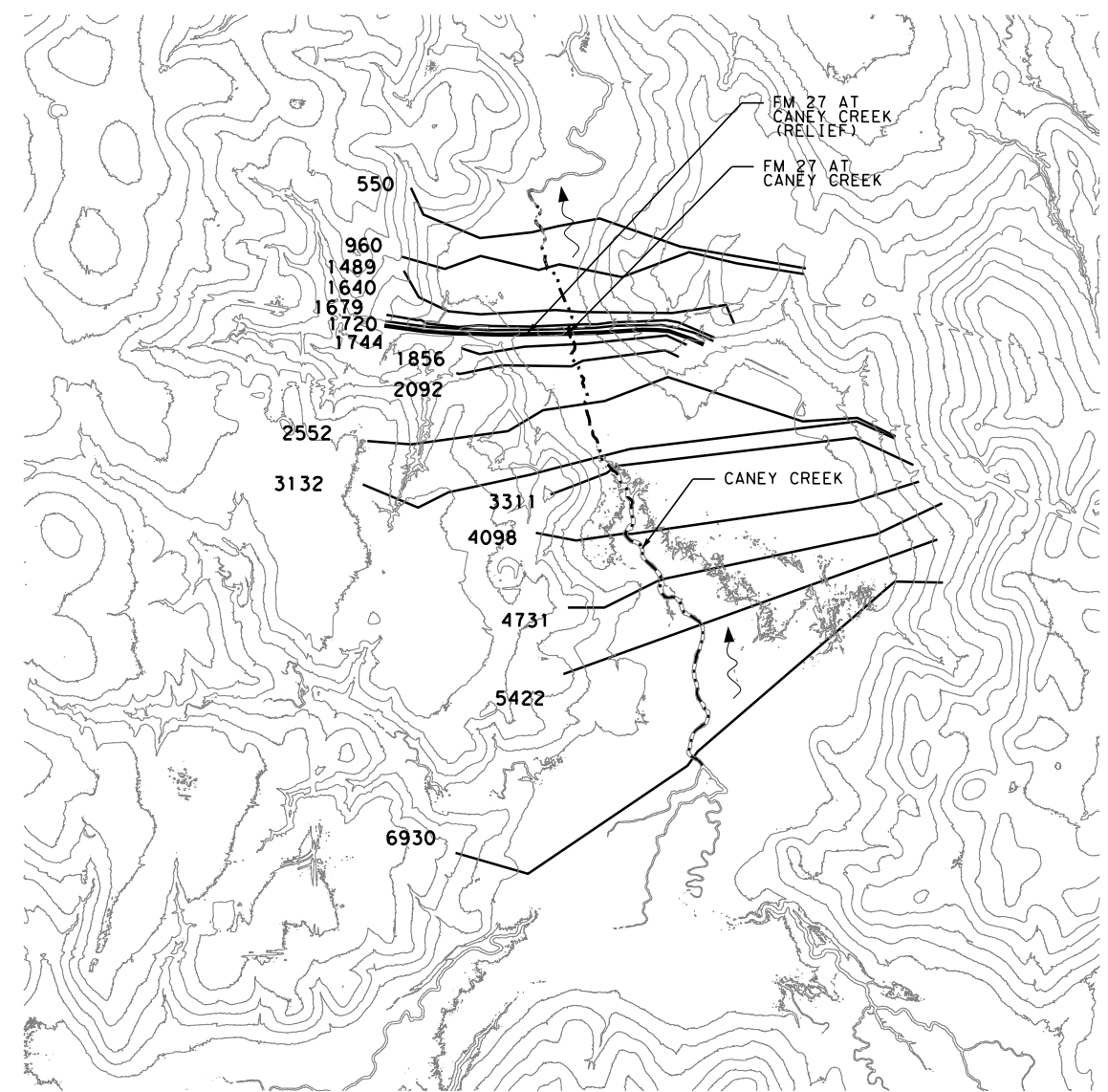
**HEC-RAS 10-YEAR COMPARISON**

RIVER STATION (FT)	LOCATION	PROPOSED STRUCTURE			RIVER STATION (FT)	EXISTING STRUCTURE			
		10 YR				10 YR			
		Q	V (CHAN)	WSEL		Q	V (CHAN)	WSEL	
		CFS	FPS	FT			CFS	FPS	FT
6930		12407	2.92	345.64	6930	12407	2.90	345.67	
5422		12407	3.37	344.62	5422	12407	3.31	344.68	
4731		12407	3.26	344.12	4731	12407	3.19	344.21	
4098		12407	2.65	343.83	4098	12407	2.58	343.94	
3311		12407	2.41	343.60	3311	12407	2.36	343.72	
3132		12407	2.66	343.54	3132	12407	2.59	343.67	
2552		12407	3.13	343.33	2552	12407	3.05	343.46	
2092		12407	5.61	342.90	2092	12407	5.44	343.07	
1856		12407	5.21	342.63	1856	12407	5.04	342.82	
1744	BR U/S XS	12407	6.67	342.02	1744	12407	6.43	342.26	
1720	FM 27 Bridge				1720	BRIDGE			
1679	BR D/S XS	12407	10.33	340.68	1679	12407	10.31	340.69	
1640		12407	10.96	340.75	1640	12407	10.96	340.75	
1489		12407	7.61	340.37	1489	12407	7.61	340.37	
960		12407	5.69	339.20	960	12407	5.69	339.20	
550		12407	5.56	338.42	550	12407	5.56	338.42	

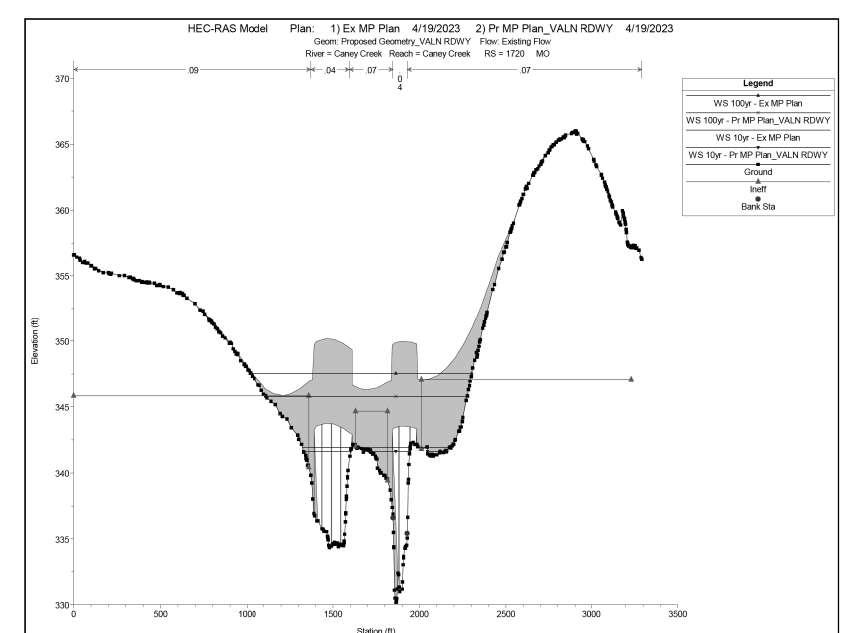
**HEC-RAS 100-YEAR COMPARISON**

RIVER STATION (FT)	LOCATION	PROPOSED STRUCTURE			RIVER STATION (FT)	EXISTING STRUCTURE			
		100 YR				100 YR			
		Q	V (CHAN)	WSEL		Q	V (CHAN)	WSEL	
		CFS	FPS	FT			CFS	FPS	FT
6930		30828	2.34	350.55	6930	30828	2.57	349.95	
5422		30828	3.05	350.22	5422	30828	3.33	349.50	
4731		30828	3.29	349.99	4731	30828	3.57	349.23	
4098		30828	2.63	349.86	4098	30828	2.85	349.07	
3311		30828	2.77	349.73	3311	30828	3.01	348.90	
3132		30828	2.93	349.69	3132	30828	3.17	348.85	
2552		30828	3.10	349.58	2552	30828	3.46	348.70	
2092		30828	6.23	349.29	2092	30828	6.85	348.32	
1856		30828	5.79	349.10	1856	30828	6.39	348.08	
1744	BR U/S XS	30828	5.45	348.97	1744	30828	6.22	347.87	
1720	FM 27 Bridge				1720	BRIDGE			
1679	BR D/S XS	30828	15.29	344.15	1679	30828	16.59	343.13	
1640		30828	14.26	343.74	1640	30828	14.26	343.74	
1489		30828	10.39	343.27	1489	30828	10.39	343.27	
960		30828	6.83	342.19	960	30828	6.83	342.19	
550		30828	7.03	341.44	550	30828	7.03	341.44	

**FM 27 AT CANEY CREEK CROSS SECTION LOCATION MAP**



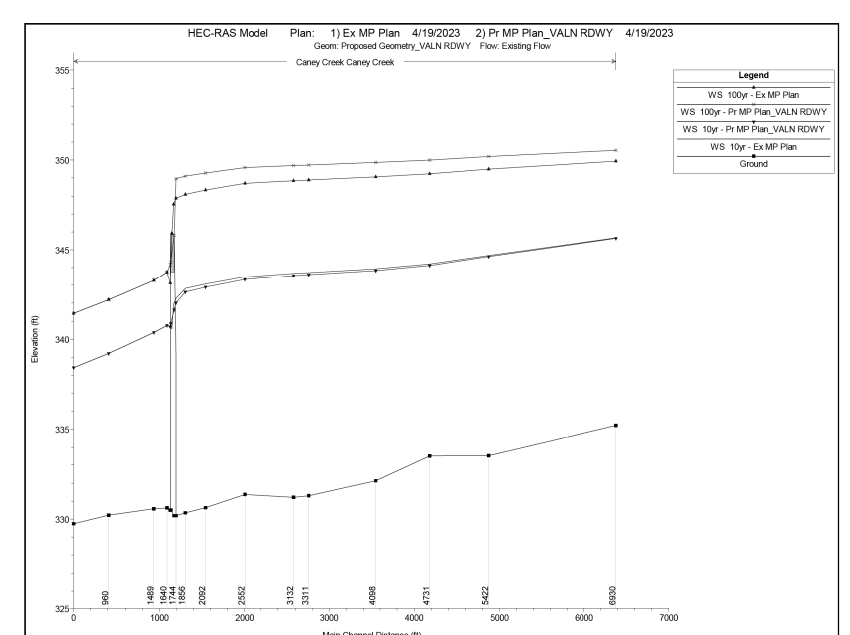
**FM 27 AT CANEY CREEK HEC-RAS CROSS SECTION COMPUTATION**



**NOTES:**

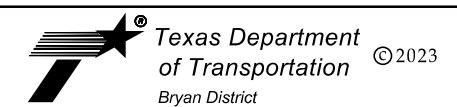
- HEC-RAS VER 5.0.7 WAS USED FOR THE HYDRAULIC ANALYSIS AND DESIGN OF THE BRIDGE. NORMAL DEPTH COMPUTATION USED FOR THE DOWNSTREAM BOUNDARY CONDITION SLOPE = 0.001815 FT/FT FOR EXISTING AND PROPOSED CONDITIONS.
- FREESTONE COUNTY FLOODPLAIN ADMINISTRATOR, LEONARD SMITH, WAS INFORMED OF THE PROPOSED PROJECT AND PROVIDED WITH A SUMMARY OF HYDRAULIC IMPACTS ON 4-27-2023.

**FM 27 AT CANEY CREEK HEC-RAS PROFILE COMPUTATION**



PRINT DATE	REVISION DATE
5/31/2023	

**Jacobs** 2705 BEE CAVE RD, SUITE 300  
AUSTIN TX 78746  
FIRM REGISTRATION F-2966



**HYDRAULIC DATA SHEET**  
**FM 27 AT CANEY CREEK AND**  
**CANEY CREEK RELIEF**

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER	
6	BR 2023(408),ETC.	FM 27	
STATE	DISTRICT	COUNTY	
TEXAS	BRY	FREESTONE	
CONTROL	SECTION	JOB	SHEET NO.
0456	02	028,ETC	57

PIER SCOUR CALCULATIONS 25-YEAR

Parameter	Value	Unit
L	9	ft
a	3.0	ft
L/a(1)	3.0	ft/ft
Angle of Attack	0.0	Degrees
K1	1.0	
K2	1.0	
K3	1.1	
Y1	11.55	ft
V1	8.44	fps
Fr	0.44	
Ys	7.42	ft

PIER SCOUR CALCULATIONS 100-YEAR

Parameter	Value	Unit
L	9	ft
a	3.0	ft
L/a(1)	3.0	ft/ft
Angle of Attack	0.0	Degrees
K1	1.0	
K2	1.0	
K3	1.1	
Y1	13.44	ft
V1	14.15	fps
Fr	0.68	
Ys	9.45	ft

NOTES:

1. UNITED STATES DEPARTMENT OF AGRICULTURE (USDA) WEB SOIL SURVEY INDICATES SILTY SAND AS THE DOMINATE SOIL TYPE.

2. D50 VALUES: MINIMUM D50 OF 0.20 MM USED AS RECOMMENDED IN THE TXDOT GEOTECHNICAL MANUAL, CHAPTER 5, SECTION 6.

CONTRACTION SCOUR CALCULATIONS 25-YEAR

PARAMETER	LOB	CHANNEL	ROB	UNIT
AVERAGE DEPTH OF FLOW IN U/S CHANNEL (Y1)		13.85		FT
APPROACH VELOCITY (V1)		6.08		FPS
DEPTH IN CONTRACTED SECTION BEFORE SCOUR (Y0)		5.80		FT
FLOW IN CONTRACTED SECTION (Q2)		6004.45		CFS
BOTTOM WIDTH OF CONTRACTED SECTION (W2)		149.00		FT
GRAIN SIZE (D50)		0.2000		MM
FLOW IN UPSTREAM CHANNEL (Q1)		6007.45		CFS
BOTTOM WIDTH OF MAIN CHANNEL (W1)		82.30		FT
CHANNEL SLOPE		0.001		FT/FT
SHEAR VELOCITY (V*) = (g.y.S)0.5		0.59		FPS
WATER TEMPERATURE		60.0		°F
MEDIAN BED MATERIALS FALL VELOCITY(1)		0.06		FPS
V*/T		9.93		-
K1(2)		0.69		-
AVERAGE FLOW DEPTH IN CONTRACTED SECTION (Y2)	N/A	9.20	N/A	FT
CONTRACTION SCOUR (Ys = Y2 - Y0)	N/A	3.40	N/A	FT
CRITICAL VELOCITY FOR INCEPTION MOTION (Vc)	0.0	1.5	0.0	FPS
EQUATION	N/A	LIVE	N/A	-

CONTRACTION SCOUR CALCULATIONS 100-YEAR

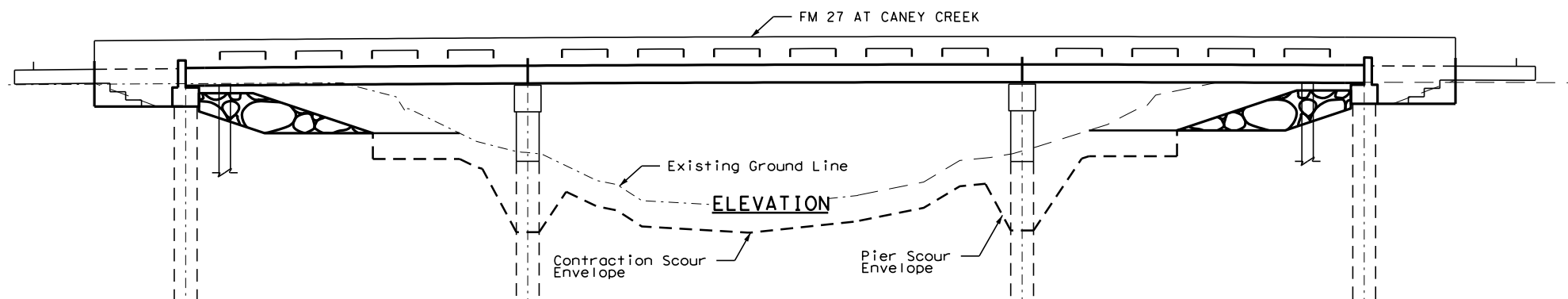
PARAMETER	LOB	CHANNEL	ROB	UNIT
AVERAGE DEPTH OF FLOW IN U/S CHANNEL (Y1)		18.75		FT
APPROACH VELOCITY (V1)		5.79		FPS
DEPTH IN CONTRACTED SECTION BEFORE SCOUR (Y0)		5.80		FT
FLOW IN CONTRACTED SECTION (Q2)		11795.00		CFS
BOTTOM WIDTH OF CONTRACTED SECTION (W2)		149.00		FT
GRAIN SIZE (D50)		0.2000		MM
FLOW IN UPSTREAM CHANNEL (Q1)		11795.00		CFS
BOTTOM WIDTH OF MAIN CHANNEL (W1)		82.30		FT
CHANNEL SLOPE		0.001		FT/FT
SHEAR VELOCITY (V*) = (g.y.S)0.5		0.69		FPS
WATER TEMPERATURE		60.0		°F
MEDIAN BED MATERIALS FALL VELOCITY(1)		0.06		FPS
V*/T		11.56		-
K1(2)		0.69		-
AVERAGE FLOW DEPTH IN CONTRACTED SECTION (Y2)	N/A	12.45	N/A	FT
CONTRACTION SCOUR (Ys = Y2 - Y0)	N/A	6.65	N/A	FT
CRITICAL VELOCITY FOR INCEPTION MOTION (Vc)	0.0	1.6	0.0	FPS
EQUATION	N/A	LIVE	N/A	-

TOTAL SCOUR

25-YR	10.81'
100-YR	16.10'



PRINT DATE	REVISION DATE
4/21/2023	



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4/21/2023 11:59:59 AM

**Jacobs** 2705 BEE CAVE RD, SUITE 300  
AUSTIN TX 78746  
FIRM REGISTRATION F-2966

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Bryan District

SCOUR DATA SHEET

FM 27 AT CANEY CREEK

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER	
6	BR 2023(408)	FM 27	
STATE	DISTRICT	COUNTY	
TEXAS	BRY	FREESTONE	
CONTROL	SECTION	JOB	SHEET NO.
0456	02	028,ETC	58



PIER SCOUR CALCULATIONS 25-YEAR

Parameter	Value	Unit
L	9	ft
a	3.0	ft
L/a(1)	3.0	ft/ft
Angle of Attack	0.0	Degrees
K1	1.0	
K2	1.0	
K3	1.1	
Y1	7.99	ft
V1	10.28	fps
Fr	0.64	
Ys	7.68	ft

PIER SCOUR CALCULATIONS 100-YEAR

Parameter	Value	Unit
L	9	ft
a	3.0	ft
L/a(1)	3.0	ft/ft
Angle of Attack	0.0	Degrees
K1	1.0	
K2	1.0	
K3	1.1	
Y1	11.45	ft
V1	12.95	fps
Fr	0.67	
Ys	8.90	ft

NOTES:

- UNITED STATES DEPARTMENT OF AGRICULTURE (USDA) WEB SOIL SURVEY INDICATES SILTY SAND AS THE DOMINATE SOIL TYPE.
- D50 VALUES: MINIMUM D50 OF 0.20 MM USED AS RECOMMENDED IN THE TxDOT GEOTECHNICAL MANUAL, CHAPTER 5, SECTION 6.

CONTRACTION SCOUR CALCULATIONS 25-YEAR

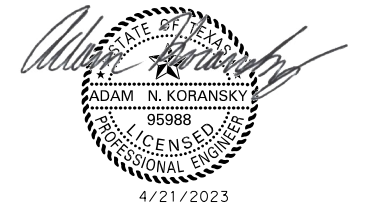
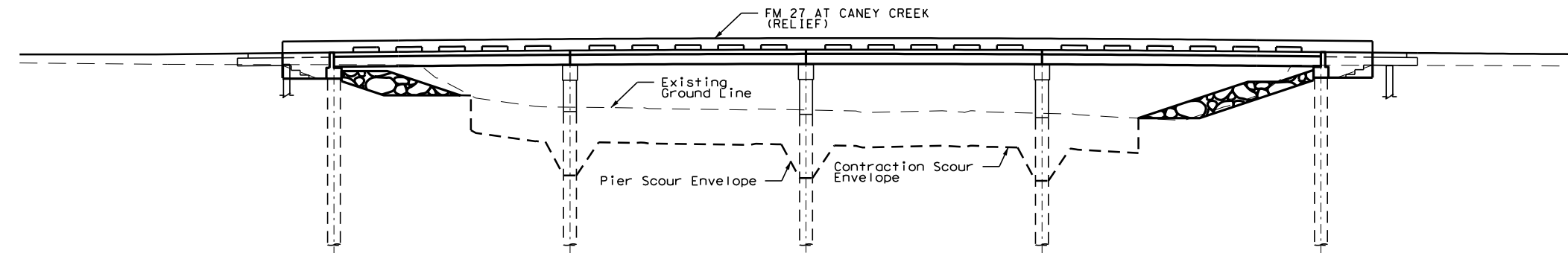
PARAMETER	LOB	CHANNEL	ROB	UNIT
AVERAGE DEPTH OF FLOW IN U/S CHANNEL (Y1)		13.85		FT
APPROACH VELOCITY (V1)		6.08		FPS
DEPTH IN CONTRACTED SECTION BEFORE SCOUR (Y0)		5.80		FT
FLOW IN CONTRACTED SECTION (Q2)		12617.55		CFS
BOTTOM WIDTH OF CONTRACTED SECTION (W2)		221.00		FT
GRAIN SIZE (D50)		0.2000		MM
FLOW IN UPSTREAM CHANNEL (Q1)		12617.55		CFS
BOTTOM WIDTH OF MAIN CHANNEL (W1)		223.20		FT
CHANNEL SLOPE		0.001		FT/FT
SHEAR VELOCITY (V*) = (g.y.S)0.5		0.59		FPS
WATER TEMPERATURE		60.0		°F
MEDIAN BED MATERIALS FALL VELOCITY(1)		0.06		FPS
V*/T		9.93		-
K1(2)		0.69		-
AVERAGE FLOW DEPTH IN CONTRACTED SECTION (Y2)	N/A	13.94	N/A	FT
CONTRACTION SCOUR (Ys = Y2 - Y0)	N/A	8.14	N/A	FT
CRITICAL VELOCITY FOR INCEPTION MOTION (Vc)	0.0	1.5	0.0	FPS
EQUATION	N/A	LIVE	N/A	-

CONTRACTION SCOUR CALCULATIONS 100-YEAR

PARAMETER	LOB	CHANNEL	ROB	UNIT
AVERAGE DEPTH OF FLOW IN U/S CHANNEL (Y1)		18.75		FT
APPROACH VELOCITY (V1)		5.79		FPS
DEPTH IN CONTRACTED SECTION BEFORE SCOUR (Y0)		5.80		FT
FLOW IN CONTRACTED SECTION (Q2)		19033.00		CFS
BOTTOM WIDTH OF CONTRACTED SECTION (W2)		221.00		FT
GRAIN SIZE (D50)		0.2000		MM
FLOW IN UPSTREAM CHANNEL (Q1)		19033.00		CFS
BOTTOM WIDTH OF MAIN CHANNEL (W1)		223.20		FT
CHANNEL SLOPE		0.001		FT/FT
SHEAR VELOCITY (V*) = (g.y.S)0.5		0.69		FPS
WATER TEMPERATURE		60.0		OF
MEDIAN BED MATERIALS FALL VELOCITY(1)		0.06		FPS
V*/T		11.56		-
K1(2)		0.69		-
AVERAGE FLOW DEPTH IN CONTRACTED SECTION (Y2)	N/A	18.88	N/A	FT
CONTRACTION SCOUR (Ys = Y2 - Y0)	N/A	13.08	N/A	FT
CRITICAL VELOCITY FOR INCEPTION MOTION (Vc)	0.0	1.6	0.0	FPS
EQUATION	N/A	LIVE	N/A	-

TOTAL SCOUR

25-YR	15.83'
100-YR	21.98'



PRINT DATE	REVISION DATE
4/21/2023	

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FIRM REGISTRATION F-2966

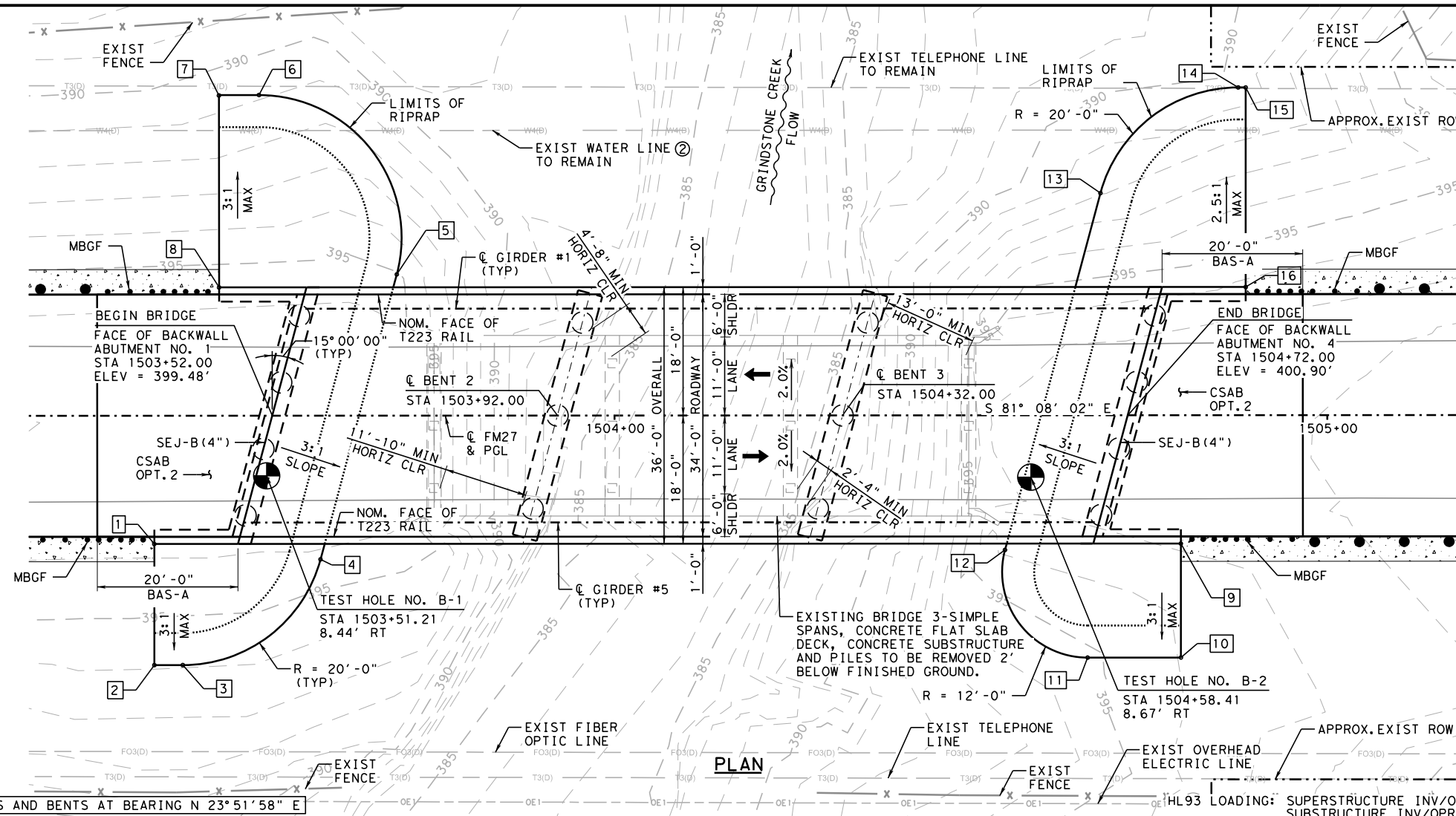
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Bryan District

SCOUR DATA SHEET

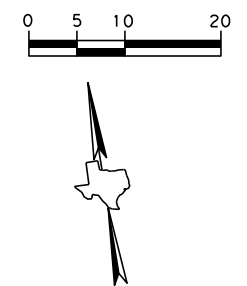
FM 27 AT CANEY CREEK (RELIEF)

SHEET 2 OF 2 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER	
6	BR 2023(408)	FM 27	
STATE	DISTRICT	COUNTY	
TEXAS	BRY	FREESTONE	
CONTROL	SECTION	JOB	SHEET NO.
0456	02	028,ETC	59



RIPRAP CONTROL DATA ①		
POINT	STA	OFFSET (FT)
1	1503+35.44	18.00 RT
2	1503+35.44	35.00 RT
3	1503+39.44	35.00 RT
4	1503+58.76	20.18 RT
5	1503+69.48	19.82 LT
6	1503+50.16	45.00 LT
7	1503+44.56	45.00 LT
8	1503+44.56	18.00 LT
9	1504+79.44	18.00 RT
10	1504+79.44	34.00 RT
11	1504+66.36	34.00 RT
12	1504+54.77	18.89 RT
13	1504+68.19	31.18 LT
14	1504+87.51	46.00 LT
15	1504+88.56	46.00 LT
16	1504+88.56	18.00 LT

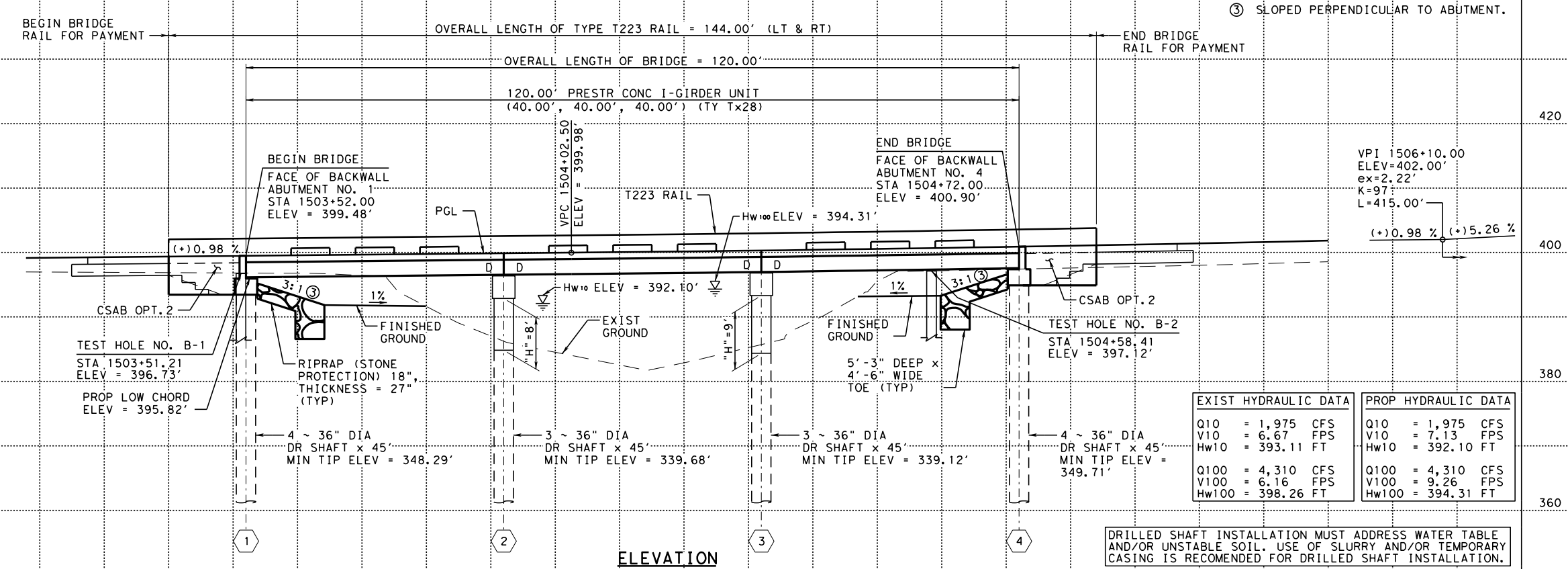


- ① RIPRAP CONTROL DATA IS APPROXIMATE AND MAY NEED TO BE ADJUSTED IN THE FIELD.
- ② NOTIFY KIRVIN WATER SUPPLY AT 903-599-2319 THIRTY (30) DAYS PRIOR TO THE SIDE SLOPE GRADING AND PLACEMENT OF THE STONE RIPRAP TO ENSURE THE WATER LINE IS TURNED OFF DURING CONSTRUCTION, AS NEEDED.

- GENERAL NOTES:
- DESIGNED ACCORDING TO AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, 9TH EDITION (2020) AND TxDOT BRIDGE DESIGN MANUAL (JAN 2023).
  - BRIDGE NOT DESIGNED FOR OVERLAY.
  - "D" DENOTES DOWELS IN THE OUTSIDE GIRDERS UNLESS SPECIFIED OTHERWISE ON THE BENT DETAIL SHEETS.
  - ALL DIMENSIONS ARE EITHER HORIZONTAL OR VERTICAL AND MUST BE CORRECTED FOR GRADE AND CROSS SLOPE.
  - COLUMN HEIGHTS ("H") SHOWN ARE CALCULATED AT THE PROFILE GRADE LINE (PGL), ACTUAL COLUMN HEIGHTS WILL BE MEASURED IN THE FIELD PRIOR TO ORDERING MATERIALS.
  - CONTRACTOR TO VERIFY LOCATION AND STATUS OF ALL UTILITIES SHOWN AND THOSE NOT IDENTIFIED PRIOR TO CONSTRUCTION.
  - CONTRACTOR MUST FIELD VERIFY ALL EXISTING ABUTMENT AND BENT LOCATIONS, DIMENSIONS, AND ELEVATIONS PRIOR TO FABRICATION OF I-GIRDERS.
  - SEE "TYPICAL TRANSVERSE SECTION" SHEET FOR TYPICAL SECTION.
  - SEE "TEST HOLE DATA" SHEET FOR TEST HOLE DATA.
  - FOUND DRILLED SHAFTS AT THE ELEVATION SHOWN OR DEEPER TO OBTAIN A MINIMUM 3.0 DRILLED SHAFT DIAMETER PENETRATION INTO VERY DENSE GRAY SAND, VERY DENSE GRAY SILT, AND/OR VERY HARD GRAY CLAY.

ABUTMENTS AND BENTS AT BEARING N 23° 51' 58" E

HL93 LOADING: SUPERSTRUCTURE INV/OPR RATING = 1.78/2.31  
SUBSTRUCTURE INV/OPR RATING = SUBSTRUCTURE NOT RATED



FUNCTIONAL CLASS: MAJOR COLLECTOR  
DESIGN SPEED: 50 MPH  
ADT : 522 (2020); 731 (2040)  
EXIST NBI: 17-082-0-0456-02-013  
PROP NBI: 17-082-0-0456-02-196



VPI 1506+10.00  
ELEV=402.00'  
ex=2.22'  
K=97'  
L=415.00'

(+)0.98% (+)5.26%

EXIST HYDRAULIC DATA		PROP HYDRAULIC DATA	
Q10 = 1,975 CFS	V10 = 6.67 FPS	Q10 = 1,975 CFS	V10 = 7.13 FPS
Hw10 = 393.11 FT		Hw10 = 392.10 FT	
Q100 = 4,310 CFS	V100 = 6.16 FPS	Q100 = 4,310 CFS	V100 = 9.26 FPS
Hw100 = 398.26 FT		Hw100 = 394.31 FT	

DRILLED SHAFT INSTALLATION MUST ADDRESS WATER TABLE AND/OR UNSTABLE SOIL. USE OF SLURRY AND/OR TEMPORARY CASING IS RECOMMENDED FOR DRILLED SHAFT INSTALLATION.

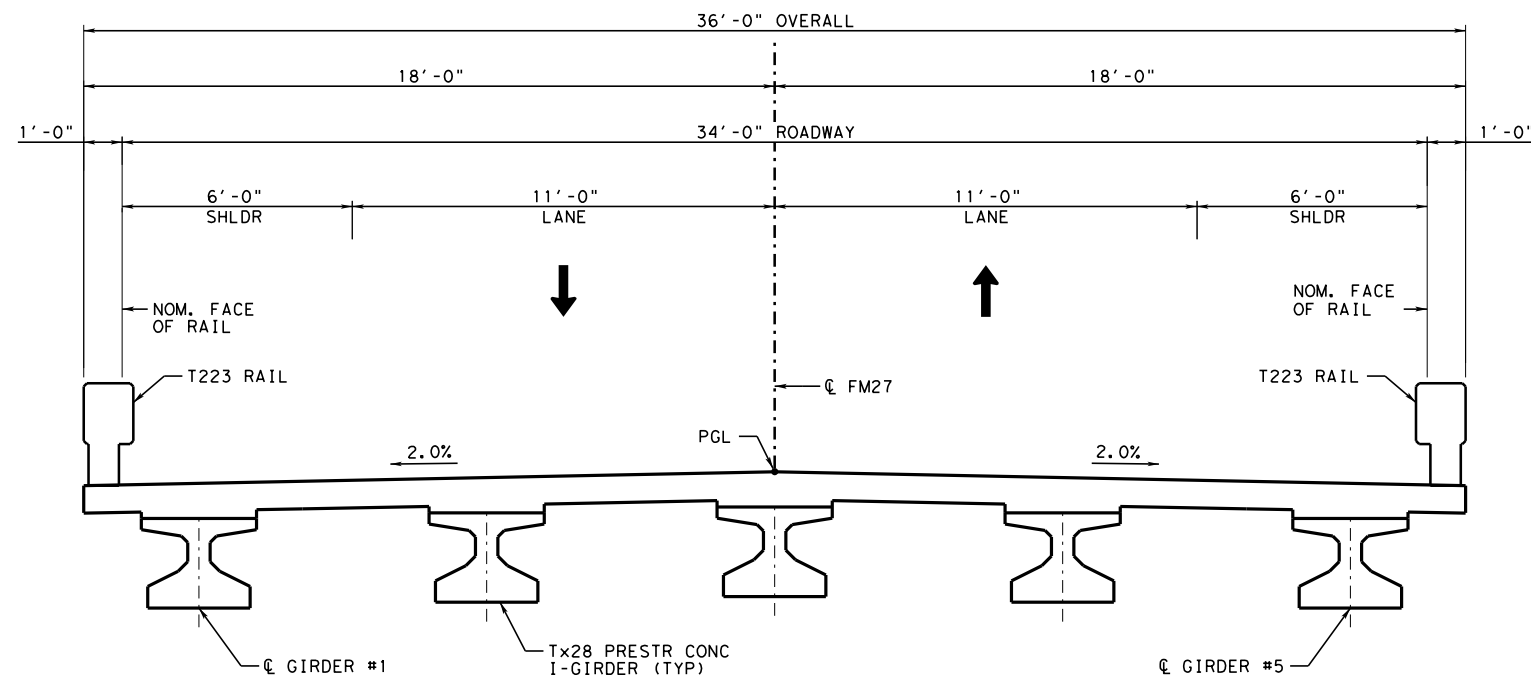
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**BRIDGE LAYOUT**  
GRINDSTONE CREEK BRIDGE

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER	
6	BR 2023(408),ETC.	FM 27	
STATE	DISTRICT	COUNTY	
TEXAS	BRY	FREESTONE	
CONTROL	SECTION	JOB	SHEET NO.
0456	02	028,ETC	60



TYPICAL TRANSVERSE SECTION  
N. T. S.



4/26/2023

HL93 LOADING

PRINT DATE	REVISION DATE
4/26/2023	

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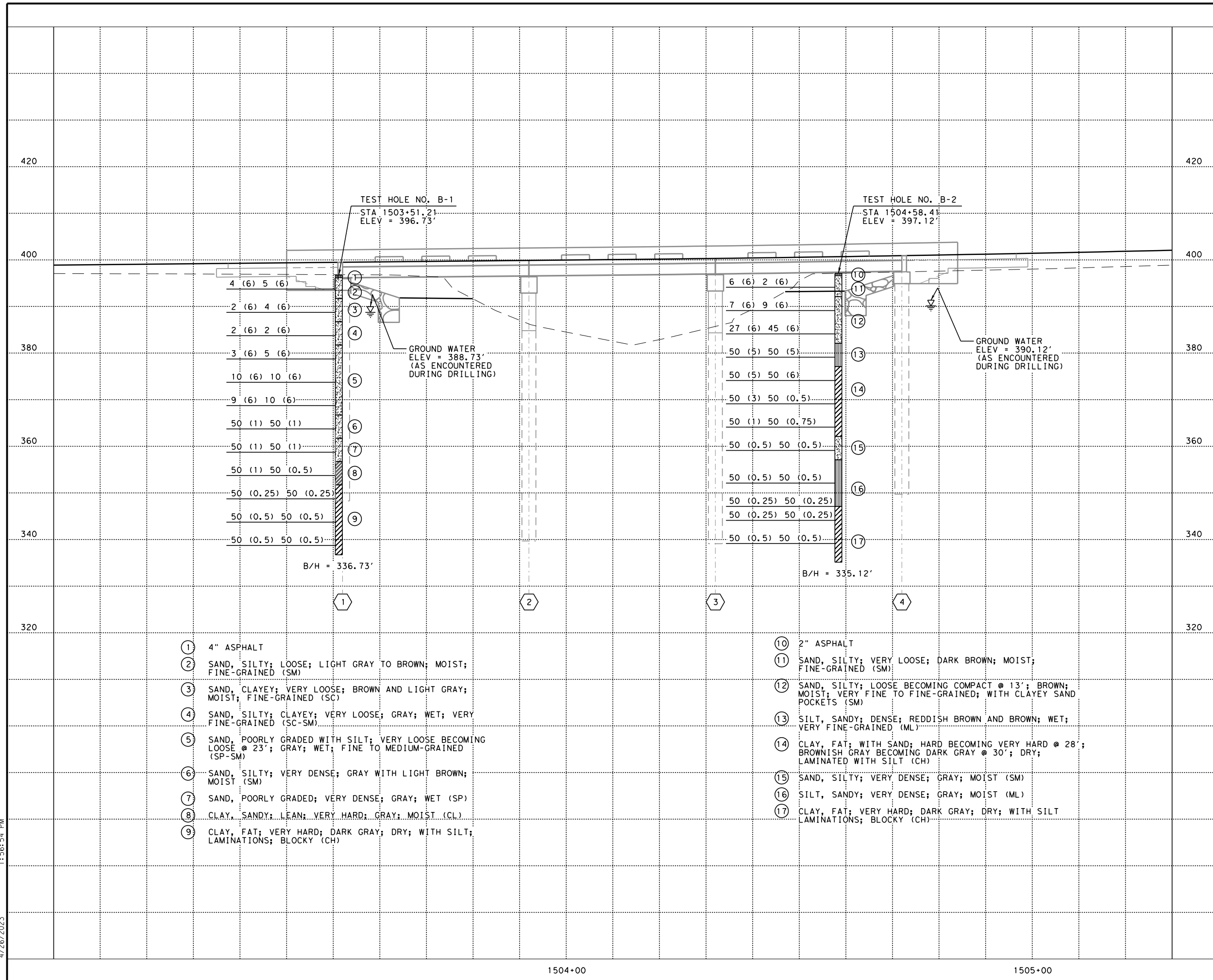


TYPICAL TRANSVERSE SECTION

GRINDSTONE CREEK BRIDGE

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER	
6	BR 2023(408),ETC.	FM 27	
STATE	DISTRICT	COUNTY	
TEXAS	BRY	FREESTONE	
CONTROL	SECTION	JOB	SHEET NO.
0456	02	028,ETC	61

TEST HOLE DATA IS A REPRODUCTION OF THE DRILLING LOGS FROM A GEOTECHNICAL INVESTIGATION BY Ettl ENGINEERS & CONSULTANTS INC. DATED JUNE 24, 2021 THROUGH JUNE 26, 2021.



- ① 4" ASPHALT
- ② SAND, SILTY; LOOSE; LIGHT GRAY TO BROWN; MOIST; FINE-GRAINED (SM)
- ③ SAND, CLAYEY; VERY LOOSE; BROWN AND LIGHT GRAY; MOIST; FINE-GRAINED (SC)
- ④ SAND, SILTY; CLAYEY; VERY LOOSE; GRAY; WET; VERY FINE-GRAINED (SC-SM)
- ⑤ SAND, POORLY GRADED WITH SILT; VERY LOOSE BECOMING LOOSE @ 23'; GRAY; WET; FINE TO MEDIUM-GRAINED (SP-SM)
- ⑥ SAND, SILTY; VERY DENSE; GRAY WITH LIGHT BROWN; MOIST (SM)
- ⑦ SAND, POORLY GRADED; VERY DENSE; GRAY; WET (SP)
- ⑧ CLAY, SANDY; LEAN; VERY HARD; GRAY; MOIST (CL)
- ⑨ CLAY, FAT; VERY HARD; DARK GRAY; DRY; WITH SILT; LAMINATIONS; BLOCKY (CH)

- ⑩ 2" ASPHALT
- ⑪ SAND, SILTY; VERY LOOSE; DARK BROWN; MOIST; FINE-GRAINED (SM)
- ⑫ SAND, SILTY; LOOSE BECOMING COMPACT @ 13'; BROWN; MOIST; VERY FINE TO FINE-GRAINED; WITH CLAYEY SAND POCKETS (SM)
- ⑬ SILT, SANDY; DENSE; REDDISH BROWN AND BROWN; WET; VERY FINE-GRAINED (ML)
- ⑭ CLAY, FAT; WITH SAND; HARD BECOMING VERY HARD @ 28'; BROWNISH GRAY BECOMING DARK GRAY @ 30'; DRY; LAMINATED WITH SILT (CH)
- ⑮ SAND, SILTY; VERY DENSE; GRAY; MOIST (SM)
- ⑯ SILT, SANDY; VERY DENSE; GRAY; MOIST (ML)
- ⑰ CLAY, FAT; VERY HARD; DARK GRAY; DRY; WITH SILT LAMINATIONS; BLOCKY (CH)



HL93 LOADING PRINT DATE: 4/26/2023 REVISION DATE:

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AUSTIN TX 78746  
FIRM REGISTRATION F-2966

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TEST HOLE DATA

GRINDSTONE CREEK BRIDGE

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6	BR 2023(408),ETC.	FM 27
STATE	DISTRICT	COUNTY
TEXAS	BRY	FREESTONE
CONTROL	SECTION	JOB SHEET NO.
0456	02	028,ETC 62

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1504+00

1505+00

**SUMMARY OF ESTIMATED QUANTITIES**

BID ITEM NUMBER	400-6005	402-6001	416-6004	420-6013	420-6029	420-6037	422-6001	422-6015	425-6035	432-6033	450-6006	454-6020	4171-6001
BRIDGE ELEMENT BID ITEM DESCRIPTION	CEM STABIL BKFL	TRENCH EXCAVATION PROTECTION	DRILL SHAFT (36 IN)	CL "C" CONC (ABUT)	CL "C" CONC (CAP)	CL "C" CONC (COLUMN)	REINF CONC SLAB	APPROACH SLAB	PRESTR CONC GIRDER (T x 28)	RIPRAP (STONE PROTECTION) (18 IN)	RAIL (TY T223)	SEALED EXPANSION JOINT (4 IN) (SEJ - B)	INSTALL BRIDGE IDENTIFICATION NUMBERS
	CY	LF	LF	CY	CY	CY	SF	CY	LF	CY	LF	LF	EA
2 ~ ABUTMENTS	173	215	360	46.0				66.9		368	48.0	74	
2 ~ INTERIOR BENTS			270		33.0	13.4							
1 ~ 120.00' PRESTR CONC I-GIRDER UNIT							4,320		592.45		240.0		
<b>TOTAL</b>	<b>173</b>	<b>215</b>	<b>630</b>	<b>46.0</b> (1)	<b>33.0</b> (2)	<b>13.4</b>	<b>4,320</b>	<b>66.9</b>	<b>592.45</b> (3)	<b>368</b>	<b>288.0</b>	<b>74</b>	<b>2</b>

- ① QUANTITY INCLUDES 0.6 CY FOR SHEAR KEYS. SEE ABUTMENT STANDARD (AIG-34-15) AND SHEAR KEY DETAILS FOR I-GIRDERS STANDARD (IGSK) FOR SHEAR KEY LOCATION, DETAILS AND NOTES.
- ② QUANTITY INCLUDES 1.0 CY FOR SHEAR KEYS. SEE BENT STANDARD (BIG-34-15) AND SHEAR KEY DETAILS FOR I-GIRDERS STANDARD (IGSK) FOR SHEAR KEY LOCATION, DETAILS AND NOTES.
- ③ LENGTHS SHOWN ARE BOTTOM GIRDER FLANGE LENGTHS WITH ADJUSTMENTS MADE FOR GIRDER SLOPE.

**BEARING SEAT ELEVATIONS**

	GIRDER 1	GIRDER 2	GIRDER 3	GIRDER 4	GIRDER 5
ABUT 1 (FWD)	395.670	395.800	395.931	395.761	395.591
	GIRDER 1	GIRDER 2	GIRDER 3	GIRDER 4	GIRDER 5
BENT 2 (BK)	396.040	396.171	396.301	396.131	395.962
(FWD)	396.060	396.190	396.320	396.151	395.981
	GIRDER 1	GIRDER 2	GIRDER 3	GIRDER 4	GIRDER 5
BENT 3 (BK)	396.485	396.609	396.733	396.558	396.383
(FWD)	396.511	396.635	396.759	396.583	396.408
	GIRDER 1	GIRDER 2	GIRDER 3	GIRDER 4	GIRDER 5
ABUT 4 (BK)	397.092	397.207	397.323	397.140	396.956



4/26/2023  
FOR BEARING SEAT ELEVATIONS ONLY

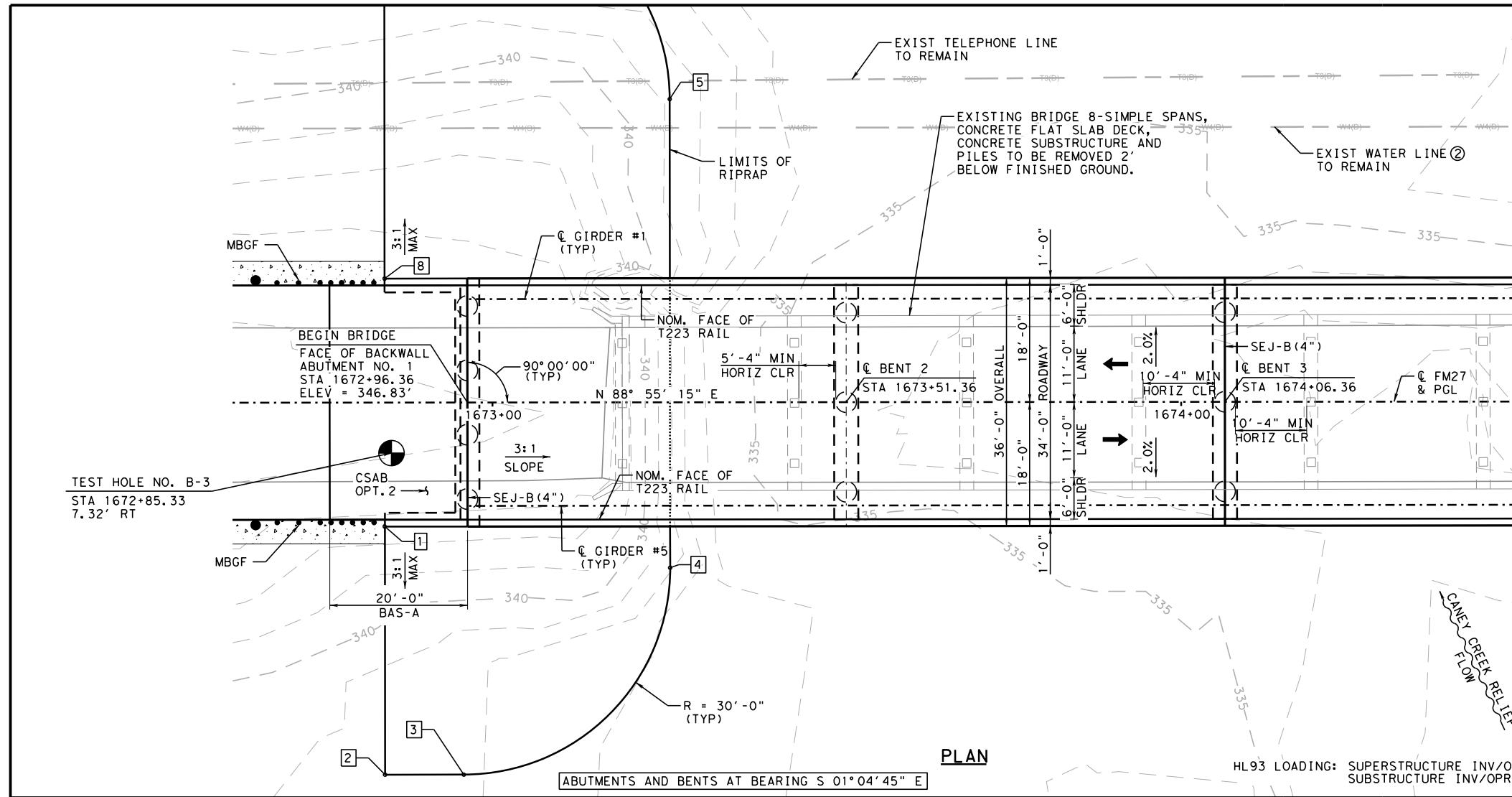
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4/26/2023	

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FIRM REGISTRATION F-2966

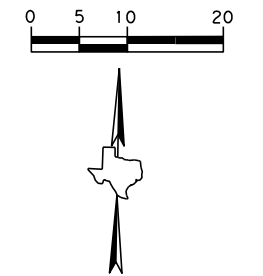


**ESTIMATED QUANTITIES AND BEARING SEAT ELEVATIONS**  
GRINDSTONE CREEK BRIDGE

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER	
6	BR 2023(408),ETC.	FM 27	
STATE	DISTRICT	COUNTY	
TEXAS	BRY	FREESTONE	
CONTROL	SECTION	JOB	SHEET NO.
0456	02	028,ETC	63



RIPRAP CONTROL DATA ①		
POINT	STA	OFFSET (FT)
1	1672+84.36	18.00 RT
2	1672+84.36	54.00 RT
3	1672+95.78	54.00 RT
4	1673+25.78	24.00 RT
5	1673+25.78	44.00 LT
6	1672+95.78	74.00 LT
7	1672+84.36	74.00 LT
8	1672+84.36	18.00 LT



NOTE: SEE RIPRAP CONTROL POINT NUMBERING SHEET FOR TYPICAL POINT NUMBERING ORDER.

① RIPRAP CONTROL DATA IS APPROXIMATE AND MAY NEED TO BE ADJUSTED IN THE FIELD.

② NOTIFY KIRVIN WATER SUPPLY AT 903-599-2319 THIRTY (30) DAYS PRIOR TO THE SIDE SLOPE GRADING AND PLACEMENT OF THE STONE RIPRAP TO ENSURE THE WATER LINE IS TURNED OFF DURING CONSTRUCTION, AS NEEDED.

- GENERAL NOTES:
- DESIGNED ACCORDING TO AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, 9TH EDITION (2020) AND TxDOT BRIDGE DESIGN MANUAL (JAN 2023).
  - BRIDGE NOT DESIGNED FOR OVERLAY.
  - "D" DENOTES DOWELS IN THE OUTSIDE GIRDERS UNLESS SPECIFIED OTHERWISE ON THE BENT DETAIL SHEETS.
  - ALL DIMENSIONS ARE EITHER HORIZONTAL OR VERTICAL AND MUST BE CORRECTED FOR GRADE AND CROSS SLOPE.
  - COLUMN HEIGHTS ("H") SHOWN ARE CALCULATED AT THE PROFILE GRADE LINE (PGL), ACTUAL COLUMN HEIGHTS WILL BE MEASURED IN THE FIELD PRIOR TO ORDERING MATERIALS.
  - CONTRACTOR TO VERIFY LOCATION AND STATUS OF ALL UTILITIES SHOWN AND THOSE NOT IDENTIFIED PRIOR TO CONSTRUCTION.
  - CONTRACTOR MUST FIELD VERIFY ALL EXISTING ABUTMENT AND BENT LOCATIONS, DIMENSIONS, AND ELEVATIONS PRIOR TO FABRICATION OF I-GIRDERS.
  - SEE "TYPICAL TRANSVERSE SECTION" SHEET FOR TYPICAL SECTION.
  - SEE "TEST HOLE DATA" SHEET FOR TEST HOLE DATA.
  - FOUND DRILLED SHAFTS AT THE ELEVATION SHOWN OR DEEPER TO OBTAIN A MINIMUM 3.0 DRILLED SHAFT DIAMETER PENETRATION INTO VERY DENSE GRAY SAND, VERY DENSE GRAY SILT, AND/OR VERY HARD GRAY CLAY.

HL93 LOADING: SUPERSTRUCTURE INV/OPR RATING = 1.17/1.78  
SUBSTRUCTURE INV/OPR RATING = SUBSTRUCTURE NOT RATED

FUNCTIONAL CLASS: MAJOR COLLECTOR  
DESIGN SPEED: 50 MPH  
ADT: 522 (2020); 731 (2040)  
EXIST NBI: 17-082-0-0456-02-014  
PROP NBI: 17-082-0-0456-02-197



PRINT DATE	REVISION DATE
4/26/2023	

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FIRM REGISTRATION F-2966

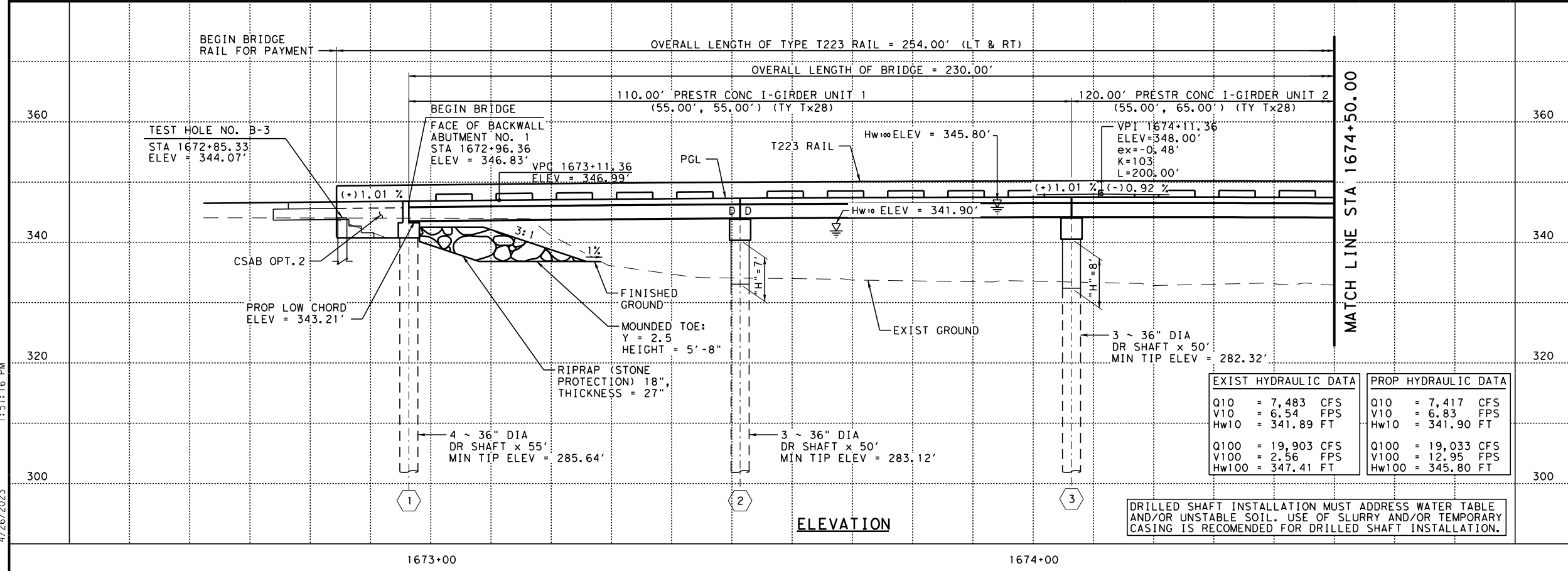
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Bryan District

BRIDGE LAYOUT

CANEY CREEK RELIEF BRIDGE

SHEET 1 OF 2

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER	
6	BR 2023(408),ETC.	FM 27	
STATE	DISTRICT	COUNTY	
TEXAS	BRY	FREESTONE	
CONTROL	SECTION	JOB	SHEET NO.
0456	02	028,ETC	64

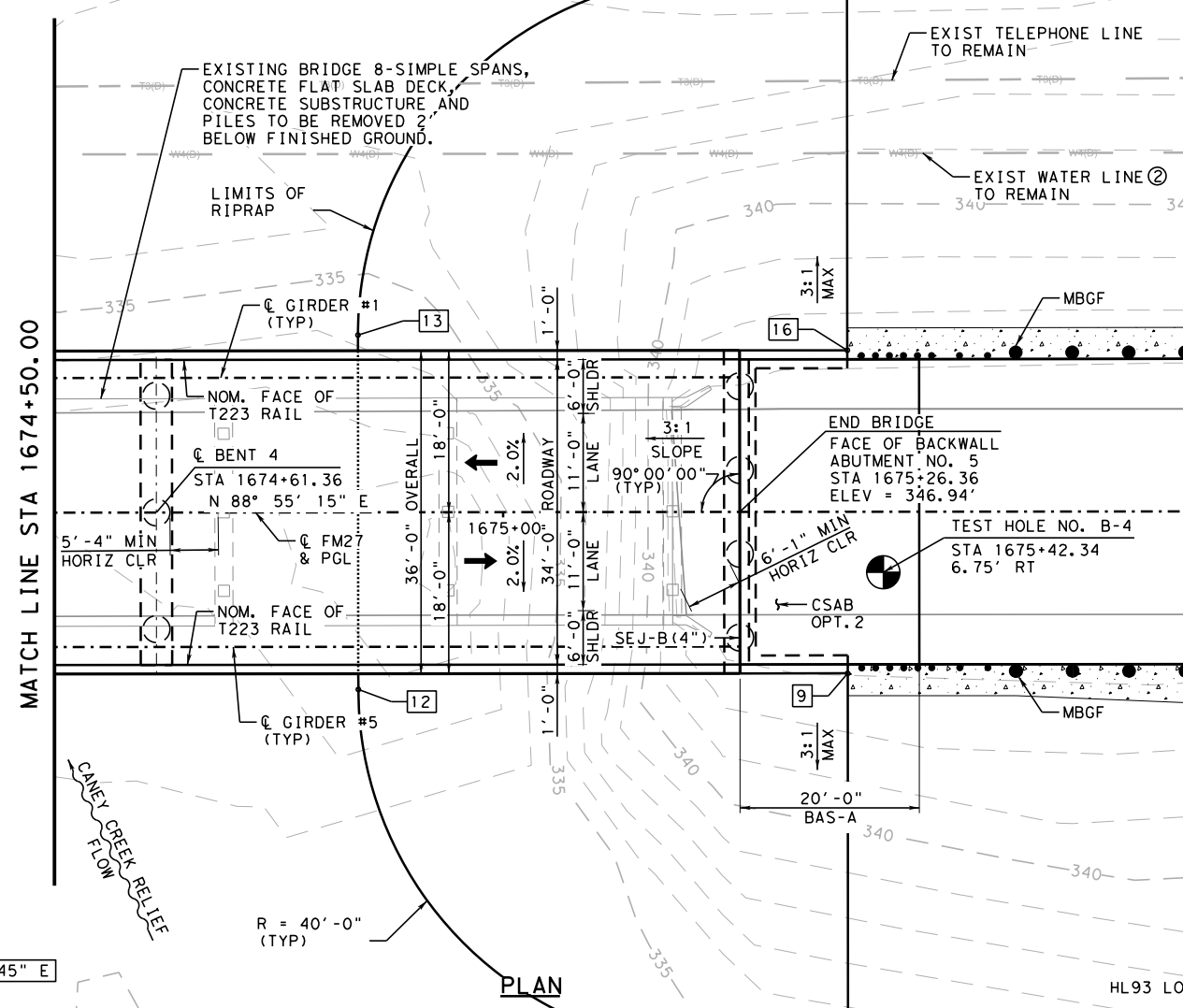


EXIST HYDRAULIC DATA		PROP HYDRAULIC DATA	
Q10	= 7,483 CFS	Q10	= 7,417 CFS
V10	= 6.54 FPS	V10	= 6.83 FPS
Hw10	= 341.89 FT	Hw10	= 341.90 FT
Q100	= 19,903 CFS	Q100	= 19,033 CFS
V100	= 2.56 FPS	V100	= 12.95 FPS
Hw100	= 347.41 FT	Hw100	= 345.80 FT

DRILLED SHAFT INSTALLATION MUST ADDRESS WATER TABLE AND/OR UNSTABLE SOIL. USE OF SLURRY AND/OR TEMPORARY CASING IS RECOMENDED FOR DRILLED SHAFT INSTALLATION.

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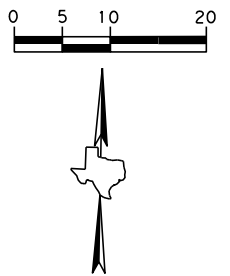




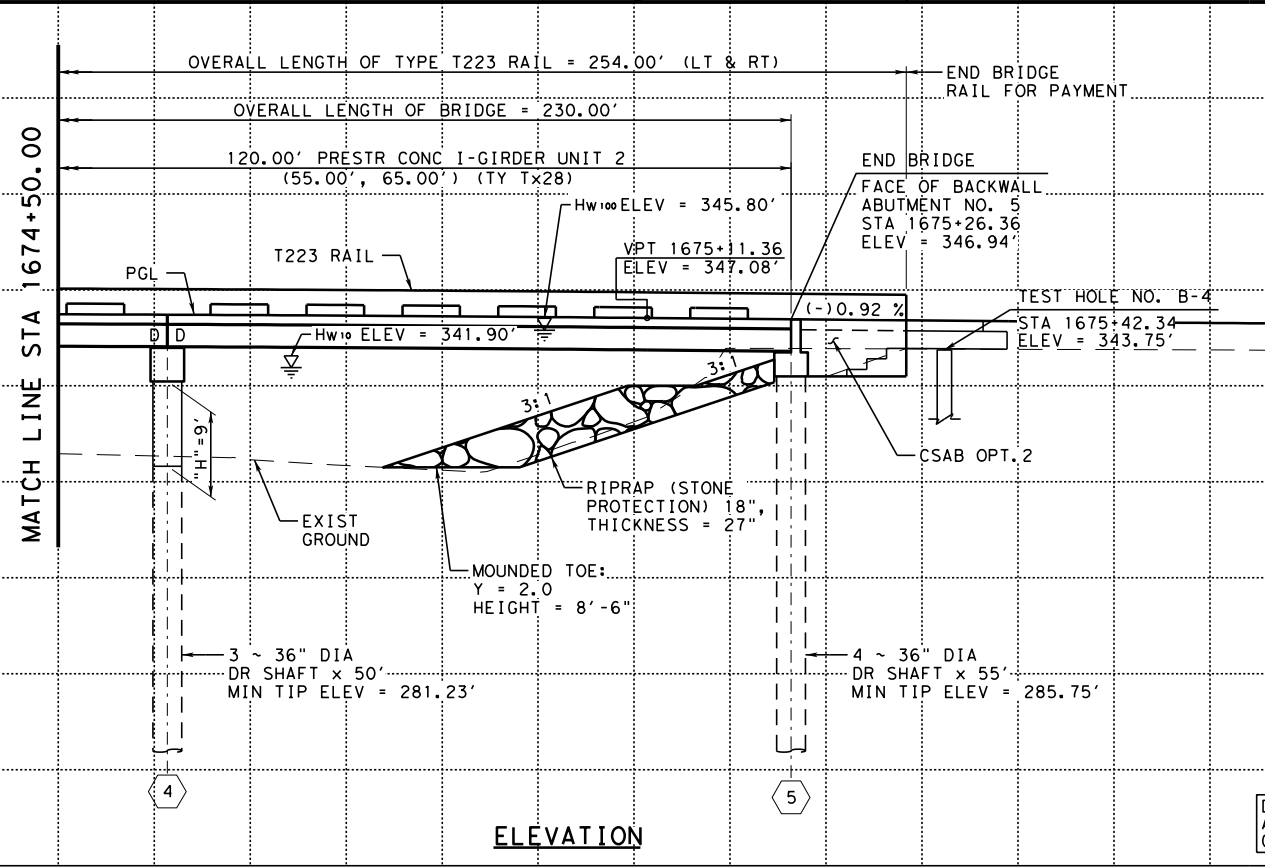
POINT	STA	OFFSET (FT)
9	1675+38.36	18.00 RT
10	1675+38.36	59.75 RT
11	1675+23.84	59.75 RT
12	1674+83.84	19.75 RT
13	1674+83.84	19.75 LT
14	1675+23.84	59.75 LT
15	1675+38.36	59.75 LT
16	1675+38.36	18.00 LT

NOTE: SEE RIPRAP CONTROL POINT NUMBERING SHEET FOR TYPICAL POINT NUMBERING ORDER.

- ① RIPRAP CONTROL DATA IS APPROXIMATE AND MAY NEED TO BE ADJUSTED IN THE FIELD.
- ② NOTIFY KIRVIN WATER SUPPLY AT 903-599-2319 THIRTY (30) DAYS PRIOR TO THE SIDE SLOPE GRADING AND PLACEMENT OF THE STONE RIPRAP TO ENSURE THE WATER LINE IS TURNED OFF DURING CONSTRUCTION, AS NEEDED.



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EXIST HYDRAULIC DATA		PROP HYDRAULIC DATA	
Q10 = 7,483 CFS	V10 = 6.54 FPS	Q10 = 7,417 CFS	V10 = 6.83 FPS
Hw10 = 341.89 FT		Hw10 = 341.90 FT	
Q100 = 19,903 CFS	V100 = 2.56 FPS	Q100 = 19,033 CFS	V100 = 12.95 FPS
Hw100 = 347.41 FT		Hw100 = 345.80 FT	

DRILLED SHAFT INSTALLATION MUST ADDRESS WATER TABLE AND/OR UNSTABLE SOIL. USE OF SLURRY AND/OR TEMPORARY CASING IS RECOMMENDED FOR DRILLED SHAFT INSTALLATION.



PRINT DATE	REVISION DATE
4/26/2023	

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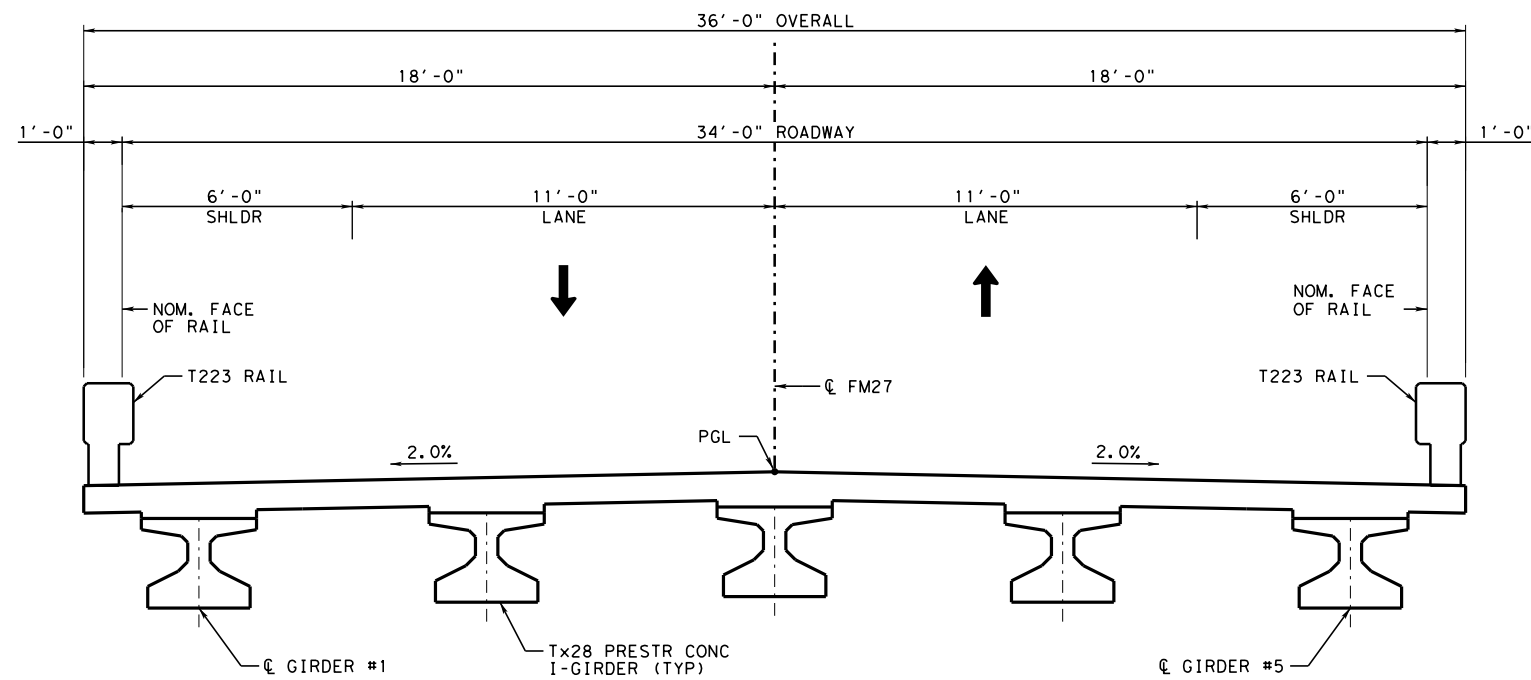
**BRIDGE LAYOUT**

CANEY CREEK RELIEF BRIDGE

SHEET 2 OF 2

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER	
6	BR 2023(408),ETC.	FM 27	
STATE	DISTRICT	COUNTY	
TEXAS	BRY	FREESTONE	
CONTROL	SECTION	JOB	SHEET NO.
0456	02	028,ETC	65

1675+00



TYPICAL TRANSVERSE SECTION  
N. T. S.



4/26/2023

HL93 LOADING

PRINT DATE	REVISION DATE
4/26/2023	

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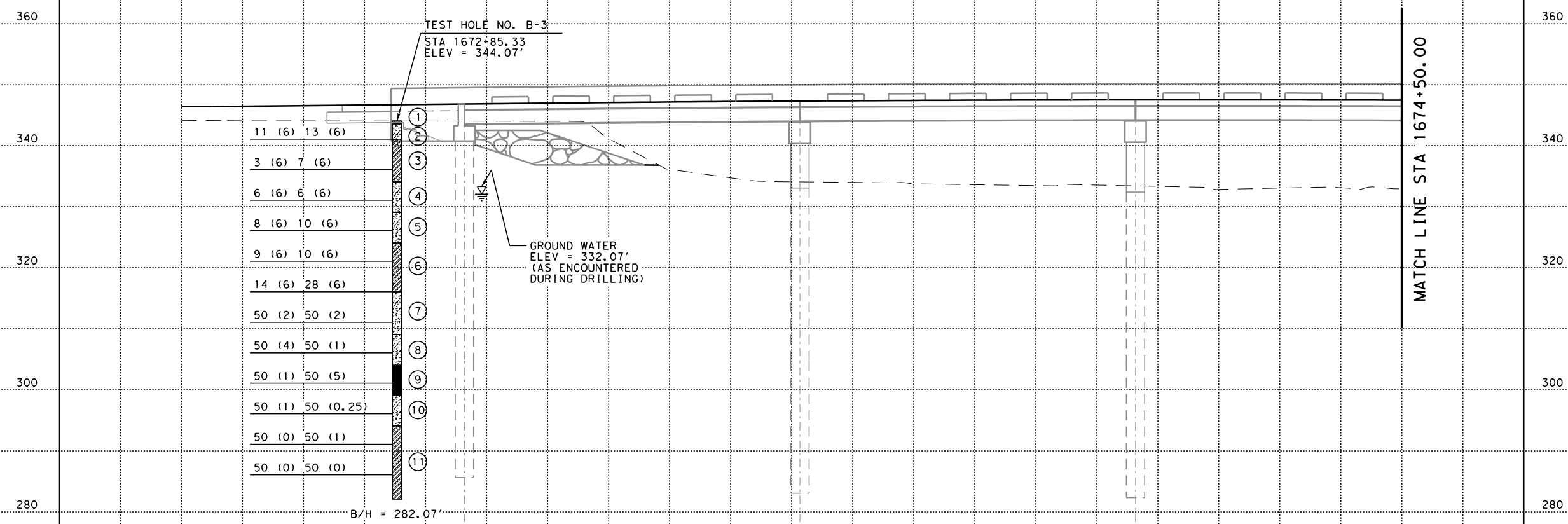


TYPICAL TRANSVERSE SECTION

CANEY CREEK RELIEF BRIDGE

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER	
6	BR 2023(408),ETC.	FM 27	
STATE	DISTRICT	COUNTY	
TEXAS	BRY	FREESTONE	
CONTROL	SECTION	JOB	SHEET NO.
0456	02	028,ETC	66

TEST HOLE DATA IS A REPRODUCTION OF THE DRILLING LOGS FROM A GEOTECHNICAL INVESTIGATION BY Ettl ENGINEERS & CONSULTANTS INC. DATED JUNE 22, 2021.



- ① 4.5" ASPHALT
- ② SAND, SILTY; BROWN; MOIST; FINE TO MEDIUM-GRAINED; WITH IRON ORE (SM)
- ③ CLAY, SANDY; LEAN; STIFF BECOMING SOFT @ 8'; GRAYISH BROWN WITH BROWN AND LIGHT BROWN; MOIST; WITH FINE-GRAINED SILTY SAND PARTINGS (CL)
- ④ SAND, SILTY; LOOSE; DARK GRAY; MOIST; FINE-GRAINED (SM)
- ⑤ SAND, SILTY; CLAYEY; LOOSE; LIGHT GRAY; WET; FINE-GRAINED; WITH MINOR ORGANICS (SC-SM)
- ⑥ CLAY, LEAN; WITH SAND; SOFT; BROWNISH GRAY BECOMING GRAY WITH LIGHT BROWN; DAMP; WITH MINOR ORGANICS; MOTTLED @ 25' (CL)
- ⑦ SAND, CLAYEY; MEDIUM DENSE; DARK GRAY; MOIST; FINE-GRAINED (SC)
- ⑧ SAND, SILTY; DENSE; DARK GRAY; MOIST; FINE-GRAINED (SM)
- ⑨ LIGNITE, DENSE; DARK GRAY; DRY
- ⑩ SAND, SILTY; VERY DENSE; GRAY; MOIST; VERY FINE-GRAINED (SM)
- ⑪ CLAY, LEAN; VERY HARD; GRAY WITH DARK GRAY BECOMING DARK GRAY WITH GRAY @ 55'; MOIST; WITH SILT LAMINATIONS (CL)



HL93 LOADING	PRINT DATE 4/26/2023	REVISION DATE
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**Jacobs** 2705 BEE CAVE RD, SUITE 300  
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FIRM REGISTRATION F-2966



**TEST HOLE DATA**

CANEY CREEK RELIEF BRIDGE

SHEET 1 OF 2

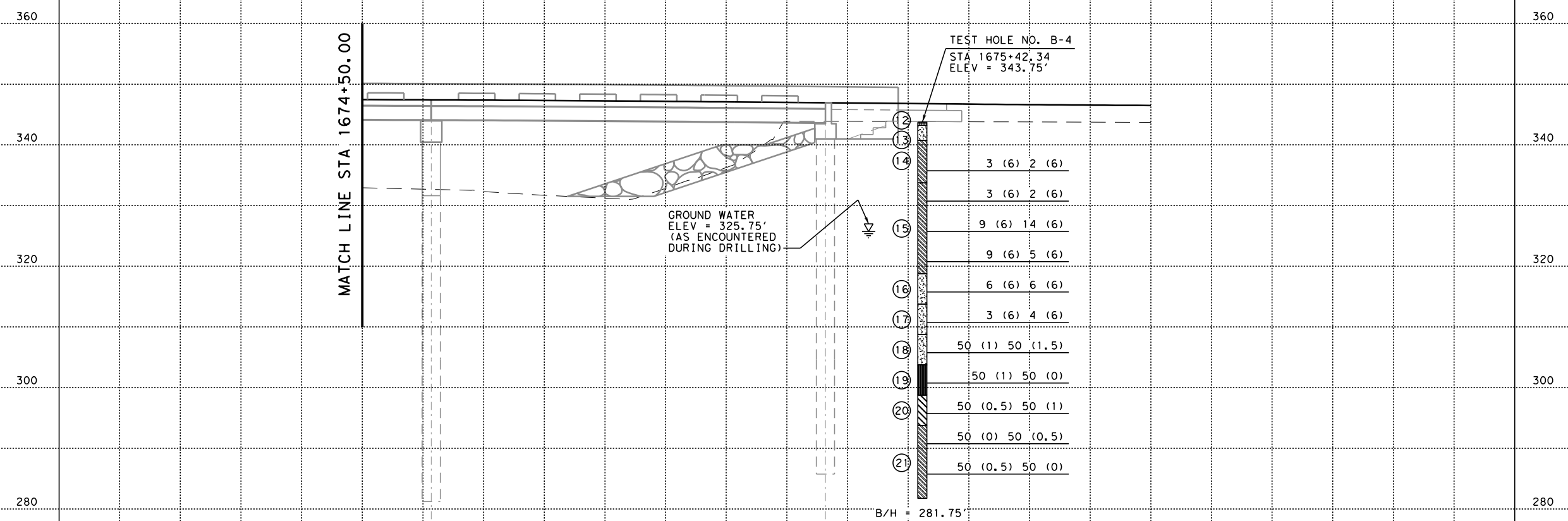
FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER	
6	BR 2023(408),ETC.	FM 27	
STATE	DISTRICT	COUNTY	
TEXAS	BRY	FREESTONE	
CONTROL	SECTION	JOB	SHEET NO.
0456	02	028,ETC	67

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TEST HOLE DATA IS A REPRODUCTION OF THE DRILLING LOGS FROM A GEOTECHNICAL INVESTIGATION BY Ettl ENGINEERS & CONSULTANTS INC. DATED JUNE 22, 2021.



- ⑫ 3.5" ASPHALT
- ⑬ SAND, SILTY; BROWN; MOIST; MEDIUM-GRAINED (SM)
- ⑭ CLAY, LEAN; WITH SAND; VERY SOFT; LIGHT GRAY WITH REDDISH BROWN; MOIST; MOTTLED (CL)
- ⑮ CLAY, SANDY; LEAN; VERY SOFT BECOMING STIFF @ 18' AND SOFT @ 23'; DARK GRAY; WET BECOMING MOIST @ 15'; WITH SILTY SAND POCKETS (CL)
- ⑯ SAND, SILTY; LOOSE; DARK GRAY; WET; VERY FINE-GRAINED (SM)
- ⑰ SAND, POORLY GRADED WITH SILT; VERY LOOSE; DARK GRAY; SATURATED; MEDIUM-GRAINED (SP-SM)
- ⑱ SAND, SILTY; VERY DENSE; DARK GRAY; WET; FINE-GRAINED (SM)
- ⑲ SILT, SANDY; VERY DENSE; GRAY; MOIST; FINE-GRAINED; GLAUCONITIC (ML)
- ⑳ CLAY, FAT; VERY HARD; DARK BROWNISH GRAY; MOIST; TRANSITIONS TO LIGHT GRAY MOIST FINE-GRAINED SILTY SAND @ 47' (CH)
- ㉑ CLAY, LEAN; WITH SAND; VERY HARD; BROWNISH GRAY AND LIGHT GRAY; MOIST; WITH SILT LAMINATIONS (CL)



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TEST HOLE DATA

CANEY CREEK RELIEF BRIDGE

SHEET 2 OF 2

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER	
6	BR 2023(408),ETC.	FM 27	
STATE	DISTRICT	COUNTY	
TEXAS	BRY	FREESTONE	
CONTROL	SECTION	JOB	SHEET NO.
0456	02	028,ETC	68

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SUMMARY OF ESTIMATED QUANTITIES

BID ITEM NUMBER	400-6005	416-6004	420-6013	420-6029	420-6037	422-6001	422-6015	425-6035	432-6033	450-6006	454-6020	4171-6001
BRIDGE ELEMENT	CEM STABIL BKFL	DRILL SHAFT (36 IN)	CL "C" CONC (ABUT)	CL "C" CONC (CAP)	CL "C" CONC (COLUMN)	REINF CONC SLAB	APPROACH SLAB	PRESTR CONC GIRDER (Tx28)	RIPRAP (STONE PROTECTION) (18 IN)	RAIL (TY T223)	SEALED EXPANSION JOINT (4 IN) (SEJ - B)	INSTALL BRIDGE IDENTIFICATION NUMBERS
	CY	LF	CY	CY	CY	SF	CY	LF	CY	LF	LF	EA
2 ~ ABUTMENTS	151	440	44.8				54.5		1,209	48.0	72	
3 ~ INTERIOR BENTS		450		47.4	18.9						36	
1 ~ 110.00' PRESTR CONC I-GIRDER UNIT 1						3,960		545.01		220.0		
1 ~ 120.00' PRESTR CONC I-GIRDER UNIT 2						4,320		595.01		240.0		
TOTAL	151	890	44.8 (1)	47.4 (2)	18.9	8,280	54.5	1,140.02 (3)	1,209	508.0	108	2

- ① QUANTITY INCLUDES 0.6 CY FOR SHEAR KEYS. SEE ABUTMENT STANDARD (AIG-34) AND SHEAR KEY DETAILS FOR I-GIRDERS STANDARD (IGSK) FOR SHEAR KEY LOCATION, DETAILS AND NOTES.
- ② QUANTITY INCLUDES 1.5 CY FOR SHEAR KEYS. SEE BENT STANDARD (BIG-34) AND SHEAR KEY DETAILS FOR I-GIRDERS STANDARD (IGSK) FOR SHEAR KEY LOCATION, DETAILS AND NOTES.
- ③ LENGTHS SHOWN ARE BOTTOM GIRDER FLANGE LENGTHS WITH ADJUSTMENTS MADE FOR GIRDER SLOPE.

BEARING SEAT ELEVATIONS

	GIRDER 1	GIRDER 2	GIRDER 3	GIRDER 4	GIRDER 5
ABUT 1 (FWD)	342.981	343.131	343.281	343.131	342.981
BENT 2 (BK) (FWD)	343.445 343.458	343.595 343.608	343.745 343.758	343.595 343.608	343.445 343.458
BENT 3 (BK) (FWD)	343.649 343.651	343.799 343.801	343.949 343.951	343.799 343.801	343.649 343.651
BENT 4 (BK) (FWD)	343.559 343.551	343.710 343.701	343.859 343.851	343.710 343.701	343.559 343.551
ABUT 5 (BK)	343.086	343.236	343.386	343.236	343.086



4/26/2023  
FOR BEARING SEAT ELEVATIONS ONLY

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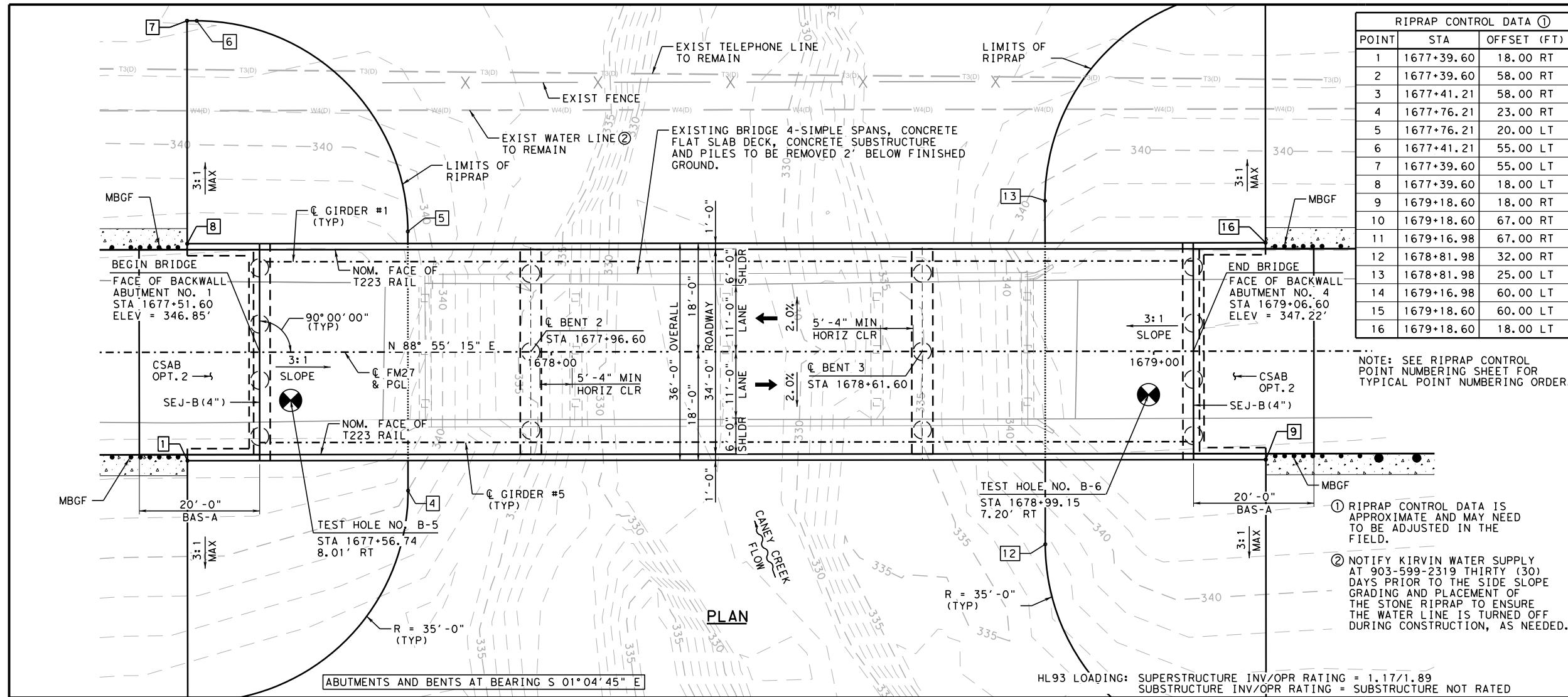
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ESTIMATED QUANTITIES AND BEARING SEAT ELEVATIONS  
CANEY CREEK RELIEF BRIDGE

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER	
6	BR 2023(408),ETC.	FM 27	
STATE	DISTRICT	COUNTY	
TEXAS	BRY	FREESTONE	
CONTROL	SECTION	JOB	SHEET NO.
0456	02	028,ETC	69





RIPRAP CONTROL DATA ①

POINT	STA	OFFSET (FT)
1	1677+39.60	18.00 RT
2	1677+39.60	58.00 RT
3	1677+41.21	58.00 RT
4	1677+76.21	23.00 RT
5	1677+76.21	20.00 LT
6	1677+41.21	55.00 LT
7	1677+39.60	55.00 LT
8	1677+39.60	18.00 LT
9	1679+18.60	18.00 RT
10	1679+18.60	67.00 RT
11	1679+16.98	67.00 RT
12	1678+81.98	32.00 RT
13	1678+81.98	25.00 LT
14	1679+16.98	60.00 LT
15	1679+18.60	60.00 LT
16	1679+18.60	18.00 LT



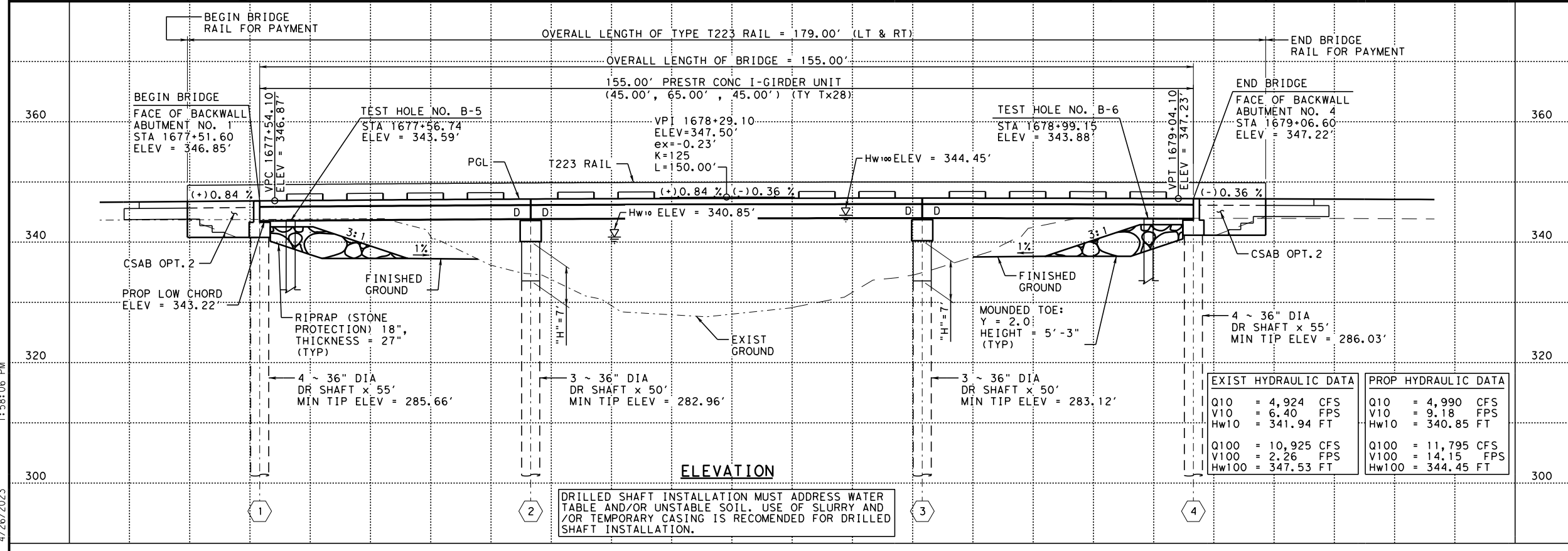
- GENERAL NOTES:
- DESIGNED ACCORDING TO AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, 9TH EDITION (2020) AND TxDOT BRIDGE DESIGN MANUAL (JAN 2023).
  - BRIDGE NOT DESIGNED FOR OVERLAY.
  - "D" DENOTES DOWELS IN THE OUTSIDE GIRDERS UNLESS SPECIFIED OTHERWISE ON THE BENT DETAIL SHEETS.
  - ALL DIMENSIONS ARE EITHER HORIZONTAL OR VERTICAL AND MUST BE CORRECTED FOR GRADE AND CROSS SLOPE.
  - COLUMN HEIGHTS ("H") SHOWN ARE CALCULATED AT THE PROFILE GRADE LINE (PGL), ACTUAL COLUMN HEIGHTS WILL BE MEASURED IN THE FIELD PRIOR TO ORDERING MATERIALS.
  - CONTRACTOR TO VERIFY LOCATION AND STATUS OF ALL UTILITIES SHOWN AND THOSE NOT IDENTIFIED PRIOR TO CONSTRUCTION.
  - CONTRACTOR MUST FIELD VERIFY ALL EXISTING ABUTMENT AND BENT LOCATIONS, DIMENSIONS, AND ELEVATIONS PRIOR TO FABRICATION OF I-GIRDERS.
  - SEE "TYPICAL TRANSVERSE SECTION" SHEET FOR TYPICAL SECTION.
  - SEE "TEST HOLE DATA" SHEET FOR TEST HOLE DATA.
  - FOUND DRILLED SHAFTS AT THE ELEVATION SHOWN OR DEEPER TO OBTAIN A MINIMUM 3.0 DRILLED SHAFT DIAMETER PENETRATION INTO VERY DENSE GRAY LIGNITE, VERY DENSE GRAY SAND, AND/OR VERY HARD GRAY CLAY.

NOTE: SEE RIPRAP CONTROL POINT NUMBERING SHEET FOR TYPICAL POINT NUMBERING ORDER.

① RIPRAP CONTROL DATA IS APPROXIMATE AND MAY NEED TO BE ADJUSTED IN THE FIELD.

② NOTIFY KIRVIN WATER SUPPLY AT 903-599-2319 THIRTY (30) DAYS PRIOR TO THE SIDE SLOPE GRADING AND PLACEMENT OF THE STONE RIPRAP TO ENSURE THE WATER LINE IS TURNED OFF DURING CONSTRUCTION, AS NEEDED.

FUNCTIONAL CLASS: MAJOR COLLECTOR  
 DESIGN SPEED: 50 MPH  
 ADT: 522 (2020); 731 (2040)  
 EXIST NBI: 17-082-0-0456-02-015  
 PROP NBI: 17-082-0-0456-02-198



ELEVATION

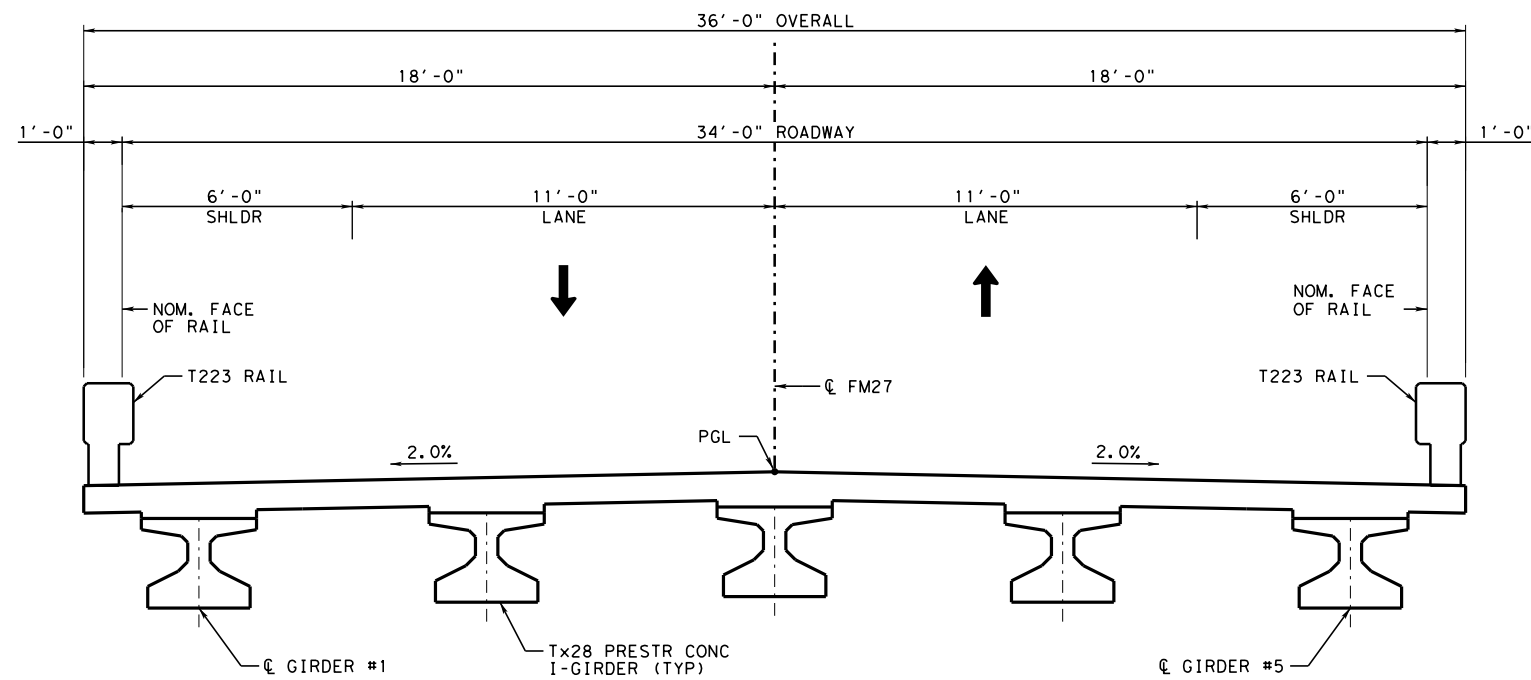
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 Bryan District

BRIDGE LAYOUT  
 CANEY CREEK BRIDGE

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER	
6	BR 2023(408),ETC.	FM 27	
STATE	DISTRICT	COUNTY	
TEXAS	BRY	FREESTONE	
CONTROL	SECTION	JOB	SHEET NO.
0456	02	028,ETC	70



TYPICAL TRANSVERSE SECTION  
N. T. S.

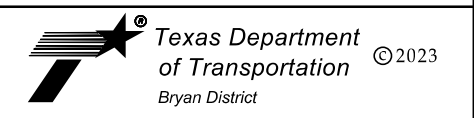


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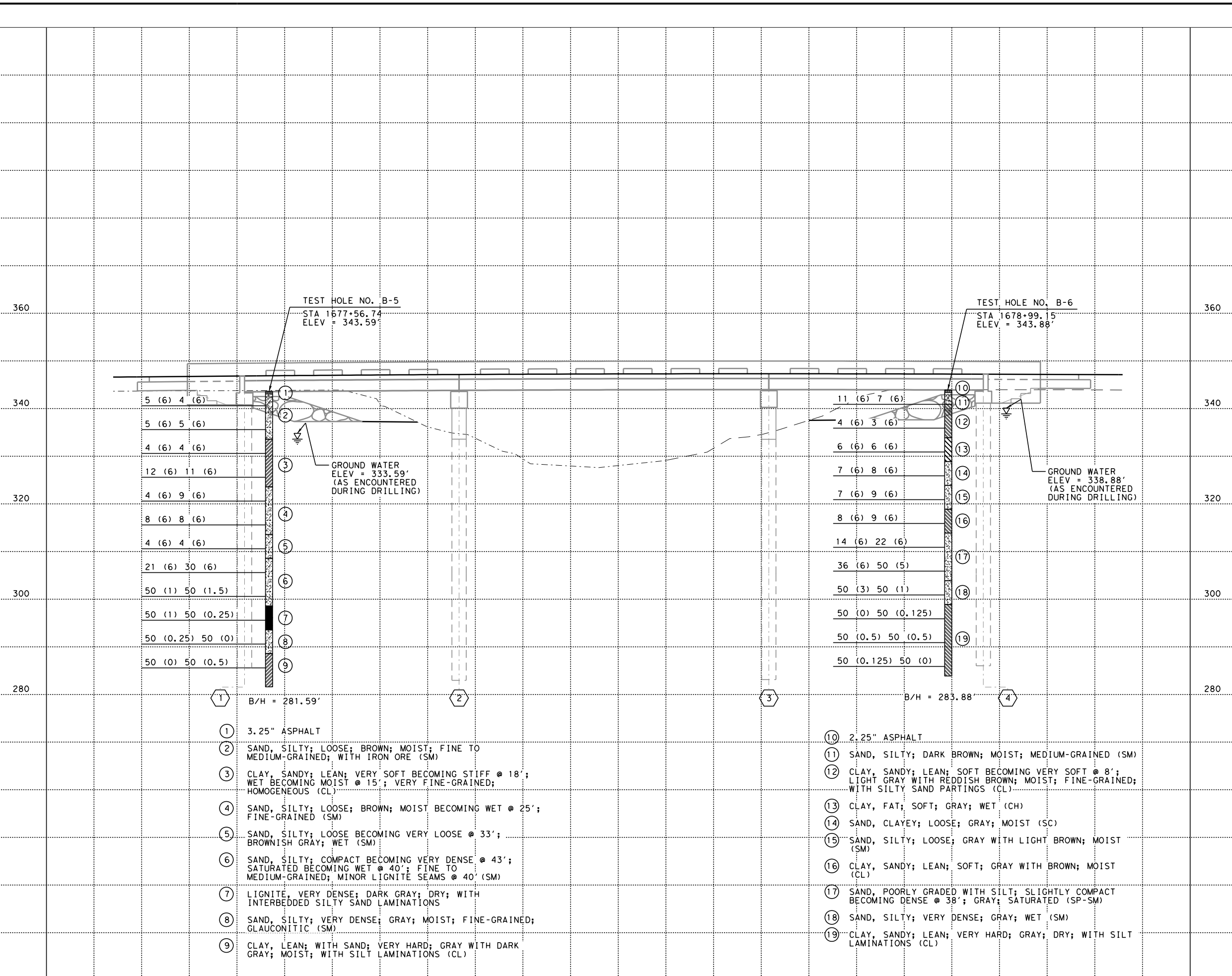
TYPICAL TRANSVERSE SECTION

CANEY CREEK BRIDGE

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER	
6	BR 2023(408),ETC.	FM 27	
STATE	DISTRICT	COUNTY	
TEXAS	BRY	FREESTONE	
CONTROL	SECTION	JOB	SHEET NO.
0456	02	028,ETC	71

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TEST HOLE DATA IS A REPRODUCTION OF THE DRILLING LOGS FROM A GEOTECHNICAL INVESTIGATION BY Ettl ENGINEERS & CONSULTANTS INC. DATED JUNE 23, 2021 THROUGH JUNE 28, 2021.



TEST HOLE NO. B-5  
 STA 1677+56.74  
 ELEV = 343.59'

TEST HOLE NO. B-6  
 STA 1678+99.15'  
 ELEV = 343.88'

GROUND WATER  
 ELEV = 333.59'  
 (AS ENCOUNTERED  
 DURING DRILLING)

GROUND WATER  
 ELEV = 338.88'  
 (AS ENCOUNTERED  
 DURING DRILLING)

5 (6) 4 (6)  
 5 (6) 5 (6)  
 4 (6) 4 (6)  
 12 (6) 11 (6)  
 4 (6) 9 (6)  
 8 (6) 8 (6)  
 4 (6) 4 (6)  
 21 (6) 30 (6)  
 50 (1) 50 (1.5)  
 50 (1) 50 (0.25)  
 50 (0.25) 50 (0)  
 50 (0) 50 (0.5)

11 (6) 7 (6)  
 4 (6) 3 (6)  
 6 (6) 6 (6)  
 7 (6) 8 (6)  
 7 (6) 9 (6)  
 8 (6) 9 (6)  
 14 (6) 22 (6)  
 36 (6) 50 (5)  
 50 (3) 50 (1)  
 50 (0) 50 (0.125)  
 50 (0.5) 50 (0.5)  
 50 (0.125) 50 (0)

1 B/H = 281.59'

4 B/H = 283.88'

- 1 3.25" ASPHALT
- 2 SAND, SILTY; LOOSE; BROWN; MOIST; FINE TO MEDIUM-GRAINED; WITH IRON ORE (SM)
- 3 CLAY, SANDY; LEAN; VERY SOFT BECOMING STIFF @ 18'; WET BECOMING MOIST @ 15'; VERY FINE-GRAINED; HOMOGENEOUS (CL)
- 4 SAND, SILTY; LOOSE; BROWN; MOIST BECOMING WET @ 25'; FINE-GRAINED (SM)
- 5 SAND, SILTY; LOOSE BECOMING VERY LOOSE @ 33'; BROWNISH GRAY; WET (SM)
- 6 SAND, SILTY; COMPACT BECOMING VERY DENSE @ 43'; SATURATED BECOMING WET @ 40'; FINE TO MEDIUM-GRAINED; MINOR LIGNITE SEAMS @ 40' (SM)
- 7 LIGNITE, VERY DENSE; DARK GRAY; DRY; WITH INTERBEDDED SILTY SAND LAMINATIONS
- 8 SAND, SILTY; VERY DENSE; GRAY; MOIST; FINE-GRAINED; GLAUCONITIC (SM)
- 9 CLAY, LEAN; WITH SAND; VERY HARD; GRAY WITH DARK GRAY; MOIST; WITH SILT LAMINATIONS (CL)

- 10 2.25" ASPHALT
- 11 SAND, SILTY; DARK BROWN; MOIST; MEDIUM-GRAINED (SM)
- 12 CLAY, SANDY; LEAN; SOFT BECOMING VERY SOFT @ 8'; LIGHT GRAY WITH REDDISH BROWN; MOIST; FINE-GRAINED; WITH SILTY SAND PARTINGS (CL)
- 13 CLAY, FAT; SOFT; GRAY; WET (CH)
- 14 SAND, CLAYEY; LOOSE; GRAY; MOIST (SC)
- 15 SAND, SILTY; LOOSE; GRAY WITH LIGHT BROWN; MOIST (SM)
- 16 CLAY, SANDY; LEAN; SOFT; GRAY WITH BROWN; MOIST (CL)
- 17 SAND, POORLY GRADED WITH SILT; SLIGHTLY COMPACT BECOMING DENSE @ 38'; GRAY; SATURATED (SP-SM)
- 18 SAND, SILTY; VERY DENSE; GRAY; WET (SM)
- 19 CLAY, SANDY; LEAN; VERY HARD; GRAY; DRY; WITH SILT LAMINATIONS (CL)



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TEST HOLE DATA  
 CANEY CREEK BRIDGE

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6	BR 2023(408),ETC.	FM 27
STATE	DISTRICT	COUNTY
TEXAS	BRY	FREESTONE
CONTROL	SECTION	JOB SHEET NO.
0456	02	028,ETC 72

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SUMMARY OF ESTIMATED QUANTITIES

BID ITEM NUMBER	400-6005	416-6004	420-6013	420-6029	420-6037	422-6001	422-6015	425-6035	432-6033	450-6006	454-6020	4171-6001
BID ITEM DESCRIPTION	CEM STABIL BKFL	DRILL SHAFT (36 IN)	CL "C" CONC (ABUT)	CL "C" CONC (CAP)	CL "C" CONC (COLUMN)	REINF CONC SLAB	APPROACH SLAB	PRESTR CONC GIRDER (Tx28)	RIPRAP (STONE PROTECTION) (18 IN)	RAIL (TY T223)	SEALED EXPANSION JOINT (4 IN) (SEJ - B)	INSTALL BRIDGE IDENTIFICATION NUMBERS
BRIDGE ELEMENT	CY	LF	CY	CY	CY	SF	CY	LF	CY	LF	LF	EA
2 ~ ABUTMENTS	151	440	44.8				54.5		714	48.0	72	
2 ~ INTERIOR BENTS		300		31.6	11.0							
1 ~ 155.00' PRESTR CONC I-GIRDER UNIT						5,580		767.51		310.0		
TOTAL	151	740	44.8 (1)	31.6 (2)	11.0	5,580	54.5	767.51 (3)	714	358.0	72	2

BEARING SEAT ELEVATIONS

	GIRDER 1	GIRDER 2	GIRDER 3	GIRDER 4	GIRDER 5
ABUT 1 (FWD)	342.994	343.144	343.294	343.144	342.994
BENT 2 (BK) (FWD)	343.286 343.297	343.436 343.447	343.586 343.596	343.436 343.447	343.286 343.297
BENT 3 (BK) (FWD)	343.448 343.447	343.598 343.597	343.748 343.747	343.598 343.597	343.448 343.447
ABUT 4 (BK)	343.361	343.511	343.661	343.511	343.361

- ① QUANTITY INCLUDES 0.6 CY FOR SHEAR KEYS. SEE ABUTMENT STANDARD (AIG-34) AND SHEAR KEY DETAILS FOR I-GIRDERS STANDARD (IGSK) FOR SHEAR KEY LOCATION, DETAILS AND NOTES.
- ② QUANTITY INCLUDES 1.0 CY FOR SHEAR KEYS. SEE BENT STANDARD (BIG-34) AND SHEAR KEY DETAILS FOR I-GIRDERS STANDARD (IGSK) FOR SHEAR KEY LOCATION, DETAILS AND NOTES.
- ③ LENGTHS SHOWN ARE BOTTOM GIRDER FLANGE LENGTHS WITH ADJUSTMENTS MADE FOR GIRDER SLOPE.



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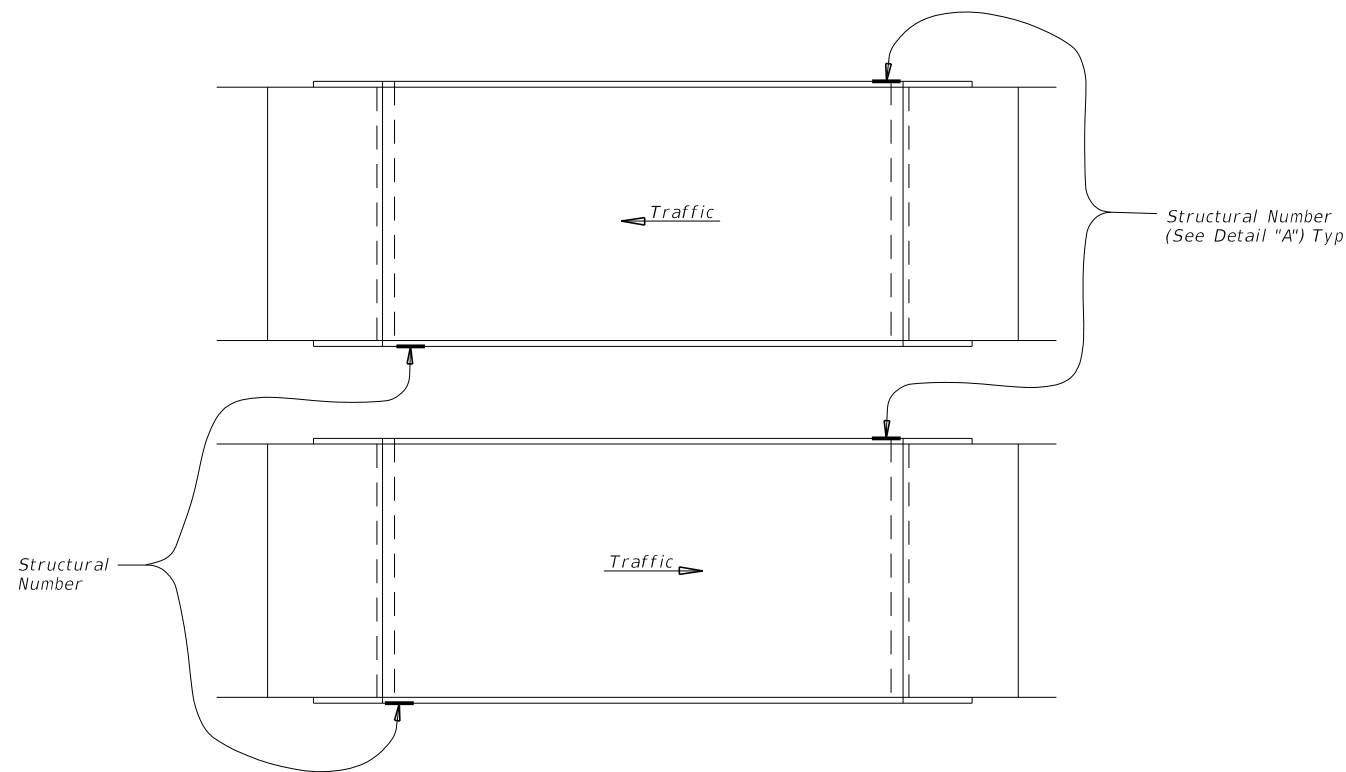
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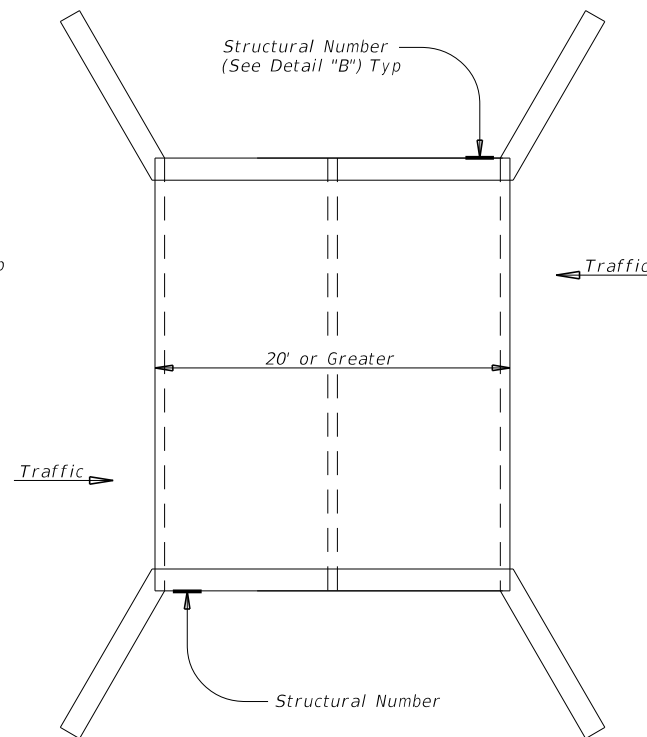


ESTIMATED QUANTITIES AND BEARING SEAT ELEVATIONS  
CANEY CREEK BRIDGE

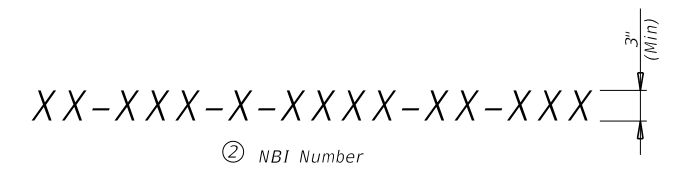
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6	BR 2023(408),ETC.	FM 27	
STATE	DISTRICT	COUNTY	
TEXAS	BRY	FREESTONE	
CONTROL	SECTION	JOB	SHEET NO.
0456	02	028,ETC	73



AT BRIDGE LOCATIONS



AT CULVERT LOCATIONS



DETAIL FOR NBI NUMBERS

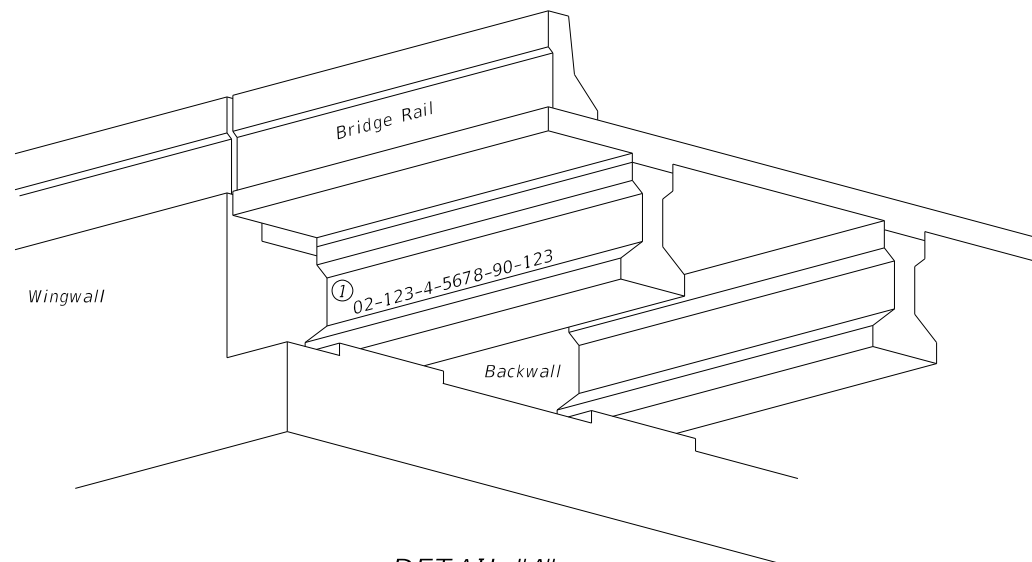
GENERAL NOTES:

Cost of furnishing and applying NBI numbers, including ink and stencil plates shall be paid at the unit bid price for "Install Bridge Identification Numbers" under SS 4171.

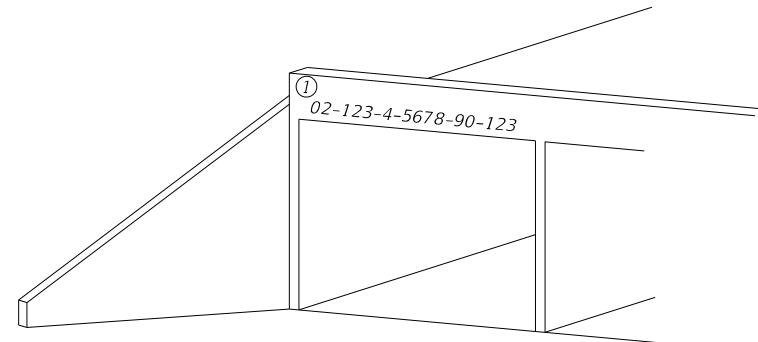
Each structure shall have 2 (two) NBI numbers applied per structure.



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DETAIL "A"



DETAIL "B"

① Apply NBI number on both sides of structure (once each side). Apply to outside beam close to abutment on the upstream traffic side at bridge locations. Apply to headwall adjacent to wingwall at culvert locations.

② Use brass stencil, 3 inch, numbers and letters, adjustable interlocking stencil set or equal of legend height 3 inches, symbol height 3 inches.

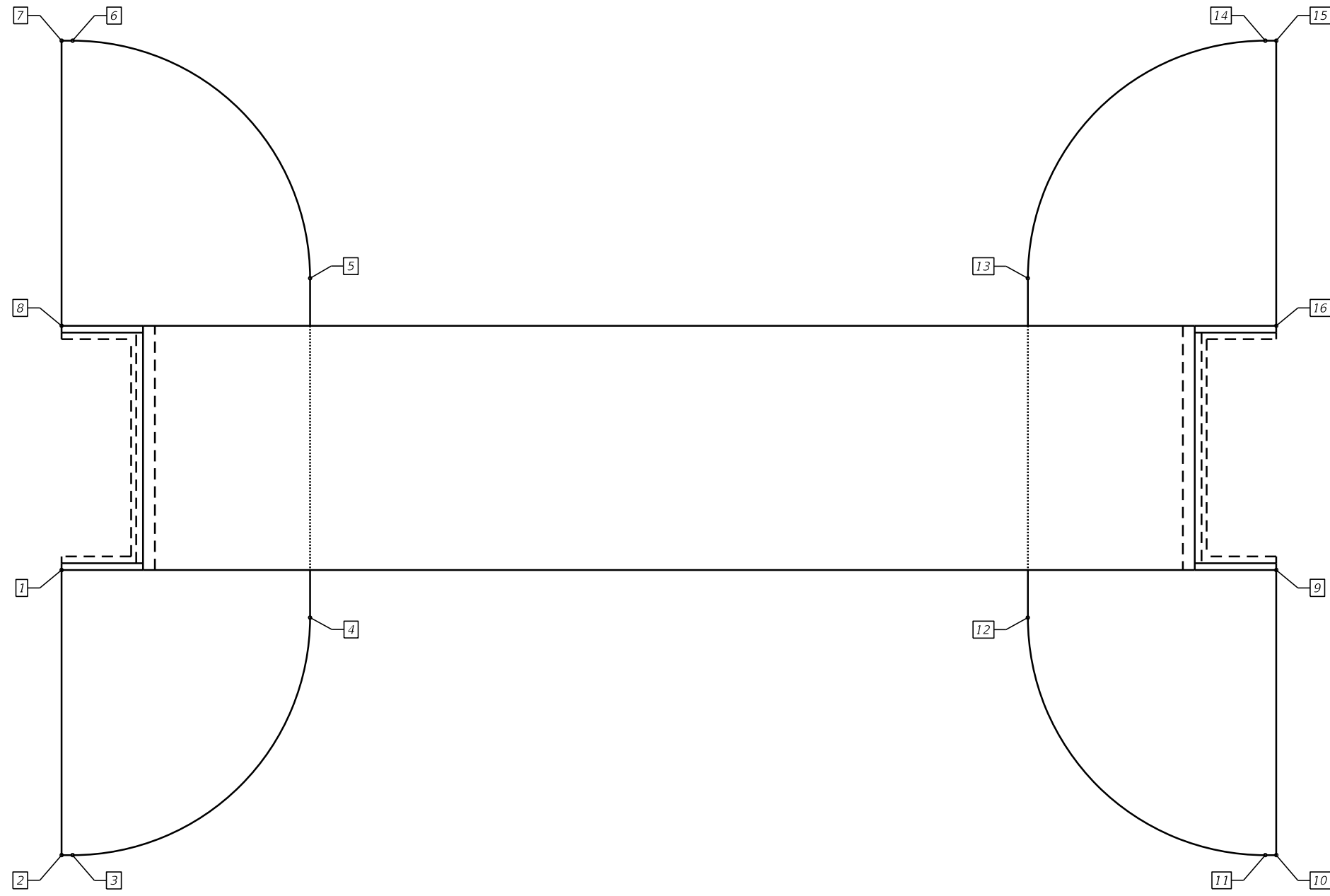
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AUSTIN TX 78746  
FIRM REGISTRATION F-2966

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NBI NUMBER LABELS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER	
6	BR 2023(408),ETC.	FM 27	
STATE	DISTRICT	COUNTY	
TEXAS	BRY	FREESTONE	
CONTROL	SECTION	JOB	SHEET NO.
0456	02	028,ETC	74



TYPICAL RIPRAP CONTROL POINT NUMBERING

GENERAL NOTES:  
See bridge layout for riprap control data.



4/26/2023

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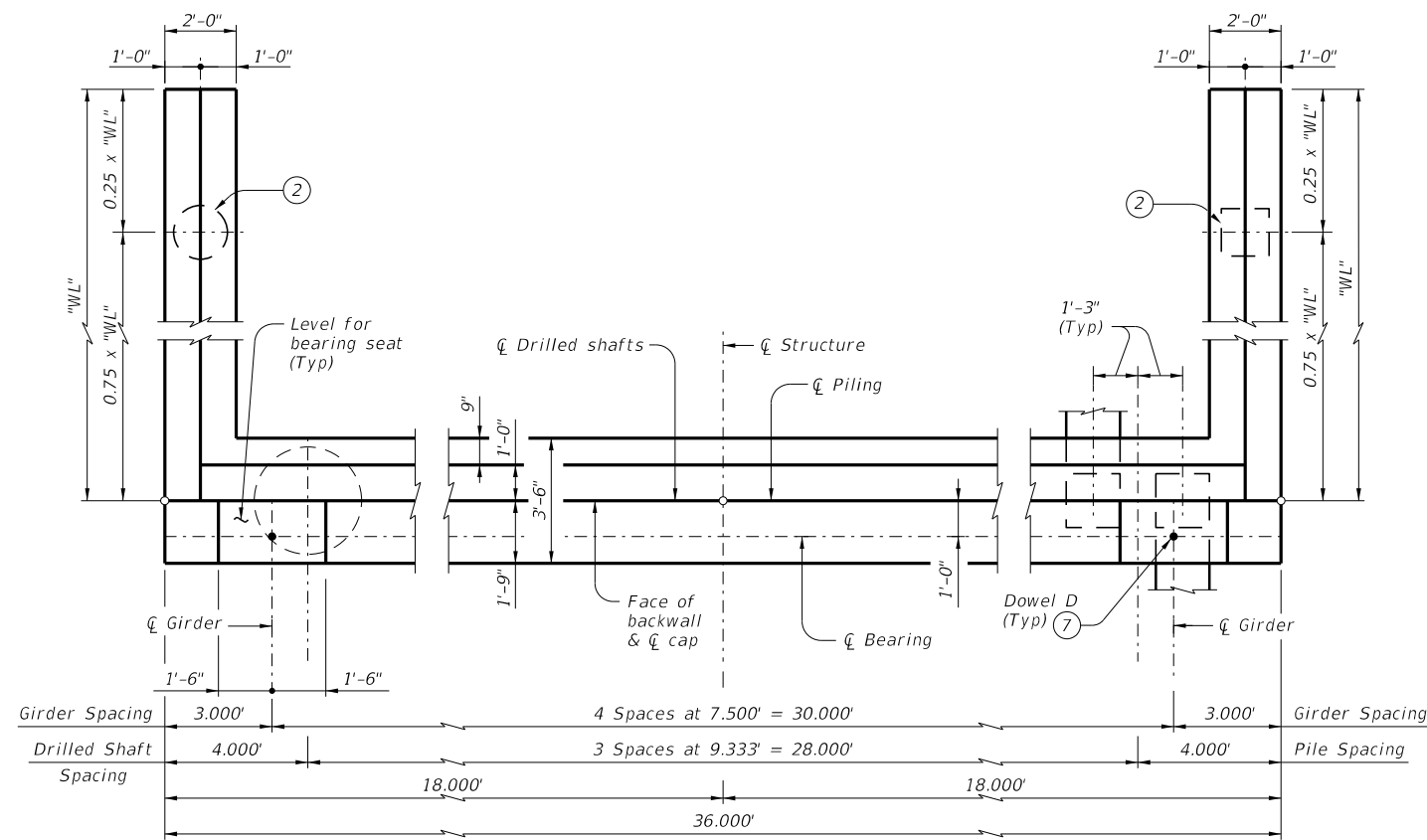
**RIPRAP CONTROL POINT NUMBERING**

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER	
6	BR 2023(408),ETC.	FM 27	
STATE	DISTRICT	COUNTY	
TEXAS	BRY	FREESTONE	
CONTROL	SECTION	JOB	SHEET NO.
0456	02	028,ETC	75



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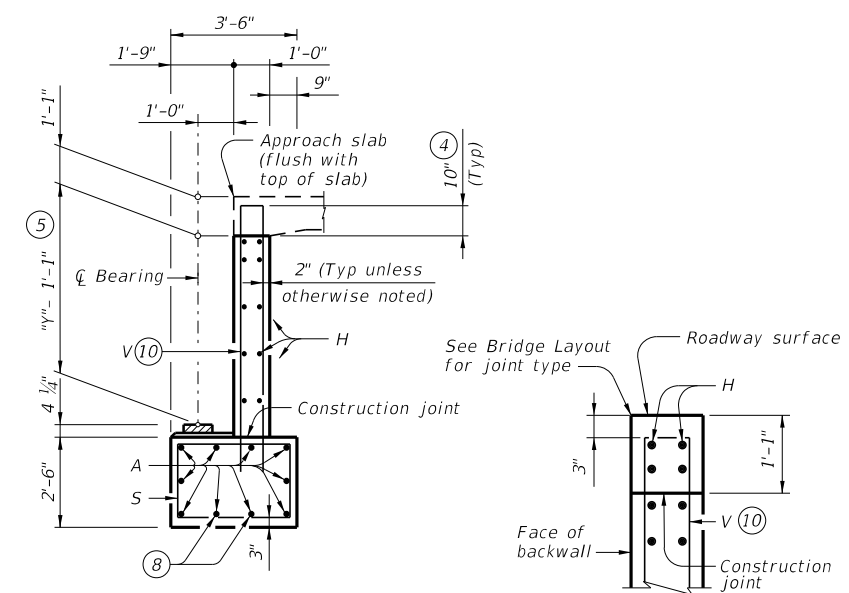
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SHOWING DRILLED SHAFTS

PLAN 1

SHOWING PILES



SECTION A-A

BACKWALL DETAIL

(With approach slab) 6

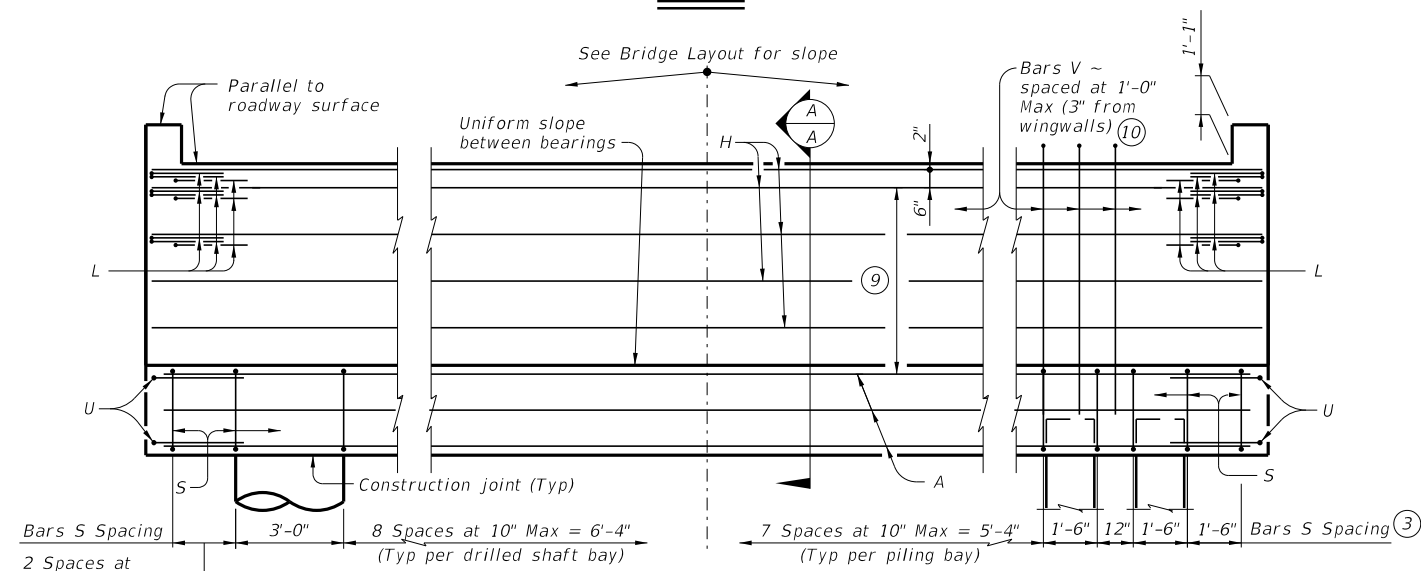
(Without approach slab) 6

- 1 See Table A for variable dimensions based on header slope and girder type.
- 2 See Table A to determine if this wingwall foundation is required.
- 3 For piling larger than 16" adjust Bars S spacing as required to avoid piling.
- 4 Increase as required to maintain 3" from finished grade.
- 5 See Span details for "Y" value.
- 6 See Bridge Layout to determine if approach slab is present.
- 7 Omit Dowels D at end of multi-span unit. Adjust reinforcing steel total accordingly.
- 8 With pile foundations, move Bars A shown to clear piles.
- 9 Spacing based on girder type:  
Tx28 ~ 3 spaces at 1'-0" Max  
Tx34 ~ 3 spaces at 1'-0" Max  
Tx40 ~ 4 spaces at 1'-0" Max  
Tx46 ~ 4 spaces at 1'-0" Max  
Tx54 ~ 5 spaces at 1'-0" Max
- 10 Field bend as needed to clear piles.

**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.  
Galvanize dowel bars D.

**GENERAL NOTES:**  
Designed according to AASHTO LRFD Bridge Design Specifications.  
See Bridge Layout for header slope and foundation type, size and length.  
See Common Foundation Details (FD) standard sheet for all foundation details and notes.  
See Concrete Riprap (CRR) standard sheet or Stone Riprap (SRR) standard sheet for riprap attachment details, if applicable.  
See applicable rail details for rail anchorage in wingwalls.  
These abutment details may be used with standard SIG-34 only.

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

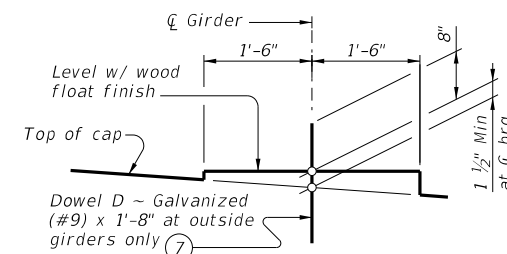


SHOWING DRILLED SHAFTS

ELEVATION

SHOWING PILES

Header Slope	Girder Type	Wingwall Type	Wingwall Lgth "WL"
2:1	Tx28	Cantilevered	8.000'
	Tx34	Cantilevered	9.000'
	Tx40	Cantilevered	10.000'
	Tx46	Cantilevered	11.000'
	Tx54	Cantilevered	12.000'
3:1	Tx28	Cantilevered	12.000'
	Tx34	Founded	13.000'
	Tx40	Founded	15.000'
	Tx46	Founded	16.000'
	Tx54	Founded	18.000'



BEARING SEAT DETAIL

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



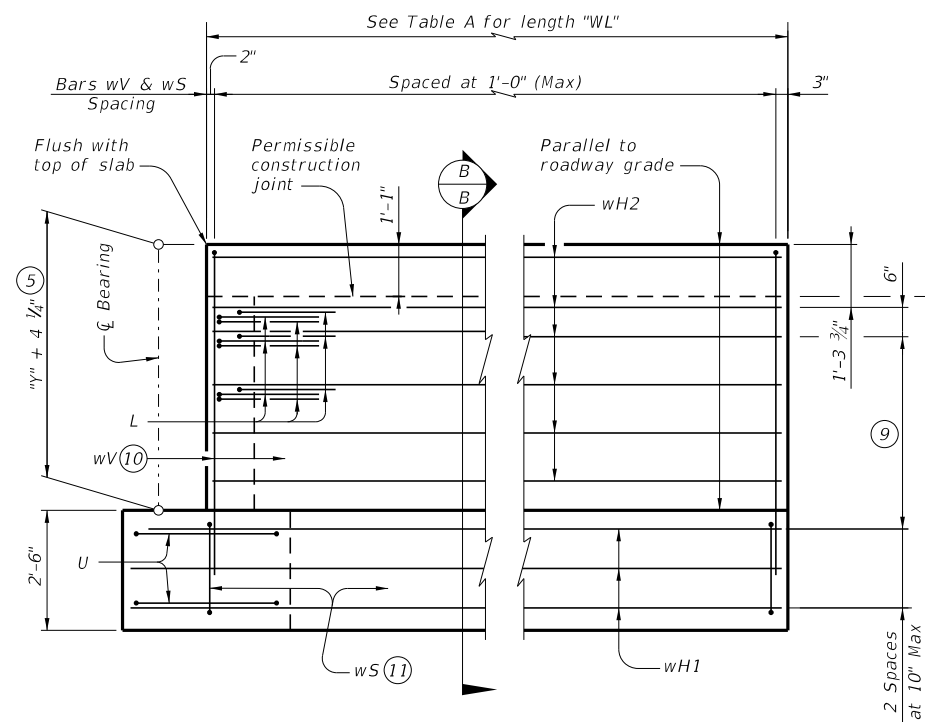
**ABUTMENTS**  
TYPE TX28 THRU TX54  
PRESTR CONC I-GIRDERS  
34' ROADWAY

AIG-34

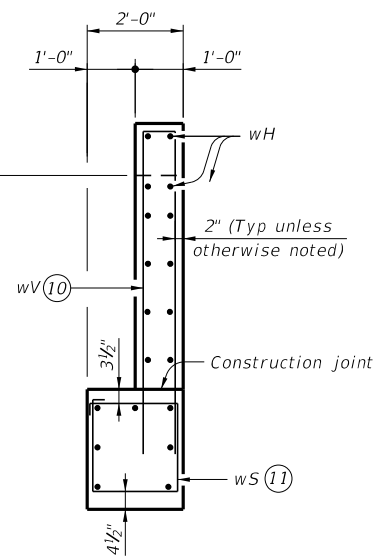
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©TxDOT January 2023	CONT	SECT	JOB	HIGHWAY
REVISIONS	0456	02	028.ETC	FM 27
	DIST	COUNTY		SHEET NO.
	BRY	FREESTONE		76

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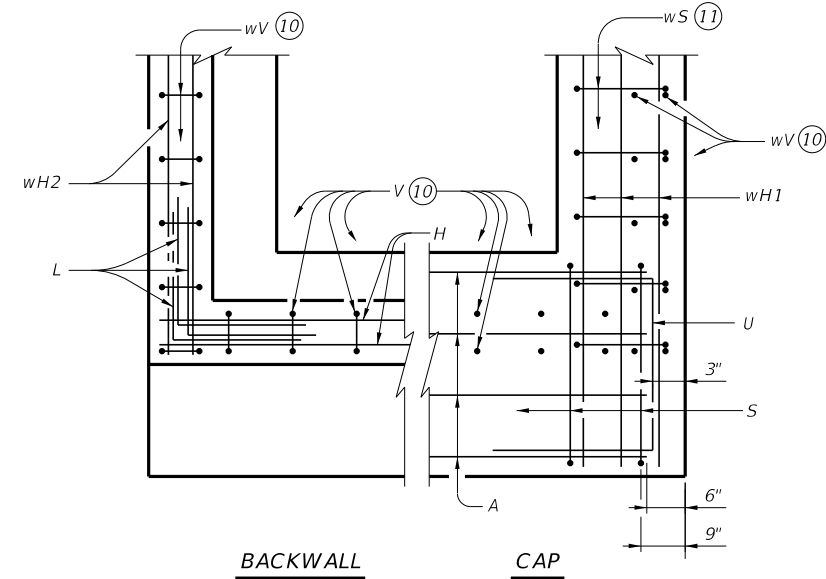
DATE:  
FILE:



WINGWALL ELEVATION



SECTION B-B

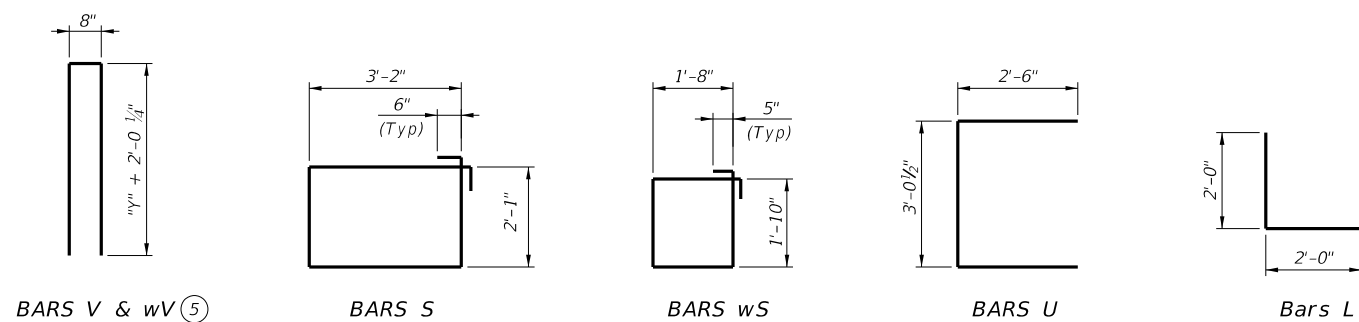


BACKWALL

CAP

CORNER DETAILS

- (5) See Span details for "Y" value.
- (9) Spacing based on girder type:  
 Tx28 ~ 3 spaces at 1'-0" Max  
 Tx34 ~ 3 spaces at 1'-0" Max  
 Tx40 ~ 4 spaces at 1'-0" Max  
 Tx46 ~ 4 spaces at 1'-0" Max  
 Tx54 ~ 5 spaces at 1'-0" Max
- (10) Field bend as needed to clear piles.
- (11) Adjust as required to avoid piling.



BARS V & wV (5)

BARS S

BARS wS

BARS U

Bars L

HL93 LOADING

SHEET 2 OF 3



**ABUTMENTS**  
 TYPE TX28 THRU TX54  
 PRESTR CONC I-GIRDERS  
 34' ROADWAY

**AIG-34**

FILE: IG-AIG3400-23.dgn	DN: TAR	CK: VC	DW: SFS	CK: TAR
©TxDOT January 2023	CONT	SECT	JOB	HIGHWAY
REVISIONS	0456	02	028.ETC	FM 27
	DIST	COUNTY		SHEET NO.
	BRY	FREESTONE		77

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**TABLES OF ESTIMATED QUANTITIES WITH 2:1 HEADER SLOPE <sup>(12)</sup>**

TYPE Tx28 Girders					TYPE Tx34 Girders					TYPE Tx40 Girders					TYPE Tx46 Girders					TYPE Tx54 Girders									
Bar	No.	Size	Length	Weight	Bar	No.	Size	Length	Weight	Bar	No.	Size	Length	Weight	Bar	No.	Size	Length	Weight	Bar	No.	Size	Length	Weight					
A	10	#11	35'-0"	1,860	A	10	#11	35'-0"	1,860	A	10	#11	35'-0"	1,860	A	10	#11	35'-0"	1,860	A	10	#11	35'-0"	1,860					
D <sup>(7)</sup>	2	#9	1'-8"	11	D <sup>(7)</sup>	2	#9	1'-8"	11	D <sup>(7)</sup>	2	#9	1'-8"	11	D <sup>(7)</sup>	2	#9	1'-8"	11	D <sup>(7)</sup>	2	#9	1'-8"	11					
H	8	#6	35'-8"	429	H	8	#6	35'-8"	429	H	10	#6	35'-8"	536	H	10	#6	35'-8"	536	H	12	#6	35'-8"	643					
L	18	#6	4'-0"	108	L	18	#6	4'-0"	108	L	18	#6	4'-0"	108	L	18	#6	4'-0"	108	L	18	#6	4'-0"	108					
S	33	#5	11'-6"	396	S	33	#5	11'-6"	396	S	33	#5	11'-6"	396	S	33	#5	11'-6"	396	S	33	#5	11'-6"	396					
U	4	#6	8'-1"	49	U	4	#6	8'-1"	49	U	4	#6	8'-1"	49	U	4	#6	8'-1"	49	U	4	#6	8'-1"	49					
V	35	#5	11'-4"	414	V	35	#5	12'-4"	450	V	35	#5	13'-4"	487	V	35	#5	14'-4"	523	V	35	#5	15'-8"	572					
wH1	14	#6	9'-5"	198	wH1	14	#6	10'-5"	219	wH1	14	#6	11'-5"	240	wH1	14	#6	12'-5"	261	wH1	14	#6	13'-5"	282					
wH2	20	#6	7'-8"	230	wH2	20	#6	8'-8"	260	wH2	24	#6	9'-8"	348	wH2	24	#6	10'-8"	385	wH2	28	#6	11'-8"	491					
wS	18	#4	7'-10"	94	wS	20	#4	7'-10"	105	wS	22	#4	7'-10"	115	wS	24	#4	7'-10"	126	wS	26	#4	7'-10"	136					
wV	18	#5	11'-4"	213	wV	20	#5	12'-4"	257	wV	22	#5	13'-4"	306	wV	24	#5	14'-4"	359	wV	26	#5	15'-8"	425					
Reinforcing Steel				Lb	4,002	Reinforcing Steel				Lb	4,144	Reinforcing Steel				Lb	4,456	Reinforcing Steel				Lb	4,614	Reinforcing Steel				Lb	4,973
Class "C" Concrete				CY	19.6	Class "C" Concrete				CY	21.2	Class "C" Concrete				CY	22.9	Class "C" Concrete				CY	24.6	Class "C" Concrete				CY	26.8

**TABLES OF ESTIMATED QUANTITIES WITH 3:1 HEADER SLOPE <sup>(12)</sup>**

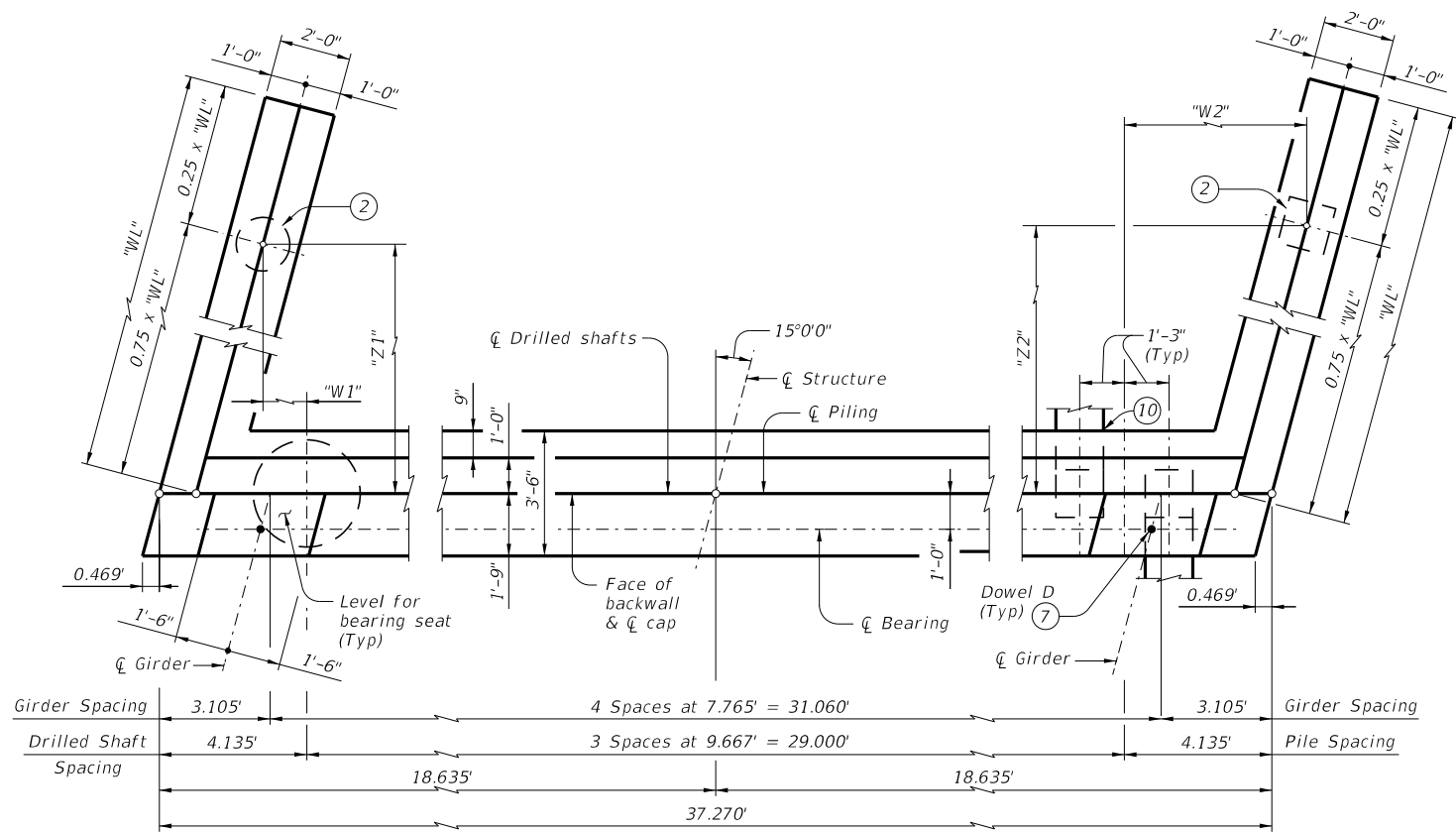
TYPE Tx28 Girders					TYPE Tx34 Girders					TYPE Tx40 Girders					TYPE Tx46 Girders					TYPE Tx54 Girders									
Bar	No.	Size	Length	Weight	Bar	No.	Size	Length	Weight	Bar	No.	Size	Length	Weight	Bar	No.	Size	Length	Weight	Bar	No.	Size	Length	Weight					
A	10	#11	35'-0"	1,860	A	10	#11	35'-0"	1,860	A	10	#11	35'-0"	1,860	A	10	#11	35'-0"	1,860	A	10	#11	35'-0"	1,860					
D <sup>(7)</sup>	2	#9	1'-8"	11	D <sup>(7)</sup>	2	#9	1'-8"	11	D <sup>(7)</sup>	2	#9	1'-8"	11	D <sup>(7)</sup>	2	#9	1'-8"	11	D <sup>(7)</sup>	2	#9	1'-8"	11					
H	8	#6	35'-8"	429	H	8	#6	35'-8"	429	H	10	#6	35'-8"	536	H	10	#6	35'-8"	536	H	12	#6	35'-8"	643					
L	18	#6	4'-0"	108	L	18	#6	4'-0"	108	L	18	#6	4'-0"	108	L	18	#6	4'-0"	108	L	18	#6	4'-0"	108					
S	33	#5	11'-6"	396	S	33	#5	11'-6"	396	S	33	#5	11'-6"	396	S	33	#5	11'-6"	396	S	33	#5	11'-6"	396					
U	4	#6	8'-1"	49	U	4	#6	8'-1"	49	U	4	#6	8'-1"	49	U	4	#6	8'-1"	49	U	4	#6	8'-1"	49					
V	35	#5	11'-4"	414	V	35	#5	12'-4"	450	V	35	#5	13'-4"	487	V	35	#5	14'-4"	523	V	35	#5	15'-8"	572					
wH1	14	#6	13'-5"	282	wH1	14	#6	14'-5"	303	wH1	14	#6	16'-5"	345	wH1	14	#6	17'-5"	366	wH1	14	#6	19'-5"	408					
wH2	20	#6	11'-8"	350	wH2	20	#6	12'-8"	381	wH2	24	#6	14'-8"	529	wH2	24	#6	15'-8"	565	wH2	28	#6	17'-8"	743					
wS	26	#4	7'-10"	136	wS	28	#4	7'-10"	147	wS	32	#4	7'-10"	167	wS	34	#4	7'-10"	178	wS	38	#4	7'-10"	199					
wV	26	#5	11'-4"	307	wV	28	#5	12'-4"	360	wV	32	#5	13'-4"	445	wV	34	#5	14'-4"	508	wV	38	#5	15'-8"	621					
Reinforcing Steel				Lb	4,342	Reinforcing Steel				Lb	4,494	Reinforcing Steel				Lb	4,933	Reinforcing Steel				Lb	5,100	Reinforcing Steel				Lb	5,610
Class "C" Concrete				CY	22.1	Class "C" Concrete				CY	23.9	Class "C" Concrete				CY	26.4	Class "C" Concrete				CY	28.4	Class "C" Concrete				CY	31.6

- <sup>(7)</sup> Omit Dowels D at end of multi-span unit. Adjust reinforcing steel total accordingly.
- <sup>(13)</sup> Quantities shown are for one abutment only (with approach slab). With no approach slab, add 1.4 CY Class "C" concrete and 214 lbs reinforcing steel for 4 additional Bars H.

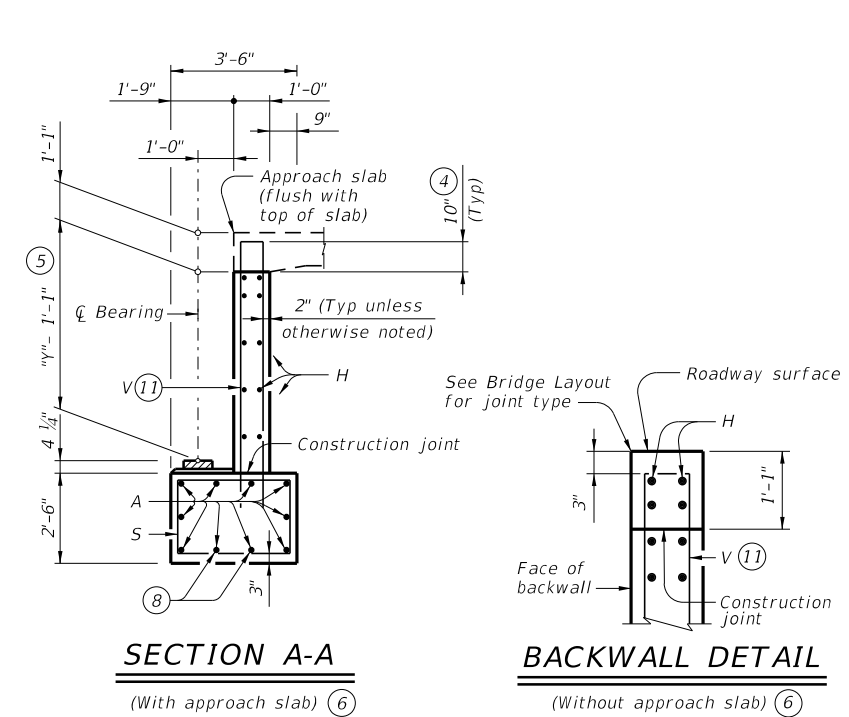
				<b>Bridge Division Standard</b>	
<b>ABUTMENTS</b> <b>TYPE TX28 THRU TX54</b> <b>PRESTR CONC I-GIRDERS</b> <b>34' ROADWAY</b>					
<b>AIG-34</b>					
FILE: IG-AIG3400-23.dgn	DN: TAR	CK: VC	DW: SFS	CK: TAR	
©TxDOT January 2023	CONT	SECT	JOB	HIGHWAY	
REVISIONS	0456	02	028,ETC	FM 27	
	DIST	COUNTY		SHEET NO.	
	BRY	FREESTONE		78	

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DATE: FILE:



PLAN 1



SECTION A-A  
(With approach slab) 6

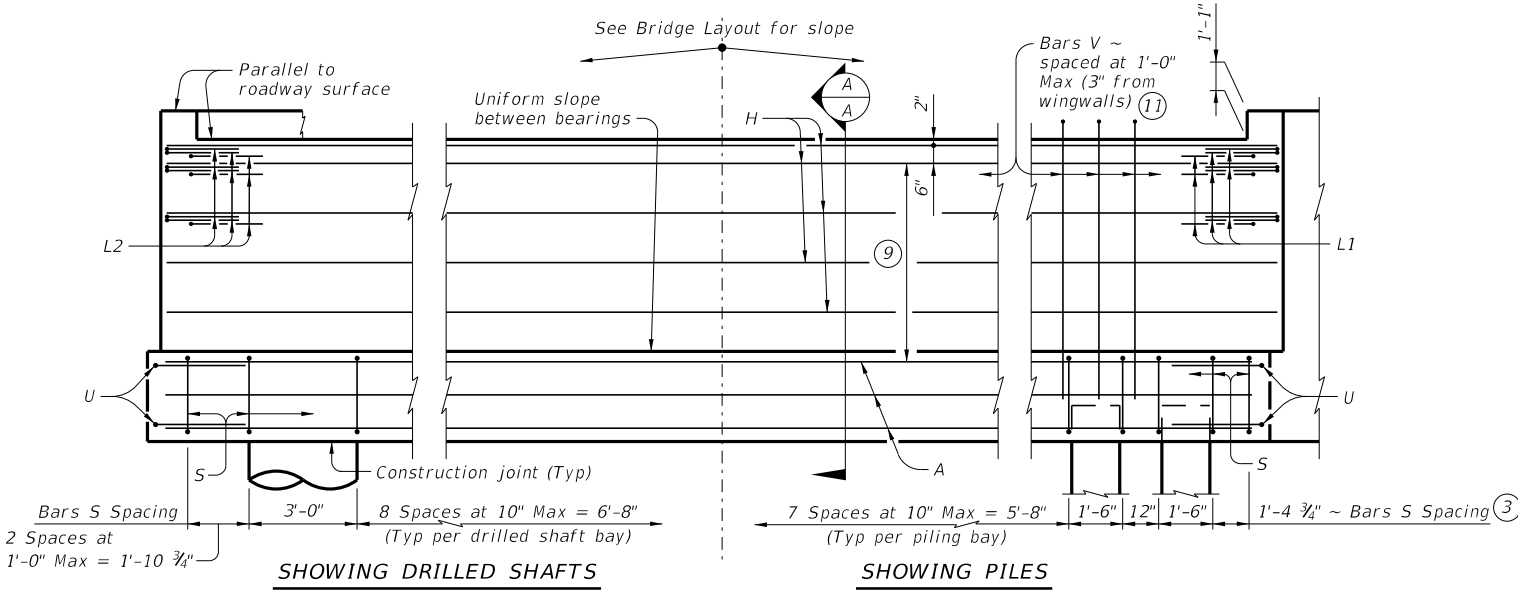
BACKWALL DETAIL  
(Without approach slab) 6

- 1 See Table A for variable dimensions based on header slope and girder type.
- 2 See Table A to determine if this wingwall foundation is required.
- 3 For piling larger than 16" adjust Bars S spacing as required to avoid piling.
- 4 Increase as required to maintain 3" from finished grade.
- 5 See Span details for "Y" value.
- 6 See Bridge Layout to determine if approach slab is present.
- 7 Omit Dowels D at end of multi-span unit. Adjust reinforcing steel total accordingly.
- 8 With pile foundations, move Bars A shown to clear piles.
- 9 Spacing based on girder type:  
Tx28 ~ 3 spaces at 1'-0" Max  
Tx34 ~ 3 spaces at 1'-0" Max  
Tx40 ~ 4 spaces at 1'-0" Max  
Tx46 ~ 4 spaces at 1'-0" Max  
Tx54 ~ 5 spaces at 1'-0" Max
- 10 See Detail A on the Common Foundation Details (FD) standard.
- 11 Field bend as needed to clear piles.
- 12 Negative values for the "W1" dimension indicates a wingwall foundation on the other side of the cap foundation from what is shown in plan view. See Detail A.

**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.  
Galvanize dowel bars D.

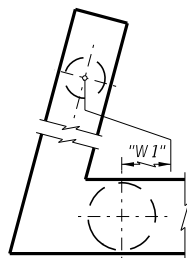
**GENERAL NOTES:**  
Designed according to AASHTO LRFD Bridge Design Specifications.  
See Bridge Layout for header slope and foundation type, size and length.  
See Common Foundation Details (FD) standard sheet for all foundation details and notes.  
See Concrete Riprap (CRR) standard sheet or Stone Riprap (SRR) standard sheet for riprap attachment details, if applicable.  
See applicable rail details for rail anchorage in wingwalls.  
Details are drawn showing right forward skew. See Bridge Layout for actual skew direction.  
These abutment details may be used with standard SIG-34-15 only.

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

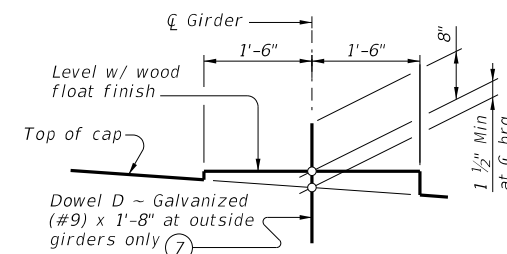


ELEVATION

Header Slope	Girder Type	Wingwall Type	Wingwall Lgth "WL"	"W1" 12	"Z1"	"W2"	Z2"				
2:1	Tx28	Cantilevered	8.000'	Not Applicable							
	Tx34	Cantilevered	9.000'								
	Tx40	Cantilevered	10.000'								
	Tx46	Cantilevered	11.000'								
	Tx54	Founded	13.000'	0.576'	9.418'	5.623'	9.418'				
3:1	Tx28	Cantilevered	12.000'	Not Applicable							
	Tx34	Founded	14.000'					0.382'	10.142'	5.817'	10.142'
	Tx40	Founded	15.000'					0.188'	10.867'	6.011'	10.867'
	Tx46	Founded	17.000'					-0.200'	12.316'	6.400'	12.316'
	Tx54	Founded	19.000'	-0.589'	13.764'	6.788'	13.764'				



DETAIL A



BEARING SEAT DETAIL

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

TABLE OF FOUNDATION LOADS

Span Length Ft	All Girder Types	
	Tons/Shaft	Tons/Pile
40	61	54
45	66	57
50	70	59
55	73	61
60	77	63
65	81	65
70	85	66
75	89	68
80	92	70
85	96	72
90	100	74
95	103	76
100	107	78
105	110	80
110	114	82
115	118	83
120	121	85
125	125	87

**Texas Department of Transportation** Bridge Division Standard

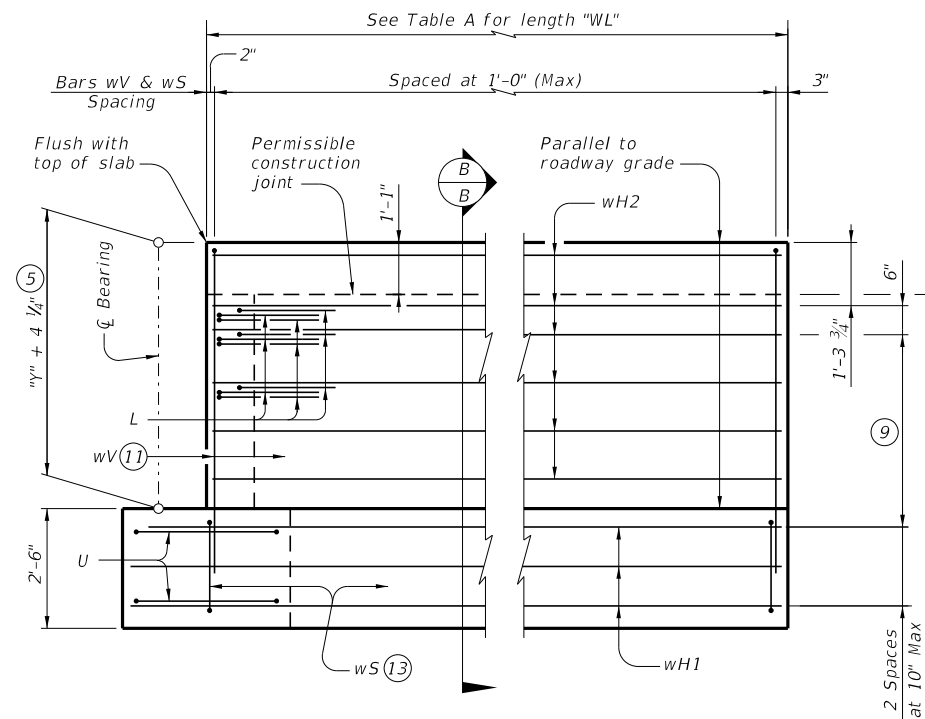
**ABUTMENTS**  
TYPE TX28 THRU TX54  
PRESTR CONC I-GIRDERS  
34' ROADWAY 15° SKEW

**AIG-34-15**

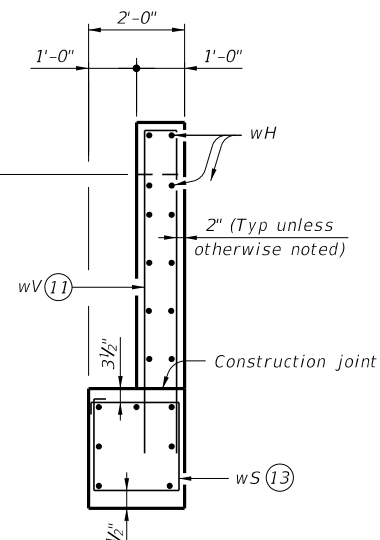
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©TxDOT January 2023	CON: SECT	JOB	HIGHWAY	
REVISIONS	0456	02	028.ETC	FM 27
DIST	COUNTY		SHEET NO.	
BRY	FREESTONE		79	

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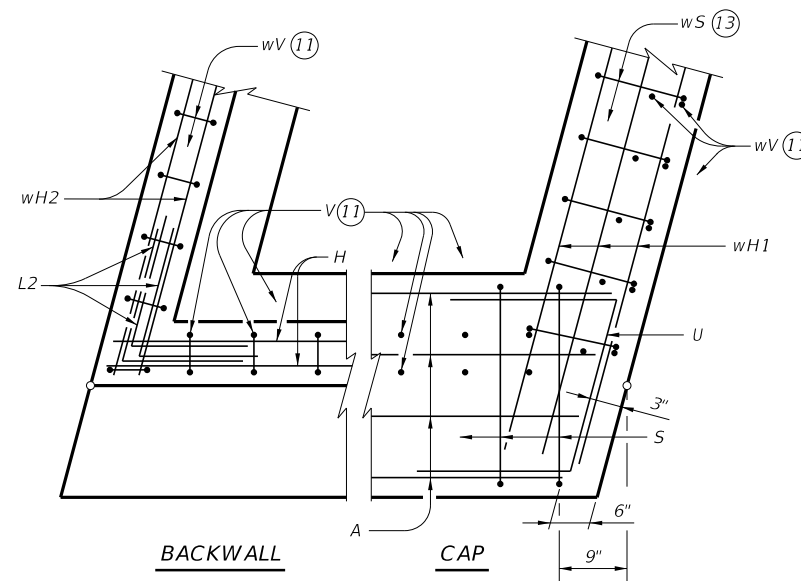
DATE:  
FILE:



WINGWALL ELEVATION

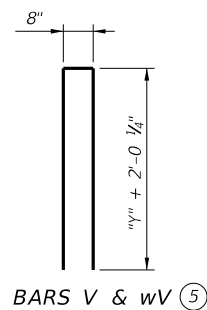


SECTION B-B

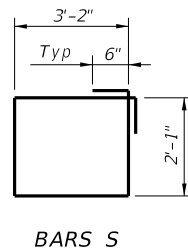


CORNER DETAILS

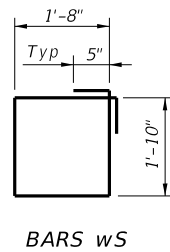
- (5) See Span details for "Y" value.
- (9) Spacing based on girder type:  
 Tx28 ~ 3 spaces at 1'-0" Max  
 Tx34 ~ 3 spaces at 1'-0" Max  
 Tx40 ~ 4 spaces at 1'-0" Max  
 Tx46 ~ 4 spaces at 1'-0" Max  
 Tx54 ~ 5 spaces at 1'-0" Max
- (11) Field bend as needed to clear piles.
- (13) Adjust as required to avoid piling.



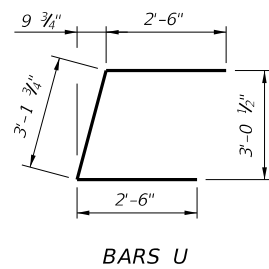
BARS V & wV (5)



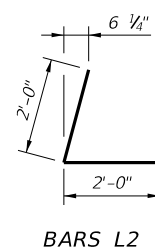
BARS S



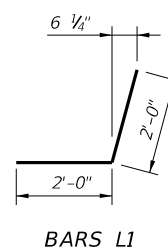
BARS wS



BARS U



BARS L2



BARS L1

HL93 LOADING

SHEET 2 OF 3



**ABUTMENTS**  
 TYPE TX28 THRU TX54  
 PRESTR CONC I-GIRDERS  
 34' ROADWAY 15° SKEW

**AIG-34-15**

FILE: IG-AIG3415-23.dgn	DN: TAR	CK: VC	DW: SFS	CK: TAR
©TxDOT January 2023	CONT	SECT	JOB	HIGHWAY
REVISIONS	0456	02	028.ETC	FM 27
DIST	COUNTY		SHEET NO.	
BRY	FREESTONE		80	

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**TABLES OF ESTIMATED QUANTITIES WITH 2:1 HEADER SLOPE (14)**

TYPE Tx28 Girders					TYPE Tx34 Girders					TYPE Tx40 Girders					TYPE Tx46 Girders					TYPE Tx54 Girders									
Bar	No.	Size	Length	Weight	Bar	No.	Size	Length	Weight	Bar	No.	Size	Length	Weight	Bar	No.	Size	Length	Weight	Bar	No.	Size	Length	Weight					
A	10	#11	36'-3"	1,926	A	10	#11	36'-3"	1,926	A	10	#11	36'-3"	1,926	A	10	#11	36'-3"	1,926	A	10	#11	36'-3"	1,926					
D(7)	2	#9	1'-8"	11	D(7)	2	#9	1'-8"	11	D(7)	2	#9	1'-8"	11	D(7)	2	#9	1'-8"	11	D(7)	2	#9	1'-8"	11					
H	8	#6	36'-11"	444	H	8	#6	36'-11"	444	H	10	#6	36'-11"	554	H	10	#6	36'-11"	554	H	12	#6	36'-11"	665					
L1	9	#6	4'-0"	54	L1	9	#6	4'-0"	54	L1	9	#6	4'-0"	54	L1	9	#6	4'-0"	54	L1	9	#6	4'-0"	54					
L2	9	#6	4'-0"	54	L2	9	#6	4'-0"	54	L2	9	#6	4'-0"	54	L2	9	#6	4'-0"	54	L2	9	#6	4'-0"	54					
S	33	#5	11'-6"	396	S	33	#5	11'-6"	396	S	33	#5	11'-6"	396	S	33	#5	11'-6"	396	S	33	#5	11'-6"	396					
U	4	#6	8'-2"	49	U	4	#6	8'-2"	49	U	4	#6	8'-2"	49	U	4	#6	8'-2"	49	U	4	#6	8'-2"	49					
V	36	#5	11'-4"	426	V	36	#5	12'-4"	463	V	36	#5	13'-4"	501	V	36	#5	14'-4"	538	V	36	#5	15'-8"	588					
wH1	14	#6	9'-5"	198	wH1	14	#6	10'-5"	219	wH1	14	#6	11'-5"	240	wH1	14	#6	12'-5"	261	wH1	14	#6	14'-5"	303					
wH2	20	#6	7'-8"	230	wH2	20	#6	8'-8"	260	wH2	24	#6	9'-8"	348	wH2	24	#6	10'-8"	385	wH2	28	#6	12'-8"	533					
wS	18	#4	7'-10"	94	wS	20	#4	7'-10"	105	wS	22	#4	7'-10"	115	wS	24	#4	7'-10"	126	wS	28	#4	7'-10"	147					
wV	18	#5	11'-4"	213	wV	20	#5	12'-4"	257	wV	22	#5	13'-4"	306	wV	24	#5	14'-4"	359	wV	28	#5	15'-8"	458					
Reinforcing Steel				Lb	4,095	Reinforcing Steel				Lb	4,238	Reinforcing Steel				Lb	4,554	Reinforcing Steel				Lb	4,713	Reinforcing Steel				Lb	5,184
Class "C" Concrete				CY	20.1	Class "C" Concrete				CY	21.7	Class "C" Concrete				CY	23.4	Class "C" Concrete				CY	25.2	Class "C" Concrete				CY	28.2

**TABLES OF ESTIMATED QUANTITIES WITH 3:1 HEADER SLOPE (14)**

TYPE Tx28 Girders					TYPE Tx34 Girders					TYPE Tx40 Girders					TYPE Tx46 Girders					TYPE Tx54 Girders									
Bar	No.	Size	Length	Weight	Bar	No.	Size	Length	Weight	Bar	No.	Size	Length	Weight	Bar	No.	Size	Length	Weight	Bar	No.	Size	Length	Weight					
A	10	#11	36'-3"	1,926	A	10	#11	36'-3"	1,926	A	10	#11	36'-3"	1,926	A	10	#11	36'-3"	1,926	A	10	#11	36'-3"	1,926					
D(7)	2	#9	1'-8"	11	D(7)	2	#9	1'-8"	11	D(7)	2	#9	1'-8"	11	D(7)	2	#9	1'-8"	11	D(7)	2	#9	1'-8"	11					
H	8	#6	36'-11"	444	H	8	#6	36'-11"	444	H	10	#6	36'-11"	554	H	10	#6	36'-11"	554	H	12	#6	36'-11"	665					
L1	9	#6	4'-0"	54	L1	9	#6	4'-0"	54	L1	9	#6	4'-0"	54	L1	9	#6	4'-0"	54	L1	9	#6	4'-0"	54					
L2	9	#6	4'-0"	54	L2	9	#6	4'-0"	54	L2	9	#6	4'-0"	54	L2	9	#6	4'-0"	54	L2	9	#6	4'-0"	54					
S	33	#5	11'-6"	396	S	33	#5	11'-6"	396	S	33	#5	11'-6"	396	S	33	#5	11'-6"	396	S	33	#5	11'-6"	396					
U	4	#6	8'-2"	49	U	4	#6	8'-2"	49	U	4	#6	8'-2"	49	U	4	#6	8'-2"	49	U	4	#6	8'-2"	49					
V	36	#5	11'-4"	426	V	36	#5	12'-4"	463	V	36	#5	13'-4"	501	V	36	#5	14'-4"	538	V	36	#5	15'-8"	588					
wH1	14	#6	13'-5"	282	wH1	14	#6	15'-5"	324	wH1	14	#6	16'-5"	345	wH1	14	#6	18'-5"	387	wH1	14	#6	20'-5"	429					
wH2	20	#6	11'-8"	350	wH2	20	#6	13'-8"	411	wH2	24	#6	14'-8"	529	wH2	24	#6	16'-8"	601	wH2	28	#6	18'-8"	785					
wS	26	#4	7'-10"	136	wS	30	#4	7'-10"	157	wS	32	#4	7'-10"	167	wS	36	#4	7'-10"	188	wS	40	#4	7'-10"	209					
wV	26	#5	11'-4"	307	wV	30	#5	12'-4"	386	wV	32	#5	13'-4"	445	wV	36	#5	14'-4"	538	wV	40	#5	15'-8"	654					
Reinforcing Steel				Lb	4,435	Reinforcing Steel				Lb	4,675	Reinforcing Steel				Lb	5,031	Reinforcing Steel				Lb	5,296	Reinforcing Steel				Lb	5,820
Class "C" Concrete				CY	22.7	Class "C" Concrete				CY	25.1	Class "C" Concrete				CY	27.0	Class "C" Concrete				CY	29.7	Class "C" Concrete				CY	33.1

(7) Omit Dowels D at end of multi-span unit. Adjust reinforcing steel total accordingly.

(14) Quantities shown are for one abutment only (with approach slab). With no approach slab, add 1.4 CY Class "C" concrete and 222 lbs reinforcing steel for 4 additional Bars H.



**ABUTMENTS**  
**TYPE TX28 THRU TX54**  
**PRESTR CONC I-GIRDERS**  
**34' ROADWAY 15° SKEW**

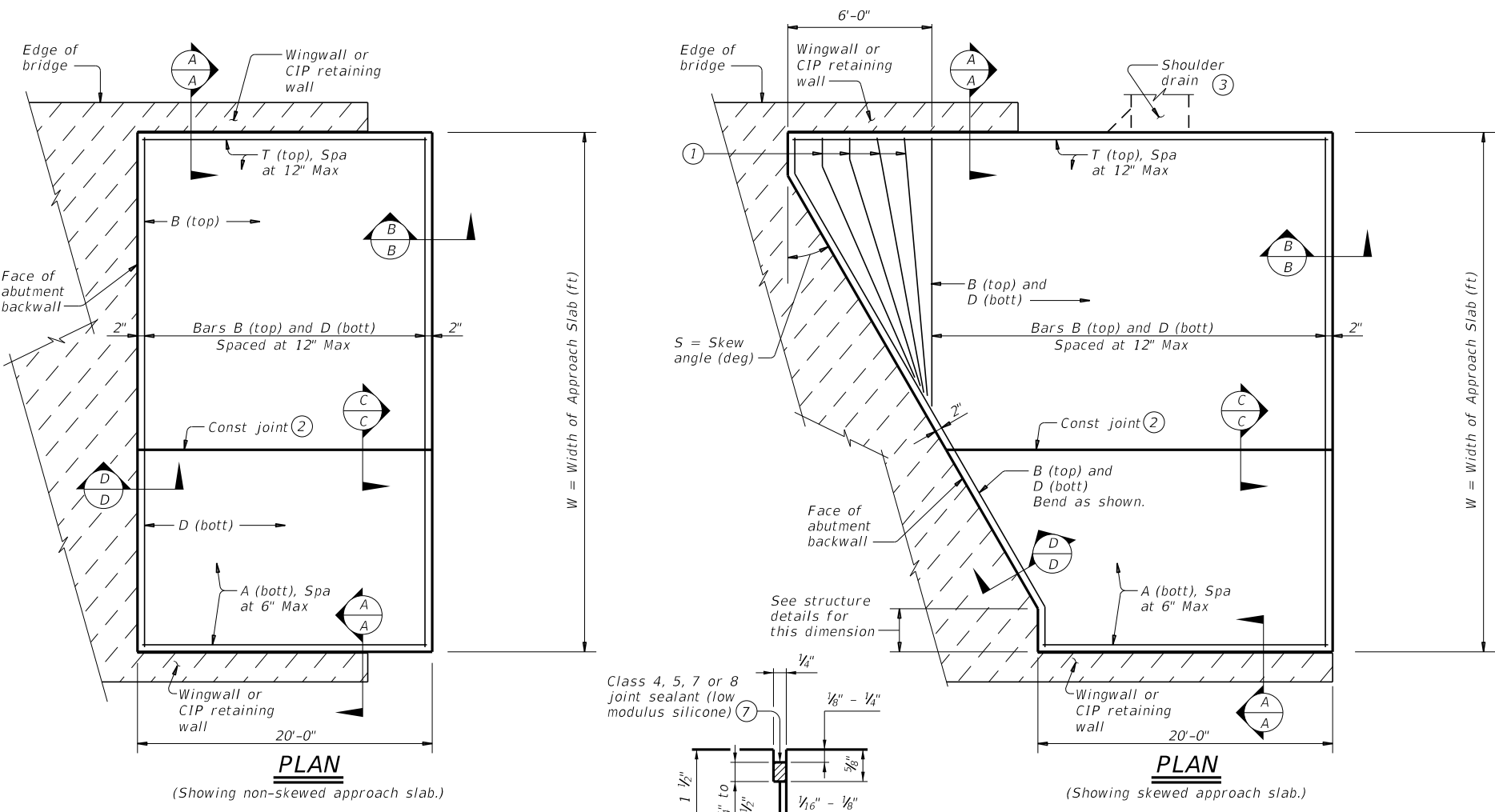
**AIG-34-15**

FILE: IG-AIG3415-23.dgn	DN: TAR	CK: VC	DW: SFS	CK: TAR
©TxDOT January 2023	CONT	SECT	JOB	HIGHWAY
REVISIONS	0456	02	028.ETC	FM 27
	DIST	COUNTY		SHEET NO.
	BRY	FREESTONE		81



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DATE: FILE:



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

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

Reinf steel weight = 8.5 Lbs/SF of Approach Slab

Volume of Appr Slab Conc (CY) = 0.802W + 0.02W<sup>2</sup> Tan S

W = Width of Approach Slab (ft)

S = Skew Angle (deg)

- ① Flare Bars B and D in this region (1'-6" Max Spa, 3" Min Spa). Minimum flared bar length = 2'-6". Bend bars as necessary.
- ② Provide longitudinal construction joints that align with longitudinal construction joints in the bridge slab with bridges built in stages. Other longitudinal construction joints must receive approval of the Engineer.
- ③ See details elsewhere in plans for shoulder drain location and details.
- ④ For Contractor's information only. Quantities shown are for one approach slab.
- ⑤ Multiple piece tie bars are acceptable at longitudinal construction joints provided minimum laps shown are achieved.
- ⑥ See details elsewhere in plans for required cross-slope.
- ⑦ Place in accordance with Item 438.
- ⑧ Provide backer rod that is 25% larger than joint opening and compatible with the sealant.
- ⑨ If bridge rail is present at the wingwall or CIP retaining wall, place 1/2" rebonded recycled tire rubber between concrete railing and top of approach slab as shown when concrete railing projects over the approach slab.

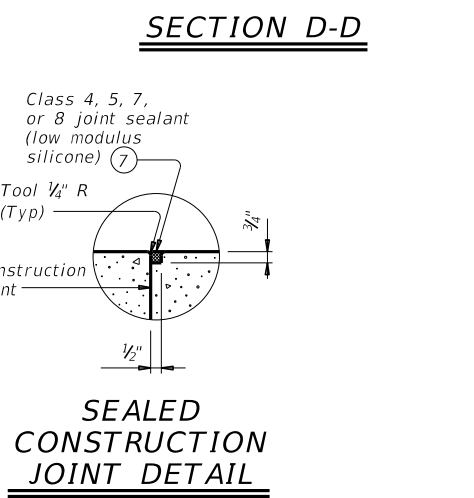
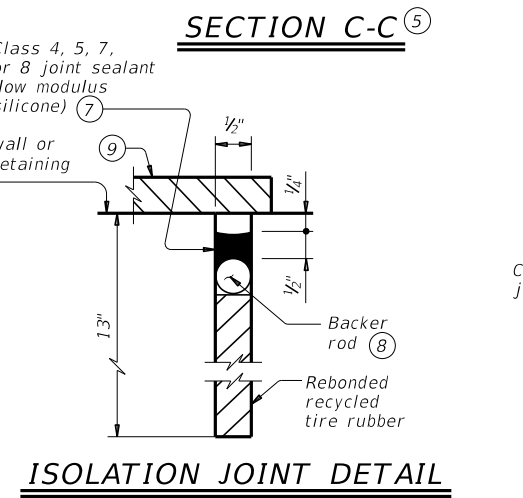
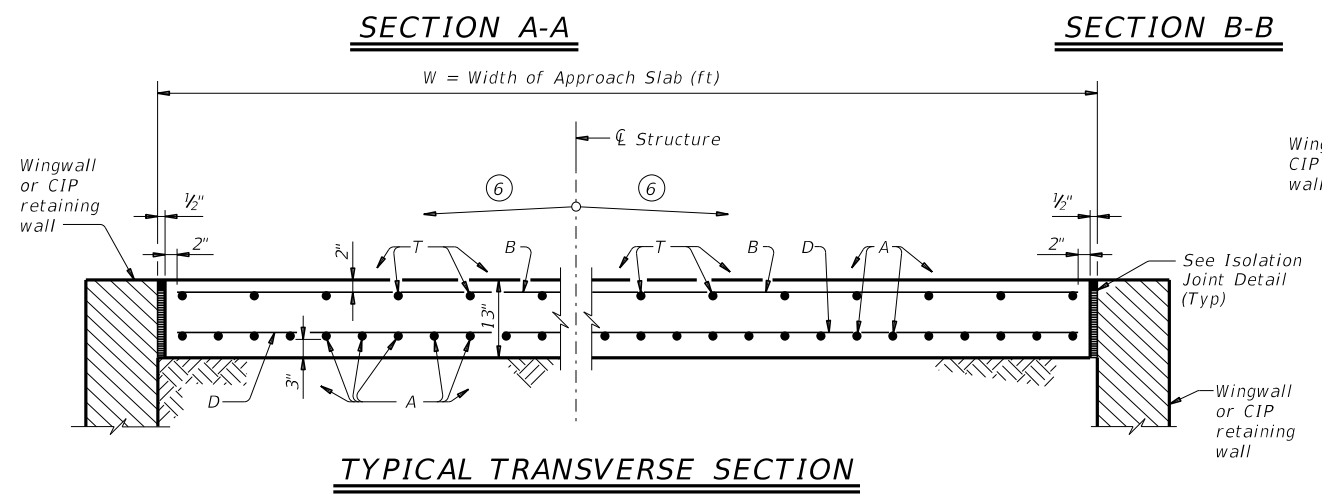
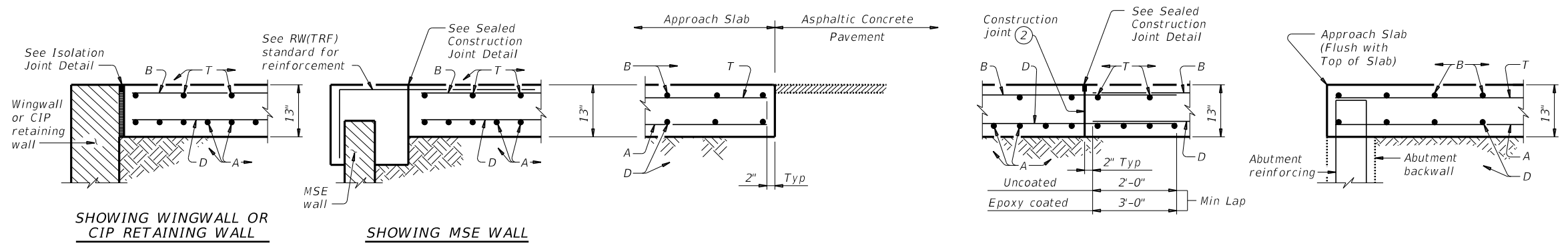
**GENERAL NOTES:**

Construct approach slab in accordance with Item 422. Provide Class "S" concrete with a minimum compressive strength of 4,000 psi. Provide Grade 60 reinforcing steel. Provide longitudinal joints as shown on the Longitudinal Saw Cut Joint Detail at lane lines and shoulders when width between longitudinal construction joints or edges of approach slab exceeds 16 feet. Saw cut joints within 24 hours of concrete placement to a depth of 1 1/2" and seal in accordance with Item 438. Alternately, provide a controlled joint consisting of 1 1/2" vinyl or plastic joint former (Stress Cap, Zip Strip, Stress Lock, or equal as approved by the Engineer.) Provide rebonded recycled tire rubber joint filler that meets the requirements of DMS-6310. "Joint Sealants and Fillers."

Construct the subgrade or subbase away from the bridge for a minimum distance of 100 feet prior to the approach slab, unless otherwise indicated on the plans. Compact and finish the subgrade or foundation for the approach slab to the typical cross-section and to the lines and grades shown on the plans. Cure for 4 days using water or membrane curing per Item 422. All details shown herein are subsidiary to bridge approach slab.

Cover dimensions are clear dimensions, unless noted otherwise.

**LONGITUDINAL SAW CUT JOINT DETAIL**



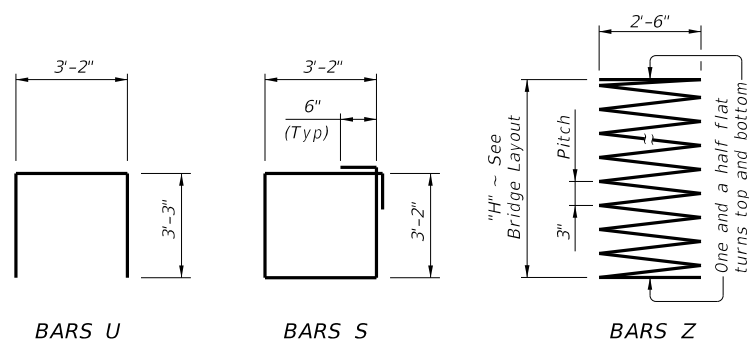
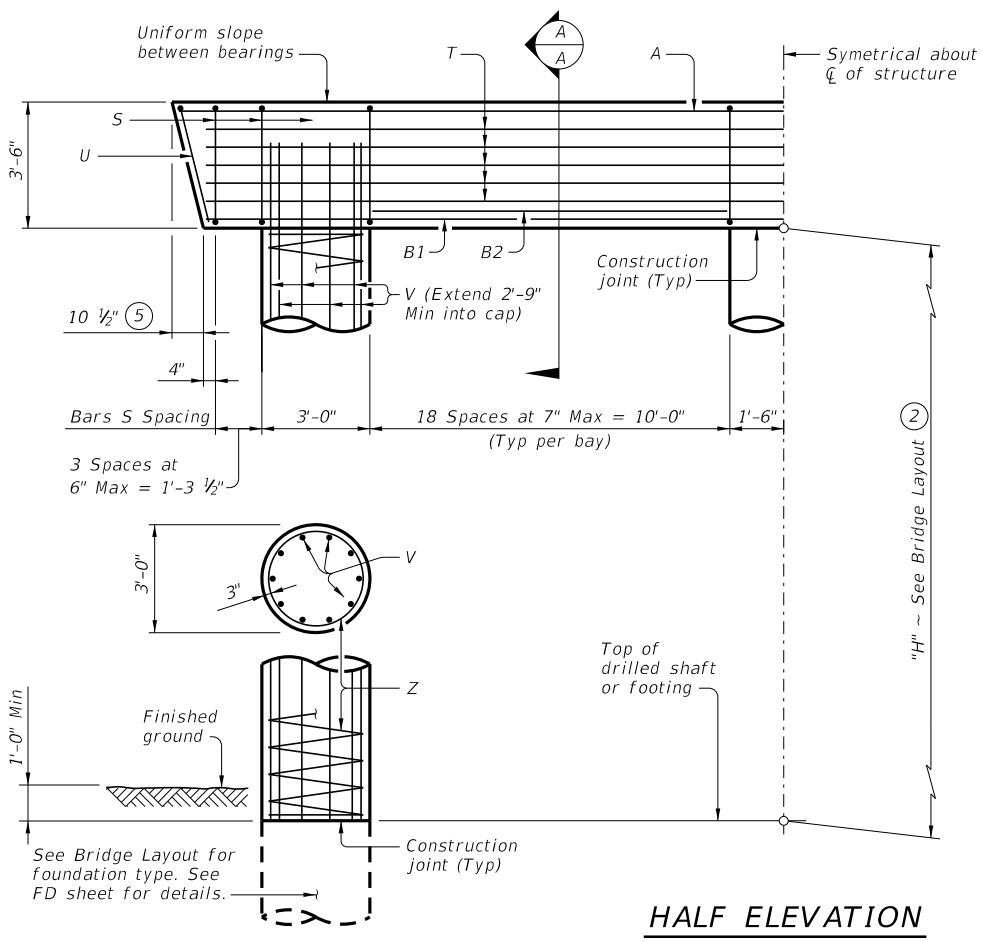
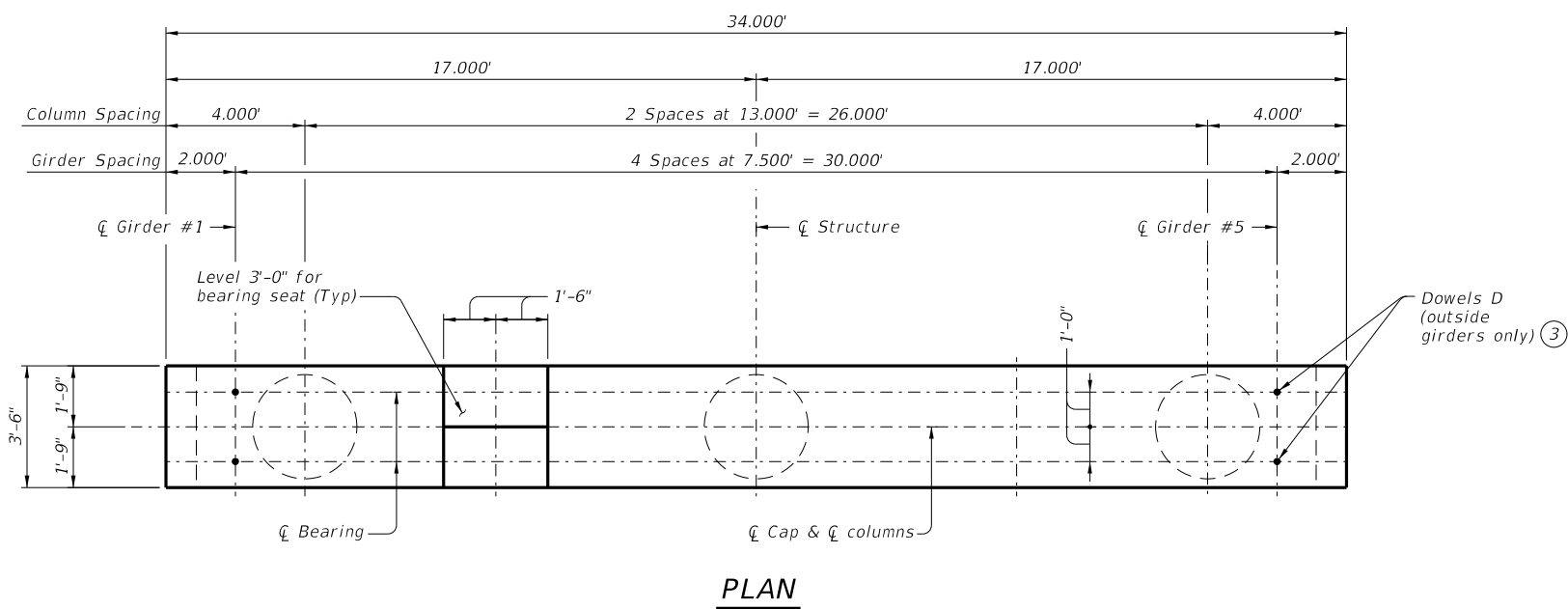
**Texas Department of Transportation** Bridge Division Standard

**BRIDGE APPROACH SLAB**  
**ASPHALTIC CONCRETE PAVEMENT**

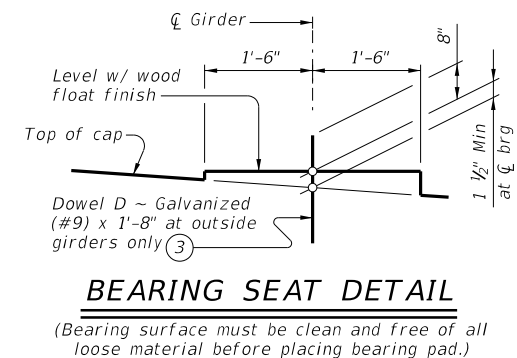
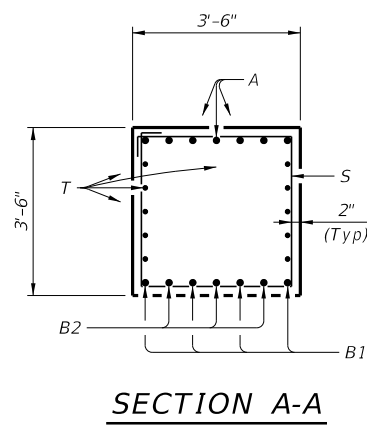
**BAS-A**

FILE: basaste1-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0456	02	028.ETC	FM 27
02-20: Removed stress relieving pad.	DIST	COUNTY	SHEET NO.	
	BRY	FREESTONE	82	

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- ① Quantities shown are based on an "H" value of 36'. For each linear foot variation in "H" value, make the following adjustments:  
 Bars V length, 1'-0"  
 Bars Z length, 31'-5"  
 Reinforcing steel, 165 Lb  
 Class "C" conc (col), 0.78 CY
- ② This standard may not be used for "H" heights exceeding 36'. In areas of very soft soil or where scour is anticipated, allowable "H" heights must be evaluated by the Engineer prior to the use of this standard.
- ③ Omit Dowels D at end of multi-span units. Adjust reinforcing steel total accordingly.
- ④ Foundation Loads based on "H" = 36'.
- ⑤ Measured parallel to top of cap cross-slope.



### TABLE OF ESTIMATED QUANTITIES ①

Bar	No.	Size	Length	Weight	
A	7	#11	33'-6"	1,246	
B1	4	#11	32'-0"	680	
B2	6	#11	10'-0"	319	
D ③	4	#9	1'-8"	23	
S	46	#5	13'-8"	656	
T	10	#5	32'-0"	334	
U	2	#5	9'-8"	20	
V	30	#9	38'-9"	3,953	
Z	3	#4	1154'-7"	2,314	
Reinforcing Steel				Lb	9,545
Class "C" Concrete (Cap)				CY	15.3
Class "C" Concrete (Col)				CY	28.3

### FOUNDATION LOADS ④

Span Average	Drilled Shaft Loads	Pile Load (Tons/Pile)		
		3 Pile Ftg	4 Pile Ftg	5 Pile Ftg
Ft	Tons/Shaft			
40	121	44	33	27
45	131	47	36	29
50	140	50	38	31
55	150	53	41	33
60	159	56	43	35
65	168	59	45	37
70	178	63	48	39
75	187	66	50	41
80	196	69	52	42
85	205	72	54	44
90	215	75	57	46
95	224	78	59	48
100	233	81	61	50
105	242	84	64	52
110	251	87	66	53
115	261	90	68	55
120	270	93	71	57
125	279	96	73	59

#### 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.  
 Galvanize dowel bars D.

#### GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications.  
 See Bridge Layout for foundation type, size and length.  
 See Common Foundation Details (FD) standard sheet for all foundation details and notes.  
 See Shear Key (IGSK) standard sheet for all shear key details and notes, if applicable.  
 Bent selected must be based on the average span length rounded up to the next 5 ft increment.  
 These bent details may be used with standard SIG-34 only.

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

HL93 LOADING



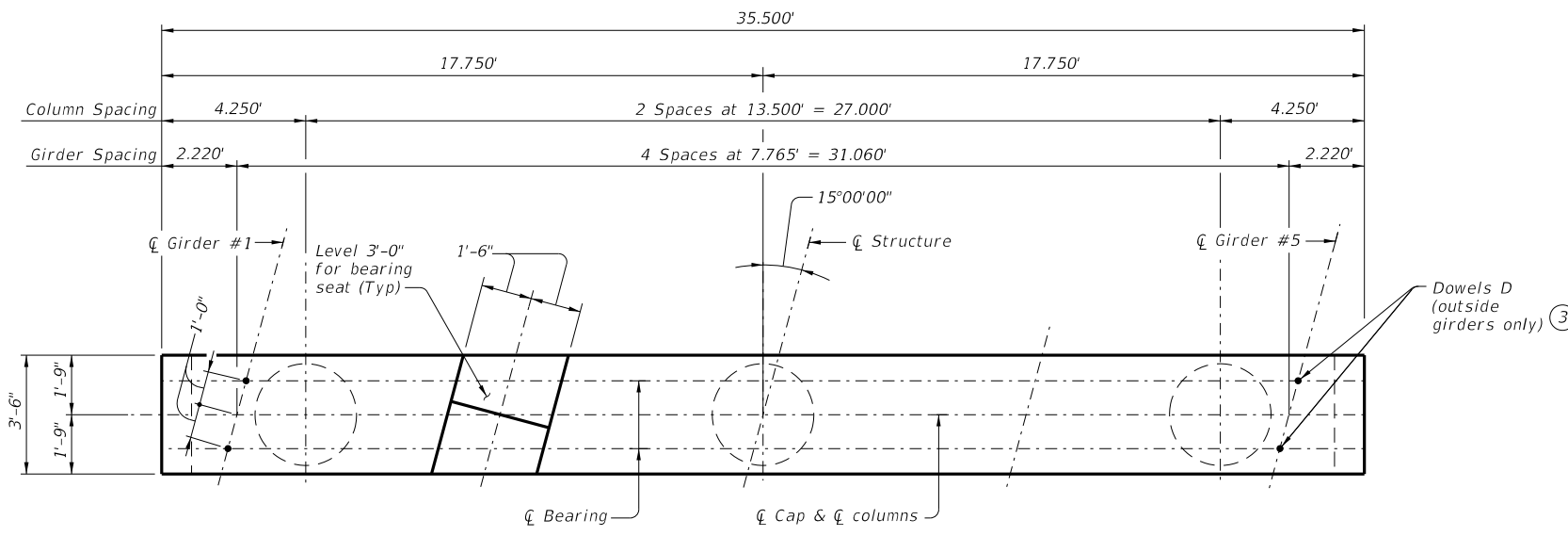
## INTERIOR BENTS TYPE TX28 THRU TX54 PRESTR CONC I-GIRDERS 34' ROADWAY

### BIG-34

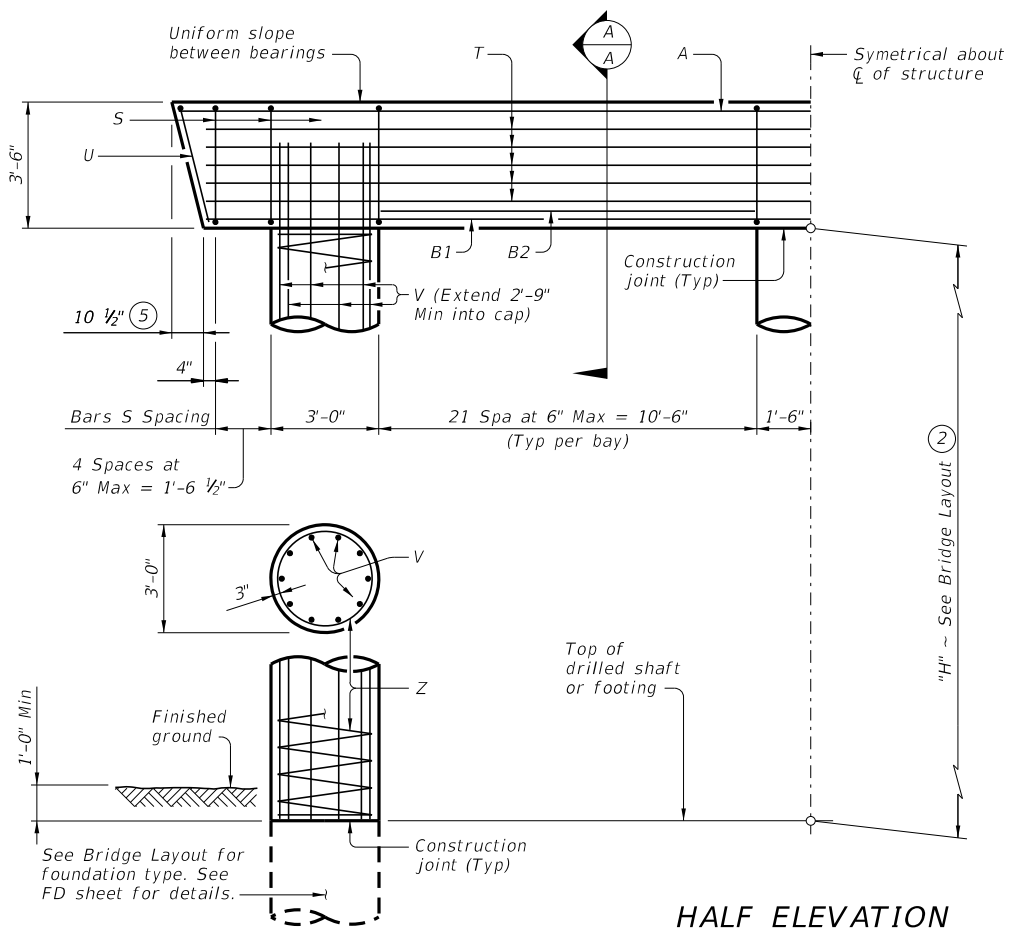
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CONTRACT: 0456	SECTION: 02	JOB: 028,ETC	HIGHWAY: FM 27	
DIST: BRY	COUNTY: FREESTONE	SHEET NO: 83		

DATE: FILE:

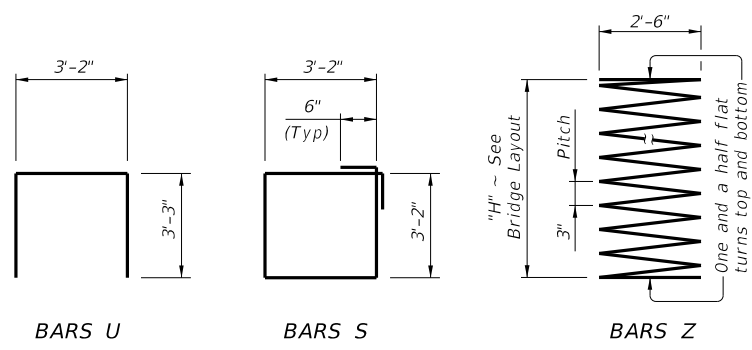
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**PLAN**



**HALF ELEVATION**

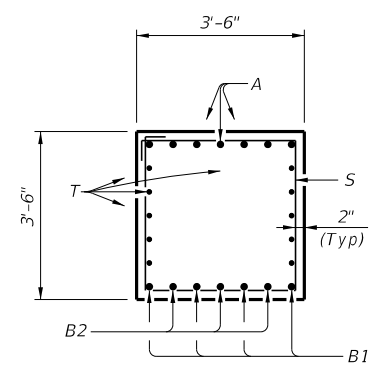


**BARS U**

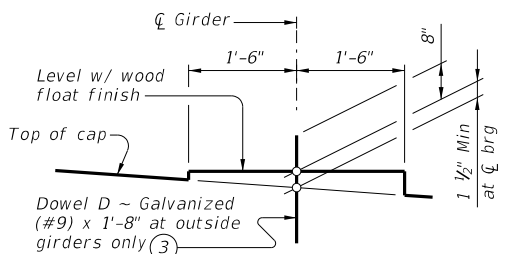
**BARS S**

**BARS Z**

- ① Quantities shown are based on an "H" value of 36'. For each linear foot variation in "H" value, make the following adjustments:  
 Bars V length, 1'-0"  
 Bars Z length, 31'-5"  
 Reinforcing steel, 165 Lb  
 Class "C" conc (col), 0.78 CY
- ② This standard may not be used for "H" heights exceeding 36'. In areas of very soft soil or where scour is anticipated, allowable "H" heights must be evaluated by the Engineer prior to the use of this standard.
- ③ Omit Dowels D at end of multi-span units. Adjust reinforcing steel total accordingly.
- ④ Foundation Loads based on "H" = 36'.
- ⑤ Measured parallel to top of cap cross-slope.



**SECTION A-A**



**BEARING SEAT DETAIL**

TABLE OF ESTIMATED QUANTITIES ①					
Bar	No.	Size	Length	Weight	
A	7	#11	35'-0"	1,302	
B1	4	#11	33'-6"	712	
B2	6	#11	10'-6"	335	
D ③	4	#9	1'-8"	23	
S	54	#5	13'-8"	770	
T	10	#5	33'-6"	349	
U	2	#5	9'-8"	20	
V	30	#9	38'-9"	3,953	
Z	3	#4	1154'-7"	2,314	
Reinforcing Steel				Lb	9,778
Class "C" Concrete (Cap)				CY	16.0
Class "C" Concrete (Col)				CY	28.3

FOUNDATION LOADS ④				
Span Average	Drilled Shaft Loads	Pile Load (Tons/Pile)		
		3 Pile Ftg	4 Pile Ftg	5 Pile Ftg
Ft	Tons/Shaft			
40	122	44	34	28
45	131	47	36	29
50	141	50	38	31
55	150	53	41	33
60	160	57	43	35
65	169	60	45	37
70	178	63	48	39
75	187	66	50	41
80	197	69	52	43
85	206	72	55	44
90	215	75	57	46
95	224	78	59	48
100	233	81	61	50
105	243	84	64	52
110	252	87	66	54
115	261	90	68	55
120	270	93	71	57
125	279	96	73	59

**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.  
 Galvanize dowel bars D.

**GENERAL NOTES:**  
 Designed according to AASHTO LRFD Bridge Design Specifications.  
 See Bridge Layout for foundation type, size and length.  
 See Common Foundation Details (FD) standard sheet for all foundation details and notes.  
 See Shear Key (IGSK) standard sheet for all shear key details and notes, if applicable.  
 Bent selected must be based on the average span length rounded up to the next 5 ft increment.  
 Details are drawn showing right forward skew. See Bridge Layout for actual skew direction.  
 These bent details may be used with standard SIG-34-15 only.

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

HL93 LOADING

Texas Department of Transportation  
 Bridge Division Standard

**INTERIOR BENTS**  
 TYPE TX28 THRU TX54  
 PRESTR CONC I-GIRDERS  
 34' ROADWAY 15° SKEW

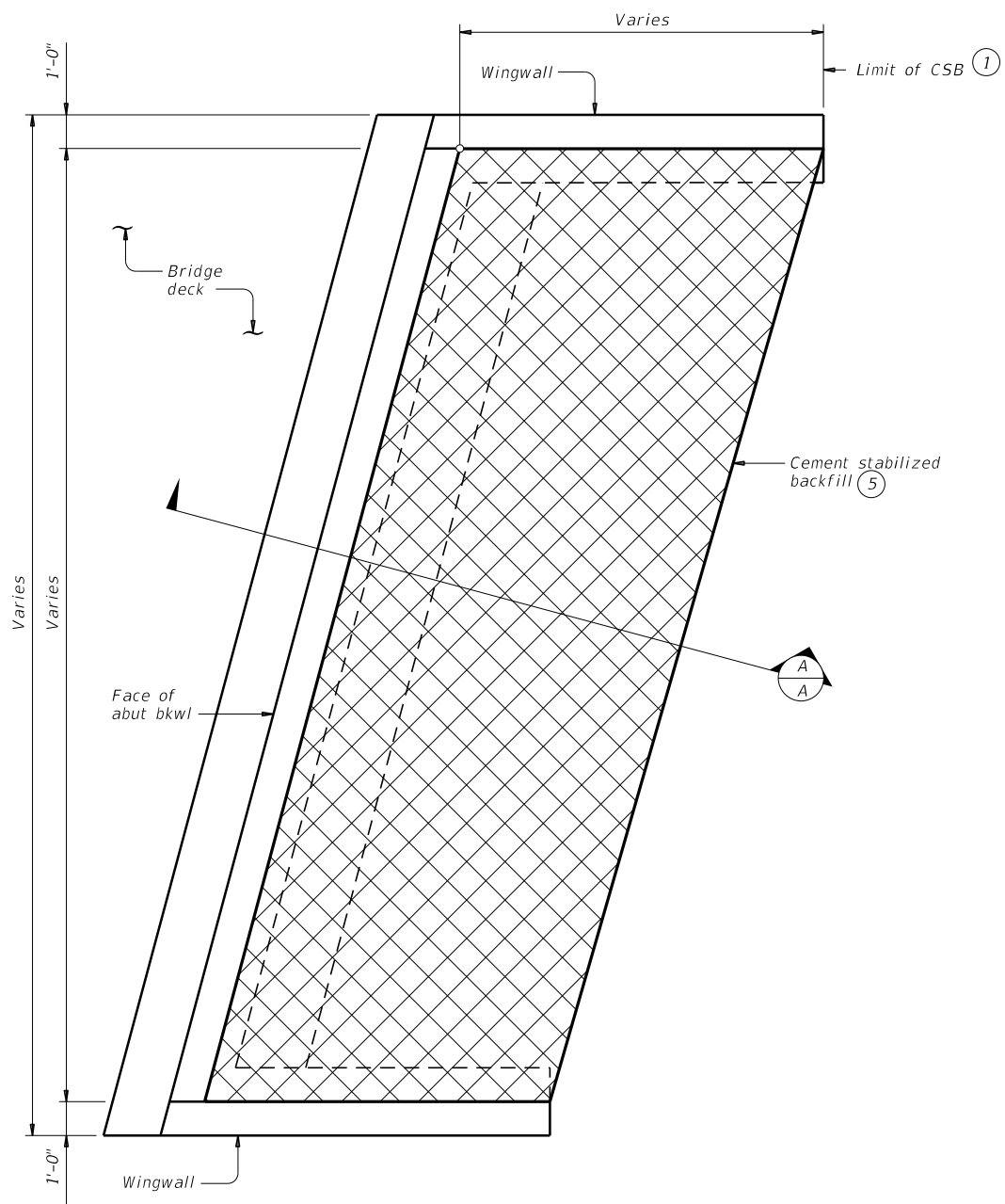
**BIG-34-15**

FILE: IG-BIG3415-23.dgn	DN: TAR	CK: VC	DW: SFS	CK: TAR
©TxDOT	January 2023	CONV	SECT	JOB
REVISIONS	0456	02	028,ETC	HIGHWAY
	DIST	COUNTY		SHEET NO.
	BRY	FREESTONE		84

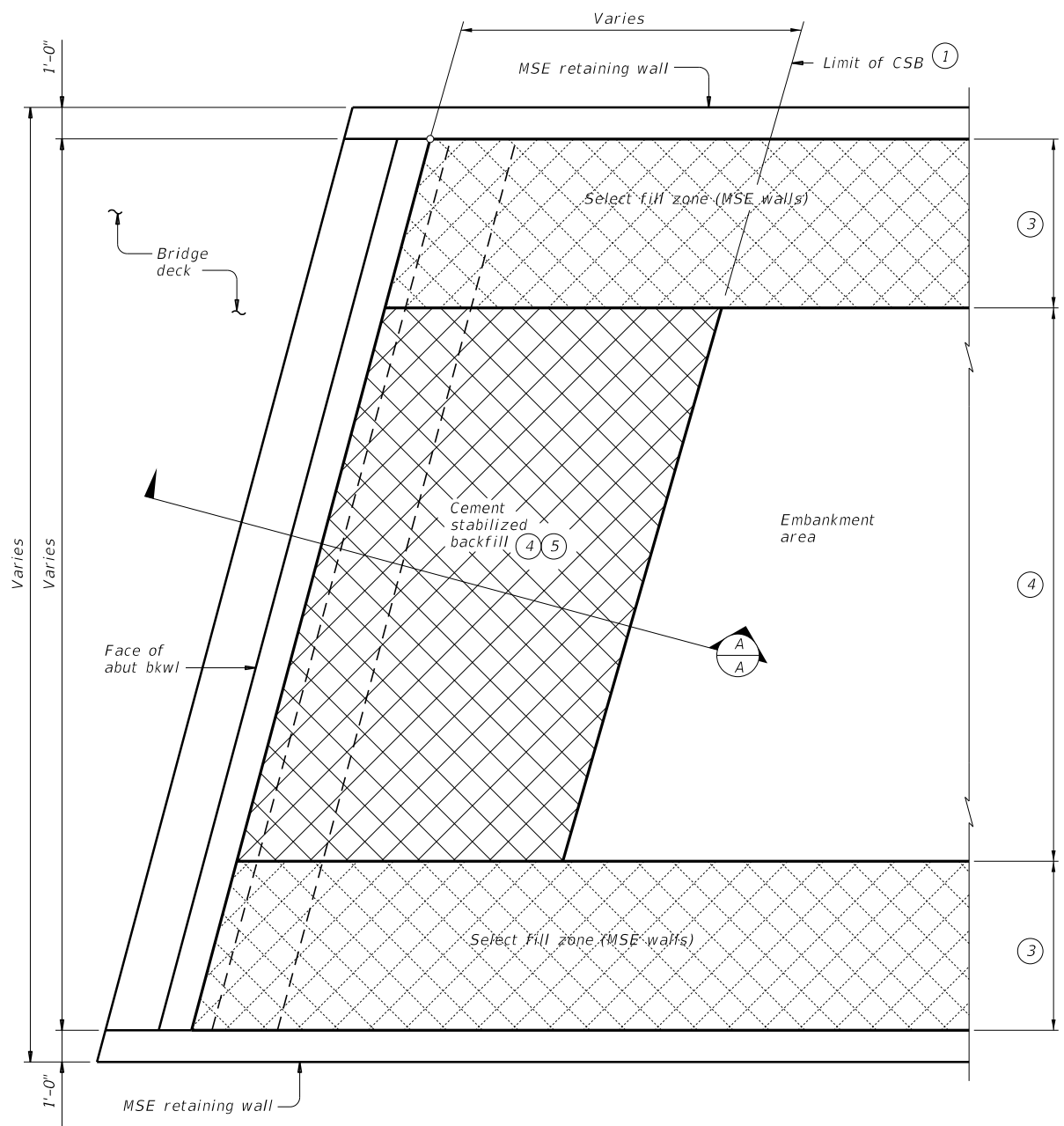
DATE: FILE:

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DATE: FILE:



**OPTION 1 ~ PLAN WITH WINGWALLS**  
Cast-in-place retaining walls similar.



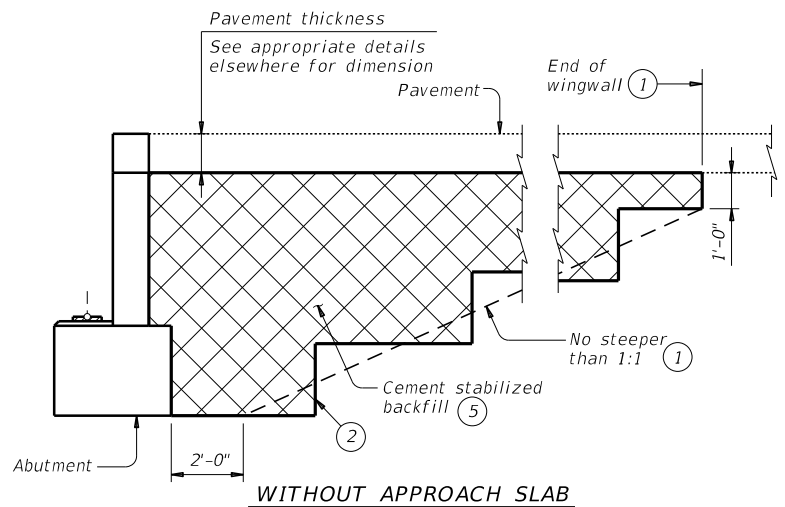
**OPTION 1 ~ PLAN WITH MSE RETAINING WALLS**

- 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 flowable fill; and
  - b) Place flowable fill in lifts not exceeding 2 feet in height, place each successive lift when the previous lift has stiffened/hardened (i.e. has lost its flowability).

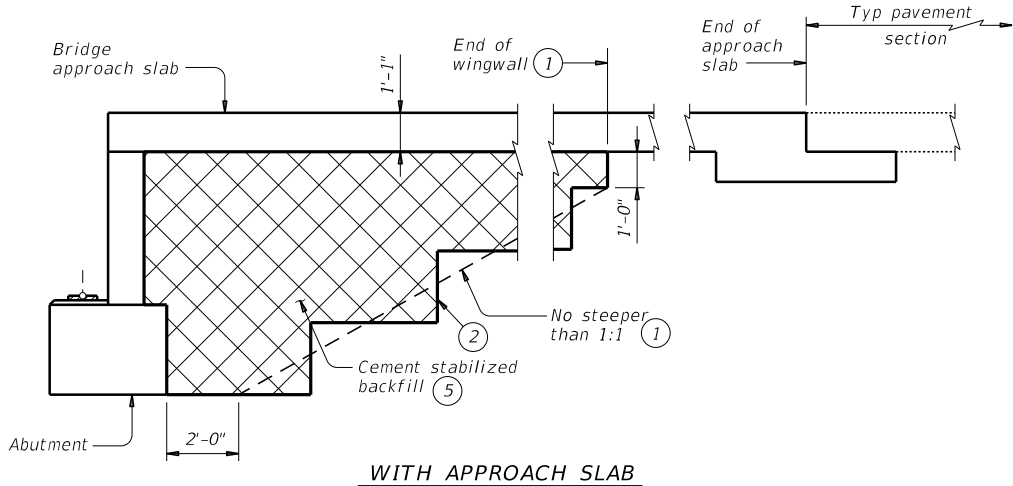
**GENERAL NOTES:**  
See the Bridge Layout for selected Option. Option 2 is intended for new construction requiring high plasticity embankment fill with a plasticity index (PI) greater than 30 or pavement built in poor native soil. Poor soils are defined as high plasticity clays or expansive clays. Option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

SHEET 1 OF 2

		<b>Bridge Division Standard</b>	
<h2>CEMENT STABILIZED ABUTMENT BACKFILL BRIDGE ABUTMENT</h2>			
<h3>CSAB</h3>			
FILE: csabste1-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT
©TxDOT	April 2019	CONV	SECT
REVISIONS	0456	02	028,ETC
02-20: Added Option 2.	DIST	COUNTY	SHEET NO.
BRY	FREESTONE		85

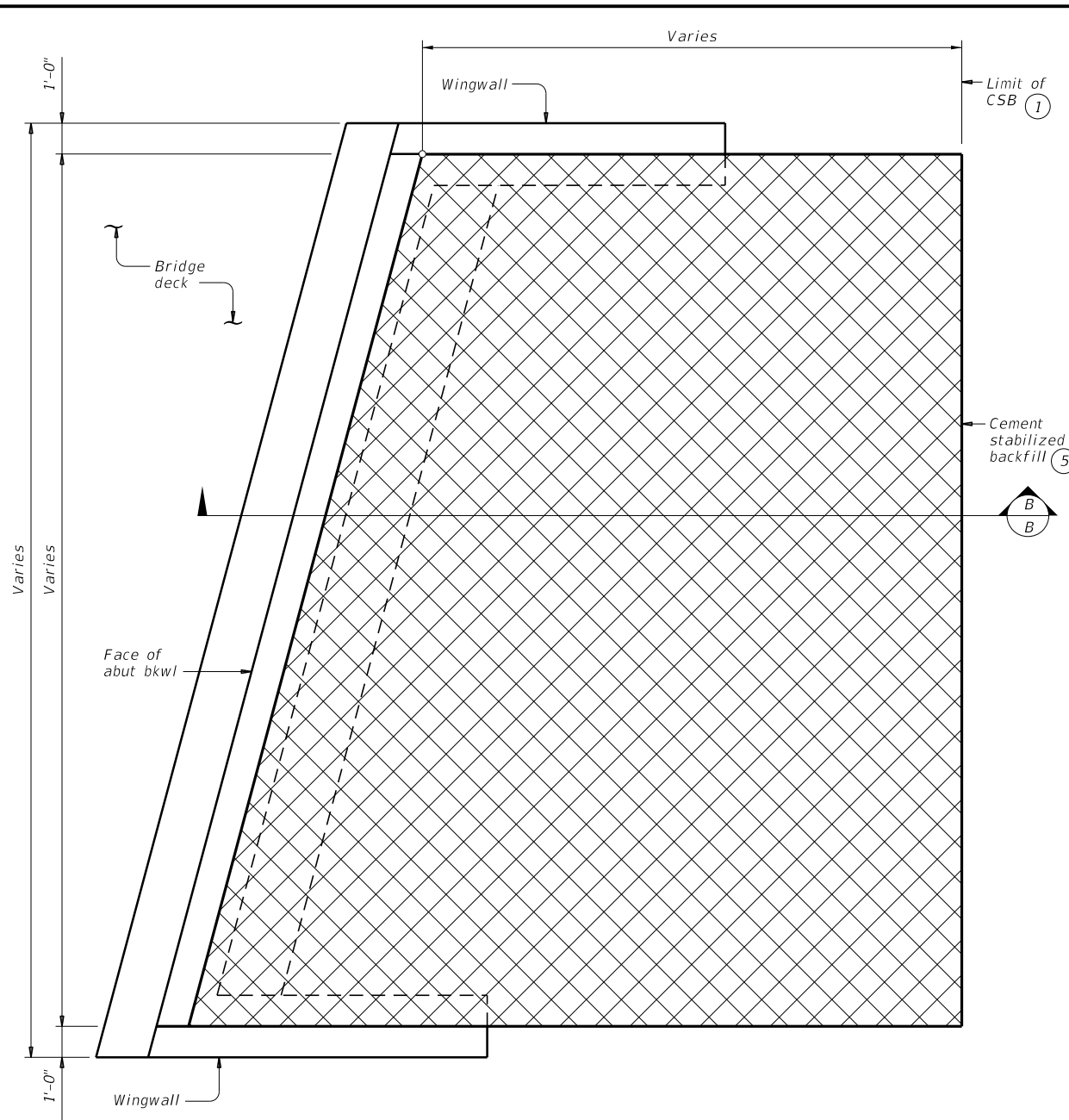


**WITHOUT APPROACH SLAB**



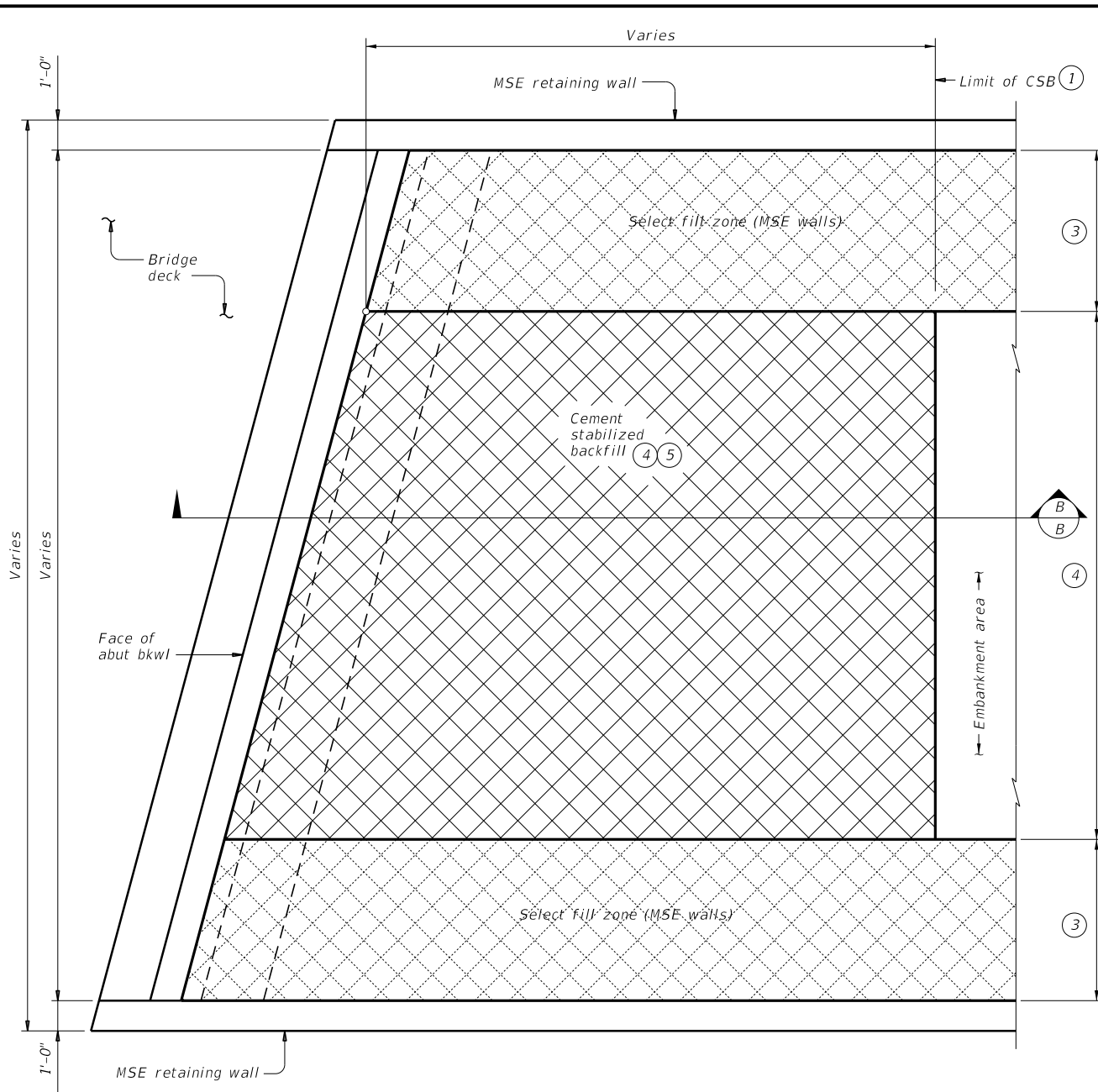
**SECTION A-A**  
**WITH APPROACH SLAB**  
(Showing BAS-C, BAS-A similar.)

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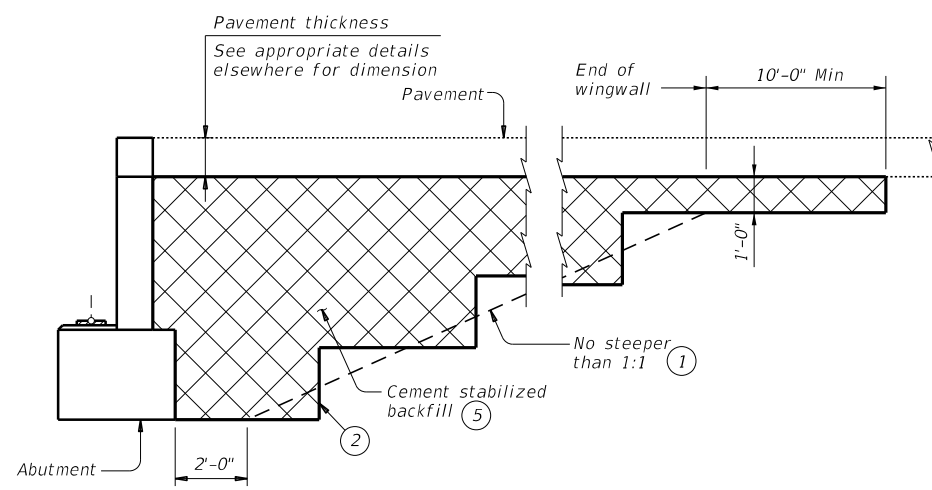
**OPTION 2 ~ PLAN WITH WINGWALLS**

Cast-in-place retaining walls similar.

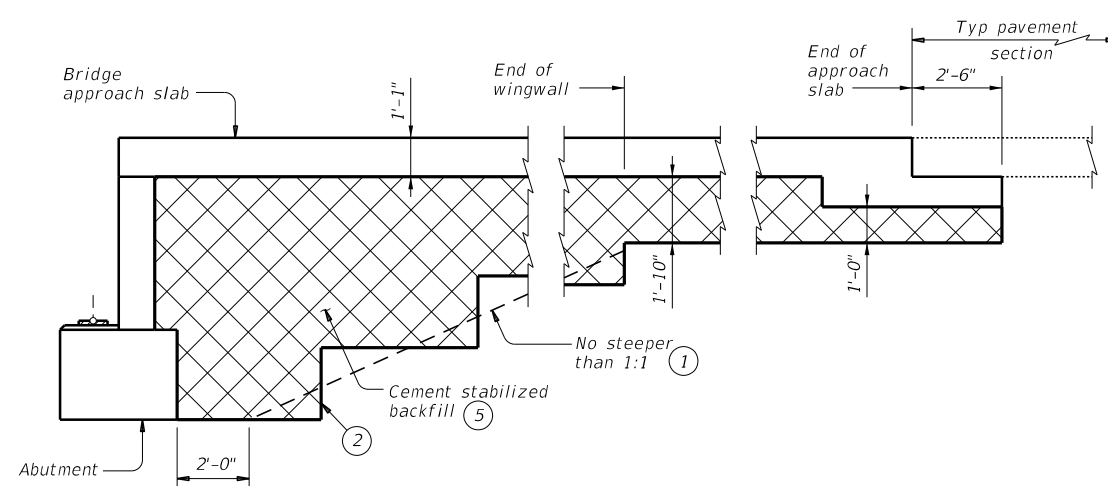


**OPTION 2 ~ PLAN WITH MSE RETAINING WALLS**

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



**WITHOUT APPROACH SLAB**



**SECTION B-B**

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

SHEET 2 OF 2



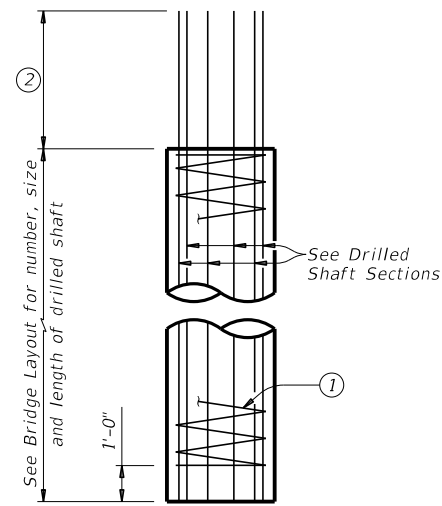
**CEMENT STABILIZED  
ABUTMENT BACKFILL  
BRIDGE ABUTMENT**

**CSAB**

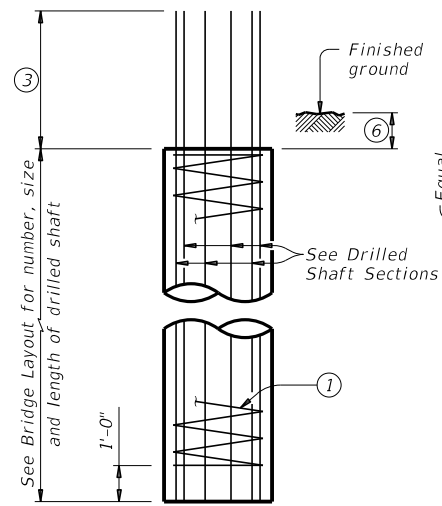
FILE: csabste1-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT April 2019	CONTRACT	SECT	JOB	HIGHWAY
REVISIONS	0456	02	028.ETC	FM 27
02-20: Added Option 2.	DIST	COUNTY	SHEET NO.	
	BRY	FREESTONE	86	

DATE:  
FILE:

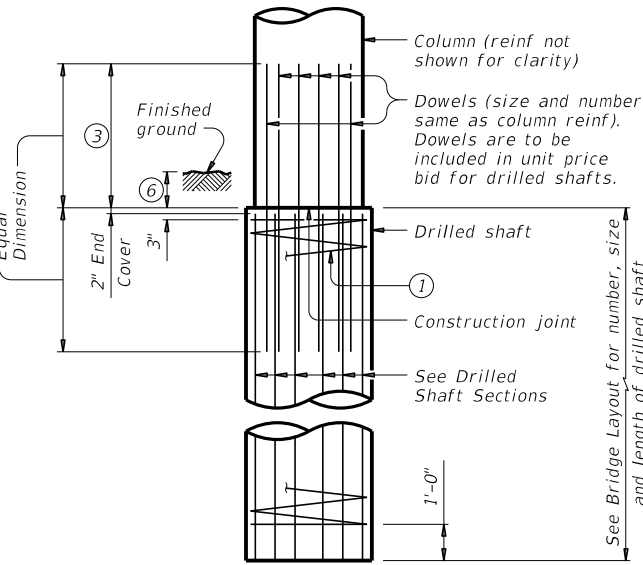
DISCLAIMER: This standard is governed by the "Texas Engineering Practice Act". No warranty of any kind is made by TxDOT for any purpose whatsoever. TxDOT assumes no responsibility for the conversion of this standard to other formats or for incorrect results or damages resulting from its use.



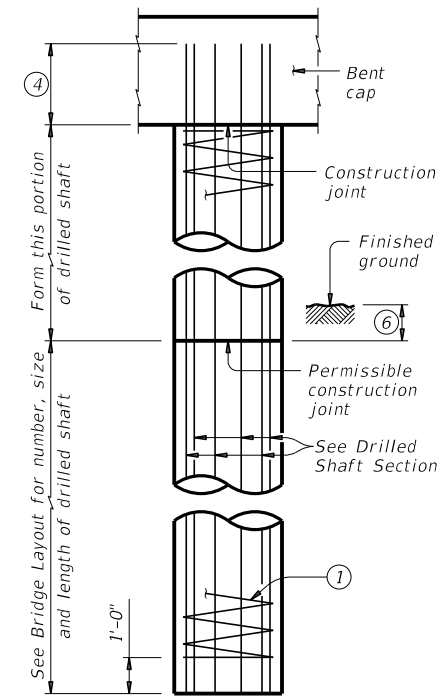
ABUTMENTS, WINGWALLS AND MULTI-DRILLED SHAFT FOOTINGS



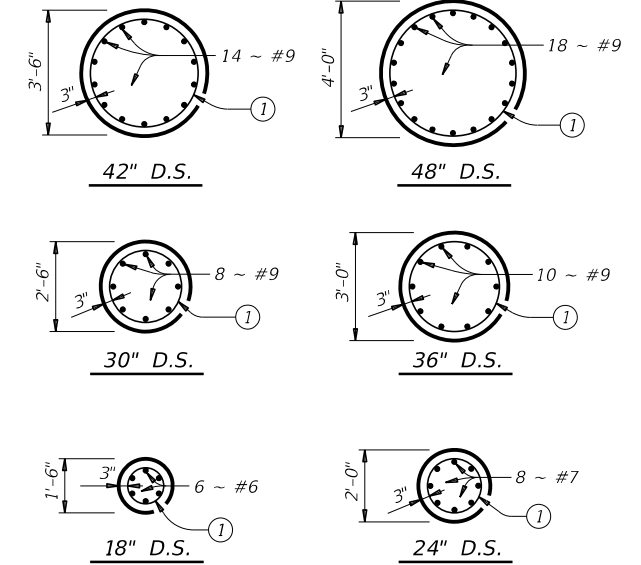
INTERIOR BENTS DRILLED SHAFT DIA EQUAL TO COLUMN DIA



INTERIOR BENTS DRILLED SHAFT DIA GREATER THAN COLUMN DIA



OPTIONAL INTERIOR BENT DRILLED SHAFT DETAIL



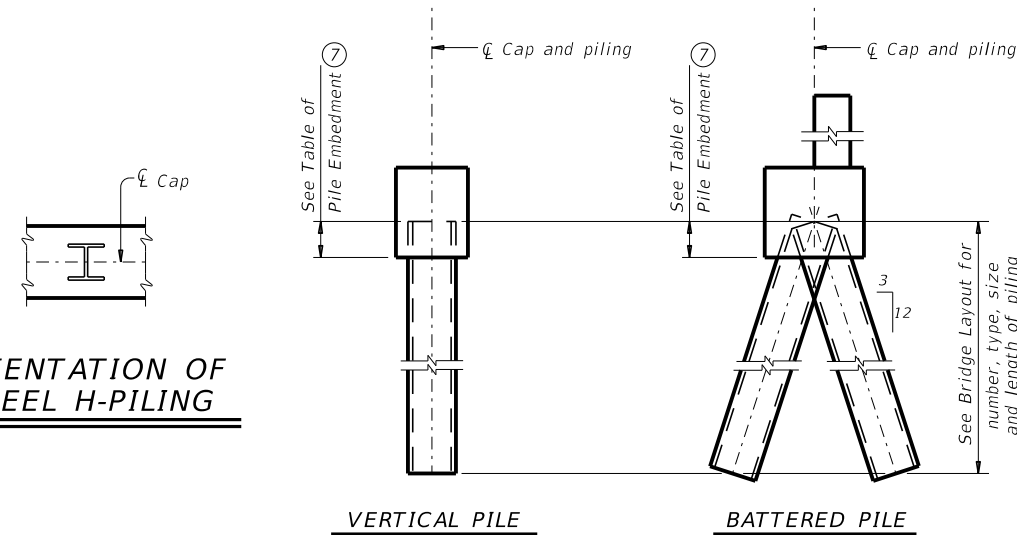
DRILLED SHAFT SECTIONS

**DRILLED SHAFT DETAILS**

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

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

**ORIENTATION OF STEEL H-PILING**

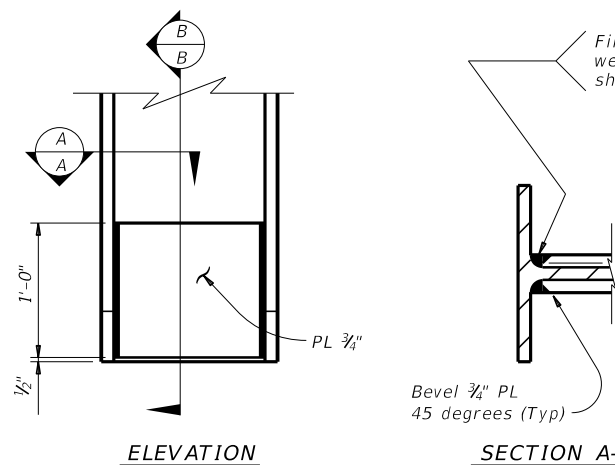


**PILING DETAILS**  
(Concrete or steel H)

**DETAIL "A"**

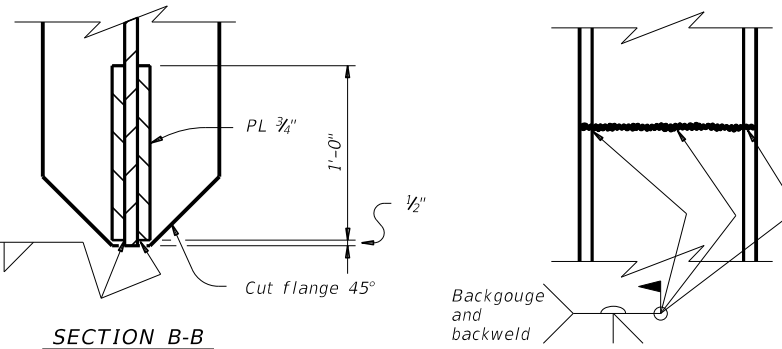
(Showing plan view of a 30° skewed abutment)

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

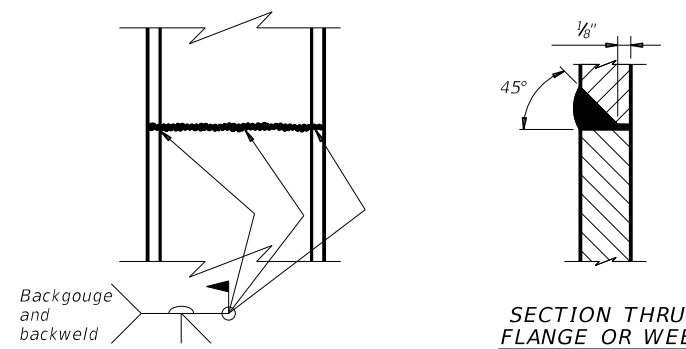


ELEVATION

SECTION A-A



SECTION B-B



SECTION THRU FLANGE OR WEB

**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.

SHEET 1 OF 2

		<b>Bridge Division Standard</b>	
<b>COMMON FOUNDATION DETAILS</b>			
<b>FD</b>			
FILE: fdst01-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT
©TxDOT April 2019	CONTRACT	SECTION	JOB
REVISIONS	0456	02	028,ETC
01-20: Added #11 bars to the FD bars.	DIST	COUNTY	SHEET NO.
	BRY	FREESTONE	87

DATE: FILE:

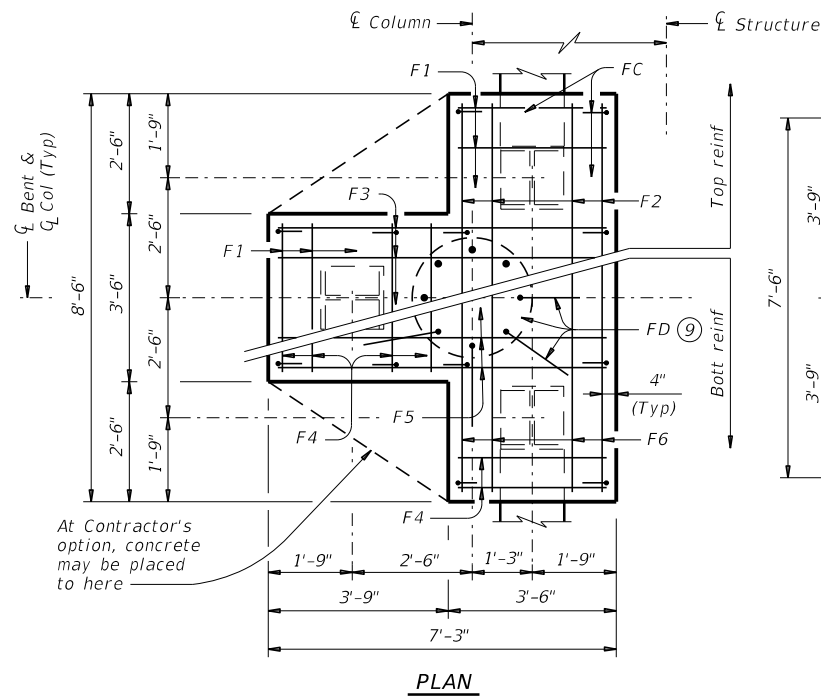
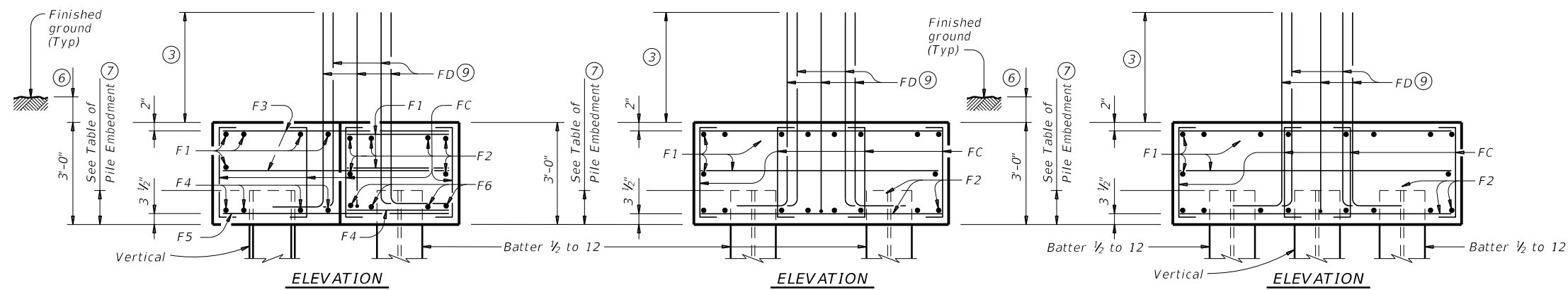


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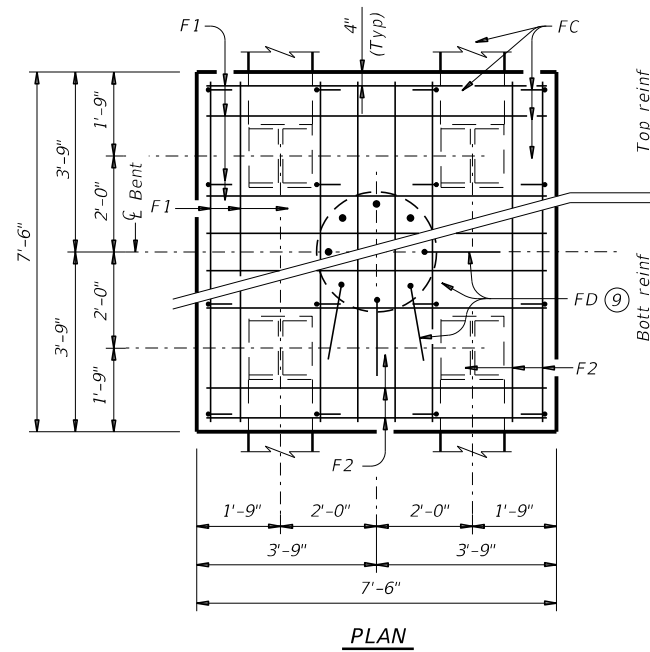
DATE: FILE:

### TABLE OF FOOTING QUANTITIES FOR 30" COLUMNS

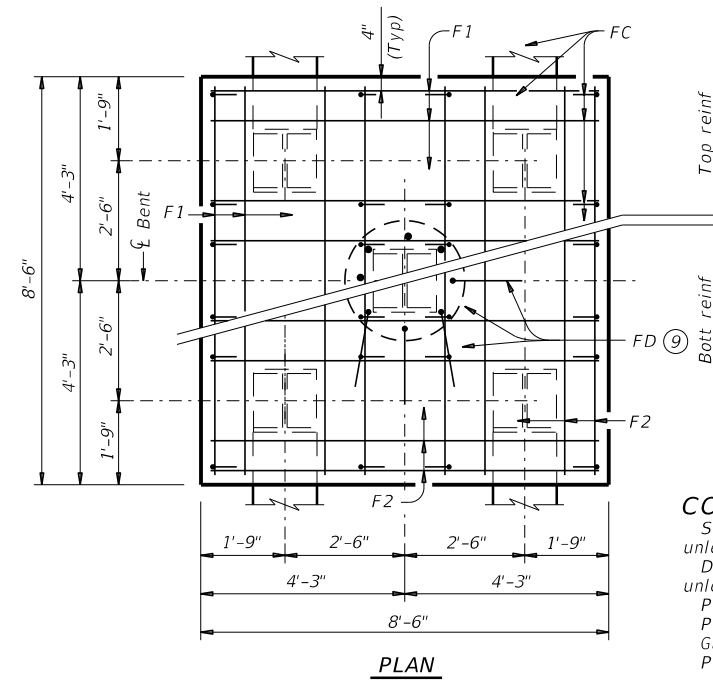
ONE 3 PILE FOOTING				
Bar	No.	Size	Length	Weight
F1	11	#4	3'- 2"	23
F2	6	#4	8'- 2"	33
F3	6	#4	6'- 11"	28
F4	8	#9	3'- 2"	86
F5	4	#9	6'- 11"	94
F6	4	#9	8'- 2"	111
FC	12	#4	3'- 6"	28
FD <sup>(10)</sup>	8	#9	8'- 1"	220
Reinforcing Steel			Lb	623
Class "C" Concrete			CY	4.8
ONE 4 PILE FOOTING				
Bar	No.	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



**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.

**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"

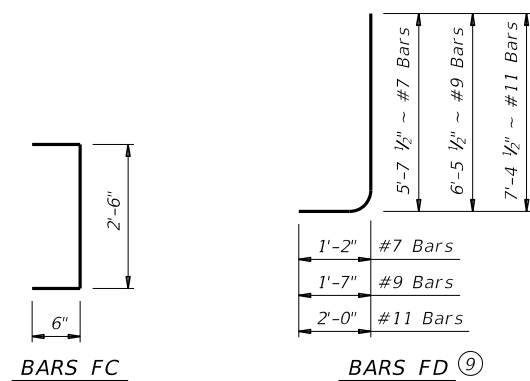
**GENERAL NOTES:**

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



- 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.



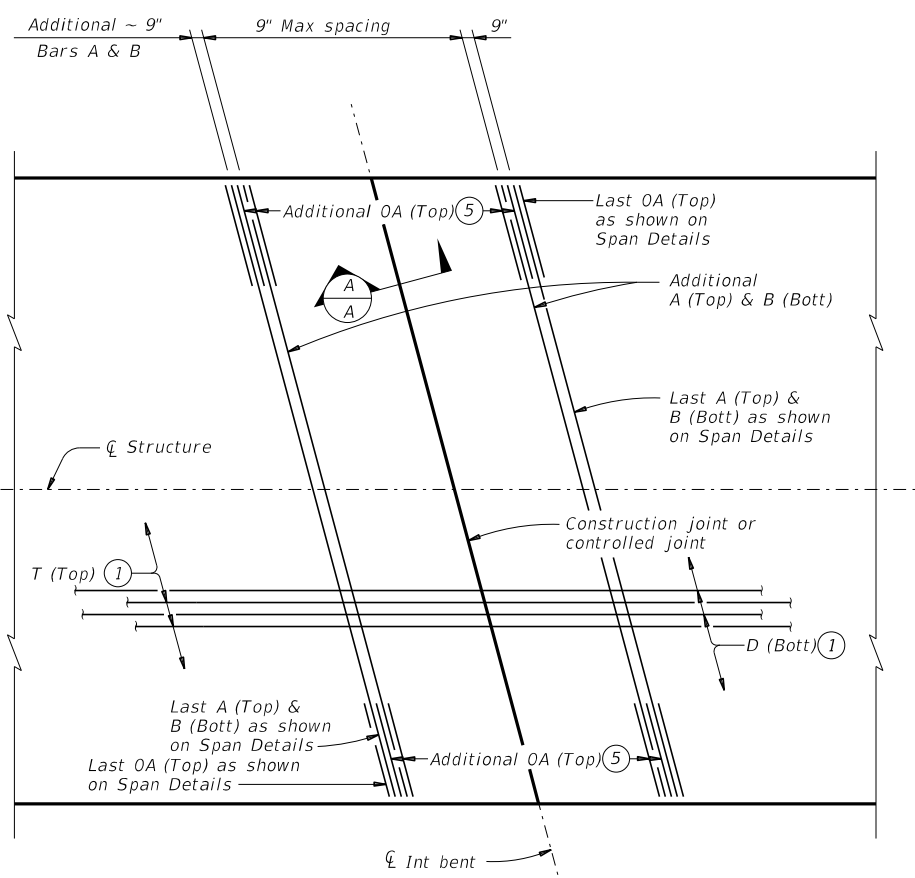
## COMMON FOUNDATION DETAILS

FD

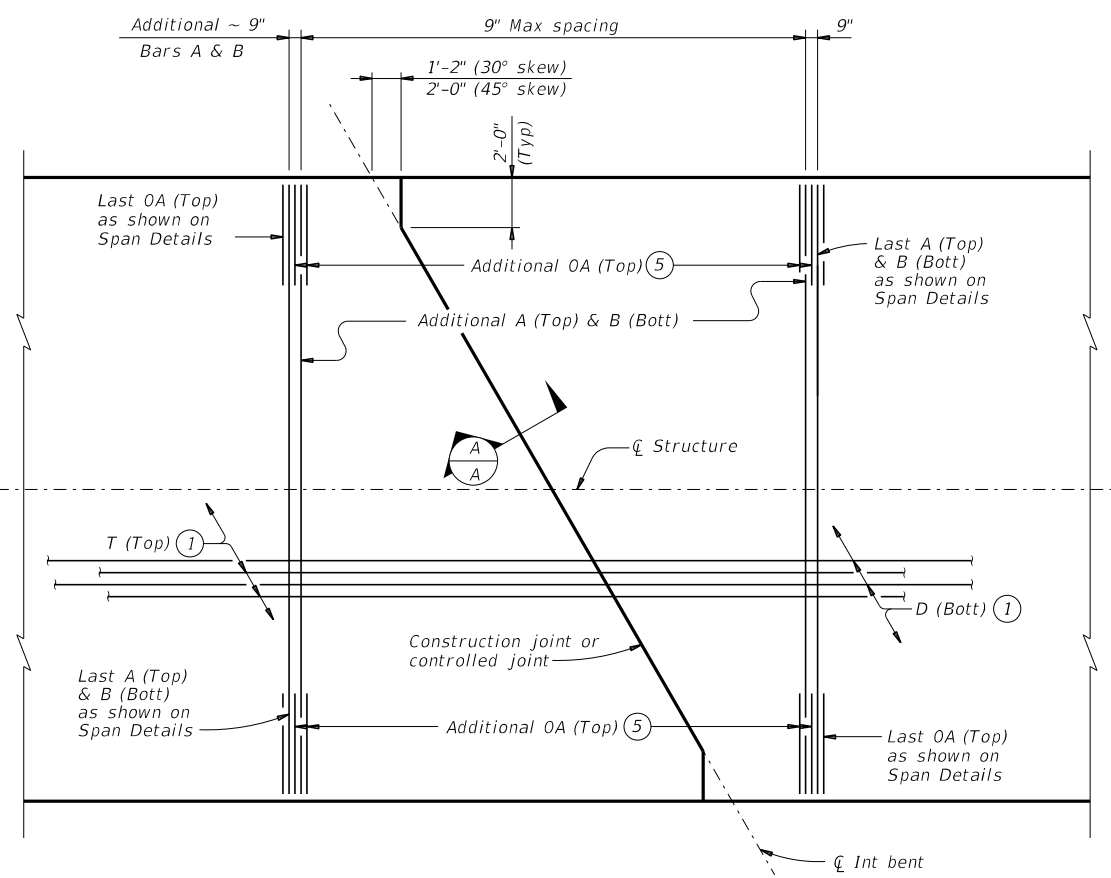
FILE: fdstoe01-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT April 2019	CONTRACT	SECTION	JOB	HIGHWAY
REVISIONS	0456	02	028,ETC	FM 27
01-20: Added #11 bars to the FD bars.	DIST	COUNTY	SHEET NO.	
	BRY	FREESTONE	88	

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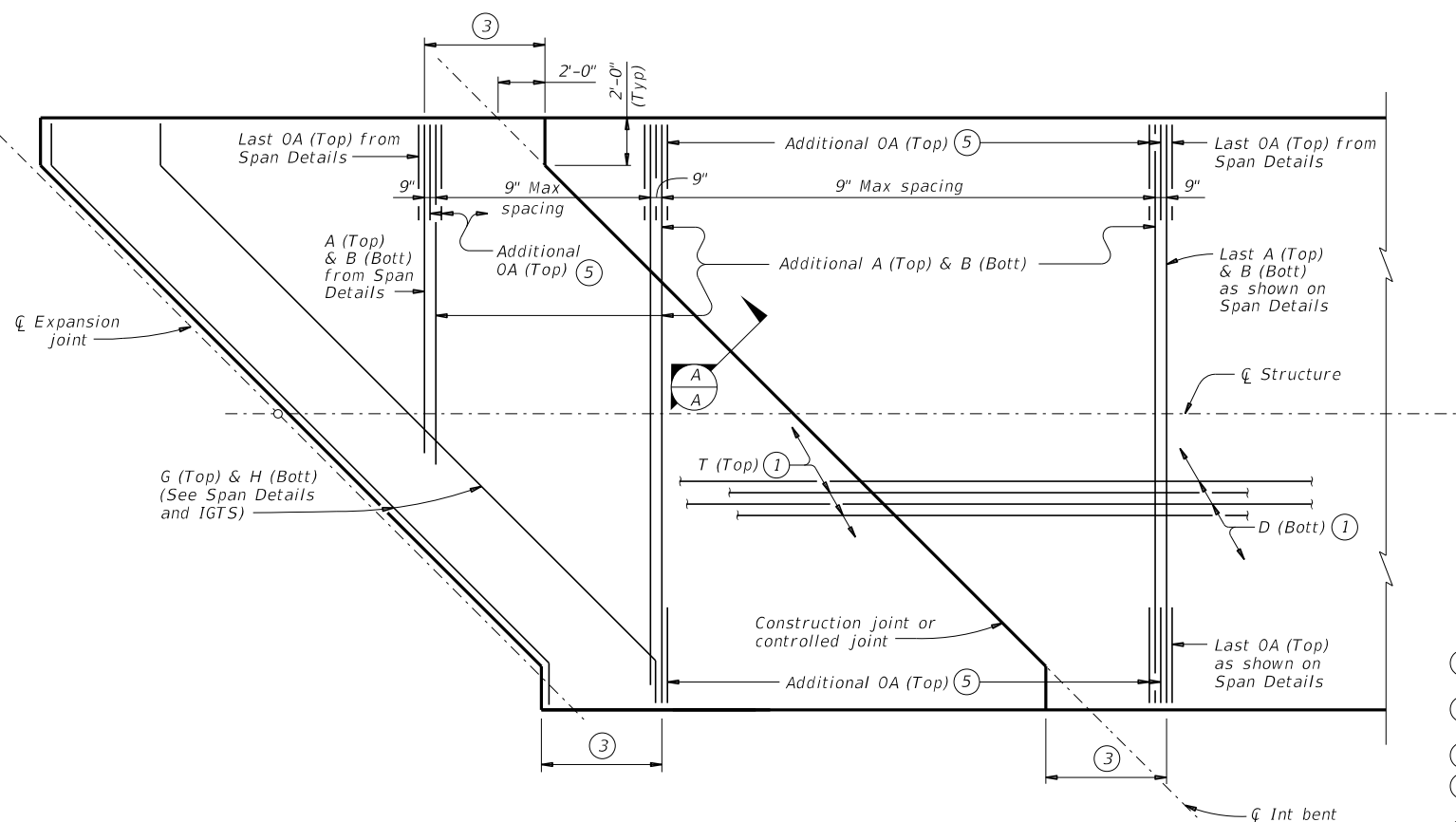
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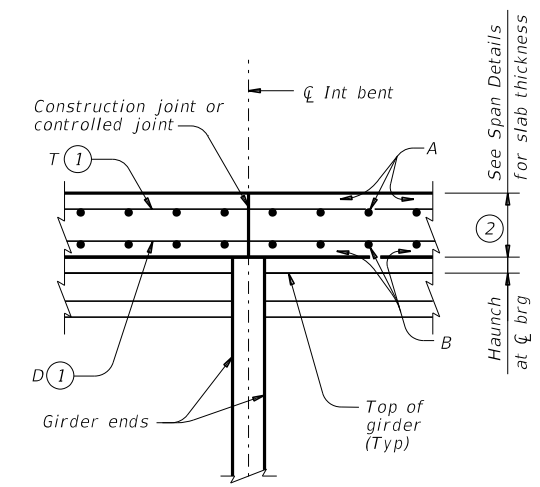
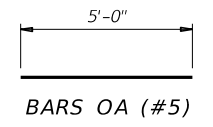
**PLAN FOR 0° OR 15° SKEW**  
(Showing 15° skew)



**PLAN FOR 30° OR 45° SKEW**  
(Showing 30° skew)



**PLAN FOR 45° SKEW**  
(Showing short span condition)



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

- ① Top and bottom mats must be continuous through joint.
- ② Maintain a constant slab thickness over the bent.
- ③ 5'-4" as shown on Span Details.
- ④ Use these details when no full slab width bars A and B are shown on Span Details.
- ⑤ Bars OA (Top) at 9" Max spacing between Bars A (Top).
- ⑥ Values in table assume a temperature change of 70° F after erection when calculating thermal movement in one direction (not total).

**TABLE OF ⑥ ALLOWABLE UNIT LENGTH**

Max Rdwy Grade, Percent	Unit Length Factor
0.00	4.1
1.00	3.9
2.00	3.7
3.00	3.5
4.00	3.3
5.00	3.1

Unit length must not exceed the length of the shortest end span times the Unit Length Factor shown in table or 400', whichever is less.

**BAR TABLE**

BAR	SIZE
A	#4
B	#4
D	#4
T	#4
OA	#5

The details shown on this sheet are applicable for two and three span units comprised of the same girder type. Units may be comprised of different span lengths. See "Table of Allowable Unit Length".

**GENERAL NOTES:**  
Designed according to AASHTO LRFD Bridge Design Specifications.  
This standard is drawn showing right forward skew. See Bridge Layout for actual skew direction.

**CONSTRUCTION NOTES:**  
Where multi-span units are indicated on the Bridge Layout, the thickened slab end details and reinforcement shown on IGTS standard (Bars AA, G, H, J, K, and M) and on the Span Details will be omitted where slabs are continuous over interior bents. At these locations, the slab details and reinforcement will be as shown on this sheet or on PCP standard (if using this option).  
Thickened slab end reinforcement and details still apply at expansion joint locations (ends of units).  
See Span Details for remainder of slab reinforcement and details.

**MATERIAL NOTES:**  
Provide Grade 60 reinforcing steel.  
Provide Class "S" concrete (f'c = 4,000 psi).  
Provide Class "S" (HPC) if shown elsewhere on the plans.  
Provide bar laps, where required, as follows:  
Uncoated ~ #4 = 1'-7"  
Epoxy Coated ~ #4 = 2'-5"

The details shown on this sheet are applicable for use only with the Prestressed Concrete I-Girder Standard Designs shown on standards IGSD-24, IGSD-28, IGSD-30, IGSD-32, IGSD-34, IGSD-38, IGSD-40 and IGSD-44.

HL93 LOADING

**Texas Department of Transportation** Bridge Division Standard

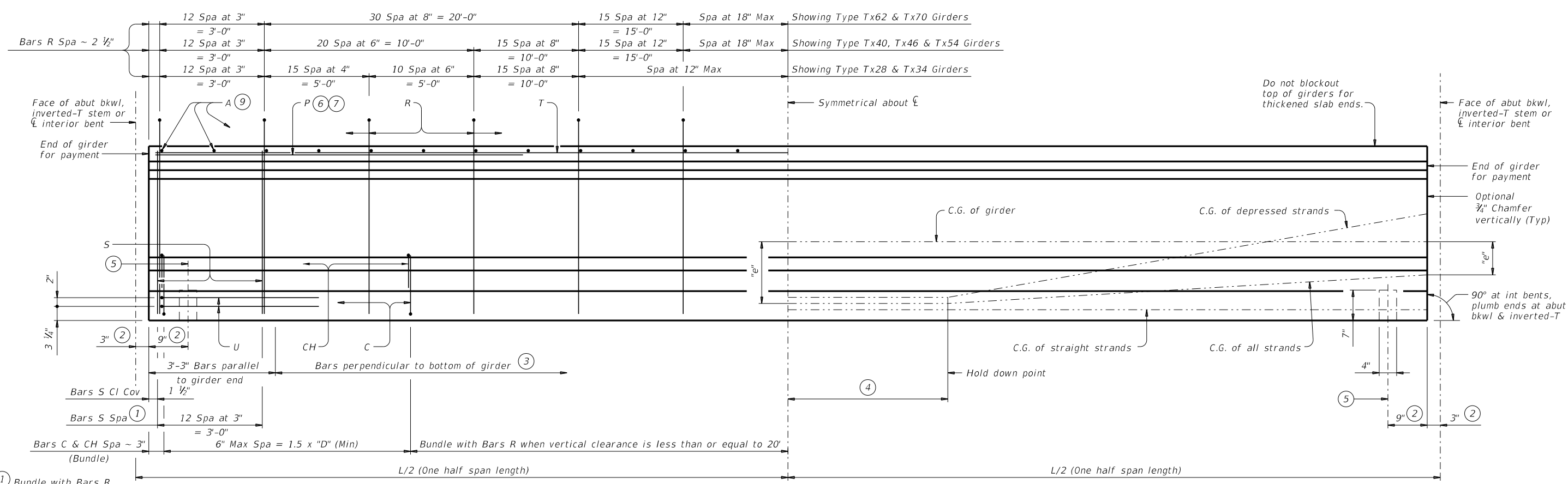
**CONTINUOUS SLAB DETAILS**  
**PRESTR CONC I-GIRDER SPANS**

**IGCS**

FILE: IG-IGCS-23.dgn	DN: JMH	CK: TxDOT	DW: JTR	CK: TxDOT
0456	02	028.ETC	FM 27	
10-19: Added bubble note 6.		COUNTY		SHEET NO.
01-23: Added 34' Rdwy.		FREESTONE		89

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DATE: FILE:



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

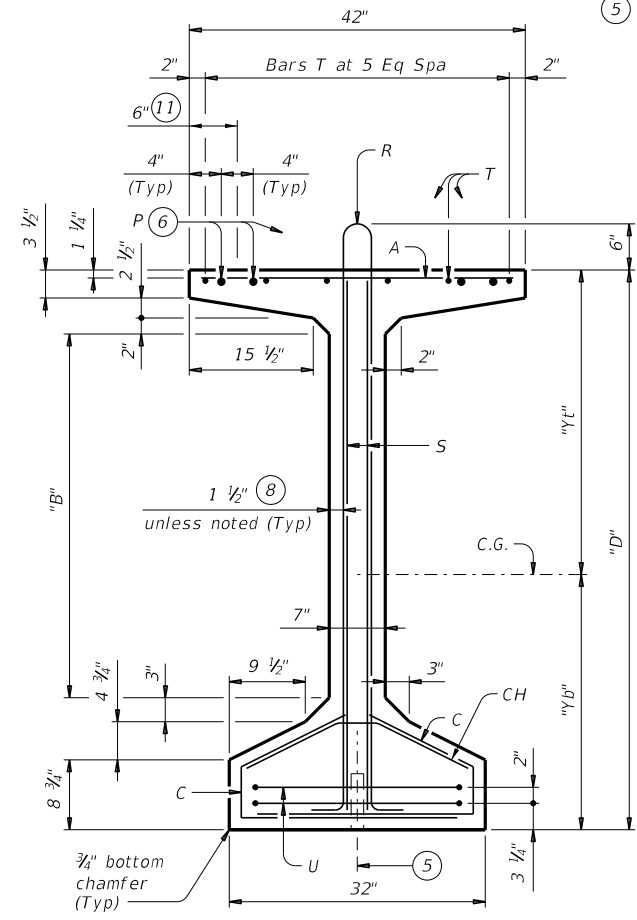
### GIRDER ELEVATION

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

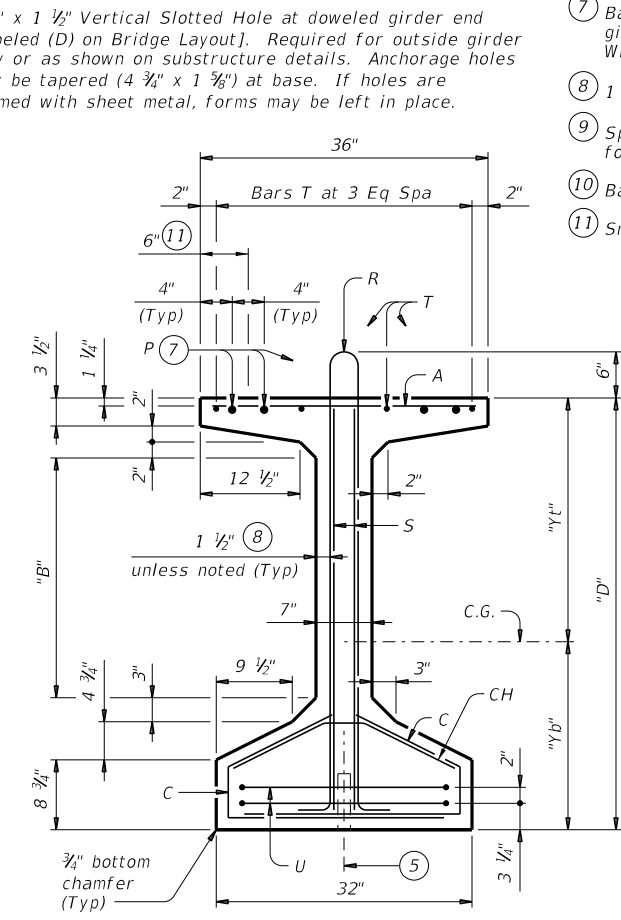
GIRDER DIMENSIONS AND SECTION PROPERTIES								
Girder Type	"D"	"B"	"Yt"	"Yb"	Area	"Ix"	"Iy"	Weight (10)
	(in.)	(in.)	(in.)	(in.)	(in. <sup>2</sup> )	(in. <sup>4</sup> )	(in. <sup>4</sup> )	(plf)
Tx28	28	6	15.02	12.98	585	52,772	40,559	630
Tx34	34	12	18.49	15.51	627	88,355	40,731	675
Tx40	40	18	21.90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

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

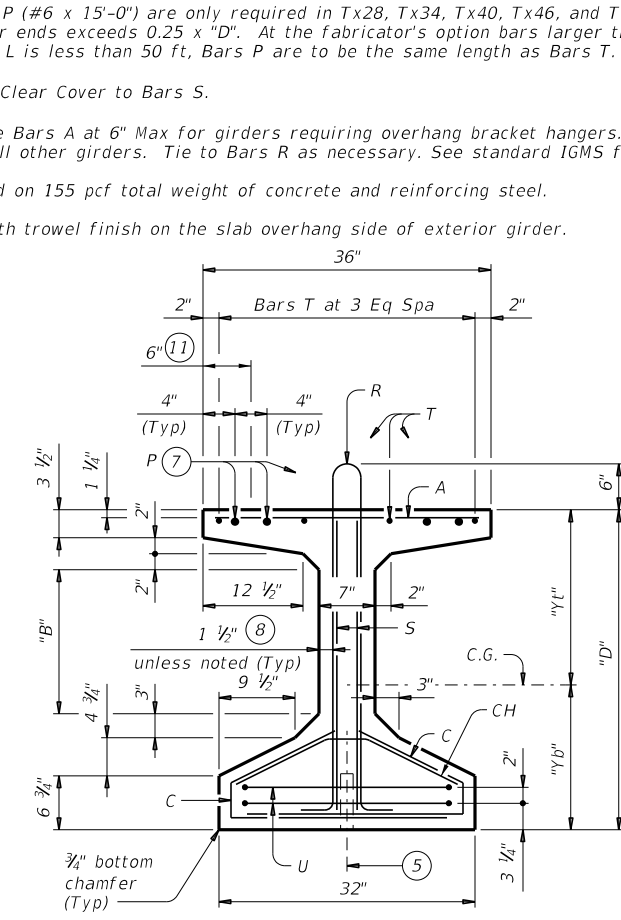
Cover dimensions are clear dimensions, unless noted otherwise. Reinforcing bar dimensions shown are out-to-out of bar.



**TYPE Tx62 & Tx70**



**TYPE Tx46 & Tx54**



**TYPE Tx28, Tx34 & Tx40**

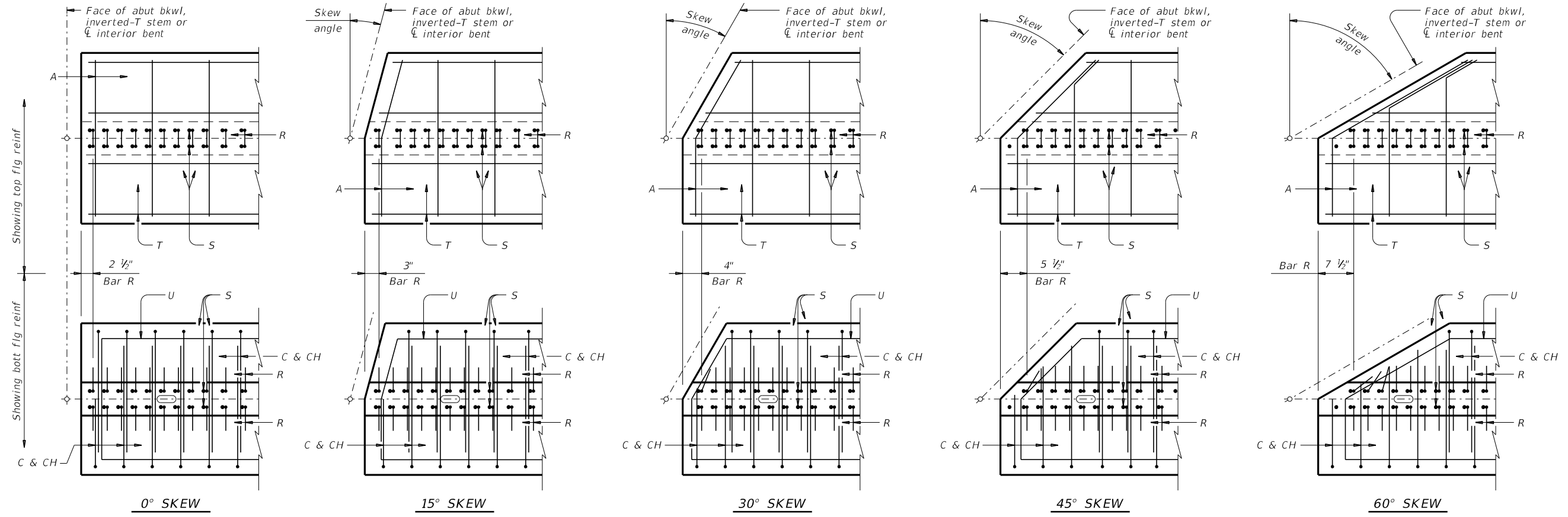


## PRESTRESSED CONCRETE I-GIRDER DETAILS

IGD

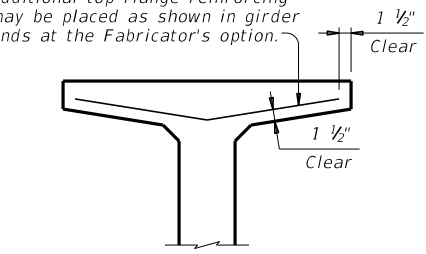
FILE: igdstds1-19.dgn	DN: TxDOT	CK: JMH	DW: JTR	CK: TAR
©TxDOT August 2017	CONT	SECT	JOB	HIGHWAY
REVISIONS	0456	02	028,ETC	FM 27
10-19: Added Bars C and CH full length for VC <= 20'	DIST	COUNTY	SHEET NO.	
	BRY	FREESTONE	90	

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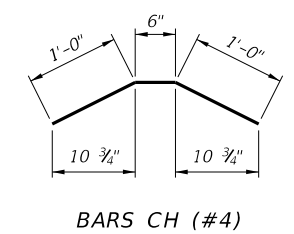


**PLAN OF GIRDER ENDS** (12)

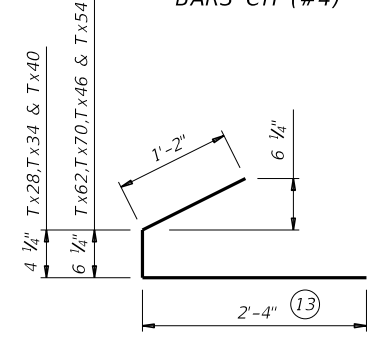
To control top flange cracking that may occur during form removal, additional top flange reinforcing may be placed as shown in girder ends at the Fabricator's option.



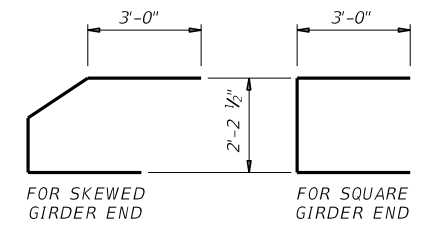
**OPTIONAL TOP FLANGE REINFORCING DETAIL**



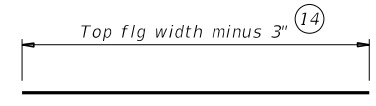
**BARS CH (#4)**



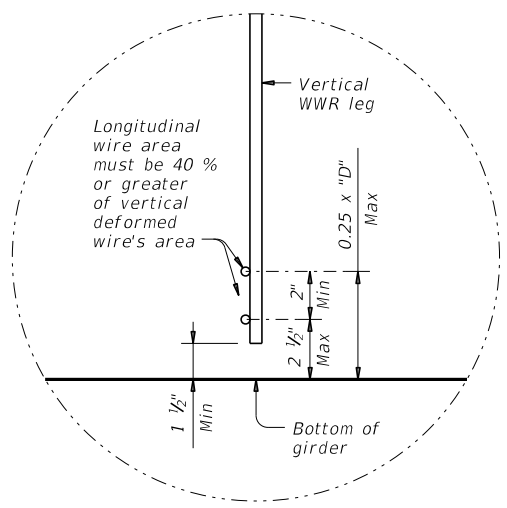
**BARS C (#4)**



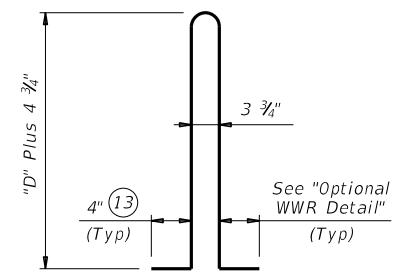
**BARS U (#5)**



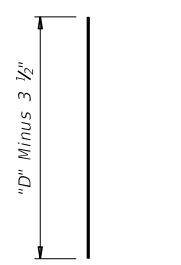
**BARS A (#3)**



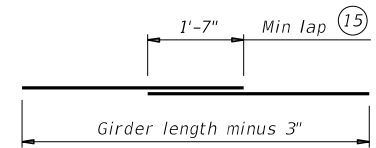
**OPTIONAL WELDED WIRE REINFORCEMENT (WWR) DETAIL**



**BARS R (#4) (16)**



**BARS S (#6)**



**BARS T (#4)**

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



**PRESTRESSED CONCRETE I-GIRDER DETAILS**

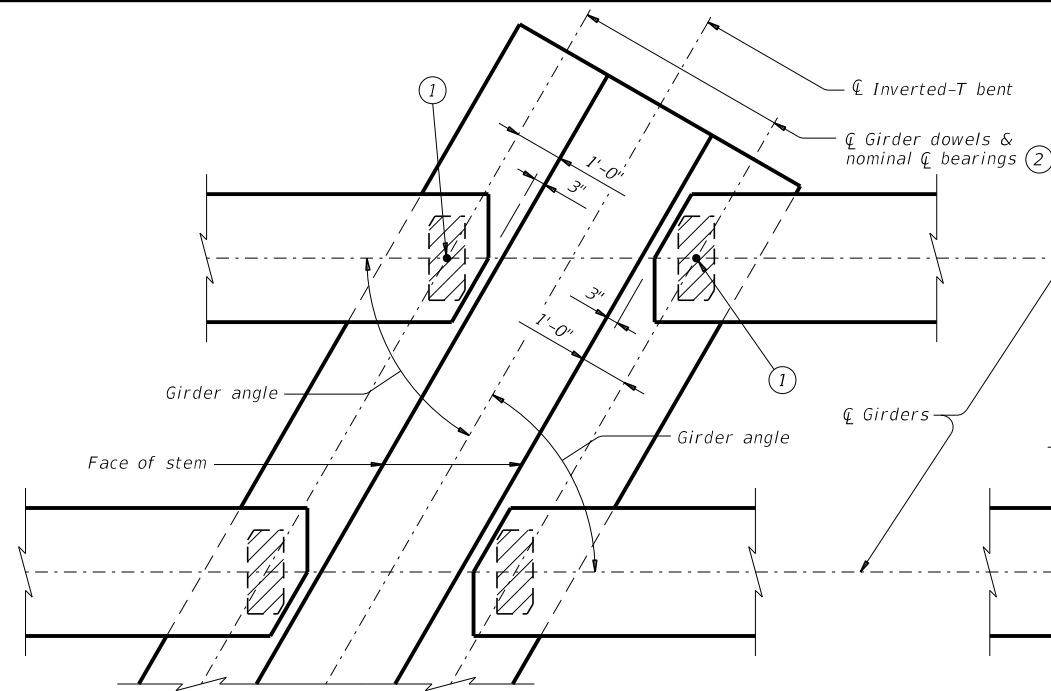
IGD

FILE: igdstds1-19.dgn	DN: TxDOT	CK: JMH	DW: JTR	CK: TAR
©TxDOT August 2017	CONT	SECT	JOB	HIGHWAY
REVISIONS	0456	02	028.ETC	FM 27
10-19: Added Bars C and CH full length for VC <= 20'	DIST	COUNTY		SHEET NO.
	BRY	FREESTONE		91

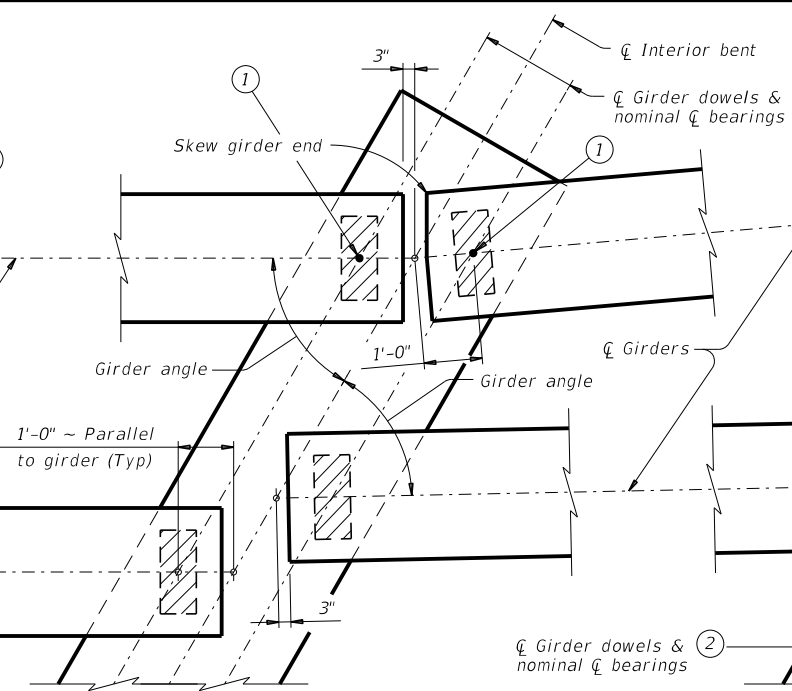
DATE: FILE:

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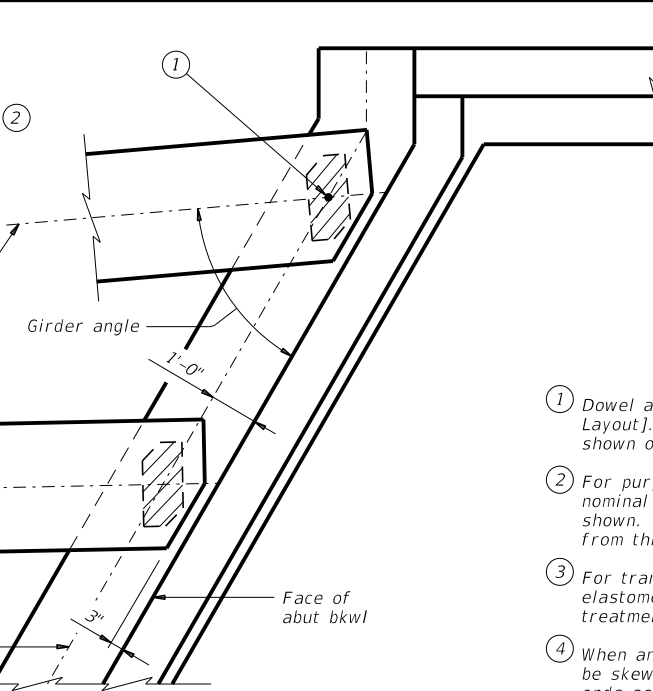
DATE: FILE:



AT INVERTED-T BENT W/SKEW

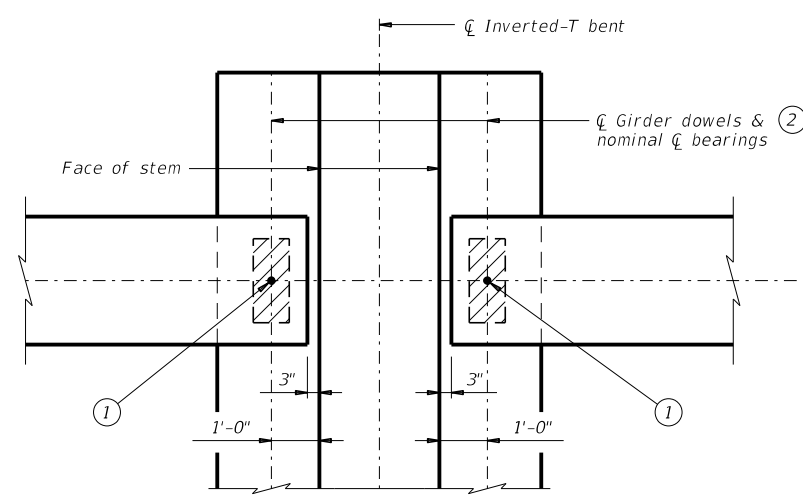


AT CONVENTIONAL INTERIOR BENT W/SKEW

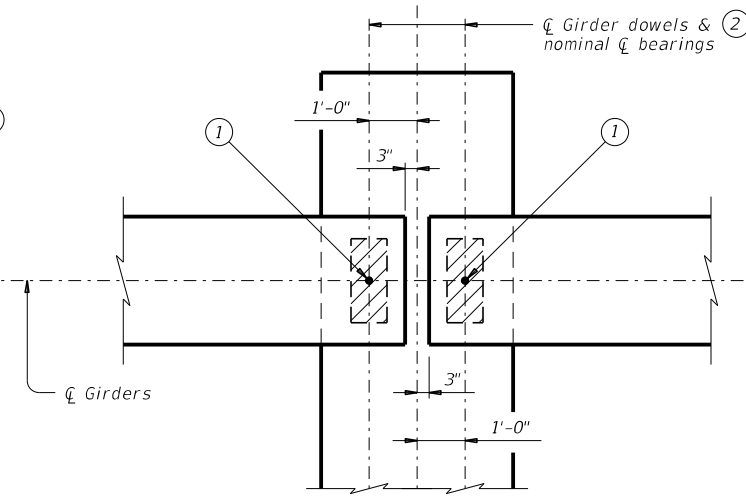


AT ABUTMENT W/SKEW

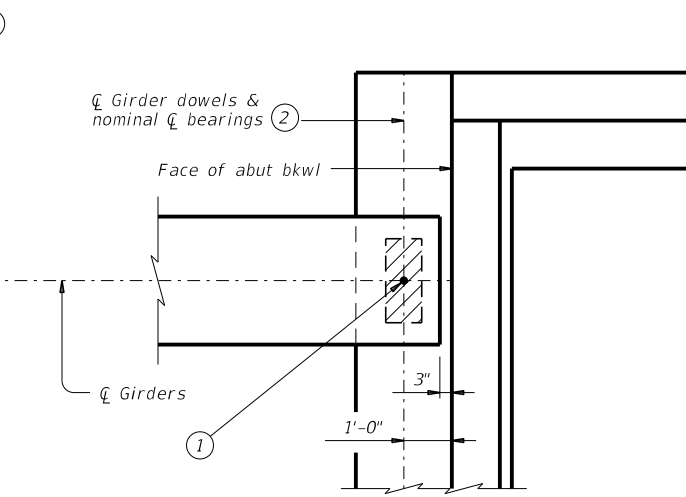
- ① Dowel at doweled girder end [labeled (D) on Bridge Layout]. Required for outside girder only or as shown on substructure details.
- ② For purposes of computing bearing seat elevations, nominal centerline of bearing must be defined as shown. The actual center of bearing pad may vary from this line.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



AT INVERTED-T BENT



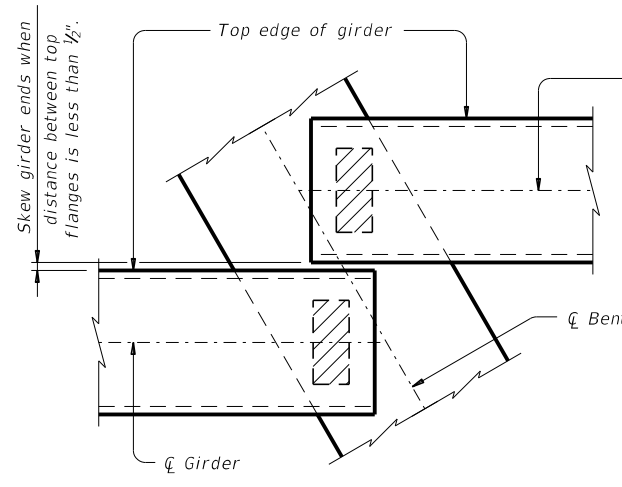
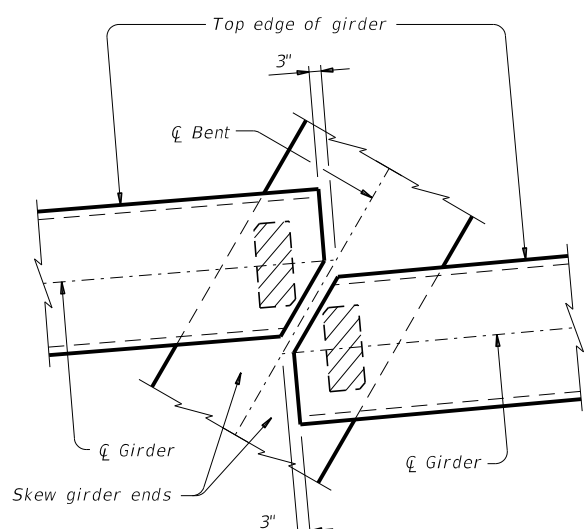
AT CONVENTIONAL INTERIOR BENT



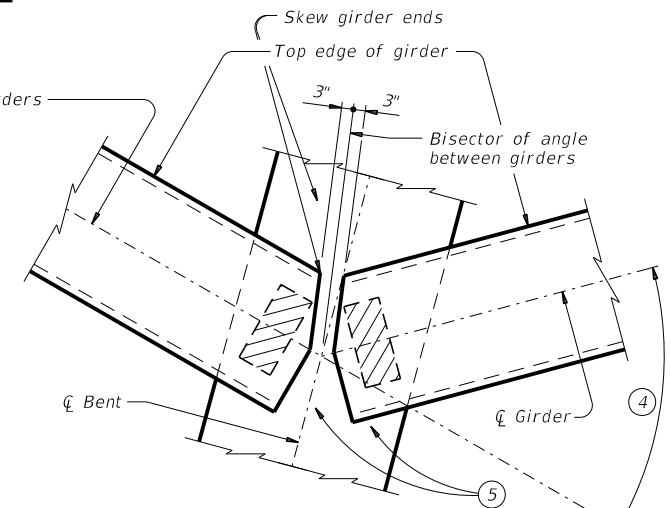
AT ABUTMENT

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

**GIRDER END DETAILS**



GIRDER CONFLICT DETAILS



HL93 LOADING SHEET 1 OF 3

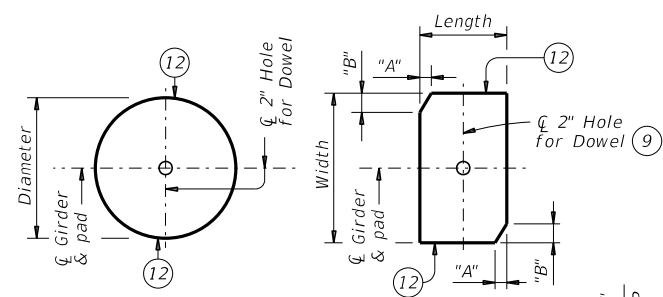
**Texas Department of Transportation** Bridge Division Standard

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

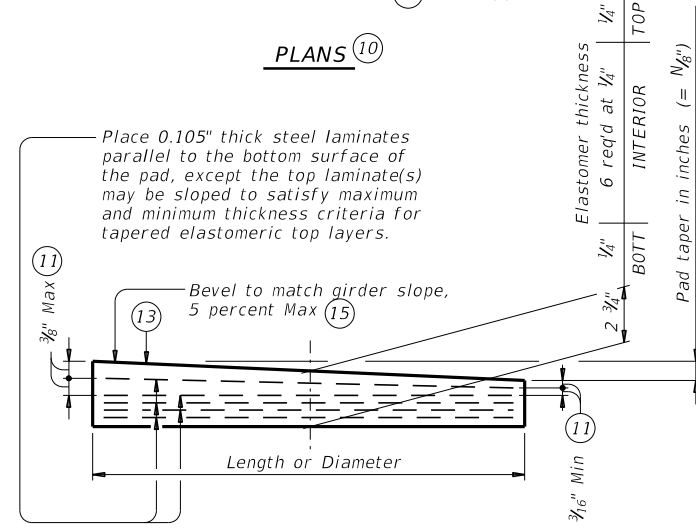
**IGEB**

FILE: igebs1-17.dgn	DN: AEE	CK: JMH	DW: JTR	CK: TxDOT
©TxDOT August 2017	CONT SECT	JOB	HIGHWAY	
REVISIONS	0456 02	028.ETC	FM 27	
DIST	COUNTY		SHEET NO.	
BRY	FREESTONE		92	

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PLANS (10)



ELEVATION

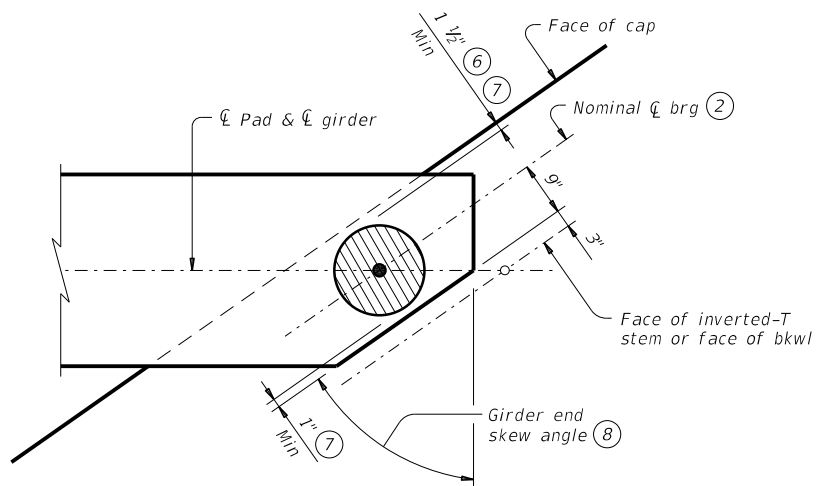
**LAMINATED ELASTOMERIC BEARING PAD**  
(50 DUROMETER)

**TABLE OF MINIMUM SUBSTRUCTURE DIMENSIONS (14)**

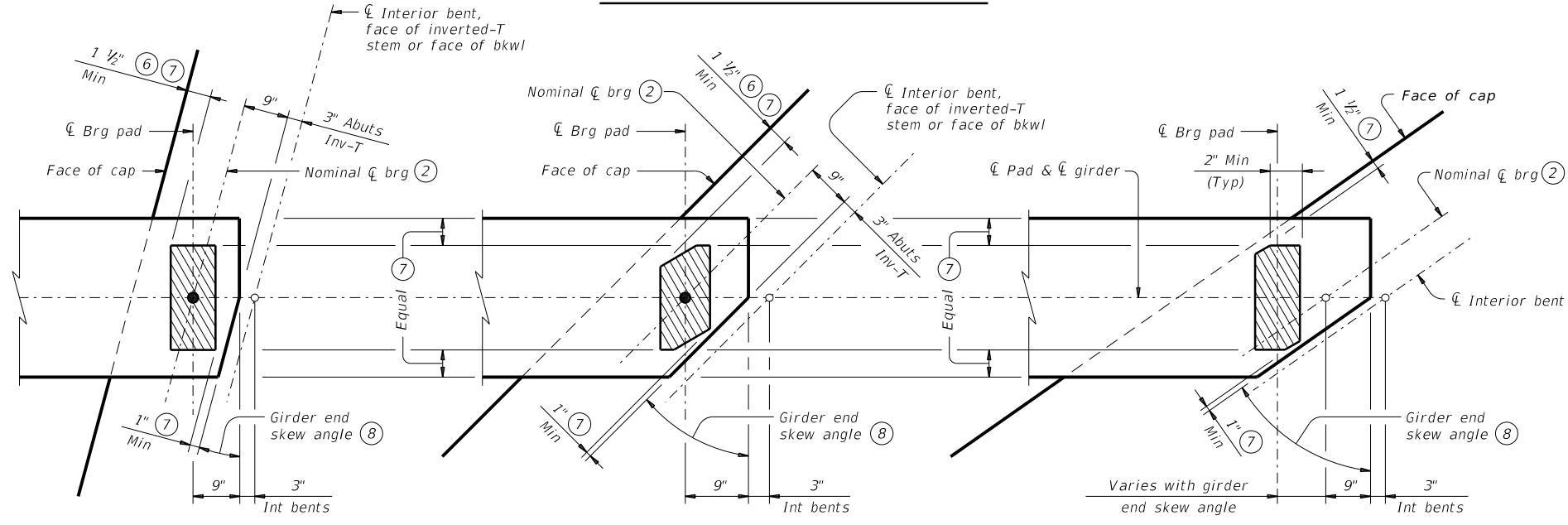
Girder Type	Abutments	Int Bents	Inv-T Bents
	Face of Bkwl to Face of Cap	Overall Cap Width	Corbel Width
Tx28 thru Tx54	1'-9"	3'-6"	1'-10 1/2"
Tx62 & Tx70	2'-0"	4'-0"	2'-1 1/2"

**TABLE OF BEARING PAD DIMENSIONS**

Bent Type	Girder Type	Bearing Type (13)	Girder End Skew Angle Range	Pad Size Lgth x Wdth	Pad Clip Dimensions	
					"A"	"B"
ABUTMENTS, INVERTED-T AND TRANSITION BENTS WITH BACKWALLS	Tx28, Tx34, Tx40, Tx46 & Tx54	G-1-"N"	0° thru 21°	8" x 21"	---	---
		G-2-"N"	21°+ thru 30°	8" x 21"	1 1/2"	2 1/2"
		G-3-"N"	30°+ thru 45°	9" x 21"	4 1/2"	4 1/2"
		G-4-"N"	45°+ thru 60°	15" Dia	---	---
	Tx62 & Tx70	G-5-"N"	0° thru 21°	9" x 21"	---	---
		G-6-"N"	21°+ thru 30°	9" x 21"	1 1/2"	2 1/2"
		G-7-"N"	30°+ thru 45°	10" x 21"	4 1/2"	4 1/2"
		G-8-"N"	45°+ thru 60°	10" x 21"	7 1/4"	4 1/4"
CONVENTIONAL INTERIOR BENTS	Tx28, Tx34, Tx40, Tx46 & Tx54	---	---	---	---	---
	Tx62 & Tx70	G-5-"N"	0° thru 60°	9" x 21"	---	---
CONVENTIONAL INTERIOR BENTS WITH SKEWED GIRDER ENDS (GIRDER CONFLICTS) (16)	Tx28, Tx34, Tx40, Tx46 & Tx54	G-1-"N"	0° thru 18°	8" x 21"	---	---
		G-2-"N"	18°+ thru 30°	8" x 21"	1 1/2"	2 1/2"
		G-9-"N"	30°+ thru 45°	8" x 21"	3"	3"
		G-10-"N"	45°+ thru 60°	9" x 21"	6"	3 1/2"
	Tx62 & Tx70	G-5-"N"	0° thru 18°	9" x 21"	---	---
		G-5-"N"	18°+ thru 30°	9" x 21"	---	---
		G-11-"N"	30°+ thru 45°	9" x 21"	1 1/2"	1 1/2"
		G-12-"N"	45°+ thru 60°	9" x 21"	3"	1 3/4"



ROUND BEARINGS FOR SKEWED GIRDER ENDS AT FACE OF INVERTED-T STEM OR FACE OF BKWL



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

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

**BEARING PAD PLACEMENT DIAGRAMS**

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



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

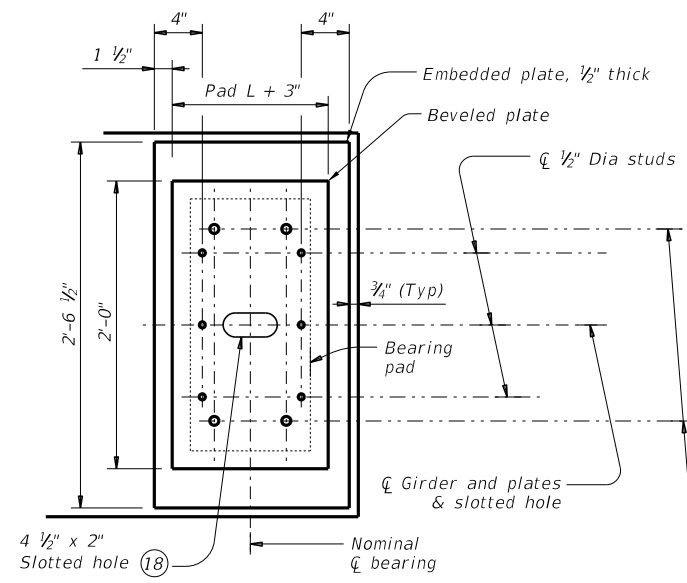
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©TxDOT August 2017	CONTRACT	SECTION	JOB	HIGHWAY
REVISIONS	0456	02	028,ETC	FM 27
	DIST	COUNTY	SHEET NO.	
	BRY	FREESTONE	93	

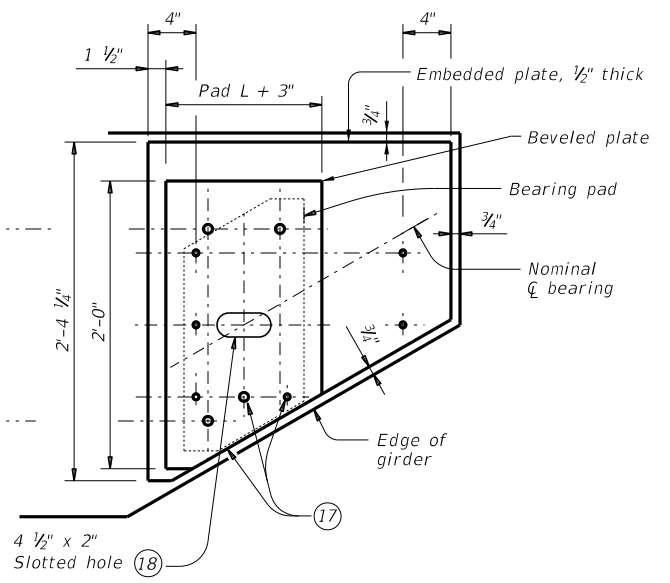
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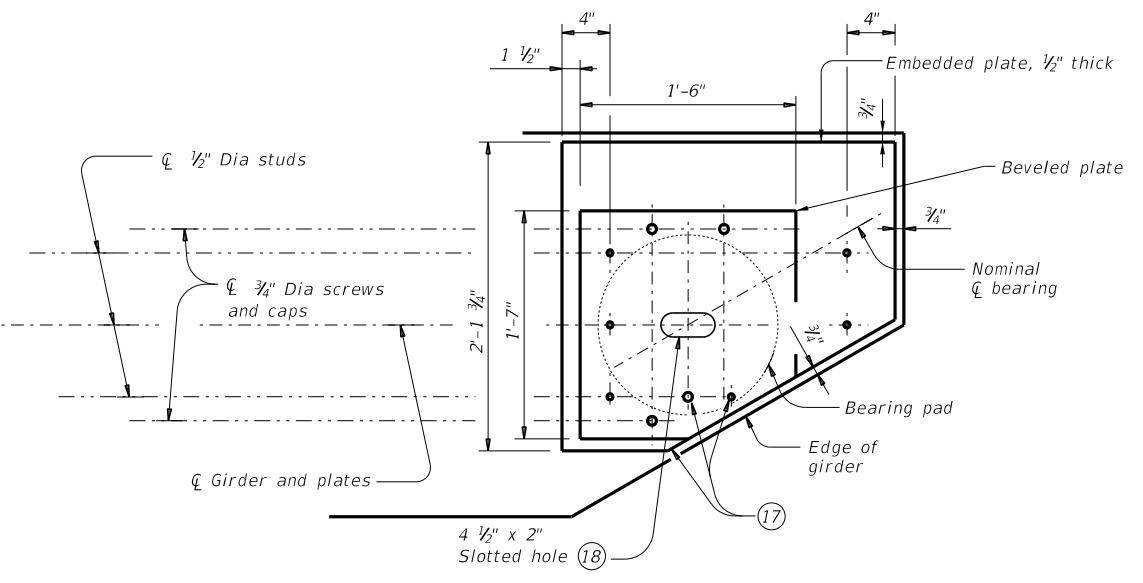
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**NORMAL GIRDER END  
RECTANGULAR BEARING PAD**

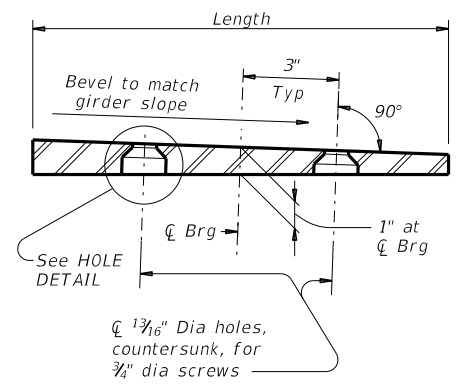


**SKEWED GIRDER END  
CLIPPED RECTANGULAR BEARING PAD**

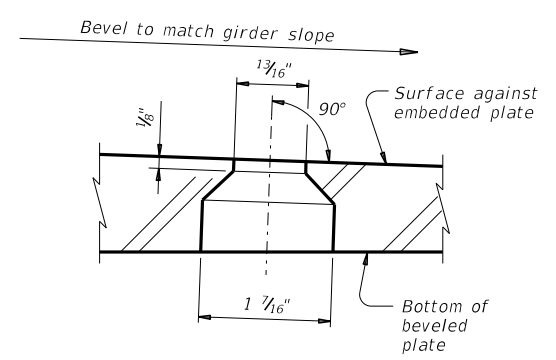


**SKEWED GIRDER END  
15" DIA BEARING PAD**

**PLAN VIEW OF SOLE PLATE DETAILS**



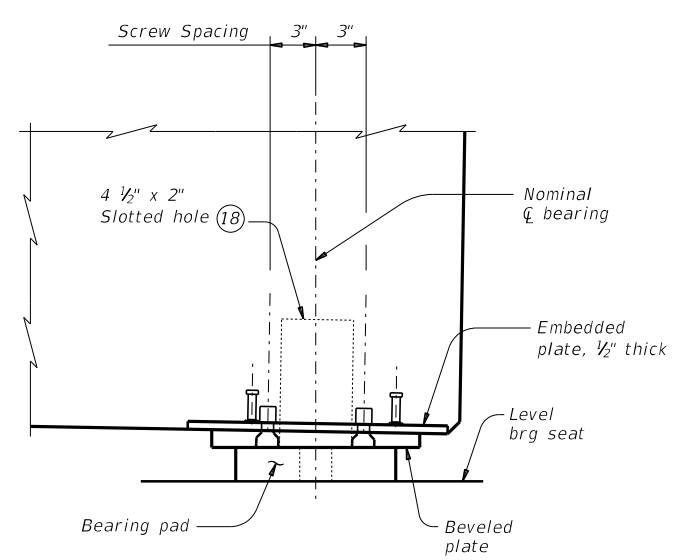
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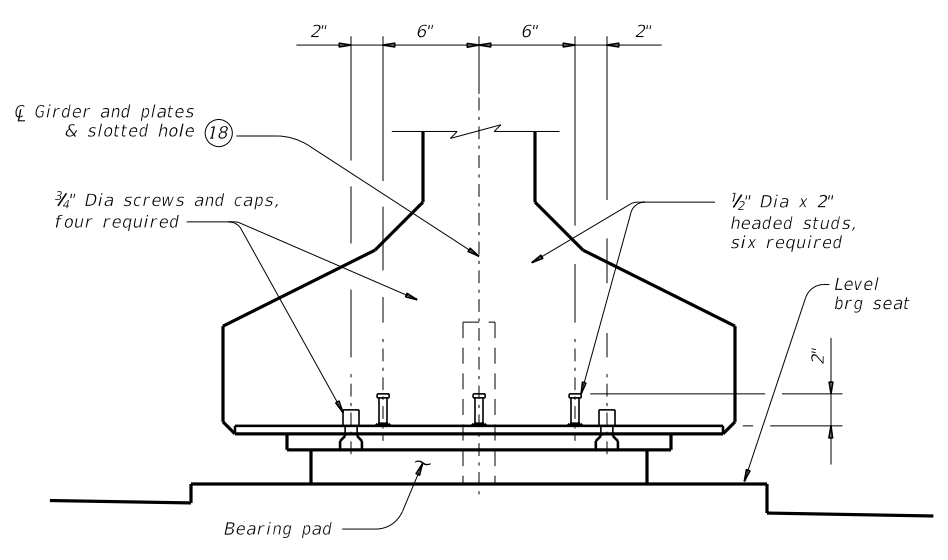
**HOLE DETAIL**

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

**BEVELED PLATE DETAILS**



**SIDE ELEVATION**



**END ELEVATION  
Showing normal girder end.**

**GIRDER DETAILS**

**SOLE PLATE NOTES:**

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

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

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

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

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

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

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



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

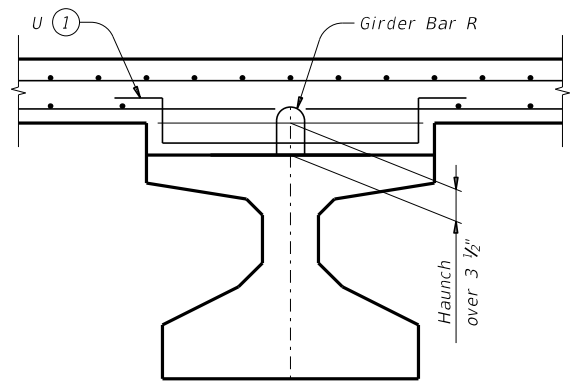
**IGEB**

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©TxDOT August 2017	CONT	SECT	JOB	HIGHWAY
REVISIONS	0456	02	028,ETC	FM 27
	DIST	COUNTY	SHEET NO.	
	BRY	FREESTONE	94	

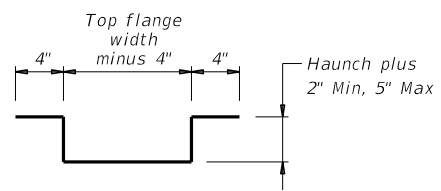
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FILE:

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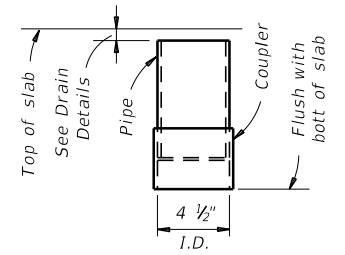
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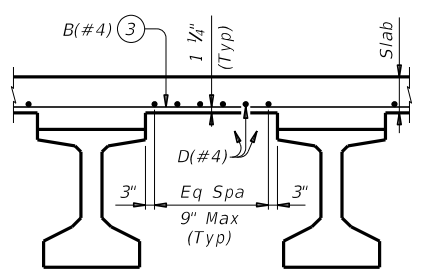
**HAUNCH REINFORCING DETAIL**



**BARS U (#4)**

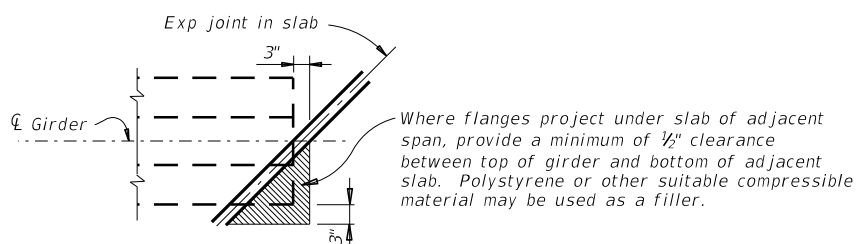


**C-I-P DRAIN DETAIL**

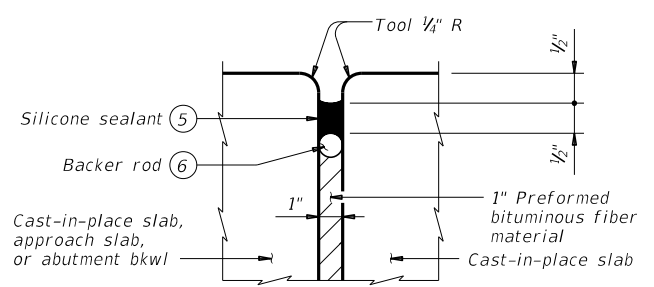


**TYPICAL PART TRANSVERSE SLAB SECTION WITHOUT PCP**

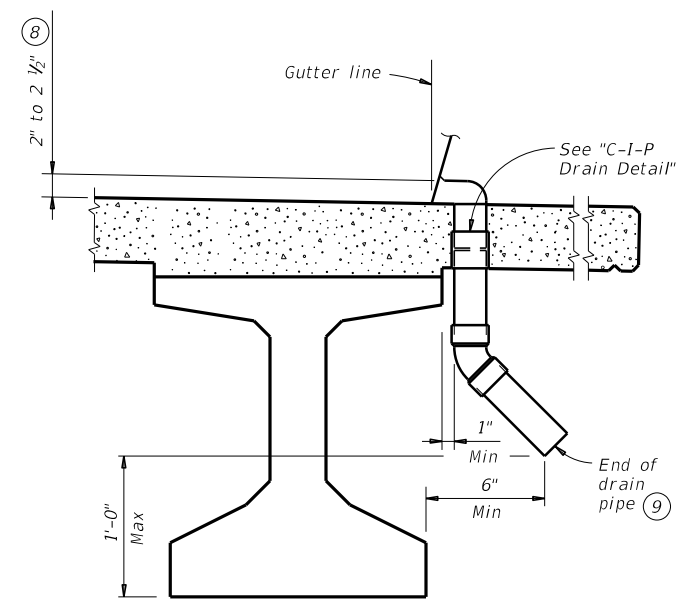
Top reinforcing steel not shown for clarity.



**TREATMENT AT GIRDER END FOR SKEWED SPANS**



**TYPE A JOINT DETAIL**



**DRAIN DETAIL**

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

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

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

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

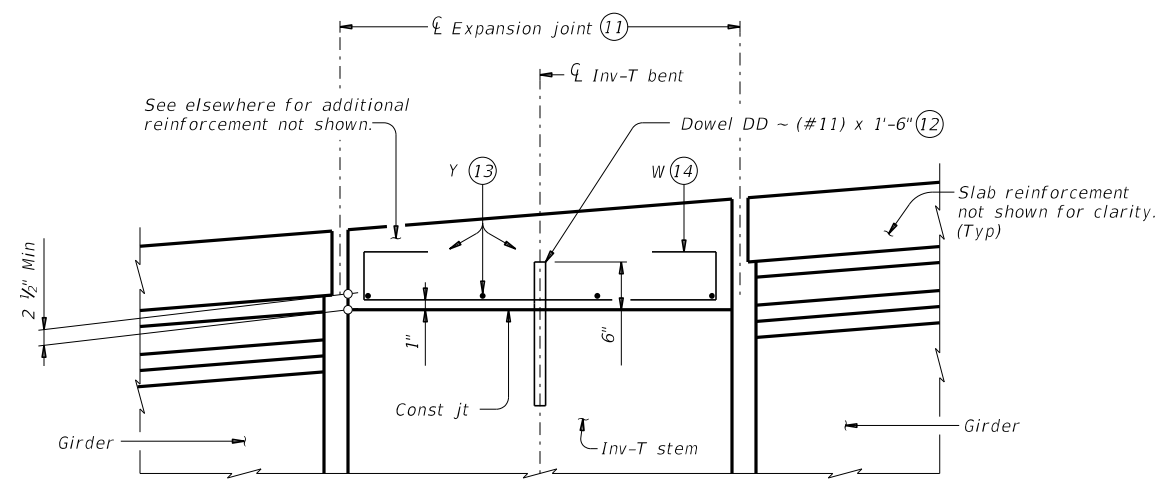
**MISCELLANEOUS SLAB DETAILS**  
**PRESTR CONCRETE I-GIRDERS**

**IGMS**

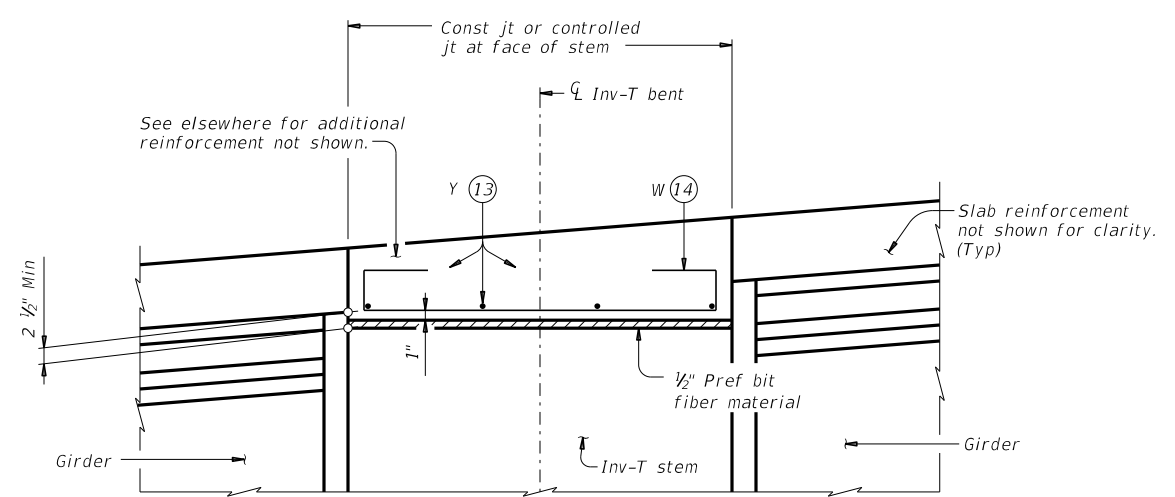
FILE: igmsts1-19.dgn	DN: TxDOT	CK: TxDOT	DW: JTR	CK: TxDOT
©TxDOT August 2017	CONT	SECT	JOB	HIGHWAY
REVISIONS	0456	02	028.ETC	FM 27
10-19: Modified Note 7. Type A now a pay item.	DIST	COUNTY	SHEET NO.	
	BRY	FREESTONE	95	

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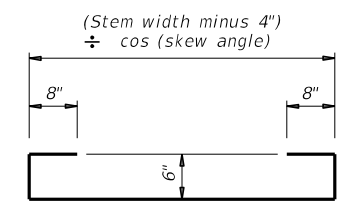
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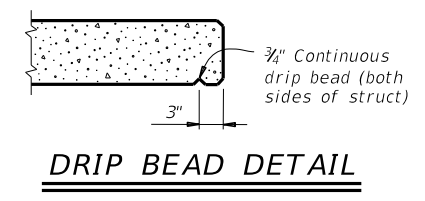
**SHOWING EXPANSION JOINTS**



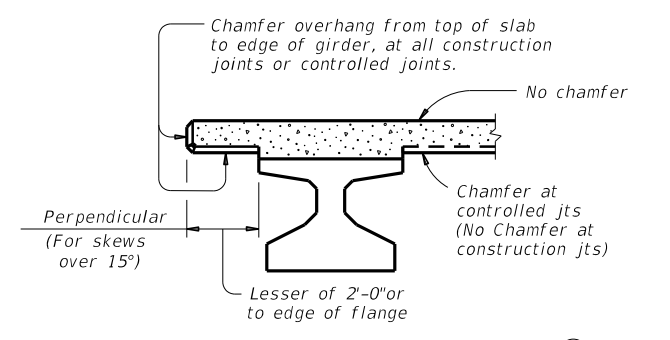
**SHOWING CONST JTS OR CONTROLLED JTS  
REINFORCEMENT OVER INV-T BENTS**



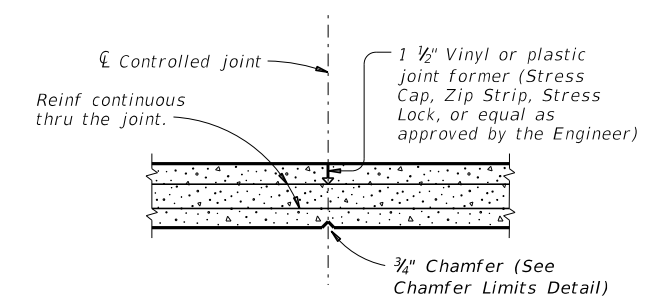
**BARS W (#4)**



**DRIP BEAD DETAIL**



**CHAMFER LIMITS DETAIL (15)**



**CONTROLLED JOINT DETAIL  
(Saw-cutting is not allowed)**

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

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

**IGMS**

FILE: igmsts1-19.dgn	DN: TxDOT	CK: TxDOT	DW: JTR	CK: TxDOT
©TxDOT August 2017	CONT	SECT	JOB	HIGHWAY
REVISIONS	0456	02	028.ETC	FM 27
10-19: Modified Note 7. Type A now a pay item.	DIST	COUNTY	SHEET NO.	
	BRY	FREESTONE	96	



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DATE: FILE:

STRUCTURE	DESIGNED GIRDERS									DEPRESSED STRAND PATTERN	CONCRETE		OPTIONAL DESIGN				LOAD RATING FACTORS				
	SPAN NO.	GIRDER NO.	GIRDER TYPE	PRESTRESSING STRANDS					NO.		TO END (in)	RELEASE STRGTH (1) f'ci (ksi)	MINIMUM 28 DAY COMP STRGTH f'c (ksi)	DESIGN LOAD COMP STRESS (TOP ε) (SERVICE I) fct(ksi)	DESIGN LOAD TENSILE STRESS (BOT ε) (SERVICE III) fcb(ksi)	REQUIRED MINIMUM ULTIMATE MOMENT CAPACITY (STRENGTH I) (kip-ft)	LIVE LOAD DISTRIBUTION FACTOR (2)		STRENGTH I		SERVICE III
				NON-STD STRAND PATTERN	TOTAL NO.	SIZE (in)	STRGTH fpu (ksi)	"e" ε (in)									"e" END (in)	Moment	Shear	Inv	Opr
Type Tx54 Girders 34' Roadway 8.5" Slab	40	ALL	Tx54		12	0.6	270	21.01	21.01			4.000	5.000	0.525	-0.609	1923	0.840	0.870	3.01	3.90	4.78
	45	ALL	Tx54		12	0.6	270	21.01	21.01			4.000	5.000	0.655	-0.740	2276	0.810	0.870	2.53	3.28	3.94
	50	ALL	Tx54		12	0.6	270	21.01	21.01			4.000	5.000	0.801	-0.889	2686	0.780	0.870	2.08	2.69	3.15
	55	ALL	Tx54		12	0.6	270	21.01	21.01			4.000	5.000	0.963	-1.053	3130	0.760	0.880	1.74	2.25	2.55
	60	ALL	Tx54		14	0.6	270	21.01	21.01			4.000	5.000	1.137	-1.230	3608	0.750	0.880	1.77	2.30	2.40
	65	ALL	Tx54		14	0.6	270	21.01	21.01			4.000	5.000	1.326	-1.413	3561	0.730	0.880	1.51	1.96	1.94
	70	ALL	Tx54		16	0.6	270	20.76	20.76			4.200	5.000	1.517	-1.597	3822	0.710	0.880	1.56	2.03	1.87
	75	ALL	Tx54		16	0.6	270	20.76	20.76			4.100	5.000	1.733	-1.807	3824	0.700	0.890	1.33	1.73	1.48
	80	ALL	Tx54		18	0.6	270	20.56	20.56			5.000	5.000	1.956	-2.021	4232	0.690	0.890	1.36	1.76	1.45
	85	ALL	Tx54		18	0.6	270	20.56	19.67	4	8.5	4.000	5.000	2.199	-2.251	4659	0.680	0.890	1.17	1.52	1.07
	90	ALL	Tx54		22	0.6	270	20.28	18.46	4	14.5	4.000	5.000	2.447	-2.485	5091	0.670	0.890	1.39	1.80	1.19
	95	ALL	Tx54		24	0.6	270	20.17	17.84	4	18.5	4.000	5.000	2.716	-2.735	5544	0.660	0.890	1.39	1.80	1.08
	100	ALL	Tx54		28	0.6	270	20.01	14.29	4	44.5	4.000	5.000	2.987	-2.987	5999	0.650	0.900	1.52	2.01	1.12
	105	ALL	Tx54		30	0.6	270	19.81	13.01	6	40.5	4.100	5.000	3.281	-3.257	6476	0.640	0.900	1.37	1.98	1.00
	110	ALL	Tx54		34	0.6	270	19.48	11.71	6	50.5	4.400	5.200	3.575	-3.526	6952	0.630	0.900	1.41	2.10	1.04
115	ALL	Tx54		38	0.6	270	19.22	12.27	6	50.5	5.000	5.800	3.895	-3.816	7452	0.620	0.900	1.50	2.07	1.09	
120	ALL	Tx54		40	0.6	270	19.11	13.11	6	46.5	5.400	6.300	4.219	-4.120	8011	0.620	0.900	1.38	2.02	1.01	
125	ALL	Tx54		44	0.6	270	18.83	12.64	8	42.5	5.800	6.900	4.564	-4.430	8537	0.610	0.900	1.47	1.98	1.02	
Type Tx62 Girders 34' Roadway 8.5" Slab	60	ALL	Tx62		14	0.6	270	25.78	25.78			4.000	5.000	0.898	-1.031	3755	0.770	0.870	2.01	2.60	2.89
	65	ALL	Tx62		14	0.6	270	25.78	25.78			4.000	5.000	1.045	-1.184	4235	0.750	0.870	1.72	2.23	2.40
	70	ALL	Tx62		14	0.6	270	25.78	25.78			4.000	5.000	1.197	-1.342	4194	0.730	0.870	1.48	1.92	1.98
	75	ALL	Tx62		16	0.6	270	25.53	25.53			4.000	5.000	1.367	-1.517	4489	0.720	0.880	1.53	1.98	1.89
	80	ALL	Tx62		16	0.6	270	25.53	25.53			4.000	5.000	1.541	-1.697	4446	0.710	0.880	1.31	1.70	1.53
	85	ALL	Tx62		18	0.6	270	25.33	25.33			4.000	5.000	1.730	-1.890	4869	0.700	0.880	1.35	1.75	1.46
	90	ALL	Tx62		18	0.6	270	25.33	25.33			4.000	5.000	1.923	-2.085	5322	0.690	0.880	1.17	1.52	1.16
	95	ALL	Tx62		20	0.6	270	25.18	24.78	4	6.5	4.000	5.000	2.132	-2.295	5799	0.680	0.880	1.20	1.56	1.10
	100	ALL	Tx62		22	0.6	270	25.05	23.96	4	10.5	4.000	5.000	2.342	-2.506	6277	0.670	0.880	1.23	1.60	1.03
	105	ALL	Tx62		26	0.6	270	24.85	22.70	4	18.5	4.000	5.000	2.571	-2.732	6781	0.660	0.890	1.42	1.85	1.12
	110	ALL	Tx62		28	0.6	270	24.78	20.21	4	36.5	4.000	5.000	2.799	-2.957	7281	0.650	0.890	1.34	1.86	1.03
	115	ALL	Tx62		32	0.6	270	24.40	15.40	6	54.5	4.000	5.000	3.047	-3.199	7810	0.640	0.890	1.40	2.04	1.05
	120	ALL	Tx62		34	0.6	270	24.25	16.84	6	48.5	4.400	5.200	3.292	-3.438	8332	0.630	0.890	1.32	2.02	1.00
	125	ALL	Tx62		38	0.6	270	23.99	16.09	6	56.5	4.800	5.700	3.566	-3.712	8951	0.630	0.890	1.40	2.13	1.04
	130	ALL	Tx62		40	0.6	270	23.88	17.88	6	46.5	5.300	6.300	3.827	-3.966	9497	0.620	0.890	1.38	2.09	1.01
135	ALL	Tx62		44	0.6	270	23.60	15.96	8	50.5	5.500	6.500	4.114	-4.240	10077	0.610	0.890	1.46	2.07	1.01	

① Based on the following allowable stresses (ksi):

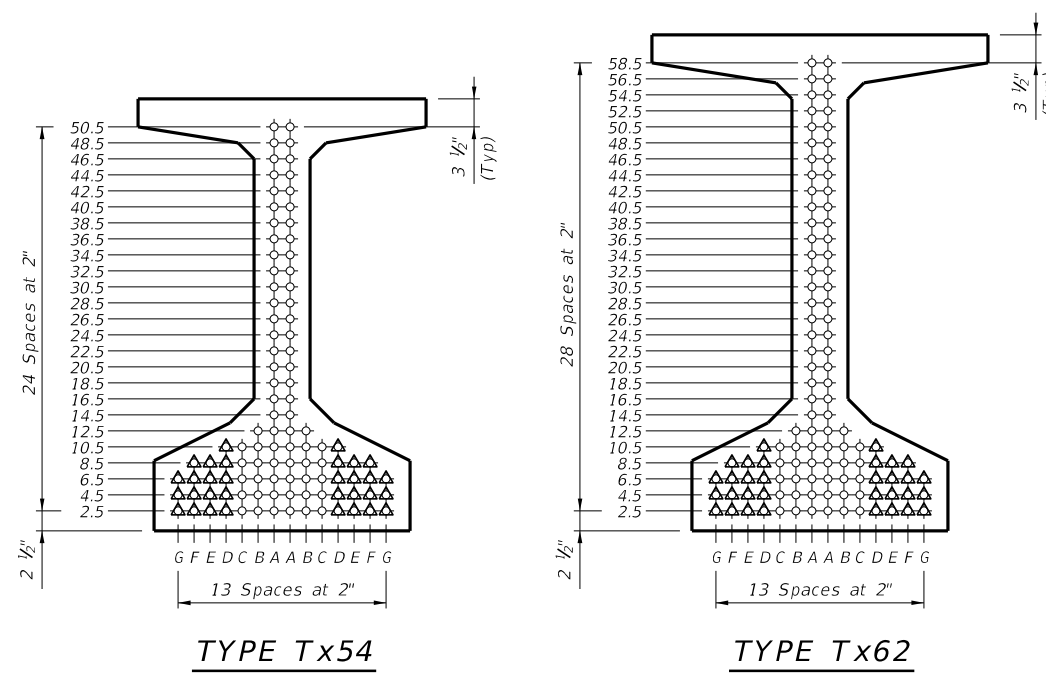
Compression = 0.65 f'ci

Tension = 0.24 √ f'ci

Optional designs must likewise conform.

② Portion of full HL93.

NON-STANDARD STRAND PATTERNS	
PATTERN	STRAND ARRANGEMENT AT ε OF GIRDER



HL93 LOADING SHEET 2 OF 2

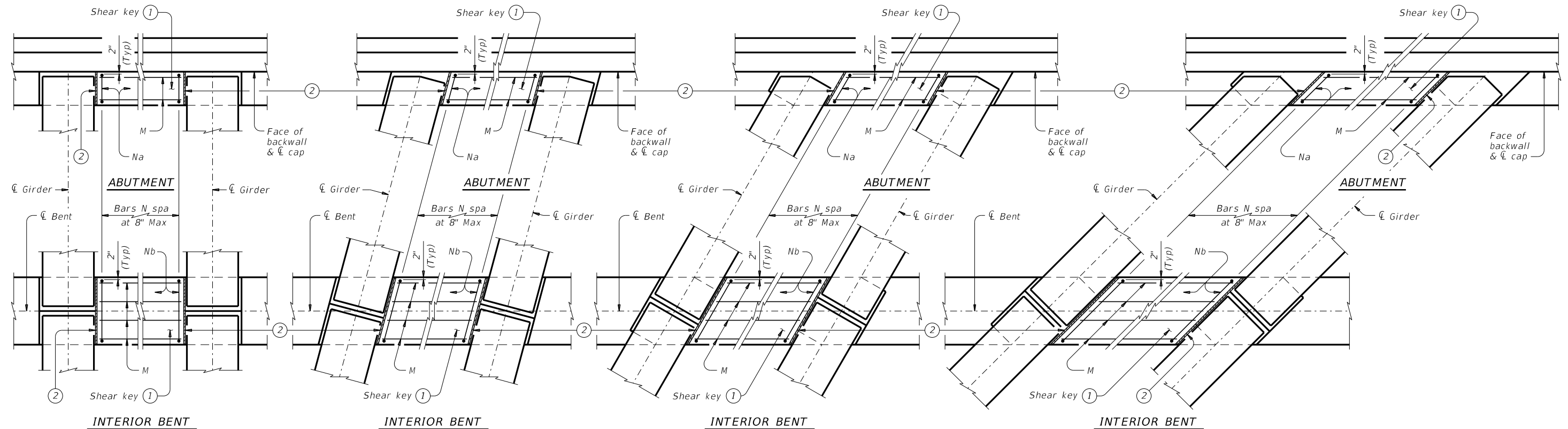


PRESTRESSED CONCRETE I-GIRDER STANDARD DESIGNS  
34' ROADWAY

IGSD-34

FILE:	DN: VC	CK: TAR	DW: SFS	CK: TAR
©TxDOT	CONT	SECT	JOB	HIGHWAY
REVISIONS	0456	02	028.ETC	FM 27
	DIST	COUNTY	SHEET NO.	
	BRY	FREESTONE	98	

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**PARTIAL PLANS WITH NO SKEW**

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

**PARTIAL PLANS WITH 15° SKEW**

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

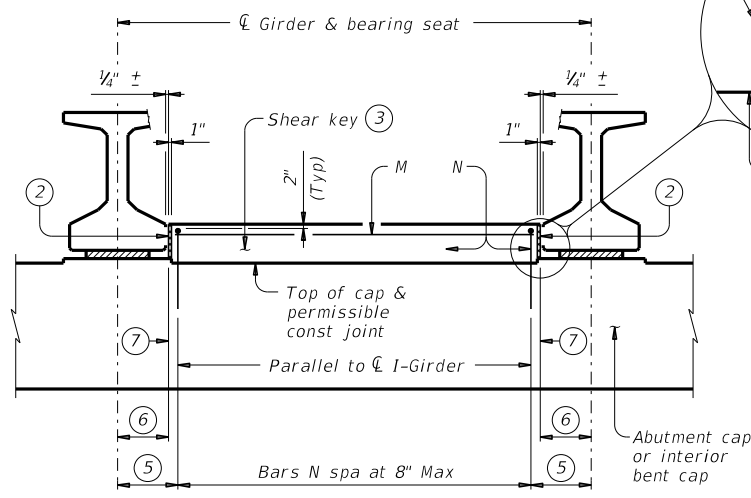
**PARTIAL PLANS WITH 30° SKEW**

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

**PARTIAL PLANS WITH 45° SKEW**

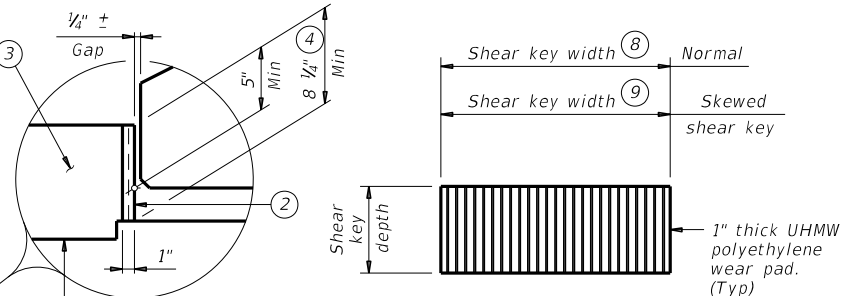
Showing shear keys on 3'-6" wide caps. 4'-0" caps similar.

- ① Place shear keys on the upstream side of structure between outside girder and next adjacent girder, unless shown otherwise on plans.
- ② UHMW polyethylene wear pad. (Typ)
- ③ Leave a 1/4" gap plus or minus between girder and face of wear pad. Cast wear pad with shear key, smooth side facing girder. Care must be taken to keep concrete from flowing under girder. Slope top of shear keys in accordance with Item 420.4.9, "Treatment and Finishing of Horizontal Surfaces."
- ④ Measure at higher bearing seat elevation forward or back. Dimension based on typical bearing pad and bearing seat. Increase as necessary to maintain 5" overlap.
- ⑤ With No Skew = 1'-8 1/4", measured along  $\bar{\ell}$  cap. With Skew =  $1'-8 \frac{1}{4} \div \cos \text{Skew}$ , measured along  $\bar{\ell}$  cap.
- ⑥ With No Skew = 1'-4 1/4", measured along  $\bar{\ell}$  cap. With Skew =  $1'-4 \frac{1}{4} \div \cos \text{Skew}$ , measured along  $\bar{\ell}$  cap.
- ⑦ Face of UHMW polyethylene wear pad. Smooth side of pad facing girder.
- ⑧ Abutments = 1/2 Cap width. Interior bents = Cap width.
- ⑨ Abutments = 1/2 Cap width  $\div \cos \text{Skew}$ . Interior bents = Cap width  $\div \cos \text{Skew}$ .

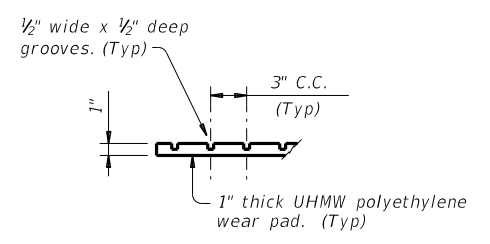


**PARTIAL ELEVATION OF ABUTMENT OR INTERIOR BENT CAP**

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

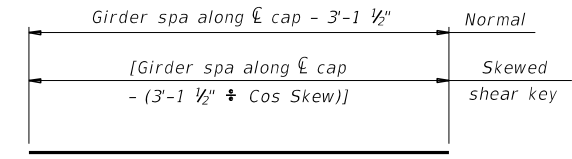


**ELEVATION**

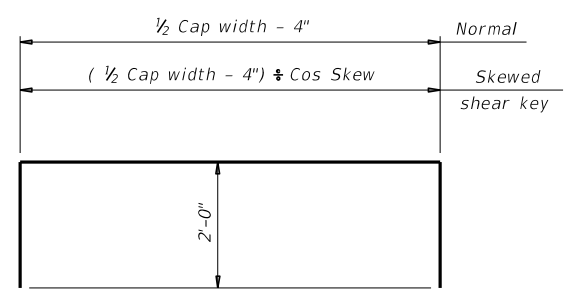


**PART SECTION**

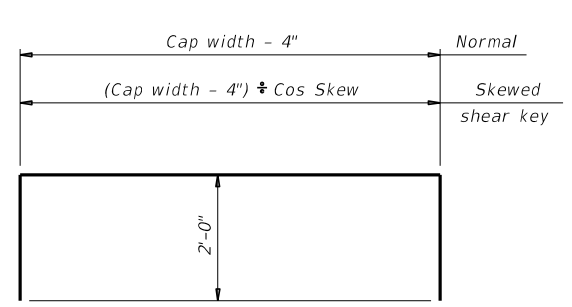
**ULTRA HIGH MOLECULAR WEIGHT (UHMW) POLYETHYLENE WEAR PAD DETAILS**



**BARS M (#5)**



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



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

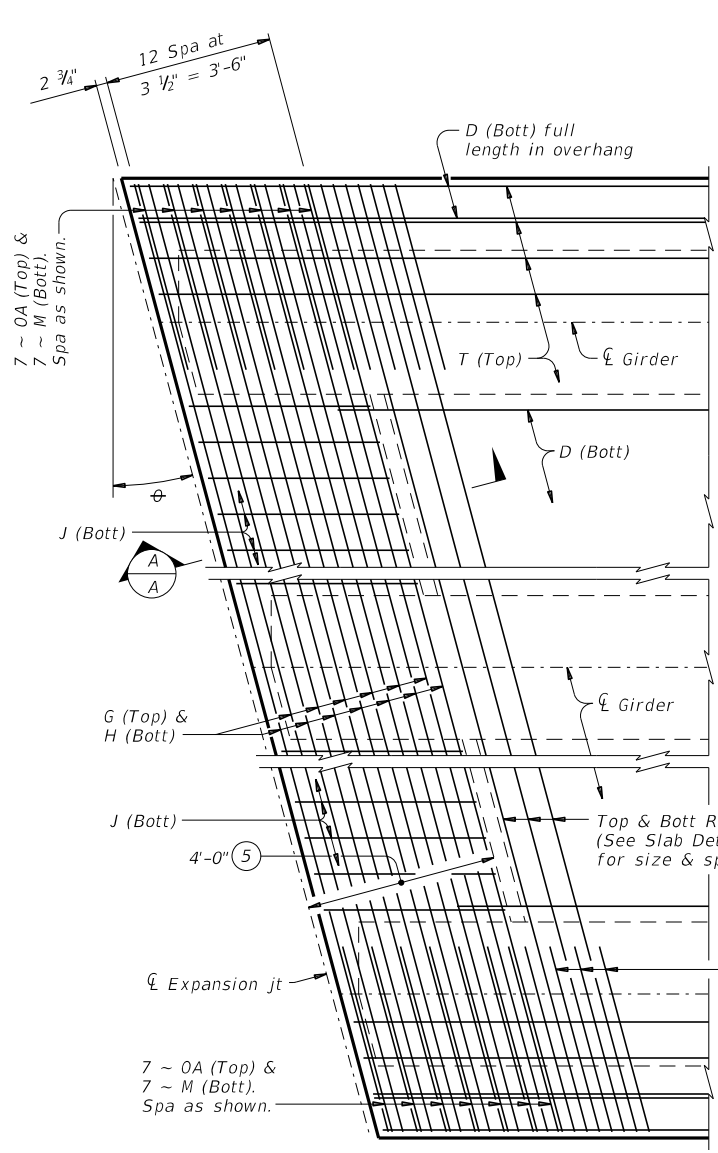
**CONSTRUCTION NOTES:**  
 Provide Class "C" concrete ( $f'_c = 3,600$  psi). Provide Class "C" (HPC) if shown elsewhere on the plans.  
 Provide Grade 60 reinforcing steel.  
 Provide epoxy coated reinforcing steel for shear key if abutment or interior bent reinforcing steel is epoxy coated.  
 Provide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

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

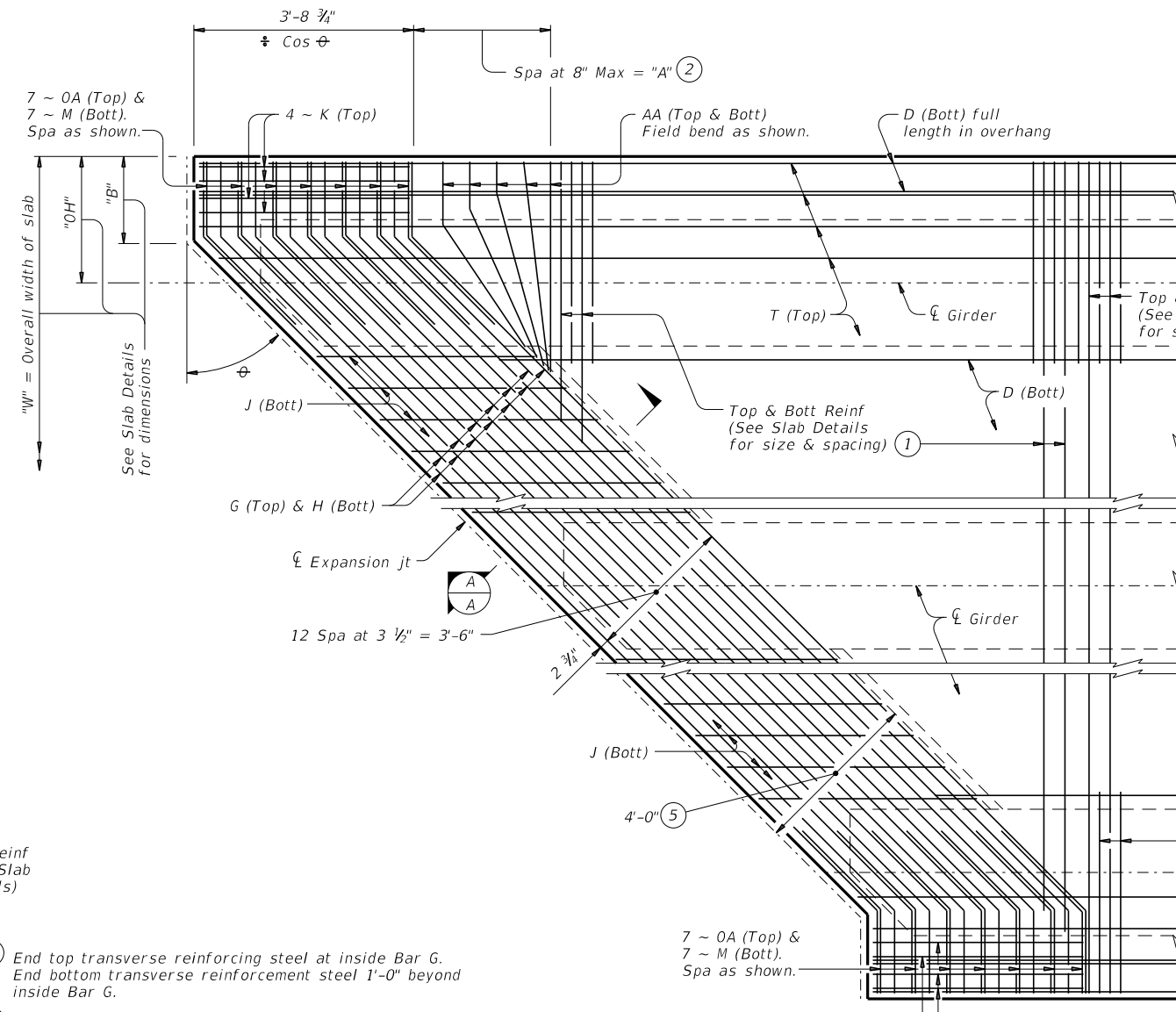
<b>SHEAR KEY DETAILS</b> <b>PRESTR CONCRETE I-GIRDERS</b>			
<b>IGSK</b>			
FILE: igskstds-17.dgn	DN: TxDOT	CK: TxDOT	DW: JTR
©TxDOT August 2017	CONV	SECT	JOB
REVISIONS	0456	02	028.ETC
	DIST	COUNTY	SHEET NO.
	BRY	FREESTONE	99

DATE: FILE:

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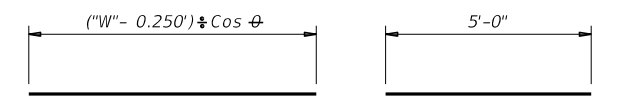


**PARTIAL PLAN FOR SLABS WITHOUT BREAKBACK**

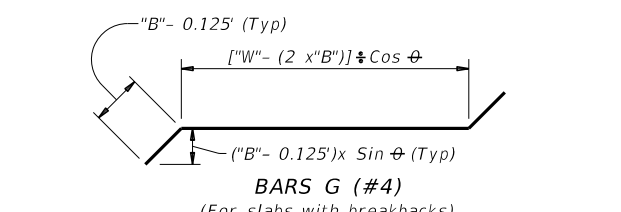


**PARTIAL PLAN FOR SLABS WITH BREAKBACK**

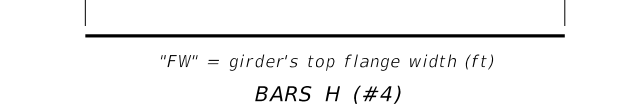
- 1 End top transverse reinforcing steel at inside Bar G. End bottom transverse reinforcement steel 1'-0" beyond inside Bar G.
- 2 "A" = ("OH" + 2.333 "B") x Tan phi
- 3 Provide clear cover as indicated unless otherwise shown on Span Details.
- 4 Only required on slabs with breakbacks.
- 5 Thickened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



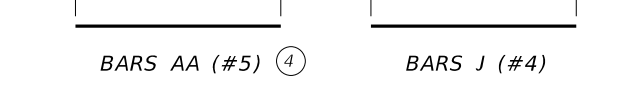
**BARS G (#4)** (For slabs without breakbacks) **BARS K (#4)** 4



**BARS G (#4)** (For slabs with breakbacks)



**BARS H (#4)**



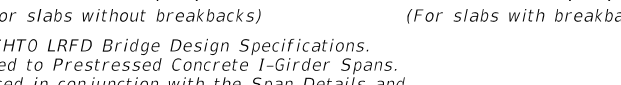
**BARS AA (#5)** 4 **BARS J (#4)**



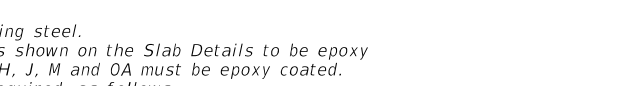
**BARS M (#4)** (For slabs without breakbacks)



**BARS M (#4)** (For slabs with breakbacks)



**BARS OA (#5)** (For slabs without breakbacks)

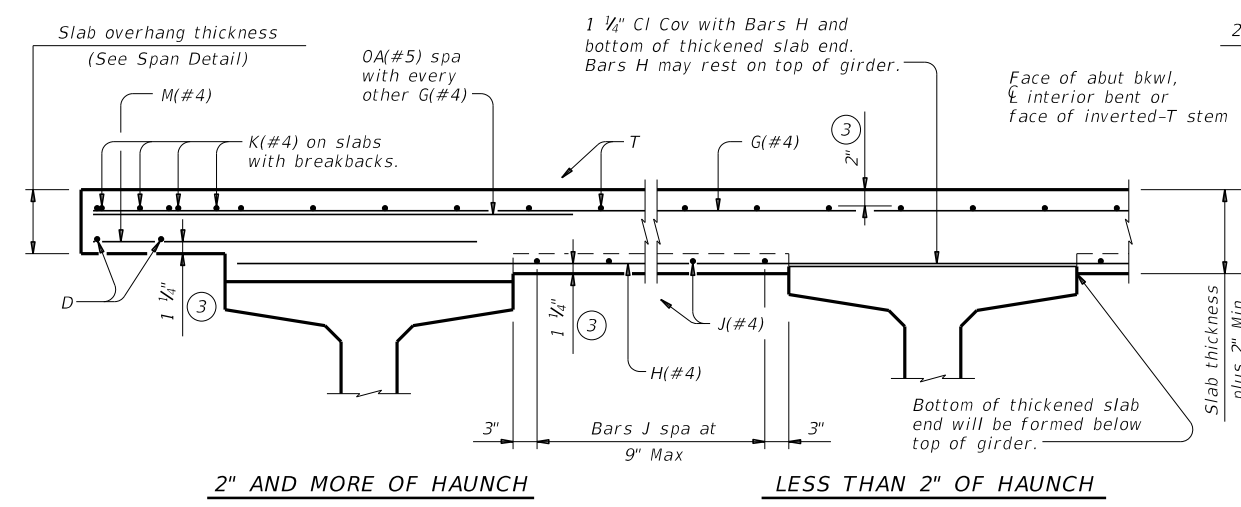


**BARS OA (#5)** (For slabs with breakbacks)

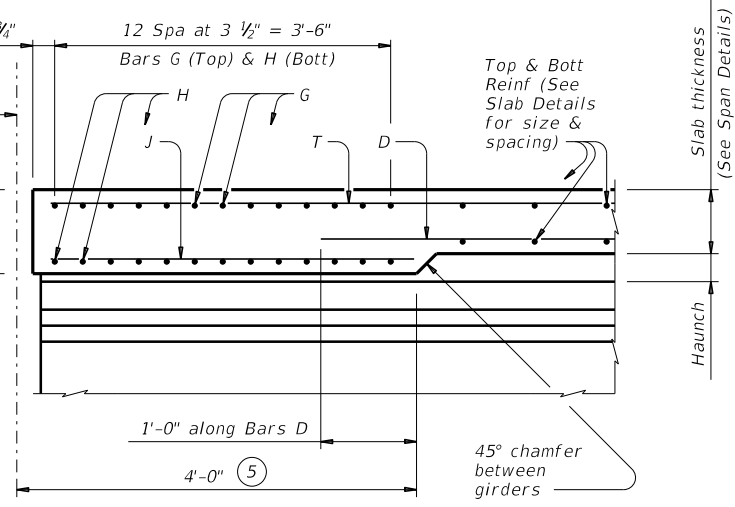
**GENERAL NOTES:**  
 Designed according to AASHTO LRFD Bridge Design Specifications. These details are restricted to Prestressed Concrete I-Girder Spans. These details are to be used in conjunction with the Span Details and PCP standard (if prestressed concrete panels are used). When Option 2 from PCP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

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

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



**TYPICAL TRANSVERSE SECTION**  
 (Showing Prestressed Conc I-Girders at Brg)



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

HL93 LOADING

Texas Department of Transportation Bridge Division Standard

**THICKENED SLAB END DETAILS  
 PRESTRESSED CONCRETE I-GIRDER SPANS**

IGTS

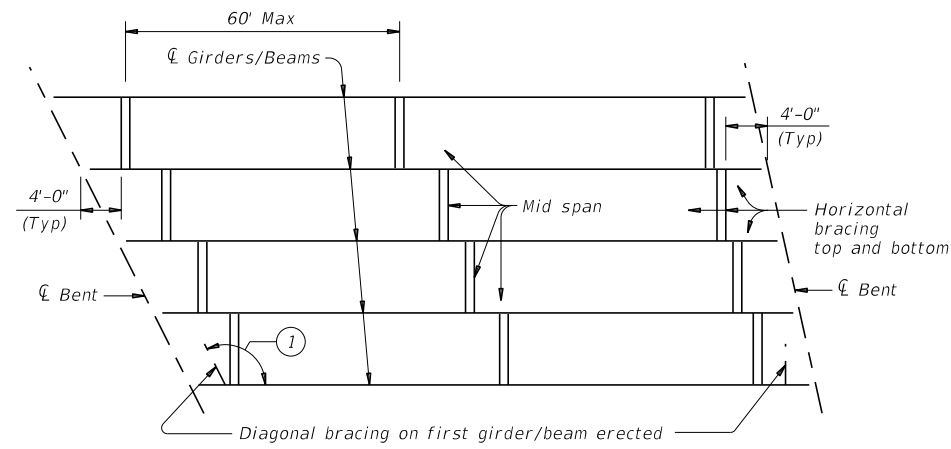
FILE: igtss1-17.dgn	DN: TxDOT	CK: TxDOT	DW: JTR	CK: TxDOT
©TxDOT August 2017	CONV	SECT	JOB	HIGHWAY
REVISIONS	0456	02	028.ETC	FM 27
	DIST	COUNTY	SHEET NO.	
	BRY	FREESTONE	100	

DATE: FILE:

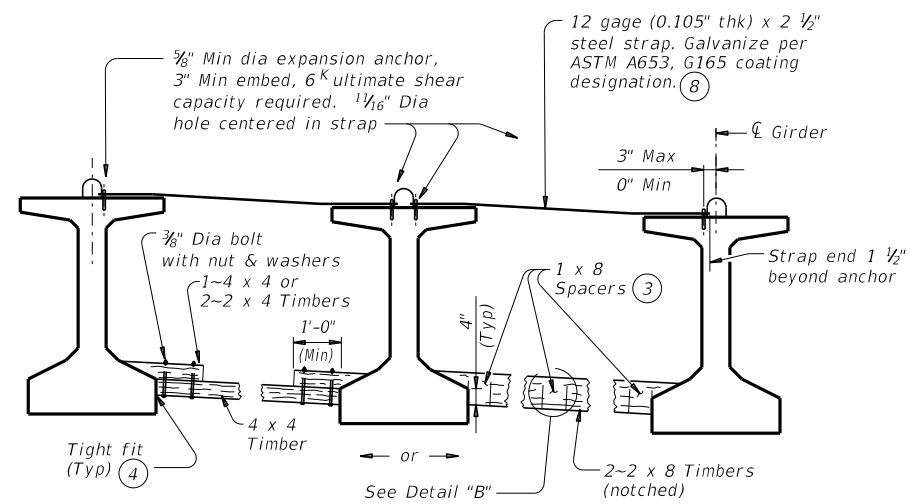


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DATE: FILE:

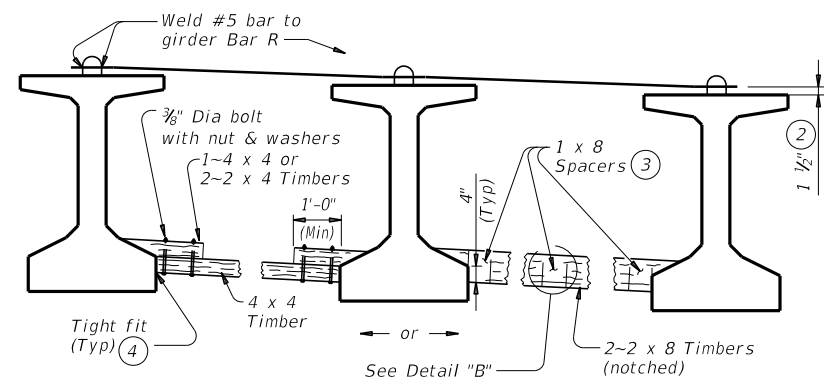


**ERECTION BRACING**



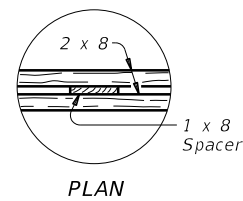
**FOR ERECTION BRACING, OPTION 1**

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

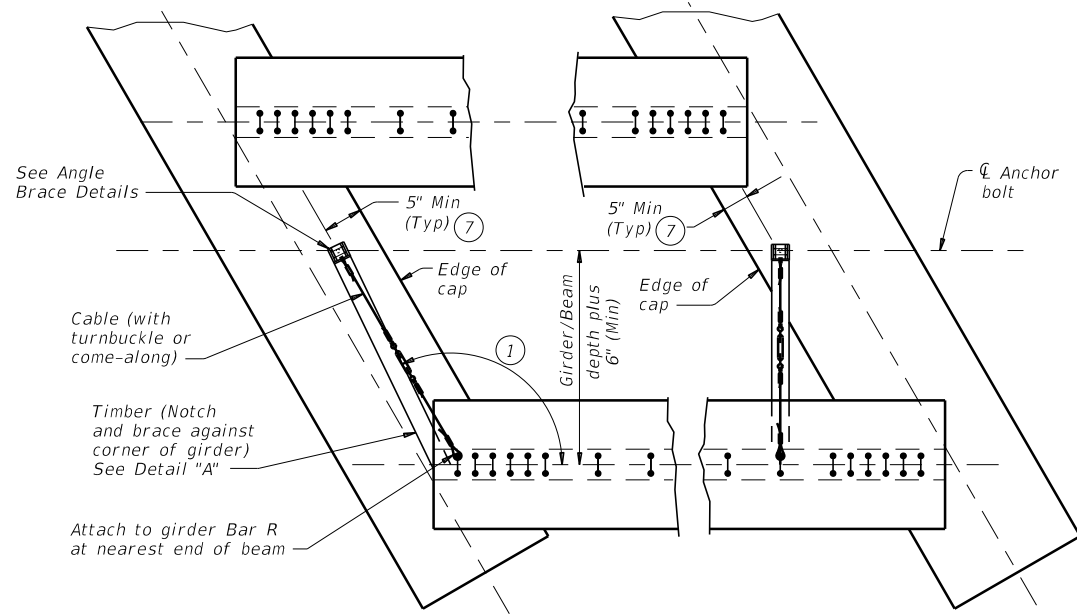


**FOR ERECTION BRACING, OPTION 2**

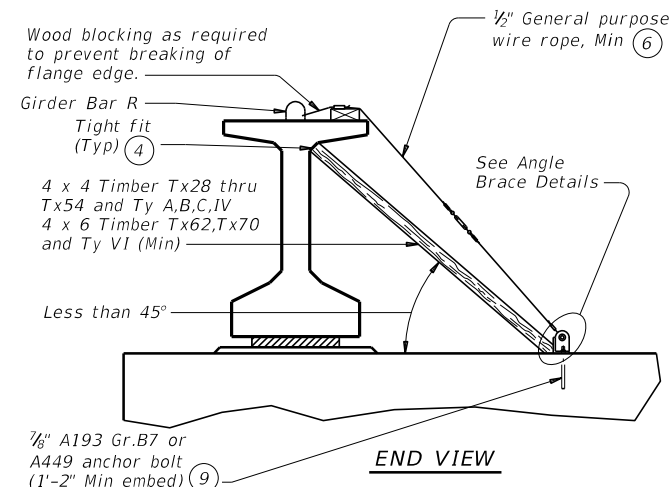
**HORIZONTAL BRACING DETAILS**



**DETAIL "B"**



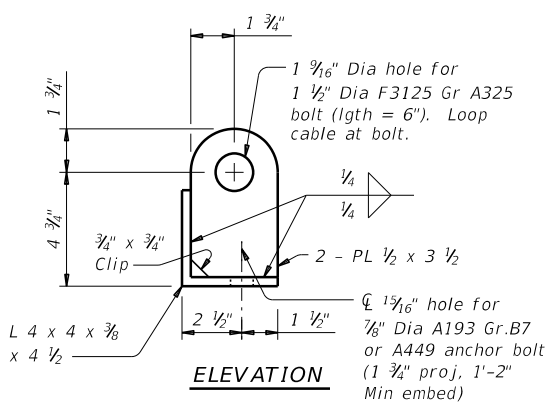
**PLAN**



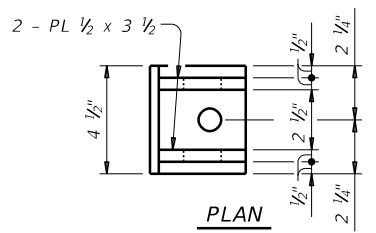
**END VIEW**

**DIAGONAL BRACING DETAILS**

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



**ELEVATION**



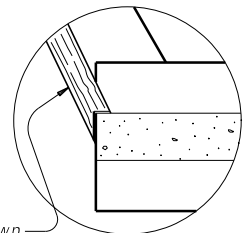
**PLAN**

**ANGLE BRACE DETAILS**

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

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

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



**DETAIL "A"**

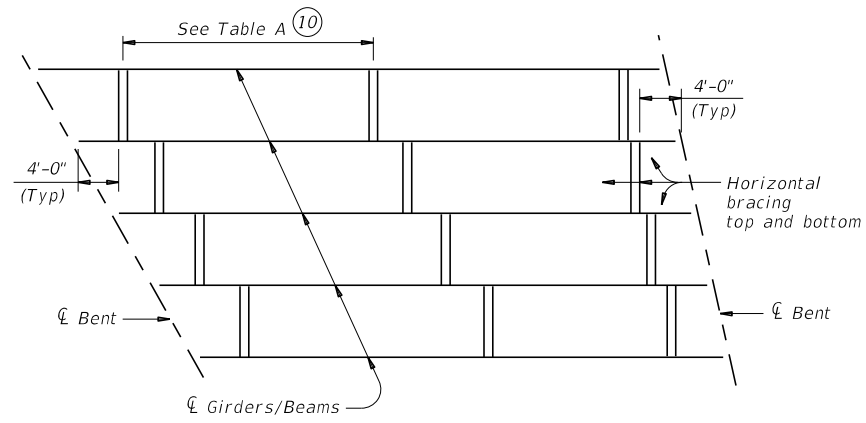
- 1 If angle shown exceeds 120 degrees, move diagonal brace to other side of girder/beam and place square to girder/beam. This may prevent exterior girder from being erected first.
- 2 Place and weld #5 bars as shown during erection. If forming deck with prestressed panels, bars can be temporarily removed,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

SHEET 1 OF 2

		<b>Bridge Division Standard</b>	
<b>MINIMUM ERECTION AND BRACING REQUIREMENTS PRESTRESSED CONCRETE I-GIRDERS AND I-BEAMS</b>			
<b>MEBR(C)</b>			
FILE: mebcsts1-17.dgn	DN: TxDOT	CK: TxDOT	OW: TxDOT
©TxDOT August 2017	CONTRACT	SECTION	HIGHWAY
REVISIONS	0456	02	028.ETC FM 27
DIST	COUNTY		SHEET NO.
BRY	FREESTONE		101

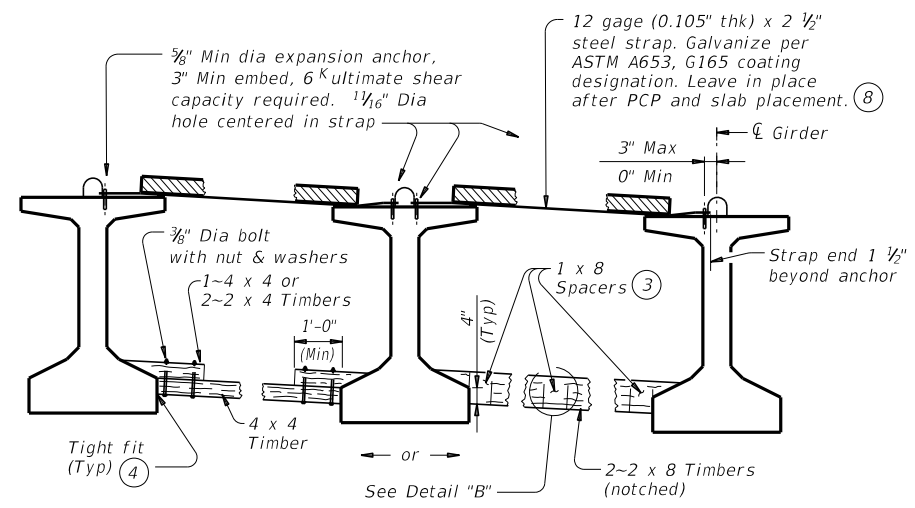
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DATE: FILE:



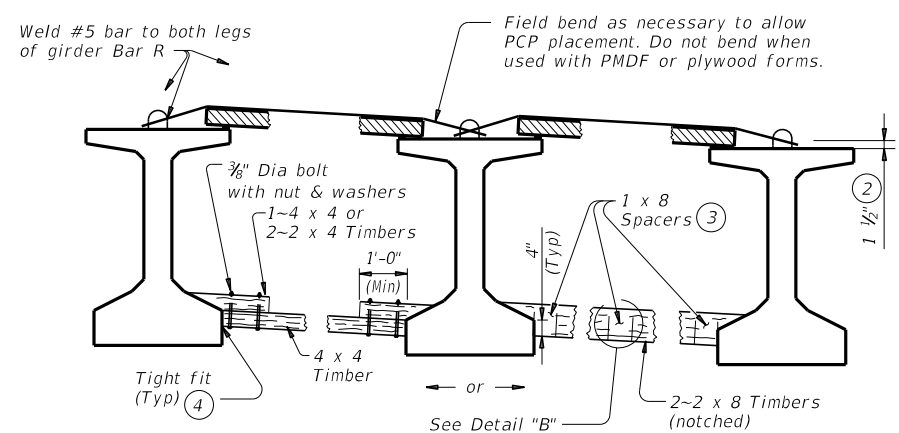
**SLAB PLACEMENT BRACING**

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



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

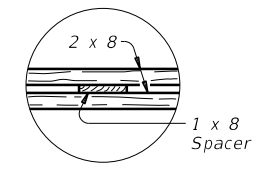
(Showing slab formed with PCP. This option is not allowed when slab is formed with PMDF or plywood.)



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

(Showing slab formed with PCP.)

**HORIZONTAL BRACING DETAILS (5)**



**PLAN  
DETAIL "B"**

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

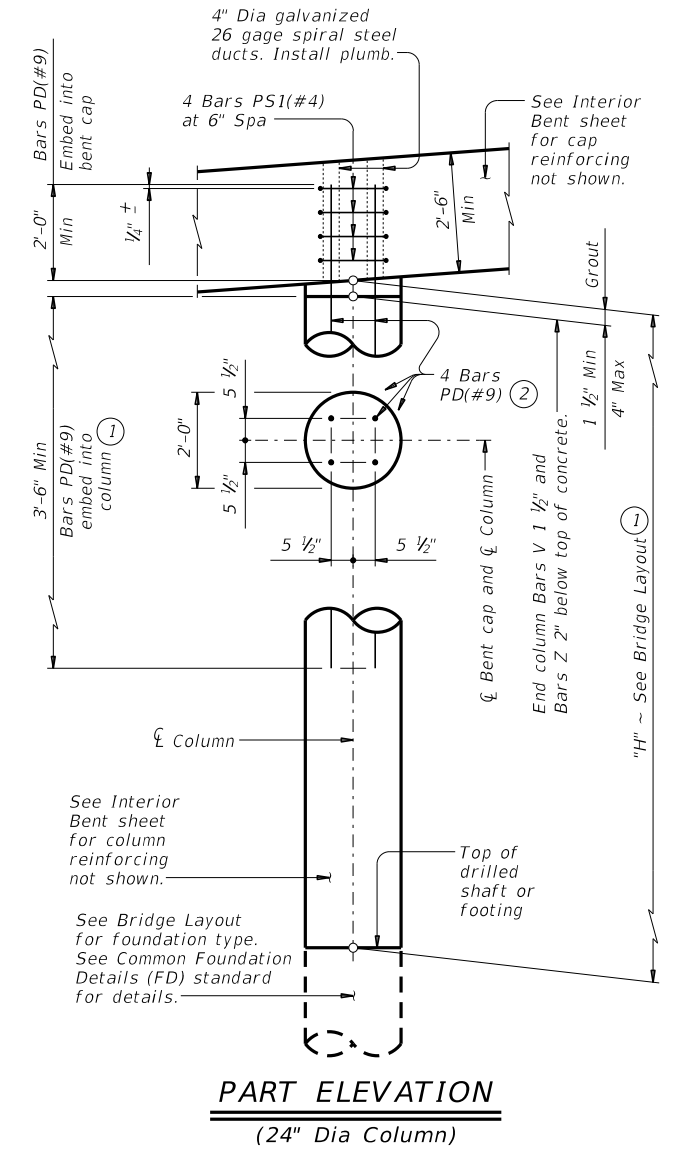
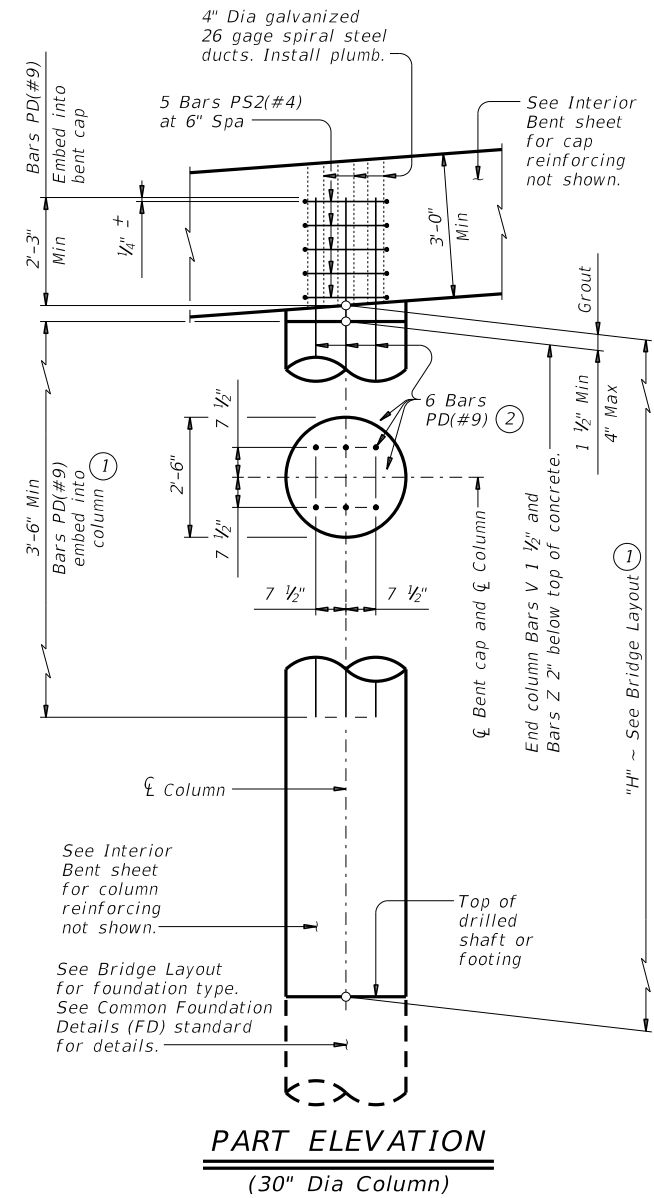
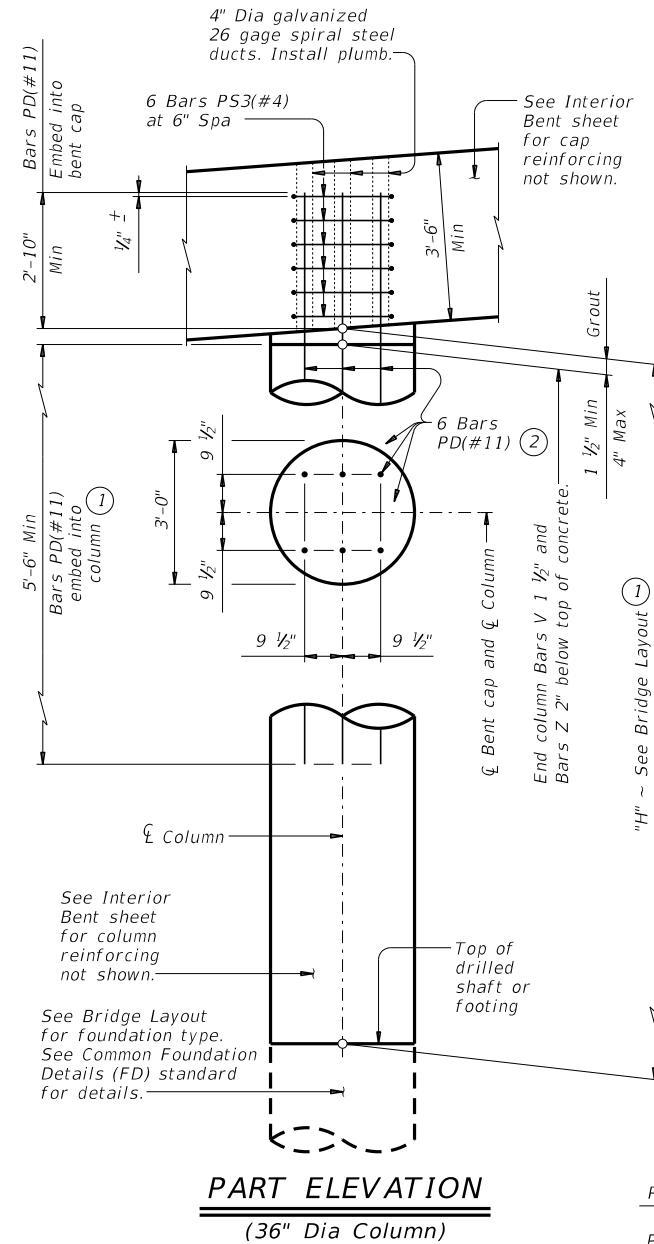
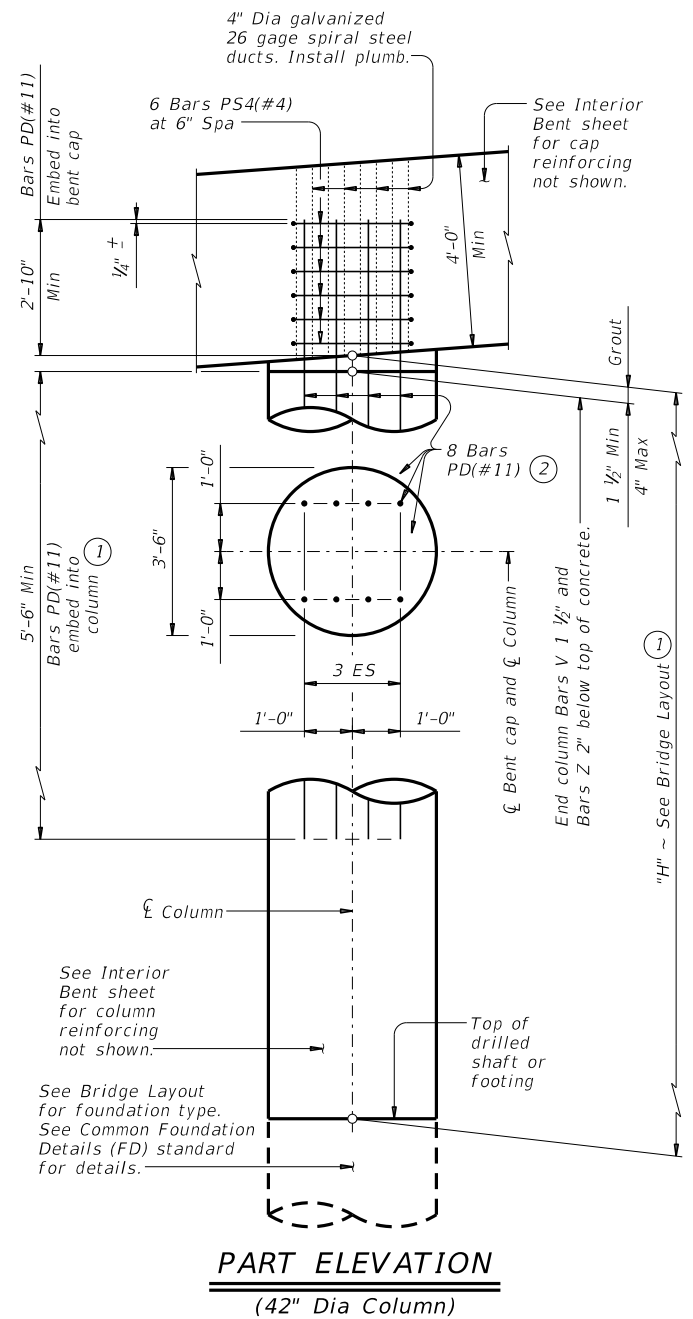
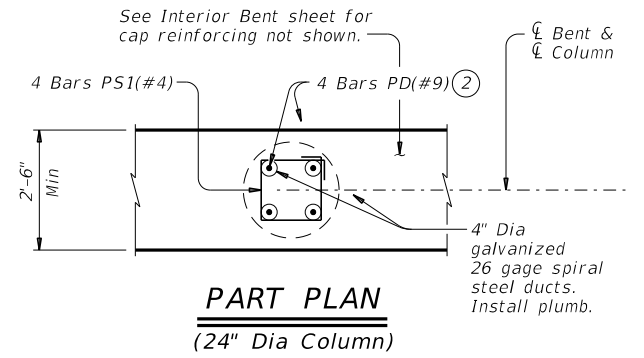
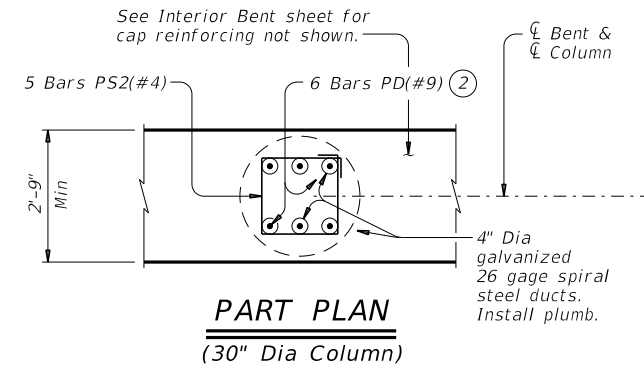
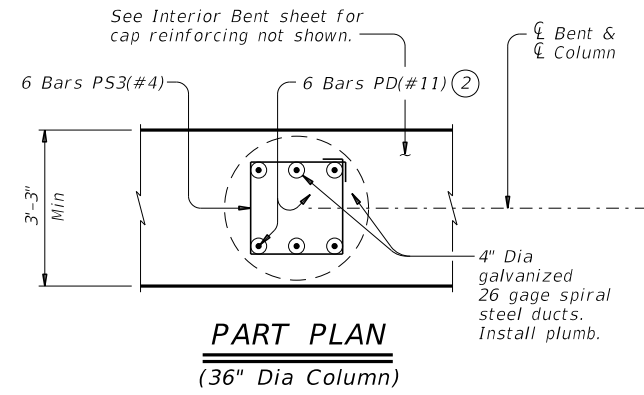
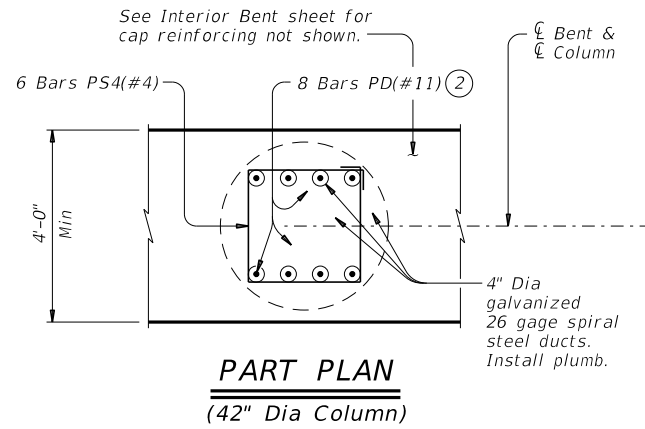
**SLAB PLACEMENT BRACING:**  
The details for slab placement bracing are considered minimum for fulfilling the requirements of Specification Items 422 and 425. Required slab placement bracing must remain in place until slab concrete has attained a compressive strength of 3000 psi.

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

		<b>Bridge Division Standard</b>	
<b>MINIMUM ERECTION AND BRACING REQUIREMENTS PRESTRESSED CONCRETE I-GIRDERS AND I-BEAMS</b>			
<b>MEBR(C)</b>			
FILE: mebcsts1-17.dgn	DN: TxDOT	CK: TxDOT	OW: TxDOT
©TxDOT August 2017	CONT	SECT	JOB
REVISIONS	0456	02	028,ETC
	DIST	COUNTY	SHEET NO.
	BRY	FREESTONE	102

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DATE: FILE:



**BARS PS (#4)**

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

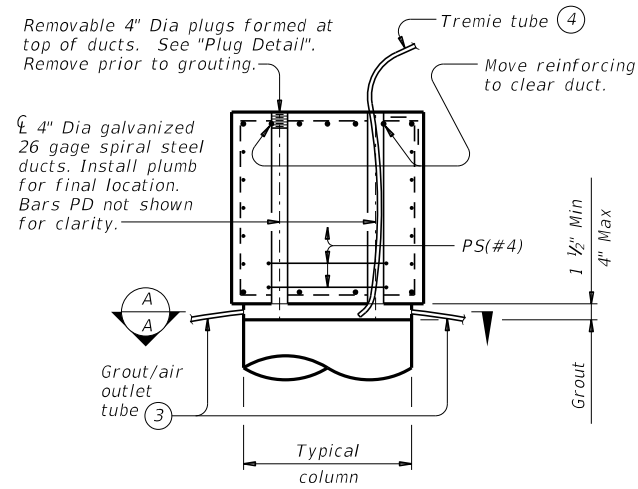
(Typ)	5"
PS1	1'-4 1/4"
PS2	1'-8 1/4"
PS3	2'-0 1/4"
PS4	2'-5 1/4"

- (1) Bars PD may need to be embedded in footing or drilled shaft for short columns.
- (2) Location tolerance of dowels in columns/drilled shafts is 1/4" from plan location, transversely and longitudinally.

HL93 LOADING SHEET 1 OF 2

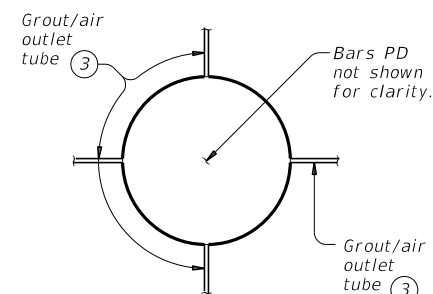
		<b>Bridge Division Standard</b>	
<h3>PRECAST CONCRETE BENT CAP OPTION FOR ROUND COLUMNS</h3>			
<h4>PBC-RC</h4>			
FILE: pbcstd01-21.dgn	DN: TxDOT	CK: JMH	DW: JTR
©TxDOT April 2019	CONTRACT	SECTION	JOB
REVISIONS 12-21: General Notes	0456	02	028,ETC
DIST	COUNTY		SHEET NO.
BRY	FREESTONE		103

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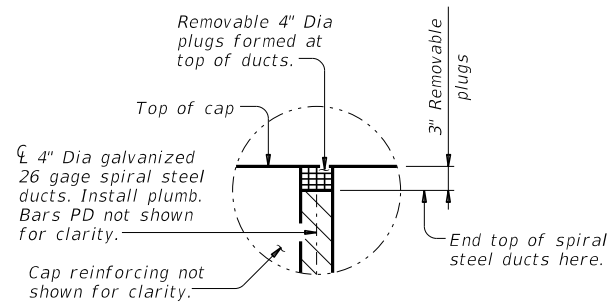


**TYPICAL SECTION THRU CAP**

(Showing example of ducts and cap reinforcing.)



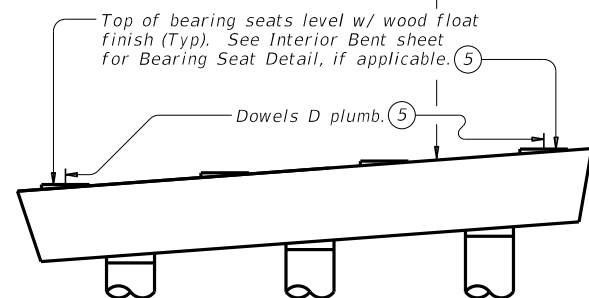
**SECTION A-A**



**PLUG DETAIL**

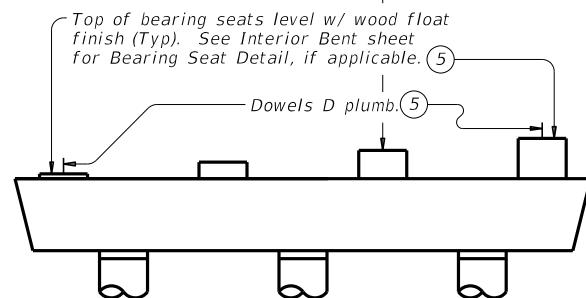
(Plug is used to keep concrete out of ducts during concrete placement. Remove prior to grouting)

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



**CAP SET AT SLOPE**

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



**CAP SET LEVEL**

**EXAMPLES OF PRECAST BENTS WITH DOWELS D**

- (3) Provide at least 4 grout/air outlet tubes equally spaced around the perimeter of the column. Install at bottom of cap to avoid air entrapment. Seal off tubes sequentially when a steady flow of grout without air occurs. Secondary tubes to help drain water, located at top of column, may also be installed.
- (4) Continuous gravity-flow grouting through a tremie tube is recommended. With this method, lower a flexible tremie tube through one of the vertical ducts to the bottom of the bedding layer and fill the connection from the bottom upward with a continuous flow of grout. This method requires a sufficient amount of grout to be mixed prior to grouting and that the funnel connected to the tremie tube have adequate volume capacity (4 quarts Min is recommended). A valve may be used to stop the flow during grouting to allow refilling the funnel or to tamp the grout. The tube should remain within the grout and gradually withdrawn as the level of the grout rises in the ducts. It is critical to ensure a continuous flow of grout to avoid air entrapment. Alternative methods, including pressure grouting with low pressure pumps, may be used provided they are proved effective in providing void-free connections during the mock-up phase.
- (5) Unless otherwise shown.

**CONSTRUCTION NOTES:**

**Cap Fabrication:**

Construct and cure cap in accordance with Item 420, "Concrete Substructures". If fabricated at an offsite location, construct and cure cap in accordance with Item 424, "Precast Concrete Structural Members (Fabrication)". Secure ducts to prevent their movement during concrete placement. Location tolerance of ducts is 1/4" from plan location, transversely and longitudinally. Seal ducts to prevent intrusion of concrete.

Bearing seats may be precast with the cap. Bearing seats over 3" in height must be reinforced as per Item 420.4.9. Do not locate lift points at bearing seats if bearing seats are precast.

Cap concrete must achieve a compressive strength of 2,500 psi prior to lifting. Limit flexural stress in cap to 250 psi during handling and storage. Store and handle caps in accordance with Item 424, "Precast Concrete Structural Members (Fabrication)". Do not stack caps. Caps that become cracked or otherwise damaged may be rejected.

**Cap-to-Column Connection:**

Make a trial batch of grout using the same material, equipment and personnel to be used for actual grouting operations and grout a mock-up of the connection at least one week before grouting and in the presence of the Engineer. This mock-up test must demonstrate the reliability of the Contractor's grouting procedures to provide a connection free of voids. Field test the trial batch grout to the same level required for the actual grouting.

Caps may be placed on columns/drilled shafts after column/drilled shaft concrete has achieved a flexural stress of 355 psi (or 2,500 psi compressive strength). Use plastic shims or friction collars to support the cap at the proper elevation prior to grouting. Total area of plastic shims used on top of each column may not exceed 6 percent of the column area. Column/drilled shaft curing may be interrupted a maximum of 2 hours for placement of plastic shims or friction collars and cap placement.

Surfaces in contact with grout must be clean and in a saturated, surface-dry condition, immediately prior to grouting. Provide water tight forms. Fill the forms with water and drain just prior to grouting. Ponding or free-standing water is not permitted. Use compressed air to blow out excess water.

Mix grout in accordance with the manufacturer's directions. Evidence of frothing, foaming, or segregation is cause for rejection. Transport grout from mixer to final location by wheel barrow, bucket or pumping.

Perform sampling and testing of grout by trained personnel at the Contractor's expense and while witnessed by the Engineer. Grouted connections must be free of voids.

Trowel finish top surface of cap anchorage ducts flush with top of cap. Wet mat cure these locations for at least 48 hours. Recess lifting loops 1-inch minimum using exothermic cutting rods. Do not overheat or damage the surrounding concrete. Abrade the concrete surfaces of excavation and end of the lifting loop to remove all slag with a needle gun, steel brush, or other suitable means. Coat the inside of the recessed area, including the lifting loops, with 10 mils (minimum) of neat, Type VIII epoxy and patch the recess with epoxy mortar.

Friction collars may be removed, if used, and beams placed on the cap after the grout obtains a compressive strength of 2,500 psi. Subsequent loading can occur when the grout reaches its final required 28 day compressive strength.

**MATERIAL NOTES:**

Provide a pre-qualified grout from TxDOT's Material Producer List "Cementitious Grouts and Mortars for Miscellaneous Applications", conforming to DMS-4675.

Provide semi-rigid spirally crimped, corrugated duct of galvanized, cold rolled steel conforming to ASTM A653. Corrugations must have a minimum amplitude of 0.094".

Grout tubes and forms must be approved prior to grouting.

Provide Grade 60 reinforcing steel. Epoxy coat or galvanize all reinforcement if column reinforcement is epoxy coated or galvanized.

**GENERAL NOTES:**

Designed in accordance with AASHTO LRFD Bridge Design Specifications.

The Contractor has the option to provide precast bent caps in accordance with the details shown. No additional payment will be made if the Contractor uses precast caps.

Submit shop drawings of precast caps for approval prior to construction. Indicate lifting attachments and locations on the shop drawings.

Precast Concrete Bent Cap Option shown on this standard may require modification for select structure types. See appropriate details elsewhere in plans for these modifications.

See Interior Bent sheet for details and notes not shown.

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



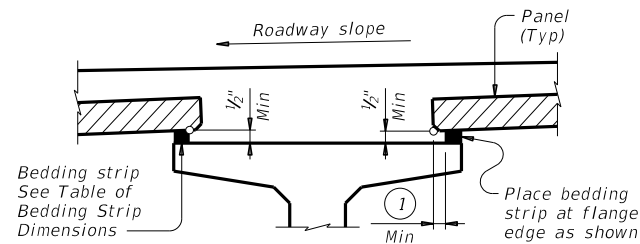
**PRECAST CONCRETE BENT CAP OPTION FOR ROUND COLUMNS**

**PBC-RC**

FILE: pbcst001-21.dgn	DN: TxDOT	CK: JMH	DW: JTR	CK: TxDOT
©TxDOT April 2019	CONTRACT	SECTION	JOB	HIGHWAY
REVISIONS	0456	02	028,ETC	FM 27
12-21: General Notes	DIST	COUNTY	SHEET NO.	
	BRY	FREESTONE	104	

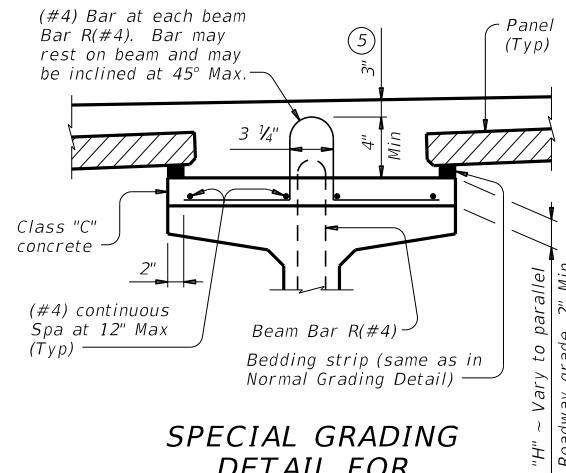
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DATE: FILE:



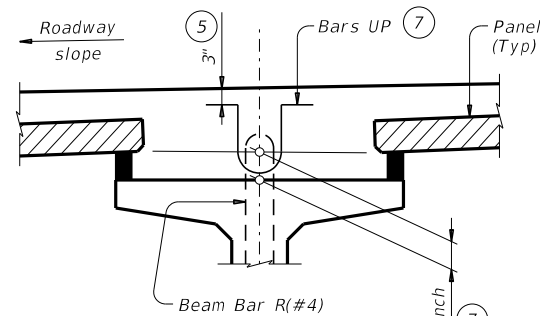
### NORMAL GRADING DETAIL ③

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



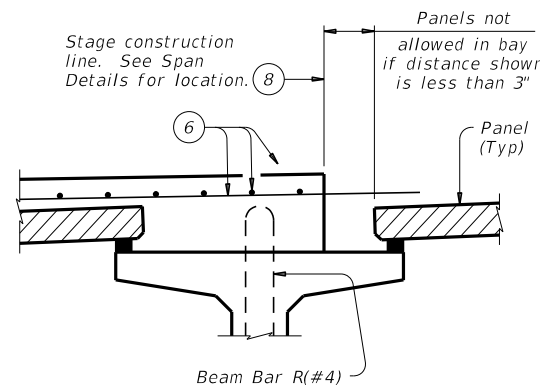
### SPECIAL GRADING DETAIL FOR CONCRETE BEAMS

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



### HAUNCH REINFORCING DETAIL

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

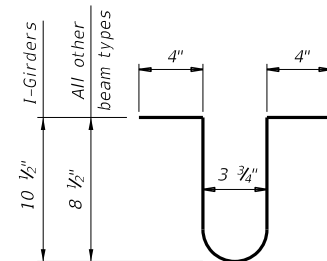


### PRESTR CONC I-GIRDERS

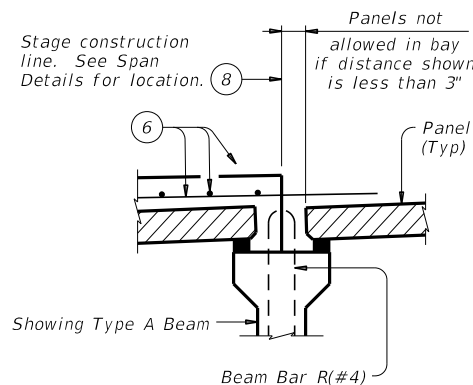
### TABLE OF BEDDING STRIP DIMENSIONS

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

### BARS UP (#4) ⑦



### PRESTR CONC I-BEAMS

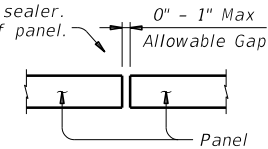


### STAGE CONSTRUCTION LIMITATIONS

(Other beam types similar)

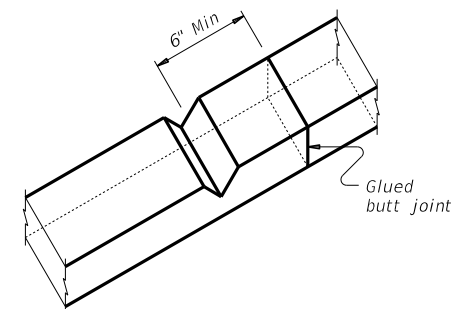
- ① 2" Min for I-girders, 1 1/2" Min for all other beam types.
- ② Allowed for I-girders, not allowed on other beam types.
- ③ To reduce the quantity of cast-in-place concrete, bedding strip thickness may be increased in 1/4" increments. Bedding strips must be comprised of one layer. Bond bedding strips to the beams with an adhesive compatible with bedding strips. Bedding strips over 2.5" high may need to be bonded to panels. The same thickness strip must be used under any one panel edge and the maximum change in thickness between adjacent panels is 1/4". Alternatively, bedding strips may be cut to grade. Panels may be supported by an alternate method, using a commercial product, if approved by the Engineer of Bridge Design, Bridge Division. If bedding strips exceed 6" high for I-Girders, 4" high for all other beam types, use Special Grading Detail for Concrete Beams or submit an alternate method to the Bridge Division for approval.
- ④ Height must not exceed twice the width.
- ⑤ Provide clear cover as indicated unless otherwise shown on Span Details.
- ⑥ See Span Details and Thickened Slab End Details for top slab reinforcement and clear cover. Transverse top slab reinforcement may rest on top of prestressed concrete panels if necessary to maintain clear cover.
- ⑦ Space Bars UP(#4) with Beam Bars R(#4) in all areas where measured haunch exceeds 3 1/2" with I-girders, and 3" for all other beam types. Epoxy coating for Bars UP is not required.
- ⑧ Do not locate construction joints on top of a panel.
- ⑨ Butt adjacent bedding strips together with adhesive. Cut v-notches, approx 1/4" deep, in the top of the bedding strips at 8' o.c..

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



### PANEL JOINTS

(Panel reinforcing not shown for clarity.  
The gap cannot be considered as a panel fabrication tolerance. Adjust panel placement to minimize joint openings.)



### BEDDING STRIP DETAIL ⑨

### CONSTRUCTION NOTES:

Erected panels must bear uniformly on bedding strips of extruded polystyrene placed along top flange edges. Placing panels to minimize joint openings is recommended. If additional blocking is needed, special grading details for supporting the panels and extra reinforcing between beam and slab will be considered subsidiary to deck construction. Bars U, shown on PCP-FAB, may be bent over or cut off if necessary. Care must be taken to ensure proper cleaning of construction debris and consolidation of concrete material under the edges of the panels. Bedding strips must be placed at beam flange edges so that adequate space is provided for the mortar to flow a minimum of 1 1/2" under the panels as the slab concrete is placed. To allow the proper amount of mortar to flow between beam and panel, the minimum vertical opening must be at least 1/2". Roadway cross-slope reduces the opening available for entry of the mortar. Bedding strips varying in thickness across the beam are therefore required. For clear span between U-beams less than or equal to 18", see Permissible Slab Forming Detail on Miscellaneous Slab Detail sheets, UBMS.

### MATERIAL NOTES:

Provide Grade 60 reinforcing steel in the cast-in-place slab. See Table of Reinforcing Steel for size and spacing of reinforcement. If the top and bottom layer of reinforcing steel is shown on the Span Details to be epoxy coated, then the D, E, P, & Z bars must be epoxy coated. Provide bar Laps, where required, as follows:  
Uncoated ~ #4 = 1'-7"  
Epoxy Coated ~ #4 = 2'-5"

### GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications. Panel placement may follow either Option 1 or Option 2 except Option 1 must be used if the skew exceeds 45 degrees. Use of Prestressed Concrete Panels is not permitted for horizontally curved steel plate or tub girders. See Span Details for other possible restrictions on their use. These details are to be used in conjunction with the Span Details, PCP-FAB and other applicable standard drawings. When panel support (bedding strips) deviates from what is shown herein, provide details signed and sealed by a professional Engineer. Any additional reinforcing or concrete required on this standard is considered subsidiary to the bid item "Reinforced Concrete Slab".

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

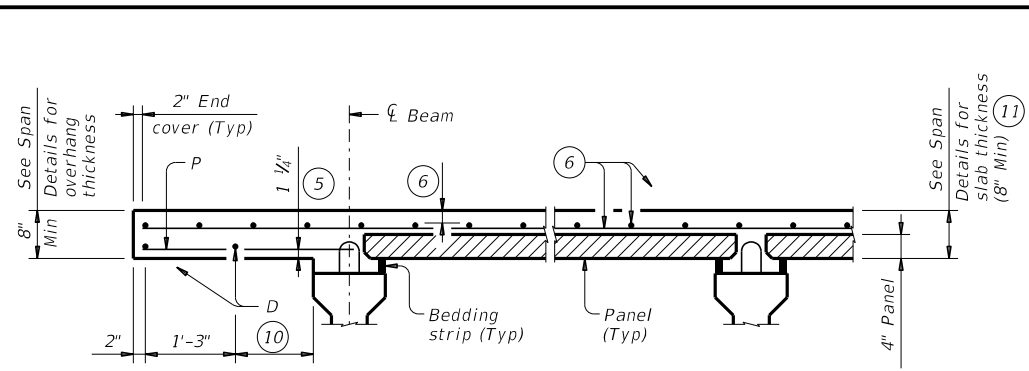
HL93 LOADING

SHEET 1 OF 4

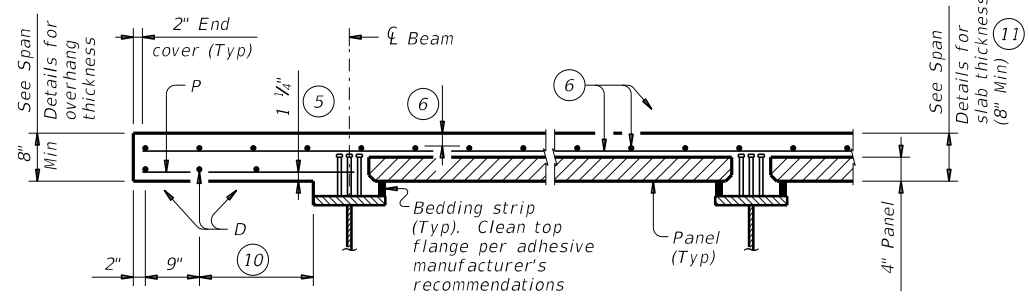
		<b>Bridge Division Standard</b>	
<h2>PRESTRESSED CONCRETE PANELS DECK DETAILS</h2>			
<h3>PCP</h3>			
FILE: pcpstd1-19.dgn	DN: TxDOT	CK: TxDOT	DW: JTR
©TxDOT April 2019	CONTRACT: 0456	SECTION: 02	JOB: 028,ETC
REVISIONS			HIGHWAY: FM 27
	DIST: BRY	COUNTY: FREESTONE	SHEET NO: 105

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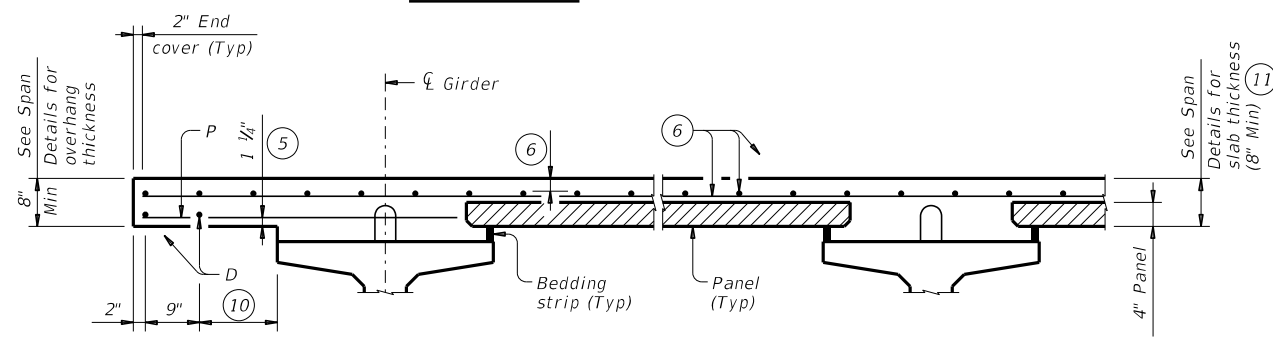
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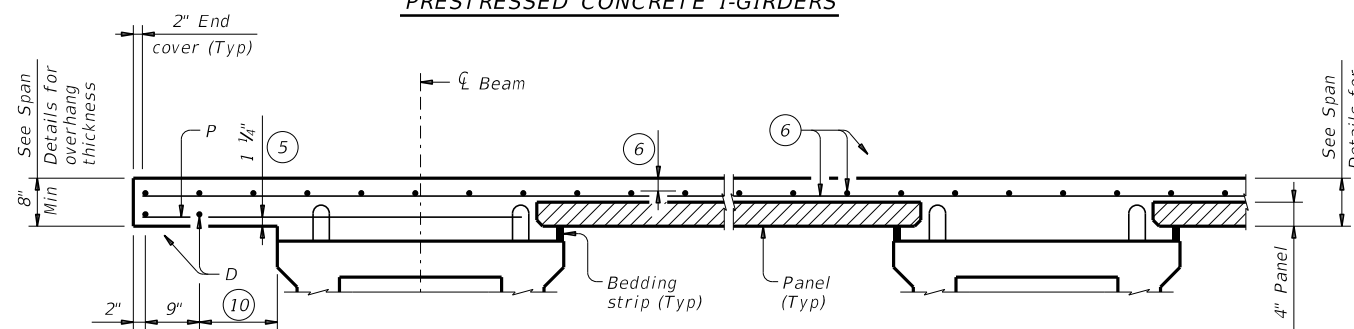
**PRESTRESSED CONCRETE I-BEAMS**



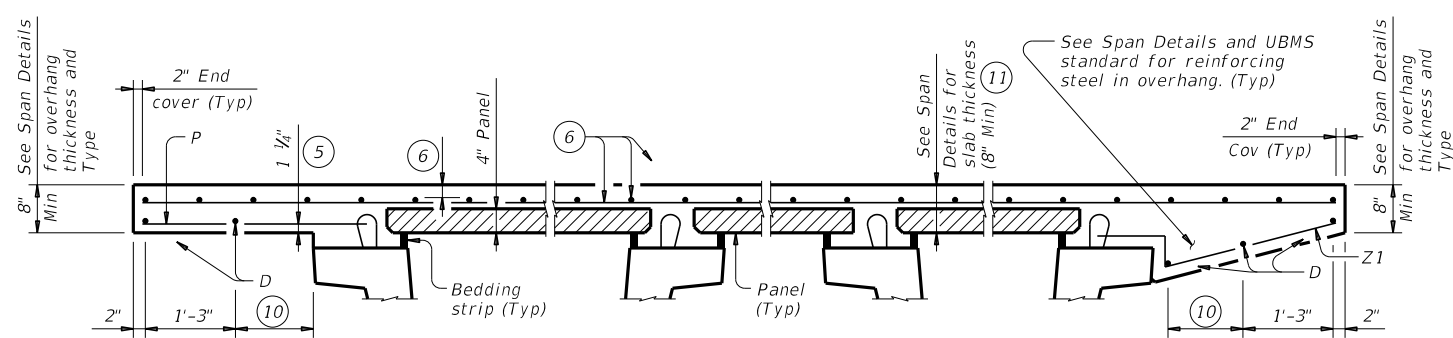
**STEEL BEAMS**



**PRESTRESSED CONCRETE I-GIRDERS**



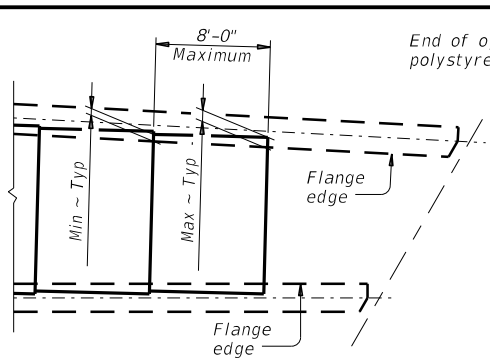
**PRESTRESSED CONCRETE X-BEAMS**



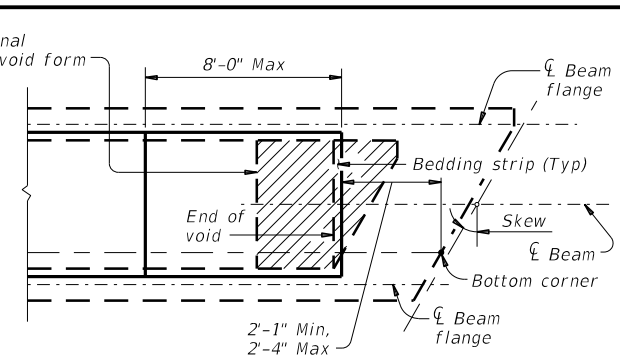
**NORMAL OVERHANG WITH PRESTR CONC U-BEAMS**

**TYPICAL PART TRANSVERSE SECTIONS**

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



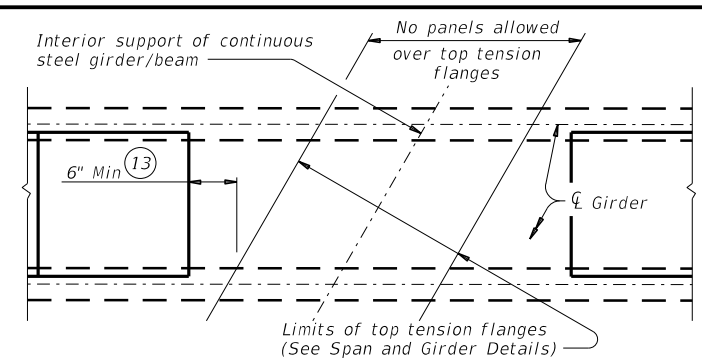
**AT FLARED BEAMS OR GIRDERS**  
See PCP-FAB standard for Min and Max dimensions based on beam/girder type.



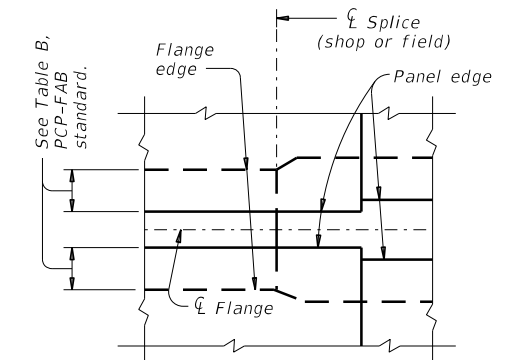
**OVER CONC U-BEAMS**

**PART PLANS OF PANEL PLACEMENT**

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



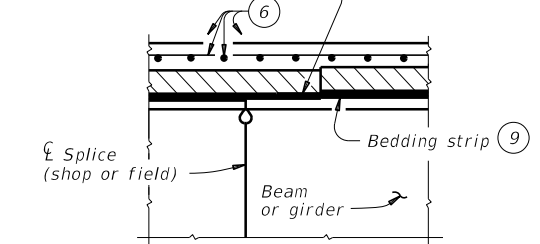
**AT INT SUPPORTS OF CONTINUOUS STEEL GIRDERS**



**PLAN AT SPLICE**

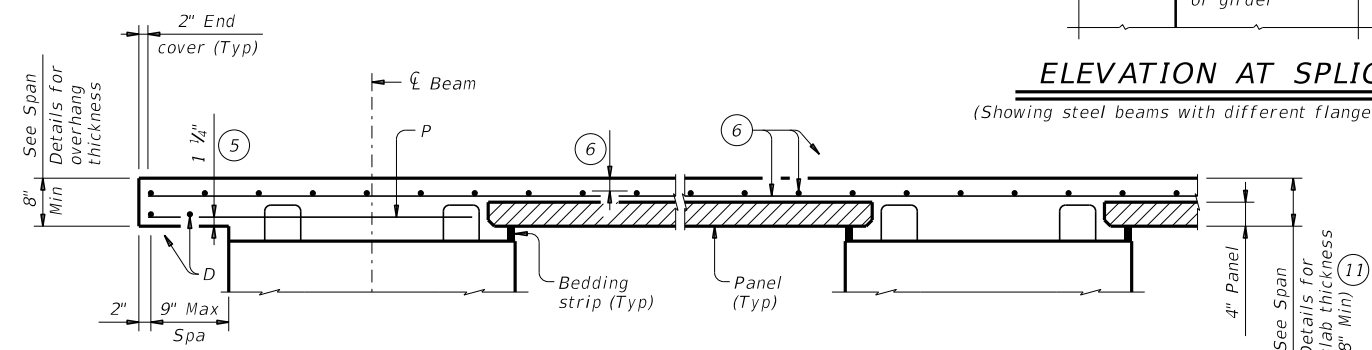
(Showing steel beams with flange width transition)

Cut bedding strip to adjust for difference in flange thickness.



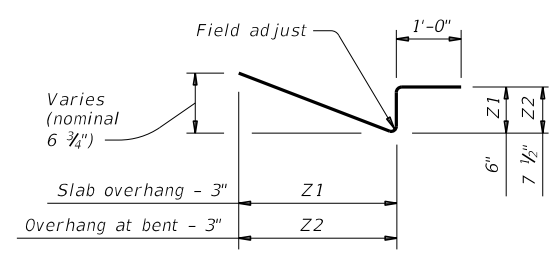
**ELEVATION AT SPLICE**

(Showing steel beams with different flange thickness)



**PRESTRESSED CONCRETE SPREAD SLAB BEAMS**

Bars P over exterior beams are still required when no overhang is used. In this case, only one Bar D, 2" from slab edge, is required.



**BARS Z (#4) (12)**

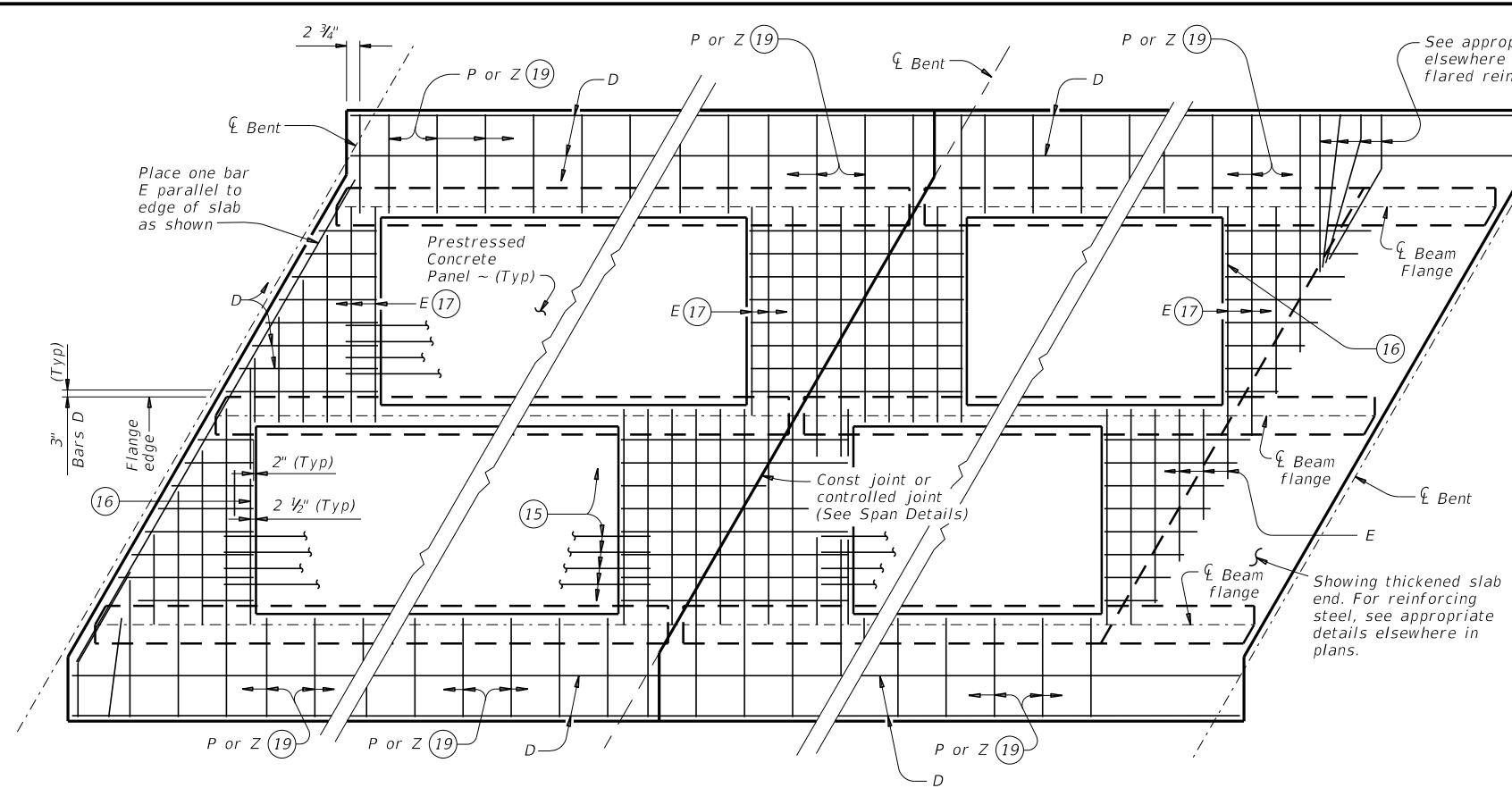
**PRESTRESSED CONCRETE PANELS DECK DETAILS**

PCP

FILE: pcpstd1-19.dgn	DN: TxDOT	CK: TxDOT	DW: JTR	CK: JMH
©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0456	02	028,ETC	FM 27
	DIST	COUNTY	SHEET NO.	
	BRY	FREESTONE	106	

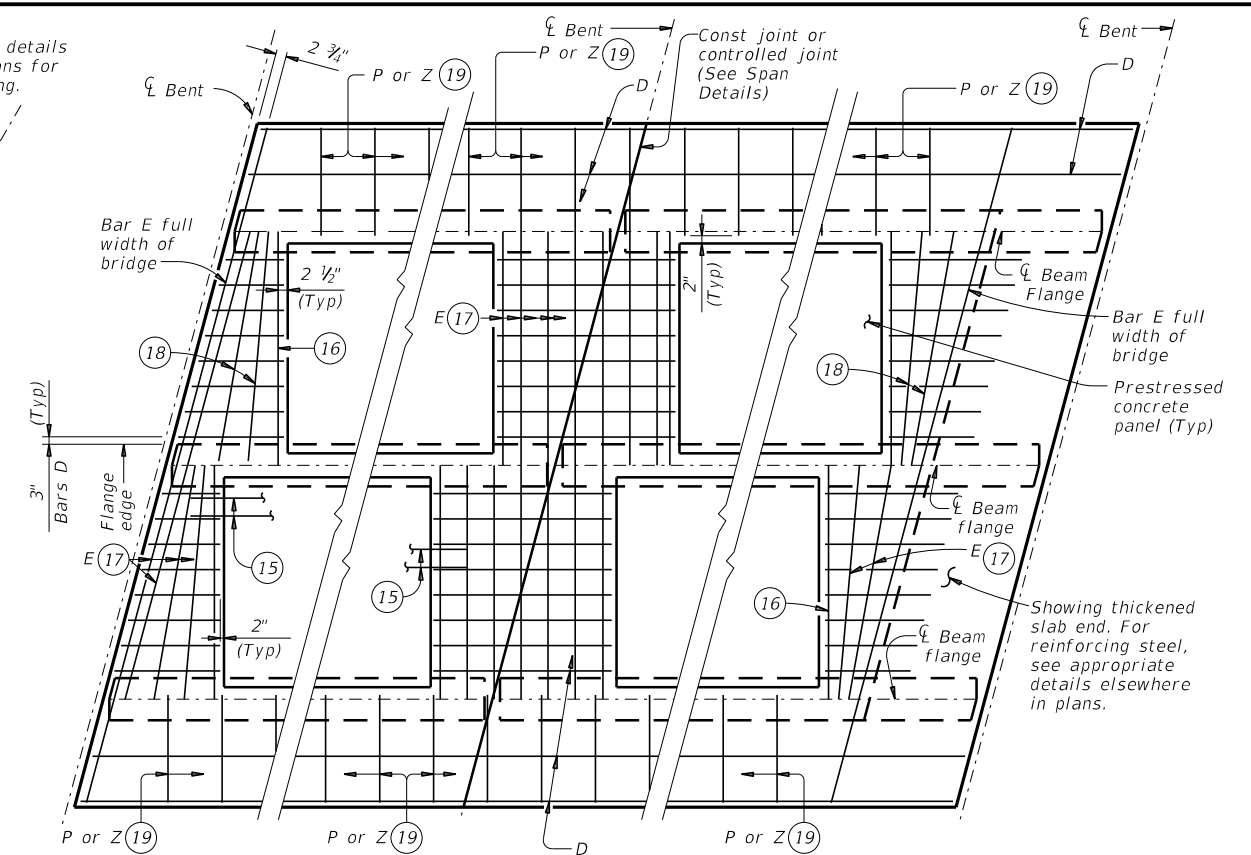


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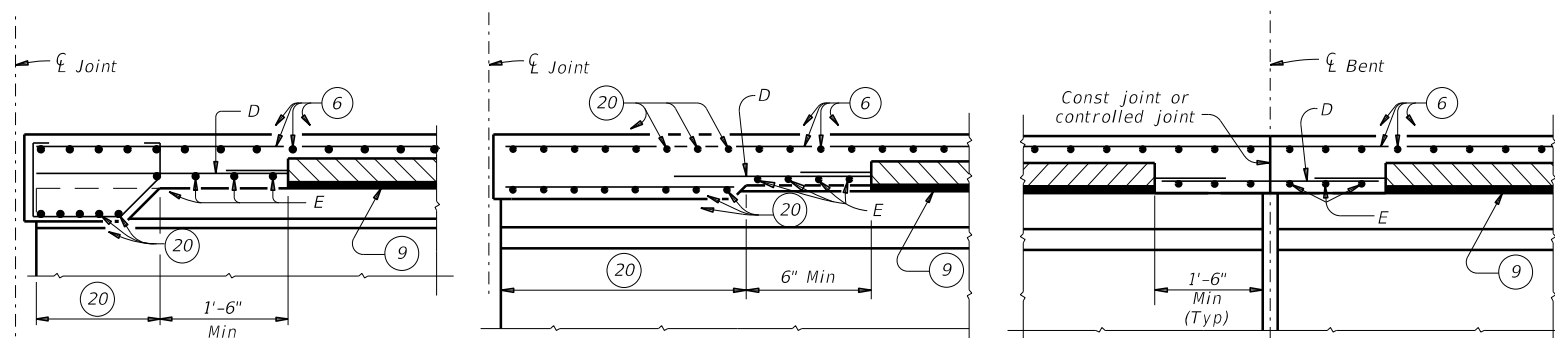
AT ALL SPAN ENDS UNLESS NOTED OTHERWISE  
 AT INTERIOR BENTS  
 AT THICKENED END SLABS

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

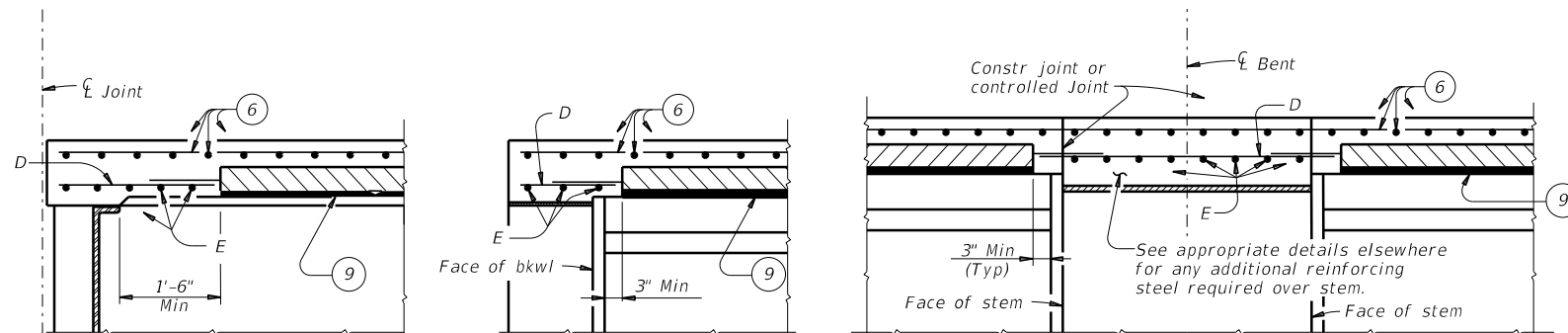


AT ALL SPAN ENDS UNLESS NOTED OTHERWISE  
 AT INTERIOR BENTS  
 AT THICKENED END SLABS

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



AT THICKENED SLAB ENDS FOR PRESTR CONC U-BMS  
 AT THICKENED SLAB ENDS FOR PRESTR CONC I-BMS AND STEEL BMS  
 AT SLAB CONTINUOUS OVER CONVENTIONAL INTERIOR BENTS FOR ALL SIMPLE SPAN BMS



AT CONVENTIONAL END DIAPHRAGMS FOR STEEL BMS  
 AT SLAB OVER ABUTMENT BACKWALL FOR ALL BMS  
 AT SLAB CONTINUOUS OVER INVERTED-T BENTS FOR ALL BMS

**OPTION 1 ~ ELEVATIONS AT BEAM ENDS**

- 6 See Span Details and Thickened Slab End Details for top slab reinforcement and clear cover. Transverse top slab reinforcement may rest on top of prestressed concrete panels if necessary to maintain clear cover.
- 9 Butt adjacent bedding strips together with adhesive. Cut v-notches, approx 1/4" deep, in the top of the bedding strips at 8" o.c.
- 14 Max Spacing as listed unless otherwise shown.
- 15 At connection with cast-in-place slab, extend longitudinal panel reinforcement. See PCP-FAB for details.
- 16 Maintain one Bar E(#4) parallel to panel ends (Typ).
- 17 Bars E(#4) not continuous over beam flanges must overlap beam flange 6" Min.
- 18 Add flared Bars E(#4) (Min Spa = 6", Max Spa = 12") as required at panel ends.
- 19 Where possible, Bars E(#4) may be extended into overhangs to replace Bars P(#4). Bars Z(#4) are required for sloped overhangs with U-Beams.
- 20 See appropriate thickened slab end details for reinforcing and limits of thickened slab end.

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



**PRESTRESSED CONCRETE PANELS DECK DETAILS**

**PCP**

FILE: pcpstd1-19.dgn	DN: TxDOT	CK: TxDOT	DW: JTR	CK: JMH
©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0456	02	028.ETC	FM 27
DIST	COUNTY		SHEET NO.	
BRY	FREESTONE		107	

DATE: FILE:

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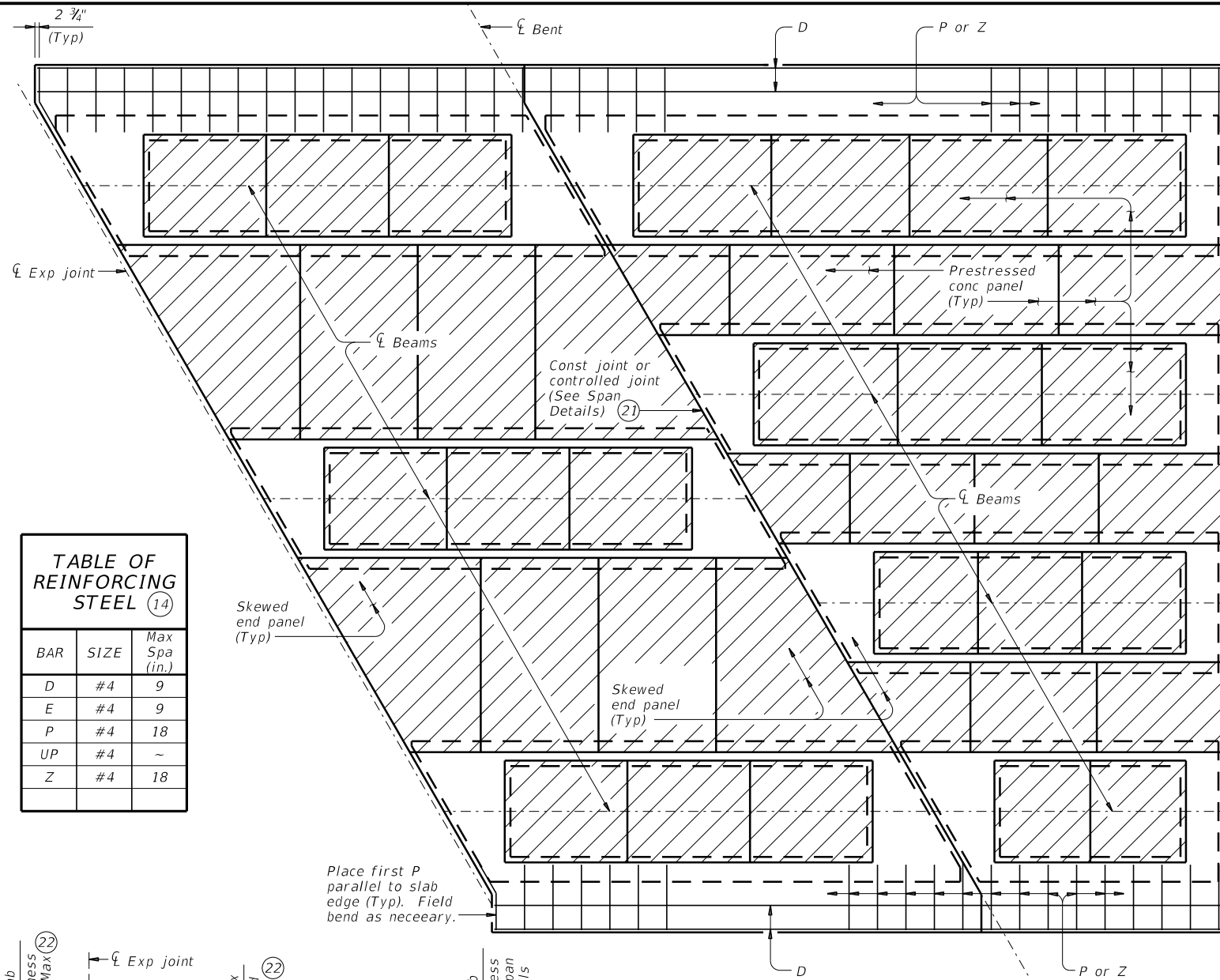
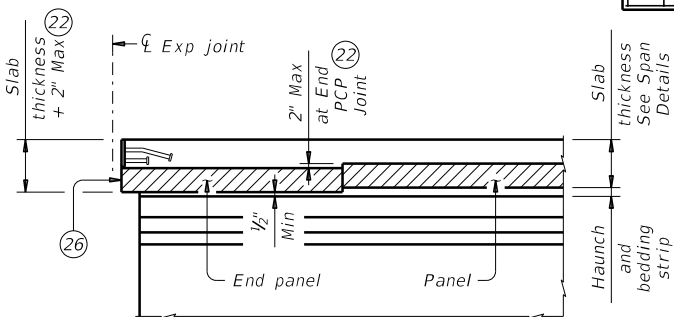
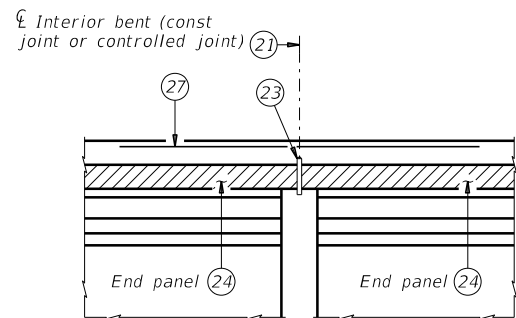


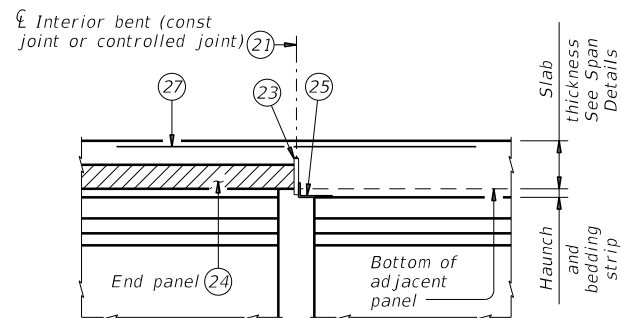
TABLE OF REINFORCING STEEL (14)		
BAR	SIZE	Max Spa (in.)
D	#4	9
E	#4	9
P	#4	18
UP	#4	~
Z	#4	18



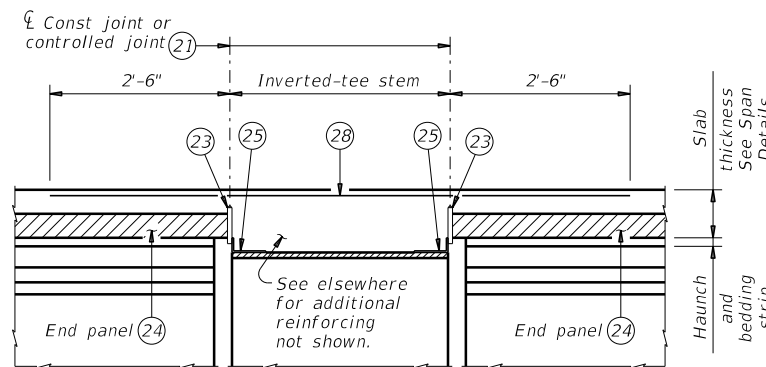
**JOINTS (BETWEEN BEAMS/GIRDERS OR AT INV-T STEM)**  
For SEJ-B, SEJ-M, SEJ-S(0), AJ, and Type A expansion joints only.



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



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



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

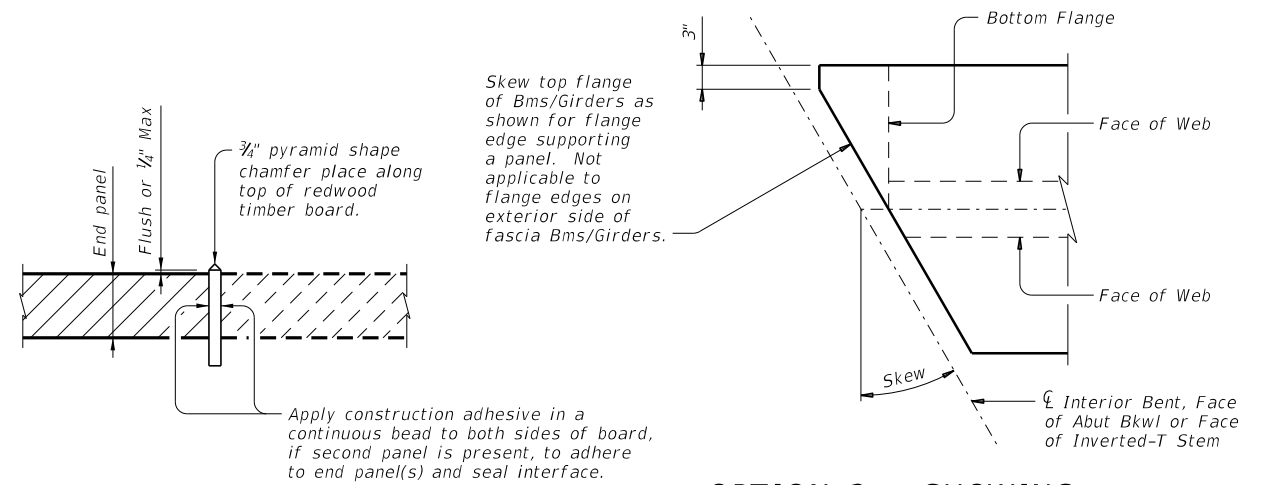
**OPTION 2 ~ ELEVATIONS AT BEAM ENDS (6)**

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

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

See "Option 2 ~ Elevation At Beam Ends".

- (6) See Span Details and Thickened Slab End Details for top slab reinforcement and clear cover. Transverse top slab reinforcement may rest on top of prestressed concrete panels if necessary to maintain clear cover.
- (14) Max Spacing as listed unless otherwise shown.
- (21) 1 1/2" Vinyl or plastic joint former at controlled joints (Stress Cap, Zip Strip, Stress Lock, or equal as approved by the Engineer.)
- (22) End panel may be set up to 2" lower to accommodate expansion joint hardware, provided bedding strip is not less than 1/2" thick.
- (23) 3/4" thick redwood timber board, leave in place. Redwood timber board placed flush with top of panel or within 1/4" Max above panel. Place 3/4" pyramid shape chamfer along top of timber board. See "Elevation Example of End Panel and Timber Board". Place straight, within 1/4" of centerline of bent or face of inverted-tee, across bridge width and end board at exterior flange edge of fascia beams/girders. Do not extend into overhang.
- (24) Place panel within 1/2" of 3/4" thick board.
- (25) Permanent galvanized steel sheet form. Removable formwork is acceptable.
- (26) Place end panel within 1/2" of expansion joint opening. End panel cannot encroach on required expansion joint opening.
- (27) Place additional (#4) bar 5'-0" in length between every slab bars T. Center (#4) bar on Joint.
- (28) Place additional (#4) bar continuous 2'-6" beyond each side of Inverted-T Stem between every slab bars T.



**OPTION 2 ~ SHOWING MODIFICATION TO BEAM/GIRDER TOP FLANGE FOR SKEWS OVER 5°**

Showing I-Bm/I-Girder, U-Bms and Steel Bms similar.

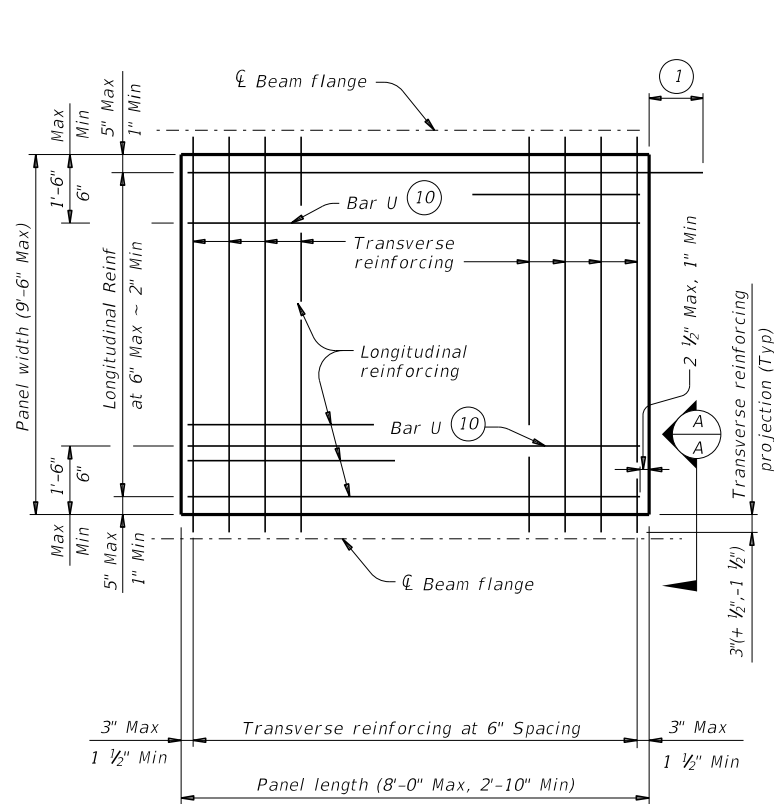
**SPECIAL OPTION 2 CONSTRUCTION NOTES:**

- When Option 2 is chosen bottom mat of thickened end slab reinforcing is not required. Use the same top mat as shown on the Thickened Slab End Details sheet.
- Placing panels adjacent to expansion joints and bent centerlines prior to completing interior panel placement is recommended. Saw cutting panels to fit is acceptable when approved by the Engineer. Minimum distance from a saw cut edge to a panel strand is 1 1/2".
- Do not extend the longitudinal panel reinforcement into the cast-in-place slab.
- Top flanges of beams and girders on skewed bridges must be modified as shown on this drawing. The Contractor is responsible for coordinating this modification with the beam fabricator prior to submitting shop drawings for approval.
- Fabricator may optionally skew the whole end. When electing to skew whole end, girder end details and bearing type at conventional interior bent must be changed to use condition at abutment. Fabricator must coordinate change in bearing type, bearing centerline location, and dowel location with Engineer and Contractor. Show appropriate changes on girder and bearing shop drawings.
- Bending of anchor studs of expansion joints shown on standards AJ, SEJ-B, SEJ-M, and SEJ-S(0) is permissible if necessary to clear top of end panels. The Contractor is responsible for coordinating modifications with the joint fabricator. Submit shop drawings for approval when modifications to expansion joint hardware are made.
- Bedding strips under skewed end panels must conform to the requirements of Item 422 except their minimum compressive strength must be 60 psi.
- Provide Bars AA, G, K and OA from standard IGTS in the slab.

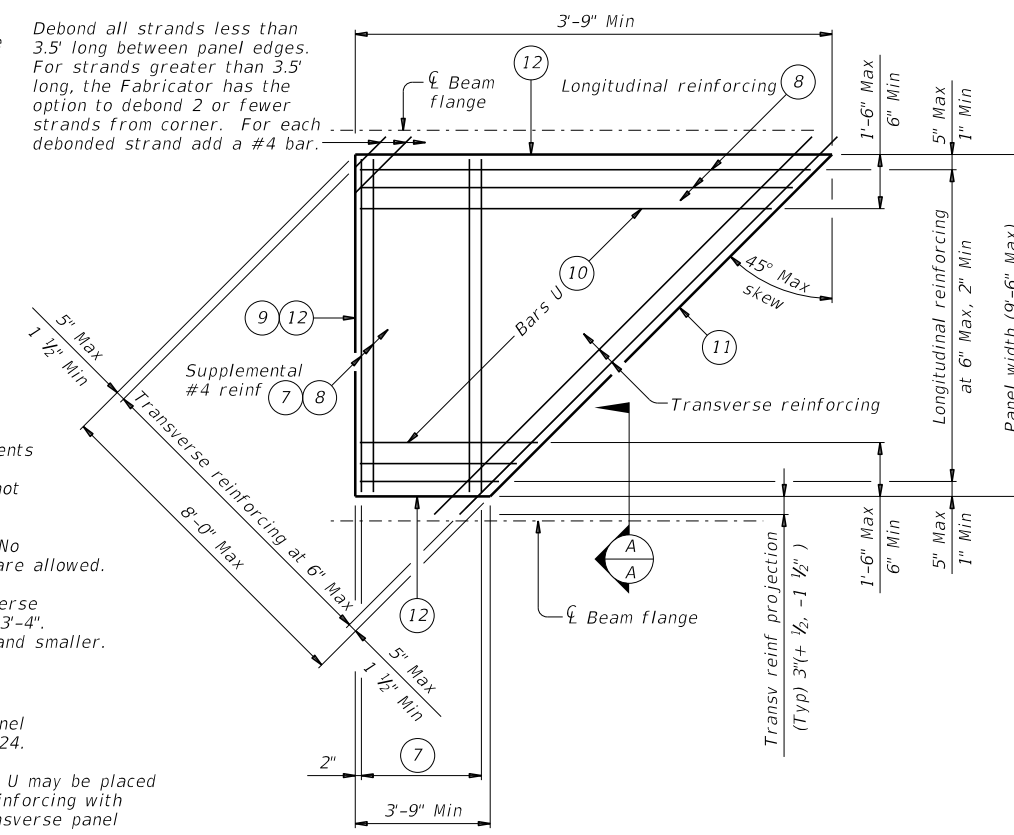
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<b>PRESTRESSED CONCRETE PANELS DECK DETAILS</b>			
<b>PCP</b>			
FILE: pcpstd1-19.dgn	DN: TxDOT	CK: TxDOT	DW: JTR
©TxDOT April 2019	CONTRACT: 0456	SECTION: 02	JOB: 028,ETC
REVISIONS			HIGHWAY: FM 27
	DIST: BRY	COUNTY: FREESTONE	SHEET NO: 108

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**TYPICAL NON-SKEWED PANEL PLAN**



**TYPICAL SKEWED END PANEL PLAN**

(Only to be used with details shown elsewhere in the plans.)

- 1 At connection with cast-in-place slab, extend longitudinal panel reinforcement 1'-0" (+2", -0") past panel end. Alternatively, provide (#3) x 2'-0" dowels at 6" Max Spacing and extend dowels 1'-0" past panel end.
- 2 Four loops required per panel.
- 3 Four loops required per panel. 3/8" or 1/2" strands may be used.
- 4 Normal dimensions must be used on spans with parallel beams. Maximum and Minimum dimensions apply only to spans with flared beams.
- 5 See Normal Grading Detail on PCP standard for lap requirements and bedding strip dimensions. Some laps shown in tables cannot utilize all bedding strip widths.
- 6 One Splice allowed per panel. No more than two sheets of WWR are allowed.
- 7 Provide (#4) bars under transverse reinforcing, 10 Spaces at 4" = 3'-4". Omit for 5 degree (1:12) skew and smaller.
- 8 End Cover 2 1/2" Max, 1" Min.
- 9 Recess strands on indicated panel edge in accordance with Item 424.
- 10 At the fabricator's option, Bars U may be placed parallel to transverse panel reinforcing with horizontal legs in plane of transverse panel reinforcing.
- 11 Use length of indicated panel edge as panel width for purpose of determining type of transverse reinforcing.
- 12 Timber form work permissible this edge.

TABLE A (4) (5)				TABLE B (4) (5)			
Beam Type	Normal (In.)	Min (In.)	Max (In.)	Top Flange Width	Normal (In.)	Min (In.)	Max (In.)
A	3	2 1/2	3 1/2	11" to 12"	2 3/4	2 1/2	2 3/4
B	3	2 1/2	3 1/2	Over 12" to 15"	3 1/4	3	3 1/4
C	4	3	4 1/2	Over 15" to 18"	4	3	4 3/4
IV	6	4	7 1/2	Over 18"	5	3 1/2	6 1/4
VI	6 1/2	4 1/2	8 1/2				
U40 - 54	5 1/2	5 1/2	7				
Tx28-70	6	5	7 1/2				
XB20 - 40	4	3	4 1/2				
XSB12 - 15	4	3	4 1/2				

**GENERAL NOTES:**

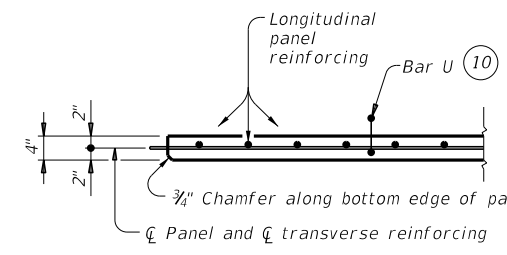
Provide Class H concrete for panels. Release strength  $f'_{ci}=3,500$  psi. Minimum 28 day strength  $f'_c=5,000$  psi.  
 Provide 3/4" chamfer along bottom edge of panel on beam side. Do not use epoxy-coated reinforcing steel bar or strand in panels. Remove laitance from top panel surface. Finish top of panel to a roughness between a No. 6 and No. 9 concrete surface profile, inclusive, as specified by the International Concrete Repair Institute (ICRI).  
 Shop drawings for the fabrication of panels will not require the Engineer's approval if fabrication is in accordance with the details shown on this standard.  
 A panel layout which identifies location of each panel must be developed by the Fabricator. Permanently mark each panel in accordance with the panel layout. A copy of the layout is to be provided to the Engineer.

**TRANSVERSE PANEL REINFORCEMENT:**

For panel widths over 5', use 3/8" or 1/2" Dia (270k) prestressing strands with a tension of 14.4 kips per strand.  
 For panel widths over 3'-6" up to and including 5', use 3/8" or 1/2" Dia (270k) prestressing strands with a tension of 14.4 kip per strand. Optionally, (#4) Grade 60 reinforcing bars may be used in lieu of prestressed strands.  
 For panel widths up to 3'-6", use (#4) Grade 60 reinforcing bars (prestressed strands alone are not allowed).  
 Place transverse panel reinforcement at panel centroid and space at 6" Max.

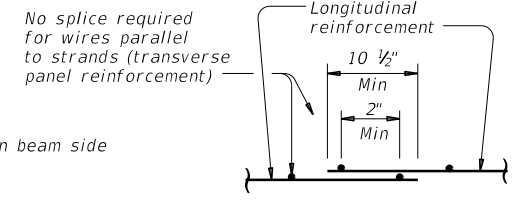
**LONGITUDINAL PANEL REINFORCEMENT:**

Any of the following options may be used for longitudinal panel reinforcement:  
 1. (#3) Grade 60 reinforcing steel at 6" Max Spacing. No splices allowed.  
 2. 3/8" Dia prestressing strands at 4 1/2" Max Spacing (unstressed). No splices allowed.  
 3. 1/2" Dia prestressing strands at 6" Max Spacing (unstressed). No splices allowed.  
 4. Deformed Welded Wire Reinforcement (WWR) (ASTM A1064) providing 0.22 sq in per foot of panel width. Wires larger than D11 not permitted. Provide transverse wires to ensure proper handling of reinforcing. One splice per panel is allowed. See WWR Splice Detail.  
 No combination of longitudinal reinforcement options in a panel is allowed. Place longitudinal panel reinforcement above or below transverse panel reinforcement. Must be placed above transverse panel reinforcement for skewed end panels with supplemental (#4) reinforcement.

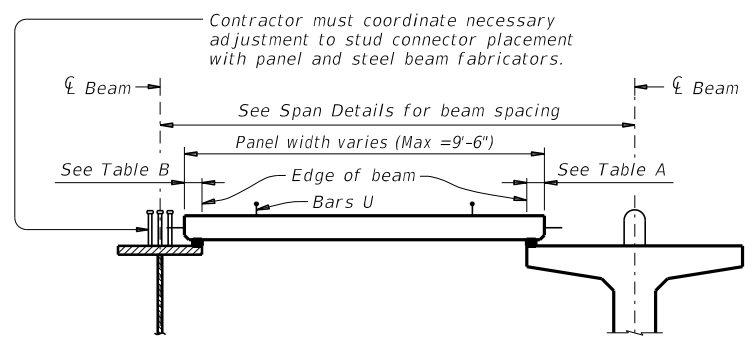


**SECTION A-A**

(Not showing supplemental #4 bars for skewed end panels.)

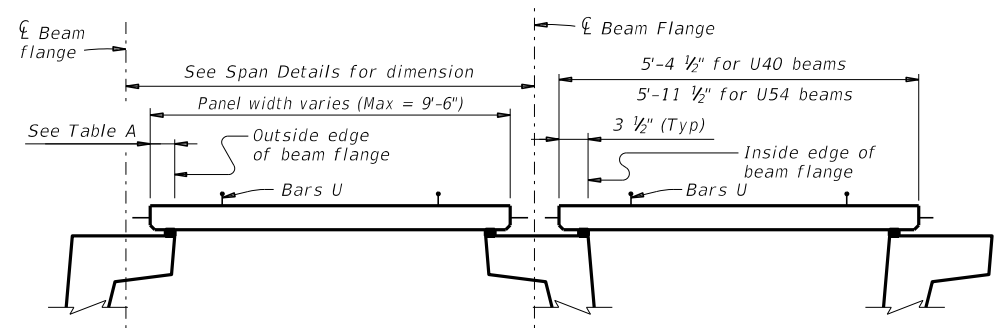


**WELDED WIRE REINFORCEMENT (WWR) SPLICE DETAIL**



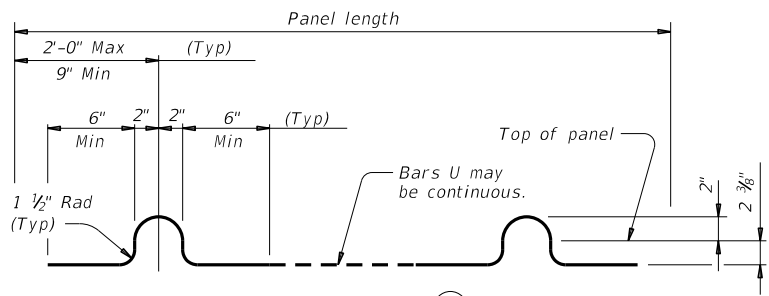
**STEEL BEAMS**

**PRESTRESSED CONCRETE BEAMS OR GIRDERS**

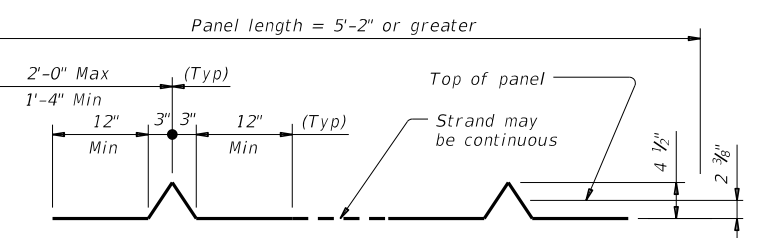


**PRESTRESSED CONCRETE U-BEAMS**

**TYPICAL SECTIONS FOR DETERMINING PANEL WIDTH**



**BARS U (#3)**



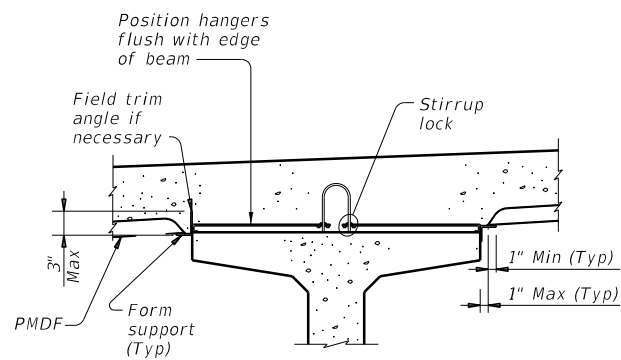
**OPTIONAL STRAND FOR BARS U**

HL93 LOADING

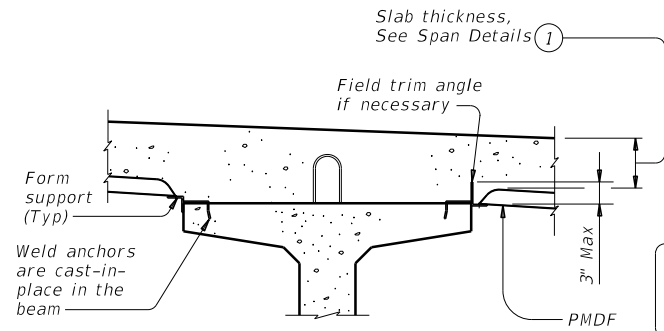
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<b>PCP-FAB</b>			
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REVISIONS	0456	02	028.ETC
	DIST	COUNTY	SHEET NO.
	BRY	FREESTONE	109

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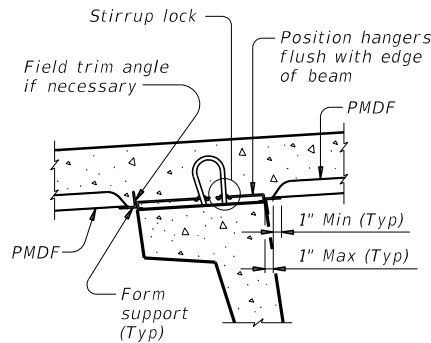
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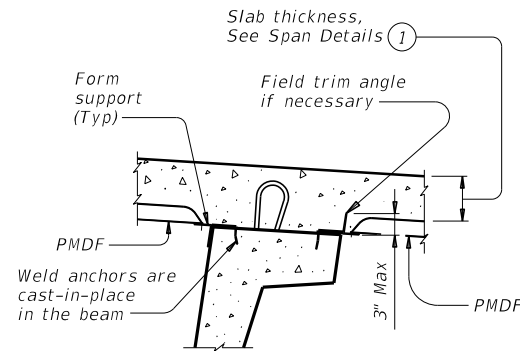
**PRESTR CONC I-BEAMS AND I-GIRDERS WITH STIRRUP LOCKS**



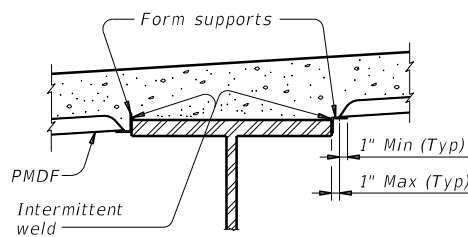
**PRESTR CONC I-BEAMS AND I-GIRDERS WITH WELD ANCHORS**



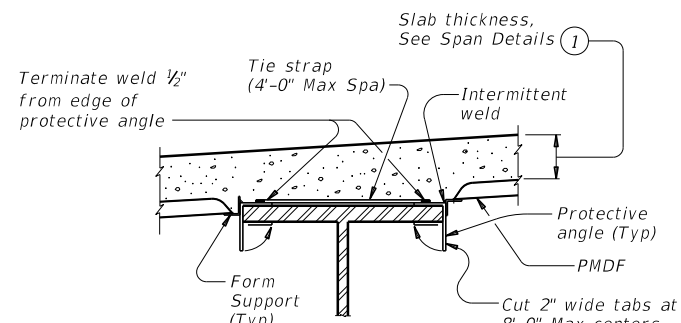
**U-BEAMS WITH STIRRUP LOCKS**



**U-BEAMS WITH WELD ANCHORS**

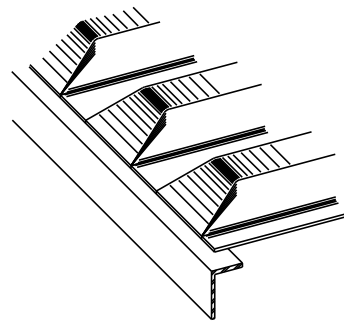


**STEEL BEAMS AT COMPRESSION FLANGES**

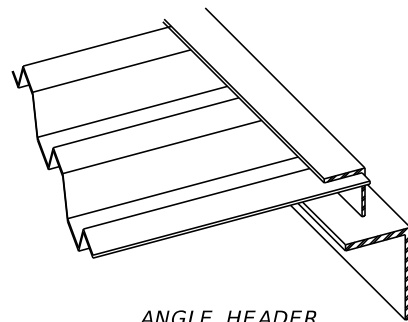


**STEEL BEAMS AT TENSION FLANGES**

**TYPICAL TRANSVERSE SECTIONS**



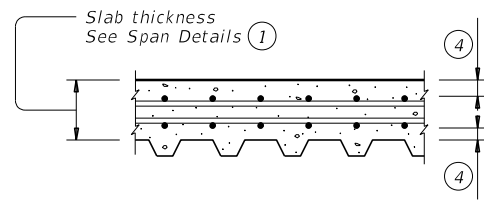
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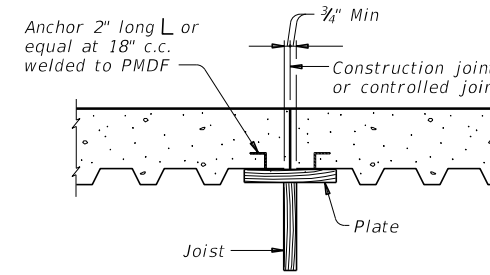
**ANGLE HEADER**

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

**TYPES OF END CLOSURES**



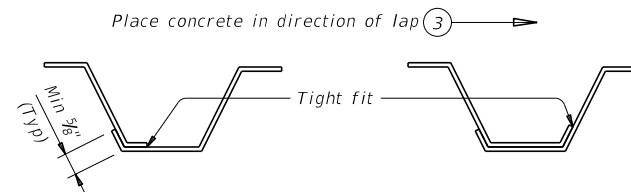
**TYP LONGITUDINAL SLAB SECTION**



Note: In spans where PMD forms are used, timber forms must be used at construction joints. Adequate provision must be made to support edge of metal form and to provide anchorage of metal form to slab concrete where joined to wood forms.

**SECTION THRU CONSTRUCTION JOINT**

**FOR PRESTR CONC U-BEAM AND STEEL GIRDER BRIDGES:**  
Unless shown elsewhere in the plans, size, spacing, and orientation of bottom mat of slab reinforcement must match the top mat of reinforcing shown on the span details except all bottom mat bars are to be #5. Bottom mat reinforcement and additional concrete is subsidiary to Item 422 "Concrete Superstructures."  
**FOR PRESTR CONC TX-GIRDER BRIDGES:**  
See Miscellaneous Slab Details, Prestr Concrete I-Girders (IGMS) standard sheet for bottom mat reinforcing.



**SIDE LAP DETAILS**

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

**GENERAL NOTES:**

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

**DESIGN NOTES:**  
As a minimum, PMDF and support angles must be designed for the dead load of the form, reinforcement and concrete plus 50 psf for construction loads. Flexural stresses due to these design loads must not exceed 75 percent of the yield strength of the steel. Allowable stress for weld metal must be 12,400 psi. Maximum deflection under the weight of forms, reinforcement and concrete or 120 psf, whichever is greater, shall not exceed the following:

1/180 of the form design span, but not more than 0.50", for design spans of 10' or less.

1/240 of the form design span, but not more than 0.75", for design spans greater than 10'.

1/240 of the form design span, but not more than 0.75", for all design spans of railroad overpass bridge spans fully or partially over railroad right-of-way, and for all bridge spans of railroad underpass structures.

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

**CONSTRUCTION NOTES:**

Form sheets must not be permitted to rest directly on the top of beam flanges. Form sheets must be securely fastened to form supports and must have a minimum bearing length of one inch at each end. Form supports must be placed in direct contact with beam flanges.

All attachments must be made by permissible welds, screws, bolts, clips or other means shown on the the forming plans. All sheet metal assembly screws must be installed with torque-limiting devices to prevent stripping. Only welds or bolts must be used to support vertical loads.

Welding and welds must be in accordance with the provisions of Item 448, "Structural Field Welding", pertaining to fillet welds. All welds must be made by a qualified welder in accordance with Item 448.

All permanently exposed form metal, where the galvanized coating has been damaged, must be thoroughly cleaned and repaired in accordance with Item 445, "Galvanizing". Minor heat discoloration in areas of welds need not be touched up.

Flutes must line up uniformly across the entire width of the structure where main reinforcing steel is located in the flute.

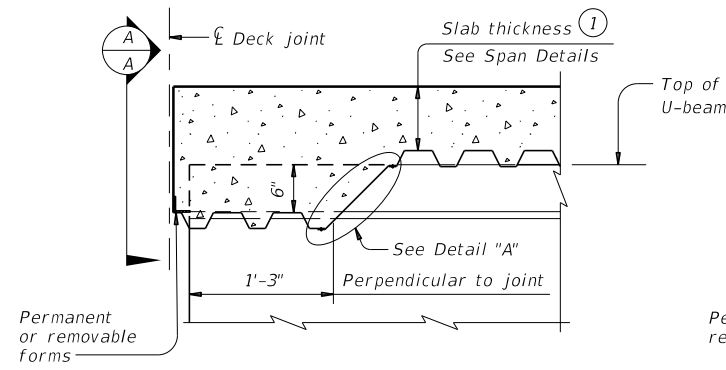
Construction joints will not be permitted unless shown on the plans. The location of and forming details for any construction joint used must be shown on the forming plans. Forms below a construction joint must be removed after curing of the slab.

A sequence for uniform vibration of concrete must be approved by the Engineer prior to concrete placement. Attention must be given to prevent damage to the forms, yet provide proper vibration to prevent voids or honeycomb in the flutes and at headers and/or construction joints.

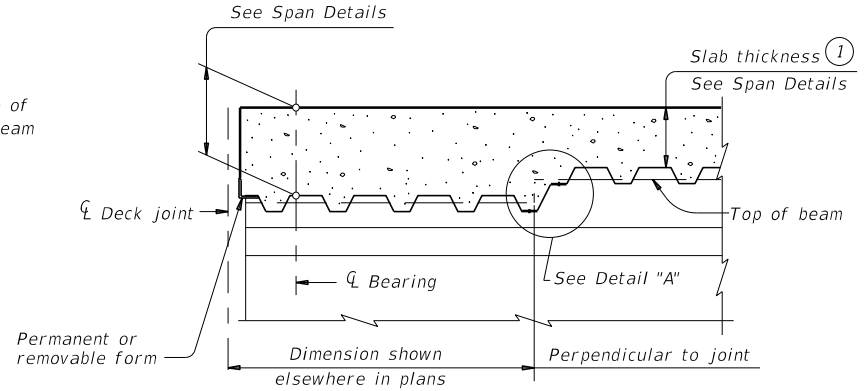
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©TxDOT April 2019	CONTRACT	SECTION	JOB	HIGHWAY	
REVISIONS	0456	02	028,ETC	FM 27	
02-20: Modified box note by adding steel beams/girders and subsidiary	DIST	COUNTY		SHEET NO.	
12-21: Updated max deflection for RR.	BRY	FREESTONE		110	

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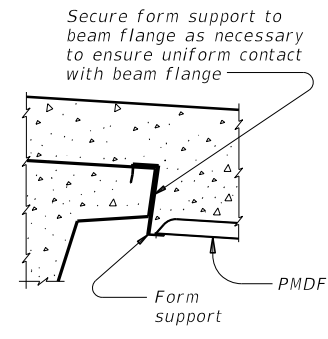
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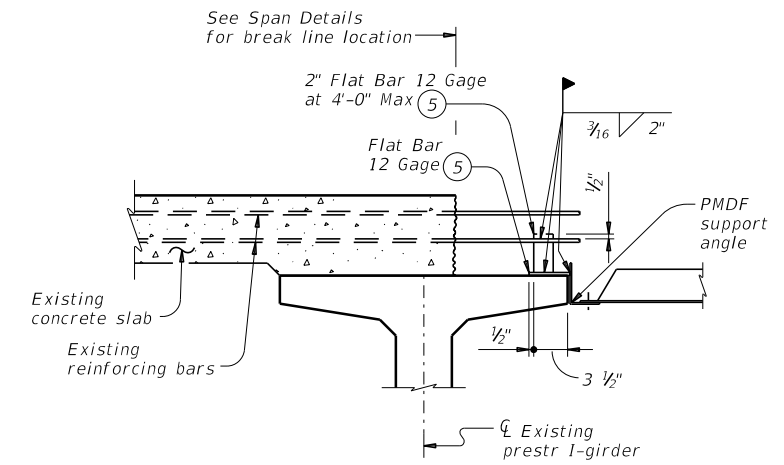
**AT THICKENED SLAB END FOR U-BEAMS**



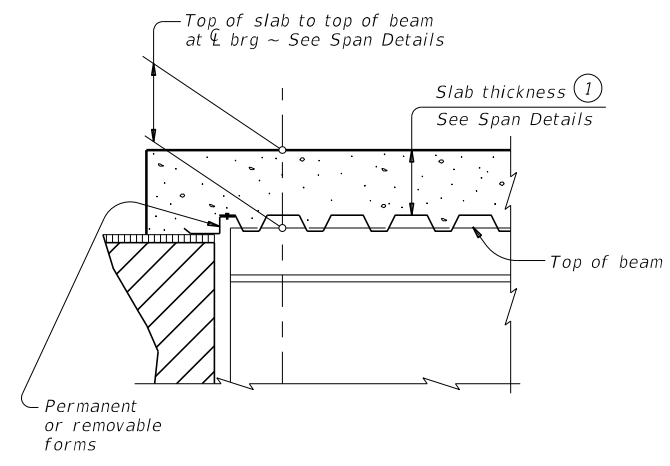
**AT THICKENED SLAB END FOR PRESTRESSED I-BEAMS, I-GIRDERS AND STEEL BEAMS**  
Showing I-beam block-out. No block-out for I-girders or steel beams.



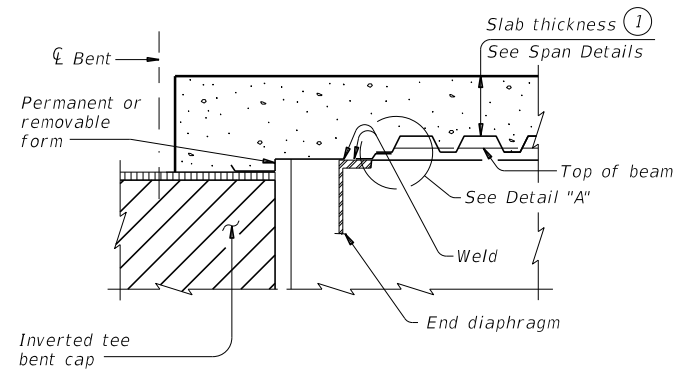
**SECTION A-A**



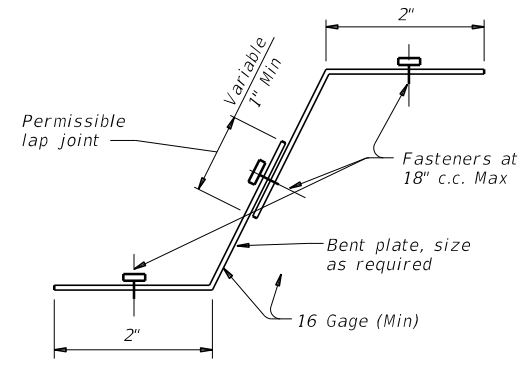
**SHOWING PRESTRESSED CONCRETE I-BEAMS, I-GIRDERS AND U-BEAMS**



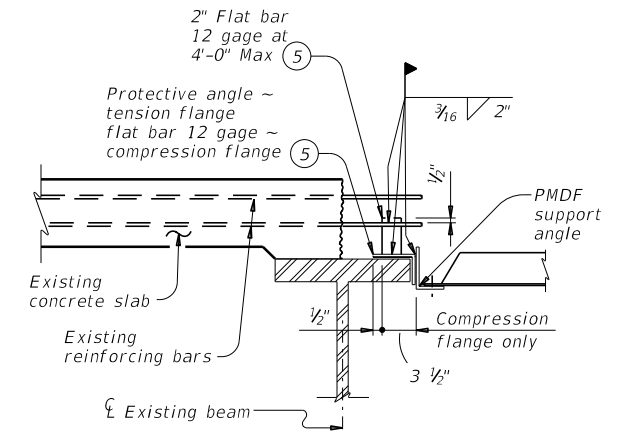
**AT SLAB OVER ABUT BKWL OR INV TEE STEM FOR CONC BEAMS WITHOUT THICKENED SLAB END**



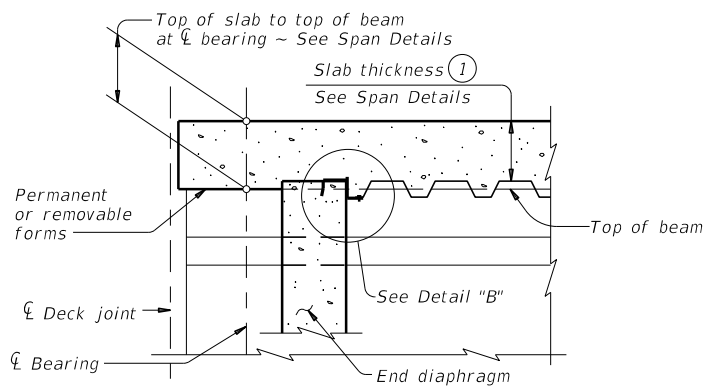
**AT SLAB OVER INV TEE STEM FOR STEEL BEAMS WITHOUT THICKENED SLAB END**



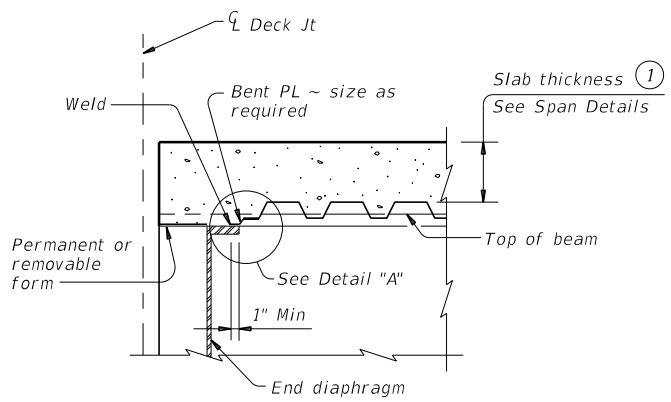
**DETAIL "A"**



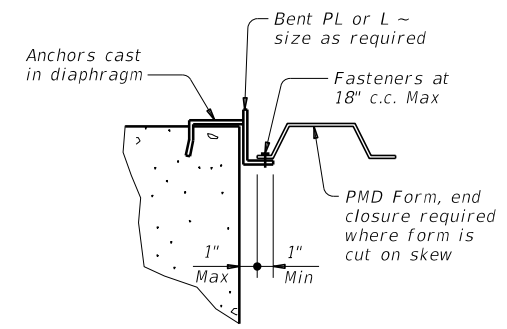
**SHOWING STEEL BEAMS**



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



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



**DETAIL "B"**

**WIDENING DETAILS**

**DETAILS AT ENDS OF BEAMS**

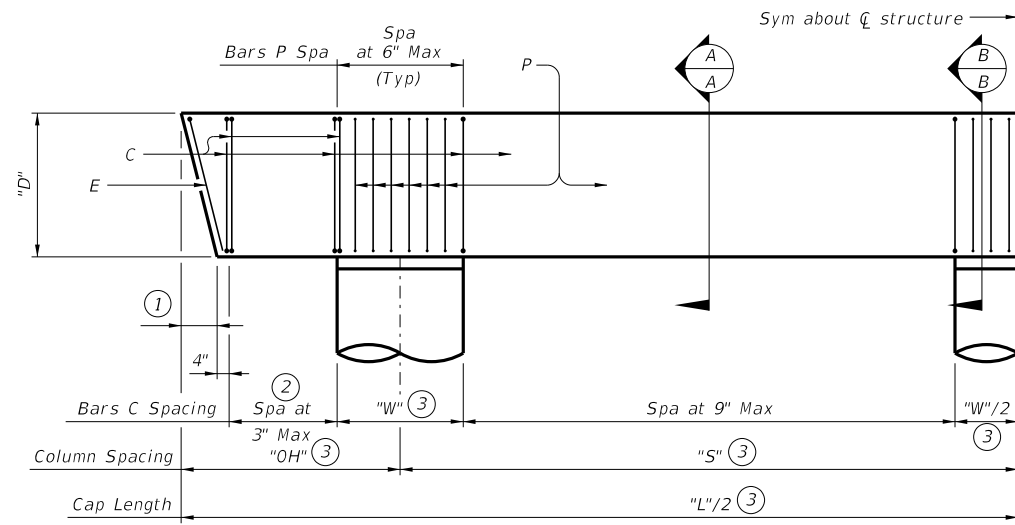
- (1) Slab thickness minus 3/8" if corrugations match reinforcing bars
- (5) Minimum yield stress of 12 gage bars shall be 40 ksi

SHEET 2 OF 2

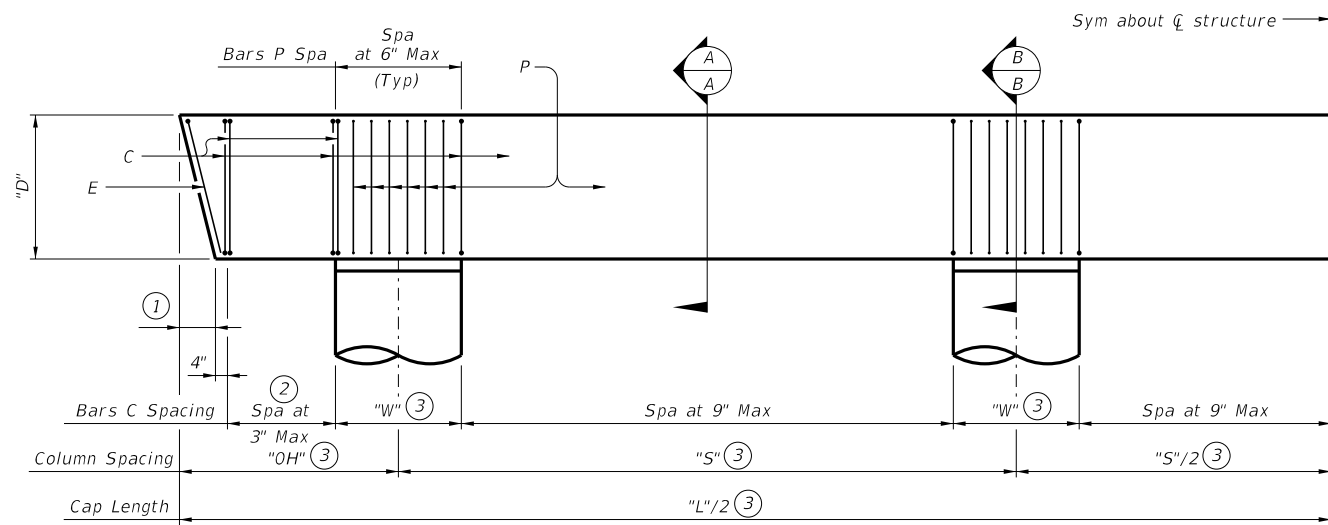
		<b>Bridge Division Standard</b>	
<b>PERMANENT METAL DECK FORMS</b>			
<b>PMDF</b>			
FILE: pmfste1-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT
©TxDOT April 2019	CONTRACT	SECTION	HIGHWAY
0456	02	028,ETC	FM 27
REVISIONS	DIST	COUNTY	SHEET NO.
02-20: Modified box note by adding steel beams/girders and Subsidiary	BRY	FREESTONE	111
12-21: Updated max deflection for RR.			

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DATE: FILE:



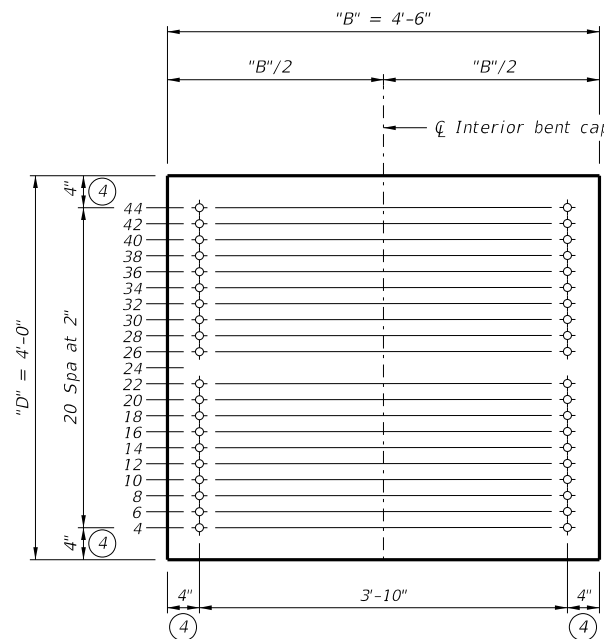
SHOWING 3 COLUMN BENT



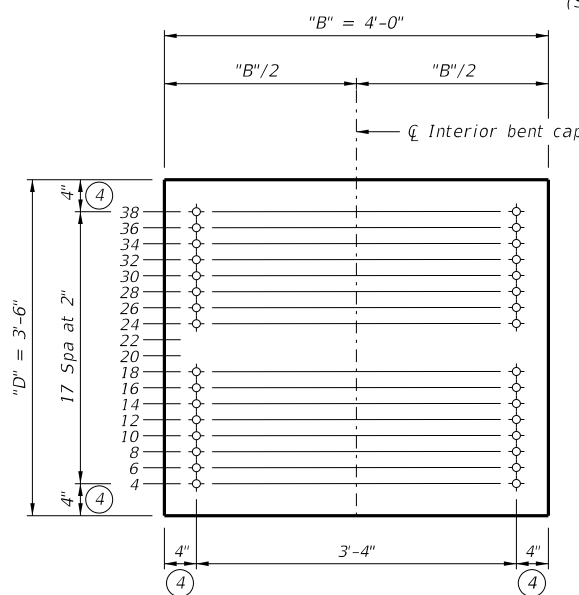
SHOWING 4 COLUMN BENT

**INTERIOR BENT HALF ELEVATION**

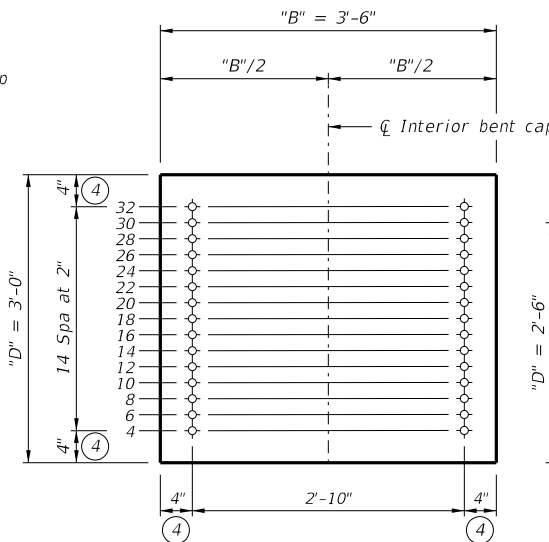
(Strands not shown for clarity.)



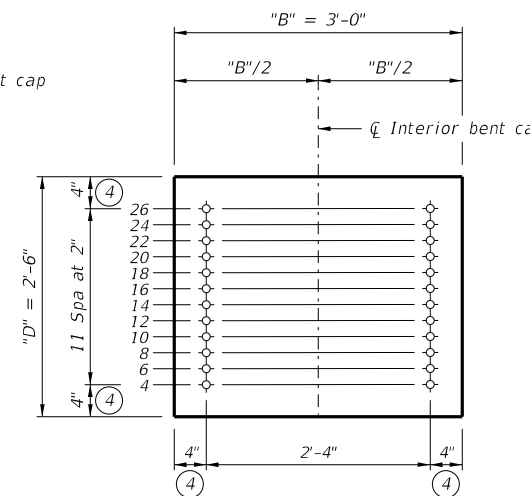
**4'-6" x 4'-0" CAP**  
Used with I-girders (Tx62)



**4'-0" x 3'-6" CAP**  
Used with I-girders (Tx28-Tx54) and X-beams



**3'-6" x 3'-0" CAP**  
Used with decked slab beams and box beams



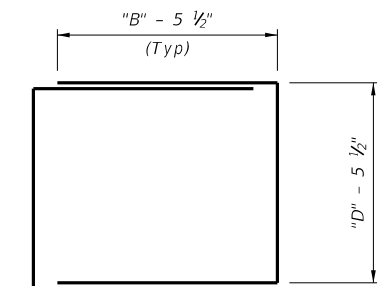
**3'-0" x 2'-6" CAP**  
Used with slab beams

**INTERIOR BENT CAP SECTIONS**

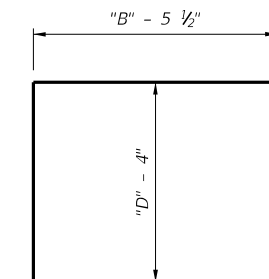
(Showing strands only.)

**TABLE OF CAP DESIGNS**

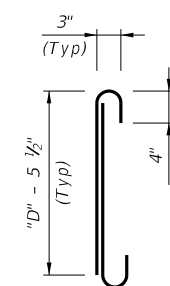
SUPERSTRUCTURE TYPE	CAP DIMENSIONS			CONCRETE		PRESTRESSING STRANDS				OPTIONAL DESIGN REQUIRED MINIMUM ULTIMATE MOMENT CAPACITY (STRENGTH I) (ft-kips)
	CAP WIDTH "B" (ft-in)	CAP DEPTH "D" (ft-in)	CORRUGATED PIPE INSIDE DIAMETER (ft-in)	RELEASE STRENGTH $f'_c$ (ksi)	MINIMUM 28 DAY COMP STRENGTH $f_c$ (ksi)	LAYERS OF PS STRANDS	TOTAL NO. PS STRANDS	SIZE (in)	STRENGTH (ksi)	
Slab Beams	3'-0"	2'-6"	1'-6"	4.0	5.0	12	24	0.6	270	1,201
Decked Slab Beams	3'-6"	3'-0"	2'-0"	4.0	5.0	15	30	0.6	270	1,886
Box Beams	3'-6"	3'-0"	2'-0"	4.0	5.0	15	30	0.6	270	1,886
X-Beams	4'-0"	3'-6"	2'-6"	5.2	6.5	16	32	0.6	270	2,671
I-Girders (Tx28-Tx54)	4'-0"	3'-6"	2'-6"	4.0	5.0	16	32	0.6	270	2,484
I-Girders (Tx62)	4'-6"	4'-0"	3'-0"	4.0	5.0	20	40	0.6	270	3,634



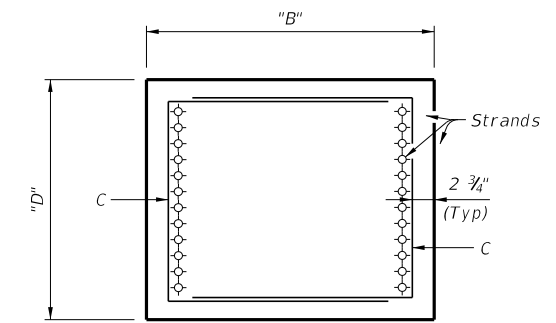
**BARS C (#5)**  
Showing one complete bar.



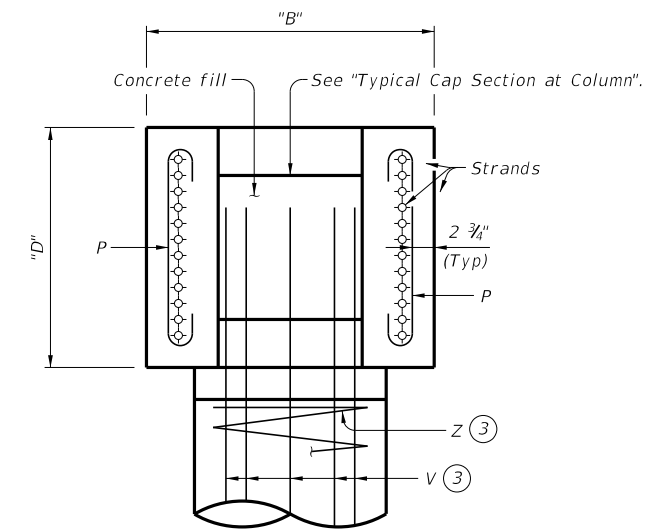
**BARS E (#5)**



**BARS P (#3)**  
Showing one complete bar.



**SECTION A-A**



**SECTION B-B**

HL93 LOADING

SHEET 1 OF 2



**PRESTRESSED, PRECAST BENT CAP OPTION FOR ROUND COLUMNS**

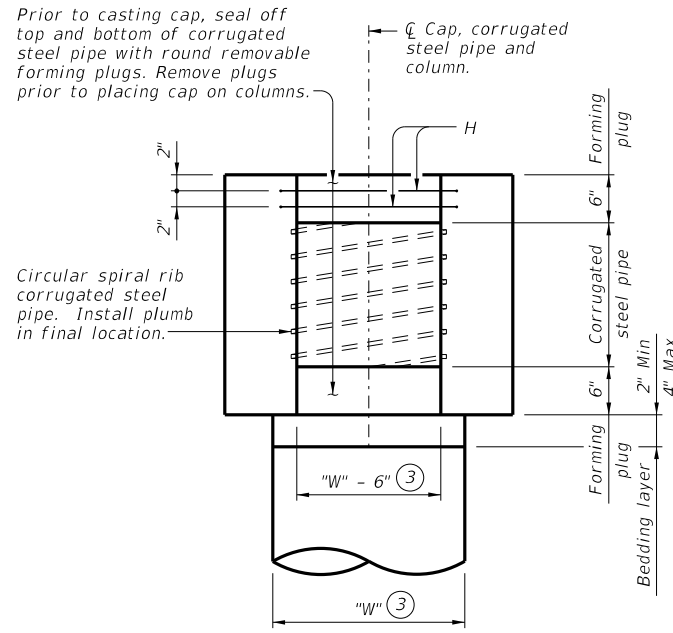
**PPBC-RC**

FILE: ppbcstd1-21.dgn	DN: CPM	CK: AJF	DW: JTR	CK: CPM
©TxDOT April 2019	CONV	SECT	JOB	HIGHWAY
REVISIONS	0456	02	028,ETC	FM 27
12-21: General Notes	DIST	COUNTY	SHEET NO.	
	BRY	FREESTONE	112	



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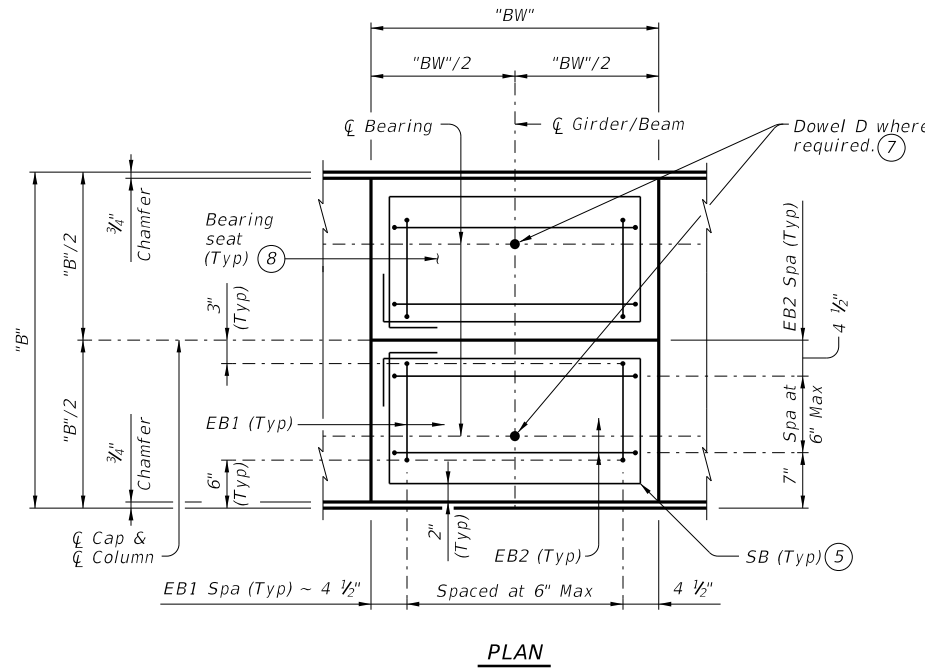
DATE: FILE:



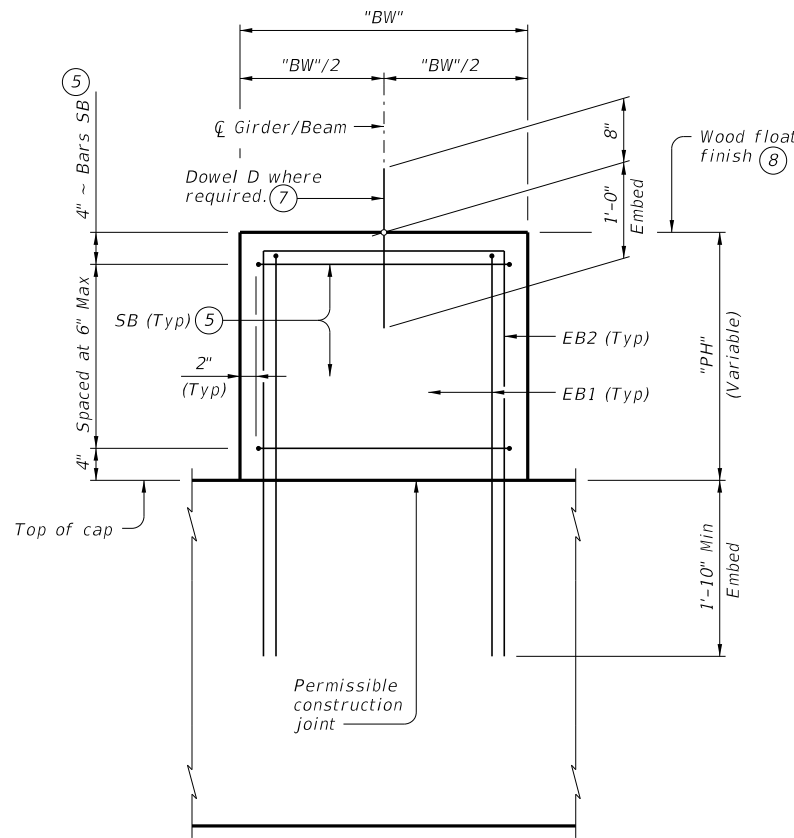
**TYPICAL CAP SECTION AT COLUMN**

Showing example of cap and corrugated steel pipe at column. Cap and column reinforcing not shown for clarity.

SUPERSTRUCTURE TYPE	BEARING DIMENSIONS
	"BW" (ft-in)
X-Beams	6'-0"
I-Girders (Tx28-Tx54)	3'-0"
I-Girders (Tx62)	3'-0"



**PLAN**

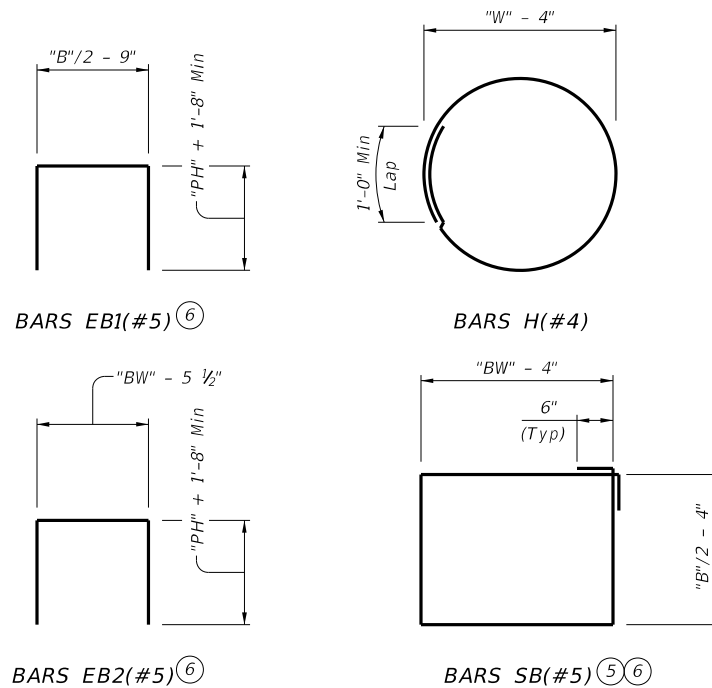


**ELEVATION**

**PEDESTAL DETAILS**

Clean bearing surface and all loose material before placing bearing pad. Reinforce bearing seats/pedestals over 3" in height as shown.

- ③ See Interior Bents sheet for details not shown.
- ⑤ Omit Bars SB for pedestal heights ("PH") under 1'-0".
- ⑥ Shown for structures without skew. Details are for "PH" heights greater than 3" and less than 18". Details are shown for standard X-Beams and I-Girders. Submit details as part of the shop drawing submittal for skewed structures and for pedestals greater than 18" in height.
- ⑦ See Interior Bents sheet for placement of dowels. Place dowels plumb.
- ⑧ See Interior Bents sheet, Bearing Seat Detail for slope.



**CONSTRUCTION NOTES:**

**Cap Fabrication:**  
 Fabricate in accordance with Item 424, "Precast Concrete Structural Members (Fabrication)". Secure corrugated metal pipes to prevent their movement during concrete placement. Location tolerance of pipes is 1/4" from plan location, transversely and longitudinally. Seal pipes to prevent intrusion of concrete.  
 Chamfer or round all exposed corners 3/4".  
 Repair cracks exceeding 0.005 in. in width as directed. The fabricator must take approved corrective actions if cracks greater than 0.005 in. form. All work, material, and engineering related to these cracks will be at the Contractor's expense.  
 Caps can be set level or at grade. If required or needed, build bearing seats/pedestals to achieve final grade. Bearing seats/pedestals may be precast with the initial cast. Bearing seats/pedestals that conflict with column locations may not be precast with cap. Do not locate lift points at bearing seats/pedestals if bearing seats/pedestals are precast. If bearing seats/pedestals are not precast, cast in accordance with Item 420.4.9, "Treatment and Finishing of Horizontal Surfaces". Do not slope the top of caps between bearing areas from the center slightly towards the edge. If pedestal reinforcement is not present, drill and epoxy anchor Bars EB1 and EB2 into top of cap in accordance with Item 420.4.7.10, "Installation of Dowels and Anchor Bolts".  
 If earwalls are required, see Interior Bents sheet for details.  
 If shear keys are required elsewhere in plans, submit details. Shear keys may not be precast. Drill and epoxy shear key anchor reinforcement into top of cap in accordance with Item 420.4.7.10 "Installation of Dowels and Anchor Bolts".  
 Limit flexural stress in cap to 250 psi during handling and storage. Store and handle caps in accordance with Item 424, "Precast Concrete Structural Members (Fabrication)". Do not stack caps.

**Cap-to-Column Connection:**

Construct a mock-up of the column-to-cap connection that must demonstrate the ability of the Contractor to provide a connection free of voids. In the presence of the Engineer, use trial batch of concrete fill using the same material, equipment, and personnel to be used for actual concrete operations and fill the mock-up at least one week before casting concrete. Field test the trial batch of concrete fill to the same levels required for the actual concrete fill depth.  
 Caps may be placed on columns/drilled shafts after column/drilled shaft concrete has achieved a flexural stress of 355 psi (or 2,500 psi compressive strength). Use plastic shims or friction collars to support the cap at the proper elevation prior to concrete fill depth. Total area of plastic shims used on top of each column may not exceed 6 percent of the column area. Column/drilled shaft curing may be interrupted a maximum of 2 hours for placement of plastic shims or friction collars and cap placement.  
 Provide mortar tight forms. Ensure the top of the column is in a saturated surface dry (SSD) condition just before placing concrete fill. Deposit concrete such that all voids in the bedding layer and bent cap are completely filled. Deposit concrete through the top opening of the cap pocket in a manner that deposits concrete from the bedding layer on the bottom of the connection upward. Vibrate concrete in the pocket in accordance with Item 420.4.7.9, "Consolidation". Trowel finish top surface of cap pockets flush with top of cap. Wet mat cure these locations for at least 48 hours. Recess lifting loops 1-inch minimum using exothermic cutting rods. Do not overheat or damage the surrounding concrete. Abrade the concrete surfaces of excavation and end of the lifting loop to remove all slag with a needle gun, steel brush, or other suitable means. Coat the inside of the recessed area, including the lifting loops, with 10 mils (minimum) of neat, Type VIII epoxy and patch the recess with epoxy mortar.

**MATERIAL NOTES:**

Provide 12 gage, Type 1, lock-seam, helical corrugated pipe conforming to Item 460, "Corrugated Metal Pipe".  
 Provide Grade 60 reinforcing steel. Do not epoxy coat reinforcement even if column reinforcement is epoxy coated.  
 Provide Class "H" (HPC) concrete for cap concrete.  
 Provide Class "C" or "S" concrete for cap-to-column connection concrete fill.  
 Use low relaxation strands, each pretensioned to 75% of Tpu.

**GENERAL NOTES:**

Designed in accordance with AASHTO LRFD Bridge Design Specifications.  
 Prestress loss calculated according to Research Report FHWA/TX-12/0-6374-2 Table 6.6 using a relative humidity of 60 percent.  
 The Contractor has the option to provide prestressed, precast bent caps in accordance with the details shown. No additional payment will be made if the Contractor uses prestressed, precast bent caps.  
 Submit shop drawings of prestressed, precast bent caps for approval prior to construction. Indicate lifting attachments and locations on the shop drawings.  
 Corrugated pipe and concrete fill are subsidiary to Item 420, "Concrete Substructures" or Item 425, "Precast Prestressed Concrete Structural Members", whichever is designated as the bid item.  
 See standard Interior Bents sheet for details and notes not shown.

These details can only be used as an alternate to standard Interior Bents with round columns for slab beams, decked slab beams, box beams, X-beams, and I-girder standard designed structures.  
 Cover dimensions are clear dimensions, unless noted otherwise.  
 Reinforcing bar dimensions shown are out-to-out of bar.



**PRESTRESSED, PRECAST BENT CAP OPTION FOR ROUND COLUMNS**

**PPBC-RC**

FILE: ppbcstd1-21.dgn	DN: CPM	CK: AJF	DW: JTR	CK: CPM
©TxDOT April 2019	CONTRACT	SECTION	JOB	HIGHWAY
12-21: General Notes	0456	02	028,ETC	FM 27
	DIST	COUNTY	SHEET NO.	
	BRY	FREESTONE	113	

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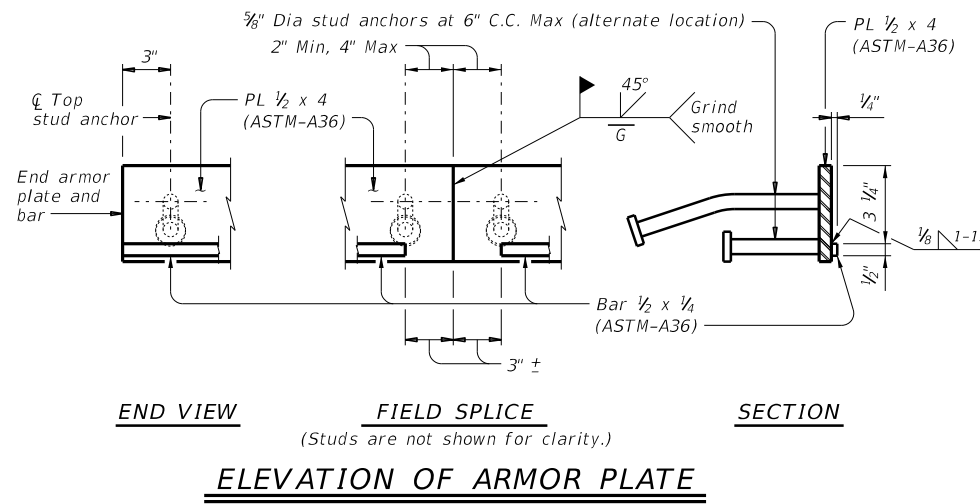
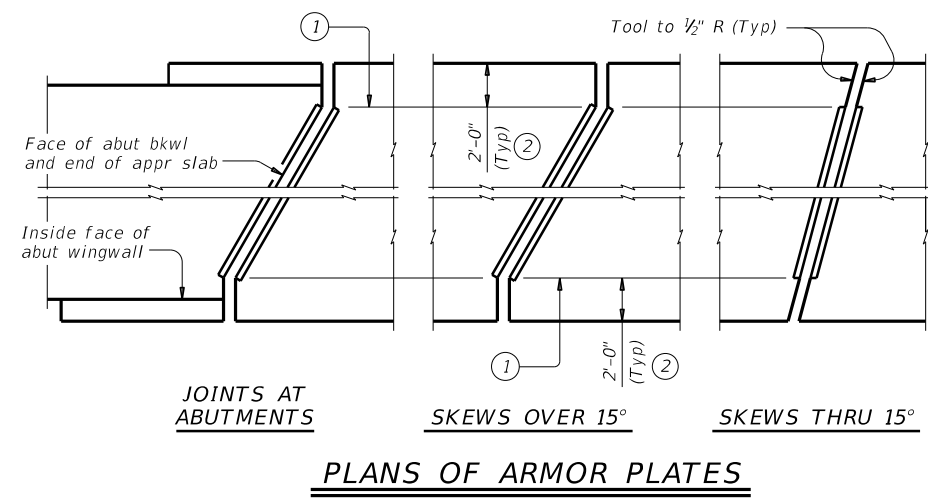
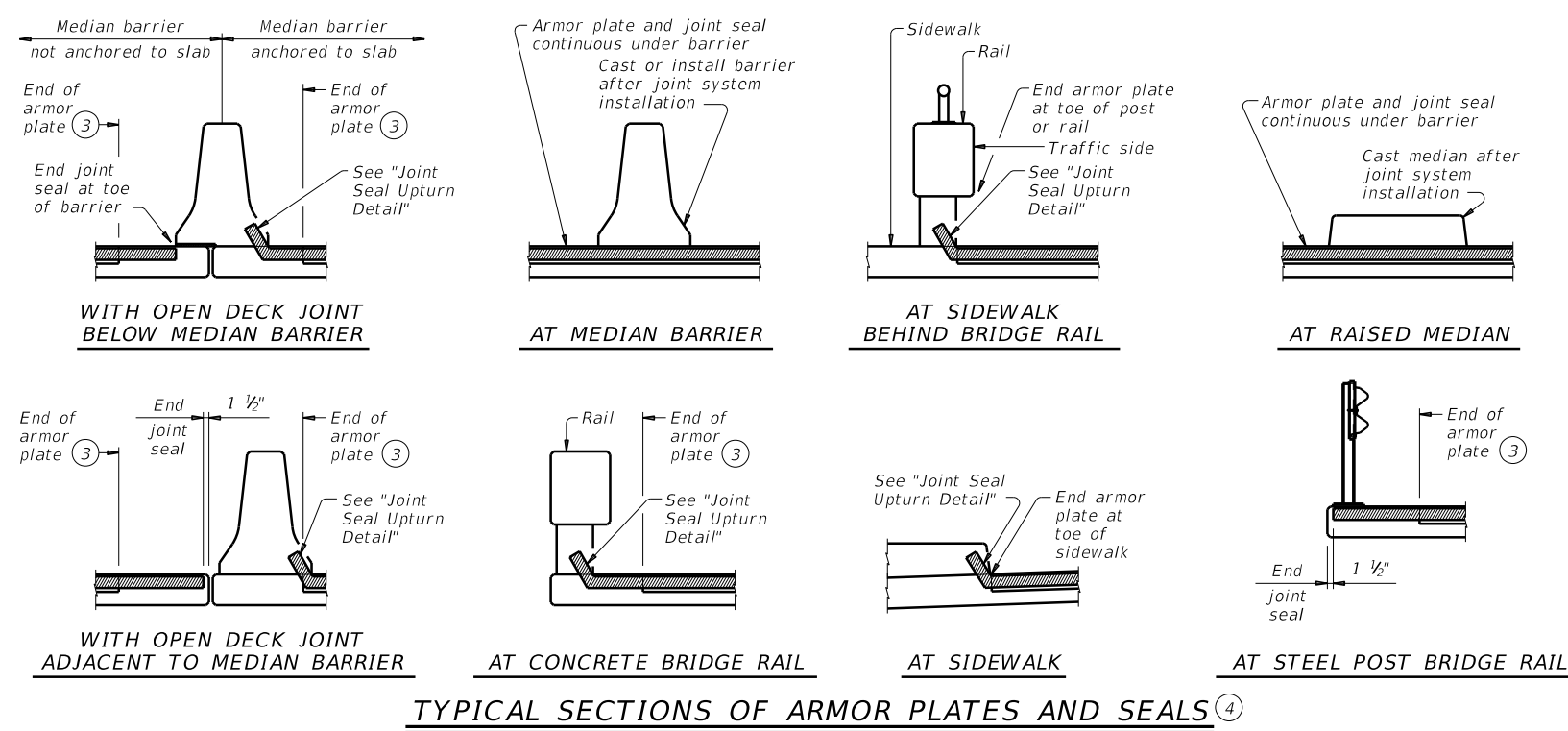


TABLE OF SEALED EXPANSION JOINT INFORMATION			
MANUFACTURER	STEEL SECTION (7)	STRIP SEAL	
		4" JOINT	
		Seal Type	Joint Opening (8)
D.S. Brown	As shown	V-400	2 1/4"
R.J. Watson	As shown	SF-400	2 1/2"
SSI	As shown	SSS-400	2 1/2"
Watson Bowman Acme	As shown	SPS-400	2"

REDUCED LONGITUDINAL MOVEMENT RANGE	
SKEW (deg)	JOINT SIZE
	4"
0	4.0"
15	4.0"
30	3.5"
45	2.8"

**DESIGN NOTES:**  
 Joints installed on a skew have reduced ability to accommodate longitudinal movement. Use table values to determine the correct joint size for skewed installations. For other skews over 25 degrees, calculate reduced movement range by multiplying joint size by cosine (skew).



- At Fabricator's option, armor plate may extend up to 6" beyond this point for skews through 15°.
- Unless shown otherwise, terminate armor plate at slab break point if break is more than 2'-0" from slab edge.
- See "Plans of Armor Plates".
- Other conditions affecting the joint profile should be noted elsewhere.
- Align shipping angle perpendicular to joint.
- Coat with Manufacturer's supplied epoxy primer above bar before installing sealant.
- Shape of steel section shown is typical. Variations in sections must be approved by the Engineer.
- These openings are also the recommended minimum installation openings.

**FABRICATION NOTES:**

Temporarily shop assemble corresponding sections of sealed expansion joints (SEJ), check for fit, and match mark for shipment. Secure corresponding sections together for shipment with shipping angle. Do not use erection bolts.

The seal must be continuous and included in the price bid for sealed expansion joint.

Ship steel sections in convenient lengths of 10'-0" Min and 24'-0" Max unless necessary for staged construction or widenings. One shop splice is permitted in each shipping length provided no piece is less than 2'-0" long and sufficient studs are added to limit the stud to shop splice distance to 2" Min and 4" Max.

Weld studs in accordance with AWS D1.1. Butt weld all shop and field splices and grind smooth areas in contact with seal. Make all necessary field splice joint preparations in the shop.

Paint the entire steel section with System II or IV primer in accordance with Item 446, "Field Cleaning and Painting Steel." Provide paints in accordance with Item 446.2. Prepare steel and apply paint in accordance with Item 446.4.7.3 and 446.4.7.4.

Shop drawings for the fabrication of sealed expansion joints will not require the Engineer's approval if fabrication is in accordance with the details shown on this standard.

**CONSTRUCTION NOTES:**

Secure the sealed expansion joint in position and place to the proper grade and alignment by welding braces to adjacent reinforcing steel, to prestressed beam stirrups, or to anchors cast in concrete diaphragms. Include cost of temporary bracing in the price bid for sealed expansion joint.

Remove shipping angle immediately after each joint half is secured in place. Grind smooth, and touch up with organic zinc-rich paint.

Clean and prepare seal cavity for seal installation as per the Manufacturer's installation procedures.

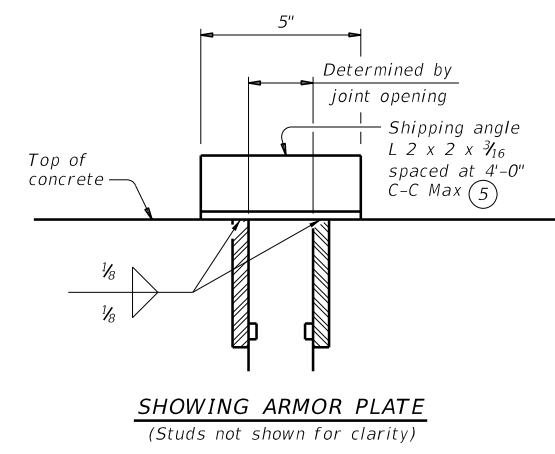
Splice and install seal in accordance with the Manufacturer's directions and with the adhesive provided by the Manufacturer.

Splice in joint seal may be performed in the field.

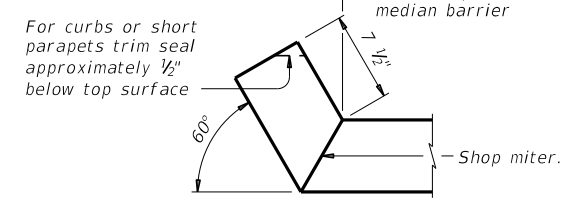
**GENERAL NOTES:**

Provide sealed expansion joints in the size and at locations shown on the plans.

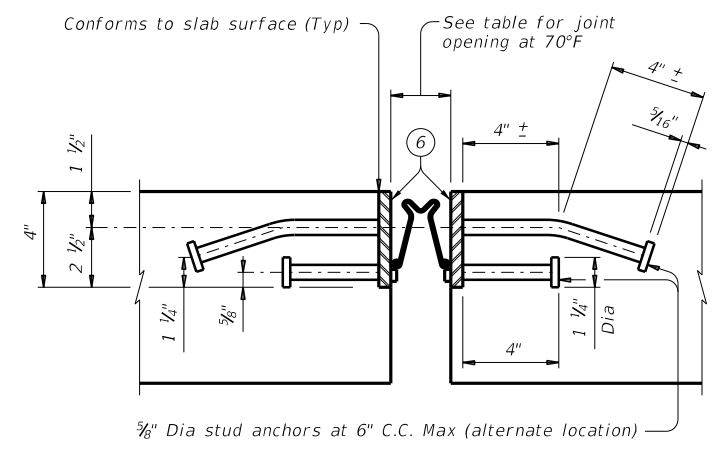
Minimum slab and overhang thickness required for the use of SEJ-B is 6 1/2".



An alternate method of securing joint sections may be used if approved by the Bridge Division. Erection bolts are not allowed.



For curbs or short parapets trim seal approximately 1/2" below top surface.



Conforms to slab surface (Typ)

**Texas Department of Transportation** Bridge Division Standard

**SEALED EXPANSION JOINT TYPE B WITHOUT OVERLAY**

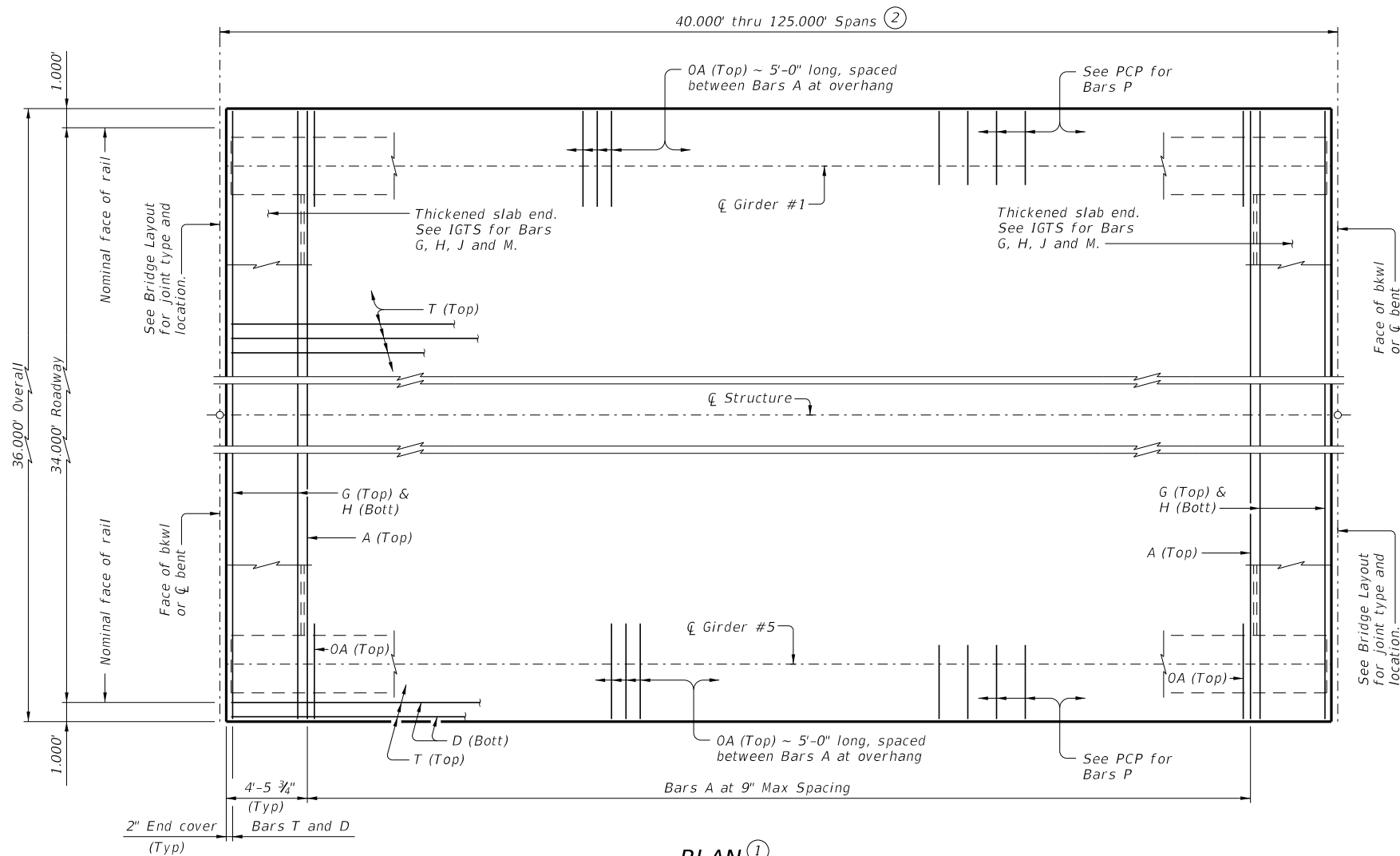
**SEJ-B**

FILE: sejbste1-19.dgn	DN: TxDOT	CK: TxDOT	DW: JTR	CK: JMH
©TxDOT April 2019	CONTRACT	SECTION	JOB	HIGHWAY
REVISIONS	0456	02	028.ETC	FM 27
	DIST	COUNTY	SHEET NO.	
	BRY	FREESTONE	114	

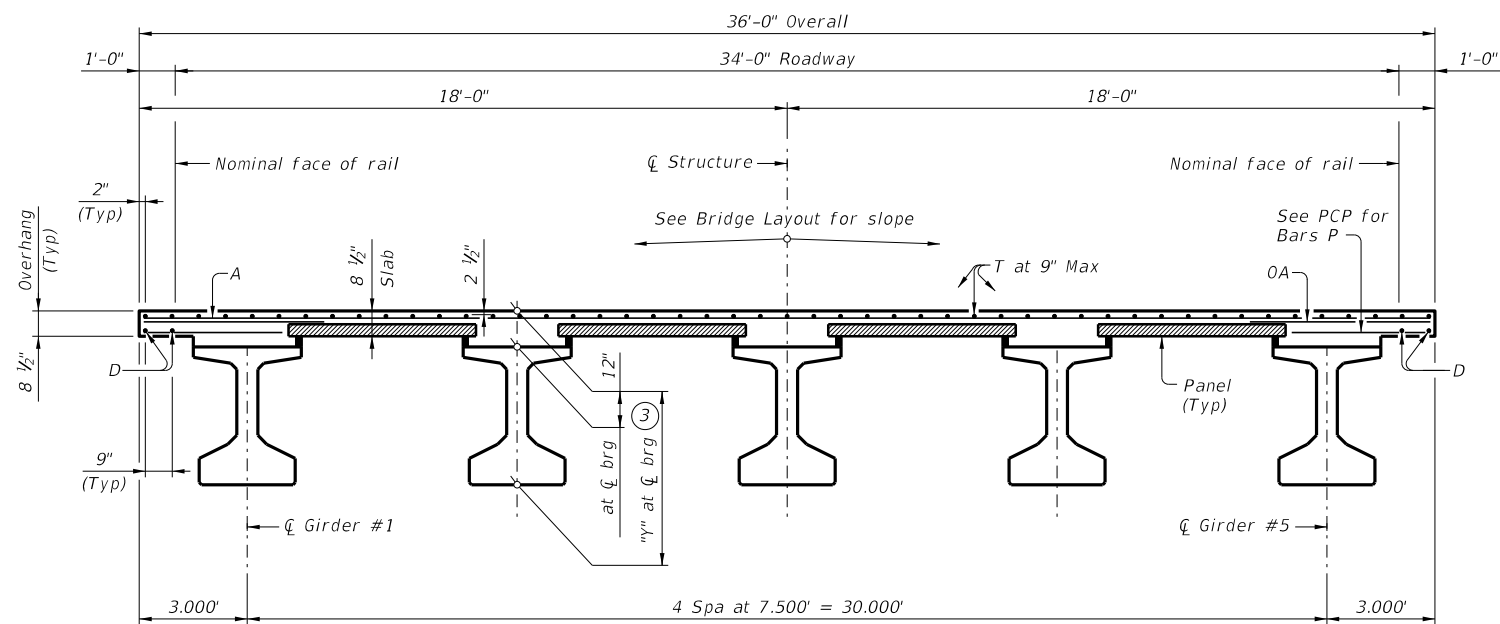
DATE: FILE:

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DATE:  
FILE:



**PLAN** ①



**TYPICAL TRANSVERSE SECTION**  
(Showing girder type Tx46)

TABLE OF SECTION DEPTHS	
GIRDER TYPE	"Y" AT $\phi$ BRG ③
	Ft/In
Tx28	3'-4"
Tx34	3'-10"
Tx40	4'-4"
Tx46	4'-10"
Tx54	5'-6"

**BAR TABLE**

BAR	SIZE
A	#4
D	#4
G	#4
H	#4
J	#4
M	#4
OA	#5
P	#4
T	#4

- ① If multi-span units (with slab continuous over interior bents) are indicated on the Bridge Layout, see standard IGCS for adjustment to slab reinforcement and quantities.
- ② Span lengths for prestressed concrete I-Girder type:  
Type Tx28 for spans lengths 40,000' thru 75,000'.  
Type Tx34 for spans lengths 40,000' thru 85,000'.  
Type Tx40 for spans lengths 40,000' thru 95,000'.  
Type Tx46 for spans lengths 40,000' thru 110,000'.  
Type Tx54 for spans lengths 40,000' thru 125,000'.
- ③ "Y" value shown is based on theoretical girder camber, dead load deflection from an 8 1/2" concrete slab, a constant roadway grade, and using precast panels (PCP). The Contractor will adjust this value as necessary for any roadway vertical curve.

HL93 LOADING

SHEET 1 OF 2



**PRESTRESSED CONCRETE I-GIRDER SPANS (TYPE Tx28 THRU Tx54) 34' ROADWAY**

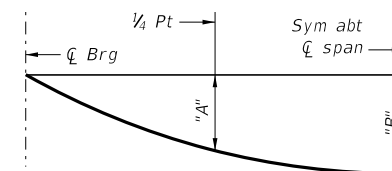
**SIG-34**

FILE: IG-SIG3400-23.dgn	DN: TAR	CK: VC	DW: SFS	CK: TAR
©TxDOT January 2023	CONT	SECT	JOB	HIGHWAY
REVISIONS	0456	02	028,ETC	FM 27
	DIST	COUNTY	SHEET NO.	
	BRY	FREESTONE	115	

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**TABLE OF DEAD LOAD DEFLECTIONS**

TYPE Tx28 GIRDERS			TYPE Tx34 GIRDERS			TYPE Tx40 GIRDERS			TYPE Tx46 GIRDERS			TYPE Tx54 GIRDERS		
SPAN LENGTH	"A"	"B"	SPAN LENGTH	"A"	"B"	SPAN LENGTH	"A"	"B"	SPAN LENGTH	"A"	"B"	SPAN LENGTH	"A"	"B"
Ft	Ft	Ft	Ft	Ft	Ft	Ft	Ft	Ft	Ft	Ft	Ft	Ft	Ft	Ft
40	0.008	0.012	40	0.005	0.007	40	0.003	0.005	40	0.002	0.003	40	0.001	0.002
45	0.014	0.019	45	0.008	0.012	45	0.005	0.008	45	0.004	0.005	45	0.002	0.003
50	0.021	0.030	50	0.013	0.018	50	0.008	0.012	50	0.006	0.008	50	0.004	0.005
55	0.031	0.045	55	0.019	0.027	55	0.012	0.017	55	0.008	0.012	55	0.006	0.008
60	0.045	0.064	60	0.027	0.038	60	0.018	0.025	60	0.012	0.017	60	0.008	0.011
65	0.063	0.089	65	0.037	0.053	65	0.025	0.035	65	0.017	0.024	65	0.011	0.016
70	0.085	0.121	70	0.051	0.073	70	0.033	0.047	70	0.023	0.032	70	0.015	0.021
75	0.113	0.161	75	0.068	0.096	75	0.044	0.063	75	0.030	0.043	75	0.020	0.028
			80	0.088	0.125	80	0.058	0.082	80	0.039	0.056	80	0.026	0.037
			85	0.113	0.161	85	0.074	0.105	85	0.050	0.072	85	0.033	0.047
						90	0.093	0.133	90	0.064	0.090	90	0.042	0.060
						95	0.117	0.166	95	0.079	0.113	95	0.052	0.075
									100	0.098	0.139	100	0.065	0.092
									105	0.119	0.170	105	0.079	0.112
									110	0.144	0.205	110	0.095	0.136
									115			115	0.114	0.163
									120			120	0.136	0.193
									125			125	0.161	0.228



**DEAD LOAD DEFLECTION DIAGRAM**

Calculated deflections shown are due to the concrete slab on interior girders only ( $E_c = 5000$  ksi). Adjust values as required for exterior girders and if optional slab forming is used. These values may require field verification.

**TABLE OF ESTIMATED QUANTITIES**

SPAN LENGTH	REINF CONCRETE SLAB	Prestressed Concrete Girders			TOTAL REINF STEEL <sup>(5)</sup>
		ABUT TO INT BT <sup>(4)</sup>	INT BT TO INT BT <sup>(4)</sup>	ABUT TO ABUT <sup>(4)</sup>	
Ft	SF	LF	LF	LF	Lb
40	1,440	197.50	197.50	197.50	3,312
45	1,620	222.50	222.50	222.50	3,726
50	1,800	247.50	247.50	247.50	4,140
55	1,980	272.50	272.50	272.50	4,554
60	2,160	297.50	297.50	297.50	4,968
65	2,340	322.50	322.50	322.50	5,382
70	2,520	347.50	347.50	347.50	5,796
75	2,700	372.50	372.50	372.50	6,210
80	2,880	397.50	397.50	397.50	6,624
85	3,060	422.50	422.50	422.50	7,038
90	3,240	447.50	447.50	447.50	7,452
95	3,420	472.50	472.50	472.50	7,866
100	3,600	497.50	497.50	497.50	8,280
105	3,780	522.50	522.50	522.50	8,694
110	3,960	547.50	547.50	547.50	9,108
115	4,140	572.50	572.50	572.50	9,522
120	4,320	597.50	597.50	597.50	9,936
125	4,500	622.50	622.50	622.50	10,350

- <sup>(4)</sup> Fabricator will adjust lengths for girder slopes as required.
- <sup>(5)</sup> Reinforcing steel weight is calculated using an approximate factor of 2.3 lbs/SF.

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

**GENERAL NOTES:**  
 Designed according to AASHTO LRFD Bridge Design Specifications.  
 Multi-span units, with slab continuous over interior bents, may be formed with the details shown on this sheet and the I-Girder Continuous Slab Detail (IGCS) standard.  
 See I-Girder Thickened Slab End Details (IGTS) standard for details and quantity adjustments.  
 See Prestressed Concrete Panels (PCP) standard and Prestressed Concrete Panel Fabrication Details (PCP-FAB) standard for panel details not shown.  
 See I-Girder Miscellaneous Slab Details (IGMS) standard for miscellaneous details.  
 See applicable rail details for rail anchorage in slab.  
 See Permanent Metal Deck Forms (PMDF) standard for details and quantity adjustments if this option is used.  
 This standard does not support the use of transition bents.

Cover dimensions are clear dimensions, unless noted otherwise.

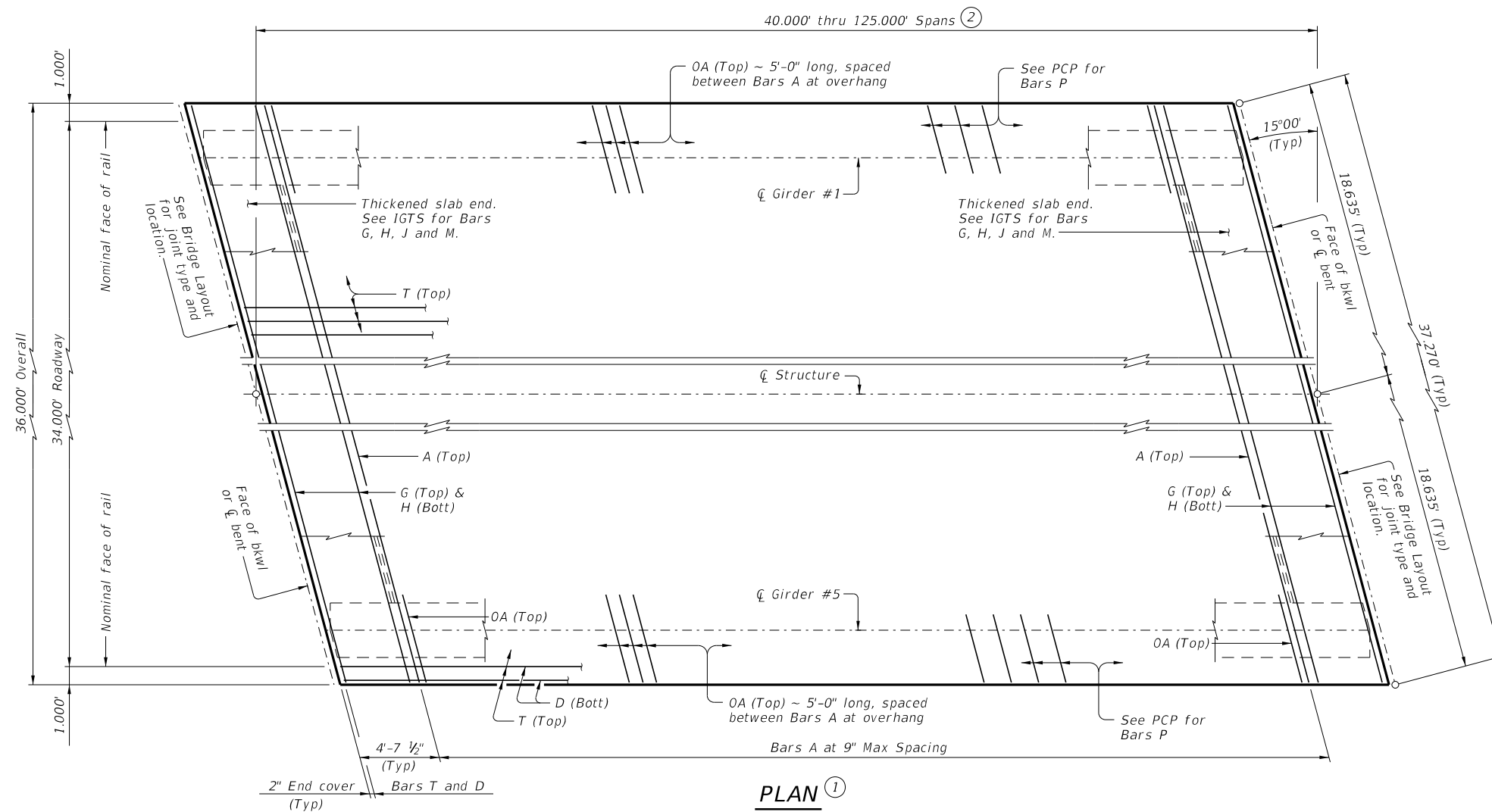
				<b>Bridge Division Standard</b>	
<b>PRESTRESSED CONCRETE I-GIRDER SPANS (TYPE Tx28 THRU Tx54) 34' ROADWAY</b>					
<b>SIG-34</b>					
FILE: IG-SIG3400-23.dgn	DN: TAR	CK: VC	DW: SFS	CK: TAR	
©TxDOT January 2023	CONT	SECT	JOB	HIGHWAY	
REVISIONS	0456	02	028,ETC	FM 27	
	DIST	COUNTY		SHEET NO.	
	BRY	FREESTONE		116	

DATE: FILE:

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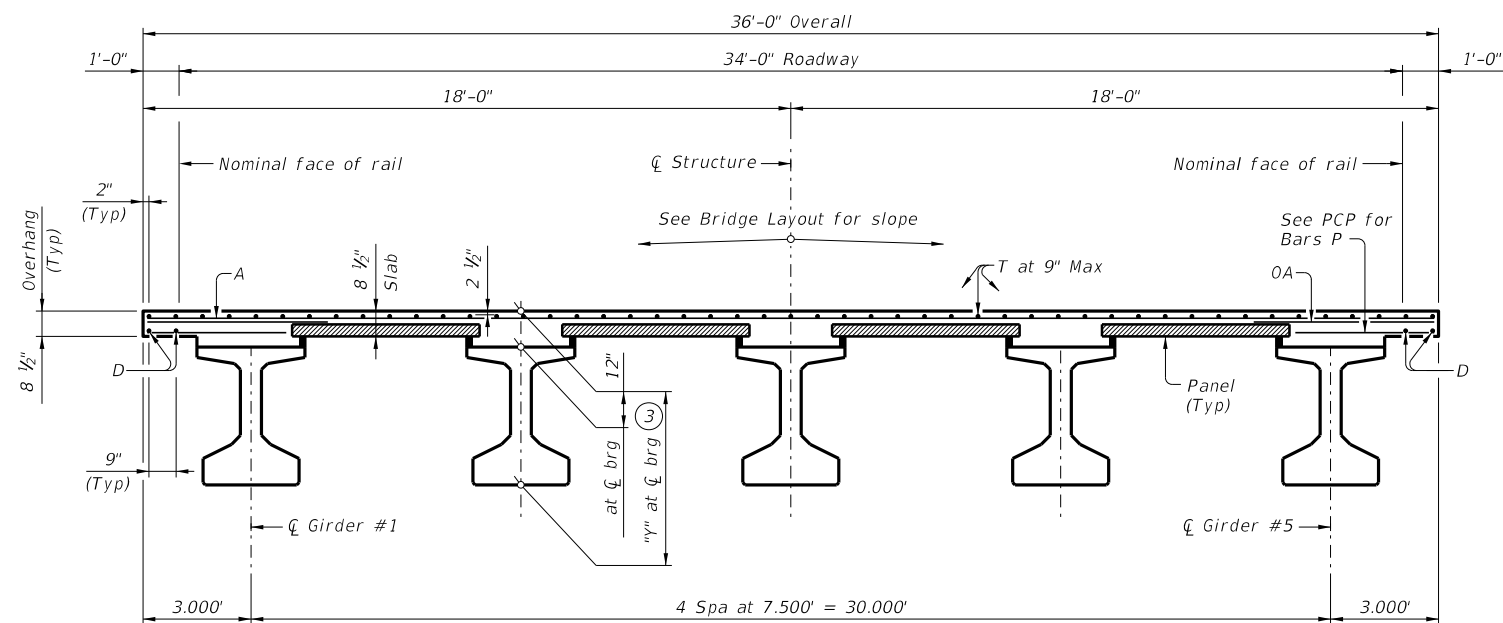
**BAR TABLE**

BAR	SIZE
A	#4
D	#4
G	#4
H	#4
J	#4
M	#4
OA	#5
P	#4
T	#4



**PLAN** ①

- ① If multi-span units (with slab continuous over interior bents) are indicated on the Bridge Layout, see standard IGCS for adjustment to slab reinforcement and quantities.
- ② Span lengths for prestressed concrete I-Girder type:  
 Type Tx28 for spans lengths 40,000' thru 75,000'.  
 Type Tx34 for spans lengths 40,000' thru 85,000'.  
 Type Tx40 for spans lengths 40,000' thru 95,000'.  
 Type Tx46 for spans lengths 40,000' thru 110,000'.  
 Type Tx54 for spans lengths 40,000' thru 125,000'.
- ③ "Y" value shown is based on theoretical girder camber, dead load deflection from an 8 1/2" concrete slab, a constant roadway grade, and using precast panels (PCP). The Contractor will adjust this value as necessary for any roadway vertical curve.



**TYPICAL TRANSVERSE SECTION**

(Showing girder type Tx46)

**TABLE OF SECTION DEPTHS**

GIRDER TYPE	"Y" AT $\bar{C}$ BRG ③
	Ft./In
Tx28	3'-4"
Tx34	3'-10"
Tx40	4'-4"
Tx46	4'-10"
Tx54	5'-6"

HL93 LOADING SHEET 1 OF 2



**PRESTRESSED CONCRETE I-GIRDER SPANS (TYPE Tx28 THRU Tx54) 34' ROADWAY 15° SKEW**

**SIG-34-15**

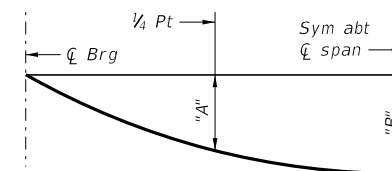
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REVISIONS	0456	02	028,ETC	FM 27
	DIST	COUNTY		SHEET NO.
	BRY	FREESTONE		117

DATE: FILE:

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**TABLE OF DEAD LOAD DEFLECTIONS**

TYPE Tx28 GIRDERS			TYPE Tx34 GIRDERS			TYPE Tx40 GIRDERS			TYPE Tx46 GIRDERS			TYPE Tx54 GIRDERS		
SPAN LENGTH	"A"	"B"	SPAN LENGTH	"A"	"B"	SPAN LENGTH	"A"	"B"	SPAN LENGTH	"A"	"B"	SPAN LENGTH	"A"	"B"
Ft	Ft	Ft	Ft	Ft	Ft	Ft	Ft	Ft	Ft	Ft	Ft	Ft	Ft	Ft
40	0.008	0.012	40	0.005	0.007	40	0.003	0.005	40	0.002	0.003	40	0.001	0.002
45	0.014	0.019	45	0.008	0.012	45	0.005	0.008	45	0.004	0.005	45	0.002	0.003
50	0.021	0.030	50	0.013	0.018	50	0.008	0.012	50	0.006	0.008	50	0.004	0.005
55	0.031	0.045	55	0.019	0.027	55	0.012	0.017	55	0.008	0.012	55	0.006	0.008
60	0.045	0.064	60	0.027	0.038	60	0.018	0.025	60	0.012	0.017	60	0.008	0.011
65	0.063	0.089	65	0.037	0.053	65	0.025	0.035	65	0.017	0.024	65	0.011	0.016
70	0.085	0.121	70	0.051	0.073	70	0.033	0.047	70	0.023	0.032	70	0.015	0.021
75	0.113	0.161	75	0.068	0.096	75	0.044	0.063	75	0.030	0.043	75	0.020	0.028
			80	0.088	0.125	80	0.058	0.082	80	0.039	0.056	80	0.026	0.037
			85	0.113	0.161	85	0.074	0.105	85	0.050	0.072	85	0.033	0.047
						90	0.093	0.133	90	0.064	0.090	90	0.042	0.060
						95	0.117	0.166	95	0.079	0.113	95	0.052	0.075
									100	0.098	0.139	100	0.065	0.092
									105	0.119	0.170	105	0.079	0.112
									110	0.144	0.205	110	0.095	0.136
									115			115	0.114	0.163
									120			120	0.136	0.193
									125			125	0.161	0.228



**DEAD LOAD DEFLECTION DIAGRAM**

Calculated deflections shown are due to the concrete slab on interior girders only (Ec = 5000 ksi). Adjust values as required for exterior girders and if optional slab forming is used. These values may require field verification.

**TABLE OF ESTIMATED QUANTITIES**

SPAN LENGTH	REINF CONCRETE SLAB	Prestressed Concrete Girders			TOTAL REINF STEEL
		ABUT TO INT BT	INT BT TO INT BT	ABUT TO ABUT	
Ft	SF	LF	LF	LF	Lb
40	1,440	197.46	197.50	197.41	3,312
45	1,620	222.46	222.50	222.41	3,726
50	1,800	247.46	247.50	247.41	4,140
55	1,980	272.46	272.50	272.41	4,554
60	2,160	297.46	297.50	297.41	4,968
65	2,340	322.46	322.50	322.41	5,382
70	2,520	347.46	347.50	347.41	5,796
75	2,700	372.46	372.50	372.41	6,210
80	2,880	397.46	397.50	397.41	6,624
85	3,060	422.46	422.50	422.41	7,038
90	3,240	447.46	447.50	447.41	7,452
95	3,420	472.46	472.50	472.41	7,866
100	3,600	497.46	497.50	497.41	8,280
105	3,780	522.46	522.50	522.41	8,694
110	3,960	547.46	547.50	547.41	9,108
115	4,140	572.46	572.50	572.41	9,522
120	4,320	597.46	597.50	597.41	9,936
125	4,500	622.46	622.50	622.41	10,350

- (4) Fabricator will adjust lengths for girder slopes as required.
- (5) Reinforcing steel weight is calculated using an approximate factor of 2.3 lbs/SF.

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

**GENERAL NOTES:**  
 Designed according to AASHTO LRFD Bridge Design Specifications.  
 Multi-span units, with slab continuous over interior bents, may be formed with the details shown on this sheet and the I-Girder Continuous Slab Detail (IGCS) standard.  
 See I-Girder Thickened Slab End Details (IGTS) standard for details and quantity adjustments.  
 See Prestressed Concrete Panels (PCP) standard and Prestressed Concrete Panel Fabrication Details (PCP-FAB) standard for panel details not shown.  
 See I-Girder Miscellaneous Slab Details (IGMS) standard for miscellaneous details.  
 See applicable rail details for rail anchorage in slab.  
 See Permanent Metal Deck Forms (PMD) standard for details and quantity adjustments if this option is used.  
 This standard is drawn showing right forward skew.  
 See Bridge Layout for actual skew direction.  
 This standard does not support the use of transition bents.

Cover dimensions are clear dimensions, unless noted otherwise.

Texas Department of Transportation  
 Bridge Division Standard

**PRESTRESSED CONCRETE I-GIRDER SPANS (TYPE Tx28 THRU Tx54) 34' ROADWAY 15° SKEW**

**SIG-34-15**

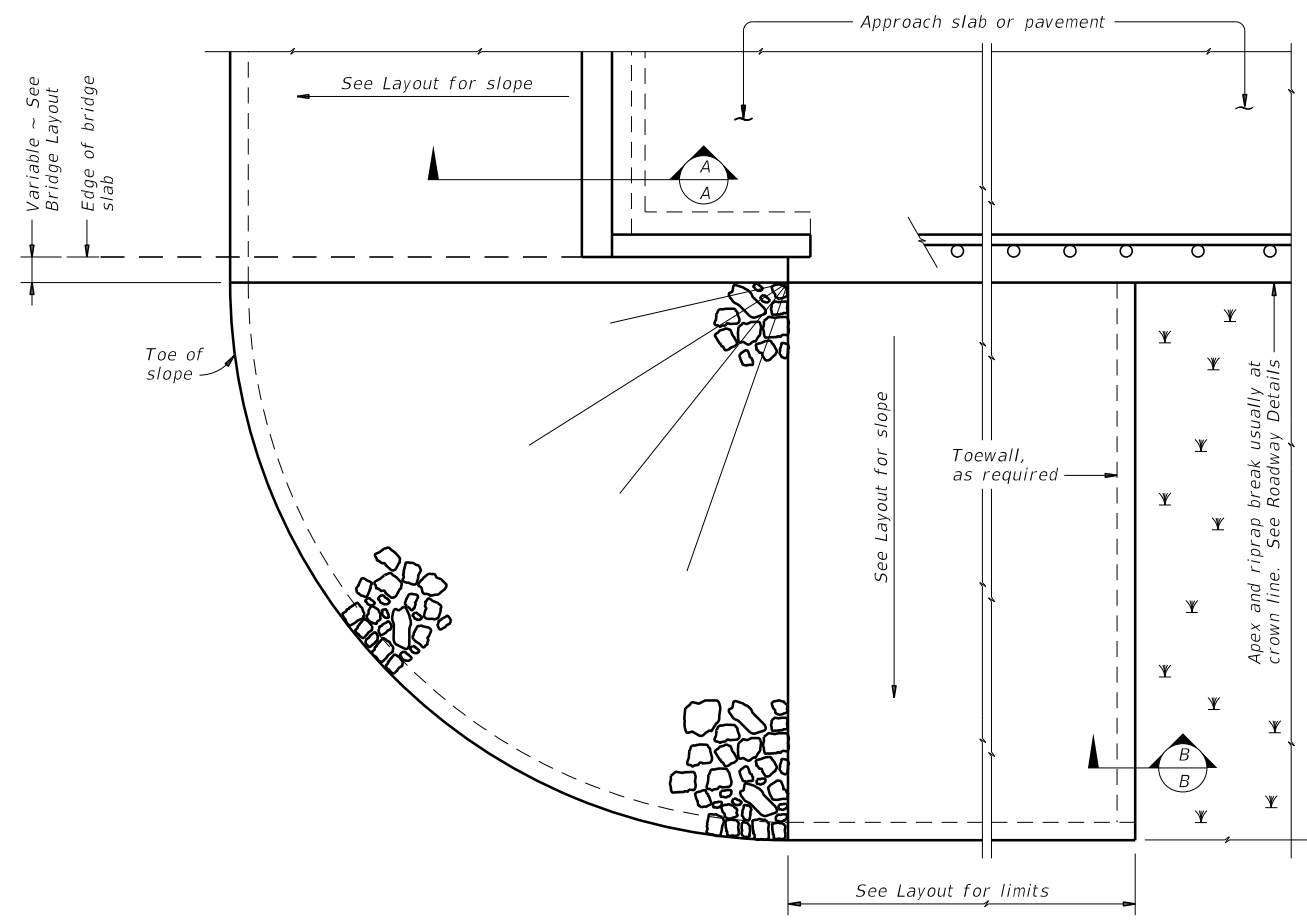
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©TxDOT January 2023	CONT	SECT	JOB	HIGHWAY
REVISIONS	0456	02	028,ETC	FM 27
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	BRY	FREESTONE	118	

DATE: FILE:

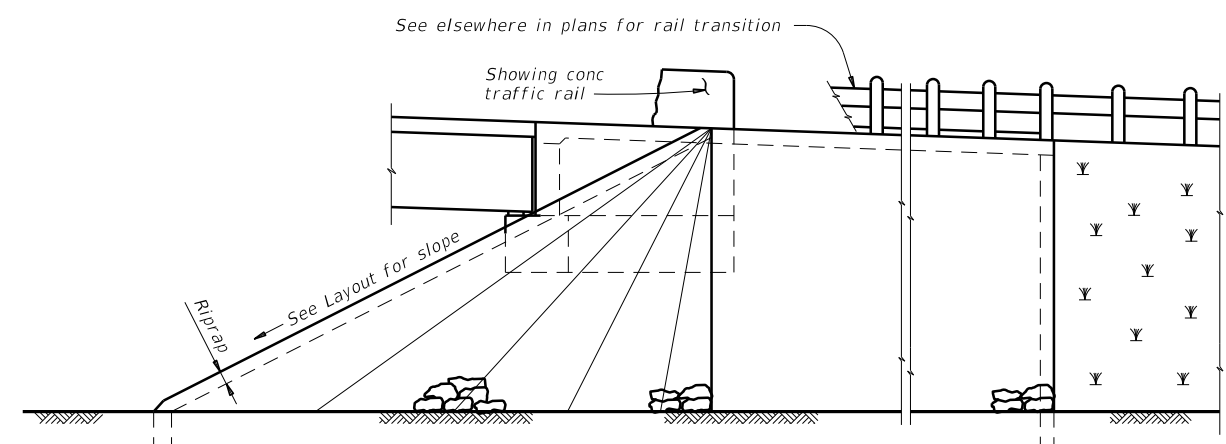


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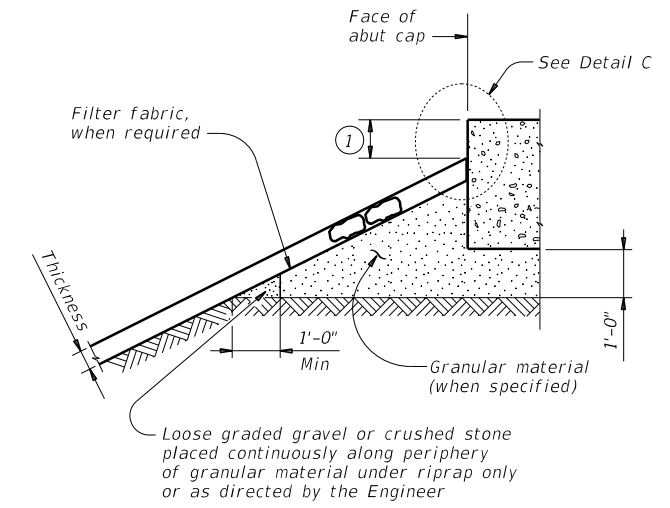
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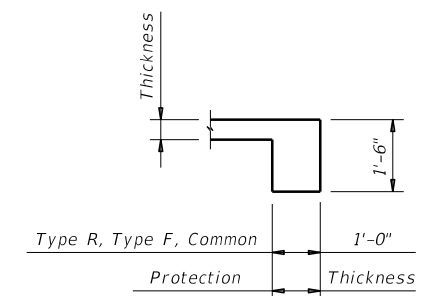
**PLAN**



**ELEVATION**

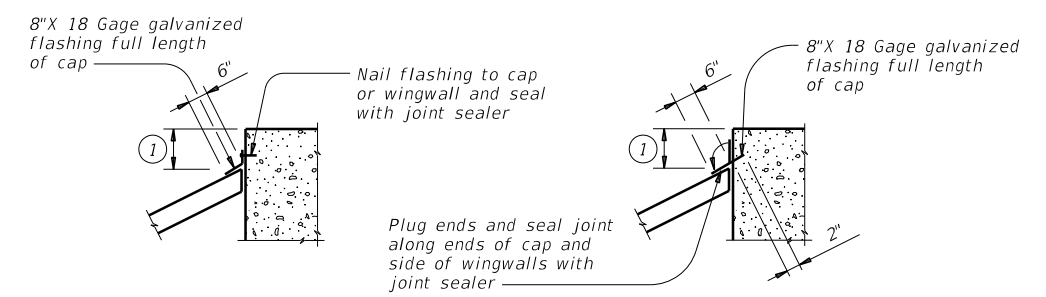


**SECTION A-A AT CAP**



**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**

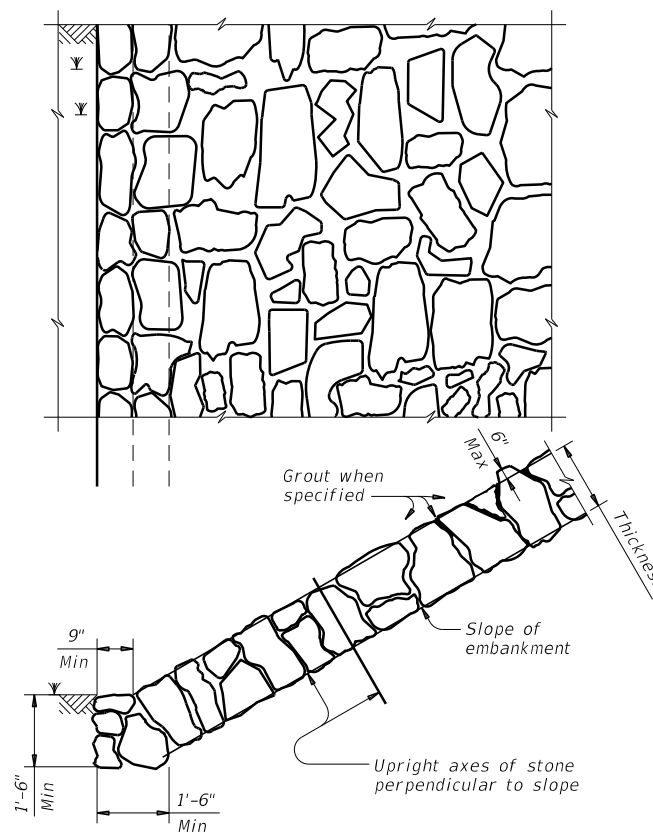
① Top of cap to top of riprap dimension varies as directed by the Engineer. Provide 9" Min for beam/slab type bridges and 1'-6" for slab span, box beam, or slab beam bridges.

**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.

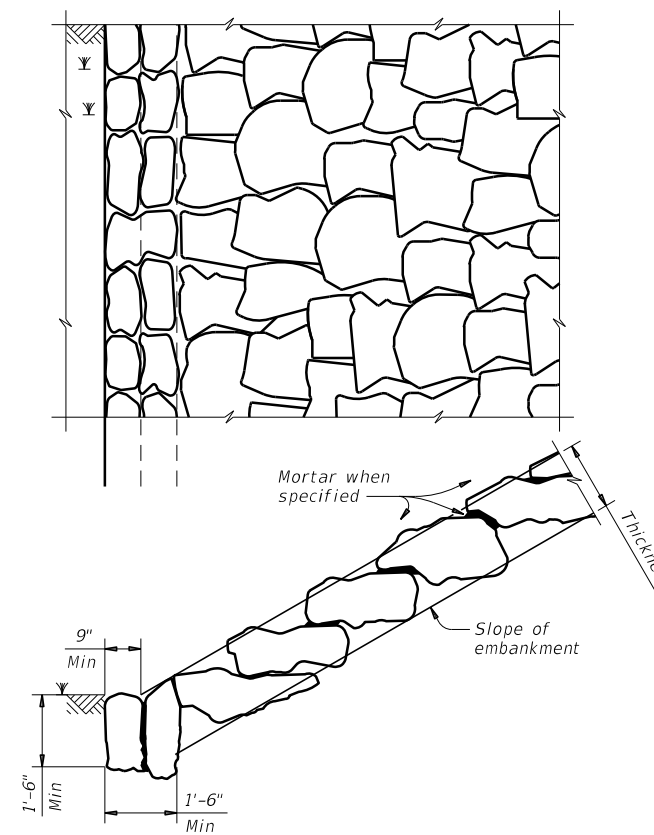
SHEET 1 OF 2

		<b>Bridge Division Standard</b>	
<h2>STONE RIPRAP</h2>			
<h3>SRR</h3>			
FILE: srrstde1-19.dgn	DN: AES	CK: JGD	DW: BWH
©TxDOT April 2019	CONT	SECT	JOB
REVISIONS	0456	02	028,ETC
	DIST	COUNTY	SHEET NO.
	BRY	FREESTONE	119

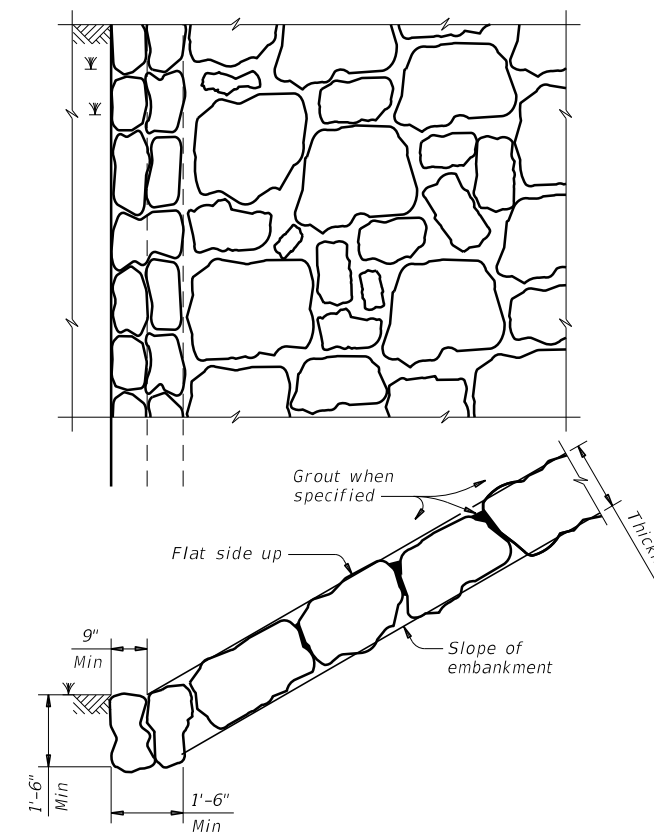
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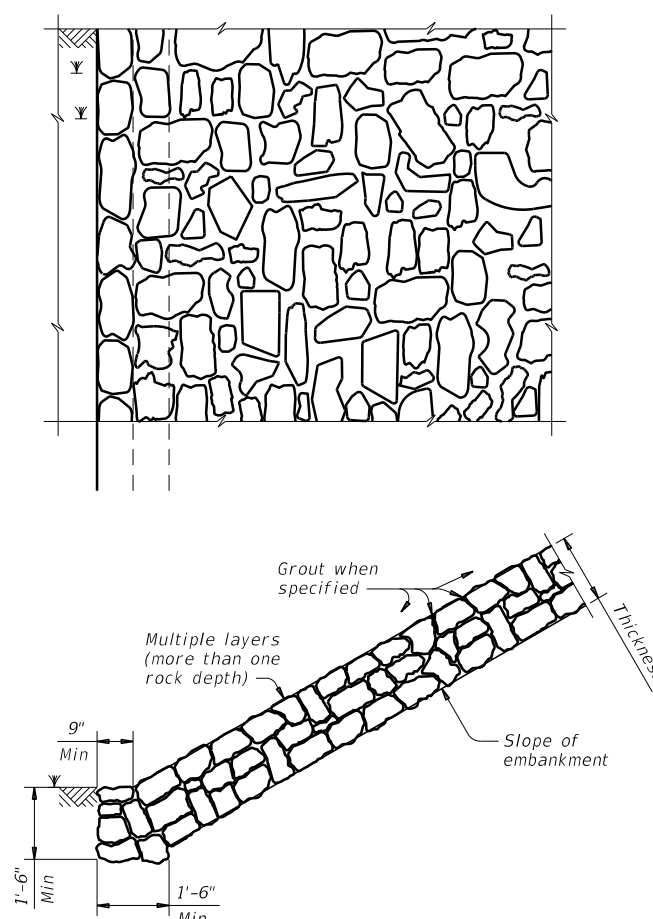
**FIGURE 1 ~ TYPE R STONE RIPRAP**  
dry or grouted



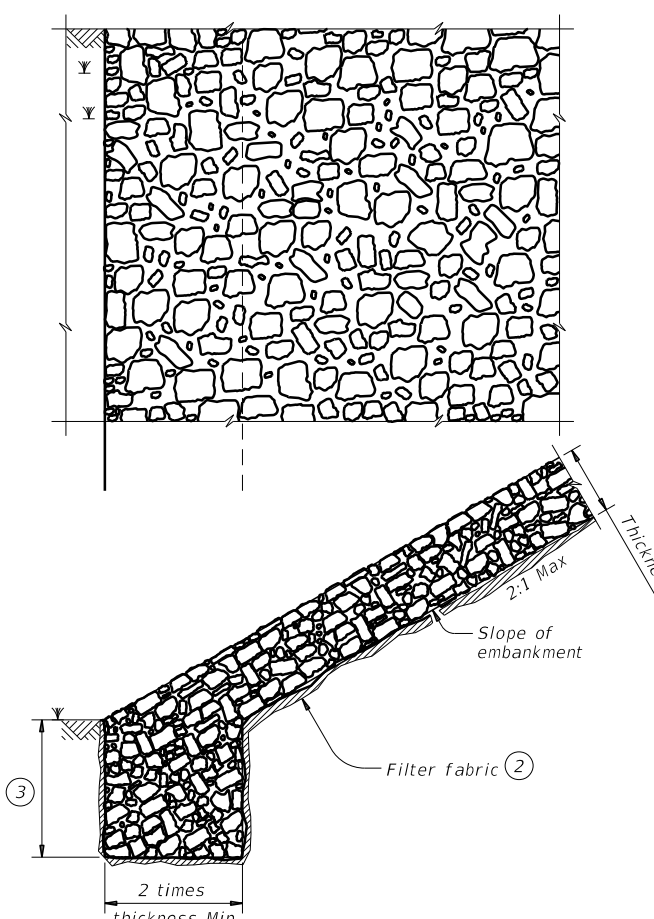
**FIGURE 2 ~ TYPE F STONE RIPRAP**  
dry or mortared



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

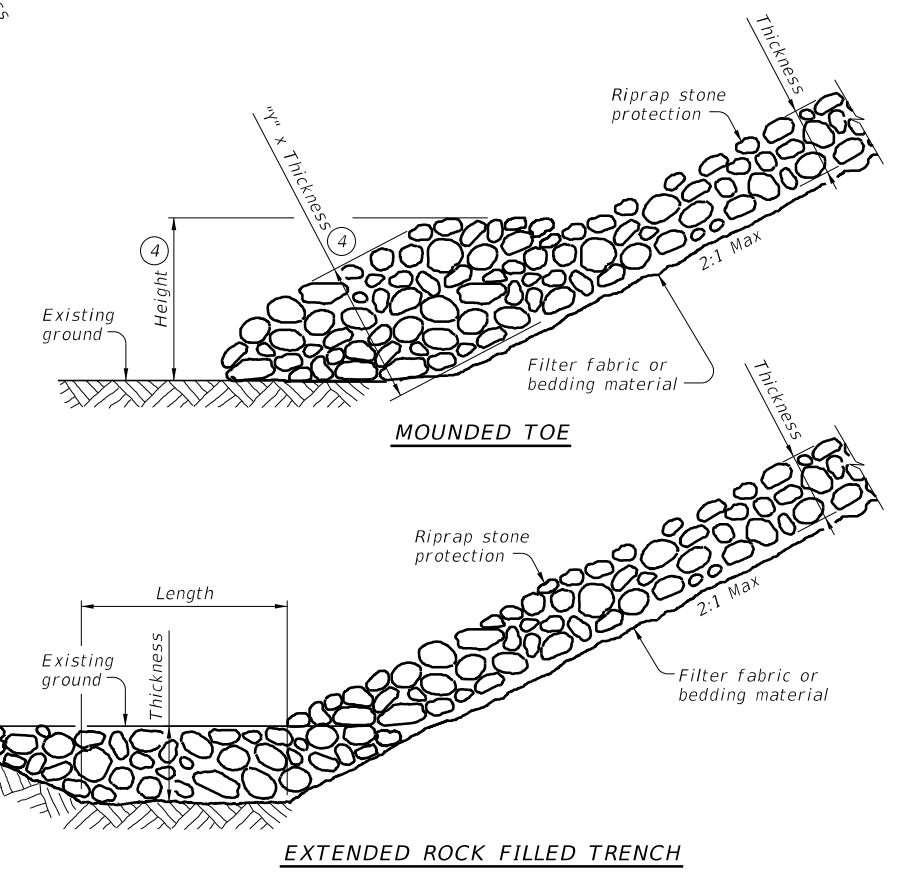


**FIGURE 4 ~ COMMON STONE RIPRAP**  
dry or grouted



**FIGURE 5 ~ PROTECTION STONE RIPRAP**

- 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**

**STONE RIPRAP**

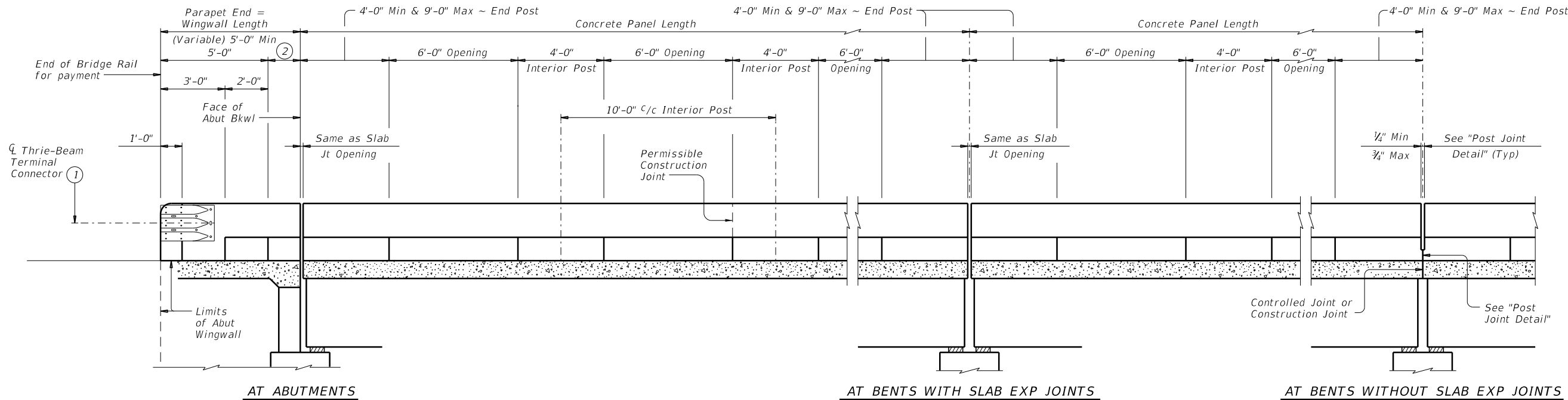
**SRR**

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©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0456	02	028.ETC	FM 27
	DIST	COUNTY		SHEET NO.
	BRY	FREESTONE		120

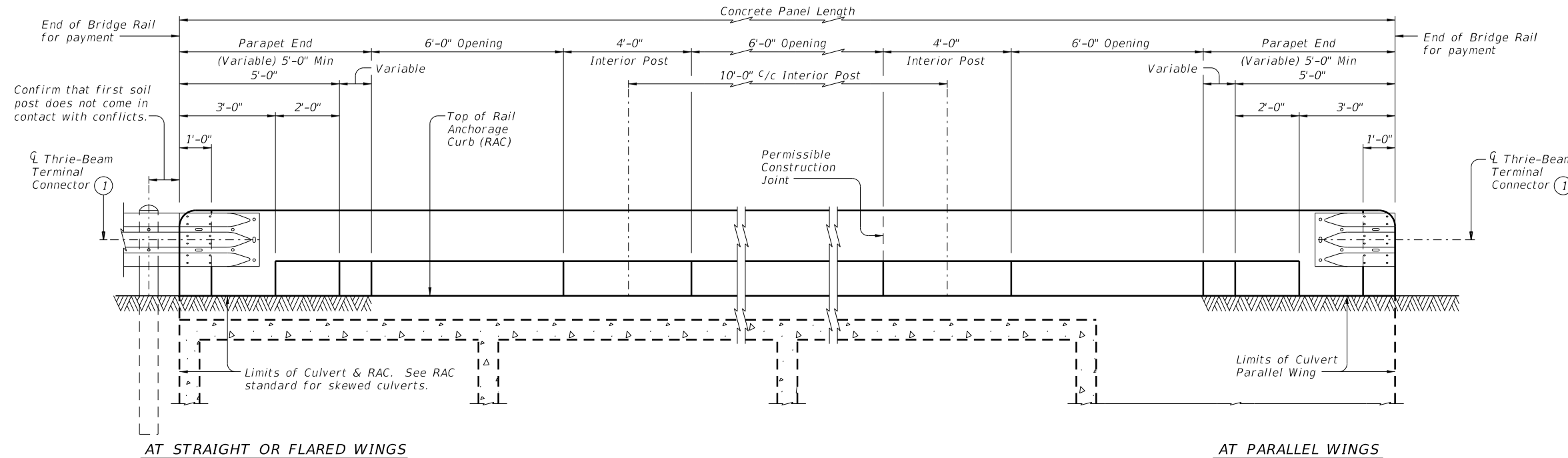
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DATE:  
FILE:



**ROADWAY ELEVATION OF RAIL ON BRIDGE**



**ROADWAY ELEVATION OF RAIL ON BOX CULVERTS**

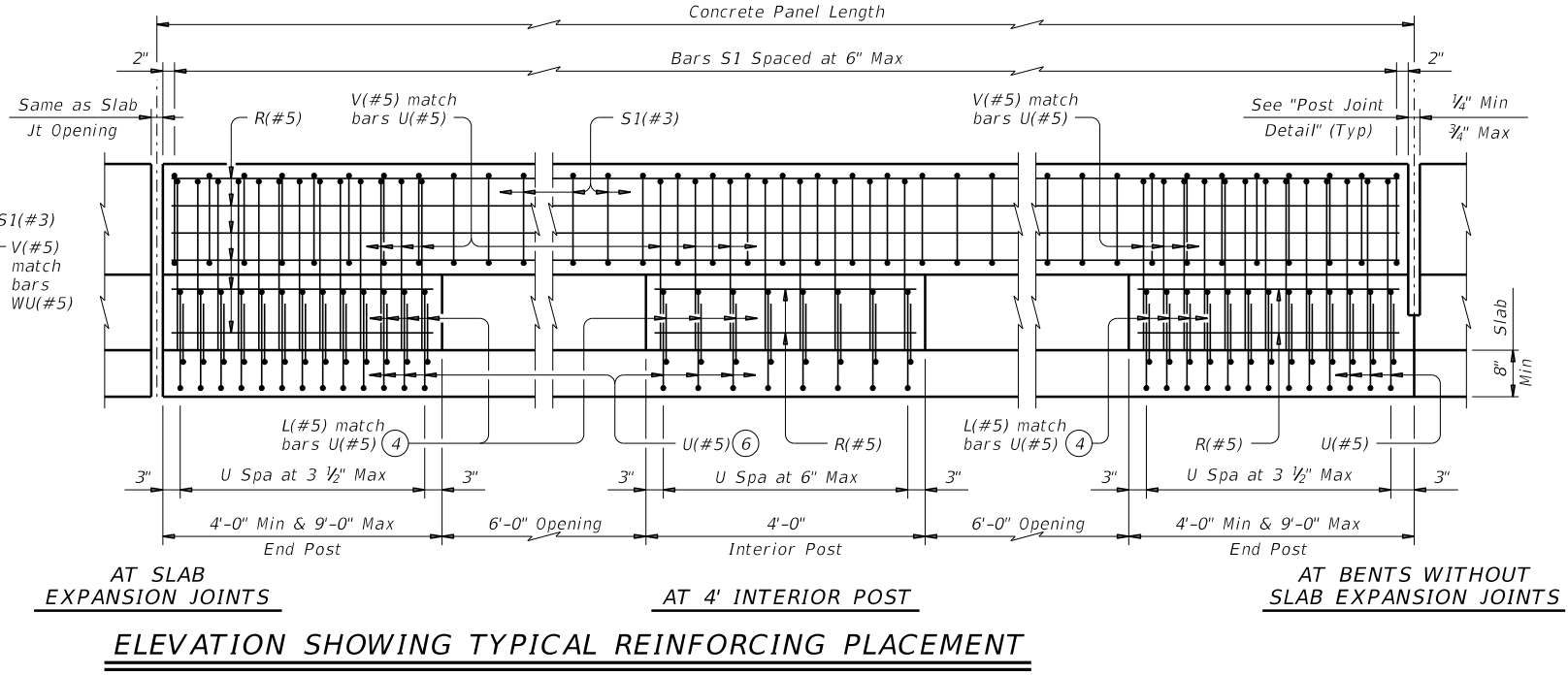
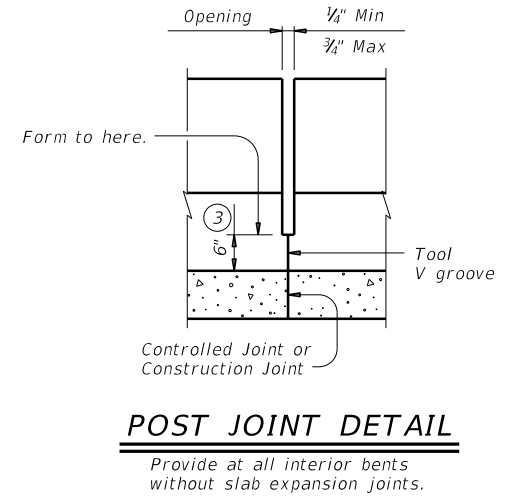
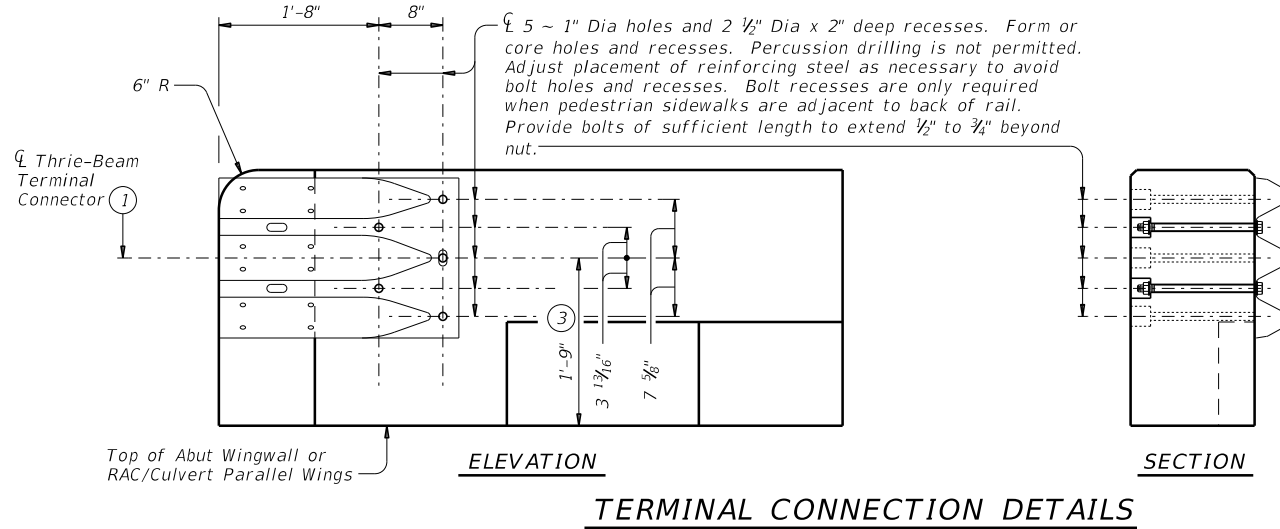
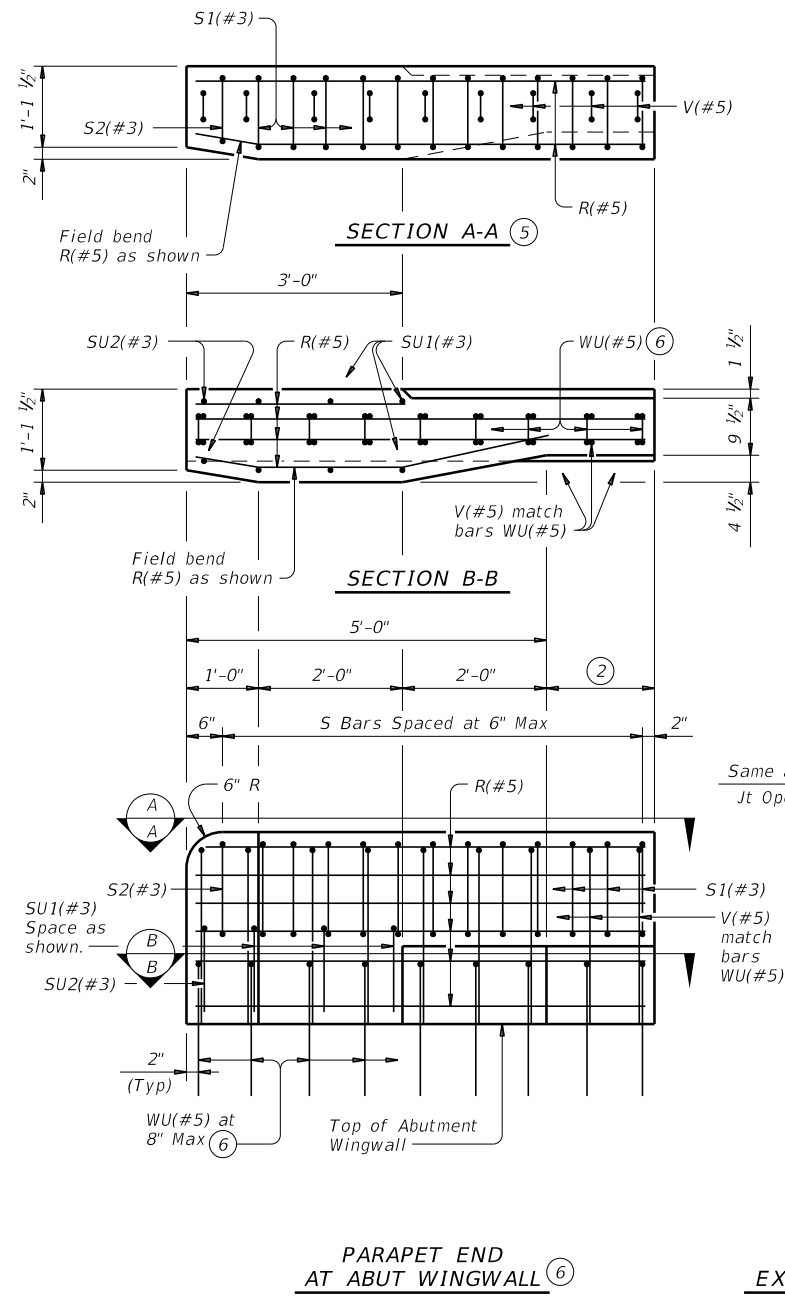
Showing 0° skew culvert. Skewed culverts similar. See RAC standard for details not shown. Vertical joints in concrete rail are not required, unless shown elsewhere.

- 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: 0456	SECT: 02	JOB: 028.ETC	HIGHWAY: FM 27	
REVISIONS		DIST: BRY	COUNTY: FREESTONE	SHEET NO: 121	

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DATE: FILE:



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.

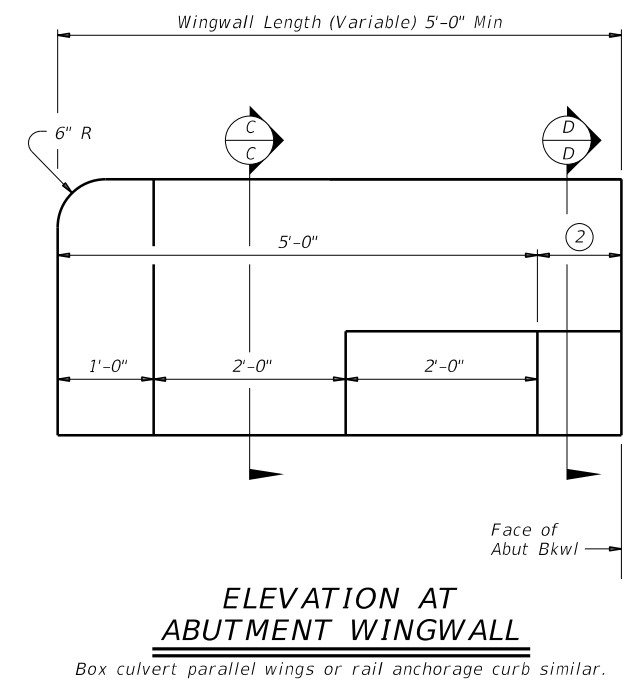
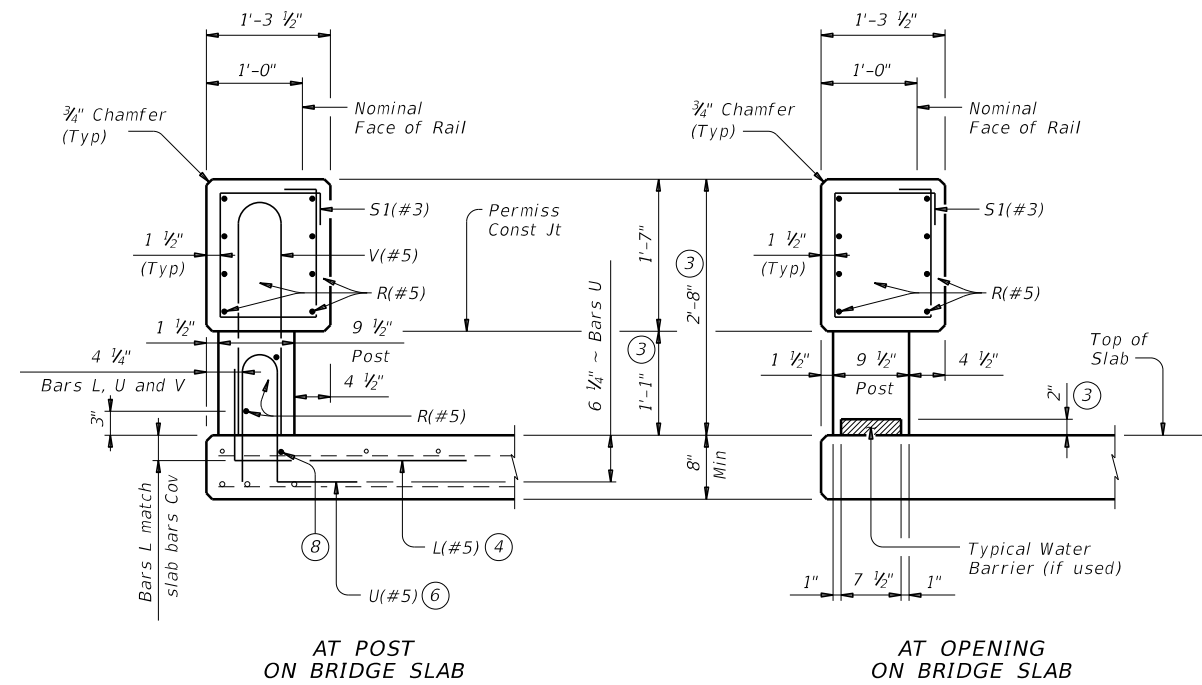
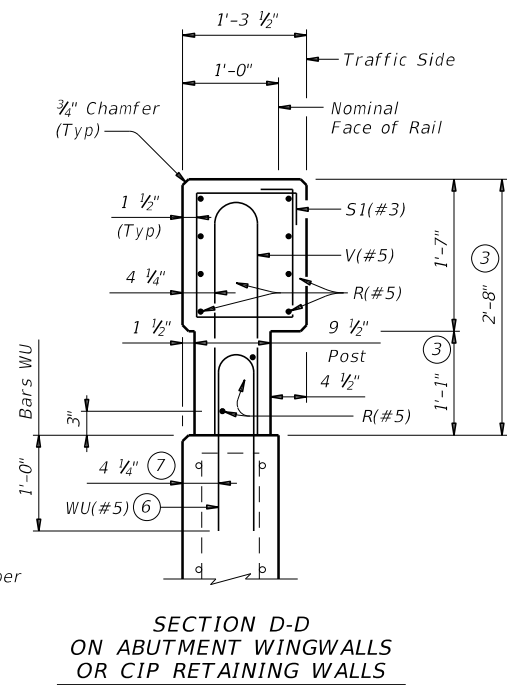
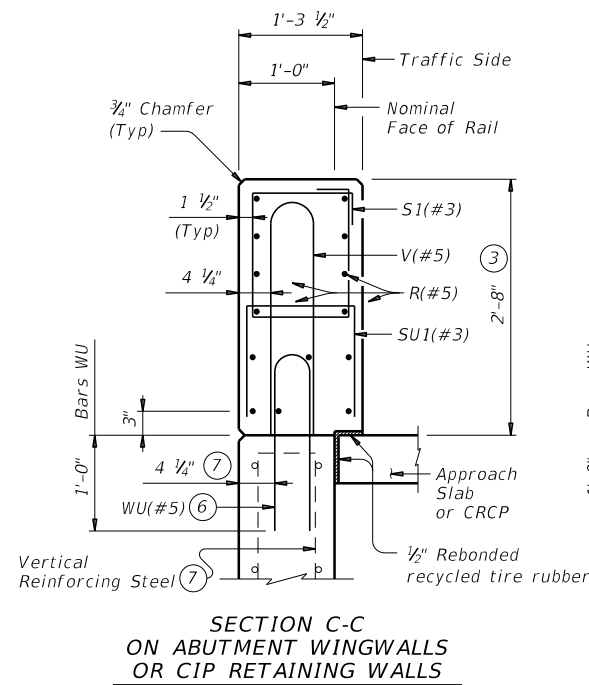
TRAFFIC RAIL

TYPE T223

FILE: r1std005-19.dgn	DN: TxDOT	CK: TxDOT	DW: JTR	CK: AES
©TxDOT September 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0456	02	028.ETC	FM 27
DIST	COUNTY		SHEET NO.	
BRY	FREESTONE		122	

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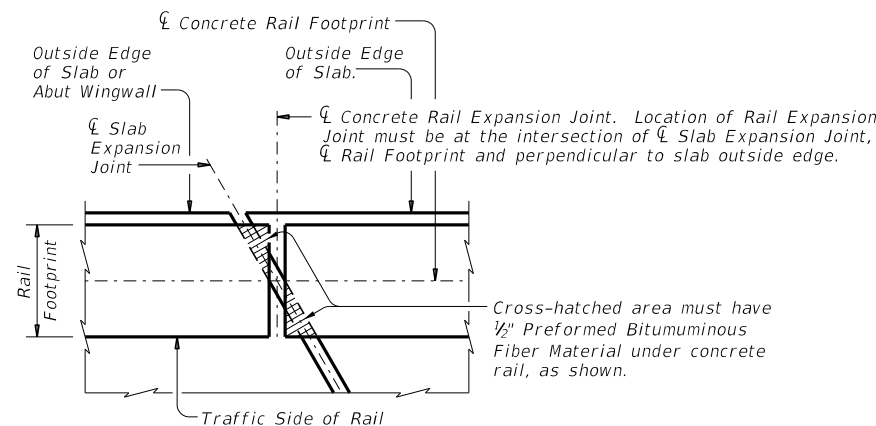
DATE: FILE:



**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.

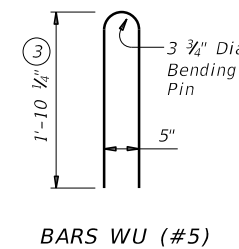
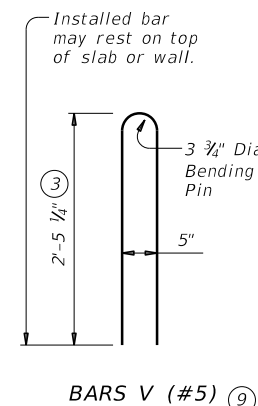
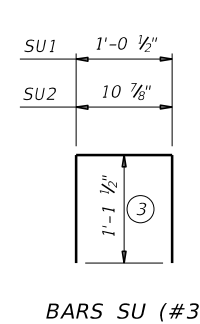
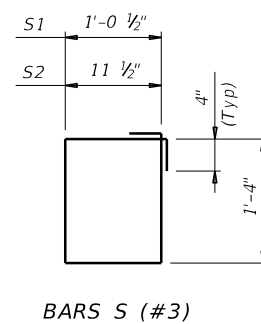
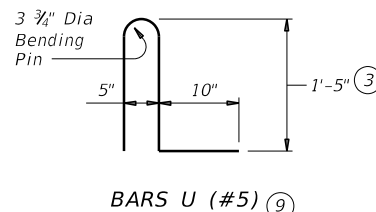
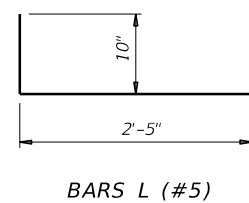
**MATERIAL NOTES:**

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:**

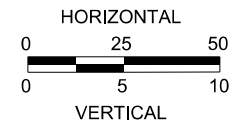
This rail has been evaluated by full-scale crash test to meet MASH TL-3 criteria. This rail can be used for speeds of 50 mph and greater when a TL-3 rated guard fence transition is used. When a TL-2 rated guard fence transition is used, this rail can be used for speeds of 45 mph and less.  
Do not use 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.

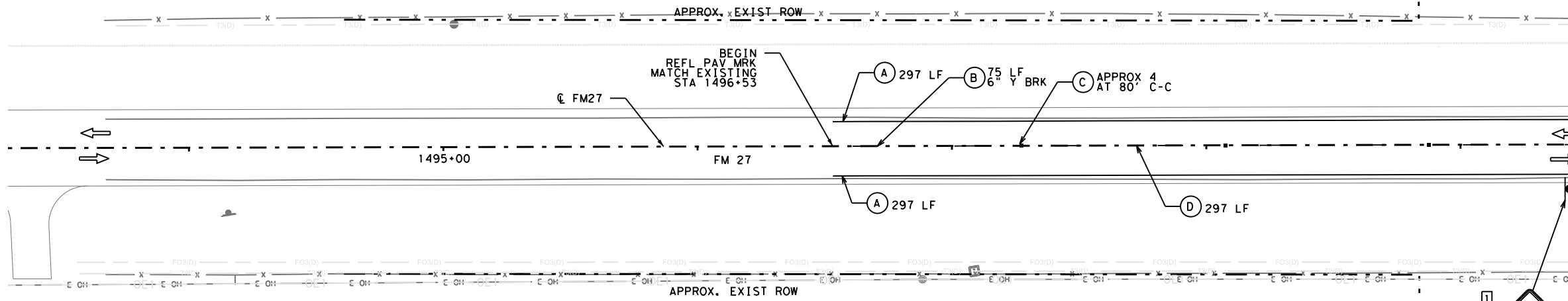


		<b>Bridge Division Standard</b>	
<h1>TRAFFIC RAIL</h1>			
<h2>TYPE T223</h2>			
FILE: r1std005-19.dgn	DN: TxDOT	CK: TxDOT	DW: JTR
©TxDOT September 2019	CONT	SECT	JOB
REVISIONS	0456	02	028.ETC
	DIST	COUNTY	SHEET NO.
	BRY	FREESTONE	123

QUANTITY SUMMARY			
ID	ITEM CODE	DESCRIPTION	QTY
A	666	6343 REF PROF PAV MRK TY I (W) 6" (SLD) (100MIL)	LF 1794
B	666	6347 REF PROF PAV MRK TY I (Y) 6" (SLD) (100MIL)	LF 744
C	672	6009 REFL PAV MRKR TY II-A-A	EA 18
D	533	6002 RUMBLE STRIPS (CENTERLINE)	LF 897
	678	6002 PAV SURF PREP FOR MRK (6")	LF 2538



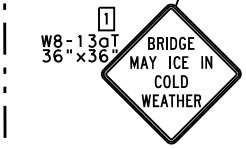
MATCH LINE STA 1499+50.00



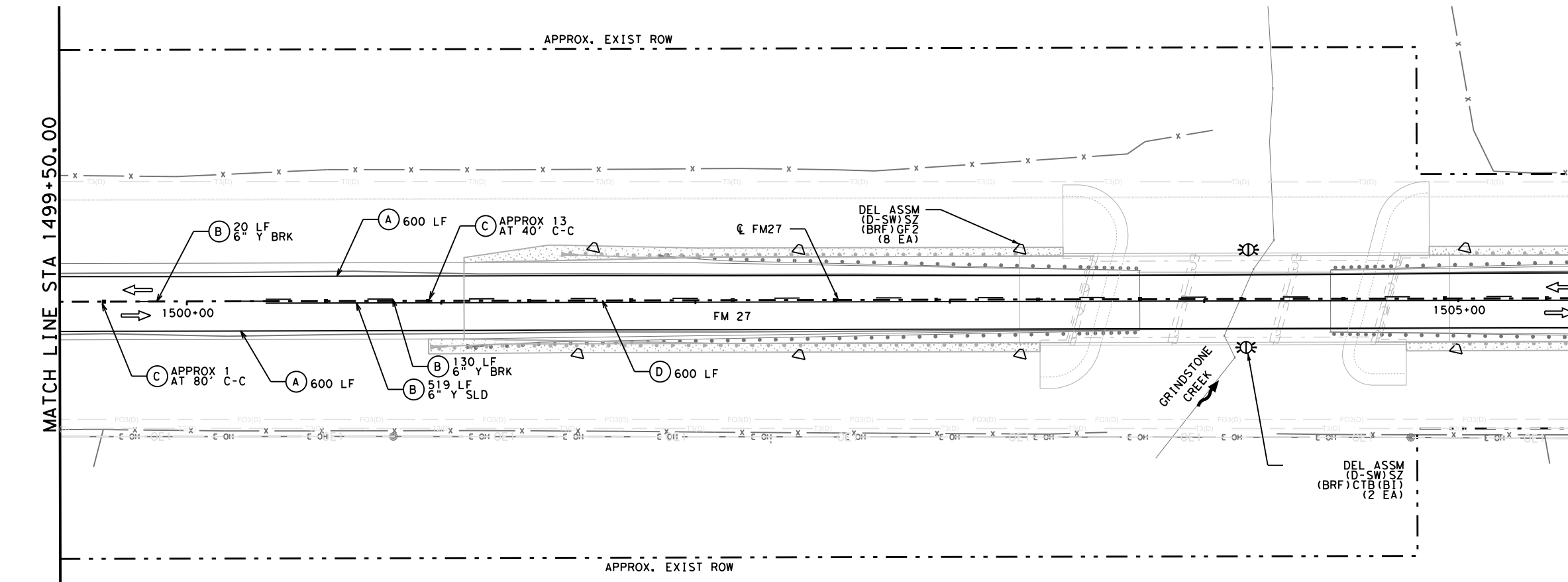
- NOTES:
- CONTRACTOR TO REFER TO D&OM(5)-20 FOR OBJECT MARKER PLACEMENT AND SPACING.

**LEGEND**

- DIRECTION OF TRAFFIC
- DIRECTION OF CREEK FLOW
- TYPE CTB DELINEATOR
- TYPE GF2 DELINEATOR
- SMALL SIGN
- SOSS IDENTIFIER
- STRIPING QUANTITY



MATCH LINE STA 1505+50.00



*Emily Weigand*



PRINT DATE	REVISION DATE
4/25/2023	

**Jacobs** 2705 BEE CAVE RD, SUITE 300  
AUSTIN TX 78746  
FIRM REGISTRATION F-2966

Texas Department of Transportation ©2023  
Bryan District

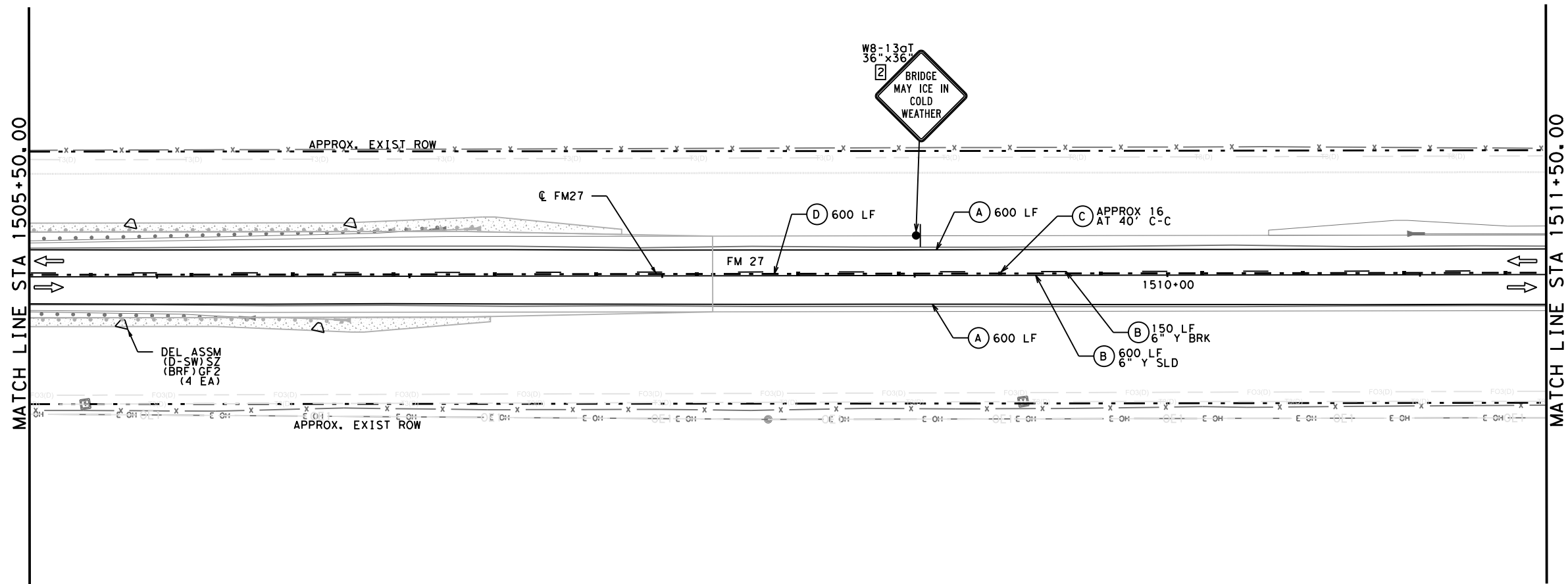
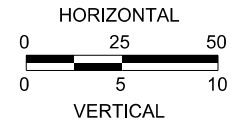
**SIGNS AND OBJECT MARKERS  
FM 27 AT GRINDSTONE CREEK**

SHEET 1 OF 4 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER	
6	BR 2023(408),ETC.	FM 27	
STATE	DISTRICT	COUNTY	
TEXAS	BRY	FREESTONE	
CONTROL	SECTION	JOB	SHEET NO.
0456	02	028,ETC	124

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4/25/2023 1:13:11 PM

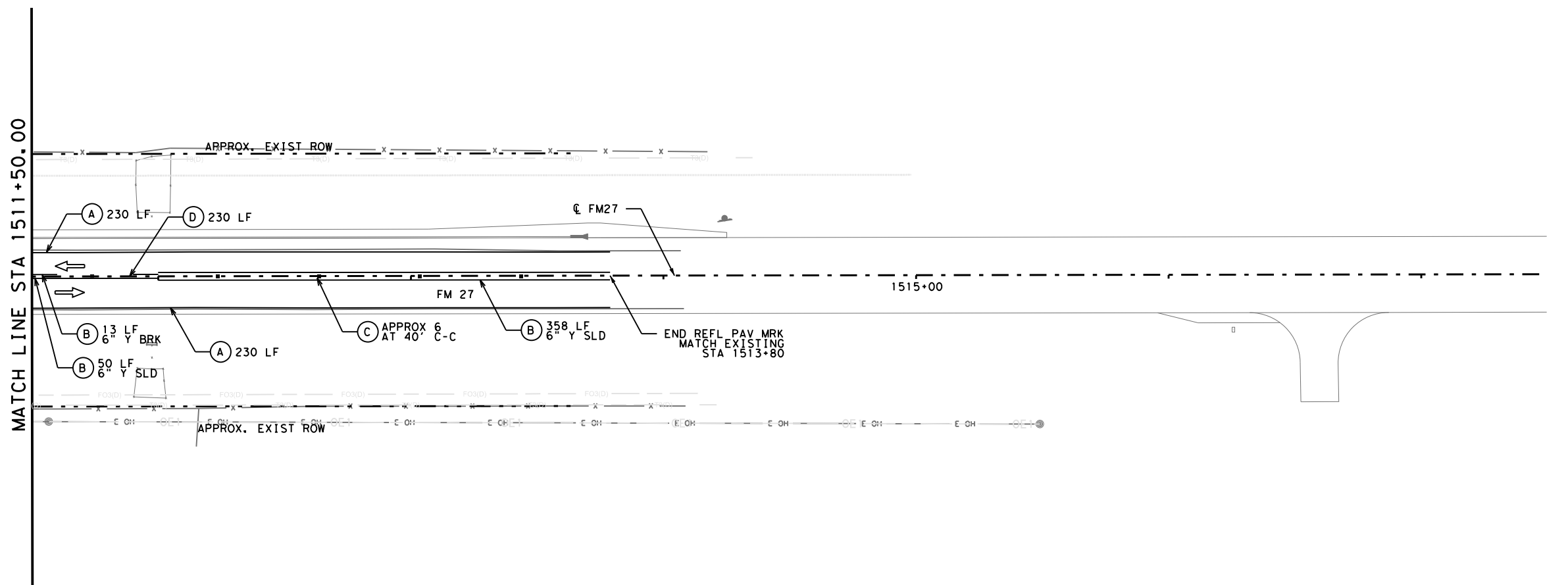
QUANTITY SUMMARY			
ID	ITEM CODE	DESCRIPTION	QTY
A	666	6343 REF PROF PAV MRK TY I (W) 6" (SLD) (100MIL)	LF 1660
B	666	6347 REF PROF PAV MRK TY I (Y) 6" (SLD) (100MIL)	LF 1171
C	672	6009 REFL PAV MRKR TY II-A-A	EA 22
D	533	6002 RUMBLE STRIPS (CENTERLINE)	LF 830
	678	6002 PAV SURF PREP FOR MRK (6")	LF 2831



NOTES:  
1. CONTRACTOR TO REFER TO D&OM(5)-20 FOR OBJECT MARKER PLACEMENT AND SPACING.

**LEGEND**

- DIRECTION OF TRAFFIC
- DIRECTION OF CREEK FLOW
- TYPE CTB DELINEATOR
- TYPE GF2 DELINEATOR
- SMALL SIGN
- SOSS IDENTIFIER
- STRIPING QUANTITY



*Emily Weigand*



PRINT DATE	REVISION DATE
4/25/2023	

**Jacobs** 2705 BEE CAVE RD, SUITE 300  
AUSTIN TX 78746  
FIRM REGISTRATION F-2966



**SIGNS AND OBJECT MARKERS  
FM 27 AT GRINDSTONE CREEK**

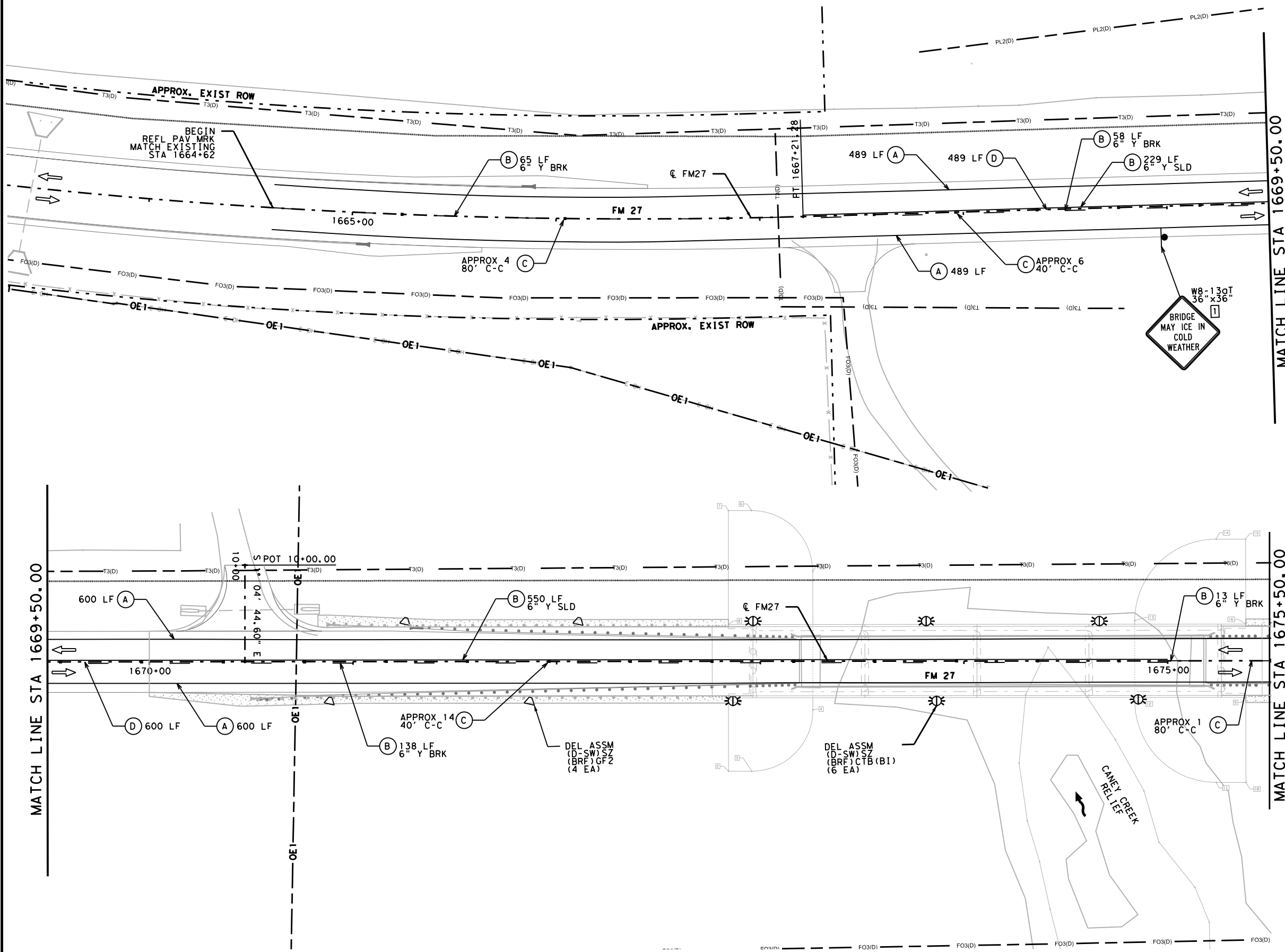
SHEET 2 OF 4 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER	
6	BR 2023(408),ETC.	FM 27	
STATE	DISTRICT	COUNTY	
TEXAS	BRY	FREESTONE	
CONTROL	SECTION	JOB	SHEET NO.
0456	02	028,ETC	125

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4/25/2023 1:13:19 PM



QUANTITY SUMMARY			
ID	ITEM CODE	DESCRIPTION	QTY
A	666	6343 REF PROF PAV MRK TY I (W) 6" (SLD) (100MIL)	LF 2178
B	666	6347 REF PROF PAV MRK TY I (Y) 6" (SLD) (100MIL)	LF 1053
C	672	6009 REFL PAV MRKR TY II-A-A	EA 25
D	533	6002 RUMBLE STRIPS (CENTERLINE)	LF 1089
	678	6002 PAV SURF PREP FOR MRK (6")	LF 3231



- NOTES:
- CONTRACTOR TO REFER TO D&OM(5)-20 FOR OBJECT MARKER PLACEMENT AND SPACING.

**LEGEND**

- DIRECTION OF TRAFFIC
- DIRECTION OF CREEK FLOW
- TYPE CTB DELINEATOR
- TYPE GF2 DELINEATOR
- SMALL SIGN
- SOSS IDENTIFIER
- STRIPING QUANTITY

*Emily Weigand*



PRINT DATE	REVISION DATE
4/25/2023	

**Jacobs** 2705 BEE CAVE RD, SUITE 300  
AUSTIN TX 78746  
FIRM REGISTRATION F-2966



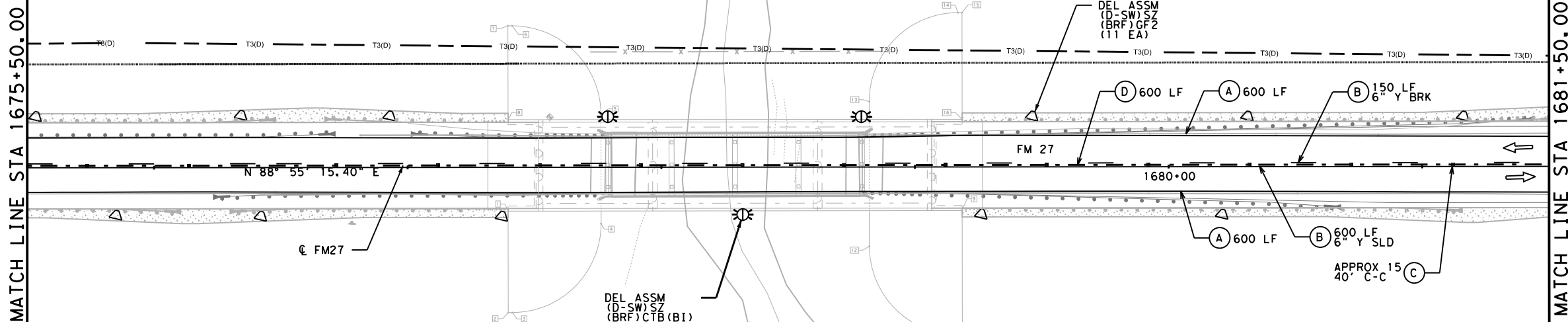
**SIGNS AND OBJECT MARKERS  
FM 27 AT CANEY CREEK RELIEF,  
CANEY CREEK**

SHEET 3 OF 4 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER	
6	BR 2023(408),ETC.	FM 27	
STATE	DISTRICT	COUNTY	
TEXAS	BRY	FREESTONE	
CONTROL	SECTION	JOB	SHEET NO.
0456	02	028,ETC	126

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4/25/2023 1:13:35 PM

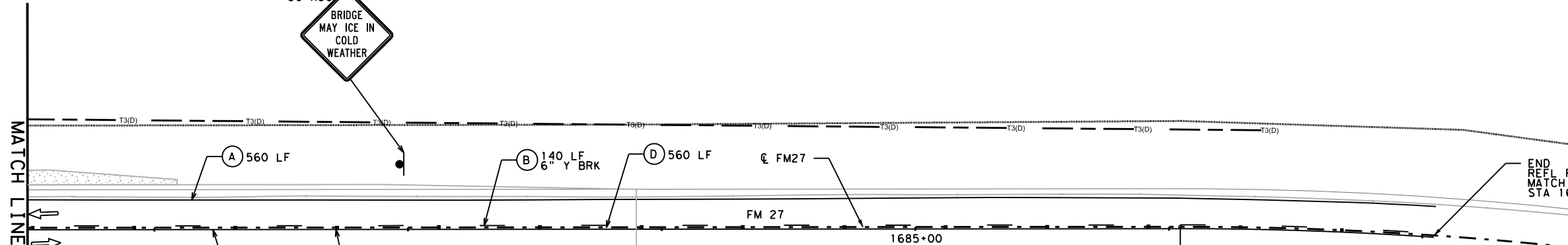
QUANTITY SUMMARY			
ID	ITEM CODE	DESCRIPTION	QTY
A	666	6343 REF PROF PAV MRK TY I (W) 6" (SLD) (100MIL)	LF 2320
B	666	6347 REF PROF PAV MRK TY I (Y) 6" (SLD) (100MIL)	LF 1450
C	672	6009 REFL PAV MRKR TY II-A-A	EA 29
D	533	6002 RUMBLE STRIPS (CENTERLINE)	LF 1160
	678	6002 PAV SURF PREP FOR MRK (6")	LF 3770



- NOTES:
- CONTRACTOR TO REFER TO D&OM(5)-20 FOR OBJECT MARKER PLACEMENT AND SPACING.

**LEGEND**

- DIRECTION OF TRAFFIC
- DIRECTION OF CREEK FLOW
- TYPE CTB DELINEATOR
- TYPE GF2 DELINEATOR
- SMALL SIGN
- SOSS IDENTIFIER
- STRIPING QUANTITY



*Emily Weigand*



PRINT DATE	REVISION DATE
4/25/2023	

**Jacobs** 2705 BEE CAVE RD, SUITE 300  
AUSTIN TX 78746  
FIRM REGISTRATION F-2966

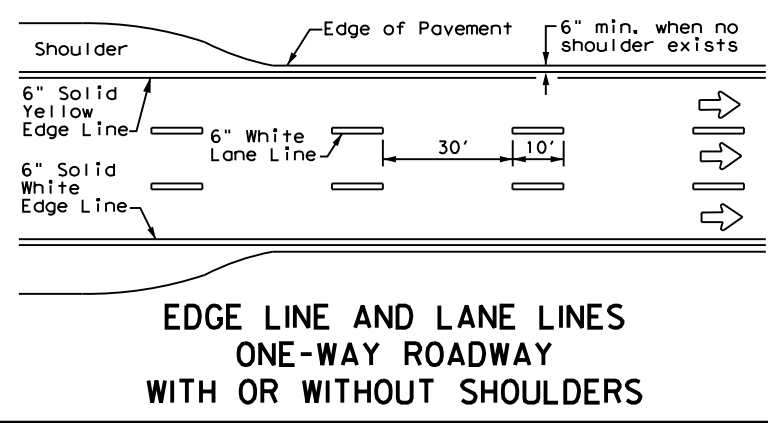
Texas Department of Transportation ©2023  
Bryan District

**SIGNS AND OBJECT MARKERS  
FM 27 AT CANEY CREEK RELIEF,  
CANEY CREEK**  
SHEET 4 OF 4 SHEETS

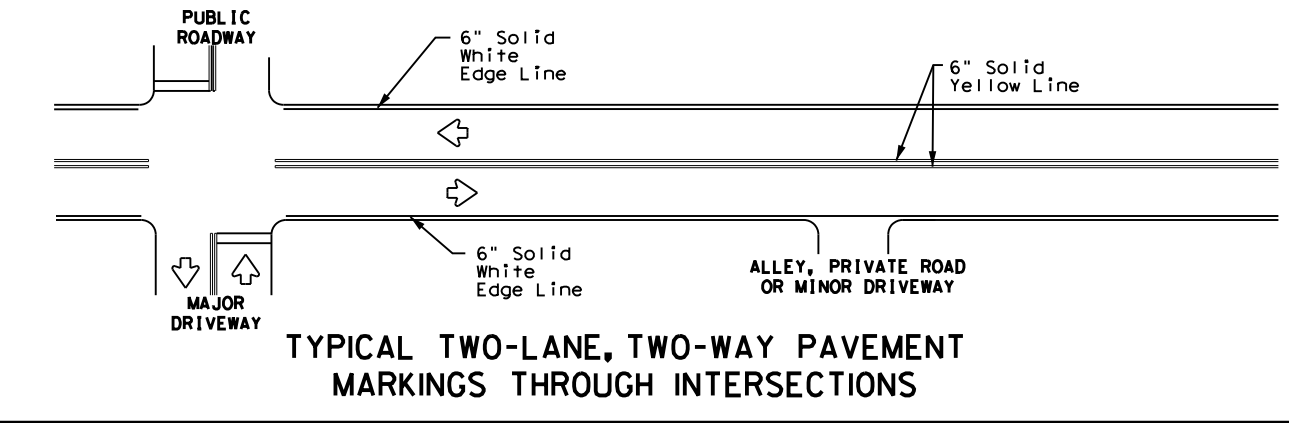
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STATE	DISTRICT	COUNTY	
TEXAS	BRY	FREESTONE	
CONTROL	SECTION	JOB	SHEET NO.
0456	02	028,ETC	127

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4/25/2023 1:13:47 PM

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 units or for the use of this standard in any project.



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

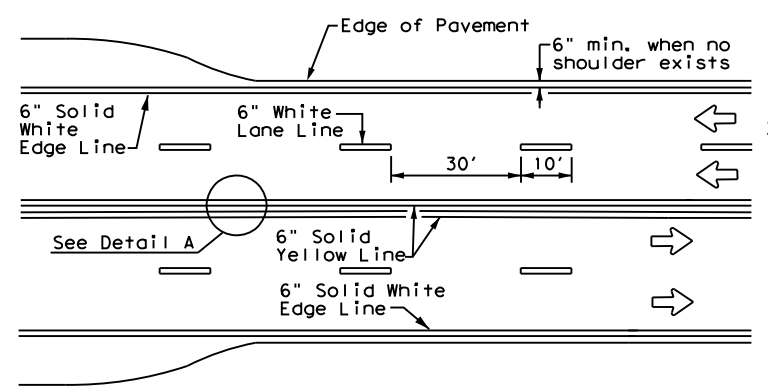


**TYPICAL TWO-LANE, TWO-WAY PAVEMENT  
MARKINGS THROUGH INTERSECTIONS**

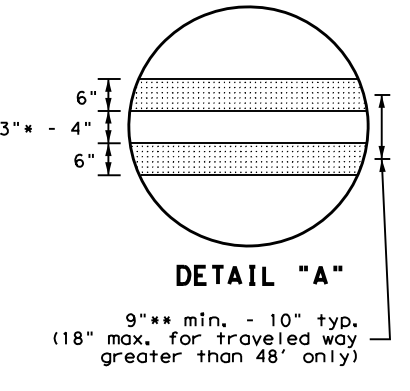
- GENERAL NOTES**
- Edge line striping shall be as shown in the plans or as directed by the Engineer. The edge line should not be placed less than 6 inches from the edge of pavement. This distance may vary due to pavement raveling or other conditions. Edge lines are not required in curb and gutter sections of roadways.
  - The traveled way includes only that portion of the roadway used for vehicular travel. It does not include the parking lanes, sidewalks, berms and shoulders. The traveled ways shall be measured from the center of edge line to the center of edge line of a two lane roadway.

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

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

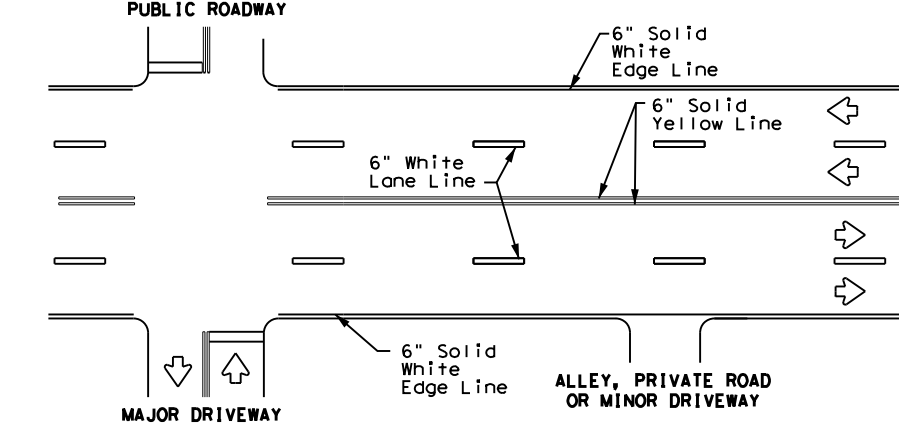


**CENTERLINE AND LANE LINES  
FOUR LANE TWO-WAY ROADWAY  
WITH OR WITHOUT SHOULDERS**

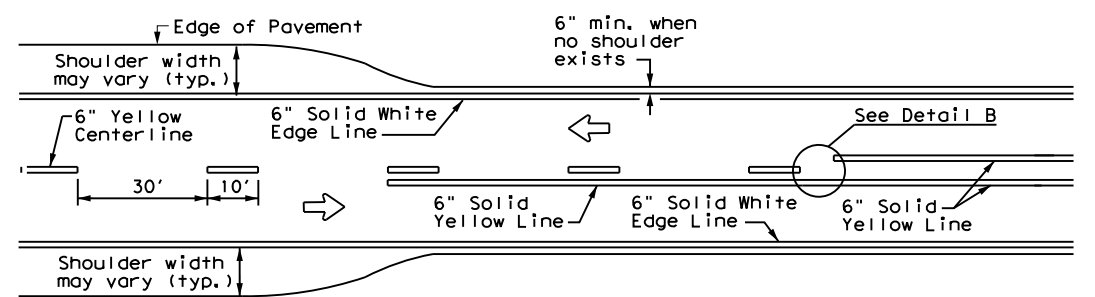


**DETAIL "A"**  
 9" min. - 10" typ.  
 (18" max. for traveled way greater than 48' only)

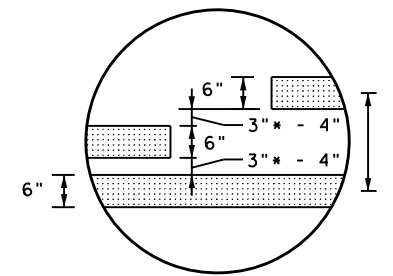
\* 2" minimum for restripe projects when approved by the Engineer.  
 \*\* 8" minimum for restripe projects when approved by the Engineer.



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

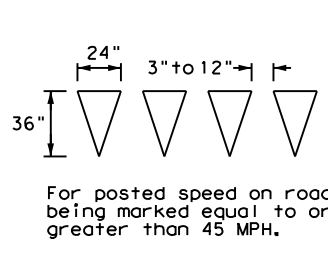


**TWO LANE TWO-WAY ROADWAY  
WITH OR WITHOUT SHOULDERS**



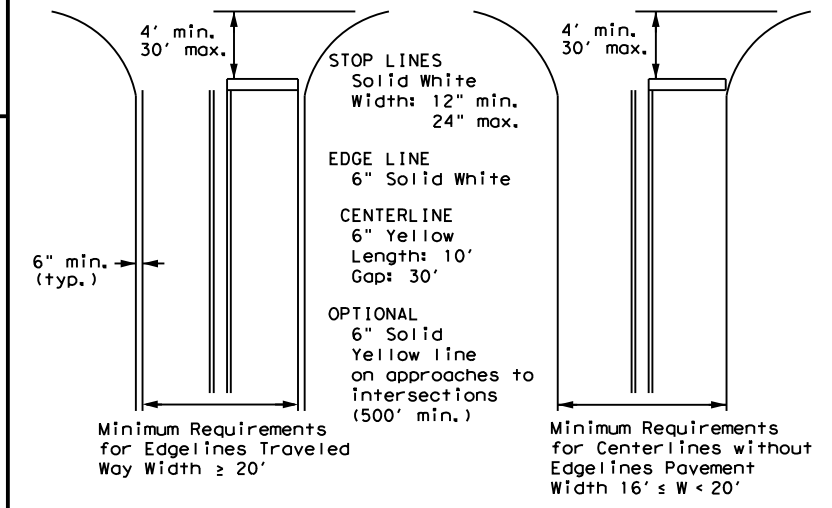
**DETAIL "B"**  
 18" min. - 20" max.  
 (16" minimum for restripe projects when approved by the Engineer.)

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



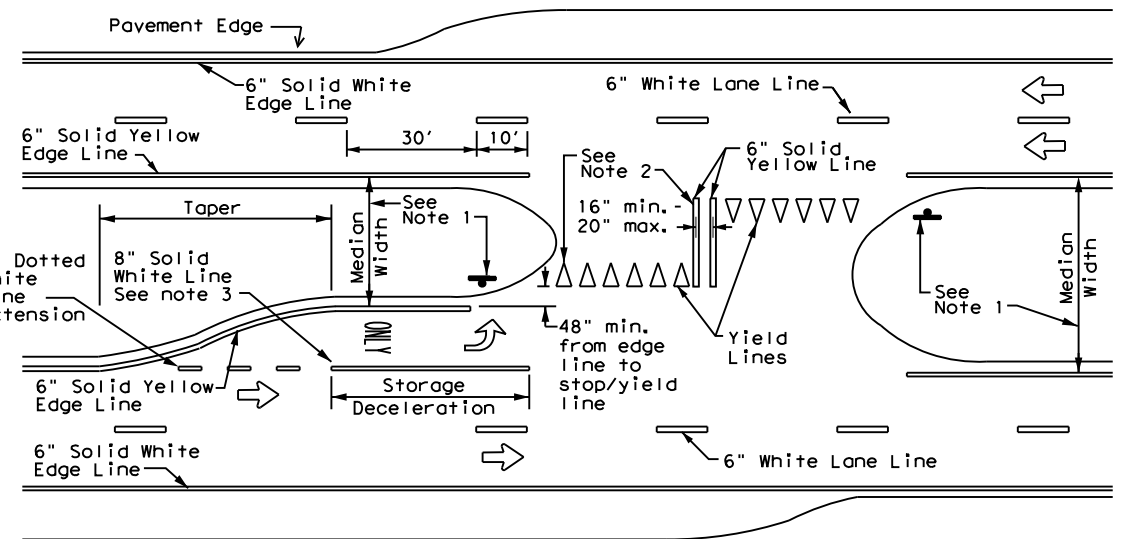
**YIELD LINES**

For posted speed on road being marked equal to or greater than 45 MPH.



NOTE: Traveled way is exclusive of shoulder widths. Refer to General Note 2 for additional details.

**GUIDE FOR PLACEMENT OF STOP LINES,  
EDGE LINE & CENTERLINE**  
 Based on Traveled Way and Pavement Widths for Undivided Roadways



**FOUR LANE DIVIDED ROADWAY CROSSOVERS**

**NOTES**

- Where divided highways are separated by median widths at the median opening itself of 30 feet or more, median openings shall be signed as two separate intersections. Each median opening has two width measurements, with one measurement for each approach. The narrow median width will be the controlling width to determine if signs are required. Yield signs are the typical intersection control. Stop signs and stop bars are optional as determined by the Engineer.
- Install median striping (double yellow centerlines and stop lines/yield lines) when a 50' or greater median centerline can be placed. Stop lines shall only be used with stop signs. Yield lines shall only be used with yield signs.
- Length of turn bays, including taper, deceleration, and storage lengths shall be as shown on the plans or as directed by the Engineer.



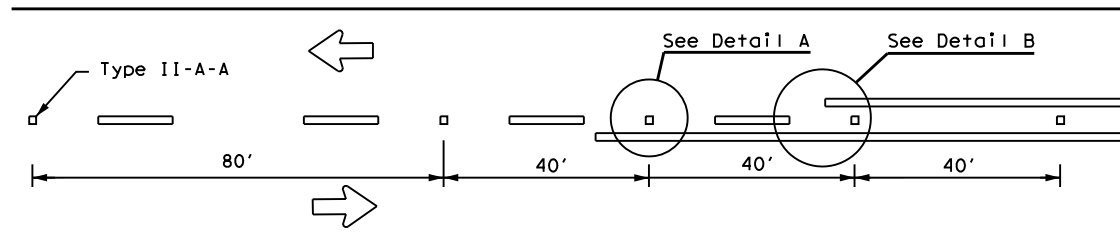
**TYPICAL STANDARD  
PAVEMENT MARKINGS**

**PM(1)-22**

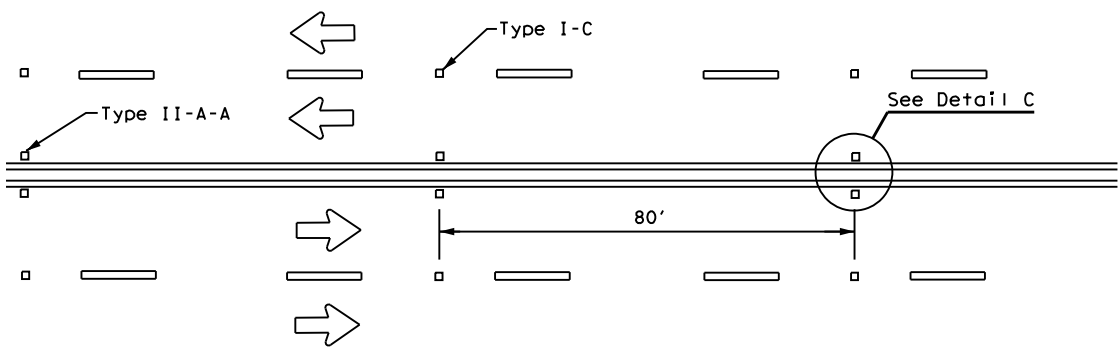
FILE: pml-22.dgn	DN:	CK:	DW:	CK:
© TxDOT December 2022	CONT	SECT	JOB	HIGHWAY
REVISIONS	0456	02	028, ETC	FM 27
11-78 8-00 6-20	DIST	COUNTY	SHEET NO.	
8-95 3-03 12-22	BRY	FREESTONE	128	
5-00 2-12				

# REFLECTIVE RAISED PAVEMENT MARKERS FOR VEHICLE POSITIONING GUIDANCE

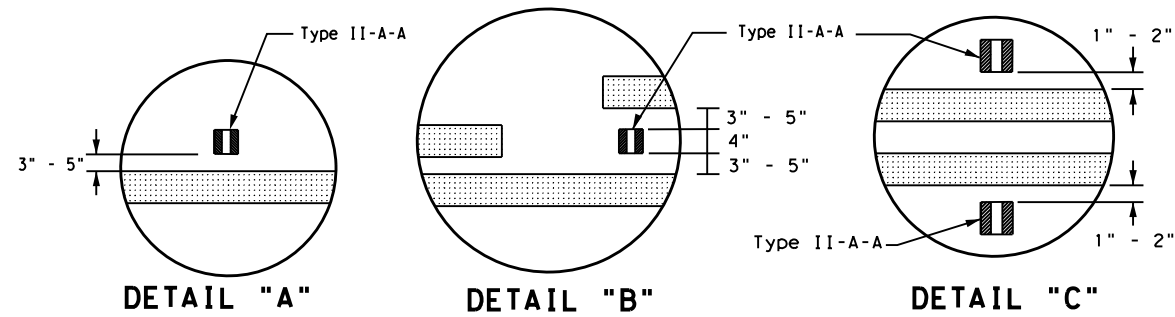
DISCLAIMER: The use of this standard is governed by the "Texas Engineering Practice Act". No warranty of any kind is made by TxDOT for any purpose whatsoever. TxDOT assumes no responsibility for the conversion of units or for the use of this standard in any project. This standard is subject to change without notice.



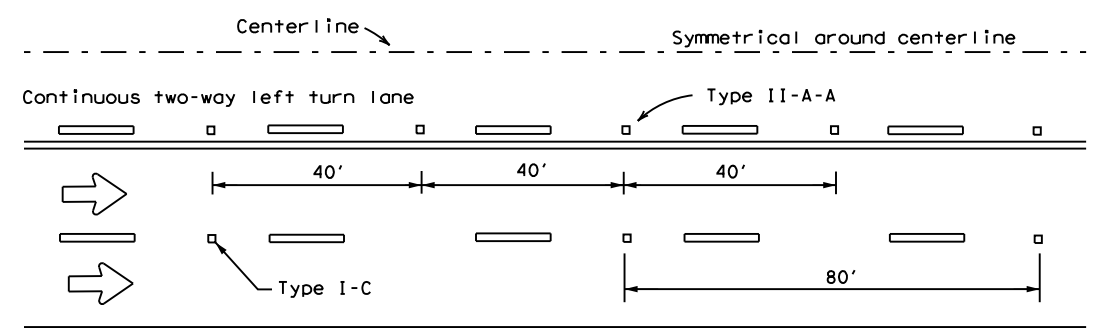
**CENTERLINE FOR ALL TWO LANE TWO-WAY ROADWAYS**



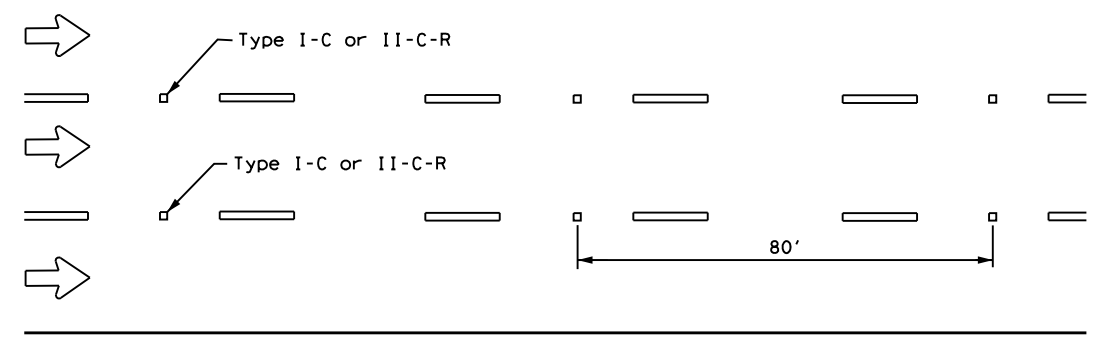
**CENTERLINE & LANE LINES  
FOR FOUR LANE TWO-WAY ROADWAYS**



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

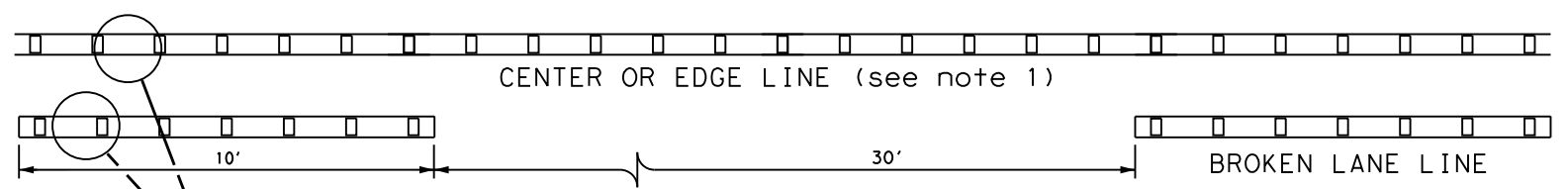


**CENTERLINE AND LANE LINES FOR TWO-WAY LEFT TURN LANE**

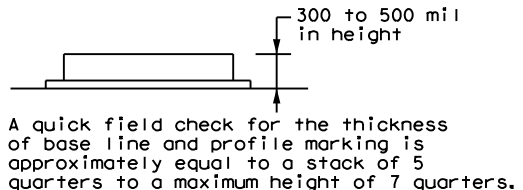


**LANE LINES FOR ONE-WAY ROADWAY (NON-FREEWAY FACILITIES)**

Raised pavement markers Type II-C-R shall have clear face toward normal traffic and red face toward wrong-way traffic.  
 See Note 3.



**REFLECTORIZED PROFILE  
PATTERN DETAIL**  
USING REFLECTIVE PROFILE PAVEMENT MARKINGS



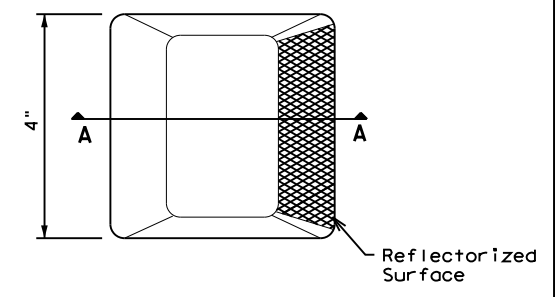
- NOTES**
- Edge lines should typically be 6" wide and the materials shall be specified in the plans.
  - Profile markings shall not be placed on roadways with a posted speed limit of 45 MPH or less.

**GENERAL NOTES**

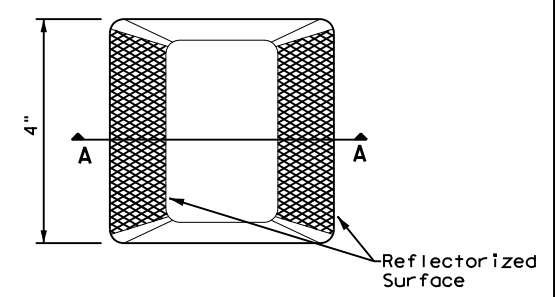
- All raised pavement markers placed along broken lines shall be placed in line with and midway between the stripes.
- On concrete pavements the raised pavement markers should be placed to one side of the longitudinal joints.
- Use raised pavement marker Type I-C with undivided roadways, flush medians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

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

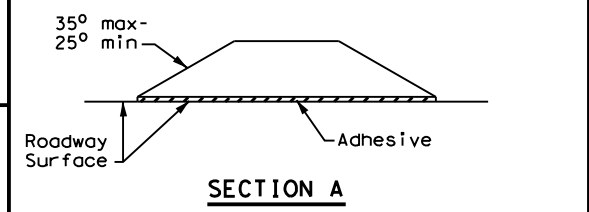
All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.



**Type I (Top View)**



**Type II (Top View)**



**SECTION A**

**RAISED PAVEMENT MARKERS**



**POSITION GUIDANCE USING  
RAISED MARKERS  
REFLECTORIZED PROFILE  
MARKINGS  
PM(2) - 22**

FILE: pm2-22.dgn	DWG:	CHK:	DWG:	CHK:
© TxDOT December 2022	CONT	SECT	JOB	HIGHWAY
REVISIONS	0456	02	028, ETC	FM 27
4-77 8-00 6-20	DIST	COUNTY	SHEET NO.	
4-92 2-10 12-22	BRY	FREESTONE	129	
5-00 2-12				

DATE: 4/25/2023 1:14:12 PM  
 FILE: \\Project\wise\AMER\_jacobs.com\Jacobs\_US\_B\_I\_SS4\Documents\WJXN4000\_BFR\T1P1\_154341.dwg  
 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 units or the use of any information from its use.

REFLECTOR UNIT SIZES FOR DELINEATORS AND OBJECT MARKERS					DELINEATORS				D & OM DESCRIPTIVE CODES																										
DEVICE	SIZE 1	SIZE 2	SIZE 3	SIZE 4	DEVICE	SINGLE		DOUBLE		INSTL DEL ASSM (D-XX)SZ X (XXXX)XXX (XX) NUMBER OF REFLECTORS S = Single D = Double COLOR OF REFLECTORS W = White Y = Yellow R = Red REFLECTOR UNIT SIZE 1 or 2 TYPE OF POST OR DELINEATOR WC = Wing Channel Post YFLX = Yellow Flexible Post WFLX = White Flexible Post BRFL = Barrier Reflector TYPE OF MOUNT GND = Embedded (drivable or set in concrete) CTB = Concrete Barrier Mount GF1 or GF2 = Guard Fence Attachment SRF = Surface Mount DIRECTION If Required BI = Bi-Directional BR = Bi-Directional with red on back																									
	SHEETING: Yellow, White or Red Type B or C reflective sheeting					1-Size 2 reflector unit		1-Size 1 reflector unit			2-Size 2 reflector units		2-Size 1 reflector units																						
NOTE					SHEETING: Yellow, White or Red Type B or C Reflective Sheeting					POST TYPE: WC, YFLX, WFLX		MOUNT TYPE: GND, SRF																							
1. Size 1 and 4 - Direct applied reflective sheeting for use on flexible post (fix). 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.												INSTL OM ASSM (OM-XX) (XXXX)XXX (XX) TYPE OF OBJECT MARKER 1, 2, 3, or 4 NUMBER OF REFLECTORS OR DIRECTION X = 3-Size 2 reflector unit (Type 2 only) Y = 1-Size 3 reflector unit (Type 2 only) Z = 3-Size 1 or 1-Size 4 reflector unit (Type 2 only) L = Left Side (Type 3 Object Marker only) R = Right Side (Type 3 Object Marker only) C = Center (Type 3 Object Marker only) TYPE OF POST WC = Wing Channel Post WFLX = White Flexible Post TWT = Thin Walled Tubing TYPE OF MOUNT GND = Embedded (drivable) SRF = Surface Mount WAS = Wedge Anchor Steel WAP = Wedge Anchor Plastic DIRECTION If Required BI = Bi-Directional																							
OBJECT MARKERS																																			
DEVICE	Type 1 (OM-1)	Type 2 (OM-2)			Type 3 (OM-3)			Type 4 (OM-4)		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																									
	OM-1	OM-2X	OM-2Y	OM-2Z	OM-3L	OM-3R	OM-3C	OM-4																											
SHEETING: Yellow-Type B <sub>FL</sub> or C <sub>FL</sub> Sheeting																																			
POST TYPE: TWT, WC, WFLX, WAS, WAP																																			
MOUNT TYPE: WAS, WAP, GND, SRF																																			
BARRIER REFLECTORS (BRF)				CHEVRONS				ONE DIRECTION LARGE ARROW			NOTE: Delineator and object marker substrates and sign substrates shall be 0.080" Aluminum sign blank to conform to ASTM B-209 Alloy 6061-T6 or approved alternative.																								
DEVICE	GF1	GF2	CTB	DEVICE	W1-8			DEVICE	W1-6																										
	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)																						
SHEETING: Yellow, White, Red				MOUNTING HEIGHT: 4'-0" or 7'-0"				MOUNTING HEIGHT: 7'-0" Only																											
NOTE				NOTE				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).																							
<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td>FILE: dom1-20.dgn</td> <td>DN: TxDOT</td> <td>CK: TxDOT</td> <td>DW: TxDOT</td> <td>CK: TxDOT</td> </tr> <tr> <td>© TxDOT August 2004</td> <td>CONT</td> <td>SECT</td> <td>JOB</td> <td>HIGHWAY</td> </tr> <tr> <td>REVISIONS</td> <td>0456</td> <td>02</td> <td>028, ETC</td> <td>FM 27</td> </tr> <tr> <td>10-09 3-15</td> <td>DIST</td> <td>COUNTY</td> <td colspan="2">SHEET NO.</td> </tr> <tr> <td>4-10 7-20</td> <td>BRY</td> <td>FREESTONE</td> <td colspan="2">130</td> </tr> </table>											FILE: dom1-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT	© TxDOT August 2004	CONT	SECT	JOB	HIGHWAY	REVISIONS	0456	02	028, ETC	FM 27	10-09 3-15	DIST	COUNTY	SHEET NO.		4-10 7-20	BRY	FREESTONE	130	
FILE: dom1-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT																															
© TxDOT August 2004	CONT	SECT	JOB	HIGHWAY																															
REVISIONS	0456	02	028, ETC	FM 27																															
10-09 3-15	DIST	COUNTY	SHEET NO.																																
4-10 7-20	BRY	FREESTONE	130																																

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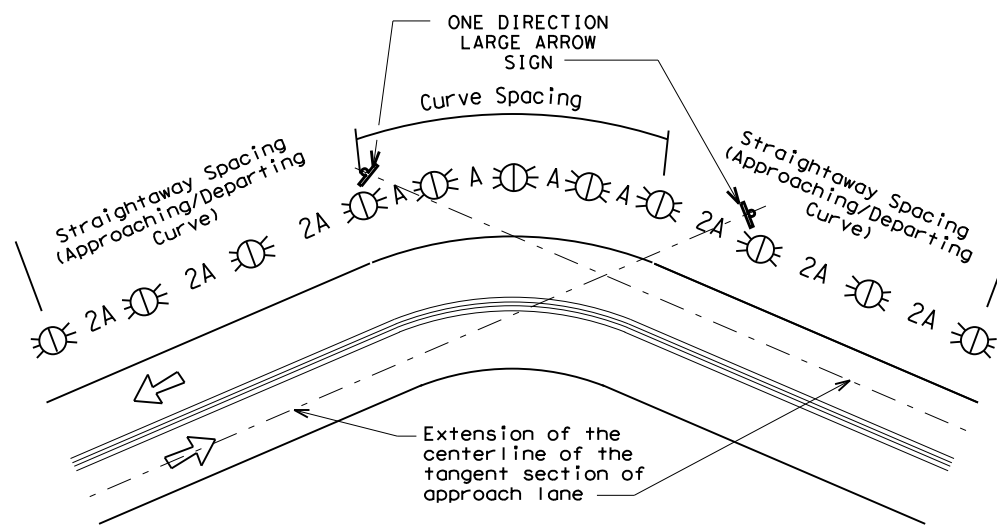
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POST TYPE AND SUPPORT FOUNDATION DETAILS				TYPE OF BARRIER MOUNTS		
WING CHANNEL (WC)	FLEXIBLE POSTS (YFLX, WFLX)		WEDGE ANCHOR SYSTEMS		GUARD FENCE ATTACHMENT	
GND	GND	SRF	WAS	WAP	GF 1	
	EMBEDDED	SURFACE MOUNT	STEEL	PLASTIC	GF 2	
<b>NOTES</b> 1. Embedded Wing Channel (WC) post option may be used for Type 2 Object Markers and Delineators only. 2. 1.12 lbs/ft steel per ASTM A 1011 SS Gr. 50, or ASTM A499.			<b>NOTES</b> 1. See "Flexible Delineator and Object Marker Posts" Material Producer List for approved devices. 2. Install per manufacturer's recommendations. 3. Post length may vary to meet field conditions. 4. When using yellow delineators with flexible posts to separate opposing direction of travel, such as centerline or median use, the flexible posts shall be yellow.			
<b>TYPES 1, 3, AND 4 OBJECT MARKERS AND CHEVRONS</b>			<b>CHEVRONS AND ONE DIRECTION LARGE ARROW SIGN</b>		<b>CONCRETE TRAFFIC BARRIER (CTB)</b>	
<b>NOTE</b> Mounting at 4 feet to the bottom of the chevron is permitted for chevrons that will not exceed a height of 6'-6" to the top of the chevron (sizes 24" x 30" and smaller)			<b>NOTE</b> Chevrons 30" x 36" and larger shall be mounted at a height of 7' to the bottom of the chevron. Chevron sign and ONE DIRECTION LARGE ARROW sign (W1-9T) shall be installed per SMD standard sheets and paid under item 644.		<b>GENERAL NOTES</b> 1. Place delineators on a section of roadway at a consistent distance from the edge of pavement. 2. Where a restriction prevents consistent placement from the pavement edge, place the affected object markers in line with the innermost edge of the obstruction. 3. When Type 2 object markers and delineators are more than 8'-0" from the edge of the pavement, it may not be possible to maintain a height of approximately 4'-0". If this is the case, place the object marker or delineator as close to the desired height as possible. 4. Install all delineators, object markers and barrier reflectors in accordance with the manufacturer's recommendation. 5. Barrier reflectors should be installed a minimum of 18 inches above the edge of the pavement surface. 6. Diagonal stripes on Type 3 object markers shall slope down toward the intended travel lane.	
			<b>DELINEATORS AND TYPE 2 OBJECT MARKERS</b>		<b>DELINEATOR &amp; OBJECT MARKER INSTALLATION</b> <b>D &amp; OM(2)-20</b>	
					See general notes 1, 2 and 3.	
					<b>Traffic Safety Division Standard</b>	
					<b>REVISIONS</b> 0456 02 028, ETC FM 27 10-09 3-15 4-10 7-20	
					DIST COUNTY SHEET NO. BRY FREESTONE 131	

### 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

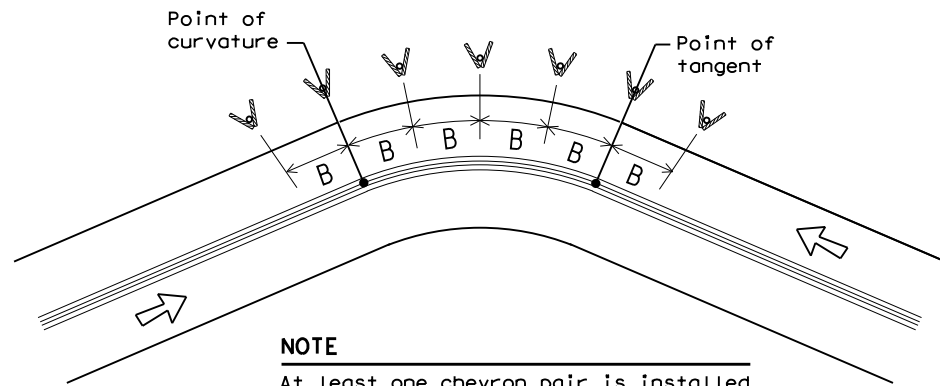
### SUGGESTED SPACING FOR DELINEATORS ON HORIZONTAL CURVES



**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

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© TXDOT August 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS	0456	02	028, ETC	FM 27
3-15 8-15	DIST	COUNTY	SHEET NO.	
8-15 7-20	BRY	FREESTONE	132	

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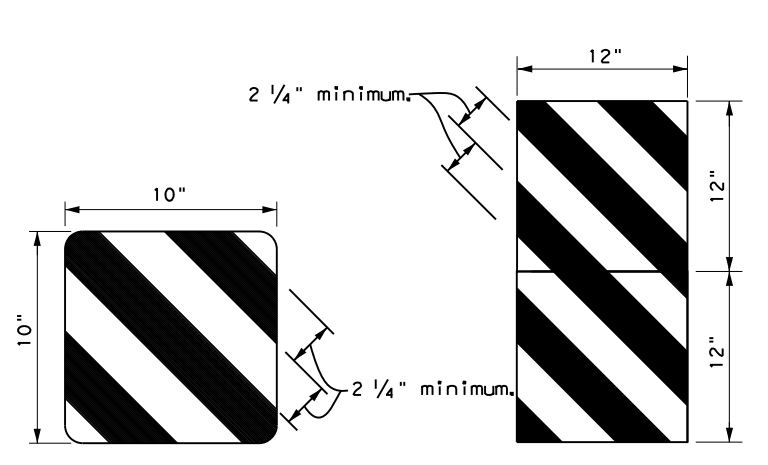
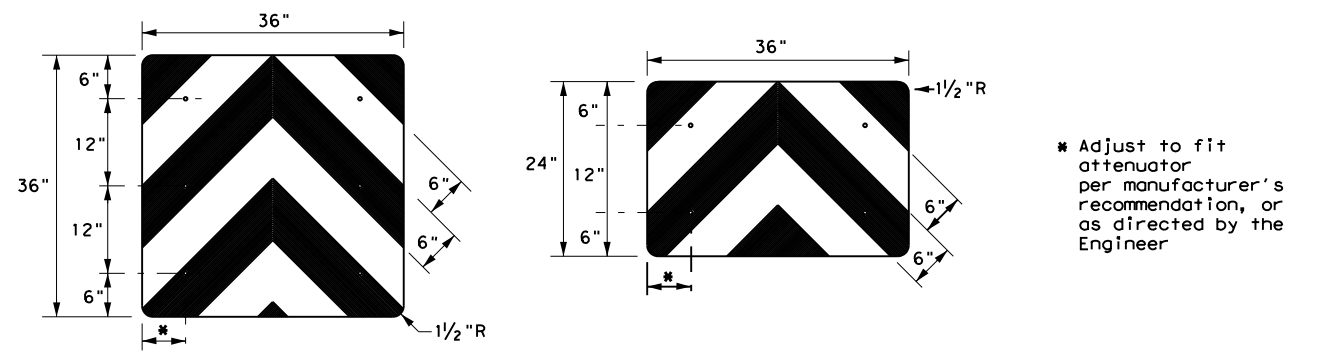
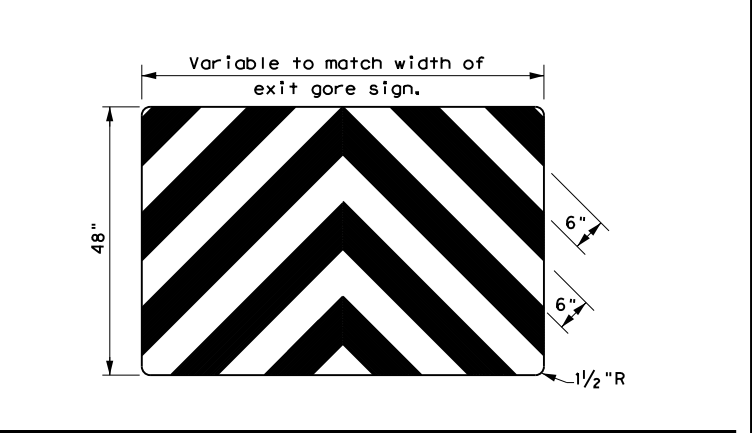
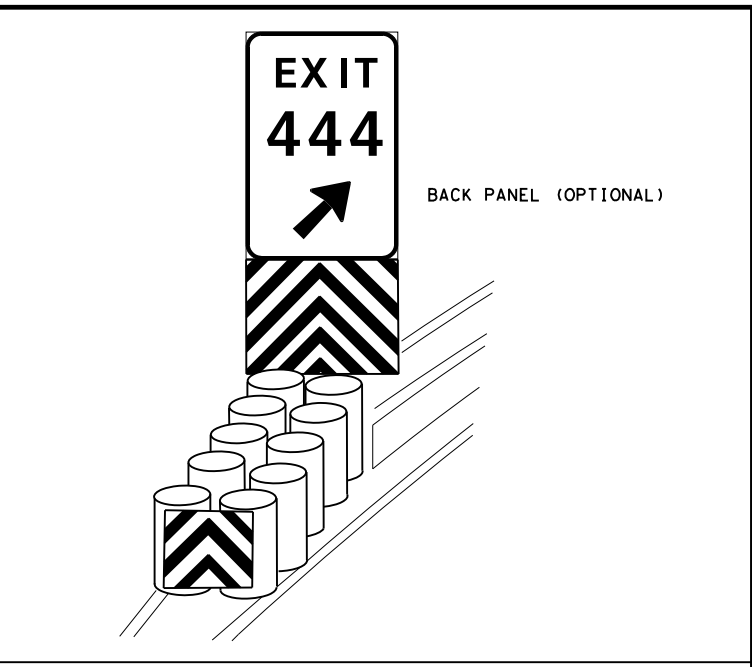
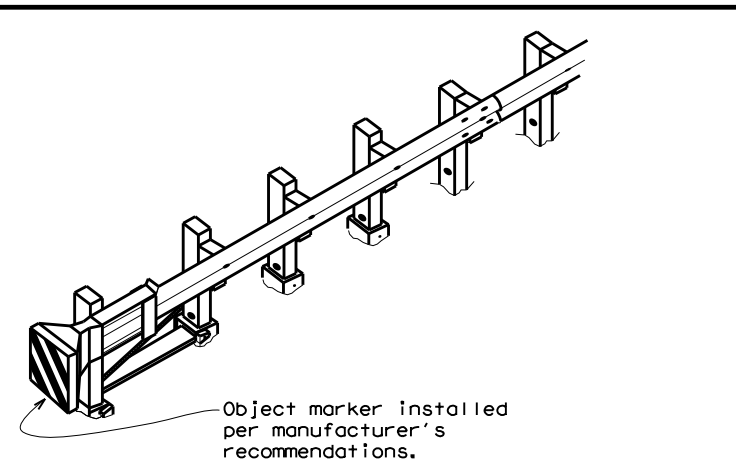
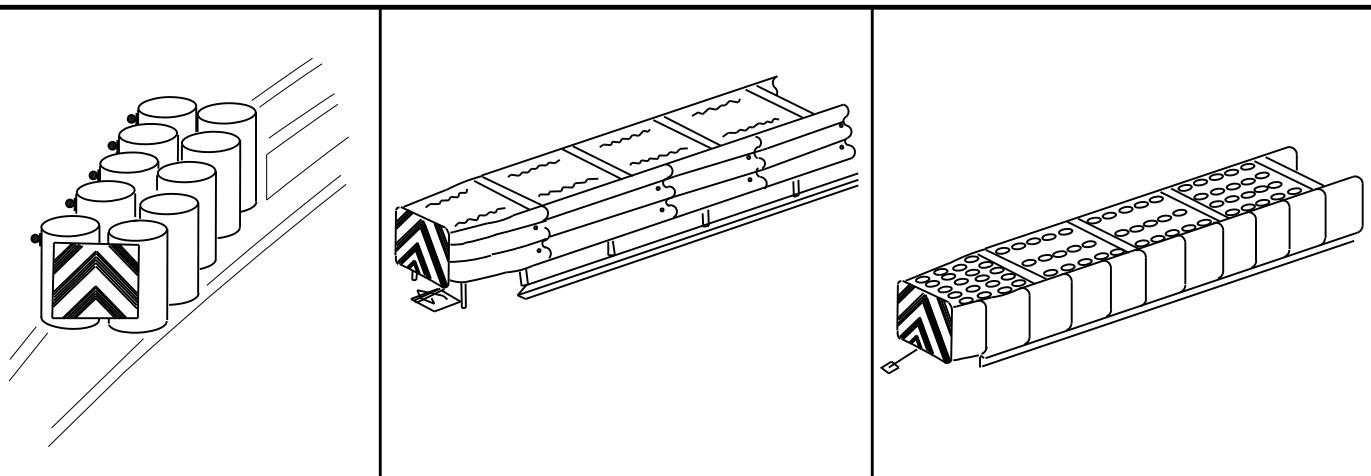
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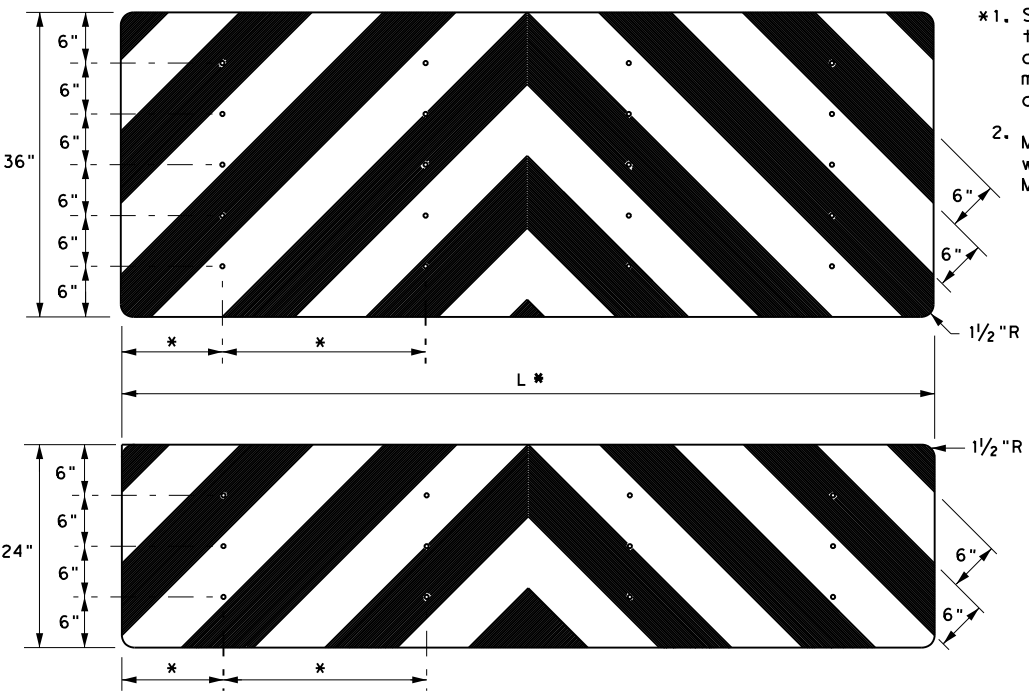
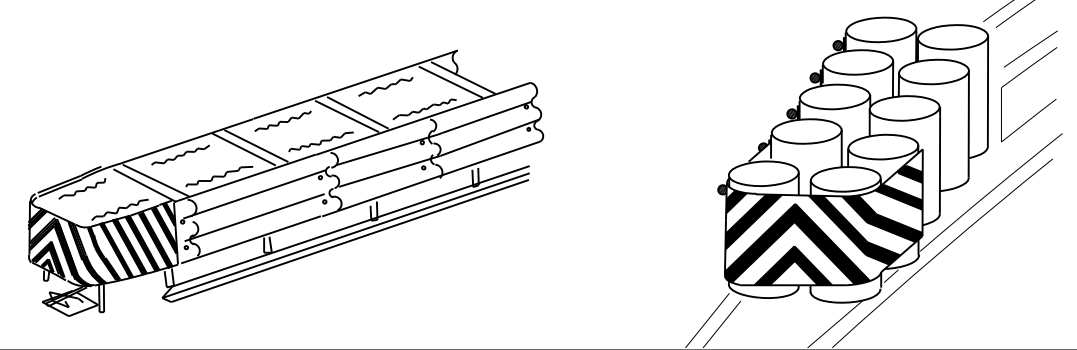


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OBJECT MARKERS SMALLER THAN 3 FT<sup>2</sup>



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

**NOTES**

1. Object Markers shall conform to the Texas MUTCD and meet the color and reflectivity requirement of Department Material Specification DMS 8300. Background shall be yellow reflective sheeting (Type B or C) and Chevron shall be black.
2. Object Markers may be fabricated from adhesive backed reflective sheeting applied directly to guardrail end treatment, or applied directly to an "end cap" as per the manufacturer's recommendation. Direct applied sheeting shall provide a smooth surface and have no wrinkles, air bubbles, cuts or tears. A radius at the corners is not required for direct applied sheeting.
3. Object Marker size may be reduced to fit smaller devices. Width of alternating black and yellow stripes are typically 6". Object Markers smaller than 3ft may have reduced width stripes of a minimum of 2 1/4".
4. Pop rivets, screws, or nuts and bolts may be used to attach object markers and reflectors. Holes, slots or other openings may be cut or drilled through object markers to allow cable or other attachments.
5. Object Marker at nose of attenuator is subsidiary to the attenuator.
6. See D & OM (1-4) for required barrier reflectors.

<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
	0456	02	028, ETC
4-92 8-04			FM 27
8-95 3-15	DIST	COUNTY	SHEET NO.
4-98 7-20	BRY	FREESTONE	134
20G			

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## SIGN SUPPORT DESCRIPTIVE CODES

(Descriptive Codes correspond to project estimate and quantities sheets)

SM RD SGN ASSM TY XXXXX(X)XX(X-XXXX)

### Post Type

- FRP = Fiberglass Reinforced Plastic Pipe (see SMD(FRP))
- TWT = Thin-Walled Tubing (see SMD(TWT))
- 10BWG = 10 BWG Tubing (see SMD(SLIP-1) to (SLIP-3))
- S80 = Schedule 80 Pipe (see SMD(SLIP-1) to (SLIP-3))

### Number of Posts (1 or 2)

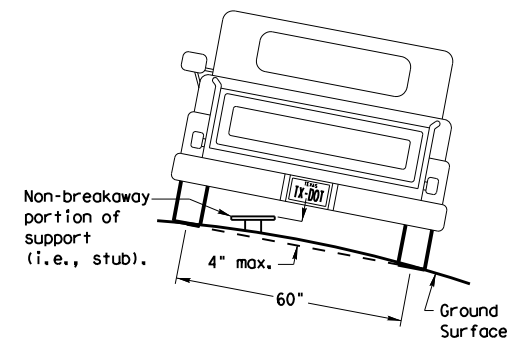
### Anchor Type

- UA = Universal Anchor - Concreted (see SMD(FRP) and (TWT))
- UB = Universal Anchor - Bolted down (see SMD(FRP) and (TWT))
- WS = Wedge Anchor Steel - (see SMD(TWT))
- WP = Wedge Anchor Plastic (see SMD(TWT))
- SA = Slipbase - Concreted (see SMD(SLIP-1) to (SLIP-3))
- SB = Slipbase - Bolted Down (see SMD(SLIP-1) to (SLIP-3))

### Sign Mounting Designation

- P = Prefab. "Plain" (see SMD(SLIP-1) to (SLIP-3), (TWT), (FRP))
- T = Prefab. "T" (see SMD(SLIP-1) to (SLIP-3), (TWT))
- U = Prefab. "U" (see SMD(SLIP-1) to (SLIP-3))
- IF REQUIRED
- 1EXT or 2EXT = Number of Extensions (see SMD(SLIP-1) to (SLIP-3), (TWT))
- BM = Extruded Wind Beam (see SMD(SLIP-1) to (SLIP-3))
- WC = 1.12 #/ft Wing Channel (see SMD(SLIP-1) to (SLIP-3))
- EXAL = Extruded Aluminum Sign Panels (see SMD(SLIP-3))

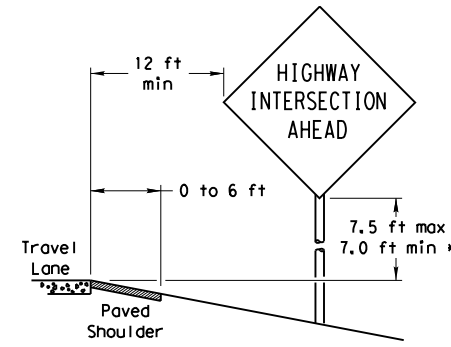
## REQUIRED CLEARANCE FOR BREAKAWAY SUPPORT



To avoid vehicle undercarriage snagging, any substantial remains of a breakaway support, when it is broken away, should not project more than 4 inches above a 60-inch chord (i.e., typical space between wheel paths).

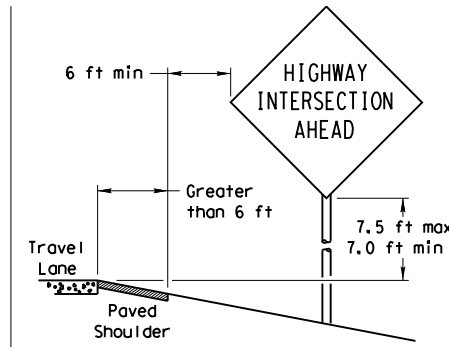
## SIGN LOCATION

### PAVED SHOULDERS



#### LESS THAN 6 FT. WIDE

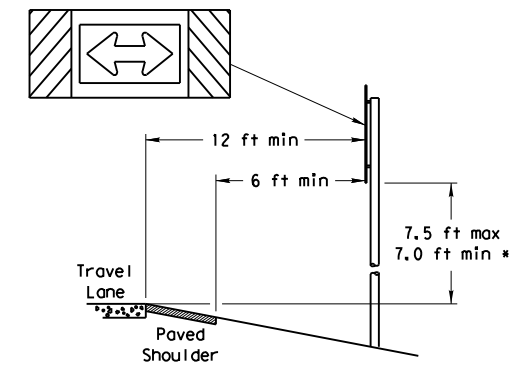
When the shoulder is 6 ft. or less in width, the sign must be placed at least 12 ft. from the edge of the travel lane.



#### GREATER THAN 6 FT. WIDE

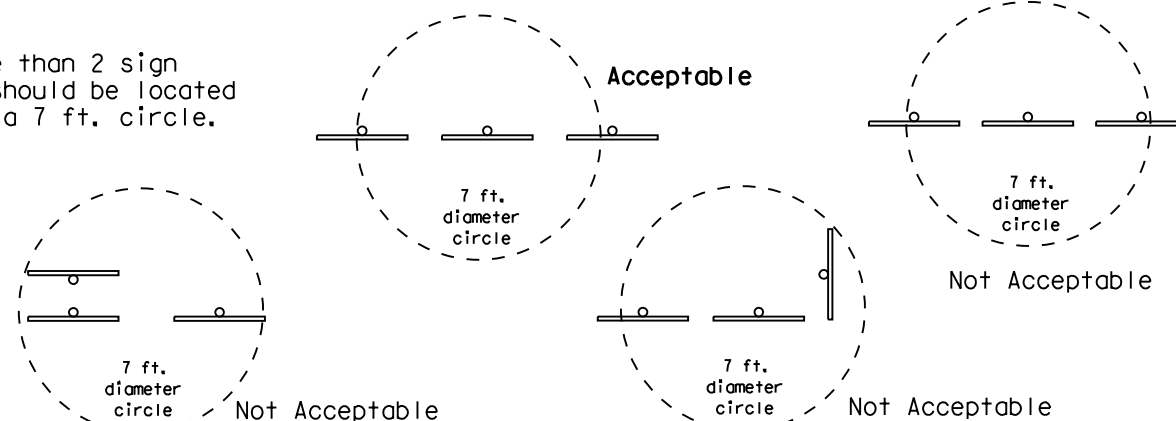
When the shoulder is greater than 6 ft in width, the sign must be placed at least 6 ft. from the edge of the shoulder.

### T-INTERSECTION

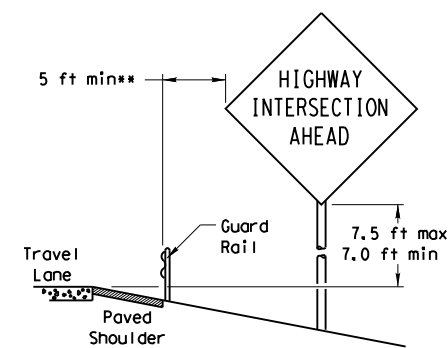


When this sign is needed at the end of a two-lane, two way roadway, the right edge of the sign should be in line with the centerline of the roadway. Place as close to ROW as practical.

No more than 2 sign posts should be located within a 7 ft. circle.

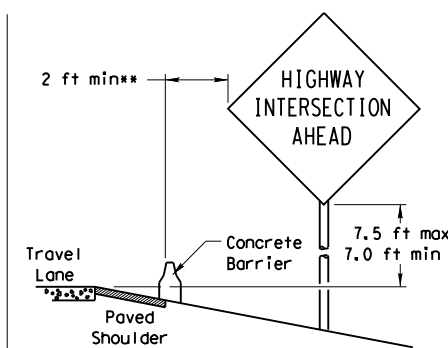


### BEHIND BARRIER



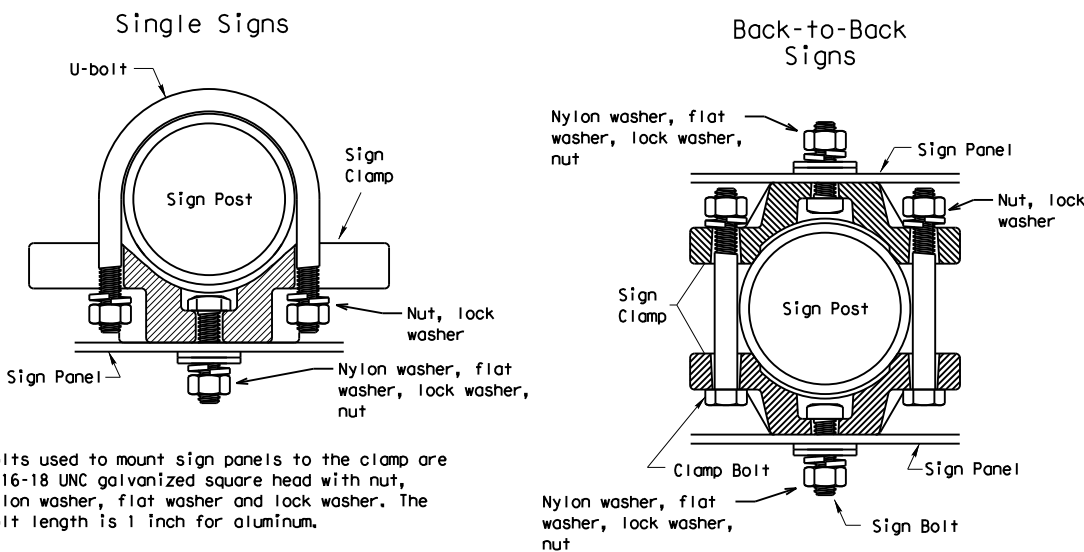
#### BEHIND GUARDRAIL

\*\*Sign clearance based on distance required for proper guard rail or concrete barrier performance.



#### BEHIND CONCRETE BARRIER

## TYPICAL SIGN ATTACHMENT DETAIL



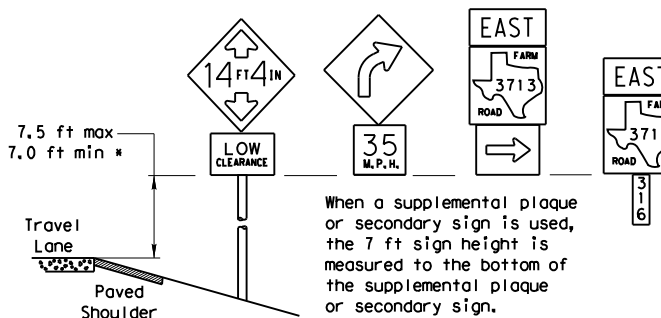
Bolts used to mount sign panels to the clamp are 5/16-18 UNC galvanized square head with nut, nylon washer, flat washer and lock washer. The bolt length is 1 inch for aluminum.

When two sign clamps are used to mount signs back-to-back, use a 5/16-18 UNC galvanized hex head per ASTM A307 with nut and helical-spring lock washer. The approximate bolt lengths for various post sizes and sign clamp types are given in the table at right. The bolt length may need to be adjusted depending upon field conditions.

Sign clamps may be either the specific size clamp or the universal clamp.

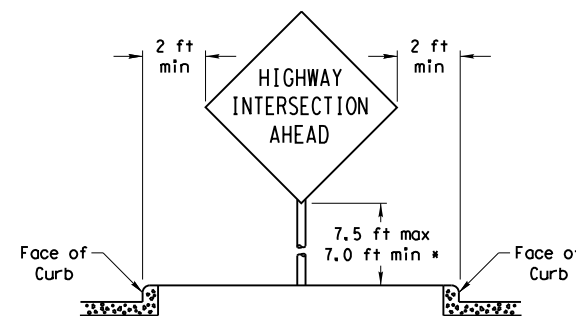
Pipe Diameter	Approximate Bolt Length	
	Specific Clamp	Universal Clamp
2" nominal	3"	3 or 3 1/2"
2 1/2" nominal	3 or 3 1/2"	3 1/2 or 4"
3" nominal	3 1/2 or 4"	4 1/2"

### SIGNS WITH PLAQUES

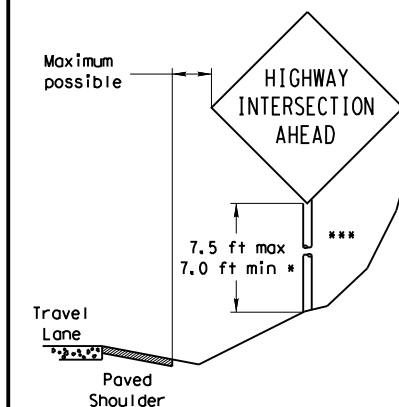


When a supplemental plaque or secondary sign is used, the 7 ft sign height is measured to the bottom of the supplemental plaque or secondary sign.

### CURB & GUTTER OR RAISED ISLAND



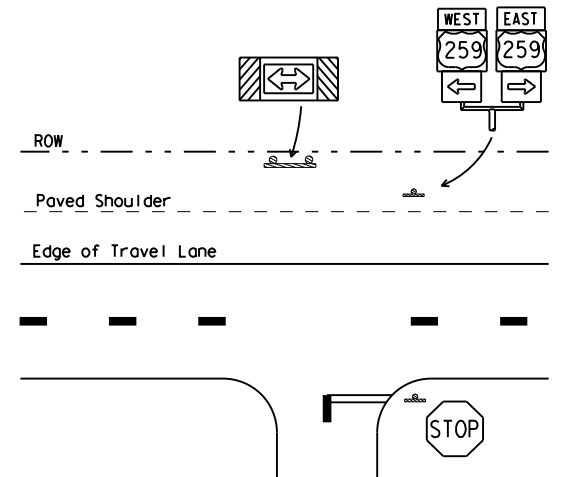
### RESTRICTED RIGHT-OF-WAY (When 6 ft min. is not possible.)



Right-of-way restrictions may be created by rocks, water, vegetation, forest, buildings, a narrow island, or other factors.

In situations where a lateral restriction prevents the minimum horizontal clearance from the edge of the travel lane, signs should be placed as far from the travel lane as practical.

\*\*\* Post may be shorter if protected by guardrail or if Engineer determines the post could not be hit due to extreme slope.



\* Signs shall be mounted using the following condition that results in the greatest sign elevation:

- (1) a minimum of 7 to a maximum of 7.5 feet above the edge of the travel lane or
- (2) a minimum of 7 to a maximum of 7.5 feet above the grade at the base of the support when sign is installed on the backslope.

The maximum values may be increased when directed by the Engineer.

See the Traffic Operations Division website for detailed drawings of sign clamps, Triangular Slipbase System components and Wedge Anchor System components.

The website address is:  
<http://www.txdot.gov/publications/traffic.htm>

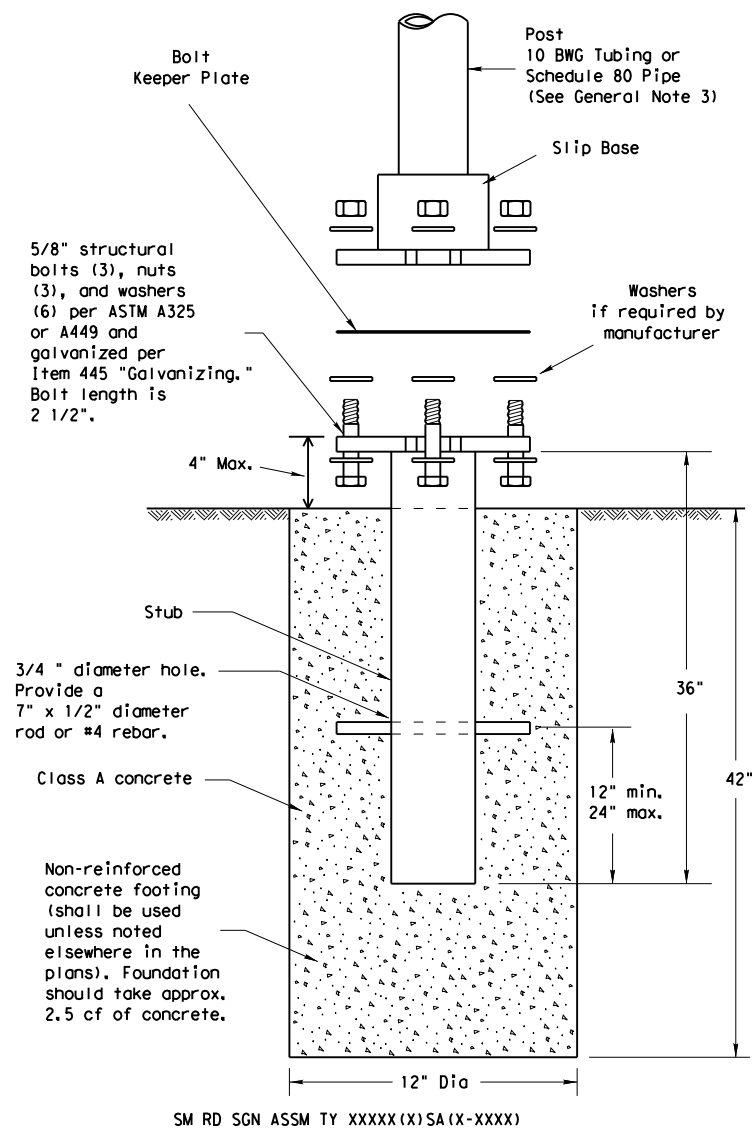


## SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS GENERAL NOTES & DETAILS

SMD(GEN) - 08

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9-08	REVISIONS	CONT	SECT	JOB	HIGHWAY
		0456	02	028, ETC	FM 27
		DIST	COUNTY		SHEET NO.
		BRY	FREESTONE		135

# TRIANGULAR SLIPBASE INSTALLATION GENERAL REQUIREMENTS



## NOTE

There are various devices approved for the Triangular Slipbase System. Please reference the Material Producer List for approved slip base systems. [http://www.txdot.gov/business/producer\\_list.htm](http://www.txdot.gov/business/producer_list.htm) The devices shall be installed per manufacturers' recommendations. Installation procedures shall be provided to the Engineer by Contractor.

## GENERAL NOTES:

- Slip base shall be permanently marked to indicate manufacturer. Method, design, and location of marking are subject to approval of the TxDOT Traffic Standards Engineer.
- Material used as post with this system shall conform to the following specifications:
  - 10 BWG Tubing (2.875" outside diameter)
    - 0.134" nominal wall thickness
    - Seamless or electric-resistance welded steel tubing or pipe
    - Steel shall be HSLAS Gr 55 per ASTM A1011 or ASTM A1008
    - Other steels may be used if they meet the following:
      - 55,000 PSI minimum yield strength
      - 70,000 PSI minimum tensile strength
      - 20% minimum elongation in 2"
    - Wall thickness (uncoated) shall be within the range of 0.122" to 0.138"
    - Outside diameter (uncoated) shall be within the range of 2.867" to 2.883"
    - Galvanization per ASTM A123 or ASTM A653 G210. For precoated steel tubing (ASTM A653), recoat tube outside diameter weld seam by metallizing with zinc wire per ASTM B833.
  - Schedule 80 Pipe (2.875" outside diameter)
    - 0.276" nominal wall thickness
    - Steel tubing per ASTM A500 Gr C
    - Other seamless or electric-resistance welded steel tubing or pipe with equivalent outside diameter and wall thickness may be used if they meet the following:
      - 46,000 PSI minimum yield strength
      - 62,000 PSI minimum tensile strength
      - 21% minimum elongation in 2"
    - Wall thickness (uncoated) shall be within the range of 0.248" to 0.304"
    - Outside diameter (uncoated) shall be within the range of 2.855" to 2.895"
    - Galvanization per ASTM A123
- See the Traffic Operations Division website for detailed drawings of sign clamps and Texas Universal Triangular Slipbase System components. The website address is: <http://www.txdot.gov/publications/traffic.htm>
- Sign supports shall not be spliced except where shown. Sign support posts shall not be spliced.

## ASSEMBLY PROCEDURE

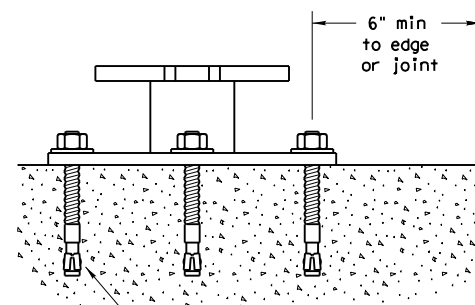
### Foundation

- Prepare 12-inch diameter by 42-inch deep hole. If solid rock is encountered, the depth of the foundation may be reduced such that it is embedded a minimum of 18 inches into the solid rock.
- The Engineer may permit batches of concrete less than 2 cubic yards to be mixed with a portable, motor-driven concrete mixer. For small placements less than 0.5 cubic yards, hand mixing in a suitable container may be allowed by Engineer. Concrete shall be Class A.
- Push the pipe end of the slip base stub into the center of the concrete. Rotate the stub back and forth while pushing it down into the concrete to assure good contact between the concrete and stub. Continue to work the stub into the concrete until it is between 2 to 4 inches above the ground.
- Plumb the stub. Allow a minimum of 4 days to set, unless otherwise directed by the Engineer.
- The triangular slipbase system is multidirectional and is designed to release when struck from any direction.

### Support

- Cut support so that the bottom of the sign will be 7 to 7.5 feet above the edge of the travelway (i.e., edge of the closest lane) when slip plate is below the edge of pavement or 7 to 7.5 feet above slip plate when the slip plate is above the edge of the travelway. The cut shall be plumb and straight.
- Attach sign to support using connections shown. When multiple signs are installed on the same support, ensure the minimum clearance between each sign is maintained. See SMD(SLIP-2) for clearances based on sign types.

## CONCRETE ANCHOR



5/8" diameter Concrete Anchor - 8 places (embed a minimum of 5 1/2" and torque to min. of 50 ft-lbs). Anchor may be expansion or adhesive type.

SM RD SGN ASSM TY XXXXX(X)SB(X-XXXX)

Concrete anchor consists of 5/8" diameter stud bolt with UNC series bolt threads on the upper end. Heavy hex nut per ASTM A563, and hardened washer per ASTM F436. The stud bolt shall have a minimum yield and ultimate tensile strength of 50 and 75 KSI, respectively. Nuts, bolts and washers shall be galvanized per Item 445, "Galvanizing." Adhesive type anchors shall have stud bolts installed with Type III epoxy per DMS-6100, "Epoxyes and Adhesives." Adhesive anchors may be loaded after adequate epoxy cure time per the manufacturer's recommendations. Top of bolt shall extend at least flush with top of the nut when installed. The anchor, when installed in 4000 psi normal-weight concrete with a 5 1/2" minimum embedment, shall have a minimum allowable tension and shear of 3900 and 3100 psi, respectively.

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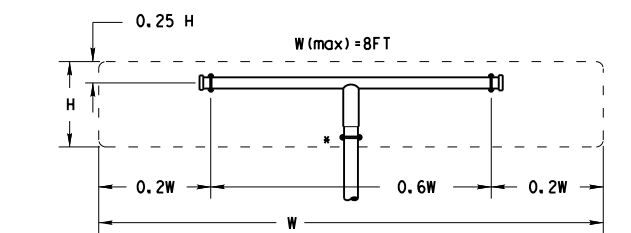
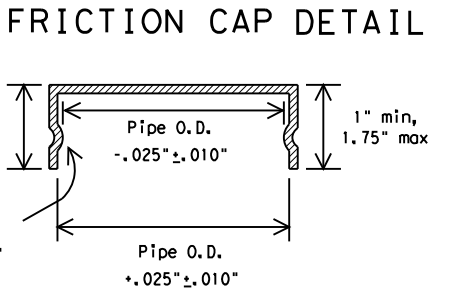
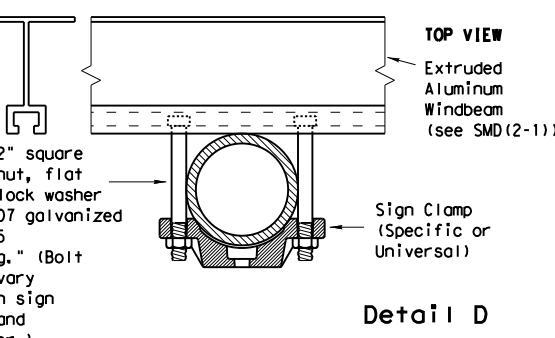
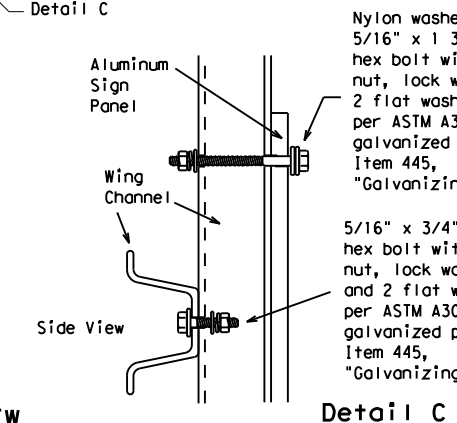
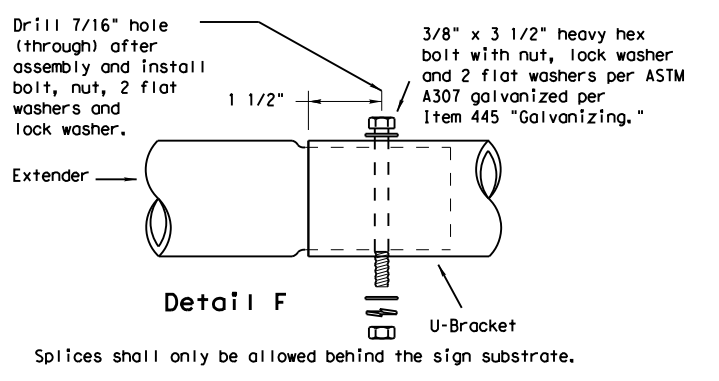
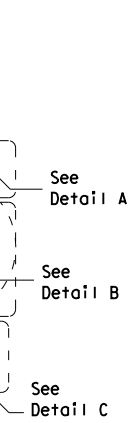
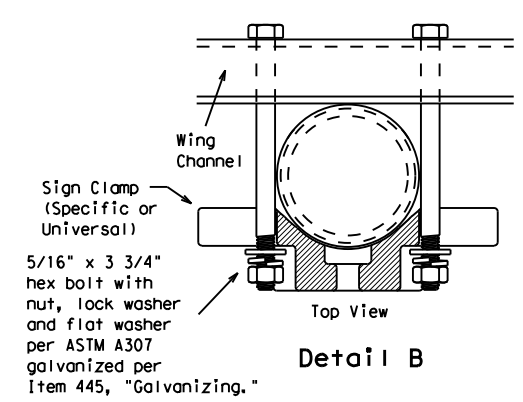
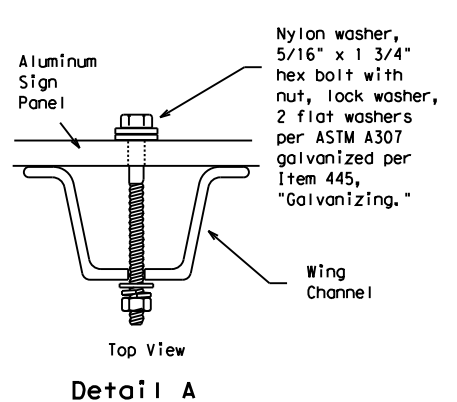
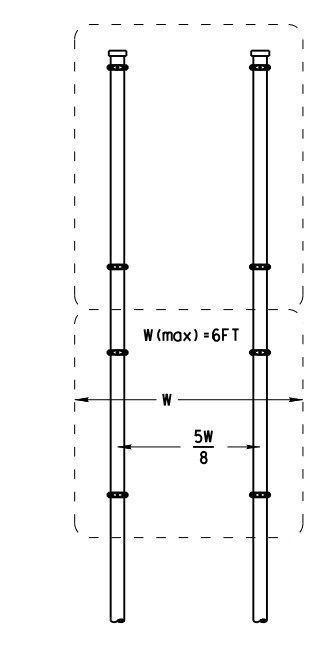
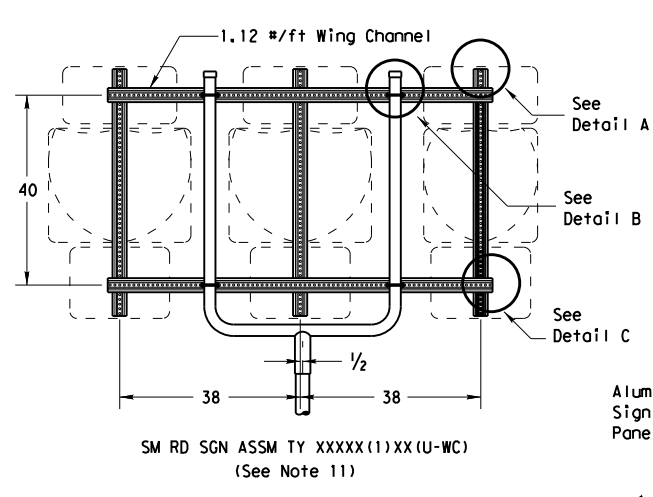
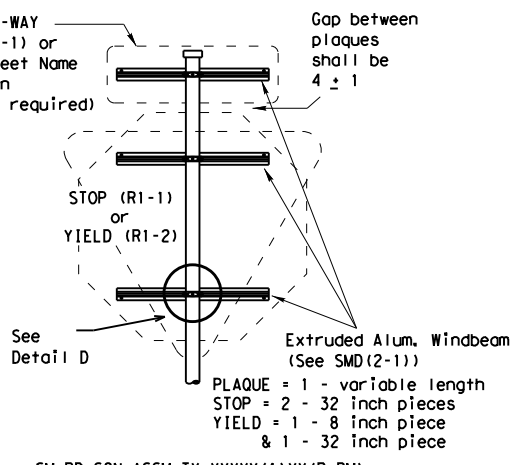
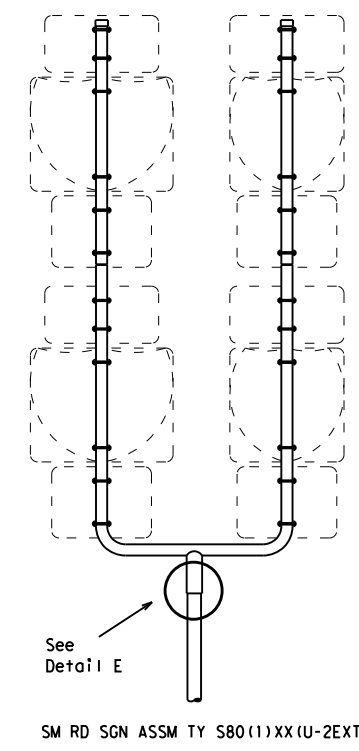
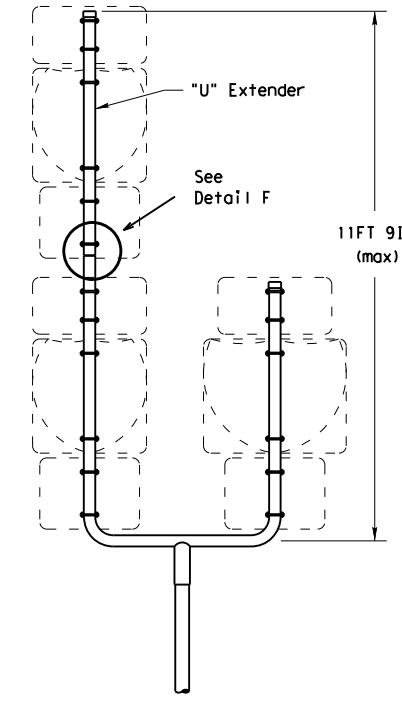
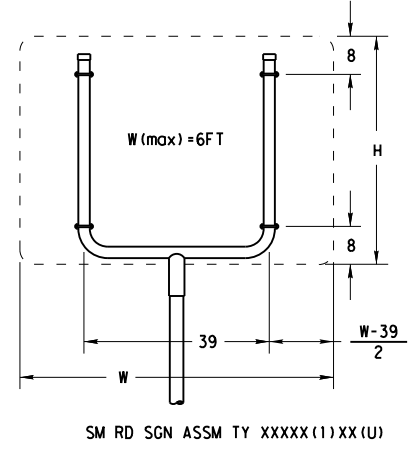
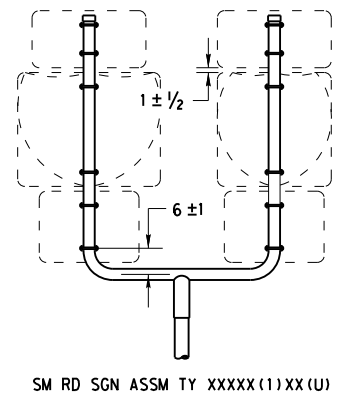
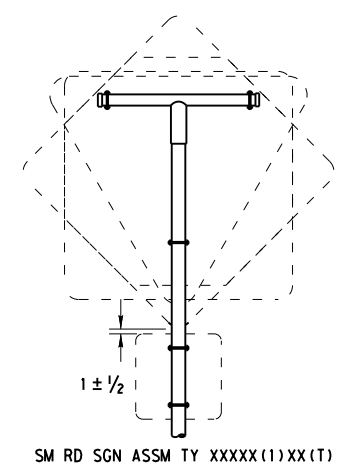
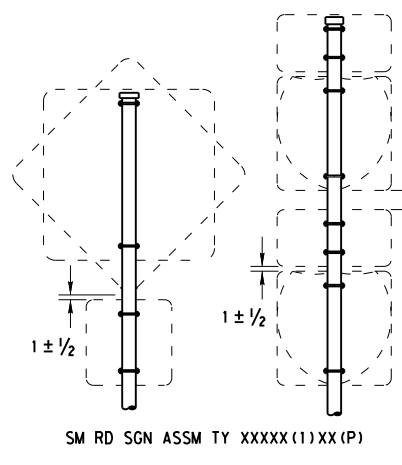
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## SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS TRIANGULAR SLIPBASE SYSTEM

SMD(SLIP-1)-08

© TxDOT July 2002		DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
9-08	REVISIONS	CONT	SECT	JOB	HIGHWAY
		0456	02	028, ETC	FM 27
		DIST	COUNTY	SHEET NO.	
		BRY	FREESTONE	136	



All dimensions are in english unless detailed otherwise.

**GENERAL NOTES:**

SIGN SUPPORT	# OF POSTS	MAX. SIGN AREA
10 BWG	1	16 SF
10 BWG	2	32 SF
Sch 80	1	32 SF
Sch 80	2	64 SF

- The Engineer may require that a Schedule 80 post be used in place of a 10 BWG where a sign height is abnormally high due to a fill slope.
- Sign supports shall not be spliced except where shown. Sign support posts shall not be spliced.
- Aluminum sign blanks shall conform to Departmental Material Specifications DMS-7110 and shall have the following minimum thicknesses: 0.080 for signs less than 7.5 sq. ft., 0.100 for signs 7.5 to 15 sq. ft., and 0.125 for signs greater than 15 sq. ft.
- Signs that require specific supports due to reasons in addition to windloading are indicated on the "REQUIRED SUPPORT" table on this sheet.
- For horizontal rectangular signs fabricated from flat aluminum, T-brackets are used for signs 24 inches or less in height. U-brackets are used for signs of greater height.
- When two triangular slipbase supports are used to support a single sign, they shall not be "rigidly" connected to each other except through the sign panel. This will allow each support to act independently when impacted by an errant vehicle.
- Wing channel shall meet ASTM A 1011 SS Gr 50 and be galvanized per ASTM A 123.
- Excess pipe, wing channel, or windbeam shall be cut off so that it does not extend beyond the sign panel (i.e., excess support shall not be visible when the sign is viewed from the front.) Repair galvanized coating at cut support ends per Item 445, "Galvanizing."
- Additional route markers may be added vertically, provided the total sign area does not exceed the maximum allowable amount per Note 1.
- Additional sign clamp required on the "T-bracket" post for 24 inch height signs. Place the clamp 3 inches above bottom of sign when possible.
- Post open ends shall be fitted with Friction Caps.
- Sign blanks shall be the sizes and shapes shown on the plans.

REQUIRED SUPPORT	
SIGN DESCRIPTION	SUPPORT
48-inch STOP sign (R1-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
60-inch YIELD sign (R1-2)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
48x16-inch ONE-WAY sign (R6-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
36x48, 48x36, and 48x48-inch signs	TY 10BWG(1)XX(T)
48x60-inch signs	TY S80(1)XX(T)
48x48-inch signs (diamond or square)	TY 10BWG(1)XX(T)
48x60-inch signs	TY S80(1)XX(T)
48-inch Advance School X-ing sign (S1-1)	TY 10BWG(1)XX(T)
48-inch School X-ing sign (S2-1)	TY 10BWG(1)XX(T)
Large Arrow sign (W1-6 & W1-7)	TY 10BWG(1)XX(T)

Texas Department of Transportation  
Traffic Operations Division

**SIGN MOUNTING DETAILS  
SMALL ROADSIDE SIGNS  
TRIANGULAR SLIPBASE SYSTEM  
SMD(SLIP-2)-08**

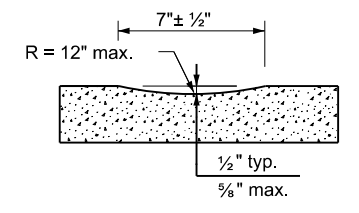
Friction caps may be manufactured from hot rolled or cold rolled steel sheets. The minimum sheet metal thickness shall be 24 gauge for all cap sizes.

The rim edges shall be reasonably straight and smooth. Caps shall be sized and formed in such a manner as to produce a drive-on friction fit and have no tendency to rock when seated on the pipe. The depth shall be sufficient to give positive protection against entrance of rainwater. They shall be free of sharp creases or indentations and show no evidence of metal fracture.

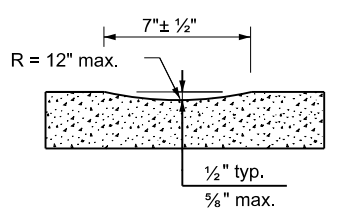
Caps shall have an electrodeposited coating of zinc in accordance with the requirements of ASTM B633 Class FE/ZN 8.

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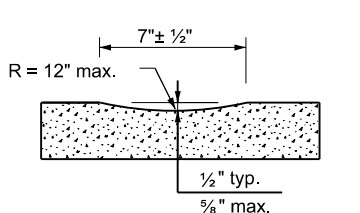
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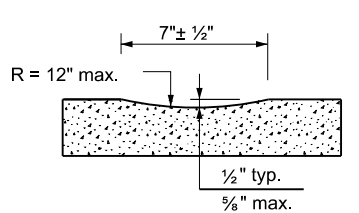
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OPTION 1



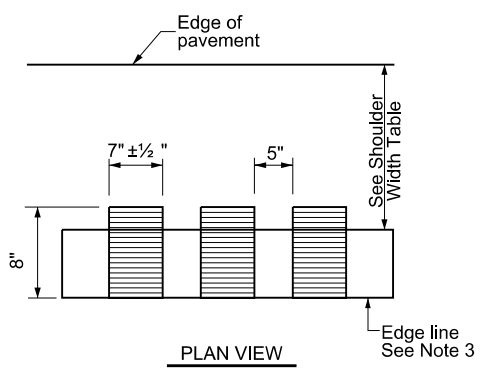
PROFILE VIEW  
OPTION 2



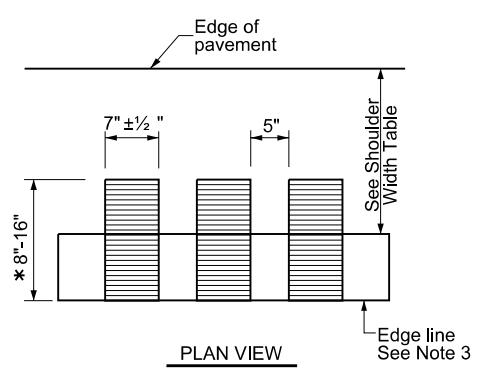
PROFILE VIEW  
OPTION 3



PROFILE VIEW  
OPTION 4

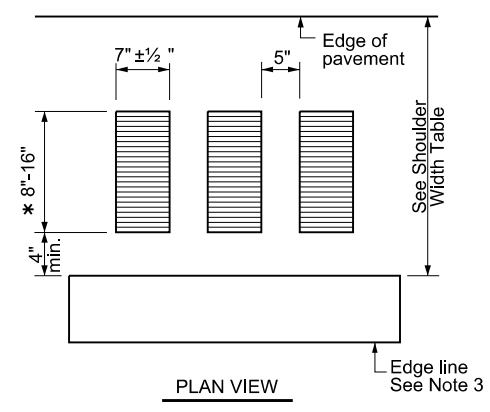


PLAN VIEW



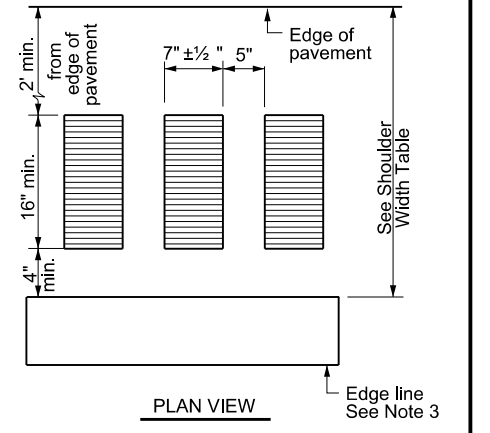
PLAN VIEW

\* This distance may vary based on width of shoulder



PLAN VIEW

\* This distance may vary based on width of shoulder



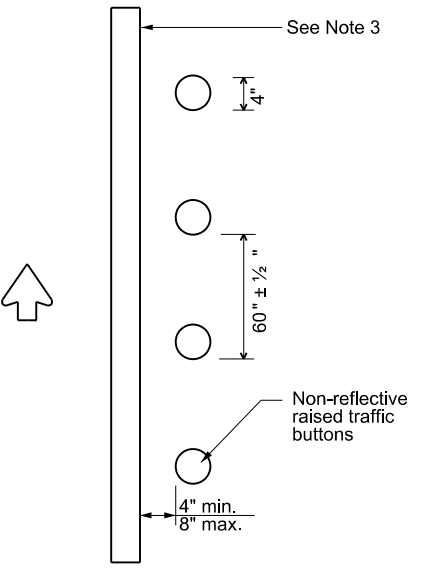
PLAN VIEW

**CONTINUOUS MILLED DEPRESSIONS (Rumble Strips)**

**CONTINUOUS MILLED DEPRESSIONS (Rumble Strips)**

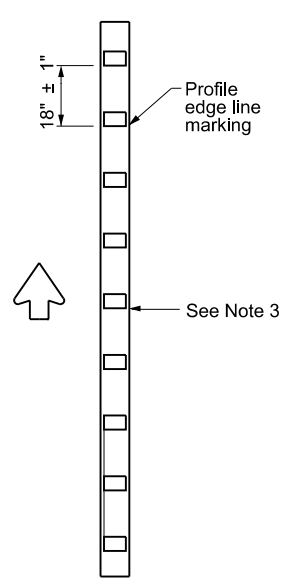
**CONTINUOUS MILLED DEPRESSIONS (Rumble Strips)**

**CONTINUOUS MILLED DEPRESSIONS (Rumble Strips)**



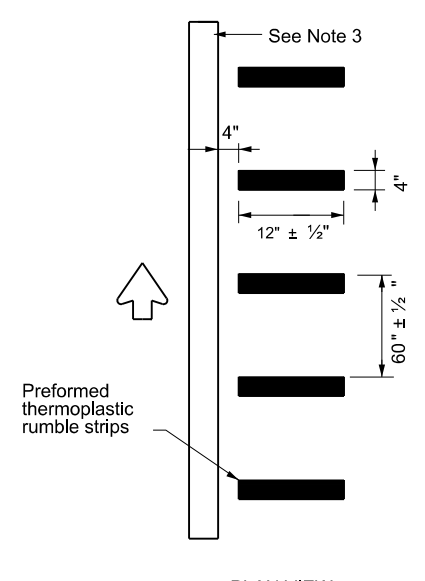
PLAN VIEW  
OPTION 5

**RAISED EDGE LINE (Rumble Strips)**



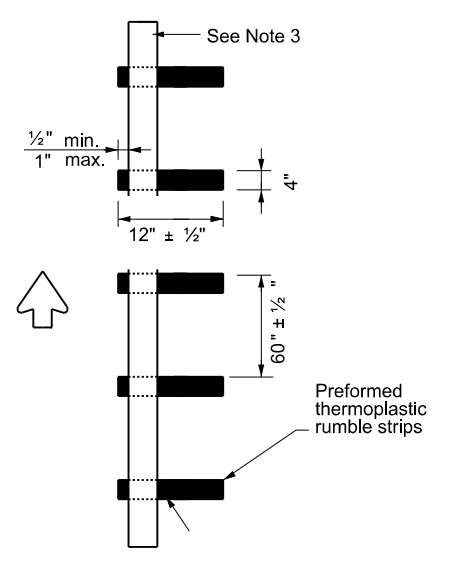
PLAN VIEW  
OPTION 6

**PROFILE EDGE LINE MARKINGS (Rumble Strips)**



PLAN VIEW  
OPTION 7

**PREFORMED THERMOPLASTIC EDGE LINE (Rumble Strips)**



PLAN VIEW  
OPTION 8

**PREFORMED THERMOPLASTIC EDGE LINE (Rumble Strips)**

SHOULDER WIDTH TABLE		
EQUAL TO OR LESS THAN 2 FEET	GREATER THAN 2 FEET LESS THAN 4 FEET	EQUAL TO OR GREATER THAN 4 FEET
Option 1, 5, 6 or 8	Option 1, 2, 3 5, 6 or 7	Option 2, 4, 5 6 or 7

**GENERAL NOTES**

- Rumble strips and profile markings shall not be placed on roadways with a posted speed limit of 45 MPH or less.
- Milled rumble strips are preferred when adequate pavement depth is available. If pavement thickness is less than 2 inches, milled rumble strips shall not be used. Rumble strips shall not be milled or depressed into bridge decks.
- Use Standard Sheet PM(2) and FPM(1) for positioning, dimensioning, and spacing of all reflective raised pavement markers, pavement markings, and profile markings.
- See the Shoulder Width Table below for determining what options may be used for edge line rumble strips.
- Breaks in edge line rumble strips shall occur at least 50 feet and no more than 150 feet in advance of bridges, railroad crossings, intersections, or driveways with high usage of large trucks when installed on conventional highways.
- Rumble strips shall not be placed across exit or entrance ramps, acceleration or deceleration lanes, crossovers, gore areas, or intersections with other roadways.
- Consideration should be given to noise levels when edgeline rumble strips are to be installed near residential areas, schools, churches, etc. A 3/8 inch deep (minimum) milled rumble strip may be considered in these areas.
- Consideration shall be given to bicyclists. See RS(6).

**WHEN INSTALLING MILLED DEPRESSION EDGE LINE RUMBLE STRIPS:**

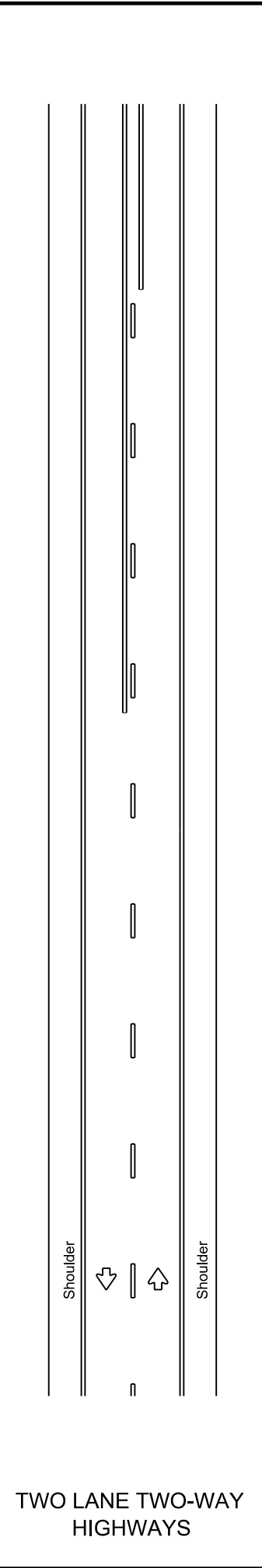
- See dimensions for milled rumble strips. Other shapes and dimensions may be used if approved by the Traffic Safety Division.
- Pavement markings can be applied over milled shoulder rumble strips to create an edge line rumble strip.

**WHEN INSTALLING RAISED OR PROFILE EDGE LINE RUMBLE STRIPS:**

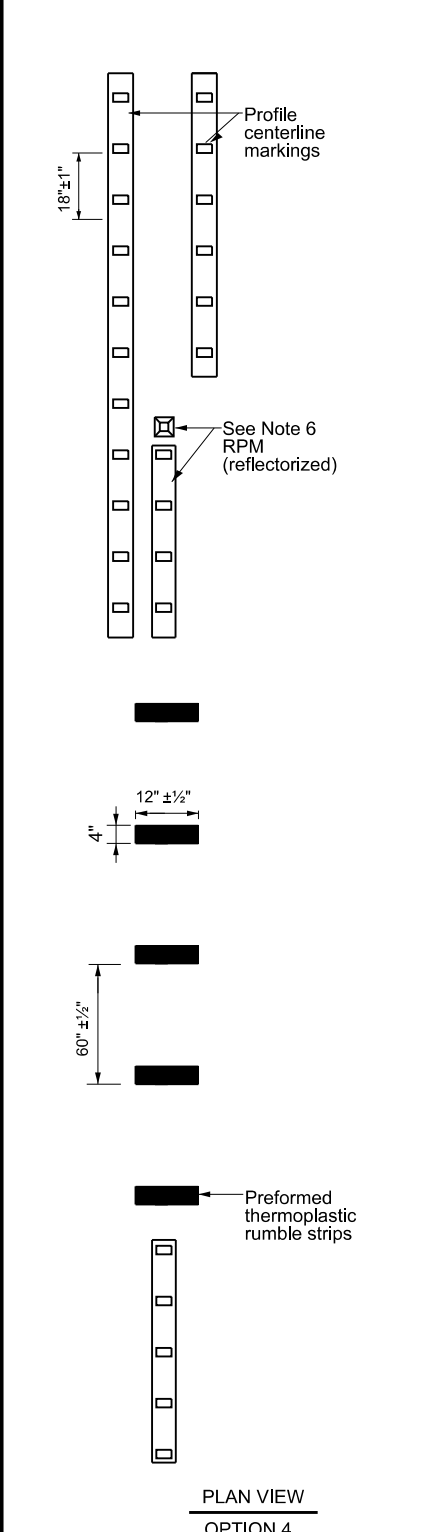
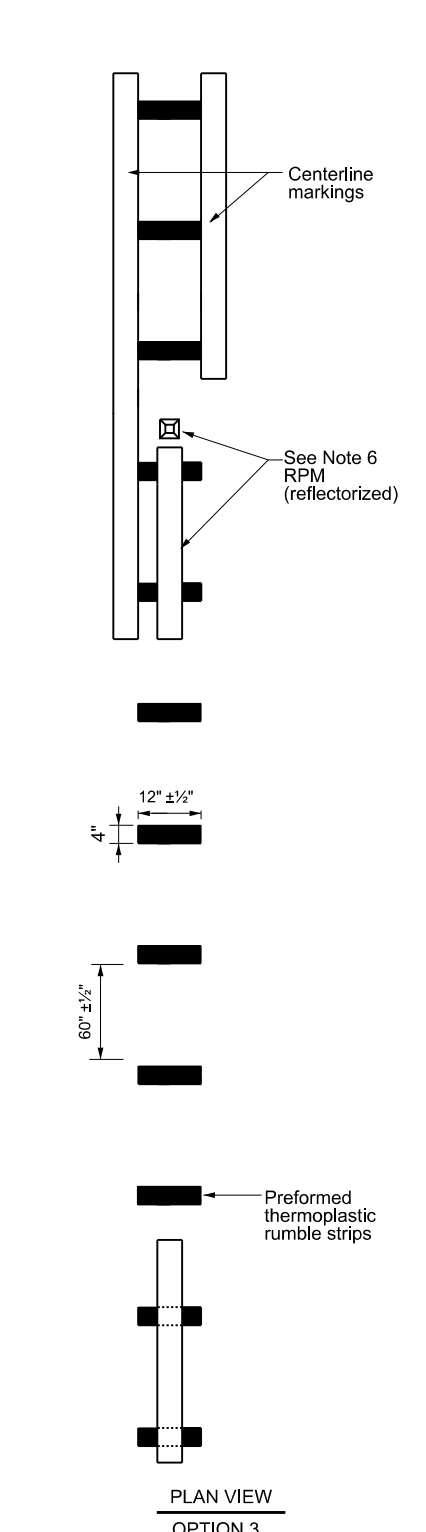
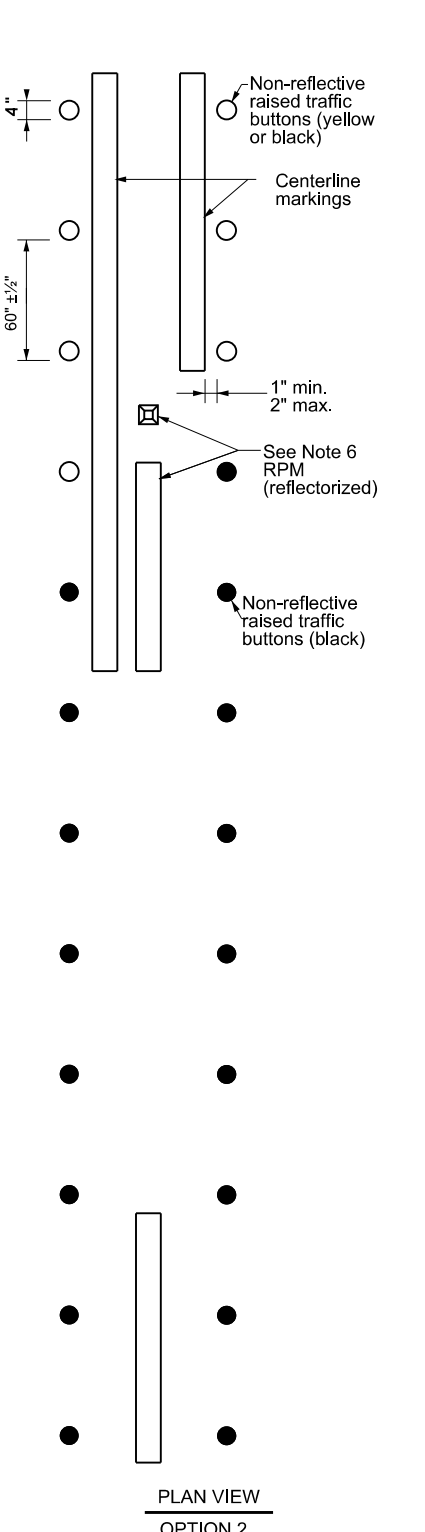
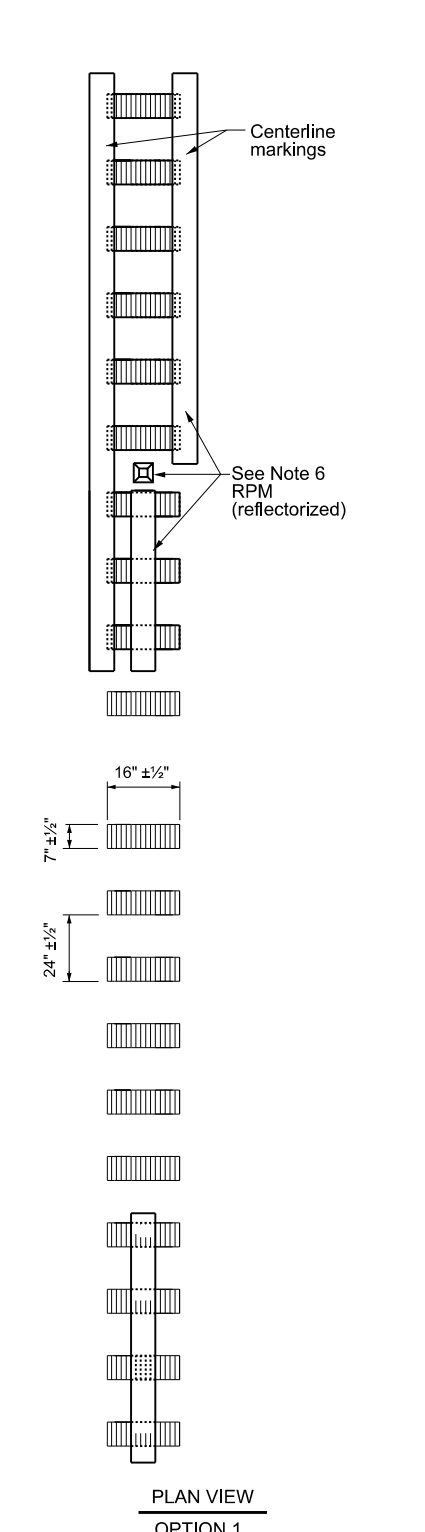
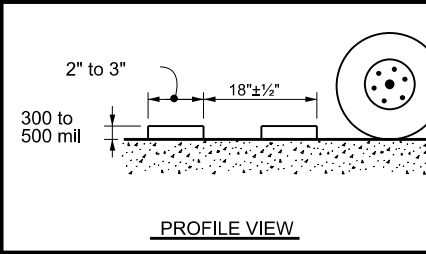
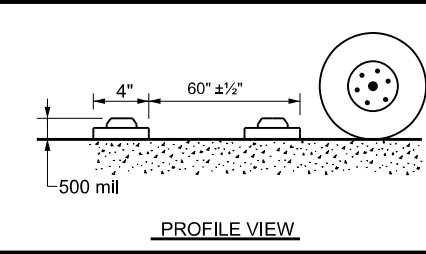
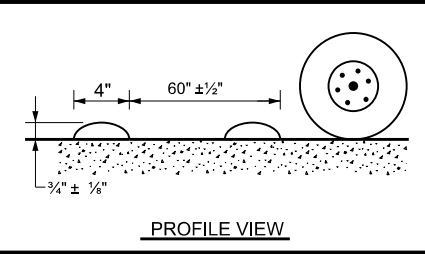
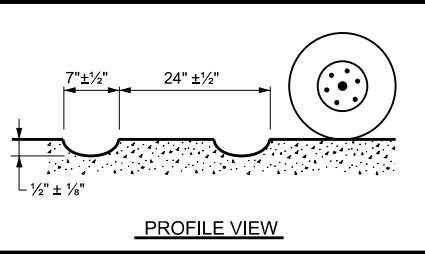
- Raised rumble strips consisting of non-reflective raised traffic buttons may be used. Non-reflective raised traffic buttons can be affixed to asphalt or concrete with bitumen or adhesives, as per the manufacturer's recommendations.
- Non-reflective traffic buttons shall be placed adjacent to the pavement marking delineating the edge line when used as a rumble strip. The color of the button should match the color of the adjacent edge line marking (white or yellow). The buttons will be paid for under Item 672, "Raised Pavement Markers." Non-reflective traffic buttons must meet the requirements of DMS-4300.
- Non-reflective traffic buttons shall not be placed across exit or entrance ramps, acceleration and deceleration lanes, crossovers, gore areas or intersections with other roadways.
- The minimum distance between the edge line and the buttons should be used if the shoulder is less than 8 feet in width.
- Raised profile thermoplastic markings used as edge lines may substitute for buttons.

<b>EDGE LINE RUMBLE STRIPS ON UNDIVIDED OR TWO LANE HIGHWAYS RS(2)-23</b>			
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© TxDOT	January 2023	CONTRACT:	0456
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		JOB:	028.ETC
		HIGHWAY:	FM 27
10-13		DIST:	COUNTY
1-23		BRY:	FREESTONE
		SHEET NO.:	138

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### CENTERLINE RUMBLE STRIPS



MILLED CENTERLINE RUMBLE STRIPS

RAISED CENTERLINE RUMBLE STRIPS

PREFORMED THERMOPLASTIC RUMBLE STRIPS

PROFILE CENTERLINE MARKINGS AND PREFORMED THERMOPLASTIC RUMBLE STRIPS

#### GENERAL NOTES

1. This standard sheet provides guidelines for installing centerline rumble strips on two-lane highways with or without shoulders.
2. Centerline and edge line rumble strips or profile markings shall not be placed on roadways with a posted speed limit of 45 MPH or less.
3. Milled rumble strips are preferred when adequate pavement depth is available. If pavement thickness is less than 2 inches, milled rumble strips shall not be used. Rumble strips shall not be milled or depressed into bridge decks.
4. See dimensions for milled rumble strips. Other shapes and dimensions may be used if approved by the Traffic Safety Division.
5. Breaks in milled centerline rumble strips shall occur at least 50 feet and no more than 150 feet in advance of bridges, railroad crossings, intersections or driveways with high usage of large trucks.
6. Use standard sheet PM(2) for positioning, dimensioning, and spacing of all reflective raised pavement markers, pavement markings and profile markings.
7. Consideration should be given to noise levels when centerline rumble strips are to be installed near residential areas, schools, churches, etc. A 3/8 inch deep (minimum) milled rumble strip may be considered in these areas.
8. Pavement markings must be applied over milled centerline rumble strips.

#### WHEN INSTALLING CENTERLINE RUMBLE STRIPS:

9. Raised rumble strips consisting of non-reflective raised traffic buttons may be used. Non-reflective raised traffic buttons can be affixed to asphalt or concrete with bitumen or adhesives, as per manufacturer's recommendations.
10. When using non-reflective raised traffic buttons as a centerline rumble strip, the button shall be placed adjacent to the pavement marking delineating the centerline. The buttons will be paid for under Item 672, "Raised Pavement Markers." Non-reflective traffic buttons must meet the requirements of DMS-4300.
11. The color of the button should be yellow for a continuous no passing roadway. Black buttons should be used in areas where passing is allowed.
12. Consideration shall be given to bicyclists. See RS(6).

#### WHEN INSTALLING EDGE LINE RUMBLE STRIPS WITH OR WITHOUT CENTERLINE RUMBLE STRIPS ON UNDIVIDED HIGHWAYS:

13. See standard sheet RS(2).

<b>CENTERLINE RUMBLE STRIPS ON TWO LANE TWO-WAY HIGHWAYS RS(4)-23</b>			
FILE:	rs(4)-23.dgn	DN:	TxDOT
© TxDOT	January 2023	CONT SECT	JOB HIGHWAY
REVISIONS	0456 02	028.ETC	FM 27
10-13 1-23	DIST	COUNTY	SHEET NO.
	BRY	FREESTONE	139





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

This SWP3 has been developed in accordance with the TPDES Construction General Permit TXR150000 (CGP). The Texas Department of Transportation (TxDOT) ensures that project specifications include adequate best management practices (BMPs) for this project.

For all projects with any soil disturbing activities, TxDOT will maintain a SWP3 with all pertinent records, correspondence, environmental documents, etc. at the project field office. If no field office is available, then this SWP3 shall be kept in the appropriate TxDOT Area Office.

This SWP3 is consistent with requirements specified in applicable stormwater plans and the projects environmental permits, issues, and commitments (EPICs). A copy of the CGP is included in Attachment 2.12 of the SWP3 binder.

**1.0 SITE/PROJECT DESCRIPTION**

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

0456-02-028

**1.2 PROJECT LIMITS:**

From: FM 27 AT GRINDSTONE CREEK

To: STR# 17-082-0-0456-02-196

**1.3 PROJECT COORDINATES:**

BEGIN: (Lat) 31°45'17, 50"N, (Long) 96°18'28,50"W

END: (Lat) \_\_\_\_\_, (Long) \_\_\_\_\_

**1.4 TOTAL PROJECT AREA (Acres):** 3.45 AC

**1.5 TOTAL AREA TO BE DISTURBED (Acres):** 3.45 AC (100%)

**1.6 NATURE OF CONSTRUCTION ACTIVITY:**

FOR THE CONSTRUCTION OF BRIDGE REPLACEMENT CONSISTING OF REPLACING BRIDGE T AND APPROACHES, GRADING, ACP BASE & SURFACE, AND MBGF.

**1.7 MAJOR SOIL TYPES:**

Soil Type	Description
CSJ 0456-02-028	The proposed subgrade soils of B-1 primarily consist of sand (SC, SM, SP) that grade into sandy lean clay (CL) and fat clay (CH). The subgrade soils of B-2 consist of sand underlain by clay with sand, underlain by sandy silt, underlain by clay. The tested plasticity indices (PI's) ranged from 3 to 32

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

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

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

Type	Sheet #s

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

**1.9 CONSTRUCTION ACTIVITIES:**

(Use the following list as a starting point when developing the Construction Activity Schedule and Ceasing Record in Attachment 2.5.)

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

**1.10 POTENTIAL POLLUTANTS AND SOURCES:**

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

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
GRINDSTONE CREEK	CANEY CREEK

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

**1.12 ROLES AND RESPONSIBILITIES: TxDOT**

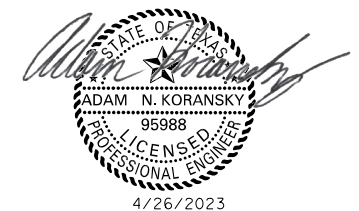
- Development of plans and specifications
- Submit Notice of Intent (NOI) to TCEQ (≥5 acres)
- Post Construction Site Notice
- Submit NOI/CSN to local MS4
- Perform SWP3 inspections
- Maintain SWP3 records and update to reflect daily operations
- Complete and submit Notice of Termination to TCEQ
- Maintain SWP3 records for 3 years
- Other: \_\_\_\_\_
- Other: \_\_\_\_\_
- Other: \_\_\_\_\_

**1.13 ROLES AND RESPONSIBILITIES: CONTRACTOR**

- Day To Day Operational Control
- Submit Notice of Intent (NOI) to TCEQ (≥5 acres)
- Post Construction Site Notice
- Submit NOI/CSN to local MS4
- Maintain schedule of major construction activities
- Install, maintain and modify BMPs
- Complete and submit Notice of Termination to TCEQ
- Maintain SWP3 records for 3 years
- Other: \_\_\_\_\_
- Other: \_\_\_\_\_
- Other: \_\_\_\_\_

**1.14 LOCAL MUNICIPAL SEPARATE STORM SEWER SYSTEM (MS4) OPERATOR COORDINATION:**

MS4 Entity
N/A



**STORMWATER POLLUTION PREVENTION PLAN (SWP3)**

FED. RD. DIV. NO.	PROJECT NO.			SHEET NO.
6	BR 2023(408), ETC.			141
STATE	STATE DIST.	COUNTY		
TEXAS	BRY	FREESTONE		
CONT.	SECT.	JOB	HIGHWAY NO.	
0456	02	028, ETC	FM 27	

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

**2.5 POLLUTION PREVENTION MEASURES:**

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

**2.6 VEGETATED BUFFER ZONES:**

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

Type	Stationing	
	From	To

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

**2.7 ALLOWABLE NON-STORMWATER DISCHARGES:**

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

**2.8 INSPECTIONS:**

All disturbed areas and erosion and sediment control devices shall be inspected at least once every seven (7) days. Inspections shall be performed by TxDOT as indicated on the Field Inspection and Maintenance Report Form 2118 and retained in Attachment 2.5 of this SWP3 .

**2.9 MAINTENANCE:**

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



**STORMWATER POLLUTION PREVENTION PLAN (SWP3)**

FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
6	BR 2023(408), ETC.		142
STATE	STATE DIST.	COUNTY	
TEXAS	BRY	FREESTONE	
CONT.	SECT.	JOB	HIGHWAY NO.
0456	02	028, ETC	FM 27

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

This SWP3 has been developed in accordance with the TPDES Construction General Permit TXR150000 (CGP). The Texas Department of Transportation (TxDOT) ensures that project specifications include adequate best management practices (BMPs) for this project.

For all projects with any soil disturbing activities, TxDOT will maintain a SWP3 with all pertinent records, correspondence, environmental documents, etc. at the project field office. If no field office is available, then this SWP3 shall be kept in the appropriate TxDOT Area Office.

This SWP3 is consistent with requirements specified in applicable stormwater plans and the projects environmental permits, issues, and commitments (EPICs). A copy of the CGP is included in Attachment 2.12 of the SWP3 binder.

**1.0 SITE/PROJECT DESCRIPTION**

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

0456-02-029 & 0456-02-030

**1.2 PROJECT LIMITS:**

From: FM 27 AT CANEY CREEK & CANEY CREEK RELIEF

To: STR# 17-082-0-0456-02-197 & STR# 17-082-0-0456-02-198

**1.3 PROJECT COORDINATES:**

BEGIN: (Lat) 31°44'47", 10"N, (Long) 96°15'9.90"W

END: (Lat) \_\_\_\_\_, (Long) \_\_\_\_\_

**1.4 TOTAL PROJECT AREA (Acres):** 3.2 AC

**1.5 TOTAL AREA TO BE DISTURBED (Acres):** 3.2 AC (100%)

**1.6 NATURE OF CONSTRUCTION ACTIVITY:**

FOR THE CONSTRUCTION OF BRIDGE REPLACEMENT CONSISTING OF REPLACING BRIDGE AND APPROACHES, GRADING, ACP BASE & SURFACE, AND MBGF.

**1.7 MAJOR SOIL TYPES:**

Soil Type	Description
CSJ 0456-02-029	The proposed subgrade soils of B-3 and B-4 primarily consist of interlayered sand and lean clay (CL) with a layer of lignite at 40 feet. The tested plasticity indices (PI's) ranged from 8 to 32.
CSJ 0456-02-030	The proposed subgrade soils of B-5 and B-6 primarily consist of interlayered sand and lean clay (CL) with a layer of lignite at 45 feet. The tested plasticity indices (PI's) ranged from 9 to 27.

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

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

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

Type	Sheet #s

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

**1.9 CONSTRUCTION ACTIVITIES:**

(Use the following list as a starting point when developing the Construction Activity Schedule and Ceasing Record in Attachment 2.5.)

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

**1.10 POTENTIAL POLLUTANTS AND SOURCES:**

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

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
CANEY CREEK	TEHUACANA CREEK (UNCLASSIFIED)

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

**1.12 ROLES AND RESPONSIBILITIES: TxDOT**

- Development of plans and specifications
- Submit Notice of Intent (NOI) to TCEQ (≥5 acres)
- Post Construction Site Notice
- Submit NOI/CSN to local MS4
- Perform SWP3 inspections
- Maintain SWP3 records and update to reflect daily operations
- Complete and submit Notice of Termination to TCEQ
- Maintain SWP3 records for 3 years
- Other: \_\_\_\_\_
- Other: \_\_\_\_\_
- Other: \_\_\_\_\_

**1.13 ROLES AND RESPONSIBILITIES: CONTRACTOR**

- Day To Day Operational Control
- Submit Notice of Intent (NOI) to TCEQ (≥5 acres)
- Post Construction Site Notice
- Submit NOI/CSN to local MS4
- Maintain schedule of major construction activities
- Install, maintain and modify BMPs
- Complete and submit Notice of Termination to TCEQ
- Maintain SWP3 records for 3 years
- Other: \_\_\_\_\_
- Other: \_\_\_\_\_
- Other: \_\_\_\_\_

**1.14 LOCAL MUNICIPAL SEPARATE STORM SEWER SYSTEM (MS4) OPERATOR COORDINATION:**

MS4 Entity
N/A



**STORMWATER POLLUTION PREVENTION PLAN (SWP3)**

FED. RD. DIV. NO.	PROJECT NO.			SHEET NO.
6	BR 2023(408) , ETC.			143
STATE	STATE DIST.	COUNTY		
TEXAS	BRY	FREESTONE		
CONT.	SECT.	JOB	HIGHWAY NO.	
0456	02	028, ETC	FM 27	



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

**2.5 POLLUTION PREVENTION MEASURES:**

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

**2.6 VEGETATED BUFFER ZONES:**

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

Type	Stationing	
	From	To

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

**2.7 ALLOWABLE NON-STORMWATER DISCHARGES:**

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

**2.8 INSPECTIONS:**

All disturbed areas and erosion and sediment control devices shall be inspected at least once every seven (7) days. Inspections shall be performed by TxDOT as indicated on the Field Inspection and Maintenance Report Form 2118 and retained in Attachment 2.5 of this SWP3 .

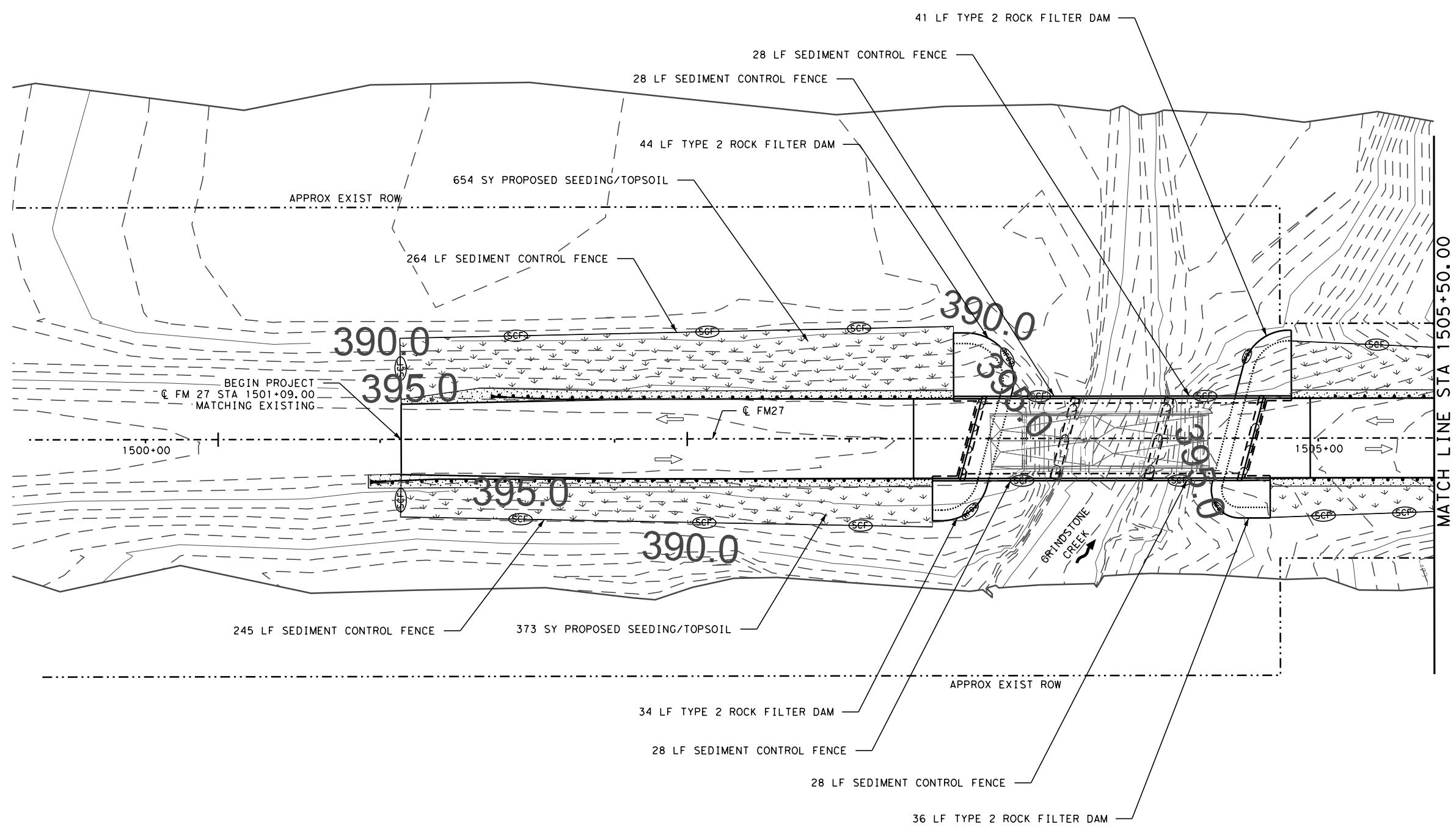
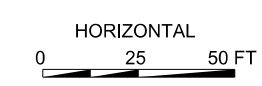
**2.9 MAINTENANCE:**

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



**STORMWATER POLLUTION PREVENTION PLAN (SWP3)**

FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
6	BR 2023(408), ETC.		144
STATE	STATE DIST.	COUNTY	
TEXAS	BRY	FREESTONE	
CONT.	SECT.	JOB	HIGHWAY NO.
0456	02	028, ETC	FM 27

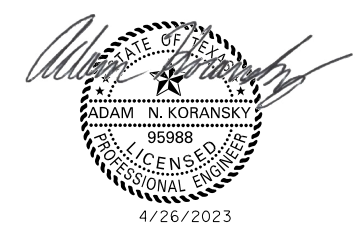


**LEGEND**

- DIRECTION OF FLOW
- TYPE 2 ROCK FILTER DAM
- TYPE 3 ROCK FILTER DAM
- SEDIMENT CONTROL FENCE
- SEEDING/TOPSOIL AREA
- EXISTING CONTOUR

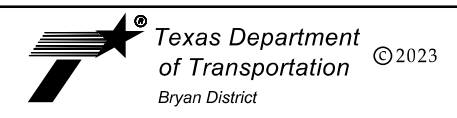
**NOTES:**

1. EROSION CONTROL DEVICE INSTALLATION, MAINTENANCE AND REMOVAL SHALL BE IN ACCORDANCE WITH TXDOT STANDARDS FOR EROSION CONTROL.
2. EROSION CONTROL DEVICES SHALL BE INSTALLED PRIOR TO THE START OF ANY CONSTRUCTION ACTIVITY AND SHALL REMAIN IN PLACE UNTIL CONSTRUCTION IS COMPLETE.
3. LOCATIONS OF EROSION CONTROL DEVICES ARE APPROXIMATIONS. ACTUAL LOCATIONS TO BE DETERMINED IN THE FIELD BY THE ENGINEER.
4. OVERALL SW3P INSTALLATION SHALL FOLLOW TCP PHASING AND CONSTRUCTION SEQUENCE.



PRINT DATE	REVISION DATE
4/26/2023	

**Jacobs** 2705 BEE CAVE RD, SUITE 300  
AUSTIN TX 78746  
FIRM REGISTRATION F-2966

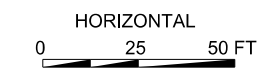


**SW3P LAYOUT  
FM 27 AT GRINDSTONE CREEK**

SHEET 1 OF 5 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER	
6	BR 2023(408),ETC.	FM 27	
STATE	DISTRICT	COUNTY	
TEXAS	BRY	FREESTONE	
CONTROL	SECTION	JOB	SHEET NO.
0456	02	028,ETC	145

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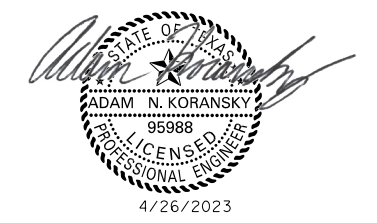


LEGEND

- DIRECTION OF FLOW
- TYPE 2 ROCK FILTER DAM
- TYPE 3 ROCK FILTER DAM
- SEDIMENT CONTROL FENCE
- SEEDING/TOPSOIL AREA
- EXISTING CONTOUR

NOTES:

1. EROSION CONTROL DEVICE INSTALLATION, MAINTENANCE AND REMOVAL SHALL BE IN ACCORDANCE WITH TXDOT STANDARDS FOR EROSION CONTROL.
2. EROSION CONTROL DEVICES SHALL BE INSTALLED PRIOR TO THE START OF ANY CONSTRUCTION ACTIVITY AND SHALL REMAIN IN PLACE UNTIL CONSTRUCTION IS COMPLETE.
3. LOCATIONS OF EROSION CONTROL DEVICES ARE APPROXIMATIONS. ACTUAL LOCATIONS TO BE DETERMINED IN THE FIELD BY THE ENGINEER.
4. OVERALL SW3P INSTALLATION SHALL FOLLOW TCP PHASING AND CONSTRUCTION SEQUENCE.



4/26/2023

PRINT DATE	REVISION DATE
4/26/2023	

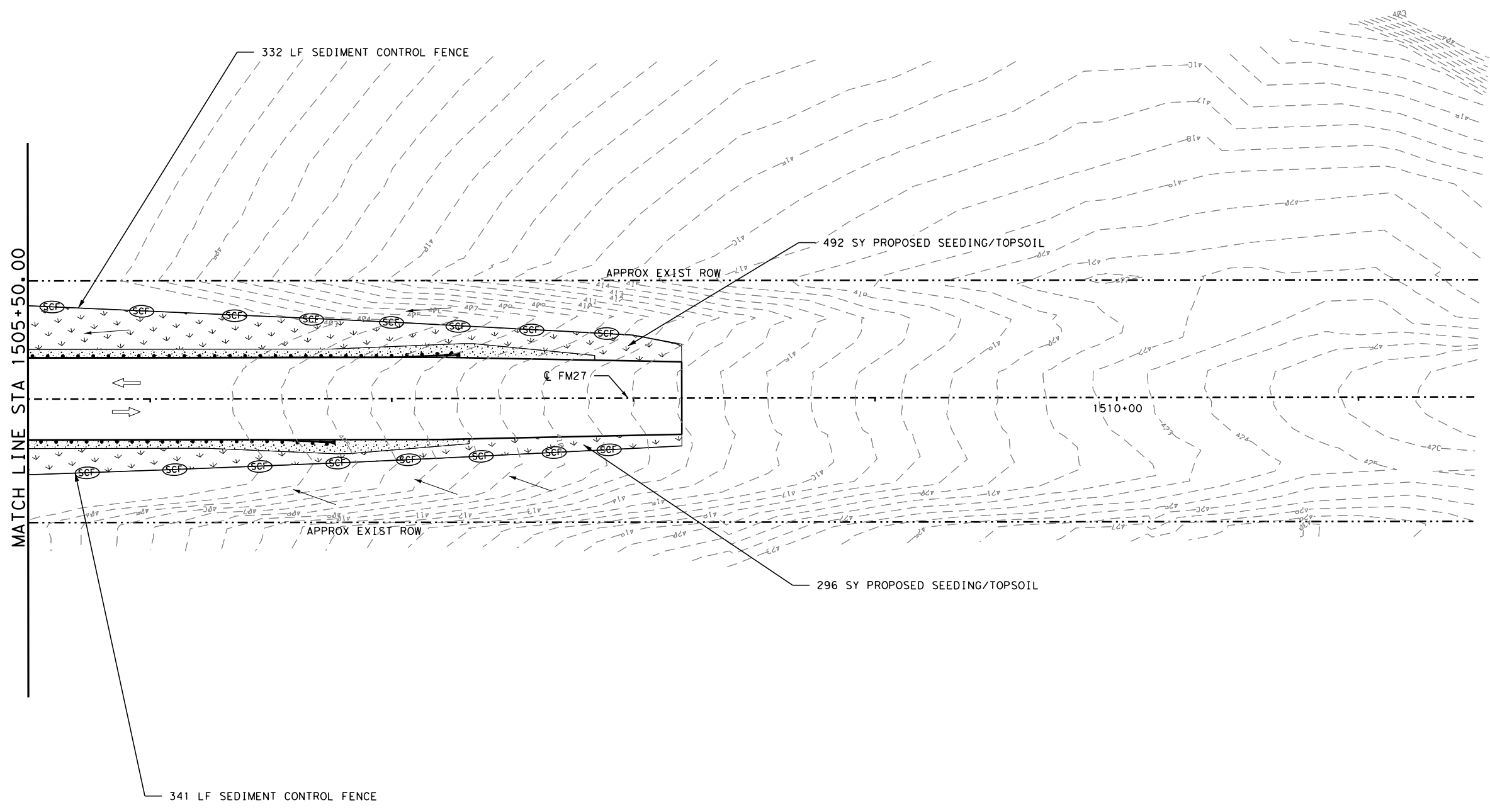
**Jacobs** 2705 BEE CAVE RD, SUITE 300  
AUSTIN TX 78746  
FIRM REGISTRATION F-2966



SW3P LAYOUT  
FM 27 AT GRINDSTONE CREEK

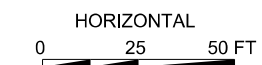
SHEET 2 OF 5 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER	
6	BR 2023(408),ETC.	FM 27	
STATE	DISTRICT	COUNTY	
TEXAS	BRY	FREESTONE	
CONTROL	SECTION	JOB	SHEET NO.
0456	02	028,ETC	146



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**LEGEND**

- DIRECTION OF FLOW
- TYPE 2 ROCK FILTER DAM
- TYPE 3 ROCK FILTER DAM
- SEDIMENT CONTROL FENCE
- SEEDING/TOPSOIL AREA
- EXISTING CONTOUR

**NOTES:**

1. EROSION CONTROL DEVICE INSTALLATION, MAINTENANCE AND REMOVAL SHALL BE IN ACCORDANCE WITH TXDOT STANDARDS FOR EROSION CONTROL.
2. EROSION CONTROL DEVICES SHALL BE INSTALLED PRIOR TO THE START OF ANY CONSTRUCTION ACTIVITY AND SHALL REMAIN IN PLACE UNTIL CONSTRUCTION IS COMPLETE.
3. LOCATIONS OF EROSION CONTROL DEVICES ARE APPROXIMATIONS. ACTUAL LOCATIONS TO BE DETERMINED IN THE FIELD BY THE ENGINEER.
4. OVERALL SW3P INSTALLATION SHALL FOLLOW TCP PHASING AND CONSTRUCTION SEQUENCE.

*Adam N. Koransky*  
 STATE OF TEXAS  
 ADAM N. KORANSKY  
 95988  
 LICENSED PROFESSIONAL ENGINEER  
 4/26/2023

PRINT DATE	REVISION DATE
4/26/2023	

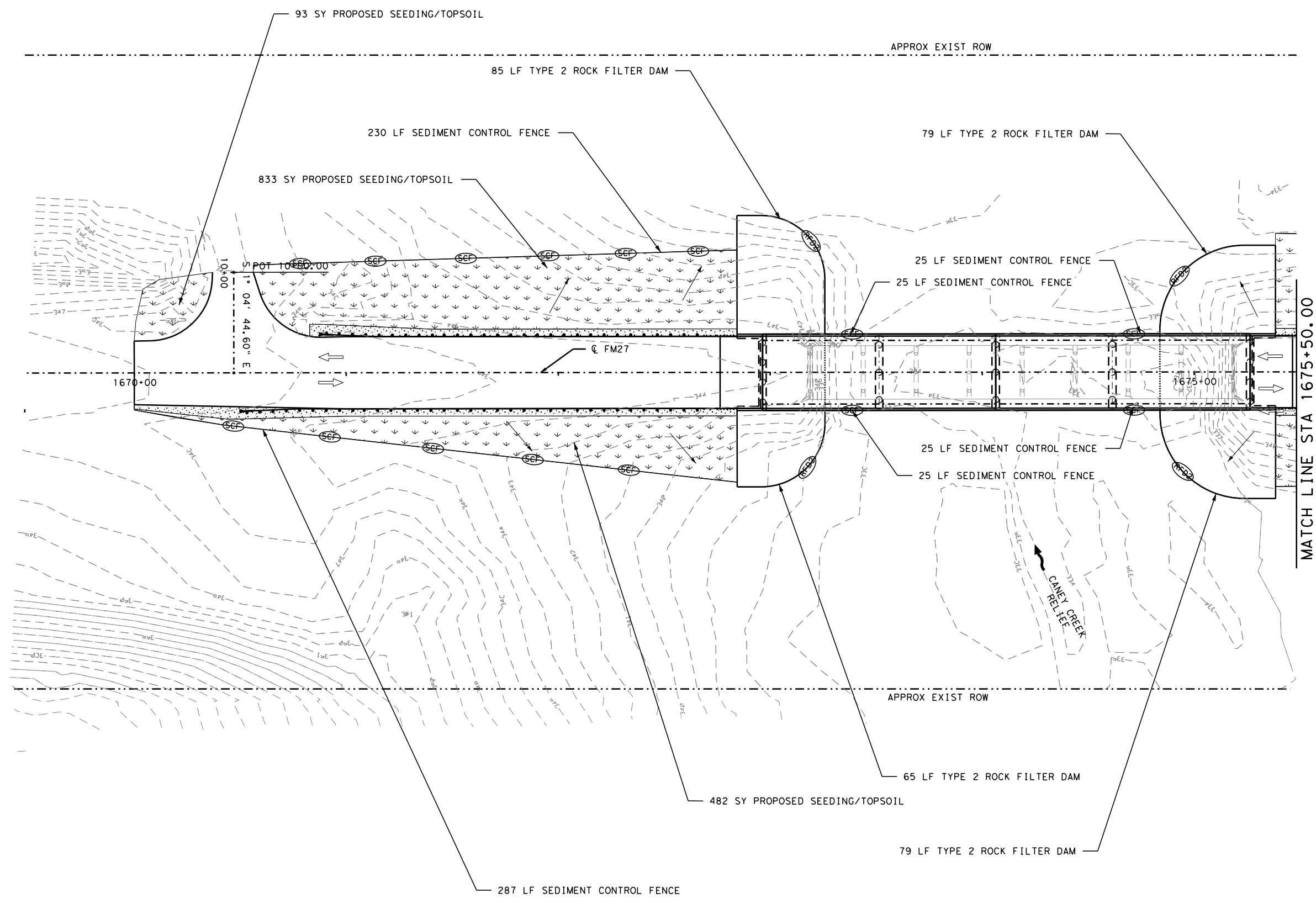
**Jacobs** 2705 BEE CAVE RD, SUITE 300  
 AUSTIN TX 78746  
 FIRM REGISTRATION F-2966

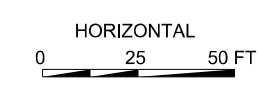
Texas Department of Transportation ©2023  
 Bryan District

**SW3P LAYOUT  
 FM 27 AT CANEY CREEK RELIEF,  
 CANEY CREEK  
 SHEET 3 OF 5 SHEETS**

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER	
6	BR 2023(408),ETC.	FM 27	
STATE	DISTRICT	COUNTY	
TEXAS	BRY	FREESTONE	
CONTROL	SECTION	JOB	SHEET NO.
0456	02	028,ETC	147

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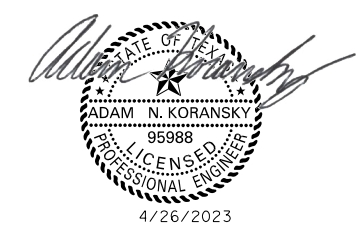


**LEGEND**

- DIRECTION OF FLOW
- TYPE 2 ROCK FILTER DAM
- TYPE 3 ROCK FILTER DAM
- SEDIMENT CONTROL FENCE
- SEEDING/TOPSOIL AREA
- EXISTING CONTOUR

**NOTES:**

1. EROSION CONTROL DEVICE INSTALLATION, MAINTENANCE AND REMOVAL SHALL BE IN ACCORDANCE WITH TxDOT STANDARDS FOR EROSION CONTROL.
2. EROSION CONTROL DEVICES SHALL BE INSTALLED PRIOR TO THE START OF ANY CONSTRUCTION ACTIVITY AND SHALL REMAIN IN PLACE UNTIL CONSTRUCTION IS COMPLETE.
3. LOCATIONS OF EROSION CONTROL DEVICES ARE APPROXIMATIONS. ACTUAL LOCATIONS TO BE DETERMINED IN THE FIELD BY THE ENGINEER.
4. OVERALL SW3P INSTALLATION SHALL FOLLOW TCP PHASING AND CONSTRUCTION SEQUENCE.



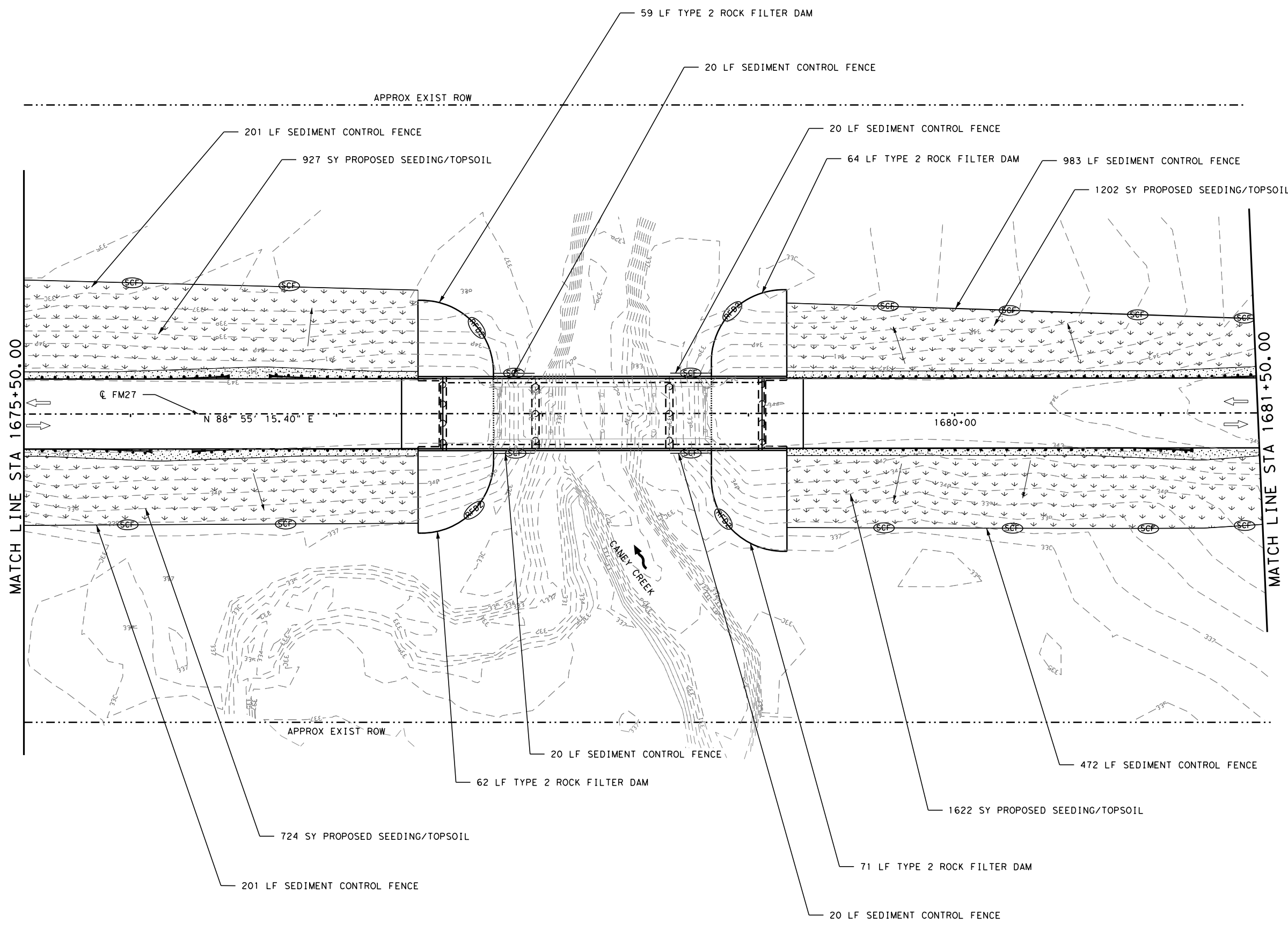
PRINT DATE	REVISION DATE
4/26/2023	

**Jacobs** 2705 BEE CAVE RD, SUITE 300  
AUSTIN TX 78746  
FIRM REGISTRATION F-2966

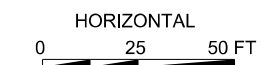


**SW3P LAYOUT**  
**FM 27 AT CANEY CREEK RELIEF,**  
**CANEY CREEK**  
SHEET 4 OF 5 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER	
6	BR 2023(408),ETC.	FM 27	
STATE	DISTRICT	COUNTY	
TEXAS	BRY	FREESTONE	
CONTROL	SECTION	JOB	SHEET NO.
0456	02	028,ETC	148



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**LEGEND**

- DIRECTION OF FLOW
- TYPE 2 ROCK FILTER DAM
- TYPE 3 ROCK FILTER DAM
- SEDIMENT CONTROL FENCE
- SEEDING/TOPSOIL AREA
- EXISTING CONTOUR

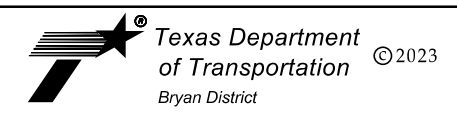
**NOTES:**

1. EROSION CONTROL DEVICE INSTALLATION, MAINTENANCE AND REMOVAL SHALL BE IN ACCORDANCE WITH TXDOT STANDARDS FOR EROSION CONTROL.
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4. OVERALL SW3P INSTALLATION SHALL FOLLOW TCP PHASING AND CONSTRUCTION SEQUENCE.



PRINT DATE	REVISION DATE
4/26/2023	

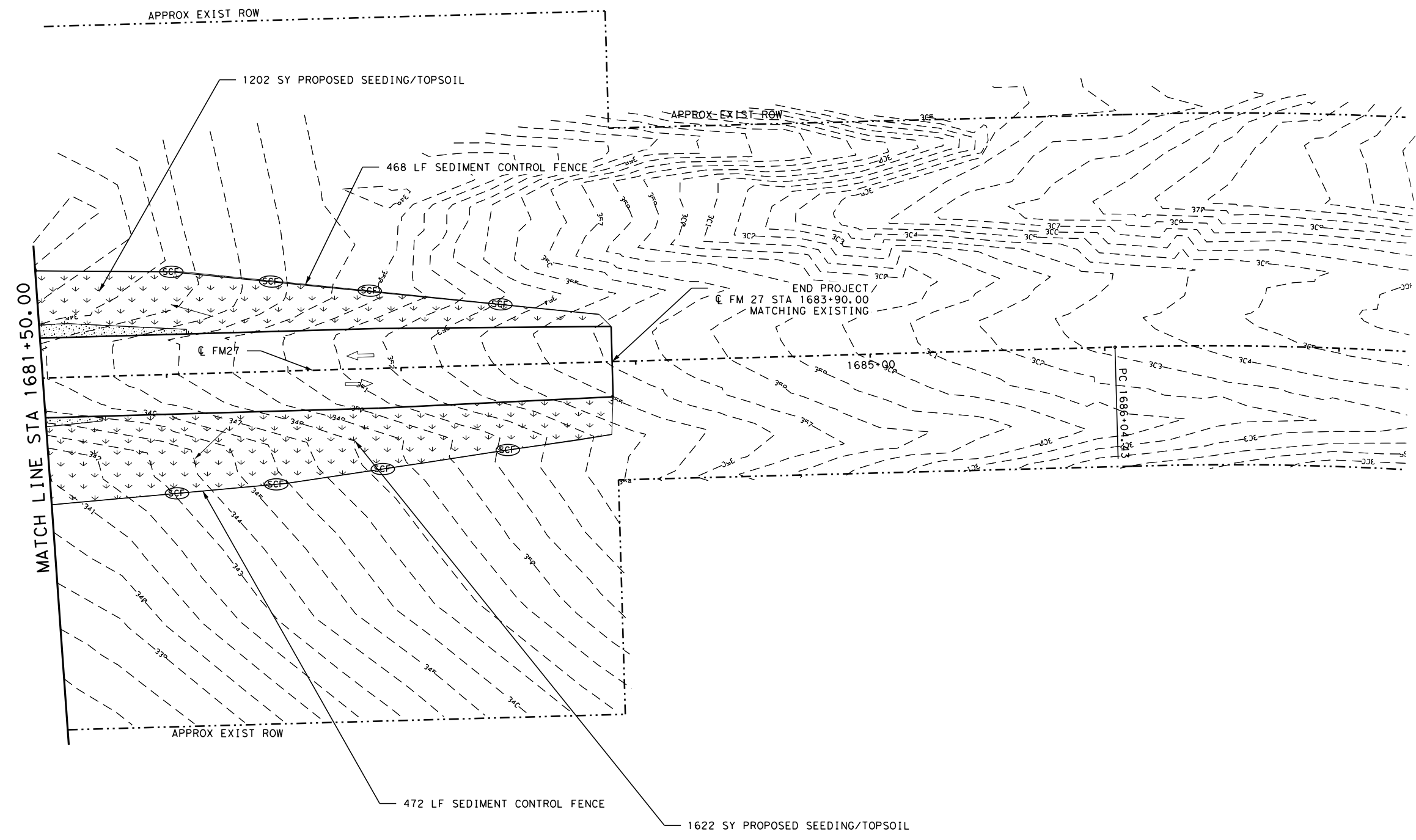
**Jacobs** 2705 BEE CAVE RD, SUITE 300  
AUSTIN TX 78746  
FIRM REGISTRATION F-2966



**SW3P LAYOUT**  
**FM 27 AT CANEY CREEK RELIEF,**  
**CANEY CREEK**  
SHEET 5 OF 5 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER	
6	BR 2023(408),ETC.	FM 27	
STATE	DISTRICT	COUNTY	
TEXAS	BRY	FREESTONE	
CONTROL	SECTION	JOB	SHEET NO.
0456	02	028,ETC	149

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I. STORMWATER POLLUTION PREVENTION-CLEAN WATER ACT SECTION 402

TPDES TXR 150000: Stormwater Discharge Permit or Construction General Permit required for projects with 1 or more acres disturbed soil. Projects with any disturbed soil must protect for erosion and sedimentation in accordance with Item 506.

List MS4 Operator(s) that may receive discharges from this project. They may need to be notified prior to construction activities.

- 1.
2.
 No Action Required  Required Action

Action No.

- 1. Prevent stormwater pollution by controlling erosion and sedimentation in accordance with TPDES Permit TXR 150000
2. Comply with the SW3P and revise when necessary to control pollution or required by the Engineer.
3. Post Construction Site Notice (CSN) with SW3P information on or near the site, accessible to the public and TCEQ, EPA or other inspectors.
4. When Contractor project specific locations (PSL's) increase disturbed soil area to 5 acres or more, submit NOI to TCEQ and the Engineer.

II. WORK IN OR NEAR STREAMS, WATERBODIES AND WETLANDS CLEAN WATER ACT SECTIONS 401 AND 404

USACE Permit required for filling, dredging, excavating or other work in any water bodies, rivers, creeks, streams, wetlands or wet areas.

The Contractor must adhere to all of the terms and conditions associated with the following permit(s):

- No Permit Required
 Nationwide Permit 14 - PCN not Required (less than 1/10th acre waters or wetlands affected)
 Nationwide Permit 14 - PCN Required (1/10 to <1/2 acre, 1/3 in tidal waters)
 Individual 404 Permit Required
 Other Nationwide Permit Required: NWP# \_\_\_\_\_

Required Actions: List waters of the US permit applies to, location in project and check Best Management Practices planned to control erosion, sedimentation and post-project TSS.

- 1. Grindstone Creek - Sta. 1504+17.57
2.
3.
4.

The elevation of the ordinary high water marks of any areas requiring work to be performed in the waters of the US requiring the use of a nationwide permit can be found on the Bridge Layouts.

Best Management Practices:

Table with 3 columns: Erosion, Sedimentation, Post-Construction TSS. Lists various practices like Temporary Vegetation, Silt Fence, Vegetative Filter Strips, etc.

III. CULTURAL RESOURCES

Refer to TxDOT Standard Specifications in the event historical issues or archeological artifacts are found during construction. Upon discovery of archeological artifacts (bones, burnt rock, flint, pottery, etc.) cease work in the immediate area and contact the Engineer immediately.

- No Action Required  Required Action

Action No.

- 1.
2.
3.
4.

IV. VEGETATION RESOURCES

Preserve native vegetation to the extent practical. Contractor must adhere to Construction Specification Requirements Specs 162, 164, 192, 193, 506, 730, 751, 752 in order to comply with requirements for invasive species, beneficial landscaping, and tree/brush removal commitments.

- No Action Required  Required Action

Action No.

- 1. Limit the clearing of vegetation and topsoil to only the areas needed to accomplish the project or activity.
2. Re-vegetation of disturbed areas in compliance with Executive Order 13112 on Invasive Species and the Executive Memorandum on Beneficial Landscaping. Re-vegetation efforts would provide appropriate and sustainable cover to prevent erosion and siltation.

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

- No Action Required  Required Action

Action No.

- 1. BMPs for Federal and State Listed Species will be discussed at the preconstruction meeting.
2. Migratory Birds - The contractor's attention is directed to the fact that there is the possibility that migratory birds may be nesting in any woody vegetation or existing structures within the project limits. The contractor shall remove all old migratory bird nests from any woody vegetation or structures between September 1 and March 1 while the nests are not occupied by a bird. In addition, the contractor must be prepared to prevent migratory birds from re-nesting between March 2 and August 31.

If any of the listed species are observed, cease work in the immediate area, do not disturb species or habitat and contact the Engineer immediately. The work may not remove active nests from bridges and other structures during nesting season of the birds associated with the nests. If caves or sinkholes are discovered, cease work in the immediate area, and contact the Engineer immediately.

LIST OF ABBREVIATIONS

Table listing abbreviations: BMP, CGP, DSHS, FHWA, MOA, MOU, MS4, MBTA, NOT, NMP, NOI, SPCC, SW3P, PCN, PSL, TCEQ, TPDES, TPWD, TxDOT, T&E, USACE, USFWS, etc.

VI. HAZARDOUS MATERIALS OR CONTAMINATION ISSUES

General (applies to all projects):

Comply with the Hazard Communication Act (the Act) for personnel who will be working with hazardous materials by conducting safety meetings prior to beginning construction and making workers aware of potential hazards in the workplace. Ensure that all workers are provided with personal protective equipment appropriate for any hazardous materials used. Obtain and keep on-site Material Safety Data Sheets (MSDS) for all hazardous products used on the project, which may include, but are not limited to the following categories: Paints, acids, solvents, asphalt products, chemical additives, fuels and concrete curing compounds or additives. Provide protected storage, off bare ground and covered, for products which may be hazardous. Maintain product labelling as required by the Act.

Maintain an adequate supply of on-site spill response materials, as indicated in the MSDS. In the event of a spill, take actions to mitigate the spill as indicated in the MSDS, in accordance with safe work practices, and contact the District Spill Coordinator immediately. The Contractor shall be responsible for the proper containment and cleanup of all product spills.

Contact the Engineer if any of the following are detected:

- \* Dead or distressed vegetation (not identified as normal)
\* Trash piles, drums, canister, barrels, etc.
\* Undesirable smells or odors
\* Evidence of leaching or seepage of substances

Does the project involve any bridge class structure rehabilitation or replacements (bridge class structures not including box culverts)?

- Yes  No

If "No", then no further action is required.

If "Yes", then TxDOT is responsible for completing asbestos assessment/inspection.

Are the results of the asbestos inspection positive (is asbestos present)?

- Yes  No

If "Yes", then TxDOT must retain a DSHS licensed asbestos consultant to assist with the notification, develop abatement/mitigation procedures, and perform management activities as necessary. The notification form to DSHS must be postmarked at least 15 working days prior to scheduled demolition.

If "No", then TxDOT is still required to notify DSHS 15 working days prior to any scheduled demolition.

In either case, the Contractor is responsible for providing the date(s) for abatement activities and/or demolition with careful coordination between the Engineer and asbestos consultant in order to minimize construction delays and subsequent claims.

Any other evidence indicating possible hazardous materials or contamination discovered on site. Hazardous Materials or Contamination Issues Specific to this Project:

- No Action Required  Required Action

Action No.

- 1.
2.
3.

VII. OTHER ENVIRONMENTAL ISSUES

(includes regional issues such as Edwards Aquifer District, etc.)

- No Action Required  Required Action

Action No.

- 1.
2.
3.

Table with 2 columns: PRINT DATE, REVISION DATE. Value: 4/27/2023

Jacobs 2705 BEE CAVE RD, SUITE 300 AUSTIN TX 78746 FIRM REGISTRATION F-2966



ENVIRONMENTAL PERMITS, ISSUES AND COMMENTS EPIC

Table with 4 columns: FED. RD. DIV. NO., PROJECT NUMBER, HIGHWAY NUMBER, STATE, DISTRICT, COUNTY, CONTROL, SECTION, JOB, SHEET NO. Values: 6, BR 2023(408), ETC., FM 27, TEXAS, BRY, FREESTONE, 0456, 02, 028, ETC, 150

**I. STORMWATER POLLUTION PREVENTION-CLEAN WATER ACT SECTION 402**

TPDES TXR 150000: Stormwater Discharge Permit or Construction General Permit required for projects with 1 or more acres disturbed soil. Projects with any disturbed soil must protect for erosion and sedimentation in accordance with Item 506.

List MS4 Operator(s) that may receive discharges from this project. They may need to be notified prior to construction activities.

- 
- No Action Required      Required Action

Action No.

- Prevent stormwater pollution by controlling erosion and sedimentation in accordance with TPDES Permit TXR 150000
- Comply with the SW3P and revise when necessary to control pollution or required by the Engineer.
- Post Construction Site Notice (CSN) with SW3P information on or near the site, accessible to the public and TCEQ, EPA or other inspectors.
- When Contractor project specific locations (PSL's) increase disturbed soil area to 5 acres or more, submit NOI to TCEQ and the Engineer.

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- Nationwide Permit 14 - PCN Required (1/10 to <1/2 acre, 1/3 in tidal waters)
- Individual 404 Permit Required
- Other Nationwide Permit Required: NWP# \_\_\_\_\_

Required Actions: List waters of the US permit applies to, location in project and check Best Management Practices planned to control erosion, sedimentation and post-project TSS.

- Caney Creek Relief - Sta. 1674+10.88
- Caney Creek - Sta. 1678+29.09
- 
- 

The elevation of the ordinary high water marks of any areas requiring work to be performed in the waters of the US requiring the use of a nationwide permit can be found on the Bridge Layouts.

Best Management Practices:

Erosion	Sedimentation	Post-Construction TSS
<input checked="" type="checkbox"/> Temporary Vegetation	<input checked="" type="checkbox"/> Silt Fence	<input type="checkbox"/> Vegetative Filter Strips
<input checked="" type="checkbox"/> Blankets/Matting	<input type="checkbox"/> Rock Berm	<input type="checkbox"/> Retention/Irrigation Systems
<input type="checkbox"/> Mulch	<input type="checkbox"/> Triangular Filter Dike	<input type="checkbox"/> Extended Detention Basin
<input type="checkbox"/> Sodding	<input type="checkbox"/> Sand Bag Berm	<input type="checkbox"/> Constructed Wetlands
<input type="checkbox"/> Interceptor Swale	<input type="checkbox"/> Straw Bale Dike	<input type="checkbox"/> Wet Basin
<input type="checkbox"/> Diversion Dike	<input type="checkbox"/> Brush Berms	<input type="checkbox"/> Erosion Control Compost
<input type="checkbox"/> Erosion Control Compost	<input type="checkbox"/> Erosion Control Compost	<input type="checkbox"/> Mulch Filter Berm and Socks
<input type="checkbox"/> Mulch Filter Berm and Socks	<input type="checkbox"/> Mulch Filter Berm and Socks	<input type="checkbox"/> Compost Filter Berm and Socks
<input type="checkbox"/> Compost Filter Berm and Socks	<input type="checkbox"/> Compost Filter Berm and Socks	<input type="checkbox"/> Vegetation Lined Ditches
	<input type="checkbox"/> Stone Outlet Sediment Traps	<input type="checkbox"/> Sand Filter Systems
	<input type="checkbox"/> Sediment Basins	<input checked="" type="checkbox"/> Grassy Swales

**III. CULTURAL RESOURCES**

Refer to TxDOT Standard Specifications in the event historical issues or archeological artifacts are found during construction. Upon discovery of archeological artifacts (bones, burnt rock, flint, pottery, etc.) cease work in the immediate area and contact the Engineer immediately.

- No Action Required      Required Action

Action No.

- 
- 
- 
- 

**IV. VEGETATION RESOURCES**

Preserve native vegetation to the extent practical. Contractor must adhere to Construction Specification Requirements Specs 162, 164, 192, 193, 506, 730, 751, 752 in order to comply with requirements for invasive species, beneficial landscaping, and tree/brush removal commitments.

- No Action Required      Required Action

Action No.

- Limit the clearing of vegetation and topsoil to only the areas needed to accomplish the project or activity.
- Re-vegetation of disturbed areas in compliance with Executive Order 13112 on Invasive Species and the Executive Memorandum on Beneficial Landscaping. Re-vegetation efforts would provide appropriate and sustainable cover to prevent erosion and siltation.

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

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**LIST OF ABBREVIATIONS**

BMP: Best Management Practice	SPCC: Spill Prevention Control and Countermeasure
CGP: Construction General Permit	SW3P: Storm Water Pollution Prevention Plan
DSHS: Texas Department of State Health Services	PCN: Pre-Construction Notification
FHWA: Federal Highway Administration	PSL: Project Specific Location
MOA: Memorandum of Agreement	TCEQ: Texas Commission on Environmental Quality
MOU: Memorandum of Understanding	TPDES: Texas Pollutant Discharge Elimination System
MS4: Municipal Separate Stormwater Sewer System	TPWD: Texas Parks and Wildlife Department
MBTA: Migratory Bird Treaty Act	TxDOT: Texas Department of Transportation
NOT: Notice of Termination	T&E: Threatened and Endangered Species
NMP: Nationwide Permit	USACE: U.S. Army Corps of Engineers
NOI: Notice of Intent	USFWS: U.S. Fish and Wildlife Service

**VI. HAZARDOUS MATERIALS OR CONTAMINATION ISSUES**

General (applies to all projects):

Comply with the Hazard Communication Act (the Act) for personnel who will be working with hazardous materials by conducting safety meetings prior to beginning construction and making workers aware of potential hazards in the workplace. Ensure that all workers are provided with personal protective equipment appropriate for any hazardous materials used. Obtain and keep on-site Material Safety Data Sheets (MSDS) for all hazardous products used on the project, which may include, but are not limited to the following categories: Paints, acids, solvents, asphalt products, chemical additives, fuels and concrete curing compounds or additives. Provide protected storage, off bare ground and covered, for products which may be hazardous. Maintain product labelling as required by the Act. Maintain an adequate supply of on-site spill response materials, as indicated in the MSDS. In the event of a spill, take actions to mitigate the spill as indicated in the MSDS, in accordance with safe work practices, and contact the District Spill Coordinator immediately. The Contractor shall be responsible for the proper containment and cleanup of all product spills.

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- \* Undesirable smells or odors
- \* Evidence of leaching or seepage of substances

Does the project involve any bridge class structure rehabilitation or replacements (bridge class structures not including box culverts)?

- Yes      No

If "No", then no further action is required.

If "Yes", then TxDOT is responsible for completing asbestos assessment/inspection.

Are the results of the asbestos inspection positive (is asbestos present)?

- Yes      No

If "Yes", then TxDOT must retain a DSHS licensed asbestos consultant to assist with the notification, develop abatement/mitigation procedures, and perform management activities as necessary. The notification form to DSHS must be postmarked at least 15 working days prior to scheduled demolition.

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- No Action Required      Required Action

Action No.

- 
- 
- 

**VII. OTHER ENVIRONMENTAL ISSUES**

(includes regional issues such as Edwards Aquifer District, etc.)

- No Action Required      Required Action

Action No.

- 
- 
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PRINT DATE	REVISION DATE
4/27/2023	

**Jacobs** 2705 BEE CAVE RD, SUITE 300  
AUSTIN TX 78746  
FIRM REGISTRATION F-2966

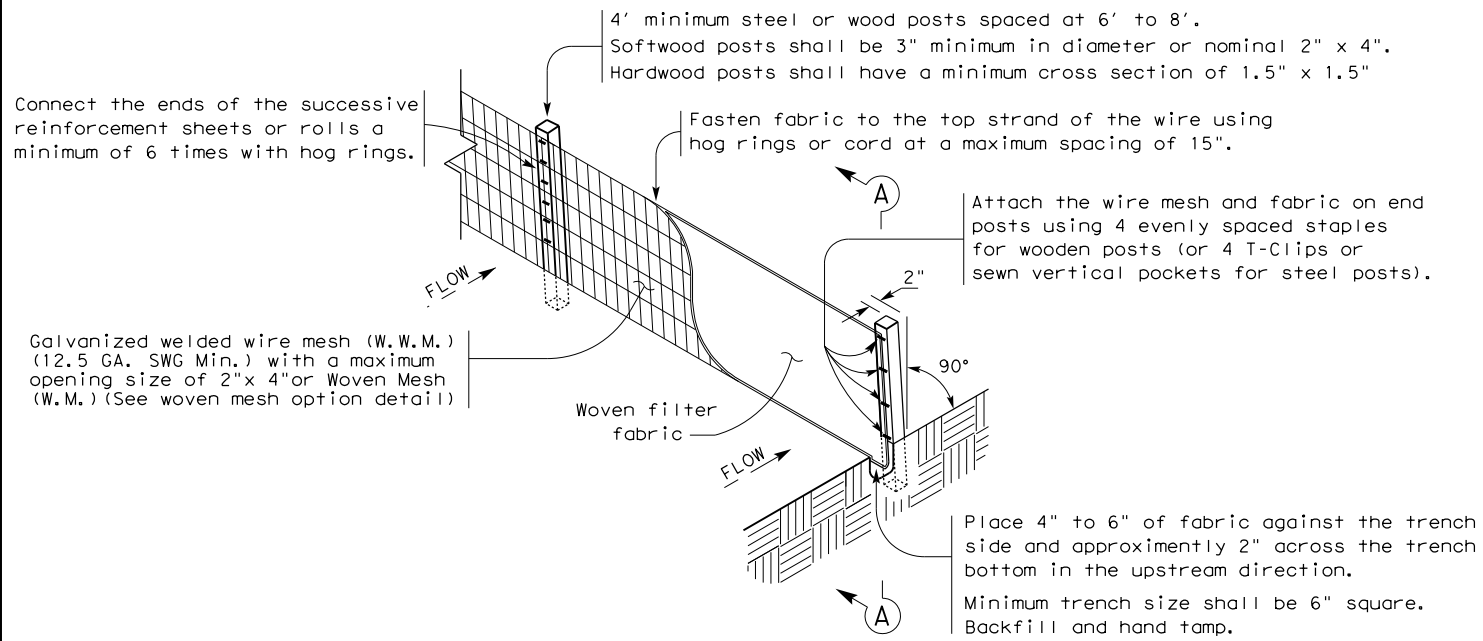


**ENVIRONMENTAL PERMITS, ISSUES AND COMMENTS EPIC**

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER	
6	BR 2023(408),ETC.	FM 27	
STATE	DISTRICT	COUNTY	
TEXAS	BRY	FREESTONE	
CONTROL	SECTION	JOB	SHEET NO.
0456	02	028,ETC	151

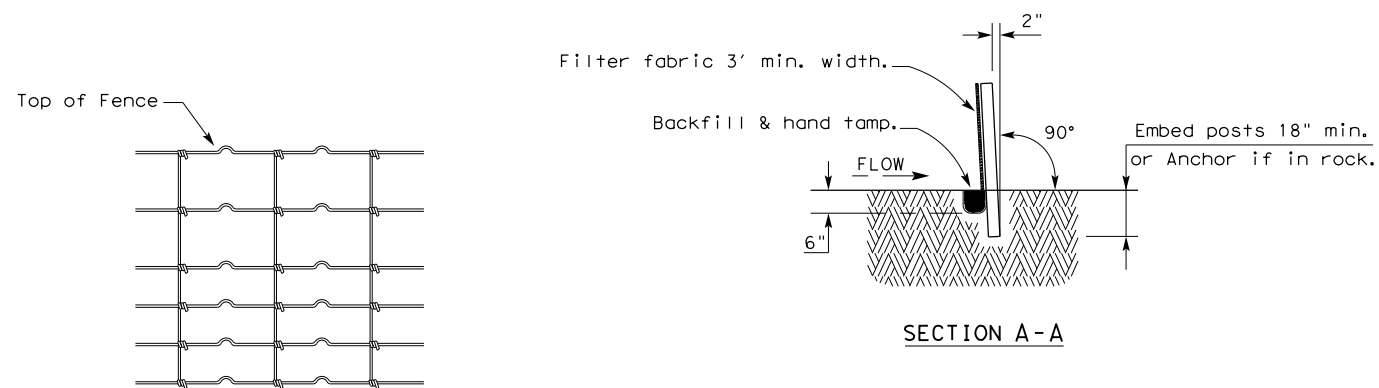


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TEMPORARY SEDIMENT CONTROL FENCE

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.

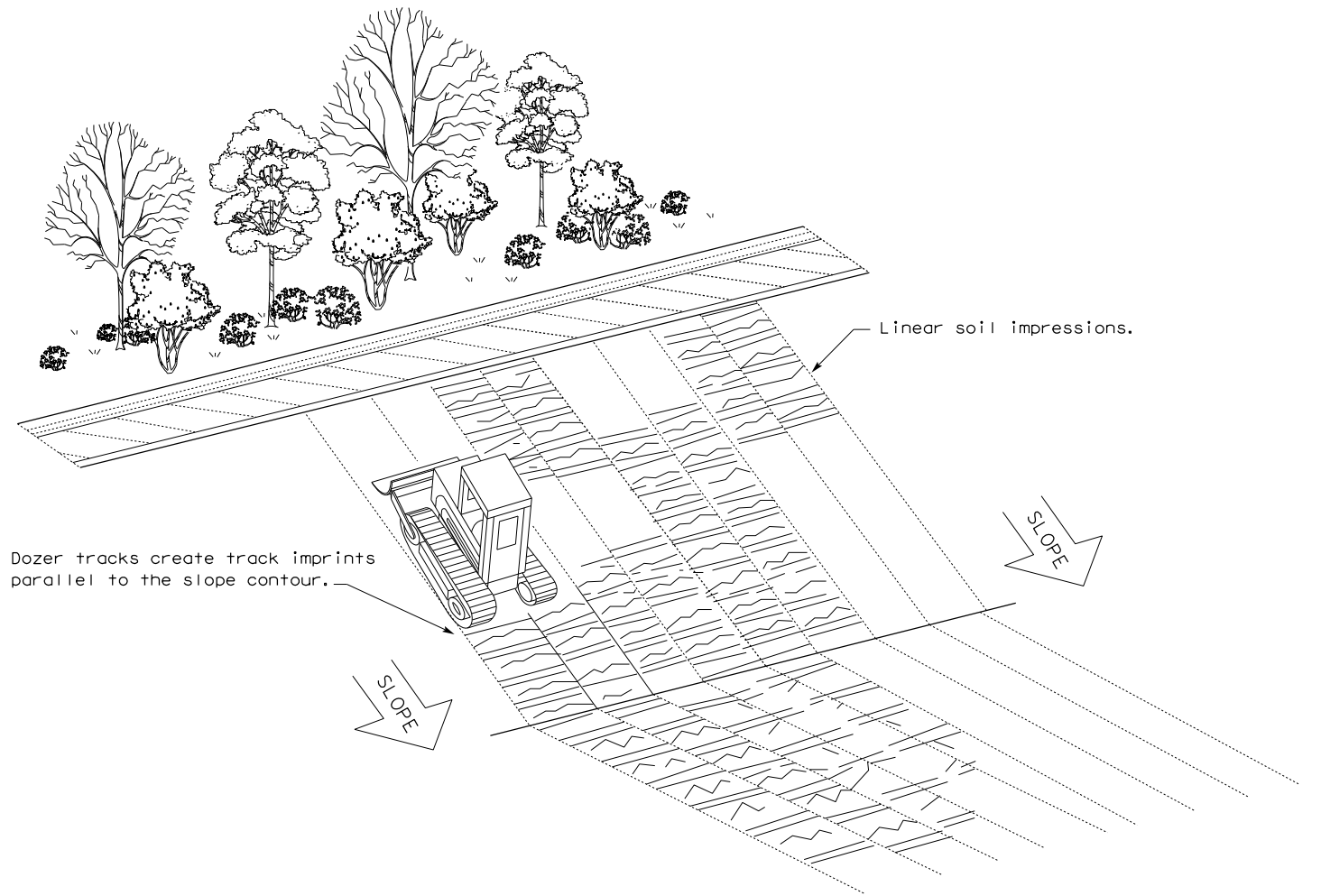
**LEGEND**

Sediment Control Fence

SCF

**GENERAL NOTES**

- Vertical tracking is required on projects where soil distributing activities have occurred unless otherwise approved.
- Perform vertical tracking on slopes to temporarily stabilize soil.
- 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.
- Do not exceed 12" between track impressions.
- Install continuous linear track impressions where the minimum 12" length impressions are perpendicular to the slope or direction of water flow.

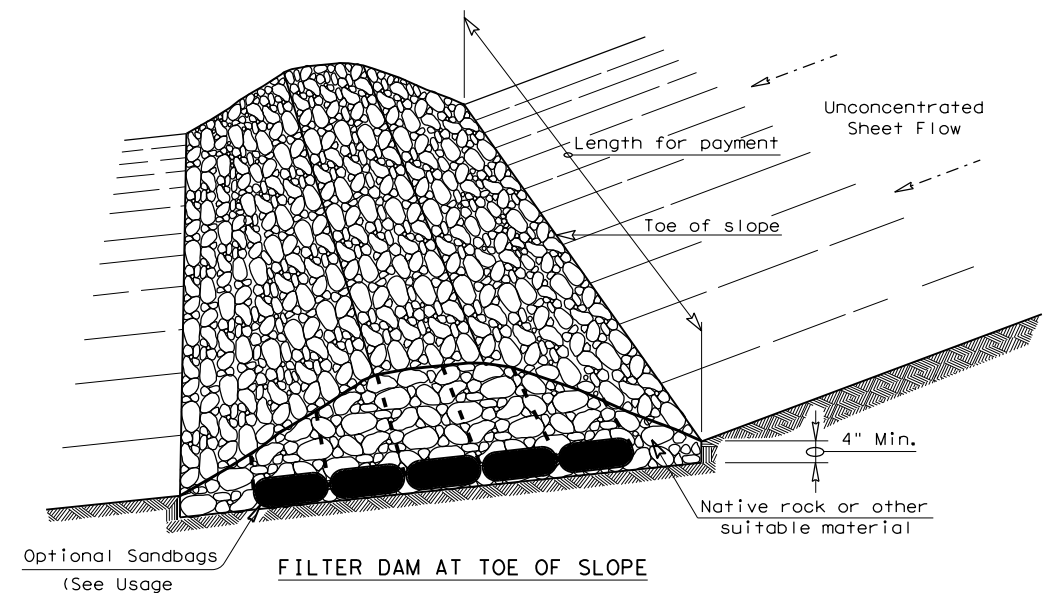


VERTICAL TRACKING

				Design Division Standard	
<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	0456	02	028, ETC	FM 27	
	DIST	COUNTY	SHEET NO.		
	BRY	FREESTONE	152		

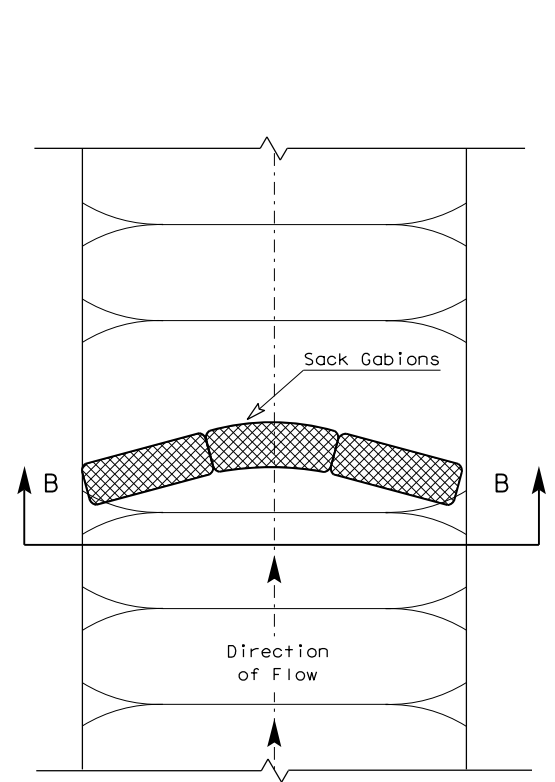
DISCLAIMER: The use of this standard is governed by the "Texas Engineering Practice Act". No warranty of any kind is made by TxDOT for any purpose whatsoever. TxDOT assumes no responsibility for the conversion of this standard to other formats or for incorrect results or damages resulting from its use.

DATE: 2/21/2023  
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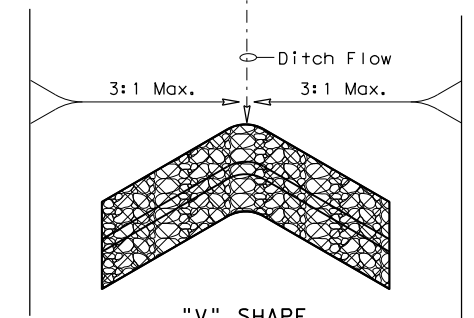


**FILTER DAM AT TOE OF SLOPE**

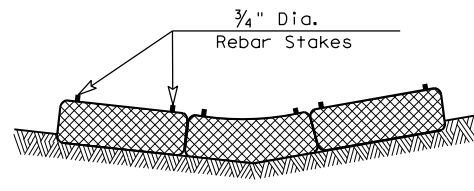
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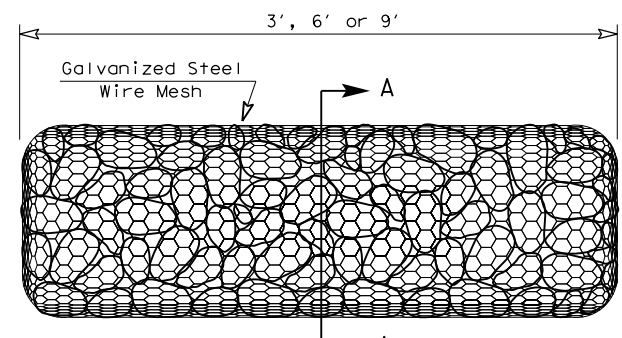
**PLAN VIEW**



**"V" SHAPE PLAN VIEW**

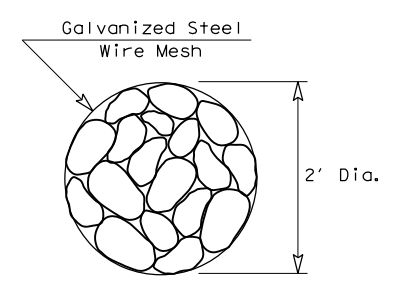


**SECTION B-B**

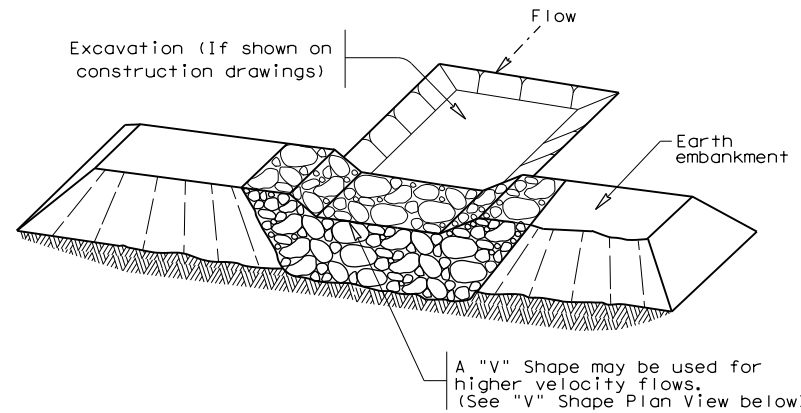


**TYPE 4 (SACK GABIONS)**

— (RFD4) —

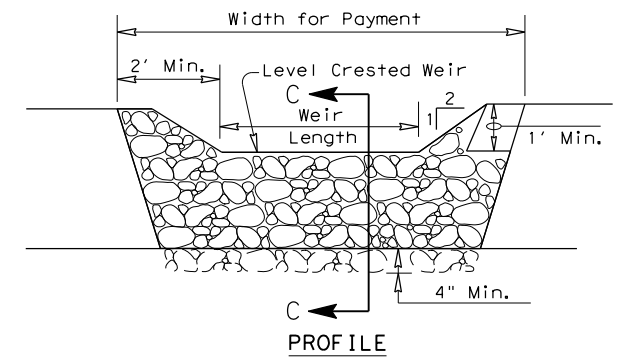


**SECTION A-A**

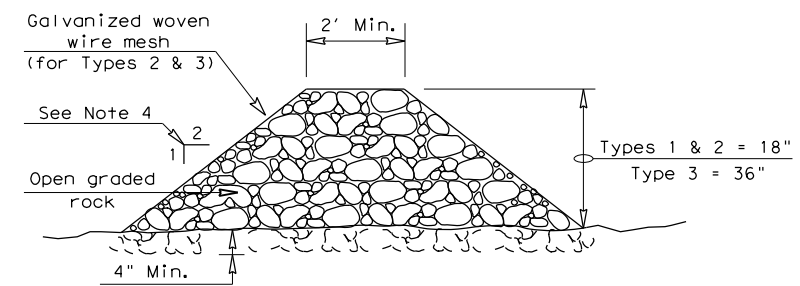


**FILTER DAM AT SEDIMENT TRAP**

— (RFD1) OR (RFD2) —



**PROFILE**



**SECTION C-C**

**ROCK FILTER DAM USAGE GUIDELINES**

Rock Filter Dams should be constructed downstream from disturbed areas to intercept sediment from overland runoff and/or concentrated flow. The dams should be sized to filter a maximum flow through rate of 60 GPM/FT<sup>2</sup> of cross sectional area. A 2 year storm frequency may be used to calculate the flow rate.

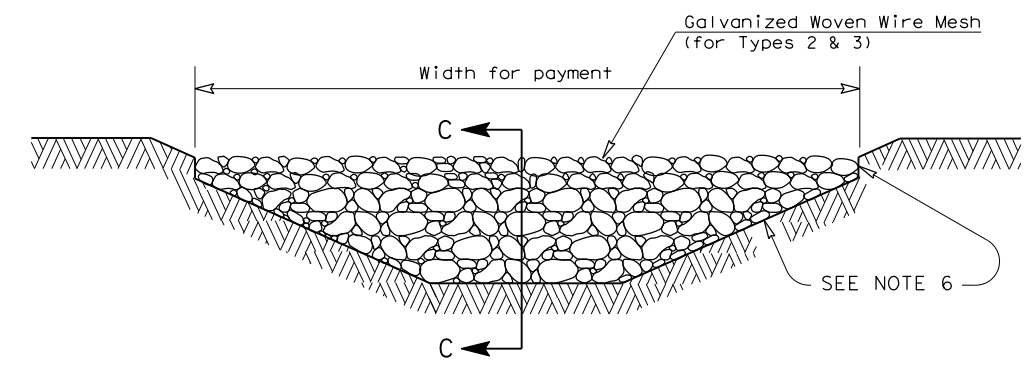
**Type 1 (18" high with no wire mesh) (3" to 6" aggregate):** Type 1 may be used at the toe of slopes, around inlets, in small ditches, and at dike or swale outlets. This type of dam is recommended to control erosion from a drainage area of 5 acres or less. Type 1 may not be used in concentrated high velocity flows (approximately 8 Ft/Sec or more) in which aggregate wash out may occur. Sandbags may be used at the embedded foundation (4" deep min.) for better filtering efficiency of low flows if called for on the plans or directed by the Engineer.

**Type 2 (18" high with wire mesh) (3" to 6" aggregate):** Type 2 may be used in ditches and at dike or swale outlets.

**Type 3 (36" high with wire mesh) (4" to 8" aggregate):** Type 3 may be used in stream flow and should be secured to the stream bed.

**Type 4 (Sack gabions) (3" to 6" aggregate):** Type 4 May be used in ditches and smaller channels to form an erosion control dam.

**Type 5:** Provide rock filter dams as shown on plans.



**FILTER DAM AT CHANNEL SECTIONS**

— (RFD1) OR (RFD2) OR (RFD3) —

**GENERAL NOTES**

1. If shown on the plans or directed by the Engineer, filter dams should be placed near the toe of slopes where erosion is anticipated, upstream and/or downstream at drainage structures, and in roadway ditches and channels to collect sediment.
2. Materials (aggregate, wire mesh, sandbags, etc.) shall be as indicated by the specification for "Rock Filter Dams for Erosion and Sedimentation Control".
3. The rock filter dam dimensions shall be as indicated on the SW3P plans.
4. Side slopes should be 2:1 or flatter. Dams within the safety zone shall have sideslopes of 6:1 or flatter.
5. Maintain a minimum of 1' between top of rock filter dam weir and top of embankment for filter dams at sediment traps.
6. Filter dams should be embedded a minimum of 4" into existing ground.
7. The sediment trap for ponding of sediment laden runoff shall be of the dimensions shown on the plans.
8. Rock filter dam types 2 & 3 shall be secured with 20 gauge galvanized woven wire mesh with 1" diameter hexagonal openings. The aggregate shall be placed on the mesh to the height & slopes specified. The mesh shall be folded at the upstream side over the aggregate and tightly secured to itself on the downstream side using wire ties or hog rings. For in stream use, the mesh should be secured or staked to the stream bed prior to aggregate placement.
9. Sack Gabions should be staked down with 3/4" dia. rebar stakes, and have a double-twisted hexagonal weave with a nominal mesh opening of 2 1/2" x 3 1/4".
10. Flow outlet should be onto a stabilized area (vegetation, rock, etc.).
11. The guidelines shown hereon are suggestions only and may be modified by the Engineer.

**PLAN SHEET LEGEND**

- Type 1 Rock Filter Dam — (RFD1) —
- Type 2 Rock Filter Dam — (RFD2) —
- Type 3 Rock Filter Dam — (RFD3) —
- Type 4 Rock Filter Dam — (RFD4) —

		<b>Design Division Standard</b>	
<b>TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES</b> <b>ROCK FILTER DAMS</b> <b>EC (2) - 16</b>			
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