STATE OF TEXAS
DEPARTMENT OF TRANSPORTATION

PLANS OF PROPOSED
STATE HIGHWAY IMPROVEMENT

FEDERAL-AID PROJECT BR 2025(203)

SH 220
ERATH COUNTY

FEDERAL AID PROJECT NO.			
BR 2025(203)			
CONT	SECT	JOB	HIGHWAY
0467	02	020, ETC.	SH 220
DIST	COUNTY		SHEET NO.
FTW	ERATH		1

FUNCTIONAL CLASS: RURAL MAJOR COLLECTOR
DESIGN SPEED: 75 MPH

AADT 2022: 2,802
AADT 2042: 4,539

INDEX OF SHEETS

CSJ	HWY	LIMITS	ROADWAY LENGTH		BRIDGE LENGTH		PROJECT LENGTH	
			FEET	MILES	FEET	MILES	FEET	MILES
0467-02-020	SH 220	AT LITTLE DUFFAU CREEK	1415.00	0.268	180.00	0.034	1595.00	0.302
0467-02-021	SH 220	AT DUFFAU CREEK	770.01	0.146	185.00	0.035	955.01	0.181

TOTAL PROJECT LENGTH = 0.483 MILES

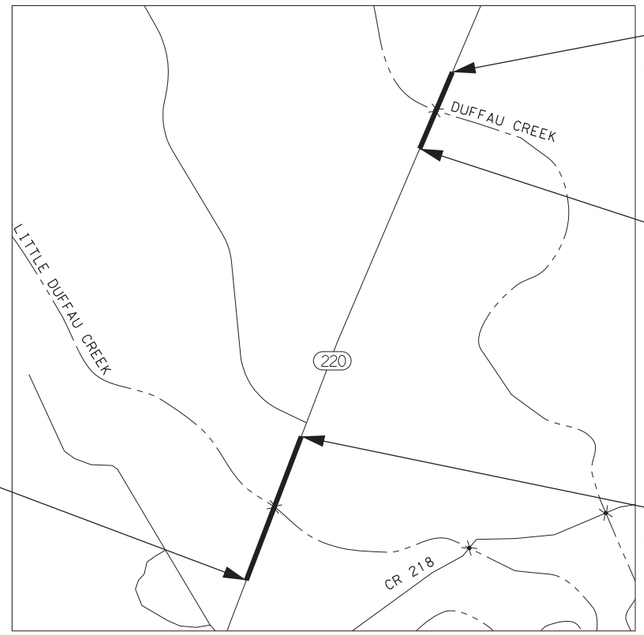
FOR THE CONSTRUCTION OF BRIDGE REPLACEMENT
CONSISTING OF: REPLACING BRIDGE AND APPROACHES.

Jacobs
1999 BRYAN ST, SUITE 3500
DALLAS, TX 75201-3136
Phone: +1 (214) 638-0145
Firm Registration: F-2966

ERATH COUNTY

NOT TO SCALE

FORT WORTH DISTRICT
(SEE PROJECT LAYOUT FOR
ADDITIONAL LOCATION DETAIL)



END PROJECT
CSJ 0467-02-021
MP 9.711
LAT 32.0345713
LON -98.0091571

BEGIN PROJECT
CSJ 0467-02-021
MP 9.711
LAT 32.0345713
LON -98.0091571

BEGIN PROJECT
CSJ 0467-02-020
MP 9.884
LAT 32.0322552
LON -98.0102860

END PROJECT
CSJ 0467-02-020
MP 9.916
LAT 32.0318277
LON -98.0104845

LETTING DATE: _____
CONTRACTOR: _____
_____
WORK BEGAN: _____
WORK COMPLETED: _____
WORK ACCEPTED: _____
CHANGE ORDERS: _____

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

SPECIFICATIONS ADOPTED BY THE TEXAS DEPARTMENT OF TRANSPORTATION, SEPTEMBER 1, 2024 AND SPECIFICATION ITEMS LISTED AND DATED AS FOLLOWS, SHALL GOVERN ON THIS PROJECT:
REQUIRED CONTRACT PROVISIONS, FEDERAL-AID CONSTRUCTION CONTRACTS (FORM FHWA 1273, OCTOBER, 2023)

EQUATIONS : NONE
RAILROAD : NONE
EXCEPTIONS : NONE
NO TDLR REQUIRED

Texas Department of Transportation

DocuSigned by: Sarah S. Homer, PE 7/15/2024
862BEBCA16FA483...
AREA ENGINEER

RECOMMENDED FOR LETTING: 7/29/2024
DocuSigned by:
7879B0B92E5D403...
DIR OF OPR, TP&D

CORRECT FOR LETTING: 7/3/2024
PROJECT MANAGER, JACOBS

APPROVED FOR LETTING: 7/30/2024
DocuSigned by: David M Salazar, P.E.
B741E64FAD82411...

TIME: 11:59:33 AM
DATE: 7/16/2024

INDEX OF SHEETS

STATE OF TEXAS
AMY HARRINGTON CAUSEY
148150
LICENSED PROFESSIONAL ENGINEER

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

Amy Harrington Causey , P.E. 7/12/2024
Signature of Registrant & Date

Jacobs Engineering Group
STATE OF TEXAS
PAUL K. CLARK
99509
LICENSED PROFESSIONAL ENGINEER
F-2966
7/12/2024

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

, P.E.
Signature of Registrant & Date

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Texas Department of Transportation

SH 220

INDEX OF SHEETS

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

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NUMBER		HIGHWAY NO.
MBT	**6**	**(See Title Sheet)**		**SH 220**
CHECK **REL**	STATE	DISTRICT	COUNTY	SHEET NO.
GRAPHICS **BDG**	**TEXAS**	**FTW**	**ERATH**	**2**
CHECK **PKC**	CONTROL **0467**	SECTION **02**	JOB **020, ETC.**	

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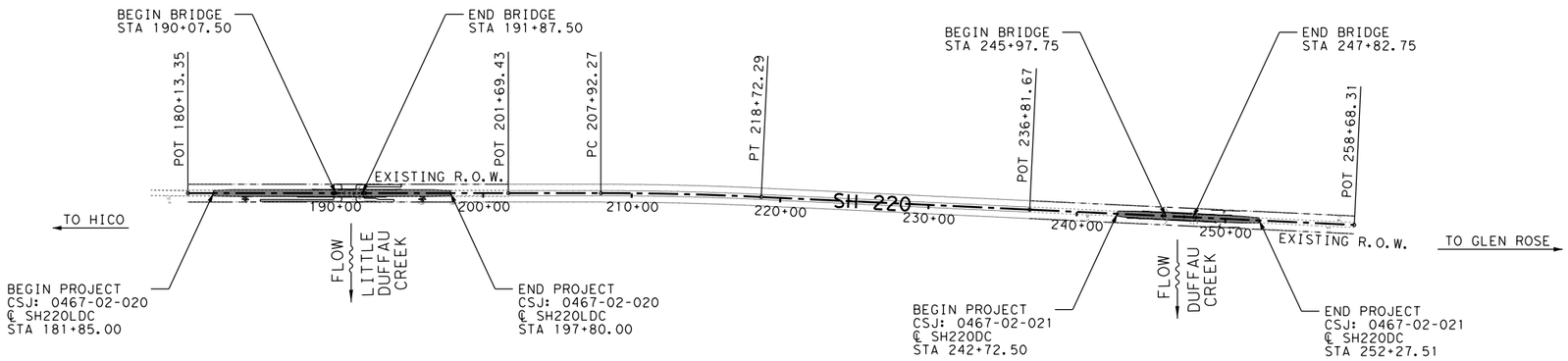

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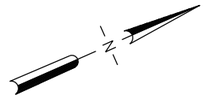
NEW NBI NO. = 02-073-0-0467-02-007



0 500 1000
SCALE IN FEET

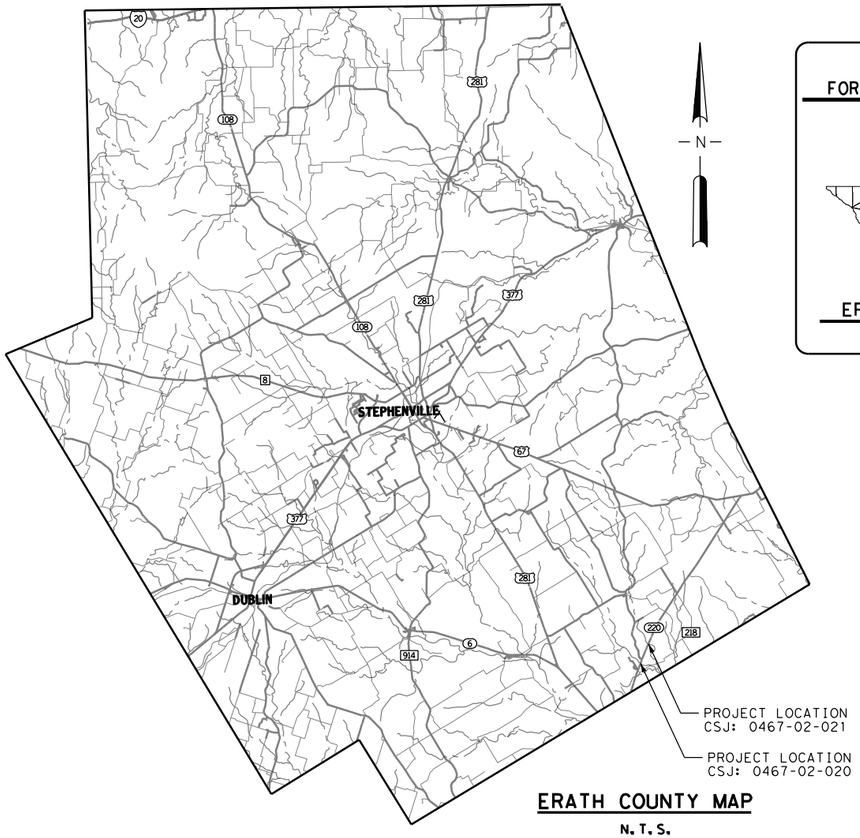
LEGEND

EXISTING RIGHT OF WAY (R.O.W.)

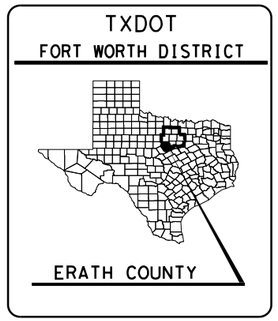
PROPOSED PAVEMENT/BRIDGE

NOTES:

1. ALL STATIONS AND OFFSETS REFER TO ℄ SH220LDC OR ℄ SH220DC UNLESS NOTED OTHERWISE.
2. ALL DIMENSIONS ARE TO EDGE OF PAVEMENT OR NOMINAL FACE OF RAIL UNLESS NOTED OTHERWISE.
3. SEE BRIDGE HYDRAULIC DATA SHEETS AND BRIDGE LAYOUTS FOR H&H INFO.
4. REMOVE EXISTING HEADWALLS AND END 2' OF EXISTING PIPE UNDER ITEM 496. EXTEND 8' ON WEST SIDE AND 12' ON EAST SIDE USING CONCRETE COLLARS. INSTALL CH-PW-S (2:1) (15° SKEW) ON EACH END. SEE MSD STANDARD FOR CONCRETE COLLAR DETAIL.
5. SEE EXISTING UTILITY LAYOUTS FOR EXISTING UTILITY INFORMATION. CONTRACTOR TO FIELD-VERIFY LOCATION OF ALL UTILITIES.
6. CONTRACTOR SHALL AVOID DAMAGING MAILBOX AND WILL BE RESPONSIBLE FOR REPAIR OR REPLACEMENT IF DAMAGED.



ERATH COUNTY MAP
N. T. S.



STATE MAP
N. T. S.

Jacobs Engineering Group
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PAUL K. CLARK
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F-2966
8/22/2024

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Texas Department of Transportation

SH 220

PROJECT LAYOUT

SCALE: 1"=1000' (H) SHEET 1 OF 1

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NUMBER		HIGHWAY NO.
MBT	6	(See Title Sheet)		SH 220
CHECK REL	STATE	DISTRICT	COUNTY	SHEET NO.
GRAPHICS BHK	TEXAS	FTW	ERATH	3
CHECK PKC	CONTROL 0467	SECTION 02	JOB 020, ETC.	

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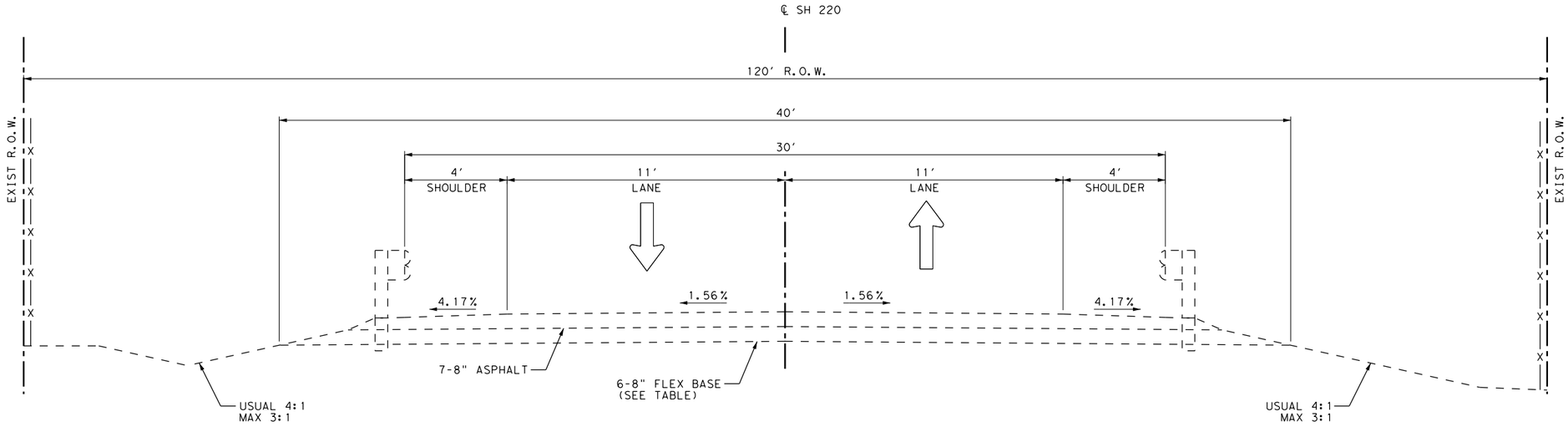


DITCH SECTION

STA 181+85 TO STA 184+50, LT & RT
STA 194+50 TO STA 197+80, LT & RT
STA 247+78 TO STA 248+00, LT
STA 249+00 TO STA 250+00, LT & RT

FILL SECTION

EXISTING TYPICAL SECTION

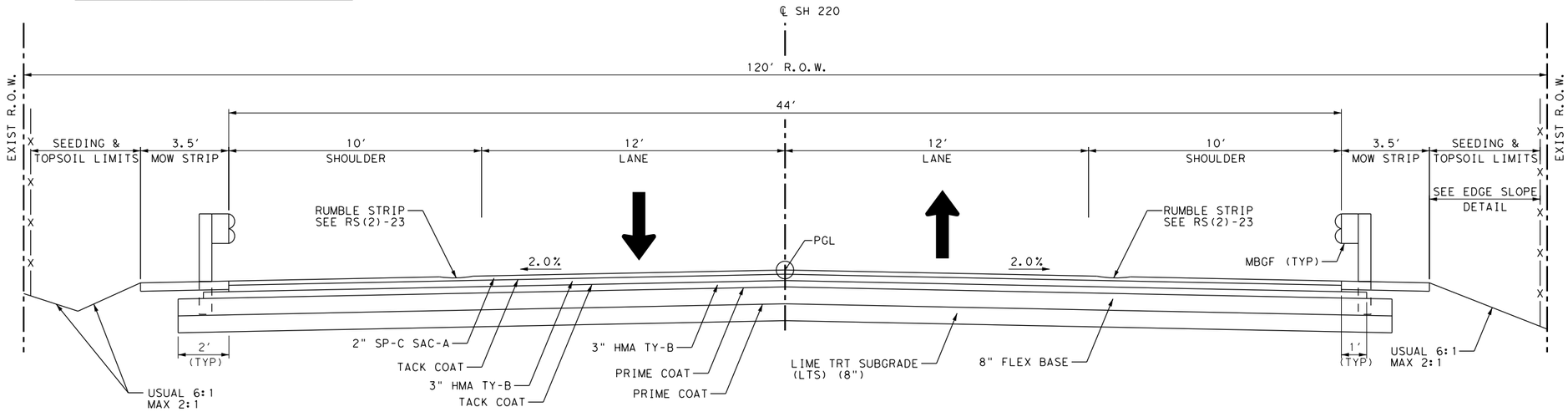
STA 181+85.00 TO STA 190+45.00
STA 191+50.00 TO STA 197+80.00
STA 242+72.50 TO STA 246+03.00
STA 247+78.00 TO STA 252+27.51

EXISTING BRIDGE LIMITS: STA 190+45 TO STA 191+50 (LITTLE DUFFAU CREEK)
STA 246+03 TO STA 247+78 (DUFFAU CREEK)

TABLE OF FLEX BASE DEPTHS			
STATION	TO	STATION	DEPTH FL BS
157+00	TO	184+00	8"
184+00	TO	203+00	6"
203+00	TO	205+00	8"
205+00	TO	256+00	6"

NOTES:

1. SEE PLAN & PROFILE SHEETS FOR SPECIFIC LIMITS OF MBGF, RAILS, FLUMES AND MOW STRIPS.
2. THE AXIS OF ROTATION FOR ALL PAVEMENTS IS LOCATED AT THE PGL.
4. EXISTING PAVEMENT STRUCTURE OBTAINED FROM BORING LOG INFORMATION AND CSJ 0467-02-001 AS-BUILT PLANS.
5. CROSS-SLOPE TRANSITIONS FROM EXISTING TO PROPOSED. SEE ROADWAY PLAN AND PROFILE FOR LIMITS OF TRANSITION.
6. SEE SHEET 3 OF 3 FOR SUBGRADE DETAILS.



DITCH SECTION

(SEE TABLE ON NEXT SHEET)

PROPOSED TYPICAL SECTION

STA 181+85.00 TO STA 189+87.50
STA 192+07.50 TO STA 197+80.00
STA 242+72.50 TO STA 245+77.75
STA 248+02.75 TO STA 252+27.51

BRIDGE LIMITS (SEE BRIDGE LAYOUT): STA 190+07.50 TO STA 191+87.50 (LITTLE DUFFAU CREEK)
STA 245+97.75 TO STA 247+82.75 (DUFFAU CREEK)
BRIDGE LIMITS DO NOT INCLUDE 20′ APPROACH SLABS

FILL SECTION

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Texas Department of Transportation

SH 220

TYPICAL SECTIONS

SCALE: N.T.S.

SHEET 1 OF 3

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NUMBER		HIGHWAY NO.
MBT	6	(See Title Sheet)		SH 220
CHECK REL	STATE	DISTRICT	COUNTY	SHEET NO.
GRAPHICS MBT	TEXAS	FTW	ERATH	4
CHECK REL	CONTROL	SECTION	JOB	
	0467	02	020, ETC.	

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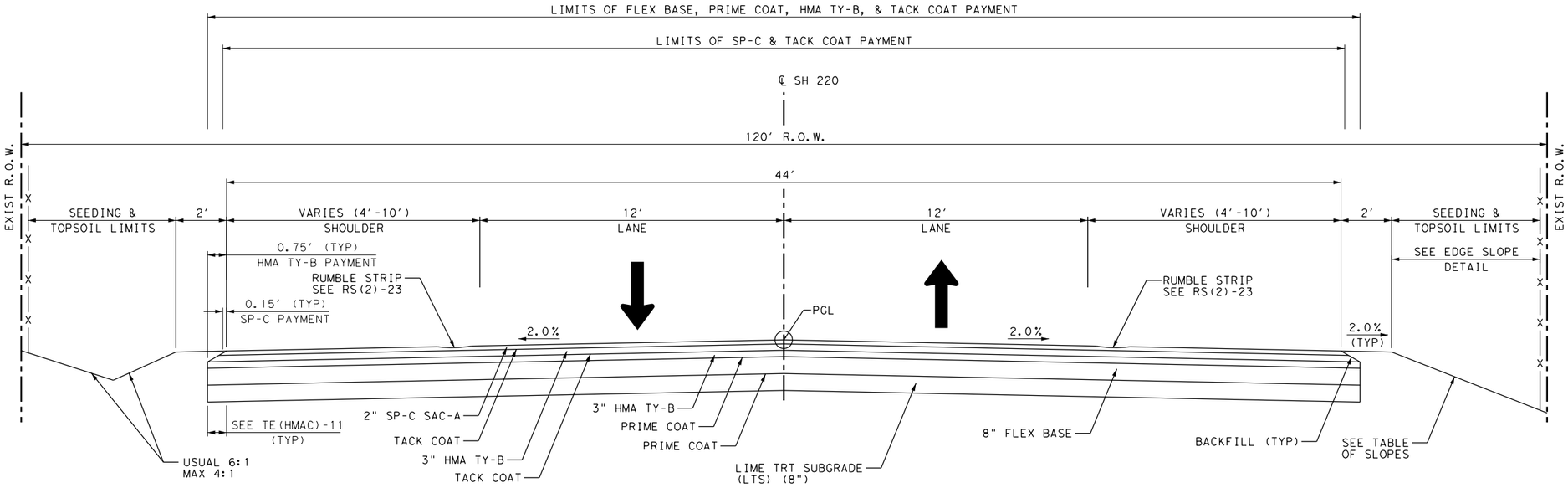


DITCH SECTION
(SEE TABLE)

PROPOSED TYPICAL SECTION
WITHOUT MBGF (SEE NOTE 1)

FILL SECTION

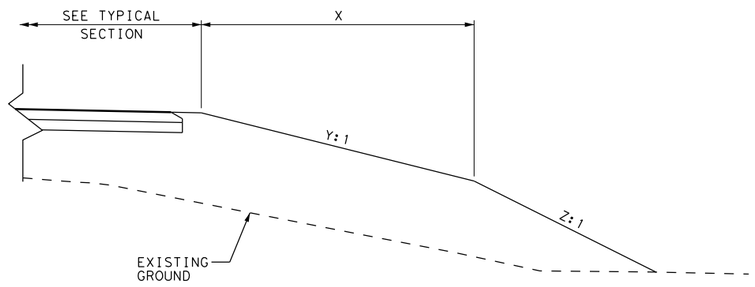
NOTES:

1. SEE PLAN & PROFILE SHEETS FOR SPECIFIC LIMITS OF MBGF, RAILS, FLUMES AND MOW STRIPS.
2. THE AXIS OF ROTATION FOR ALL PAVEMENTS IS LOCATED AT THE PGL.
4. EXISTING PAVEMENT STRUCTURE OBTAINED FROM BORING LOG INFORMATION AND CSJ 0467-02-001 AS-BUILT PLANS.
5. CROSS-SLOPE TRANSITIONS FROM EXISTING TO PROPOSED. SEE ROADWAY PLAN AND PROFILE FOR LIMITS OF TRANSITION.
6. SEE SHEET 3 OF 3 FOR SUBGRADE DETAILS.

TABLE OF DITCH FLOW LINES				
	LEFT		RIGHT	
STATION	OFF	ELEV	OFF	ELEV
181+85	28.21'	1066.59'	27.89'	1066.10'
182+00	28.20'	1065.91'	28.64'	1065.59'
183+00	30.27'	1062.28'	32.65'	1061.69'
183+50	32.81'	1059.98'	35.86'	1059.22'
184+00	37.41'	1057.28'	DRIVEWAY	
195+00	44.85'	1049.66'	43.67'	1049.95'
196+00	36.55'	1053.59'	DRIVEWAY	
197+00	MATCH EXIST		MATCH EXIST	
197+80	MATCH EXIST		MATCH EXIST	

TABLE OF DITCH FLOW LINES				
	LEFT		RIGHT	
STATION	OFF	ELEV	OFF	ELEV
249+00	54.43'	1051.96'	55.28'	1051.54'
*249+77	57.24'	1049.88'	58.79'	1048.59'
250+00	56.80'	1050.03'	57.21'	1049.83'
251+00	56.67'	1052.19'	53.22'	1053.38'

*STA 249+92 (LT) & STA 249+65 (RT) (24" RCP)



EDGE SLOPE DETAIL
N.T.S.

TABLE OF SLOPES						
	LEFT			RIGHT		
STATION	X	Y	Z	X	Y	Z
181+85	N/A	N/A	4	N/A	N/A	4
182+00	N/A	N/A	4	N/A	N/A	4
183+00	**	4	3	**	4	3
184+00	**	4	3	DRIVEWAY		
185+00	18'	4	3	18'	4	3
186+00	18'	4	3	18'	4	2
187+00	18'	4	3	18'	4	2
188+00	16.5'	4	3	16.5'	4	2
189+00	16.5'	4	3	16.5'	4	2
189+95	16.5'	4	3	16.5'	4	2
190+07	N/A	N/A	3	N/A	N/A	3

**SEE TABLE OF DITCH FLOW LINES

TABLE OF SLOPES						
	LEFT			RIGHT		
STATION	X	Y	Z	X	Y	Z
191+87	N/A	N/A	2	N/A	N/A	2
192+00	16.5'	4	2	8.5'	3	2
193+00	16.5'	4	2	16.5'	4	2
194+00	16.5'	4	2	16.5'	4	3
195+00	**	4	3	**	4	3
196+00	**	4	3	DRIVEWAY		
197+00	N/A	N/A	4	N/A	N/A	4
197+80	N/A	N/A	6	N/A	N/A	6

**SEE TABLE OF DITCH FLOW LINES

TABLE OF SLOPES						
	LEFT			RIGHT		
STATION	X	Y	Z	X	Y	Z
242+72	N/A	N/A	4	N/A	N/A	4
243+00	20'	4	3	22.4'	4	3
244+00	16.5'	4	3	16.5'	4	2
245+00	16.5'	4	3	16.5'	4	2
245+78	16.5'	4	2	16.5'	4	2
245+86	16.5'	4	2	16.5'	4	2
245+98	N/A	N/A	3	N/A	N/A	3
247+83	N/A	N/A	3	N/A	N/A	3
247+95	16.5'	4	2	16.5'	4	2
248+00	16.5'	4	2	16.5'	4	2
249+00	16.5'	4	2	16.5'	4	2
250+00	16.5'	4	2	16.5'	4	2
251+00	16.5'	4	3	16.5'	4	3
252+00	20.2'	4	3	20.8'	4	3
252+27	23'	4	3	23.6'	4	3

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7/9/2024

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Texas Department of Transportation

SH 220

TYPICAL SECTIONS

SCALE: N.T.S.
SHEET 2 OF 3

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NUMBER		HIGHWAY NO.
MBT	6	(See Title Sheet)		SH 220
CHECK	STATE	DISTRICT	COUNTY	SHEET NO.
REL	TEXAS	FTW	ERATH	5
GRAPHICS	CONTROL	SECTION	JOB	
MBT	0467	02	020, ETC.	
CHECK				
REL				

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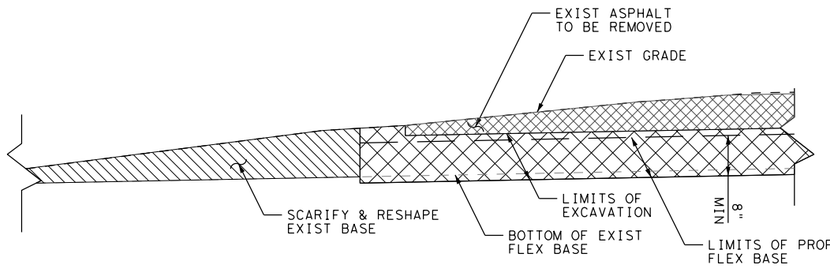

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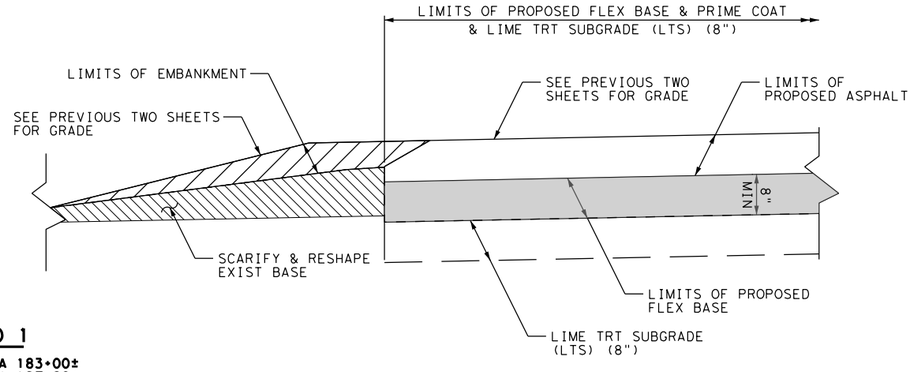

SCENARIO 1

STA 181+85± TO STA 183+00±
STA 197+00± TO STA 197+80±
STA 242+72± TO STA 244+00±
STA 250+00± TO STA 252+28±
OVER-EXCAVATE TO ACHIEVE MINIMUM DEPTH FLEX BASE

LEGEND

- EXIST FLEX BASE TO REMAIN
- EXIST ASPHALT TO BE REMOVED
- PROPOSED EXCAVATION
- PROPOSED EMBANKMENT
- PROPOSED FLEX BASE

NOTES:

1. SEE PLAN & PROFILE SHEETS FOR SPECIFIC LIMITS OF MBGF, RAILS, FLUMES AND MOW STRIPS.
2. THE AXIS OF ROTATION FOR ALL PAVEMENTS IS LOCATED AT THE PGL.
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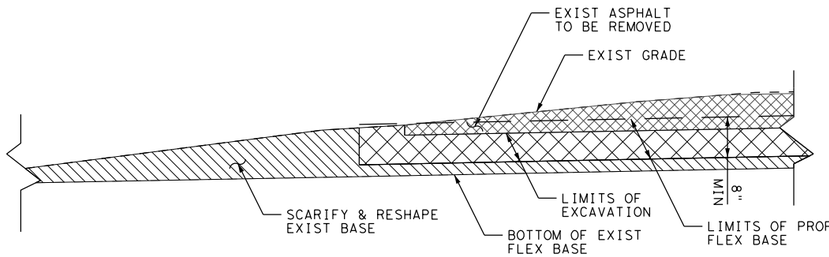
5. CROSS-SLOPE TRANSITIONS FROM EXISTING TO PROPOSED. SEE ROADWAY PLAN AND PROFILE FOR LIMITS OF TRANSITION.

STEP 1:



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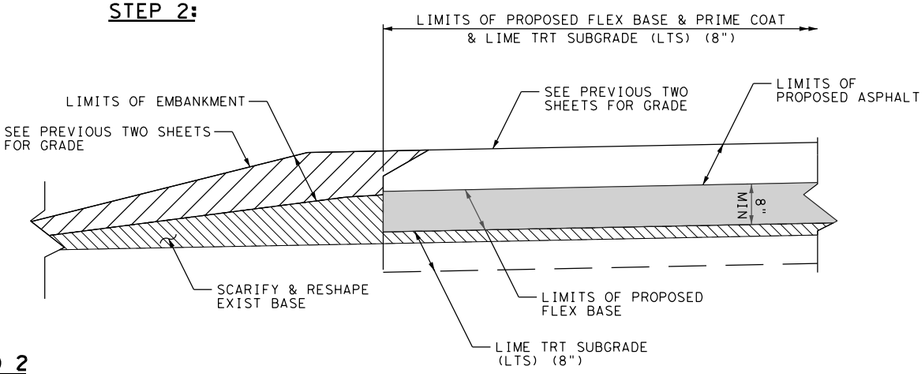
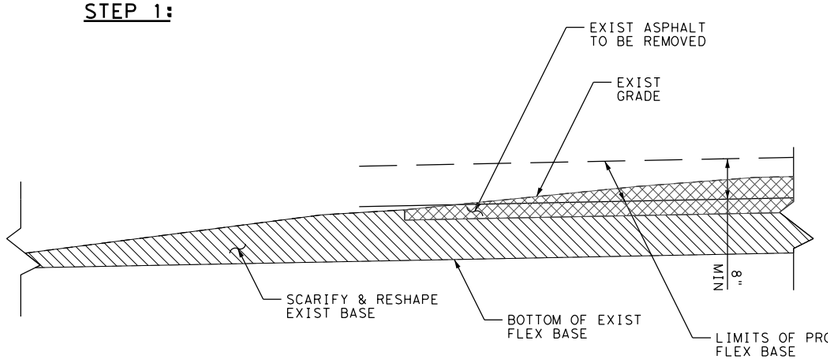


SCENARIO 2

STA 183+00± TO STA 184+00±
STA 196+50± TO STA 197+00±
STA 244+00± TO STA 245+00±
STA 249+00± TO STA 250+00±
PARTIAL EXCAVATION OF EXISTING FLEX BASE

STEP 1:



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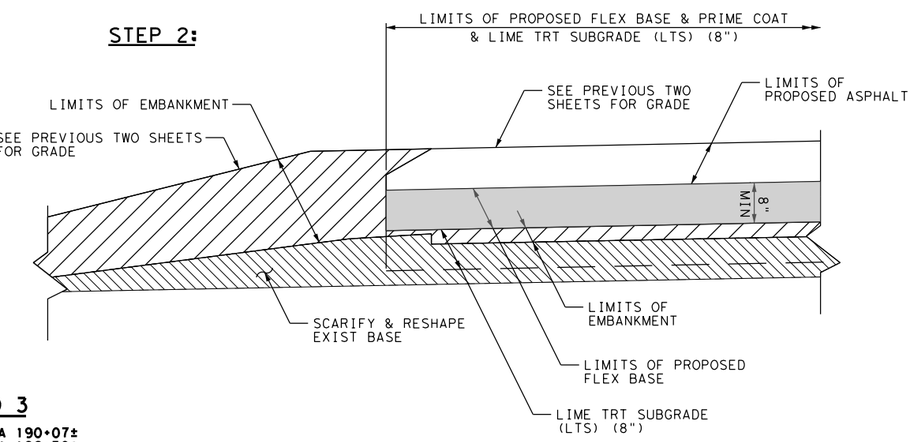

SCENARIO 3

STA 184+00± TO STA 190+07±
STA 191+87± TO STA 196+50±
STA 245+00± TO STA 245+98±
STA 247+83± TO STA 249+00±
FILL ON TOP OF EXISTING FLEX BASE

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SH 220

TYPICAL SECTIONS

SCALE: **N.T.S.** SHEET **3** OF **3**

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NUMBER		HIGHWAY NO.
MBT	**6**	**(See Title Sheet)**		**SH 220**
CHECK **REL**	STATE	DISTRICT	COUNTY	SHEET NO.
GRAPHICS **MBT**	**TEXAS**	**FTW**	**ERATH**	**6**
CHECK **REL**	CONTROL **0467**	SECTION **02**	JOB **020, ETC.**	

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Specification Data

Basis of Estimate

Item	Description	Rate	Unit
168	Vegetative Watering	169,400 gal./acre	1,000 gal.
260	Lime (Hydrated, Commercial Or Quicklime)(Slry)	150 lb./cu. yd.	ton
310	Asph Mat'l (MC-30, EC-30, or CBSMS-1S) (Flex Base)	0.30 gal./sq. yd.*	gal.
341	Hot Mix (All Types)	115 lb./sq. yd.-in.	ton
341	Tack Coat - Trackless Tack	0.15-0.22 gal./sq. yd.	gal.
344	Hot Mix (All Types)	115 lb./sq. yd.-in.	ton
344	Tack Coat - Trackless Tack	0.15-0.22 gal./sq. yd.	gal.

* Based On 50% Asphalt Residue.

Compaction Requirements for Base Courses

Item	Material	Course	Min. Density
247	Flex Base	All	100 %

(Minimum Density is the percentage of density required based on results of Tex-113-E, Tex-114-E, Tex-120-E, and/or Tex-121-E)

Special Notes

Electronic files containing answered pre-letting questions and other project related design information will be placed in the following FTP site periodically.

Check this site for new information. Notices of new postings will not be sent out by the Engineer.

The data located in these files is for non-construction purposes only and can be found at

TxDOT's public FTP site at https://ftp.dot.state.tx.us/pub/txdot-info/Pre-Letting Responses/.

Access is read-only.

All files in the FTP site are subject to the License Agreement shown on the FTP site.

To obtain a copy of the project plans free of charge, submit a request from the following site: http://www.txdot.gov/business/letting-bids/plans-online.html

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

Area Engineer's Email: Sarah.Horner@txdot.gov
Assistant Area Engineer's Email: Noel.Spaar@txdot.gov
Design Manager's Email: Emmanuel.Navarro@txdot.gov

For Q&A's on Proposals navigate to https://tableau.txdot.gov/views/ProjectInformationDashboard/NoticetoContractors. Use the dashboard to navigate to the project you are interested in by scrolling or filtering the dashboard using the controls on the left. Hover over the blue hyperlink for the project you want to view the Q&A for and click on the link in the window that pops up.

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

Existing storm sewers and utilities are shown from the best available information. Verify the location of all underground facilities prior to starting work.

For dimensions of right-of-way not shown on the plans, see right-of-way map on file at the TxDOT District Office.

Modifications to Lane Closure / Work Restrictions:

Submit a request in writing for approval by the Engineer a minimum of 10 days in advance of implementing a change to lane closure restrictions.

When deemed necessary, the Engineer will lengthen, shorten, or otherwise modify lane closure restrictions as traffic conditions warrant.

Remove all existing fences within the right of way and remove and replace all existing fences within easements where such fences conflict with the work. Protect the remaining fence from damage due to slacking. Erect temporary fencing in the easement areas as necessary to secure the property. Provide at least one week notice to the property owner prior to removing or relocating the fence. Restore permanent fencing to an equal or better condition.

Mailbox manipulation made necessary because of construction will be in accordance with Item 560 "Mailbox Assemblies," except that this work will not be paid for directly but will subsidiary to the pertinent bid items.

Where necessary, the governing slopes indicated herein may be varied from the limits shown, to the extent approved.

Locations and lengths of all private entrances are approximate only. The actual locations, lengths, lines, and grades are to be established in the field.

Remove the grass from the crown of shoulders or pavement edges by blading or other approved methods. Payment for this work will not be made directly, but will be subsidiary to the various items of the contract.

Plugging of pipes or culverts will not be paid for directly, but will be subsidiary to the various bid items, unless otherwise shown on the plans.

Remove any obstructions to existing drainage due to the contractor's operations, as required, at the Contractor's expense.

Install all required concrete riprap flumes immediately following the construction of ditches in which they are to be placed. In addition, apply all erosion control measures as shown on the plans or as directed, immediately following construction of channels to their required line, grade, and section.

Item 4. Scope of Work

Reimbursement for project overhead will not be considered until project completion has extended beyond the original Contract Time.

Item 5. Control of the Work

When supplementary bridge plans, shop drawings, shop details, erection drawings, working drawings, forming plans, or other drawings are required, prepare and submit drawings on sheets 8-1/2 by 11 inches, 17 by 22 inches, or full-size drawings reduced to half scale if completely legible. If, in the opinion of the Engineer, the drawings are not completely legible, prepare and submit on sheets 22 by 34 inches, with a 1-1/2 inch left margin, and 1/2 inch top, right, and bottom margins.

Submit all sheets with a title in the lower right-hand corner. The title must include the sheet index data shown on the lower right corner of the project plans, name of the structure or element or stream, sheet numbering for the shop drawings, name of the fabricator and the name of the Contractor.

Prior to contract letting, bidders may obtain a free computer diskette or a computerized transfer of files (from the Engineer’s office) that contains the earthwork information in ASCII format, plain text files. If copies of the actual cross-sections are requested, in addition to, or instead of

the diskette, they will be available at the Engineers office for borrowing by copying companies for the purpose of making copies for the bidder, at the bidder’s expense.

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

Do not initiate activities in a project specific location (PSL) associated with a U.S. Army Corps of Engineers (USACE) permit area that has not been previously evaluated by the USACE as part of the permit review of this project. Such activities include, but are not limited to haul roads, equipment staging areas, borrow and disposal sites. “Associated” as defined here means materials are delivered to or from the PSL. The permit area includes all waters of the U.S. or associated wetlands affected by activities associated with this project. Special restrictions may be required for such work. The contractor will be responsible for all consultations with the USACE regarding activities, including project specific locations (PSLs) that have not been previously evaluated by the USACE. Provide the Department with a copy of all consultations or approvals from the USACE prior to initiating activities.

The Contractor may proceed with activities in PSLs that do not affect a USACE permit area if a self-determination has been made that the PSL is non-jurisdictional or proper USACE clearances have been obtained in jurisdictional areas or have been previously evaluated by the USACE as part of the permit review of this project. The contractor is solely responsible for documenting any determinations that their activities do not affect a USACE permit area. Maintain copies of these determinations for review by the Department or any regulatory agency.

Document and coordinate with the USACE, if required, prior to any excavation hauled from or embankment hauled into a USACE permit area by either (1) or (2) below.

(1) Restricted Use of Materials for Previously Evaluated Permit Areas. Document both the project specific location (PSL) and its authorization. Maintain copies for review by the Department or any regulatory agency. When an area within the project limits has been evaluated by the USACE as part of the permit process for this project:

a. Suitable excavation of required material in the areas shown on the plans and cross sections as specified in Item 110 is used for permanent or temporary fill (Item 132, Embankment) within a USACE permit area;
b. Suitable embankment (Item 132) from within the USACE permit area is used as fill within a USACE evaluated area; and,
c. Unsuitable excavation or excess excavation [“Waste”] (Item 110) that is disposed of at a location approved by the Engineer within a USACE evaluated area.

(2) Contractor Materials from Areas Other than Previously Evaluated Areas. Provide the Department with a copy of all USACE coordination or approvals prior to initiating any activities for an area within the project limits that has not been evaluated by the USACE or for any off right of way locations used for the following, but not limited to haul roads, equipment staging areas, borrow and disposal sites:

a. Item 132, Embankment, used for temporary or permanent fill within a USACE permit area; and,
b. Unsuitable excavation or excess excavation [“Waste”] (Item 110, Excavation) that is disposed of outside a USACE evaluated area.

The total area disturbed for this project is **6.99** acres. The disturbed area in this project, all project locations in the Contract, and the Contractor project specific locations (PSLs), within 1 mile of the project limits, for the Contract will further establish the authorization requirements for storm water discharges. The Department will obtain an authorization to discharge storm water from the Texas Commission on Environmental Quality (TCEQ) for the construction activities shown on the plans. The Contractor is to obtain required authorization from the TCEQ for Contractor PSLs for construction support activities on or off the right of way. When the total area disturbed in the Contract and PSLs within 1 mile of the project limits exceeds 5 acres, provide a copy of the Contractor NOI for PSLs on the right of way to the Engineer and to the local government that operates a separate storm sewer system.

Prevention of Migratory Bird Nesting

It is anticipated that migratory birds, a protected group of species, may try to nest on bridges, culverts, vegetation, or gravel substrate, at any time of the year. The preferred nesting season for migratory birds is from February 15 through October 1. When practicable, schedule construction operations outside of the preferred nesting season. Otherwise, avoid nests containing migratory birds and perform no work in the nesting areas until the young birds have fledged.

Structures

Do not begin bridge and culvert construction operations until swallow nesting prevention is implemented, until after October 1 if it’s determined that swallow nesting is actively occurring, or until it’s determined swallow nests have been abandoned. If the State installed nesting deterrent on the bridges and culverts, maintain the existing nesting deterrent to prevent swallow nesting until October 1 or completion of the bridge and culvert work, whichever occurs earlier. If new nests are built and occupied after the beginning of the work, do not perform work that can interfere with or discourage swallows from returning to their nests. Prevention of swallow nesting can be performed by one of the following methods:

1. By February 15 begin the removal of any existing mud nests and all other mud placed by swallows for the construction of nests on any portion of the bridge and culverts. The Engineer will inspect the bridges and culverts for nest building activity. If swallows begin nest building, scrape or wash down all nest sites. Perform these activities daily unless the Engineer determines the need to do this work more frequently. Remove nests and mud through October 1 or until bridge and culvert construction operations are completed.

2. By February 15 place a nesting deterrent (which prevents access to the bridge and culvert by swallows) on the entire bridge (except deck and railing) and culverts.

No extension of time or compensation payment will be granted for a delay or suspension of work caused by nesting swallows. This work is subsidiary to the various bid items.

No significant traffic generator events identified.

Item 8. Prosecution and Progress

Working days will be computed and charged in accordance with Section 8.3.1.1, ‘Five-Day Workweek.’

Nighttime work is not allowed unless approved in writing by the Engineer. Before starting night work on a construction project, prepare and submit a work zone light system design in accordance with NCHRP Report 476, Section 3 for approval by the Engineer. The Engineer will review the work zone light system design and notify the contractor of its acceptability. Do not start work until the work zone light system design is accepted.

The number of working days for final acceptance will be **512** working days.

Use a Critical Path Method (CPM) schedule in P6 format for this project. Include all planned work activities and sequences. Submit baseline the schedule and obtain approval prior to beginning construction. The baseline schedule working days will be the same as the number of working days established by the Contract. The Estimate will be held if a monthly schedule update is not submitted. Also submit the XER file.

Item 100. Preparing Right of Way

Measurement for this item will be along the centerline of the project with the limits of measurements as shown on the plans.

Item 104. Removing Concrete

When associated with a structure to be removed, removal of riprap as required, approach slabs, and shoulder drains are to be included in the unit price bid for Item 496, “Removing Structures.”

Item 110. Excavation

Review proposed waste sites to determine if any site is located in a “Base Floodplain” or “Floodway” as defined by the Federal Emergency Management Agency (FEMA).

If waste material from this project is placed in a base floodplain as defined by FEMA, obtain a permit from the local community responsible for enforcing National Flood Insurance Program (NFIP) regulations. Ensure that the owner of the property receiving the waste has obtained the necessary permit.

Items 110, 112, and 132. Excavation, Subgrade Widening, and Embankment

Off-Site Borrow Sources. In addition to meeting pertinent specification requirements, test off-site borrow sources for sulfate content. Test soils for soluble sulfates in accordance with Test Method Tex-145 and Tex-146-E and provide documentation that supports compliance with previously stated requirements. The Engineer will perform additional testing for sulfates of this material upon delivery to the project. Only material that is placed within one foot vertically or laterally of subgrade treatment will require testing for sulfates. Remove and replace failing material (sulfate concentrations >7,000 PPM by dry weight).

Item 132. Embankment

Provide Type C2 embankment material with a Plasticity Index (PI) between 8 and 25.

Furnish test results per Test Procedures Tex-104, 105, and 106-E (PIs), Tex-113 or 114-E (M-D Curves), and Tex-145 and/or Tex-146-E (Sulfates) for each material sample provided by the Engineer. Perform field density tests (Tex-115-E, Part I) at a frequency for each worked section to produce passing results prior to testing by the Engineer per Tex-115-E, Part I. The Engineer will perform separate testing of the material.

When embankment is placed as a bridge header bank, test each lift for compliance with density requirements, near the center of each travel lane at the following locations:

1. At the “beginning of bridge” or “end of bridge” station (if abutment is on retaining wall, location may be adjusted by not more than 5 feet.)
2. At 25-foot intervals for a distance of 150 feet in advance of the “beginning of bridge” station.
3. At 25-foot intervals for a distance of 150 feet after the “end of bridge” station.

Density tests must be conducted by a department-certified independent testing laboratory. Results of tests will be furnished to TxDOT within 24 hours after testing; a final copy of all test reports must be signed and sealed by a Professional Engineer in the State of Texas and furnished within five (5) working days after testing. Areas which do not meet minimum density requirements will be removed, re-compacted, and re-tested for compliance at the contractor’s entire expense. Testing and reporting of test results will not be paid for directly, but will be subsidiary to this item.

Construct embankments for bridge header banks to final subgrade elevation prior to excavation for abutment caps and placement of foundation course at approach slabs. Payment for structural excavation and/or excavation for placement of foundation course will not be paid for directly, but will be subsidiary to the pertinent bid items.

At all locations where guardrail is shown to flare, widen the embankment as necessary to accommodate the guardrail.

Item 161. Compost

Place approximately 4" of compost manufactured topsoil (CMT) on all cut and fill slopes (except drainage channels where flexible channel liners are indicated), at other locations shown on the plans, or as directed.

Where “pre-blended” CMT is specified, amend suitable soil material, as directed, with 25% compost, by volume, to produce the compost manufactured topsoil. Place the compost manufactured topsoil in a loose layer approximately 4" thick, as shown on the plans.

Use the processed material from Item 100 as the wood chips to blend with the compost to produce the Erosion Control Compost required for this project. This is considered subsidiary to Item 161.

Blending compost on site is not permitted.

Item 164. Seeding for Erosion Control

Apply seeding required between December 1 and January 31 using seed types and mixtures as shown in Item 164.2.1, Table 3. If, in the opinion of the Engineer, this does not provide an effective vegetative cover, apply “straw or hay mulch” as specified in Article 164.3.2, “Straw or

Hay Mulch Seeding" as soon as possible. After February 1, apply warm season seeding in order to establish a permanent protective vegetative cover.

Item 168. Vegetative Watering

Furnish and install an approved rain gauge at the project site, as directed. Furnishing and installation of the rain gauge will not be paid for directly, but will be subsidiary to Item 168.

Apply vegetative watering for an establishment period of thirteen weeks following application of seed or installation of sod, at a rate of 1/2 inch of water depth per week (approximately 13,030 gallons per acre). During the first four weeks after seeding, apply water twice per week, on non-consecutive days, each at half the weekly application rate. For the remainder of the establishment period, apply vegetative watering once per week during the months of January through June or September through December, at the weekly application rate; apply watering twice per week, on non-consecutive days during the months of July and August, each at one-half the weekly application rate.

Average weekly rainfall rates for the District are:

January—0.39"	April—0.86"	July—0.48"	October—0.68"
February—0.46"	May—1.00"	August—0.47"	November—0.46"
March—0.48"	June—0.63"	September—0.74"	December—0.37"

Item 247. Flexible Base

Place material in two or more equal lifts unless otherwise directed.

The TY E GR 4 Flex Base is subsidiary to Item 400-6005 Cement Stabilized Backfill.

Item 260. Lime Treatment (Road-Mixed)

Apply lime by the "slurry placement" method. Allow the mixture to mellow for a minimum of 4 days after initial mixing.

Except as noted below, treat the raw subgrade to a depth of 8".

Item 301. Asphalt Antistripping Agent

Furnish a liquid antistripping agent unless otherwise directed.

Item 305. Salvaging, Hauling, and Stockpiling Reclaimed Asphalt Pavement (RAP)

Stockpile all RAP salvaged and not used for this project at the intersection of SH 220 and US 67, in TxDOT ROW, or as directed.

Build stockpiles between 10 and 15 feet in height with layers approximately 2 feet in depth.

Item 310. Prime Coat

Provide an MC-30 for this Item. MC-30 is restricted to usage from September 16 through April 15.

Item 341. Dense-Graded Hot-Mix Asphalt

RAP aggregate must meet the requirements of Table 1.

Provide aggregate with a Surface Aggregate Classification (SAC) value of **A** for the travel lanes and shoulders.

No blending, of the material retained on the No. 4 sieve, to meet SAC A will be allowed for surface mixes.

Natural (field) sands are not allowed.

Provide a PG 64-22 asphalt for the base course.

Furnish a trackless tack with greater than 50% asphalt residue for the tack coat on this project. The Engineer will set the rate at time of application.

Warm Mix Asphalt (WMA) is not permitted in any mix type on this project.

RAP and RAS are not permitted in any surface and levelup mixes on this project.

Grade substitution per Table 5 is not allowed.

Use the Boil Test, Test Procedure Tex-530-C, and provide only mixes that produce zero percent (0%) stripping for design verification and during production.

Include the approved mix design number on each delivery ticket.

Use a Material Transfer Device (MTD) unless otherwise directed.

Stop production after Lot 1. Review all test data and confirm any changes with the Engineer. Do not start production and placement on subsequent Lots until approved by the Engineer.

Shoulders, crossovers, and other areas listed on the Plan sheets or as directed are not subject to in-place air void determination for this project.

Temporary detours are subject to in-place air void determination for this project.

Item 344. Superpave Mixtures

RAP aggregate must meet the requirements of Table 1.

Provide aggregate with a Surface Aggregate Classification (SAC) value of **A** for the travel lanes and shoulders.

No blending, of the material retained on the No. 4 sieve, to meet SAC A will be allowed for surface mixes.

Natural (field) sands are not allowed.

Provide a PG 70-28 asphalt for the surface course and levelup course, if applicable.

Furnish a trackless tack with greater than 50% asphalt residue for the tack coat on this project. The Engineer will set the rate at time of application.

Warm Mix Asphalt (WMA) is not permitted in any mix type on this project.

RAP and RAS are not permitted in any surface and levelup mixes on this project.

Grade substitution per Table 5 is not allowed.

Provide a mix design with the gradation curve below the restricted zone.

Use the Boil Test, Test Procedure Tex-530-C, and provide only mixes that produce zero percent (0%) stripping for design verification and during production.

Include the approved mix design number on each delivery ticket.

Use a Material Transfer Device (MTD) unless otherwise directed.

Stop production after Lot 1. Review all test data and confirm any changes with the Engineer. Do not start production and placement on subsequent Lots until approved by the Engineer.

Shoulders, crossovers, and other areas listed on the Plan sheets or as directed are not subject to in-place air void determination for this project.

Temporary detours are subject to in-place air void determination for this project.

Item 400. Excavation and Backfill for Structures

Class B bedding will be permitted in lieu of Class C bedding.

Recycled flex base and RAP are allowed individually or combined for use as granular material and backfill in Class B and C bedding at the discretion of the Engineer. These materials must meet the requirements of Table 1. The Engineer may require the mixing of one or both of these materials with the local soil to provide a cohesive material for compaction and stability of the backfill around the pipe or box culvert.

Item 403. Temporary Special Shoring

Payment for the temporary shoring starts at the bottom of the existing underlayment pavement limit.

Item 420. Concrete Substructures

Restrict large aggregate size to ¾” maximum for class “C” concrete used in aesthetic details requiring form liners.

Provide weepholes at bridge ends in the wingwalls as directed.

Concrete for ”Column” and “Bents” will be paid for as a plan quantity.

Item 421. Hydraulic Cement Concrete

For Class S (Item 421) Concrete Only: For concrete plants equipped with 2 aggregate bins or no calibrated metering system, blend manufactured and natural sand at the aggregate source only. For concrete plants equipped with a minimum of 3 bins and a calibrated metering system, blending of the separate sands on-site is permitted to meet gradation and AIR requirements.

Strength/cylinder testing equipment must be equipped with a printer for an electronic print out of all test results.

Air entrainment requirements are waived for all classes of concrete except all Class S concrete.

Concrete will not be rejected for low air content. Adjustment to the dosage of air entrainment will be as directed or allowed by the Engineer.

Include the approved mix design number on each delivery ticket.

Item 427. Surface Finishes for Concrete

Unless otherwise noted, provide a surface area **(II)** with a slurry coat finish on the bridge(s).

Item 432. Riprap

The quantities for riprap at the location indicated may be varied to the extent necessary to ensure proper functioning for the purpose intended.

All concrete riprap will be 5" (.42') in thickness, unless otherwise shown on the plans, and must be reinforced.

Provide a toe wall at all exposed edges of all protection stone riprap, unless otherwise directed.

Locations and lengths of riprap flumes shown on the plans are approximate. Actual lengths and locations are to be determined in the field.

Use rebar for all reinforcement. Do not use wire mesh or synthetic fiber.

Item 440. Reinforcement for Concrete

Top and bottom layers of slab reinforcing steel shall be epoxy coated.

Item 454. Bridge Expansion Joints

For header-type expansion joints refer to the following TxDOT website for the approved systems:

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

Item 464. Reinforced Concrete Pipe

All bends and connections in pipe must be prefabricated.

Item 466. Headwalls and Wingwalls

Do not use precast headwalls/wingwalls.

Item 496. Removing Structures

When required by the plans, partial or complete removal of a structure for staged construction shall be accomplished in a manner which does not cause damage to the remainder of the structure or its supporting members. The Contractor shall submit a demolition plan for all structures to be replaced and/or removed in accordance with Item 496. Submit the procedure for removal of superstructure or substructure in writing or plan drawing for approval prior to implementation.

Asbestos and Lead reports will be available upon request.

The Area Office shall notify the Texas Department of State Health Services (DSHS) prior to demolition or renovation of bridges or other structures, using DSHS Form APB#5, “Demolition/Renovation Notification Form”. The form and instructions may be found on the DSHS Asbestos Programs Branch web page at http://www.dshs.state.tx.us/asbestos/notification.shtm. The DSHS notification form must be hand-delivered or mailed to (received at) the DSHS Austin office at least ten working days (10)(not working days) prior to commencing demolition or renovation. Fax or e-mail notifications will not be accepted. For projects with multiple bridges, a single notification, with a listing of all bridges or structures to be demolished or renovated and the expected start dates of their demolition or renovation (the start date is defined as the first date of visible demolition activities). Notify the DSHS Regional or Local inspector of all start date changes. The expected project completion date may be used as the “end” date.

Removal of riprap as required, approach slabs and shoulder drains to be included in the unit price bid.

The structure(s) to be removed have surface coatings which may contain hazardous materials. Provide for the safety and health of employees and abide by all OSHA standards and regulations.

To allow for disassembly, the Department will remove paint containing hazardous materials off the steel during the Contract in accordance with the following:

- For simple steel I-beam spans less than 80’ in length, a four inch wide strip around the perimeter of the diaphragm member or members at each attachment location to the beams.
- For continuous I-beam units or simple spans more than 80’ in length, a six inch wide strip around the perimeter of the beam cross-section for each beam at each cut location. A four inch wide strip around the perimeter of the diaphragm member or members at each attachment location to the beams.
- A four inch wide strip around bearing attachments and at the anchor bolts.
- As requested elsewhere and approved by the Engineer. Paint removal requested beyond that listed herein will be at the Contractor’s expense.

Provide to the Engineer a detailed plan of the locations of paint removal at least 60 days prior to start of steel structure removal.

Do not cut simple I-beams less than 70’ in length.

Cut continuous I-beams or simple I-beams more than 80’ in length, into sections not less than 40’ in length or more than 70’ in length, as directed. Salvage wide flange (WF) beams that are W30 and larger. Contact District Bridge for information on lengths needed.

Item 502. Barricades, Signs, and Traffic Handling

The contractor force account ‘safety contingency’ that has been established for this project is intended to be utilized for work zone enhancements to improve the effectiveness of the traffic control plan that could typically 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.

Maintenance of roadways, not paid as Item 508, "Constructing Detours," and designated in the traffic control plan to carry traffic, will be the responsibility of the Contractor and will be paid for by "Contractor Force Account or Agreed Unit Price".

Permanent signs may be installed when construction in an area is complete and they will not conflict with the traffic control plan for the remainder of the job.

Existing signs are to remain as long as they do not interfere with construction and they do not conflict with the traffic control plan.

Any sign not detailed in the plans but called for in the layout will be as shown in the current "Standard Highway Sign Designs for Texas”.

When traffic is obstructed, arrange warning devices in accordance with the latest edition of the "Texas Manual on Uniform Traffic Control Devices".

Cover or remove any work zone signs when work or condition referenced is not occurring.

Do not place barricades, signs, or any other traffic control devices where they interfere with sight distance at driveways or side streets. Provide access to all driveways during all phases of construction unless otherwise noted in the plans or as directed.

Item 503. Portable Changeable Message Signs

Provide all portable changeable message signs and arrow panels with a photoelectric device to allow for automatic dimming of operations to approximately 50% of their normal brightness when ambient light drops to approximately five footcandles, and then increase back again for daytime operations.

(**Two**) electronic portable changeable message sign unit(s) will be required. Individual or collective use of signs will be required by the Engineer when deemed necessary to supplement the traffic control plan.

Each sign must have programmed in its permanent memory the following 15 messages:

1. Exit Closed Ahead
2. Use Other Routes
3. Right Lane
4. Left Lane
5. Closed Ahead
6. Two Lane
7. Detour Ahead
8. Thru Traffic
9. Prepare To Stop
10. Merging Traffic
11. Expect 15 Minute Delay
12. Max Speed ** MPH
13. Merge Right
14. Merge Left
15. No Exit Next ** Miles

Item 504. Field Office and Laboratory

The Contractor shall furnish the following structures for this project:

Type	No.
Field Office TY E	1
Field Lab TY A	1
Field Lab TY D	1

The Type E Field Office shall be a minimum of 1680 SF and shall have a minimum of four (4) individual office spaces, a kitchen space, two restrooms (minimum) and meeting area. The field office shall be furnished and functional with all pertinences prior to beginning work. In addition to the other requirements the field office shall be equipped with the following

a) Minimum of ten desks with chairs

b) A meeting table capable of seating 20 people with chairs
c) Two (2) equipment storage closets. Each closet shall provide a minimum of 3ftx3ft of floor space or equivilant and shall have provisions for locking securely.
d) Three (3) four drawer metal locking filing cabinets
e) One (1) refrigerator (minimum 18 CF)
f) One (1) microwave oven
g) One (1) water cooler with water service
h) One (1) ice machine (minimum 200 LBS/day)
i) One Wireless Capable Plain Paper Copier/Printer/Scanner/Fax machine, 30 ppm, 2GB memory, and 11x17 paper size capable.
j) Four (4) Laptop Computers with Aircards
k) Internet Service with minimum of 30 GB connectivity.
l) Wireless Router
m) Weekly janitorial service
n) Minimum 4Ft x 4 Ft top and bottom landing at all steps to field office

The office and its contents will be subject to approval by the engineer. Upon final completion and acceptance by the engineer of the project, computers, refrigerator, water cooler, copier and ice machine will become the property of the contractor. The contractor shall be responsible for all maintenance and supplies (both permanent and consumable) for the aforementioned electronic equipment for the duration of the project. All electronic equipment shall meet current department standards.

Provide a secure all-weather, lighted parking area of a minimum of 3,000 square feet adjacent to the field office. This area is to be for the sole exclusive use of the department. Storage of contractor's material or equipment will not be allowed.

Item 505. Truck Mounted Attenuator (TMA) and Trailer Attenuator (TA)

In addition to the shadow vehicles with truck mounted attenuator (TMA) that are specified as being required on the traffic control plan for this project, provide **4** additional shadow vehicle(s) with TMA for **TCP (3-1)-13** as detailed on General Note of this standard sheet.

Therefore, **4** total shadow vehicles with TMA will be required for this type of work. Determine if one or more of these operations will be ongoing at the same time to determine the total number of TMAs needed for the project.

Item 506. Temporary Erosion, Sedimentation, and Environmental Controls

Remove accumulated sediment or replace SW3P controls when the capacity has been reduced by 50% or when the depth of sediment at the control structure exceeds one foot.

Item 512. Portable Concrete Traffic Barrier

"*Furnish and Install*" barrier in compliance with Concrete Safety Barrier (CSB), Single-Slope Concrete Barrier (SSCB), or Low Profile Concrete Barrier (LPCB) standards as shown on the plans.

Used barrier will be inspected and approved by the Engineer prior to using, in accordance with Item 512.2.1.3.

Furnish Class H Concrete with a minimum 28 day compressive strength of 3,600 psi.

Provide the hardware assemblies to join barrier sections, including barrier from stockpile.

Delineate all barriers in accordance with Barricade and Construction (BC) Standard sheets. Barrier delineation will not be paid for directly, but will be subsidiary to Item 512,"Portable Concrete Traffic Barrier".

Remove and replace traffic barrier damaged by the traveling public and no longer serviceable as directed. Replace traffic barrier with Contractor furnished barrier or Department-furnished barrier from designated stockpile as directed. Additional payment will be provided as compensation to remove, replace and dispose of the traffic barrier damaged by the traveling public in accordance with Item 512.

Place PCTB in the State stockpile at the end of the project.

Items 530 And 531. Intersections, Driveways and Turnouts, and Sidewalks

The furnishing and installation of the sand cushion in proposed sidewalks, sidewalk ramps, and driveways will not be paid for directly but will be subsidiary to this bid item.

Item 540. Metal Beam Guard Fence

The locations and lengths of guard fence shown on the plans are approximate. Actual lengths and locations are to be determined in the field.

The tops of timber posts will be domed. Beveled tops will not be permitted for timber or steel posts.

When holes for timber posts are drilled below bottom of proposed grade, backfill the excessive depth with an acceptable sand. The furnishing and installation of the sand backfill will not be paid for directly but will be subsidiary to this Item.

When guardrail posts are placed in a finished surface, backfill the top 4 inches with an asphaltic material, domed to carry water away from the posts or as shown on the plans. The furnishing and installation of the asphaltic material backfill will not be paid for directly but will be subsidiary to this Item.

When connecting a Thrie-Beam to a concrete wingwall, bridge rail, CTB, etc., drill the holes for bolt placement using rotary or core type equipment. Use a core type drill when reinforcing steel is encountered. Do not use percussion or impact drilling. Repair damage to the concrete and spalls exceeding ½" from the edge of the hole.

Item 542. Removing Metal Beam Guard Fence

Remove existing metal beam guard fence only when authorized.

Item 585. Ride Quality for Pavement Surfaces

Before performing work, the Engineer will determine whether Surface Test Type A will be used instead of the specified payment adjustment schedule when the following conditions exist in existing travel lanes:

- travel lane is directly adjacent to existing curb and gutter, or
- travel lane has repair areas or crack sealing that may result in reflective defects.

Item 666. Reflectorized Pavement Markings with Retroreflective Requirements

If retroreflectivity readings are collected using a portable or handheld unit, then measurement is defined as a collective average of at least 20 readings taken along a 200-foot test section. A minimum of three measurements will be required per mile of roadway. Measurements collected on a centerline stripe will be averaged separately for stripe in each direction of travel. A TxDOT inspector must witness the calibration and collection of all retro-reflectivity data.

Estimate & Quantity Sheet

CONTROLLING PROJECT ID 0467-02-020 **DISTRICT** Fort Worth **COUNTY** Erath
HIGHWAY SH 220

			CONTROL SECTION JOB		**0467-02-020**		**0467-02-021**		TOTAL EST.	TOTAL FINAL
			PROJECT ID		**A00064427**		**A00136886**			
			COUNTY		**Erath**		**Erath**			
			HIGHWAY		**SH 220**		**SH 220**			
ALT	**BID CODE**	**DESCRIPTION**	**UNIT**	EST.	FINAL	EST.	FINAL		
	100-7002	PREPARING ROW	STA	15.950		9.550		25.500	
	110-7001	EXCAV (ROADWAY)	CY	887.000		425.000		1,312.000	
	132-7010	EMBANK (FNL)(DC)(TY C2)	CY	13,025.000		4,003.000		17,028.000	
	132-7012	EMBANK (FNL)(DC)(TY D)	CY	887.000		425.000		1,312.000	
	134-7001	BACKFILL (TY A)	STA	15.950		9.550		25.500	
	161-7002	COMPOST MANUF TOPSOIL (4")	SY	9,452.000		4,080.000		13,532.000	
	164-7001	BROADCAST SEED (PERM_RURAL_SAND)	SY	9,452.000		4,080.000		13,532.000	
	164-7029	STRAW/HAY MLCH SEED (TEMP_WARM)	SY	4,726.000		2,040.000		6,766.000	
	164-7030	STRAW/HAY MLCH SEED (TEMP_COOL)	SY	4,726.000		2,040.000		6,766.000	
	168-7001	VEGETATIVE WATERING	TGL	661.000		285.000		946.000	
	169-7030	SOIL RET BLKT(CHAN_TEMP_4 PSF)	SY	1,284.000		1,756.000		3,040.000	
	247-7259	FL BS (RDWY DEL)(TY A GR 1-2)(FNAL POS)	CY	1,593.000		864.000		2,457.000	
	260-7005	LIME (COM OR QK)(SLURRY)	TON	113.000		58.000		171.000	
	260-7007	LIME TRT (EXIST MATL)(8")	SY	6,767.000		3,495.000		10,262.000	
	305-7005	SALV, HAUL & STKPL RCL APH PV (6 TO 8")	SY	5,539.000		2,577.000		8,116.000	
	310-7004	PRIME COAT (MC-30)	GAL	4,060.000		2,096.000		6,156.000	
	341-7002	D-GR HMA TY-B SAC-B PG64-22	TON	2,349.000		1,220.000		3,569.000	
	341-7082	TACK COAT	GAL	2,680.000		1,389.000		4,069.000	
	344-7024	SP MIXES SP-C SAC-A PG70-28	TON	763.000		397.000		1,160.000	
	400-7010	CEM STABIL BKFL	CY	170.000		170.000		340.000	
	403-7001	TEMPORARY SPL SHORING	SF	6,709.000		618.000		7,327.000	
	416-7006	DRILL SHAFT (36 IN)	LF	430.000		400.000		830.000	
	420-7013	CL C CONC (ABUT)(HPC)	CY	52.800		52.800		105.600	
	420-7023	CL C CONC (CAP)(HPC)	CY	41.600		41.600		83.200	
	420-7039	CL C CONC (COLUMN)(HPC)	CY	32.000		27.200		59.200	
	420-7061	CL C CONC (COLLAR)	EA			2.000		2.000	
	422-7002	REINF CONC SLAB (HPC)	SF	8,280.000		8,510.000		16,790.000	
	422-7014	APPROACH SLAB (HPC)	CY	70.600		70.600		141.200	
	425-7001	PRESTR CONC GIRDER (TX28)	LF	1,071.000		1,101.000		2,172.000	
	432-7013	RIPRAP (MOW STRIP)(4 IN)	CY	38.000		38.000		76.000	
	432-7041	RIPRAP (STONE PROTECTION)(12 IN)	CY	1,108.000		1,235.000		2,343.000	
	432-7047	RIPRAP (STONE PROTECTION)(30 IN)	CY	2,420.000		1,765.000		4,185.000	
	450-7025	RAIL (TY SSTR)(HPC)	LF	408.000		418.000		826.000	
	454-7003	ARMOR JOINT (SEALED)	LF	84.000		84.000		168.000	
	464-7003	RC PIPE (CL III)(18 IN)	LF	57.000				57.000	
	464-7005	RC PIPE (CL III)(24 IN)	LF			20.000		20.000	
	466-7116	HEADWALL (CH - PW - S) (DIA= 24 IN)	EA			2.000		2.000	

Estimate & Quantity Sheet

CONTROLLING PROJECT ID 0467-02-020 **DISTRICT** Fort Worth **COUNTY** Erath
HIGHWAY SH 220

			CONTROL SECTION JOB		**0467-02-020**		**0467-02-021**		TOTAL EST.	TOTAL FINAL
			PROJECT ID		**A00064427**		**A00136886**			
			COUNTY		**Erath**		**Erath**			
			HIGHWAY		**SH 220**		**SH 220**			
ALT	**BID CODE**	**DESCRIPTION**		**UNIT**	EST.	FINAL	EST.	FINAL		
	467-7308	SET (TY II) (18 IN) (RCP) (6: 1) (P)		EA	2.000				2.000	
	496-7006	REMOV STR (HEADWALL)		EA			2.000		2.000	
	496-7007	REMOV STR (PIPE)		LF	47.000		4.000		51.000	
	496-7010	REMOV STR (BRIDGE 100 - 499 FT LENGTH)		EA	1.000		1.000		2.000	
	500-7001	MOBILIZATION		LS	0.500		0.500		1.000	
	502-7001	BARRICADES, SIGNS AND TRAFFIC HANDLING		MO	12.000		12.000		24.000	
	503-7002	PORTABLE CHANGEABLE MESSAGE SIGN		EA	2.000				2.000	
	505-7001	TMA (STATIONARY)		DAY	106.000		106.000		212.000	
	505-7003	TMA (MOBILE OPERATION)		DAY	16.000		16.000		32.000	
	506-7001	ROCK FILTER DAMS (INSTALL) (TY 1)		LF	180.000		150.000		330.000	
	506-7011	ROCK FILTER DAMS (REMOVE)		LF	180.000		150.000		330.000	
	506-7020	CONSTRUCTION EXITS (INSTALL) (TY 1)		SY	225.000		225.000		450.000	
	506-7024	CONSTRUCTION EXITS (REMOVE)		SY	225.000		225.000		450.000	
	506-7039	TEMP SEDMT CONT FENCE (INSTALL)		LF	1,698.000		1,248.000		2,946.000	
	506-7041	TEMP SEDMT CONT FENCE (REMOVE)		LF	1,698.000		1,248.000		2,946.000	
	508-7001	CONSTRUCTING DETOURS		SY	1,763.000		326.000		2,089.000	
	510-7003	ONE-WAY TRAF CONT (PORT TRAF SIG)		MO	12.000		12.000		24.000	
	512-7005	PORT CTB (FUR & INST)(F-SHAPE)(TY 1)		LF	3,600.000				3,600.000	
	512-7029	PORT CTB (MOVE)(F-SHAPE)(TY 1)		LF	3,600.000		2,340.000		5,940.000	
	512-7053	PORT CTB (REMOVE)(F-SHAPE)(TY 1)		LF			3,600.000		3,600.000	
	530-7016	DRIVEWAYS (SURF TREAT)		SY	153.000				153.000	
	533-7001	MILL RUMBLE STRIPS (ASPHALT) (SHLDR)		LF	2,750.000		1,460.000		4,210.000	
	540-7001	MTL W-BEAM GD FEN (TIM POST)		LF	500.000		500.000		1,000.000	
	540-7005	MTL BEAM GD FEN TRANS (THRIE-BEAM)		EA	4.000		4.000		8.000	
	542-7001	REMOVE METAL BEAM GUARD FENCE		LF	591.000		786.000		1,377.000	
	544-7001	GUARDRAIL END TREATMENT (INSTALL)		EA	4.000		4.000		8.000	
	545-7002	CRASH CUSH ATTEN (MOVE & RESET)		EA	2.000		2.000		4.000	
	545-7004	CRASH CUSH ATTEN (REMOVE)		EA	2.000		2.000		4.000	
	545-7014	CRASH CUSH ATTEN (INSTL)(S)(N)(TL3)		EA	2.000		2.000		4.000	
	552-7003	WIRE FENCE (TY C)		LF	260.000				260.000	
	552-7011	WIRE FENCE (REMOVE)		LF	260.000				260.000	
	644-7001	IN SM RD SN SUP&AM TY10BWG(1)SA(P)		EA	6.000		2.000		8.000	
	644-7073	REMOVE SM RD SN SUP&AM		EA	8.000		4.000		12.000	
	658-7013	INSTL DEL ASSM (D-SW)SZ 1(BRF)CTB (BI)		EA	8.000		8.000		16.000	
	658-7019	INSTL DEL ASSM (D-SW)SZ 1(BRF)GF2(BI)		EA	14.000		16.000		30.000	
	662-7068	WK ZN PAV MRK REMOV (W)6"(SLD)		LF	5,401.000		3,495.000		8,896.000	
	662-7077	WK ZN PAV MRK REMOV (W)24"(SLD)		LF	44.000		44.000		88.000	

Estimate & Quantity Sheet

CONTROLLING PROJECT ID 0467-02-020 **DISTRICT** Fort Worth **COUNTY** Erath
HIGHWAY SH 220

			CONTROL SECTION JOB		**0467-02-020**		**0467-02-021**		TOTAL EST.	TOTAL FINAL
			PROJECT ID		**A00064427**		**A00136886**			
			COUNTY		**Erath**		**Erath**			
			HIGHWAY		**SH 220**		**SH 220**			
ALT	**BID CODE**	**DESCRIPTION**		**UNIT**	EST.	FINAL	EST.	FINAL		
	662-7100	WK ZN PAV MRK REMOV (Y)6"(SLD)		LF	370.000		518.000		888.000	
	662-7112	WK ZN PAV MRK SHT TERM (TAB)TY W		EA	500.000		500.000		1,000.000	
	662-7113	WK ZN PAV MRK SHT TERM (TAB)TY Y		EA	500.000		500.000		1,000.000	
	662-7115	WK ZN PAV MRK SHT TERM RMV (W)(4")		LF	3,190.000		1,910.000		5,100.000	
	662-7116	WK ZN PAV MRK SHT TERM RMV (Y)(4")		LF	3,190.000		1,910.000		5,100.000	
	666-7175	RE PM TY II (W) 6" (SLD)		LF	440.000		450.000		890.000	
	666-7213	RE PM TY II (Y) 6" (SLD)		LF	60.000		50.000		110.000	
	666-7265	RE PROFILE PM TY I(W)6"(SLD)(090MIL)		LF	4,282.000		3,278.000		7,560.000	
	666-7269	RE PROFILE PM TY I(Y)6"(SLD)(090MIL)		LF	1,652.000		166.000		1,818.000	
	666-7273	RE PROFILE PM TY I(Y)6"(BRK)(090MIL)		LF	550.000		415.000		965.000	
	666-7347	PAVEMENT SLER 6"		LF	6,484.000		3,859.000		10,343.000	
	672-7004	REFL PAV MRKR TY II-A-A		EA	47.000		23.000		70.000	
	677-7001	ELIM EXT PM & MRKS (4")		LF	2,722.000		1,640.000		4,362.000	
	678-7002	PAV SURF PREP FOR MRK (6")		LF	2,273.000		2,209.000		4,482.000	
	678-7033	PAV SURF PREP FOR MRK (RPM)		EA	17.000		15.000		32.000	
	752-7001	TREE TRIMMING / BRUSH REMOVAL		MI	0.300		0.200		0.500	
	5002-7001	INSTALL FTB		LF	96.000		132.000		228.000	
	5002-7002	REMOVE FTB		LF	96.000		132.000		228.000	
	18	EROSION CONTROL MAINTENANCE: CONTRACTOR FORCE ACCOUNT WORK (PART)		LS	1.000				1.000	
		SAFETY CONTINGENCY: CONTRACTOR FORCE ACCOUNT WORK (PART)		LS	1.000				1.000	

TIME: 8:13:48 AM
DATE: 9/6/2024

CSJ: 0467-02-020

SUMMARY OF WORKZONE TRAFFIC CONTROL ITEMS (CSJ 0467-02-020)

LOCATION	403 7001	502 7001	503 7002	505 7001	505 7003	508 7001	510 7003	512 7005	512 7029	545 7002	545 7004	545 7014	662 7068	662 7077	662 7100
	TEMPORARY SPL SHORING	BARRICADES, SIGNS AND TRAFFIC HANDLING	* PORTABLE CHANGEABLE MESSAGE SIGN	TMA (STATIONARY)	TMA (MOBILE OPERATION)	CONSTRUCTING DETOURS	ONE-WAY TRAF CONT (PORT TRAF SIG)	PORT CTB (FUR & INST)(F-SHAPE)(TY 1)	PORT CTB (MOVE)(F-SHAPE)(TY 1)	CRASH CUSH ATTEN (MOVE & RESET)	CRASH CUSH ATTEN (REMOVE)	CRASH CUSH ATTEN (INSTL)(S)(N)(TL3)	WK ZN PAV MRK REMOV (W)6"(SLD)	WK ZN PAV MRK REMOV (W)24"(SLD)	WK ZN PAV MRK REMOV (Y)6"(SLD)
	SF	MO	EA	DAY	DAY	SY	MO	LF	LF	EA	EA	EA	LF	LF	LF
0467-02-020 (SH 220 @ LDC)	6709	12	2	106	16	1763	12	3600	3600	2	2	2	5401	44	370
PROJECT TOTALS	6709	12	2	106	16	1763	12	3600	3600	2	2	2	5401	44	370

*TWO SIGNS TO BE PLACED TWO WEEKS IN ADVANCE OF WORK AND TO REMAIN IN PLACE FOR THE DURATION OF CONSTRUCTION ON THE FIRST BRIDGE.

SUMMARY OF WORKZONE TRAFFIC CONTROL ITEMS (CSJ 0467-02-020)

LOCATION	662 7112	662 7113	662 7115	662 7116	677 7001
	WK ZN PAV MRK SHT TERM (TAB)TY W	WK ZN PAV MRK SHT TERM (TAB)TY Y	WK ZN PAV MRK SHT TERM RMV (W)(4")	WK ZN PAV MRK SHT TERM RMV (Y)(4")	ELIM EXT PAV MRK & MRKS (4")
	EA	EA	LF	LF	LF
0467-02-020 (SH 220 @ LDC)	500	500	3190	3190	2722
PROJECT TOTALS	500	500	3190	3190	2722

SUMMARY OF REMOVAL ITEMS (CSJ 0467-02-020)

LOCATION	100 7002	305 7005	496 7007	496 7010	542 7001	752 7001
	PREPARING ROW	SALV, HAUL & STKPL RCL APH PV (6 TO 8")	REMOV STR (PIPE)	REMOV STR (BRIDGE 100 - 499 FT LENGTH)	REMOVE METAL BEAM GUARD FENCE	TREE TRIMMING / BRUSH REMOVAL
	STA	SY	LF	EA	LF	MI
0467-02-020 (SH 220 @ LDC)	15.95	5539	47	1	591	0.3
PROJECT TOTALS	15.95	5539	47	1	591	0.3

SUMMARY OF ROADWAY ITEMS (CSJ 0467-02-020)

LOCATION	110 7001	132 7010	132 7012	134 7001	247 7259	260 7005	260 7007	310 7004	341 7002	341 7082
	EXCAV (ROADWAY)	EMBANK (FNL)(DC)(TY C2)	EMBANK (FNL)(DC)(TY D)	BACKFILL (TY A)	FL BS (RDWY DEL)(TY A GR 1-2)(FNAL POS)	LIME (COM OR QK) (SLURRY)	LIME TRT (EXIST MATL) (8")	PRIME COAT (MC-30)	D-GR HMA TY-B SAC-B PG64-22	TACK COAT
	CY	CY	CY	STA	CY	TON	SY	GAL	TON	GAL
0467-02-020 P&P Sheet 1 of 2	625	6120	625	6.15	799	51	3045	1831	1052	1203
0467-02-020 P&P Sheet 2 of 2	262	6905	262	9.80	794	62	3722	2229	1297	1477
PROJECT TOTALS	887	13025	887	15.95	1593	113	6767	4060	2349	2680

SUMMARY OF ROADWAY ITEMS (CSJ 0467-02-020)

LOCATION	344 7024	432 7013	432 7041	432 7047	530 7016	540 7001	540 7005	544 7001	552 7003	552 7011
	SP MIXES SP-C SAC-A PG70-28	RIPRAP (MOW STRIP)(4 IN)	RIPRAP (STONE PROTECTION)(12 IN)	RIPRAP (STONE PROTECTION)(30 IN)	DRIVEWAYS (SURF TREAT)	MTL W-BEAM GD FEN (TIM POST)	MTL BEAM GD FEN TRANS (THRIE-BEAM)	GUARDRAIL END TREATMENT (INSTALL)	WIRE FENCE (TY C)	WIRE FENCE (REMOVE)
	TON	CY	CY	CY	SY	LF	EA	EA	LF	LF
0467-02-020 P&P Sheet 1 of 2	341		321		80					
0467-02-020 P&P Sheet 2 of 2	422	38	787	2420	73	500	4	4	260	260
PROJECT TOTALS	763	38	1108	2420	153	500	4	4	260	260

FILE: ...\WFX08703 - WA3\SU\020GQS01.sht

Jacobs
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DALLAS, TX 75201-3136
Phone: +1 (214) 638-0145
Firm Registration: F-2966

SH 220

QUANTITY SUMMARIES
SH 220 AT LITTLE DUFFAU CREEK

SCALE: N.T.S.

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NUMBER		HIGHWAY NO.
MBT	6	(See Title Sheet)		SH 220
CHECK REL	STATE	DISTRICT	COUNTY	SHEET NO.
GRAPHICS BHK	TEXAS	FTW	ERATH	20
CHECK PKC	CONTROL	SECTION	JOB	
	0467	02	020, ETC.	

SUMMARY OF DRAINAGE ITEMS (CSJ 0467-02-020)		
	464 7003	467 7308
LOCATION	RC PIPE (CL III)(18 IN)	SET (TY II) (18 IN) (RCP) (6: 1) (P)
	LF	EA
0467-02-020 (SH 220 @ LDC)	57	2
PROJECT TOTALS	57	2

SUMMARY OF SIGNING ITEMS (CSJ 0467-02-020)				
LOCATION	644 7001	644 7073	658 7013	658 7019
	IN SM RD SN SUP&AM TY10BWG(1)SA(P)	REMOVE SM RD SN SUP&AM	INSTL DEL ASSM (D-SW)SZ 1(BRF)CTB (BI)	INSTL DEL ASSM (D-SW)SZ 1(BRF)GF2 (BI)
	EA	EA	EA	EA
0467-02-020 (SH 220 @ LDC)	6	8	8	14
PROJECT TOTALS	6	8	8	14

SUMMARY OF EROSION CONTROL ITEMS (CSJ 0467-02-020)												
LOCATION	161 7002	164 7001	164 7029	164 7030	168 7001	169 7030	506 7001	506 7011	506 7020	506 7024	506 7039	506 7041
	COMPOST MANUF TOPSOIL (4")	BROADCAST SEED (PERM_RURAL_SAND)	STRAW/HAY MLCH SEED (TEMP_WARM)	STRAW/HAY MLCH SEED (TEMP_COOL)	VEGETATIVE WATERING	SOIL RET BLKT (CHAN_TEMP_4 PSF)	ROCK FILTER DAMS (INSTALL) (TY 1)	ROCK FILTER DAMS (REMOVE)	CONSTRUCTION EXITS (INSTALL) (TY 1)	CONSTRUCTION EXITS (REMOVE)	TEMP SEDMT CONT FENCE (INSTALL)	TEMP SEDMT CONT FENCE (REMOVE)
	SY	SY	SY	SY	TGL	SY	LF	LF	SY	SY	LF	LF
0467-02-020 (SH 220 @ LDC)	9452	9452	4726	4726	661	1284	180	180	225	225	1698	1698
PROJECT TOTALS	9452	9452	4726	4726	661	1284	180	180	225	225	1698	1698

SUMMARY OF EROSION CONTROL ITEMS (CSJ 0467-02-0		
LOCATION	5002 7001	5002 7002
	INSTALL FTB	REMOVE FTB
	LF	LF
0467-02-020 (SH 220 @ LDC)	96	96
PROJECT TOTALS	96	96

SUMMARY OF PAVEMENT MARKING ITEMS (CSJ 0467-02-020)										
LOCATION	533 7001	666 7175	666 7213	666 7265	666 7269	666 7273	666 7347	672 7004	678 7002	678 7033
	MILL RUMBLE STRIPS (ASPHALT) (SHOULDER)	RE PM TY II (W) 6" (SLD)	RE PM TY II (Y) 6" (BRK)	RE PROFILE PM TY I(W)6"(SLD) (090MIL)	RE PROFILE PM TY I(Y)6"(SLD) (090MIL)	RE PROFILE PM TY I(Y)6"(BRK) (090MIL)	PAVEMENT SLER 6"	REFL PAV MRKR TY II-A-A	PAV SURF PREP FOR MRK (6")	PAV SURF PREP FOR MRK (RPM)
	LF	LF	LF	LF	LF	LF	LF	EA	LF	EA
0467-02-020 (SH 220 @ LDC)	2750	440	60	4282	1652	550	6484	47	2273	17
PROJECT TOTALS	2750	440	60	4282	1652	550	6484	47	2273	17

TIME: 9:16:26 AM
DATE: 7/8/2024

FILE: ...\WFXQ8703 - WA3\SU\020GQS02.sht

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Firm Registration: F-2966

Texas Department of Transportation

SH 220

QUANTITY SUMMARIES
SH 220 AT LITTLE DUFFAU CREEK

SCALE: N.T.S.

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NUMBER		HIGHWAY NO.
MBT	6	(See Title Sheet)		SH 220
CHECK	STATE	DISTRICT	COUNTY	SHEET NO.
REL	TEXAS	FTW	ERATH	21
GRAPHICS	CONTROL	SECTION	JOB	
BHK	0467	02	020, ETC.	
CHECK				
PKC				

TIME: 5:36:20 PM
DATE: 7/29/2024

CSJ: 0467-02-021

SUMMARY OF WORKZONE TRAFFIC CONTROL ITEMS (CSJ 0467-02-021)

LOCATION	403 7001 TEMPORARY SPL SHORING	502 7001 BARRICADES, SIGNS AND TRAFFIC HANDLING	503 7002 * PORTABLE CHANGEABLE MESSAGE SIGN	505 7001 TMA (STATIONARY)	505 7003 TMA (MOBILE OPERATION)	508 7001 CONSTRUCTING DETOURS	510 7003 ONE-WAY TRAF CONT (PORT TRAF SIG)	512 7029 PORT CTB (MOVE)(F-SHAPE)(TY 1)	512 7053 PORT CTB (REMOVE)(F-SHAPE)(TY 1)	545 7002 CRASH CUSH ATTEN (MOVE & RESET)	545 7004 CRASH CUSH ATTEN (REMOVE)	545 7014 CRASH CUSH ATTEN (INSTL)(S)(N)(TL3)	662 7068 WK ZN PAV MRK REMOV (W)6"(SLD)	662 7077 WK ZN PAV MRK REMOV (W)24"(SLD)	662 7100 WK ZN PAV MRK REMOV (Y)6"(SLD)
	SF	MO	EA	DAY	DAY	SY	MO	LF	LF	EA	EA	EA	LF	LF	LF
0467-02-021 (SH 220 @ DC)	618	12	-	106	16	326	12	2340	3600	2	2	2	3495	44	518
PROJECT TOTALS	618	12	-	106	16	326	12	2340	3600	2	2	2	3495	44	518

*AFTER CONSTRUCTION OF FIRST BRIDGE IS COMPLETE, MOVE SIGNS TO SECOND BRIDGE (PAYMENT FOR MOVING SUBSIDIARY TO ITEM 503). SIGNS TO REMAIN IN PLACE AT SECOND BRIDGE FOR DURATION OF CONSTRUCTION.

SUMMARY OF WORKZONE TRAFFIC CONTROL ITEMS (CSJ 0467-02-021)

LOCATION	662 7112 WK ZN PAV MRK SHT TERM (TAB)TY W	662 7113 WK ZN PAV MRK SHT TERM (TAB)TY Y	662 7115 WK ZN PAV MRK SHT TERM RMV (W)(4")	662 7116 WK ZN PAV MRK SHT TERM RMV (Y)(4")	677 7001 ELIM EXT PAV MRK & MRKS (4")
	EA	EA	LF	LF	LF
0467-02-021 (SH 220 @ DC)	500	500	1910	1910	1640
PROJECT TOTALS	500	500	1910	1910	1640

SUMMARY OF REMOVAL ITEMS (CSJ 0467-02-021)

LOCATION	100 7002 PREPARING ROW	305 7005 SALV, HAUL & STKPL RCL APH PV (6 TO 8")	496 7006 REMOV STR (HEADWALL)	496 7007 REMOV STR (PIPE)	496 7010 REMOV STR (BRIDGE 100 - 499 FT LENGTH)	542 7001 REMOVE METAL BEAM GUARD FENCE	752 7001 TREE TRIMMING / BRUSH REMOVAL
	STA	SY	EA	LF	EA	LF	MI
0467-02-021 (SH 220 @ DC)	9.55	2577	2	4	1	786	0.2
PROJECT TOTALS	9.55	2577	2	4	1	786	0.2

SUMMARY OF ROADWAY ITEMS (CSJ 0467-02-021)

LOCATION	110 7001 EXCAV (ROADWAY)	132 7010 EMBANK (FNL)(DC)(TY C2)	132 7012 EMBANK (FNL)(DC)(TY D)	134 7001 BACKFILL (TY A)	247 7259 FL BS (RDWY DEL)(TY A GR 1-2)(FNAL POS)	260 7005 LIME (COM OR QK) (SLURRY)	260 7007 LIME TRT (EXIST MATL) (8")	310 7004 PRIME COAT (MC-30)	341 7002 D-GR HMA TY-B SAC-B PG64-22	341 7082 TACK COAT
	CY	CY	CY	STA	CY	TON	SY	GAL	TON	GAL
0467-02-021 (SH 220 @ DC)	425	4003	425	9.55	864	58	3495	2096	1220	1389
PROJECT TOTALS	425	4003	425	9.55	864	58	3495	2096	1220	1389

SUMMARY OF ROADWAY ITEMS (CSJ 0467-02-021)

LOCATION	344 7024 SP MIXES SP-C SAC-A PG70-28	432 7013 RIPRAP (MOW STRIP)(4 IN)	432 7041 RIPRAP (STONE PROTECTION) (12 IN)	432 7047 RIPRAP (STONE PROTECTION) (30 IN)	540 7001 MTL W-BEAM GD FEN (TIM POST)	540 7005 MTL BEAM GD FEN TRANS (THRIE-BEAM)	544 7001 GUARDRAIL END TREATMENT (INSTALL)
	TON	CY	CY	CY	LF	EA	EA
0467-02-021 (SH 220 @ DC)	397	38	1235	1765	500	4	4
PROJECT TOTALS	397	38	1235	1765	500	4	4

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Texas Department of Transportation

SH 220

QUANTITY SUMMARIES
SH 220 AT DUFFAU CREEK

SCALE: N.T.S. SHEET 3 OF 4

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NUMBER		HIGHWAY NO.
REL	6	(See Title Sheet)		SH 220
CHECK	STATE	DISTRICT	COUNTY	SHEET NO.
MBT	TEXAS	FTW	ERATH	
GRAPHICS	CONTROL	SECTION	JOB	22
BHK				
CHECK	0467	02	020, ETC.	
PKC				

FILE: ...\WFXO8703 - WA3\SU\02IGQSOI.sht

TIME: 9:23:06 AM
DATE: 7/8/2024

CSJ: 0467-02-021

SUMMARY OF DRAINAGE ITEMS (CSJ 0467-02-021)			
LOCATION	420 7061	464 7005	466 7116
	CL C CONC (COLLAR)	RC PIPE (CL III)(24 IN)	HEADWALL (CH-PW-S) (DIA=24 IN)
	EA	LF	EA
0467-02-021 (SH 220 @ DC)	2	20	2
PROJECT TOTALS	2	20	2

SUMMARY OF SIGNING ITEMS (CSJ 0467-02-021)				
LOCATION	644 7001	644 7073	658 7013	658 7019
	IN SM RD SN SUP&AM TY10BWG(1)SA(P)	REMOVE SM RD SN SUP&AM	INSTL DEL ASSM (D-SW)SZ (BRF)CTB (BI)	INSTL DEL ASSM (D-SW)SZ 1(BRF)GF2 (BI)
	EA	EA	EA	EA
0467-02-021 (SH 220 @ DC)	2	4	8	16
PROJECT TOTALS	2	4	8	16

SUMMARY OF EROSION CONTROL ITEMS (CSJ 0467-02-021)												
LOCATION	161 7002	164 7001	164 7029	164 7030	168 7001	169 7030	506 7001	506 7011	506 7020	506 7024	506 7039	506 7041
	COMPOST MANUF TOPSOIL (4")	BROADCAST SEED (PERM_RURAL_SAND)	STRAW/HAY MLCH SEED (TEMP_WARM)	STRAW/HAY MLCH SEED (TEMP_COOL)	VEGETATIVE WATERING	SOIL RET BLKT (CHAN_TEMP_4 PSF)	ROCK FILTER DAMS (INSTALL) (TY 1)	ROCK FILTER DAMS (REMOVE)	CONSTRUCTION EXITS (INSTALL) (TY 1)	CONSTRUCTION EXITS (REMOVE)	TEMP SEDMT CONT FENCE (INSTALL)	TEMP SEDMT CONT FENCE (REMOVE)
	SY	SY	SY	SY	TGL	SY	LF	LF	SY	SY	LF	LF
0467-02-021 (SH 220 @ DC)	4080	4080	2040	2040	285	1756	150	150	225	225	1248	1248
PROJECT TOTALS	4080	4080	2040	2040	285	1756	150	150	225	225	1248	1248

SUMMARY OF EROSION CONTROL ITEMS (CSJ 0467-02-0		
LOCATION	5002 7001	5002 7002
	INSTALL FTB	REMOVE FTB
	LF	LF
0467-02-021 (SH 220 @ DC)	132	132
PROJECT TOTALS	132	132

SUMMARY OF PAVEMENT MARKING ITEMS (CSJ 0467-02-021)										
LOCATION	533 7001	666 7175	666 7213	666 7265	666 7269	666 7273	666 7347	672 7004	678 7002	678 7033
	MILL RUMBLE STRIPS (ASPHALT) (SHOULDER)	RE PM TY II (W) 6" (SLD)	RE PM TY II (Y) 6" (BRK)	RE PROFILE PM TY I(W)6"(SLD) (090MIL)	RE PROFILE PM TY I(Y)6"(SLD) (090MIL)	RE PROFILE PM TY I(Y)6"(BRK) (090MIL)	PAVEMENT SLER 6"	REFL PAV MRKR TY II-A-A	PAV SURF PREP FOR MRK (6")	PAV SURF PREP FOR MRK (RPM)
	LF	LF	LF	LF	LF	LF	LF	EA	LF	EA
0467-02-021 (SH 220 @ DC)	1460	450	50	3278	166	415	3859	23	2209	15
PROJECT TOTALS	1460	450	50	3278	166	415	3859	23	2209	15

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SH 220

QUANTITY SUMMARIES
SH 220 AT DUFFAU CREEK

SCALE: N.T.S.

SHEET 4 OF 4

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NUMBER		HIGHWAY NO.
REL	6	(See Title Sheet)		SH 220
CHECK	STATE	DISTRICT	COUNTY	SHEET NO.
MBT	TEXAS	FTW	ERATH	23
GRAPHICS	CONTROL	SECTION	JOB	
BHK	0467	02	020, ETC.	
CHECK				
PKC				

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SUMMARY OF BRIDGES

New PSN	Layout Sheet No	Description	Station Begin	Station End	Length	0400-7010 Cem Stabil Bkfl	0416-7006 Drill Shaft (36 In)	0420-7013 (1) CL "C" Conc (Abut) (HPC)	0420-7023 (1) CL "C" Conc (Cap) (HPC)	0420-7039 CL "C" Conc (Column) (HPC)	0422-7002 Reinf Conc Slab (HPC)	0422-7014 Approach Slab (HPC)	0425-7001 Prestr Conc Girder (Tx28)	0432-7047 Riprap (Stone Protection) (30 In)	0450-7025 Rail (Ty SSTR) (HPC)	0454-7003 Armor Joint (Sealed)	0496-7010 Remov Str (Bridge 100-499 FT Length)
			Begin	End	LF	CY	LF	CY	CY	CY	SF	CY	LF	CY	LF	LF	EA
006		SH 220 at Little Duffau Creek	190+07.50	191+87.50	180.00	170	430	52.8	41.6	32.0	8,280	70.6	1,071.00	2,420	408.0	84	1
007		SH 220 at Duffau Creek	245+97.75	247+82.75	185.00	170	400	52.8	41.6	27.2	8,510	70.6	1,101.00	1,765	418.0	84	1
TOTALS																	

(1) Quantity includes shear keys. See abutment details, interior bent details, and IGSK standard for shear key location, details, and notes.

DESCRIPTIONS:

Summary of Bridges and Index
SH 220 at Little Duffau Creek
SH 220 at Duffau Creek
AJ (Armor Joint with Seal)
BAS-A (Bridge Approach Slab)
CSAB (FTW)(Cement Stabilized Abutment Backfill)
FD (Common Foundation Details)
IGCS (Continuous Slab Details)
IGD (Prestressed Concrete I-Girder Details)
IGEB (Elastomeric Bearing & Girder End Details)
IGFRP (GFRP Slab Top Mat Reinforcement)
IGMS (Miscellaneous Slab Details)
IGND (Prestressed I-Girder Non-Standard Designs)
IGSK (Shear Key Details for Prestr Concrete I-Girders)
IGTS (Thickened Slab End Details)
MEBR (C) (Minimum Erection & Bracing Requirements)
NBIS (NBI Bridge Identification Sign Standard)
PCP (Prestressed Concrete Panels)
PCP-FAB (Prestressed Concrete Panel Fabrication Details)
PMDF (Permanent Metal Deck Forms)
SRR (Stone Riprap Details)
TYPE SSTR (Traffic Rail Single Slope)

Notes:

Existing substructure to remain in place until Phase 1 of the new bridge is constructed.

T:\BRIDGE\share\220.04670202O\Summary.dgn

SHEET 1 OF 1

Texas Department of Transportation

Fort Worth Bridge Design

SUMMARY OF BRIDGES

	DN: AC & JT	CK: FE & MP	DW: SM	CK: FE & MP
©TxDOT 07-12-24	CONT	SECT	JOB	HIGHWAY
REVISIONS	0467	02	020, ETC.	SH 220
	DIST	COUNTY		SHEET NO.
	FTW	ERATH		24

LOC NO.	TCP PHASE	PLAN SHEET NUMBER	LOCATION	STATION	TEST LEVEL	DIRECTION OF TRAFFIC (UNI/BI)	FOUNDATION PAD		BACKUP SUPPORT			AVAILABLE SITE LENGTH	CRASH CUSHION									
															MOVE/RESET		L	L	R	R	S	S
							PROPOSED MATERIAL	PROPOSED THICKNESS	DESCRIPTION	WIDTH	HEIGHT		INSTALL	REMOVE	MOVE/ RESET	FROM LOC. #	N	W	N	W	N	W
1	1B	30	020 SH 220 RT	180+79	TL-3	UNI	EXIST ASPHALT	7-8" (EXIST)	PORT CTB	24"	32"	50'+	1								1	
2	1B	30	020 SH 220 RT	198+76	TL-3	UNI	EXIST ASPHALT	7-8" (EXIST)	PORT CTB	24"	32"	50'+	1								1	
3	2	31	020 SH 220 LT	180+79	TL-3	UNI	EXIST ASPHALT	7-8" (EXIST)	PORT CTB	24"	32"	50'+		1	1	1					1	
4	2	31	020 SH 220 LT	198+76	TL-3	UNI	EXIST ASPHALT	7-8" (EXIST)	PORT CTB	24"	32"	50'+		1	1	2					1	
5	1B	35	021 SH 220 RT	241+70	TL-3	UNI	EXIST ASPHALT	7-8" (EXIST)	PORT CTB	24"	32"	50'+	1								1	
6	1B	35	021 SH 220 RT	253+40	TL-3	UNI	EXIST ASPHALT	7-8" (EXIST)	PORT CTB	24"	32"	50'+	1								1	
7	2	36	021 SH 220 LT	241+70	TL-3	UNI	EXIST ASPHALT	7-8" (EXIST)	PORT CTB	24"	32"	50'+		1	1	5					1	
8	2	36	021 SH 220 LT	253+40	TL-3	UNI	EXIST ASPHALT	7-8" (EXIST)	PORT CTB	24"	32"	50'+		1	1	6					1	
												TOTALS	4	4	4							

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

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

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7/9/2024

CRASH CUSHION SUMMARY SHEET

FILE: ccss.dgn	DN: TxDOT	CK:		CK:
© TxDOT	CONT	SECT	JOB	HIGHWAY
REVISIONS	0467	02	020, ETC.	SH 220
	DIST	COUNTY		
	FTW	ERATH		
	FEDERAL AID PROJECT			SHEET NO.
	(See Title Sheet)			25

TIME: 1:10:47 PM
DATE: 6/12/2024

GENERAL TCP NOTES

NOTES:

1. THE FOLLOWING SEQUENCE IS THE METHOD OF PROSECUTION OF THE CONSTRUCTION. THE CONTRACTOR MAY PROPOSE/RECOMMEND MODIFICATIONS TO THE SEQUENCE OF WORK FOR CONSIDERATION BY THE ENGINEER. ANY MAJOR RECOMMENDED MODIFICATION BY THE CONTRACTOR SHALL INCLUDE ANY CHANGE TO THE OVERALL PROJECT SCHEDULE AND COST, ETC. IF THE PROPOSAL IS IMPLEMENTED, THE CONTRACTOR WILL BE RESPONSIBLE FOR DEVELOPING DETAILED PLAN SHEETS TO BE SEALED BY A LICENSED PROFESSIONAL ENGINEER FOR INCLUSION WITH A CHANGE ORDER. THE CONTRACTOR SHALL NOT PROCEED WITH ANY CONSTRUCTION OPERATIONS UNTIL THIS REQUIREMENT IS MET.

2. THE CONTRACTOR SHALL SUBMIT A DETAILED SCHEDULE OF WORK TO THE PROJECT ENGINEER FOR APPROVAL PRIOR TO THE BEGINNING OF CONSTRUCTION AND WILL SUBMIT REQUESTS TO ALTER THE SEQUENCE OF OPERATION OF TCP PLANS TO THE ENGINEER FOR WRITTEN APPROVAL.

3. ALL BARRICADES, WARNING SIGNS, AND CHANNELIZING DEVICES FOR THE GUIDANCE AND PROTECTION OF TRAFFIC AND PEDESTRIANS MUST CONFORM TO THE INSTALLATION SHOWN IN THE 2011 TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES, AS CURRENTLY AMENDED AND STANDARD HIGHWAY SIGN DESIGNS (2014).

4. THE TRAFFIC CONTROL PLAN IDENTIFIES THE PHASE/STAGE/STEP IN WHICH ITEMS OF WORK MUST BE STARTED OR BY "LATE START". THE CONTRACTOR MAY BEGIN CONSTRUCTION AT AN EARLIER TIME WITH APPROVAL BY THE ENGINEER, UNLESS OTHERWISE NOTED IN THE PLANS AND SPECIFICATIONS.

5. TRAFFIC CONTROL & LANE CLOSURES WILL BE IN ACCORDANCE WITH THE PLANS, BC, TCP, AND WZ STANDARDS AND AS DIRECTED BY THE ENGINEER. ALL CHANNELIZING DEVICES SHOULD BE SUPPLEMENTED BY TY C WARNING LIGHTS AS SPECIFIED IN BC (7)-21.

6. ALL TRAFFIC CONTROL SIGNS WILL FOLLOW THE MINIMUM SIGN SPACING ACCORDING TO THE TRAFFIC CONTROL STANDARDS. CONTRACTORS SHALL MAINTAIN TEMPORARY SIGNS WITHIN THE PROJECT LIMITS AND WHEN NOT APPLICABLE OR IN USE, WILL NEED TO BE COVERED OR REMOVED TO AID THE TRAVELING PUBLIC.

7. SIGNS, BARRICADES, AND OTHER WARNING DEVICES SHOWN SHALL BE CONSIDERED MINIMUM AND ADDITIONAL SIGNS, BARRICADES AND OTHER WARNING DEVICES DEEMED NECESSARY BY THE ENGINEER OR DICTATED BY FIELD CONDITIONS SHALL BE PROVIDED ACCORDINGLY TO ALL APPLICABLE STANDARDS AND THEY WILL BE SUBSIDIARY TO THE BID ITEM BARRICADES, SIGNS, AND TRAFFIC HANDLING.

8. TEMPORARY SW3P EROSION CONTROL MEASURES SHALL ONLY BE PLACED IN AREAS WHERE SOIL DISTURBANCE IS EXPECTED TO OCCUR WITHIN TWO WEEKS. TEMPORARY SW3P EROSION CONTROL MEASURES SHALL BE REMOVED IN EACH AREA WITHIN TWO WEEKS OF VEGETATION ESTABLISHMENT OR AS APPROVED BY THE ENGINEER.

9. IT IS THE CONTRACTOR'S RESPONSIBILITY TO COORDINATE ALL LANE CLOSURES, NIGHT WORK, AND ACCOMMODATE PLANNED EVENTS WITH ERATH COUNTY, CITY OF GLEN ROSE, TXDOT, AND EMS PERSONNEL.

10. THE CONTRACTOR IS RESPONSIBLE FOR MAINTAINING ALL EXISTING DRAINAGE FACILITIES IN GOOD ORDER UNTIL THOSE FACILITIES ARE REPLACED BY PERMANENT CONSTRUCTION OR THEIR FLOWS ARE REROUTED. THE CONTRACTOR SHALL PROVIDE AND MAINTAIN INTERIM DRAINAGE IN AREAS THAT MAY BE AFFECTED BY DETOUR OR OTHER CONSTRUCTION THAT WERE NOT SPECIFICALLY ANTICIPATED HEREIN. POSITIVE DRAINAGE SHALL BE PROVIDED AND MAINTAINED FOR ALL DETOURS AND AFFECTED AREAS BY THE USE OF CROSS-SLOPE, DITCHES, TEMPORARY LINES, OR OTHER METHODS WETHER SPECIFICALLY SHOWN HEREIN OR NOT.

11. REFER TO THE STORM WATER POLLUTION PREVENTION PLAN FOR SW3P & EROSION CONTROL TREATMENTS AND DEVICES TO BE INSTALLED PRIOR TO EACH PHASE/STAGE/STEP OF CONSTRUCTION.

12. THE CONTRACTOR IS RESPONSIBLE FOR COMMUNICATING LANE CLOSURES, TRAFFIC SHIFTS AND OTHER CONSTRUCTION ACTIVITIES THAT WILL IMPACT TRAFFIC TO THE TRAVELING PUBLIC, ADJACENT PROPERTIES, AND EMS. THIS COMMUNICATION SHALL INCLUDE, BUT NOT BE LIMITED TO, THE PROJECT PCMS AND ISSUING NOTICES TO THE PRESS.

13. ACCESS TO ALL STREETS AND ADJOINING PROPERTIES SHALL BE MAINTAINED AT ALL TIMES. CHANNELIZING DEVICES AND SIGNS SHALL BE PLACED TO AVOID INTERFERENCE WITH DRIVEWAY AND CROSS STREET OPERATIONS.

14. BEFORE COMPLETION OF THE WORK, THE CONTRACTOR SHALL CLEAR AND REMOVE FROM THE SITE ALL SURPLUS AND DISCARD MATERIALS AND DEBRIS OF EVERY KIND AND LEAVE THE PROJECT IN A SMOOTH, CLEAN, NEAT AND SIGHTLY CONDITION.

15. UTILITIES NOT SHOWN ON TRAFFIC CONTROL PHASE LAYOUTS FOR CLARITY. REFER TO EXISTING UTILITY LAYOUTS, ROADWAY PLAN AND PROFILE, AND BRIDGE LAYOUTS FOR UTILITY LOCATIONS. CONTRACTOR TO FIELD-VERIFY LOCATION OF ALL UTILITIES.

16. SEE TREATMENT FOR VARIOUS EDGE CONDITIONS SHEET FOR TREATMENT AT PAVEMENT DROP-OFFS.

17. NO FULL ROAD CLOSURES OR DETOURS ARE PERMITTED. ONE LANE OF TRAFFIC AT A MINIMUM SHALL BE MAINTAINED ON SH 220 AT ALL TIMES.

TCP NARRATIVE SEQUENCE OF CONSTRUCTION

LITTLE DUFFAU CREEK (CONSTRUCT ONE BRIDGE AT A TIME)

PRE-PHASE 1 - SITE PREPARATION

1. INSTALL ADVANCED WARNING SIGNS AND PROJECT SIGNS IN ACCORDANCE WITH TEXAS MUTCD, BC STANDARDS, OR AS DIRECTED. SEE ADVANCED WARNING LAYOUT.
2. IMPLEMENT STORM WATER POLLUTION PREVENTION PLAN (SW3P) AND EROSION CONTROL MEASURES THROUGHOUT PROJECT LIMITS.
3. PREPARE RIGHT-OF-WAY AND INSTALL TEMPORARY STREAM CROSSING.

PHASE 1A - CONSTRUCT TEMPORARY DRIVEWAYS

1. PLACE CHANNELIZING DEVICES AS SHOWN IN THE PLANS. CONSTRUCT TEMPORARY DRIVEWAYS SO THAT ACCESS IS MAINTAINED TO THE EXISTING DRIVEWAYS THROUGHOUT CONSTRUCTION. MAINTAIN POSITIVE DRAINAGE THROUGHOUT PHASING.

PHASE 1B - CONSTRUCT NORTHBOUND PORTION OF PROPOSED ROADWAY AND BRIDGE

1. FURNISH AND INSTALL CTB AND TRAFFIC CONTROL SIGNS IN ACCORDANCE WITH THE PLANS AND STANDARDS. USE TCP (2-8)-23 FOR LONG TERM, ONE-LANE TWO-WAY TRAFFIC CONTROL WITH TRAFFIC SIGNALS AT THE EXISTING BRIDGE. TWO-WAY TRAFFIC SHALL USE EXISTING SOUTHBOUND LANE.
2. INSTALL TEMPORARY SHORING AND REMOVE PORTIONS OF THE EXISTING SUPERSTRUCTURE AND BENT CAPS, AS SHOWN IN THE PLANS.
3. CONSTRUCT NORTHBOUND PORTION OF PROPOSED ROADWAY (SUBGRADE AND FLEX BASE), MBGF, RIPRAP, AND PROPOSED BRIDGE, AS SHOWN IN THE PLANS.
4. CONSTRUCT TEMPORARY PAVEMENT WIDENING, AS SHOWN IN THE PLANS.

PHASE 2 - CONSTRUCT SOUTHBOUND PORTION OF PROPOSED ROADWAY AND BRIDGE

1. FURNISH AND INSTALL CTB AND TRAFFIC CONTROL SIGNS IN ACCORDANCE WITH THE PLANS AND STANDARDS. USE TCP (2-8)-23 FOR LONG TERM, ONE-LANE TWO-WAY TRAFFIC CONTROL WITH TRAFFIC SIGNALS AT THE NEWLY CONSTRUCTED LANE OF PROPOSED BRIDGE. TWO-WAY TRAFFIC SHALL USED PROPOSED NORTHBOUND LANE AND TEMPORARY PAVEMENT WIDENING CONSTRUCTED IN PHASE 1.
2. REMOVE REMAINDER OF EXISTING SUPERSTRUCTURE AND SUBSTRUCTURE, AS SHOWN IN THE PLANS.
3. CONSTRUCT SOUTHBOUND PORTION OF PROPOSED ROADWAY (SUBGRADE AND FLEX BASE), MBGF, RIPRAP AND PROPOSED BRIDGE, AS SHOWN IN THE PLANS.

PHASE 3 - FINAL PAVEMENT, SIGNING AND CLEAN UP

1. REMOVE ANY REMAINING DRIVEWAY DETOUR AND TEMPORARY PAVEMENT. MOVE CTB TO ON-SITE TEMPORARY STOCKPILE.
2. USE TCP (7-1)-13 FOR SURFACING OPERATIONS TO COMPLETE PAVEMENT SURFACE COURSES.
3. INSTALL FINAL PAVEMENT MARKINGS IN ACCORDANCE WITH THE PLANS USING TCP (3-1)-13 AND TCP (3-3)-14 FOR MOBILE OPERATIONS. PLACE FINAL SIGNS IN ACCORDANCE WITH THE PLANS.
4. CONSTRUCT REMAINING FENCE NEAR PROPOSED BRIDGE ABUTMENTS, IN ACCORDANCE WITH THE PLANS.
5. REMOVE SW3P DEVICES, PREFORM FINAL CLEAN UP, AND DEMOBILIZE.

DUFFAU CREEK (CONSTRUCT ONE BRIDGE AT A TIME)

ALL PHASES

REPEAT ABOVE TCP NARRATIVE SEQUENCE OF CONSTRUCTION FOR DUFFAU CREEK, MOVING CTB FROM TEMPORARY STOCKPILE TO DUFFAU CREEK BRIDGE. REMOVE ALL CTB AT PROJECT COMPLETION.

BOTH LOCATIONS:

PAVEMENT DROP-OFF

1. MAXIMUM ELEVATION DROP-OFF ON PAVEMENT EDGE SHALL NOT EXCEED 1 INCH WHEN TRAFFIC IS ALLOWED ADJACENT TO THE DROP-OFF. THE SLOPE MUST BE COMPACTED MATERIALS CAPABLE OF SUPPORTING VEHICLES. THIS WORK WILL NOT BE PAID DIRECTLY, BUT SHALL CONSIDERED SUBSIDIARY TO THE VARIOUS BIDS.
2. SIGNING FOR PAVEMENT DROP-OFF (CW8-9a) SHOULD BE INSTALLED IN ADVANCE TO THE CONDITION. SIGNS INSTALLED ALONG THE PAVEMENT EDGE SHOULD BE SUPPLEMENTED WITH THE NEXT XX FEET SIGN (CW16-2P) OR ADVISORY SPEED SIGN (CW13-1)

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Texas Department of Transportation

SH 220

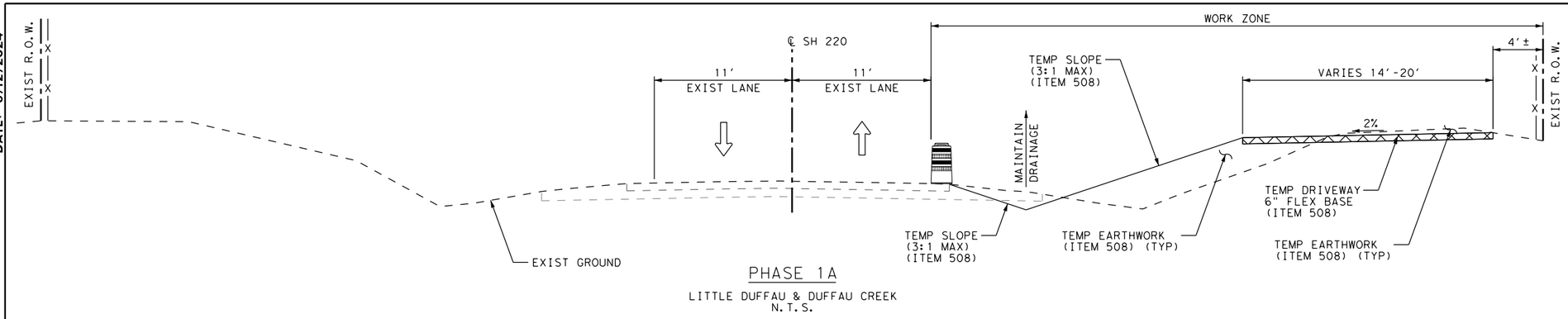
TRAFFIC CONTROL NARRATIVE

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

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NUMBER		HIGHWAY NO.
MBT	6	(See Title Sheet)		SH 220
CHECK	STATE	DISTRICT	COUNTY	SHEET NO.
REL	TEXAS	FTW	ERATH	
GRAPHICS	CONTROL	SECTION	JOB	26
BHK	0467	02	020, ETC.	
CHECK				
PKC				

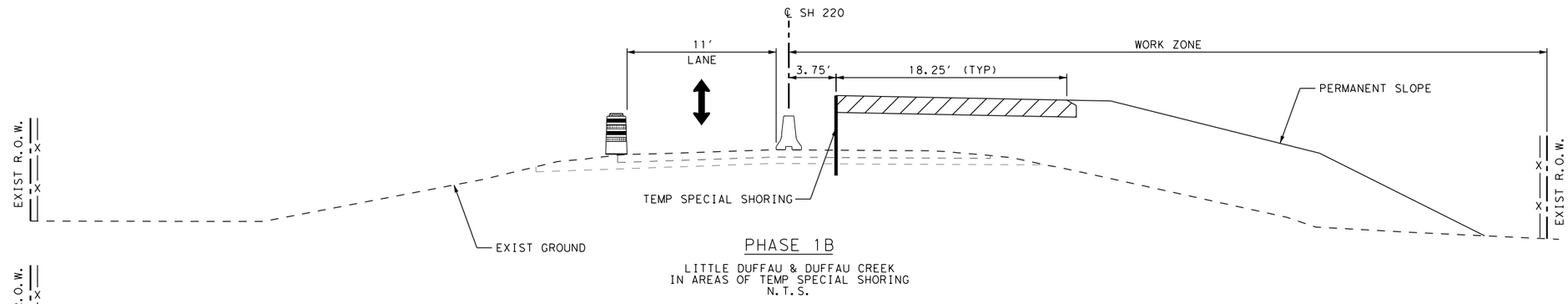
FILE: ...\TCP\020TCNOI.sht

TIME: 1:11:02 PM
DATE: 6/12/2024



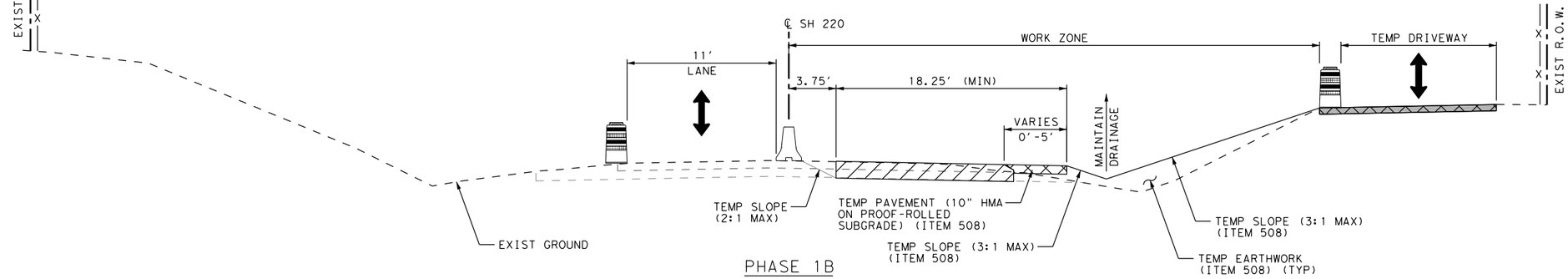
PHASE 1A

LITTLE DUFFAU & DUFFAU CREEK
N.T.S.



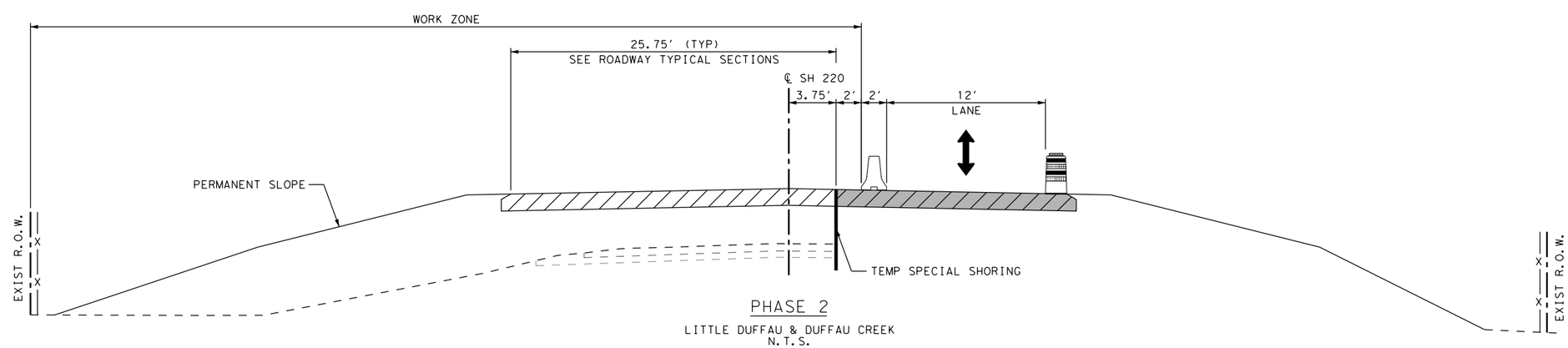
PHASE 1B

LITTLE DUFFAU & DUFFAU CREEK
IN AREAS OF TEMP SPECIAL SHORING
N.T.S.



PHASE 1B

LITTLE DUFFAU & DUFFAU CREEK
IN AREAS OF TEMP DRIVEWAY OR TEMP PAVEMENT
N.T.S.



PHASE 2

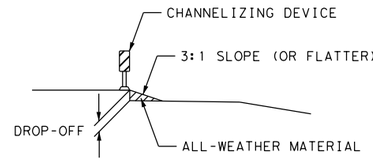
LITTLE DUFFAU & DUFFAU CREEK
N.T.S.

LEGEND

- PERMANENT CONSTRUCTION THIS PHASE
- TEMPORARY PAVEMENT THIS PHASE
- COMPLETED PERMANENT CONSTRUCTION
- COMPLETED TEMPORARY PAVEMENT
- CHANNELIZING DEVICE
- CONCRETE BARRIER

NOTES:

1. PROTECT ALL DROP OFFS AT END OF WORK DAY AND OUTSIDE LIMITS OF CONSTRUCTION WITH 3:1 OR FLATTER NON ERODABLE MATERIAL, EXCEPT WHERE NOTED IN THE PLANS. REFER TO DETAIL "A".



DETAIL "A"

N.T.S.

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SH 220

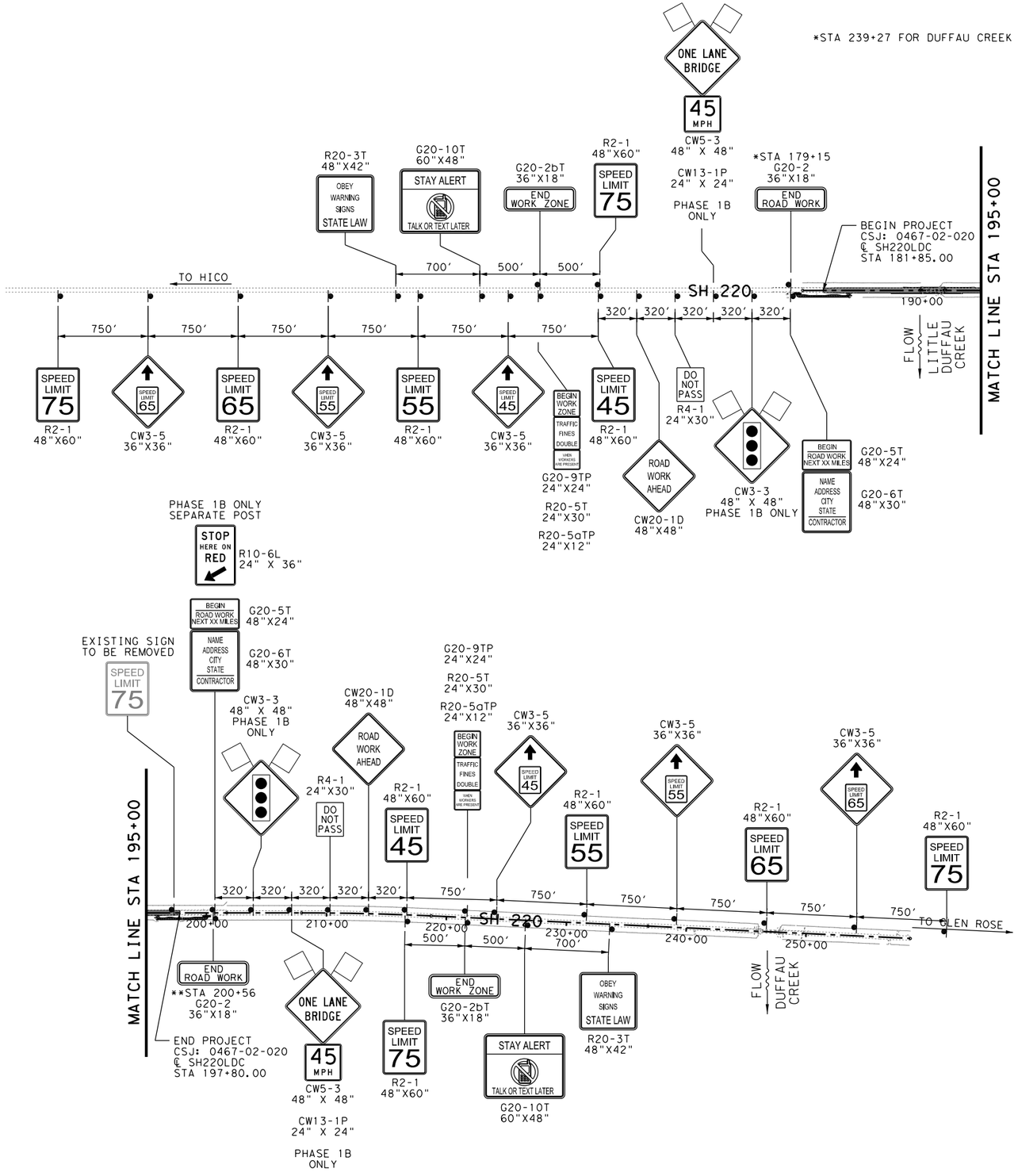
TRAFFIC CONTROL PHASED TYPICAL SECTIONS

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

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NUMBER		HIGHWAY NO.
MBT	6	(See Title Sheet)		SH 220
CHECK	STATE	DISTRICT	COUNTY	SHEET NO.
PKC	TEXAS	FTW	ERATH	27
GRAPHICS	CONTROL	SECTION	JOB	
MBT	0467	02	020, ETC.	
CHECK				
PKC				

FILE: ...\TCP\020TTS01.sht

TIME: 1:11:16 PM
DATE: 6/12/2024



N

0 500 1000
SCALE IN FEET

LEGEND

● TCP SIGN

NOTES:

1. PLACE PROJECT LIMITS SIGNS AT LOCATION TO REMAIN FOR THE DURATION OF THE PROJECT.
2. PROVIDE AND MAINTAIN ALL BARRICADES, WARNING SIGNS, FLASHING LIGHTS, AND TRAFFIC CONTROL DEVICES IN CONFORMANCE WITH TXDOT BC AND TCP STANDARDS, AND PART VI OF THE TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES.
3. DETERMINE AND PLACE ALL APPROPRIATE DISTANCES FOR SIGNS SHOWING X MILES.
4. COVER OR REMOVE EXISTING SIGNS THAT ARE IN CONFLICT WITH CONSTRUCTION SIGNS.
5. REFERENCE TCP PHASE LAYOUTS FOR THE LOCATIONS OF THE LIMITS TO PLACE ADVANCE WARNING SIGNS FOR SPECIFIC PHASES.
6. ALL SIGNING SHALL BE PLACED 25' MINIMUM FROM DRIVEWAYS.
7. SIGNING SHOWN FOR LITTLE DUFFAU CREEK LOCATION. IMPLEMENT SIMILAR SET-UP AND SPACING FOR DUFFAU CREEK LOCATION (STATIONS INDICATED WITH * AND **).

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Texas Department of Transportation

SH 220

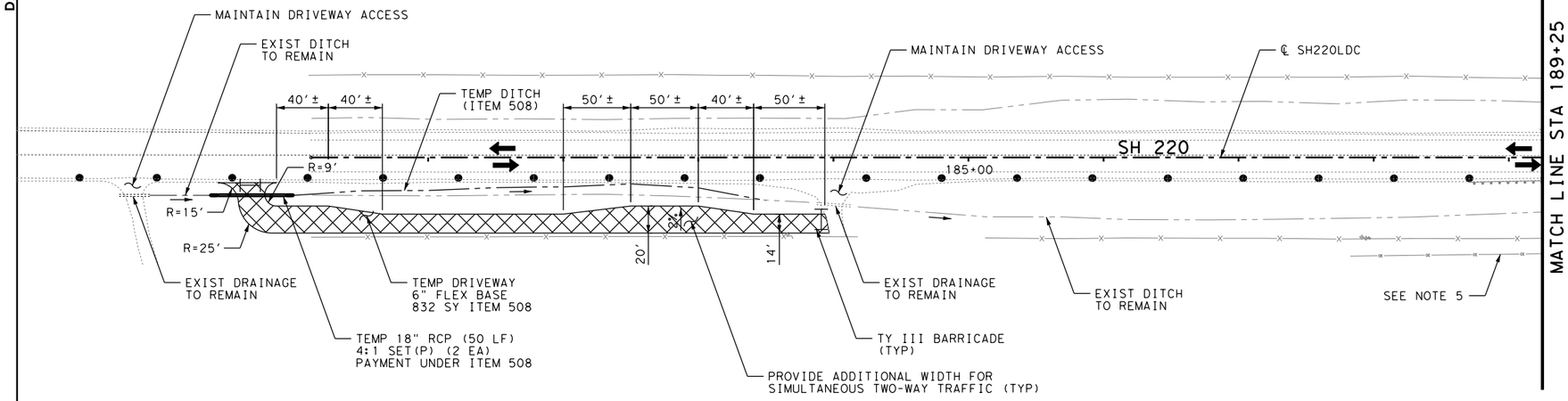
TRAFFIC CONTROL ADVANCED WARNING SIGNS

SCALE: 1"=1000' (H) SHEET 1 OF 1

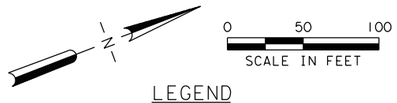
DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NUMBER		HIGHWAY NO.
MBT	6	(See Title Sheet)		SH 220
CHECK	STATE	DISTRICT	COUNTY	SHEET NO.
PKC	TEXAS	FTW	ERATH	28
GRAPHICS	CONTROL	SECTION	JOB	
PKC	0467	02	020, ETC.	
CHECK				
JDB				

FILE: ...\TCP\020AWS01.sht

TIME: 11:48:06 AM
DATE: 6/27/2024



LITTLE DUFFAU CREEK

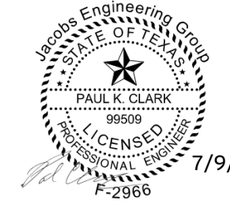


LEGEND

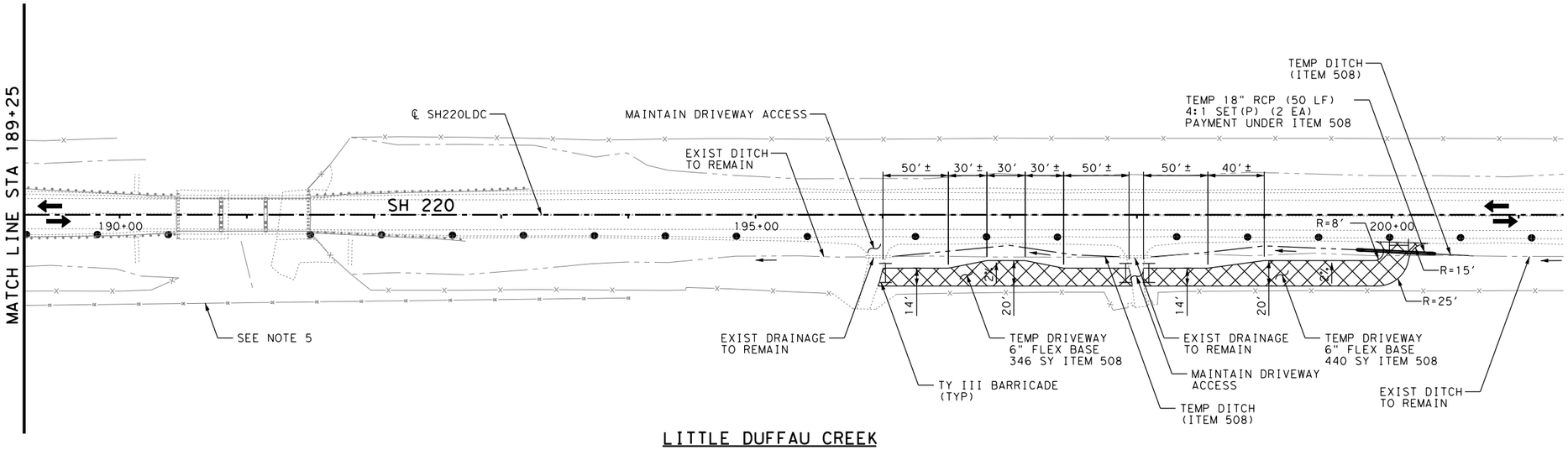
- SIGN DESIGNATION
- TCP SIGN
- TRAFFIC LANE
- TY III BARRICADE
- PERMANENT CONSTRUCTION THIS PHASE
- TEMPORARY PAVEMENT THIS PHASE
- COMPLETED PERMANENT CONSTRUCTION
- COMPLETED TEMPORARY PAVEMENT
- CHANNELIZING DEVICES
- CONCRETE BARRIER
- PORTABLE CHANGEABLE MESSAGE SIGN
- TEMPORARY TRAFFIC SIGNAL
- TEMPORARY SPECIAL SHORING

NOTES:

1. REFER TO BC(2)-21 STANDARD FOR CONSTRUCTION WARNING SIGN SPACING REQUIREMENTS.
2. PROVIDE AND MAINTAIN ALL BARRICADES, WARNING SIGNS, FLASHING LIGHTS, AND TRAFFIC CONTROL DEVICES IN CONFORMANCE WITH TXDOT BC AND TCP STANDARDS, AND PART VI OF THE TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES.
3. DETERMINE AND PLACE ALL APPROPRIATE DISTANCES FOR SIGNS SHOWING X MILES.
4. COVER OR REMOVE EXISTING SIGNS THAT ARE IN CONFLICT WITH CONSTRUCTION SIGNS.
5. SEE EXISTING UTILITY LAYOUTS FOR MORE INFO. USE CAUTION DURING CRANE USE, ESPECIALLY WHEN SETTING BEAMS. IF SWINGING BEAMS OVER OPEN TRAFFIC LANE(S), TEMPORARILY STOP TRAFFIC USING TCP(3-1). CONTRACTOR'S PICK PLAN SHALL DESCRIBE MEANS AND METHODS REGARDING SETTING BEAMS FOR SPAN 2.



7/9/2024



LITTLE DUFFAU CREEK

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SH 220

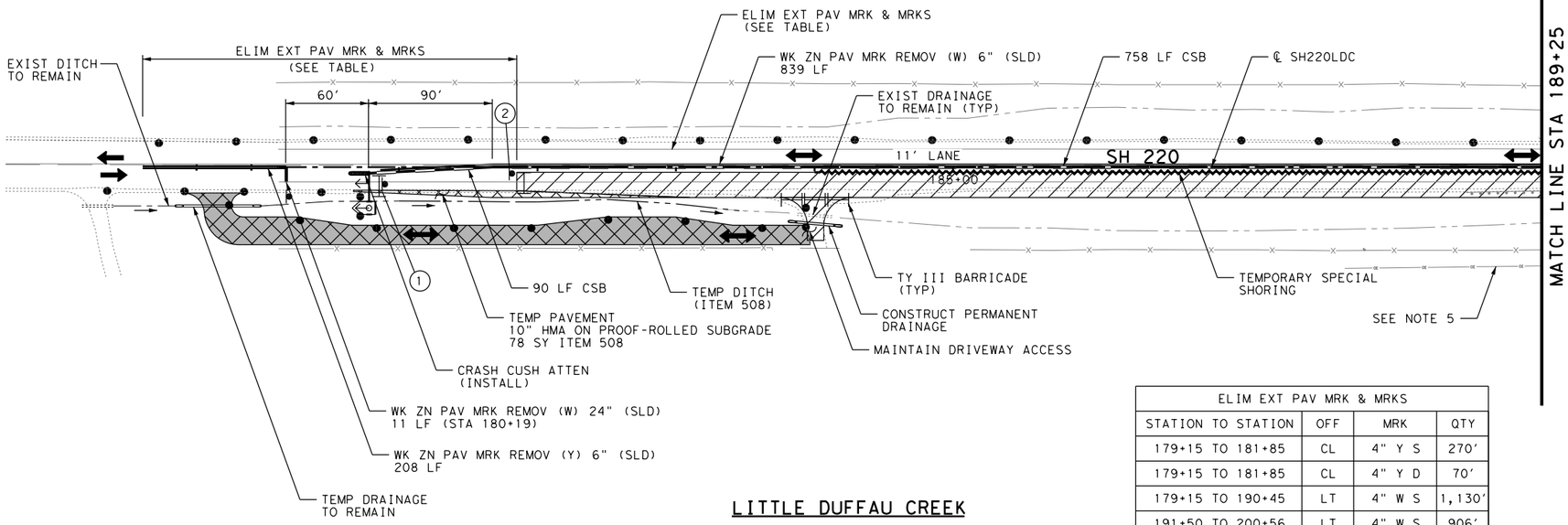
TRAFFIC CONTROL PHASE 1A SH 220 AT LITTLE DUFFAU CREEK

SCALE: 1"=100' SHEET 1 OF 3

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NUMBER		HIGHWAY NO.
MBT	6	(See Title Sheet)		SH 220
CHECK	STATE	DISTRICT	COUNTY	SHEET NO.
PKC	TEXAS	FTW	ERATH	29
GRAPHICS	CONTROL	SECTION	JOB	
PKC	0467	02	020, ETC.	
CHECK				
JDB				

FILE: ...\TCP\020TPS01A.sht

TIME: 11:48:21 AM
DATE: 6/27/2024



LITTLE DUFFAU CREEK

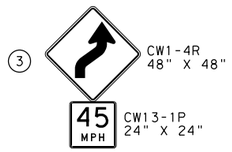
ELIM EXT PAV MRK & MRKS			
STATION TO STATION	OFF	MRK	QTY
179+15 TO 181+85	CL	4" Y S	270'
179+15 TO 181+85	CL	4" Y D	70'
179+15 TO 190+45	LT	4" W S	1,130'
191+50 TO 200+56	LT	4" W S	906'
197+80 TO 200+56	CL	4" Y S	276'
197+80 TO 200+56	CL	4" Y D	70'

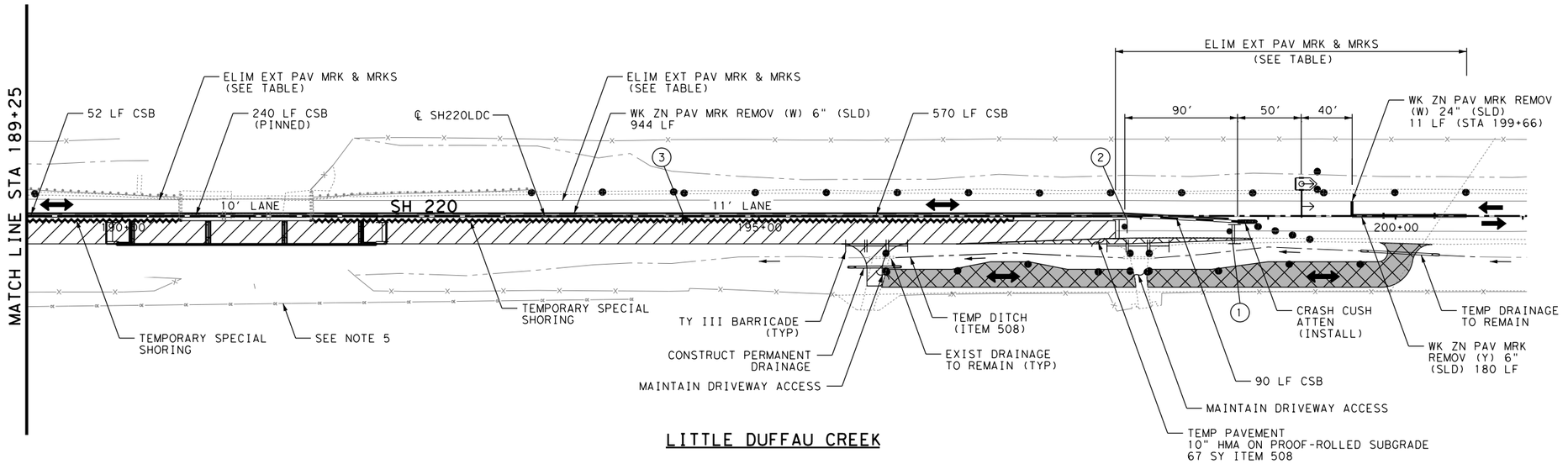
LEGEND

- (X) SIGN DESIGNATION
- TCP SIGN
- TRAFFIC LANE
- TY III BARRICADE
- PERMANENT CONSTRUCTION THIS PHASE
- TEMPORARY PAVEMENT THIS PHASE
- COMPLETED PERMANENT CONSTRUCTION
- COMPLETED TEMPORARY PAVEMENT
- CHANNELIZING DEVICES
- CONCRETE BARRIER
- PORTABLE CHANGEABLE MESSAGE SIGN
- TEMPORARY TRAFFIC SIGNAL
- TEMPORARY SPECIAL SHORING

NOTES:

1. REFER TO BC(2)-21 STANDARD FOR CONSTRUCTION WARNING SIGN SPACING REQUIREMENTS.
2. PROVIDE AND MAINTAIN ALL BARRICADES, WARNING SIGNS, FLASHING LIGHTS, AND TRAFFIC CONTROL DEVICES IN CONFORMANCE WITH TXDOT BC AND TCP STANDARDS, AND PART VI OF THE TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES.
3. DETERMINE AND PLACE ALL APPROPRIATE DISTANCES FOR SIGNS SHOWING X MILES.
4. COVER OR REMOVE EXISTING SIGNS THAT ARE IN CONFLICT WITH CONSTRUCTION SIGNS.
5. SEE EXISTING UTILITY LAYOUTS FOR MORE INFO. USE CAUTION DURING CRANE USE, ESPECIALLY WHEN SETTING BEAMS. IF SWINGING BEAMS OVER OPEN TRAFFIC LANE(S), TEMPORARILY STOP TRAFFIC USING TCP(3-1). CONTRACTOR'S PICK PLAN SHALL DESCRIBE MEANS AND METHODS REGARDING SETTING BEAMS FOR SPAN 2.





LITTLE DUFFAU CREEK

7/9/2024

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SH 220

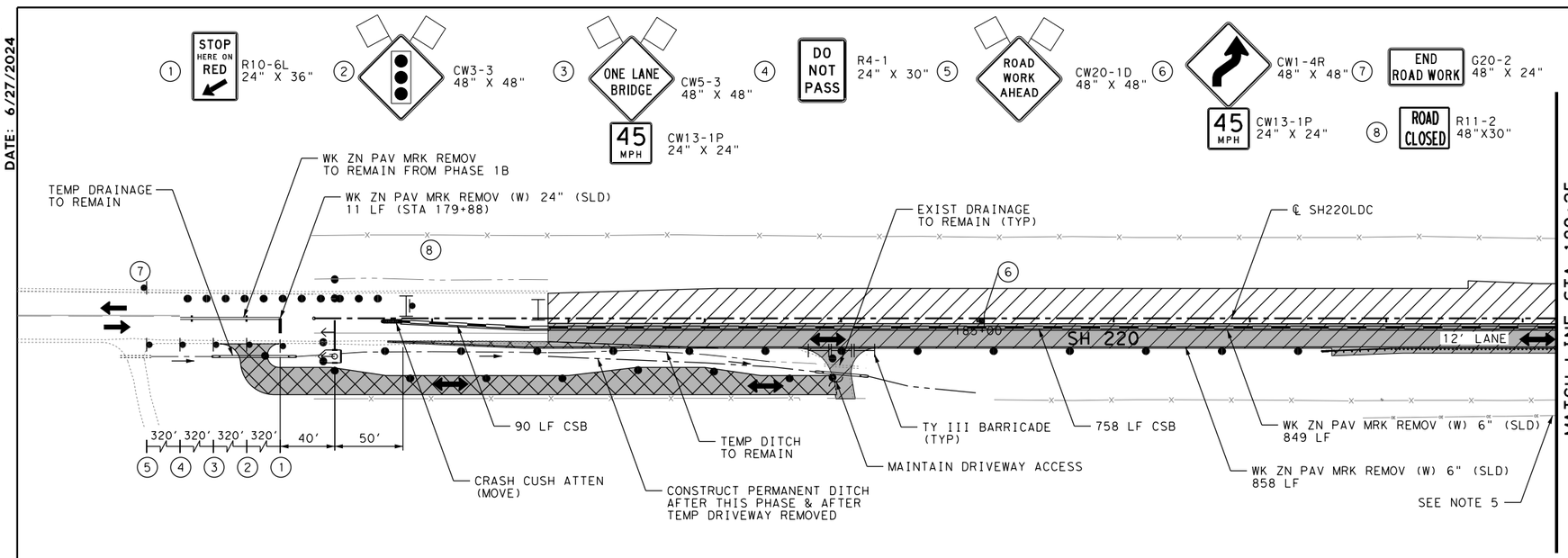
TRAFFIC CONTROL
PHASE 1B
SH 220 AT LITTLE DUFFAU CREEK

SCALE: 1"=100' SHEET 2OF 3

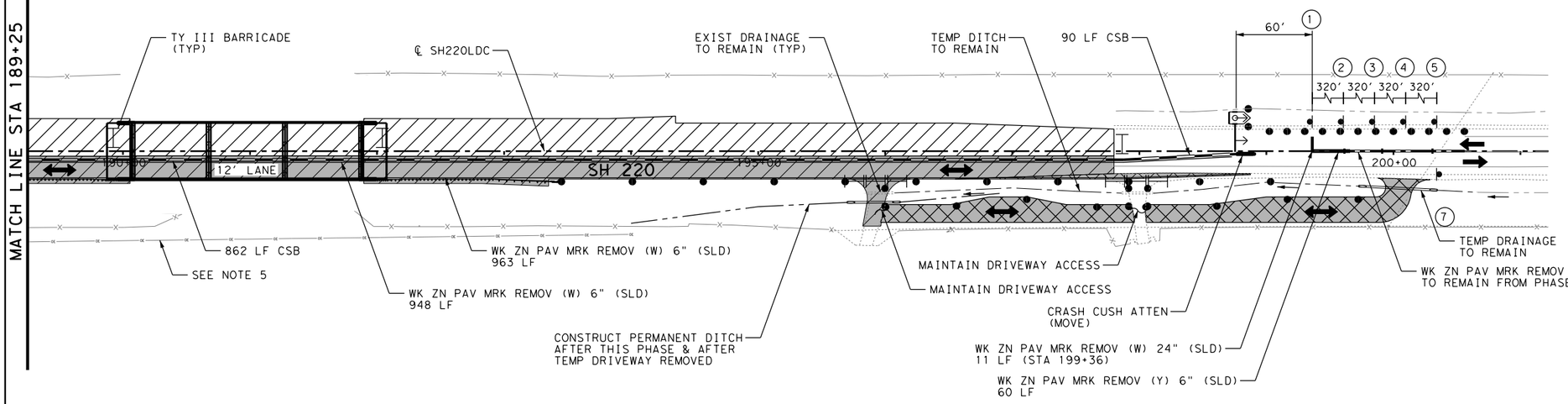
DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NUMBER		HIGHWAY NO.
MBT	6	(See Title Sheet)		SH 220
CHECK	STATE	DISTRICT	COUNTY	SHEET NO.
PKC	TEXAS	FTW	ERATH	
GRAPHICS	CONTROL	SECTION	JOB	30
PKC				
CHECK	0467	02	020, ETC.	
JDB				

FILE: ...\TCP\020TPSOLB.sht

TIME: 11:48:34 AM
DATE: 6/27/2024

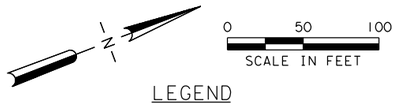


LITTLE DUFFAU CREEK



LITTLE DUFFAU CREEK

FILE: ...\TCP\020TPS02.sht

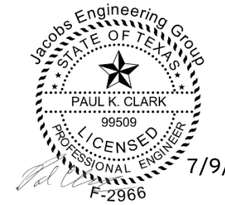


LEGEND

- (X) SIGN DESIGNATION
- TCP SIGN
- TRAFFIC LANE
- TY III BARRICADE
- PERMANENT CONSTRUCTION THIS PHASE
- TEMPORARY PAVEMENT THIS PHASE
- COMPLETED PERMANENT CONSTRUCTION
- COMPLETED TEMPORARY PAVEMENT
- CHANNELIZING DEVICES
- CONCRETE BARRIER
- PORTABLE CHANGEABLE MESSAGE SIGN
- TEMPORARY TRAFFIC SIGNAL
- TEMPORARY SPECIAL SHORING

NOTES:

1. REFER TO BC(2)-21 STANDARD FOR CONSTRUCTION WARNING SIGN SPACING REQUIREMENTS.
2. PROVIDE AND MAINTAIN ALL BARRICADES, WARNING SIGNS, FLASHING LIGHTS, AND TRAFFIC CONTROL DEVICES IN CONFORMANCE WITH TXDOT BC AND TCP STANDARDS, AND PART VI OF THE TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES.
3. DETERMINE AND PLACE ALL APPROPRIATE DISTANCES FOR SIGNS SHOWING X MILES.
4. COVER OR REMOVE EXISTING SIGNS THAT ARE IN CONFLICT WITH CONSTRUCTION SIGNS.
5. SEE EXISTING UTILITY LAYOUTS FOR MORE INFO. USE CAUTION DURING CRANE USE, ESPECIALLY WHEN SETTING BEAMS. IF SWINGING BEAMS OVER OPEN TRAFFIC LANE(S), TEMPORARILY STOP TRAFFIC USING TCP(3-1). CONTRACTOR'S PICK PLAN SHALL DESCRIBE MEANS AND METHODS REGARDING SETTING BEAMS FOR SPAN 2.



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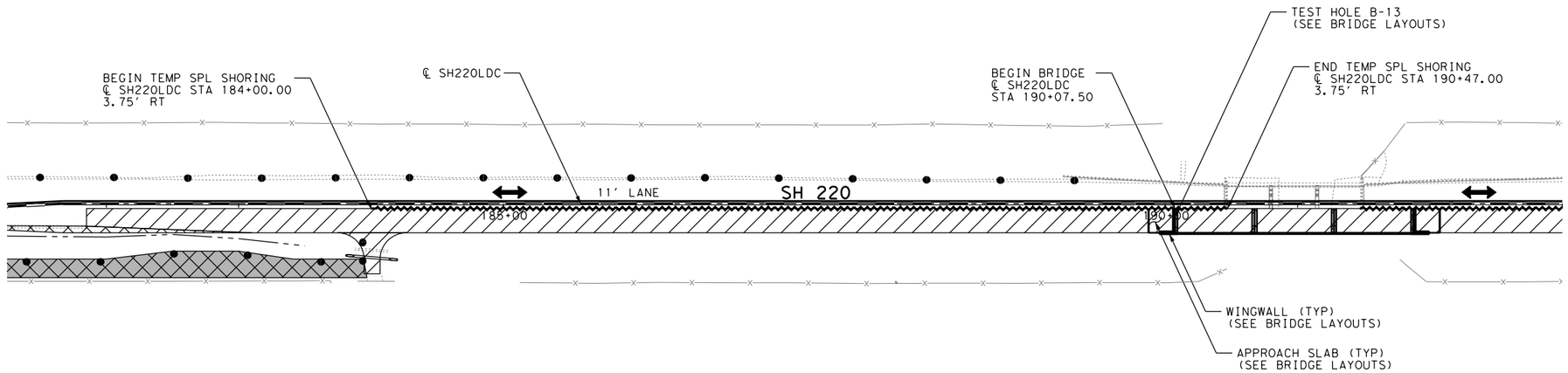
SH 220

TRAFFIC CONTROL
PHASE 2
SH 220 AT LITTLE DUFFAU CREEK

SCALE: 1"=100' SHEET 3 OF 3

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NUMBER		HIGHWAY NO.
MBT	6	(See Title Sheet)		SH 220
CHECK	STATE	DISTRICT	COUNTY	SHEET NO.
PKC	TEXAS	FTW	ERATH	31
GRAPHICS	CONTROL	SECTION	JOB	
PKC	0467	02	020, ETC.	
CHECK				
JDB				

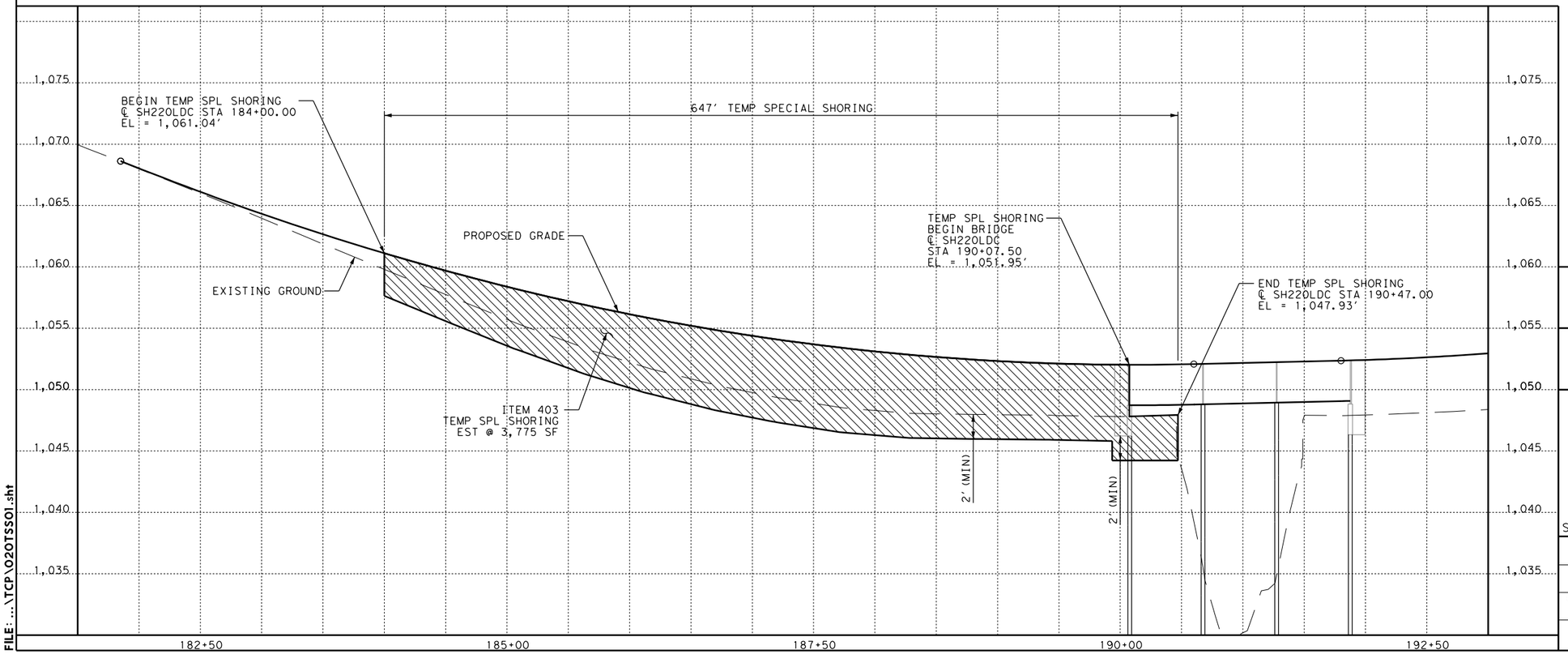
TIME: 1:12:11 PM
DATE: 6/12/2024



LEGEND

- TRAFFIC LANE
- PERMANENT CONSTRUCTION THIS PHASE
- TEMPORARY PAVEMENT THIS PHASE
- COMPLETED TEMPORARY PAVEMENT
- CHANNELIZING DEVICES
- CONCRETE BARRIER
- TEMPORARY SPECIAL SHORING (PLAN)
- TEMPORARY SPECIAL SHORING (PROFILE)

LITTLE DUFFAU CREEK



NOTES:

1. SEE TRAFFIC CONTROL PLANS AND STANDARDS FOR ADDITIONAL INFORMATION.
2. SEE BRIDGE LAYOUTS FOR DETAILED BRIDGE CONSTRUCTION PHASING.
3. UTILITIES NOT SHOWN FOR CLARITY. SEE EXISTING UTILITY LAYOUTS FOR UTILITY INFORMAITON.
4. TEMPORARY SPECIAL SHORING MEASUREMENT IS PROVIDED FOR CONTRACTOR INFORMATION ONLY. CONTRACTOR SHALL PROVIDE TEMPORARY SPECIAL SHORING DESIGN INCLUDING BOTTOM-OF-WALL ELEVATIONS, TO BE APPROVED BY THE ENGINEER.

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Texas Department of Transportation

SH 220

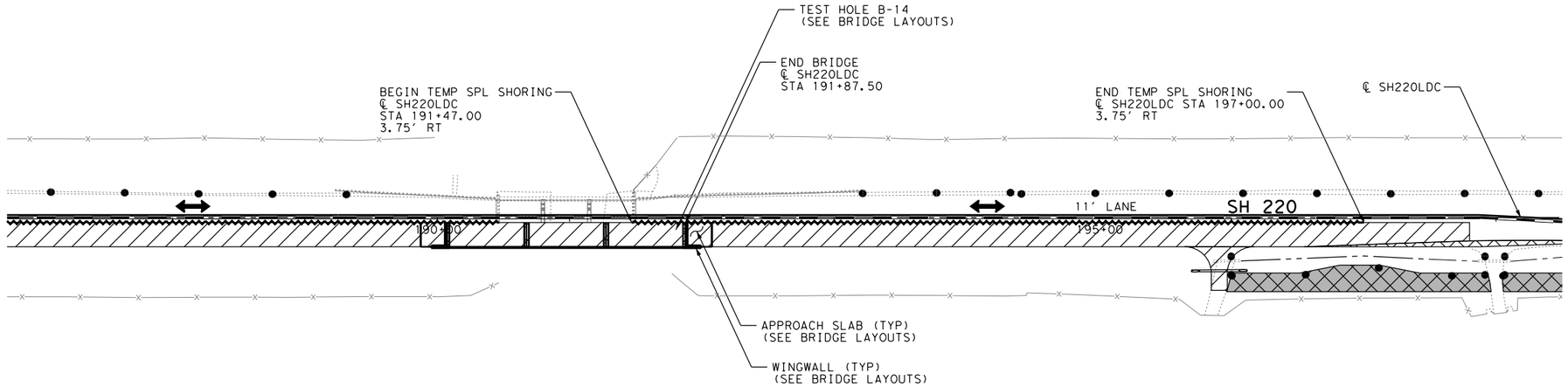
TRAFFIC CONTROL
TEMPORARY SPECIAL SHORING LAYOUT
SH 220 AT LITTLE DUFFAU CREEK

SCALE: 1"=100' (H), 1"=10' (V) SHEET 1 OF 2

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NUMBER		HIGHWAY NO.
MBT	6	(See Title Sheet)		SH 220
CHECK PKC	STATE	DISTRICT	COUNTY	SHEET NO.
GRAPHICS PKC	TEXAS	FTW	ERATH	32
CHECK JDB	CONTROL	SECTION	JOB	
	0467	02	020, ETC.	

FILE: ...\TCP\020TSSO1.sht

TIME: 1:12:22 PM
DATE: 6/12/2024



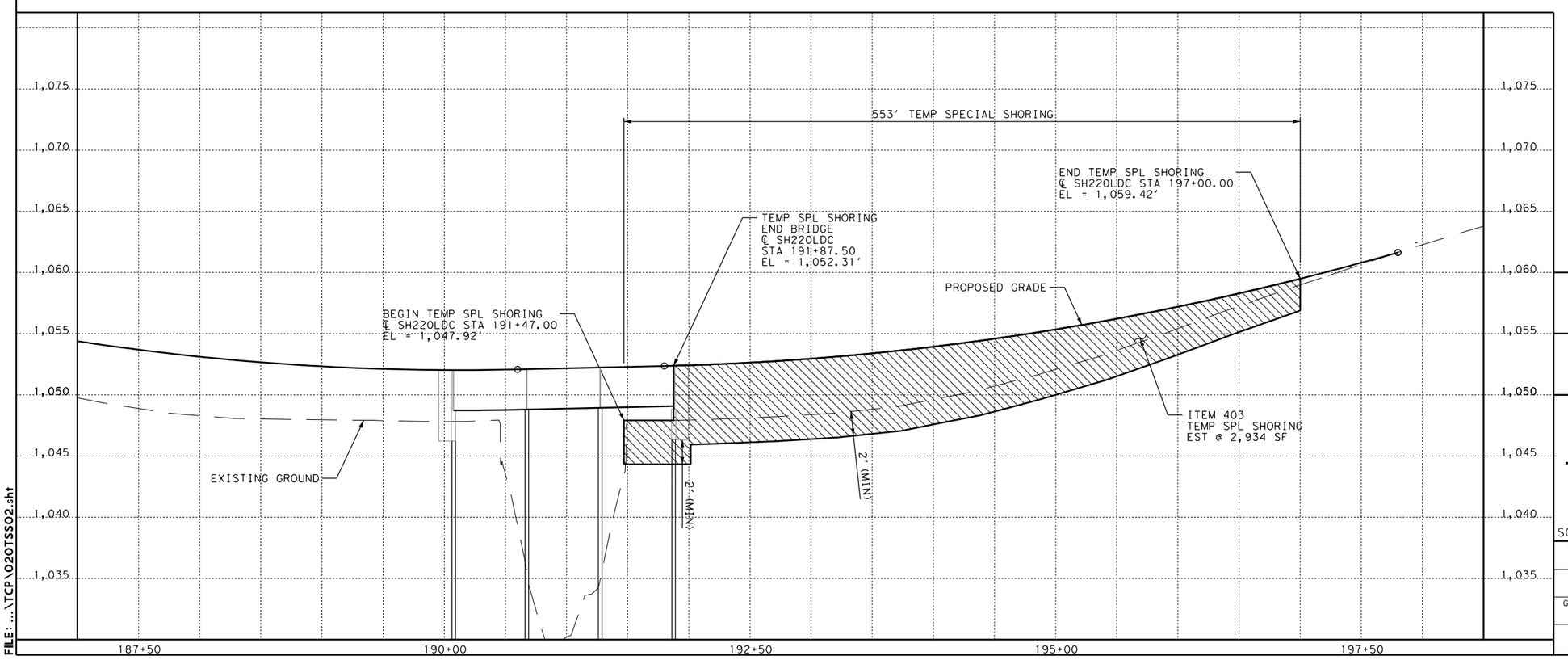
LITTLE DUFFAU CREEK

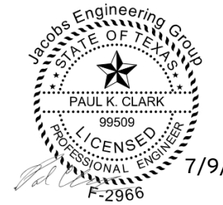
LEGEND

- TRAFFIC LANE
- PERMANENT CONSTRUCTION THIS PHASE
- TEMPORARY PAVEMENT THIS PHASE
- COMPLETED TEMPORARY PAVEMENT
- CHANNELIZING DEVICES
- CONCRETE BARRIER
- TEMPORARY SPECIAL SHORING (PLAN)
- TEMPORARY SPECIAL SHORING (PROFILE)

NOTES:

1. SEE TRAFFIC CONTROL PLANS AND STANDARDS FOR ADDITIONAL INFORMATION.
2. SEE BRIDGE LAYOUTS FOR DETAILED BRIDGE CONSTRUCTION PHASING.
3. UTILITIES NOT SHOWN FOR CLARITY. SEE EXISTING UTILITY LAYOUTS FOR UTILITY INFORMAITON.
4. TEMPORARY SPECIAL SHORING MEASUREMENT IS PROVIDED FOR CONTRACTOR INFORMATION ONLY. CONTRACTOR SHALL PROVIDE TEMPORARY SPECIAL SHORING DESIGN INCLUDING BOTTOM-OF-WALL ELEVATIONS, TO BE APPROVED BY THE ENGINEER.





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SH 220

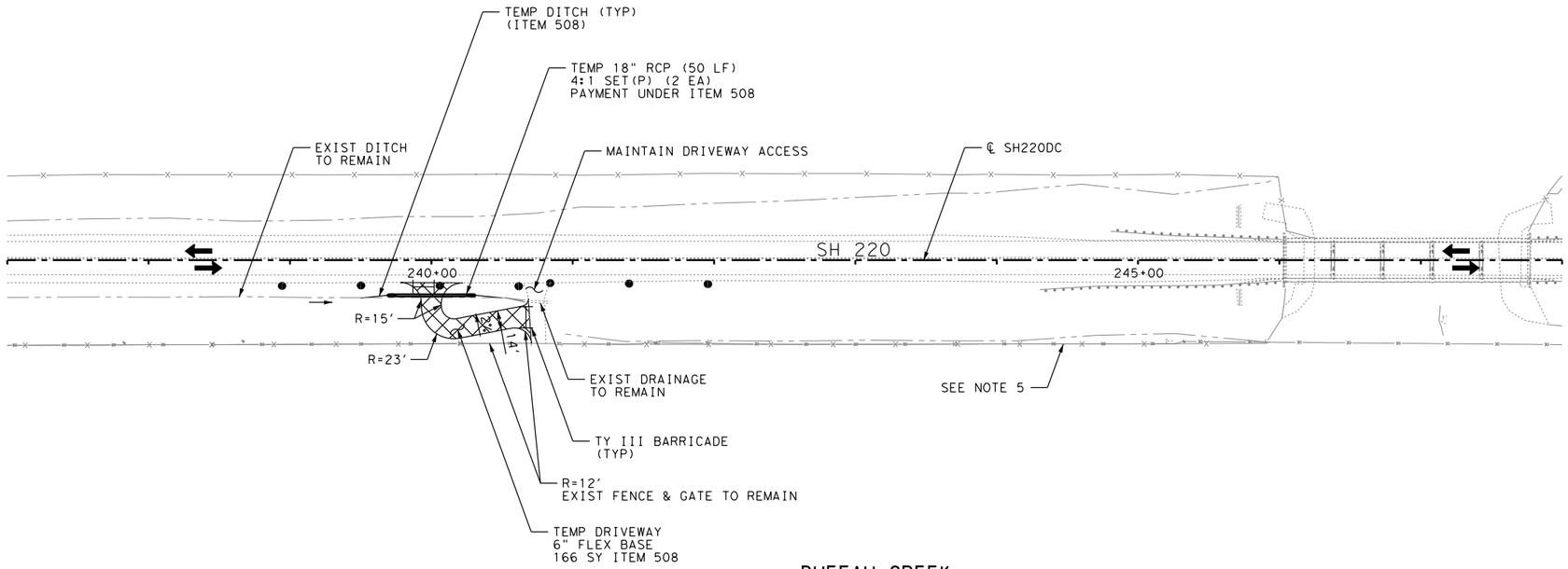
TRAFFIC CONTROL
TEMPORARY SPECIAL SHORING LAYOUT
SH 220 AT LITTLE DUFFAU CREEK

SCALE: 1"=100' (H), 1"=10' (V) SHEET 2 OF 2

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NUMBER		HIGHWAY NO.
MBT	6	(See Title Sheet)		SH 220
CHECK PKC	STATE	DISTRICT	COUNTY	SHEET NO.
GRAPHICS PKC	TEXAS	FTW	ERATH	33
CHECK JDB	CONTROL	SECTION	JOB	
	0467	02	020, ETC.	

FILE: ...\TCP\020TSS02.sht

TIME: 11:48:45 AM
DATE: 6/27/2024



0 50 100
SCALE IN FEET

LEGEND

- SIGN DESIGNATION
- TCP SIGN
- TRAFFIC LANE
- TY III BARRICADE
- PERMANENT CONSTRUCTION THIS PHASE
- TEMPORARY PAVEMENT THIS PHASE
- COMPLETED PERMANENT CONSTRUCTION
- COMPLETED TEMPORARY PAVEMENT
- CHANNELIZING DEVICES
- CONCRETE BARRIER
- PORTABLE CHANGEABLE MESSAGE SIGN
- TEMPORARY TRAFFIC SIGNAL
- TEMPORARY SPECIAL SHORING

NOTES:

1. REFER TO BC(2)-21 STANDARD FOR CONSTRUCTION WARNING SIGN SPACING REQUIREMENTS.
2. PROVIDE AND MAINTAIN ALL BARRICADES, WARNING SIGNS, FLASHING LIGHTS, AND TRAFFIC CONTROL DEVICES IN CONFORMANCE WITH TXDOT BC AND TCP STANDARDS, AND PART VI OF THE TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES.
3. DETERMINE AND PLACE ALL APPROPRIATE DISTANCES FOR SIGNS SHOWING X MILES.
4. COVER OR REMOVE EXISTING SIGNS THAT ARE IN CONFLICT WITH CONSTRUCTION SIGNS.
5. SEE EXISTING UTILITY LAYOUTS FOR MORE INFO. USE CAUTION DURING CRANE USE, ESPECIALLY WHEN SETTING BEAMS. IF SWINGING BEAMS OVER OPEN TRAFFIC LANE(S), TEMPORARILY STOP TRAFFIC USING TCP(3-1). CONTRACTOR'S PICK PLAN SHALL DESCRIBE MEANS AND METHODS REGARDING SETTING BEAMS FOR SPAN 2.

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Texas Department of Transportation

SH 220

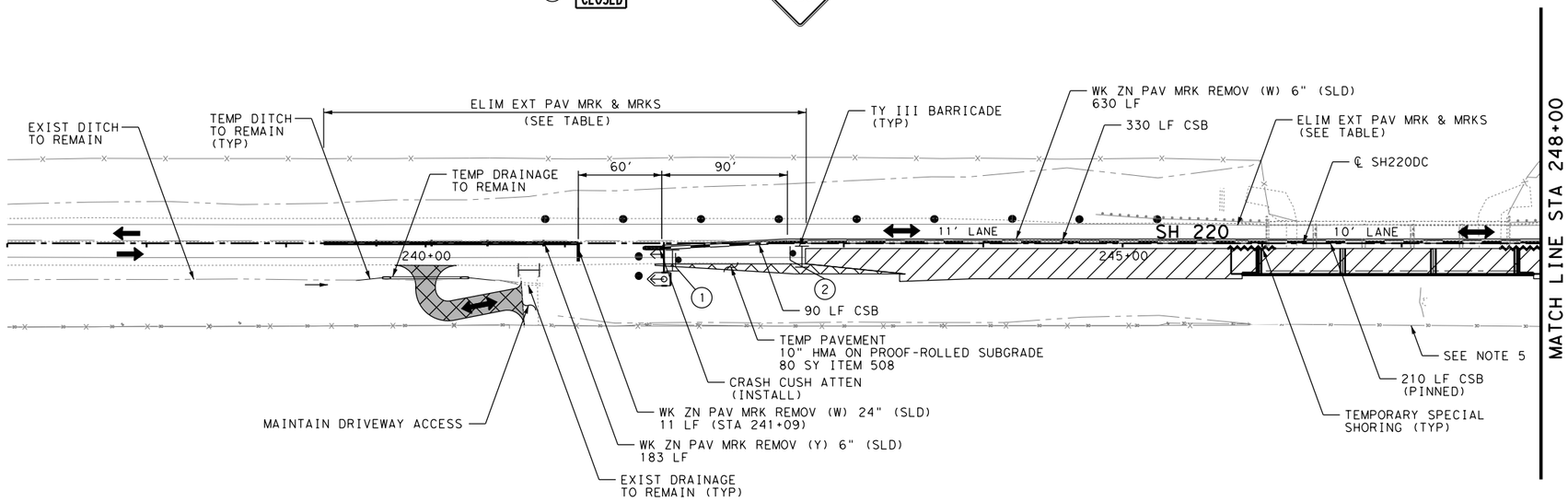
TRAFFIC CONTROL
PHASE 1A
SH 220 AT DUFFAU CREEK

SCALE: 1"=100' SHEET 1 OF 3

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NUMBER		HIGHWAY NO.
CHECK	6	(See Title Sheet)		SH 220
	STATE	DISTRICT	COUNTY	SHEET NO.
GRAPHICS	TEXAS	FTW	ERATH	34
CHECK	CONTROL	SECTION	JOB	
	0467	02	020, ETC.	

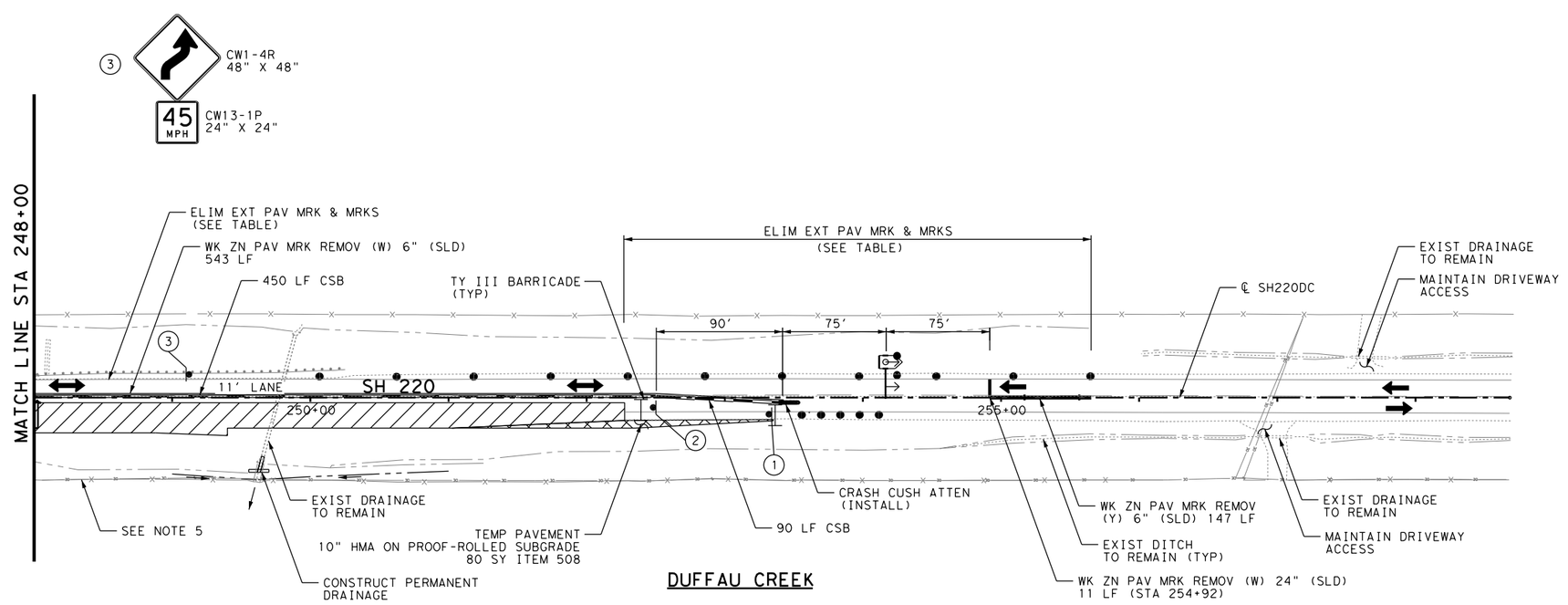
FILE: ...\TCP\021TPS01A.sht

TIME: 11:48:55 AM
DATE: 6/27/2024

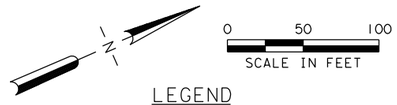


ELIM EXT PAV MRK & MRKS			
STATION TO STATION	OFF	MRK	QTY
239+27 TO 242+73	CL	4" Y D	90'
239+27 TO 246+03	LT	4" W S	676'
247+77 TO 255+66	LT	4" W S	789'
252+27 TO 255+66	CL	4" Y D	85'

DUFFAU CREEK



DUFFAU CREEK

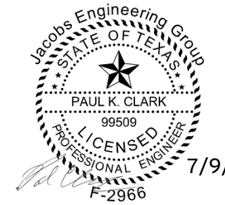


LEGEND

- (X) SIGN DESIGNATION
- TCP SIGN
- TRAFFIC LANE
- TY III BARRICADE
- PERMANENT CONSTRUCTION THIS PHASE
- TEMPORARY PAVEMENT THIS PHASE
- COMPLETED PERMANENT CONSTRUCTION
- COMPLETED TEMPORARY PAVEMENT
- CHANNELIZING DEVICES
- CONCRETE BARRIER
- PORTABLE CHANGEABLE MESSAGE SIGN
- TEMPORARY TRAFFIC SIGNAL
- TEMPORARY SPECIAL SHORING

NOTES:

1. REFER TO BC(2)-21 STANDARD FOR CONSTRUCTION WARNING SIGN SPACING REQUIREMENTS.
2. PROVIDE AND MAINTAIN ALL BARRICADES, WARNING SIGNS, FLASHING LIGHTS, AND TRAFFIC CONTROL DEVICES IN CONFORMANCE WITH TXDOT BC AND TCP STANDARDS, AND PART VI OF THE TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES.
3. DETERMINE AND PLACE ALL APPROPRIATE DISTANCES FOR SIGNS SHOWING X MILES.
4. COVER OR REMOVE EXISTING SIGNS THAT ARE IN CONFLICT WITH CONSTRUCTION SIGNS.
5. SEE EXISTING UTILITY LAYOUTS FOR MORE INFO. USE CAUTION DURING CRANE USE, ESPECIALLY WHEN SETTING BEAMS. IF SWINGING BEAMS OVER OPEN TRAFFIC LANE(S), TEMPORARILY STOP TRAFFIC USING TCP(3-1). CONTRACTOR'S PICK PLAN SHALL DESCRIBE MEANS AND METHODS REGARDING SETTING BEAMS FOR SPAN 2.



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Phone: +1 (214) 638-0145
Firm Registration: F-2966

Texas Department of Transportation

SH 220

TRAFFIC CONTROL PHASE 1B SH 220 AT DUFFAU CREEK

SCALE: 1"=100' SHEET 2OF 3

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NUMBER		HIGHWAY NO.
MBT	6	(See Title Sheet)		SH 220
CHECK	STATE	DISTRICT	COUNTY	SHEET NO.
REL	TEXAS	FTW	ERATH	35
GRAPHICS	CONTROL	SECTION	JOB	
BHK	0467	02	020, ETC.	
CHECK				
PKC				

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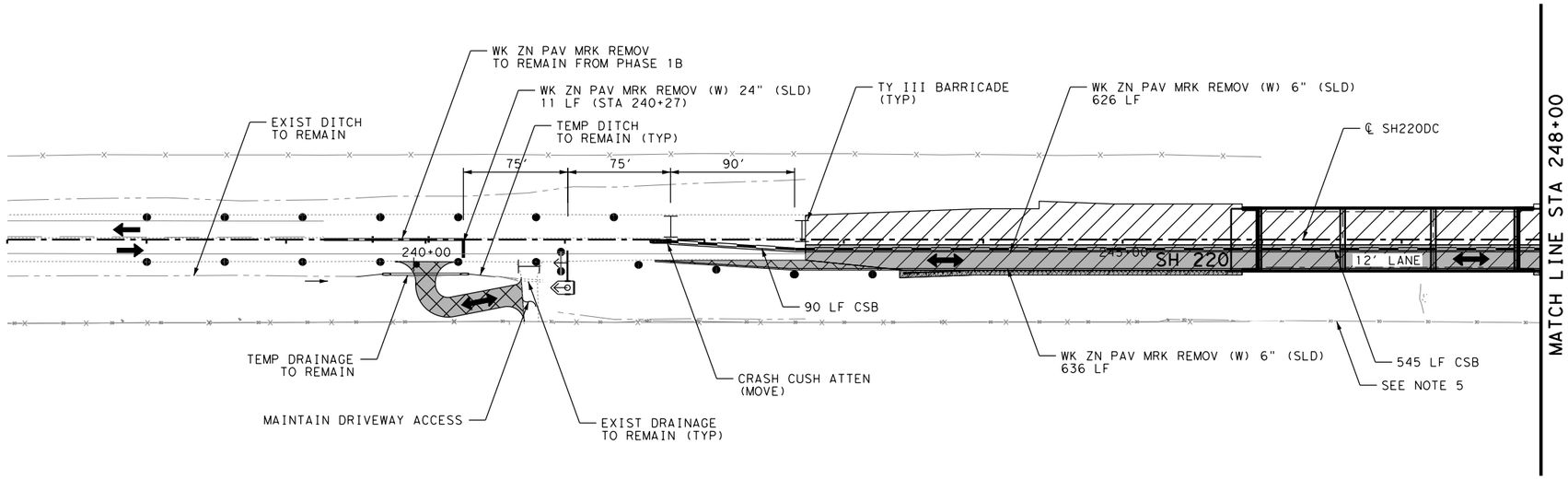
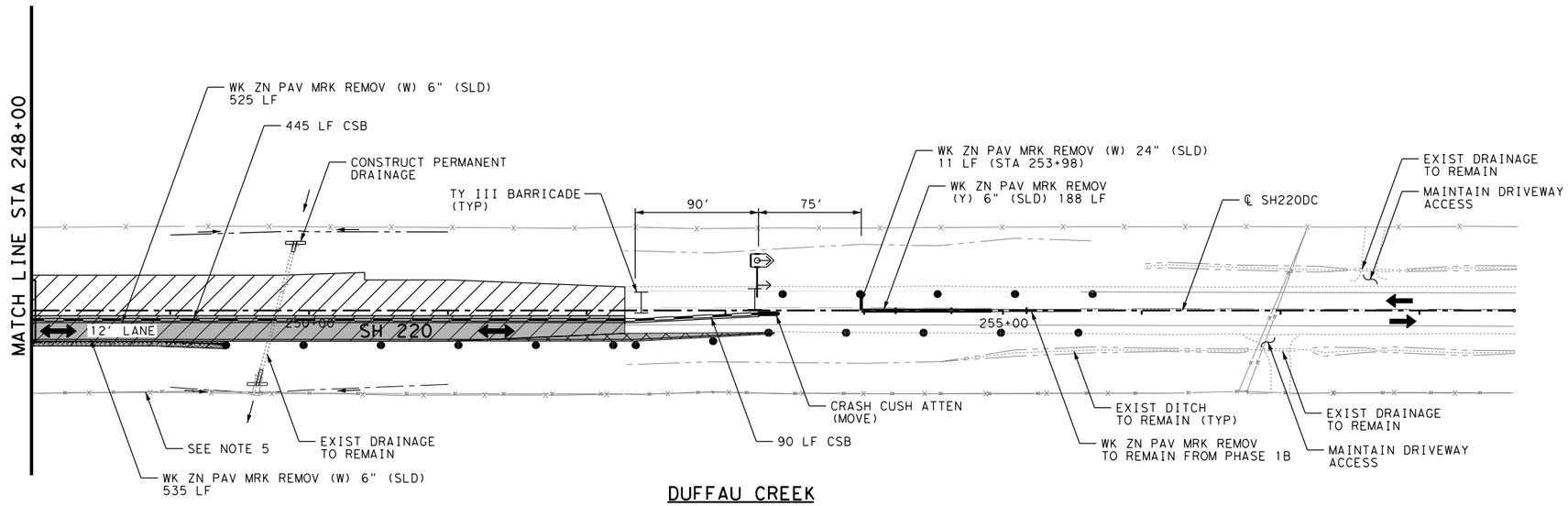
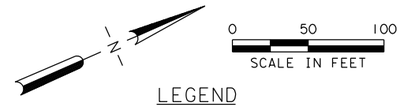
DATE: 6/27/2024



DUFFAU CREEK



DUFFAU CREEK

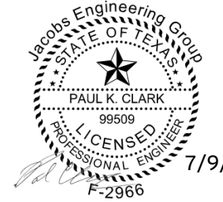


LEGEND

- SIGN DESIGNATION
- TCP SIGN
- TRAFFIC LANE
- TY III BARRICADE
- PERMANENT CONSTRUCTION THIS PHASE
- TEMPORARY PAVEMENT THIS PHASE
- COMPLETED PERMANENT CONSTRUCTION
- COMPLETED TEMPORARY PAVEMENT
- CHANNELIZING DEVICES
- CONCRETE BARRIER
- PORTABLE CHANGEABLE MESSAGE SIGN
- TEMPORARY TRAFFIC SIGNAL
- TEMPORARY SPECIAL SHORING

NOTES:

1. REFER TO BC(2)-21 STANDARD FOR CONSTRUCTION WARNING SIGN SPACING REQUIREMENTS.
2. PROVIDE AND MAINTAIN ALL BARRICADES, WARNING SIGNS, FLASHING LIGHTS, AND TRAFFIC CONTROL DEVICES IN CONFORMANCE WITH TXDOT BC AND TCP STANDARDS, AND PART VI OF THE TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES.
3. DETERMINE AND PLACE ALL APPROPRIATE DISTANCES FOR SIGNS SHOWING X MILES.
4. COVER OR REMOVE EXISTING SIGNS THAT ARE IN CONFLICT WITH CONSTRUCTION SIGNS.
5. SEE EXISTING UTILITY LAYOUTS FOR MORE INFO. USE CAUTION DURING CRANE USE, ESPECIALLY WHEN SETTING BEAMS. IF SWINGING BEAMS OVER OPEN TRAFFIC LANE(S), TEMPORARILY STOP TRAFFIC USING TCP(3-1). CONTRACTOR'S PICK PLAN SHALL DESCRIBE MEANS AND METHODS REGARDING SETTING BEAMS FOR SPAN 2.



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Texas Department of Transportation

SH 220

TRAFFIC CONTROL
PHASE 2
SH 220 AT DUFFAU CREEK

SCALE: 1"=100' SHEET 3 OF 3

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NUMBER		HIGHWAY NO.
MBT	6	(See Title Sheet)		SH 220
CHECK	STATE	DISTRICT	COUNTY	SHEET NO.
PKC	TEXAS	FTW	ERATH	36
GRAPHICS	CONTROL	SECTION	JOB	
PKC	0467	02	020, ETC.	
CHECK				
JDB				

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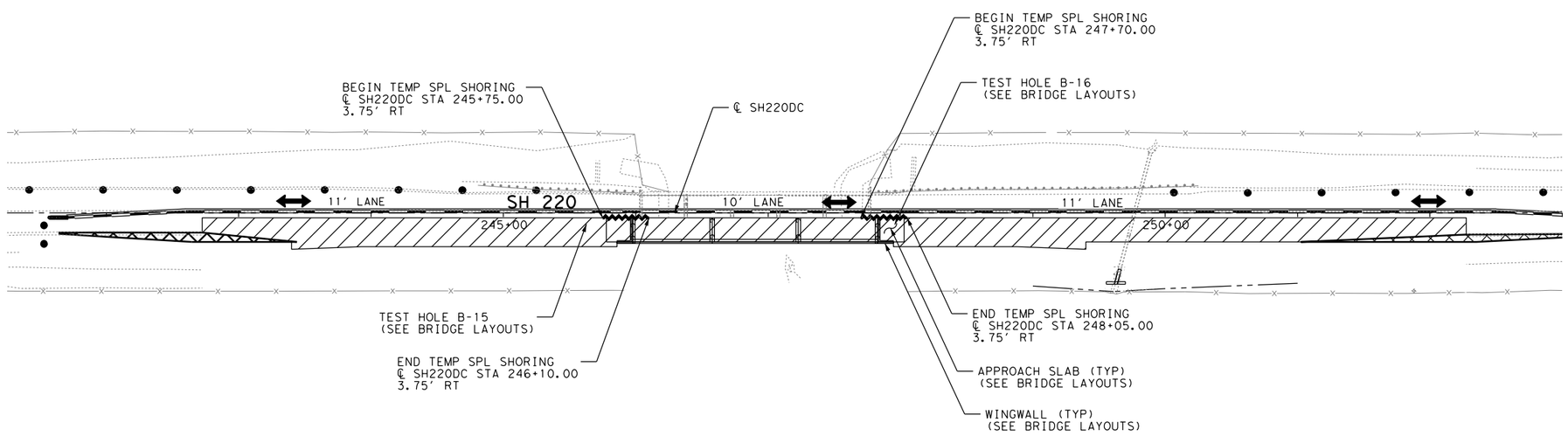
DATE: 6/12/2024



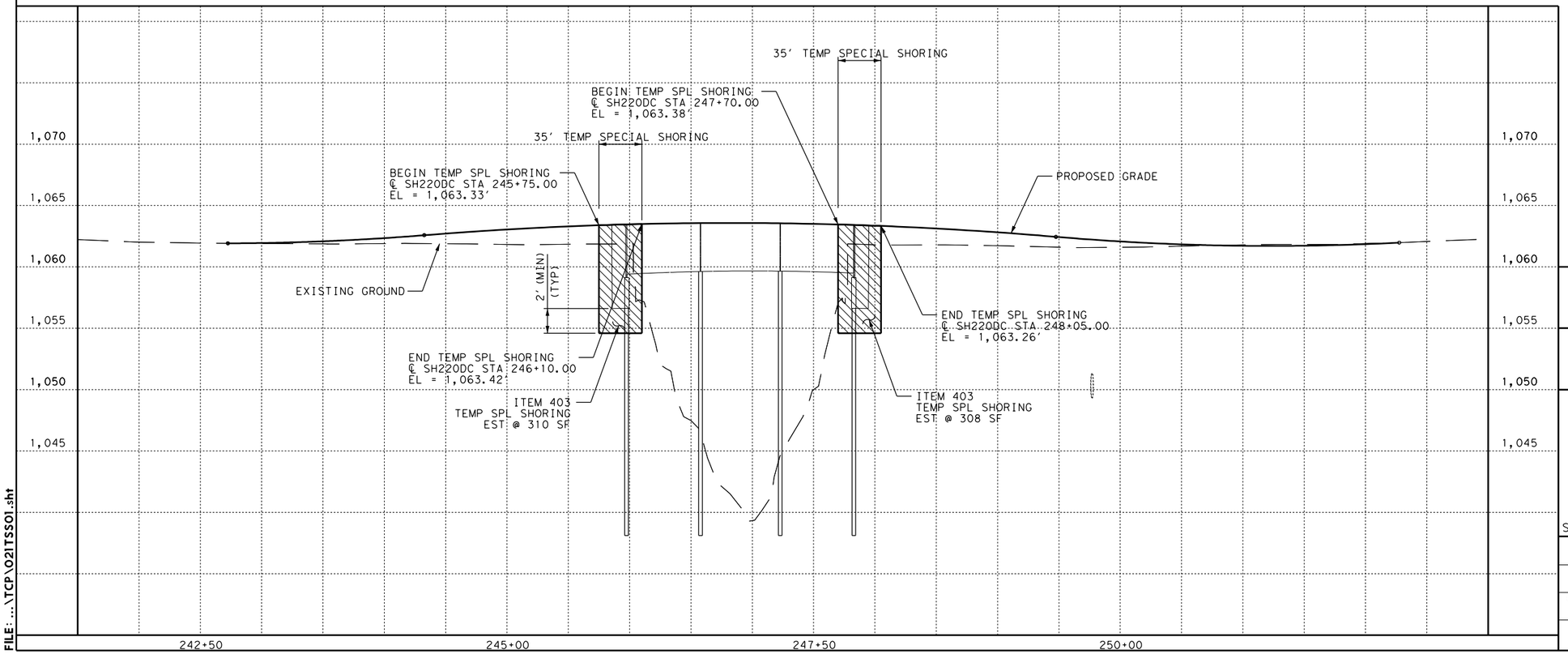
LEGEND

- TRAFFIC LANE
- PERMANENT CONSTRUCTION THIS PHASE
- TEMPORARY PAVEMENT THIS PHASE
- COMPLETED TEMPORARY PAVEMENT
- CHANNELIZING DEVICES
- CONCRETE BARRIER
- TEMPORARY SPECIAL SHORING (PLAN)
- TEMPORARY SPECIAL SHORING (PROFILE)

NOTES:

1. SEE TRAFFIC CONTROL PLANS AND STANDARDS FOR ADDITIONAL INFORMATION.
2. SEE BRIDGE LAYOUTS FOR DETAILED BRIDGE CONSTRUCTION PHASING.
3. UTILITIES NOT SHOWN FOR CLARITY. SEE EXISTING UTILITY LAYOUTS FOR UTILITY INFORMAITON.
4. TEMPORARY SPECIAL SHORING MEASUREMENT IS PROVIDED FOR CONTRACTOR INFORMATION ONLY. CONTRACTOR SHALL PROVIDE TEMPORARY SPECIAL SHORING DESIGN INCLUDING BOTTOM-OF-WALL ELEVATIONS, TO BE APPROVED BY THE ENGINEER.

DUFFAU CREEK



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7/9/2024
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Texas Department of Transportation

SH 220

TRAFFIC CONTROL
TEMPORARY SPECIAL SHORING LAYOUT
SH 220 AT DUFFAU CREEK

SCALE: 1"=100' (H), 1"=10' (V) SHEET 1 OF 1

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NUMBER		HIGHWAY NO.
MBT	6	(See Title Sheet)		SH 220
CHECK PKC	STATE	DISTRICT	COUNTY	SHEET NO.
GRAPHICS PKC	TEXAS	FTW	ERATH	37
CHECK JDB	CONTROL	SECTION	JOB	
	0467	02	020, ETC.	

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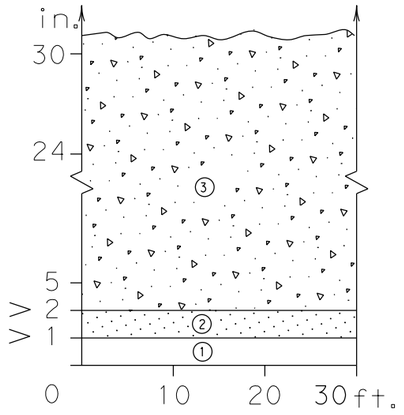
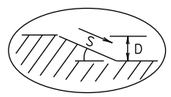
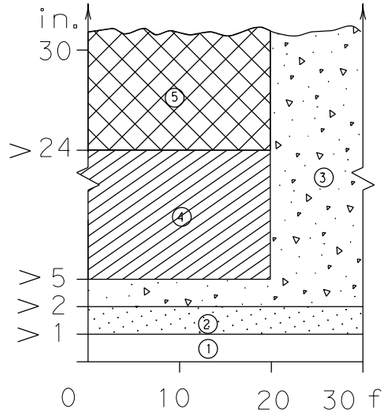
DEFINITION OF TREATMENT ZONES FOR VARIOUS EDGE CONDITIONS

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

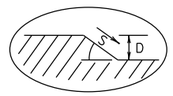


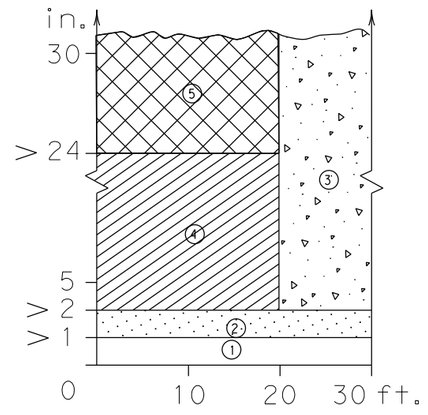
Edge Condition I
S = (3:1) (or flatter)



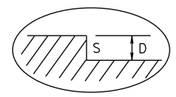


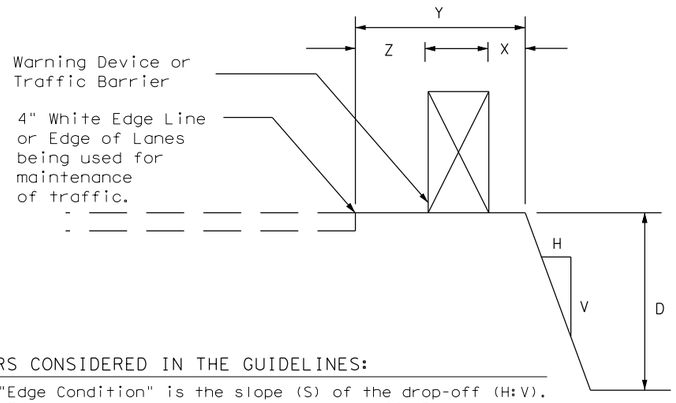
Edge Condition II
S = ((2.99):1) to (1:1)





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





FACTORS CONSIDERED IN THE GUIDELINES:

1. The "Edge Condition" is the slope (S) of the drop-off (H:V). The "Edge Height is the depth of the drop-off "D".

2. Distance "X" is to be the maximum practical under job conditions. Two feet minimum for high speed conditions. Distance "Y" is the lateral clearance from edge of travel lane to edge of dropoff. Distance "Z" does not have a minimum.

3. In addition to the factors considered in the guidelines, each construction zone drop-off situation should be analyzed individually, taking into account other variables, such as: traffic mix, posted speed in the construction zone, horizontal curvature, and the practicality of the treatment options.

4. The conditions for indicating the use of positive or protective barriers are given by Zone-5 and Figure-1. Traffic barriers are primarily applicable for high speed conditions. Urban areas with speeds of 30 mph or less may have a lesser need for signing, delineation, and barriers. Right-angled edges, however, with "D" greater than 2 inches and located within a lateral offset of 6 feet, may indicate a higher level of treatment.

5. If the distance "Y" must be less than 3 feet, the use of a positive barrier may not be feasible. In such a case, consider either: 1) narrowing the lanes to a desired 11 to 12 feet or 10 foot minimum (see CW20-8 sign), or 2) provide an edge slope such as Edge Condition I.

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:

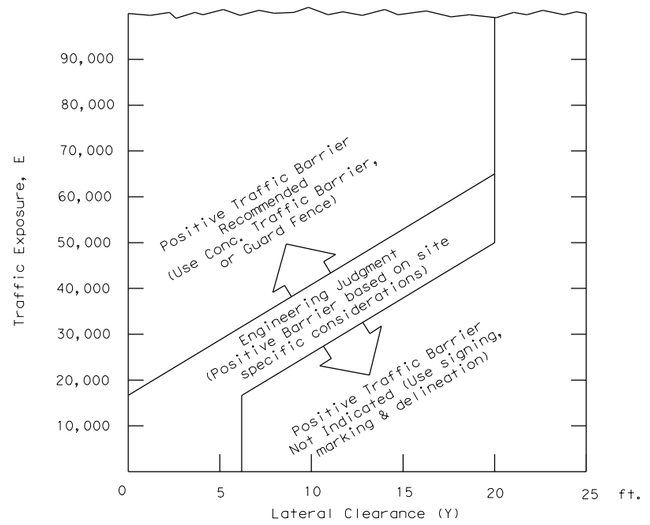
1. Edge Condition I: Most vehicles are able to traverse an edge condition with a slope rate of (3 to 1) or flatter. The slope must be constructed with a compacted material capable of supporting vehicles.

2. Edge Condition II: Most vehicles are able to traverse an edge condition with a slope between (2.99 to 1) and (1 to 1) so long as "D" does not exceed 5 inches. Under-carriage drag on most automobiles will occur when "D" exceeds 6 inches. As "D" exeeds 24 inches, the possibility for rollover is greater in most vehicles.

3. Edge Condition III: When slopes are greater than (1 to 1) and where "D" is greater than 2 inches, a more difficult control factor may exist for some vehicles, if not properly treated. For example, where "D" is greater than 2 inches and up to 24 inches different types of vehicles may experience different steering control at different edge heights. Automobiles might experience more steering control differential when "D" is greater than 2 inches and up to 5 inches. Trucks, 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.

4. Milling or overlay operations that result in Edge Condition III should not be in place without appropriate warning treatments, and these conditions should not be left in place for extended periods of time.

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



1. E = ADT x T
   Where ADT is that portion of the average daily traffic volume traveling within 20 feet (generally two adjacent lanes) of the edge dropoff condition; and, T is the duration time in years of the dropoff condition.

2. Figure-1 provides a practical approach to the use of positive barriers for the protection of vehicles from pavement drop-offs. Other factors, such as the presence of heavy machinery, construction workers, or the mix and volume of traffic may make the use of positive barriers appropriate, even when the edge condition alone may not justify the use of a barrier.

3. An approved end treatment should be provided for any positive barrier end located within the clear zone.

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

Engineer's Seal

Jacobs Engineering Group
STATE OF TEXAS
PAUL K. CLARK
99509
LICENSED
PROFESSIONAL ENGINEER
7/9/2024
F-2966

Date _____

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
REVISIONS	0467	02	020, ETC.	SH 220
03-01 08-01 9-21	DIST	COUNTY		SHEET NO.
	FTW	ERATH		38

DATE: 6/12/2024 1:13:45 PM
FILE: ...\TCP\02edgecon-21.dgn

BARRICADE AND CONSTRUCTION (BC) STANDARD SHEETS GENERAL NOTES:

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

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

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

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

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

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

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

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

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

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

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

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

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

WORKER SAFETY NOTES:

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

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

COMPLIANT WORKZONE TRAFFIC CONTROL DEVICES

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

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

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

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION GENERAL NOTES AND REQUIREMENTS

BC(1)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS 4-03 7-13	0467	90	020, ETC.	SH 220
9-07 8-14	DIST	COUNTY		SHEET NO.
5-10 5-21	FTW	ERATH		39

DATE: 3/21/2024 9:08:00 AM
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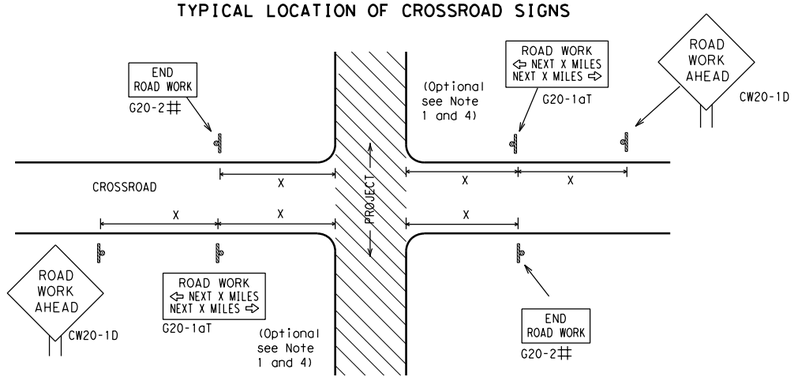
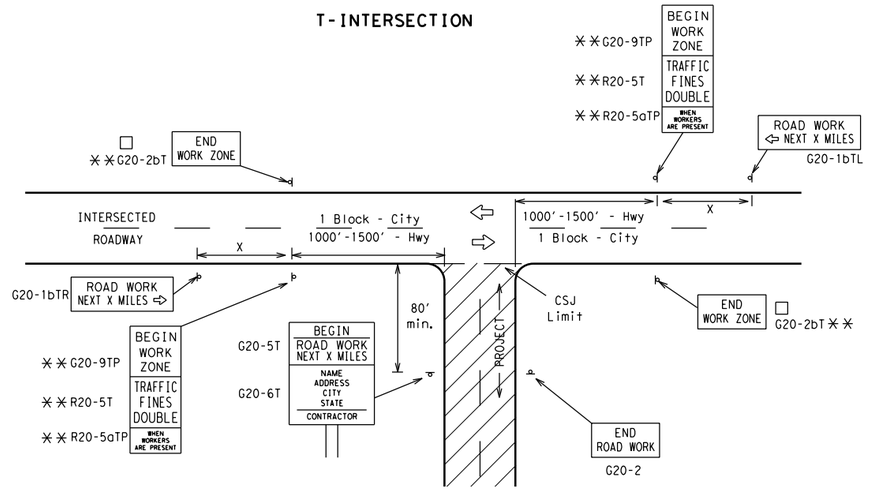
TYPICAL LOCATION OF CROSSROAD SIGNS



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

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

T-INTERSECTION



CSJ LIMITS AT T-INTERSECTION

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

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

SIZE

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

SPACING

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

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

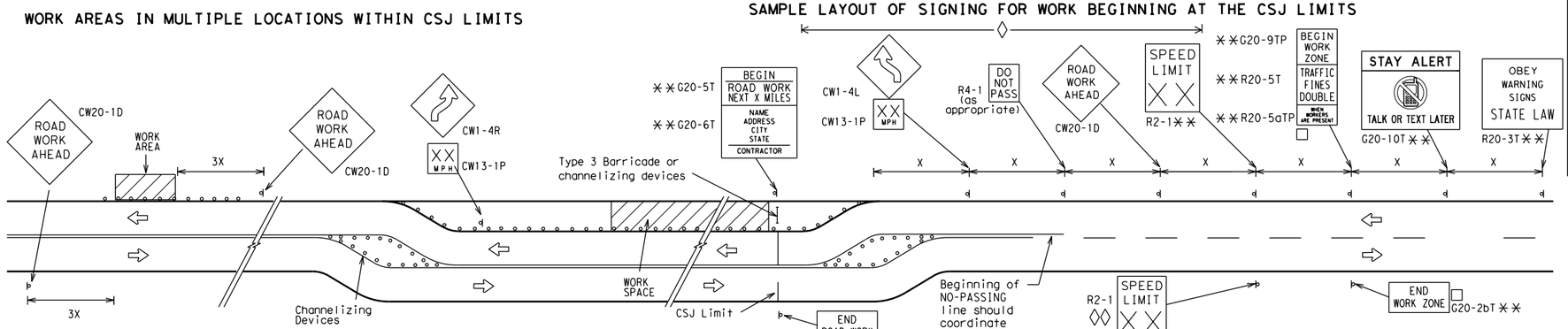
△ Minimum distance from work area to first Advance Warning sign nearest the work area and/or distance between each additional sign.

GENERAL NOTES

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

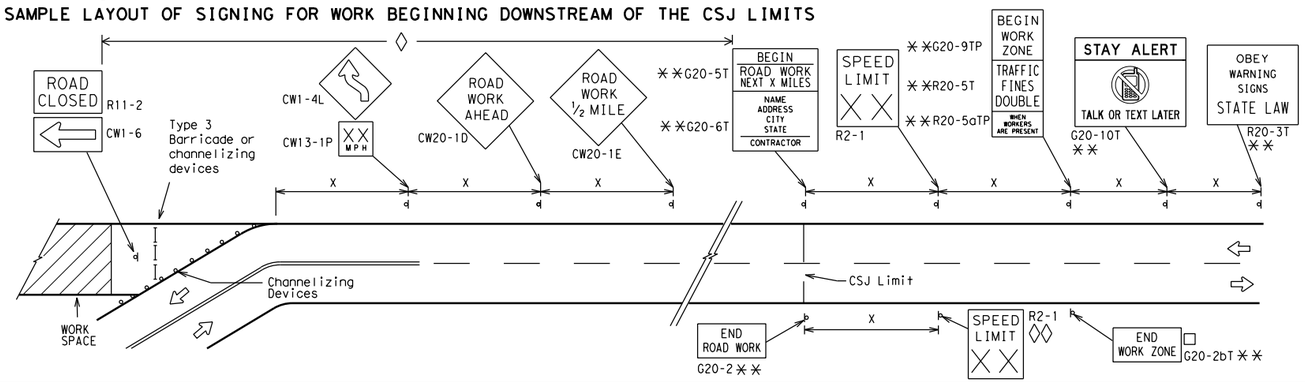
WORK AREAS IN MULTIPLE LOCATIONS WITHIN CSJ LIMITS

SAMPLE LAYOUT OF SIGNING FOR WORK BEGINNING AT THE 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



NOTES

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

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

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

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

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

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

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION PROJECT LIMIT

BC(2)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0467	90	020, ETC.	SH 220
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	FTW	ERATH		40

DATE: 3/21/2024 9:08:00 AM
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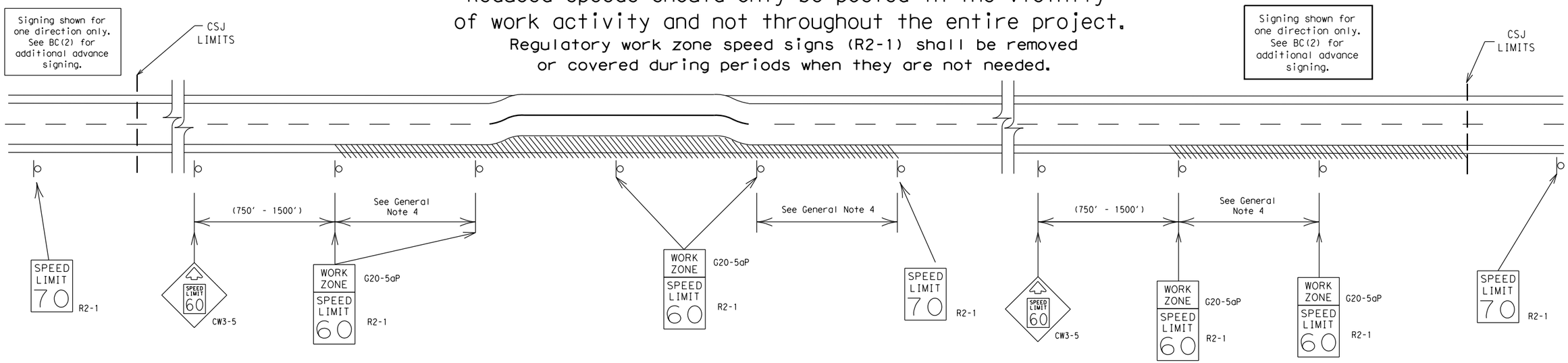
TYPICAL APPLICATION OF WORK ZONE SPEED LIMIT SIGNS

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

Reduced speeds should only be posted in the vicinity of work activity and not throughout the entire project.

Regulatory work zone speed signs (R2-1) shall be removed or covered during periods when they are not needed.



GUIDANCE FOR USE:

LONG/INTERMEDIATE TERM WORK ZONE SPEED LIMITS

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

Long/Intermediate Term Work Zone Speed Limit signs, when approved as described above, should be posted and visible to the motorist when work activity is present. Work activity may also be defined as a change in the roadway that requires a reduced speed for motorists to safely negotiate the work area, including:

a) rough road or damaged pavement surface
b) substantial alteration of roadway geometrics (diversions)
c) construction detours
d) grade
e) width
f) other conditions readily apparent to the driver

As long as any of these conditions exist, the work zone speed limit signs should remain in place.

SHORT TERM WORK ZONE SPEED LIMITS

This type of work zone speed limit may be included on the design of the traffic control plans when workers or equipment are not behind concrete barrier, when work activity is within 10 feet of the traveled way or actually in the traveled way.

Short Term Work Zone Speed Limit signs should be posted and visible to the motorists only when work activity is present. When work activity is not present, signs shall be removed or covered.
(See Removing or Covering on BC(4)).

GENERAL NOTES

1. Regulatory work zone speed limits should be used only for sections of construction projects where speed control is of major importance.
2. Regulatory work zone speed limit signs shall be placed on supports at a 7 foot minimum mounting height.
3. Speed zone signs are illustrated for one direction of travel and are normally posted for each direction of travel.
4. Frequency of work zone speed limit signs should be:
   40 mph and greater 0.2 to 2 miles
   35 mph and less 0.2 to 1 mile
5. Regulatory speed limit signs shall have black legend and border on a white reflective background (See "Reflective Sheeting" on BC(4)).
6. Fabrication, erection and maintenance of the"ADVANCE SPEED LIMIT"(CW3-5)sign, "WORK ZONE"(G20-5aP) plaque and the "SPEED LIMIT"(R2-1)signs shall not be paid for directly, but shall be considered subsidiary to Item 502.
7. Turning signs from view, laying signs over or down will not be allowed, unless as otherwise noted under "REMOVING OR COVERING" on BC(4).
8. Techniques that may help reduce traffic speeds include but are not limited to:
   A. Law enforcement.
   B. Flagger stationed next to sign.
   C. Portable changeable message sign (PCMS).
   D. Low-power (drone) radar transmitter.
   E. Speed monitor trailers or signs.
9. Speeds shown on details above are for illustration only. Work Zone Speed Limits should only be posted as approved for each project.
10. For more specific guidance concerning the type of work, work zone conditions and factors impacting allowable regulatory construction speed zone reduction see TxDOT form #1204 in the TxDOT e-form system.

Texas Department of Transportation | Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION WORK ZONE SPEED LIMIT

BC(3)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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REVISIONS 9-07 8-14 7-13 5-21	0467	90	020, ETC.	SH 220
	DIST	COUNTY		SHEET NO.
	FTW	ERATH		41

DATE: 3/21/2024 9:08:01 AM
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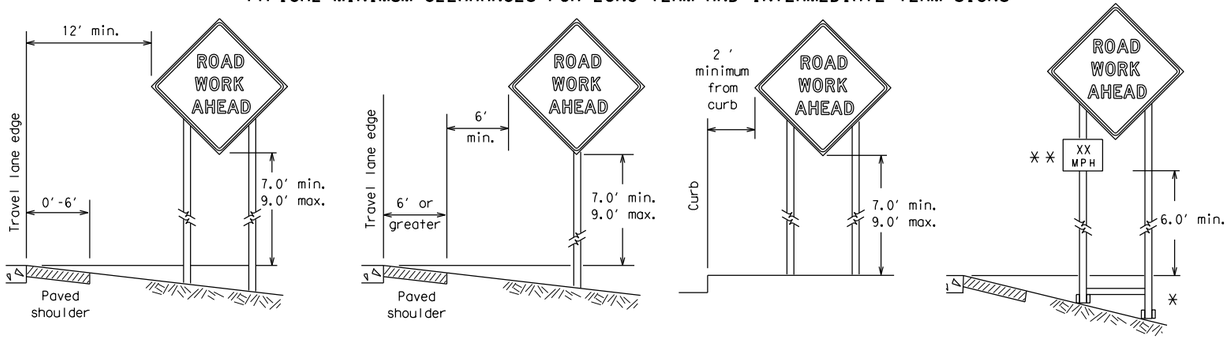
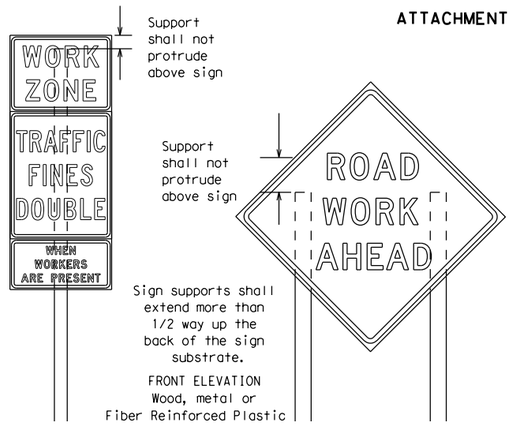
TYPICAL MINIMUM CLEARANCES FOR LONG TERM AND INTERMEDIATE TERM SIGNS

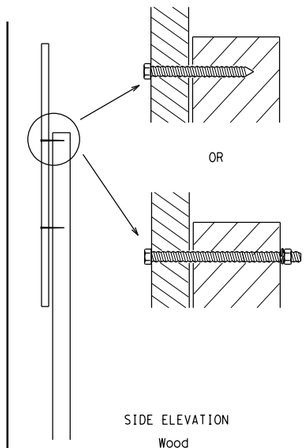


⁎ When placing skid supports on unlevel ground, the leg post lengths must be adjusted so the sign appears straight and plumb. Objects shall NOT be placed under skids as a means of leveling.

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

ATTACHMENT FOR SIGN SUPPORTS





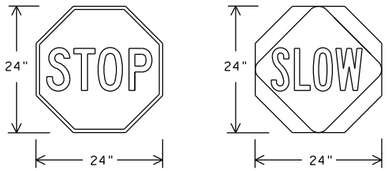
Attachment to wooden supports will be by bolts and nuts or screws. Use TxDOT's or manufacturer's recommended procedures for attaching sign substrates to other types of sign supports

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

Splicing embedded perforated square metal tubing in order to extend post height will only be allowed when the splice is made using four bolts, two above and two below the spice point. Splice must be located entirely behind the sign substrate, not near the base of the support. Splice insert lengths should be at least 5 times nominal post size, centered on the splice and of at least the same gauge material.

STOP/SLOW PADDLES

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



SHEETING REQUIREMENTS (WHEN USED AT NIGHT)		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	RED	TYPE B OR C SHEETING
BACKGROUND	ORANGE	TYPE B_{FL} OR C_{FL} SHEETING
LEGEND & BORDER	WHITE	TYPE B OR C SHEETING
LEGEND & BORDER	BLACK	ACRYLIC NON-REFLECTIVE FILM

CONTRACTOR REQUIREMENTS FOR MAINTAINING PERMANENT SIGNS WITHIN THE PROJECT LIMITS

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

GENERAL NOTES FOR WORK ZONE SIGNS

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

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

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

SIGN MOUNTING HEIGHT

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

SIZE OF SIGNS

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

SIGN SUBSTRATES

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

REFLECTIVE SHEETING

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

SIGN LETTERS

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

REMOVING OR COVERING

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

SIGN SUPPORT WEIGHTS

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

FLAGS ON SIGNS

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

Texas Department of Transportation | Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION TEMPORARY SIGN NOTES

BC(4)-21

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©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
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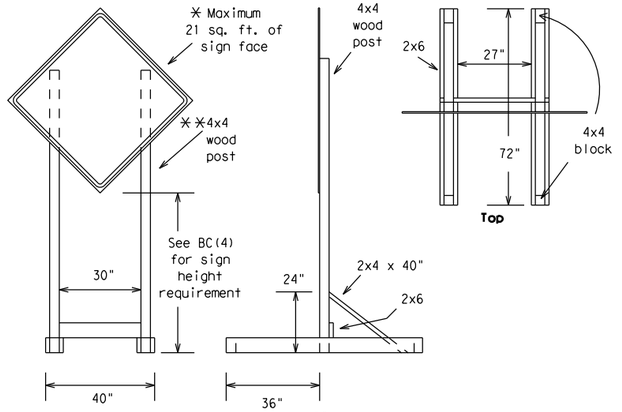
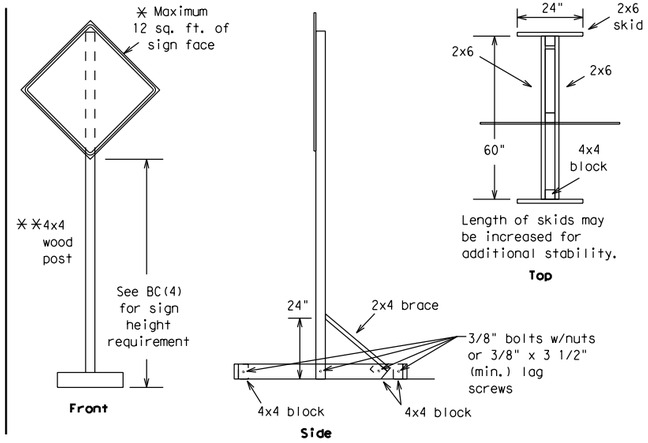
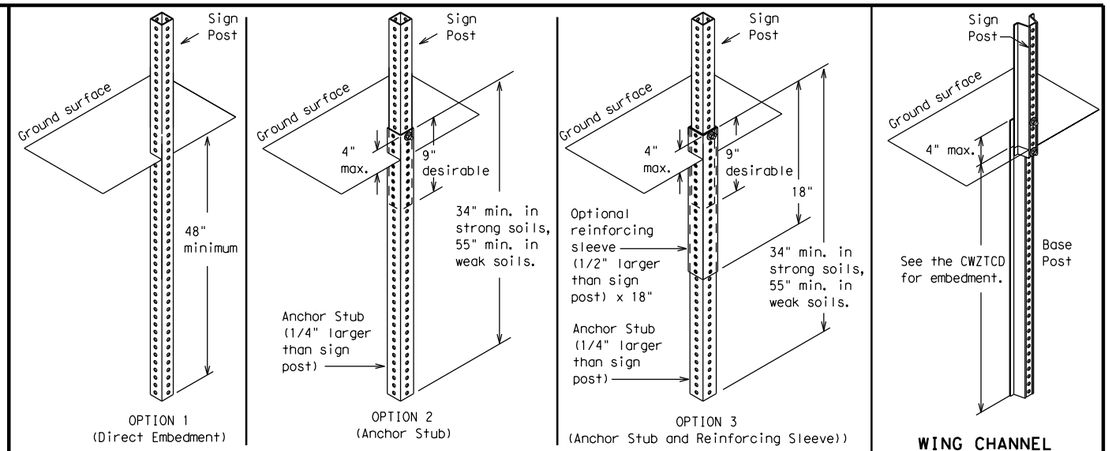




SKID MOUNTED WOOD SIGN SUPPORTS

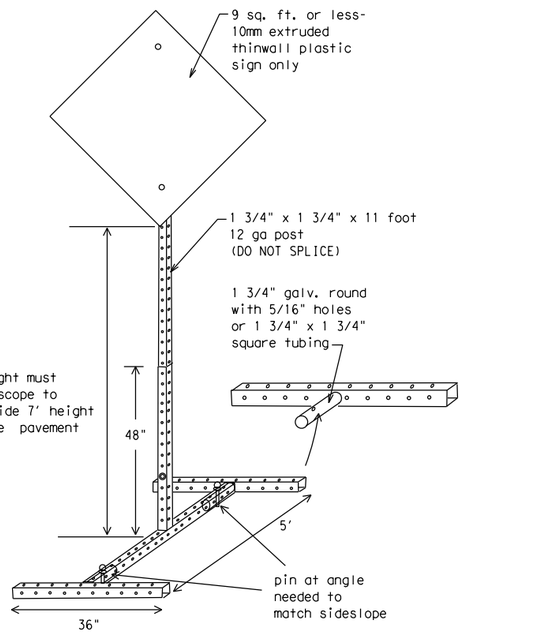
* LONG/INTERMEDIATE TERM STATIONARY - PORTABLE SKID MOUNTED SIGN SUPPORTS

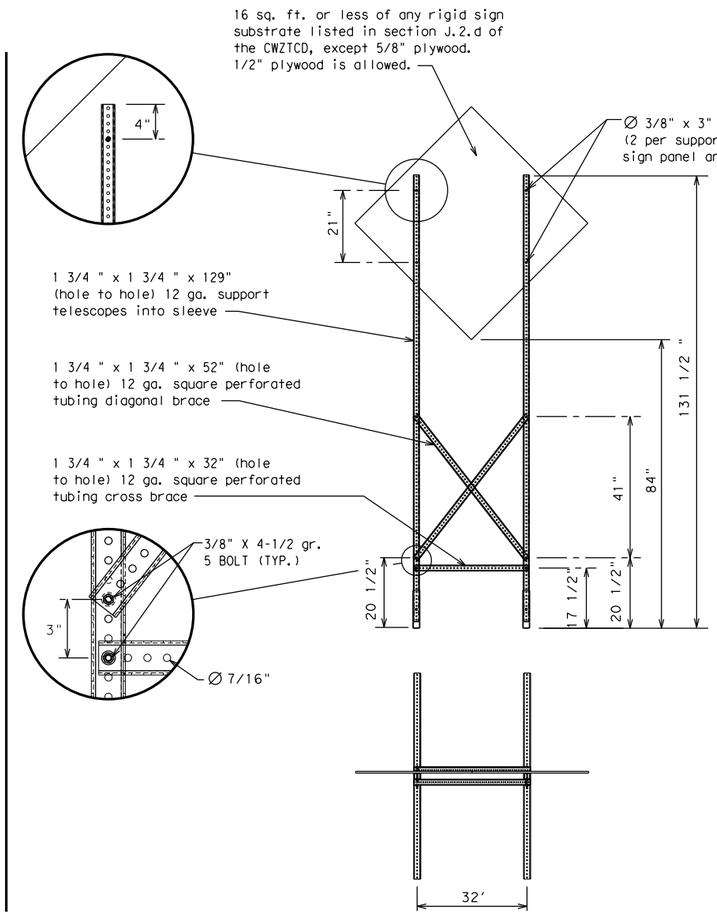


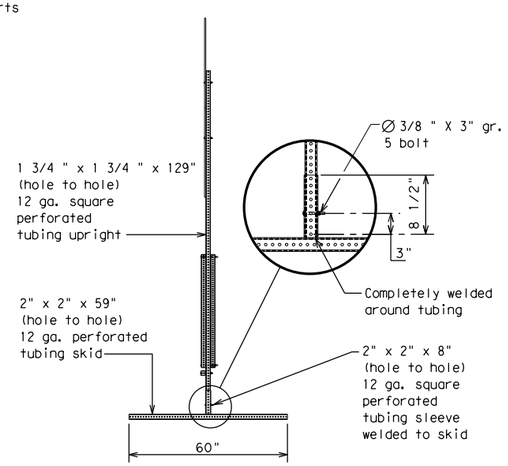
PERFORATED SQUARE METAL TUBING

GROUND MOUNTED SIGN SUPPORTS

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







SKID MOUNTED PERFORATED SQUARE STEEL TUBING SIGN SUPPORTS

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

WEDGE ANCHORS

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

OTHER DESIGNS

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

GENERAL NOTES

1. Nails may be used in the assembly of wooden sign supports, but 3/8" bolts with nuts or 3/8" x 3 1/2" lag screws must be used on every joint for final connection.
2. No more than 2 sign posts shall be placed within a 7 ft. circle, except for specific materials noted on the CWZTCD List.
3. When project is completed, all sign supports and foundations shall be removed from the project site. This will be considered subsidiary to Item 502.

* See BC(4) for definition of "Work Duration."

** Wood sign posts MUST be one piece. Splicing will NOT be allowed. Posts shall be painted white.

□ See the CWZTCD for the type of sign substrate that can be used for each approved sign support.

Texas Department of Transportation | Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION TYPICAL SIGN SUPPORT

BC(5)-21

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7-13 5-21	FTW	ERATH		43

DATE: 3/21/2024 9:08:01 AM
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WHEN NOT IN USE, REMOVE THE PCMS FROM THE RIGHT-OF-WAY OR PLACE THE PCMS BEHIND BARRIER OR GUARDRAIL WITH SIGN PANEL TURNED PARALLEL TO TRAFFIC

PORTABLE CHANGEABLE MESSAGE SIGNS

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

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

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

RECOMMENDED PHASES AND FORMATS FOR PCMS MESSAGES DURING ROADWORK ACTIVITIES

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

Phase 1: Condition Lists

Road/Lane/Ramp Closure List

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

Other Condition List

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

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

Phase 2: Possible Component Lists

Action to Take/Effect on Travel List

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

Location List

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

Warning List

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

** Advance Notice List

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

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

** See Application Guidelines Note 6.

APPLICATION GUIDELINES

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

WORDING ALTERNATIVES

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

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

FULL MATRIX PCMS SIGNS

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

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)

BC(6)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0467	90	020, ETC.	SH 220
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	FTW	ERATH		44

100

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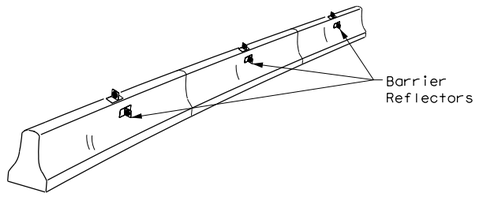
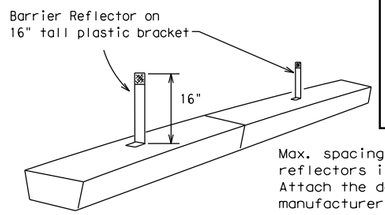
1. Barrier Reflectors shall be pre-qualified, and conform to the color and reflectivity requirements of DMS-8600. A list of prequalified Barrier Reflectors can be found at the Material Producer List web address shown on BC(1).
2. Color of Barrier Reflectors shall be as specified in the TMUTCD. The cost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



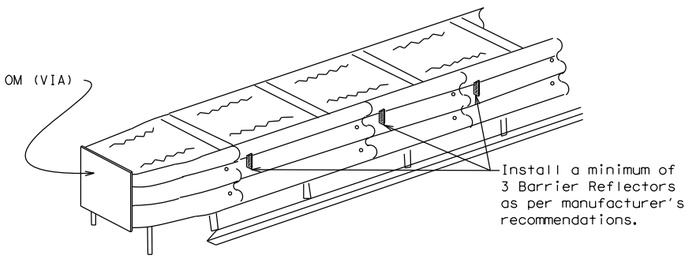
CONCRETE TRAFFIC BARRIER (CTB)

3. Where traffic is on one side of the CTB, two (2) Barrier Reflectors shall be mounted in approximately the midsection of each section of CTB. An alternate mounting location is uniformly spaced at one end of each CTB. This will allow for attachment of a barrier grapple without damaging the reflector. The Barrier Reflector mounted on the side of the CTB shall be located directly below the reflector mounted on top of the barrier, as shown in the detail above.
4. Where CTB separates two-way traffic, three barrier reflectors shall be mounted on each section of CTB. The reflector unit on top shall have two yellow reflective faces (Bi-Directional)while the reflectors on each side of the barrier shall have one yellow reflective face, as shown in the detail above.
5. When CTB separates traffic traveling in the same direction, no barrier reflectors will be required on top of the CTB.
6. Barrier Reflector units shall be yellow or white in color to match the edgeline being supplemented.
7. Maximum spacing of Barrier Reflectors is forty (40) feet.
8. Pavement markers or temporary flexible-reflective roadway marker tabs shall NOT be used as CTB delineation.
9. Attachment of Barrier Reflectors to CTB shall be per manufacturer's recommendations.
10. Missing or damaged Barrier Reflectors shall be replaced as directed by the Engineer.
11. Single slope barriers shall be delineated as shown on the above detail.



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

LOW PROFILE CONCRETE BARRIER (LPCB)



DELINEATION OF END TREATMENTS

LOW PROFILE CONCRETE BARRIER (LPCB) USED IN WORK ZONES

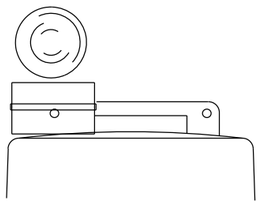
LPCB is approved for use in work zone locations, where the posted speed is 45mph, or less. See Roadway Standard Sheet LPCB.

END TREATMENTS FOR CTB'S USED IN WORK ZONES

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

BARRIER REFLECTORS FOR CONCRETE TRAFFIC BARRIER AND ATTENUATORS

WARNING LIGHTS

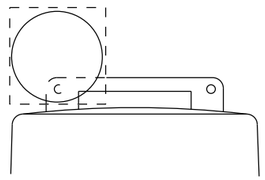


Type C Warning Light or approved substitute mounted on a drum adjacent to the travel way.

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

WARNING LIGHTS MOUNTED ON PLASTIC DRUMS

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



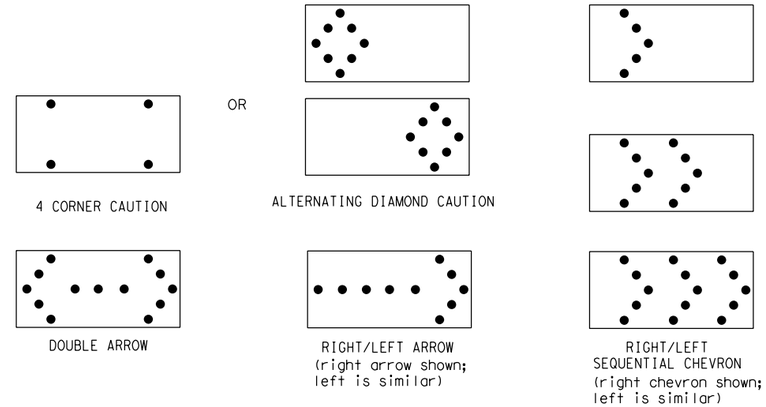
Warning reflector may be round or square. Must have a yellow reflective surface area of at least 30 square inches

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

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

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

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



4 CORNER CAUTION

ALTERNATING DIAMOND CAUTION

DOUBLE ARROW

RIGHT/LEFT ARROW (right arrow shown; left is similar)

RIGHT/LEFT SEQUENTIAL CHEVRON (right chevron shown; left is similar)

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

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

ATTENTION

Flashing Arrow Boards shall be equipped with automatic dimming devices.

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

FLASHING ARROW BOARDS

TRUCK-MOUNTED ATTENUATORS

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

SHEET 7 OF 12

Texas Department of Transportation — Traffic Safety Division Standard

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

BC(7)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0467	90	020, ETC.	SH 220
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	FTW	ERATH		45

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GENERAL NOTES

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

GENERAL DESIGN REQUIREMENTS

Pre-qualified plastic drums shall meet the following requirements:

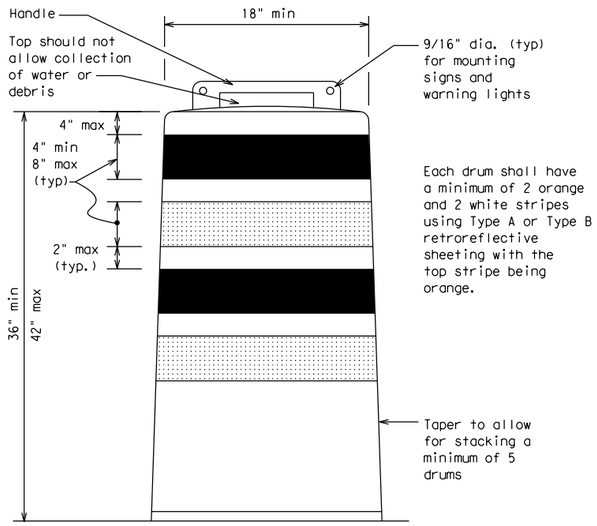
1. Plastic drums shall be a two-piece design; the "body" of the drum shall be the top portion and the "base" shall be the bottom.
2. The body and base shall lock together in such a manner that the body separates from the base when impacted by a vehicle traveling at a speed of 20 MPH or greater but prevents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

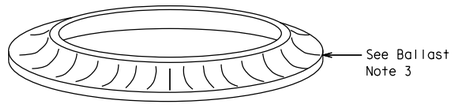
RETROREFLECTIVE SHEETING

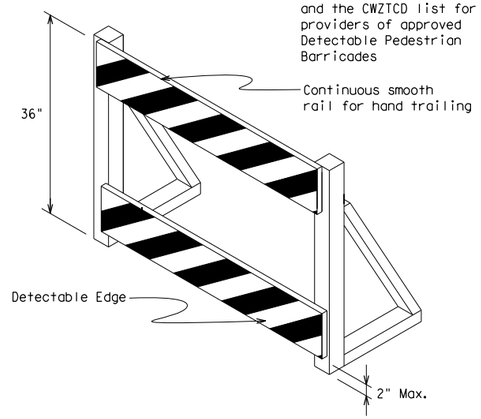
1. The stripes used on drums shall be constructed of sheeting meeting the color and retroreflectivity requirements of Departmental Materials Specification DMS-8300, "Sign Face Materials." Type A or Type B reflective sheeting shall be supplied unless otherwise specified in the plans.
2. The sheeting shall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

BALLAST

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

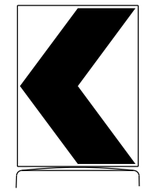




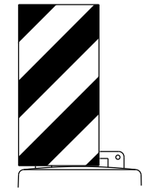


DETECTABLE PEDESTRIAN BARRICADES

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



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



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

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

SIGNS, CHEVRONS, AND VERTICAL PANELS MOUNTED ON PLASTIC DRUMS

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

Texas Department of Transportation | Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(8)-21

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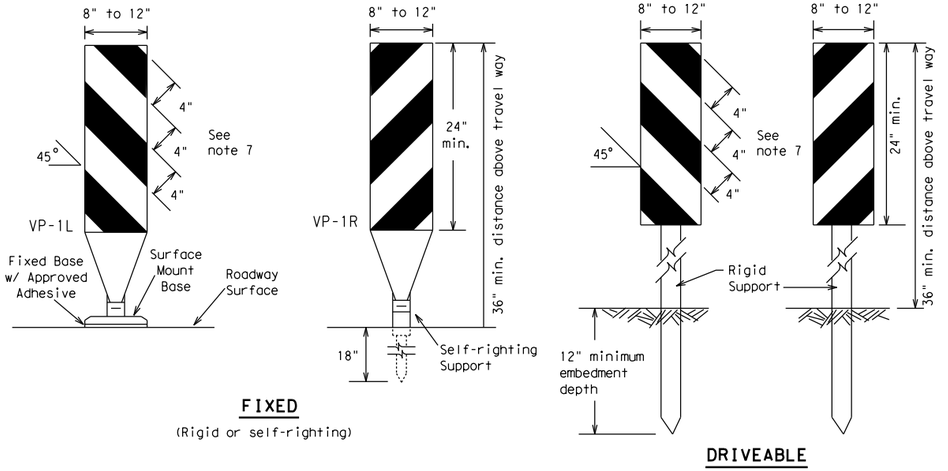
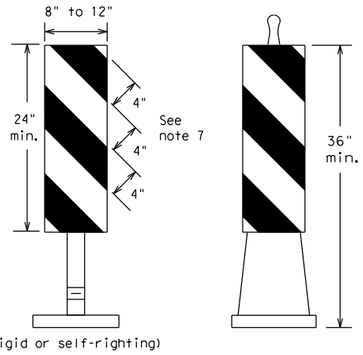


FIXED
(Rigid or self-righting)

DRIVEABLE

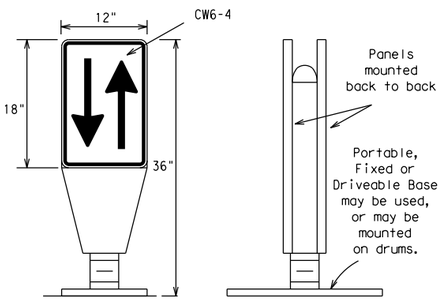


(Rigid or self-righting)

PORTABLE

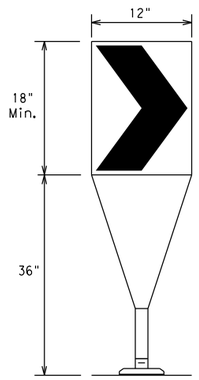
VERTICAL PANELS (VPs)

1. Vertical Panels (VP's) are normally used to channelize traffic or divide opposing lanes of traffic.
2. VP's may be used in daytime or nighttime situations. They may be used at the edge of shoulder drop-offs and other areas such as lane transitions where positive daytime and nighttime delineation is required. The Engineer/Inspector shall refer to the Roadway Design Manual for additional requirements on the use VP's for drop-offs.
3. VP's should be mounted back to back if used at the edge of cuts adjacent to two-way two lane roadways. Stripes are to be reflective orange and reflective white and should always slope downward toward the travel lane.
4. VP's used on expressways and freeways or other high speed roadways, may have more than 270 square inches of retroreflective area facing traffic.
5. Self-righting supports are available with portable base. See "Compliant Work Zone Traffic Control Devices List" (CWZTCD).
6. Sheeting for the VP's shall be retroreflective Type A or Type B conforming to Departmental Material Specification DMS-8300, unless noted otherwise.
7. Where the height of reflective material on the vertical panel is 36 inches or greater, a panel stripe of 6 inches shall be used.



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

OPPOSING TRAFFIC LANE DIVIDERS (OTLD)



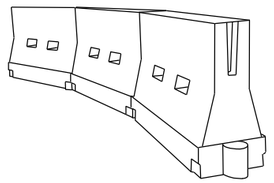
Fixed Base w/ Approved Adhesive (Driveable Base, or Flexible Support can be used)

1. The chevron shall be a vertical rectangle with a minimum size of 12 by 18 inches.
2. Chevrons are intended to give notice of a sharp change of alignment with the direction of travel and provide additional emphasis and guidance for vehicle operators with regard to changes in horizontal alignment of the roadway.
3. Chevrons, when used, shall be erected on the outside of a sharp curve or turn, or on the far side of an intersection. They shall be in line with and at right angles to approaching traffic. Spacing should be such that the motorist always has three in view, until the change in alignment eliminates its need.
4. To be effective, the chevron should be visible for at least 500 feet.
5. Chevrons shall be orange with a black nonreflective legend. Sheeting for the chevron shall be retroreflective Type B_{FL} or Type C_{FL} conforming to Departmental Material Specification DMS-8300, unless noted otherwise. The legend shall meet the requirements of DMS-8300.
6. For Long Term Stationary use on tapers or transitions on freeways and divided highways, self-righting chevrons may be used to supplement plastic drums but not to replace plastic drums.

CHEVRONS

GENERAL NOTES

1. Work Zone channelizing devices illustrated on this sheet may be installed in close proximity to traffic and are suitable for use on high or low speed roadways. The Engineer/Inspector shall ensure that spacing and placement is uniform and in accordance with the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD).
2. Channelizing devices shown on this sheet may have a driveable, fixed or portable base. The requirement for self-righting channelizing devices must be specified in the General Notes or other plan sheets.
3. Channelizing devices on self-righting supports should be used in work zone areas where channelizing devices are frequently impacted by errant vehicles or vehicle related wind gusts making alignment of the channelizing devices difficult to maintain. Locations of these devices shall be detailed elsewhere in the plans. These devices shall conform to the TMUTCD and the "Compliant Work Zone Traffic Control Devices List" (CWZTCD).
4. The Contractor shall maintain devices in a clean condition and replace damaged, nonreflective, faded, or broken devices and bases as required by the Engineer/Inspector. The Contractor shall be required to maintain proper device spacing and alignment.
5. Portable bases shall be fabricated from virgin and/or recycled rubber. The portable bases shall weigh a minimum of 30 lbs.
6. Pavement surfaces shall be prepared in a manner that ensures proper bonding between the adhesives, the fixed mount bases and the pavement surface. Adhesives shall be prepared and applied according to the manufacturer's recommendations.
7. The installation and removal of channelizing devices shall not cause detrimental effects to the final pavement surfaces, including pavement surface discoloration or surface integrity. Driveable bases shall not be permitted on final pavement surfaces. The Engineer/Inspector shall approve all application and removal procedures of fixed bases.



LONGITUDINAL CHANNELIZING DEVICES (LCD)

1. LCDs are crashworthy, lightweight, deformable devices that are highly visible, have good target value and can be connected together. They are not designed to contain or redirect a vehicle on impact.
2. LCDs may be used instead of a line of cones or drums.
3. LCDs shall be placed in accordance to application and installation requirements specific to the device, and used only when shown on the CWZTCD list.
4. LCDs should not be used to provide positive protection for obstacles, pedestrians or workers.
5. LCDs shall be supplemented with retroreflective delineation as required for temporary barriers on BC(7) when placed roughly parallel to the travel lanes.
6. LCDs used as barricades placed perpendicular to traffic should have at least one row of reflective sheeting meeting the requirements for barricade rails as shown on BC(10). Place reflective sheeting near the top of the LCD along the full length of the device.

WATER BALLASTED SYSTEMS USED AS BARRIERS

1. Water ballasted systems used as barriers shall not be used solely to channelize road users, but also to protect the work space per the appropriate Manual for Assessing Safety Hardware (MASH) crashworthiness requirements based on roadway speed and barrier application.
2. Water ballasted systems used to channelize vehicular traffic shall be supplemented with retroreflective delineation or channelizing devices to improve daytime/nighttime visibility. They may also be supplemented with pavement markings.
3. Water ballasted systems used as barriers shall be placed in accordance to application and installation requirements specific to the device, and used only when shown on the CWZTCD list.
4. Water ballasted systems used as barriers should not be used for a merging taper except in low speed (less than 45 MPH) urban areas. When used on a taper in a low speed urban area, the taper shall be delineated and the taper length should be designed to optimize road user operations considering the available geometric conditions.
5. When water ballasted systems used as barriers have blunt ends exposed to traffic, they should be attenuated as per manufacturer recommendations or flared to a point outside the clear zone.

If used to channelize pedestrians, longitudinal channelizing devices or water ballasted systems must have a continuous detectable bottom for users of long canes and the top of the unit shall not be less than 32 inches in height.

HOLLOW OR WATER BALLASTED SYSTEMS USED AS LONGITUDINAL CHANNELIZING DEVICES OR BARRIERS

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

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

SUGGESTED MAXIMUM SPACING OF CHANNELIZING DEVICES AND MINIMUM DESIRABLE TAPER LENGTHS

Texas Department of Transportation | Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(9)-21

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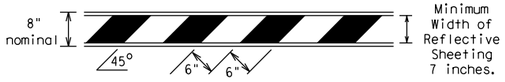
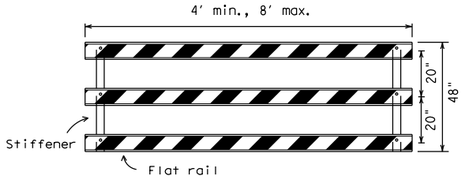
TYPE 3 BARRICADES

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

Barricades shall NOT be used as a sign support.



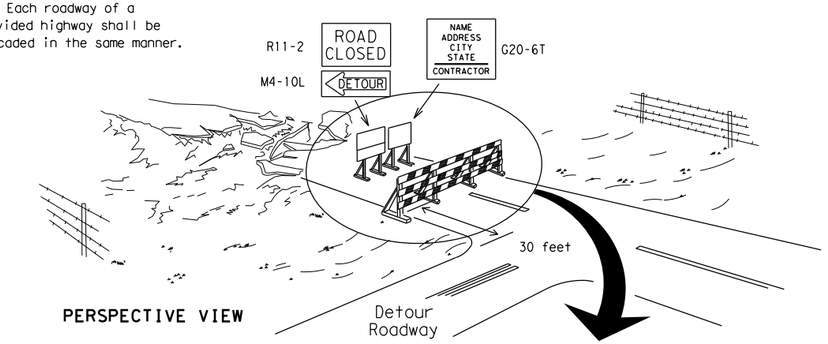
TYPICAL STRIPING DETAIL FOR BARRICADE RAIL



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

TYPICAL PANEL DETAIL FOR SKID OR POST TYPE BARRICADES

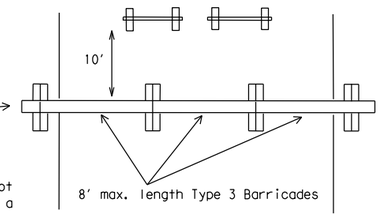
Each roadway of a divided highway shall be barricaded in the same manner.



PERSPECTIVE VIEW

The three rails on Type 3 barricades shall be reflectorized orange and reflective white stripes on one side facing one-way traffic and both sides for two-way traffic.

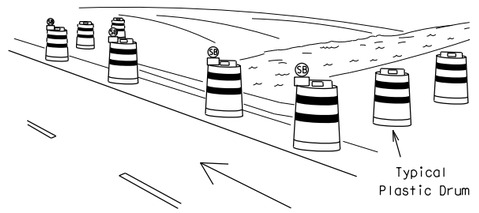
Barricade striping should slant downward in the direction of detour.



PLAN VIEW

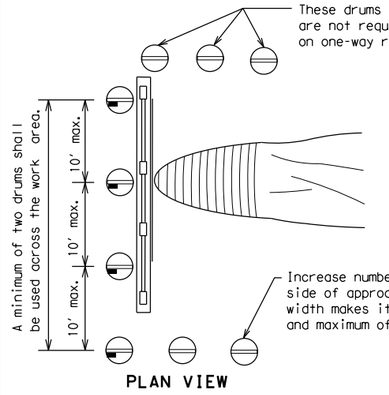
1. Signs should be mounted on independent supports at a 7 foot mounting height in center of roadway. The signs should be a minimum of 10 feet behind Type 3 Barricades.
2. Advance signing shall be as specified elsewhere in the plans.

TYPE 3 BARRICADE (POST AND SKID) TYPICAL APPLICATION



PERSPECTIVE VIEW

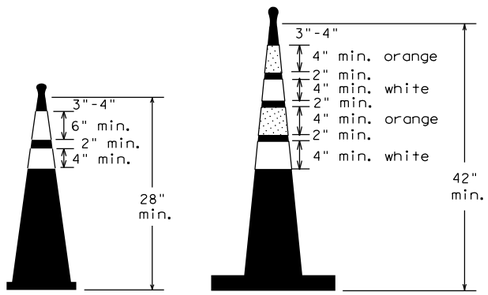
1. Where positive redirectional capability is provided, drums may be omitted.
2. Plastic construction fencing may be used with drums for safety as required in the plans.
3. Vertical Panels on flexible support may be substituted for drums when the shoulder width is less than 4 feet.
4. When the shoulder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



PLAN VIEW

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

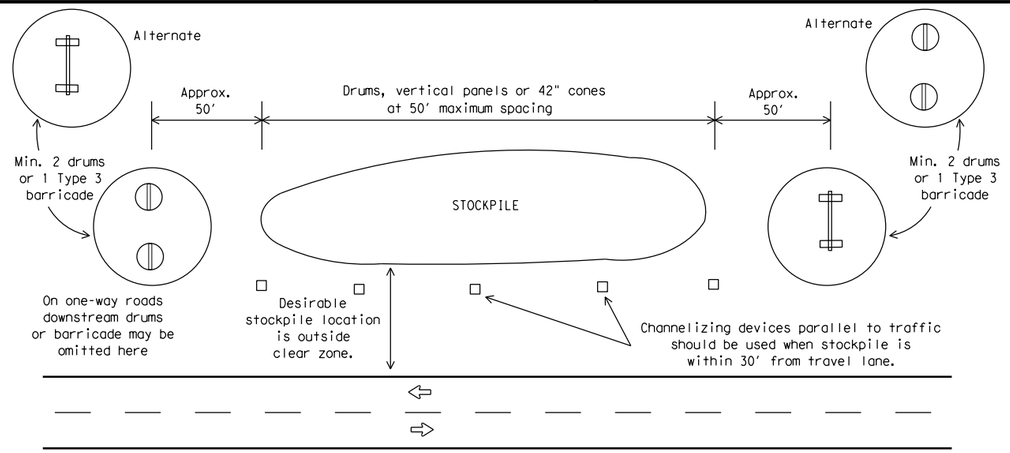
CULVERT WIDENING OR OTHER ISOLATED WORK WITHIN THE PROJECT LIMITS



28" Cones shall have a minimum weight of 9 1/2 lbs.

42" 2-piece cones shall have a minimum weight of 30 lbs. including base.

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



TRAFFIC CONTROL FOR MATERIAL STOCKPILES

SHEET 10 OF 12

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(10)-21

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WORK ZONE PAVEMENT MARKINGS

GENERAL

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

RAISED PAVEMENT MARKERS

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

PREFABRICATED PAVEMENT MARKINGS

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

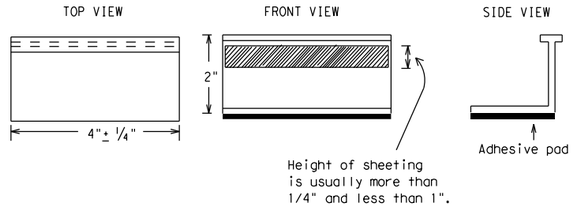
MAINTAINING WORK ZONE PAVEMENT MARKINGS

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

REMOVAL OF PAVEMENT MARKINGS

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

Temporary Flexible-Reflective Roadway Marker Tabs



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

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

RAISED PAVEMENT MARKERS USED AS GUIDEMARKS

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

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

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

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

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BARRICADE AND CONSTRUCTION PAVEMENT MARKINGS

BC(11)-21

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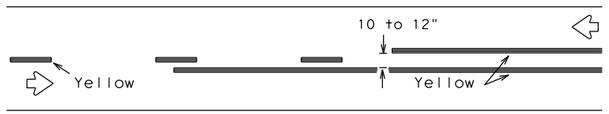
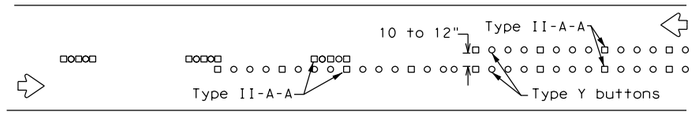
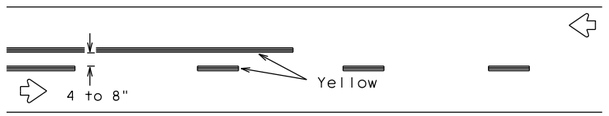
PAVEMENT MARKING PATTERNS



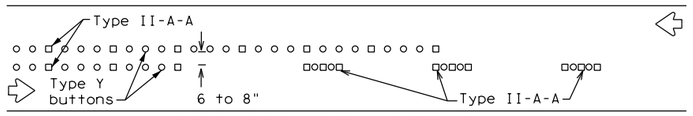
REFLECTORIZED PAVEMENT MARKINGS - PATTERN A



RAISED PAVEMENT MARKERS - PATTERN A



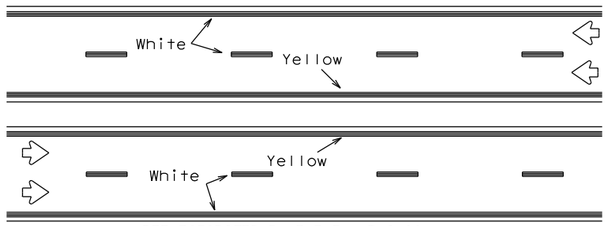
REFLECTORIZED PAVEMENT MARKINGS - PATTERN B



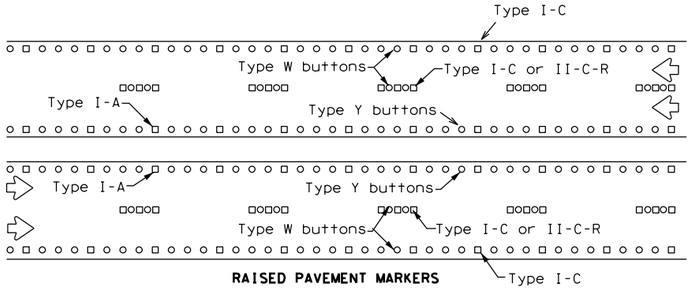
RAISED PAVEMENT MARKERS - PATTERN B

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

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



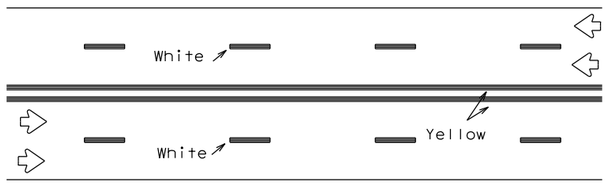
REFLECTORIZED PAVEMENT MARKINGS



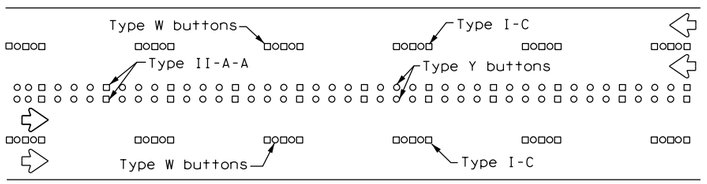
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

EDGE & LANE LINES FOR DIVIDED HIGHWAY



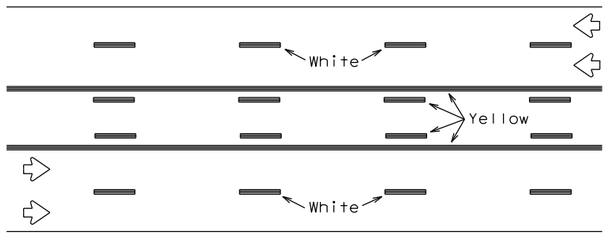
REFLECTORIZED PAVEMENT MARKINGS



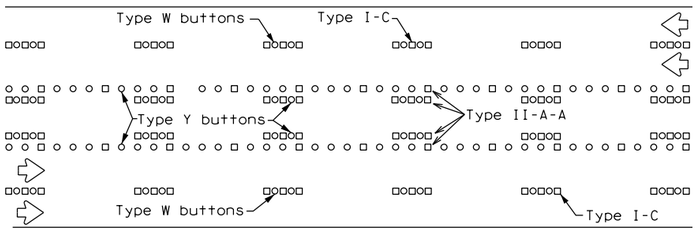
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS



REFLECTORIZED PAVEMENT MARKINGS



RAISED PAVEMENT MARKERS

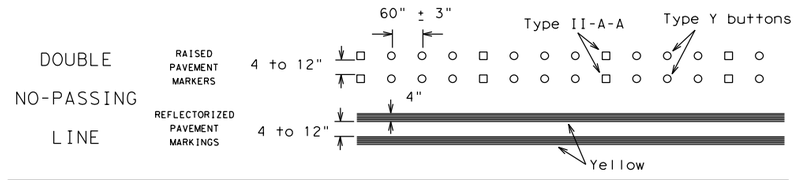
Prefabricated markings may be substituted for reflectorized pavement markings.

TWO-WAY LEFT TURN LANE

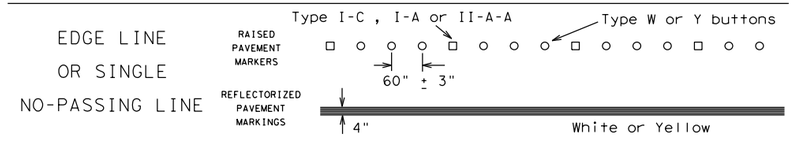
STANDARD WORK ZONE PAVEMENT MARKINGS DETAILS

SOLID LINES

DOUBLE NO-PASSING LINE

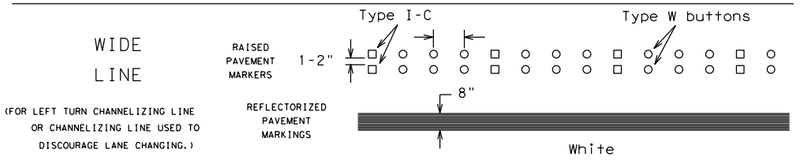


EDGE LINE OR SINGLE NO-PASSING LINE



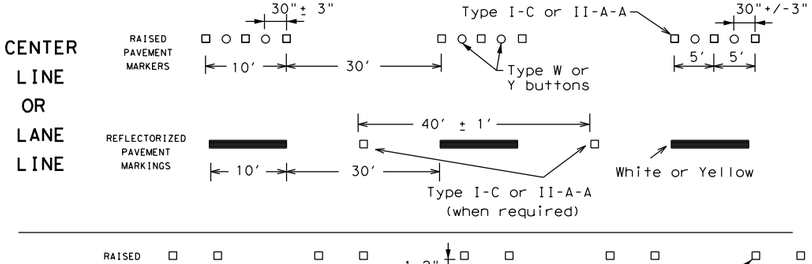
WIDE LINE

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

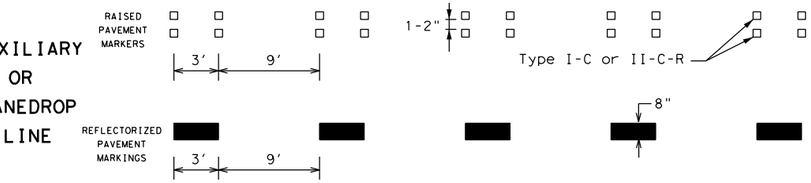


BROKEN LINES

CENTER LINE OR LANE LINE

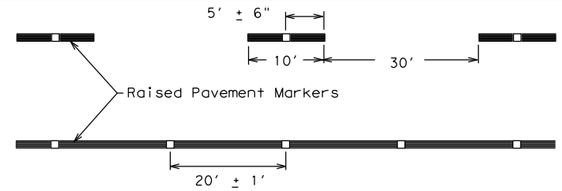


AUXILIARY OR LANEDROP LINE



REMOVABLE MARKINGS WITH RAISED PAVEMENT MARKERS

If raised pavement markers are used to supplement REMOVABLE markings, the markers shall be applied to the top of the tape at the approximate mid length of tape used for broken lines or at 20 foot spacing for solid lines. This allows an easier removal of raised pavement markers and tape.



Centerline only - not to be used on edge lines

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

Texas Department of Transportation

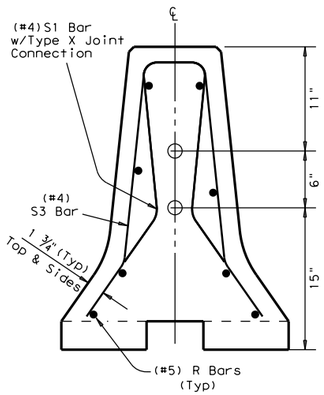
Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION PAVEMENT MARKING PATTERNS

BC(12)-21

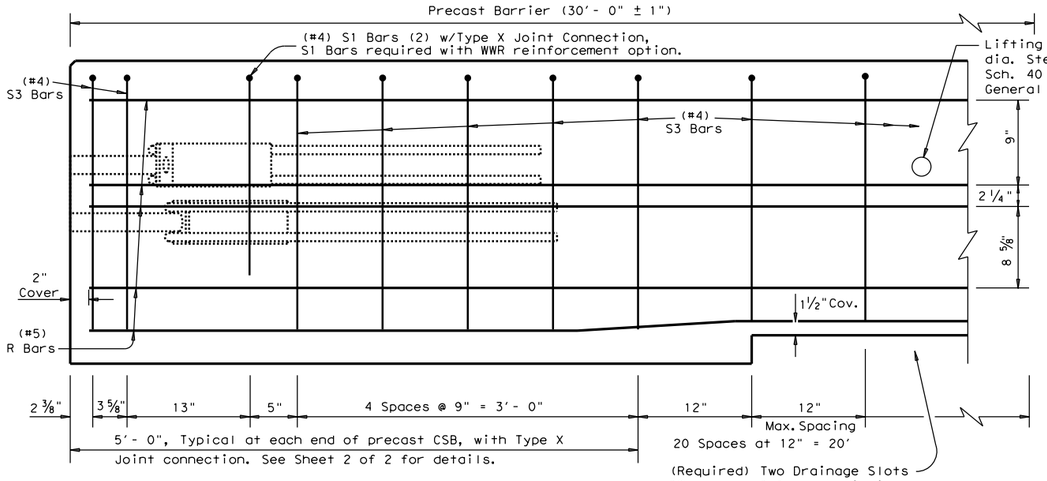
FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 1998	CONT	SECT	JOB	HIGHWAY
REVISIONS 1-97 9-07 5-21	0467	90	020, ETC.	SH 220
2-98 7-13	DIST	COUNTY		SHEET NO.
11-02 8-14	FTW	ERATH		50

106



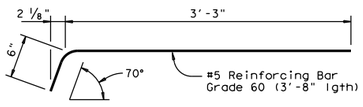
End View Precast Barrier

See sheet 2 of 3 for Joint connection Type X



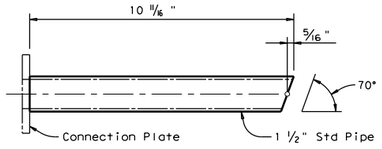
Reinforcement for Precast (CSB) Concrete Safety Barrier (Type 1)

Showing reinforcement for Joint Type X



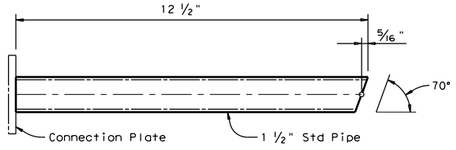
DEFORMED BAR ANCHOR DETAILS

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



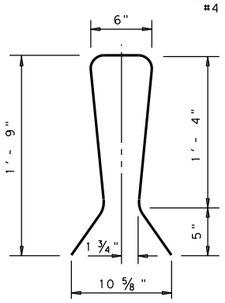
UPPER CONNECTION PIPE DETAILS

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



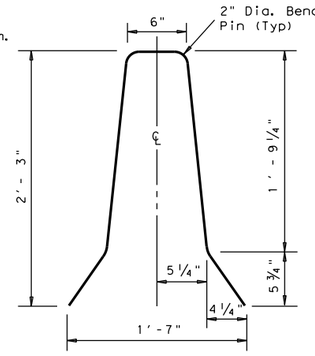
LOWER CONNECTION PIPE DETAILS

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



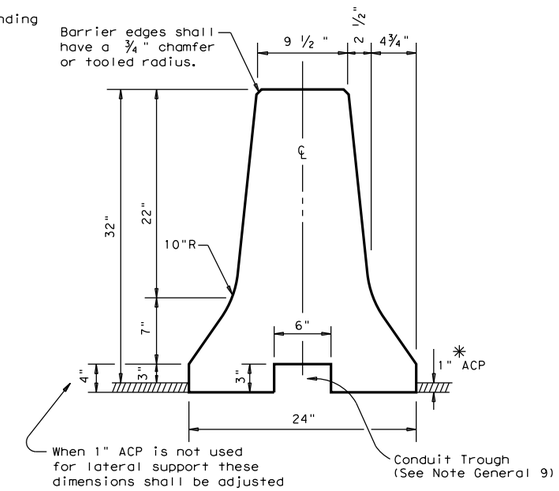
S1 Bar

#4 Bar (2)
(Joint Type X)



S3 Bar

#4 Bar

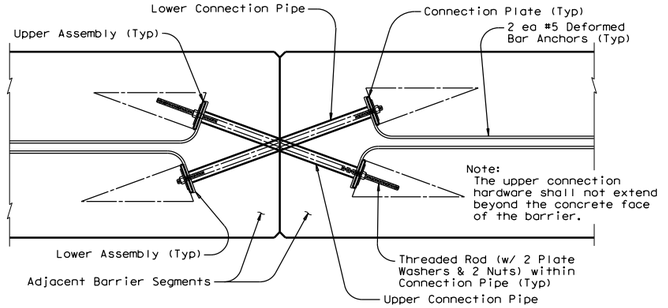


Concrete Safety Barrier

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

GENERAL NOTES

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



TYPE X JOINT INSTALLATION DETAIL

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

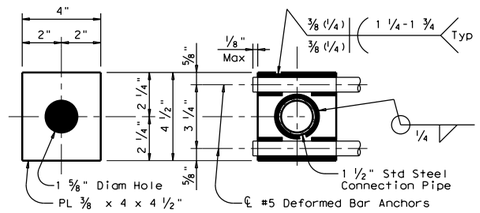
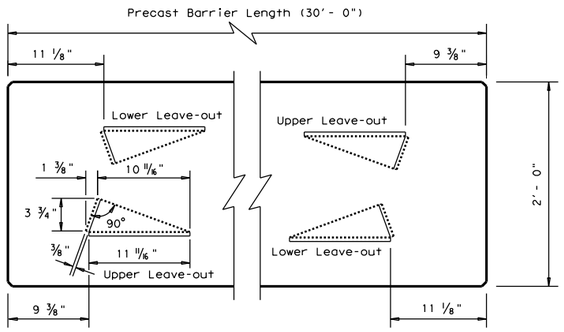


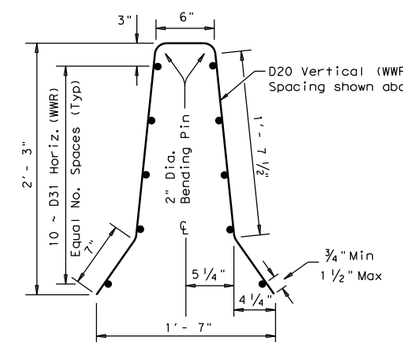
PLATE DIMENSIONS WELDING DETAILS

CONNECTION PLATE DETAILS

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



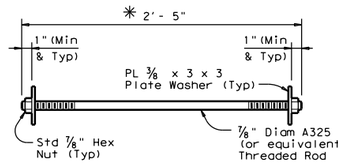
BARRIER PLAN AT END JOINTS



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

(WWR) General Notes

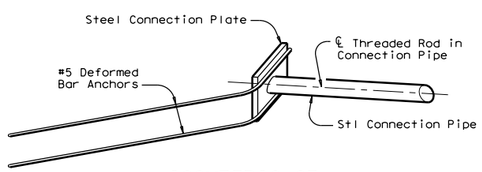
1. Deformed Welded Wire Reinforcement (WWR) shall conform to ASTM A497.
2. Welded wire cage may be cut or bent to accommodate the Type X joint connection and drainage slots, as directed by the Engineer.
3. All reinforcement shall comply with Item 440, "Reinforcing Steel."
4. Combinations of reinforcing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



CONNECTION BOLT OR THREADED ROD DETAIL

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

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



ISOMETRIC OF TYPICAL WELDED ASSEMBLY

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

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

SHEET 1 OF 2

Texas Department of Transportation | Design Division Standard

CONCRETE SAFETY BARRIER (F-SHAPE)

PRECAST BARRIER (TYPE 1)

CSB(1)-10

FILE: csb110.dgn	DN: TxDOT	CK: AM	DW: BD	CK: VP
©TxDOT December 2010	CONT	SECT	JOB	HIGHWAY
REVISIONS	0467	02	020, ETC.	SH 220
	DIST	COUNTY		SHEET NO.
	FTW	ERATH		51

DATE: 3/21/2024 9:08:14 AM
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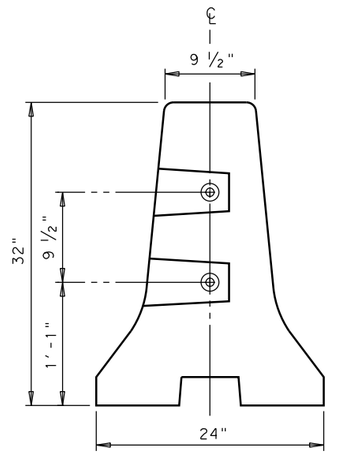
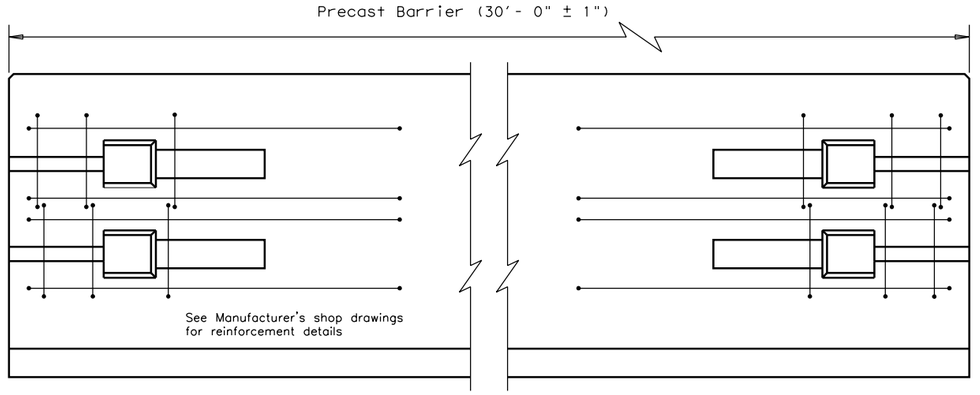


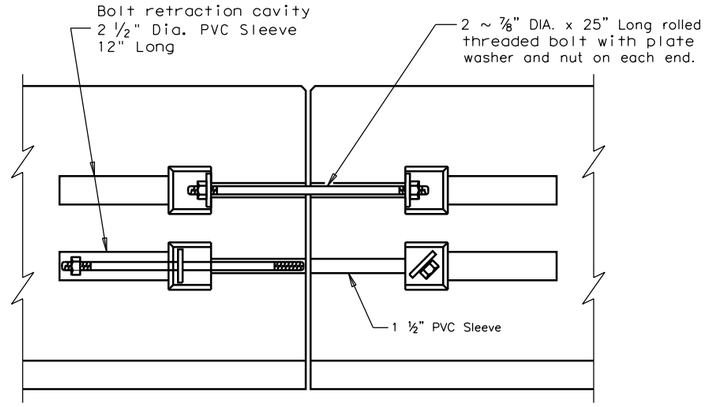
END VIEW (CSB) QUICK-BOLT

QUICK-BOLT POCKET LOCATIONS



ELEVATION (CSB) QUICK-BOLT

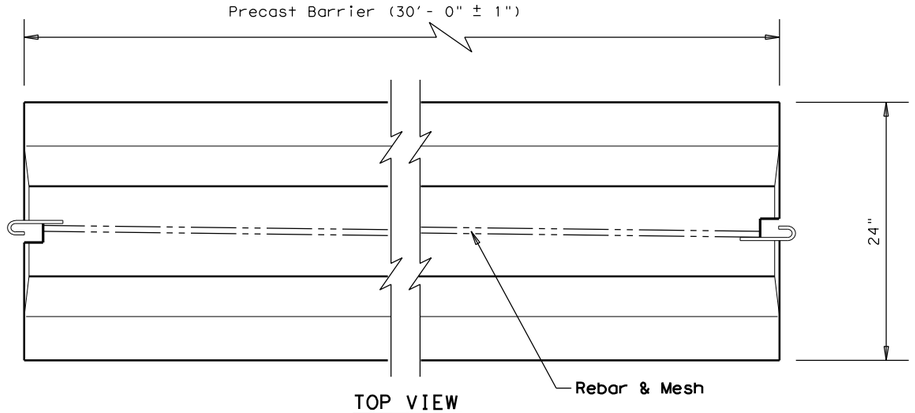
See Manufacturer's shop drawing for additional details



ELEVATION VIEW SHOWING JOINT CONNECTION

"QUICK-BOLT"

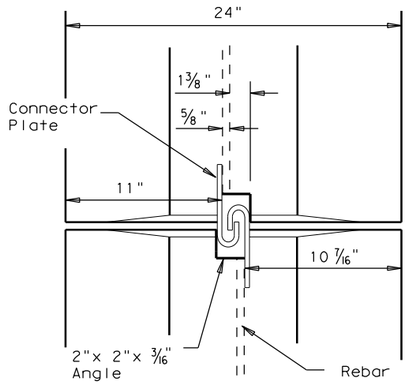
Joint Connection (Type Q)



TOP VIEW

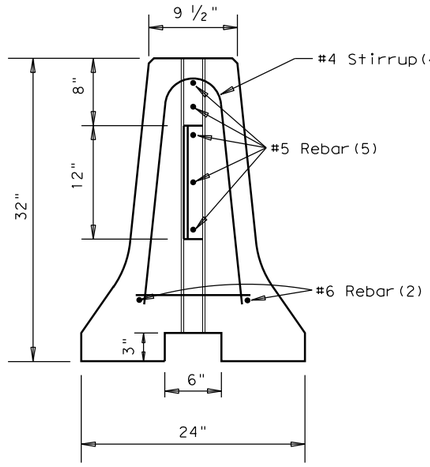
PRECAST (CSB) WITH J-J HOOKS

See Manufacturer's shop drawing for additional details



VIEW FROM ABOVE

J-J HOOK CONNECTION



END VIEW

J-J HOOK CONNECTION

Joint Connection (Type J)

Proprietary Joint Connections (CSB)

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

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

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

Texas Department of Transportation

Design Division Standard

CONCRETE SAFETY BARRIER (F-SHAPE)

PRECAST BARRIER
(TYPE 1)

CSB(1)-10

FILE: csb110.dgn	DN: TxDOT	CK: AM	DW: BD	CK: VP
©TxDOT December 2010	CONT	SECT	JOB	HIGHWAY
REVISIONS	0467	02	020, ETC.	SH 220
	DIST	COUNTY		SHEET NO.
	FTW	ERATH		52

DATE: 3/21/2024 9:08:14 AM
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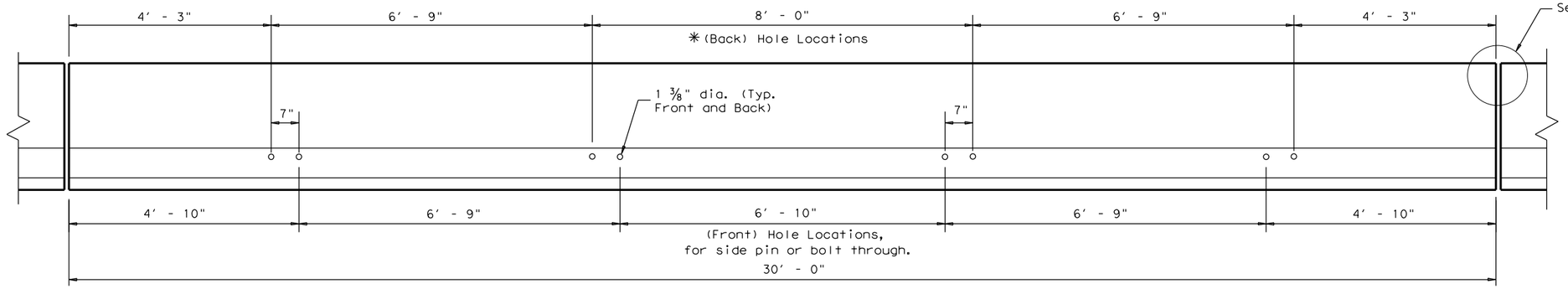
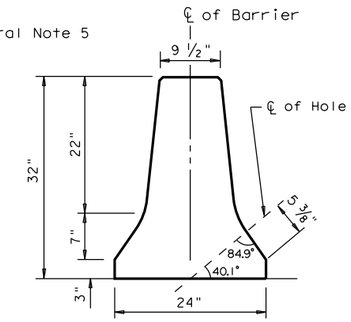
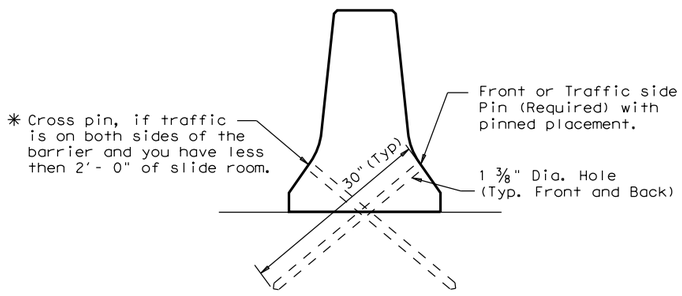


DETAIL 1

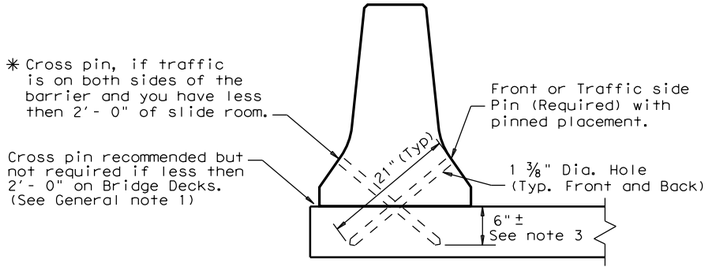


HOLE LOCATION DETAIL



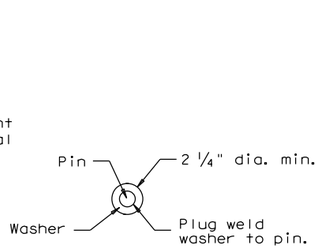
DETAIL 2

Placement on (ACP)
Asphalt Concete Pavement
or Treated Base Material
(30" Pin required)

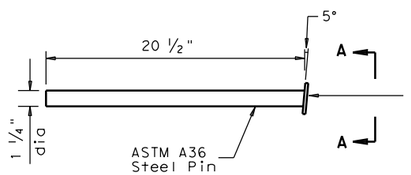


DETAIL 3

Bridge Deck or CRCP
(21" pin required)



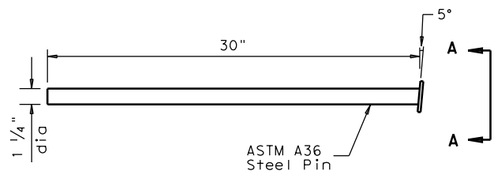
VIEW A-A



Steel washer welded to pin at 5° angle so that the washer is flush to the barrier surface. (See View A-A)

(21") PIN DETAIL

See Detail 3

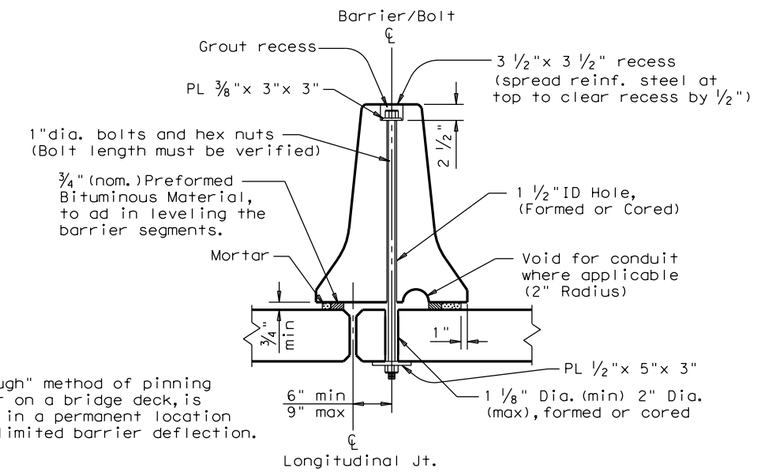


(30") PIN DETAIL

See Detail 2

CORE DRILLING EXISTING BARRIER

Core drilling existing concrete barrier is permitted. Holes shall be drilled with coring or masonry drilling type equipment. Percussion (star) drilling shall not be used. A special drill bit (to cut through existing reinforcing) will likely be required. Spalls in the concrete exceeding ½" shall be patched.



Note:
The "Bolt Through" method of pinning precast barrier on a bridge deck, is primarily used in a permanent location that requires limited barrier deflection.

PRECAST CSB (BOLT THROUGH) PLACEMENT OVER LONGITUDINAL EXPANSION JOINT

For bolt through locations, use the (Front) hole locations shown on Detail 1.

GENERAL NOTES

1. These details provide a method of laterally restraining precast concrete barrier to limit deflections under normally expected passenger vehicle impacts. These details are intended for use in work zones, primarily on bridge decks, or pavement where temporary barrier must be placed less then 2 ft. from the longitudinal edge of the deck or dropoff and parallel to the direction of travel. Other applications of these details are acceptable as directed by the Engineer.
2. Each precast concrete barrier section shall have a minimum of four or total of eight 1 ⅜" ID, holes formed or cored through the barrier. The center lines of the holes are shown in the hole location detail. If rebar is encountered, the entry point may be shifted 2" plus or minus longitudinally along the barrier. The eight holes are spaced along the length of the barrier as shown in Detail 1.
3. The drilling of the travel surface is accomplished by placing the pre-drilled barrier section on the travel surface in the desired position. Then the hole is drilled with the bit passing though the hole in the barrier. The bit is to be inserted into the hole in the barrier so that the travel surface is drilled to a point which is slightly more than the pin length.
4. Note that steel washers have been welded to the top of the steel pins to aid in the removal of the pins, when the barrier is removed.
5. See CSB(1) standard sheets for reinforcement requirements and joint connection types.
6. The forming or coring of holes in the barrier, drilling of holes in bridge deck or pavement, fabrication and materials for the 1 ¼" pins, installation of pins, and any repair to the barrier shall be considered as subsidiary to the barrier bid items.
7. The barrier and travel surface will be repaired as directed by the Engineer in accordance with Item 429, "Concrete Structure Repair."
8. Provide galvanized bolts, nuts, and plate washers. All steel pins shall be galvanized after fabrication in accordance with Item 445, "Galvanizing."
9. Weight of barrier is approx. 440 lbs per foot.

Texas Department of Transportation

Design Division Standard

CONCRETE SAFETY BARRIER (F-SHAPE)

PRECAST BARRIER
(TYPE 1)
PINNED PLACEMENT

CSB(7)-10

FILE: csb710.dgn	DN: TxDOT	CK: AM	DW: BD	CK:
© TxDOT December 2010	CONT	SECT	JOB	HIGHWAY
REVISIONS	0467	02	020, ETC.	SH 220
	DIST	COUNTY		SHEET NO.
	FTW	ERATH		53

DATE: 3/21/2024
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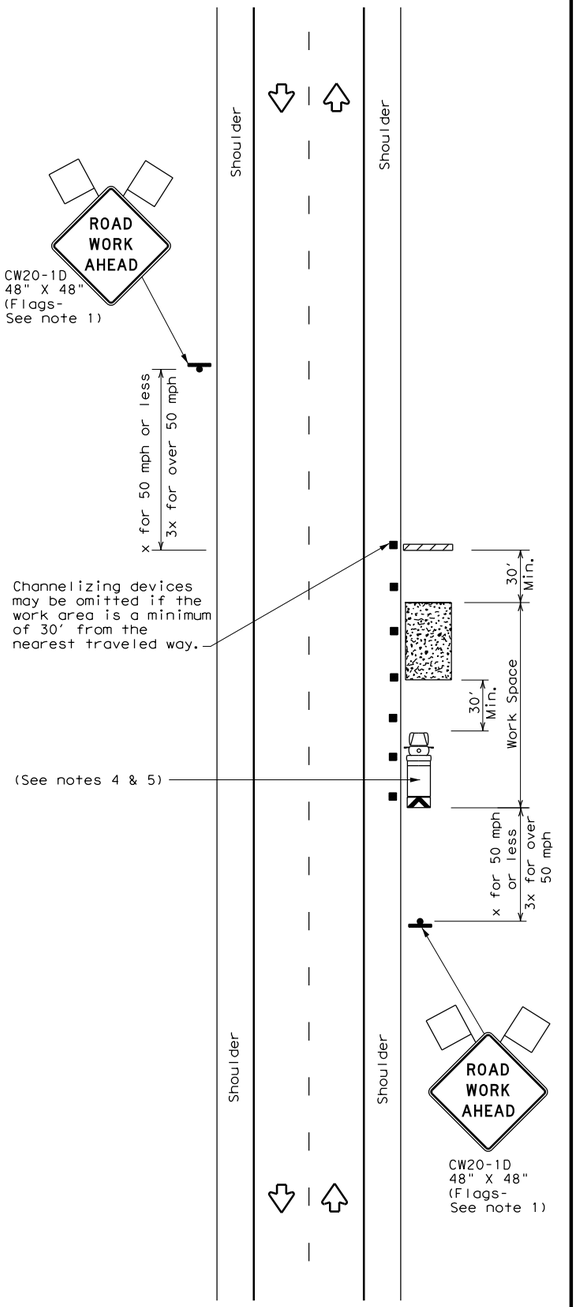
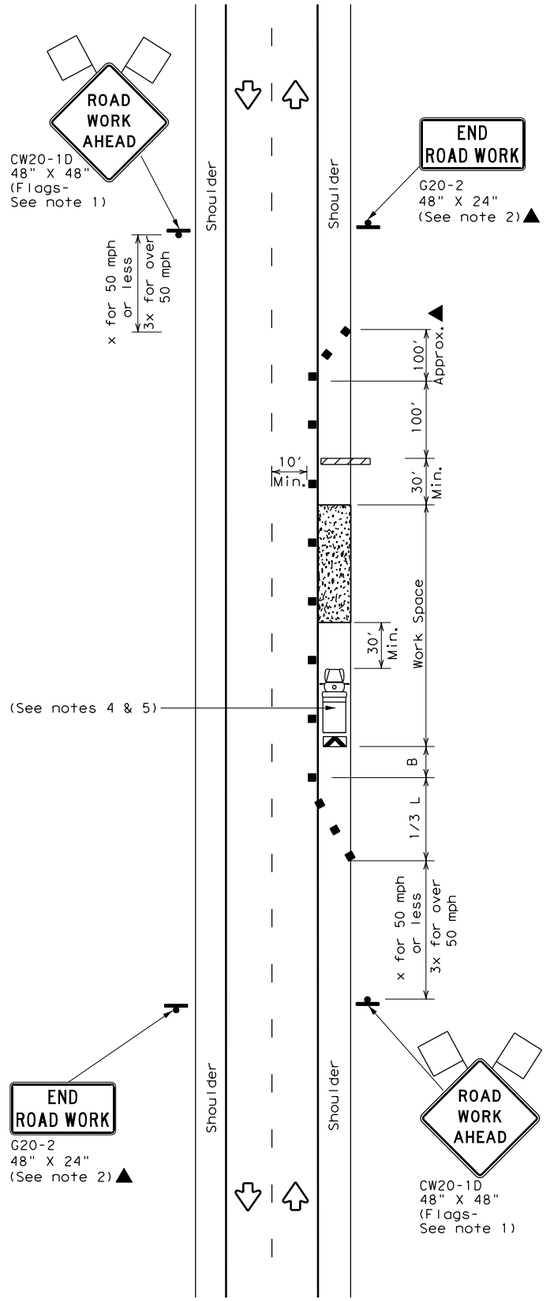


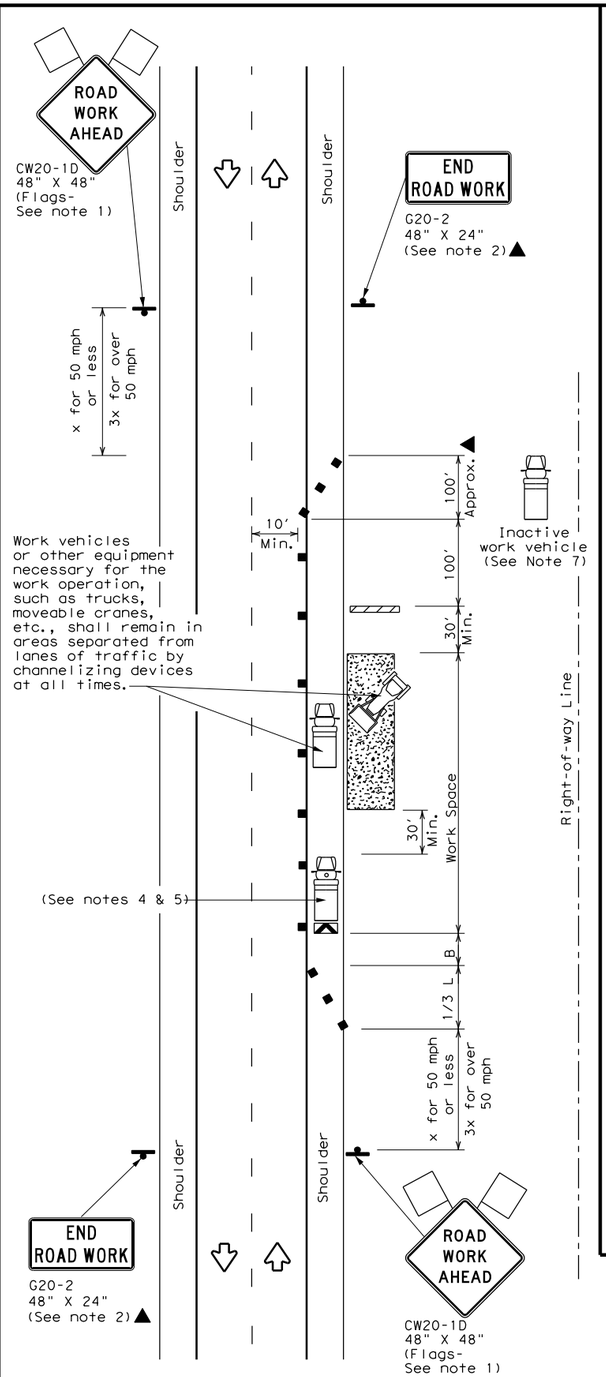
TCP (2-1a)

WORK SPACE NEAR SHOULDER
Conventional Roads



TCP (2-1b)

WORK SPACE ON SHOULDER
Conventional Roads



TCP (2-1c)

WORK VEHICLES ON SHOULDER
Conventional Roads

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

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

* Conventional Roads Only

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

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

GENERAL NOTES

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

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN CONVENTIONAL ROAD SHOULDER WORK

TCP(2-1)-18

FILE: tcp2-1-18.dgn	DN:	CK:	DW:	CK:
© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS 2-94 4-98 8-95 2-12 1-97 2-18	0467	02	020, ETC.	SH 220
	DIST	COUNTY		SHEET NO.
	FTW	ERATH		54

161

DATE: 3/21/2024 9:08:37 AM
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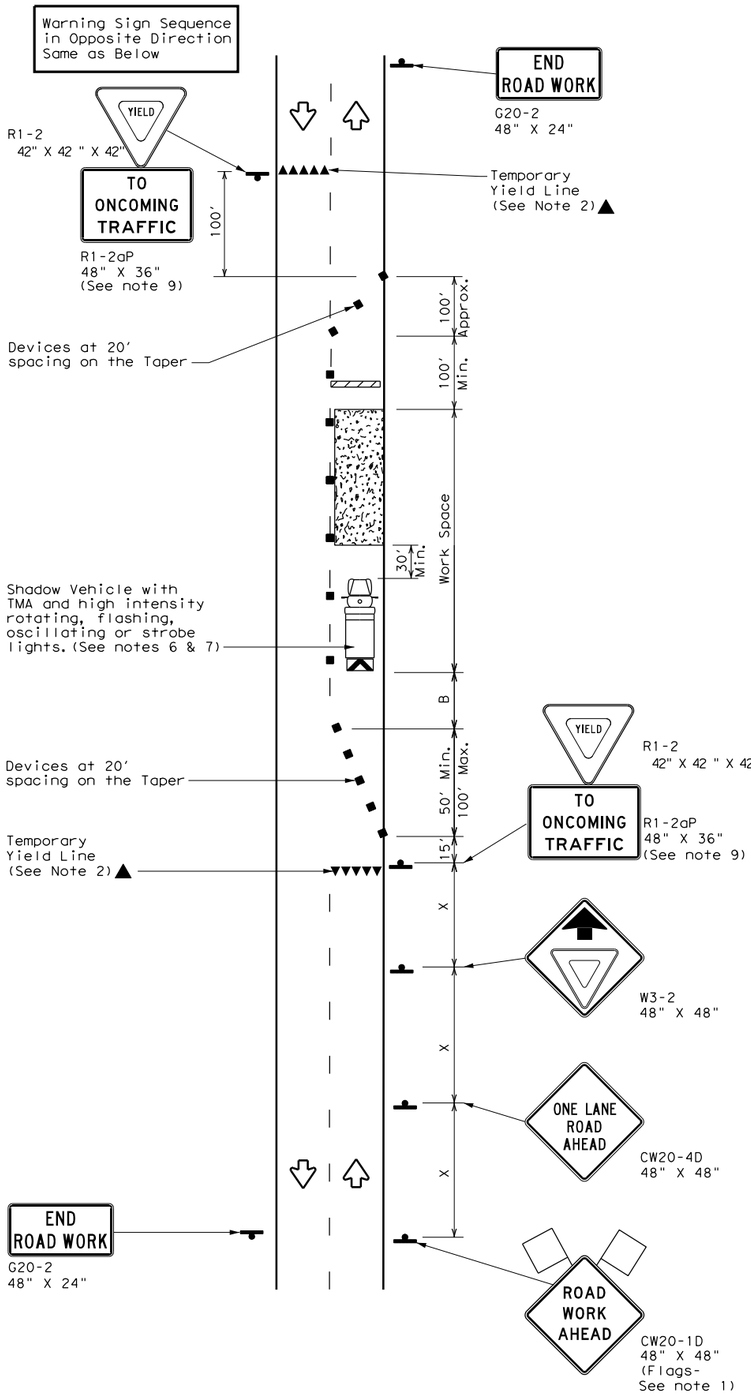
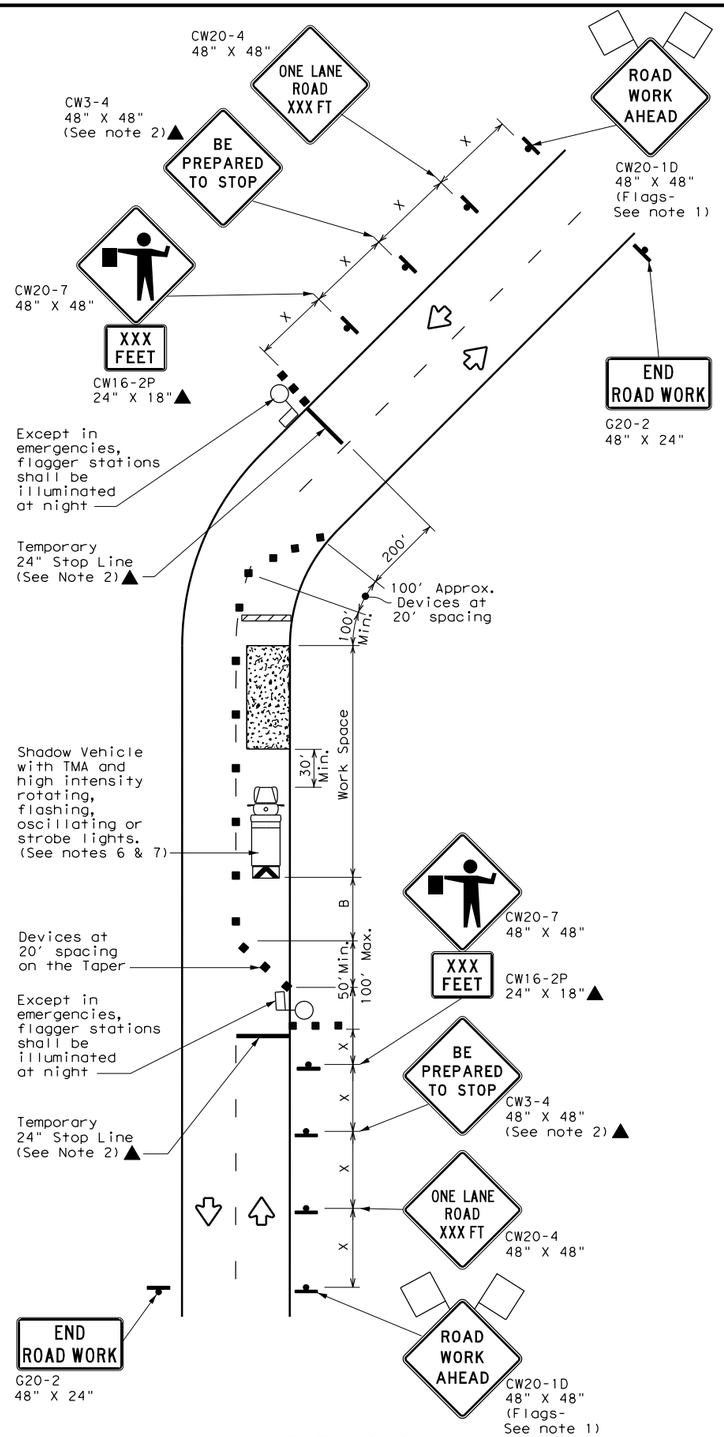


TCP (2-2a)
2-LANE ROADWAY WITHOUT PAVED SHOULDERS
ONE LANE TWO-WAY
CONTROL WITH YIELD SIGNS
(Less than 2000 ADT - See Note 9)



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

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

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

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

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

GENERAL NOTES

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

TCP (2-2a)

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

TCP (2-2b)

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

Texas Department of Transportation
Traffic Operations Division Standard

TRAFFIC CONTROL PLAN
ONE-LANE TWO-WAY TRAFFIC CONTROL

TCP(2-2)-18

FILE: tcp2-2-18.dgn	DN:	CK:	DW:	CK:
©TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS 8-95 3-03 1-97 2-12 4-98 2-18	0467	02	020, ETC.	SH 220
	DIST	COUNTY		SHEET NO.
	FTW	ERATH		55

162

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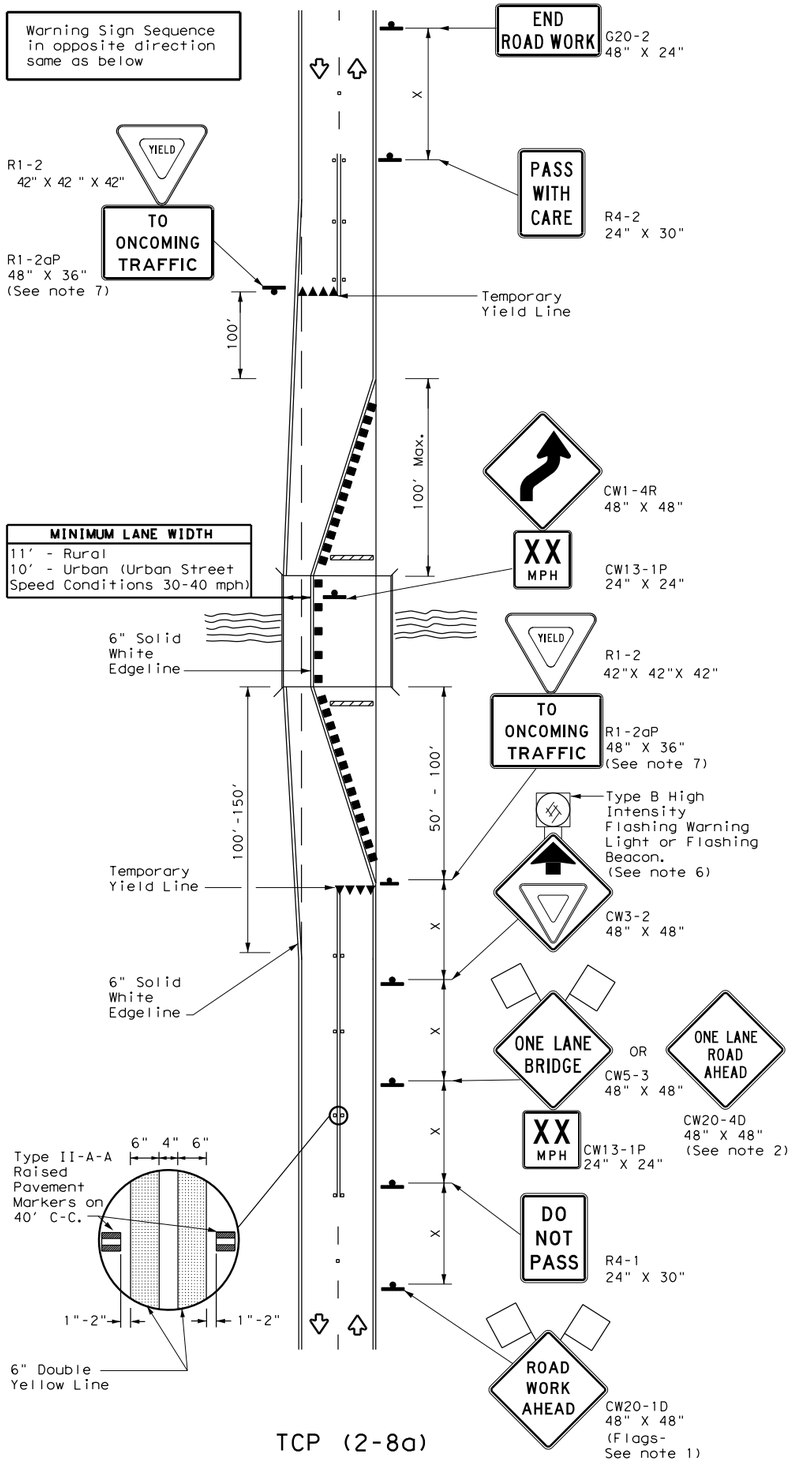
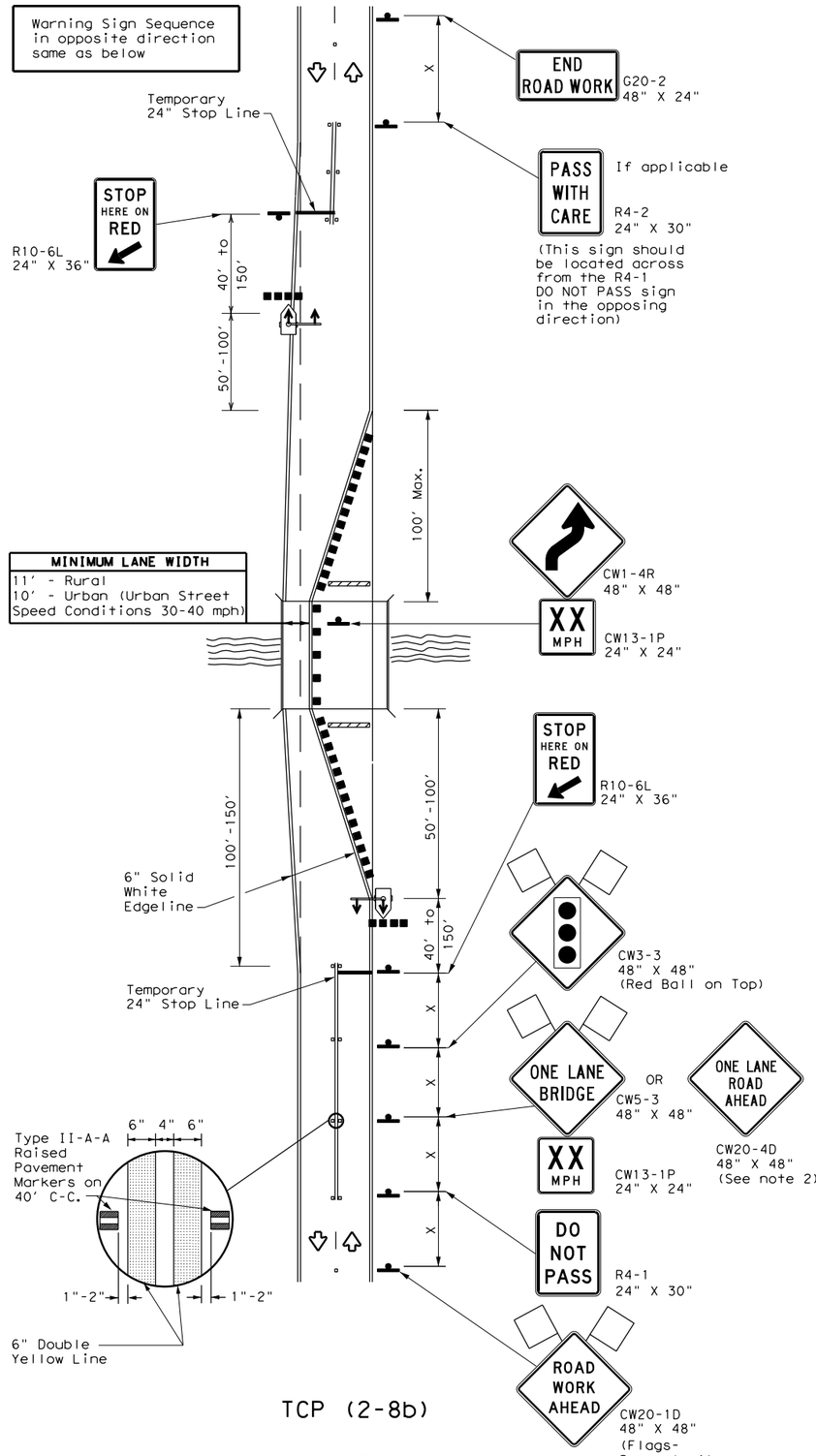


TCP (2-8a)

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



TCP (2-8b)

ONE LANE TWO-WAY
TRAFFIC CONTROL WITH TRAFFIC SIGNAL

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

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

* Conventional Roads Only

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

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

GENERAL NOTES

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

TCP (2-8a)

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

TCP (2-8b)

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

Texas Department of Transportation | Traffic Safety Division Standard

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

TCP(2-8)-23

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© TxDOT April 2023	CONT	SECT	JOB	HIGHWAY
REVISIONS 12-85 4-98 2-18 8-95 3-03 4-23 1-97 2-12	0467	02	020, ETC.	SH 220
	DIST	COUNTY		SHEET NO.
	FTW	ERATH		56

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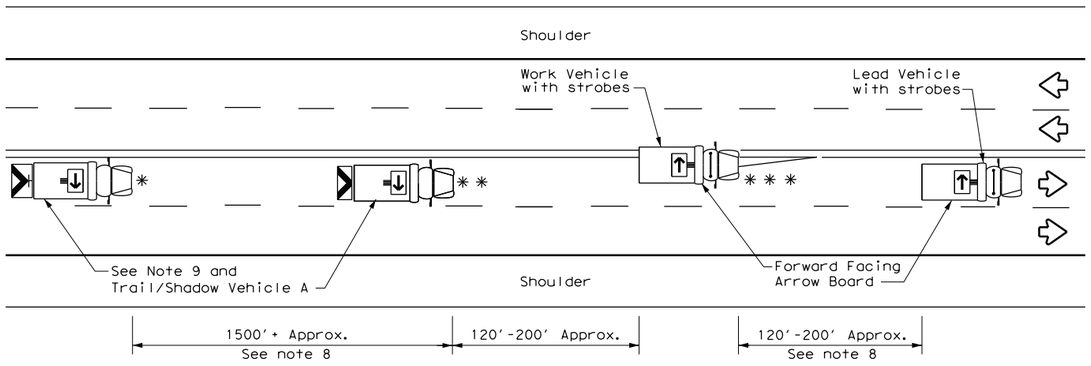
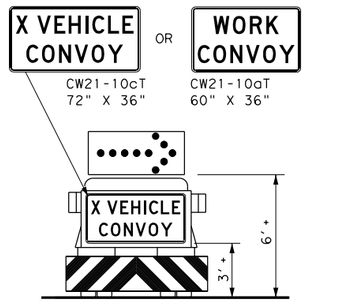


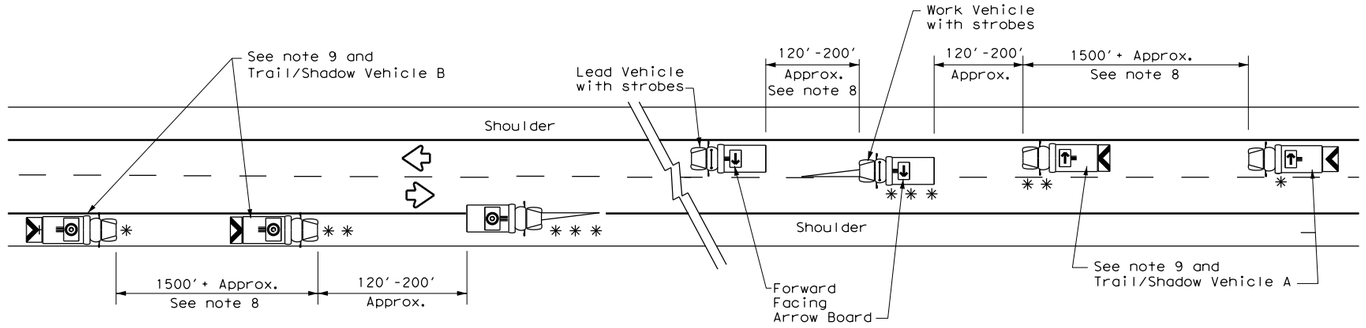
TCP (3-1a)

UNDIVIDED MULTILANE ROADWAY



TRAIL/SHADOW VEHICLE A

with RIGHT Directional display Flashing Arrow Board

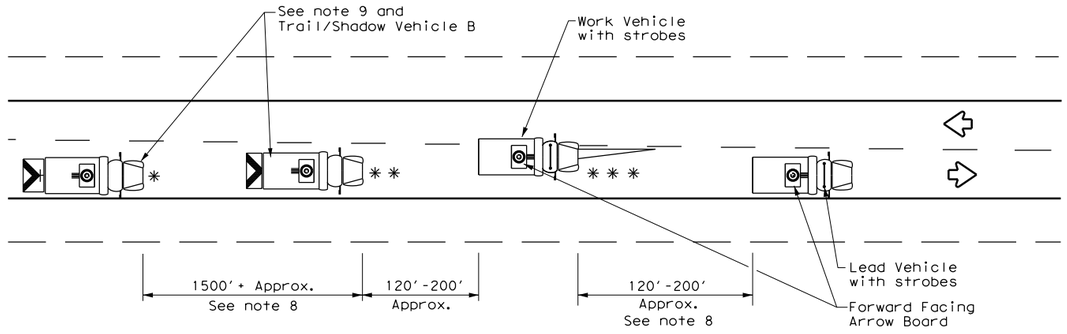


WORK ON SHOULDER

WORK ON TRAVEL LANE

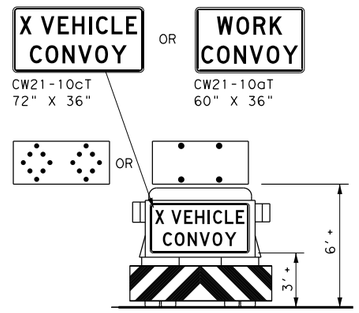
TCP (3-1b)

TWO-WAY ROADWAY WITH PAVED SHOULDERS



TCP (3-1c)

TWO-WAY ROADWAY WITHOUT PAVED SHOULDERS



TRAIL/SHADOW VEHICLE B

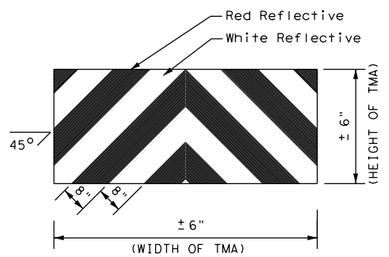
with Flashing Arrow Board in CAUTION display

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

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

GENERAL NOTES

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



STRIPING FOR TMA

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN MOBILE OPERATIONS UNDIVIDED HIGHWAYS

TCP(3-1)-13

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©TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS 2-94 4-98 8-95 7-13 1-97	0467	02	020, ETC.	SH 220
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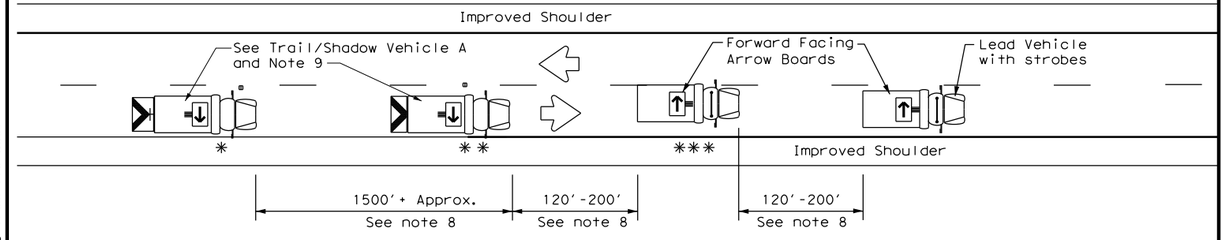
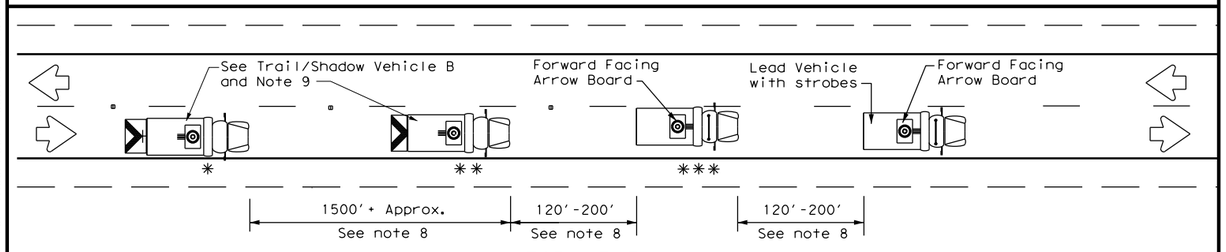


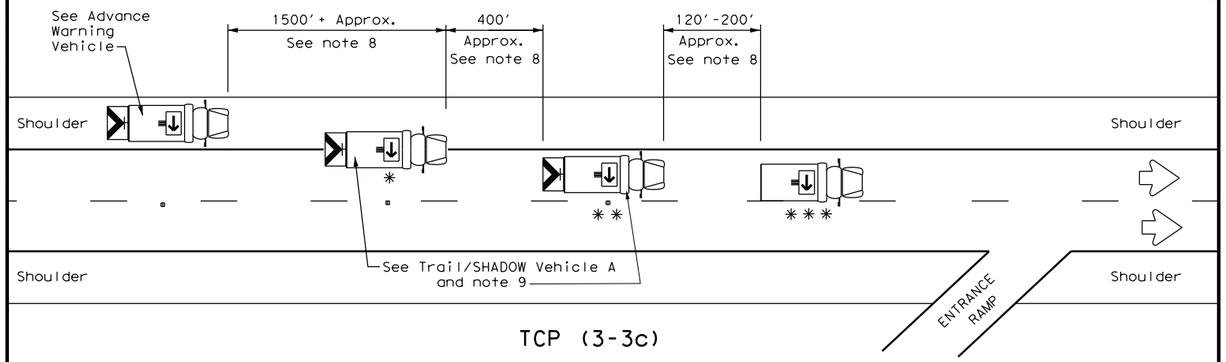
TCP (3-3a)

TWO LANE HIGHWAY WITH PAVED SHOULDERS (WORK ON TRAVEL LANE)



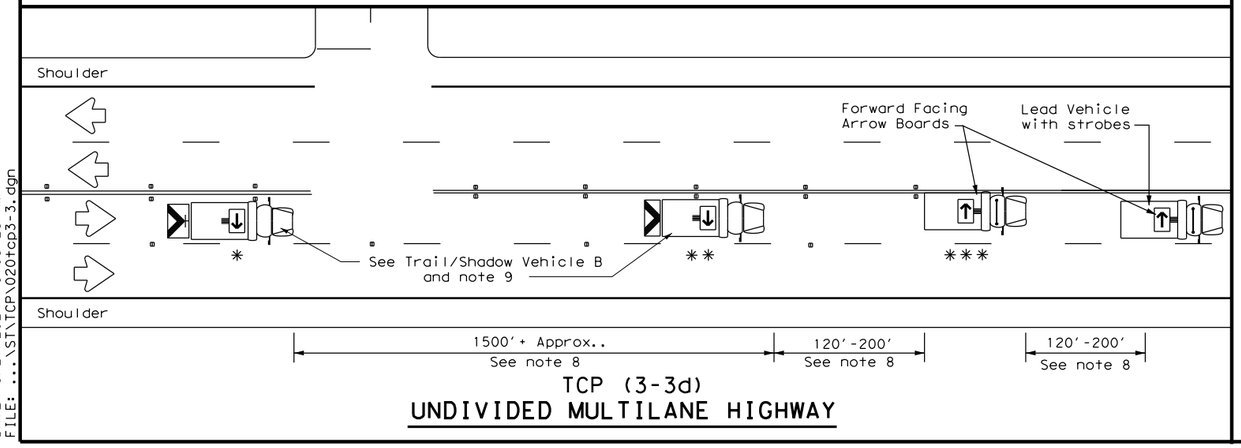
TCP (3-3b)

TWO LANE HIGHWAY WITHOUT PAVED SHOULDERS (WORK ON TRAVEL LANE)



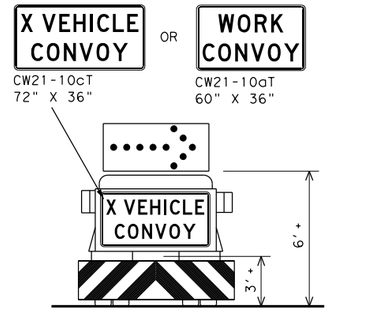
TCP (3-3c)

DIVIDED MULTILANE HIGHWAY



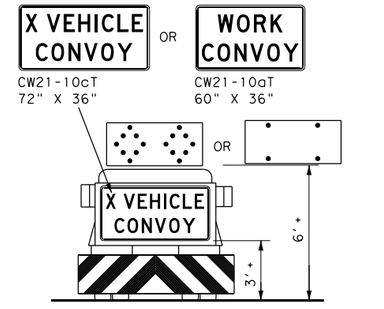
TCP (3-3d)

UNDIVIDED MULTILANE HIGHWAY



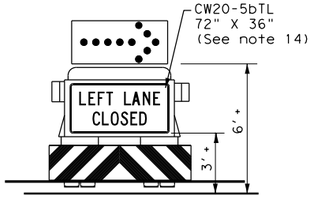
TRAIL/SHADOW VEHICLE A

with RIGHT Directional display
Flashing Arrow Board

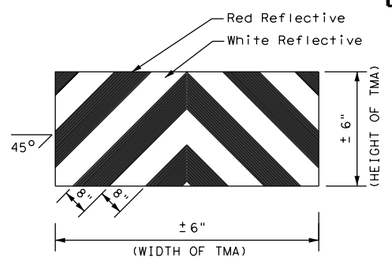


TRAIL/SHADOW VEHICLE B

with Flashing Arrow Board
in Caution Mode



ADVANCE WARNING VEHICLE



STRIPING FOR TMA

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

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

GENERAL NOTES

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

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN MOBILE OPERATIONS RAISED PAVEMENT MARKER INSTALLATION/ REMOVAL

TCP(3-3)-14

FILE: tcp3-3.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT September 1987	CONT	SECT	JOB	HIGHWAY
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2-94 4-98	DIST	COUNTY		SHEET NO.
8-95 7-13	FTW	ERATH		58
1-97 7-14				

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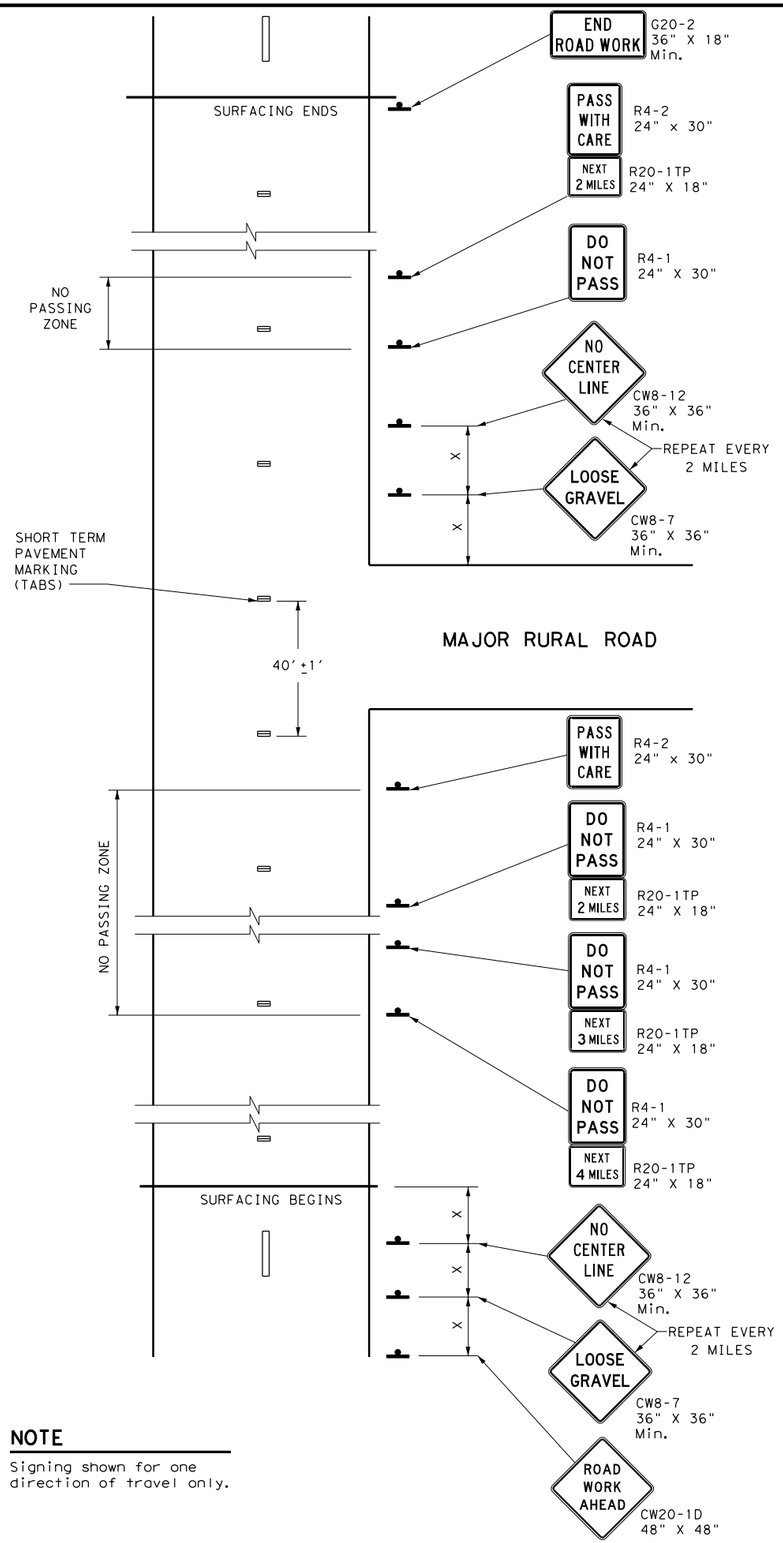
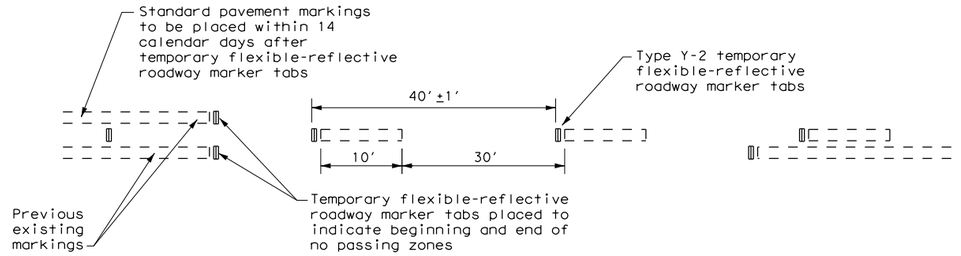


NOTE

Signing shown for one direction of travel only.

NO PASSING ZONES ON TWO-LANE TWO-WAY ROADS



TABS ON CENTERLINES OF TWO-LANE TWO-WAY ROADS

For seal coat, micro-surface or similar operations

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

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

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

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

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

"NO CENTER LINE" SIGN (CW8-12)

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

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

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

"LOOSE GRAVEL" SIGN (CW8-7)

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

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

PAVEMENT MARKINGS

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

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

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

COORDINATION OF SIGN LOCATIONS

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

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

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

* Conventional Roads Only

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

GENERAL NOTES

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

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL DETAILS FOR SURFACING OPERATIONS

TCP(7-1)-13

FILE: tcp7-1.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT March 1991	CONT	SECT	JOB	HIGHWAY
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1-97 7-13	FTW	ERATH		59

210

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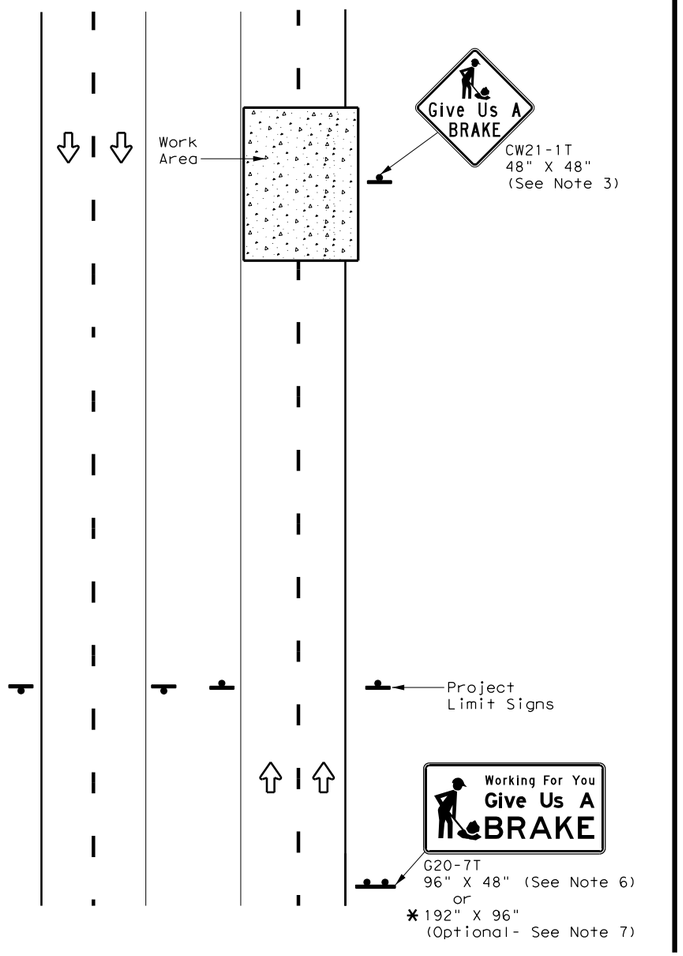
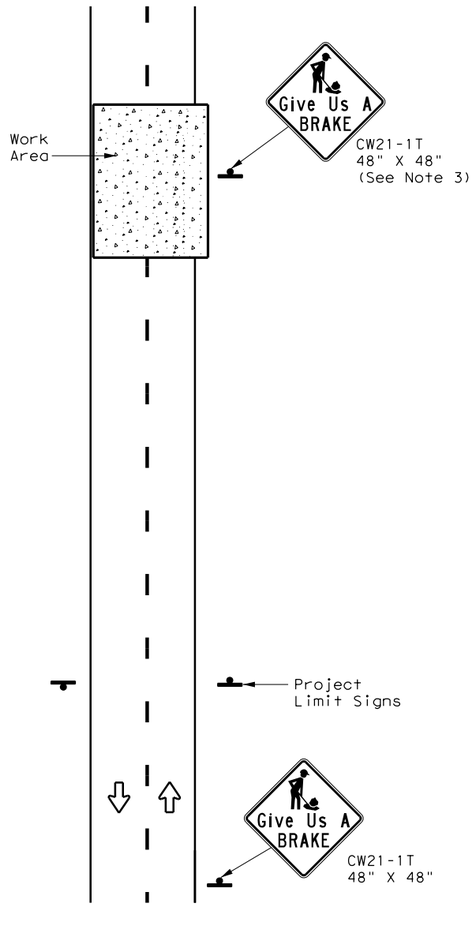


DIVIDED HIGHWAY



UNDIVIDED HIGHWAY

SIGNS ARE SHOWN FOR ONE DIRECTION OF TRAVEL

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

SUMMARY OF LARGE SIGNS

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

▲ See Note 6 Below

LEGEND	
	Sign
	Large Sign
	Traffic Flow

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

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

GENERAL NOTES

1. See BC and SMD sheets for additional sign support details.
2. Sign locations shall be approved by the Engineer.
3. For projects more than two miles in length, Give Us a BRAKE signs should be repeated halfway through the project. The Give Us a Brake (CW21-1T) may be used for this purpose.
4. Work zone speed limits are sometimes used in conjunction with GIVE US A BRAKE signing. See BC(3) for location and spacing of construction speed zone signing when required.
5. Give Us a Brake (CW21-1T) signs and supports shall be considered subsidiary to Item 502, "Barricades, Signs and Traffic Handling."
6. The 96" X 48" Working For You Give Us A BRAKE (G20-7T) may use a 1/2" or 5/8" plywood substrate or 0.125" aluminum sheeting substrate and may be supported by two 4" x 6" wood posts with drilled holes for breakaway as per BC(5) and will be subsidiary to Item 502.
7. The Working For You Give Us A BRAKE (G20-7T) 192" X 96" sign shall be paid for under the following specification items:
   Item 636 - Aluminum Signs
   Item 647 - Large Roadside Sign Supports and Assemblies.
   Item 416 - Drilled Shaft Foundations
8. All signs shall be constructed in accordance with the details found in the "Standard Highway Sign Designs for Texas," latest edition. Sign details not shown in this manual shall be shown in the plans or the Engineer shall provide a detail to the Contractor before the sign is manufactured.

Texas Department of Transportation

Traffic Operations Division Standard

WORK ZONE "GIVE US A BRAKE" SIGNS

WZ(BRK)-13

FILE: wzbrk-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT August 1995	CONT	SECT	JOB	HIGHWAY
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6-96 5-98 7-13	DIST	COUNTY		SHEET NO.
8-96 3-03	FTW	ERATH		60

116

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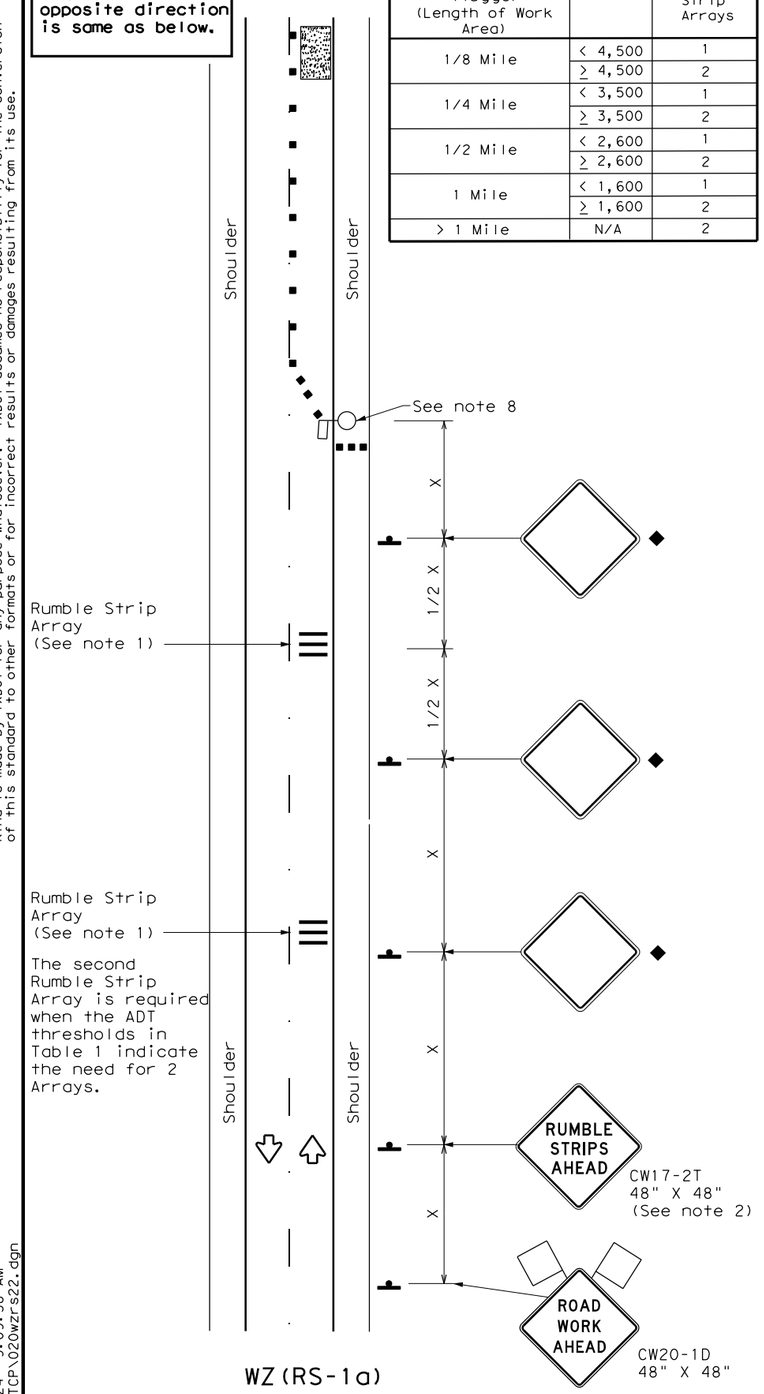
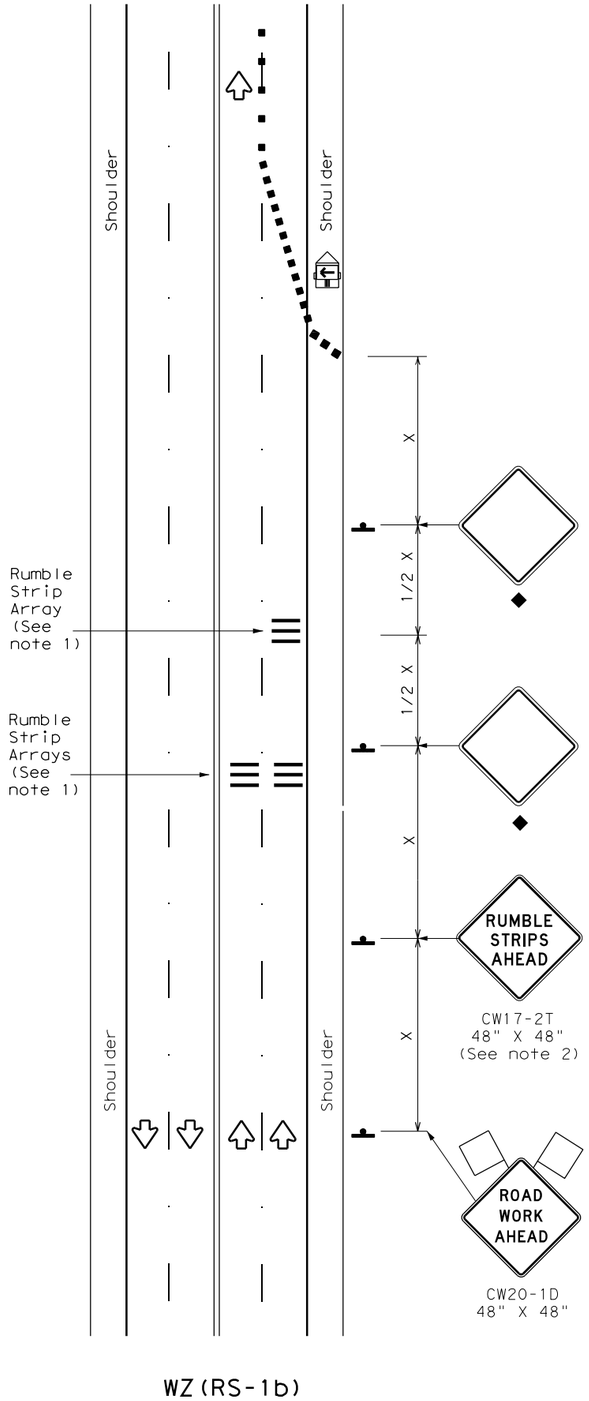
Warning sign and rumble strip sequence in opposite direction is same as below.

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



WZ(RS-1a)

RUMBLE STRIPS ON ONE-LANE TWO-WAY APPLICATION



WZ(RS-1b)

RUMBLE STRIPS FOR LANE CLOSURE ON CONVENTIONAL ROADWAY

GENERAL NOTES

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

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

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

* Conventional Roads Only

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

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

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

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

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

Texas Department of Transportation

Traffic Safety Division Standard

TEMPORARY RUMBLE STRIPS

WZ(RS)-22

FILE: wzrs22.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2012	CONT	SECT	JOB	HIGHWAY
REVISIONS 2-14 1-22 4-16	0467	02	020, ETC.	SH 220
	DIST	COUNTY		SHEET NO.
	FTW	ERATH		61

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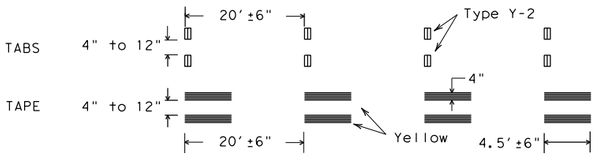
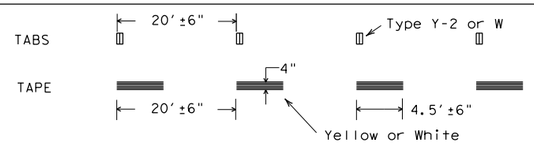
WORK ZONE SHORT TERM PAVEMENT MARKINGS DETAILS

SOLID LINES

DOUBLE NO-PASSING LINE

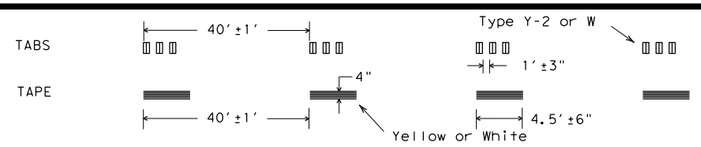


SINGLE NO-PASSING LINE or CHANNELIZATION LINE



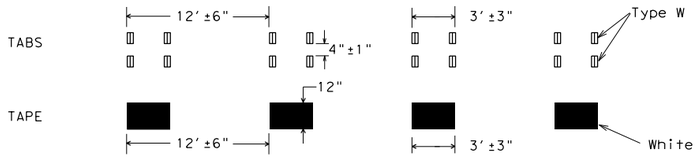
BROKEN LINES

(FOR CENTER LINE OR LANE LINE)

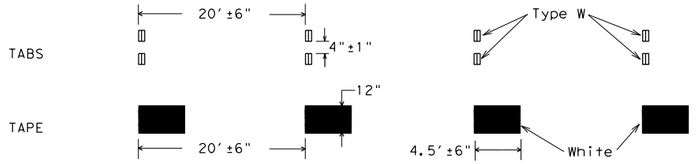


WIDE DOTTED LINES

(FOR LANE DROP LINES)



WIDE GORE MARKINGS



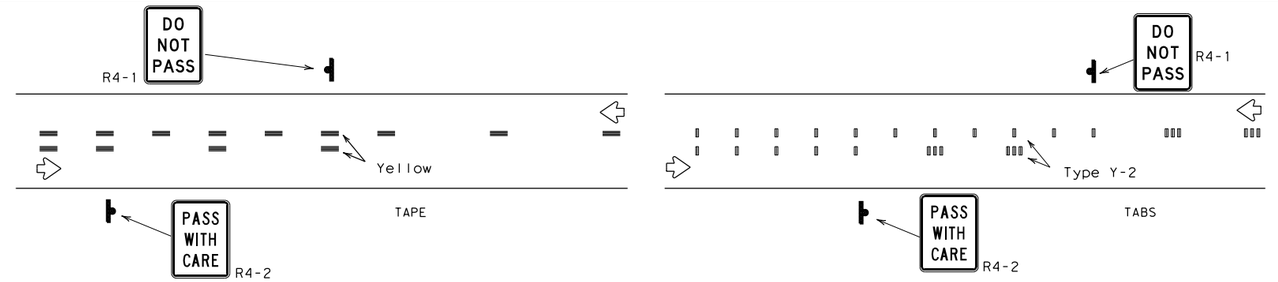
NOTES:

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

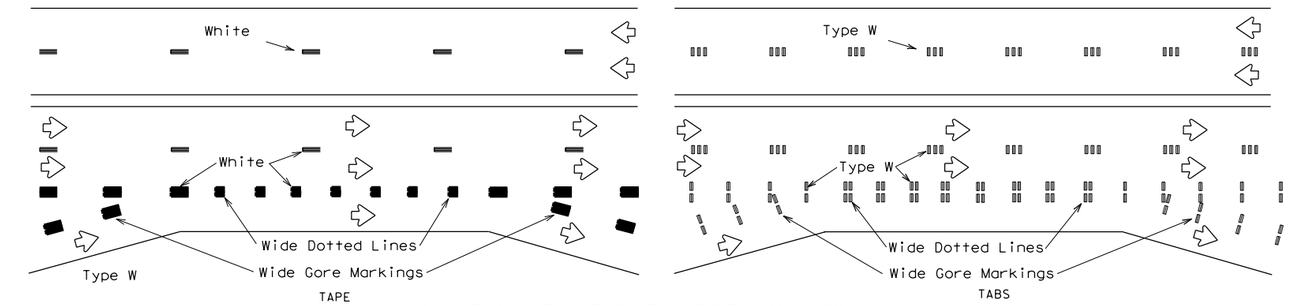
TEMPORARY FLEXIBLE, REFLECTIVE ROADWAY MARKER TABS (TABS)

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

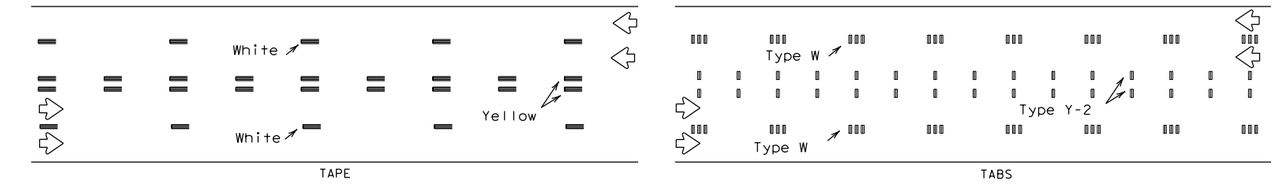
WORK ZONE SHORT TERM PAVEMENT MARKINGS PATTERNS



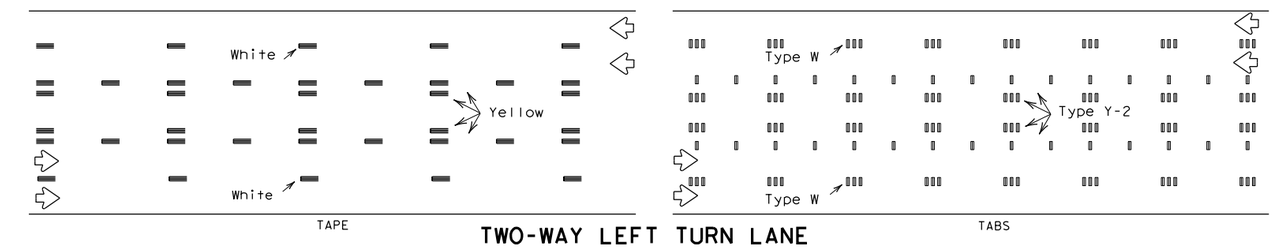
CENTER LINE & NO-PASSING ZONE BARRIER LINES FOR TWO LANE TWO-WAY HIGHWAYS



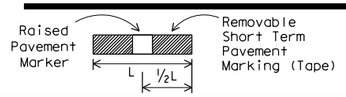
LANE LINES FOR DIVIDED HIGHWAY



LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS



TWO-WAY LEFT TURN LANE



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

PREFABRICATED PAVEMENT MARKINGS

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

RAISED PAVEMENT MARKERS

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

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

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

Texas Department of Transportation

Traffic Operations Division Standard

WORK ZONE SHORT TERM PAVEMENT MARKINGS

WZ(STPM)-13

FILE:	wzstpm-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT	April 1992	CONT	SECT	JOB	HIGHWAY
REVISIONS		0467	02	020, ETC.	SH 220
1-97		DIST	COUNTY		SHEET NO.
3-03		FTW	ERATH		62
7-13					

111

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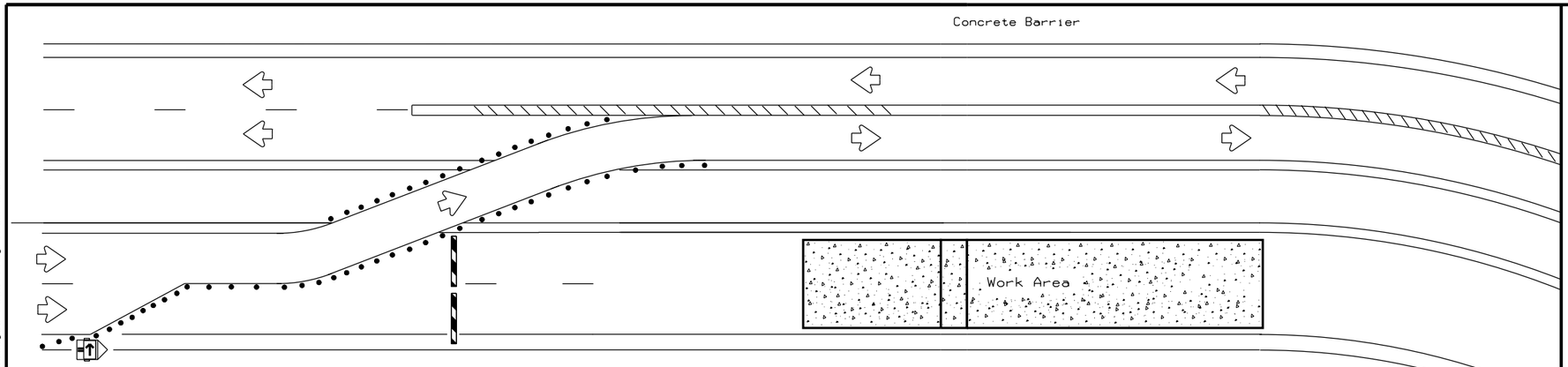


NOTES:

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

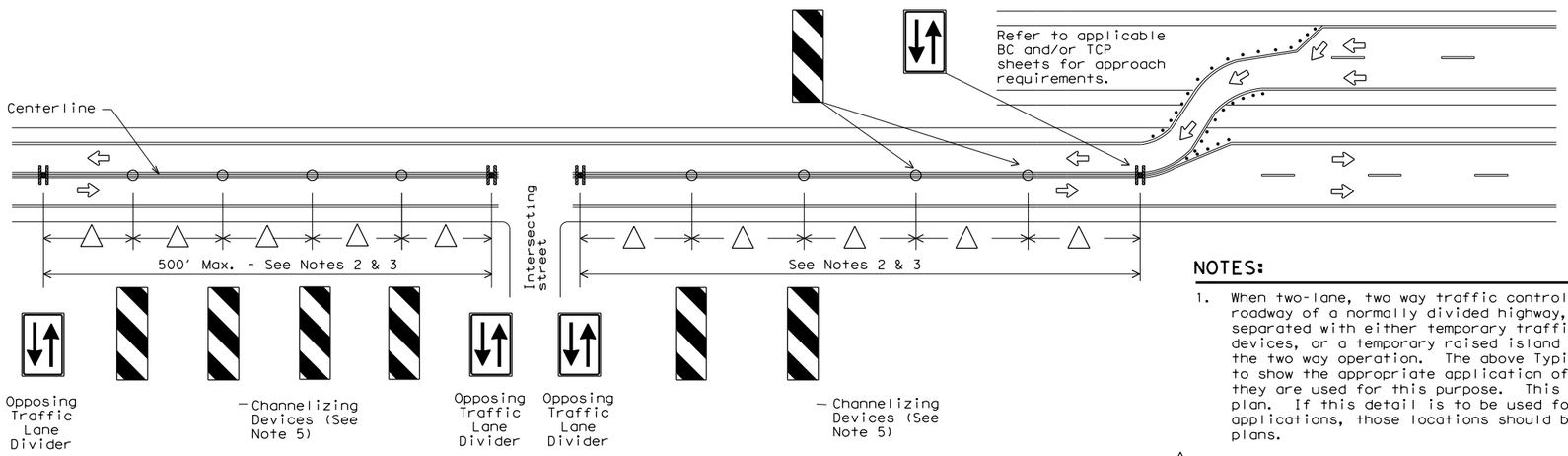
BARRIER DELINEATION WITH MODULAR GLARE SCREENS

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

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

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

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



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

NOTES:

1. When two-lane, two way traffic control must be maintained on one roadway of a normally divided highway, opposing traffic shall be separated with either temporary traffic barriers, channelizing devices, or a temporary raised island throughout the length of the two way operation. The above Typical Application is intended to show the appropriate application of channelizing devices when they are used for this purpose. This is not a traffic control plan. If this detail is to be used for other types of roads or applications, those locations should be stated elsewhere in the plans.

△2. Space devices according to the Tangent Spacing shown on the Device Spacing table on BC(9) but not exceeding 100′.

3. Every fifth device should be an OTLD except when spaced closer to accommodate an intersection. An OTLD should be the first device on each side of intersecting streets or roads.
4. Locations where surface mount bases with adhesives or self-righting devices will be required in order to maintain them in their proper position should be noted elsewhere in the plans.
5. Channelizing devices are to be vertical panels, 42" cones or tubular markers that are at least 36" tall. Tubular markers used to separate traffic should have a rubber base weighing at least 30 pounds. Tubular markers that are 42" tall or more shall have four bands of reflective material as detailed for 42" cones on BC(10). Tubular markers less than 42" but at least 36" tall shall have three bands of 3" wide white reflective material spaced 2" apart. Reflective material shall meet DMS-8300, Type A.

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN TYPICAL DETAILS

WZ(TD)-17

FILE: wztd-17.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 1998	CONT	SECT	JOB	HIGHWAY
REVISIONS 4-98 2-17 3-03 7-13	0467	02	020, ETC.	SH 220
	DIST	COUNTY		SHEET NO.
	FTW	ERATH		63

110

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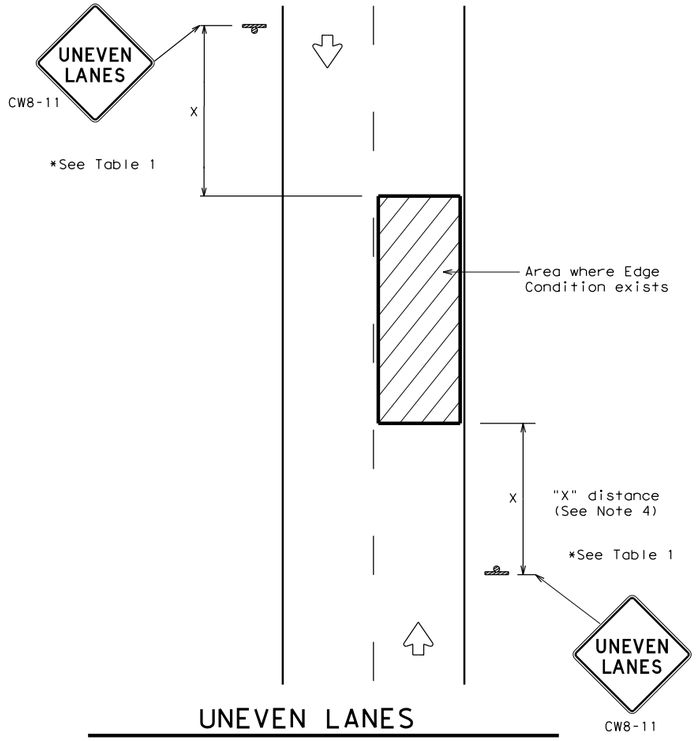
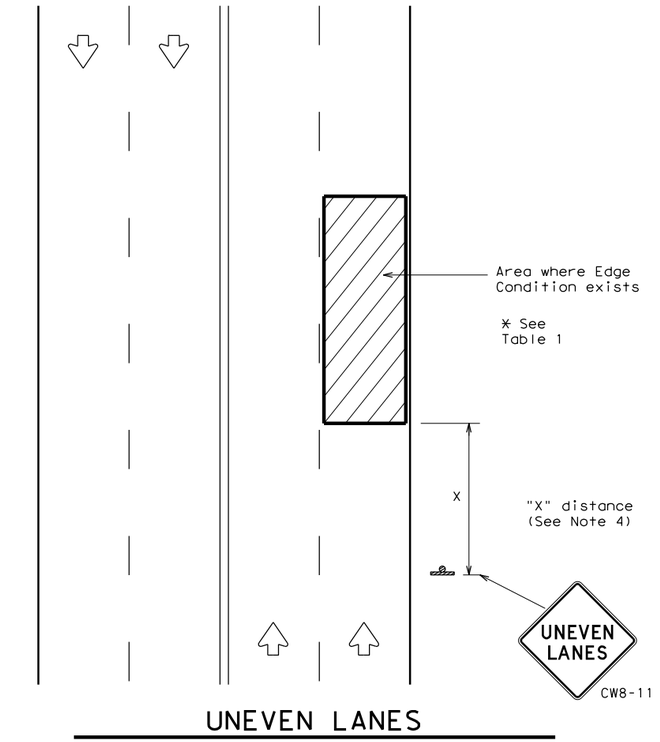
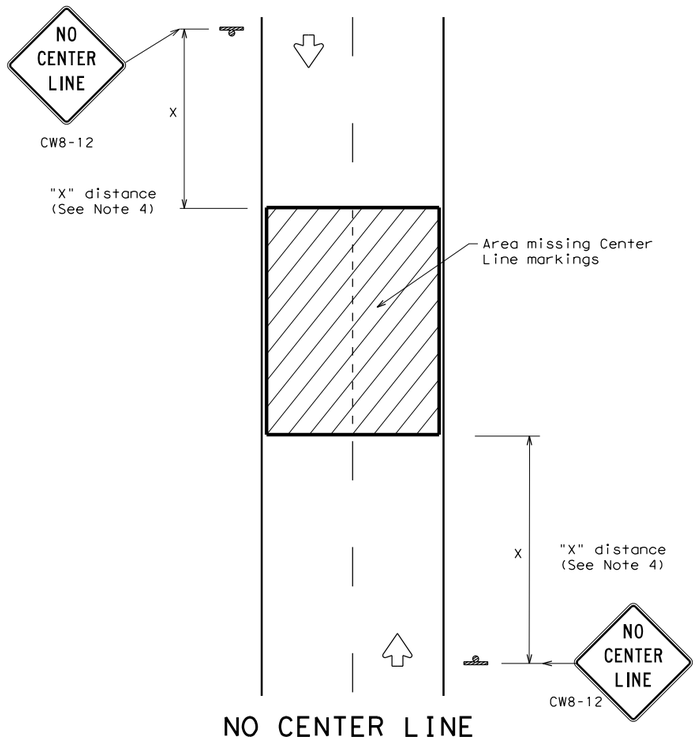


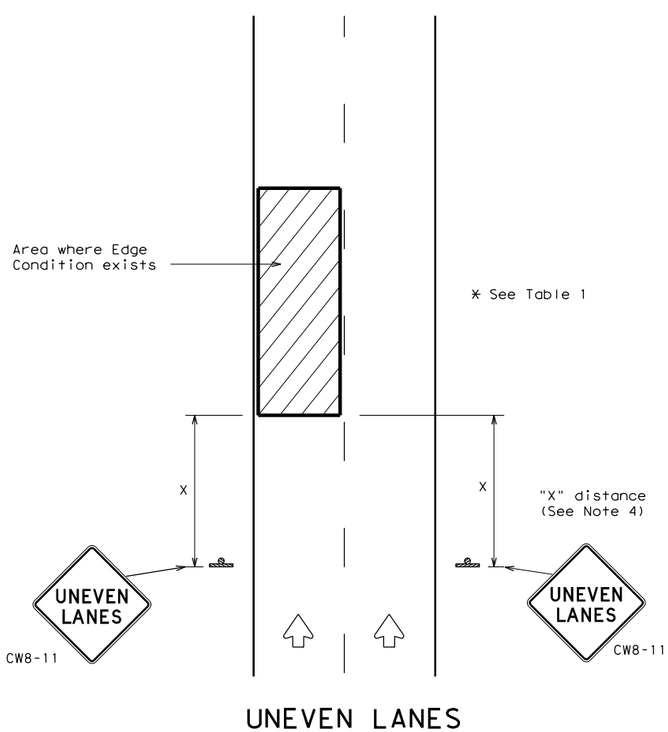
UNEVEN LANES
TWO LANE CONVENTIONAL ROAD



UNEVEN LANES
FOUR LANE CONVENTIONAL ROAD



NO CENTER LINE
TWO LANE CONVENTIONAL ROAD



UNEVEN LANES
DIVIDED ROADWAY

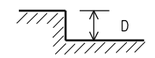
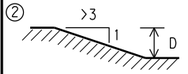
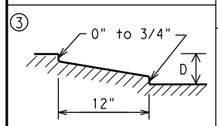
DEPARTMENTAL MATERIAL SPECIFICATIONS	
PERMANENT PREFABRICATED PAVEMENT MARKINGS	DMS-8240
TEMPORARY (REMOVABLE) PREFABRICATED PAVEMENT MARKINGS	DMS-8241
SIGN FACE MATERIALS	DMS-8300

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

GENERAL NOTES

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

TABLE 1

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

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

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

Texas Department of Transportation

Traffic Operations Division Standard

SIGNING FOR UNEVEN LANES

WZ(UL)-13

FILE: wzul-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT April 1992	CONT	SECT	JOB	HIGHWAY
REVISIONS	0467	02	020, ETC.	SH 220
8-95 2-98 7-13	DIST	COUNTY		SHEET NO.
1-97 3-03	FTW	ERATH		64

112

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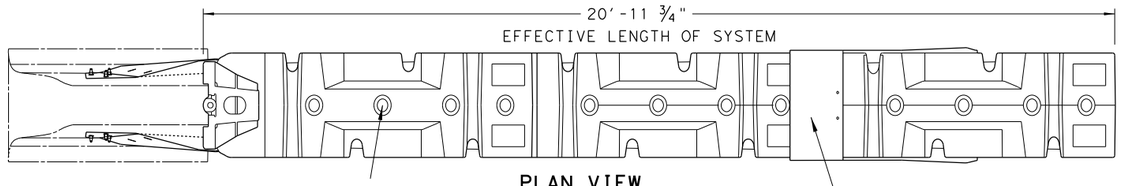
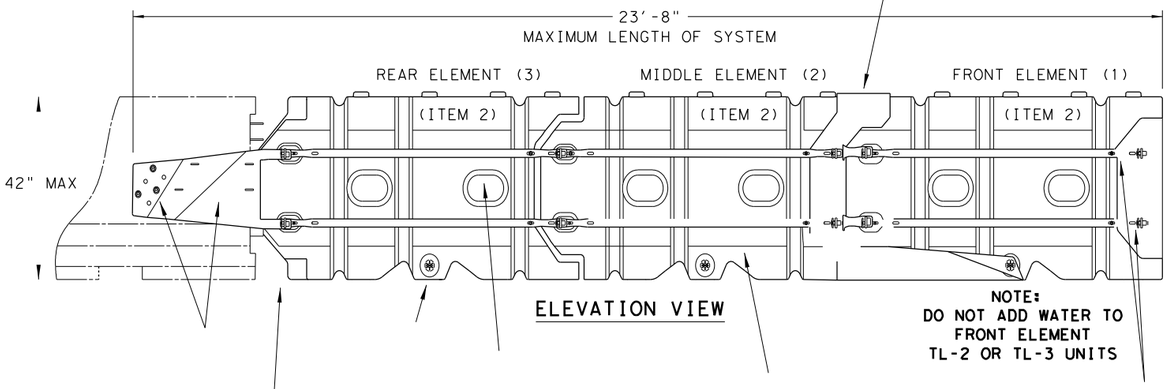
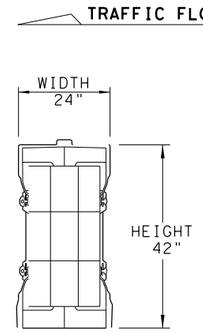
SYSTEM SHOWN - ABSORB-M TL-3



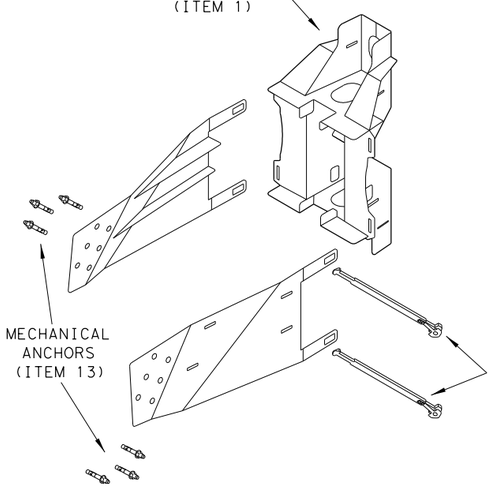
PLAN VIEW



ELEVATION VIEW



SECTION A-A



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

GENERAL NOTES

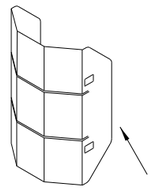
1. FOR SPECIFIC INFORMATION REGARDING THE INSTALLATION AND TECHNICAL GUIDANCE, CONTACT: LINDSAY TRANSPORTATION SOLUTIONS (LTS) - BARRIER SYSTEMS, INC. AT (707) 374-6800. 180 RIVER ROAD, RIO VISTA, CA 94571
2. THE ABSORB-M SYSTEM IS ONLY APPROVED FOR USE IN (TEMPORARY WORK ZONE) LOCATIONS.
3. THE ABSORB-M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

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

*COMPONENTS PRE-ASSEMBLED WITH ELEMENT ASSEMBLY

DELINEATION DECAL PLACEMENT GUIDE

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



NOSE PLATE

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

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

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

SACRIFICIAL

Texas Department of Transportation — Design Division Standard

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

FILE: absorbm19	DN: TxDOT	CK: KM	DW: VP	CK:
© TxDOT: JULY 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0467	02	020, ETC.	SH 220
	DIST	COUNTY		SHEET NO.
	FTW	ERATH		65

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Note: Transition requirement, When a single sided transition section is required, see the MBGF transition standards for the proper installation.

3360G 5/8"x1 1/4" H.G.R. Bolt and 3340G Nuts
9852A 6"x3" Strut
984G side Pl 10 Ga both sides
9915A Spacer Channel w/hole for Cable ass'y. facing Post (2)
31G 12 Ga
Begin M.B.G.F. Length of need
19261G 1/2" Plate both sides
130A 10 Ga Slotted w/steel plate at Post (4)
19259G Washers (typ)
Rail is lapped such that over-sections face away from the nose (typ)
End payment for CAT(EA), begin payment for Metal Thrie-Beam Guard Fence(LF)
Thrie-Beam (Nested-2 each side) rail (12 gauge)
End payment for Metal Thrie-Beam Guard Fence (LF)
*Change splice lap direction for uni-directional application
*Traffic
Median Barrier
Bracket A ℄ 9606A
983G Nose Plate 10 Ga
3360G 5/8"x1 1/4" H.G.R. Bolt and 3340G Nuts
Traffic
31G 12 Ga
3275G 3/8" Rod & 4252G 4-Nuts w/2 4258G Wash
9921G Tube
3395G Splice Bolts (typ)
3000G
701A
9G
21G
"W" beam to Thrie-Beam transition rail (12 gauge) 974G
Spacer Bracket Attachment Options:
(1) 2-5/8"x 15" post bolts 3550G through the barrier with rectangular washers 3320G
(2) 8 Expansion bolts 4406G to attach 2 brackets to the barrier (No bracket attachment to thrie-beam is required).

PLAN VIEW

31'-3" Front Section | 12' 6" End Section | 18'-9" Transition Section
6'-3" | 3'-1 1/2"
5/8"x 2" H.G.R. Splice Bolts 3400G & Nuts 3340G
5/8"x 2" H.G.R. Splice Bolts 3400G & Nuts 3340G
782G 5/8" Plate
19271G Pipe Sleeve
3380G 5/8"x1 1/2" Large Hex Hd Bolt & 3340G Nuts
3360G 5/8"x1 1/4" H.G.R. splice Bolts and 3340G Nuts
3177B 18"x18" (2) Object markers
Pipe 705G Sleeve
2'-3"
5" Ground Line
782G
3000G
3320G (typ)
Rail ℄
3910G 2-1" Hex Nuts & 3900G 1-1" Washer each end of 3000G
705G Pipe Sleve (inserted into Post)
740G 6'x8" Tube (typ) at all Wood Posts
766G 1/4" Plate (typ) at all Wood Posts
3910G Double Nut at each end for locking
3012G 3/4" Cable Assembly
9852A 6"x3" Strut
3320G Washer PL 1 3/4" x 3/16" x 3" Lg
See Thrie-Beam Terminal Connection Detail 980G
10"
Option (1) above 2-15" thru Bolts 3550G with rectangular washers 3320G
5/8"x (B) H.G.R. Bolts & Nuts (Typ.) (See table below)

ELEVATION VIEW

Note: There are no Rail to Post attachments for Posts (3), (5), & (6)

3650G 5/8"x 25" H.G.R. Post Bolt & 3340G Nut w/2 3320G Washers
3100B Wood Block
9916A Sleeve
705G Pipe inserted in Post
782G 5/8" Plate
9852A Strut
3075B Wood Post (notched)
766G Soil Plate
3497G 5/8"x 9 1/2" Large Hex Hd Bolt & 3340G Nut w/2 3300G Washer
3478G 5/8"x 7 1/2" Hex Hd Bolt and 3340G Nut
740G 6"x8"x4'-6" Tube

SECTION A-A (1)

3101B Wood Block
Toe nail
3360G 5/8"x1 1/4" H.G.R. Bolt and 3340G Nut (typ)
705G Pipe inserted in Post
9852A Strut
3074B Wood Post
766G Soil Plate

SECTION B-B (2)

3101B Wood Block
3' - 6" Minimum (typ)
4640G 5/8"x 24" Hex Hd Bolt & 3340G Nut w/2 3300G Wash
3497G 5/8"x 9 1/2" Hex Hd Bolt and 3340G Nut
3074B Wood Post
3478G 5/8"x 7 1/2" Hex Hd Bolt and 3340G Nut
740G 6"x8"x4'-6" Tube
7/8" x 2 1/2" slotted holes for 5/8" bolts (typical)

SECTION C-C (3) & (5)

4470G 5/8"x 8" Hex Hd Bolt & 3340G Nut for 19261G Plates, Post 4 only
9921G 6"x8" Tube located 4" down from top of Wood Post
3101B Wood Block
3395G Splice Bolt & 3340G Nut w/2 19259G Wash (typ)
For Post (4) only
3263G 3/8"x 2" Lag Screws & 4257G Wash
3074B Wood Post
766G Soil Plate

SECTION E-E (4) & (6)

Note: 3395G Splice Bolts are used to allow telescoping action

5/8" Dia.
5/8"-11 Threads
1" Unthreaded
1 3/4"

3395G SPLICE BOLT

3275G 3/8" Rod w/4 4252G Nuts and 2 4258G Lock Washers
Lockwashers
3/8" Hex Nut

SECTION D-D

Steel Plate on Slotted 10 Ga Rail at Post (4)

DETAIL 1

Post to be refitted in field as approved by the Engineer
Varies with curb type (approx 6 1/2" for Type II Curb & Gutter)
4"max
28"
6 1/4"
21"
3'-6"
Post Length
4'-6" Tube
Width of plate reduced in the field at curb locations as approved by the Engineer

TYPICAL CURB PLACEMENT

21G W-Beam Guardrail
8" 8" 8"
Toe nail
9G W-Beam GR
14"
1'-9"
3101B
4062B
3650G
3340G
3320G
3'-8"

POSTS (7) (8)

(A) 8" (A)
Nested Thrie-Beam both sides at Posts (10) (11) & (12) only
22"
1'-9"
2'-7"
3'-4"

SECTION F-F Post (9) (10) (11) & (12)

9 1/2"
3" 3 1/2" 3"
1 1/4"
7/8" x 2 1/2" slotted holes for 5/8" bolts (typical)
2 3/4"
4"
7 3/16"
7 5/8"
3 3/16"
5"
3/4"
1 1/4"
9606A

BRACKET "A" DETAILS AT C.T.B. (1" ACP Key-in)

1/4" steel plate or section of rectangular tubing with flanges welded on to the satisfaction of the Engineer

Post	(A) Block Width	Product Code	(B) Post Bolt Length	Product Code
9	6 1/2"	3409B	24"	3640G
10	5 1/2"	3408B	22"	3620G
11	4 1/2"	3407B	20"	3600G
12	3 1/2"	3406B	18"	3580G

** Modifications (as approved by the Engineer) in bracket design will be required for other barrier configurations.

SACRIFICIAL

SHEET 1 OF 2

Texas Department of Transportation
Design Division Standard

TRINITY HIGHWAY ENERGY ABSORPTION CRASH CUSHION (CONCRETE BARRIER)

CATCB(1)-17

FILE: catcb17.dgn	DN: TxDOT	CK: KM	DW: BD	CK: VP
©TxDOT: 1997	CONT	SECT	JOB	HIGHWAY
REVISIONS REVISED 03,2016 VP REVISED 03,2017 KM	0467	02	020, ETC.	SH 220
	DIST	COUNTY		SHEET NO.
	FTW	ERATH		66

DATE: 3/21/2024 9:11:01 AM
FILE: ...\ST\TCP\020catcb17.dgn

CATCB FRONT SECTION (POSTS 1 THRU 6)

BILL OF MATERIAL

Mfr Code #	QTY	DESCRIPTION
983G	1	Nose Plate (10 Ga)
984G	2	Side Plate (10 Ga)
31G	2	"W" Beam 12 Ga x 13'-6 1/2"
130A	2	"W" Beam 10 Ga x 13'-6 1/2"
9852A	1	Channel Strut x 6'-6"
740G	6	Steel Foundation Tube
766G	6	Soil Plate 18"x 24"
3075B	1	Wood Post 5 1/2" x 7 1/2" (Notched) (Post 1)
3074B	5	Wood Post 5 1/2" x 7 1/2"(Post 2-6)
3100B	2	Wood Block 5 1/2" x 7 1/2"(Post 1)
3101B	10	Wood Block 5 1/2" x 7 1/2"(Post 2-6)
9916A	1	Sleeve (Post 1)
9915A	1	Spacer Channel (Post 2)
9921G	2	Steel Tube (Posts 4 & 6)
19271G	1	Pipe Sleeve (Post 1)
705G	1	Pipe Sleeve (Post 2)
19261G	2	Post Plate (Post 4)
782G	1	Bearing Plate (Post 1)
3012G	1	Cable Assembly(Posts 1 to 2)
3275G	2	3/8" Restraint Rod(Post 3 & 5)
19259G	32	Plate Washer (Posts 4 & 6)

HARDWARE

3263G	4	3/8" x 2" Lg Lag Screw
4252G	8	3/8" Hex Nut
4258G	4	3/8" Lock Washer
4257G	4	3/8" Flat Washer
3320G	4	Rectangular Washer
3395G	32	5/8" x 1 3/4" H.H. Splice Bolt
3650G	2	5/8" x 25" Lg H.G.R. Bolt
4640G	8	5/8" x 24" Lg H.H. Bolt
3478G	13	5/8" x 7 1/2" Lg H.H. Bolt
3380G	8	5/8" x 1 1/2" Lg H.H. Bolt
3360G	16	5/8" x 1 1/4" Lg H.G.R. Bolt
3340G	85	5/8" H.G.R. Nut
3300G	8	5/8" Flat Washer
3497G	6	5/8" x 9 1/2" Lg H.H. Bolt
3910G	4	1" Hex Nut
3900G	2	1" Flat Washer

CATCB GUARDRAIL TERMINAL END SECTION (POSTS 7 & 8)

BILL OF MATERIAL

Mfr Code #	QTY	DESCRIPTION
4064B	2	Wood Post 5 1/2" x 7 1/2" x 6'
3101B	4	Wood Block 5 1/2" x 7 1/2"
21G	1	"W" Beam Guard Rail (12 Ga)
9G	1	"W" Beam Guard Rail (12 Ga)
701A	1	Bracket
782G	1	Bearing Plate
705G	1	Pipe Sleve
3000G	1	Cable Assembly
3320G	2	Rectangular Washer

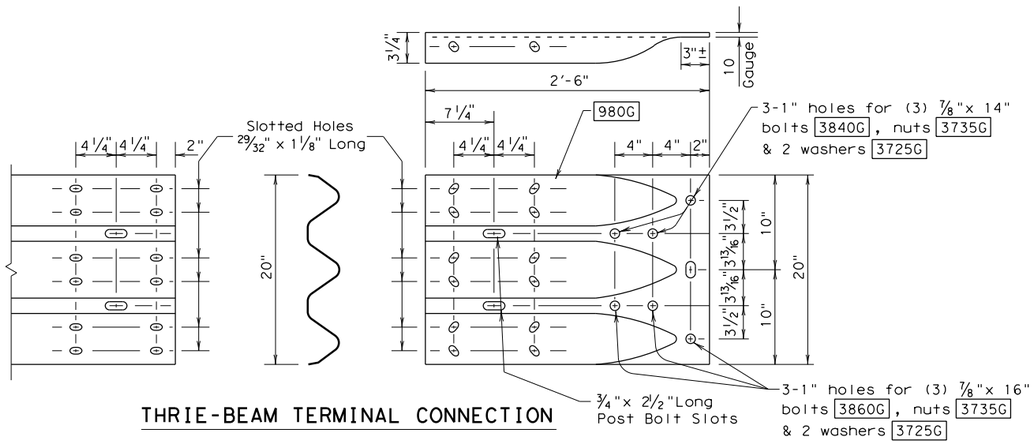
HARDWARE		
3360G	24	5/8" x 1 1/4" H.G.R. Splice Bolt
3400G	4	5/8" x 25" H.G.R. Post Bolt
3380G	8	5/8" x 1 1/2" Hex Hd Bolt
3340G	28	5/8" H.G.R. Nut
3300G	8	5/8" Washer
3910G	4	1" Hex Nut
3900G	2	1" Washer

CATCB TRANSITION SECTION (POST 9 THRU END SHOE)

BILL OF MATERIAL

	Mfr Code #	QTY	DESCRIPTION
	211G	4	Thrie beam 12'-6"(12 Ga)
	974G	2	Trans panel 6'-3"(12 Ga)
	980G	2	Special Thrie beam end shoe
	3078B	3	Wood Post 6"x 8"x 6', (Posts11&12)
	3320G	20	Rectangular Washer
	3340G	62	5/8" H.G.R. Nut
	3400G	52	5/8" x 2" Splice Bolt
	3406B	2	22 1/2" Block 6"x 3 1/2" (Post 12)
	3407B	2	22 1/2" Block 6"x 4 1/2" (Post 11)
	3408B	2	22 1/2" Block 6"x 5 1/2" (Post 10)
	3409B	2	22 1/2" Block 6"x 6 1/2" (Post 9)
	3412B	1	Wood Post 6"x 8"x 6', (Posts 9)
*	3560G	2	5/8" x 16" Bolt
*	4406G	8	5/8" x 3 3/4" Expansion Bolts w/Nuts
	3580G	2	5/8" x 18"Post Bolt (Post 12)
	3600G	2	5/8" x 20"Post Bolt (Post 11)
	3620G	2	5/8" x 22"Post Bolt (Post 10)
	3640G	2	5/8" x 24"Post Bolt (Post 9)
	3725G	12	7/8" Washer (End Shoe Bolts)
	3735G	6	7/8" Hex Nuts (End Shoe Bolts)
	3840G	3	7/8" x 14" Hex Bolt (End Shoe)
	3860G	3	7/8" x 16" Hex Bolt (End Shoe)
	9606A	2	Spacer Bracket
	Delineation		
	3177B	2	Object Marker 18"x 18" (Cut to fit)
	Optional Hardware for Single Slope Barrier-42"		
	3640G	2	5/8" x 24" Bolt
	4896G	6	7/8" x 24" Hex Bolt (End Shoe)

* Expansion or through bolts may be used with optional bracket installation.



THRIE-BEAM TERMINAL CONNECTION

GENERAL NOTES

1. For specific information regarding installation and technical guidance of the system, contact: Trinity Highway at 1(888)323-6374. 70 W. Madison St. Suite 2350. Chicago, IL 60602
2. Crown will be widened to accommodate the CAT system. The crown should extend at least 3 feet beyond the inside face of rail. The ground line at posts should be an extension of the roadway surface crown.
3. All bolts, nuts, washers, cable assemblies, cable anchors, post tubes, backup plates, and soil plates shall be galvanized.
4. The exposed end segment of an "End Section" should be evaluated as a potential obstacle in the determination of the need of MBGF for the opposing direction of traffic.
5. For placement at curb sections, the height from gutter pan to post bolt will be 21", and the front section shall be flared (See Detail 2).
6. The wood blockouts shall be "toe nailed" to the rectangular wood posts to prevent them from turning when the wood shrinks.
7. Either 6"- 8" or 5 1/2"x 7 1/2" wood blocks may be used at posts 1 thru 8 as supplied by the manufacturer.
8. If a "single sided" transition section is required for the attachment to a rigid concrete rail, see the MBGF transition standards for the proper installation.
9. Object markers shall be installed on the front of the terminal as detailed on the D&OM(VIA).

SACRIFICIAL

SHEET 2 OF 2

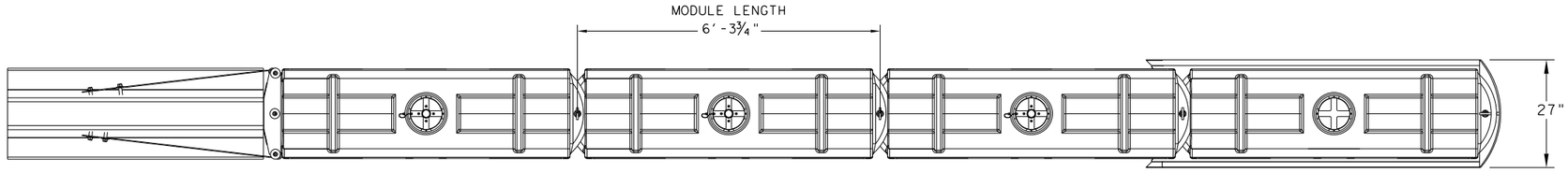
Texas Department of Transportation

Design Division Standard

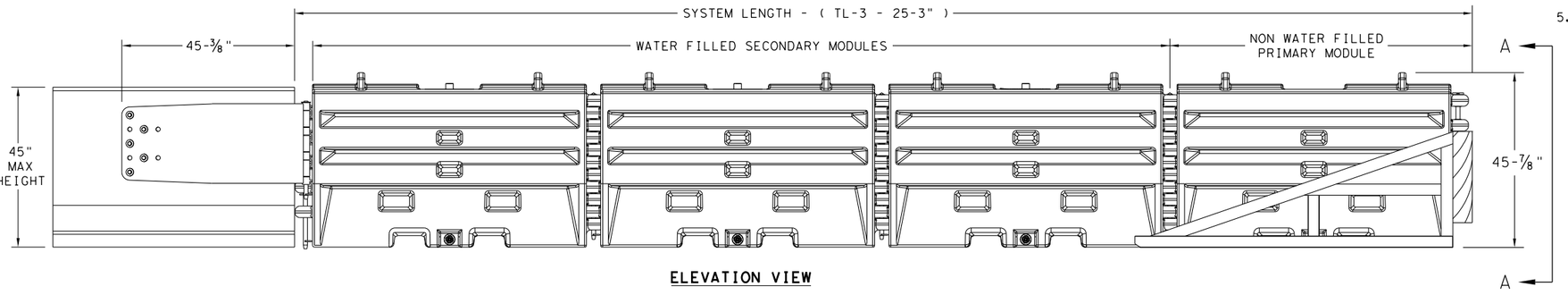
TRINITY HIGHWAY ENERGY ABSORPTION CRASH CUSHION (CONCRETE BARRIER)

CATCB(1)-17

FILE: catcb17.dgn	DN: TxDOT	CK: KM	DW: BD	CK: VP
© TxDOT: 1997	CONT	SECT	JOB	HIGHWAY
REVISIONS REVISED 03,2016 VP REVISED 03,2017 KM	0467	02	020, ETC.	SH 220
	DIST	COUNTY		SHEET NO.
	FTW	ERATH		67



PLAN VIEW



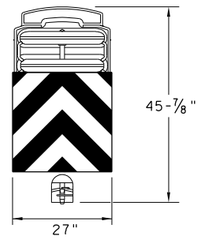
ELEVATION VIEW

GENERAL NOTES

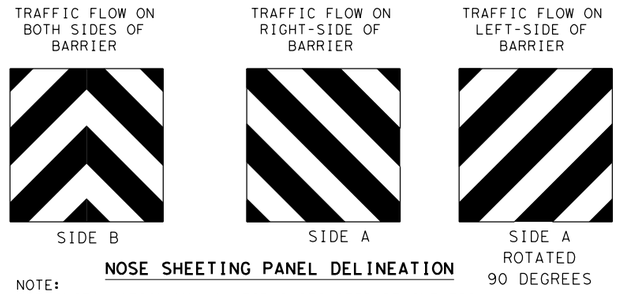
1. REFER TO THE INSTALLATION MANUAL FOR SPECIFIC SYSTEM ASSEMBLY AND MODULE ORIENTATION. FOR ADDITIONAL INFORMATION, CONTACT TRAFFIX, INC. AT (949) 361-5663.
2. THE SLED SYSTEM IS A MASH APPROVED TEST LEVEL 3 (TL-3) CRASH CUSHION APPROVED FOR USE IN TEMPORARY WORK ZONES. THE SLED SYSTEM IS A NON-REDIRECTIVE,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

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

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

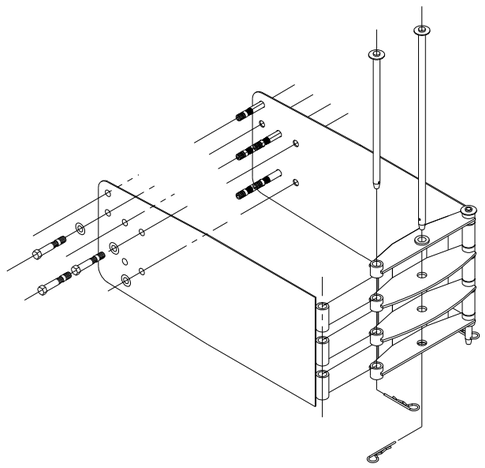


SECTION A-A



NOSE SHEETING PANEL DELINEATION

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



SLED TRANSITION COMPONENTS FOR ATTACHMENT TO CMB

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

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

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

SACRIFICIAL

BILL OF MATERIAL

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

Texas Department of Transportation

Design Division Standard

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

FILE: sled19.dgn	DN: TxDOT	CK: KM	DW: VP	CK:
© TxDOT: DECEMBER 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0467	02	020, ETC.	SH 220
	DIST	COUNTY		SHEET NO.
	FTW	ERATH		68

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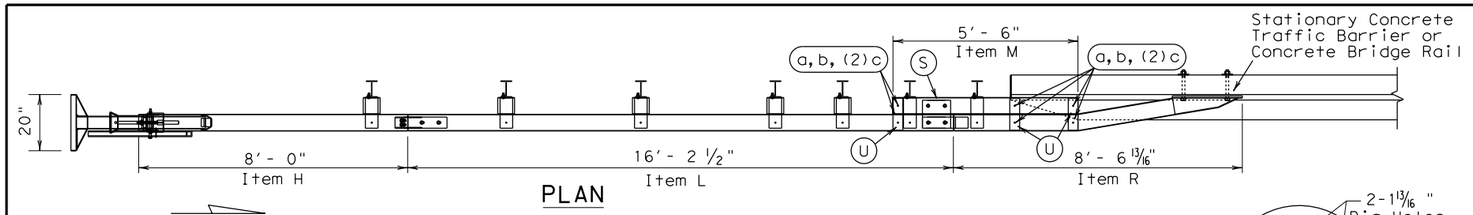
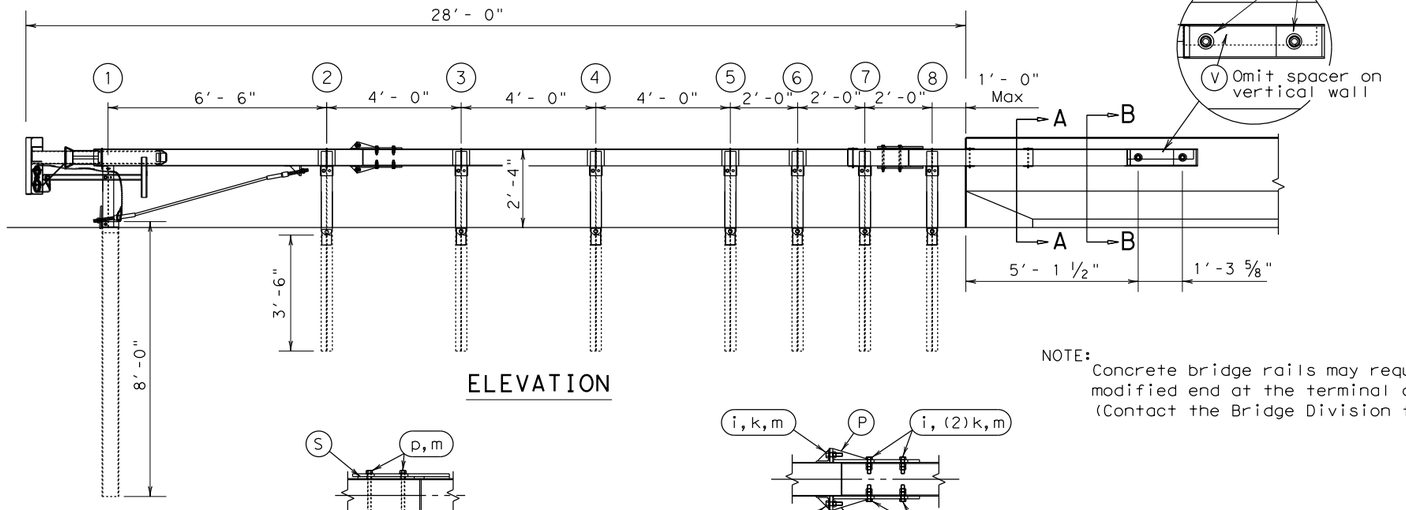


PLAN

Direction of Traffic



ELEVATION

NOTE:
Concrete bridge rails may require a modified end at the terminal connection. (Contact the Bridge Division for details.)

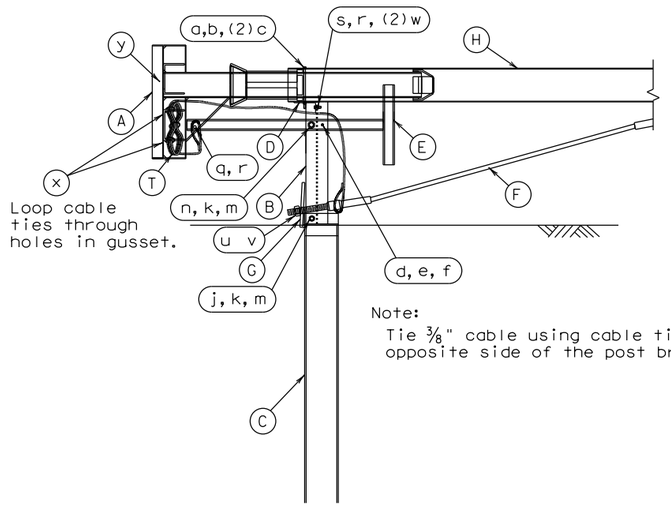
SPLICE PLATE DETAIL

END SPLICE PLATE DETAIL

GENERAL NOTES

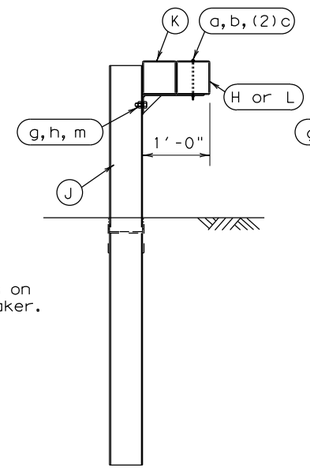
1. For specific information regarding installation and technical guidance of the system, contact: Road Systems, Inc., at (330)346-0721. 3616 Old Howard County Airport. Big Springs, TX 79720
2. Due to the Single-Sided design, the BEAT-SSCC is not appropriate for use at locations where backside hits towards the rigid concrete barrier are possible, e.g. In gore areas, or in narrow median locations where backside opposite direction hits are likely.
3. All bolts, nuts, cable assemblies, cable anchors, bearing plate, tubing, post, impact heads, and other steel components shall be galvanized, unless otherwise noted.
4. The breakaway cable assembly must be taut. A locking device, (vice grips or channel lock pliers) should be used to prevent the cable from twisting when tightening the nuts.
5. When site conditions permit, posts may be driven. The lower section of post #1 should not be driven with the upper post section attached. If posts are placed in a drilled hole, the backfill material must be satisfactorily compacted to prevent settlement.
6. If rock excavation is encountered, see manufacturer's installation booklet for installation recommendations.
7. Post shall not be set full depth in concrete.
8. The appropriate connection of the SSCC to the stationary rigid structure is a critical component to insure proper performance of the system. The length of the 1" bolts used to attach the system to the rigid structure will vary with the wall thickness and will need to be determined in the field.
9. The approach area in front of the SSCC and the area within the system itself shall be free of fixed obstacles greater than 4 inches in height and have a fill slope or a cut slope of 1V:10H or flatter.
10. Unless otherwise shown in the plans, SSCC rail placed in the vicinity of curbs shall be blocked out so that the face of curb is located directly below the face of rail. The steel posts shall be installed at the proper ground elevation above the gutter pan or roadway surface. Curbs located along or in front of the SSCC system shall not be greater than 4 inches in height.
11. An object marker shall be installed on the front of the impact head as detailed on D & OM(VIA).

ITEM	QTY	DESCRIPTION
A	1	Box-Beam Impact Head
B	1	Upper End Post (A1) W6 x 9 x 1′-9 ½" LG.
C	1	Lower End Post (A4) W6 x 15 x 8′-0" LG.
D	1	Support Bracket (B1) L4 x 2 x 4" LG.
E	1	Post Breaker (A2) Welded TS2 x 2 x ¼"
F	1	Cable Anchor Assembly
G	1	Cable Anchor Bearing Plate
H	1	End Tube Rail (A5) x 8′-0" LG.
J	7	Steel Breakaway Post W6 x 9 x 6′-0" LG.
K	5	Support Bracket w/ Blockout (A9) TS6 x 6 w/ Bent PL.
L	1	Second Rail (A11) x 16′-2 ½" LG.
M	1	Transition Blockout (A6) x 5′-6" LG.
N	2	Trans. Support Bracket (A10) 3/16" Bent PL. w/ Gusset
P	2	End Section Splice Plate (A3) - Detail Below
Q	2	1" Square Washer (B10) PL 4 x 4 x ¼"
R	1	Anchor Rail (A13) x 8′-6 15/16 "LG.
S	2	Splice Plate (A12) PL 10 x 10 x 3/8" Detail Below
T	1	3/8" GALV. Cable x 20′-0" (A14)
U	6	Tie Plate (C10) PL 11 ½" x 3 ½"x 3/16"
V	1	Spacer (D10) (OMIT ON VERTICAL WALL)
		HARDWARE
a	14	5/16" x 7 ½" Hex Bolt (A449)
b	14	5/16" Hex Nut
c	28	5/16" Washer
d	1	¼" x 3" Hex Bolt (A449)
e	1	¼" Hex Nut
f	1	¼" Washer
g	7	5/8" x 1 ½" Bolt (A307)
h	7	5/8" Recess Nut
j	8	5/8" x 2" Hex Bolt (A325 or A449)
j	1	5/8" x 8" Hex Bolt (A325 or A449)
k	18	5/8" Hex Nut
m	25	5/8" Washer
n	1	5/8" x 3" Hex Bolt (A325 or A449)
p	4	5/8" x 9" Hex Bolt (A325 or A449)
q	1	½" x 5" Hex Bolt (A325 or A449)
r	2	½" Hex Nut
s	1	½" x 2" Hex Bolt (A307, A325 or A449)
t	2	1" x 10"Hex Bolt(A325 or A449)(Length Varies w/Wall Sect)
u	4	1" Hex Nut (2H Heavy Hex Nut)
v	4	1" Washer Structural Washer
w	2	½" Washer
x	2	Cable Tie
y	1	Object Marker

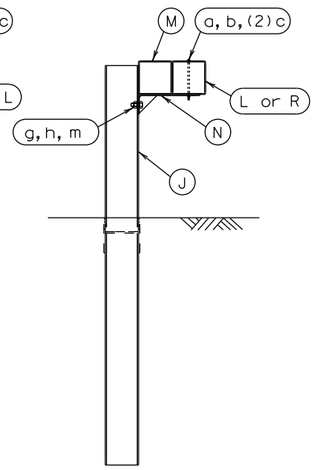


Note:
Tie 3/8" cable using cable ties on opposite side of the post breaker.

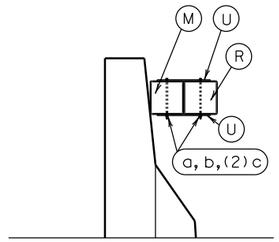
POSTS 1
IMPACT HEAD DETAIL



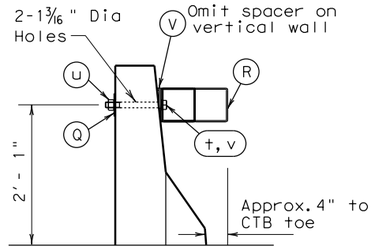
POSTS 2 THRU 6



POSTS 7 & 8



SECTION A-A



SECTION B-B

Texas Department of Transportation

Design Division Standard

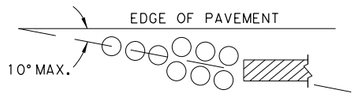
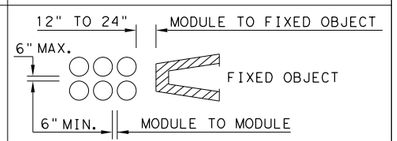
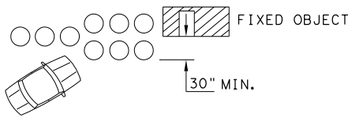
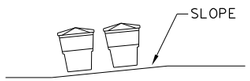
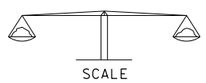
ROAD SYSTEMS INC CRASH CUSHION (BEAT)

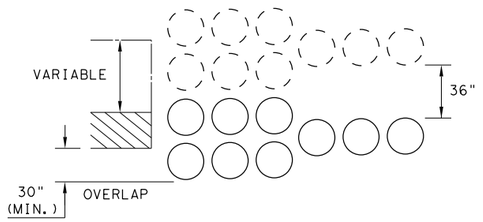
SSCC-16

FILE: sscc16.dgn	DN: TxDOT	CK: KM	DW: BD	CK: VP
©TxDOT April 2003	CONT	SECT	JOB	HIGHWAY
REVISIONS	0467	02	020, ETC.	SH 220
REVISED 03,2016 (VP)	DIST	COUNTY		SHEET NO.
	FTW	ERATH		69

DATE: 3/21/2024
FILE: ...\ST\TCP\020viasfpm19.dgn

SITE CONDITIONS AND PLACEMENT GUIDELINES

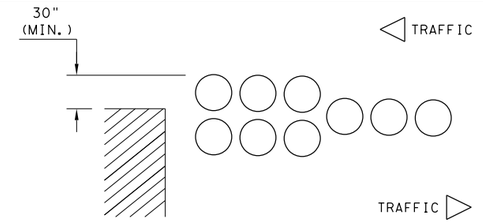
CONDITION	RECOMMENDATION	ILLUSTRATION
1. ANGLE OF ARRAY IN RELATION TO CENTER LINE OF OBSTACLE	NOT RECOMMENDED FOR MORE THAN 10°	
2. MODULE SPACING: MODULE TO FIXED OBJECT MODULE TO MODULE	 12" TO 24" SEE DIAGRAM	
3. BI-DIRECTIONAL TRAFFIC	OFFSET ARRAY TO AVOID REAR CORNER MODULE SNAGGING, POTENTIAL BY TRAFFIC IN THE UPSTREAM DIRECTION OF FLOW.	SEE (DETAIL B) SHOWING BI-DIRECTIONAL TRAFFIC
4. "COFFIN" CORNER	SHIELD 30" MINIMUM OUTSIDE OF FIXED OBJECT	
5. SLOPING SITES: LATERAL AND LONGITUDINAL FOR MORE INFORMATION READ GENERAL NOTE: 7	1:10 MAXIMUM (V: H:)	
6. CURB: RAISED ISLAND:	NO MORE THAN 4" HIGH (REMOVE IF POSSIBLE)	
7. FOUNDATION PADS:	FLAT SURFACE: CONCRETE OR ASPHALT	
8. MAINTENANCE:	KEEP SITE CLEAR OF TRASH, ROAD DEBRIS, ETC	
9. SAND DENSITIES	100 LBS / CF	
10. VANDALISM	CHECK PERIODICALLY FOR DAMAGES, GRAFFITI.	



MODULE PLACEMENT FOR FIXED OBJECT OF VARIABLE WIDTH

DETAIL A

SEE GENERAL NOTE 2



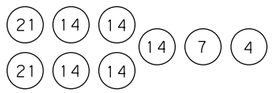
MODULE PLACEMENT FOR BI-DIRECTIONAL TRAFFIC

DETAIL B

SEE GENERAL NOTE 2

TYPICAL MODULE ARRAYS WITH CORRESPONDING DESIGN SPEED AND SAND WEIGHT (X 100 LB) SHOWN IN CIRCLES.

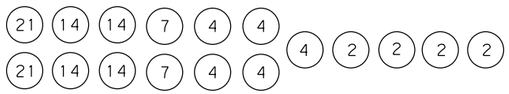
CONFIGURATION = 12,300 LB



TL-2

TL-2 = 45 MPH OR LOWER

CONFIGURATION = 14,000 LB



TL-3

TL-3 = 50 MPH OR GREATER

TYPICAL MODULE ARRAY

NOTE: MODULE ARRAYS SHOWN ARE THE MINIMUM DESIGNS REQUIRED. SITE SPECIFIC VARIATIONS OF THESE DESIGNS WILL REQUIRE ADDITIONAL DETAILS WITH AN ENGINEER'S SEAL.

GENERAL NOTES

1. FOR SPECIFIC INFORMATION REGARDING INSTALLATION AND TECHNICAL GUIDANCE OF THE AVAILABLE MASH COMPLIANT SYSTEMS, CONTACT: TrafFix DEVICES, INC. AT (949) 361-5663 OR PSS INNOVATIONS, INC. AT (800) 662-6338.
2. REAR MODULES SHOULD OVERLAP THE HAZARDOUS FIXED OBJECT IN WIDTH ON EACH SIDE BY A MINIMUM OF 30 INCHES. SEE DETAILS A, B.
3. BARRIERS CAN BE INSTALLED AT ANY DISTANCE FROM THE SHOULDER, AT ROADSIDE AND MEDIAN LOCATIONS FROM ZERO FT UP TO 30 FT, DEPENDING UPON THE LOCATION OF THE HAZARDOUS FIXED OBJECT.
4. ANGLING THE BARRIER TOWARDS ON-COMING TRAFFIC IS SUGGESTED, 3-DEGREES UP TO 10-DEGREES DEPENDING ON SPACE AVAILABLE.
5. WHENEVER POSSIBLE, CURBS 4 INCHES AND HIGHER SHOULD BE REMOVED FROM THE HAZARDOUS SITES. HOWEVER, WHEN REMOVAL IS NOT POSSIBLE, MODULES CAN BE SEPARATED ALONG THE BARRIER AXIS TO FIT THE SITUATION.
6. LONGITUDINAL SPACING OF MODULES MAY BE INCREASED WHERE SPACE PERMITS, E.G., 2 FT UP TO 3 FT SPACING OF SELECTED MODULES MAY PERMIT THE DESIGNER TO USE ALL THE SPACE ALLOCATED FOR AN ENERGY-ABSORBING BARRIER.
7. THE ENTIRE AREA OF THE CRASH CUSHION INSTALLATION AND APPROACHES SHALL BE GRADED SO THAT THE MAXIMUM SLOPE DOES NOT EXCEED 1V:10H VERTICALLY OR HORIZONTALLY IN ANY DIRECTION.
8. WHERE REQUIRED, SUPPORT PADS, CONCRETE, ASPHALT, ETC, WILL BE MEASURED AND PAID FOR IN ACCORDANCE WITH PERTINENT BID ITEMS.
9. TrafFIX DEVICES AND PSS INNOVATIONS SAND BARREL SYSTEMS HAVE BEEN ASSESSED AS MASH COMPLIANT.

SACRIFICIAL

Texas Department of Transportation

Design Division Standard

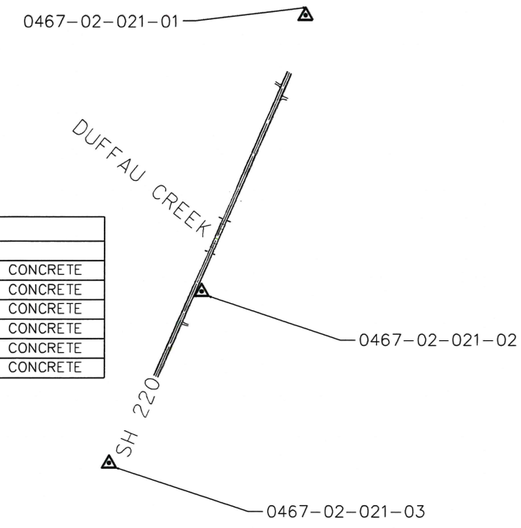
VEHICLE IMPACT ATTENUATOR SAND FILLED PLASTIC MODULES MASH TL-3 & TL-2

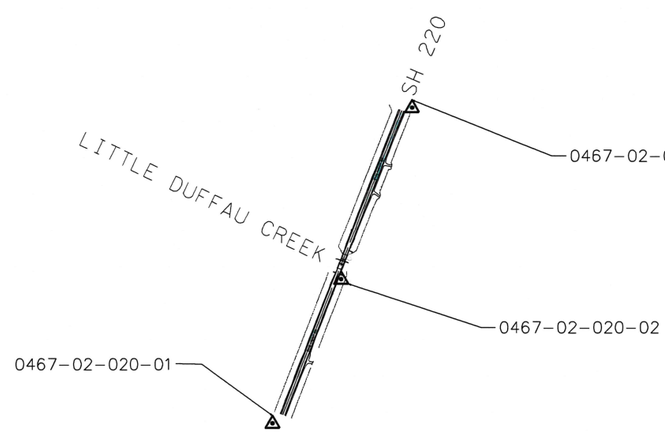
VIA(SFPM)-19

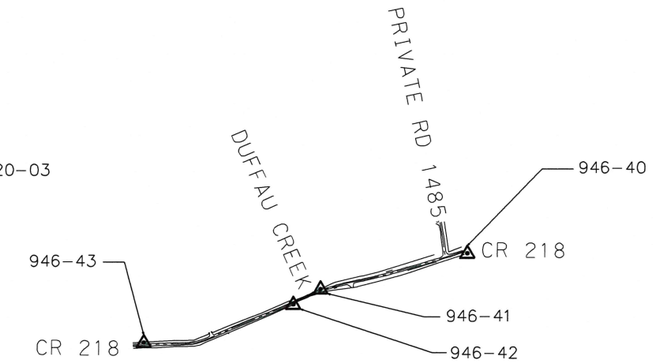
FILE: viasfpm19.dgn	DN: TxDOT	CK: KM	DW: VP	CK: CL		
©TxDOT: DECEMBER 2019	CONT	SECT	JOB		HIGHWAY	
REVISIONS	0467	02	020, ETC.		SH 220	
	DIST	COUNTY			SHEET NO.	
	FTW	ERATH			70	

PRIMARY CONTROL POINTS

CONTROL	SURFACE COORDINATES			GRID COORDINATES		
POINT	NORTHING	EASTING	ELEVATION	NORTHING	EASTING	DESCRIPTION
0467-02-020-01	6,694,278.648	2,119,925.412	1,079.12'	6,693,877.015	2,119,798.224	3 1/2" ALUMINUM DISC IN CONCRETE
0467-02-020-02	6,695,230.480	2,120,376.700	1,042.32'	6,694,828.790	2,120,249.485	3 1/2" ALUMINUM DISC IN CONCRETE
0467-02-020-03	6,696,363.708	2,120,838.364	1,073.69'	6,695,961.950	2,120,711.121	3 1/2" ALUMINUM DISC IN CONCRETE
0467-02-021-01	6,701,954.928	2,123,124.681	1,080.79'	6,701,552.835	2,122,997.301	3 1/2" ALUMINUM DISC IN CONCRETE
0467-02-021-02	6,700,139.679	2,122,437.333	1,052.70'	6,699,737.695	2,122,309.994	3 1/2" ALUMINUM DISC IN CONCRETE
0467-02-021-03	6,699,009.451	2,121,828.358	1,071.14'	6,698,607.534	2,121,701.056	3 1/2" ALUMINUM DISC IN CONCRETE







SECONDARY CONTROL POINTS

CONTROL	SURFACE COORDINATES			GRID COORDINATES		
POINT	NORTHING	EASTING	ELEVATION	NORTHING	EASTING	DESCRIPTION
946-40	6,695,493.656	2,125,703.603	1055.88'	6,695,091.950	2,125,576.068	5/8" IRON ROD W/ PLASTIC YELLOW CAP
946-41	6,695,257.658	2,124,730.848	1025.11'	6,694,855.967	2,124,603.372	5/8" IRON ROD W/ PLASTIC YELLOW CAP
946-42	6,695,156.900	2,124,550.902	1024.83'	6,694,755.214	2,124,423.436	5/8" IRON ROD W/ PLASTIC YELLOW CAP
946-43	6,694,904.500	2,123,563.960	1023.79'	6,694,502.830	2,123,436.554	5/8" IRON ROD W/ PLASTIC YELLOW CAP

500 0 500 1,000
GRAPHIC SCALE IN FEET

PLEASE REFER TO BAR SCALE. DRAWING MAY HAVE BEEN REDUCED OR ENLARGED.
IF PRINTED ON A 11 X 17 USE 1" = 1,000'
IF PRINTED ON A 22 X 34 USE 1" = 500'

NOTES:

HORIZONTAL COORDINATES SHOWN HEREON ARE REFERENCED TO THE TEXAS COORDINATE SYSTEM OF 1983, NORTH CENTRAL ZONE 4202 AND ARE BASED ON THE NORTH AMERICAN DATUM OF 1983, 2011 ADJUSTMENT (NAD83 2011), AND WERE DERIVED FROM THE TXDOT REAL TIME NETWORK UTILIZING VIRTUAL REFERENCE STATION METHODOLOGIES IN FEBRUARY OF 2022. ALL SURFACE DISTANCES AND COORDINATES SHOWN HEREON MAY BE CONVERTED TO GRID VALUES BY MULTIPLYING THE SURFACE VALUES BY A COMBINED SCALE FACTOR OF 0.9999400036, OR BY DIVIDING THOSE SURFACE VALUES BY THE ERATH COUNTY SURFACE ADJUSTMENT FACTOR OF 1.00006.

I HEREBY CERTIFY THAT THE HORIZONTAL AND VERTICAL DATA SHOWN HEREON WERE DETERMINED FROM MULTIPLE GNSS OBSERVATIONS MADE UTILIZING TXDOT'S VIRTUAL REFERENCE NETWORK AND FROM DIFFERENTIAL LEVELING, IN FEBRUARY OF 2022 AND ARE AS SHOWN HEREON.

10/20/22

Scott M. Posey
Registered Professional Land Surveyor
No. 5350

CONTROL POINT LEGEND

PRIMARY CONTROL POINT:
5/8" IRON ROD WITH ALUMINUM CAP IN CONCRETE STAMPED "TEXAS DEPT OF TRANSPORTATION CONTROL POINT" PROVIDED BY TxDOT

SECONDARY CONTROL POINT:
A 5/8" IRON ROD WITH PLASTIC YELLOW CAP STAMPED "LAMB-STAR CONTROL"

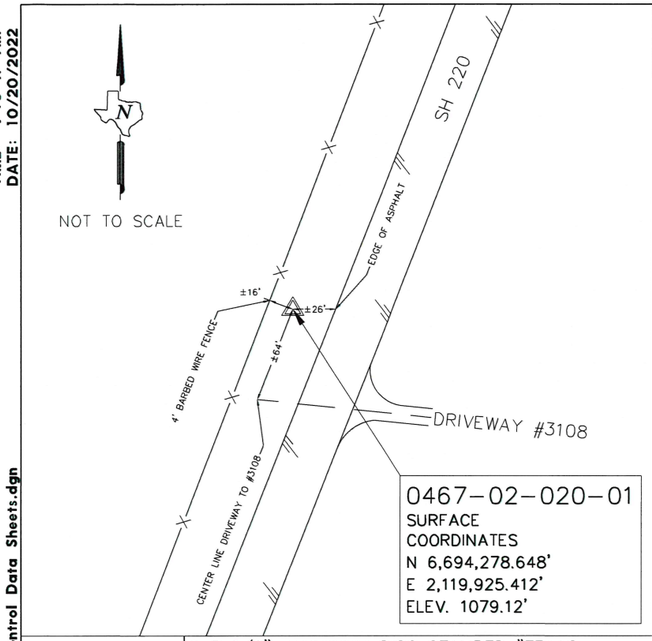
LAMB-STAR ENGINEERING, L.L.C.
5700 W. PLANO PARKWAY, SUITE 1000
PLANO, TEXAS 75093
TBPLS # 10048300

SH 220

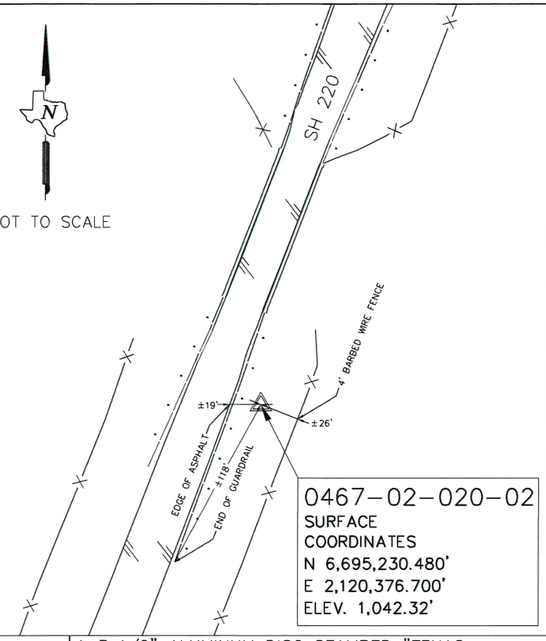
CONTROL DATA
INDEX SHEET

SHEET 1 OF 3

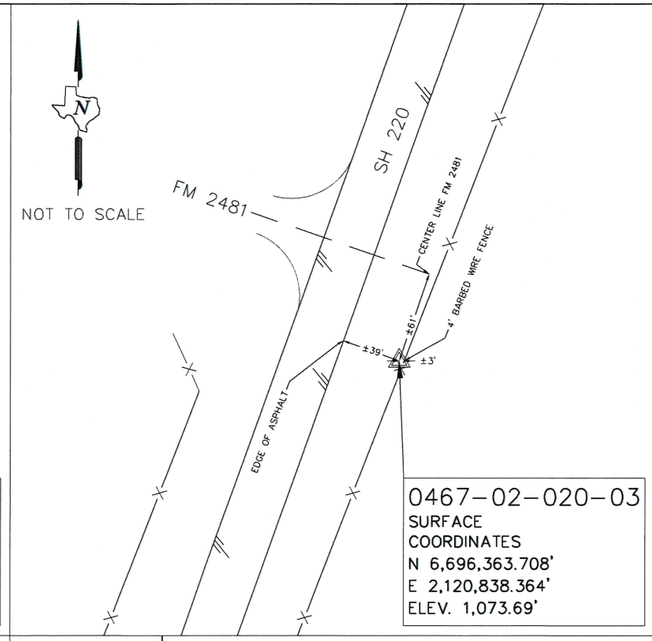
DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NUMBER		HIGHWAY NO.
CHECK	6	(See Title Sheet)		220
	STATE	DISTRICT	COUNTY	SHEET NO.
GRAPHICS	TEXAS	FW	ERATH	71
CHECK	CONTROL	SECTION	JOB	
	0467	02	020, 021	



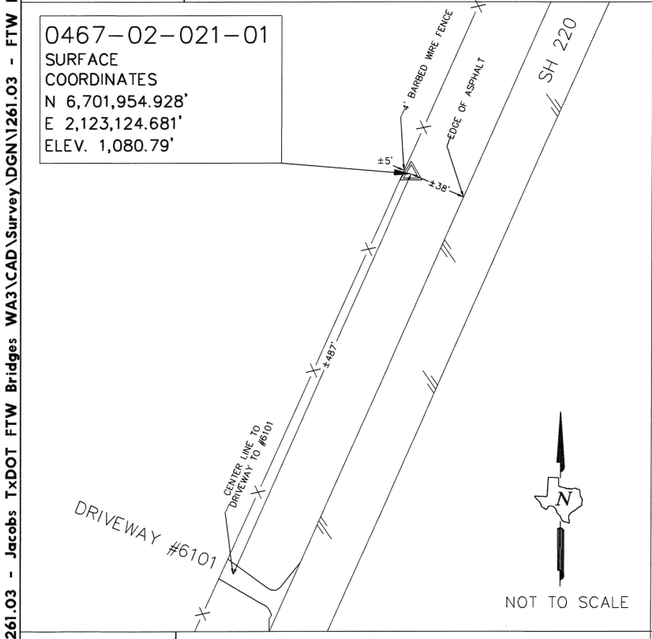
STAMPED 0467-02-020 01	A 3 1/2" ALUMINUM DISC STAMPED "TEXAS DEPARTMENT OF TRANSPORTATION CONTROL MARK 0467-02-020-01" SET IN CONCRETE ON WEST SIDE OF SH 220, NORTH OF CR 218 ±820', ±64' NORTH OF THE CENTER LINE OF THE DRIVEWAY TO #3108, ±26' WEST OF THE EDGE OF ASPHALT, ±16' EAST OF A 4' BARBED WIRE FENCE



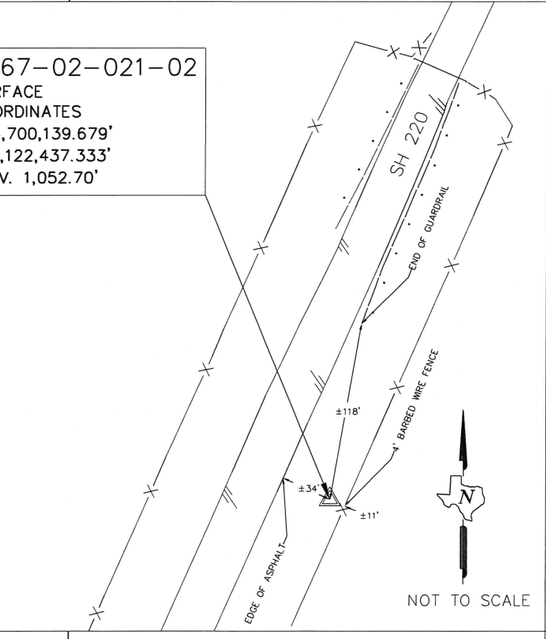
STAMPED 0467-02-020 02	A 3 1/2" ALUMINUM DISC STAMPED "TEXAS DEPARTMENT OF TRANSPORTATION CONTROL MARK 0467-02-020-02" SET IN CONCRETE ON EAST SIDE OF SH 220 SOUTH OF FM 2481 1285'±, ±118' NORTH OF THE END OF GUARDRAIL, ±28' WEST OF A 4' BARBED WIRE FENCE, ±19' EAST OF THE EDGE OF ASPHALT



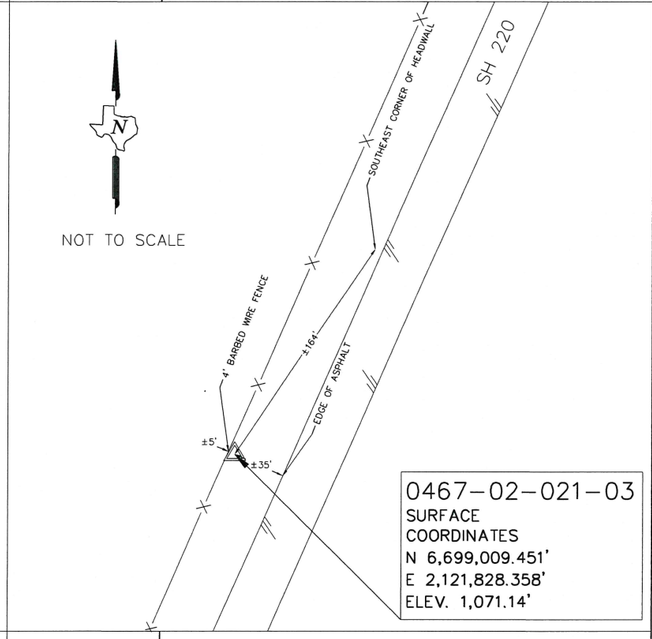
STAMPED 0467-02-020 03	A 3 1/2" ALUMINUM DISC STAMPED "TEXAS DEPARTMENT OF TRANSPORTATION CONTROL MARK 0467-02-020-03" SET IN CONCRETE ON EAST SIDE OF SH 220 SOUTH OF FM 2481 61'±, ±39' EAST OF A EDGE OF ASPHALT, ±3' WEST OF A 4' BARBED WIRE FENCE,



STAMPED 0467-02-021 01	A 3 1/2" ALUMINUM DISC STAMPED "TEXAS DEPARTMENT OF TRANSPORTATION CONTROL MARK 0467-02-021-01" SET IN CONCRETE ON WEST SIDE OF SH 220 SOUTH OF PRIVATE RD. 1474 845'±, ±487' NORTH OF THE CENTER LINE OF THE DRIVEWAY TO #6101, ±38' WEST OF THE EDGE OF ASPHALT, ±5' EAST OF A 4' BARBED WIRE FENCE



STAMPED 0467-02-021 02	A 3 1/2" ALUMINUM DISC STAMPED "TEXAS DEPARTMENT OF TRANSPORTATION CONTROL MARK 0467-02-021-02" SET IN CONCRETE ON EAST SIDE OF SH 220 NORTH OF PRIVATE RD. 1476 2130'±, ±118' SOUTH OF THE END OF GUARDRAIL, ±34' EAST OF THE EDGE OF ASPHALT, ±11' WEST OF A 4' BARBED WIRE FENCE



STAMPED 0467-02-021 03	A 3 1/2" ALUMINUM DISC STAMPED "TEXAS DEPARTMENT OF TRANSPORTATION CONTROL MARK 0467-02-021-03" SET IN CONCRETE ON WEST SIDE OF SH 220 NORTH OF PRIVATE RD. 1476 865'±, ±164' SW OF THE SE CORNER OF A HEADWALL, ±35' WEST OF THE EDGE OF ASPHALT, ±5' EAST OF A 4' BARBED WIRE FENCE

NOTES:

HORIZONTAL COORDINATES SHOWN HEREON ARE REFERENCED TO THE TEXAS COORDINATE SYSTEM OF 1983, NORTH CENTRAL ZONE 4202 AND ARE BASED ON THE NORTH AMERICAN DATUM OF 1983, 2011 ADJUSTMENT (NAD83 2011), AND WERE DERIVED FROM THE TXDOT REAL TIME NETWORK UTILIZING VIRTUAL REFERENCE STATION METHODOLOGIES IN FEBRUARY OF 2022. ALL SURFACE DISTANCES AND COORDINATES SHOWN HEREON MAY BE CONVERTED TO GRID VALUES BY MULTIPLYING THE SURFACE VALUES BY A COMBINED SCALE FACTOR OF 0.9999400036, OR BY DIVIDING THOSE SURFACE VALUES BY THE ERATH COUNTY SURFACE ADJUSTMENT FACTOR OF 1.00006.

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STATE OF TEXAS REGISTERED
SCOTT M. POSEY
5350
PROFESSIONAL LAND SURVEYOR

10/20/22

Scott M. Posey
Registered Professional Land Surveyor
No. 5350

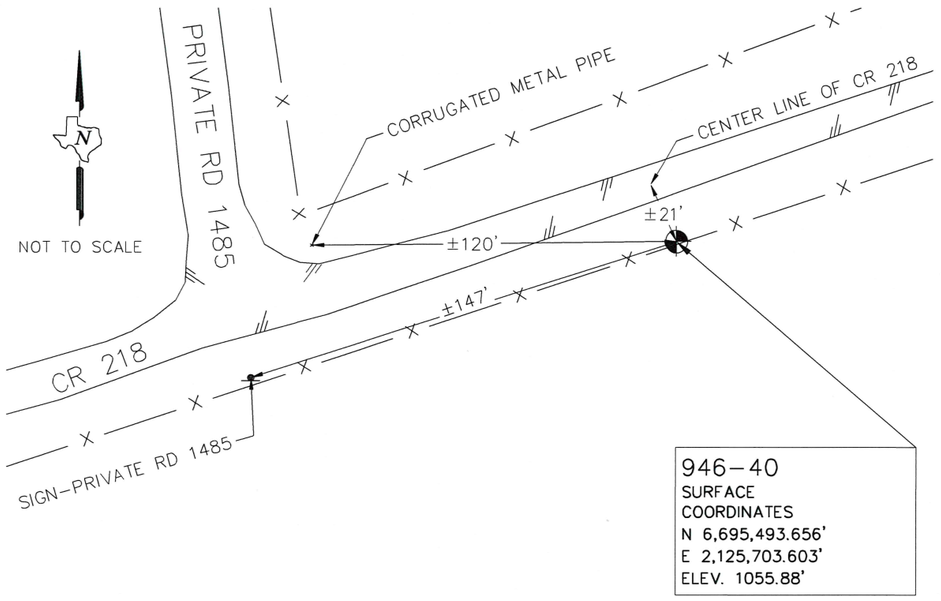
LAMB-STAR ENGINEERING, L.L.C.
5700 W. PLANO PARKWAY, SUITE 1000
PLANO, TEXAS 75093
TBPLS # 10048300

Texas Department of Transportation

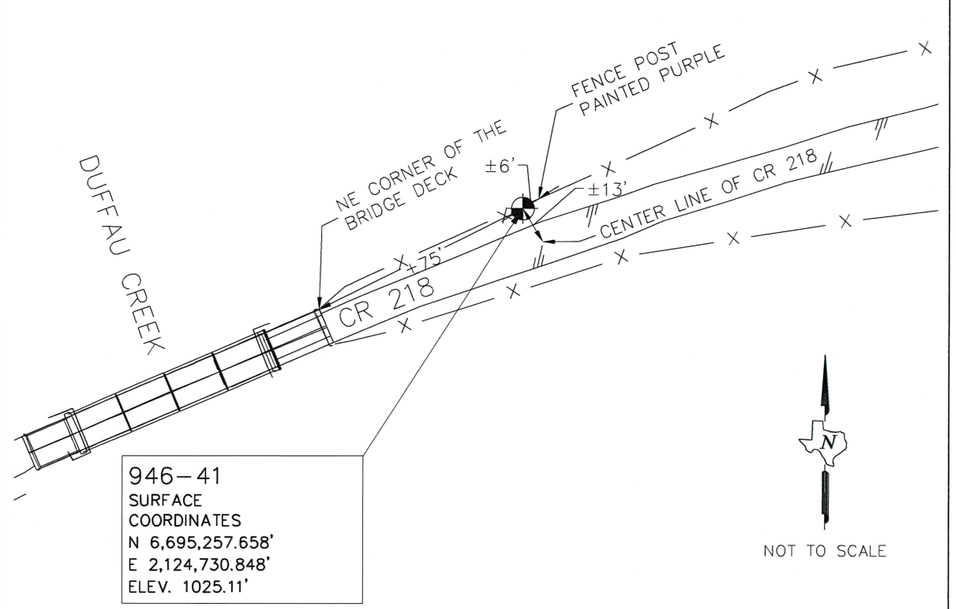
SH 220

HORIZONTAL AND VERTICAL CONTROL

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NUMBER		HIGHWAY NO.
CHECK	6	(See Title Sheet)		220
	STATE	DISTRICT	COUNTY	SHEET NO.
GRAPHICS	TEXAS	FW	ERATH	72
CHECK	CONTROL	SECTION	JOB	
	0467	02	020, 021	



946–40	A 5/8" IRON ROD WITH PLASTIC YELLOW CAP STAMPED "LAMB–STAR CONTROL" SET ON THE SOUTH SIDE OF CR 218, ±148' SE OF PRIVATE RD 1485, ±147' NE OF A SIGN–"PRIVATE RD 1485", ±120' SE OF A CORRUGATED METAL PIPE, ±21' SE OF THE CENTER LINE OF CR 218



946–41	A 5/8" IRON ROD WITH PLASTIC YELLOW CAP STAMPED "LAMB–STAR CONTROL" SET ON THE SOUTH SIDE OF CR 218, ±854' SW OF PRIVATE RD 1485, ±75' NE OF THE NE CORNER OF THE BRIDGE DECK, ±6' SW FENCE POST PAINTED PURPLE, ±13' NW OF THE CENTER LINE OF CR 218

NOTES:

HORIZONTAL COORDINATES SHOWN HEREON ARE REFERENCED TO THE TEXAS COORDINATE SYSTEM OF 1983, NORTH CENTRAL ZONE 4202 AND ARE BASED ON THE NORTH AMERICAN DATUM OF 1983, 2011 ADJUSTMENT (NAD83 2011), AND WERE DERIVED FROM THE TXDOT REAL TIME NETWORK UTILIZING VIRTUAL REFERENCE STATION METHODOLOGIES IN FEBRUARY OF 2022. ALL SURFACE DISTANCES AND COORDINATES SHOWN HEREON MAY BE CONVERTED TO GRID VALUES BY MULTIPLYING THE SURFACE VALUES BY A COMBINED SCALE FACTOR OF 0.9999400036, OR BY DIVIDING THOSE SURFACE VALUES BY THE ERATH COUNTY SURFACE ADJUSTMENT FACTOR OF 1.00006.

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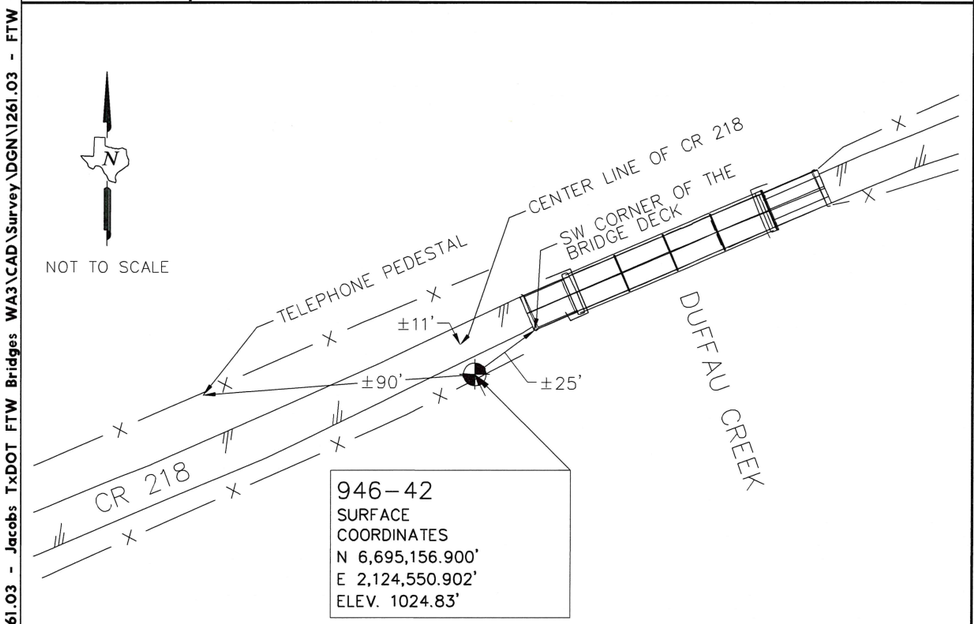
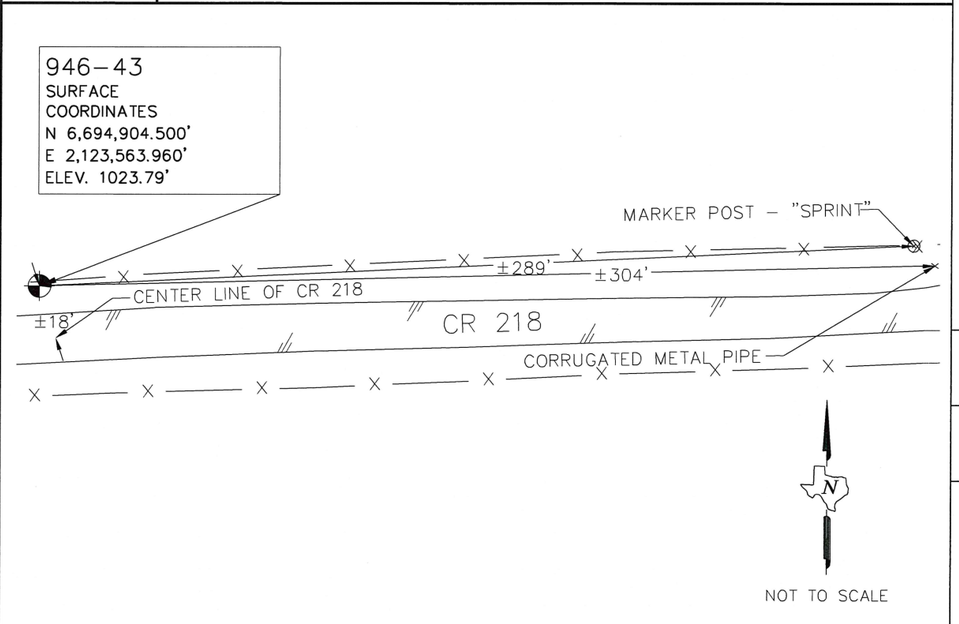
STATE OF TEXAS
REGISTERED
SCOTT M. POSEY
5350
PROFESSIONAL
LAND SURVEYOR

10/20/22

Scott M. Posey
Registered Professional Land Surveyor
No. 5350



949–42	A 5/8" IRON ROD WITH PLASTIC YELLOW CAP STAMPED "LAMB–STAR CONTROL" SET ON THE SOUTH SIDE OF CR 218, ±1055' SW OF PRIVATE RD 1485, ±90' EAST OF A TELEPHONE PEDESTAL, ±25' SW OF THE SW CORNER OF THE BRIDGE DECK, ±11' SE OF THE CENTER LINE OF CR 218



949–43	A 5/8" IRON ROD WITH PLASTIC YELLOW CAP STAMPED "LAMB–STAR CONTROL" SET ON THE SOUTH SIDE OF CR 218, ±2086' SW OF PRIVATE RD 1485, ±304' WEST OF A CORRUGATED METAL PIPE, ±289' WEST OF A MARKER POST – "SPRINT", ±18' NW OF THE CENTER LINE OF CR 218

LAMB–STAR ENGINEERING, L.L.C.
5700 W. PLANO PARKWAY, SUITE 1000
PLANO, TEXAS 75093
TBPLS # 10048300

Texas Department of Transportation

SH 220

HORIZONTAL AND VERTICAL CONTROL

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NUMBER		HIGHWAY NO.
CHECK	6	(See Title Sheet)		220
	STATE	DISTRICT	COUNTY	SHEET NO.
GRAPHICS	TEXAS	FW	ERATH	73
CHECK	CONTROL	SECTION	JOB	
	0467	02	020, 021	

TIME: 1:18:09 PM
DATE: 6/12/2024

SH 220 AT LITTLE DUFFAU CREEK

Beginning chain SH220LDC description
Feature: Geom*Centerline

Point 15	N 6,694,333.6769	E 2,119,994.1314	Sta	180+13.3485
Course from 15 to 16 N 21° 06′ 00.00" E Dist 2,156.0767				
Point 16	N 6,696,345.1962	E 2,120,770.3121	Sta	201+69.4251

Ending chain SH220LDC description

SH 220 AT DUFFAU CREEK

Beginning chain SH220DC description
Feature: Geom_Centerline

Point 17	N 6,699,578.8346	E 2,122,136.6421	Sta	236+81.6723
Course from 17 to 18 N 23° 48′ 00.00" E Dist 2,186.6351				
Point 18	N 6,701,579.5175	E 2,123,019.0484	Sta	258+68.3074

Ending chain SH220DC description

Jacobs Engineering Group
STATE OF TEXAS
PAUL K. CLARK
99509
LICENSED
PROFESSIONAL ENGINEER
F-2966
7/9/2024

Jacobs
1999 BRYAN ST, SUITE 3500
DALLAS, TX 75201-3136
Phone: +1 (214) 638-0145
Firm Registration: F-2966

Texas Department of Transportation

SH 220

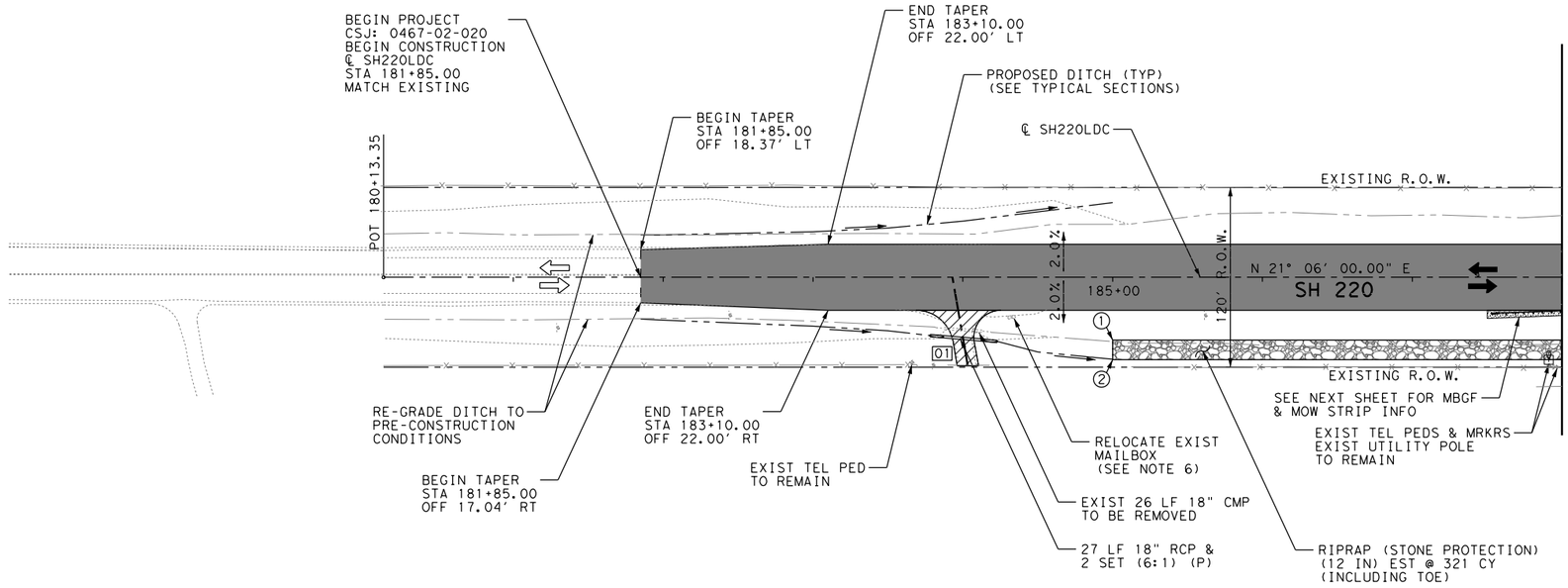
ROADWAY
HORIZONTAL ALIGNMENT DATA

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

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NUMBER		HIGHWAY NO.
MBT	6	(See Title Sheet)		SH 220
CHECK REL	STATE	DISTRICT	COUNTY	SHEET NO.
GRAPHICS BHK	TEXAS	FTW	ERATH	74
CHECK PKC	CONTROL 0467	SECTION 02	JOB 020, ETC.	

FILE: ...\WFXO8703 - WA3\RD\02ORGTOI.sht

TIME: 9:31:06 AM
DATE: 6/25/2024



LITTLE DUFFAU CREEK

TABLE OF RIPRAP		
POINT	STATION	OFF
1	185+00	42' R
2	185+00	55' R

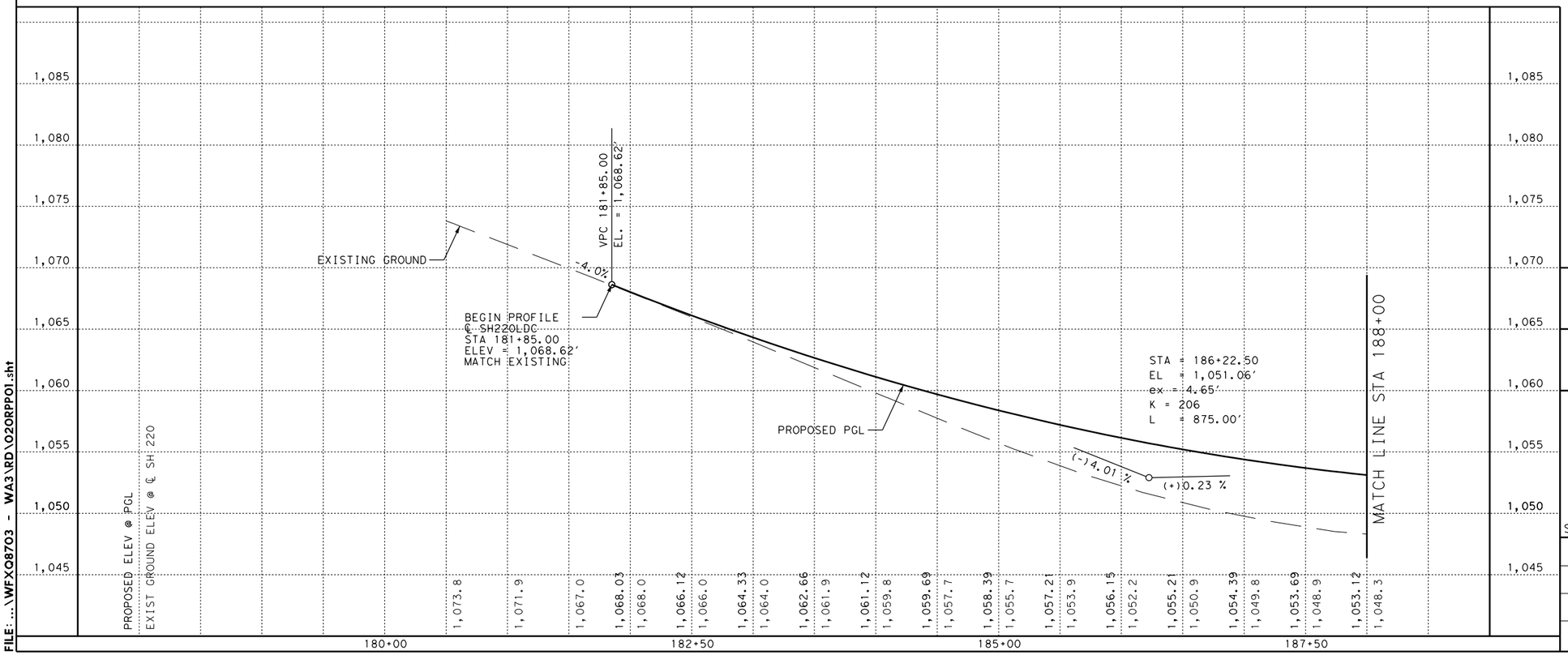
0 25 50 100 (H)
0 5 10 (V)

LEGEND

- EXISTING RIGHT OF WAY (R.O.W.)
- PROPOSED PAVEMENT/BRIDGE
- PROPOSED TRAFFIC LANE
- EXISTING TRAFFIC LANE
- PROPOSED RIPRAP (STONE)
- 01 — DRIVEWAY NUMBER (SEE DRIVEWAY DETAIL SHEET)
- PROPOSED ASPHALT DRIVEWAY

NOTES:

1. ALL STATIONS AND OFFSETS REFER TO ℄ SH220LDC OR ℄ SH220DC UNLESS NOTED OTHERWISE.
2. ALL DIMENSIONS ARE TO EDGE OF PAVEMENT OR NOMINAL FACE OF RAIL UNLESS NOTED OTHERWISE.
3. SEE BRIDGE HYDRAULIC DATA SHEETS AND BRIDGE LAYOUTS FOR H&H INFO.
4. REMOVE EXISTING HEADWALLS AND END 2' OF EXISTING PIPE UNDER ITEM 496. EXTEND 8' ON WEST SIDE AND 12' ON EAST SIDE USING CONCRETE COLLARS. INSTALL CH-PW-S (2:1) (15° SKEW) ON EACH END. SEE MSD STANDARD FOR CONCRETE COLLAR DETAIL.
5. SEE EXISTING UTILITY LAYOUTS FOR EXISTING UTILITY INFORMATION. CONTRACTOR TO FIELD-VERIFY LOCATION OF ALL UTILITIES.
6. CONTRACTOR SHALL AVOID DAMAGING MAILBOX AND WILL BE RESPONSIBLE FOR REPAIR OR REPLACEMENT IF DAMAGED.



Jacobs Engineering Group
STATE OF TEXAS
PAUL K. CLARK
99509
LICENSED
PROFESSIONAL ENGINEER
F-2966
7/9/2024

Jacobs
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DALLAS, TX 75201-3136
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Firm Registration: F-2966

Texas Department of Transportation

SH 220

ROADWAY PLAN AND PROFILE
SH 220 AT LITTLE DUFFAU CREEK

SCALE: 1"=100' (H), 1"=10' (V) SHEET 1 OF 2

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NUMBER		HIGHWAY NO.
MBT	6	(See Title Sheet)		SH 220
CHECK REL	STATE	DISTRICT	COUNTY	SHEET NO.
GRAPHICS MBT	TEXAS	FTW	ERATH	75
CHECK REL	CONTROL	SECTION	JOB	
	0467	02	020, ETC.	

FILE: ...\WFXQ8703 - WA3\RD\02ORPP01.sht

TIME: 8:54:37 AM
DATE: 7/11/2024

TABLE OF RIPRAP					
POINT	STATION	OFF	POINT	STATION	OFF
5	190+48.70	42′ R	7	190+33.70	60′ L
6	190+48.70	45′ L	8	189+95.50	60′ L

TABLE OF RIPRAP															
POINT	STATION	OFF	POINT	STATION	OFF	POINT	STATION	OFF	POINT	STATION	OFF	POINT	STATION	OFF	
19	194+50.00	42′ L	21	192+70.00	34′ R	23	193+00.00	58′ R	25	194+00.00	58′ R				
20	192+70.00	55′ R	22	193+00.00	42′ R	24	194+00.00	42′ R							

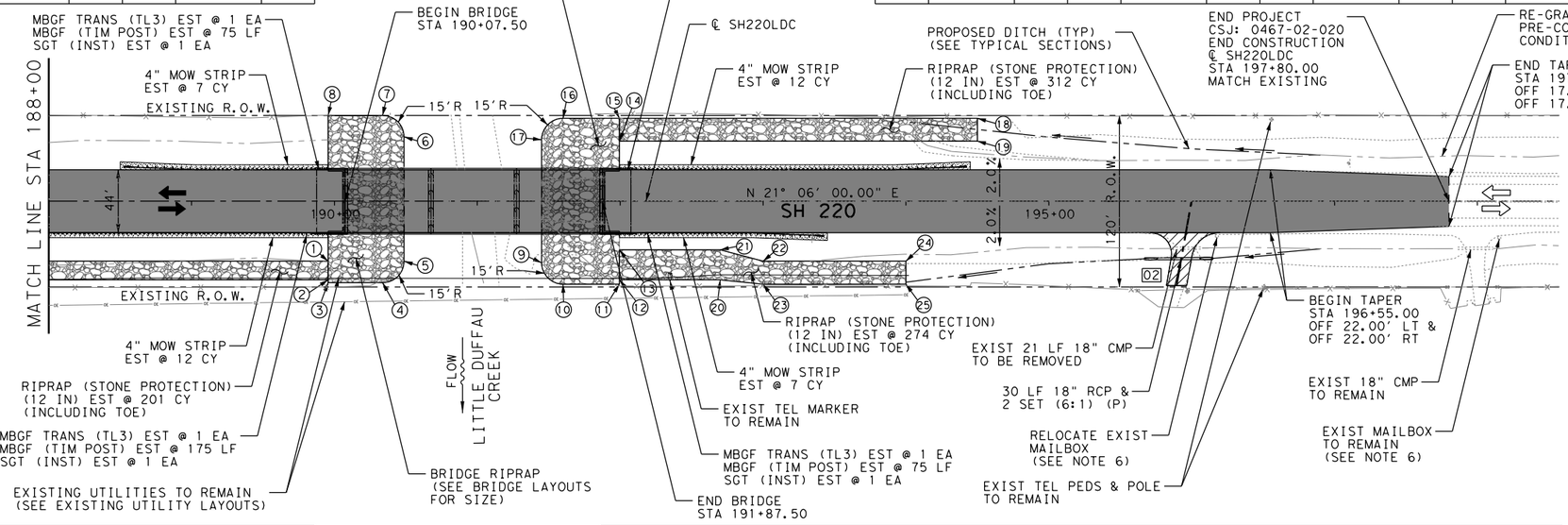
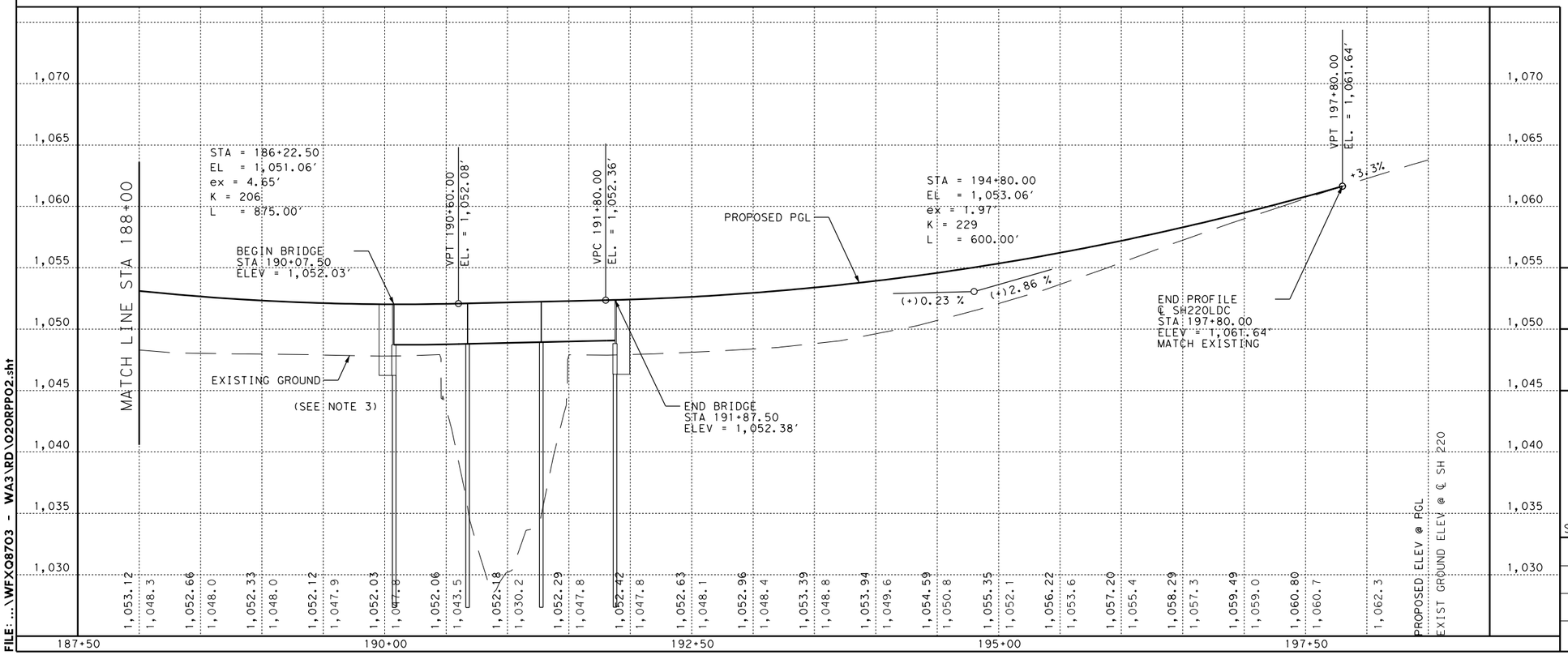


TABLE OF RIPRAP					
POINT	STATION	OFF	POINT	STATION	OFF
1	189+95.50	42′ R	3	189+95.50	57′ R
2	189+95.50	55′ R	4	190+33.70	57′ R

LITTLE DUFFAU CREEK

TABLE OF RIPRAP															
POINT	STATION	OFF	POINT	STATION	OFF	POINT	STATION	OFF	POINT	STATION	OFF	POINT	STATION	OFF	
9	191+45.00	43′ R	11	191+99.50	58′ R	13	191+99.50	34′ R	15	191+99.50	58′ L	17	191+45.00	43′ L	
10	191+60.00	58′ R	12	191+99.50	55′ R	14	191+99.50	42′ L	16	191+60.00	58′ L	18	194+50.00	58′ L	



0 25 50 100 (H)
0 5 10 (V)

LEGEND

- EXISTING RIGHT OF WAY (R.O.W.)
- PROPOSED PAVEMENT/BRIDGE
- PROPOSED TRAFFIC LANE
- EXISTING TRAFFIC LANE
- PROPOSED RIPRAP (STONE)
- 01 DRIVEWAY NUMBER (SEE DRIVEWAY DETAIL SHEET)
- PROPOSED ASPHALT DRIVEWAY

NOTES:

1. ALL STATIONS AND OFFSETS REFER TO ℄ SH220LDC OR ℄ SH220DC UNLESS NOTED OTHERWISE.
2. ALL DIMENSIONS ARE TO EDGE OF PAVEMENT OR NOMINAL FACE OF RAIL UNLESS NOTED OTHERWISE.
3. SEE BRIDGE HYDRAULIC DATA SHEETS AND BRIDGE LAYOUTS FOR H&H INFO.
4. REMOVE EXISTING HEADWALLS AND END 2′ OF EXISTING PIPE UNDER ITEM 496. EXTEND 8′ ON WEST SIDE AND 12′ ON EAST SIDE USING CONCRETE COLLARS. INSTALL CH-PW-S (2:1) (15° SKEW) ON EACH END. SEE MSD STANDARD FOR CONCRETE COLLAR DETAIL.
5. SEE EXISTING UTILITY LAYOUTS FOR EXISTING UTILITY INFORMATION. CONTRACTOR TO FIELD-VERIFY LOCATION OF ALL UTILITIES.
6. CONTRACTOR SHALL AVOID DAMAGING MAILBOX AND WILL BE RESPONSIBLE FOR REPAIR OR REPLACEMENT IF DAMAGED.

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SH 220

ROADWAY PLAN AND PROFILE
SH 220 AT LITTLE DUFFAU CREEK

SCALE: 1"=100′ (H), 1"=10′ (V) SHEET 2 OF 2

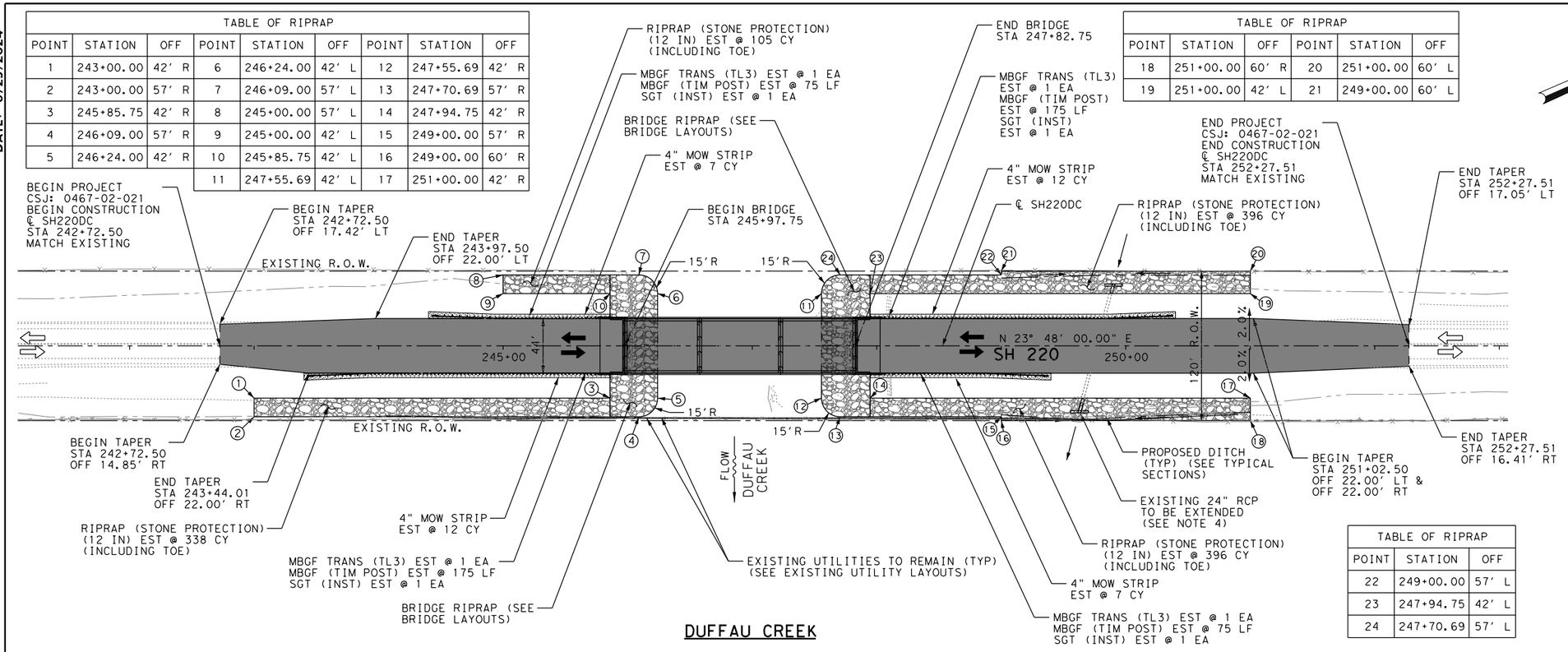
DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NUMBER		HIGHWAY NO.
MBT	6	(See Title Sheet)		SH 220
CHECK	STATE	DISTRICT	COUNTY	SHEET NO.
REL	TEXAS	FTW	ERATH	76
GRAPHICS	CONTROL	SECTION	JOB	
MBT	0467	02	020, ETC.	
CHECK				
REL				

FILE: ...\WFXQ8703 - WA3\RD\02ORPP02.sht

TIME: 9:31:25 AM
DATE: 6/25/2024

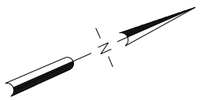
TABLE OF RIPRAP								
POINT	STATION	OFF	POINT	STATION	OFF	POINT	STATION	OFF
1	243+00.00	42' R	6	246+24.00	42' L	12	247+55.69	42' R
2	243+00.00	57' R	7	246+09.00	57' L	13	247+70.69	57' R
3	245+85.75	42' R	8	245+00.00	57' L	14	247+94.75	42' R
4	246+09.00	57' R	9	245+00.00	42' L	15	249+00.00	57' R
5	246+24.00	42' R	10	245+85.75	42' L	16	249+00.00	60' R
			11	247+55.69	42' L	17	251+00.00	42' R

TABLE OF RIPRAP					
POINT	STATION	OFF	POINT	STATION	OFF
18	251+00.00	60' R	20	251+00.00	60' L
19	251+00.00	42' L	21	249+00.00	60' L



DUFFAU CREEK

TABLE OF RIPRAP		
POINT	STATION	OFF
22	249+00.00	57' L
23	247+94.75	42' L
24	247+70.69	57' L



0 25 50 100 (H)
0 5 10 (V)

LEGEND

- EXISTING RIGHT OF WAY (R.O.W.)
- PROPOSED PAVEMENT/BRIDGE
- PROPOSED TRAFFIC LANE
- EXISTING TRAFFIC LANE
- PROPOSED RIPRAP (STONE)
- 01 DRIVEWAY NUMBER (SEE DRIVEWAY DETAIL SHEET)
- PROPOSED ASPHALT DRIVEWAY

NOTES:

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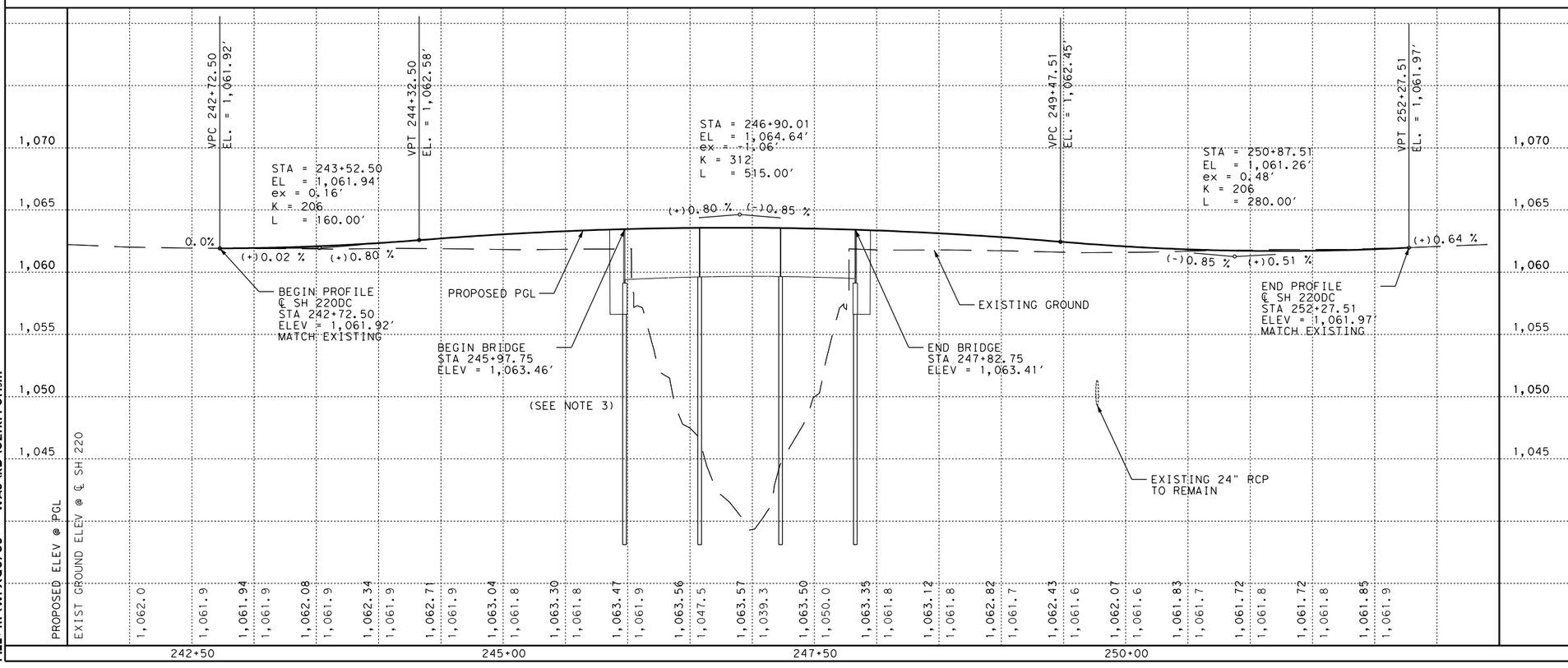
6. CONTRACTOR SHALL AVOID DAMAGING MAILBOX AND WILL BE RESPONSIBLE FOR REPAIR OR REPLACEMENT IF DAMAGED.



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Texas Department of Transportation

SH 220

ROADWAY PLAN AND PROFILE
SH 220 AT DUFFAU CREEK

SCALE: 1"=100' (H), 1"=10' (V) SHEET 1 OF 1

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NUMBER		HIGHWAY NO.
MBT	6	(See Title Sheet)		SH 220
CHECK	STATE	DISTRICT	COUNTY	SHEET NO.
REL	TEXAS	FTW	ERATH	77
GRAPHICS	CONTROL	SECTION	JOB	
MBT	0467	02	020, ETC.	
CHECK				
REL				

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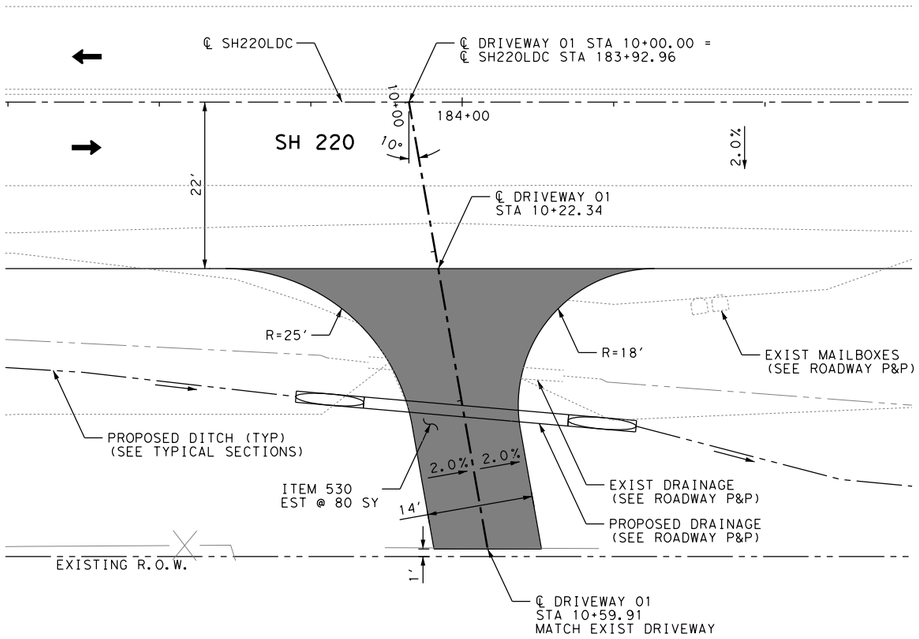
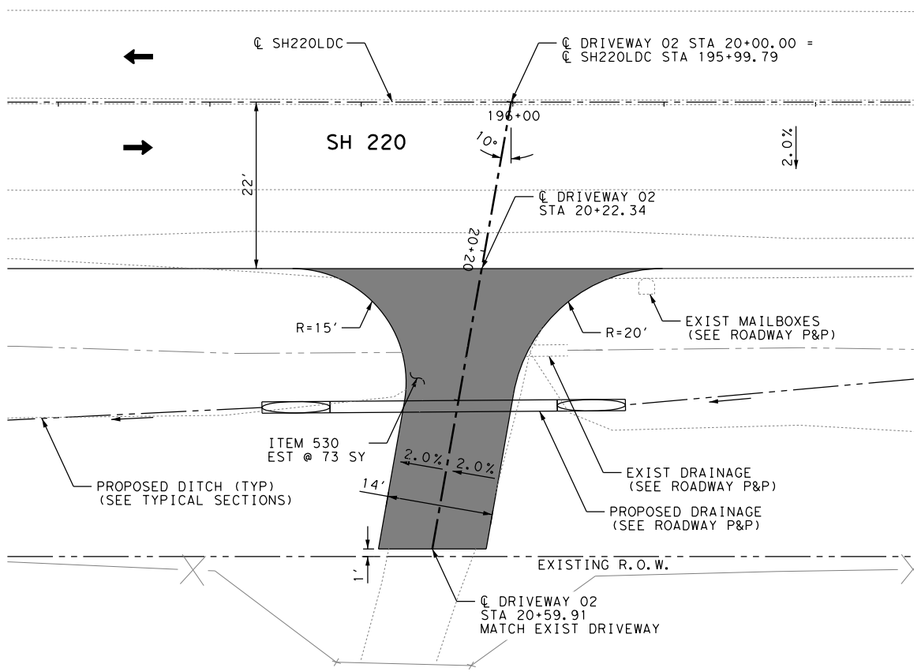
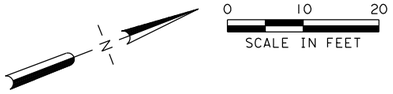
DATE: 6/12/2024



DRIVEWAY 01 - PLAN



DRIVEWAY 02 - PLAN

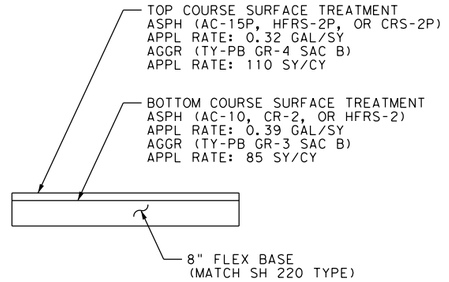


LEGEND

- EXISTING RIGHT OF WAY (R.O.W.)
- PROPOSED ASPHALT DRIVEWAY
- PROPOSED TRAFFIC LANE

NOTES:

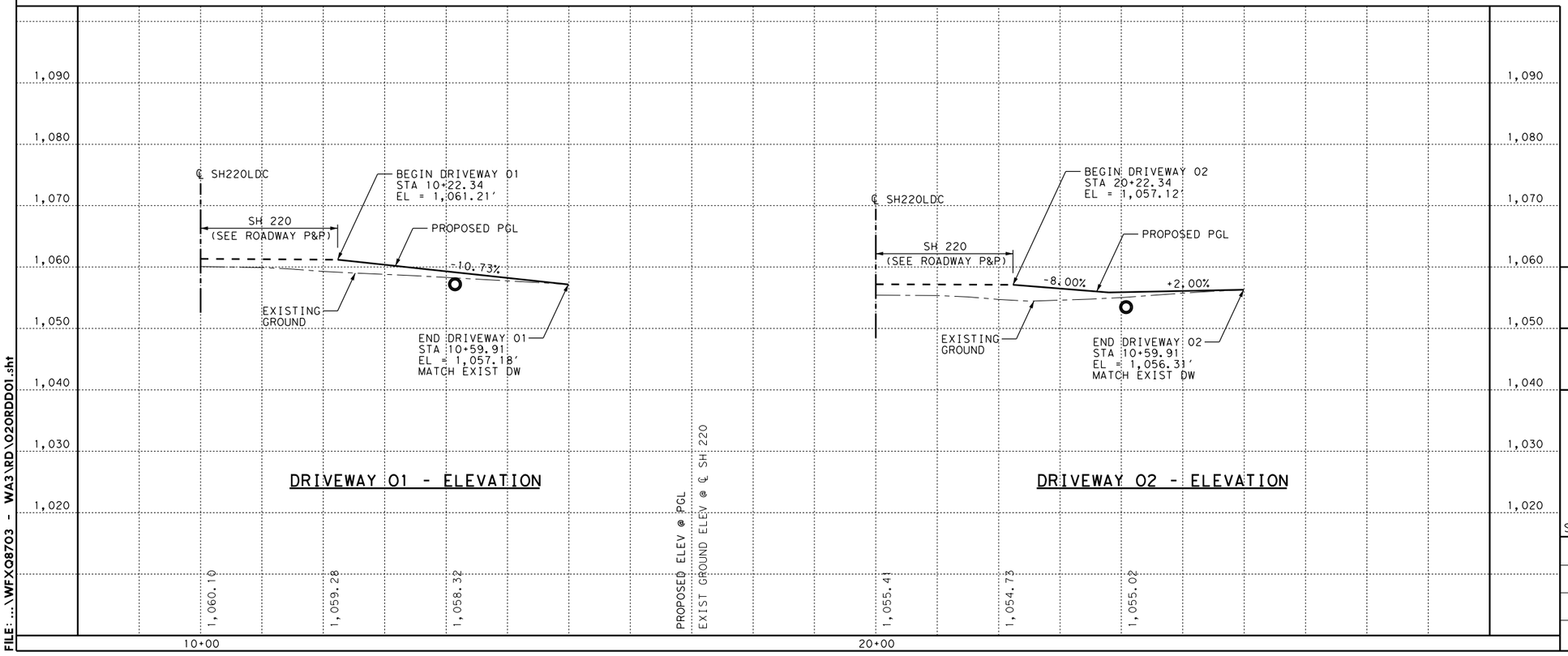
1. ALL STATIONS AND OFFSETS REFER TO ℄ SH220LDC OR ℄ SH220DC UNLESS NOTED OTHERWISE.
2. ALL DIMENSIONS ARE TO EDGE OF PAVEMENT OR NOMINAL FACE OF RAIL UNLESS NOTED OTHERWISE.



PROPOSED DRIVEWAY PAVEMENT SECTION

N.T.S.
PAYMENT UNDER ITEM 530

LITTLE DUFFAU CREEK



DRIVEWAY 01 - ELEVATION

DRIVEWAY 02 - ELEVATION

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SH 220

DRIVEWAY DETAIL

SCALE: 1"=20' (H), 1"=20' (V) SHEET 1 OF 1

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NUMBER		HIGHWAY NO.
MBT	6	(See Title Sheet)		SH 220
CHECK	STATE	DISTRICT	COUNTY	SHEET NO.
PKC	TEXAS	FTW	ERATH	78
GRAPHICS	CONTROL	SECTION	JOB	
PKC	0467	02	020, ETC.	
CHECK				
JDB				

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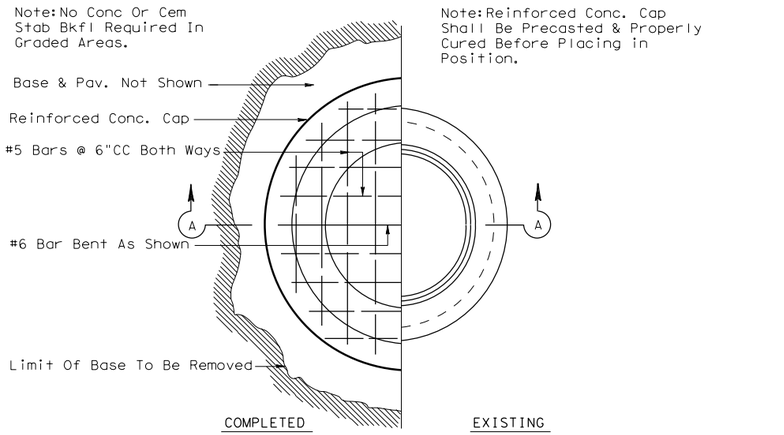
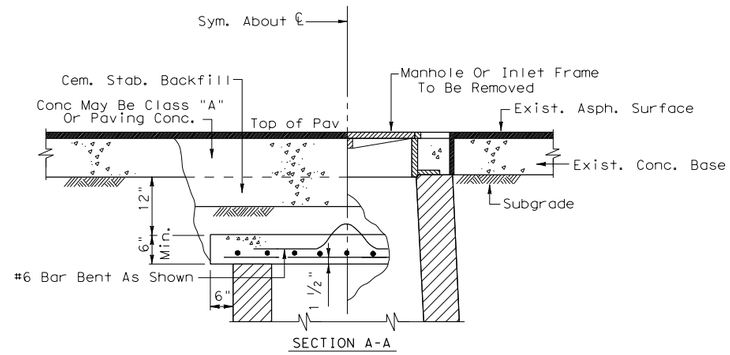
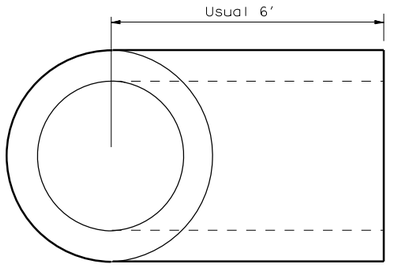


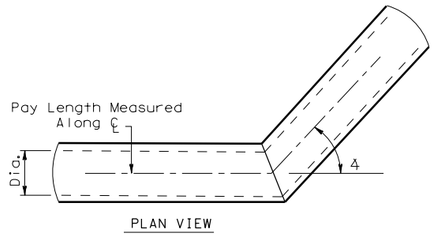


DETAIL SHOWING METHOD OF CAPPING ABANDONED MANHOLES OR INLETS (GRADED OR PAVED AREAS)



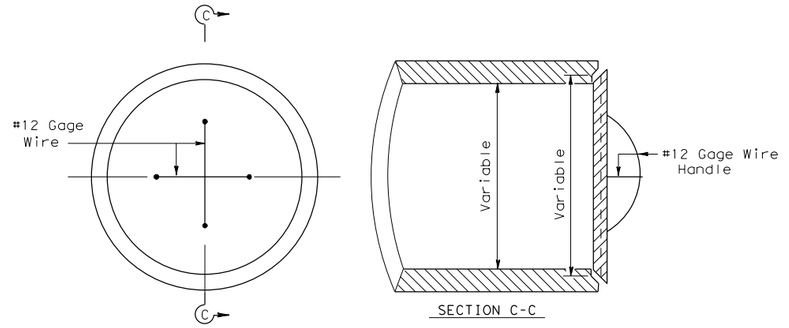
Note: Jointing Material Shall Conform To Requirements Of Item "Reinforced Concrete Pipe." Material For Tees Shall Conform To Requirements Of Item "Reinforced Concrete Pipe." Payment For Tee To Be In Accordance With Item "Reinforced Concrete Pipe."

PRECAST STORM SEWER TEE



BENDING DETAIL

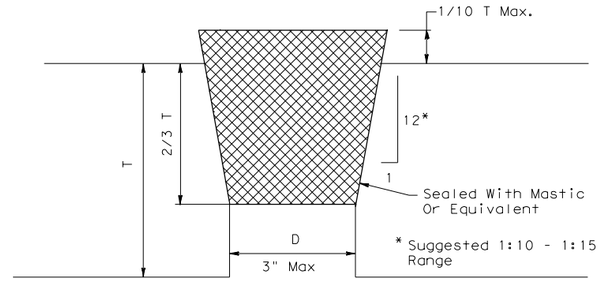
Note: Bending Of Proposed Pipe Sewer Or RCP In A Vertical & /Or Horizontal Plane Shall Be Accomplished By The Use Of A "Pipe Collar" Or A "Precast Elbow", As Approved By The Engineer.
Price Of "Pipe Collar" Or, "Precast Elbow" Shall Be Subsidiary To The Unit Prices Bid For Item Reinforced Concrete Pipe.
Pay Length Measurement To Be Along Horizontal ℄ & Horizontal Plane Of Pipes.



Note: The Price Of Plug Shall Be Subsidiary To The Unit Bid Price For Pipe Sewer Or RCP. Mortar Joints To Be Used As Directed By The Engineer. Removal Of The Existing Plugs For Storm Sewer Or RCP Conns. Shall Be Considered Incidental To Item "Excavation And Backfill For Structures."

Concrete Plug For End Of Pipe Culvert Or Sewer

CONCRETE PLUG FOR PIPE

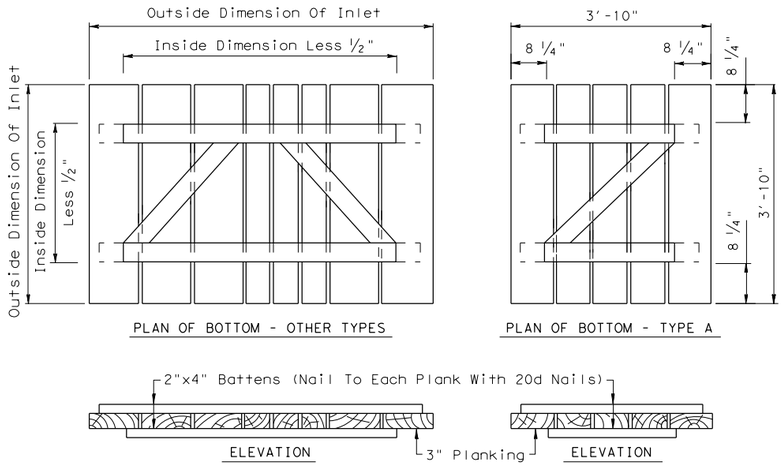


T = Wall Thickness On Top Of Box Or Pipe
D = Diameter Of Lifting Hole

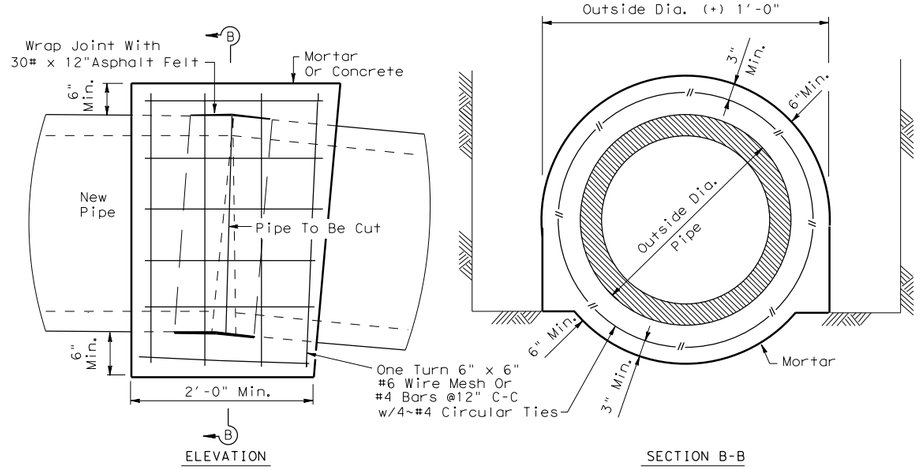
Minimum Length Of Plug Is 2/3 T +/-
Minimum Diameter At Bottom Of Plug = D - ⅛"
Maximum 1/10 T Of Plug Not Seated In Lifting Hole

Note: The Plug Shall Be Cast With The Same Taper As The Lifting Hole.

DETAIL OF PLUG FOR LIFTING HOLES IN RCB AND RCP



TEMPORARY COVERS FOR ALL TYPES OF INLETS



PIPE COLLAR DETAIL

For Horizontal Or Vertical Placement

d = Diameter
R = Radius

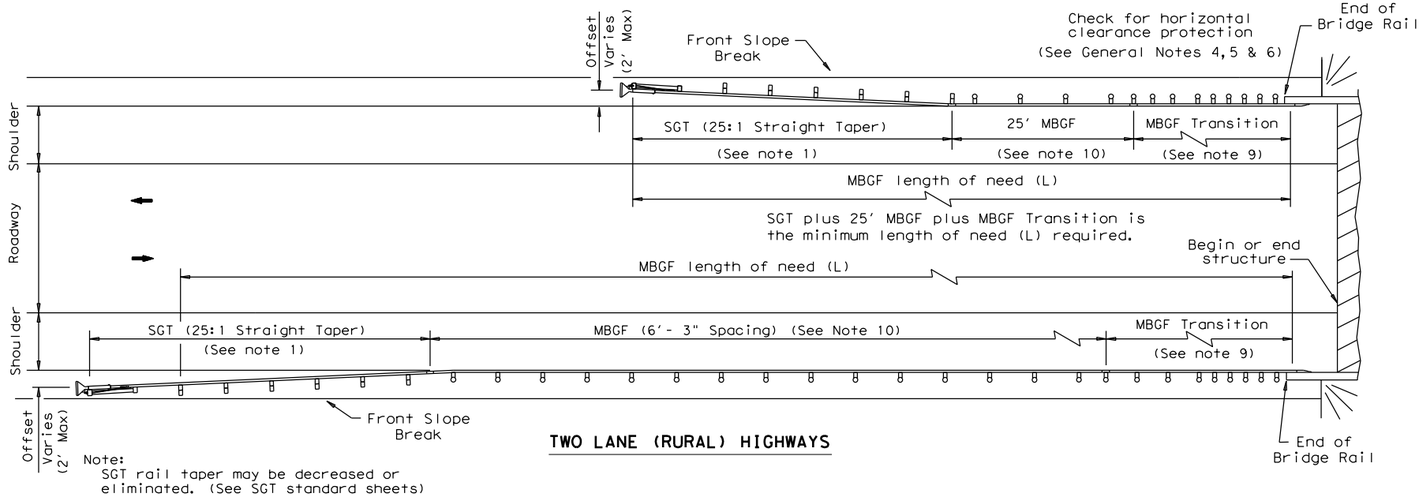
Texas Department of Transportation
Houston District (Bridge)

MISCELLANEOUS SEWER DETAILS

MSD

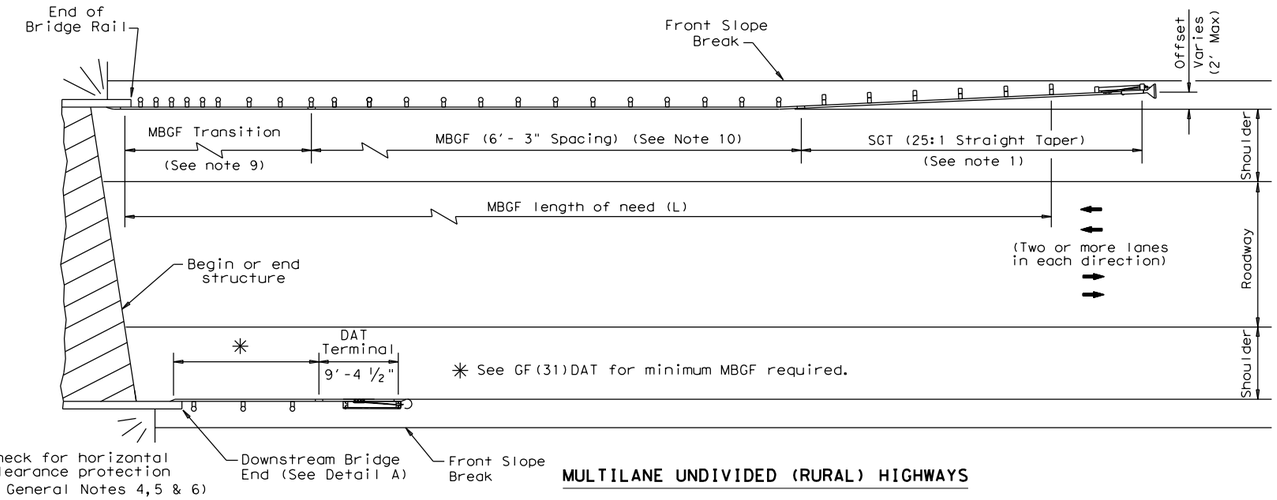
FILE: STDD11.DGN	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK:	
© TxDOT Mar 2004	DISTRICT	FED REG	PROJECT NO.		SHEET
REVISIONS 3/2015 2014 Specs	HOU	6	(See Title Sheet)		79
	COUNTY		CONTROL	SECT	JOB	HIGHWAY
	ERATH		0467	02	020,ETC.	SH 220

STDD11.DGN

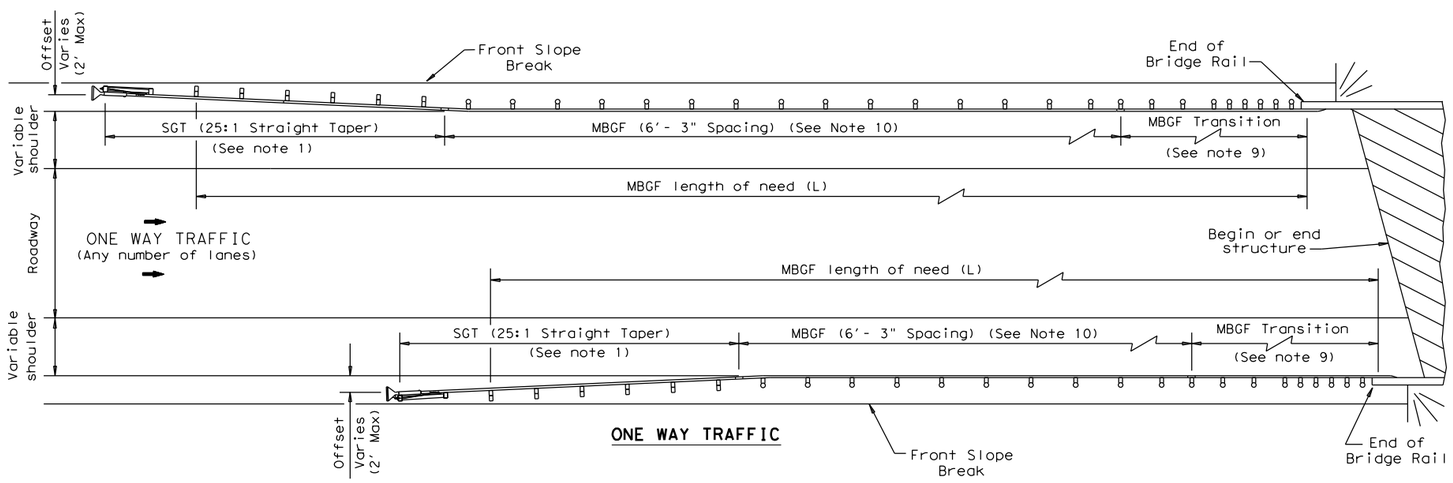


TWO LANE (RURAL) HIGHWAYS

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



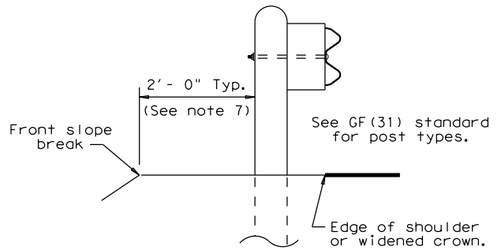
MULTILANE UNDIVIDED (RURAL) HIGHWAYS



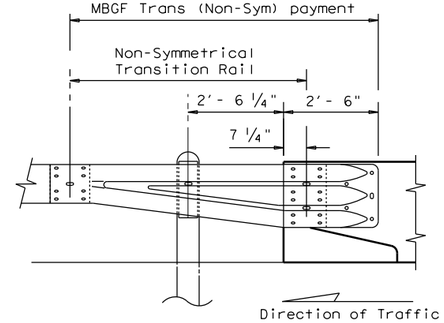
ONE WAY TRAFFIC

GENERAL NOTES

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



TYPICAL CROSS SECTION AT MBGF



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

DETAIL A

Showing Downstream Rail Attachment

Texas Department of Transportation — Design Division Standard

BRIDGE END DETAILS

(METAL BEAM GUARD FENCE APPLICATIONS TO RIGID RAILS)

BED-14

FILE: bed14.dgn	DN: TxDOT	CK: AM	DW: BD/VP	CK: CGL
©TxDOT: December 2011	CONT	SECT	JOB	HIGHWAY
REVISIONS REVISED APRIL 2014 SEE (MEMO 0414)	0467	02	020, ETC.	SH 220
	DIST	COUNTY		SHEET NO.
	FTW	ERATH		80

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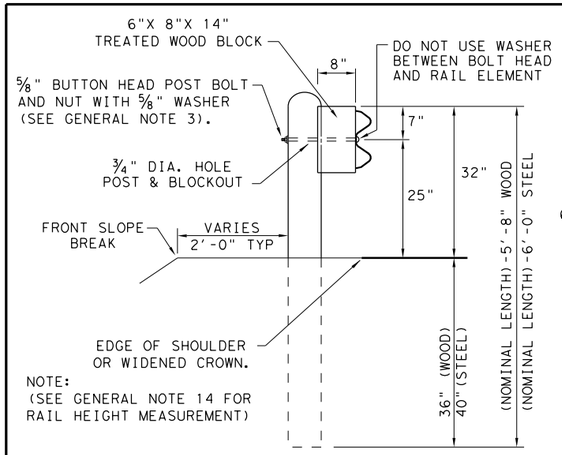
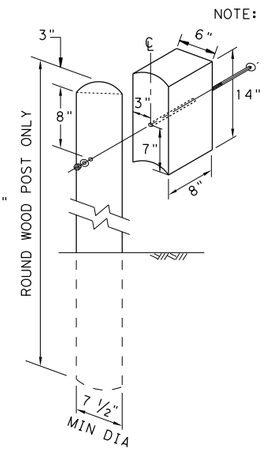
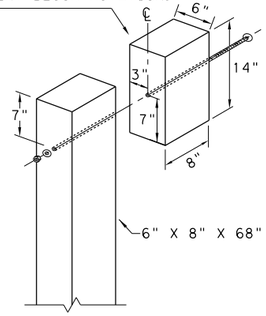


TYPICAL POST PLACEMENT

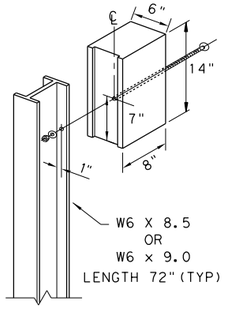


WOOD BLOCK TO ROUND WOOD POST

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

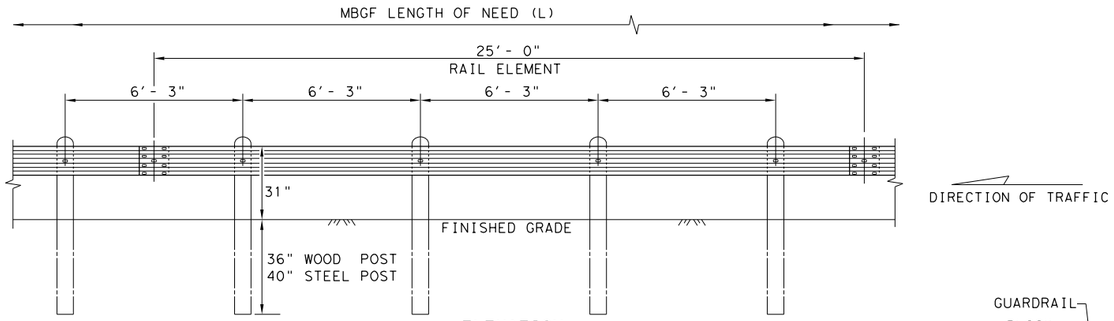


WOOD BLOCK TO RECTANGULAR WOOD POST



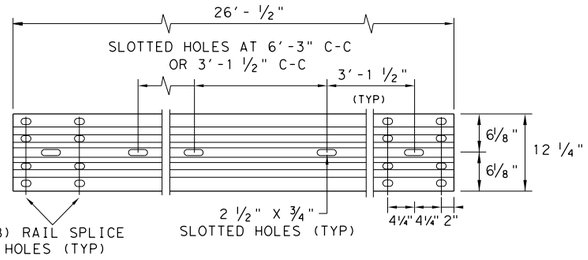
ROUTED WOOD BLOCK TO I-BEAM STEEL POST

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



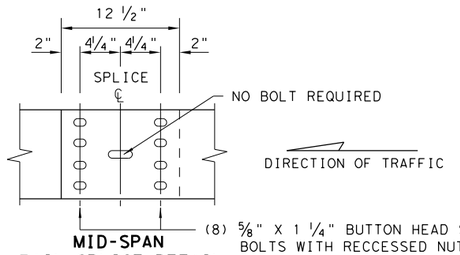
ELEVATION MID-SPAN RAIL SPLICE

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



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

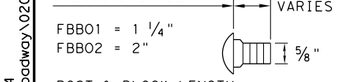
NOTES: SEE GENERAL NOTE 2 FOR ALLOWABLE RAIL TYPES.
SEE RAIL SPLICE DETAIL FOR REQUIRED HARDWARE.



MID-SPAN RAIL SPLICE DETAIL

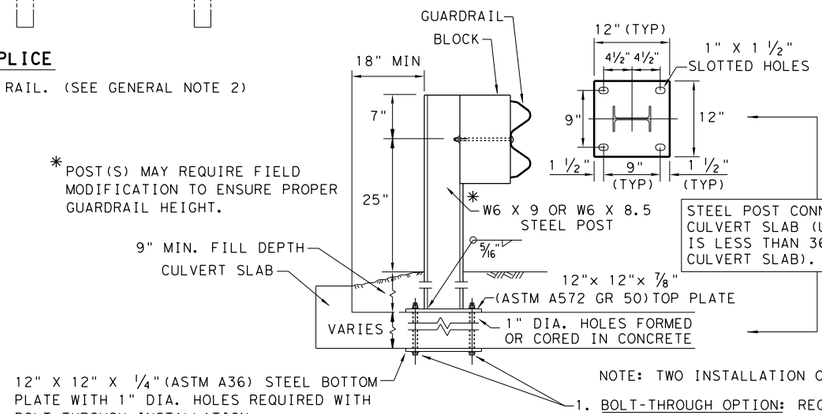
NOTE: GF(31), MID-SPAN RAIL SPLICES ARE REQUIRED WITH 6'-3" POST SPACINGS.

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



BUTTON HEAD BOLT

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



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

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

LOW FILL CULVERT POST

NOTE: TWO INSTALLATION OPTIONS.

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

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

GENERAL NOTES

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

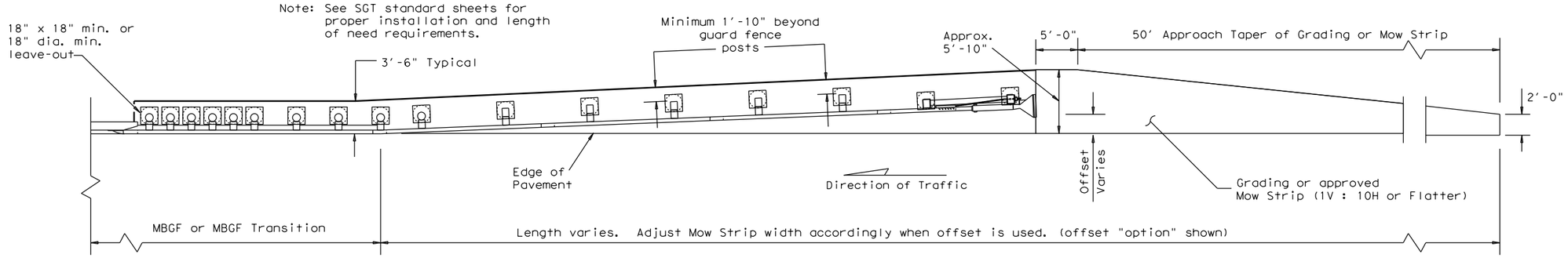
NOTE: TRANSISTIONS TO BRIDGE RAILS OR TRAFFIC BARRIERS.
SEE GF(31)TL3 TR STANDARD FOR HIGH-SPEED TL-3 TRANSITIONS.
SEE GF(31)TL2 TR STANDARD FOR LOW-SPEED TL-2 TRANSITIONS.

Texas Department of Transportation — Design Division Standard

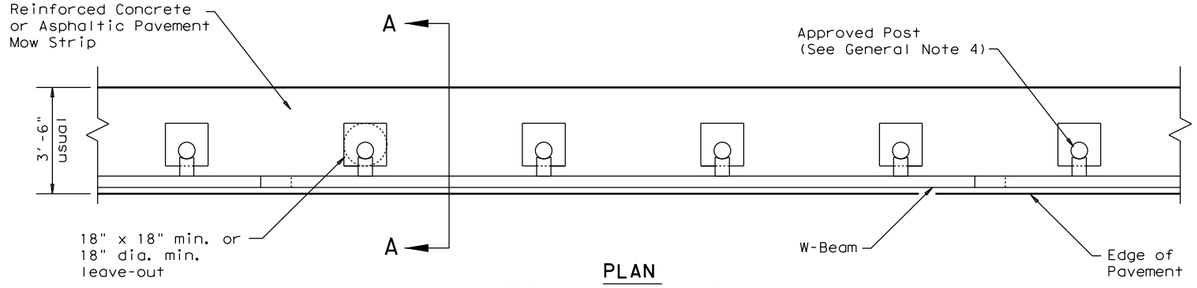
METAL BEAM GUARD FENCE
TL-3 MASH COMPLIANT
GF(31)-19

FILE: gf3119.dgn	DN: TxDOT	CK: KM	DW: VP	CK: CGL/AG	
©TxDOT: NOVEMBER 2019	CONT	SECT	JOB	HIGHWAY	
REVISIONS	0467	02	020,ETC.	SH 220	
	DIST	COUNTY		SHEET NO.	
	FTW	ERATH		81	

DATE: 3/22/2024
FILE: ...\ST\Roadway\020gf3119.dgn

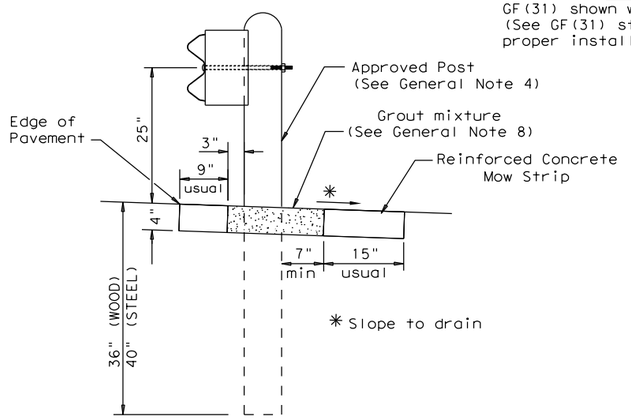


GRADING AND MOW STRIP AT GUARDRAIL END TREATMENTS



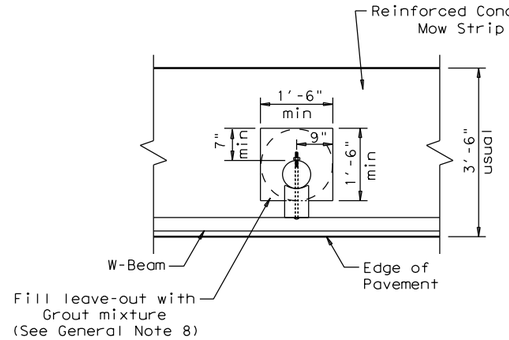
PLAN

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



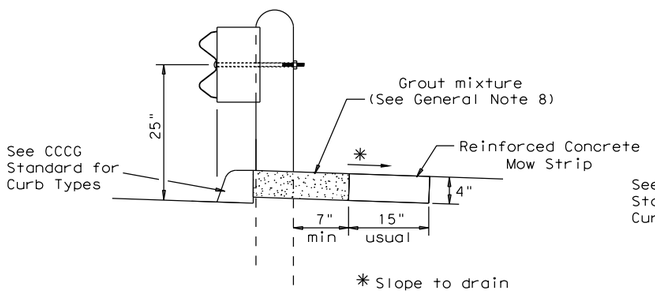
SECTION A-A

Typical



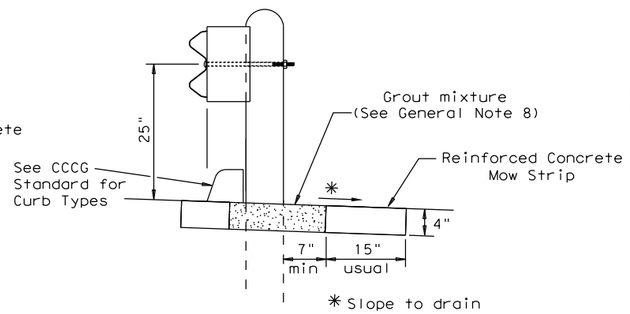
MOW STRIP DETAIL

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



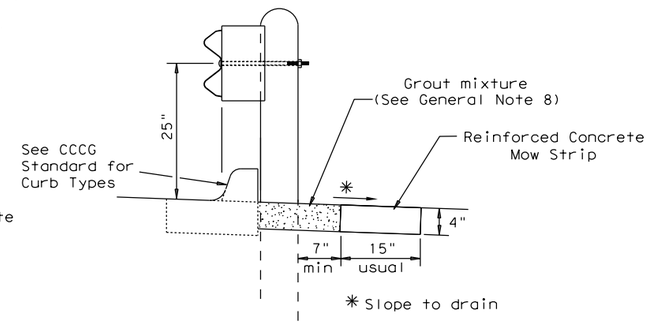
CURB OPTION (1)

This option will increase the post embedment throughout the system.



CURB OPTION (2)

Curb shown on top of mow strip



CURB OPTION (3)

Note: Site Condition(s)

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

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

GENERAL NOTES

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

Texas Department of Transportation | Design Division Standard

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

GF(31)MS-19

FILE: gf31ms19.dgn	DN: TxDOT	CK: KM	DW: VP	CK: CGL/AG
©TxDOT: NOVEMBER 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0467	02	020, ETC.	SH 220
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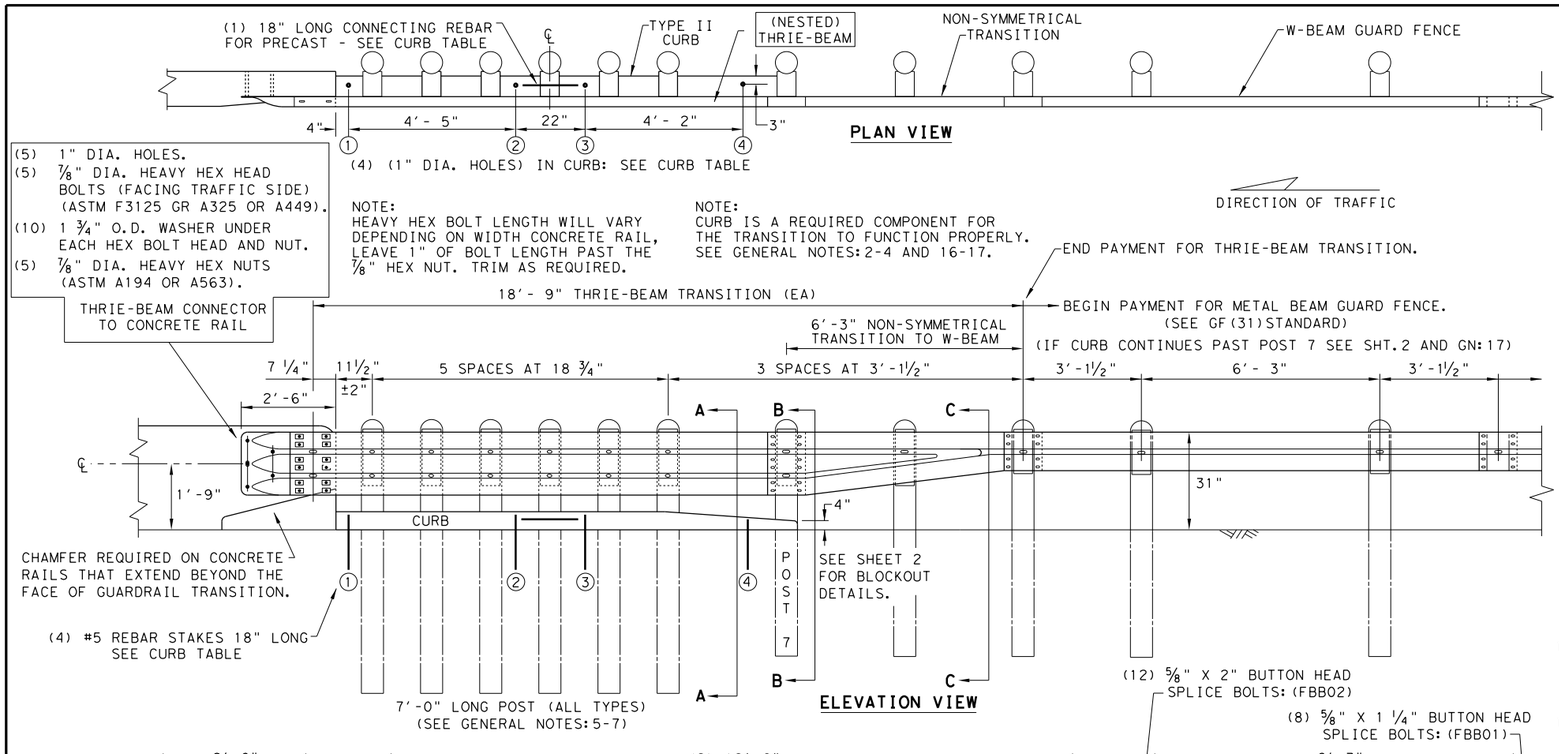


GENERAL NOTES

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

THRIE-BEAM TERMINAL - CURB TABLE

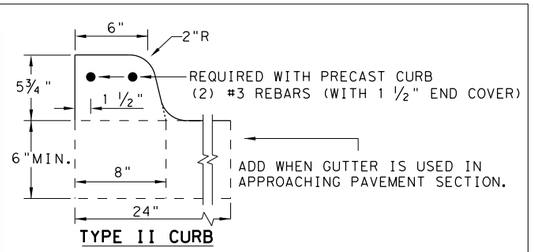
PRECAST CURB FULL LENGTH EQUALS 12'- 2"
THE PRECAST CURB MAY BE FORMED INTO TWO SECTIONS.

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.



TYPE II CURB

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

TYPE II CURB DETAILS

HIGH-SPEED TRANSITION

SHEET 1 OF 2

Texas Department of Transportation | Design Division Standard

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

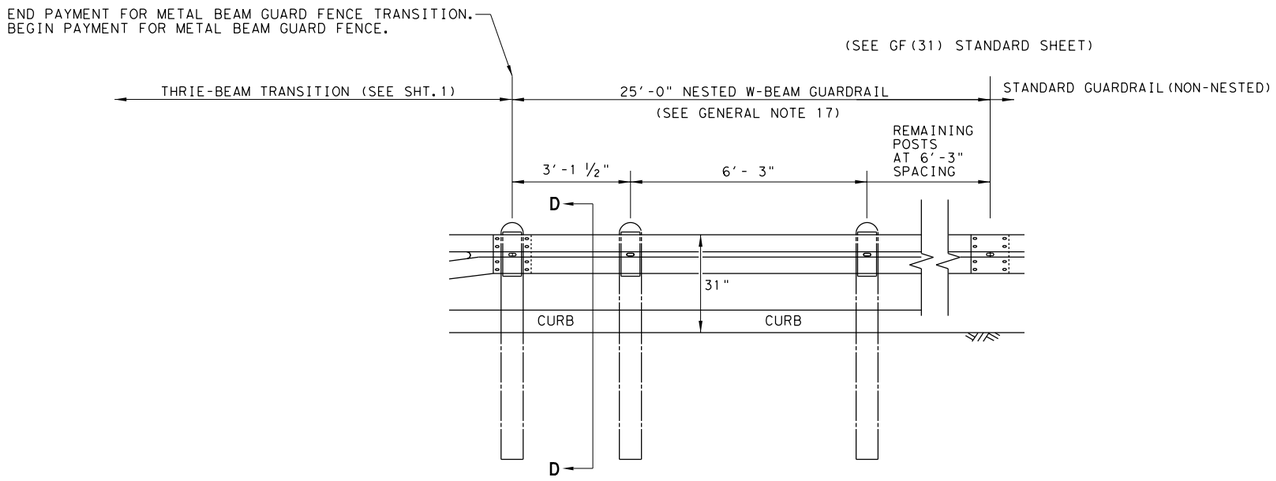
GF(31)TR TL3-20

FILE: gf31trt1320.dgn	DN: TxDOT	CK: KM	DW: VP	CK: CGL/AG
©TxDOT: NOVEMBER 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0467	02	020, ETC.	SH 220
	DIST	COUNTY		SHEET NO.
	FTW	ERATH		83

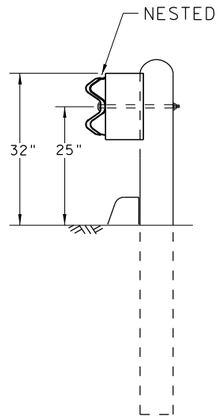
DATE: 3/22/2024
FILE: ...\ST\Roadway\020gf31trt1320.dgn

DATE: 3/22/2024
FILE: ...\ST\Roadway\020gf31tr1320.dgn

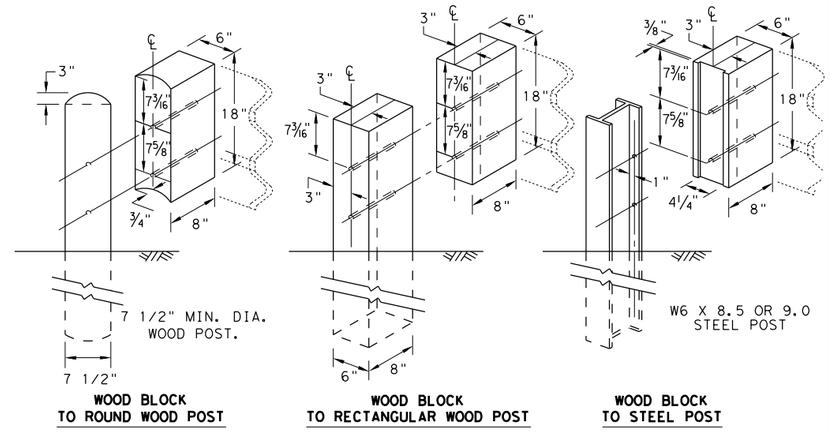
REQUIRED ALTERNATIVE FOR CONTINUOUS CURB EXTENDING PAST POST 7 (SEE SHT. 1 GENERAL NOTE 17)



ELEVATION VIEW



SECTION D-D



THRIE BEAM TRANSITION BLOCKOUT DETAILS

HIGH-SPEED TRANSITION

SHEET 2 OF 2

Texas Department of Transportation | Design Division Standard

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

GF(31)TR TL3-20

FILE: gf31tr1320.dgn	DN: TxDOT	CK: KM	DW: KM	CK: CGL/AG	
©TxDOT: NOVEMBER 2020	CONT	SECT	JOB	HIGHWAY	
REVISIONS	0467	02	020, ETC.	SH 220	
	DIST	COUNTY		SHEET NO.	
	FTW	ERATH		84	

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

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

LINE AT THE BACK OF POST #2 THRU #8

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

ANCHOR PADDLE PN: 15204A

ANGLE STRUT PN: 15202G

16"

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

DO NOT BOLT ANCHOR RAIL TO - POST (2)

SEE DETAIL 1

BEGIN LENGTH OF NEED

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

PLAN VIEW

TRAFFIC FLOW

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

BEGIN STANDARD MBGF

END PAYMENT FOR SGT

6¼" 3'-1 ½" 6'-3" 6'-3"

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

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

OUTSIDE SLOTS CUTOUT (2)½" X 6'-9 ⅝"

SoftStop FACE SEE GN(3) & NOTE:B

MBGF LAPPED IN DIRECTION OF TRAFFIC FLOW

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

SoftStop ANCHOR RAIL (12GA) PN: 15215G

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

B B A A

SEE NOTE:C

ANCHOR PADDLE PN: 15204A

END OF ANCHOR RAIL PN: 15215G

SEE NOTE:A

POST 32" HEIGHT

31"

RAIL HEIGHT

RAIL 25'-0" PN: 61G

RAIL 25'-0" PN: 15215G

DO NOT BOLT ANCHOR RAIL TO POST(2)

SEE DETAIL 2

SEE DETAIL 3

13/16" DIA. YIELDING HOLES

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

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

POST 40" DEPTH (TYP 1-8)

6'-1⅜"

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

ELEVATION VIEW

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

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

(1) ⅝" x 1 ¾" HEX HD BOLT PN 3391G

ANGLE STRUT PN: 15202G

(2) ⅝" WASHERS PN 4372G

(1) ⅝" HGR HEX NUT PN 3340G

DETAIL 1
SHOWN AT POST(1) NEAR GROUND

(1) ⅝" HEX NUT

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

(2) ⅝" ROUND WASHERS PN: 3240G

DETAIL 2
SHOWN AT POST(1)

ANCHOR KEEPER PLATE (24 GA) PN: 15207G

ANCHOR PLATE WASHER ½" THICK PN: 15206G

1" ROUND WASHER F463 PN: 4902G

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

(2) ⅝" ROUND WASHER (WIDE) PN: 3240G

ALTERNATE BLOCKOUT SEE GENERAL NOTE:6

ANCHOR PADDLE PN: 15204A

(2) ⅝" HEX NUT A563 GR.DH PN: 3245G

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

W-BEAM FLATTENED (4 PLIES)

ANGLE STRUT PN: 15202G

SEE NOTE:A

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

(4) ¾" FLAT WASHER (TYP) PN: 3701G

(2) ¾" HEX NUT (TYP) PN: 3704G

6'-1 ⅜" POST DEPTH

(2) ANCHOR POST ANGLE PN: 15201G

DETAIL 3
AT POST(0)
6'-5 ⅜" (W6 X 15)
I-BEAM POST PN: 15205A

ALTERNATE BLOCKOUT SEE GENERAL NOTE:6

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

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

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

8" 6" 14"

⅝" HGR NUT PN: 3340G

⅝" X 10" HGR POST BOLT PN: 3500G

13/16" DIAMETER YIELDING HOLES LOCATED IN FLANGES

FINISHED GRADE

(HOLES APROXIMATELY CENTERED AT FINISHED GRADE)

ISOMETRIC VIEW POST(1 & 2)
W6 X 8.5 I-BEAM POST SHOWING STANDARD WOOD BLOCKOUT

NOTE: NO BLOCKOUT INSTALLED AT POST(1)

W-BEAM RAIL 25'-0"

6" X 8" X 14" BLOCKOUT WOOD

⅝" X 10" HGR POST BOLT PN: 3500G

⅝" HGR NUT PN: 3340G

POST HEIGHT 32"

31" RAIL HEIGHT

40"

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

FINISHED GRADE

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

6" X 8" X 14" BLOCKOUT WOOD

W-BEAM RAIL 25'-0"

⅝" X 10" HGR POST BOLT PN: 3500G

⅝" HGR NUT PN: 3340G

POST HEIGHT 32"

31" RAIL HEIGHT

40"

POST(2)

FINISHED GRADE

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

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

POST 17"- ½" HEIGHT

4'-9 ½"

13/16" DIA. YIELDING HOLES

40"

POST(1)

FRONT VIEW POST(1)
4'-9 ½" (W6 X 8.5)
(SYTP) I-BEAM POST PN: 15203G

NOTE: NO BLOCKOUT INSTALLED AT POST(1)

APPROX 5'-10"

5'-0"

50' APPROACH GRADING

2'-0"

STANDARD MBGF

EDGE OF PAVEMENT

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

2'-0" MAX. RAIL OFFSET

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

APPROACH GRADING AT GUARDRAIL END TREATMENTS

GENERAL NOTES

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

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

PART	QTY	MAIN SYSTEM COMPONENTS
620237B	1	PRODUCT DESCRIPTION ASSEMBLY MANUAL (LATEST REV.)
15208A	1	SoftStop HEAD (SEE MANUAL FOR RIGHT-LEFT APPROACH)
15215G	1	SoftStop ANCHOR RAIL (12GA) WITH CUTOUT SLOTS
61G	1	SoftStop DOWNSTREAM W-BEAM RAIL (12GA) (25'- 0")
15205A	1	POST #0 - ANCHOR POST (6'- 5 ⅞")
15203G	1	POST #1 - (SYTP) (4'- 9 ½")
15000G	1	POST #2 - (SYTP) (6'- 0")
533G	6	POST #3 THRU #8 - I-BEAM (W6 x 8.5) (6'- 0")
4076B	7	BLOCKOUT - WOOD (ROUTED) (6" x 8" x 14")
6777B	7	BLOCKOUT - COMPOSITE (4" x 7 ½" x 14")
15204A	1	ANCHOR PADDLE
15207G	1	ANCHOR KEEPER PLATE (24 GA)
15206G	1	ANCHOR PLATE WASHER (½" THICK)
15201G	2	ANCHOR POST ANGLE (10" LONG)
15202G	1	ANGLE STRUT
		HARDWARE
4902G	1	1" ROUND WASHER F436
3908G	1	1" HEAVY HEX NUT A563 GR.DH
3717G	2	¾" x 2 ½" HEX BOLT A325
3701G	4	¾" ROUND WASHER F436
3704G	2	¾" HEAVY HEX NUT A563 GR.DH
3360G	16	⅝" x 1 ¼" W-BEAM RAIL SPLICE BOLTS HGR
3340G	25	⅝" W-BEAM RAIL SPLICE NUTS HGR
3500G	7	⅝" x 10" HGR POST BOLT A307
3391G	1	⅝" x 1 ¾" HEX HD BOLT A325
4489G	1	⅝" x 9" HEX HD BOLT A325
4372G	4	⅝" WASHER F436
105285G	2	⅝" x 2 ½" HEX HD BOLT GR-5
105286G	1	⅝" x 1 ½" HEX HD BOLT GR-5
3240G	6	⅝" ROUND WASHER (WIDE)
3245G	3	⅝" HEX NUT A563 GR.DH
5852B	1	HIGH INTENSITY REFLECTIVE SHEETING - SEE NOTE:B

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

Texas Department of Transportation

Design Division Standard

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

FILE: sgt10s3116	DN: TxDOT	CK: KM	DW: VP	CK: MB/VP		
©TxDOT: JULY 2016	CONT	SECT	JOB	HIGHWAY		
REVISIONS	0467	02	020, ETC.	SH 220		
	DIST	COUNTY		SHEET NO.		
	FTW	ERATH		85		

DATE: 3/22/2024
FILE: ...\ST\Roadway\020sgt10s3116.dgn

(SEE GN NOTE 15)
STANDARD 31" MBGF

ITEM (6)
INNER SIDE SLIDER
(ISS) PANEL FOR RAIL 3

FIELD-SIDE
(RAIL 3)

NOTE:
RECESSED HEX NUTS FACING
TRAFFIC-SIDE **SEE DETAIL (C)**

REFERENCE LINE USED TO INSTALL
LINE POST(9) THRU POST(2)

POST 1 OFFSET DISTANCE MEASURED
7-⅝" FROM REFERENCE LINE

POST 9 | POST 8 | POST 7 | POST 6 | POST 5 | POST 4 | POST 3 | POST 2

RAIL 4 | RAIL 3 | RAIL 2 | RAIL 1

ITEM (10)
CABLE ASSEMBLY

ITEM (2)
GROUNDSTRUT

NO BLOCKOUT
AT (POST 1)

CABLES

ITEM (5)
TRAFFIC SIDE SLIDER
(TSS) PANEL FOR RAIL 2

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

PLAN VIEW

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

INSTALL GUARD FENCE RECESSED
HEX NUTS ON TRAFFIC-SIDE

MBGF
RAIL 2

MBGF
RAIL 1

DETAIL (C)

TRAFFIC FLOW

ITEM (25)
MAX-TENSION HEAD
SEE DETAIL (A)

END PAYMENT (SGT) BY EACH

DO NOT BOLT
RAIL TO POST 6

BEGIN LENGTH OF NEED

INSTALLATION LENGTH 55'- ½"

49'-8 ⅝"

6'-3" | 6'-3" | 6'-3" | 6'- ¾" | 6'-3" | 6'-3" | 6'-3" | 37 ½" | 5'-3 11/16"

RAIL
HEIGHT
31"

ARROWS

DETAIL (D)

HEAD
HEIGHT

DETAIL (B)

32-¼"

68-⅛"

ITEM (13) RAIL 4 | ITEM (13) RAIL 3 | ITEM (13) RAIL 2 | ITEM (13) RAIL 1

FINISHED
GRADE

CABLES

ITEM (10)
CABLE
ASSEMBLY

ITEM (2)
GROUNDSTRUT

POST 9 | POST 8 | POST 7 | POST 6 | POST 5 | POST 4 | POST 3 | POST 2 | POST 1

ITEM (4)
I-BEAM
W6 X 9

NO BLOCKOUT
AT (POST 1)

(8) X-LITE LINE POST - ITEM (11)

ELEVATION VIEW

**SOIL
ANCHOR POST**
ITEM (1)

A

A

TSS PANEL
GALVANIZED
ITEM (5)

RSS PLATE
GALVANIZED
ITEM (8)

INSTALL THE TSS AND RSS
WITH THE ARROWS POINTING
TOWARDS THE MAX-HEAD

TSS PANEL AND RSS PLATE

DETAIL (D)

NOTE:
USE THE MASH APPROVED
X-TENSION CABLE ASSEMBLY.

7 5/16"

2 ⅛"

UPPER CABLE
(BACK SIDE)

LOWER CABLE
(TRAFFIC SIDE)

DETAIL (B)

HEAD
HEIGHT

32-¼"

TOP OF POST

31-⅞"

FINISHED
GRADE

40-⅛"

68-⅛"
ANCHOR POST
DEPTH

ITEM (1)
ANCHOR

ITEM (11)
LINE POSTS
2 THRU 9
(NOTE: ITEM (4) POST 1 (NOT SHOWN),
TO BE INSTALLED AT SAME DEPTH
AS LINE POSTS.)

**SOIL ANCHOR, POST 1
& LINE POST 2 THRU 9**

SECTION VIEW A-A

CABLE
FRICTION PLATE
HEAD UNIT
ITEM (9)

NOTE:
INSTALL ⅝" RECESSED HEX
NUTS ON TRAFFIC SIDE.

ITEM (24)

ITEM (21)

ITEM (20)
8X

ITEM (17)
8X

ITEM (23)
6X
3 SCREWS
EACH SIDE

(RAIL 1)

ITEM (22)
BRACKET
SHIPPED FLAT

ITEM (3)

ITEM (16)
4X

✳ ITEM (25)
HIGH INTENSITY
REFLECTIVE SHEETING

NOTE: DELINEATION MARKER IN
ACCORDANCE WITH TEXAS MUTCD.

SPLICE FOR IMPACT-HEAD
TO GUARD FENCE (RAIL1)

DETAIL (A)

GENERAL NOTES

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

ITEM #	PART NUMBER	DESCRIPTION	QTY
1	BSI-1610060-00	SOIL ANCHOR - GALVANIZED	1
2	BSI-1610061-00	GROUND STRUT - GALVANIZED	1
3	BSI-1610062-00	MAX-TENSION IMPACT HEAD	1
4	BSI-1610063-00	W6x9 I-BEAM POST 6FT.-GALVANIZED	1
5	BSI-1610064-00	TSS PANEL - TRAFFIC SIDE SLIDER	1
6	BSI-1610065-00	ISS PANEL - INNER SIDE SLIDER	1
7	BSI-1610066-00	TOOTH - GEOMET	1
8	BSI-1610067-00	RSS PLATE - REAR SIDE SLIDER	1
9	B061058	CABLE FRICTION PLATE - HEAD UNIT	1
10	BSI-1610069-00	CABLE ASSEMBLY - MASH X-TENSION	2
11	BSI-1012078-00	X-LITE LINE POST-GALVANIZED	8
12	B090534	8" W-BEAM COMPOSITE-BLOCKOUT XT110	8
13	BSI-4004386	12'-6" W-BEAM GUARD FENCE PANELS 12GA.	4
14	BSI-1102027-00	X-LITE SQUARE WASHER	1
15	BSI-2001886	⅝" X 7" THREAD BOLT HH (GR.5)GEOMET	1
16	BSI-2001885	¾" X 3" ALL-THREAD BOLT HH (GR.5)GEOMET	4
17	4001115	⅝" X 1 ¼" GUARD FENCE BOLTS (GR.2)MGAL	48
18	2001840	⅝" X 10" GUARD FENCE BOLTS MGAL	8
19	2001636	⅝" WASHER F436 STRUCTURAL MGAL	2
20	4001116	⅝" RECESSED GUARD FENCE NUT (GR.2)MGAL	59
21	BSI-2001888	⅝" X 2" ALL THREAD BOLT (GR.5)GEOMET	1
22	BSI-17O1063-00	DELINEATION MOUNTING (BRACKET)	1
23	BSI-2001887	¼" X ¾" SCREW SD HH 410SS	7
24	4002051	GUARDRAIL WASHER RECT AASHTO FWR03	1
✳ 25	SEE NOTE BELOW	HIGH INTENSITY REFLECTIVE SHEETING	1
✳✳ 26	4002337	8" W-BEAM TIMBER-BLOCKOUT, PDB01B	8
✳✳ 27	BSI-4004431	25' W-BEAM GUARDRAIL PANEL,8-SPACE,12GA.	2
28	MANMAX Rev-(D)	MAX-TENSION INSTALLATION INSTRUCTIONS	1

✳ TO BE PROVIDED BY DISTRIBUTOR OR CONTRACTOR.

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

STANDARD
MBGF

APPROX 5'-10"

5'-0"

50' APPROACH GRADING

2'-0"

EDGE OF PAVEMENT

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

2'-0" MAX.
RAIL OFFSET

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

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

APPROACH GRADING AT GUARDRAIL END TREATMENTS

TRAFFIC FLOW

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

Texas Department of Transportation

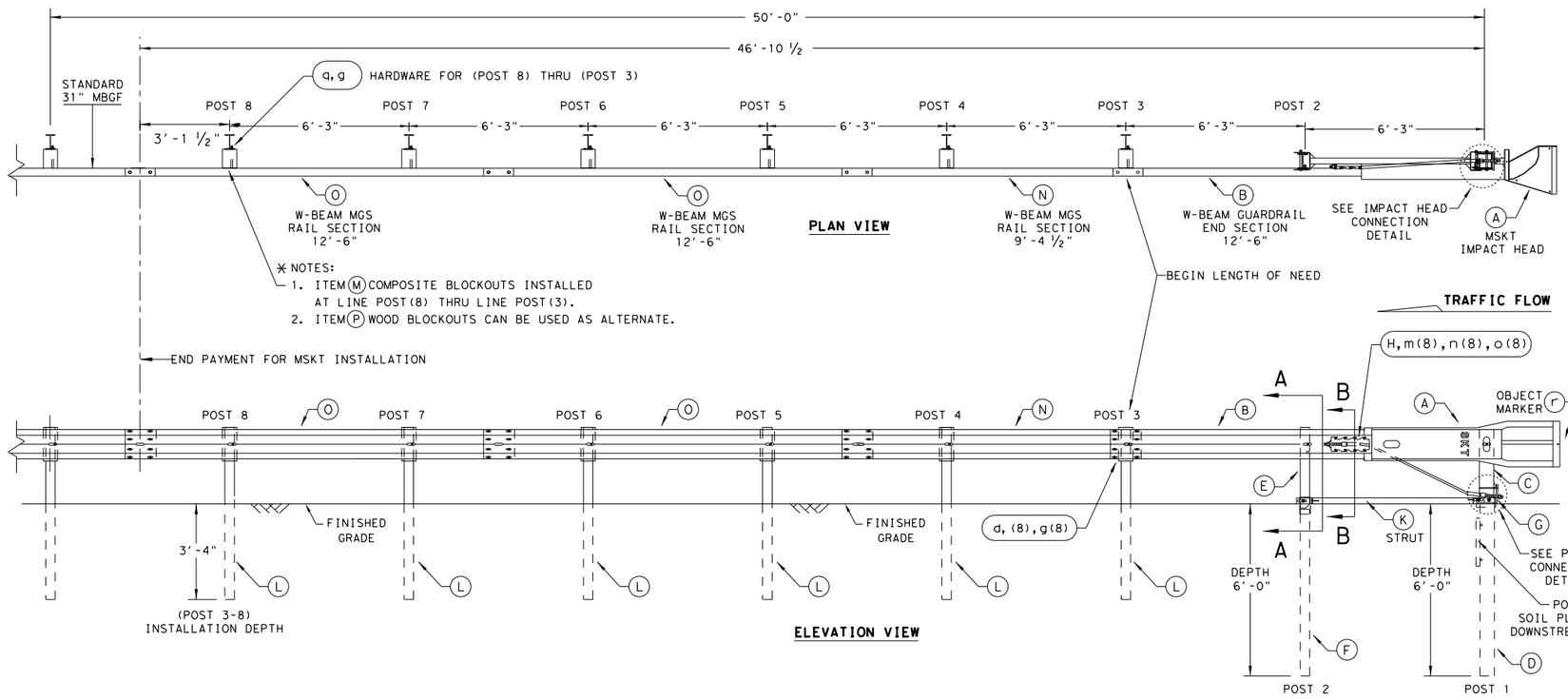
Design Division Standard

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

FILE: sgt11s3118.dgn	DN: TxDOT	CK: KM	DW: TxDOT	CK: CL
© TxDOT: FEBRUARY 2018	CONT	SECT	JOB	HIGHWAY
REVISIONS	0467	02	020, ETC.	SH 220
	DIST	COUNTY		SHEET NO.
	FTW	ERATH		86

DATE: 3/22/2024
FILE: ...\ST\Roadway\020sgt11s3118.dgn

DATE: 3/22/2024
FILE: ...\ST\Roadway\020sgt12s3118.dgn



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

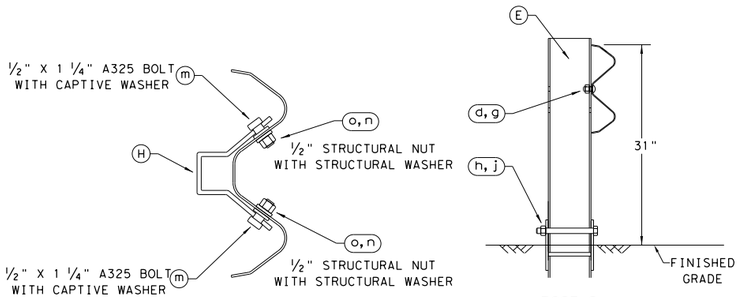
GENERAL NOTES

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

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

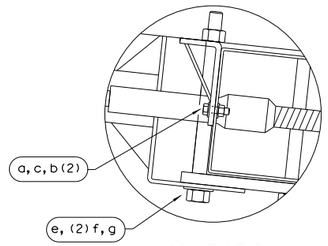
SEE NOTES: ✳

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

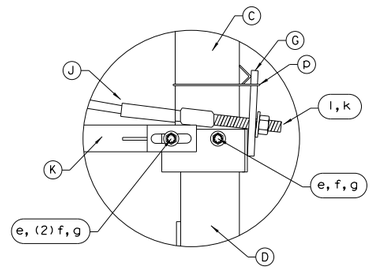


SECTION B-B
ANCHOR BRACKET

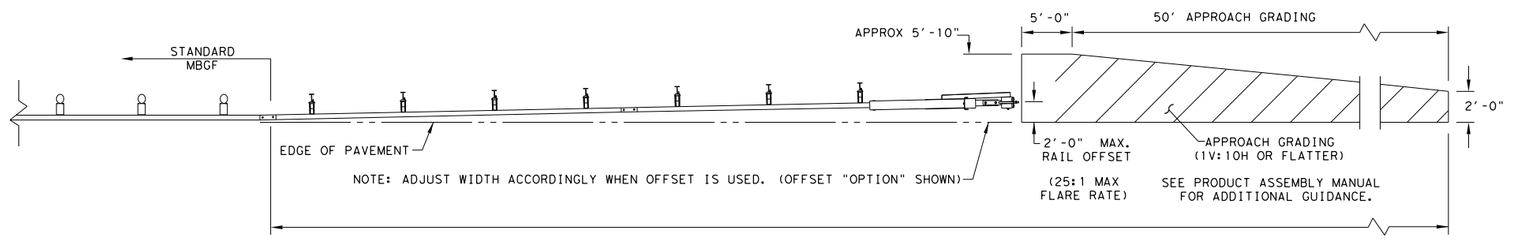
POST 2
SECTION A-A



IMPACT HEAD
CONNECTION DETAIL



POST 1
CONNECTION DETAIL



APPROACH GRADING AT GUARDRAIL END TREATMENTS

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

TRAFFIC FLOW

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

Texas Department of Transportation

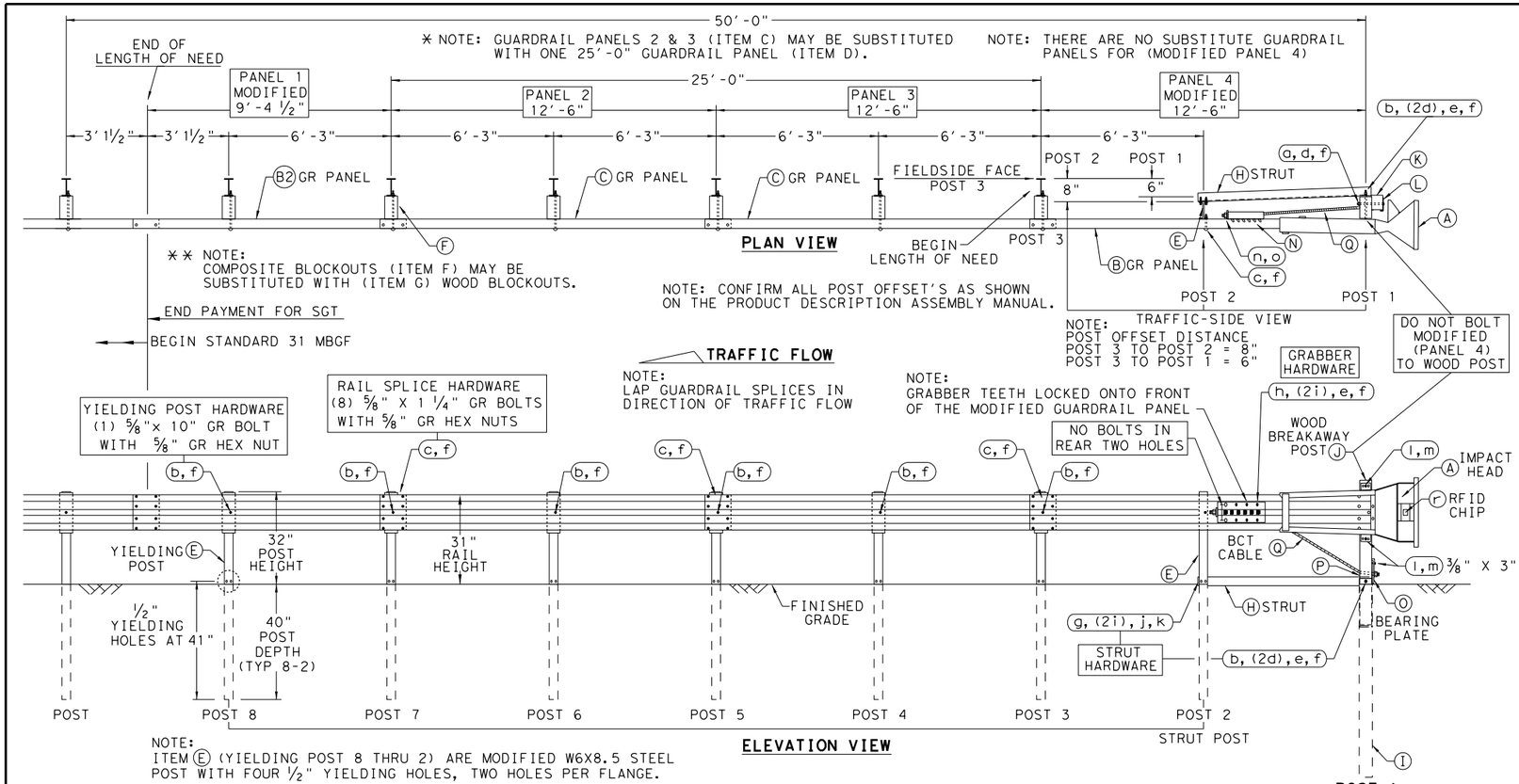
Design Division Standard

SINGLE GUARDRAIL TERMINAL

MSKT-MASH-TL-3

SGT(12S)31-18

FILE: sgt12s3118.dgn	DN: TxDOT	CK: KM	DW: VP		CK: CL
© TxDOT: APRIL 2018	CONT	SECT	JOB		HIGHWAY
REVISIONS	0467	02	020, ETC.		SH 220
	DIST	COUNTY			SHEET NO.
	FTW	ERATH			87

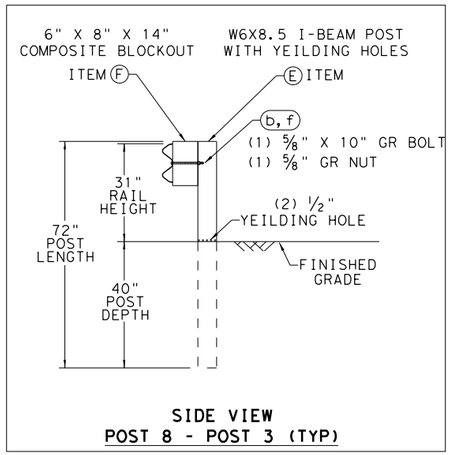


GENERAL NOTES

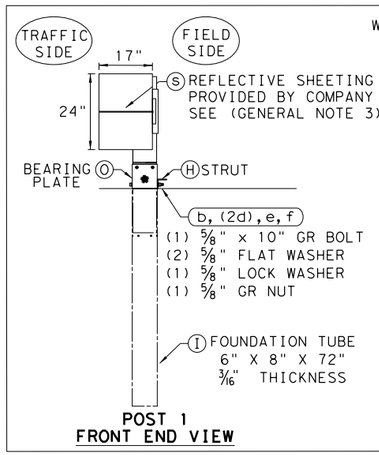
1. FOR SPECIFIC INFORMATION REGARDING INSTALLATION AND TECHNICAL GUIDANCE OF THE SYSTEM, CONTACT: SPIG INDUSTRY, INC. AT 1(267) 644-9510. 14675 INDUSTRIAL PARK RD; BRISTOL, VA 24202
2. FOR INSTALLATION, REPAIR AND MAINTENANCE REFER TO THE MANUFACTURER'S; SGET END TERMINAL, PRODUCT DESCRIPTION ASSEMBLY MANUAL.
3. MANUFACTURER WILL APPLY HIGH INTENSITY REFLECTIVE SHEETING, "OBJECT MARKER" TO THE FACE PLATE OF THE DEVICE PER MANUFACTURER'S RECOMMENDATIONS. THE OBJECT MARKER SHALL CONFORM TO THE STANDARDS REQUIRED IN TEXAS MUTCD.
4. THE NOMINAL HEIGHT OF THE GUARDRAIL BEAM IS 31 INCHES WITH A TOLERANCE OF +/- ONE INCH.
5. FOR POST (LEAVE-OUT) INSTALLATION AND GUIDANCE SEE TXDOT'S LATEST ROADWAY MOW STRIP STANDARD.
6. (POST 2 THROUGH POST 8) ARE MODIFIED STEEL-YIELDING POSTS WITH YIELDING HOLES AT GROUND LEVEL. THERE ARE NO SUBSTITUTE POSTS.
7. POSTS SHALL NOT BE SET IN CONCRETE.
8. IF SOLID ROCK IS ENCOUNTERED FOR ANY OF THE POSTS IN THE SYSTEM, CONTACT THE MANUFACTURER FOR SPECIFIC INSTALLATION GUIDANCE.
9. HARDWARE (BOLTS, NUTS, & WASHERS) SHALL BE GALVANIZED IN ACCORDANCE WITH ITEM 445,"GALVANIZING". FITTINGS SHALL BE SUBSIDIARY TO THE BID ITEM.
10. A COMPOSITE MATERIAL BLOCKOUT THAT MEETS DMS-7210 REQUIREMENTS MAY BE SUBSTITUTED FOR AN APPROVED WOOD BLOCKOUT. SEE CONSTRUCTION DIVISION MATERIAL PRODUCER LIST (MPL) FOR CERTIFIED PRODUCERS.
11. THE ENTIRE SYSTEM MUST BE INSTALLED IN A STRAIGHT LINE WITHOUT ANY CURVE. HOWEVER, THE SYSTEM CAN BE OFFSET BY TWO FEET AS SHOWN ON THE APPROACH GRADING DETAIL TO HELP OFF-SET THE IMPACT HEAD FROM SHOULDER OF THE ROAD.

ITEM	QTY	MAIN SYSTEM COMPONENTS	ITEM #
A	1	SGET IMPACT HEAD	SIH1A
B	1	MODIFIED GUARDRAIL PANEL 12'-6" 12GA	126SPZGP
B2	1	MODIFIED GUARDRAIL PANEL 9'-4 1/2" 12GA	GP94
C	2	STANDARD GUARDRAIL PANEL 12'-6" 12GA	GP126
D	1	STANDARD GUARDRAIL PANEL 25'-0" 12GA	GP25
E	7	MODIFIED YIELDING I-BEAM POST W6x8.5	YP6MOD
F	6	COMPOSITE BLOCKOUT 6" X 8" X 14"	CBO8
G	6	WOOD BLOCKOUT 6" X 8" X 14"	WBO8
H	1	STRUT 3" X 3" X 80" x 1/4" A36 ANGLE	STR80
I	1	FOUNDATION TUBE 6" X 8" X 72" x 3/16"	FNDT6
J	1	WOOD BREAKAWAY POST 5 1/2" x 7 1/2" x 50"	WBRK50
K	1	WOOD STRIKE BLOCK	WSBLK14
L	1	STRIKE PLATE 1/4" A36 BENT PLATE	SPLT8
M	1	REINFORCEMENT PLATE 12 GA. GR55	REPLT17
N	1	GUARDRAIL GRABBER 2 1/2" X 2 1/2" X 16 1/2"	GGR17
O	1	BEARING PLATE 8" X 8 5/8" X 5/8" A36	BPLT8
P	1	PIPE SLEEVE 4 1/4" X 2 3/8" O.D. (2 1/8" I.D.)	PSLV4
Q	1	BCT CABLE 3/4" X 81" LENGTH	CBL81
		SMALL HARDWARE	
a	1	5/8" X 12" GUARDRAIL BOLT 307A HDG	12GRBLT
b	7	5/8" X 10" GUARDRAIL BOLT 307A HDG	10GRBLT
c	33	5/8" X 1 1/4" GR SPLICE BOLTS 307A HDG	1GRBLT
d	3	5/8" FLAT WASHER F436 A325 HDG	58FW436
e	1	5/8" LOCK WASHER HDG	58LW
f	39	5/8" GUARDRAIL HEX NUT HDG	58HN563
g	2	1/2" X 2" STRUT BOLT A325 HDG	2BLT
h	6	1/2" X 1 1/4" PLATE BOLT A325 HDG	125BLT
i	16	1/2" FLAT WASHER F436 A325 HDG	12FWF436
j	8	1/2" LOCK WASHER HDG	12LW
k	8	1/2" HEX NUT A563 HDG	12HN563
l	4	3/8" X 3" HEX LAG SCREW GR5 HDG	38LS
m	4	3/8" FLAT WASHER F436 A325 HDG	38FW844
n	2	1" FLAT WASHER F436 A325 HDG	1FWF436
o	2	1" HEX NUT A563DH HDG	1HN563
p	1	18" TO 24" LONG ZIP TIE RATED 175-200LB	ZPT18
q	1	1 1/2" X 4" SCH-40 PVC PIPE	PSPCR4
r	1	RFID CHIP RATED MIL-STD-810F	RFID810F
s	1	IMPACT HEAD REFLECTIVE SHEETING	RS30M

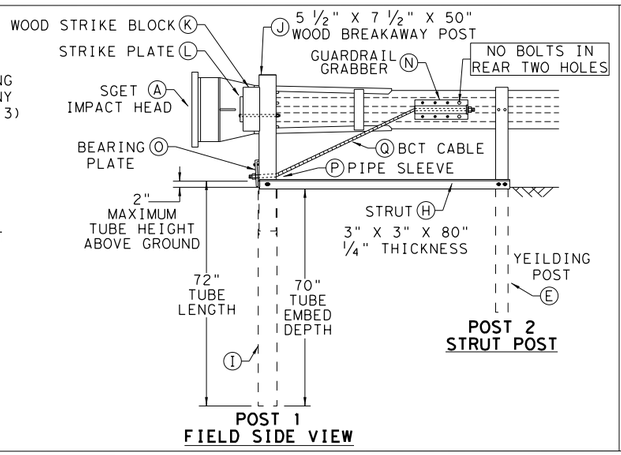
* ALTERNATIVE ITEMS
** NOTE: SEE PLAN VIEW



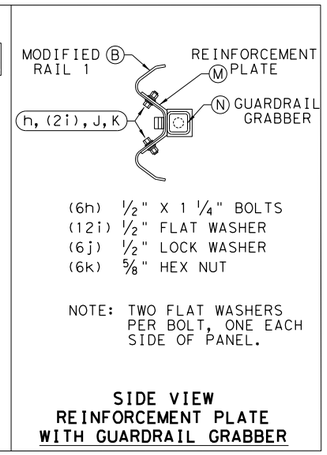
SIDE VIEW
POST 8 - POST 3 (TYP)



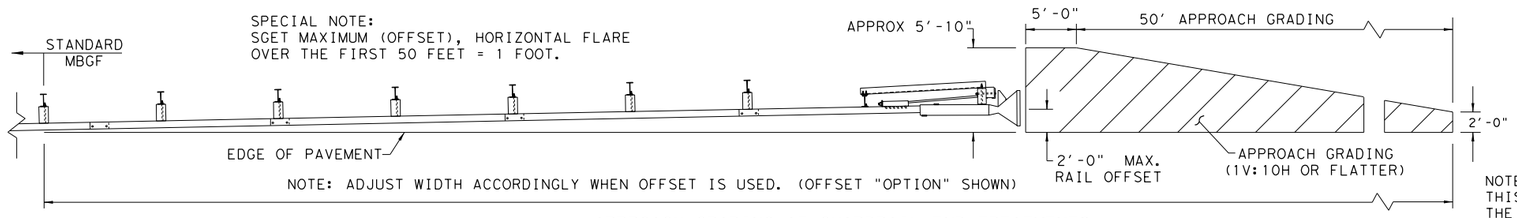
POST 1
FRONT END VIEW



POST 1
FIELD SIDE VIEW



SIDE VIEW
REINFORCEMENT PLATE
WITH GUARDRAIL GRABBER



APPROACH GRADING AT GUARDRAIL END TREATMENTS

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

Texas Department of Transportation

Design Division Standard

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

FILE: sgt153120.dgn	DN: TxDOT	CK: KM	DW: VP	CK: VP		
©TxDOT: APRIL 2020	CONT	SECT	JOB	HIGHWAY		
REVISIONS	0467	02	020, ETC.	SH 220		
	DIST	COUNTY		SHEET NO.		
	FTW	ERATH		88		

DATE: 3/22/2024
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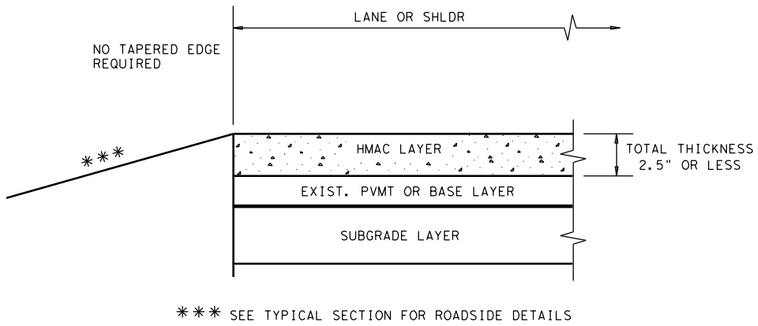
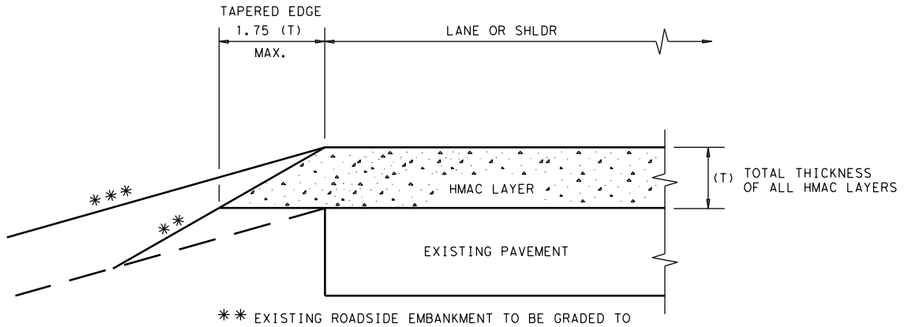


*** SEE TYPICAL SECTION FOR ROADSIDE DETAILS

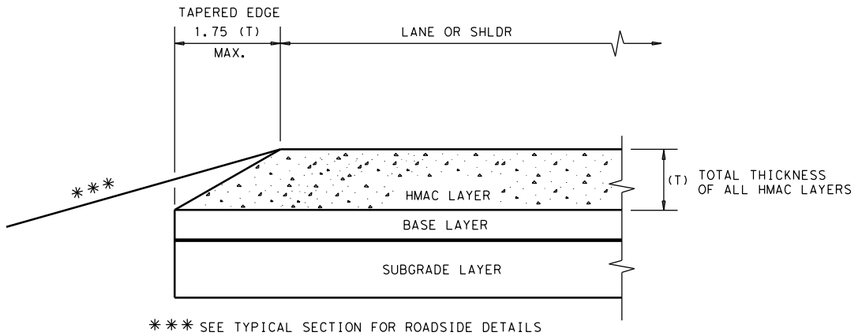
CONDITION - 1
THIN HMAC SURFACES OR HMAC OVERLAY
WITH THICKNESS OF 2.5" OR LESS



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

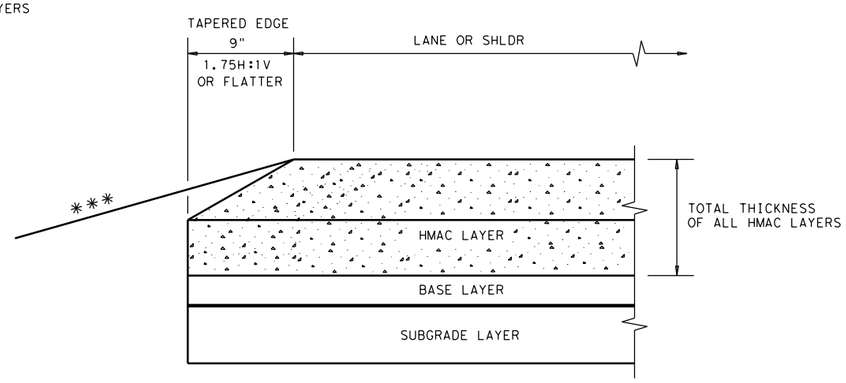
*** SEE TYPICAL SECTION FOR ROADSIDE DETAILS

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



*** SEE TYPICAL SECTION FOR ROADSIDE DETAILS

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



*** SEE TYPICAL SECTION FOR ROADSIDE DETAILS

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

(NOT TO SCALE)

GENERAL NOTES

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

Texas Department of Transportation

Design Division Standard

TAPERED EDGE DETAILS
HMAC PAVEMENT

TE(HMAC)-11

FILE: tehmac11.dgn	DN: TxDOT		CK: RL		DW: KB		CK:
©TxDOT January 2011	CONT	SECT	JOB			HIGHWAY	
REVISIONS	0467	02	020, ETC.			SH 220	
	DIST		COUNTY				SHEET NO.
	FTW		ERATH				89

DATE: 3/22/2024
FILE: ...\ST\Roadway\020tehmac11.dgn

DATE: 4/24/2024 2:34:14 PM
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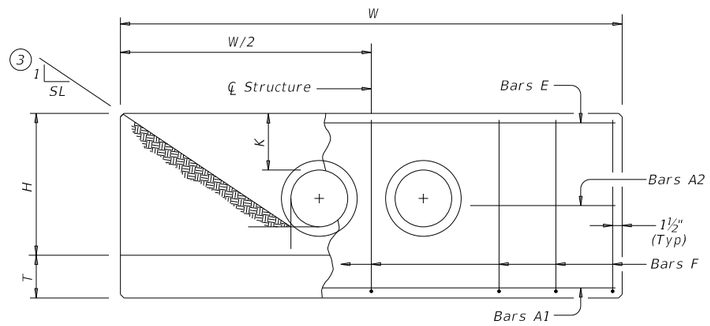
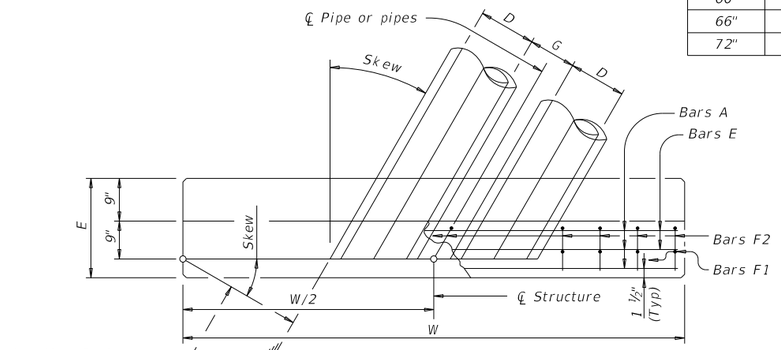
TABLE OF VARIABLE DIMENSIONS AND QUANTITIES FOR ONE HEADWALL (5)

Slope	Dia of Pipe (D)	15° Skew						30° Skew						45° Skew					
		Values for One Pipe			Values To Be Added for Each Addt'l Pipe			Values for One Pipe			Values To Be Added for Each Addt'l Pipe			Values for One Pipe			Values To Be Added for Each Addt'l Pipe		
		W	Reinf (Lbs) (1)	Conc (CY) (2)	W	Reinf (Lbs) (1)	Conc (CY) (2)	W	Reinf (Lbs) (1)	Conc (CY) (2)	W	Reinf (Lbs) (1)	Conc (CY) (2)	W	Reinf (Lbs) (1)	Conc (CY) (2)	W	Reinf (Lbs) (1)	Conc (CY) (2)
2:1	12"	9' – 4"	124	1.1	1' – 9 3/4"	15	0.2	10' – 5"	130	1.2	2' – 0"	16	0.2	12' – 9"	159	1.5	2' – 5 3/4"	17	0.3
	15"	10' – 7"	136	1.3	2' – 3"	17	0.2	11' – 10"	159	1.5	2' – 6"	18	0.2	14' – 6"	191	1.8	3' – 0 3/4"	20	0.3
	18"	11' – 11"	165	1.5	2' – 9"	19	0.3	13' – 3"	174	1.7	3' – 1"	29	0.3	16' – 3"	207	2.1	3' – 9 1/4"	33	0.4
	21"	13' – 2"	203	1.9	3' – 2 1/4"	31	0.4	14' – 9"	233	2.1	3' – 6 3/4"	33	0.4	18' – 0"	276	2.6	4' – 4 1/4"	36	0.5
	24"	14' – 6"	240	2.1	3' – 8 1/4"	34	0.4	16' – 2"	251	2.4	4' – 1 3/4"	36	0.5	19' – 10"	318	2.9	5' – 0 3/4"	39	0.6
	27"	15' – 9"	258	2.5	4' – 0 3/4"	38	0.5	17' – 7"	292	2.8	4' – 6 1/4"	39	0.6	21' – 7"	342	3.4	5' – 6 1/4"	44	0.7
	30"	17' – 1"	297	2.8	4' – 5 3/4"	40	0.6	19' – 1"	311	3.1	5' – 0"	42	0.6	23' – 4"	388	3.8	6' – 1 3/4"	47	0.8
	33"	18' – 5"	320	3.3	4' – 9 3/4"	43	0.6	20' – 6"	358	3.6	5' – 4 3/4"	46	0.7	25' – 1"	439	4.4	6' – 7 1/4"	51	0.9
	36"	19' – 8"	401	4.0	5' – 3"	47	0.9	21' – 11"	422	4.5	5' – 10 3/4"	50	0.9	26' – 10"	517	5.5	7' – 2 1/4"	55	1.2
	42"	22' – 3"	476	5.0	6' – 0 3/4"	53	1.1	24' – 10"	528	5.6	6' – 8 3/4"	56	1.2	30' – 5"	634	6.9	8' – 3"	76	1.4
	48"	25' – 11"	577	6.6	6' – 9 3/4"	60	1.3	28' – 10"	637	7.3	7' – 7 1/4"	79	1.5	35' – 4"	791	9.0	9' – 3 3/4"	88	1.8
	54"	28' – 6"	711	7.8	7' – 9"	83	1.6	31' – 9"	781	8.7	8' – 8"	81	1.8	38' – 11"	958	10.7	10' – 7 1/4"	97	2.2
	60"	31' – 1"	805	9.2	8' – 6 1/4"	91	1.9	34' – 8"	881	10.2	9' – 6 1/4"	97	2.1	42' – 5"	1,113	12.5	11' – 8"	124	2.6
	66"	33' – 8"	907	10.6	9' – 0 3/4"	98	2.1	37' – 6"	1,028	11.8	10' – 1 1/4"	102	2.4	46' – 0"	1,235	14.5	12' – 4 1/4"	132	2.9
	72"	36' – 3"	1,071	12.1	9' – 8"	105	2.4	40' – 5"	1,207	13.5	10' – 9 1/4"	110	2.6	49' – 6"	1,446	16.6	13' – 2 1/4"	141	3.2
3:1	12"	13' – 6"	178	1.6	1' – 9 3/4"	15	0.2	15' – 0"	189	1.8	2' – 0"	15	0.2	18' – 5"	237	2.2	2' – 5 3/4"	17	0.2
	15"	15' – 3"	212	1.9	2' – 3"	17	0.2	17' – 0"	223	2.1	2' – 6"	17	0.3	20' – 10"	276	2.6	3' – 0 3/4"	20	0.3
	18"	17' – 1"	231	2.3	2' – 9"	19	0.3	19' – 1"	259	2.5	3' – 1"	29	0.3	23' – 4"	318	3.1	3' – 9 1/4"	32	0.4
	21"	18' – 11"	306	2.7	3' – 2 1/4"	31	0.4	21' – 1"	339	3.0	3' – 6 3/4"	33	0.4	25' – 10"	413	3.7	4' – 4 1/4"	36	0.5
	24"	20' – 8"	345	3.1	3' – 8 3/4"	35	0.4	23' – 1"	384	3.5	4' – 1 3/4"	36	0.5	28' – 3"	462	4.2	5' – 0 3/4"	40	0.6
	27"	22' – 6"	376	3.7	4' – 0 3/4"	38	0.5	25' – 1"	438	4.1	4' – 6 1/4"	39	0.6	30' – 9"	522	5.0	5' – 6 1/4"	44	0.7
	30"	24' – 4"	422	4.1	4' – 5 3/4"	40	0.6	27' – 2"	466	4.6	5' – 0"	42	0.6	33' – 3"	578	5.6	6' – 1 3/4"	47	0.8
	33"	26' – 2"	476	4.8	4' – 10"	43	0.6	29' – 2"	522	5.3	5' – 4 3/4"	46	0.7	35' – 9"	644	6.5	6' – 7 1/4"	51	0.9
	36"	27' – 11"	590	5.9	5' – 3"	47	0.8	31' – 2"	645	6.6	5' – 10 3/4"	50	0.9	38' – 2"	787	8.0	7' – 2 1/4"	56	1.2
	42"	31' – 7"	684	7.3	6' – 0 1/4"	53	1.1	35' – 3"	776	8.2	6' – 8 3/4"	56	1.2	43' – 2"	933	10.0	8' – 3"	79	1.4
	48"	36' – 9"	880	9.6	6' – 9 3/4"	61	1.3	41' – 0"	953	10.7	7' – 7 1/4"	81	1.5	50' – 2"	1,166	13.1	9' – 3 3/4"	88	1.8
	54"	40' – 5"	1,065	11.4	7' – 9"	85	1.6	45' – 0"	1,185	12.7	8' – 8"	89	1.8	55' – 2"	1,435	15.5	10' – 7 1/4"	97	2.2
	60"	44' – 0"	1,224	13.3	8' – 6 1/4"	93	1.9	49' – 1"	1,356	14.8	9' – 6 1/4"	96	2.1	60' – 1"	1,635	18.2	11' – 8"	124	2.6
	66"	47' – 7"	1,357	15.4	9' – 1"	98	2.1	53' – 1"	1,497	17.2	10' – 1 1/4"	103	2.3	65' – 1"	1,892	21.1	12' – 4 1/4"	130	2.9
	72"	51' – 3"	1,624	17.7	9' – 8"	105	2.3	57' – 2"	1,787	19.7	10' – 9 1/4"	109	2.6	70' – 0"	2,218	24.1	13' – 2 1/4"	139	3.2
4:1	12"	17' – 7"	232	2.1	1' – 9 3/4"	15	0.2	19' – 8"	259	2.4	2' – 0"	16	0.2	24' – 0"	314	2.9	2' – 5 3/4"	18	0.2
	15"	19' – 11"	272	2.5	2' – 3"	17	0.2	22' – 3"	301	2.8	2' – 6"	18	0.3	27' – 3"	361	3.5	3' – 0 3/4"	21	0.3
	18"	22' – 3"	313	3.0	2' – 9"	19	0.3	24' – 10"	344	3.3	3' – 1"	29	0.3	30' – 5"	427	4.0	3' – 9 1/4"	32	0.4
	21"	24' – 7"	407	3.6	3' – 2 1/4"	31	0.4	27' – 5"	446	4.0	3' – 6 3/4"	33	0.4	33' – 7"	549	4.9	4' – 4 1/4"	36	0.5
	24"	26' – 11"	455	4.1	3' – 8 3/4"	35	0.4	30' – 0"	499	4.5	4' – 1 3/4"	36	0.5	36' – 9"	609	5.6	5' – 0 3/4"	40	0.6
	27"	29' – 3"	514	4.8	4' – 0 3/4"	38	0.5	32' – 7"	562	5.4	4' – 6 1/4"	40	0.6	39' – 11"	703	6.6	5' – 6 1/4"	43	0.7
	30"	31' – 7"	568	5.4	4' – 5 3/4"	40	0.6	35' – 3"	620	6.0	5' – 0"	42	0.6	43' – 2"	768	7.4	6' – 1 3/4"	49	0.8
	33"	33' – 11"	634	6.2	4' – 10"	43	0.7	37' – 10"	710	7.0	5' – 4 3/4"	46	0.7	46' – 4"	848	8.5	6' – 7 1/4"	52	0.9
	36"	36' – 3"	776	7.7	5' – 3"	48	0.9	40' – 5"	868	8.6	5' – 10 3/4"	49	0.9	49' – 6"	1,058	10.6	7' – 2 1/4"	56	1.1
	42"	40' – 11"	921	9.6	6' – 0 1/4"	53	1.0	45' – 7"	1,022	10.7	6' – 8 3/4"	57	1.2	55' – 10"	1,262	13.1	8' – 3"	78	1.4
	48"	47' – 7"	1,152	12.6	6' – 10"	61	1.3	53' – 1"	1,268	14.0	7' – 7 1/4"	80	1.5	65' – 1"	1,587	17.2	9' – 3 3/4"	86	1.8
	54"	52' – 3"	1,416	14.9	7' – 9 1/4"	86	1.6	58' – 4"	1,589	16.6	8' – 8"	89	1.8	71' – 5"	1,924	20.4	10' – 7 1/4"	95	2.2
	60"	56' – 11"	1,606	17.5	8' – 6 3/4"	92	1.9	63' – 6"	1,806	19.5	9' – 6 1/4"	95	2.1	77' – 9"	2,192	23.9	11' – 8"	122	2.6
	66"	61' – 7"	1,819	20.2	9' – 0 3/4"	97	2.1	68' – 8"	2,019	22.5	10' – 1 1/4"	101	2.4	84' – 2"	2,472	27.6	12' – 4 1/4"	131	2.9
	72"	66' – 3"	2,150	23.2	9' – 8"	104	2.4	73' – 11"	2,379	25.9	10' – 9 1/4"	108	2.6	90' – 6"	2,937	31.7	13' – 2 1/4"	138	3.2
6:1	12"	25' – 11"	342	3.1	1' – 9 3/4"	15	0.2	28' – 10"	374	3.5	2' – 0"	16	0.2	35' – 4"	456	4.3	2' – 5 3/4"	17	0.2
	15"	29' – 3"	390	3.7	2' – 3"	17	0.2	32' – 7"	442	4.2	2' – 6"	18	0.2	39' – 11"	549	5.1	3' – 0 3/4"	20	0.3
	18"	32' – 7"	459	4.4	2' – 9"	20	0.3	36' – 4"	515	4.9	3' – 1"	29	0.3	44' – 7"	629	6.0	3' – 9 1/4"	33	0.4
	21"	36' – 0"	608	5.3	3' – 2 1/4"	31	0.4	40' – 2"	660	5.9	3' – 6 3/4"	33	0.4	49' – 2"	823	7.2	4' – 4 1/4"	38	0.5
	24"	39' – 4"	672	6.0	3' – 8 3/4"	35	0.4	43' – 11"	748	6.7	4' – 1 3/4"	36	0.5	53' – 9"	920	8.2	5' – 0 3/4"	42	0.6
	27"	42' – 8"	770	7.1	4' – 0 3/4"	38	0.5	47' – 8"	852	8.0	4' – 6 1/4"	41	0.5	58' – 4"	1,039	9.7	5' – 6 1/4"	45	0.7
	30"	46' – 1"	839	8.0	4' – 5 3/4"	40	0.6	51' – 5"	949	8.9	5' – 0"	44	0.6	62' – 11"	1,162	10.9	6' – 1 3/4"	48	0.8
	33"	49' – 5"	947	9.2	4' – 10"	45	0.7	55' – 2"	1,040	10.3	5' – 4 3/4"	48	0.7	67' – 6"	1,292	12.6	6' – 7 1/4"	50	0.9
	36"	52' – 10"	1,151	11.4	5' – 3"	49	0.8	58' – 11"	1,287	12.7	5' – 10 3/4"	51	1.0	72' – 1"	1,583	15.6	7' – 2 1/4"	55	1.1
	42"	59' – 6"	1,365	14.2	6' – 0 1/4"	55	1.0	66' – 5"	1,530	15.8	6' – 8 3/4"	57	1.2	81' – 4"	1,875	19.4	8' – 3"	76	1.4
	48"	69' – 4"	1,737	18.5	6' – 10"	59	1.3	77' – 4"	1,942	20.7	7' – 7 1/4"	79	1.5	94' – 9"	2,368	25.3	9' – 3 3/4"	86	1.8
	54"	76' – 1"	2,138	22.0	7' – 9 1/4"	83	1.6	84' – 10"	2,378	24.6	8' – 8"	87	1.8	103' – 11"	2,912	30.1	10' – 7 1/4"	95	2.2
	60"	82' – 10"	2,426	25.8	8' – 6 3/4"	90	1.9	92' – 5"	2,681	28.8	9' – 6 1/4"	94	2.1	113' – 2"	3,294	35.3	11' – 8"	122	2.6
	66"	89' – 7"	2,730	29.9	9' – 0 3/4"	96	2.1	99' – 11"	3,038	33.3	10' – 1 1/4"	101	2.4	122' – 4"	3,697	40.8	12' – 4 1/4"	130	2.9
	72"	96' – 3"	3,218	34.2	9' – 8"	102	2.4	107' – 5"	3,580	38.2	10' – 9 1/4"	108	2.6	131' – 6"	4,372	46.8	13' – 2 1/4"	139	3.2



ELEVATION

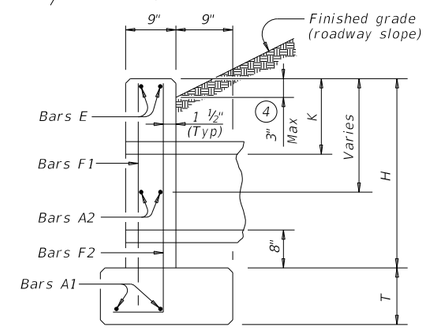


Lengths of wings based on SL:1 slope along this line.

3 Toe of slope

PLAN OF SKEWED PIPES

Showing 30° skew.



SECTION AT CENTER OF PIPE

(1) Total quantities include one 3'-1" lap for bars over 60' in length.

(2) Quantities shown are for concrete pipe and will increase slightly for metal pipe installations.

(3) Indicated slope is perpendicular to centerline pipe or pipes.

(4) For vehicle safety, construct curbs no more than 3" above finished grade. Reduce curb heights, if necessary, to meet these requirements. No changes will be made in quantities and no additional compensation will be allowed for this work.

(5) Dimensions shown are usual and maximum.

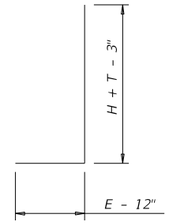
(6) Quantities shown are for one structure end only (one headwall).

TABLE OF CONSTANT DIMENSIONS

Dia of Pipe (D)	G	K (5)	H	T	E
12"	0' – 9"	1' – 0"	2' – 8"	0' – 9"	1' – 9"
15"	0' – 11"	1' – 0"	2' – 11"	0' – 9"	1' – 9"
18"	1' – 2"	1' – 0"	3' – 2"	0' – 9"	1' – 9"
21"	1' – 4"	1' – 0"	3' – 5"	0' – 9"	2' – 0"
24"	1' – 7"	1' – 0"	3' – 8"	0' – 9"	2' – 0"
27"	1' – 8"	1' – 0"	3' – 11"	0' – 9"	2' – 3"
30"	1' – 10"	1' – 0"	4' – 2"	0' – 9"	2' – 3"
33"	1' – 11"	1' – 0"	4' – 5"	0' – 9"	2' – 6"
36"	2' – 1"	1' – 0"	4' – 8"	1' – 0"	2' – 6"
42"	2' – 4"	1' – 0"	5' – 2"	1' – 0"	2' – 9"
48"	2' – 7"	1' – 3"	5' – 11"	1' – 0"	3' – 0"
54"	3' – 0"	1' – 3"	6' – 5"	1' – 0"	3' – 3"
60"	3' – 3"	1' – 3"	6' – 11"	1' – 0"	3' – 6"
66"	3' – 3"	1' – 3"	7' – 5"	1' – 0"	3' – 9"
72"	3' – 4"	1' – 3"	7' – 11"	1' – 0"	4' – 0"

TABLE OF (6) REINFORCING STEEL

Bar	Size	Spa	No.
A1	#5	~	2
A2	#5	1' – 6"	~
E	#5	~	2
F	#5	1' – 0"	~



BARS F2

MATERIAL NOTES:
Provide Grade 60 reinforcing steel.
Provide Class C concrete (f'c = 3,600 psi).

GENERAL NOTES:
Designed according to AASHTO LRFD Bridge Design Specifications.
Do not mount bridge rails of any type directly to these culvert headwalls.
This standard may not be used for wall heights, H, exceeding the values shown.

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

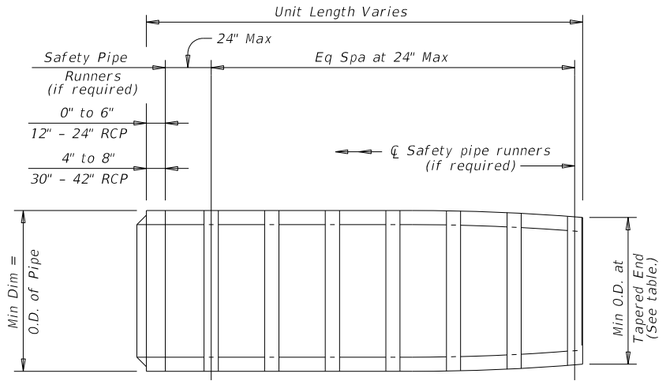
Texas Department of Transportation

Bridge Division Standard

CONCRETE HEADWALLS
WITH PARALLEL WINGS FOR SKEWED PIPE CULVERTS

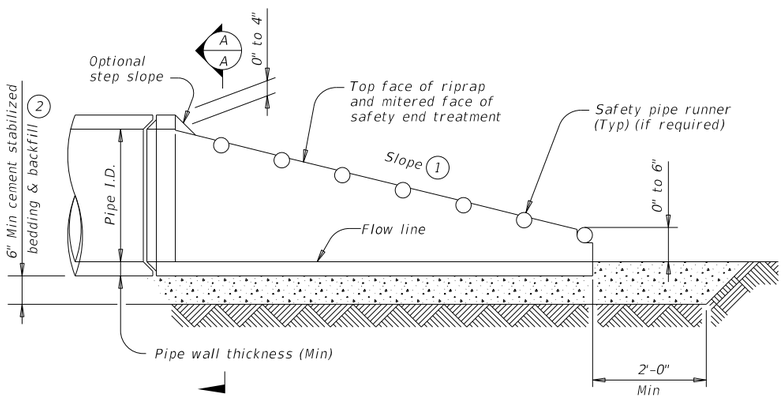
CH-PW-S

FILE:	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020 REVISIONS	CONT	SECT	JOB	HIGHWAY
	0467	02	020, ETC.	SH 220
	DIST	COUNTY		SHEET NO.
	FTW	ERATH		90



PLAN VIEW – 12" THRU 24"

(Showing spigot end connection.)



LONGITUDINAL ELEVATION - 12" THRU 24"

(Showing spigot end connection.)

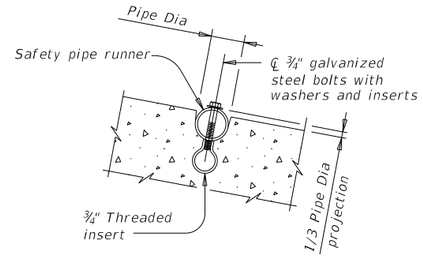
(1) Slope as shown elsewhere in the plans. Slope of 6:1 or flatter is required for vehicle safety.

(2) Provide cement stabilized bedding and backfill in accordance with the Item, "Excavation and Backfill for Structures." Bedding and backfill is considered subsidiary to the Item 467, "Safety End Treatment." When concrete riprap is specified around the safety end treatment, backfill as directed by Engineer.

(3) Fill the top 4" of void between precast end treatments with concrete riprap. Concrete riprap is considered subsidiary to the Item 467, "Safety End Treatment."

(4) Adjust clear distance between pipes to provide for the minimum distance between safety end treatments.

(5) Safety pipe runners are required for multiple pipe culverts with more than two pipes.



INSTALLATION DETAIL FOR SAFETY PIPE RUNNERS

(If required)

REQUIREMENTS FOR CULVERT PIPES AND SAFETY PIPE RUNNERS

Pipe I.D.	Min Wall Thickness	Min O.D.	Min O.D. at Tapered End	Min Reinf Requirements (sq. in. per ft. of Pipe)	Max Slope	Min Length of Unit	Pipe Runner Requirements		Required Pipe Runner Sizes		
							Single Pipe	Multiple Pipe	Nominal Dia	O.D.	I.D.
12"	2"	16"	16"	0.07 Circ.	6:1	4'–0"	No	(5)	3" STD	3.500"	3.068"
15"	2 ¼"	19 ½"	19"	0.07 Circ.	6:1	5'–8"	No	(5)	3" STD	3.500"	3.068"
18"	2 ½"	23"	21 ½"	0.07 Circ.	6:1	7'–3"	No	(5)	3" STD	3.500"	3.068"
24"	3"	30"	27"	0.07 Circ.	6:1	10'–6"	No	(5)	3" STD	3.500"	3.068"
30"	3 ½"	37"	31"	0.18 Circ.	6:1	12'–1"	No	Yes	4" STD	4.500"	4.026"
36"	4"	44"	36"	0.19 Ellip.	6:1	15'–4"	Yes	Yes	4" STD	4.500"	4.026"
42"	4 ½"	51"	41 ½"	0.23 Ellip.	6:1	18'–7"	Yes	Yes	4" STD	4.500"	4.026"

MATERIAL NOTES:

Synthetic fibers listed on the "Fibers for Concrete" Material Producer List (MPL) may be used in lieu of steel reinforcing in riprap concrete unless noted otherwise.

Provide pipe runners meeting the requirements of ASTM A53 (Type E or S, Gr B), ASTM A500 Gr B, or API 5LX52.

Galvanize steel components except reinforcing steel after fabrication. Repair galvanizing damaged during transport or construction in accordance with the specifications.

GENERAL NOTES:

Precast safety end treatment for reinforced concrete pipe (RCP) may be used for TYPE II end treatment as specified in Item 467, "Safety End Treatment."

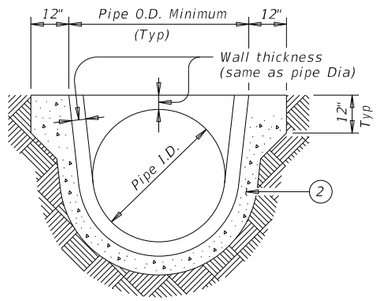
When precast safety end treatment is used as a Contractor's alternate to mitered RCP, riprap will not be required unless noted otherwise on the plans.

Manufacture precast concrete end sections in accordance with Item 464, "Reinforced Concrete Pipe" and in accordance with ASTM Specification C-76, Class III, Wall B for circular pipe.

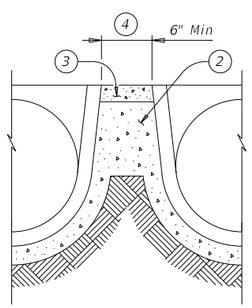
Provide precast concrete end sections with a spigot or bell end for compatibility to upstream or downstream end conditions with sufficient annular space to allow for grout, mortar, cold applied asphalt joint compound or pre-formed plastic gasket material.

Methods of lifting shall be provided by the manufacturer for ease of loading, unloading and installation.

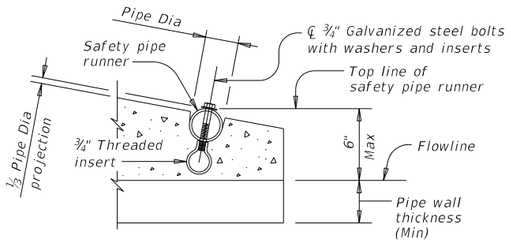
Pipe runners are designed for a traversing load of 10,000 Lbs at yield as recommended by Research Report 280-2F, "Safety Treatment of Roadside Parallel-Drainage Structures", Texas Transportation Institute, March 1981.



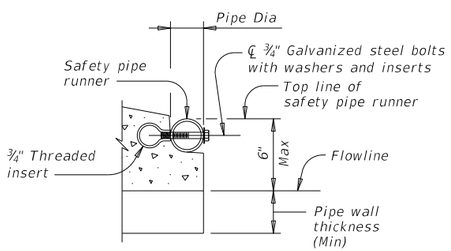
SECTION A-A



MULTIPLE PIPE INSTALLATION



OPTION A



OPTION B

END DETAILS FOR INSTALLATION OF SAFETY PIPE RUNNERS

(If required)

Texas Department of Transportation

Bridge Division Standard

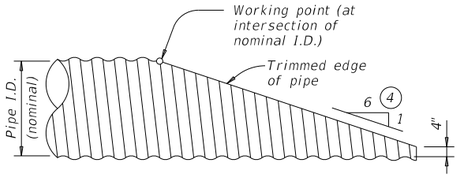
PRECAST SAFETY END TREATMENT

TYPE II ~ PARALLEL DRAINAGE

PSET-RP

FILE:	DN: RLW	CK: KLR	DW: JTR	CK: GAF
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0467	02	020, ETC.	SH 220
	DIST	COUNTY		SHEET NO.
	FTW	ERATH		91

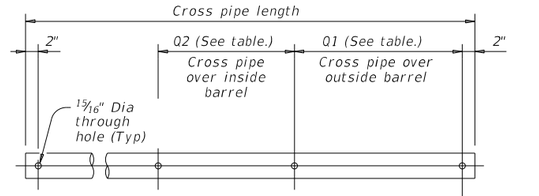
DATE: 4/24/2024 2:34:22 PM
FILE: ...\Roadway\020CD-PSET-RP-20.dgn



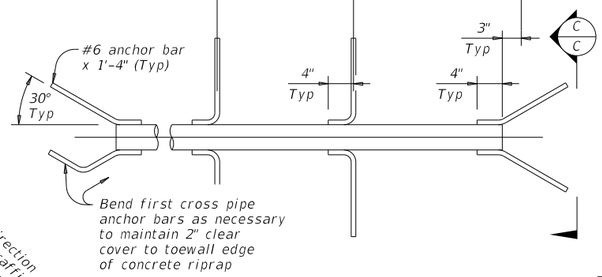
NOTE: All cross pipes, calculations, and dimensions are based on the pipe culverts mitered as shown in this detail. Alternate styles of mitered ends will require that appropriate adjustments be made to the values presented on this standard.

SIDE ELEVATION OF TYPICAL PIPE CULVERT MITER

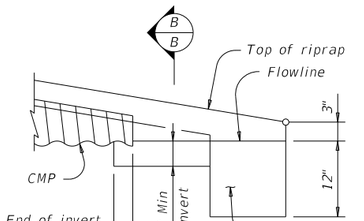
(Showing corrugated metal pipe (CMP) culvert Details at reinforced concrete pipe (RCP) culvert are similar.)



PIPE WITH BOLTED ANCHOR

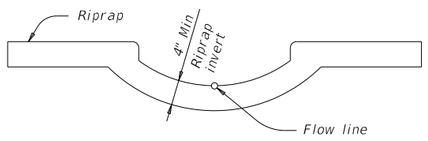


PIPE WITH ANCHOR BARS



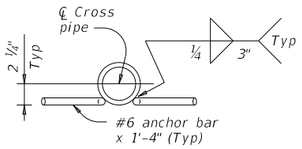
DETAIL "A"

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



SECTION B-B

(Cross pipes not shown for clarity.)



SECTION C-C

CROSS PIPE DETAILS

CROSS PIPE LENGTHS, REQUIRED PIPE SIZES, AND RIPRAP QUANTITIES (2)

Nominal Culvert I.D.	Conc Riprap (CY) (6)	Pipe Culvert Spa ~ G	Single Barrel ~ Q1	Multi-Barrel ~ Q1	Q2	Conditions for Use of Cross Pipes	Cross Pipe Sizes
12"	0.6	0' – 9"	N/A	2' – 1"	1' – 9"	3 or more pipe culverts	3" Std (3.500" O.D.)
15"	0.7	0' – 11"	N/A	2' – 5"	2' – 2"		
18"	0.8	1' – 2"	N/A	2' – 10"	2' – 8"		
21"	0.9	1' – 4"	N/A	3' – 2"	3' – 1"		
24"	0.9	1' – 7"	N/A	3' – 6"	3' – 7"		
27"	1.0	1' – 8"	N/A	3' – 10"	3' – 11"	3 or more pipe culverts	3 ½" Std (4.000" O.D.)
30"	1.1	1' – 10"	N/A	4' – 2"	4' – 4"	2 or more pipe culverts	
33"	1.2	1' – 11"	4' – 2"	4' – 5"	4' – 8"	All pipe culverts	
36"	1.3	2' – 1"	4' – 5"	4' – 9"	5' – 1"	All pipe culverts	4" Std (4.500" O.D.)
42"	1.5	2' – 4"	4' – 11"	5' – 5"	5' – 10"		
48"	1.7	2' – 7"	5' – 5"	6' – 0"	6' – 7"	All pipe culverts	5" Std (5.563" O.D.)
54"	2.0	3' – 0"	5' – 11"	6' – 9"	7' – 6"		
60"	2.2	3' – 3"	6' – 5"	7' – 4"	8' – 3"		
66"	2.4	3' – 3"	6' – 11"	7' – 10"	8' – 9"		
72"	2.7	3' – 4"	7' – 5"	8' – 5"	9' – 4"		

(1) The proper installation of the first cross pipe is critical for vehicle safety. Place the top of the first cross pipe no more than 6" above the flow line.

(2) Provide cross pipes, except the first bottom pipe, of the size shown in the table. Provide a 3 1#2" standard pipe (4" O.D.) for the first bottom pipe.

(3) Install the third cross pipe from the bottom of the culvert using a bolted connection. Ensure that riprap concrete does not flow into the cross pipe so as to permit disassembly of the bolted connection to allow cleanout access. At the Contractor's option, install all other cross pipes using the bolted connection details.

(4) Match cross slope as shown elsewhere in the plans. Cross slope of 6:1 or flatter is required for vehicle safety.

(5) Riprap placed beyond the limits shown will be paid for as concrete riprap in accordance with Item 432, "Riprap."

(6) Quantities shown are for one end of one reinforced concrete pipe (RCP) culvert. For multiple pipe culverts or for corrugated metal pipe (CMP) culverts, quantities will need to be adjusted. Riprap quantities are for contractor's information only.

MATERIAL NOTES:

Synthetic fibers listed on the "Fibers for Concrete" Material Producer List (MPL) may be used in lieu of steel reinforcing in riprap concrete unless noted otherwise.

Provide cross pipes that meet the requirements of ASTM A53 (Type E or S, Gr B), ASTM A500 (Gr B), or API 5LX52.

Provide ASTM A307 bolts and nuts.

Galvanize all steel components, except concrete reinforcing, after fabrication. Repair galvanizing damaged during transport or construction in accordance with the specifications.

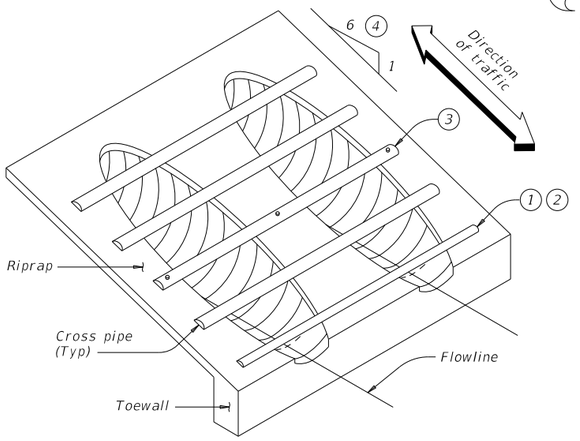
GENERAL NOTES:

Cross pipes are designed for a traversing load of 10,000 pounds at yield as recommended by Research Report 280-2F, "Safety Treatment of Roadside Parallel-Drainage Structures", Texas Transportation Institute, March 1981.

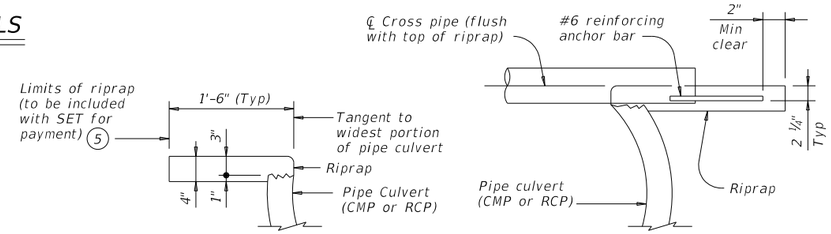
Safety end treatments (SET) shown herein are intended for use in those installations where out of control vehicles are likely to traverse the openings approximately perpendicular to the cross pipes.

Construct concrete riprap and all necessary inverts in accordance with the requirements of Item 432, "Riprap."

Payment for riprap and toewall is included in the Price Bid for each Safety End Treatment.

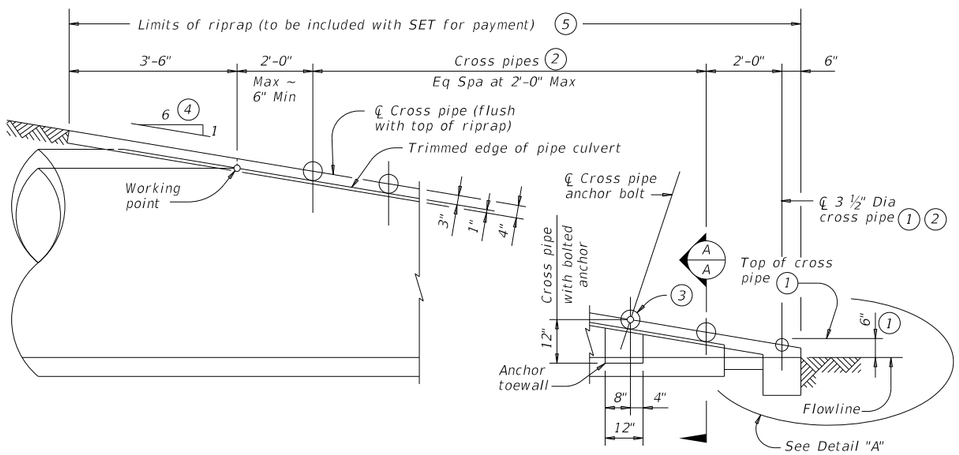


ISOMETRIC VIEW OF TYPICAL INSTALLATION



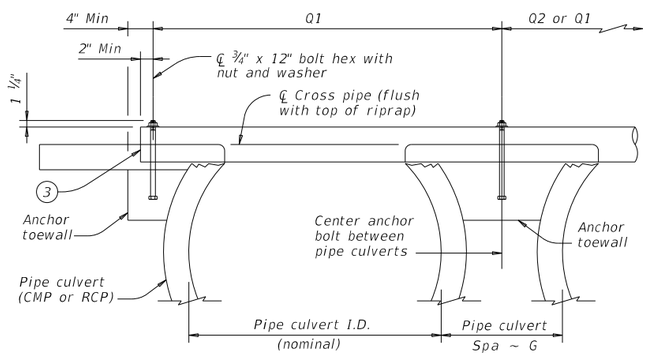
SHOWING TYPICAL PIPE CULVERT AND RIPRAP

SHOWING CROSS PIPE WITH ANCHOR BAR



SIDE ELEVATION OF CAST-IN-PLACE CONCRETE

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



SHOWING CROSS PIPE WITH BOLTED ANCHOR

SECTION A-A

Texas Department of Transportation

Bridge Division Standard

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

SETP-PD

FILE:	DN: GAF	CK: CAT	DW: JRP	CK: GAF
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0467	02	020, ETC.	SH 220
	DIST	COUNTY		SHEET NO.
	FTW	ERATH		92

DATE: 4/24/2024 2:34:29 PM
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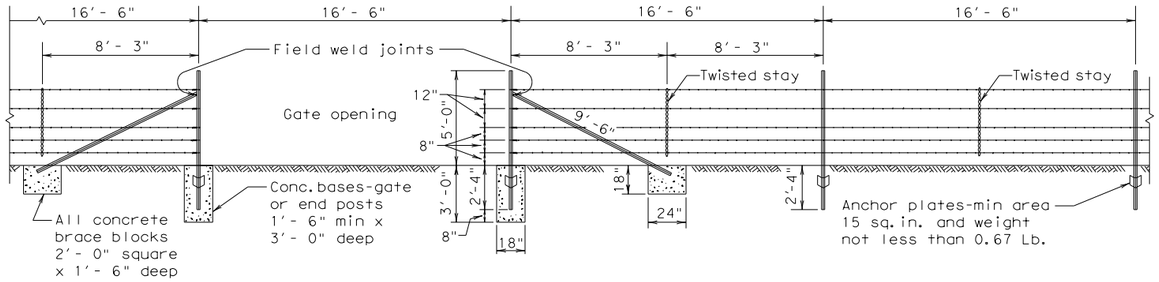
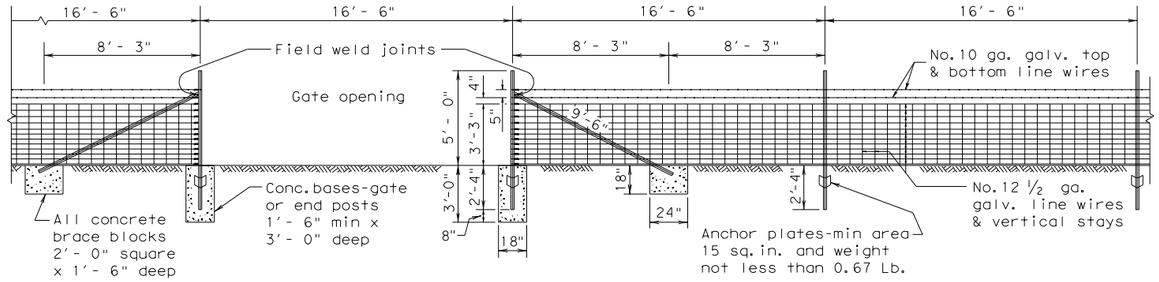
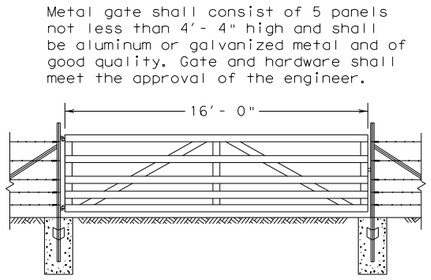


SECTION GALVANIZED BARBED WIRE FENCE WITH METAL POSTS
BRACING DETAIL USED AT ENDS AND GATES
TYPE "C" FENCE
(See General Note 8)

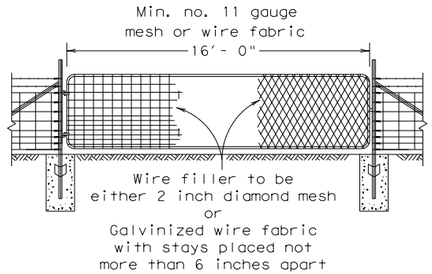


SECTION GALVANIZED WOVEN WIRE FENCE WITH METAL POSTS
BRACING DETAIL USED AT ENDS AND GATES
TYPE "D" FENCE
(See General Note 8)

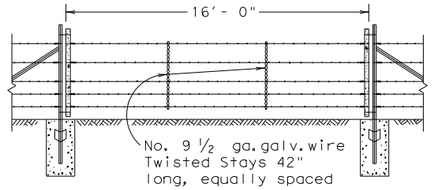
Note:
For Steel pipe and T-Post requirements.
(See General Notes 6 & 7)



DETAIL TYPE 1 GATE



DETAIL TYPE 2 GATE

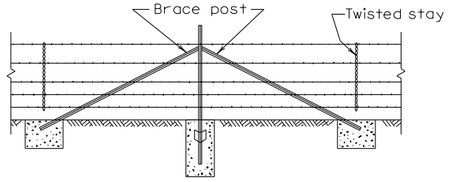


DETAIL TYPE 3 GATE

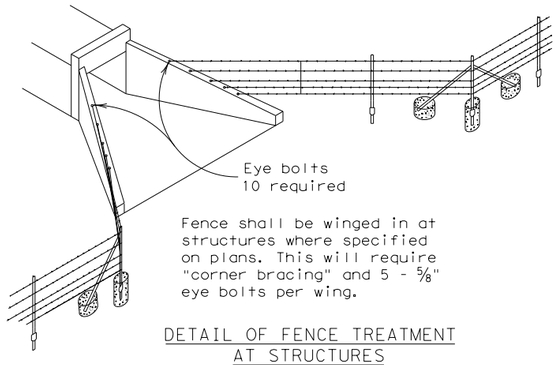
GENERAL NOTES

1. Any high point which interferes with the placing of wire mesh shall be excavated to provide a 2 inch clearance.
2. Latches for Type 1 and Type 2 gates shall be good commercial quality and design latch of the spring, fork or chain type. All latches shall be suitable to the gate and shall be approved by the Engineer.
3. Hinges for Type 2 gates shall be a commercial design approved by the Engineer suitable for post and gate.
4. Concrete shall be of the design and consistency approved by the Engineer and shall contain not less than 4 sacks of cement per cubic yard. Concrete footings are to be crowned at the top to shed water.
5. Steel anchor plates shall be of a design and thickness sufficient to prevent turning of the post in firm soil.
6. Steel pipe end posts, corner and pull posts shall be a minimum of 2" Std. pipe (2.375" O.D., 0.154" wall thickness) with a 1¼" Std. pipe brace (1.660" O.D., 0.140" wall thickness), with a 2"x2"x1/4" angle, or other as approved by the Engineer. Fasteners for securing barbed wire or woven wire fence to metal posts shall be a minimum of 11 gauge galvanized steel wire. Tubular posts shall be fitted with water malleable iron caps.
7. If Steel pipe is used for posts and braces, use standard pipe in accordance with ASTM A 53, Class B or A 501. For T-Posts use steel that meets ASTM A 702. Metal line posts shall be not less than 6′-6" in length and shall weigh not less than (1.33 lbs./lin.ft.). These Items shall be in accordance with Item 552, "Wire Fence."
8. Barbed Wire shall be in accordance with ASTM A 121, Class 1 Design designation 12-2-4-1 4R or 12-2-5-1 4R, or as approved by the Engineer.

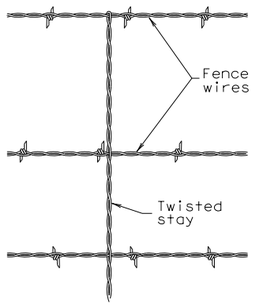
   Woven Wire Fence (Type D) shall be in accordance with ASTM A 116, Class 1 No. 12-1/2 Grade 60 (See Table 1 ASTM A 116) to the height and design shown on the plans, or as approved by the Engineer.
9. The location of gates and corner posts will be as indicated elsewhere in these plans.



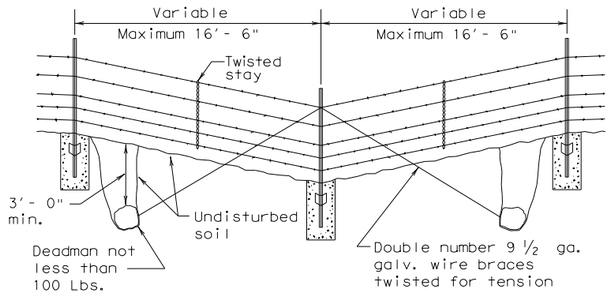
CORNER OR PULL POST ASSEMBLY



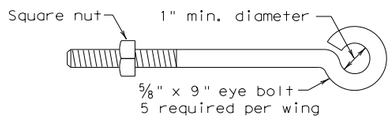
DETAIL OF FENCE TREATMENT AT STRUCTURES



DETAIL OF STAY
(Barbed Wire Fence)



DETAIL OF FENCE SAG



DETAIL OF EYE BOLT

Texas Department of Transportation
Design Division Standard

BARBED WIRE AND WOVEN WIRE FENCE (STEEL POSTS)

WF(2)-10

FILE: wf210.dgn	DN: TxDOT	CK: AM	DW: VP	CK:
©TxDOT 1996	CONT	SECT	JOB	HIGHWAY
REVISIONS	0467	02	020, ETC.	SH 220
	DIST	COUNTY		SHEET NO.
	FTW	ERATH		92A

DATE: 9/6/2024
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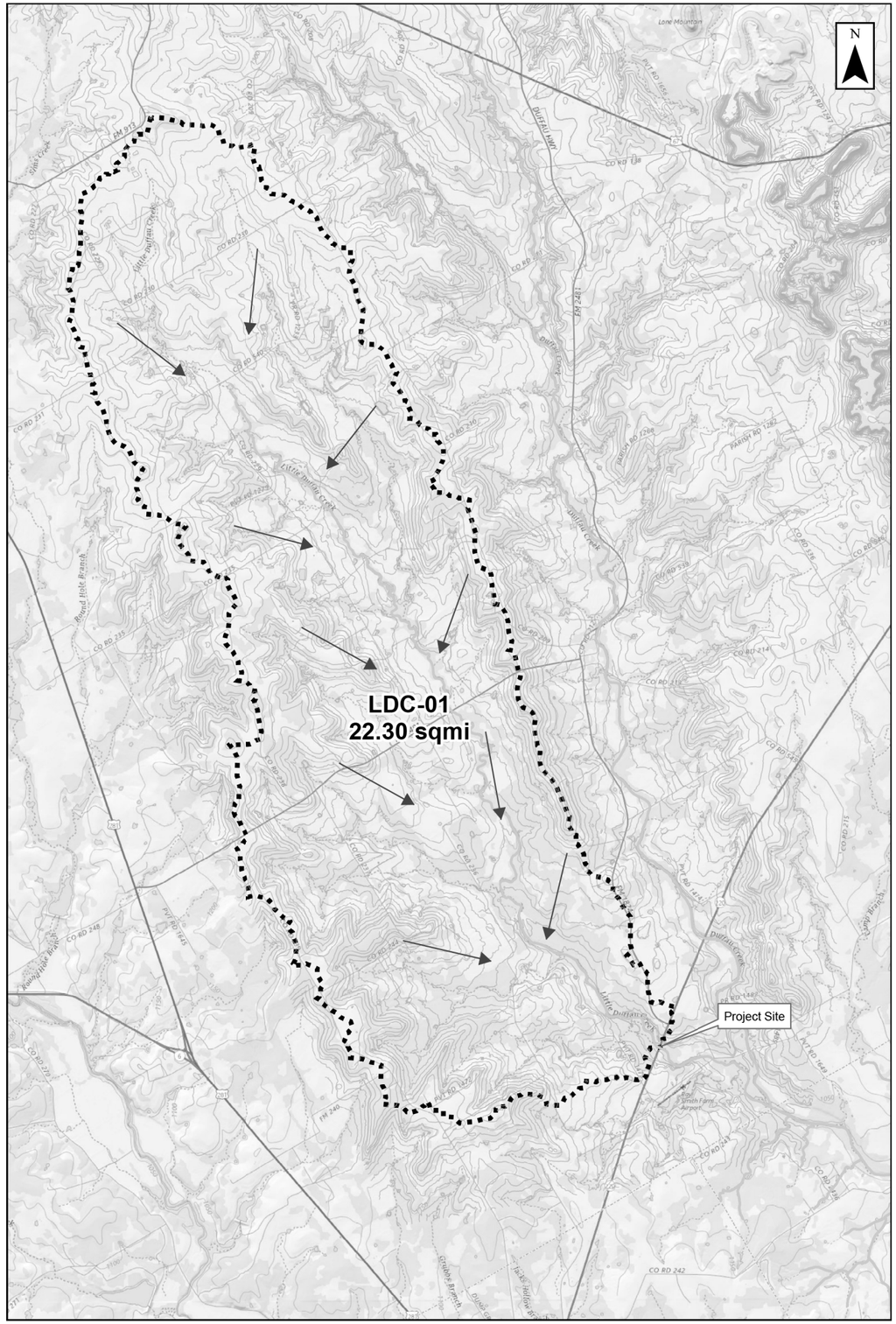
DATE: 7/1/2024



DRAINAGE AREA MAP

HYDROLOGIC COMPUTATIONS

WATERSHED NAME	SOURCE	AREA (SQ MI)	TC (MIN)	LAG TIME (MIN)	CN	Q2	Q5	Q10	Q25	Q50	Q100
LITTLE DUFFAU CREEK (LDC-01)	SCS 24-HR FLOWS	22.30	370	222	80	3455	5460	7178	9656	11589	13632
	OMEGA EM REGRESSION	22.30	-	-	-	1014	2173	3110	4635	5992	7638

STORM FREQUENCY (YR)		2	5	10	25	50	100
Pd (IN)	24 HOUR DURATION	3.68	4.76	5.72	7.10	8.21	9.40

NOTES:

1. RUNOFF COMPUTATIONS PERFORMED USING HEC-HMS 4.8 AND COMPARED TO TXDOT OMEGA REGRESSION RESULTS.
2. WEIGHTED CURVE NUMBER & TIME OF CONCENTRATION PARAMETERS DETERMINED USING ARCGIS WATERSHED MODEL.
3. THE RAINFALL DEPTHS IN INCHES WERE TAKEN FROM THE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATOR'S (NOAA'S) NATIONAL WEATHER SERVICE HYDROMETEOROLOGICAL DESIGN STUDIES CENTER PRECIPITATION FREQUENCY DATA SERVER (PFDS) NOAA ATLAS 14 POINT PRECIPITATION FREQUENCY ESTIMATES FOR TEXAS.
4. RAINFALL WAS MODELED USING HEC-HMS FREQUENCY STORMS WITH MAXIMUM DEPTHS PROVIDED FOR 15-MINUTE TO 24-HOUR EVENT DURATIONS.
5. RUNOFF VOLUME WAS COMPUTED USING THE SCS CURVE NUMBER LOSS MODEL.
6. TIME OF CONCENTRATION (TC) WAS COMPUTED USING THE KERBY-KIRPICH METHOD. LAG TIME = 0.6*TC
7. THE SCS UNIT HYDROGRAPH METHOD WAS USED TO DEVELOP DISCHARGE HYDROGRAPH.
8. PS&E SCS CALCULATED FLOWS WERE USED FOR THE DESIGN ANALYSIS OF THE 2-YR, 5-YR 10-YR, 25-YR, 50-YR, & 100-YR STORM FREQUENCIES BASED ON THEIR CONSISTENCIES WITH METHODOLOGIES OUTLINED IN THE TXDOT HDM. SEE "PRELIMINARY DRAINAGE REPORT FOR SH 220 AT LITTLE DUFFAU CREEK".
9. ERATH COUNTY FPA (MICKI BELL) WAS NOTIFIED OF THE PROJECT ON SEPTEMBER 8, 2021 AND WILL BE PROVIDED A COPY OF THE FINAL DRAINAGE REPORT.

REFERENCES:

1. TXDOT'S HYDRAULIC DESIGN MANUAL (SEPTEMBER 2019)
2. TOPOGRAPHIC DATA SOURCES (TNRIS 2016 BRAZOS RIVER BASIN LIDAR & SURVEY SITE TOPO)
3. SITE IS LOCATED ON FEMA FIRM PANEL 48143C0600D FOR ERATH CO. & UNINCORPORATED AREAS, DATED NOVEMBER 16, 2011, ZONE A

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Texas Department of Transportation

SH 220

AT LITTLE DUFFAU CREEK
BRIDGE HYDRAULIC DATA SHEET

SCALE: N.T.S. SHEET 1 OF 7

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NUMBER		HIGHWAY NO.
GD	6	(See Title Sheet)		SH 220
CHECK	STATE	DISTRICT	COUNTY	SHEET NO.
JC	TEXAS	FTW	ERATH	93
GRAPHICS	CONTROL	SECTION	JOB	
RS	0467	02	020, ETC.	
CHECK				
JC				

FILE: ...\DR\Shr\020DHD01.sht

TIME: 10:42:49 AM
DATE: 7/1/2024

NOTES:

1. USACE HEC-RAS VERSION 6.3.1 UTILIZED FOR THE ANALYSIS.
2. THIS SITE IS DESIGNATED AS A ZONE "A" AS SHOWN IN PANELS 48143C0600D. 100-YEAR FLOODPLAIN WIDTHS ARE COMPARABLE.
3. ALL ELEVATIONS BASED ON THE NAVD88 VERTICAL DATUM.
4. THE DOWNSTREAM BOUNDARY CONDITIONS ARE ESTABLISHED FROM THE NORMAL DEPTH. THERE ARE NO KNOWN WATER SURFACE ELEVATIONS.
5. SCHEMATIC SCS CALCULATED FLOWS WERE USED FOR THE DESIGN ANALYSIS OF THE 25-YR STORM FREQUENCY & THE CHECK OF THE 100-YR STORM FREQUENCY BASED ON THEIR CONSISTENCIES WITH METHODOLOGIES OUTLINED IN THE TXDOT HDM. SEE "PRELIMINARY DRAINAGE REPORT FOR SH 220 AT LITTLE DUFFAU CREEK".

NOTES CONTINUED:

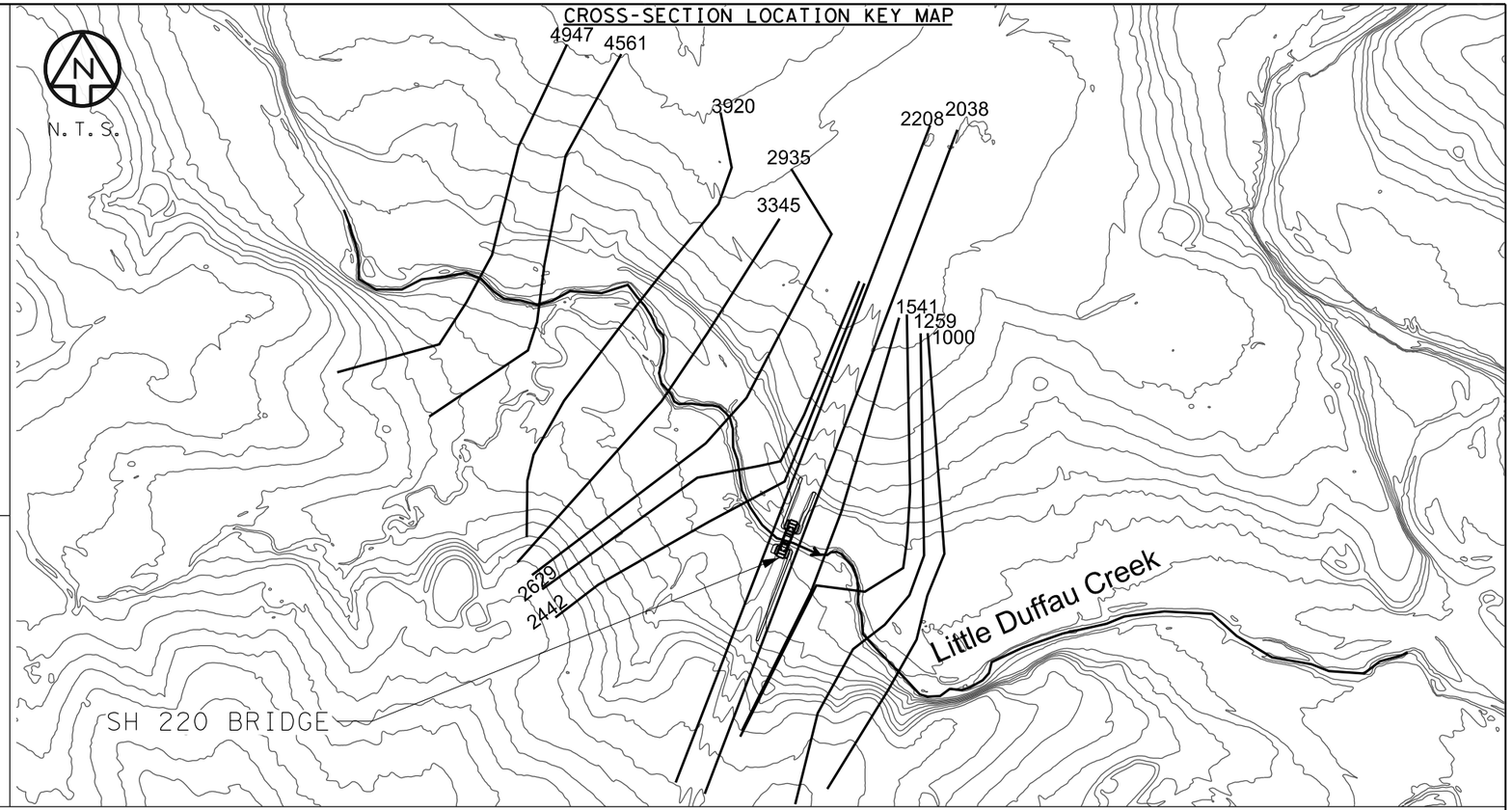
6. REFER TO THE H&H REPORT "PRELIMINARY DRAINAGE REPORT FOR SH 220 AT LITTLE DUFFAU CREEK" FOR ADDITIONAL INFORMATION.
7. ERATH COUNTY FPA (MICKI BELL) WAS NOTIFIED OF THE PROJECT ON SEPTEMBER 8, 2021 AND WILL BE PROVIDED A COPY OF THE FINAL DRAINAGE REPORT.

REFERENCES:

1. TXDOT'S HYDRAULIC DESIGN MANUAL (SEPTEMBER 2019)
2. TOPOGRAPHIC DATA SOURCES (TNRIS 2016 BRAZOS RIVER LIDAR & SURVEY SITE TOPO)

TIE-IN WSELS @ RS 1000

STORM FREQUENCY (YR)	2	5	10	25	50	100
NORMAL DEPTH D/S/WSEL (FT)*	1036.62	1037.52	1038.06	1038.72	1039.18	1039.63



HYDRAULIC COMPUTATIONS

HEC-RAS RIVER STA	DESIGN FREQUENCY 25-YR						DESIGN FREQUENCY 100-YR					
	FLOWS (CFS)	COMPUTED WATER SURFACE ELEVATION (FT)			VELOCITIES (FPS)		FLOWS (CFS)	COMPUTED WATER SURFACE ELEVATION (FT)			VELOCITIES (FPS)	
		EXIST	PROP	RISE	EXIST	PROP		EXIST	PROP	RISE	EXIST	PROP
4947	9656	1052.2	1052.2	0	10.67	10.68	13632	1053.26	1053.25	-0.01	12.01	12.03
4561	9656	1050.63	1050.64	0.01	9.59	9.57	13632	1051.58	1051.67	0.09	10.78	10.56
3920	9656	1048.21	1048.18	-0.03	10.08	10.15	13632	1049.8	1049.14	-0.64	9.83	11.3
3345	9656	1047.33	1046.1	-1.23	6.69	9.1	13632	1049.32	1047.93	-1.39	6.27	8.12
2935	9656	1047.04	1045.33	-1.81	5.24	7.21	13632	1049.08	1047.4	-1.68	5.32	6.82
2629	9656	1046.92	1044.88	-2.04	5.19	7.63	13632	1048.99	1047.18	-1.81	5.32	6.87
2442	9656	1046.86	1044.71	-2.15	4.7	7.02	13632	1048.93	1047.07	-1.86	4.89	6.29
2208 (ROW)	9656	1046.37	1043.61	-2.76	5.95	9.69	13632	1048.85	1045.63	-3.22	4.35	10.78
2116 (BR U/S	9656	1044.36	1041.45	-2.91	9.74	10.09	13632	1048.85	1043.41	-5.44	9.36	11.05
2116	SH 220 Bridge at Little Duffau Creek						SH 220 Bridge at Little Duffau Creek					
2116 (BR D/S	9656	1041.3	1041.49	0.19	14.75	11.52	13632	1048.7	1042.4	-6.3	10.31	12.42
2038 (ROW)	9656	1041.05	1041.53	0.37	13.74	13.95	13632	1042.45	1042.79	0.34	14.9	15.74
1881	9656	1040.45	1040.42	-0.03	10.32	10.32	13632	1041.27	1041.16	-0.11	12.55	12.72
1541	9656	1039.76	1039.86	0.1	9.77	9.77	13632	1040.68	1040.73	0.05	11.65	11.24
1259	9656	1039.16	1039.17	0.01	8.62	8.62	13632	1040.04	1040	-0.04	9.4	9.53
1000	9656	1038.72	1038.75	0.03	6.57	6.57	13632	1039.63	1039.61	-0.02	7.18	7.16

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Texas Department of Transportation

SH 220

AT LITTLE DUFFAU CREEK
BRIDGE HYDRAULIC DATA SHEET

SCALE: N.T.S. SHEET 2 OF 7

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NUMBER		HIGHWAY NO.
GD	6	(See Title Sheet)		SH 220
CHECK	STATE	DISTRICT	COUNTY	SHEET NO.
JC	TEXAS	FTW	ERATH	94
GRAPHICS	CONTROL	SECTION	JOB	
RS	0467	02	020, ETC.	
CHECK				
JC				

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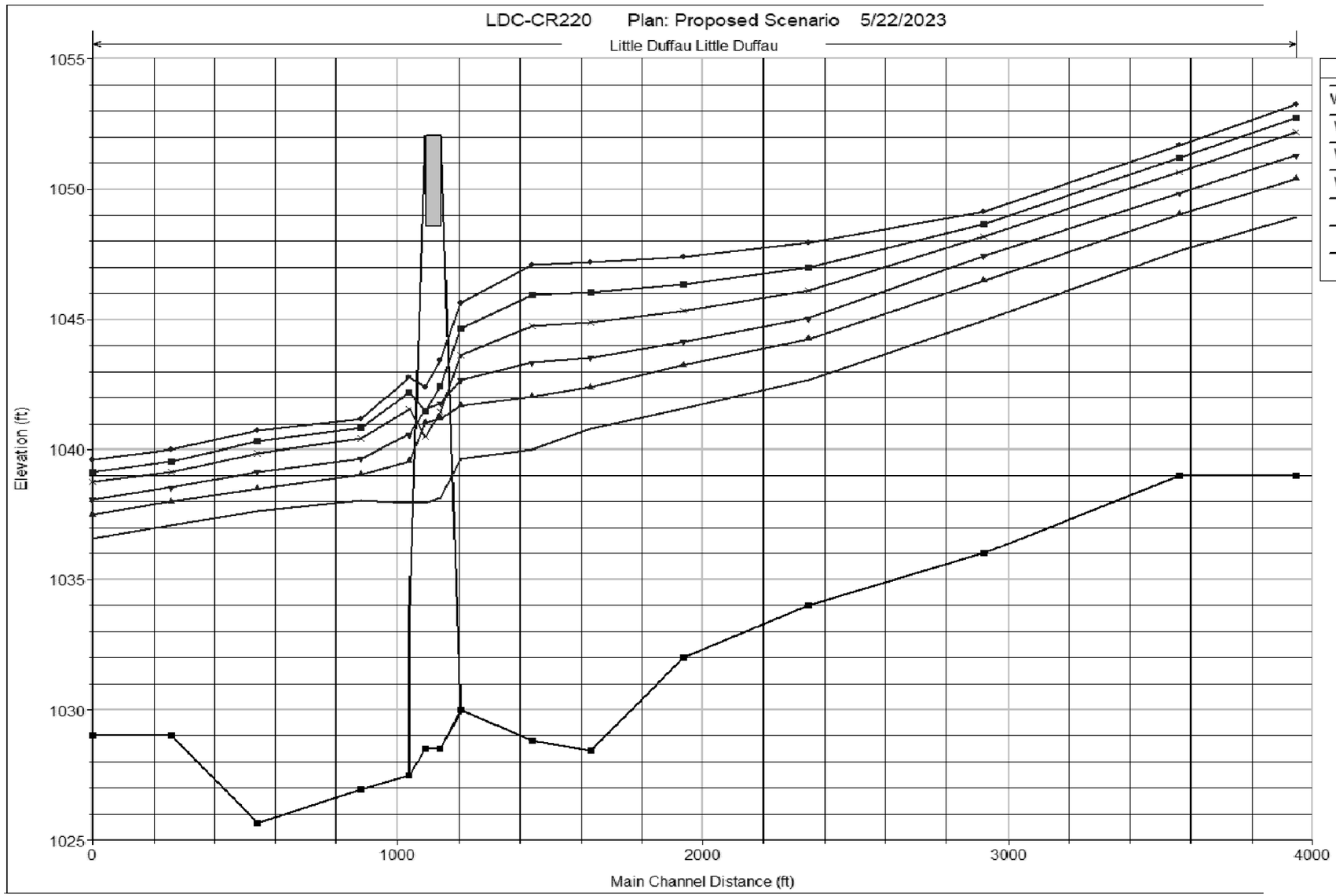
DATE: 7/1/2024

PROPOSED DESIGN PROFILE LITTLE DUFFAU CREEK



REFERENCES:

1. TXDOT'S HYDRAULIC DESIGN MANUAL (SEPTEMBER 2019)
2. TOPOGRAPHIC DATA SOURCES (TNRIS 2016 BRAZOS RIVER LIDAR & SURVEY SITE TOPO)

NOTES:

1. USACE HEC-RAS VERSION 6.3.1 UTILIZED FOR THE ANALYSIS.
2. THIS SITE IS DESIGNATED AS A ZONE "A" AS SHOWN IN PANELS 48143C0600D. 100-YEAR FLOODPLAIN WIDTHS ARE COMPARABLE.
3. ALL ELEVATIONS BASED ON THE NAVD88 VERTICAL DATUM.
4. THE DOWNSTREAM BOUNDARY CONDITIONS ARE ESTABLISHED FROM THE NORMAL DEPTH. THERE ARE NO KNOWN WATER SURFACE ELEVATIONS.
5. SCHEMATIC SCS CALCULATED FLOWS WERE USED FOR THE DESIGN ANALYSIS OF THE 25-YR STORM FREQUENCY & THE CHECK OF THE 100-YR STORM FREQUENCY BASED ON THEIR CONSISTENCIES WITH METHODOLOGIES OUTLINED IN THE TXDOT HDM. SEE "PRELIMINARY DRAINAGE REPORT FOR SH 220 AT LITTLE DUFFAU CREEK".
6. REFER TO THE H&H REPORT "PRELIMINARY DRAINAGE REPORT FOR SH 220 AT LITTLE DUFFAU CREEK" FOR ADDITIONAL INFORMATION.
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SH 220

AT LITTLE DUFFAU CREEK
BRIDGE HYDRAULIC DATA SHEET

SCALE: N.T.S. SHEET 3 OF 7

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NUMBER		HIGHWAY NO.
GD	6	(See Title Sheet)		SH 220
CHECK	STATE	DISTRICT	COUNTY	SHEET NO.
JC	TEXAS	FTW	ERATH	
GRAPHICS	CONTROL	SECTION	JOB	95
RS	0467	02	020, ETC.	
CHECK				
JC				

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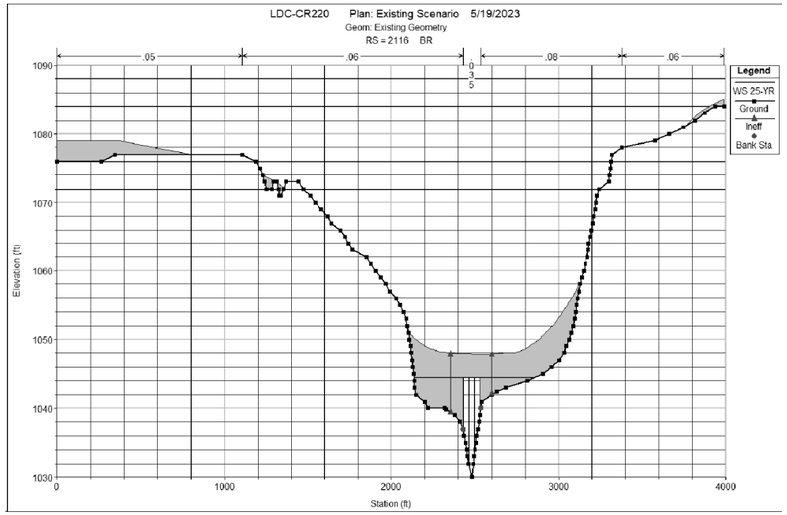
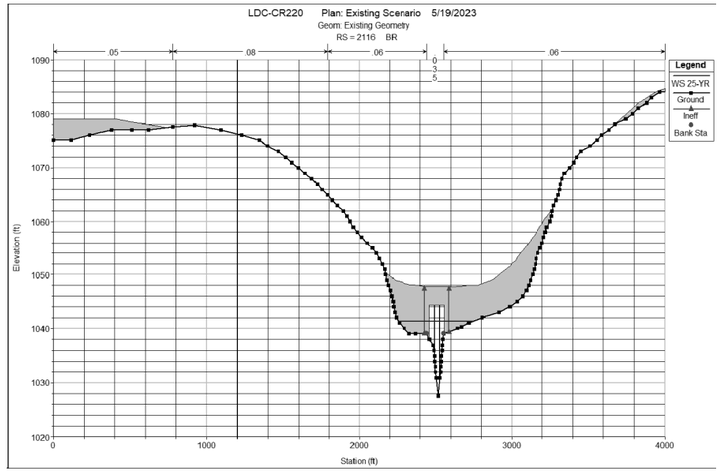
EXISTING DESIGN STREAM CROSS-SECTION STATE HIGHWAY 220

HEC-RAS SECTION STA 2116 BR UPSTREAM



HEC-RAS SECTION STA 2116 BR DOWNSTREAM



REFERENCES:

1. TXDOT'S HYDRAULIC DESIGN MANUAL (SEPTEMBER 2019)
2. TOPOGRAPHIC DATA SOURCES (TNRIS 2016 BRAZOS RIVER LIDAR & SURVEY SITE TOPO)

NOTES:

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2. THIS SITE IS DESIGNATED AS A ZONE "A" AS SHOWN IN PANELS 48143C0600D. 100-YEAR FLOODPLAIN WIDTHS ARE COMPARABLE.
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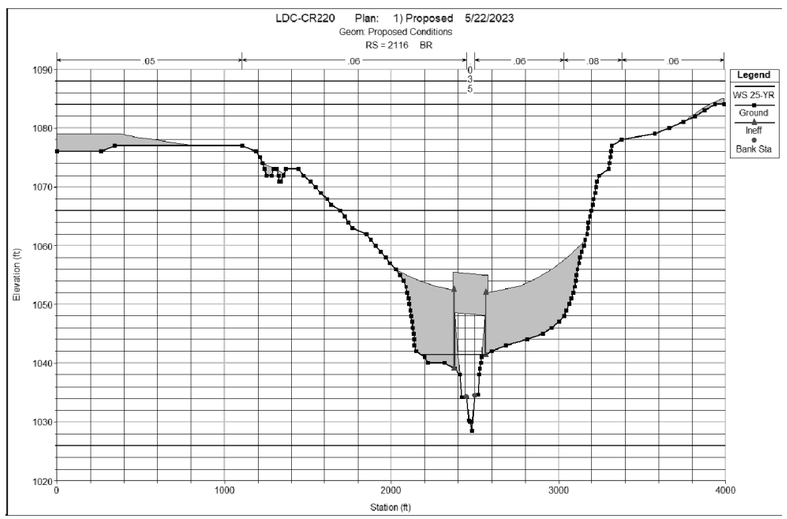
4. THE DOWNSTREAM BOUNDARY CONDITIONS ARE ESTABLISHED FROM THE NORMAL DEPTH. THERE ARE NO KNOWN WATER SURFACE ELEVATIONS.
5. SCHEMATIC SCS CALCULATED FLOWS WERE USED FOR THE DESIGN ANALYSIS OF THE 25-YR STORM FREQUENCY & THE CHECK OF THE 100-YR STORM FREQUENCY BASED ON THEIR CONSISTENCIES WITH METHODOLOGIES OUTLINED IN THE TXDOT HDM. SEE "PRELIMINARY DRAINAGE REPORT FOR SH 220 AT LITTLE DUFFAU CREEK".
6. REFER TO THE H&H REPORT "PRELIMINARY DRAINAGE REPORT FOR SH 220 AT LITTLE DUFFAU CREEK" FOR ADDITIONAL INFORMATION.
7. ERATH COUNTY FPA (MICKI BELL) WAS NOTIFIED OF THE PROJECT ON SEPTEMBER 8, 2021 AND WILL BE PROVIDED A COPY OF THE FINAL DRAINAGE REPORT.

PROPOSED DESIGN STREAM CROSS-SECTION STATE HIGHWAY 220

HEC-RAS SECTION STA 2116 BR UPSTREAM



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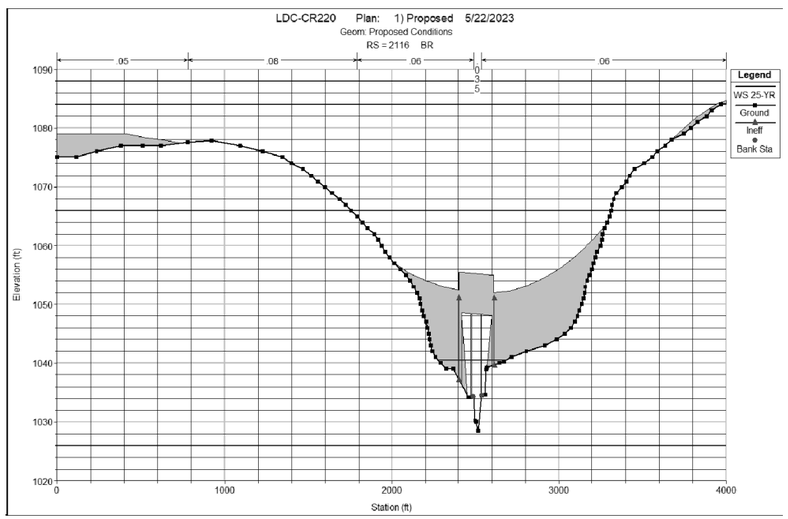

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Texas Department of Transportation

SH 220

AT LITTLE DUFFAU CREEK
BRIDGE HYDRAULIC DATA SHEET

SCALE: N.T.S. SHEET 4 OF 7

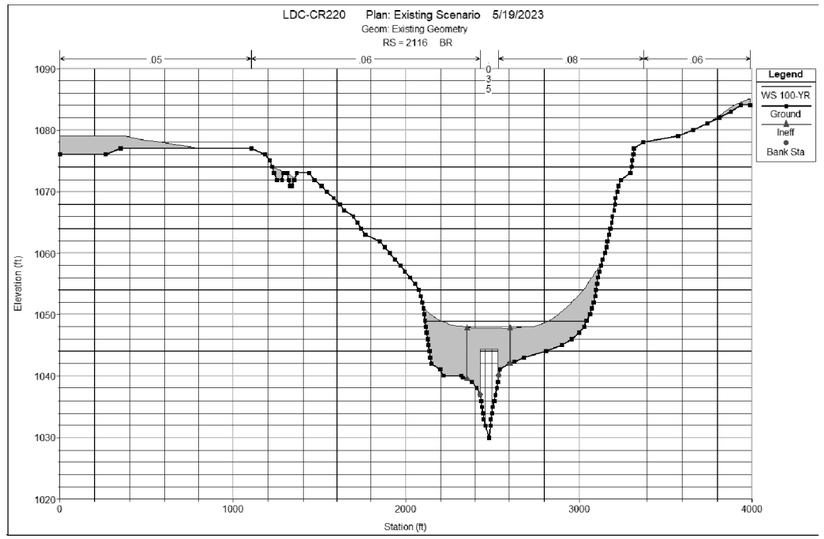
DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NUMBER		HIGHWAY NO.
GD	6	(See Title Sheet)		SH 220
CHECK	STATE	DISTRICT	COUNTY	SHEET NO.
JC	TEXAS	FTW	ERATH	
GRAPHICS	CONTROL	SECTION	JOB	96
RS	0467	02	020, ETC.	
CHECK				
JC				

FILE: ...\DR\Sht\02ODHD04.sht

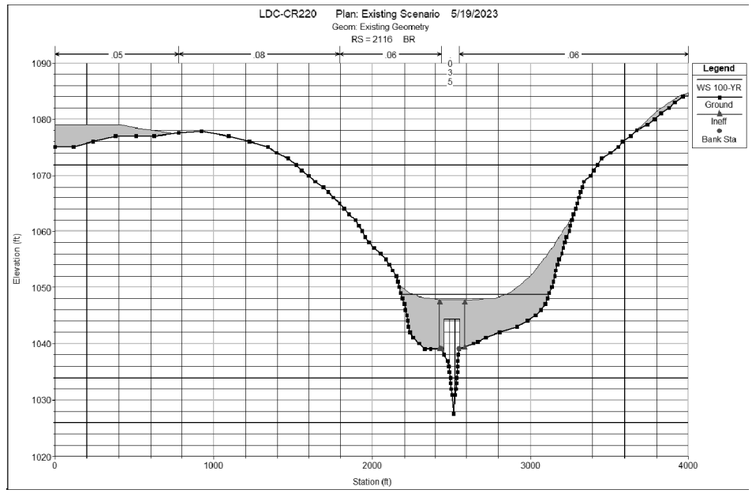
TIME: 10:43:28 AM
DATE: 7/1/2024

EXISTING CHECK STREAM CROSS-SECTION STATE HIGHWAY 220

HEC-RAS SECTION STA 2116 BR UPSTREAM



HEC-RAS SECTION STA 2116 BR DOWNSTREAM



REFERENCES:

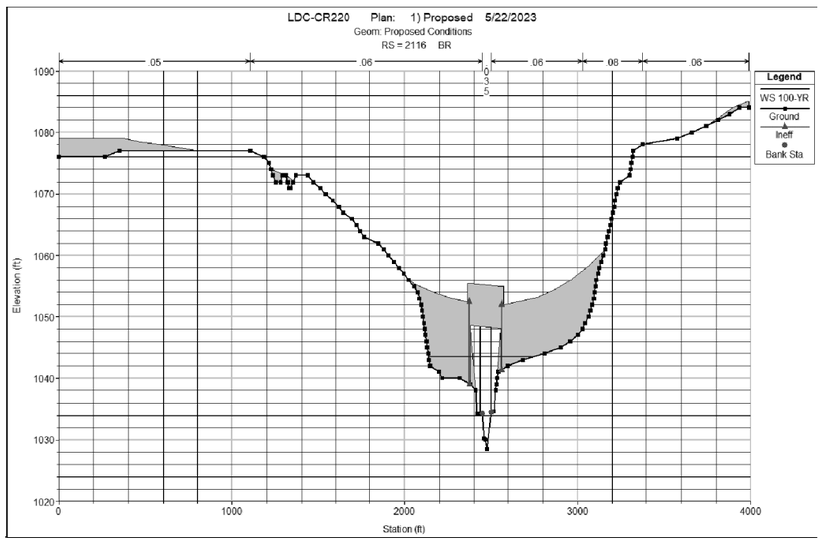
1. TXDOT'S HYDRAULIC DESIGN MANUAL (SEPTEMBER 2019)
2. TOPOGRAPHIC DATA SOURCES (TNRIS 2016 BRAZOS RIVER LIDAR & SURVEY SITE TOPO)

NOTES:

1. USACE HEC-RAS VERSION 6.3.1 UTILIZED FOR THE ANALYSIS.
2. THIS SITE IS DESIGNATED AS A ZONE "A" AS SHOWN IN PANELS 48143C0600D. 100-YEAR FLOODPLAIN WIDTHS ARE COMPARABLE.
3. ALL ELEVATIONS BASED ON THE NAVD88 VERTICAL DATUM.
4. THE DOWNSTREAM BOUNDARY CONDITIONS ARE ESTABLISHED FROM THE NORMAL DEPTH. THERE ARE NO KNOWN WATER SURFACE ELEVATIONS.
5. SCHEMATIC SCS CALCULATED FLOWS WERE USED FOR THE DESIGN ANALYSIS OF THE 25-YR STORM FREQUENCY & THE CHECK OF THE 100-YR STORM FREQUENCY BASED ON THEIR CONSISTENCIES WITH METHODOLOGIES OUTLINED IN THE TXDOT HDM. SEE "PRELIMINARY DRAINAGE REPORT FOR SH 220 AT LITTLE DUFFAU CREEK".
6. REFER TO THE H&H REPORT "PRELIMINARY DRAINAGE REPORT FOR SH 220 AT LITTLE DUFFAU CREEK" FOR ADDITIONAL INFORMATION.
7. ERATH COUNTY FPA (MICKI BELL) WAS NOTIFIED OF THE PROJECT ON SEPTEMBER 8, 2021 AND WILL BE PROVIDED A COPY OF THE FINAL DRAINAGE REPORT.

PROPOSED CHECK STREAM CROSS-SECTION STATE HIGHWAY 220

HEC-RAS SECTION STA 2116 BR UPSTREAM



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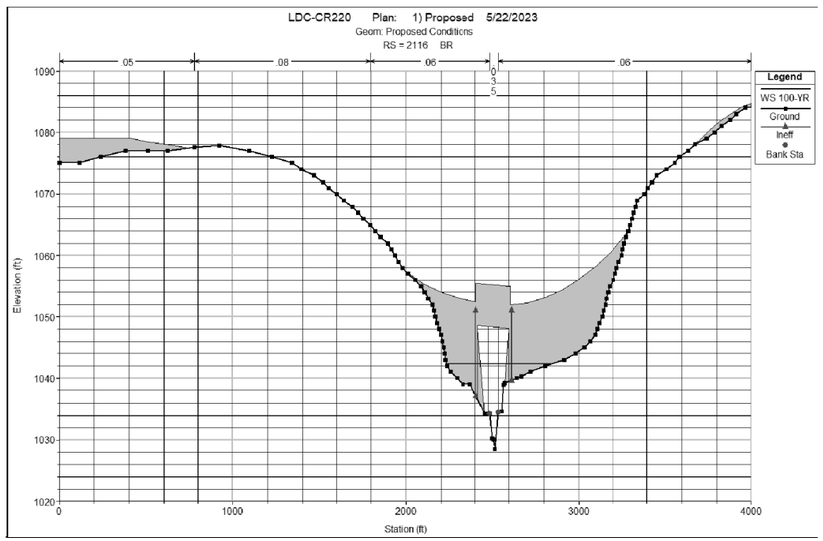

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Texas Department of Transportation

SH 220

AT LITTLE DUFFAU CREEK
BRIDGE HYDRAULIC DATA SHEET

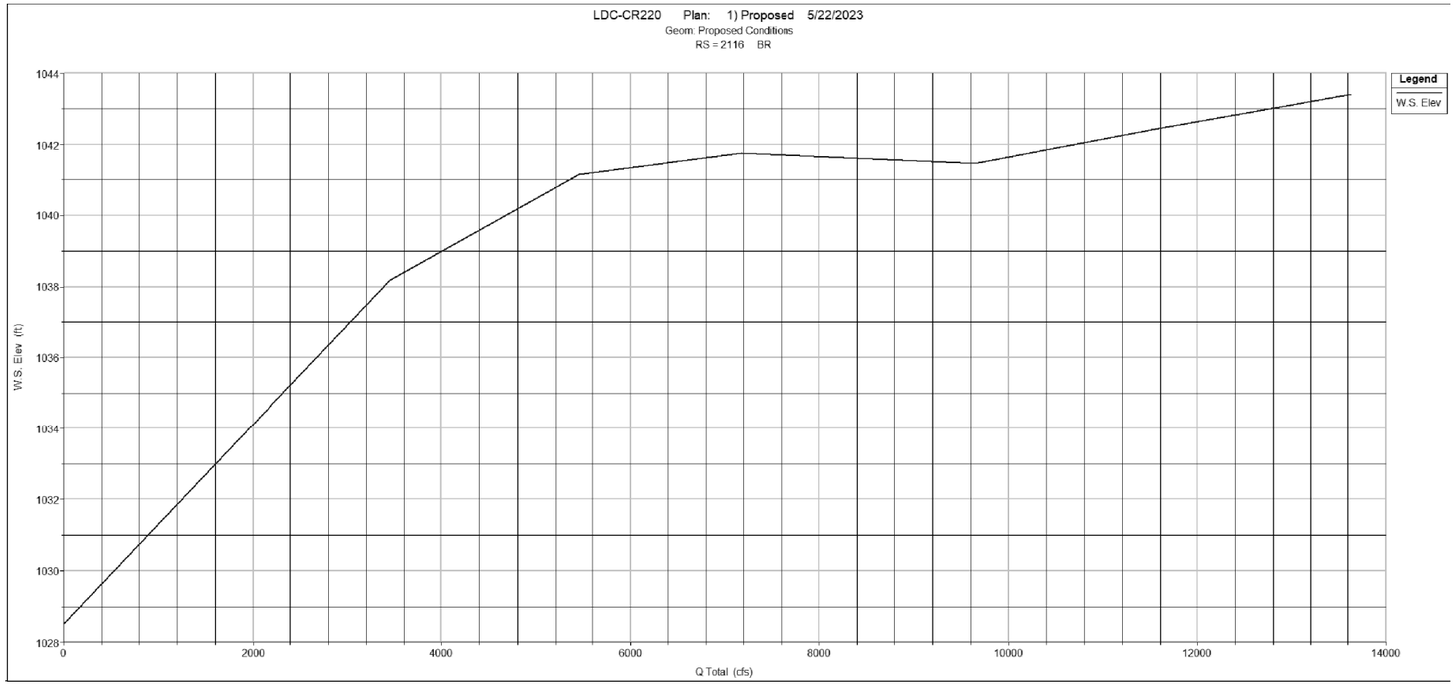
SCALE: N.T.S. SHEET 5 OF 7

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NUMBER		HIGHWAY NO.
GD	6	(See Title Sheet)		SH 220
CHECK	STATE	DISTRICT	COUNTY	SHEET NO.
JC	TEXAS	FTW	ERATH	97
GRAPHICS	CONTROL	SECTION	JOB	
RS	0467	02	020, ETC.	
CHECK				
JC				

FILE: ...\DR\Sht\020DHD05.sht

TIME: 10:43:40 AM
DATE: 7/1/2024

CONVEYANCE CURVE @ RS 2116



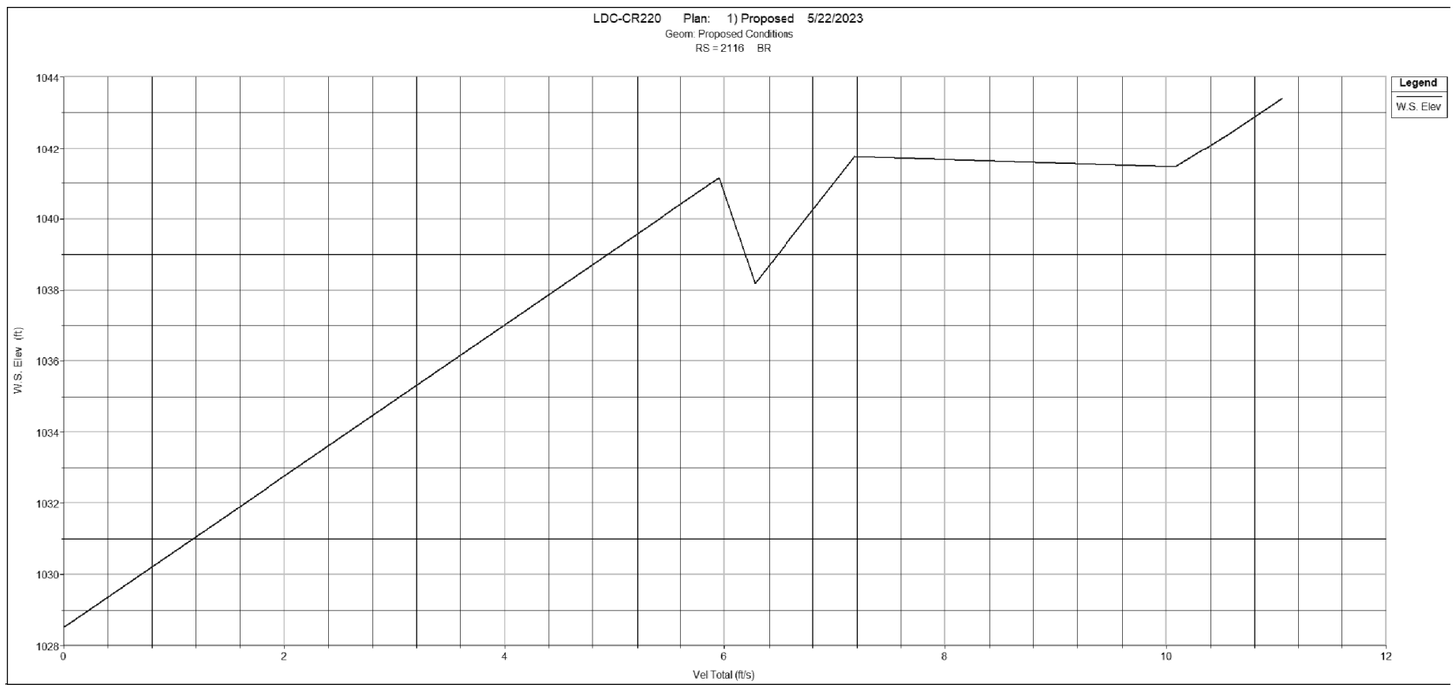
REFERENCES:

1. TXDOT'S HYDRAULIC DESIGN MANUAL (SEPTEMBER 2019)
2. TOPOGRAPHIC DATA SOURCES (TNRIS 2016 BRAZOS RIVER LIDAR & SURVEY SITE TOPO)

NOTES:

1. USACE HEC-RAS VERSION 6.3.1 UTILIZED FOR THE ANALYSIS.
2. THIS SITE IS DESIGNATED AS A ZONE "A" AS SHOWN IN PANELS 48143C0600D. 100-YEAR FLOODPLAIN WIDTHS ARE COMPARABLE.
3. ALL ELEVATIONS BASED ON THE NAVD88 VERTICAL DATUM.
4. THE DOWNSTREAM BOUNDARY CONDITIONS ARE ESTABLISHED FROM THE NORMAL DEPTH. THERE ARE NO KNOWN WATER SURFACE ELEVATIONS.
5. SCHEMATIC SCS CALCULATED FLOWS WERE USED FOR THE DESIGN ANALYSIS OF THE 25-YR STORM FREQUENCY & THE CHECK OF THE 100-YR STORM FREQUENCY BASED ON THEIR CONSISTENCIES WITH METHODOLOGIES OUTLINED IN THE TXDOT HDM. SEE "PRELIMINARY DRAINAGE REPORT FOR SH 220 AT LITTLE DUFFAU CREEK".
6. REFER TO THE H&H REPORT "PRELIMINARY DRAINAGE REPORT FOR SH 220 AT LITTLE DUFFAU CREEK" FOR ADDITIONAL INFORMATION.
7. ERATH COUNTY FPA (MICKI BELL) WAS NOTIFIED OF THE PROJECT ON SEPTEMBER 8, 2021 AND WILL BE PROVIDED A COPY OF THE FINAL DRAINAGE REPORT.

VELOCITY CURVE @ RS 2116



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SH 220

AT LITTLE DUFFAU CREEK
BRIDGE HYDRAULIC DATA SHEET

SCALE: N.T.S. SHEET 6 OF 7

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NUMBER		HIGHWAY NO.
GD	6	(See Title Sheet)		SH 220
CHECK	STATE	DISTRICT	COUNTY	SHEET NO.
JC	TEXAS	FTW	ERATH	
GRAPHICS	CONTROL	SECTION	JOB	98
RS	0467	02	020, ETC.	
CHECK				
JC				

FILE: ...\DR\Sht\020DHD06.sht

TIME: 1:16:23 PM
DATE: 7/1/2024

50-YR SCOUR DESIGN FLOOD FREQUENCY

CR 220 at LITTLE DUFFAU CREEK					
50-YEAR SCOUR DESIGN FLOOD FREQUENCY					
Pier Shape	round	k_{sh}	1.15	$t_{e(P)}$ (hr)	514.7
α (degrees)	0	k_{sp}	1.00	τ_c (Pa)	15.55
a (m)	0.9144	k_w	1.03	$\tau_{i(C)}$ (Pa)	111.8
a' (m)	0.91	K_W	1.00	$\tau_{i(P)}$ (Pa)	79.6
A_1 (m^2)	296.3	K_{SH}	1.00	ν (m^2/s)	0.000001
B_1 (m)	207.5	K_{SP}	1.01	V_1 (m/s)	1.11
B_2 (m)	41.4	L_c (m)	28.65	V_2 (m/s)	3.65
γ (kg/m^3)	9810	L_p (m)	14.02	V_c (m/s)	3.53
g (m/s^2)	9.81	n	0.039	$\dot{z}_{i(C)}$ (mm/hr)	65.33
θ (degrees)	9.2	n_b	2	$\dot{z}_{i(P)}$ (mm/hr)	54.60
H_1 (m)	1.43	ρ (kg/m^3)	1000	$Z_{max(C)}$ (m)	1.99
H_2 (m)	2.17	P (m)	210.5	$Z_c(\Delta t)$ (m)	1.97
$H_{2\Delta}$ (m)	2.17	R_e	3227832	$Z_{max(P)}$ (m)	2.47
k_α	1.00	R_h (m)	1	$Z_p(\Delta t)$ (m)	2.27
k_θ	1.03	S (m)	18	**$Z_c(\Delta t)$ (ft)**	**6.47**
k_{Lc}	0.95	Δt (yr)	100	**$Z_p(\Delta t)$ (ft)**	**7.44**
k_r	7.00	$t_{e(C)}$ (hr)	3062.1	**$Z_{tot}(\Delta t)$ (ft)**	**13.91**

SEE NOTE 4 FOR MAXIMUM SCOUR DEPTH EXPLANATION

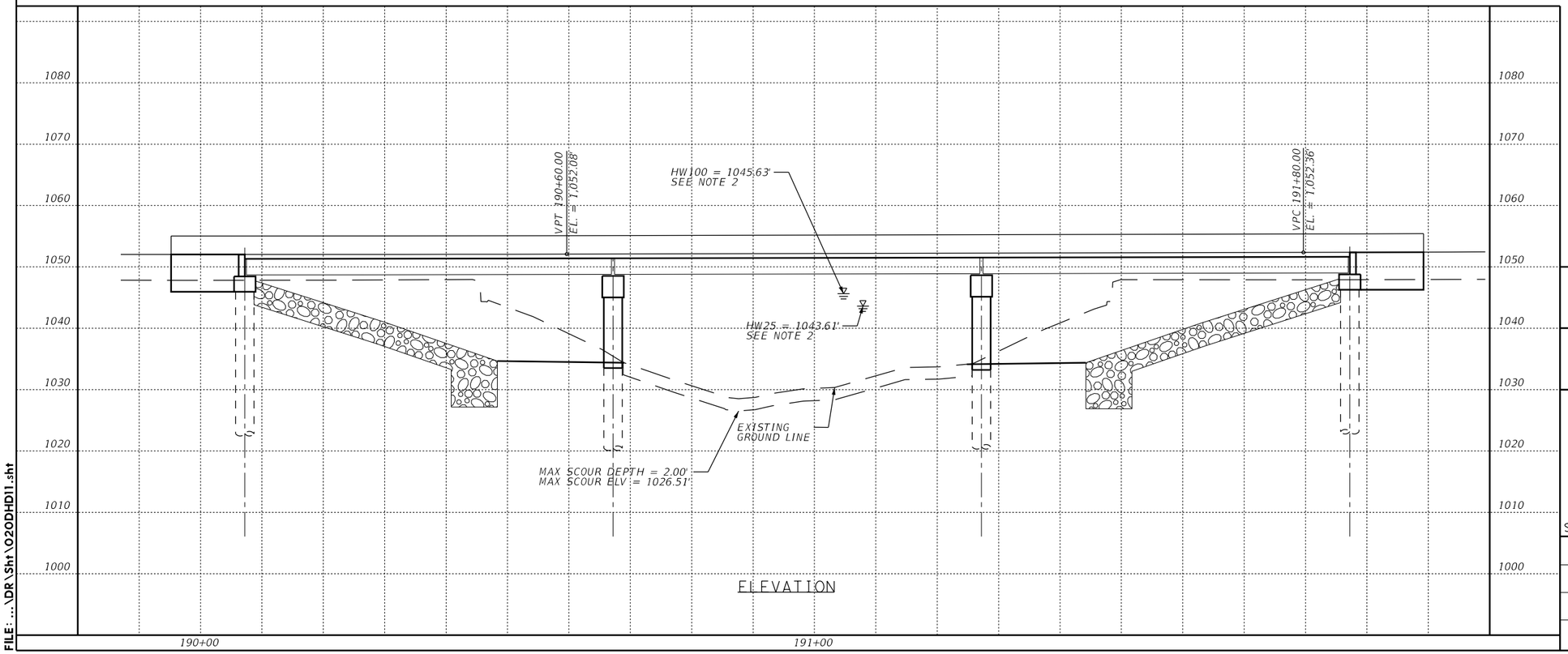
100-YR SCOUR DESIGN FLOOD FREQUENCY

CR 220 at LITTLE DUFFAU CREEK					
100-YEAR SCOUR DESIGN FLOOD FREQUENCY					
Pier Shape	round	k_{sh}	1.15	$t_{e(P)}$ (hr)	546.4
α (degrees)	0	k_{sp}	1.00	τ_c (Pa)	15.55
a (m)	0.9144	k_w	1.01	$\tau_{i(C)}$ (Pa)	117.2
a' (m)	0.91	K_W	1.00	$\tau_{i(P)}$ (Pa)	84.3
A_1 (m^2)	371.1	K_{SH}	1.00	ν (m^2/s)	1.00E-06
B_1 (m)	227.4	K_{SP}	1.01	V_1 (m/s)	1.04
B_2 (m)	43.1	L_c (m)	28.65	V_2 (m/s)	3.79
γ (kg/m^3)	9810	L_p (m)	14.02	V_c (m/s)	3.53
g (m/s^2)	9.81	n	0.042	$\dot{z}_{i(C)}$ (mm/hr)	66.82
θ (degrees)	10.2	n_b	2	$\dot{z}_{i(P)}$ (mm/hr)	56.41
H_1 (m)	1.63	ρ (kg/m^3)	1000	$Z_{max(C)}$ (m)	2.26
H_2 (m)	2.37	P (m)	230.5	$Z_c(\Delta t)$ (m)	2.24
$H_{2\Delta}$ (m)	2.37	R_e	3227832	$Z_{max(P)}$ (m)	2.47
k_α	1.00	R_h (m)	2	$Z_p(\Delta t)$ (m)	2.28
k_θ	1.03	S (m)	18	**$Z_c(\Delta t)$ (ft)**	**7.35**
k_{Lc}	0.93	Δt (yr)	100	**$Z_p(\Delta t)$ (ft)**	**7.49**
k_r	7.60	$t_{e(C)}$ (hr)	3213.9	**$Z_{tot}(\Delta t)$ (ft)**	**14.84**

SEE NOTE 4 FOR MAXIMUM SCOUR DEPTH EXPLANATION

Design Event	Contraction Scour (ft)	Pier Scour (ft)	Total Scour (ft)	Design Scour (ft)
50-year	6.47	7.44	13.91	**2.0**
100-year (check)	7.35	7.49	14.84	**2.0**

SEE NOTE 4 FOR MAXIMUM SCOUR DEPTH EXPLANATION



ELEVATION

0 10 20
SCALE IN FEET

NOTES:

1. THE SCOUR CALCULATIONS SHOWN ASSUME AN INFINITELY DEEP SOIL LAYER. IN CASES WHERE THERE IS A FINITE ERODIBLE LAYER THICKNESS, MAXIMUM SCOUR DEPTH IS CONFINED TO THE DEPTH OF THAT LAYER. A LAYER OF NON-ERODIBLE LIMESTONE EXISTS AT ELEVATION 1030.00 FEET, WHICH IS APPROXIMATELY 2.0 FEET BELOW CURRENT CHANNEL BOTTOM (ASSUMING A LINEAR TRANSITION BETWEEN SOIL BORINGS).

2. HEADWATER ELEVATIONS DETERMINED AT UPSTREAM BOUNDING CROSS SECTION 2208.

3. THE SRICOS-EFA METHOD OF SCOUR EVALUATION WAS USED PER TxDOT GUIDANCE BECAUSE COHESIVE SOILS ARE PRESENT AT THE BRIDGE SITE. CALCULATIONS WERE PERFORMED USING TxDOT's SRICOS ANALYSIS SPREADSHEET (REV 10-21-2020).

4. MAXIMUM SCOUR DEPTH IS LIMITED BY PRESENCE OF NON-ERODIBLE LIMESTONE LAYER APPROXIMATELY TWO FEET BELOW CHANNEL BOTTOM.

5. SEE "STATE HIGHWAY 220 AT LITTLE DUFFAU CREEK AND DUFFAU CREEK HYDRAULIC REPORT" DATED 07/01/2024 FOR MORE INFORMATION.

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SH 220

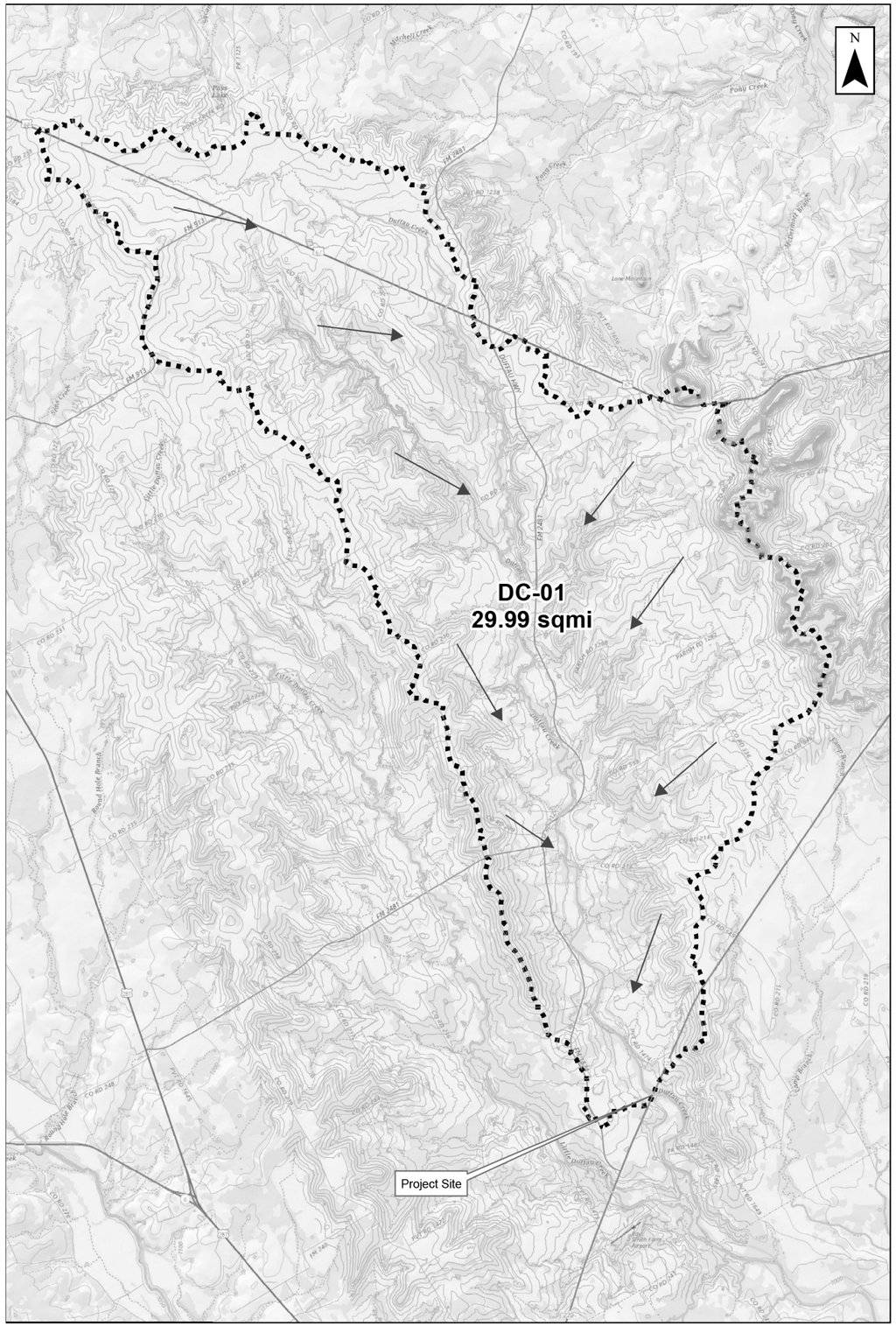
AT LITTLE DUFFAU CREEK
BRIDGE HYDRAULIC DATA SHEET
SCOUR ENVELOPE

SCALE: 1"=100' (H), 1"=10' (V) SHEET 7 OF 7

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NUMBER		HIGHWAY NO.
EB	6	(See Title Sheet)		SH 220
CHECK	STATE	DISTRICT	COUNTY	SHEET NO.
JC	TEXAS	FTW	ERATH	99
GRAPHICS	CONTROL	SECTION	JOB	
EB	0467	02	020, ETC.	
CHECK				
JC				

FILE: ...\DR\Shr\020DHD11.sht

TIME: 10:44:01 AM
DATE: 7/1/2024



DRAINAGE AREA MAP

HYDROLOGIC COMPUTATIONS

WATERSHED NAME	SOURCE	AREA (SQ MI)	TC (MIN)	LAG TIME (MIN)	CN	Q2	Q5	Q10	Q25	Q50	Q100
DUFFAU CREEK (DC-01)	SCS 24-HR FLOWS	29.99	477	286	82	4166	6447	8390	11177	13347	15637
	OMEGA EM REGRESSION	29.99	-	-	-	1171	2496	3570	5314	6864	8737

STORM FREQUENCY (YR)		2	5	10	25	50	100
Pd (IN)	24 HOUR DURATION	3.68	4.76	5.72	7.10	8.21	9.40

NOTES:

1. RUNOFF COMPUTATIONS PERFORMED USING HEC-HMS 4.8 AND COMPARED TO TXDOT OMEGA REGRESSION RESULTS.
2. WEIGHTED CURVE NUMBER & TIME OF CONCENTRATION PARAMETERS DETERMINED USING ARCGIS WATERSHED MODEL.
3. THE RAINFALL DEPTHS IN INCHES WERE TAKEN FROM THE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATOR'S (NOAA'S) NATIONAL WEATHER SERVICE HYDROMETEOROLOGICAL DESIGN STUDIES CENTER PRECIPITATION FREQUENCY DATA SERVER (PFDS) NOAA ATLAS 14 POINT PRECIPITATION FREQUENCY ESTIMATES FOR TEXAS.
4. RAINFALL WAS MODELED USING HEC-HMS FREQUENCY STORMS WITH MAXIMUM DEPTHS PROVIDED FOR 15-MINUTE TO 24-HOUR EVENT DURATIONS.
5. RUNOFF VOLUME WAS COMPUTED USING THE SCS CURVE NUMBER LOSS MODEL.
6. TIME OF CONCENTRATION (TC) WAS COMPUTED USING THE KERBY-KIRPICH METHOD. LAG TIME = 0.6*TC
7. THE SCS UNIT HYDROGRAPH METHOD WAS USED TO DEVELOP DISCHARGE HYDROGRAPH.
8. PS&E SCS CALCULATED FLOWS WERE USED FOR THE DESIGN ANALYSIS OF THE 2-YR, 5-YR 10-YR, 25-YR, 50-YR, & 100-YR STORM FREQUENCIES BASED ON THEIR CONSISTENCIES WITH METHODOLOGIES OUTLINED IN THE TXDOT HDM. SEE "PRELIMINARY DRAINAGE REPORT FOR SH 220 AT DUFFAU CREEK".
9. ERATH COUNTY FPA (MICKI BELL) WAS NOTIFIED OF THE PROJECT ON SEPTEMBER 8, 2021 AND WILL BE PROVIDED A COPY OF THE FINAL DRAINAGE REPORT.

REFERENCES:

1. TXDOT'S HYDRAULIC DESIGN MANUAL (SEPTEMBER 2019)
2. TOPOGRAPHIC DATA SOURCES (TNRIS 2016 BRAZOS RIVER BASIN LIDAR & SURVEY SITE TOPO)
3. SITE IS LOCATED ON FEMA FIRM PANEL 48143C0600D FOR ERATH CO. & UNINCORPORATED AREAS, DATED NOVEMBER 16, 2011, ZONE A

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Texas Department of Transportation

SH 220

AT DUFFAU CREEK
BRIDGE HYDRAULIC DATA SHEET

SCALE: N.T.S. SHEET 1 OF 7

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NUMBER		HIGHWAY NO.
GD	6	(See Title Sheet)		SH 220
CHECK JC	STATE	DISTRICT	COUNTY	SHEET NO.
GRAPHICS RS	TEXAS	FTW	ERATH	100
CHECK JC	CONTROL	SECTION	JOB	
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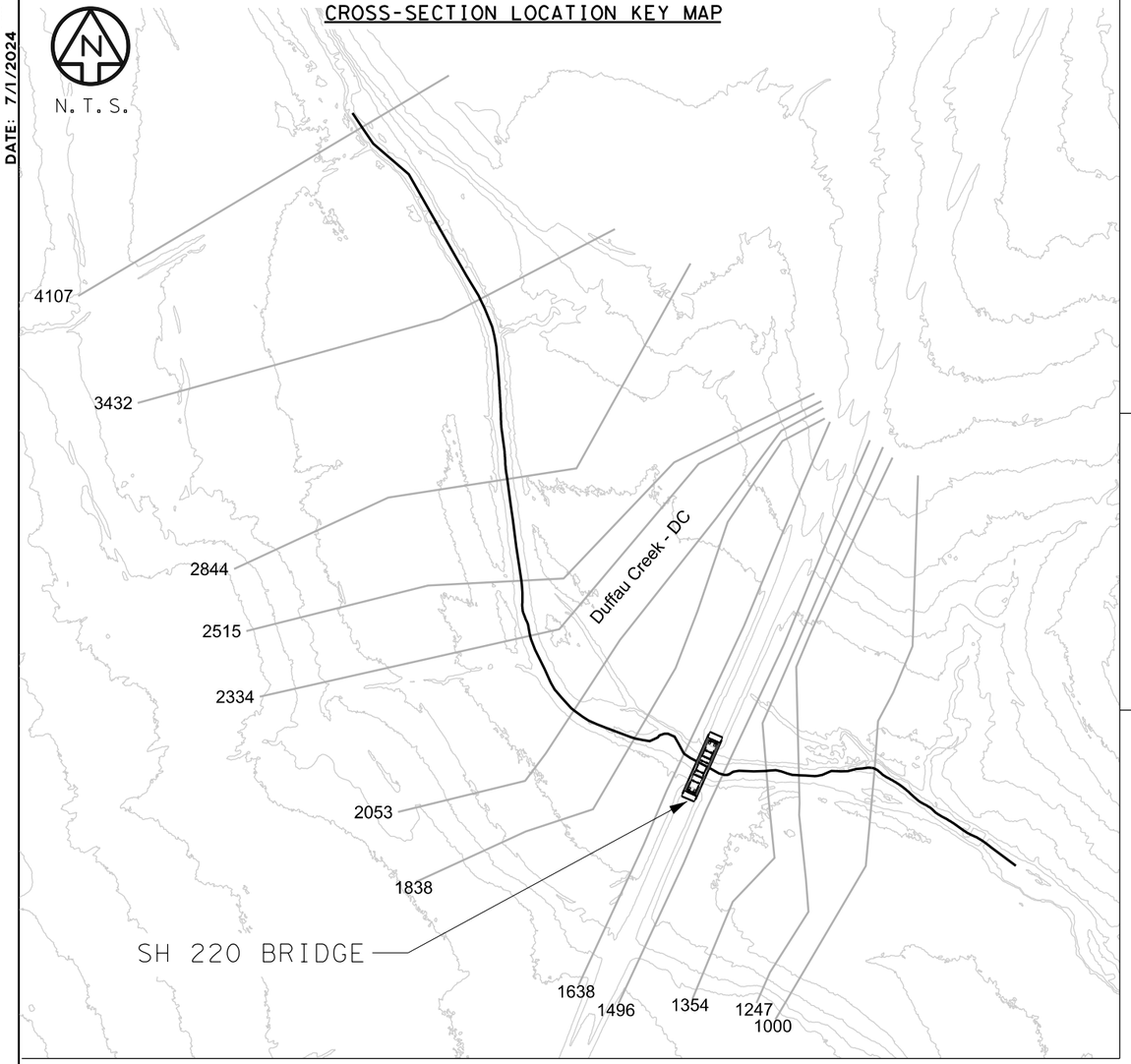
FILE: ...\DR\Shr\02IDHD01.shr

TIME: 10:44:17 AM
DATE: 7/1/2024

CROSS-SECTION LOCATION KEY MAP



NOTES:

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NOTES CONTINUED:

6. REFER TO THE H&H REPORT "PRELIMINARY DRAINAGE REPORT FOR SH 220 AT DUFFAU CREEK" FOR ADDITIONAL INFORMATION.
7. ERATH COUNTY FPA (MICKI BELL) WAS NOTIFIED OF THE PROJECT ON SEPTEMBER 8, 2021 AND WILL BE PROVIDED A COPY OF THE FINAL DRAINAGE REPORT.

REFERENCES:

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2. TOPOGRAPHIC DATA SOURCES (TNRIS 2016 BRAZOS RIVER LIDAR & SURVEY SITE TOPO)

STORM FREQUENCY (YR)	2	5	10	25	50	100
NORMAL DEPTH D/S BOUNDARY (FT/FT)	0.00362	0.00362	0.00362	0.00362	0.00362	0.00362

HYDRAULIC COMPUTATIONS

HEC-RAS RIVER STA	DESIGN FREQUENCY 25-YR						CHECK FREQUENCY 100-YR					
	FLOWS (CFS)	COMPUTED WATER SURFACE ELEVATION (FT)			VELOCITIES (FPS)		FLOWS (CFS)	COMPUTED WATER SURFACE ELEVATION (FT)			VELOCITIES (FPS)	
		EXIST	PROP	RISE	EXIST	PROP		EXIST	PROP	RISE	EXIST	PROP
4107	11177	1062.07	1062.07	0.00	12.21	12.21	15637	1062.89	1062.89	0.00	14.55	14.55
3432	11177	1060.01	1060.01	0.00	10.87	10.87	15637	1060.96	1060.99	0.03	11.21	11.14
2844	11177	1058.27	1058.34	0.07	9.75	9.49	15637	1060.46	1060.50	0.04	6.88	6.82
2515	11177	1057.81	1057.92	0.11	7.58	7.33	15637	1060.25	1060.29	0.04	5.64	5.60
2334	11177	1057.44	1057.60	0.16	8.02	7.67	15637	1060.11	1060.16	0.05	5.91	5.86
2053	11177	1057.23	1057.40	0.17	6.93	6.64	15637	1060.00	1060.04	0.04	5.45	5.40
1838	11177	1057.11	1057.29	0.18	5.81	5.58	15637	1059.93	1059.97	0.04	4.83	4.80
1638 (ROW)	11177	1056.29	1056.53	0.24	8.32	8.07	15637	1059.10	1059.16	0.06	8.40	8.36
1569	SH 220 Bridge at Duffau Creek											
1496 (ROW)	11177	1052.95	1052.95	0.00	14.11	14.10	15637	1054.59	1054.59	0.00	15.48	15.47
1354	11177	1052.85	1052.87	0.02	12.45	12.39	15637	1053.67	1053.67	0.00	14.06	14.05
1247	11177	1051.51	1051.52	0.01	11.93	11.89	15637	1052.15	1052.15	0.00	13.48	13.48
1000	11177	1050.16	1050.16	0.00	10.20	10.20	15637	1051.21	1051.21	0.00	10.94	10.94

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Texas Department of Transportation

SH 220

AT DUFFAU CREEK
BRIDGE HYDRAULIC DATA SHEET

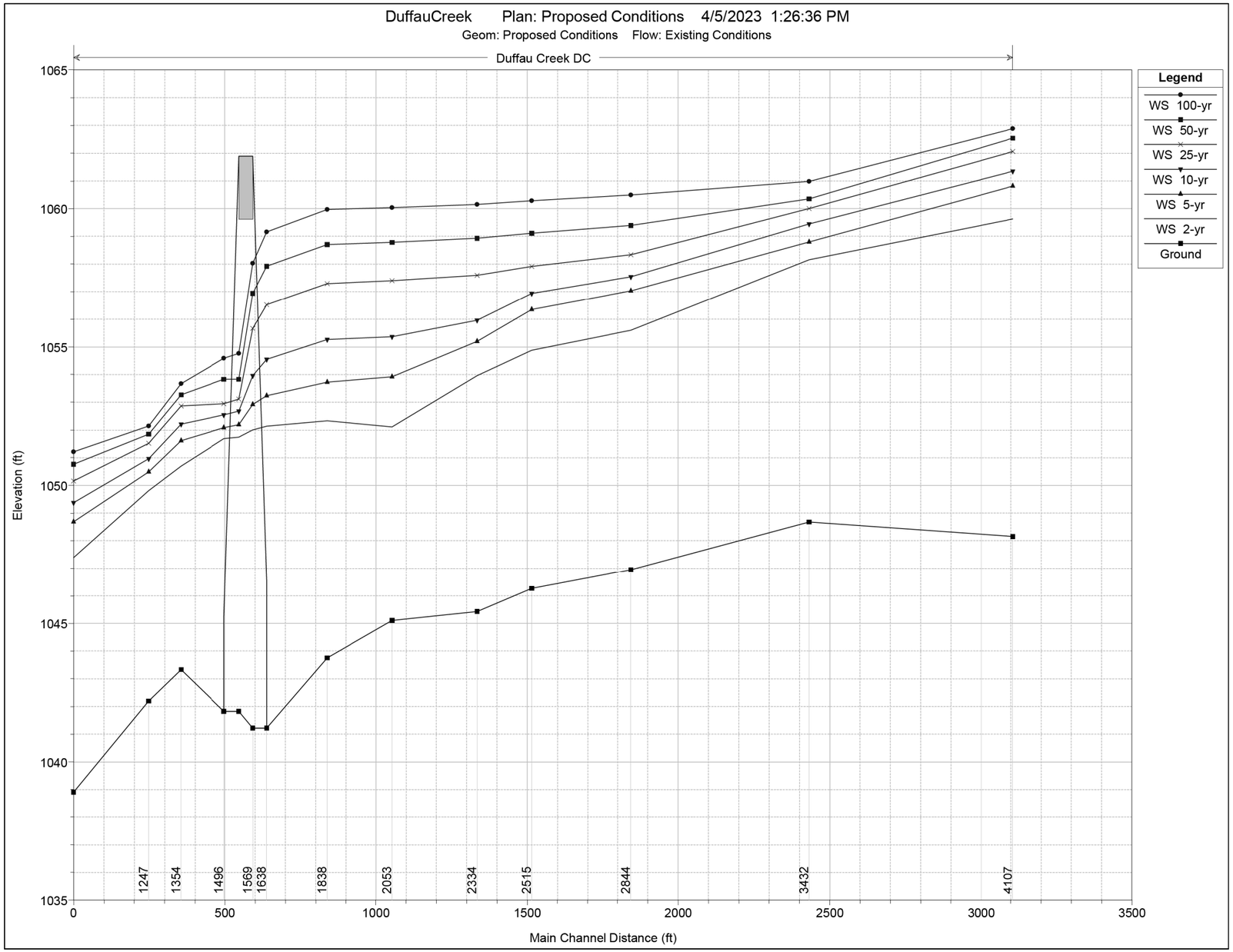
SCALE: N.T.S. SHEET 2 OF 7

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NUMBER		HIGHWAY NO.
GD	6	(See Title Sheet)		SH 220
CHECK	STATE	DISTRICT	COUNTY	SHEET NO.
JC	TEXAS	FTW	ERATH	101
GRAPHICS	CONTROL	SECTION	JOB	
RS	0467	02	020, ETC.	
CHECK				
JC				

FILE: ...\DR\Shr\02IDHD02.sht

TIME: 10:44:25 AM
DATE: 7/1/2024

PROPOSED DESIGN PROFILE DUFFAU CREEK



REFERENCES:

1. TXDOT'S HYDRAULIC DESIGN MANUAL (SEPTEMBER 2019)
2. TOPOGRAPHIC DATA SOURCES (TNRIS 2016 BRAZOS RIVER LIDAR & SURVEY SITE TOPO)

NOTES:

1. USACE HEC-RAS VERSION 6.3.1 UTILIZED FOR THE ANALYSIS.
2. THIS SITE IS DESIGNATED AS A ZONE "A" AS SHOWN IN PANELS 48143C0600D. 100-YEAR FLOODPLAIN WIDTHS ARE COMPARABLE.
3. ALL ELEVATIONS BASED ON THE NAVD88 VERTICAL DATUM.
4. THE DOWNSTREAM BOUNDARY CONDITIONS ARE ESTABLISHED FROM THE NORMAL DEPTH. THERE ARE NO KNOWN WATER SURFACE ELEVATIONS.
5. SCHEMATIC SCS CALCULATED FLOWS WERE USED FOR THE DESIGN ANALYSIS OF THE 25-YR STORM FREQUENCY & THE CHECK OF THE 100-YR STORM FREQUENCY BASED ON THEIR CONSISTENCIES WITH METHODOLOGIES OUTLINED IN THE TXDOT HDM. SEE "PRELIMINARY DRAINAGE REPORT FOR SH 220 AT DUFFAU CREEK".
6. REFER TO THE H&H REPORT "PRELIMINARY DRAINAGE REPORT FOR SH 220 AT DUFFAU CREEK" FOR ADDITIONAL INFORMATION.
7. ERATH COUNTY FPA (MICKI BELL) WAS NOTIFIED OF THE PROJECT ON SEPTEMBER 8, 2021 AND WILL BE PROVIDED A COPY OF THE FINAL DRAINAGE REPORT.

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Texas Department of Transportation

SH 220

AT DUFFAU CREEK
BRIDGE HYDRAULIC DATA SHEET

SCALE: N.T.S. SHEET 3 OF 7

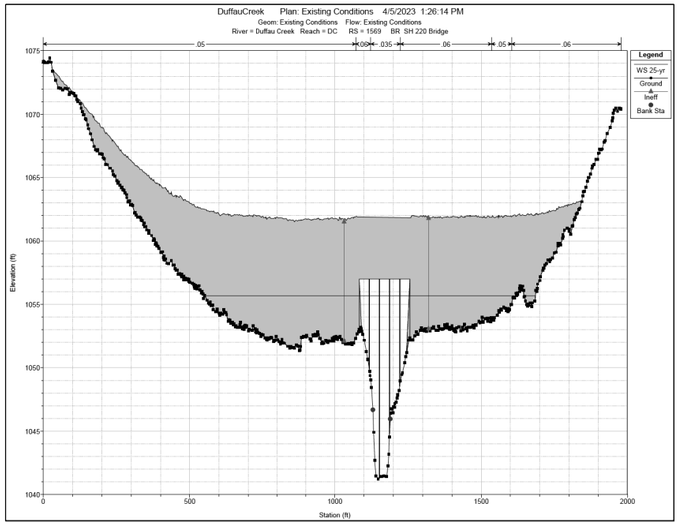
DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NUMBER		HIGHWAY NO.
GD	6	(See Title Sheet)		SH 220
CHECK	STATE	DISTRICT	COUNTY	SHEET NO.
JC	TEXAS	FTW	ERATH	102
GRAPHICS	CONTROL	SECTION	JOB	
RS	0467	02	020, ETC.	
CHECK				
JC				

FILE: ...\DR\Shr\02IDHD03.shr

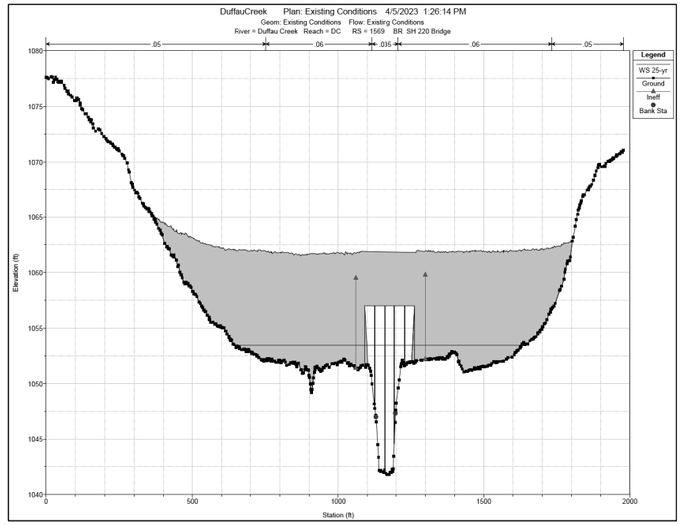
TIME: 10:44:36 AM
DATE: 7/1/2024

EXISTING DESIGN STREAM CROSS-SECTION STATE HIGHWAY 220

HEC-RAS SECTION STA 1569 BR UPSTREAM



HEC-RAS SECTION STA 1569 BR DOWNSTREAM



REFERENCES:

1. TXDOT'S HYDRAULIC DESIGN MANUAL (SEPTEMBER 2019)
2. TOPOGRAPHIC DATA SOURCES (TNRIS 2016 BRAZOS RIVER LIDAR & SURVEY SITE TOPO)

NOTES:

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2. THIS SITE IS DESIGNATED AS A ZONE "A" AS SHOWN IN PANELS 48143C0600D. 100-YEAR FLOODPLAIN WIDTHS ARE COMPARABLE.
3. ALL ELEVATIONS BASED ON THE NAVD88 VERTICAL DATUM.
4. THE DOWNSTREAM BOUNDARY CONDITIONS ARE ESTABLISHED FROM THE NORMAL DEPTH. THERE ARE NO KNOWN WATER SURFACE ELEVATIONS.
5. SCHEMATIC SCS CALCULATED FLOWS WERE USED FOR THE DESIGN ANALYSIS OF THE 25-YR STORM FREQUENCY & THE CHECK OF THE 100-YR STORM FREQUENCY BASED ON THEIR CONSISTENCIES WITH METHODOLOGIES OUTLINED IN THE TXDOT HDM. SEE "PRELIMINARY DRAINAGE REPORT FOR SH 220 AT DUFFAU CREEK".
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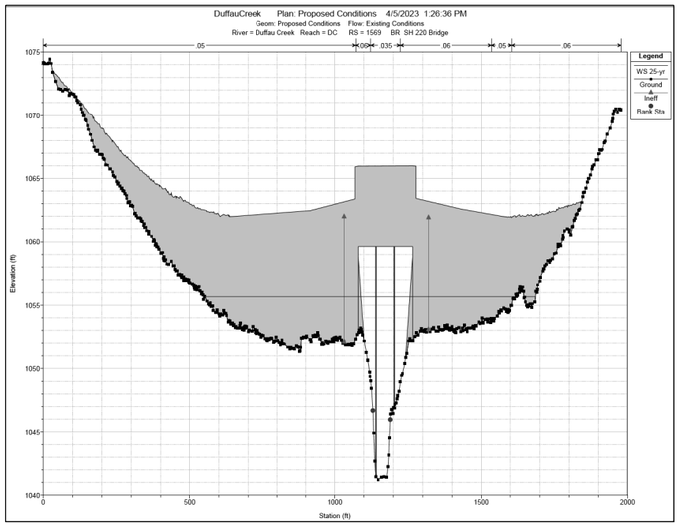
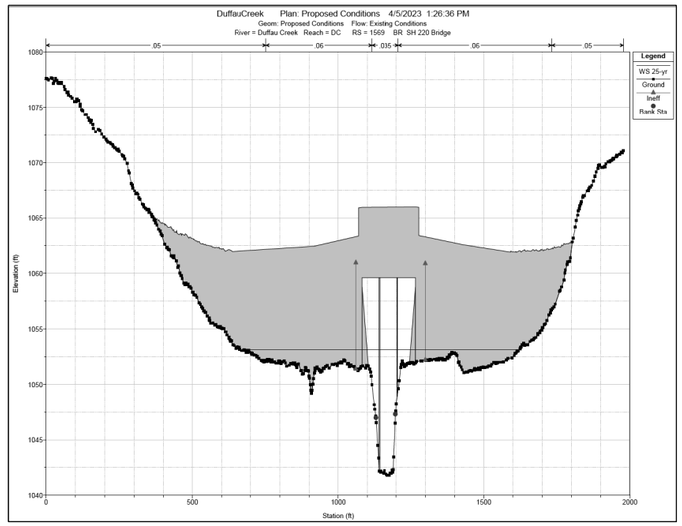
7. ERATH COUNTY FPA (MICKI BELL) WAS NOTIFIED OF THE PROJECT ON SEPTEMBER 8, 2021 AND WILL BE PROVIDED A COPY OF THE FINAL DRAINAGE REPORT.

PROPOSED DESIGN STREAM CROSS-SECTION STATE HIGHWAY 220

HEC-RAS SECTION STA 1569 BR UPSTREAM



HEC-RAS SECTION STA 1569 BR DOWNSTREAM



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Texas Department of Transportation

SH 220

AT DUFFAU CREEK
BRIDGE HYDRAULIC DATA SHEET

SCALE: N.T.S. SHEET 4 OF 7

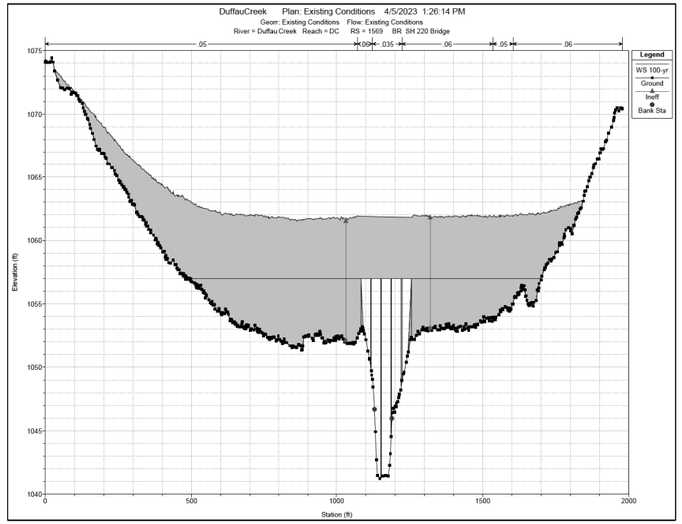
DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NUMBER		HIGHWAY NO.
GD	6	(See Title Sheet)		SH 220
CHECK	STATE	DISTRICT	COUNTY	SHEET NO.
JC	TEXAS	FTW	ERATH	
GRAPHICS	CONTROL	SECTION	JOB	103
RS	0467	02	020, ETC.	
CHECK				
JC				

FILE: ...\DR\Sht\021DHD04.sht

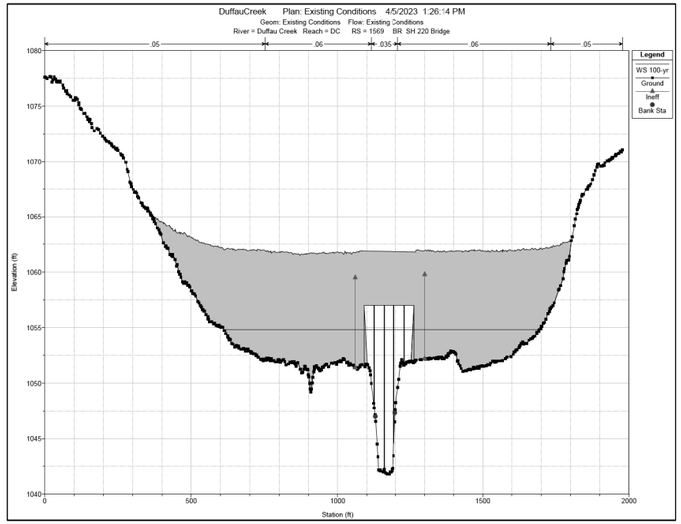
TIME: 10:44:46 AM
DATE: 7/1/2024

EXISTING CHECK STREAM CROSS-SECTION STATE HIGHWAY 220

HEC-RAS SECTION STA 1569 BR UPSTREAM

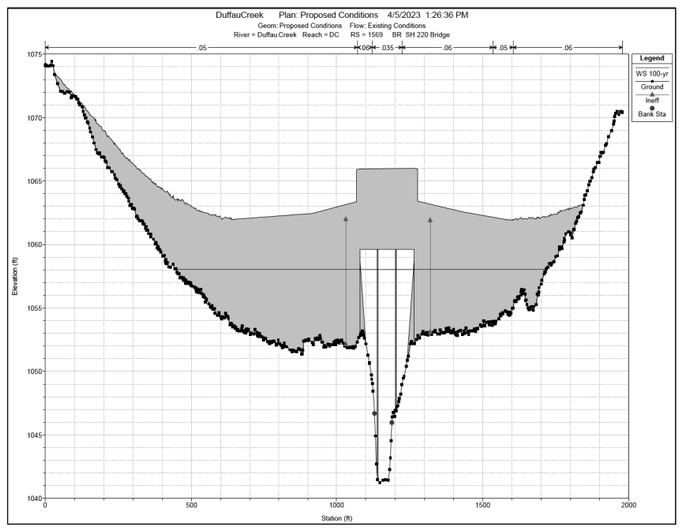


HEC-RAS SECTION STA 1569 BR DOWNSTREAM



PROPOSED CHECK STREAM CROSS-SECTION STATE HIGHWAY 220

HEC-RAS SECTION STA 1569 BR UPSTREAM



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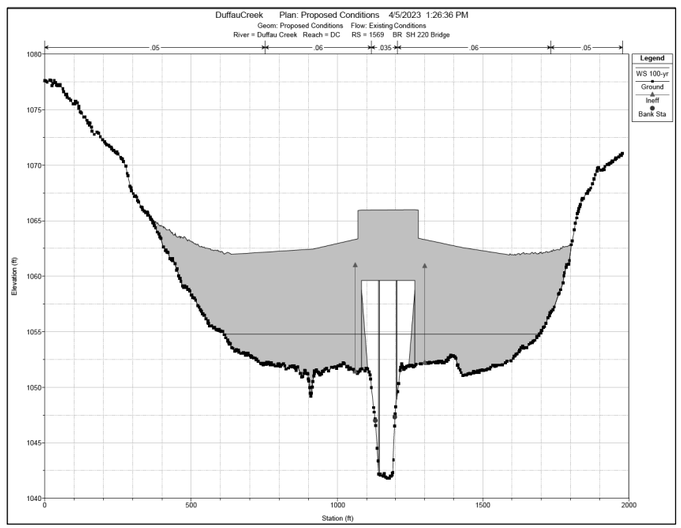

REFERENCES:

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2. TOPOGRAPHIC DATA SOURCES (TNRIS 2016 BRAZOS RIVER LIDAR & SURVEY SITE TOPO)

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Texas Department of Transportation

SH 220

AT DUFFAU CREEK
BRIDGE HYDRAULIC DATA SHEET

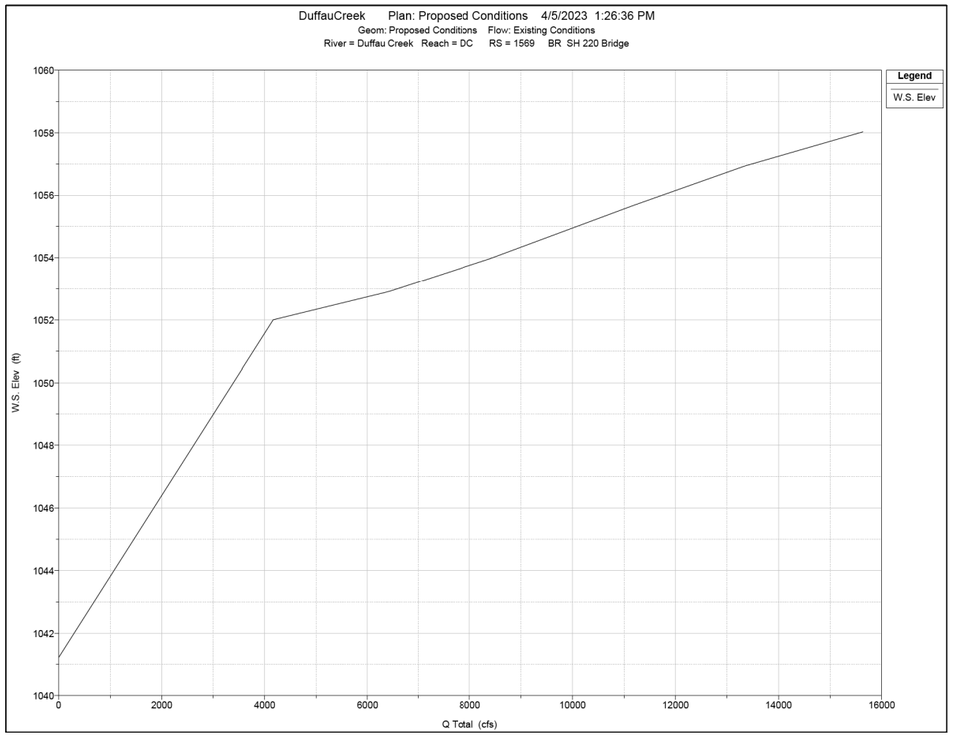
SCALE: N.T.S. SHEET 5 OF 7

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NUMBER		HIGHWAY NO.
GD	6	(See Title Sheet)		SH 220
CHECK	STATE	DISTRICT	COUNTY	SHEET NO.
JC	TEXAS	FTW	ERATH	104
GRAPHICS	CONTROL	SECTION	JOB	
RS	0467	02	020, ETC.	
CHECK				
JC				

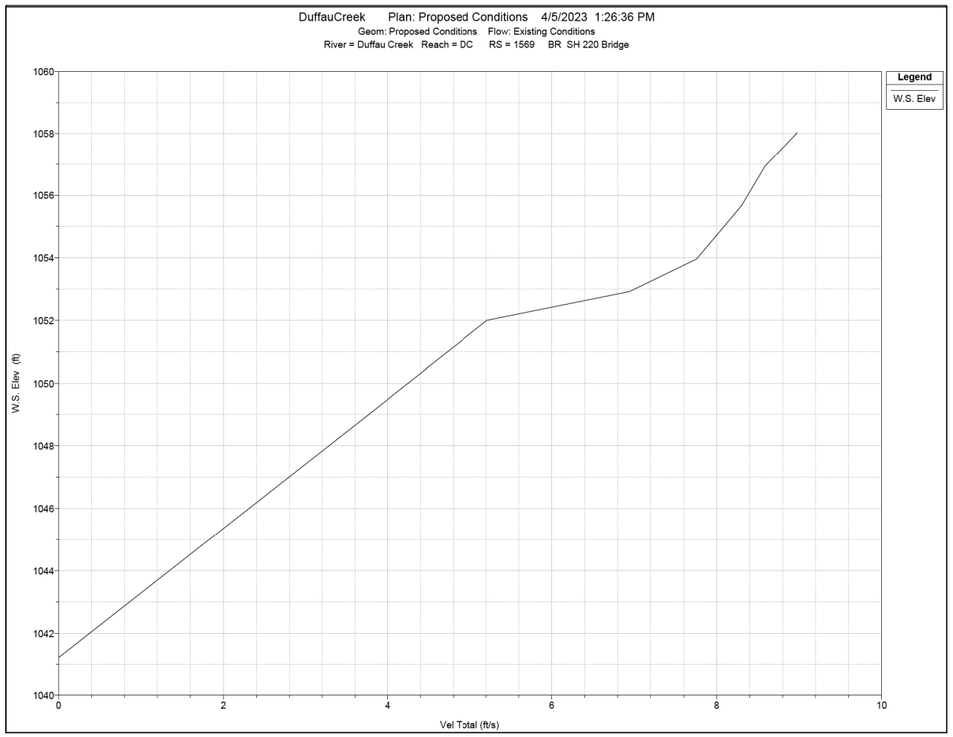
FILE: ...\DR\Sht\021DHD05.sht

TIME: 10:44:56 AM
DATE: 7/1/2024

CONVEYANCE CURVE @ RS 1569



VELOCITY CURVE @ RS 1569



REFERENCES:

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2. TOPOGRAPHIC DATA SOURCES (TNRIS 2016 BRAZOS RIVER LIDAR & SURVEY SITE TOPO)

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Texas Department of Transportation

SH 220

AT DUFFAU CREEK
BRIDGE HYDRAULIC DATA SHEET

SCALE: N.T.S. SHEET 6 OF 7

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NUMBER		HIGHWAY NO.
GD	6	(See Title Sheet)		SH 220
CHECK	STATE	DISTRICT	COUNTY	SHEET NO.
JC	TEXAS	FTW	ERATH	
GRAPHICS	CONTROL	SECTION	JOB	105
RS	0467	02	020, ETC.	
CHECK				
JC				

FILE: ...\DR\Sht\02IDHD06.sht

TIME: 1:16:32 PM
DATE: 7/1/2024

50-YR SCOUR DESIGN FLOOD FREQUENCY

CR 220 at DUFFAU CREEK					
50-YEAR SCOUR DESIGN FLOOD FREQUENCY					
Pier Shape	round	k_{sh}	1.15	$t_{e(P)}$ (hr)	208.3
α (degrees)	0	k_{sp}	1.00	τ_c (Pa)	0.78
a (m)	0.9144	k_w	1.44	$\tau_{i(C)}$ (Pa)	229.2
a' (m)	0.91	K_W	1.00	$\tau_{i(P)}$ (Pa)	81.5
A_1 (m^2)	255.3	K_{SH}	1.00	ν (m^2/s)	0.000001
B_1 (m)	310.7	K_{SP}	1.01	V_1 (m/s)	1.24
B_2 (m)	51.2	L_c (m)	35.05	V_2 (m/s)	2.62
γ (kg/m^3)	9810	L_p (m)	14.02	V_c (m/s)	0.52
g (m/s^2)	9.81	n	0.04	$\dot{z}_{i(C)}$ (mm/hr)	356.28
θ (degrees)	5.8	n_b	2	$\dot{z}_{i(P)}$ (mm/hr)	125.03
H_1 (m)	0.82	ρ (kg/m^3)	1000	$Z_{max(C)}$ (m)	1.31
H_2 (m)	2.82	P (m)	312.5	$Z_C(\Delta t)$ (m)	1.30
$H_{2\Delta}$ (m)	2.82	R_e	475488	$Z_{max(P)}$ (m)	0.73
k_α	1.00	R_h (m)	1	$Z_P(\Delta t)$ (m)	0.71
k_θ	1.01	S (m)	20	**$Z_C(\Delta t)$ (ft)**	**4.28**
k_{Lc}	0.92	Δt (yr)	100	**$Z_P(\Delta t)$ (ft)**	**2.33**
k_r	9.54	$t_{e(C)}$ (hr)	635.4	**$Z_{tot}(\Delta t)$ (ft)**	**6.60**

SEE NOTE 4 FOR MAXIMUM SCOUR DEPTH EXPLANATION

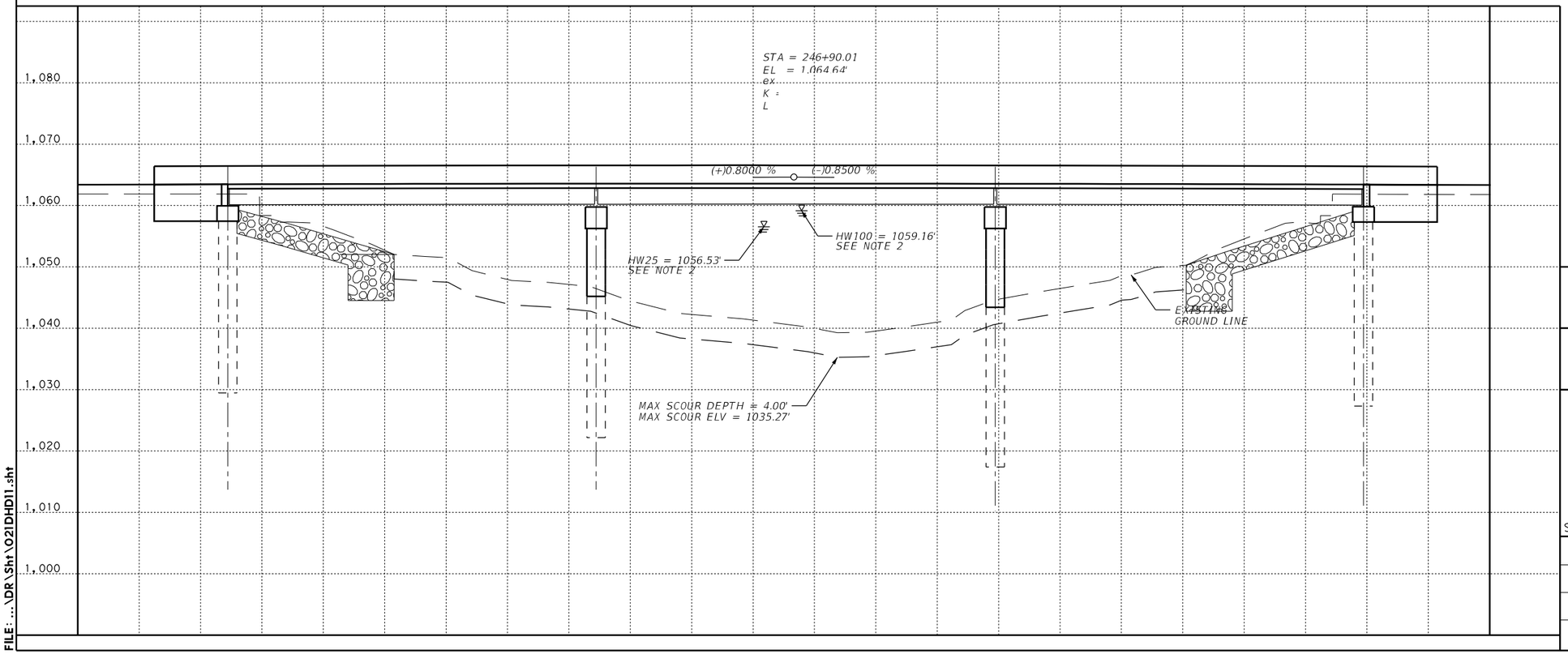
100-YR SCOUR DESIGN FLOOD FREQUENCY

CR 220 at DUFFAU CREEK					
100-YEAR SCOUR DESIGN FLOOD FREQUENCY					
Pier Shape	round	k_{sh}	1.15	$t_{e(P)}$ (hr)	246.7
α (degrees)	0	k_{sp}	1.00	τ_c (Pa)	0.78
a (m)	0.9144	k_w	1.05	$\tau_{i(C)}$ (Pa)	144.6
a' (m)	0.91	K_W	1.00	$\tau_{i(P)}$ (Pa)	45.9
A_1 (m^2)	479	K_{SH}	1.00	ν (m^2/s)	1.00E-06
B_1 (m)	366.9	K_{SP}	1.01	V_1 (m/s)	0.92
B_2 (m)	53.2	L_c (m)	35.05	V_2 (m/s)	2.74
γ (kg/m^3)	9810	L_p (m)	14.02	V_c (m/s)	3.53
g (m/s^2)	9.81	n	0.042	$\dot{z}_{i(C)}$ (mm/hr)	223.82
θ (degrees)	7	n_b	2	$\dot{z}_{i(P)}$ (mm/hr)	69.29
H_1 (m)	1.3	ρ (kg/m^3)	1000	$Z_{max(C)}$ (m)	1.73
H_2 (m)	3.04	P (m)	368.8	$Z_C(\Delta t)$ (m)	1.71
$H_{2\Delta}$ (m)	3.04	R_e	3227832	$Z_{max(P)}$ (m)	2.46
k_α	1.00	R_h (m)	1	$Z_P(\Delta t)$ (m)	2.15
k_θ	1.02	S (m)	20	**$Z_C(\Delta t)$ (ft)**	**5.62**
k_{Lc}	0.90	Δt (yr)	100	**$Z_P(\Delta t)$ (ft)**	**7.05**
k_r	11.77	$t_{e(C)}$ (hr)	906.2	**$Z_{tot}(\Delta t)$ (ft)**	**12.67**

SEE NOTE 4 FOR MAXIMUM SCOUR DEPTH EXPLANATION

Design Event	Contraction Scour (ft)	Pier Scour (ft)	Total Scour (ft)	Design Scour (ft)
50-year	4.28	2.33	6.60	**4.0**
100-year (check)	5.62	7.05	12.67	**4.0**

SEE NOTE 4 FOR MAXIMUM SCOUR DEPTH EXPLANATION



0 10 20
SCALE IN FEET

NOTES:

1. THE SCOUR CALCULATIONS SHOWN ASSUME AN INFINITELY DEEP SOIL LAYER. IN CASES WHERE THERE IS A FINITE ERODIBLE LAYER THICKNESS, MAXIMUM SCOUR DEPTH IS CONFINED TO THE DEPTH OF THAT LAYER. A LAYER OF NON-ERODIBLE LIMESTONE EXISTS AT ELEVATION 1041.22 FEET, WHICH IS APPROXIMATELY 4.0 FEET BELOW CURRENT CHANNEL BOTTOM (ASSUMING A LINEAR TRANSITION BETWEEN SOIL BORINGS).

2. HEADWATER ELEVATIONS DETERMINED AT UPSTREAM BOUNDING CROSS SECTION 1638.

3. THE SRICOS-EFA METHOD OF SCOUR EVALUATION WAS USED PER TxDOT GUIDANCE BECAUSE COHESIVE SOILS ARE PRESENT AT THE BRIDGE SITE. CALCULATIONS WERE PERFORMED USING TxDOT's SRICOS ANALYSIS SPREADSHEET (REV 10-21-2020).

4. MAXIMUM SCOUR DEPTH IS LIMITED BY PRESENCE OF NON-ERODIBLE LIMESTONE LAYER APPROXIMATELY FOUR FEET BELOW CHANNEL BOTTOM.

5. SEE "STATE HIGHWAY 220 AT LITTLE DUFFAU CREEK AND DUFFAU CREEK HYDRAULIC REPORT" DATED 07/01/2024 FOR MORE INFORMATION.

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Texas Department of Transportation

SH 220

AT DUFFAU CREEK
BRIDGE HYDRAULIC DATA SHEET

SCALE: 1"=100' (H), 1"=10' (V) SHEET 7 OF 7

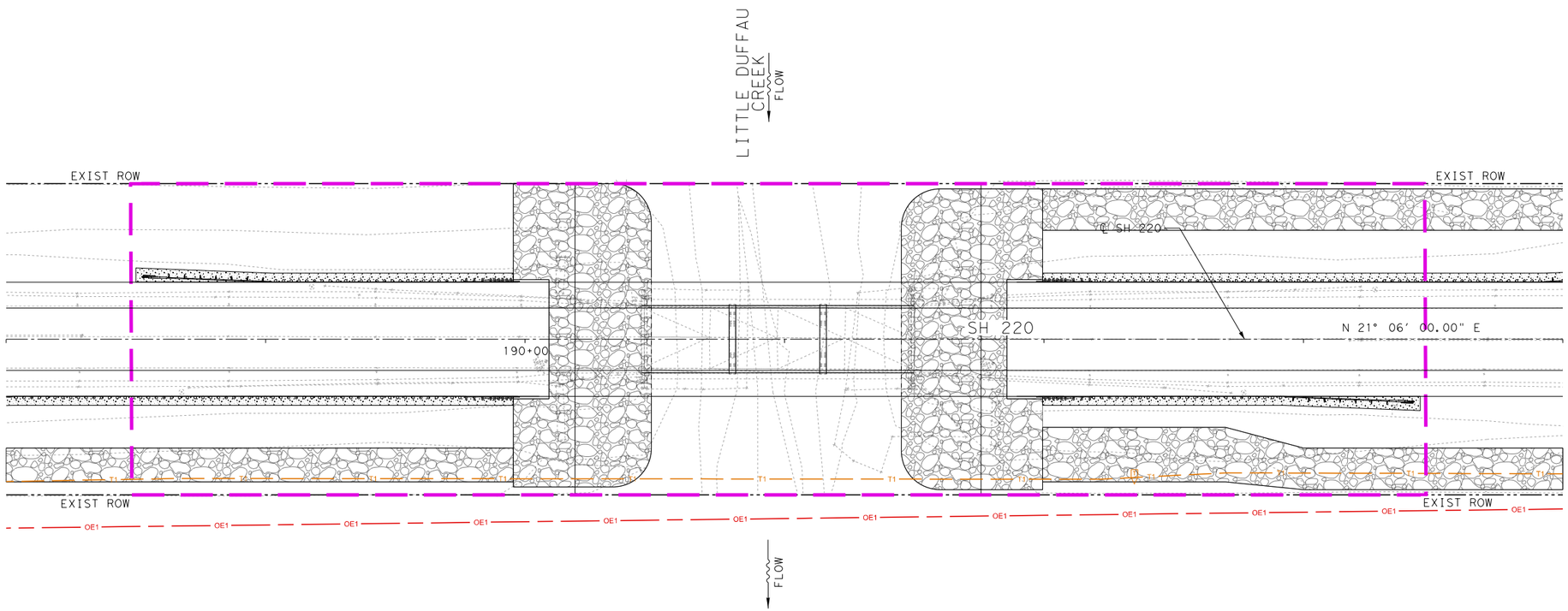
DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NUMBER		HIGHWAY NO.
EB	6	(See Title Sheet)		SH 220
CHECK	STATE	DISTRICT	COUNTY	SHEET NO.
JC	TEXAS	FTW	ERATH	
GRAPHICS	CONTROL	SECTION	JOB	106
EB				
CHECK	0467	02	020, ETC.	
JC				

FILE: ...\DR\Sht\02IDHD11.sht

TIME: 9:37:56 AM
DATE: 2/7/2024

0 25 50
SCALE IN FEET

N



LEGEND OF UTILITY TYPES

GENERAL
- UTILITY CONTINUES
- UTILITY TERMINATES
- QL-B SIGNAL LOST
- LIMITS OF INVESTIGATION

COMMUNICATIONS
- TELEPHONE - BRIGHTSPEED (QL-B) — T1
- TELEPHONE - BRIGHTSPEED (QL-D) — T1(D)

ELECTRIC
- OH ELECTRIC - UCS — OE1

UTILITY OWNER	UTILITY TYPE	NAME	PHONE NUMBER	EMAIL
BRIGHTSPEED	COMMUNICATIONS	JAMES CARTER	254-690-9352	JAMES.W.CARTER@BRIGHTSPEED.COM
UCS	ELECTRIC	JESSE WHITT	254-918-6164	JESSE@UCS.NET

PRELIMINARY
FOR INTERIM REVIEW ONLY. NOT FOR PERMITTING, BIDDING, OR CONSTRUCTION.
Prepared by or under the Direct Supervision of
DAKOTA SMITH, P.E. 133272
2/7/2024

LAMB-STAR ENGINEERING, L.L.C.
3801 PARKWOOD BLVD, SUITE 550
FRISCO, TEXAS 75034 (214) 440-3600
TEXAS REGISTERED ENGINEERING FIRM F-9073

Texas Department of Transportation

SH 220 AT LITTLE DUFFAU CREEK

EXISTING UTILITY LAYOUTS

SCALE: 1"=50' (H) SHEET 1 OF 1

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NUMBER		HIGHWAY NO.
BWG	6	(See Title Sheet)		SH 220
CHECK: DWS	STATE	DISTRICT	COUNTY	SHEET NO.
GRAPHICS: BWG	TEXAS	FW	ERATH	107
CHECK: DWS	CONTROL: 0467	SECTION: 02	JOB: 020, ETC.	

FILE: O2OUEUTL01.dgn

TIME: $TIME$
DATE: $DATE$

UTILITY QUALITY LEVELS

(OBTAINED FROM ASCE PUBLICATION CI/ASCE STANDARD 38-02)

1. UTILITY QUALITY LEVEL D (QL D): INFORMATION DERIVED FROM EXISTING RECORDS OR ORAL RECOLLECTIONS.
2. UTILITY QUALITY LEVEL C (QL C): INFORMATION OBTAINED BY SURVEYING AND PLOTTING VISIBLE ABOVE-GROUND UTILITY FEATURES AND BY USING PROFESSIONAL JUDGEMENT IN CORRELATING THIS INFORMATION TO QUALITY LEVEL D INFORMATION.
3. UTILITY QUALITY LEVEL B (QL B): INFORMATION OBTAINED THROUGH THE APPLICATION OF APPROPRIATE SURFACE GEOPHYSICAL METHODS TO DETERMINE THE EXISTENCE AND APPROXIMATE HORIZONTAL POSITION OF SUBSURFACE UTILITIES. QUALITY LEVEL B DATA SHOULD BE REPRODUCIBLE BY SURFACE GEOPHYSICS AT ANY POINT OF THEIR DEPICTION. THIS INFORMATION IS SURVEYED TO APPLICABLE TOLERANCES DEFINED BY THE PROJECT AND REDUCED ONTO PLAN DOCUMENTS.
4. UTILITY QUALITY LEVEL A (QL A): PRECISE HORIZONTAL AND VERTICAL LOCATION OF UTILITIES OBTAINED BY THE ACTUAL EXPOSURE (OR VERIFICATION OF PREVIOUSLY EXPOSED AND SURVEYED UTILITIES) AND SUBSEQUENT MEASUREMENT OF SUBSURFACE UTILITIES, USUALLY AT A SPECIFIC POINT. MINIMALLY INTRUSIVE EXCAVATION EQUIPMENT IS TYPICALLY USED TO MINIMIZE THE POTENTIAL FOR UTILITY DAMAGE. A PRECISE HORIZONTAL AND VERTICAL LOCATION, AS WELL AS OTHER UTILITY ATTRIBUTES, IS SHOWN ON PLAN DOCUMENTS. ACCURACY IS TYPICALLY SET TO 15-MM VERTICAL AND TO APPLICABLE HORIZONTAL SURVEY AND MAPPING ACCURACY AS DEFINED OR EXPECTED BY THE PROJECT OWNER.

GENERAL NOTES

1. THE UTILITIES DEPICTED WERE INVESTIGATED BY LAMB-STAR ENGINEERING, ALL OTHER PLAN INFORMATION, NOTABLY THE BACKGROUND INFORMATION WAS PROVIDED BY OTHERS AND LAMB-STAR ENGINEERING DISCLAIMS RESPONSIBILITY FOR ITS ACCURACY.
2. EXISTING SUBSURFACE UTILITY INVESTIGATIONS WERE COMPLETED ON 10/21/2021. LAMB-STAR ENGINEERING EXPRESSLY DISCLAIMS ANY AND ALL RESPONSIBILITY FOR SUE DATA PROVIDED BY OTHERS AND NEW UTILITY INSTALLATIONS OR MODIFICATIONS, AND ADJUSTMENTS TO EXISTING UTILITIES AFTER THE COMPLETION DATE.
3. UTILITY LOCATIONS ON THESE DRAWINGS ARE INTENDED FOR DESIGN PURPOSES AND NOT CONSTRUCTION. THEY REFLECT SUBSURFACE UTILITIES AT THE TIME SURVEYED. CALL TEXAS 811 FOR UTILITY LOCATIONS 48-HOURS PRIOR TO ANY WORK.
4. UTILITIES ON THESE DRAWINGS HAVE BEEN IDENTIFIED TO ASCE STANDARD 38-02. QUALITY LEVEL D INFORMATION IS SHOWN AS NOTED IN THE LEGEND.
5. UTILITIES ON THESE DRAWINGS HAVE BEEN IDENTIFIED TO ASCE STANDARD 38-02. QUALITY LEVEL C INFORMATION IS SHOWN AS NOTED IN THE LEGEND.
6. UTILITY LINES WERE DESIGNATED WHERE POSSIBLE. HOWEVER, SOME SERVICE LINES ARE CONSTRUCTED OF NON-CONDUCTIVE MATERIAL AND UTILITY COMPANY DRAWINGS DO NOT SHOW SERVICE LINE LOCATIONS. THEREFORE, NOT ALL SERVICE LINES MAY BE SHOWN.
7. UTILITIES SHOWN OUTSIDE OF LIMITS OF INVESTIGATION ARE FOR REFERENCE ONLY. THESE UTILITIES ARE SHOWN FOR GENERAL INFORMATION USE DURING UTILITY COORDINATION, BUT THEY HAVE NOT BEEN VERIFIED AS BEING COMPLETE OR ACCURATE.

LEGEND OF UTILITY SYMBOLS

COMMUNICATIONS
- TELEPHONE PEDESTAL
- UNDERGROUND TELEPHONE MARKER

ELECTRIC
- POWER POLE
- POWER POLE WITH RISER

LEGEND OF UTILITY TYPES

GENERAL
- UTILITY CONTINUES
- UTILITY TERMINATES
- QL-B SIGNAL LOST
- LIMITS OF INVESTIGATION

COMMUNICATIONS
- TELEPHONE - BRIGHTSPEED (QL-B) — T1
- TELEPHONE - BRIGHTSPEED (QL-D) — T1(D)

ELECTRIC
- OH ELECTRIC - UCS — OE1

STATE OF TEXAS
DAKOTA W. SMITH
133272
LICENSED PROFESSIONAL ENGINEER
07/18/2024

LAMB-STAR ENGINEERING, LLC
TEXAS REGISTERED ENGINEERING FIRM F-9073

LAMB-STAR ENGINEERING, L.L.C.
3801 PARKWOOD BLVD, SUITE 550
FRISCO, TEXAS 75034 (214) 440-3600
TEXAS REGISTERED ENGINEERING FIRM F-9073

Texas Department of Transportation

SH 220 AT LITTLE DUFFAU CREEK

EXISTING UTILITY LEGEND AND NOTES

SCALE: 1"=50' (H) SHEET 1 OF 1

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NUMBER		HIGHWAY NO.
BWG	6	(See Title Sheet)		SH 220
CHECK	STATE	DISTRICT	COUNTY	SHEET NO.
DWS	TEXAS	FW	ERATH	108
GRAPHICS	CONTROL	SECTION	JOB	
BWG	0467	02	020, ETC.	
CHECK				
DWS				

FILE: $FILES$

TIME: $TIME$
DATE: $DATE$

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SCALE IN FEET

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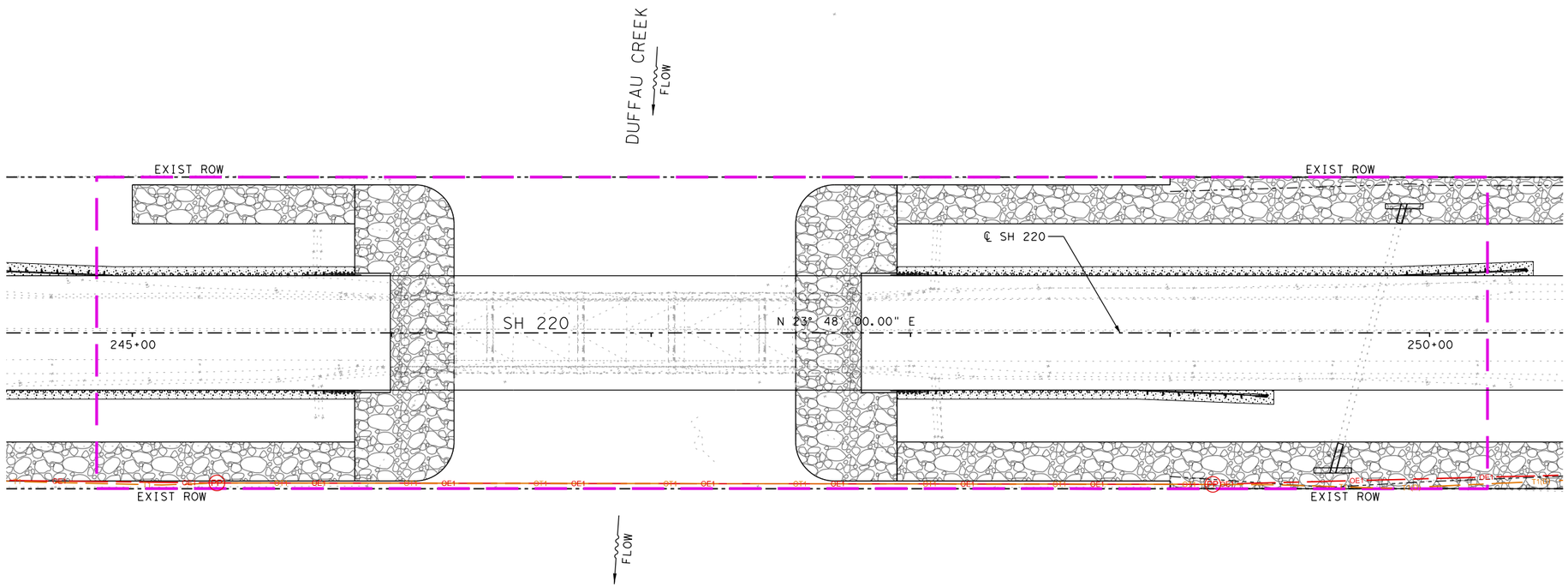

LEGEND OF UTILITY TYPES

GENERAL
- UTILITY CONTINUES
- UTILITY TERMINATES
- QL-B SIGNAL LOST
- LIMITS OF INVESTIGATION

COMMUNICATIONS
- OH TELEPHONE - BRIGHTSPEED — OT1
- TELEPHONE - BRIGHTSPEED (QL-B) — T1
- TELEPHONE - BRIGHTSPEED (QL-D) — T1(D)

ELECTRIC
- OH ELECTRIC - UCS — OE1

UTILITY OWNER	UTILITY TYPE	NAME	PHONE NUMBER	EMAIL
BRIGHTSPEED	COMMUNICATIONS	JAMES CARTER	254-690-9352	JAMES.W.CARTER@BRIGHTSPEED.COM
UCS	ELECTRIC	JESSE WHITT	254-918-6164	JESSE@UCS.NET

STATE OF TEXAS
DAKOTA W. SMITH
133272
LICENSED
PROFESSIONAL ENGINEER
07/18/2024

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Texas Department of Transportation

SH 220 AT DUFFAU CREEK

EXISTING UTILITY LAYOUTS

SCALE: 1"=50' (H) SHEET 1 OF 1

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NUMBER		HIGHWAY NO.
BWG	6	(See Title Sheet)		SH 220
CHECK	STATE	DISTRICT	COUNTY	SHEET NO.
DWS	TEXAS	FW	ERATH	109
GRAPHICS	CONTROL	SECTION	JOB	
BWG	0467	02	021, ETC.	
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DWS				

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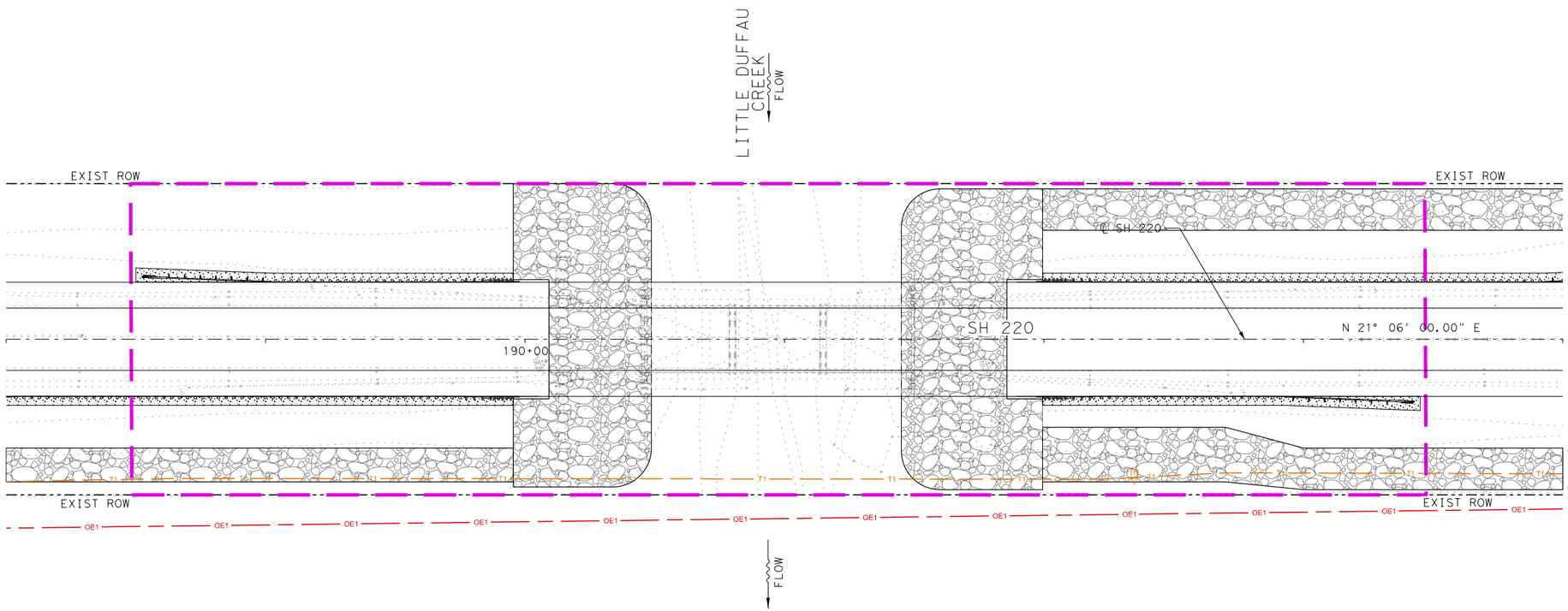

LEGEND OF UTILITY TYPES

GENERAL
- UTILITY CONTINUES
- UTILITY TERMINATES
- QL-B SIGNAL LOST
- LIMITS OF INVESTIGATION

COMMUNICATIONS
- TELEPHONE - BRIGHTSPEED (QL-B) — T1
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UCS	ELECTRIC	JESSE WHITT	254-918-6164	JESSE@UCS.NET

STATE OF TEXAS
DAKOTA W. SMITH
133272
LICENSED PROFESSIONAL ENGINEER
07/18/2024

LAMB-STAR ENGINEERING, LLC
TEXAS REGISTERED ENGINEERING FIRM F-9073

LAMB-STAR ENGINEERING, L.L.C.
3801 PARKWOOD BLVD, SUITE 550
FRISCO, TEXAS 75034 (214) 440-3600
TEXAS REGISTERED ENGINEERING FIRM F-9073

Texas Department of Transportation

SH 220 AT LITTLE DUFFAU CREEK

EXISTING UTILITY LAYOUTS

SCALE: 1"=50' (H) SHEET 1 OF 1

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NUMBER		HIGHWAY NO.
BWG	6	(See Title Sheet)		SH 220
CHECK: DWS	STATE	DISTRICT	COUNTY	SHEET NO.
GRAPHICS: BWG	TEXAS	FW	ERATH	107
CHECK: DWS	CONTROL	SECTION	JOB	
	0467	02	020, ETC.	

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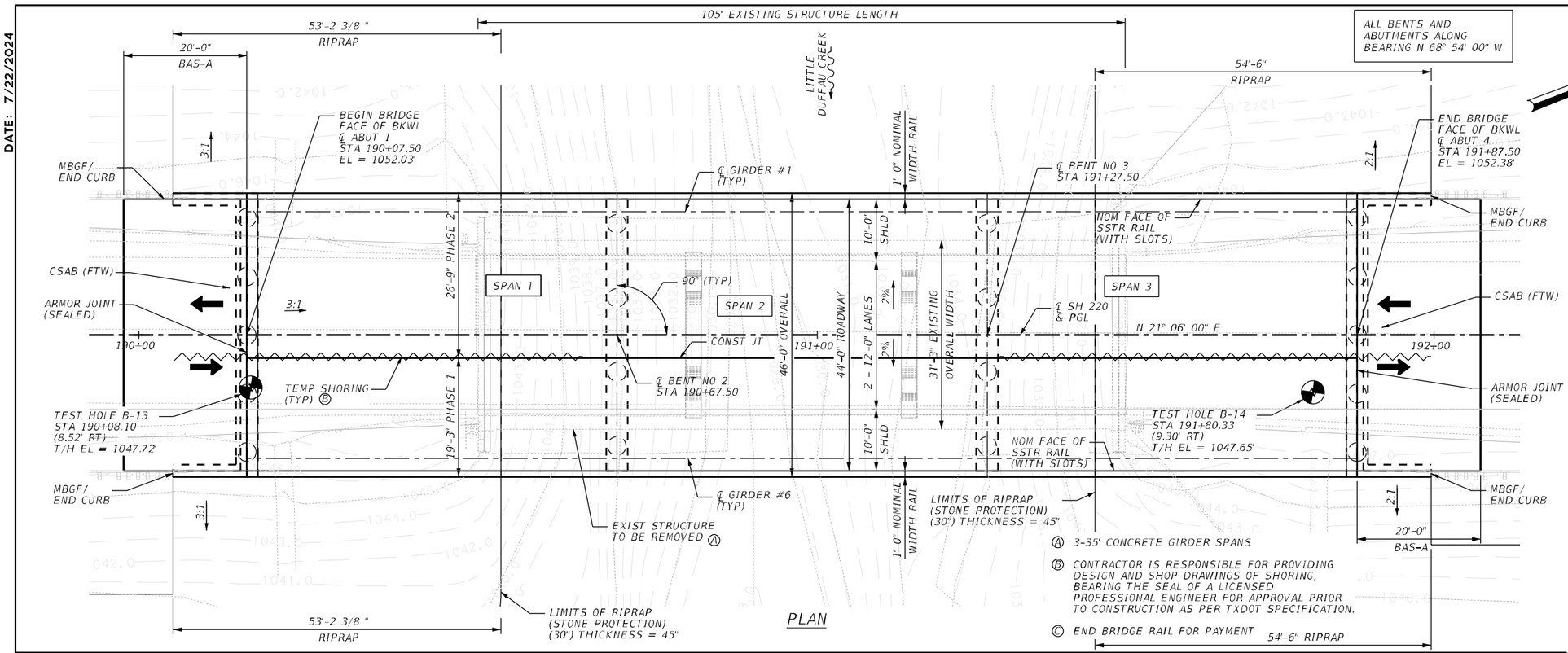


Ⓐ 3-35' CONCRETE GIRDER SPANS

Ⓑ CONTRACTOR IS RESPONSIBLE FOR PROVIDING DESIGN AND SHOP DRAWINGS OF SHORING, BEARING THE SEAL OF A LICENSED PROFESSIONAL ENGINEER FOR APPROVAL PRIOR TO CONSTRUCTION AS PER TXDOT SPECIFICATION.

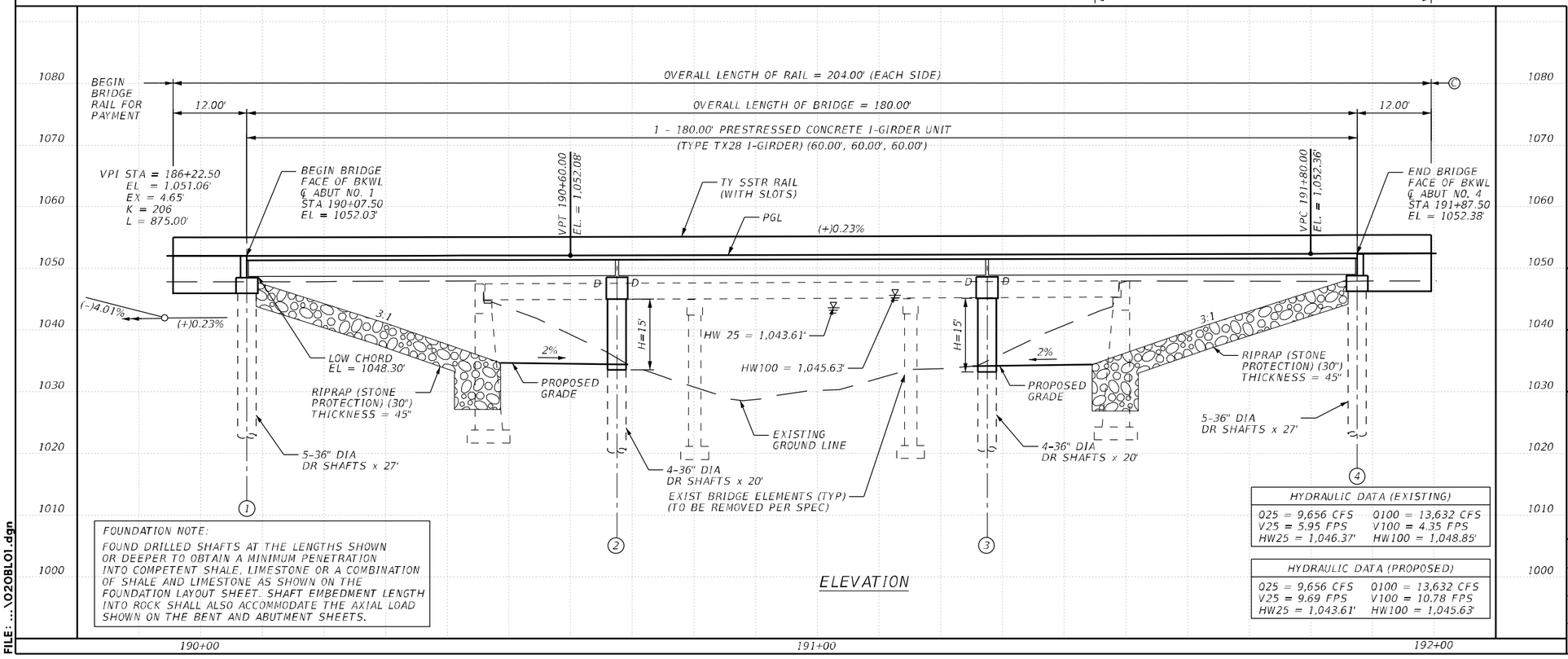
Ⓒ END BRIDGE RAIL FOR PAYMENT

0 10 20
SCALE IN FEET

NOTES:

1. DESIGNED IN ACCORDANCE WITH AASHTO LRFD SPECIFICATIONS AND INTERIM REVISIONS THERETO FOR HL93 LOADING, 9TH EDITION AND TXDOT BRIDGE DESIGN MANUAL, (NOV. 2021).
2. THE "H" VALUES SHOWN ARE ESTIMATED COLUMN HEIGHTS. THE CONTRACTOR IS RESPONSIBLE FOR CALCULATING ACTUAL COLUMN HEIGHTS BASED ON FIELD CONDITIONS.
3. CONTRACTOR SHALL FIELD VERIFY LOCATIONS OF ALL STRUCTURES AND UTILITIES PRIOR TO ORDERING MATERIALS AND NOTIFY ENGINEERS IN WRITING OF ANY CONFLICTS OR DISCREPANCIES.
4. SEE BRIDGE TYPICAL TRANSVERSE SECTION SHEET FOR ADDITIONAL INFORMATION.
5. SAWCUT GROOVING OF THE BRIDGE DECK AND APPROACH SLAB IS REQUIRED.
6. RIPRAP SLOPES SHOWN. CONTRACTOR SHALL FIELD VERIFY.
7. SEE CSAB (FTW) STANDARD FOR CEMENT STABILIZED ABUTMENT BACKFILL DETAILS.
8. REFER TO ROADWAY PLAN AND PROFILE SHEETS FOR RIPRAP LIMITS.
9. SEE BORING SHEET FOR SOIL BORING DATA.
10. HYDRAULIC DATA REPORTED AT UPSTREAM AND DOWNSTREAM RIGHT-OF-WAY LIMITS. THESE LOCATIONS ROUGHLY CORRESPOND TO HEC-RAS CROSS SECTIONS 2208 (US) AND 2038 (DS).

FUNCT. CLASS = RURAL MAJOR COLLECTOR
DESIGN SPEED = 75 MPH
EXIST ADT (2020)= 2,395
PROP ADT (2040) = 3,353
EXIST NBI NO. = 02-073-0-0467-02-003
NEW NBI NO. = 02-073-0-0467-02-006



ELEVATION

FOUNDATION NOTE:
FOUND DRILLED SHAFTS AT THE LENGTHS SHOWN OR DEEPER TO OBTAIN A MINIMUM PENETRATION INTO COMPETENT SHALE, LIMESTONE OR A COMBINATION OF SHALE AND LIMESTONE AS SHOWN ON THE FOUNDATION LAYOUT SHEET. SHAFT EMBEDMENT LENGTH INTO ROCK SHALL ALSO ACCOMMODATE THE AXIAL LOAD SHOWN ON THE BENT AND ABUTMENT SHEETS.

HYDRAULIC DATA (EXISTING)	
Q25 = 9,656 CFS	Q100 = 13,632 CFS
V25 = 5.95 FPS	V100 = 4.35 FPS
HW25 = 1,046.37'	HW100 = 1,048.85'

HYDRAULIC DATA (PROPOSED)	
Q25 = 9,656 CFS	Q100 = 13,632 CFS
V25 = 9.69 FPS	V100 = 10.78 FPS
HW25 = 1,043.61'	HW100 = 1,045.63'

STATE OF TEXAS
AMY HARRINGTON CAUSEY
148150
LICENSED PROFESSIONAL ENGINEER

Amy Harrington Causey
7/22/2024
FOUNDATION DESIGN ONLY

Jacobs Engineering Group
STATE OF TEXAS
LAUREN VAN ANDEL
111751
LICENSED PROFESSIONAL ENGINEER
F-2966

Lauren Vanfleet
07/24/2024

SUPERSTRUCTURE INV/OPR RATINGS 1.16/1.93
HL93 LOADING

Jacobs
1999 BRYAN ST, SUITE 1200
DALLAS, TX 75201-3136
Phone: +1 (214) 638-0145
Firm Registration: F-2966

Texas Department of Transportation

BRIDGE LAYOUT

SH 220 AT LITTLE DUFFAU CREEK

SCALE: 1"=20'(H), 1"=20'(V) SHEET 1 OF 1

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NUMBER		HIGHWAY NO.
JDB	6	(See Title Sheet)		SH 220
CHECK	STATE	DISTRICT	COUNTY	SHEET NO.
LVA	TEXAS	FTW	ERATH	111
GRAPHICS	CONTROL	SECTION	JOB	
KAC	0467	02	020, ETC.	
CHECK				
JDB				

FILE: ...\020BL01.dgn

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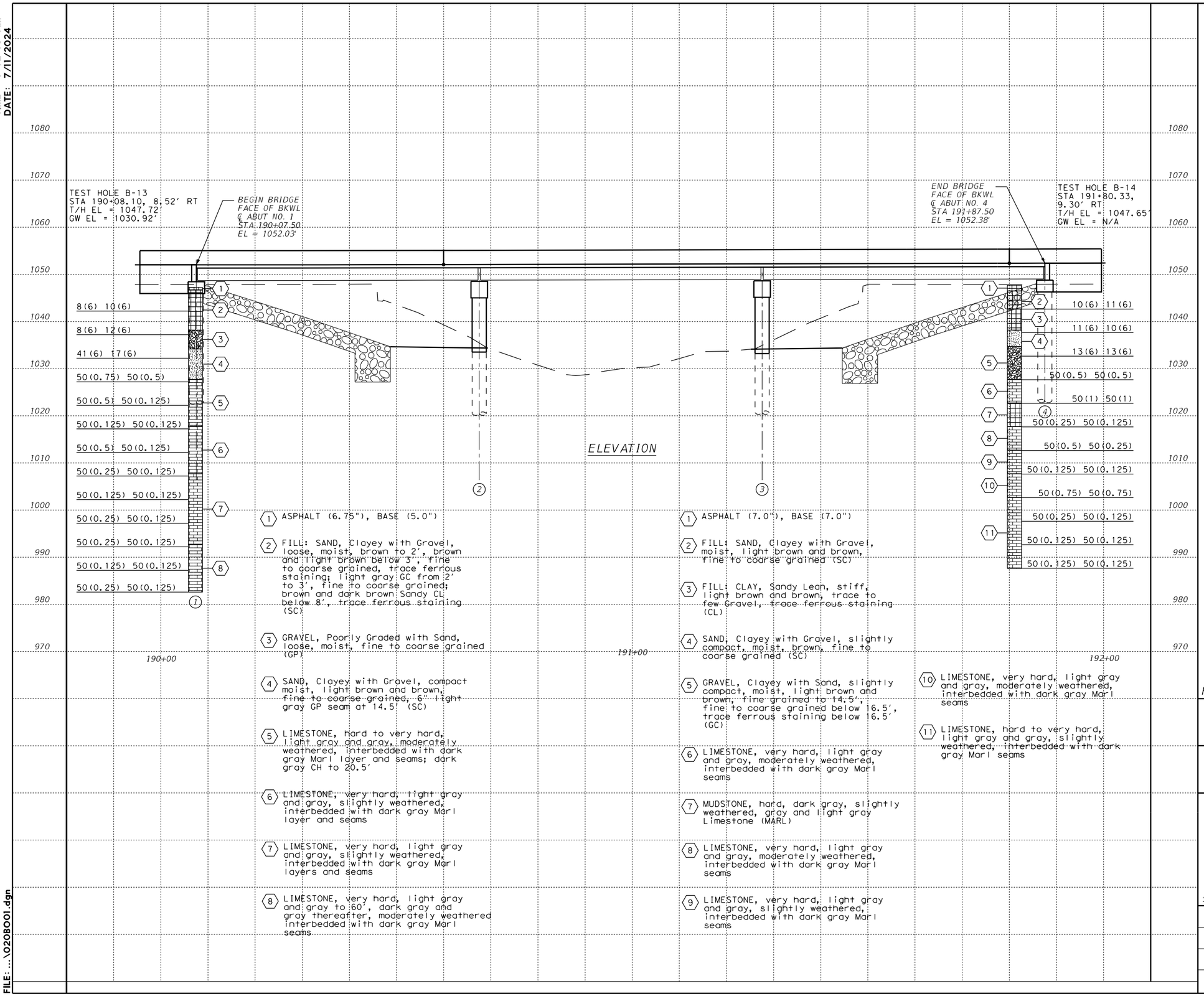
DATE: 7/11/2024



1. ASPHALT (6.75"), BASE (5.0")
2. FILL: SAND, Clayey with Gravel, loose, moist, brown to 2', brown and light brown below 3', fine to coarse grained, trace ferrous staining; light gray GC from 2' to 3', fine to coarse grained; brown and dark brown Sandy CL below 8', trace ferrous staining (SC)
3. GRAVEL, Poorly Graded with Sand, loose, moist, fine to coarse grained (GP)
4. SAND, Clayey with Gravel, compact moist, light brown and brown, fine to coarse grained, 6" light gray GP seam at 14.5' (SC)
5. LIMESTONE, hard to very hard, light gray and gray, moderately weathered, interbedded with dark gray Marl layer and seams; dark gray CH to 20.5'
6. LIMESTONE, very hard, light gray and gray, slightly weathered, interbedded with dark gray Marl layer and seams
7. LIMESTONE, very hard, light gray and gray, slightly weathered, interbedded with dark gray Marl layers and seams
8. LIMESTONE, very hard, light gray and gray to 60', dark gray and gray thereafter, moderately weathered interbedded with dark gray Marl seams

1. ASPHALT (7.0"), BASE (7.0")
2. FILL: SAND, Clayey with Gravel, moist, light brown and brown, fine to coarse grained (SC)
3. FILL: CLAY, Sandy Lean, stiff, light brown and brown, trace to few Gravel, trace ferrous staining (CL)
4. SAND, Clayey with Gravel, slightly compact, moist, brown, fine to coarse grained (SC)
5. GRAVEL, Clayey with Sand, slightly compact, moist, light brown and brown, fine grained to 14.5', fine to coarse grained below 16.5', trace ferrous staining below 16.5' (GC)
6. LIMESTONE, very hard, light gray and gray, moderately weathered, interbedded with dark gray Marl seams
7. MUDSTONE, hard, dark gray, slightly weathered, gray and light gray Limestone (MARL)
8. LIMESTONE, very hard, light gray and gray, moderately weathered, interbedded with dark gray Marl seams
9. LIMESTONE, very hard, light gray and gray, slightly weathered, interbedded with dark gray Marl seams

10. LIMESTONE, very hard, light gray and gray, moderately weathered, interbedded with dark gray Marl seams
11. LIMESTONE, hard to very hard, light gray and gray, slightly weathered, interbedded with dark gray Marl seams

0 10 20
SCALE IN FEET

Jacobs Engineering Group
STATE OF TEXAS
LAUREN VAN ANDEL
111751
LICENSED
PROFESSIONAL ENGINEER
F-2966
07/24/2024

HL93 LOADING

Jacobs
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DALLAS, TX 75201-3136
Phone: +1 (214) 638-0145
Firm Registration: F-2966

Texas Department of Transportation

BORINGS

SH 220 AT LITTLE DUFFAU CREEK

SCALE: 1"=20'(H), 1"=20'(V) SHEET 10F 1

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NUMBER		HIGHWAY NO.
JDB	6	(See Title Sheet)		SH 220
CHECK	STATE	DISTRICT	COUNTY	SHEET NO.
LVA	TEXAS	FTW	ERATH	
GRAPHICS	CONTROL	SECTION	JOB	112
KAC	0467	02	020, ETC.	
CHECK				
JDB				

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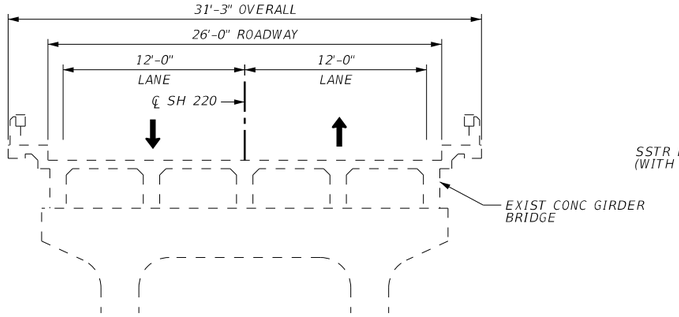
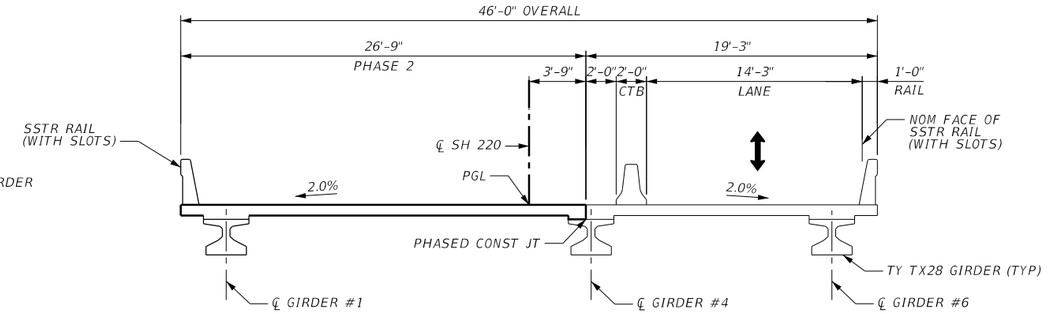
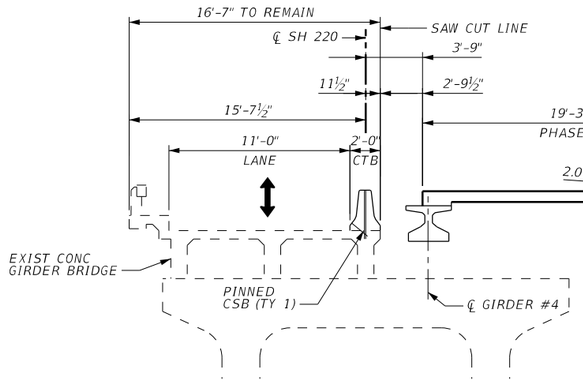


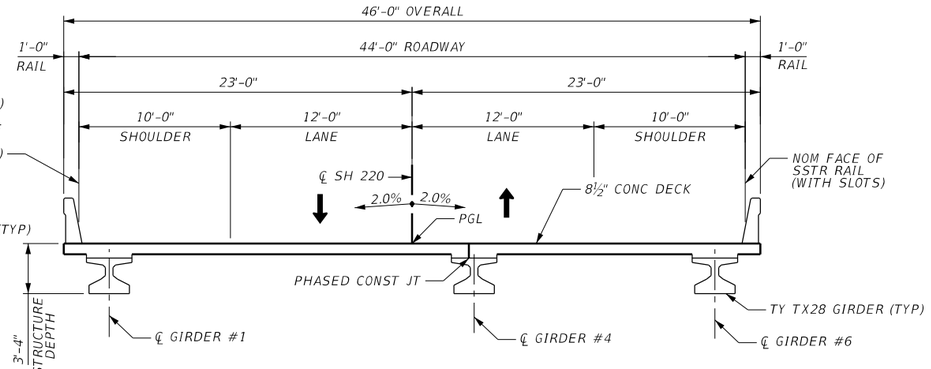
EXISTING TYPICAL TRANSVERSE SECTION



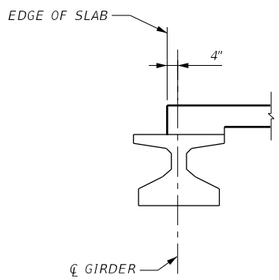
PHASE 2 CONSTRUCTION



PHASE 1 CONSTRUCTION



FINAL TYPICAL TRANSVERSE SECTION



PHASE CONSTRUCTION DETAIL

HL93 LOADING

Jacobs
1999 BRYAN ST, SUITE 1200
DALLAS, TX 75201-3136
Phone: +1 (214) 638-0145
Firm Registration: F-2966

Texas Department of Transportation

BRIDGE TYPICAL SECTIONS

SH 220 AT LITTLE DUFFAU CREEK

SCALE: N.T.S.

SHEET 1 OF 1

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NUMBER		HIGHWAY NO.
CHECK	6	(See Title Sheet)		SH 220
	STATE	DISTRICT	COUNTY	SHEET NO.
GRAPHICS KAC	TEXAS	FTW	ERATH	113
CHECK JDB	CONTROL 0467	SECTION 02	JOB 020, ETC.	

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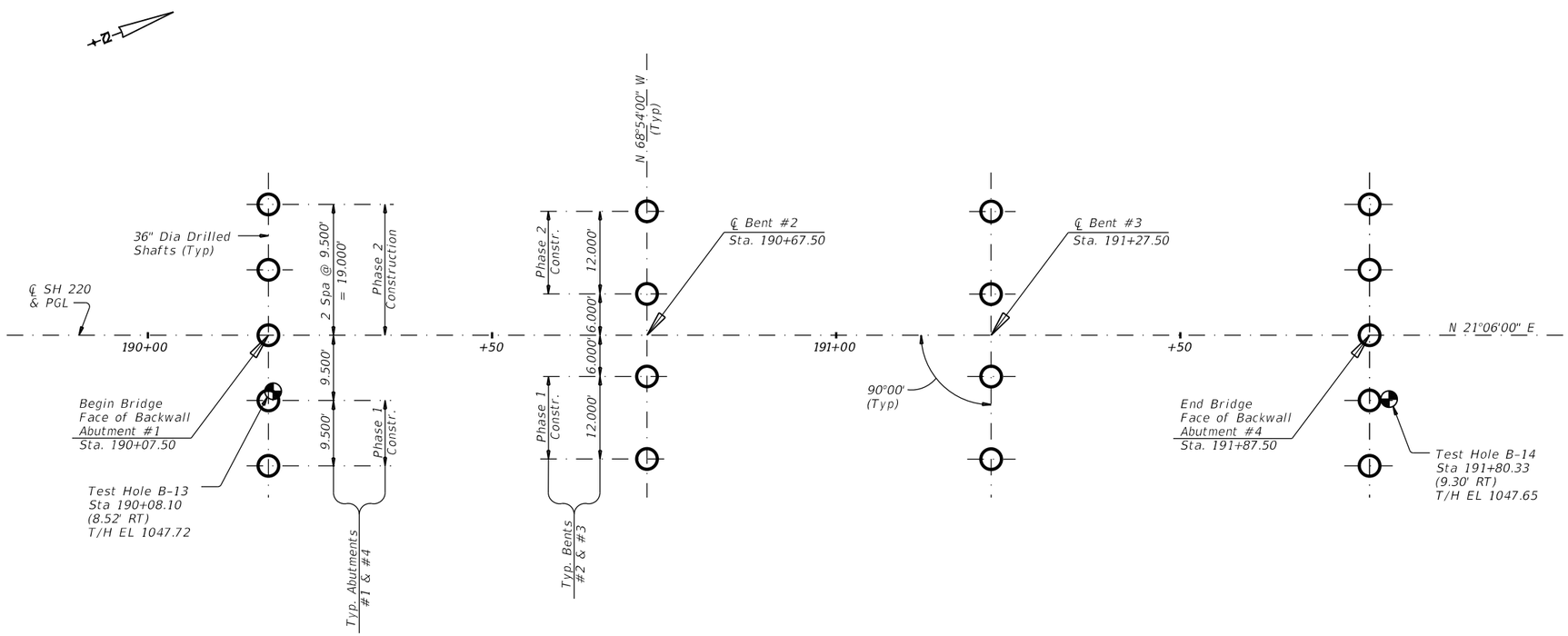
ESTIMATED QUANTITIES

DESCRIPTIONS	0400-7010 Cem Stabil Bkfl	0416-7006 Drill Shaft (36 In)	0420-7013 (1) CL "C" Conc (Abut) (HPC)	0420-7023 (1) CL "C" Conc (Cap) (HPC)	0420-7039 CL "C" Conc (Column) (HPC)	0422-7002 Reinf Conc Slab (HPC)	0422-7014 Approach Slab (HPC)	0425-7001 Prestr Conc Girder (Tx28)	0432-7047 Riprap (Stone Protection) (30 In)	0450-7025 Rail (Ty SSTR) (HPC)	0454-7003 Armor Joint (Sealed)	0496-7010 Remov Str (Bridge 100-499 FT Length)
	CY	LF	CY	CY	CY	SF	CY	LF	CY	LF	LF	EA
2 ~ Abutments	170	270	52.8	~	~	~	~	~	~	48.0	~	~
2 ~ Interior Bents	~	160	~	41.6	32.0	~	~	~	~	~	~	~
1 ~ 180.00' Prestr Slab Beam Unit	~	~	~	~	~	8,280	~	1,071.00	~	360.0	84	~
TOTALS	170	430	52.8	41.6	32.0	8,280	70.6	1,071.00	2,420	408.0	84	1

(1) Quantity includes shear keys. See abutment details, interior bent details, and IGSK standard for shear key location, details, and notes.



GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications, 9th Edition (2020).

See Common Foundation Details (FD) standard sheet for all foundation details and notes not shown.

See Abutment or Bent Details for top of Drilled Shaft Elevations. Top of shafts shown are to be used as basis of measurement. Lengths shown on layout are minimum lengths.

Drilled shafts are designed for point bearing and skin friction, and shall be founded at the elevations shown or deeper, to provide a minimum penetration as follows:

Abut 1 = 6' into limestone, hard to very hard
Bent 2&3 = 9' into limestone, hard to very hard
Abut 4 = 6' into limestone, very hard

MATERIAL NOTES:

Provide Class "C" Concrete (f'c = 3,600 psi).
Provide Grade 60 reinforcing steel.

HL93 LOADING

SHEET 1 OF 1

STATE OF TEXAS
AMY HARRINGTON CAUSEY
148150
LICENSED PROFESSIONAL ENGINEER

7/12/2024

Amy Harrington Causey

Digitally signed by Amy Causey
Date: 2024.09.06 15:10:55 -05'00'
Adobe Acrobat version: 2024.002.20736

Texas Department of Transportation

Fort Worth Bridge Design

EST. QUANTITIES AND FOUNDATION LAYOUT

LITTLE DUFFAU CREEK

DN: AC	CK: MP	DW: SM/AC	CK: MP/AC

©TxDOT 07-12-24 REVISIONS	CONT	SECT	JOB	HIGHWAY
	0467	02	020, ETC.	SH 220
	DIST	COUNTY		SHEET NO.
	FTW	ERATH		114

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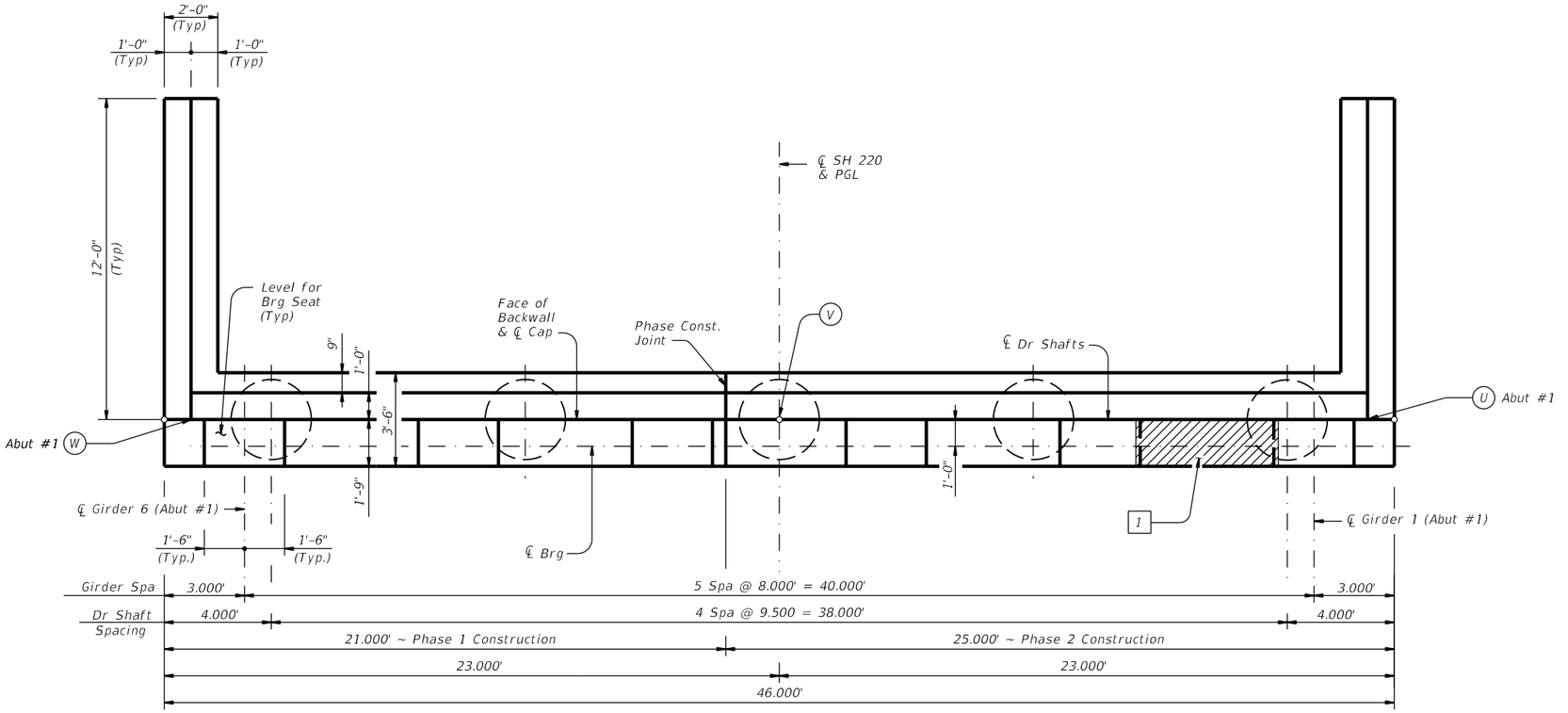
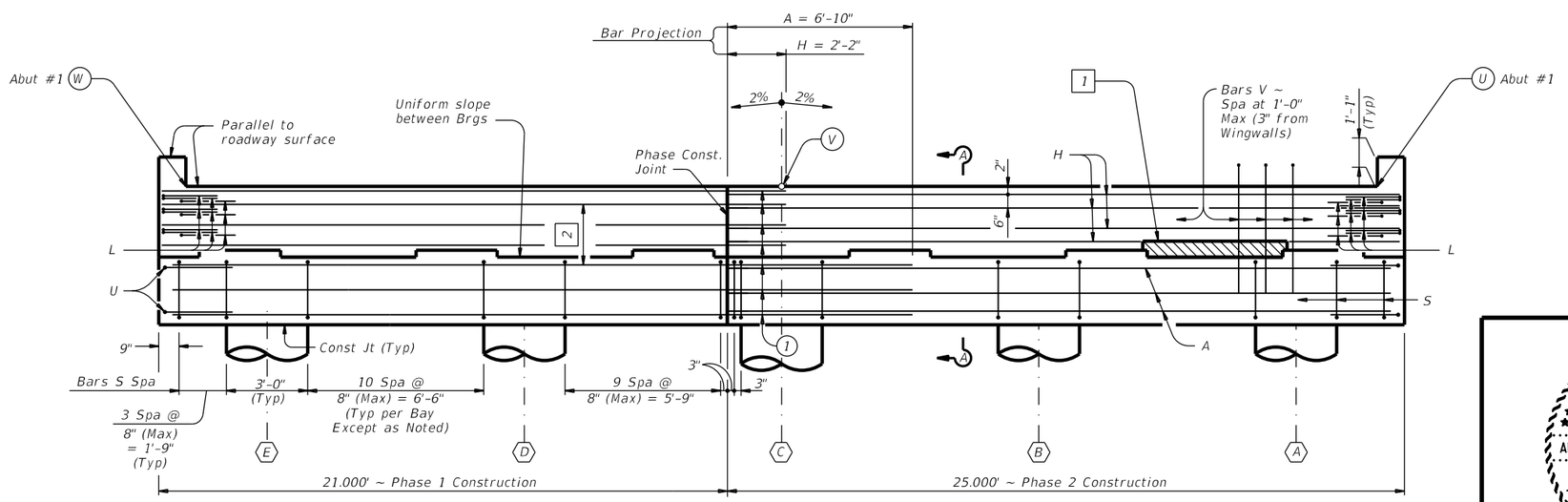


PLAN



ELEVATION

(Abut #1 ~ Looking Backward)

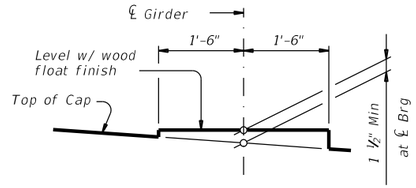
TABLE OF ELEVATIONS

	BEARING SEATS					
	1	2	3	4	5	6
Abut #1	1048.062	1048.222	1048.382	1048.382	1048.222	1048.062

	TOP OF DS				
	(A)	(B)	(C)	(D)	(E)
Abut #1	1045.457	1045.647	1045.837	1045.647	1045.457

	BOTTOM OF DS (AS BUILT)				
	(A)	(B)	(C)	(D)	(E)
Abut #1					

	TOP OF BACKWALL		
	(U)	(V)	(W)
Abut #1	1050.502	1050.942	1050.502



BEARING SEAT DETAIL

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

1. If contractor opts to use mechanical couplers, then extend bars 1'-0" into Phase 2 Construction. If mechanical couplers are not used, then reinforcement shall project as shown on details.

1 Abut #1 (Looking Backward) Only: Shear Key required in between Girders #1 and #2. See "IGSK" standard for details.

2 3 Spa @ 1'-0" Max.

HL93 LOADING

SHEET 1 OF 3

STATE OF TEXAS
AMY HARRINGTON CAUSEY
148150
LICENSED PROFESSIONAL ENGINEER

7/22/2024

Amy Harrington Causey

Digitally signed by Amy Causey
Date: 2024.09.06 15:12:32 -05'00'
Adobe Acrobat version: 2024.002.20736

Texas Department of Transportation

Fort Worth Bridge Design

ABUTMENTS NOS. 1 & 4

LITTLE DUFFAU CREEK

		DN: AC	CK: MP	DW: SM/AC	CK: MP/AC	
©TxDOT	07-19-24	CONT	SECT	JOB	HIGHWAY	
REVISIONS		0467	02	020, ETC.	SH 220	
		DIST	COUNTY		SHEET NO.	
		FTW	ERATH		115	

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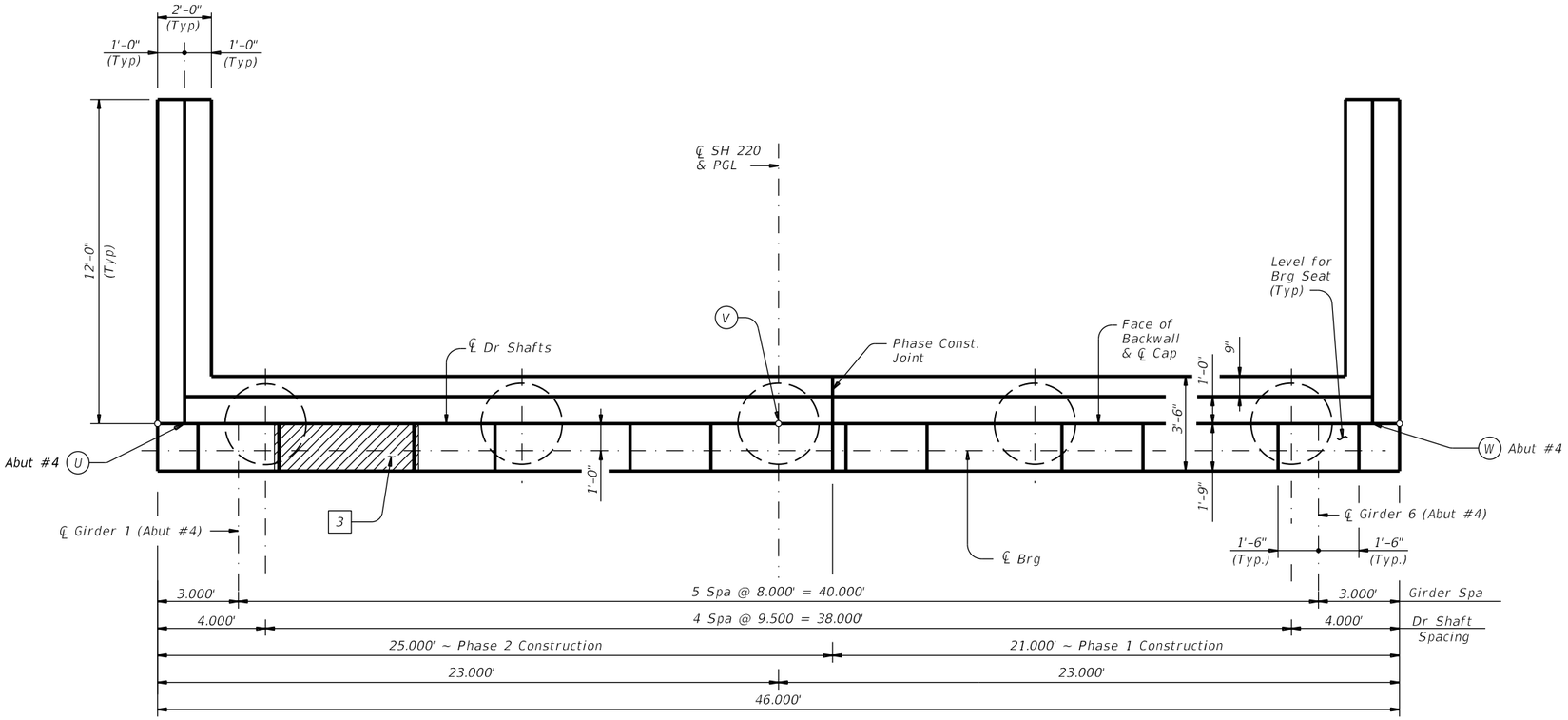
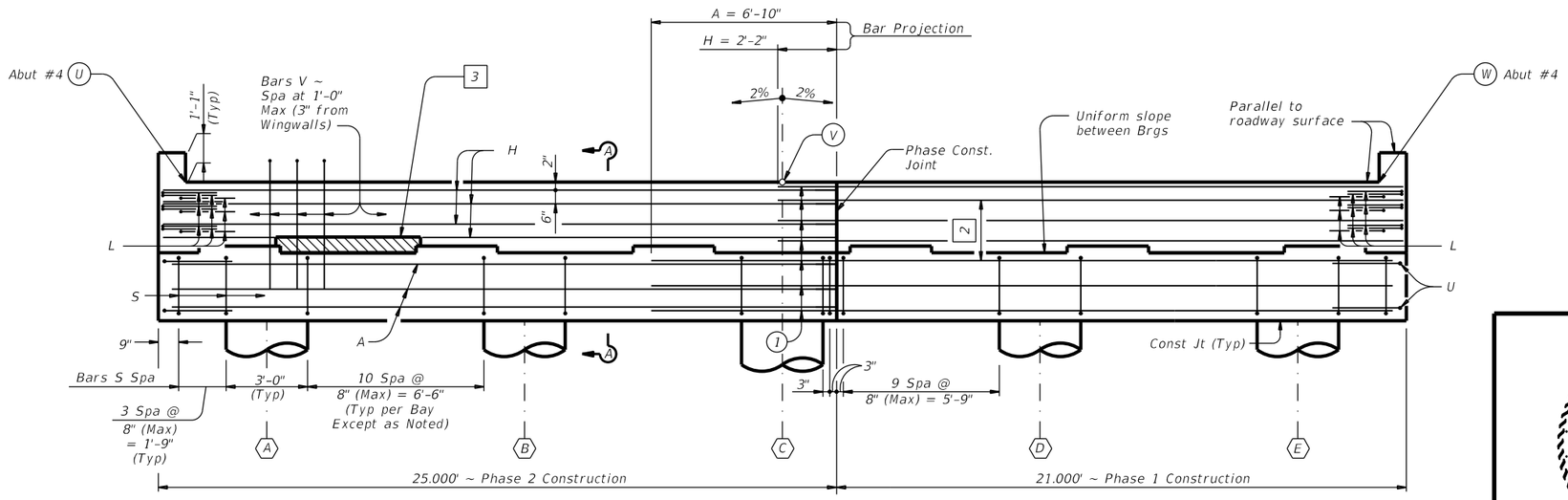


PLAN



ELEVATION

(Abut #4 ~ Looking Forward)

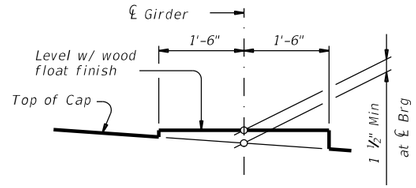
TABLE OF ELEVATIONS

	BEARING SEATS					
	1	2	3	4	5	6
Abut #4	1048.413	1048.573	1048.733	1048.733	1048.573	1048.413

	TOP OF DS				
	(A)	(B)	(C)	(D)	(E)
Abut #4	1045.810	1046.000	1046.190	1046.000	1045.810

	BOTTOM OF DS (AS BUILT)				
	(A)	(B)	(C)	(D)	(E)
Abut #4					

	TOP OF BACKWALL		
	(U)	(V)	(W)
Abut #4	1050.855	1051.295	1050.855



BEARING SEAT DETAIL

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

(1) If contractor opts to use mechanical couplers, then extend bars 1'-0" into Phase 2 Construction. If mechanical couplers are not used, then reinforcement shall project as shown on details.

2 3 Spa @ 1'-0" Max.

3 Abut #4 (Looking Forward) Only: Shear Key required in between Girders #1 and #2. See "IGSK" standard for details.

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148150
LICENSED PROFESSIONAL ENGINEER

09/09/2024

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ABUTMENTS NOS. 1 & 4

LITTLE DUFFAU CREEK

		DN: AC	CK: MP	DW: SM/AC	CK: MP/AC	
©TxDOT	07-12-24	CONT	SECT	JOB	HIGHWAY	
REVISIONS		0467	02	020, ETC.	SH 220	
		DIST	COUNTY			SHEET NO.
		FTW	ERATH			116

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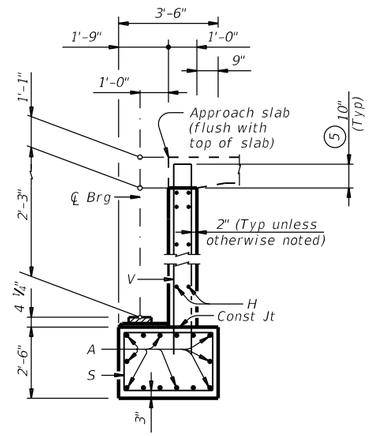
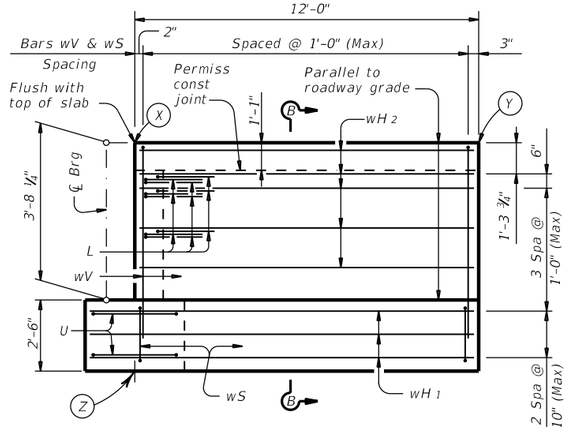
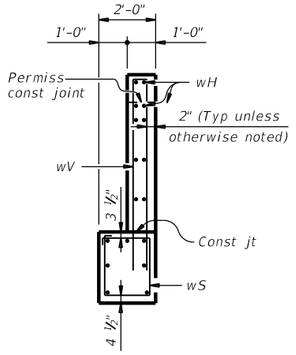


SECTION A-A



WINGWALL ELEVATION



SECTION B-B

②TABLE OF ESTIMATED QUANTITIES

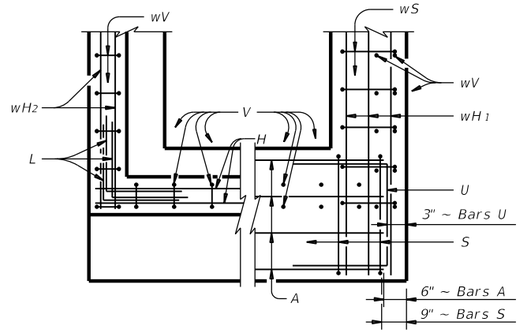
PHASE 1 CONSTRUCTION					PHASE 2 CONSTRUCTION				
Bar	No.	Size	Length	Weight	Bar	No.	Size	Length	Weight
A	14	#11	③ 27'-4"	2,033	A	14	#11	24'-6"	1,822
H	8	#6	④ 23'-0"	276	H	8	#6	24'-10"	298
L	9	#6	4'-0"	54	L	9	#6	4'-0"	54
S	25	#5	11'-6"	300	S	28	#5	11'-6"	336
U	2	#6	8'-1"	24	U	2	#6	8'-1"	24
V	22	#5	11'-3"	258	V	25	#5	11'-3"	293
wH1	7	#6	13'-5"	141	wH1	7	#6	13'-5"	141
wH2	10	#6	11'-8"	175	wH2	10	#6	11'-8"	175
wS	13	#4	7'-10"	68	wS	13	#4	7'-10"	68
wV	13	#5	11'-5"	155	wV	13	#5	11'-5"	155
Reinforcing Steel			Lb	3,484	Reinforcing Steel			Lb	3,366
Cl "C" Conc (Abut)			CY	12.2	Cl "C" Conc (Abut)			CY	14.2

② Quantities shown are for one Abutment only. Two required.

③ Includes one 6'-10" splice

④ Includes one 2'-2" splice

⑤ Increase as required to maintain 3" from finished grade.



BACKWALL CAP

CORNER DETAILS

WINGWALL ELEVATIONS

	ABUTMENT #1		ABUTMENT #4	
POINT	LEFT WING	RIGHT WING	LEFT WING	RIGHT WING
X	1051.585	1051.585	1051.938	1051.938
Y	1051.591	1051.591	1051.966	1051.966
Z	1045.397	1045.397	1045.750	1045.750

GENERAL NOTES:

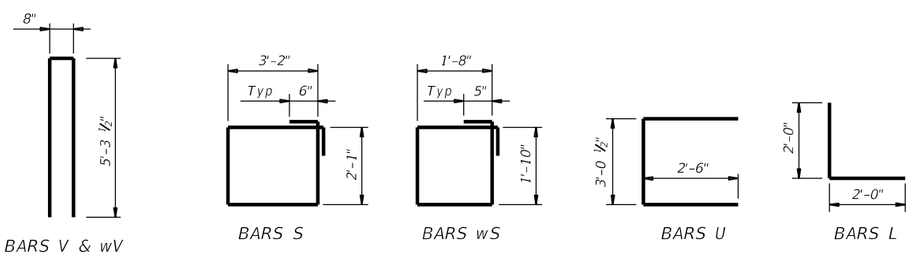
Designed according to AASHTO LRFD Bridge Design Specifications, 9th Edition (2020).
See Common Foundation Details (FD) standard sheet for drilled shaft information and notes.
See Shear Key (IGSK) standard sheet for all shear key details and notes.
See Traffic Rail Type SSTR standard for details for rail anchorage in wingwalls.

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

Abutment #1 & Abutment #4
Maximum Calculated Footing Load = 172 Tons/Shaft.
Point Bearing Based on Pen. Test Of 0.625"/100 Blows.
Point Bearing @ 31.0 T.S.F. = 219 Tons/Shaft.
TOTAL = 219 Tons/Shaft

MATERIAL NOTES:

Provide Class "C" (HPC) Concrete (f'c = 3600 psi).
Provide Grade 60 Reinforcing steel.



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

HL93 LOADING SHEET 3 OF 3

STATE OF TEXAS
AMY HARRINGTON CAUSEY
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Fort Worth Bridge Design

ABUTMENTS NOS. 1 & 4

LITTLE DUFFAU CREEK

	DN: AC	CK: MP	DW: SM/AC	CK: MP/AC
©TxDOT 07-19-24	CONT	SECT	JOB	HIGHWAY
REVISIONS	0467	02	020, ETC.	SH 220
	DIST	COUNTY		SHEET NO.
	FTW	ERATH		117

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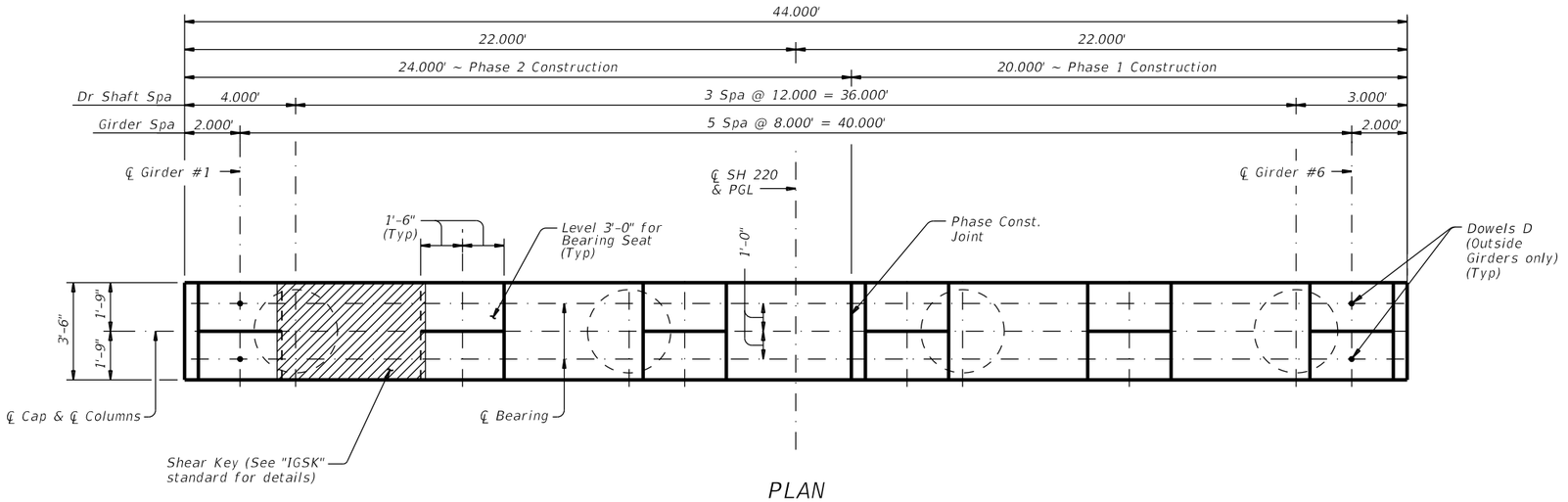

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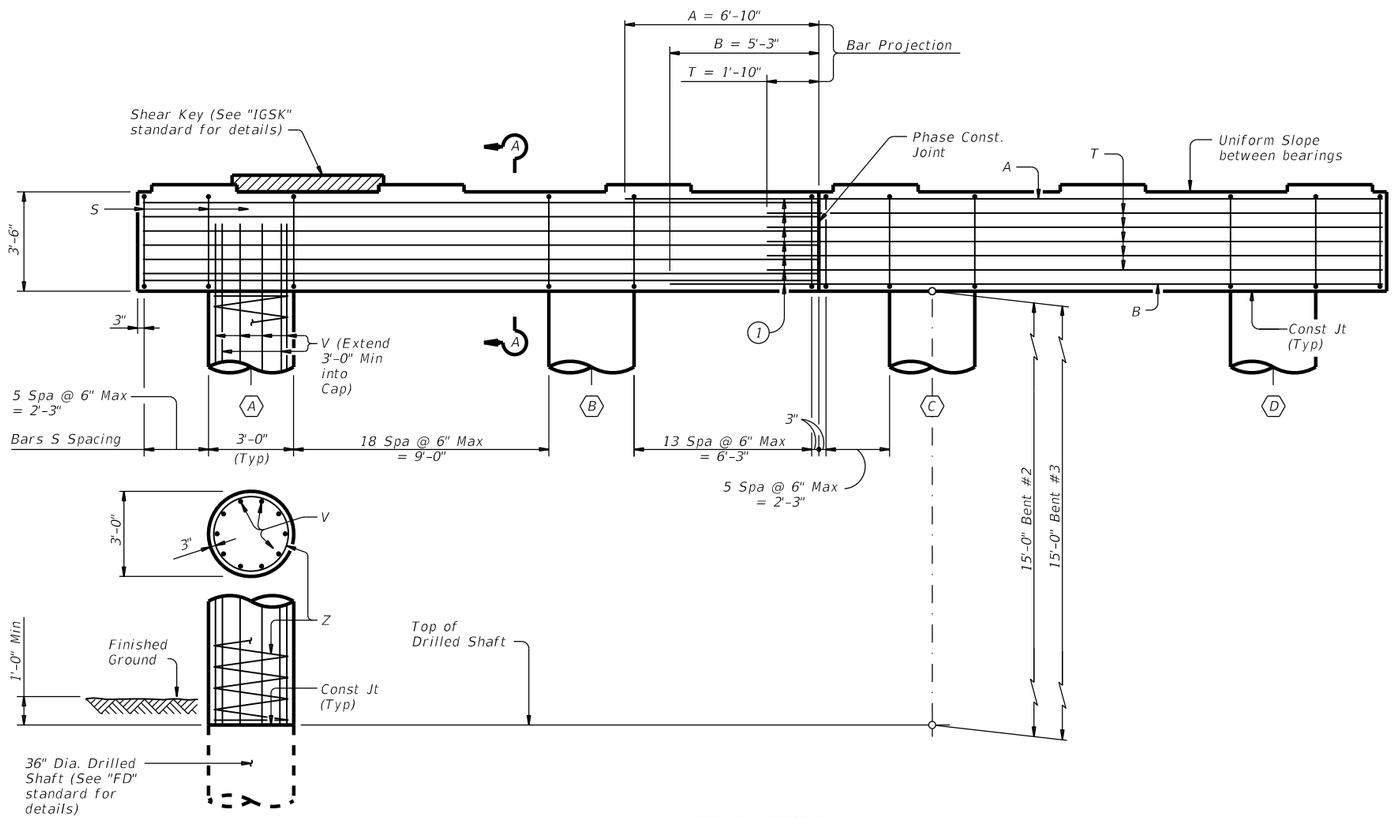
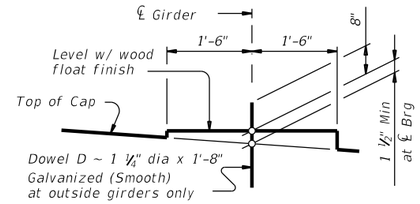


ELEVATION



BEARING SEAT DETAIL

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

TABLE OF ELEVATIONS

		BEARING SEATS					
		1	2	3	4	5	6
Bent #2	BKD	1048.133	1048.293	1048.453	1048.453	1048.293	1048.133
	FWD	1048.138	1048.298	1048.458	1048.458	1048.298	1048.138
Bent #3	BKD	1048.273	1048.433	1048.593	1048.593	1048.433	1048.273
	FWD	1048.278	1048.438	1048.598	1048.598	1048.438	1048.278

	TOP OF COLUMN			
	(A)	(B)	(C)	(D)
Bent #2	1044.550	1044.790	1044.790	1044.550
Bent #3	1044.815	1045.055	1045.055	1044.815

	TOP OF DRILLED SHAFT			
	(A)	(B)	(C)	(D)
Bent #2	1029.550	1029.790	1029.790	1029.550
Bent #3	1029.815	1030.055	1030.055	1029.815

	BOTTOM OF DS (AS BUILT)			
	(A)	(B)	(C)	(D)
Bent #2				
Bent #3				

(1) If contractor opts to use mechanical couplers, then extend bars 1'-0" into Phase 2 Construction. If mechanical couplers are not used, then reinforcement shall project as shown on details.

HL93 LOADING

SHEET 1 OF 2

STATE OF TEXAS
AMY HARRINGTON CAUSEY
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LICENSED PROFESSIONAL ENGINEER

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INTERIOR BENTS NOS. 2 & 3

LITTLE DUFFAU CREEK

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	CONT	SECT	JOB	HIGHWAY
	0467	02	020, ETC.	SH 220
	DIST	COUNTY		SHEET NO.
	FTW	ERATH		118

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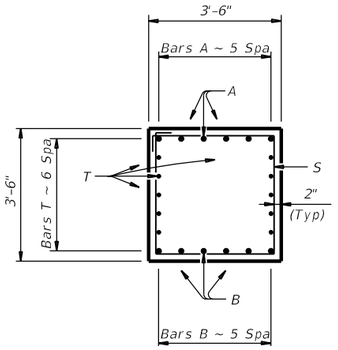


SECTION A-A

[1] TABLE OF ESTIMATED CAP QUANTITIES

Phase 1 Construction					Phase 2 Construction				
Bar	No.	Size	Length	Weight	Bar	No.	Size	Length	Weight
A	6	#11	[2] 26'-8"	850	A	6	#11	23'-10"	760
B	6	#11	[3] 25'-1"	800	B	6	#11	23'-10"	760
D	2	#9	1'-8"	14	D	2	#9	1'-8"	14
S	31	#5	13'-8"	442	S	39	#5	13'-8"	556
T	10	#5	[4] 21'-8"	226	T	10	#5	23'-10"	249
Reinforcing Steel			Lb	2,332	Reinforcing Steel			Lb	2,339
Class "C" Concrete (Cap)(HPC)			CY	9.8	Class "C" Concrete (Cap)(HPC)			CY	11.0

[1] Quantities shown are for one bent cap. (2 Required)

[2] Includes one 6'-10" splice

[3] Includes one 5'-3" splice.

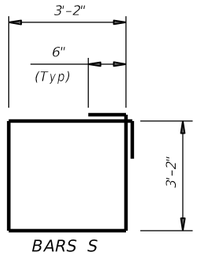
[4] Includes one 1'-10" splice.

[2] TABLE OF ESTIMATED COLUMN QUANTITIES

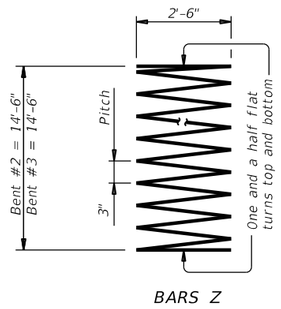
Interior Bent /Columns #		"H"	Bars V 10 Ea ~ #9		Bars Z 1 Ea ~ #4		Reinf Steel	Class "C" Conc (Col) (HPC)
		Height	Length	Weight	Length	Weight	Lbs	CY
Bent #2	A-D	15'-0"	18'-0"	612	479'-2"	320	932	4.0
Bent #3	A-D	15'-0"	18'-0"	612	479'-2"	320	932	4.0

[2] Quantities are for one column only. 4 Required per Bent.
Quantities shown are based on an "H" value of 15'.
For each linear foot variation in "H" value, make the following adjustments:

Bars V length, 1'-0"
Bars Z length, 31'-5"
Reinforcing steel, 55 Lb
Class "C" Conc (Col) (HPC), 0.26 CY



BARS S



BARS Z

GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications, 9th Edition (2020).
See Common Foundation Details (FD) standard sheet for drilled shaft information and notes.
See Shear Key (IGSK) standard sheet for all shear key details and notes.

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

Bent#2 & #3:
Maximum calculated footing load = 247 Tons/shaft.
Point bearing based on penetration test of 0.625"/100 blows.
Skin friction based on penetration test of 0.625"/100 blows.
Point bearing at 31.0 TSF = 219 Tons/shaft.
1'-0" Skin friction @ 3.25 TSF = 31 Tons/Shaft
Total Load Resistance = 250 Tons/Shaft

MATERIAL NOTES:

Provide Class "C" (HPC) Concrete (f'c = 3600 psi).
Provide Grade 60 Reinforcing steel.
Galvanize Dowel Bars D.

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AMY HARRINGTON CAUSEY
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INTERIOR BENTS NOS. 2 & 3

LITTLE DUFFAU CREEK

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©TxDOT 07-12-24	CONT	SECT	JOB	HIGHWAY
REVISIONS	0467	02	020, ETC.	SH 220
	DIST	COUNTY		SHEET NO.
	FTW	ERATH		119

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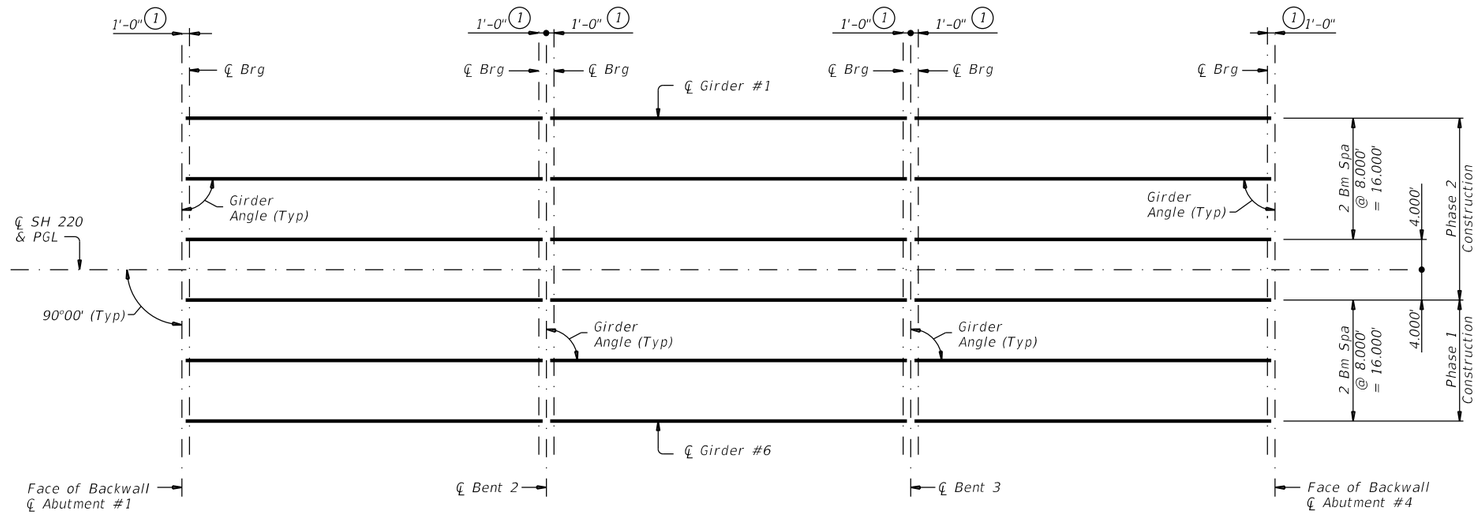

SPAN 1 (Tx28 Girders)

SPAN 2 (Tx28 Girders)

SPAN 3 (Tx28 Girders)

FRAMING PLAN

① See IGEB Standard for orientation of dimension.

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180.00' PRESTRESSED CONC I-GIRDER UNIT
(SPANS 1, 2, & 3)

LITTLE DUFFAU CREEK

DN: AC	CK: MP	DW: SM/AC	CK: MP/AC
©TxDOT 07-11-24	CONT	SECT	JOB	HIGHWAY
REVISIONS	0467	02	020, ETC.	SH 220
	DIST	COUNTY		SHEET NO.
	FTW	ERATH		120

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BENT REPORT

BENT REPORT

BENT NO. 1 (N 68 54 0.00 W)

DISTANCE BETWEEN STATION LINE AND BEAM 1, 20.0000 L

		BEAM SPAC. (CL BENT)	BEAM ANGLE D M S
SPAN 1	BEAM 1	0.0000	90 0 0.00
	BEAM 2	8.0000	90 0 0.00
	BEAM 3	8.0000	90 0 0.00
	BEAM 4	8.0000	90 0 0.00
	BEAM 5	8.0000	90 0 0.00
	BEAM 6	8.0000	90 0 0.00
	TOTAL	40.0000	

BENT REPORT

BENT NO. 2 (N 68 54 0.00 W)

DISTANCE BETWEEN STATION LINE AND BEAM 1, 20.0000 L

		BEAM SPAC. (CL BENT)	BEAM ANGLE D M S
SPAN 1	BEAM 1	0.0000	90 0 0.00
	BEAM 2	8.0000	90 0 0.00
	BEAM 3	8.0000	90 0 0.00
	BEAM 4	8.0000	90 0 0.00
	BEAM 5	8.0000	90 0 0.00
	BEAM 6	8.0000	90 0 0.00
	TOTAL	40.0000	

BENT REPORT

BENT NO. 2 (N 68 54 0.00 W)

DISTANCE BETWEEN STATION LINE AND BEAM 1, 20.0000 L

		BEAM SPAC. (CL BENT)	BEAM ANGLE D M S
SPAN 2	BEAM 1	0.0000	90 0 0.00
	BEAM 2	8.0000	90 0 0.00
	BEAM 3	8.0000	90 0 0.00
	BEAM 4	8.0000	90 0 0.00
	BEAM 5	8.0000	90 0 0.00
	BEAM 6	8.0000	90 0 0.00
	TOTAL	40.0000	

BENT REPORT

BENT NO. 3 (N 68 54 0.00 W)

DISTANCE BETWEEN STATION LINE AND BEAM 1, 20.0000 L

		BEAM SPAC. (CL BENT)	BEAM ANGLE D M S
SPAN 2	BEAM 1	0.0000	90 0 0.00
	BEAM 2	8.0000	90 0 0.00
	BEAM 3	8.0000	90 0 0.00
	BEAM 4	8.0000	90 0 0.00
	BEAM 5	8.0000	90 0 0.00
	BEAM 6	8.0000	90 0 0.00
	TOTAL	40.0000	

BENT REPORT

BENT NO. 3 (N 68 54 0.00 W)

DISTANCE BETWEEN STATION LINE AND BEAM 1, 20.0000 L

		BEAM SPAC. (CL BENT)	BEAM ANGLE D M S
SPAN 3	BEAM 1	0.0000	90 0 0.00
	BEAM 2	8.0000	90 0 0.00
	BEAM 3	8.0000	90 0 0.00
	BEAM 4	8.0000	90 0 0.00
	BEAM 5	8.0000	90 0 0.00
	BEAM 6	8.0000	90 0 0.00
	TOTAL	40.0000	

BENT REPORT

BENT NO. 4 (N 68 54 0.00 W)

DISTANCE BETWEEN STATION LINE AND BEAM 1, 20.0000 L

		BEAM SPAC. (CL BENT)	BEAM ANGLE D M S
SPAN 3	BEAM 1	0.0000	90 0 0.00
	BEAM 2	8.0000	90 0 0.00
	BEAM 3	8.0000	90 0 0.00
	BEAM 4	8.0000	90 0 0.00
	BEAM 5	8.0000	90 0 0.00
	BEAM 6	8.0000	90 0 0.00
	TOTAL	40.0000	

BEAM REPORT

BEAM REPORT, SPAN 1

	HORIZONTAL DISTANCE C-C BENT	C-C BRG.	TRUE DISTANCE BEAM BOT. BM. FLG. ②	SLOPE	BEAM BEARING
BEAM 1	60.0000	58.0000	59.5000	0.00122	N 21 6 0.00 E
BEAM 2	60.0000	58.0000	59.5000	0.00122	N 21 6 0.00 E
BEAM 3	60.0000	58.0000	59.5000	0.00122	N 21 6 0.00 E
BEAM 4	60.0000	58.0000	59.5000	0.00122	N 21 6 0.00 E
BEAM 5	60.0000	58.0000	59.5000	0.00122	N 21 6 0.00 E
BEAM 6	60.0000	58.0000	59.5000	0.00122	N 21 6 0.00 E

BEAM REPORT, SPAN 2

	HORIZONTAL DISTANCE C-C BENT	C-C BRG.	TRUE DISTANCE BEAM BOT. BM. FLG. ②	SLOPE	BEAM BEARING
BEAM 1	60.0000	58.0000	59.5002	0.00233	N 21 6 0.00 E
BEAM 2	60.0000	58.0000	59.5002	0.00233	N 21 6 0.00 E
BEAM 3	60.0000	58.0000	59.5002	0.00233	N 21 6 0.00 E
BEAM 4	60.0000	58.0000	59.5002	0.00233	N 21 6 0.00 E
BEAM 5	60.0000	58.0000	59.5002	0.00233	N 21 6 0.00 E
BEAM 6	60.0000	58.0000	59.5002	0.00233	N 21 6 0.00 E

BEAM REPORT, SPAN 3

	HORIZONTAL DISTANCE C-C BENT	C-C BRG.	TRUE DISTANCE BEAM BOT. BM. FLG. ②	SLOPE	BEAM BEARING
BEAM 1	60.0000	58.0000	59.5002	0.00233	N 21 6 0.00 E
BEAM 2	60.0000	58.0000	59.5002	0.00233	N 21 6 0.00 E
BEAM 3	60.0000	58.0000	59.5002	0.00233	N 21 6 0.00 E
BEAM 4	60.0000	58.0000	59.5002	0.00233	N 21 6 0.00 E
BEAM 5	60.0000	58.0000	59.5002	0.00233	N 21 6 0.00 E
BEAM 6	60.0000	58.0000	59.5002	0.00233	N 21 6 0.00 E

② Girder lengths shown are bottom girder flange lengths with adjustments made for girder slope.

HL93 LOADING SHEET 2 OF 4

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09/09/2024

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Fort Worth Bridge Design

180.00' PRESTRESSED CONC I-GIRDER UNIT
(SPANS 1, 2, & 3)

LITTLE DUFFAU CREEK

DN: AC	CK: MP	DW: SM/AC	CK: MP/AC
©TxDOT 07-19-24	CONT	SECT	JOB	HIGHWAY
REVISIONS	0467	02	020, ETC.	SH 220
	DIST	COUNTY		SHEET NO.
	FTW	ERATH		121

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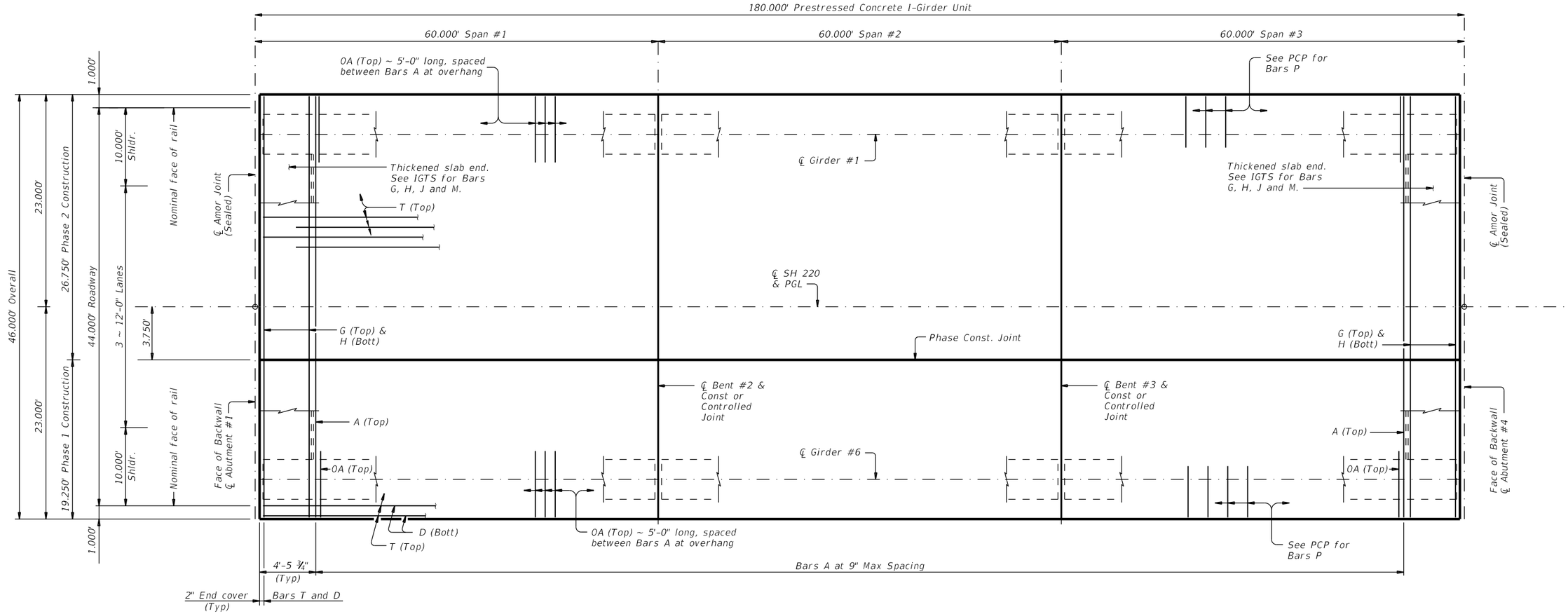

REINFORCEMENT PLAN

HL93 LOADING

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AMY HARRINGTON CAUSEY
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09/09/2024

Amy Harrington Causey

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Date: 2024.09.09 13:18:42 -05'00'
Adobe Acrobat version: 2024.002.20736

Texas Department of Transportation

Fort Worth Bridge Design

180.00' PRESTRESSED CONC I-GIRDER UNIT
(SPANS 1, 2, & 3)

LITTLE DUFFAU CREEK

DN: AC	CK: MP	DW: SM/AC	CK: MP/AC
©TxDOT 07-11-24 REVISIONS	CONT	SECT	JOB	HIGHWAY
	0467	02	020, ETC.	SH 220
	DIST	COUNTY		SHEET NO.
	FTW	ERATH		122

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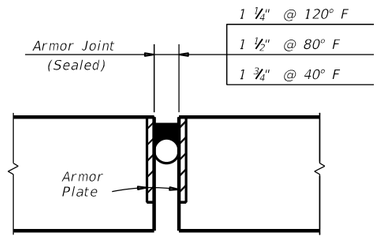


JOINT OPENING DETAIL

(For Additional Information and Details, See Related Standard Sheet "AJ".)

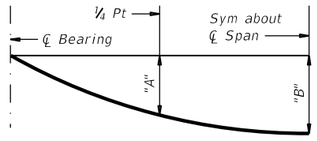
ARMOR JOINT DETAILS

TABLE OF ARMOR JOINT ESTIMATED QUANTITIES

Abutment/Bent	Phase 1	Phase 2	Total
	LF	LF	LF
1	17.25	24.75	42.0
4	17.25	24.75	42.0
Total	34.5	49.5	84.0

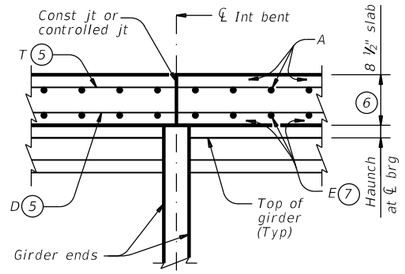
TABLE OF VARIABLE VALUES

Span	Span Length	Beam Type	Dead Load Deflection	
			"A"	"B"
	Ft		Ft	Ft
1	60.00	Tx28	0.048	0.068
2	60.00	Tx28	0.048	0.068
3	60.00	Tx28	0.048	0.068



DEAD LOAD DEFLECTION DIAGRAM

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



SECTION THRU CONST OR CONTROLLED JOINT

Bars 0A (Top) not shown for clarity.

BAR TABLE

BAR	SIZE
A	#4
D	#4
G	#4
H	#4
J	#4
M	#4
0A	#5
P	#4
T	#4

TABLE OF ESTIMATED QUANTITIES

Span	Reinf Concrete Slab (HPC)	(4) Prest Conc Girder (Tx28)	(3) Total Reinforcing Steel	Rail (Ty SSTR)
No.	SF	LF	Lb	LF
Phase 1				
1	1,155	178.500	2,656	60.0
2	1,155	178.500	2,656	60.0
3	1,155	178.500	2,656	60.0
Phase 2				
1	1,605	178.500	3,692	60.0
2	1,605	178.500	3,692	60.0
3	1,605	178.500	3,692	60.0
Total	8,280	1,071.00	19,044	360.0

TABLE OF SECTION DEPTHS

Span No.	Girder	"X" at ℄ Brg	"Y" at ℄ Brg	"Z" at ℄ Span (8)
1	All	1'-0"	3'-4"	9 ¾"
2	All	1'-0"	3'-4"	9 ¾"
3	All	1'-0"	3'-4"	9 ¾"

(8) Theoretical dimension

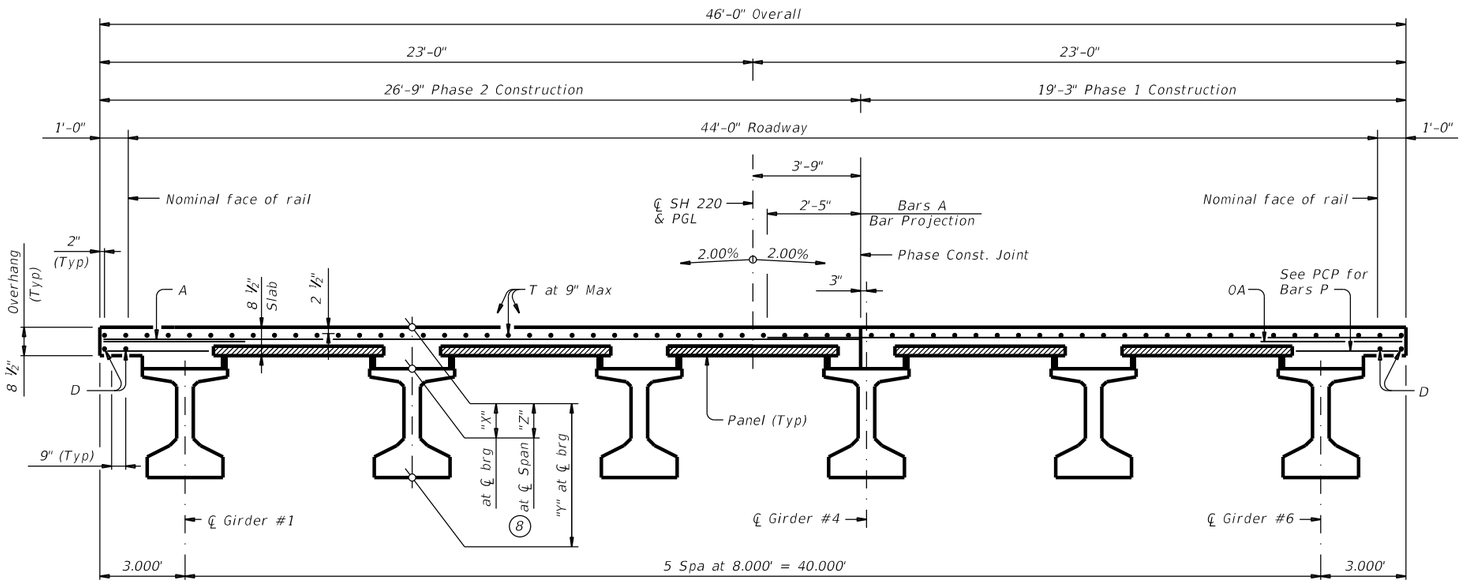
(3) Reinforcing steel weight is calculated using an approximate factor of 2.3 lbs/SF.

(4) Lengths shown are bottom girder flange lengths with adjustments made for girder slope.

(5) Top and bottom mats must be continuous through joint.

(6) Maintain a constant slab thickness over the bent.

(7) See PCP for Bars E if Option 1 is used.



TYPICAL TRANSVERSE SECTION

(Showing girder type Tx28)

GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications.

Multi-span units, with slab continuous over interior bents, may be formed with the details shown on this sheet and standard IGCS.

See IGTS standard for Thickened Slab End details and quantity adjustments.

See PCP and PCP-FAB for panel details not shown.

See IGMS standard for miscellaneous details.

See Traffic Rail Ty SSTR standard for rail anchorage in slab.

See PMDF standard for details and quantity adjustments if this option is used.

Cover dimensions are clear dimensions, unless noted otherwise.

MATERIAL NOTES:

Provide Class S (HPC) concrete (f'c = 4,000 psi).

Provide Grade 60 reinforcing steel.

Provide bar laps, where required, as follows:

Epoxy coated ~ #4 = 2'-5"

~ #5 = 3'-0"

Deformed Welded Wire Reinforcement (WWR) (ASTM A1064) of equal size and spacing may be substituted for Bars A, D, 0A, P or T unless noted otherwise.

Top & bottom mats of steel must be continuous through Construction or Controlled Joints.

HL93 LOADING

STATE OF TEXAS
AMY HARRINGTON CAUSEY
148150
LICENSED
PROFESSIONAL ENGINEER

09/09/2024

Amy Harrington Causey

Digitally signed by Amy Causey
Date: 2024.09.09 10:54:20 -05'00'
Adobe Acrobat version: 2024.002.20736

Texas Department of Transportation

Fort Worth Bridge Design

180.00' PRESTRESSED CONC I-GIRDER UNIT
(SPANS 1, 2, & 3)

LITTLE DUFFAU CREEK

	DN: AC	CK: MP	DW: SM/AC	CK: MP/AC
©TxDOT 07-11-24	CONT	SECT	JOB	HIGHWAY
REVISIONS	0467	02	020, ETC.	SH 220
	DIST	COUNTY		SHEET NO.
	FTW	ERATH		123

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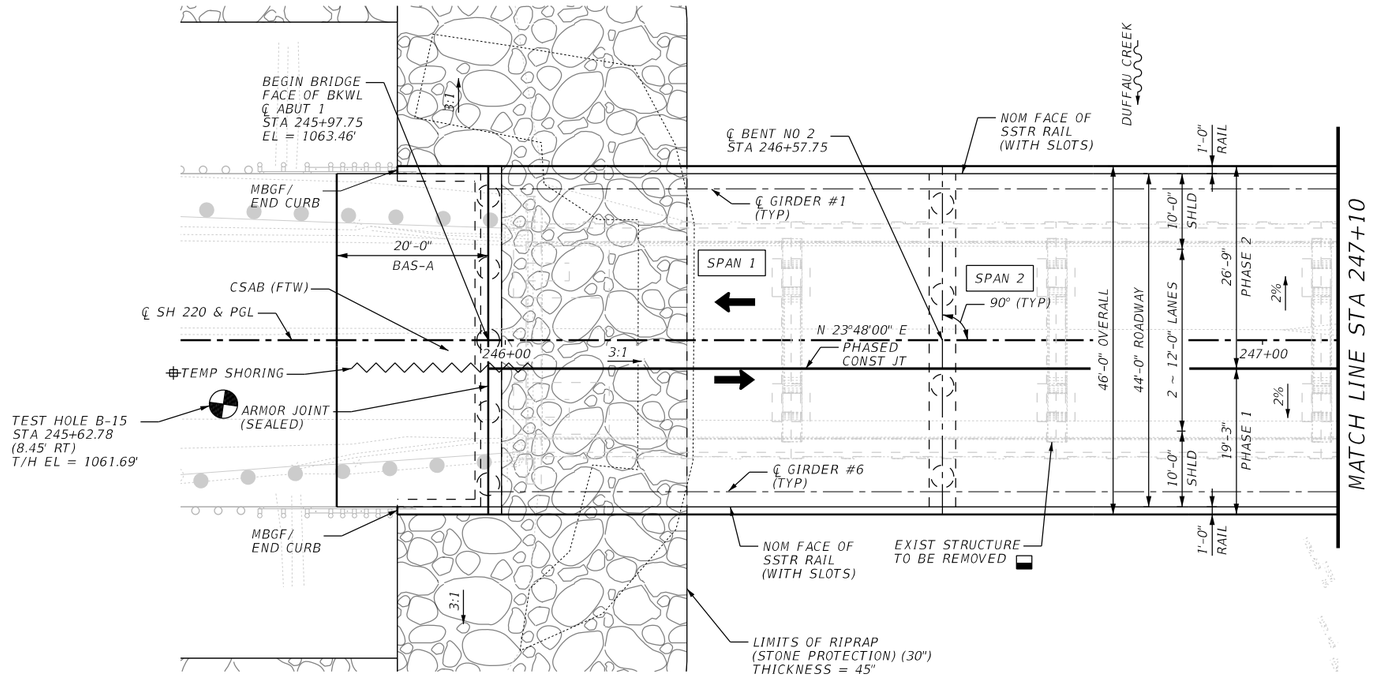


PLAN

ALL BENTS AND ABUTMENTS ALONG BEARING N 66° 12' 00" W

5-35' CONCRETE GIRDER SPANS ON SPREAD FOOTING

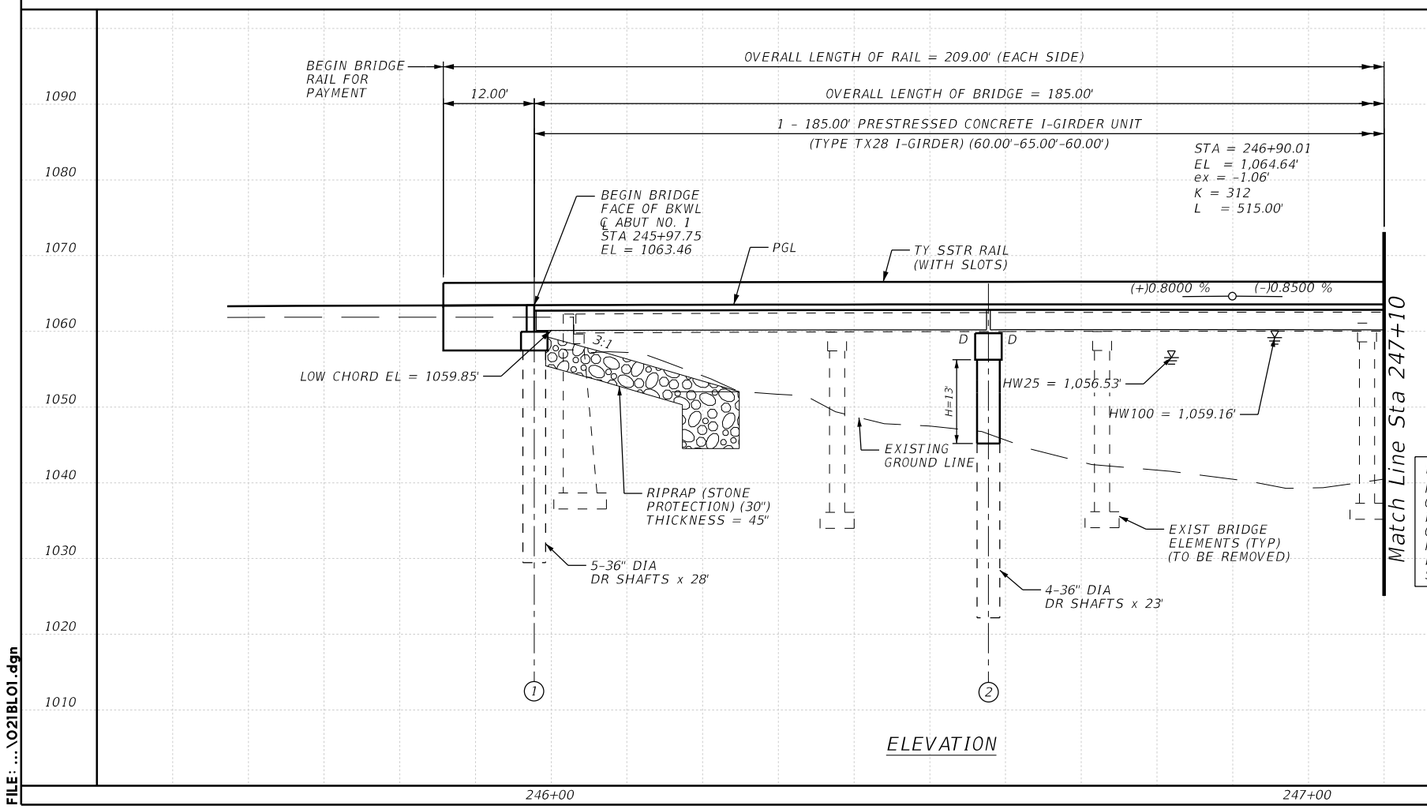
CONTRACTOR IS RESPONSIBLE FOR PROVIDING DESIGN AND SHOP DRAWINGS OF SHORING, BEARING THE SEAL OF A LICENSED PROFESSIONAL ENGINEER FOR APPROVAL PRIOR TO CONSTRUCTION AS PER TXDOT SPECIFICATION.

0 10 20
SCALE IN FEET

NOTES:

1. DESIGNED IN ACCORDANCE WITH AASHTO LRFD SPECIFICATIONS AND INTERIM REVISIONS THERETO FOR HL93 LOADING, 9TH EDITION AND TXDOT BRIDGE DESIGN MANUAL,(NOV. 2021).
2. THE "H" VALUES SHOWN ARE ESTIMATED COLUMN HEIGHTS. THE CONTRACTOR IS RESPONSIBLE FOR CALCULATING ACTUAL COLUMN HEIGHTS BASED ON FIELD CONDITIONS.
3. CONTRACTOR SHALL FIELD VERIFY LOCATIONS OF ALL STRUCTURES AND UTILITIES PRIOR TO ORDERING MATERIALS AND NOTIFY ENGINEERS IN WRITING OF ANY CONFLICTS OR DISCREPANCIES.
4. SEE BRIDGE TYPICAL TRANSVERSE SECTION SHEET FOR ADDITIONAL INFORMATION.
5. SAWCUT GROOVING OF THE BRIDGE DECK AND APPROACH SLAB IS REQUIRED.
6. RIPRAP SLOPES SHOWN. CONTRACTOR SHALL FIELD VERIFY.
7. SEE CSAB (FTW) STANDARD FOR CEMENT STABILIZED ABUTMENT BACKFILL DETAILS.
8. REFER TO ROADWAY GRADING LAYOUT SHEET FOR RIPRAP LIMITS.
9. SEE BORING SHEET FOR SOIL BORING DATA.
10. HYDRAULIC DATA REPORTED AT UPSTREAM AND DOWNSTREAM RIGHT-OF-WAY LIMITS. THESE LOCATIONS ROUGHLY CORRESPOND TO HEC-RAS CROSS SECTIONS 1638 (US) AND 1496 (DS).
11. PROVIDE BRIDGE IDENTIFICATION SIGN PER NBIS STANDARD.

FUNCT. CLASS = RURAL MAJOR COLLECTOR
DESIGN SPEED = 65 MPH
EXIST ADT (2020)= 2,395
PROP ADT (2040) = 3,353
EXIST NBI NO. = 02-073-0-0467-02-004
NEW NBI NO. = 02-073-0-0467-02-007



ELEVATION

FOUNDATION NOTE:
FOUND DRILLED SHAFTS AT THE LENGTHS SHOWN OR DEEPER TO OBTAIN A MINIMUM PENETRATION INTO COMPETENT SHALE, LIMESTONE OR A COMBINATION OF SHALE AND LIMESTONE AS SHOWN ON THE FOUNDATION LAYOUT SHEET. SHAFT EMBEDMENT LENGTH INTO ROCK SHALL ALSO ACCOMMODATE THE AXIAL LOAD SHOWN ON THE BENT AND ABUTMENT SHEETS.

HYDRAULIC DATA (EXISTING)	
Q25 = 11,177 CFS	Q100 = 15,637 CFS
V25 = 8.32 FPS	V100 = 8.40 FPS
HW25 = 1,056.29'	HW100 = 1,059.10'

HYDRAULIC DATA (PROPOSED)	
Q25 = 11,177 CFS	Q100 = 15,637 CFS
V25 = 8.07 FPS	V100 = 8.36 FPS
HW25 = 1,056.53'	HW100 = 1,059.16'

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LICENSED PROFESSIONAL ENGINEER
STATE OF TEXAS
07/22/2024

Jacobs Engineering Group
LAUREN VAN ANDEL
111751
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STATE OF TEXAS
F-2966
07/24/2024

FOUNDATION DESIGN ONLY
SUPERSTRUCTURE INV/OPR RATINGS: 1.25/2.05
HL93 LOADING

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DALLAS, TX 75201-3136
Phone: +1 (214) 638-0145
Firm Registration: F-2966

Texas Department of Transportation

BRIDGE LAYOUT

SH 220 AT DUFFAU CREEK

SCALE: 1"=20'(H), 1"=20'(V) SHEET 1OF 5

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NUMBER		HIGHWAY NO.
JDB	6	(See Title Sheet)		SH 220
CHECK	STATE	DISTRICT	COUNTY	SHEET NO.
LVA	TEXAS	FTW	ERATH	
GRAPHICS	CONTROL	SECTION	JOB	124
KAC				
CHECK	0467	02	020, ETC.	
JDB				

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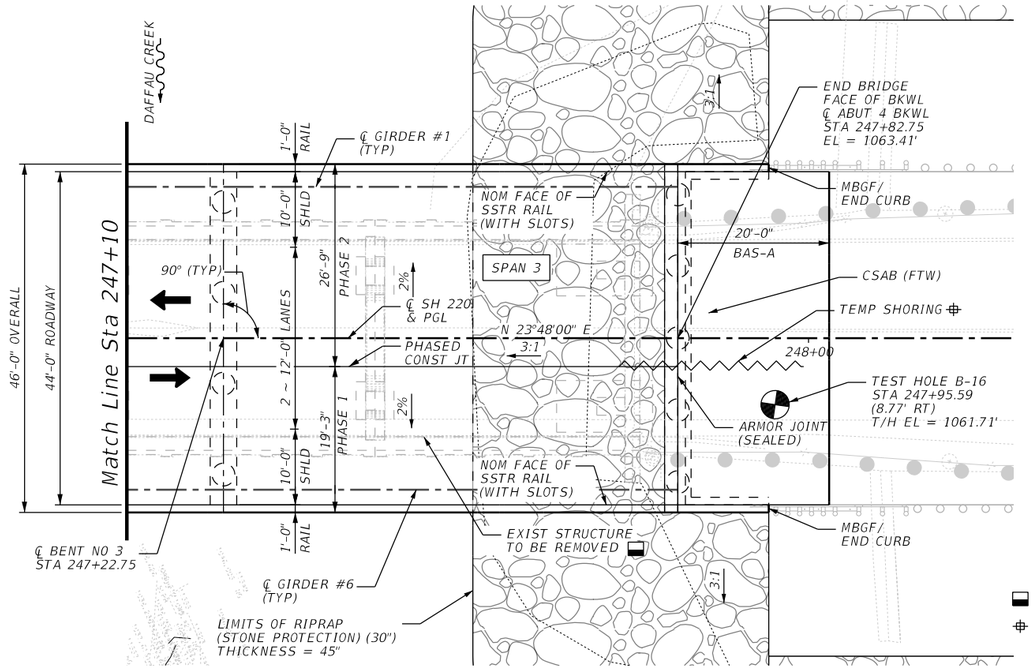
DATE: 7/22/2024



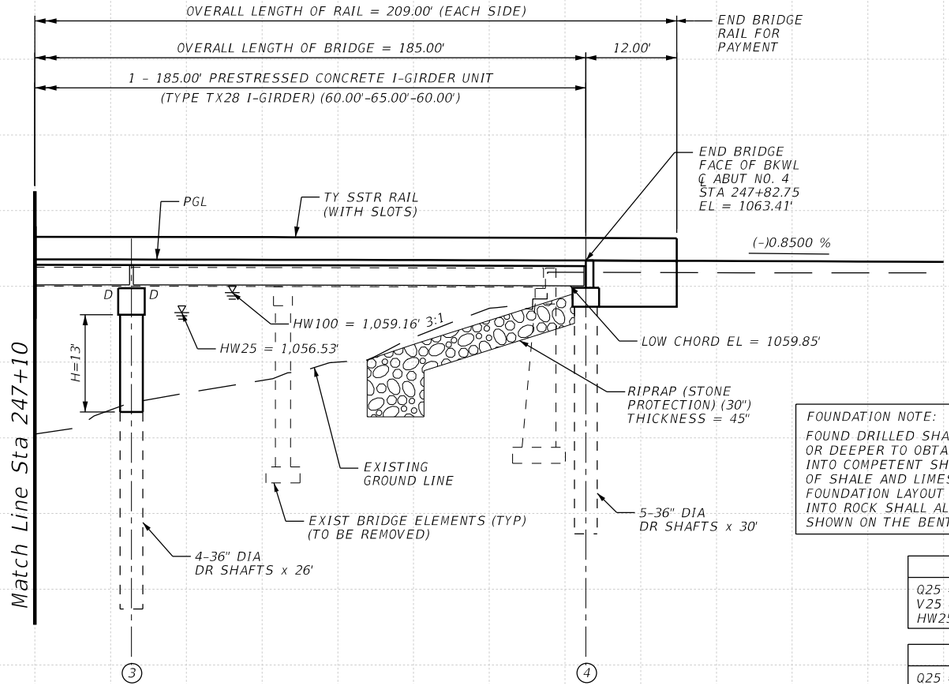
PLAN

ALL BENTS AND ABUTMENTS ALONG BEARING N 66° 12' 00" W

0 10 20
SCALE IN FEET

5-35' CONCRETE GIRDER SPANS ON SPREAD FOOTING

CONTRACTOR IS RESPONSIBLE FOR PROVIDING DESIGN AND SHOP DRAWINGS OF SHORING, BEARING THE SEAL OF A LICENSED PROFESSIONAL ENGINEER FOR APPROVAL PRIOR TO CONSTRUCTION AS PER TXDOT SPECIFICATION.



ELEVATION

FOUNDATION NOTE:
FOUND DRILLED SHAFTS AT THE LENGTHS SHOWN OR DEEPER TO OBTAIN A MINIMUM PENETRATION INTO COMPETENT SHALE, LIMESTONE OR A COMBINATION OF SHALE AND LIMESTONE AS SHOWN ON THE FOUNDATION LAYOUT SHEET. SHAFT EMBEDMENT LENGTH INTO ROCK SHALL ALSO ACCOMMODATE THE AXIAL LOAD SHOWN ON THE BENT AND ABUTMENT SHEETS.

HYDRAULIC DATA (EXISTING)	
Q25 = 11,177 CFS	Q100 = 15,637 CFS
V25 = 8.32 FPS	V100 = 8.40 FPS
HW25 = 1,056.29'	HW100 = 1,059.10'

HYDRAULIC DATA (PROPOSED)	
Q25 = 11,177 CFS	Q100 = 15,637 CFS
V25 = 8.07 FPS	V100 = 8.36 FPS
HW25 = 1,056.53'	HW100 = 1,059.16'

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FOUNDATION DESIGN ONLY

SUPERSTRUCTURE INV/OPR RATINGS: 1.25/2.05
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BRIDGE LAYOUT

SH 220 AT DUFFAU CREEK

SCALE: 1"=20'(H), 1"=20'(V) SHEET 20F 5

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NUMBER		HIGHWAY NO.
JDB	6	(See Title Sheet)		SH 220
CHECK	STATE	DISTRICT	COUNTY	SHEET NO.
LVA	TEXAS	FTW	ERATH	
GRAPHICS	CONTROL	SECTION	JOB	125
KAC				
CHECK	0467	02	020, ETC.	
JDB				

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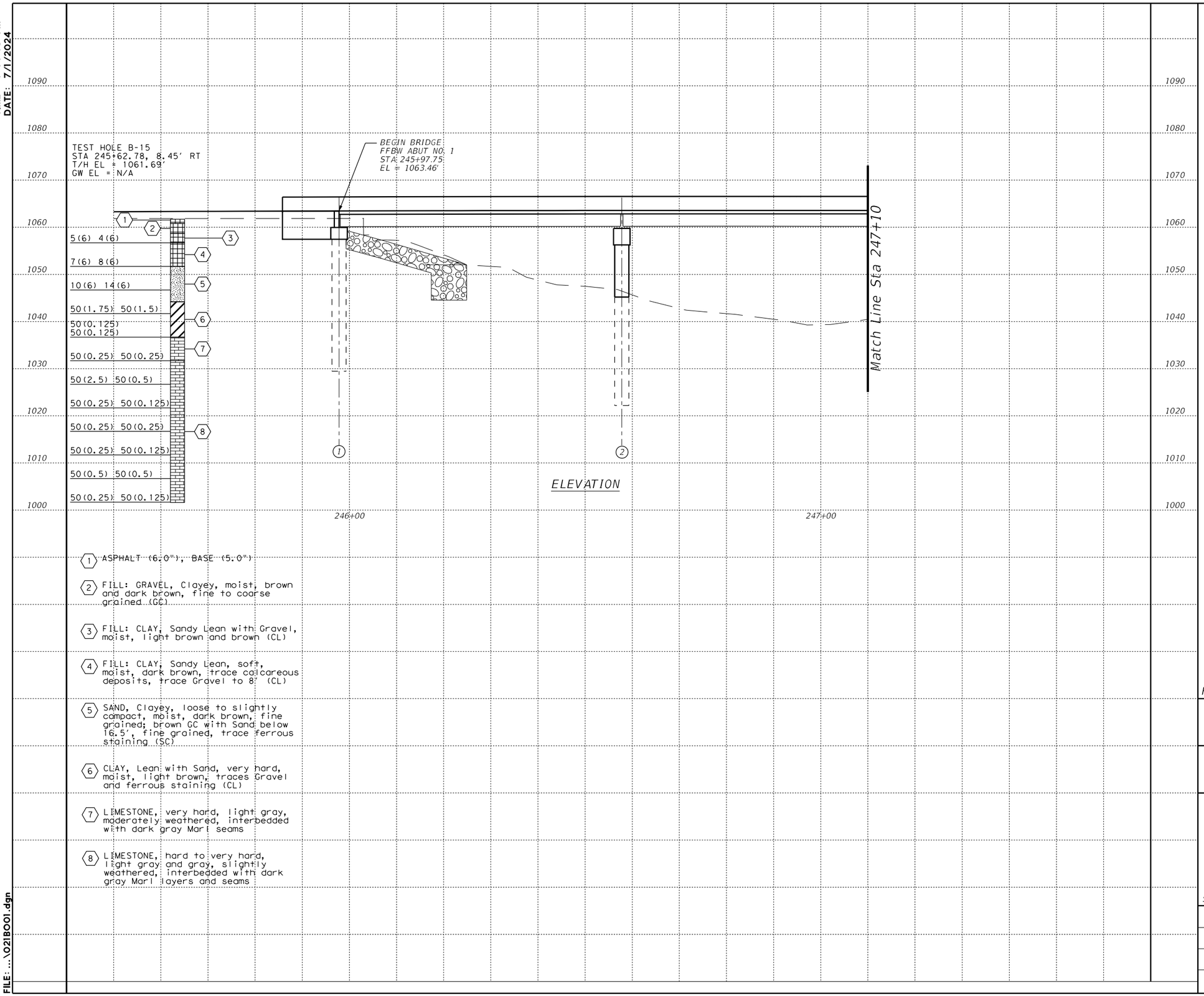

ELEVATION

0 10 20
SCALE IN FEET

1. ASPHALT (6.0"), BASE (5.0")
2. FILL: GRAVEL, Clayey, moist, brown and dark brown, fine to coarse grained (GC)
3. FILL: CLAY, Sandy Lean with Gravel, moist, light brown and brown (CL)
4. FILL: CLAY, Sandy Lean, soft, moist, dark brown, trace calcareous deposits, trace Gravel to 8' (CL)
5. SAND, Clayey, loose to slightly compact, moist, dark brown, fine grained; brown GC with Sand below 16.5', fine grained, trace ferrous staining (SC)
6. CLAY, Lean with Sand, very hard, moist, light brown, traces Gravel and ferrous staining (CL)
7. LIMESTONE, very hard, light gray, moderately weathered, interbedded with dark gray Marl seams
8. LIMESTONE, hard to very hard, light gray and gray, slightly weathered, interbedded with dark gray Marl layers and seams

HL93 LOADING

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Texas Department of Transportation

BORINGS

SH 220 AT DUFFAU CREEK

SCALE: 1"=20'(H), 1"=20'(V)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NUMBER		HIGHWAY NO.
JDB	6	(See Title Sheet)		SH 220
CHECK	STATE	DISTRICT	COUNTY	SHEET NO.
LVA	TEXAS	FTW	ERATH	
GRAPHICS	CONTROL	SECTION	JOB	126
KAC	0467	02	020, ETC.	
CHECK				
JDB				

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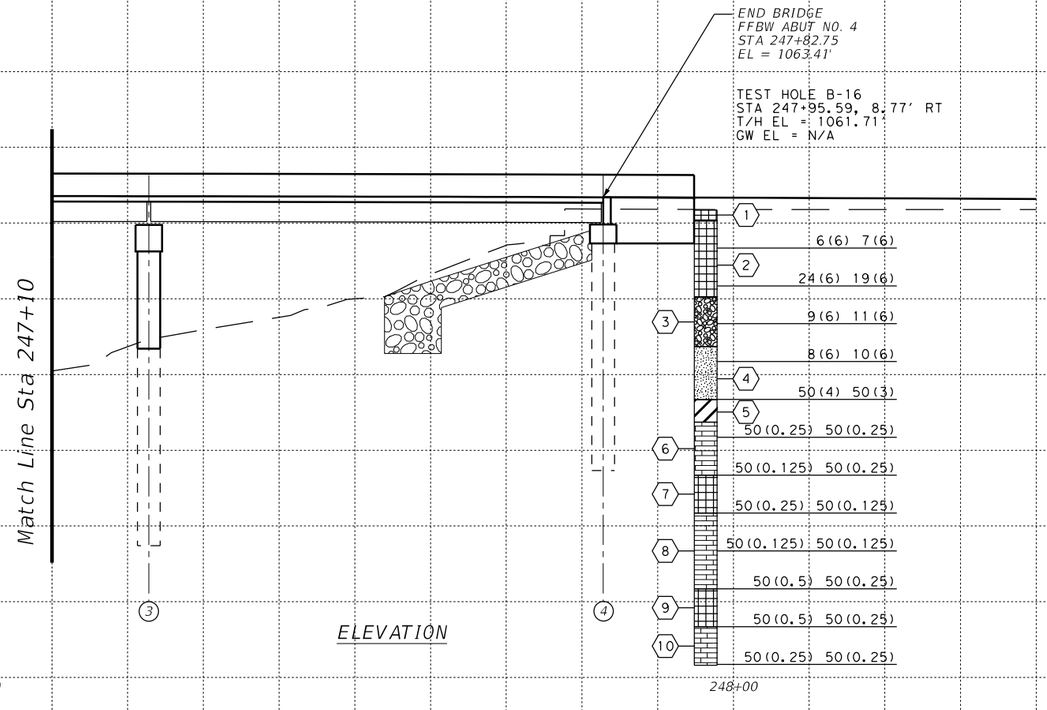

ELEVATION

0 10 20
SCALE IN FEET

1. ASPHALT (7.5"), BASE (8.5")
2. FILL: CLAY, Sandy Lean, soft to stiff, moist, light brown and brown, few Gravel, trace calcareous deposits, trace ferrous staining below 3' (CL)
3. GRAVEL, Clayey with Sand, loose, moist, brown, fine to coarse grained; dark brown SC to 13'; brown Sandy CL from 13' to 13.5'; light brown GP-GC with Sand from 13.5' to 14.5' (GC)
4. SAND, Clayey, loose, moist, brown, fine to coarse grained, few Gravel (SC)
5. CLAY, Lean, hard, moist, brown and dark gray (CL)
6. LIMESTONE, very hard, light gray and gray, slightly weathered, interbedded with dark gray Marl seams
7. MUDSTONE, very hard, dark gray, slightly weathered, interbedded with gray Limestone layer and seam (MARL)
8. LIMESTONE, very hard, light gray and gray, slightly weathered, interbedded with dark gray Marl layer and seams
9. MUDSTONE, very hard, dark gray, slightly weathered, interbedded with light gray Limestone layer and seam (MARL)
10. LIMESTONE, very hard, light gray and gray, moderately weathered, interbedded with dark gray Marl seams

HL93 LOADING

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Texas Department of Transportation

BORINGS

SH 220 AT DUFFAU CREEK

SCALE: 1"=20'(H), 1"=20'(V) SHEET 4OF 5

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NUMBER		HIGHWAY NO.
JDB	6	(See Title Sheet)		SH 220
CHECK LVA	STATE	DISTRICT	COUNTY	SHEET NO.
GRAPHICS KAC	TEXAS	FTW	ERATH	127
CHECK JDB	CONTROL	SECTION	JOB	
	0467	02	020, ETC.	

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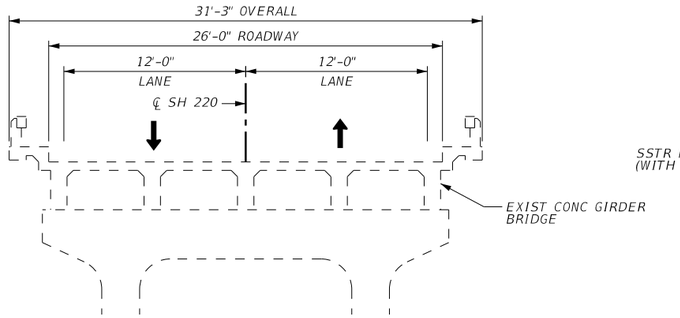
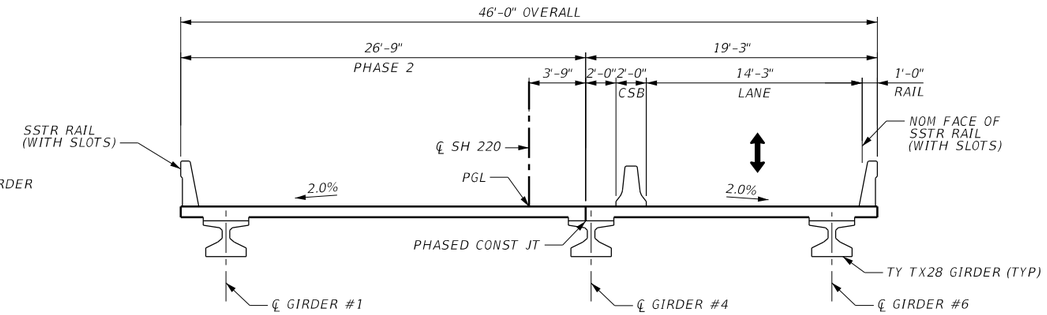
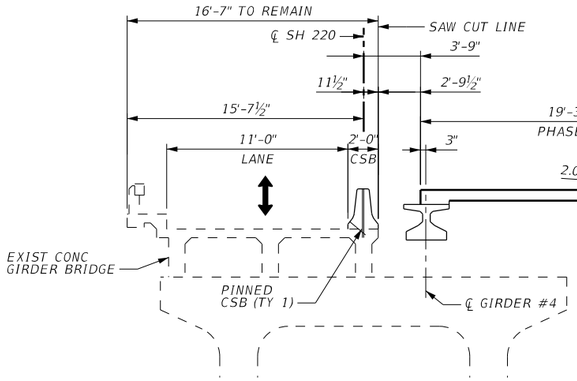


EXISTING TYPICAL TRANSVERSE SECTION



PHASE 2 CONSTRUCTION



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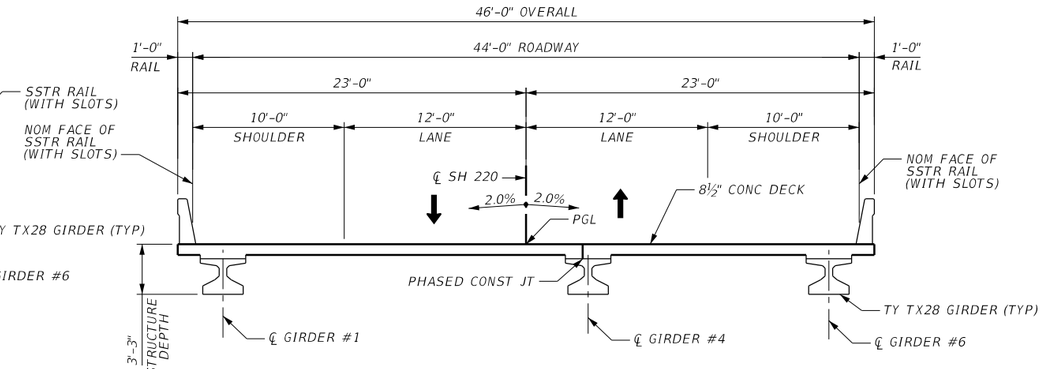
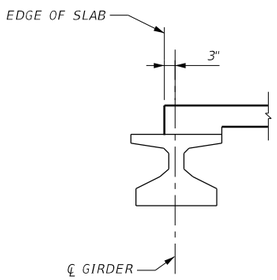


FINAL TYPICAL TRANSVERSE SECTION



PHASE CONSTRUCTION DETAIL

HL93 LOADING

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07/24/2024

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Firm Registration: F-2966

Texas Department of Transportation

BRIDGE TYPICAL SECTIONS

SH 220 AT DUFFAU CREEK

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

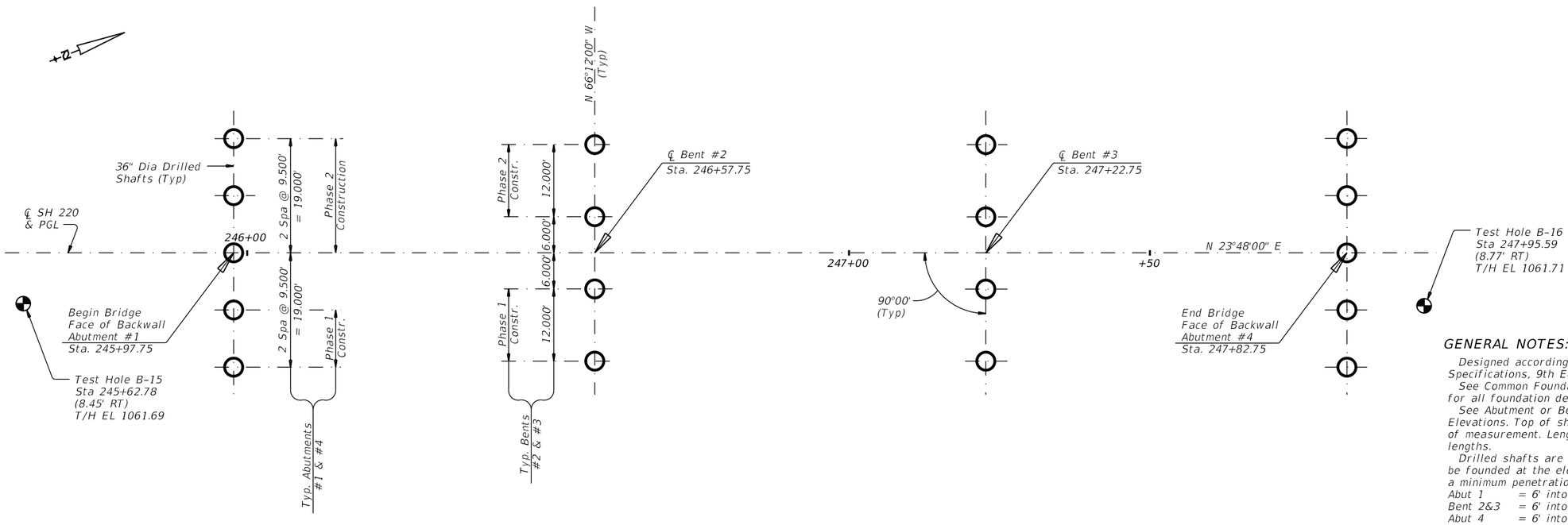
DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NUMBER		HIGHWAY NO.
JDB	6	(See Title Sheet)		SH 220
CHECK	STATE	DISTRICT	COUNTY	SHEET NO.
LVA	TEXAS	FTW	ERATH	128
GRAPHICS	CONTROL	SECTION	JOB	
KAC	0467	02	020, ETC.	
CHECK				
JDB				

FILE: ...\02IBTYP01.dgn

ESTIMATED QUANTITIES

DESCRIPTIONS	0400-7010 Cem Stabil Bkfl	0416-7006 Drill Shaft (36 In)	0420-7013 (1) CL "C" Conc (Abut) (HPC)	0420-7023 (1) CL "C" Conc (Cap) (HPC)	0420-7039 CL "C" Conc (Column) (HPC)	0422-7002 Reinf Conc Slab (HPC)	0422-7014 Approach Slab (HPC)	0425-7001 Prestr Conc Girder (Tx28)	0432-7047 Riprap (Stone Protection) (30 In)	0450-7025 Rail (Ty SSTR) (HPC)	0454-7003 Armor Joint (Sealed)	0496-7010 Remov Str (Bridge 100-499 FT Length)
	CY	LF	CY	CY	CY	SF	CY	LF	CY	LF	LF	EA
2 ~ Abutments	170	280	52.8	~	~	~	~	~	~	48.0	84	~
2 ~ Interior Bents	~	120	~	41.6	27.2	~	~	~	~	~	~	~
1 ~ 185.00' Prestr Slab Beam Unit	~	~	~	~	~	8,510	~	1,101.00	~	370.0	~	~
TOTALS	170	400	52.8	41.6	27.2	8,510	70.6	1,101.00	1,765	418.0	84	1

(1) Quantity includes shear keys. See abutment details, interior bent details, and IGSK standard for shear key location, details, and notes.



GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications, 9th Edition (2020).

See Common Foundation Details (FD) standard sheet for all foundation details and notes not shown.

See Abutment or Bent Details for top of Drilled Shaft Elevations. Top of shafts shown are to be used as basis of measurement. Lengths shown on layout are minimum lengths.

Drilled shafts are designed for point bearing, and shall be founded at the elevations shown or deeper, to provide a minimum penetration as follows:

Abut 1 = 6' into limestone
Bent 2&3 = 6' into limestone
Abut 4 = 6' into limestone

MATERIAL NOTES:

Provide Class "C" Concrete (f'c = 3,600 psi).
Provide Grade 60 reinforcing steel.

HL93 LOADING

STATE OF TEXAS
JAMES ROBERT TRAVIS
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07/29/2024

Texas Department of Transportation
Fort Worth Bridge Design

EST. QUANTITIES AND FOUNDATION LAYOUT

DUFFAU CREEK

	DN: JT	CK: FE	DW: SM/JT	CK: FE/JT
©TxDOT 07-29-24	CONT	SECT	JOB	HIGHWAY
REVISIONS	0467	02	020, ETC.	SH 220
	DIST	COUNTY		SHEET NO.
	FTW	ERATH		129

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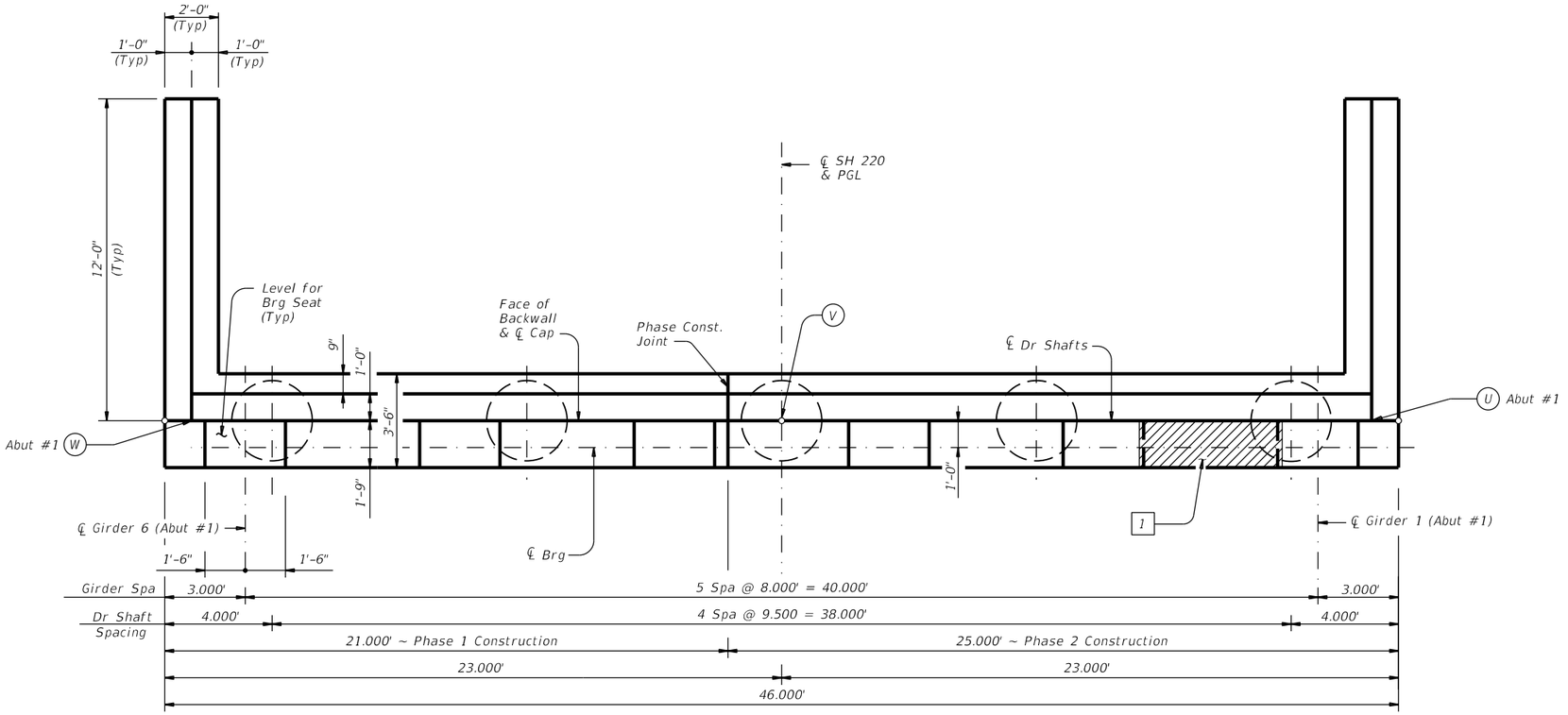

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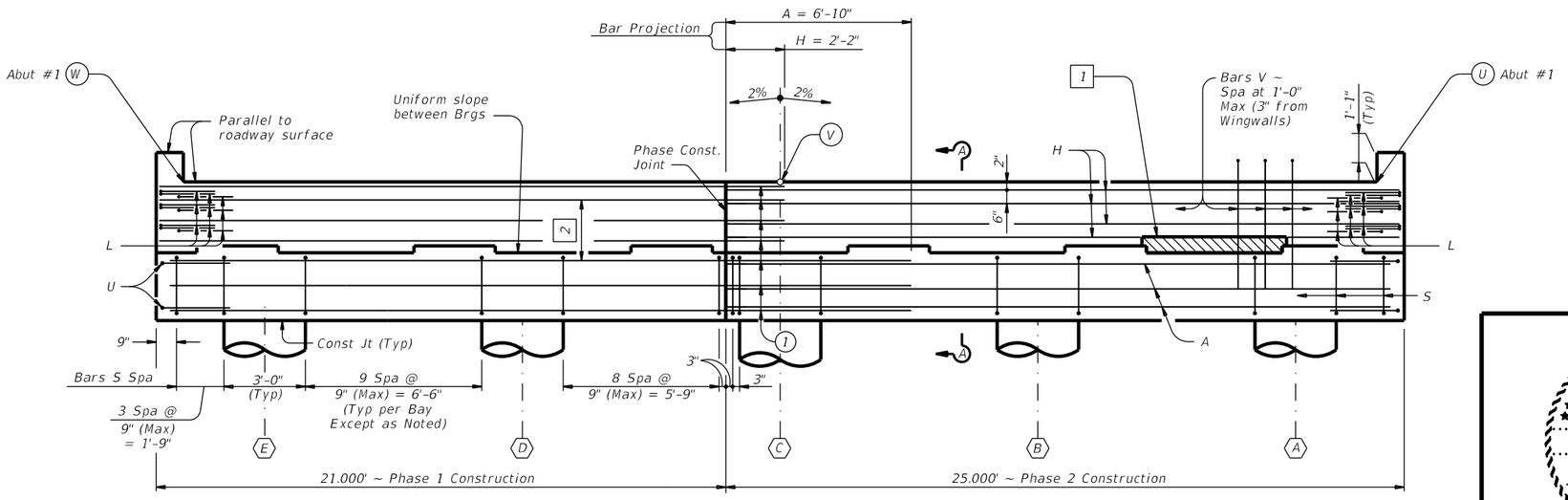


ELEVATION

(Abut #1 ~ Looking Backward)

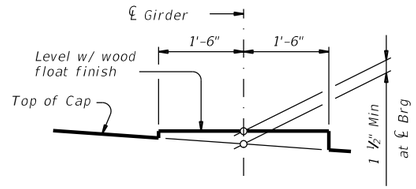
TABLE OF ELEVATIONS

	BEARING SEATS					
	1	2	3	4	5	6
Abut #1	1059.546	1059.706	1059.866	1059.866	1059.706	1059.546

	TOP OF DS				
	(A)	(B)	(C)	(D)	(E)
Abut #1	1056.939	1057.129	1057.319	1057.129	1056.939

	BOTTOM OF DS (AS BUILT)				
	(A)	(B)	(C)	(D)	(E)
Abut #1					

	TOP OF BACKWALL		
	(U)	(V)	(W)
Abut #1	1063.024	1063.464	1063.024



BEARING SEAT DETAIL

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

(1) If contractor opts to use mechanical couplers, then extend bars 1'-0" into Phase 2 Construction. If mechanical couplers are not used, then reinforcement shall project as shown on details.

[1] Abut #1 (Looking Backward) Only: Shear Key required in between Girders #1 and #2. See "IGSK" standard for details.

[2] 3 Spa @ 1'-0" Max.

HL93 LOADING

SHEET 1 OF 3

STATE OF TEXAS
JAMES ROBERT TRAVIS
149203
LICENSED PROFESSIONAL ENGINEER
07/12/2024

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Fort Worth Bridge Design

ABUTMENTS NOS. 1 & 4

DUFFAU CREEK

	DN: JT	CK: FE	DW: SM/JT	CK: FE/JT	
©TxDOT 07-12-24	CONT	SECT	JOB	HIGHWAY	
REVISIONS	0467	02	020, ETC.	SH 220	
	DIST	COUNTY		SHEET NO.	
	FTW	ERATH		130	

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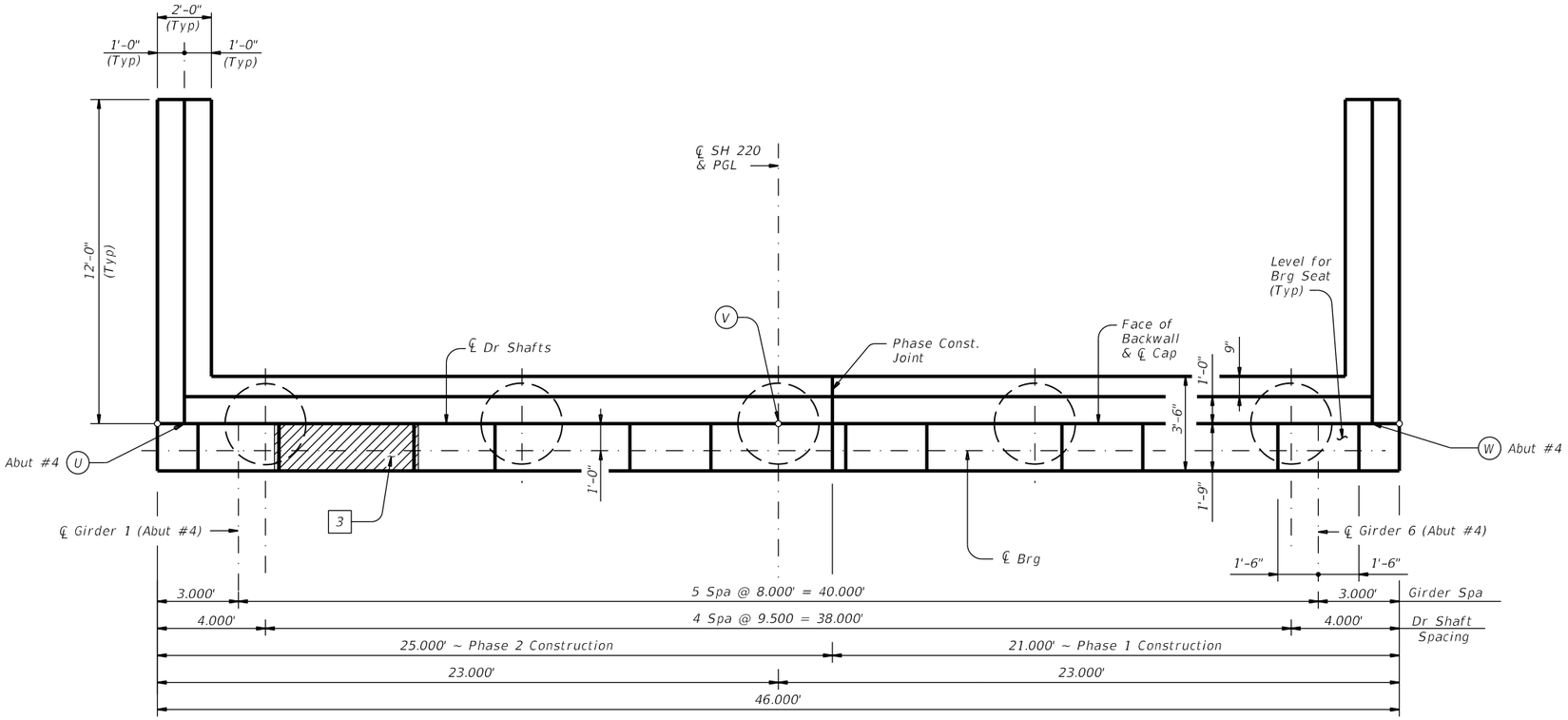

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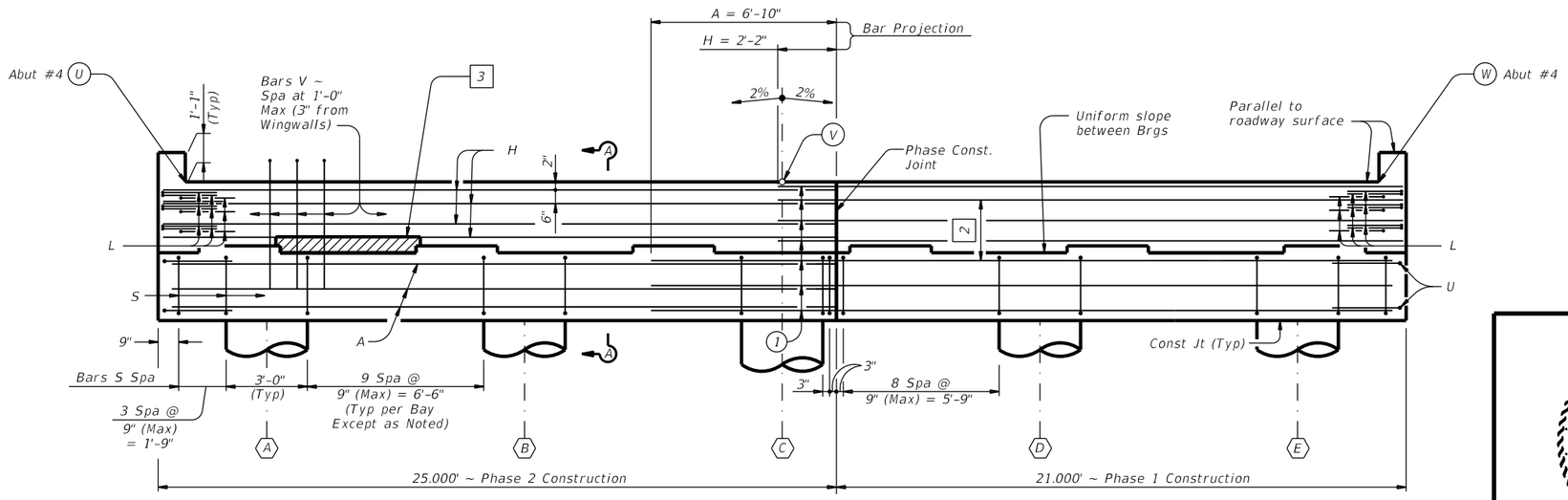


ELEVATION

(Abut #4 ~ Looking Forward)

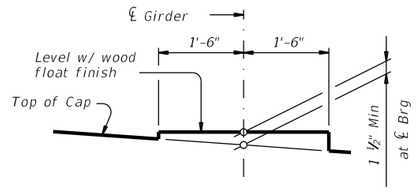
TABLE OF ELEVATIONS

	BEARING SEATS					
	1	2	3	4	5	6
Abut #4	1059.499	1059.659	1059.819	1059.819	1059.659	1059.499

	TOP OF DS				
	(A)	(B)	(C)	(D)	(E)
Abut #4	1056.891	1057.081	1057.271	1057.081	1056.891

	BOTTOM OF DS (AS BUILT)				
	(A)	(B)	(C)	(D)	(E)
Abut #4					

	TOP OF BACKWALL		
	(U)	(V)	(W)
Abut #4	1062.976	1063.416	1062.976



BEARING SEAT DETAIL

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

(1) If contractor opts to use mechanical couplers, then extend bars 1'-0" into Phase 2 Construction. If mechanical couplers are not used, then reinforcement shall project as shown on details.

2 3 Spa @ 1'-0" Max.

3 Abut #4 (Looking Forward) Only: Shear Key required in between Girders #1 and #2. See "IGSK" standard for details.

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ABUTMENTS NOS. 1 & 4

DUFFAU CREEK

	DN: JT	CK: FE	DW: SM/JT	CK: FE/JT
©TxDOT 07-12-24	CONT	SECT	JOB	HIGHWAY
REVISIONS	0467	02	020, ETC.	SH 220
	DIST	COUNTY		SHEET NO.
	FTW	ERATH		131

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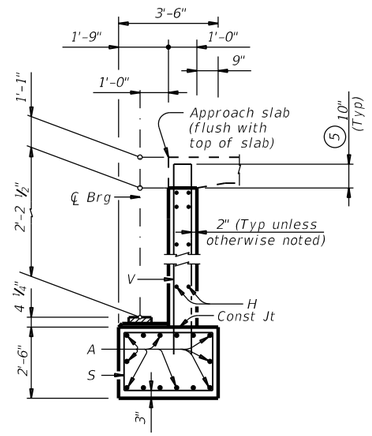
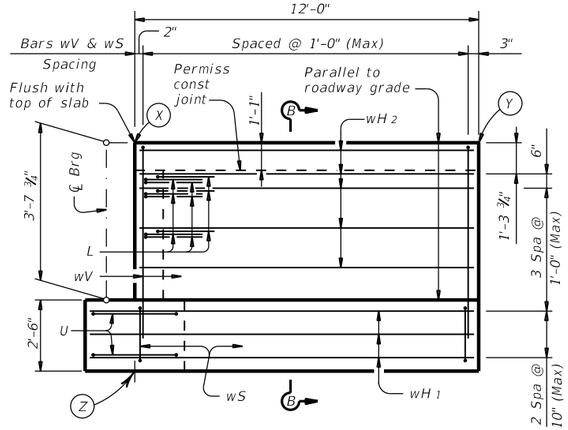
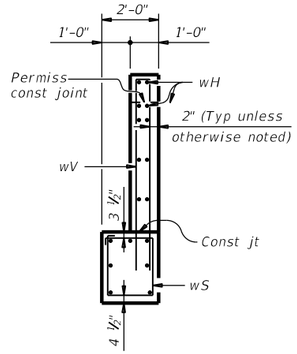


SECTION A-A



WINGWALL ELEVATION



SECTION B-B

②TABLE OF ESTIMATED QUANTITIES

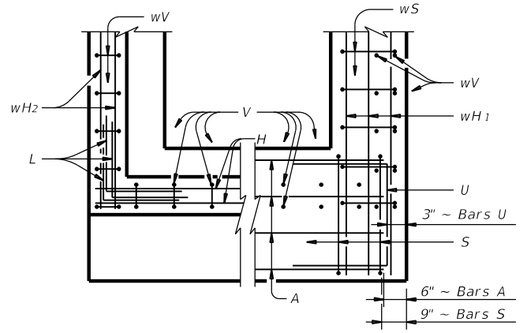
PHASE 1 CONSTRUCTION					PHASE 2 CONSTRUCTION				
Bar	No.	Size	Length	Weight	Bar	No.	Size	Length	Weight
A	14	#11	③ 27'-7"	2,052	A	14	#11	24'-9"	1,841
H	8	#6	④ 23'-0"	276	H	8	#6	24'-10"	298
L	9	#6	4'-0"	54	L	9	#6	4'-0"	54
S	23	#5	11'-6"	276	S	26	#5	11'-6"	312
U	2	#6	8'-1"	24	U	2	#6	8'-1"	24
V	21	#5	11'-3"	246	V	25	#5	11'-3"	293
wH1	7	#6	13'-5"	141	wH1	7	#6	13'-5"	141
wH2	10	#6	11'-8"	175	wH2	10	#6	11'-8"	175
wS	13	#4	7'-10"	68	wS	13	#4	7'-10"	68
wV	13	#5	11'-3"	153	wV	13	#5	11'-3"	153
Reinforcing Steel			Lb	3,465	Reinforcing Steel			Lb	3,359
Cl "C" Conc (Abut)(HPC)			CY	12.2	Cl "C" Conc (Abut)(HPC)			CY	14.2

② Quantities shown are for one Abutment only. Two required.

③ Includes one 6'-10" splice

④ Includes one 2'-2" splice

⑤ Increase as required to maintain 3" from finished grade.



BACKWALL CAP

CORNER DETAILS

WINGWALL ELEVATIONS

	ABUTMENT #1		ABUTMENT #4	
POINT	LEFT WING	RIGHT WING	LEFT WING	RIGHT WING
X	1063.004	1063.004	1062.956	1062.956
Y	1062.970	1062.970	1062.915	1062.915
Z	1056.900	1056.900	1056.852	1056.852

GENERAL NOTES:

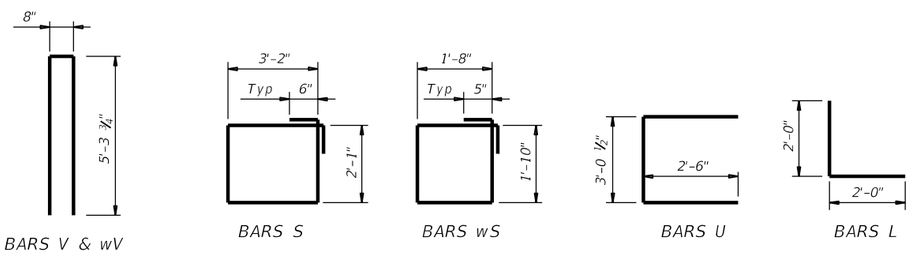
Designed according to AASHTO LRFD Bridge Design Specifications, 9th Edition (2020).
See Common Foundation Details (FD) standard sheet for drilled shaft information and notes.
See Shear Key (IGSK) standard sheet for all shear key details and notes.
See Traffic Rail Type SSTR standard for details for rail anchorage in wingwalls.

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

Abutment #1 & Abutment #4
Maximum Calculated Footing Load = 123.4 Tons/Shaft
Point Bearing Based on Pen. Test Of 1"/100 Blows
Point Bearing @ 31.0 T.S.F. = 219 Tons/Shaft
TOTAL = 219 Tons/Shaft

MATERIAL NOTES:

Provide Class "C" (HPC) Concrete (f'c = 3600 psi).
Provide Grade 60 Reinforcing steel.



HL93 LOADING

SHEET 3 OF 3

STATE OF TEXAS
JAMES ROBERT TRAVIS
149203
LICENSED PROFESSIONAL ENGINEER
07/12/2024

Texas Department of Transportation

Fort Worth Bridge Design

ABUTMENTS NOS. 1 & 4

DUFFAU CREEK

	DN: JT	CK: FE	DW: SM/JT	CK: FE/JT
©TxDOT 07-12-24	CONT	SECT	JOB	HIGHWAY
REVISIONS	0467	02	020, ETC.	SH 220
	DIST	COUNTY		SHEET NO.
	FTW	ERATH		132

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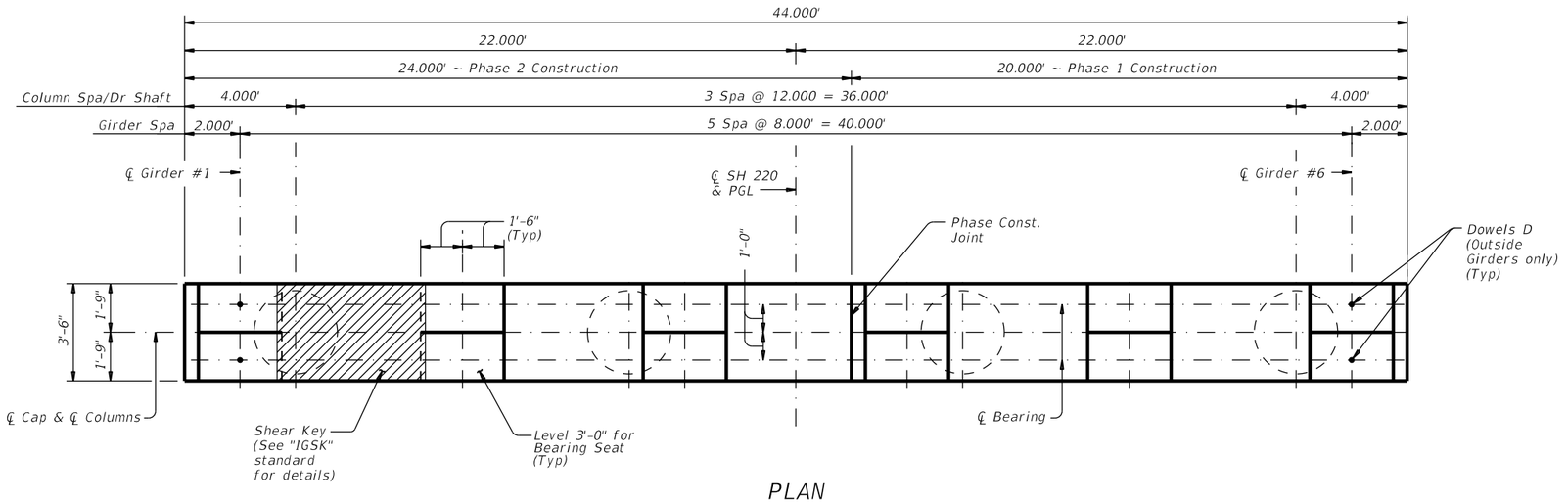

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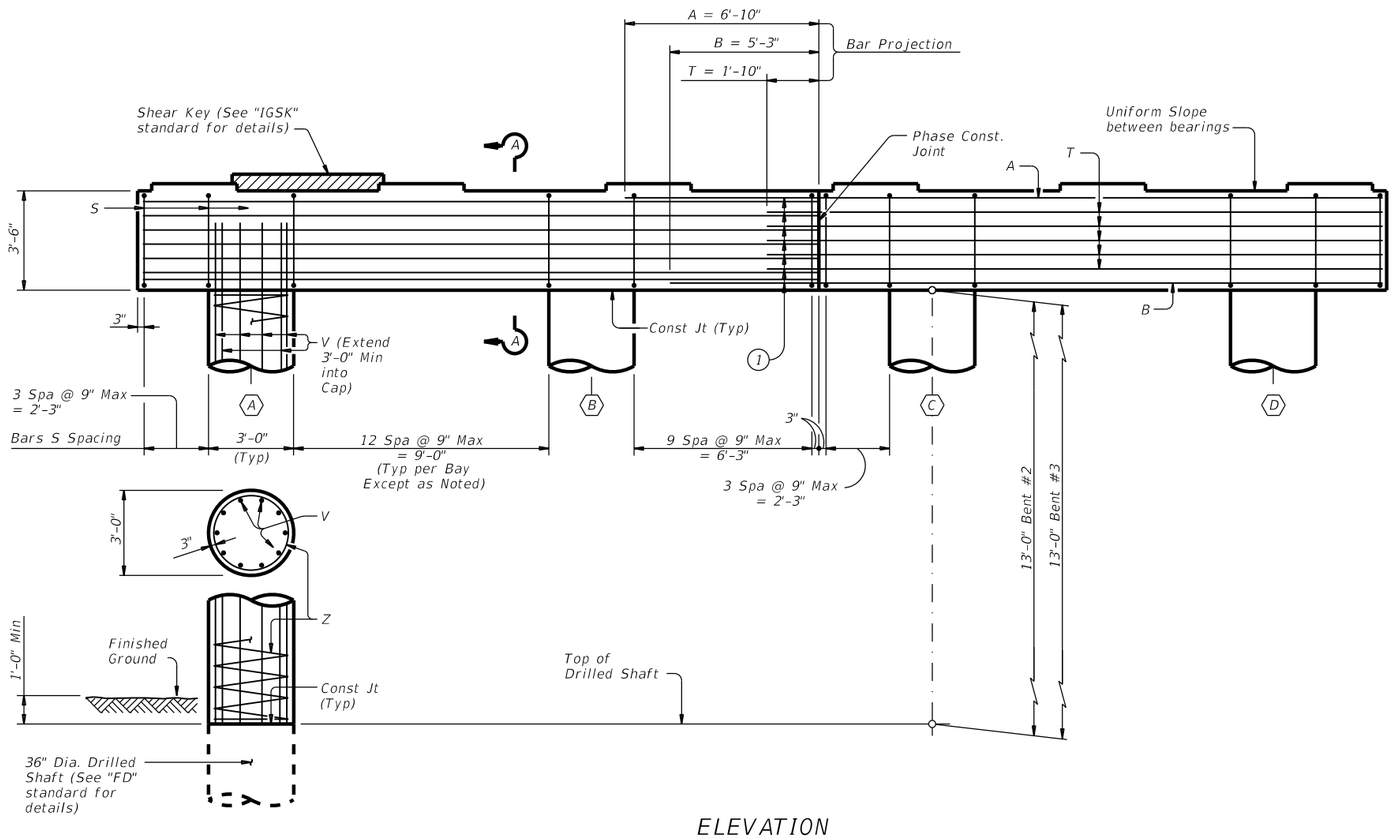
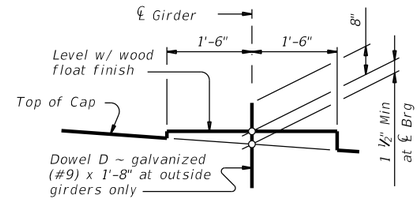


ELEVATION



BEARING SEAT DETAIL

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

TABLE OF ELEVATIONS

		BEARING SEATS					
		1	2	3	4	5	6
Bent #2	BKD	1059.647	1059.807	1059.967	1059.967	1059.807	1059.647
	FWD	1059.649	1059.809	1059.969	1059.969	1059.809	1059.649
Bent #3	BKD	1059.633	1059.793	1059.953	1059.953	1059.793	1059.633
	FWD	1059.630	1059.790	1059.950	1059.950	1059.790	1059.630

	TOP OF COLUMN			
	(A)	(B)	(C)	(D)
Bent #2	1056.063	1056.303	1056.303	1056.063
Bent #3	1056.046	1056.286	1056.286	1056.046

	TOP OF DRILLED SHAFT			
	(A)	(B)	(C)	(D)
Bent #2	1043.063	1043.303	1043.303	1043.063
Bent #3	1043.046	1043.286	1043.286	1043.046

	BOTTOM OF DS (AS BUILT)			
	(A)	(B)	(C)	(D)
Bent #2				
Bent #3				

(1) *If contractor opts to use mechanical couplers, then extend bars 1'-0" into Phase 2 Construction. If mechanical couplers are not used, then reinforcement shall project as shown on details.*

HL93 LOADING

STATE OF TEXAS
JAMES ROBERT TRAVIS
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07/12/2024

Texas Department of Transportation

Fort Worth Bridge Design

INTERIOR BENTS NOS. 2 & 3

DUFFAU CREEK

DN: JT	CK: FE	DW: SM/JT	CK: FE/JT

©TxDOT 07-12-24	CONT	SECT	JOB	HIGHWAY
REVISIONS	0467	02	020, ETC.	SH 220
	DIST	COUNTY		SHEET NO.
	FTW	ERATH		133

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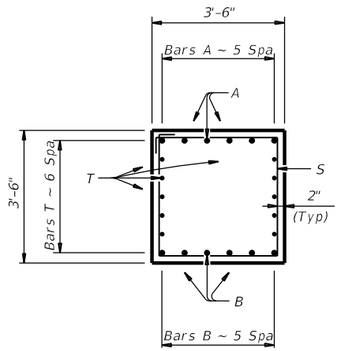


SECTION A-A

[1] TABLE OF ESTIMATED CAP QUANTITIES

Phase 1 Construction					Phase 2 Construction				
Bar	No.	Size	Length	Weight	Bar	No.	Size	Length	Weight
A	6	#11	[2] 26'-8"	850	A	6	#11	23'-10"	760
B	6	#11	[3] 25'-1"	800	B	6	#11	23'-10"	760
D	2	#9	1'-8"	14	D	2	#9	1'-8"	14
S	21	#5	13'-8"	299	S	27	#5	13'-8"	385
T	10	#5	[4] 21'-8"	226	T	10	#5	23'-10"	249
Reinforcing Steel			Lb	2,189	Reinforcing Steel			Lb	2,168
Class "C" Concrete (Cap)(HPC)			CY	9.2	Class "C" Concrete (Cap)(HPC)			CY	11.6

[1] Quantities shown are for one bent cap. (2 Required)

[2] Includes one 6'-10" splice

[3] Includes one 5'-3" splice.

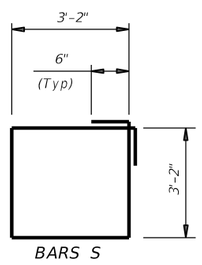
[4] Includes one 1'-10" splice.

[2] TABLE OF ESTIMATED COLUMN QUANTITIES

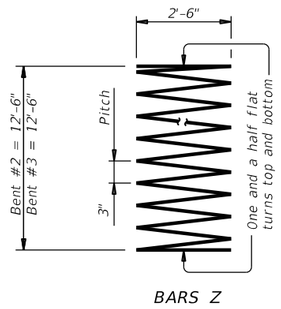
Interior Bent /Columns #		"H"	Bars V 10 Ea ~ #9		Bars Z 1 Ea ~ #4		Reinf Steel	Class "C" Conc (Col) (HPC)
		Height	Length	Weight	Length	Weight	Lbs	CY
Bent #2	A-D	13'-0"	16'-0"	544	432'-0"	289	833	3.4
Bent #3	A-D	13'-0"	16'-0"	544	432'-0"	289	833	3.4

[2] Quantities are for one column only. 4 Required per Bent.
Quantities shown are based on an "H" value of 13'.
For each linear foot variation in "H" value, make the following adjustments:

Bars V length, 1'-0"
Bars Z length, 31'-5"
Reinforcing steel, 55 Lb
Class "C" Conc (Col) (HPC), 0.26 CY



BARS S



BARS Z

GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications, 9th Edition (2020).
See Common Foundation Details (FD) standard sheet for drilled shaft information and notes.
See Shear Key (IGSK) standard sheet for all shear key details and notes.

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

Bent #2 & Bent #3
Maximum Calculated Footing Load = 211.4 Tons/Shaft.
Point Bearing Based on Pen. Test Of 1.00"/100 Blows.
Point Bearing @ 31.0 T.S.F. = 219 Tons/Shaft.
TOTAL = 219 Tons/Shaft

MATERIAL NOTES:

Provide Class "C" (HPC) Concrete (f'c = 3600 psi).
Provide Grade 60 Reinforcing steel.
Galvanize Dowel Bars D.

HL93 LOADING

SHEET 2 OF 2

STATE OF TEXAS
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07/12/2024

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Fort Worth Bridge Design

INTERIOR BENTS NOS. 2 & 3

DUFFAU CREEK

	DN: JT	CK: FE	DW: SM/JT	CK: FE/JT
©TxDOT 07-12-24	CONT	SECT	JOB	HIGHWAY
REVISIONS	0467	02	020, ETC.	SH 220
	DIST	COUNTY		SHEET NO.
	FTW	ERATH		134

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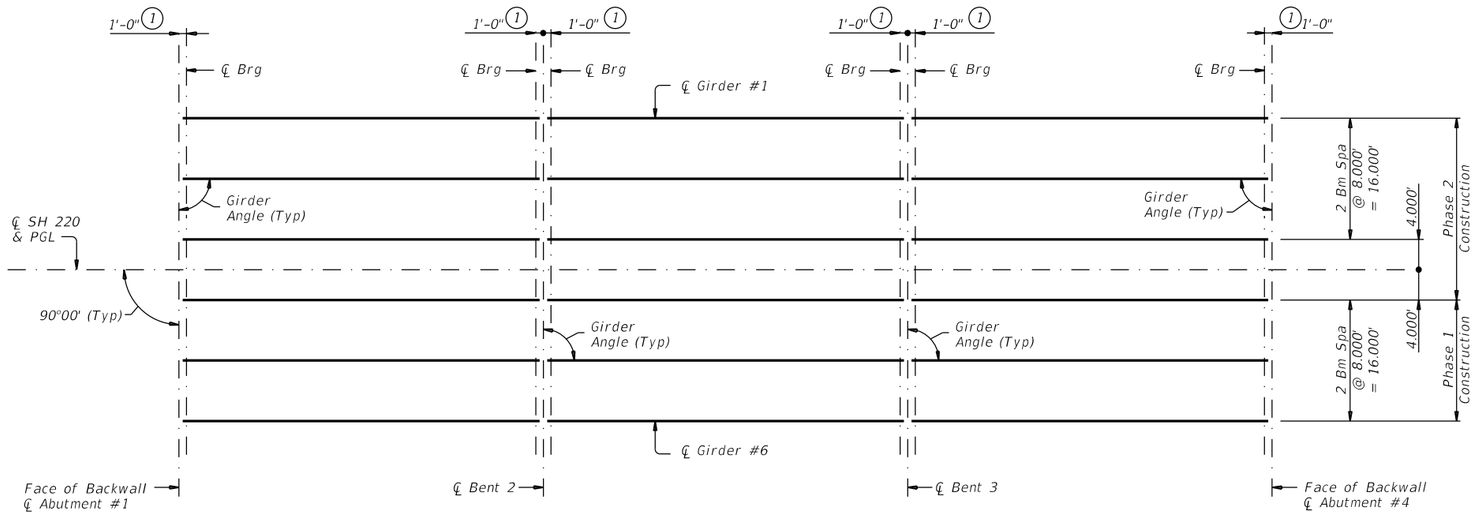

SPAN 1 (Tx28 Girders) | SPAN 2 (Tx28 Girders) | SPAN 3 (Tx28 Girders)

FRAMING PLAN

(1) See IGEB Standard for orientation of dimension.

HL93 LOADING SHEET 1 OF 4

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07/12/2024

Texas Department of Transportation
Fort Worth Bridge Design

185.00' PRESTRESSED CONC I-GIRDER UNIT
(SPANS 1, 2, & 3)

DUFFAU CREEK

	DN: JT	CK: FE	DW: SM/JT	CK: FE/JT
©TxDOT 05-13-24	CONT	SECT	JOB	HIGHWAY
REVISIONS	0467	02	020, ETC.	SH 220
	DIST	COUNTY		SHEET NO.
	FTW	ERATH		135

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BENT REPORT

BENT REPORT

BENT NO. 1 (S 66 12 0.00 E)

DISTANCE BETWEEN STATION LINE AND BEAM 1, 20.0000 L

		BEAM SPAC. (CL BENT)	BEAM ANGLE D M S
SPAN 1	BEAM 1	0.0000	90 0 0.00
	BEAM 2	8.0000	90 0 0.00
	BEAM 3	8.0000	90 0 0.00
	BEAM 4	8.0000	90 0 0.00
	BEAM 5	8.0000	90 0 0.00
	BEAM 6	8.0000	90 0 0.00
	TOTAL	40.0000	

BENT REPORT

BENT NO. 2 (S 66 12 0.00 E)

DISTANCE BETWEEN STATION LINE AND BEAM 1, 20.0000 L

		BEAM SPAC. (CL BENT)	BEAM ANGLE D M S
SPAN 1	BEAM 1	0.0000	90 0 0.00
	BEAM 2	8.0000	90 0 0.00
	BEAM 3	8.0000	90 0 0.00
	BEAM 4	8.0000	90 0 0.00
	BEAM 5	8.0000	90 0 0.00
	BEAM 6	8.0000	90 0 0.00
	TOTAL	40.0000	

BENT REPORT

BENT NO. 2 (S 66 12 0.00 E)

DISTANCE BETWEEN STATION LINE AND BEAM 1, 20.0000 L

		BEAM SPAC. (CL BENT)	BEAM ANGLE D M S
SPAN 2	BEAM 1	0.0000	90 0 0.00
	BEAM 2	8.0000	90 0 0.00
	BEAM 3	8.0000	90 0 0.00
	BEAM 4	8.0000	90 0 0.00
	BEAM 5	8.0000	90 0 0.00
	BEAM 6	8.0000	90 0 0.00
	TOTAL	40.0000	

BENT REPORT

BENT NO. 3 (S 66 12 0.00 E)

DISTANCE BETWEEN STATION LINE AND BEAM 1, 20.0000 L

		BEAM SPAC. (CL BENT)	BEAM ANGLE D M S
SPAN 2	BEAM 1	0.0000	90 0 0.00
	BEAM 2	8.0000	90 0 0.00
	BEAM 3	8.0000	90 0 0.00
	BEAM 4	8.0000	90 0 0.00
	BEAM 5	8.0000	90 0 0.00
	BEAM 6	8.0000	90 0 0.00
	TOTAL	40.0000	

BENT REPORT

BENT NO. 3 (S 66 12 0.00 E)

DISTANCE BETWEEN STATION LINE AND BEAM 1, 20.0000 L

		BEAM SPAC. (CL BENT)	BEAM ANGLE D M S
SPAN 3	BEAM 1	0.0000	90 0 0.00
	BEAM 2	8.0000	90 0 0.00
	BEAM 3	8.0000	90 0 0.00
	BEAM 4	8.0000	90 0 0.00
	BEAM 5	8.0000	90 0 0.00
	BEAM 6	8.0000	90 0 0.00
	TOTAL	40.0000	

BENT REPORT

BENT NO. 4 (S 66 12 0.00 E)

DISTANCE BETWEEN STATION LINE AND BEAM 1, 20.0000 L

		BEAM SPAC. (CL BENT)	BEAM ANGLE D M S
SPAN 3	BEAM 1	0.0000	90 0 0.00
	BEAM 2	8.0000	90 0 0.00
	BEAM 3	8.0000	90 0 0.00
	BEAM 4	8.0000	90 0 0.00
	BEAM 5	8.0000	90 0 0.00
	BEAM 6	8.0000	90 0 0.00
	TOTAL	40.0000	

BEAM REPORT

BEAM REPORT, SPAN 1

	HORIZONTAL DISTANCE C-C BENT	C-C BRG.	TRUE DISTANCE BOT. BM. FLG. ②	BEAM SLOPE	BEAM BEARING
BEAM 1	60.0000	58.0000	59.5001	0.00174	N 23 48 0.00 E
BEAM 2	60.0000	58.0000	59.5001	0.00174	N 23 48 0.00 E
BEAM 3	60.0000	58.0000	59.5001	0.00174	N 23 48 0.00 E
BEAM 4	60.0000	58.0000	59.5001	0.00174	N 23 48 0.00 E
BEAM 5	60.0000	58.0000	59.5001	0.00174	N 23 48 0.00 E
BEAM 6	60.0000	58.0000	59.5001	0.00174	N 23 48 0.00 E

BEAM REPORT, SPAN 2

	HORIZONTAL DISTANCE C-C BENT	C-C BRG.	TRUE DISTANCE BOT. BM. FLG. ②	BEAM SLOPE	BEAM BEARING
BEAM 1	65.0000	63.0000	64.5000	-0.00026	N 23 48 0.00 E
BEAM 2	65.0000	63.0000	64.5000	-0.00026	N 23 48 0.00 E
BEAM 3	65.0000	63.0000	64.5000	-0.00026	N 23 48 0.00 E
BEAM 4	65.0000	63.0000	64.5000	-0.00026	N 23 48 0.00 E
BEAM 5	65.0000	63.0000	64.5000	-0.00026	N 23 48 0.00 E
BEAM 6	65.0000	63.0000	64.5000	-0.00026	N 23 48 0.00 E

BEAM REPORT, SPAN 3

	HORIZONTAL DISTANCE C-C BENT	C-C BRG.	TRUE DISTANCE BOT. BM. FLG. ②	BEAM SLOPE	BEAM BEARING
BEAM 1	60.0000	58.0000	59.5002	-0.00226	N 23 48 0.00 E
BEAM 2	60.0000	58.0000	59.5002	-0.00226	N 23 48 0.00 E
BEAM 3	60.0000	58.0000	59.5002	-0.00226	N 23 48 0.00 E
BEAM 4	60.0000	58.0000	59.5002	-0.00226	N 23 48 0.00 E
BEAM 5	60.0000	58.0000	59.5002	-0.00226	N 23 48 0.00 E
BEAM 6	60.0000	58.0000	59.5002	-0.00226	N 23 48 0.00 E

② Girder lengths shown are bottom girder flange lengths with adjustments made for girder slope.

HL93 LOADING SHEET 2 OF 4

STATE OF TEXAS
JAMES ROBERT TRAVIS
149203
LICENSED
PROFESSIONAL ENGINEER
07/12/2024

Texas Department of Transportation

Fort Worth Bridge Design

185.00' PRESTRESSED CONC I-GIRDER UNIT
(SPANS 1, 2, & 3)

DUFFAU CREEK

	DN: JT	CK: FE	DW: SM/JT	CK: FE/JT
©TxDOT 05-13-24	CONT	SECT	JOB	HIGHWAY
REVISIONS	0467	02	020, ETC.	SH 220
	DIST	COUNTY		SHEET NO.
	FTW	ERATH		136

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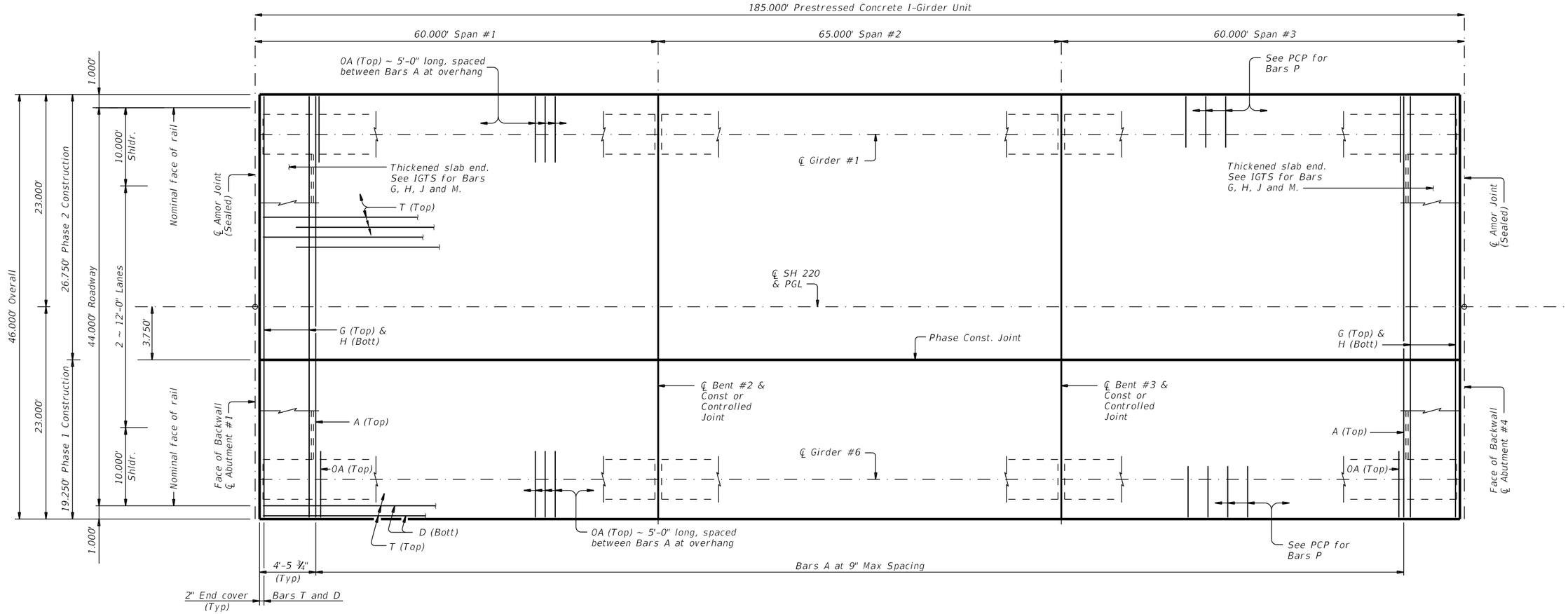

REINFORCEMENT PLAN

HL93 LOADING SHEET 3 OF 4

STATE OF TEXAS
JAMES ROBERT TRAVIS
149203
LICENSED PROFESSIONAL ENGINEER
07/12/2024

Texas Department of Transportation
Fort Worth Bridge Design

185.00' PRESTRESSED CONC I-GIRDER UNIT
(SPANS 1, 2, & 3)

DUFFAU CREEK

	DN: JT	CK: FE	DW: SM/JT	CK: FE/JT
©TxDOT 05-13-24 REVISIONS	CONT	SECT	JOB	HIGHWAY
	0467	02	020, ETC.	SH 220
	DIST	COUNTY		SHEET NO.
	FTW	ERATH		137

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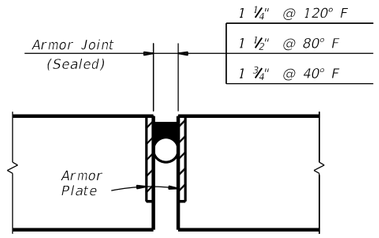


JOINT OPENING DETAIL

(For Additional Information and Details, See Related Standard Sheet "AJ".)

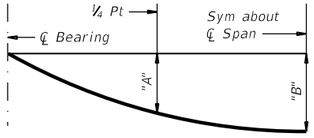
ARMOR JOINT DETAILS

TABLE OF ARMOR JOINT ESTIMATED QUANTITIES

Abutment	Phase 1	Phase 2	Total
	LF	LF	LF
1	17.25	24.75	42.0
4	17.25	24.75	42.0
Total	34.5	49.5	84.0

TABLE OF VARIABLE VALUES

Span	Span Length	Beam Type	Dead Load Deflection	
			"A"	"B"
	Ft		Ft	Ft
1	60.00	Tx28	0.048	0.068
2	65.00	Tx28	0.067	0.095
3	60.00	Tx28	0.048	0.068



DEAD LOAD DEFLECTION DIAGRAM

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

BAR TABLE

BAR	SIZE
A	#4
D	#4
G	#4
H	#4
J	#4
M	#4
0A	#5
P	#4
T	#4

TABLE OF ESTIMATED QUANTITIES

Span	Reinf Concrete Slab (HPC)	(4) Prest Conc Girder (Tx28)	(3) Total Reinforcing Steel	Rail (Ty SSTR)
No.	SF	LF	Lb	LF
Phase 1				
1	1155	178.50	2,657	60.0
2	1251	193.50	2,877	65.0
3	1155	178.50	2,657	60.0
Phase 2				
1	1605	178.50	3,692	60.0
2	1739	193.50	4,000	65.0
3	1605	178.50	3,692	60.0
Total	8,510	1101.00	19,575	370.0

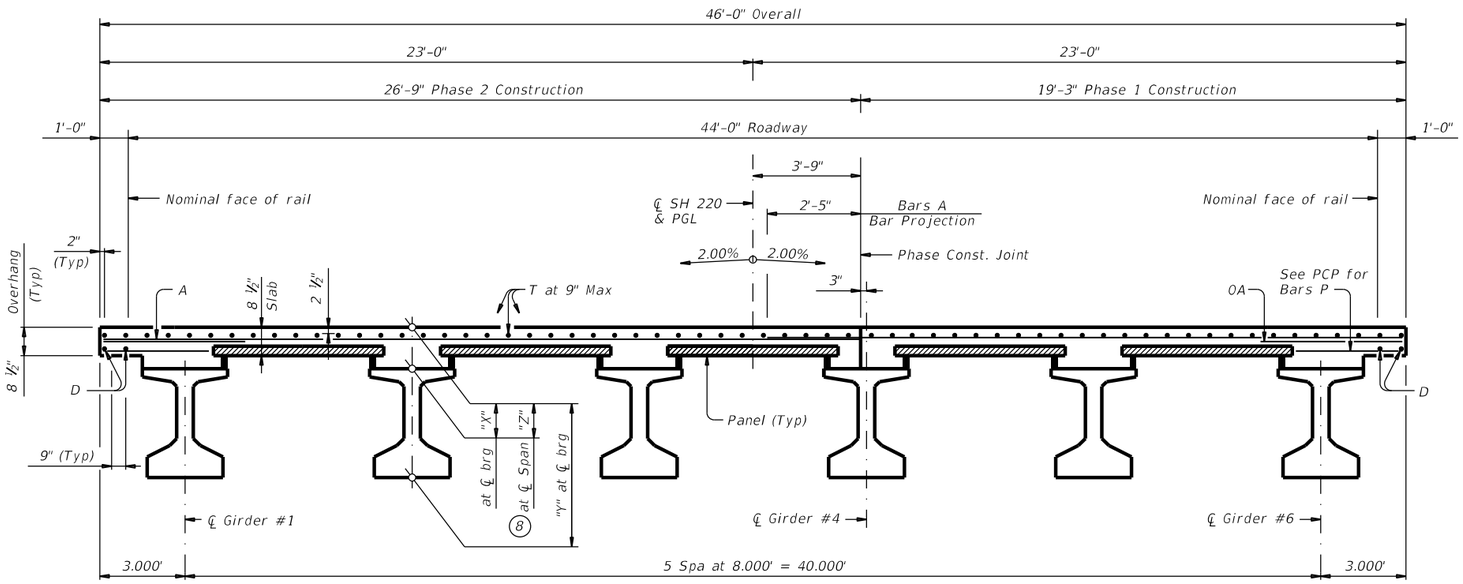
TABLE OF SECTION DEPTHS

Span No.	Girder	"X" at ℄ Brg	"Y" at ℄ Brg	"Z" at ℄ Span (8)
1	1-3,5,6	11 ½"	3'-3 ½"	9 ⅞"
2	1-3,5,6	11 ½"	3'-3 ½"	10"
3	1-3,5,6	11 ½"	3'-3 ½"	9 ⅞"
1	4	11 ½"	3'-3 ½"	9 ½"
2	4	11 ½"	3'-3 ½"	9 ⅝"
3	4	11 ½"	3'-3 ½"	9 ½"

(8) Theoretical dimension

(3) Reinforcing steel weight is calculated using an approximate factor of 2.3 lbs/SF.

(4) Lengths shown are bottom girder flange lengths with adjustments made for girder slope.



TYPICAL TRANSVERSE SECTION

(Showing girder type Tx28)

GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications, 9th Edition (2020).

Multi-span units, with slab continuous over interior bents, may be formed with the details shown on this sheet and standard IGCS.

See IGTS standard for Thickened Slab End details and quantity adjustments.

See PCP and PCP-FAB for panel details not shown.

See IGMS standard for miscellaneous details.

See Traffic Rail Ty SSTR standard for rail anchorage in slab.

See PMDF standard for details and quantity adjustments if this option is used.

Cover dimensions are clear dimensions, unless noted otherwise.

MATERIAL NOTES:

Provide Class S (HPC) concrete (f'c = 4,000 psi).

Provide Grade 60 reinforcing steel.

Provide bar laps, where required, as follows:

Epoxy coated ~ #4 = 2'-5"

~ #5 = 3'-0"

Deformed Welded Wire Reinforcement (WWR) (ASTM A1064) of equal size and spacing may be substituted for Bars A, D, 0A, P or T unless noted otherwise.

Top & bottom mats of steel must be continuous through Construction or Controlled Joints.

HL93 LOADING

SHEET 4 OF 4

STATE OF TEXAS
JAMES ROBERT TRAVIS
149203
LICENSED
PROFESSIONAL ENGINEER

07/12/2024

Texas Department of Transportation

Fort Worth Bridge Design

185.00' PRESTRESSED CONC I-GIRDER UNIT

(SPANS 1, 2, & 3)

DUFFAU CREEK

©TxDOT 07-10-24	DN: JT	CK: FE	DW: SM/JT	CK: FE/JT
REVISIONS	CONT	SECT	JOB	HIGHWAY
	0467	02	020, ETC.	SH 220
	DIST	COUNTY		SHEET NO.
	FTW	ERATH		138

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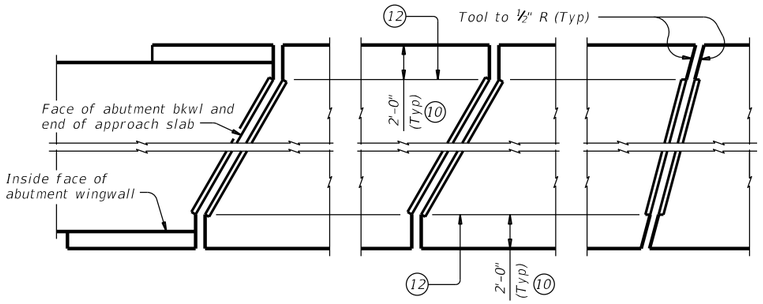
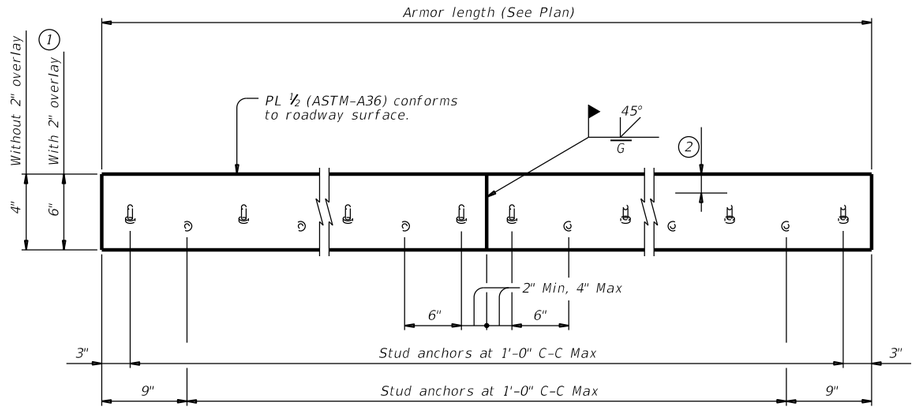


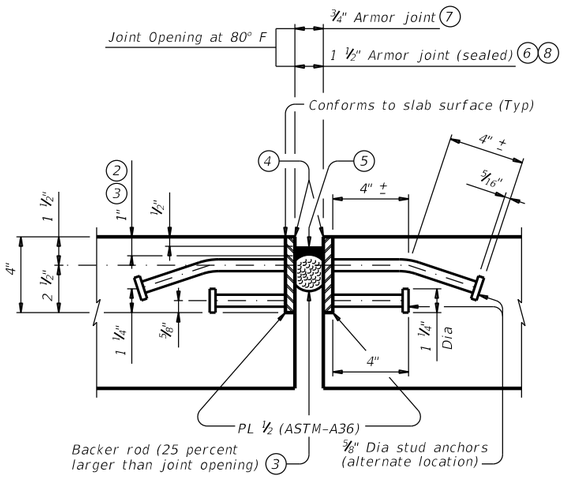
JOINTS AT ABUTMENTS | SKEWS OVER 15° | SKEWS THRU 15°

PLANS OF ARMOR PLATES

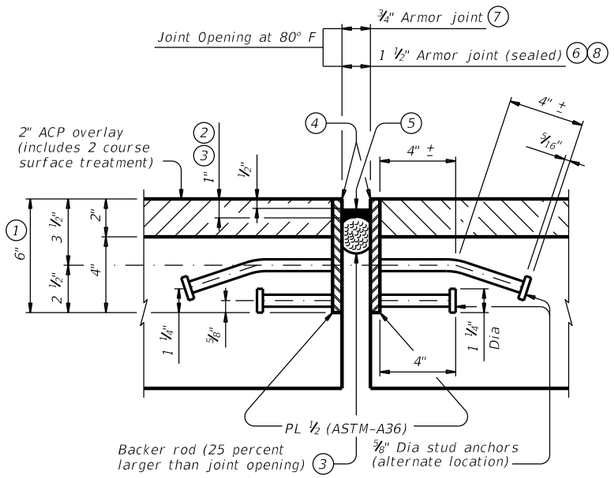


ELEVATION OF BASIC ARMOR PLATE

1. Adjust 6" plate height for overlay thicknesses other than the 2" shown. Adjust weight by 1.70 plf for each ½" variation in thickness.
2. Do not paint top 1 ½" of plate if using sealed armor joint.
3. Set top of backer rod 1" below top of armor plate. Backer rod must be compatible with joint sealant. Use of multiple pieces to create a backer rod cross section is not permitted. Top of backer rod must be convex as shown.
4. Blast clean entire contact area between sealant and plate (SSPC-SP10) before installing sealant. Light brush blast and thoroughly clean all dust and debris from concrete surfaces in contact with joint sealant before application of silicone seal.
5. Use Class 7 joint sealant that conforms to DMS-6310.
6. Place sealant while ambient temperature is between 55°F and 80°F and is rising.
7. Armor joint does not include joint sealant or backer rod.
8. Armor joint (sealed) includes Class 7 joint sealant and backer rod.
9. Form vertical leg of seal as per the Manufacturer's recommendations. Use Class 4 joint sealant if Class 7 cannot be installed correctly. Install according to Manufacturer's recommendations.
10. Unless shown otherwise, terminate armor plate at slab break point if break is more than 2'-0" from slab edge.
11. See "Plans of Armor Plates".
12. At Fabricator's option, armor plate may extend up to 6" beyond this point for skews through 15°.
13. Align shipping angle perpendicular to joint.



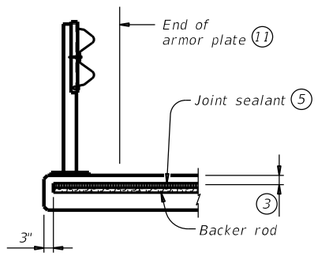
SHOWN WITHOUT 2" OVERLAY AT JOINT LOCATION



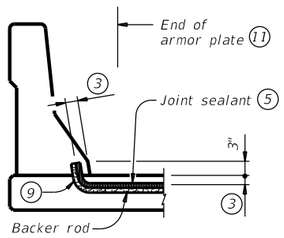
SHOWN WITH 2" OVERLAY AT JOINT LOCATION 1

ARMOR JOINT SECTIONS

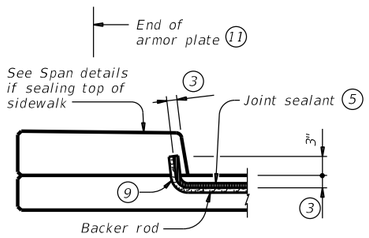
Showing Armor Joint (Sealed)



AT STEEL POST BRIDGE RAIL



AT CONCRETE BRIDGE RAIL



AT SIDEWALK

JOINT SEALANT TERMINATION DETAILS

Armor joint (sealed) only. Armor plate is not shown for clarity.

FABRICATION NOTES:

Match mark corresponding plate sections and secure together for shipment with shipping angle. Do not use erection bolts.

Ship armor joints in convenient lengths of 10'-0" Min and 24'-0" Max unless necessary for stage construction or widenings. One shop splice is permitted in each shipping length provided no piece is less than 2'-0" long and sufficient studs are added to limit the stud to shop splice distance to 2" Min and 4" Max.

Weld studs in accordance with AWS D1.1.

Use groove welds for all shop and field butt splices. Grind smooth areas in contact with seal. Make all necessary field splice joint preparations in the shop.

Paint the entire steel section, except as stated in Note 2, with System II or IV primer in accordance with Item 446 "Field Cleaning and Painting Steel." Provide paints in accordance with Item 446.2. Prepare steel and apply paint in accordance with Items 446.4.7.3 and 446.4.7.4.

Shop drawings for the fabrication of armor joints will not require the Engineer's approval if fabrication is in accordance with the details shown on this standard.

CONSTRUCTION NOTES:

Secure armor joints in position and place to proper grade and alignment by welding braces to adjacent reinforcing steel, to prestressed beam stirrups, or to anchors cast in concrete diaphragms. Include cost of temporary bracing in the price bid for Armor Joint.

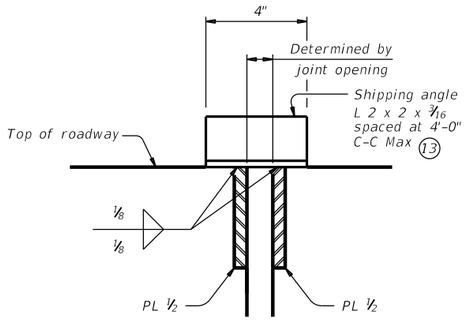
Remove shipping angle immediately after each joint half is secured in place. Grind smooth, and touch up with organic zinc-rich paint.

GENERAL NOTES:

Provide armor joints at locations shown on the plans. Provide the seal when "Armor Joint (Sealed)" is noted on the plans.

These joint details accommodate a joint movement range of 1 ⅜" (½" opening movement and ⅜" closure movement).

Payment for armor joint, with or without seal, is based on length of armor plate.



SHOWN WITHOUT 2" OVERLAY AT JOINT LOCATION

With overlay similar

SHIPPING ANGLE

An alternate method of securing joint sections may be used if approved by the Bridge Division. Erection bolts are not allowed.

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

Texas Department of Transportation

Bridge Division Standard

ARMOR JOINT DETAILS

AJ

FILE:	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT April 2019 REVISIONS	CONT	SECT	JOB	HIGHWAY
	0467	02	020, ETC.	SH 220
	DIST	COUNTY		SHEET NO.
	FTW	ERATH		139

DATE:
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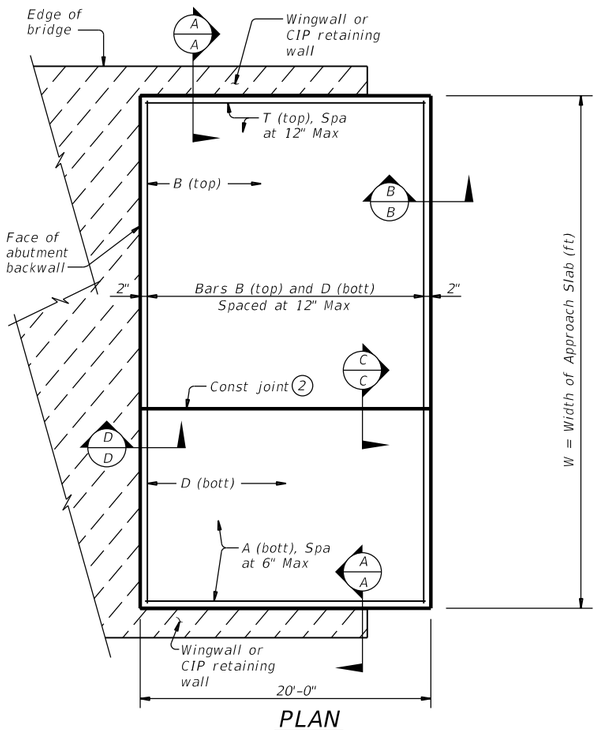
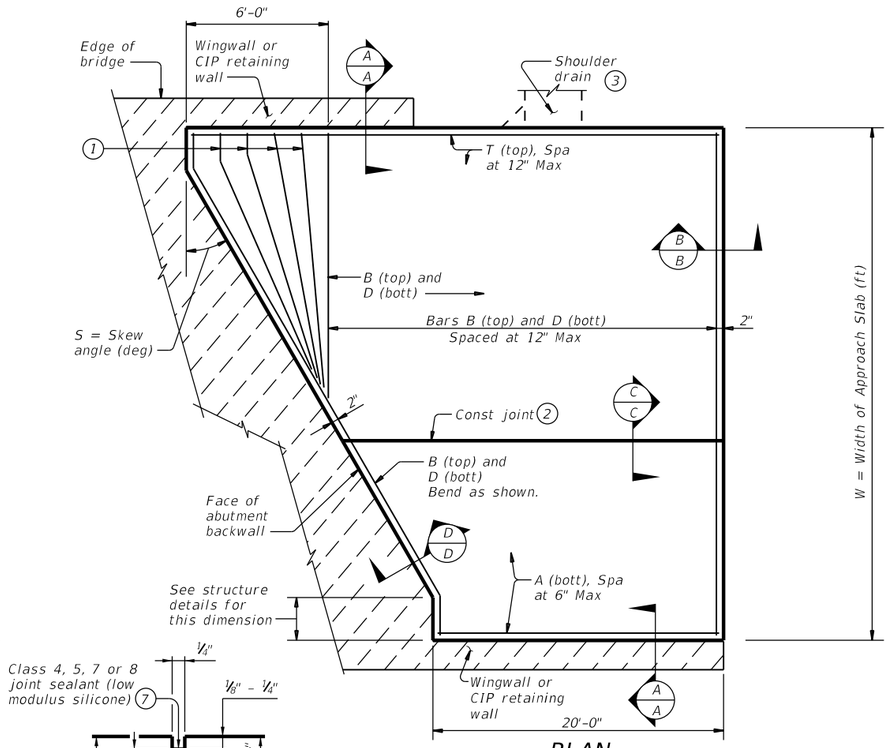


PLAN

(Showing non-skewed approach slab.)



PLAN

(Showing skewed approach slab.)

LONGITUDINAL SAW CUT JOINT DETAIL

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

APPROXIMATE QUANTITIES (4)

Reinf steel weight = 8.5 Lbs/SF of Approach Slab

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

W = Width of Approach Slab (ft)

S = Skew Angle (deg)

(1) Flare Bars B and D in this region (1'-6" Max Spa, 3" Min Spa). Minimum flared bar length = 2'-6". Bend bars as necessary.

(2) Provide longitudinal construction joints that align with longitudinal construction joints in the bridge slab with bridges built in stages. Other longitudinal construction joints must receive approval of the Engineer.

(3) See details elsewhere in plans for shoulder drain location and details.

(4) For Contractor's information only. Quantities shown are for one approach slab.

(5) Multiple piece tie bars are acceptable at longitudinal construction joints provided minimum laps shown are achieved.

(6) See details elsewhere in plans for required cross-slope.

(7) Place in accordance with Item 438.

(8) Provide backer rod that is 25% larger than joint opening and compatible with the sealant.

(9) If bridge rail is present at the wingwall or CIP retaining wall, place ½" rebonded recycled tire rubber between concrete railing and top of approach slab as shown when concrete railing projects over the approach slab.

GENERAL NOTES:

Construct approach slab in accordance with Item 422.

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

Provide Grade 60 reinforcing steel.

Provide longitudinal joints as shown on the Longitudinal Saw Cut Joint Detail at lane lines and shoulders when width between longitudinal construction joints or edges of approach slab exceeds 16 feet. Saw cut joints within 24 hours of concrete placement to a depth of 1 ½" and seal in accordance with Item 438. Alternately, provide a controlled joint consisting of 1 ½" vinyl or plastic joint former (Stress Cap, Zip Strip, Stress Lock, or equal as approved by the Engineer.)

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

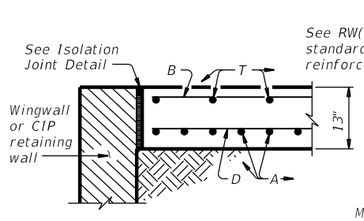
Construct the subgrade or subbase away from the bridge for a minimum distance of 100 feet prior to the approach slab, unless otherwise indicated on the plans.

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

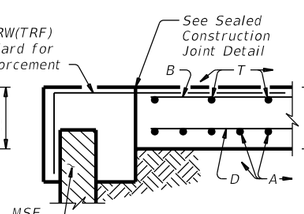
Cure for 4 days using water or membrane curing per Item 422.

All details shown herein are subsidiary to bridge approach slab.

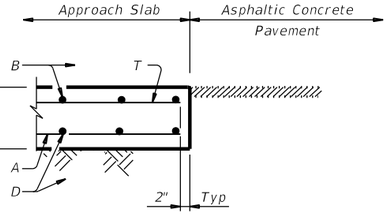
Cover dimensions are clear dimensions, unless noted otherwise.



SHOWING WINGWALL OR CIP RETAINING WALL

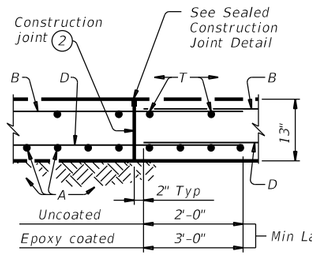


SHOWING MSE WALL

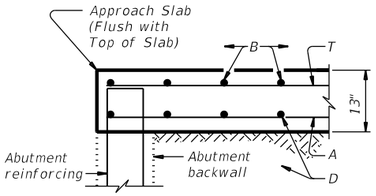


SECTION A-A

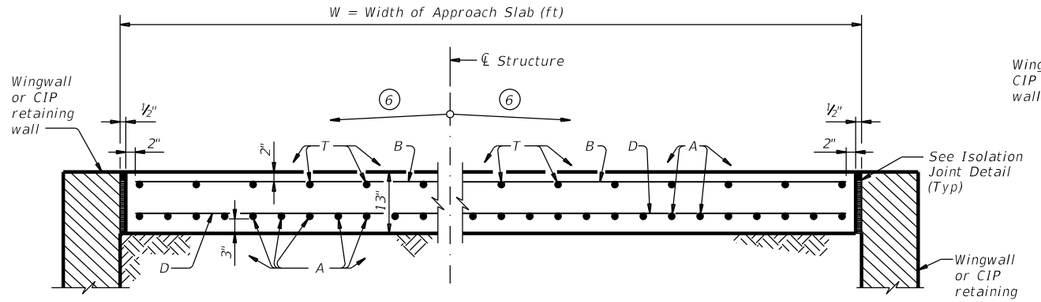
SECTION B-B



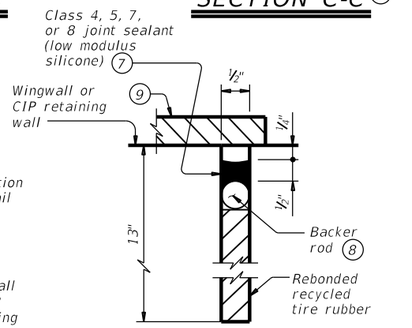
SECTION C-C (5)



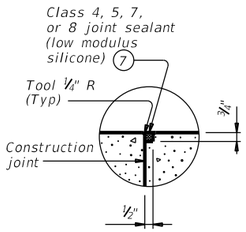
SECTION D-D



TYPICAL TRANSVERSE SECTION



ISOLATION JOINT DETAIL



SEALED CONSTRUCTION JOINT DETAIL

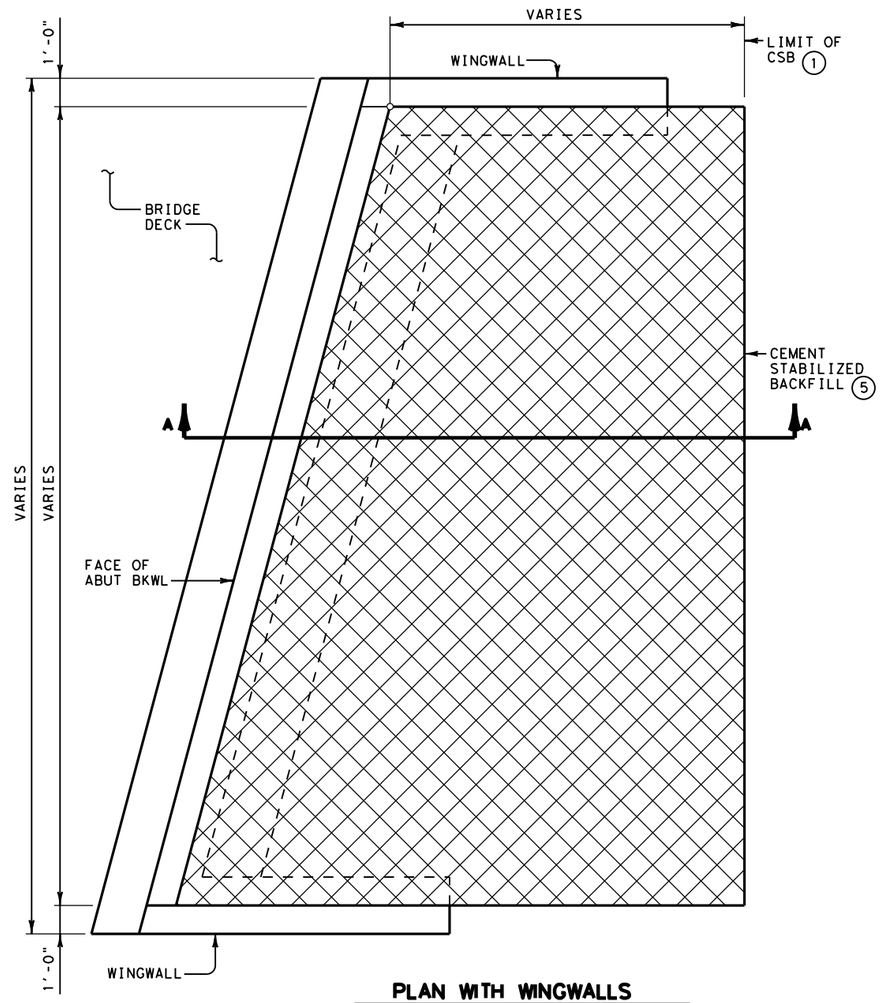
Texas Department of Transportation

Bridge Division Standard

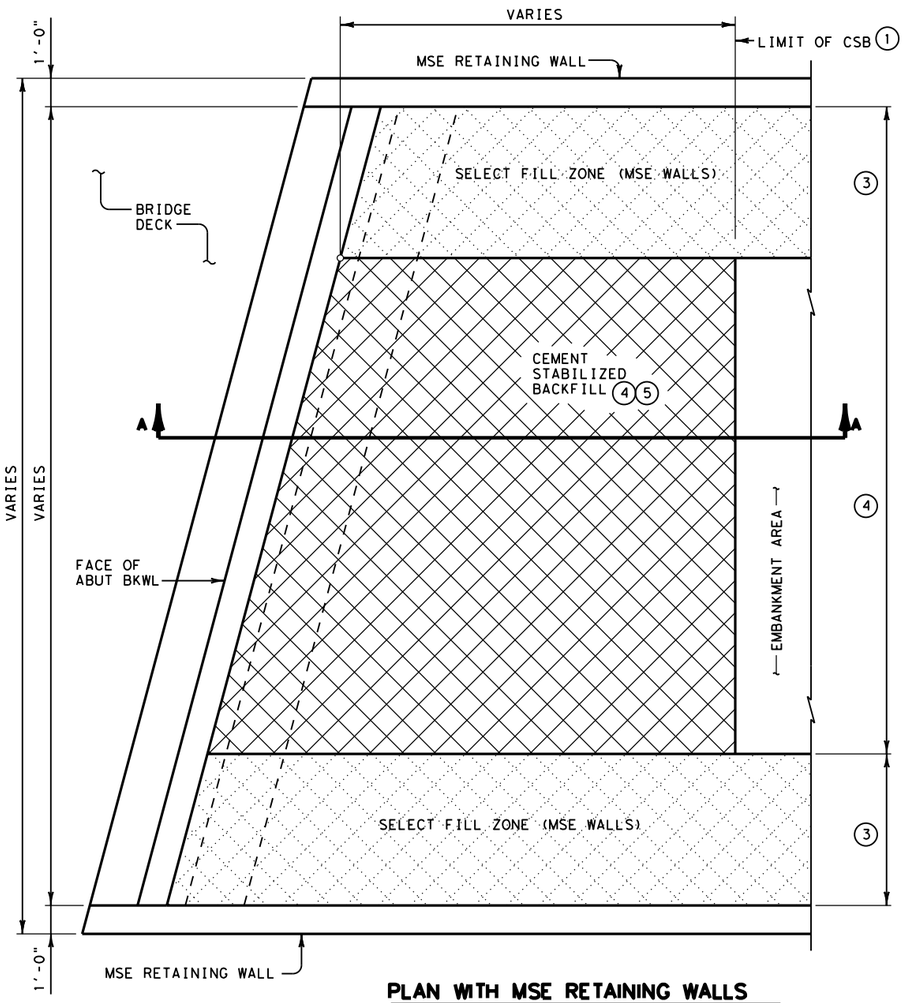
BRIDGE APPROACH SLAB
ASPHALTIC CONCRETE PAVEMENT

BAS-A

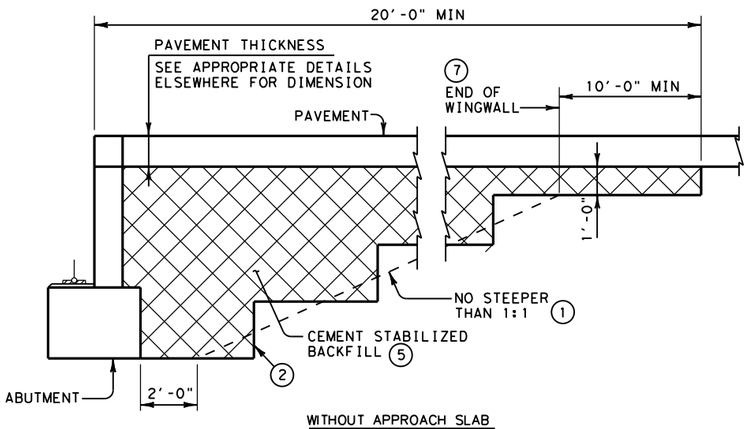
FILE:	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0467	02	020, ETC.	SH 220
02-20: Removed stress relieving pad.	DIST	COUNTY		SHEET NO.
	FTW	ERATH		140



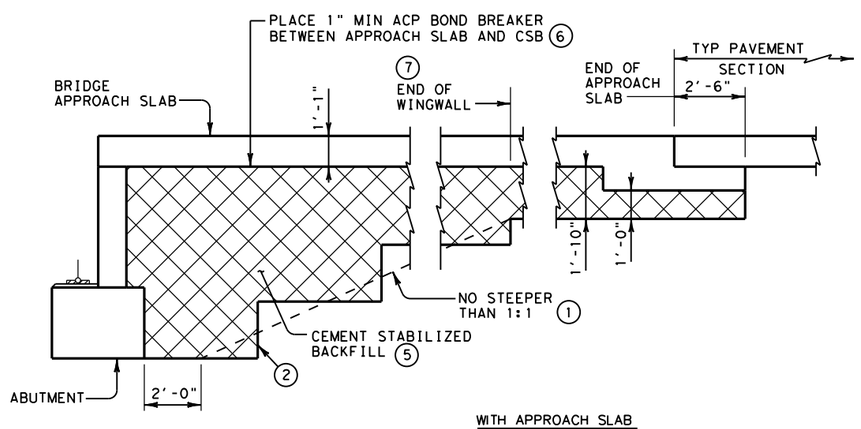
PLAN WITH WINGWALLS
CAST-IN-PLACE RETAINING WALLS SIMILAR



PLAN WITH MSE RETAINING WALLS



WITHOUT APPROACH SLAB



WITH APPROACH SLAB
(SHOWING BAS-C, BAS-A SIMILAR)

SECTION A-A

GENERAL NOTES

1. PROVIDE CEMENT STABILIZED BACKFILL (CSB) MEETING THE REQUIREMENTS OF ITEM 400, "EXCAVATION AND BACKFILL FOR STRUCTURES", TO THE LIMITS SHOWN AT BRIDGE ABUTMENTS. PLACE CSB IN ACCORDANCE WITH ITEM 400.
2. DETAILS ARE DRAWN SHOWING LEFT FORWARD SKEW. SEE BRIDGE LAYOUT FOR ACTUAL SKEW.
3. THESE DETAILS DO NOT APPLY WHEN CONCRETE BLOCK RETAINING WALLS ARE USED IN LIEU OF WINGWALLS. CONTACT THE BRIDGE DIVISION FOR MORE INFORMATION.

(1) USUAL LIMIT OF CEMENT STABILIZED BACKFILL IS AT 20' FROM BACK OF ABUTMENT BACKWALL, IF NO APPROACH SLAB, OR AT END OF SUPPORT SLAB IF APPROACH SLAB IS USED.

(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 APPORVAL FROM THE ENGINEER.

(5) IF APPROVED BY THE ENGINEER, "NON-EXCAVATABLE" FLOWABLE BACKFILL, AS DEFINED BY ITEM 401, TABLE 2, MAY BE USED AS A SUBSTITUTE FOR CEMENT STABILIZED BACKFILL, WITH THE FOLLOWING CONSTRAINTS:
   a. IF FLOWABLE BACKFILL IS TO BE PLACED OVER MSE BACKFILL, PLACE A FILTER FABRIC OVER THE MSE BACKFILL; AND
   b. PLACE FLOWABLE FILL IN LIFTS NOT EXCEEDING 2 FEET IN DEPTH; PLACE EACH SUCCESSIVE LIFT WHEN THE PREVIOUS LIFT HAS STIFFENED/HARDENED (HAS LOST ITS FLOWABILITY).
   c. NO ADJUSTMENT IN PAYMENT WILL BE MADE FOR SUBSTITUTION OF FLOWABLE FILL IN LIEU OF CEMENT STABILIZED BACKFILL.

(6) OTHER MATERIALS MAY BE USED AS A BOND BREAKER IF PERMITTED BY THE ENGINEER. 2 LAYERS OF 30 LB ROOFING FELT OR 2 LAYERS OF HEAVY MIL POLYETHYLENE SHEETING ARE EXAMPLES. BOND BREAKER WILL NOT BE PAID FOR DIRECTLY, BUT WILL BE SUBSIDIARY TO THE VARIOUS BID ITEMS.

(7) 10'-0" FROM BACK OF ABUTMENT BACKWALL, IF NO WINGWALLS.

Texas Department of Transportation

Fort Worth District Standard

CEMENT STABILIZED ABUTMENT BACKFILL BRIDGE ABUTMENT

CSAB (FTW)

ORIGINAL DRAWING: 05/2019	csab-ftw.dgn	PROJECT NO.			SHEET NO.
DATE	REVISIONS				141
05/2019	NEW STANDARD	STATE	STATE DIST. NO.	COUNTY	
11/2020	REVISE NOTES; ELIMINATE SKEWED END.	TEXAS	FTW	ERATH	
		CONT.	SECT.	JOB	HIGHWAY NO.
		0467	02	02, ETC	SH 220

http://www.dot.state.tx.us/ftw/specinfo/standard.htm
7/11/2024 10:28:36 AM
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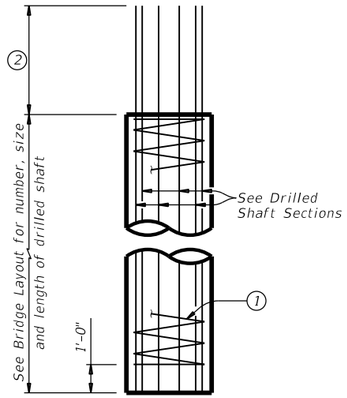
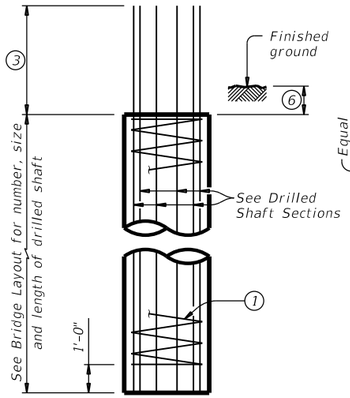
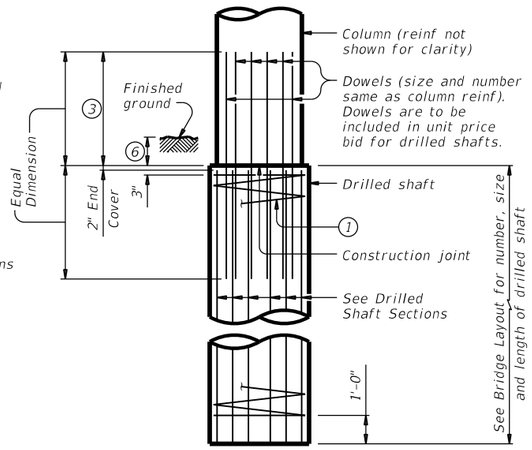
DATE:
FILE:



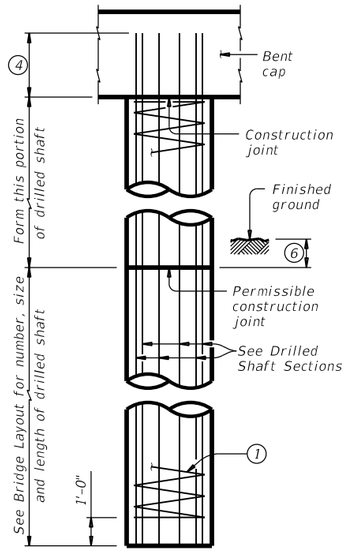
ABUTMENTS, WINGWALLS AND MULTI-DRILLED SHAFT FOOTINGS



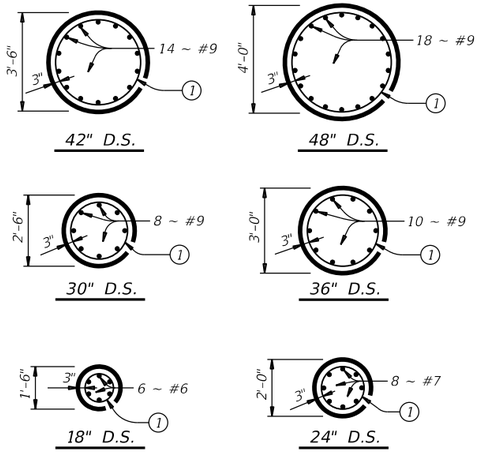
INTERIOR BENTS DRILLED SHAFT DIA EQUAL TO COLUMN DIA



INTERIOR BENTS DRILLED SHAFT DIA GREATER THAN COLUMN DIA



OPTIONAL INTERIOR BENT DRILLED SHAFT DETAIL (5)

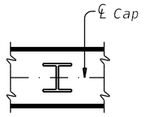


DRILLED SHAFT SECTIONS

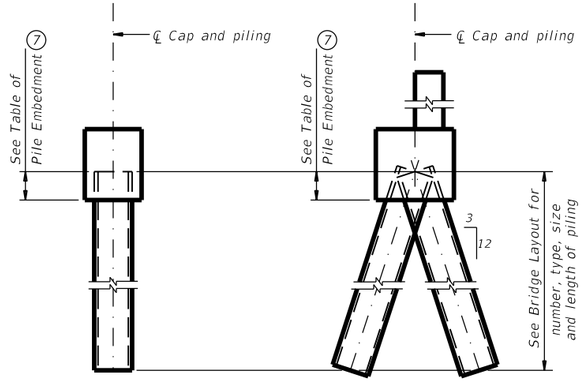
DRILLED SHAFT DETAILS

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

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



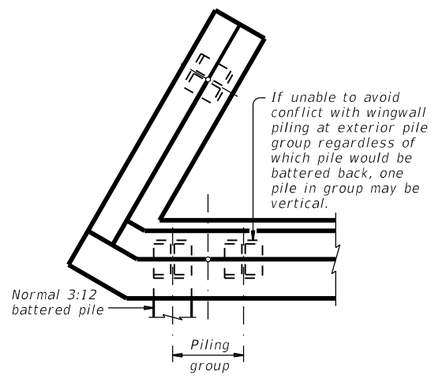
ORIENTATION OF STEEL H-PILING



VERTICAL PILE BATTERED PILE

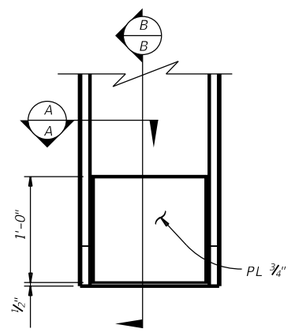
PILING DETAILS

(Concrete or steel H)

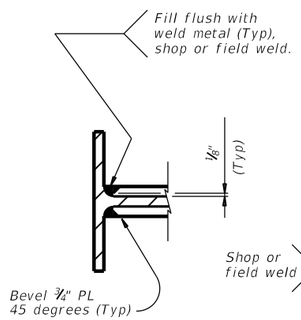


DETAIL "A"

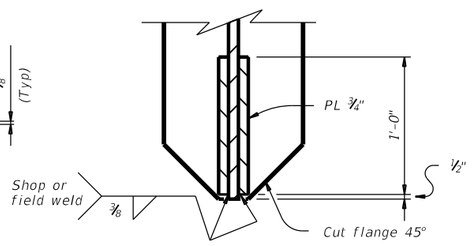
(Showing plan view of a 30° skewed abutment)



ELEVATION



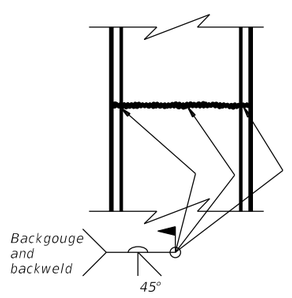
SECTION A-A

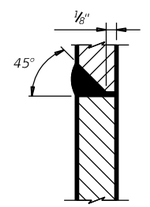


SECTION B-B

STEEL H-PILE TIP REINFORCEMENT

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





SECTION THRU FLANGE OR WEB

STEEL H-PILE SPLICE DETAIL

Use when required.

(1) #3 spiral at 6" pitch (one and a half flat turns top and bottom).

(2) Min extension into supported element:
#6 Bars = 1'-11"
#7 Bars = 2'-0"
#9 Bars = 2'-3"

(3) Min lap with column reinf:
#7 Bars = 2'-11"
#9 Bars = 3'-9"
#11 Bars = 4'-8"

(4) Min extension into supported element:
#6 Bars = 1'-11"
#7 Bars = 2'-3"
#9 Bars = 2'-9"

(5) Drilled shafts may extend to the bottom of bent caps for "H" heights of 6 ft and less (as shown on the Bridge Layout), if approved. This option can only be used when the drilled shaft diameter equals the column diameter. Obtain approval of the forming method above the ground line prior to construction. No adjustments in payment will be made if this option is used.

(6) 1'-0" Min, unless shown otherwise on plans.

(7) Or as shown on plans.

SHEET 1 OF 2

Texas Department of Transportation

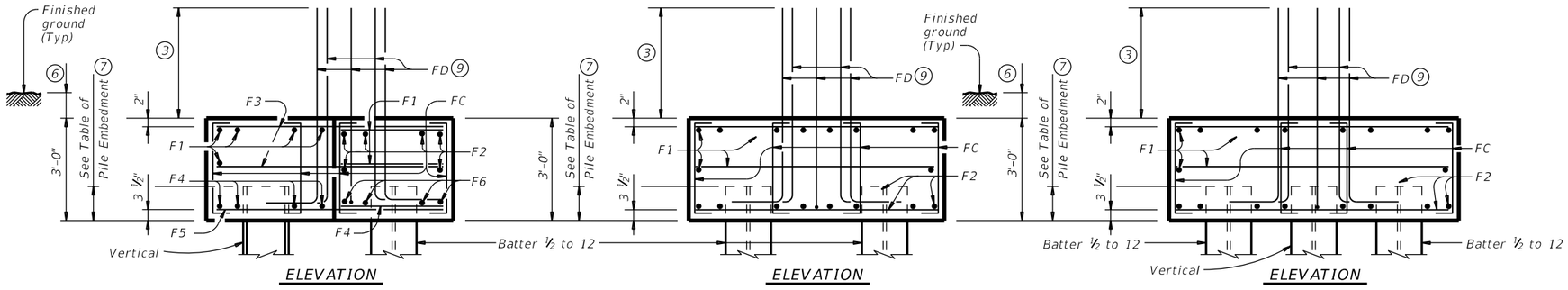
Bridge Division Standard

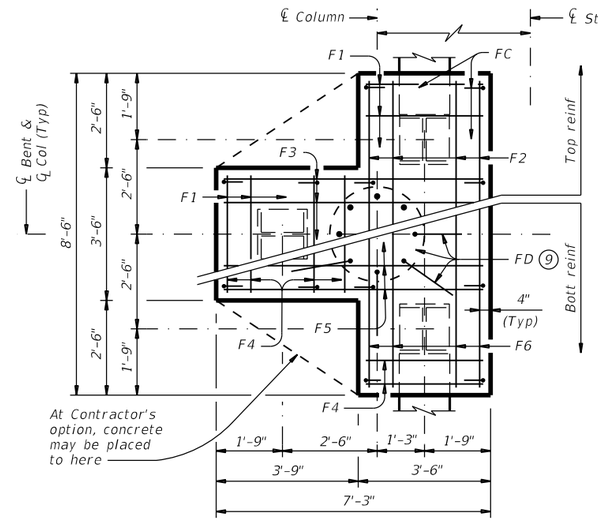
COMMON FOUNDATION DETAILS

FD

FILE:	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0467	02	020, ETC.	SH 220
01-20: Added #11 bars to the FD bars.	DIST	COUNTY		SHEET NO.
	FTW	ERATH		142

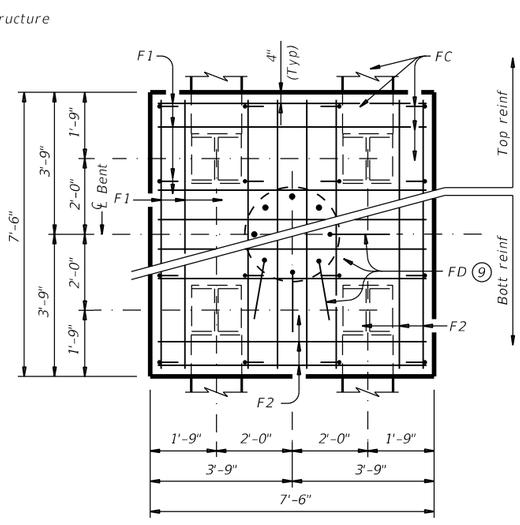
DATE:
FILE:





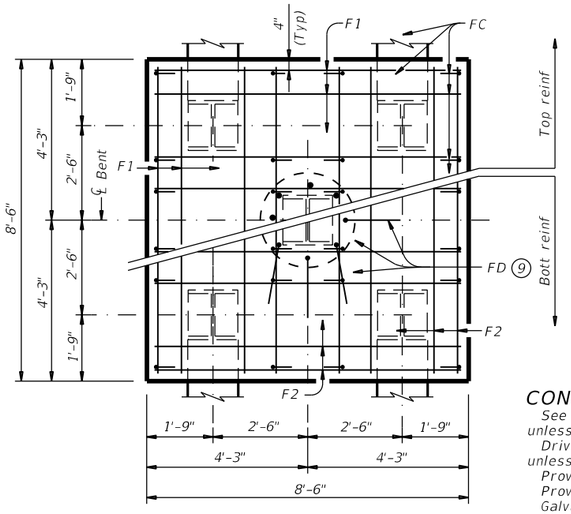
THREE PILE FOOTING (8)

For 36" Dia and smaller columns.



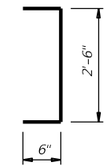
FOUR PILE FOOTING (8)

For 42" Dia and smaller columns.

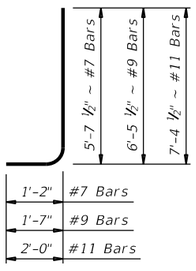


FIVE PILE FOOTING (8)

For 42" Dia and smaller columns.



BARS FC



BARS FD (9)

(3) Min lap with column reinforcing:
#7 Bars = 2'-11"
#9 Bars = 3'-9"
#11 Bars = 4'-8"

(6) 1'-0" Min, unless shown otherwise on plans.

(7) Or as shown on plans.

(8) See Bridge Layout for type, size and length of piling.

(9) Number and size of FD bars must match column reinforcing. Tie FD bars to the top of the bottom reinforcing mat.

(10) Adjust FD quantity, size and weight as needed to match column reinforcing.

TABLE OF FOOTING QUANTITIES FOR 30" COLUMNS

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

ONE 4 PILE FOOTING				
Bar	No.	Size	Length	Weight
F1	20	#4	7'- 2"	96
F2	16	#8	7'- 2"	306
FC	16	#4	3'- 6"	37
FD (10)	8	#9	8'- 1"	220
Reinforcing Steel			Lb	659
Class "C" Concrete			CY	6.3

ONE 5 PILE FOOTING				
Bar	No.	Size	Length	Weight
F1	20	#4	8'- 2"	109
F2	16	#9	8'- 2"	444
FC	24	#4	3'- 6"	56
FD (10)	8	#9	8'- 1"	220
Reinforcing Steel			Lb	829
Class "C" Concrete			CY	8.0

CONSTRUCTION NOTES:

See Bridge Layout for foundation type required. Use these foundation details unless shown otherwise.

Drive piling under abutment wingwalls to a minimum resistance of 10 Tons/Pile unless shown otherwise.

Provide Class C Concrete (f'c = 3,600 psi), unless shown otherwise.

Provide Grade 60 reinforcing steel.

Galvanize reinforcing if shown elsewhere in the plans.

Provide bar laps for drilled shaft reinforcing, where required, as follows:

Uncoated or galvanized (#6) ~ 2'-6"
Uncoated or galvanized (#7) ~ 2'-11"
Uncoated or galvanized (#9) ~ 3'-9"

GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications.

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

DESIGNER NOTES:

Do not use the drilled shaft details shown on this standard for retaining wall, noise wall, barrier, or sign foundations without structural evaluation.

Do not use the footings shown on this standard in direct contact with salt water or exposed to salt water spray.

Maximum allowable pile loads for the footings shown are:

72 Tons/Pile with 24" Dia Columns
80 Tons/Pile with 30" Dia Columns
100 Tons/Pile with 36" Dia Columns
120 Tons/Pile with 42" Dia Columns

Texas Department of Transportation

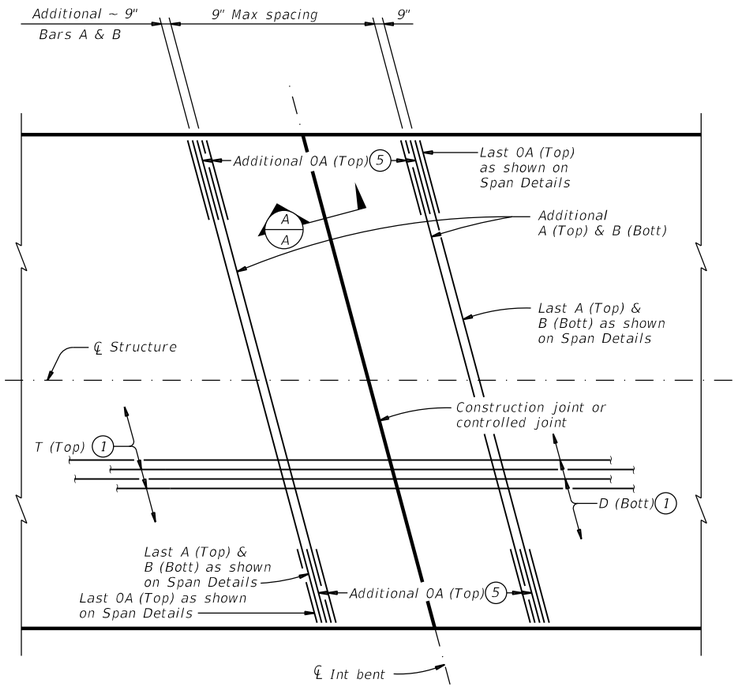
Bridge Division Standard

COMMON FOUNDATION DETAILS

FD

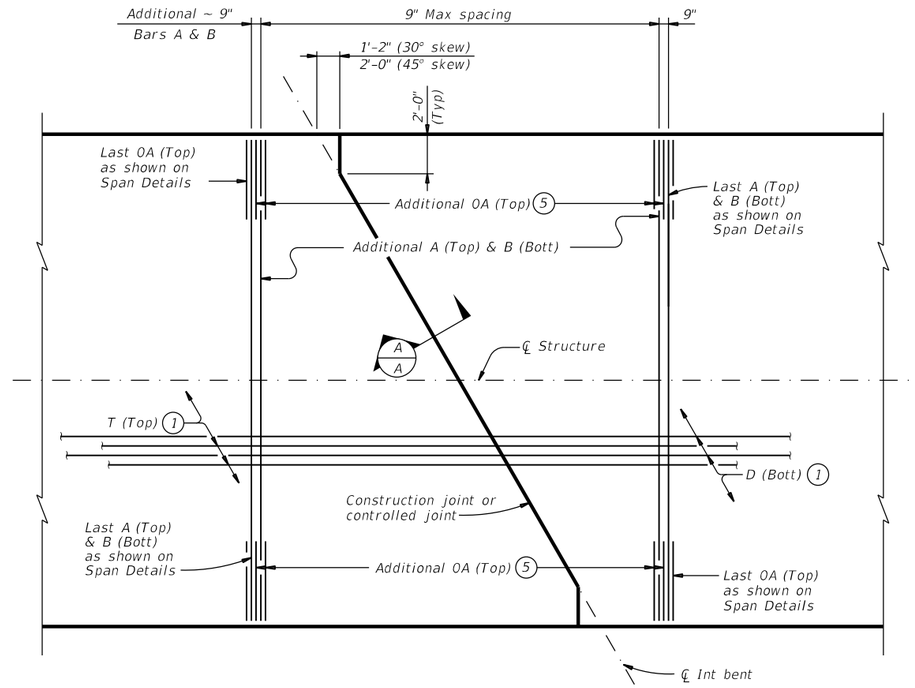
FILE:	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0467	02	020, ETC.	SH 220
01-20: Added #11 bars to the FD bars.	DIST	COUNTY		SHEET NO.
	FTW	ERATH		143

DATE:
FILE:



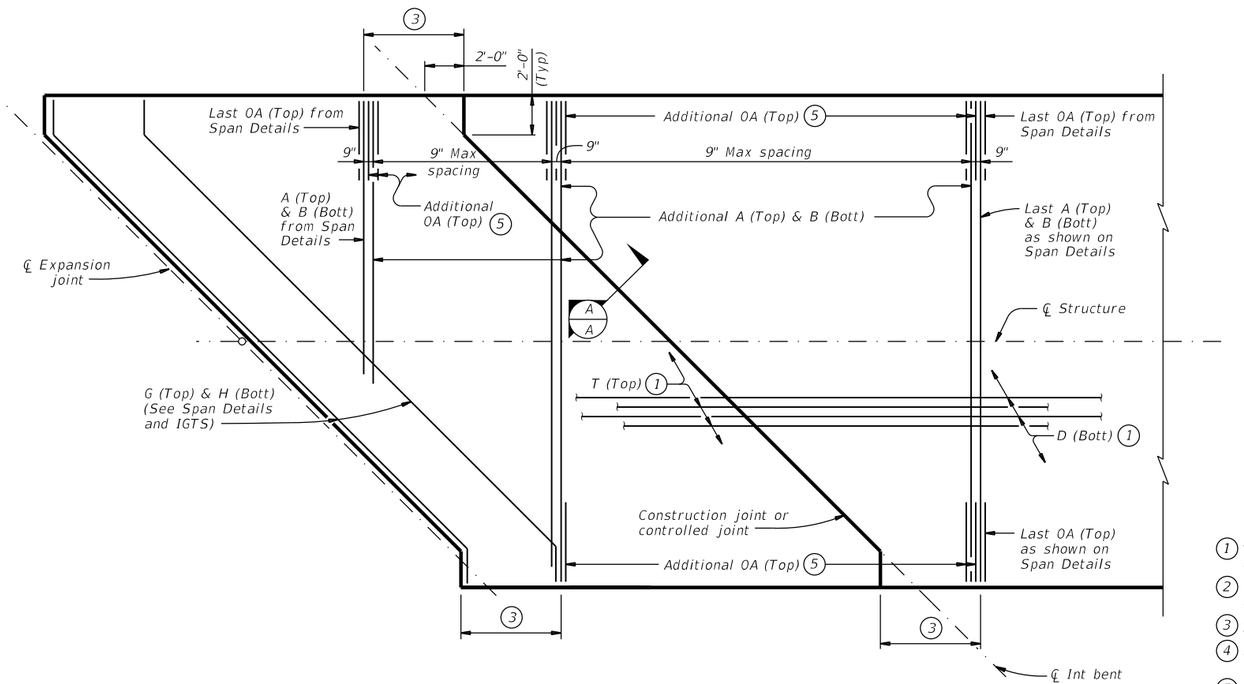
PLAN FOR 0° OR 15° SKEW

(Showing 15° skew)



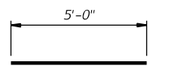
PLAN FOR 30° OR 45° SKEW

(Showing 30° skew)

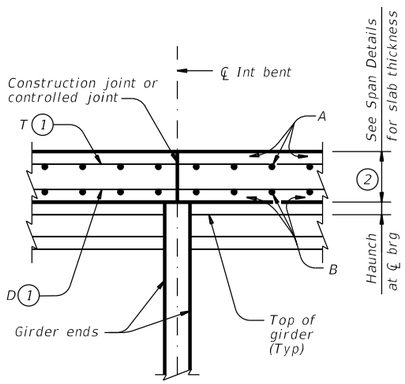


PLAN FOR 45° SKEW 4

(Showing short span condition.)



BARS OA (#5)



SECTION A-A

Bars 0A (Top) not shown for clarity.

1. Top and bottom mats must be continuous through joint.
2. Maintain a constant slab thickness over the bent.
3. 5'-4" as shown on Span Details.
4. Use these details when no full slab width bars A and B are shown on Span Details.
5. Bars 0A (Top) at 9" Max spacing between Bars A (Top).
6. Values in table assume a temperature change of 70° F after erection when calculating thermal movement in one direction (not total).

TABLE OF (6) ALLOWABLE UNIT LENGTH

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

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

BAR TABLE

BAR	SIZE
A	#4
B	#4
D	#4
T	#4
0A	#5

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

GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications.

This standard is drawn showing right forward skew. See Bridge Layout for actual skew direction.

CONSTRUCTION NOTES:

Where multi-span units are indicated on the Bridge Layout, the thickened slab end details and reinforcement shown on IGTS standard (Bars AA, G, H, J, K, and M) and on the Span Details will be omitted where slabs are continuous over interior bents. At these locations, the slab details and reinforcement will be as shown on this sheet or on PCP standard (if using this option).

Thickened slab end reinforcement and details still apply at expansion joint locations (ends of units).

See Span Details for remainder of slab reinforcement and details.

MATERIAL NOTES:

Provide Grade 60 reinforcing steel.

Provide Class "S" concrete (f'c = 4,000 psi). Provide Class "S" (HPC) if shown elsewhere on the plans.

Provide bar laps, where required, as follows:
Uncoated ~ #4 = 1'-7"
Epoxy Coated ~ #4 = 2'-5"

The details shown on this sheet are applicable for use only with the Prestressed Concrete I-Girder Standard Designs shown on standards IGSD-24, IGSD-28, IGSD-30, IGSD-32, IGSD-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:	DN: JMH	CK: TxDOT	DW: JTR	CK: TxDOT
©TxDOT August 2017	CONT	SECT	JOB	HIGHWAY
REVISIONS 10-19: Added bubble note 6. 01-23: Added 34' Rdwy.	0467	02	020, ETC.	SH 220
	DIST	COUNTY		SHEET NO.
	FTW	ERATH		144

DATE:
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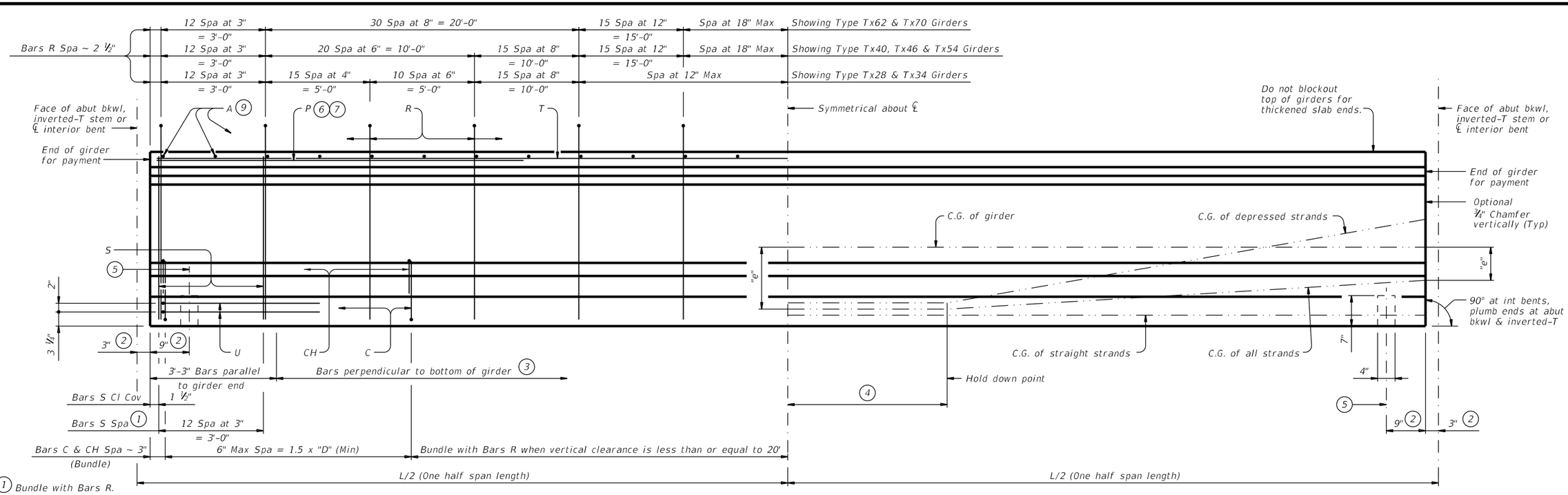


(1) Bundle with Bars R.

(2) Measured along ℄ Girder at interior bents; perpendicular to abutment bkwl or inverted-T stem.

(3) The average of the top and bottom spacing of Bars R cannot exceed the required spacing.

(4) L/20, but not less than 5'-0" (-0,+2').

(5) ℄ 4" x 1 ½" Vertical Slotted Hole at doweled girder end [labeled (D) on Bridge Layout]. Required for outside girder only or as shown on substructure details. Anchorage holes may be tapered (4 ¾" x 1 ⅝") at base. If holes are formed with sheet metal, forms may be left in place.

GIRDER ELEVATION

(6) Bars P (#6 x 15'-0") required in Tx62 and Tx70 girders. At the fabricator's option bars larger than #6 may be used. When L is less than 50 ft, Bars P are to be the same length as Bars T.

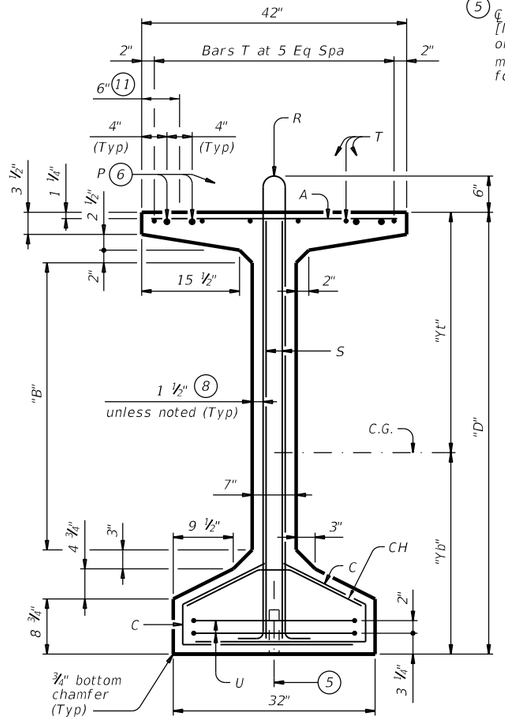
(7) Bars P (#6 x 15'-0") are only required in Tx28, Tx34, Tx40, Tx46, and Tx54 girders when "e" at girder ends exceeds 0.25 x "D". At the fabricator's option bars larger than #6 may be used. When L is less than 50 ft, Bars P are to be the same length as Bars T.

(8) 1 ⅜" Clear Cover to Bars S.

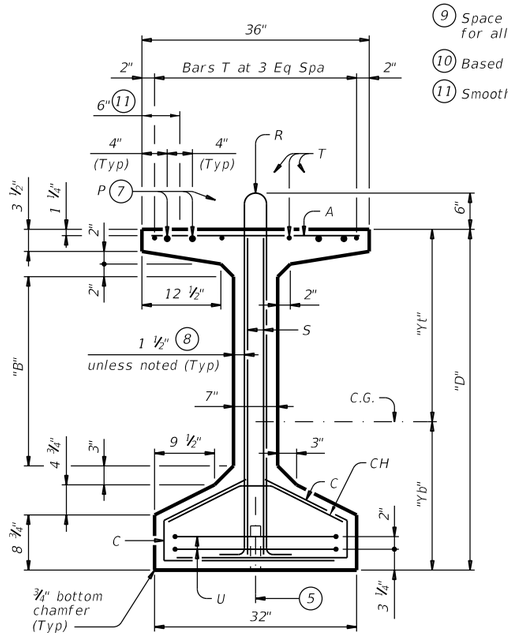
(9) Space Bars A at 6" Max for girders requiring overhang bracket hangers. Space at 12" Max for all other girders. Tie to Bars R as necessary. See standard IGMS for "Deck Forming Notes".

(10) Based on 155 pcf total weight of concrete and reinforcing steel.

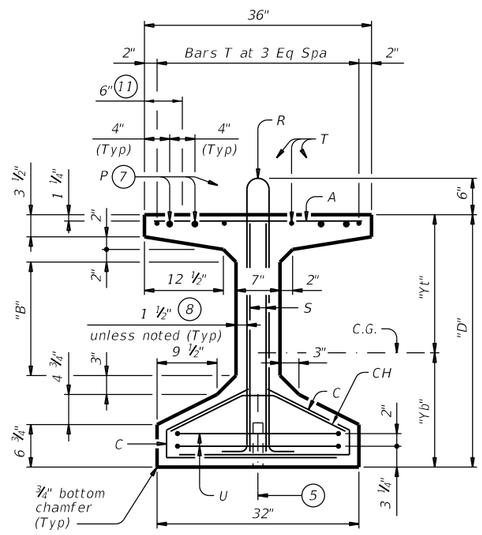
(11) Smooth trowel finish on the slab overhang side of exterior girder.



TYPE Tx62 & Tx70



TYPE Tx46 & Tx54



TYPE Tx28, Tx34 & Tx40

GIRDER DIMENSIONS AND SECTION PROPERTIES

Girder Type	"D" (in.)	"B" (in.)	"Yt" (in.)	"Yb" (in.)	Area (in.²)	"Ix" (in.⁴)	"Iy" (in.⁴)	Weight (10) (plf)
Tx28	28	6	15.02	12.98	585	52,772	40,559	630
Tx34	34	12	18.49	15.51	627	88,355	40,731	675
Tx40	40	18	21.90	18.10	669	134,990	40,902	720
Tx46	46	22	25.90	20.10	761	198,089	46,478	819
Tx54	54	30	30.49	23.51	817	299,740	46,707	880
Tx62	62	37 ½"	33.72	28.28	910	463,072	57,351	980
Tx70	70	45 ½"	38.09	31.91	966	628,747	57,579	1,040

GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications.
Provide Class H concrete.
Provide Grade 60 reinforcing steel.
An equal area of deformed Welded Wire Reinforcement (WWR) (ASTM A1064) may be substituted for Bars A, C, R or T unless otherwise noted.
It is permissible for bars or strands to come in contact with materials used in forming anchor holes.
When vertical clearance of the span is less than or equal to 20', provide additional Bars C and CH in every girder of that span.

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

HL93 LOADING

SHEET 1 OF 2

Texas Department of Transportation

Bridge Division Standard

PRESTRESSED CONCRETE I-GIRDER DETAILS

IGD

FILE:	DN: TxDOT	CK: JMH	DW: JTR	CK: TAR
©TxDOT August 2017	CONT	SECT	JOB	HIGHWAY
REVISIONS 10-19: Added Bars C and CH full length for VC<= 20' 3-23: Clarified C and CH requirement	0467	02	020, ETC.	SH 220
	DIST	COUNTY		SHEET NO.
	FTW	ERATH		145

DATE:
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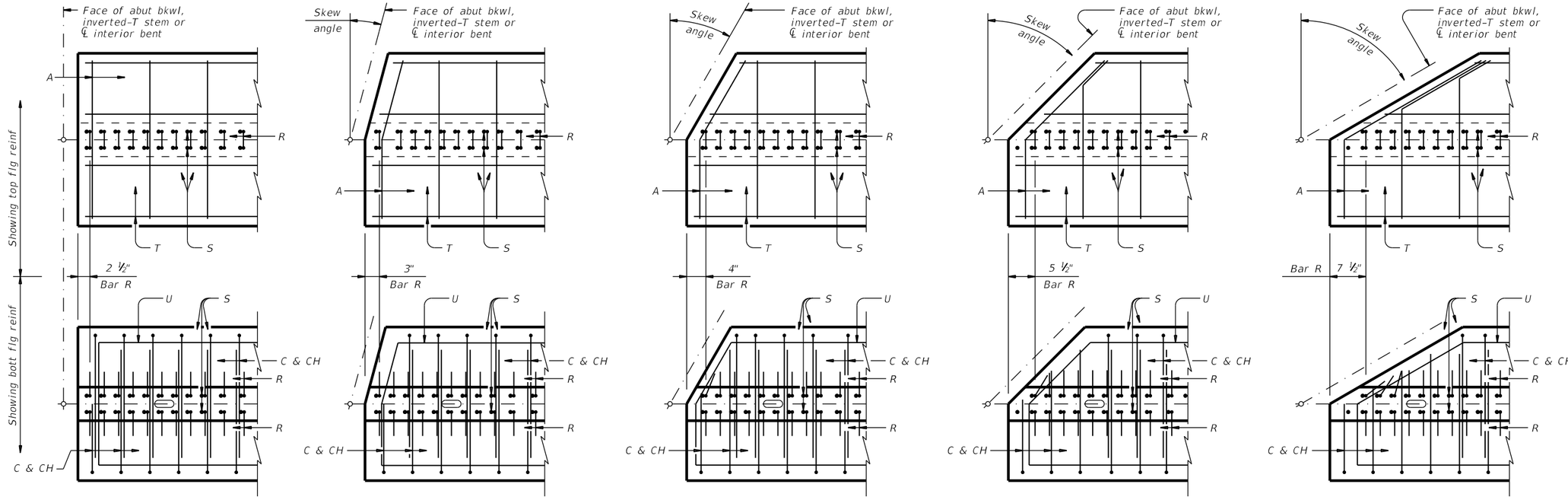
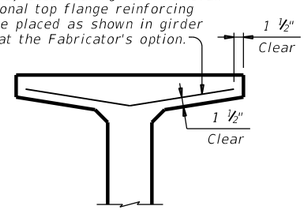
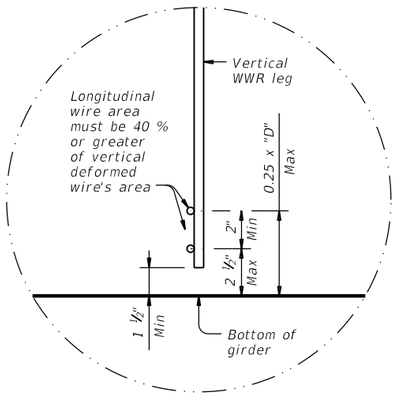


PLAN OF GIRDER ENDS (12)

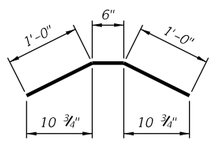
To control top flange cracking that may occur during form removal, additional top flange reinforcing may be placed as shown in girder ends at the Fabricator's option.



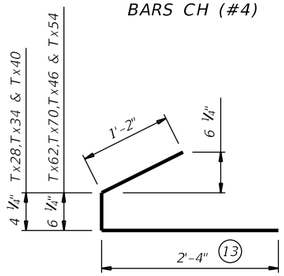
OPTIONAL TOP FLANGE REINFORCING DETAIL



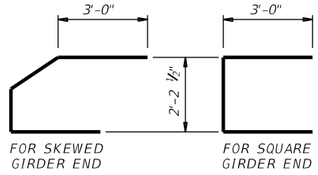
OPTIONAL WELDED WIRE REINFORCEMENT (WWR) DETAIL



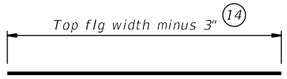
BARS CH (#4)



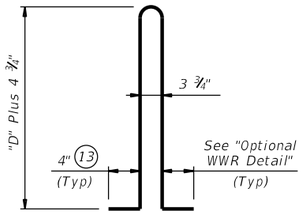
BARS C (#4)



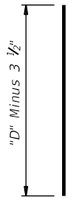
BARS U (#5)



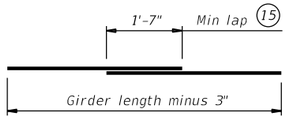
BARS A (#3)



BARS R (#4) (16)



BARS S (#6)



BARS T (#4)

(12) Reinforcing patterns shown are provided as guides to determine reinforcement placement in skewed ends. Place Bars S as close to girder end as cover requirements permit, which may prevent them to be bundled with Bars R.

(13) Bars may be cut or bent at skewed end as required.

(14) Increase as necessary for bars at skewed end.

(15) No portion of bar less than 10 ft.

(16) For Welded Wire Reinforcement (WWR) option, area of Bars R may be reduced in proportion to the increase in reinforcement yield strength over 60 ksi. Yield strength of WWR is limited to 75 ksi.

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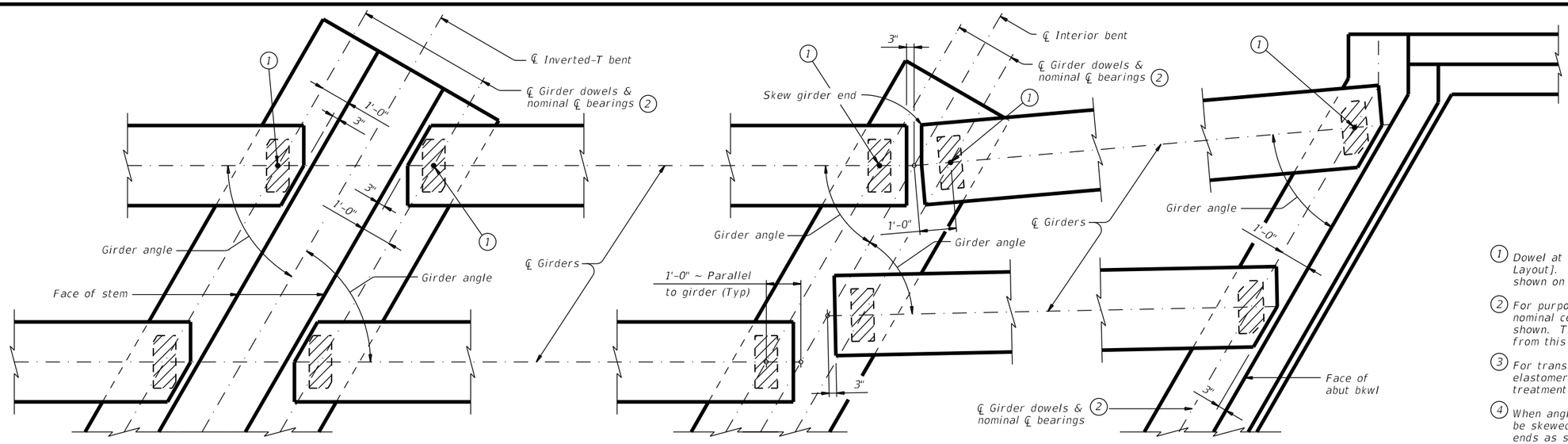
PRESTRESSED CONCRETE I-GIRDER DETAILS

IGD

FILE:	DN: TxDOT	CK: JMH	DW: JTR	CK: TAR
©TxDOT August 2017	CONT	SECT	JOB	HIGHWAY
REVISIONS 10-19: Added Bars C and CH full length for VC<= 20' 3-23: Clarified C and CH requirement	0467	02	020, ETC.	SH 220
	DIST	COUNTY		SHEET NO.
	FTW	ERATH		146

DATE:
FILE:



AT INVERTED-T BENT W/SKEW

AT CONVENTIONAL INTERIOR BENT W/SKEW

AT ABUTMENT W/SKEW (3)

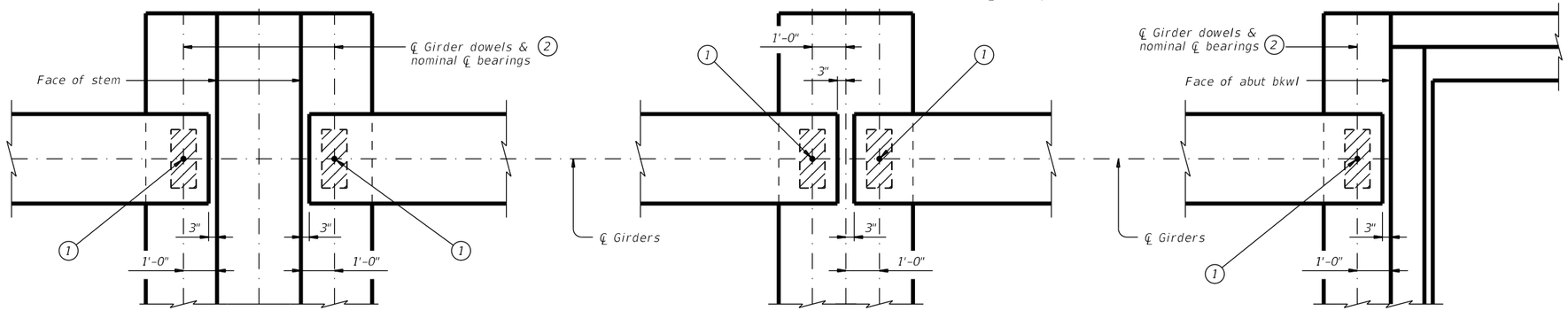
(1) Dowel at doweled girder end [labeled (D) on Bridge Layout]. Required for outside girder only or as shown on substructure details.

(2) For purposes of computing bearing seat elevations, nominal centerline of bearing must be defined as shown. The actual center of bearing pad may vary from this line.

(3) For transition bents with backwall, girder and elastomeric bearings must receive the same treatment as shown for abutments.

(4) When angle exceeds 0°, one or both girders ends must be skewed to maintain the clearance between girder ends as shown in view.

(5) See Table of Bearing Pad Dimensions for bearing size. Girder end skew angles in Table not applicable for this situation. Table reflects girder conflicts of this type on radial bents only.



AT INVERTED-T BENT

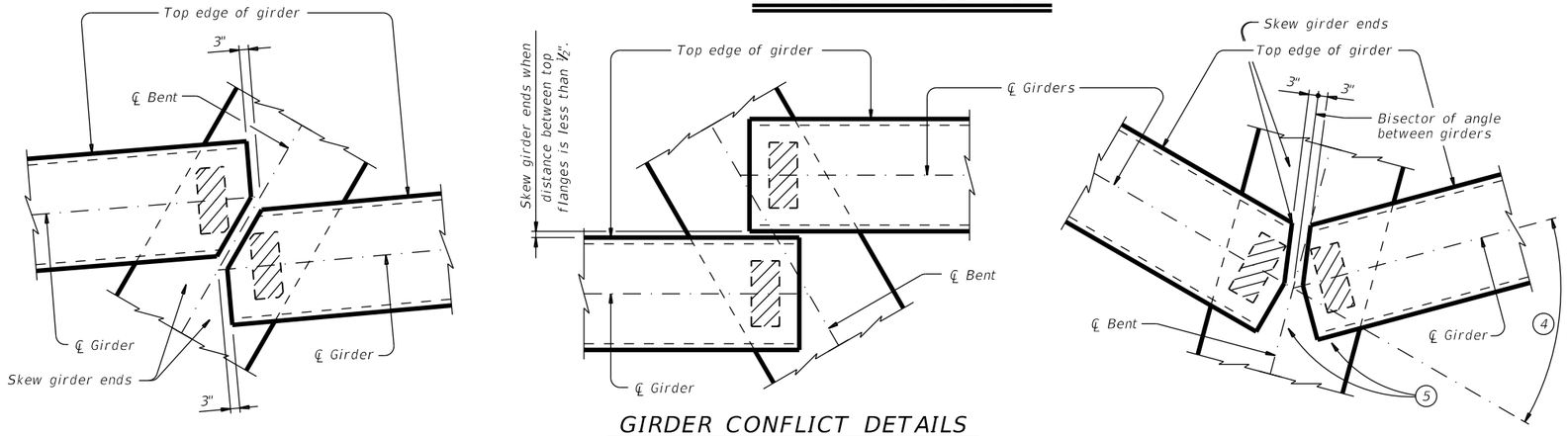
AT CONVENTIONAL INTERIOR BENT

AT ABUTMENT (3)

GIRDER END DETAILS

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 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:	DN: AEE	CK: JMH	DW: JTR	CK: TxDOT
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	0467	02	020, ETC.	SH 220
	DIST	COUNTY		SHEET NO.
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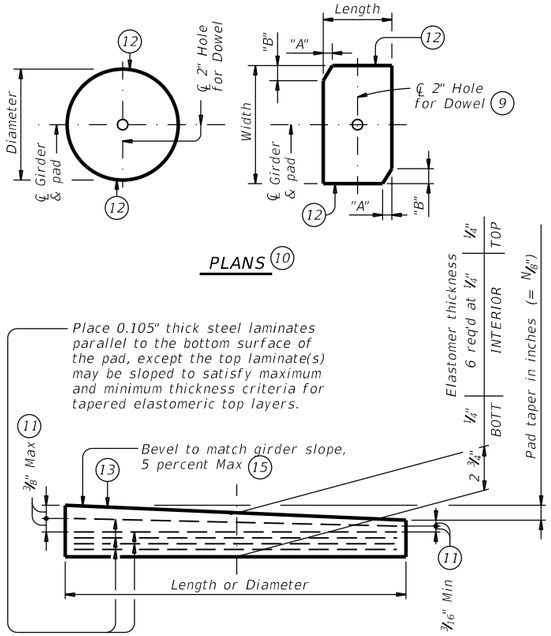
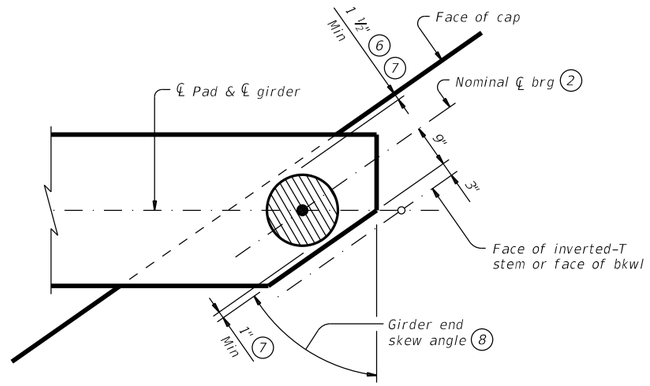
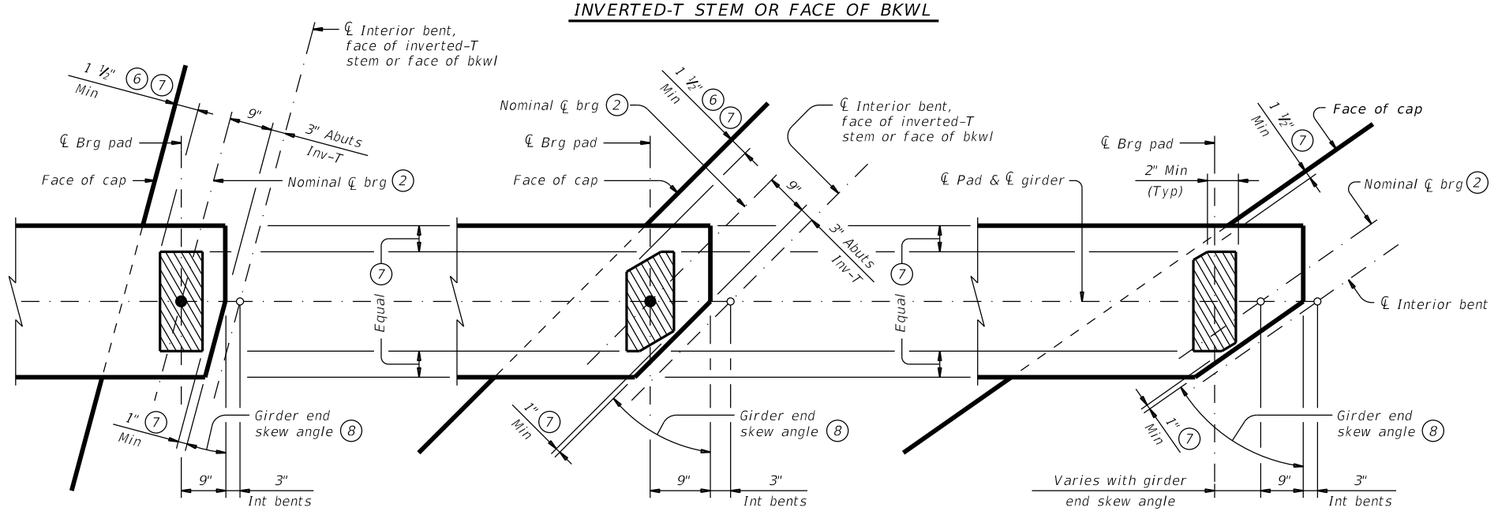


LAMINATED ELASTOMERIC BEARING PAD

(50 DUROMETER)



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



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

SKEWED GIRDER ENDS AT CONVENTIONAL INTERIOR BENTS (16)

(NO GIRDER DOWELS)

BEARING PAD PLACEMENT DIAGRAMS

TABLE OF MINIMUM SUBSTRUCTURE DIMENSIONS (14)

Girder Type	Abutments: Face of Bkwl to Face of Cap	Int Bents: Overall Cap Width	Inv-T Bents: Corbel Width
Tx28 thru Tx54	1'-9"	3'-6"	1'-10 ½"
Tx62 & Tx70	2'-0"	4'-0"	2'-1 ½"

TABLE OF BEARING PAD DIMENSIONS

Bent Type	Girder Type	Bearing Type (13)	Girder End Skew Angle Range	Pad Size Lgth x Wdth	Pad Clip Dimensions "A"	Pad Clip Dimensions "B"
ABUTMENTS, INVERTED-T AND TRANSITION BENTS WITH BACKWALLS	Tx28,Tx34, Tx40,Tx46 & Tx54	G-1-"N"	0° thru 21°	8" x 21"	---	---
		G-2-"N"	21°+ thru 30°	8" x 21"	1 ½"	2 ½"
		G-3-"N"	30°+ thru 45°	9" x 21"	4 ½"	4 ½"
		G-4-"N"	45°+ thru 60°	15" Dia	---	---
	Tx62 & Tx70	G-5-"N"	0° thru 21°	9" x 21"	---	---
		G-6-"N"	21°+ thru 30°	9" x 21"	1 ½"	2 ½"
		G-7-"N"	30°+ thru 45°	10" x 21"	4 ½"	4 ½"
		G-8-"N"	45°+ thru 60°	10" x 21"	7 ¼"	4 ¼"
CONVENTIONAL INTERIOR BENTS	Tx28,Tx34, Tx40,Tx46 & Tx54	---	---	---	---	---
		---	---	---	---	---
		G-1-"N"	0° thru 60°	8" x 21"	---	---
	Tx62 & Tx70	G-5-"N"	0° thru 60°	9" x 21"	---	---
CONVENTIONAL INTERIOR BENTS WITH SKEWED GIRDER ENDS (GIRDER CONFLICTS) (16)	Tx28,Tx34, Tx40,Tx46 & Tx54	G-1-"N"	0° thru 18°	8" x 21"	---	---
		G-2-"N"	18°+ thru 30°	8" x 21"	1 ½"	2 ½"
		G-9-"N"	30°+ thru 45°	8" x 21"	3"	3"
		G-10-"N"	45°+ thru 60°	9" x 21"	6"	3 ½"
	Tx62 & Tx70	G-5-"N"	0° thru 18°	9" x 21"	---	---
		G-5-"N"	18°+ thru 30°	9" x 21"	---	---
		G-11-"N"	30°+ thru 45°	9" x 21"	1 ½"	1 ½"
		G-12-"N"	45°+ thru 60°	9" x 21"	3"	1 ¾"

(2) For purposes of computing bearing seat elevations, nominal centerline of bearing must be defined as shown. The actual center of bearing pad may vary from this line.

(6) 3" for inverted-T.

(7) Place centerline pad as near nominal centerline bearing as possible between limits shown.

(8) Girder end skew angle is equal to 90° minus the girder angle except at some conflicting girders.

(9) Provide 2" dia hole only at locations required. See Substructure details for location.

(10) See Table of Bearing Pad Dimensions for dimensions.

(11) Maximum and minimum layer thicknesses shown are for elastomer only, on tapered layers.

(12) Locate Permanent Mark here.

(13) Indicate BEARING TYPE on all pads. For tapered pads, locate BEARING TYPE on the high side. The Fabricator must include the value of "N" (amount of taper in ⅛" increments) in this mark.
Examples: N=0, (for 0" taper)
N=1, (for ⅛" taper)
N=2, (for ¼" taper)
(etc.)
Fabricated pad top surface slope must not vary from plan girder slope by more than $\left(\frac{0.0625"}{\text{Length or Dia}}\right)$ IN/IN.

(14) Substructure dimensions must satisfy the minimums provided to accommodate the elastomeric bearings shown on this standard.

(15) See sheet 3 of 3 for beveled plate use when slopes exceed 5 percent.

(16) If girder end is skewed for a girder conflict at an interior bent and a beveled sole plate is required, use bearing type for abutments at this location. Location of bearing centerline is to be set as for abutments in this case.

HL93 LOADING SHEET 2 OF 3

Texas Department of Transportation | Bridge Division Standard

ELASTOMERIC BEARING AND GIRDER END DETAILS

PRESTR CONCRETE I-GIRDERS

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	0467	02	020, ETC.	SH 220
	DIST	COUNTY		SHEET NO.
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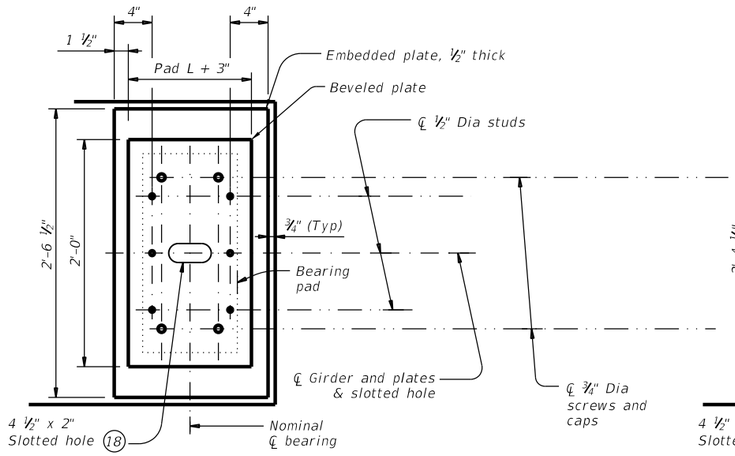
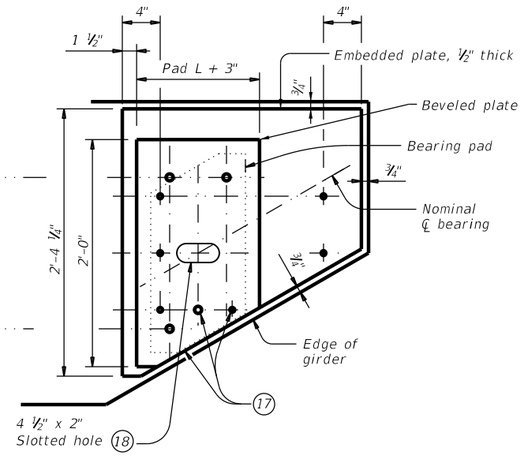
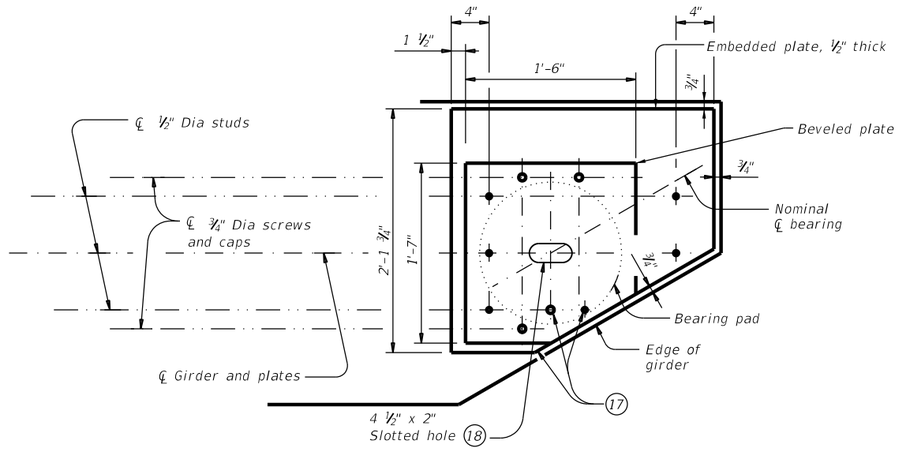


NORMAL GIRDER END
RECTANGULAR BEARING PAD

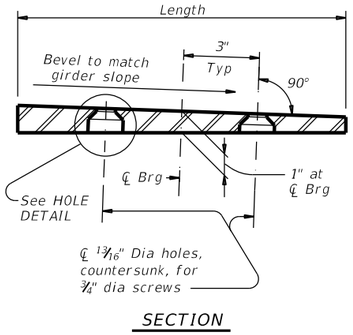


SKEWED GIRDER END
CLIPPED RECTANGULAR BEARING PAD

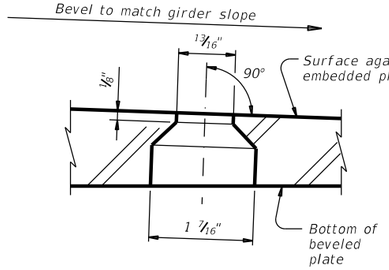


SKEWED GIRDER END
15" DIA BEARING PAD

PLAN VIEW OF SOLE PLATE DETAILS



SECTION



HOLE DETAIL

(17) Cut beveled and embedded plates to match girder end skew. Adjust location of screw and stud as shown when necessary.

(18) Slotted hole is required at doweled girder end locations.

SOLE PLATE NOTES:

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

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

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

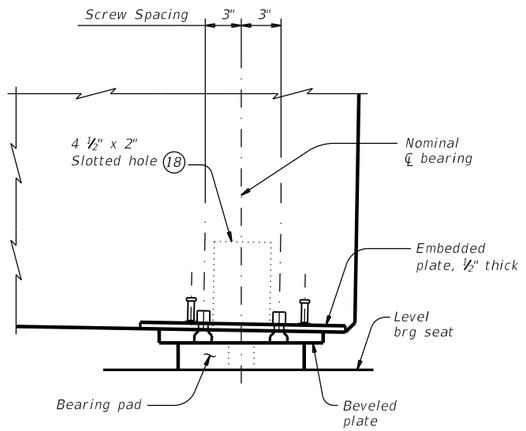
When determining if relocation of screw holes and studs are necessary for skewed girder ends, minimum clearance from screw or stud centerline to plate edge is 1.25".

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

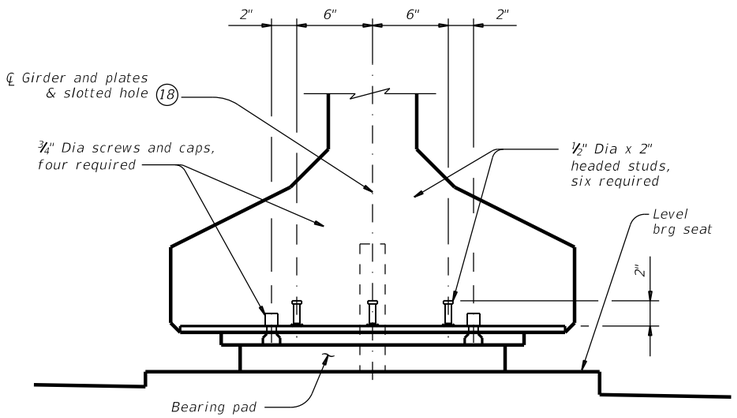
¾" Dia screws must be electroplated, socket flat head countersunk cap screws conforming to ASTM F835. Electroplating must conform to ASTM B633, SC 2, Type I. Provide screws long enough to maintain a ¾" minimum embedment into the embedded plate and galvanized cap. Provide galvanized steel caps (16 ga Min) with a nominal 1" inside diameter and deep enough to accommodate the screws, but not less than ½" deep or deeper than 1".

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

BEVELED PLATE DETAILS



SIDE ELEVATION



END ELEVATION
Showing normal girder end.

GIRDER DETAILS

HL93 LOADING SHEET 3 OF 3

Texas Department of Transportation | Bridge Division Standard

ELASTOMERIC BEARING AND GIRDER END DETAILS
PRESTR CONCRETE I-GIRDERS

IGEB

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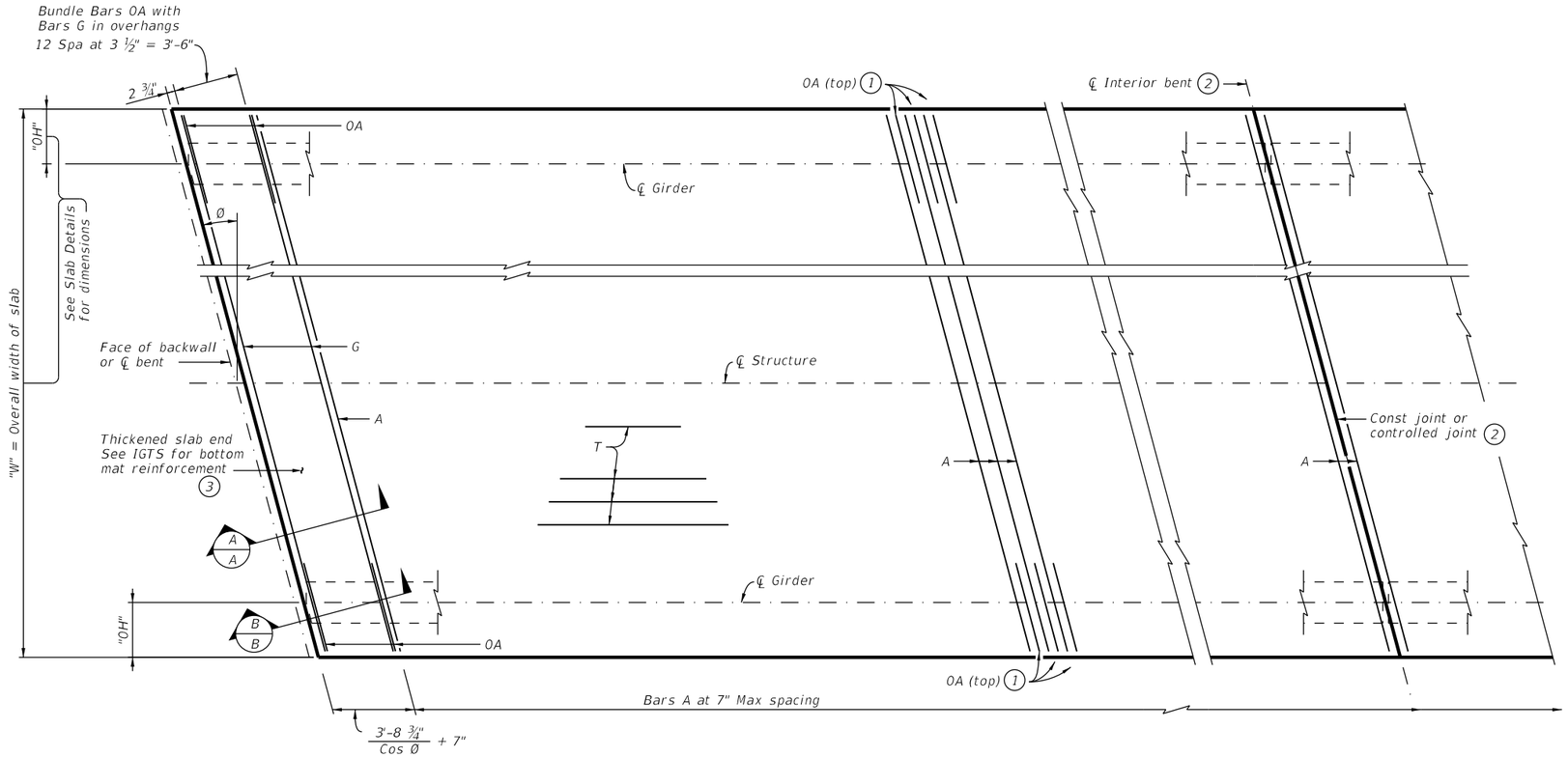
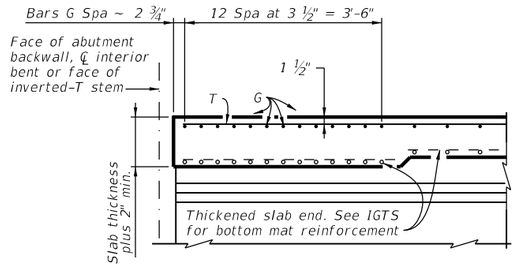


AT THICKENED SLAB END

AT SLAB CONTINUOUS OVER INTERIOR BENTS

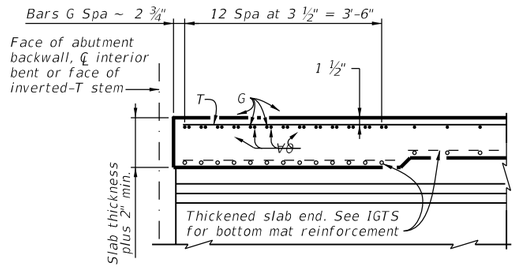
PLAN FOR SLABS WITHOUT BREAKBACKS

Showing top mat reinforcement only.



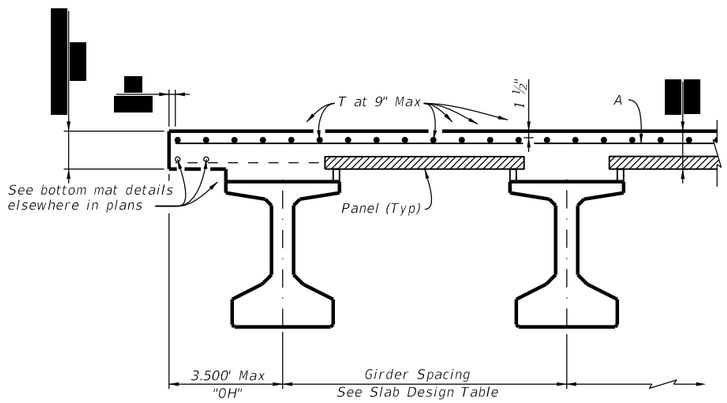
SECTION A-A

Showing Thickened Slab End with PCP Option 1. Option 2 similar.

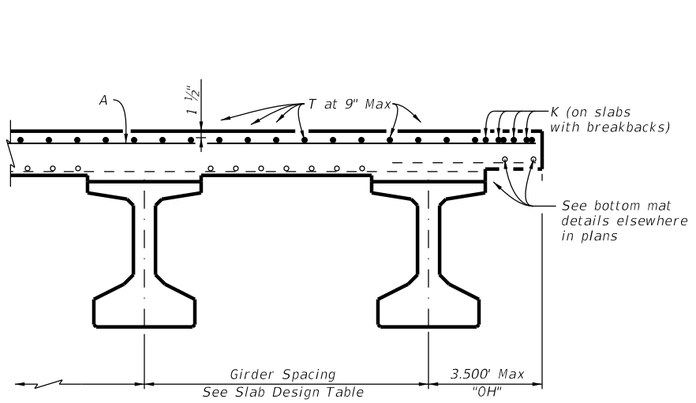


SECTION B-B

Showing Thickened Slab End with PCP Option 1. Option 2 similar.



PARTIAL TYPICAL TRANSVERSE SECTION



SECTION OF THICKENED SLAB END

Showing PCP Option 1. Option 2 similar.

(1) Place Bars 0A midway between Bars A at overhang.

(2) Bars are continuous through joint.

(3) Thickened slab end dimensioned perpendicular to face of bkwl, centerline interior bent or face of inverted-T stem.

HL93 LOADING

SHEET 1 OF 2

Texas Department of Transportation

Bridge Division Standard

GFRP SLAB TOP MAT REINFORCEMENT

PRESTRESSED CONC I-GIRDER SPANS

IGFRP

FILE:	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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REVISIONS 10-19: Updated to latest design specification.	0467	02	020, ETC.	SH 220
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	FTW	ERATH		150

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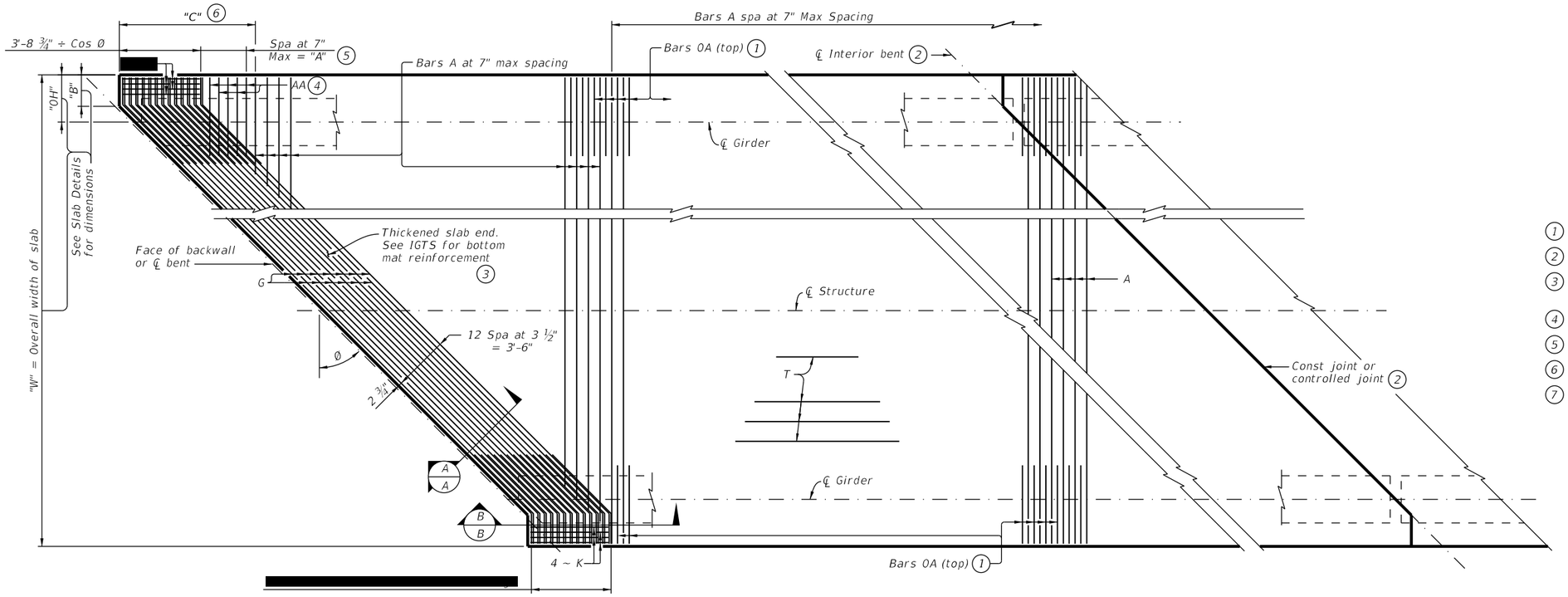
FILE:

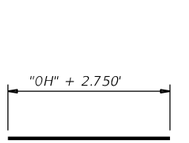


AT THICKENED SLAB END

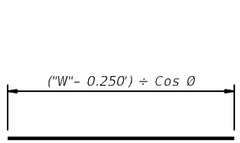
AT SLAB CONTINUOUS OVER INTERIOR BENTS

PLAN FOR SLABS WITH BREAKBACKS

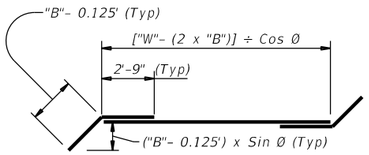
Showing top mat reinforcement only.



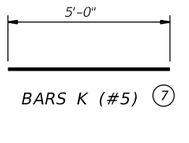
BARS AA (#5) (7)



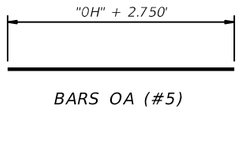
BARS G (#5)
(For slabs without breakbacks)



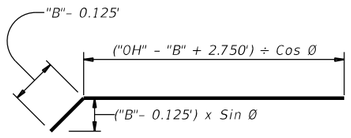
BARS G (#5)
(For slabs with breakbacks)



BARS K (#5) (7)



BARS OA (#5)



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

BAR TABLE

BAR	SIZE
A	#5
AA	#5
G	#5
K	#5
0A	#5
T	#5

(1) Place Bars 0A midway between Bars A at overhang.

(2) Bars are continuous through joint.

(3) Thickened slab end dimensioned perpendicular to face of bkwl, centerline interior bent or face of inverted-T stem.

(4) Tie Bars AA to bottom of Bars G in this location.

(5) A = ("0H" + 2.333' - "B") x Tan Ø

(6) $C = \frac{3.729'}{\text{Cos } Ø} + \text{"A"} + \text{Bar A spacing}$

(7) Only required on slabs with breakbacks.

GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications and AASHTO LRFD Bridge Design Guide Specifications for GFRP-Reinforced Concrete, 2nd Edition.

These details are restricted to Prestressed Concrete I-Girder spans with an 8 1/2" slab and up to a 10'-0" girder spacing.

These details are to be used in conjunction with the Span Details and PCP Standard (if prestressed concrete panels are used).

This standard provides Glass Fiber Reinforced Polymer (GFRP) reinforcement details for the top mat of slab reinforcement. The bottom mat reinforcement and other slab details are as shown elsewhere in the plans.

The Contractor has the option to provide GFRP reinforcement, in accordance with the details shown, when epoxy-coated steel bars are specified for the deck slab. The Contractor may provide an alternate GFRP slab design with calculations signed and sealed by a Professional Engineer.

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

MATERIAL NOTES:

Provide GFRP bars, conforming to ASTM D7957/7957M, except provide a minimum modulus of elasticity of 7,500 ksi.

Provide Grade 60 steel bars for all bottom mat reinforcement as shown elsewhere in plans.

Provide bar laps, where required, as follows:
#5 GFRP bar = 2'-9"

HL93 LOADING

Texas Department of Transportation

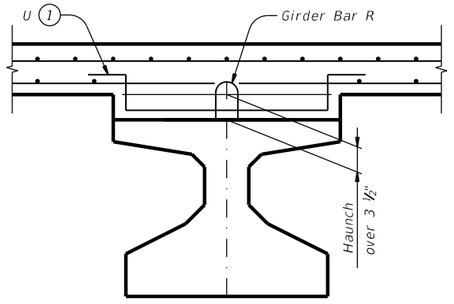
Bridge Division Standard

GFRP SLAB TOP MAT REINFORCEMENT

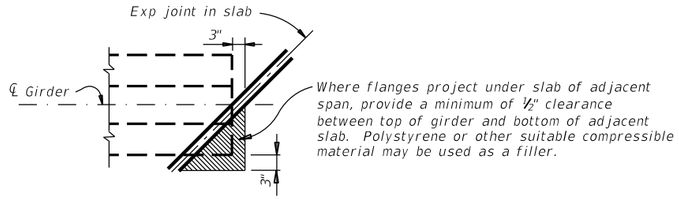
PRESTRESSED CONC I-GIRDER SPANS

IGFRP

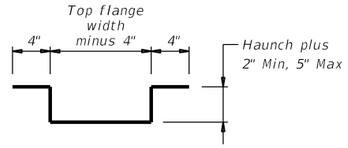
FILE:	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT August 2017	CONT	SECT	JOB	HIGHWAY
REVISIONS 10-19: Updated to latest design specification.	0467	02	020, ETC.	SH 220
	DIST	COUNTY		SHEET NO.
	FTW	ERATH		151



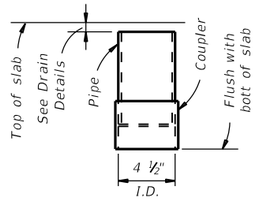
HAUNCH REINFORCING DETAIL



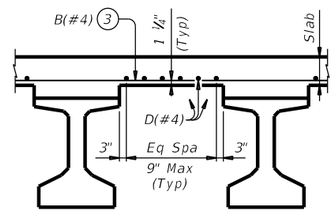
TREATMENT AT GIRDER END FOR SKEWED SPANS



BARS U (#4)

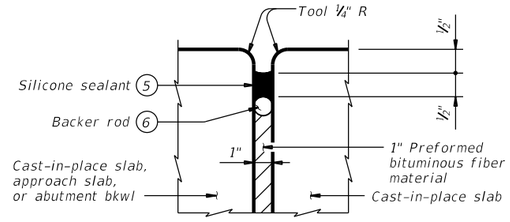


C-I-P DRAIN DETAIL (2)

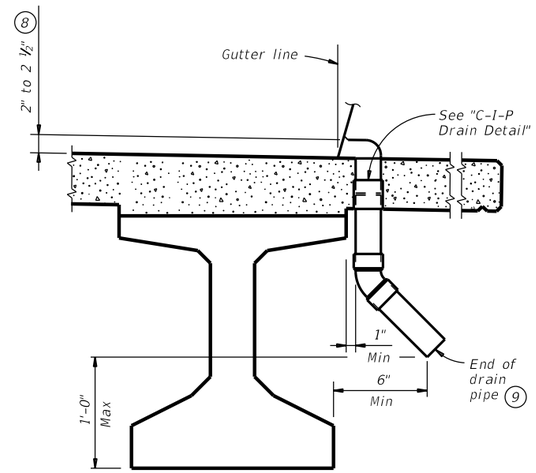


TYPICAL PART TRANSVERSE SLAB SECTION WITHOUT PCP (4)

Top reinforcing steel not shown for clarity.



TYPE A JOINT DETAIL (7)



DRAIN DETAIL (10)

(1) Space Bars U with girder Bars R in all areas where measured haunch exceeds 3 ½".

(2) Roughen outside of PVC with coarse rasp or equal to ensure bond with cast-in-place concrete.

(3) Bars B(#4) spaced at 9" Max with 2" end cover. Overhang option, Contractor's may end alternating bars B(#4) at centerline outside girder.

(4) Provide Grade 60 reinforcing steel. Provide bar laps, where required, as follows:
Uncoated ~ #4 = 1'-7"
Epoxy coated ~ #4 = 2'-5"

(5) Class 7 silicone sealant that conforms to DMS-6310. Install when ambient temperature is between 55°F and 85°F and rising. Engineer to determine allowable hours for sealant application.

(6) 1 ¼" backer rod must be compatible with joint sealant. Use of multiple pieces to create a backer rod cross section is not permitted. Top of backer rod must be convex as shown.

(7) The maximum distance between Type A expansion joints is 100'. See Bridge Layout for location of joints.

(8) Drain entrance formed in rail or sidewalk.

(9) Water may not be discharged onto girders.

(10) All drain pipe and fittings to be 4" diameter (Sch 40) PVC. See Item 481 "Pipe for Drains" for pipe, connections and solvent welding. Bend reinforcing steel to clear PVC 1". Drain length and location is as directed by the Engineer. Drains are not permitted over roadways or railways, or within 10'-0" of bent caps. Degrease outside of exposed PVC, apply acrylic water base primer, then coat with same surface finishing material as used for outside girder face. Variations of the above designs, as required for the type of rail used and its location on the structure, may be installed with the approval and direction of the Engineer.

GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications.

Payment for Type A joint will be as per Item 454, "Bridge Expansion Joints."

All other items (reinforcing steel, drains, etc.) shown on this sheet are subsidiary to other bid items.

Cover dimensions are clear dimensions, unless noted otherwise.

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

DECK FORMWORK NOTES:

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

Texas Department of Transportation

Bridge Division Standard

MISCELLANEOUS SLAB DETAILS

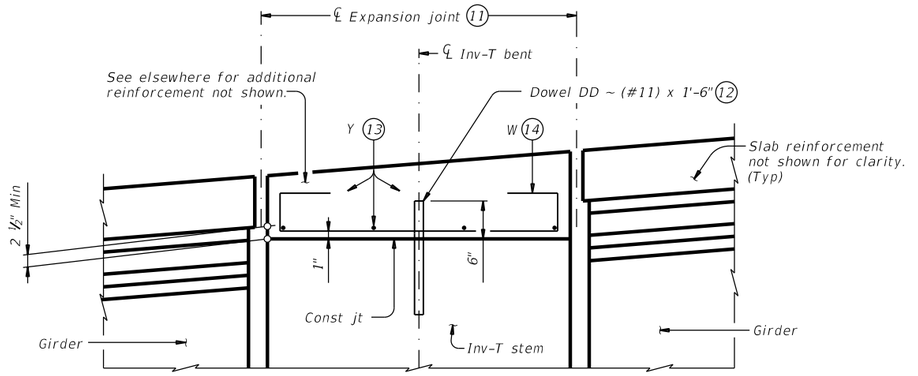
PRESTR CONCRETE I-GIRDERS

IGMS

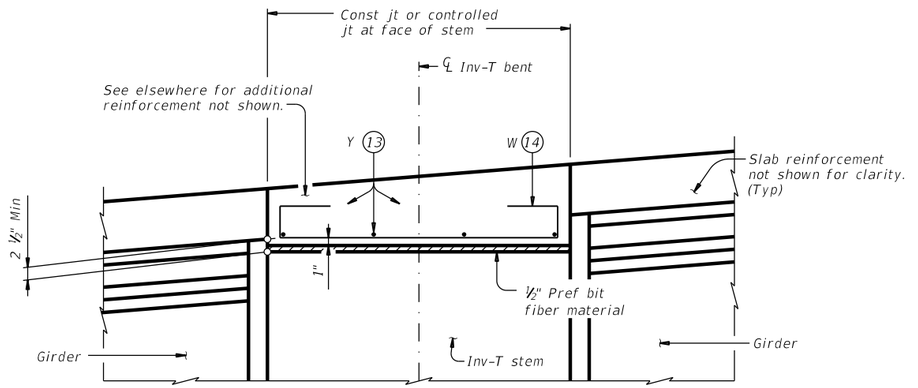
FILE:	DN: TxDOT	CK: TxDOT	DW: JTR	CK: TxDOT
©TxDOT August 2017	CONT	SECT	JOB	HIGHWAY
REVISIONS	0467	02	020, ETC.	SH 220
10-19: Modified Note 7. Type A now a pay item.	DIST	COUNTY		SHEET NO.
	FTW	ERATH		152

DATE:
FILE:

DATE:
FILE:

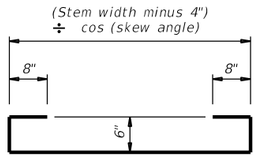


SHOWING EXPANSION JOINTS

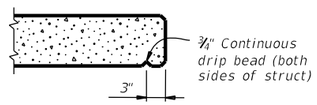


SHOWING CONST JTS OR CONTROLLED JTS

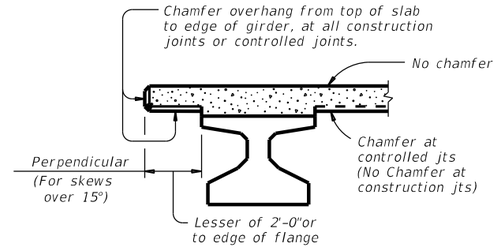
REINFORCEMENT OVER INV-T BENTS



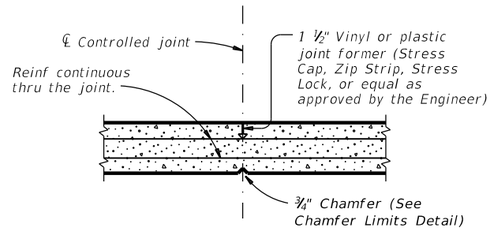
BARS W (#4)



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.

Texas Department of Transportation

Bridge Division Standard

MISCELLANEOUS SLAB DETAILS
PRESTR CONCRETE I-GIRDERS

IGMS

FILE:	DN: TxDOT	CK: TxDOT	DW: JTR	CK: TxDOT
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REVISIONS	0467	02	020, ETC.	SH 220
10-19: Modified Note 7, Type A now a pay item.	DIST	COUNTY		SHEET NO.
	FTW	ERATH		153

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 ℄) (SERVICE I) fct(ksi)	DESIGN LOAD TENSILE STRESS (BOTT ℄) (SERVICE III) fcb(ksi)	REQUIRED MINIMUM ULTIMATE MOMENT CAPACITY (STRENGTH I) (kip-ft)	LIVE LOAD DISTRIBUTION FACTOR (2)		STRENGTH I		SERVICE III
				NON-STD STRAND PATTERN	TOTAL NO.	SIZE (in)	STRGTH fpu (ksi)	"e" ℄ (in)	"e" END (in)								Moment	Shear	Inv	Opr	Inv
SH 220 at Little Duffau Creek	1	1-6	Tx28		20	0.6	270	9.88	6.28	4	22.5	5.000	6.000	2.367	-3.113	2440	0.655	0.814	1.50	1.93	1.17
	2	1-6	Tx28		20	0.6	270	9.88	6.28	4	22.5	5.000	6.000	2.367	-3.113	2440	0.655	0.814	1.50	1.93	1.16
	3	1-6	Tx28		20	0.6	270	9.88	6.28	4	22.5	5.000	6.000	2.367	-3.113	2440	0.655	0.814	1.50	1.93	1.16
SH 220 at Duffau Creek	1	1-6	Tx28		22	0.6	270	9.75	6.48	4	22.5	4.400	6.800	2.437	-3.173	2466	0.655	0.814	1.68	2.18	1.40
	2	1-6	Tx28		24	0.6	270	9.65	6.31	4	24.5	5.200	7.200	2.853	-3.660	2798	0.640	0.814	1.58	2.05	1.25
	3	1-6	Tx28		22	0.6	270	9.75	6.48	4	22.5	4.400	6.800	2.437	-3.173	2466	0.655	0.814	1.68	2.18	1.40

NON-STANDARD STRAND PATTERNS

PATTERN	STRAND ARRANGEMENT AT ℄ OF GIRDER

(1) Based on the following allowable stresses (ksi):

Compression = 0.65 f'ci

Tension = $0.24\sqrt{f'ci}$

Optional designs must likewise conform.

(2) Portion of full HL93.

DESIGN NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications. Load rated using Load and Resistance Factor Rating according to AASHTO Manual for Bridge Evaluation.

Optional designs for girders 120 feet or longer must have a calculated residual camber equal to or greater than that of the designed girder.

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

FABRICATION NOTES:

Provide Class H concrete.

Provide Grade 60 reinforcing steel bars.

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

Strand debonding must comply with Item 424.4.2.2.2.4. Full-length debonded strands are only permitted in positions marked △. Double wrap full-length debonded strands in outer most position of each row.

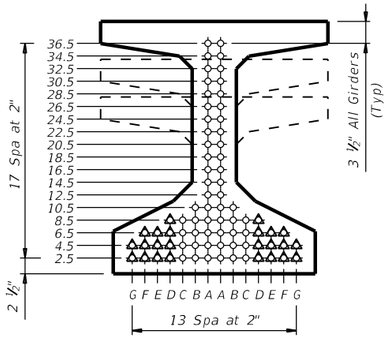
When shown on this sheet, the Fabricator has the option of furnishing either the designed girder or an approved optional design. All optional design submittals must be signed, sealed and dated by a Professional Engineer registered in the State of Texas.

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

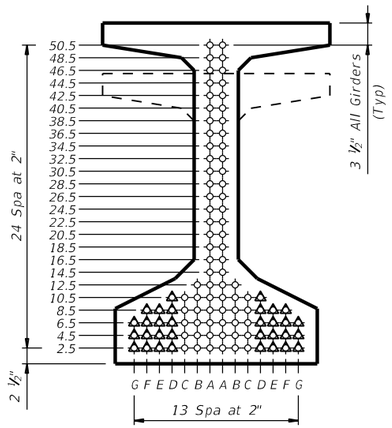
DEPRESSED STRAND DESIGNS:

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

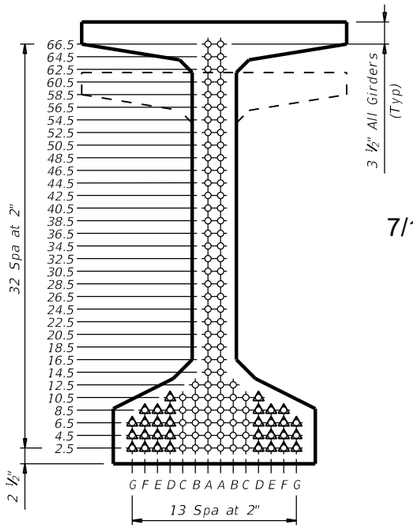
To complete this sheet input the girder designs in the table and the relative humidity under Design Notes. In all cases, remove this block. This sheet must be signed, sealed, and dated by a registered Professional Engineer.



TYPE Tx28, Tx34 & Tx40



TYPE Tx46 & Tx54



TYPE Tx62 & Tx70

STATE OF TEXAS
AMY HARRINGTON CAUSEY
148150
LICENSED
PROFESSIONAL ENGINEER

7/12/2024

Amy Harrington Causey

For Little Duffau Ck Only.

STATE OF TEXAS
JAMES ROBERT TRAVIS
149203
LICENSED
PROFESSIONAL ENGINEER

07/12/2024

For Duffau Ck Only.

HL93 LOADING

Texas Department of Transportation

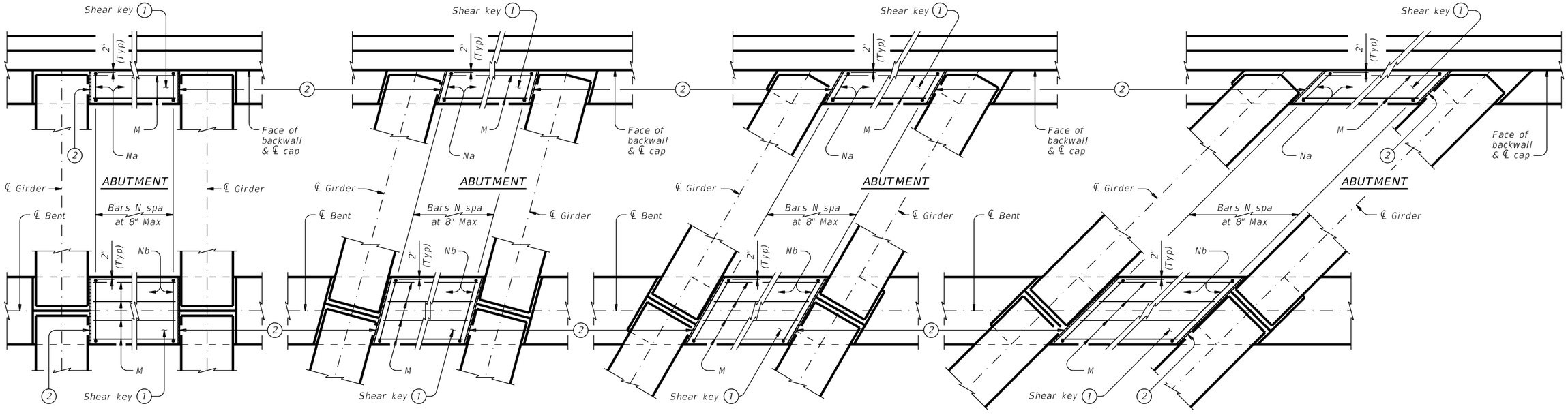
Bridge Division Standard

PRESTRESSED CONCRETE I-GIRDER DESIGNS (NON-STANDARD SPANS)

IGND

FILE: igndsts1-22.dgn	DN: TxDOT	CK: TxDOT	DW: EFC	CK: TAR
©TxDOT August 2017	CONT	SECT	JOB	HIGHWAY
REVISIONS 10-19: Modified for depressed strands only. 3-22: Added Load Rating.	0467	02	020, ETC.	SH 220
	DIST	COUNTY		SHEET NO.
	FTW	ERATH		154

DATE:
FILE:



PARTIAL PLANS WITH NO SKEW

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

PARTIAL PLANS WITH 15° SKEW

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

PARTIAL PLANS WITH 30° SKEW

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

PARTIAL PLANS WITH 45° SKEW

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

(1) Place shear keys on the upstream side of structure between outside girder and next adjacent girder, unless shown otherwise on plans.

(2) UHMW polyethylene wear pad. (Typ)

(3) Leave a ¼" gap plus or minus between girder and face of wear pad. Cast wear pad with shear key, smooth side facing girder. Care must be taken to keep concrete from flowing under girder. Slope top of shear keys in accordance with Item 420.4.9, "Treatment and Finishing of Horizontal Surfaces."

(4) Measure at higher bearing seat elevation forward or back. Dimension based on typical bearing pad and bearing seat. Increase as necessary to maintain 5" overlap.

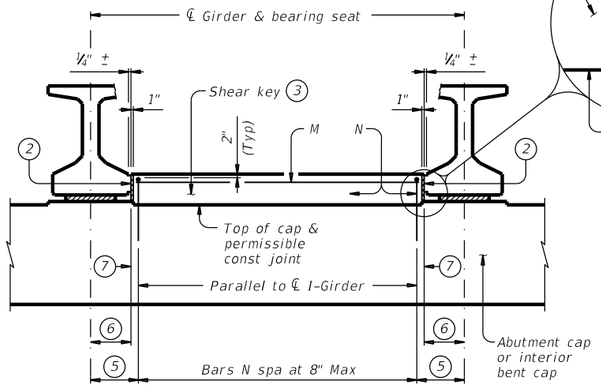
(5) With No Skew = 1'-8 ¼", measured along ℄ cap.
With Skew = 1'-8 ¼" ÷ Cos Skew, measured along ℄ cap.

(6) With No Skew = 1'-4 ¼", measured along ℄ cap.
With Skew = 1'-4 ¼" ÷ Cos Skew, measured along ℄ cap.

(7) Face of UHMW polyethylene wear pad. Smooth side of pad facing girder.

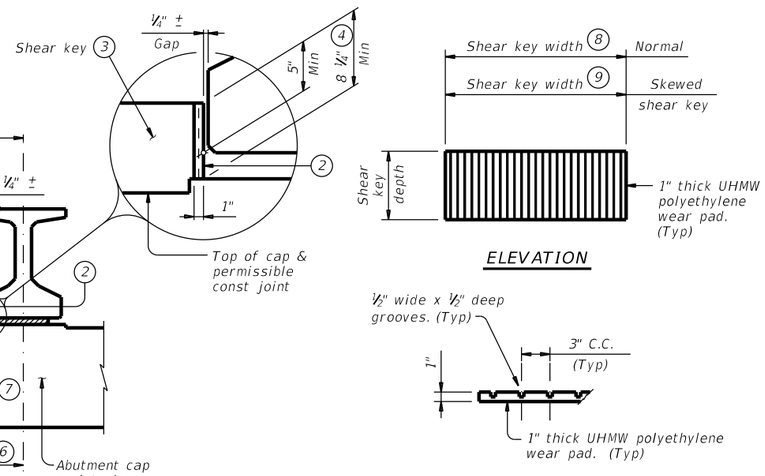
(8) Abutments = ½ Cap width.
Interior bents = Cap width.

(9) Abutments = ½ Cap width ÷ Cos Skew.
Interior bents = Cap width ÷ Cos Skew.

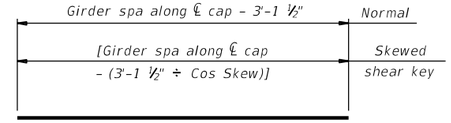


PARTIAL ELEVATION OF ABUTMENT OR INTERIOR BENT CAP (1)

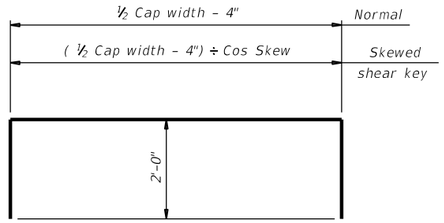
Showing shear key with girder Type Tx46.
Other I-Girder types similar.



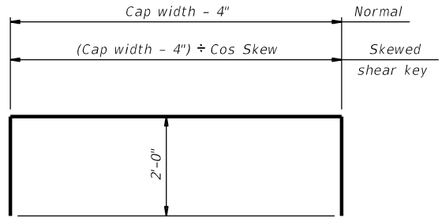
ULTRA HIGH MOLECULAR WEIGHT (UHMW) POLYETHYLENE WEAR PAD DETAILS



BARS M (#5)



BARS Na (#5)
(For abutments)



BARS Nb (#5)
(For interior bents)

CONSTRUCTION NOTES:

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

GENERAL NOTES:

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

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

Texas Department of Transportation

Bridge Division Standard

SHEAR KEY DETAILS
PRESTR CONCRETE I-GIRDERS

IGSK

FILE:	DN: TxDOT	CK: TxDOT	DW: JTR	CK: AES
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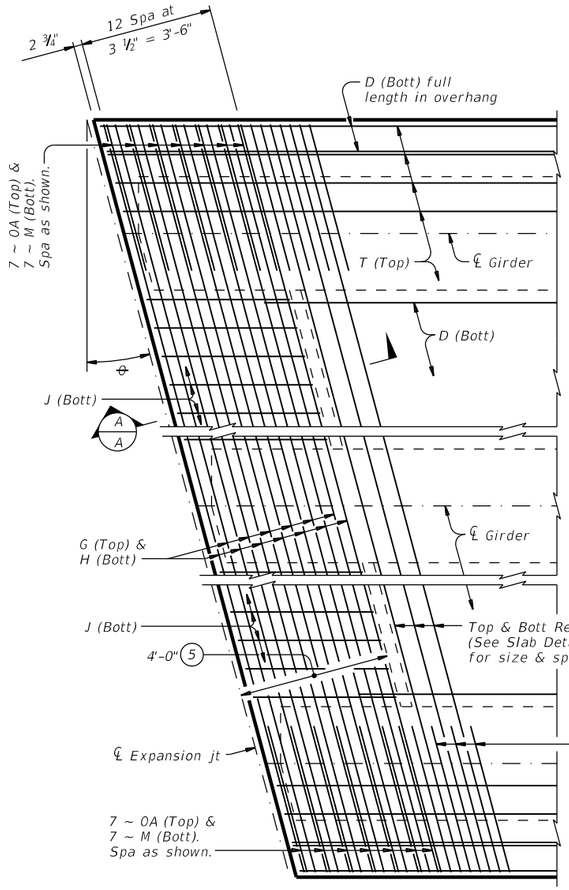
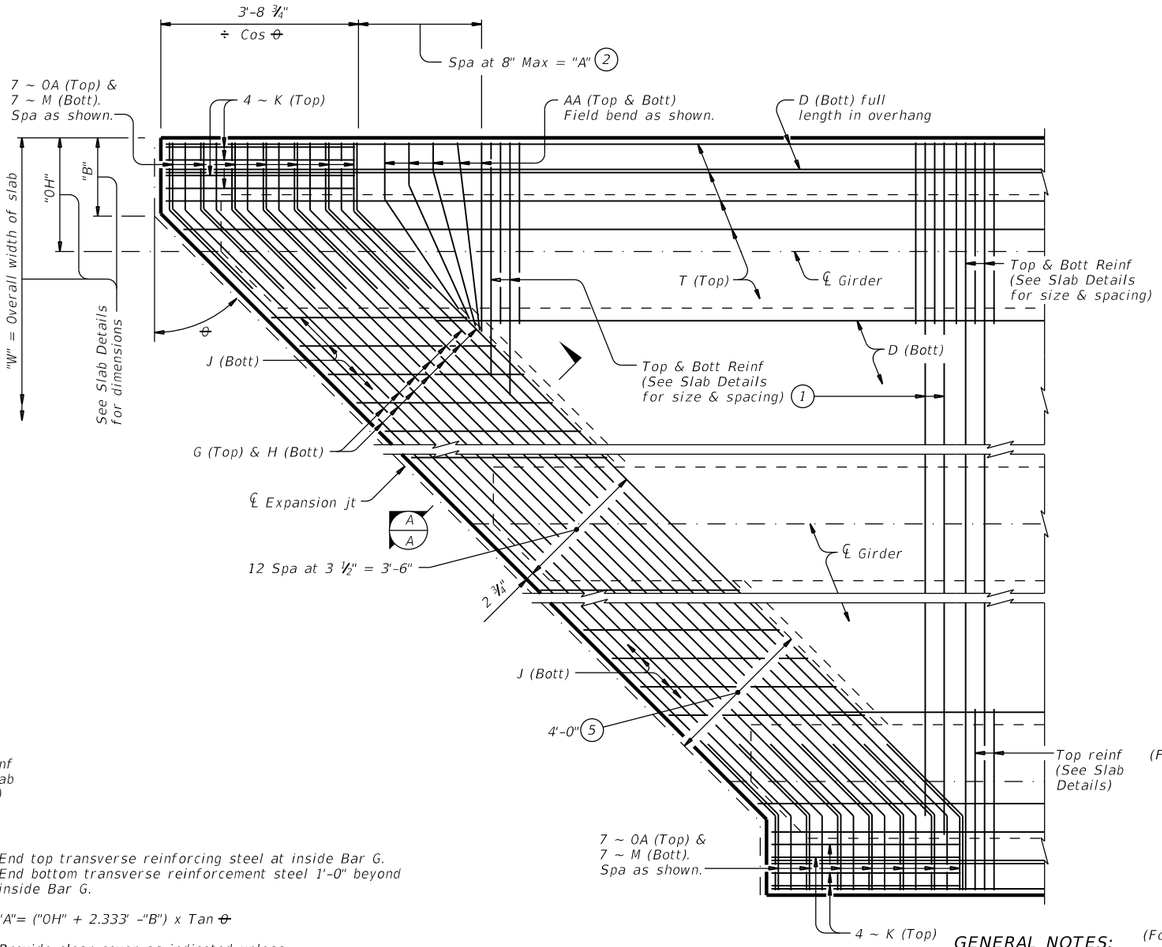
REVISIONS	0467	02	020, ETC.	SH 220
	DIST	COUNTY		SHEET NO.
	FTW	ERATH		155

DATE:
FILE:



PARTIAL PLAN FOR SLABS WITHOUT BREAKBACK



PARTIAL PLAN FOR SLABS WITH BREAKBACK

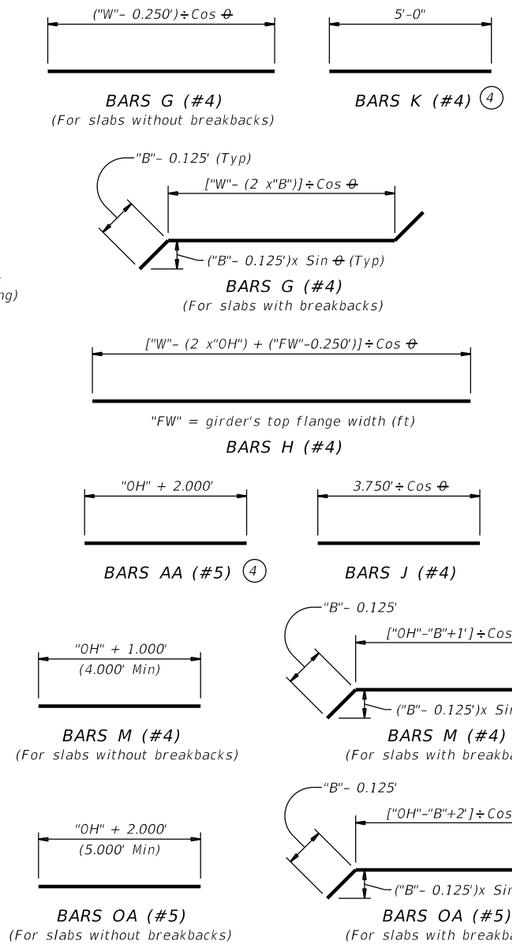
(1) End top transverse reinforcing steel at inside Bar G. End bottom transverse reinforcement steel 1'-0" beyond inside Bar G.

(2) "A"= ("OH" + 2.333' -"B") x Tan θ

(3) Provide clear cover as indicated unless otherwise shown on Span Details.

(4) Only required on slabs with breakbacks.

(5) Thickened slab end dimensioned perpendicular to face of bkwl, centerline interior bent or face of inverted-T stem.



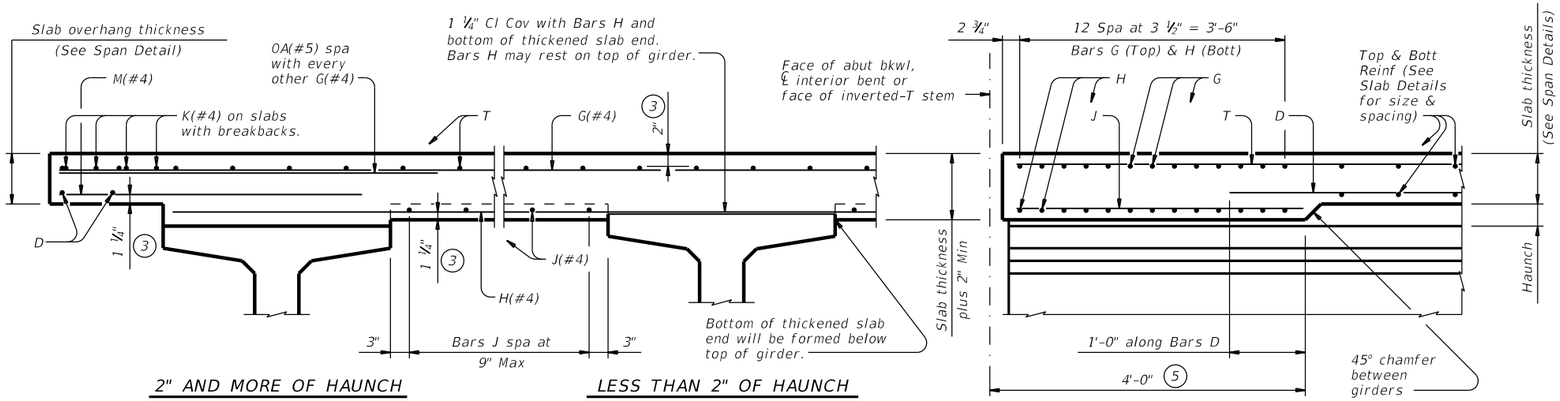
GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications.
These details are restricted to Prestressed Concrete I-Girder Spans.
These details are to be used in conjunction with the Span Details and PCP standard (if prestressed concrete panels are used).
When Option 2 from PCP standard is used, provide Bars AA, G, K and 0A in the slab.

MATERIAL NOTES:

Provide Grade 60 reinforcing steel.
If slab reinforcing steel is shown on the Slab Details to be epoxy coated, then Bars AA, G, K, H, J, M and 0A must be epoxy coated.
Provide bar laps, where required, as follows:
Uncoated ~ #4 = 1'-7"
Epoxy Coated ~ #4 = 2'-5"

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



2" AND MORE OF HAUNCH — LESS THAN 2" OF HAUNCH

TYPICAL TRANSVERSE SECTION

(Showing Prestressed Conc I-Girders at ℄ Brg)

SECTION A-A

(Showing with 2" and more of haunch)

HL93 LOADING

Texas Department of Transportation

Bridge Division Standard

THICKENED SLAB END DETAILS

PRESTRESSED CONCRETE I-GIRDER SPANS

IGTS

FILE:	DN: TxDOT	CK: TxDOT	DW: JTR	CK: TxDOT
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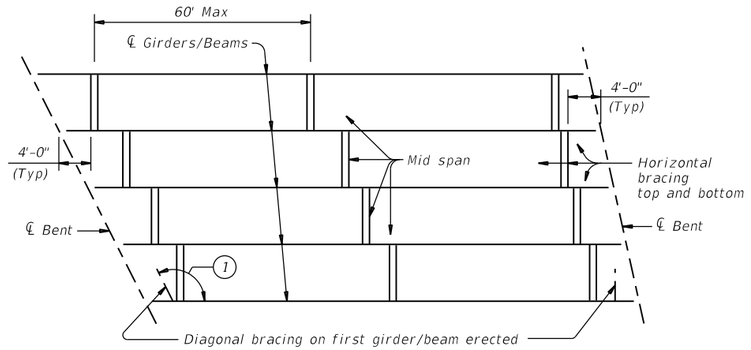
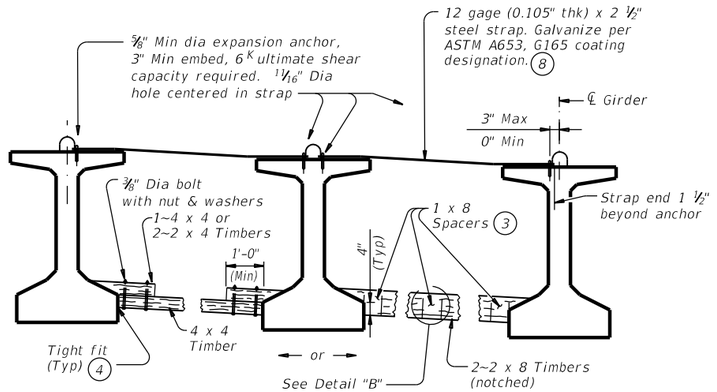
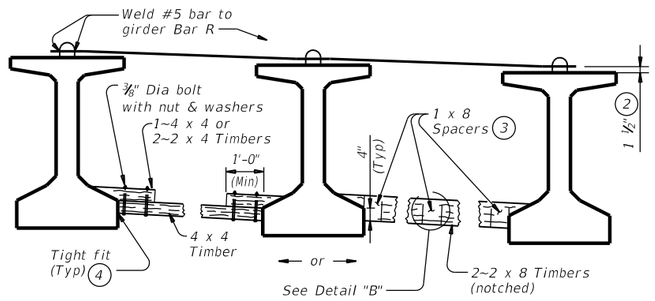


ERECTION BRACING



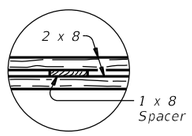
FOR ERECTION BRACING, OPTION 1

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



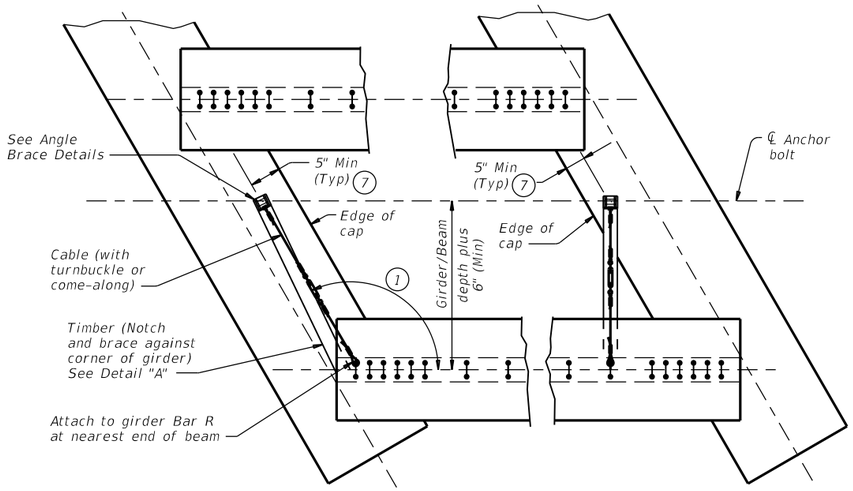
FOR ERECTION BRACING, OPTION 2

HORIZONTAL BRACING DETAILS (5)

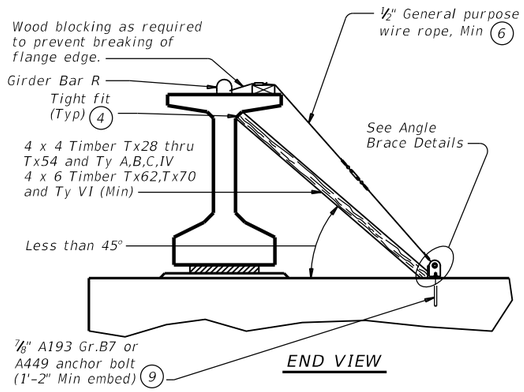


PLAN

DETAIL "B"



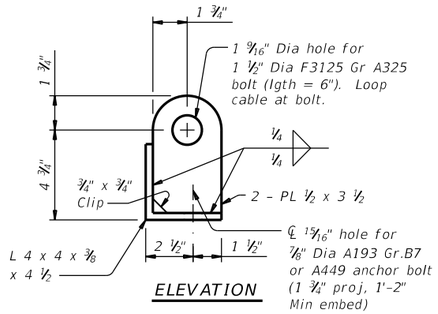
PLAN



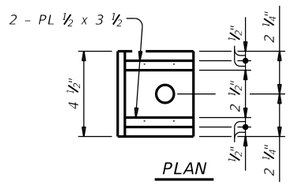
END VIEW

DIAGONAL BRACING DETAILS (5)

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



ELEVATION



PLAN

ANGLE BRACE DETAILS

HAULING & ERECTION:

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

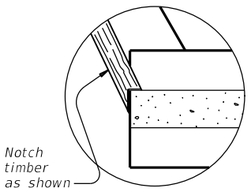
ERECTION BRACING:

Erection bracing details shown are considered the minimum for fulfilling the bracing requirements of Item 425.

Required erection bracing must be placed immediately after erection of each girder and remain in place until additional bracing as required for slab placement is in place. This standard is needed in all cases to meet requirements for Slab Placement Bracing.

PHASED CONSTRUCTION:

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



DETAIL "A"

(1) If angle shown exceeds 120 degrees, move diagonal brace to other side of girder/beam and place square to girder/beam. This may prevent exterior girder from being erected first.

(2) Place and weld #5 bars as shown during erection. If forming deck with prestressed panels, bars can be temporarily removed, one at a time, during panel erection. Re-install bar prior to additional panel erection. Bars can rest on panels and be bent down and welded to girder Bars R (See Sheet 2 of 2).

(3) Clear distance between spacers must not exceed 3'. Nail together with 16d nails.

(4) Use wedges as necessary to obtain tight fit. Nail wedges to timbers.

(5) Pressure treated landscape timbers can not be used.

(6) All hardware used with cable must be able to develop a minimum 25 kips breaking strength. Use thimbles at all loops in cable. Install cable clamps with saddles bearing against the live end and U-bolts bearing aginst the dead end.

(7) It is acceptable to tie anchor bolts to cap reinforcement.

(8) Prior to installing, field bend strap to lay flush on both girders' top flange and slope between flange tips.

(9) Anchor bolt may be drilled and epoxied in place. Provide 25k minimum pullout. Core drill hole.

Texas Department of Transportation

Bridge Division Standard

MINIMUM ERECTION AND BRACING REQUIREMENTS

PRESTRESSED CONCRETE I-GIRDERS AND I-BEAMS

MEBR(C)

FILE:	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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	FTW	ERATH		157

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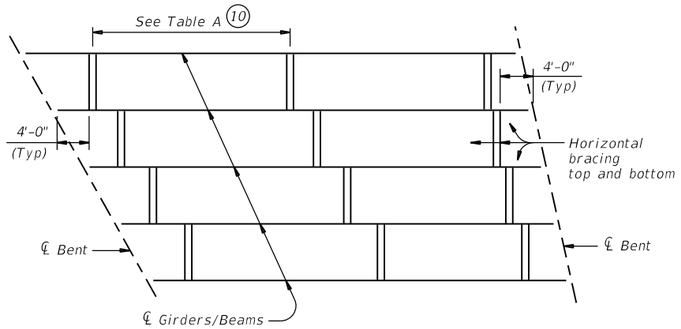


SLAB PLACEMENT BRACING

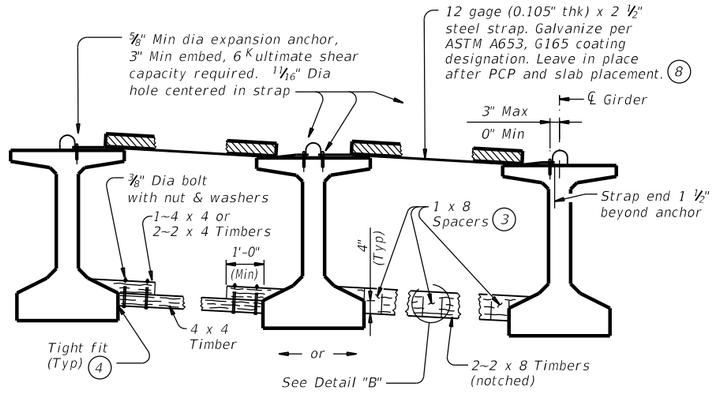
TABLE A

OPTION 1-RIGID BRACING (STEEL STRAP)

Girder or Beam Type	Maximum Bracing Spacing	
	Slab Overhang less than 4'-0" (11)	Slab Overhang 4'-0" and greater (11)
Tx28	¼ points	¼ points
Tx34	¼ points	¼ points
Tx40	¼ points	⅛ points
Tx46	¼ points	⅛ points
Tx54	¼ points	⅛ points
Tx62	¼ points	⅛ points
Tx70	¼ points	⅛ points
A	⅛ points	⅛ points
B	⅛ points	⅛ points
C	⅛ points	⅛ points
IV	¼ points	⅛ points
VI	¼ points	⅛ points

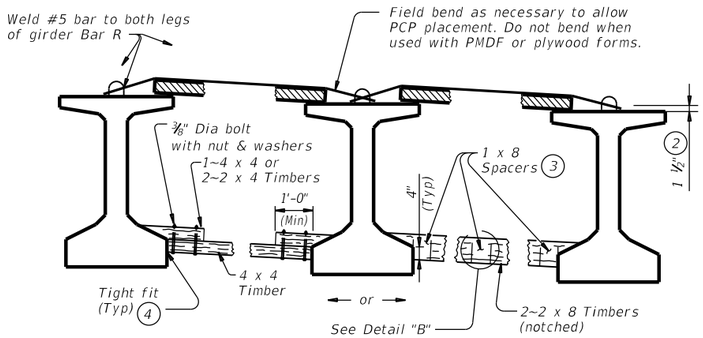
OPTION 2-FLEXIBLE BRACING (NO. 5 OVER PCP)

Girder or Beam Type	Maximum Bracing Spacing	
	Slab Overhang less than 4'-0" (11)	Slab Overhang 4'-0" and greater (11)
Tx28	¼ points	⅛ points
Tx34	¼ points	⅛ points
Tx40	¼ points	⅛ points
Tx46	¼ points	⅛ points
Tx54	¼ points	⅛ points
Tx62	¼ points	⅓ points
Tx70	¼ points	⅛ points
A	2.0 ft	1.5 ft
B	3.0 ft	2.0 ft
C	4.5 ft	2.0 ft
IV	¼ points	4.0 ft
VI	¼ points	4.0 ft



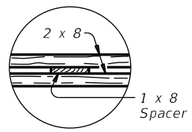
FOR SLAB PLACEMENT BRACING, OPTION 1 - RIGID

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



FOR SLAB PLACEMENT BRACING, OPTION 2 - FLEXIBLE

(Showing slab formed with PCP.)



PLAN

DETAIL "B"

HORIZONTAL BRACING DETAILS (5)

(2) Place and weld #5 bars as shown during erection. If forming deck with prestressed panels, bars can be temporarily removed, one at a time, during panel erection. Re-install bar prior to additional panel erection. Bars can rest on panels and be bent down and welded to girder Bars R.

(3) Clear distance between spacers must not exceed 3'. Nail together with 16d nails.

(4) Use wedges as necessary to obtain tight fit. Nail wedges to timbers.

(5) Pressure treated landscape timbers can not be used.

(8) Prior to installing, field bend strap to lay flush on both girders' top flange and slope between flange tips.

(10) Bracing spacing (¼ and ⅛ points) measured between first and last typical brace location.

(11) Measure slab overhang from centerline of girder or beam. When overhang varies in span, determine bracing spacing based on largest overhang.

SLAB PLACEMENT BRACING:

The details for slab placement bracing are considered minimum for fulfilling the requirements of Specification Items 422 and 425.

Required slab placement bracing must remain in place until slab concrete has attained a compressive strength of 3000 psi.

GENERAL NOTES:

Bracing details for spans longer than 150' are not provided. The Contractor must submit proposed bracing details for such conditions to the Engineer for approval prior to erection.

Systems equal to or better than those shown may be used provided details of such systems are submitted to and approved by the Engineer prior to erection.

Use of these systems or details does not relieve the Contractor of the responsibility for the adequacy of the bracing and the safety of the structure.

Removal of bracing for short periods of time to align girders and beams is permissible.

All turn-buckles, come-alongs, anchors and other connections must be capable of developing the full strength of the cable shown.

Furnish anchor bolts and nuts in accordance with Item 449, "Anchor Bolts".

Texas Department of Transportation

Bridge Division Standard

MINIMUM ERECTION AND BRACING REQUIREMENTS

PRESTRESSED CONCRETE I-GIRDERS AND I-BEAMS

MEBR(C)

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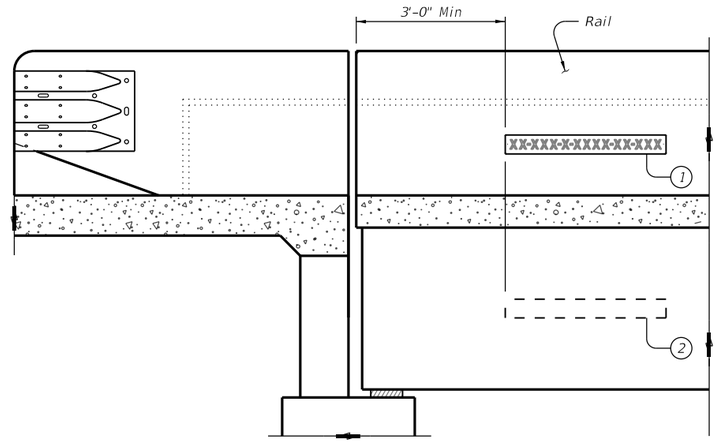
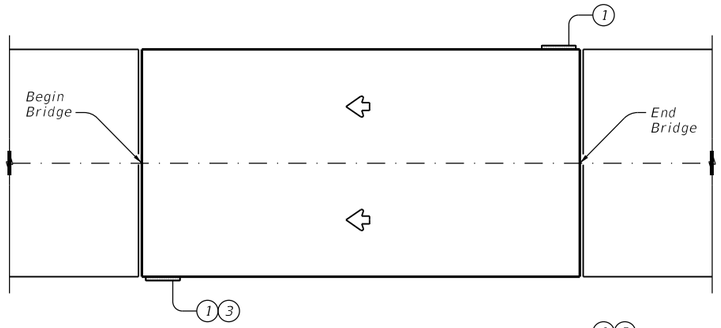
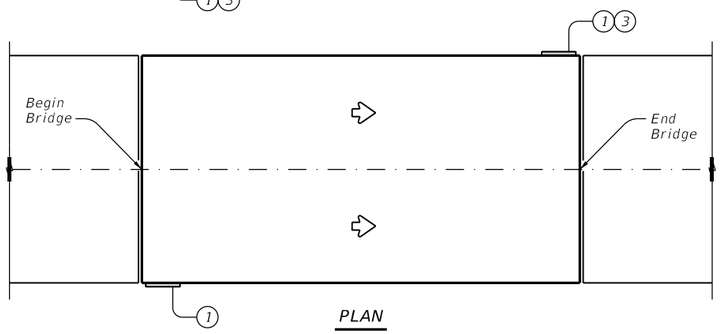


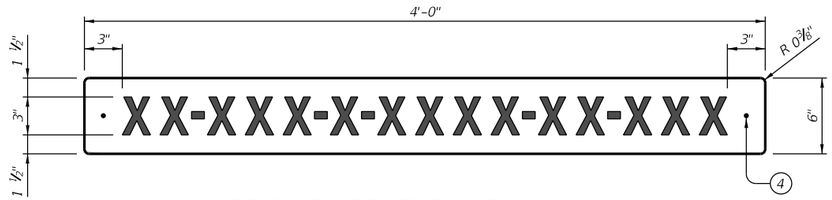
ELEVATION



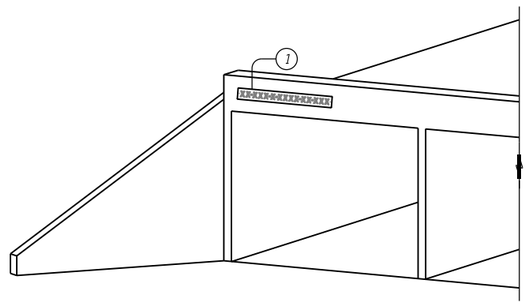


PLAN

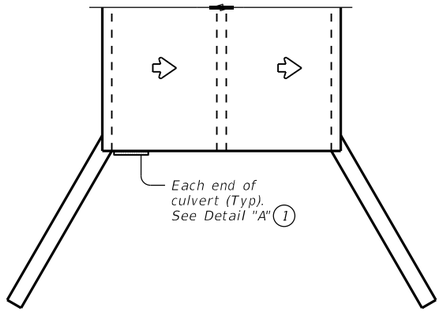
BRIDGE SIGN LOCATIONS



BRIDGE IDENTIFICATION SIGN

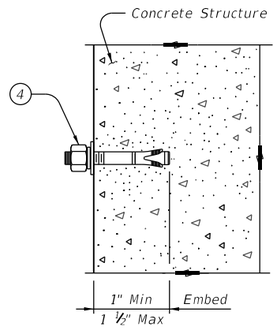


DETAIL "A"



PLAN

BRIDGE CLASS CULVERT SIGN PLACEMENT



ANCHOR DETAIL

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

(1) Bridge identification sign location

(2) Alternate sign placement location for exterior concrete beams.

(3) If adjacent bridges are less than 2 feet apart, these signs may be omitted.

(4) ¼" Diameter stainless steel expansion anchor with hex nut, washer, and spring-lock washer.

SIGN NOTES:

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

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

MATERIAL NOTES:

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

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

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

Provide ¼" diameter stainless steel expansion anchors with one hex head nut, one flat washer, and one helical spring-lock washer each.

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

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

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

GENERAL NOTES:

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

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

Do not install anchors sections of members under tension.

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

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NBIS BRIDGE IDENTIFICATION SIGN STANDARD

NBIS

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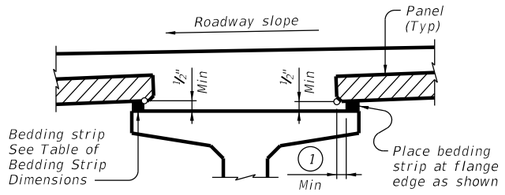
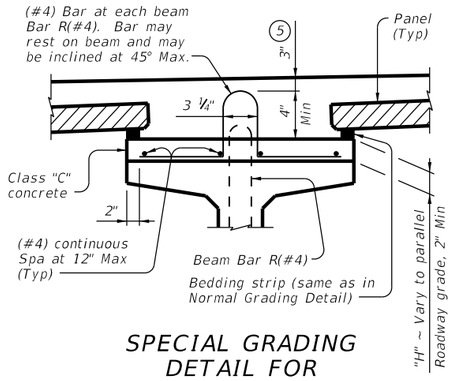


NORMAL GRADING DETAIL (3)

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



SPECIAL GRADING DETAIL FOR CONCRETE BEAMS

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

TABLE OF BEDDING STRIP DIMENSIONS		
WIDTH	HEIGHT (4)	
	Min	Max
1" (Min)	½"	2"
1 ¼"	½"	2 ½"
1 ½"	½"	3"
1 ¾"	½"	3 ½"
2"	½"	4"
2 ¼"	½"	4 ½" (2)
2 ½"	½"	5" (2)
2 ¾"	½"	5 ½" (2)
3" (Max)	½"	6" (2)

(1) 2" Min for I-girders, 1 ½" Min for all other beam types.

(2) Allowed for prestressed concrete I-girders, not allowed on other beam types.

(3) To reduce the quantity of cast-in-place concrete, bedding strip thickness may be increased in ¼" increments. Bedding strips must be comprised of one layer. Bond bedding strips to the beams with an adhesive compatible with bedding strips. Bedding strips over 2.5" high may need to be bonded to panels. The same thickness strip must be used under any one panel edge and the maximum change in thickness between adjacent panels is ¼". Alternatively, bedding strips may be cut to grade. Panels may be supported by an alternate method, using a commercial product, if approved by the Engineer of Bridge Design, Bridge Division. If bedding strips exceed 6" high for I-Girders, 4" high for all other beam types, use Special Grading Detail for Concrete Beams or submit an alternate method to the Bridge Division for approval.

(4) Height must not exceed twice the width.

(5) Provide clear cover as indicated unless otherwise shown on Span Details.

(6) See Span Details and Thickened Slab End Details for top slab reinforcement and clear cover. Transverse top slab reinforcement may rest on top of prestressed concrete panels if necessary to maintain clear cover.

(7) Space Bars UP(#4) with Beam Bars R(#4) in all areas where measured haunch exceeds 3 ½" with I-girders, and 3" for all other beam types. Epoxy coating for Bars UP is not required.

(8) Do not locate construction joints on top of a panel.

(9) Butt adjacent bedding strips together with adhesive. Cut v-notches, approx ¼" deep, in the top of the bedding strips at 8' o.c..

CONSTRUCTION NOTES:

Erected panels must bear uniformly on bedding strips of extruded polystyrene placed along top flange edges.

Placing panels to minimize joint openings is recommended.

If additional blocking is needed, special grading details for supporting the panels and extra reinforcing between beam and slab will be considered subsidiary to deck construction.

Bars U, shown on PCP-FAB, may be bent over or cut off if necessary.

Care must be taken to ensure proper cleaning of construction debris and consolidation of concrete material under the edges of the panels. Bedding strips must be placed at beam flange edges so that adequate space is provided for the mortar to flow a minimum of 1 ½" under the panels as the slab concrete is placed.

To allow the proper amount of mortar to flow between beam and panel, the minimum vertical opening must be at least ½". Roadway cross-slope reduces the opening available for entry of the mortar. Bedding strips varying in thickness across the beam are therefore required.

For clear span between U-beams less than or equal to 18", see Permissible Slab Forming Detail on Miscellaneous Slab Detail sheets, UBMS.

MATERIAL NOTES:

Provide Grade 60 reinforcing steel in the cast-in-place slab. See Table of Reinforcing Steel for size and spacing of reinforcement.

If the top and bottom layer of reinforcing steel is shown on the Span Details to be epoxy coated, then the D, E, P, & Z bars must be epoxy coated.

Provide bar Laps, where required, as follows:

Uncoated ~ #4 = 1'-7"
Epoxy Coated ~ #4 = 2'-5"

GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications.

Panel placement may follow either Option 1 or Option 2 except Option 1 must be used if the skew exceeds 45 degrees.

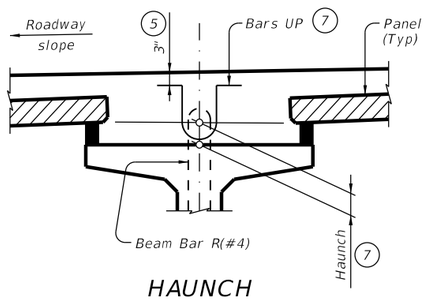
Use of Prestressed Concrete Panels is not permitted for horizontally curved steel plate or tub girders. See Span Details for other possible restrictions on their use.

These details are to be used in conjunction with the Span Details, PCP-FAB and other applicable standard drawings.

When panel support (bedding strips) deviates from what is shown herein, provide details signed and sealed by a professional Engineer.

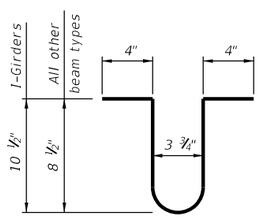
Any additional reinforcement or concrete required on this standard is considered subsidiary to the bid Item "Reinforced Concrete Slab".

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

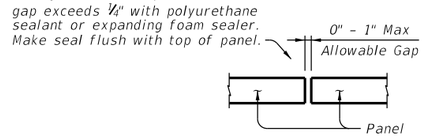


HAUNCH REINFORCING DETAIL

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

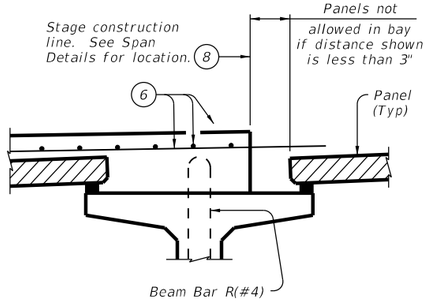


BARS UP (#4) (7)

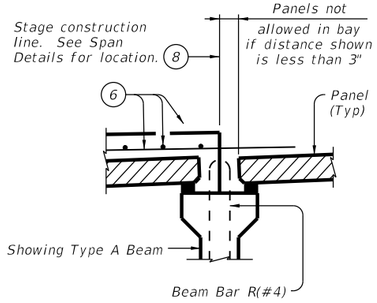


PANEL JOINTS

(Panel reinforcing not shown for clarity.
The gap cannot be considered as a panel fabrication tolerance. Adjust panel placement to minimize joint openings.)



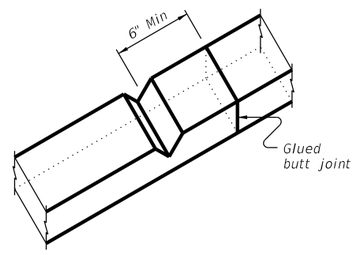
PRESTR CONC I-GIRDERS



PRESTR CONC I-BEAMS

STAGE CONSTRUCTION LIMITATIONS

(Other beam types similar)



BEDDING STRIP DETAIL (9)

HL93 LOADING SHEET 1 OF 4

Texas Department of Transportation — Bridge Division Standard

PRESTRESSED CONCRETE PANELS
DECK DETAILS

PCP

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DATE:
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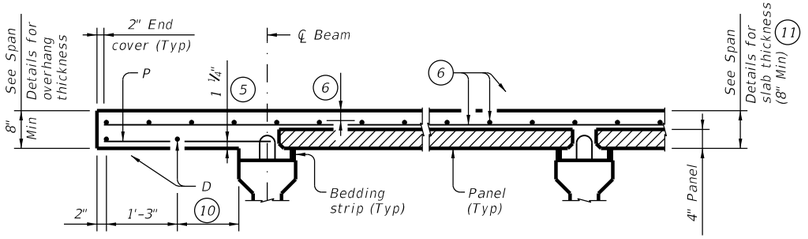
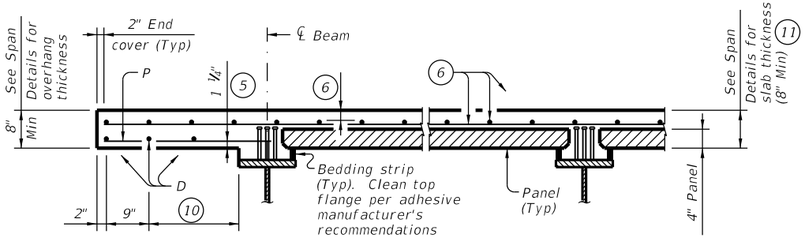
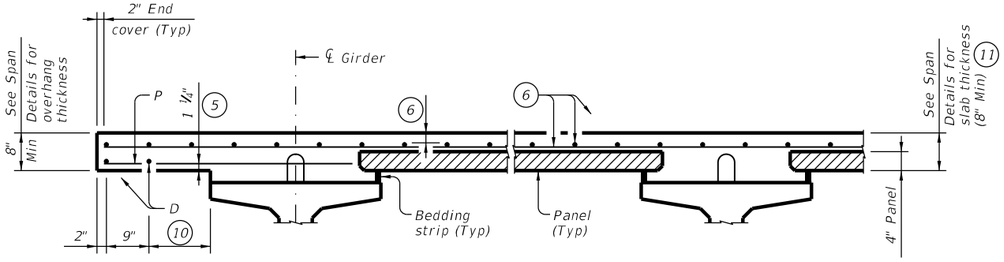


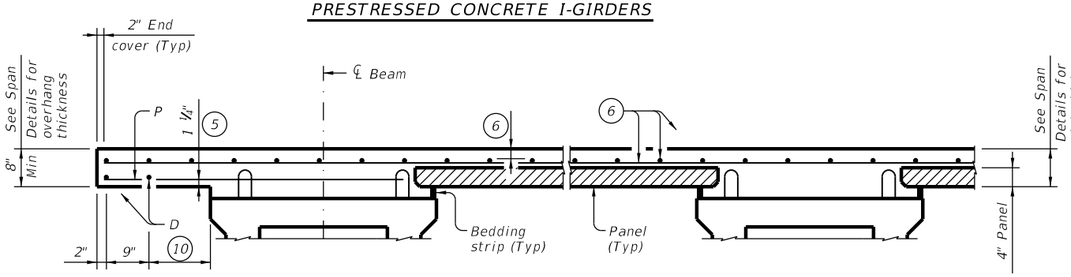
PRESTRESSED CONCRETE I-BEAMS



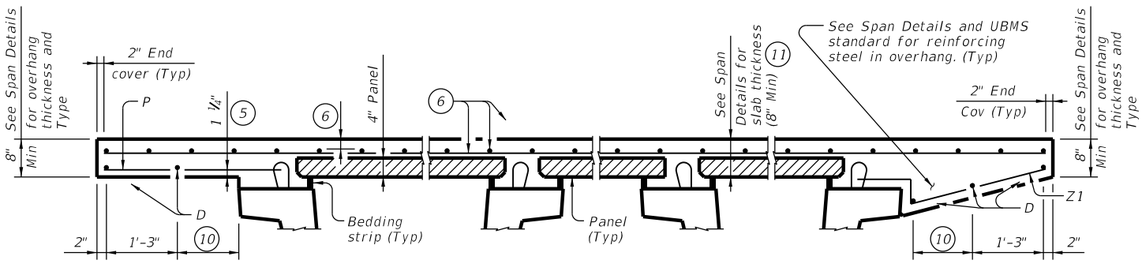
STEEL BEAMS (13)



PRESTRESSED CONCRETE I-GIRDERS



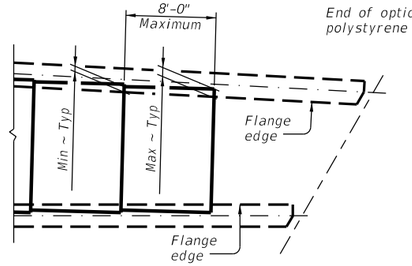
PRESTRESSED CONCRETE X-BEAMS



NORMAL OVERHANG WITH PRESTR CONC U-BEAMS

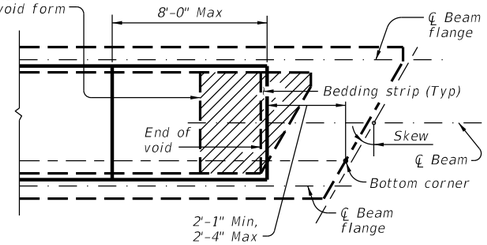
SLOPED OVERHANG WITH PRESTR CONC U-BEAMS

TYPICAL PART TRANSVERSE SECTIONS



AT FLARED BEAMS OR GIRDERS

See PCP-FAB standard for Min and Max dimensions based on beam/girder type.



OVER CONC U-BEAMS

PART PLANS OF PANEL PLACEMENT

(5) Provide clear cover as indicated unless otherwise shown on Span Details.

(6) See Span Details and Thickened Slab End Details for top slab reinforcement and clear cover. Transverse top slab reinforcement may rest on top of prestressed concrete panels if necessary to maintain clear cover.

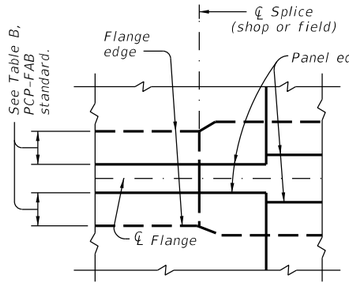
(9) Butt adjacent bedding strips together with adhesive. Cut v-notches, approx ¼" deep, in the top of the bedding strips at 8' o.c..

(10) Equally space additional bar if more than 1'-3" Max.

(11) The actual thickness constructed may exceed the slab thickness shown on the Span Details but the extra thickness may be no more than 2" (1" for prestressed concrete U-beams and steel beams). Bearing seat elevations or finished grade may be adjusted.

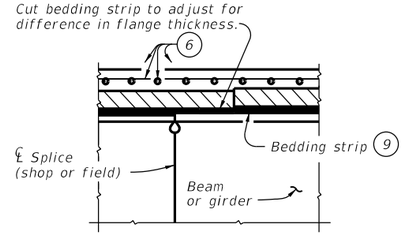
(12) Field adjust Bars Z1(#4) to match actual slope of slab overhangs. Width of slab overhang will vary along span with curved slab edges. Adjust Bar Z1(#4) dimensions to maintain proper cover. Bars Z2(#4) are located at Inverted-Tee stems only.

(13) Panels are allowed over top tension flanges, as approved by the Engineer. See Span Details for additional top mat reinforcement required in tension zones. Location of concrete placement sequence boundaries and bolted field splices should be considered by the contractor in determining panel limits.



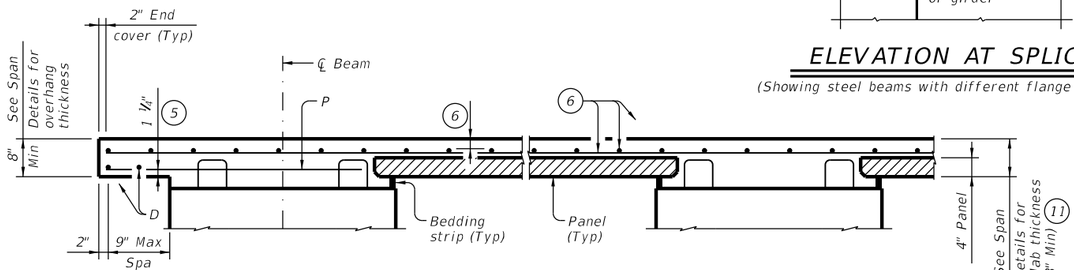
PLAN AT SPLICE

(Showing steel beams with flange width transition)



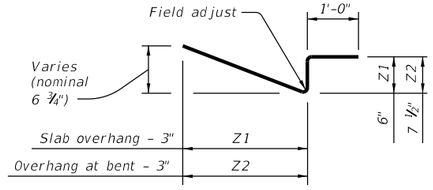
ELEVATION AT SPLICE

(Showing steel beams with different flange thickness)



PRESTRESSED CONCRETE SPREAD SLAB BEAMS

Bars P over exterior beams are still required when no overhang is used. In this case, only one Bar D, 2" from slab edge, is required.



BARS Z (#4) (12)

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PRESTRESSED CONCRETE PANELS
DECK DETAILS

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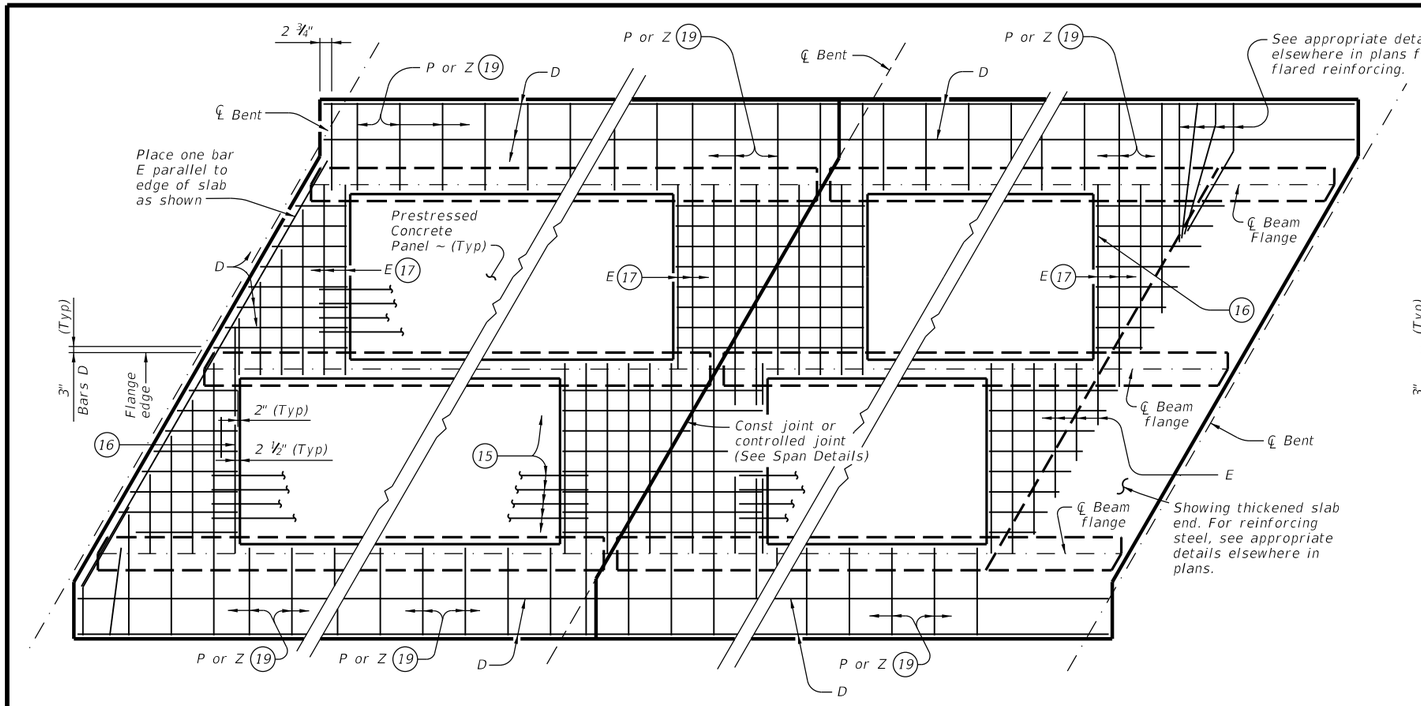
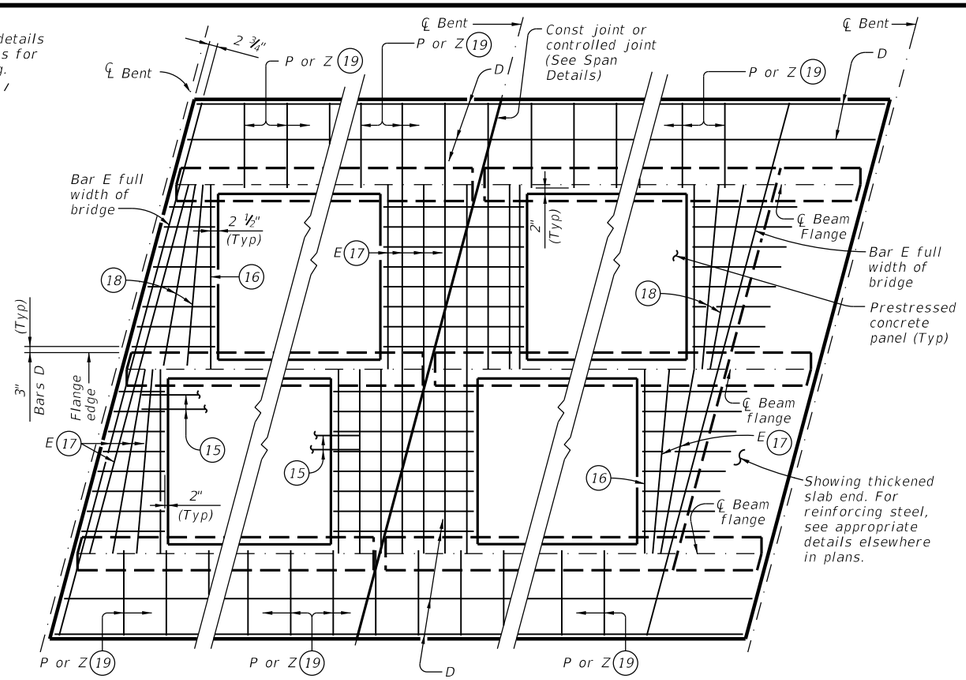


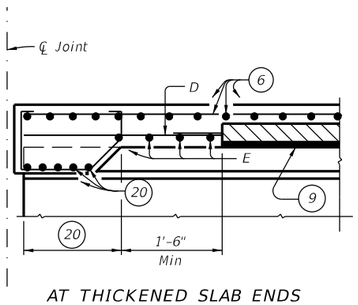
AT ALL SPAN ENDS UNLESS NOTED OTHERWISE | AT INTERIOR BENTS | AT THICKENED END SLABS

OPTION 1 ~ PLAN OF SLABS WITH NORMAL REINFORCEMENT

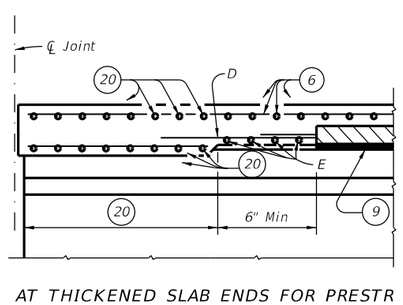


AT ALL SPAN ENDS UNLESS NOTED OTHERWISE | AT INTERIOR BENTS | AT THICKENED END SLABS

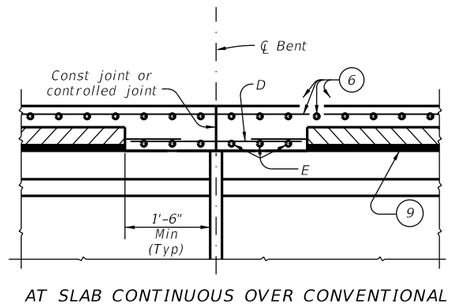
OPTION 1 ~ PLAN OF SLABS WITH SKEWED REINFORCEMENT



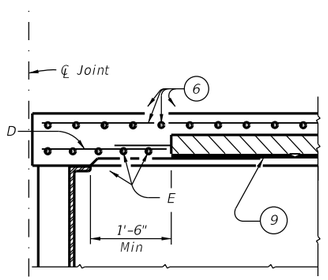
AT THICKENED SLAB ENDS FOR PRESTR CONCRETE U-BEAMS



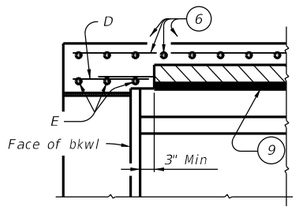
AT THICKENED SLAB ENDS FOR PRESTR CONCRETE I-BEAMS AND STEEL BEAMS



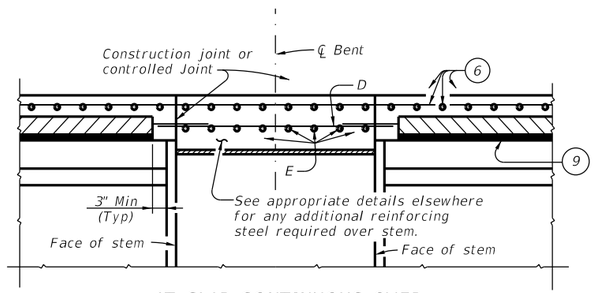
AT SLAB CONTINUOUS OVER CONVENTIONAL INTERIOR BENTS FOR ALL SIMPLE SPAN BEAMS



AT CONVENTIONAL END DIAPHRAGMS FOR STEEL BEAMS



AT SLAB OVER ABUTMENT BACKWALL FOR ALL BEAMS



AT SLAB CONTINUOUS OVER INVERTED-T BENTS FOR ALL BEAMS

OPTION 1 ~ ELEVATIONS AT BEAM ENDS

(6) See Span Details and Thickened Slab End Details for top slab reinforcement and clear cover. Transverse top slab reinforcement may rest on top of prestressed concrete panels if necessary to maintain clear cover.

(9) Butt adjacent bedding strips together with adhesive. Cut v-notches, approx ¼" deep, in the top of the bedding strips at 8' o.c.

(14) Max Spacing as listed unless otherwise shown.

(15) At connection with cast-in-place slab, extend longitudinal panel reinforcement. See PCP-FAB for details.

(16) Maintain one Bar E(#4) parallel to panel ends (Typ).

(17) Bars E(#4) not continuous over beam flanges must overlap beam flange 6" Min.

(18) Add flared Bars E(#4) (Min Spa = 6", Max Spa = 12") as required at panel ends.

(19) Where possible, Bars E(#4) may be extended into overhangs to replace Bars P(#4). Bars Z(#4) are required for sloped overhangs with U-Beams.

(20) See appropriate thickened slab end details for reinforcing and limits of thickened slab end.

TABLE OF REINFORCING STEEL (14)

BAR	SIZE	Max Spa (in.)
D	#4	9
E	#4	9
P	#4	18
UP	#4	~
Z	#4	18

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Bridge Division Standard

PRESTRESSED CONCRETE PANELS
DECK DETAILS

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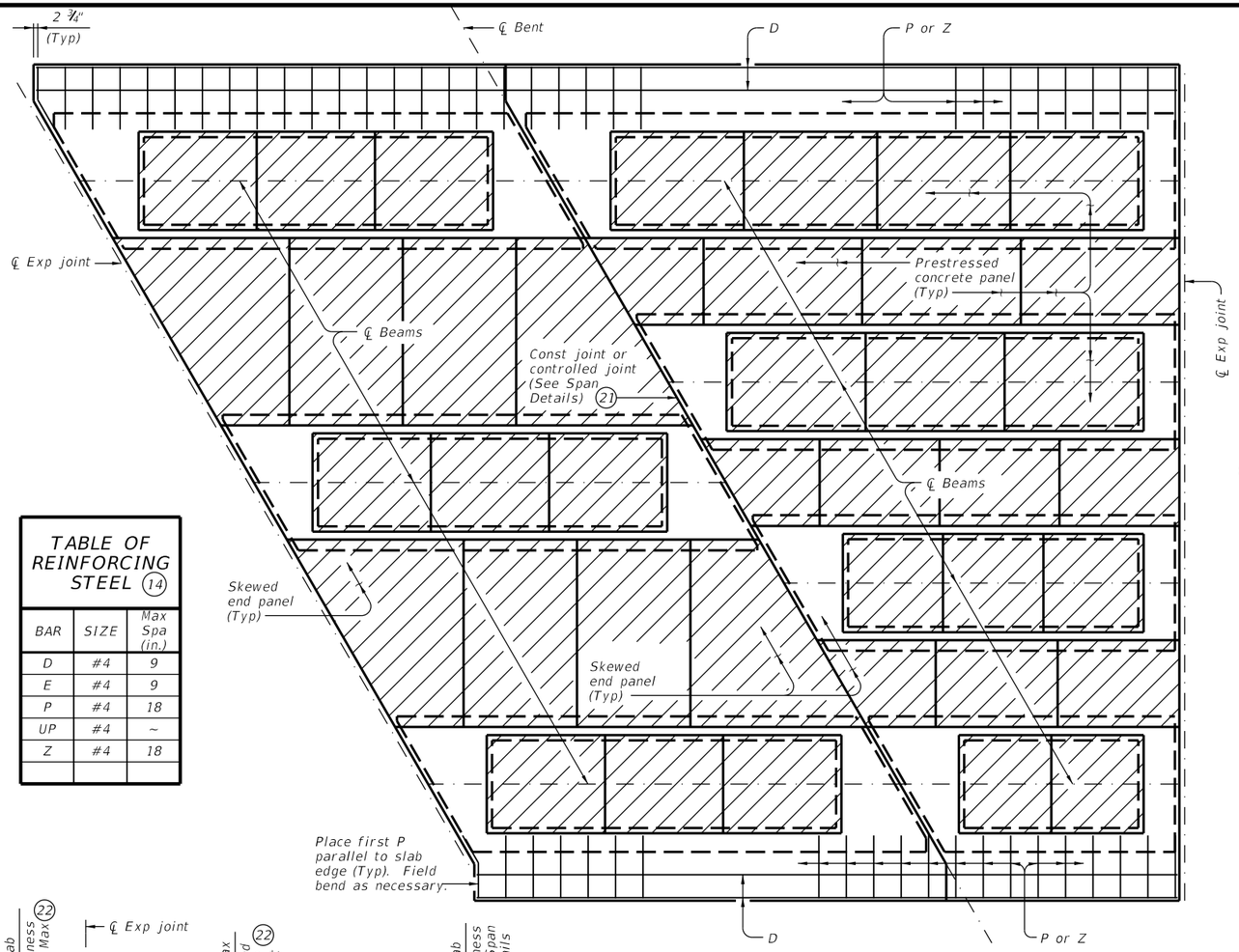
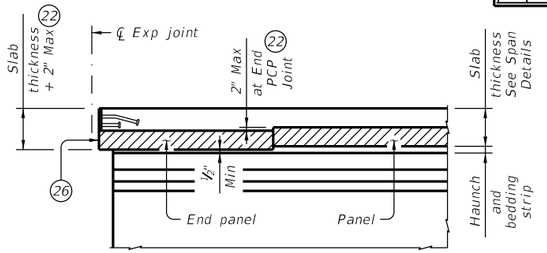


OPTION 2 ~ PLAN OF SLAB

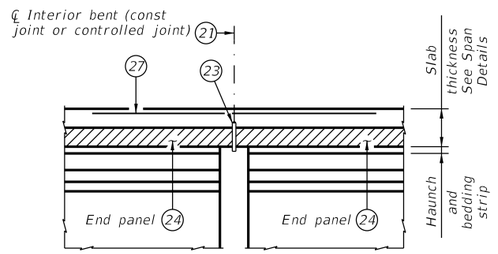
(Showing U-Beams; other beams similar)

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



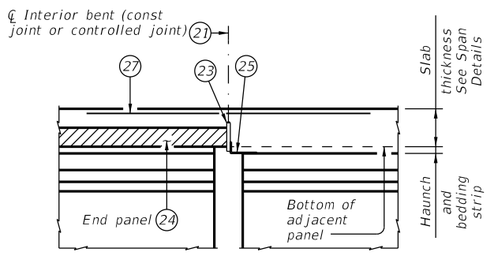
JOINTS (BETWEEN BEAMS/GIRDERS OR AT INV-T STEM)

For SEJ-B, SEJ-M, SEJ-S(0), AJ, and Type A expansion joints only.



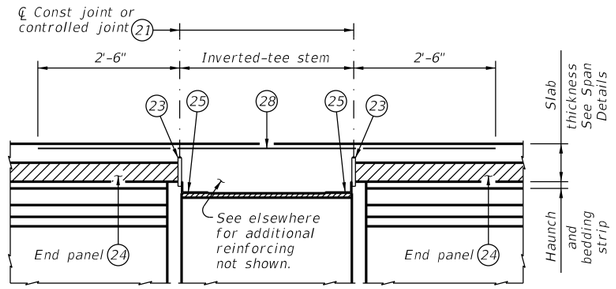
CONVENTIONAL INTERIOR BENT

Panel against panel between beams/girders.



CONVENTIONAL INTERIOR BENT

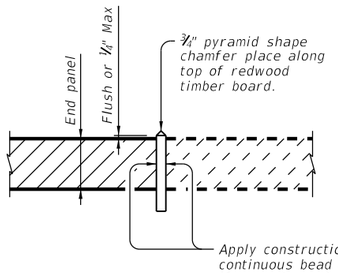
Panel against beam/girder end in adjacent span.



INVERTED-T BENT

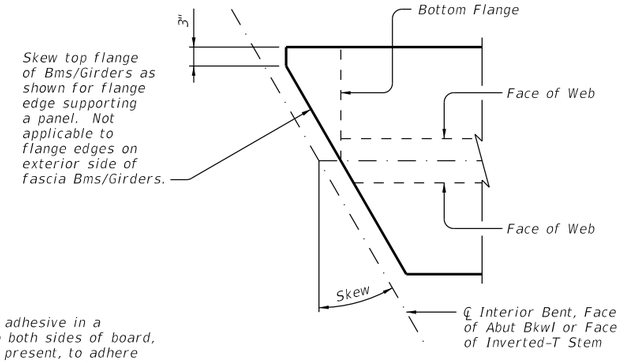
Panels against inverted-tee stem

OPTION 2 ~ ELEVATIONS AT BEAM ENDS (6)



ELEVATION EXAMPLE OF END PANEL AND TIMBER BOARD (23)

See "Option 2 ~ Elevation At Beam Ends".



OPTION 2 ~ SHOWING MODIFICATION TO BEAM/GIRDER TOP FLANGE FOR SKEWS OVER 5°

Showing I-Beam/I-Girder, U-Beams and Steel Beams similar.

(6) See Span Details and Thickened Slab End Details for top slab reinforcement and clear cover. Transverse top slab reinforcement may rest on top of prestressed concrete panels if necessary to maintain clear cover.

(14) Max Spacing as listed unless otherwise shown.

(21) 1 ½" Vinyl or plastic joint former at controlled joints (Stress Cap, Zip Strip, Stress Lock, or equal as approved by the Engineer.)

(22) End panel may be set up to 2" lower to accommodate expansion joint hardware, provided bedding strip is not less than ½" thick.

(23) ¾" thick redwood timber board, leave in place. Redwood timber board placed flush with top of panel or within ¼" Max above panel. Place ¾" pyramid shape chamfer along top of timber board. See "Elevation Example of End Panel and Timber Board". Place straight, within ¼" of centerline of bent or face of inverted-tee, across bridge width and end board at exterior flange edge of fascia beams/girders. Do not extend into overhang.

(24) Place panel within ½" of ¾" thick board.

(25) Permanent galvanized steel sheet form. Removable formwork is acceptable.

(26) Place end panel within ½" of expansion joint opening. End panel cannot encroach on required expansion joint opening.

(27) Place additional (#4) bar 5'-0" in length between every slab Bars T. Center (#4) bar on Joint.

(28) Place additional (#4) bar continuous 2'-6" beyond each side of Inverted-T Stem between every slab bars T.

SPECIAL OPTION 2 CONSTRUCTION NOTES:

When Option 2 is chosen bottom mat of thickened end slab reinforcing is not required. Use the same top mat as shown on the Thickened Slab End Details sheet.

Placing panels adjacent to expansion joints and bent centerlines prior to completing interior panel placement is recommended. Saw cutting panels to fit is acceptable when approved by the Engineer. Minimum distance from a saw cut edge to a panel strand is 1 ½".

Do not extend the longitudinal panel reinforcement into the cast-in-place slab.

Top flanges of beams and girders on skewed bridges must be modified as shown on this drawing. The Contractor is responsible for coordinating this modification with the beam fabricator prior to submitting shop drawings for approval.

Fabricator may optionally skew the whole end. When electing to skew whole end, girder end details and bearing type at conventional interior bent must be changed to use condition at abutment. Fabricator must coordinate change in bearing type, bearing centerline location, and dowel location with Engineer and Contractor. Show appropriate changes on girder and bearing shop drawings.

Bending of anchor studs of expansion joints shown on standards AJ, SEJ-B, SEJ-M, and SEJ-S(0) is permissible if necessary to clear top of end panels. The Contractor is responsible for coordinating modifications with the joint fabricator. Submit shop drawings for approval when modifications to expansion joint hardware are made.

Bedding strips under skewed end panels must conform to the requirements of Item 422 except their minimum compressive strength must be 60 psi.

Provide Bars AA, G, K and 0A from standard IGTS in the slab.

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PRESTRESSED CONCRETE PANELS
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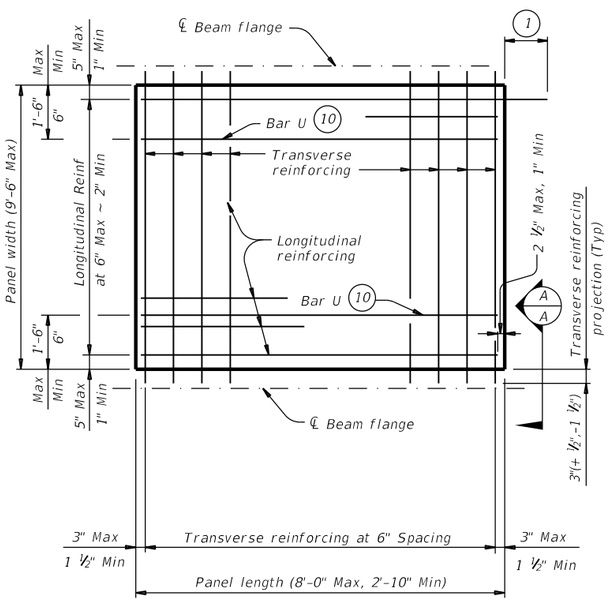
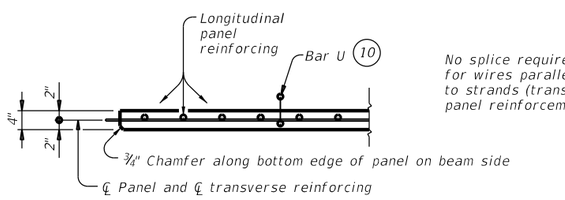
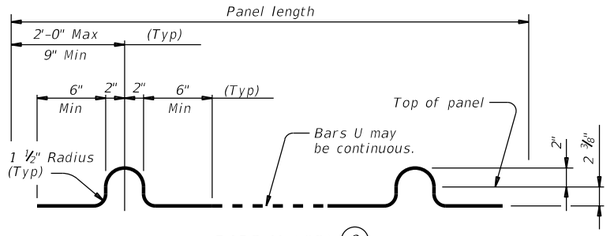


TYPICAL NON-SKEWED PANEL PLAN

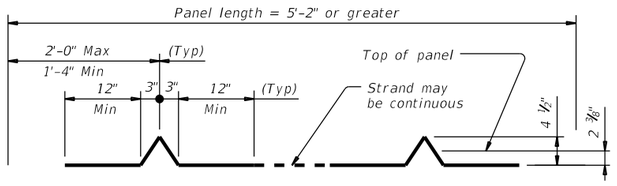


SECTION A-A

(Not showing supplemental #4 bars for skewed end panels.)



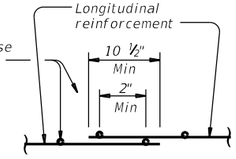
BARS U (#3) (2)



OPTIONAL STRAND FOR BARS U (3)

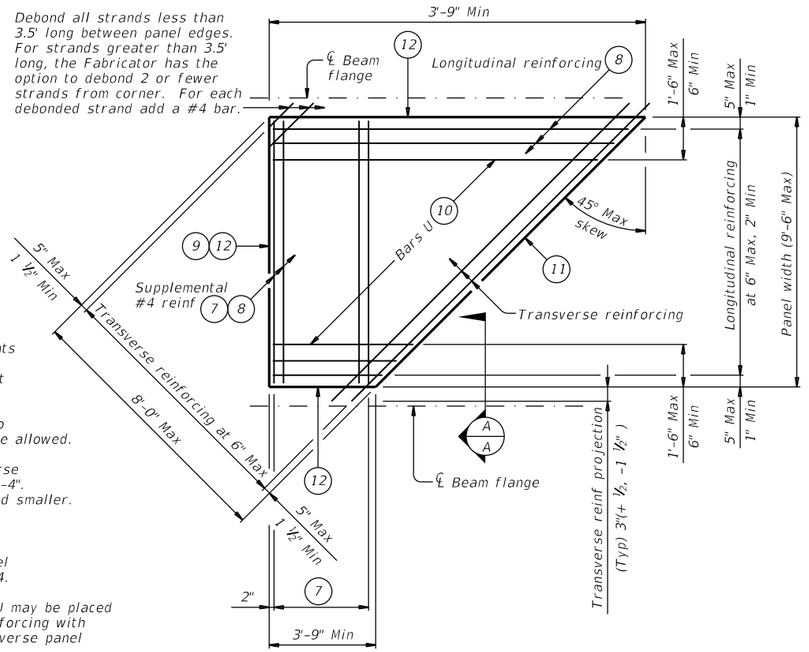
1. At connection with cast-in-place slab, extend longitudinal panel reinforcement 1'-0" (+2",-0") past panel end. Alternatively, provide (#3) x 2'-0" dowels at 6" Max Spacing and extend dowels 1'-0" past panel end.
2. Four loops required per panel.
3. Four loops required per panel. ⅜" or ½" strands may be used.
4. Normal dimensions must be used on spans with parallel beams. Maximum and Minimum dimensions apply only to spans with flared beams.
5. See Normal Grading Detail on PCP standard for lap requirements and bedding strip dimensions. Some laps shown in tables cannot utilize all bedding strip widths.
6. One Splice allowed per panel. No more than two sheets of WWR are allowed.
7. Provide (#4) bars under transverse reinforcing, 10 Spaces at 4" = 3'-4". Omit for 5 degree (1:12) skew and smaller.
8. End Cover 2 ½" Max, 1" Min.
9. Recess strands on indicated panel edge in accordance with Item 424.
10. At the fabricator's option, Bars U may be placed parallel to transverse panel reinforcing with horizontal legs in plane of transverse panel reinforcing.
11. Use length of indicated panel edge as panel width for purpose of determining type of transverse reinforcing.
12. Timber form work permissible this edge.

No splice required for wires parallel to strands (transverse panel reinforcement)



WELDED WIRE REINFORCEMENT (WWR) SPLICE DETAIL (6)

Debond all strands less than 3.5' long between panel edges. For strands greater than 3.5' long, the Fabricator has the option to debond 2 or fewer strands from corner. For each debonded strand add a #4 bar.

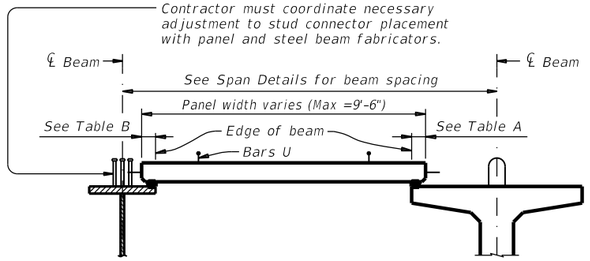


TYPICAL SKEWED END PANEL PLAN

(Only to be used with details shown elsewhere in the plans.)

TABLE A (4) (5)			
Beam Type	Normal (In.)	Min (In.)	Max (In.)
A	3	2 ½	3 ½
B	3	2 ½	3 ½
C	4	3	4 ½
IV	6	4	7 ½
VI	6 ½	4 ½"	8 ½
U40 – 54	5 ½	5 ½	7
Tx28-70	6	5	7 ½
XB20 – 40	4	3	4 ½
XSB12 – 15	4	3	4 ½

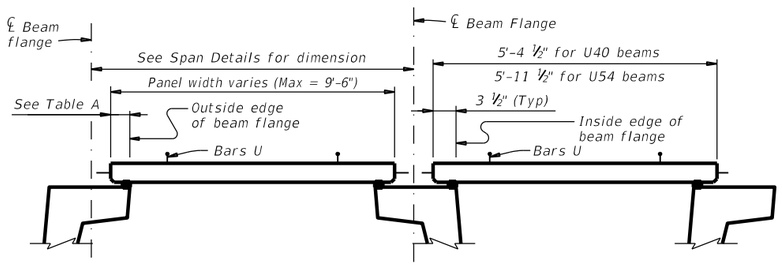
TABLE B (4) (5)			
Top Flange Width	Normal (In.)	Min (In.)	Max (In.)
11" to 12"	2 ¾	2 ½	2 ¾
Over 12" to 15"	3 ¼	3	3 ¼
Over 15" to 18"	4	3	4 ¾
Over 18"	5	3 ½	6 ¼



STEEL BEAMS

PRESTRESSED CONCRETE BEAMS OR GIRDERS

Typ unless noted otherwise



PRESTRESSED CONCRETE U-BEAMS

TYPICAL SECTIONS FOR DETERMINING PANEL WIDTH

GENERAL NOTES:

Provide Class H concrete for panels. Release strength f'ci=3,500 psi. Minimum 28 day strength f'c=5,000 psi.

Provide ¾" chamfer along bottom edge of panel on beam side.

Do not use epoxy-coated reinforcing steel bar or strand in panels.

Remove laitance from top panel surface.

Finish top of panel to a roughness between a No. 6 and No. 9 concrete surface profile, inclusive, as specified by the International Concrete Repair Institute (ICRI).

Shop drawings for the fabrication of panels will not require the Engineer's approval if fabrication is in accordance with the details shown on this standard.

A panel layout which identifies location of each panel must be developed by the Fabricator. Permanently mark each panel in accordance with the panel layout. A copy of the layout is to be provided to the Engineer.

TRANSVERSE PANEL REINFORCEMENT:

For panel widths over 5', use ⅜" or ½" Dia (270k) prestressing strands with a tension of 14.4 kips per strand.

For panel widths over 3'-6" up to and including 5', use ⅜" or ½" Dia (270k) prestressing strands with a tension of 14.4 kip per strand. Optionally, (#4) Grade 60 reinforcing bars may be used in lieu of prestressed strands.

For panel widths up to 3'-6", use (#4) Grade 60 reinforcing bars (prestressed strands alone are not allowed).

Place transverse panel reinforcement at panel centroid and space at 6" Max.

LONGITUDINAL PANEL REINFORCEMENT:

Any of the following options may be used for longitudinal panel reinforcement:

1. (#3) Grade 60 reinforcing steel at 6" Max Spacing. No splices allowed.
2. ⅜" Dia prestressing strands at 4 ½" Max Spacing (unstressed). No splices allowed.
3. ½" Dia prestressing strands at 6" Max Spacing (unstressed). No splices allowed.
4. Deformed Welded Wire Reinforcement (WWR) (ASTM A1064) providing 0.22 sq in per foot of panel width. Wires larger than D11 not permitted. Provide transverse wires to ensure proper handling of reinforcing. One splice per panel is allowed. See WWR Splice Detail.

No combination of longitudinal reinforcement options in a panel is allowed.

Place longitudinal panel reinforcement above or below transverse panel reinforcement. Must be placed above transverse panel reinforcement for skewed end panels with supplemental (#4) reinforcement.

HL93 LOADING

Texas Department of Transportation

Bridge Division Standard

PRESTRESSED CONCRETE PANEL FABRICATION DETAILS

PCP-FAB

FILE:	DN: TxDOT	CK: TxDOT	DW: JTR	CK: AES
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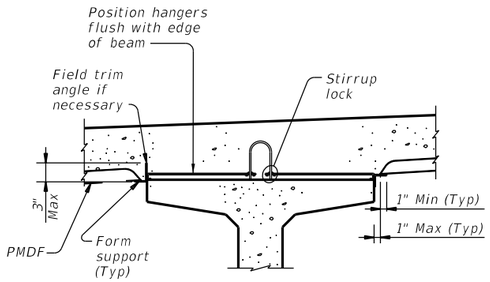
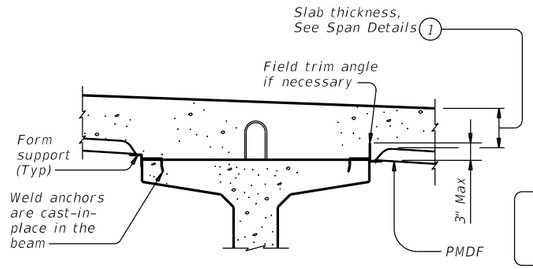
	0467	02	020, ETC.	SH 220
	DIST	COUNTY		SHEET NO.
	FTW	ERATH		164

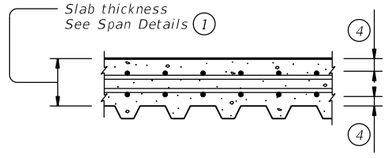
DATE:
FILE:



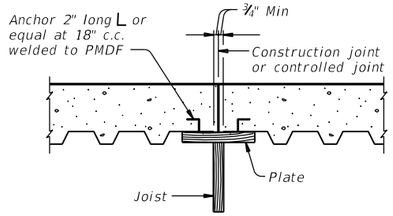
PRESTR CONC I-BEAMS AND I-GIRDERS WITH STIRRUP LOCKS



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

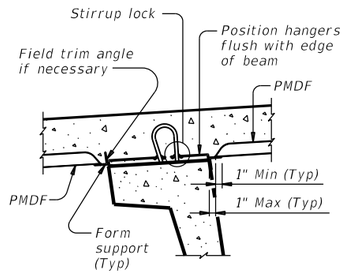


TYP LONGITUDINAL SLAB SECTION

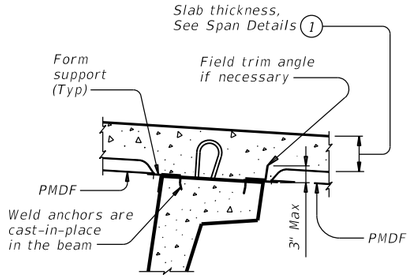


Note: In spans where PMD forms are used, timber forms must be used at construction joints. Adequate provision must be made to support edge of metal form and to provide anchorage of metal form to slab concrete where joined to wood forms.

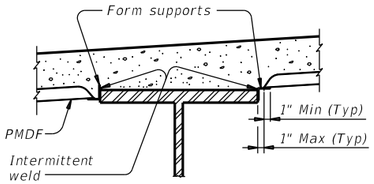
SECTION THRU CONSTRUCTION JOINT



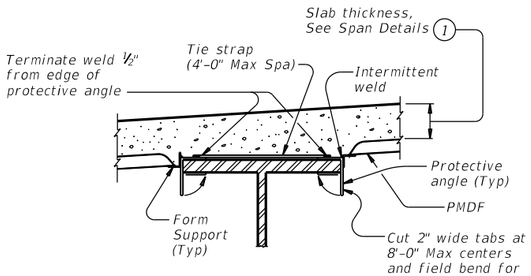
U-BEAMS WITH STIRRUP LOCKS



U-BEAMS WITH WELD ANCHORS

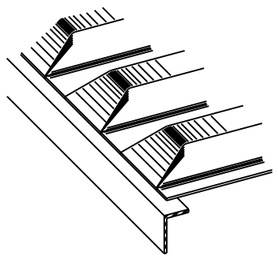


STEEL BEAMS AT COMPRESSION FLANGES

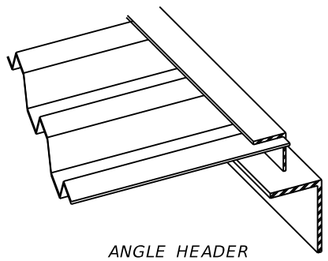


STEEL BEAMS AT TENSION FLANGES (2)

TYPICAL TRANSVERSE SECTIONS



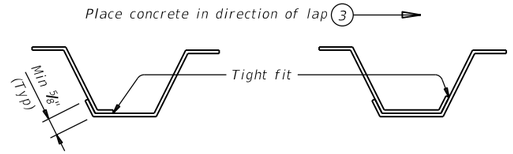
PRECLOSED



ANGLE HEADER

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

TYPES OF END CLOSURES



SIDE LAP DETAILS

(1) Slab thickness minus 3/8" if corrugations match reinforcing bars.

(2) Welding of form supports to tension flanges will not be permitted. Other methods of providing wind hold down resistance for PMDF in tension flange zones will be considered. At least one layer of sheet metal must be provided between the flange and the weld joint.

(3) The direction of concrete placement will be such that the upper layer of the form overlap is loaded first.

(4) See Span details for cover requirements.

FOR PRESTR CONC U-BEAM AND STEEL GIRDER BRIDGES:
Unless shown elsewhere in the plans, size, spacing, and orientation of bottom mat of slab reinforcement must match the top mat of reinforcing shown on the span details except all bottom mat bars are to be #5. Bottom mat reinforcement and additional concrete is subsidiary to Item 422 "Concrete Superstructures."

FOR PRESTR CONC TX-GIRDER BRIDGES:
See Miscellaneous Slab Details, Prestr Concrete I-Girders (IGMS) standard sheet for bottom mat reinforcing.

GENERAL NOTES:

Steel for Permanent Metal Deck Forms (PMDF) and support angles shall conform to ASTM A653, structural steel (SS), with coating designation G165. Steel must have a minimum yield strength of 33 ksi. Minimum thickness of PMDF is 20 gage and that of support angles and protective angles is 12 gage.

Submit two copies of forming plans for PMDF to the Engineer. These plans must show all essential details of proposed form sheets, closures, fasteners, supports, connectors, special conditions and size and location of welds. These plans must clearly show areas of tension flanges for steel beams and provisions for protecting the tension flanges from welding notch effects by inclusion of separating sheet metal or other positive method. These plans must be designed, signed, and sealed by a licensed professional engineer. Department approval of these plans is not required, but the Department reserves the right to require modifications to the plans. The Contractor is responsible for the adequacy of these plans.

The details and notes shown on this standard are to be used as a guide in preparation of the forming plans.

All material, labor, tools and incidentals necessary to form a bridge deck with Permanent Metal Deck Forms is considered subsidiary to Item 422, "Concrete Superstructures".

DESIGN NOTES:

As a minimum, PMDF and support angles must be designed for the dead load of the form, reinforcement and concrete plus 50 psf for construction loads. Flexural stresses due to these design loads must not exceed 75 percent of the yield strength of the steel. Allowable stress for weld metal must be 12,400 psi.

Maximum deflection under the weight of forms, reinforcement and concrete or 120 psf, whichever is greater, shall not exceed the following:

1/180 of the form design span, but not more than 0.50", for design spans of 10' or less.

1/240 of the form design span, but not more than 0.75", for design spans greater than 10'.

1/240 of the form design span, but not more than 0.75", for all design spans of railroad overpass bridge spans fully or partially over railroad right-of-way, and for all bridge spans of railroad underpass structures.

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

CONSTRUCTION NOTES:

Form sheets must not be permitted to rest directly on the top of beam flanges. Form sheets must be securely fastened to form supports and must have a minimum bearing length of one inch at each end. Form supports must be placed in direct contact with beam flanges.

All attachments must be made by permissible welds, screws, bolts, clips or other means shown on the forming plans. All sheet metal assembly screws must be installed with torque-limiting devices to prevent stripping. Only welds or bolts must be used to support vertical loads.

Welding and welds must be in accordance with the provisions of Item 448, "Structural Field Welding", pertaining to fillet welds. All welds must be made by a qualified welder in accordance with Item 448.

All permanently exposed form metal, where the galvanized coating has been damaged, must be thoroughly cleaned and repaired in accordance with Item 445, "Galvanizing". Minor heat discoloration in areas of welds need not be touched up.

Flutes must line up uniformly across the entire width of the structure where main reinforcing steel is located in the flute.

Construction joints will not be permitted unless shown on the plans. The location of and forming details for any construction joint used must be shown on the forming plans. Forms below a construction joint must be removed after curing of the slab.

A sequence for uniform vibration of concrete must be approved by the Engineer prior to concrete placement. Attention must be given to prevent damage to the forms, yet provide proper vibration to prevent voids or honeycomb in the flutes and at headers and/or construction joints.

Texas Department of Transportation

Bridge Division Standard

PERMANENT METAL DECK FORMS

PMDF

FILE:	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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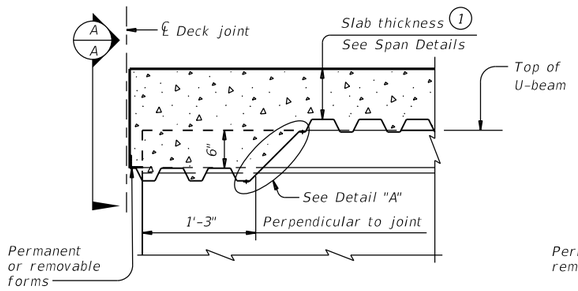
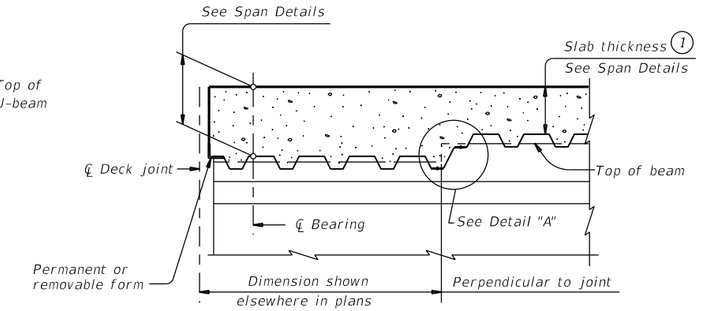
02-20: Modified box note by adding steel beams/girders and subsidiary.	DIST	COUNTY		SHEET NO.
12-21: Updated max deflection for RR.	FTW	ERATH		165

DATE:
FILE:

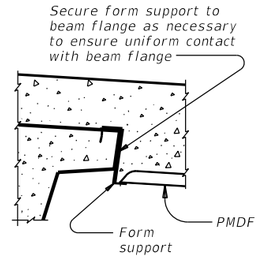


AT THICKENED SLAB END FOR U-BEAMS

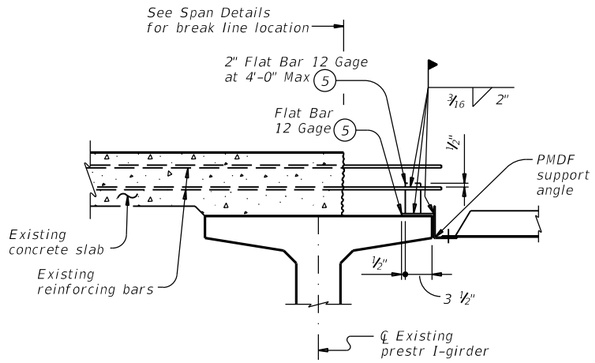


AT THICKENED SLAB END FOR PRESTRESSED I-BEAMS, I-GIRDERS AND STEEL BEAMS

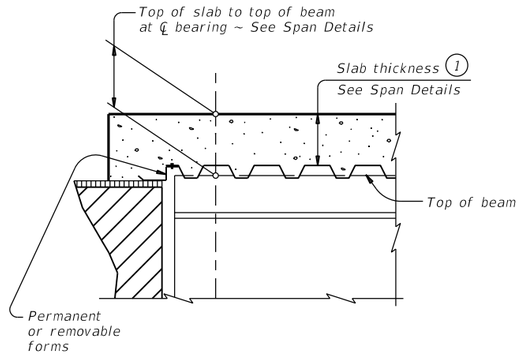
Showing I-beam block-out. No block-out for I-girders or steel beams.



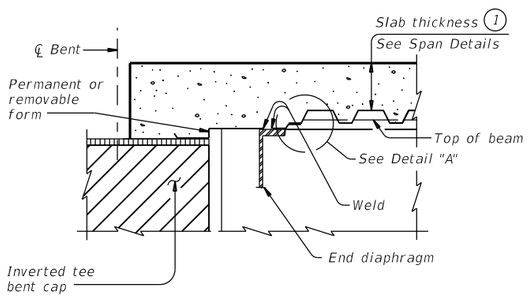
SECTION A-A



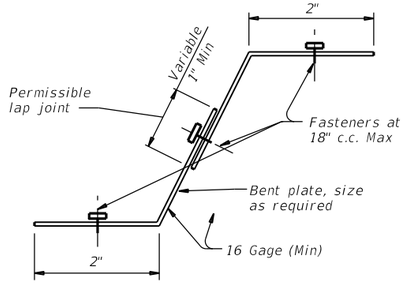
SHOWING PRESTRESSED CONCRETE I-BEAMS, I-GIRDERS AND U-BEAMS



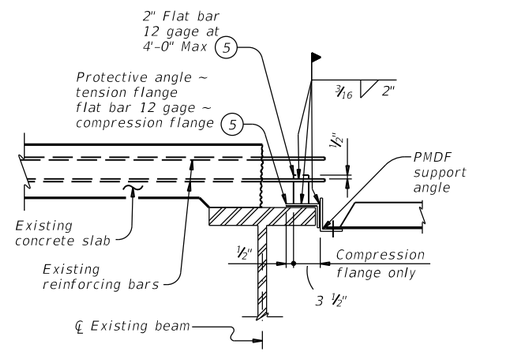
AT SLAB OVER ABUTMENT BACKWALL OR INVERTED-T STEM FOR CONCRETE BEAMS WITHOUT THICKENED SLAB END



AT SLAB OVER INVERTED-T STEM FOR STEEL BEAMS WITHOUT THICKENED SLAB END

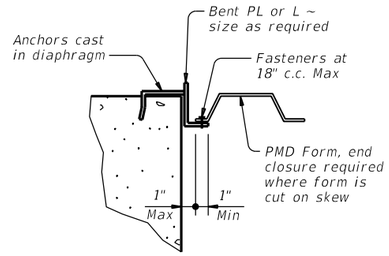


DETAIL "A"

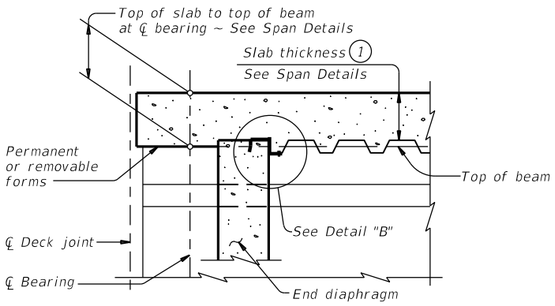


SHOWING STEEL BEAMS

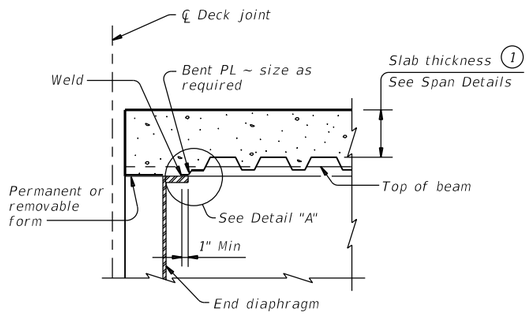
WIDENING DETAILS



DETAIL "B"



AT CONCRETE END DIAPHRAGM FOR PRESTRESSED I-BEAMS AND STEEL BEAMS



AT END DIAPHRAGM FOR STEEL BEAMS WITHOUT THICKENED SLAB END

(1) *Slab thickness minus 5/8" if corrugations match reinforcing bars*

(5) *Minimum yield stress of 12 gage bars shall be 40 ksi*

DETAILS AT ENDS OF BEAMS

SHEET 2 OF 2

Texas Department of Transportation

Bridge Division Standard

PERMANENT METAL DECK FORMS

PMDF

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REVISIONS	0467	02	020, ETC.	SH 220
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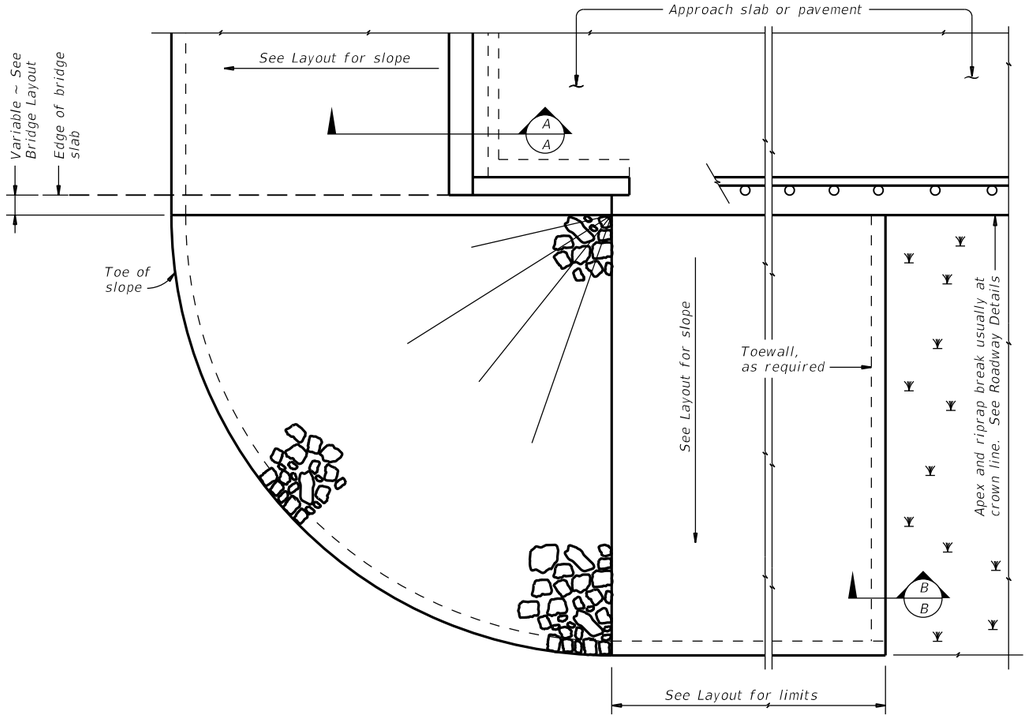
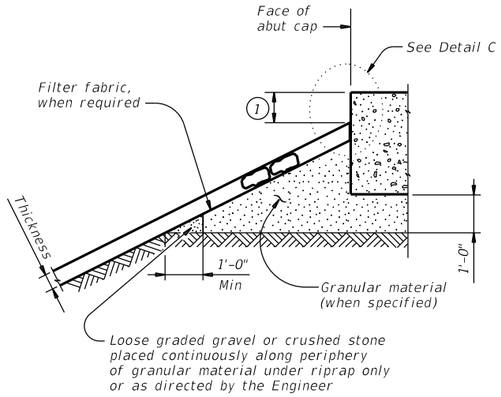
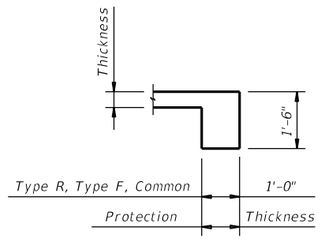
12-21: Updated max deflection for RR.	FTW	ERATH		166



PLAN

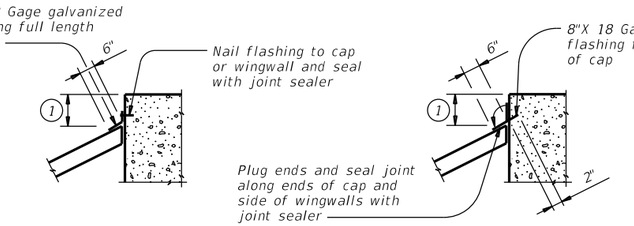


SECTION A-A AT CAP



SECTION B-B

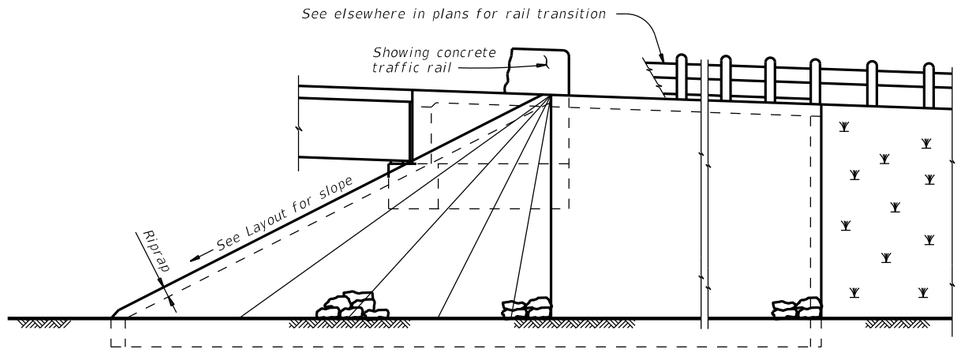
Provide toewall when shoulder drain is located adjacent to limits of stone riprap. Omit toewall when thickness of protection riprap is greater than 18".



CAP OPTION A

CAP OPTION B

DETAIL C



ELEVATION

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.

(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.

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STONE RIPRAP

SRR

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REVISIONS	0467	02	020, ETC.	SH 220
	DIST	COUNTY		SHEET NO.
	FTW	ERATH		167

DATE:
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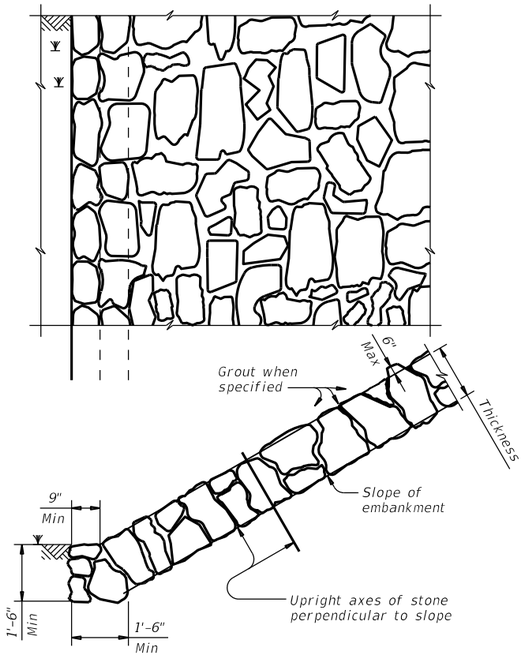


FIGURE 1 ~ TYPE R STONE RIPRAP

dry or grouted

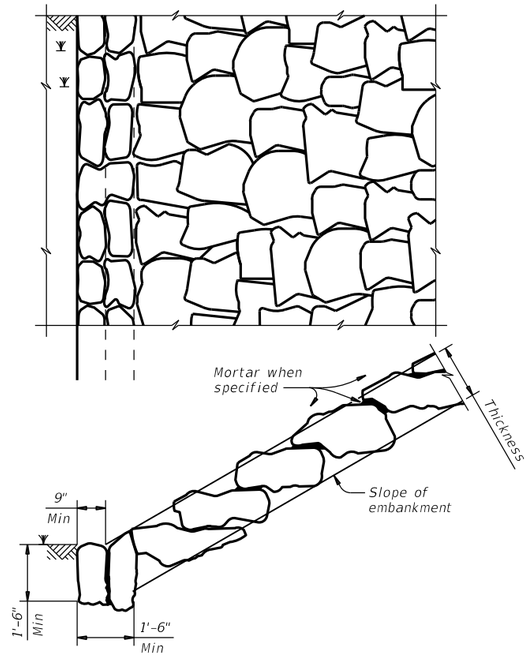


FIGURE 2 ~ TYPE F STONE RIPRAP

dry or mortared

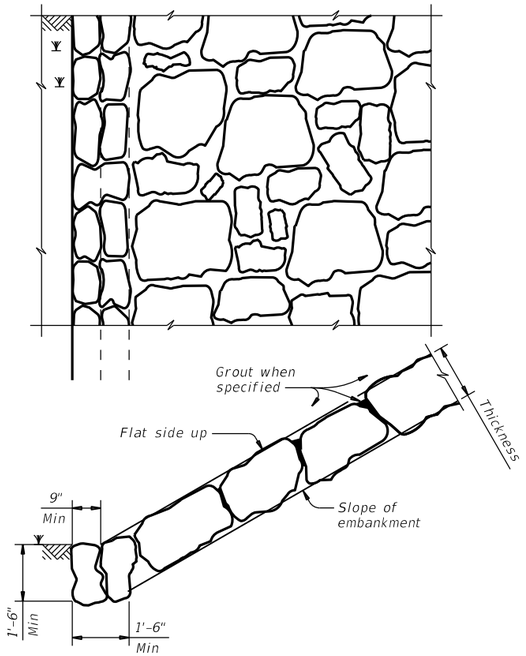


FIGURE 3 ~ TYPE F STONE RIPRAP

grouted

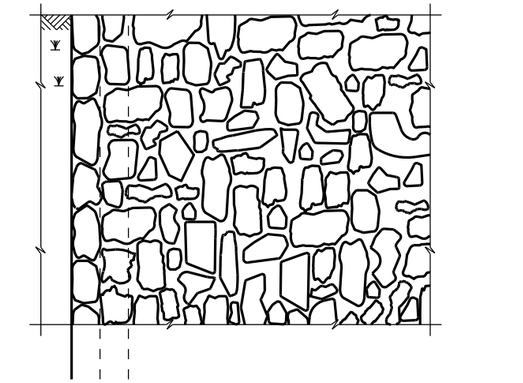


FIGURE 4 ~ COMMON STONE RIPRAP

dry or grouted

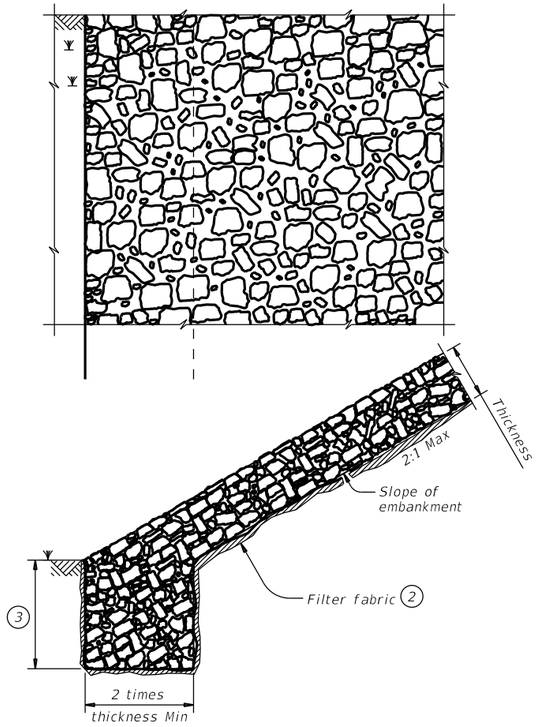


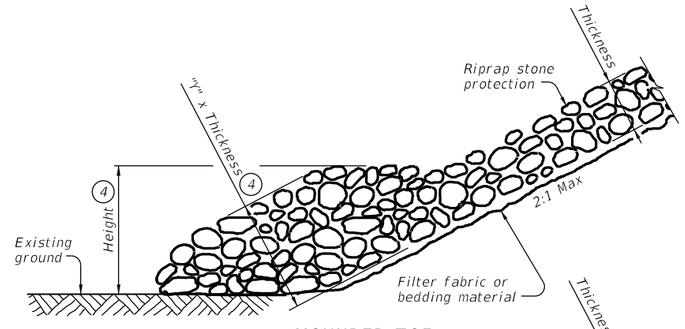
FIGURE 5 ~ PROTECTION STONE RIPRAP (5)

(2) Provide bedding material instead of filter fabric if shown elsewhere in plans. See Layout for thickness of bedding material.

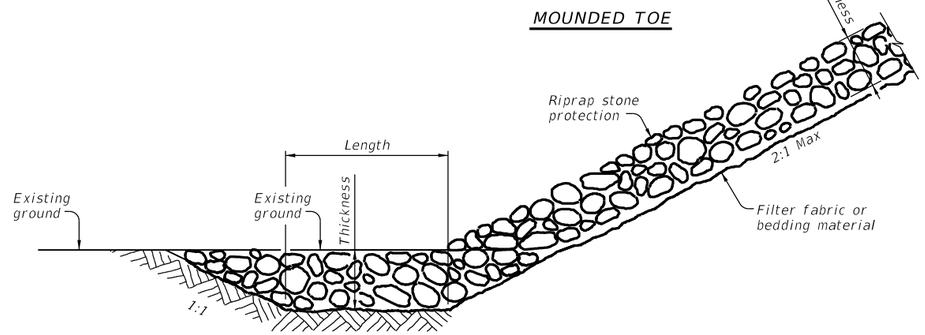
(3) Minimum toe depth is the larger of the maximum scour depth or 2 times the riprap thickness.

(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.



MOUNDED TOE



EXTENDED ROCK FILLED TRENCH

PROTECTION STONE RIPRAP TOE OPTIONS (5)

SHEET 2 OF 2

Texas Department of Transportation

Bridge Division Standard

STONE RIPRAP

SRR

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REVISIONS	0467	02	020, ETC.	SH 220
	DIST	COUNTY		SHEET NO.
	FTW	ERATH		168

DATE:
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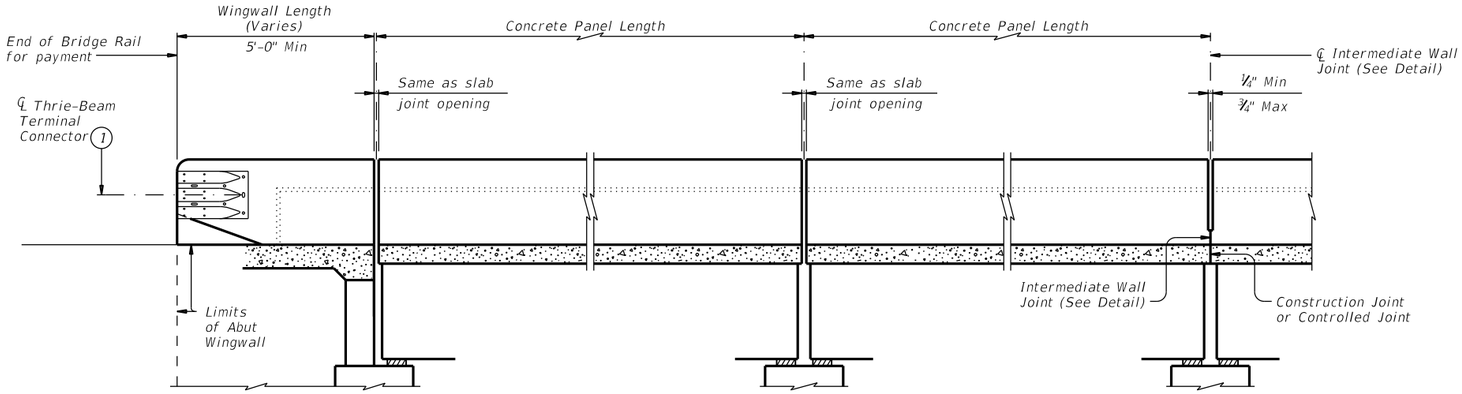
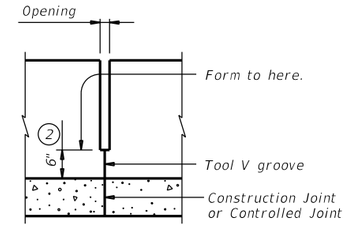


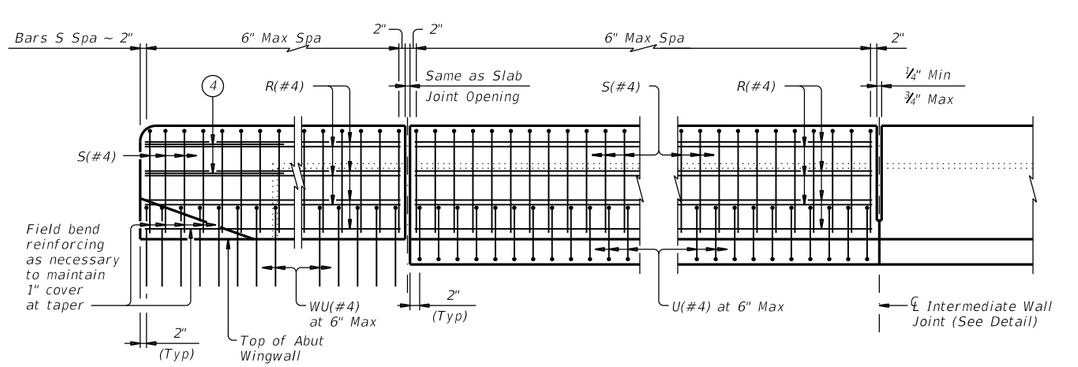
AT ABUTMENTS | AT BENTS WITH SLAB EXP JOINTS | AT BENTS WITHOUT SLAB EXP JOINTS

ROADWAY ELEVATION OF RAIL

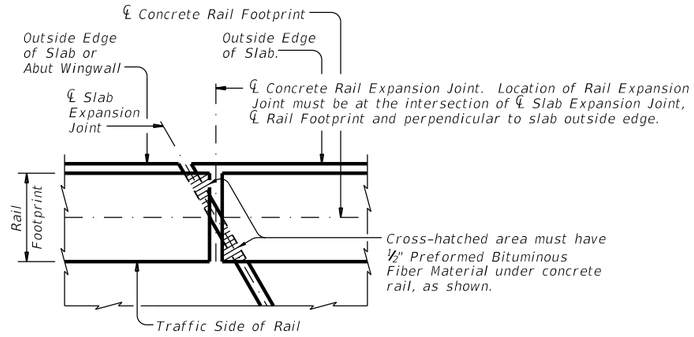


INTERMEDIATE WALL JOINT DETAIL

Provide at all interior bents without slab expansion joints.



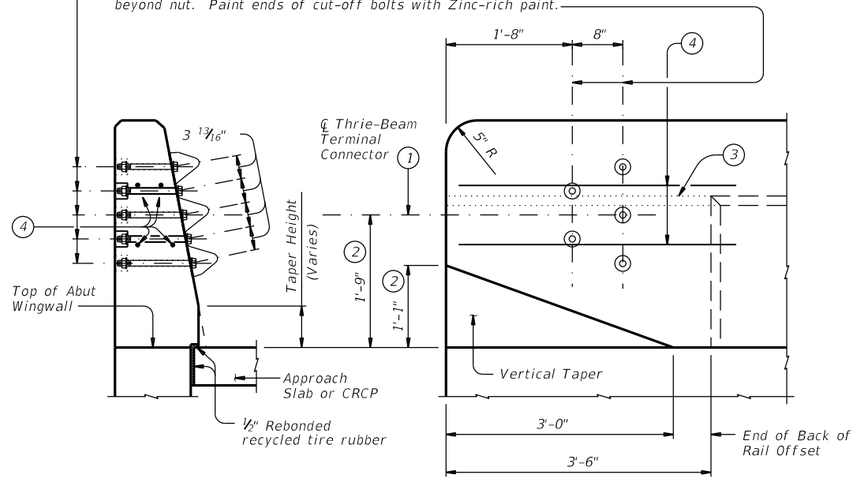
ELEVATION SHOWING TYPICAL REINFORCING PLACEMENT



PLAN OF RAIL AT EXPANSION JOINTS

Example showing Slab Expansion Joints without breakbacks.

℄ 5 ~ 1" Dia holes and 2 ½" Dia x 2" deep recesses. Form or core holes and recesses. Percussion drilling is not permitted. Adjust placement of reinforcing steel as necessary to avoid bolt holes and recesses. Bolt recesses are only required when pedestrian sidewalks are adjacent to back of rail. Tighten the 5 Terminal Connection Bolts in a well distributed pattern so to prevent damage or distortion of the Thrie-Beam Connection and the MBGF Transition. Cut bolts off after installation so as to extend no more than ¾" beyond nut. Paint ends of cut-off bolts with Zinc-rich paint.



SECTION | ELEVATION

TERMINAL CONNECTION DETAILS

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

SHEET 1 OF 2

Texas Department of Transportation | Bridge Division Standard

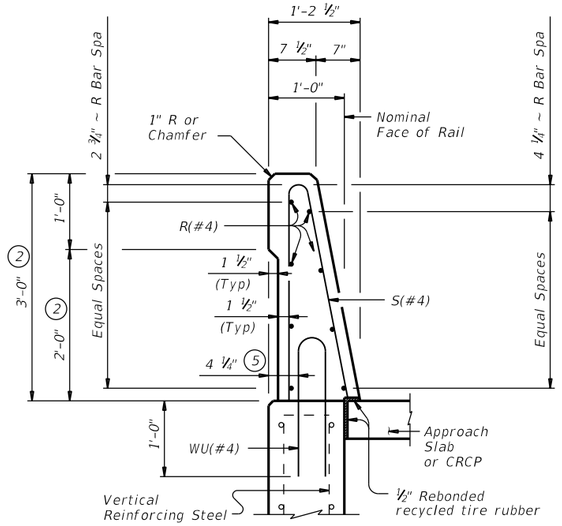
TRAFFIC RAIL SINGLE SLOPE

TYPE SSTR

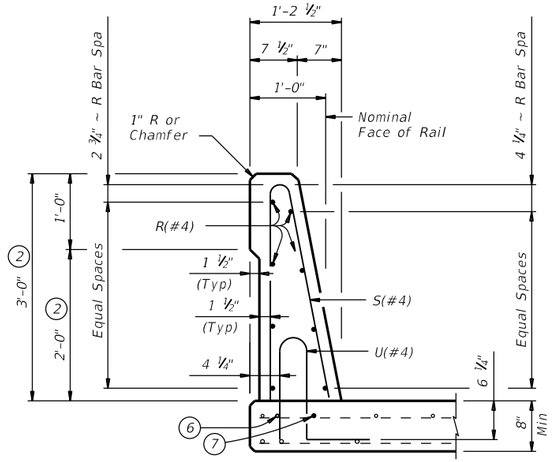
FILE:	DN: TxDOT	CK: TxDOT	DW: JTR	CK: TxDOT
©TxDOT September 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0467	02	020, ETC.	SH 220
	DIST	COUNTY		SHEET NO.
	FTW	ERATH		169

DATE:
FILE:

DATE:
FILE:



ON ABUTMENT WINGWALLS OR CIP RETAINING WALLS



ON BRIDGE SLAB

SECTIONS THRU RAIL

(2) Increase 2" for structures with Overlay.

(5) 5 ¼" when vertical reinforcing has closer clear cover over horizontal reinforcing in abutment wingwalls or retaining walls on traffic side of wall.

(6) As an aid in supporting reinforcement, additional longitudinal bars may be used in the slab with the approval of the Engineer. Such bars must be furnished at the Contractor's expense.

(7) Top longitudinal slab bar may be adjusted laterally 3" plus or minus to tie reinforcing.

(8) No longitudinal wires may be within upper bend.

(9) Bend or cut as required to clear drain slots.

(10) Space U(#4) bars at 4" Max when end region of panel length is less than 6'-0" to side slot drain. Space U(#4) bars at 6" Max when end region of panel length is 6'-0" and greater to side slot drain.

CONSTRUCTION NOTES:

This railing may be constructed by the slipform process when approved by the Engineer, with equipment approved by the Engineer. Provide sensor control for both line and grade. Tack welding to provide bracing for slipform operations is acceptable. Welding may be performed at a minimum spacing of 3 ft between the cage and the anchorage. It is permissible to weld to bars U, WU and S at any location on the cage. If increased bracing is needed, provide additional anchorage devices and weld in the upper two thirds of the cage. Paint welded areas on epoxy coated and/or galvanized reinforcing with an organic zinc rich paint in accordance with Item 445 "Galvanizing".

If rail is slipformed, apply an heavy epoxy bead 1" behind toe of traffic side of rail to concrete deck just prior to slip forming. Provide a ⅜" width x ¼" tall heavy epoxy bead with Type III, Class C or a Type V epoxy.

The back of railing must be vertical unless otherwise shown in the plans or approved by the Engineer.

MATERIAL NOTES:

Provide Class "C" concrete. Provide Class "C" (HPC) if required elsewhere.

Provide Grade 60 reinforcing steel.

Epoxy coat or galvanize all reinforcing steel if slab bars are epoxy coated or galvanized.

Deformed Welded Wire Reinforcement (WWR) (ASTM A1064) of equal size and spacing may be substituted for Bars U and WU unless noted otherwise. Deformed WWR (ASTM A1064) may be substituted for Bars R and S, as shown. Combinations of reinforcing steel and WWR or configurations of WWR other than shown are permitted if conditions in the table are satisfied. Provide the same laps as required for reinforcing bars.

Provide bar laps, where required, as follows:

Uncoated or galvanized ~ #4 = 1'-7"

Epoxy coated ~ #4 = 2'-5"

GENERAL NOTES:

This rail has been successfully evaluated by full-scale crash test to meet MASH TL-4 criteria. This rail can be used for speeds of 50 mph and greater when a TL-3 rated guard fence transition is used. When a TL-2 rated guard fence transition is used, this rail can only be used for speeds of 45 mph and less.

Do not use this railing on bridges with expansion joints providing more than 5" movement.

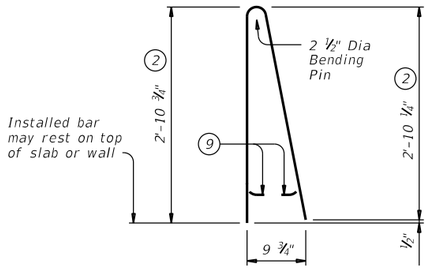
Rail anchorage details shown on this standard may require modification for select structure types. See appropriate details elsewhere in plans for these modifications.

Shop drawings will not be required for this rail.

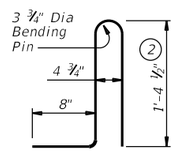
Average weight of railing with no overlay is 376 plf.

Cover dimensions are clear dimensions, unless noted otherwise.

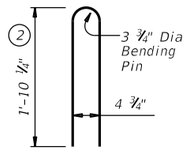
Reinforcing bar dimensions shown are out-to-out of bar.



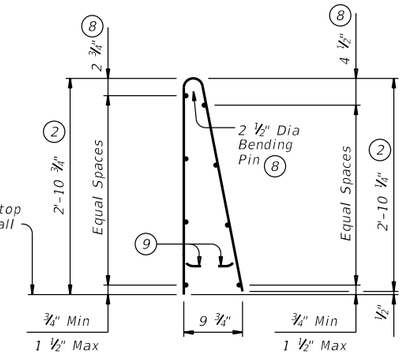
BARS S (#4)



BARS U (#4)

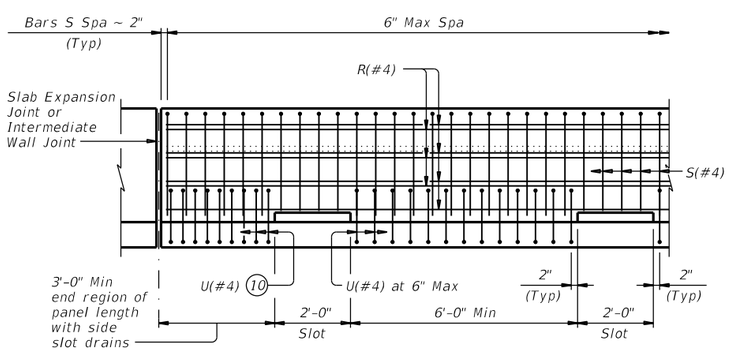


BARS WU (#4)



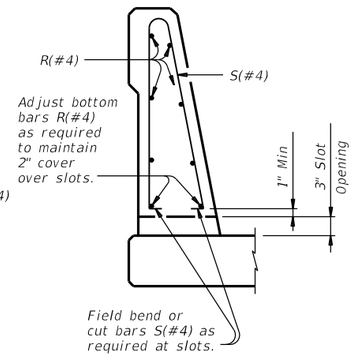
OPTIONAL WELDED WIRE REINFORCEMENT (WWR)

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



OPTIONAL SIDE SLOT DRAIN DETAIL

Note: Side Slot Drains may be used where shown elsewhere on the plans or as directed by the Engineer. Drains should not be placed over railroad tracks, lower roadways, or sidewalks. When this rail is used as a separator between a roadway surface and a sidewalk surface, side drain slots will not be permitted.



SECTION THRU OPTIONAL SIDE SLOT DRAIN

SHEET 2 OF 2

Texas Department of Transportation

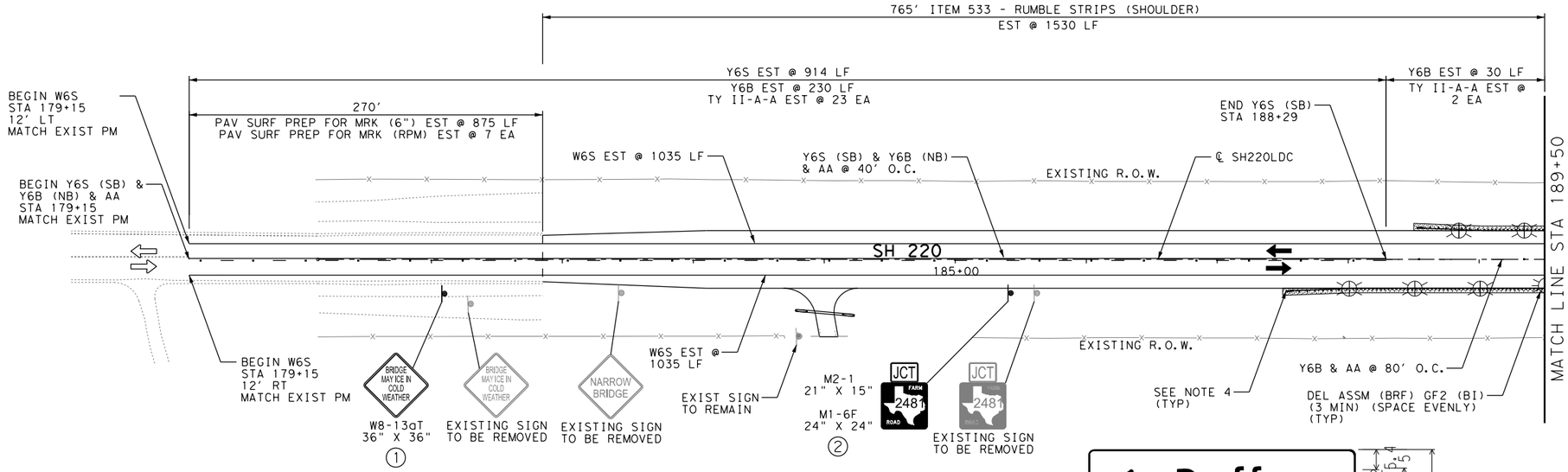
Bridge Division Standard

TRAFFIC RAIL SINGLE SLOPE

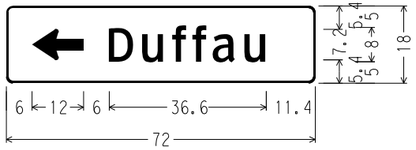
TYPE SSTR

FILE:	DN: TxDOT	CK: TxDOT	DW: JTR	CK: TxDOT
©TxDOT September 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0467	02	020, ETC.	SH 220
	DIST	COUNTY		SHEET NO.
	FTW	ERATH		170

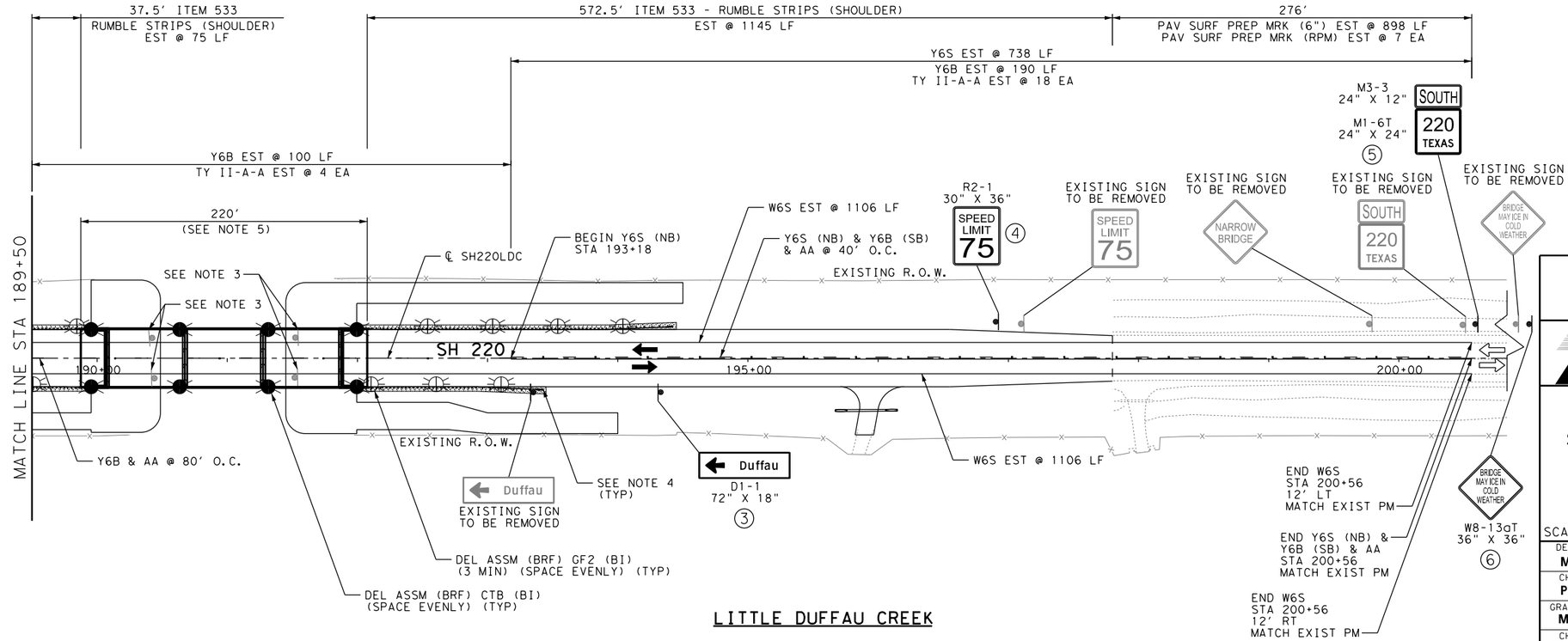
TIME: 6:30:18 PM
DATE: 7/10/2024



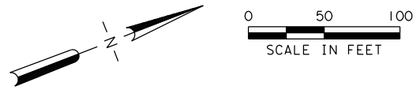
LITTLE DUFFAU CREEK



D1-1 8in LT;
1.5" Radius, 0.5" Border, White on Green;
Standard Arrow Custom 12.0" X 7.1" 180°;
"Duffau", ClearviewHwy-3-W;



LITTLE DUFFAU CREEK



LEGEND

W6S	RE PM W/RET REQ TY I(W)6"(SLD)(090MIL)
Y6S	RE PM W/RET REQ TY I(Y)6"(SLD)(090MIL)
Y6B	RE PM W/RET REQ TY I(Y)6"(BRK)(090MIL)
·	REFLECTIVE PAVEMENT MARKER TY II-A-A
	DEL ASSM (D-SW) SZ 1 (BRF) GF2 (BI)
	DEL ASSM (D-SW) SZ 1 (BRF) CTB (BI)
(#)	PROPOSED SMALL SIGN & SIGN NUMBER
	EXISTING SMALL SIGN

NOTES:

1. REFER TO STANDARDS FOR ADDITIONAL DETAILS.
2. SEAL ALL TY II PAVEMENT MARKINGS.
3. REMOVE EXIST DELINEATORS AND OBJECT MARKERS UNDER ITEM 100 - PREP ROW.
4. TERMINAL ENDS REQUIRE REFLECTIVE SHEETING. SEE D&OM(5)-20 & D&OM(VIA)-20.
5. PAV SURF PREP MRK (6") EST @ 500 LF
   PAV SURF PREP MRK (RPM) EST @ 3 EA
   REFL PAV MRK TY II(W)6"(SLD) EST @ 440 LF
   REFL PAV MRK TY II(Y)6"(BRK) EST @ 60 LF

Jacobs Engineering Group
STATE OF TEXAS
PAUL K. CLARK
99509
LICENSED
PROFESSIONAL ENGINEER
F-2966
7/11/2024

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Phone: +1 (214) 638-0145
Firm Registration: F-2966

SH 220

SIGNING AND PAVEMENT MARKINGS SH 220 AT LITTLE DUFFAU CREEK

SCALE: 1"=100' SHEET 1 OF 1

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NUMBER		HIGHWAY NO.
MBT	6	(See Title Sheet)		SH 220
CHECK PKC	STATE	DISTRICT	COUNTY	SHEET NO.
GRAPHICS MBT	TEXAS	FTW	ERATH	171
CHECK PKC	CONTROL	SECTION	JOB	
	0467	02	020, ETC.	

FILE: ...\TRAFFIC\020SPM01.sht

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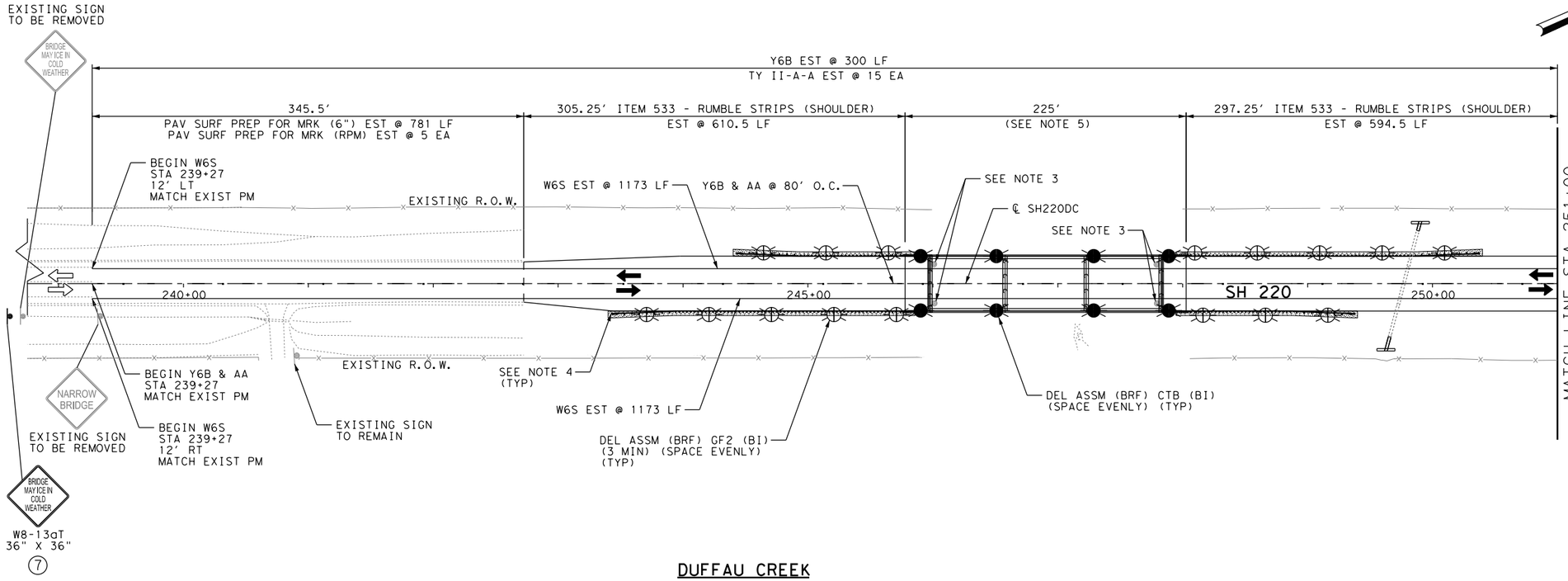
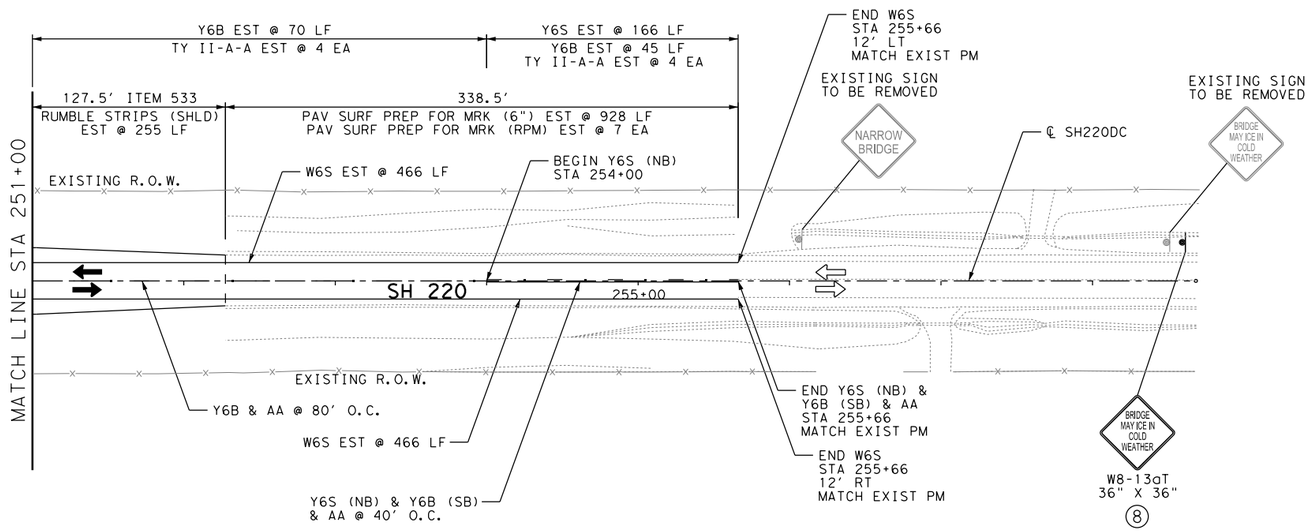
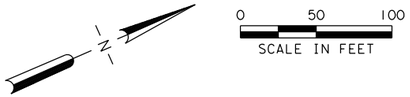
DATE: 7/10/2024



DUFFAU CREEK



DUFFAU CREEK



LEGEND

W6S	RE PM W/RET REQ TY I(W)6"(SLD)(090MIL)
Y6S	RE PM W/RET REQ TY I(Y)6"(SLD)(090MIL)
Y6B	RE PM W/RET REQ TY I(Y)6"(BRK)(090MIL)
·	REFLECTIVE PAVEMENT MARKER TY II-A-A
	DEL ASSM (D-SW) SZ 1 (BRF) GF2 (BI)
	DEL ASSM (D-SW) SZ 1 (BRF) CTB (BI)
(#)	PROPOSED SMALL SIGN & SIGN NUMBER
	EXISTING SMALL SIGN

NOTES:

1. REFER TO STANDARDS FOR ADDITIONAL DETAILS.
2. SEAL ALL TY II PAVEMENT MARKINGS.
3. REMOVE EXIST DELINEATORS AND OBJECT MARKERS UNDER ITEM 100 - PREP ROW.
4. TERMINAL ENDS REQUIRE REFLECTIVE SHEETING. SEE D&OM(5)-20 & D&OM(VIA)-20.
5. PAV SURF PREP MRK (6") EST @ 500 LF
   PAV SURF PREP MRK (RPM) EST @ 3 EA
   REFL PAV MRK TY II(W)6"(SLD) EST @ 450 LF
   REFL PAV MRK TY II(Y)6"(BRK) EST @ 50 LF

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7/11/2024

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Firm Registration: F-2966

Texas Department of Transportation

SH 220

SIGNING AND PAVEMENT MARKINGS SH 220 AT DUFFAU CREEK

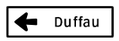
SCALE: 1"=100' SHEET 1 OF 1

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NUMBER		HIGHWAY NO.
MBT	6	(See Title Sheet)		SH 220
CHECK	STATE	DISTRICT	COUNTY	SHEET NO.
PKC	TEXAS	FTW	ERATH	172
GRAPHICS MBT	CONTROL	SECTION	JOB	
CHECK PKC	0467	02	020, ETC.	

FILE: ...\TRAFFIC\021SPM01.sht

SUMMARY OF SMALL SIGNS

SM RD SGN ASSM TY XXXXX (X) XX (X-XXXX)

PLAN SHEET NO.	SIGN NO.	SIGN NOMENCLATURE	SIGN	DIMENSIONS	FLAT ALUMINUM (TYPE A)	EXAL ALUMINUM (TYPE G)	POST TYPE FRP = Fiberglass TWT = Thin-Wall 10BWG = 10 BWG S80 = Sch 80	POSTS 1 or 2	ANCHOR TYPE UA=Universal Conc UB=Universal Bolt SA=Slipbase-Conc SB=Slipbase-Bolt WS=Wedge Steel WP=Wedge Plastic	MOUNTING DESIGNATION PREFABRICATED P = "Plain" T = "T" U = "U"	1EXT or 2EXT = # of Ext BM = Extruded Wind Beam WC = 1.12 #/ft Wing Channel EXAL= Extruded Alum Sign Panels	BRIDGE MOUNT CLEARANCE SIGNS (See Note 2) TY = TYPE TY N TY S
171	1	W8-13aT		36" x 36"	X		10BWG	1	SA	P		
171	2	M2-1 M1-6F		21" x 15" 24" x 24"	X		10BWG	1	SA	P		
171	3	D1-1		72" x 18"	X		10BWG	1	SA	P		
171	4	R2-1		30" x 36"	X		10BWG	1	SA	P		
171	5	M3-3 M1-6T		24" x 12" 24" x 24"	X		10BWG	1	SA	P		
171	6	W8-13aT		36" x 36"	X		10BWG	1	SA	P		
172	7	W8-13aT		36" x 36"	X		10BWG	1	SA	P		
172	8	W8-13aT		36" x 36"	X		10BWG	1	SA	P		

ALUMINUM SIGN BLANKS THICKNESS	
Square Feet	Minimum Thickness
Less than 7.5	0.080"
7.5 to 15	0.100"
Greater than 15	0.125"

The Standard Highway Sign Designs for Texas (SHSD) can be found at the following website.

http://www.txdot.gov/

NOTE:

1. Sign supports shall be located as shown on the plans, except that the Engineer may shift the sign supports, within design guidelines, where necessary to secure a more desirable location or to avoid conflict with utilities. Unless otherwise shown on the plans, the Contractor shall stake and the Engineer will verify all sign support locations.
2. For installation of bridge mount clearance signs, see Bridge Mounted Clearance Sign Assembly (BMCS)Standard Sheet.
3. For Sign Support Descriptive Codes, see Sign Mounting Details Small Roadside Signs General Notes & Details SMD(GEN).

DATE: 7/10/2024 6:30:37 PM
FILE: ...\ST\Traffic\020SOSS.dgn

Texas Department of Transportation

Traffic Operations Division Standard

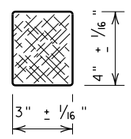
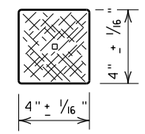
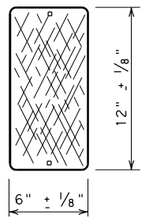
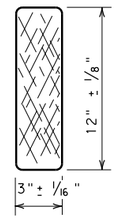
SH 220
SUMMARY OF SMALL SIGNS

SOSS

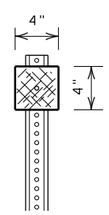
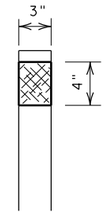
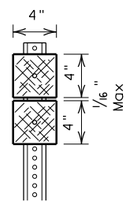
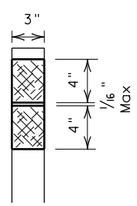
FILE:	sums16.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT	May 1987	CONT	SECT	JOB	HIGHWAY
REVISIONS		0467	02	020, ETC.	SH 220
4-16		DIST	COUNTY		SHEET NO.
8-16		FTW	ERATH		173

18

REFLECTOR UNIT SIZES FOR DELINEATORS AND OBJECT MARKERS

	SIZE 1	SIZE 2	SIZE 3	SIZE 4
DEVICE				
SHEETING	Yellow, White or Red Type B or C reflective sheeting			
NOTE	1. Size 1 and 4 - Direct applied reflective sheeting for use on flexible post (flx). 2. Size 2 and 3 - For use on wing channel (wc) post only. Use approved metal, plastic or fiberglass backplate with 17/64" mounting holes.			

DELINEATORS

	SINGLE		DOUBLE	
DEVICE				
	1-Size 2 reflector unit	1-Size 1 reflector unit	2-Size 2 reflector units	2-Size 1 reflector units
SHEETING	Yellow, White or Red Type B or C Reflective Sheeting			
POST TYPE	WC	YFLX, WFLX	WC	YFLX, WFLX
MOUNT TYPE	GND	GND, SRF	GND	GND, SRF

D & OM DESCRIPTIVE CODES

INSTL DEL ASSM (D-XX)SZ X (XXXX)XXX(XX)

NUMBER OF REFLECTORS
- S = Single
- D = Double

COLOR OF REFLECTORS
- W = White
- Y = Yellow
- R = Red

REFLECTOR UNIT SIZE
- 1 or 2

TYPE OF POST OR DELINEATOR
- WC = Wing Channel Post
- YFLX = Yellow Flexible Post
- WFLX = White Flexible Post
- BRF = Barrier Reflector

TYPE OF MOUNT
- GND = Embedded (drivable or set in concrete)
- CTB = Concrete Barrier Mount
- GF1 or GF2 = Guard Fence Attachment
- SRF = Surface Mount

DIRECTION
- If Required
- BI = Bi-Directional
- BR = Bi-Directional with red on back

INSTL OM ASSM (OM-XX) (XXXX)XXX(XX)

TYPE OF OBJECT MARKER
- 1, 2, 3, or 4

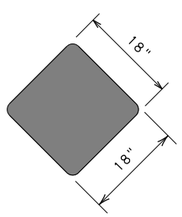
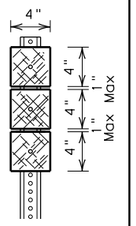
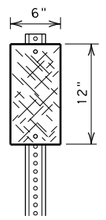
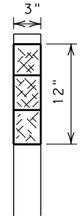
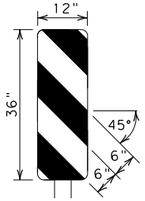
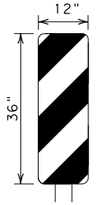
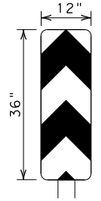
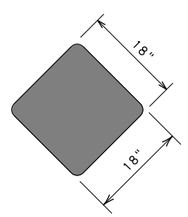
NUMBER OF REFLECTORS OR DIRECTION
- X = 3-Size 2 reflector units (Type 2 only)
- Y = 1-Size 3 reflector unit (Type 2 only)
- Z = 3-Size 1 or 1-Size 4 reflector unit(s)(Type 2 only)
- L = Left Side (Type 3 Object Marker only)
- R = Right Side (Type 3 Object Marker only)
- C = Center (Type 3 Object Marker only)

TYPE OF POST
- WC = Wing Channel Post
- WFLX = White Flexible Post
- TWT = Thin Walled Tubing

TYPE OF MOUNT
- GND = Embedded (drivable)
- SRF = Surface Mount
- WAS = Wedge Anchor Steel
- WAP = Wedge Anchor Plastic

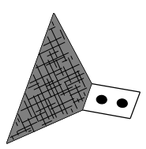
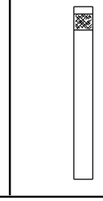
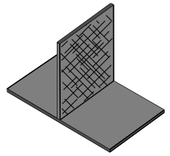
DIRECTION
- If Required
- BI = Bi-Directional

OBJECT MARKERS

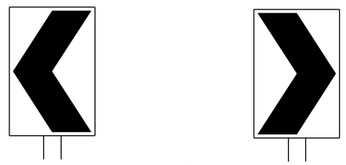
	Type 1 (OM-1)	Type 2 (OM-2)			Type 3 (OM-3)			Type 4 (OM-4)
	OM-1	OM-2X	OM-2Y	OM-2Z	OM-3L	OM-3R	OM-3C	OM-4
DEVICE								
		3-Size 2 reflector units	1-Size 3 reflector unit	3-Size 1 reflector units or 1-Size 4 reflector unit				
SHEETING	Yellow-Type B_{FL} or C_{FL} Sheeting	Yellow - Type B or C Sheeting			Alternating acrylic black and retroflective yellow - Type B_{FL} or C_{FL} Sheeting			Red -Type B_{FL} or C_{FL} Sheeting
POST TYPE	TWT	WC	WC	WFLX	TWT			TWT
MOUNT TYPE	WAS, WAP	GND	GND	GND, SRF	WAS, WAP			WAS, WAP

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

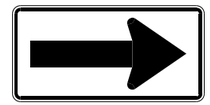
BARRIER REFLECTORS (BRF)

	GF1	GF2	CTB
DEVICE			
	1. Barrier reflectors shall meet the requirements of DMS 8600. 2. Approved Barrier Reflectors are listed on the "Barrier Reflectors" Material Producer List at: www.txdot.gov.		
SHEETING	Yellow, White, Red		
NOTE	1. Reflective sheeting shall have a minimum dimension of 3 inches and minimum surface area of 9 square inches.		

CHEVRONS

DEVICE	 W1-8			
SIZE (W x L)	18"x 24" (Conventional)	24"x 30" (Conventional Oversize)	30"x 36" (Expressway)	36" x 48" (Freeway)
MOUNTING HEIGHT	4'-0" or 7'-0"		7'-0" Only	
NOTE	1. CHEVRON (W1-8) signs and ONE DIRECTION LARGE ARROW (W1-6) Signs shall be installed per Sign Mounting Details (SMD) Standard Sheets and paid under Item 644 (Small Roadside Sign Assemblies). 2. When there is a need to increase conspicuity, the Texas version of the ONE DIRECTION LARGE ARROW sign (W1-9T) may be used instead of the ONE DIRECTION LARGE ARROW (W1-6).			

ONE DIRECTION LARGE ARROW

DEVICE	 W1-6	
SIZE (W x L)	48" x 24" (Conventional)	60" x 30" (Expressway & Freeway)
MOUNTING HEIGHT	7'-0"	

NOTE:

Delineator and object marker substrates and sign substrates shall be 0.080" Aluminum sign blank to conform to ASTM B-209 Alloy 6061-T6 or approved alternative.

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DELINEATOR & OBJECT MARKER MATERIAL DESCRIPTION

D & OM(1)-20

FILE: dom1-20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
©TxDOT August 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS	0467	02	020, ETC.	SH 220
10-09 3-15	DIST	COUNTY		SHEET NO.
4-10 7-20	FTW	ERATH		174

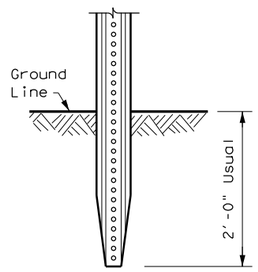
20A

DATE: 7/10/2024 6:30:44 PM
FILE: ...\ST\Traffic\020dom1-20.dgn

POST TYPE AND SUPPORT FOUNDATION DETAILS

WING CHANNEL (WC)

GND

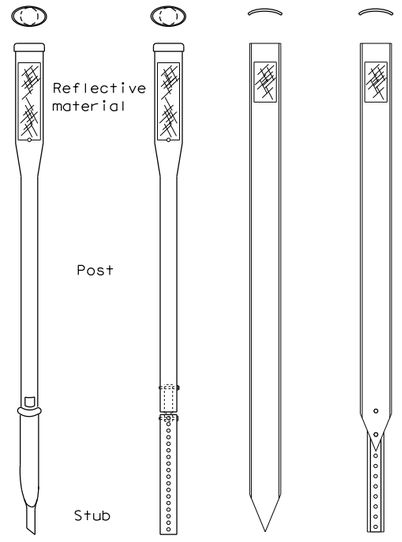


NOTES

1. Embedded Wing Channel (WC) post option may be used for Type 2 Object Markers and Delineators only.
2. 1.12 lbs/ft steel per ASTM A 1011 SS Gr. 50, or ASTM A499.

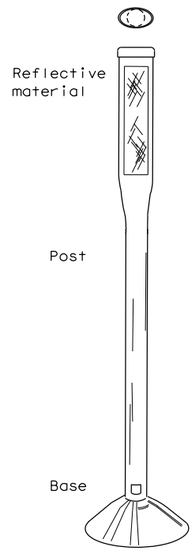
FLEXIBLE POSTS (YFLX, WFLX)

GND



EMBEDDED

SRF



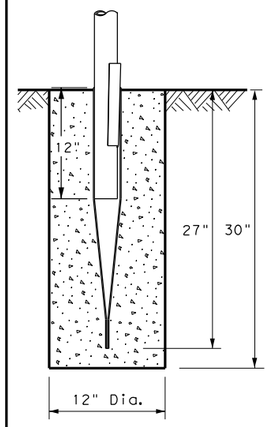
SURFACE MOUNT

NOTES

1. See "Flexible Delineator and Object Marker Posts" Material Producer List for approved devices.
2. Install per manufacturer's recommendations.
3. Post length may vary to meet field conditions.
4. When using yellow delineators with flexible posts to separate opposing direction of travel, such as centerline or median use, the flexible posts shall be yellow.

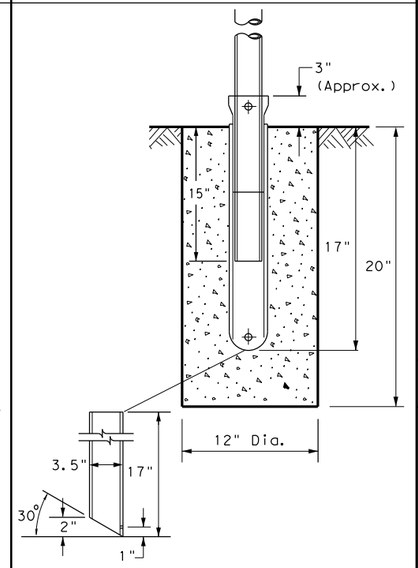
WEDGE ANCHOR SYSTEMS

WAS



STEEL

WAP



PLASTIC

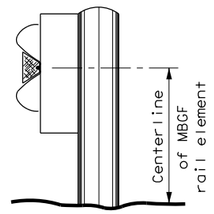
NOTE

1. Install per manufacturer's recommendations.

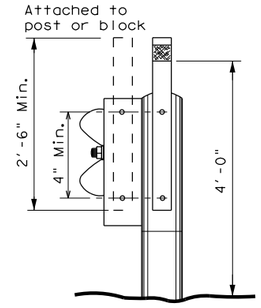
TYPE OF BARRIER MOUNTS

GUARD FENCE ATTACHMENT

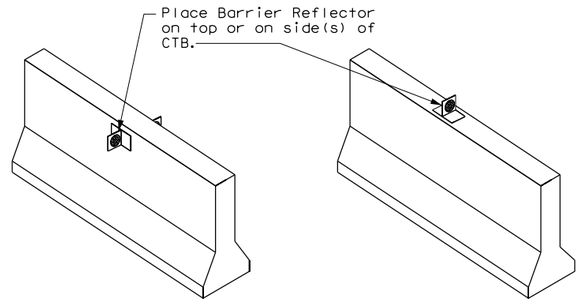
GF1



GF2



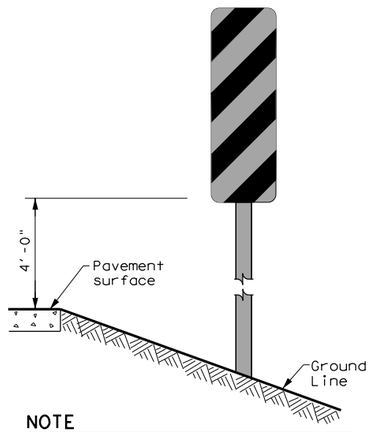
CONCRETE TRAFFIC BARRIER (CTB)



GENERAL NOTES

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

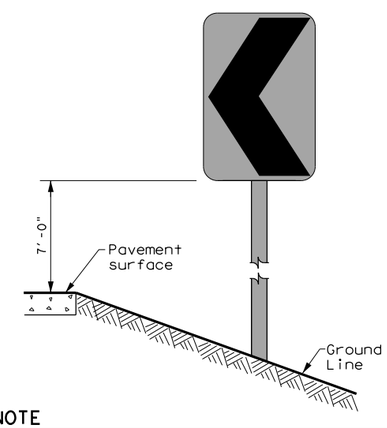
TYPES 1, 3, AND 4 OBJECT MARKERS AND CHEVRONS



NOTE

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

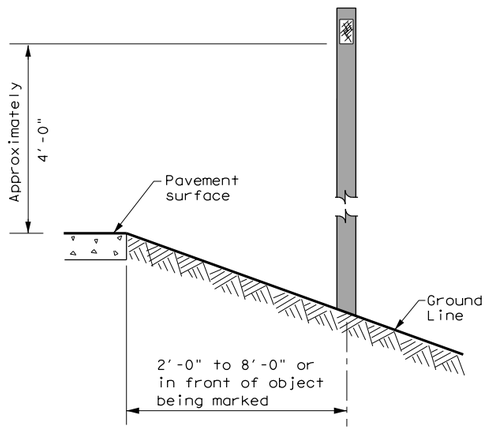
CHEVRONS AND ONE DIRECTION LARGE ARROW SIGN



NOTE

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

DELINEATORS AND TYPE 2 OBJECT MARKERS



See general notes 1, 2 and 3.

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DELINEATOR & OBJECT MARKER INSTALLATION

D & OM(2)-20

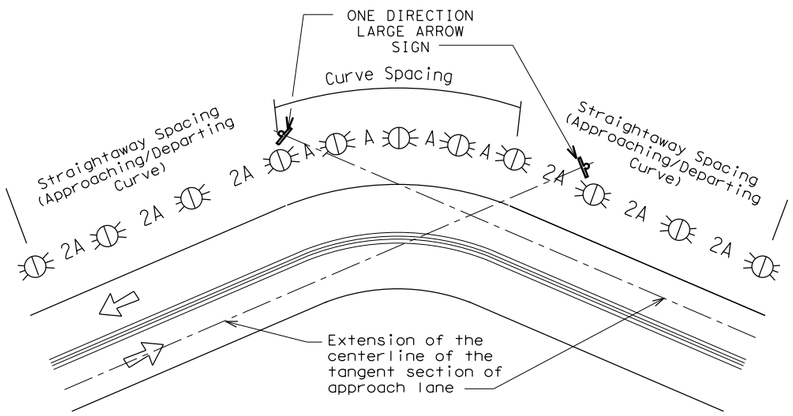
FILE: dom2-20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
© TxDOT August 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS	0467	02	020, ETC.	SH 220
10-09 3-15	DIST	COUNTY		SHEET NO.
4-10 7-20	FTW	ERATH		175

20B

MINIMUM WARNING DEVICES AT CURVES WITH ADVISORY SPEEDS

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

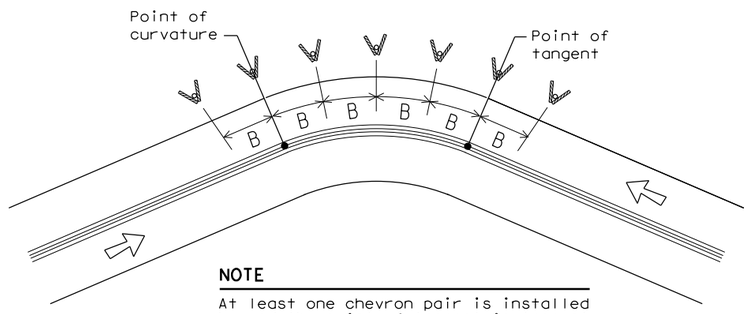
SUGGESTED SPACING FOR DELINEATORS ON HORIZONTAL CURVES



NOTE

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

SUGGESTED SPACING FOR CHEVRONS ON HORIZONTAL CURVES



NOTE

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

DELINEATOR AND CHEVRON SPACING

WHEN DEGREE OF CURVE OR RADIUS IS KNOWN

Degree of Curve	FEET			
	Radius of Curve	Spacing in Curve	Spacing in Straightaway	Chevron Spacing in Curve
		A	2A	B
1	5730	225	450	——
2	2865	160	320	——
3	1910	130	260	200
4	1433	110	220	160
5	1146	100	200	160
6	955	90	180	160
7	819	85	170	160
8	716	75	150	160
9	637	75	150	120
10	573	70	140	120
11	521	65	130	120
12	478	60	120	120
13	441	60	120	120
14	409	55	110	80
15	382	55	110	80
16	358	55	110	80
19	302	50	100	80
23	249	40	80	80
29	198	35	70	40
38	151	30	60	40
57	101	20	40	40

Curve delineator approach and departure spacing should include 3 delineators spaced at 2A. This spacing should be used during design preparation or when the degree of curve is known.

DELINEATOR AND CHEVRON SPACING

WHEN DEGREE OF CURVE OR RADIUS IS NOT KNOWN

Advisory Speed (MPH)	Spacing in Curve	Spacing in Straightaway	Chevron Spacing in Curve
	A	2xA	B
65	130	260	200
60	110	220	160
55	100	200	160
50	85	170	160
45	75	150	120
40	70	140	120
35	60	120	120
30	55	110	80
25	50	100	80
20	40	80	80
15	35	70	40

If the degree of curve is not known, delineator spacing may be determined based on the Advisory Speed of the curve. Use the delineator curve spacing for each Advisory Speed (MPH).

DELINEATOR AND OBJECT MARKER APPLICATION AND SPACING

CONDITION	REQUIRED TREATMENT	MINIMUM SPACING
Frwy./Exp. Tangent	RPMs	See PM-series and FPM-series standard sheets
Frwy./Exp. Curve	Single delineators on right side	See delineator spacing table
Frwy/Exp.Ramp	Single delineators on at least one side of ramp (should be on outside of curves) (see Detail 3 on D&OM(4))	100 feet on ramp tangents Use delineator spacing table for ramp curves ("straightway spacing" does not apply to ramp curves)
Acceleration/Deceleration Lane	Double delineators (see Detail 3 on D&OM(4))	100 feet (See Detail 3 on D & OM (4))
Truck Escape Ramp	Single red delineators on both sides	50 feet
Bridge Rail (steel or concrete)and Metal Beam Guard Fence	Bi-Directional Delineators when undivided with one lane each direction Single Delineators when multiple lanes each direction	Equal spacing (100'max) but not less than 3 delineators
Concrete Traffic Barrier (CTB) or Steel Traffic Barrier	Barrier reflectors matching the color of the edge line	Equal spacing 100' max
Cable Barrier	Reflectors matching the color of the edge line	Every 5th cable barrier post (up to 100'max)
Guard Rail Terminus/Impact Head	Divided highway - Object marker on approach end Undivided 2-lane highways - Object marker on approach and departure end	Requires reflective sheeting provided by manufacturer per D & OM (VIA) or a Type 3 Object Marker (OM-3) in front of the terminal end See D & OM (5) and D & OM (6)
Bridges with no Approach Rail	Type 3 Object Marker (OM-3) at end of rail and 3 single delineators approaching rail	See D & OM(5)
Reduced Width Approaches to Bridge Rail	Type 2 and Type 3 Object Markers (OM-3) and 3 single delineators approaching bridge	Requires reflective sheeting provided by manufacturer per D & OM (VIA) or a Type 3 Object Marker (OM-3) in front of the terminal end See D & OM (5)
Culverts without MBGF	Type 2 Object Markers	See Detail 2 on D & OM(4)
Crossovers	Double yellow delineators and RPMs	See Detail 1 on D & OM (4)
Pavement Narrowing (lane merge) on Freeways/Expressway	Single delineators adjacent to affected lane for full length of transition	100 feet

NOTES

1. Unless indicated otherwise, the delineator or barrier reflector color shall conform to the color of the pavement edge line on the side of the road where the delineators or barrier reflectors are placed.
2. Barrier reflectors may be used to replace required delineators.
3. Single red delineators may be mounted on the back side of delineator posts for wrong way driver applications

LEGEND	
	Bi-directional Delineator
	Delineator
	Sign

Texas Department of Transportation

Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER PLACEMENT DETAILS

D & OM(3)-20

FILE: dom3-20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
©TxDOT August 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS	0467	02	020, ETC.	SH 220
3-15 8-15 8-15 7-20	DIST	COUNTY		SHEET NO.
	FTW	ERATH		176

20C

DATE: 7/10/2024 6:30:57 PM
FILE: ...\ST\Traffic\020dom3-20.dgn

DATE: 7/10/2024 6:31:04 PM
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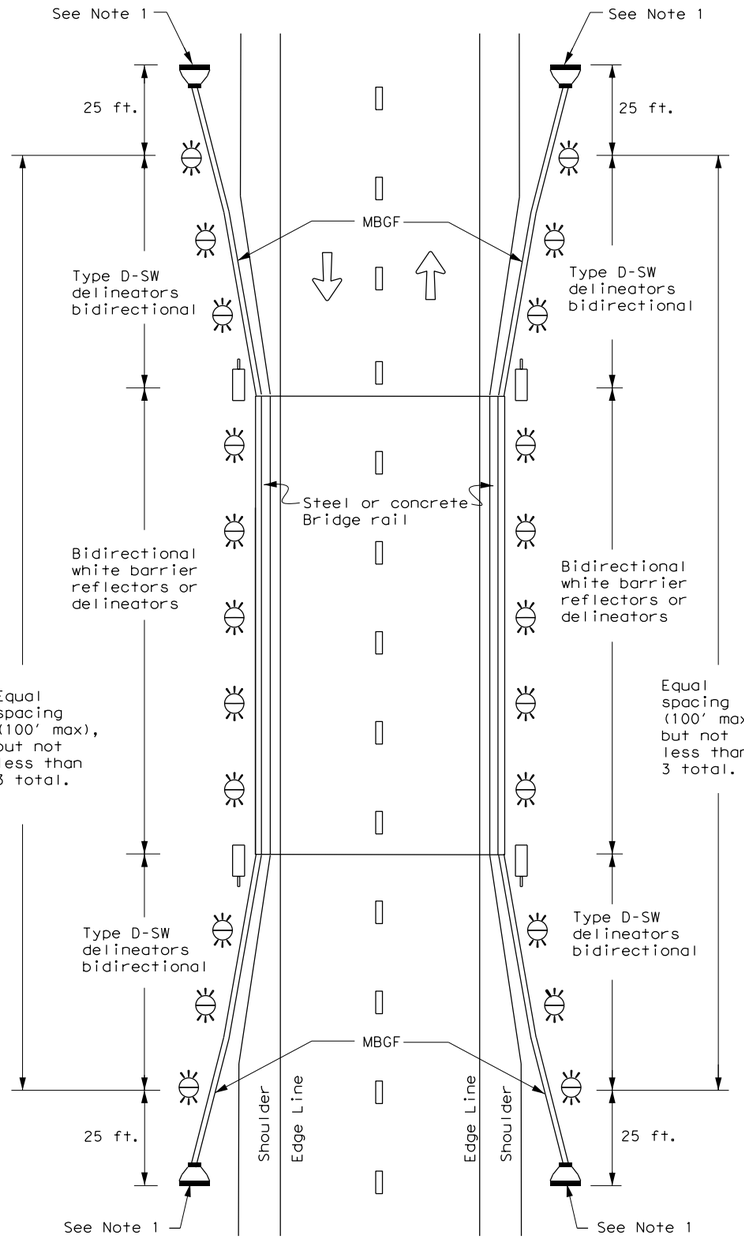
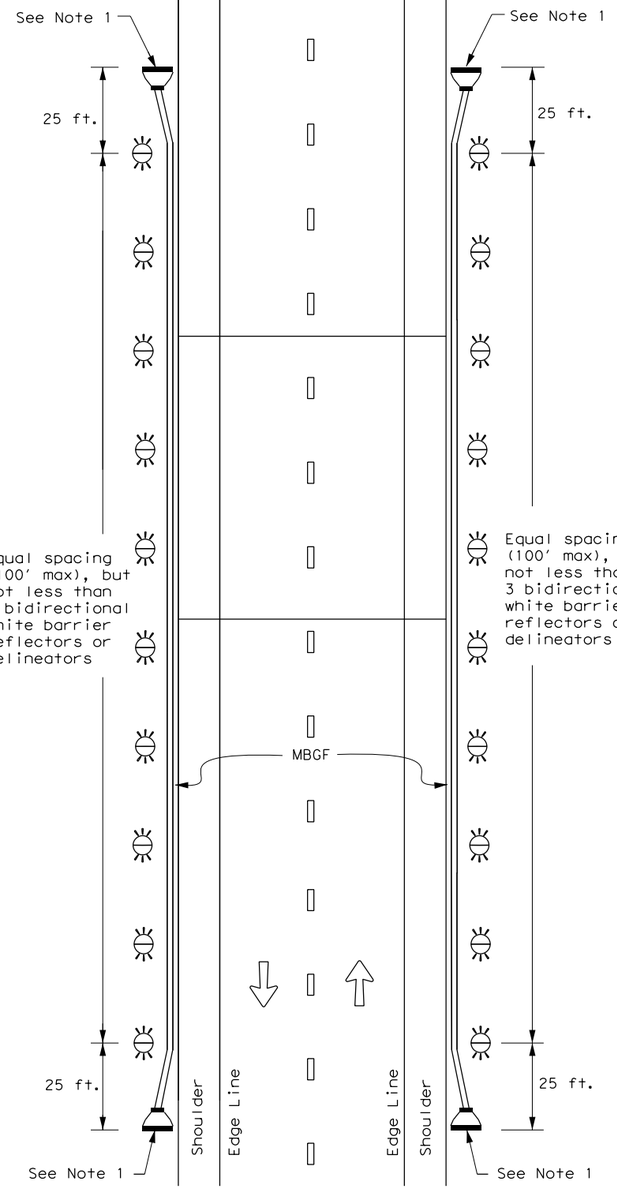
TWO-WAY, TWO LANE ROADWAY WITH REDUCED WIDTH APPROACH RAIL



NOTE:

1. Terminal ends require reflective sheeting provided by manufacturer per D & OM (VIA) or a Type 3 Object Marker (OM-3) in front of the terminal end.

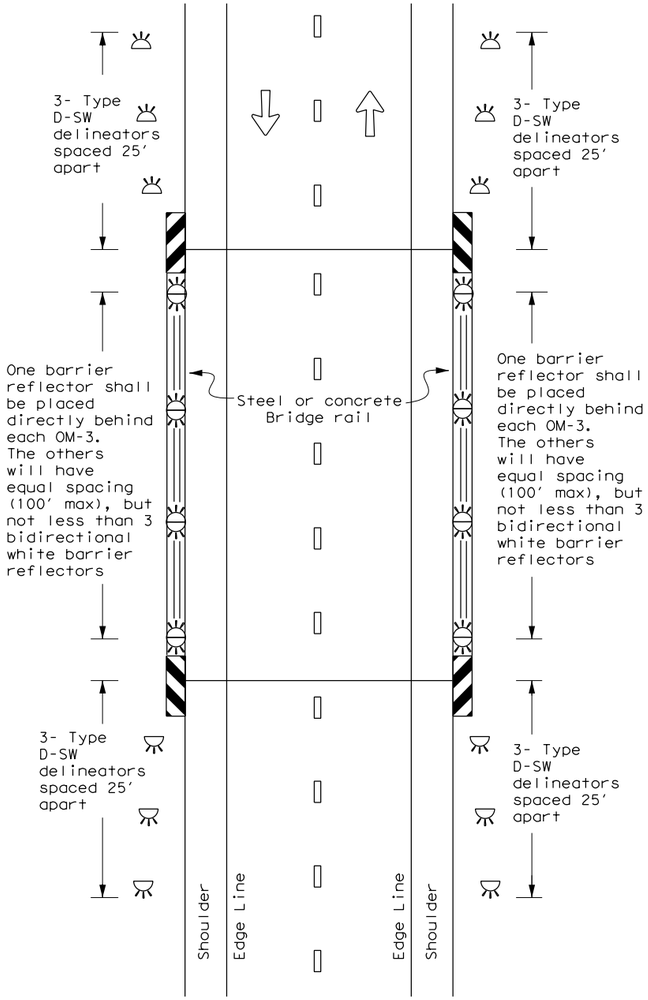
TWO-WAY, TWO LANE ROADWAY WITH METAL BEAM GUARD FENCE (MBGF)



NOTE:

1. Terminal ends require reflective sheeting provided by manufacturer per D & OM (VIA) or a Type 3 Object Marker (OM-3) in front of the terminal end.

TWO-WAY, TWO LANE ROADWAY BRIDGE WITH NO APPROACH RAIL



LEGEND

	Bidirectional Delineator
	Delineator
	OM-3
	OM-2
	Terminal End
	Traffic Flow

Texas Department of Transportation

Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER PLACEMENT DETAILS

D & OM(5)-20

FILE: dom5-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT August 2015	CONT	SECT	JOB	HIGHWAY
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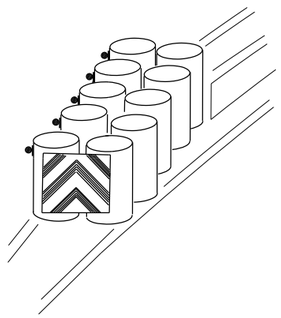
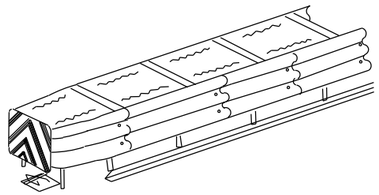
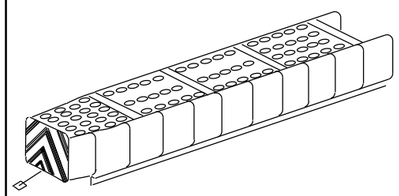
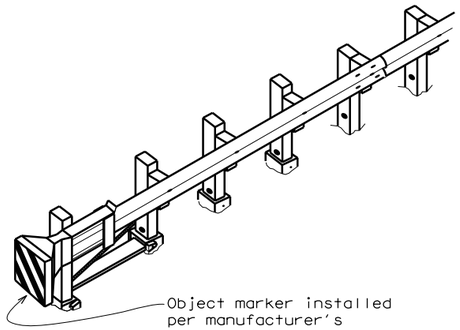
7-20	DIST	COUNTY		SHEET NO.
	FTW	ERATH		177

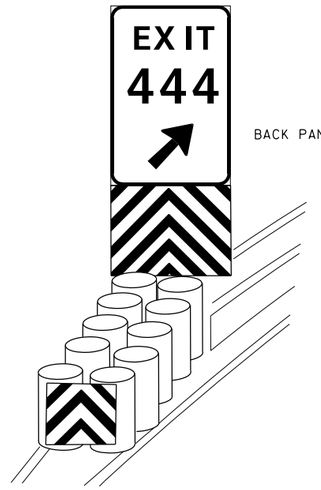
20E

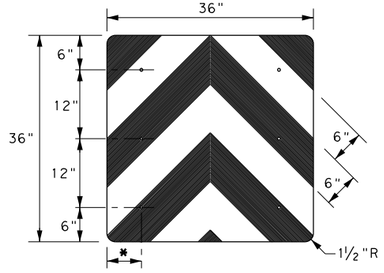


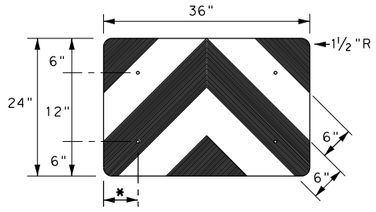




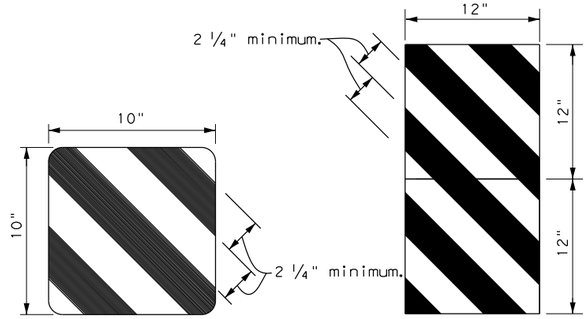




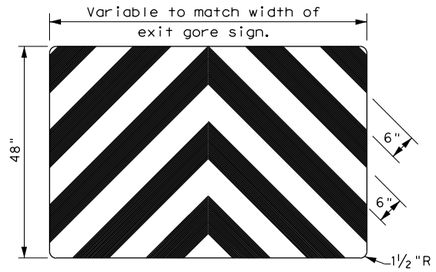


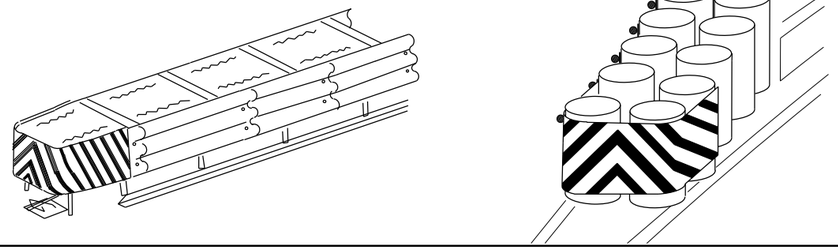


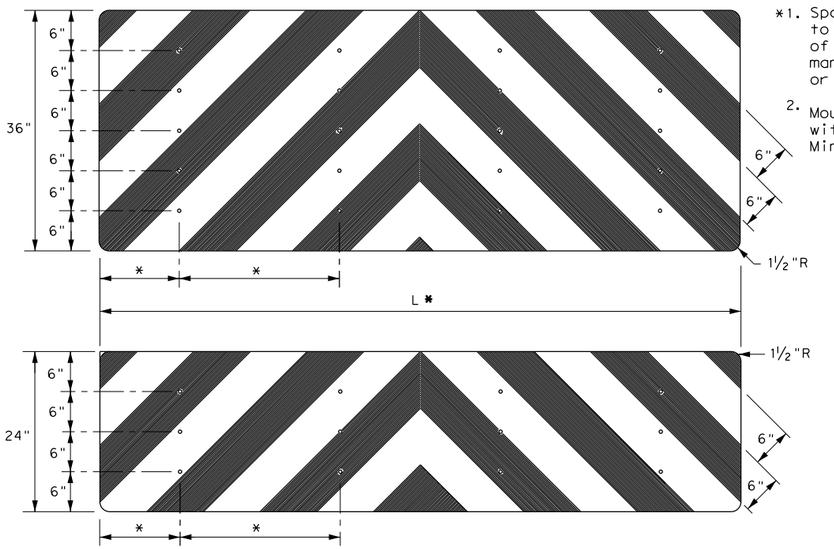
* Adjust to fit attenuator per manufacturer's recommendation, or as directed by the Engineer



OBJECT MARKERS SMALLER THAN 3 FT^2







NOTES

*1. Spacing should be adjusted to attach through centerline of drum, per attenuator manufacturers recommendation, or as directed by the Engineer.

2. Mounting should be flush with top of attenuator. Minimum size 96" x 24".

NOTES

1. Object Markers shall conform to the Texas MUTCD and meet the color and reflectivity requirement of Department Material Specification DMS 8300. Background shall be yellow reflective sheeting (Type B or C) and Chevron shall be black.

2. Object Markers may be fabricated from adhesive backed reflective sheeting applied directly to guardrail end treatment, or applied directly to an "end cap" as per the manufacturer's recommendation. Direct applied sheeting shall provide a smooth surface and have no wrinkles, air bubbles, cuts or tears. A radius at the corners is not required for direct applied sheeting.

3. Object Marker size may be reduced to fit smaller devices. Width of alternating black and yellow stripes are typically 6". Object Markers smaller than 3ft may have reduced width stripes of a minimum of 2 ¼".

4. Pop rivets, screws, or nuts and bolts may be used to attach object markers and reflectors. Holes, slots or other openings may be cut or drilled through object markers to allow cable or other attachments.

5. Object Marker at nose of attenuator is subsidiary to the attenuator.

6. See D & OM (1-4) for required barrier reflectors.

Texas Department of Transportation

Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER FOR VEHICLE IMPACT ATTENUATORS

D & OM(VIA)-20

FILE: domvia20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
©TxDOT December 1989	CONT	SECT	JOB	HIGHWAY
REVISIONS	0467	02	020, ETC.	SH 220
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8-95 3-15	FTW	ERATH		178
4-98 7-20				

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SIGN SUPPORT DESCRIPTIVE CODES

(Descriptive Codes correspond to project estimate and quantities sheets)

SM RD SGN ASSM TY XXXXX(X)XX(X-XXXX)

Post Type

FRP = Fiberglass Reinforced Plastic Pipe (see SMD(FRP))
TWT = Thin-Walled Tubing (see SMD(TWT))
10BWG = 10 BWG Tubing (see SMD(SLIP-1) to (SLIP-3))
S80 = Schedule 80 Pipe (see SMD(SLIP-1) to (SLIP-3))

Number of Posts (1 or 2)

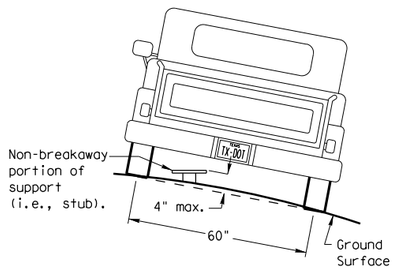
Anchor Type

UA = Universal Anchor - Concreted (see SMD(FRP) and (TWT))
UB = Universal Anchor - Bolted down (see SMD(FRP) and (TWT))
WS = Wedge Anchor Steel - (see SMD(TWT))
WP = Wedge Anchor Plastic (see SMD(TWT))
SA = Slipbase - Concreted (see SMD(SLIP-1) to (SLIP-3))
SB = Slipbase - Bolted Down (see SMD(SLIP-1) to (SLIP-3))

Sign Mounting Designation

P = Prefab. "Plain" (see SMD(SLIP-1) to (SLIP-3), (TWT), (FRP))
T = Prefab. "T" (see SMD(SLIP-1) to (SLIP-3), (TWT))
U = Prefab. "U" (see SMD(SLIP-1) to (SLIP-3))
IF REQUIRED
1EXT or 2EXT = Number of Extensions (see SMD(SLIP-1) to (SLIP-3), (TWT))
BM = Extruded Wind Beam (see SMD(SLIP-1) to (SLIP-3))
WC = 1.12 #/ft Wing Channel (see SMD(SLIP-1) to (SLIP-3))
EXAL = Extruded Aluminum Sign Panels (see SMD(SLIP-1))

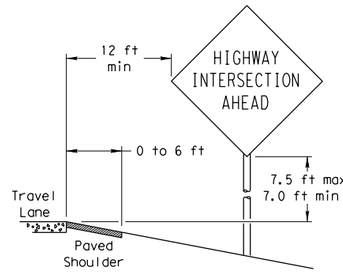
REQUIRED CLEARANCE FOR BREAKAWAY SUPPORT



To avoid vehicle undercarriage snagging, any substantial remains of a breakaway support, when it is broken away, should not project more than 4 inches above a 60-inch chord (i.e., typical space between wheel paths).

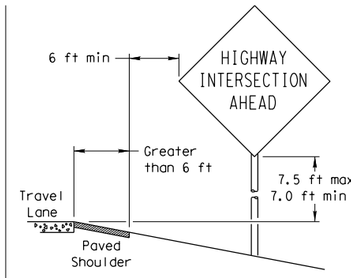
SIGN LOCATION

PAVED SHOULDERS



LESS THAN 6 FT. WIDE

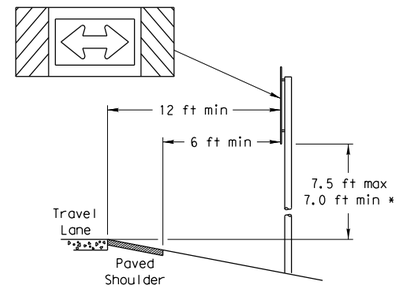
When the shoulder is 6 ft. or less in width, the sign must be placed at least 12 ft. from the edge of the travel lane.



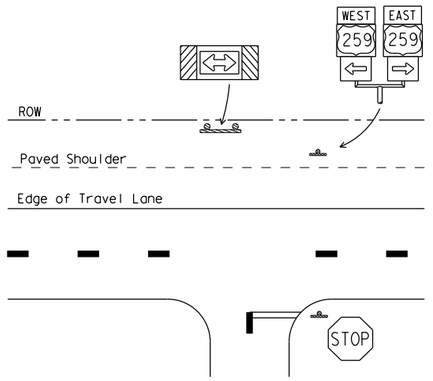
GREATER THAN 6 FT. WIDE

When the shoulder is greater than 6 ft in width, the sign must be placed at least 6 ft. from the edge of the shoulder.

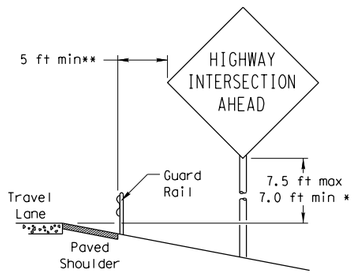
T-INTERSECTION



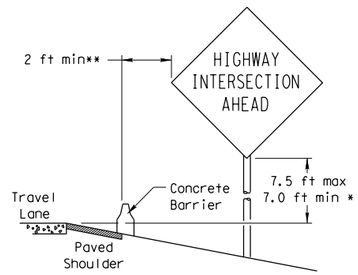
When this sign is needed at the end of a two-lane, two way roadway, the right edge of the sign should be in line with the centerline of the roadway. Place as close to ROW as practical.



BEHIND BARRIER



BEHIND GUARDRAIL

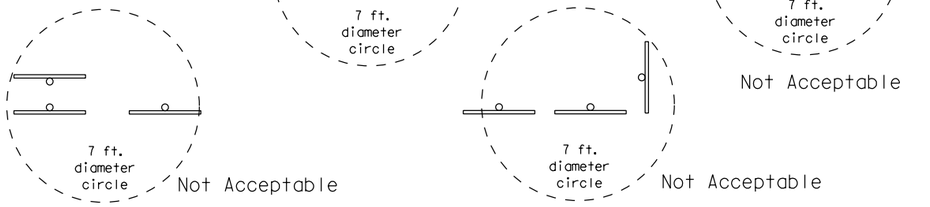


BEHIND CONCRETE BARRIER

**BEHIND GUARDRAIL

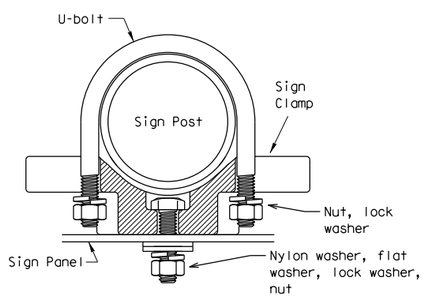
**Sign clearance based on distance required for proper guard rail or concrete barrier performance.

No more than 2 sign posts should be located within a 7 ft. circle.



TYPICAL SIGN ATTACHMENT DETAIL

Single Signs

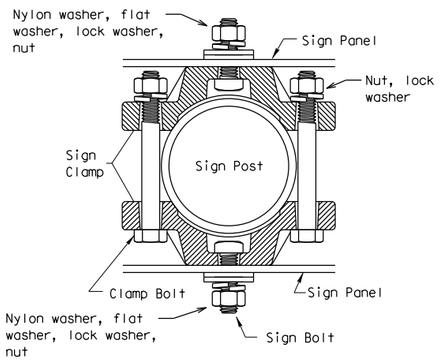


Bolts used to mount sign panels to the clamp are 5/16-18 UNC galvanized square head with nut, nylon washer, flat washer and lock washer. The bolt length is 1 inch for aluminum.

When two sign clamps are used to mount signs back-to-back, use a 5/16-18 UNC galvanized hex head per ASTM A307 with nut and helical-spring lock washer. The approximate bolt lengths for various post sizes and sign clamp types are given in the table at right. The bolt length may need to be adjusted depending upon field conditions.

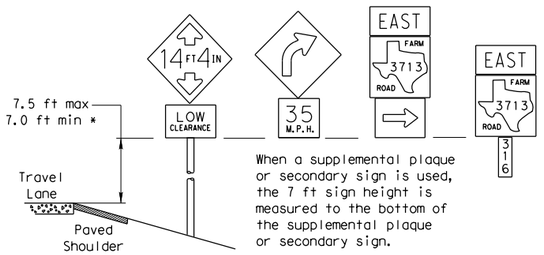
Sign clamps may be either the specific size clamp or the universal clamp.

Back-to-Back Signs



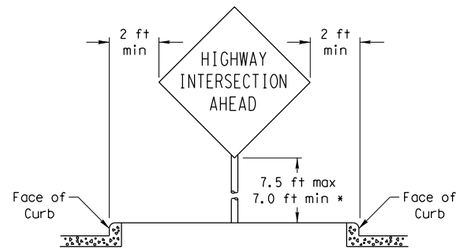
Pipe Diameter	Approximate Bolt Length	
	Specific Clamp	Universal Clamp
2" nominal	3"	3 or 3 1/2"
2 1/2" nominal	3 or 3 1/2"	3 1/2 or 4"
3" nominal	3 1/2 or 4"	4 1/2"

SIGNS WITH PLAQUES



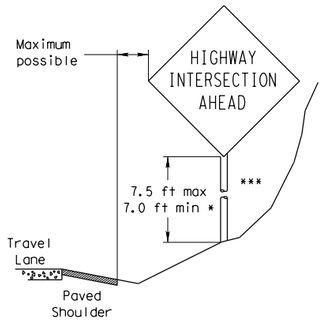
When a supplemental plaque or secondary sign is used, the 7 ft sign height is measured to the bottom of the supplemental plaque or secondary sign.

CURB & GUTTER OR RAISED ISLAND



RESTRICTED RIGHT-OF-WAY

(When 6 ft min. is not possible.)



Right-of-way restrictions may be created by rocks, water, vegetation, forest, buildings, a narrow island, or other factors.

In situations where a lateral restriction prevents the minimum horizontal clearance from the edge of the travel lane, signs should be placed as far from the travel lane as practical.

*** Post may be shorter if protected by guardrail or if Engineer determines the post could not be hit due to extreme slope.

* 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

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS GENERAL NOTES & DETAILS

SMD(GEN)-08

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

REVISIONS	CONT	SECT	JOB	HIGHWAY
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	DIST	COUNTY		SHEET NO.
	FTW	ERATH		179

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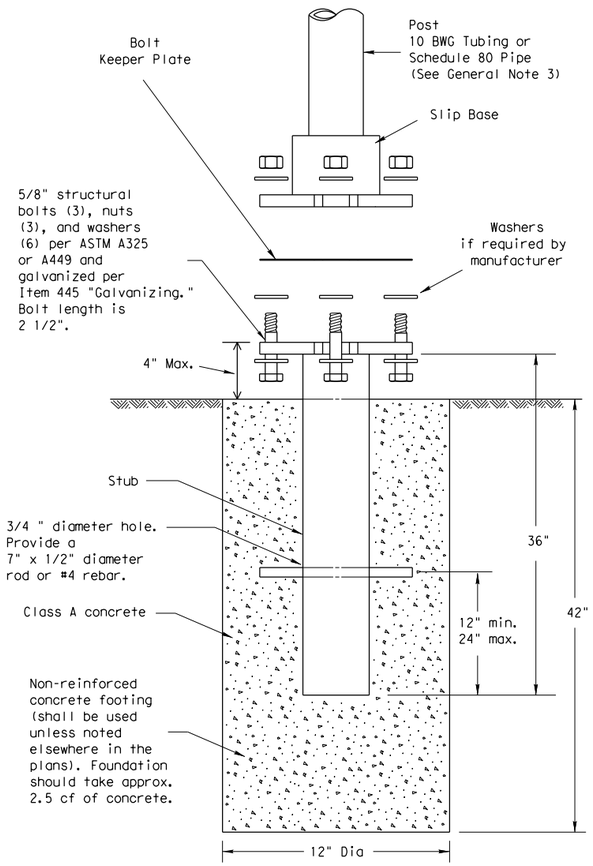
TRIANGULAR SLIPBASE INSTALLATION GENERAL REQUIREMENTS



SM RD SGN ASSM TY XXXXX(X)SA(X-XXXX)

NOTE

There are various devices approved for the Triangular Slipbase System. Please reference the Material Producer List for approved slip base systems. http://www.txdot.gov/business/producer_list.htm The devices shall be installed per manufacturers' recommendations. Installation procedures shall be provided to the Engineer by Contractor.

GENERAL NOTES:

1. Slip base shall be permanently marked to indicate manufacturer. Method, design, and location of marking are subject to approval of the TxDOT Traffic Standards Engineer.
2. Material used as post with this system shall conform to the following specifications:
   10 BWG Tubing (2.875" outside diameter)
   - 0.134" nominal wall thickness
   - Seamless or electric-resistance welded steel tubing or pipe
   - Steel shall be HSLAS Gr 55 per ASTM A1011 or ASTM A1008
   - Other steels may be used if they meet the following:
     - 55,000 PSI minimum yield strength
     - 70,000 PSI minimum tensile strength
     - 20% minimum elongation in 2"
   - Wall thickness (uncoated) shall be within the range of 0.122" to 0.138"
   - Outside diameter (uncoated) shall be within the range of 2.867" to 2.883"
   - Galvanization per ASTM A123 or ASTM A653 G210. For precoated steel tubing (ASTM A653), recoat tube outside diameter weld seam by metallizing with zinc wire per ASTM B833.

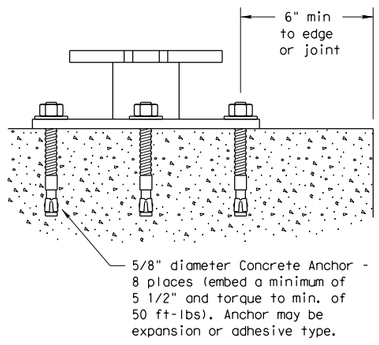
   Schedule 80 Pipe (2.875" outside diameter)
   - 0.276" nominal wall thickness
   - Steel tubing per ASTM A500 Gr C
   - Other seamless or electric-resistance welded steel tubing or pipe with equivalent outside diameter and wall thickness may be used if they meet the following:
     - 46,000 PSI minimum yield strength
     - 62,000 PSI minimum tensile strength
     - 21% minimum elongation in 2"
   - Wall thickness (uncoated) shall be within the range of 0.248" to 0.304"
   - Outside diameter (uncoated) shall be within the range of 2.855" to 2.895"
   - Galvanization per ASTM A123
3. See the Traffic Operations Division website for detailed drawings of sign clamps and Texas Universal Triangular Slipbase System components. The website address is: http://www.txdot.gov/publications/traffic.htm
4. Sign supports shall not be spliced except where shown. Sign support posts shall not be spliced.

ASSEMBLY PROCEDURE

Foundation
1. Prepare 12-inch diameter by 42-inch deep hole. If solid rock is encountered, the depth of the foundation may be reduced such that it is embedded a minimum of 18 inches into the solid rock.
2. The Engineer may permit batches of concrete less than 2 cubic yards to be mixed with a portable, motor-driven concrete mixer. For small placements less than 0.5 cubic yards, hand mixing in a suitable container may be allowed by Engineer. Concrete shall be Class A.
3. Push the pipe end of the slip base stub into the center of the concrete. Rotate the stub back and forth while pushing it down into the concrete to assure good contact between the concrete and stub. Continue to work the stub into the concrete until it is between 2 to 4 inches above the ground.
4. Plumb the stub. Allow a minimum of 4 days to set, unless otherwise directed by the Engineer.
5. The triangular slipbase system is multidirectional and is designed to release when struck from any direction.

Support
1. Cut support so that the bottom of the sign will be 7 to 7.5 feet above the edge of the travelway (i.e., edge of the closest lane) when slip plate is below the edge of pavement or 7 to 7.5 feet above slip plate when the slip plate is above the edge of the travelway. The cut shall be plumb and straight.
2. Attach sign to support using connections shown. When multiple signs are installed on the same support, ensure the minimum clearance between each sign is maintained. See SMD(SLIP-2) for clearances based on sign types.

CONCRETE ANCHOR



SM RD SGN ASSM TY XXXXX(X)SB(X-XXXX)

Concrete anchor consists of 5/8" diameter stud bolt with UNC series bolt threads on the upper end. Heavy hex nut per ASTM A563, and hardened washer per ASTM F436. The stud bolt shall have a minimum yield and ultimate tensile strength of 50 and 75 KSI, respectively. Nuts, bolts and washers shall be galvanized per Item 445, "Galvanizing." Adhesive type anchors shall have stud bolts installed with Type III epoxy per DMS-6100, "Epoxies and Adhesives." Adhesive anchors may be loaded after adequate epoxy cure time per the manufacturer's recommendations. Top of bolt shall extend at least flush with top of the nut when installed. The anchor, when installed in 4000 psi normal-weight concrete with a 5 1/2" minimum embedment, shall have a minimum allowable tension and shear of 3900 and 3100 psi, respectively.

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS
SMALL ROADSIDE SIGNS
TRIANGULAR SLIPBASE SYSTEM

SMD(SLIP-1)-08

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

REVISIONS
9-08

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0467	02	020, ETC.	SH 220

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FTW	ERATH	180

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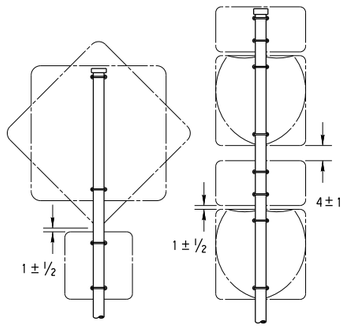
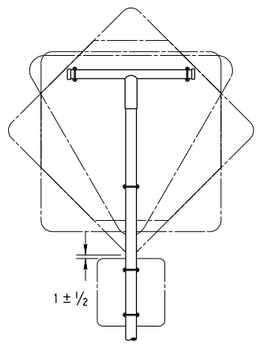


SM RD SGN ASSM TY XXXXX(1)XX(P)



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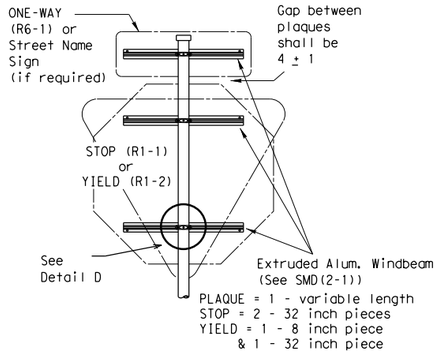

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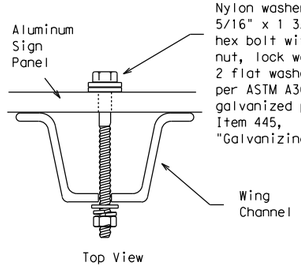
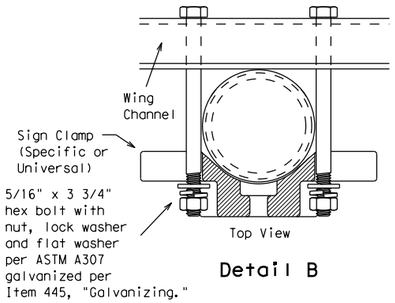
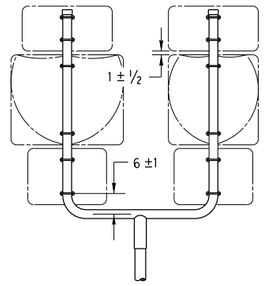


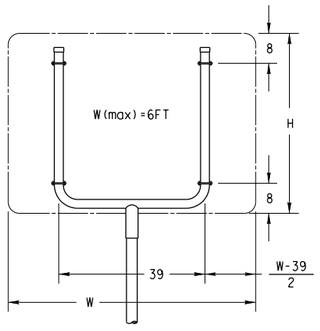
Detail A



Detail B



SM RD SGN ASSM TY XXXXX(1)XX(U)



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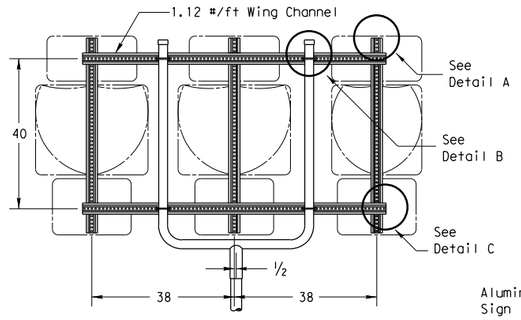
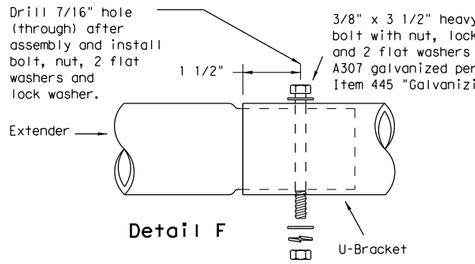
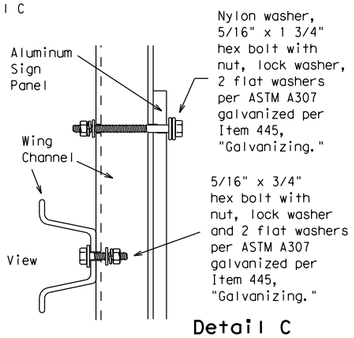


SM RD SGN ASSM TY XXXXX(1)XX(U-WC)
(See Note 11)

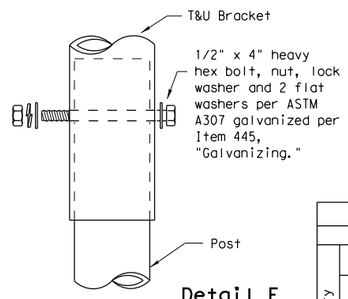


Detail F

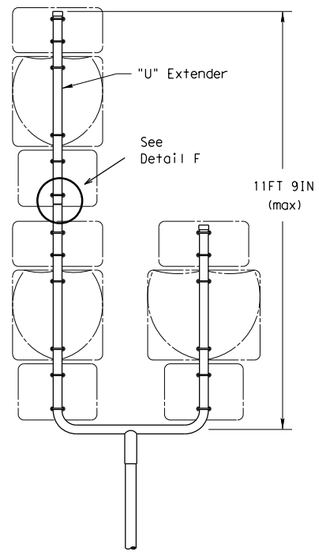
Splices shall only be allowed behind the sign substrate.



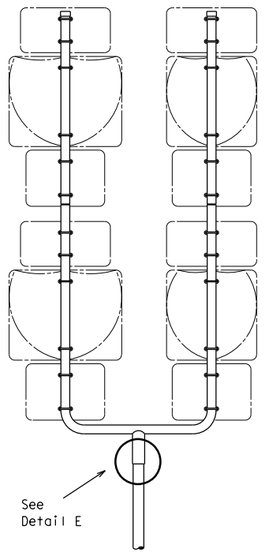
Detail C



Detail E



SM RD SGN ASSM TY S80(1)XX(U-1EXT)



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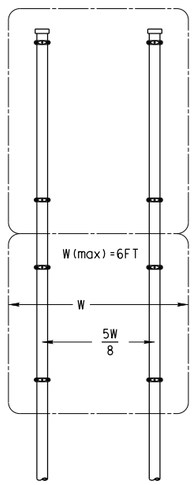
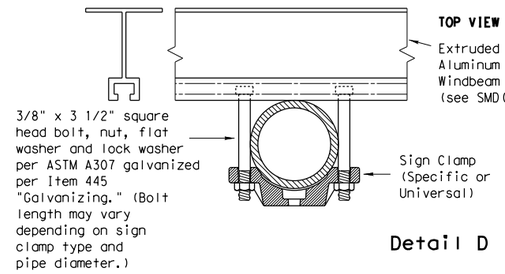
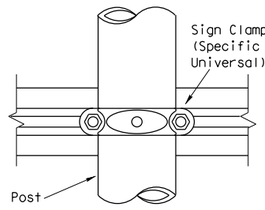


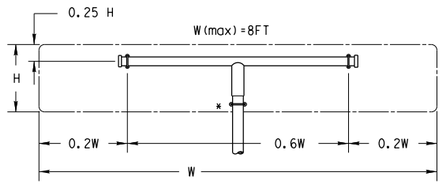
SM RD SGN ASSYM TY XXXXX(2)XX(P)

SIDE VIEW



Detail D

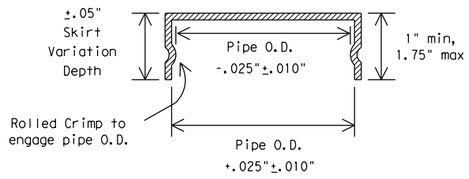




SM RD SGN ASSM TY XXXXX(1)XX(T)
(* - See Note 12)

All dimensions are in english unless detailed otherwise.

FRICTION CAP DETAIL



Friction caps may be manufactured from hot rolled or cold rolled steel sheets. The minimum sheet metal thickness shall be 24 gauge for all cap sizes.

The rim edges shall be reasonably straight and smooth. Caps shall be sized and formed in such a manner as to produce a drive-on friction fit and have no tendency to rock when seated on the pipe. The depth shall be sufficient to give positive protection against entrance of rainwater. They shall be free of sharp creases or indentations and show no evidence of metal fracture.

Caps shall have an electrodeposited coating of zinc in accordance with the requirements of ASTM B633 Class FE/ZN 8.

GENERAL NOTES:

1.

SIGN SUPPORT	# OF POSTS	MAX. SIGN AREA
10 BWG	1	16 SF
10 BWG	2	32 SF
Sch 80	1	32 SF
Sch 80	2	64 SF

2. The Engineer may require that a Schedule 80 post be used in place of a 10 BWG where a sign height is abnormally high due to a fill slope.
3. Sign supports shall not be spliced except where shown. Sign support posts shall not be spliced.
4. Aluminum sign blanks shall conform to Departmental Material Specifications DMS-7110 and shall have the following minimum thicknesses: 0.080 for signs less than 7.5 sq. ft., 0.100 for signs 7.5 to 15 sq. ft., and 0.125 for signs greater than 15 sq. ft.
5. Signs that require specific supports due to reasons in addition to windloading are indicated on the "REQUIRED SUPPORT" table on this sheet.
6. For horizontal rectangular signs fabricated from flat aluminum, T-brackets are used for signs 24 inches or less in height. U-brackets are used for signs of greater height.
7. When two triangular slipbase supports are used to support a single sign, they shall not be "rigidly" connected to each other except through the sign panel. This will allow each support to act independently when impacted by an errant vehicle.
8. Wing channel shall meet ASTM A 1011 SS Gr 50 and be galvanized per ASTM A 123.
9. Excess pipe, wing channel, or windbeam shall be cut off so that it does not extend beyond the sign panel (i.e., excess support shall not be visible when the sign is viewed from the front.) Repair galvanized coating at cut support ends per Item 445, "Galvanizing."
10. Additional route markers may be added vertically, provided the total sign area does not exceed the maximum allowable amount per Note 1.
11. Additional sign clamp required on the "T-bracket" post for 24 inch height signs. Place the clamp 3 inches above bottom of sign when possible.
12. Post open ends shall be fitted with Friction Caps.
13. Sign blanks shall be the sizes and shapes shown on the plans.

REQUIRED SUPPORT

	SIGN DESCRIPTION	SUPPORT
Regulatory	48-inch STOP sign (R1-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	60-inch YIELD sign (R1-2)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	48x16-inch ONE-WAY sign (R6-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	36x48, 48x36, and 48x48-inch signs	TY 10BWG(1)XX(T)
	48x60-inch signs	TY S80(1)XX(T)
Warning	48x48-inch signs (diamond or square)	TY 10BWG(1)XX(T)
	48x60-inch signs	TY S80(1)XX(T)
	48-inch Advance School X-ing sign (S1-1)	TY 10BWG(1)XX(T)
	48-inch School X-ing sign (S2-1)	TY 10BWG(1)XX(T)
	Large Arrow sign (W1-6 & W1-7)	TY 10BWG(1)XX(T)

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS TRIANGULAR SLIPBASE SYSTEM

SMD(SLIP-2)-08

REVISIONS	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
9-08	CONT	SECT	JOB	HIGHWAY
	0467	02	020, ETC.	SH 220
	DIST	COUNTY		SHEET NO.
	FTW	ERATH		181

26C

DATE: 7/10/2024 6:31:34 PM
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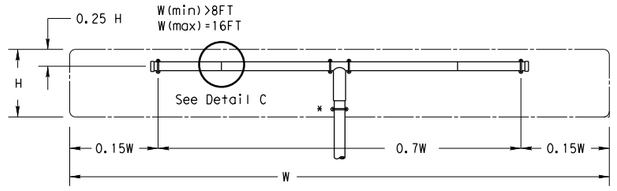
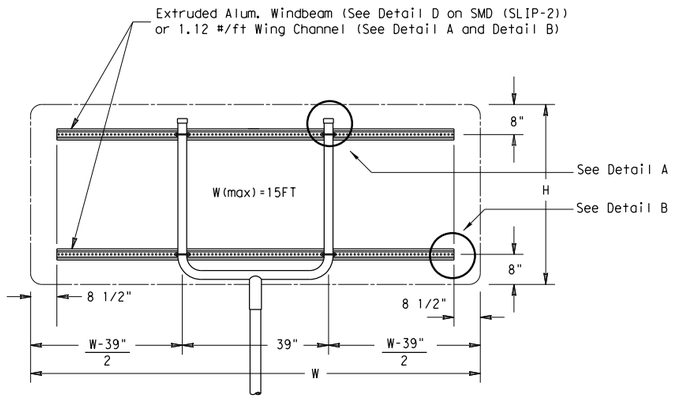
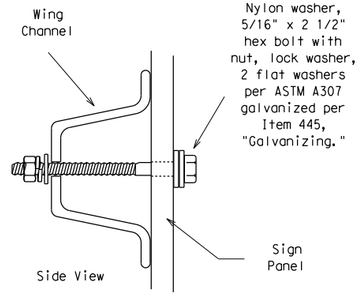


SM RD SGN ASSM TY XXXXX(1)XX(T-2EXT)

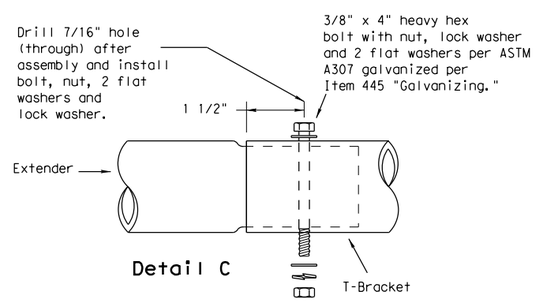
(* - See Note 12)



SM RD SGN ASSM TY XXXXX(1)XX(U-XX)



Detail B



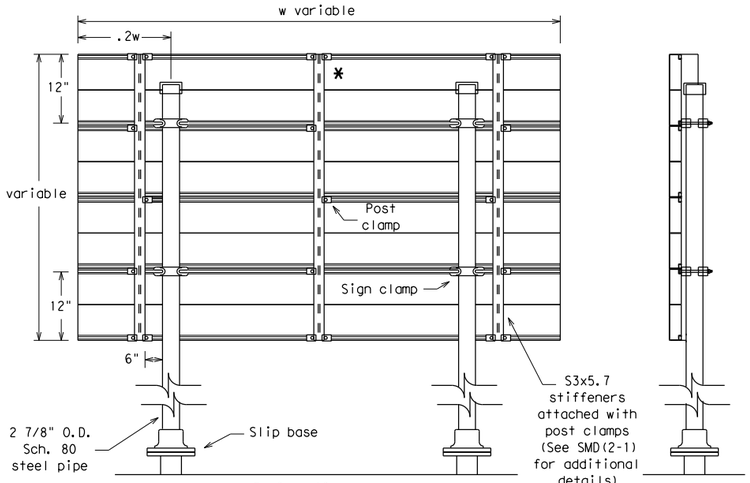
Detail C

Splices shall only be allowed behind the sign substrate.

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

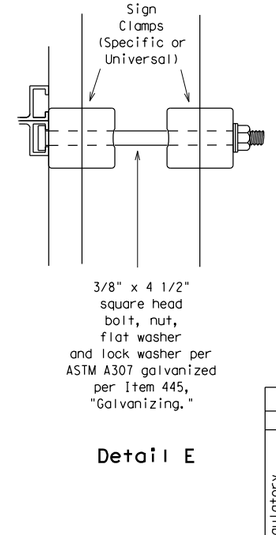
2. The Engineer may require that a Schedule 80 post be used in place of a 10 BWG where a sign height is abnormally high due to a fill slope.
3. Sign supports shall not be spliced except where shown. Sign support posts shall not be spliced.
4. Aluminum sign blanks shall conform to Departmental Material Specifications DMS-7110 and shall have the following minimum thicknesses: 0.080 for signs less than 7.5 sq. ft., 0.100 for signs 7.5 to 15 sq. ft., and 0.125 for signs greater than 15 sq. ft.
5. Signs that require specific supports due to reasons in addition to windloading are indicated on the "REQUIRED SUPPORT" table on this sheet.
6. For horizontal rectangular signs fabricated from flat aluminum, T-brackets are used for signs 24 inches or less in height. U-brackets are used for signs of greater height.
7. When two triangular slipbase supports are used to support a single sign, they shall not be "rigidly" connected to each other except through the sign panel. This will allow each support to act independently when impacted by an errant vehicle.
8. Wing channel shall meet ASTM A 1011 SS Gr 50 and be galvanized per ASTM A 123.
9. Excess pipe, wing channel, or windbeam shall be cut off so that it does not extend beyond the sign panel (i.e., excess support shall not be visible when the sign is viewed from the front.) Repair galvanized coating at cut support ends per Item 445, "Galvanizing."
10. Sign blanks shall be the sizes and shapes shown on the plans.
11. Additional sign clamp required on the "T-bracket" post for 24 inch high signs. Place the clamp 3 inches above bottom of sign when possible.
12. Post open ends shall be fitted with Friction Caps.



Typical Sign Mount

SM RD SGN ASSM TY S80(2)XX(P-EXAL)

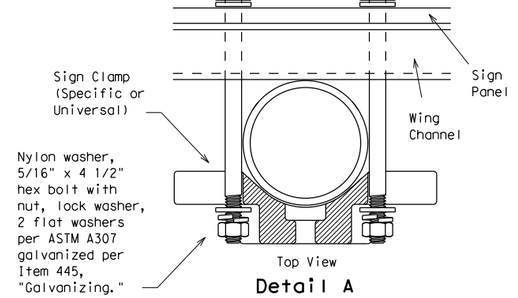
* Additional stiffener placed at approximate center of signs when sign width is greater than 10'.



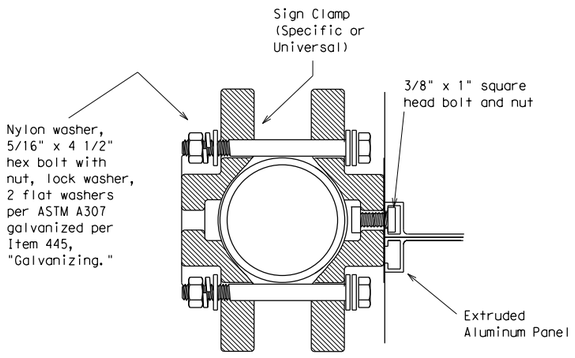
3/8" x 4 1/2"
square head
bolt, nut,
flat washer
and lock washer per
ASTM A307 galvanized
per Item 445,
"Galvanizing."

Detail E

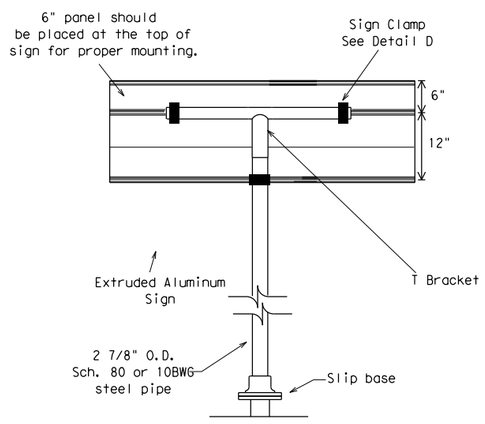
See Detail E
for clamp installation



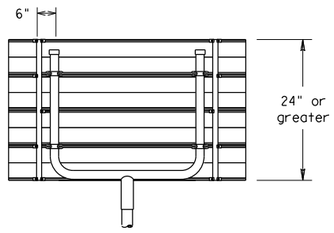
Detail A



Detail D
EXTRUDED ALUMINUM SIGN WITH T BRACKET



Extruded Aluminum Sign
With T Bracket



Use Extruded Alum. Windbeam as stiffeners
See SMD (2-1) for additional details

See Detail E
for clamp installation

REQUIRED SUPPORT		
	SIGN DESCRIPTION	SUPPORT
Regulatory	48-inch STOP sign (R1-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	60-inch YIELD sign (R1-2)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	48x16-inch ONE-WAY sign (R6-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	36x48, 48x36, and 48x48-inch signs	TY 10BWG(1)XX(T)
	48x60-inch signs	TY S80(1)XX(T)
Warning	48x48-inch signs (diamond or square)	TY 10BWG(1)XX(T)
	48x60-inch signs	TY S80(1)XX(T)
	48-inch Advance School X-ing sign (S1-1)	TY 10BWG(1)XX(T)
	48-inch School X-ing sign (S2-1)	TY 10BWG(1)XX(T)
	Large Arrow sign (W1-6 & W1-7)	TY 10BWG(1)XX(T)

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS
SMALL ROADSIDE SIGNS
TRIANGULAR SLIPBASE SYSTEM

SMD(SLIP-3)-08

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

REVISIONS
9-08

CONT	SECT	JOB	HIGHWAY
0467	02	020, ETC.	SH 220

DIST	COUNTY	SHEET NO.
FTW	ERATH	182

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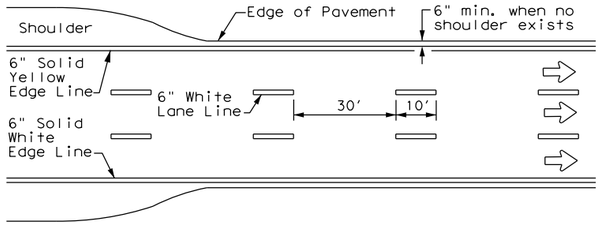
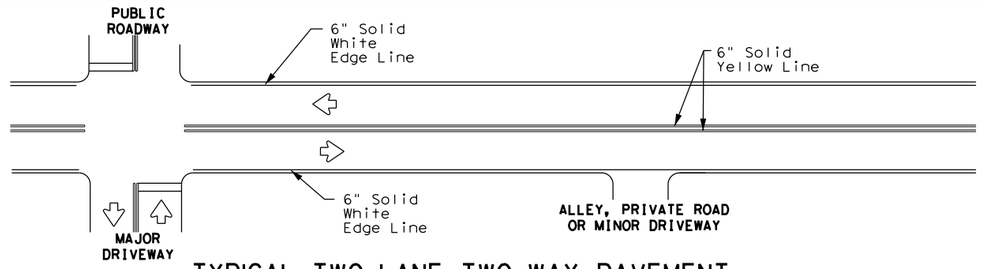
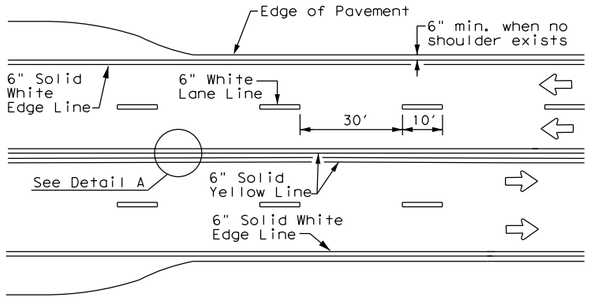
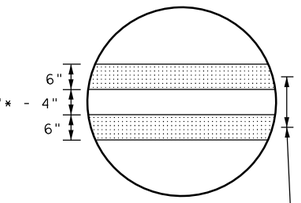


EDGE LINE AND LANE LINES ONE-WAY ROADWAY WITH OR WITHOUT SHOULDERS



TYPICAL TWO-LANE, TWO-WAY PAVEMENT MARKINGS THROUGH INTERSECTIONS





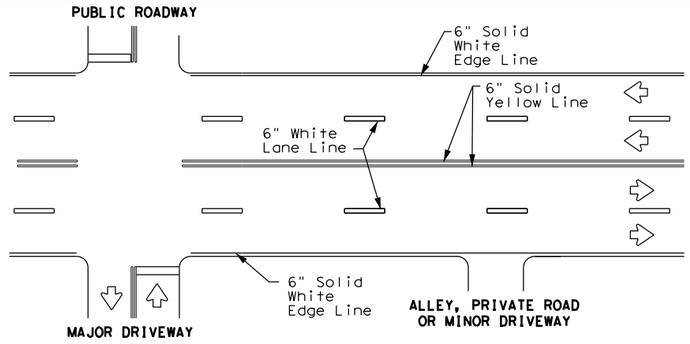
DETAIL "A"

9"** min. - 10" typ.
(18" max. for traveled way greater than 48' only)

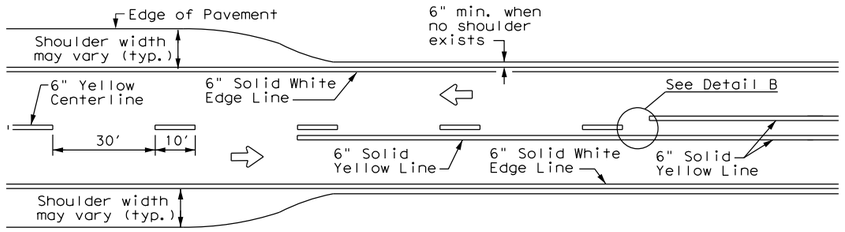
CENTERLINE AND LANE LINES FOUR LANE TWO-WAY ROADWAY WITH OR WITHOUT SHOULDERS

* 2" minimum for restripe projects when approved by the Engineer.

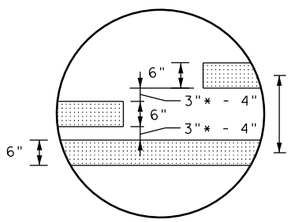
** 8" minimum for restripe projects when approved by the Engineer.



TYPICAL MULTI-LANE, TWO-WAY PAVEMENT MARKINGS THROUGH INTERSECTIONS

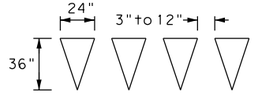


TWO LANE TWO-WAY ROADWAY WITH OR WITHOUT SHOULDERS

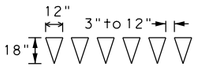


DETAIL "B"

* 2" minimum for restripe projects when approved by the Engineer.

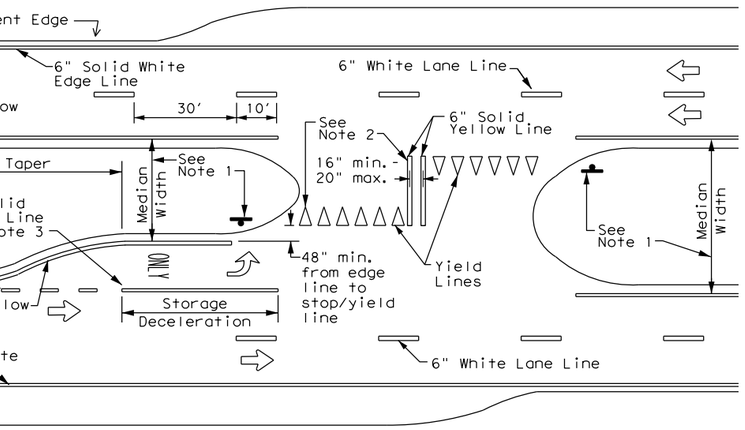


For posted speed on road being marked equal to or greater than 45 MPH.



For posted speed on road being marked equal to or less than 40 MPH.

YIELD LINES



FOUR LANE DIVIDED ROADWAY CROSSOVERS

NOTES

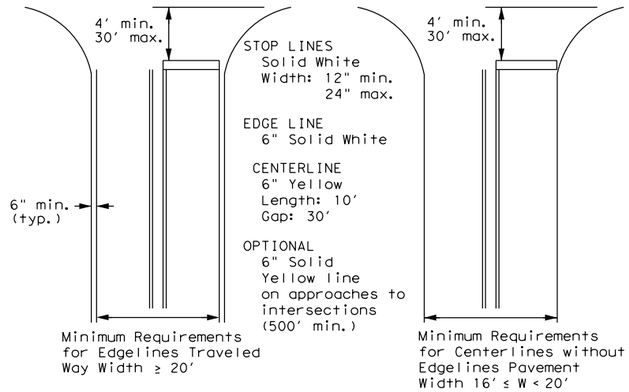
1. Where divided highways are separated by median widths at the median opening itself of 30 feet or more, median openings shall be signed as two separate intersections. Each median opening has two width measurements, with one measurement for each approach. The narrow median width will be the controlling width to determine if signs are required. Yield signs are the typical intersection control. Stop signs and stop bars are optional as determined by the Engineer.
2. Install median striping (double yellow centerlines and stop lines/yield lines) when a 50' or greater median centerline can be placed. Stop lines shall only be used with stop signs. Yield lines shall only be used with yield signs.
3. Length of turn bays, including taper, deceleration, and storage lengths shall be as shown on the plans or as directed by the Engineer.

GENERAL NOTES

1. Edge line striping shall be as shown in the plans or as directed by the Engineer. The edge line should not be placed less than 6 inches from the edge of pavement. This distance may vary due to pavement raveling or other conditions. Edge lines are not required in curb and gutter sections of roadways.
2. The traveled way includes only that portion of the roadway used for vehicular travel. It does not include the parking lanes, sidewalks, berms and shoulders. The traveled ways shall be measured from the center of edge line to the center of edge line of a two lane roadway.

MATERIAL SPECIFICATIONS	
PAVEMENT MARKERS (REFLECTORIZED)	DMS-4200
EPOXY AND ADHESIVES	DMS-6100
BITUMINOUS ADHESIVE FOR PAVEMENT MARKERS	DMS-6130
TRAFFIC PAINT	DMS-8200
HOT APPLIED THERMOPLASTIC	DMS-8220
PERMANENT PREFABRICATED PAVEMENT MARKINGS	DMS-8240

All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.



NOTE: Traveled way is exclusive of shoulder widths. Refer to General Note 2 for additional details.

GUIDE FOR PLACEMENT OF STOP LINES, EDGE LINE & CENTERLINE

Based on Traveled Way and Pavement Widths for Undivided Roadways

Texas Department of Transportation

Traffic Safety Division Standard

TYPICAL STANDARD PAVEMENT MARKINGS

PM(1)-22

FILE: pm1-22.dgn	DN:	CK:	DW:	CK:
© TxDOT December 2022	CONT	SECT	JOB	HIGHWAY
REVISIONS 11-78 8-00 6-20	0467	02	020, ETC.	SH 220
8-95 3-03 12-22	DIST	COUNTY		SHEET NO.
5-00 2-12	FTW	ERATH		183

22A

DATE: 7/10/2024 6:31:47 PM
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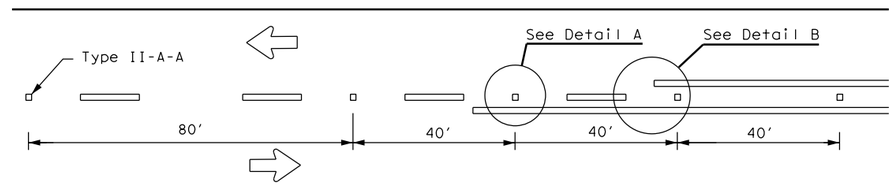
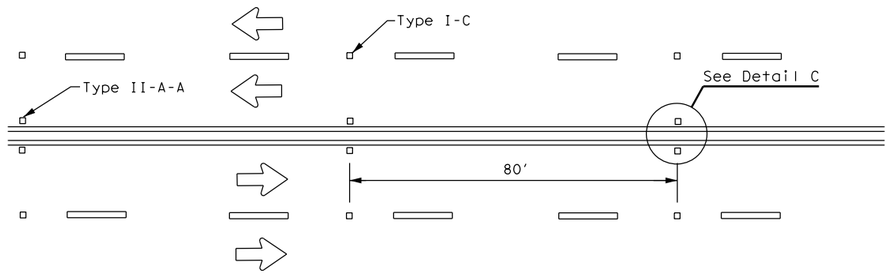
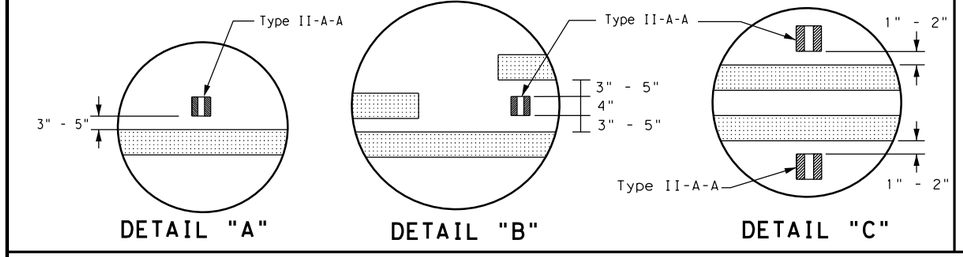
REFLECTIVE RAISED PAVEMENT MARKERS FOR VEHICLE POSITIONING GUIDANCE

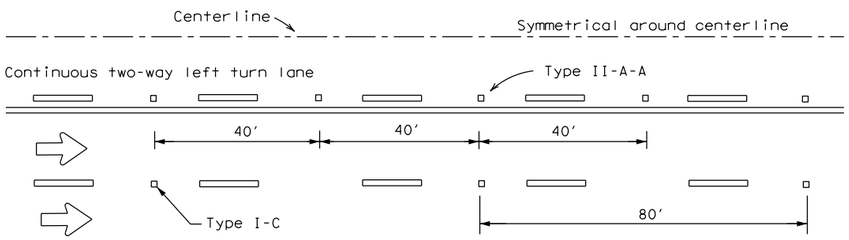


CENTERLINE FOR ALL TWO LANE TWO-WAY ROADWAYS

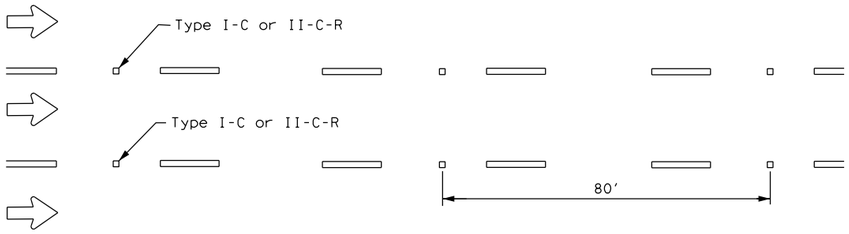


CENTERLINE & LANE LINES FOR FOUR LANE TWO-WAY ROADWAYS





CENTERLINE AND LANE LINES FOR TWO-WAY LEFT TURN LANE



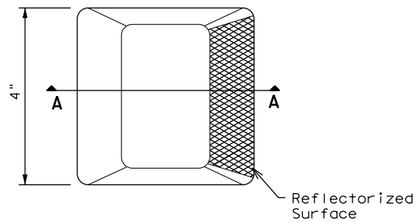
LANE LINES FOR ONE-WAY ROADWAY (NON-FREEWAY FACILITIES)

Raised pavement markers Type II-C-R shall have clear face toward normal traffic and red face toward wrong-way traffic.

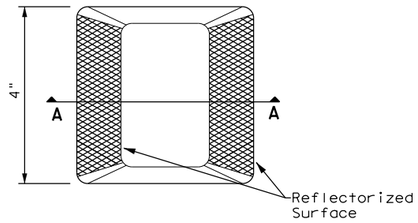
See Note 3.

MATERIAL SPECIFICATIONS	
PAVEMENT MARKERS (REFLECTORIZED)	DMS-4200
EPOXY AND ADHESIVES	DMS-6100
BITUMINOUS ADHESIVE FOR PAVEMENT MARKERS	DMS-6130
TRAFFIC PAINT	DMS-8200
HOT APPLIED THERMOPLASTIC	DMS-8220
PERMANENT PREFABRICATED PAVEMENT MARKINGS	DMS-8240

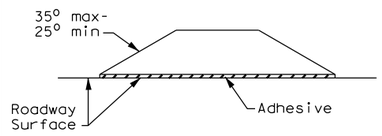
All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.



Type I (Top View)

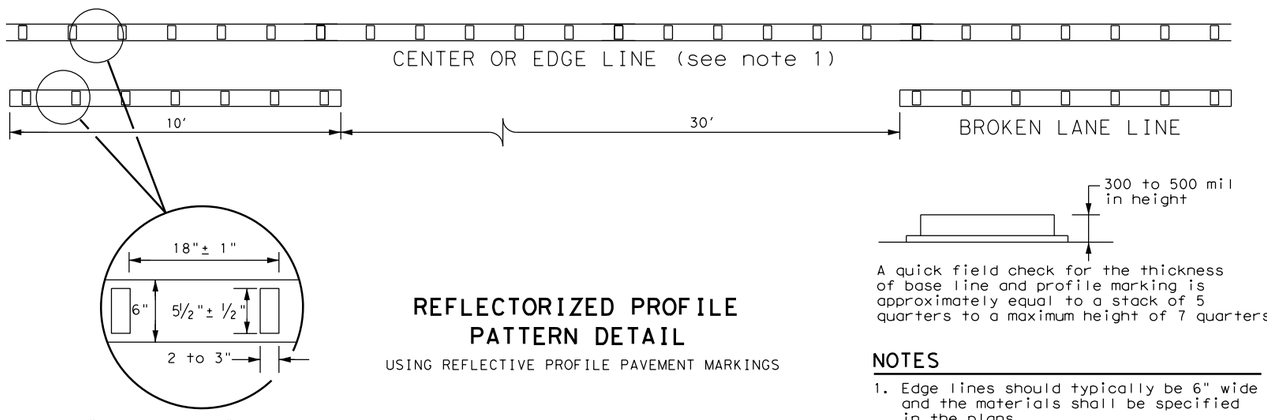


Type II (Top View)



SECTION A

RAISED PAVEMENT MARKERS



6" EDGE LINE, 6" CENTERLINE OR 6" LANE LINE

REFLECTORIZED PROFILE PATTERN DETAIL

USING REFLECTIVE PROFILE PAVEMENT MARKINGS

A quick field check for the thickness of base line and profile marking is approximately equal to a stack of 5 quarters to a maximum height of 7 quarters.

NOTES

1. Edge lines should typically be 6" wide and the materials shall be specified in the plans.
2. Profile markings shall not be placed on roadways with a posted speed limit of 45 MPH or less.

GENERAL NOTES

1. All raised pavement markers placed along broken lines shall be placed in line with and midway between the stripes.
2. On concrete pavements the raised pavement markers should be placed to one side of the longitudinal joints.
3. Use raised pavement marker Type I-C with undivided roadways, flush medians and two way left turn lanes. Use raised pavement marker Type II-C-R with divided highways and raised medians.

Texas Department of Transportation

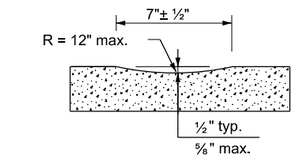
Traffic Safety Division Standard

POSITION GUIDANCE USING RAISED MARKERS RELECTORIZED PROFILE MARKINGS PM(2)-22

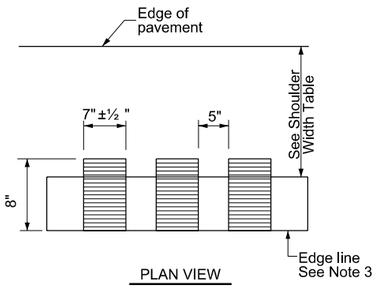
FILE: pm2-22.dgn	DN:	CK:	DW:	CK:
© TxDOT December 2022	CONT	SECT	JOB	HIGHWAY
REVISIONS 4-77 8-00 6-20 4-92 2-10 12-22 5-00 2-12	0467	02	020, ETC.	SH 220
	DIST	COUNTY		SHEET NO.
	FTW	ERATH		184

22B

DATE: 7/10/2024 6:31:54 PM
FILE: ...\STKTraffic\020pm2-22.dgn

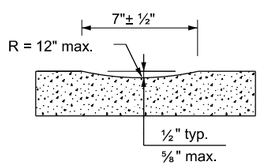


PROFILE VIEW
OPTION 1

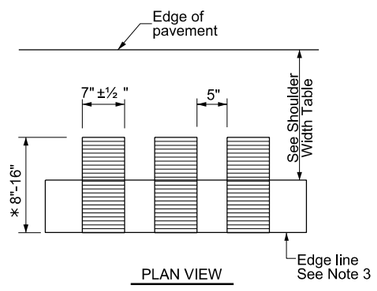


PLAN VIEW

CONTINUOUS MILLED DEPRESSIONS (Rumble Strips)



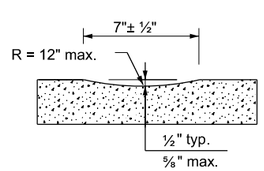
PROFILE VIEW
OPTION 2



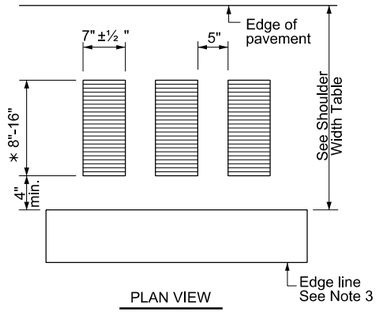
PLAN VIEW

∗ This distance may vary based on width of shoulder

CONTINUOUS MILLED DEPRESSIONS (Rumble Strips)



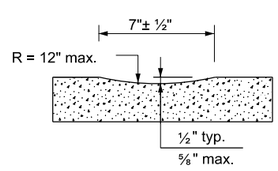
PROFILE VIEW
OPTION 3



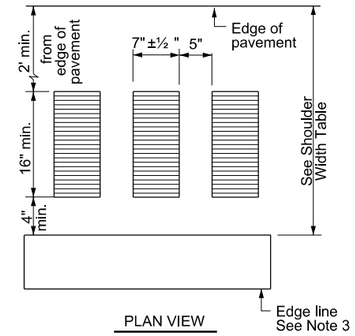
PLAN VIEW

∗ This distance may vary based on width of shoulder

CONTINUOUS MILLED DEPRESSIONS (Rumble Strips)

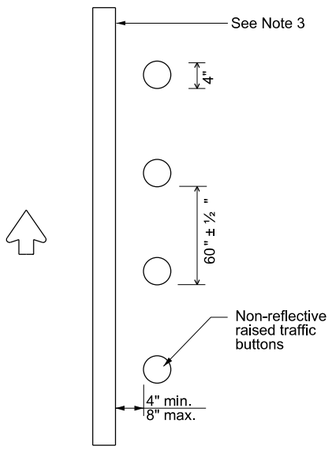


PROFILE VIEW
OPTION 4



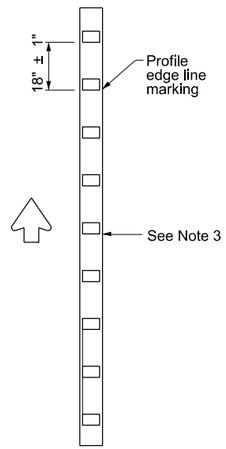
PLAN VIEW

CONTINUOUS MILLED DEPRESSIONS (Rumble Strips)



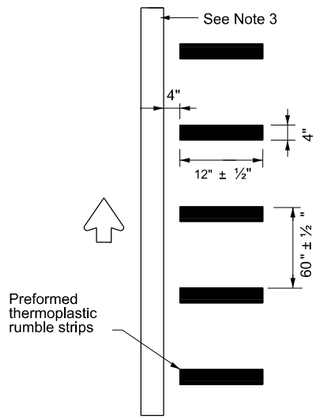
PLAN VIEW
OPTION 5

RAISED EDGE LINE (Rumble Strips)



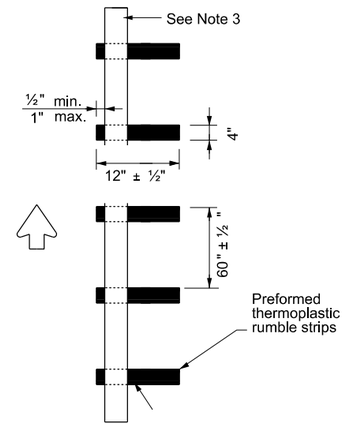
PLAN VIEW
OPTION 6

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

1. Rumble strips and profile markings shall not be placed on roadways with a posted speed limit of 45 MPH or less.
2. Milled rumble strips are preferred when adequate pavement depth is available. If pavement thickness is less than 2 inches, milled rumble strips shall not be used. Rumble strips shall not be milled or depressed into bridge decks.
3. Use Standard Sheet PM(2) and FPM(1) for positioning, dimensioning, and spacing of all reflective raised pavement markers, pavement markings, and profile markings.
4. See the Shoulder Width Table below for determining what options may be used for edge line rumble strips.
5. 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.
6. Rumble strips shall not be placed across exit or entrance ramps, acceleration or deceleration lanes, crossovers, gore areas, or intersections with other roadways.
7. 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.
8. Consideration shall be given to bicyclists. See RS(6).

WHEN INSTALLING MILLED DEPRESSION EDGE LINE RUMBLE STRIPS:

9. See dimensions for milled rumble strips. Other shapes and dimensions may be used if approved by the Traffic Safety Division.
10. 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:

11. Raised rumble strips consisting of non-reflective raised traffic buttons may be used. Non-reflective raised traffic buttons can be affixed to asphalt or concrete with bitumen or adhesives, as per the manufacturer's recommendations.
12. Non-reflective traffic buttons shall be placed adjacent to the pavement marking delineating the 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.
13. Non-reflective traffic buttons shall not be placed across exit or entrance ramps, acceleration and deceleration lanes, crossovers, gore areas or intersections with other roadways.
14. The minimum distance between the edge line and the buttons should be used if the shoulder is less than 8 feet in width.
15. Raised profile thermoplastic markings used as edge lines may substitute for buttons.

Texas Department of Transportation

Traffic Safety Division Standard

EDGE LINE RUMBLE STRIPS ON UNDIVIDED OR TWO LANE HIGHWAYS RS(2)-23

FILE: rs(2)-23.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT January 2023	CONT	SECT	JOB	HIGHWAY
REVISIONS	0467	02	020, ETC.	SH 220
10-13 1-23	DIST	COUNTY		SHEET NO.
	FTW	ERATH		185

DATE: 7/10/2024 6:32:00 PM
FILE: ...\ST\Traffic\020rs(2)-23.dgn

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):
0467-02-020, ETC.

1.2 PROJECT LIMITS:

SH 220 AT LITTLE DUFFAU CREEK &
SH 220 AT DUFFAU CREEK

1.3 PROJECT COORDINATES:

CSJ 0467-02-020 (SH 220 at Little Duffau Creek):

BEGIN: (Lat) 32.0322552, (Long) -98.0102860

END: (Lat) 32.0318277, (Long) -98.0104845

CSJ 0467-02-021 (SH 220 at Duffau Creek):

BEGIN: (Lat) 32.0320034, (Long) -98.0103524

END: (Lat) 32.0320034, (Long) -98.0103524

1.4 TOTAL PROJECT AREA (Acres): 6.99

CSJ 0467-02-020 (SH 220 at Little Duffau Creek): 4.39 Acres

CSJ 0467-02-021 (SH 220 at Duffau Creek): 2.63 Acres

1.5 TOTAL AREA TO BE DISTURBED (Acres): 6.99

1.6 NATURE OF CONSTRUCTION ACTIVITY:
Replace bridge and approaches
Grading and replacing bridge approach pavement

1.7 MAJOR SOIL TYPES:

Soil Type	Description
Sand	Clayey to clayey with gravel
Clay	Sandy lean
Limestone	

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: Replace bridge, install riprap
☐ Other: _____
☐ Other: _____

1.10 POTENTIAL POLLUTANTS AND SOURCES:

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

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

Tributaries	Classified Waterbody
Upper Duffau Creek	Subwatershed
Duffau Creek North Bosque River	Watershed
North Bosque	Subbasin
Brazos River	
Gulf of Mexico	

* 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
None

Jacobs Engineering Group
STATE OF TEXAS
PAUL K. CLARK
99509
LICENSED
PROFESSIONAL ENGINEER
F-2966
8/15/2024

STORMWATER POLLUTION PREVENTION PLAN (SWP3)

Sheet 1 of 2

Texas Department of Transportation

FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
6	(See Title Sheet)		186
STATE	STATE DIST.	COUNTY	
TEXAS	FTW	ERATH	
CONT.	SECT.	JOB	HIGHWAY NO.
0467	02	020, ETC.	SH 220

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
Seeding	181+85.00 242+72.50	197+80.00 252+27.50

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

2.4 OFFSITE VEHICLE TRACKING CONTROLS:

- ☒ Excess dirt/mud on road removed daily
- ☐ Haul roads dampened for dust control
- ☐ Loaded haul trucks to be covered with tarpaulin
- ☒ Stabilized construction exit
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____

2.5 POLLUTION PREVENTION MEASURES:

- ☒ Chemical Management
- ☒ Concrete and Materials Waste Management
- ☒ Debris and Trash Management
- ☒ Dust Control
- ☒ Sanitary Facilities
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____

2.6 VEGETATED BUFFER ZONES:

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

Type	Stationing	
	From	To

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

2.7 ALLOWABLE NON-STORMWATER DISCHARGES:

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

2.8 INSPECTIONS:

All disturbed areas and erosion and sediment control devices shall be inspected at least once every seven (7) days. Inspections shall be performed by TxDOT as indicated on the Field Inspection and Maintenance Report Form 2118 and retained in Attachment 2.5 of this SWP3 .

2.9 MAINTENANCE:

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

Jacobs Engineering Group
STATE OF TEXAS
PAUL K. CLARK
99509
LICENSED
PROFESSIONAL ENGINEER
F-2966

8/15/2024

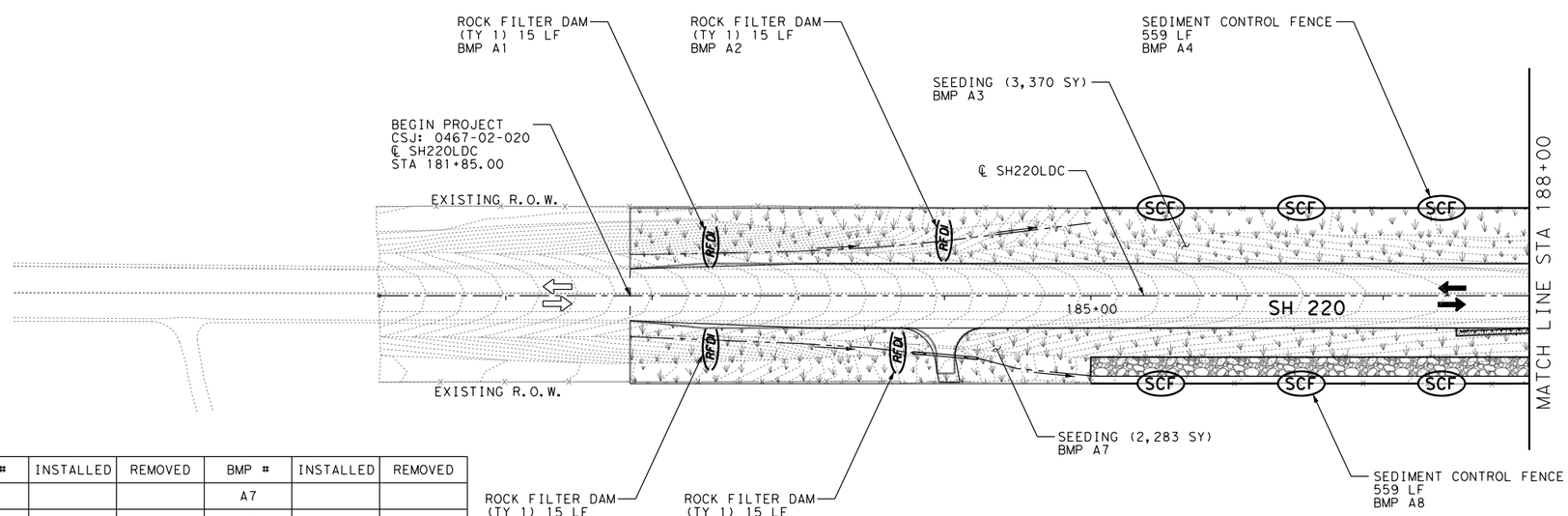
STORMWATER POLLUTION PREVENTION PLAN (SWP3)

Sheet 2 of 2

Texas Department of Transportation

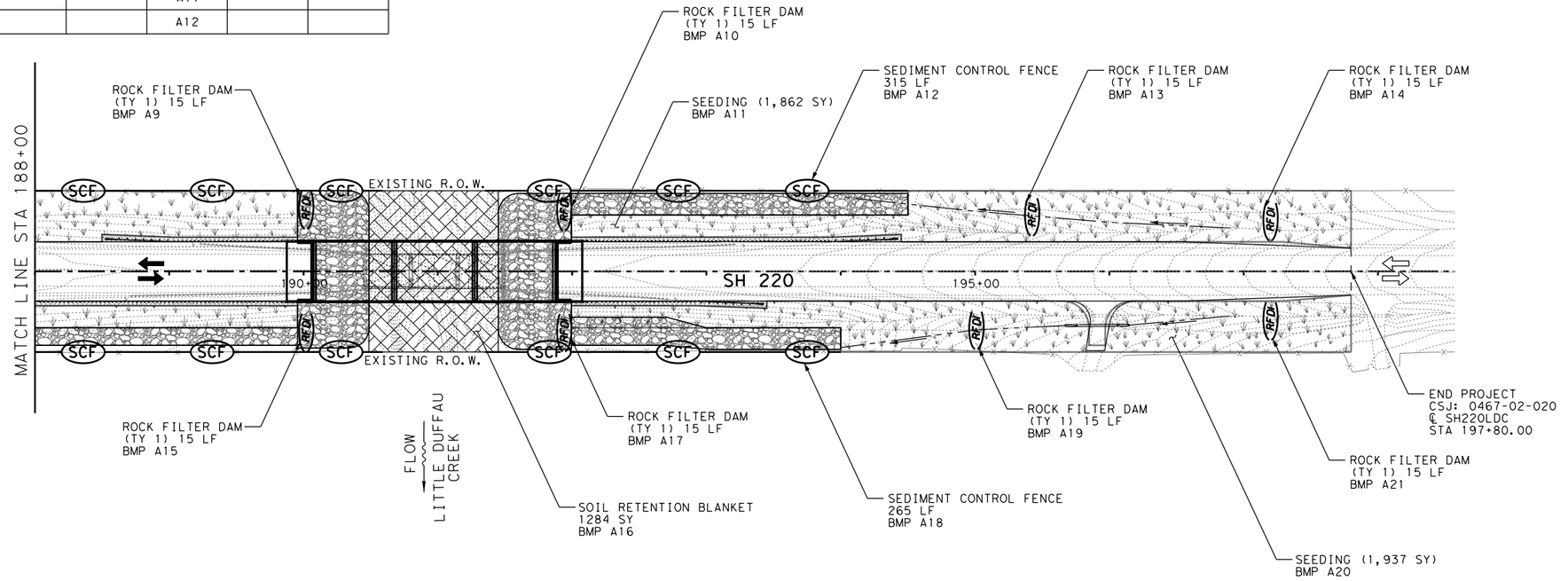
FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
6	(See Title Sheet)		187
STATE	STATE DIST.	COUNTY	
TEXAS	FTW	ERATH	
CONT.	SECT.	JOB	HIGHWAY NO.
0467	02	020, ETC.	SH 220

TIME: 6:32:21 PM
DATE: 7/10/2024



BMP #	INSTALLED	REMOVED	BMP #	INSTALLED	REMOVED
A1			A7		
A2			A8		
A3			A9		
A4			A10		
A5			A11		
A6			A12		

LITTLE DUFFAU CREEK



LITTLE DUFFAU CREEK

BMP #	INSTALLED	REMOVED	BMP #	INSTALLED	REMOVED
A13			A19		
A14			A20		
A15			A21		
A16					
A17					
A18					

LEGEND

- SCF — SEDIMENT CONTROL FENCE
- RFD — ROCK FILTER DAM (TY 1)
- STONE RIPRAP
- CONC MOWSTRIP
- SEEDING
- SOIL RETENTION BLANKET

NOTES:

1. CONSTRUCTION EXIT LOCATIONS TO BE DETERMINED IN THE FIELD BY THE CONTRACTOR AND APPROVED BY THE ENGINEER.
2. CONTRACTOR SHALL FIELD VERIFY LOCATIONS OF BMPS SHOWN AND ALTER LOCATIONS AS NEEDED TO ACHIEVE INTENDED PURPOSE AS APPROVED BY THE ENGINEER.

Jacobs
1999 BRYAN ST, SUITE 3500
DALLAS, TX 75201-3136
Phone: +1 (214) 638-0145
Firm Registration: F-2966

Texas Department of Transportation

SH 220

EROSION CONTROL PLAN
SH 220 AT LITTLE DUFFAU CREEK

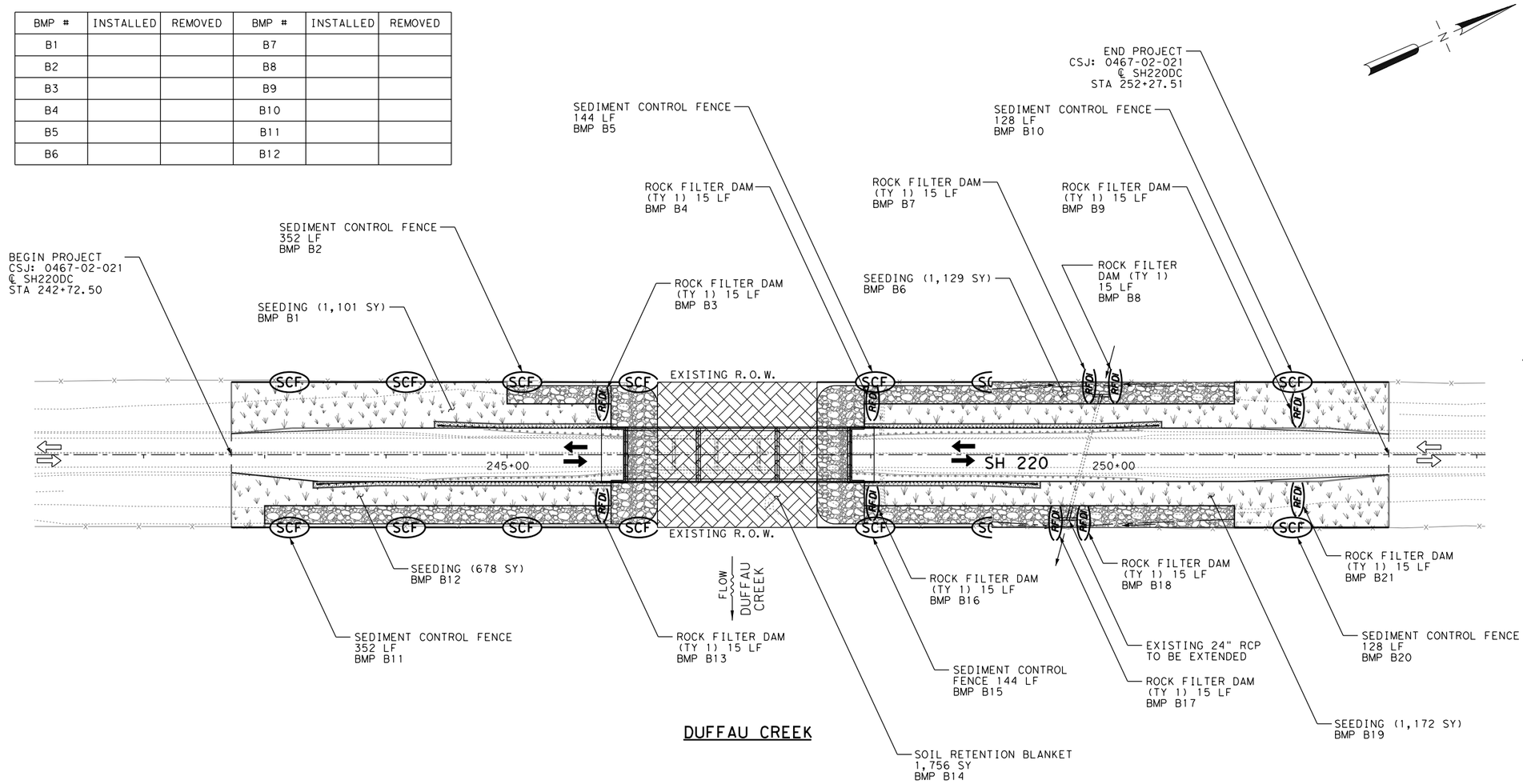
SCALE: 1"=100' (H) SHEET 1 OF 1

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NUMBER		HIGHWAY NO.
MBT	6	(See Title Sheet)		SH 220
CHECK	STATE	DISTRICT	COUNTY	SHEET NO.
PKC	TEXAS	FTW	ERATH	188
GRAPHICS	CONTROL	SECTION	JOB	
PKC	0467	02	020, ETC.	
CHECK				
JDB				

FILE: ...\EN\Shts\020EROO1.sht

TIME: 6:32:30 PM
DATE: 7/10/2024

BMP #	INSTALLED	REMOVED	BMP #	INSTALLED	REMOVED
B1			B7		
B2			B8		
B3			B9		
B4			B10		
B5			B11		
B6			B12		



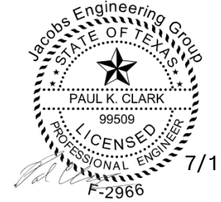
LEGEND

- SCF — SEDIMENT CONTROL FENCE
- RFDI — ROCK FILTER DAM (TY 1)
- STONE RIPRAP
- CONC MOWSTRIP
- SEEDING
- SOIL RETENTION BLANKET

NOTES:

1. CONSTRUCTION EXIT LOCATIONS TO BE DETERMINED IN THE FIELD BY THE CONTRACTOR AND APPROVED BY THE ENGINEER.
2. CONTRACTOR SHALL FIELD VERIFY LOCATIONS OF BMPS SHOWN AND ALTER LOCATIONS AS NEEDED TO ACHIEVE INTENDED PURPOSE AS APPROVED BY THE ENGINEER.

BMP #	INSTALLED	REMOVED	BMP #	INSTALLED	REMOVED
B13			B19		
B14			B20		
B15			B21		
B16					
B17					
B18					



Jacobs
1999 BRYAN ST, SUITE 3500
DALLAS, TX 75201-3136
Phone: +1 (214) 638-0145
Firm Registration: F-2966

Texas Department of Transportation

SH 220

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SH 220 AT DUFFAU CREEK

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CHECK PKC	STATE	DISTRICT	COUNTY	SHEET NO.
GRAPHICS PKC	TEXAS	FTW	ERATH	189
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	0467	02	020, ETC.	

FILE: ...\EN\Sht\021EROO1.sht

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. The Storm Water Management Plan covers all the incorporated urbanized areas of the City

☐ 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. NWP 14 - Little Duffau Creek
2.
3.
4.

The elevation of the ordinary high water marks of any areas requiring work to be performed in the waters of the US requiring the use of a nationwide permit can be found on the Bridge Layouts.

Best Management Practices:

Erosion	Sedimentation	Post-Construction TSS
☒ Temporary Vegetation	☒ Silt Fence	☐ Vegetative Filter Strips
☒ Blankets/Matting	☒ Rock Berm	☐ Retention/Irrigation Systems
☐ Mulch	☐ Triangular Filter Dike	☐ Extended Detention Basin
☐ Sodding	☐ Sand Bag Berm	☐ Constructed Wetlands
☐ Interceptor Swale	☐ Straw Bale Dike	☐ Wet Basin
☐ Diversion Dike	☐ Brush Berms	☐ Erosion Control Compost
☐ Erosion Control Compost	☐ Erosion Control Compost	☐ Mulch Filter Berm and Socks
☐ Mulch Filter Berm and Socks	☐ Mulch Filter Berm and Socks	☐ Compost Filter Berm and Socks
☐ Compost Filter Berm and Socks	☐ Compost Filter Berm and Socks	☐ Vegetation Lined Ditches
	☐ Stone Outlet Sediment Traps	☐ Sand Filter Systems
	☐ Sediment Basins	☐ Grassy Swales

III. CULTURAL RESOURCES

Refer to TxDOT Standard Specifications in the event historical issues or archeological artifacts are found during construction. Upon discovery of archeological artifacts (bones, burnt rock, flint, pottery, etc.) cease work in the immediate area and contact the Engineer immediately.

☒ No Action Required ☐ Required Action

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

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

☐ No Action Required ☒ Required Action

Action No.

1. The following species could occur in the project area: Golden-cheeked Warbler, Monarch Butterfly, Strecker's chorus frog, Woodhouse's toad, black-capped vireo, American bumblebee, Eastern red bat, Eastern spotted skunk, hoary bat, swamp rabbit, slender glass lizard, Texas garter snake, Western box turtle, Western massasauga, Comanche Peak prairie clover, and Hall's prairie clover. Follow the BMPs and Special Notes listed below to protect these species.
2. Contractor to implement the following BMPs from "Beneficial Management Practices: Avoiding, Minimizing, and Mitigating Impacts of Transportation Projects on State Natural Resources" available at https://ftp.txdot.gov/pub/txdot-info/env/toolkit/300-01-bmp.pdf.
   a. Section 2.4.4 Insect Pollinator BMP
   b. Section 2.5.1 Small Mammal BMP
   c. Section 2.2.1 Bird BMP
   d. Section 1.4 Water Quality BMP
   e. Section 1.5 Stream Crossing BMP
   f. Section 1.6 Dewatering BMP
   g. Section 1.2 Vegetation BMP
   h. Section 2.6.1 Aquatic Amphibian and Reptile BMP
   i. Section 2.6.2 Terrestrial Amphibian and Reptile BMP
   j. Section 2.5.3 Bat BMP
3. Any removal of woody vegetation habitat will be phased such that it occurs outside of the breeding season of the Golden-cheeked Warbler (therefore, between September 15 and March 1) to minimize effects to individual birds.

Special note: The Migratory Bird Act of 1918 states that it is unlawful to kill, capture, collect, possess, buy, sell trade or transport any migratory bird, nest, young, feather or egg in part or in while, without a federal permit issued in accordance within the Act's policies and regulations. The contractor would remove all old migratory bird nests from any structure where work would be done from October 1 to February 15. In addition, the contractor would be prepared to prevent migratory birds from building nest(s) between February 15 to October 1. In the event that migratory birds are encountered on site during construction, efforts to avoid adverse impacts on protected birds, active nests, eggs and/or young would be observed.

LIST OF ABBREVIATIONS

BMP:	Best Management Practice	SPCC:	Spill Prevention Control and Countermeasure
CGP:	Construction General Permit	SW3P:	Storm Water Pollution Prevention Plan
DSHS:	Texas Department of State Health Services	PCN:	Pre-Construction Notification
FHWA:	Federal Highway Administration	PSL:	Project Specific Location
MOA:	Memorandum of Agreement	TCEQ:	Texas Commission on Environmental Quality
MOU:	Memorandum of Understanding	TPDES:	Texas Pollutant Discharge Elimination System
MS4:	Municipal Separate Stormwater Sewer System	TPWD:	Texas Parks and Wildlife Department
MBTA:	Migratory Bird Treaty Act	TxDOT:	Texas Department of Transportation
NOT:	Notice of Termination	T&E:	Threatened and Endangered Species
NWP:	Nationwide Permit	USACE:	U.S. Army Corps of Engineers
NOI:	Notice of Intent	USFWS:	U.S. Fish and Wildlife Service

VI. HAZARDOUS MATERIALS OR CONTAMINATION ISSUES

General (applies to all projects):

Comply with the Hazard Communication Act (the Act) for personnel who will be working with hazardous materials by conducting safety meetings prior to beginning construction and making workers aware of potential hazards in the workplace. Ensure that all workers are provided with personal protective equipment appropriate for any hazardous materials used.

Obtain and keep on-site Material Safety Data Sheets (MSDS) for all hazardous products used on the project, which may include, but are not limited to the following categories: Paints, acids, solvents, asphalt products, chemical additives, fuels and concrete curing compounds or additives. Provide protected storage, off bare ground and covered, for products which may be hazardous. Maintain product labelling as required by the Act.

Maintain an adequate supply of on-site spill response materials, as indicated in the MSDS. In the event of a spill, take actions to mitigate the spill as indicated in the MSDS, in accordance with safe work practices, and contact the District Spill Coordinator immediately. The Contractor shall be responsible for the proper containment and cleanup of all product spills.

Contact the Engineer if any of the following are detected:
* Dead or distressed vegetation (not identified as normal)
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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)?

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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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Any other evidence indicating possible hazardous materials or contamination discovered on site. Hazardous Materials or Contamination Issues Specific to this Project:

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Action No.

1.

VII. OTHER ENVIRONMENTAL ISSUES

(includes regional issues such as Edwards Aquifer District, etc.)

☒ No Action Required ☐ Required Action

Action No.

1.

LITTLE DUFFAU CREEK

Texas Department of Transportation — Design Division Standard

ENVIRONMENTAL PERMITS, ISSUES AND COMMITMENTS

EPIC

FILE: epic.dgn	DN: TxDOT	CK: RG	DW: VP	CK: AR
©TxDOT: February 2015	CONT	SECT	JOB	HIGHWAY
REVISIONS 12-12-2011 (DS)	0467	02	020, ETC.	SH 220
05-07-14 ADDED NOTE SECTION IV.	DIST	COUNTY		SHEET NO.
01-23-2015 SECTION I (CHANGED ITEM 1122 TO ITEM 506, ADDED GRASSY SWALES.	FTW	ERATH		190

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FILE: ...\ST\SW3P\020epic.dgn

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DUFFAU CREEK

Texas Department of Transportation — Design Division Standard

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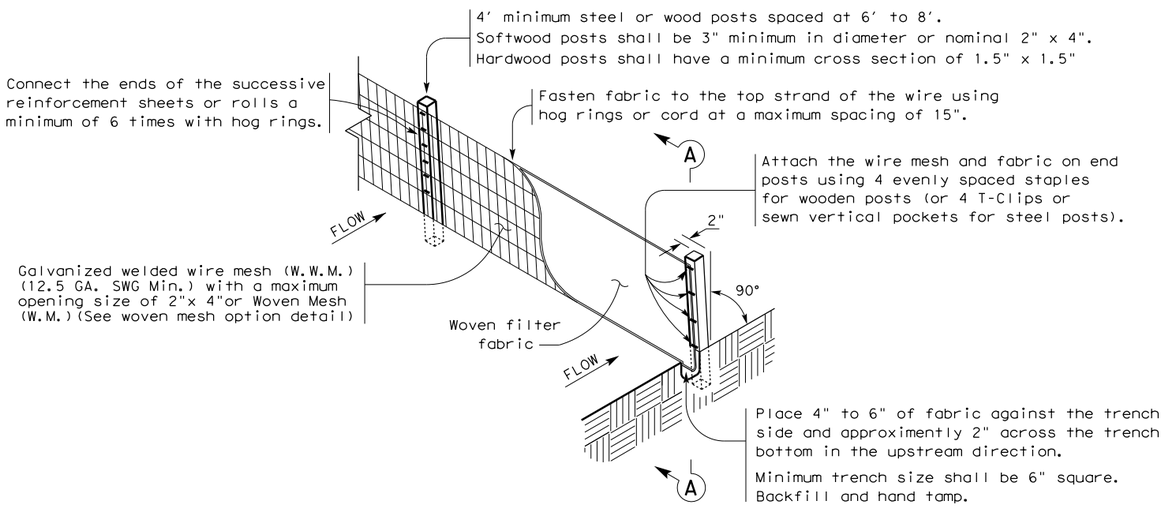
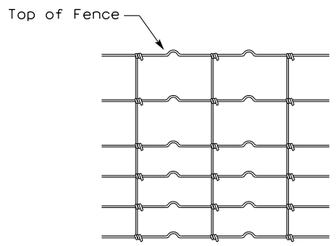
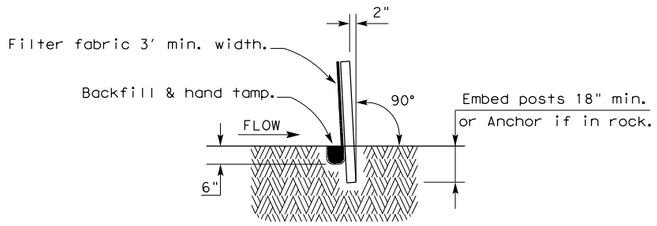


TEMPORARY SEDIMENT CONTROL FENCE

SCF





SECTION A-A

HINGE JOINT KNOT WOVEN MESH (OPTION) DETAIL

Galvanized hinge joint knot woven mesh (12.5 GA.SWG Min.) requires a minimum of five horizontal wires spaced at a maximum of 12 inches apart and all vertical wires spaced at a maximum of 12 inches apart.

SEDIMENT CONTROL FENCE USAGE GUIDELINES

A sediment control fence may be constructed near the downstream perimeter of a disturbed area along a contour to intercept sediment from overland runoff. A 2 year storm frequency may be used to calculate the flow rate to be filtered.

Sediment control fence should be sized to filter a maximum flow through rate of 100 GPM/FT^2. Sediment control fence is not recommended to control erosion from a drainage area larger than 2 acres.

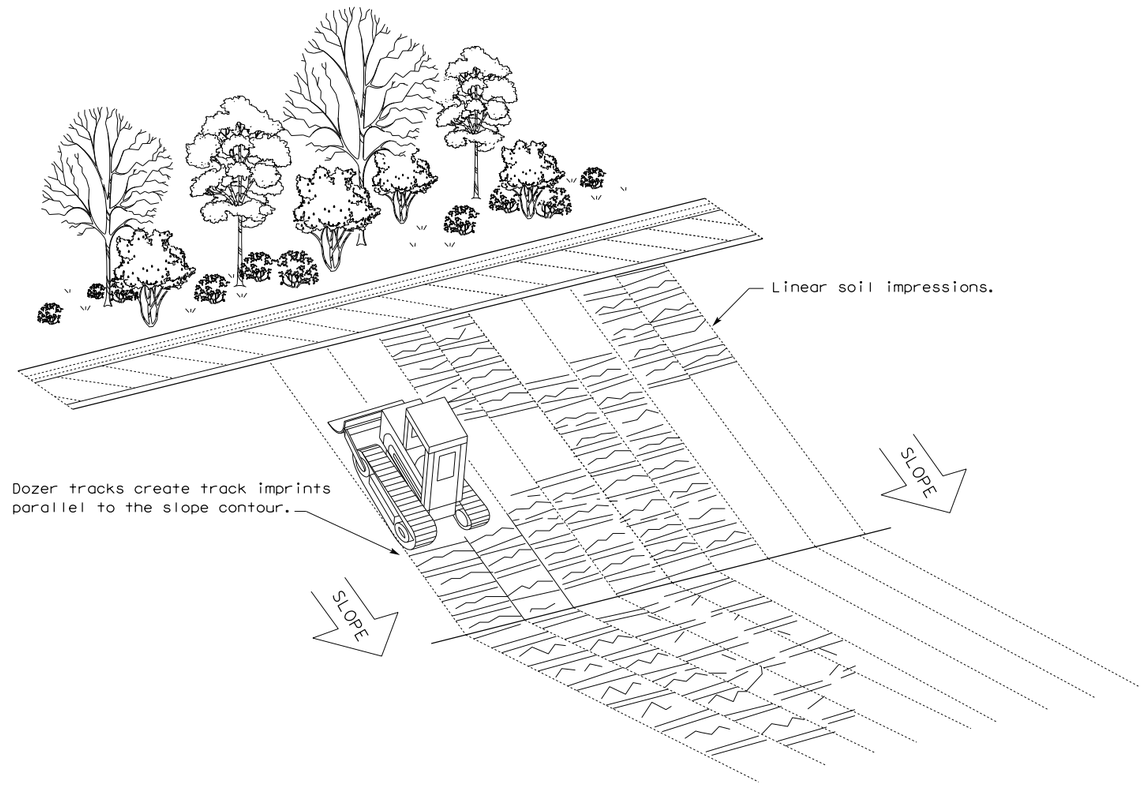
LEGEND

Sediment Control Fence

SCF

GENERAL NOTES

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



VERTICAL TRACKING

Texas Department of Transportation

Design Division Standard

TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

FENCE & VERTICAL TRACKING

EC(1)-16

FILE: ec116	DN: TxDOT		CK: KM		DW: VP		DN/CK: LS
© TxDOT: JULY 2016	CONT	SECT	JOB		HIGHWAY		
REVISIONS	0467	02	020, ETC.		SH 220		
	DIST	COUNTY			SHEET NO.		
	FTW	ERATH			192		

DATE 7/11/2024
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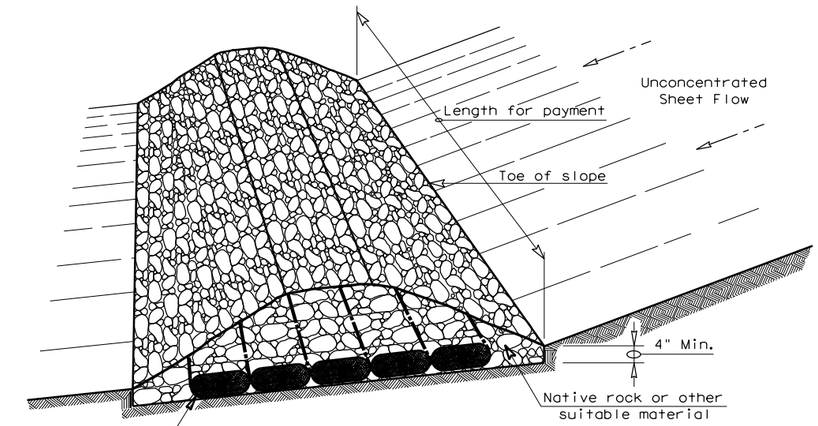
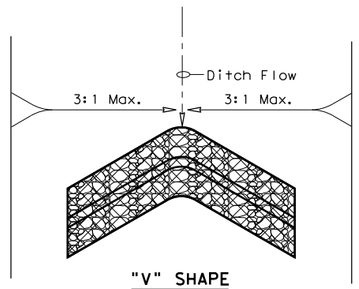
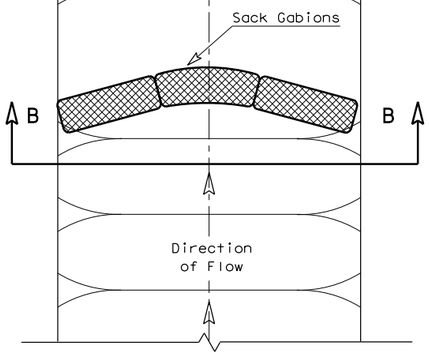


FILTER DAM AT TOE OF SLOPE

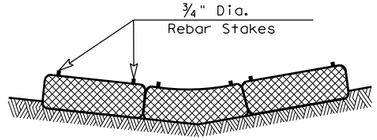
RFD1



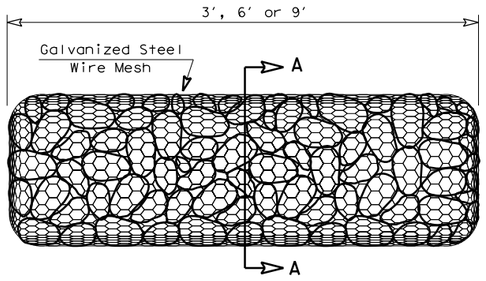
"V" SHAPE PLAN VIEW



PLAN VIEW

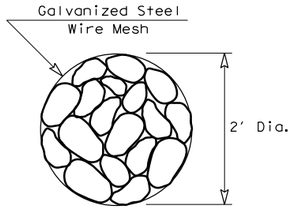


SECTION B-B

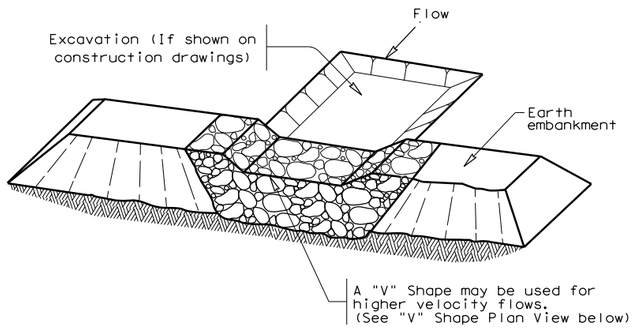


TYPE 4 (SACK GABIONS)

RFD4

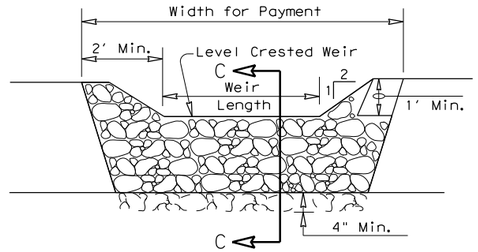


SECTION A-A

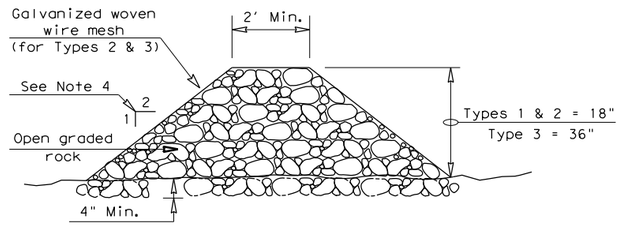


FILTER DAM AT SEDIMENT TRAP

RFD1 — OR — RFD2



PROFILE



SECTION C-C

ROCK FILTER DAM USAGE GUIDELINES

Rock Filter Dams should be constructed downstream from disturbed areas to intercept sediment from overland runoff and/or concentrated flow. The dams should be sized to filter a maximum flow through rate of 60 GPM/FT^2 of cross sectional area. A 2 year storm frequency may be used to calculate the flow rate.

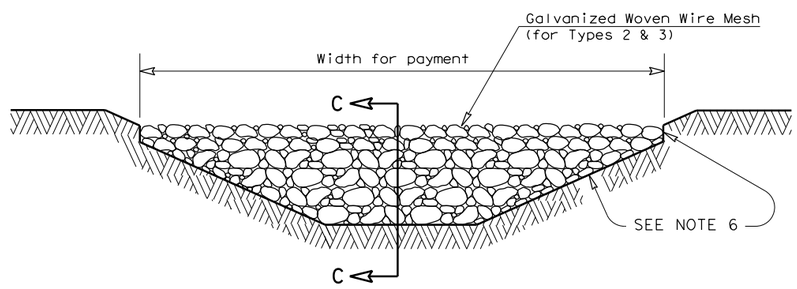
Type 1 (18" high with no wire mesh) (3" to 6" aggregate): Type 1 may be used at the toe of slopes, around inlets, in small ditches, and at dike or swale outlets. This type of dam is recommended to control erosion from a drainage area of 5 acres or less. Type 1 may not be used in concentrated high velocity flows (approximently 8 Ft/Sec or more) in which aggregate wash out may occur. Sandbags may be used at the embedded foundation (4" deep min.) for better filtering efficiency of low flows if called for on the plans or directed by the Engineer.

Type 2 (18" high with wire mesh) (3" to 6" aggregate): Type 2 may be used in ditches and at dike or swale outlets.

Type 3 (36" high with wire mesh) (4" to 8" aggregate): Type 3 may be used in stream flow and should be secured to the stream bed.

Type 4 (Sack gabions) (3" to 6" aggregate): Type 4 May be used in ditches and smaller channels to form an erosion control dam.

Type 5: Provide rock filter dams as shown on plans.



FILTER DAM AT CHANNEL SECTIONS

RFD1 — OR — RFD2 — OR — RFD3

GENERAL NOTES

1. If shown on the plans or directed by the Engineer, filter dams should be placed near the toe of slopes where erosion is anticipated, upstream and/or downstream at drainage structures, and in roadway ditches and channels to collect sediment.
2. Materials (aggregate, wire mesh, sandbags, etc.) shall be as indicated by the specification for "Rock Filter Dams for Erosion and Sedimentation Control".
3. The rock filter dam dimensions shall be as indicated on the SW3P plans.
4. Side slopes should be 2:1 or flatter. Dams within the safety zone shall have sideslopes of 6:1 or flatter.
5. Maintain a minimum of 1' between top of rock filter dam weir and top of embankment for filter dams at sediment traps.
6. Filter dams should be embedded a minimum of 4" into existing ground.
7. The sediment trap for ponding of sediment laden runoff shall be of the dimensions shown on the plans.
8. Rock filter dam types 2 & 3 shall be secured with 20 gauge galvanized woven wire mesh with 1" diameter hexagonal openings. The aggregate shall be placed on the mesh to the height & slopes specified. The mesh shall be folded at the upstream side over the aggregate and tightly secured to itself on the downstream side using wire ties or hog rings. For in stream use, the mesh should be secured or staked to the stream bed prior to aggregate placement.
9. Sack Gabions should be staked down with ¾" dia. rebar stakes, and have a double-twisted hexagonal weave with a nominal mesh opening of 2 ½" x 3 ¼"
10. Flow outlet should be onto a stabilized area (vegetation, rock, etc.).
11. The guidelines shown hereon are suggestions only and may be modified by the Engineer.

PLAN SHEET LEGEND

Type 1 Rock Filter Dam — RFD1
Type 2 Rock Filter Dam — RFD2
Type 3 Rock Filter Dam — RFD3
Type 4 Rock Filter Dam — RFD4

Texas Department of Transportation

Design Division Standard

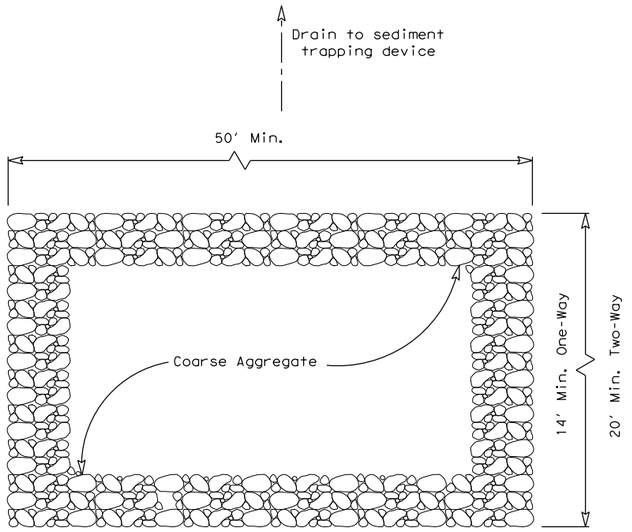
TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

ROCK FILTER DAMS

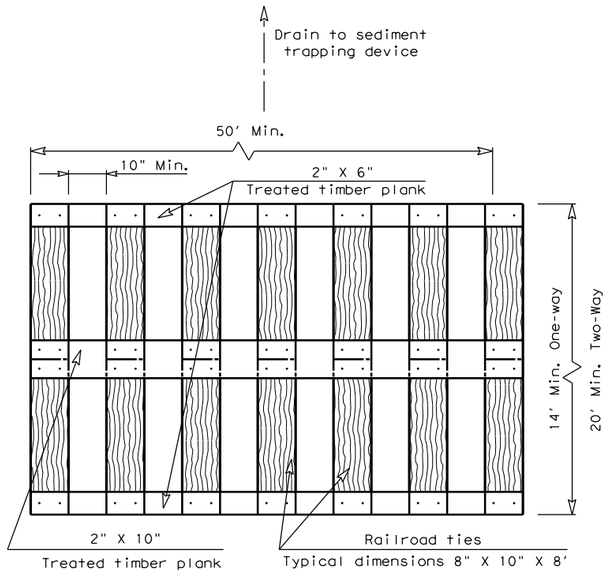
EC(2)-16

FILE: ec216	DN: TxDOT	CK: KM	DW: VP	DN/CK: LS
© TxDOT: JULY 2016	CONT	SECT	JOB	HIGHWAY
REVISIONS	0467	02	020, ETC.	SH 220
	DIST	COUNTY		SHEET NO.
	FTW	ERATH		193

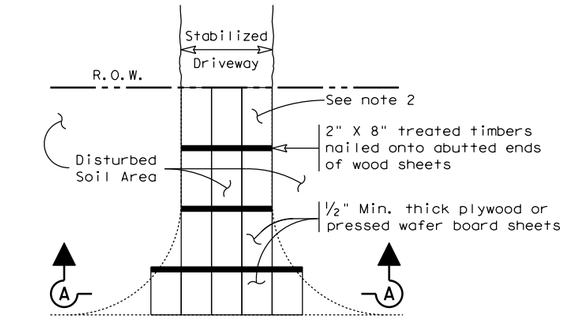
DATE: 7/11/2024
FILE: ...\ST\SW3P\020ec216.dgn



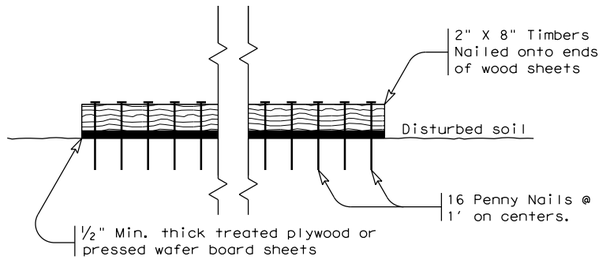
PLAN VIEW



PLAN VIEW



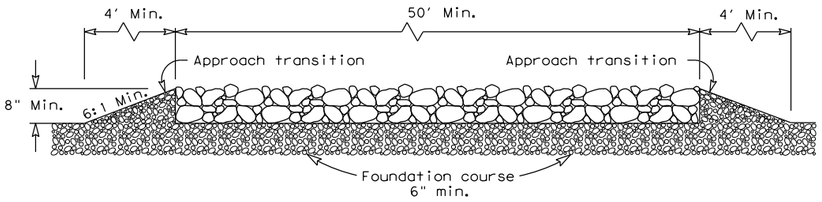
PLAN VIEW



SECTION A-A

CONSTRUCTION EXIT (TYPE 3)

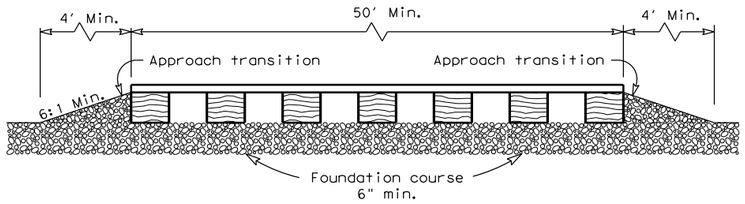
SHORT TERM



ELEVATION VIEW

CONSTRUCTION EXIT (TYPE 1)

ROCK CONSTRUCTION (LONG TERM)



ELEVATION VIEW

CONSTRUCTION EXIT (TYPE 2)

TIMBER CONSTRUCTION (LONG TERM)

GENERAL NOTES (TYPE 1)

1. The length of the type 1 construction exit shall be as indicated on the plans, but not less than 50′.
2. The coarse aggregate should be open graded with a size of 4" to 8".
3. The approach transitions should be no steeper than 6:1 and constructed as directed by the Engineer.
4. The construction exit foundation course shall be flexible base, bituminous concrete, portland cement concrete or other materialas approved by the Engineer.
5. The construction exit shall be graded to allow drainage to a sediment trapping device.
6. The guidelines shown hereon are suggestions only and may be modified by the Engineer.
7. Construct exits with a width of at least 14 ft. for one-way and 20 ft. for two-way traffic for the full width of the exit, or as directed by the engineer.

GENERAL NOTES (TYPE 2)

1. The length of the type 2 construction exit shall be as indicated on the plans, but not less than 50′.
2. The treated timber planks shall be attached to the railroad ties with ½"x 6" min. lag bolts. Other fasteners may be used as approved by the Engineer.
3. The treated timber planks shall be #2 grade min., and should be free from large and loose knots.
4. The approach transitions shall be no steeper than 6:1 and constructed as directed by the Engineer.
5. The construction exit foundation course shall be flexible base, bituminous concrete, portland cement concrete or other material as approved by the Engineer.
6. The construction exit should be graded to allow drainage to a sediment trapping device.
7. The guidelines shown hereon are suggestions only and may be modified by the Engineer.
8. Construct exits with a width of at least 14 ft. for one-way and 20 ft. for two-way traffic for the full width of the exit, or as directed by the engineer.

GENERAL NOTES (TYPE 3)

1. The length of the type 3 construction exit shall be as shown on the plans, or as directed by the Engineer.
2. The type 3 construction exit may be constructed from open graded crushed stone with a size of two to four inches spread a min. of 4" thick to the limits shown on the plans.
3. The treated timber planks shall be #2 grade min., and should be free from large and loose knots.
4. The guidelines shown hereon are suggestions only and may be modified by the Engineer.

Texas Department of Transportation

Design Division Standard

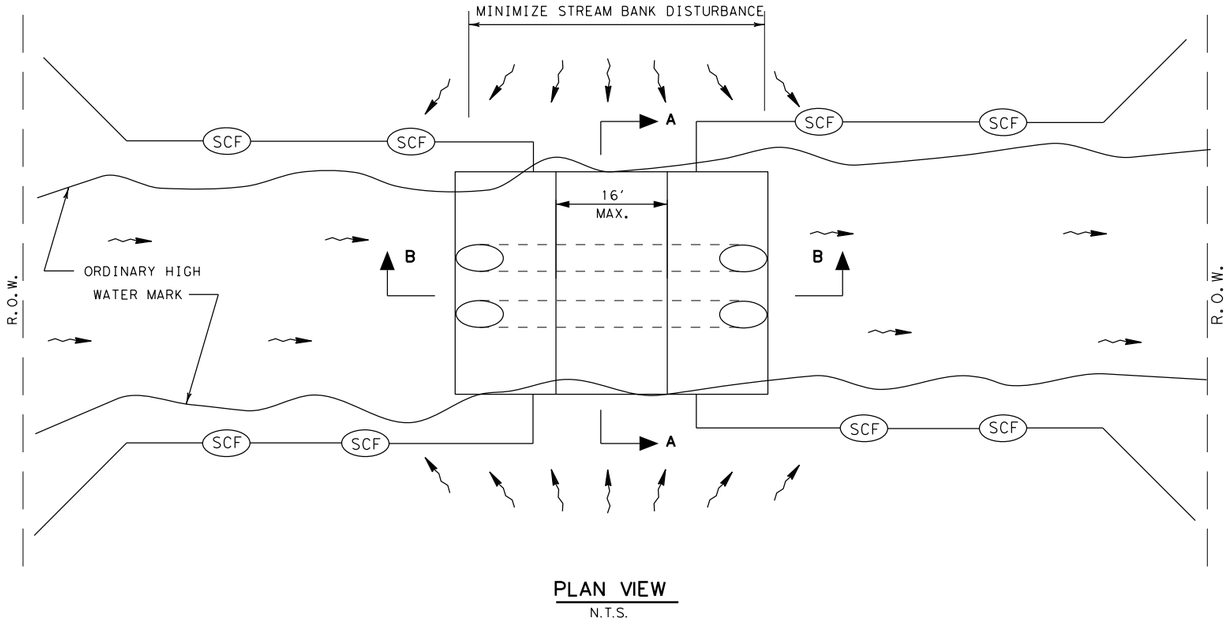
TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

CONSTRUCTION EXITS

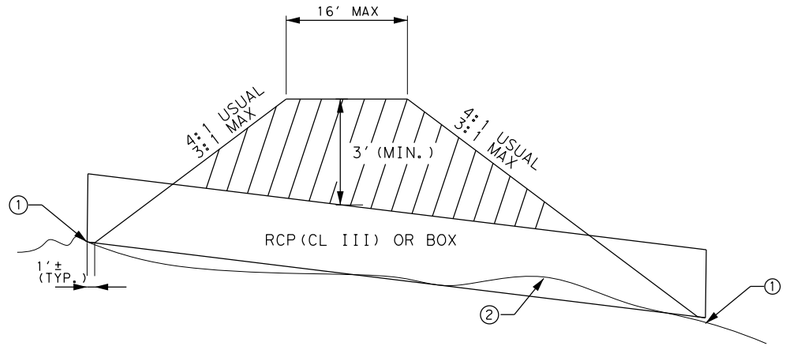
EC(3)-16

FILE: ec316	DN: TxDOT	CK: KM	DW: VP	DN/CK: LS
©TxDOT: JULY 2016	CONT	SECT	JOB	HIGHWAY
REVISIONS	0467	02	020, ETC.	SH 220
	DIST	COUNTY		SHEET NO.
	FTW	ERATH		194

DATE: 7/11/2024
FILE: ...\ST\SW3P\020ec316.dgn



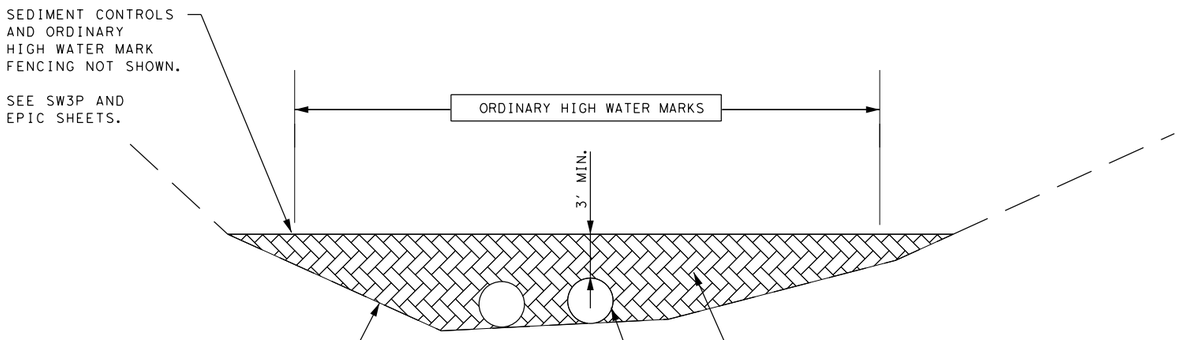
PLAN VIEW
N.T.S.



(1) MATCH EXISTING STREAM BED ELEVATION. MULTIPLE PIPES MAY HAVE DIFFERENT PROFILES.

(2) CROSSING LOCATION TO BE SELECTED SO THAT PIPES PROVIDE POSITIVE DRAINAGE WITH MINIMAL DISTURBANCE OF THE STREAM BED.

SECTION B–B
N.T.S.



SECTION A–A
N.T.S.

GENERAL NOTES

1. THIS DETAIL IS TO BE USED AT ANY LOCATIONS WHERE A TEMPORARY STREAM CROSSING IS NEEDED. A STREAM CROSSING IS ANY LOCATION WHERE CONCENTRATED FLOWING WATER OCCURS OR IS EXPECTED TO OCCUR FOLLOWING A RAIN EVENT. TEMPORARY CROSSINGS ARE NOT PERMITTED TO IMPOUND WATER BY BLOCKING A NATURAL WATERCOURSE.
2. THE CONTRACTOR WILL SUBMIT, IN WRITING AND ACCOMPANIED BY APPROPRIATE DRAWINGS, THE TYPE AND LOCATION OF EACH PROPOSED TEMPORARY STREAM CROSSING. THE SUBMTTAL WILL SHOW, IN DETAIL, THE PROPOSED WORK SEQUENCE AND THE MATERIALS TO BE USED IN THE CONSTRUCTION OF THE CROSSING. THE SUBMITTAL WILL BE EVALUATED BY THE TXDOT DISTRICT ENVIRONMENTAL QUALITY COORDINATOR AND APPROVED BY THE ENGINEER.
3. USE REINFORCED CONCRETE PIPE (CLASS III) OR PRECAST BOX CULVERTS UNLESS OTHERWISE APPROVED. DO NOT USE CORRUGATED METAL PIPE.
4. TEMPORARY STREAM CROSSINGS WILL BE PERMITTED ONLY WHEN NECESSARY AS DETERMINED BY THE ENGINEER. TXDOT WILL EVALUATE ACCESS FROM BOTH SIDES OF THE BRIDGE OR CULVERT AND ALSO EVALUATE THE CONTRACTOR'S PROPOSED DEMOLITION AND CONSTRUCTION TECHNIQUES.
5. ORDINARY HIGH WATER MARKS ARE ESTABLISHED BY THE FLUCTUATIONS OF WATER IN THE STREAM AND ARE INDICATED BY PHYSICAL CHARACTERISTICS SUCH AS A CLEAR NATURAL LINE IMPRESSED ON THE BANK, SHELVING, CHANGES IN THE SOIL CHARACTER, ABSENCE OF TERRESTRIAL VEGETATION, PRESENCE OF LITTER OR DEBRIS, OR OTHER APPROPRIATE MEANS THAT CONSIDER THE CHARACTERISTICS OF THE SURROUNDING AREAS.
6. DO NOT PUSH OR MOVE SOIL FROM ABOVE OR OUTSIDE THE ORDINARY HIGH WATER MARKS TO BELOW OR INSIDE THE ORDINARY HIGH WATER MARKS. NON–COMPLIANT WORK WILL BE REMOVED AT THE CONTRACTOR'S EXPENSE.
7. DAMAGE TO ANY TEMPORARY STREAM CROSSING WILL BE REPAIRED AT THE CONTRACTOR'S EXPENSE.
8. REMOVE ANY TEMPORARY STREAM CROSSINGS AS SOON AS POSSIBLE.
9. EXCEPT FOR SEDIMENT CONTROL FENCE, THE MATERIALS AND LABOR REQUIRED FOR CONSTRUCTION OF TEMPORARY STREAM CROSSINGS WILL NOT BE PAID FOR DIRECTLY, BUT WILL BE SUBSIDIARY TO THE VARIOUS BID ITEMS.

~→	DIRECTION OF FLOW
—SCF—	SEDIMENT CONTROL FENCE

Texas Department of Transportation

Fort Worth District Standard

TEMPORARY STREAM CROSSING DETAIL
TSCD-FTW

ORIGINAL DRAWING: 05/2019	tscdftw.dgn	PROJECT NO.			SHEET NO.
DATE	REVISIONS	(See Title Sheet)			195
05/2019	NEW STANDARD	STATE	STATE DIST. NO.	COUNTY	
		TEXAS	FTW	ERATH	
		CONT.	SECT.	JOB	HIGHWAY NO.
		0467	02	020, ETC.	SH 220